Mercedes-Benz

Service

Model Year 1992 (USA)
Models 124, 129, 201

Introduction into service

Mercedes-Benz of North America, Inc.

This Introduction Manual is intended to familiarize you with the technical changes for Model Year 1992. This manual covers models 124, 129 and 201, and *Sportline* models 300 E, 300 CE and 190 E 2.6.

Coverage of models 400 E and 500 E is contained in the Introduction Manual

Model Year 1992 (LSA)
Models 124.034 036 (400 E 500 E)

Coverage of model 140 is contained in the Introduction Manual

Model Year 1992 (LSA)
Model 140

Until the latest repair instructions are available on microfiche, this Introduction Manual can be used by Mercedes-Benz service personnel to familiarize themselves with important technical details to perform maintenance and repairs on the above Model Year 1992 vehicles.

All other repair instructions, adjustment values and maintenance jobs not listed here can be found in existing technical literature.

Mercedes-Benz Aktiengesellschaft
Vertrieb Personenwagen

February 1992

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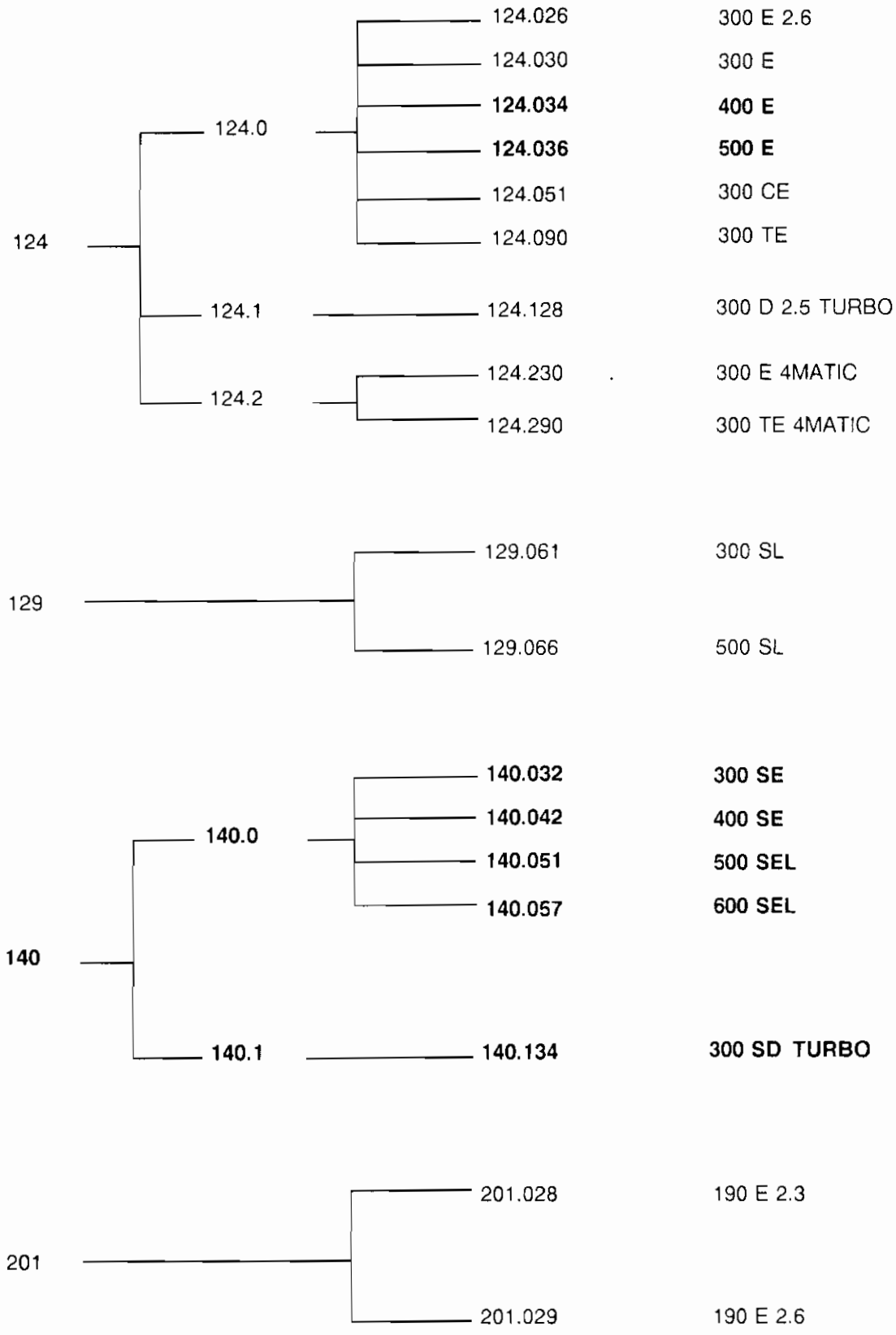
Vehicle identification 1992 (USA)



Models indicated in **bold** type are covered in separate Introduction Manuals.

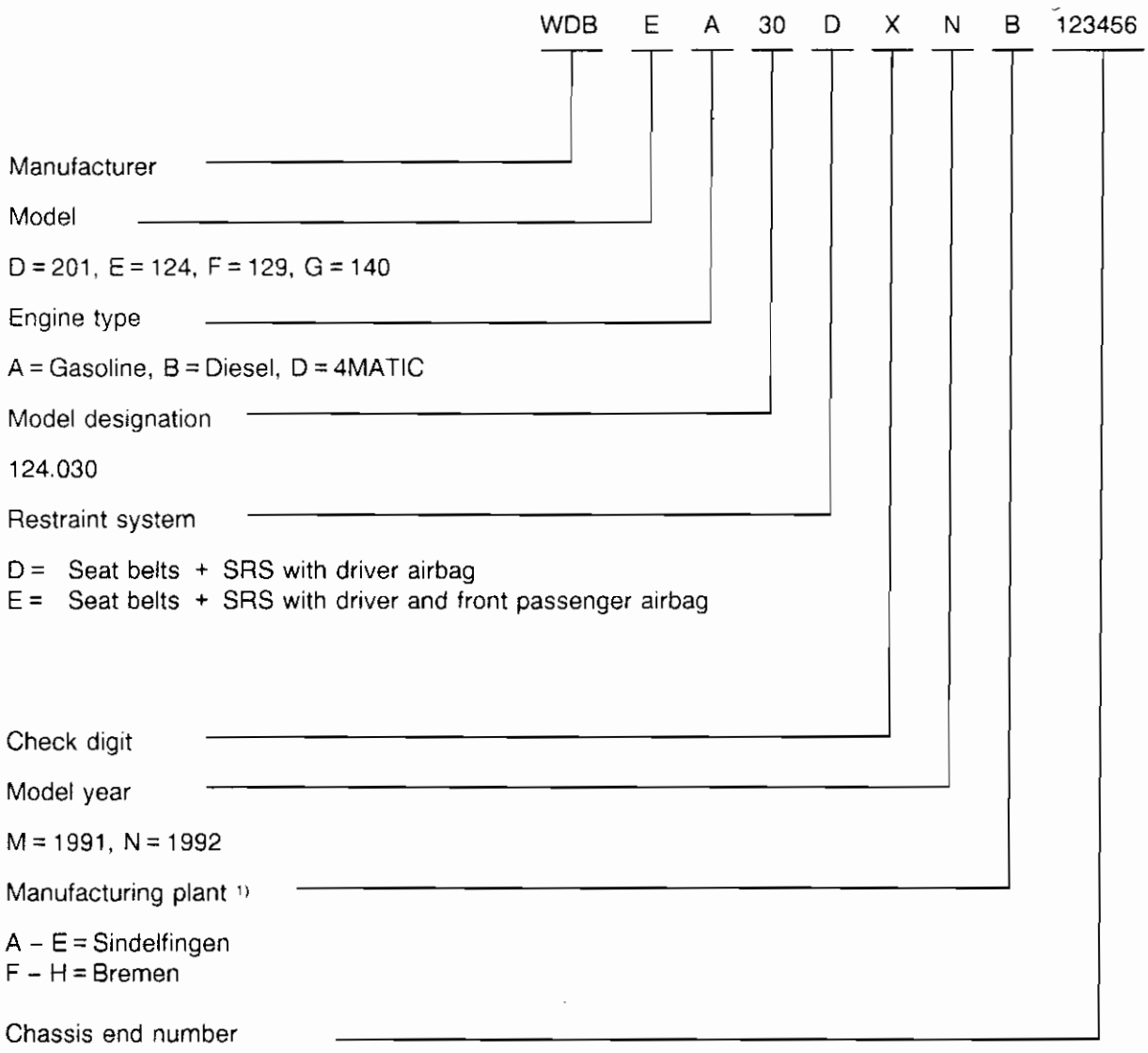
Component identification 1992 (USA)

Sales designation	Model	Engine	Manual transmission	Automatic transmission	Power steering
190 E 2.3	201.028	102.985	717.413	722.408	765.903
190 E 2.6	201.029	103.942	717.432	722.409	765.903
300 D 2.5 TURBO	124.128	602.962	–	722.418	765.904
300 E 2.6	124.026	103.940	–	722.409	765.904
300 E	124.030	103.983	–	722.358	765.904
400 E	124.034	119.975	–	722.354	765.921
500 E	124.036	119.974	–	722.365	765.921
300 CE	124.051	104.980	–	722.359	765.908
300 TE	124.090	103.983	–	722.358	765.904
300 E 4MATIC	124.230	103.985	–	722.342	765.906
300 TE 4MATIC	124.290	103.985	–	722.342	765.906
300 SD TURBO	140.134	603.971	–	722.367	765.940
300 SE	140.032	104.990	–	722.502	765.940
400 SE	140.042	119.971	–	722.366	765.940
500 SEL	140.051	119.970	–	722.370	765.940
600 SEL	140.057	120.980	–	722.362	765.940
300 SL	129.061	104.981	717.451	722.500	765.907
500 SL	129.066	119.960	–	722.353	765.925

Vehicle identification number (VIN)

The following information is encoded into the VIN:
Manufacturer, model, restraint system, model year, manufacturing plant and chassis end number.

Example, model 300 E: WDB E A 30 D X L B 123456



1) Manufacturing plant letter must be specified with the end number because simultaneous production at both plants may mean the same end number digits are assigned to two cars.

Engine family designations

The emission control system information plate attached to the radiator crossmember also shows the engine family designation. The engine family designation identifies model year, piston displacement, version, etc. (see example on next page).

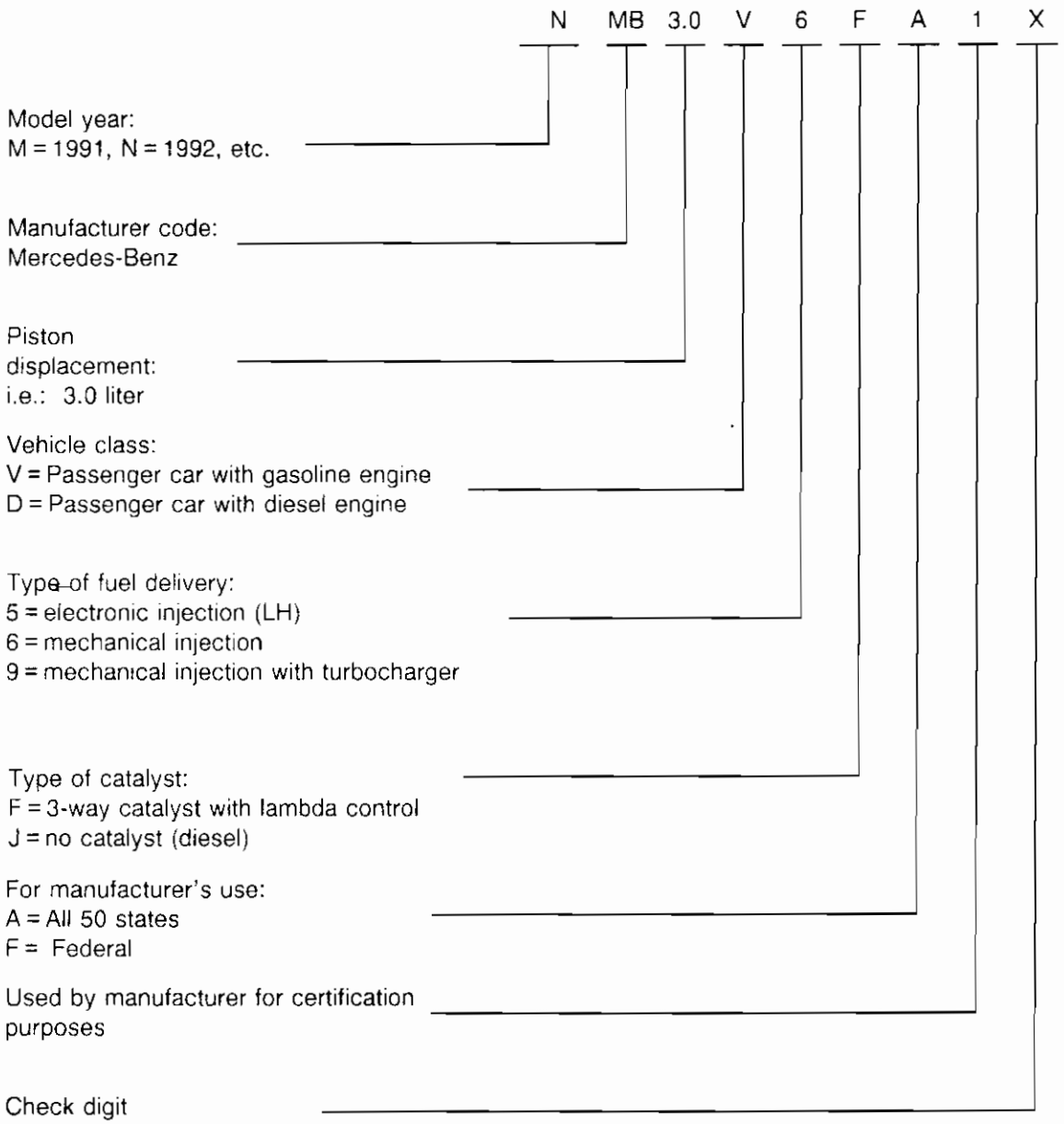
Designations

Engine family	Version [1]	Model	Vehicle sales designation
NMB 2.3 V 6 F A 19	A	201.028	190 E 2.3
NMB 3.0 V 6 F A 1X [2]	A	201.029	190 E 2.6
NMB 3.0 V 6 F A 1X [2]	A	124.026	300 E 2.6
NMB 3.0 V 6 F A 1X	A	124.030	300 E
NMB 3.0 V 6 F A 20	A	124.051	300 CE
NMB 3.0 V 6 F A 1X	A	124.090	300 TE
NMB 2.5 D 9 J F 11	F	124.128	300 D 2.5 TURBO
NMB 3.0 V 6 F A 1X	A	124.230	300 E 4MATIC
NMB 3.0 V 6 F A 1X	A	124.290	300 TE 4MATIC
NMB 3.0 V 6 F A 31	A	129.061	300 SL
NMB 5.0 V 6 F A 14	A	129.066	500 SL

1) A = All 50 states (including California)
F = Federal only (**not** including California)

2) For certification reasons, all 103.94 engines fall into the 3.0 liter engine family, even if the displacement equals only 2.6 liters (190 E 2.6 and 300 E 2.6).

Example: NMB 3.0 V 6 F A 1X



Engines 102, 103, 104, 119

07.3 CIS-E gasoline injection system

- Dual fuel pump package (engine 102.985).
- Battery voltage-dependent idle speed increase.
- Pneumatically operated transmission upshift delay.

14 Emission control system

- O_2-sensor replacement indicator (California only).
  Maintenance note:
  When warning lamp comes on (60,000 miles), replace O_2-sensor.

Engine 602.962

07.1 Diesel injection system

Modifications as compared to model year 1990/91:

- Injection pump (cam shape).
- Vacuum line layout.
- EDS control unit (reference map).
- EDS test program.
- EGR shut-off microswitch.
- Electric wiring diagrams
  (see Electrical Troubleshooting Manual).
- Prechamber with increased volume.
- Electric switchover valves: EGR, boost pressure control, pressure control flap.
- Single vacuum transducer for boost pressure control and pressure control flap.

07.1 Diesel injection system (continued)

The following was deleted:

- Boost pressure control vacuum transducer.
- Engine overload protection.
- Vacuum amplifier and vacuum amplifier switchover valve.

Drivetrain

27 Automatic transmission

- Secondary pump deleted.
- Transmission upshift delay modified.

35 Rear axle

- Rear axle ratio changed in models 124.026, 201.028/029.

46 Steering

- New design steering wheel.

54 Electrical system - equipment and instruments

- CHECK ENGINE warning lamp eliminated in Federal version vehicles.

Sportline (models 124.030/051, 201.029)

32 Suspension

- Suspension components modified, ride height lowered.

40 Wheels, wheel alignment

- Newly designed 8-hole light-alloy wheels for models 124.030/051.

46 Steering

- Newly designed steering wheel, 390 mm in diameter.

91 Seats

- Sport 4-place seating standard equipment in all *Sportline* models.

CIS-E gasoline injection system

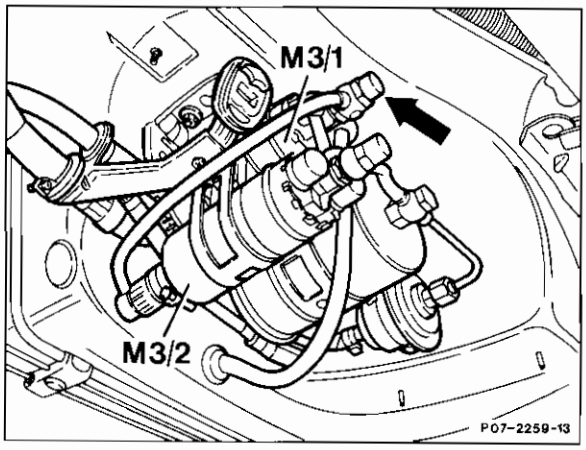
Modifications as compared to model year 1991

- Fuel pump package (engine 102.985).
- Battery voltage-dependent idle speed increase (engine 119 in model 129).
- Transmission upshift delay
  - Control of upshift delay via switchover valve (Y3/3).
  - Relay (K29) as well as solenoid valve (Y3/2) for upshift delay deleted from transmission.

Fuel pump package

Engine 102.985

Two fuel pumps are installed, as in model 201.029.



Battery voltage-dependent idle speed increase
Engine 119 in model 129

Effective serial number:
As of chassis end no. F 032599

Depending on battery voltage, the engine idle speed is increased by approx. 100 rpm with the transmission in gear, thereby increasing the charging capacity of the alternator.
The CIS-E control unit received a new part number to differentiate the control unit from the previous version.

Part no.

(USA) Federal	012 545 22 32
(USA) California	012 545 23 32

Operation
The idle speed increase is activated under the following conditions:

- Engine coolant temperature between 60 – 110 °C,
- Selector lever in gear,
- Battery voltage < 12.5 V for at least 20 seconds,
- Engine speed exceeded 900 rpm once.

The idle speed increase is switched off if:

- Selector lever positions "N" or "P" are engaged,
- Engine coolant temperature exceeds 110 °C,
- Ignition is switched OFF.

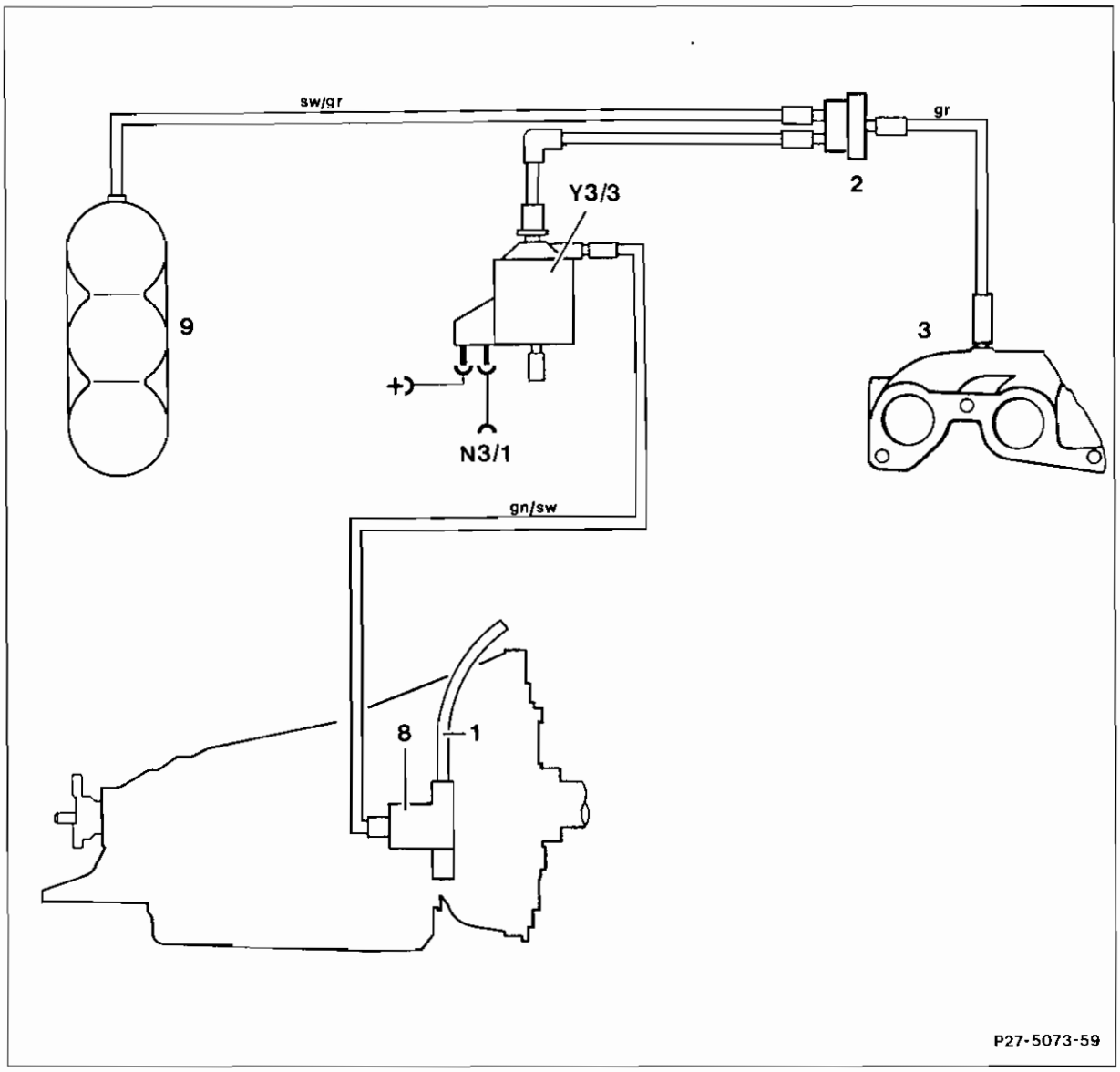
Once the conditions for activation are met, they remain stored in the CIS-E control unit until the ignition is switched off, even if the battery voltage has since risen above 12.5 V.

Transmission upshift delay

Engines 102, 103, 104, 119

The transmission upshift delay is controlled by the upshift delay switchover valve (Y3/3). The conditions for upshift delay remain unchanged (Operation, see group 27).

Function diagram, transmission upshift delay



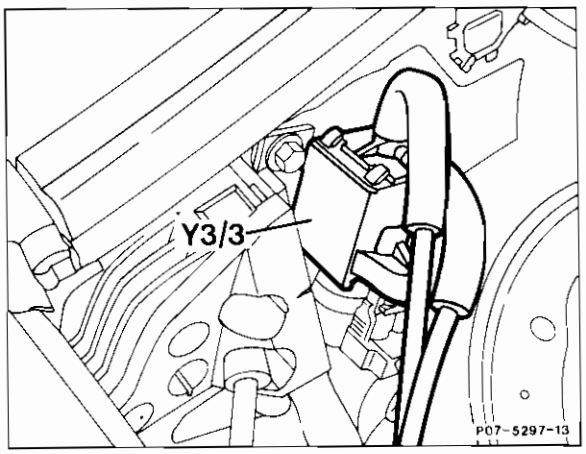
1 Control pressure cable
2 Check valve
3 Intake manifold
8 Upshift delay vacuum element
9 Vacuum reservoir

N3/1 LH control unit (N3 - CIS-E control unit)
Y3/3 Upshift delay switchover valve

sw black
gr grey
gn green

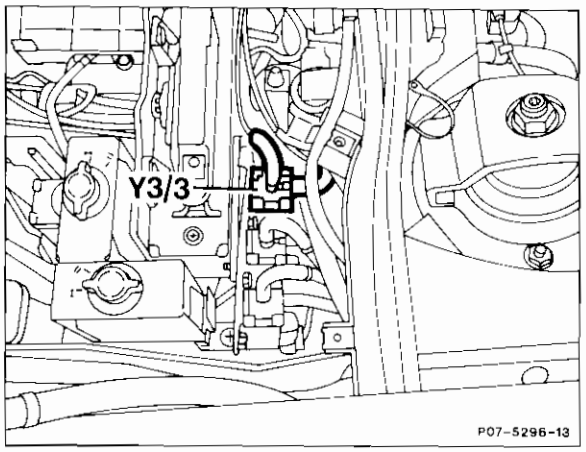
Component locations

Model 124



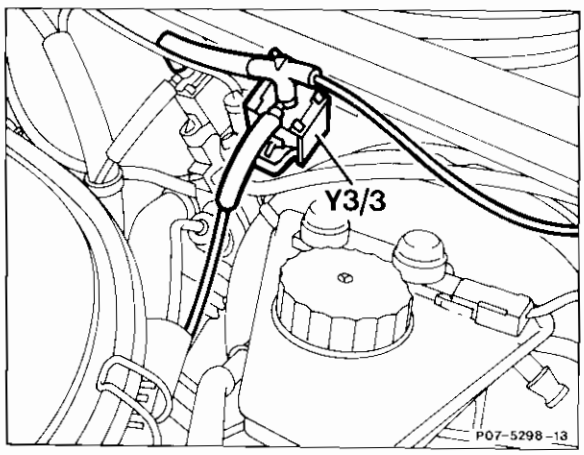
Y3/3 Upshift delay switchover valve

Model 129



Y3/3 Upshift delay switchover valve

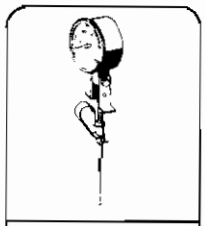
Model 201

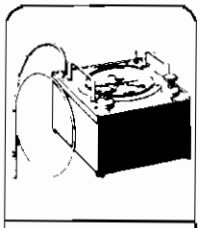


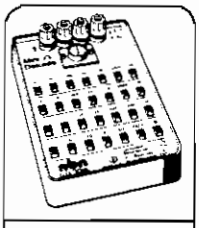
Y3/3 Upshift delay switchover valve

Transmission upshift delay test

Special tools


116 589 27 21 00


201 589 13 21 00


124 589 09 63 00


201 589 00 99 00

Equipment

Multimeter [1]	Fluke model 23 with 80i - 410 inductive pickup

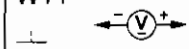
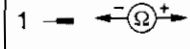
[1] Available through the MBNA Standard Equipment Program

Test conditions

- Engine oil temperature approx. 80 °C.
- All electrical consumers switched off.
- Battery voltage 11 – 14 V.

Test step	Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
⇒ 1.0	Operation of upshift delay switchover valve (Y3/3)	Disconnect vacuum line (arrow, Figures 1 – 3) on Y3/3. Connect vacuum tester with Y-fitting to Y3/3.	Coolant temperature sensor (B11/2) connector unplugged. Using resistance substitution units, simulate a 2.5 kΩ (+20 °C) resistance at sockets 1 + 3, 2 + 4. Engine: **Start** [1]	>400 mbar up to max. switching time (see Grp. 27 for description of operation).	Y3/3 activation, Open/short circuit, Y3/3 defective. Vacuum element for transmission upshift delay. Vacuum line.

[1] Vehicle must have rear wheels driven to measure nominal value (speed signal dependent).

Test step	Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
⇒ 2.0	Activation of upshift delay switchover valve (Y3/3)	W11 — Y3/3  — 2	Ignition: **On** Connector on Y3/3 unplugged.	11 – 14 V	Overvoltage protection relay, Open/short circuit.
		Y3/3 1 —  — +	Coolant temperature sensor (B11/2) connector unplugged. Using resistance substitution units, simulate a 2.5 kΩ (+ 20 °C) resistance at sockets 1 + 3, 2 + 4. Engine: **Start**	11 – 14 V up to max. switching time (see Grp. 27 for description of operation).	Open/short circuit, CIS-E control unit defective.
⇒ 3.0	Coil resistance of upshift delay switchover valve (Y3/3)	Y3/3 1 —  — Y3/3 2	Connector on Y3/3 unplugged. Ignition: **OFF**	25 – 40 Ω	Y3/3 defective.

Emission control system

O_2-sensor replacement indicator (California only)

The warning lamp (A1e33) for the O_2-sensor replacement indicator is installed in the instrument cluster.
Upon reaching 60,000 ± 250 miles (i.e. every 60,000 miles), illumination of the warning lamp indicates that the O_2-sensor must be replaced.
For instructions on how to turn off the warning lamp after O_2-sensor replacement, see "Maintenance note".

Activation of the warning lamp occurs via the O_2-sensor replacement indicator control unit (N44/1). The control unit is located in the passenger-side footwell.

The Hall-effect sensor output on the speedometer provides information on miles driven. The number of impulses per mile is determined by multiplying a fixed number by the number of impulses from the Hall-effect sensor. The resulting distance is stored in the control unit.

The warning lamp comes on with the ignition/starter switch in position "2" and goes out again with the engine running (circuit 61 recognition).

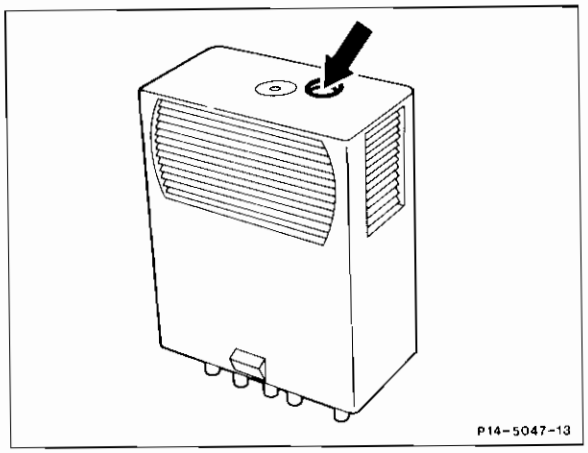
A test mode is initiated if the button (arrow) is pressed for longer than 5 seconds with the ignition/starter switch in position "2". The test mode start is indicated by the O_2-sensor warning lamp switching off.

- After a pause of 5 seconds, the recorded mileage is indicated by a blink impulse. The warning lamp blinks once for every 10,000 miles recorded.
- After a 2 second pause, the lamp blinks once for every additional 1,000 miles recorded.
- After a further 2 second pause, the lamp blinks once for every additional 100 miles recorded.

- If the mileage recorded is "0", this is indicated by the lamp not blinking.

- After a further 5 second pause, the operation of the Hall-effect sensor is tested. After the required 5 second pause, the O_2-sensor warning lamp will blink continuously if the vehicle is driven on the road or dynamometer.

The test mode may only be interrupted by switching the ignition off.



Maintenance note:

The O_2-sensor must be replaced when the warning lamp illuminates at 60,000 ± 250 miles. After replacing the sensor, the warning lamp may be switched off via the button (arrow) on the control unit (N44/1). The button must be pressed for longer than 2 seconds to turn off the lamp. In ignition/starter position "2", the lamp remains lit even after resetting the control unit. The lamp will only go out after the engine is started (circuit 61 recognition) The previously recorded mileage remains stored. The warning lamp will illuminate again at 120,000 miles.

Diesel injection system

General information

Modifications as compared to model year 1990/1991:

- Injection pump (cam shape),
- Vacuum line layout,
- EDS control unit (reference map),
- EDS test program,
- EGR shut-off microswitch,
- Electric wiring diagrams (see Electrical Troubleshooting Manual),
- Prechamber with increased volume,
- Electric switchover valves: EGR, boost pressure control, pressure control flap,
- Single vacuum transducer for boost pressure control and pressure control flap.

The following was deleted:

- Boost pressure control vacuum transducer,
- Engine overload protection,
- Vacuum amplifier and vacuum amplifier switchover valve.

Fuel injection system components

Engine	602.962
Injection pump model designation	PES 5 M 55 C 320 RS 177
Bosch number (for test sheet)	0 400 075 944
Fuel pump (Bosch designation)	FP/KG 24 M 150
Injection nozzle (Bosch designation)	DN 0 SD 265
Injection nozzle part no.	001 017 49 12
Nozzle holder (Bosch designation)	KCA 27 S 55
Injection nozzle and holder complete (Part no.)	002 017 40 21

Test and adjustment values

Engines		602.962
Idle speed at 60–80 °C coolant temperature	rpm	680 ± 20
Injection pump timing (reference impulse) adjustment value		14 + 0.5° after TDC [1]
Injection pump timing (reference impulse) nominal value		15 ± 1° after TDC
Boost pressure at 4,000 rpm, under load	bar	0.75 – 0.85
Injection nozzle opening pressure with new injection nozzles	bar	135 – 145
Injection nozzle opening pressure with used injection nozzles	bar	120

[1] One-time adjustment at 15,000 miles, adjust to 14 + 0.5° after TDC

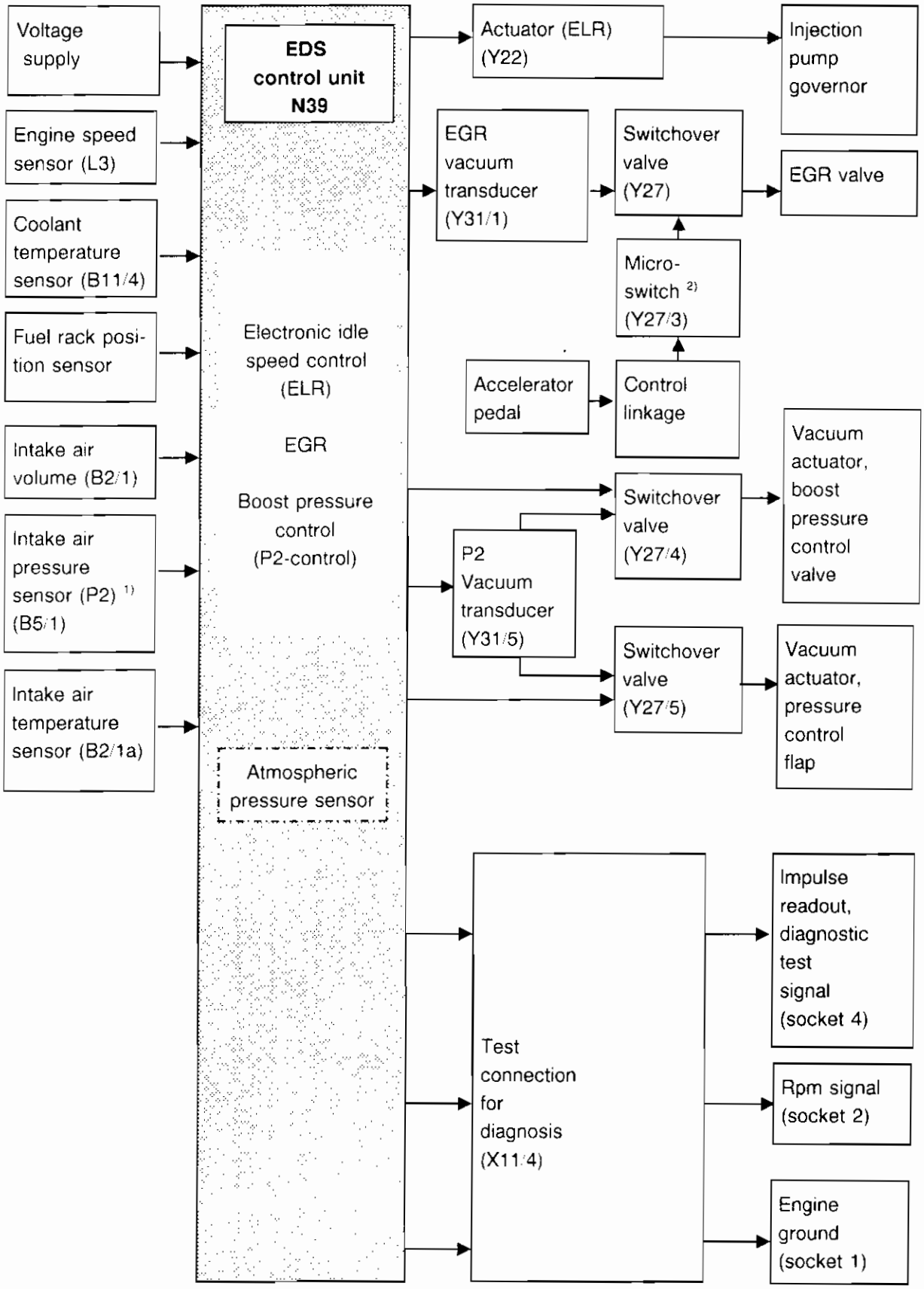
Electronic diesel system (EDS)

The EDS control unit processes the following functions:

- Electronic idle speed control (ELR),
- Exhaust gas recirculation (EGR),
- Boost pressure control (P2-control),
- System diagnostics.

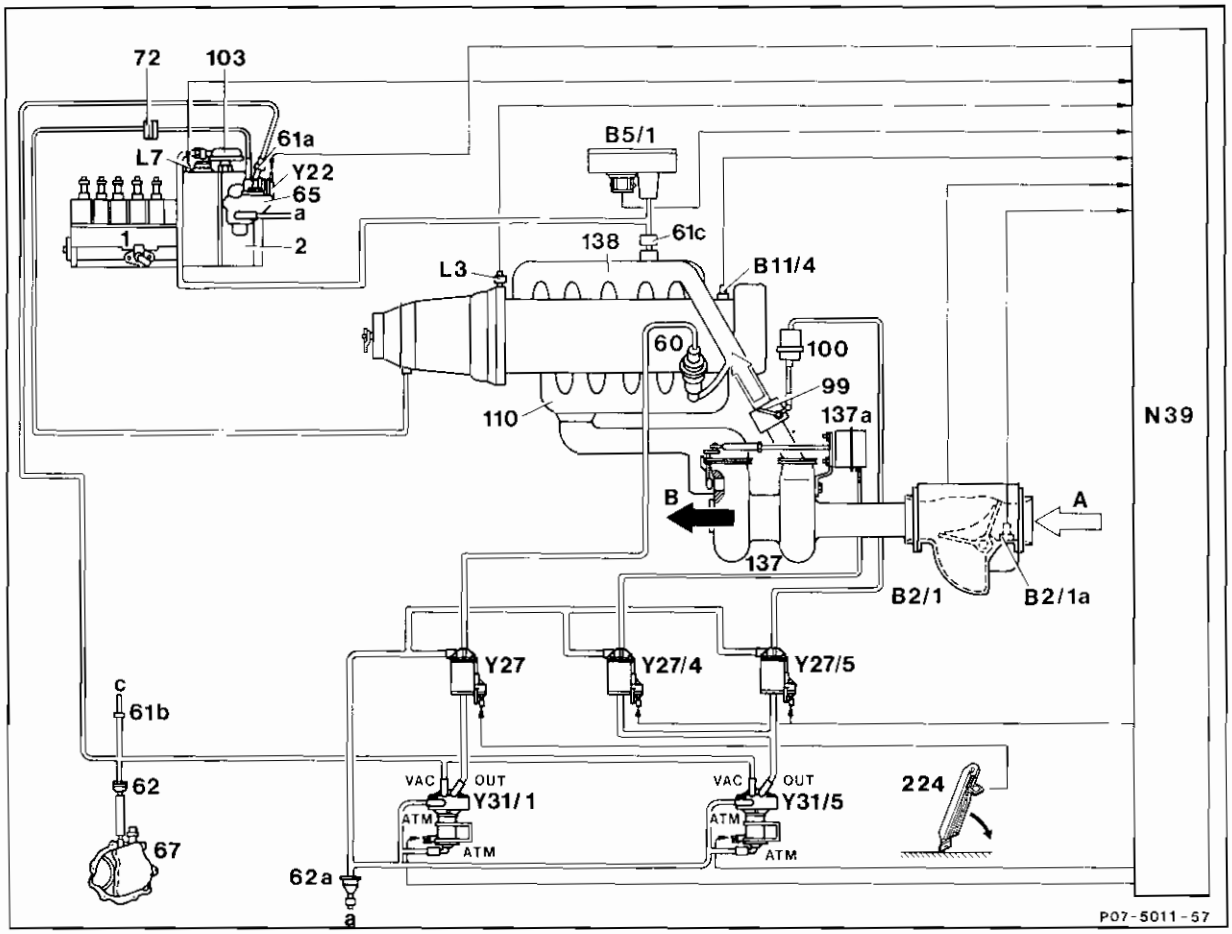
The EDS control unit processes the incoming signals and delivers a milliamp current to the vacuum transducer(s) and to the electro-magnetic actuator on the injection pump. The entire system can be tested with an impulse counter i.e. the malfunction memory can be read by means of an output signal to the test connection (X11/4).

Block diagram, EDS



1) Pressure before the intake valves
2) The switchover valve is activated by the control linkage microswitch 10° before full load.

Function diagram, EDS



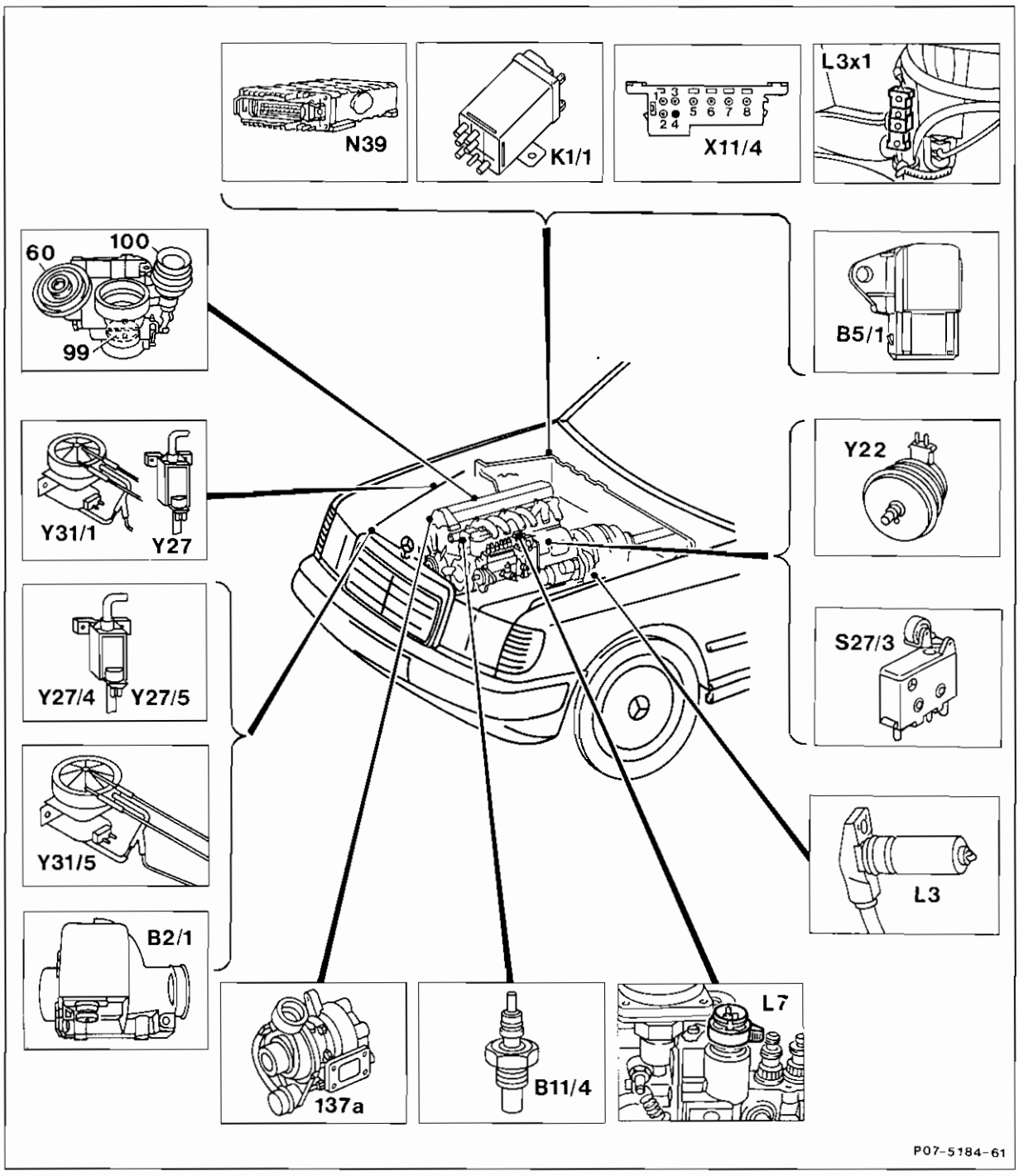
1	Injection pump
2	Governor
60	EGR valve
61a	Orifice
61b	Orifice 0.5
61c	Orifice 0.7
62	Filter
62a	Filter
65	Vacuum control valve
67	Vacuum pump
72	Vacuum damper
99	Pressure control flap and housing
100	Pressure control flap vacuum actuator
103	Aneroid compensator (ALDA)
110	Exhaust manifold
137	Turbocharger
137a	Boost pressure control valve vacuum actuator
138	Intake manifold
224	Accelerator pedal
B2/1	Air flow sensor
B2/1a	Intake air temperature sensor
B5/1	Pressure sensor (EDS)
B11/4	Coolant temperature sensor (EDS)
L3	Starter ring gear speed sensor
L7	Fuel rack position sensor

N39	EDS control unit
Y22	Electromagnetic actuator, electronic idle speed control (ELR)
Y27	EGR switchover valve
Y27/4	Boost pressure control switchover valve
Y27/5	Pressure control flap switchover valve
Y31/1	EGR vacuum transducer
Y31/5	Boost pressure control/pressure control flap vacuum transducer
A	Intake air
B	Exhaust gas
a	Vent line to passenger compartment
c	Remaining vacuum consumers

Pressure and vacuum connections at vacuum transducers

VAC	Vacuum from vacuum pump
ATM	Vent line to passenger compartment
OUT	From vacuum transducer (Y31/1) to EGR switchover valve (Y27)
OUT	From vacuum transducer (Y31/5) to switchover valves (Y27/4) and (Y27/5)

Component locations



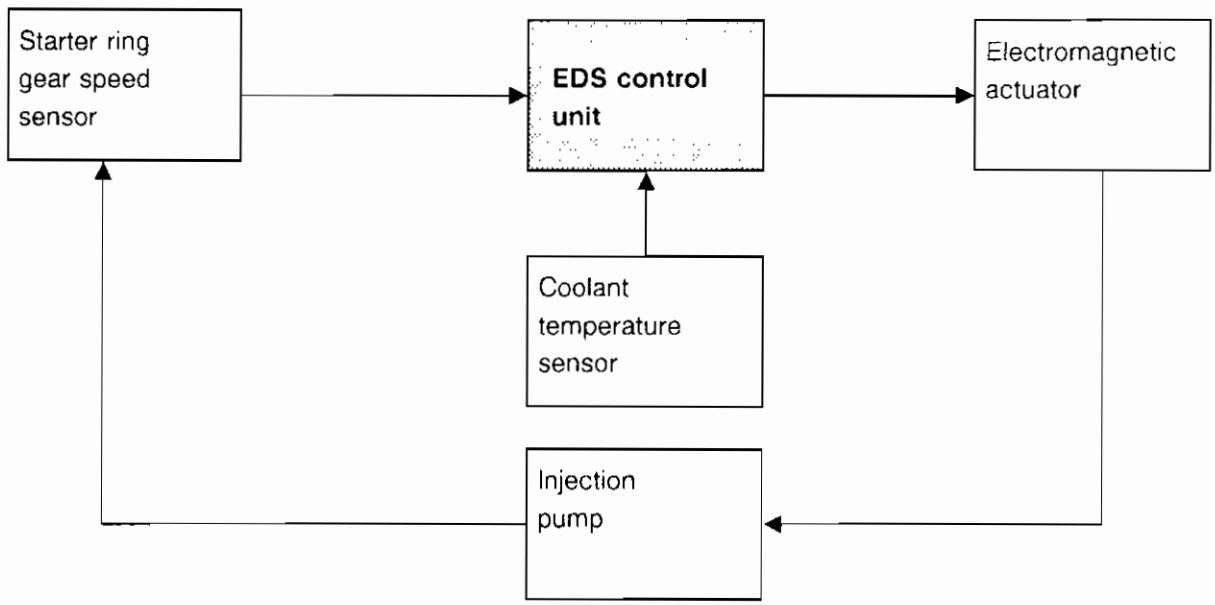
B2/1	Air flow sensor and air intake temperature sensor
B5/1	Pressure sensor (EDS)
B11/4	Coolant temperature sensor (EDS)
K1/1	Overvoltage protection relay, 87E
L3	Starter ring gear speed sensor
L3x1	Connector, starter ring gear speed sensor
L7	Fuel rack position sensor
N39	EDS control unit
S27/3	EGR microswitch
X11/4	Test connection for diagnosis (impulse readout, 8-pole)
Y22	Electromagnetic actuator, electronic idle speed control (ELR)
Y27	EGR switchover valve
Y27/4	Boost pressure control switchover valve
Y27/5	Pressure control flap switchover valve
Y31/1	EGR vacuum transducer
Y31/5	Boost pressure control/pressure control flap vacuum transducer
60	EGR valve
99	Pressure control flap and housing
100	Pressure control flap vacuum actuator
137a	Boost pressure control valve vacuum actuator

Electronic idle speed control (ELR)

The starter ring gear speed sensor (L3) picks up the engine speed (144 impulses per revolution) and sends it in the form of an AC voltage signal to the EDS control unit. The EDS control unit processes the rpm signal and performs an nominal/actual value comparison.

As a result, the idle speed is held constant by the electromagnetic actuator regardless of engine load. At coolant temperatures below 60 °C, the idle speed nominal value is increased according to a preset reference map.

Block diagram, idle speed control



Exhaust gas recirculation (EGR)

Exhaust gas recirculation occurs as soon as the following conditions are met:

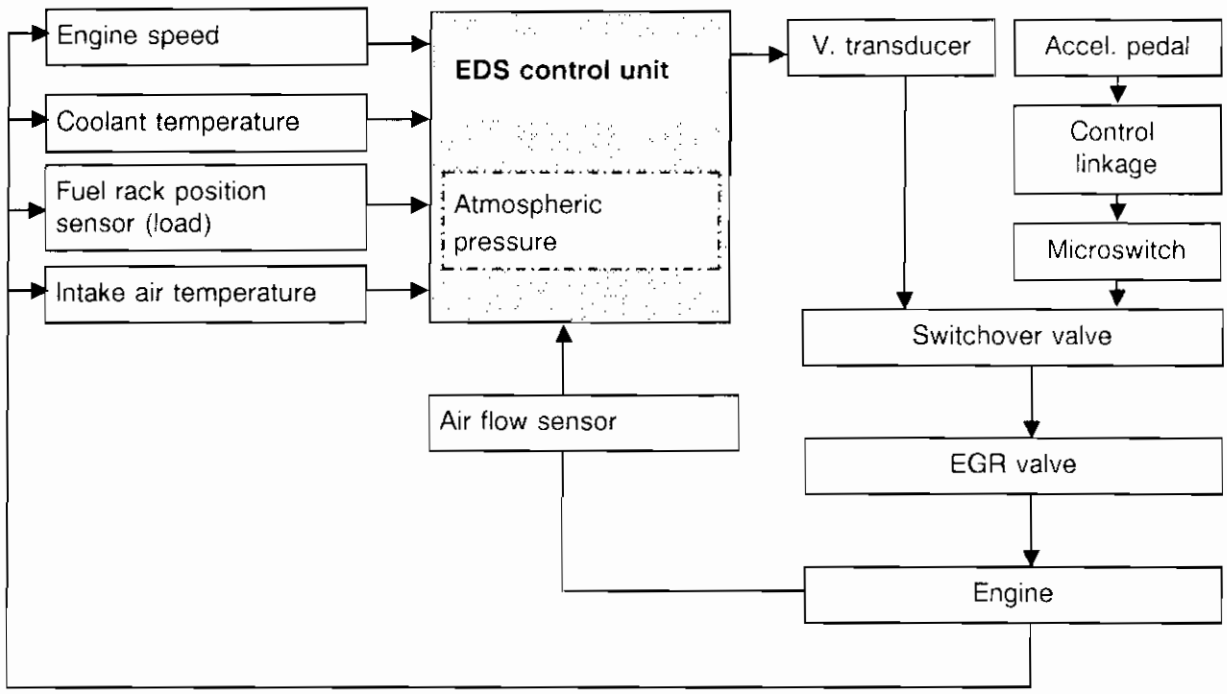
- Coolant temperature between 60 °C and 110 °C
- Battery voltage 11–14 Volt
- Fuel rack travel < 9 mm
- Engine speed up to approx. 3500 rpm

According to the input signals from sensors e.g. fuel rack travel, engine speed, etc., the EDS control unit calculates the corresponding volume of exhaust gas recirculation for the respective operating conditions.

Control current is applied to the vacuum transducer which delivers a respective amount of vacuum to the EGR valve.

The EGR volume is reduced as engine speed and load increase.
This means:
Increasing control current = increasing EGR volume
Decreasing control current = decreasing EGR volume.
In addition: EGR shut-off at 10° before full load via control linkage microswitch and switchover valve in vacuum line. As a result, smoke emission is reduced during load changes towards full load.

Block diagram, EGR



The EGR system with vacuum transducer, EGR switchover valve, EGR valve, air flow sensor and EDS control unit operates as a closed loop.

Boost pressure control (P2-control)

A **"reference map"** (for P2-control) is stored in the EDS control unit. The pressure values received by the control unit relative to injection volume and engine speed generate optimal engine performance with respect to consumption, NOx, HC and particulate emission.

By reducing the pressure (P2) ahead of the intake valves during partial load operation, it is possible to achieve a reduction in particulate emission.

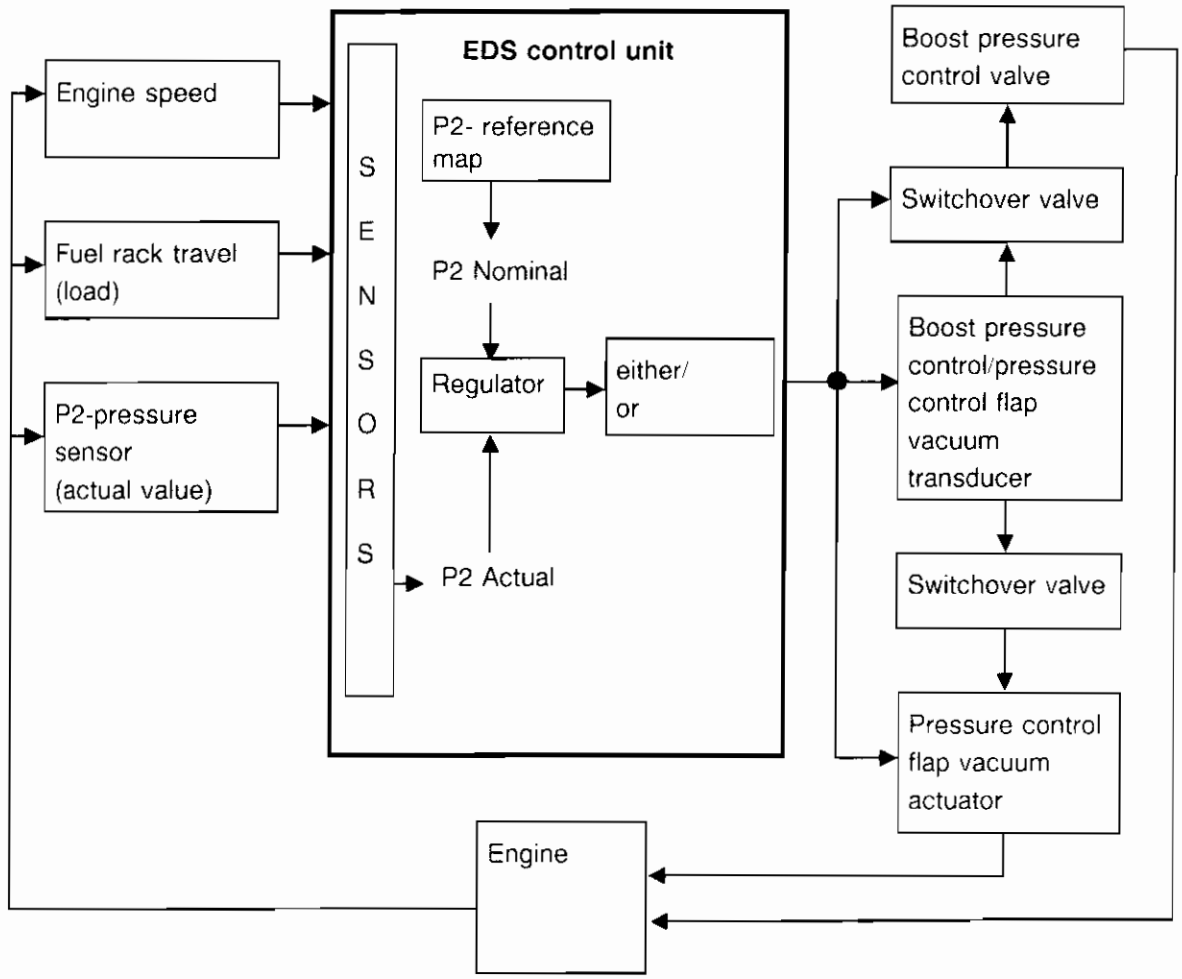
The EDS control unit contains a closed loop circuit which compares pressures "P2 actual" with "P2 nominal" (see block diagram).

Any difference between the two pressure values is equalized either by the boost pressure control valve or by the pressure control flap.
The boost pressure control valve is activated by electronically adjustable vacuum from the vacuum transducer and electric switchover valve.

Boost pressure control is dependent on:

- Intake air pressure,
- Engine speed,
- Fuel rack position (travel).

Block diagram, boost pressure control (P2-control)



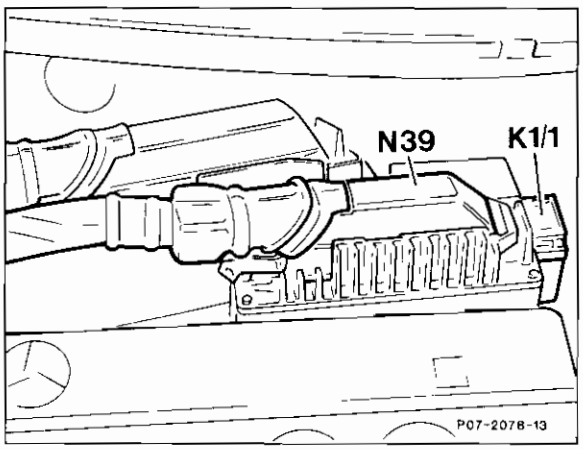
System diagnostics

The self-check program integrated into the EDS control unit tests the electronic diesel system i.e. detects and stores system malfunctions. Intermittent malfunctions, which occur for longer than 4 seconds, are also stored.
For example, sensor malfunctions, with the exception of engine speed sensor, are stored into memory, as well as short circuits in the actuators and their input wiring.

Through the use of an impulse counter at socket 4 of test connection (X11/4), the individual malfunctions can be recalled for evaluation. The proper diagnosis can be determined according to the indicated malfunction.

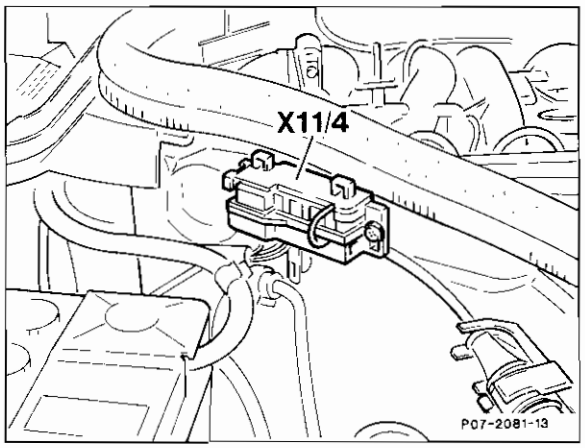
Component operation

EDS control unit (N39)
The control unit processes the incoming signals and delivers a milliamp current to the two vacuum transducers, to the electromagnetic actuator on the injection pump, and the boost pressure control and pressure control flap switchover valves. The entire system can be tested with an impulse counter i.e. the malfunction memory can be read by means of the test connection (X11/4, socket 4).

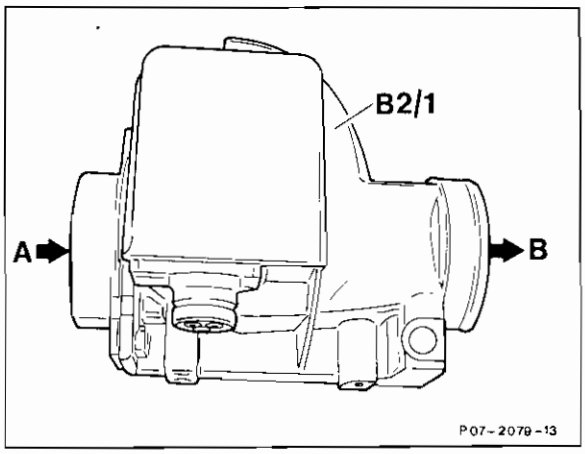


Atmospheric pressure sensor (integrated into control unit)
Depending on altitude or atmospheric pressure, the atmospheric pressure sensor influences EGR volume and boost pressure. The atmospheric pressure sensor sends the control unit a decreasing voltage signal at decreasing air pressures (increasing altitudes). The EGR and P2 reference map values are adapted according to a pressure dependent characteristic.

Test connection for diagnosis (X11/4)
The impulse readout for diagnosis can be picked up at this test connection.

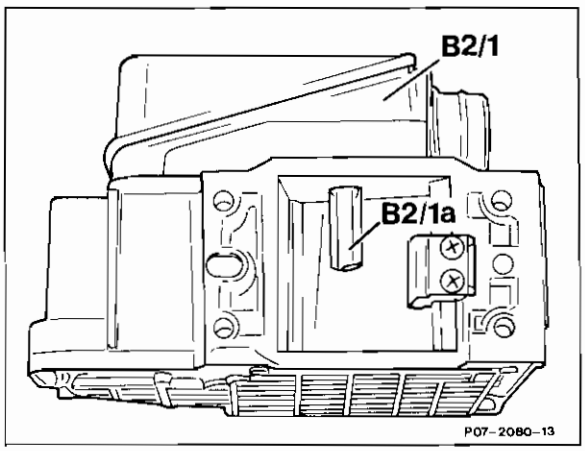


Air flow sensor (B2/1)
Intake air temperature sensor (B2/1a)
Located in the air flow between the air filter and the turbocharger.

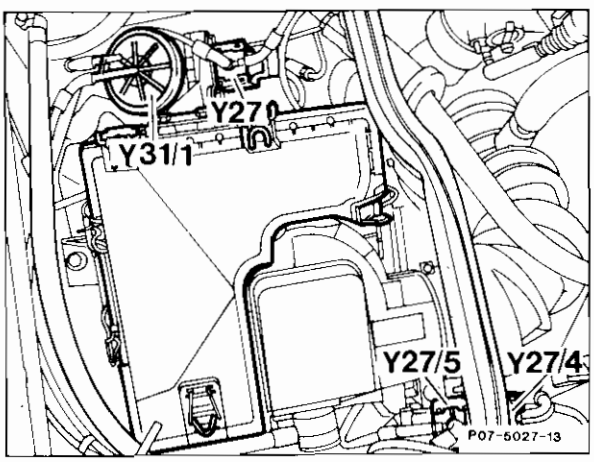


A from air filter
B to turbocharger

Acting against a return spring, intake air opens the air flow sensor plate to a specific angle. The position of the plate is measured by a potentiometer which converts the position into a voltage signal.
The intake air temperature is read by the temperature sensor (B2/1a) in the air flow sensor.



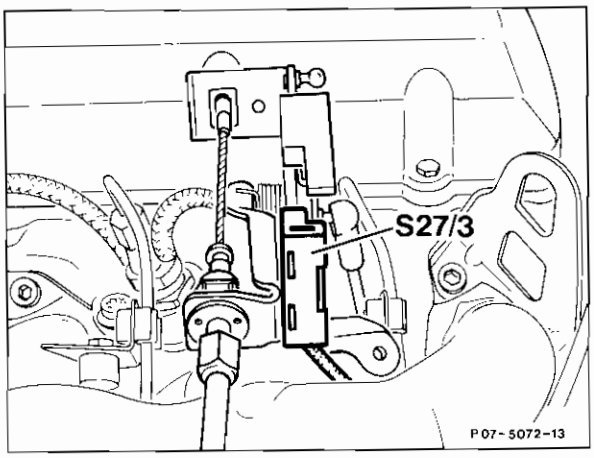
Vacuum transducers (Y31/1, Y31/5)
Respective to operating conditions, the vacuum transducers receive a control current from the control unit. The vacuum transducers then deliver a corresponding amount of vacuum for the electric switchover valves.



Y31/1 EGR valve vacuum transducer
Y31/5 Boost pressure control/pressure control valve vacuum transducer (not visible, located under air filter)

EGR switchover valve (Y27), EGR microswitch (S27/3)

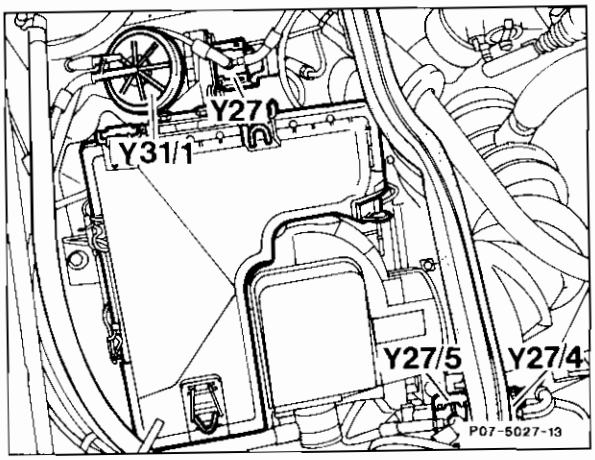
The EGR switchover valve (Y27) is activated by the control linkage microswitch (S27/3) 10° before full load, thereby closing the EGR valve.



S27/3 EGR microswitch

Electric switchover valves (Y27/4, Y27/5)

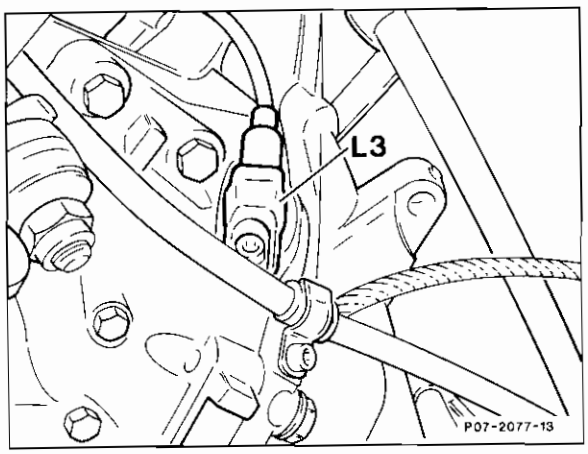
Depending on operating conditions, the electric switchover valves receive a control current from the control unit and vacuum from the vacuum transducer (Y31/5). They convey the control unit command as a pneumatic signal to the boost pressure control valve and pressure control flap.



Y27	EGR switchover valve
Y27/4	Boost pressure control switchover valve
Y27/5	Pressure control flap switchover valve

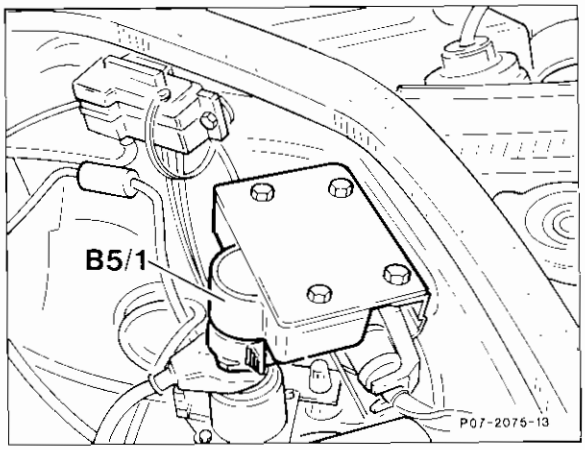
Starter ring gear speed sensor (L3)

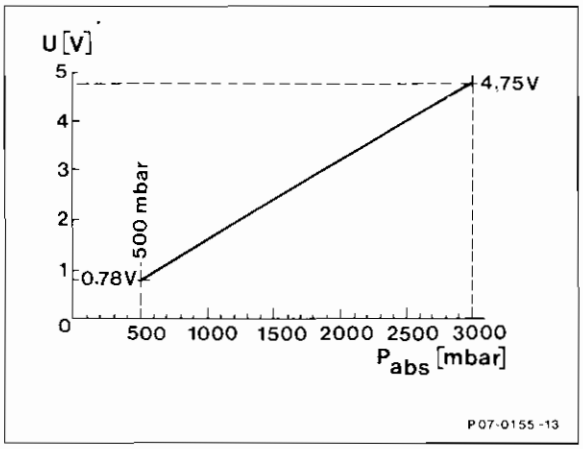
Determines engine speed via the starter ring gear (144 impulses per revolution) and sends it in the form of a AC voltage signal to the control unit.



Pressure sensor (B5/1)

Located on the right, behind the firewall, the pressure sensor reads the pressure (P2) and converts it into a voltage signal which is used by the EDS control unit as an input signal.

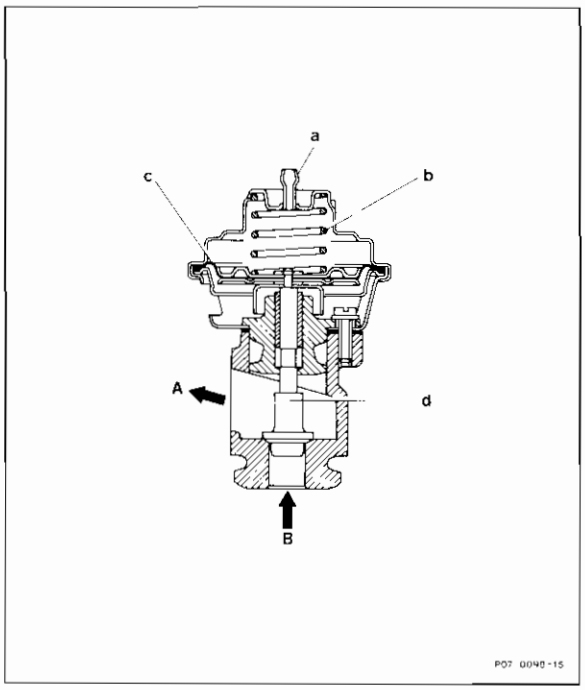




Pabs Absolute pressure in mbar, reference at 5 V supply voltage

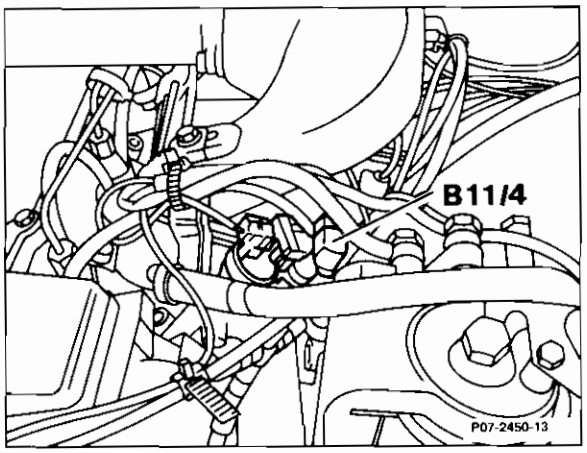
EGR valve (60)

The EGR valve, together with the mixture tube, is bolted laterally to the cylinder head. It is connected to the exhaust manifold, the intake manifold crossover pipe and to a corrugated tube. Controlled vacuum from the switchover valve (Y27) and vacuum transducer (Y31/1) is applied to the EGR valve to open the valve.

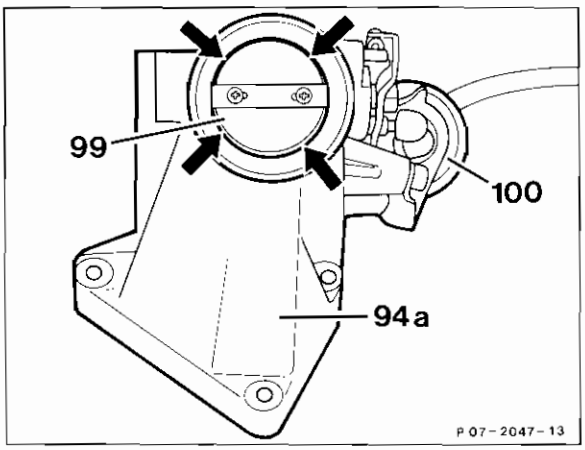


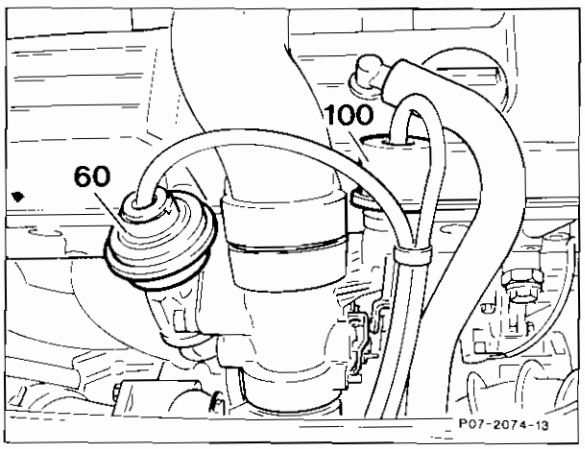
A Exhaust to the intake manifold
B Exhaust from the exhaust manifold
a Vacuum connection
b Spring
c Diaphragm
d Valve

Coolant temperature sensor (B11/4)
Coolant temperature is determined by the coolant temperature sensor (B11/4) which is controlled by t he EDS control unit.
The temperature sensor resistance changes according to coolant temperature.



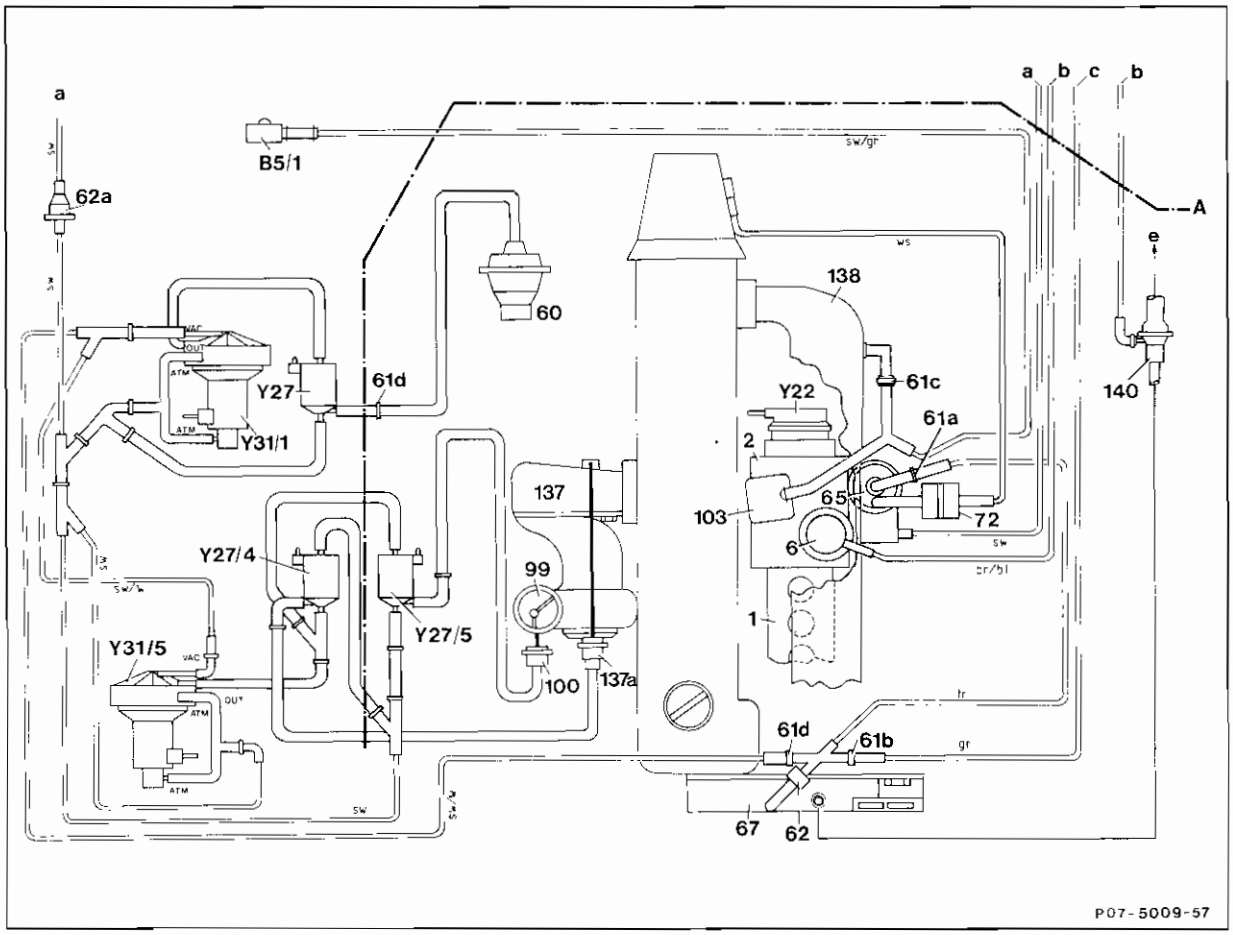
Housing (94a) with pressure control flap (99) and vacuum actuator (100)
A pneumatically operated pressure control flap, located in a housing on the intake manifold. adjusts boost pressure in the intake manifold. The pressure control flap closes the fresh air intake during EGR operation. A minimal opening (arrows) between the pressure control flap and the housing remains. The vacuum actuator (100) is activated by the pressure control flap switchover valve (Y27/5) and vacuum transducer (Y31/5) (see functional diagram).





60 EGR valve
100 Vacuum actuator

Vacuum line layout



1	Injection pump
2	Governor
6	Vacuum shut-off unit
60	EGR valve
61b	Orifice
61d	Connection piece (without orifice)
62	Filter
62a	Filter
65	Vacuum control valve
67	Vacuum pump
72	Damper
99	Pressure control flap
100	Pressure control flap vacuum actuator
103	Aneroid compensator (ALDA)
137	Turbocharger
137a	Boost pressure control valve vacuum actuator
138	Intake manifold
140	Brake booster check valve
B5/1	Pressure sensor (EDS)
Y22	Electromagnetic actuator, electronic idle speed control (ELR)
Y27	EGR switchover valve
Y27/4	Boost pressure control switchover valve
Y27/5	Pressure control flap switchover valve
Y31/1	EGR vacuum transducer
Y31/5	Boost pressure control/pressure control flap vacuum transducer

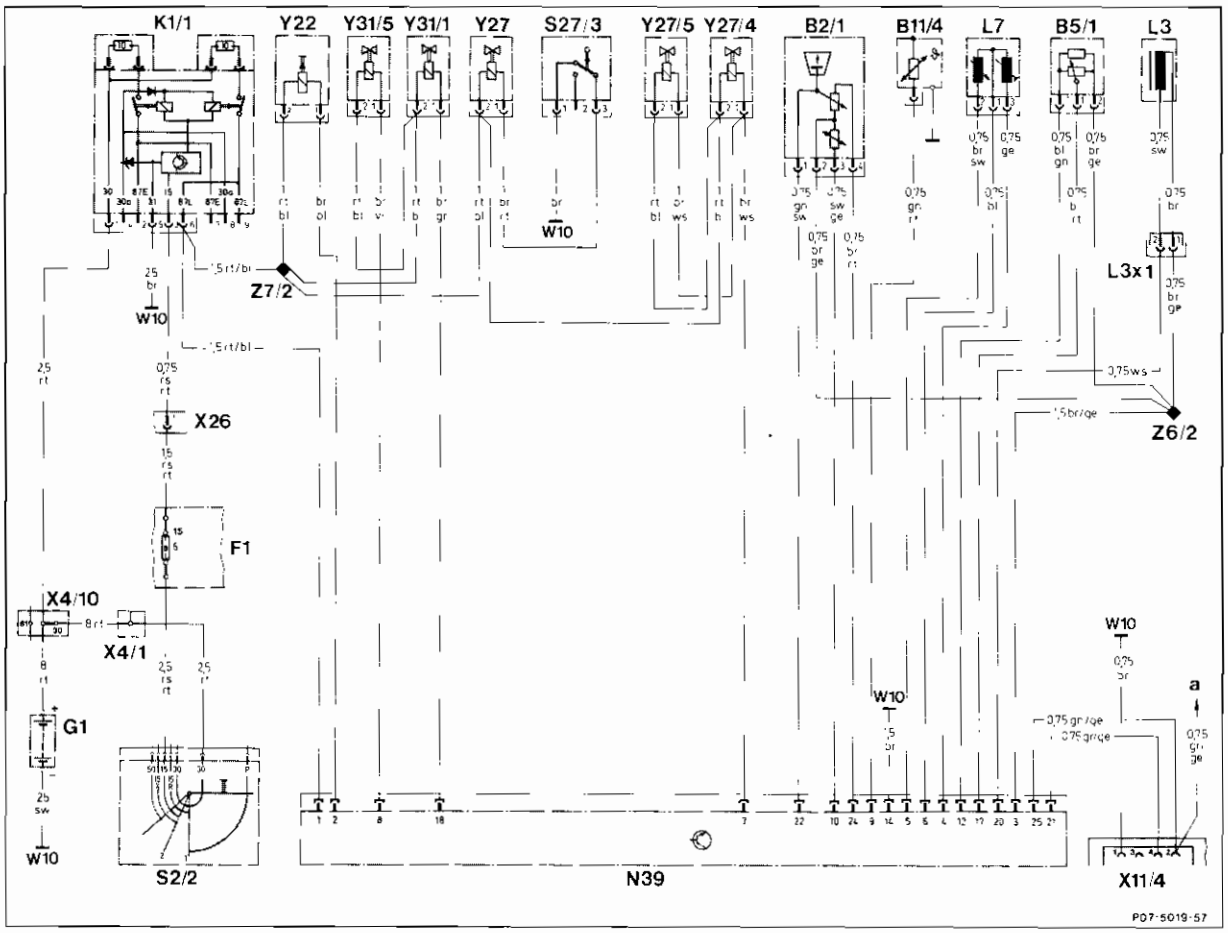
A	Firewall
a	Vent line to passenger compartment
b	Key shut-off
c	Remaining vacuum consumers
e	Brake booster

Pressure and vacuum connections at vacuum transducers

VAC	Vacuum from vacuum pump
ATM	Vent line to passenger compartment
OUT	From vacuum transducer (Y31/1) to EGR switchover valve (Y27)
OUT	From vacuum transducer (Y31/5) to switchover valves (Y27/4) and (Y27/5)

sw	black
w or ws	white
gr	grey
br	brown
bl	blue
tr	transparent

Electric wiring diagram



B2/1	Air flow sensor with intake air temperature sensor (EDS)	Y27/4	Boost pressure control switchover valve
B5/1	Pressure sensor (EDS)	Y27/5	Pressure control flap switchover valve
B11/4	Coolant temperature sensor	Y31/1	EGR valve vacuum transducer
F1	Fuse and relay box	Y31/5	Boost pressure control/pressure control flap vacuum transducer
G1	Battery	Z6/2	Connector sleeve, ground supply (solder joint in connector)
K1/1	Overvoltage protection relay, 87E (7-pole)	Z7/2	Connector sleeve, terminal 87 (solder joint in harness)
L3	Starter ring gear speed sensor		
L3x1	Connector, starter ring gear speed sensor		
L7	Fuel rack position sensor		
N39	EDS control unit	a	To A/C compressor control unit (N6), pin 4
S2/2	Glow/starter switch	b	To A/C compressor control unit (N6), pin 4
S27/3	Microswitch (EGR)		
W10	Ground, battery	sw	black
X4/1	Terminal block, terminal 30/interior (2-pole)	ws	white
X4/10	Terminal block, terminal 30/61, battery (3-pole)	gr	grey
X11/4	Test connection for diagnosis (impulse readout, 8-pole)	ge	yellow
		gn	green
X26	Connector, interior/engine (12-pole)	bl	blue
Y22	Electromagnetic actuator, electronic idle speed control (ELR)	br	brown
		rt	red
Y27	EGR switchover valve	rs	pink

Electronic diesel system (EDS) test

The test is divided into the following:

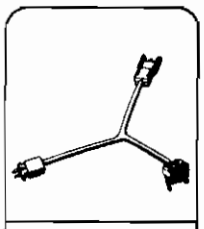
- Diagnosis,
- Electrical test program,
- Function test, electronic idle speed control, EGR, P2-control.

Diagnosis

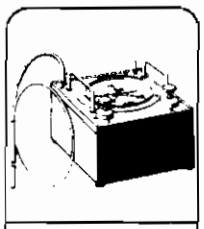
Test conditions:

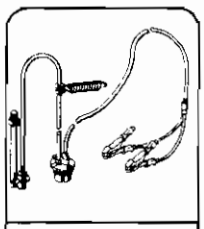
- Coolant temperature 60 – 80 °C,
- Automatic climate control off,
- Selector lever in position "P",
- Overvoltage protection fuse OK,
- Battery voltage approx. 12 volts at overvoltage protection relay between sockets 1 and 5.

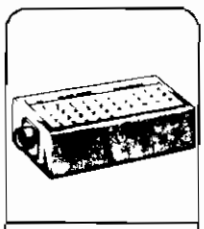
Special tools

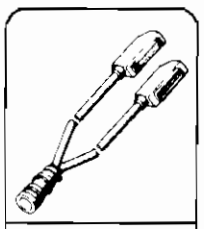

102 589 04 63 00


201 589 00 99 00


201 589 13 21 00


603 589 00 21 00

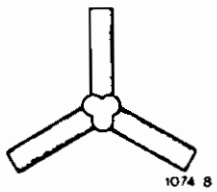

124 589 00 21 00


124 589 33 63 00


124 589 19 21 00

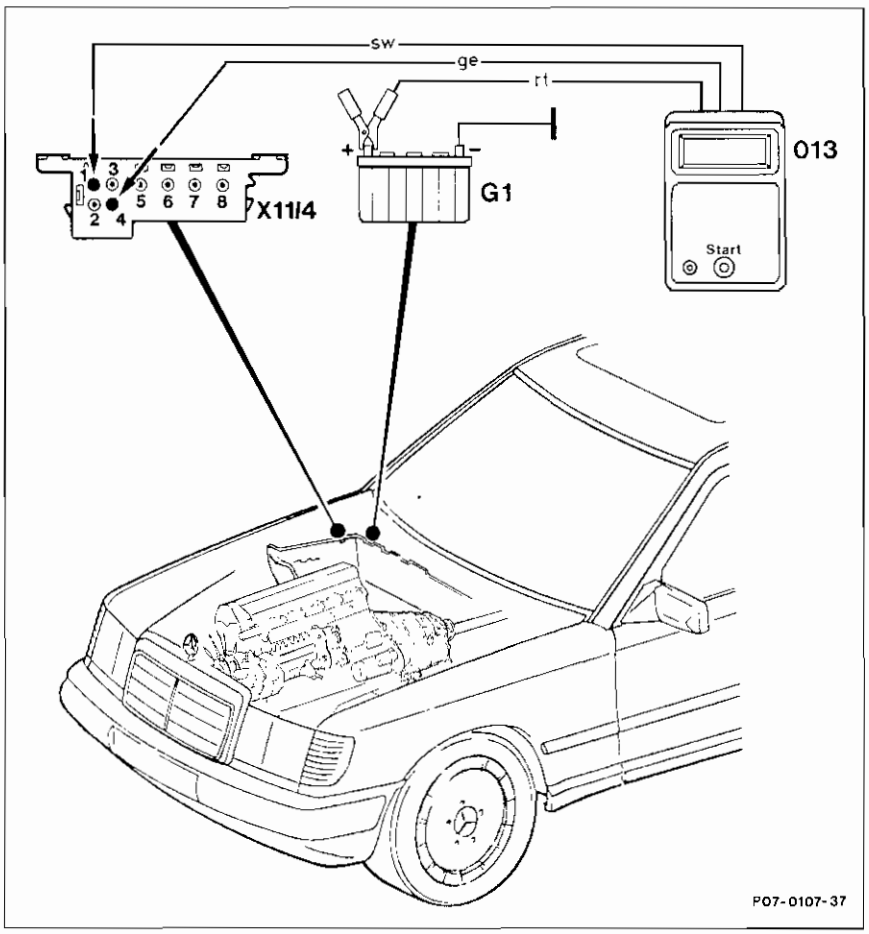
Equipment

Multimeter [1]	Fluke models 23, 83, 85, 87 Sun DMM-5
Engine analyzer [1]	Bear DACE (Model 40-960) Sun EMT-1019/Master 3 Sun MCM-2110 Sun MEA-1500MB
Y-distributor	117 078 01 45



1) Available through the MBNA Standard Equipment Program

Connection diagram



013	Impulse counter
G1	Battery
X11/4	Test connection for diagnosis
sw	black
ge	yellow
rt	red

Layout (X11/4)

1	Ground
2	TD-signal
4	EDS control unit impulse readout

Note regarding impulse readout:

If the impulse readout does not indicate a malfunction in spite of a complaint, perform function test.

The number "1" indicates that there are no recognized malfunctions in the electronic system. All further numbers refer to a particular component or malfunction source.

Numbers ranging from 1 to 15 may be displayed on the impulse counter.

If the LED "U-Batt" lights after connecting the impulse counter, then the impulse counter and voltage supply for the impulse counter are ok.

Testing with impulse counter

1 Connect impulse counter according to connection diagram.

Note:

LED "U-Batt" in display must light up, otherwise:

a) Check impulse counter fuse,
b) Check socket 1 of test connection (X11/4) against the positive pole of the battery (11–14 V),
c) Check socket 4 of test connection (X11/4) against socket 1 (6–12 V).

2 **Engine at idle.**

3 Press start button for 2 to 4 seconds.

4 Read and note impulse readout displayed.
Display "1" = no malfunction stored,
Greater than "1" = malfunction in system.

5 Press start button again for 2 to 4 seconds. If there are no further malfunctions in the system, the previously displayed number will reappear. If additional malfunctions exist, then the respective malfunction code will be displayed.

6 Repeat step 5 until the first number displayed is repeated.

7 Eliminate noted malfunctions (impulse readout) according to troubleshooting chart.

8 Perform tests of individual components.

Erasing malfunction memory:

After eliminating a malfunction, the respective impulse readout must be cleared as follows:

9 Press start button and read out the eliminated malfunction. Then press the start button for 6 to 8 seconds.

Note:

Each malfunction displayed must be **erased individually**.
If the malfunction has been eliminated and its respective readout erased, then the malfunction code will no longer be displayed when performing the impulse readout.
If the number displayed is greater than 1, then there are further malfunctions in the system.

Malfunction table

The respective number in the display of the impulse counter indicates whether a component is defective, which one it is, or whether or not components in the control circuit are defective.

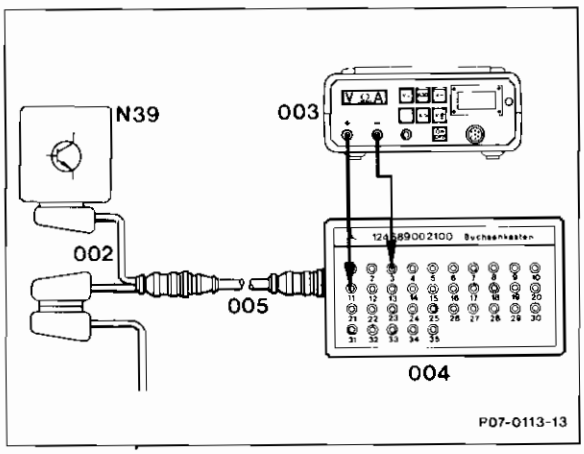
EDS control unit

Impulse readout	Component/malfunction circuit
1 [1]	All functions ok, no malfunction stored
2	Fuel rack position sensor (L7)
3	Air flow sensor (B2/1)
4	EDS control unit (N39), atmospheric pressure sensor
5	EGR valve vacuum transducer (Y31/1) or malfunction in EGR control circuit
6	EDS control unit (N39), internal voltage supply
7	Starter ring gear speed sensor (L3)
8	Coolant temperature sensor (B11/4)
9	Intake air temperature sensor (B2/1a)
10	Voltage supply
11 [2]	Electronic idle speed control actuator or EGR valve vacuum transducer (Y31/1)
12	Not used
13	EDS control unit (N39) defective (internal memory)
14	EDS pressure sensor (B5/1) defective
15	Boost pressure control/pressure control flap vacuum transducer (Y31/5) or defect in boost pressure control circuit.

1) If there are complaints nonetheless, perform function tests for electronic idle speed control, EGR and P2-control.
2) Displayed only if there a short circuit.

Electrical test program

Connection diagram, socket box



002 25-pole test cable 124 589 33 63 00
003 Multimeter
004 35-pole socket box 124 589 00 21 00
005 Test cable 124 589 34 63 00
N39 EDS control unit

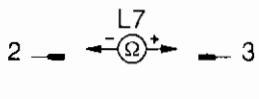
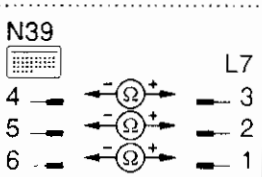
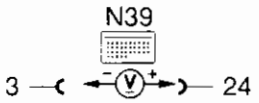
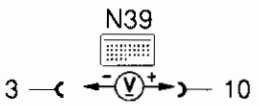
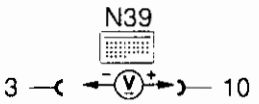
Equipment/test symbols

Socket box
Multimeter
Socket
Pin
Voltage measurement (DC volts)
Resistance measurement (Ohms)

Note:
If nominal values cannot be met when performing pneumatic tests, ensure that all vacuum lines and connections are in order by comparing routing and connections to applicable EDS vacuum schematic.

Test program

Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
1	1.0	–	–	–	No malfunction stored.
2	2.0 Fuel rack position sensor (L7)	N39 4 — Ω — 5 4 — Ω — 6 4 — Ω — 3 4 — Ω — 1	Ignition: **OFF** EDS control unit unplugged.	50 ±4 Ω 25 ±2 Ω ∞ Ω ∞ Ω	Replace injection pump, Wiring.

Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
[2]	2.1 Fuel rack position sensor (L7)		Ignition: **OFF** Connector on fuel rack position sensor (L7) unplugged.	50 ± 4 Ω	Replace injection pump.
			Connector on fuel rack position sensor (L7) unplugged.	25 ± 2 Ω	Replace injection pump.
	2.2 Wiring		Connector on fuel rack position sensor (L7) unplugged.	< 1 Ω	Open circuit.
3	3.0 Air flow sensor (B2/1)		Ignition: **ON** EDS control unit (N39) connected.	5 ± 0.5 V	EDS control unit (N39).
			Ignition: **ON**	< 0.5 V	Open circuit.
			Engine: **at Idle**	1.7 ± 0.2 V [1]	EDS control unit (N39).

[1] Voltage increases with increasing rpm.

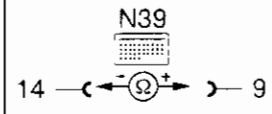
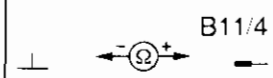
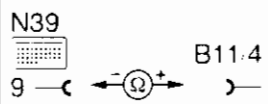
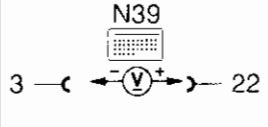
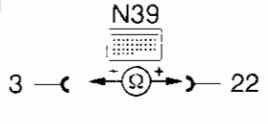
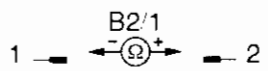
Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
[3]	3.1 Air flow sensor (B2/1)	N39 3 — Ω — 24	Ignition: **OFF** EDS control unit (N39) unplugged.	500 – 1200 Ω	Air flow sensor (B2/1).
		N39 3 — Ω — 10	Air flow sensor plate, rest position.	50 – 200 Ω	Air flow sensor (B2/1).
		N39 3 — Ω — 10	Air flow sensor plate, fully deflected.	560 – 1100 Ω	Air flow sensor (B2/1).
	3.2 Wiring	N39 10 — Ω — B2/1 3	Connector on air flow sensor (B2/1) unplugged.	< 1 Ω	Open circuit.
		N39 24 — Ω — B2/1 4		< 1 Ω	Open circuit.
4	4.0				Atmospheric pressure sensor, replace EDS control unit (N39).
5 [1]	5.0 EGR valve vacuum transducer (Y31/1)	N39 18 — V — 1	Engine: **at 700 ± 50 rpm**	> 3 V [1]	Supply line (black/white) leaking, Vent line (black) clogged, Vent filter (62a) clogged.
	EGR valve	Vacuum tester with Y-distributor at EGR valve.		approx. 250 mbar [1]	Supply line (black/white) or vacuum line (black rubber) closed or interrupted. EGR valve vacuum transducer (Y31/1), Wiring, EDS control unit (N39), Air flow sensor (B2/1), EGR valve, Coolant temperature sensor.

[1] Briefly apply full throttle. Vacuum and voltage fall. The test values are approximate.

Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
[5]	5.1 Wiring (Y31/1)	N39 18 — Ω — Y31/1 1	Connector on vacuum transducer (Y31/1) unplugged.	< 1 Ω	Open circuit.
		N39 1 — Ω — Y31/1 2		< 1 Ω	Open circuit.
	5.2 EGR microswitch (S27/3)	S27/3 1 — Ω — 3	Ignition: **OFF** Microswitch connector unplugged -Accel. pedal **not** in full load position.	< 1 Ω	EGR microswitch (S27/3).
			-Accel. pedal in full load position.	∞ Ω	
	5.3 Wire between EGR microswitch (S27/3) and EGR switch-over valve (Y27)	S27/3 3 — Ω — Y27 1	Ignition: **OFF** Connector on EGR switch-over valve (Y27) and connector on EGR micro-switch (S27/3) unplugged.	< 1 Ω	Open circuit.
	5.4 EGR switchover valve (Y27)	Vacuum tester with Y-distributor at switchover valve (side outlet).	Engine: **at Idle**	> 250 mbar	EGR switchover valve (Y27).
			Full throttle	< 10 mbar	
6	6.0	–	–	–	Internal voltage supply, replace EDS control unit (N39).

Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
7	7.0 Starter ring gear speed sensor (L3)	N39 3 — (V) — 20	Engine: **at Idle** EDS control unit unplugged.	>2 V~ [1]	Speed sensor, gap, dirt, Wiring.
	7.1 TD-signal	N39 3 — (V) — 25	Engine: **at Idle** EDS control unit connected.	>3.5V~ [2]	Short circuit in wire from N39 to (X11/4) or EDS control unit (N39).
	7.2 Starter ring gear speed sensor (L3)	N39 3 — (Ω) — 20	Ignition: **OFF** EDS control unit unplugged.	Beru [3] 527 Ω ± 10 % VDO [3] 1900 Ω ± 10 %	Starter ring gear speed sensor (L3), Wiring.
		L3x1 1 — (Ω) — 2	Connector (L3x1) unplugged.	Beru [3] 527 Ω ± 10 % VDO [3] 1900 Ω ± 10 %	Starter ring gear speed sensor (L3).
	7.3 Wiring	N39 20 — (Ω) — L3x1 2		< 1 Ω	Open circuit.
		N39 3 — (Ω) — L3x1 1		< 1 Ω	Open circuit.

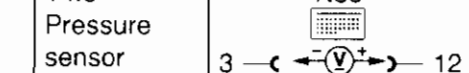
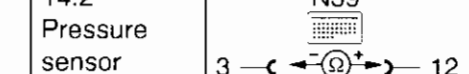
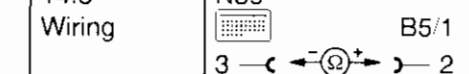
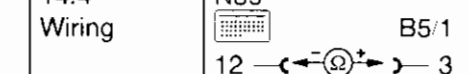
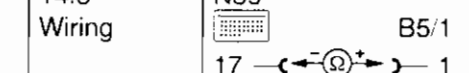
1) Voltage increases with increasing rpm.
2) Voltage decreases with increasing rpm.
3) Measured at 20 °C ambient temperature (for every 10 °C difference in ambient temperature, the resistance changes by 4 %).

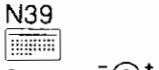
Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
8	8.0 Coolant temperature sensor (B11/4)		Ignition: **ON** EDS control unit connected.	1)	Coolant temperature sensor, Wiring, EDS control unit.
	8.1 Coolant temperature sensor (B11/4)		Ignition: **OFF** EDS control unit unplugged.	1)	Coolant temperature sensor, Wiring.
			Connector (B11/4) unplugged.	1)	Coolant temperature sensor.
	8.2 Wiring		Ignition: **OFF** EDS control unit unplugged.	< 1 Ω	Open circuit
9	9.0 Intake air temperature sensor (B2/1a)		Ignition: **ON** EDS control unit connected.	1)	Air flow sensor with intake air temperature sensor (B2/1), Wiring, EDS control unit (N39).
	9.1 Intake air temperature sensor (B2/1a)		Ignition: **OFF** EDS control unit unplugged.	1)	Wiring to intake air temperature sensor, Intake air temperature sensor (B2/1a).
			Connector on air flow sensor (B2/1) unplugged.	1)	Intake air temperature sensor (B2/1a).

1) See table for coolant and intake air temperature sensors.

Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
[9]	9.2 Wiring	N39 — B2/1 22 — Ω — 1	Ignition: **OFF** EDS control unit unplugged, connector on air flow sensor (B2/1) unplugged.	< 1 Ω	Open circuit.
		N39 — B2/1 3 — Ω — 2		< 1 Ω	Open circuit.
10	10.0 Voltage supply	N39 14 — V — 1	Engine: **at approx. 1500 rpm**	11–14 V	Voltage > 18 V, voltage regulator.
11 [1]	11.0 Electro-magnetic actuator, electronic idle speed control (Y22)	N39 3 — V — 2	Engine: **at approx. 1500 rpm** EDS control unit connected.	11–14 V	Actuator (Y22), Wiring.
		N39 2 — V — 1	Engine: **at Idle**	1.5 ± 0.5 V [2]	EDS control unit (N39), perform test steps 5 and 15.
	11.1	N39 1 — Ω — 2	Ignition: **OFF** EDS control unit unplugged.	4 ± 1 Ω	Actuator (Y22), Wiring.
	11.2 Wiring	N39 — Y22 1 — Ω — 2	Ignition: **OFF** Connector on actuator (Y22) unplugged.	< 1 Ω	Open circuit.
		N39 — Y22 2 — Ω — 1		< 1 Ω	Open circuit.

1) Displayed only if there is a short circuit.
2) Reference value only, voltage decreases with increasing engine speed.

Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
13	13.0	-	-	-	Replace EDS control unit (N39).
14	14.0 Pressure sensor (B5/1)	N39  3 — 12	Ignition: **ON** EDS control unit connected.	> 4.9 V	Pressure sensor, Wiring.
	14.1 Pressure sensor (B5/1)	N39  3 — 17 Vacuum tester with Y-distributor at pressure sensor.	Engine: **at Idle** Briefly apply full throttle.	> 1.5 V 0 mbar Voltage increases as pressure increases > 500 mbar	Pressure sensor, Pressure lines, Wiring.
	14.2 Pressure sensor (B5/1)	N39  3 — 12	Ignition: **OFF** EDS control unit unplugged.	3 ± 0.2 kΩ	Pressure sensor, Wiring.
	14.3 Wiring	N39 B5/1  3 — 2	Ignition: **OFF** EDS control unit unplugged.	< 1 Ω	Open circuit.
	14.4 Wiring	N39 B5/1  12 — 3	Ignition: **OFF** EDS control unit unplugged.	< 1 Ω	Open circuit.
	14.5 Wiring	N39 B5/1  17 — 1	Ignition: **OFF** EDS control unit unplugged.	< 1 Ω	Open circuit.

Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
15	15.0 Vacuum transducer (Y31/5)	N39  8 — 1	Engine: **at Idle** EDS control unit connected.	>4 V [1]	Supply line (black/white) leak, Vent line (black) clogged, Vent filter (62a) dirty.
	Boost pressure control/ pressure control flap	Vacuum tester with Y-distributor at vacuum transducer (Y31/5) outlet (OUT).		>300 mbar [1]	Supply line (black/white) or vacuum line (black rubber) clogged or leaks, Vacuum transducer (Y31/5), Open circuit, EDS control unit (N39).
	15.1 Wiring	N39 — Y31/5  8 — 1 N39 — Y31/5  1 — 2	Ignition: **OFF** EDS control unit unplugged, connector at Y31/5 unplugged.	<1 Ω <1 Ω	Open circuit.
	15.2 Boost pressure control switchover valve (Y27/4)	N39  7 — 1	EDS control unit connected.		Boost pressure control switchover valve (Y27/4), EDS control unit (N39), Open circuit.
		Vacuum tester with Y-distributor at switchover valve (Y27/4) (side connection).	Engine: **at Idle** **Engine speed:** >1000 rpm [2]	12 V >300 mbar <1 V <10 mbar	
	15.3 Pressure control flap switchover valve (Y27/5)	N39  7 — 1	EDS control unit connected.		Pressure control flap switchover valve (Y27/5), EDS control unit (N39), Open circuit.
		Vacuum tester with Y-distributor at switchover valve (Y27/5) (side connection).	Engine: **at Idle** **Engine speed:** >1000 rpm [2]	12 V >300 mbar < 1 V >200 mbar	

1) Voltage and vacuum decrease with increasing rpm

2) Slowly increase engine speed to 1000 rpm **(from idle)**

Impulse readout	Test step/ test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
[15]	15.4 Wiring (Y27/4)	N39 7 — Ω — Y27/4 1 N39 1 — Ω — Y27/4 2	Ignition: **OFF** EDS control unit unplugged, connector at Y27/4 unplugged.	< 1 Ω < 1 Ω	Open circuit.
	15.5 Wiring (Y27/5)	Y27/4 1 — Ω — Y27/5 1 Y27/4 2 — Ω — Y27/5 2	Ignition: **OFF** connector at Y27/4, Y27/5 unplugged.	< 1 Ω < 1 Ω	Open circuit.

Coolant and intake air temperature sensors

Temperature in °C	Resistance (± 10 %)	Voltage (± 10 %)
20	2.5 kΩ	3.85 V
30	1.7 kΩ	3.47 V
40	1.18 kΩ	3.05 V
50	833 Ω	2.63 V
60	600 Ω	2.22 V
70	440 Ω	1.85 V
80	327 Ω	1.5 V
90	243 Ω	1.22 V
100	185 Ω	0.99 V

Function test, electronic idle speed control (ELR), EGR, P2-control

Note:
This test should be performed if, in spite of a complaint, the impulse readout does not indicate a malfunction.

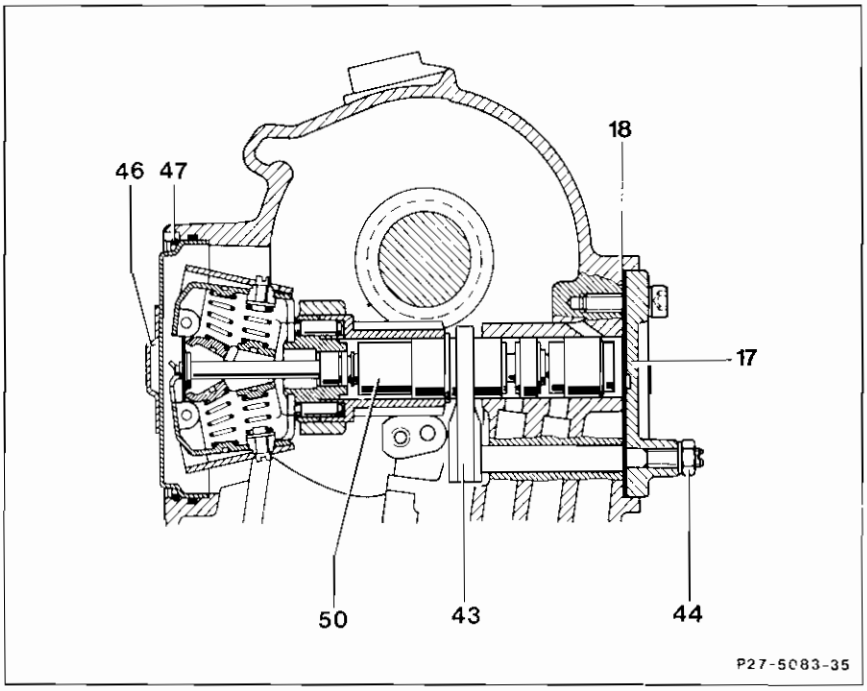
Engine 602.96

Test step/ test scope	Test connection/ equipment	Test condition	Nominal value	Possible cause/ remedy
1.0 Idle speed control	Connect tachometer to test connection (X11/4).	Engine: **at Idle** Coolant temperature approx. 80 °C.	680 ± 20 rpm	Actuator, Injection pump, Starter ring gear speed sensor (L3), EDS control unit (N39), see test steps 7 and 11 (EDS test).
		Connector on actuator unplugged.	610 ± 20 rpm	Adjust engine speed at injection pump, Injection pump.
2.0 EGR control circuit	Connect vacuum tester with Y-distributor to EGR valve.	Engine at 900 ± 50 rpm and approx. 300 mbar, briefly apply full throttle.	Vacuum decreases	Vacuum transducer (Y31/1), Vacuum switchover valve (Y27), Mechanically check air flow sensor (B2/1), EDS control unit (N39), EGR valve, Pneumatic connections.
3.0 EGR valve	Connect vacuum tester directly to EGR valve.	Engine: **OFF** Apply 300 mbar vacuum to EGR valve. Pull off vacuum line.	EGR valve closes audibly	Replace EGR valve.

Test step/ test scope	Test connection/ equipment	Test condition	Nominal value	Possible cause/ remedy
4.0 Boost pressure control	Connect vacuum tester (20) with Y-distributor to outlet (OUT) of vacuum transducer (Y31/3).	Engine: **at Idle**	>300 mbar	Vacuum supply, Vacuum line, Vacuum transducer (Y31/3), EDS control unit (N39).
Boost pressure control valve vacuum actuator		Slowly increase engine speed to approx. 2000 rpm.	Vacuum decreases	
4.1 Pressure control flap vacuum actuator (100)	Connect vacuum tester (20) with Y-distributor to pressure control flap vacuum actuator (100).	Engine: **at Idle**	<100 mbar	Vacuum supply, Vacuum line.
		Slowly increase engine speed to approx. 2000 rpm.	Vacuum increases	Vacuum transducer (Y31/2), Pressure line at pressure sensor (B5/1), EDS control unit (N39).

Automatic transmission

Deletion of secondary pump



Transmission 722.3

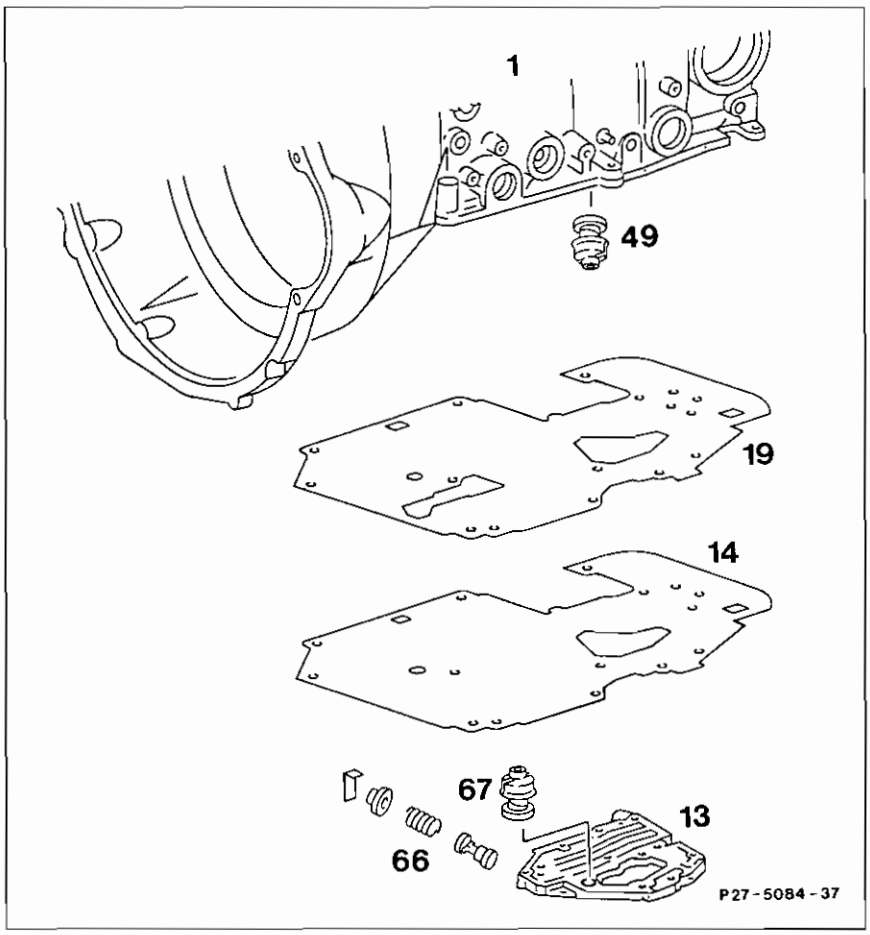
17 Cover
18 Gasket
43 Axial bracket
44 Nut, axial bracket
46 Governor cover
47 Snap ring
50 Governor

The secondary pump was deleted. As a result, it is no longer possible to tow-start the engine. Towing of the vehicle is still possible as previously, i.e. selector lever in position "N", maximum towing speed of 50 km/h (31 mph) and a maximum distance of 50 km (31 miles).

A cover (17) and gasket (18) are used to close off the existing bores for the secondary pump in the transmission housing.

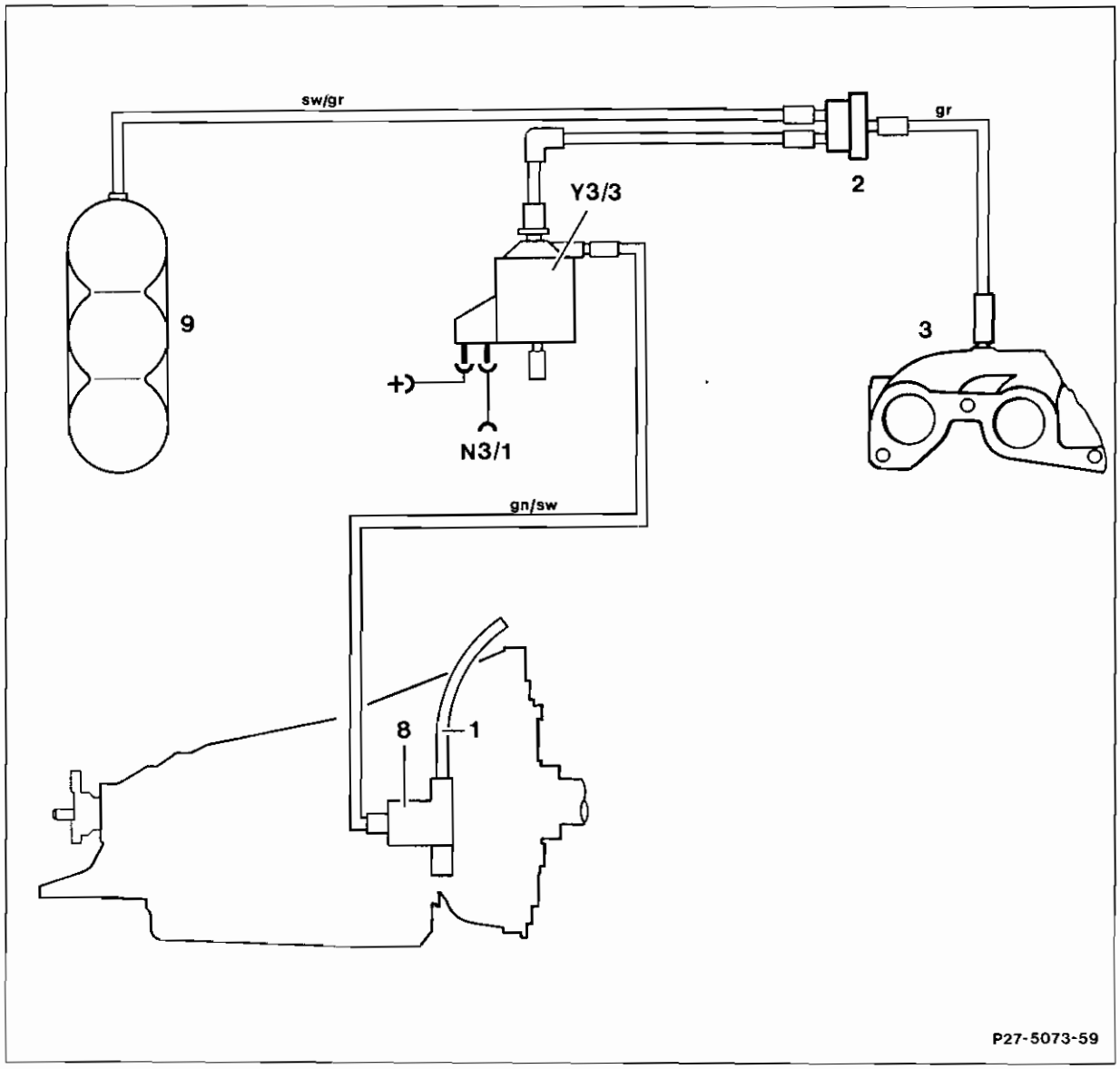
In conjunction with this change, the bores for the secondary pump in the large intermediate plate (14) have also been deleted. The check valves (49) and (67) as well as the secondary pump shift valve (66) have been eliminated as well.

This does not apply to 5-speed automatic transmission 722.5 installed in model 129.061, which still uses the shift valve (66), but only as a closure plug.



1 Transmission housing
13 Lower cover
14 Large intermediate plate
19 Gasket
49 Check valve
66 Shift valve - secondary pump
67 Check valve

Upshift delay



1 Control pressure cable
2 Check valve
3 Intake manifold
8 Upshift delay vacuum element
9 Vacuum reservoir

N3/1 LH control unit (N3 - CIS-E control unit)
Y3/3 Upshift delay switchover valve

sw black
gr grey
gn green

Modified upshift delay for rapid heating of catalyst

The upshift delay previously controlled by a relay (K29) and a solenoid (Y3/2) in the governor pressure circuit has been eliminated. The upshift delay is now actuated pneumatically by means of a switchover valve (Y3/3) and a vacuum element (8) on the control pressure bowden cable. This modifies the bowden cable's influence on the control valve (46) in the valve body.

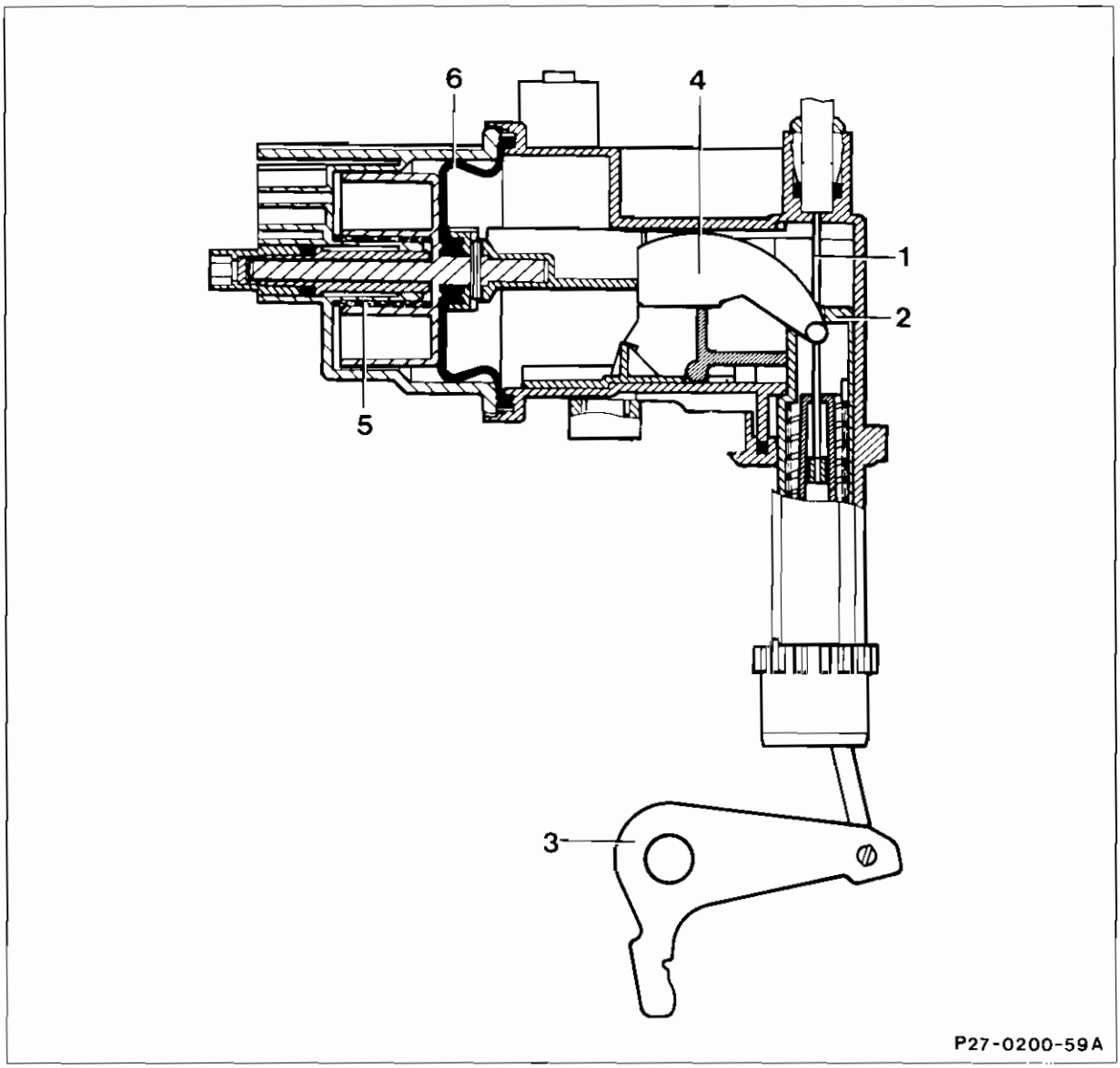
Operation

Depending on the coolant temperature, vehicle speed and running time, the upshift delay switchover valve (Y3/3) receives ground via the CIS-E control unit (N3). The vacuum element (8) then receives vacuum via the switchover valve under the following conditions:

- Coolant temperature approx. 0 °C to 50 °C max.,
- Vehicle speed between 6 mph (10 km/h) and 30 mph (48 km/h).

Upshift delay remains active for a maximum of approx. 80 seconds. Under light throttle the shift point for the 2 – 3 upshift is raised, thereby increasing the engine rpm and heating the catalyst quicker. The above mentioned values are nominal values and can vary depending on engine version.

Vacuum element (8)



1	Control pressure cable	4	Lever
2	Shift valve	5	Spring
3	Lever	6	Diaphragm

Vacuum pulls the diaphragm (6) to the left against the force of the spring (5). By means of a lever (4), the shift valve (2) is then moved upwards, independent of the control pressure bowden cable (1).

This causes the shift valve (2) to move the control pressure valve via a connecting rod and lever (3).

Rear axle

General information

The rear axle ratio was changed in models 124.026, 201.028/029.

Gear set and rear axle shaft

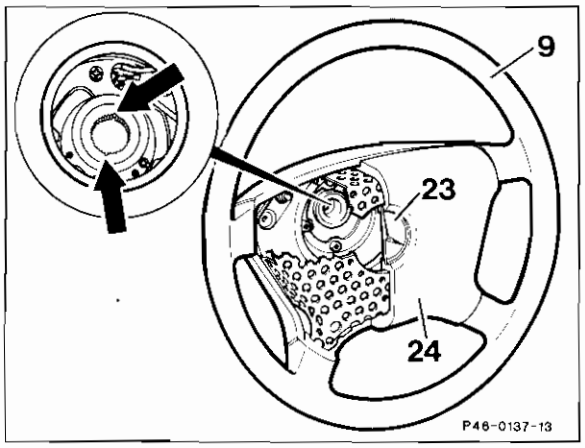
Model		124.026	201.028	201.029
Transmission version		automatic	automatic	automatic
Rear axle center piece	Ring gear dia. (mm)	185	185	185
	Ratio	2.87	2.85 [1]	2.85 [1]
	No. of teeth	43:15	37:13	37:13
Gear/rotor on drive pinion for ABS/ASD	No. of teeth	33	34	34
Constant velocity joint flange dia. (mm)		90	90	90
Rear axle shaft with constant velocity joint	Ball dia. inner (mm)	22.225	19.05	22.225
	Ball dia. outer (mm)	22.225	19.05	22.225
	Inner bolt circle diameter (mm)	94	86	94
	Shaft dia. (mm)	25	25	25
	Grease fill quantity (g) inner	120	100	120
	Grease fill quantity (g) outer	120	100	120

[1] matched gear set

Steering

Steering wheel (140-design)

All models are equipped with a newly designed steering wheel which is 400 mm in diameter (*Sportline* models 390 mm). The steering wheel, along with the transmission shift/selector lever knob, are covered in leather. The steering wheel in model 129 is color coordinated to the interior.



Installation note:
Correct positioning of the steering wheel during installation is assured by two grooves in the hub (arrows) and by a mark on the steering shaft spindle.

Electrical system - equipment and instruments

Instrument cluster

CHECK ENGINE warning lamp (A1e26)
Federal version models are no longer equipped with a CHECK ENGINE warning lamp. As a result, the O_2-sensor signal is no longer being monitored in these models.

California version models remain equipped with a CHECK ENGINE warning lamp to indicate an emissions-related component failure.

General information

A sports package (i.e. *Sportline*) is available for models 124.030/051 and 201.029. *Sportline* models were developed to provide enhanced characteristics for performance oriented drivers.

Sportline models are identified by two badges on the vehicle front quarter panels and a leather covered shift knob with a *Sportline* emblem.

Sportline equipment modifications are detailed as follows:

Suspension

Modifications

The following suspension components have been modified to increase handling performance:

- Front and rear springs,
- Front damper struts,
- Rear shock absorbers,
- Control arm bushings,
- Torsion bars.

The sport tuned springs and shocks are approximately 20% firmer than the standard components installed.

The overall vehicle height is lowered approx. 21 mm for model 201.029 and approx. 23 mm for models 124.030/051.

Test and adjustment data

Cross reference - springs-damper struts/shock absorbers

Model	Front spring part no.	Front damper strut part no.	Rear spring part no.	Rear shock absorber part no.
124.030	124 321 29 04	124 320 56 30	124 324 23 04 124 324 28 04	124 320 17 31
124.051	124 321 29 04	124 320 56 30	124 324 28 04	124 320 17 31
201.029	201 321 37 04 201 321 38 04	201 320 44 30	201 324 39 04	201 320 12 31

Front axle - number of points

Model	124.030	124.051	201.029
Base points	57	62	49
Sliding/lifting roof	3	3	2
Automatic transmission	Standard	Standard	4
Automatic locking differential (ASD)	Not available	Not available	1
Headlamp cleaning system	Standard	Standard	1

Cross reference - front springs/rubber mounts

Model	Total points	Front spring part no.	Height of rubber mounts (mm) according to spring color code	
			blue	red
124.030/051	53 – 59 60 – 66	124 321 29 04	13 18	18 23
201.029	up to 49 50 – 57	201 321 37 04 201 321 38 04	18 8	23 13

Rear axle - number of points

Model	124.030	124.051	201.029
Base points	29	41	19
Sliding/lifting roof	3	3	3
Automatic transmission	Standard	Standard	1
Automatic locking differential (ASD)	Not available	Not available	3
Rear head restraints	Standard	Standard	1

Cross reference - rear springs/rubber mounts

Model	Total points	Rear spring part no.	Height of rubber mounts (mm) according to spring color code	
			blue	red
124.030	21 – 31	124 324 23 04	13	18
124.030/051	32 – 41 42 – 50	124 324 28 04	8 13	13 18
201.029	up to 25	201 324 39 04	8	13
201.029	26 – 34	201 324 39 04	13	18

Wheels, chassis measurement, wheel alignment

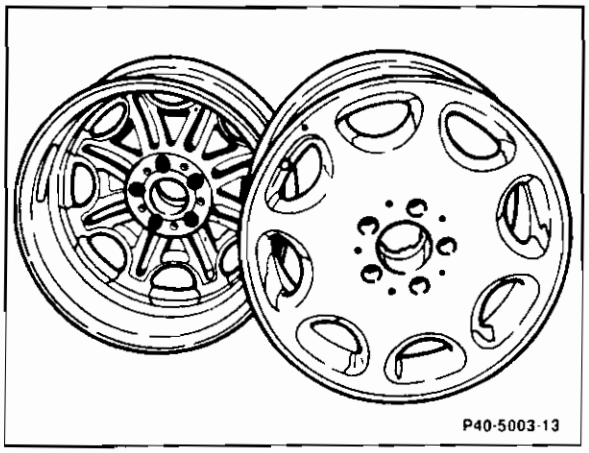
Wheels

Cross reference - wheels/tires/recommended tire brands

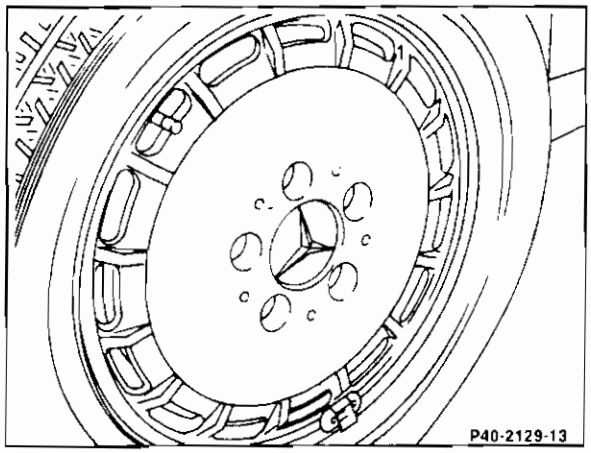
Model	Rim designation part no.	Summer tires, tubeless		Winter tires, tubeless	
		Tire size	Brand	Tire size	Brand
124.030 124.051	Light alloy 7 J×15 H 2 ET 41 [1] 124 401 13 02	205/60 ZR 15	GOODYEAR EAGLE NCT 2 MICHELIN MXV	205/60 R 15 91 H M+S	DUNLOP SP WINTER SPORT
201.029	Light alloy 7 J×15 H 2 ET 44 [1] [2] 201 400 13 02	205/55 ZR 15	PIRELLI P6 MICHELIN MXV	205/55 R 15 87 T M+S	PIRELLI MS WINTER 190 or CONTINENTAL SUPER CONTACT TS 740
				205/55 R 15 87 H M+S	DUNLOP SP WINTER SPORT

[1] Only use balancing weights with separate spring retaining clip.
[2] Only use adhesive balancing weights on inside of rim.

Light-alloy wheel rims
Models 124.030/051
A newly designed 8-hole light-alloy wheel with the following designation is installed:
7J ×15 H 2 ET 41.

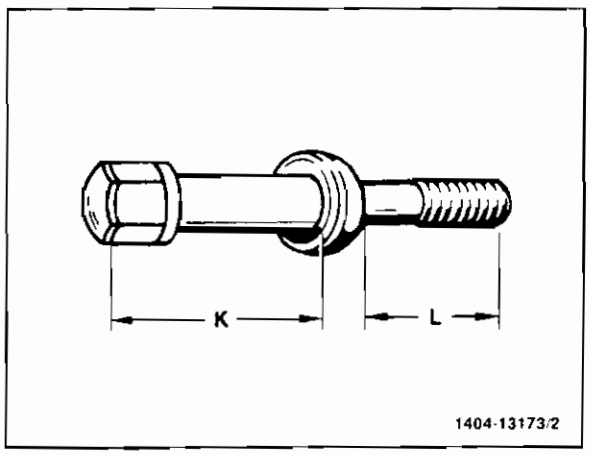


Model 201.029
The 15-hole light-alloy wheel known from model 201.034 is installed and has the following designation: 7 J×15 H 2 ET 44.



Wheel bolts for light-alloy wheel rims
Models 124.030/051, 201.029
The wheel bolts are identical for all *Sportline* models.
Part no. 201 400 00 70
Height of head "K" = 22.5 mm
Bolt shank length "L" = 40 mm
The screw head is hollow and is covered with a light-alloy cap.

Tightening torque: 110 Nm.



Wheel alignment

Test and adjustment data

Vehicle level

Models	Front axle (vehicle at curb weight) mm	Rear axle (vehicle at curb weight) mm
124.030/051	$+2^{+10}_{-15}$	$+3^{+10}_{-12}$
201.029	$+2^{+10}_{-15}$	$+6^{+10}_{-12}$

Front axle wheel alignment at specified vehicle level (curb weight)

Model		124.030/051 **[201.029]**	
Camber [1]	Wheels in straight ahead position (toe 0°)	$-0°50'^{+10'}_{-20'}$	$(-0.85°^{+0.15°}_{-0.35°})$
	Permissible difference between right and left	0°20'	(0.35°)
Caster [1]	Wheels in straight ahead position (toe 0°)	10°40' + 30' **[10°40' – 30'**	(10.65° + 0.50°) **(10.65° – 0.50°)]**
	Measured against wheel stop	10°25' ± 30'	(10.40° ± 0.50°)
	Permissible difference between right and left	0°30'	(0.50°)
Toe-in [1] (Front wheels spread with 90 – 110 N force)		0°20' ± 10'	(0.35° ± 0.15°)
Toe-out with inner wheel turned 20° [2]		-0°55' ± 30' **[–0°40' ± 30'**	(–0.90° ± 0.50°) **(–0.60° ± 0.50°)]**
Maximum permissible steering angle at inner wheel [3]		43°	(43.00°)
Ball joint position [4]		27.5 ± 2 mm **[30 ± 2 mm]**	
Permissible ball joint height difference between pitman and idler arms		3 mm	

1) Tolerance is for checking only. If outside of tolerance, adjust to specified value.
2) Value given does not include toe.
3) Wheel angle on outside wheel will be 7° to 11° less than on inside wheel.
4) Correction is made on idler arm in upward or downward direction by addition or removal of washer.

Note:
Values in **bold** text and in brackets [ ] are for model 201.029.

Values in parentheses ( ) are decimal degrees.

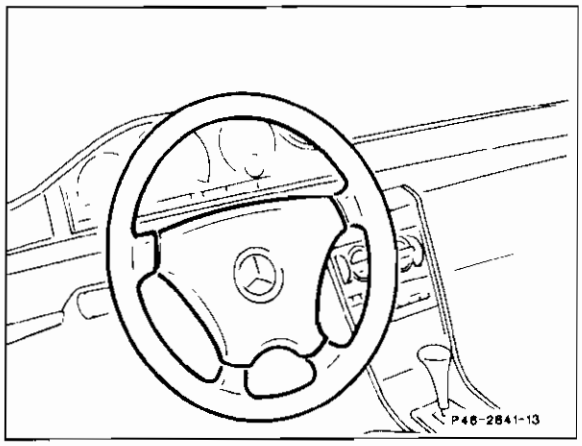
Steering

Cross reference, model/steering gear

Model	124.030	124.051	201.029
Steering gear	765.928	765.904	765.927
Ratio (standard ratio in parentheses)	13.28 (13.91)	13.91 (14.61)	13.91 (14.61)

Steering wheel (140-design)

Sportline models are equipped with a newly designed steering wheel which is 390 mm in diameter (standard models 400 mm). The steering wheel is covered in leather.



Seats

Sport 4-place seating

Model 201.029
Sport 4-place seating known from model 201.034 is installed and is available only in leather in the following interior colors: creme beige, black, blue, dark brown and grey.

Model 124.030
Sport 4-place leather seating is installed and is available only in the following interior colors: creme beige, black, blue, dark brown and grey.

Model 124.051
Sport 4-place leather seating continues to be standard in this model and is available in all eight interior colors.