Service Manual
Engines M 110

Mercedes-Benz
service

Mercedes-Benz of North America Inc.

Complete Service Manual coverage for late model year Mercedes-Benz vehicles requires three individual manuals:

Service Manual, Engine
Service Manual, Transmission
Service Manual, Chassis and Body

Throughout these manuals, the vehicles are identified by their chassis and engine numbers. These numbers are made up of the first six digits of the respective serial number. For the actual location of Chassis number and Engine number, see page 00–010/1. In cases where the repair instructions apply to all versions of the engine, only the first three digits of the respective number are referenced.

For example, engine 110 applies to all 2.8 liter 6 cylinder engines with dual overhead camshafts.

See the **engine and vehicle identification** table on page 00–010/1 for the engine installed in your vehicle.

Location of specific repair instructions

First locate the major component group in the Group Index. Individual groups are separated by an easily visible dividing page, which is followed by the job index page. Then check the job index for the exact job required. The first page of a typical job description looks like this:

07.3-135 Checking Injection valves

Job Title appears on
same line as Group No.

Major component group
Sub component group
Unit version
Revision status of microfilm
Job No.
Page No.

07.3.2 II-135/1

Technical data, tightening torques and tools are listed at the beginning of each Job.

All the dimensions are in metric units, provided no other unit of measure is used. The indicated part numbers are serving exclusively for identification and better differentiation of individual versions. When odering spare parts, always use part numbers from the latest parts literature.

00 Engine number and vehicle indentification tag location

Installation Survey

6-Cylinder in-line engine with dual two-stage carburetor.

Model	Chassis type	Engine type
280	114.060	110.921
280 C	114.073	110.921
280 S	116.020	110.922

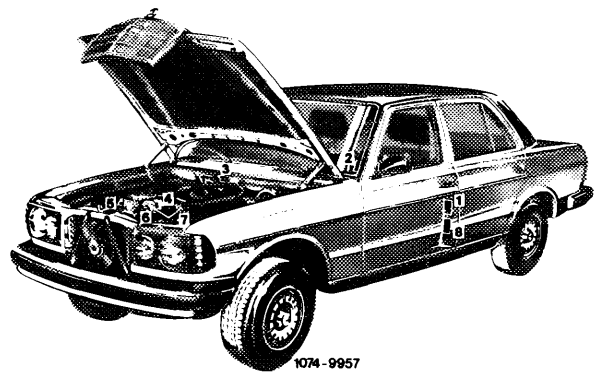
Engines with CIS (Continuous Injection System)

Model	Chassis type	Engine type
280 E	123.033	110.984
280 CE	123.053	110.984
280 SE	116.024	110.985

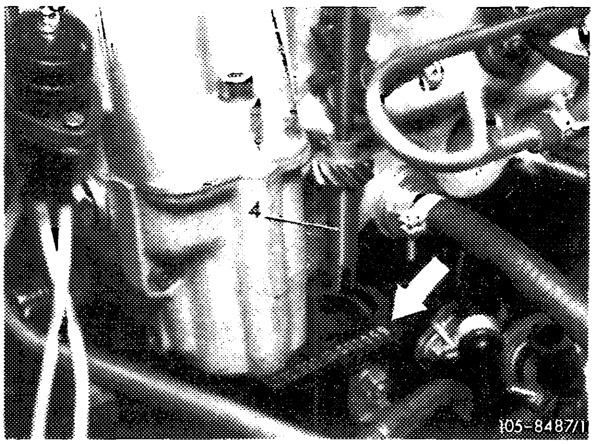
Identification of Vehicle

When ordering spare parts, please quote chassis and engine numbers.

With your MERCEDES-BENZ you receive two vehicle data cards listing all major vehicle data.



1 Certification Tag (left door pillar)
2 Identification Tag (left window post)
3 Chassis No.
4 Engine No.
5 Body No. and Paintwork No.
6 Information Tag
California Version
Vacuum line routing for emission control system
7 Emission Control Tag
8 Emission Control Tag
Catalyst Information



Engine No. stamped on left front of cylinder block (arrow)

Engine

Model	280	280 C	280 S	
Chassis Type	114.060	114.073	116.020	
Engine Type	110.921/922			
Year	1976	1975	1974	1973
Operation	Four stroke, gasoline engine with carburetor			
Number of cylinders	6			
Arrangement of cylinders	upright in line			
Bore/stroke mm(ins.)	86/78 (3.39/3.10)			
Total eff. piston displacement cm^3 (cu. ins.)	2746 (167.6)			
Compression ratio	9 : 1	8 : 1	9 : 1	8 : 1
Firing order	1-5-3-6-2-4			
Max. engine rpm	6500			
Engine output SAE net bhp/rpm	160/5500	145/5500	160/5500	130/5000
Max. torque SAE net ft. lb/rpm	165/4000	154/4000	165/4000	150/3500
Crankshaft bearings	7			
Valve arrangement	overhead			
Camshaft arrangement	DOHC			
Oil cooling	None			
Cooling	Water circulation pump, thermostat with by-pass line, finned tube radiator, fan with viscous coupling			
Lubrication	Forced oil circulation via gear-type oil pump			
Oil filter	Full-flow filter			
Air filter	Air filter with paper cartridge			

Filling Capacities

Model			280	280 C	280 S	
Chassis Type			114.060	114.073	116.020	
Engine Type			110.921/922			
Year			1976	1975	1974	1973
Engine	Initial filling	Engine oil approx. ltr. (US qt)	7 (7.4)			
	Oil and filter change	Engine oil approx. ltr. (US qt)	6.5 (6.9)			
	Oil pan up to max. marking on oil dipstick	Engine oil max. ltr. (US qt)	6 (6.3)			
	Oil filter	Engine oil approx. ltr. (US qt)	0.6 (0.62)			
Cooling system with heater		Coolant approx. ltr. (US qt)	11 (11.6)	10.5 (11)*		11 (11.6)
Water pump			maintenance free			
Brake system		Brake fluid approx. ltr. (US qt)	0.5 (0.53)			
Autom. Trans-mission	Initial filling/ fluid change	Autom. transmission fluid (ATF) approx. ltr. (US qt)	6.6/5.3 (7.0/5.6)			
Power steering		Autom transmission fluid (ATF) approx. ltr. (US qt)	1.4 (1.5)			

*110.922 (280 S) = 11 ltr./11.6 qt

Engine

Model		280 E	280 CE	280 SE	
Chassis Type		123.033	123.053	116.024	
Engine Type		110.984/985			
Year		1980/1981	1979	1978	1977
Operation		Four stroke, gasoline engine, mechanical (CIS) fuel injection with airflow sensor			
Number of cylinders		6			
Arrangement of cylinders		upright in line			
Bore/stroke	mm (ins.)	86/78 (3.39/3.10)			
Total eff. piston displacement	cm^3 (cu. ins.)	2746 (167.6)			
Compression ratio		8 ± 0.4 : 1	8 : 1		
Firing order		1-5-3-6-2-4			
Max. engine rpm		6400	6500		
Engine output	SAE net bhp/rpm	140/5500	142/5750[1]) 137/5750[2])		
Max. torque	SAE net ft. lb/rpm	145/4500	149/4600[1]) 142/4600[2])		
Crankshaft bearings		7			
Valve arrangement		overhead			
Camshaft arrangement		DOHC			
Oil cooling		None			
Cooling		Water circulation pump, thermostat with by-pass line, finned tube radiator, fan with viscous coupling			
Lubrication		Forced oil circulation via gear-type oil pump			
Oil filter		Full-flow filter			
Air filter		Air filter with paper cartridge			

[1]) Federal
[2]) California

Filling Capacities

Model			280 E	280 CE	280 SE	
Chassis Type			123.033	123.053	116.024	
Engine Type			110.984/985			
Year			1980/1981	1979	1978	1977
Engine	Initial filling	Engine oil approx. ltr. (US qt)	6.5 (6.9)	7 (7.4)		
	Oil and filter change	Engine oil approx. ltr. (US qt)	6 (6.3)	6.5 (6.9)		
	Oil pan up to max. marking on oil dipstick	Engine oil max. ltr. (US qt)	5.4 (5.7)	6 (6.3)		
	Oil filter	Engine oil approx. ltr. (US qt)	0.6 (0.62)			
Cooling system with heater		Coolant approx. ltr. (US qt)	10 (10.6)*			
Water pump			maintenance free			
Brake system		Brake fluid approx. ltr. (US qt)	0.5 (0.53)			
Autom. Trans-mission	Initial filling/ fluid change	Autom. transmission fluid (ATF) approx. ltr. (US qt)	6.6/5.3 (7.0/5.6)			
Power steering		Autom transmission fluid (ATF) approx. ltr. (US qt)	1.4 (1.5)			

*110.985 (280 SE) = 11 ltr./11.6 qt

01–001 Engine and model survey

Engine	Model	Sales designation	kW at 1/min
110.921[1])	114.060	280	118/5500
110.921[1])	114.073	280 C	118/5500
110.922[1])	116.020	280 S	118/5500
110.923	123.030	280	115/5500
110.923 NV	123.030	280	105/5500
110.923	123.050	280 C	115/5500
110.923 NV	123.050	280 C	105/5500
110.924	126.021	280 S	115/5500
110.924 NV	126.021	280 S	115/5500
110.931 NV	114.060	280	107/5500
110.931 NV	114.073	280 C	107/5500
110.932 NV	116.020	280 S	107/5500
110.981	114.062	280 E	136/6000
110.981	114.072	280 CE	136/6000
110.982	107.022	280 SLC	136/6000
110.982	107.042	280 SL	136/6000
110.983	116.024	280 SE	136/6000
110.983	116.025	280 SEL	136/6000
110.984	123.007[2])	280 E Special body long	130/6000
110.984[1])	123.033	280 E	130/6000
110.984	123.053	280 CE	130/6000
110.984	123.093	280 TE	130/6000
110.985[1])	116.024	280 SE	130/6000
110.985[1])	116.025	280 SEL	130/6000
110.986	107.022	280 SLC	130/6000
110.986	107.042	280 SL	130/6000
110.987	126.022	280 SE	136/5800
110.987	126.023	280 SEL	136/5800
110.991 NV	114.062	280 E	125/6000
110.991 NV	114.072	280 CE	125/6000
110.992 NV	107.022	280 SLC	125/6000
110.992 NV	107.042	280 SL	125/6000
110.993 NV	116.024	280 SE	125/6000
110.993 NV	116.025	280 SEL	125/6000

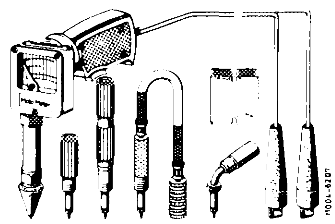
[1]) for USA
[2]) Sweden only
NV = low compression (SA 012.276)
SA = special equipment

01–010 Checking compression

Test values in bar for engine at operating temperature

Engine	Compression ratio ε : 1	Compression normal	Min. Compression	Max. difference between separate cylinders
Normal compression	9,0	10–12	approx. 8,5	
Low compression USA S J starting 1976 AUS starting 1977	8,0	9–10	approx. 7,5	max. 1,5

Special tool

Compression recorder with attachments and contact grip.		001 589 46 21 00

Notes

Check compression with coolant at temperature of 80° C.

Check cylinders for leaks if compression is less than the minimum specification (01–015).

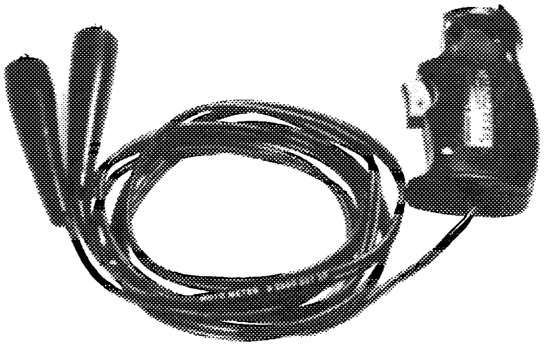
Unscrew all spark plugs for testing.

Checking

Models 107, 114 and 116

Connect contact handle to battery + and terminal 50 on starter.

Disconnect cable on ignition coil terminal 1.

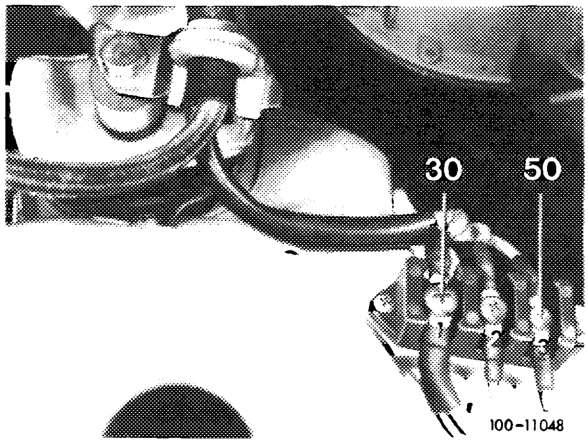


105-9061

Model 123

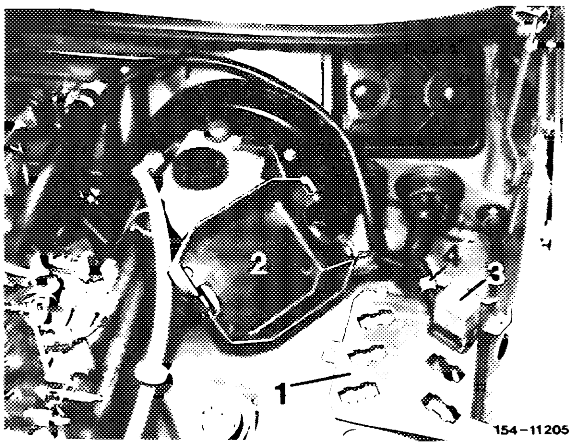
Connect contact handle to terminal 30 and to terminal 50 on cable connector.

Disconnect cable on ignition coil terminal 1.



100-11048

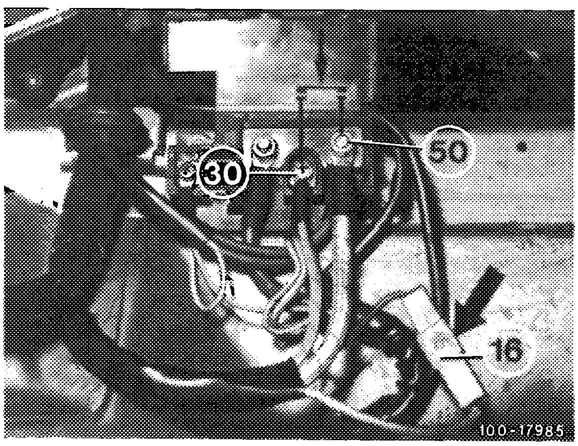
Attention!
On engines with CIS injection system, pull-off relay with code number 21 (3) for fuel pump—warm-up compensator.



154-11205

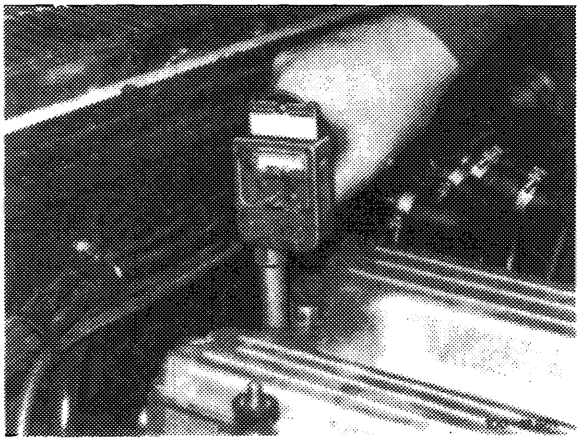
Model 126

Separate cable plug, arrow terminal 16, so that the ignition coil, and on engines with CIS the fuel pump, cannot be activated. Connect terminal 30 and 50.



100-17985

1 Rotate engine for several turns with ignition switched off and idle speed or selector lever position ,,P'' so that residue and soot will be blown out.



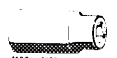
2 For testing, rotate engine for eight turns while opening throttle valve.

01–015 Checking cylinders for leaks

Data

Total pressure loss	max 25%
On valves and cylinder head gasket	max 10%
On piston and piston rings	max 20%

Special tool

Socket 27 mm for rotating engine	 11004-6193	001 589 65 09 00

Conventional tool

Cylinder leak tester	e.g. made by Bosch, EFAW 210 A made by SUN, CLT 228

Checking

1 Run engine up to operating temperature.

2 Unscrew spark plugs.

3 Remove radiator cap and add coolant.

4 Remove oil filler plug.

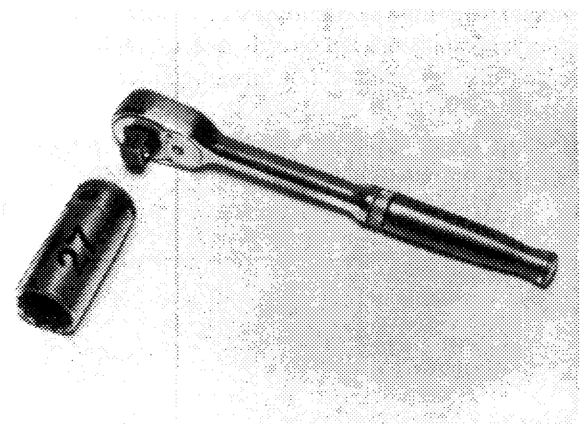
5 Remove air filter.

6 Connect cylinder leak tester to a compressed air source. Calibrate tester.

7 Set piston of cylinder 1 to ignition TDC.

For this purpose, turn engine on crankshaft by means of tool combination.

8 Set throttle valve to fully open.



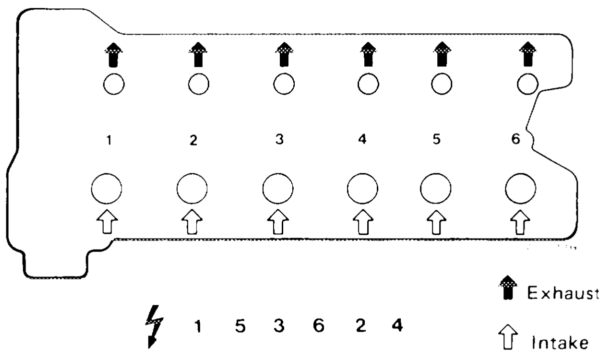
1100-6498/1

9 Screw connection hose into first spark plug bore and couple to connecting hose of tester. Crankshaft should not rotate.

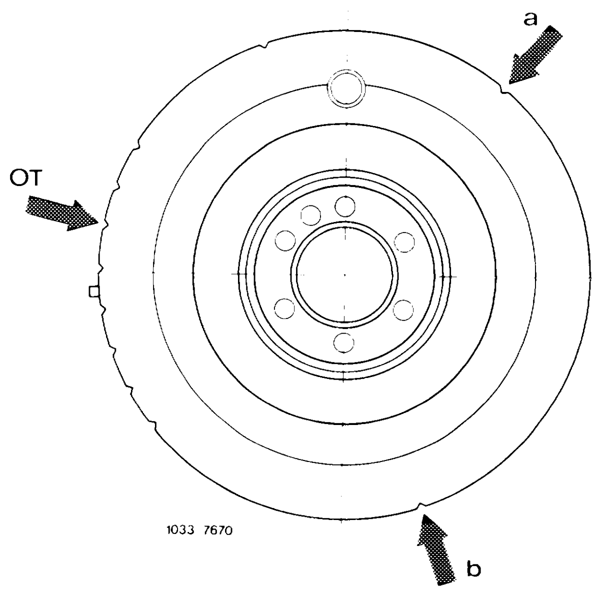
10 Read pressure loss on tester.

11 Check by listening whether pressure escapes via intake pipe, exhaust, oil filler cap, spark plug bore of adjacent cylinder or radiator cap.

12 Check all cylinders in ignition sequence.



Note: The respective pistons are in TDC position when the markings on vibration damper as shown in adjacent drawing are below TDC indicator.



TDC position of pistons

TDC Piston 1 and 6
a Piston 3 and 4
b Piston 2 and 5

Note: There is the possibility that the piston ring gaps of individual pistons are directly one above the other, so that the test result will be misrepresented.

When in doubt, continue running vehicle and check cylinders for leaks once again later on.

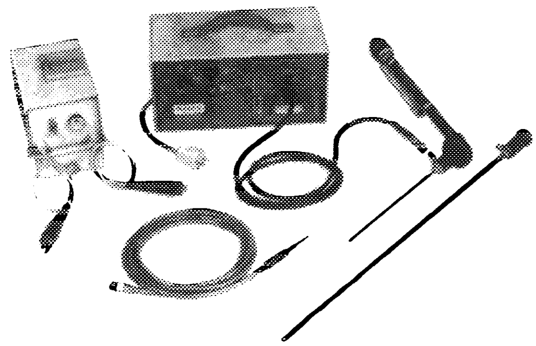
Conventional tool

Cylinder illuminating lamp	e.g. made by Karl Storz GmbH, 7200 Tuttlingen Motoskop TW (cold light) with lens attachment 210 mm long.

Note

Visual inspections can be made with a cylinder illuminating lamp on mounted cylinder head.

When illuminating because of oil consumption or blue smoke, run engine warm, shut off and illuminate cold, or immediately following deceleration (coasting).



103 – 15713

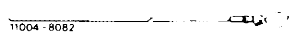
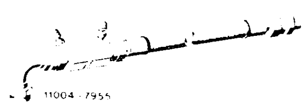
When evaluating scored or streaky cylinder walls, it is often no easy job for a workshop to decide whether the respective damage is bad enough to require removal of engine or repairs, or whether the marks are insignificant. The following information will help in making an expert and correct decision.

With regard to marks on cylinder walls the first important difference is between "optical streaks" and "seizure streaks". In most cases "optical streaks" are about 3 mm wide, they are produced by the piston ring gaps and the honing structure will still be visible; while "seizure streaks" will obliterate the honing structure.

"Longitudinal streaks" (in piston pin direction) are not the result of shaft scratches or seizure, since there is no contact between piston skirt and cylinder wall.

01–025 Measuring oil consumption

Special tools

Oil dipstick with millimeter scale for engines with oil suction		115 589 15 21 00
Oil dipstick with millimeter scale for engines without oil suction		110 589 11 21 00
Telethermometer		116 589 27 21 00
Valve for interrupting oil return flow from oil cooler		110 589 00 91 00

Note

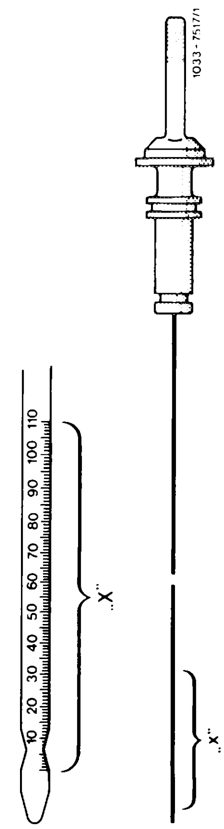
The oil consumption can be measured by means of oil dipstick with millimeter scale and the pertinent diagram on back of data sheet.

Data sheets

Engine 110	Print no.
Engines with oil suction	800 99 403 00 German/English 800 99 403 01 French/Spanish
Engines without oil suction	800 99 227 00 a German/English 800 99 227 01 a French/Spanish

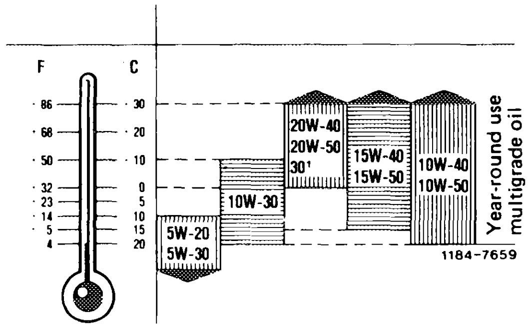
The measuring procedure is explained on front page of data sheet.

To avoid faulty measuring, check engine oil for dilution by fuel prior to measuring.



01–030 Removal and installation of engine (oil filling capacity)

Specified viscosity classes
according to SAE
during constant outside temperatures



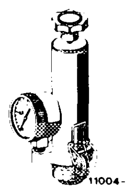
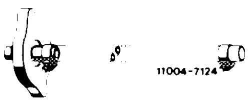
¹) During constant outside temperatures above + 30°C (+ 86° F) SAE 40 may be used.

Oil filling capacity in liters (for approved engine oil grades refer to specifications for service products)

Color code of oil dipstick	total capacity when refilling engine
Wine red pink brown (USA 1975/76 only)	7
yellow-green	6.5

Tightening torques		Nm
Oil drain plug to oil pan		40
Fastening screw for oil filter lower half		40
Screws for engine carrier on engine mount front	M 12	70
	M 10	40

Special tools

Tester for cooling system and radiator cap		001 589 48 21 00
Double connection for radiator cap test in combination with tester		000 589 73 63 00
Radiator cap with hose for leak test		605 589 00 25 00

11004-8325
11004-8326
11004-7124

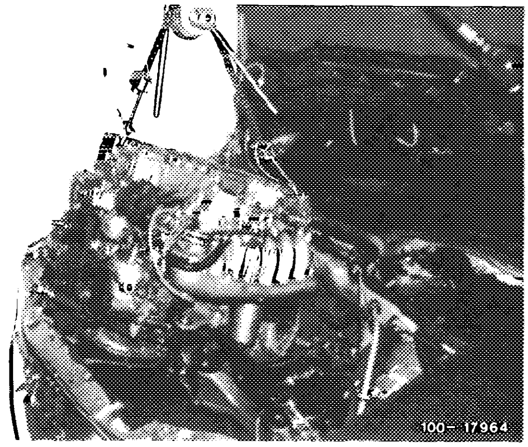
Conventional tool

Engine hoist (Motordirigent) size 1.5	e.g. made by Bäcker, D-5630 Remscheid order no. 3178

Note

Remove and install engine with transmission by means of an engine hoist in diagonal position.

If removal and installation is performed on a lifting platform, the engine of model 126 can be placed on cross yoke center piece at the rear during installation.

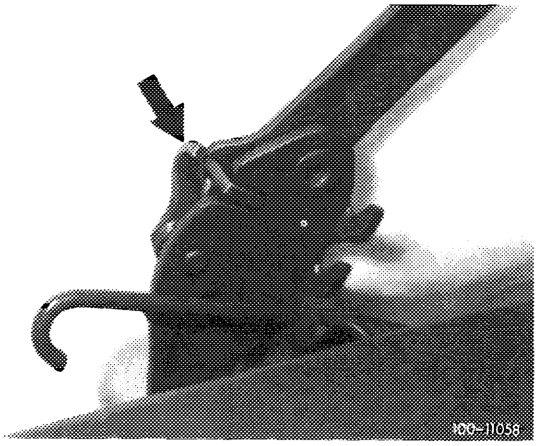


Removal

1 On model 123 and 126 move engine hood into 90° position and let left-hand locking lever (arrow) engage.

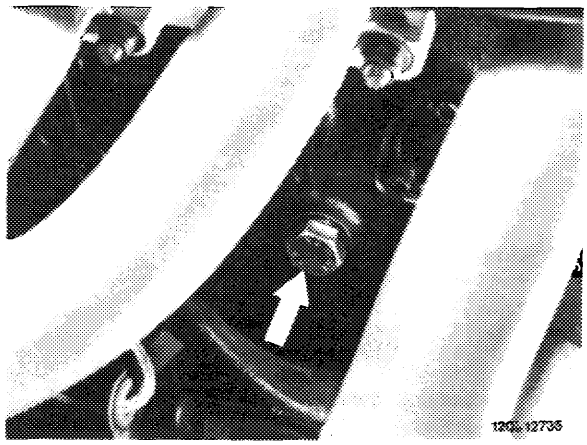
On other models, remove engine hood.

2 Disconnect battery cable.



3 Drain coolant (arrow).

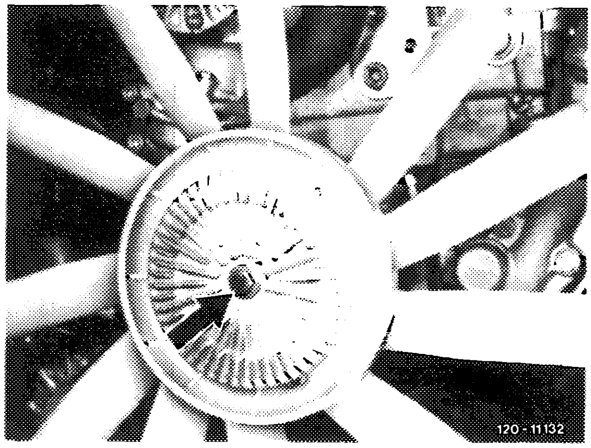
4 Disconnect and close lines for air oil cooler and transmission oil cooler on radiator and close, so that no oil will run out.



5 Remove radiator together with air oil cooler, while suspending fan cover over fan.

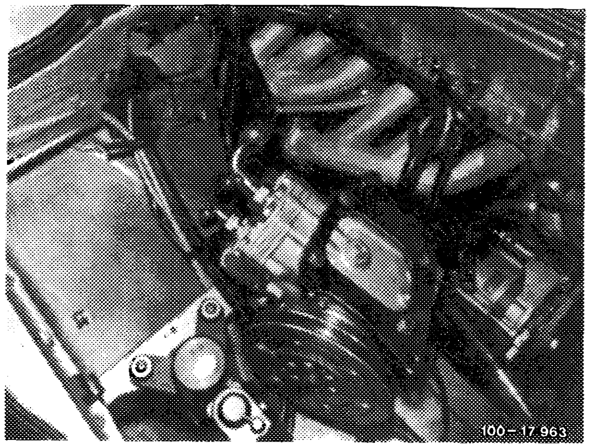
6 Remove fan.

For this purpose, loosen screw (arrow) on magnetic fan.

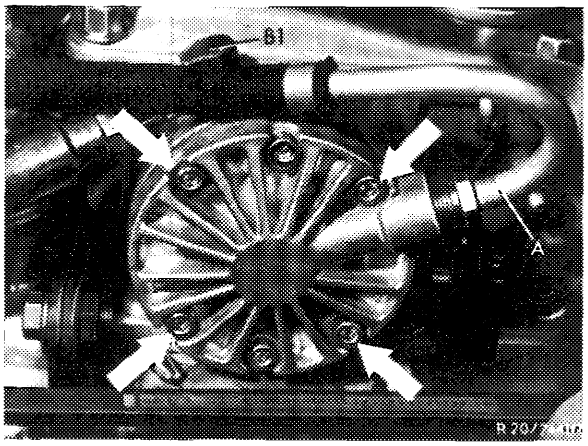


7 On vehicles with air conditioning, unscrew refrigerant compressor and put aside with lines connected.

When removing refrigerant compressor, drain air conditioning system (83–516).

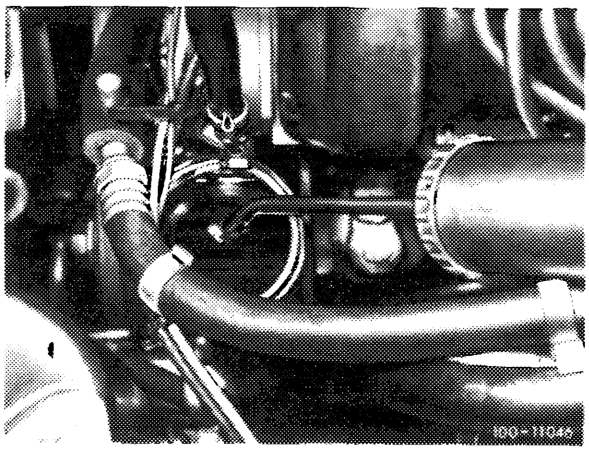


8 Disconnect lines at oil pressure pump. Only loosen bolts (arrows) to detach oil pressure pump.



9 Draw oil out of power steering pump tank.

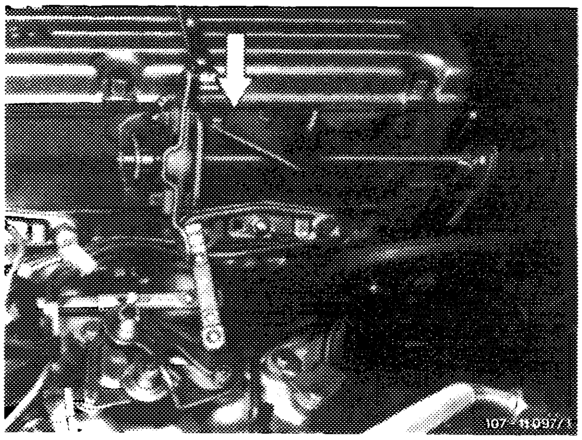
10 Disconnect hoses at power steering pump.



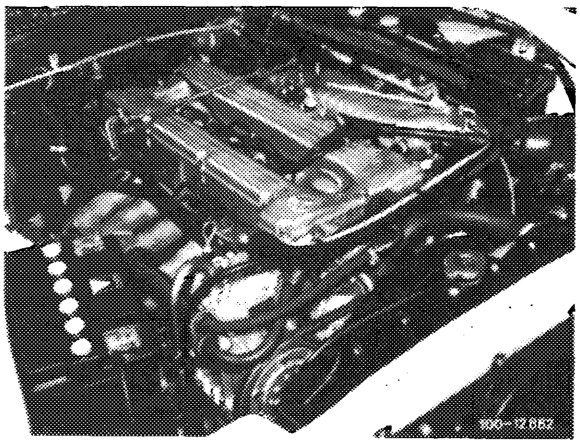
11 Disconnect electric harness for starter motor and alternator.

12 Disconnect all electric connections on engine.

13 Remove longitudinal control shaft.

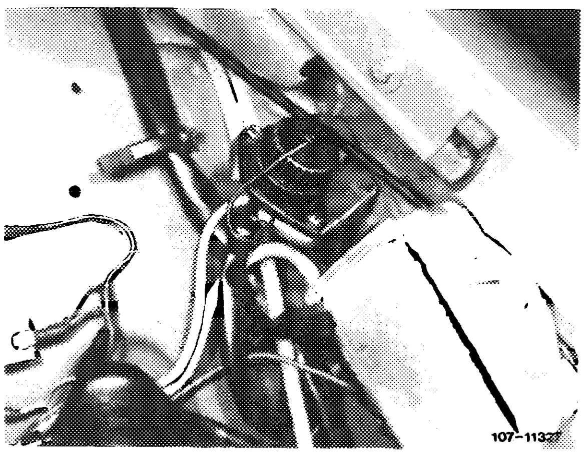


14 Disconnect all coolant, vacuum. oil and electric lines leading to the engine.

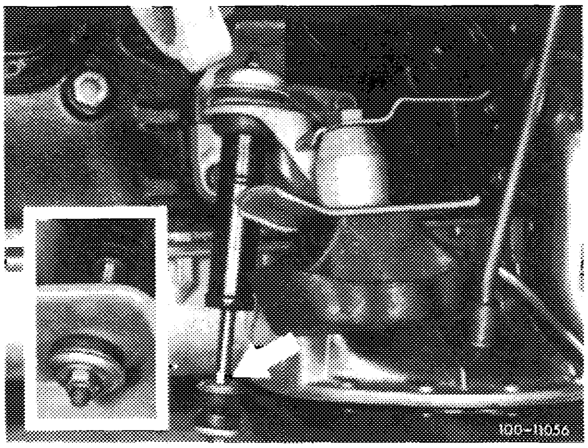


15 Pull off TDC transmitter wires at test socket. This requires unscrewing test socket at holder.

16 Detach exhaust pipes at exhaust manifold and exhaust strut at transmission.



17 Unscrew engine shock absorbers left and right (00–240).

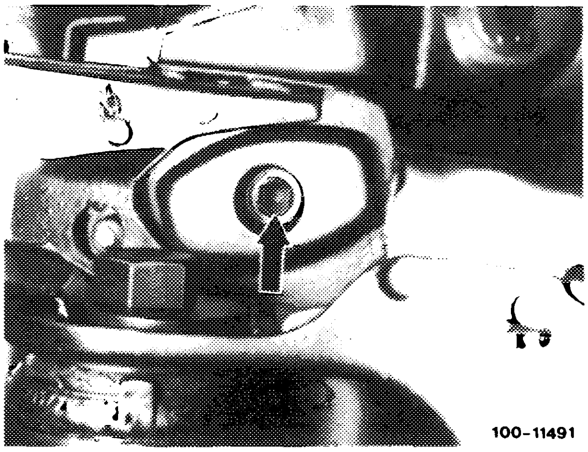


Model 123

18 Remove engine mounting bolts from engine mount.

Model 114 from above.

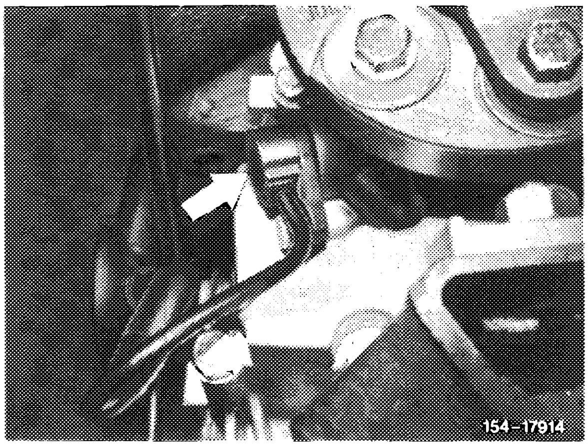
Models 107, 116, 123 and 126 from bottom of vehicle (arrow).



19 Remove rear engine carrier with engine mount.

20 Disconnect tachometer shaft on transmission.

Models with inductance transmitter (arrow): Disconnect inductance transmitter for tachometer. For this purpose, unscrew screw M 6 and pull out inductance transmitter.



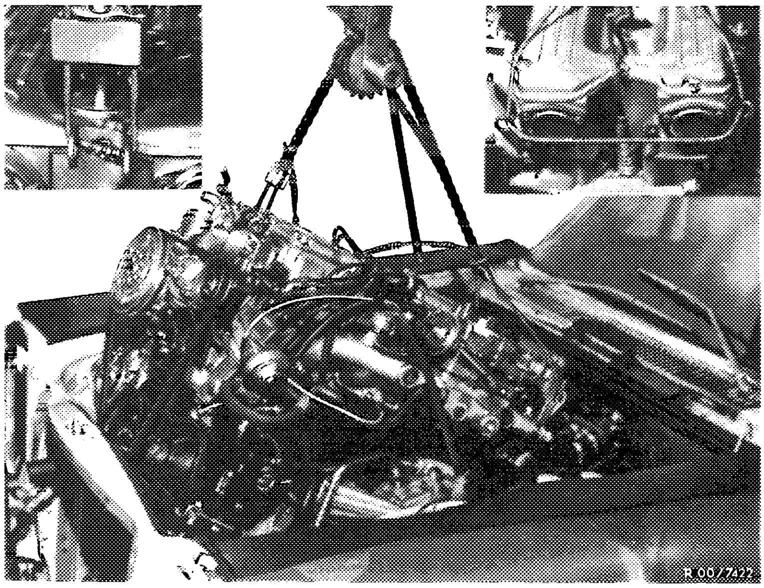
21 Disconnect propeller shaft on transmission and slide back.

Support propeller shaft, so that shaft will not abut against transmission flange when installing engine.

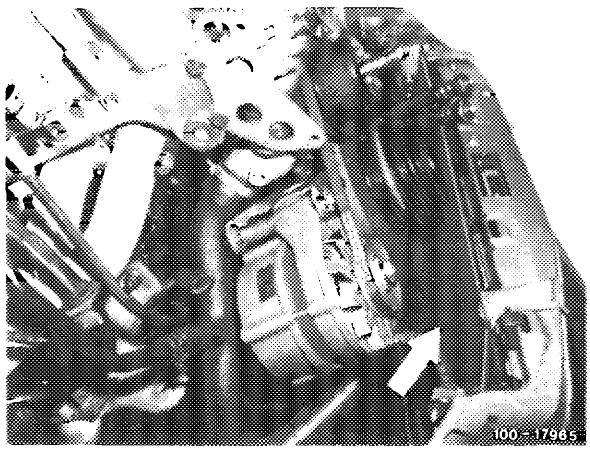
22 Loosen all connections and shift rods on transmission.

23 Attach engine at rear and front to suspension eyes.

24 Lift engine with transmission by means of engine hoist in an approx. 45° diagonal position. Make sure that the partition for unit compartment (model 126) is not damaged, since its damping effects will be lost by absorbed splash water.

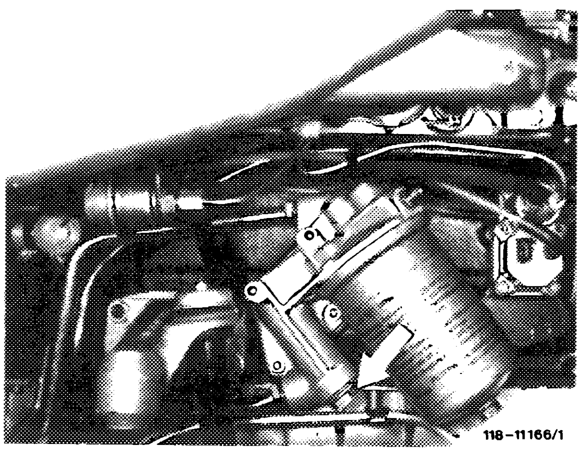


Attention!
On vehicles with air conditioning, cover condenser with a hard fiber board (arrow).



Installation

Attention!
When installing an engine because of previous bearing damage, flush out the oil cooler and oil hoses. Clean oil filter housing.



25 Check engine mounts, engine shock absorbers, coolant, oil and fuel hoses and replace them if necessary.

26 Prior to flanging-on manual transmission, check radial ball bearing in crankshaft and throw-out of clutch and renew, if required.

27 Install engine and connect.

28 Adjust rear engine mount free of tension (00–220).

29 Connect propeller shaft.

30 Check all drain plugs for tight seat.

31 Add oil and coolant (20–010).

32 Check cooling system for leaks with leak tester.

Note: On vehicles with auxiliary heater, bleed coolant circuit (refer to repair instructions auxiliary heater 83–415).

33 Check coolant for antifreeze.

34 Clean air filter and renew, if required.

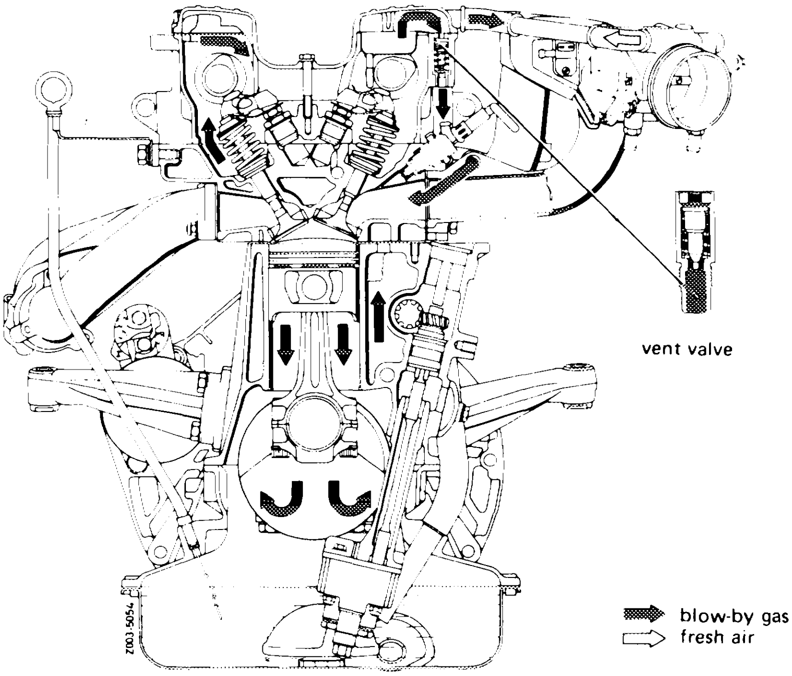
35 Check dwell angle and firing point.

36 Adjust idle speed and emission value (07.2–100).

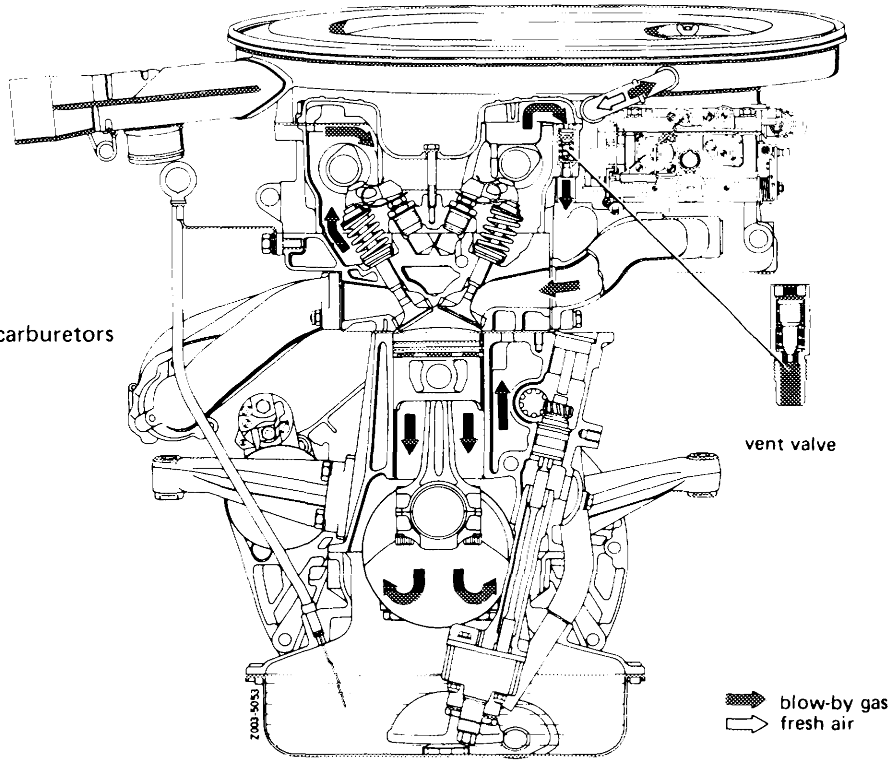
37 Check regulating shaft for function.

A. Engine with vent valve

This engine has a closed crankcase vent system which does not require maintenance.



Engine with electronic fuel injection system.

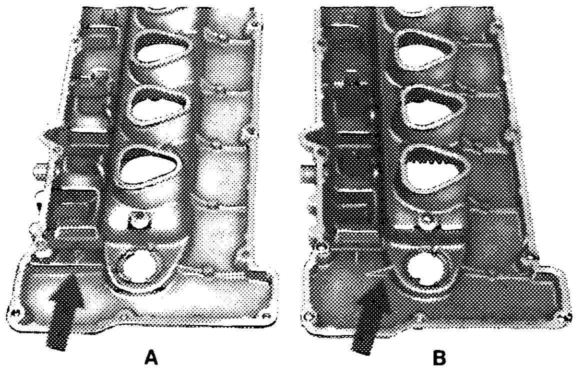


Engine with twin two-stage carburetors

First version with vent valve

The blow-by gases flow via an oil separator in the cylinder head cover to the vent valve.

Attention!
Only use cylinder head covers of version A with oil protection ribs.



101-9341

At idle speed and lower speed ranges the blow-by gas will enter the combustion chamber via the vent valve and intake manifold or idle air passage.

The vent valve spring works against the intake manifold vacuum pressure.

Depending on intake manifold vacuum pressure the valve cone will be pulled or pressed up by the valve spring and thus changes the through-flow cross section opening.

Since the through-flow capacity of the vent valve is larger than the amount of blow-by gas from the crankcase, fresh air is also drawn off from the air cleaner of a carburetor engine or from the throttle housing in front of the throttle valve via a pipe of an engine with fuel injection.

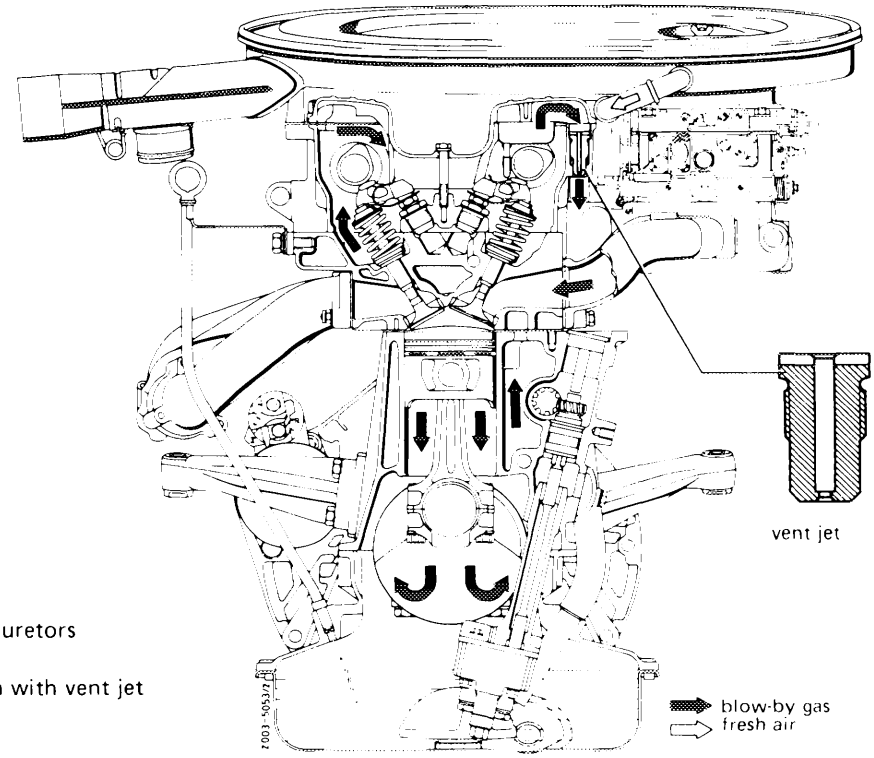
The additional fresh air is taken from an air cleaner of a carburetor engine via a hose.

When coasting the high intake manifold pressure will close the vent valve. The very slight amounts of blow-by gas in this case will now travel in reverse direction to the throttle housing via a pipe or the air cleaner via a hose and are drawn off at these points.

Note: Carburetor engines with a vent valve can also be equipped with a vent jet.

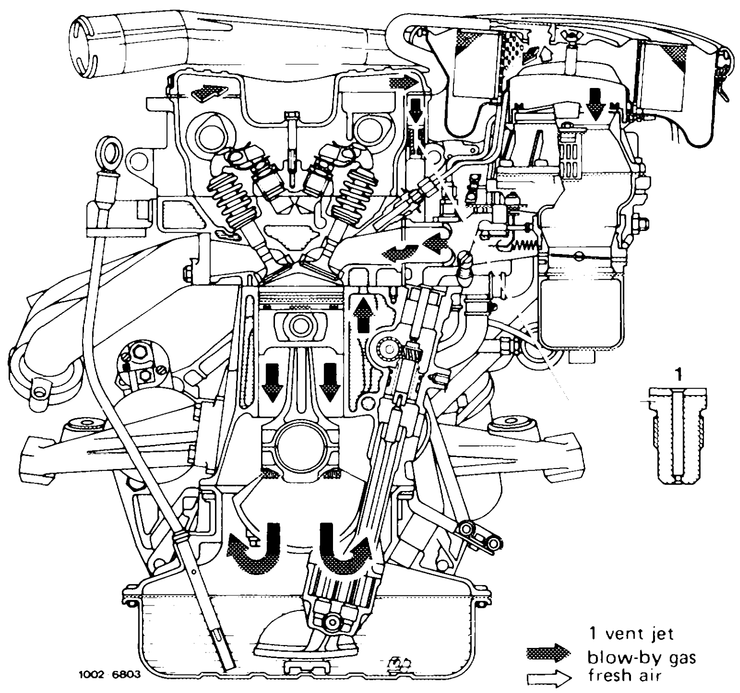
B. Engine with vent jet

This engine has a closed crankcase vent which does not require maintenance.



Engine with twin two-stage carburetors

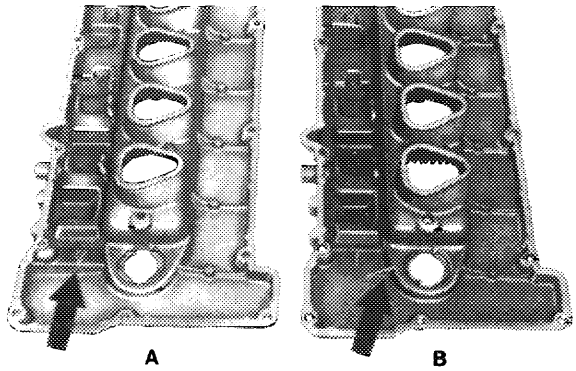
Second version and USA version with vent jet (including model year 1979).



Engine with continuous fuel injection

The blow-by gases flow to the vent jet via an oil separator in the cylinder head cover.

Attention!
Only use cylinder head covers of version A with oil protection ribs.



101-9341

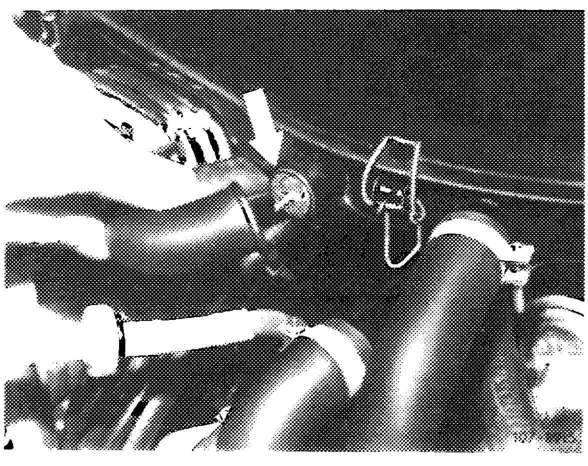
At idle speed and in low speed ranges the blow-by gas will enter into the combustion chambers via the vent jet and intake manifold or idle air passage.

In lower and medium speed ranges the intake manifold vacuum will cause fresh air to be drawn in from the air cleaner via a hose in addition to the blow-by gas.

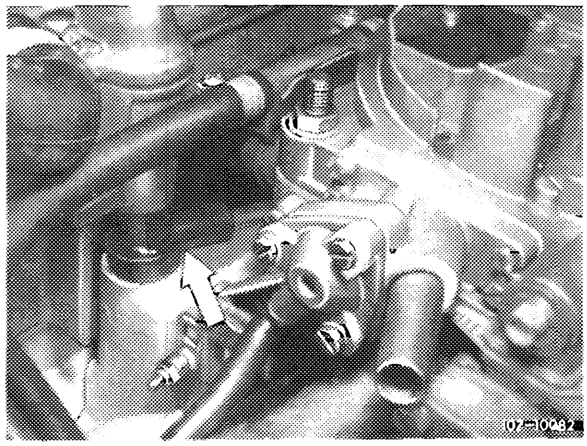
In the upper speed range blow-by gas will also flow from the fresh air side of the air cleaner depending on the blow-by quantity.

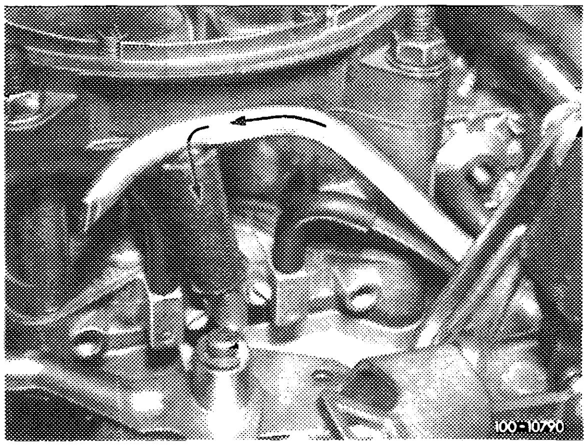
This is drawn off to the combustion chambers via the carburetor or air flow sensor and intake manifold.

Models for USA, Australia and Japan up to model year of 1977 have a flame guard (arrow) in the engine vent connection.

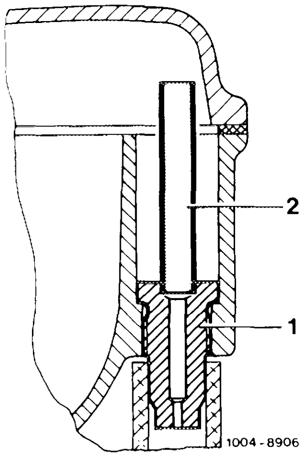


For 1975 and 1976 USA models, 1976 Sweden model and 1976 Japan models the blow-by gas is drawn off to the carburetor via an angle connector (arrow).





On USA vehicles starting model year 1980 the vent nozzle is mounted with an overflow pipe (2), so that no engine oil is carried along in idle speed air duct.



Data

Group number[1]		0	1	2
Standard dimension 86.0	piston dia.	85.970–85.982	85.980–85.992	85.990–86.002
	cylinder dia.	85.998–86.008	86.008–86.018	86.019–86.028
Repair stage 1 + 0.5	piston dia.	86.470–86.482	86.480–86.492	86.490–86.502
	cylinder dia.	86.498–86.508	86.508–86.518	86.519–86.528
Repair stage 2 + 1.0	piston dia.	86.970–86.982	86.980–86.992	86.990–86.002
	cylinder dia.	86.998–86.008	87.008–87.018	87.019–87.028

[1]) Decisive for association is the smallest measured cylinder dia. and the largest measured piston dia.

Max. wear limit in driving or transverse direction of cylinder bores at upper reversing point of 1st piston ring		0,10
Piston clearance	When new	0,025–0,035
	Wear limit	0,08

Machining tolerances

Permissible deviation (radial distance) from cylinder shape	When new	0,007
	Wear limit	0,025
Permissible deviation from square with reference to cylinder height		0,05
Mean height of roughness		0,002–0,004
Permissible height of waviness		50 % of roughness
Chamfer of cylinder bores		see fig. point 2

Conventional tools

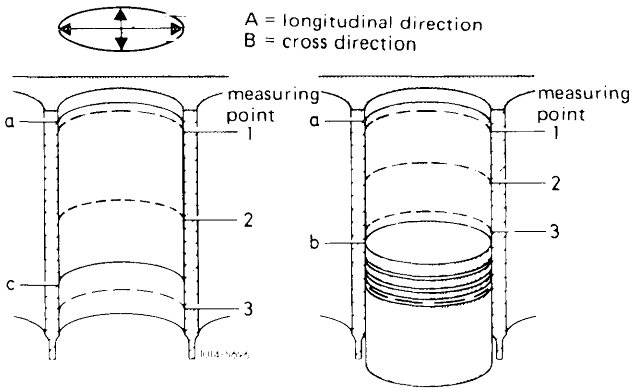
Inside measuring instrument for 50–150 mm dia., with 0.01 mm readout and measuring point pressure relief	e.g. made by Hommel Handel, 5000 Köln 71 Sunnen GRM-2125

Note

In particular for a complaint concerning "excessive oil consumption" a measurement of the cylinder bores is essential in addition to a visual inspection.

1 Measure the cleaned cylinder bores with an internal tester at measuring points 1, 2 and 3 in longitudinal direction A (piston pin axis) and in cross direction B.

When the pistons are installed measuring point 3 will be just barely above the piston, which must be at BDC.



a top reversing point of first piston ring
b BDC of piston
c bottom reversing point of oil scraper ring

The group number punched into crankcase (arrow), matches the group number of the pistons installed as standard equipment.

On used engines, the original cylinder dia. shows up after thorough cleaning of top land zone.

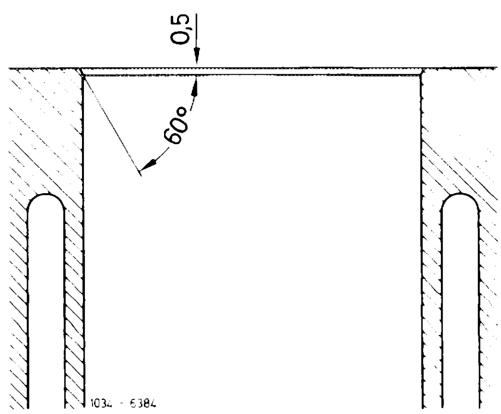
The difference in diameter of dimension shown on top land zone and the dimension at measuring point 1 generally indicates the respective max. wear.

In the event of repairs, hone cylinder bores according to dimensions of available pistons plus piston clearance.

The processing machines used for boring (pre-honing), finish-honing and polishing should be set in accordance with respective operating instructions.

Upon boring, the cylinder bores should be chamfered at upper cylinder end according to drawing.

The lower cylinder end should remain sharp edged without burr.



Data

Height of new crankcase	213.1–213.2
Min. height after removal of necessary material	212.8
Permissible deviation from parallel of upper parting surface in relation to lower parting surface in longitudinal direction	0,1
Permissible deviation from flatness of upper parting surface	0,03
Mean height of roughness of upper parting surface	0,005–0,020
Leak test with 1.5 bar air gauge pressure under water. Permissible leak rate in cc/min	10
Chamfer of cylinder bores	see note

Piston spacing in relation to parting surface

Engines with		normal compression		USA version and low compression	
Distance between piston crown and crankcase mating surface	Standard size piston	Below	min. 0.20 max. 0.70	above 0.25 below 0.15	
	Oversizes + 0.5 and 1.0	Below	min. 1.0 max. 1.5	below	min. 0.55 max. 0.95

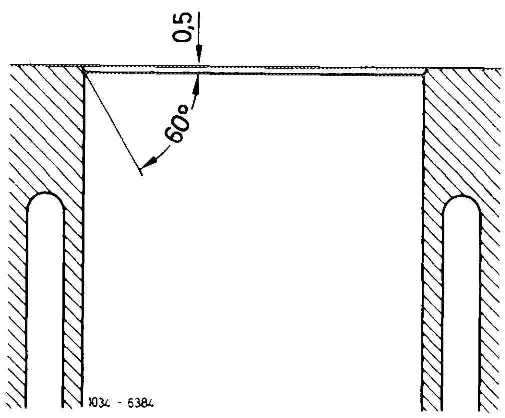
Conventional tools

Surface grinding machine	e.g. made by Ruaro u. Fi., Schio/Italy Scledum, type RTY
Knife-edge straightedge approx. 750 mm long	

Note

Chamfer cylinder bores after grinding.

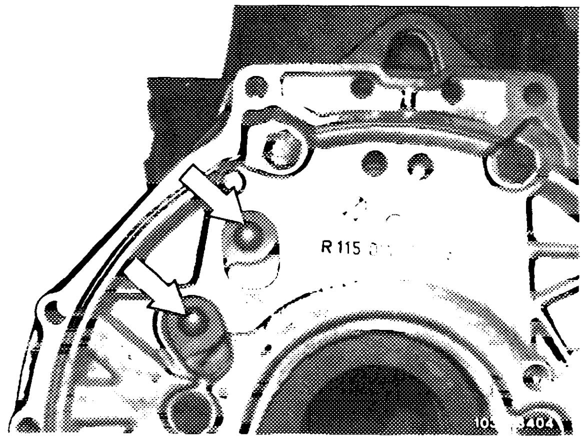
Adjust valve timing (05–215), if crankcase mating surface has been machined.



Tightening torques		Nm
Fastening bolts for intermediate flange		65
Closing plug for main oil duct		40
Pressure relief valve in main oil duct front		40
Closing plug pressure relief valve		50
Screw M 8 x 65 for vibration damper		35
Screw M 18 x 1.5 x 45 on crankshaft		400–450
Necked-down screw for driven plate and flywheel	initial torque	40
	torque angle	90°–100°

Note

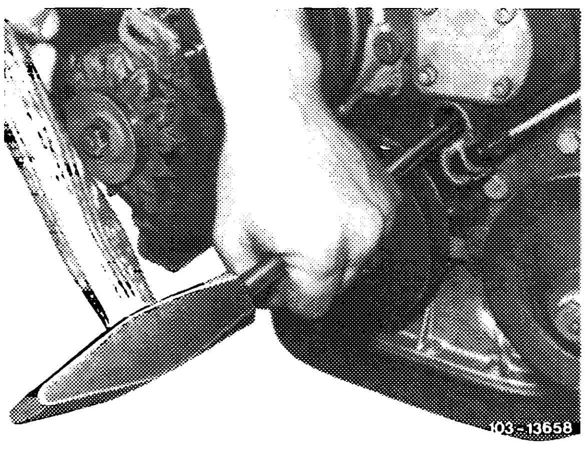
Since October 1976 the 2 main oil ducts (arrows) in cylinder crankcase at transmission end are closed by means of steel balls 15 mm dia. VO DIN 5401 part no. 005401 515001.



For cleaning main oil ducts during engine repairs, the steel balls must be knocked-out from direction of front end of engine.

Undamaged steel balls can be used several times without refinishing ball seat in crankcase.

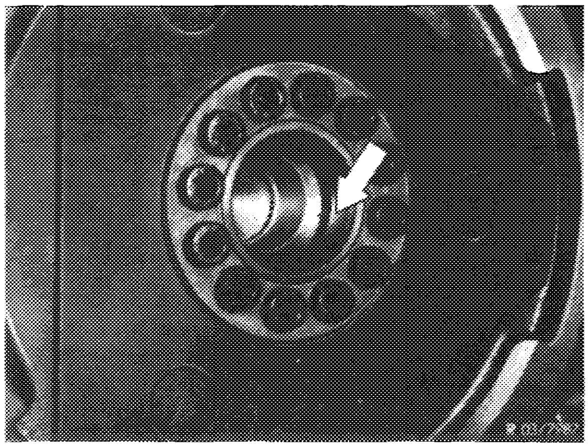
Damaged and rusty steel balls should be replaced.



Knocking-out steel ball in upper main oil duct

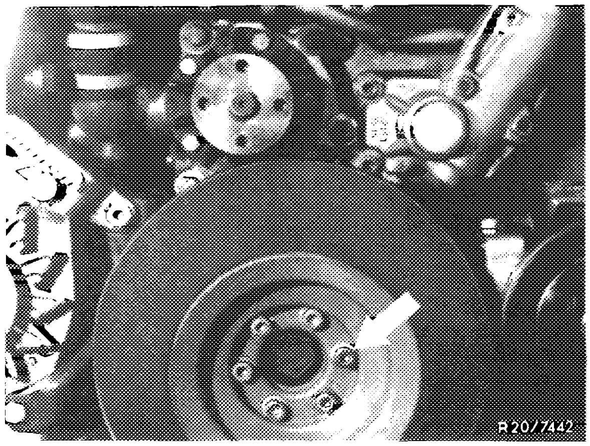
1 Remove transmission.

2 Remove flywheel (03–410).



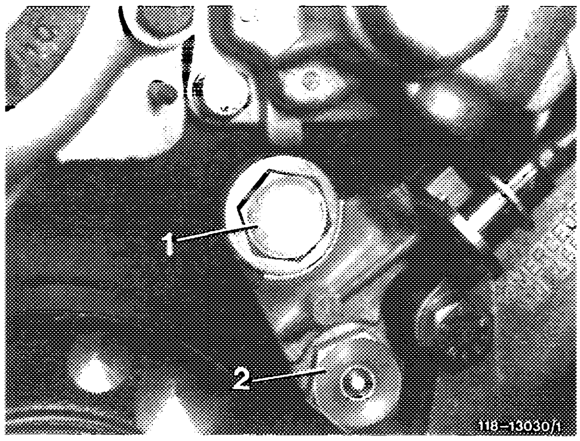
3 Remove radiator (20–420).

4 Remove vibration damper (03–340).



5 Unscrew closing plug (1) and screw oil pressure relief valve out of main oil duct.

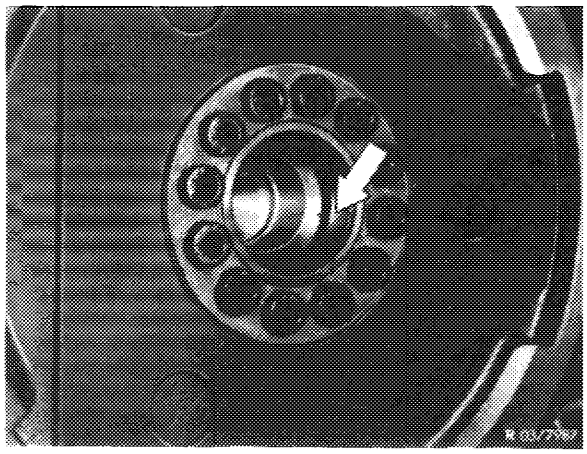
6 Knock-out steel ball from direction of engine front end by means of a round steel bar 13 mm dia. and approx. 700 mm long.



Knocking-out steel ball in lower main oil duct

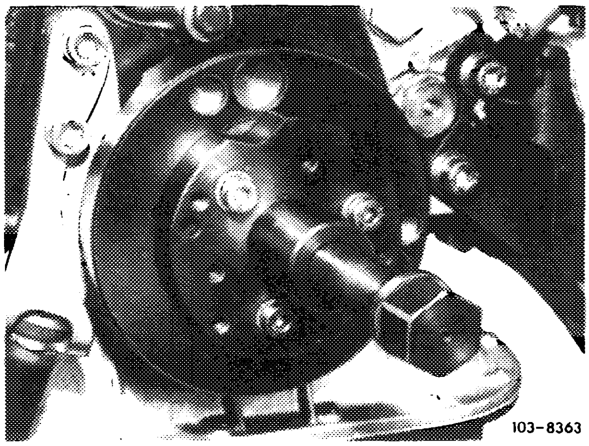
1 Remove transmission.

2 Remove flywheel (03–410).



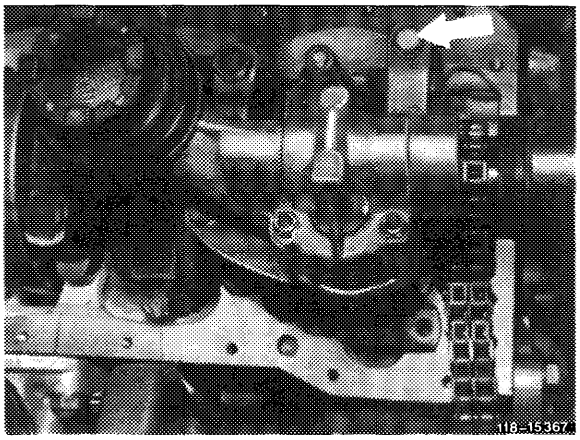
3 Remove radiator (20–420).

4 Remove vibration damper and compensating weight (03–340).



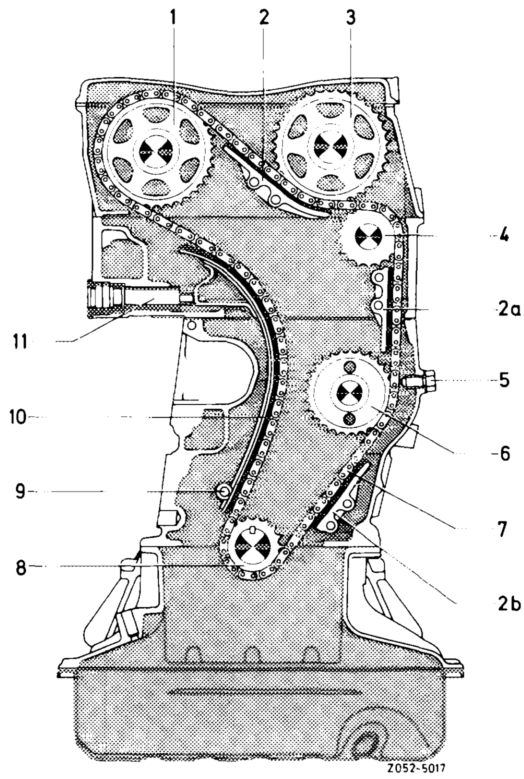
5 Remove complete oil pan (01–310).

6 Remove oil pump (18–210).



7 Remove slide rail (2b) in crankcase (05–340).

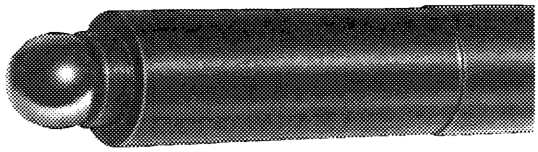
8 Knock-out steel ball from direction of engine front end by means of a round steel bar 13 mm dia. and approx. 700 mm long.



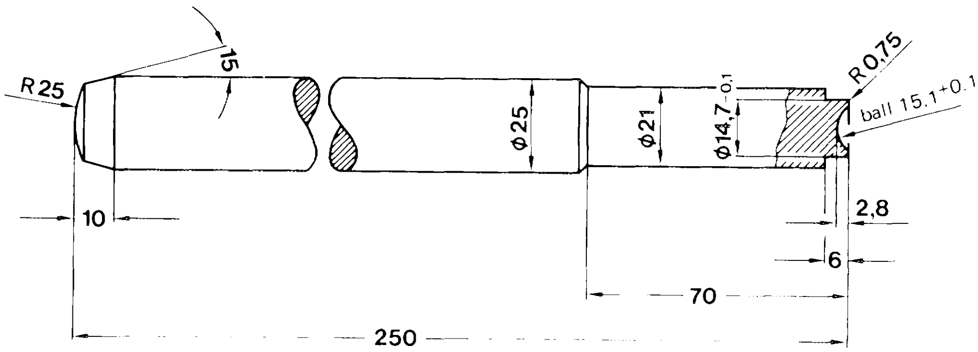
Closing main oil duct

1 Thoroughly clean ball seat and bore in main oil duct.

2 Coat up on self-made knocking-in mandrel with grease and place steel ball into cup.



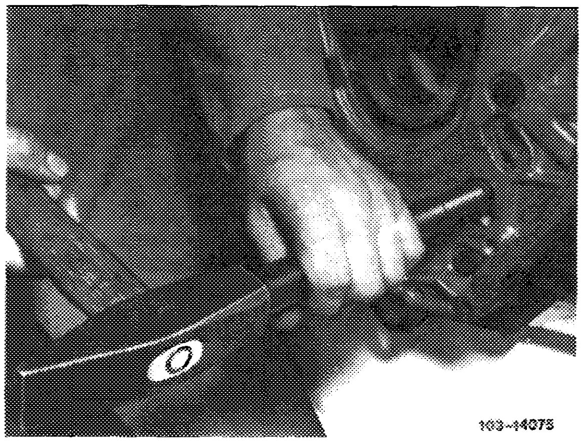
103-13 405



Material: C 45

11003-7473

3 Position steel ball with knocking-in mandrel and knock-in up to stop on mandrel.



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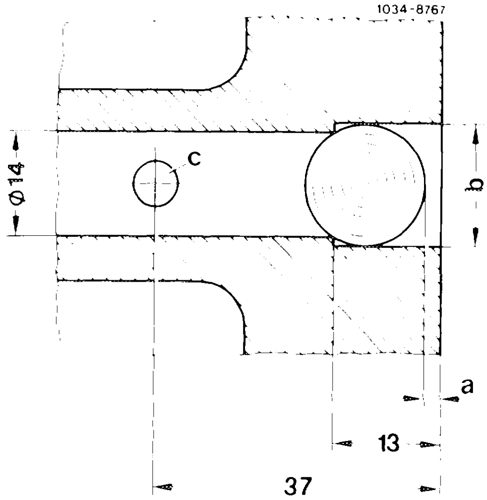
If the mandrel has no stop, do not exceed dimension a = max. 3 mm to prevent cracking of crankcase.



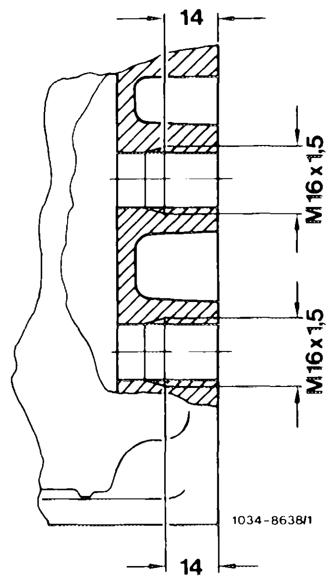
a = max. 3 mm
b = dia. 14.75 to 14.86 mm
c = oil ducts to crankshaft bearing

4 Mount all parts taken off or removed.

5 Run engine warm and check for leaks.

Note: If oil flows out as the result of a leaking ball seat, knock-out respective steel ball and close main oil duct with a closing plug after cutting the required threads into duct.

Closing main oil duct with closing plug



1 Cut threads M 16 x 1.5 mm approx. 14 mm deep into respective main oil duct.

2 Carefully clean main oil duct.

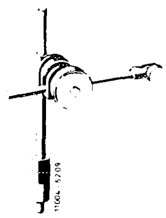
3 Screw closing plug M 16 x 1.5 mm DIN 908, part no. 000 908 016 001 with aluminum sealing ring A 16 x 22 mm DIN 7603 – AL, part no. 007 603 016 102, and tighten to 40 Nm.

Data

Radial runout of intermediate flange	max. 0.10
Permissible axial runout of intermediate flange when mounted in crankshaft bearing basic bore during one full turn.	0.10

Tightening torques		Nm
Intermediate flange mounting bolts		65
Drive plate and flywheel expansion bolt	Torque pressure	40
	Torque angle	90–100°

Special tool

Dial gage holder (two required)		121 589 00 21 00

Self-made tool

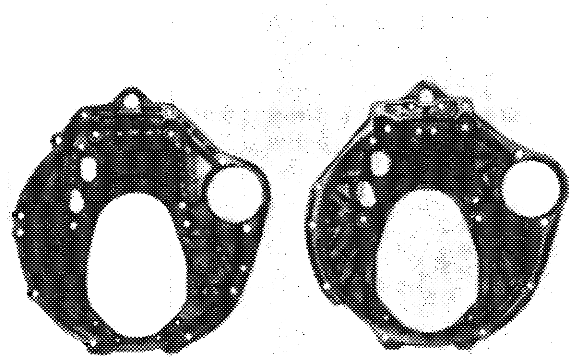
Threaded pin	see fig, point 3

Conventional tool

Dial gauge A 1 DIN 878	e.g. made by Mahr, 7300 Esslingen order no. 810

Note

A replaced intermediate flange must be centered. The automatic transmission W4A040 requires the intermediate flange (1) with fitted pin and all-around centering system, which can be used as a replacement for the formerly used intermediate flange (2) with all-around centering system.



1 Modified intermediate flange 110 011 15 45
2 Former intermediate flange 115 011 11 45

Series installation of intermediate flange
110 011 15 45 starting end of november 1979

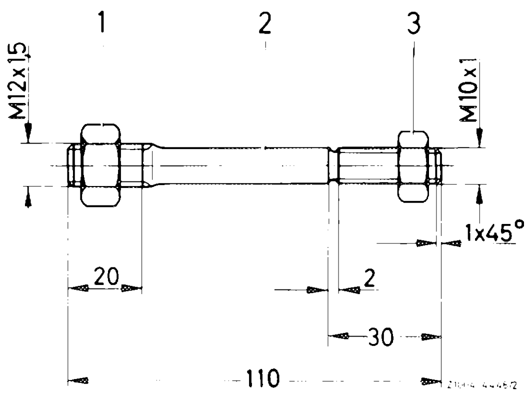
Starting engine end no.		Starting chassis end no.
110.923	–10–014 453	123.030–028 448
	–12–017 710	123.050–003 543
110.984	–10–021 092	123.033–067 904
	–12–070 620	123.053–018 127
110.922	–10–040 775	116.020–121 410
	–12–067 894	
110.932	–10–010 365	
	–12–002 796	
110.985	–10–014 287	116.024/025–154 967
	–12–073 060	
110.986	–10–003 392	107.042–007 301
	–12–007 701	107.022–007 921

Installing and centering

1 Place intermediate flange over dowel pins in crankcase.

2 Tighten the four mounting bolts slightly.

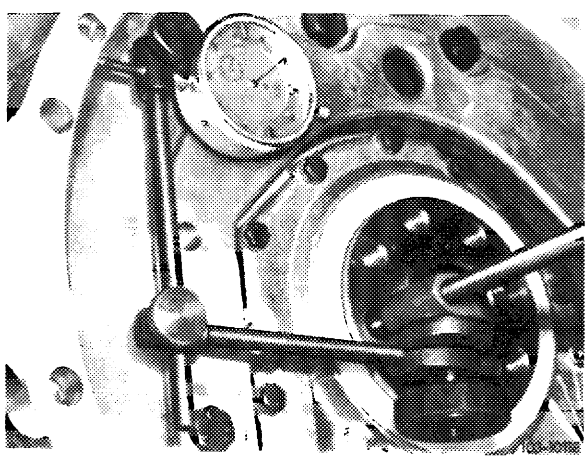
3 Screw threaded bolt (self-made) into crankshaft and counterlock with hex nut.



1 Hex nut M 12 x 1.5
2 Threaded bolt 10 mm dia
3 Hex nut M 10 x 1

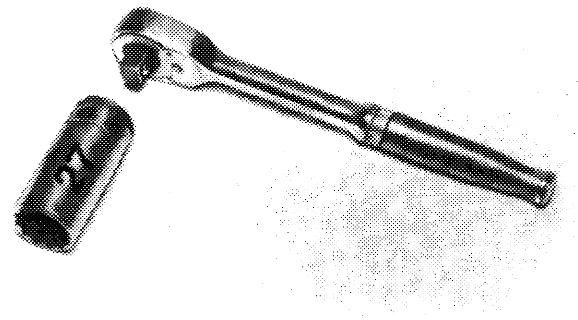
4 Attach dial gauge holder with dial gauge to threaded bolt.

5 Position feeler pin at fitting point of centering surface. Set dial gauge to 0.



6 Rotate crankshaft for one full turn by means of tool combination. Vertical runout should not exceed max 0.10 mm.

Note: When rotating crankshaft, make sure that the feeler pin of the dial gauge is not getting stuck.



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7 Correct vertical runout by light blows against intermediate flange.

8 Tighten fastening screws.

Note: If the vertical runout exceeds 0.10 mm, remove intermediate flange.

9 Increase diameter of both fitted bores in intermediate flange to 12.1 mm.

10 Repeat item 1–8.

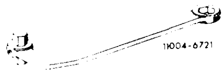
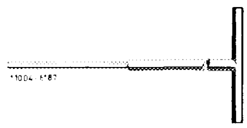
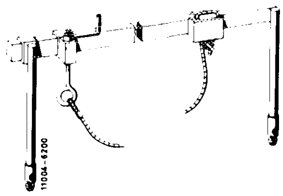
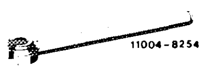
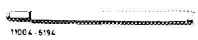
Oil capacity in liters

Oil dipstick color code		wine red, pink brown[1])	yellow-green
Oil pan		6	5.5
Oil filter		0.5	
Air oil cooler	Model 107, 114, 116	0.7	
	Model 123, 126	0.40	

1) (USA) model year 1975/76

Tightening torques	Nm
Oil drain plug on oil pan	40
Oil drain plug on air oil cooler	35
Filter lower section mounting bolt	45
Oil pan lower section to upper section	11

Special tools

Stud/ring wrench 13 x 14 mm		117 589 02 07 00
Stud wrench 5 mm, 300 mm long		116 589 02 07 00
Stud wrench 6 mm, 440 mm long		116 589 03 07 00
Engine support		107 589 02 61 00
Knocking-in tool for oil dipstick guide tube		117 589 00 31 00
Knocking-out mandrel 9 mm dia		110 589 02 15 00

Conventional tool

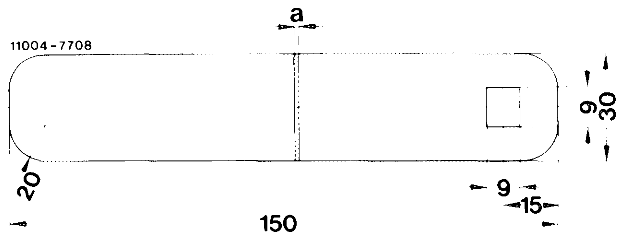
Engine hoist (Motordirigent) size 1.5	e.g. made by Bäcker, D-5630 Remscheid, order no. 3178

Self-made tools

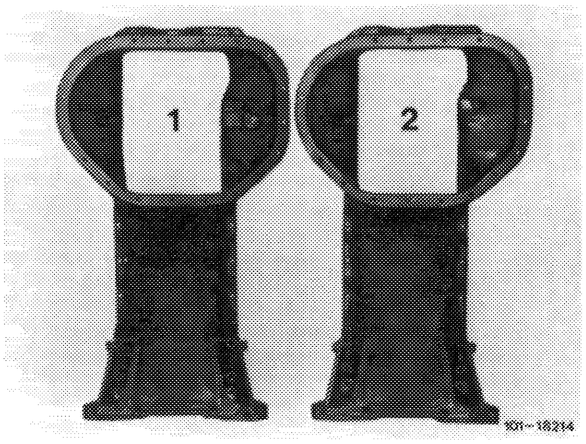
Gauges for cutting-off radial sealing rings

Radial sealing ring graphite-grey
Part no. 000 997 65 41 a = 1 mm

Radial sealing ring yellow-brown a = 0.5 mm



Note



The modified oil pan (1) is installed on models 107, 116 and 123 since October 1979 and model 126 since begin of series.

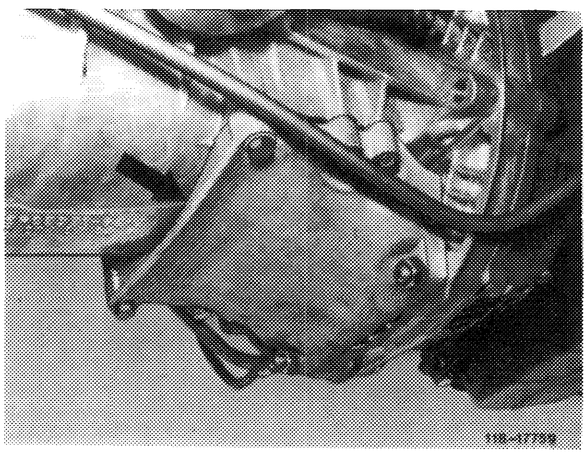
For this purpose, the rear 3 fastening threads on cylinder crankcase have been changed on both sides from M 6 to M 8 mm.

Begin of series: October 1979

Model	Engine	Engine end no. manual transm.	Engine end no. automatic transm.	chassis end no.
107.022				007709
107.042	110.986	003225	007317	006965
116.020	110.922	040571	067591	120830
116.020	110.932	010337	002781	
116.024/025	110.985	014120	070947	152618
123.030	110.923	014163	017466	028051
123.033	110.984	020182	068009	065415
123.050	110.923	014163	017466	003470
123.053	110.984	020182	068009	017451
123.093				004597

This modified oil pan is screwed to cylinder crankcase at the rear with 6 screws M 8 x 95 mm, formerly 4 screws M 6 x 40 mm and 2 screws M 6 x 25 mm.

On model 126 the modified oil pan is screwed to cylinder crankcase together with supporting tray (arrow) by means of 6 screws M 8 x 110 mm.



If a modified oil pan is installed in the course of repairs, the respective threaded bores in cylinder crankcase should be enlarged from M 6 to M 8 mm.

In the event of repairs, use radial sealing ring 000 997 90 41 (yellow-brown) with a projection of 0.5 mm on both sides, except when a new or newly ground crankshaft with new crankshaft bearings is installed. In such a case, use radial sealing ring 000 997 69 41 (graphite-grey) with a projection of 1 mm on both sides. This will protect the rear bearing journal of crankshaft against being overheated under influence of a low crankshaft bearing play and excessive pressure against yellow-brown radial sealing ring.

Removal

Model 107

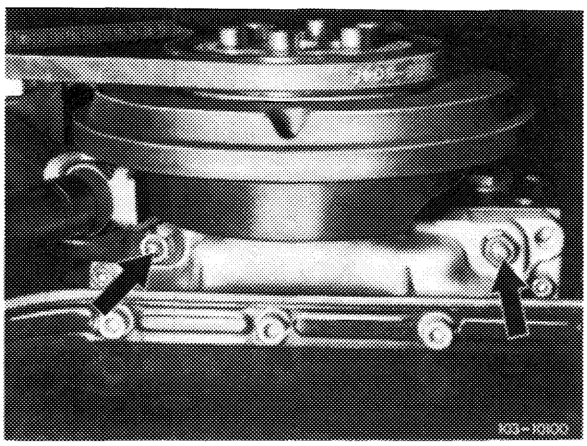
1 Remove front axle (33–100).

2 Detach oil return pipe at cylinder head and pull off at oil pan.

3 Detach oil dipstick guide tube at cylinder head.

4 Detach steering rod at one side.

5 Detach alternator holder strut at oil pan.



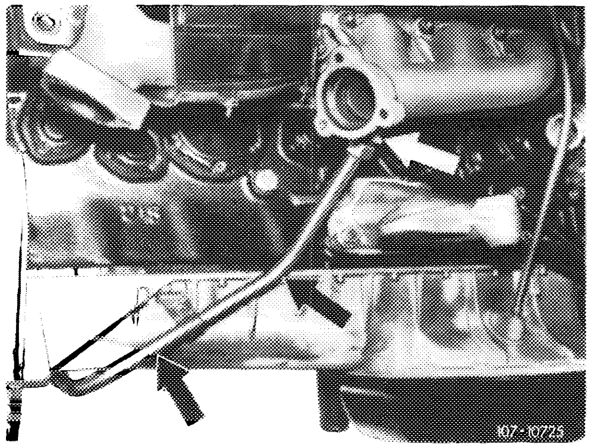
6 Remove oil pan downward.

Note: Hold engine with engine support when working underneath engine.

Model 114

1 Remove front axle (33–100).

2 Remove exhaust gas recirculation line (arrows) for USA models.



3 Remove oil lines for automatic transmission.

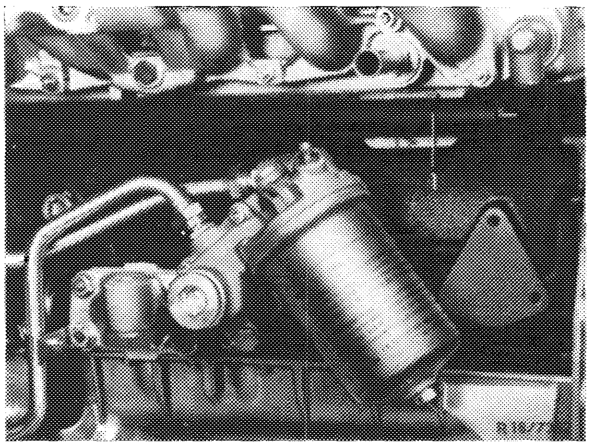
4 Detach oil dipstick guide tube at cylinder head.

5 Pull oil return line (1) off of oil pan (18–030).

6 Drain engine oil.

7 Remove oil pan.

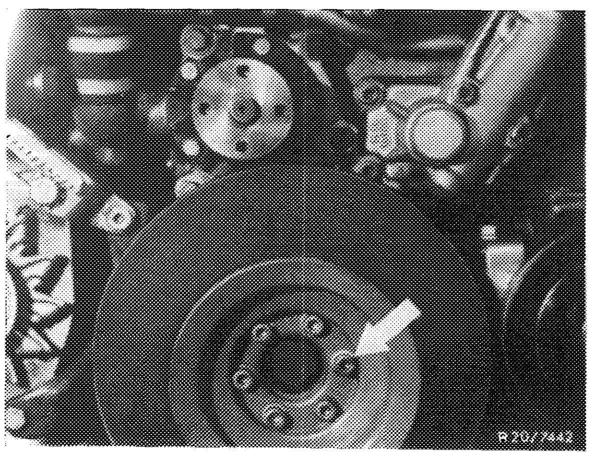
Note: Hold engine with engine support while working underneath engine.



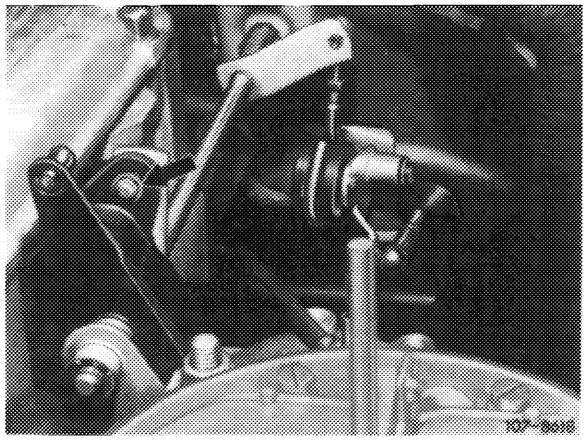
Model 116

1 Remove radiator.

2 Remove vibration damper (03–340).



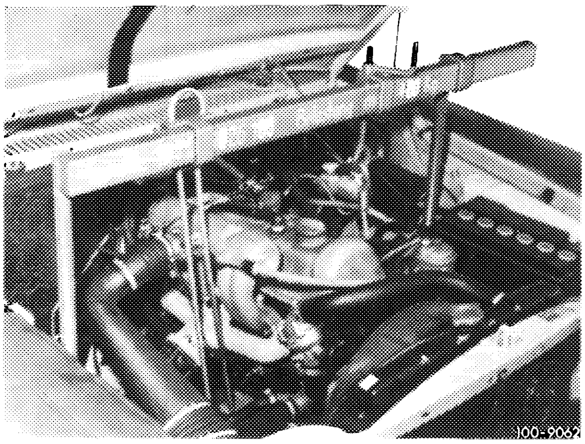
3 Detach control shaft (07.2–442).



4 Detach both front engine mounts and engine dampers.

5 Pull oil return line off of oil pan (18–030).

6 Drain engine oil.



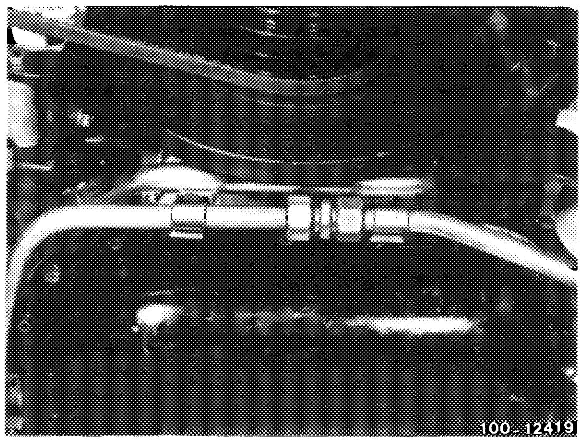
7 Remove oil pan lower section and oil pump. Remove fuel pump of carburetor engines.

8 Remove oil lines for automatic transmission.

9 Detach oil dipstick guide tube at cylinder head and drive it out from below with a 7.5 mm dia. mandrel.

Knock-out oil guide tube for drawing off oil with knocking-out mandrel 9 mm.

USA version



10 Detach rear engine mount, lift engine and place an approximately 40 mm thick piece of wood underneath.

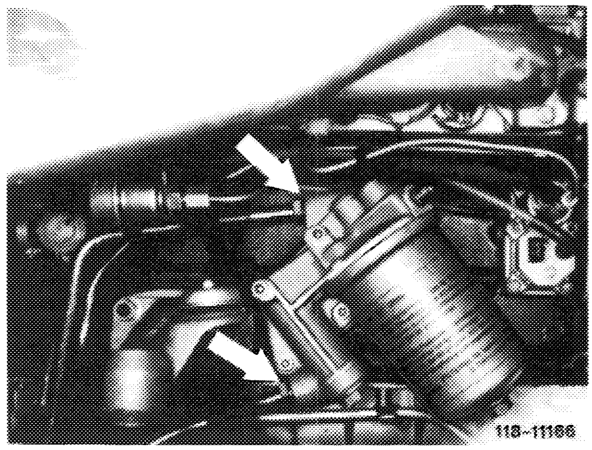
11 Lift front of engine and place approximately 60 mm thick pieces of wood on both sides between the engine carrier and engine mounts.

12 Detach oil pan and remove forward.

Model 123

1 Remove engine (01–030).

2 Remove oil filter complete with lines.

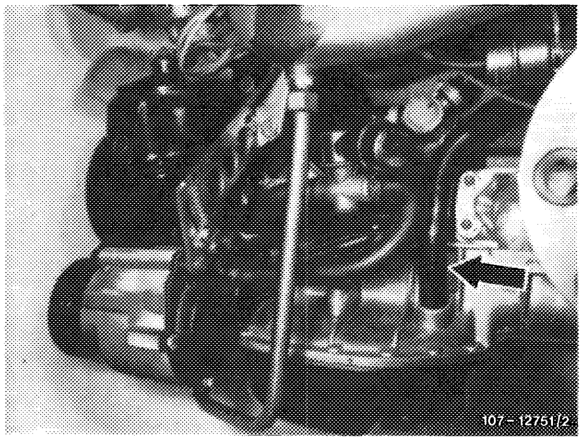


3 Pull-off oil return pipe (arrow).

4 Loosen strut for alternator bracket on oil pan.

5 Remove oil pan.

USA version



Model 126

1 Pull-off oil return line on oil pan.

2 Remove supporting tray.

3 Turn wheels completely to the left.

4 Unscrew cover plate.

5 Remove vibration damper (03–340).

6 Unscrew lower holding bracket of alternator.

7 Unscrew oil pan upper half to the extent that it is still held to crankcase by 2 screws.

8 Remove oil pan lower half.

9 Remove oil pump (3 screws).

10 Pull oil dipstick guide tube at top out of holder and knock out of oil pan upper half from below by means of a plastic hammer.

11 On vehicles with refrigerant compressor, remove lower strut.

12 Disconnect regulating linkage.

13 Unflange propeller shaft at transmission and push back.

14 Unscrew engine shock absorber below.

15 Unscrew screws for engine carrier on engine mount.

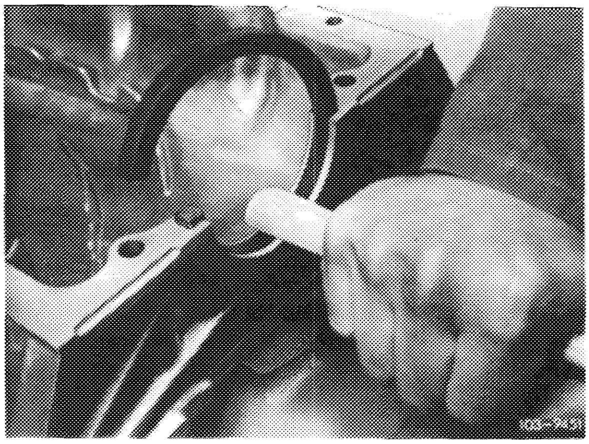
16 Suspend engine at the front and rear on engine removing eyes and lift until oil pan can be removed.

Installation, all models

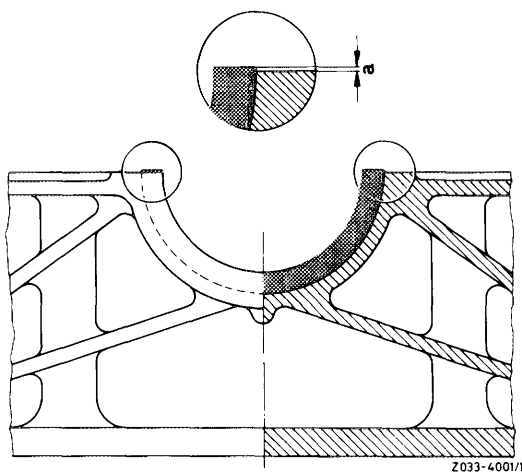
1 Clean parting surface on cylinder crankcase and oil pan.

2 Renew rear radial sealing ring in oil pan and work in.

Note: Do not install radial sealing ring 000 997 90 41 (yellow-brown) in engines which are provided with a new or refinished crankshaft and new crankshaft bearings in the event of repairs.



3 To arrive at an overlap, cut off radial sealing ring approx. 0.5 or 1.0 mm above parting surface. Use self-made gauge for this purpose.



Radial sealing ring, part no.	Dimension a (mm)
000 997 69 41 (graphite-grey)	1.0
000 997 90 41 (yellow-brown)	0.5

4 Provide radial sealing ring with engine oil.

5 Coat parting surface of oil pan with sealing compound.

6 Install oil pan and screw-on lightly at front and rear with 2 screws each.

Attention!
The oil pan should rest against or be screwed to intermediate flange prior to tightening fastening screws for crankcase.

7 For further installation proceed vice versa.

Attention!
Check regulating linkage for function.

Timing at 2 mm valve lift		Engine 110	Engine 110 California 1974	Engine 110 Federal 1973 and 1974
Camshaft code number[1]	Exhaust	24, 57, 71, 78	24	30, 95
	Intake	25, 67, 74	25, 74	33, 91
Intake valve	opens after TDC	7°		11°
	closes after BDC	21°		15°
Exhaust valve	opens before BDC	30°		22°
	closes before TDC			

[1]) The camshaft code number is punched into rear end of camshaft.

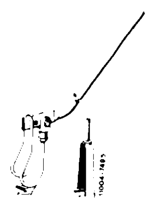
Valve clearance	on cold engine (approx. 20 °C)	on warm engine (60°C ± 15°C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm larger during lasting outside temperatures below –20°C.

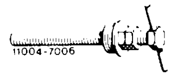
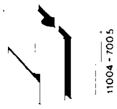
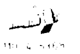
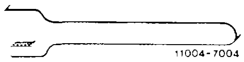
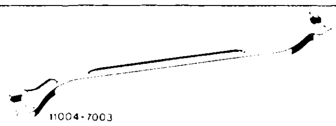
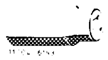
Tightening torques		Nm
Bolts and cap nuts for cylinder head cover		5
Necked-down screw for camshaft sprockets		80
Cylinder head bolts M 12 x 1.5 on cold engine	step 1	40
	step 2	70
	after 10 min. setting time	110
Bolts M 8 for cylinder head to crankcase		25
Closing plug chain tensioner		50
Threaded ring chain tensioner		50
Ball seat ring in chain tensioner		25

Special tools

Remover and installer for rocker arm



110 589 04 61 00

Rigid chain tensioner		110 589 03 31 00
Chain tensioner holder		110 589 02 31 00
Bearing pin impact extractor (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00
M 6 x 150 bolt for impact extractor		116 589 02 34 00
M 10 x 100 bolt for impact extractor		116 589 03 34 00
Camshaft wrench		116 589 01 01 00
17 mm valve adjusting wrench		110 589 01 01 00
27 mm socket to turn engine, 1/2" square		001 589 65 09 00
Socket 10 mm 1/2" square 140 mm long		000 589 05 07 00

Conventional tools

Engine director size 1.5	e.g. made by Bäcker, D-5630 Remscheid Order No. 3178

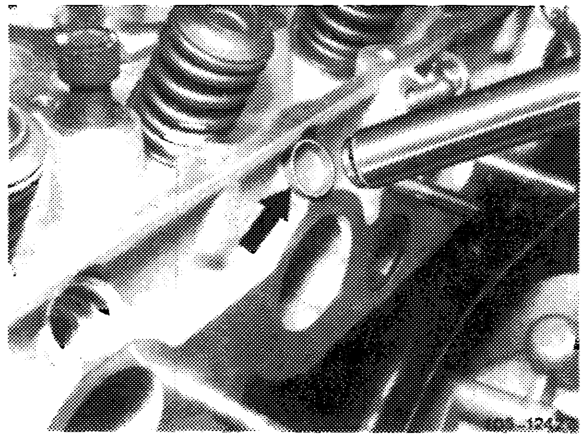
Note

A cylinder head may only be removed after the engine is cold. Removal is together with the camshaft housing, exhaust manifold and intake manifold.

There is only one type of cylinder head as a replacement part for carburetor and fuel injection engines.

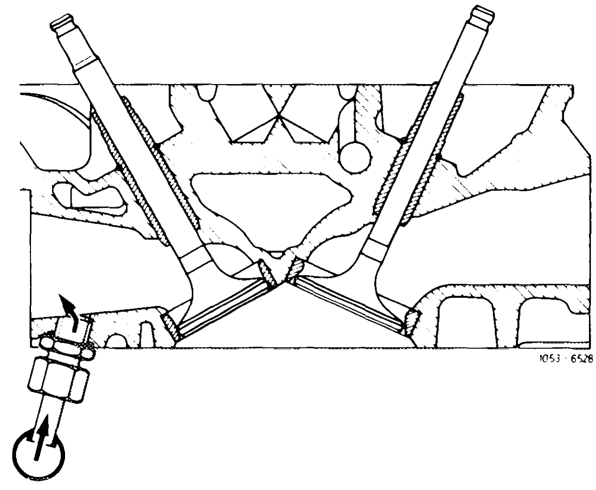
If the cylinder head is used on a carburetor engine, the fuel injector bores must be plugged with 6 covers, part number 000 443 01 80 00.

Starting April 1978 exhaust valve seat rings 42 mm OD and valve guides 9 mm ID are installed in cylinder head. Exception: engines national version.



Cylinder heads for engines with air injection are attached to exhaust ducts by means of threaded bores for air injection.

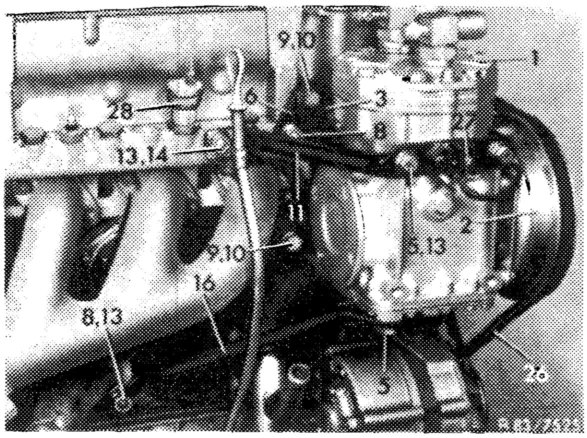
The diameter of the combustion chamber frame on cylinder head gaskets for the various repair stages varies:



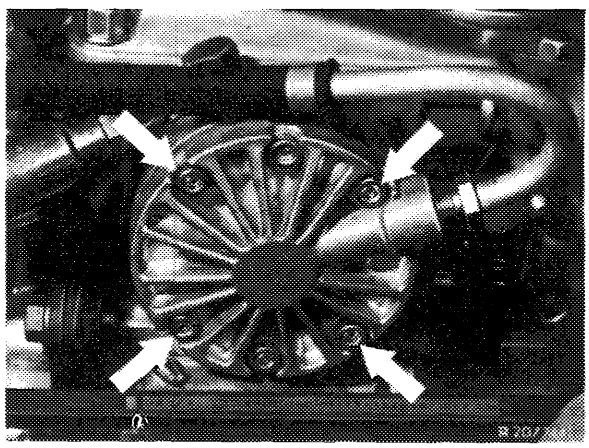
Cylinder bore	Combustion chamber frame
86.00 ϕ 86.50 ϕ	86.70 + 0.5 mm ϕ
87.00 ϕ	87.20 + 0.5 mm ϕ

Removal

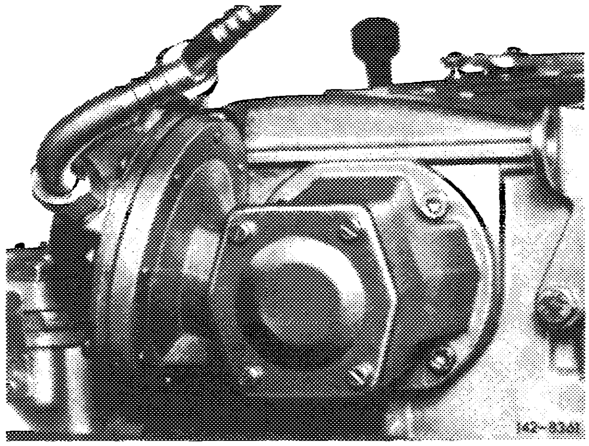
1 Remove compressor of models with an air conditioner.



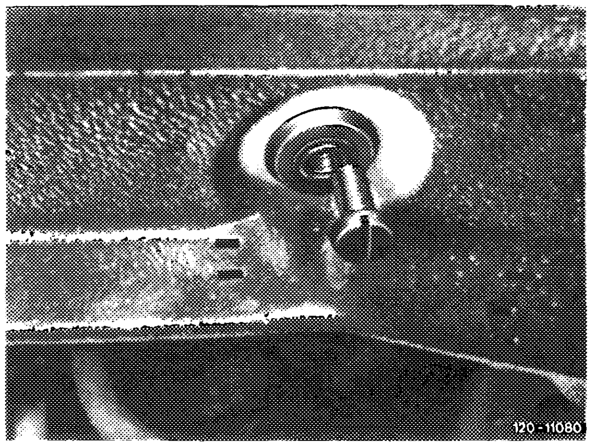
2 Remove oil pump of models with a level control system and place it to one side without undoing the lines. Only unscrew the bolts marked with an arrow for this purpose.



3 Remove vacuum pump of models for USA.

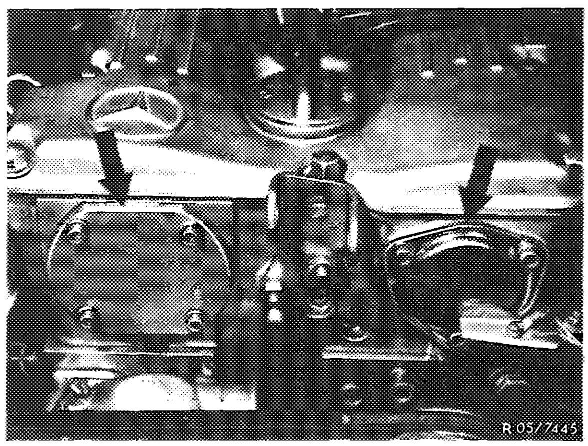


4 Drain coolant from radiator and engine.



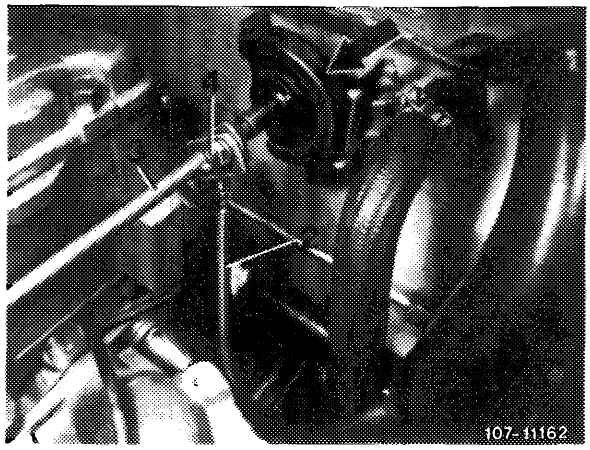
Model 123

5 Unscrew both covers at front of camshaft housing.

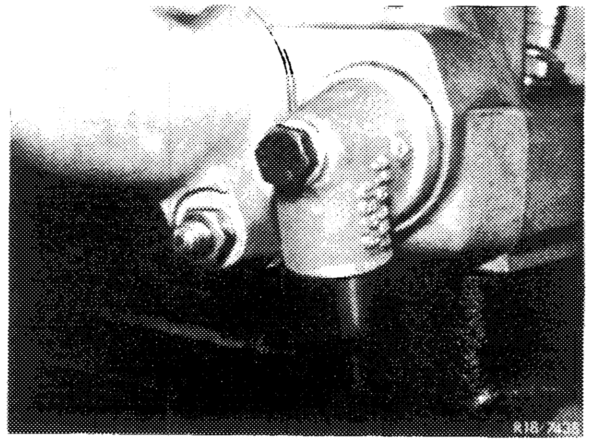


6 Disconnect all electric wires, heater water, fuel and vacuum lines which are connected to the cylinder head and intake manifold or carburetor.

7 Remove longitudinal regulating shaft (3).

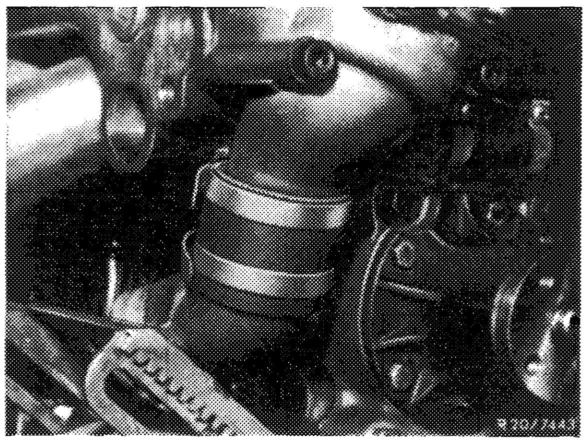


8 Disconnect oil return pipe at cylinder head.



9 Remove hose between thermostat housing and water pump.

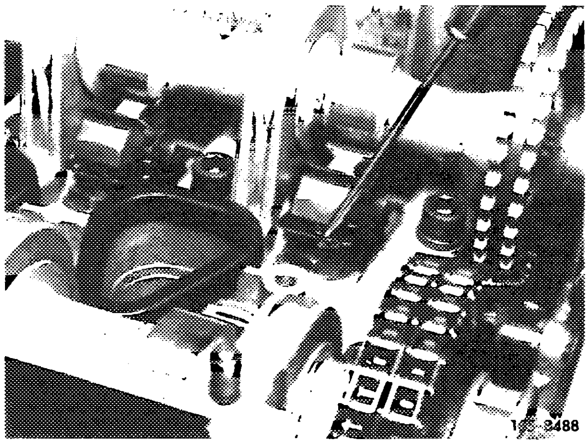
Disconnect bypass line at water pump.



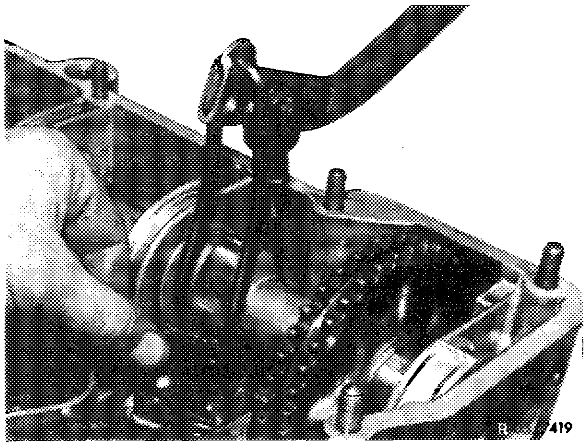
10 Disconnect oil dipstick guide tube from clamp on cylinder head and bend to one side.

11 Detach exhaust pipe at exhaust manifold and transmission. Unscrew pre-heating cowl of models with carburetor engines.

12 Press out all spring clamps with a wrench socket.

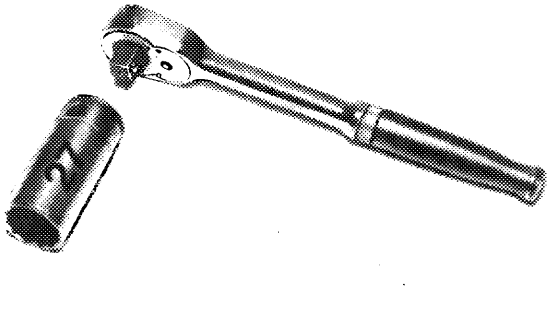


13 Remove all rocker arms with the remover and installer (05–230).



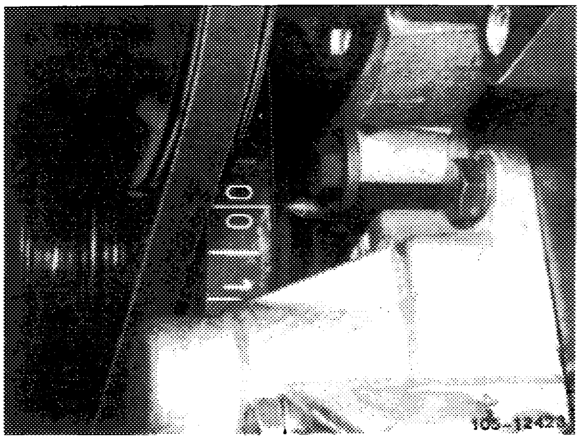
14 Turn crankshaft with combination tool.

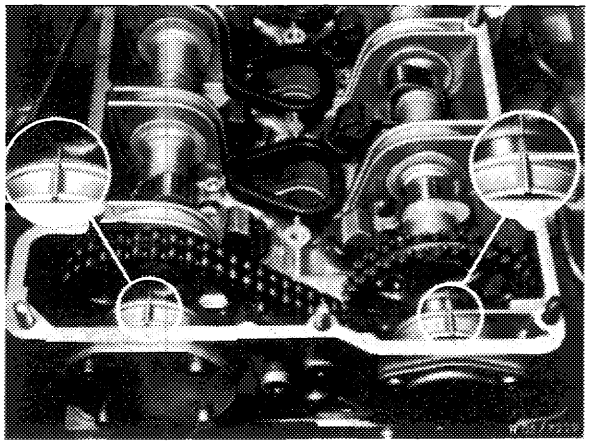
Attention!
Don't turn engine on **camshafts.** Don't turn engine in reverse direction of rotation.



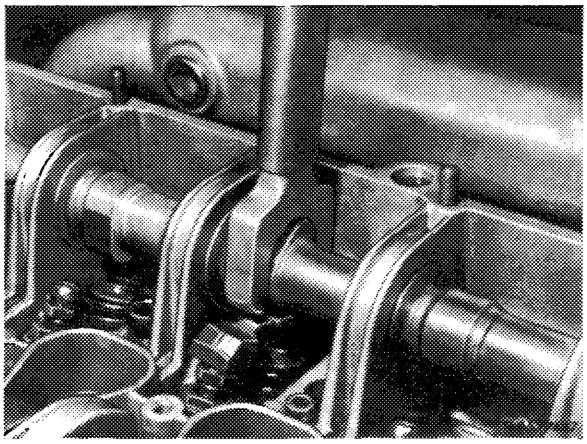
1100-6498/1

15 Position 1st cylinder of engine at ignition TDC. Marks on camshaft sprockets and camshaft housing must align.



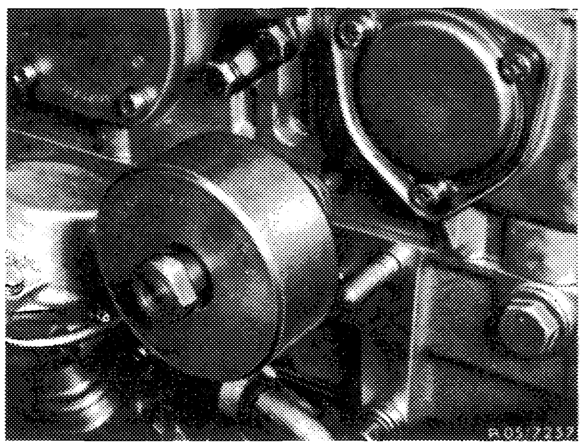


16 Remove both expansion bolts of camshaft sprockets. Counterhold camshaft with holder.



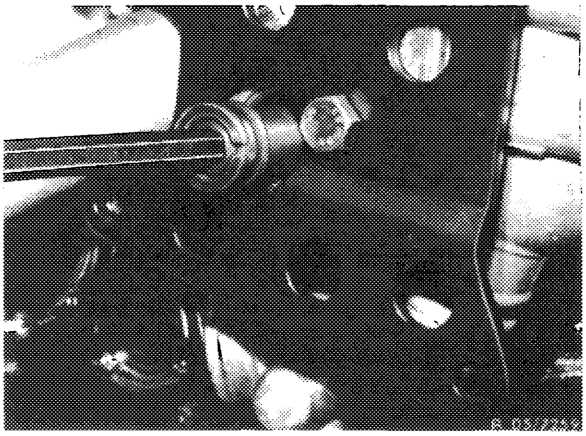
17 Remove upper slide rail in camshaft housing (05–340).

Knock out bearing pins with the impact extractor for this purpose.

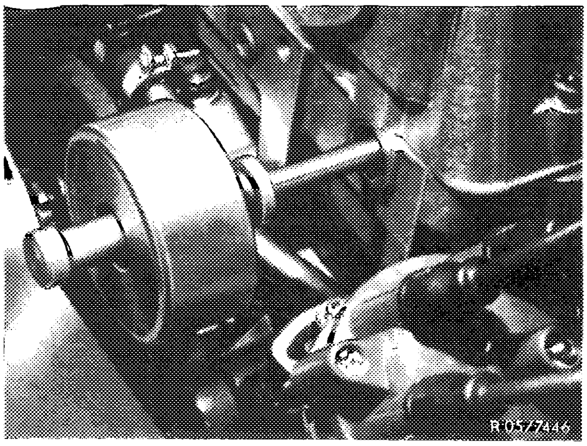


18 Remove chain tensioner (05–310).

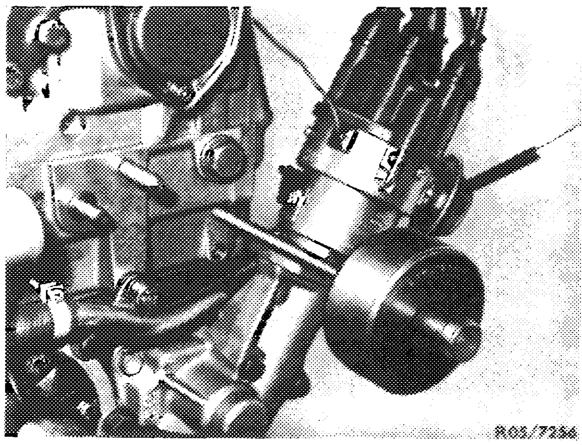
19 Push both camshafts to the rear and remove camshaft sprockets.



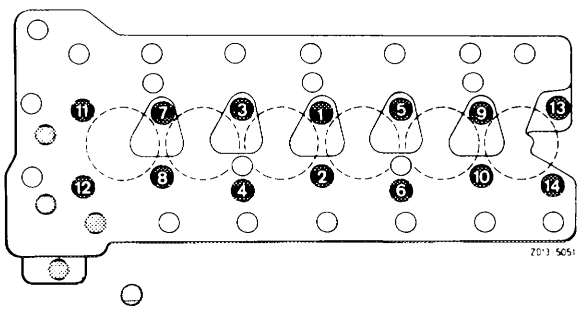
20 Remove guide wheel. Knock out bearing pins with impact extractor (M 10 bolts) for this purpose.



21 Remove guide rail in cylinder head. Knock out bearing pins with impact extractor (6 x 150 mm bolt) for this purpose.



22 Loosen and remove cylinder head bolts in reverse sequence of tightening diagram. Pull out the two **M 8 bolts in the timing case** with a magnet.



23 Pull up timing chain and press tensioning rail to center of engine. Lift off cylinder head straight up with a cable attached to the suspension eyes.

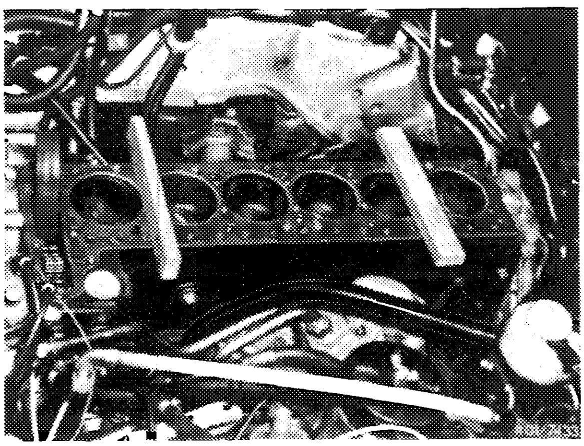
Installation

24 Clean cylinder head and crankcase mating surfaces thoroughly.

25 Install new cylinder head gasket.

Note: Two dowel sleeves are press-fit in the crankcase to locate the cylinder head.

26 Place two locally manufactured wooden boards (15 x 35 x 240 mm) on the cylinder head gasket, front upright and rear flat.



27 Place cylinder head on board, guide in timing chain and tensioning rail.

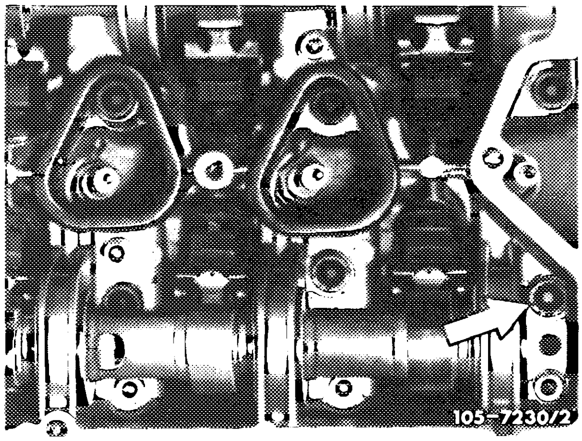
28 Lift front of cylinder head and pull out front wooden board toward exhaust side. Lower cylinder head until it fits on the dowel sleeve.

29 Lift rear of cylinder head slightly and pull out wooden board toward exhaust side. Lower cylinder head until it fits over rear dowel sleeve.

Note: If possible, connect cylinder head with camshaft housing to eyes for engine removal, carefully lower with a crane and set down.

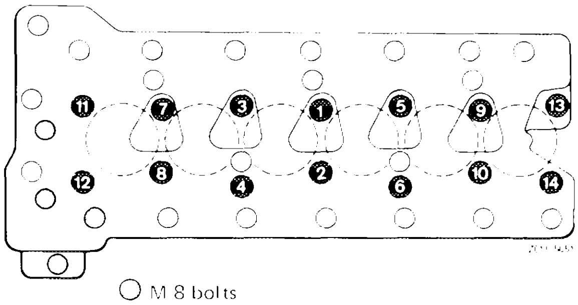
30 Lubricate threads and head surface of cylinder head bolts before installation.

Attention!
Since July of 1974 the clearance on the camshaft housing for the **22 mm dia. washer** of cylinder head bolt number 14 has been extended. The former **20 mm dia. washer** must be installed on older camshaft housings (arrow).



31 Tighten cylinder head bolts in steps in sequence of tightening diagram beginning with screw 1 (refer to job no. 01–415 removal and installation of cylinder head).

Tighten screws M 8 to 25 Nm (2.5 kpm).



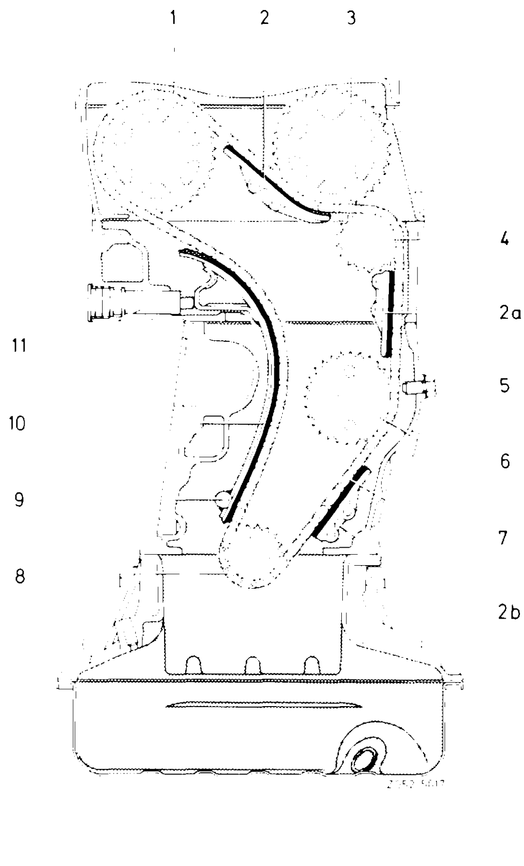
○ M 8 bolts

Attention!
After all bolts have been tightened, it must be possible to turn both **camshafts by hand.**

32 Install slide rail (2a). For this purpose, pull up timing chain while introducting slide rail with pliers and knocking-in bearing bolts with impact puller. Align slide rail laterally (equalize).

33 Pull up timing chain, position guide wheel (4) with left hand and knock-in lubricated bearing bolt by means of impact puller.

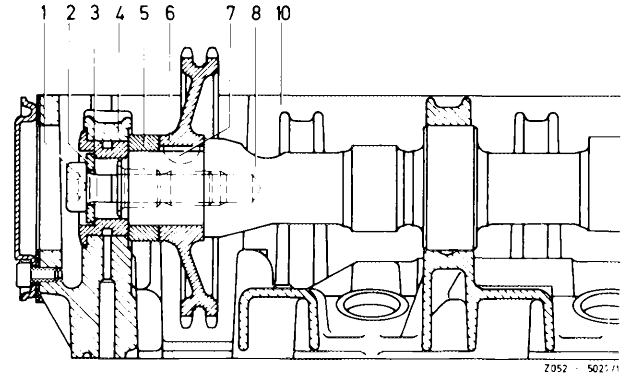
Screw-in screw connection with sealing ring.



Chain drive

1 Exhaust camshaft sprocket
2– 2b Sliding rail
3 Intake camshaft sprocket
4 Guide wheel
5 Lock bolt
6 Intermediate wheel
7 Timing chain
8 Crankshaft sprocket
9 Tensioning rail bearing pin
10 Tensioning rail
11 Hydraulic chain tensioner

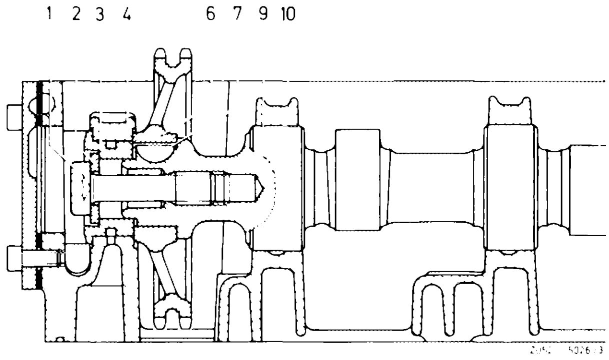
34 Install camshaft sprocket (6) of intake camshaft with spacer (5). Lubricate spacer (3) with engine oil and slide it into bearing (4).



Intake

1 Expansion bolt
2 Washer
3 Spacer
4 Bearing
5 Spacer
6 Camshaft sprocket
7 Woodruff key
8 Camshaft
10 Camshaft housing

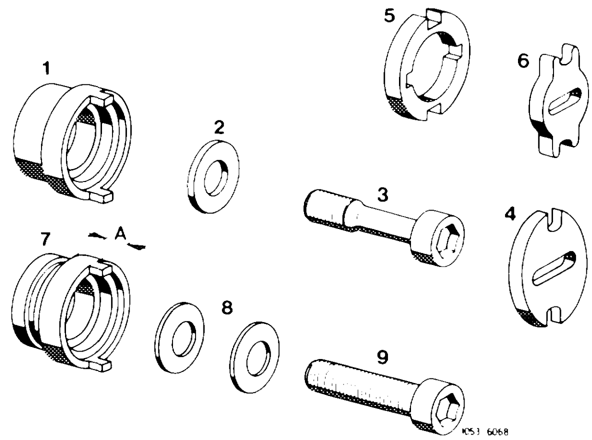
35 Install camshaft sprocket (6) of exhaust camshaft with timing chain. Lubricate spacer (3) with engine oil and slide it into bearing (4).



Exhaust camshaft

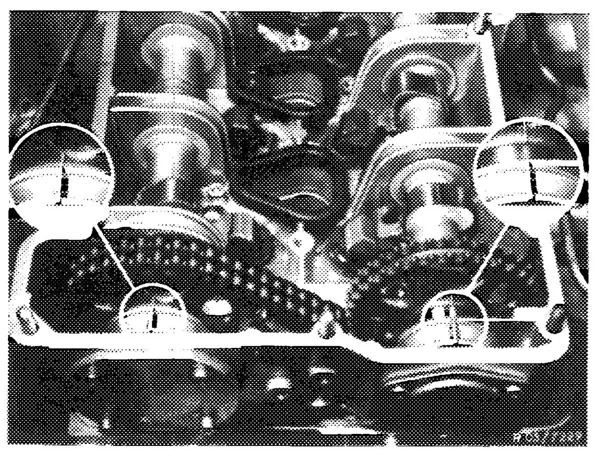
1 Expansion bolt
2 Washer
3 Spacer
4 Bearing
6 Camshaft sprocket
7 Woodruff key
9 Camshaft
10 Camshaft housing

36 During repair jobs, mount necked-down screw (3) with washer (2) only, but do not yet tighten.

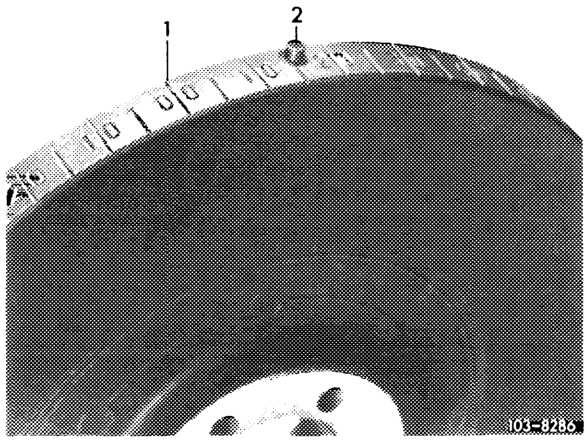


1 Spacer 2nd version without lubricating groove (for pressure oil pump and vacuum pump 2nd version)
2 Washer
3 Expansion bolt
4 Dog (for pressure oil pump and vacuum pump 2nd version)
5 Dog (for vacuum pump 1st version)
6 Dog 1st version with lubricating groove
A = 4.7 mm for vacuum pump 1st version
A = 8.3 mm for pressure oil pump and vacuum pump 2nd version
8 Spring washers (not valid)
9 Mounting bolt (not valid)

37 When 1st cylinder is at ignition TDC the adjustment marks on both camshaft sprockets and camshaft housing must align.

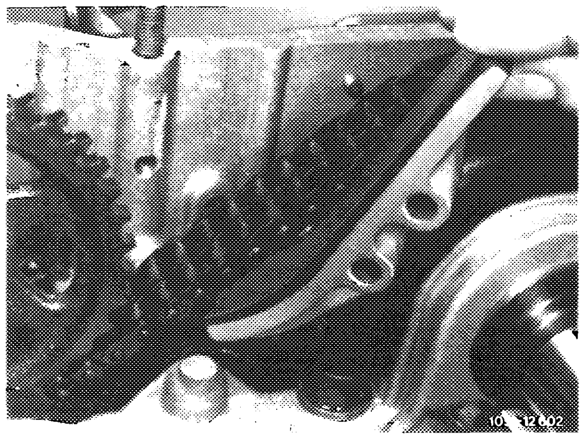


Attention!
If the vibration damper of an engine has a "00" mark for BDC in addition to TDC, the TDC mark is next to pin (2) in the vibration damper.



1 TDC mark

38 Install sliding rail in camshaft housing so that the timing chain cannot jump.

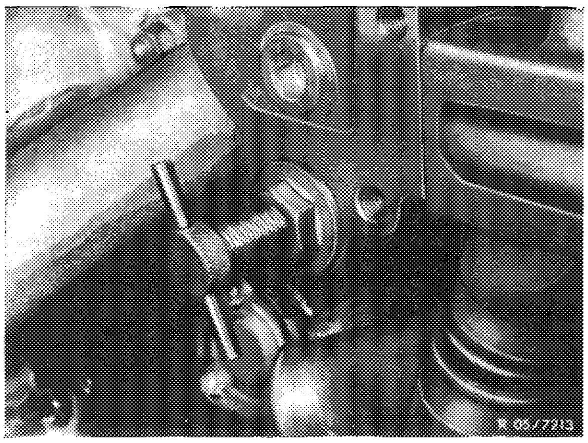


39 Install rigid chain tensioner and tighten by hand.

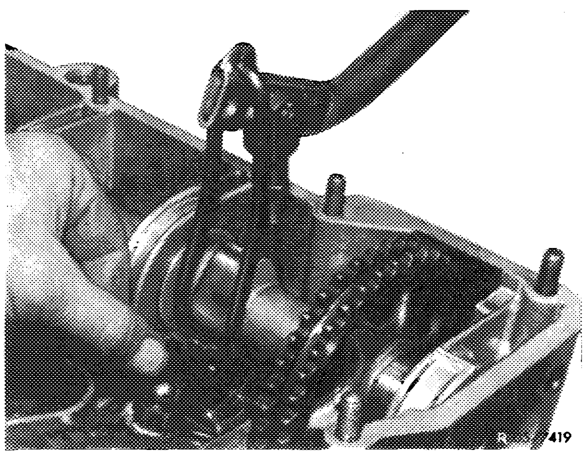
40 Turn crankshaft with combination tool and adjust to ignition TDC. Check adjustment marks (fig. of point 37).

Check timing, if cylinder head or camshaft housing surfaces have been faced (05–215).

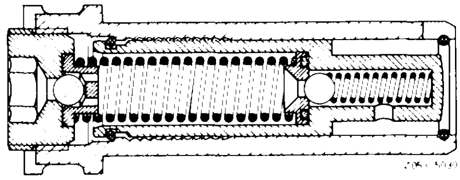
41 Tighten necked-down screw for camshaft sprocket to 80 Nm (8 kpm), while applying counterhold to camshaft by means of holding wrench.



42 Install rocker arms and spring clamps (05–230).

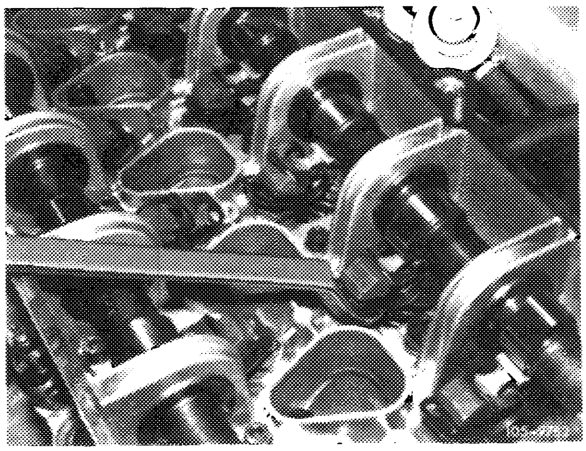


43 Position chain tensioner for insallation and install (05–310).



44 Adjust valve clearance (05–210).

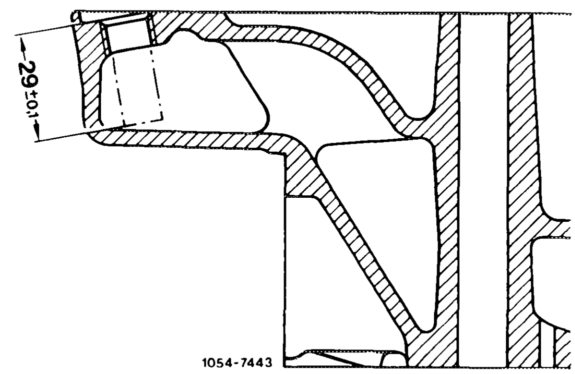
Further installation instructions in reverse sequence of removal.

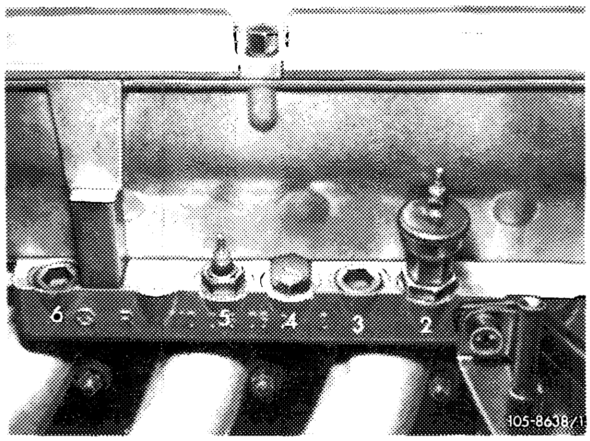


Note

The measuring sensor box must be equipped to agree with the engine version.

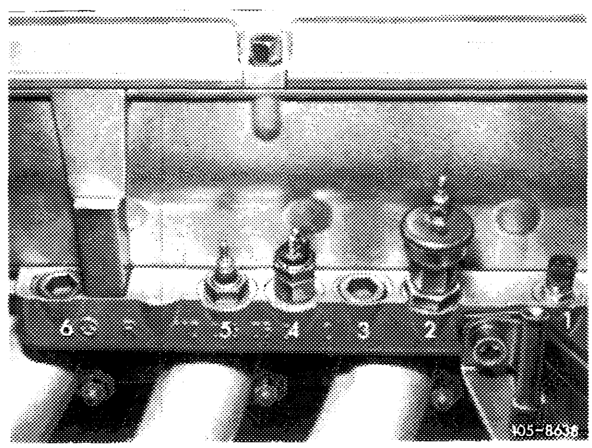
Note screwed depth and use seals of sufficient thickness.





Measuring sensor box for **carburator engine with air conditioner**

2 100°C temperature switch and adaptor for extra fan/air conditioner
3 Core plug M 22 x 1.5
4 Plug M 14 x 1.5
5 Coolant temperature gage sensor
6 Core plug M 22 x 1.5

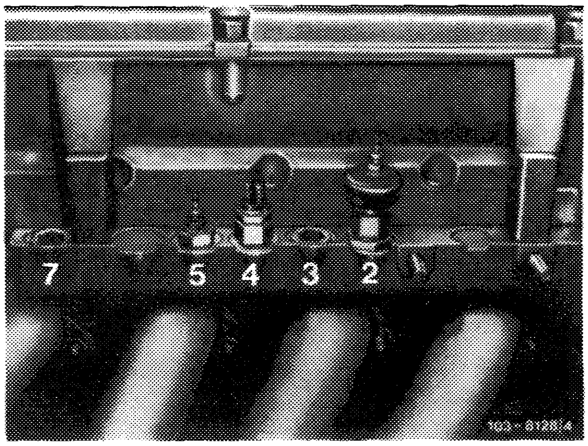


Measuring sensor box for **fuel injection engine** with **air conditioner**

1 Coolant temperature sensor for control unit
2 100°C temperature switch and adaptor M 18 x 1.5 for extra fan/air conditioner
3 Core plug M 22 x 1.5
4 Temperature timing switch for cold starts
5 Coolant temperature gage sensor
6 Core plug M 22 x 1.5

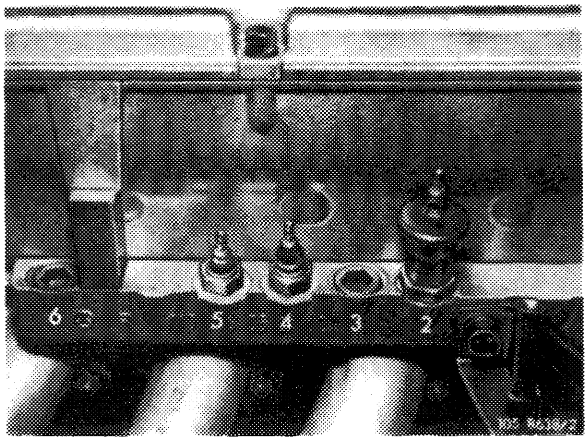
Measuring sensor box for **continuous fuel injection engine** with **air conditioner**

2 100°C temperature switch and adaptor M 18 x 1.5 for extra fan/air conditioner
3 Core plug M 22 x 1.5
4 Temperature timing switch for cold starts
5 Coolant temperature gage sensor
7 Core plug M 22 x 1.5



Measuring sensor box for **carburetor engine USA** with **air conditioner**

2 100°C temperature switch and adaptor M 18 x 1.5 for extra fan/air conditioner and exhaust gas recirculation
3 Core plug M 22 x 1.5
4 65°C temperature switch (exhaust gas recirculation)
5 Coolant temperature gage sensor
6 Core plug M 22 x 1.5



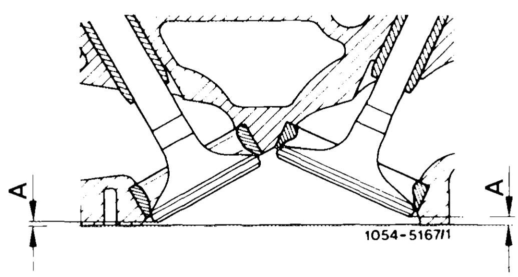
Data

Total cylinder head height		93.9–94.0
Min. height after machining		93.1
Permissible unevenness of mating surfaces	in longitudinal direction	0.08
	in cross direction	0.0
Permissible deviation in parallel of upper mating surface to lower mating surface in longitudinal direction		0.1
Peak to valley height		0.010
Pressure test with air under water in bar gauge pressure		2

Minimum distance A with new valves and new valve seats, cylinder head parting surface not machined			Minimum distance A with new valves and new valve seats, cylinder head parting surface 0.4 mm milled off
Intake		3.3	2.9
Exhaust	Valve retainer dia. 37 mm	0.6	0.2
	Valve retainer dia. 39 mm	0.04	0.36 standout

Max. distance A with new valves and machined valve seats, cylinder head parting surface not machined			Max. distance A with new valves and machined valve seats, cylinder head parting surface 0.4 mm milled off
Intake		4.2	3.8
Exhaust	Valve retainer dia. 37 mm	1.5	1.1
	Valve retainer dia. 39 mm	0.94	0.54

Max. distance A is reduced by the same dimension by which the cylinder head parting surface has been machined down.



Conventional tools

Surface grinding machine with milling equipment for light alloy surface	e.g. made by Ruaro u. Fi., Schio/Italy Scledum, type RTY
Knife-edged straightedge approx. 750 mm long	

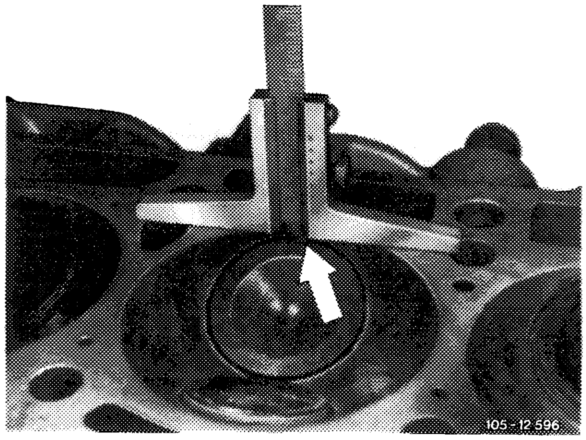
Facing

Only 0.4 mm material can be machined off of the cylinder head at the mating surfaces to the crankshaft and camshaft housing.

A distorted cylinder head must always be faced on both mating surfaces.

Machine valve seats until the permissible distance A between the valve head and cylinder head mating surface is reached.

The timing must be adjusted, if a cylinder head mating surface is faced (05–215).

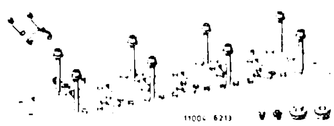
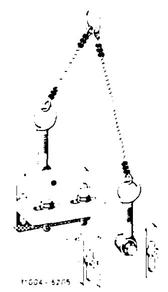


01–420 Pressure testing cylinder head

Data

Pressure test with air under water in bar gauge pressure	2

Special tools

Pressure testing plate		110 589 00 25 00
Suspension fixture		110 589 34 63 00

Conventional tool

Electrically heated sink	e.g. made by Otto Dürr, D-7123 Sachsenheim-Ochsenbach

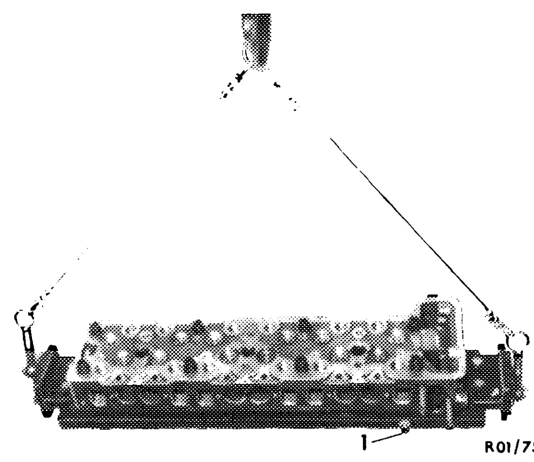
Pressure testing

If the loss of water indicates cracks, the cylinder head must be pressure tested.

1 Bolt pressure testing plate to a cleaned cylinder head.

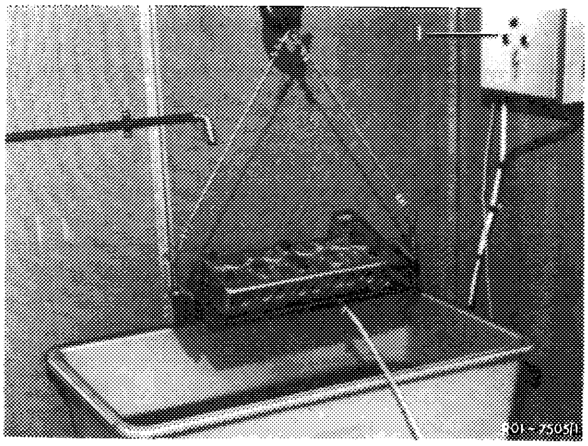
2 Plug holes and connections.

3 Connect compressed air hose (1) and regulate compressed air to 2 bar gauge pressure.



4 Attach cylinder head to suspension device and lower into heated water (80°C).

5 Find location of leaks, if air bubbles rise.



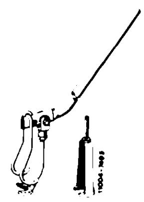
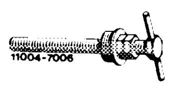
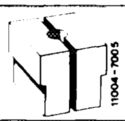
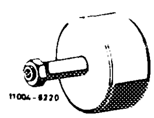
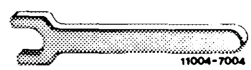
Data

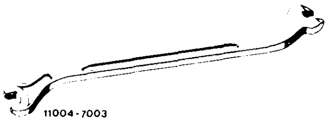
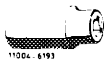
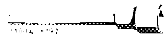
Valve clearance	Cold engine (ca. 20°C)	Warm engine (60°C ± 15°C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below −20°C.

Tightening torques	Nm
Cylinder head bolts M 12 x 1.5	110
Bolts M 8 for camshaft housing to cylinder head and crankcase	25
Expansion bolt for camshaft sprockets	80
Ball locating ring in chain tensioner	25
Valve adjusting screw	20–40
Cylinder head cover bolts and capped nuts	5
Level control pump to camshaft housing	9

Special tools

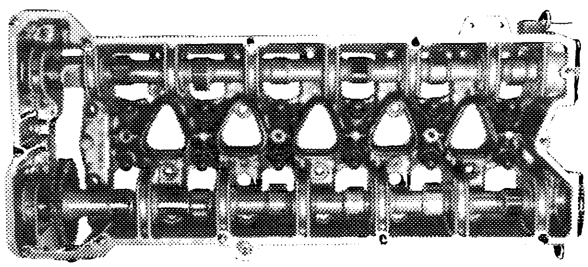
Rocker arm removal and installation tool		110 589 04 61 00
Rigid chain tensioner		110 589 03 31 00
Chain tensioner holder		110 589 02 31 00
Bearing pin impact extractor (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00
Holding wrench for camshafts		116 589 01 01 00

Valve adjusting wrench 17 mm		110 589 01 01 00
Socket 27 mm to turn engine		001 589 65 09 00
10 mm wrench socket 1/2" square, 140 mm long		000 589 05 07 00

Note

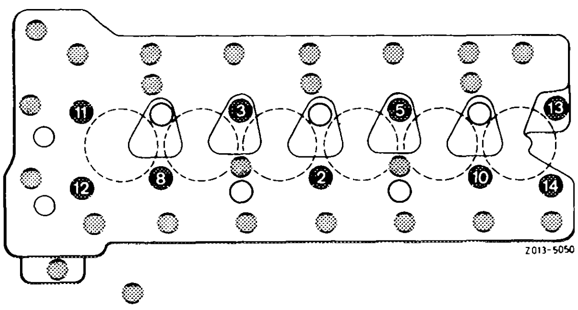
Camshaft housing may only be removed after engine is cold.

The camshaft housing must be removed to remove the camshafts and valve springs or to replace the valve seals.



105-8003

Attention!
On exchange engines starting unit no. 496.861 (starting October 1977) 9 cylinder head screws with a **length** of **150 mm** are used instead of 145 mm in combination with camshaft housings which are countersunk by 5 mm at the 9 bolt head supporting points 2, 3, 5, 8, 10, 11, 12, 13 and 14.
These cylinder head bolts must be installed together with a washer part no. 186 990 09 40 (5 mm high), since otherwise the thread lugs in cylinder crankcase may be forced off.

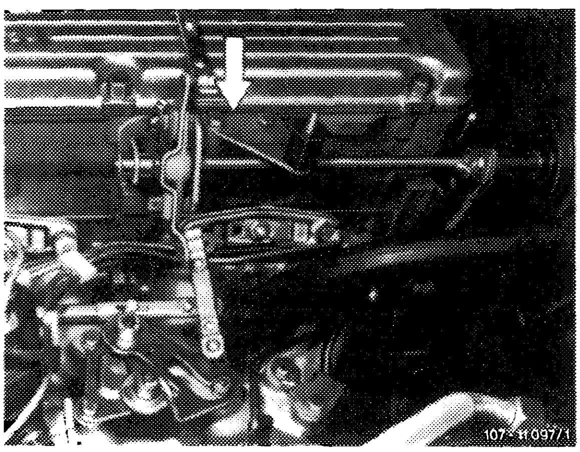


For engines with CIS, use camshaft housing with lug for attaching air cleaner (arrow).

Camshaft housings with repair stages are available for camshaft with reground bearing journals (01–471).

Exchange engines are in part supplied with camshaft bearing intermediate stages and repair stages (01–471).

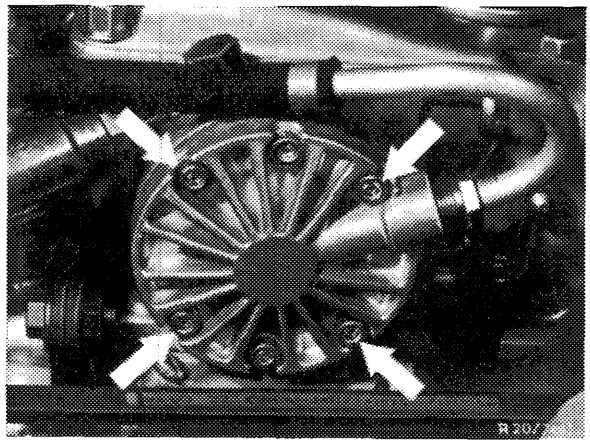
Also refer to 01–471, association camshaft housing and camshafts.



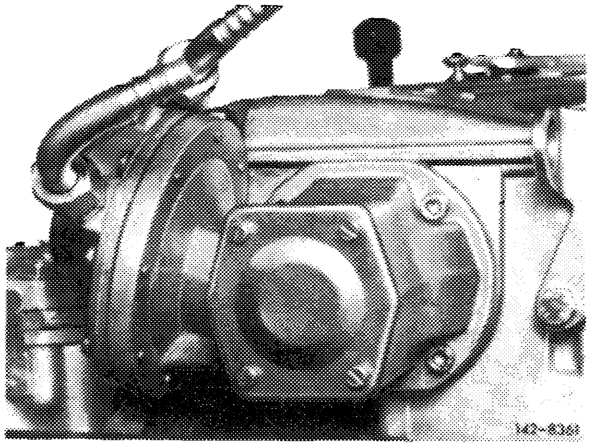
Removal

1 Remove pressure oil pump of models with level control and place to one side without disconnecting the lines. This requires loosening only those bolts marked with an arrow.

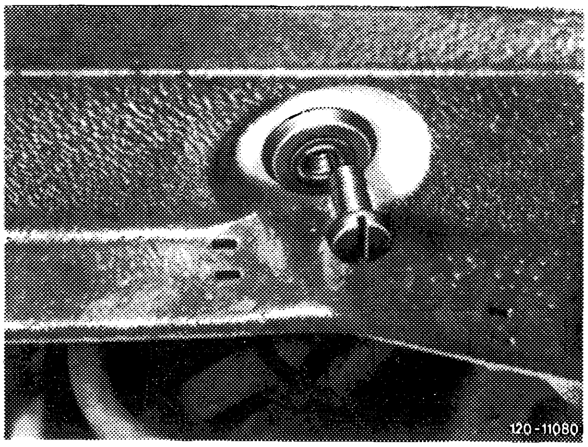
2 Remove compressor of models with an air conditioner.



3 Remove vacuum pump of models in USA version.

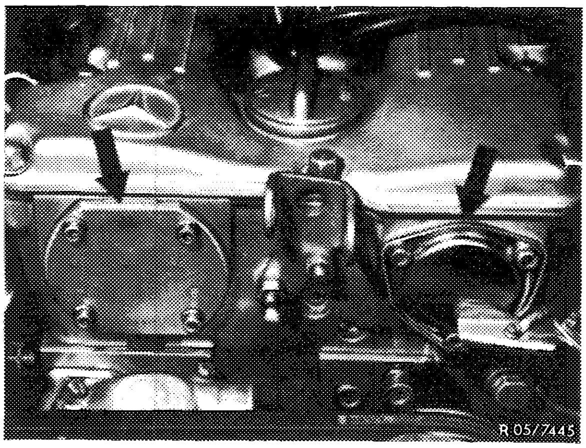


4 Drain coolant from radiator and remove upper water hose from engine to radiator. Remove cylinder head cover.

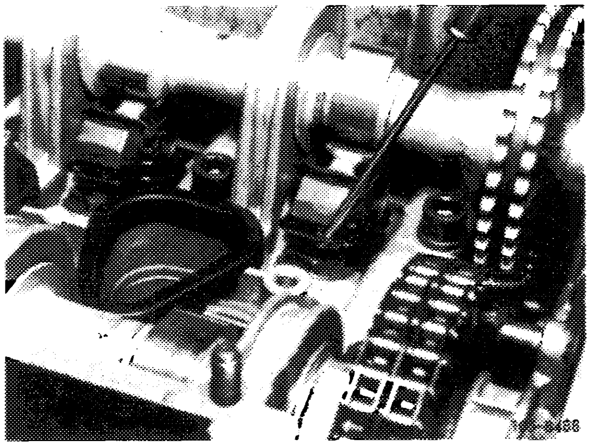


Radiator drain plug of type 123.

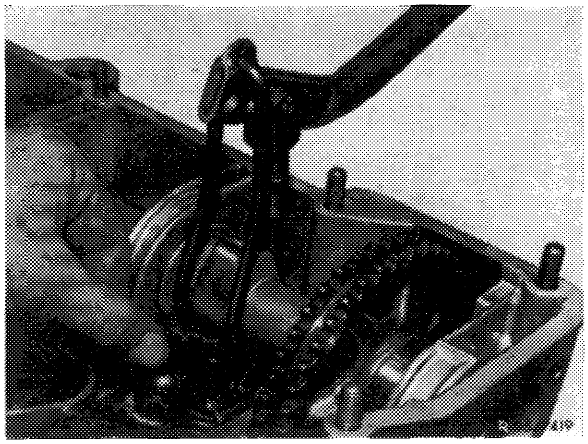
5 Unscrew right cover (arrow) on front of camshaft housing.



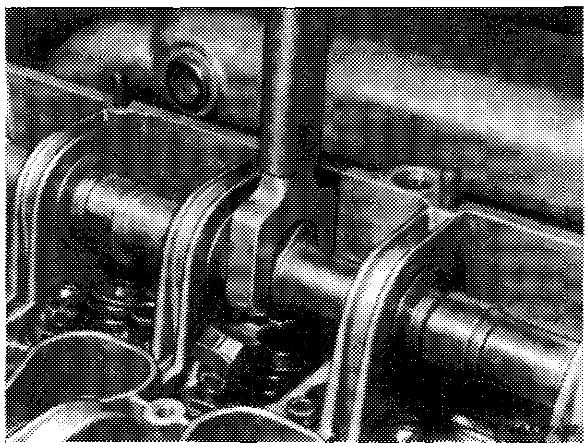
6 Remove all spring clamps with a wrench socket.



7 Remove all rocker arms with removal and installation tool.



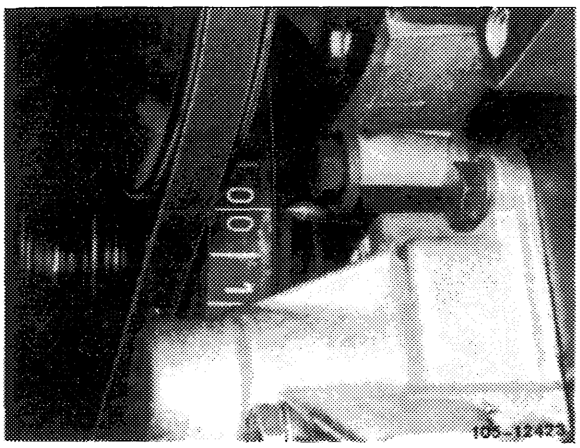
8 Counterhold only the right camshaft (exhaust) with the holding wrench and loosen the camshaft sprocket mounting expansion bolt.



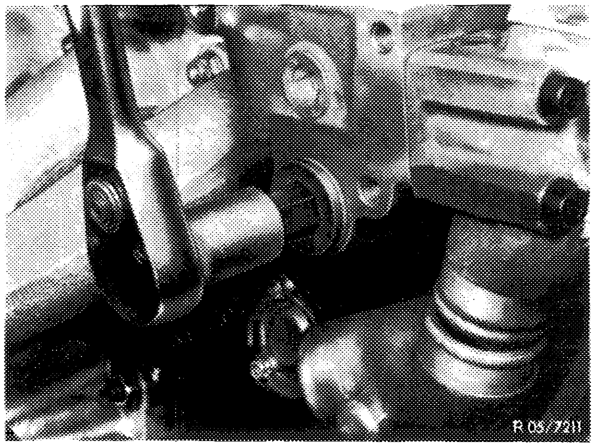
9 Position piston 1 at ignition TDC and both camshafts at marks.

This requires turning the crankshaft with the combination tool.

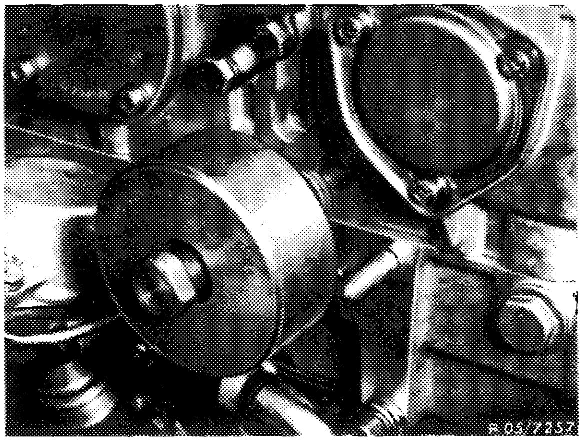
Attention!
Do not turn engine at the mounting bolts of the camshaft sprockets. Don't turn engine in **reverse direction** of rotation.



10 Remove chain tensioner and pressure spring (05–310).



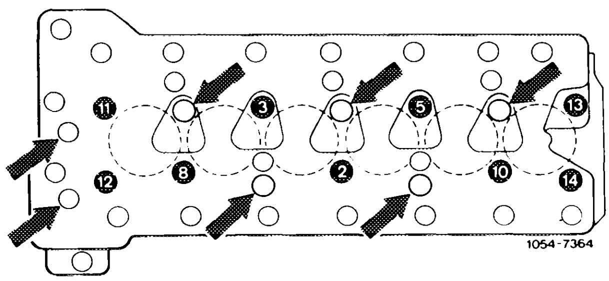
11 Remove sliding rail in camshaft housing. This requires knocking out bearing pins with an impact extractor.



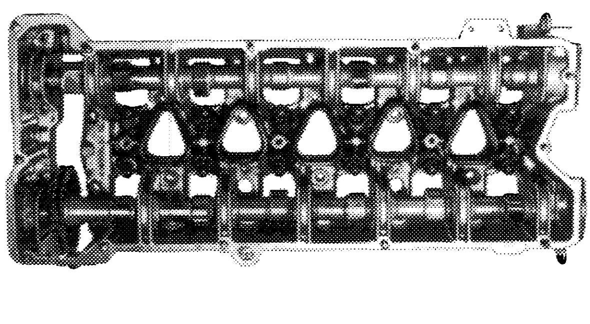
12 Push back righthand camshaft and remove camshaft sprocket.

13 Guide camshaft into bearings again. Unscrew M 8 bolts and cylinder head bolts in reverse sequence of tightening.

Do not loosen the 5 cylinder head bolts positioned deeper (arrows) and the 2 M 8 bolts (arrows).



14 Remove camshaft housing with camshafts.

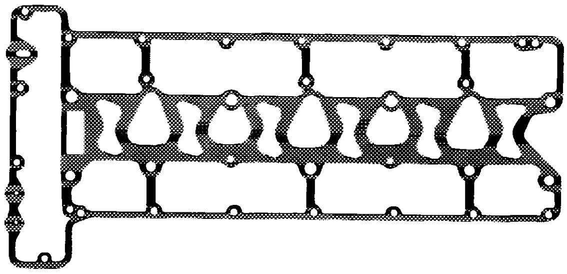


105–8003

Installation

15 Clean mating surface on cylinder head and camshaft housing to remove grease and install **sheet metal foil, part number 110 016 06 80,** without a sealing compound.

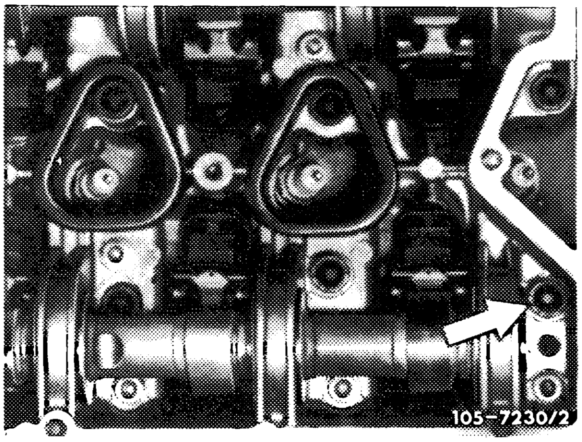
16 Install camshaft housing.



105 - 12 599

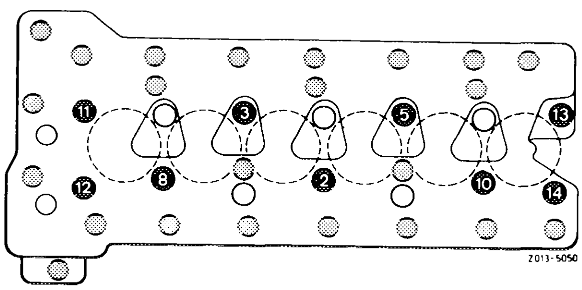
17 Lubricate threads and cylinder head surfaces of cylinder head bolts before installation.

Attention!
Since July of 1974 the clearance on the camshaft housing for **22 mm dia. washer** of cylinder head bolt No. 14 has been extended. Use the former 20 mm dia. washer (arrow) on former camshaft housings.



18 Tighten cylinder head bolts in steps in the sequence of tightening.

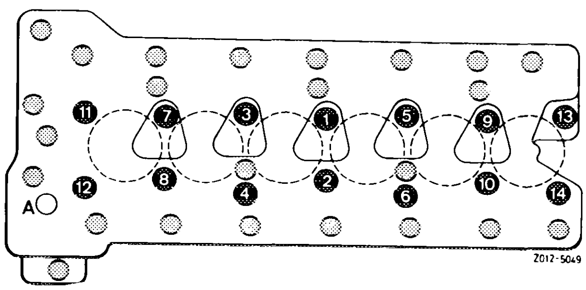
1st step: to **70 Nm** (7 kpm) starting with bolt No. 2.



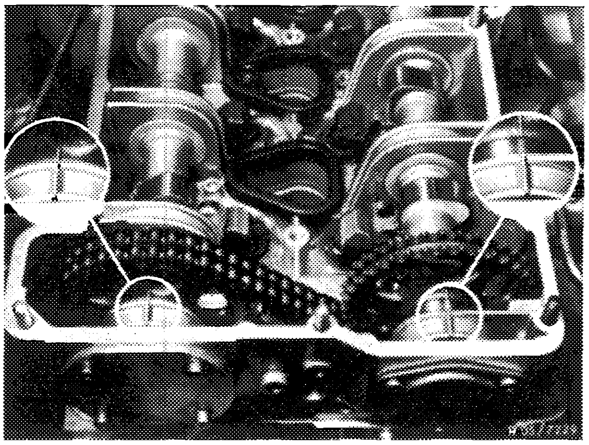
2nd step: all cylinder head bolts to **110 Nm** starting with bolt No. 1. This requires first loosening the five cylinder head bolts 1, 4, 6, 7 and 9 located deeper **separately** somewhat.

Tighten the M 8 bolts from inside to outside to 25 Nm.

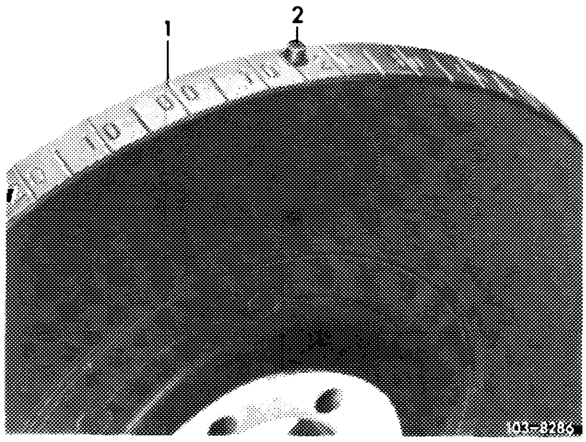
Attention!
After tightening all bolts, it must be possible to **turn both camshafts by hand.**



19 Install right camshaft sprocket making sure that the adjustment marks of both camshafts align when the crankshaft is at TDC.

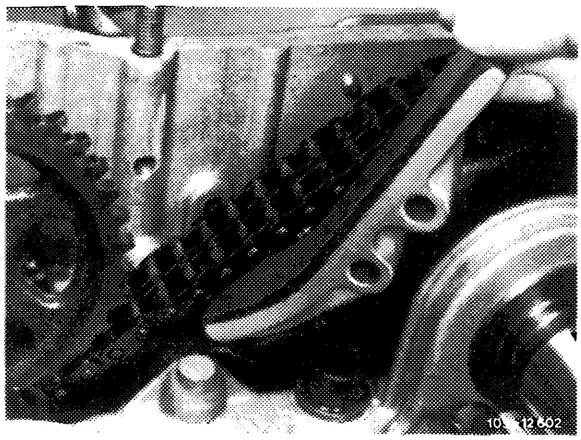


Attention!
When the vibration damper of an engine has a ,,0/0'' mark for BDC in addition to TDC, the TDC mark is next to the pin in the vibration damper.



1 TDC mark

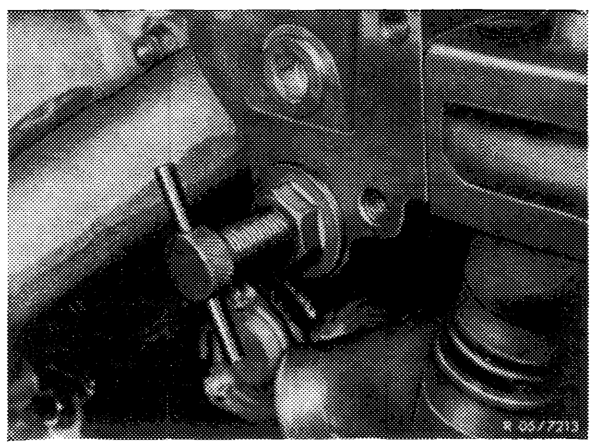
20 Install sliding rail so that the timing chain cannot jump.

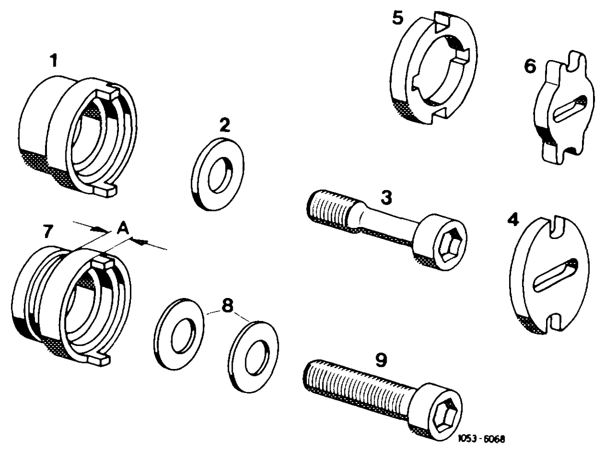


21 Install ,,rigid'' chain tensioner and tighten by hand.

Attention!
If camshaft housing has been ground, the timing must be adjusted.

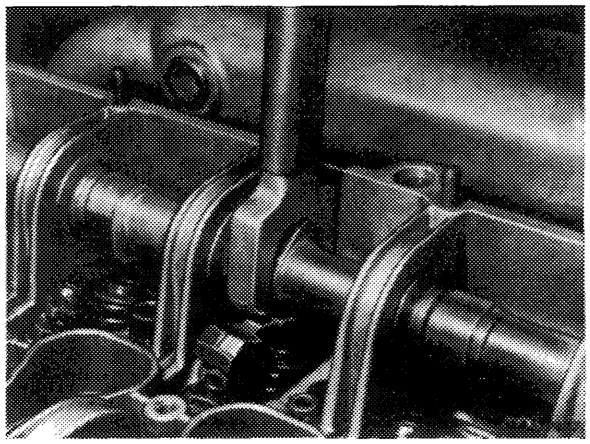
22 Lubricate spacers with engine oil and slide them into camshaft housing.





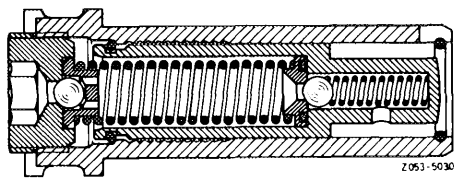
1 Spacer 2nd version without lubrication groove (for pressure oil pump and vacuum pump 2nd version)
2 Washer
3 Expansion bolt
4 Dog (for pressure oil pump and vacuum pump 2nd version)
5 Dog (for vacuum pump 1st version)
6 Dog 1st version (for oil pump)
7 Spacer 1st version with lubrication groove
A = 4.7 mm for vacuum pump 1st version
A = 8.3 mm for pressure oil pump and vacuum pump 2nd version
8 Spring washers (not valid)
9 Mounting bolt (not valid)

23 Torque expansion bolt for camshaft sprocket to 80 Nm (8 kpm), counterholding camshaft with the holding wrench.



Note: Washer (2) with 30 mm OD is not fitting into spacing sleeve for vacuum pump on USA vehicles up to January 1973. In such a case, machine OD of washer (2) down by approx. 1 mm.

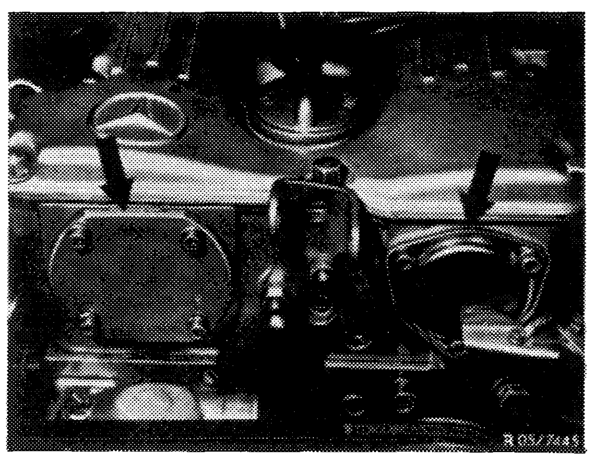
24 Position chain tensioner for installation and install. Also install pressure spring (05–310).



Chain tensioner in installation position

25 Install cover on front of camshaft housing and install level control pump or vacuum pump with gaskets.

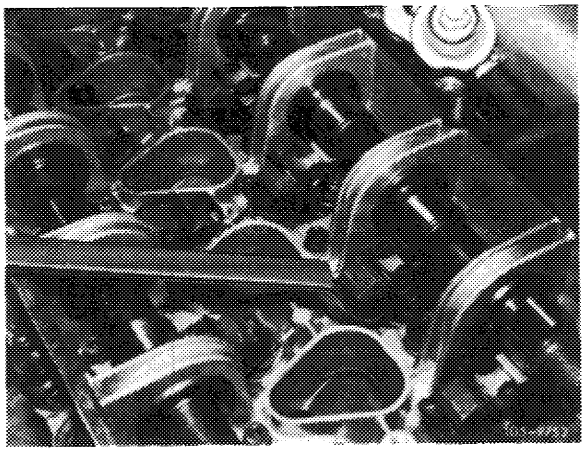
26 Install rocker arms (05–230).



27 Adjust valve clearance (05–210).

28 Complete engine.

Note: If the camshaft housing has been faced, readjust timing (05–215).



Note

Exchange engines are in part supplied with camshaft bearing intermediate stages and repair stages. In the event of repairs, install pertinent camshafts with reduced bearing dia. Also refer to table: Camshaft housing with 11 bearing points.

Camshaft housings with repair stages are available for camshafts with reground bearing journals. Also refer to table: Camshaft housing with 11 bearing points.

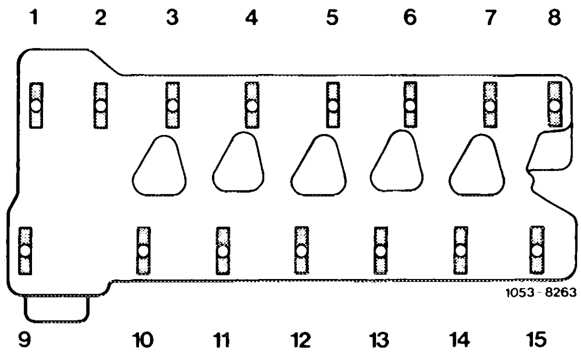
Camshaft housing with 15 bearing points

Bearing points		1, 9	2	3, 10, 11	4,5,12,13	6,7,14,15	8
Standard dimension	bearing dia.	38.016 / 38.000	50.066 / 50.050	50.016 / 50.000	51.519 / 51.500	53.019 / 53.000	54.019 / 54.000
	journal dia.	23.993 / 23.980	49.950 / 49.934	49.950 / 49.934	51.440 / 51.421	52.940 / 52.921	53.940 / 53.921
Intermediate stage –0.1 mm (exchange engines)	bearing dia.		49.966 / 49.950	49.916 / 49.900	51.419 / 51.400	52.919 / 52.900	53.919 / 53.900
	journal dia.		49.850 / 49.834	49.850 / 49.834	51.340 / 51.321	52.840 / 52.821	53.840 / 53.821
Repair stage 1 –0.25 mm	bearing dia.		49.816 / 49.800	49.765 / 49.750	51.269 / 51.250	52.769 / 52.750	53.769 / 53.750
	journal dia.		49.700 / 49.684	49.700 / 49.684	51.190 / 51.171	52.690 / 52.671	53.690 / 53.671
Repair stage 2 –0.50 mm	bearing dia.		49.566 / 49.550	49.516 / 49.500	51.019 / 51.000	52.519 / 52.500	53.519 / 53.500
	journal dia.		49.450 / 49.434	49.450 / 49.434	50.940 / 50.921	52.440 / 52.421	53.440 / 53.421
Camshaft bearing play	radial	0.057 / 0.124	0.100 / 0.132	0.050 / 0.082	0.060 / 0.098	0.060 / 0.098	0.060 / 0.098
	axial	0.050 / 0.120					
Sleeve for bearing a	OD	37.950 / 37.925	ID	24.013 / 24.000			

Combinations in the event of repairs

a) Camshaft housing with 15 bearing points intake-camshaft code number 25, 67 and 33 with 7 bearing journals.

Exhaust-camshaft code number 24, 30, 57 and 71 with 8 bearing journals.



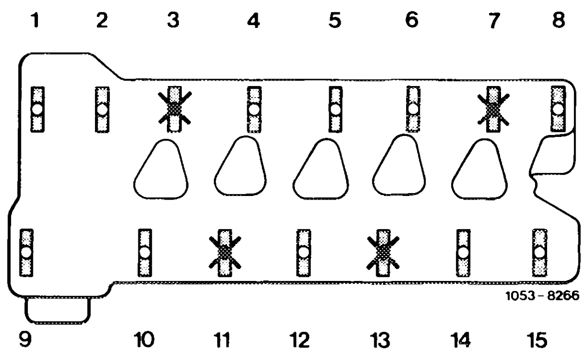
b) Camshaft housing with 15 bearing points, with bearing points 11 and 13 at intake end or 3 and 7 at exhaust end out of function.

Intake camshaft code number 74 and 91 with 5 bearing journals and intermediate stage or repair camshafts with reduced bearing dia.

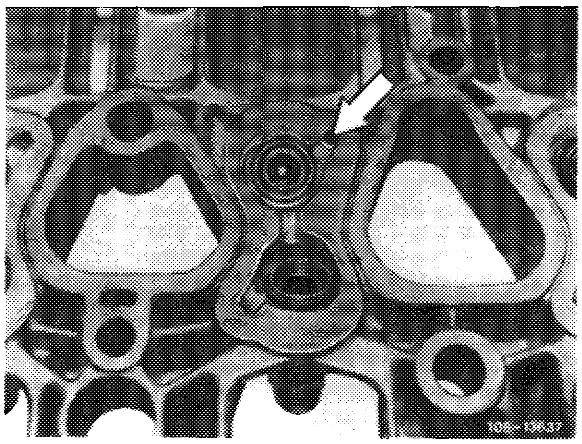
Exhaust camshaft code no. 78 and 95 with 6 bearing journals and intermediate stage or repair camshafts with reduced bearing dia.

In this case, the oil bores of bearing points 11 and 13 or 3 and 7 on removed camshaft housing must be closed.

For this purpose, cut threads M 6, approx. 10 mm deep from below into oil bores (arrow) and screw-in threaded plug 000 913 006 110 with sealing compound.



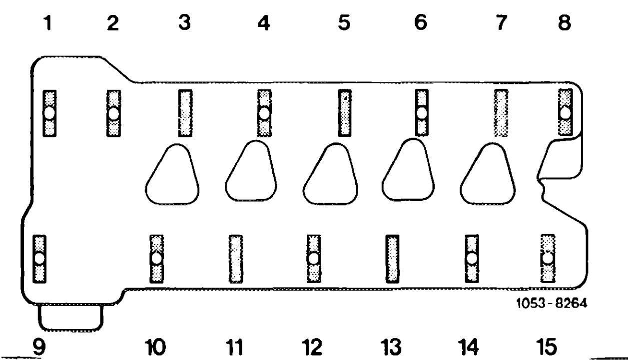
X close oil bores



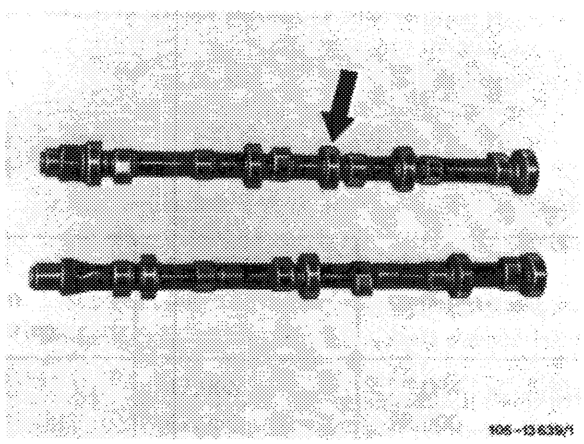
c) Camshaft housing with 15 bearing points, with bearing points 11 and 13 (intake end) or bearing points 3.5 and 7 (exhaust end) without oil supply.

Intake-camshaft code number 25, 67 and 33 with 7 bearing points, of which bearing points 11 and 13 with 1 mm machined off.

Exhaust-camshaft code number 24, 57, 71 and 30, of which bearing points 3, 5 and 7 machined off by 1 mm.



Exchange engines starting unit no. 464.130 are supplied in this version (c). When installing an exhaust-camshaft with code number 78 and 95 into camshaft housing version c, machine 1 mm from bearing journal 5 (arrow).

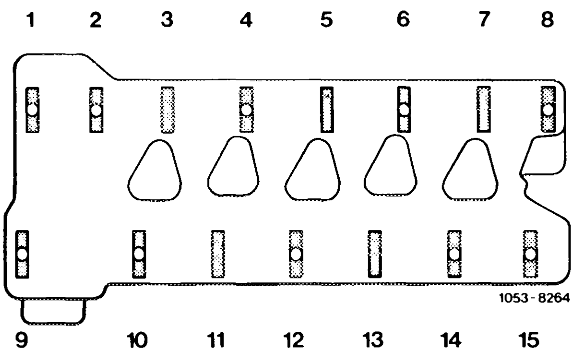


Camshaft housing with 15 bearing points of which 5 bearing points without oil bore

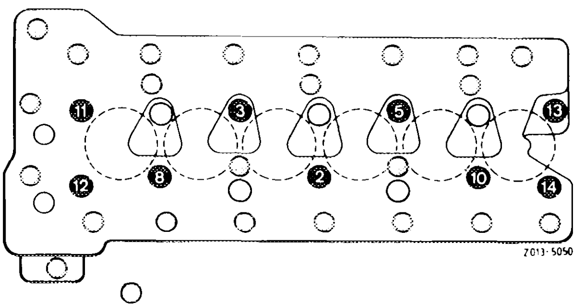
Bearing points		1, 9	2	3, 11	4, 12	5, 13	6, 14, 15	7	8	10
Bearing points	Bearing dia.	38.016 / 38.000	50.066 / 50.050	51.0	51.519 / 51.500	52.5	53.019 / 53.000	54.0	54.019 / 54.000	50.016 / 50.000
	Journal dia.	23.993 / 23.980	49.950 / 49.934	–	49.950 / 49.934	–	52.940 / 52.921	–	53.940 / 53.921	49.950 / 49.934

This camshaft housing is not manufactured as an intermediate or repair stage.

On this camshaft housing, the bearing points 3, 5, 7, 11 and 13 are without oil bore and their ID is 1 mm larger than the respective camshaft bearing journals. This camshaft housing can be used to install **all camshafts with normal dimension.**



This camshaft housing is attached together with cylinder head by means of 9 cylinder head bolts, M 12 x 145 mm (formerly M 12 x 150 mm), since the bolt head contact surfaces in camshaft housing were countersunk by 5 mm.



Attention!

On exchange engines starting unit number 496.861 (approx. starting October 1977) these 9 cylinder head bolts are installed with a length of 150 mm. **Washers 5 mm thick part no. 186 990 09 40 are fitted to make sure that the thread lugs in cylinder crankcase are not forced off.**

Camshaft housing with 11 bearing points, of which 1 bearing point without oil bore

Bearing points		1, 9	2	4, 12	5	6, 14, 15	8	10
Bearing points	Bearing dia.	38.016 / 38.000	50.066 / 50.050	51.519 / 51.500	52.5	53.019 / 53.000	54.019 / 54.000	50.016 / 50.000
	Journal dia.	23.993 / 23.980	49.950 / 49.934	51.440 / 51.421		52.940 / 52.921	53.940 / 53.921	49.950 / 49.934

Intermediate stage – 0.1 mm (exchange engines only)

Camshaft housing part no. 110 010 20 36
Intake camshaft part no. 110 051 **77** 01
Exhaust camshaft part no. 110 051 **98** 01

	1, 9	2	4, 12	5	6, 14, 15	8	10
Bearing dia.		49.966 / 49.950	51.419 / 51.400	52.5	52.919 / 52.900	53.919 / 53.900	49.916 / 49.900
Journal dia.		49.850 / 49.834	51.340 / 51.321		52.840 / 52.821	53.840 / 53.821	49.850 / 49.834

Repair stage 1 – 0.25 mm

Camshaft housing part no. 110 010 21 36
Intake camshaft part no. 110 051 **75** 01
Exhaust camshaft part no. 110 051 **79** 01

	1, 9	2	4, 12	5	6, 14, 15	8	10
Bearing dia.		49.816 / 49.800	51.269 / 51.250	52.5	52.769 / 52.750	53.769 / 53.750	49.765 / 49.750
Journal dia.		49.700 / 49.684	51.190 / 51.171		52.690 / 52.671	53.690 / 53.671	49.700 / 49.684

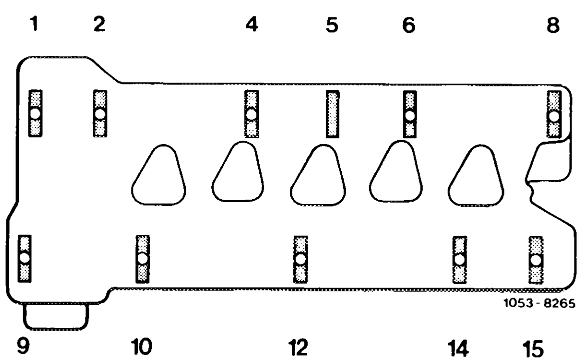
Repair stage 2 – 0.50 mm

Camshaft housing part no. 110 010 22 36
Intake camshaft part no. 110 051 **76** 01
Exhaust camshaft part no. 110 051 **80** 01

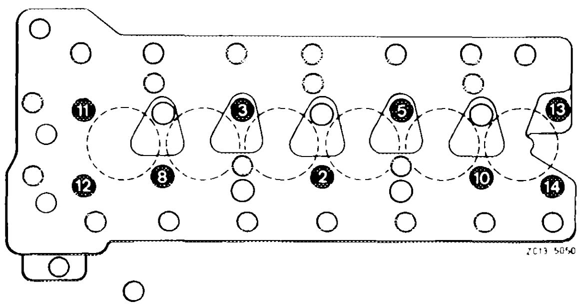
	1, 9	2	4, 12	5	6, 14, 15	8	10
Bearing dia.		49.566 / 49.550	51.019 / 51.000	52.5	52.519 / 52.500	53.519 / 53.500	49.516 / 49.500
Journal dia.		49.450 / 49.434	50.940 / 50.921		52.440 / 52.421	53.440 / 53.421	49.450 / 49.434

On this camshaft housing bearing point 5 is without oil bore and its ID is 1 mm larger than the respective camshaft bearing journal.

This camshaft housing can be used to install camshaft without changes on bearing journals.



This camshaft housing is attached together with cylinder head by means of 9 cylinder head bolts M 12 x 145 (formerly M 12 x 150), since the bolt head contact surfaces in camshaft housing were counter-sunk by 5 mm.



Attention!

On exchange engines starting unit number 496.861 (approx. starting October 1977) these 9 cylinder head bolts are installed with a length of 150 mm. Washers **5 mm thick part no. 186 990 09 40 are fitted to make sure that the thread lugs in cylinder crankcase are not forced off.**

01–472 Facing camshaft housing

Data

Total height of new camshaft housing	104.8–105.0
Min. height after machining	104.0
Permissible deviation from parallel between upper and lower parting surface in longitudinal direction	0.1
Mean height of roughness of parting surfaces	0.006–0.014

Conventional tools

Surface grinding machine with milling equipment for light alloy surfaces	e.g. made by Ruaro u. Fi., Schio/Italy Scledum, type RTY
Knife-edged straightedge approx. 750 mm long	

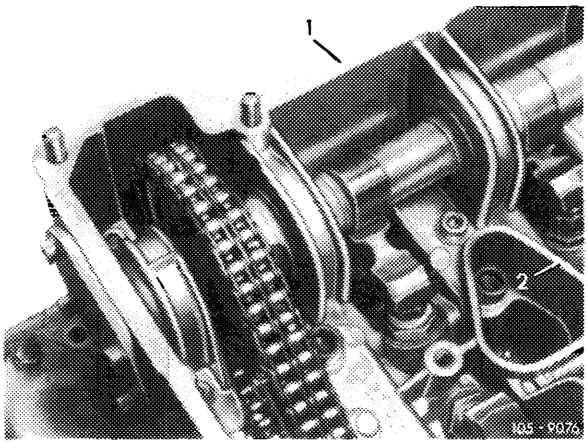
Note

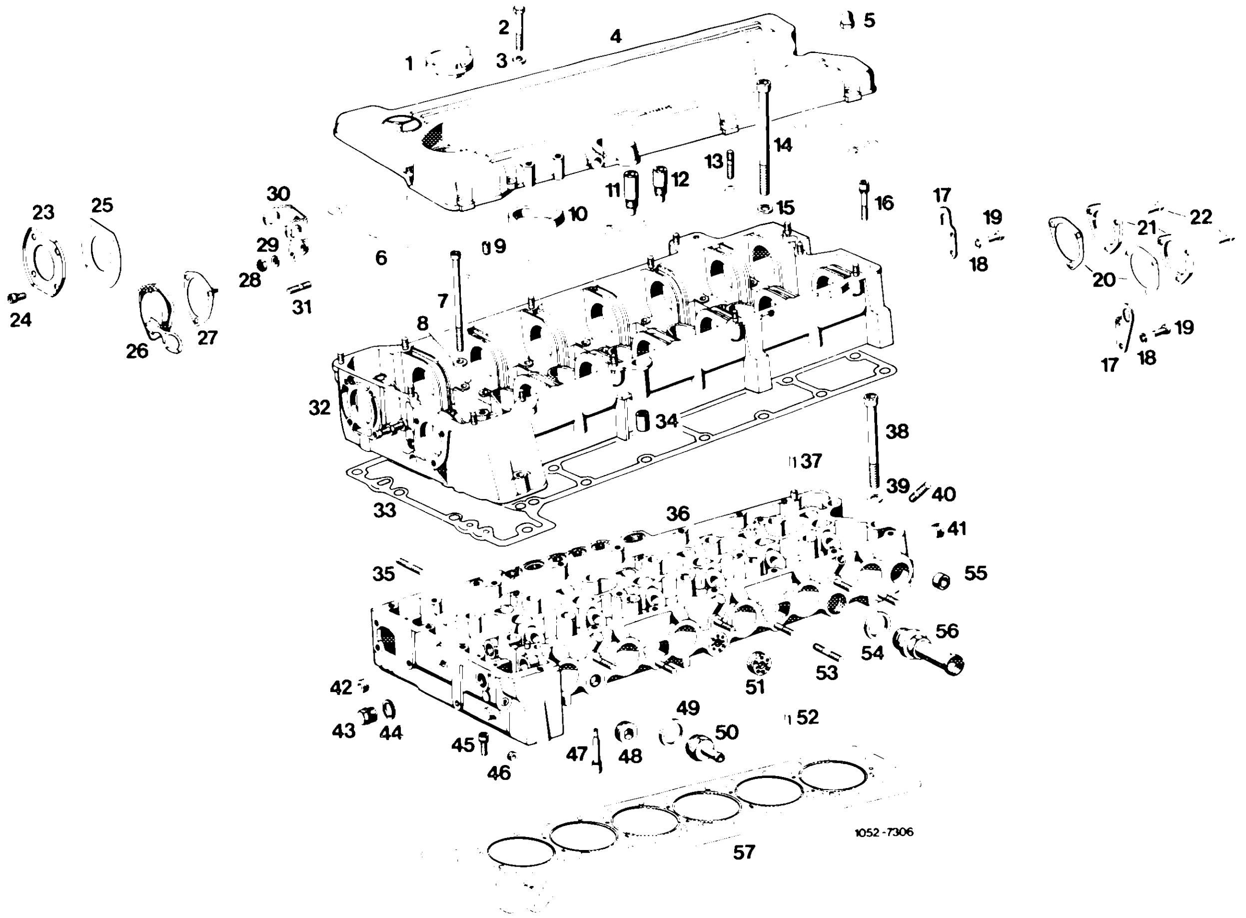
The camshaft housing may only be faced, if mechanical damage is visible on the mating surfaces.

A distorted camshaft housing will align with the cylinder head when tightened.

Only 0.4 mm may be machined off of the camshaft housing mating surfaces to the cylinder head or cylinder head cover. The same amount of material must be removed from the bearing surfaces for the gaskets at the spark plugs (2) as was machined from the mating surface to the cylinder head cover (1).

If the camshaft housing was faced, the timing must be adjusted (05–215).





1 Filler plug
2 3 bolts M 8 x 55
3 3 seals C 8 x 13
4 Valve cover
5 Capped nuts
6 Cylinder head cover gasket
7 2 bolts M 8 x 135
8 Plain washers 38 x 15
9 3 threaded inserts M 8 x 16
10 5 cylinder head cover gaskets
11 Vent valve
12 Vent jet
13 12 studs M 8 x 18
14 9 bolts
15 9 washers
16 21 combination bolts M 8 x 40
17 2 suspension eyes, rear
18 Circlip
19 4 bolts M 8 x 15
20 2 gaskets
21 2 covers
22 6 combination bolts
23 Cover
24 7 combination bolts M 6 x 15
25 Gasket
26 Cover with holder
27 Gasket
28 2 nuts M 8
29 2 circlips
30 Suspension eyes, front
31 2 studs M 8 x 18
32 Camshaft housing
33 Sheet metal foil for repairs
34 Engine vent connecting hose
35 Stud M 8 x 30
36 Cylinder head
37 2 dowel pins 8 x 16
38 5 bolts
39 5 washers
40 Studs M 8 x 20
41 2 plugs for oil bores
42 Plug AM 22 x 1.5
43 Plug M 18 x 1.5
44 Seal A 22 x 27
45 2 combination bolts M 8 x 20
46 Plug M 10 x 1 for oil connecting bore
47 Return flow oil jet
48 Plug OM 30 x 1.5
49 Seal A 30 x 36
50 Connector for pre-heating
51 Connectors for carburetor heating
52 2 dowel pins 8 x 16
53 Stud M 8 x 35
54 Seal A 30 x 36
55 Cover for injection bore
56 Heater connection
57 Cylinder head gasket

Conrod bolt sizes

<table>
<tr><th rowspan="2">Version</th><th rowspan="2">Part Number</th><th colspan="2">Distance a and b (fig., point 1)</th><th rowspan="2">Thread dia. d</th><th rowspan="2">Expansion stem dia. c when new (fig., point 1)</th><th rowspan="2">Min. Expansion stem dia.</th></tr>
<tr><th>a</th><th>b</th></tr>
<tr><td>1st version</td><td>110 038 01 71</td><td rowspan="2">5.5</td><td>3</td><td rowspan="3">M 10x1</td><td rowspan="3">8.4–0.1</td><td rowspan="3">8.0</td></tr>
<tr><td>2nd version</td><td>110 038 03 71</td><td rowspan="2">4.5</td></tr>
<tr><td>3rd version</td><td>110 038 04 71</td><td>6.6</td></tr>
<tr><td colspan="5">Conrod bolt installation pressure</td><td colspan="2">45000 N</td></tr>
</table>

Conrod nut torque

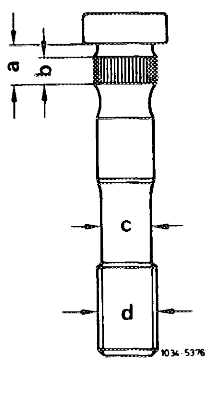
Initial torque	40–50
Torque angle	90–100°

Self-made tool

Steel plate	see fig., point 3

Checking

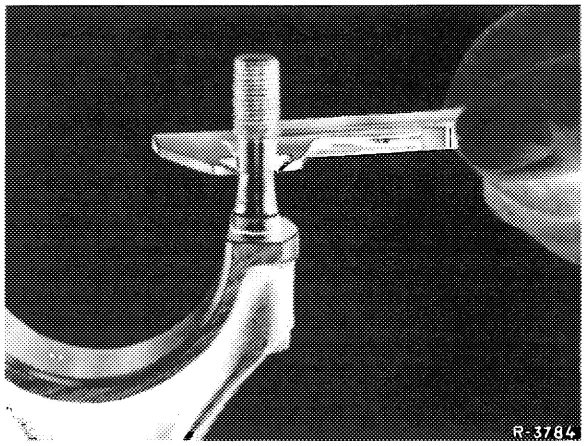
1 Measure smallest expansion stem diameter before reusing.



Note: If the minimum expansion stem diameter reaches or is less than 8.0 mm, **replace conrod bolt.**

Only knock out a conrod bolt to replace it.

Use third version conrod bolts for repairs.

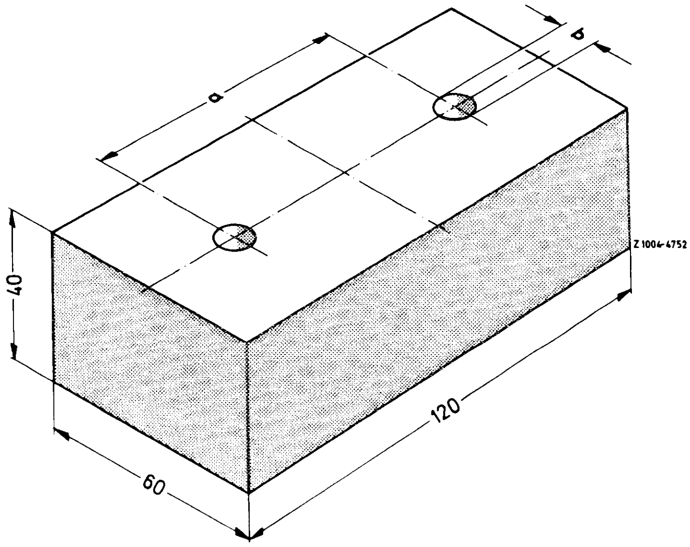


Replacing

2 Knock out conrod bolts.

3 Press new bolts into conrod with a pressure of about 45000 N, or knock in with a hammer and mandrel.

Place the connecting rod on a ground steel plate when knocking in or pressing in conrod bolts.



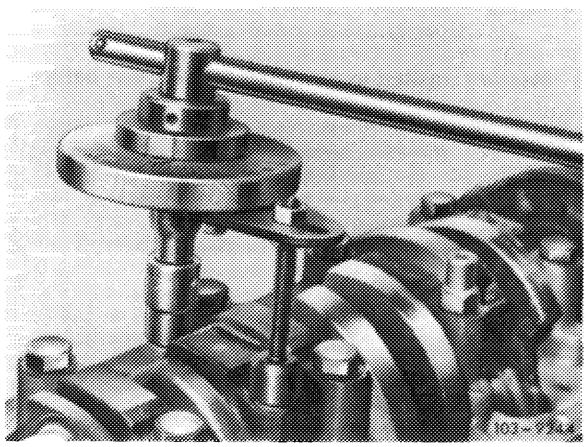
Distance between holes a = 64.6 mm
Bore b = 11 mm

Tightening

4 Lubricate nuts and threads.

5 Tighten conrod nuts to a torque pressure of 40–50 Nm and a torque angle of 90–100°.

Attention!
Tighten conrod bolts knocked in with a hammer to a torque pressure of 60–70 Nm and a torque angle of 90–100° for the first time.



Make sure that this instruction is observed, since otherwise the nuts **of the conrod bolts may** become loose.

Note: If no angle of rotation wrench is available, the connecting rod nuts can also be tightened by means of a normal socket wrench with toggle **in one step** by an angle of 90–100°. Estimate angle as accurately as possible. **To eliminate angle faults, do not use a torque wrench** for tightening according to angles of rotation.

Data

Center of conrod bearing bore to center of conrod bushing bore	131.950 / 130.050
Width of conrod at conrod bearing bore and conrod bushing bore	27.890 / 27.857
Basic bore for conrod bearing shells	51.619 / 51.600
Basic bore for conrod bushing	26.021 / 26.000
Conrod bushing inside dia.	23.013 / 23.007
Peak to valley height on inside of conrod bushing	0.004
Permissible stagger of conrod bore to conrod bushing bore in reference to a length of 100 mm	0.1
Permissible difference in parallel between axes: conrod bearing bore to conrod bushing bore in reference to a length of 100 mm	dia. 0.015
Permissible deviation of conrod bearing bore from true	0.020
Permissible difference in weight of all connecting rods of one engine	5 gr.

Tightening torque

Conrod nuts	Initial torque	40–50 Nm
	Torque angle	90–100°

Conventional tool

Connecting rod checking and straightening tool	Made by Krupp GmbH, 5309 Meckenheim e.g. Model CL 6

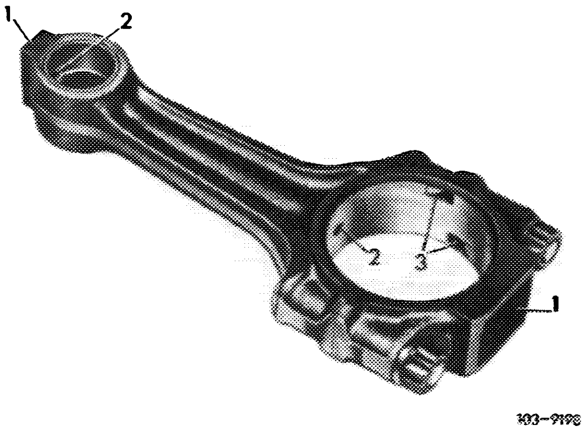
Note

Connecting rods, which are overheated (blue discoloration) due to bearing damage, may not be re-used.

The connecting rod and its cap are marked to fit together. The connecting rod stem must not show cross scoring and notches.

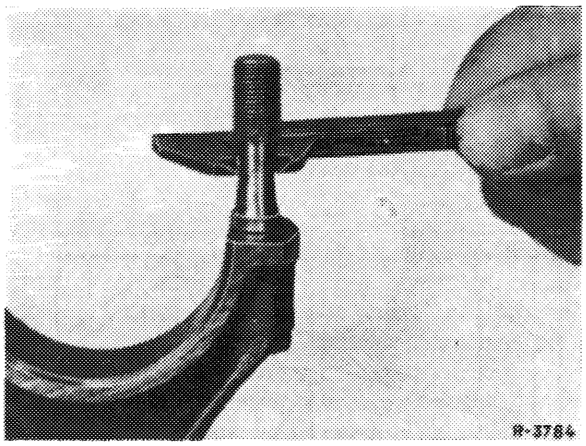
Connecting rods with a machined conrod bushing are delivered as replacement parts.

When renewing conrods pay attention to different weights of rods.



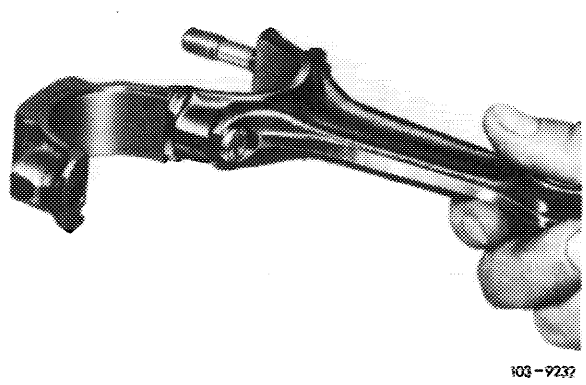
Repairing

1 Check conrod bolts and replace if necessary (03–310).



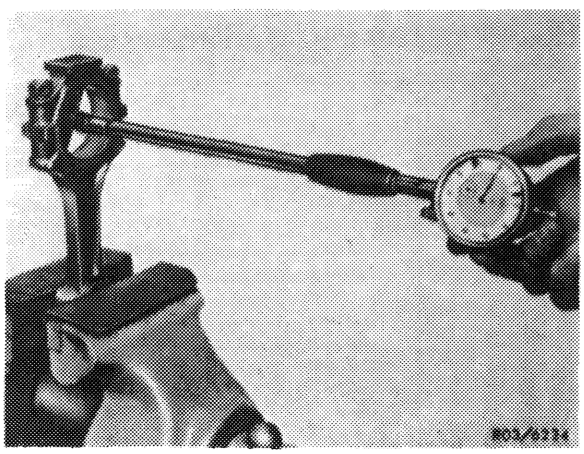
2 Check conrod bolt bores.

Place conrod cap on a conrod bolt. If the conrod cap moves down by its own weight, the connecting rod must be replaced.



3 Mount connecting rod bearing cap and tighten to 40–50 Nm and 90–100° angle of rotation torque.

4 Measure conrod bearing basic bore. If a basic bore exceeds the value of 51.62 mm or shows conicity, hone bearing surface of bearing cap on a surface plate up to max. 0.02 mm.

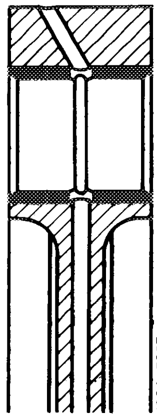


5 Press in new conrod bushing that oil bores match.

Installation pressure 2500 Nm.

6 Mill or ream out conrod bushing.

7 Hone side bearing surfaces of connecting rod on a surface plate.

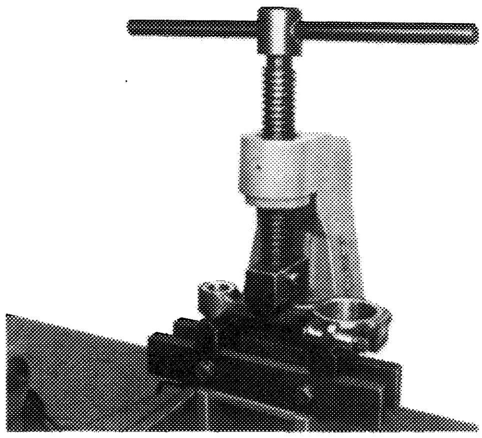


1034-7657

Squaring

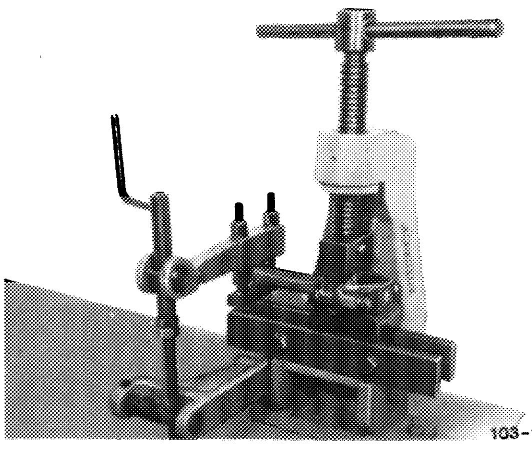
8 Square connecting rod with a conrod tester.

9 Align parallel of conrod bore to conrod bushing bore.



103-11174

10 Correct stagger of conrod bore to conrod bushing bore.



103-11173

Association piston – cylinder[1])

Group number		0	1	2
Standard dimension	Piston dia	85.970–85.982	85.980–85.992	85.990–86.002
	Cylinder dia	85.998–86.008	86.009–86.018	86.019–86.028
1st repair stage + 0.5	Piston dia	86.470–86.482	86.480–86.492	86.490–86.502
	Cylinder dia	86.498–86.508	86.509–86.518	86.519–86.528
2nd repair stage + 1.0	Piston dia	86.970–86.982	86.980–86.992	86.990–86.002
	Cylinder dia	86.998–86.008	87.009–87.018	87.019–87.028

[1]) The smallest measured cylinder dia and the largest measured piston dia are decisive for association.

Piston code number and piston distance

Engine		Compression ratio $\epsilon : 1$		Piston code number	Distance between piston crown and cylinder crankcase parting surface
Normal compression					
110.921	110.983		Std	37, 40, 50, 60, 64, 69 80[1]), 83, 86[1]), 89	Standback 0.20 to 0.70
110.922	110.984				
110.923	110.985				
110.924	110.986	9.0 ± 0.2	+ 0.5	38, 41, 51, 67, 70, 84, 90	Standback 1.0 to 1.50
110.981	110.987	8.7 ± 0.2			
110.982			+ 1.0	39, 42, 52, 68, 71, 85, 91	
Low compression					
110.921	110.984		Std	28, 54, 72, 75	0.25 standout up to 0.15 standback
110.922	110.985				
110.923	110.991	8.0–0.4			
110.924			+ 0.5	29, 55, 73, 76	Standback 0.55 to 0.95
110.931	110.992		+ 1.0	30, 56, 74, 77	
110.932	110.993				

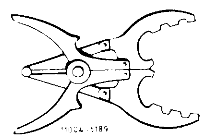
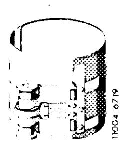
[1]) Installed in engine 110.984, 110.985, 110.986 and 110.987 as standard equipment. Not available as repair stages. Use only together with piston of same piston code number.

Test values		New (Installation tolerance)	Wear limit
Piston clearance		0.016 to 0.040	0.08
Difference in weight of pistons in one engine		4 g	10 g
Piston pin dia.		22.996 to 23.00	
Piston pin clearance	in conrod bushing	0.007 to 0.017	
	in piston	0.002 to 0.011	
Piston ring gap	groove 1	0.30 to 0.45	1.0
	groove 2	0.30 to 0.45	0.8
	groove 3	0.25 to 0.40	0.8
Piston ring clearance	groove 1	0.05 to 0.08	0.15
	groove 2	0.03 to 0.06	0.08
	groove 3	0.01 to 0.04	0.08

Tightening torque

Connecting rod nuts	torque pressure	40–50 Nm
	torque angle	90–100°

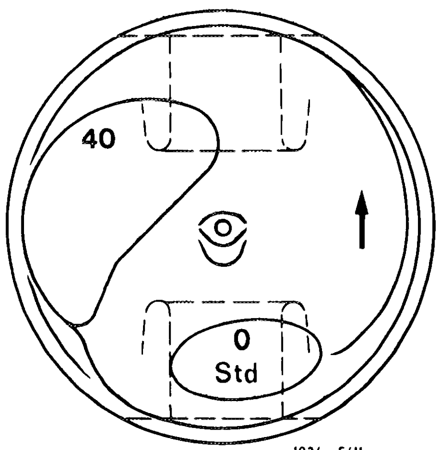
Special tools

Piston ring pliers		000 589 51 37 00
Piston ring compressor		000 589 04 14 00

Note

The piston version (std, + 0.5 or + 1.0), the group number (0, 1 or 2), the piston code (e.g. 40) and an arrow for forward direction are stamped in the piston crown.

The group number is also stamped in the crankcase mating surface.



1034 - 5411

The group number of pistons (e.g. 1) is the same as the group number of cylinder bores (production).

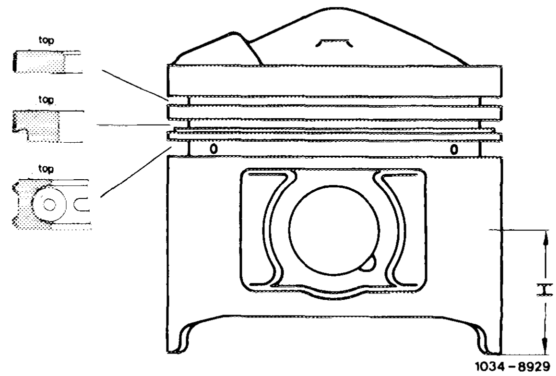
This will guarantee the specified piston clearance.

When repairing, the cylinder bores should be honed according to the sizes of the existing pistons plus the piston clearance.

Pistons and piston pins are matched.

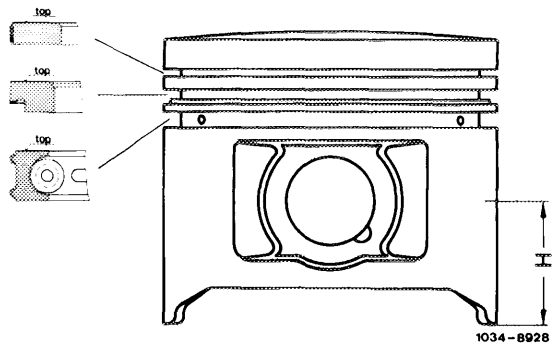
The measuring point for nominal diameter of pistons is offset by 90° in relation to piston pin axis at level H.

On used pistons the measured value does not necessarily correspond with nominal diameter of a new piston, since piston in range of measuring point and at shaft tab may "recede" already after a short operating period, that is, the nominal diameter may become smaller by up to 0.070 mm.



Piston normal compression
dimension H = 32 mm

If used pistons are used again, make sure that the oil drain bores in 3rd piston ring groove are cleaned.



Piston low compression and
USA version
dimension H = 32 mm

Removal

1 Take out connecting rod with piston from above.

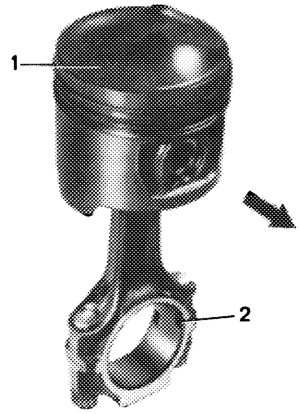
2 Remove piston pin circlips and press out piston pin.

3 Repair and square connecting rod (03–313).

Installation

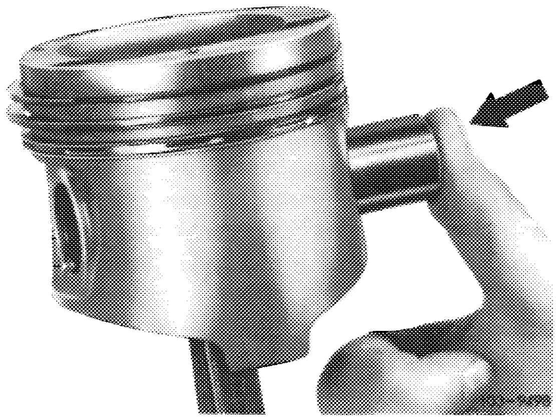
4 Place piston on connecting rod that arrow (1) faces in forward direction and circlip grooves (2) in connecting rod face to left side of engine (intake manifold).

Attention!
Don't heat piston.



103 - 8914/1

5 Press in piston pin coated with engine oil **by hand.**

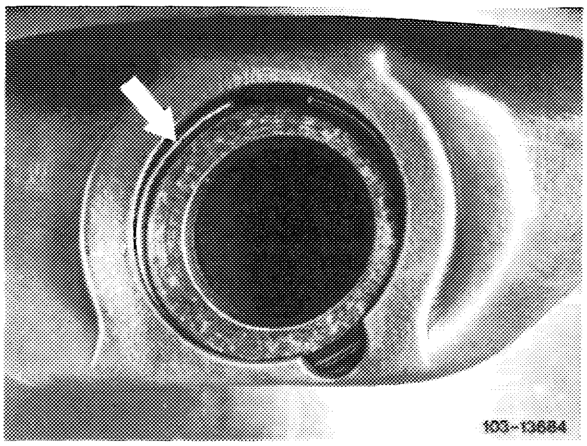


6 Insert piston pin circlips in grooves.

When installing used pistons, check piston ring gaps and clearances.

Check piston rings for easy movement.

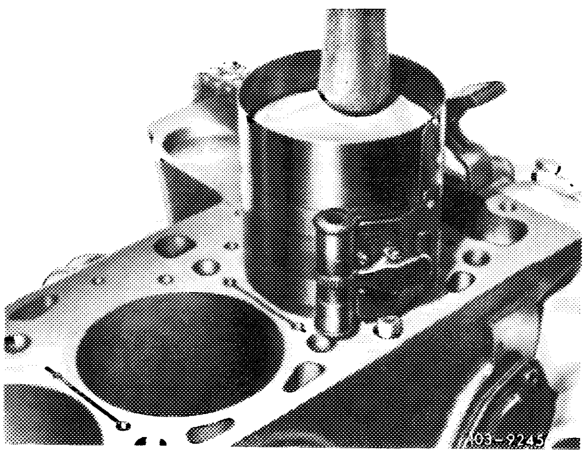
7 Lubricate cleaned cylinder bores, conrod bearing journals, conrod bearing shells and the pistons.



103-13684

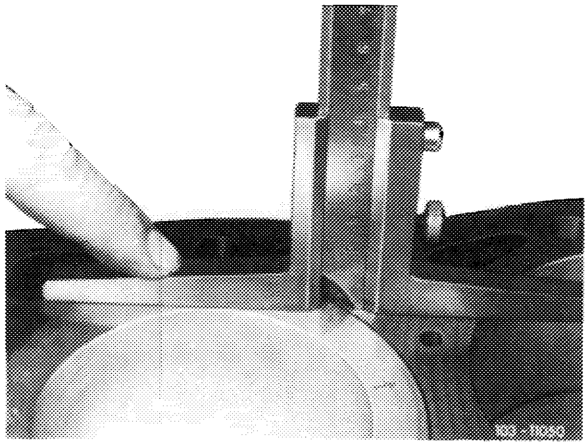
8 Distribute gaps of piston rings around piston circumference evenly.

9 Install piston ring compressor and guide in piston with arrow facing forward.



103-9245

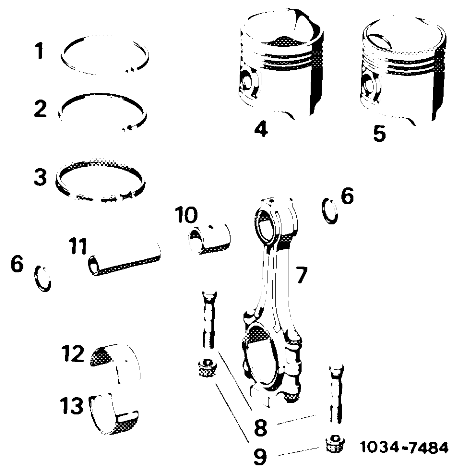
10 Place connecting rod bearing caps with code numbers facing each other on connecting rod and tighten connecting nuts to 40–50 Nm initial torque and to 90–100° angle of rotation torque.



11 Turn crankshaft and check clearance between piston pin boss and connecting rod.

12 Measure distance between piston crown and crankcase mating surface when piston is positioned at TDC (see chart).

Pistons and connecting rods



1 Plain compression ring
2 Oil scraper ring
3 Bevelled compression ring with hose lined spring
4 Piston
5 Piston, USA and low compression
6 Circlip
7 Connecting rod with conrod cap
8 Conrod bolt
9 Nut
10 Conrod bushing
11 Conrod pin
12 Conrod bearing upper half with oil bore
13 Conrod bearing lower half

Data

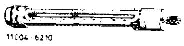
<table>
<tr><th>Crankshaft
Standard size &
undersizes</th><th>Crankshaft
bearing journal
dia.</th><th>Width of journal
at thrust
bearing</th><th>Conrod
bearing journal
dia.</th><th>Conrod
bearing
journal width</th></tr>
<tr><td>Standard size</td><td>59.96
59.95</td><td>29.00
29.02</td><td>47.96
47.95</td><td>28.00
28.08</td></tr>
<tr><td>1st Undersize</td><td>59.71
59.70</td><td rowspan="4">to 29.60</td><td>47.71
47.70</td><td rowspan="4">to 28.30</td></tr>
<tr><td>2nd Undersize</td><td>59.46
59.45</td><td>47.46
47.45</td></tr>
<tr><td>3rd Undersize</td><td>59.21
59.20</td><td>47.21
47.20</td></tr>
<tr><td>4th Undersize</td><td>58.96
58.95</td><td>46.96
46.95</td></tr>
</table>

Crankshaft journal dia. for mounting compensating weight		0.030
Permissible deviation of crankshaft journal prior to mounting compensating weight	from cyl. shape	0.005
	from true[1)]	0.030
Permissible deviation of crank pins and crankshaft bearing journals from true		0.0025
Permissible deviation of crank pin cyl. line from parallel		0.010
Permissible deviation of running surfaces of fitted bearing from parallel[1)]		0.020
Permissible deviation of running surface of rear radial sealing ring from concentric true[1)]		0.015
Permissible deviation of flywheel flange from axial true[1)]		0.010
Permissible deviation of crankshaft bearing journal from concentric true[1)]	journal II, VI	0.070
	journal III, IV, V	0.100
Fillets on crankshafts and crank pins		2.5 to 3

Scleroscope hardness of crankshaft bearing journals and crank pins	when new	74–84
	boundary value	60[2)]
Permissible unbalance of crankshaft		15 cmg

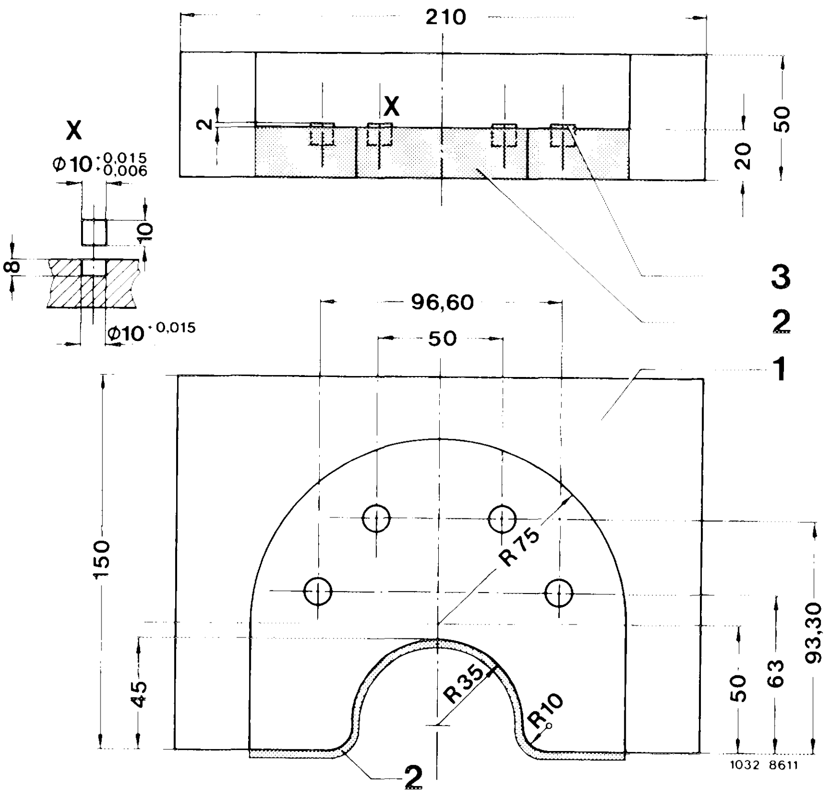
1) When mounting crankshaft on outer crankshaft bearing journal I and VII after one full turn.
2) Boundary value should be available at min. 2/3 of journal circumference.

Special tool

Impact hardness tester		000 589 20 21 00

Self-made tool

Rivet support for riveting counterweight to crankshaft.



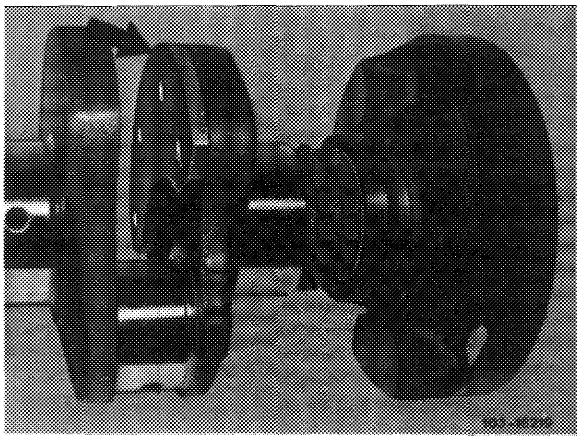
Note

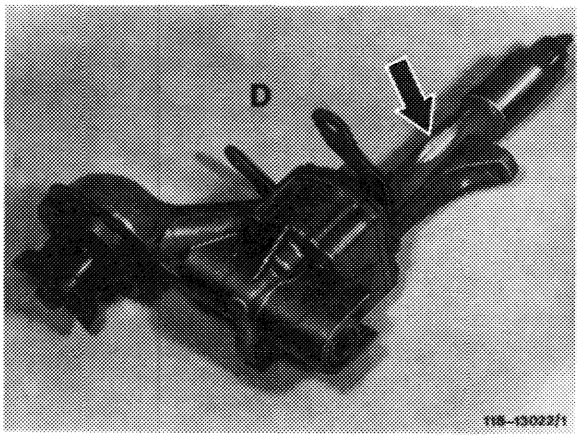
Since December 1978, the crankshaft of engine 110 is provided with an additional weight.
Remove additional weight when machining first crank pin.
After machining crank pin, rivet additional weight on again. Then check crankshaft for runout, and balance together with flywheel and balancing disc, also when re-using the old additional weight.

The crankshaft with riveted-on additional weight may be used only together with a modified oil pump which is provided with a recess (arrow) on housing shaft.

When checking and reconditioning crankshafts, proceed in sequence of the following diagram and pertinent explanations.

For grinding crank pins, a difference of only one repair stage per crankshaft is permitted.





Visual checkup
heavy damage? — yes — V

no

Crack test*
Cracks showing up? — yes — V

no

Hardness test* — no
All bearing journals
scleroscope hardness
min 60 at 2/3 of
journal circum-
ference

yes

Measure journal
Are dimensions
in order? — no

yes

Lap

Dimensional checkup
Dimensions in order? — no

yes

Balance crankshaft together with compensating weight and flywheel

Crankshaft with additional weight:
If required, bore out additional weight (e.g. when hardening, re-grinding etc.) and rivet-on again prior to balancing.
Refer to job no. 03–318.

Check whether regrinding with-
in last
specified reapair
stage 4
is still
possible — no — V
— no — V
— yes

yes

Crankshaft straighten

Crankshaft grind

Crack test
Cracks showing
up? — yes — V

no

Refer to lap

Harden*

Journal with
hardened fillets

Induction
hardening system
available?

no — V

yes — Induction hardening — **Test hardness by etching***

Journal without
hardened fillets

Induction or
flame hardening

Test hardness by etching*

Relieve crankshaft for 2 hours at 80°C

Refer to crankshaft, straighten

Explanations concerning diagram

Crack test

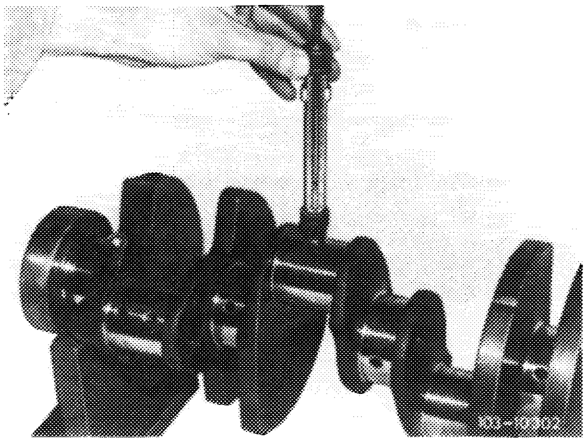
Clean crankshaft. Bearing journals should be free of oil and grease. Magnetize crankshaft and apply fluorescent powder (flux). A color penetration method (insertion in bath or with spray can) can also be applied.

Aids: paint or fluorescent powder,
cleaning agent,
developer.

Hardness test

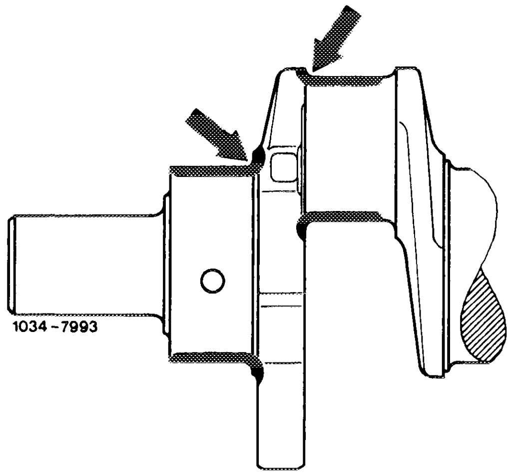
Test hardness with impact hardness tester (scleroscope hardness).

Scleroscope hardness of 60 should be available at 2/3 of journal circumference.

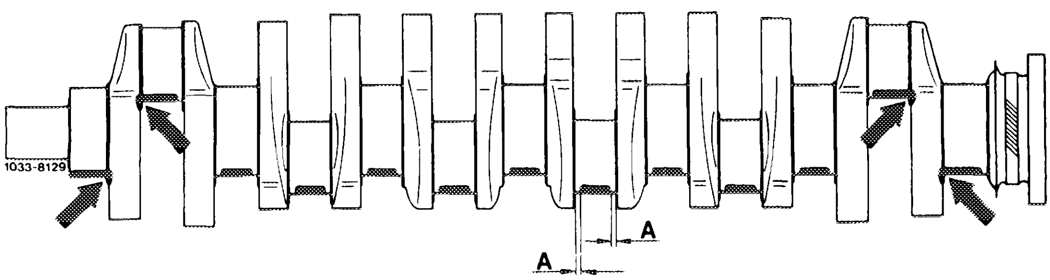


Hardening

Journals without hardened fillets can be hardened inductively or by flame hardening. Journals with hardened fillets (arrows) should be inductance-hardened on principle. If this is not possible, scrap crankshaft.



When hardening journals without hardened fillets, maintain distance A between runout of hardened surface and fillet (4—5 mm).



Checking hardening procedure

For a good hardening job, test adjustment of hardening plant by metallographic grinding tests.

These tests can be made by testing scrapped crankshafts.

Check hardening by etching surface of journal with a 2% alcoholic nitric acid (HNO_3).

No dark spots should show up at surface of journal.

Non-hardened fillets will become dark.

The hardened fillets, on the other hand, should be as bright as surface of journal.

For comparison, perform an etching job on a metallographically controlled journal.

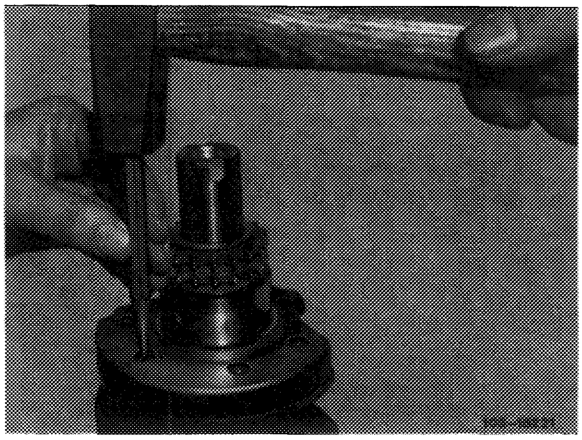
Then, carefully wash off nitric acid by means of alcohol.

Corrosion protection

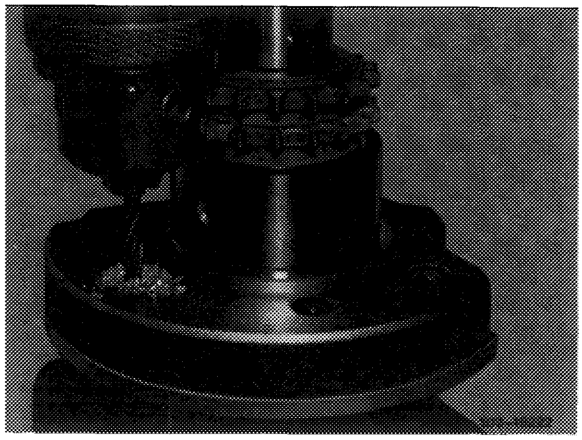
Crankshafts which are not immediately installed again should be lubricated with engine initial operation oil (SAE 30).

Riveting additional weight off and on

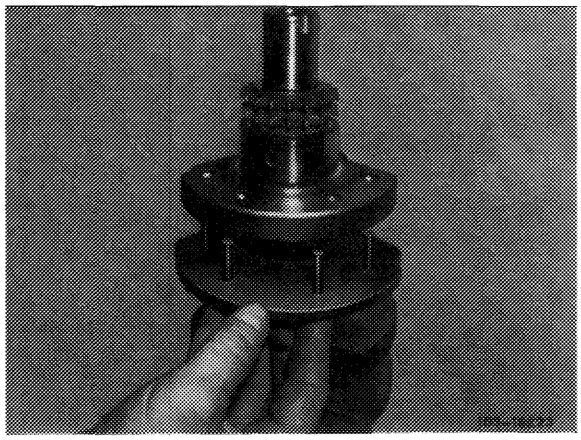
1 Punch mark countersunk rivet 6 x 28 mm accurately in center.



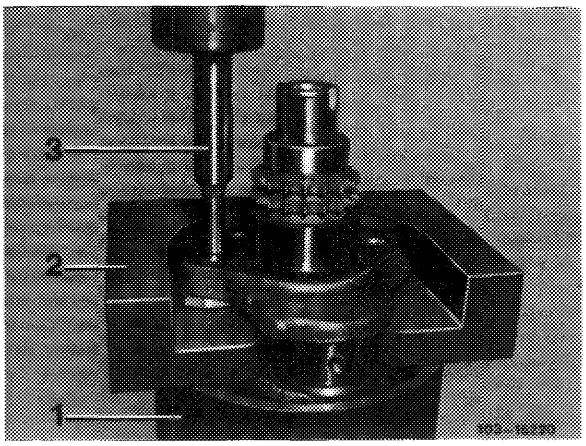
2 Drill into rivet heads with a 6.5 mm dia. drill and knock out.



3 Slip-on new or former, undamaged additional weight together with 4 countersunk rivets.



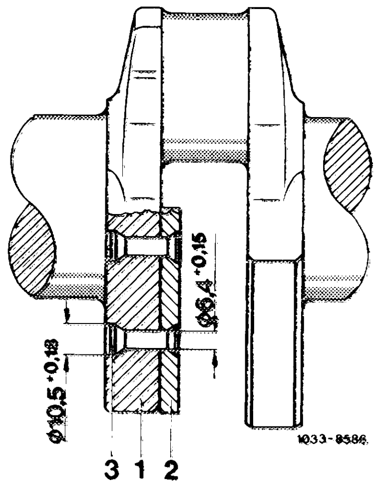
4 Introduce crankshaft into a suitable steel tube (approx. 165 mm dia. x 420 mm long) and place self-made rivet support (2) underneath.



1 Steel tube 165 mm dia. x 420 mm long
2 Self-made rivet support
3 Snap die

5 Rivet countersunk rivet by means of a hydraulic press. The additional weight should then rest fully against crankshaft cheek without leaving any intermediate space.

6 Then check crankshaft for runout of bearing journals and balance together with balancing disc and flywheel, even if the former additional weight is used again.



1 Crankshaft
2 Additional weight 110 031 05 01
3 Countersunk rivet 6 x 28 mm DIN 661 MUSt 34

Series production of riveted-on additional weight starting December 1978

starting engine end no.		starting chassis end no.
110.992	–10–038 031 –12–062 390	116.020–112 253
110.923	–10–012 665 –12–015 613	123.030–025 675 123.050–002 801
110.932	–10–009 748 –12–002 556	116.020–112 253
110.984	–10–014 634 –12–051 160	123.033–050 600 123.053–013 292
110.984	–10–014 634 –12–051 160	123.093–001 229
110.985	–10–011 106 –12–052 660	116.024/025–131 270
110.986	–10–002 276 –12–005 142	107.022–006 288 107.042–005 285

Data

Crankshaft standard dimension and repair stages	Crankshaft bearing journal dia	Width of journal on fitted bearing	Crankpin dia	Width of crankpin
Standard dimension	59.965 59.955	29.021 29.000	47.965 47.955	28.084 28.000
1st repair stage	59.715 59.705	up to 29.60	47.715 47.705	up to 28.30
2nd repair stage	59.465 59.455		47.465 47.455	
3rd repair stage	59.215 59.205		47.215 47.205	
4th repair stage	58.965 58.955		46.965 46.955	

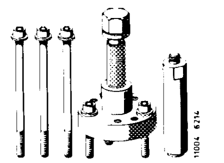
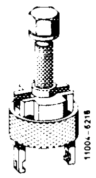
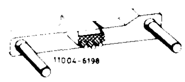
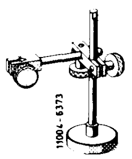
Basic bore and bearing play		Crankshaft bearing	Connecting rod bearing
Basic bore dia		67.00 67.02	51.60 51.62
Perm. out-of-round and conicity of basic bore		0.01	
Radial bearing play	when new	0.031 to 0.053[1]	0.025 to 0.065[1]
	wear limit	0.08	
Axial bearing play	when new	0.10–0.24	0.11–0.23
	wear limit	0.30	0.50

[1] Try for mean value of radial play (vertical runout).

Bearing shells	Wall thickness crankshaft bearing	Width of fitted bearing shells	Wall thickness connecting rod bearing
Standard dimension	3.500–3.513	28.78–28.90	1.804–1.814
1st repair stage	3.625–3.638	29.4–29.6[3]	1.929–1.939
2nd repair stage	3.750–3.763		2.054–2.064
3rd repair stage	3.875–3.888		2.179–2.189
4th repair stage	4.000–4.013		2.304–2.314

1) Measured at apex of bearing shell.
2) The fitted bearing shells for 1st to 4th repair stage are supplied in oversize width and should be refinished in accordance with ground crankshaft bearing journal.

Tightening torques		Nm
Crankshaft bearing bolts		80
Connecting rod nuts	initial torque	40–50
	angle of rotation torque	90–100°
Balancing disc to crankshaft		400–450
Necked down screws for flywheel or driven plate	initial torque	30–40
	angle of rotation torque	90–100°

Special tools		
Puller for balancing disc		116 589 10 33 00
Puller for crankshaft gear		615 589 01 33 00
Detent		110 589 00 40 00
Countersupport for internal puller		000 589 33 33 00
Internal puller 14.5–18.5 mm for radial ball bearing		000 589 25 33 00
Dial gauge holder for measuring end play		116 589 12 21 00

Note

Engine removed and disassembled.

Main oil duct in crankcase open (if with steel balls, refer to 01–130). Oil ducts in crankcase and in crankshaft carefully cleaned.

Test crankshaft for cracks, accuracy and hardness (03–318).

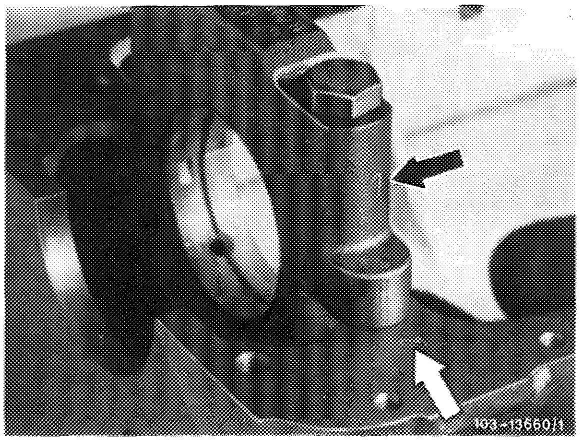
When grinding crankpins a difference of one repair stage only permitted per crankshaft.

Associating cranskhaft bearings, installing crankshaft

1 Install crankshaft bearing cap. Pay attention to identification, 1 is at front (arrows).

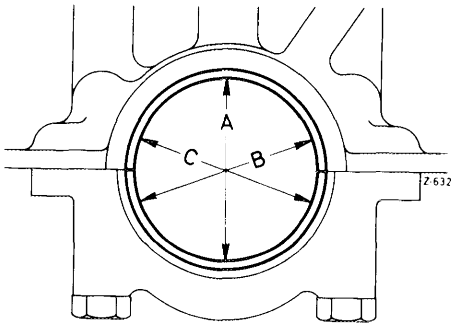
Do not mix up crankshaft bearing caps.

2 Tighten bolts to 80 Nm.



3 Measure basic bore in direction A, B and C in two levels (conicity).

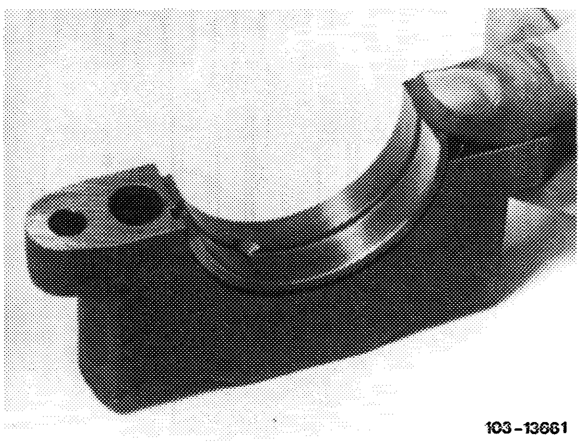
If a basic bore exceeds the specified value or is conical, touch up bearing cap at its contact surface on a surface plate up to max. 0.02 mm.



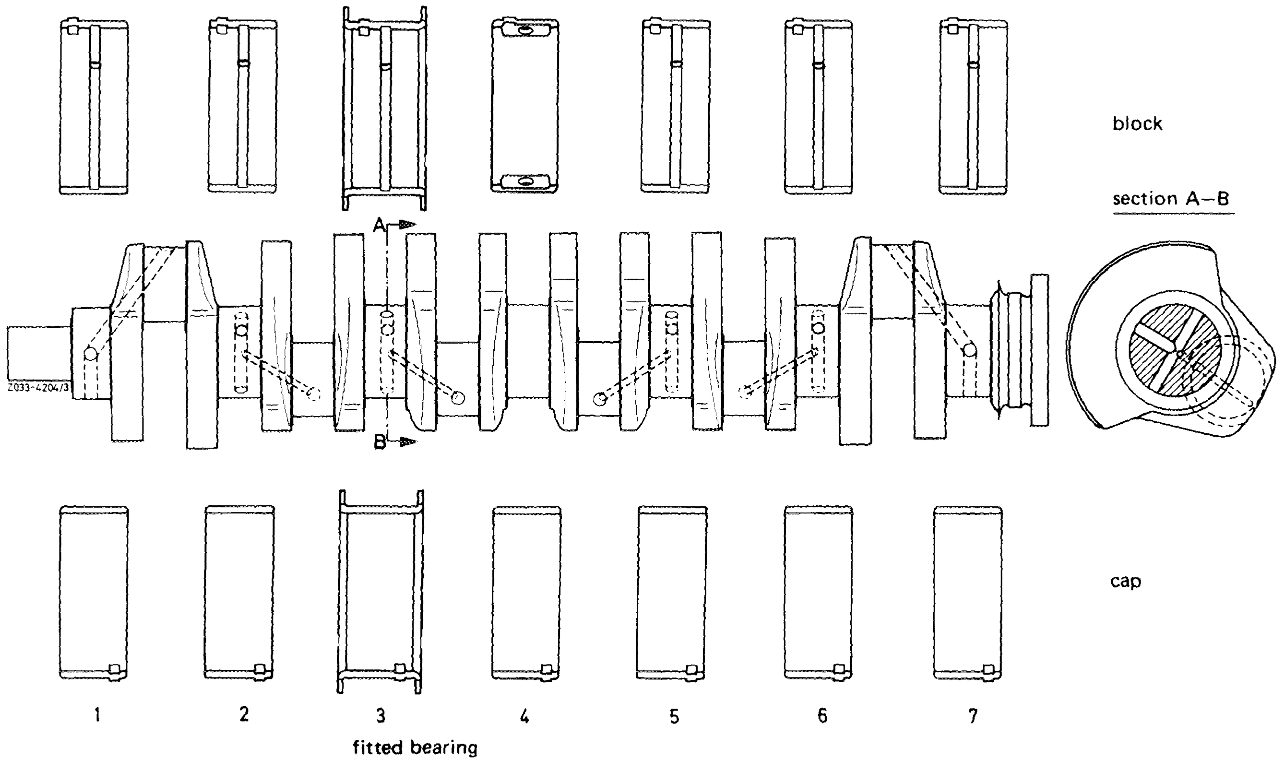
4 Insert crankshaft bearing shells and mount bearing cap. Tighten bolts to 80 Nm torque.

Attention!
When associating crankshaft bearing shells, observe the two different crankshafts.

On crankshafts with tapered bore (2nd version) install crankshaft bearing shells with 360° oil groove.

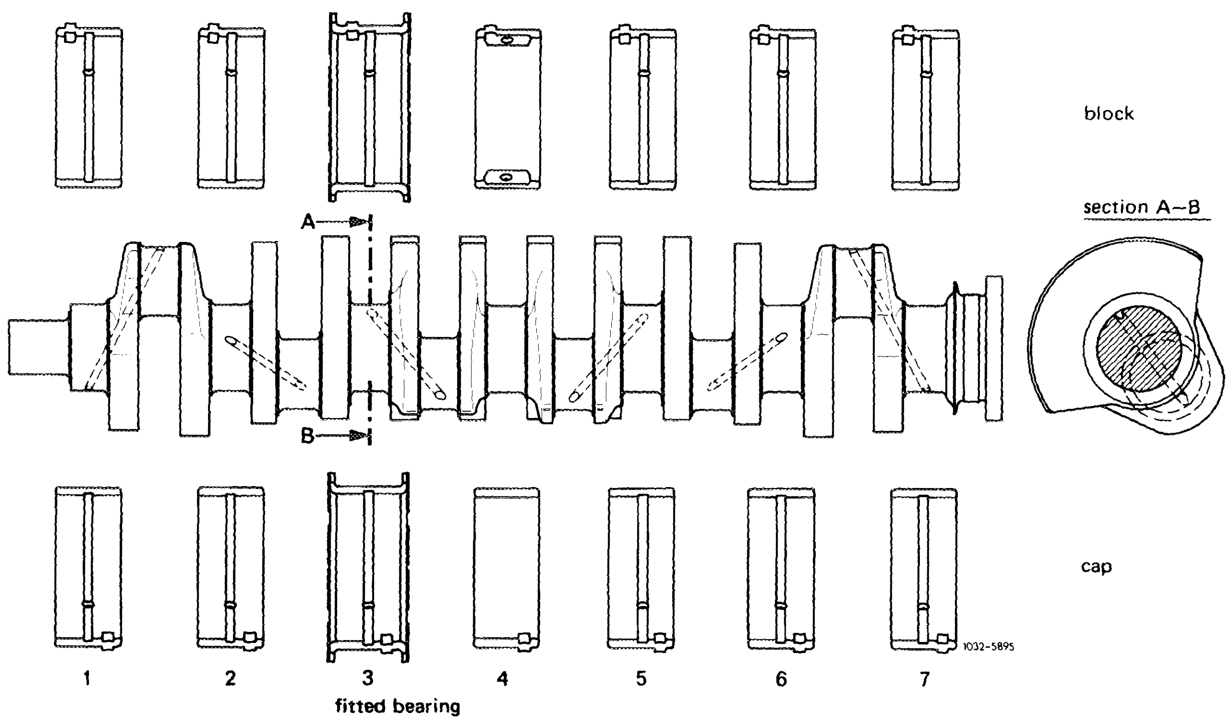


103–13661



1st version

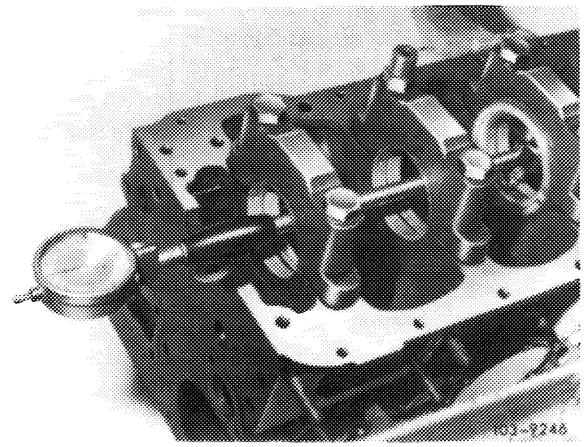
Crankshaft with T-bore, bearing shells with 180° oil groove.



2nd version

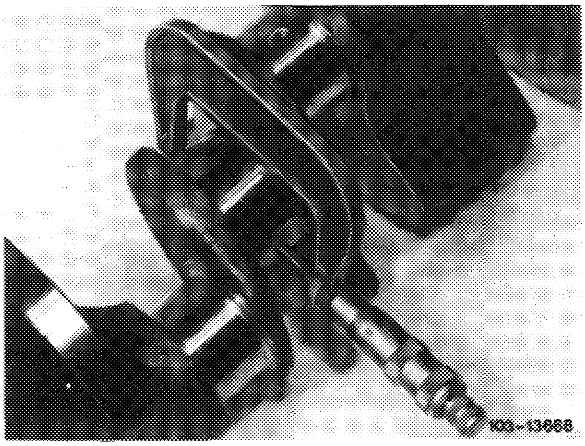
Crankshaft with inclined bore, bearing shells with 360° oil groove.

5 Measure bearing dia and write down.



6 Measure crankshaft bearing journal, find radial crankshaft bearing play (vertical runout).

Note: The bearing play can be corrected by exchanging bearing shells, while trying for lower value (0.031 mm) of specified bearing play. Crankshaft bearing shells without color code are thicker than those with a blue color code, but the fact must be taken into consideration that a wall thickness without and one with color code may overlap.

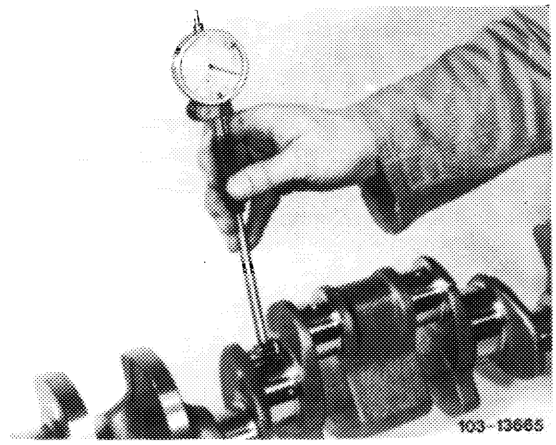


7 Measure width of fitted bearing journal and fitted bearing.

Measure crankshaft bearing end play.

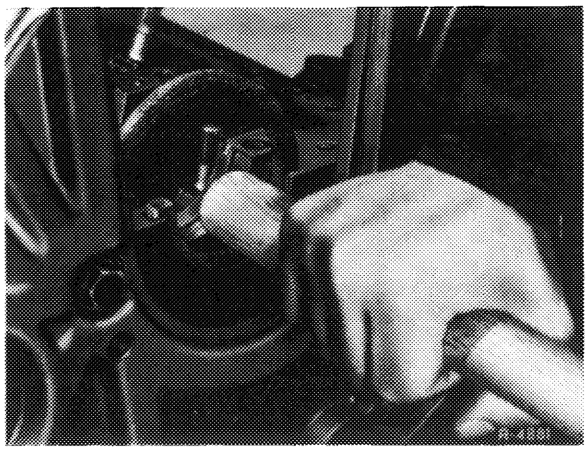
Note: The fitted bearing shells of the repair stages are supplied at oversize.

Both fitted bearing shells must be machined on both sides down to width of fitted bearing journal minus end play. Try for lower value of 0.10 mm.



8 Replace rear crankshaft radial sealing ring (03–327).

9 Provide bearing shells, crankshaft and radial sealing ring with engine oil and install crankshaft.

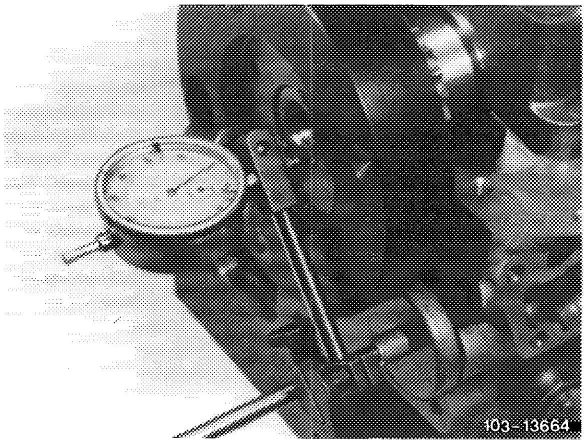


10 Provide screws on threads and on screw head contact surface with oil and tighten to 80 Nm.

Note: Since January 1976 there are no more washers on crankshaft bearing bolts.

11 Measure end play of crankshaft bearings.

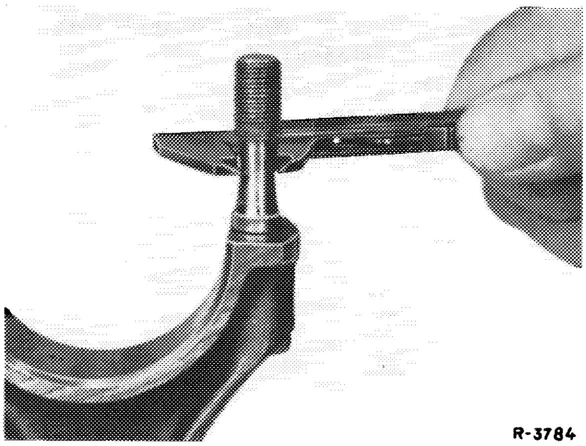
12 Rotate crankshaft manually and check whether shaft is freely running.



Associating connecting rod bearings and installing connecting rods

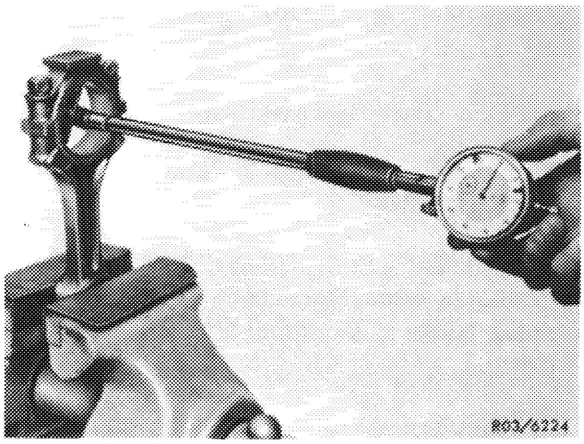
13 Check connecting rod bolts (03–310).

14 Recondition connecting rods and square (03–313).


R-3784

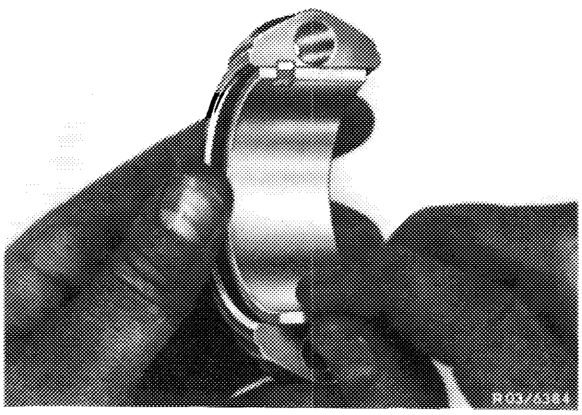
15 Mount connecting rod bearing caps while paying attention to identification. Tighten connecting rod nuts to 40–50 Nm.

16 Measure basic bore in two directions. If a basic bore exceeds the specified value or is tapered, touch up bearing cap at its contact surface on a surface plate up to max 0.02 mm.



17 Insert connecting rod bearing shells, mount connecting rod bearing caps with bearing shells and tighten connecting rod nuts to 40–50 Nm.

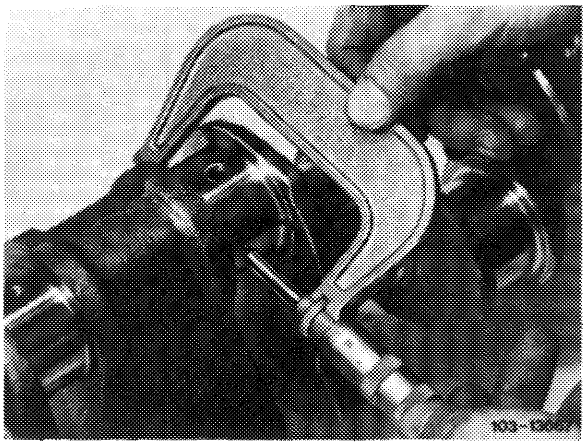
Attention!
Connecting rod bearing shell in connecting rod has an oil bore for lubricating piston pin.



18 Measure bearing dia and write down.

19 Measure crankpins, determine radial play (vertical runout) of connecting rod bearings.

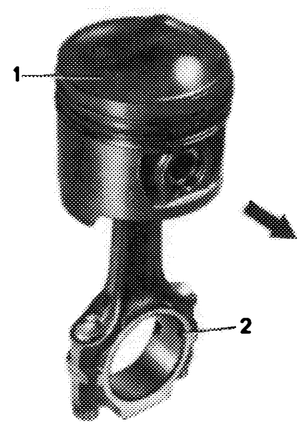
Note: The bearing play can be corrected by exchanging bearing shells, while trying for mean value (0.04 mm) of specified bearing play. Crankshaft bearing shells without color code are thicker than those with a blue color code, but the fact must be taken into consideration that a wall thickness without and one with color code may overlap.



20 Mount piston on connecting rod (03–316).

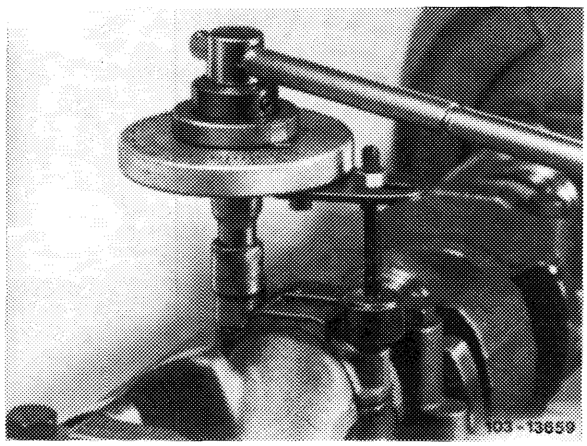
21 Provide bearing shells, crankshaft, piston and cylinder with engine oil. Install connecting rod with piston (03–316).

Pay attention to **identification.**



103-8914/1

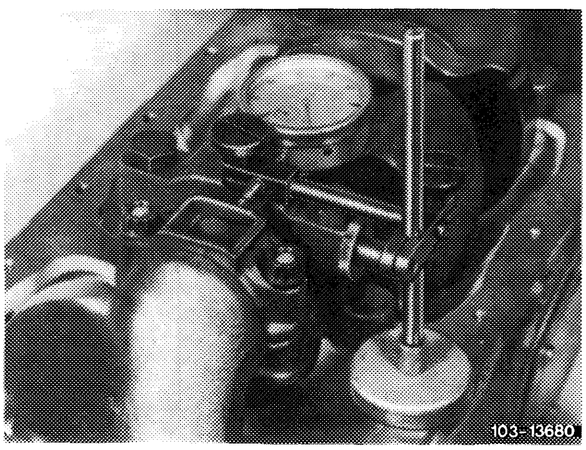
22 Tighten connecting rod nuts to 40–50 Nm **initial torque** and 90–100° **angle of rotation.**



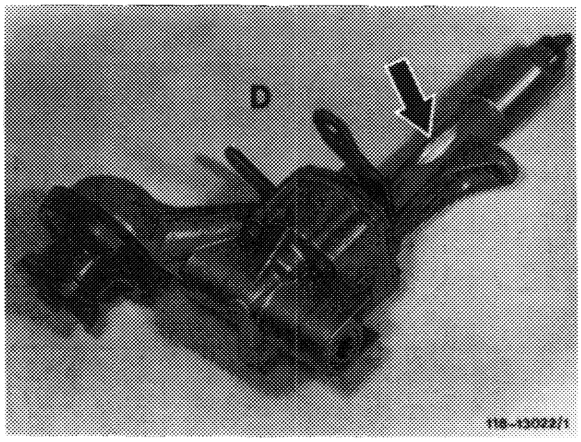
23 Measure end play of connecting rod bearing. Check connecting rod in piston for unobstructed operation.

Attention!
Disassemble and clean oil pump, renew if required. Renew oil pressure relief valve. Disassemble oil filter top and clean. Carefully clean air-oil cooler.

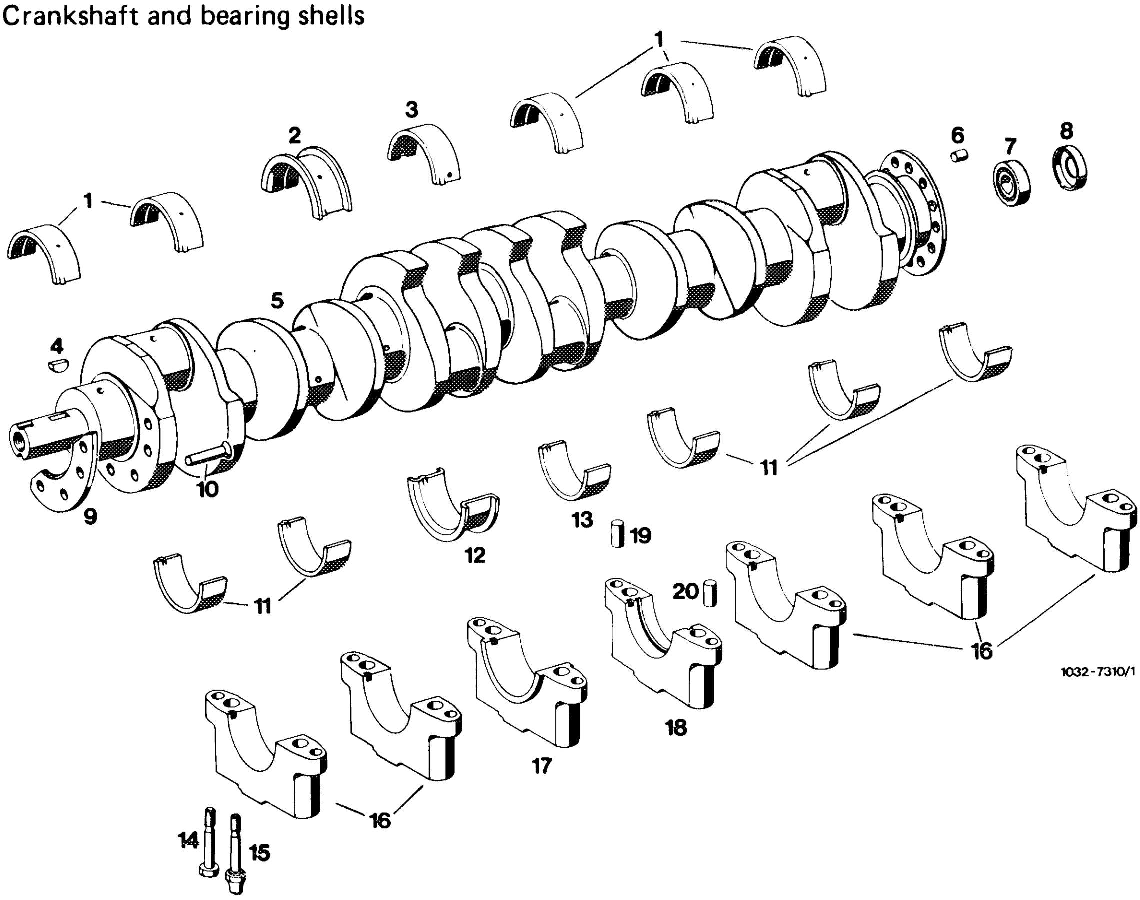
Install initial operation oil filter element. Change engine oil and oil filter element after **1000–1500** km.



Crankshafts with riveted-on additional weight may not be used together with oil pumps, which are provided with a recess (arrow) on housing shaft.



Crankshaft and bearing shells



1 Crankshaft bearing shells with oil groove and oil bore for bearing 1, 2, 5, 6 and 7
2 Fitted bearing shell with oil groove and oil bore for bearing 3
3 Crankshaft bearing shell with 2 oil pockets and 2 oil bores for bearing 4
4 Woodruff key
5 Crankshaft
6 Cyl. pin 10h 8 x 18
7 Radial ball bearing
8 Closing ring
9 Additional weight
10 4 Countersunk rivets 6 x 28 mm DIN 661 MUSt 34
11 1st version crankshaft bearing shells without oil groove and oil bore for bearing cap 1, 2, 5, 6 and 7 and crankshaft with T-bore

2nd version crankshaft bearing shells with oil groove and oil bore for bearing cap 1, 2, 5, 6 and 7 and crankshaft with 360° tapered bore

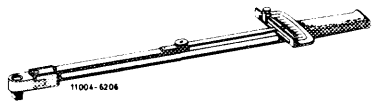
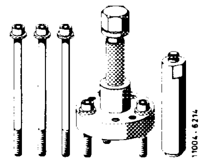
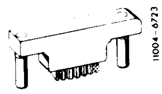
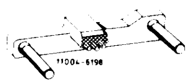
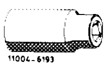
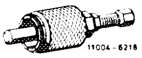
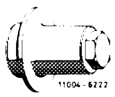
12 1st version fitted bearing shell without oil groove and oil bore for crankshaft with T-bore

2nd version fitted bearing shell with oil groove and oil bore for crankshaft with 360° tapered bore

13 Crankshaft bearing shell without oil groove and oil bore for bearing cap 4
14 12 screws for crankshaft bearing cap
15 2 screws for crankshaft bearing cap (for fastening oil pump)
16 Crankshaft bearing cap 1, 2, 5, 6 and 7
17 Crankshaft bearing cap 4 (fitted bearing)
18 Crankshaft bearing cap 4 (with oil groove)
19 7 cyl. pins 10 m 6 x 16
20 7 cyl. pins 8 m 6 x 16

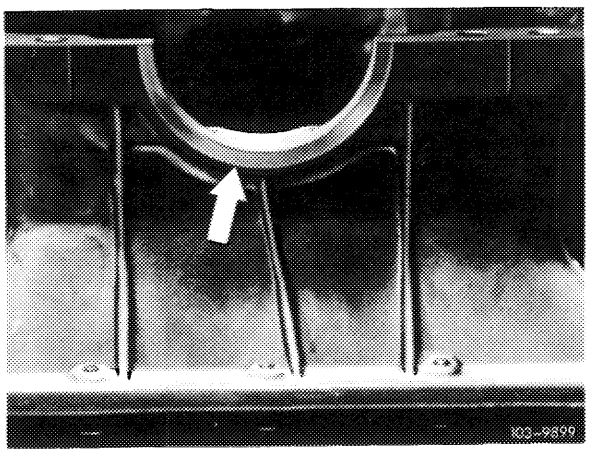
Tightening torques	Nm
Bolt M 18x1.5x45 on crankshaft	400
Bolt M 8 x 65	35

Special tools

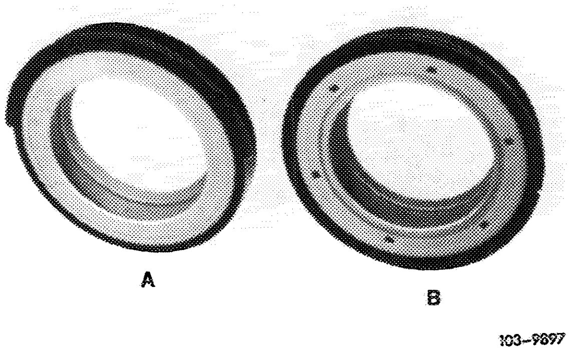
Torque wrench 150–500 Nm (15–50 kpm) 3/4" square		001 589 31 21 00
Puller for balance disc		116 589 10 33 00
Holder		116 589 01 40 00 or
Holder		110 589 00 40 00
27 mm socket 1/2" square		001 589 65 09 00
Puller for spacer		616 589 00 33 00
Radial oil seal installer		110 589 07 61 00

Note

Install radial sealing rings, part no. 004 997 66 47 (twc component ring) or 003 997 03 47 (solid viton ring), with all-around shoulder only in engines with oil pan milled flat (arrow).
Radial sealing rings, part no. 008 997 04 47 (two-component ring) or 008 997 05 47 (solid viton ring) with half-round shoulder are provided for oil pans not milled flat.
Prior to installation, provide all radial sealing rings with longterm grease between sealing lip and dust lip.



Install radial oil seals with a half shoulder in engines without a surface milled oil pan.

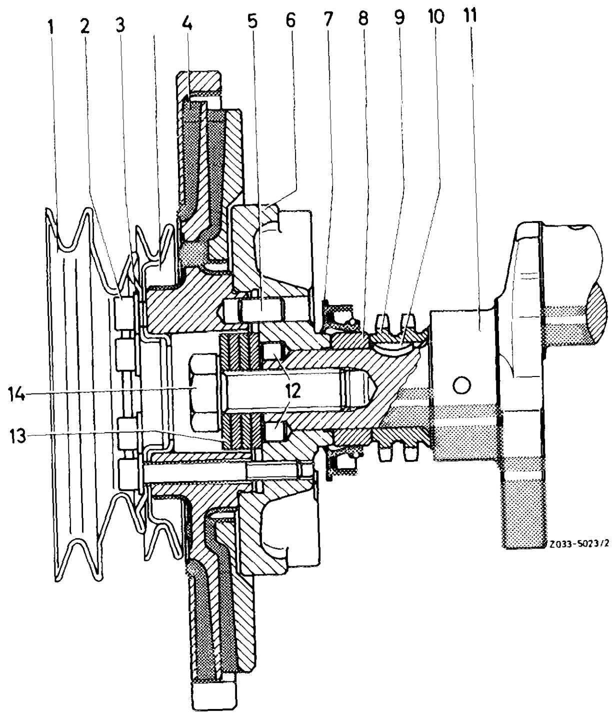


A Radial oil seal with half shoulder
B Radial oil seal with full shoulder

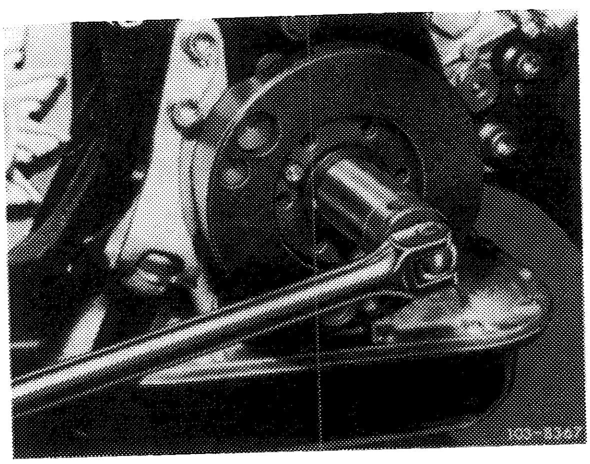
Removal

1 Remove radiator and fan.

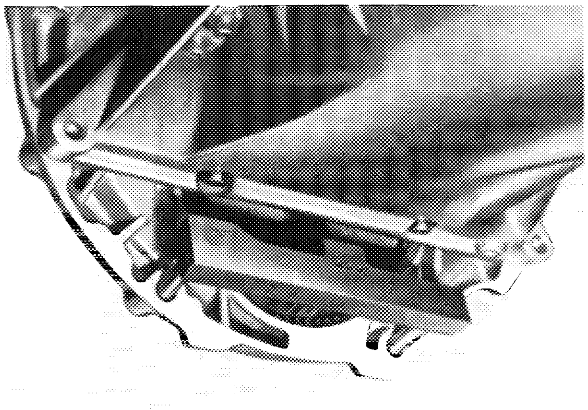
2 Remove pulley (1) and vibration damper (4) (03–340).



3 Loosen bolt on crankshaft.

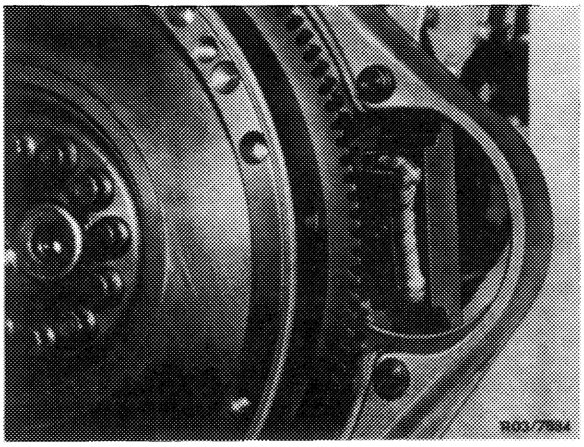


4 Counterhold crankshaft with holder.



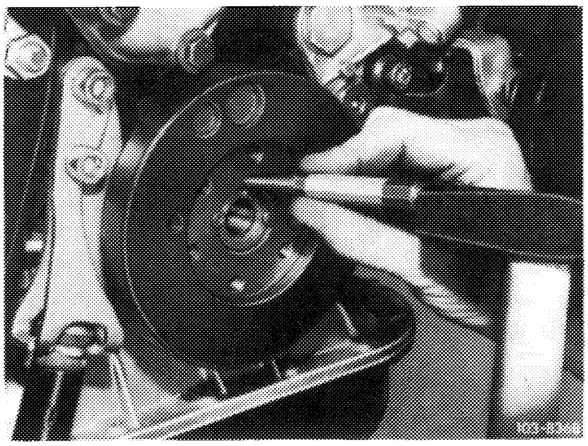
103-9243

Holder 100 589 00 40 00

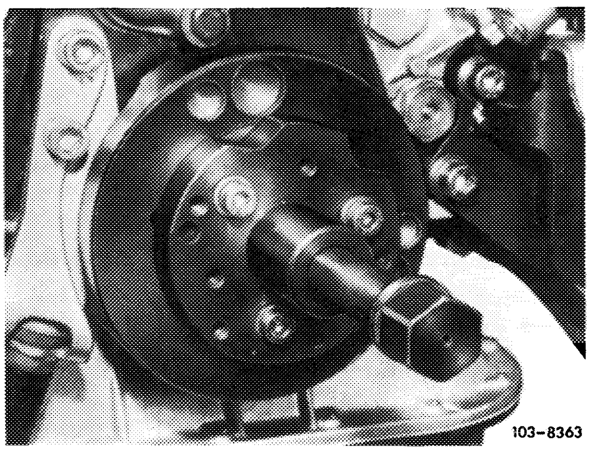


Holder 116 589 01 40 00
when starter is removed

5 Mark balance disc and crankshaft together with a punch mark.



6 Pull off balance disc with an extractor.

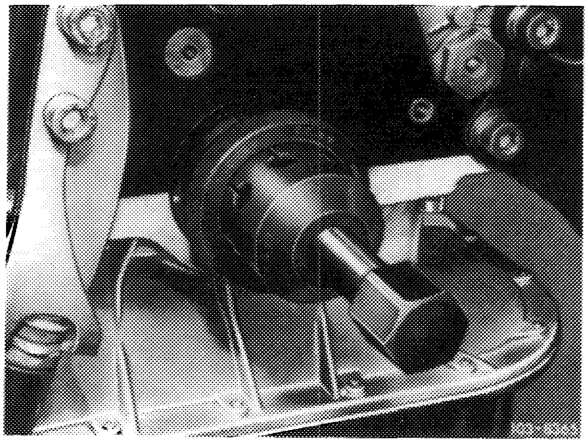


103-8363

7 Press out radial oil seal with a screwdriver.

Attention!
Be careful not to damage crankshaft journals and radial oil seal bore.

8 If wear can be felt, pull off spacer with an extractor.



Installation

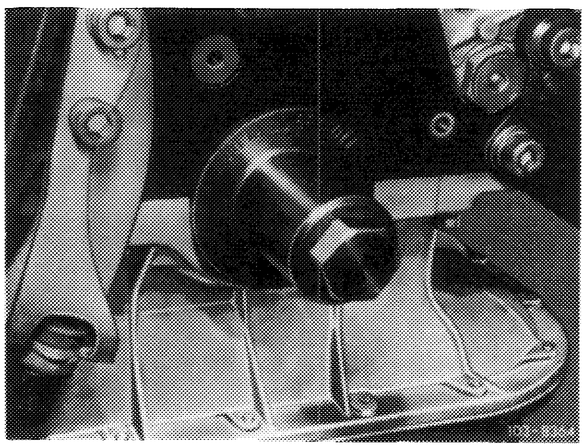
9 Deburr and clean radial oil seal bore.

Note: If the removed radial sealing ring has been leaking at outer shoulder, coat new radial sealing ring prior to insertion on outer shoulder in range of joints with sealing compound, part no. 001 989 29 20 or part no. 001 989 46 20. Permit sealing compound to harden for approx. 3 hours and do not remove inserting tool until then.

10 Fill new radial sealing ring behind sealing lip with longterm grease.

11 Insert radial sealing ring with inserting tool. For radial sealing rings inserted with sealing compound, remove inserting tool only after 10–15 minutes.

Attention!
The radial oil seal must be at an exact right angle to the crankshaft journal, since otherwise a perfect seal cannot be reached.



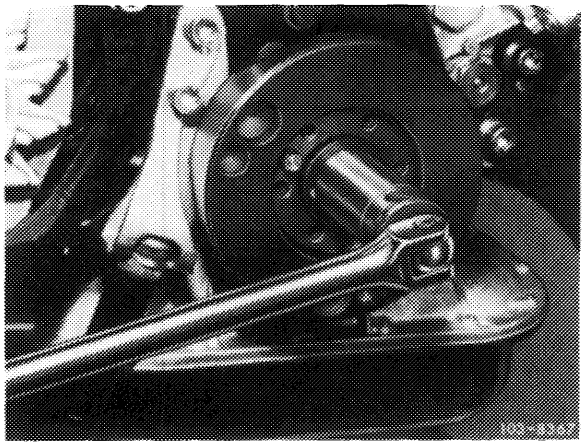
12 Install new spacing ring or turn spacing ring used up to now around and mount in such a manner that the worn groove comes to rest toward the rear.

13 Place balance disc on crankshaft, that the dowel pin bores align.

Note: The balance disc is located on the crankshaft by two **offset** dowel pins.

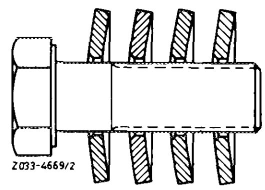
14 Pull balance disc on to crankshaft with M 18x1.5x45 bolt and one belleville spring washer.

Knock in both dowel pins.



15 Install four belleville spring washers with concave surface facing bolt head.

16 Tighten bolt on crankshaft to torque of 400 Nm (40 kpm), while counterholding the crankshaft with a holder.



17 Install vibration damper, pulley, fan and radiator (03–340).

Tightening torques		Nm
Necked down screw for camshaft gear		80
Connecting rod nuts	initial torque	40–50
	angle of rotation torque	90–100°
Necked down screws for flywheel or driven plate	initial torque	30–40
	angle of rotation torque	90–100°
Crankshaft bearing bolts		80

Self-made tool	
Gage	see fig., point 4

Note

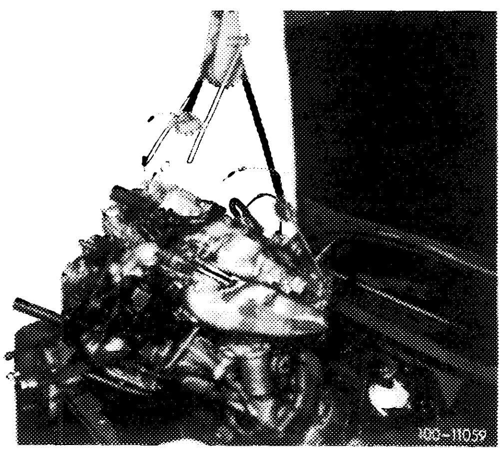
When repairing engines 110, use radial sealing ring 000 997 90 41 (yellow-brown) and cut off with 0.5 mm projection.

Exception: On engines which are provided with a new or a newly machined (refinished) crankshaft and new crankshaft bearings during repairs, install radial sealing ring 000 997 69 41 (graphite-grey) and cut off with 1 mm projection.

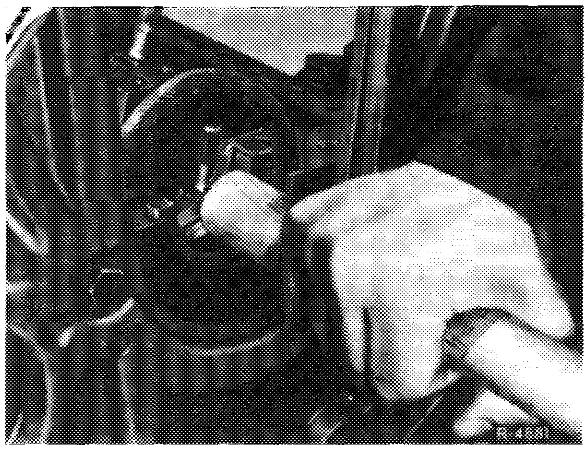
Replacing

1 Remove engine (01–030).

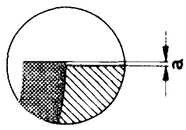
2 Remove crankshaft.



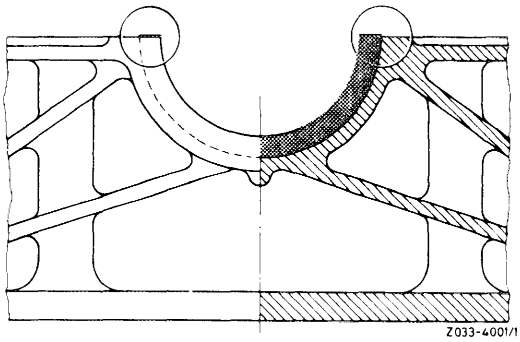
3 Place radial oil seal in crankcase and oil pan, and rub in with an oiled hammer handle.



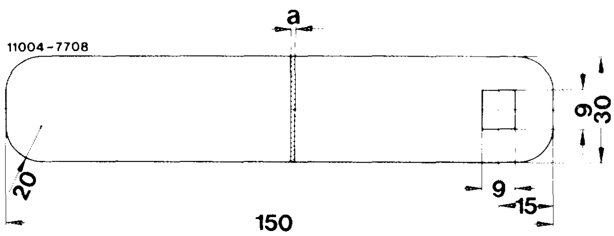
4 To provide an overlap, cut off radial oil seal in crankcase and oil pan about 0.5 mm or 1.0 mm above mating surface.



Note: For cutting off, a self-made gauge according to drawing can be used.



Radial sealing ring, part no.	Dimension a (mm)
000 997 69 41 (graphite-grey)	1.0
000 997 90 41 (yellow-brown)	0.5



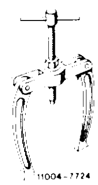
5 Coat radial oil seal with oil before installation of crankshaft.

6 Install crankshaft.

7 Install oil pan, turn crankshaft and check for easy movement.

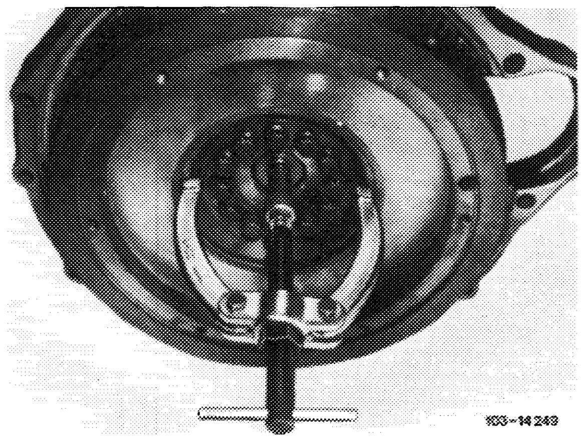
03–330 Removal and installation of radial ball bearing and closing ring in crankshaft

Special tools

Countersupport for internal puller		000 589 33 33 00
Internal puller 14.5–18.5 mm		000 589 25 33 00

Removal

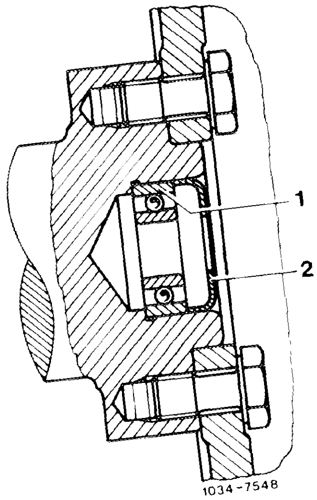
1 Pull ball bearing and closing ring out of crankshaft together with countersupport and internal puller.



Installation

2 Provide new ball bearing (1) with anti-friction bearing grease and knock into crankshaft with a suitable mandrel.

3 Knock-in closing ring (2).

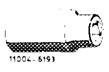
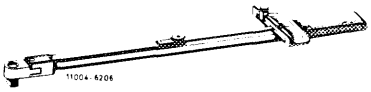
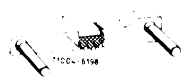
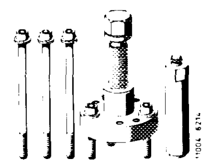


1034-7548

03–340 Removal and installation of pulley, vibration damper and balancing disc

Tightening torques	Nm
Screw M 18 x 1.5 x 45 on crankshaft	400–450
Screw M 8 x 65	35

Special tools

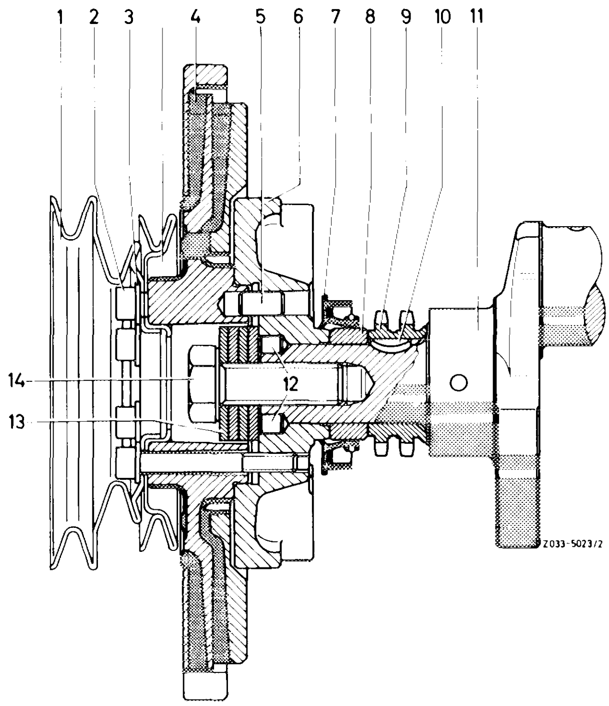
Socket 27 mm 1/2" square		001 589 65 09 00
Torque wrench 150–500 Nm (15–50 kpm), 3/4" square		001 589 31 21 00
Detent		110 589 00 40 00 or
Detent		116 589 01 40 00
Puller for balancing disc		116 589 10 33 00

Note

The **vibration damper** can be replaced **without balancing.**

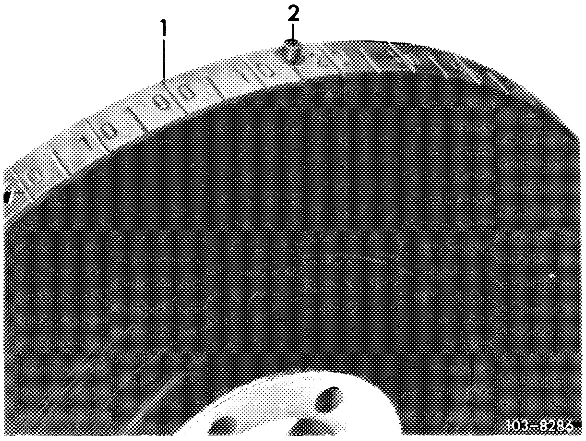
If the **balancing disc** is renewed, static **balancing is required** (03–344).

Since May 1974 a balancing disc with 3 cutouts for removing tensioning rail bearing bolt is installed.



1 Pulley
2 Screw M 8 x 65
3 Disc
4 Vibration damper 254 mm dia
5 Cyl. pin 10h 8 x 18
6 Balancing disc
7 Radial sealing ring
8 Spacing ring
9 Crankshaft gear
10 Woodruff key
11 Crankshaft
12 Set pin 8 x8
13 Cup spring
14 Screw M 18 x 1.5 x 4!

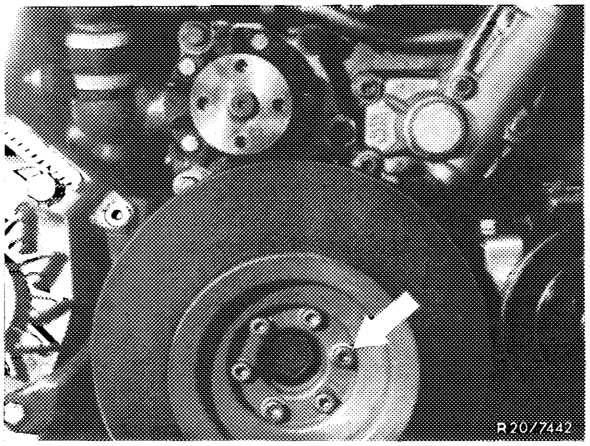
Attention!
For engines which have a "0/0" mark for BDC on the vibration damper besides TDC, the **TDC mark** in the vibration damper is **next to the pin.**



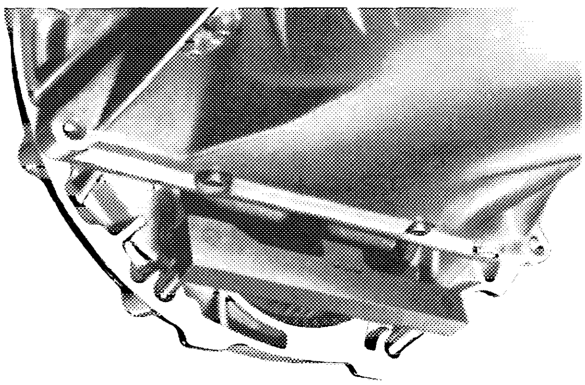
Removal

1 Remove radiator and fan.

2 Remove pulley and vibration damper.



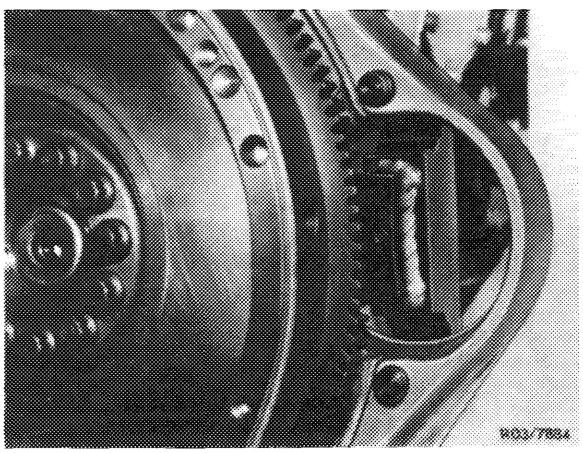
3 Counterhold crankshaft with holder.



103-9243

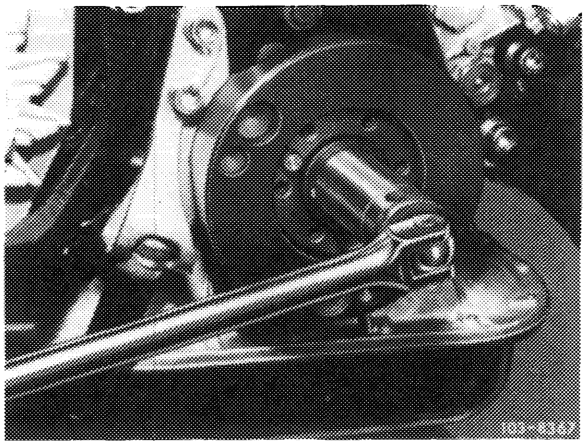
Holder 110 589 00 40 00

Also remove starter of engines with a manual transmission.

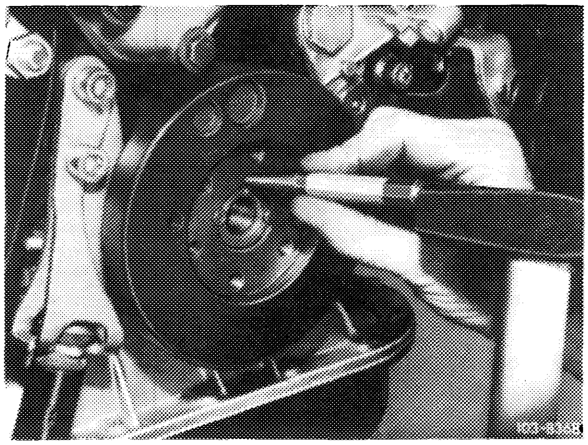


Holder 116 589 01 40 00

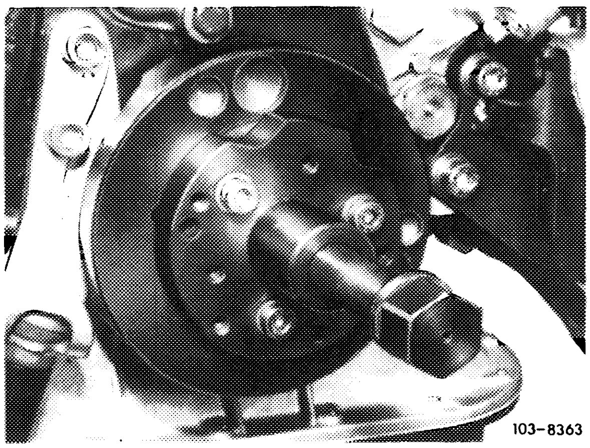
4 Remove bolt in crankshaft.



5 Mark balance disc and crankshaft together with a punch mark.



6 Pull off balance disc with an extractor.



103–8363

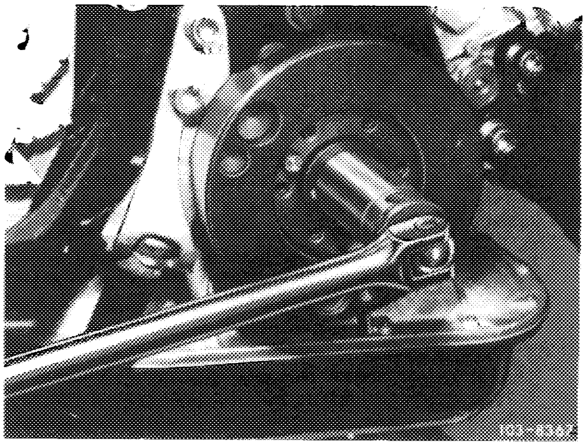
Installation

7 Install balance disc on crankshaft that bores for dowel pins align.

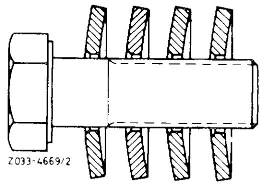
Note: The balance disc is located on the crankshaft by two **offset** dowel pins.

8 Pull balancing disc on crankshaft with screw M 18 x 1.5 x 45 and a cup spring.

9 Knock-in both set pins.



10 Mount four cup springs with convex face facing screw head.



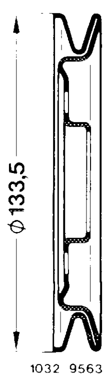
11 Tighten screw on crankshaft to 400 Nm while applying counterhold to crankshaft by means of detent.

Note: Damaged threads M 18 x 1.5 in crankshaft journal at the front can be repaired by inserting a helicoil insert 0130 0184027.

12 Install vibration damper, pulley, viscofan and radiator.

Note: Take association of pulley on crankshaft for various engines 110 from the following list.

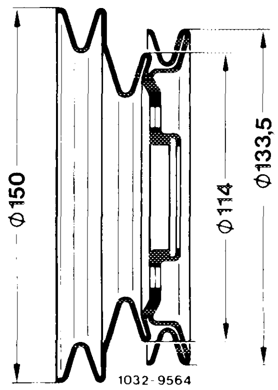
Pulley	Engine
110 155 00 15	110.921
	110.931
	110.981
	110.991



110 155 00 15

Pulley	Engine
110 466 01 15	110.921*
	110.931*
	110.922 version 1
	110.032 version 1
	110.981*
	110.991*
	110.982
	110.992
	110.983
	110.993

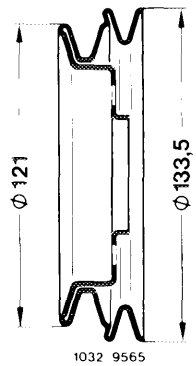
* with special version power steering or air conditioning



110 466 01 15

Pulley	Engine
123 032 00 04	110.922 version 2
	110.932 version 2
	110.923 version 1*
	110.924 version 1*
	110.984 version 1*
	110.985
	110.986
	110.987 version1*
	110.994

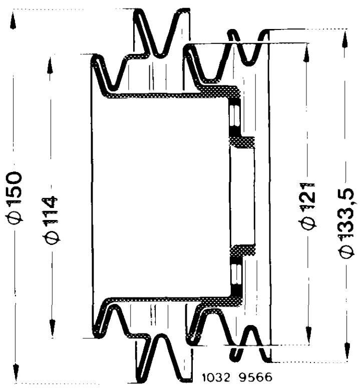
* with 55 Ah alternator



123 032 00 04

Pulley	Engine
123 032 01 04	110.922*
	110.932*
	110.923*
	110.924*
	110.984*
	110.985*
	110.986*
	110.987*
	110.994*

* with special version air conditioning or emission control



123 032 01 04

Pulley 110 032 08 04[1)]

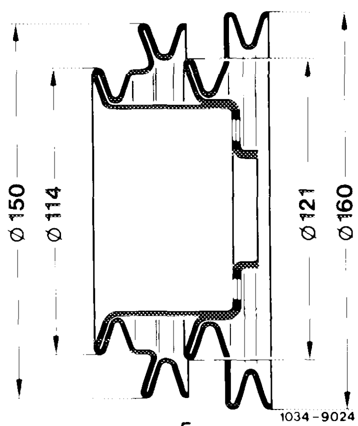
Introduction into series (J) August 1978

starting engine end no.	starting chassis end no.
110.984–12–043 370	123.033–12–043 906
110.985–12–044 308	123.053–12–010 554

Introduction into series (S)[2)] and (USA) March 1980

starting engine end no.	starting chassis end no.
	123.007[2)]
110.984 –10–023 276 –12–076 809	123.033 019 600 123.053
110.985 –12–075 271	116.024–157 385

1) Together with 65 Ah alternator
2) (S) only



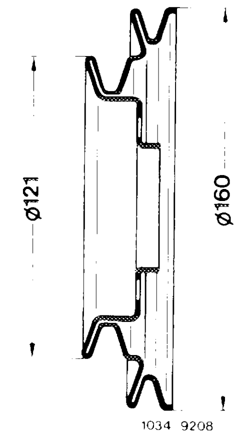
5
110 032 08 04

Pulley 110 032 09 04* (formerly 123 032 00 04)

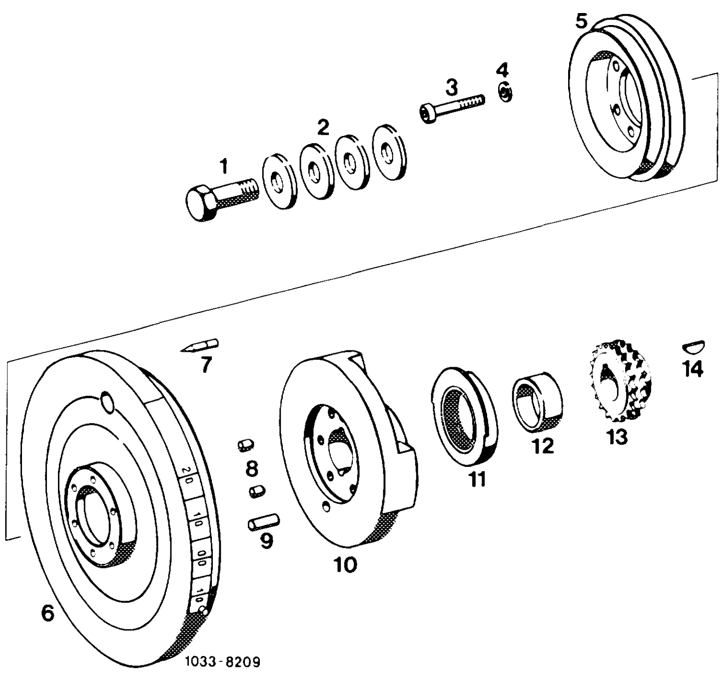
Introduction into series March 1980

starting engine end no.		starting chassis end no.
110.923	–10–014 965	123.030–029 250
	–12–018 195	123.050–003 705
110.924	–10–000 356	126.021–001 320
	–12–001 102	
110.984	–10–023 276	123.033–073 349
	–12–076 809	123.053–019 600
110.985	–12–075 271	126.024/025–157 385
110.987	–10–000 675	126.022/023–004 070
	–12–003 696	

* together with 65 Ah alternator

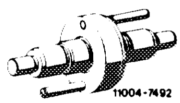


Pulleys, vibration damper and balancing disc



1 Screw M 18 x 1.5 x 45
2 Cup springs
3 6 screws M 8 x 65
4 6 washers 8.4
5 Pulley
6 Vibration damper 254 mm dia
7 Adjustment indicator
8 2 set pins 8 x 8
9 Cyl. pin 10h 8 x 18
10 Balancing disc
11 Radial sealing ring
12 Spacing ring
13 Crankshaft gear
14 Woodruff key

Special tool

Balance disc holder		617 589 02 63 00

Conventional tool

Rolling device	Trebel, D-4030 Ratingen, type EO, order no. 03600/0904/E 0010

Note

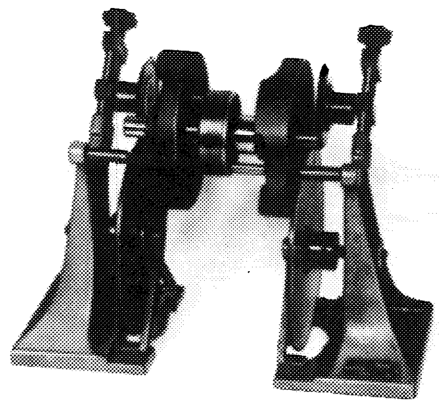
The balance condition of the old balance disc must be transferred to the new balance disc.

All parts of a broken balance disc must be pasted together and be statically balanced with a new balance disc.

Static balancing

1 Place new balance disc on balancing holder with an offset of 180° over old one.

2 Let balancing holder with both balance discs oscillate on rolling device.

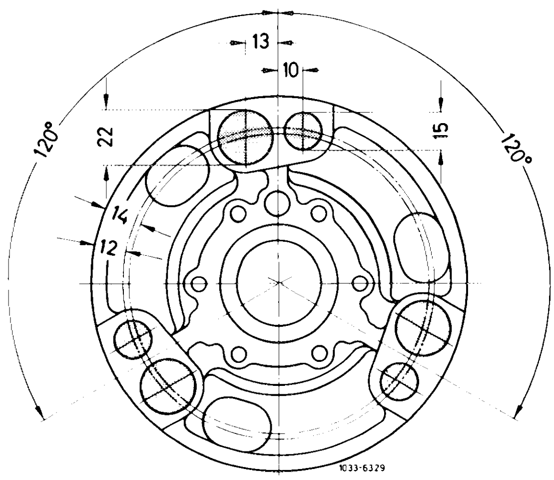


103–10649

3 Drill new balance disc in such a manner, that the balance discs remain still without oscillating in any position on the rolling device.

Pay attention to position of balancing bores (illustration).

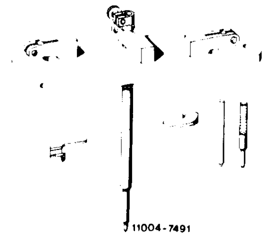
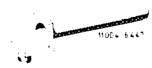
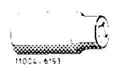
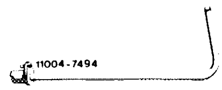
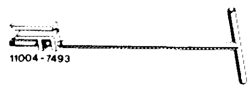
Hole depth max 25 mm.



Balancing disc rear

Tightening torque	Nm
Bolts and capped nuts for cylinder head cover	5

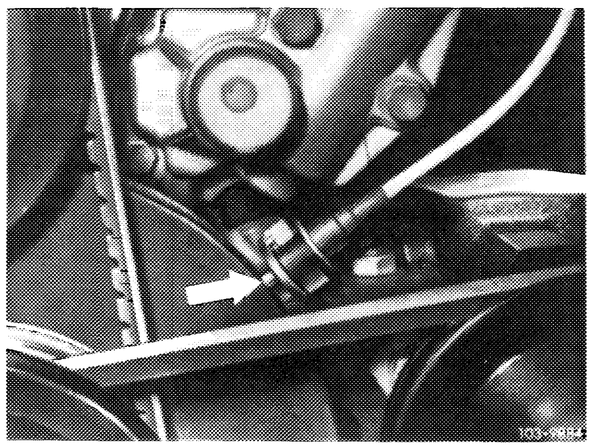
Special tools

TDC tester		110 589 10 21 00
Locating device for adjusting slide (2nd version of adjusting slide)		116 589 19 21 00
27 mm socket to turn engine		001 589 65 09 00
Locating device for TDC transmitter (1st version of adjusting slide)		110 589 08 21 00
Guide for TDC transmitter (1st version of adjusting slide)		110 589 06 61 00

Note

With the crankshaft position at 20° the TDC transmitter must be exactly above the TDC pin in the vibration damper (arrow).

Distance between TDC transmitter and guide pin in vibration damper 0.2–2.0 mm.



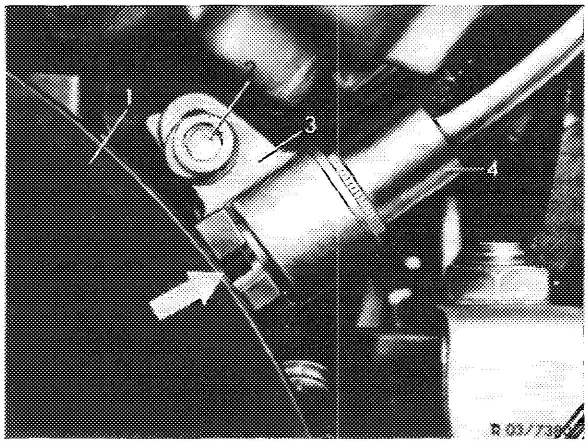
2nd version of adjusting slide

The adjustment of the TDC transmitter must be checked and corrected:

a) when replacing TDC transmitter adjusting slide,

b) when replacing crankshaft with balance disc and vibration damper, and

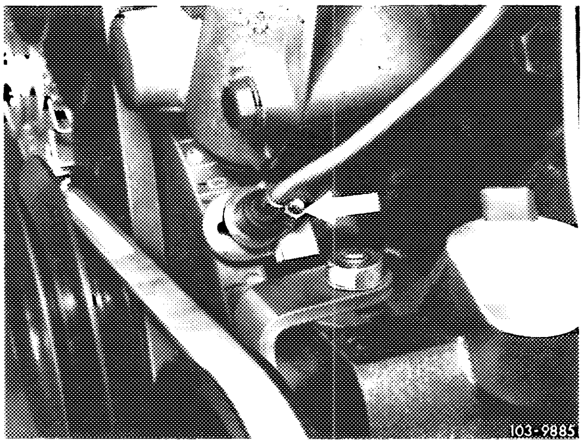
c) when completing a partial engine.



1st version of adjusting slide

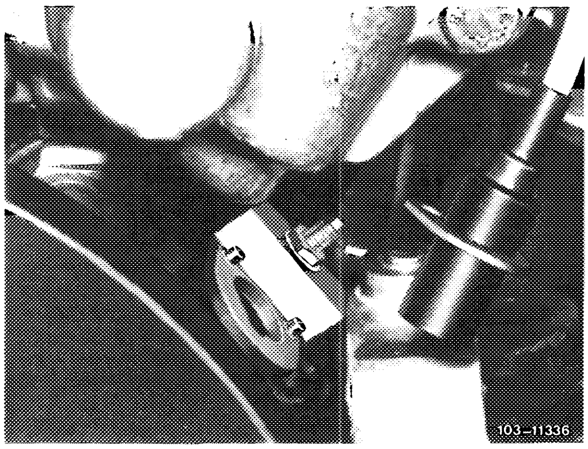
Checking

1 Unscrew TDC transmitter (arrow).



2 Pull out TDC transmitter.

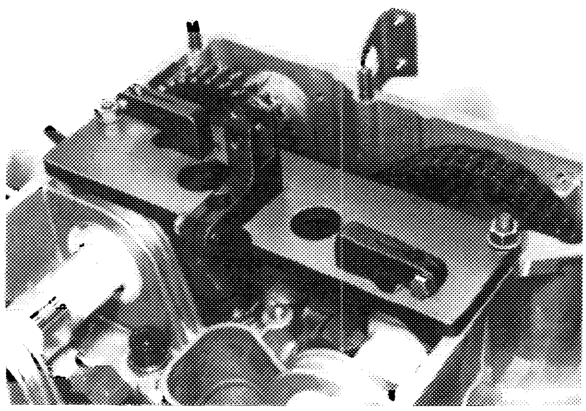
Note: TDC transmitters (1st version), which are fastened with a socket head cap screw, must be loosened and removed with guide 110 589 06 61 00.



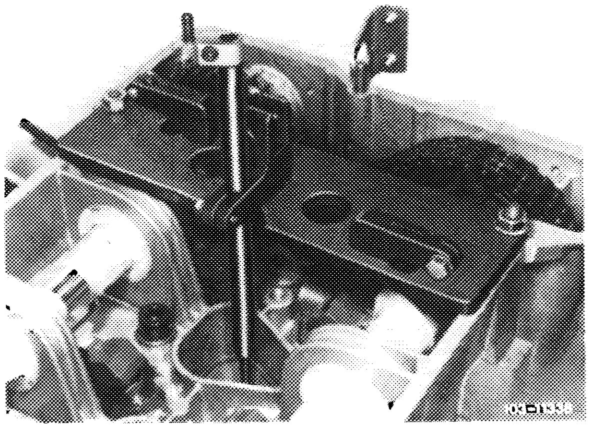
3 Take off cylinder head cover.

4 Unscrew spark plug of 1st cylinder.

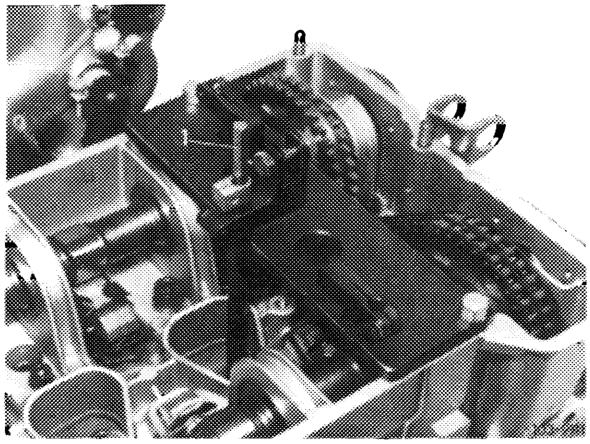
5 Screw-on tester above 1st cylinder.



6 Guide in gage extension, do not clamp.

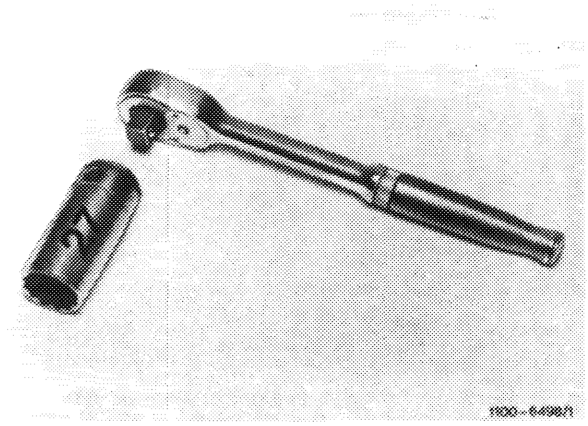


7 Insert adjusting pin (1) and press down.

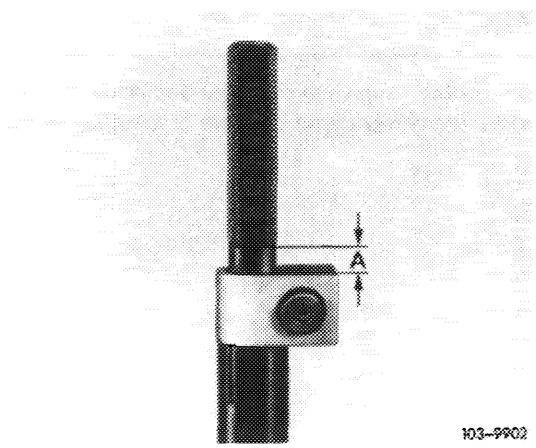


8 Turn crankshaft with tool combination until adjusting pin is at its highest point.

The piston is at TDC.



9 Clamp the gage extension in the tester that distance A will be about 5 mm when the adjusting pin is pressed down.



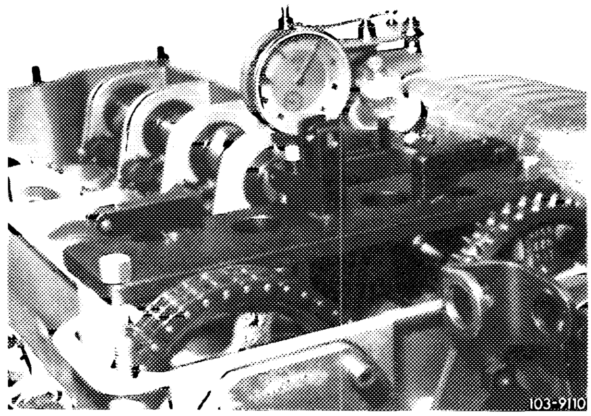
10 Remove adjusting pin. Insert dial gage and clamp it with preload of about 5 mm.

11 Turn crankshaft and adjust TDC accurately with dial gage.

Always turn crankshaft in direction of rotation.

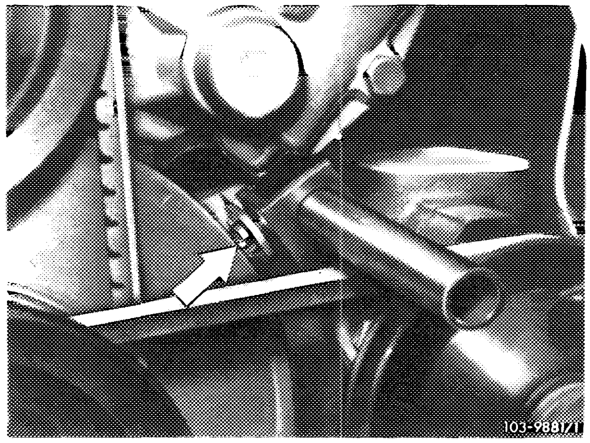
12 Turn dial gage scale until needle points to 0.

13 Continue turning crankshaft until dial gage goes back by **3.07 mm.**



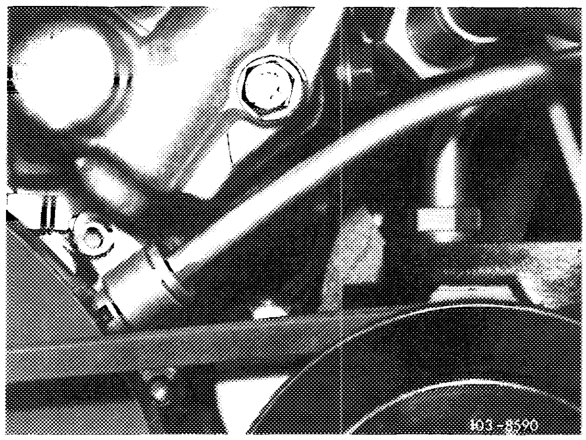
14 Insert locating device in adjusting slide.

Pin of vibration damper should engage in groove of locating device (arrow).



2nd version of adjusting slide, locating device 116 589 19 21 00

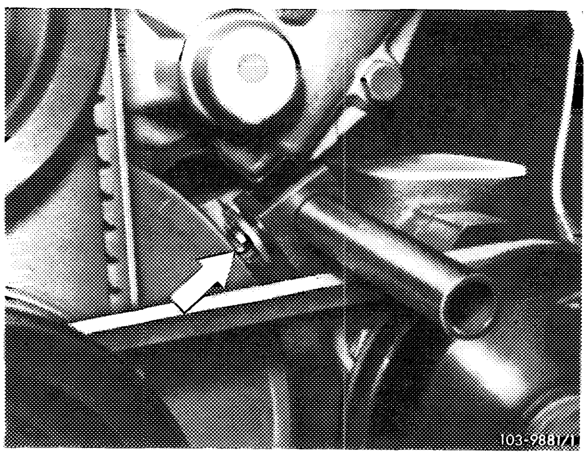
Note: Use locating device 110 589 08 21 00 for 1st version of adjusting slide.



1st version of adjusting slide. locating device 110 589 08 21 00

Correcting

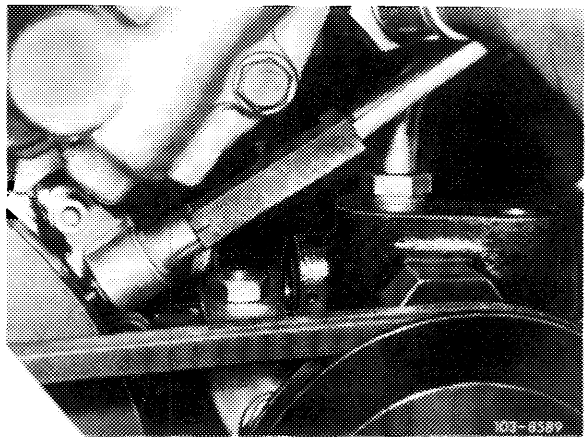
15 Loosen adjusting slide and displace until pin of vibration damper enters groove of locating device.



16 Tighten adjusting slide and remove locating device.

17 Install and fasten TDC transmitter.

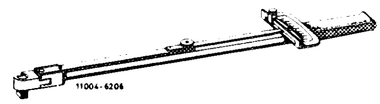
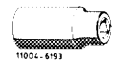
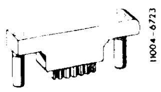
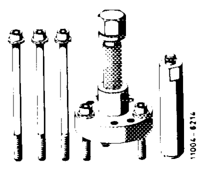
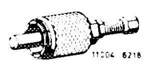
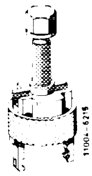
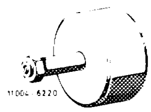
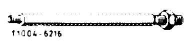
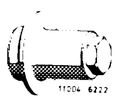
Note: For 1st version of adjusting slide install the TDC transmitter with guide 110 589 06 61 00 and fasten with a socket head cap screw.

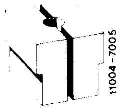
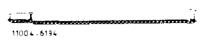


03–350 Removal and installation of crankshaft sprocket

Tightening torques	Nm
Bolt M 18 x 1.5 x 45 on crankshaft	**400–450**
Bolts and capped nuts for cylinder head cover	5

Special tools

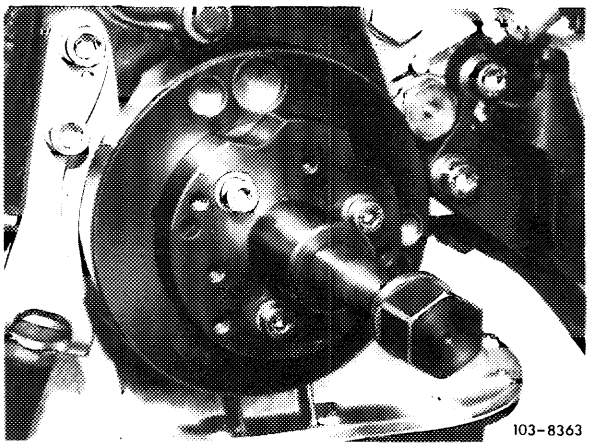
Torque wrench 150–500 Nm (15–50 kpm), 3/4" square		001 589 31 21 00
Socket 27 mm, 1/2" square		001 589 65 09 00
Detent		110 589 00 40 00
Detent		116 589 01 40 00
Puller for balancing disc		116 589 10 33 00
Puller for spacing ring		102 589 00 33 00
Crankshaft sprocket extractor		615 589 01 33 00
Bearing pin impact extractor (basic unit)		116 589 20 33 00
Threaded pin M 6 x 50 for impact extractor		116 589 01 34 00
Threaded pin M 10 x 100 for impact extractor		116 589 03 34 00
Stud socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00
Radial oil seal installer		110 589 07 61 00

Chain tensioner holder		110 589 02 31 00
Knocking-out mandrel 9 mm dia		110 589 02 15 00

Removal

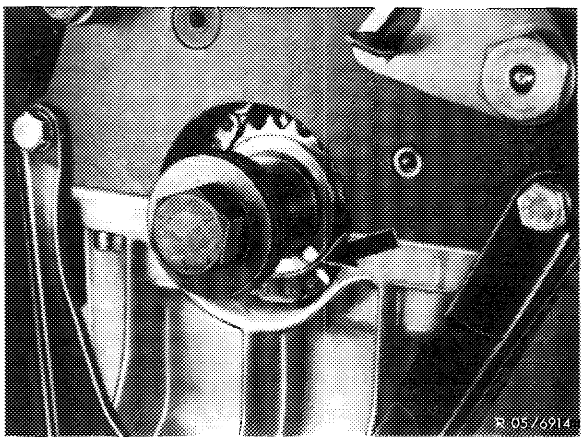
1 Remove radiator and fan.

2 Remove front crankshaft radial oil seal (03–324).

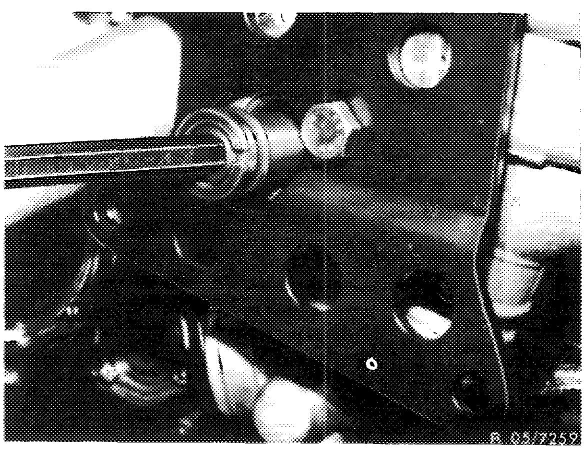


103–8363

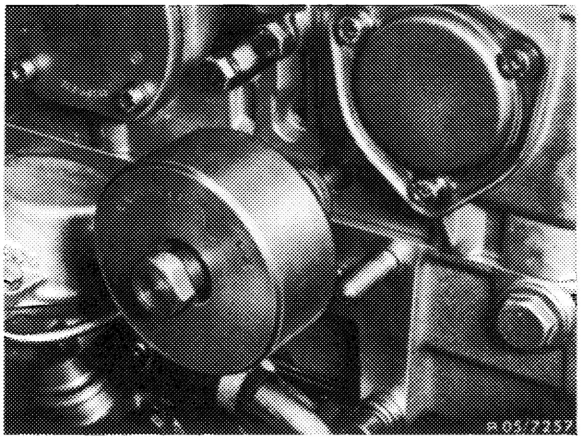
3 Use paint to mark both camshaft sprockets and camshaft sprocket to timing chain (arrow).



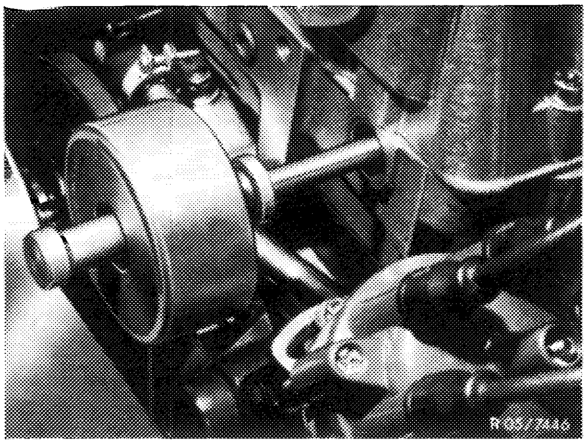
4 Remove chain tensioner (05–310).



5 Remove guide rail in camshaft housing.



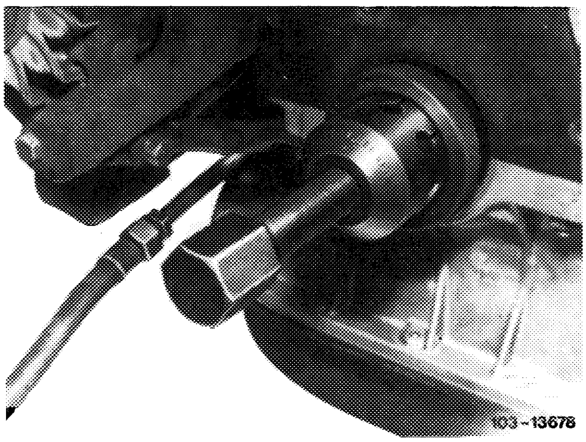
6 Remove reversing wheel. This requires unscrewing the plug and knocking out the bearing pin with an impact extractor (M 10 threaded pin).



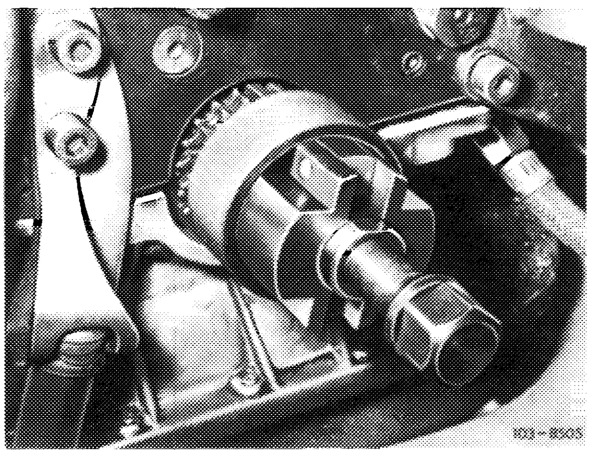
7 Remove reversing wheel with a wire hook upward.

8 Remove oil pan to an extent that the timing chain can be taken off of the crankshaft sprocket.

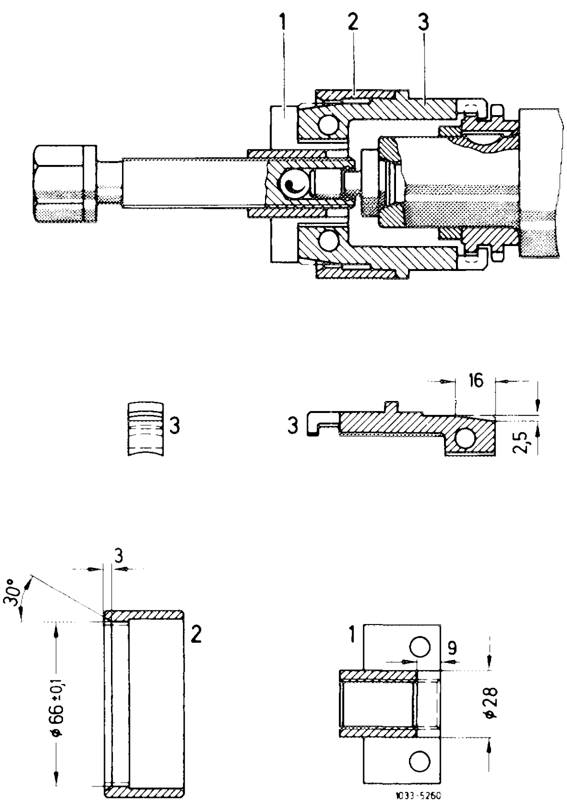
9 Pull-off spacing ring with puller.



10 Pull off crankshaft sprocket with an extractor.



Note: Change puller 615 589 01 33 00 to dimensions shown in drawing.



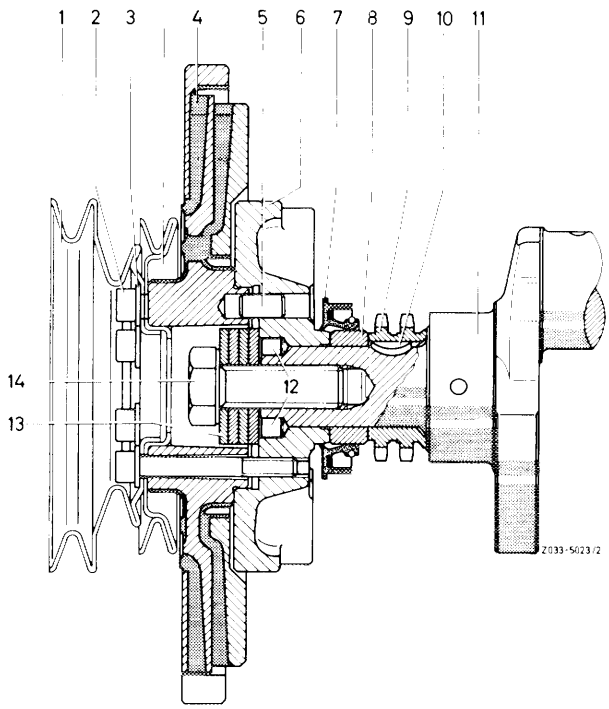
Installation

11 Transfer color marks from old to new crankshaft gear.

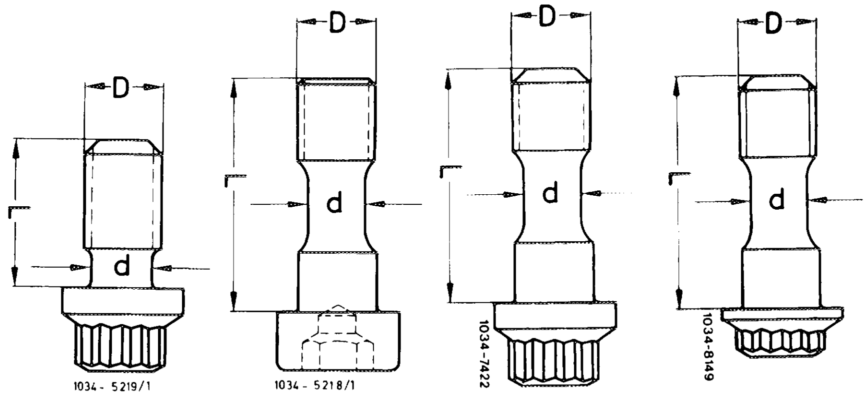
12 Heat crankshaft gear on a hot plate (approx. 80 °C) and slip on crankshaft.

13 Slip spacing ring on crankshaft.

14 For further installation proceed vice versa, paying attention to pertinent color marks.



Necked down screws		for manual transmission	for automatic transmission		

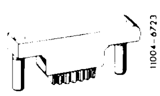


			1st version	2nd version	3rd version
Part no.		615 032 05 7	108 990 03 19	110 990 03 19	110 990 04 19
Thread dia D		M 10 x 1	M 10 x 1	M 10 x 1	M 10 x 1
Necked down dia d	when new	8.5–0.2	7.7–0.2	7.7–0.2	7.7–0.2
	minimum dia	8.1	7.3	7.3	7.3
Length L		20	31	31	31

Tightening torques

Necked down screw for driven plate and flywheel	Initial torque	40 Nm
	Torque angle	90–100°

Special tool

Detent		116 589 01 40 00

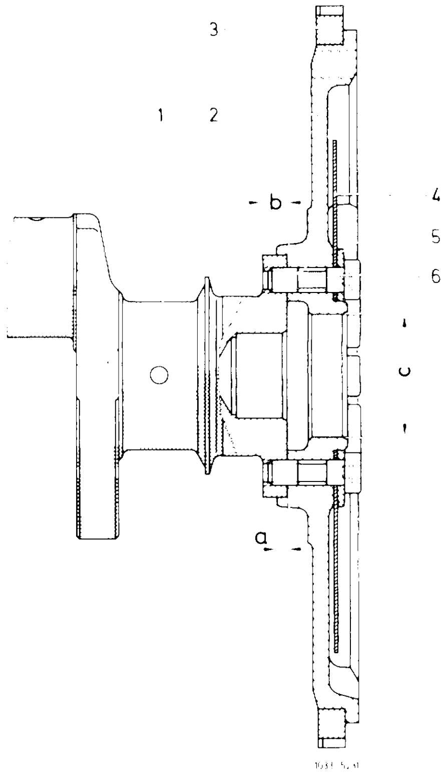
Note

Do not mix up flywheel for automatic transmission of 110 engine with flywheel for automatic transmission of 4-cylinder engines **115** and **615.**

Engine 110 dimension a = 4.5 mm

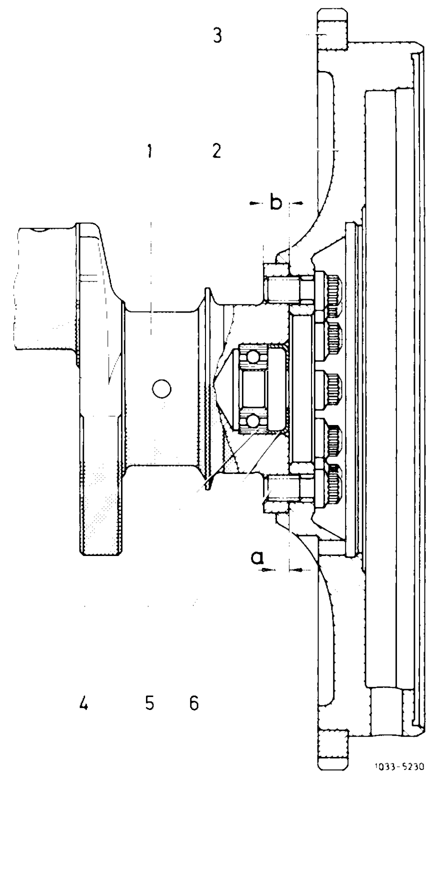
Engine 115 and 615 dimension a = 6.5 mm

On exchange engines, the mounting bore in flywheel of 35 mm dia can be bored to 50.00–50.016 mm dia (50 H6) for transmission with hydraulic clutch (722.200/202).



Layout of flywheel and driven plate for automatic transmission

1	Crankshaft	a =	4.5 mm
2	Flywheel	b =	10 mm
3	Ring gear	c =	50 mm dia (transmission with hydraulic clutch 722.200/202), transmission type K4C025
4	Driven plate		
5	Disc		
6	Necked down screw	c =	35 mm dia. (transmission with torque converter 722.1), transmission type W4B025



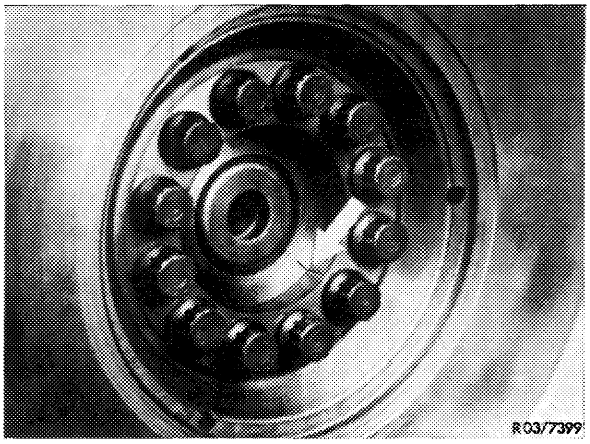
Layout flywheel for manual transmission

1	Crankshaft	5	Closing ring
2	Flywheel	6	Necked down screw
3	Ring gear	a =	5 mm
4	Ball bearing	b =	10 mm

Removal

1 Loosen necked down screws, remove flywheel, driven plate and spacing washer.

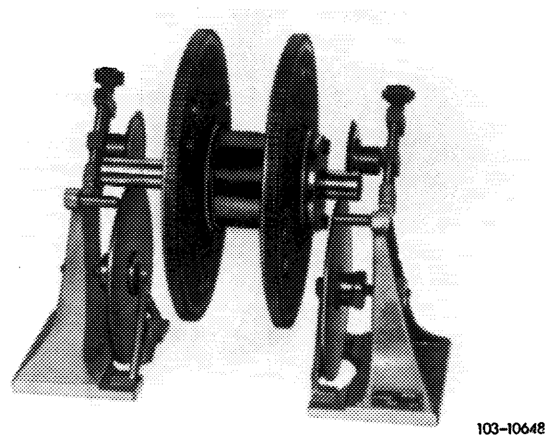
Note: The flywheels and the crankshaft are marked together (arrow).



Flywheel manual transmission

Installation

Note: If a new flywheel is installed, unbalance should be the same as for old flywheel (03–440).

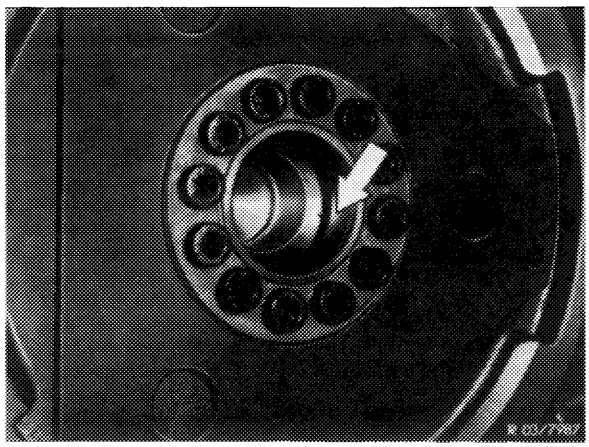


2 Measure necked down dia d of necked down screws.

When the minimum dia is attained, replace necked down screws.

Necked down screws 1st and 2nd version for automatic transmission can be replaced by 3rd version.

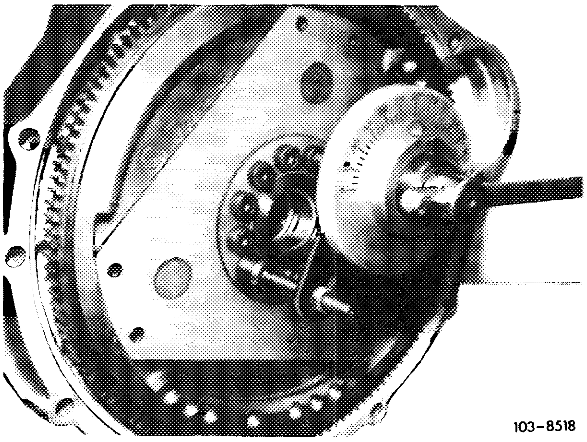
3 Position flywheel on crankshaft journal in such a manner that the markings (arrow) are in alignment.

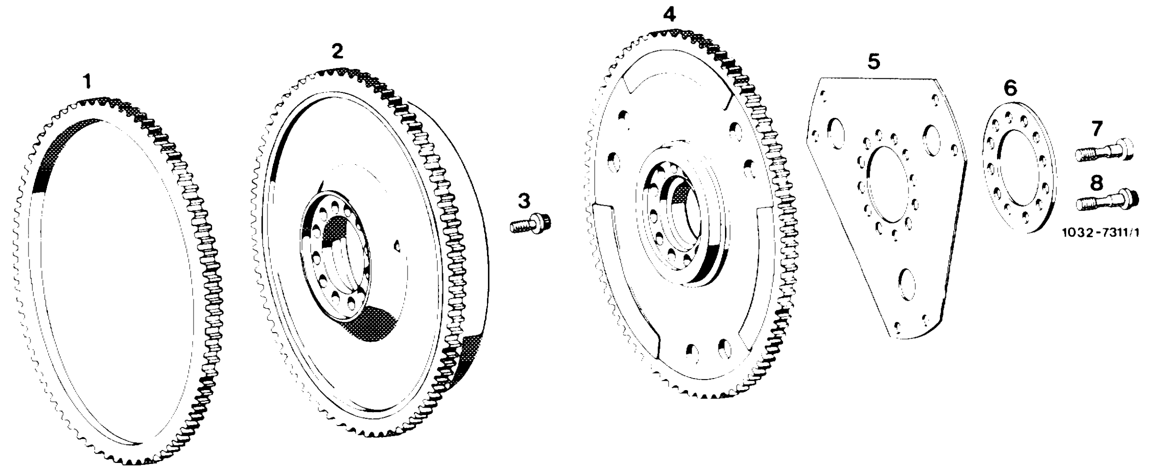


Flywheel automatic transmission

4 Screw-in necked down screws and pre-tighten to 30–40 Nm with torque wrench.

5 Complete angle of rotation torque 90–100° by means of angle of rotation wrench.





1 Starter ring gear
2 Flywheel with starter ring gear for manual transmission
3 12 necked down screws
4 Flywheel with starter ring gear for automatic transmission
5 Driven plate
6 Spacing ring
7 12 necked down screws 1st version
8 12 necked down screws 2nd and 3rd version

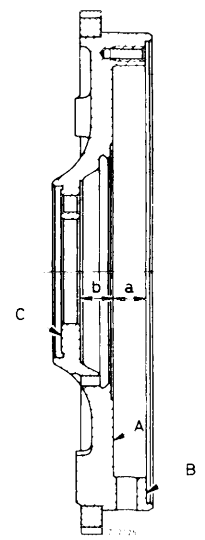
Data

Distance a		19.4 + 0.1
Distance b	New	18.5
	Machining limit	17.5
Permissible axial runout		0.05

Note

Machine a flywheel for manual transmissions having grooves, cracks or burnt spots by grinding or milling.

If grooves or cracks are deeper than the max permissible allowance, replace flywheel.



If clutch surface A is machined, mounting surface B must also be machined to maintain distance a.

Machining must never reduce distance b.

The flywheel must be held perfectly for machining, so that the permissible axial runout of 0.05 mm will not be exceeded.

After machining the clutch surface must not show blow-holds or chatter marks.

Data

Permissible axial runout measured on ring gear	max 0.4
Centering flange dia for ring gear	268.31–268.39
Shrink-on temperature	max 250°C
Annealing color	red brown

Conventional accessory

Temperature measuring chalk for 220°C	e.g. made by AW Faber-Castell D-8504 Stein bei Nürnberg Color no. 2815/220 (white) thermochrome

Note

The ring gear is hardened. To protect hardened structure a max temperature of 250 °C should never be exceeded at any point when heating ring gear. Heating can be reliably done by means of a hot plate or a heating furnace only.

A flame may be used as an exception only. Flame should cover inside of ring gear only.

Following replacement of ring gear, no balancing of flywheel is required.

Only ring gears with chamfered teeth are supplied as spare parts.

These ring gears can also be installed on vehicles with manual transmission in place of ring gears without chamfer.

Replacement

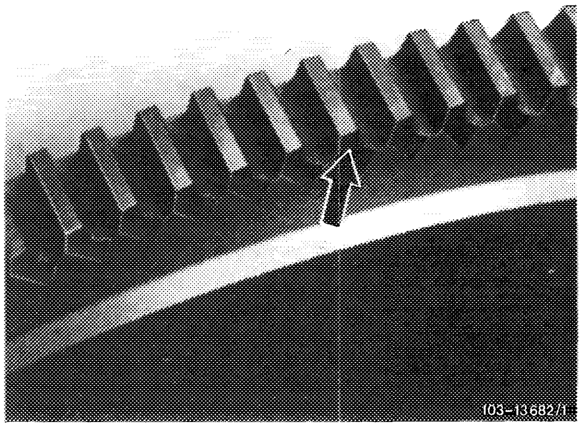
1 Drill into old ring gear and break up with a chisel, or heat quickly and then remove immediately.

2 Clean contact surface of ring gear on flywheel.

3 Uniformly heat new ring gear on a hot plate or in a heating furnace.
For this purpose, use temperature measuring chalk according to instructions.

4 Fit heated ring gear immediately on flywheel.

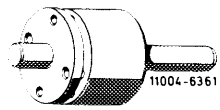
Attention!
The tooth chamfer (arrow) should face starting motor.



Data

Flywheel for	Balance bores max. drilling depth	Drill dia.	Hole locating dia.
manual transmission	20 + 1	11	251
automatic transmission	drilled through		

Special tool

Balancing mandrel (flywheel for automatic and manual transmissions)		617 589 00 63 00

Conventional tool

Rolling device for static balancing	Trebel, D-4030 Ratingen type EO, order no. 03600/0904/E 0010

Note

Crankshaft, balance disc and flywheel are balanced together.

A new flywheel must be balanced to the same value of the one removed.

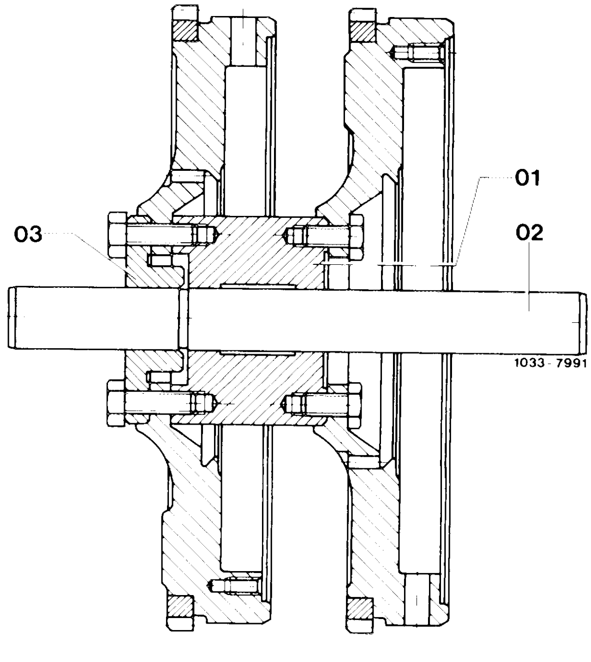
The balancing condition of a flywheel for manual transmission can be transferred to a flywheel for automatic transmission by static balancing (and vice versa).

Static balancing

1 Place old and new flywheels on top of each other that all bores align and both clutch surfaces face in one direction.

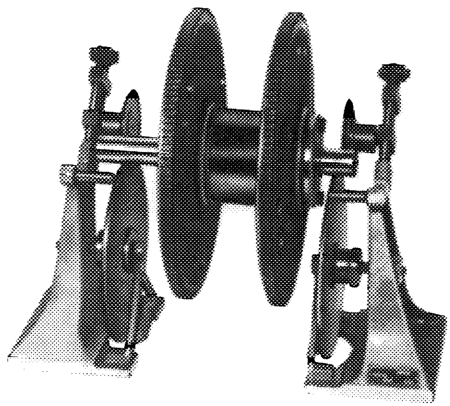
2 Transfer mark from old to new flywheel.

3 Apply balancing mandrel and bolt new flywheel with an offset of exactly 180° over old unit.



01 Mounting fixture
02 Shaft
03 Centering disc

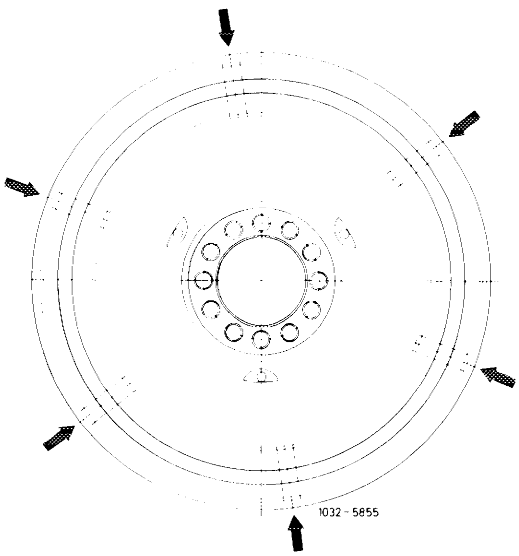
4 Let balancing mandrel with both flywheels oscillate on rolling device.



5 If an unbalance is found, drill so many holes in mass of new flywheel until the flywheels remain still without oscillating in any position.

Attention!
The hole circle dia, the drill dia and the max drilling depth must be maintained (refer to table).

The dust bores (arrows) must not be drilled.

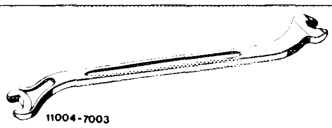
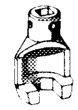
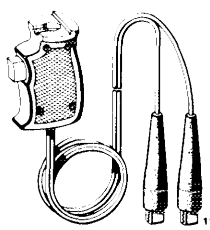


Valve clearance	cold engine (approx. 20 °C)	warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperature below −20 °C.

Tightening torques	Nm
Valve adjusting screw	20–40
Cylinder head cover capped nuts and bolts	5

Special tools

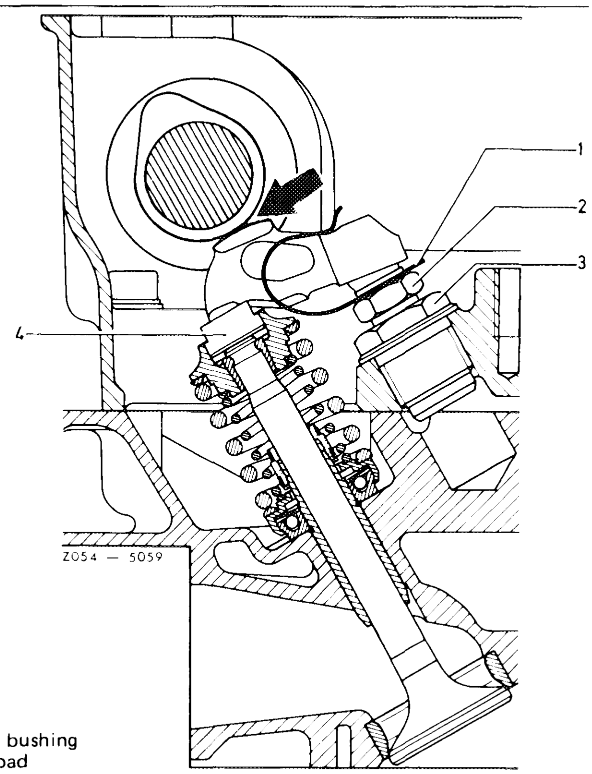
Valve adjusting wrench 17 mm		 11004-7003	110 589 00 01 00
Valve adjusting wrench 17 mm, 1/2" square, for checking torque of adjusting screw		 11004-6201	110 589 00 01 00
Slip gauge		 11004-6364	617 589 00 40 00
Slip gauge blades	0.10 mm thick 0.15 mm thick 0.20 mm thick 0.25 mm thick 0.30 mm thick	11004-6369	617 589 00 23 00 617 589 01 23 00 117 589 00 23 00 117 589 01 23 00 617 589 02 23 00
Socket wrench insert 27 mm, 1/2" square		 11004-6193	001 589 65 09 00
Contact grip to turn engine (part of compression recorder 001 589 46 21 00)		 11004-8487	001 589 46 21 08

Note

Check and adjust valve clearance **of cold or warm engine.**

Install a thinner pressure pad (4) if the room for adjustment is no longer sufficient. Pressure pads are available in thicknesses of 2.5, 3.5 and 4.5 mm.

Attention!
The torque of easy going valve adjusting screws (2) must be checked. This requires removing all spring clamps (1) with a screwdriver and checking the torque with a valve adjusting wrench, part number 110 589 00 01 00, and a torque wrench (e. g. part number 000 589 27 21). If the torque of the valve adjusting screw is less than 20 Nm (2 kpm), replace valve adjusting screw (2) or threaded bushing (3) with valve adjusting screw (2).



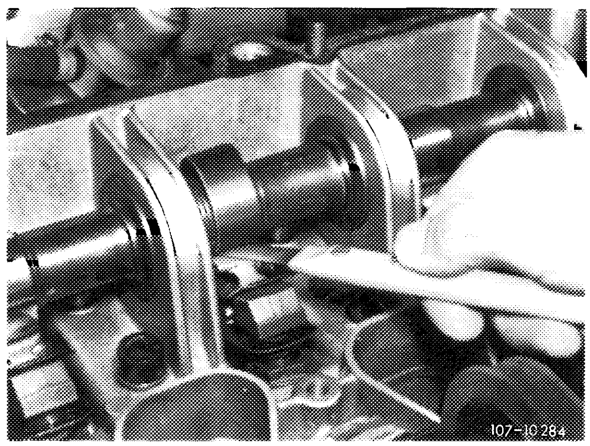
1 Spring clamp
2 Valve adjusting screw
3 Threaded bushing
4 Pressure pad

Adjusting valve clearance

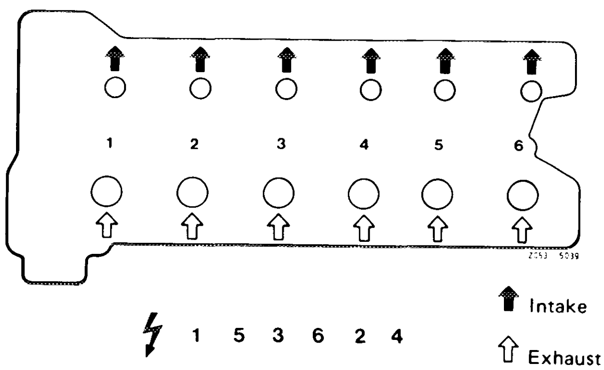
1 Remove rubber seals.

2 Check valve clearance between rocker arm and camshaft, whereby the cam peak must be up.

The valve clearance is correctly adjusted, if the slip gauge fits tight when pulled through.

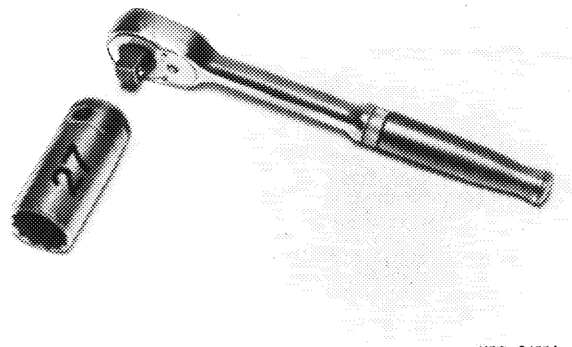


3 Note layout of intake and exhaust valves.



The engine can be turned as follows:

a) with the combination tool at front end of crankshaft.



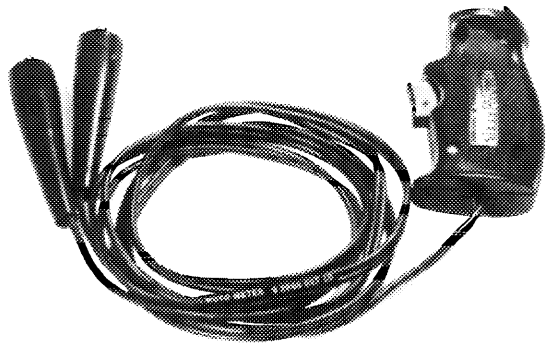
1100-6498/1

b) with the starter and contact grip.

Models 107, 114 and 116

Connect contact grip to battery plus and terminal 50 to starter.

Disconnect cable on ignition coil terminal 1.

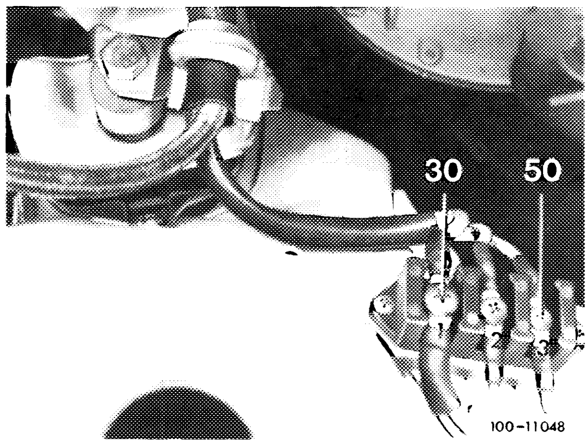


105-9061

Model 123

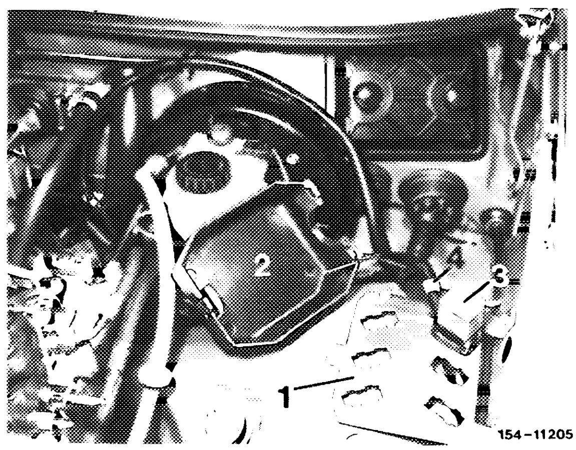
Connect contact grip to terminal 30 and terminal 50 to wire connector.

Disconnect cable on ignition coil terminal 1.



100-11048

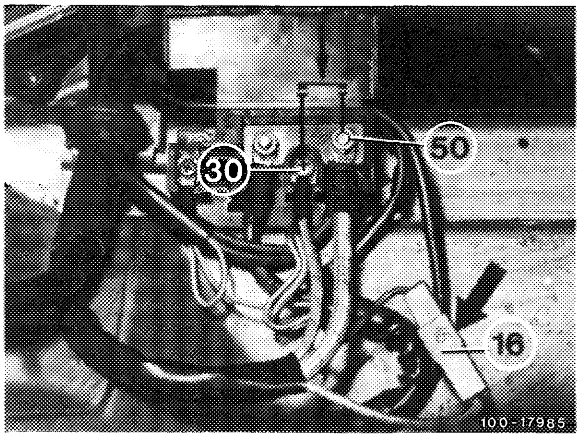
Disconnect fuel pump relay (3) of engines with continuous fuel injection.



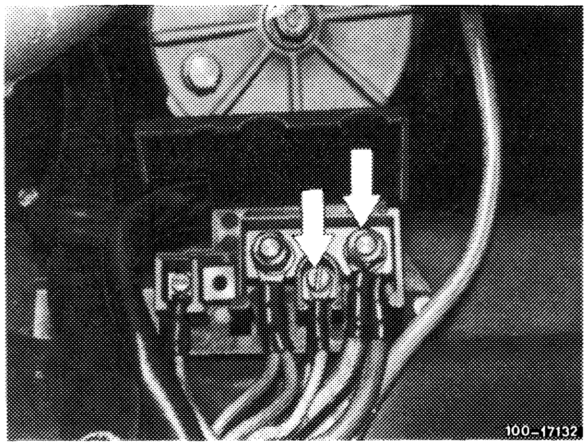
154-11205

Model 126

Separate cable plug (terminal 16, arrow) so that ignition coil and on engines with CIS the fuel pump cannot be activated.



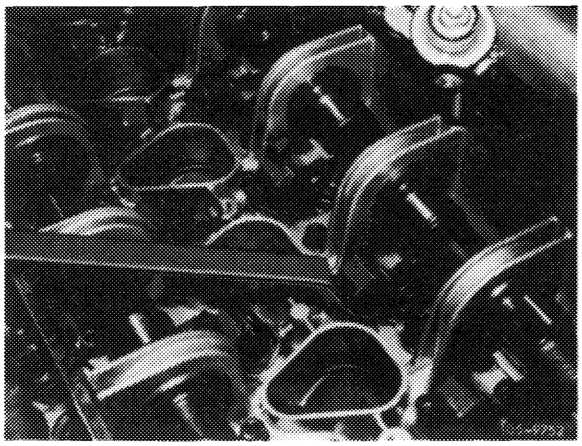
Connect terminals designated with arrows.



4 Adjust valve clearance by turning the valve adjusting screw with a valve adjusting wrench.

5 Check spring clamps for perfect fit.

6 Check seals, replacing if necessary.

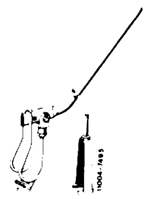
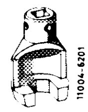
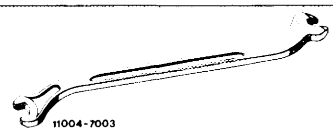
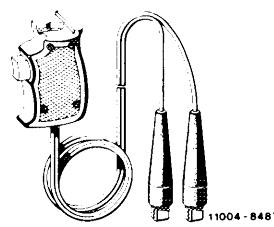


Valve clearance	Cold engine (approx. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below –20 °C.

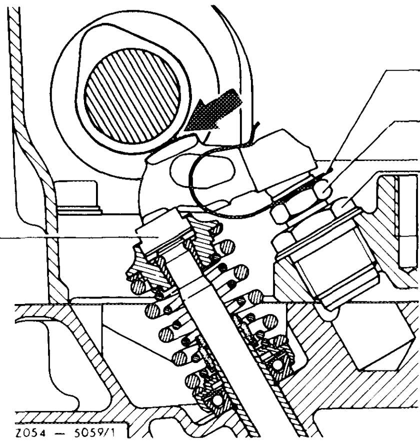
Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Cylinder head threaded bushing	80
Valve adjusting screw	20–40

Special tools

Depressor for valve spring		110 589 04 61 00
Valve adjusting wrench 17 mm, 1/2" square, for checking torque of adjusting screw		110 589 00 01 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Contact grip to turn engine (part of compression recorder 001 589 46 21 00)		001 589 46 21 08

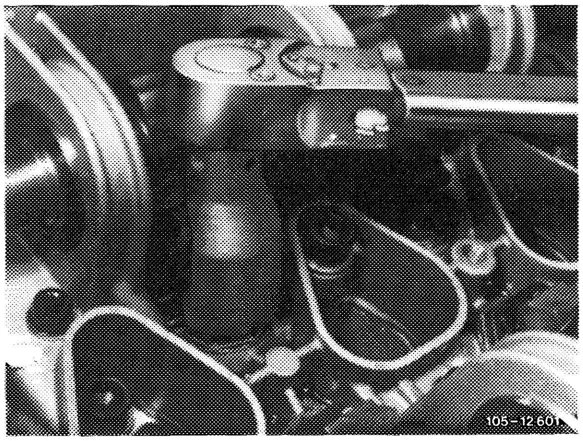
Note

If torque of valve adjusting screw is less than 20 Nm (2 kpm), replace valve adjusting screw (2) or threaded bushing (3) with valve adjusting screw (2).



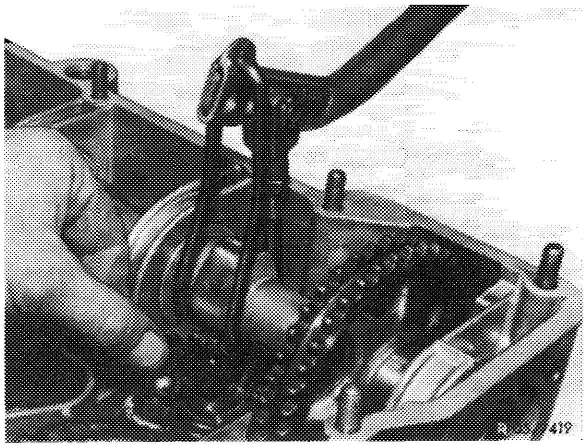
1 Spring clamp
2 Valve adjusting screw
3 Threaded bushing
4 Pressure pad

The torque can be checked with a valve adjusting wrench, part number **110 589 00 01 00** and a torque wrench (e. g. part number **000 589 27 21**).

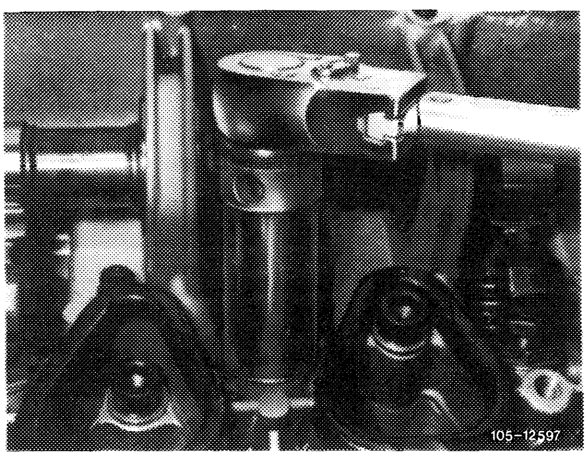


Replacing

1 Remove rocker arms (05–230).



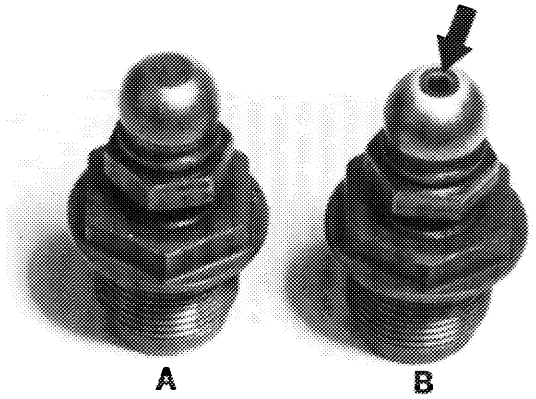
2 Unscrew threaded bushing with valve adjusting screw.



Attention!
Only use valve adjusting screws with an oil bore (arrow).

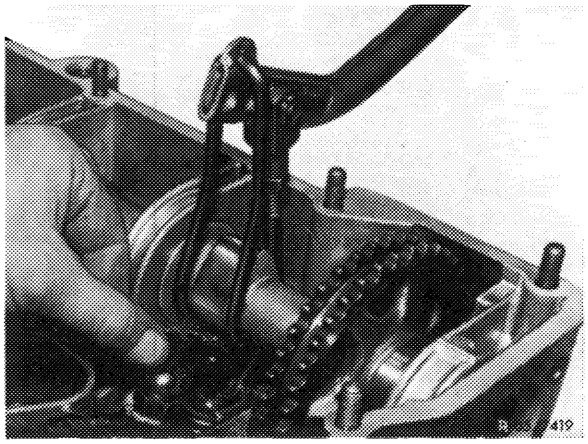
3 Coat threads of threaded bushing with valve adjusting screw with tallow, install and tighten threaded bushing to a torque of 80 Nm (8 kpm).

Attention!
Threaded bushing must be free of burrs when installing, since these would find their way into the oil circuit.

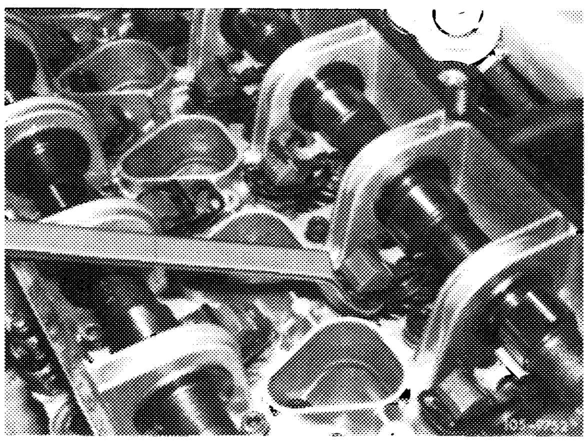


105–12453

4 Install rocker arms (05–230).



5 Adjust valve clearance (05–210).



Timing at 2 mm valve lift

Version		all	Exceptions USA California 1974	USA Federal 1973 and 1974	J USA 1981
Camshaft code number[1])	Exhaust	24, 57, 71, 78	24	20, 95	78
	Intake	25, 67, 74	25, 74	33, 91	74
Intake valve	Opens after TDC	7°		11°	7°
	Closes after BDC	21°		15°	21°
Exhaust valve	Opens before BDC	30°		22°	34°
	Closes before TDC	12°		14°	16°

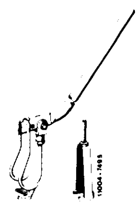
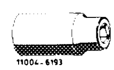
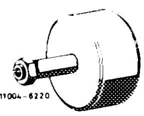
[1]) Camshaft code number is punched into rear end of camshaft.

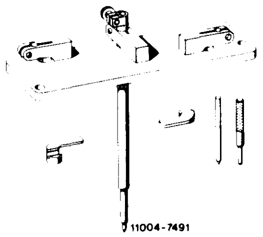
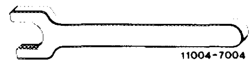
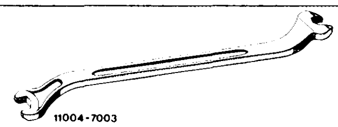
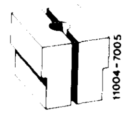
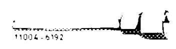
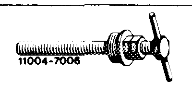
Valve clearance	On cold engine (approx. 20 °C)	On warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm larger during lasting outside temperatures below −20 °C.

Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Expansion bolts for camshaft sprockets	80
Ball locating ring in chain tensioner	25
Valve adjusting screw	20–40

Special tools

Depressor for valve springs		110 589 04 61 00
Socket 27 mm, 1/2" square for rotating engine		001 589 65 09 00
Impact extractor for bearing pins (Basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00

Timing test tool		110 589 10 21 00
Camshaft holding wrench		116 589 01 01 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Holding jaws for chain tensioner		110 589 02 31 00
Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00
Chain tensioner rigid		110 589 03 31 00

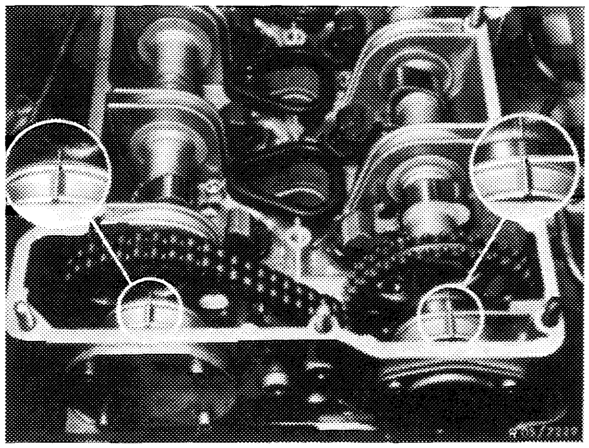
Conventional tool

Dial gauge A 1 DIN 878	e.g. made by Mahr, 7300 Esslingen order no. 810

Note

Check when intake valve begins to open and exhaust valve of 1st cylinder stops to close.

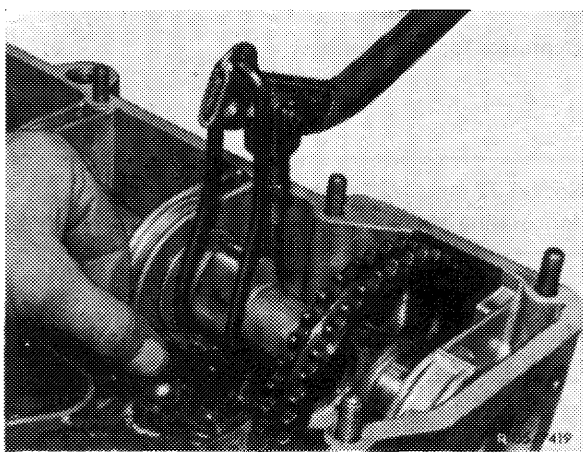
For assembly jobs it is sufficient when the marks on the camshafts are aligned for ignition TDC position of 1st cylinder.



Checking

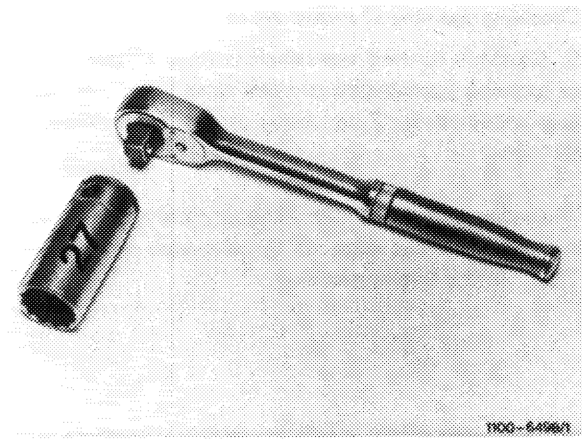
1 Remove both rocker arms of 1st cylinder with the installation and removal tool.

This requires turning the crankshaft until the cam peak is up.

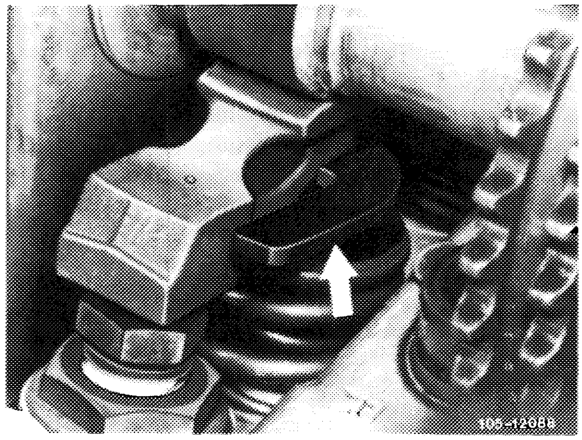


Turn crankshaft with combination tool.

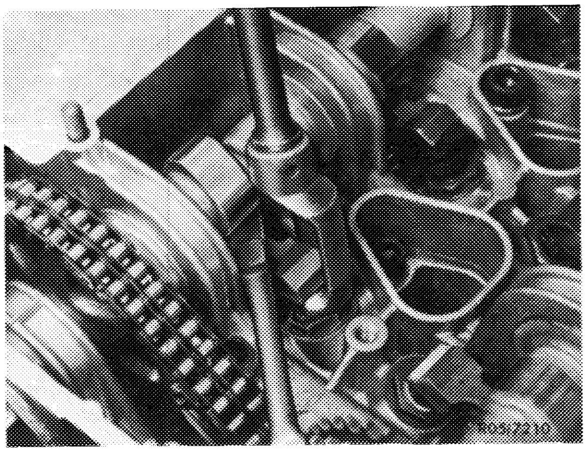
Attention!
Never turn engine on camshafts.



2 Replace both pressure pads by test pads (arrow) and install rocker arms without spring clamps.



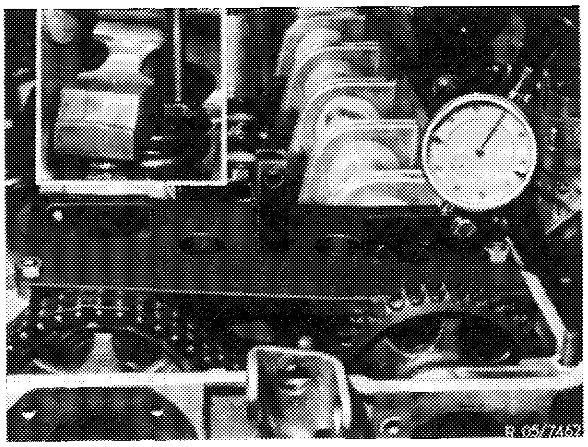
3 Turn valve adjusting screw until rocker arm rests free of play against cam base circle.



4 Set up and install tester.

5 When valve is closed, i. e. the cam faces up, insert the dial gage with an extension pin into the tester. Adjust for a preload of 3 mm (small indicator must point to 3) and clamp the dial gage.

Turn the adjustable dial, until the large indicator points to "0".



Checking opening of intake valve

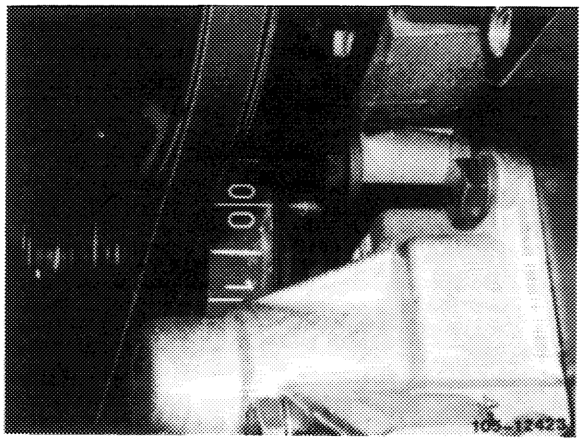
6 Continue turning crankshaft in engine's direction of rotation (cam begins to open valve), until the dial gage goes back by 2 mm (valve stroke) to a preload of 1 mm.

The value on the vibration damper must correspond with the specified value for "intake valve opens after TDC" in this engine position.

Checking closing of exhaust valve

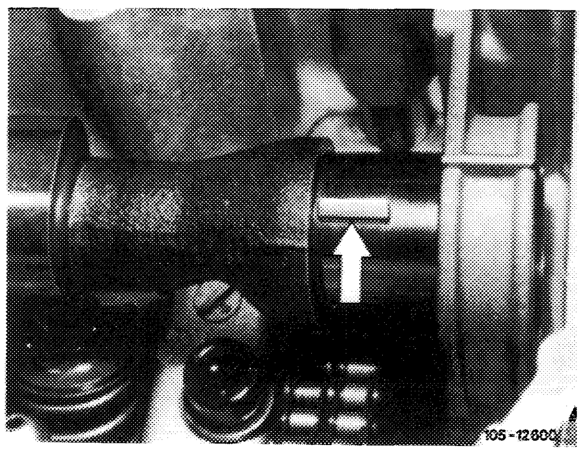
7 Continue turning crankshaft in engine's direction of rotation. The exhaust valve will be opened and the dial gage returns to "0". Now when closing the exhaust valve, the dial gage pin returns to position and the indicators begin to turn. The small indicator must stop at 1 and the large indicator at "0".

The value on the vibration damper must correspond with the specified value for "exhaust valve closes before TDC" in this engine position.



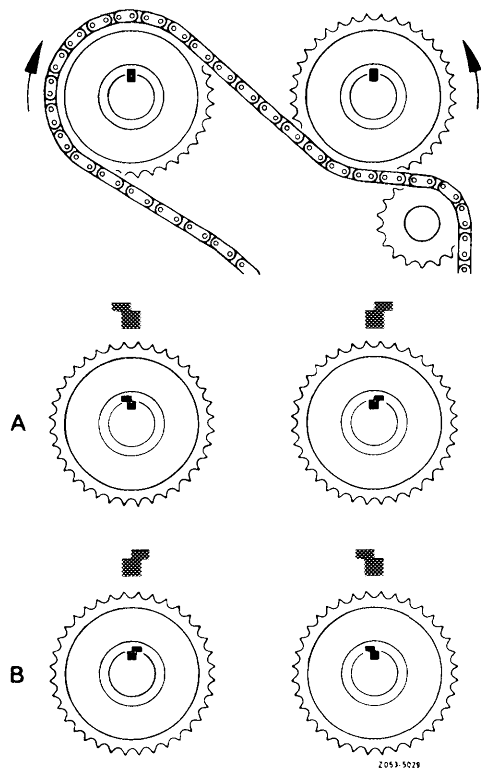
Adjusting

If the timing has to be corrected, an offset woodruff key or a new timing chain, if chain stretching is excessive, must be installed.



Woodruff keys are available in the following sizes.

Offset in mm	Part number	for correction of about
0.7	621 991 04 67	4° crankshaft
0.9	621 991 02 67	6 1/2° crankshaft
1.1	621 991 01 67	8° crankshaft
1.3	621 991 00 67	10° crankshaft

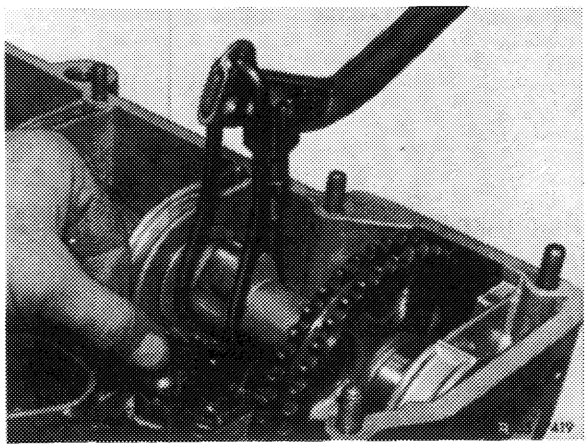


With installed position "A" opening begins earlier
With installed position "B" opening begins later

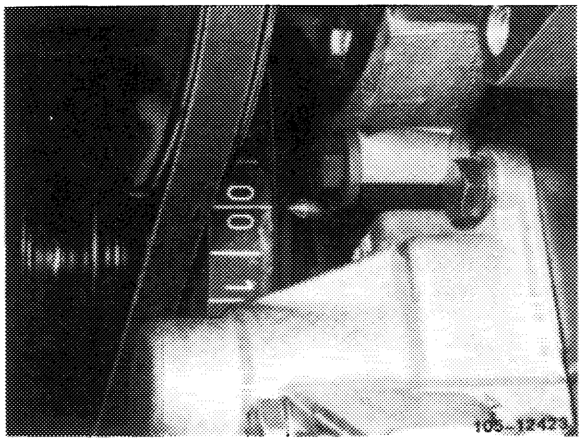
An offset of 1 tooth on the camshaft sprocket means about 18° on the crankshaft.

Since both camshafts rotate against each other, the installed position is important when installing an offset woodruff key.

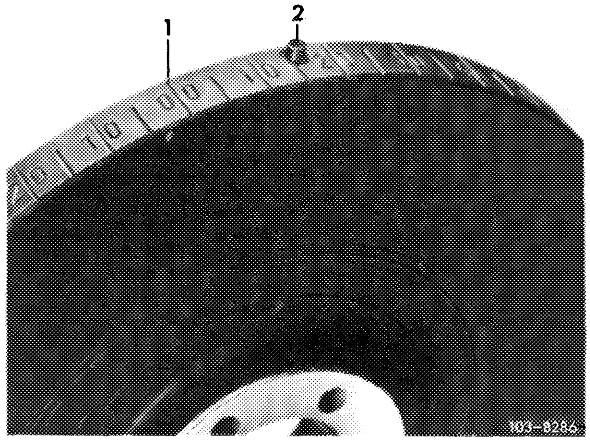
8 Remove all rocker arms on camshaft to be adjusted (05–230).



9 Set first cylinder of engine at ignition TDC. Marks on camshaft sprockets and camshaft housing must align.

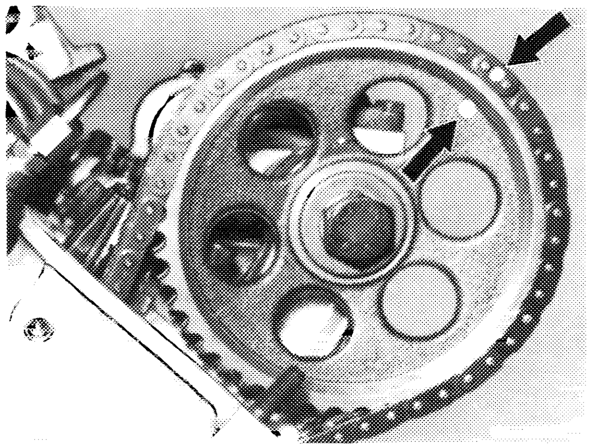


Attention!
If the vibration damper of an engine has a "0/0" mark for BDC in addition to one for TDC, the TDC mark is next to the pin in the vibration damper.

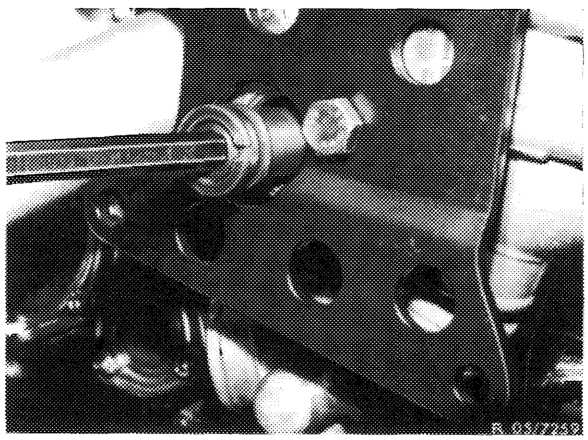


1 TDC mark

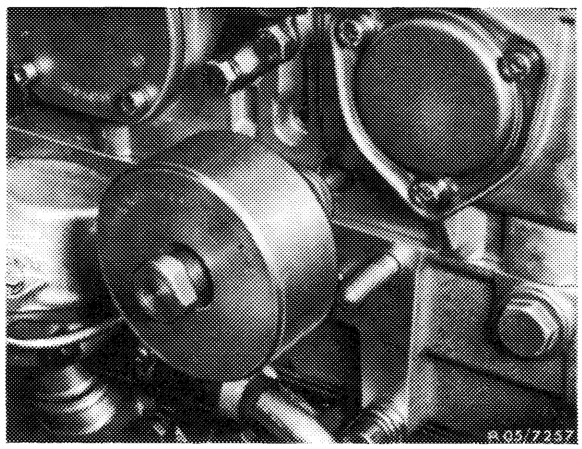
10 Mark relation between camshaft sprockets and chain with paint to facilitate assembly.



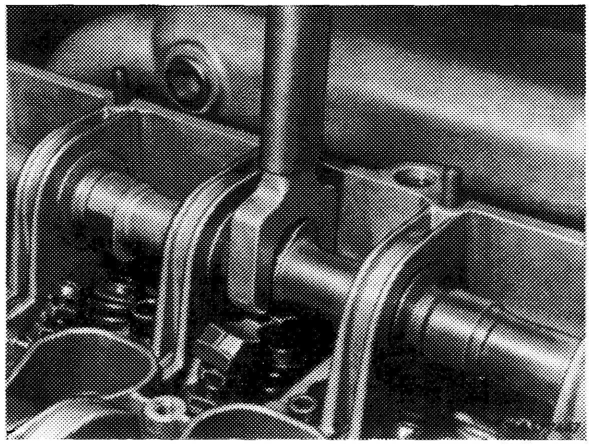
11 Remove chain tensioner (05–310).



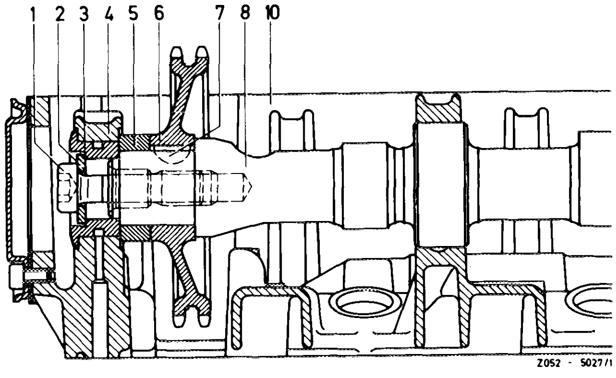
12 Knock out only the bottom bearing pin of the sliding rail in the camshaft housing with an impact extractor.



13 Remove expansion bolt for camshaft sprocket, counterholding camshaft with a holding wrench.



14 Press back camshaft and remove camshaft sprocket. Take spacer (5) off of intake camshaft.

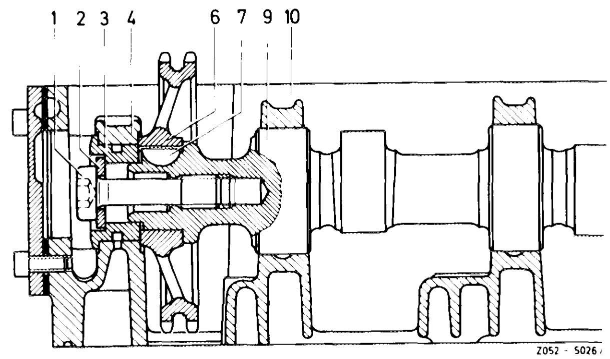


Intake camshaft

1	Expansion bolt	6	Camshaft sprocket
2	Washer	7	Woodruff key
3	Spacer	8	Camshaft
4	Bearing	10	Camshaft housing
5	Spacer		

15 Place a clean cloth in timing chain housing underneath the camshaft and remove the woodruff key.

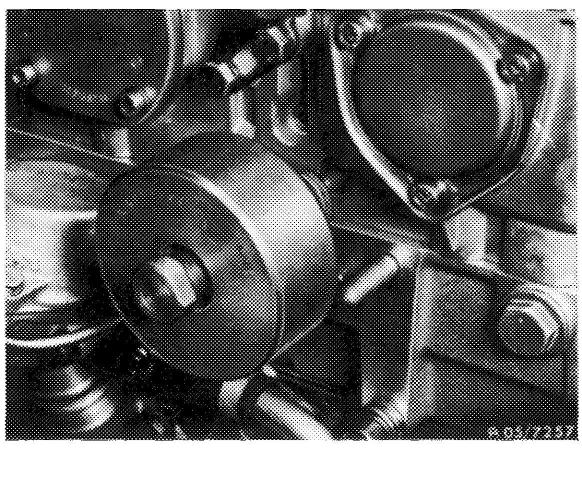
16 Install a woodruff key (7) selected according to the diagram.



Exhaust camshaft

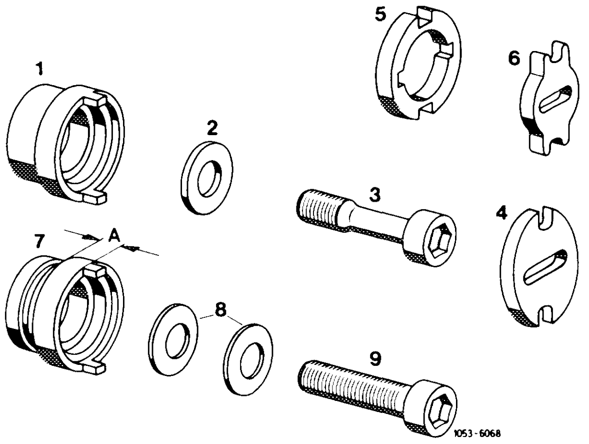
1	Expansion bolt	6	Camshaft sprocket
2	Washer	7	Woodruff key
3	Spacer	9	Camshaft
4	Bearing	10	Camshaft housing

17 Install camshaft sprocket and bottom sliding rail bearing pin, so that the timing chain cannot jump.



Note: Use only expansion bolt (3) with washer (2) for repairs.

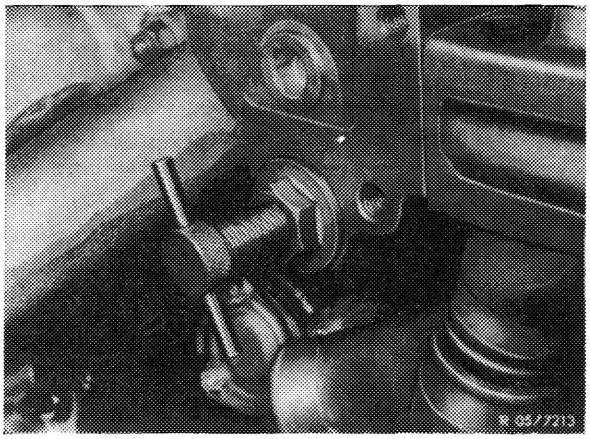
1 Spacer 2nd version without lubricating groove (for pressure oil pump and vacuum pump 2nd version)
2 Washer
3 Expansion bolt
4 Dog for pressure oil pump and vacuum pump 2nd version
5 Dog for vacuum pump 1st version
6 Dog 1st version for pressure oil pump
7 Spacer 1st version with lubricating groove
A = 4.7 mm for vacuum pump 1st version
A = 8.3 mm for pressure oil pump and vacuum pump 2nd version
8 Spring washers (not valid)
9 Mounting bolt (not valid)



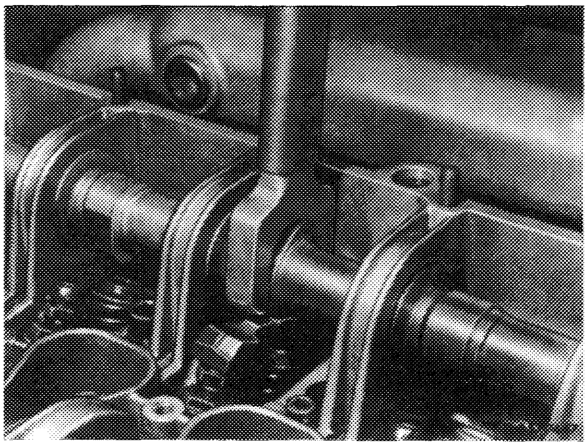
18 Install rigid chain tensioner and tension by hand.

19 Turn crankshaft with combination tool.

20 Check timing.



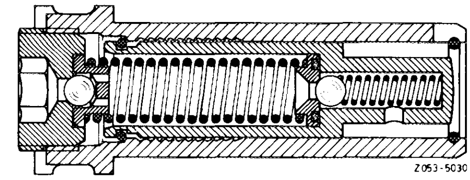
21 Torque expansion bolts for camshaft sprocket to 80 Nm (8 kpm), counterholding with a holding wrench.



22 Position chain tensioner for installation and install (05–310).

23 Install rocker arms (05–230).

24 Adjust valve clearance (05–210).



Chain tensioner positioned for installation.

Timing with 2 mm valve stroke

Version		all	Exceptions (USA) California 1974	(USA) Federal 1973 and 1974	(J) (USA) 1981
Camshaft code[1])	Exhaust	24, 57, 71, 78	24	30, 95	78
	Intake	25, 67, 74	25, 74	33, 91	74
Intake valve	Opens after TDC	7°		11°	7°
	Closes after BDC	21°		15°	21°
Exhaust valve	Opens before BDC	30°		22°	34°
	Closes before TDC	12°		14°	16°

[1]) Camshaft codes are stamped on rear end of camshaft.

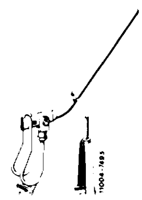
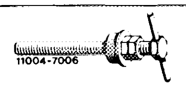
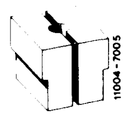
Valve clearance	Cold engine (approx. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

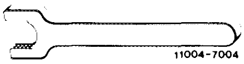
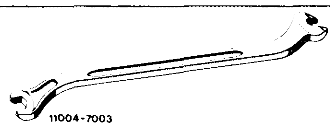
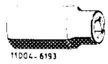
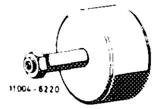
[1]) 0.05 mm more for consistent outside temperatures below –20 °C.

Data

Permissible runout of center bearing journal and camshaft sprocket seat when camshaft turns on outer bearing journals	0.025
Scleroscope hardness of cams	68–82

Special tools

Depressor for valve spring		110 589 04 61 00
Rigid chain tensioner		110 589 03 31 00
Chain tensioner holder		110 589 02 31 00

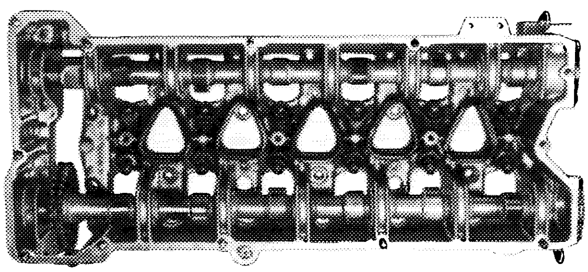
Camshaft holding wrench	 11004-7004	116 589 01 01 00
Valve adjusting wrench 17 mm	 11004-7003	110 589 01 01 00
Wrench socket 27 mm, 1/2" square to turn engine	 11004-6193	001 589 65 09 00
Wrench socket 10 mm 1/2" square, 140 mm long	 11004-6192	000 589 05 07 00
Impact extractor for bearing pin (basic unit)	 11004-6220	116 589 20 33 00
M 6 x 50 bolt for impact extractor	 11004-6368	116 589 01 34 00

Tightening torques	Nm
Cylinder head bolts M 12 x 1.5	100
Bolts M 8 camshaft housing to cylinder head and crankcase	25
Necked-down screw for camshaft sprockets	80
Chain tensioner oil jet	25
Valve adjusting screw	20–40
Cylinder head cover bolts and capped nuts	5
Level control pump to camshaft housing	9

Note

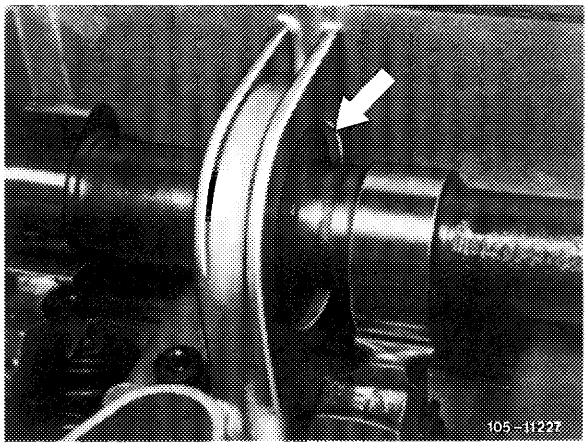
Camshafts can be removed from an installed engine only together with the camshaft housing.

If a new camshaft has to be installed, the rocker arms must also be replaced.



105–8003

Camshafts with **wide** bearing journals (e.g. 21 mm) can be exchanged against camshafts with **narrow** bearing journals (arrow) (e.g. 16 mm).



Attention!
Exchange engines are partially delivered with camshaft bearing journals ground to intermediate or repair stage dimension (01–471).

Install camshafts with reground bearing journals in a camshaft housing with a pertinent bearing diameter (05–225).

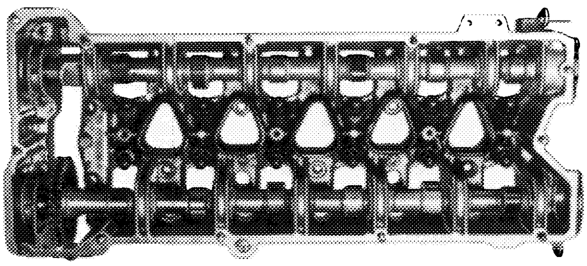
Also refer to coordination camshaft housing and camshafts (01–471).

Removal

1 Remove camshaft housing (01–470).

2 Unscrew both rear covers on camshafts housing.

3 Unscrew necked-down screw of lefthand camshaft while applying counterhold with holding wrench.



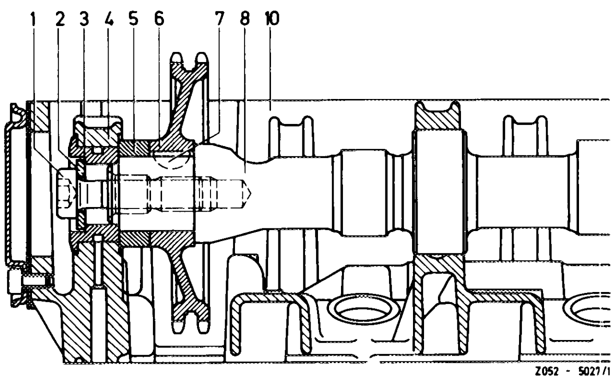
105–8003

4 Press back camshafts and remove camshaft sprocket.

5 Remove both camshafts toward rear.

Installation

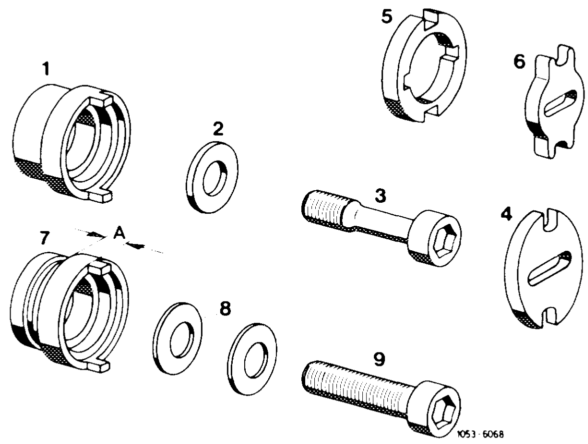
6 Coat camshaft bearings with engine oil and guide in left camshaft (intake). Slide on camshaft sprocket (6) and spacer (5). Coat spacer (3) with engine oil and install.



Intake camshaft

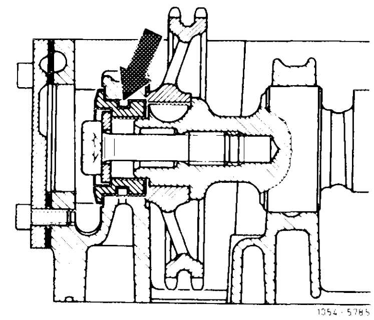
1 Expansion bolt
2 Washer
3 Spacer
4 Bearing
5 Spacer
6 Camshaft sprocket
7 Woodruff key
8 Camshaft
10 Camshaft housing

7 Expansion bolt (3) with washer (2) **must be installed for repair jobs.** Mounting bolt (9) and spring washers (8) must not be used.

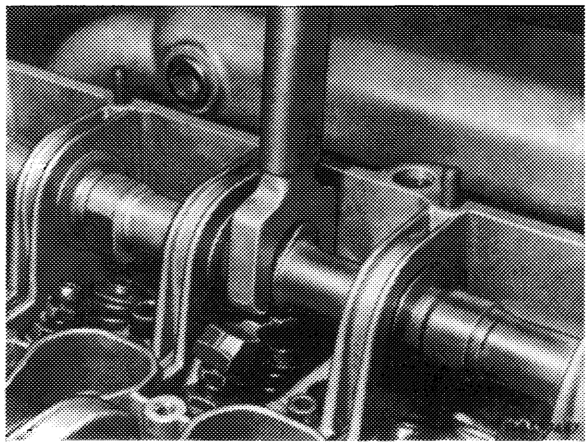


1 Spacer 2nd version without lubricating groove (for pressure oil pump and vacuum pump 2nd version)
2 Washer
3 Expansion bolt
4 Dog (for pressure oil pump and vacuum pump 2nd version)
5 Dog (for vacuum pump 1st version)
6 Dog 1st version (for pressure oil pump)
7 Spacer 1st version with lubricating groove
A = 4.7 mm for vacuum pump 1st version
A = 8.3 mm for pressure oil pump and vacuum pump 2nd version
8 Spring washers (not valid)
9 Mounting bolt (not valid)

Note: Lubricating groove in spacing sleeve (arrow) no longer in place starting January 1974.

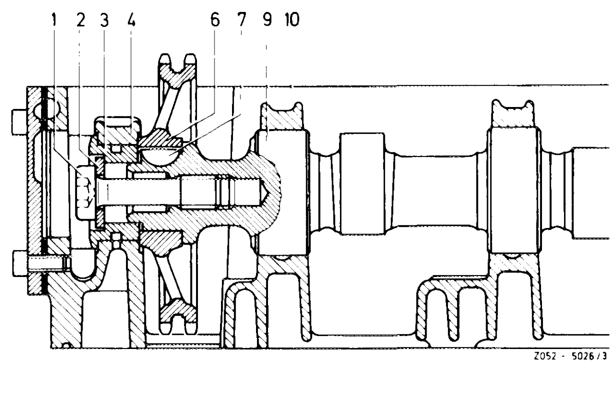


8 Tighten torque camshaft expansion bolt to 80 Nm (8 kpm), counterholding camshaft with a holding wrench.



9 Guide right camshaft (exhaust) into lubricated bearings.

The right camshaft sprocket is installed after the camshaft housing has been mounted.

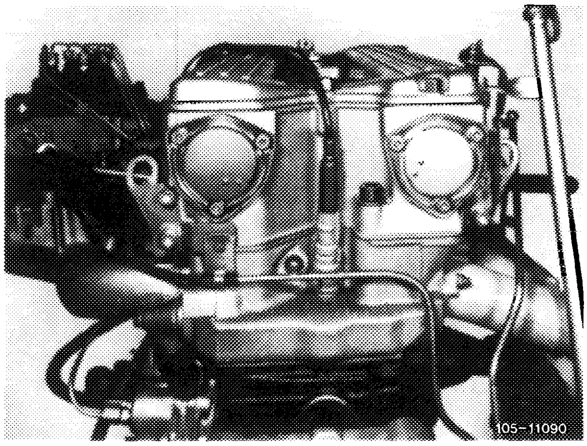


Exhaust camshaft

1	Expansion bolt	6	Camshaft sprocket
2	Washer	7	Woodruff key
3	Spacer	9	Camshaft
4	Bearing	10	Camshaft housing

10 Install both rear covers with gaskets on camshaft housing.

11 Install camshaft housing (01–470).

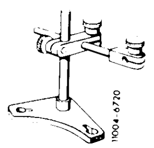


Data

Mean roughness of camshaft bearing journal	0.005
Deviation of camshaft bearing journal from true when mounted at camshaft sprocket seat and rear camshaft bearing journal	0.030
Deviation of camshaft bearing journal from true	0.010

Bearing points (fig., refer to note)		1, 9	2	3, 10, 11	4,5,12,13	6,7,14,15	8
Standard dimension	bearing dia.	38.016 / 38.000	50.066 / 50.050	50.016 / 50.000	51.519 / 51.500	53.019 / 53.000	54.019 / 54.000
	journal dia.	23.993 / 23.980	49.950 / 49.934	49.950 / 49.934	51.440 / 51.421	52.940 / 52.921	53.940 / 53.921
Intermediate stage −0.1 mm (exchange engines)	bearing dia.		49.966 / 49.950	49.916 / 49.900	51.419 / 51.400	52.919 / 52.900	53.919 / 53.900
	journal dia.		49.850 / 49.834	49.850 / 49.834	51.340 / 51.321	52.840 / 52.821	53.840 / 53.821
1st repair stage −0.25 mm	bearing dia.		49.816 / 49.800	49.765 / 49.750	51.269 / 51.250	52.769 / 52.750	53.769 / 53.750
	journal dia.		49.700 / 49.684	49.700 / 49.684	51.190 / 51.171	52.690 / 52.671	53.690 / 53.671
2nd repair stage −0.5 mm	bearing dia.		49.566 / 49.550	49.516 / 49.500	51.019 / 51.000	52.519 / 52.500	53.519 / 53.500
	journal dia.		49.450 / 49.434	49.450 / 49.434	50.940 / 50.921	52.440 / 52.421	53.440 / 53.421
Camshaft bearing play	radial	0.057 / 0.124	0.100 / 0.132	0.050 / 0.082	0.060 / 0.098	0.060 / 0.098	0.060 / 0.098
	axial	0.050 / 0.120					
Sleeve for bearing a	OD	37.950 / 37.925	ID	24.013 / 24.000			

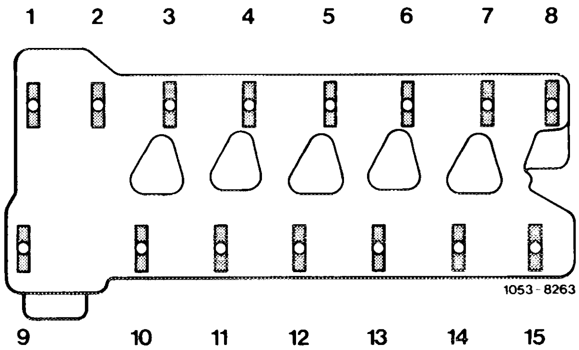
Special tool

Dial gauge holder for camshaft axial play		136 589 04 21 00

Note

For camshafts with reground bearing journals, **camshaft housings with repair stages −0.25 mm and −0.50 mm** are available.

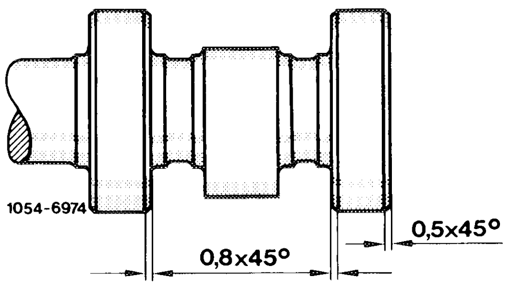
The bearing journals are not hardened.



Some exchange engines are delivered with camshaft bearings in intermediate and repair sizes. This means that a standard camshaft cannot be installed in this camshaft housing, since the bearing journals are larger in diameter than the bearings.

Also refer to coordination camshaft housing and camshafts (01–471).

Chamfer bearing journals after grinding (see sketch for dimensions).



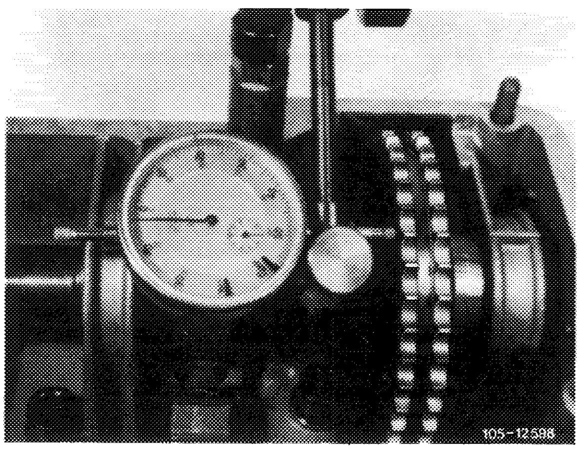
Checking axial play

1 Bolt dial gauge holder to camshaft housing.

2 Clamp dial gauge with a preload of about 3 mm.

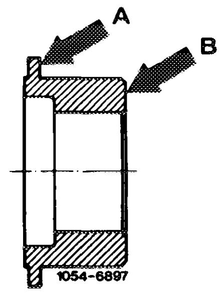
3 Press back camshaft and set needle at 0.

4 Press camshaft forward and read axial play.

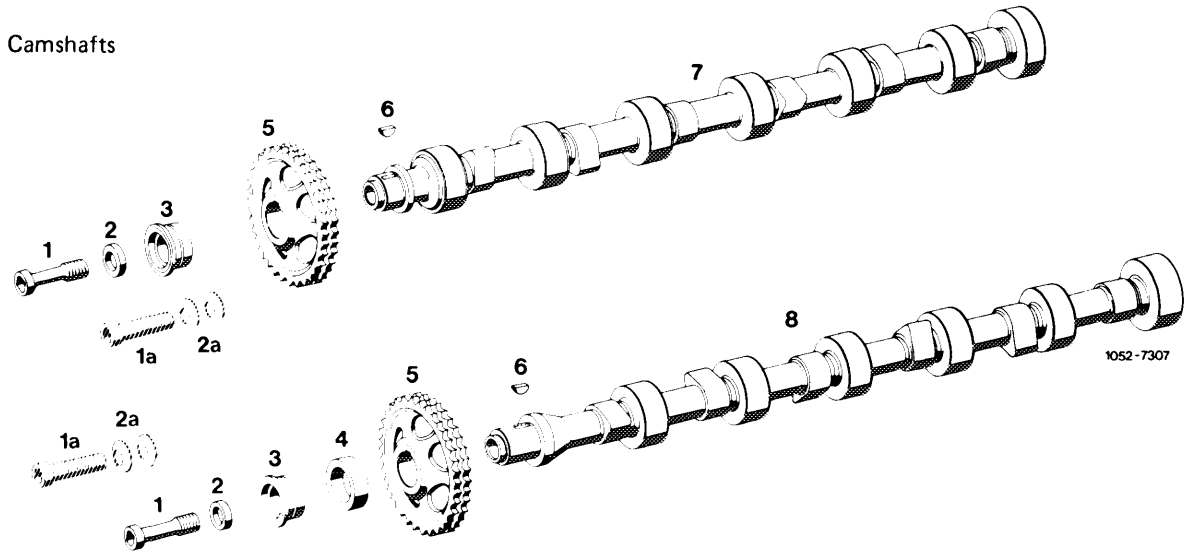


Note: If the end play is too small, grind spacing sleeve or driver at face B as required.

If the axial play is too large, the spacer or dog must be ground at collar A.



Camshafts



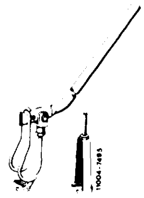
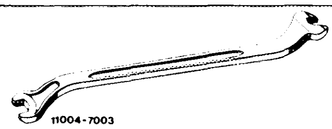
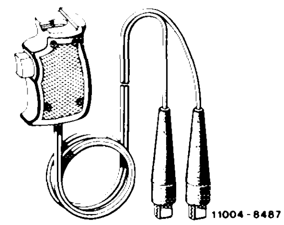
1	2 expansion bolts 2nd version	4	Spacer
1a	2 bolts 1st version (not valid)	5	2 camshaft sprockets
2	2 washers 2nd version	6	2 woodruff keys 4 x 6.5
2a	4 washers 1st version (not valid)	7	Exhaust camshaft
3	2 spacers	8	Intake camshaft

Valve clearance	Cold engine (ca. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below −20 °C.

Tightening torque	Nm	(kpm)
Cylinder head cover bolts and capped nuts	5	(0.5)

Special tools

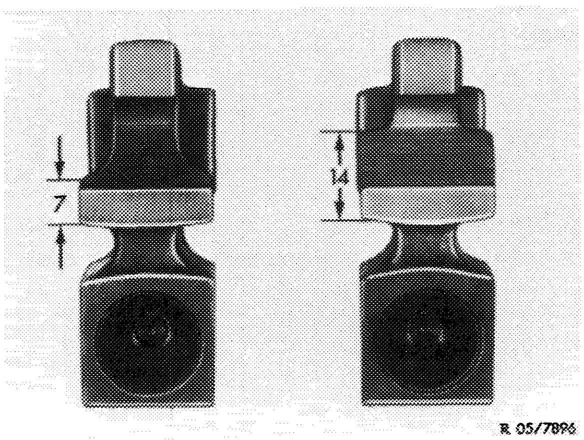
Depressor for valve spring		110 589 04 61 00
Valve adjusting wrench, 17 mm		110 589 01 01 00
Contact grip to turn engine (Part of compression recorder 001 589 46 21 00)		001 589 46 21 08

Note

1st version rocker arm, guiding surface 7 mm.

2nd version rocker arm, guiding surface 14 mm.

A 1st version rocker arm is replaced by a 2nd version rocker arm when repairing.



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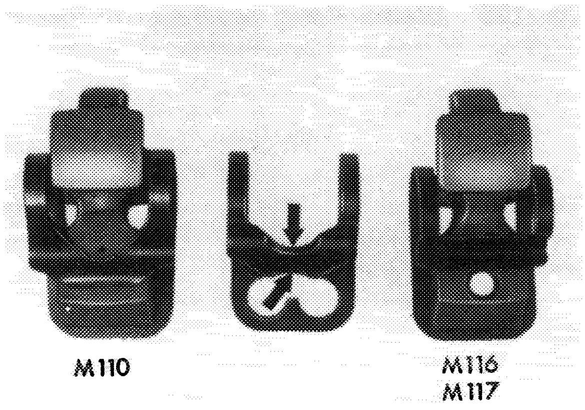
Attention!
The rocker arms and spring clamps of engines 110 are not interchangeable with the rocker arms and spring clamps of engines 116 and 117.

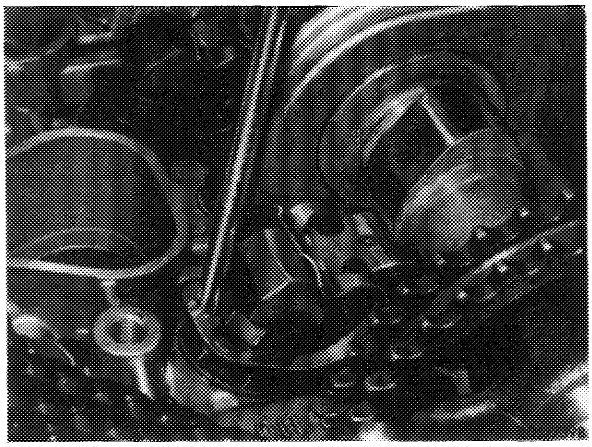
The standard spring clamps (arrows) can be installed in engines 110, 116 and 117.

Always install rocker arms on cam from which they were removed.



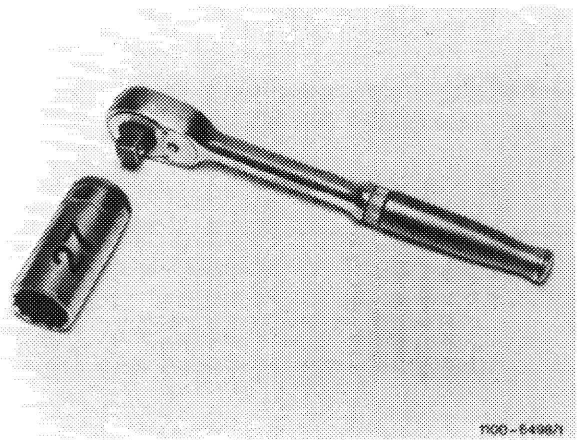
Removal

1 Press off spring clamps with a screwdriver.

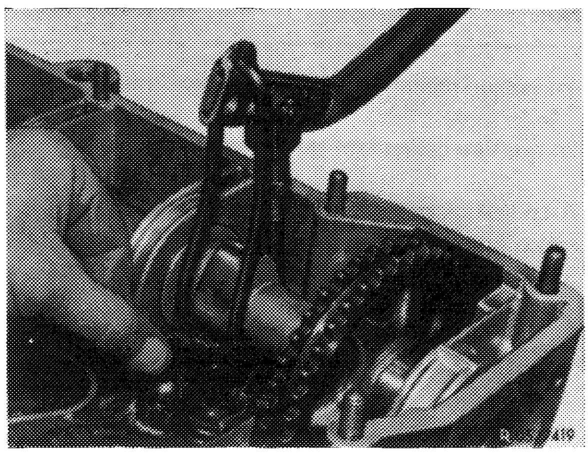


2 Turn crankshaft with combination tool until cam peak is up.

Never turn engine on camshafts.



3 Remove rocker arms with installation and removal tool.



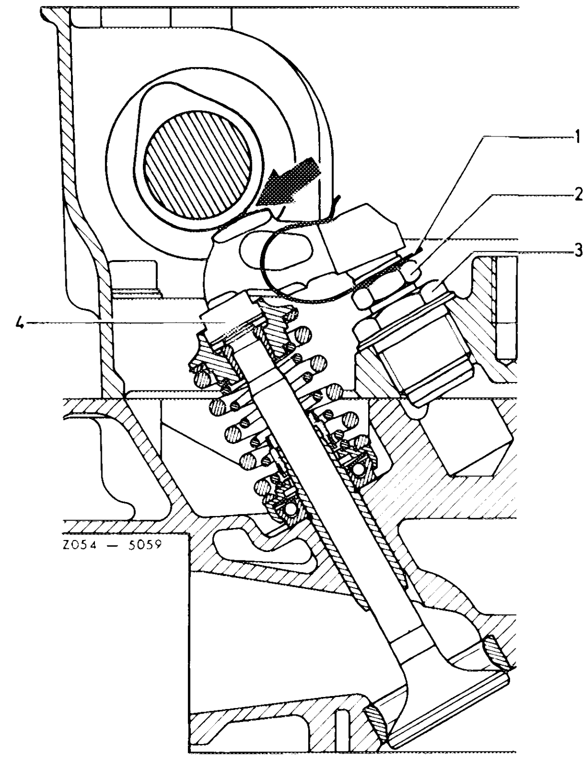
Installation

4 Check oil spray bore in rocker arm for plugging.

5 Coat bearing surfaces of rocker arm with oil and install rocker arm.

6 Press spring clamps into grooves of adjusting screws.

7 Adjust valve clearance (05–210).



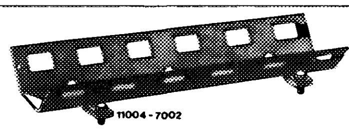
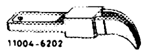
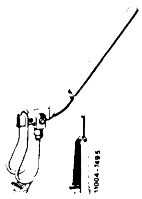
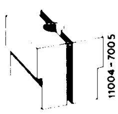
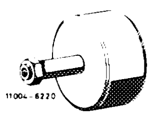
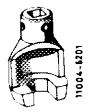
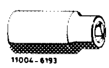
1 Spring clamp
2 Adjusting screw
3 Threaded bushing
4 Pressure pad

Valve clearance	Cold engine (ca. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below −20 °C.

Tightening torques	Nm
Cylinder head bolts M 12 x 1.5	100
M 8 bolts for camshaft housing	25
Mounting bolts for camshaft sprockets	80
Ball locating ring in chain tensioner	25
Cylinder head cover bolts and capped nuts	5

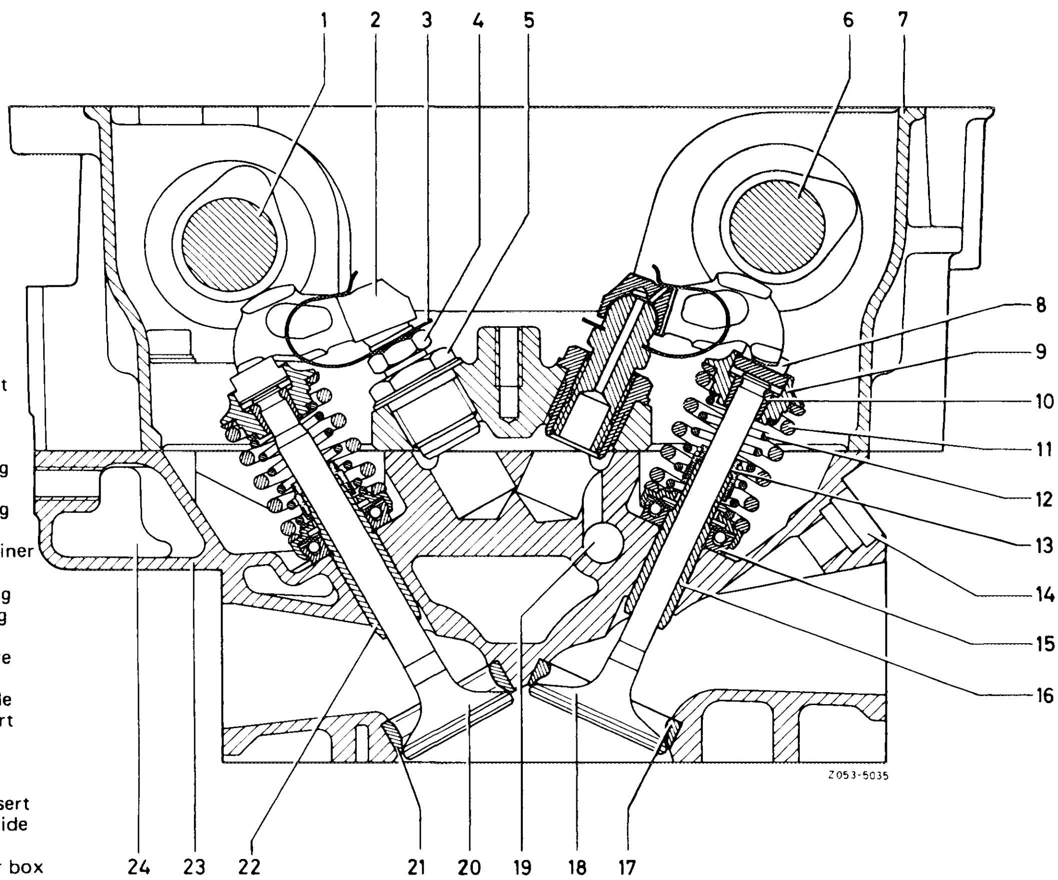
Special tools

Rail to hold down valve springs		110 589 06 62 00
Magnetic lifter for valve collets		116 589 06 63 00
Depressor for valve spring		110 589 04 61 00
Chain tensioner holder		110 589 02 31 00
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00
Valve adjusting wrench 17 mm, 1/2" square		110 589 00 01 00
Wrench socket 27 mm, 1/2" square to turn engine		001 589 65 09 00

Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00

Conventional tool

Cylinder leak tester	e.g. made by Bosch EFAW 210 A e.g. made by SUN CLT 228



Valve timing

1 Exhaust camshaft
2 Rocker arm
3 Spring clamp
4 Adjusting screw
5 Threaded bushing
6 Intake camshaft
7 Camshaft housing
8 Pressure pad
9 Valve spring retainer
10 Valve cone
11 Outer valve spring
12 Inner valve spring
13 Valve stem seal
14 Fuel injector bore
15 Rotocap
16 Intake valve guide
17 Intake valve insert
18 Intake valve
19 Oil bore
20 Exhaust valve
21 Exhaust valve insert
22 Exhaust valve guide
23 Cylinder head
24 Measuring sensor box

Removal

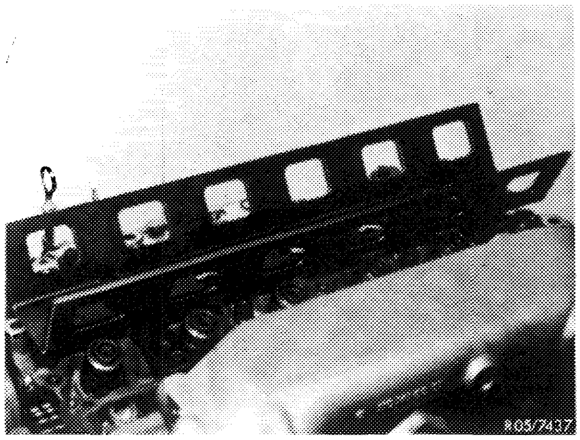
1 Remove camshaft housing (01–470).

2 Remove pressure pads (8).

3 Unscrew spark plug of respective cylinder and set piston to ignition TDC to prevent valves from dropping in.

4 Bolt hold-down rail to cylinder head.

5 Support valves with pneumatic air (cylinder leak tester).

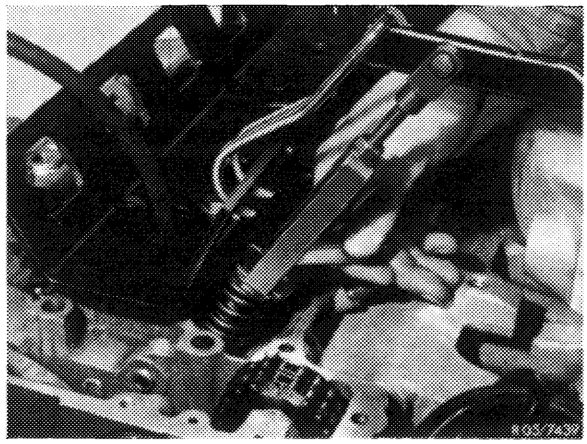


6 Loosen valve collets by applying light knocks from a hammer to valve spring retainers.

7 Press down valve spring retainer with removal and installation tool and remove valve collets with magnetic lifter.

Attention!
Valves must not rest on piston skirt, since this could bend the valves.

8 Remove valve spring retainer, outer and inner valve springs.



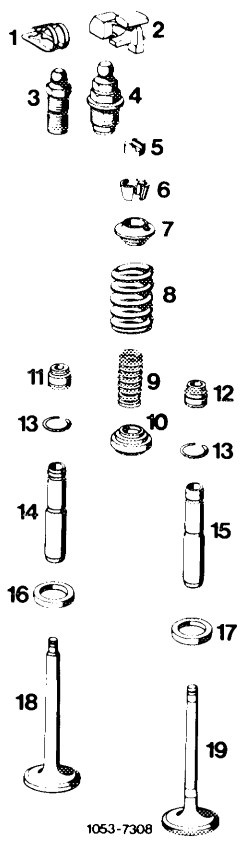
Installation

9 Check valve springs and replace if necessary (05–260).

10 Replace valve stem seals (05–270).

11 Further installation in reverse sequence of removal.

Attention!
Install valve springs that tighter coil ends rest on rotocap.



Valves and rocker arms

1 Spring clamp
2 Rocker arm
3 Adjusting screw
4 Threaded bushing with adjusting screw
5 Pressure pad
6 Valve cone
7 Valve spring retainer
8 Outer valve spring
9 Inner valve spring
10 Rotocap
11 Exhaust valve stem seal
12 Intake valve stem seal
13 Circlip
14 Exhaust valve guide
15 Intake valve guide
16 Exhaust valve insert
17 Intake valve insert
18 Exhaust valve
19 Intake valve

Valve springs

	Part No.	Color code	Outside dia. mm	Wire gage dia. mm	Relaxed length mm	Spring force at pretensioned length mm	New N	Limit N
Inner	130 053 00 22	yellow/brown or violet/brown	22–22.4	2.5	45	21.5	235	224–246
	110 053 02 20	yellow	33.8–34.1	4.6	49.5			
Outer (optional)	110 053 01 20	violet/red yellow/red	34.2	4.75	49	30.5	863	843–902

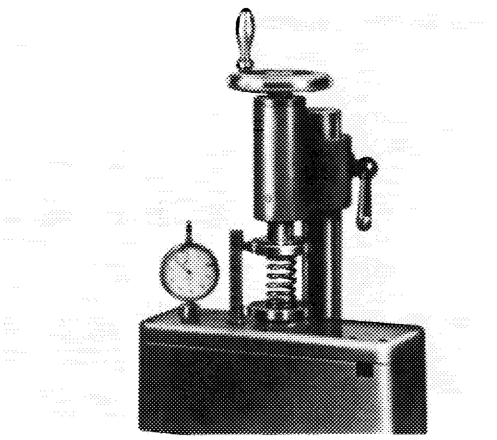
Checking

1 Check valve springs with a valve spring tester or a spring testing scale.

2 Check spring force at specified length.

3 If value is less than limit, replace valve springs.

Note: Prior to installation, check wire surface of used valve springs for corrosion.



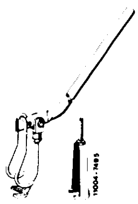
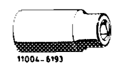
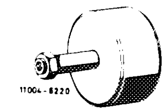
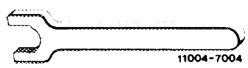
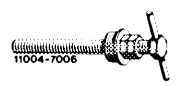
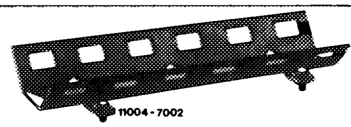
R 05/6385

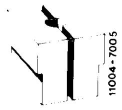
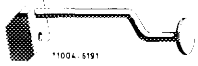
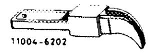
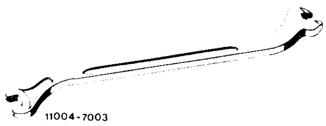
Valve clearance	Cold engine (ca. 20 °C)	Warm engine (60 °C ± 15 °C)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below –20 °C.

Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Cylinder head bots M 12 x 1.5	100
Bolts M 8 for camshaft housing to cylinder head and crankcase	25
Necked-down screws for camshaft sprockets	80
Ball locating ring in chain tensioner	25

Special tools

Depressor for valve spring		110 589 04 61 00
Socket 27 mm, 1/2" square for rotating engine		001 589 65 09 00
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00
Camshaft holding wrench		116 589 01 01 00
Rigid chain tensioner		110 589 03 31 00
Wrench socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00
Rail to hold down valve springs		110 589 00 62 00

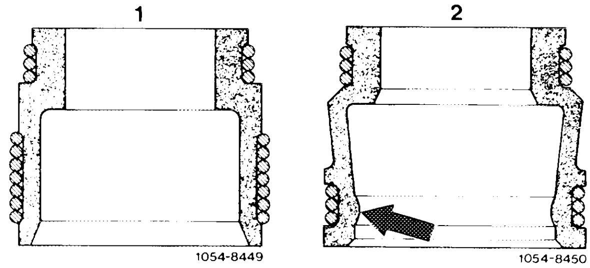
Chain tensioner holder		110 589 02 31 00
Assembly mandrel for valve stem seals intake and exhaust 9 mm dia.		116 589 00 43 00
Installation mandrel for exhaust valve stem seals 11 mm dia.		116 589 01 43 00
Magnetic lifter for valve collets		116 589 06 63 00
Valve adjusting wrench 17 mm		110 589 01 01 00

Note

Remove camshaft housing with camshafts (01–470) and pertinent valve springs (05–250) to replace valve stem seals.

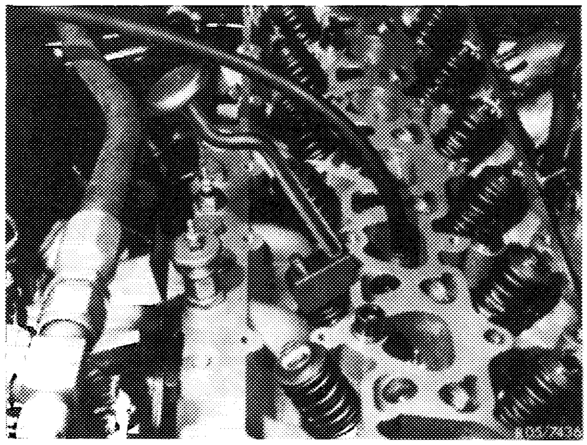
Valve stem seals are supplied in a repair kit with assembly sleeves.

1 2



The exhaust valve stem seal with 9 mm ID for engines starting April 1978 (emission-controlled engines starting model year 1980) has a holding bead inside (arrow) Do not mix up with intake valve stem seal without holding bead.

Valve guides, which are worn at the groove for the valve stem seal, must be replaced.



Valve stem seals

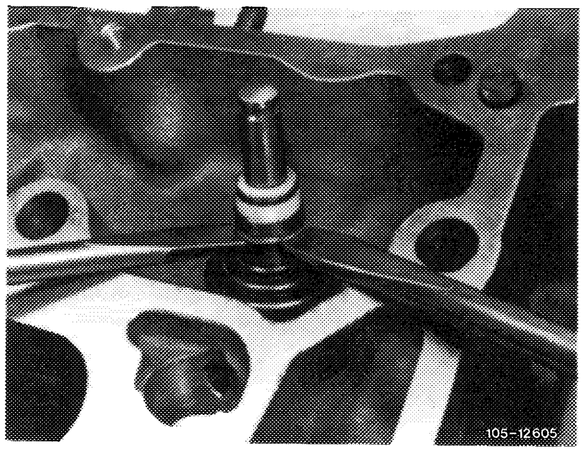
Repair set 123 586 03 05 (up to April 1978 or up to model year 1980 (USA)).

Repair set 110 586 03 05 (starting April 1978 or starting model year 1980 (USA)).

Replacing

1 Press off valve stem seals.

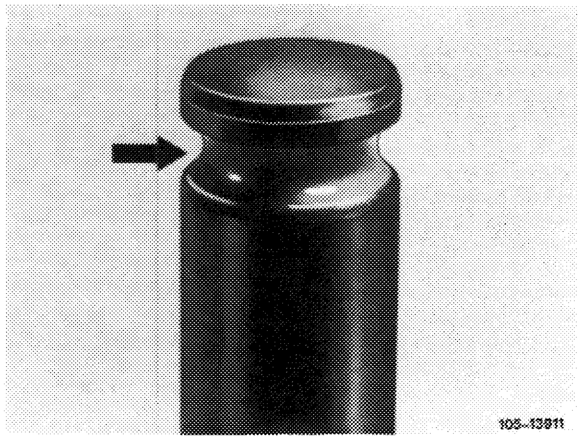
Attention!
Don't damage valve stem and valve guide.



2 Deburr valve stem at groove (arrow).

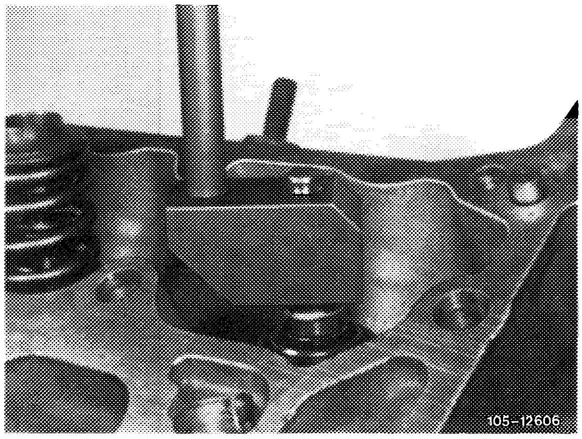
3 Replace dented valve cones and spring retainers.

4 Check Rotocap and replace if necessary.

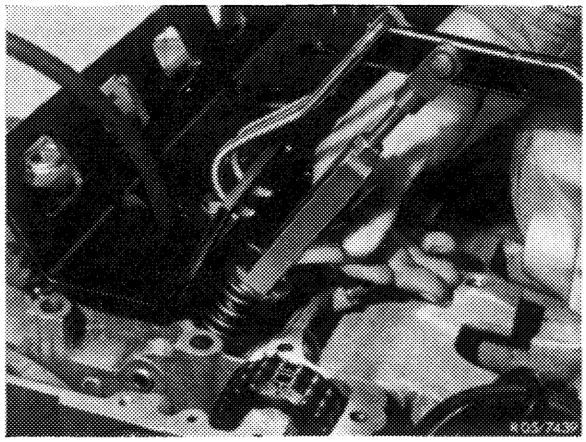


5 Lubricate valve stem seals and install with installation mandrel.

Use assembly sleeve on intake valve.



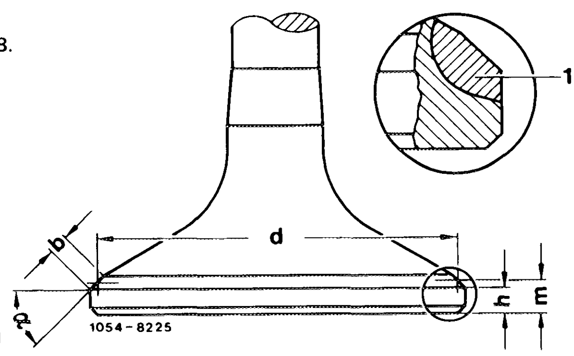
6 Install valve springs (05–250) and camshaft housing (01–470).



Data

		Intake valve	Exhaust valve Version 1	Exhaust valve[2]) Version 2
Valve retainer dia.		45.1–45.3	37.0–37.2	38.9–39.01
Valve stem dia.		8.95–8.97	10.94–10.96	8.94–8.96
Valve length		115	118	118
Code number at end of stem		E 110 06 E 110 07[1])	A 110 00 A 110 00 C	A 117 00 A 117 00 C
Filled-in sodium		without	with	with
Valve seat plating		with	with	with
Height „h" of valve retainer	When new	1.5	2.5	2.5
	Limit value	1.0	2.0	2.0
Width „b" of valve seat		1.8–3.0	1.5–2.5	
Dia. „d" on valve seat center		44.2	36.1	38.0
Height „m" up to valve seat center	When new	2.1–2.3	3.1–3.3	3.1–3.3
	Limit value	1.6–1.8	2.6–2.8	2.6–2.8
Adjusting angle for machining valves			45° + 15'	
Permissible runout on valve stem and valve seat max.			0.03	
Permissible runout at face of valve stem when held at valve stem			0.015	

[1]) Valve with spherical section.
[2]) Standard (except emission controlled engines) starting April 1978. Emission controlled engines starting model year 1980.



1 Valve seat plating

Conventional tools

Valve cone grining machine or Valve cone machining tool	e.g. made by Krupp, D-5309 Meckenheim model VS e.g. made by Hunger, D-8000 München 55 type VKDR 1, order no. 203.00.200

Note

The exhaust valves are filled with sodium!

Observe safety regulations when scrapping. Because of the danger of explosion sodium filled valves must not be melted or converted into tools (punches, etc.), without first removing the sodium filling.

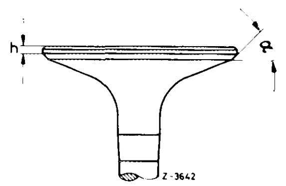
Be careful when removing sodium from valves, since sodium reacts violently and explosion-like when combined with water and watery solutions, to avoid any risk of fire caused by the resulting hydrogen gas.

Sodium from cut and broken valves can be neutralized in the open air in a vessel container in a mixture of 2 liters of spirits of alcohol and 1 liter of water.

Sodium filled valves can be collected and sent for neutralization to the Warranty Checking Department at Stuttgart-Untertürkheim.

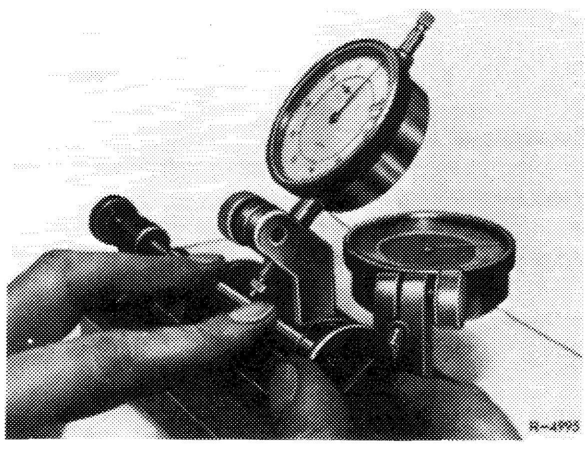
Checking and machining

1 Clean valves and inspect visually.



Valves with a burnt valve head, with insufficient height ,,h'' of valve head and valves with a worn or scored valve stem, must be replaced.

2 Check valve stem runout. If runout measure exceeds 0.03 mm, replace valve.

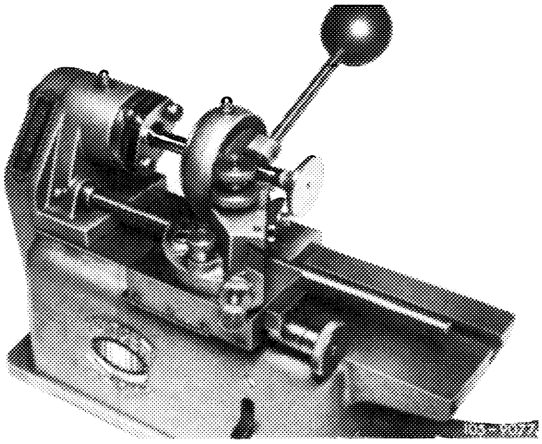


3 Machine valve seat.

Observe instructions supplied with machining equipment and adjusting angle of 45°.

4 Measure valve seat runout and valve head height ,,h''.

Replace valve, if limits have been reached.



Valve guides

	Step settings and part no.	OD	Color code	Basic bore in cylinder head	Code number in cylinder head [1])	Valve guide ID
intake	Standard dimension (110 050 25 24)	14.016–14.023	green	14.000–14.006	1	9.000–9.015
		14.021–14.028	without	14.007–14.012	2	
		14.026–14.033	brown	14.013–14.018	3	
	Intermediate stage 110 050 26 24	14.034–14.040	gray-green	–[1])		
		14.039–14.046	gray	–[1])		
		14.045–14.051	gray-brown	–[1])		
	1st repair stage 110 050 27 24	14.216–14.233	red	14.200–14.218		
	2nd repair stage 110 050 28 24	14.416–14.433	white	14.400–14.418		
exhaust 11 mm ⌀	Standard dimension 110 050 33 24	15.016–15.023	green	15.000–15.006	1	11.000–11.018
		15.021–15.028	without	15.007–15.012	2	
		15.026–15.033	brown	15.013–15.018	3	
	Intermediate stage 110 050 34 24	15.034–15.040	gray-green	–[1])		
		15.039–15.046	gray	–[1])		
		15.045–15.051	gray-brown	–[1])		
	1st repair stage 110 050 35 24	15.216–15.233	red	15.200–15.218		
	2nd repair stage 110 050 36 24	15.416–15.433	white	15.400–15.418		
	3rd repair stage 110 050 37 24	16.2 (roughing dim.)[2])	–	16.000–16.018		
exhaust 9 mm ⌀	Standard dimension 110 050 40 24	15.016–15.023	green	15.000–15.006	1	9.000–9.015[3])
		15.021–15.028	without	15.007–15.012	2	
		15.026–15.033	brown	15.013–15.018	3	
	Intermediate stage 110 050 41 24	15.034–15.040	gray-green	–[1])		
		15.039–15.046	gray	–[1])		
		15.045–15.051	gray-brown	–[1])		
	1st repair stage 110 050 42 24	15.216–15.233	red	15.200–15.218		
	2nd repair stage 110 050 43 24	15.416–15.433	white	15.400–15.418		
	3rd repair stage 110 050 44 24	16.2 (roughing dim.)[2])	–	16.000–16.018		

For overlap of valve guide in cylinder head refer to table: Association basic bore valve guide

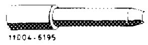
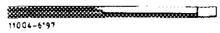
[1]) After kocking-out valve guide, the basic bore is not essentially larger than the series basic bore. On exchange engines the basic bore is machined and does not correspond to series basic bore.
[2]) For machining OD 16.016–16.033.
[3]) Series (except emisssion-controlled engines) starting April 1978. Emission-controlled engines starting model year 1980.

Special tools

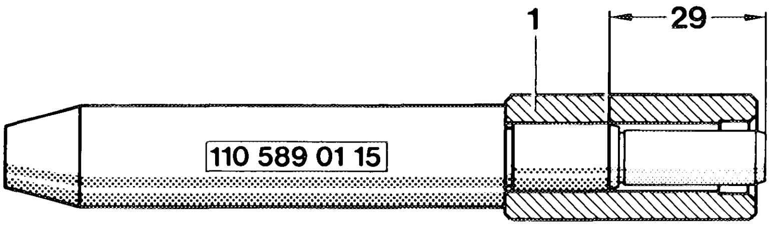
Master mandrel 9 mm dia. intake and exhaust — 116 589 08 21 00


11004-6211

Master mandrel 11 mm dia. exhaust — 116 589 09 21 00

Knock-out mandrel 9 mm dia. intake and exhaust		110 589 02 15 00
Knock-out mandrel 11 mm dia exhaust		110 589 03 15 00
Knock-in mandrel 9 mm dia. intake		116 589 20 15 00
Knock-in mandrel 11 mm dia. exhaust [1])		116 589 19 15 00
Reamer 8.99 mm dia. H 7 intake and exhaust		000 589 10 53 00
Reamer 10.99 mm dia. H 7 exhaust		000 589 15 53 00

[1]) Change former knock-in mandrel 110 589 01 15 00 according to following drawing, so that exhaust valve guides with 9 mm ID can also be knocked-in. Press-off sleeve (1), machine guide pin (dimension 29 mm), press sleeve (1) on again.



11004-9014

Conventional tool

Internal precision measuring instrument 8–12 mm dia.	e.g. made by Hommel, D-5000 Köln 71 Subito, order no. 33 830 103

Note

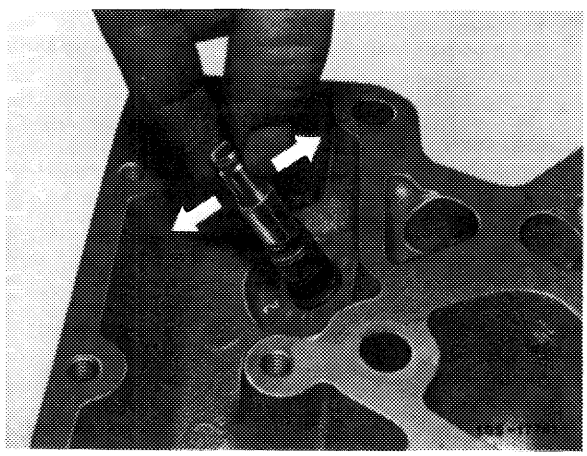
Valve guides which must be renewed due to wear, should permit installation in original basic bore in cylinder head without additional machining.

Valve guides which are loosely seated in cylinder head must be inserted in newly made basic bores.

Checking valve guide

Upon removal of valve spring and valve stem seal, the wear on valve guide can be determined in installed condition by moving valve stem predominantly cross-wise in relation to engine.

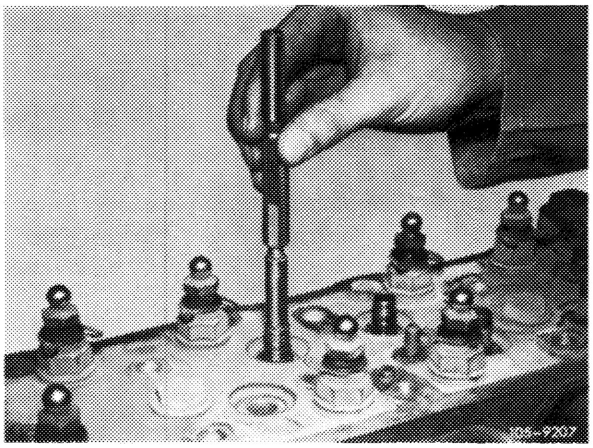
As a reference value, a max. wear of approx. 1.2 μm for 1000 km (0.12 mm for 100 000 km) should be assumed.



However, this value does not apply to upper and lower range of valve guide, since experience has shown that the wear at these points is higher.

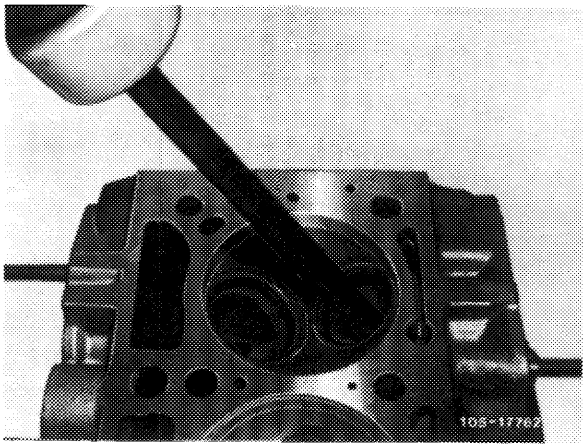
Check valve guides with inspection mandrel and cylinder head disassembled.

Valve guides, which are worn outside on seat of valve stem seal, should be replaced, since the valve stem seal is no longer tightly seated.



Assigning and inserting valve guides

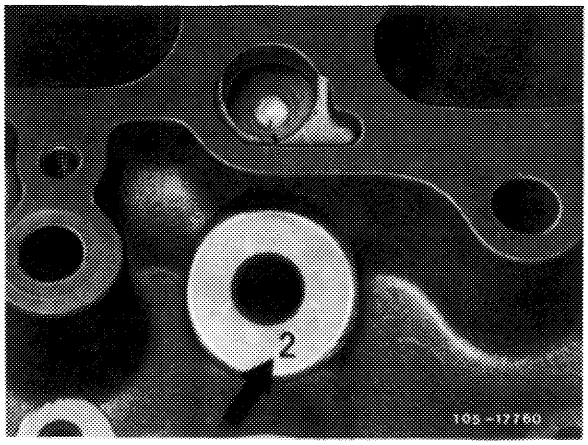
1 Knock-out valve guide with knock-out mandrel from direction of combustion chamber or press out.



2 Visually check basic bore in cylinder head for score marks and deposits.

Equalize deposits (if any) by means of a small file.

Attention!
A basic bore with punched-in code number, e.g. 2 (arrow) should be associated with the respective valve guide with regard to the applied color code or the measured OD.



On **exchange engines** the basic bore in cylinder head is larger than normal. This means, that the punched-in code numbers in cylinder head are no longer in accordance with basic bores according to table.

In such a case, measure basic bore or OD of knocked-out valve guide prior to pertinent association.

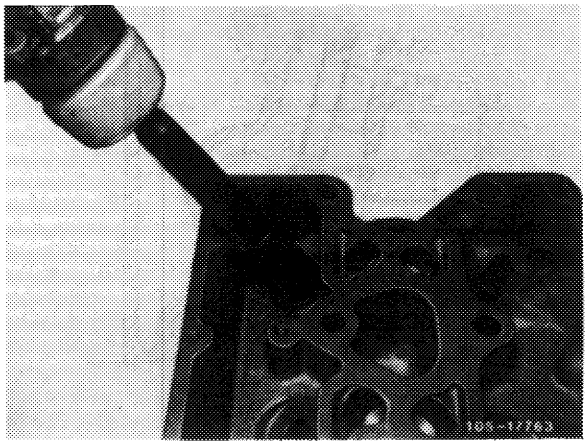
Association of a valve guide with a not-refinished basic bore in cylinder head

Punched-in code number adjacent to basic bore in cylinder head[1]	Color code of valve guide[2]	Overlap in cylinder head	Machining note
0	without	0.015—0.028	Knock-in valve guide with knock-in mandrel.
	brown	0.020—0.027	Undercool valve guide, knock-in with knock-in mandrel or heat cylinder head, knock-in with knock-in mandrel.
	gray-green[3]	0.028—0.040	Undercool valve guide, knock-in with knock-in mandrel, ream ID or heat cylinder head, knock-in, ream ID with reamer.
1	brown	0.019—0.026	Knock-in valve guide with knock-in mandrel.
	gray-green	0.022—0.033	Undercool valve guide, knock-in with knock-in mandrel or heat cylinder head, knock-in with knock-in mandrel.
	gray[3]	0.027—0.039	Undercool valve guide, knock-in with knock-in mandrel, ream ID or heat cylinder head, knock-in, ream ID with reamer.
2	gray-green	0.016—0.027	Knock-in valve guide with knock-in mandrel.
	gray	0.021—0.033	Undercool valve guide, knock-in with knock-in mandrel or heat cylinder head, knock-in with knock-in mandrel.
	gray-brown[3][4]	0.027—0.038	Undercool valve guide, knock-in with knock-in mandrel, ream ID or heat cylinder head, knock-in, ream with reamer.

[1] After knocking-out valve guide, the basic bore is not essentially larger than the series basic bore.
On exchange engines the basic bore is machined and does no longer correspond to series bore.
[2] Valve guides with color code "green", overlap 0.010—0.023 mm, should not be used since they may become loose.
[3] Use valve guides which require inside reaming after knocking-in, should be used only if no other valve guides are available.
[4] Valve guide gray-brown with 0.027—0.038 mm overlap, may also be installed into cylinder head instead of a slightly loose valve guide without refinishing basic bore.

3 Insert valve guide for approx. 3–4 minutes into liquid oxygen, then insert **immediately** into knock-in mandrel and **immediately** into respective bore while following-up with a hammer.

Note: If the valve guide is not knocked-in immediately up to locking ring, it will absorb the temperature of the cylinder head and can then be completely knocked-in with considerable difficulty.

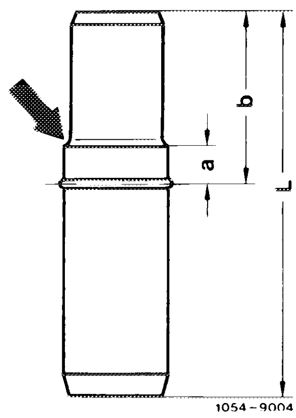


4 If no liquid oxygen is available, heat cylinder head in a water bath, e.g. a parts washing system or a heating oven to max. 80 °C (176 °F).

5 Coat valve guide with tallow and knock-in with knock-in mandrel until circlip or knock-in mandrel rests against cylinder head.

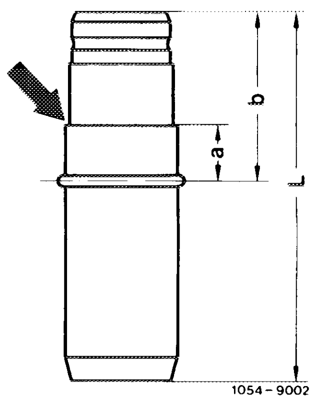
Attention!
Use specified knock-in mandrel only.

The stop in knock-in mandrel is adapted to valve guide and dimension a in such a manner that the valve guide can be knocked into end position without damage.



Intake valve guide

	Intake	Exhaust
a	5	7.5
b	23	20.5
L	51.5	54
ID	9	9 starting April 1978 starting (USA) 1980
		11 up to April 1978 up to (USA) 1980

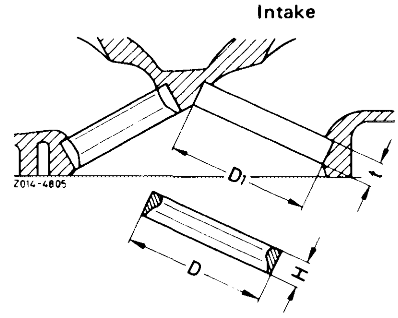


Exhaust valve guide

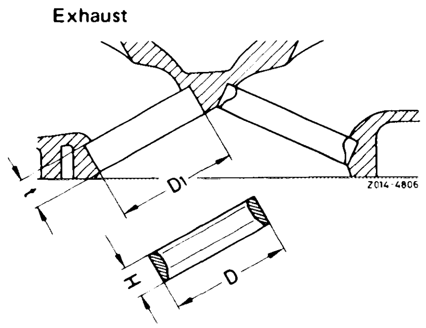
Data

Overlap of valve seat rings in cylinder head	0.08–0.10

Intake	Normal dimension		Repair stage
D	47.10 / 47.09		Rough dimension 48.30
D1	47.00 / 47.01		Max. up to 48.00
t		8.60 / 8.70	
H		8.60 / 8.51	



Exhaust	Normal dimension		Repair stage	
	Version 1	Version 2 [1]	Version 1	Version 2 [1]
D	40.10 / 40.09	42.10 / 42.09	Rough dimension 41.3	43.3
D1	40.00 / 40.01	42.00 / 42.01	max. up to 41.00	max. up to 43.00
t		10.50 / 10.60		
H		10.50 / 10.39		



[1] Series (except emission-controlled engines) starting April 1978. Emission-controlled engines starting model year 1980.

Conventional tools

Plug gauge 9 mm dia. for intake and exhaust valve guide	116 589 08 21 00
Plug gauge 11 mm dia. for exhaust valve guide	116 589 09 21 00

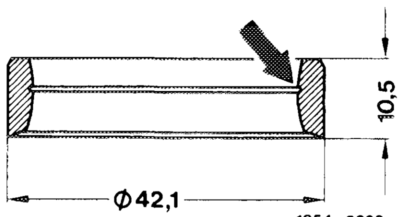
Conventional tools

Cylinder head clamping device	e.g. made by Christ, D-6801 Neckarhausen order no. DBK 60-2
Ring seat machining tool	e.g. made by Hunger, D-8000 München size 2, order no. 220.03.110
Valve seat machining tool	e.g. made by Hunger, D-8000 München order no. 236.03.308, type VDSNL 1/45/30
Test set for valves	e.g. made by Hunger, D-8000 München order no. 216.93.300

Internal micrometer (range 25–60 mm)	e.g. made by Mahr, D-7300 Esslingen order No. 844
External micrometer (range 25–50 mm)	e.g. made by Mahr, D-7300 Esslingen order No. 40 S

Note

Exhaust valve seat rings for unleaded fuel with red or blue color dot on inside may be installed only in USA engines starting model year 1975. Starting model year 1980 these valve seat rings are identified by a machined groove (arrow).

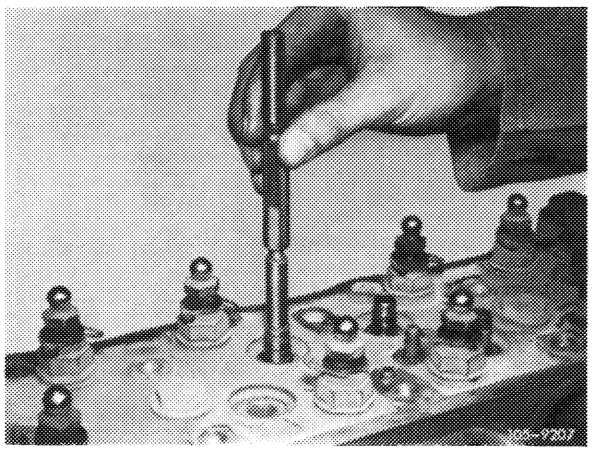


1054-8923

Replacing

1 Unscrew old valve seat ring by means of ring seat machining tool.

2 Check valve guides, replacing if necessary (05–285).



3 Measure basic bore D1.

A new standard size valve seat insert can be used, if the specified overlap is given.

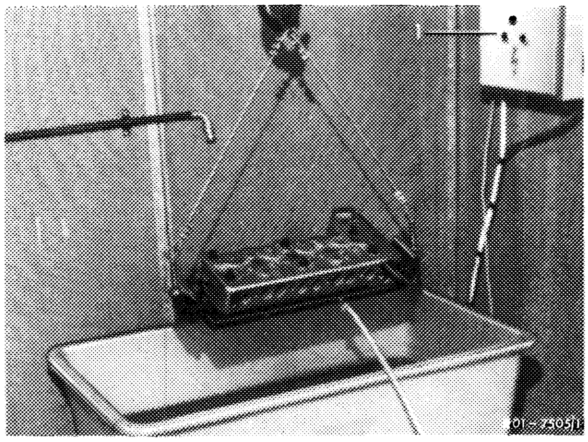
4 Machine basic bore repair stage D1 with ring seat machining tool in such a manner that bore is just cleaned.

5 Measure machined basic bore.

6 Provide specified overlap by machining the oversize valve seat inserts.

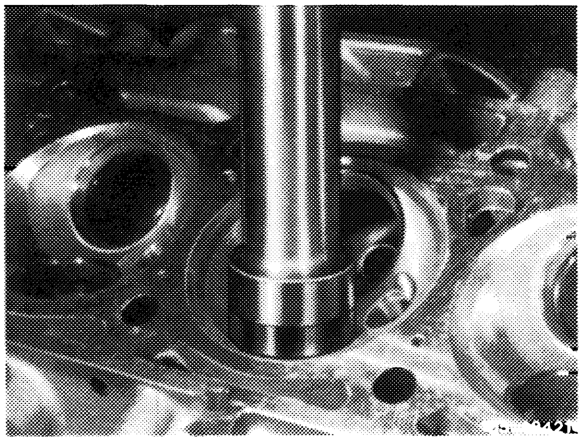
7 Heat cylinder head in water to approx. 80 °C (176 °F).

8 Undercool valve seat insert with fluid air.

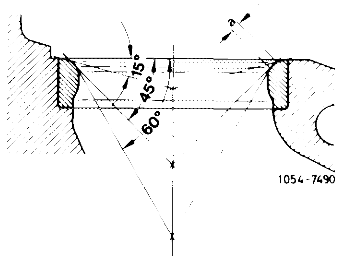


9 Knock in valve seat insert with a pertinent mandrel.

10 Machine valve seats (05–291).



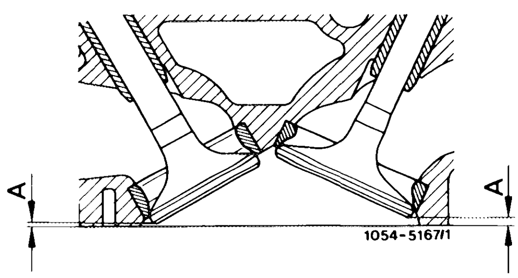
Data	Intake	Exhaust
Valve seat width a	1.8–2.5	1.5–2.0
Valve seat angle	45°	
Correction angle, top	15°	
Correction angle, bottom	60°	
Permissible runout of valve seat	0.05	



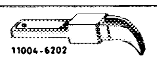
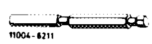
		Minimum distance A with new valves and new valve seats, cylinder head parting surface not machined	Minimum distance A with new valves and new valve seats, cylinder head parting surface 0.4 mm milled off
Intake		3.3	2.9
Exhaust	Valve retainer dia. 37 mm	0.6	0.2
	Valve retainer dia. 39 mm	0.04	0.36 standout

		Max. distance A with new valves and machined valve seats, cylinder head parting surface not machined	Max. distance A with new valves and machined valve seats, cylinder head parting surface 0.4 mm milled off
Intake		4.2	3.8
Exhaust	Valve retainer dia. 37 mm	1.5	1.1
	Valve retainer dia. 39 mm	0.94	0.54

Max. distance A is reduced by the same dimension by which the cylinder head parting surface has been machined down.



Special tools

Magnetic lifter for valve cone halves		116 589 06 63 00
Master mandrel 9 mm dia. for intake and exhaust valve guide		116 589 08 21 00
Master mandrel 11 mm dia. for exhaust valve guide		116 589 09 21 00

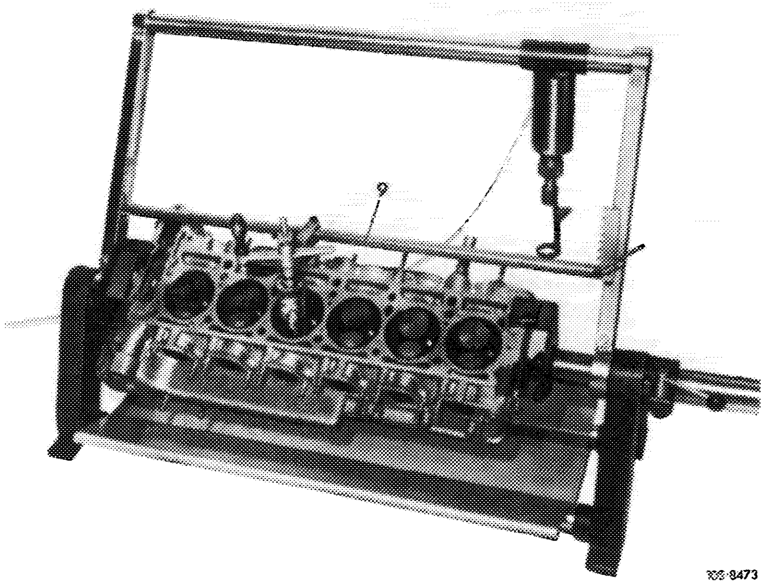
Conventional tools

Cylinder head clamping device	e.g. made by Rothenberger, D-6233 Kelkheim order no. 2.9900
Valve seat machining tool	e.g. made by Hunger, D-8000 München type VDSNL 1/45/30 order No. 236.00.308
Test set for valve seats	e.g. made by Hunger, D-8000 München order No. 216.93.300
60° correcting bit No. 13 for bottom correction angle	e.g. made by Hunger, D-8000 München order No. 216.64.622

Note

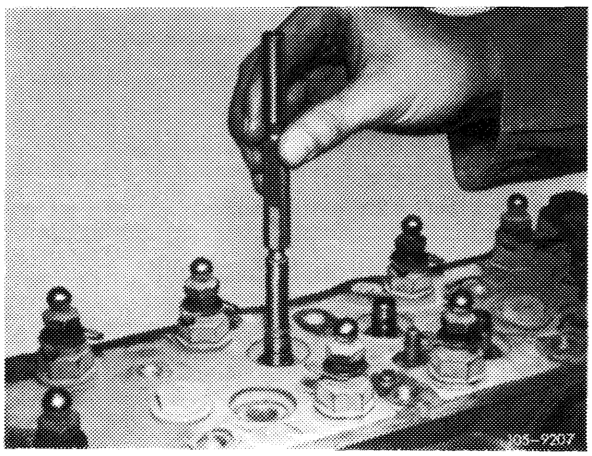
Clamp cylinder head in clamping device for disassembly and machining.

Machine valve seats with valve seat machining tool, valve seat grinding machine or with a valve seat cutter.



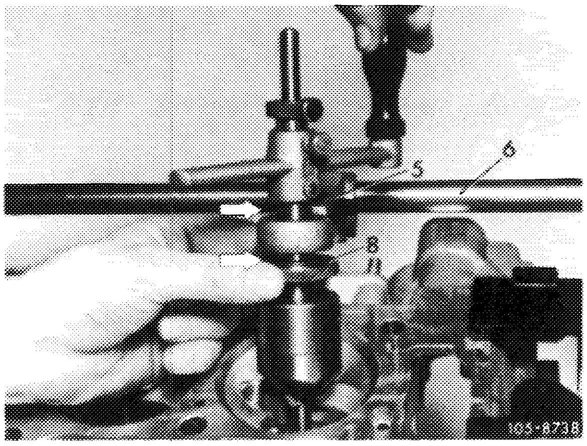
Machining valve seats

1 Check valve guides, replacing if necessary (05–295).



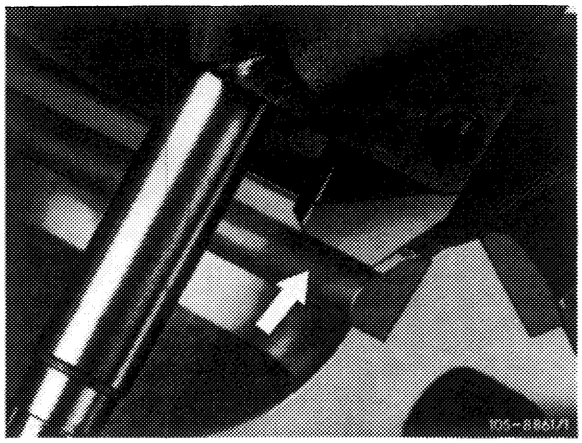
2 Machine valve seat (45°) according to instructions of tool manufacturer.

Attention!
First loosen pilot after runout of valve seat has been checked (point 5).

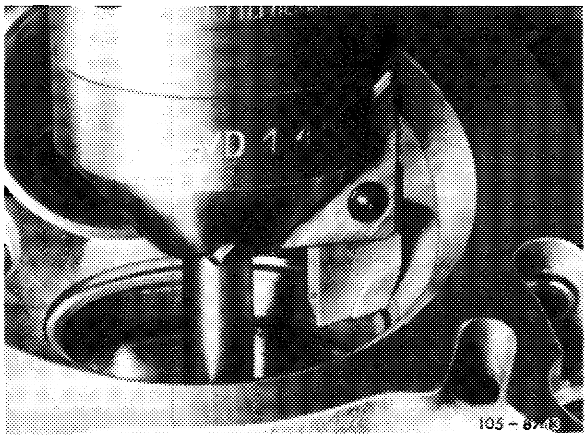


3 Correct bottom of valve seat to 60°.

Attention!
Do not machine bead (arrow) on lower part of valve seat.

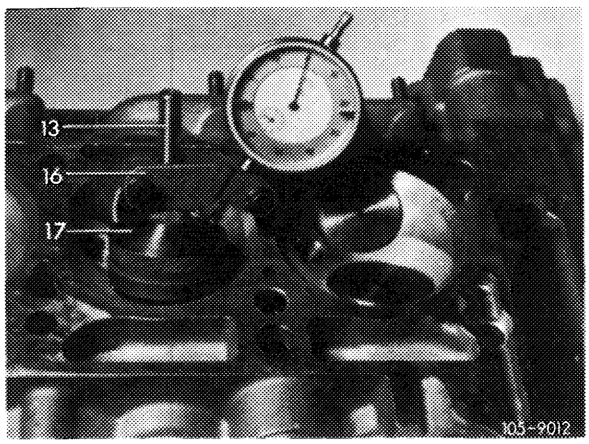


4 Measure valve seat width, and, if necessary, correct top to 15°.



5 Check valve seat runout.

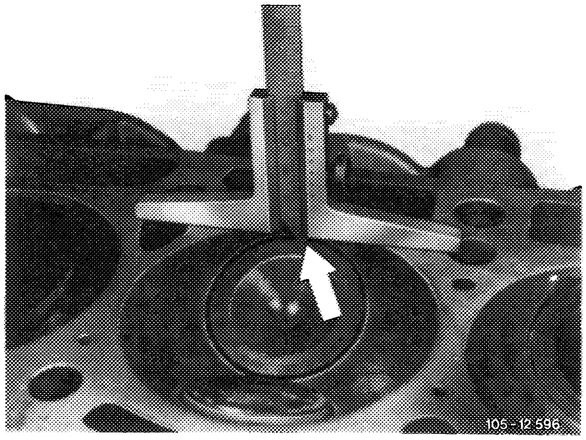
This requires sliding test sleeve (17) with dial gage holder (16) and dial gage on to pilot, and turning test sleeve. In so doing the permissible runout must not exceed 0.05 mm.



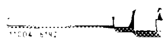
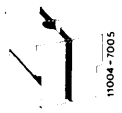
13 Pilot
16 Dial gage holder
17 Test sleeve

6 Guide in new valve and check max. distance A (arrow).

If necessary, replace valve seat insert (05–140).



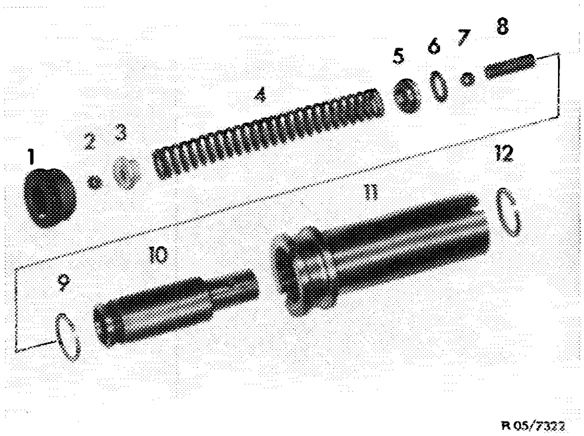
Tightening torques	Nm
Ball locating ring (oil jet) in chain	25
Plug	50
Threaded ring	50

Special tool		
Wrench socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00
Holder for chain tensioner		110 589 02 31 00

Conventional tools	
Screwdriver socket 19 mm 1/2" square	e.g. made by Hazet, D-5630 Remscheid order No. 985–19
Screwdriver socket 17 mm 1/2" square	e.g. made by Hazet, D-5630 Remscheid order No. 985–17

Note

Chain tensioners are available in two versions and interchangeable with each other.



1st version

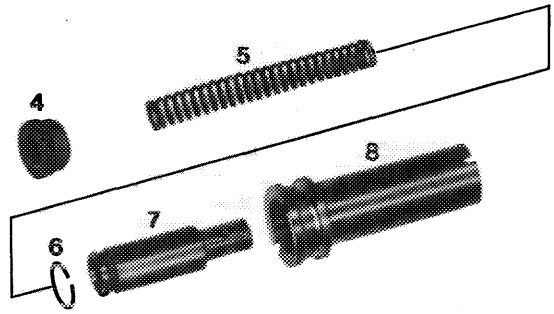
1 Ball seat ring with 3.0 mm bore
2 Ball
3 Ball cage
4 Spring
5 Valve disc
6 O-ring
7 Ball
8 Spring
9 Snap ring
10 Pressure pin
11 Housing
12 Snap ring

The 2nd version chain tensioner does not have valves and its oil jet (4) has a 1.1 mm bore.

Difference when installed:

1st version: bore in ball locating ring closed by ball.

2nd version: bore in oil jet can be checked for plugging with a piece of 1 mm dia. wire.

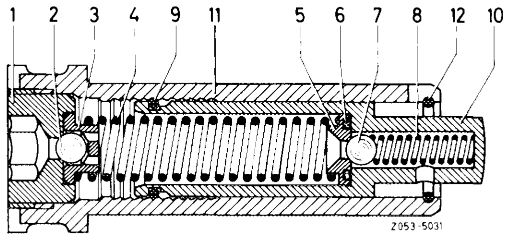


R05-7322/2

2nd version

4 Oil nozzle with 1.1 mm bore
5 Spring
6 Snap ring
7 Pressure pin
8 Housing

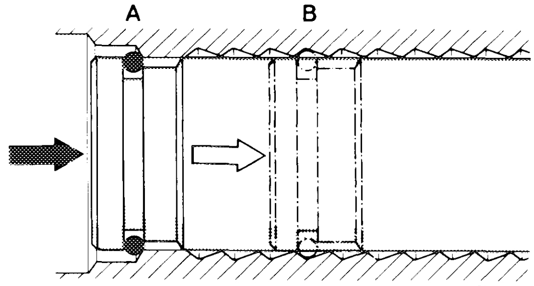
Attention!
Without counterpressure from the clamping rail the pressure pin (10) with snap ring (9) will be pressed forward up to the stop by spring (4).



Z053-5031

Chain tensioner in operating position

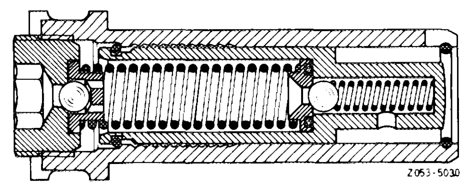
1 Ball locating ring
2 Ball
3 Ball cage
4 Spring
5 Valve disc
6 O-ring
7 Ball
8 Spring
9 Snap ring
10 Pressure pin
11 Housing
12 Snap ring



Z053-5032

The pressure pin cannot be pressed back beyond the saw tooth type catch in assembly position „A".

Thus the chain tensioner must be disassembled before each installation to move the pressure pin to assembly position „A", since otherwise the timing chain would be too tight.

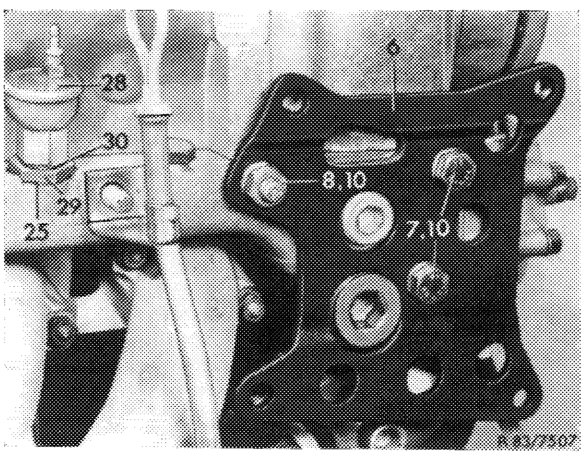


Z053-5030

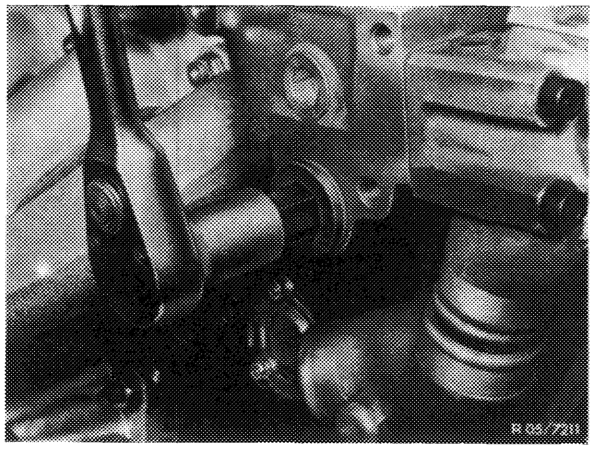
Chain tensioner in assembly position.

Removal

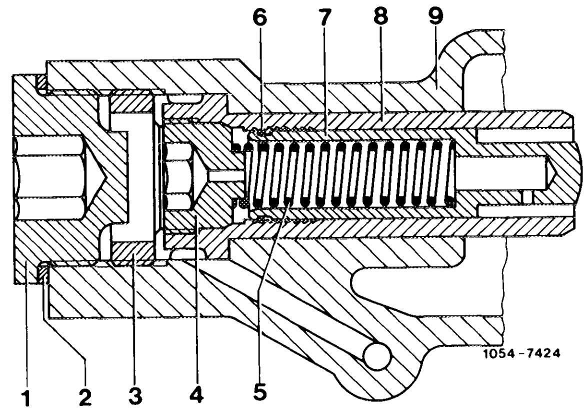
1 Remove battery and compressor of models with an air conditioner.



2 Remove plug with the 17 mm screwdriver socket.

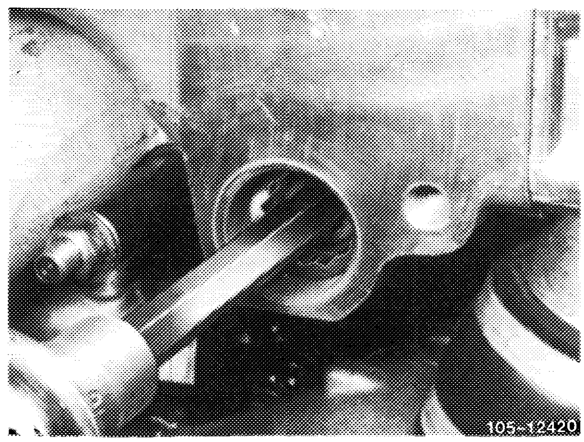


Attention!
If a 2nd version chain tensioner is installed, during **assembly** it will be sufficient to **first remove spring** (5) of an installed chain tensioner at the chain drive (e.g. remove camshaft sprocket or tensioning rail).

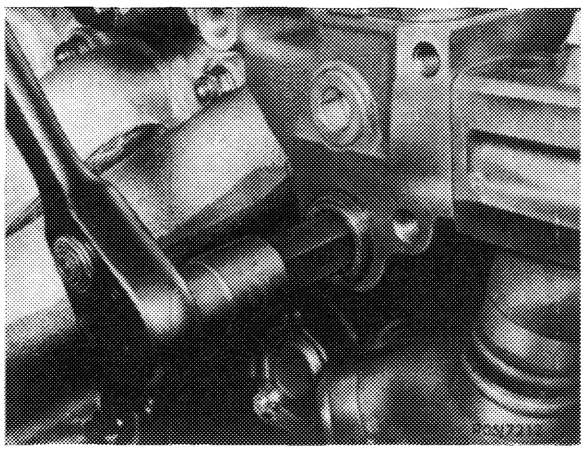


3 Loosen ball locating ring (oil jet) by about 2 turns with a socket wrench.

This requires that the threaded ring be tightened.



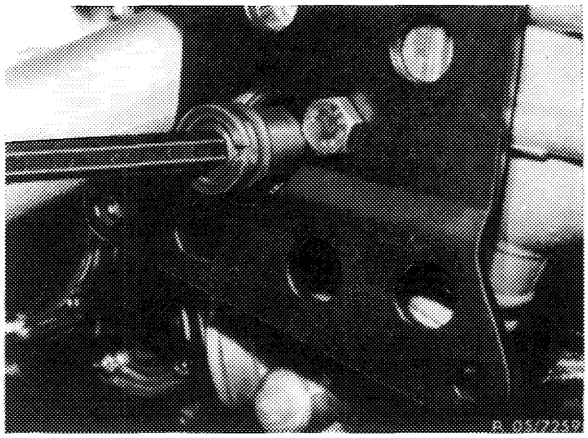
4 Remove threaded ring with a 19 mm screwdriver socket.



5 Pull out chain tensioner with a 10 mm socket wrench.

This requires that the socket wrench be canted slightly and the chain tensioner turned to the right.

For pulling out stuck chain tensioner, screw a M 18 x 1.5 screw into chain tensioner housing instead of ball seat ring (oil nozzle).

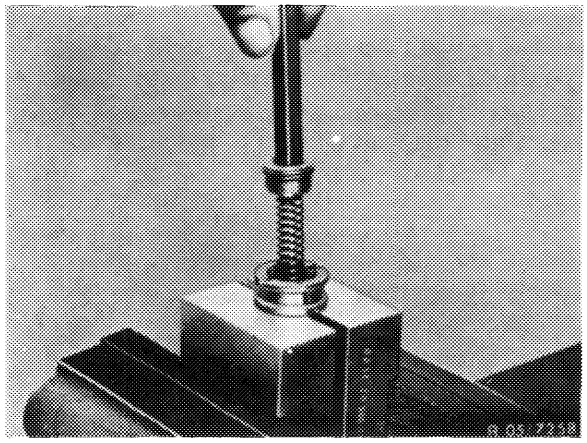


Disassembling

6 Clamp chain tensioner in holders.

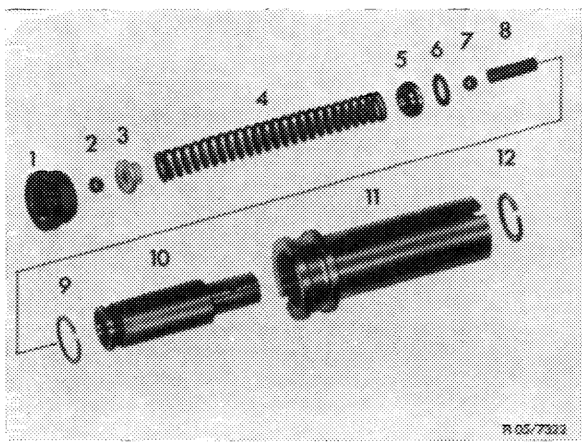
7 Unscrew ball seat ring (oil nozzle) with hex. socket wrench.

When disassembling be careful of the spring force and apply counterpressure with a socket wrench.



8 Remove spring (4) with ball cage (3), ball (2) and valve disc (5).

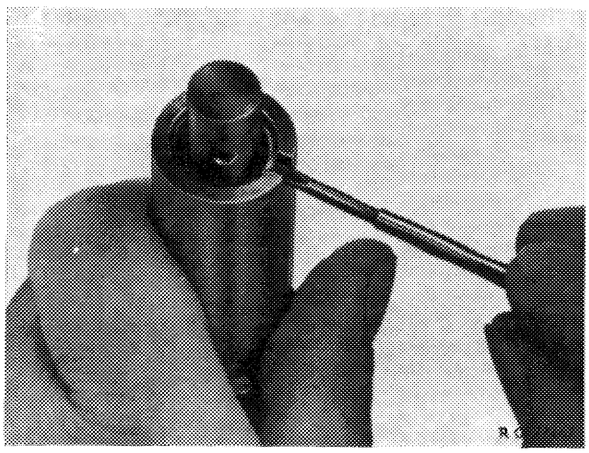
9 Relief chain tensioner, remove ball (7) and spring (8) from pressure limit valve.



10 Take off snap ring (12) with a small screwdriver.

11 Pull out pressure pin toward front (pressure direction).

12 Clean out parts thoroughly.

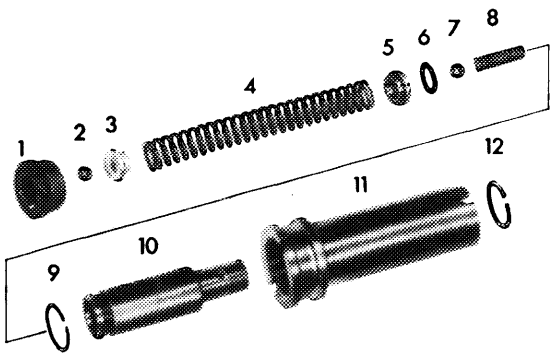


Assembling and installation

1st version

13 Clamp housing (11) with installed snap ring (12) in holders.

14 Install pressure pin (10) with snap ring (9) from above. The snap ring rests on the assembly chamfer and prevents the pressure pin from falling through onto a catch.



R 05/7322

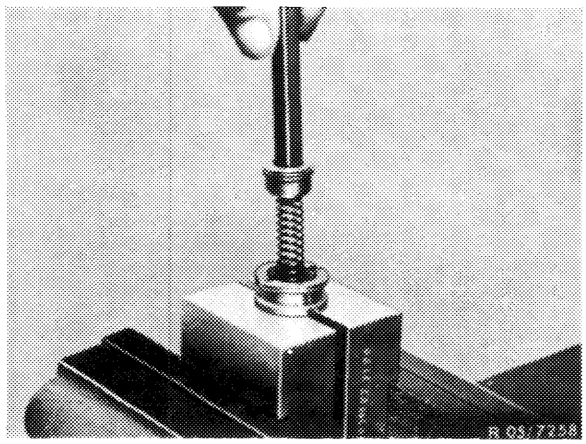
15 Install spring (8) and ball (7) of pressure limit valve.

16 Install spring (4) with valve disc (5) and O-Ring (6).

17 Place ball cage (3) and ball (2) on spring (4).

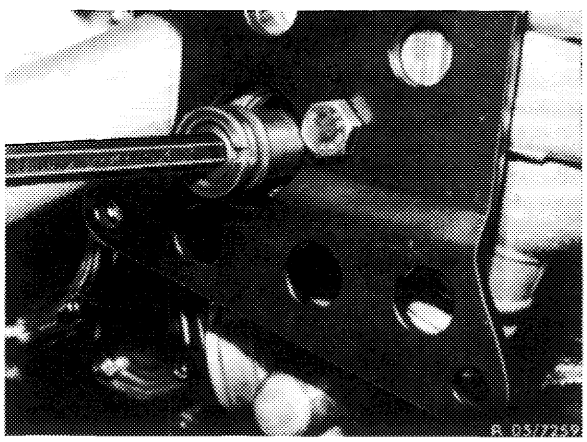
18 Install ball locating ring (1) on ball cage with an internal socket wrench. Compress spring (4) and screw ball locating ring into housing by **about 2** turns.

Attention!
Don't tighten ball locating ring, since otherwise the pressure pin will jump forward and the chain tensioner will have to be disassembled again.



19 Guide chain tensioner into chain tensioner hole in cylinder head with an internal socket wrench.

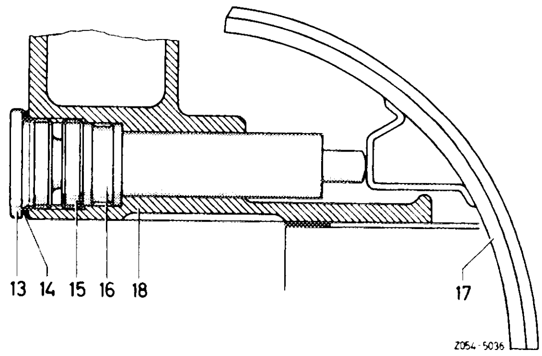
Attention!
Don't apply knocks to socket wrench, since otherwise the pressure pin will jump forward.



20 Install threaded ring (15) and tighten to a torque of 50 Nm.

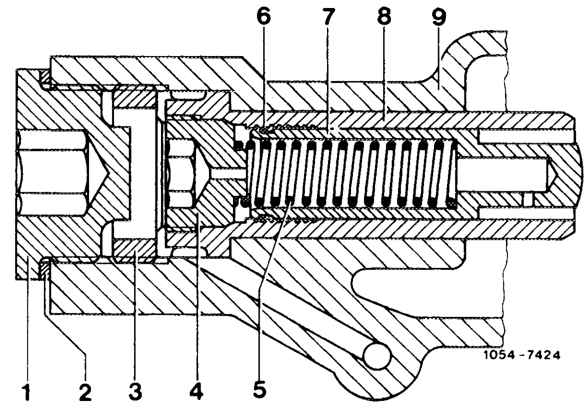
21 Tighten ball locating ring to 25 Nm whereby the pressure pin must **make a clicking noise** as it jumps forward.

22 Install plug (13) with seal (14) and torque to 50 Nm.

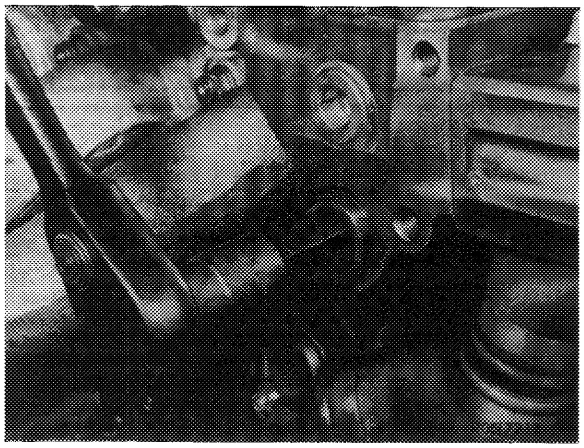


2nd version

23 Guide housing (8) into cylinder head.

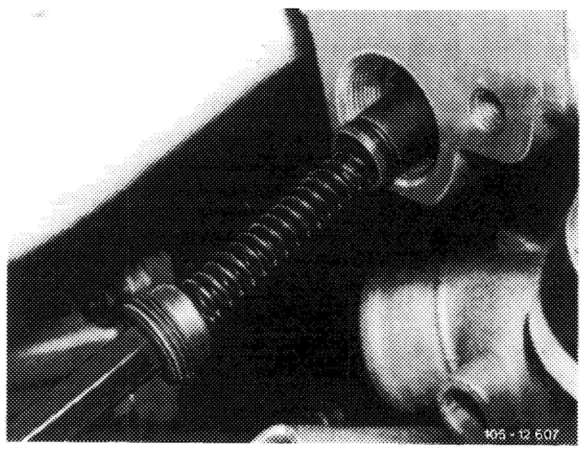


24 Install threaded ring (3) and torque to 50 Nm.



25 Install pressure pin (7) with installed snap ring (6) and spring (5) in housing and torque oil jet (4) to 25 Nm, whereby the pressure pin must **make a clicking noise** as it jumps forward.

26 Install plug (1) with seal (2) and torque to 50 Nm.

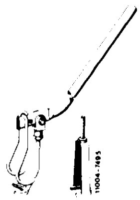
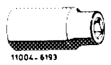
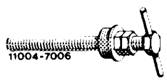
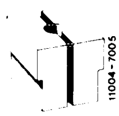
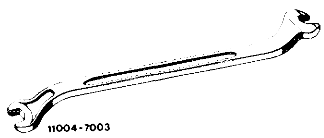


Valve clearance	Cold engine (approx. 20 °C) (68 °F)	Warm engine (60 °C ± 15 °C) (140 °F ± 59 °F)
Intake	0.10[1])	0.15[1])
Exhaust	0.25	0.30

[1]) 0.05 mm more for consistent outside temperatures below –20 °C (–4.0 °F).

Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Chain tensioner ball locating ring	25
Valve adjusting screw	20–40

Special tools

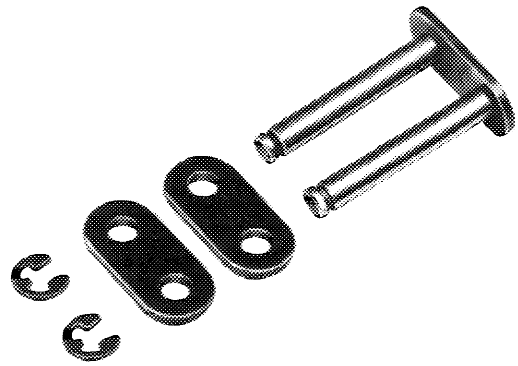
Depressor for valve springs		110 589 04 61 00
27 mm wrench socket, 1/2" square, to turn engine		001 589 65 09 00
Rigid chain tensioner		110 589 03 31 00
Holder for chain tensioner		110 589 02 31 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Wrench socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00

Note

For repairs a repair chain with plug link, part no. 000 997 69 94 is available.

If only an endless timing chain with 130 links is available, chain can be split by grinding into **both pins of a link** and using a plug link for assembly. (Do not apply pressure, since this would result in lateral deflection). Use only one plug link, part no. 000 997 05 98 with two lock washers.

Check sprockets for scoring and pitting.



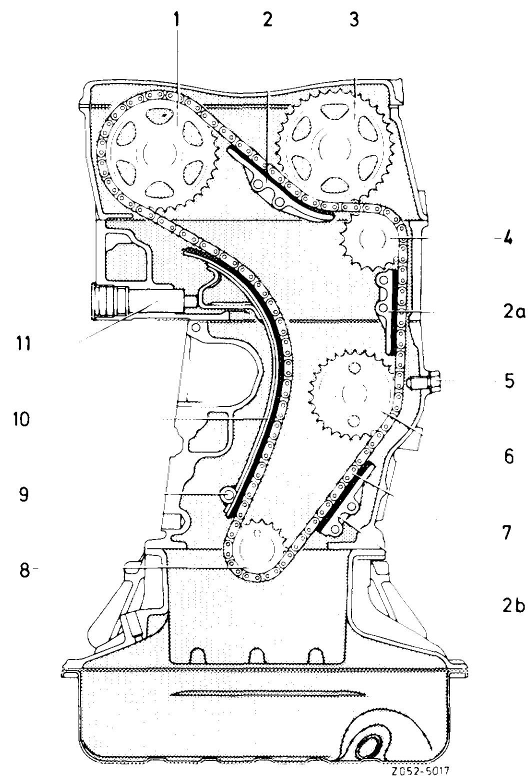
105-9259

Replacing

1 Remove spark plugs and take off cylinder head cover.

2 Remove rocker arm of righthand camshaft (exhaust) (05–230), so that camshaft will not rotate in jerks.

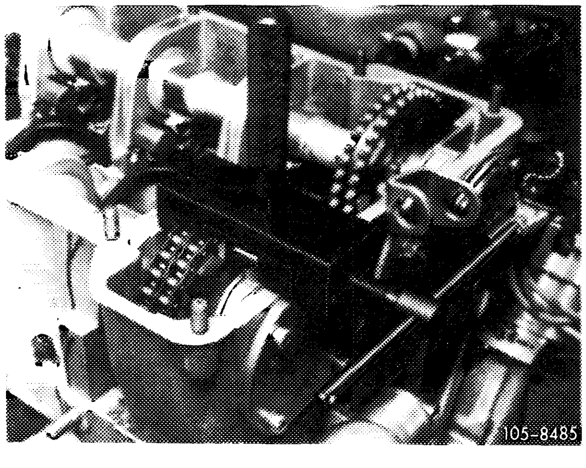
3 Remove chain tensioner (05–310). Install rigid chain tensioner and tighten by hand.



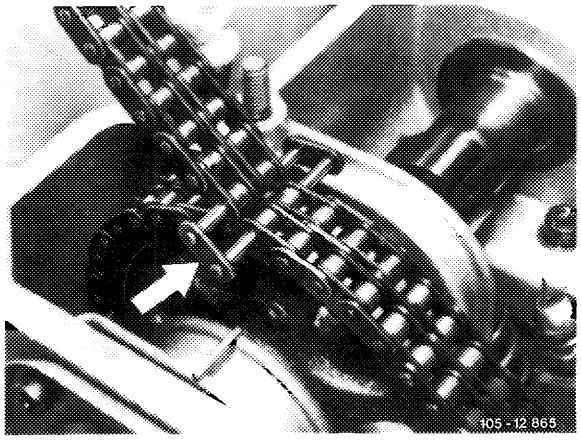
Chain drive

1 Exhaust camshaft sprocket	7 Timing chain
2-2b Sliding rail	8 Camshaft sprocket
3 Intake camshaft sprocket	9 Bearing pin tensioning rail
4 Guide wheel	10 Tensioning rail
5 Lock screw	11 Hydraulic chain tensioner
6 Intermediate gear	

4 Cover chain housing with a clean cloth and break timing chain with chain separating device or grind off both chain pins of **one link.**

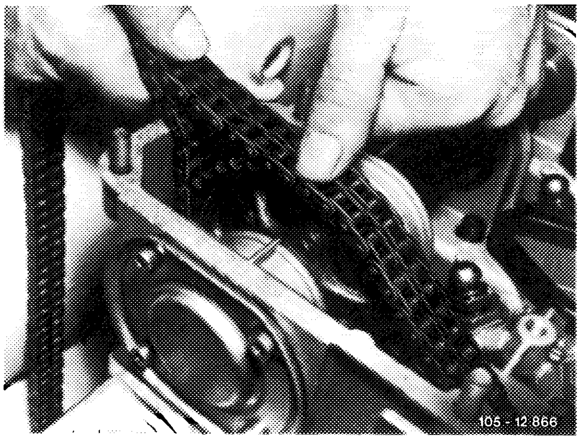


5 Connect new timing chain to old timing chain with one link, whereby the broken link is pressed out.

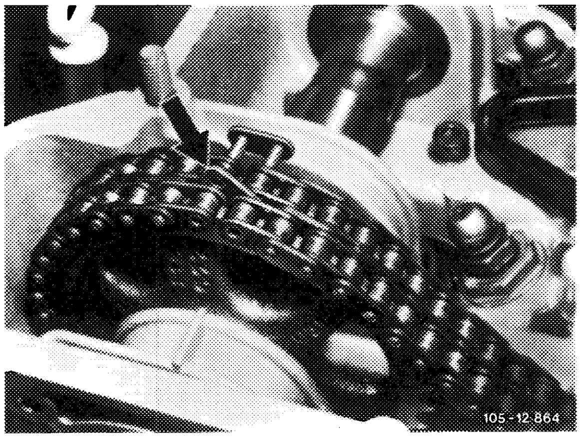


6 Turn crankshaft in engine's direction of rotation slowly with a 27 mm socket wrench and a ratchet, and at the same time lift the old chain until the link is at the uppermost point of the right camshaft sprocket.

Attention!
While turning the timing chain must be in constant engagement on both camshaft sprockets.



7 Detach old timing chain and connect ends of new timing chain with one link. Install center bar (arrow) and outer bar. Press on lock washers.

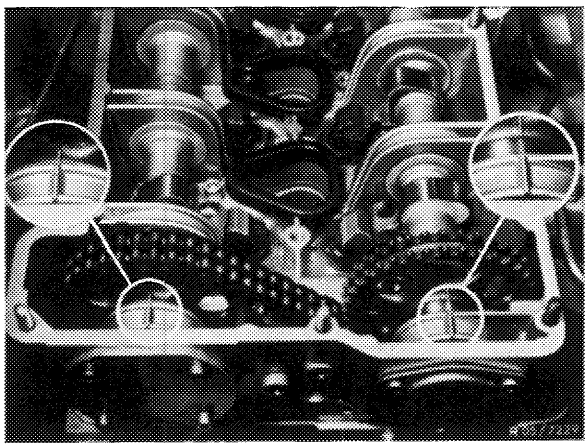


8 Turn crankshaft and check adjustment marks with engine in TDC position.

9 Disassemble chain tensioner, move to assembly position and install (05–310).

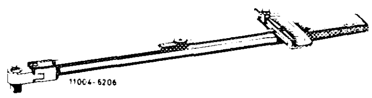
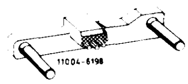
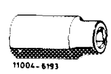
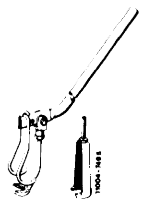
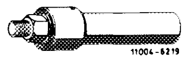
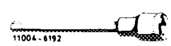
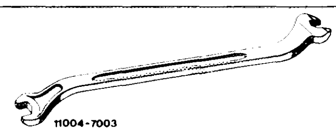
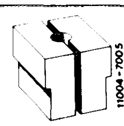
10 Install rocker arms (05–230).

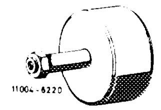
11 Adjust valve clearance of exhaust camshaft (05–210).



Tightening torques	Nm
Expansion bolt for camshaft sprocket	80
Valve adjusting screw	20–40
Cylinder head cover capped nuts and bolts	5
Balance disc to cranskhaft	400 + 50
Pulley and vibration damper to balance disc	35
Ball locating ring in chain tensioner	25

Special tools

Torque wrench 150–500 Nm (15–50 kpm) 3/4" square		001 589 31 21 00
Holder		110 589 00 40 00
Socket 27 mm, 1/2" square for rotating engine		001 589 65 09 00
Depressor for valve spring		110 589 04 61 00
Puller for bearing bolt (basic unit)		115 589 20 33 00
M 8 x 30 bolt for extractor		115 589 00 34 00
Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Chain tensioner holder		110 589 02 31 00

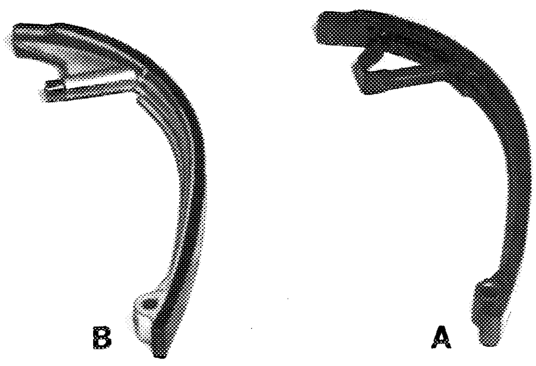
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00

Conventional tools

Connection 3/4" square socket to 1/2" square head	e.g. made by Hazet, D-5630 Remscheid 1 order no. 1058 R-1

Note

A 1st version tensioning rail (A) can be replaced by a 2nd version tensioning rail (B).

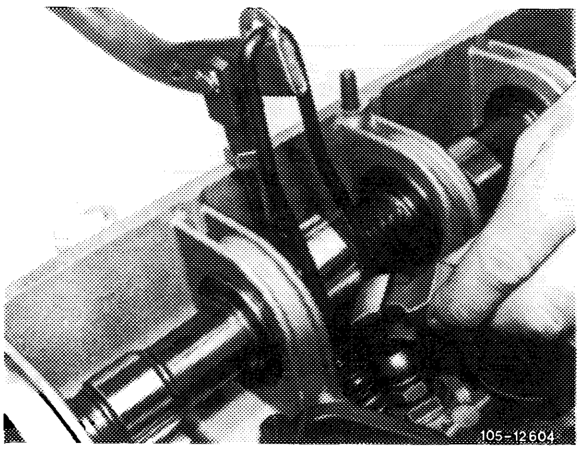


105–12452

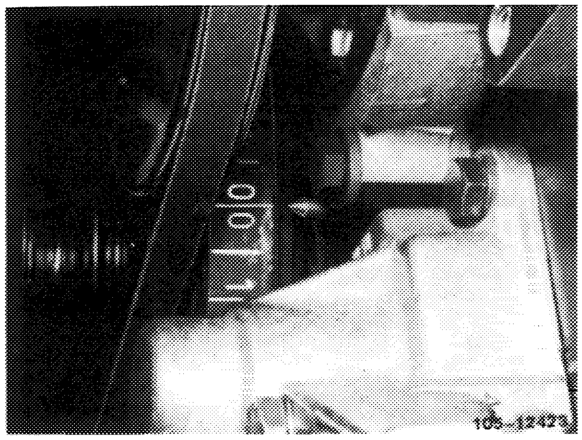
Removal

1 Remove radiator (20–240).

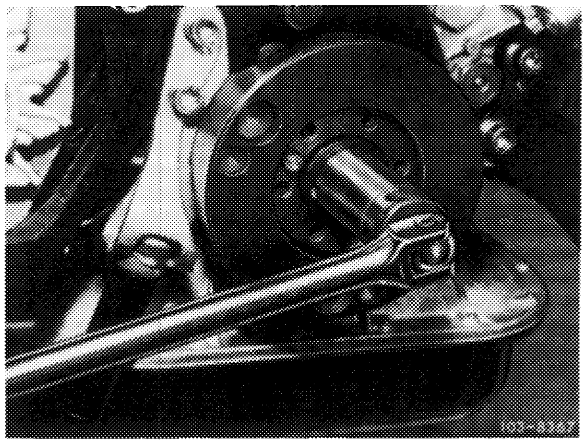
2 Remove rocker arms of right camshaft (exhaust) (05–230).



3 Position engine at ignition TDC.

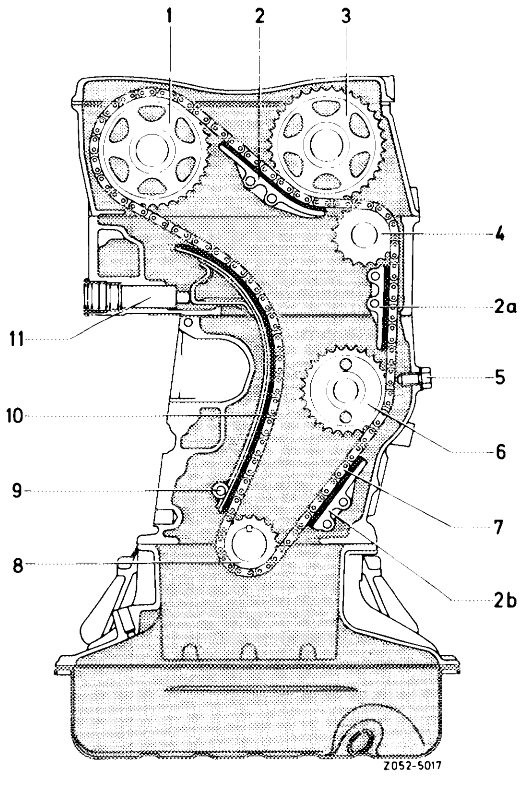


4 Remove vibration damper (03–340). Remove balance disc without bore to extract the tensioning rail bearing pin (03–340).



5 Remove chain tensioner (05–310).

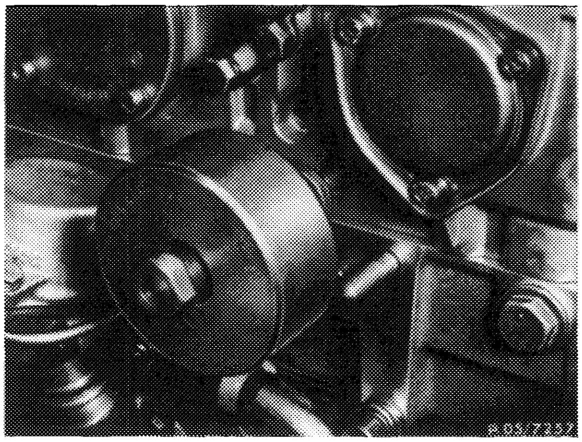
6 Mark relation of left and right camshaft sprockets and timing chain with paint, and remove **right** camshaft sprocket (1).



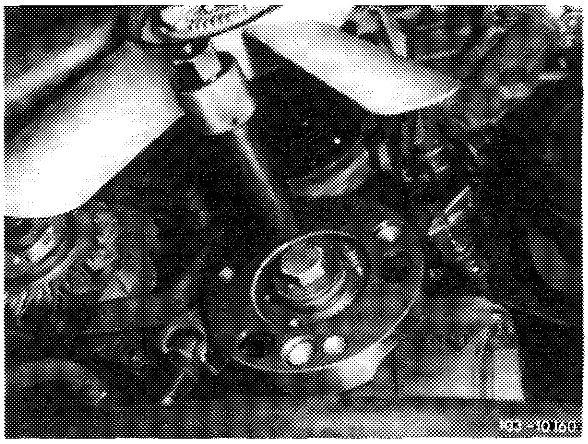
Chain drive

1 Exhaust camshaft sprocket
2–2b Sliding rails
3 Intake camshaft sprocket
4 Guide wheel
5 Lock screw
6 Intermediate wheel
7 Timing chain
8 Crankshaft sprocket
9 Bearing pin tensioning rail
10 Tensioning rail
11 Hydraulic chain tensioner

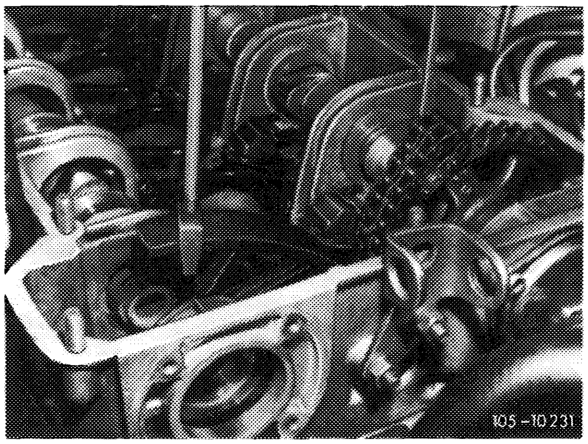
7 Remove sliding rail in camshaft housing.



8 Pull out tensioning rail bearing pin with extractor.

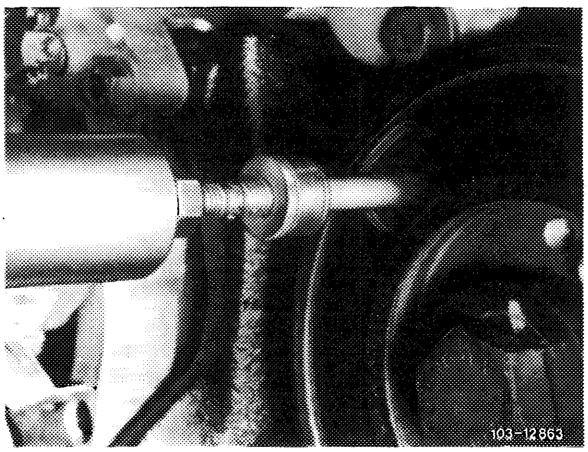


9 Remove tensioning rail upward.



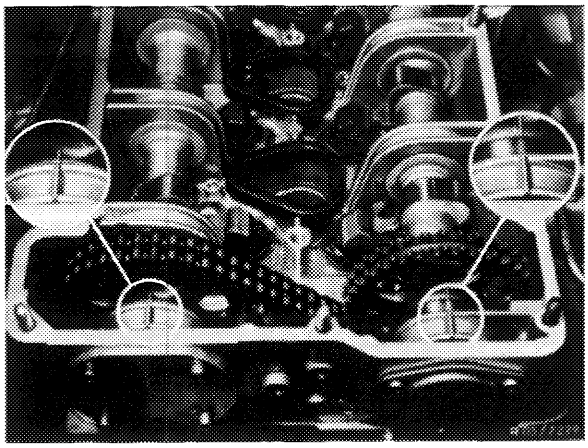
Installation

10 Guide in tensioning rail. Coat bearing pin with a sealing compound and knock in.



11 Install righthand camshaft sprocket, while paying attention to color symbol on camshaft sprocket and timing chain.

Marks on camshaft sprockets and camshaft housing must align when engine is set at TDC position.



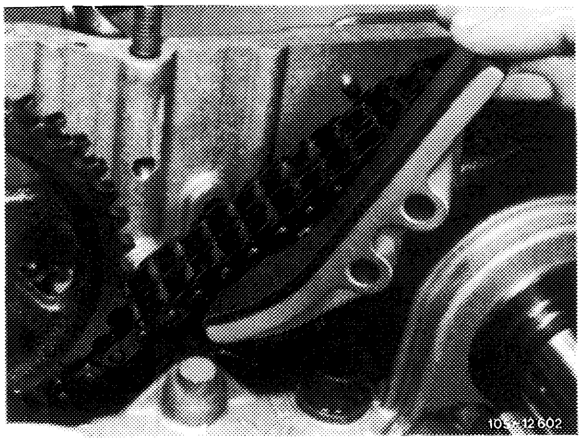
12 Insall sliding rail in camshaft housing (05–340).

13 Set chain tensioner at assembly position and install (05–310).

14 Install balance disc and vibration damper (03–314).

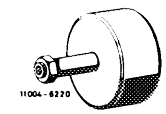
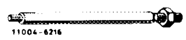
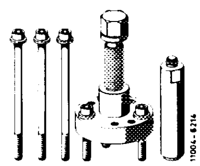
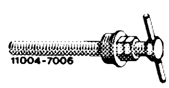
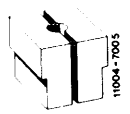
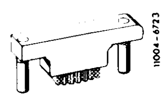
15 Install rocker arms (05–230).

16 Install radiator.



Tightening torques	Nm
Cylinder head cover capped nuts and bolts	5
Radiator drain plug	10
Ball locating ring in chain tensioner	25
Necked-down screw camshaft sprocket	80
Balance disc to crankshaft	400+50
Oil cooler drain plug	35

Special tools

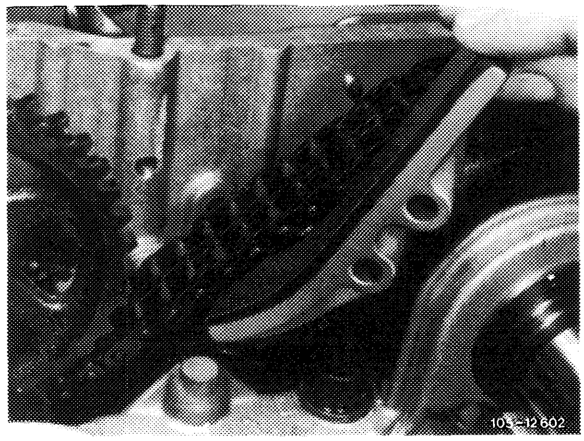
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
Bolt 6 x 50 for impact extractor		116 589 01 34 00
Bolt 6 x 150 for impact extractor		116 589 02 34 00
Bolt 10 x 100 for impact extractor		116 589 03 34 00
Balance disc extractor		116 589 10 33 00
Rigid chain tensioner		110 589 03 31 00
Chain tensioner holder		110 589 02 31 00
Holder		116 589 01 40 00

Sliding rail (2) in camshaft housing

1 Remove valve cover and knock out sliding rail pin with an impact extractor.
Remove sliding rail.

2 Watch position of sliding rail when installing.

Coat collar of sliding rail pin with a sealing compound.



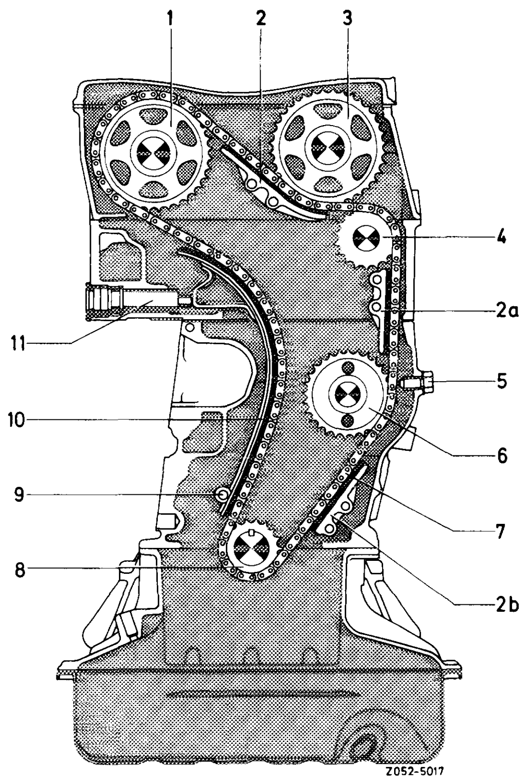
Sliding rail (2a) in cylinder head

1 Remove radiator.

2 Remove chain tensioner or spring in chain tensioner (05–310).

3 Mark relation of camshaft sprockets and timing chain with paint.

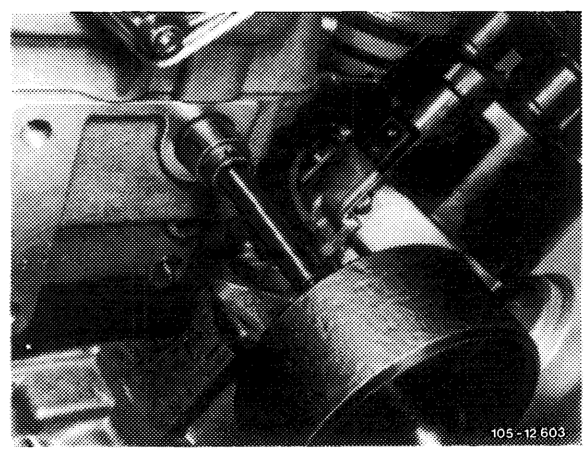
4 Remove sliding rail (2) in camshaft housing.



Chain drive

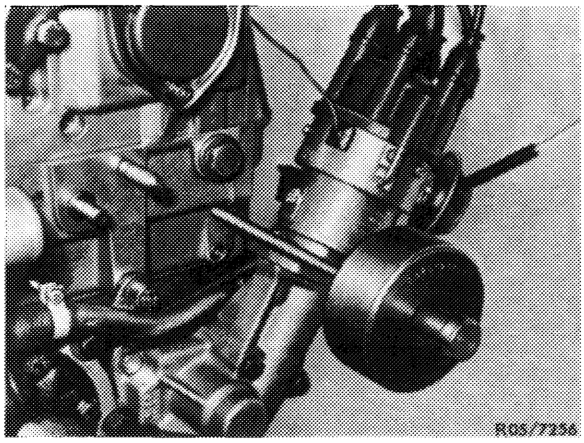
1 Exhaust camshaft sprocket
2–2b Sliding rail
3 Intake camshaft sprocket
4 Guide wheel
5 Lock screw
6 Intermediate wheel
7 Timing chain
8 Crankshaft sprocket
9 Tensioning rail bearing pin
10 Tensioning rail
11 Hydraulic chain tensioner

5 Connect a wire hook (5 mm thick) to guide wheel (4) and knock out the bearing pin with an impact extractor (10 mm bolt).
Remove guide wheel.



6 Knock out sliding rail pin with an impact extractor and pull out sliding rail with a wire hook.

7 Installation in reverse sequence of removal.



Sliding rail (2b) in crankcase

1 Remove radiator.

2 Remove entire oil pan (01–310).

3 Remove vibration damper and balance disc (03–340).

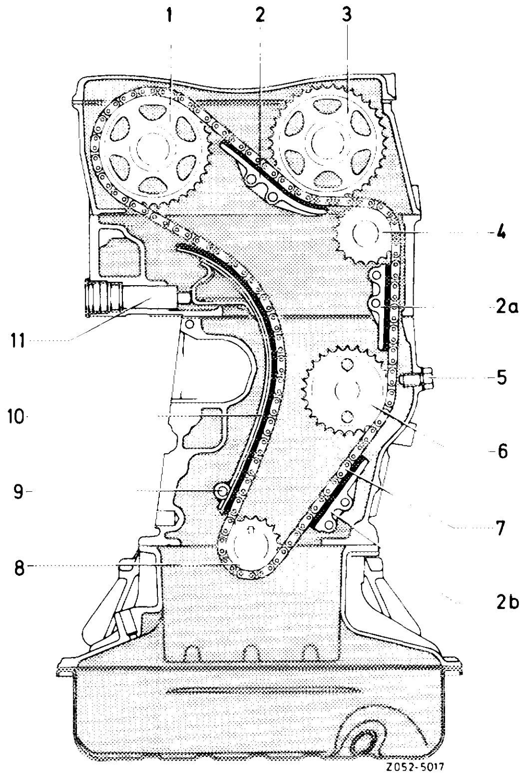
4 Mark relation of camshaft sprockets and timing chain with paint.

5 Remove sliding rail (2) and guide wheel (4).

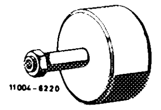
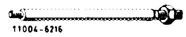
6 Remove chain tensioner or compression spring (05–310).

7 Knock out sliding rail pin with an impact extractor and remove sliding rail.

8 Installation in reverse sequence of removal.



Special tools

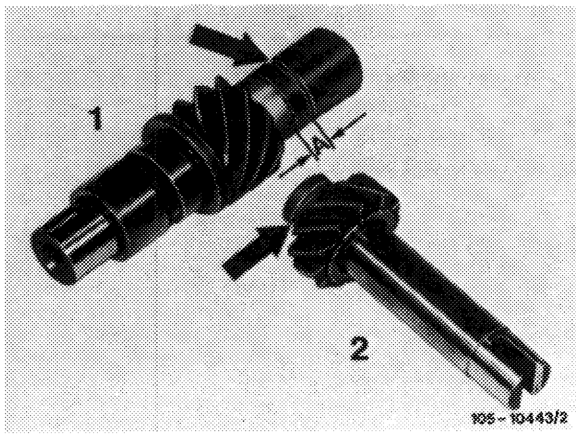
Impact puller for bearing bolt (basic unit)		116 589 20 33 00
Threaded bolt M 6 x 150 for impact puller		116 589 02 34 00

Note

The oil pump drive comprises the **intermediate gear shaft (1)** and the **helical gear shaft (2)**, and may be **replaced in sets** only (05–412).

In the event of repairs, install oil pump drive part no. 110 050 02 06:

Intermediate gear (1): 9 teeth, groove (arrow), dimension A = 5 mm
Helical gear (2): 12 teeth, groove (arrow).



Standard installation oil pump drive 110 050 02 06

Engine		Engine end no. from	to
110.921 – 10 –		009381	009738
– 12 –		039115	040762
110.922 – 10 –		018226	019645
	and starting	033340 (1.1978)	
– 12 –		027657	030434
	and starting	055136 (1. 1978)	
110.923 – 10 –		010452 (1. 1978)	
– 12 –		012890 (1. 1978)	
110.931 – 10 –		001071	001080
– 12 –		000137	000138
110.932 – 10 –		002861	003151
	and starting	007879 (1. 1978)	
– 12 –		000432	000491
	and starting	001954 (1. 1978)	
110.981 – 10 –		010491	010636
– 12 –		022258	022809
110.982 – 10 –		000547	000704
– 12 –		001196	001528
110.983 – 10 –		013511	014341
– 12 –		035853	038811
110.984 – 10 –		005137 (1. 1977)	
– 12 –		013900 (1. 1977)	

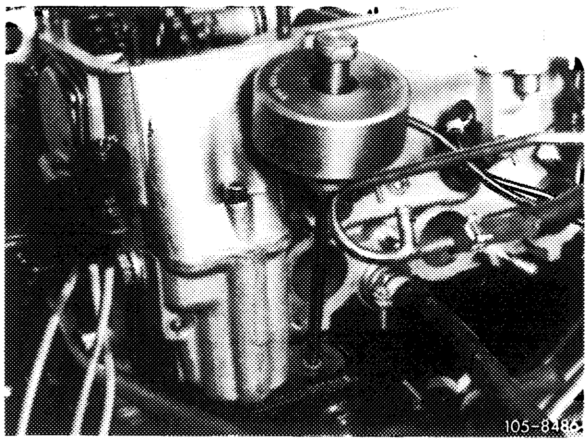
110.985 – 10 –	002060 (1. 1977)
– 12 –	009179 (1. 1977)
110.986 – 10 –	000461 (1. 1977)
– 12 –	000991 (1. 1977)

All exchange engines starting unit no. 464 130 are provided with oil pump drive part no. 110 050 02 06.

Removal

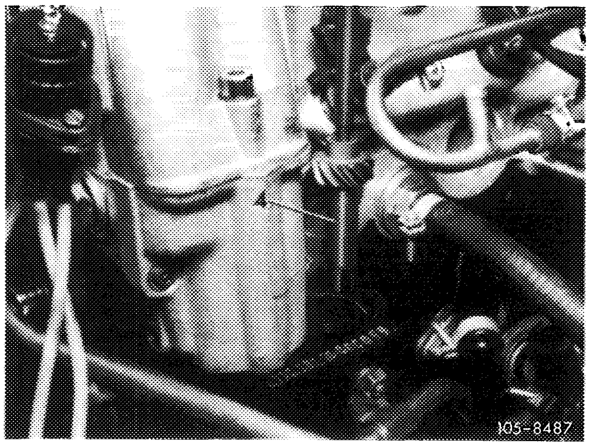
1 Remove intake pipe (09–400).

2 Knock out closing cover by means of impact puller (6 mm threaded bolt).



3 Pull out helical gear shaft (4) in upward direction by means of an M-6 screw.

Note: The bearing body together with bearing bushing for helical gear shaft can be knocked out in upward direction with intermediate gear shatt removed.

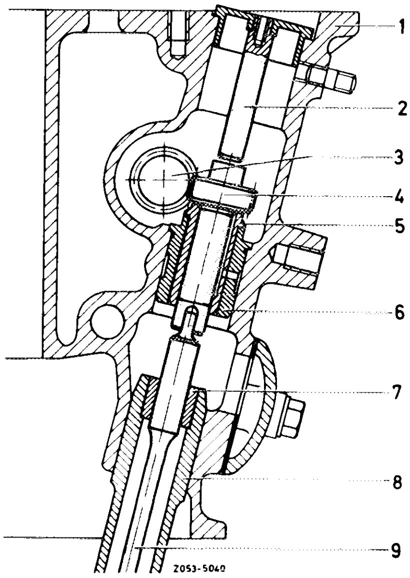


Installation

4 Guide in helical gear shaft (4).
Oil pump drive shaft (9) must engage in dog claws of helical gear shaft (4).

5 Knock in new cover (2) with a pertinent sleeve (approx. 35 mm dia.).

6 Install intake manifold with a new gasket (09–400).

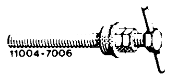
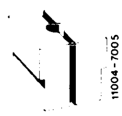
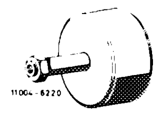
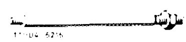
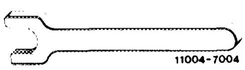
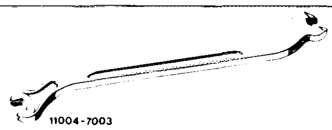
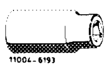


Oil pump drive

1 Crankcase
2 Cover with stop pin
3 Intermediate gear shaft of oil pump drive
4 Helical gear shaft of oil pump drive
5 Bearing bushing
6 Bearing
7 Bearing bushing of oil pump housing
8 Oil pump housing
9 Oil pump drive shaft

Tightening torques	Nm
Bolt on intermediate gear shaft	25
Expansion bolt for camshaft sprocket	80
Valve adjusting screw	20–40
Cylinder head cover capped nuts and bolts	5
Ball locating ring in chain tensioner	25
Oil pressure relief valve in main oil bore	40
Plug for oil pressure relief valve	40

Special tools

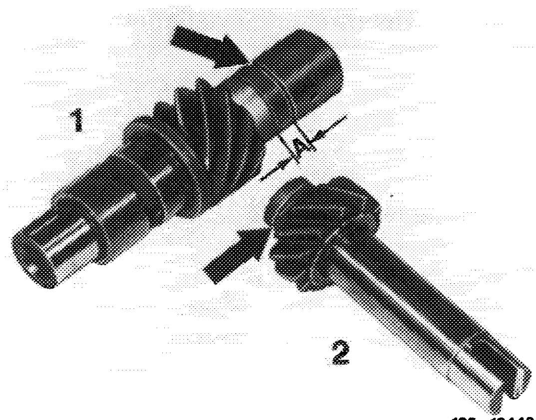
Rigid chain tensioner		110 589 03 31 00
Chain tensioner holder		110 589 02 31 00
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
M 6 x 50 bolt for impact extractor		116 589 01 34 00
M 6 x 150 bolt for impact extractor		116 589 02 34 00
M 8 x 150 bolt for impact extractor		616 589 00 34 00
Camshaft holding wrench		116 589 01 01 00
Valve adjusting wrench 17 mm		110 589 01 01 00
Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00
Wrench socket 27 mm, 1/2" square to turn engine		001 589 65 09 00

Note

The oil pump drive consists of **intermediate gear shaft (1)** and **helical gear shaft (2),** and must always be **replaced in pairs** (05–410).

For repairs, install oil pump drive part no. 110 050 02 06.

Intermediate gear (1): 9 teeth, groove (arrow). Dimension A = 5 mm.
Helical gear (2): 12 teeth, groove (arrow), standard installation refer to 05–410.



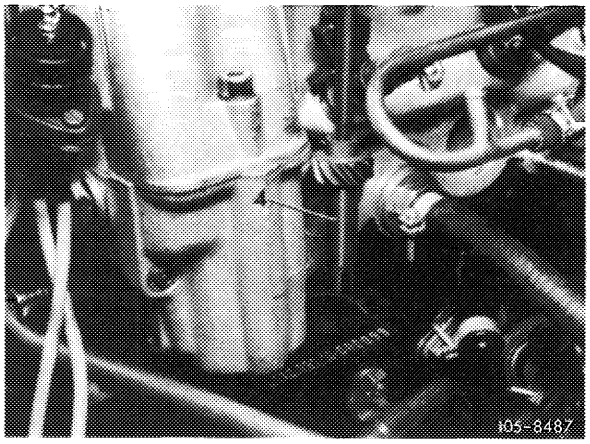
105-10443/2

Removal

1 Partially drain coolant. Remove fan and radiator.

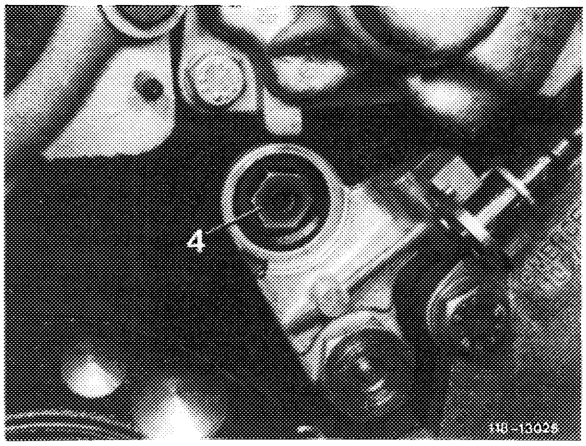
2 Remove helical gear shaft (05–410).

3 Remove vibration damper and pulley (03–340).



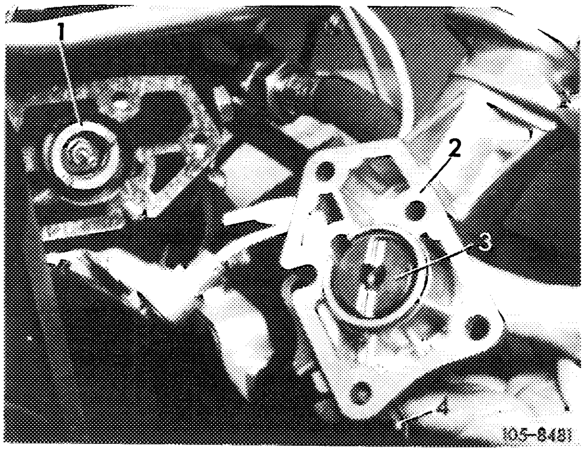
105-8487

4 Unscrew plug in crankcase and remove oil pressure relief valve (4).



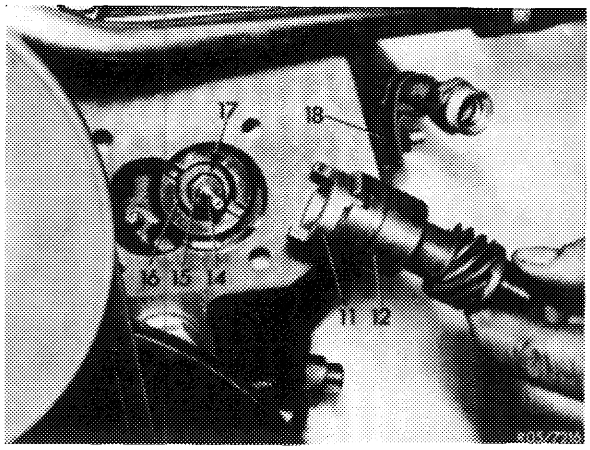
110-13025

5 Remove distributor housing (2) and take off dog (1). Do not take distributor drive shaft (3) out of distributor housing (2).

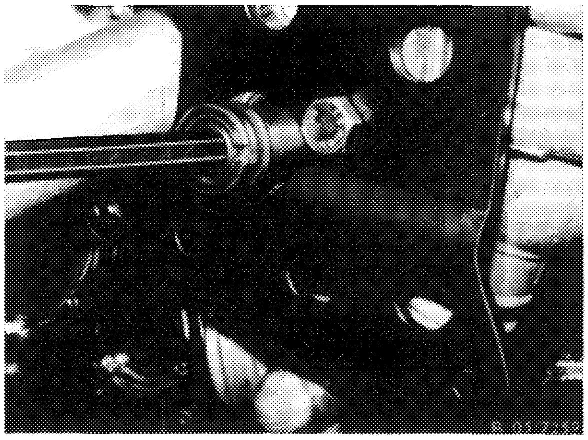


105-8481

6 Remove screw (15) and washer (16).

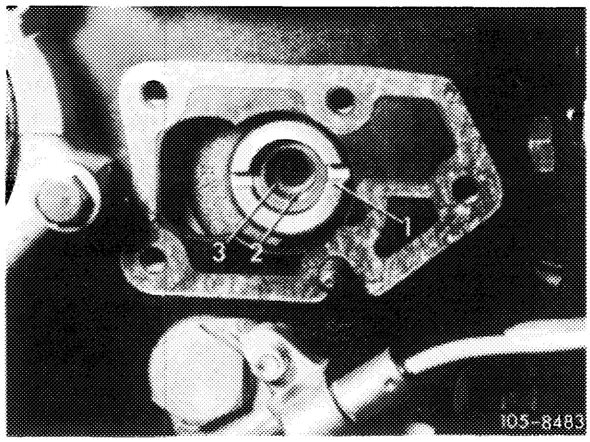


7 Remove chain tensioner (05–310).



8 Relief tension on timing chain at intermediate wheel by turning crankshaft backwards briefly. Remove chain lock screw.

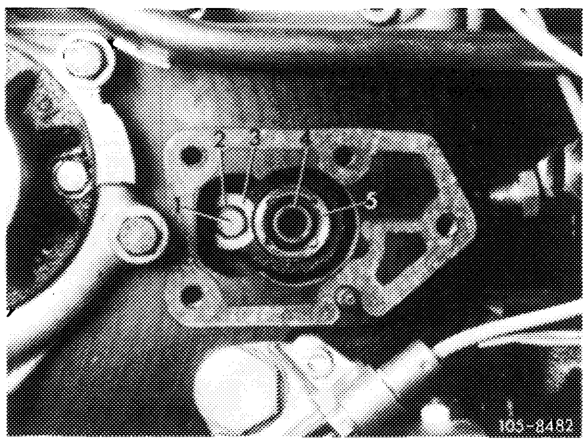
9 Knock in intermediate wheel shaft (3) and at the same time pull off intermediate wheel (1) forward.



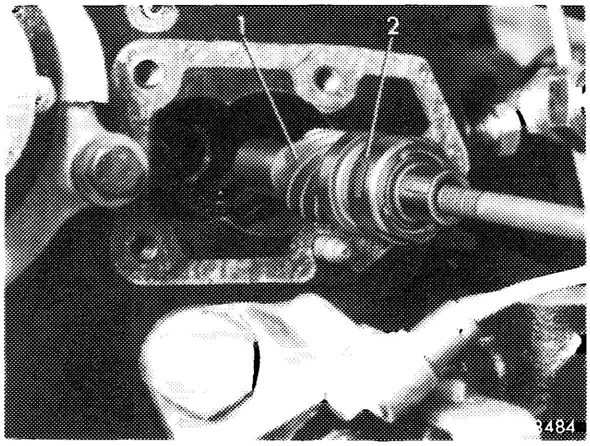
10 Place intermediate wheel down until bolt (1) is accessible.

11 Cover bottom of chain case with a cloth.

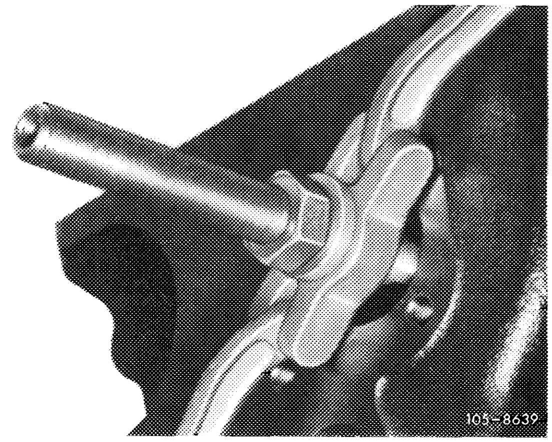
12 Unscrew bolt (1). Remove circlip (2) and lock washer (3).



13 Pull out intermediate wheel shaft (1) and bearing sleeve (2) with a M 8 bolt.



14 Pull out rear bearing bushing with an internal claw extractor.



Installation

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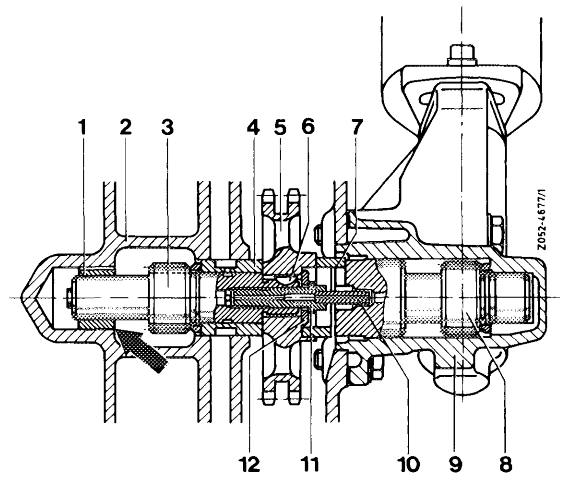
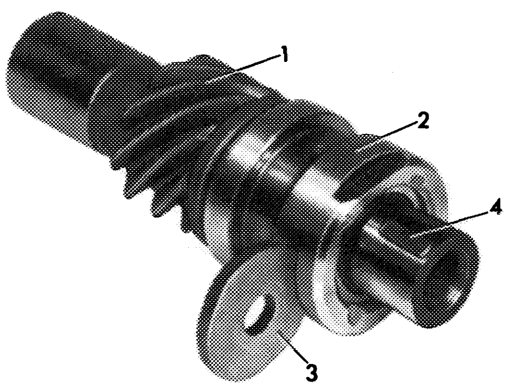
15 Knock in rear bearing bushing (1) with groove facing up using a 17 mm dia. stepped mandrel until it is flush with crankcase (arrow).

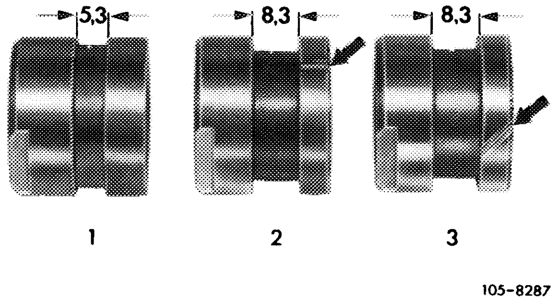


16 Install new intermediate wheel shaft (1) with woodruff key (4), bearing bushing (2) and lock washer (3).



105–10442

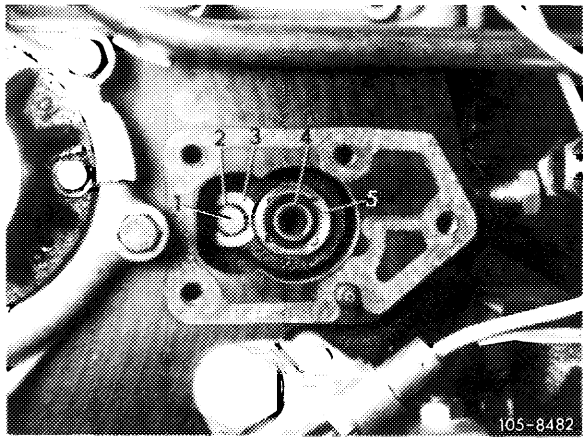
Attention!
Use bearing bushing (2) part no. 110 052 00 06 with straight splash groove only.



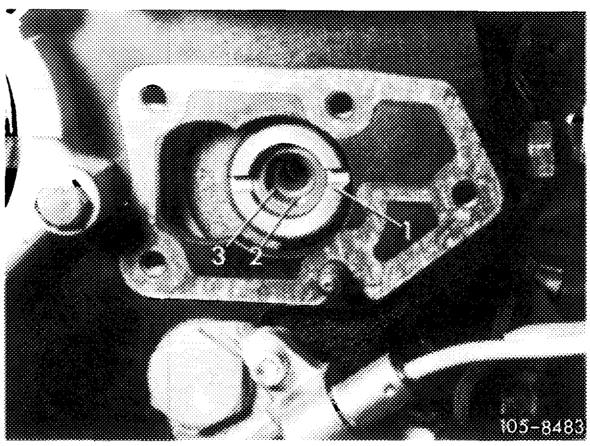
Front bearing bushing

Version 2 : valid
Version 1 and 3 : not valid

17 Install bolt (1) with circlip (2) and washer (3), and tighten.

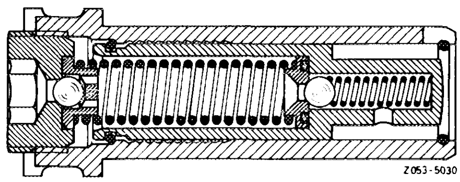


18 Position intermediate wheel on intermediate wheel shaft and pull on with a M 8 bolt. In so doing the woodruff key must be aligned with groove in intermediate wheel. Teeth of intermediate wheel must grasp timing chain.

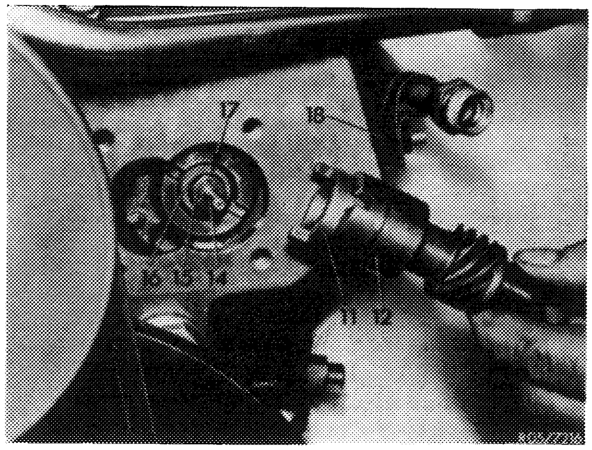


19 Move chain tensioner to assembly position and install (05–310).

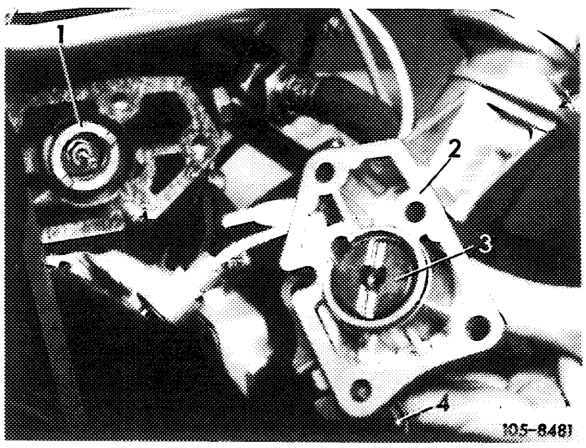
Chain tensioner in assembly position



20 Install bolt (15) with oil tube (14) and washer (16), and torque to 25 Nm.

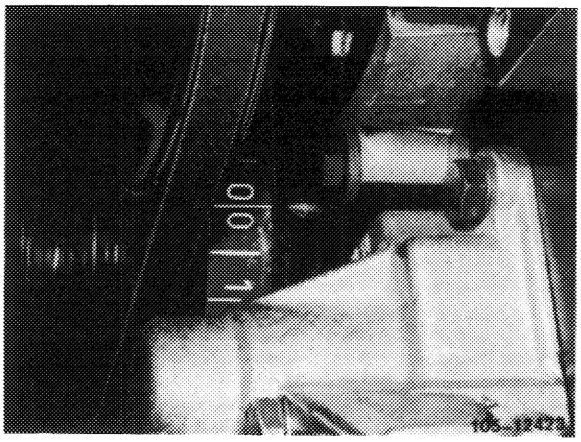


21 Place dog (1) on intermediate wheel and install distributor housing (2) with drive gear (3). Also fasten TDC pointer (4).



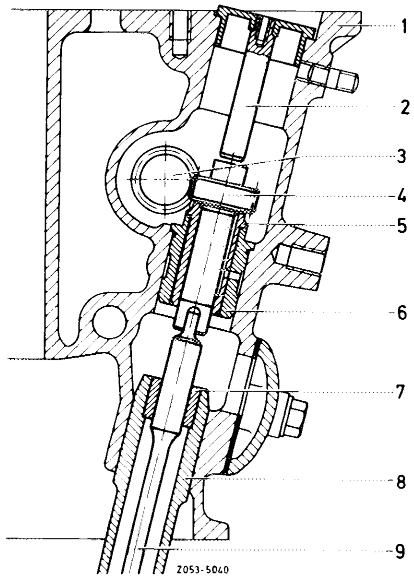
22 Set piston 1 at ignition TDC and install distributor.

23 Install new helical gear (4). Turn engine until oil pump drive shaft (9) engages in helical gear.



24 Knock in new cover (2) with an approx. 35 mm dia. sleeve.

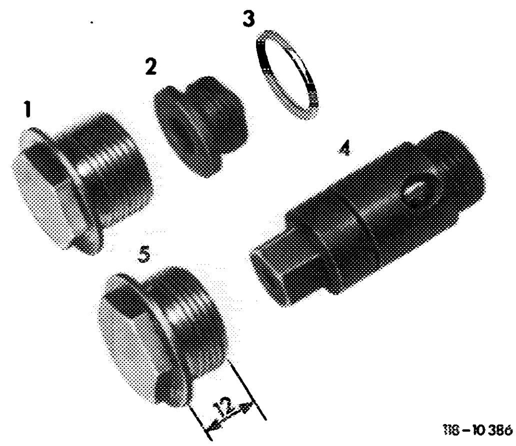
25 Install intake manifold.



Attention!
Additionally install an oil pressure relief valve 114 180 02 15 with 5 bar gauge pressure into main oil duct in cylinder crankcase together with oil pump drive 110 050 02 06.
Standard installation refer to 18–020.

26 Install 5 bar oil pressure relief valve (4) without seal in main oil bore of crankcase and torque to 40 Nm.

27 Coat plug (5) with a sealing compound, install without seal and torque to 40 Nm.



1 Plug
2 Oil bore plug
3 Aluminium seal
4 Oil pressure relief valve (5 bar)
5 Plug for oil pressure relief valve

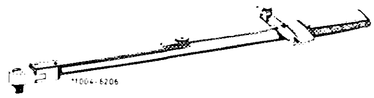
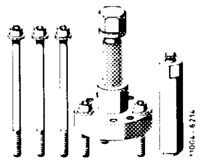
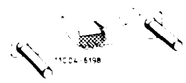
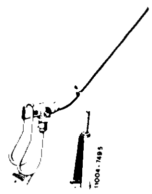
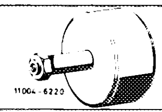
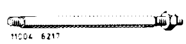
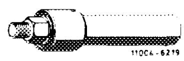
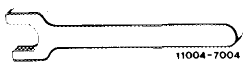
28 Install vibration damper and pulley (03–340).

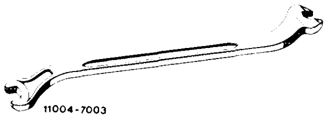
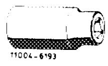
29 Install radiator and fan (20–420).

30 Check and adjust ignition timing (07.5–510).

Tightening torques	Nm
Intermediate wheel shaft bolt	25
Camshaft sprocket expansion bolt	80
Valve adjusting screw	20–40
Cylinder head cover capped nuts and bolts	5
Balance disc to crankshaft	400+50
Ball locating ring in chain tensioner	25

Special tools

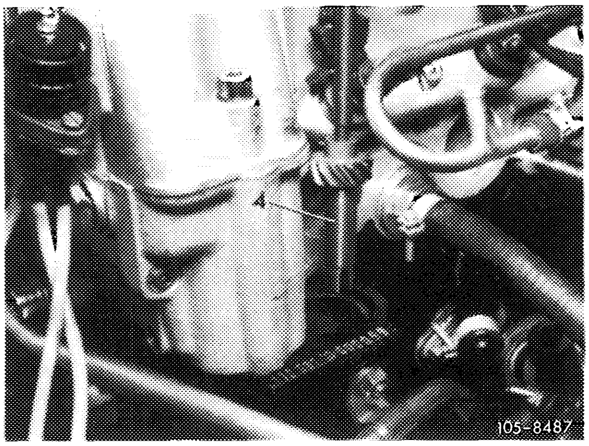
Torque wrench single-arm, 3/4" square, 150–500 Nm		001 589 31 21 00
Balance disc extractor		116 589 10 33 00
Holder		110 589 00 40 00
Depressor for valve spring		110 589 04 61 00
Impact extractor for bearing pin (basic unit)		116 580 20 33 00
Threaded bolt M 8 x 150 long (for impact puller)		616 589 00 34 00
Puller for bearing bolt (basic unit)		115 589 20 33 00
M 8 x 30 bolt for extractor		115 589 00 34 00
Camshaft holding wrench		116 589 01 01 00

Valve adjusting wrench 17 mm		110 589 01 01 00
Wrench socket 27 mm, 1/2" square		001 589 65 09 00
Wrench socket 10 mm, 1/2" square, 140 mm long		000 589 05 07 00

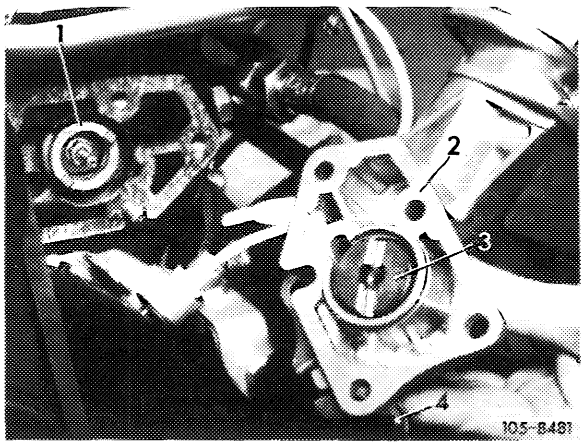
Removal

1 Remove radiator and fan.

2 Remove oil pump drive helical gear shaft (4) (05–410).

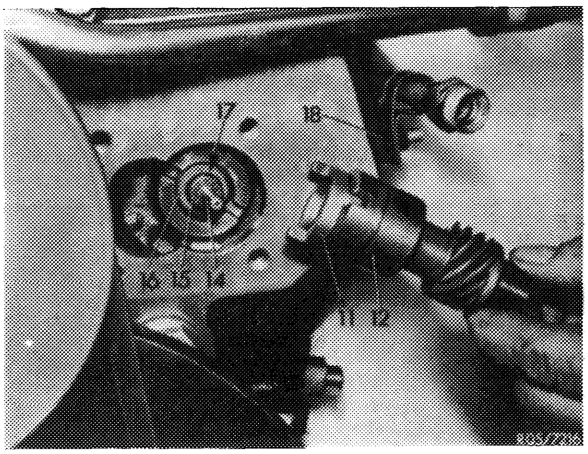


3 Remove distributor housing (2) with drive gear (3) for distributor drive (05–450).

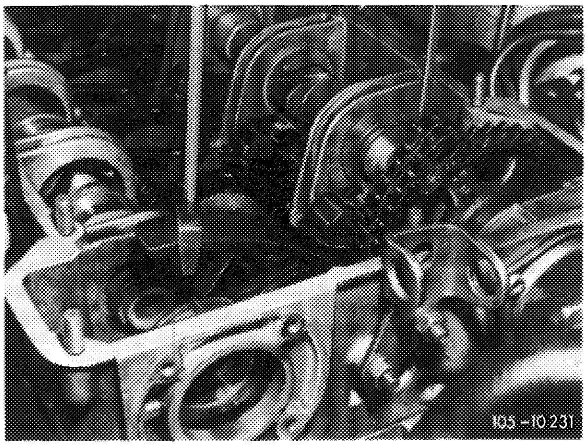


4 Remove bolt (15) with oil tube (14), lock washer (17) and washer (16).

5 Unscrew chain lock screw (18).

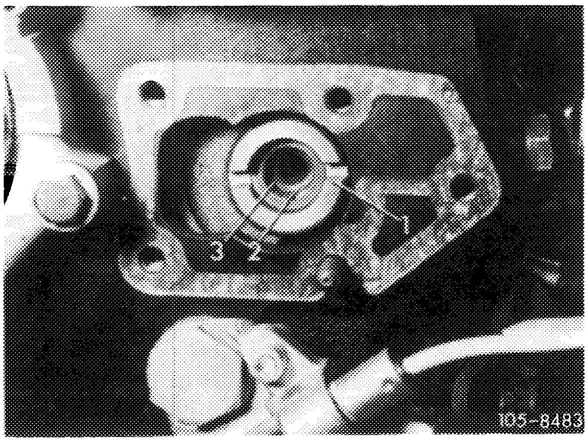


6 Remove tensioning rail (05—330).



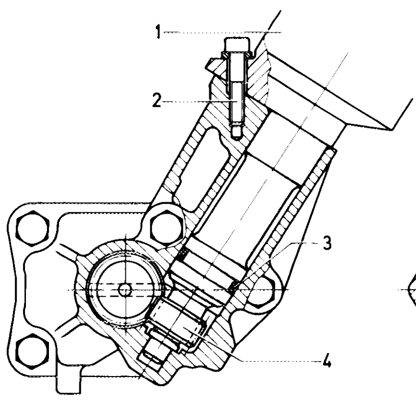
7 Turn intermediate wheel shaft (3) until woodruff key (2) is up.

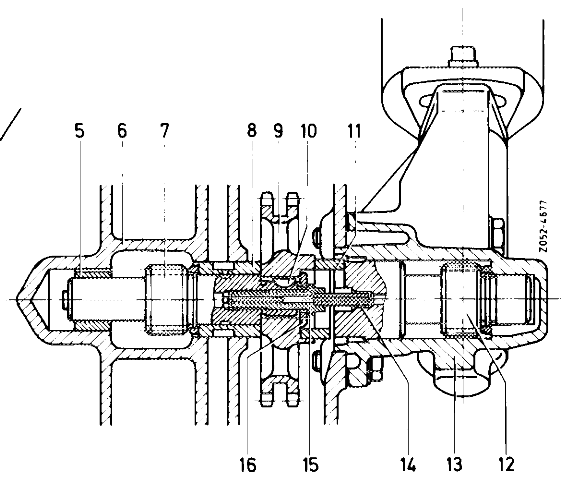
8 Press back intermediate wheel shaft (3) until intermediate wheel (1) can be removed upward. Watch woodruff key.



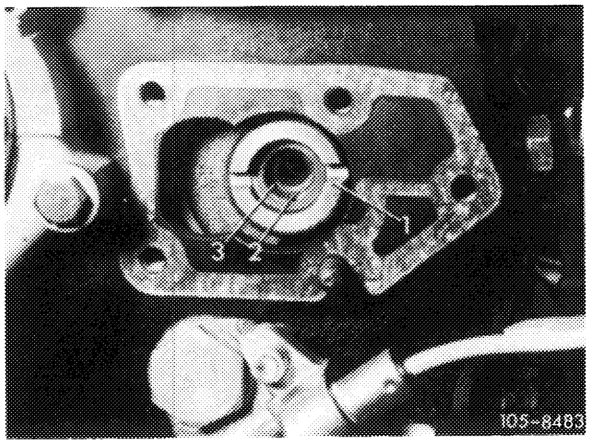
Installation

9 Guide intermediate wheel into chain case and install on intermediate wheel shaft.



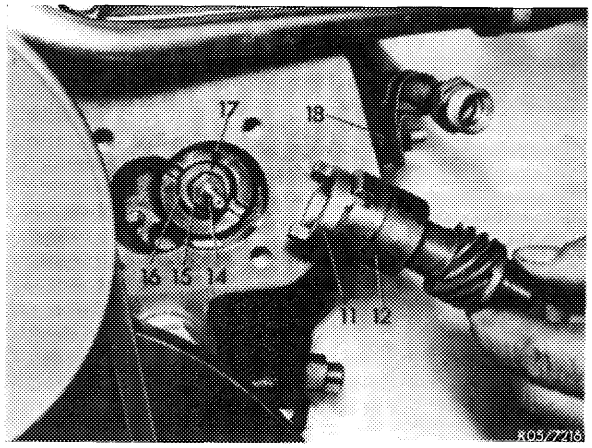


10 Pull intermediate wheel shaft (3) forward carefully with a M 8 bolt and at the same time turn intermediate wheel (1) until woodruff key (2) slides into groove of intermediate wheel.

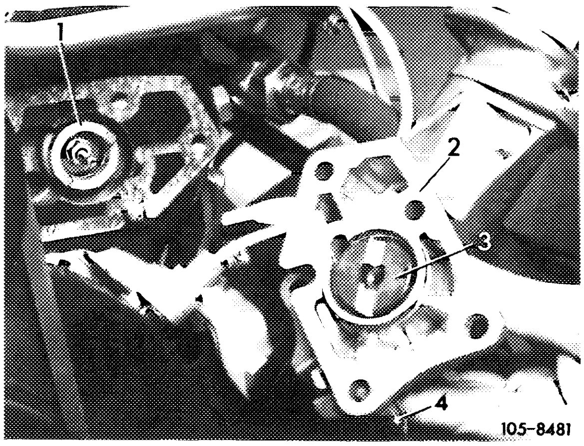


11 Install bolt (15) with oil tube (14), lock washer (17) and washer (16), and torque to 25 Nm.

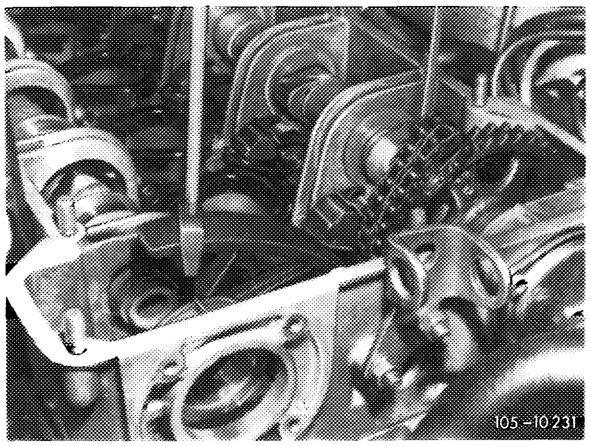
Install chain lock screw (18).



12 Install distributor housing with drive gear for distributor drive (05–450).

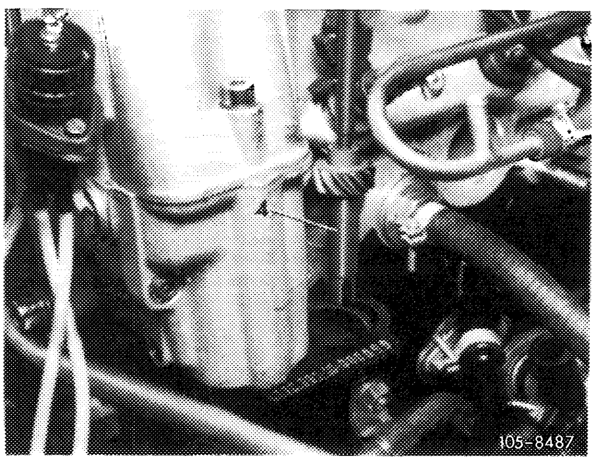


13 Install tensioning rail (05–330).



14 Install helical gear shaft for oil pump drive (05–410).

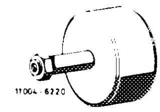
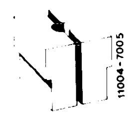
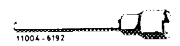
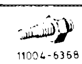
15 Install radiator and fan.



05–440 Removal and installation of guide wheel

Tightening torques	Nm
Cylinder head cover bolts and capped nuts	5
Ball locating ring in chain tensioner	25

Special tools

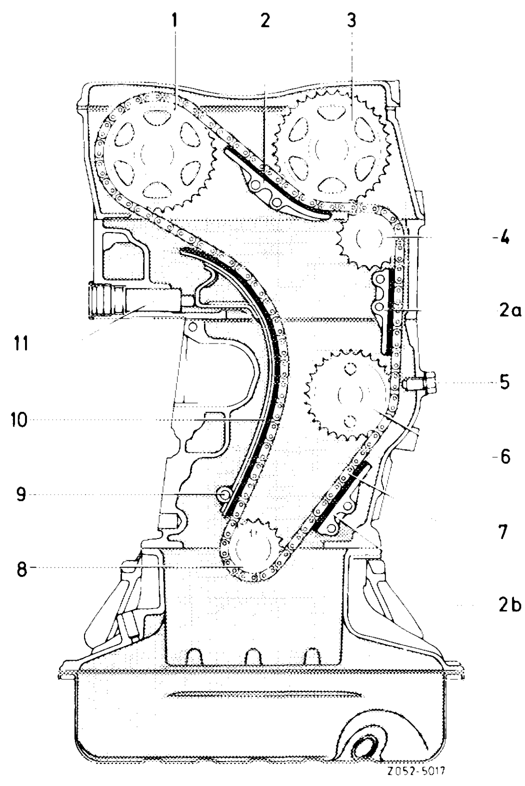
Impact extractor for bearing pin (basic unit)		116 589 20 33 00
Chain tensioner holder		110 589 02 31 00
Wrench socket 10 mm 1/2" square, 140 mm long		000 589 05 07 00
M 6 x 50 mm bolt for impact extractor		116 589 01 34 00
M 10 x 100 mm bolt for impact extractor		116 589 03 34 00

Removal

1 Mark relation to timing chain and left camshaft sprocket with paint.

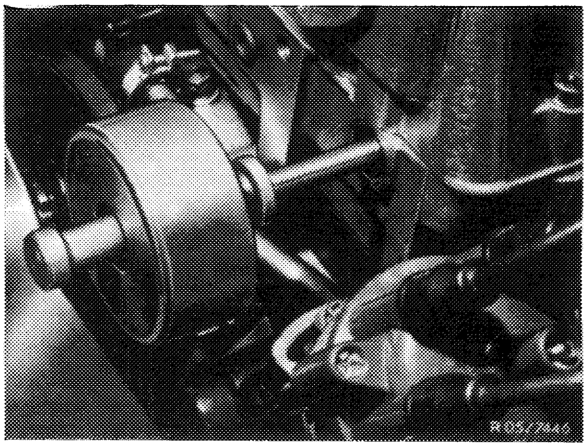
2 Remove chain tensioner or spring (05–310).

3 Remove sliding rail (2) in camshaft housing. This requires knocking out bearing pin with impact extractor (05–340).



1 Exhaust camshaft sprocket
2– 2b Sliding rail
3 Intake camshaft sprocket
4 Guide wheel
5 Locking screw
6 Intermediate wheel
7 Timing chain
8 Camshaft sprocket
9 Tensioning rail bearing pin
10 Tensioning rail
11 Hydraulic chain tensioner

4 Hold guide wheel with a 5 mm dia. wire hook and knock out bearing pin with an impact extractor (10 mm bolt).

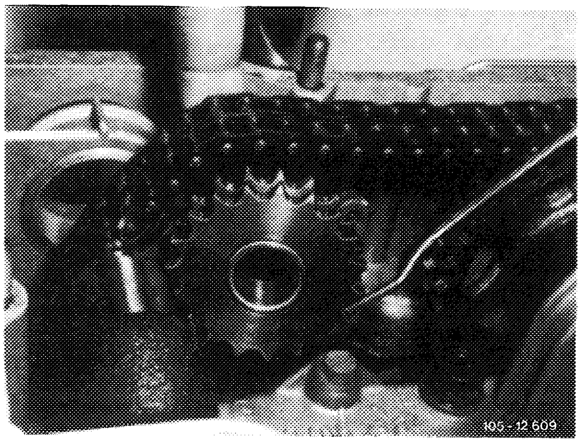


Installation

5 Guide in guide wheel with a 5 mm dia. wire hook, position correctly and knock in bearing pin with an impact extractor.

6 Install sliding rail in camshaft housing, noting marks on timing chain and left camshaft sprocket.

7 Set chain tensioner at assembly position and install, or install spring (05–310).

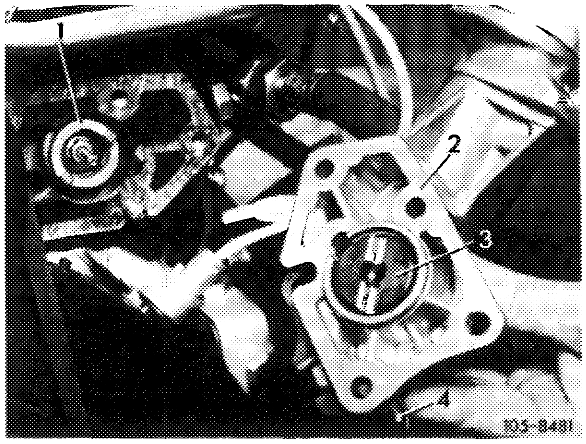


Removal

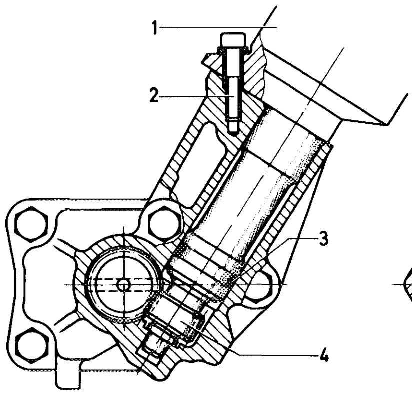
1 Remove radiator and fan.

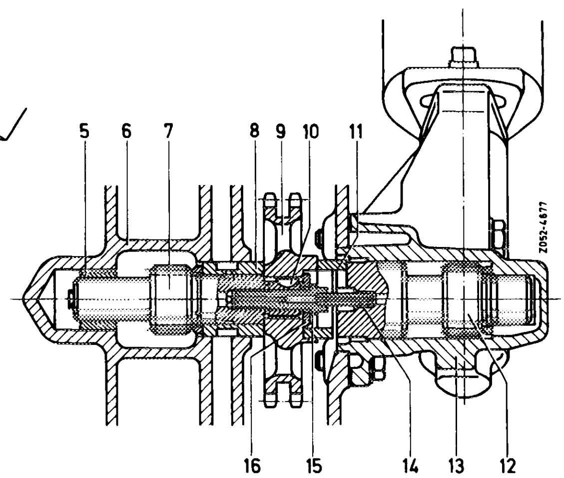
2 Remove distributor housing (2) with distributor and take off dog (1).

3 Mark location of drive gear (3) to distributor housing.



Installation





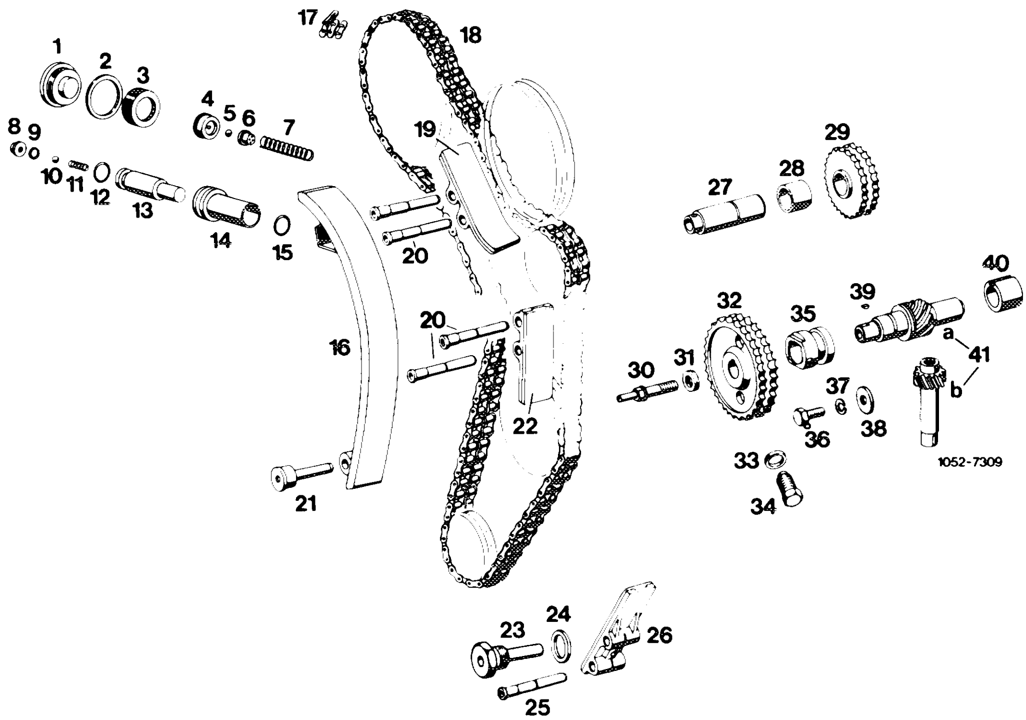
1 Distributor
2 Screw M 6 x 30
3 Seal
4 Distributor drive gear
5 Rear bearing bushing
6 Crankcase
7 Intermediate wheel shaft
8 Front bearing bushing
9 Intermediate wheel
10 Woodruff key 3 x 3.7
11 Dog
12 Distributor drive gear
13 Distributor housing
14 Oil tube
15 Bolt with oil tube (14)
16 Washer

4 If drive gear has been taken out, coat it with engine oil and slide it into distributor housing, watching marks.

5 Place dog (11) on intermediate wheel (9) and install distributor housing (13) with a new gasket, also bolting the TDC pointer.

6 Check and adjust distributor adjustment (07.5–510).

7 Install fan and radiator.



1	Plug	21	Tensioning rail bearing pin
2	Seal A 30 x 36	22	Sliding rail in cylinder head
3	Threaded ring	23	Bearing pin with plug
4	Ball locating ring (oil jet)	24	Seal A 20 x 24
5	Ball 5 mm dia. (version 1 only)	25	Bearing pin
6	Ball cage (version 1 only)	26	Sliding rail in crankcase
7	Spring	27	Guide wheel bearing journal
8	Valve disc (version 1 only)	28	Bushing
9	O-ring (version 1 only)	29	Guide wheel with bushing
10	Ball 5 mm dia. (version 1 only)	30	Bolt with oil tube
11	Spring (version 1 only)	31	Intermediate wheel washer
12	Snap ring	32	Intermediate wheel
13	Pressure pin	33	Seal A 12 x 17
14	Chain tensioner housing	34	Chain drive lock screw
15	Circlip	35	Front bearing bushing
16	Tensioning rail	36	Screw M 6 x 12
17	Connecting link	37	Circlip B 6
18	Timing chain	38	Washer
19	Sliding rail in camshaft housing	39	Woodruff key 3 x 3.7
20	4 bearing pins for sliding rails	40	Rear bearing bushing
		41	a Intermediate wheel shaft b Helical gear wheel

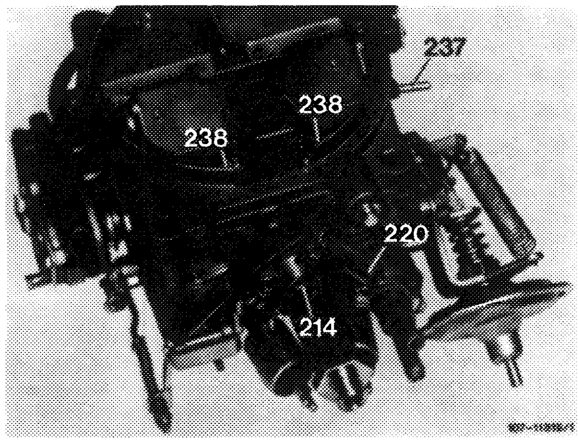
A. General

This Solex carburetor 4 A 1 is a two-stage downdraft carburetor with an intake manifold ID of 32 mm in stage I and 54 mm manifold ID in stage II.

It is important that all measurements or adjustments of exhaust emissions are made **without** influence of emission control system. For this reason, the air injection or EGR (exhaust gas recirculation) must be made inoperative.

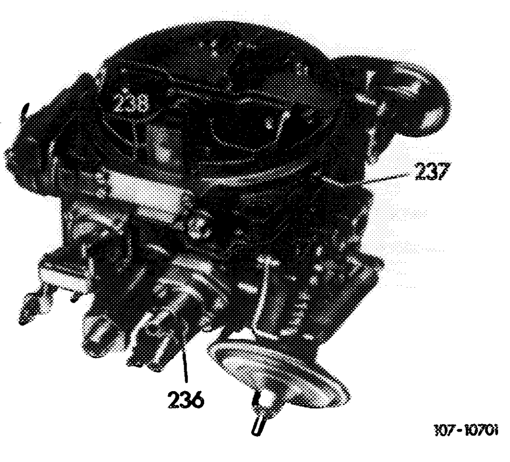
Identification code:

4 = number of mixing chambers
A = identification of design principle
1 = identification of version



Solex carburetor 4 A 1 (J) 1976

214 Float chamber vent valve (vacuum-controlled)
237 Vacuum connection for vacuum booster of EGR
238 Idle air combination jet

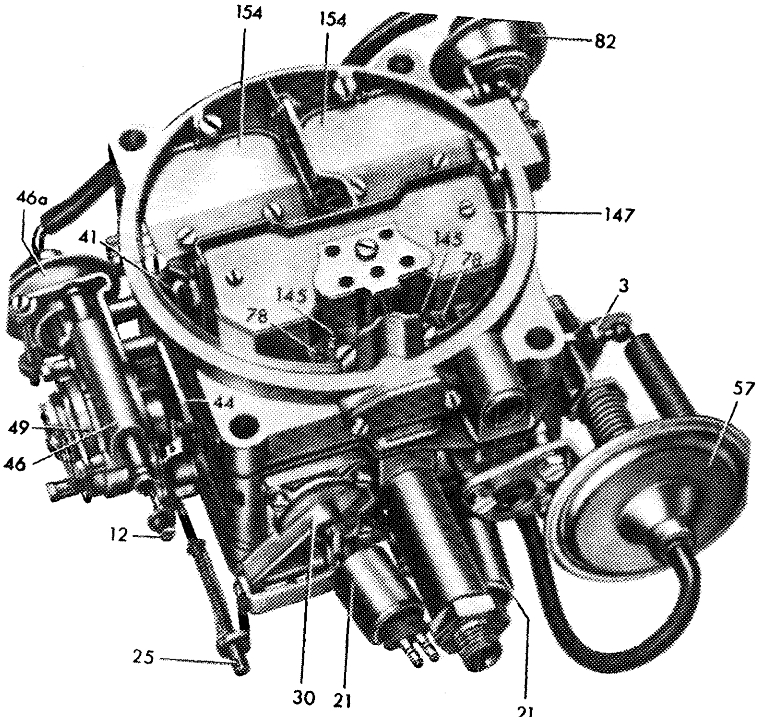


Solex carburetor 4 A 1 (S) 1976

236 TN auxiliary choke
237 Vacuum connection for vacuum booster of EGR
238 Idle air combination jet

Solex carburetor 4 A 1 (USA) 1973/74

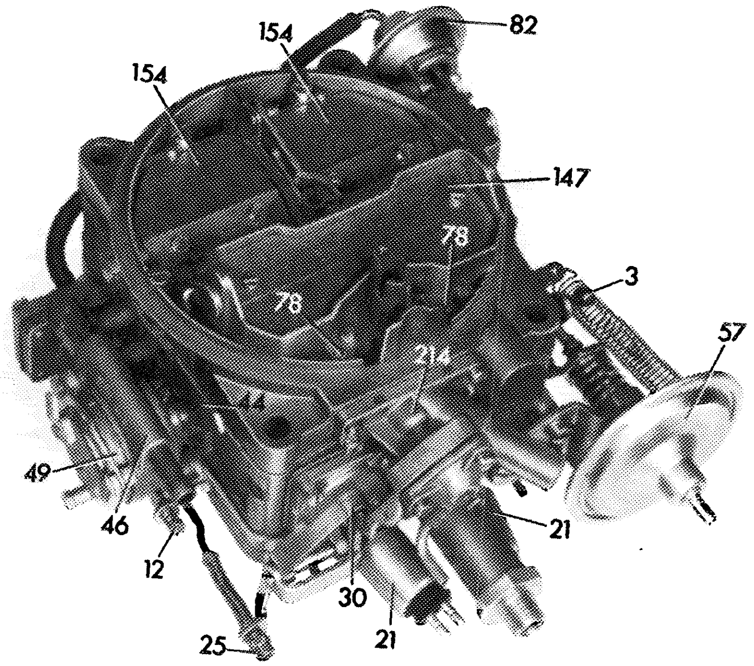
3 Throttle valve lever
12 Cold starting speed adjusting screw
21 Idle mixture cutoff valves
25 Adjusting nut accelerating pump
30 Accelerating pump cover
41 Choke rod
44 Fast idle cam
46 Choke housing
46a Vacuum control unit for automatic choke
49 Choke cover
57 Vacuum governor
78 Idle air jets
82 Vacuum control unit – air valve damper stage II
145 Air correction jets stage I
147 Choke valve
154 Air valves stage II



R 07/7461/2

Solex carburetor 4 A 1 (USA)
California 1974

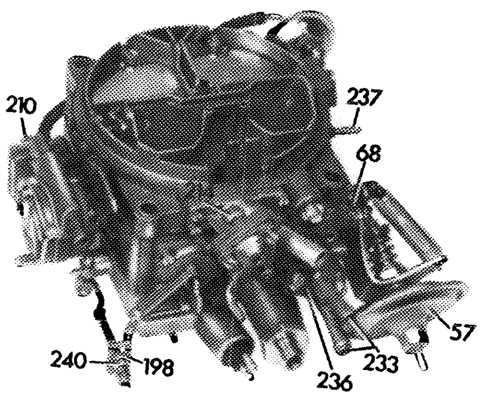
3 Throttle valve lever
12 Cold starting speed adjusting screw
21 Idle mixture cutoff valves
25 Adjusting nut accelerating pump
30 Accelerating pump cover
44 Fast idle cam
49 Choke cover
57 Vacuum governor
78 Idle air jets
82 Vacuum control unit – air valve damper stage II
147 Choke valve
154 Air valves stage II
214 Float chamber vent valve



107–8978

Solex carburetor 4 A 1 (USA) 1975/76

57 Vacuum governor
198 Actuating lever – accelerating pump
210 Pulldown cover
214 Float chamber vent valve
233 Coolant connection for TN starter
236 TN starter (thermostatically controlled bypass choke)
237 Vacuum connection for vacuum booster of EGR (Venturi connection)
240 Plastic guide piece



107–10018

The Solex carburetor 4 A 1 comprises 4 main components which are screwed to each other.

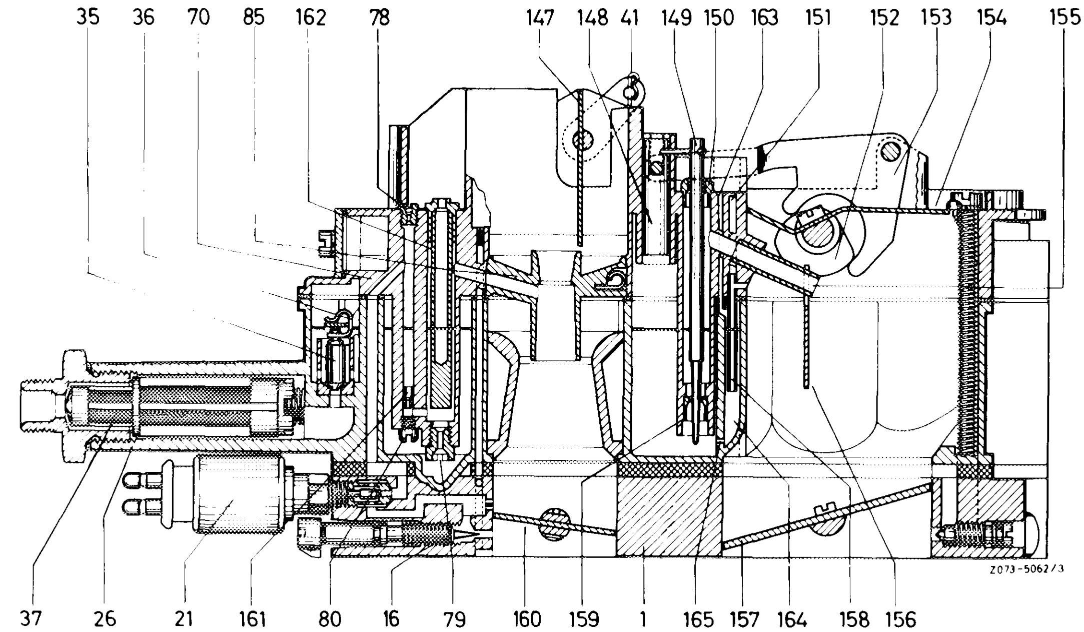
– carburetor cover
– carburetor housing
– throttle valve section
– starting device (choke)

Stage I is designed on the principle of Zenith carburetor:

– variable vacuum in mixing chamber
– main jet without change of cross section

Stage II operates on principle of Stromberg carburetor (constant pressure principle):

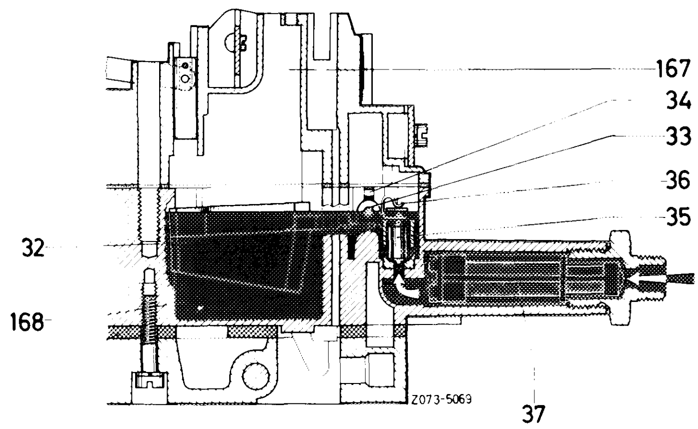
– constant vacuum in mixing chamber by means of an air valve constantly adapted to respective air flow
– main jets with variable cross section via needle control



1	Throttle valve section	80	Closing plug – idle speed duct	156	Baffle plate
16	Idle mixture adjusting screw	85	Pre-atomizer with fuel outlet arm	157	Throttle valve stage II
21	Idle mixture cutoff valve	147	Choke valve	158	Riser – bypass system stage II
26	Float housing	148	Guide pin jet needles stage II	159	Needle-controlled main jet stage II
35	Float needle valve	149	Jet needle stage II	160	Throttle valve stage I
36	Wire clip	150	Air correction jet stage II	161	Idle speed fuel jet
37	Fuel filter	151	Bypass bore stage II	162	Mixing tube stage I
41	Choke rod	152	Fast idle cam	163	Vent bore – reserve chamber
70	Carburetor cover	153	Transmitting lever stage II	164	Reserve chamber stage II
78	Idle speed air jet	154	Air valve stage II	165	Feed bore – reserve chamber
79	Main jet stage I	155	Fuel outlet arm stage II		

B. Float

The float is centrally located between the four mixing chambers. The float needle seat is pressed into carburetor housing. The needle is positively controlled. The fuel intake connection is provided with a filter.

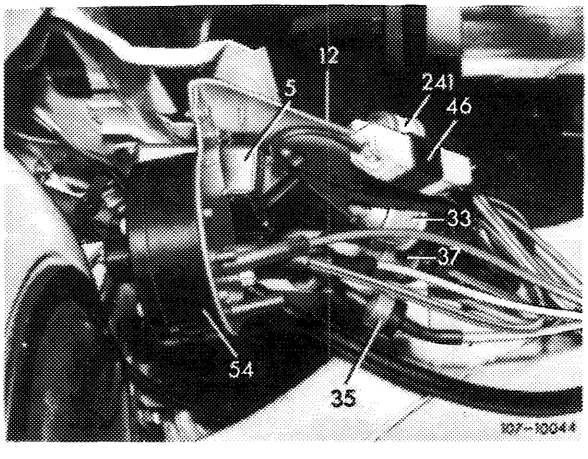


32 Float
33 Float shaft
34 Holddown
35 Float needle
36 Wire clip
37 Fuel filter
167 Vent shaft
168 Float chamber

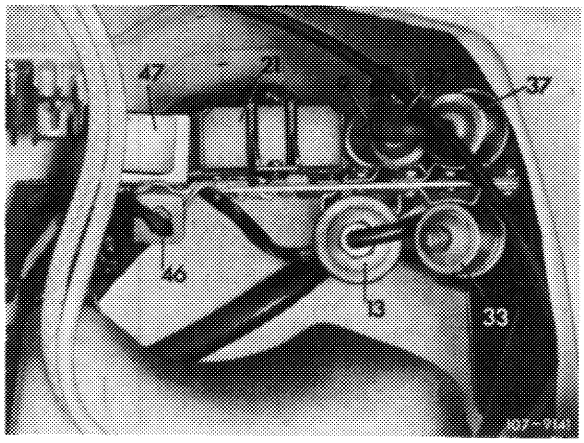
Float chamber vent system

The float chamber must be vented to provide the pressure difference between fuel level and mixture outlet. The fuel flows out under the influence of the pressure difference between float chamber and mixture outlet.
The carburetor is vented internally and externally. The external venting is operative when the engine is stopped, the internal venting when the engine is running.

With the ignition switched on, the switchover valve for float chamber external venting is energized and switches.

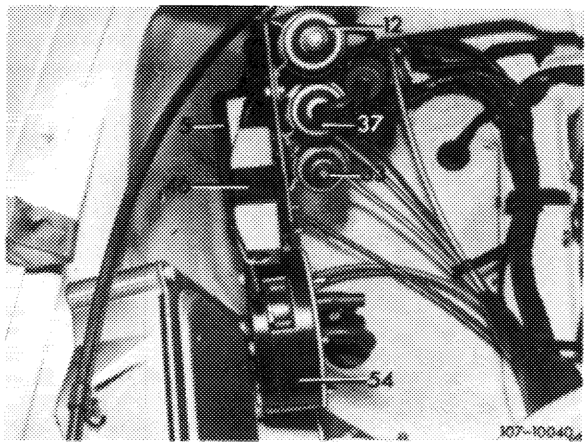


Model
Ⓙ 1976
USA 1975/76
37 Switchover valve



Model 114 (USA) California 1974

37 Switchover valve

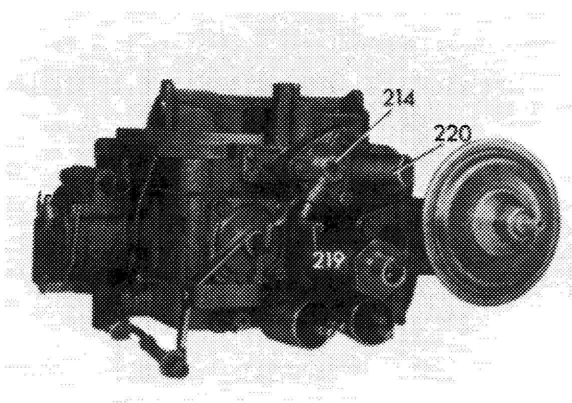


Model 114 (USA) 1975/76

37 Switchover valve

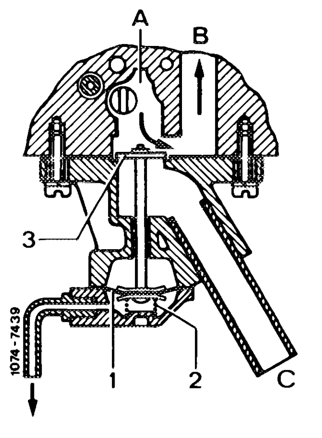
For the national version (J) 1976 and (USA) 1975/76 the float chamber vent valve is provided with a vacuum upon starting and will switch to **"internal venting"**.

For the national version (USA) California 1974 the float chamber vent valve is already provided with a vacuum from a vacuum reservoir with the engine stopped and the ignition switched on. The system switches to **"internal venting"**.



214 Float chamber vent valve
219 Vacuum connection
220 Negative vent connection

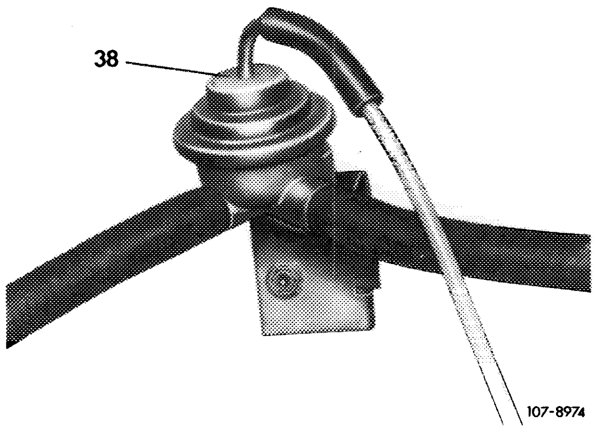
107-8977



Float chamber, internally vented

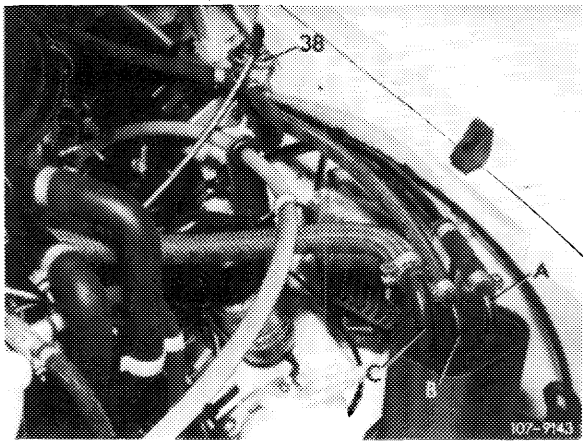
A Duct from air filter clean air end
1 Diaphragm
2 Compression spring
3 Valve plate

In dependence of the throttle valve position of stage I of the carburetor, the diaphragm of the intake valve is activated by a vacuum and the draw-off valve (purge valve) will switch.



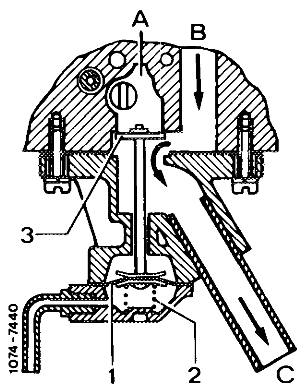
38 Draw-off valve (purge valve)

The intake pipe vacuum will now draw the stored vapors from charcoal canister by way of the draw-off valve and a connection on carburetor into intake pipe for combustion.



38 Draw-off valve (purge valve)
A Negative tank vent connection
B Draw-off valve connection
C Float chamber positive vent valve connection

When the ignition is switched off, the switchover valve is de-energized and will switch. The vacuum in the diaphragm chamber is exhausted and the float chamber vent valve will switch to **"external venting"**.



Float chamber, externally vented

B Duct from float chamber
C Duct to atmosphere

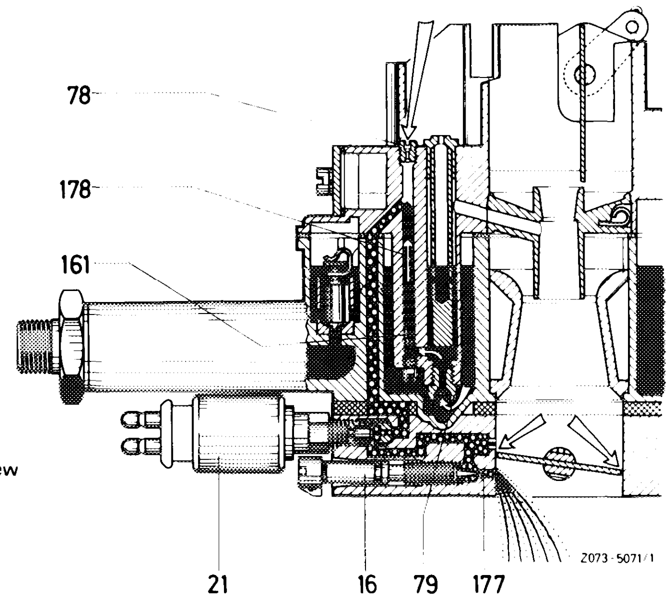
To prevent the float chamber vent valve to switch to external venting at low intake pipe vacuum (e.g. during acceleration or when driving at full throttle), a check valve is installed in vacuum line.

C. Idle speed

The idle speed system is associated with stage I. The fuel required for idle speed is taken from main jet system behind main jets (dependent idle speed system). The fuel flows via main jet through idle speed fuel jet.

The required air is fed via the idle speed air nozzle and mixes with the intake fuel. This idle speed emulsion (initial mixture) flows out below throttle valve. Its quantity can be changed by the idle speed mixture adjusting screw.

The idle speed mixture is formed by the initial mixture and the air entering through annular gap of throttle valves.



16 Idle speed mixture adjusting screw
21 Idle speed shutoff valve
78 Idle speed air jet
79 Main jet stage I
161 Idle speed fuel jet
177 Idle speed mixture outlet bore
178 Idle speed fuel duct

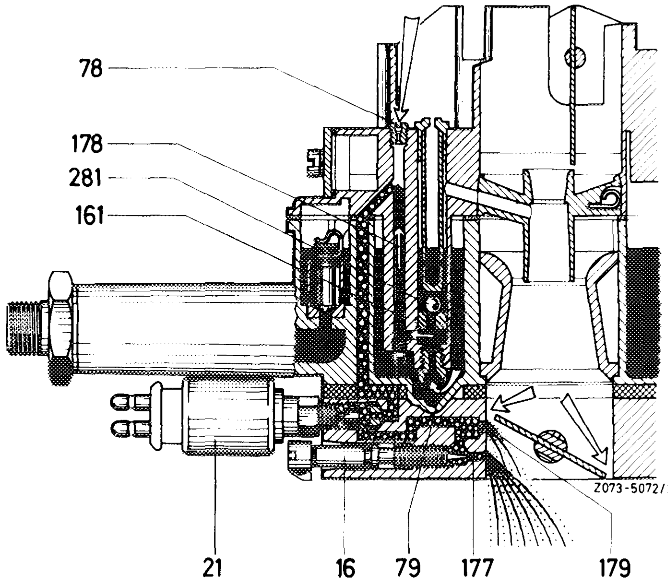
Idle speed shutoff valve

The idle speed mixture ducts are provided with screwed-in shutoff valves in front of idle speed mixture adjusting screws.

With the ignition switched on, the shutoff valves are energized and are open. When the ignition is switched off, the shutoff valves will be de-energized and will close the idle speed mixture flow holes by means of their spring-loaded sealing cones, so that any afterrunning of engine is prevented.

D. Bypass carburetor stage I

To guarantee perfect transition from idle speed to main jet system of stage I, bypass bores are provided above idle speed mixture outlet bores, covered by the throttle valves. When the throttle valves are opened, these calibrated bores are exposed. The resulting vacuum will draw off additional fuel emulsion through those bores.



16 Idle speed mixture adjusting screw
21 Idle speed shutoff valve
78 Idle speed air jet
79 Main jet stage I
161 Idle speed fuel jet
177 Idle speed mixture outlet bore
178 Idle speed fuel duct
179 Bypass bores stage I

E. Acceleration

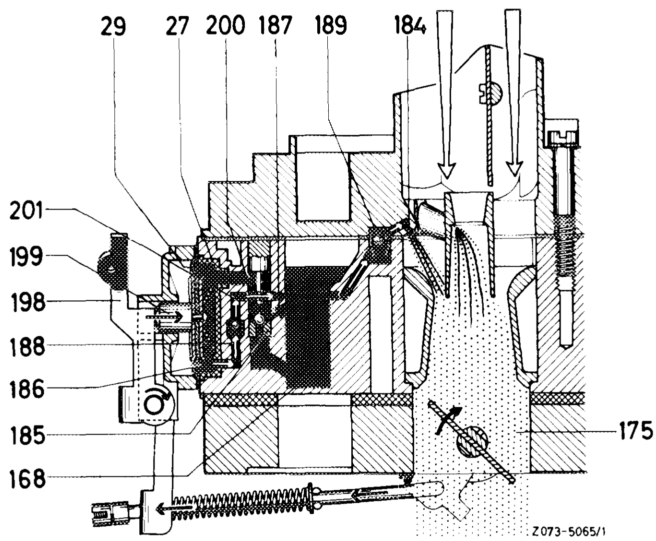
To guarantee adaptation of mixture quantity to heavily increasing air flow during sudden acceleration, an accelerating pump will be required.

The accelerating pump is a mechanically actuated diaphragm pump. The fuel is injected through calibrated bores or jets in carburetor cover.

During the suction stroke of the diaphragm, the fuel is sucked from float chamber through suction valve into pump chamber. The pump chamber is lined by a plastic shell for thermal insulation. Any vapor bubbles will escape through a vent bore in float chamber.

During pressure stroke of diaphragm, the fuel is injected into mixing chambers of stages I via the pressure valves and the calibrated injection bores. The two pressure valves prevent the penetration of air into pump system during suction stroke.

Note: To enrich the mixture, additional fuel is drawn from pump system (neutral pump) in dependence of the vacuum in the mixing chamber.



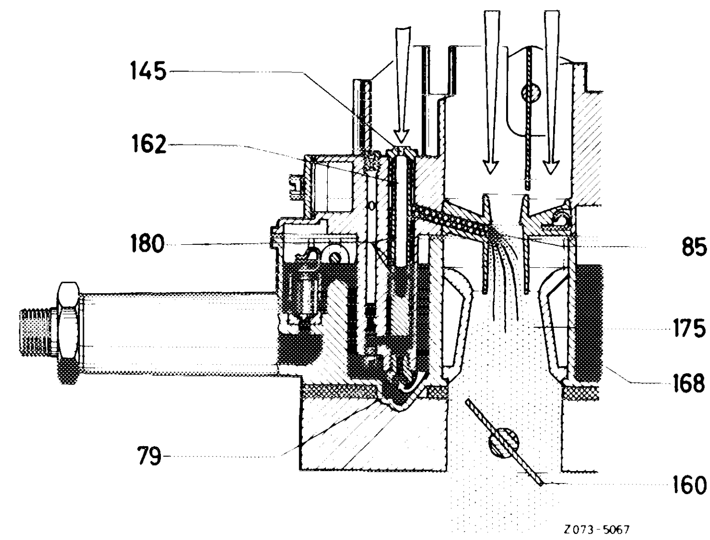
27 Plastic shell
29 Diaphragm
184 Calibrated injection bore
185 Suction valve
186 Pump chamber
187 Vent bore
188 Pressure valve
189 Pressure valve

F. Main jet system carburetor stage I

Main jet system

The fuel flows from float chamber through main jets into the mixing tubes. When the air flow rate (vacuum) is adequately high, the fuel is drawn off into the mixing chambers.

At increasing speed, the fuel level in mixing tubes will drop and will expose the compensating air bores one after the other. The compensating air flowing in through air correction jets mixes with the fuel into an emulsion and prevents excessive enrichment.

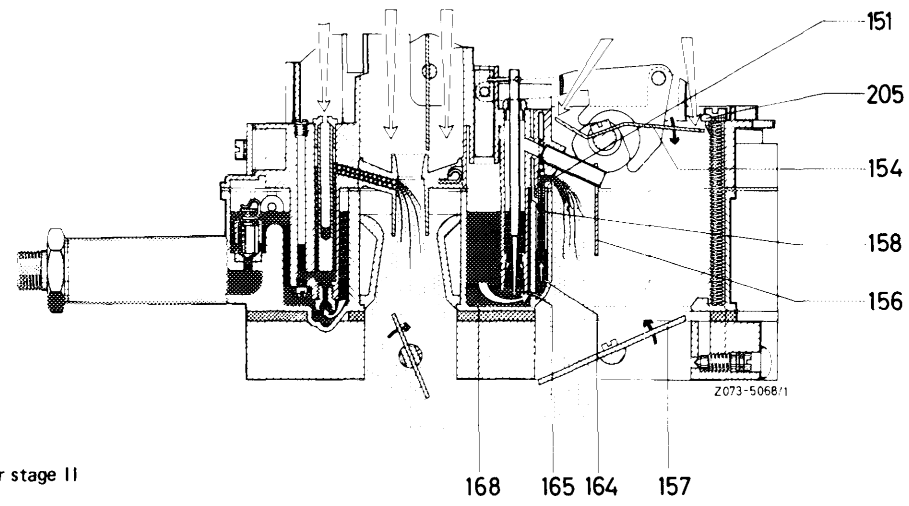


79 Main jet stage I
85 Pre-atomizer with mixture outlet arm
145 Air correction jet stage I
162 Mixing tube stage I
168 Float chamber
180 Compensating bores

G. Bypass carburetor stage II

To guarantee a lag-free transition (bypass) from stage I up to start of main jet system of stage II, bypass bores are located below air valves.

When the air valves are opening, fuel is drawn from reserve chambers through the riser pipes. The fuel flows to the reserve chambers through calibrated bores which are dimensioned in such a manner that only the follow-up fuel can be drawn from empty reserve chambers. This will limit a quantity available for enrichment. The mixture is guided by the baffle plates into the gap of the opening throttle valves.

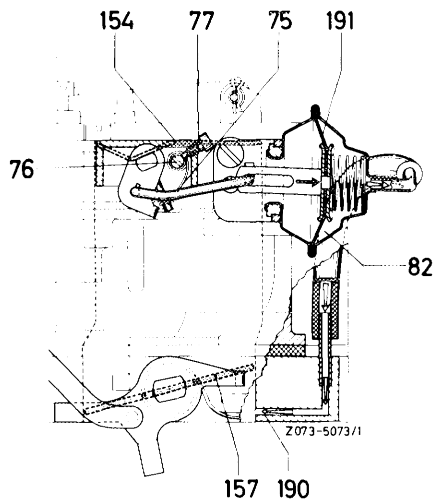


151 Bypass bore stage II
154 Air valve
156 Baffle plate
158 Riser bypass system stage II
164 Reserve chamber
165 Calibrated feed bore
168 Float chamber
205 Stop for air valve carburetor stage II

Dashpot for air valve carburetor stage II

The vacuum-controlled dashpot serves the purpose of preventing the sudden opening of the air valves. The dashpot is provided with a vacuum by way of a vacuum line which opposes the vacuum at the air valve.

The location of the vacuum tapping bore for the dashpot, as well as the dimensions of the diaphragm in the dashpot are designed in such a manner that the vacuum effective at the air valve is always able to open the valves.



75 Restoring spring
82 Dashpot – air valves
154 Air valve stage II
190 Vacuum tapping bore
191 Diaphragm

Note: During acceleration, the air flaps must be opened under delay so that enough fuel is available for a good bypass (fuel column will accelerate slower than air column) to eliminate faults when passing from carburetor stage I to carburetor stage II.

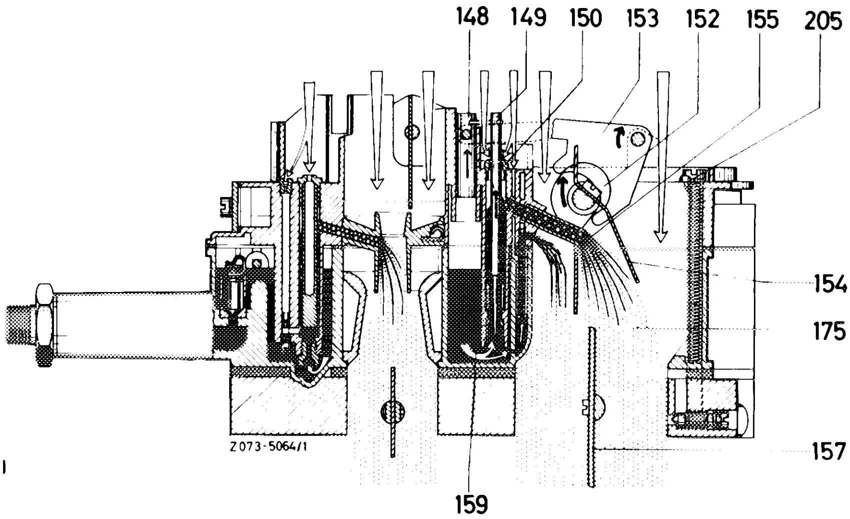
The dashpot serves the same purpose as that in Stromberg carburetor (accelerating pump effect). The dashpot acts in direction of restoring spring on air valves of stage II and only during acceleration, but not when the throttle valve position remains the same.

H. Main jet system carburetor stage II

When the throttle valves are opening, the vacuum in mixing chambers will increase. The eccentrically supported air valves are opened by this vacuum against the force of the restoring spring. The opening of the air valves makes the intake cross section larger and reduces the vacuum until an equilibrium is established between the vacuum on the one hand and the spring-loaded air valves on the other. As a result, the air valves will take a position which is in a given ratio to the throttle valve opening and to the air flow rate. Consequently, the vacuum at fuel outlet will remain approximately constant.

When the air valves are opening, the cam will simultaneously actuate the transmitting lever, the guide pin and the jet needles, with the latter releasing a pertinent annular gap in main jet with their conical section.

The correction air flows in via the annular gap between jet needle and air correction jet and mixes with the fuel into an emulstion which is drawn off into the mixing chambers via the outlet arms.



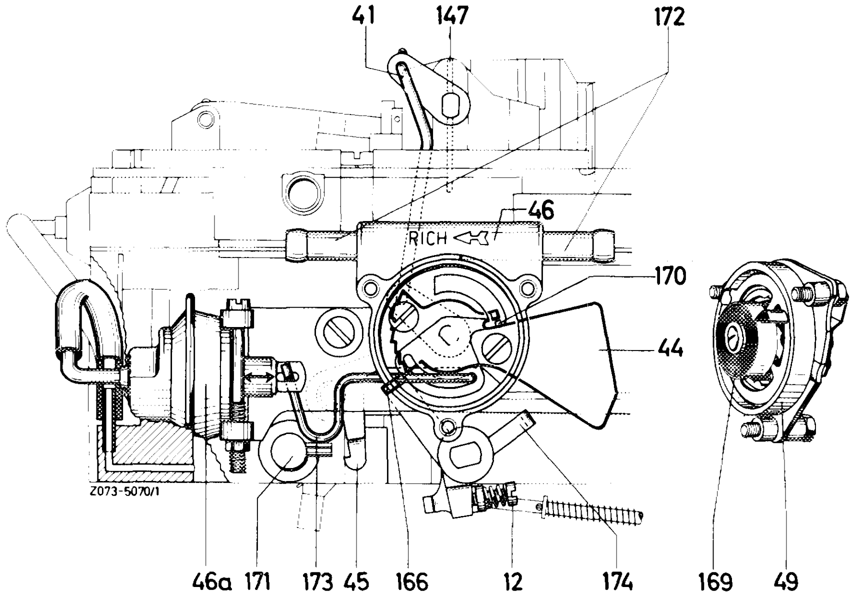
148 Guide pin
149 Jet needle stage II
150 Air correction jet stage II
152 Cam
153 Transmitting lever
154 Air valve stage II
155 Fuel outlet arm
159 Needle-controlled main jet stage II
175 Mixing chamber
205 Fuel outlet

I. Starting device (choke)

The starting device (choke) is controlled by means of the electrically and coolant-heated bimetallic spring in choke cover. The coolant heating is required to prevent re-engagement of choke when the engine is shut off for a short period.

The choke engages automatically on cold engine when the accelerator pedal is actuated once. The choke valve is closed by the bimetallic spring by way of a driver and the choke rod. The fast idle cam with the counterweight is simultaneously turned to cold starting position. This will place the throttle valve lever on the topmost step of the fast idle cam and the throttle valves of stage I are opened by a given angle.

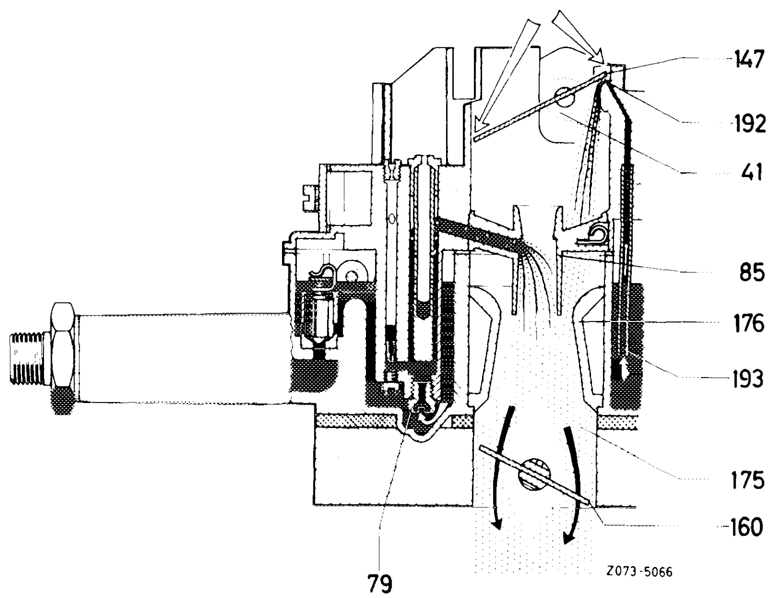
12 Cold starting speed adjusting screw
41 Choke rod
44 Fast idle cam with coutnerweight
45 Detent lever stage II
46 Vacuum control unit housing
46a Dashpot (pulldown)
49 Choke cover
147 Choke valve
166 Throttle valve stop for choke
169 Bimetallic spring
170 Drive lever – choke valve
171 Throttle valve shaft stage II
172 Coolant connection
173 Connecting rod (pulldown)
174 Transmitting lever – accelerating pump



The closed choke valve will increase the vacuum in the mixing chambers when the engine is started to the extent that fuel is drawn from main jet system. This vacuum will also act against closed choke valve and will open that valve against the force of the bimetallic spring to the extent that the air required for the starting mixture can flow in.

Additional fuel is drawn in via the riser pipes of the start enrichment system until the choke valve is slightly opened (choke valve gap). The result is an initially rich starting mixture which permits the engine to fire reliably even at low temperatures.

41 Choke rod
79 Main jet stage I
85 Pre-atomizer with mixture outlet arm
147 Choke valve
160 Throttle valve stage I
175 Mixing chamber
176 Venturi
192 Starting mixture enrichment bore
193 Riser pipe-starting mixture enrichment



Following firing of the engine the choke valve is opened to a given gap dimension (choke valve gap) by the vacuum diaphragm of the choke via the connecting rod and the drive lever. The increasing heat of the bimetallic spring will open the choke valve still further so that at 70–75 °C coolant temperature the choke is completely switched off.

The throttle valve of stage II is locked by the detent lever. Unlocking will occur only when the choke is completely switched off, i.e. when the choke valve is fully opened by the drive pin of the fast idle cam.

Thermostatically controlled auxiliary bypass choke (TN choke)

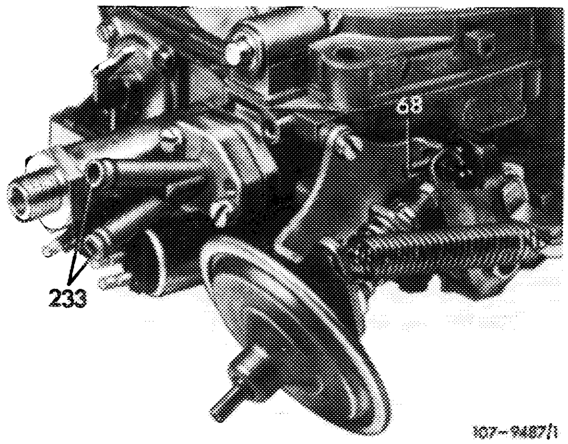
The thermostatically controlled auxiliary bypass choke is installed together with the following carburetors:

(J) 1976
(S) 1976
(USA) 1975/76

Significance of designation "TN":

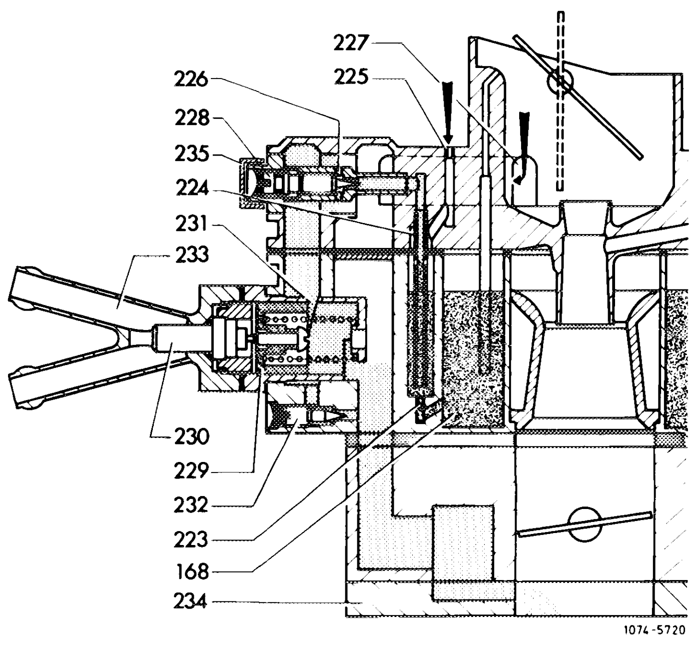
T = temperature-controlled
N = bypass

To improve the warming-up characteristics, the warming-up mixture is guided into the intake pipe in dependence of the coolant temperature, while bypassing the throttle valve.



233 Thermostatically controlled auxiliary bypass choke (TN choke)

The vacuum in intake pipe serves to draw fuel from float chamber by way of the starting fuel jet. The fuel will move upwards in mixing tube and will be mixed with air from the starting air jet into a fuel-air mixture. This fuel-air mixture is mixed with additional air from air duct at outlet bores. The mixing ratio is set by the manufacturer by means of the temperature-controlled mixture adjusting screw (TN mixture adjusting screw).



168 Float chamber
223 Starter fuel jet
224 Mixing tube
225 Starting air jet
226 Outlet bore
227 Air duct (TN main air)
228 TN mixture adjusting screw
229 Control piston
230 Expanding element
231 Control window
232 Leak volume adjusting screw
233 Coolant connection
234 Insulating flange
235 Plastic cap

The mixture flowing to the intake pipe is metered by a control piston which is actuated in dependence of the coolant temperature by means of an expanding element. With increasing coolant temperature, the control piston will close the control window until it is completely closed at 70–75 °C. The choke is thereby switched off except for a very low amount of leak mixture, which flows to the intake pipe by way of the leak volume adjusting screw. The leak volume is set by the manufacturer.

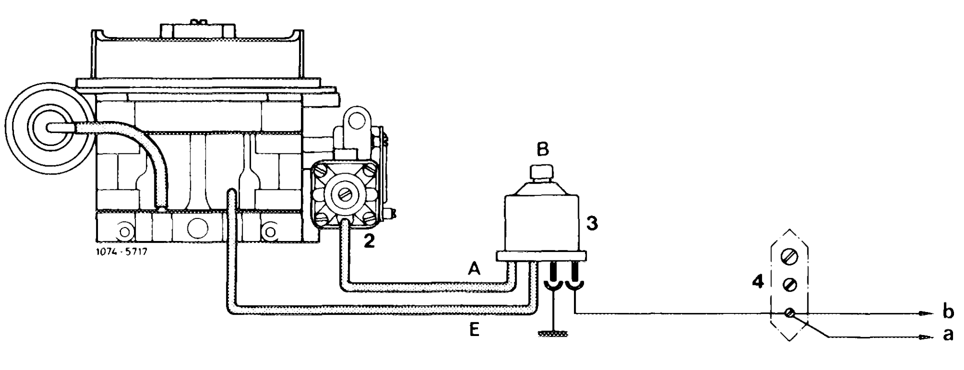
The setting of the throttle valve required for a cold start is no longer made by means of the fast idle cam, but via the vacuum governor. For this reason, the adjusting screw for cold starting speed is no longer installed. The fast idle cam now controls only the unlocking of stage II which results in the complete opening of the choke valve.

Switchover valve for pulldown delay (lag)

The switchover valve prevents the pulldown from pulling the starting valve immediately to a gap position during the starting procedure, since this might stop the engine immediately upon starting.

During the starting procedure (as long as the ignition key is in starting position) the choke provides the switchover valve in vacuum line to choke housing with control current via terminal 50. This will connect the vacuum chamber to the outside air (atmosphere).

When the ignition key moves back from its starting position, the switchover valve will switch over. This will provide the vacuum chamber in choke housing with a vacuum and the choke valve will be pulled to the specified gap.



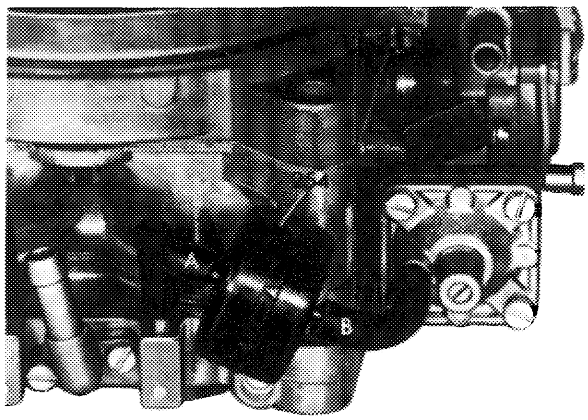
1 Solex carburetor 4 A 1
2 Choke housing
3 Switchover valve
4 Cable connector

A Outlet (to choke housing – red line)
B Connection to atmosphere
E Inlet (from carburetor – white line)
a To ignition starter switch
b To starter terminal 50

The carburetor is provided with an orifice (throttle) in vacuum connecting pipe. As a result, the choke valve will not be opened suddenly, but is pulled to choke valve gap under delay.

Thermo delay valve for choke (Ⓢ 1976 only)

The thermo delay valve opens the choke valve upon firing of engine under delay in dependence of the temperature. The valve is located in vacuum line to pulldown.



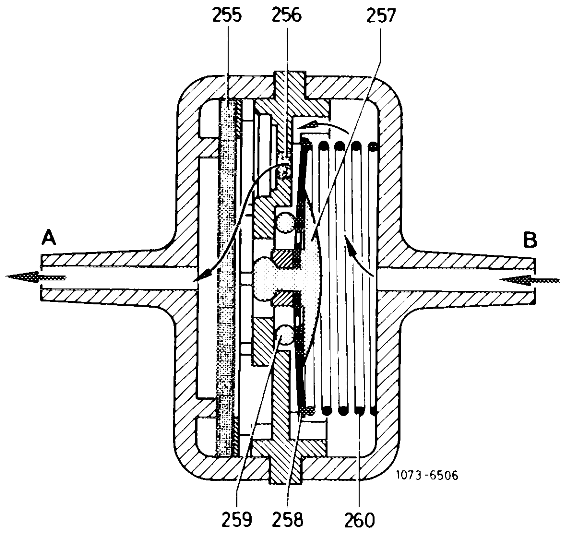
254 Thermo delay valve 107–10706

The thermo delay valve serves the purpose of pulling the choke valve at temperatures **above approx. – 12 °C** upon firing of engine not immediately to the required choke valve gap, but **under delay.**

At temperatures **below approx. – 12 °C there is no delay** under influence of thermo delay valve. At low outside temperatures, the vacuum generated by the engine is relatively low. If this vacuum would be additionally throttled, the choke valve would be opened too slowly and the warming-up mixture would become too rich, i.e. the spark plugs would soot up and misfiring would result.

Ambient temperature above approx. – 12 °C

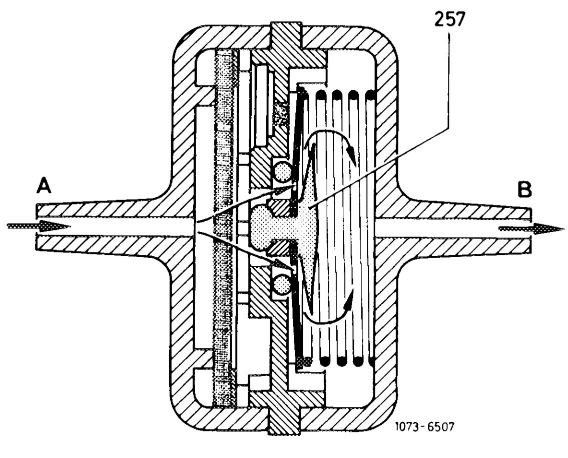
The vacuum generated by the engine is established via connection (A), filter, sintered metal disc up to diaphragm of choke. The throttle effect of the sintered metal disc will pull (open) the choke valve under delay.



255 Filter
256 Sintered metal disc
257 Check valve
258 Bimetallic valve plate
259 Rubber sealing ring
260 Spring
A Connection to carburetor
B Connection to pulldown

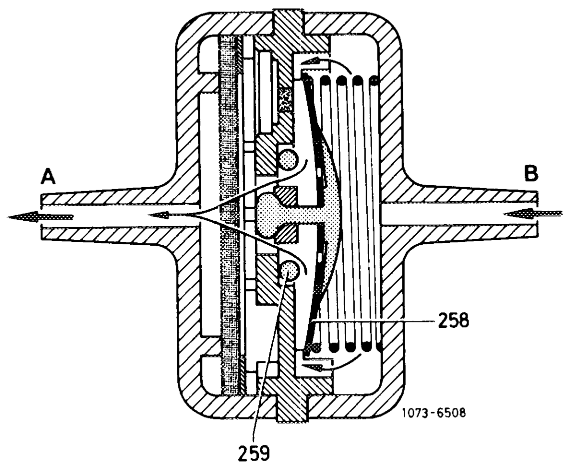
A rubber check valve is installed to make sure that the choke valve returns immediately and without delay into closing position prior to a possible attempt for a re-start.

If the engine stops after starting, the vacuum in choke housing will open the check valve. The diaphragm chamber in choke housing will be energized, the choke valve will close immediately.



Ambient temperature below approx. – 12 °C

Below approx. – 12 °C the bimetallic valve plate will snap over and will lift off from rubber sealing ring, so that the vacuum can act unthrottled on diaphragm of automatic choke. The sintered metal disc will be by-passed.



258 Bimetallic valve plate
259 Rubber sealing ring

Attention!
When installing the thermo delay valve, pay attention to direction of installation.

1. Thermo delay valve with arrow:

Arrow in direction of throttle valve section

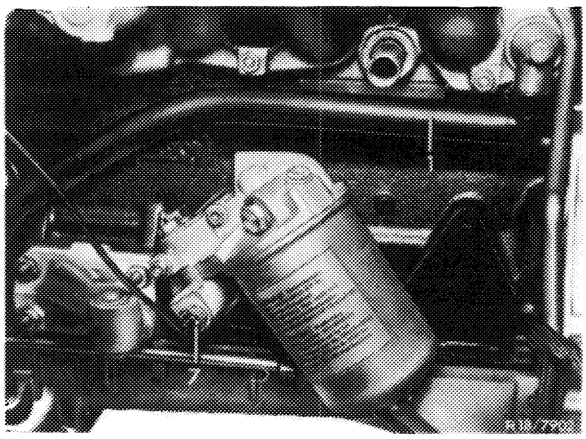
2. Thermo delay valve in two colors:

Black side in direction of throttle valve section

Choke cover-stepped heater

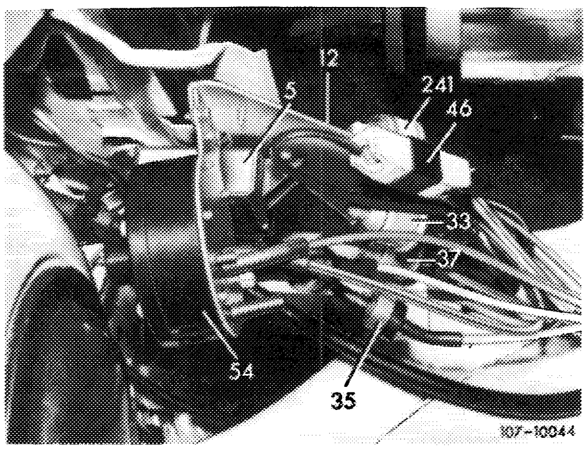
To improve warming-up characteristics, the choke cover of the automatic choke is heated in two steps. **Below 17 °C oil temperature** at **reduced** output, **above 17 °C oil temperature** the choke cover **is heated at normal capacity.**

Below 17 °C oil temperature the oil temperature switch (7) in oil filter housing is closed, the relay will switch, so that the current flows across pre-resistor.

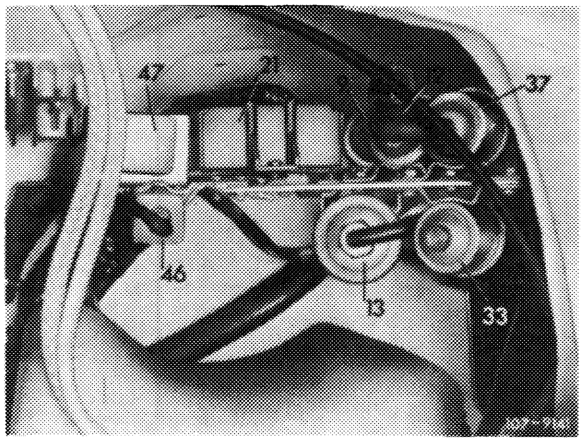


7 Oil temperature switch 17 °C

The oil temperature switch (7) will open above 17 °C oil temperature and thereby interrupt the ground connection to relay. The relay switches over, so that the current will flow directly to choke cover while bypassing the pre-resistor.

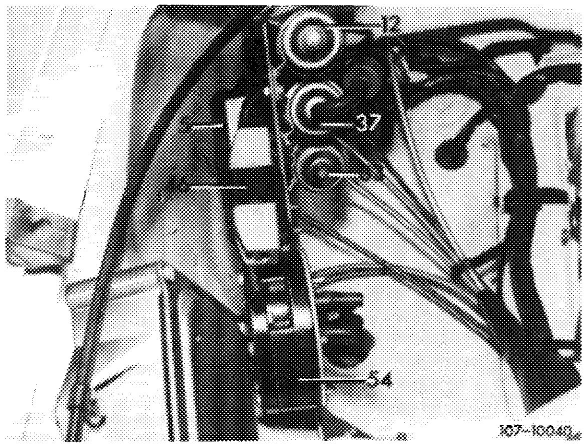


Model 116 J 1976, USA 1975/76
5 Relay
46 Resistor for choke cover-stepped heater



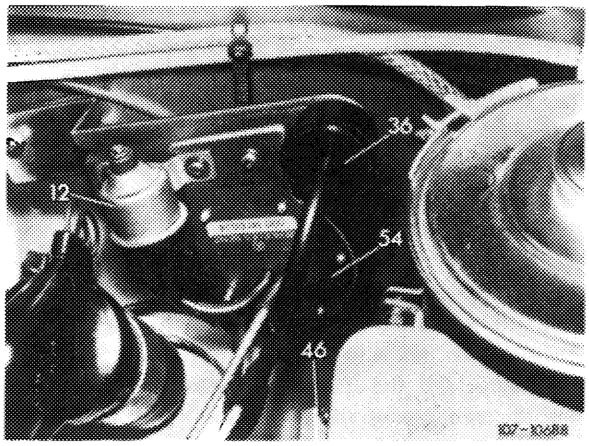
Model 114 (USA) California 1974

21 Relay
46 Resistor for choke cover-stepped heater



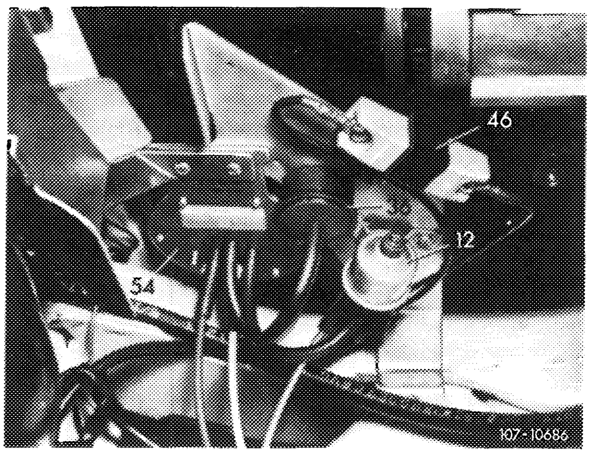
Model 114 (USA) 1975/76

5 Relay
46 Resistor for choke cover-stepped heater



Model 114 (S) 1976

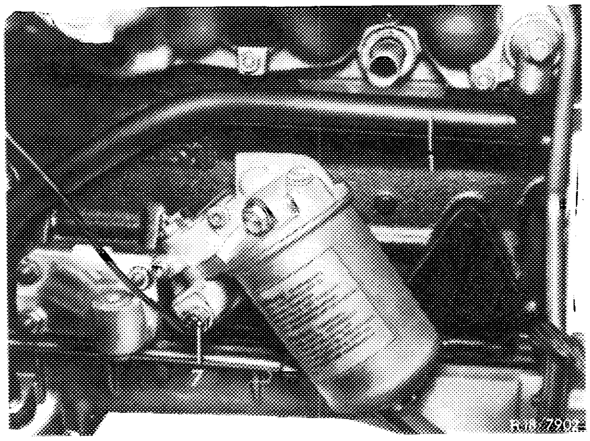
46 Resistor for choke cover-stepped heater



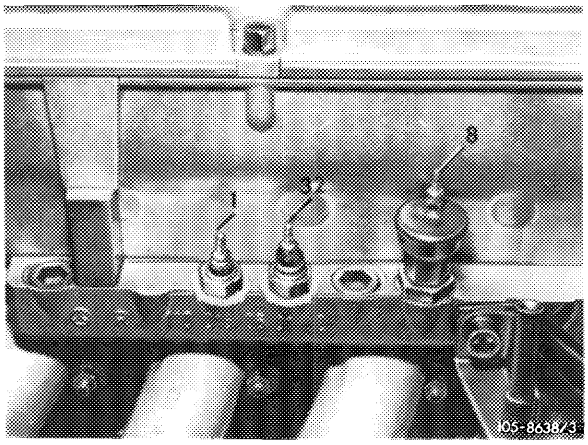
Model 116 (S) 1976

46 Resistor for choke cover-stepped heater

As a result of the electric coupling of temperature switch 17 °C (7) and temperature switch 100 °C (8) the reduced heater output will also become effective at coolant temperatures above 100 °C, but the automatic choke will then no longer be affected.

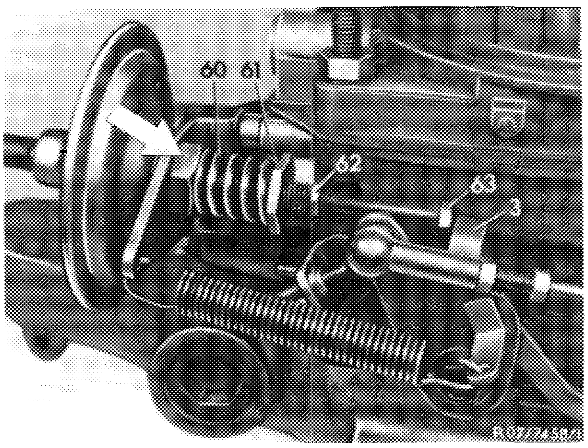


7 Oil temperature switch 17 °C



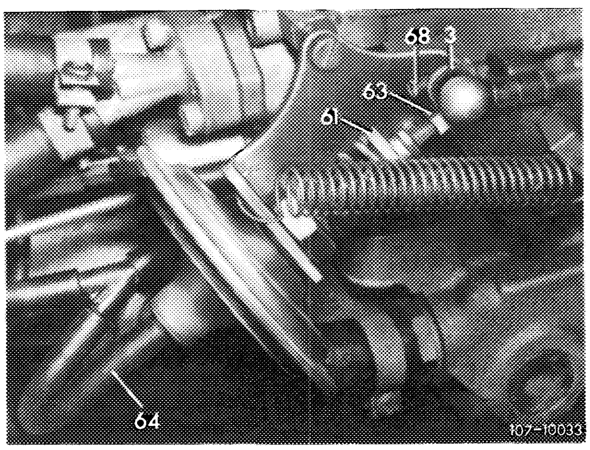
8 Coolant temperature switch 100 °C

J. Vacuum governor



The vacuum governor is installed on all Solex carburetors 4 A 1 as standard equipment and serves the purpose of stabilizing the idle speed when the engine is loaded by the additional engagement of auxiliary units or by shifting into a driving position.

At idle speed of the engine, the intake pipe vacuum will pull back the diaphragm by means of the adjusting screw. If the idling speed drops as a result of the engine load, the effective vacuum will also drop and the compression spring can now adjust the throttle valve still further by means of the adjusting screw.



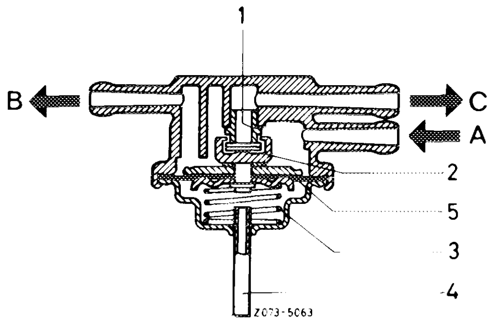
On Solex carburetors 4 A 1 with thermostatically controlled bypass choke (TN choke) the arrangement of the vacuum governor has been changed. Operation is as described above with the following difference. The throttle valve is no longer moved into starting position as before by means of the fast idle cam, but via the vacuum governor. During the warming-up period, the throttle valve lever rests against idle speed stop. When a driving position is engaged or when the power steering is operating, the vacuum governor can lift the throttle valve slightly when the engine speed drops.

Carburetor with thermostatically controlled bypass choke (TN choke)

K. Fuel return valve

The fuel return valve is located in fuel feed line in front of carburetor and is connected to fuel tank by means of a return line.

At idle and in partial load range the diaphragm is pulled down against the spring by the high vacuum and the valve will open. The excess fuel flows back into fuel tank. This fuel circulation will continuously feed relatively cool fuel to the carburetor and vapor lock will be checked.

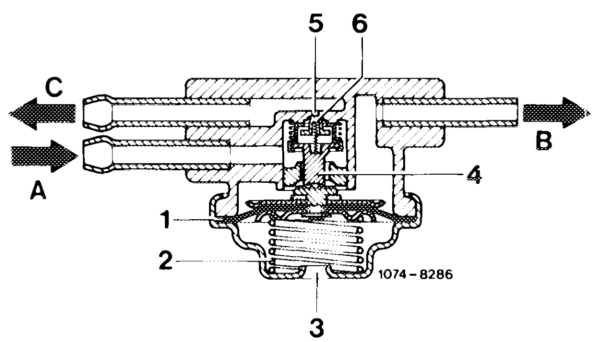


1 Valve seat
2 Valve
3 Spring
4 Vacuum connection
5 Diaphragm

A Fuel feed from delivery pump
B Fuel feed to carburetor
C Fuel return to fuel tank

Fuel return valve with pressure control
(ⓢ 1976 only)

The fuel return valve is simultaneously designed as a fuel pressure regulator. Regulation of fuel return quantity and fuel pressure to approx. 0.2 bar (gauge pressure) is effected by means of a spring-loaded valve. Fuel level fluctuations will be widely avoided. The former vacuum connection to fuel return valve is no longer in place.



1 Diaphragm
2 Spring
3 Vent bore
4 Control cone
5 Throttle bore
6 Return valve

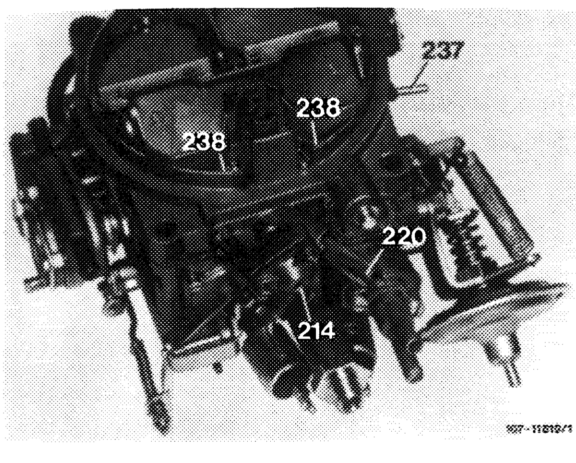
A Fuel feed from delivery pump
B Fuel feed to carburetor
C Fuel return to fuel tank

Notes

Below is a description of the different carburetor systems in relation to standard version or model years in relation to each other. Further below are the modifications introduced during the model year.

A. Ⓙ model year 1976
Differences as compared with standard version

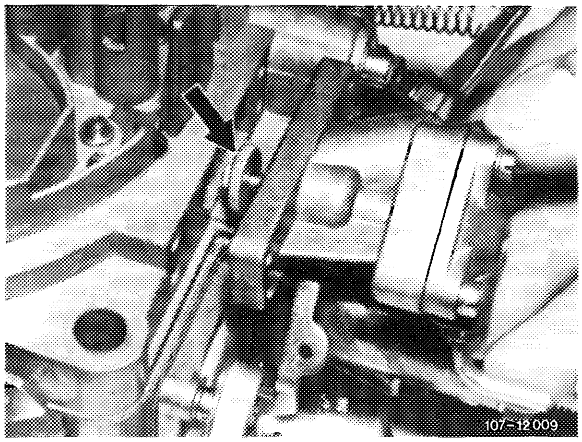
- Float chamber vent valve
- Full load enrichment in stage I no longer applicable
- Idle speed combination jet
- Vacuum connection for vacuum booster of EGR
- Carburetor cover with raised centering flange for air filter
- Draw-off connection for fuel evaporation control system and crankcase breather
- Pre-atomizer with slot
- New nozzle line-up (refer to adjusting data)
- New insulating flange
- Choke cover-stepped heater



214 Float chamber vent valve (vacuum-actuated)
237 Vacuum connection for vacuum booster of EGR
238 Idle speed combination jet

Float chamber vent valve

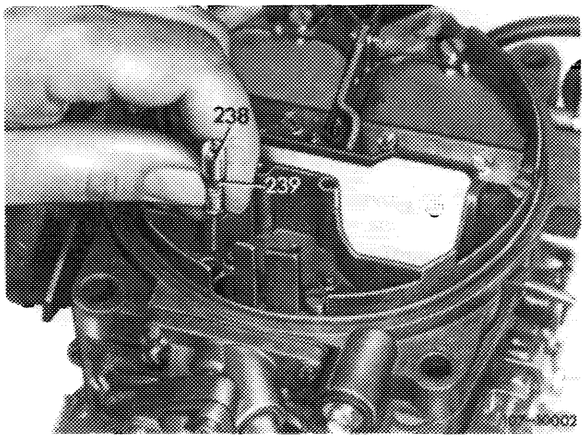
This valve (arrow) is vacuum-controlled. With the engine stopped and the ignition switched off the vent valve is set to external venting, as a result of which the fuel evaporation vapors will flow from float chamber into charcoal canister. This will improve hot starting.



Idle speed combination jet

The idle speed fuel jet and the idle speed air jet are united into a combination jet (238).

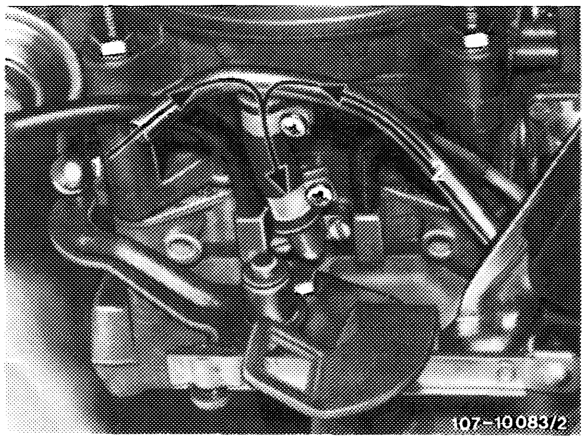
Access to idle speed fuel jet is thereby improved. *Sealing is by means of a sealing ring (239).*



Draw-off connection for fuel evaporation control system and crankcase breather

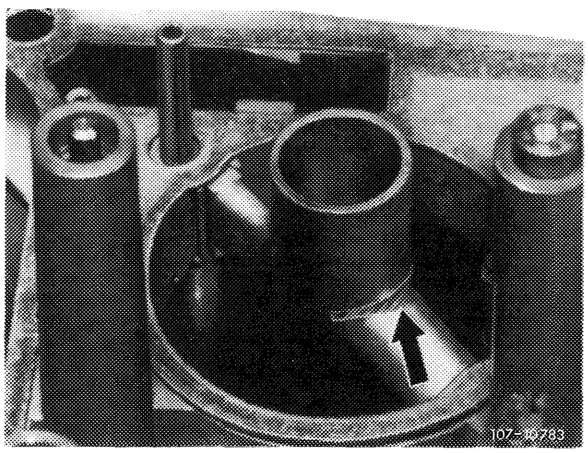
The fuel evaporation vapors from float chamber and fuel tank stored in charcoal canister, as well as the vapors of the crankcase venting system are drawn off in direction of arrow by way of a draw-off connection at the rear on carburetor while the engine is running.

1 From charcoal canister
2 From crankcase venting system



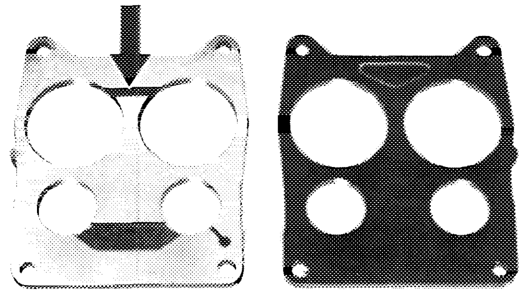
Pre-atomizer with slot

The pre-atomizer is provided with a slot (arrow) to improve atomization of the fuel.



New insulating flange

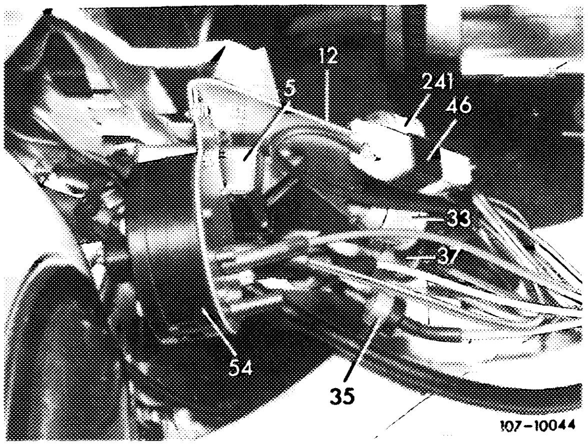
The new insulating flange is provided with a groove (arrow) by means of which the fuel evaporation vapors and the crankcase evaporation vapors are drawn off into stage II.



107-9854/1

Choke cover-stepped heater

To improve the warming-up characteristics the starter cover of the automatic choke is heated in two steps. Below 17 °C oil temperature at reduced output via pre-resistor (46), above 17 °C oil temperature the choke cover is heated at normal output.



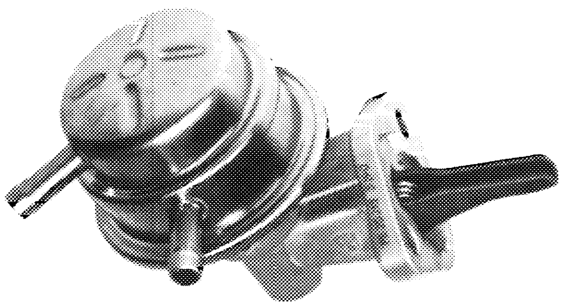
107-10044

46 Pre-resistor for choke cover-stepped heater

Fuel pump

Following the installation of the air pump for air injection, the available space made the installation of a fuel pump with angle drive necessary.

The closing cap is brazed to housing and can no longer be removed. Cleaning of the filter strainer is no longer necessary.

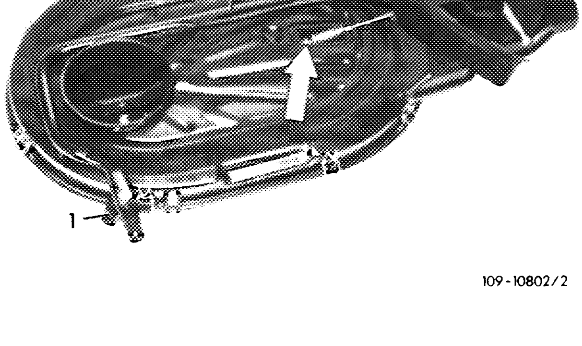


107-10953/1

Air filter

The expanding element (arrow) for controlling the intake air preheater has been moved inside air filter.

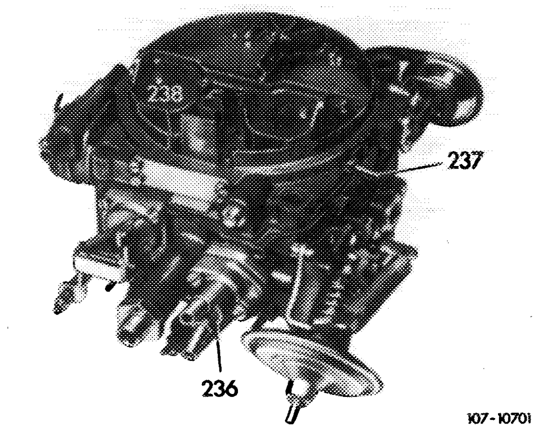
For air injection the air filter is provided with an additional hose connection (1). For reasons of available space, the air injection line (2) is attached below to air filter.



109-10802/2

B. (s) model year 1976
Differences as compared with standard version

- Idle speed combination nozzle
- Needle-controlled enrichment in stage I no longer applicable
- Vacuum connection (237) on carburetor cover for vacuum booster of EGR
- Carburetor cover with raised centering flange for air filter
- New fuel return valve with fuel pressure control
- New expanding element for thermostatically controlled bypass choke (TN choke)
- Thermo delay valve for choke
- Choke cover-stepped heater
- Pre-atomizer with slot
- Draw-off connection for crankcase ventilation
- Orifice (throttle) in hose to vacuum governor
- Jet line-up (refer to adjusting data)

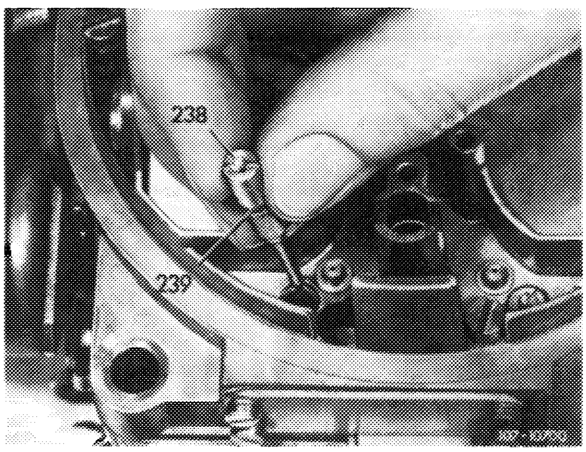


236 Thermostatically controlled bypass choke (TN choke)
237 Vacuum connection for vacuum booster of EGR
238 Idle speed combination jet

Idle speed combination jet

The idle speed fuel and idle speed air jets are united into a combination jet (238) which can be removed in upward direction.

Access to idle speed fuel jet is thereby improved. Sealing by means of rubber sealing ring (239).

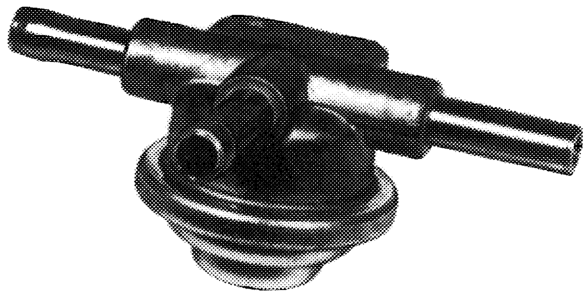


New fuel return valve with fuel pressure regulation

The new fuel return valve is simultaneously designed as a fuel pressure regulator. Regulation of the fuel return flow rate and the fuel pressure to approx. 0.2 bar gauge pressure is performed by means of a spring-loaded valve. Fuel level fluctuations will then be widely avoided.

The former vacuum connection on fuel return valve is no longer applicable.

The new fuel return valve can also be installed on carburetors used up to now. Vacuum hose for fuel return valve and distributor are no longer installed. Vacuum hose from vacuum governor is directly plugged on connection "C" on throttle valve member.

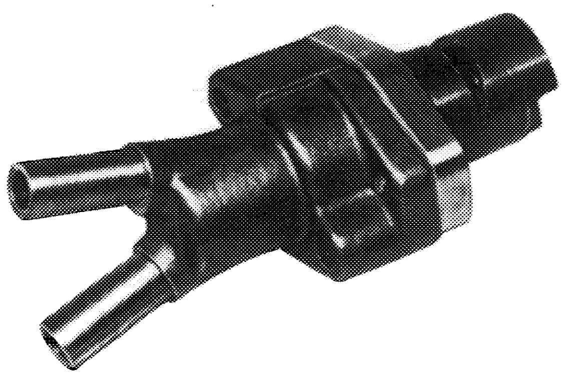


107-10705

New expanding element for thermostatically controlled bypass choke (TN choke)

The dimensions of the new expanding element are larger and the housing had to be enlarged accordingly.

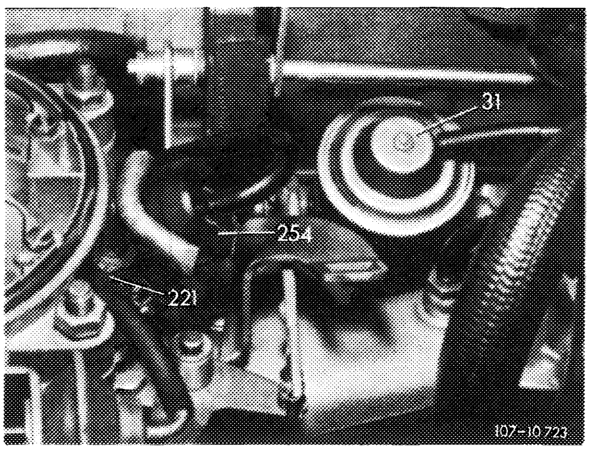
The new TN choke can also be installed on the type of carburetors used up to now.



107-10704

Thermo delay valve for choke

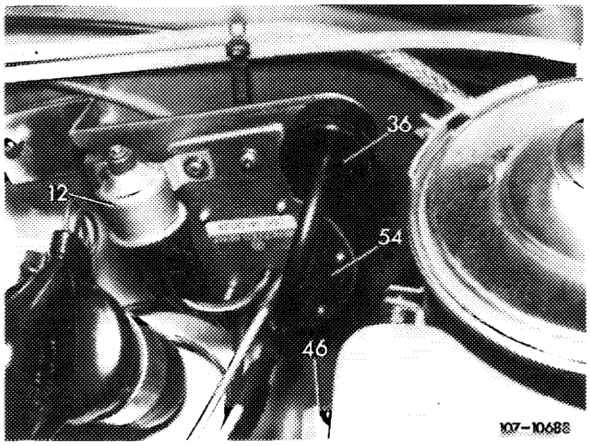
The thermo delay valve makes sure that at temperatures above approx. – 12 °C the choke valve is not immediately pulled after the engine is started, but at a delay. There is no delay by the thermo delay valve at temperatures below approx. – 12 °C.



254 Thermo delay valve

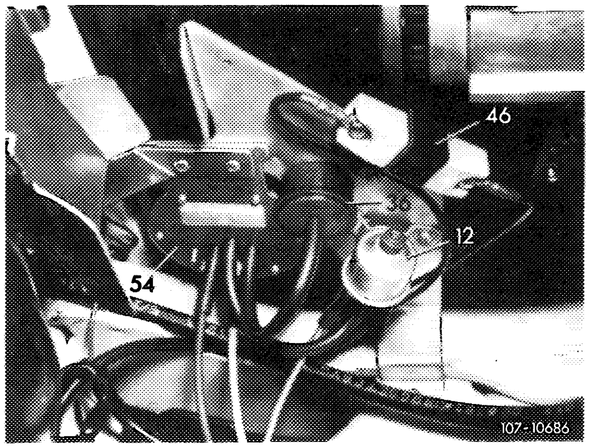
Choke cover-stepped heater

The choke cover of the automatic carburetor choke is heated in two steps. Below 17 °C oil temperature at reduced output by way of a pre-resistor (46), above 17 °C oil temperature the choke cover is heated directly.



Model 114

46 Pre-resistor for choke cover-stepped heater

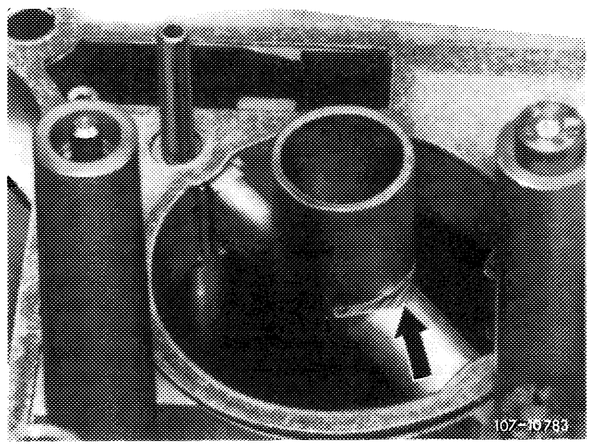


Model 116

46 Pre-resistor for choke cover-stepped heater

Pre-atomizer with slot

The pre-atomizer has a slot (arrow), by means of which the atomization of the fuel is still further improved.

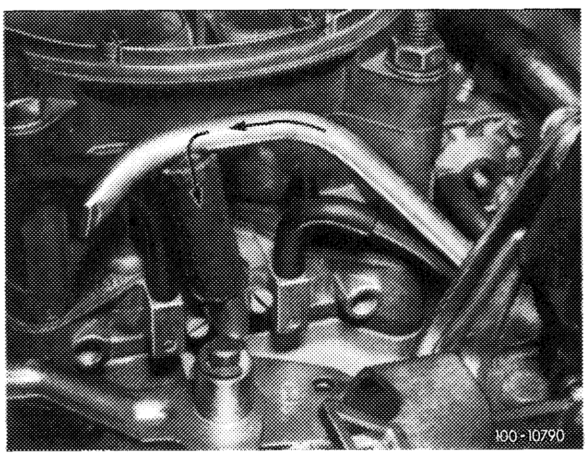


Draw-off connection for crankcase ventilation

The crankcase evaporation vapors are guided from cylinder head to draw-off connection at the rear on carburetor and are drawn off by the engine below throttle valves of stage II in direction of arrow.

Throttle in hose to vacuum governor

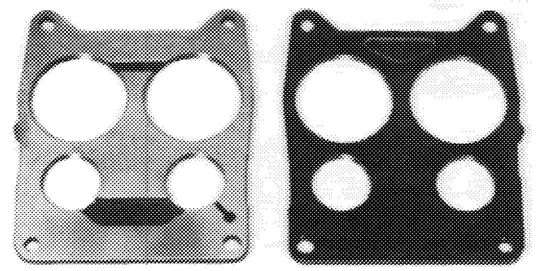
A throttle is installed in line to vacuum governor. As a result, the throttle valve will be dampened when returning to idle upon deceleration.



Insulating flange

To guide the starting and warming-up mixture from thermostatically controlled bypass choke into intake pipe, the insulating flange has been given a wide groove between stages I, and a narrow groove between stages II for drawing off crankcase evaporation vapors.

Attention!
Do not install this insulating flange in carburetors used up to now.

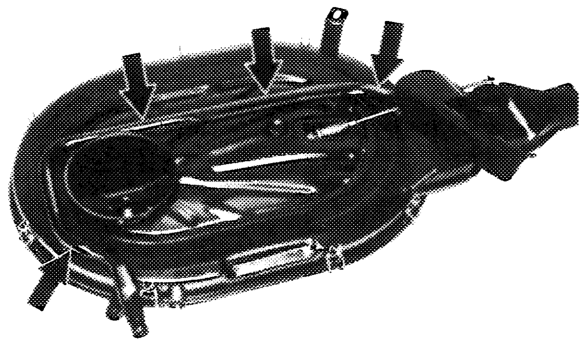


107-9854

Air cleaner

The air cleaner is provided with an additional hose connection for air relief (air discharge).

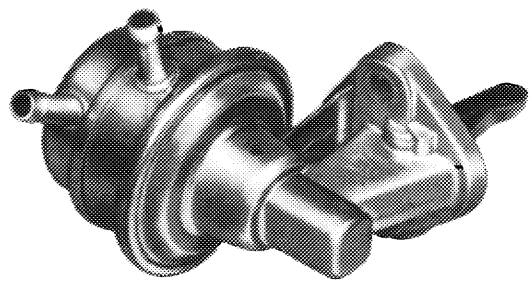
For reasons of available space, the air relief (air discharge) is attached below on cleaner.



109-10802

Fuel pump

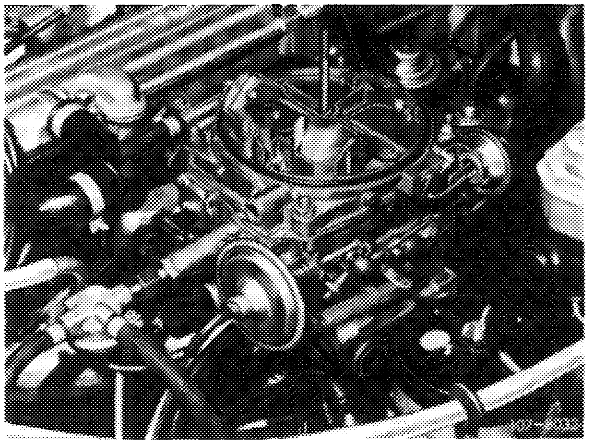
For lack of space following installation of air pump for air relief (air discharge) the fuel pump had to be provided with an angle drive.



107-9099

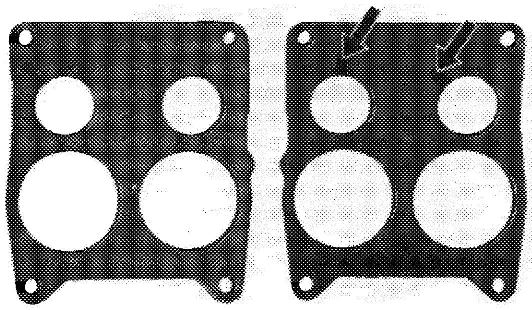
C. USA model year 1973 Federal
Differences as compared with standard version

- Needle-controlled enrichment in stage I no longer applicable
- Float chamber vent shaft with protective flange cover
- Modified jet line-up, new jet needle for stage II
- Location of vacuum bores changed
- New insulating flange



Insulating flange

The insulating flange is provided with two grooves (arrows) along which a portion of the emissions is returned to intake pipe.

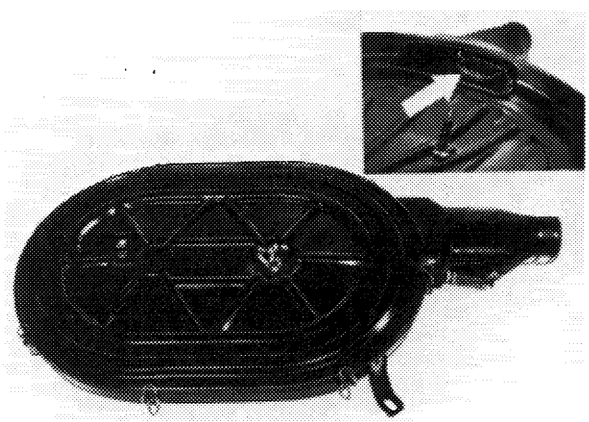


Left = top
Right = bottom

107-8916/1

Air filter

An additional flap (arrow) is mounted in air filter intake pipe above connection for intake air preheater. The flap prevents the escape of fuel evaporation vapors of warm engine as a result of preheating the intake air.



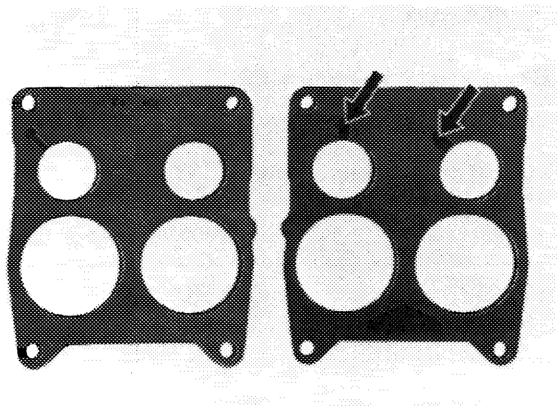
107-8001

Modifications in model year 1973

Insulating flange

The grooves (arrows) for controlling the exhaust gas return volume were milled flatter to reduce the respective exhaust emission volume.

This in turn improved driving characteristics at partial load (complaints about bucking). Former insulating flanges can be exchanged for modified version.



Left = top
Right = bottom

107-8916/1

Identification

Depth of grooves (arrows) 2.3 mm (formerly 3.0 mm).

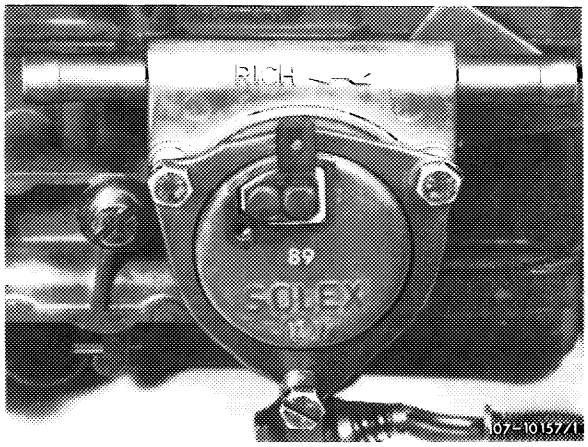
Start of production: October 1972

Model	Starting chassis end no.
114.060	006 650
114.073	001 326

Choke cover

The choke cover heater has been changed to 12 ohms (16 ohms before).

The bimetallic spring is now heated faster, the automatic choke is shut off earlier. Former choke cover exchangeable for modified version.



89 Choke cover code number

Identification

Choke cover code number **89**

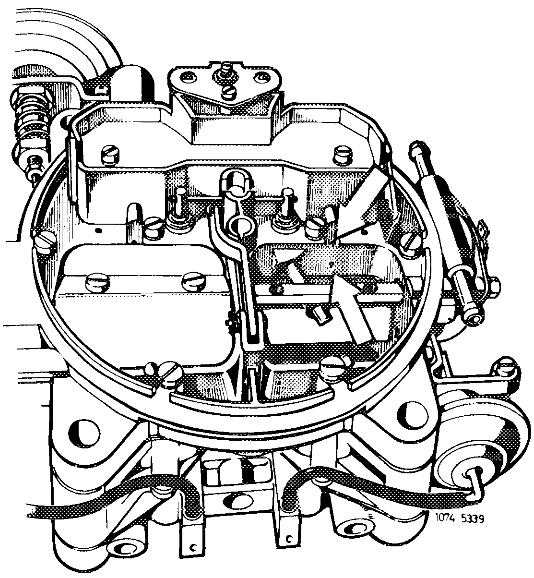
Start of production: December 1972

Model	Starting chassis end no.
114.060	009 560
114.073	002 080

Bypass bores for stage II

The bypass bores of stage II were set 8 mm deeper and increased to 2 mm dia. (1.3 mm dia. before) (lower arrow).

As a result, improved bypass characteristics from stage I to II. Former carburetor cover exchangeable for modified version.



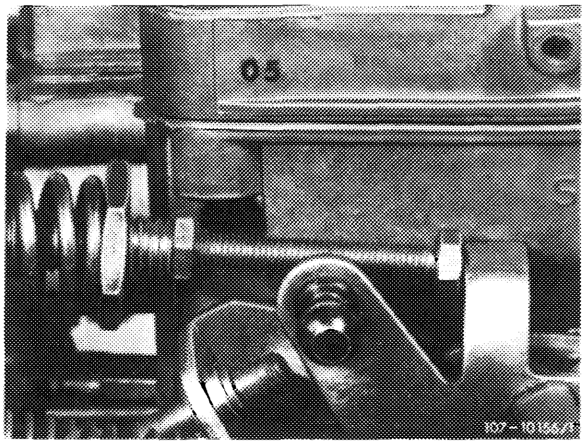
Layout bypass bore stage II
Upper arrow = former layout
Lower arrow = new layout

Identification

Starting carburetor cover code number **05** modified bypass bores for stage II.

Start of production: January 1973

Model	Starting chassis end no.
114.060	010 439
114.073	002 288



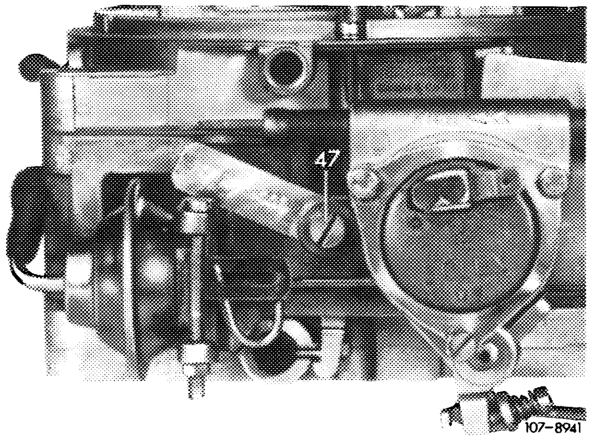
Carburetor cover code number

Choke housing

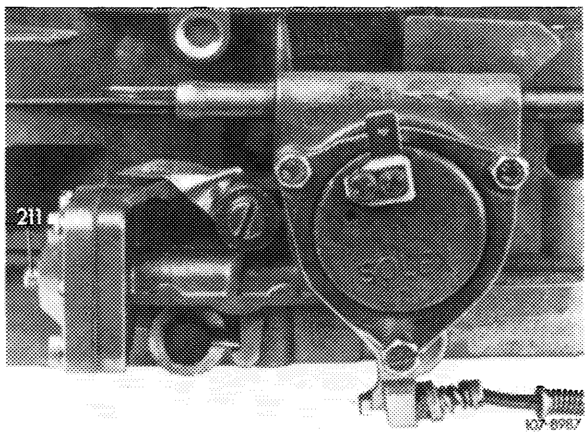
The choke housing installed up to now with separate sheet metal pulldown has been replaced by a cast iron housing with integrated pulldown and choke valve gap adjusting screw (211).

The choke valve gap adjusting procedure is now easier. Former choke housing exchangeable for modified version.

The carburetor part number has been changed to 000 070 **99 04** (000 070 87 04 before).



Choke housing with sheet metal pulldown



Cast iron choke housing with integrated pulldown

Identification

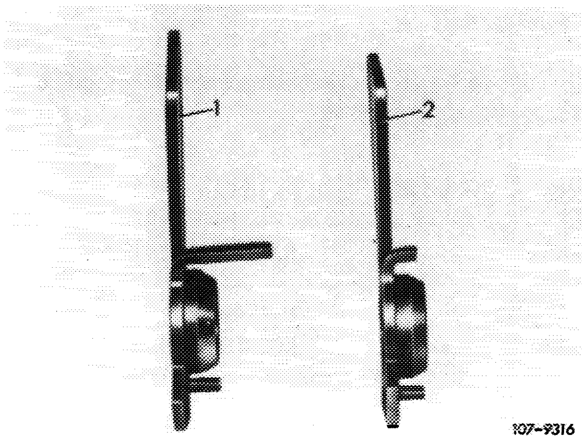
Externally recognized by choke valve gap adjusting screw (211).

Start of production: May 1973

Model	Starting chassis end no.
114.060	014 400
114.073	003 448

Repair instruction

The modified choke housing can be installed **only** in combination with a fast idle cam 2nd version (2) with shorter lever.
A longer bolt is used for fastening choke housing. (Subsequent conversion 07.2–140).



Fast idle cam versions

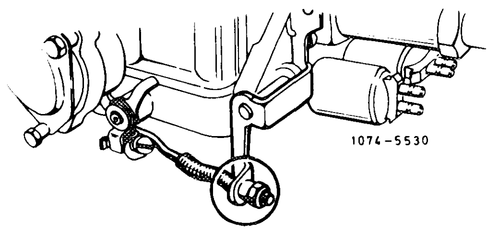
1 For choke housing with sheet metal pulldown
2 For cast iron housing with integrated pulldown

Accelerating pump

The adjusting nut with pinch lock has been replaced for a self-locking polystop adjusting nut. Simultaneously the connecting rod has been extended by 2 mm.

As a result, easier adjustment of injection volume.

Subsequent installation is possible, connecting rod and adjusting nut are replaced together.



Former version

Present version

Identification

Externally recognized by self-locking polystop adjusting nut.

Start of production: June 1973

Model	Starting chassis end no.
114.060	017 007
114.073	004 200

D. (USA) model year 1974 Federal
Differences as compared with model year 1973 Federal

The carburetor (USA) 1974 Federal is similar to (USA) 1973 Federal.

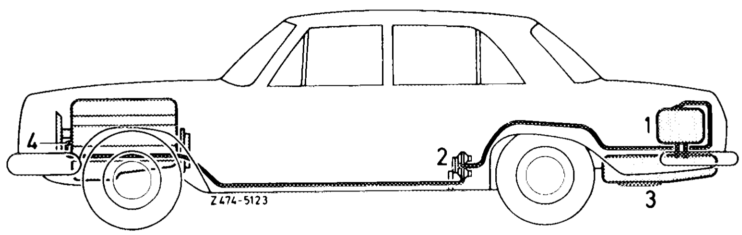
The following components of the emission control system are new:

- fuel evaporation control system
- flame arrester coil

Fuel evaporation control system

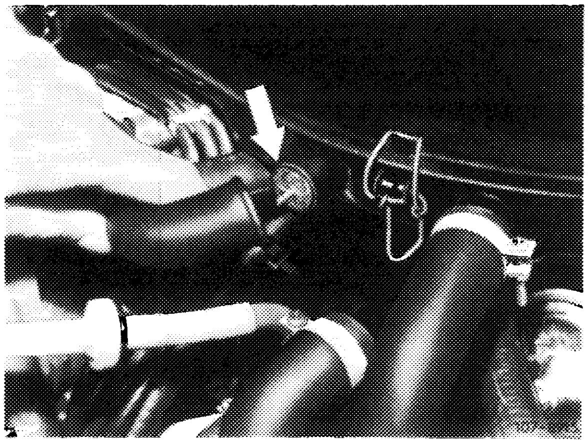
In the USA, starting model 1974, the fuel evaporation vapors from the fuel tank may no longer be discharged into the atmosphere. For this reason, they are guided through lines and a valve system into the crankcase, from where they will be flowing into the intake pipe via the engine venting system.

1 Expansion tank
2 Valve system
3 Fuel tank
4 Connection on crankcase



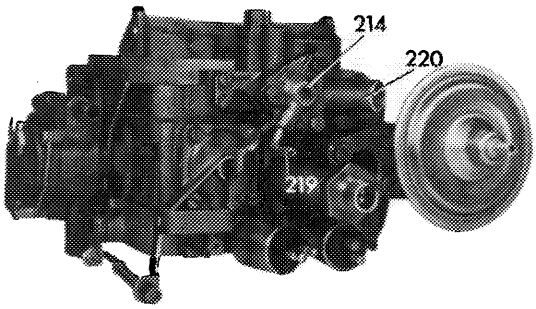
Flame arrester coil

To prevent flames from reaching the cylinder head cover in the event of a backfiring engine, a flame arrester coil (arrow) is installed in air filter.



E. (USA) model year 1974 California
Differences as compared with model year 1973 Federal

- Float chamber vent valve
- Draw-off connection for fuel evaporation control system
- New insulating flange
- Choke cover-stepped heater
- Jet line-up

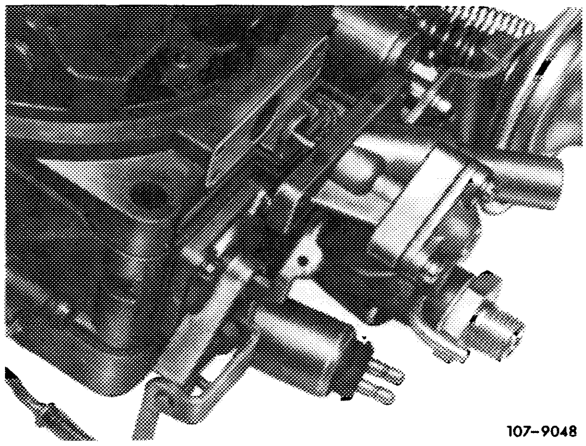


214 Float chamber vent valve
219 Vacuum connection
220 Vent connection

107-8977

Float chamber vent valve

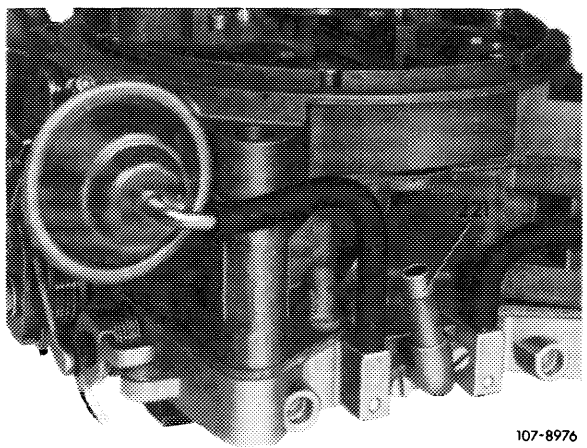
The float chamber vent valve opens with the engine switched off, so that the gases can escape toward charcoal canister.



107-9048

Draw-off connection for fuel evaporation control system

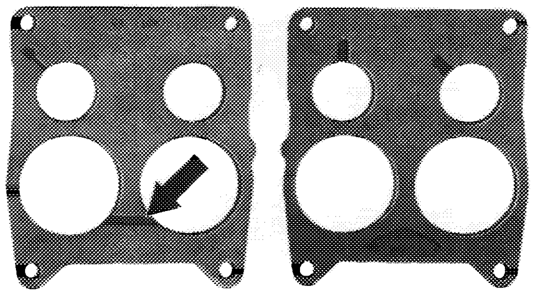
The fuel evaporation vapors from fuel tank and from float chamber are stored in charcoal canister and are drawn-off from canister via draw-off connection (221) by means of the engine vacuum.



107-8976

Insulating flange

As a result of the fuel evaporation vapors drawn off into stage II, the insulating flange is provided with a groove (arrow) between carburetor and intake pipe.

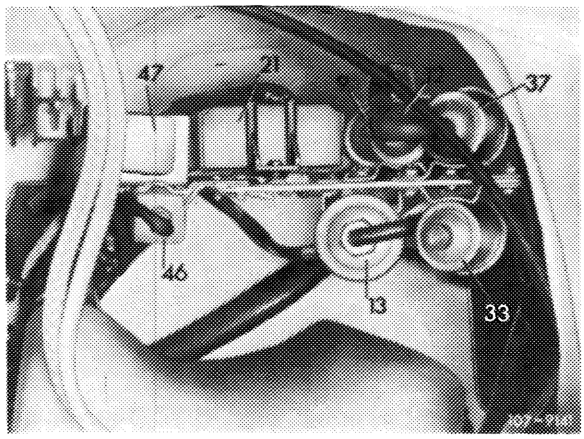


Left = top
Right = bottom

107-8916

Choke cover-stepped heater

To improve warming-up characteristics, the choke cover is heated in two steps. Below 17 °C oil temperature at reduced capacity by way of a resistor. Above 17 °C oil temperature the choke cover is heated directly (functional description 07.2–090).

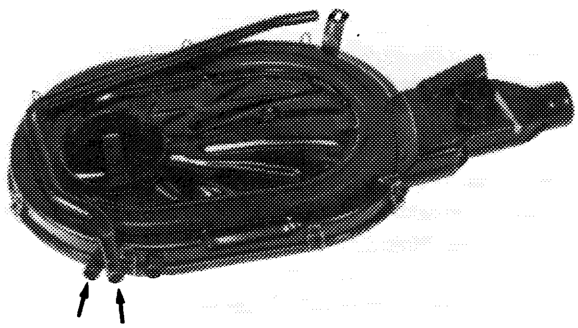


46 Pre-resistor for choke cover-stepped heater

Air filter

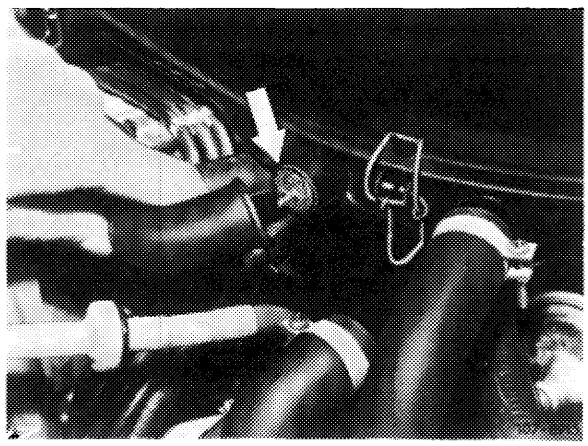
The air filter is provided with an additional hose connection for air relief (air discharge).

For reasons of available space, the air injection line is attached below on filter.



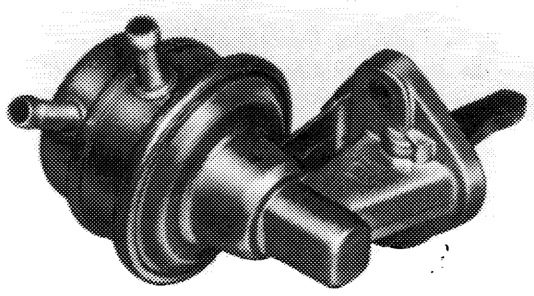
109-8972

The air filter is provided with a flame arrester coil (arrow). The coil prevents flames from reaching the cylinder head cover in the event of a backfiring engine.



Fuel pump

Lack of space caused by the installation of the air pump for air injection, required the use of an angle drive for fuel pump.



107-9099

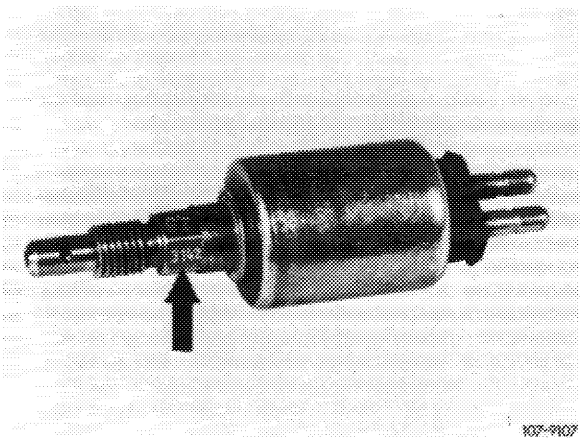
Modifications in model year 1974 (Federal and California)

Idle air shutoff valve

The idle air shutoff valves were modified in electrical section and by increasing the shutoff voltage to approx. 3 volts.

The installation of this idle speed shutoff valves prevents afterrunning of the engine. Idle speed shutoff valves installed up to now can be exchanged for modified version, including model year 1973.

Production code number
3 = Production year 1973
142 = Production day (consecutive calendar day)



107-9107

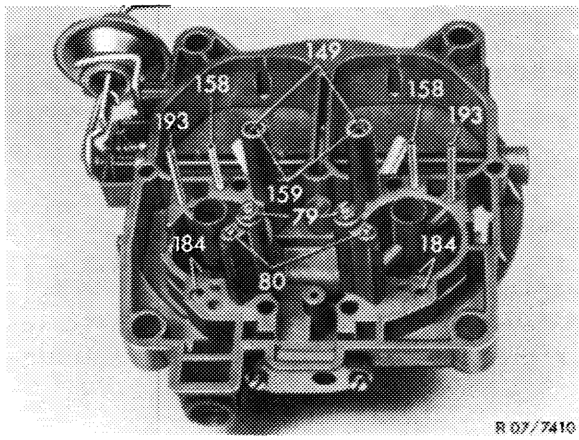
Identification

New version starting production code number **3142.**

Start of production: August 1973

Model	Starting chassis end no.
114.060	101 343
114.073	100 355

Riser pipes for bypass system stage II



The ID of the riser pipes (158) has been reduced to 1.0 mm (formerly 1.8 mm).

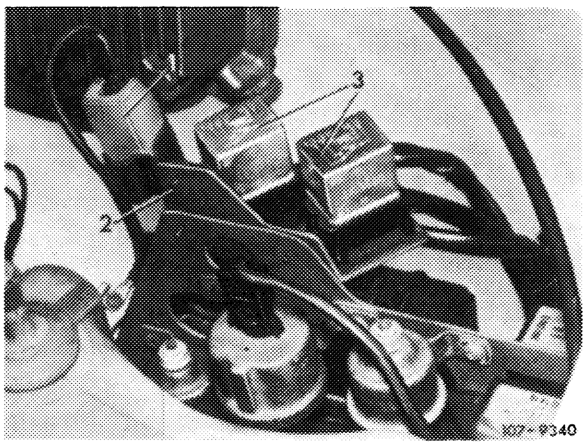
As a result, improved bypass characteristics during sudden full throttle acceleration of the stopped vehicle or from low engine speed.

Start of production: January 1974

Subsequent conversion of riser pipes for stage II, also for model year 1973 (for conversion refer to programmed repairs at "Bypass faults during acceleration from carburetor stage I to II").

Choke cover-stepped heater

(**For Federal emission control only**, for California emission control installed from start of series).



1 Pre-resistor
2 Auxiliary mounting bracket
3 Relay

The choke cover is heated in two steps:

Up to + 17 °C engine oil temperature reduced by adding a pre-resistor (1), **above + 17 °C engine oil temperature normally** heated.

As a result, improved riding characteristics during warming-up stage in temperature range from −5 °C to +5 °C.

Identification

Externally visible by pre-resistor (1).

Start of production: January 1974

Model	Starting chassis end no.
114.060	106 145
114.073	101 989

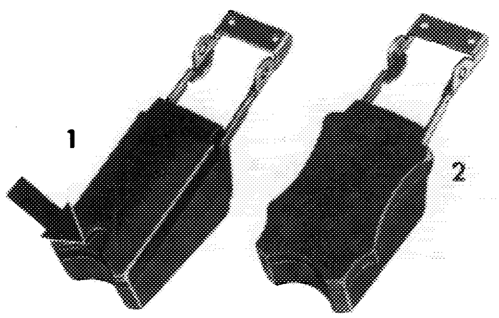
Repair instruction

Subsequent installation of choke cover-stepped heater also for model year 1973 (refer to 07.2–147). Simultaneously install a choke cover with code number 104 (formerly 89).

New float

Weight and shape of float has been changed. New float weight 6.8 g (formerly 8.7 g).

As a result, higher buoyancy, as a result of which the closing force of float needle is increased. Former float can be exchanged for new version, also model year 1973.



107-9844

Arrow = measuring point for float level
1 New version
2 Former version

Simultaneously, the former fuel level checkup has been replaced by the float level checkup or adjustment (07.2.2–180).

Identification

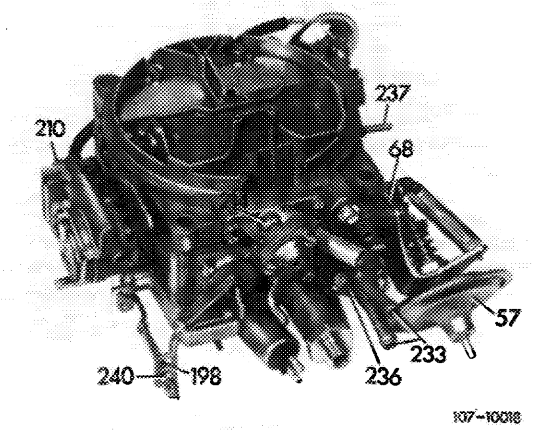
Externally recognized by hip roof shape with measuring point for float level (arrow).

Start of production: January 1974

Model	Starting chassis end no.
114.060	104 986
114.073	101 671

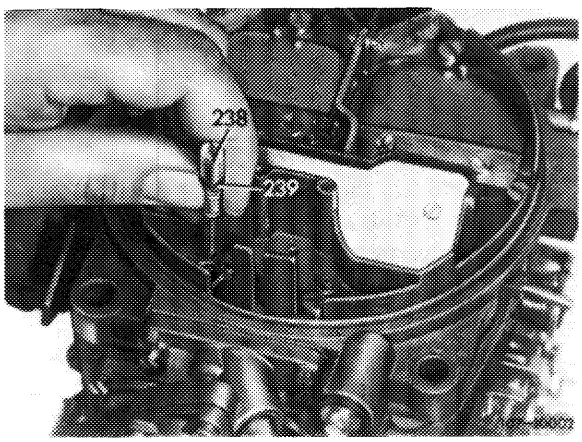
F. (USA) model year 1975
Differences as compared with model year 1974 Federal

- Carburetor cover with raised centering flange for air filter
- Idle speed combination jet
- Vacuum connection (237) for vacuum booster of EGR (Venturi connection)
- Actuating lever for accelerating pump
- Seal for choke valve adjusting screw
- Thermostatically controlled bypass choke (TN choke)
- Float chamber vent valve
- Draw-off connection for fuel evaporation control system
- Modified insulating flange



57 Vacuum governor
198 Actuating lever for accelerating pump
210 Pulldown cover
214 Float chamber vent valve
233 Coolant connection for thermostatically controlled bypass choke
236 Thermostatically controlled bypass choke
237 Vacuum connection for vacuum booster of EGR (venturi connection)
240 Plastic guide piece

Idle speed combination jet

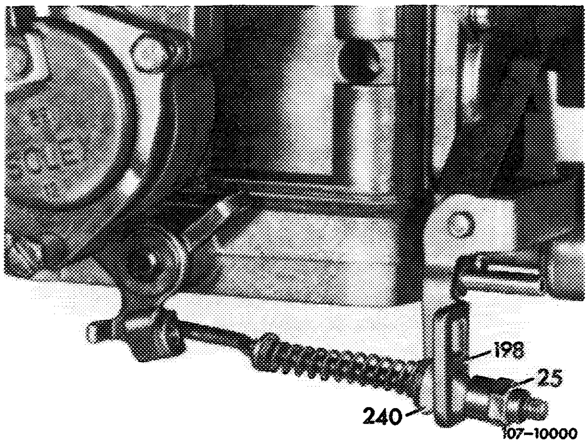


The idle speed fuel jet and the idle speed air jet are combined into a combination jet (238).

To improve access this jet is screwed into carburetor cover from above. Sealing is by means of a rubber sealing ring (239).

Actuating lever for accelerating pump

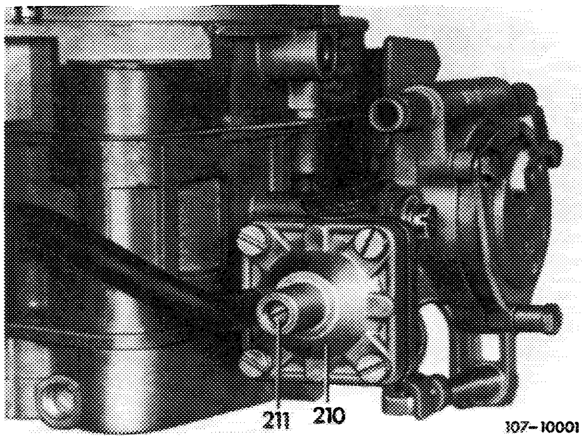
To improve guiding of actuating rod for accelerating pump, the actuating rod is provided with a plastic guide piece (240). The shape of the actuating lever (198) has been changed to hold the plastic guide piece.



Sealing of choke valve gap adjusting screw

The sealing of the adjusting screw (211) has been improved and is now effected by means of an exchangeable rubber sealing ring.

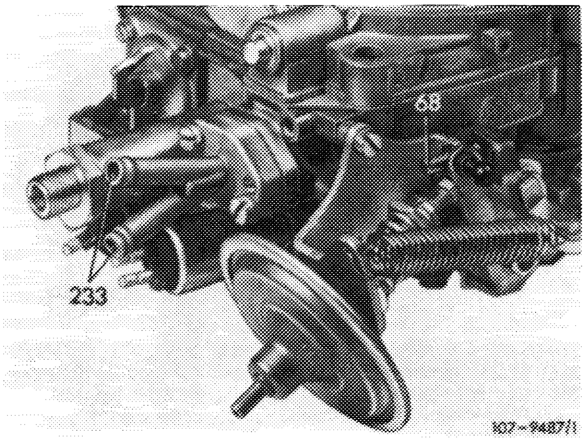
The shape of the pulldown cover (210) has been changed to mount the modified adjusting screw.



Thermostatically controlled bypass choke (TN choke)

The carburetor has an additional choke with its own jet and control system carrying the designation of **TN** choke (**TN** = thermostatically controlled bypass choke).

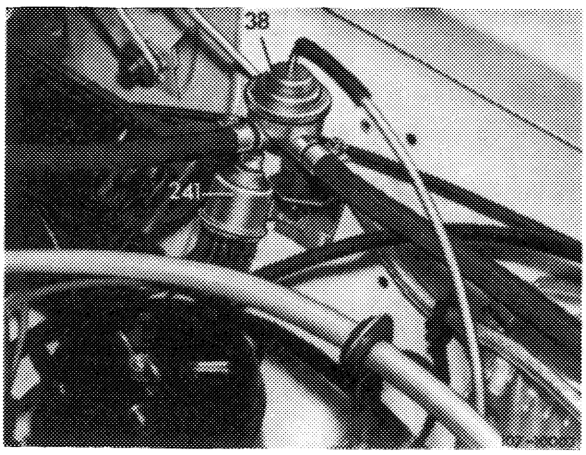
By means of this choke the warming-up mixture is guided into intake pipe in dependence of the coolant temperature while bypassing (shunt connection) the throttle valve (functional description 07.2–090).



233 Coolant connection for TN choke

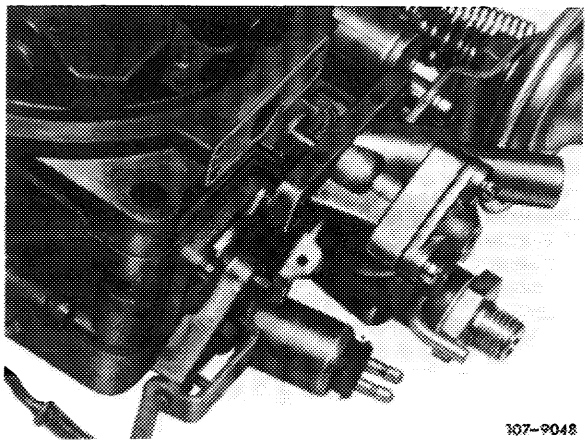
A switchover valve (241) is additionally installed, so that the vacuum chamber in choke housing (pulldown) is not provided with a vacuum during starting operation. This will prevent the choke valve from opening ahead of time.

On model 116.020 the switchover valve for the automatic choke (241) is screwed to holder at front left in engine compartment.



Float chamber vent valve

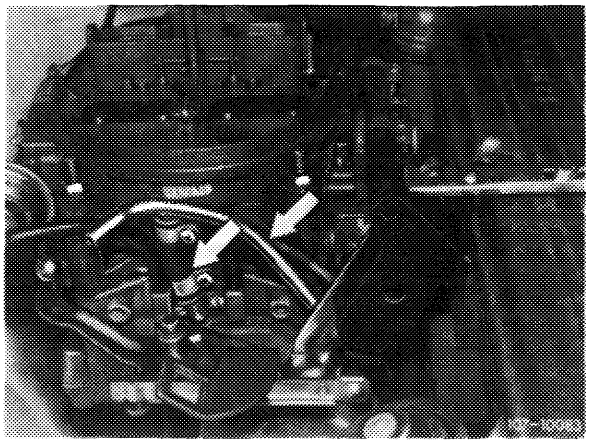
The float chamber vent valve opens with the engine stopped, so that the vapors can escape toward charcoal canister.



107–9048

Draw-off connection for fuel evaporation control system

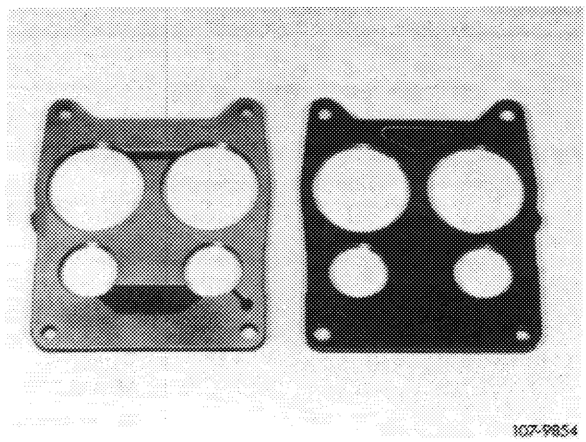
A connection (arrow) is mounted at the rear on carburetor for drawing off fuel evaporation vapors.



Insulating flange

To guide the cold start warming-up mixture from TN choke into intake pipe, the insulating flange has been provided with a groove between stages I.

The fuel vapors are drawn off in stage II by way of a groove.



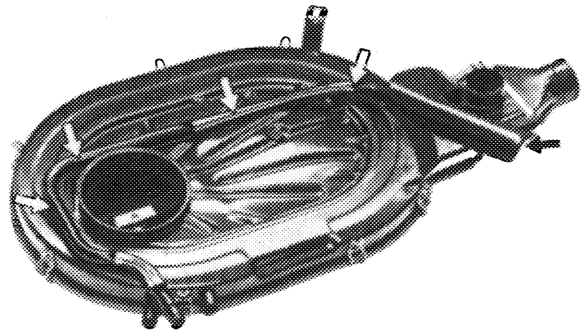
Left = top
Right = bottom

107–9854

Air filter

The installation of the catalyst required a rerouting of the air injection line. As a result, the line layout on air filter has also been changed.

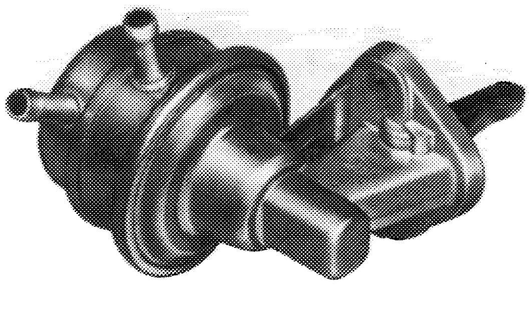
The air filters of model years 1974 and 1975/76 are *not exchangeable.*



107–10005

Fuel pump

Lack of space caused by the installation of the air pump for air injection required the use of an angle drive for fuel pump.



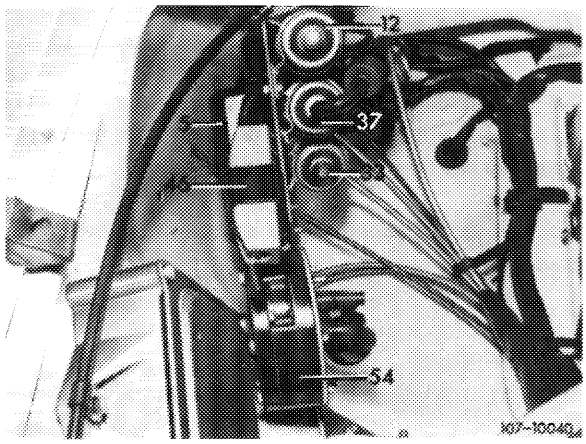
107–9099

Modifications in model year 1975

Choke cover-stepped heater

There is one diode less in relay box (5).

As a result, elimination of reduced heating of choke cover above + 65 °C coolant temperature.



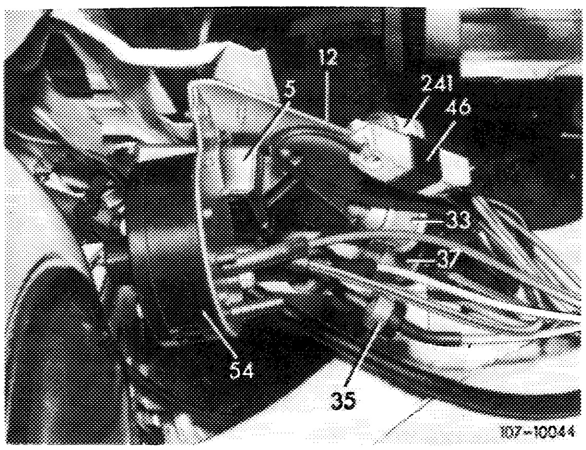
Model 114
5 Relay box

Identification

Externally recognized by spare part number on sticker on relay box (5). From now on, install this relay box only.

New part no. 001 542 **30 19** (formerly 001 542 26 19).

Start of production: July 1975



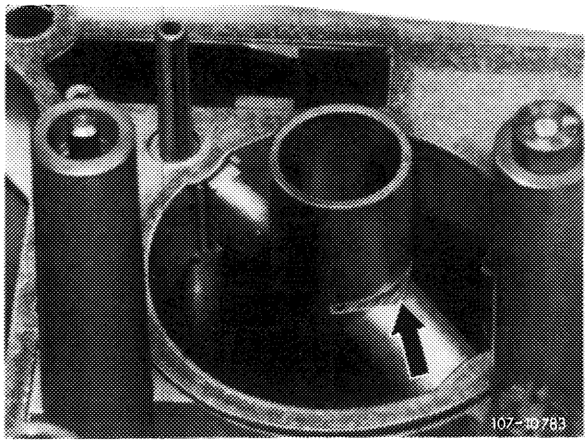
Model 116
5 Relay box

G. (USA) model year 1976
Differences as compared with model year 1975

- Pre-atomizer, main jet
- Expanding element for TN choke
- Fuel pump

Pre-atomizer, main jet

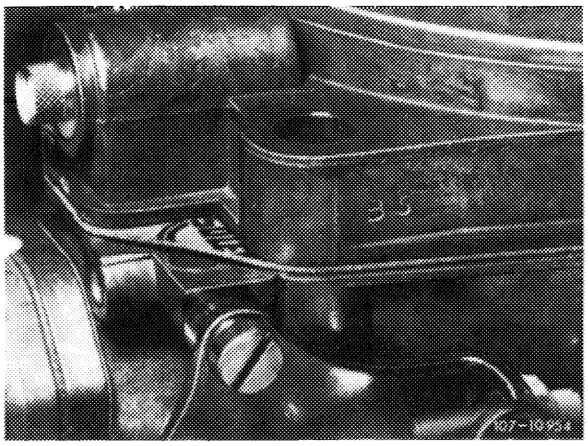
The pre-atomizer is provided with a milled slot (arrow). As a result, the main jet had to be increased to **X 105** (formerly X 100).



Identification

Externally recognized by carburetor cover code number **B 5** (formerly B 1).

The pre-atomizer with slot can be installed only in combination with the large main jet (X 105) in the event of repairs.



Carburetor code number

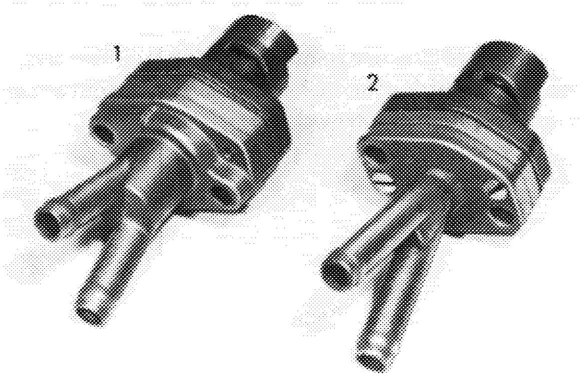
Expanding element for TN choke

Expanding element and housing are larger.

Identification

Externally recognized by larger dimension.

In the event of repairs, the new expanding element can be installed as a complete TN unit only as a replacement for the former version.



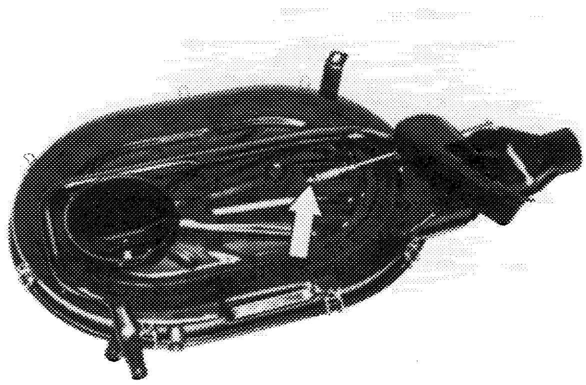
1 New version
2 Former version

107-10971

Air filter

The expanding element (arrow) for control of intake air preheater has been moved to inside of air filter.

In the event of repairs, this air filter can be installed as a replacement for the former filter of model year 1975.

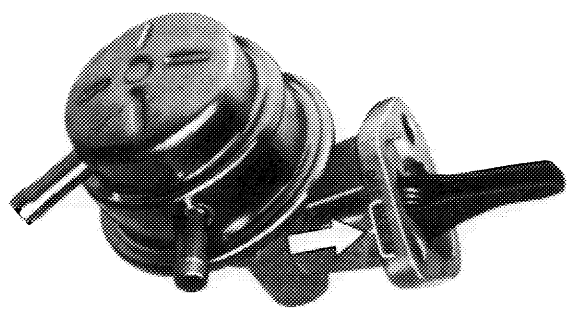


109-10802/1

Fuel pump

Due to the new safety rule (roll-over test) the fuel pump has been provided with a **diaphragm-controlled fuel shutoff valve**, which is closed when the engine is stopped.

This will prevent fuel from fuel tank flowing outside via fuel pump and carburetor following an accident.



107-10953

Identification

The closing cap of this fuel pump is brazed to housing and can no longer be disassembled. In addition, the index **PE 20 215** is punched into pump flange (arrow).

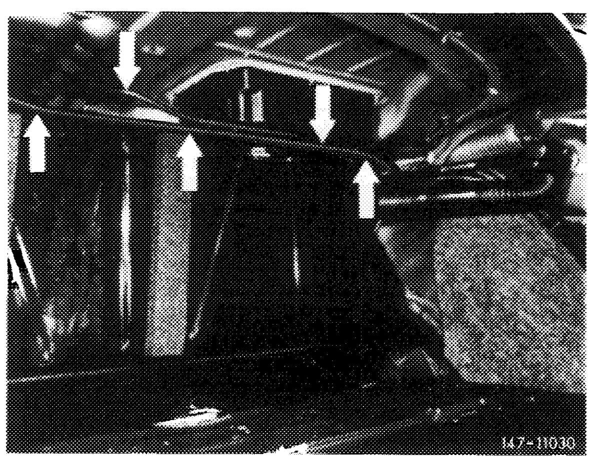
Repair instruction

In the event of repairs, the new fuel pump can be installed to replace the former version.

Fuel system

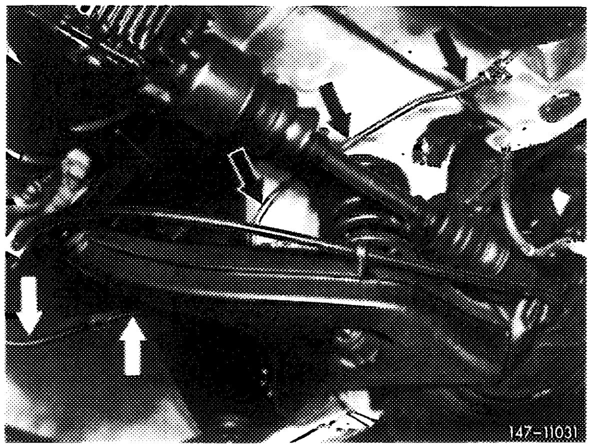
As a result of the new safety regulation (rollover test) the line layout for the fuel evaporation control system has been modified (arrows).

Line layout



147-11030

Line layout



Identification: Information plate in national language on cross member in front of radiator or on cylinder head cover. Adjust engines according to data of respective emission control information plate.

Testing and adjusting values

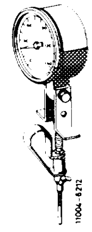
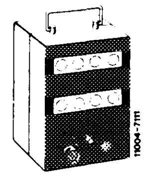
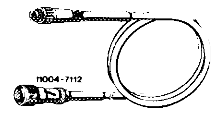
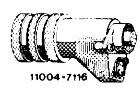
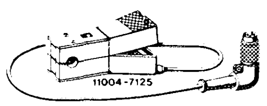
National version		Idle speed 1/min	Idle speed emission value % CO
J	up to 1976	800–900	max. 1.5
J	1976		max. 1.0 **without** air injection
S	1976		
USA	1973	750–900	up to 1.5
USA	1974 Federal		
USA	1974 California	700–900	6–8 **without** air injection
USA	1975/76	800–900	max. 1.0 **without** air injection

Vacuum governor[1]

National version		Engine speed Vacuum hose pulled off 1/min		Engine speed Driving position engaged 1/min
		without TN choke	**with** TN choke	
J	1976	–	1700–1900	600–700
S	1976	–		
USA	1973/74	1200–1400		
USA	1975/76	–		

[1]) When engaging all auxiliary units, the engine should still run smoothly.

Special tools

Oil telethermometer		116 589 27 21 00
Digital tester		001 589 54 21 00
Connecting cable 6 m long		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00

Conventional tools

Rpm and CO measuring instrument

Note

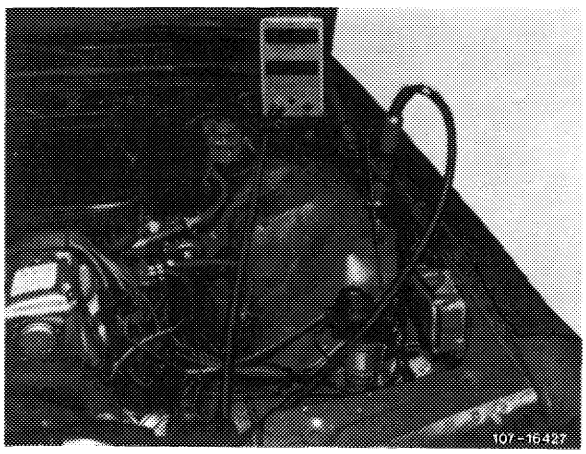
Do not set idle speed on dynamometer when the engine is too hot, e.g. immediately after a fast drive or after measuring output. The air filter must be mounted.

Adjusting

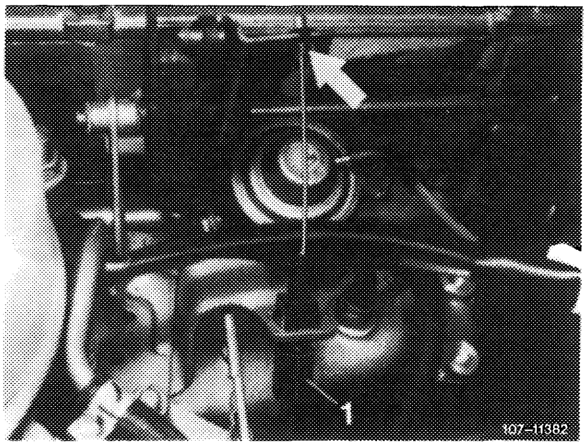
1 Connect test instruments:

- digital tester or revolution counter
- CO measuring instrument
- oil telethermometer

2 Switch off air conditioning system or automatic climate control. Move selector lever into position "P".



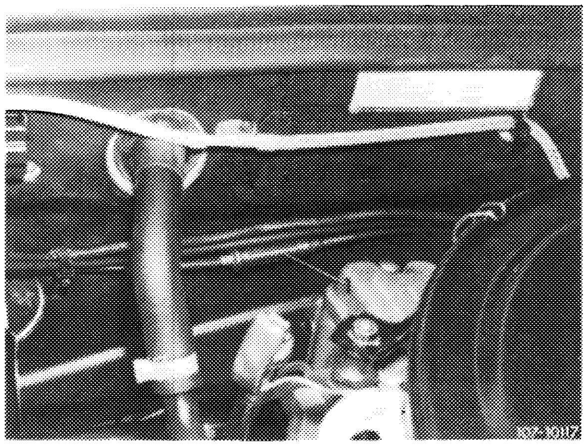
3 Check whether on vehicles with cruise control (Tempomat) the Bowden wire rests **free of tension** against regulating lever. Adjust Bowden wire with adjusting nut (1), if required. For this purpose, run engine.



4 Set engine oil temperature to 60–80 °C.

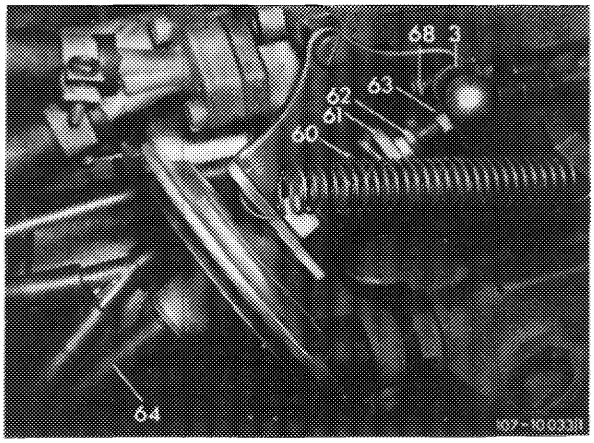
5 Check intake system for leaks. For this purpose, spray all sealed points with Iso-Oktan DIN 51 756 or benzine. A changing engine speed or CO value indicates the presence of leaks.

Attention!
Do not use conventional fuel for spraying (unhealthy vapors). Pay attention to inflammability and do not spray on the red-hot parts or components of the ignition system.



6 With the engine running, check whether throttle valve lever (3) rests against adjusting screw (68).

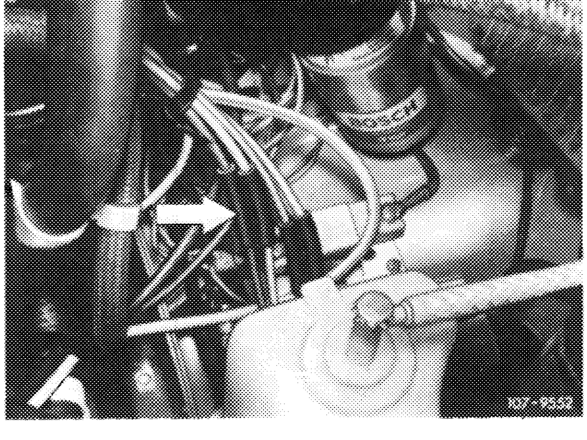
7 Check idle speed and adjust with adjusting screw (68), if required.



8 Check idle speed emission value **without air injection.** For this purpose, make air injection inoperative as follows (for USA 1973/74 nothing need be made inoperative):

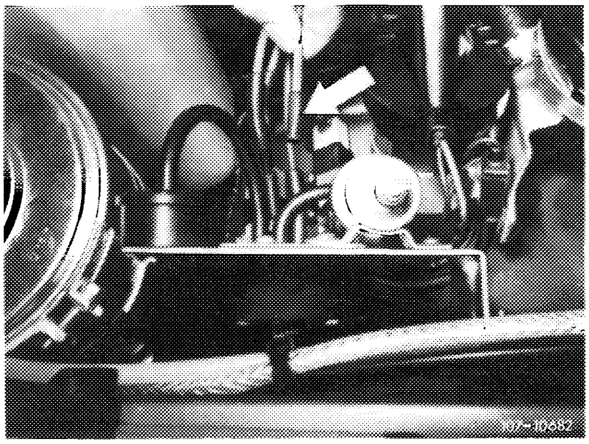
J **1976**

Pull off **blue/purple** vacuum line at connecting point (arrow).



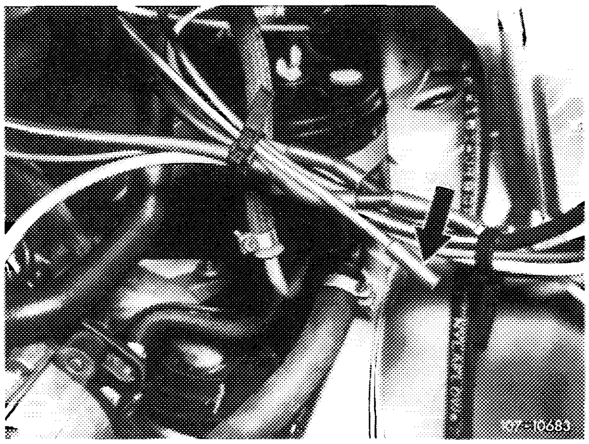
(S) 1976, model 114

Pull rubber cap (arrow) from **blue/purple** vacuum line.



(S) 1976, model 116

Pull rubber cap (arrow) from **blue/purple** vacuum line.

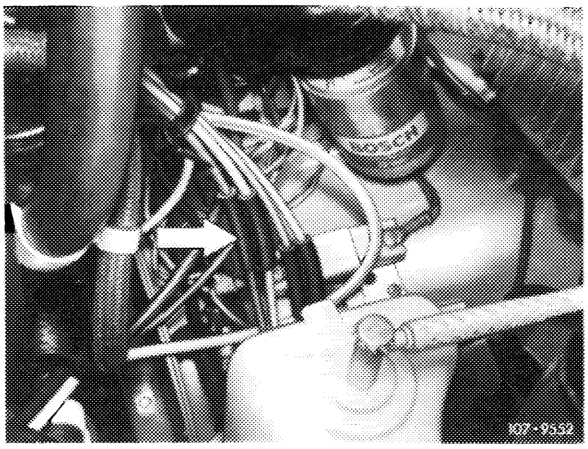


(USA) California 1974

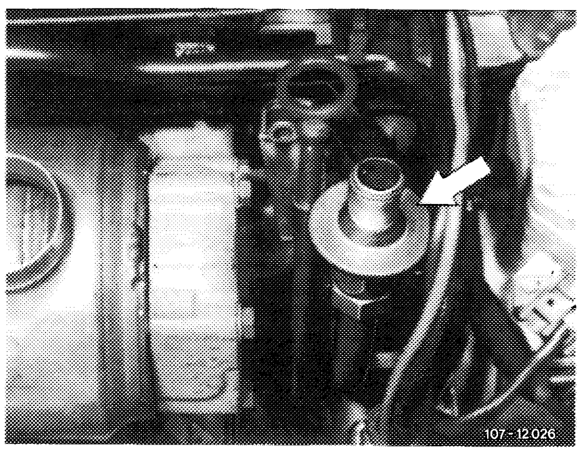
Pull off **red** vacuum line at connecting point (arrow).

(USA) 1975/76

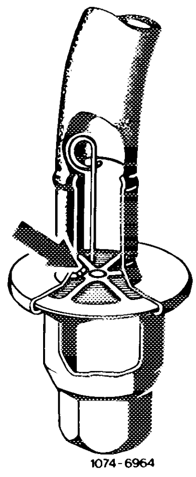
Pull off **blue/purple** vacuum line at connecting point (arrow).



The exhaust gas for idle speed CO measurement on vehicles with catalyst, (J) 1976 and (USA) 1975/76, is drawn off in front of catalyst at check valve (arrow) of air injection.



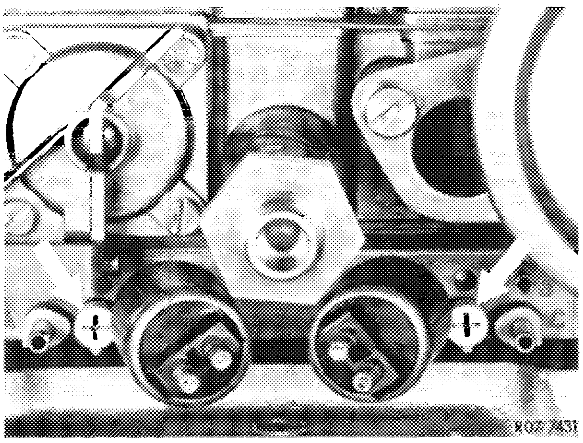
For measuring idle speed emissions, open valve plate of check valve by means of a self-made wire hook. Connect exhaust gas hose of CO measuring instrument to check valve.



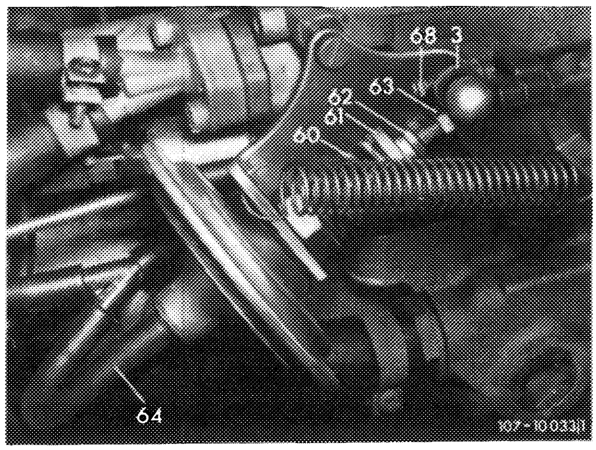
9 Adjust idle speed emission value **without air injection.** For this purpose, adjust both adjusting screws (arrows) uniformly.

Screwing out = richer
Screwing in = leaner

Accelerate for a short moment, check idle speed and idle speed emission value once again and readjust, if required.



10 Reattach vacuum hose for air injection (air injection operating). The idle speed emission value should now be **below** the previously set value.



11 Adjust vacuum governor. Run engine, pull off vacuum hose (64), set to specified speed by means of an adjusting screw (63), attach vacuum hose.

Attention!
When loosening counternut, apply counterhold to diaphragm rod.

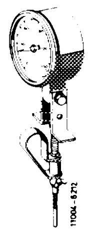
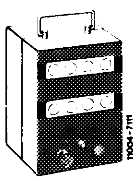
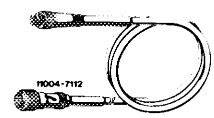
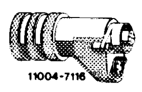
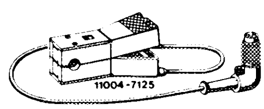
Engage driving position on automatic transmission, set to specified speed by means of adjusting nut (61). Turn power steering to full lock and engage air conditioning system, engine should still run smoothly. Readjust speed, if required.

Identification: Information plate in national language on cross member in front of radiator or on cylinder head cover. Adjust engines according to data of respective emission control information plate.

Testing and adjusting values

National version		Idle speed 1/min	Idle speed emission value % CO
J	up to 1976	800–900	max. 1.5
	1976		max. 1.0 **without** air injection
S	1976		
USA	1973	750–900	up to 1.5
USA	1974 Federal		
USA	1974 California	700–900	6–8 **without** air injection
USA	1975/76	800–900	max. 1.0 **without** air injection

Special tools

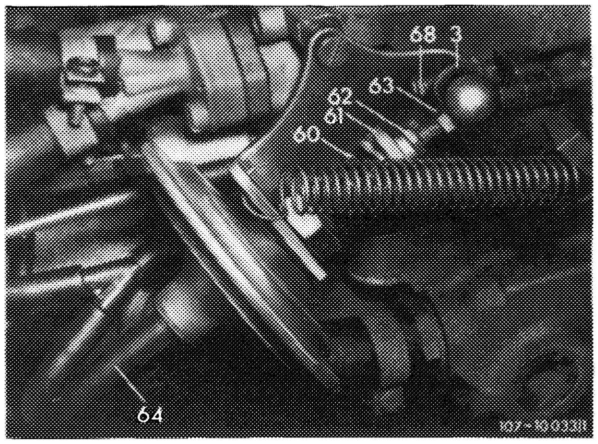
Oil telethermometer		116 589 27 21 00
Digital tester		001 589 54 21 00
Connecting cable		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00

Synchronizing

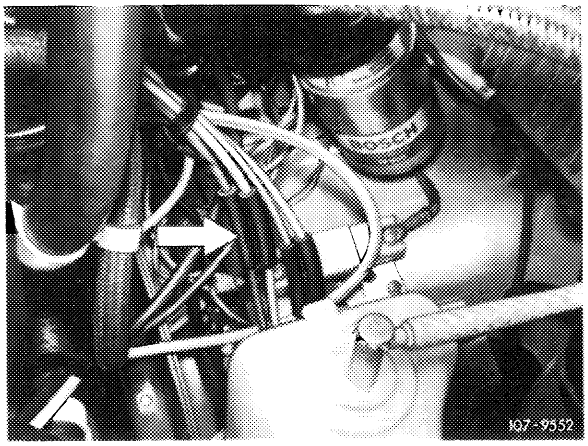
1 Connect test instruments. Run engine oil temperature to 60–80 °C.

2 Remove air filter.

3 Check idle speed and adjust with adjusting screw (68), if required.



4 Check idle speed emission value **without air injection.** For this purpose, make air injection inoperative as follows (for (USA) 1973/74 nothing need be made inoperative):

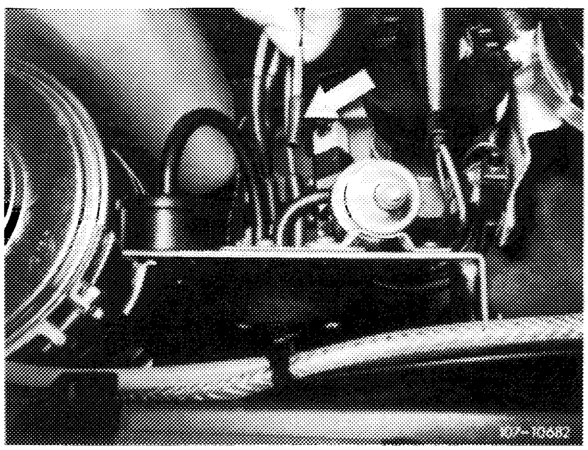


(J) **1976**

Pull off **blue/purple** vacuum line at connecting point (arrow).

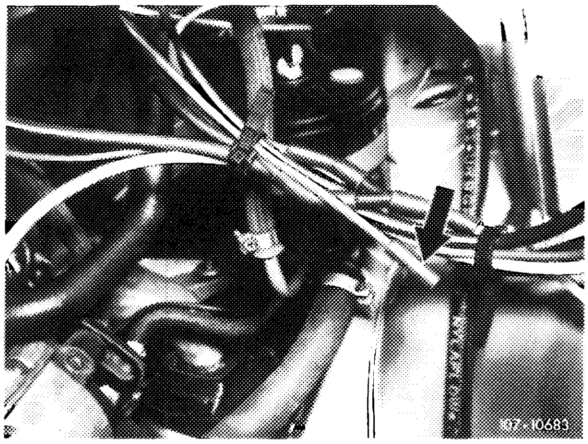
(S) **1976, model 114**

Pull rubber cap (arrow) from **blue/purple** vacuum line.



Ⓢ **1976, model 116**

Pull rubber cap (arrow) from **blue/purple** vacuum line.



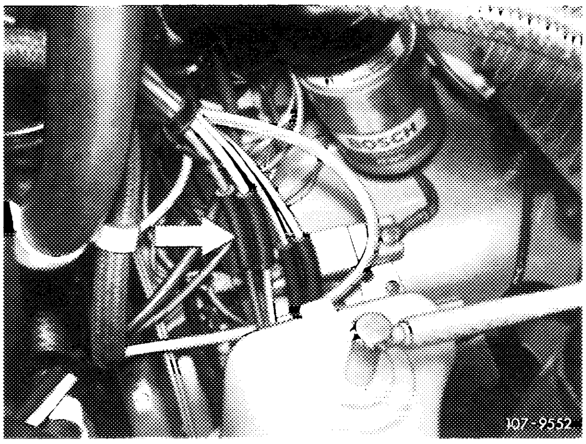
107-10683

Ⓤⓢⓐ **California 1974**

Pull off **red** vacuum line at connecting point (arrow).

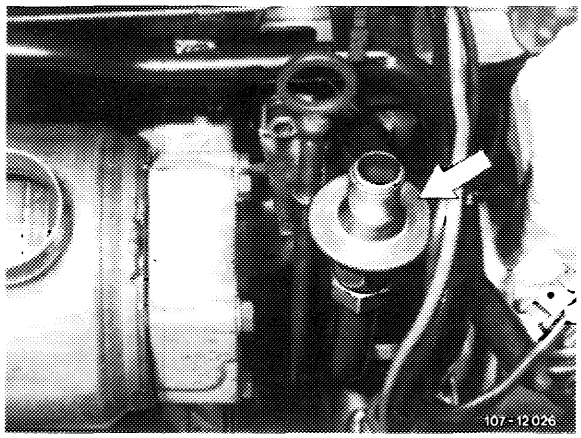
Ⓤⓢⓐ **1975/76**

Pull off **blue/purple** vacuum line at connecting point (arrow).



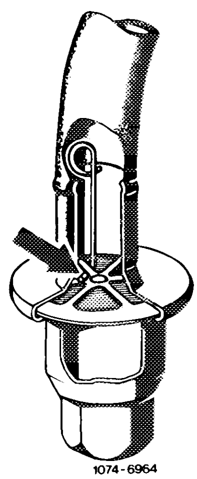
107-9552

The exhaust gas for idle speed CO measurement on vehicles with catalyst, Ⓙ 1976 and Ⓤⓢⓐ 1975/76, is drawn off in front of catalyst at check valve (arrow) of air injection.



107-12026

For measuring idle speed emissions, open valve plate of check valve by means of a self-made wire hook. Connect exhaust gas hose of CO measuring instrument to check valve.

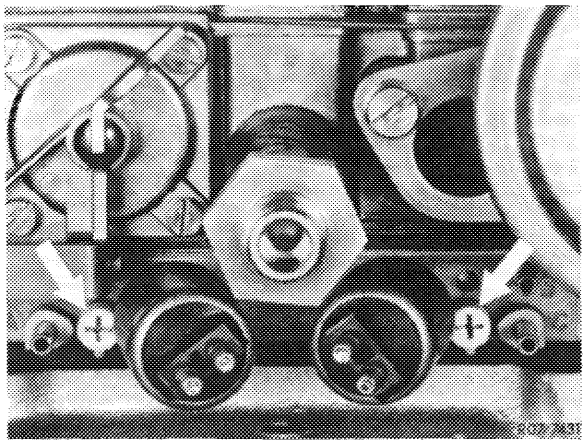


1074-6964

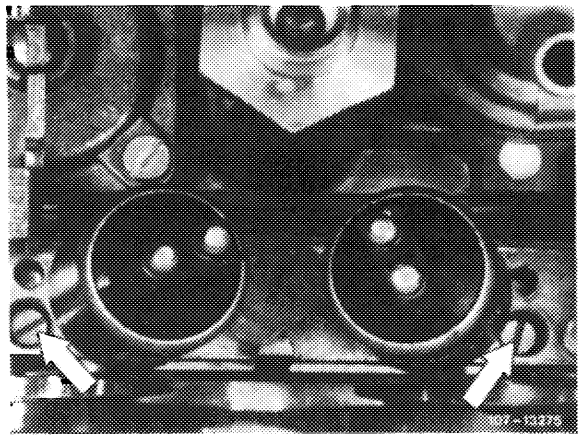
5 Adjust idle speed emission value **without air injection.** For this purpose, adjust both adjusting screws (arrows) uniformly.

Screwing out = **richer**
Screwing in = **leaner**

Accelerate for a short moment, check idle speed and idle speed emission value once again and readjust, if required.

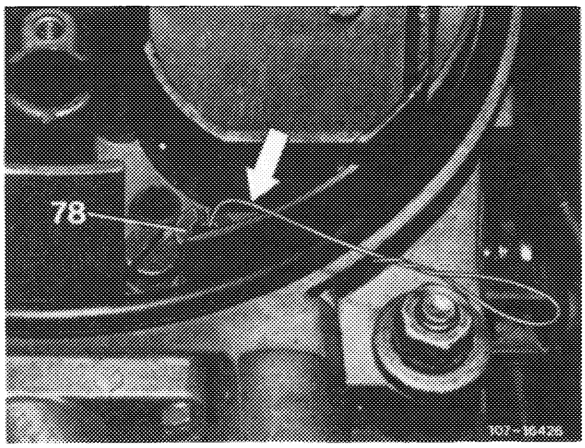


6 Check for uniform adjustment (synchronization) of mixture adjusting screws (arrows).



For this purpose, insert test wire of 0.5 mm dia. (arrow) into both air correction nozzles (78) one after the other and measure CO increase. CO increase **should be uniformly high on both sides.** Readjust with mixture adjusting screws, if required.

Note: To prevent measuring faults, do not insert test wire deeper than 10 mm into idle speed jet. Without test wire the max. idle speed emission value must not be exceeded.



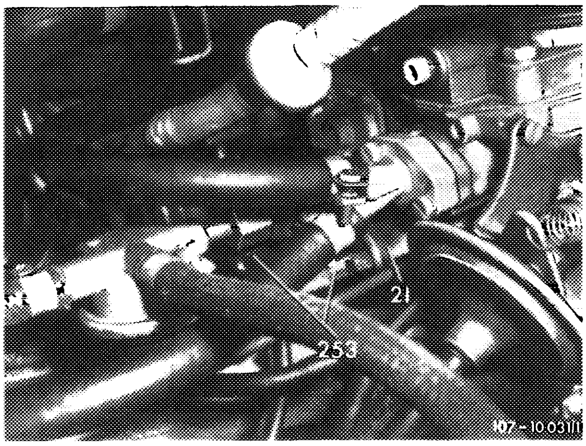
Then check whether the max. permissible idle speed emission value is not exceeded without test wire and **uniformly** adjust both mixture adjusting screws, if required.

7 Reattach vacuum hose for air injection (air injection operating). The idle speed emission value should now be **below** the previously set value.

Function test

1 Switch ignition on and then off again, each time the operating noise of the idle speed shutoff valves should be clearly heard or should be felt with hand.

2 Run engine at idle speed. Pull plug (253) from one valve, engine speed should clearly drop or engine should start hunting. Check likewise at opposite valve.

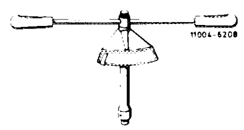


Leak test

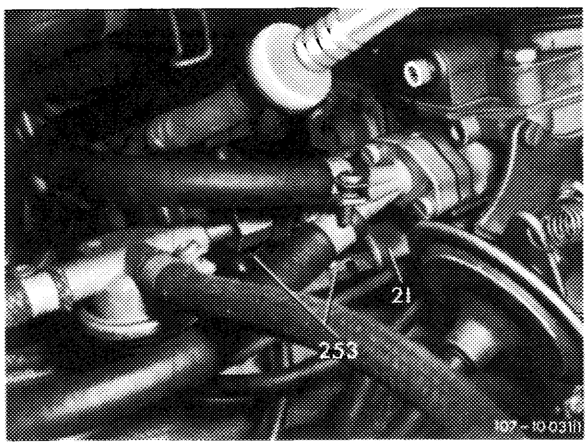
3 Run engine at idle speed. Simultaneously pull both plugs (253) from valves, engine should stop immediately without afterrunning. Replace shutoff valve, if required.

07.2–104 Removal and installation of idle speed shutoff valves

Tightening torques		Nm	(kpm)
Carburetor fastening nuts	with new insulating flange	10	(1.0)
	with insulating flange used up to now	8	(0.8)

Special tool		
Torque wrench 4–16 Nm (40–60 kpcm)		000 589 67 21 00

Removal



1 Remove carburetor (07.2–194).

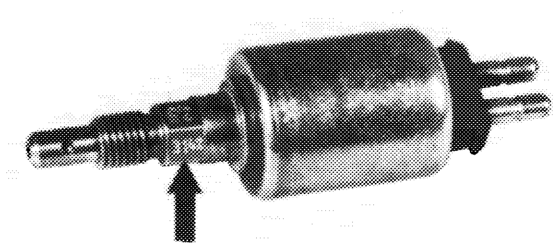
2 Unscrew idle speed shutoff valves.

Installation

4 For installation proceed vice versa.

Starting August 1973 the shutoff voltage of the installed idle speed shutoff valves has been increased to 3.0 volts (formerly 0.5 volt). This will prevent afterrunning of engine. Subsequent installation is generally possible.

Identification: production code number 3 142 (arrow).



3 = Production year 1973
142 = Production day (consecutive calendar day)

107–9107

Identification: Information plate in national language on cross member in front of radiator or on cylinder head cover. Adjust engines according to data of respective emission control information plate.

Testing and adjusting values

National version		Idle speed 1/min	Idle speed emission value % CO
J	up to 1976	800–900	max. 1.5
J	1976		max. 1.0 **without** air injection
S	1976		
USA	1973	750–900	up to 1.5
USA	1974 Federal		
USA	1974 California	700–900	6–8 **without** air injection
USA	1975/76	800–900	max. 1.0 **without** air injection

Vacuum governor[1])

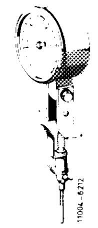
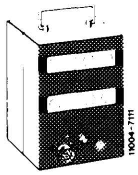
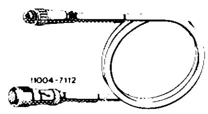
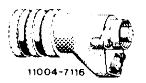
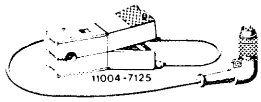
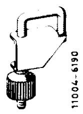
National version		Engine speed Vacuum hose pulled off 1/min		Engine speed Driving position engaged 1/min
		without TN choke	**with** TN choke	
J	1976	–	1700–1900	600–700
S	1976	–		
USA	1973/74	1200–1400		
USA	1975/76	–		

[1]) When engagigg all auxiliary units, the engine should still run smoothly.

Accelerating pump

Begin of injection	immediately

Special tools

Oil telethermometer		116 589 27 21 00
Digital tester		001 589 54 21 00
Connecting cable 3 m long		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00
Clamp		000 589 40 37 00

Conventional tools

Closing angle (dwell angle) and revolution counter, stroboscope, oscilloscope, CO measuring instrument

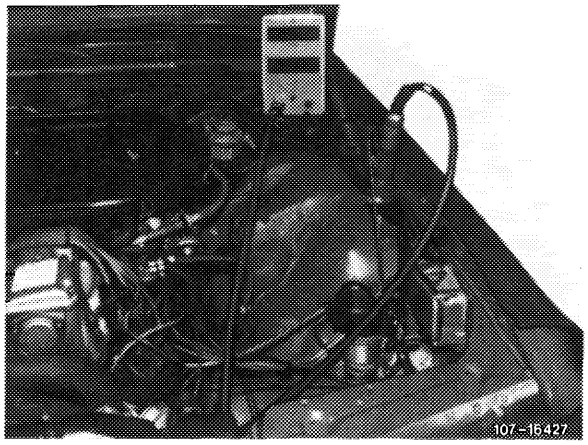
Note

Do not adjust idle speed when engine is too hot, e.g. after a fast drive or after measuring performance on a dynamometer. The air filter should be mounted.

Regulation

1 Connect test instruments:

- Closing angle and revolution counter
- Stroboscope
- Oscilloscope
- CO measuring instrument
- Digital tester



2 Check contact resistance, closing angle and closing angle change, adjust closing angle **only** when renewing contact breaker points (07.5–510).

3 Evaluate oscilloscope display.

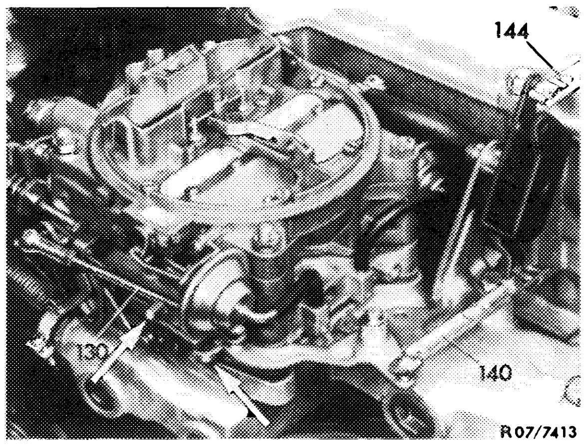
4 Check firing point and adjust, if required. Check centrifugal and vacuum ignition adjustment (07.5–510).

5 Run engine oil temperature up to 60–80 °C.

6 Check intake system for leaks. For this purpose, spray all seal points with Iso-Oktan DIN 51756 or benzine. Change of engine speed indicates leaks.

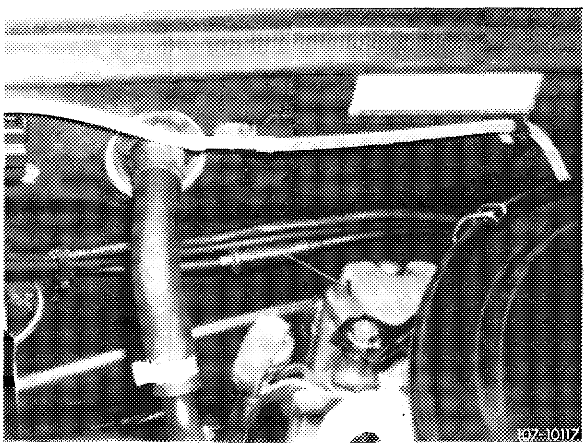
Attention!
For spraying, do not use conventional fuel (unhealthy vapors). Pay attention to inflammability and do not spray on red-hot components or components of ignition system.

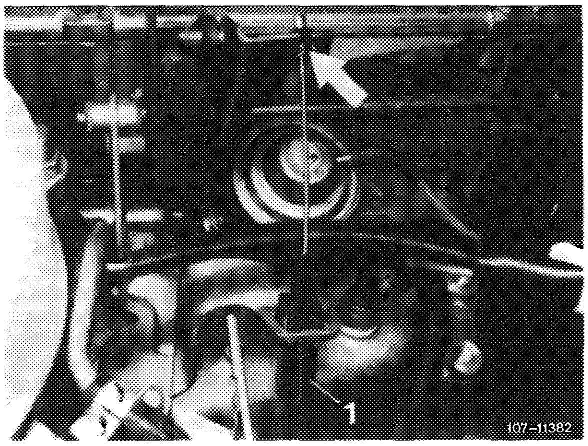
7 Check engine regulating linkage for easy operation and wear. Lubricate all bearing points and ball sockets.



8 Switch off air conditioning system or automatic climate control. Move selector lever into position "P"

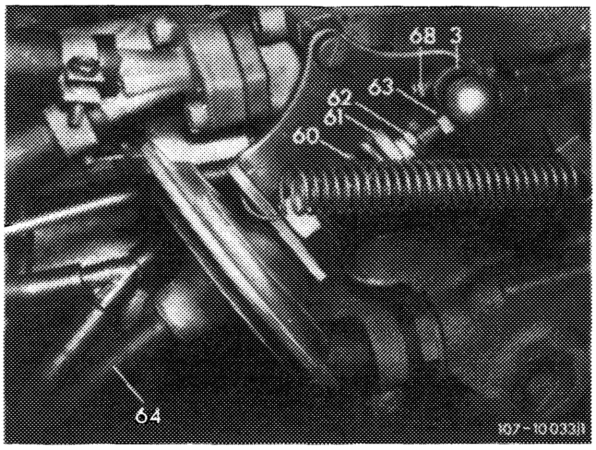
9 Check whether on vehicles with cruise control (Tempomat) the Bowden wire rests **free of tension** against regulating lever with the engine running. Adjust Bowden wire with adjusting nut (1), if required. For this purpose, run engine.





10 With the engine running, check whether throttle valve lever (3) rests against adjusting screw (68).

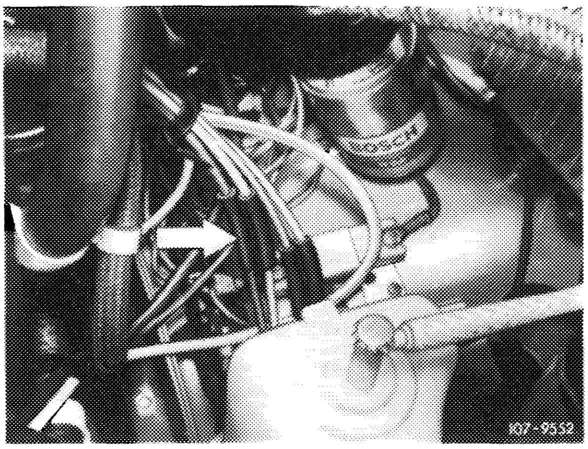
11 Check idle speed and adjust with adjusting screw (68), if required.



12 Check idle speed emission value **without air injection.** For this purpose, make air injection inoperative as follows (for (USA) 1973/74 nothing need be made inoperative):

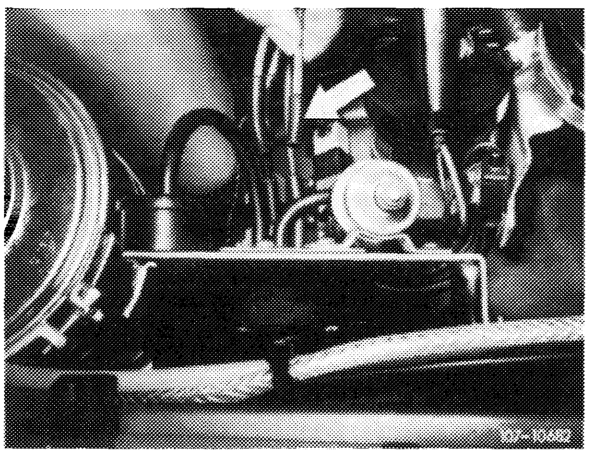
(J) **1976**

Pull off **blue/purple** vacuum line at connecting point (arrow).



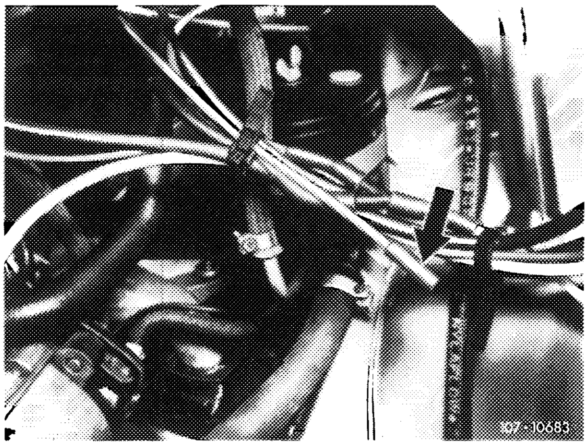
(S) **1976, model 114**

Pull rubber cap (arrow) from **blue/purple** vacuum line.



Ⓢ **1976, model 116**

Pull rubber cap (arrow) from **blue/purple** vacuum line.

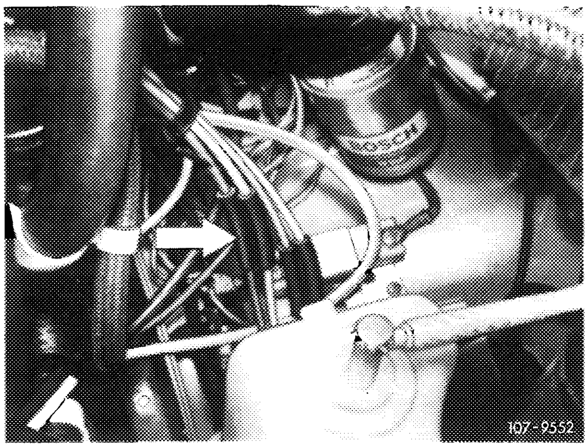

107-10683

Ⓤⓢⓐ **California 1974**

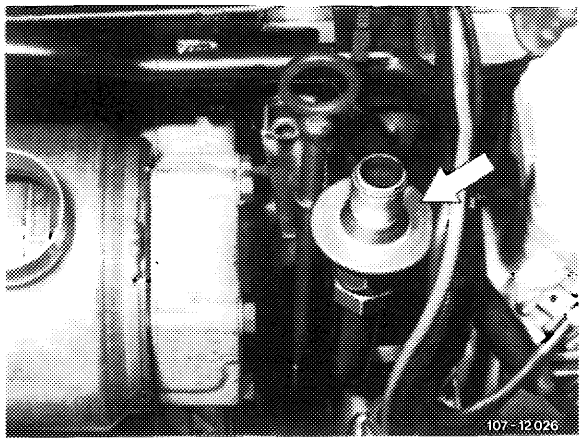
Pull off **red** vacuum line at the connecting point (arrow).

Ⓤⓢⓐ **1975/76**

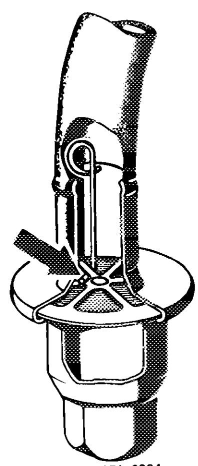
Pull off **blue/purple** vacuum line at connecting point (arrow).


107-9552

The exhaust gas for idle speed CO measurement on vehicles with catalyst, Ⓙ 1976 and Ⓤⓢⓐ 1975/76, is drawn off in front of catalyst at check valve (arrow) of air injection.

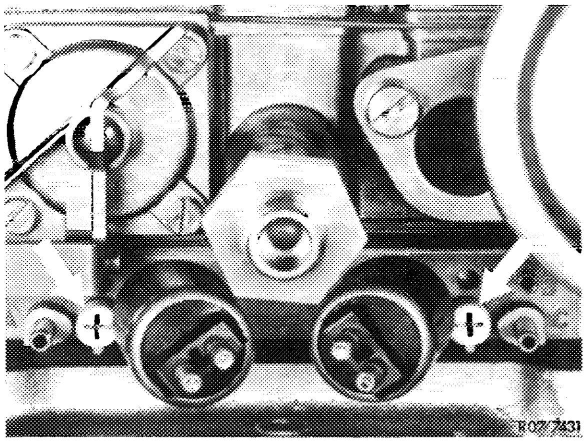

107-12026

For measuring idle speed emissions, open valve plate of check valve by means of a self-made wire hook. Connect exhaust gas hose of CO measuring instrument to check valve.

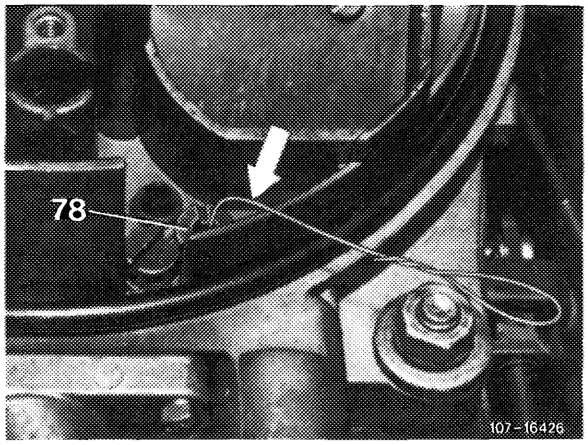

1074-6964

13 Adjust idle speed emission value **without air injection.** For this purpose, adjust both adjusting screws (arrows) uniformly.

Screwing out = **richer**
Screwing in = **leaner**



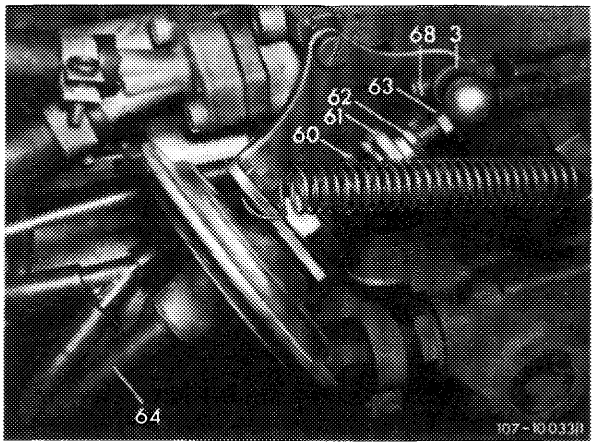
Then check idle speed synchronization while inserting test wire 0.5 mm dia (arrow) into both air correction nozzles (78) one after the other and measuring CO increase. The CO increase **should be uniformly high on both sides.** Readjust with idle speed mixture adjusting screws, if required.



Note: To prevent measuring faults, do not insert test wire deeper than 10 mm into idle speed air jet. Without test wire, the max. idle speed emission value may not be exceeded. Readjust uniformly, if required.

Accelerate for a short moment, check idle speed and idle speed emission value once again and regulate again, if required.

14 Reattach vacuum hose for air injection (air injection operating). The idle speed emission value should now be **below** the previously set value.

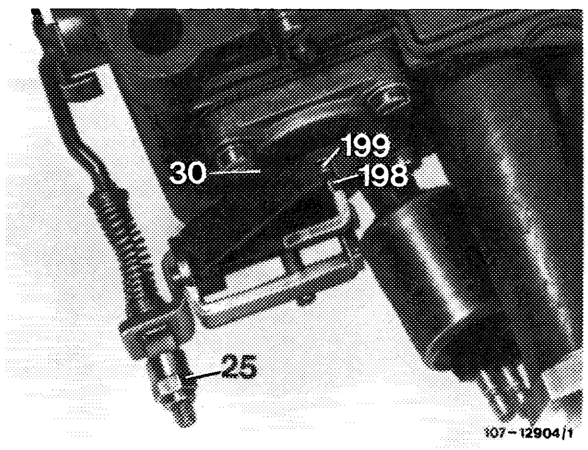


15 Adjust vacuum governor. For this purpose, run engine, pull off vacuum hose (64), adjust specified speed with adjusting screw (63), attach vacuum hose.

Attention!
When loosening counternut, apply counterhold to diaphragm rod.

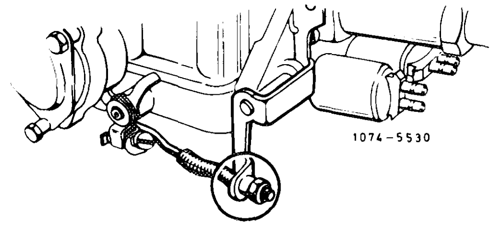
Engage driving position on automatic transmission, set to specified speed with adjusting nut (61). Turn power steering to full lock and engage air conditioning system, engine should still run smoothly. Regulate speed again, if required.

16 Adjust accelerating pump. For this purpose, run engine, pinch vacuum hose (64). Check whether throttle valve lever (3) rests against adjusting screw (68) (Fig. item 15).



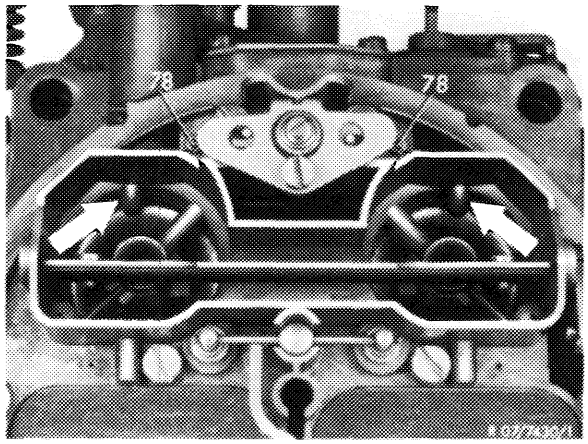
Set adjusting nut (25) in such a manner that the actuating lever (198) pushes the diaphragm thrust bolt (199) 1.0 mm inwards.

Starting June 1973 the adjusting nut with pinch lock is replaced by a self-locking polystop nut. Simultaneously, the connecting rod has been extended by 2 mm (to facilitate adjustments).



Former version Present version

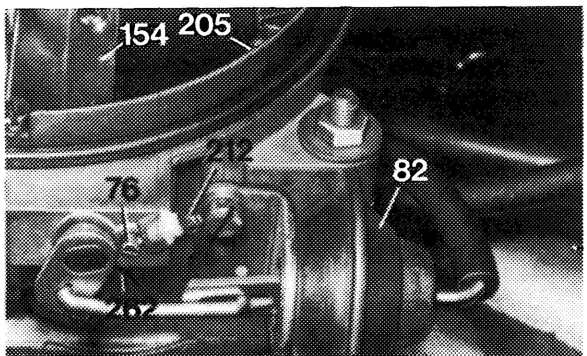
Checking operation and direction of injection.



For this purpose, slowly actuate throttle valve lever, a **uniform** fuel jet should now come out of both injection bores (arrows) **immediately** and **on both sides.**

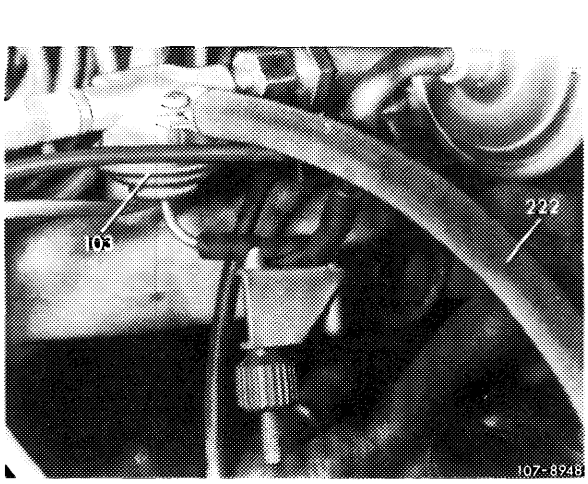
Attention!
The fuel jet should not touch edge of Venturi and pre-atomizer, since this may result in starting and bypass faults. If required, remove carburetor cover and clean injection bores.

17 Check dashpot (82) for leaks. Then run engine, pinch vacuum hose of damper (82). Open air valve (154) and release, air valve should then snap back against stop (205). If not, replace dashpot. With the engine stopped, check whether air valve (154) operates easily and returns automatically to stop (205) if slightly opened.



82 Dashpot for air valve stage II

18 Check fuel return valve for leaks. For this purpose, run engine at idle speed. Pinch vacuum hose on fuel return valve, idle speed emission value or engine speed should not change. Replace return valve, if required.



Testing and adjusting values

Carburetor **without** thermostatically controlled bypass choke (TN choke)

National version and model year		USA 1973/74	USA 1974 California
Choke cover	Code number	80/104[1]	103
	Preload	on mark	
Choke valve gap		1.5 mm	2.5 mm
Cold starting speed (at operating temperature)		2400–2600/min	
Vacuum governor adjusting data	Engine speed Vacuum hose pulled off	1200–1400	
	Driving position engaged	600–700	

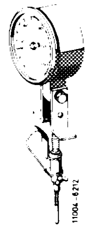
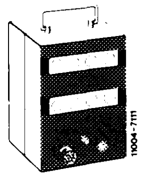
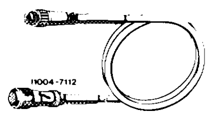
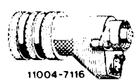
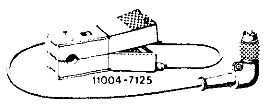
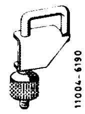
[1] Only in combination with choke cover-stepped heater.

Carburetor **with** thermostatically controlled bypass choke (TN choke)

National version and model year		J 1976	S 1976	USA 1975/76
Choke cover	Code number	89		
	Preload	on mark		
Delay time	Total	–	5–12 s	–
	Choke (orifice)	–	max. 3 s	–
TN mixture		0.5–0.6 % CO		
Warming-up total mixture		7–8 % CO[1]		
TN control piston overlap at + 85 °C coolant temperature		0.8–1.0 mm		
Vacuum governor adjusting data	Engine speed Vacuum hose pulled off	1700–1900		
	Driving position engaged	600–700		

[1] On vehicles with draw-off for accelerating pump, adjust to lower tolerance value.

Special tools

Oil telethermometer		116 589 27 21 00
Digital tester		001 589 54 21 00
Connecting cable 3 m long		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00
Clamp		000 589 40 37 00

Conventional tools

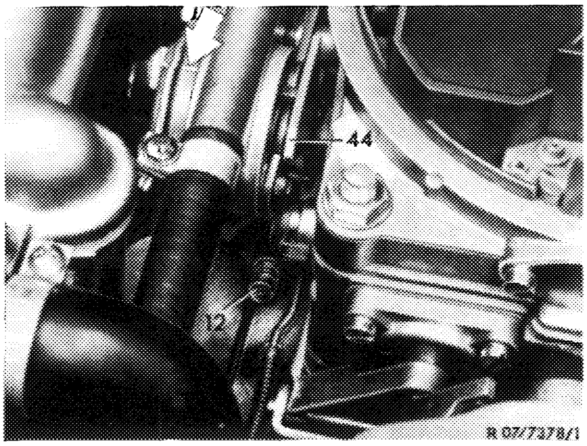
Rpm and CO measuring instrument	
Pliers, offset for inner locks	e.g. made by Hazet, order no. 1846 b-2
Pliers, offset for outer locks	e.g. made by Hazet, order no. 1846 d-2

Self-made tool

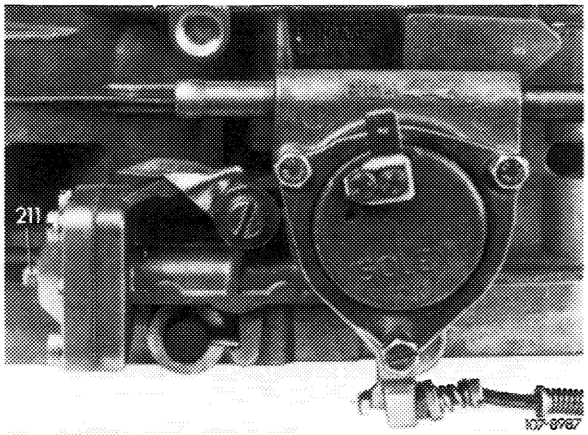
TN test choke	for instructions, refer to section B, item 16

A. Carburetor without thermostatically controlled bypass choke (TN choke) (USA) 1973/74, (USA) 1974 California

Testing, adjusting



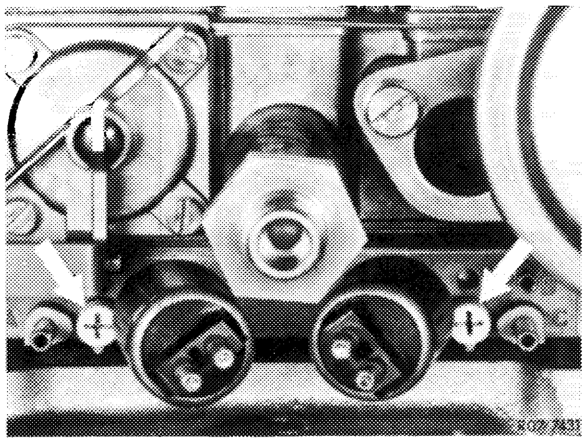
1 Remove air filter. Check whether marking notch on choke cover is exactly opposite mark on carburetor housing (arrow) and adjust choke cover, if required.



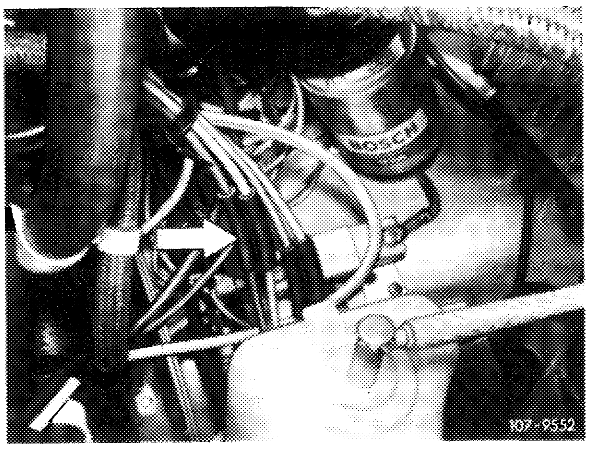
2 Check choke housing for tight seat, insert loose fastening screws with Omnifit or Loctite, if required.

3 Check choke valve for easy operation and make operable, if required.

Complete test with cold engine whenever possible. The choke valve and the transmitting linkage should move easily in any position. To check, disconnect choke rod, if required. If choke valve binds or is hard to move, refinish carburetor shaft laterally as required.



4 Check for uniform adjustment of idle speed mixture adjusting screws (arrows). For this purpose, run engine oil temperature to approx. 80 °C. Then run engine for approx. 5 min. at idle speed for stabilization.



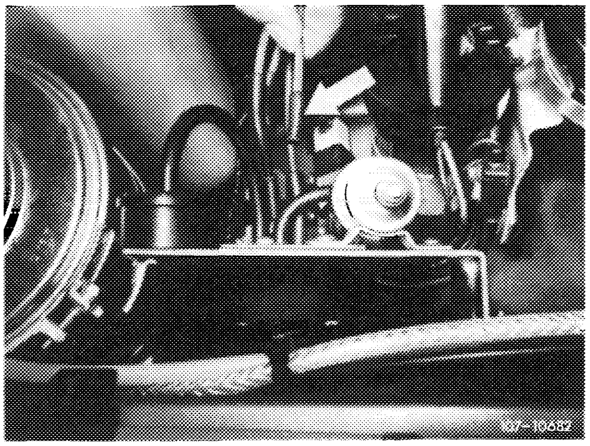
For subsequent CO measurement, make air injection inoperative as follows (for (USA) 1973/74 nothing need be made inoperative):

(J) **1976**

Pull off **blue/purple** vacuum line at connecting point (arrow).

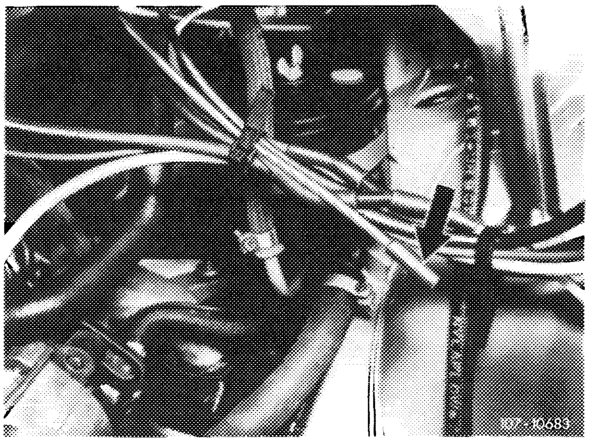
Ⓢ **1976, model 114**

Pull rubber cap (arrow) from **blue/purple** vacuum line.



Ⓢ **1976, model 116**

Pull rubber cap (arrow) from **blue/purple** vacuum line.

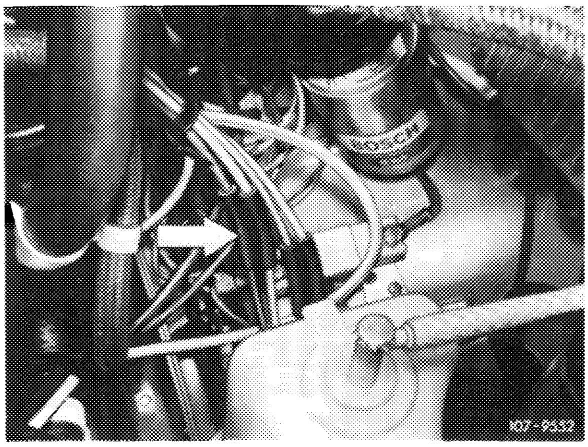


Ⓤⓢⓐ **California 1974**

Pull off **red** vacuum line at connecting point (arrow).

Ⓤⓢⓐ **1975/76**

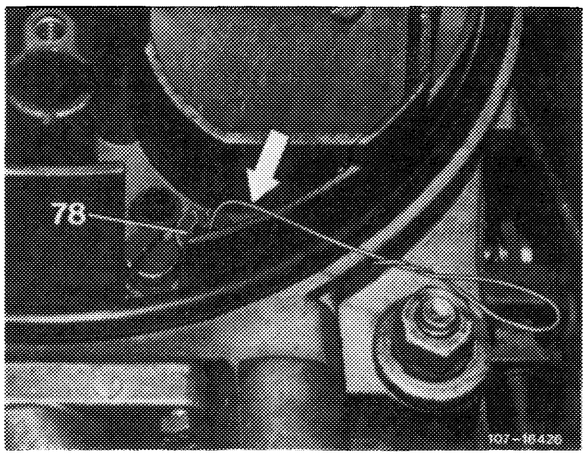
Pull off **blue/purple** vacuum line at connecting point (arrow).



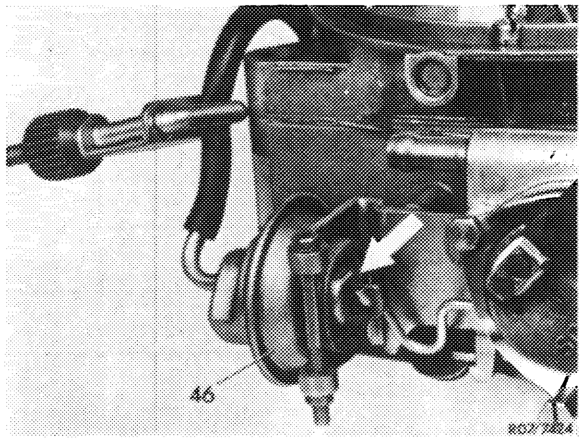
Insert test wire 0.5 mm dia. (arrow) into both air correction jets (78) one after the other and measure CO increase. The CO increase **should be the same on both sides** (corrections 07.2–101).

Note: To prevent measuring faults, do not insert test wire deeper than 10 mm into idle speed jet. Without test wire, the max. idle speed emission value should not be exceeded.

5 Reattach vacuum hose for air injection (air injection operating).

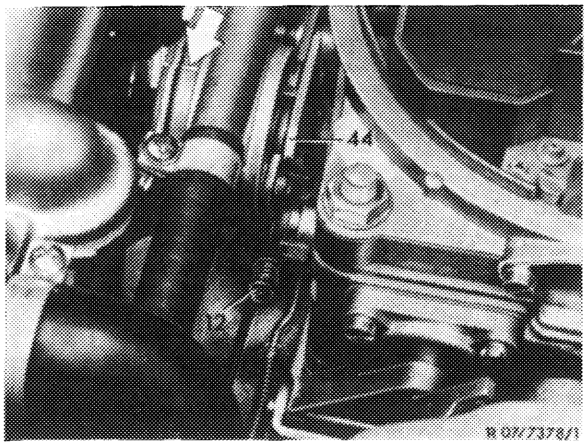


6 Adjust choke valve gap. For this purpose, run engine at idle speed until the vacuum has pulled the diaphragm in dashpot (46) completely back against stop (arrow). Then pinch vacuum hose.



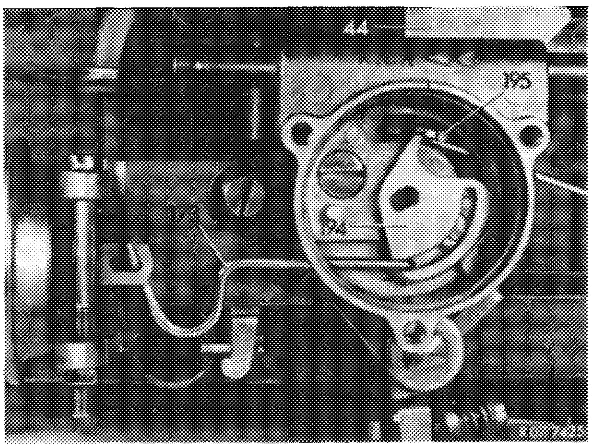
Choke housing version 1
(sheet metal pulldown)

Slightly actuate throttle valve lever and push fast idle cam (44) upwards against stop. Release throttle valve lever.



Insert wire hook (195) through slot in choke housing to push drive lever (194) of bimetallic spring **up to noticeable stop.**

Attention!
Do not push drive lever too heavily against stop, since otherwise the **diaphragm will be pulled back** and measuring faults will result.

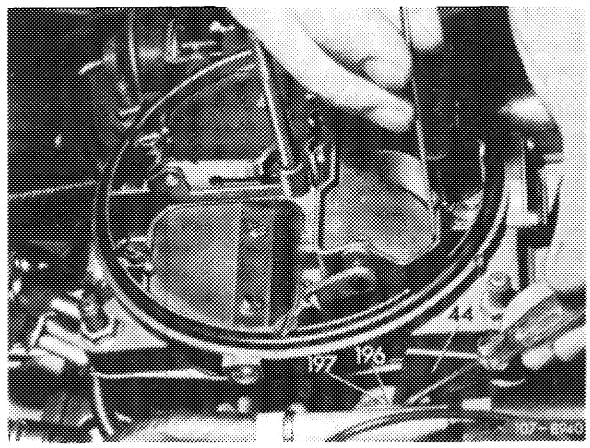


Starter housing version 1
(sheet metal pulldown)

Push drive lever (196) **up to noticeable stop** by means of a screwdriver.

Measure choke valve gap between downward-opening wing of choke valve and measure carburetor wall.

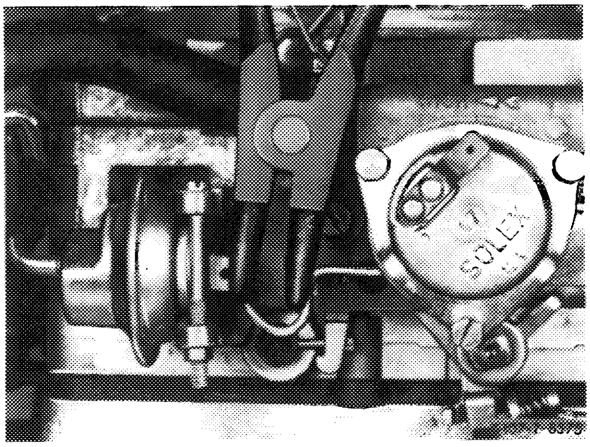
Note: To eliminate any play in linkage, make sure that the measuring plug enters tightly.



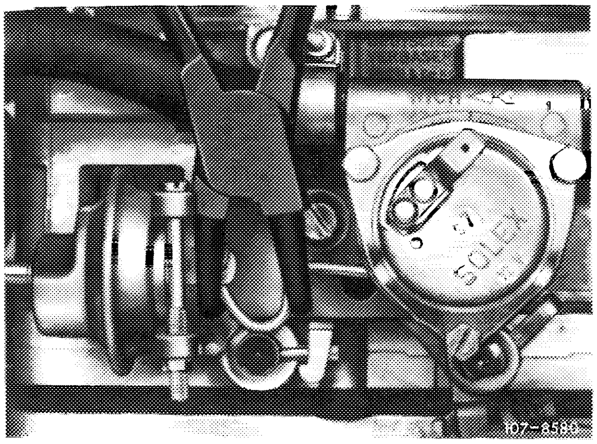
Choke housing version 2
(cast iron starter housing)

Adjust choke valve gap by bending connecting rod between automatic choke and dashpot as required.

Pushing apart = decreasing gap
Pushing together = increasing gap



Decreasing choke valve gap

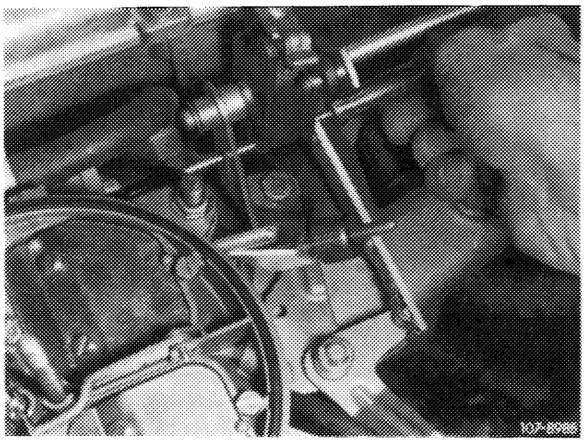


Increasing choke valve gap

Adjust choke valve gap by turning choke valve gap adjusting screw in choke housing cover.

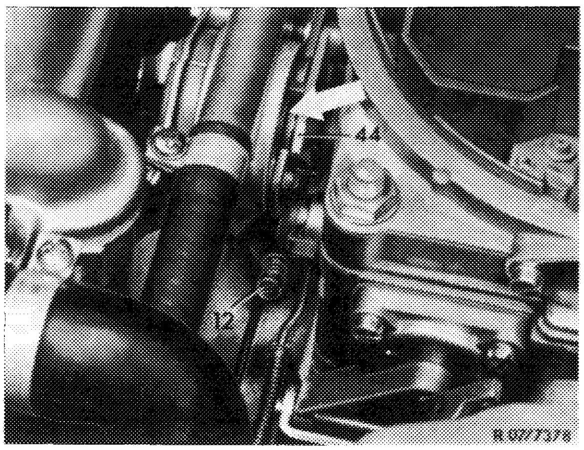
Screwing in = decreasing gap
Screwing out = increasing gap

Attention!
If choke valve gap changes during adjustment, check pulldown for leaks, since the O-ring in pulldown cover might be leaking.



Adjusting choke valve gap
(cast iron choke housing)

7 Adjust cold starting speed. For this purpose, run engine at operating temperature (60–80 °C engine oil temperature). Slightly lift throttle valve lever and push fast idle cam (44) upwards against stop. Release throttle valve lever. Measure engine speed and adjust with adjusting screw (12), if required.



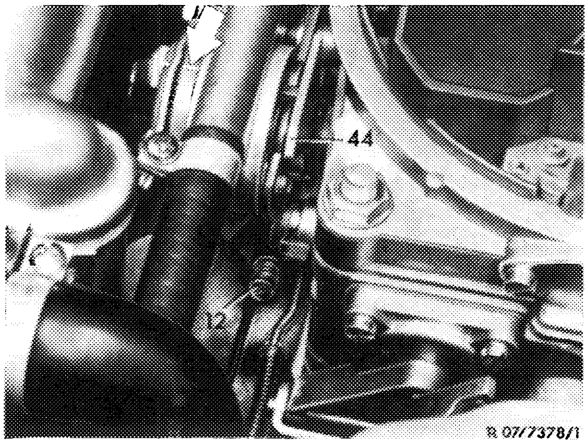
B. Carburetor with thermostatically controlled bypass choke (TN choke)

Note

To obtain perfect starting and warming-up characteristics, the tests and adjustments described here should be performed with great care. It is particularly important that all CO measurements are made without air injection and EGR, as well as without draw-off for accelerating pump, if installed. The CO tester should be in perfect condition. CO value should be balanced well.

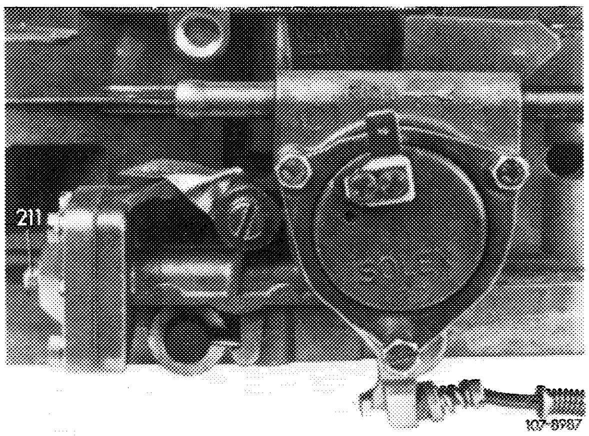
Testing, adjusting

1 Remove air filter. Check whether marking notch on choke cover is located accurately opposite mark on carburetor housing (arrow) and adjust choke cover, if required.



R 07/7378/1

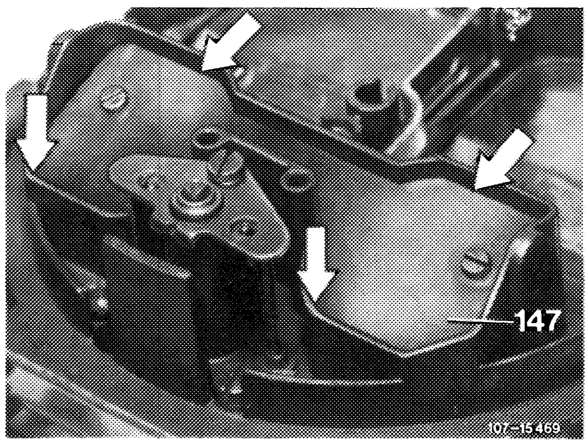
2 Check choke housing for tight seat and insert any loose fastening screws with Omnifit or Loctite.



107-8987

3 Check choke valve (147) for easy operation and make operable, if required.

Complete test on cold engine whenever possible. The choke valve and the transmitting linkage should be easily moving in any position. To check, disconnect choke rod, if required. If choke valve binds or is hard to move, refinish carburetor shaft accordingly.



107–15469

4 Run engine oil temperature to approx. 80 °C.

5 Check pulldown delay.

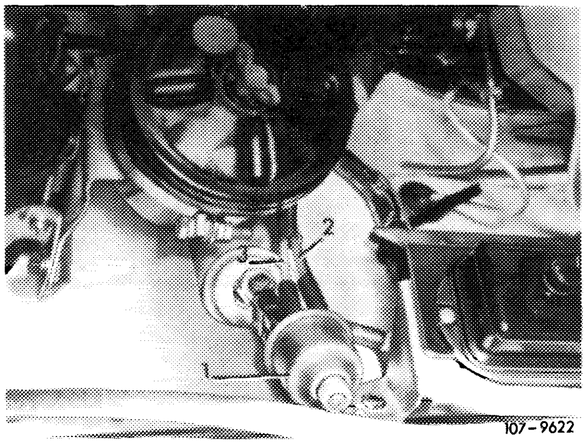
Note: If the delay is too long, the mixture is made leaner too slowly after starting and the spark plugs may soot up and fail. If the delay is too short, the mixture is made leaner too fast and the engine develops a trend towards stalling.

a) Testing switchover valve for pulldown delay

For this purpose, pull high-voltage cable 4 out of distributor cover and connect to ground.

Actuate starter several times for short periods. Switching procedure of switchover valve (1) should be heard or felt.

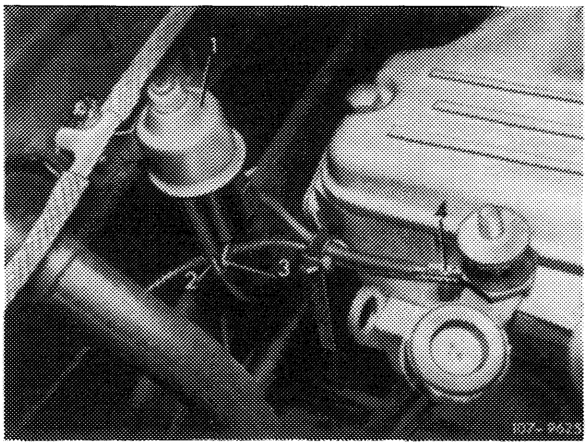
Pull **red** vacuum line (2) from switchover valve and connect vacuum tester to valve. Actuate starter, tester **should indicate no vacuum** (switchover valve switches vacuum to atmosphere).



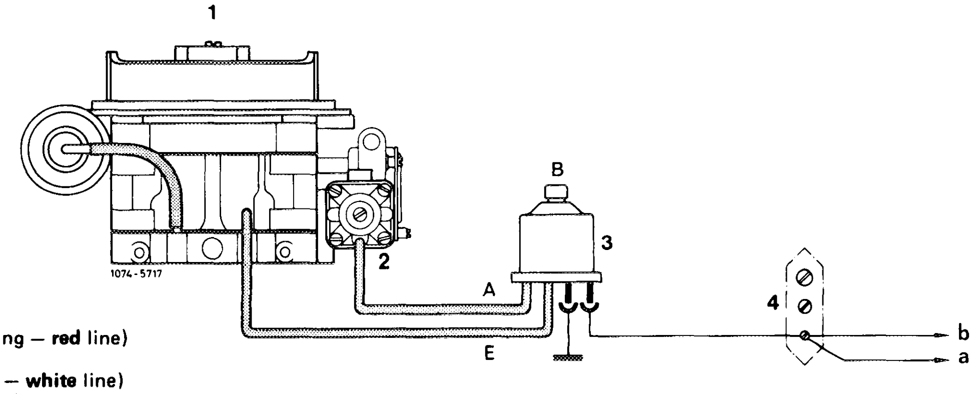
Model 114

Plug high-voltage cable 4 in again. Run engine, tester should now indicate a vacuum (switchover valve connects vacuum to pulldown).

Note: The vacuum on tester is indicated under delay, under influence of throttle jet in connecting pipe for vacuum.



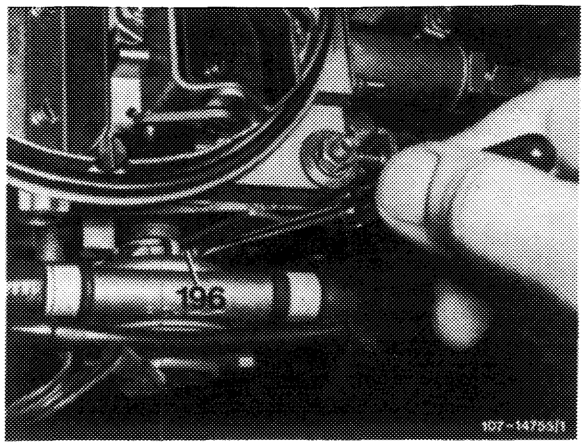
Model 116



1 Solex carburetor 4 A 1
2 Choke housing
3 Switchover valve
4 Cable connector

A Outlet (to choke housing – **red** line)
B Vent (to atmosphere)
E Inlet (from carburetor – **white** line)
a To ignition starter switch
b To starter terminal 50

b) Checking thermo delay valve

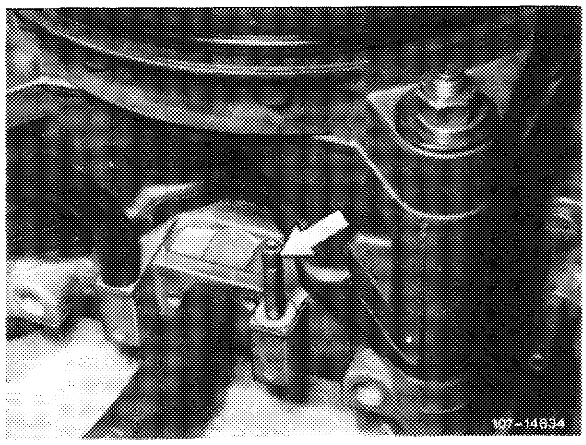


With the engine running, pull off vacuum hose for pulldown on throttle valve section. Plug vacuum hose in again while simultaneously measuring the time up to the moment when choke valve is not opening any further. The delay should amount to 5–12 seconds.

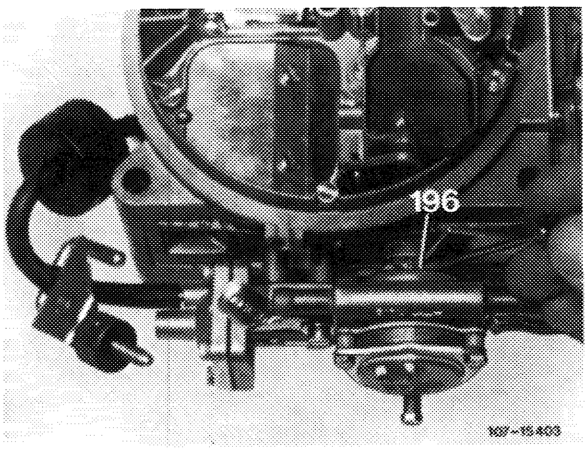
After attaching vacuum hose, wait for approx. 4–5 seconds, then push lever (196) lightly against stop. (If the idle speed drops, stop checkup and start again to avoid faulty measurements).

Yielding to counterpressure of pulldown now becoming effective on lever (196), watch until the choke valve stops opening any further. If the delay period is not the result of the tolerance, check pulldown throttle for passage and pulldown itself for leaks.

c) Checking pulldown throttle



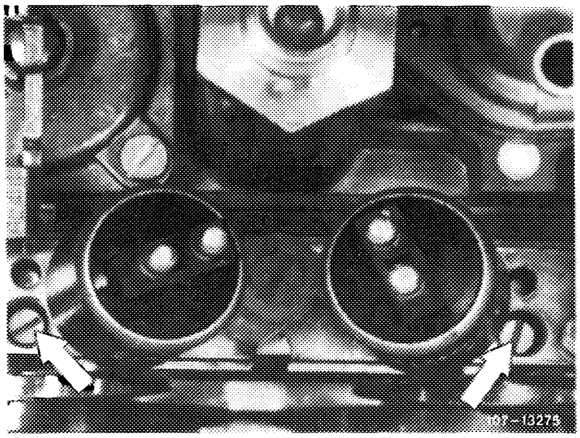
For this purpose, remove thermo delay valve together with vacuum hoses. Plug the longer of the removed vacuum hoses to pulldown. Run engine and plug vacuum hose to throttle valve member. After max. 3 seconds, push lever (196) up to noticeable stop, the choke valve should now be at gap width. If not, clean throttle and replace, if required. Repeat checkup.



6 Check pulldown for leaks. For this purpose, pinch vacuum hose with a clamp while the engine is running, then stop engine and push choke valve to gap width; width of choke valve gap should not decrease, if it does, the pulldown is leaking. Replace pulldown cover ı r diaphragm, if required.

If the pulldown is sealed well and the throttle passage is in order, replace thermo delay valve.

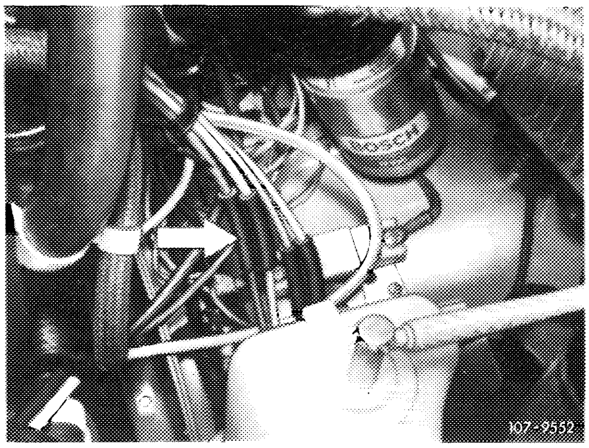
7 Check for uniform adjustment of idle speed mixture adjusting screws (arrows). For this purpose, run engine oil temperature up to approx. 80 °C. Permit approx. one minute for CO indication to come to rest.



Perform the following CO measurements **without air injection** and without EGR. Make air injection inoperative as follows:

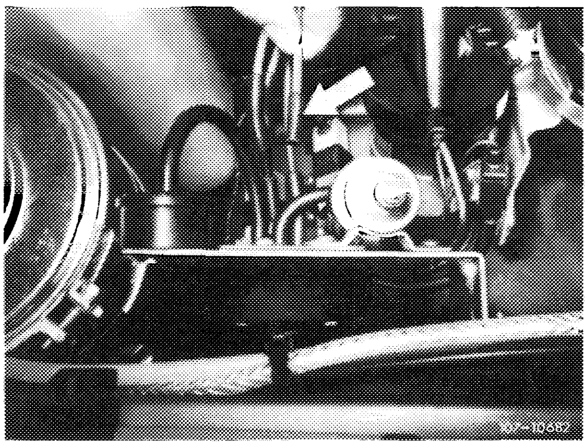
Ⓙ **1976**

Pull off **blue/purple** vacuum line at connecting point (arrow).



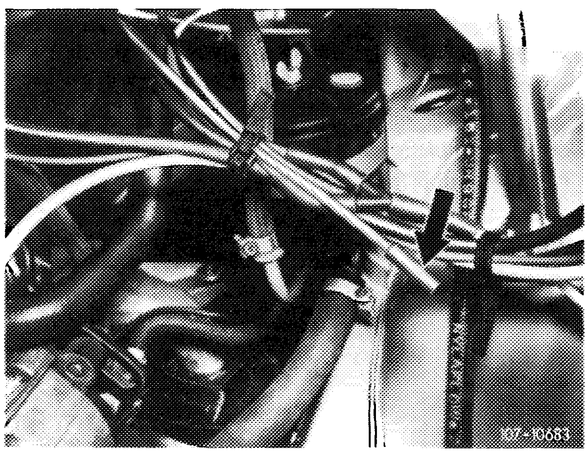
Ⓢ **1976, model 114**

Pull rubber cap (arrow) from **blue/purple** vacuum line.



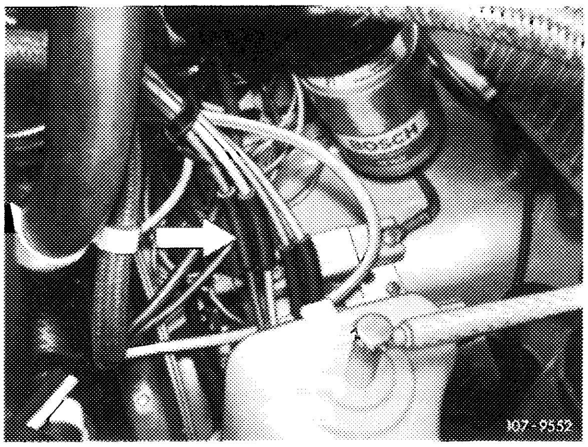
Ⓢ **1976, model 116**

Pull rubber cap (arrow) from **blue/purple** vacuum line.

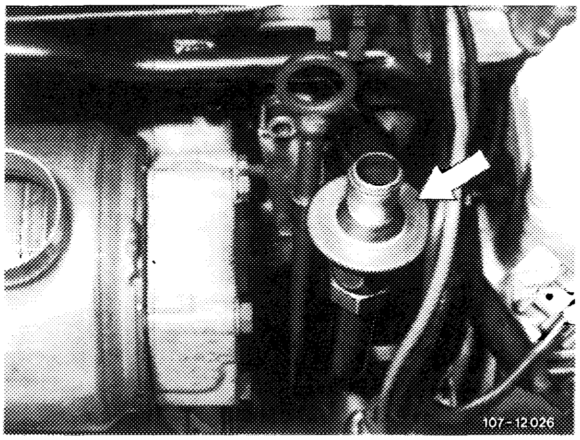


USA 1975/76

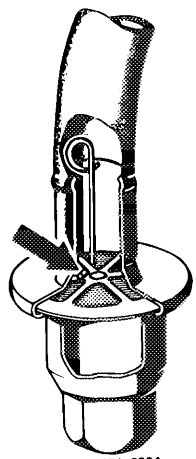
Pull off **blue/purple** vacuum line at connecting point (arrow).



The exhaust gas for idle speed CO measurement on vehicles with catalyst, J 1976 and USA 1975/76 is drawn off in front of catalyst at check valve (arrow) of air injection.



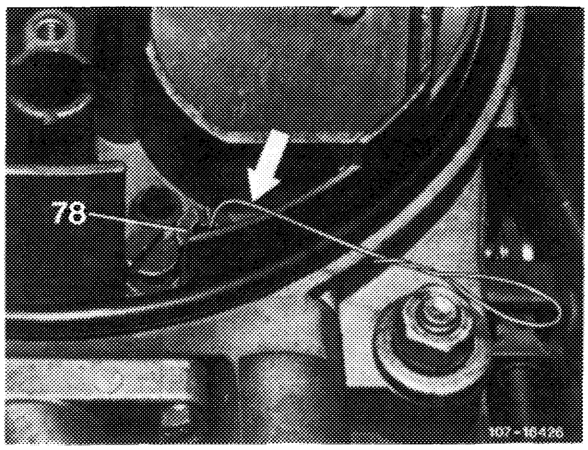
For measuring idle speed emissions, open valve plate of check valve by means of a self-made wire hook. Connect exhaust gas hose of CO measuring instrument to check valve.



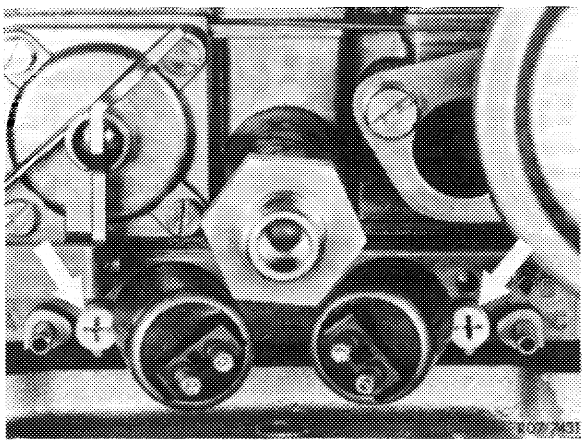
1074-6964

Insert test wire 0.5 mm dia. (arrow) into both air correction jets (78) one after the other and measure CO increase. The CO increase **should be the same on both sides** (corrections 07.2–101).

Note: To prevent measuring faults, do not insert test wire for more than 10 mm into idle speed air jet. Without test wire, the max. idle speed emission value should *not be exceeded.*



8 Check TN mixture and adjust. For this purpose, run engine oil temperature to approx. 80 °C. Then run engine for approx. five minutes to stabilize at idle.

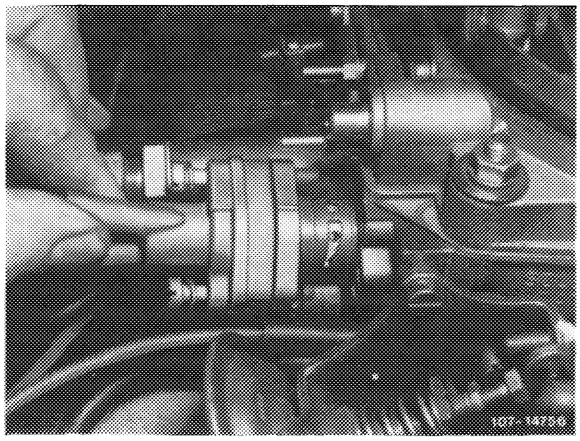


Set idle speed emission value **accurately to 1.0 % CO** by uniform adjustment of adjusting screws (arrows).

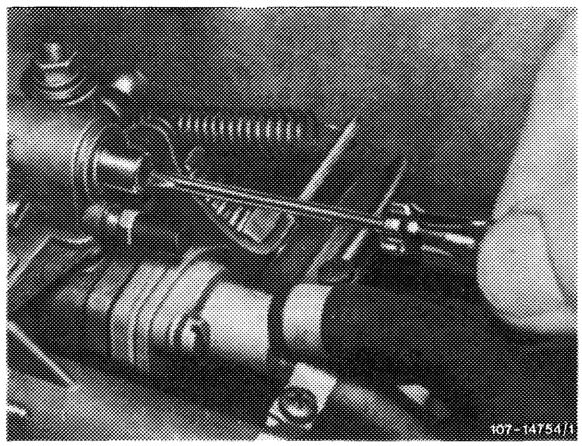
Screwing in = leaner
Screwing out = richer

Attention!
Wait for approx. one minute to let CO values come to rest to avoid measuring faults. CO measurements should be taken and adjustments made at approximately the same engine oil temperature and, if installed, without drawing off at accelerating pump.

Remove thermostatically controlled bypass choke (TN choke) with water hoses connected and put aside. Then install TN test choke (self-made, refer to end of chapter) with gasket in such a manner that the bores are facing **upwards.**



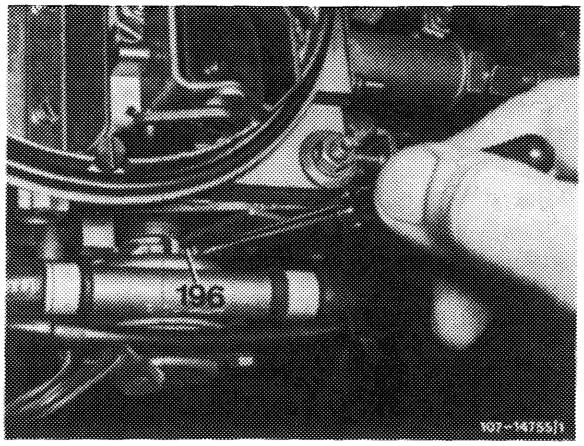
Pull off hose for drawing off at accelerating pump, if installed, and close draw-off connection on TN choke duct. With the engine running and the choke valve completely open, check CO value, which should amount to **0.5–0.6 %.** If required, adjust by means of TN mixture adjusting screw.



Screwing in = leaner
Screwing out = richer

(Below 0.5 % CO, the TN mixture is too lean, above 0.6 % it is too rich).

9 Check warming-up total mixture and adjust. Run engine with TN test choke installed. Push choke valve on lever (196) until noticeably stopped (choke valve gap). Check CO value and set by adjusting choke valve gap, if required.

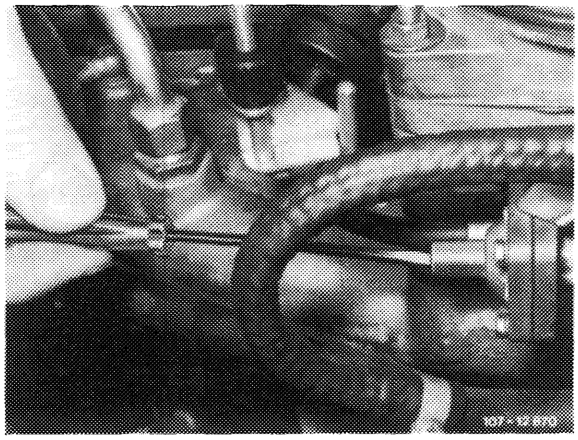


Screwing out = **leaner**
Screwing in = **richer**

Nominal value: 7–8 % CO

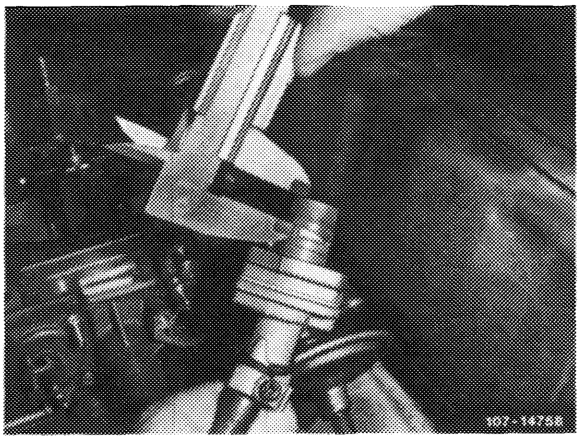
(On carburetors with draw-off connection for accelerating pump, set to low CO value).

Note: If the adjusting screw is suddenly moving easily during adjustment, the O-ring is defective. In such a case, make sure to check pulldown once again for leaks.



Adjusting warming-up total mixture

10 Check TN control piston position at 85 °C coolant temperature and adjust. For this purpose, run engine with TN test choke installed. Measure dimension "X" form face to upper edge of control window directly adjacent to web.

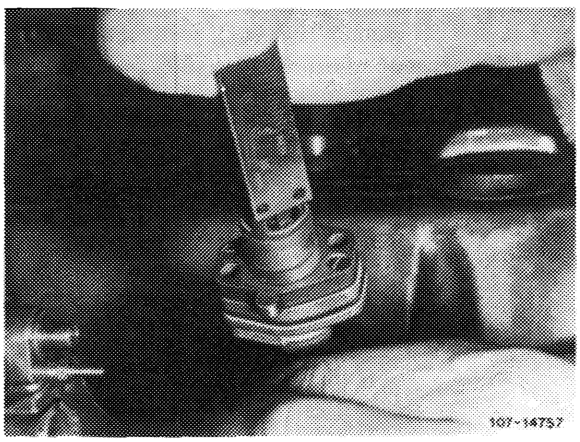


Measure dimension "X"

Then measure dimension "Y" from face to edge of control piston.

Dimension "Y" should be 0.8–1.0 mm smaller than dimension "X", so that the control piston closes the control window with overlap.

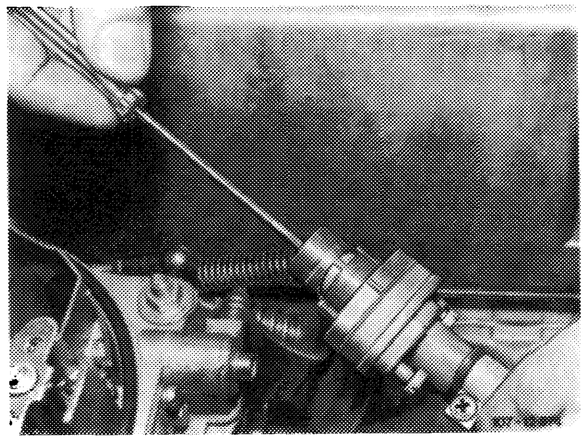
Control piston overlap: at 85 °C coolant temperature ***0.8–1.0 mm.***



Measure dimension "Y"

Setting control piston position by means of adjusting screw.

Screwing out = **reducing overlap**
Screwing in = **increasing overlap**



Note: At + 20 °C temperature of TN choke the TN control window should be open by at least 2.5 mm. At each 10 °C change in temperature, the control piston travels a distance of approx. 0.5 mm, i.e. at approx. 70 °C coolant temperature the control window is just closed. At approx. 0 °C control window is completely open.

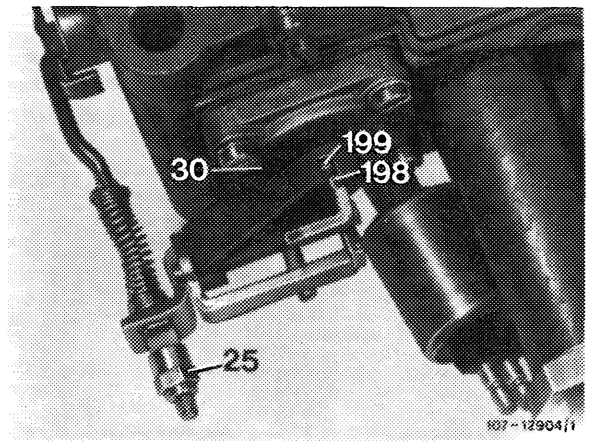
11 Remove TN test choke and re-install TN choke put aside earlier.

12 Check idle speed and idle speed emission value and adjust, if required.

Note: If the idle speed emission value is within the specified tolerance and the engine is running smoothly, do not change emission value since this value influences the warming-up total mixture.

13 Plug-in again vacuum line for air injection and EGR (air injection and EGR operative).

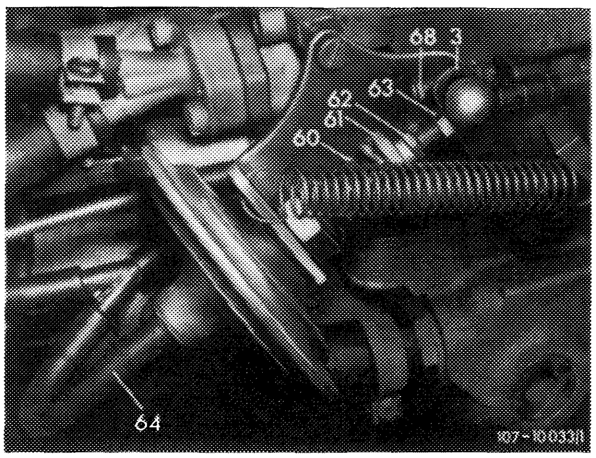
14 Check accelerating pump and adjust, if required (67.2–150).



25 Adjusting nut in accelerating pump

15 Adjust vacuum governor. For this purpose, run engine, pull off vacuum hose (64), set to specified speed by means of adjusting screw (63), plug-on vacuum hose.

Attention!
When loosening counternut, apply counterhold to diaphragm rod.

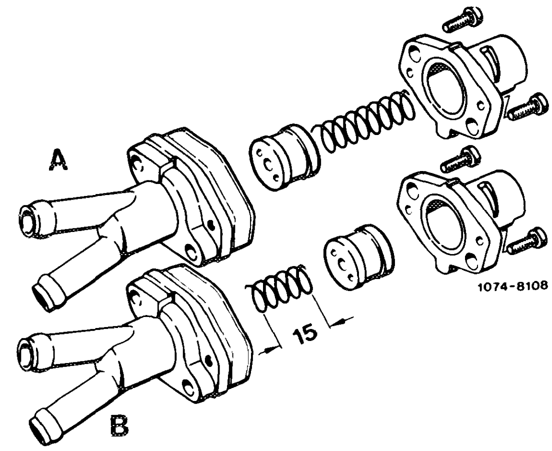


On automatic transmission, engage driving position, set to specified speed by means of adjusting nut (61). Turn power steering to full lock and engage air conditioner, engine should still run smoothly. Readjust speed, if required.

Self-made TN test choke

16 Unscrew the two fastening screws for the TN piston housing and remove piston housing.

17 Coat control piston with Omnifit or Loctite and slip back into piston housing with **open side first.** Shorten compression spring to approx. 15 mm, mount and tighten piston housing.



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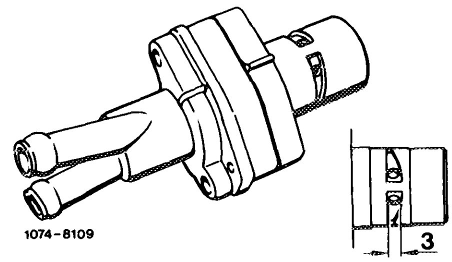
18 Then drill two 3 mm holes through TN control piston.



1074-8109

Testing and adjusting values

Voltages measured at battery

Rest potential	min. 12.2 volts
Starting voltage	min. 10 volts
Regulating voltage alternator	13.0–14.5 volts

Voltages measured at ignition coil

Terminal 15	Breaker contact "closed"	3.6–4.6
Terminal 1		0.7–1.5
Terminal 15	Breaker contact "open"	battery voltage
Terminal 1		battery voltage

Voltage at pre-resistor

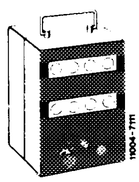
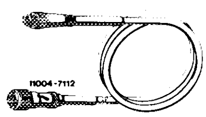
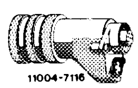
Pre-resistor output 0.4 ohm Cable: red/black (Pre-resistor bridge-over)	min. 9.6 volts

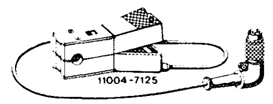
Carburetor

TN control window opening at + 20 °C	approx. 2.5 mm
CO value after starting cold engine	7–8 %[1])

[1]) If the CO value is essentially above upper tolerance, spark plugs have a tendency for sooting, engine starts misfiring. If it is considerably below lower tolerance, starting faults and bypass faults may occur.

Special tools

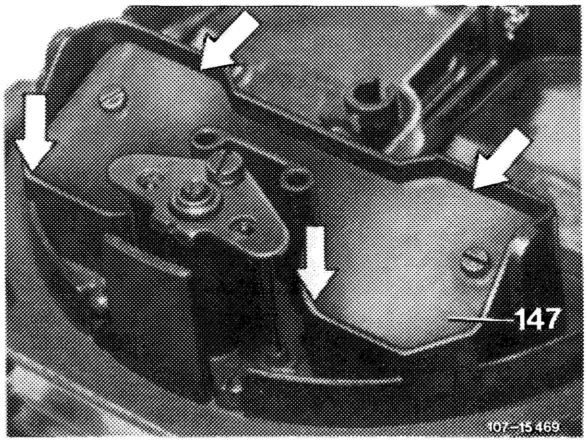
Digital tester		001 589 54 21 00
Connecting cable 3 m long		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00

Trigger		000 589 71 63 00

Conventional test instruments

Voltmeter, revolution counter and CO measuring instrument

Testing



1 Let engine cool down to below + 20 °C. Check whether choke valve (147) is completely closed and has lateral clearance. (**Below + 20 °C** the choke valve **should be completely closed).**

2 Remove air filter, pull cable from choke cover heater so that choke valve is not completely opening during the following voltage measurements.

3 Check battery for external condition (visual checkup). Check battery poles for oxidation.

4 Test voltages on battery.

a) Rest potential

Connect voltmeter to battery plus and minus pole, read voltage.

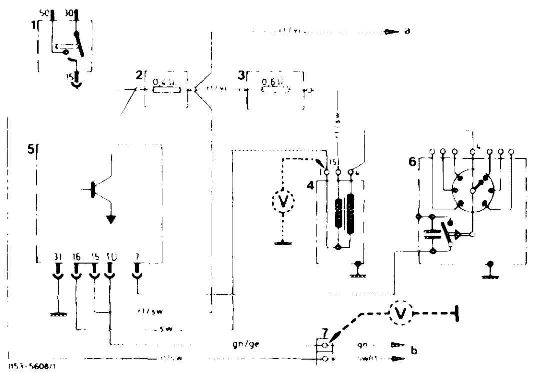
Nominal value: min. 12.2 volts

b) Starting voltage

Pull high-voltage ignition cable 4 out of distributor cover and connect to ground. Operate starting motor while reading voltage.

Nominal value: min. 10 volts

1 Ignition starter switch
2 Pre-resistor 0.4 ohm
3 Pre-resistor 0.6 ohm
4 Ignition coil
5 Standard switchgear
6 Ignition distributor
7 Diagnosis plug
a To starter terminal 16
b To diagnosis socket



5 Test voltages at ignition coil.

a) With breaker contact **closed** at terminal 15 and terminal 1:

Nominal values:	Terminal 15,	3.6–4.6 volts
	Terminal 1,	0.7–1.5 volts

b) With breaker contact **opened** at terminal 15 and terminal 1:

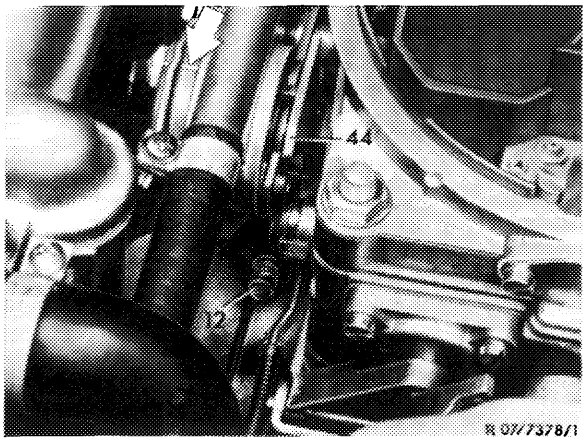
Nominal values: Terminal 15 and terminal 1 should be energized by battery voltage.

6 Measure voltage at pre-resistor 0.4 ohm while starting (pre-resistor bridge-over).

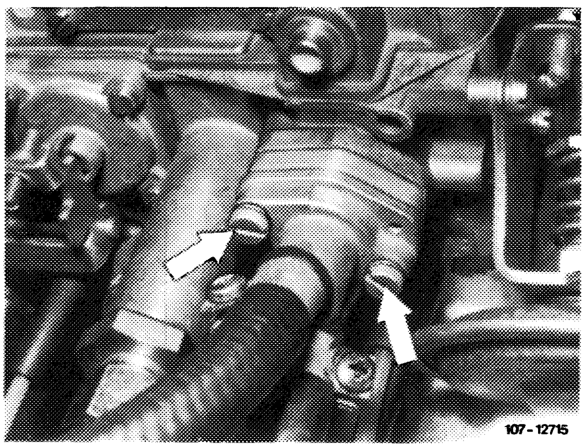
Nominal value: min. 9.6 volts

7 Insert high-voltage ignition cable 4 again into distributor cover.

8 Check choke cover preload. Markings (arrow) should be opposite each other.



9 Remove TN choke after loosening fastening screws (arrow) together with coolant hoses.

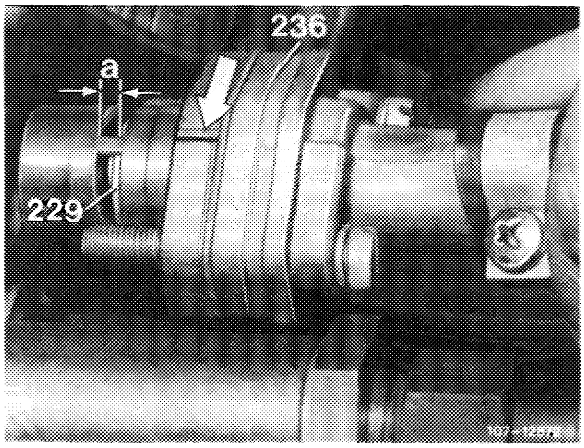


10 Measure control window opening "a" exposed by control piston with slide gauge.

Nominal values: At + 20 °C approx. 2.5 mm.
At approx. 0 °C control window should be completely open.

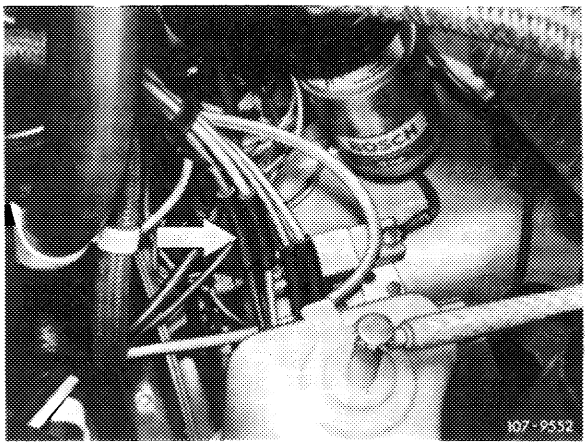
11 Install TN choke and air filter.

12 Check warming-up total mixture without air injection and EGR, adjust. For this purpose, connect CO measuring instrument and make air injection inoperative as described below (for (USA) 1973/74 nothing need be made inoperative):



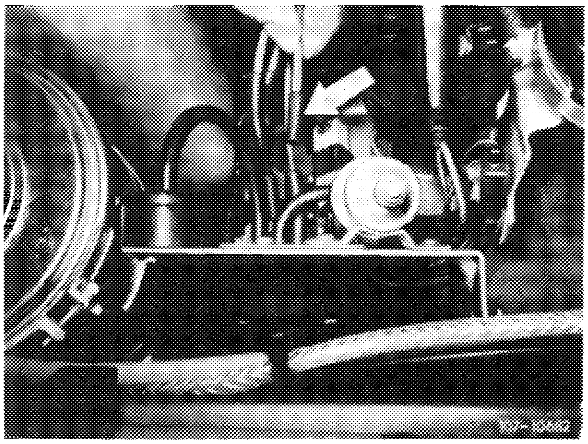
(J) **1976**

Pull off **blue/purple** vacuum line at connecting point (arrow).



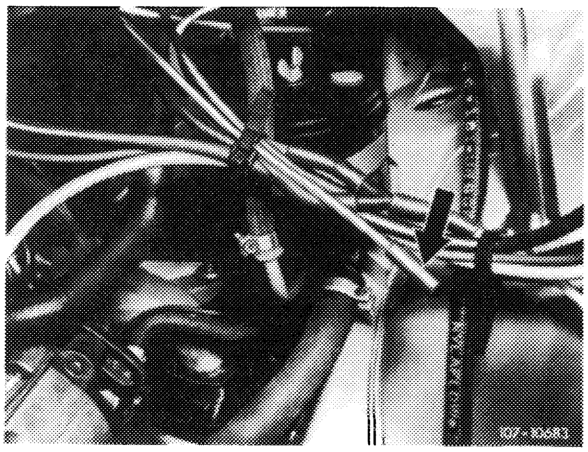
(S) **1976, model 114**

Pull rubber cap (arrow) from **blue/purple** vacuum line.



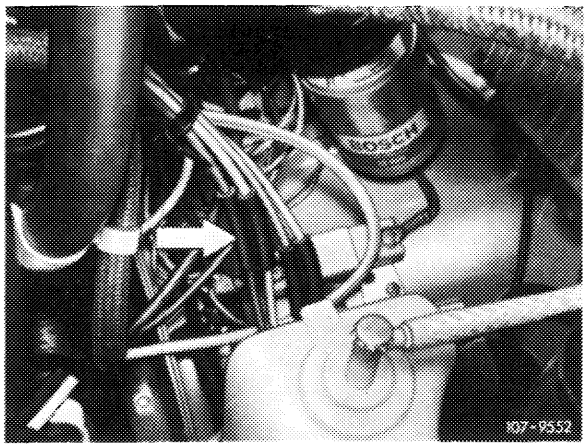
(S) **1976, model 116**

Pull rubber cap (arrow) from **blue/purple** vacuum line.



(USA) California 1974

Pull off **red** vacuum line at connecting point (arrow).



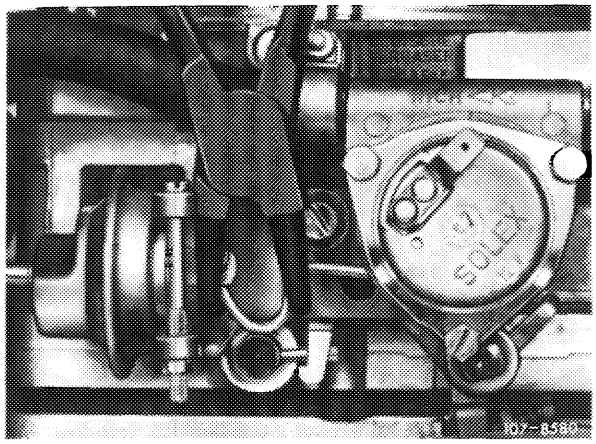
(USA) 1975/76

Pull off **blue/purple** vacuum line at connecting point (arrow).

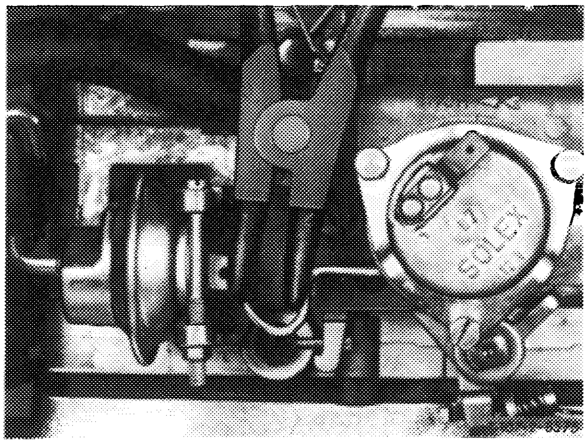
Start engine and rapidly depress accelerator upon firing.

Engage driving position for automatic transmission, permit CO value to come to rest and read. (If deviations from tolerance value are high, stop engine immediately, change choke valve gap accordingly and repeat CO test).

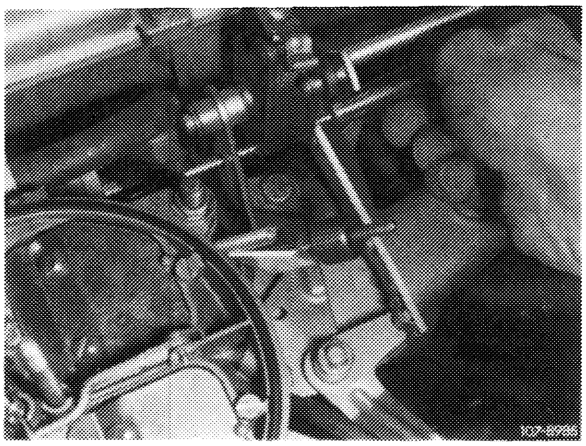
Nominal value: 7–8 % CO



Pushing together = leaner



Pushing apart = richer



Screwing out = leaner
Screwing in = richer

Again plug-on vacuum hoses for air injection and EGR (air injection with EGR operative).

13 Again plug-on cable for choke cover heater.

14 Test regulating voltage of alternator.

Note: Prior to testing regulating voltage, check acid density of battery. If acid density (state of charge) of battery is lower than 1.24 kg/dm^3 in tropical countries, a defective transistor regulator (full regulation) is no longer recognized.

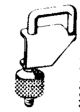
Checkup

Engine speed: 3000/min
Battery load: Compulsory consumer only (ignition)
Regulating voltage measured after approx. two minutes: 13.0–14.5 volts.

Testing and adjusting values

TN control piston overlap at + 85 °C coolant temperature	0.8–1.0 mm
TN control window opening at + 20 °C	approx. 2.5 mm

Special tool

Clamp	 11004-6190	000 589 40 37 00

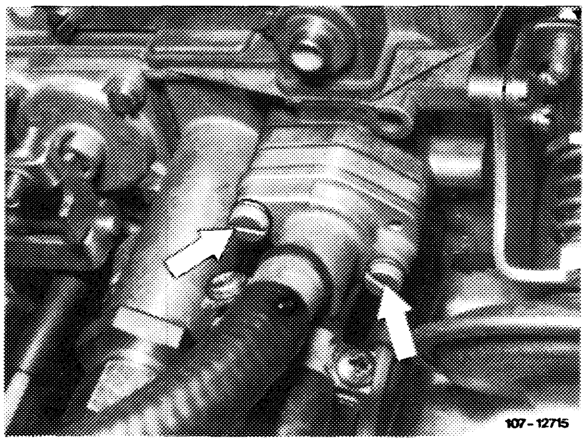
Conventional tool

Combined slide and depth gauge

Testing, adjusting

1 Run engine to operating temperature (coolant thermostat opened (approx. 85 °C).

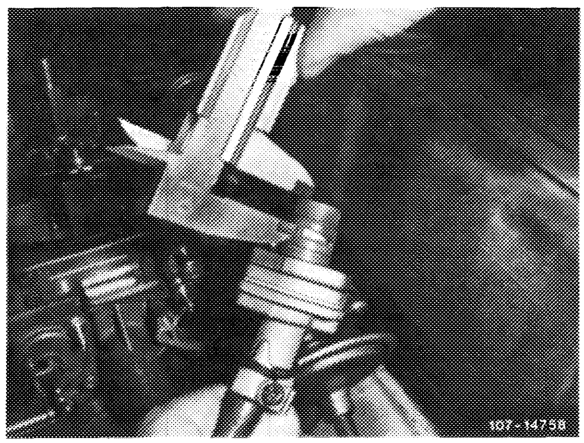
2 After loosening the two fastening screws (arrows) pull out TN choke with water hoses connected.



TN choke version 2 with enlarged expansion element and housing

3 Test and adjust TN control piston position. For this purpose, after pulling out TN choke, immediately measure dimension "X" from face up to upper edge of control window directly adjacent to web.

Attention!
Measuring is required immediately because upon cooling down the expansion element will respond and cause control piston to move to another position.

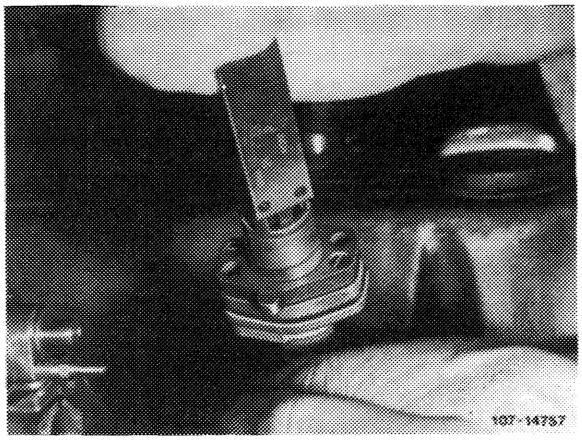


Measuring dimension "X"

4 Then measure dimension "Y" from face up to edge of control piston.

Dimension "Y" should be 0.8–1.0 mm smaller than dimension "X", so that the control piston will close control window with overlap.

TN control piston overlap: at + 85 °C coolant temperature **0.8–1.0 mm.**

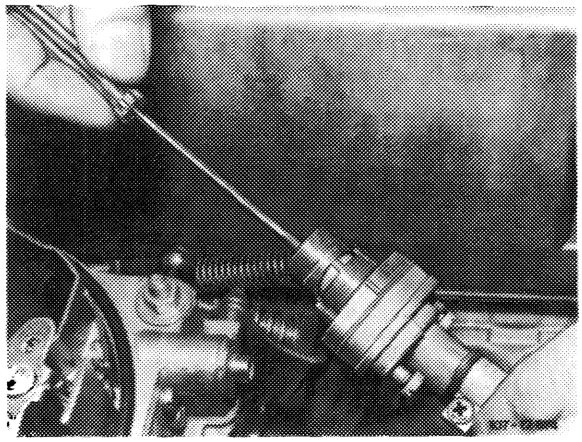


Measuring dimension "Y"

5 Adjust TN control piston position by means of adjusting screw.

Screwing out = reducing overlap
Screwing in = increasing overlap

Note: At + 20 °C temperature of TN choke, the TN control window should be open by approx. **2.5 mm.** Each 10 °C of temperature change will cause control piston to travel approx. 0.5 mm, i.e. at approx. 70 °C coolant temperature the control window is just closed. At approx. 0 °C the control window is wide open.



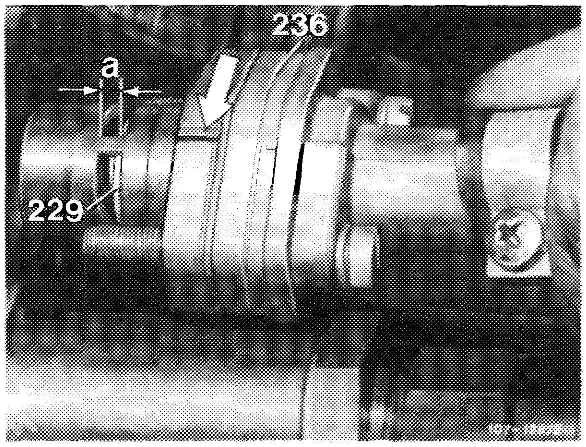
6 Pinch coolant hoses on TN choke and pull off.

7 Let TN choke cool down below + 20 °C (e.g. tap water) and then measure TN control window opening "a"

Nominal value: min. 2.5 mm.

(If control window opening is essentially less, replace TN choke).

8 Reinstall TN choke.

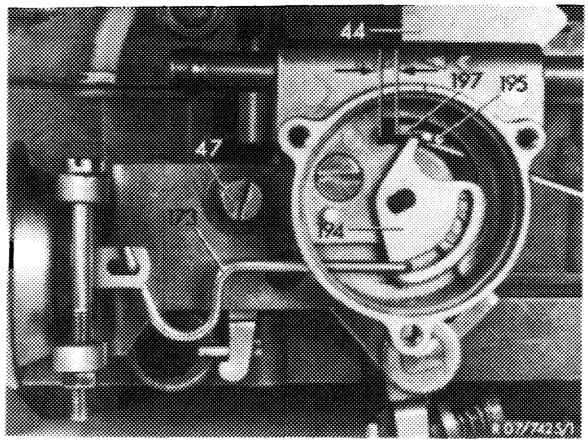


Testing and adjusting value

Distance "a" between choke housing and driver (197)	approx. 1.0 mm

Checking, correcting

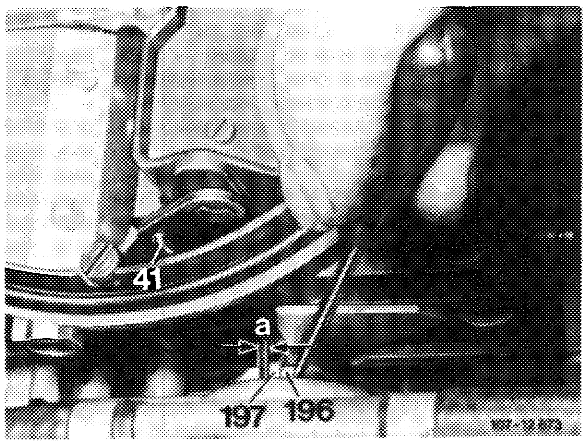
1 Check whether driver (196 and 197) is at right angle in relation to choke housing and rebend lever, if required.



Choke housing version 1

2 Operate throttle valve lever by half. Push driver (196 or 194) to the left up to stop.

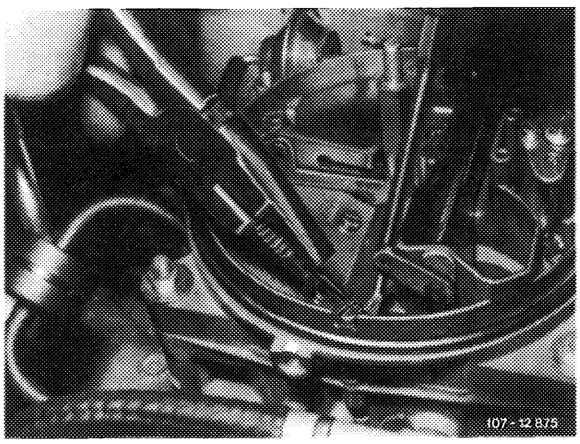
3 Check whether choke valve is **closed free of play** and whether the distance "a" between driver (197) and choke housing amounts to approx. 1.0 mm.



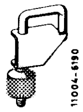
Choke housing version 2

4 Disconnect choke rod (41) if required and bend as needed.

Attention!
To prevent distortion of driver (196), support choke rod.

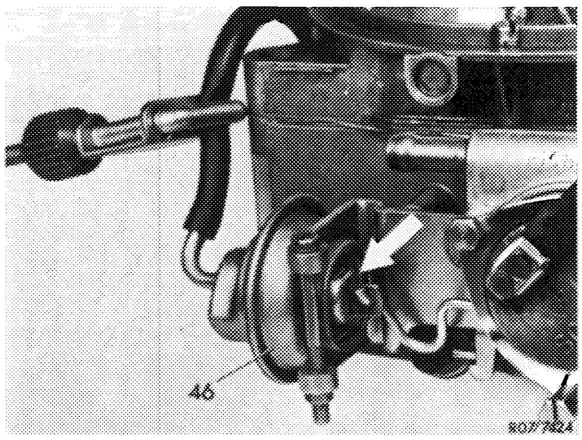


Special tool

Clamp		000 589 40 37 00

Testing

a) Choke housing version 1 (sheet metal pulldown)

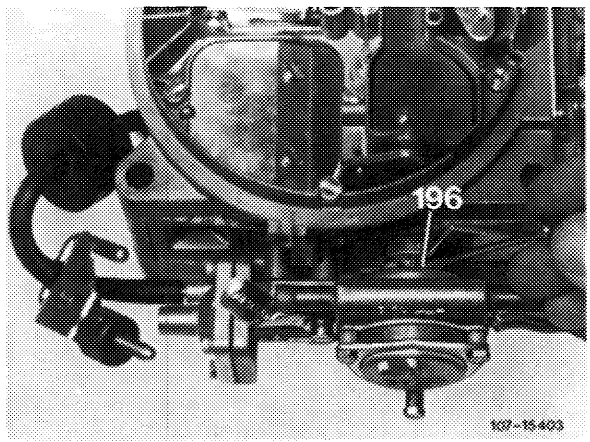


1 Run engine at idle until diaphragm rests against end stop. Pinch vacuum hose, stop engine.

2 Push with screwdriver against sheet metal cup of diaphragm and check whether diaphragm is still resting against end stop. Replace vacuum hose or dashpot (46), if required.

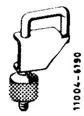
b) Choke housing version 2 (cast iron choke housing)

3 For this purpose, pinch vacuum hose with clamp with engine running. Stop engine. Open choke valve to gap. Choke valve gap should not become smaller, if it does, pulldown is leaking. Replace pulldown cover or diaphragm, if required.



Pulldown cover with O-ring

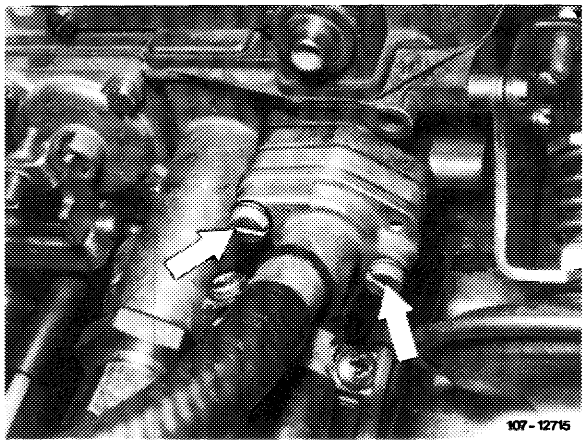
Special tool

Clamp		000 589 40 37 00

Removal

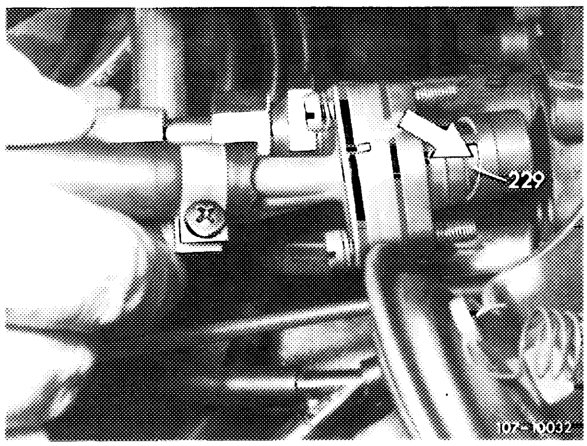
1 Pinch coolant hoses and pull off.

2 Pull TN choke out of carburetor housing after loosening fastening screws (arrows).



Installation

3 For installation proceed vice versa. Use new gasket and make sure that control window (arrow) is pointing upwards.



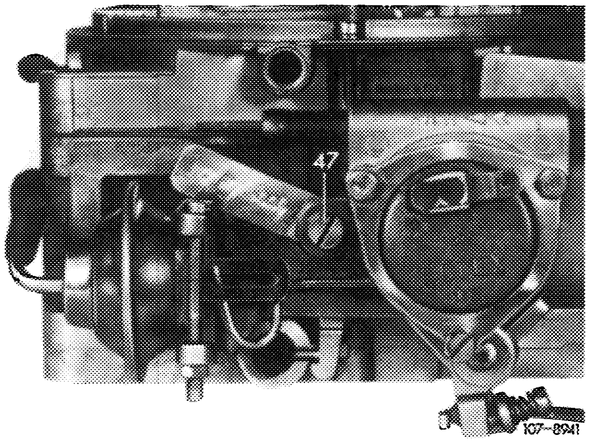
Note

The starter housing can be removed or installed without difficulties only with carburetor removed.

Removal

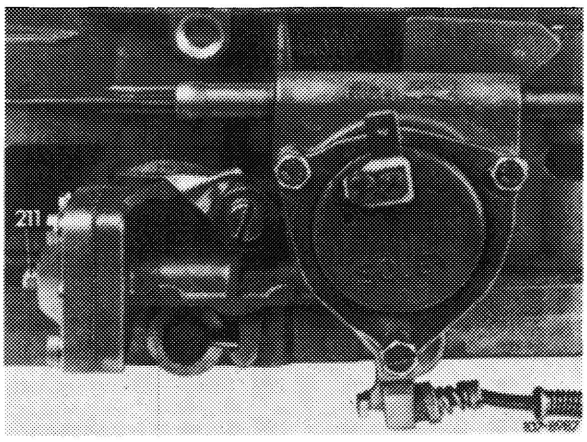
1 Remove carburetor (07.2–194).

2 Pull vacuum hose from choke housing. Unscrew fastening screw, remove choke housing and choke cover.

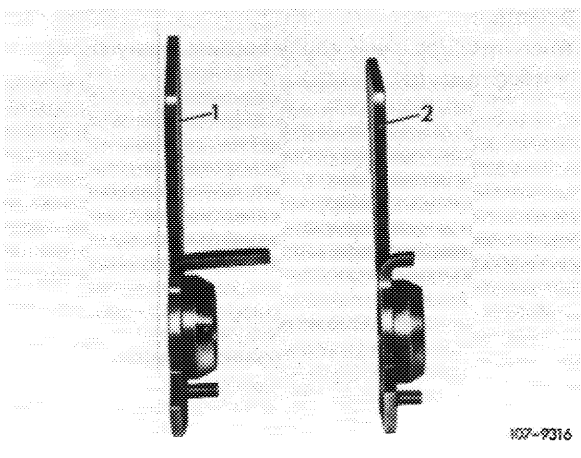


Choke housing version 1
(sheet metal pulldown)

Starting May 1973 a cast iron choke housing with integrated pulldown and a modified fast idle cam is installed. The choke valve gap is set by means of adjusting screw (211) to simplify adjustment. Subsequent installation is generally possible.



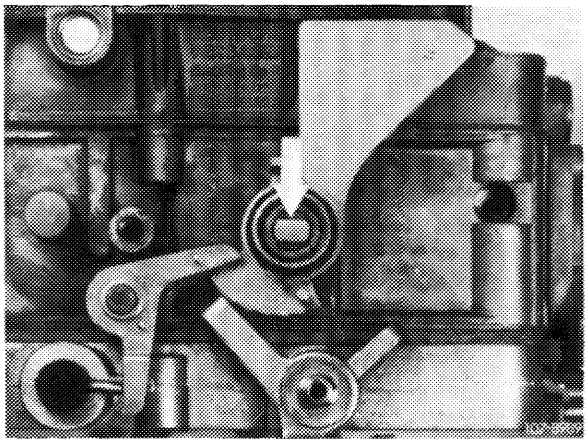
Choke housing version 2
(cast iron choke housing)



Fast idle cam versions

1 For choke housing with sheet metal pulldown
2 For cast iron choke housing (with short driver)

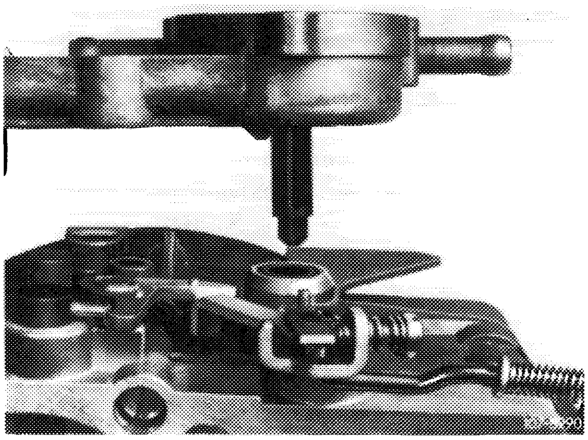
Installation



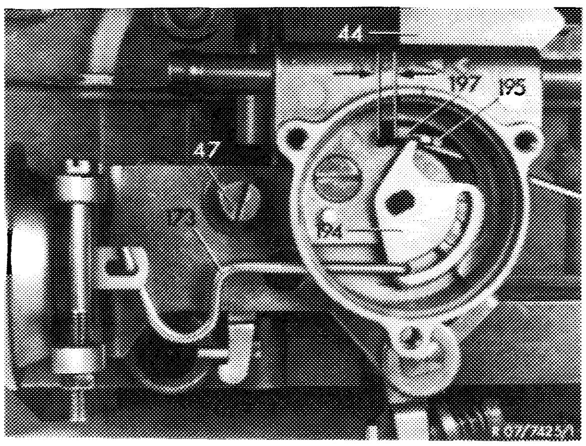
3 For installation, set up carburetor in such a manner that the choke housing can be installed vertically.

4 Position fast idle cam as shown in illustration and align.

5 Align driver lever for choke rod by means of a screwdriver inserted through bore in carburetor housing (arrow) in such a manner that the recess in driver lever shows up horizontally in center of carburetor housing bore.



6 Carefully install choke housing from above.

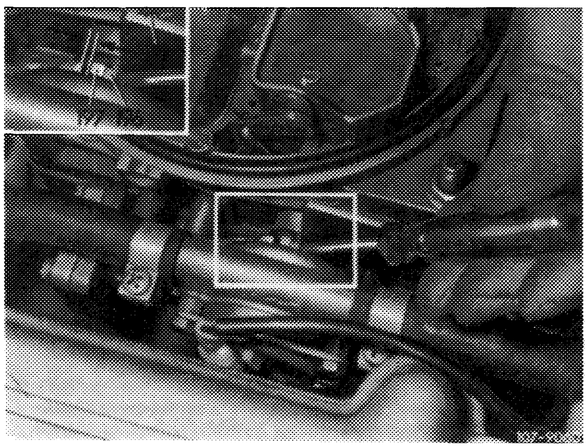


7 Check that drivers (196 and 197) are aligned as shown in illustration.

8 Check whether the driver (196 or 194) is moving when the choke valve is actuated, e.g. that it is positively connected. Then attach choke housing.

Choke housing version 1
(sheet metal pulldown)

44	Fast idle cam	194	Driver for actuating fast idle cam
47	Fastening screw	197	Driver of fast idle cam
173	Connecting rod		

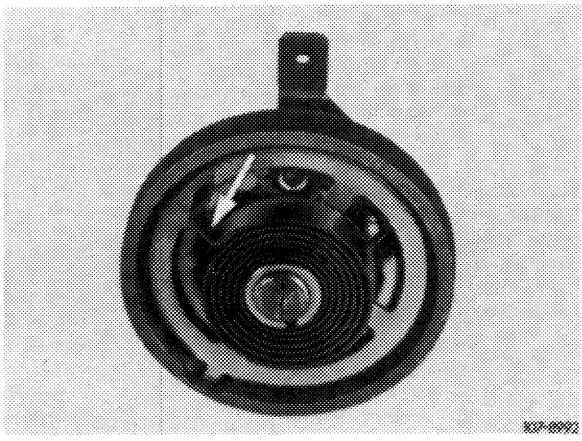


Attention!
When installing a new choke housing, apply choke housing mark (07.2–142).

Choke housing version 2
(cast iron choke housing)

44	Fast idle cam
196	Driver for actuating fast idle cam
197	Driver of fast idle cam

9 Install choke cover, making sure that the driver in choke housing rests against bimetallic spring side (arrow).



Spare parts for installing cast iron choke housing

Designation	Part no.
Choke housing	000 070 19 47
Fast idle cam	110 071 12 62
Fastening screw	001 071 27 71

Testing and adjusting values

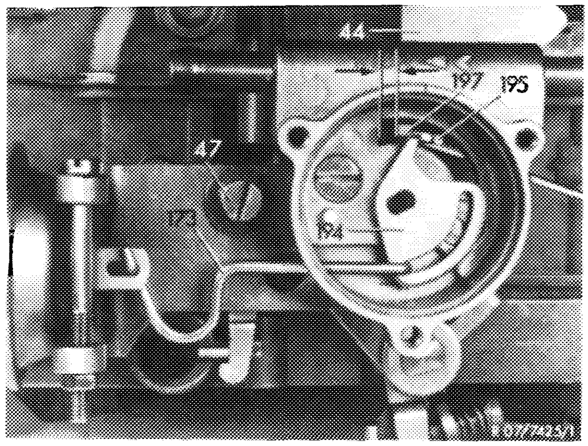
Distance "a" between choke housing and driver (197)	approx. 1.0 mm
Choke cover preload	to mark

Checking, correcting

1 Check whether driver (196 and 197) is at right angle in relation to choke housing and bend lever accordingly, if required.

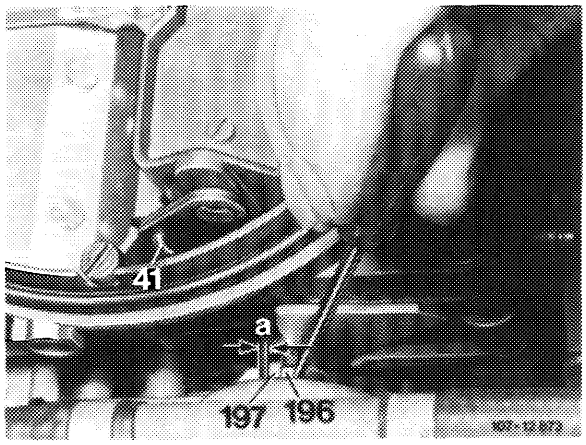
2 Operate throttle valve lever by half, push driver (196 or 197) to the left up to stop.

3 Check whether choke valve is closed free of play and distance "a" between driver (197) and choke housing amounts to approx. 1.0 mm.

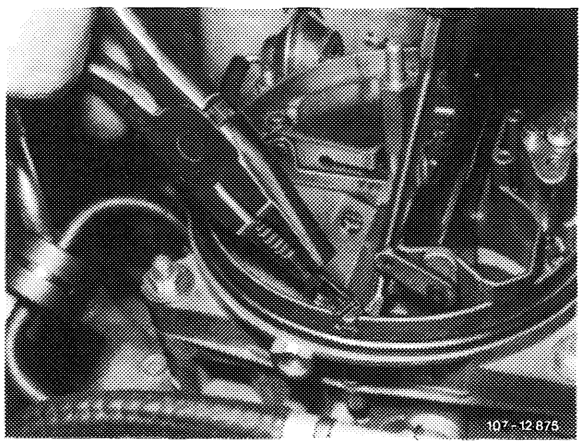


4 Disconnect choke rod, if required, and bend as needed.

Attention!
To avoid distortion of driver (196), support choke rod.

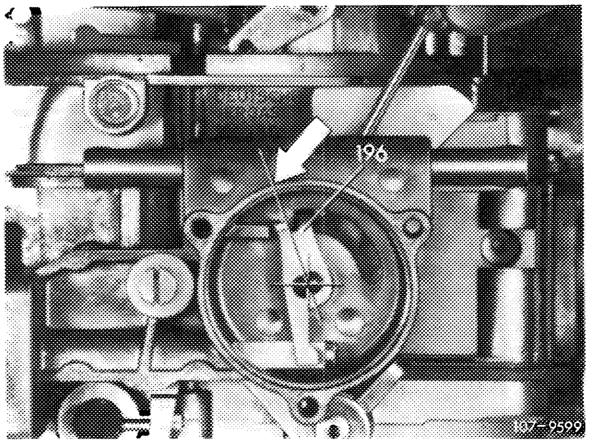


5 Actuate throttle valve lever by half. Push driver (194 or 196) to the left up to stop.



Rebending choke rod

6 Check marking notch (arrow) in extension of driver (194 or 196) and punch in new notch, if required.

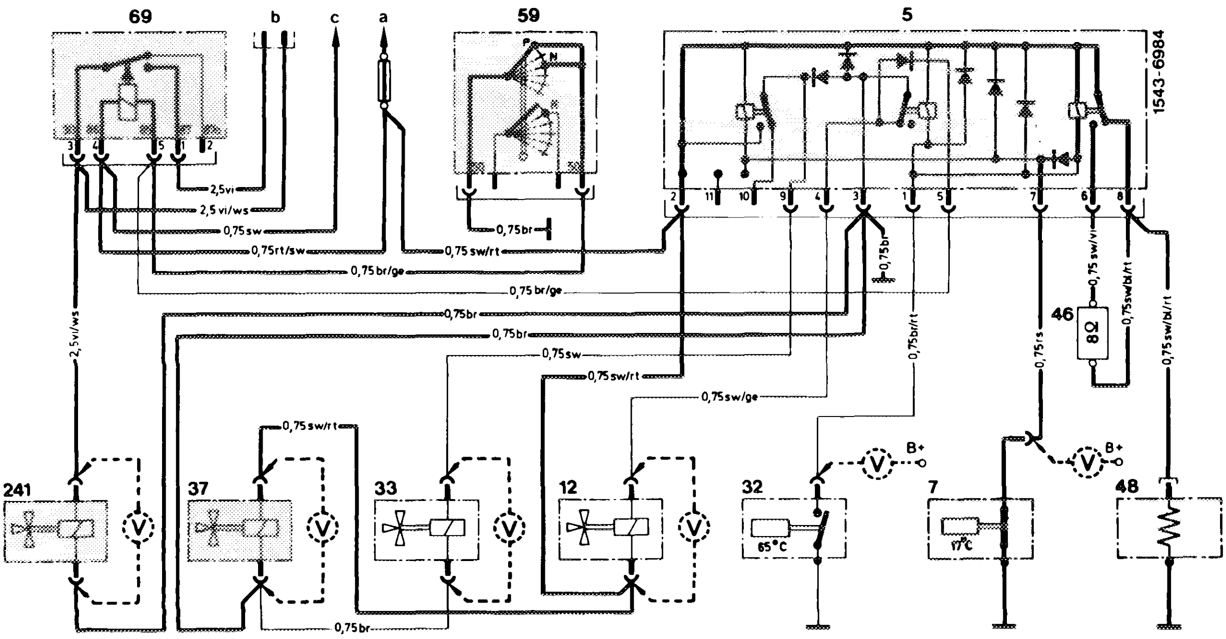


A. Ⓙ 1976

Test conditions: All fuses in order, engine at operating temperature, run engine at idle.

Wiring diagram (drawn with ignition switched off below 17 °C engine oil temperature)

Choke cover-stepped heater, automatic choke, positive and negative venting of float chamber



5 Relay box
7 Temperature switch 17 °C
12 Switchover valve EGR (brown)
32 Temperature switch 65 °C
33 Switchover valve air injection (blue)
37 Switchover valve float chamber positive ventilation (green)
46 Resistor 8 ohms
48 Choke cover
59 Starter lockout and back-up lamp switch
241 Switchover valve automatic choke (white)

Color code

bl = blue	rs = pink	vi = purple
br = brown	rt = red	ws = white
ge = yellow	sw = black	

a Fuse no. 4

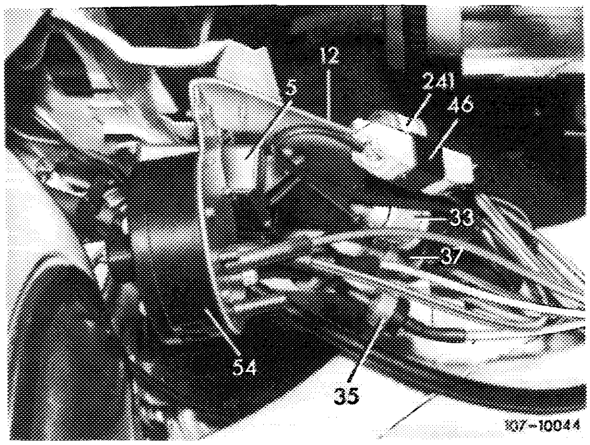
b Coupler to main conductor
Cable color purple – starter terminal 50
Cable color purple/white – starter switch terminal 50

c Warning switch catalyst temperature

Testing choke cover-stepped heater

Connect voltmeter at output of resistor (46) and connect to ground. Disconnect plug connection of electric line to temperature switch 17 °C (7) and connect to ground.

Voltmeter indicating 7–8 volts.	Voltmeter not indicating 7–8 volts.

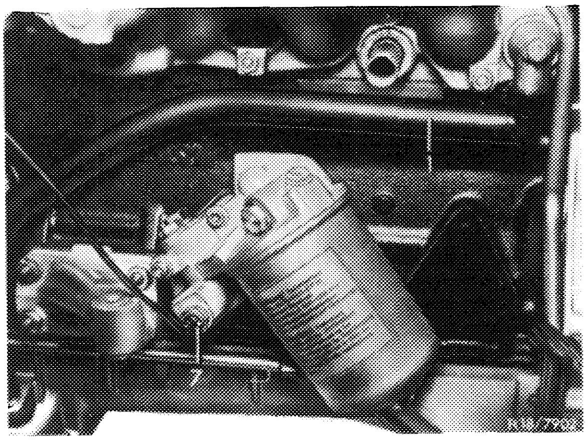


Test relay box (5)

Connect voltmeter at input of resistor (46) and to ground.

Connect plug connection of temperature switch (7) to ground. Voltmeter should indicate 7–8 volts.

If no voltage is measured, renew relay box (5).

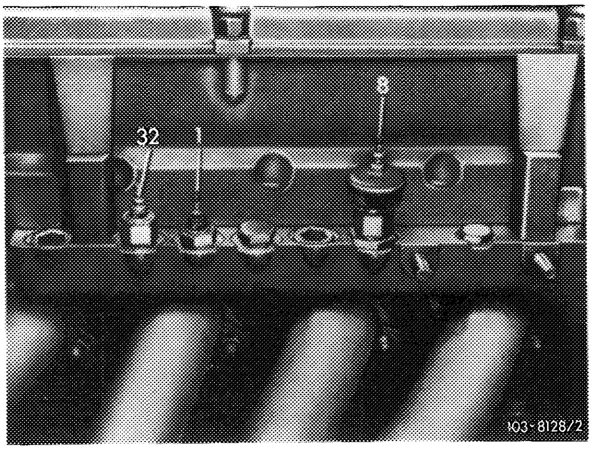


Testing choke cover-stepped heater

Connect voltmeter at output of resistor (46) and to ground.

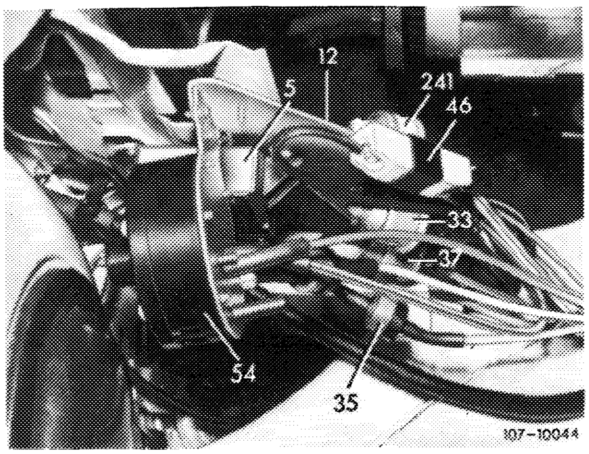
Pull plug from temperature switch 65 °C.

Voltmeter indicating approx. 12 volts.	Voltmeter not indicating approx. 12 volts.



Renew relay box (5).

End of test



B. Ⓢ 1976

Test conditions: All fuses in order, engine at operating temperature, run engine at idle.

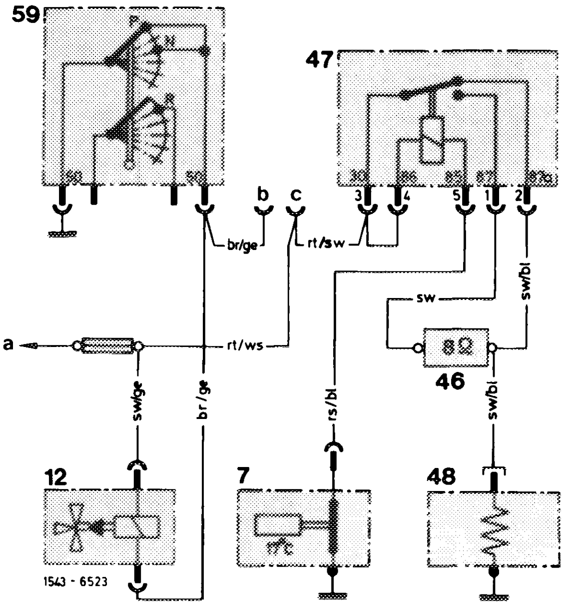
Wiring diagram (drawn with ignition switched off, below 17 °C engine oil temperature)

Choke cover-stepped heater, EGR

Color code

bl = blue	rs = pink	vi = purple
br = brown	rt = red	ws = white
ge = yellow	sw = black	

a Fuse no. 3 (15/54)
b Relay starter terminal 85
c Relay starter terminal 86



7 Temperature switch 17 °C
12 Switchover valve EGR (brown)
46 Pre-resistor 8 ohms
47 Relay pre-resistor choke cover
48 Choke cover
49 Starter lockout and back-up light switch

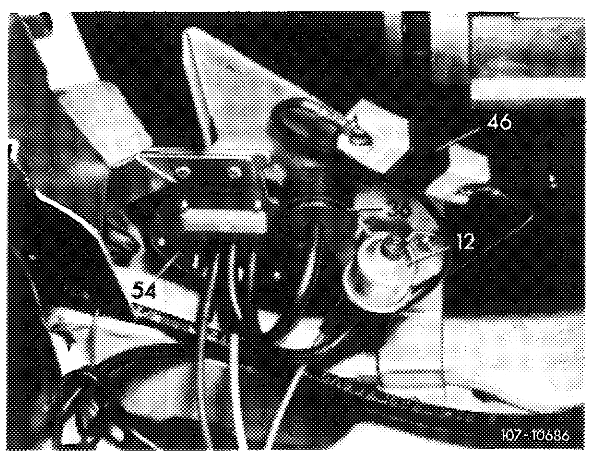
Testing choke cover-stepped heater

Connect voltmeter to output of resistor (46) and to ground. Disconnect plug connection of electric line to temperature switch 17 °C (7) and connect to ground.

Voltmeter indicating 7–8 volts.	Voltmeter not indicating 7–8 volts.

Test relay pre-resistor choke cover (47)

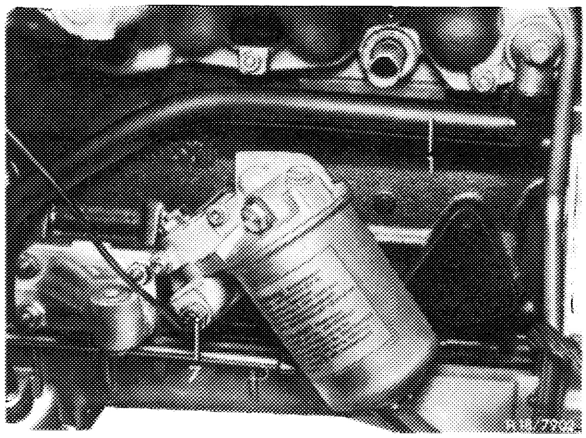
Connect voltmeter one after the other to both connections of pre-resistor choke cover (46) and to ground.



Connect plug connection of temperature switch 17 °C (7) to ground. Voltmeter should indicate approx. 7–8 volts once.

If no voltage of 12 volts is measured, test choke cover.

If less than 7–8 volts are measured, test pre-resistor or renew relay.



Testing choke cover-stepped heater

Connect voltmeter to output of resistor (46) and to ground.

Pull plug from temperature switch 65 °C.

Voltmeter indicating approx. 12 volts.	Voltmeter not indicating approx. 12 volts.

If less than 7–8 volts are measured, test pre-resistor or replace relay.

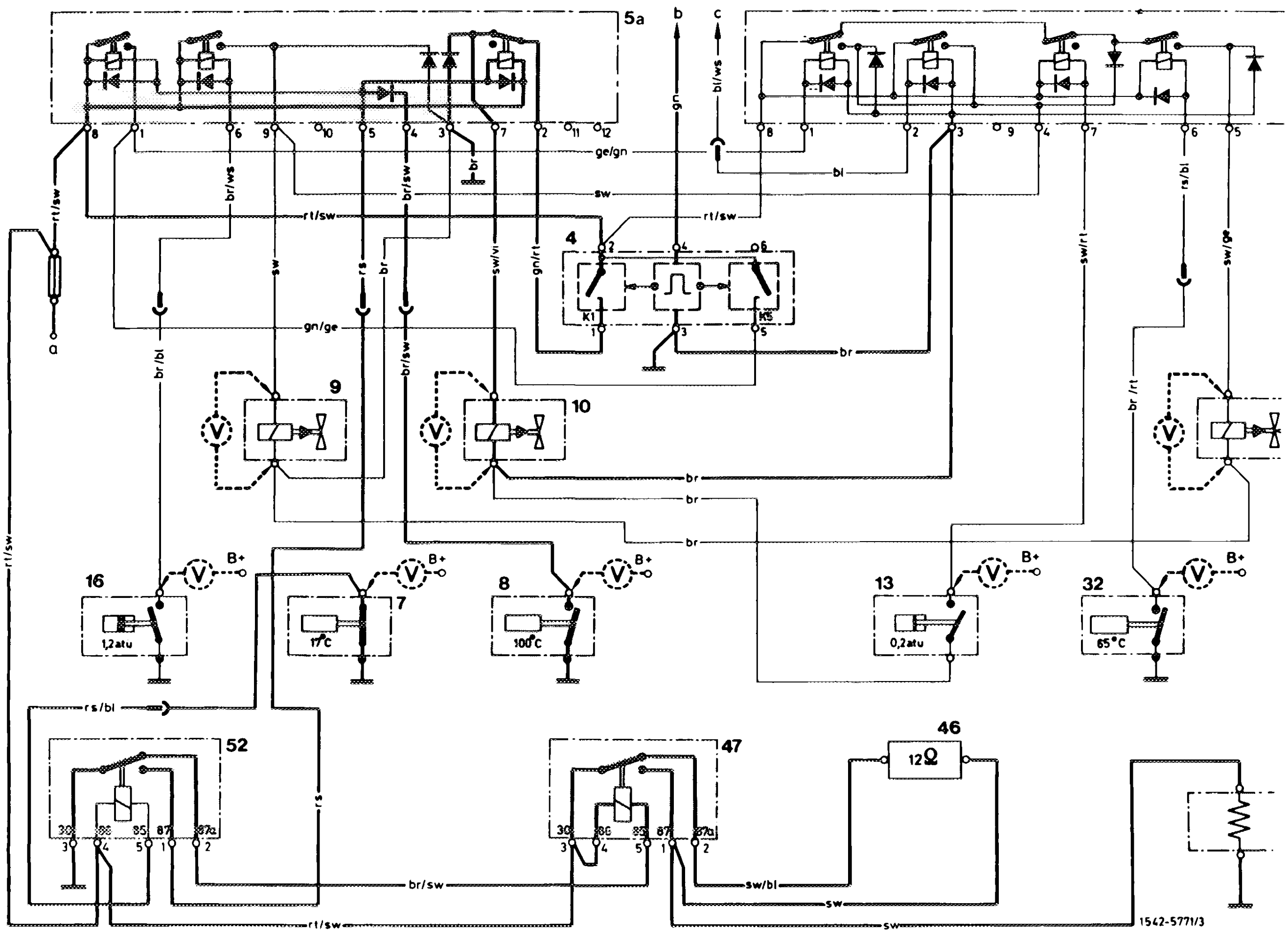
End of test

C. (USA) 1973/74

Test conditions: All fuses in order, engine at operating temperature, run engine at idle.

Wiring diagram (drawn with ignition switched off, below 17 °C engine oil temperature)

Choke cover-stepped heater, throttle valve lift



4 Rpm relay with 2 speeds 1800/2000/min and 3000/3400/min
5 Relay box (8-pole)
5a Relay box (12-pole)
7 Temperature switch 17 °C
8 Temperature switch 100 °C
9 Switchover valve ignition
10 Switchover valve throttle valve lift
12 Switchover valve EGR
13 Vacuum switch 0.2 bar
16 Oil pressure switch 1.2 bar
32 Temperature switch 65 °C
46 Resistor choke cover
47 Relay resistor choke cover
48 Choke cover
52 Relay temperature switch 17 °C

Color code

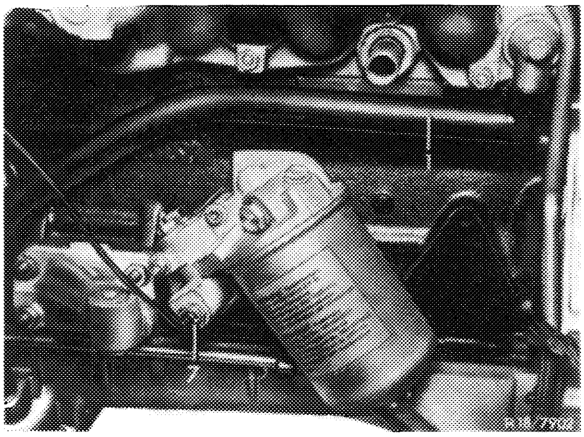
bl = blue
br = brown
ge = yellow
gn = green
rs = pink
rt = red
sw = black
vi = purple
ws = white

a Fuse no. 3
b Double cable connector terminal 1 ZV
c Relay air conditioner terminal 87a

Testing choke cover-stepped heater

Disconnect plug connection of electric line to temperature switch 17 °C (7) in oil filter housing and connect to ground.

Relax (47 and 52) audibly switching.	Relay (47 and 52) not switching.

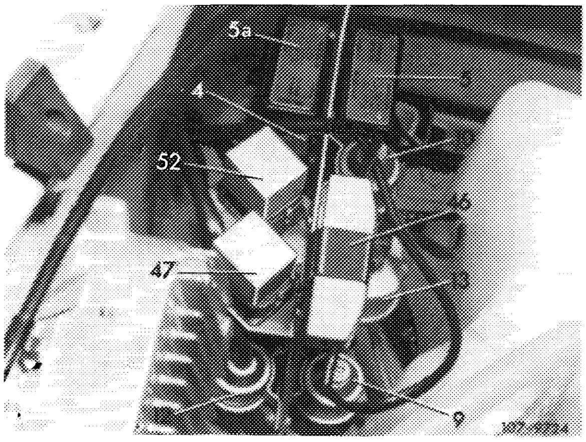


Test relay for resistor of choke cover (47)
(front relay, short cable)

Connect voltmeter to output of resistor (46) and to ground. With the ignition switched on, the voltmeter should indicate approx. 13 volts. If there is no voltage, renew relay (47).

Loosen plug connection of electric line to temperature switch 17 °C and connect to ground. Voltmeter should indicate approx. 5 volts. If there is no voltage, renew resistor.

If approx. 13 volts are measured, exchange choke cover on carburetor and repeat test.



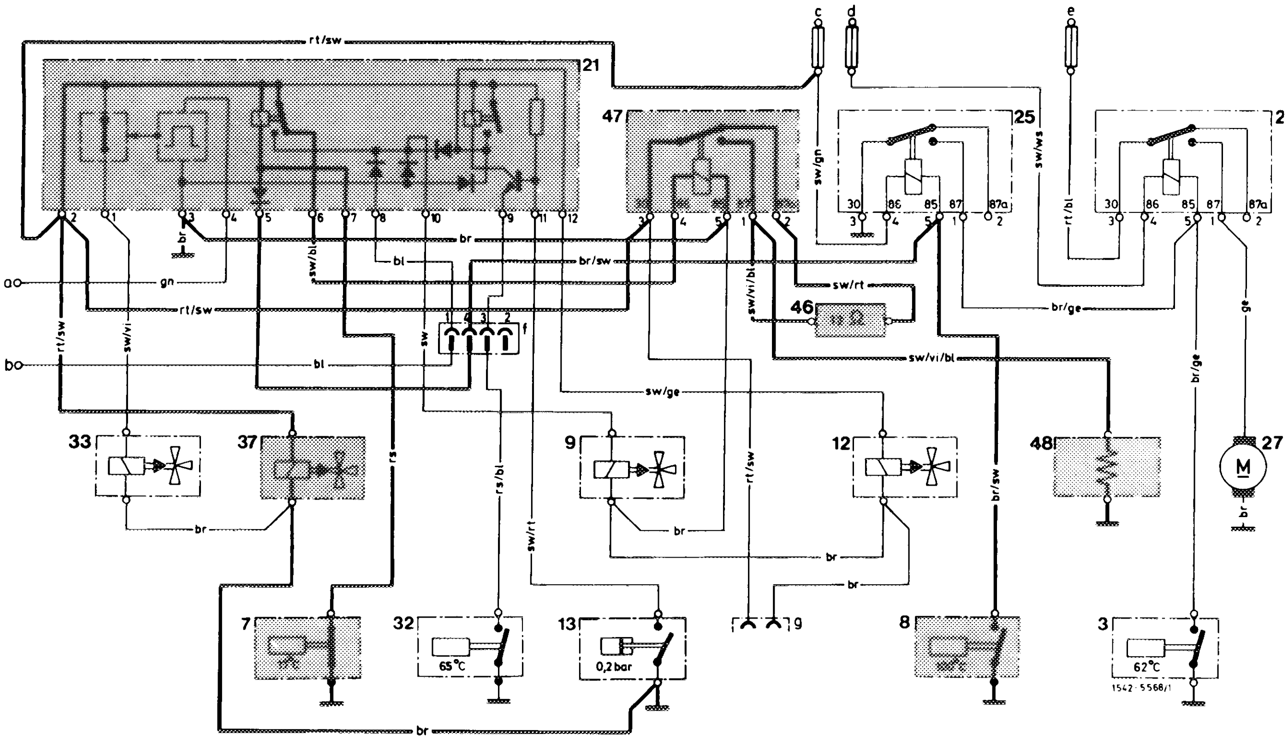
End of test

D. (USA) 1974 California

Test conditions: All fuses in order, engine at operating temperature, run engine at idle.

Wiring diagram (drawn with ignition switched off, below 17 °C engine oil temperature)

Choke cover-stepped heater, fuel evaporation control system



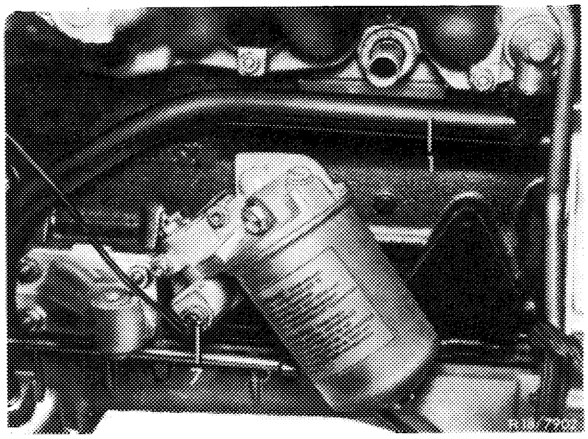
3 Temperature switch 62 °C	21 Switchbox	33 Switchover valve air injection
7 Temperature switch 17 °C	25 Relay disconnection temperature switch 62 °C/100 °C	37 Switchover valve fuel evaporation control system
8 Temperature switch 100 °C	26 Relay auxiliary fan	46 Resistor choke cover
9 Switchover valve ignition	27 Auxiliary fan	47 Relay resistor choke cover
12 Switchover valve EGR	32 Temperature switch 65 °C	48 Choke cover
13 Vacuum switch		

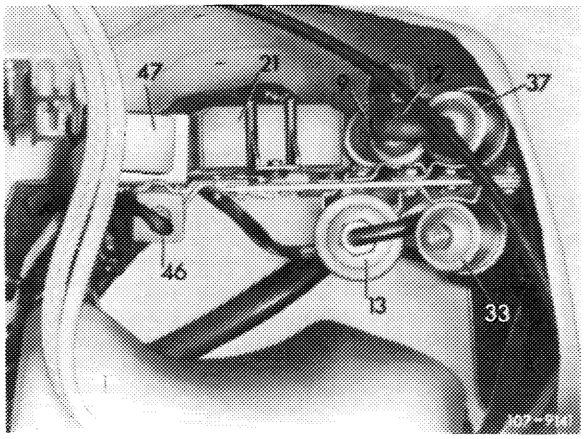
Color code

bl = blue	gn = green	sw = black
br = brown	rs = pink	vi = purple
ge = yellow	rt = red	ws = white

a To two-point cable connector terminal 7 (TD)
b Switch air conditioning system
c Fuse no. 3 (15/54)
d Fuse no. 4 (15/54)
e Auxiliary fuse box for auxiliary fan
f 4-point plug on relay holder
g 2-point coupler, tied-up

Testing choke cover-stepped heater Disconnect plug connection of electric line to temperature switch 17 °C (7) in oil filter housing and connect to ground.	
Relay (47) audibly switching.	Relay (47) not switching.





Test relay in switchbox (21)

Pull coupler from relay for resistor of automatic choke and connect voltmeter to terminal 1 and 3. Loosen plug connection of electric line to temperature switch (7) and connect to ground.

With the ignition switched on, the voltmeter should indicate approx. 13 volts. If no voltage is measured, renew switchbox (21).

Test relay for resistor of choke cover (47)

Connect voltmeter to output of resistor (46, upper connection) and to ground. With the ignition switched on, the voltmeter should indicate approx. 13 volts. If no voltage is measured, renew relay (47).

Loosen plug connection of electric line to temperature switch (7) and connect to ground. Voltmeter should indicate approx. 5 volts. If no voltage is measured, renew resistor.

If approx. 13 volts are measured, exchange choke cover on carburetor.

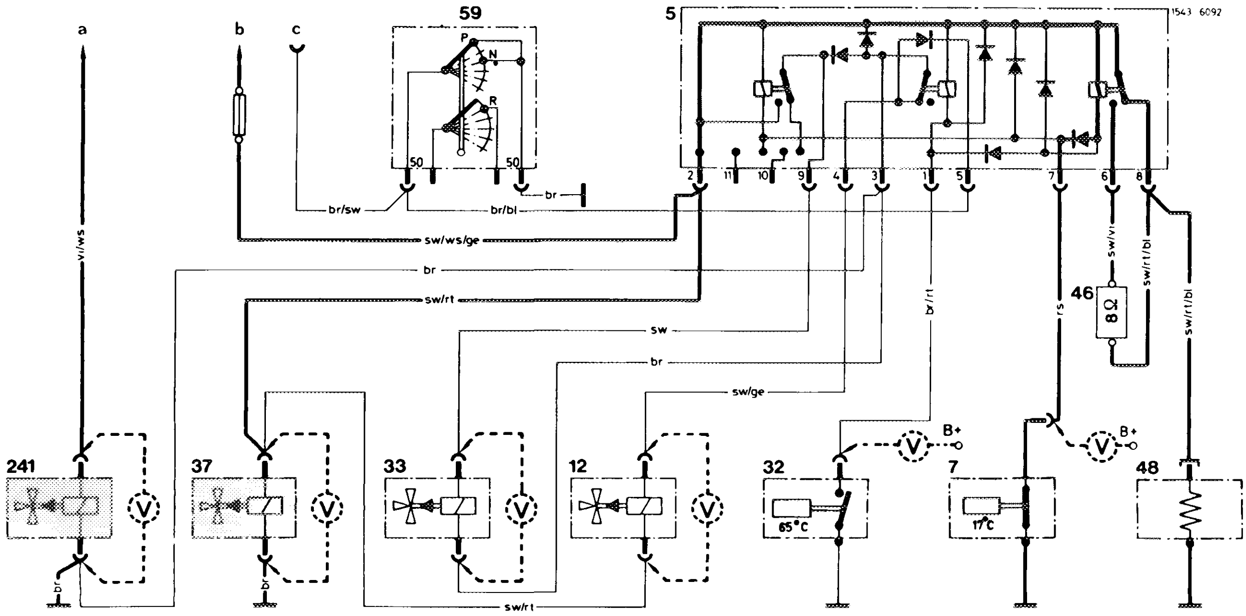
End of test

E. (USA) 1975/76

Test conditions: All fuses in order, engine at operating temperature, run engine at idle.

Wiring diagram (drawn with ignition switched off, below 17 °C engine oil temperature)

Choke cover-stepped heater, automatic choke, tank breather



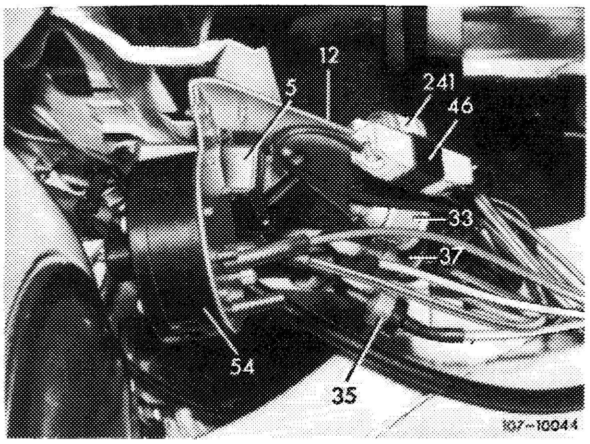
5 Relay box
7 Temperature switch 17 °C
12 Switchover valve EGR (brown)
32 Temperature switch 65 °C
33 Switchover valve air injection (blue)
37 Switchover valve float chamber positive vent (green)
46 Resistor 8 ohms
48 Choke cover
49 Starter lockout and back-up light switch
241 Switchover valve automatic choke (white)

Color code

bl = blue
br = brown
ge = yellow
rs = pink
rt = red
sw = black
vi = purple
ws = white

a Terminal 50 starter
b Fuse no. 3
c Terminal 30 emergency starter switch

Testing choke cover-stepped heater Connect voltmeter to output of resistor (46) and to ground. Disconnect plug connection of electric line to temperature switch 17 °C (7) and connect to ground.	
Voltmeter indicating 7–8 volts.	Voltmeter not indicating 7–8 volts.

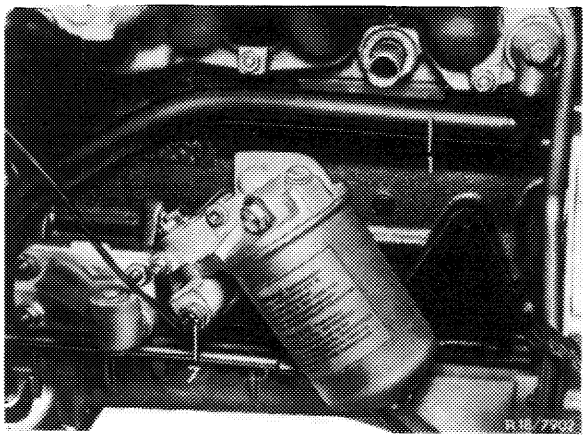


Test relay box (5)

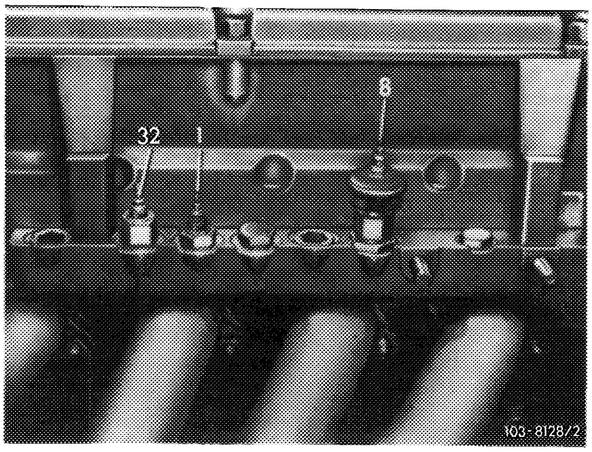
Connect voltmeter to input of resistor (46) and to ground.

Connect plug connection of temperature switch to ground. Voltmeter should indicate 7–8 volts.

If no voltage is measured, renew relay box (5).

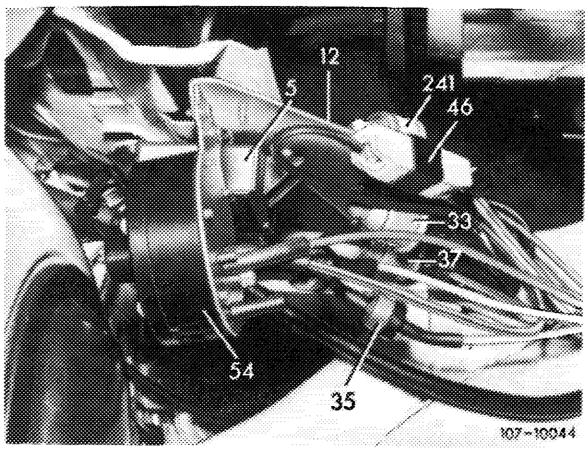


Testing choke cover-stepped heater Connect voltmeter to output of resistor (46) and to ground. Pull plug from temperature switch 65 °C.	
Voltmeter indicating approx. 12 volts.	Voltmeter not indicating approx. 12 volts.



Renew relay box (5).

End of test



(USA) 1974 Federal

Testing and adjusting values

Voltage at pre-resistor output	above + 17 °C engine oil temperature below + 17 °C engine oil temperature	approx. 12 volts approx. 5 volts

Conventional tool

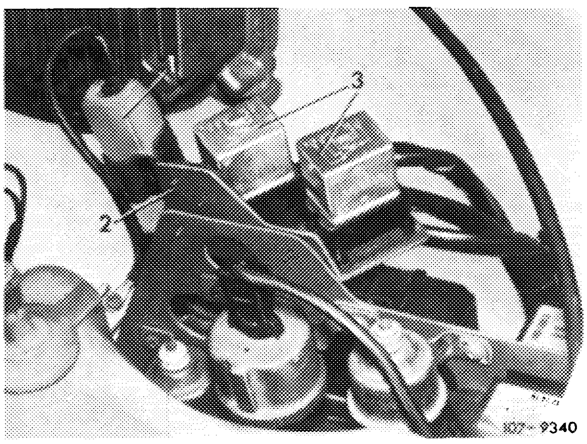
Voltmeter

Note

In the event of complaints about poor engine output a choke cover-stepped heater can be installed in warming-up stage between – 5 °C to + 5 °C of (USA) 1974 Federal version as a remedy.

Installation

1 Attach pre-resistor (1) to auxiliary mounting bracket (2). Connect long cable of auxiliary cable harness at top to pre-resistor.

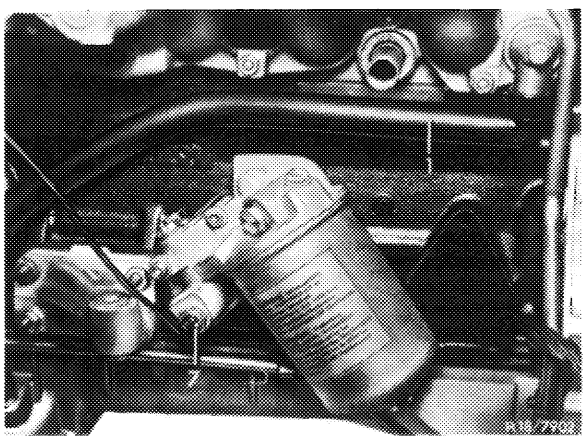


107–9340

2 Attach auxiliary mounting bracket (2) to relay bracket.

3 Attach both relays (3) to auxiliary bracket (2). Attach plug of auxiliary harness to relay. Then install auxiliary harness in downward direction along main harness toward fuse box.

4 Attach grounding cable of auxiliary harness to ignition coil bracket. Disconnect connecting plug for engine oil temperature switch 17 °C laterally on front end carrier and connect to auxiliary harness. Engage connecting plug in clip.



5 Connect auxiliary harness with fuse no. 3 of fuse box.

6 Remove air filter and check whether a choke cover with code number "104" is installed and install, if required.

7 Pull cable from choke cover and disconnect cable terminal. Then insulate end of cable and slip plug of auxiliary line harness on choke cover.

8 Check choke cover-stepped heater for function (07.2–145).

Flat rate (includes choke cover, exchange):

Basic job: 20 work units or 1.7 hours
Connected job: 17 work units or 1.4 hours

Spare parts

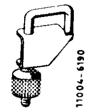
Quantity	Designation	Part no.
2	Relay	001 542 02 19
1	Auxiliary bracket	114 542 14 40
1	Auxiliary line harness	114 540 47 09
1	Choke cover "144"	000 071 28 28
1	Pre-resistor	001 545 11 18

07.2–150 Adjusting accelerating pump

Testing and adjusting values

Begin of injection	immediately

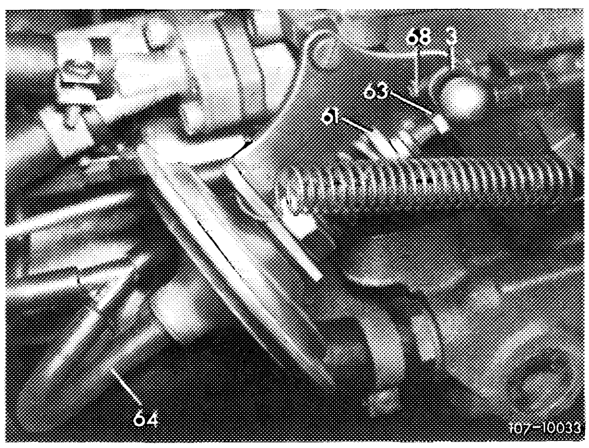
Special tool

Clamp		000 589 40 37 00

Note

Perfect functioning of accelerating pump as well as accurate adjustment of pump are absolutely necessary for perfect starting or bypass characteristics. Starting and bypass faults may be caused by a wrong direction of injection jet, the jet should not touch neither the pre-atomizer nor the edge of the Venturi. Unless otherwise specified, injection should begin immediately. If the injected quantity is too low, bypass faults may occur in stage I and from stage I – II (stage jump).

Testing, adjusting

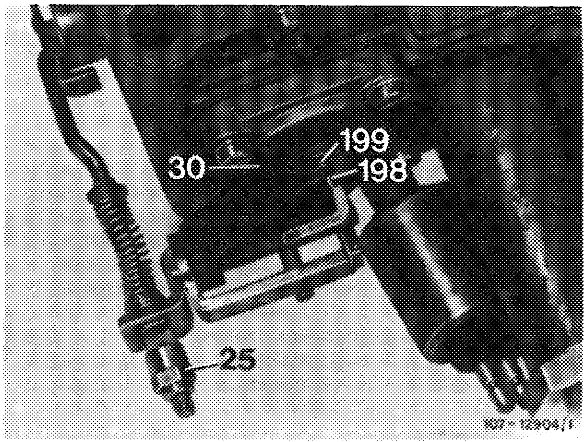


a) Begin of injection

1 Keep engine running. Pinch vacuum hose (64), shut off engine.

2 Check whether throttle valve lever (3) is resting against idle speed adjusting screw (68) and adjust vacuum governor, if required.

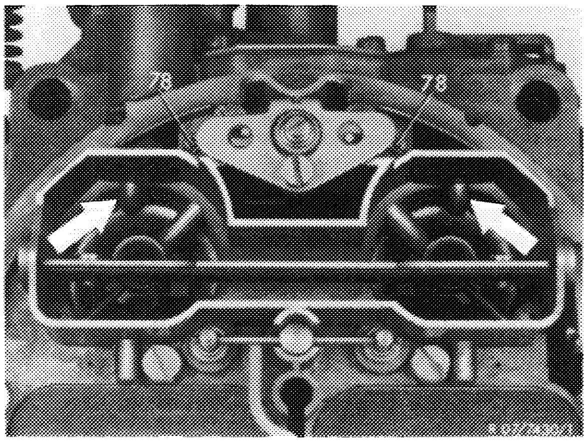
3 Set adjusting nut (25) in such a manner that the actuating lever (198) depresses the diaphragm pressure pin (199) by 1.0 mm.



Note: If no self-locking polystop adjusting nut (25) is installed, secure adjusting nut following adjustment by compressing (pinching) nut.

b) Operation and direction of injection

4 For this purpose, slowly actuate throttle valve lever, so that a **uniform** fuel jet will come out of both injection bores (arrows) **immediately and on both sides.**



Attention!
The fuel jet should not touch edge of Venturi and pre-atomizer, since this may result in starting and bypass faults. If required, remove carburetor cover and clean injection bores.

07.2–152 Checking suction valve and delivery valves of accelerating pump for leaks

Self-made tool

Puller	refer to Fig. item 1

Note

With a leaking suction valve, fuel is pushed back into float chamber during delivery stroke and the quantity of the injected fuel is reduced. This may result in starting and bypass faults particularly during slow acceleration. If the delivery valves are leaking, air is drawn in during suction stroke which will also reduce the quantity of the injected fuel.

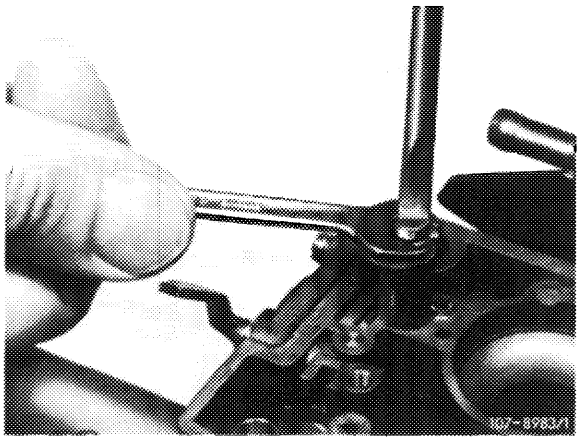
Checking suction valve for leaks

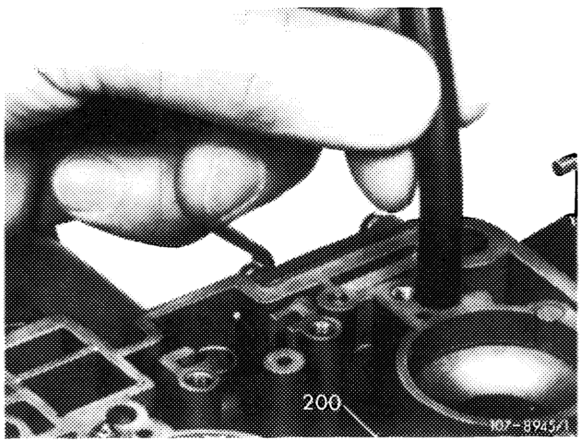
1 Remove carburetor cover (07.2–192).

2 Check suction valve for leaks. For this purpose, pull out closing plug for suction duct of accelerating pump by means of a self-made puller.

Attention!
Closing plugs without threads should be drilled 4 mm deep by means of a 3 mm drill and provided with M 4 metric threads. Carefully cover area around drilled hole first.

3 Fill float chamber with fuel, slip suitable hose over suction duct.

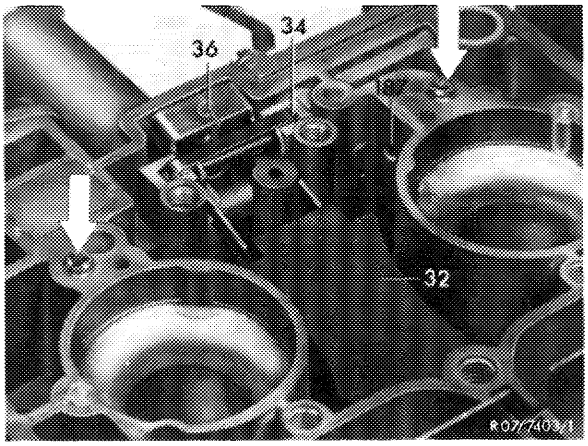




200 Suction bore

4 Keep both delivery valves (arrow) closed, on carburetors with negative vent bore (187) also keep this bore closed and blow into hose. No or only individual bubbles should come out of suction bore and enter float chamber.

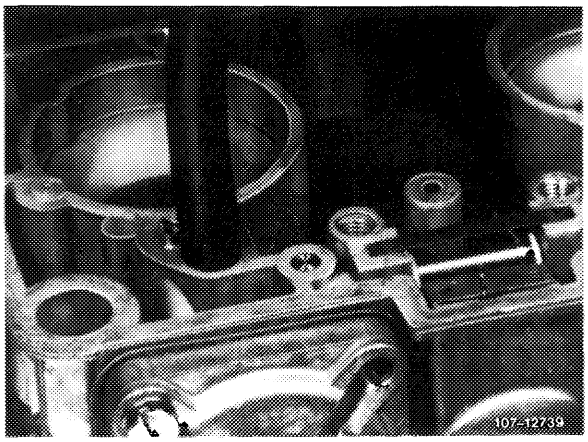
Attention!
In the event of a leaking suction valve seat, knock **lightly** against seat with a steel ball (5 mm dia.). Insert new steel ball and check once again for leaks. Then close suction duct.



Checking delivery valves for leaks

5 For this purpose, slip suitable hose over a delivery valve, keep other delivery valve closed, on carburetors with negative vent bore (187) keep this bore also closed and blow into hose. No or only individual air bubbles should come out of suction bore (200) and enter float chamber.

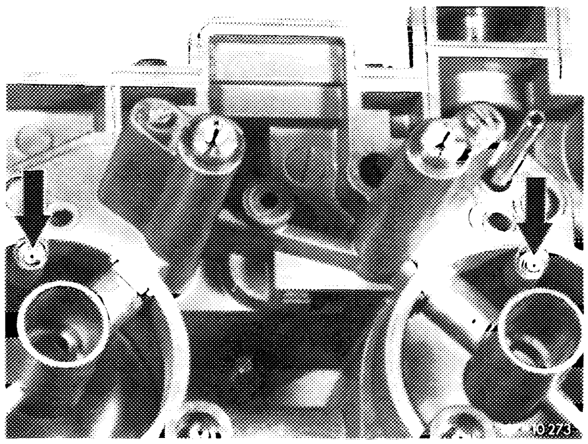
Attention!
In the event of leaks, knock **lightly** against balls of delivery valves on their seat.



6 Blow out injection bores (arrows) of accelerating pump with compressed air and check for unobstructed passage (clean injection bores with a 0.5 mm drill, if required).

7 Mount carburetor cover with new gasket (07.2–192).

8 Adjust accelerating pump (07.2–150).

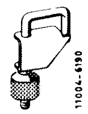


Arrows = injection jets

Testing and adjusting values

Begin of injection	immediately

Special tool

Clamp		000 589 40 37 00

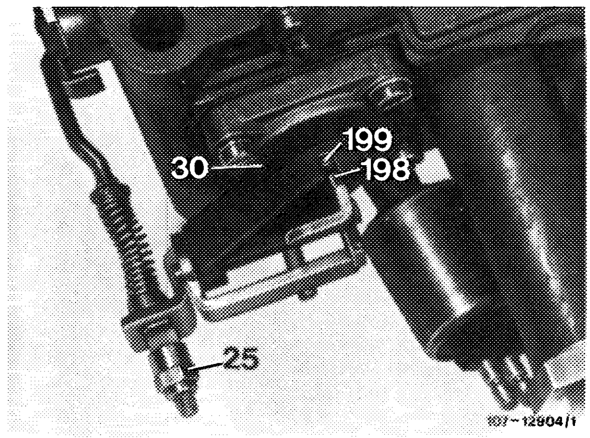
Removal

1 Remove air filter.

2 Remove cover (30) after loosening fastening screws.

3 Remove diaphragm and compression spring.

4 Clean pump chamber.



Installation

5 Install new diaphragm, if required.

Note: Insert compression spring in such a manner that the large diameter faces the pump chamber. When tightening fastening screws of cover, operate throttle valve lever to full extent.

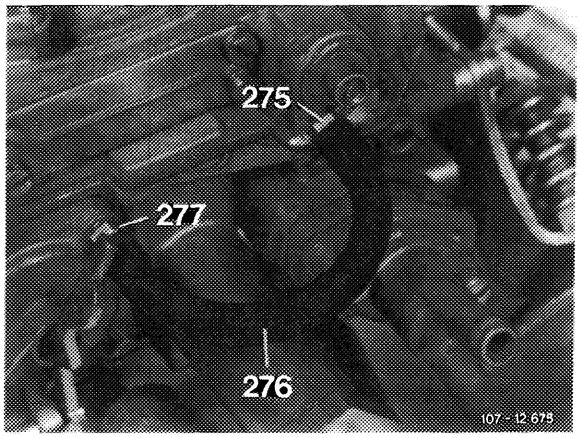
6 Adjust accelerating pump (07.2–150).

Subsequent installation of vapor bubble draw-off for accelerating pump (USA 1975/76 only)

A. General information and operation

Starting faults may come up at high outside temperatures as a result of vapor lock in accelerating pump.

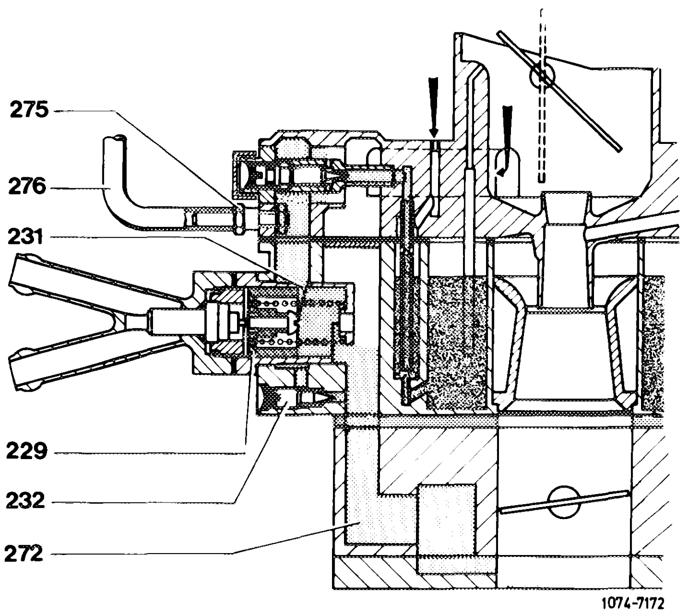
As a remedy, a vapor bubble draw-off can be subsequently installed.



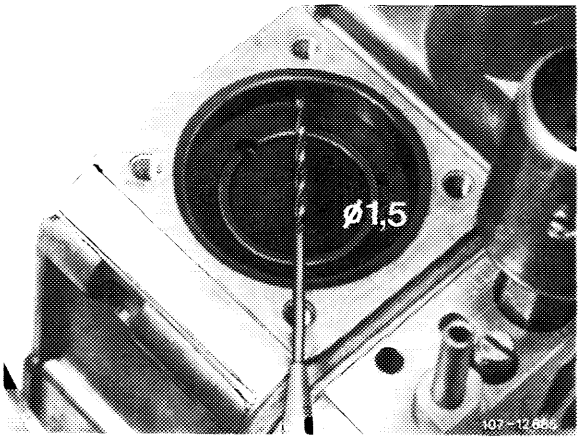
Layout of vapor bubble draw-off

Operation

At operating temperature, the control window (231) of thermostatically controlled bypass choke (TN choke) is closed. By means of leak air on control piston (229) at idle, the vacuum in intake pipe is effective up to pump chamber and able to draw-off any vapor bubbles there.



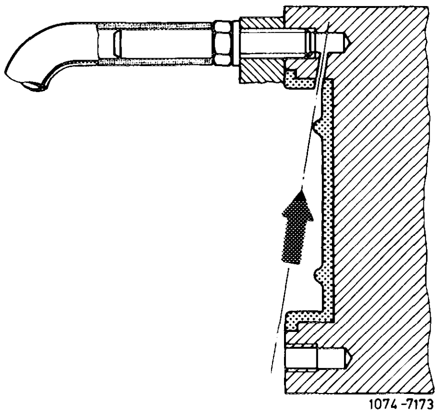
B. Subsequent installation



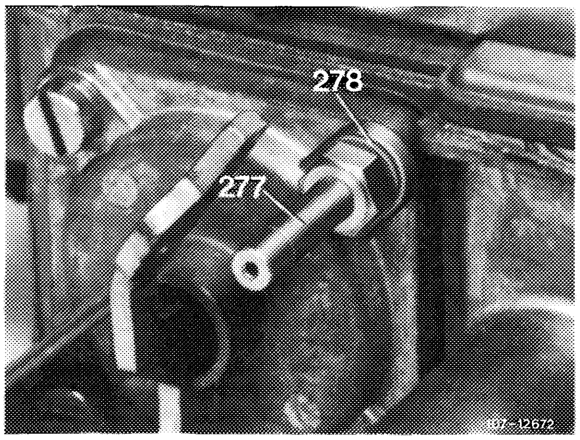
1 Remove carburetor, remove carburetor cover and take out float (07.2–194).

2 Remove accelerating pump cover, diaphragm and diaphragm spring.

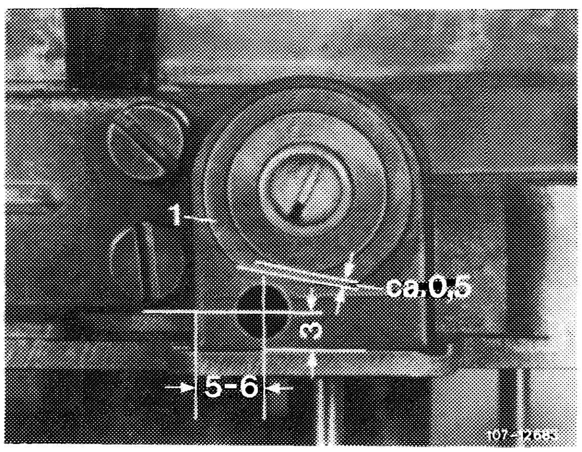
3 Drill a connecting duct of 1.5 mm dia. from pump chamber to threaded hole of cover fastening means.



Attention!
Be sure to maintain proper direction when drilling, to avoid drilling into float chamber. In addition, the suction and delivery bore in pump chamber must be kept closed (e.g. with grease) as a protection against drill chips.



4 Clean connecting duct, pump chamber, suction and delivery bore (drill chips, grease). Install components of accelerating pump. Instead of fastening screw used up to now for threaded bore drilled through connecting duct, screw in draw-off connection (277) calibrated to 0.15 mm dia. together with sealing ring (278).

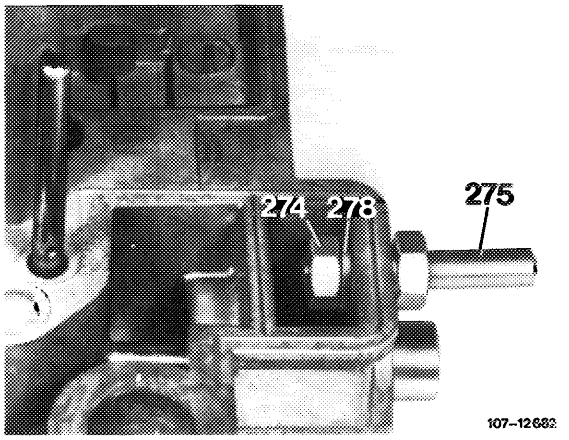


5 Drill fastening bore for draw-off connection (275).

For this purpose, refinish housing eye (1) in such a manner that approx. 0.5 mm material will remain on flange of carburetor cover. Mark bore, punch, drill to 2 mm dia. and then to 4 mm dia.

6 Screw draw-off connection (275) with sealing ring (278) and hex. nut (274) into carburetor cover.

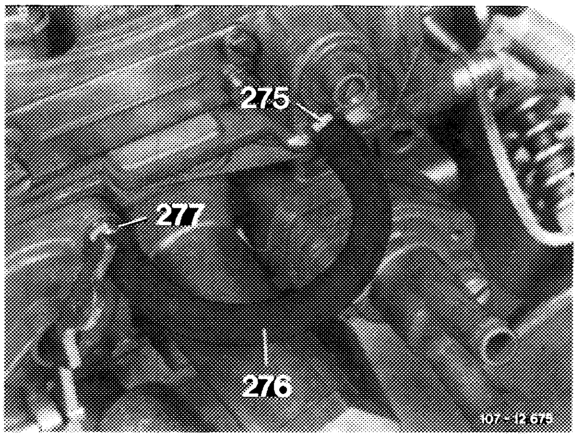
Note: The flange of the draw-off connection should be seated flat. If required, refinish contact surface. If hex. nut on carburetor cover touches carburetor cover, file off slightly.



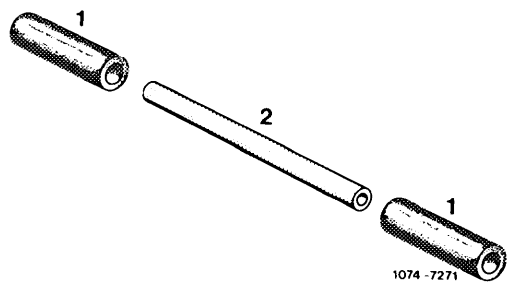
7 Shorten fuel hose (276) to 100 mm and plug on.

8 Insert float bracket and holddown, mount carburetor cover.

9 Install carburetor (07.2–194).



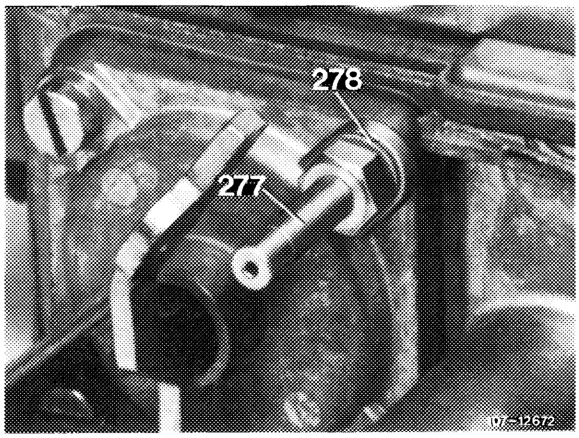
C. Checking vapor bubble draw-off for function



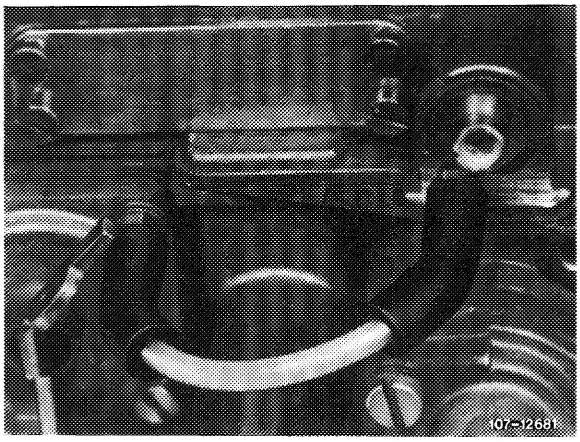
Test line

1 Vacuum hose, 30 mm long
2 Transparent vacuum line, 65 mm long

1 Run **engine at operating temperature** for a short moment and stop. Remove fuel hose and actuate throttle valve lever smoothly several times. A fuel jet should now come out of draw-off connection (277). If not, the throttle bore in draw-off connection is clogged. Clean throttle bore, if required.

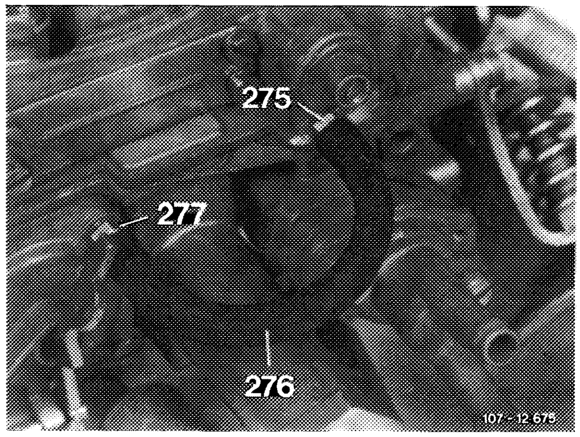


2 Plug-on self-made test line, run engine at idle. Fuel or vapor bubbles should be drawn off, visible in transparent test line.



Test line

3 If neither fuel nor vapor bubbles are drawn off, check draw-off connection (275) for passage and clean, if required.

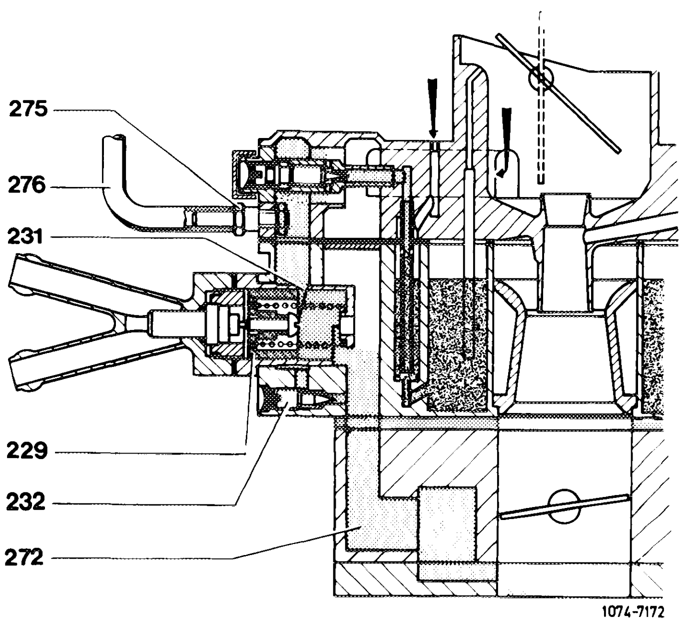


4 If there is still no draw-off, there is no or not enough vacuum available. In this case, unscrew leak air adjusting screw (232) by one turn. Repeat test.

5 Pull off test line and plug-on fuel hose (276).

6 Set to idle (07.2–100).

Attention!
When adjusting or checking idle speed emission value, the fuel hose (276) for drawing off at accelerating pump must be pulled off.

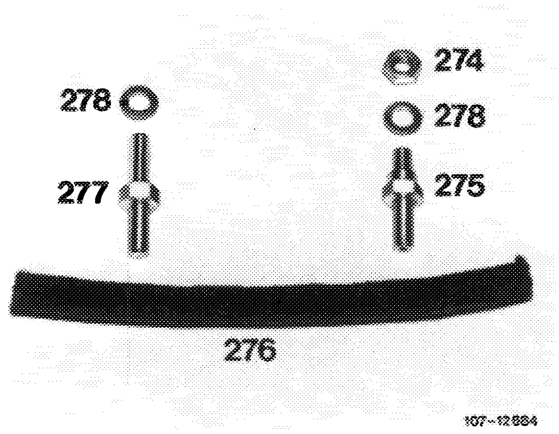


Flat rate

Basic job: 19 work units or 1.6 hours
Related job: 16 work units or 1.3 hours

Spare parts

Designation	Part no.
Conversion set for vapor bubble draw-off of accelerating pump	110 586 00 07



Conversion set

274 Hex nut.
275 Draw-off connection
276 Fuel hose
277 Draw-off connection with 0.15 mm throttle bore (orifice)
278 Sealing ring

Testing and adjusting values

National version		Adjusting weight	Length[1])
(J)	1976	170 ± 2	190
(S)	1976	160 ± 2	180
(USA)	Federal 1973/74	112 ± 2	125
(USA)	California 1974	143 ± 2	160
(USA)	Federal and California 1975/76	170 ± 2	190

[1]) These dimensions apply to St 37. When using other materials, the specified testing weight must be maintained. The respective length results from this weight.

Air valve gap

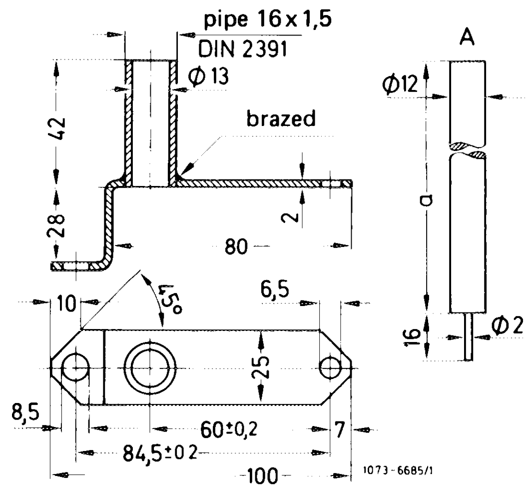
When loaded with adjusting weight	1.5 mm

Conventional tool

Hex. socket wrench 2.5 mm

Self-made tool

Adjusting device for air valve stage II



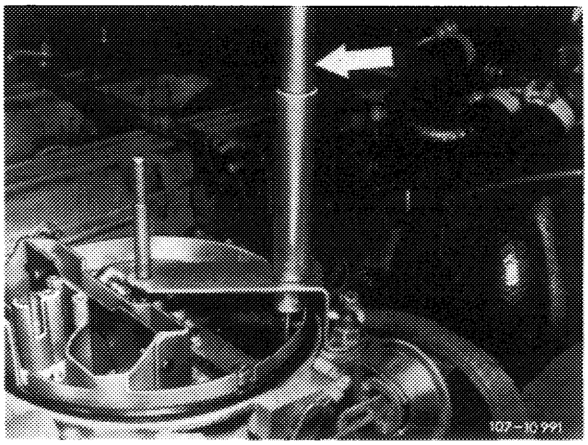
Note

The correct adjustment of the restoring spring for air valve of stage II has a large influence on bypass from stage I to stage II. When the spring preload is too low, the air valve will open too fast, the mixture will become leaner and bypass faults (stage jump) will result. When the spring preload is too high, the air valve opens too slowly and the mixture will become overrich. Bypass faults and high fuel consumption will result.

If the dashpot for the air valve is leaking, sudden acceleration will make the mixture too lean and bypass faults may result.

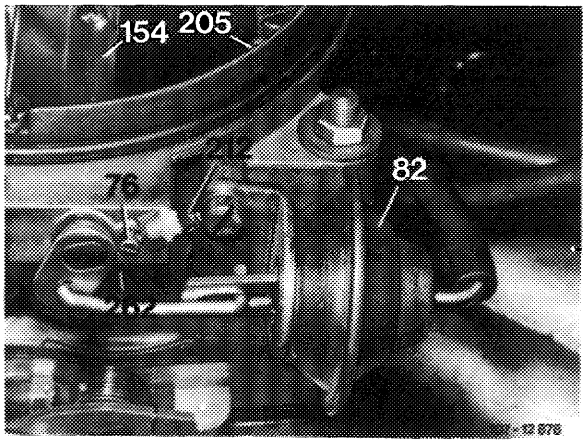
Testing, correcting

1 Check air valve for easy operation. For this purpose, actuate air valve, which should close again automatically.



2 Adjust air valve preload. For this purpose, attach adjusting device (self-made) to carburetor. Unscrew air filter fastening screw and insert instead a suitable stud or round rod for centering adjusting device.

3 **Carefully** place test weight (arrow) on air valve (do not drop) and check gap.



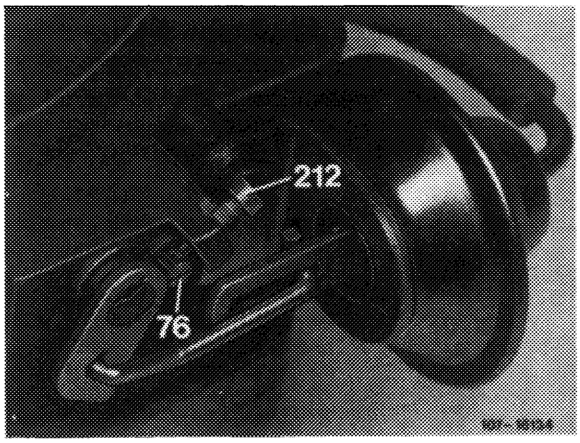
4 If the air valve is not pushed open or not more than 1.5 mm, change tension of restoring spring (262) by setting adjusting pin (76) accordingly. Prior to adjustment, slightly loosen locking screw (212) and then tighten again well.

Attention!
To avoid wrong adjustments, lift test weight from air valve while making adjustments.

5 Check dashpot for leaks. For this purpose, run engine, pinch vacuum hose of dashpot (82). Push air valve (154) open and release, the air valve should then snap back to stop (205). If not, replace vacuum control unit. With the engine stopped, check whether air valve (154) is easily operating and returns automatically to stop (205) when pushed-open lightly.

Note: If the adjusting pin (212) has been automatically released, or if the restoring spring must be replaced, install a modified adjusting pin, which is knurled at contact surface of locking screw (76).

Subsequent installation of knurled adjusting pin is generally possible (07.2–175).



Testing and adjusting values

Adjustment of jet needle	Dimension B = A + 3.3 mm

Conventional tool

Depth gauge

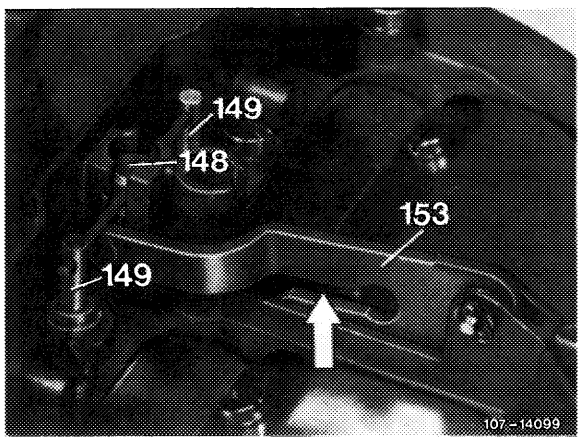
Note

The adjustment of the jet needles has an influence on fuel consumption and bypass characteristics from stage I to stage II. By means of the method described below, the jet needle position can be checked and corrected with the engine stopped.

Checking, correcting

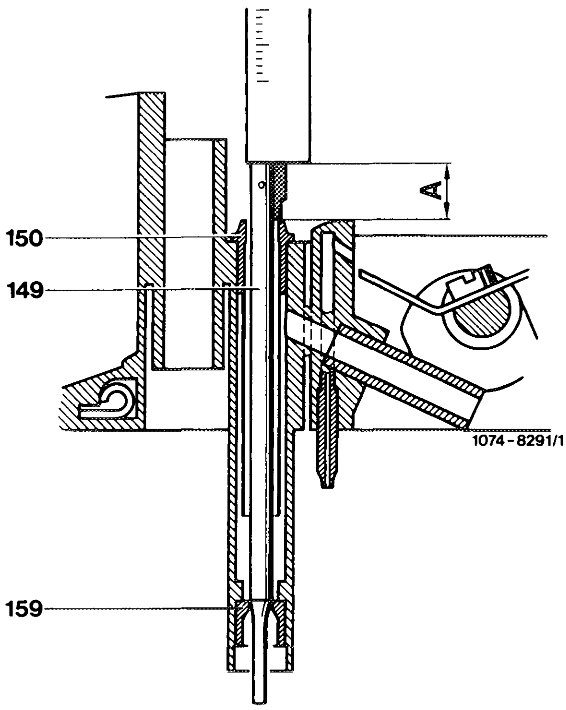
1 Remove carburetor cover (07.2–192).

2 Remove transmitting lever (153) and guide pin (148).



148 Guide pin
149 Jet needle
153 Transmitting lever

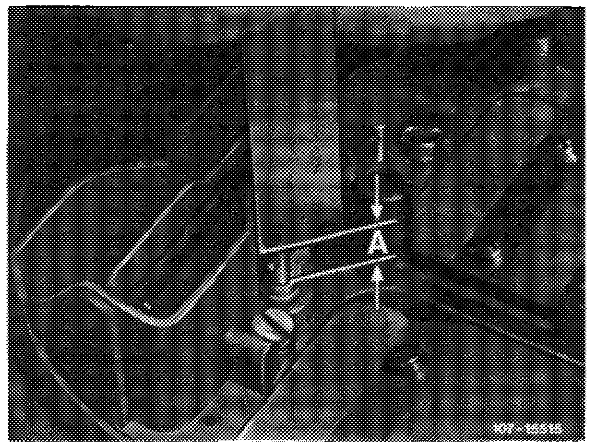
3 Place carburetor cover on two supports in such a manner that the jet needles (149) are unobstructed at bottom end. Let jet needles (149) be seated in main jets (159).



Measuring dimension "A"

4 Measure dimension "A" with depth gauge from face of jet needles to upper flange of air correction nozzles (150) and write down.

Note: Dimension "A" should be approximately the same on both sides. Deviations in excess of 0.5 mm indicate that the main jet has been subject to creep. In such a case, renew carburetor cover.



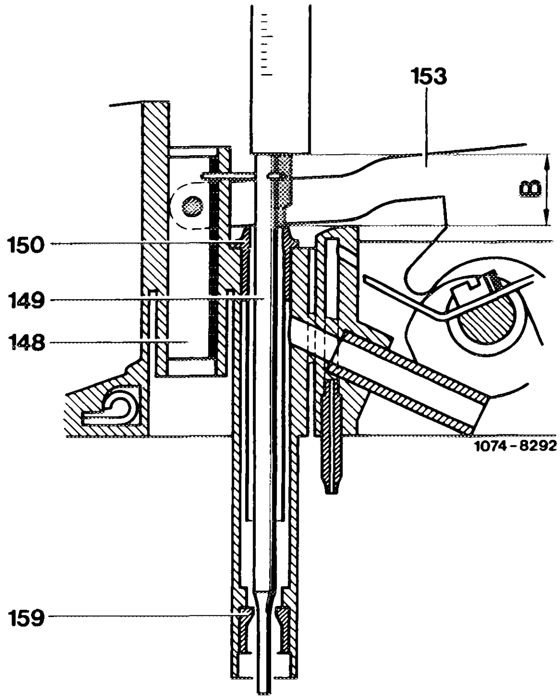
Measuring dimension "A"

5 Reinstall guide pin (148) and transmitting lever (153) and measure dimension "B" from face of jet needles to upper flange of air correction jets (150) and correct, if required.

Dimension "B" should be similar to dimension "A" + 0.3 mm.

Measuring example:

Measured dimension "A"	=	7.7 mm
	+	3.3 mm
Dimension "B" should be		11.0 mm



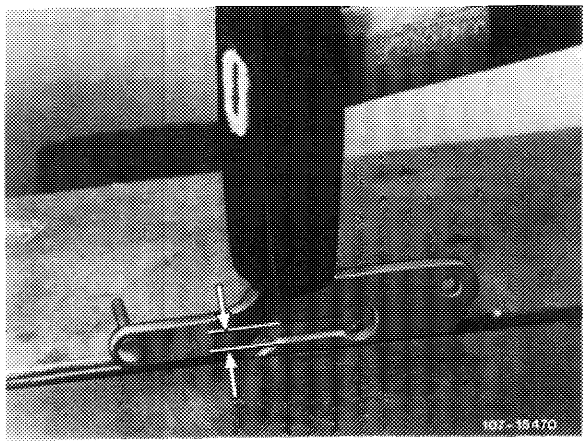
Measuring dimension "B"

Slight and one-sided deviations of dimension "B" should be corrected by pertinent bending of guide pin (148) arms.

Decreasing dimension "B" = leaner
Increasing dimension "B" = richer

If dimension "B" is the same on both sides but essentially too high, correct as follows:

Remove transmitting lever (153) (do not remove jet needles). Clamp removed transmitting lever into vise in such a manner that only the actuating arm of the jet needles projects. Reduce gap (arrows) by max. 0.3 mm by means of a light hammer blow and repeat test.



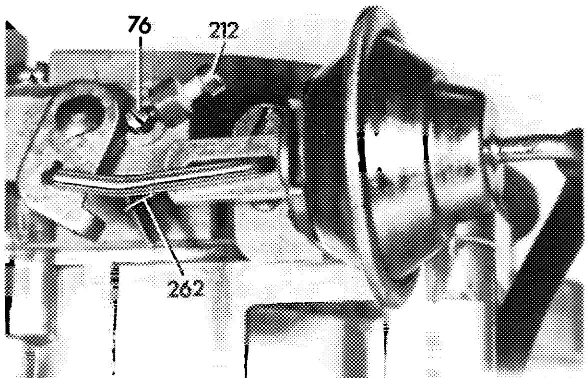
Attention!
When installing transmitting lever, make sure that the fastening pin can be slipped in free of tension so that air valve will not bind, since this will result in bypass faults.

Removal

1 Remove air filter.

2 Unscrew clamping screw (212).

3 Pull out adjusting pin (76) while removing restoring spring (262).



107–10972

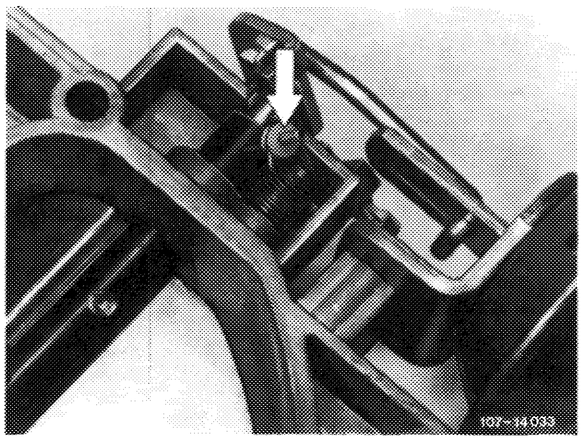
Installation

4 Install rew restoring spring, if required. For this purpose, move restoring spring into installation position. Slip in adjusting pin (76) up to stop while rotating adjusting pin so that the restoring spring can engage in slot of driver.

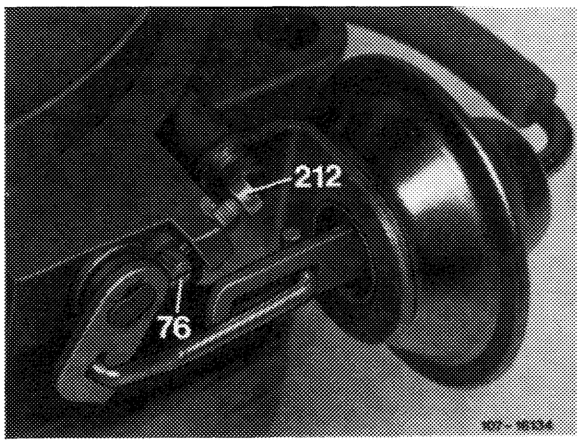
5 Correct air valve adjustment (07.2–170).

Note: When renewing restoring spring, install restoring spring with slide block (arrow) only. This will improve easy operation and breaking of spring will be prevented.

Restoring spring:	part no. 000 071 64 16
Slide block:	part no. 000 071 03 50


107–14033

Simultaneously install adjusting pin (76) with knurled contact surface for locking screw (212) (07.2–175). This will prevent any automatic self-adjustment of adjusting pin and bypass faults from stage I to stage II.



107–16134

Testing and adjusting values

National version		Adjusting weight	Length[1])
Ⓙ	1976	170 ± 2	190
Ⓢ	1976	160 ± 2	180
(USA)	Federal 1973/74	112 ± 2	125
(USA)	California 1974	143 ± 2	160
(USA)	Federal and California 1975/76	170 ± 2	190

[1]) These dimensions apply to St 37. When using other materials, the specified testing weight must be maintained. The respective length results from this weight.

Air valve gap

When loaded with adjusting weight	1.5 mm

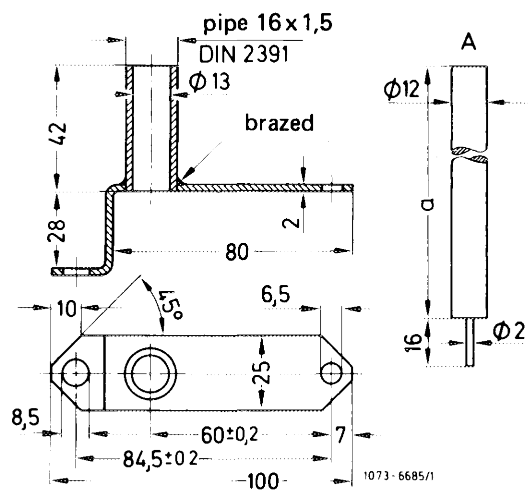
Conventional tools

Hex. socket wrench 2.5 mm

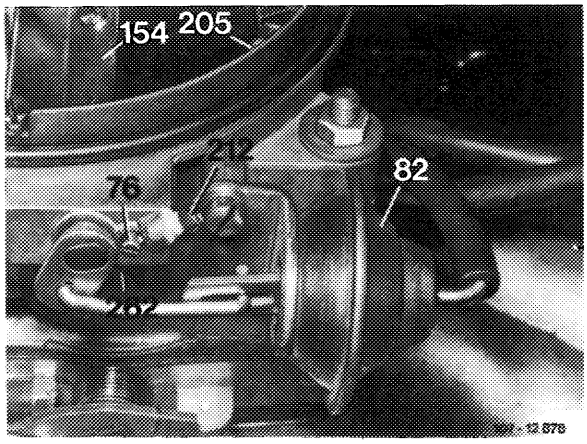
Drill 4.6 mm dia.

Self-made tool

Adjusting device for air valve of stage II



Subsequent installation

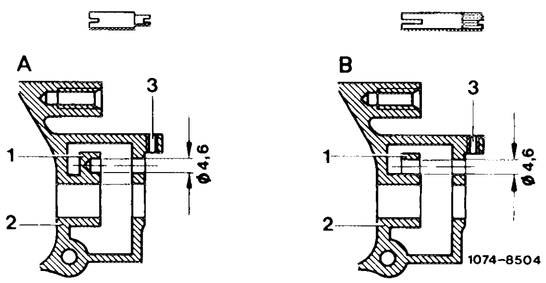


1 Remove carburetor cover (07.2–192).

2 Unscrew locking screw (212), remove adjusting pin (76) and restoring spring of adjusting pin.

3 Clamp carburetor cover into vise, using projective jaws.

4 Extend rear mounting bore of adjusting pin. For this purpose, drill completely through housing eye (1) with a drill of 4.6 mm dia.

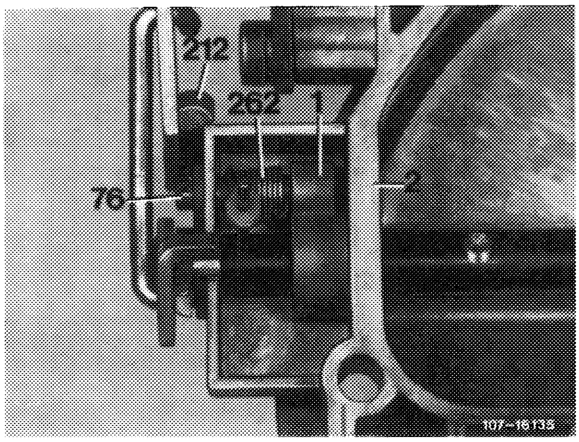


A Before B New

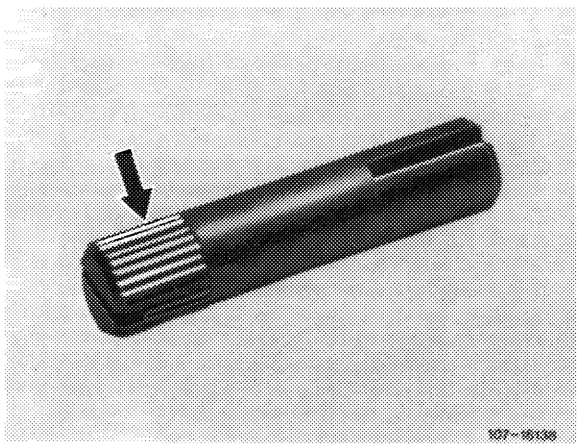
Attention!
Do not damage carburetor housing wall (2) toward mixing chamber while drilling.

5 Install new adjusting pin with knurls and restoring spring with slide block. For this purpose, move restoring spring into installation position. Slip-in adjusting pin up to stop while turning adjusting pin so that the restoring spring can engage in slot of driver. Install carburetor cover.

6 Complete air valve adjustment of stage II (07.2–170).



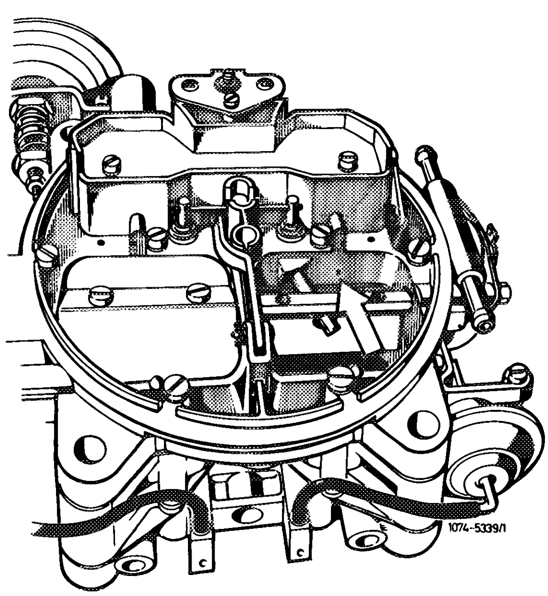
1 Housing eye
2 Carburetor housing wall
76 Adjusting pin
212 Locking screw
262 Restoring spring



New adjusting pin with knurls (arrow)

Note

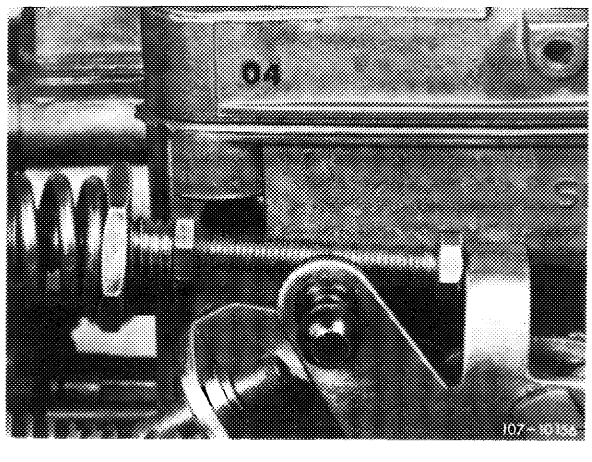
To prevent bypass faults (stage jump) from stage I to stage II, the bypass bores (arrow) are located 8 mm deeper under air valve starting January 1973 or starting carburetor cover code number "04", respectively. Subsequent installation is generally possible.



Scope

1 Remove carburetor cover, remove air valves of stage II.

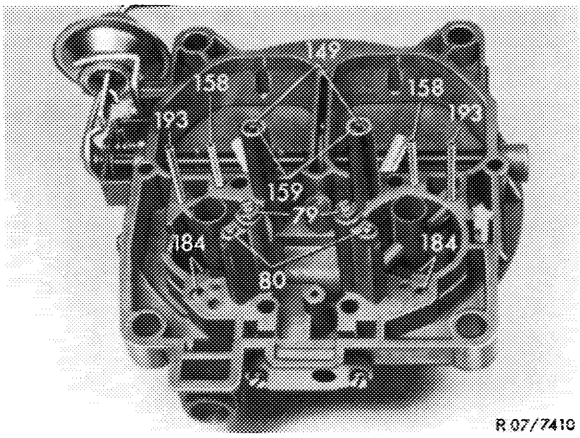
2 Close former bypass bores by riveting with aluminum plugs of 2 mm dia. and, in similar alignment underneath, 8 mm above carburetor cover parting surface, drill a new bypass bore 2 mm dia. for each stage.



Carburetor cover code number

3 Blow through riser pipes (158) for stage II, install air valves, while paying attention to easy operation of valves.

4 Mount carburetor cover.



R 07/7410

Testing and adjusting values

Float version	Float level[1]
Flat roof float	–2 to 6 mm[3]
Hip roof float and fuel return valve **without** fuel pressure control	0 mm[2]
Hip roof float and fuel return valve **with** fuel pressure control	+2 mm[2]

[1] Measured from parting surface **without** gasket.
[2] With starting or bypass faults, set 2 mm higher.
[3] Below parting surface.

Conventional tool

Depth gauge or slide gauge with depth gauge

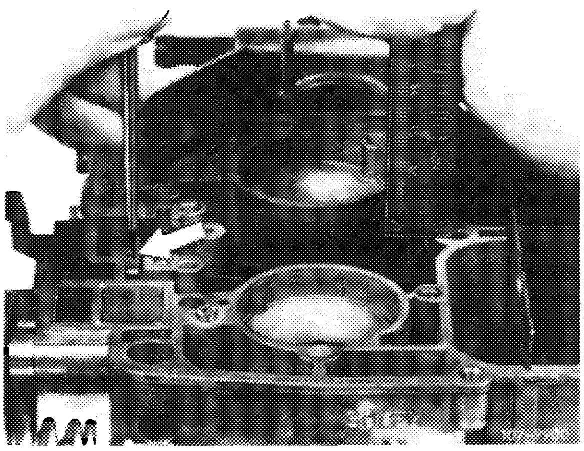
Note

The float level has an influence on starting characteristics particularly on gradients. If it is too low, the starting performance may become poorer, because the fuel level in mixing tubes of stage I is too low and the main jet system will start too late. In the event of starting faults, set to upper float level tolerance value.

Testing, adjusting

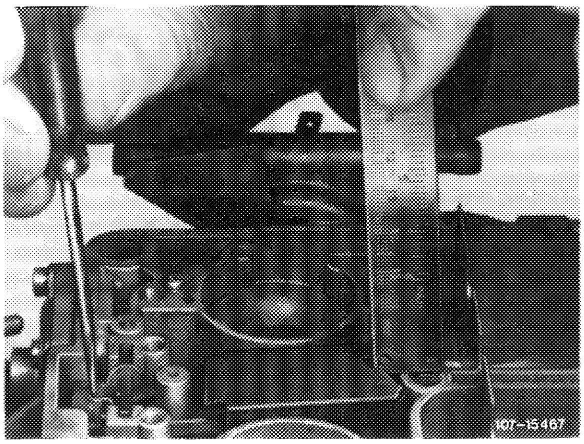
1 Check float level and adjust, if required. For this purpose, push connecting web (arrow) downwards against **noticeable stop** and check float level without gasket.

Attention!
To prevent measuring errors, make sure that the float shaft rests on housing base while testing.

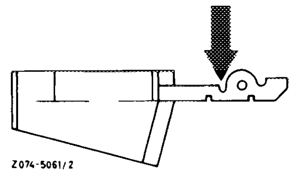


Measuring with flat roof float

Measuring with hip roof float

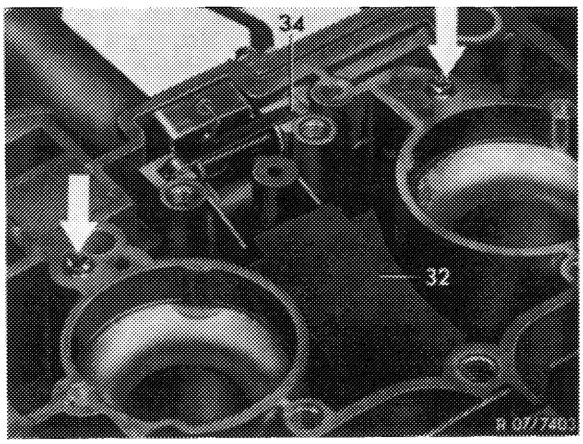


2 Correct float level by rebending at specified bending spot (arrow).

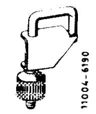


3 When installing float, attach float needle with wire clip to float arm in such a manner that the **open side** of the clip is pointing **in driving direction.**

Install float (32), making sure that the float shaft rests on base of recesses. Install holddown (34). Holddown should project slightly over parting surface. Rebend, if required.



Special tool

Clamp		000 589 40 37 00

Conventional tool

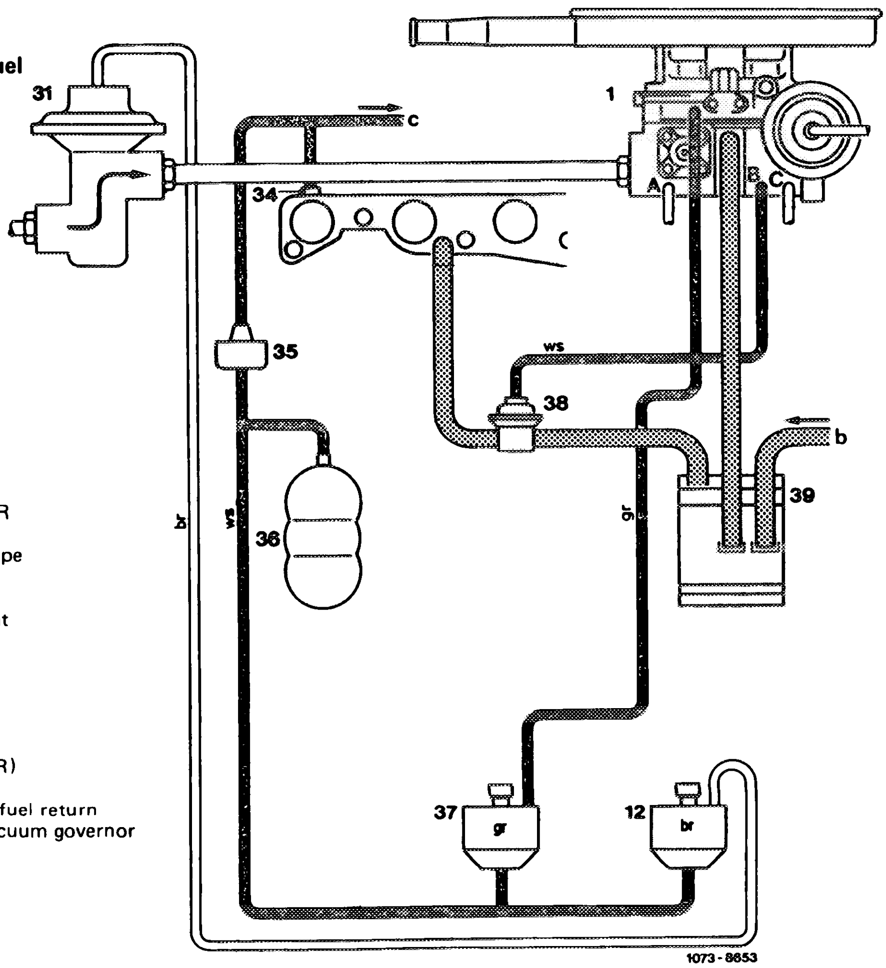
Vacuum tester

Note

The float chamber external venting system influences hot start characteristics, fuel consumption, bypass characteristics stage I and II and driving performance under full load. If the float chamber external venting system is defective, the fuel level in float chamber will be exposed to atmospheric air pressure, the fuel in mixing tubes will rise to an inadmissible level and the engine will be supplied with excessively rich fuel. High fuel consumption and driving faults will result.

A. (USA) 1974 California

Function diagram
Float chamber ventilation and fuel evaporation control system



1 Carburetor
12 Electric switchover valve for EGR
31 EGR valve
34 Vacuum connection on intake pipe
35 Check valve
36 Vacuum supply tank
37 Electric switchover valve for float chamber ventilation
38 Draw-off valve
39 Charcoal canister

b Negative tank vent connection
c Air conditioner connection
A Vacuum switch connection (EGR)
B Draw-off valve connection
C Decel diverter valve connection, fuel return valve, ignition switchover and vacuum governor

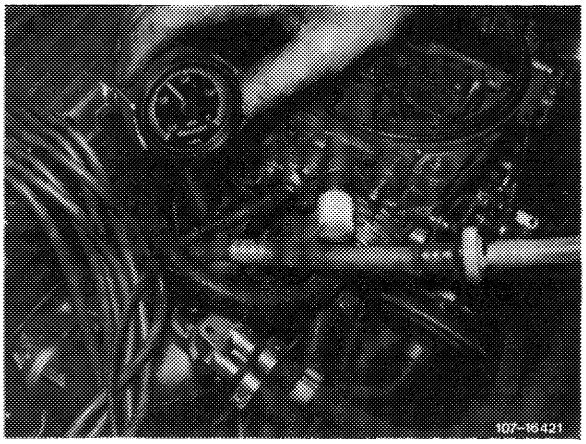
Line color

br = brown
gr = grey
ws = white

Test conditions: All electric fuses in order. Engine at operating temperature. Sealing at vacuum end of controls for EGR and air conditioner, as well as their operation in order.

Test scope

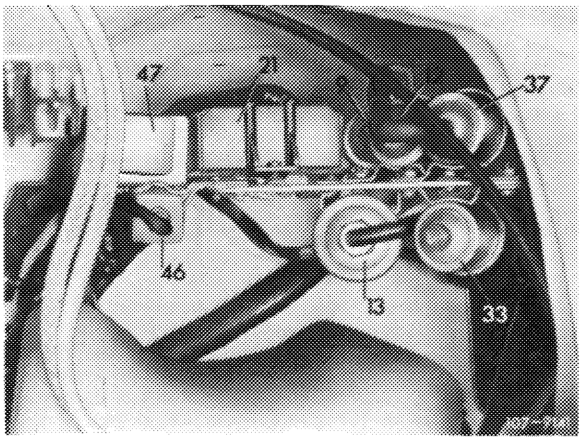
Connect vacuum tester. Run engine at idle, a vacuum should be indicated.	
Vacuum in order.	No vacuum.



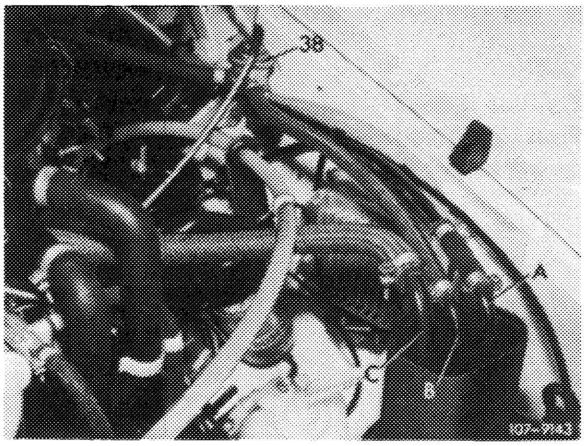
1 Check connecting pipe and diaphragm for leaks. For this purpose, pinch vacuum hose at vent valve. If vacuum is now available, attach connecting pipe by glueing with Omnifit or renew diaphragm, respectively.

2 Check all vacuum hoses up to intake pipe for correct layout, condition and tight seat and recondition, if required.

3 Check electric switchover valve (37). For this purpose, switch ignition on and off. The operating noise should now be heard or felt. If not, check whether with the ignition switched on the plug is energized and connected to ground. Renew fuse or establish ground connection, as required. If everything is in order and the switchover valve is nevertheless not yet switching, renew valve since a mechanical defect is indicated.

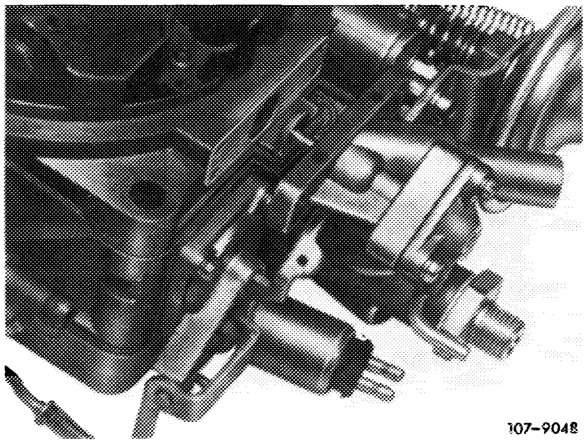


Pull hose on connection "C" from charcoal canister. With the engine running, blow into hose. There should be no passage and engine should not shut off.	
No passage or engine not shutting off.	Passage or engine shutting off.



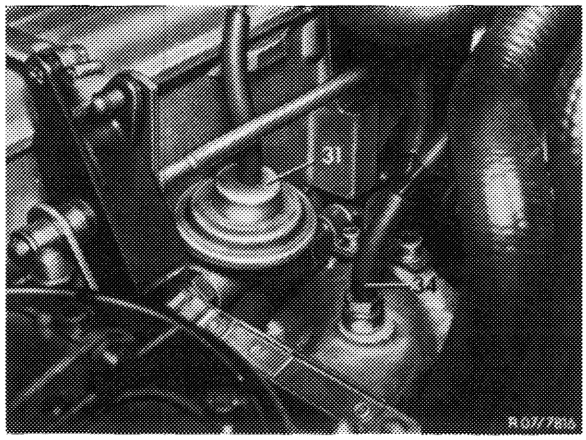
1. Valve plate not sealing because gasket is wrongly mounted (asymmetric), correct position of gasket, if required.

2. Valve plate not sealing because it is distorted. Renew vent valve, if required.



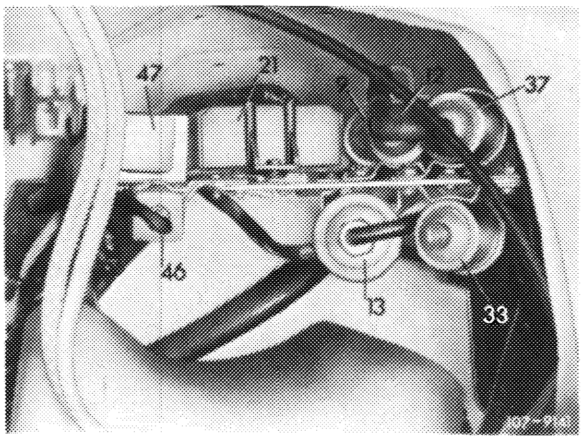
107-9048

With the engine running, pull vacuum hose (34) from intake pipe (= full throttle simulation!) and watch vacuum readout. Vacuum should not drop and **should remain constant for at least two minutes.** **Note:** Below 130 mbar, valve plate will no longer close.	
Vacuum remains constant.	Vacuum drops.



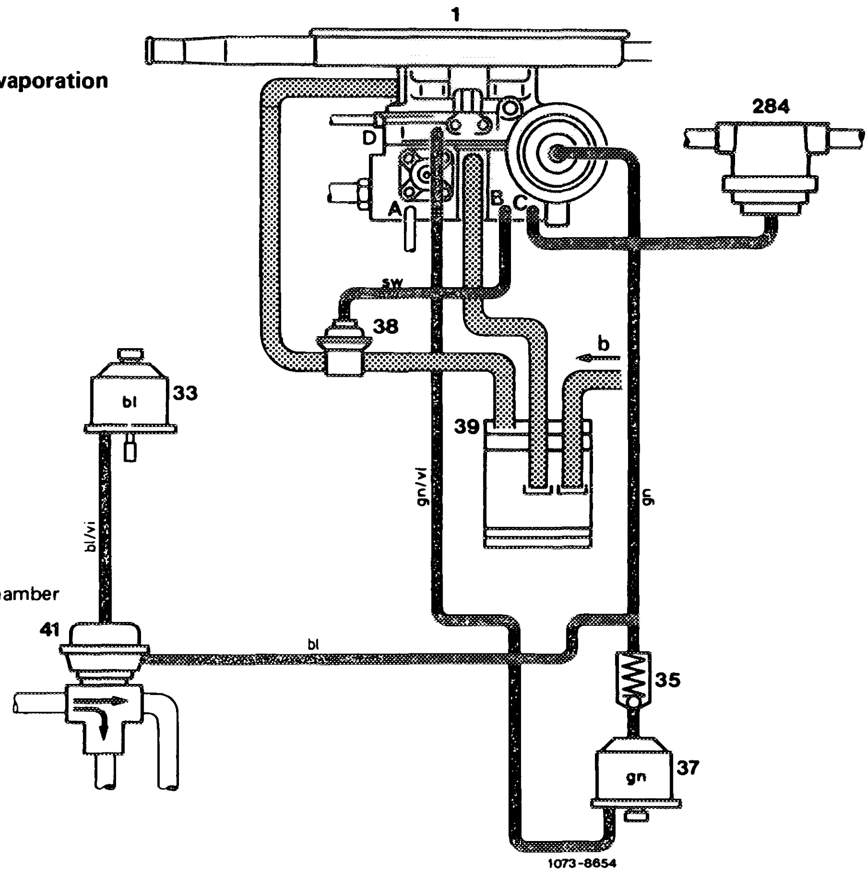
1. Check valve (35) leaking, renew if required.

2. Electric switchover valve (37) or (12) leaking. Check for leaks by shorting both switchover valves one after the other by pinching vacuum hoses to localize leaking member. Renew, if required.



B. USA 1975/76, J 1976

Function diagram
Float chamber ventilation and fuel evaporation control system



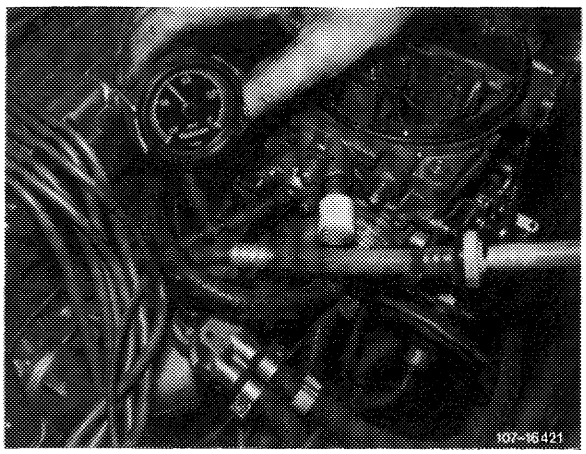
1 Carburetor
33 Vacuum valve for air injection
35 Check valve
37 Electric switchover valve for float chamber ventilation
38 Draw-off valve
41 Decel diverter valve (air injection)
284 Fuel return valve (vacuum-actuated)
b Negative tank vent connection

Line colors

bl = blue
gn = green
gn/vi = green/purple
sw = black

Test conditions: All electric fuses in order. Engine at operating temperature. Sealing at vacuum end of decel diverter valve (41) and switchover valve (33), as well as their function in order.

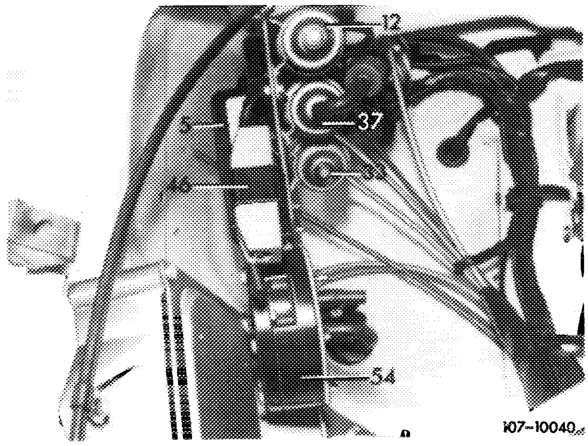
Connect vacuum tester. Run engine at idle speed, vacuum should be indicated.	
Vacuum in order.	No vacuum.



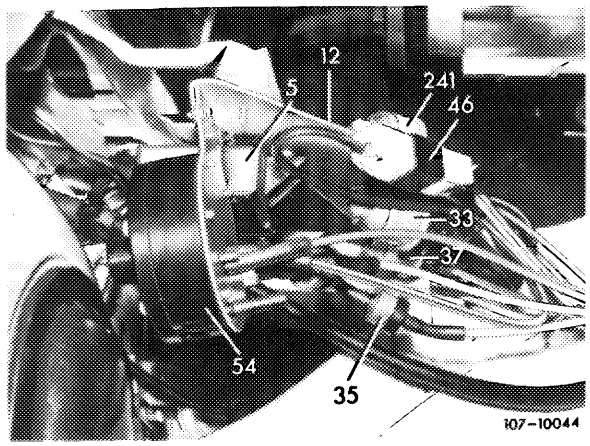
1. Check connecting pipe and diaphragm for leaks. For this purpose, pinch vacuum hose at vent valve. If vacuum is now available, attach connecting pipe, glue in with Omnifit or renew diaphragm, as required.

2. Check all vacuum hoses up to vacuum governor for correct layout, condition and tight seat and recondition, if required.

3. Check electric switchover valve (37). For this purpose, switch ignition on and off, the operating noise should now be heard or felt. If not, check whether with the ignition switched on the plug is energized and connected to ground. Renew fuse, if required or establish ground connection. If everything is in order and the switchover valve is nevertheless not switching, renew valve since a mechanical defect is indicated.

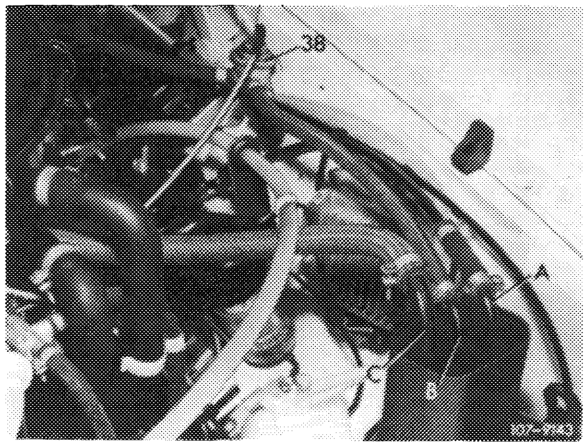


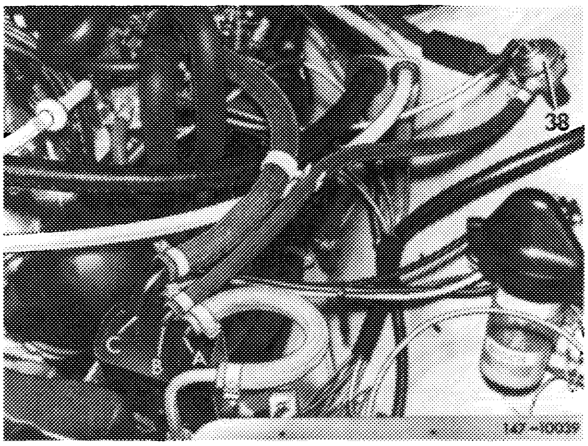
107–10040



107–10044

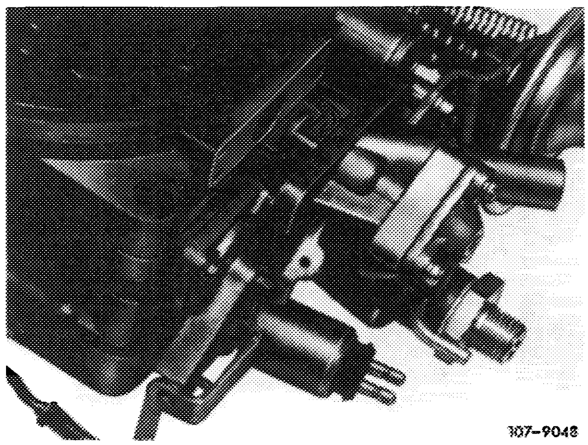
Pull off hose at connection "C" of charcoal canister. With the engine running, blow into hose, there should be no passage and engine should not shut off.	
No passage and engine not shutting off.	Passage or engine shutting off.





1. Valve plate not sealing because gasket is wrongly mounted (asymmetric), correct position of gasket, if required.

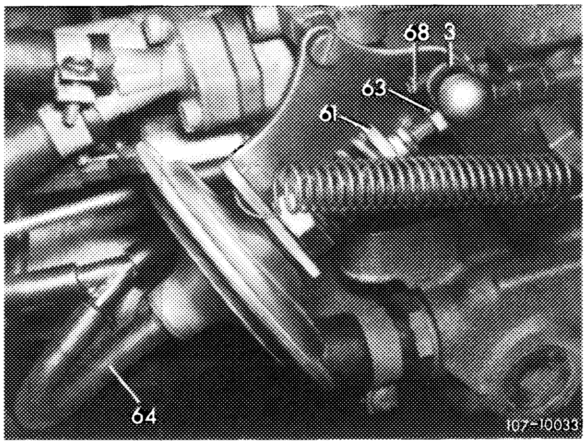
2. Valve plate not sealing because it is distorted. Renew vent valve, if required.



107–9048

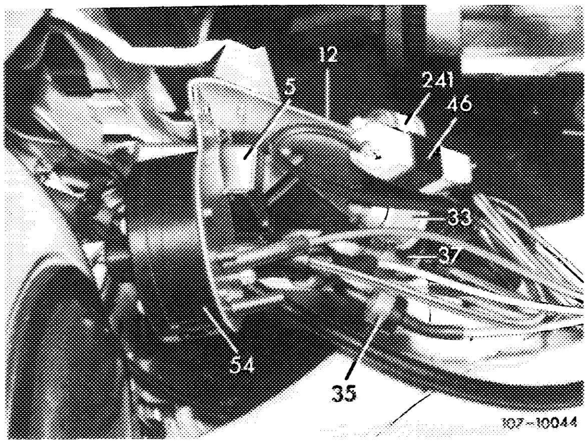
With the engine running, pull off vacuum hose (64) (= full throttle simulation!) and watch vacuum readout. Watch vacuum, which **should remain constant for at least two minutes.** **Note:** Below aprrox. 130 mbar, valve plate is no longer closing.

Vacuum remains constant.	Vacuum drops.



1. Check valve (35) leaking, renew if required.

2. Electric switchover valve (37), decel diverter valve, switchover valve (33) or fuel return leaking at vacuum end. Check for leaks by pinching vacuum hoses one after the other to localize leaking member, renew if required.

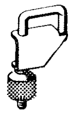


End of test

07.2–186 Checking fuel return valve

A. Without fuel pressure control

Special tool

Clamp		000 589 40 37 00

Conventional tool

Pressure tester

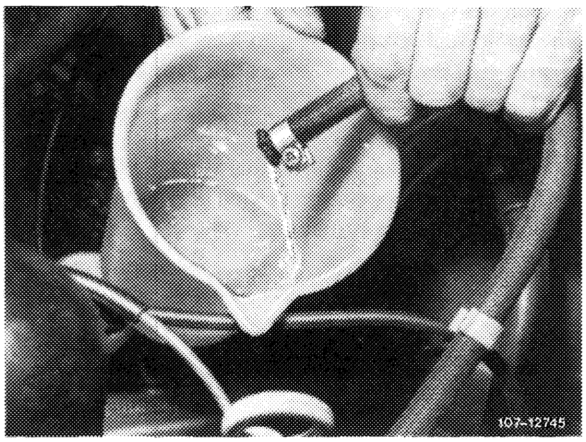
Note

On a vacuum -controlled fuel return valve, with a leaking diaphragm, the fuel is drawn off by the intake pipe vacuum. The results are high fuel consumption and irregular idle running. It may not be possible to adjust the idle speed emission value.

Checking

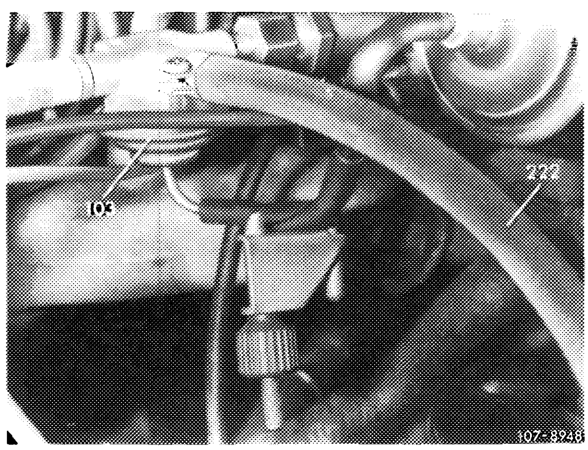
1 Pull fuel return hose from connection to return line. Hold fuel return hose into a container. Run engine, fuel should now come out of return hose in the shape of a jet.

On vehicles with air conditioning system and automatic transmission, engage driving position or switch on air conditioning system.



2 On fuel return valves **without** fuel pressure regulation (vacuum -controlled!), check diaphragm for leaks.

For this purpose, run engine at idle speed, pinch vacuum hose, idle speed emission value or idle speed should not change. Repiace return valve, if required.



B. With fuel pressure control (S 1976 only)

Test value

Fuel pressure (measured after fuel return valve)	approx. 0.2 bar gauge pressure

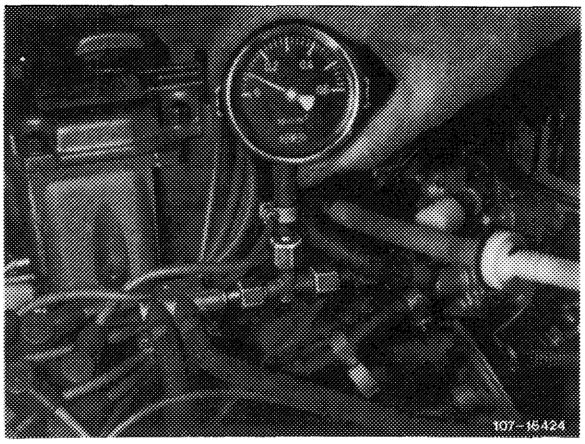
Conventional tool

Pressure tester

Testing

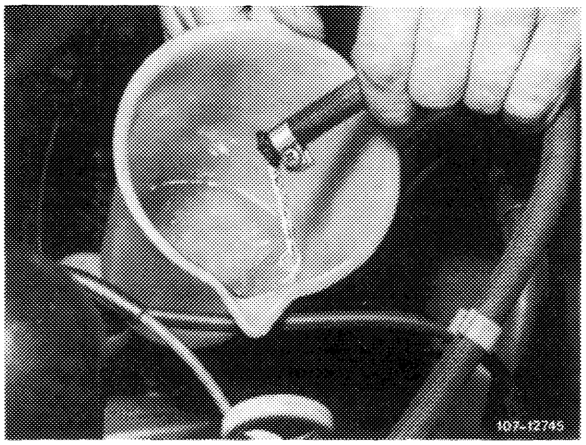
1 On fuel return valves **with** fuel pressure regulation S 1976, check function of pressure control.

For this purpose, connect pressure tester between return valve and carburetor. Run engine at idle and read regulated fuel pressure.



2 Pull off fuel return hose at connection for return line. Hold fuel return hose into a container. Run engine, fuel should now come out of return hose in the shape of a jet.

On vehicles with air conditioning system and automatic transmission, engage driving position or switch on air conditioning system.



Identification: Information plate in national language on cross member in front of radiator or on cylinder head cover. Adjust engines according to data of respective exhaust gas information plate.

Testing and adjusting values

National version		Idle speed 1/min	Idle speed emission value % CO
J	up to 1976	800–900	max. 1.5
	1976		max. 1.0 **without** air injection
S	1976		
USA	1973	750–900	up to 1.5
USA	1974 Federal		
USA	1974 California	700–900	6–8 **without** air injection
USA	1975/76	800–900	max. 1.0 **without** air injection

Vacuum governor[1])

National version		Engine speed Vacuum hose pulled off 1/min		Engine speed Driving position engaged 1/min
		without TN choke	**with** TN choke	
J	1976	–	1700–1900	600–700
S	1976	–		
USA	1973/74	1200–1400		
USA	1975/76	–		

[1]) When all auxiliary units are engaged, the engine should still run smoothly.

Float level

Float version	Float level[1])
Flat roof float	−2 to 6 mm[3])
Hip roof float and fuel return valve **without** fuel pressure regulation	0 mm[2])
Hip roof float and fuel return valve **with** fuel pressure regulation	+2 mm[2])

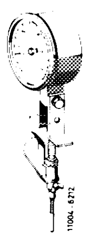
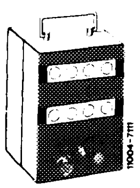
[1]) Measure from parting surface **without** gasket.
[2]) In the event of starting or bypass faults, set 2 mm higher.
[3]) Under parting surface.

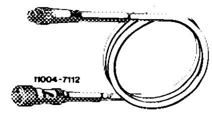
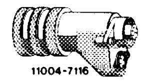
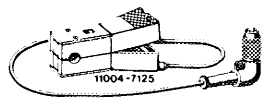
Carburetor line-up

National version	(J) 1976		(S) 1976		(USA) 1973 (USA) 1974 Federal		(USA) 1974 California		(USA) 1975/76	
Carburetor designation	Solex two-stage downdraft carburetor 4 A 1									
Carburetor stage	Stage I	Stage II	Stage I	Stage II	Stage I	Stage II	Stage I	Stage II	Stage I	Stage II
Main jet	X 105	–	X 105	–	X 100	–	X 112.5	–	X 105[2])	–
Jet needle	–	A 7	–	A 4	–	A 4	–	A 5	–	A 7
Idle speed fuel jet	47.5[1])	–	45[1])	–	45[3])	–	45[3])	–	47.5[1])	–
Idle speed air jet	102.5[1])	–	102.5[1])	–	110	–	100	–	102.5[1])	–

[1]) Combination jet
[2]) Model year 1975, size 100
[3]) Pressed-in, cannot be disassembled.

Special tools

Oil telethermometer		116 589 27 21 00
Digital tester		001 589 54 21 00

Connecting cable 3 m long		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00

Conventional tools

Revolution counter and CO measuring instrument

Self-made tool

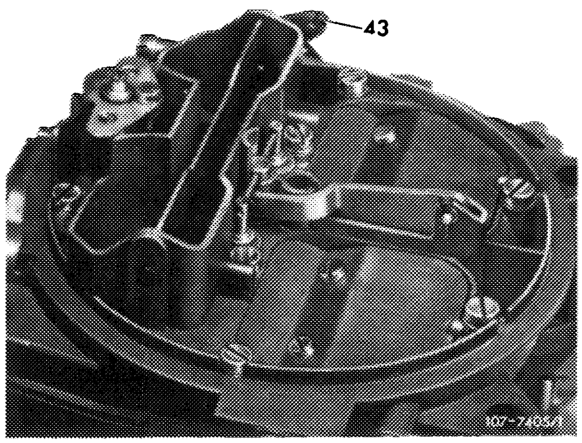
Puller	refer to Fig. item 9

Cleaning

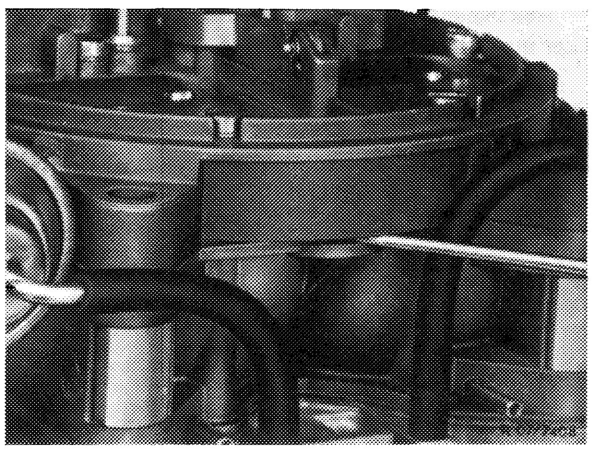
1 Remove air filter.

2 Thoroughly clean outside of carburetor.

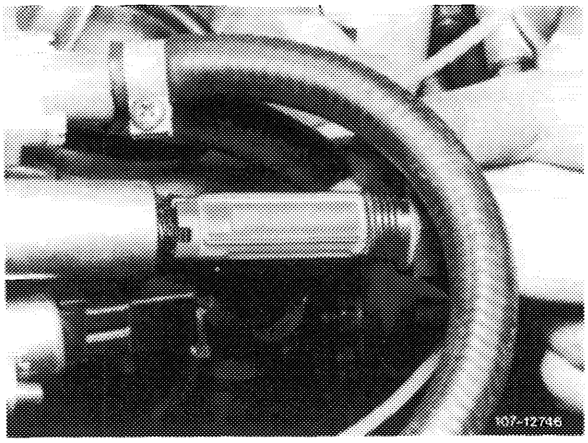
3 Loosen all fastening nuts and screws on carburetor cover. Pull off lock (43) and disconnect choke rod. Unscrew air filter fastening screw.



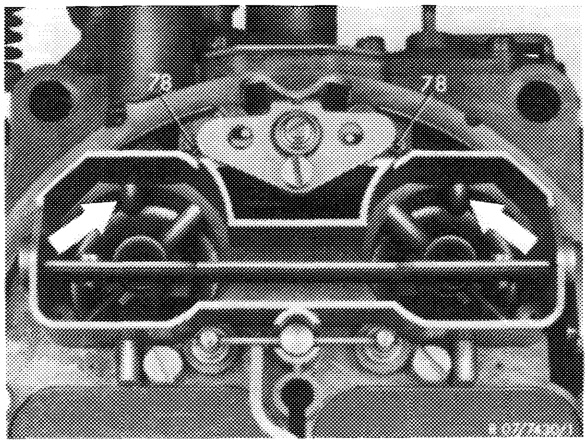
Attention!
Press off carburetor cover only at pressing-off point.



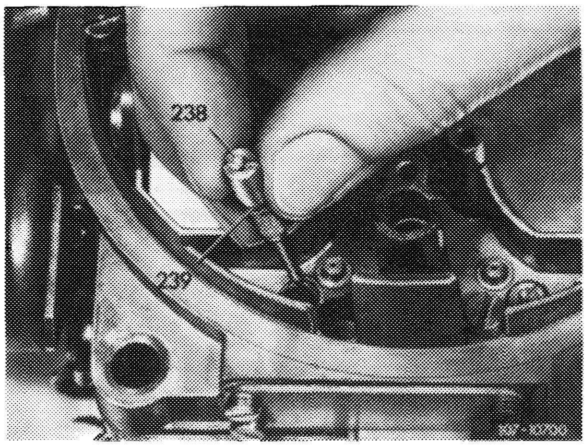
4 Clean filter strainer with compressed air.



5 Unscrew idle speed jets or combination jet (238). Blow out jet and duct with compressed air.



78 Idle speed air jet

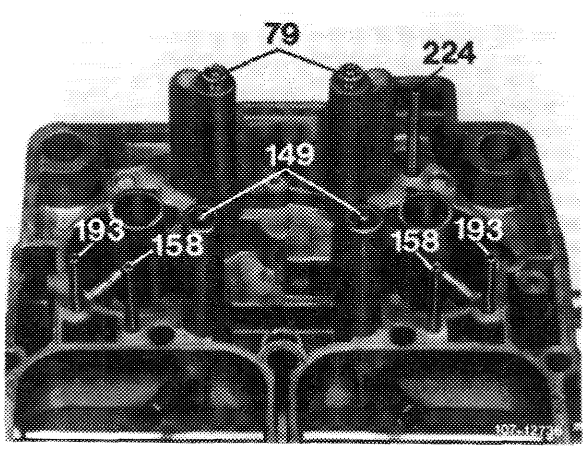


Combination jet

238 Idle speed and idle speed fuel jet
239 O-ring

6 Remove main jets (79). Blow out all ducts, bores, riser pipes and jets with compressed air.

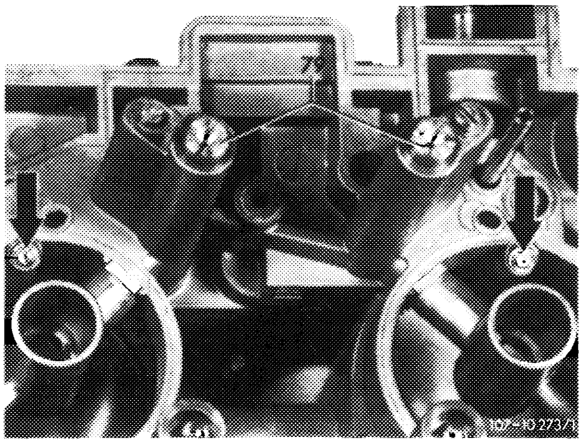
Attention!
Do not clean jets with metallic items (e.g. wire, drill).



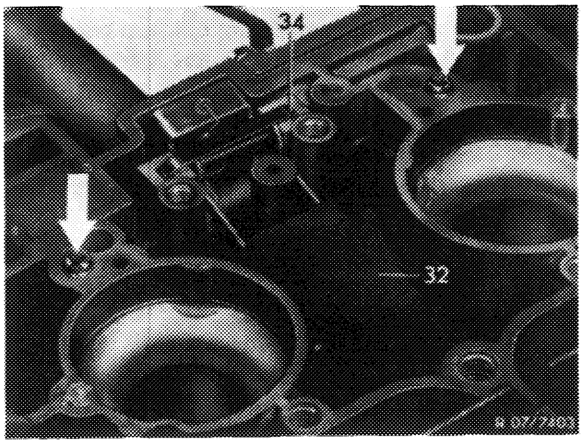
79 Main jets stages I
149 Jet needles stage II
158 Riser pipes bypass system stage II
193 Riser pipes starting mixture enrichment
224 Riser pipe TN choke (thermostatically controlled bypass choke)

7 Blow out injection bores (arrows) of accelerating pump with compressed air and check for unobstructed passage (clean injection bores with a 0.5 mm drill, if required).

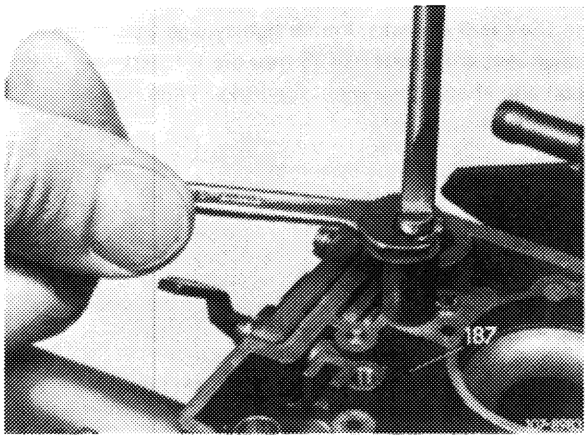
Check jet line-up. Install all parts.



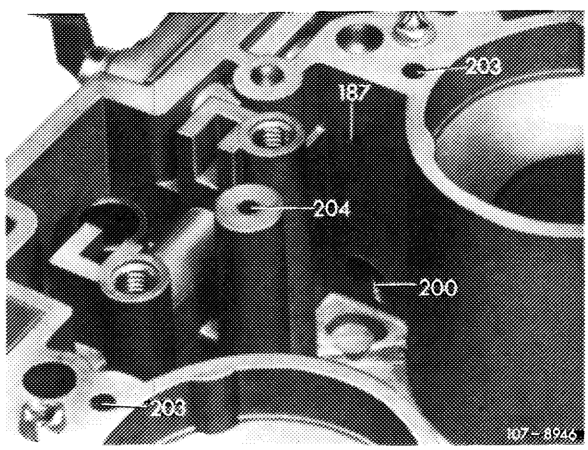
8 Remove holddown (34), float (32) with float needle valve.



9 Pull out closing plug for intake port (suction duct) of accelerating pump with self-made puller. Lift valve ball out of duct (e.g. welding wire with grease).

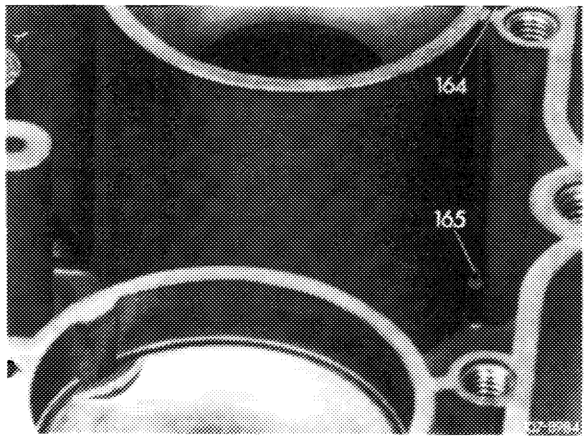


10 Clean float chamber and ducts (200, 203, 204, 187) with compressed air.



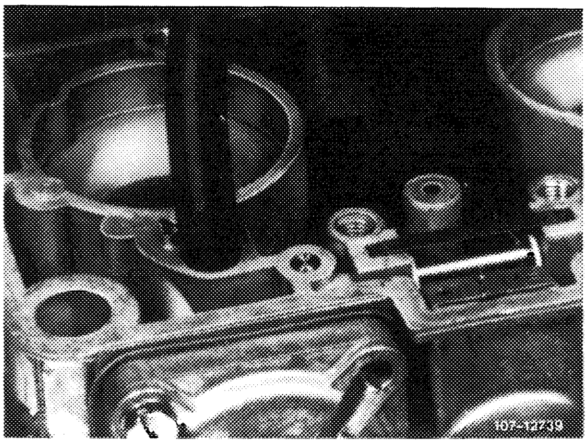
187 Vent bore
200 Intake port
203 Idle speed mixture ducts
204 Vacuum bore for controlling enrichment

11 Clean feed bores (165) and reserve chambers (164) with compressed air.

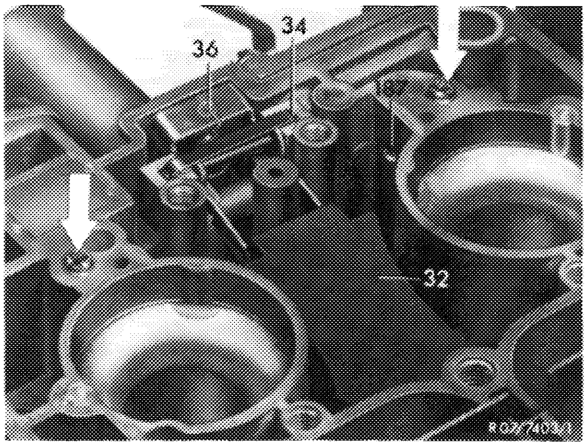


164 Reserve chamber for bypass system stage II
165 Feed bore for reserve chamber stage II

12 Check suction valve for leaks. For this purpose, install valve ball (5 mm steel ball). Fill float chamber with fuel. Slip suitable hose over suction duct (intake port), keep both delivery valves (arrow) closed, on carburetors with vent bore (187) also keep these bores closed and blow into hose. No or only individual air bubbles should come out of intake bore and enter float chamber.



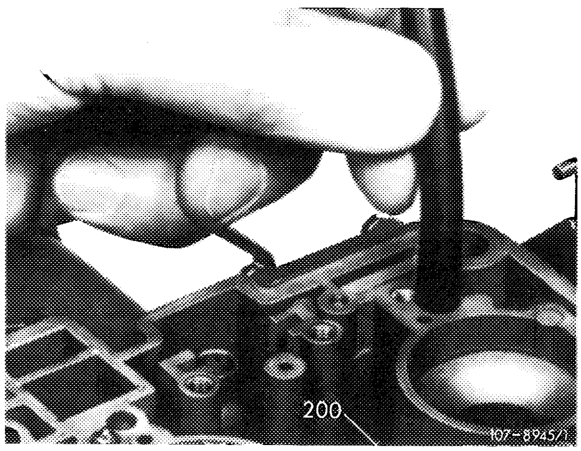
Attention!
In the event of leaks, knock **lightly** against suction valve seat with steel ball (5 mm dia.). Insert new steel ball and check once again for leaks. Then close intake port (suction duct).



187 Vent bore
Arrow = delivery valve

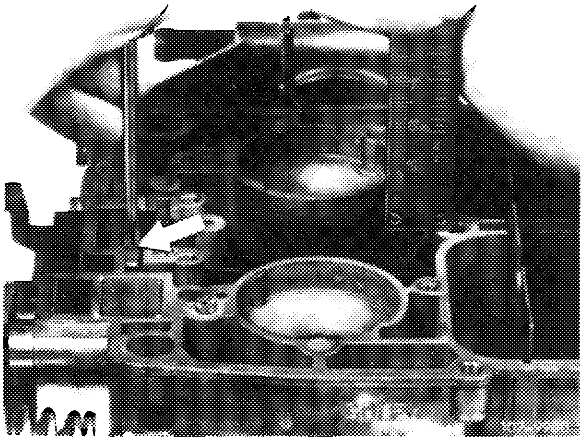
13 Check delivery valves for leaks. For this purpose, slip suitable hose over a delivery valve, keep other delivery valve closed, on carburetors with vent bore (187) keep this bore also closed and blow into hose. No or only individual air bubbles should come out of suction bore (200) and enter float chamber. Then check opposite delivery valve.

Attention!
In the event of leaks, knock balls of delivery valves "**lightly**" against their seat.

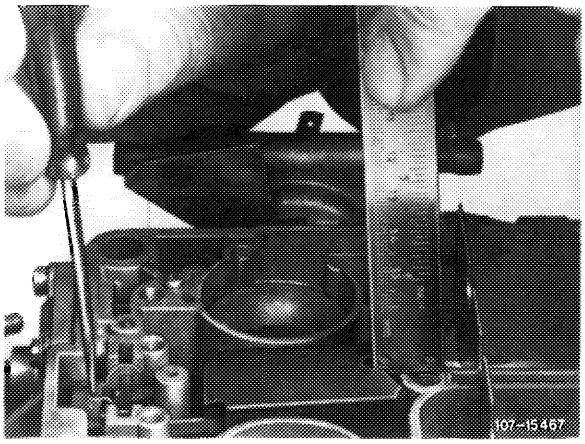


14 Check float level and adjust, if required. For this purpose, push connecting web (arrow) up to **noticeable stop** in downward direction and check float level without gasket.

Attention!
To avoid measuring faults, make sure that the float shaft rests on base of housing during test.

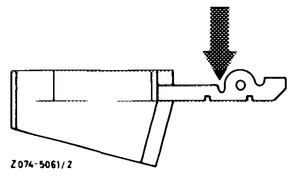


Measuring float level with flat roof float



Measuring float level with hip roof float

Correct float level, if required, by rebending at specified bending point (arrow).



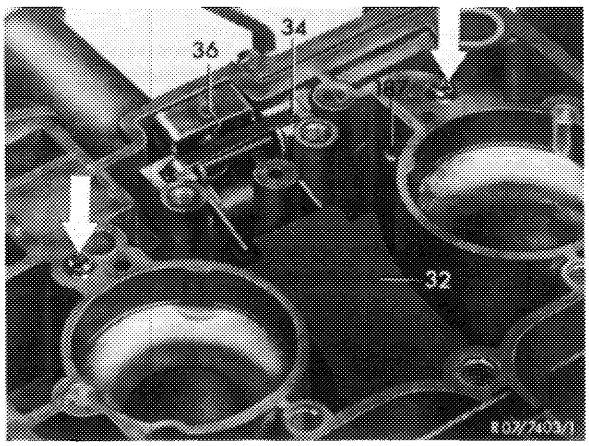
15 Attach float needle with wire clip on float arm in such a manner that the **open side** of clip points **in driving direction.**

16 Install float (32), making sure that the float shaft rests on base of recesses. Insert holddown (34). Holddown should project slightly over parting surface. Rebend, if required.

17 Mount carburetor cover with new gasket.

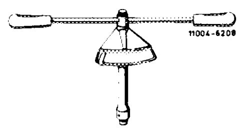
18 Mount air filter.

19 Adjust idle speed (07.2–100).



07.2–192 Removal and installation of carburetor cover

Tightening torques		Nm	(kpm)
Carburetor fastening nuts	with new insulating flange	10	(1.0)
	with insulating flange used up to now	8	(0.8)

Special tool		
Torque wrench 4–16 Nm (40–160 kpcm)		000 589 67 21 00

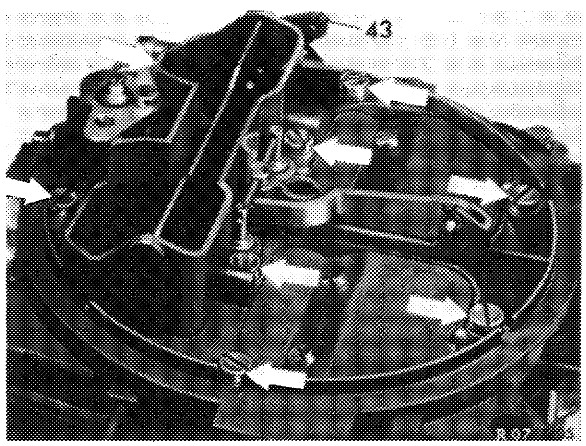
Removal

1 Remove air filter.

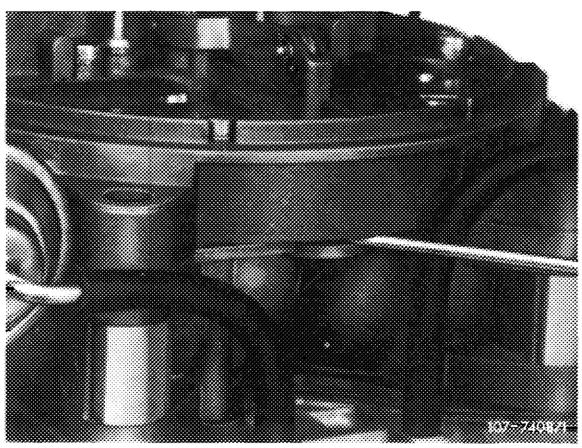
2 Pull off fuse (43) and disconnect choke rod.

3 Unscrew carburetor fastening nuts.

4 Unscrew carburetor cover fastening screws (arrow).



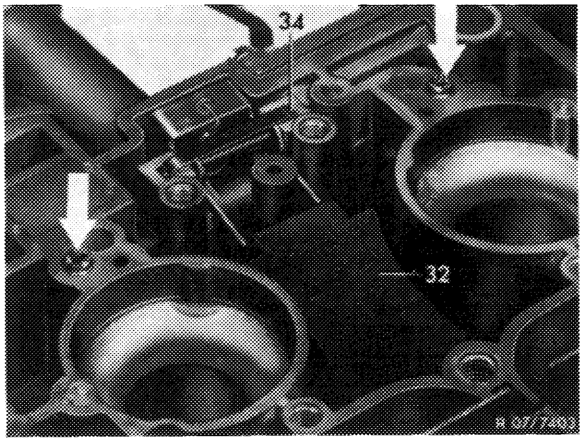
5 Force off carburetor cover at forcing-off point and remove.



Installation

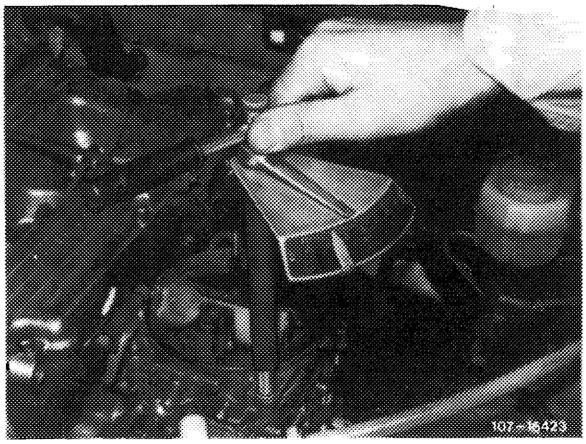
6 Install carburetor cover in vice versa sequence. Use new gasket.

Attention!
Prior to mounting carburetor cover, make sure that holddown (34) is installed.



Tighten carburetor fastening nuts uniformly and crosswise to specified torque.

Attention!
To prevent distortion of carburetor, tighten with a torque wrench only and up to specified torque.



Identification: Information plate in national language on cross member in front of radiator or on cylinder head cover. Adjust engines according to data of respective exhaust gas information plate.

Testing and adjusting values

Idle speed adjustment

National version		Idle speed 1/min	Idle speed emission value % CO
J	up to 1976	800–900	max. 1.5
	1976		max. 1.0 **without** air injection
S	1976		
USA	1973	750–900	up to 1.5
USA	1974 Federal		
USA	1974 California	700–900	6–8 **without** air injection
USA	1975/76	800–900	max. 1.0 **without** air injection

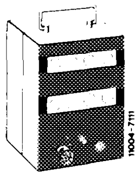
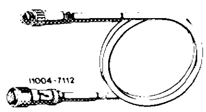
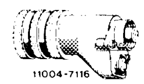
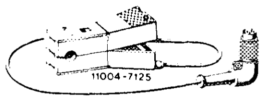
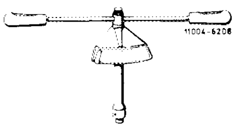
Vacuum governor[1])

National version		Engine speed Vacuum hose pulled off 1/min		Engine speed Driving position engaged 1/min
		without TN choke	**with** TN choke	
J	1976	–	1700–1900	600–700
S	1976	–		
USA	1973/74	1200–1400		
USA	1975/76	–		

1) When engaging all auxiliary units, the engine should still run smoothly.

Tightening torques		Nm	(kpm)
Carburetor fastening nuts	with new insulating flange	10	(1.0)
	with insulating flange used up to now	8	(0.8)

Special tools

Oil telethermometer		116 589 27 21 00
Digital tester		001 589 54 21 00
Connecting cable 6 m long		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00
Torque wrench 4–16 Nm (40–160 kpcm)		000 589 67 21 00

Conventional tools

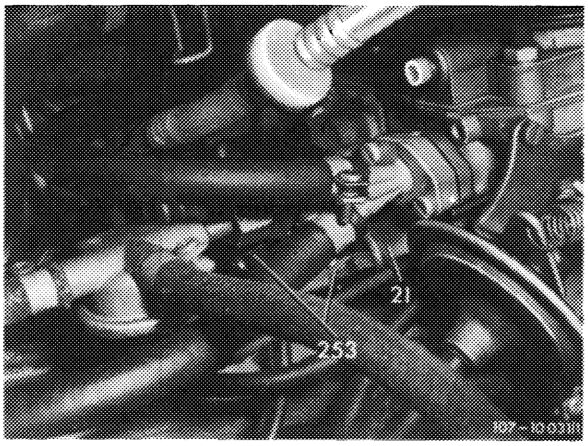
Revolution counter, CO measuring instrument

Removal

1 Remove air filter.

2 Evacuate excess pressure in cooling system by loosening radiator cap for a short moment, then tighten cap again.

3 Unscrew fuel return valve. Pull off electric cable on choke cover, plug on idle speed shutoff valves, vacuum lines and coolant hoses. Disconnect regulating rod on carburetor.



4 Unscrew carburetor fastening nuts and remove carburetor.

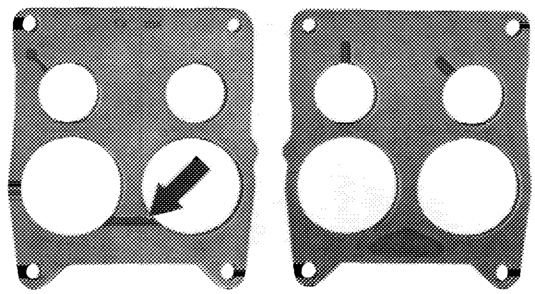
Installation

5 Install carburetor in vice versa sequence. Proceed as follows:

- Check insulating flange for damage and replace, if required.
- Pay attention to installation position and various insulating flange versions.

(USA) 1973/74
(USA) California 1974

Arrow = groove for drawing off fuel evaporation vapors, should point toward carburetor.

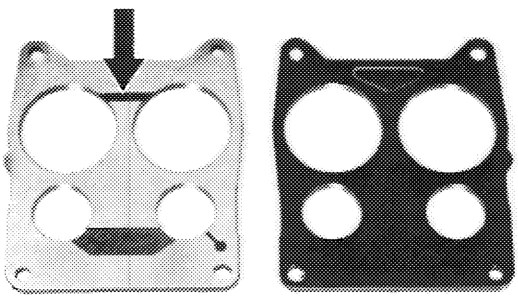


107-8916

(J) 1976
(S) 1976
(USA) 1975/76

Arrow = groove for drawing off fuel and crankcase evaporation vapors, should point toward carburetor.

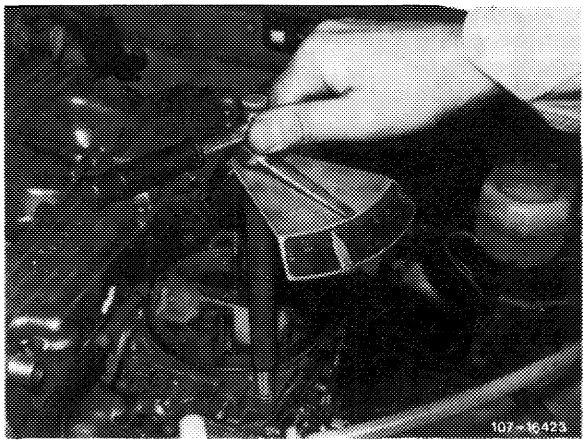
Attention!
This insulating flange should no longer be installed for model years 1973/74.



107-9854/1

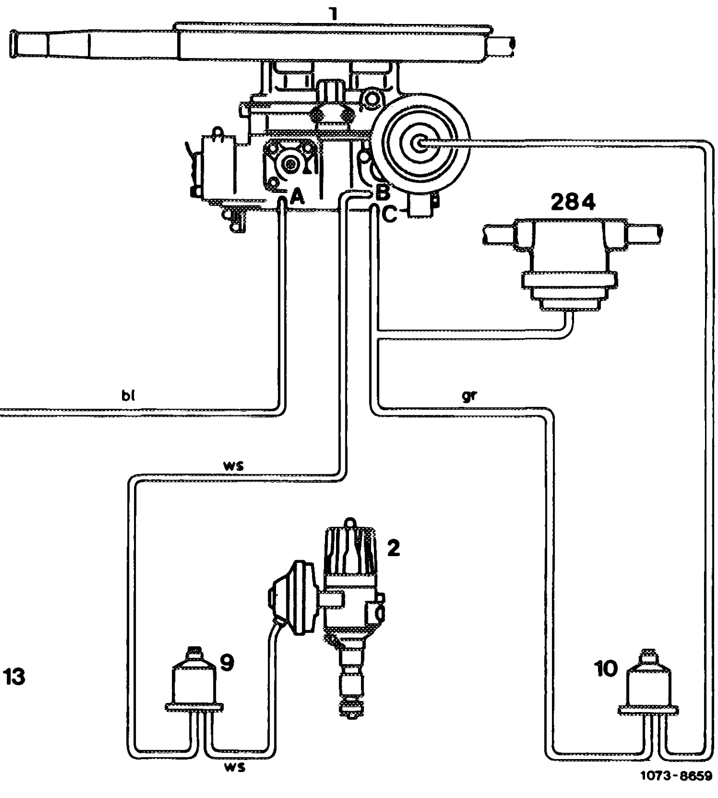
- Tighten carburetor fastening nuts uniformly and crosswise to specified torque.

Attention!
To prevent distortion of carburetor, tighten with a torque wrench only and up to specified torque.



- Attach vacuum lines on carburetor according to diagram.

(USA) **1973/74 Federal**

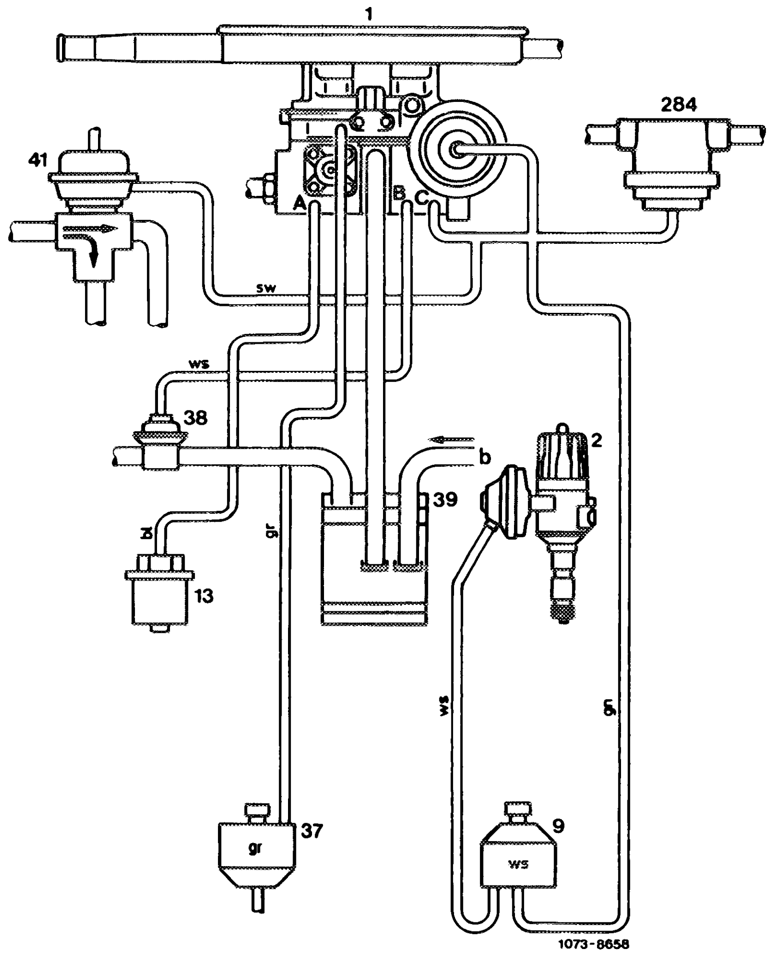


A Vacuum connection for vacuum switch (13) of ignition retard
B Vacuum connection for switchover valve (9) of ignition retard
C Vacuum connection for switchover valve (10) of throttle valve lift by vacuum governor, as well as for fuel return valve (284)

Line colors

gr = grey
bl = blue
ws = white

(USA) 1974 California

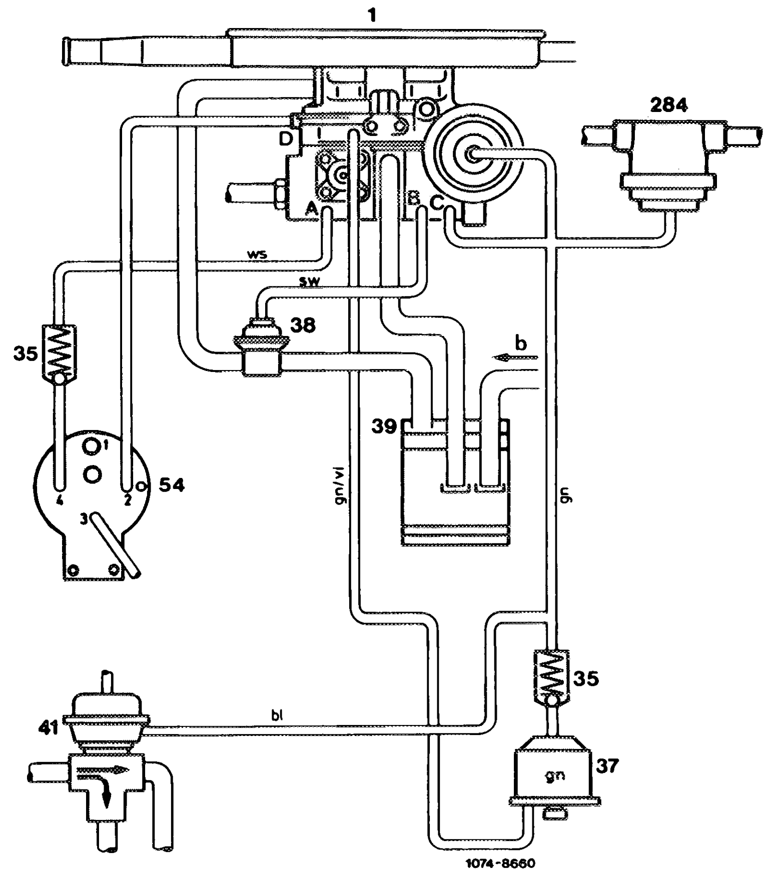


A Vacuum connection for vacuum switch (13) of ignition adjustment
B Vacuum connection for draw-off valve (38) of fuel evaporation control system
C Vacuum connection for switchover valve (9) of ignition adjustment, decel diverter valve of air injection, vacuum governor and fuel return valve (284)

Line colors

bl = blue
br = brown
gr = grey
gn = green
rt = red
ws = white

(USA) 1975/76, (J) 1976

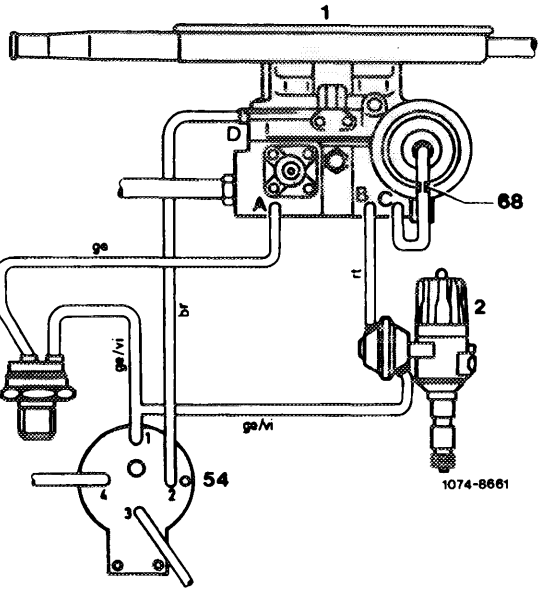


A Vacuum connection check valve (35) of vacuum booster for EGR
B Vacuum connection for draw-off valve (38) of fuel evaporation control system
C Vacuum connection for check valve (35) of float chamber vent system, vacuum governor and fuel return valve (284)

Line colors

bl = blue
br = brown
gn = green
sw = black
vi = purple
ws = white

Ⓢ 1976



A Vacuum connection 40 °C thermovalve (60) of EGR
B Vacuum connection for ignition advance
C Vacuum connection for vacuum governor
D Vacuum connection for vacuum booster (54) of EGR

Line colors

br = brown
ge = yellow
rt = red
vi = purple

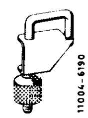
6 Adjust idle speed (07.2–100).

07.2–210 Checking fuel pump

Test values

	Measuring point	prior to pump inlet
Vacuum (suction end)	at starting speed mbar (mm Hg)	335–470 (250–350)
	max. pressure drop within first minute mbar (mm Hg)	95 (70)
	Measuring point	following pump outlet
Delivery pressure (pressure end)	at starting speed bar gauge pressure	0.20
	max. pressure drop within first minute bar gauge pressure	0.05

Special tool

Clamp		000 589 40 37 00

Conventional tool

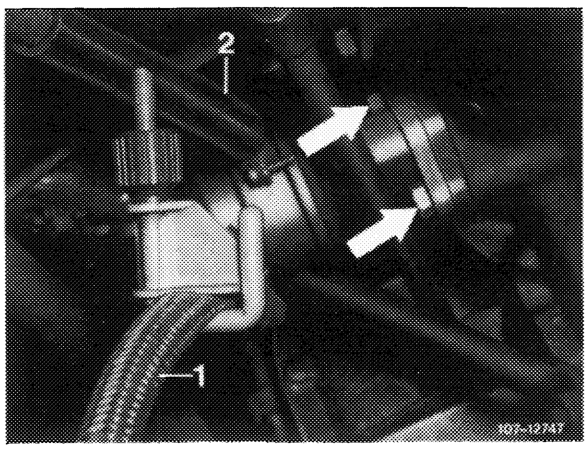
Fuel pump pressure vacuum tester	e.g. made by Bosch, EFAW 177
	e.g. made by SUN, VPT 212

Checking vacuum at suction end

1 Short ignition system. For this purpose, connect cable from ground to terminal 1 of ignition coil.

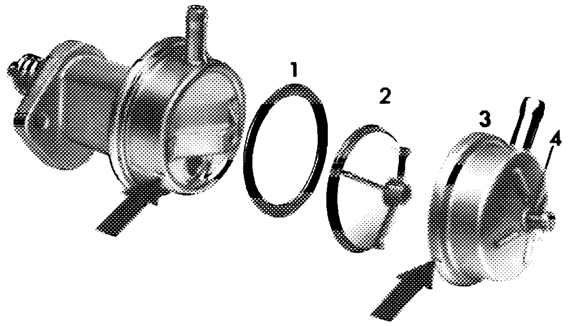
2 Pinch suction hose. Pull off suction and pressure hose.

Connect tester at suction end.



1 Suction hose
2 Pressure hose

3 Crank engine with starting motor until vacuum is no longer increasing. Compare indicated value with rated value. Watch pressure drop.



R 07/6447

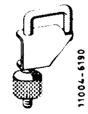
Checking delivery pressure at pressure end

4 Connect tester at pressure end.

5 Crank engine with starting motor until delivery pressure is no longer increasing. Compare indicated value with rated value. Watch pressure drop.

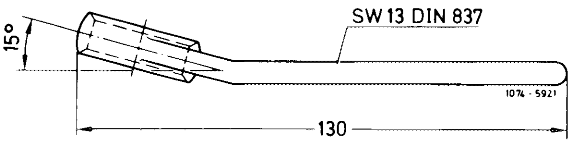
Note: If the vacuum or delivery pressure is not attained, check whether infiltrated (false) air is sucked in at rubber sealing ring (1). Renew sealing ring, if required, and repeat test.

Special tool

Clamp		000 589 40 37 00

Note

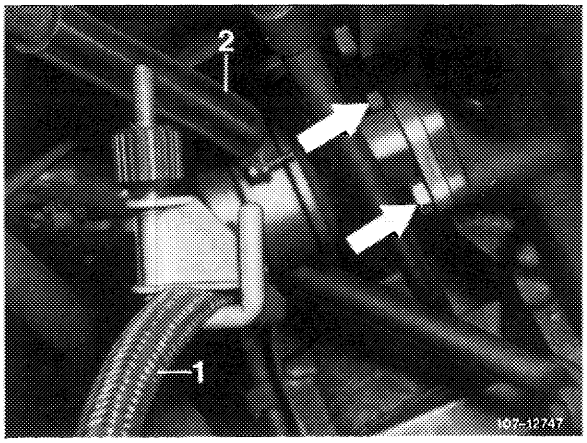
To facilitate loosening or tightening of fastening screws during removal and installation of fuel pump, particularly on vehicles with power steering, offset a conventional box wrench as shown in illustration.



Removal

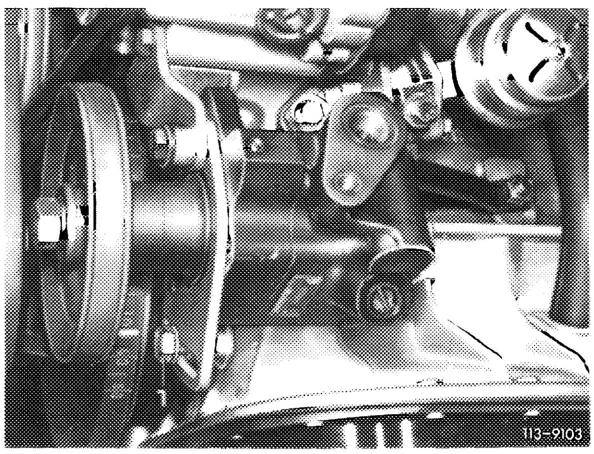
1 Pinch suction hose. Pull off suction and pressure hose.

2 Unscrew fastening screws (arrows), remove fuel pump and sealing flange.



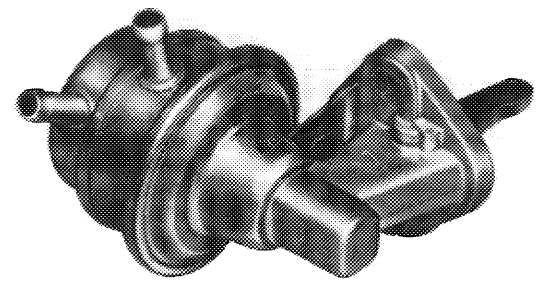
USA 1973/74
1 Suction hose
2 Pressure hose

For J 1976, S 1976, USA 1974 California an angular fuel pump is installed for lack of space due to air pump.



Angular fuel pump with removable cover

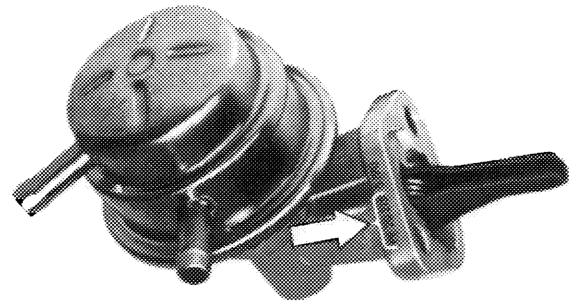
(USA) 1974 California
(USA) 1975/76
(J) 1976



107-9099

Angular fuel pump without removable cover with fuel shutoff valve (roll-over test)

Code number: PE 20 215 (arrow)
(J) 1976
(USA) 1976

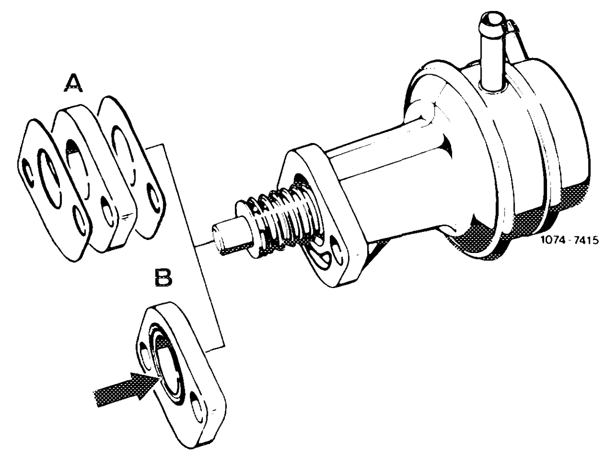


107-10953

Installation

3 For installation proceed vice versa.

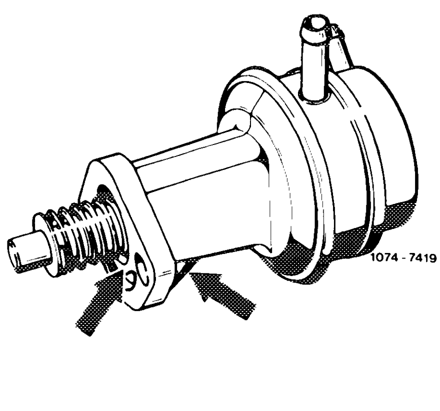
Note: For better sealing, starting May 1976, a sealing flange (B) with two O-rings (arrow) is installed between the fuel pump or angle piece and crankcase.



Repair instructions

a) Fuel pumps attached directly to crankcase by means of a sealing flange

For this type of arrangement, the sealing flange with two O-rings may be installed throughout only with a fuel pump provided with stiffening ribs (arrows).



b) Fuel pumps attached to an angle piece (engines with air pump)

With this arrangement, the sealing flange can be installed with two O-rings between angle piece and crankcase.

The respectively installed or available fuel pump (with or without stiffening ribs) may be used.

Attention!
When installing sealing flange, make sure in both cases that the O-ring rests on crankcase with its entire circumference, i.e. serves as a seal.

For this purpose, clean sealing surface on crankcase and apply a coat of chalk, talcum or india ink to O-ring. Press sealing flange with O-ring against crankcase. Use the two fastening screws for centering. Then evaluate contact surface. If the O-ring is not resting on its entire circumference, remove O-ring at crankcase end from sealing flange and install a paper gasket.

Note: Provide screws for attachment to crankcase prior to assembly with sealing compound (e.g. Hylomar) on threads.

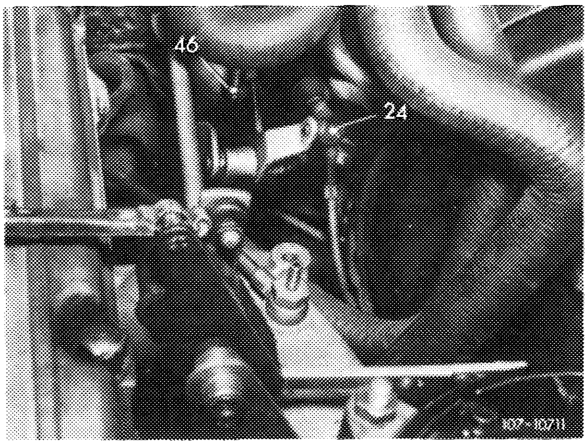
Length of regulating rods in mm[1])

Regulating rod, item		24	46	130	144
Model	114	88	69	120	306
	116	122			

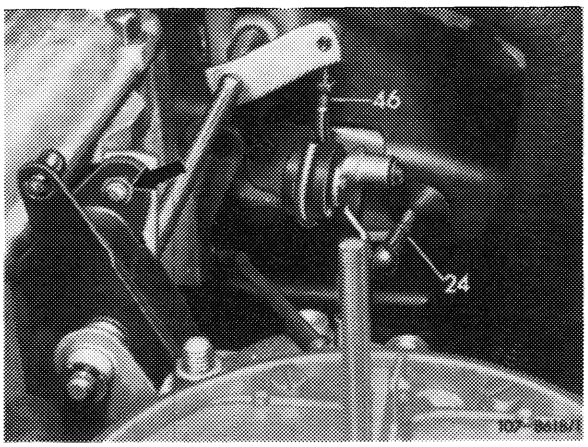
1) Measured from center of ball socket to center of ball socket.

Testing, adjusting

1 Disconnect regulating rods (24 and 46), check for specified length, adjust if required and reconnect.



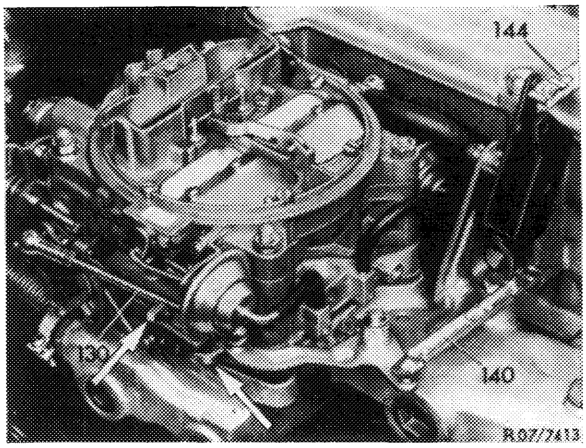
Model 114

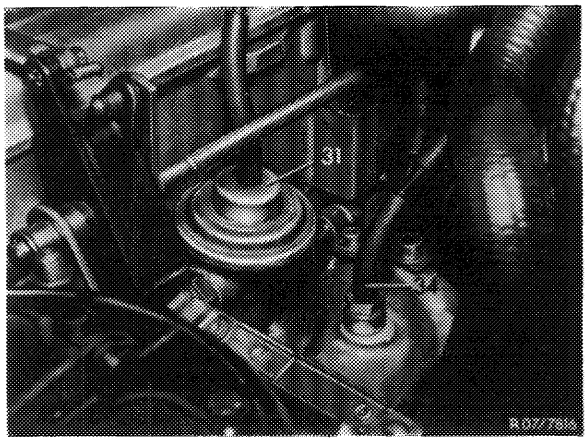


Model 116

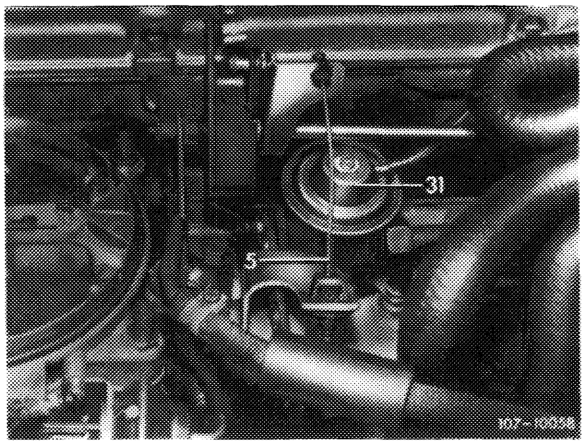
2 Adjust regulating rod (130). For this purpose, disconnect regulating rod, check for specified length, adjust if required and reconnect.

3 Adjust regulating rod (144). For this purpose, disconnect regulating rod, check for specified length, adjust if required and reconnect.

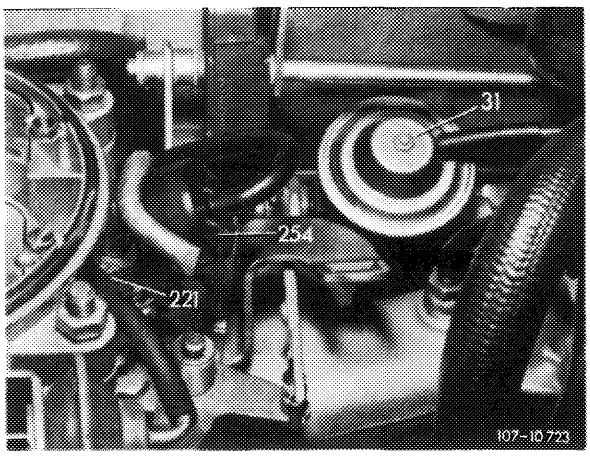




Layout regulation
(USA) 1973/74 Federal
(USA) 1974 California



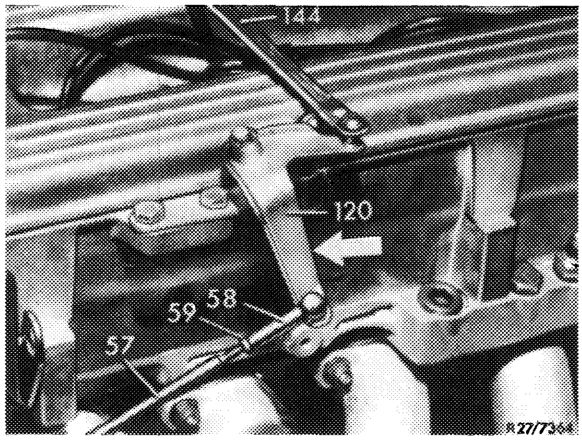
Layout regulation
(J) 1976
(USA) 1975/76



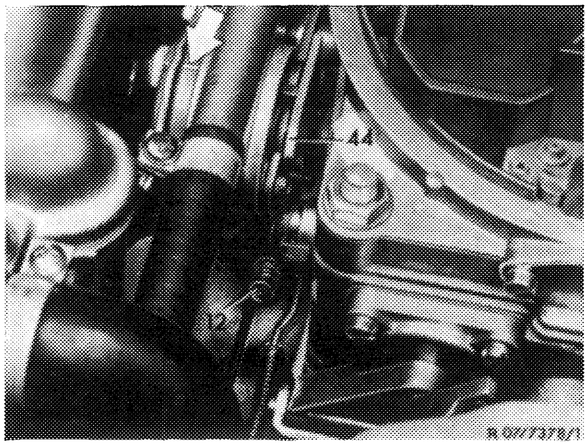
Layout regulation
(S) 1976

4 Adjust control pressure rod (57) for automatic transmission. Keep engine running. Disconnect control pressure rod and push toward the rear up to stop. Push angle lever (120) in direction of arrow until idle travel in regulating rod (140 in fig. item 3) is cancelled.

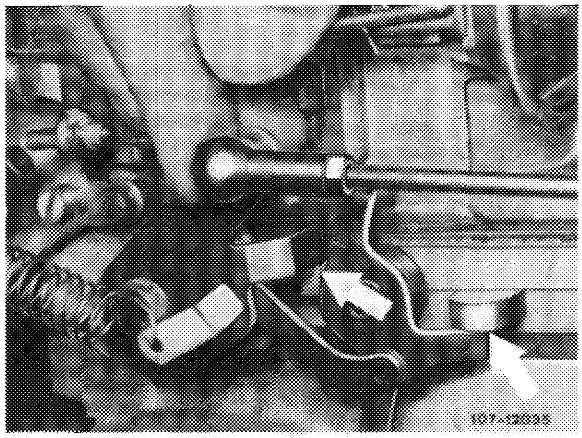
Then adjust ball socket (58) until socket can be connected again **free of tension.**



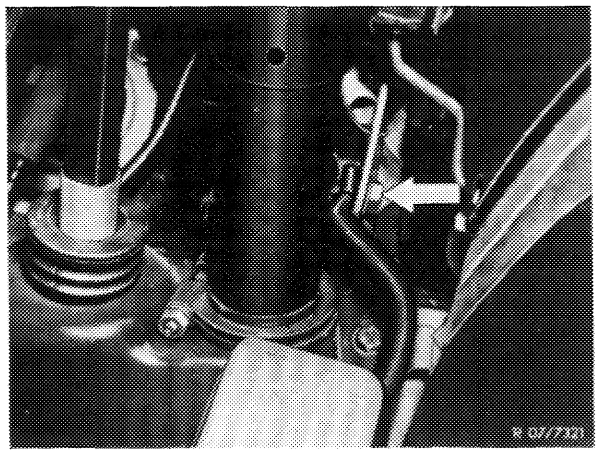
5 **Adjust full throttle stop.** Check and adjust only with stage II **unlocked.** For this purpose, push fast idle cam (44) completely down (not required if engine is at operating temperature).



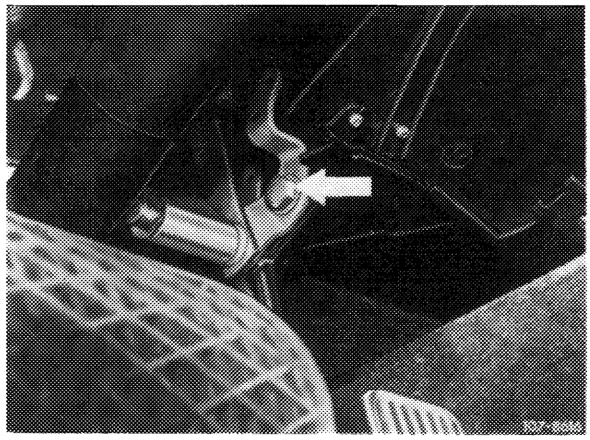
With the engine stopped, depress accelerator pedal only up to stop on kickdown switch (do not actuate kickdown switch). The throttle valve lever of I. and II. stage should rest against full throttle stop (arrows).



If the full throttle stop is not attained on model 114 or 116, loosen clamping screw (arrow) on regulating shaft. Slightly pull up accelerator pedal and tighten screw again. Check full throttle stop once again.

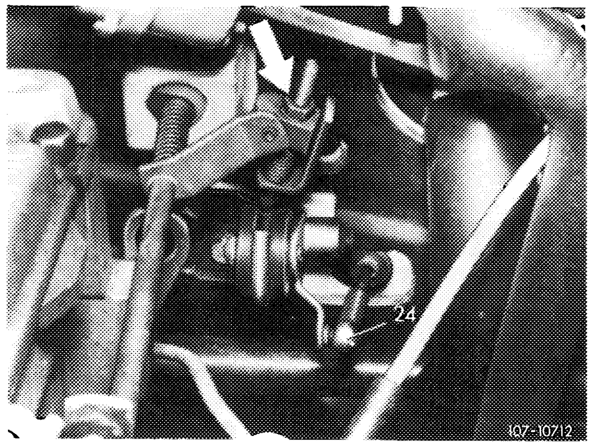


Model 114



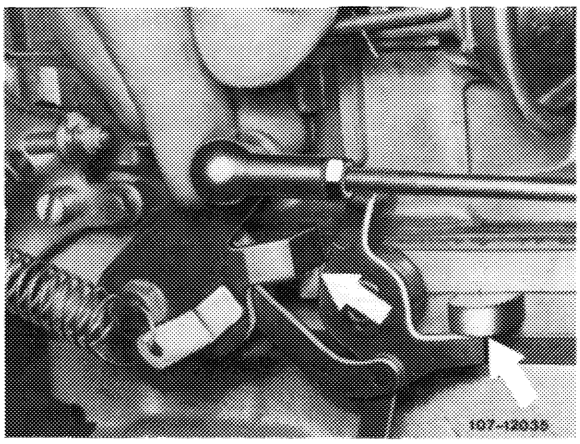
Model 116

On model 116 with stepless full throttle stop adjustment, set adjusting nut (arrow) accordingly.

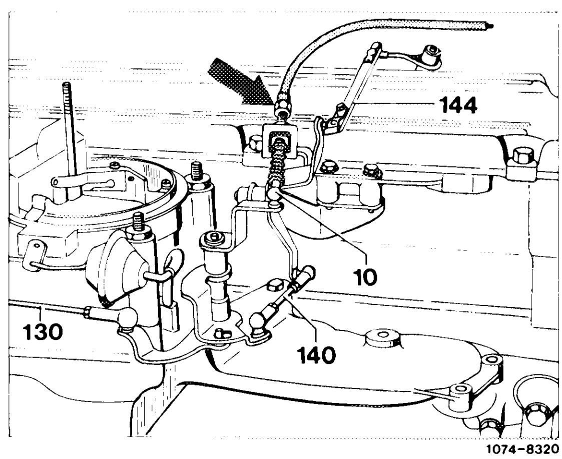


Adjustment on vehicles with righthand steering

The adjusting lengths are similar to lefthand steering vehicles, the same applies to adjustment. Following adjustment with engine stopped, step down fully on accelerator pedal (with automatic transmission, apply kickdown). The throttle valve lever of stage I and II should rest **free of tension** against full throttle stop of carburetor (arrows).

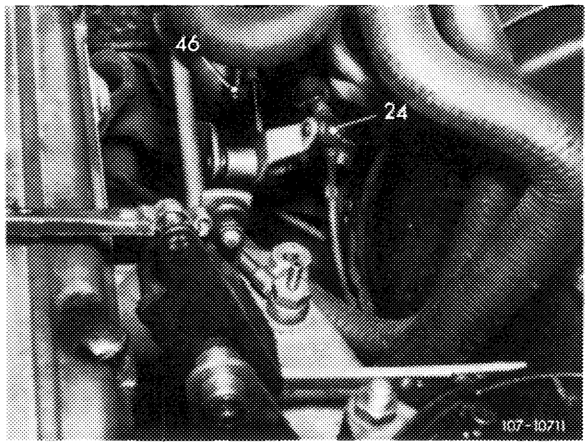


If the full throttle stop on carburetor is not attained, readjust Bowden wire (arrow).

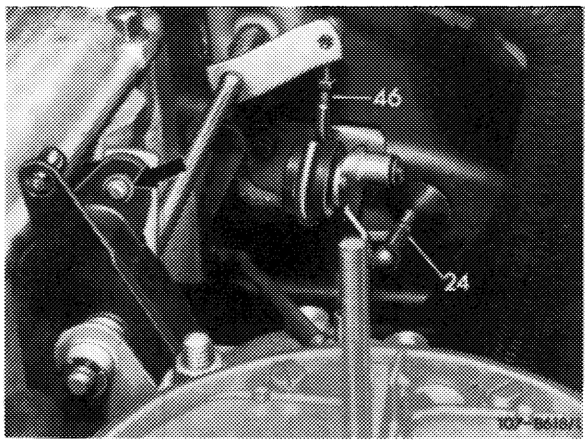


Removal

1 Disconnect regulating rod (46).

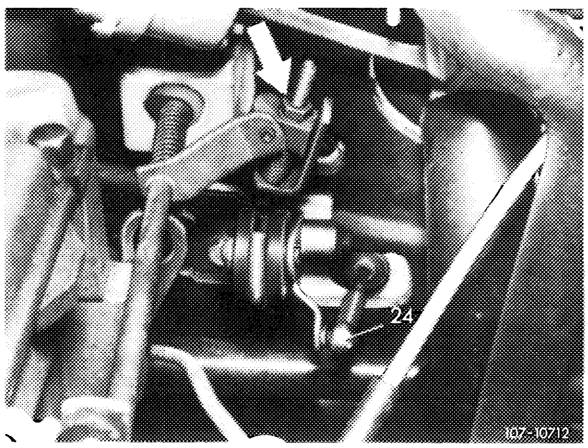


Model 114

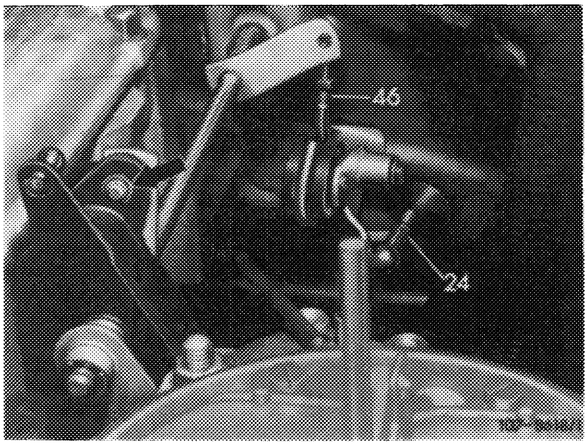


Model 116

On vehicles with stepless full throttle stop adjustment, force off regulating rod together with rubber bearing.



2 Pull off lock (arrow). Slide longitudinal regulating shaft toward the rear and remove. Pay attention to components of rear bearing.



Installation

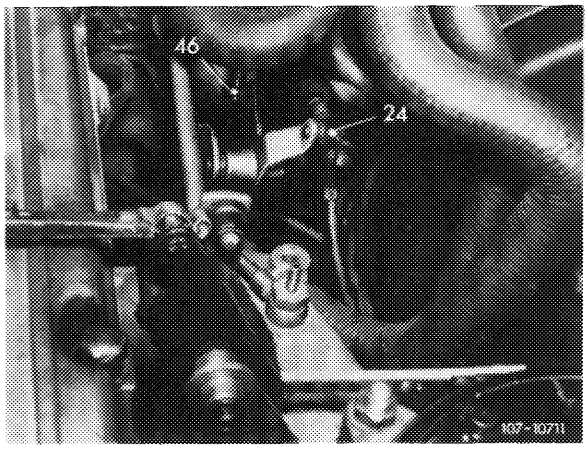
3 For installation proceed vice versa. Grease bearing points as well as ball sockets with Molykote-Longterm 2.

4 Adjust regulating linkage (07.2–300).

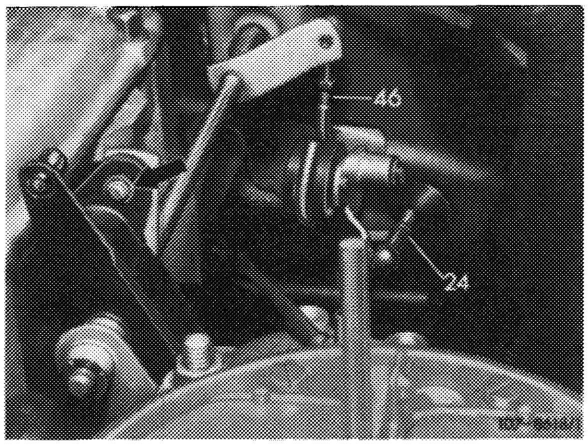
Removal

1 Remove accelerator pedal (07.2–330).

2 Disconnect regulating rod (24) and return spring in vehicle interior.

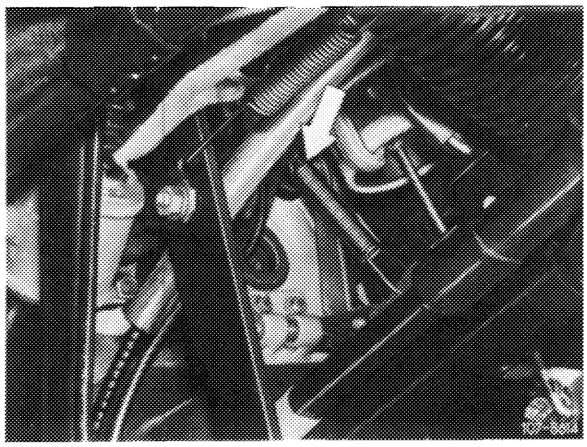


Model 114



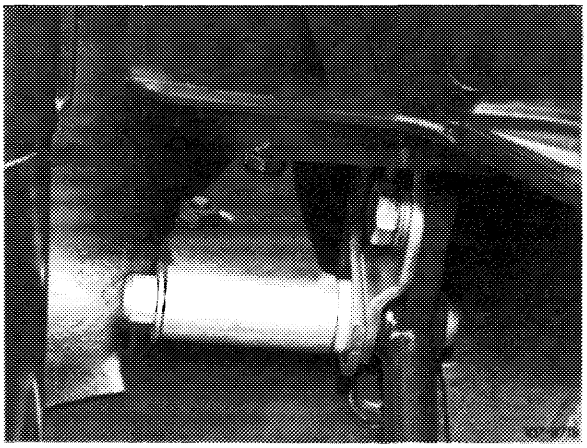
Model 116

3 Unscrew fastening screws or nuts from bearing bracket. Remove bearing bracket and front wall regulating shaft.

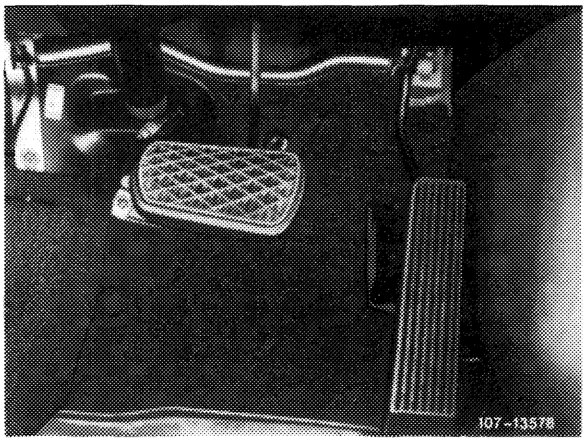


Model 114 Bearing bracket fastening screws

Model 116



Righthand steering



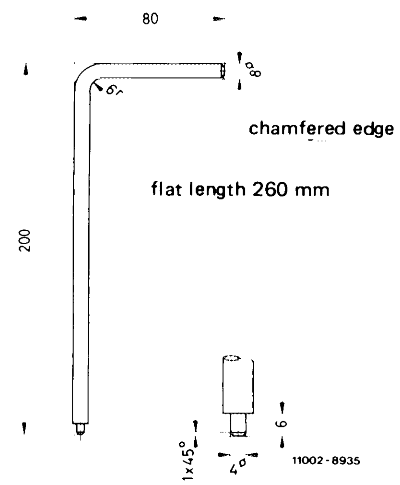
Installation

4 For installation proceed vice versa. Grease bearing points as well as ball sockets with Molykote-Longterm 2.

5 Adjust regulating linkage (07.2–300).

Self-made tool

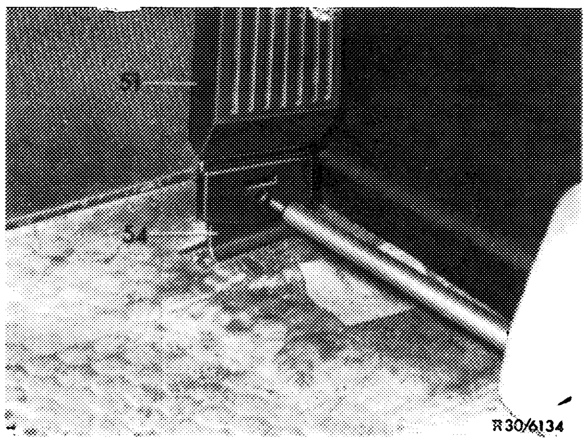
Remover for accelerator pedal



Version 1

Removal

1 Remove accelerator pedal (51) from bearing plate (54). For this purpose, disengage clip from bearing plate by means of remover. **Be sure to use remover,** so that clip (53) is not damaged or excessively stretched.

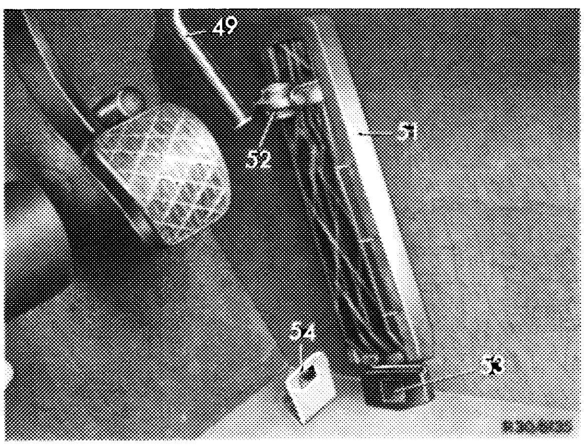


Fastening accelerator pedal with push-type clip

2 Pull off accelerator pedal (51) in upward direction and out of accelerator lever (49).

Installation

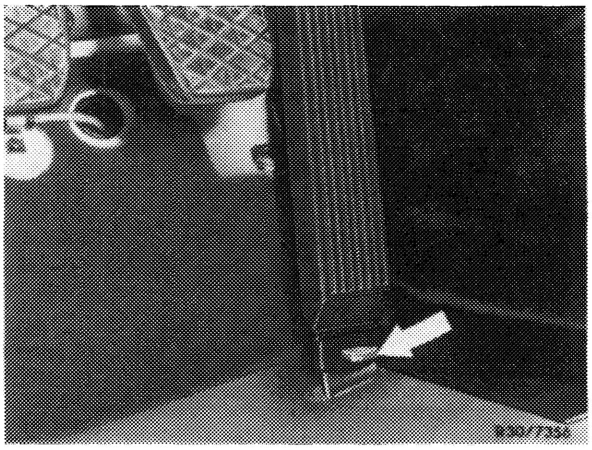
3 Slip accelerator pedal (51) with joint (52) into accelerator lever (49) and push tightly on bearing plate so that clip (53) is reliably engaging.



Version 2

Removal

1 Compress clip (arrow) behind accelerator pedal and pull out.



Fastening accelerator pedal with spreader-type clip

Installation

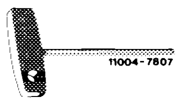
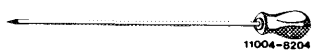
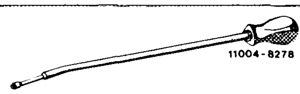
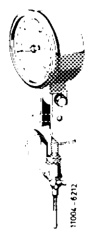
2 During installation, make sure that clip is reliably engaging.

A. Standard version

Checking and adjusting data

Engine	Idle speed 1/min	Idle speed emission value % CO
110.984/985 110.986/987	750–850	0.5–1.5
110.988 110.989 110.990	700–800	

Special tools

Screw driver 3 mm with tommy handle for regulating idle speed emission value		000 589 14 11 00
Puller		123 589 05 33 00
Installer		123 589 00 15 00
Oil telethermometer		116 589 27 21 00

Conventional testing tools and accessories

CO-measuring instrument, revolution counter	
Digital tester	e.g. made by Bosch, MOT 001.03

Note

On light alloy fuel distributor, removal of air cleaner for adjusting emission value at idle is no longer necessary.

Do not adjust idle speed when engine is too hot, e.g. immediately after a fast drive or after measuring output on chassis dynamometer.

Adjusting

1 Switch off air-conditioning system or automatic climate control. Move selector lever into position "P".

2 Remove air cleaner, with gray iron fuel distributor only.

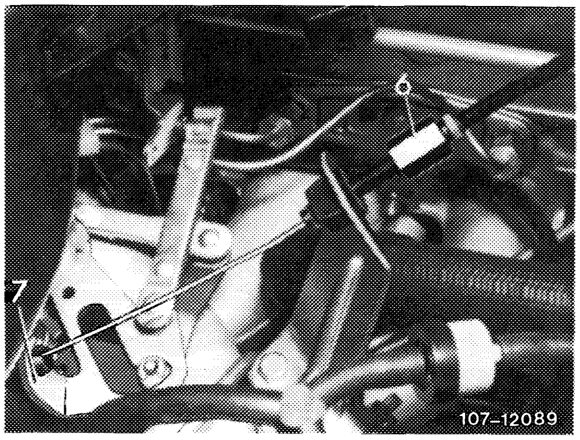
3 Connect test instruments: Revolution counter, CO-measuring instrument, digital tester, oil telethermometer.

4 Run engine to 75–85 °C oil temperature.

5 Check intake system for leaks. For this purpose, spray all sealing points with Iso-Oktan DIN 51 756 or benzine.

Attention!
Do not use conventional fuel for spraying (unhealthy vapors). Pay attention to inflammability and do not spray on red-hot parts or components of ignition system.

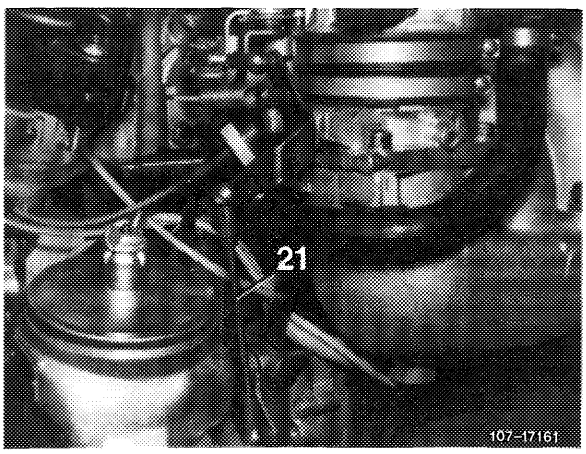
6 Vehicles with cruise control/tempomat:



Cruise control/tempomat, pneumatic

Check whether bowden wire for cruise control/tempomat rests free of tension against regulating lever (7).

Set with adjusting nut (6), if necessary.

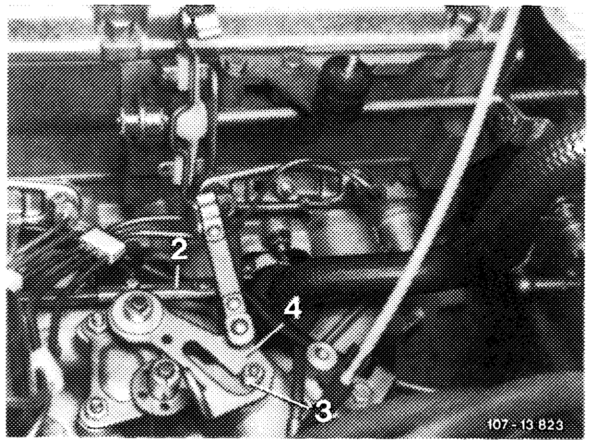


Cruise control/tempomat, electrical

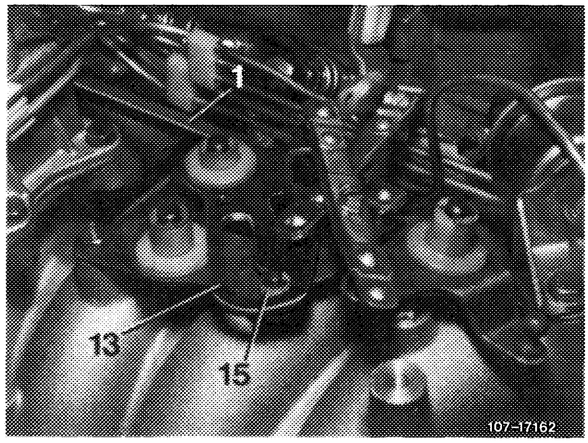
Check whether actuator rests against idle speed stop of cruise control/tempomat. For this purpose, disconnect pull rod (21) and push lever of actuator clockwise to idle speed stop.

When connecting pull rod (21), make sure that the lever of the actuator is raised by approx. 1 mm from idle speed stop. Adjust pull rod, if required.

7 Check whether roller (3 and 15) in slotted lever (4 and 13) rests free of play against end stop. Adjust with connecting rod (1 and 2), if required.

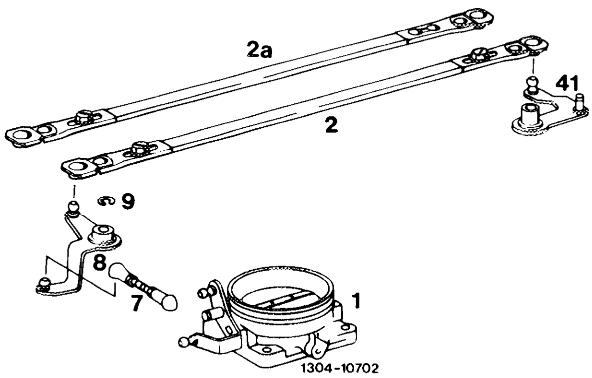


Model 123



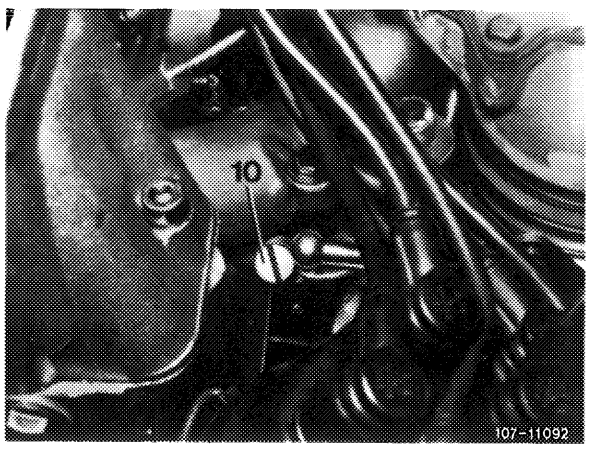
Model 126

Connecting rod can be adjusted on one side only. Pay attention to installation position (refer to Fig.).

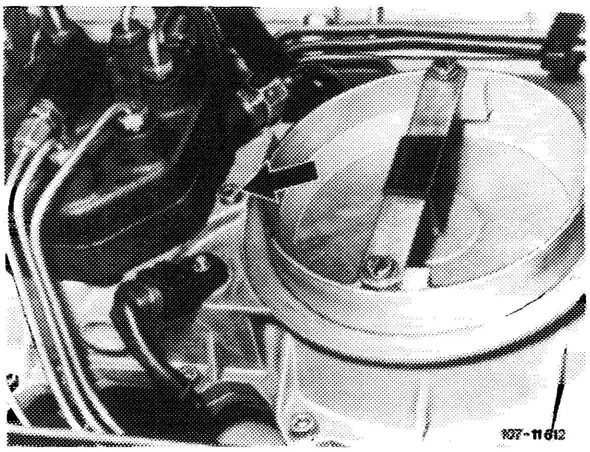


2 Former version
2a Present version

8 Set to specified speed by means of idle speed adjusting screw (10).



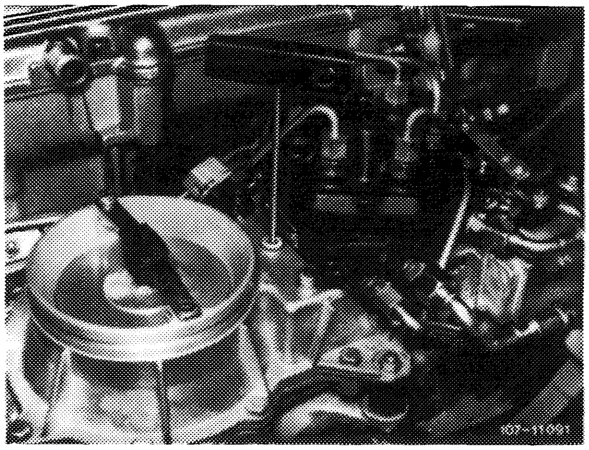
9 Adjusting idle speed emission value:



With gray iron fuel distributor

Unscrew closing plug (arrow).

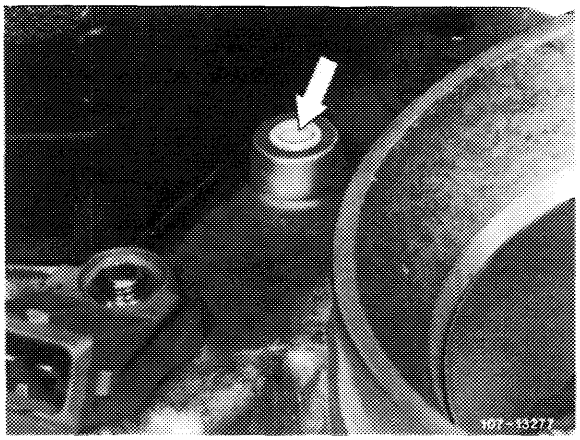
Attention!
On vehicles manufactured after 1.10.1976, remove safety plug first.



Insert screw driver through bore on idle speed mixture control screw and set emission value by turning screw.

Turning counterclockwise = leaner
Turning clockwise = richer

Close bore for closing plug. Accelerate for a short moment, check idle speed emission value and readjust, if required.



Following adjustments on vehicles manufactured after 1.10.1976, engines were provided with a blue safety plug (arrow), MB part no. 000 997 59 86.

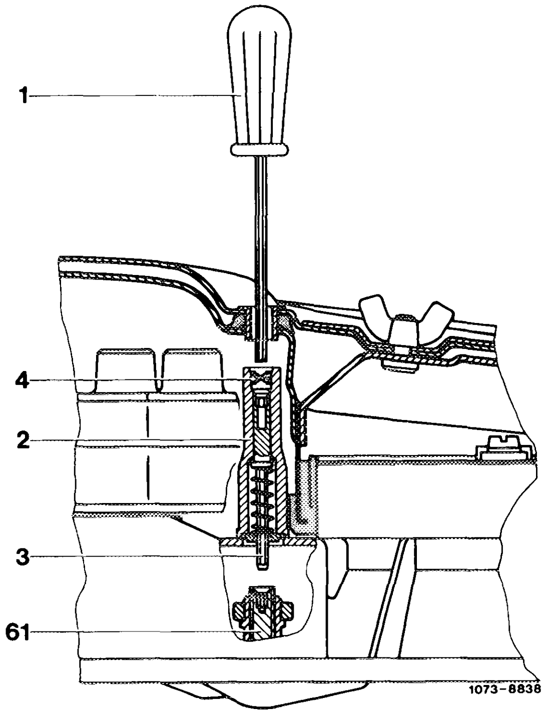
With light alloy fuel distributor

Pull out safety plug (4) by means of puller.

Push with screw driver (1) through recess on air cleaner top against adjusting device (2). Push adjusting device down with screw driver against spring force, turn slightly until hexagon (3) engages in mixture control screw (61).

Turning counterclockwise = leaner
Turning clockwise = richer

Release screw driver, the compression spring will then force adjusting device out of mixture control screw.



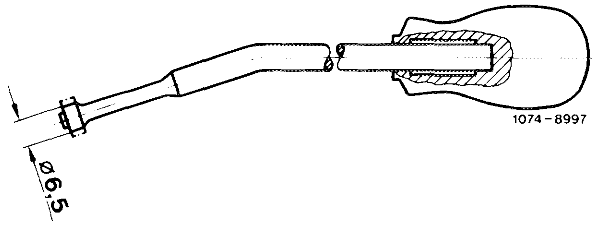
1 Screw driver
2 Adjusting device
3 Hexagon
4 Safety plug
61 Mixture control screw

Accelerate for a short moment, check idle speed emission value and readjust, if required.

Following adjustment, install a blue fuse plug (4), part no. 000 997 56 86 by means of installer.

Note: The diameter of the installer for knocking-in safety plug for protective cap of mixture control screw (61) has been changed from 8 mm to 6.5 mm.

In spare parts sector, only installers with changed diameter are now available. On former installers, grind diameter down to 6.5 mm.



10 With gray iron fuel distributor, mount air cleaner. Check idle speed emission value once again and readjust, if required.

11 Place selector lever into driving position, switch-on air conditioning, turn power steering to full lock, with engine running. Readjust engine speed, if required.

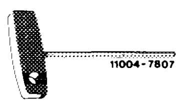
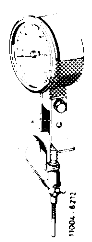
B. National version (AUS) (J) (S) (USA)

Identification label: Identification label in national language on radiator cross member.
Adjust engines according to data of respective emission label.

Testing and adjusting values

National version and model year	Idle speed 1/min	Idle speed emission value % CO **without air injection**
(AUS) Label: color code silver.		
1977–1980	800	0.5–1.5
1981/82	750–850	0.3–1.3
(J) Label: in Japanese language.		
1977–1980	800	0.4–2.0
(S) Label: color code blue.		
1977–1980	800	0.5–1.5
1981/82	750–850	0.3–1.3
(USA) Label: color code Federal black, California yellow.		
1977–1979	800	0.4–2.0

Special tools

Screw driver 3 mm with tommy handle for readjusting idle speed emission value		000 589 14 11 00
Puller		123 589 05 33 00
Installer		123 589 00 15 00
Oil telethermometer		116 589 27 21 00

Conventional testing instruments and accessories

CO-measuring instrument, revolution counter	
Digital tester	e.g. made by Bosch, MOT 001.03

Note

For adjustment of emission value at idle with light alloy fuel distributor, removal of air cleaner is no longer required.

Do not adjust idle speed if engine is too hot, e.g. immediately after a fast drive or after measuring output on chassis dynamometer.

Adjustment

1 Switch off air conditioning or automatic climate control. Move selector lever into position "P".

2 With gray iron fuel distributor, remove air cleaner.

3 Connect test instruments.

- Revolution counter
- CO-measuring instrument
- Digital tester
- Oil telethermometer

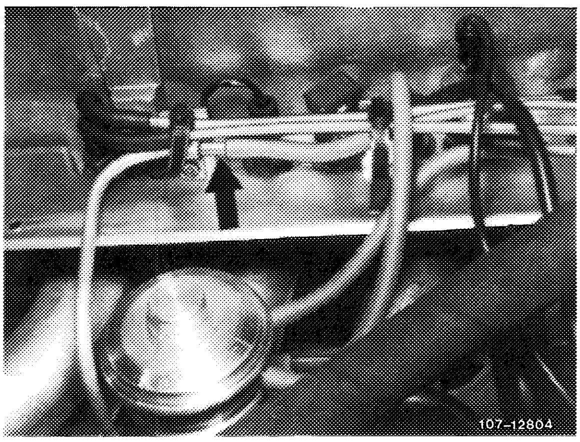
Connecting CO-measuring instrument

For this purpose, on J and USA version, pull conecting hose (arrow) from measuring point (exhaust back-pressure line).

Respective model years:
J 1977–1980
USA 1977–1979

Connect CO-measuring instruments and exhaust back-pressure line with a hose.

No catalyst is installed on USA tourist vehicles, for this reason, the emission value can be measured at exhaust tail pipe.



4 Run engine to 75–85 °C oil temperature.

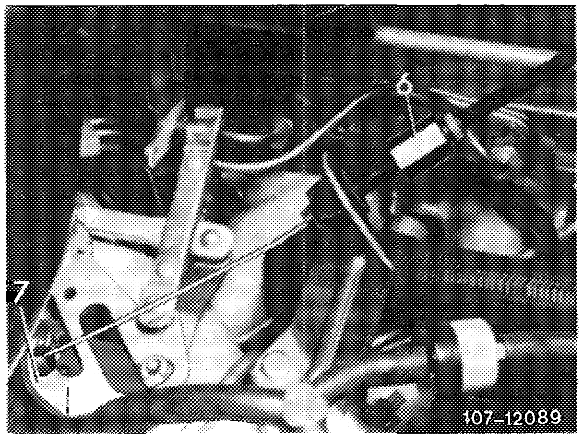
5 Check intake system for leaks. For this purpose, spray all sealing points with Iso-Oktan DIN 51756 or benzine.

Attention!
Do not use conventional fuel for spraying (unhealthy vapors). Pay attention to inflammability and do not spray on red-hot parts or components of ignition system.

6 Vehicles with cruise control/tempomat:

Cruise control/tempomat, pneumatic

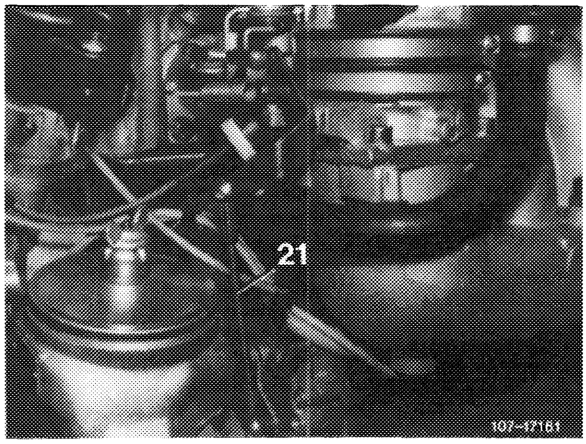
Check whether Bowden for cruise control/tempomat rests free of tension against regulating lever (7). Set with adjusting screw (6) if required.



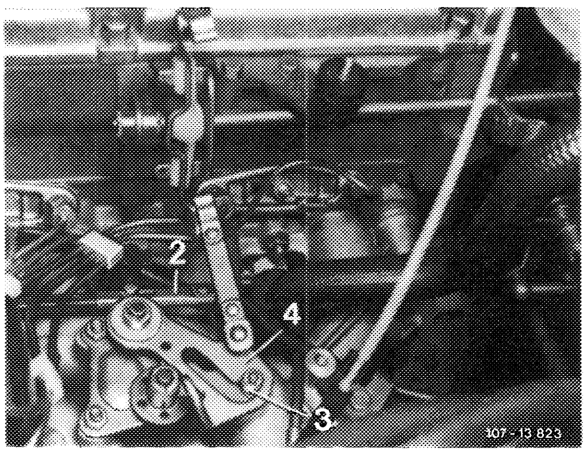
Cruise control/tempomat, electrical

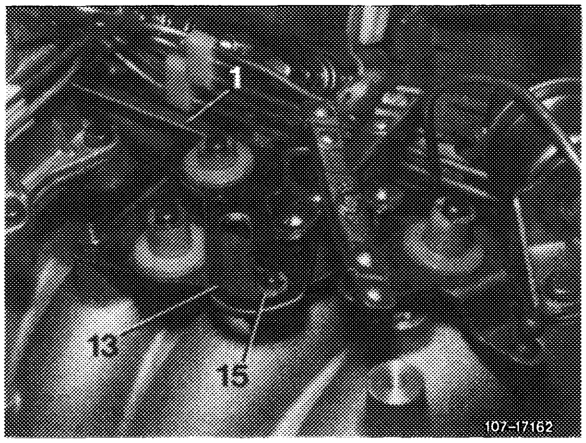
Check whether actuator rests against idle speed stop of cruise control/tempomat. For this purpose, disconnect pull rod (21) and push lever of actuator clockwise to idle speed stop.

When connecting pull rod (21), make sure that the lever of the actuator is raised from idle speed stop by approx. 1 mm. Adjust pull rod, if required.



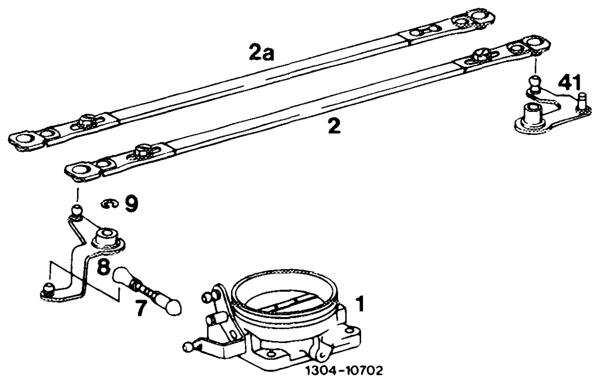
7 Check whether roller (3 and 15) in slotted lever (4 and 13) rests free of tension against final stop. Adjust with connecting rod (1 and 2), if required.





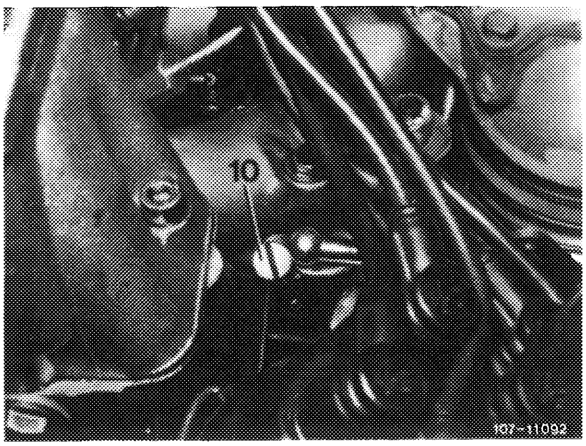
Model 126

Connecting rod can be adjusted on one side only.
Pay attention to installation position (refer to Fig.).



2 Former version
2a Present version

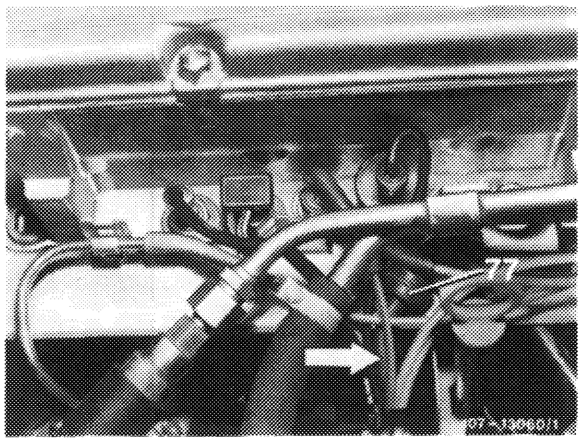
8 Set to specified engine speed by means of idle speed air screw (10).

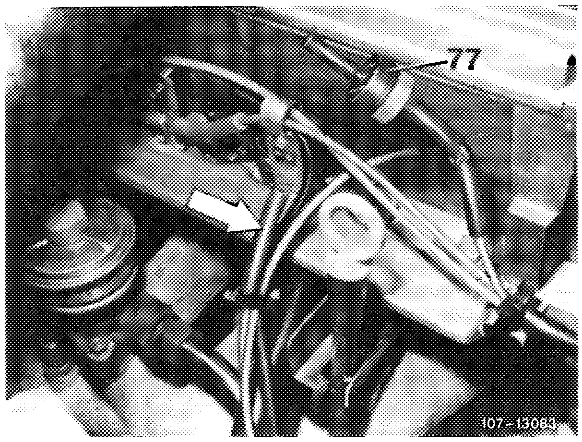


9 Check idle speed emission value.

(AUS) 1977–1982
(S) 1977–1982

Check idle speed emission value **without air injection.** For this purpose, pull blue/purple vacuum line (arrow) from delay valve (77) and close small tube. This will disconnect air injection.

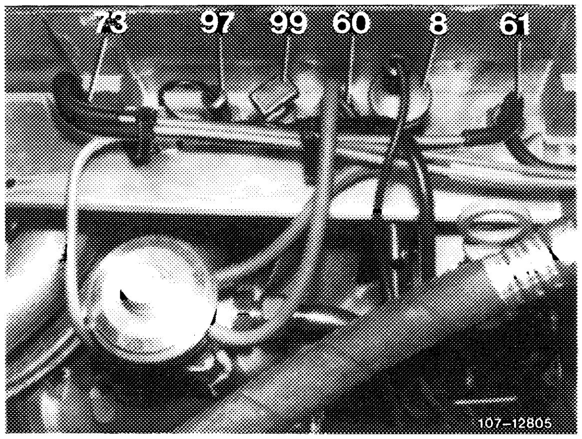




Ⓢ

Ⓙ 1977–1980
Ⓤⓢⓐ 1977–1979

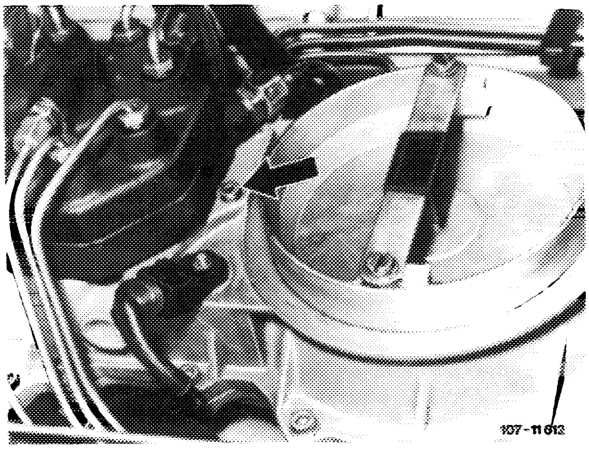
Check idle speed emission value **without** air injection, in cylinder head. For this purpose, pull blue vacuum line from blue thermo valve (60) and close line.
This will disconnect air injection.



10 Adjust idle speed emission value:

With gray iron fuel distributor

For this purpose, unscrew closing plug (arrow).



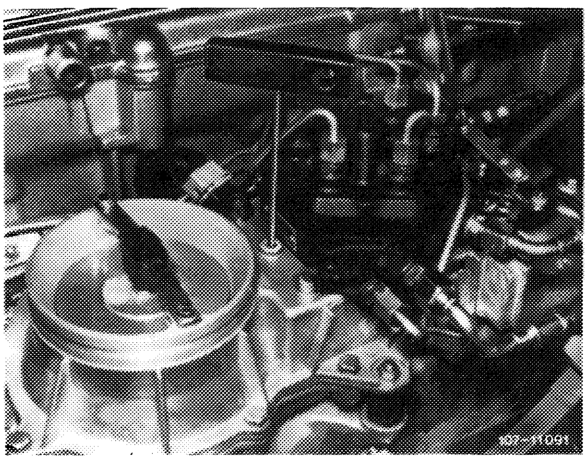
Insert screw driver through bore against idle speed mixture control screw and adjust emission value by turning screw.

Turning counterclockwise = leaner
Turning clockwise = richer

Close bore for closing plug. Accelerate for a short moment, check idle speed emission value once again and readjust, if required.

Put back vacuum line on thermo valve.

Check idle speed emission value again (air injection operational). The idle speed emission value should be **below** previously set value.



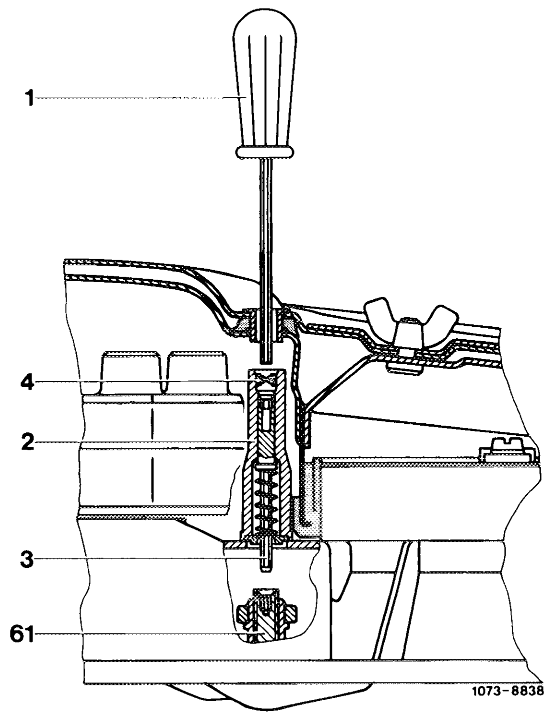
With light alloy fuel distributor

Pull out safety plug (4) with puller.

Insert screw driver (1) through cutout on air cleaner top and push against adjusting device (2). Push adjusting device down with screw driver against force of spring, turn slightly until hexagon (3) engages in mixture control screw (61).

Turning counterclockwise = leaner
Turning clockwise = richer

Release screw driver, the compression spring will disengage adjusting device from mixture control screw.



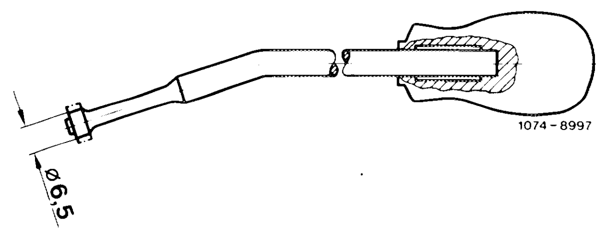
1 Screw driver
2 Adjusting device
3 Hexagon
4 Safety plug
61 Mixture control screw

Accelerate for a short moment, check idle speed emission value and readjust, if required.

Following adjustment, install a blue safety plug (4), part no. 000 997 56 86 by means of installer.

Note: The diameter of the installer for knocking-in safety plug for protective cap of mixture control screw (61) has been changed from 8 mm to 6.5 mm.

In spare parts sector, only the installers with changed diameter are now available. On former installers, grind diameter down to 6.5 mm.



11 With gray iron fuel distributor, mount air cleaner. Check idle speed and idle speed emission value once again and adjust, if required.

12 Place selector lever into driving position, engage air conditioning, turn power steering to full lock, while keeping engine running. Readjust engine speed, if required.

National version J USA

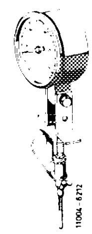
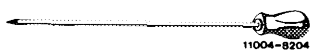
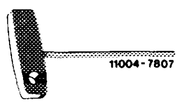
Identification: Information label in national language on radiator cross member.

Adjust engines according to data on respective emission label.

Testing and adjusting values

Model year	Idle speed 1/min	On-off ratio in % Test value	Adjusting value
J Identification: Label in Japanese language.			
1981/82	750 ± 50	40–60	50 ± 10
USA Identification: Label, black.			
1980/81	750 ± 50	40–60	50 ± 10

Special tools

Oil telethermometer		116 589 27 21 00
Puller for safety plug		123 589 05 33 00
Installer for safety plug		123 589 00 15 00
Screw driver 3 mm with tommy handle for readjusting idle speed emission value		000 589 14 11 00

Conventional testing instruments

Revolution counter	
Digital tester	e.g. made by Bosch, MOT 001.03
Lambda control tester KDJE-P 600	e.g. made by Bosch

Adjustment

1 Connect digital tester or revolution counter, oil telethermometer and lambda control tester.

2 Switch off air conditioning or automatic climate control. Move selector lever into position "P".

3 Run engine to 75–85 °C.

4 Check whether throttle valve lever rests against idle speed stop.

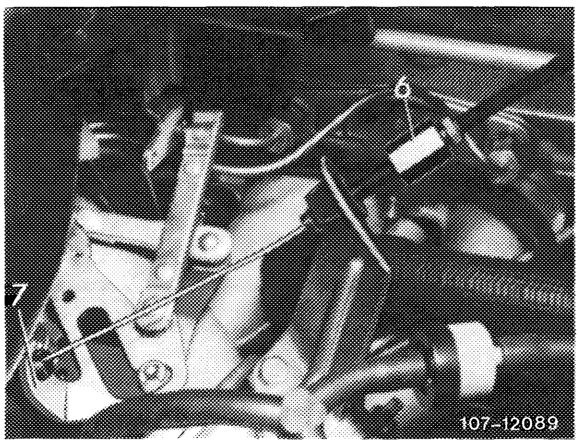
5 Check intake system for leaks. For this purpose, spray all sealing points with Iso-Oktan DIN 51756 or benzine.

Attention!
Do not use conventional fuel for spraying (unhealthy vapors). Pay attention to inflammability and do not spray on red-hot parts or components of ignition system.

6 Vehicles with cruise control/tempomat:

Cruise control/tempomat, pneumatic

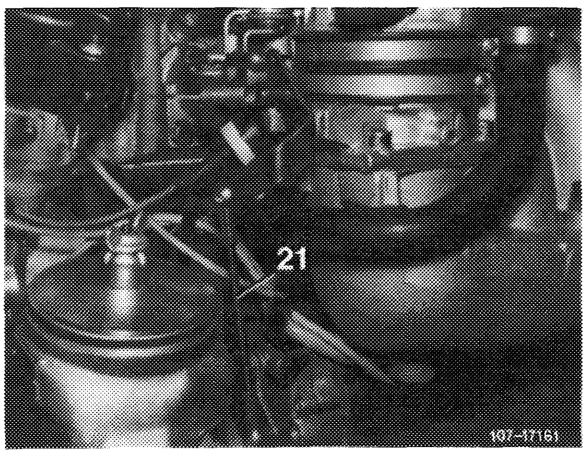
Check whether bowden wire for cruise control/tempomat rests free of tension against regulating lever (7). Adjust with adjusting nut (6), if required.



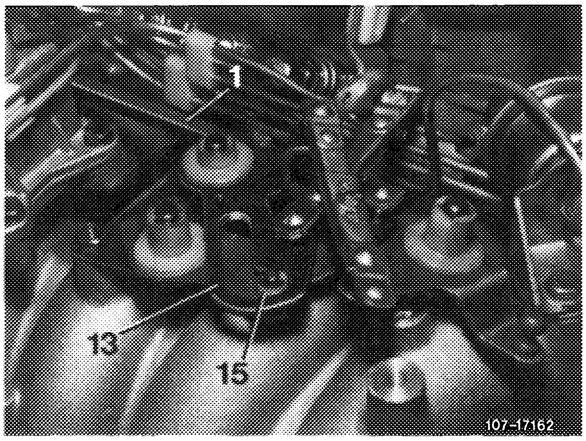
Cruise control/tempomat, electrical

Check whether actuator rests against idle speed stop of cruise control/tempomat. For this purpose, disconnect pull rod (21) and push lever of actuator clockwise to idle speed stop.

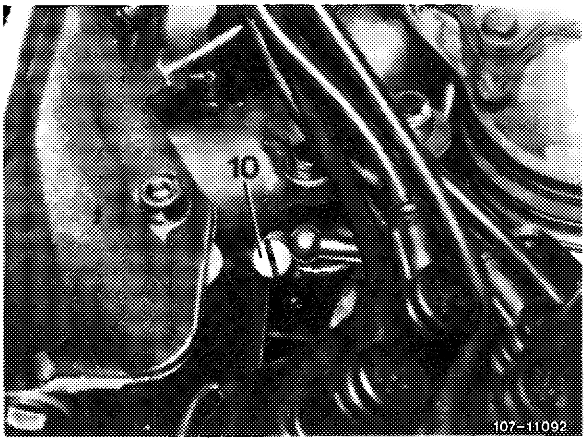
When connecting pull rod (21), make sure that lever of the actuator is raised by approx. 1 mm from idle speed stop. Adjust pull rod, if required.



7 Check whether roller (15) in slotted lever (13) rests free of tension against final stop. Adjust with connecting rod (1), if required.



8 Run engine at idle, switch off all electrical auxiliary consumers. Adjust an idle speed of 750–50/min by means of idle speed air screw (10).



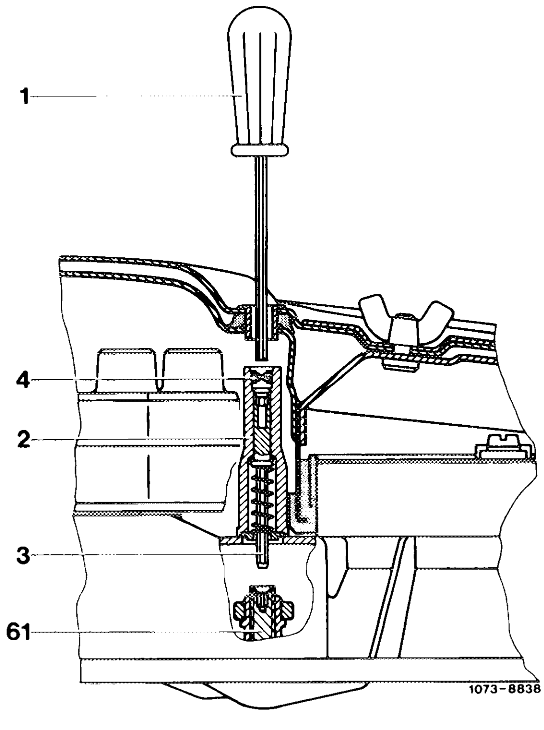
9 Check on-off ratio and adjust, if required.
(J) starting 1981, (USA) 1980.

Note: Air cleaner need not be removed for adjusting on-off ratio at idle.

Read on-off ratio on tester, if value is between 40–60 %, on-off ratio is in order. If not, pull out safety plug (4) by means of puller.

Insert screw driver (1) through cutout in air cleaner top and push against adjusting device (2). Push adjusting device down by means of screw driver against force of spring, turn slightly until hexagon (3) enters mixture control screw (61).

Turning counterclockwise = 60 % (leaner)
Turning clockwise = 40 % (richer)



Release screw driver, compression spring will push adjusting device out of mixture control screw.

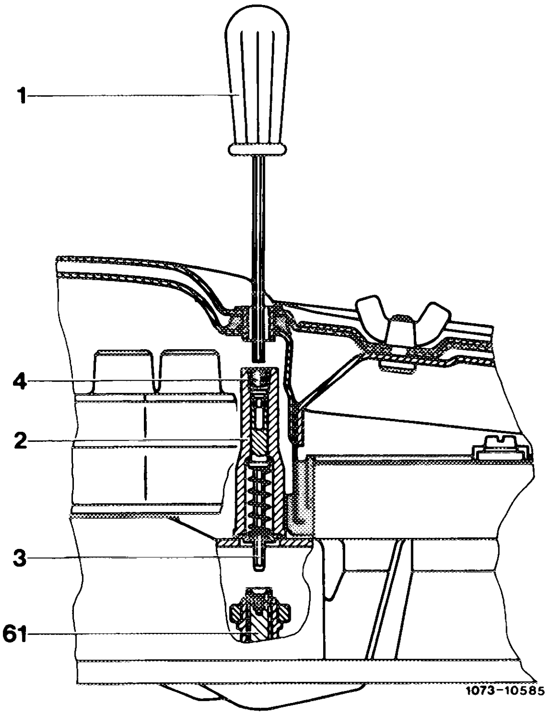
Accelerate for a short moment, check on-off ratio and readjust, if required.

Following adjustment, install a blue safety plug (4), part no. 000 997 56 86 by means of installer.

(USA) 1981

Note

The adjusting device (2) is provided with a protective steel cap (4). Remove this cap only in the event of repairs, e.g. when renewing fuel distributor.



Read on-off ratio on tester, if value is between 40–60 %, on-off ratio is in order. If not, remove air cleaner.

Punch mark protective cap (4) and drill through sleeve with a 2 mm twist drill.

Screw 2.5 mm sheet metal screw (cut off tip) into hole and pull out protective cap (4) by means of pliers.

Push with screw driver (1) against adjusting device (2). Push adjusting device down with screw driver against force of spring, turn slightly until hexagon (3) enters mixture control screw (61).

Turning counterclockwise = 60 % (leaner)
Turning clockwise = 40 % (richer)

Release screw driver, compression spring will then push adjusting device out of mixture control screw.

Mount air cleaner, accelerate for a short moment, check on-off ratio and readjust, if required.

Following adjustment, install new protective cap (4), part no. 116 070 00 54.

10 Move selector lever into driving position, switch on air conditioning, turn power steering to full lock, engine should now run smoothly. Readjust speed, if required.

A. Standard version

Testing and adjusting values

Engine	Idle speed 1/min	Idle speed emission value % CO
110.984/985/986/987	750–850	0.5–1.5
110.988/989/990	700–800	

Battery voltages

Rest potential	12.2 V
Starting voltage, min.	10 V

Voltages at ignition coil (with engine stopped and ignition switched on)

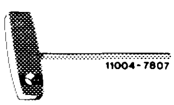
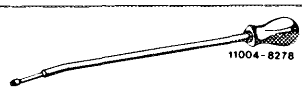
Transistorized ignition system TSZ 4

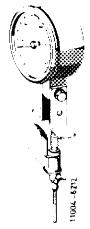
Voltage at terminal 15	approx. 4.5 V
Voltage at terminal 1	0.5–2.0 V
Pre-resistance bridge (when starting)	10 V

Transistorized ignition system TSZ 8 u

Terminal 15 (bushing 5 on diagnosis socket) against mass	Battery voltage
Terminal 1 and 15 (bushing 5 and 4 at diagnosis socket)	0 V

Special tools

Screw driver 3 mm with tommy handle for readjusting idle speed emission value		000 589 14 11 00
Puller		123 589 05 33 00
Installer		123 589 00 15 00

Oil telethermometer		116 589 27 21 00

Conventional testing instruments and accessories

CO-measuring instrument, revolution counter, stroboscope, voltmeter, oscilloscope

Digital tester	e.g. made by Bosch, MOT 001.03

Note

Do not regulate engine of it is too hot, e.g. immediately following a fast drive or after measuring output on chassis dynamometer.

Regulation

1 Switch-off air conditioning or automatic climate control. Move selector lever into position "P".

2 Remove air cleaner.

3 Check engine regulating linkage for easy operation and wear. Lubricate all bearing points and ball sockets.

4 Perform full throttle checkup from inside vehicle (30–300).

5 Connect test instruments: CO-measuring instrument, revolution counter, stroboscope, oscilloscope, digital tester, oil telethermometer.

6 Evaluate oscilloscope display.

7 Check firing point and adjust, if required. Check centrifugal and vacuum ignition adjustment (15–501).

8 Test battery voltages.

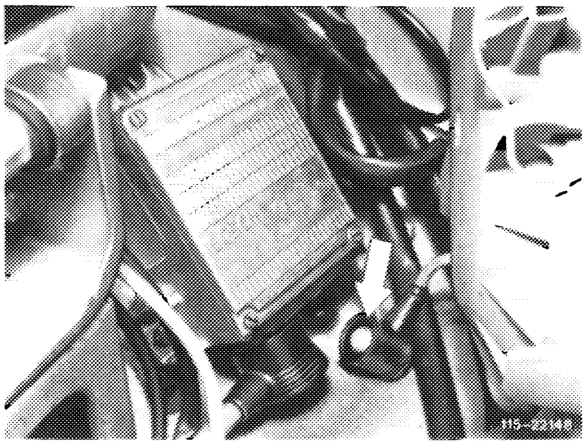
Note: Voltmeter connection remains unchanged during tests a) and b).

a) Rest potential

Connect voltmeter to battery while paying attention to polarity and read voltages. Nominal value 12.2 Volts.

b) Starting voltage

Pull plug from transmitter of ignition distributor on switching unit (green cable) or protective plug, part no. 102 589 02 21 00, plug on diagnosis socket.



Operate starter for a short moment while reading voltage. Nominal value min. 10 Volts; if nominal value is not attained, test battery, charge or replace, if required.

9 Voltages on ignition coil:

Transistorized ignition system TSZ 4

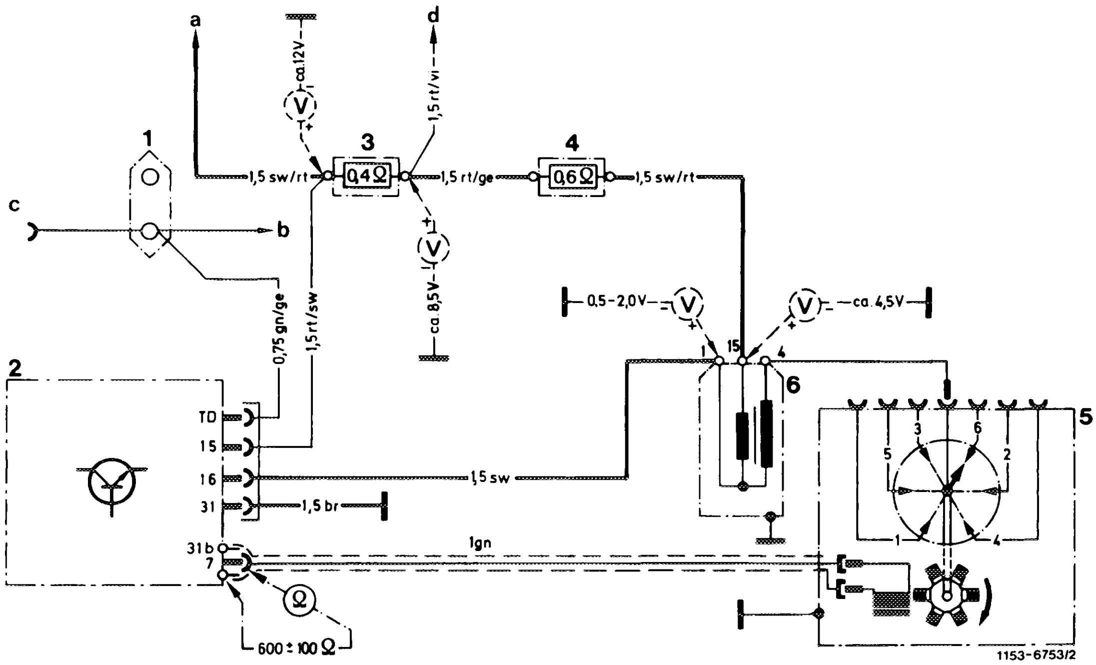
Test voltage on terminal 15 of ignition coil. For this purpose, disconnect positive cable of voltmeter from battery and connect to terminal 15 of ignition coil.

Switch-on ignition and read voltage. Nominal value approx. 4.5 volts.

Voltage test on terminal 1 of ignition coil. For this purpose, disconnect positive cable of voltmeter from terminal 15 and connect to terminal 1 of ignition coil.

Switch-on ignition and read voltage. Nominal value 0.5–2.0 Volts.

Test pre-resistance bridge by starting engine and reading voltage during starting procedure. Nominal value 10 Volts.



Wiring diagram breakerless transistorized ignition TSZ 4

1 2-point cable connector
2 Switching unit
3 Pre-resistor 0.4 Ω
4 Pre-resistor 0.6 Ω
5 Ignition distributor with transmitter section
6 Ignition coil

a Ignition starting switch
b Instrument cluster revolution counter
c Diagnosis socket
d Terminal 16 starter

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

Transistorized ignition system TSZ 8 u

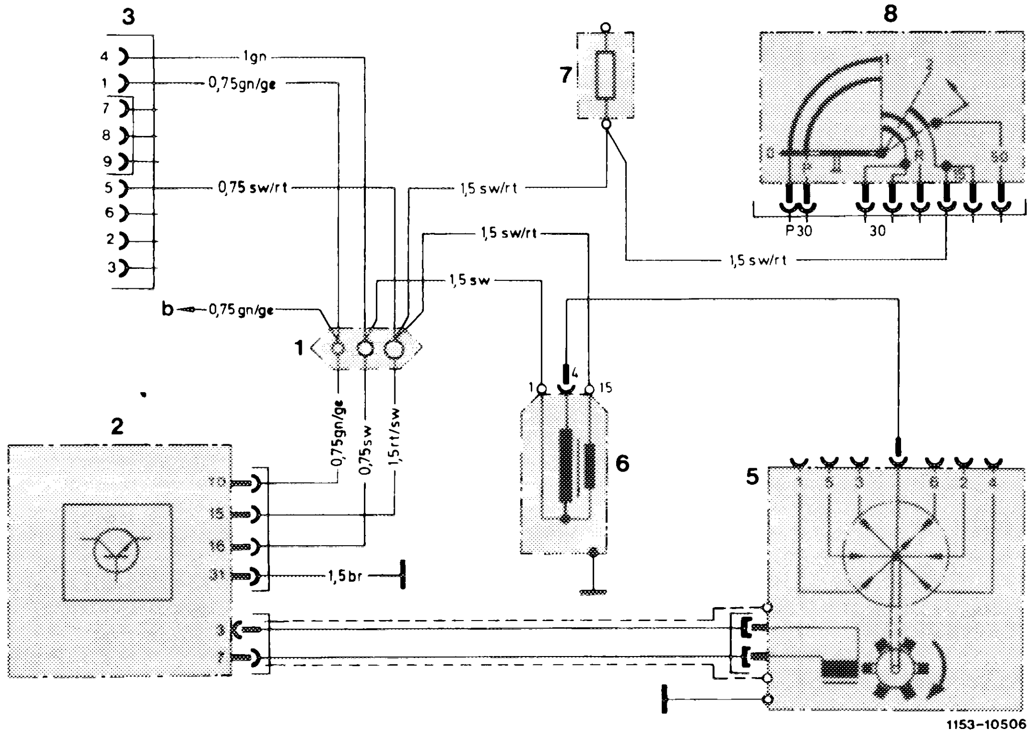
Switch-on ignition with engine stopped. Check voltage on jack 5 of diagnosis socket (3). Test terminal 15 against ground.

Nominal value: Battery voltage.

Test voltage difference between terminal 15 and terminal 1 on jack 5 and 4 of diagnosis socket (3).

Nominal value: 0 Volt.

If nominal values are not attained, test ignition system (15–562).

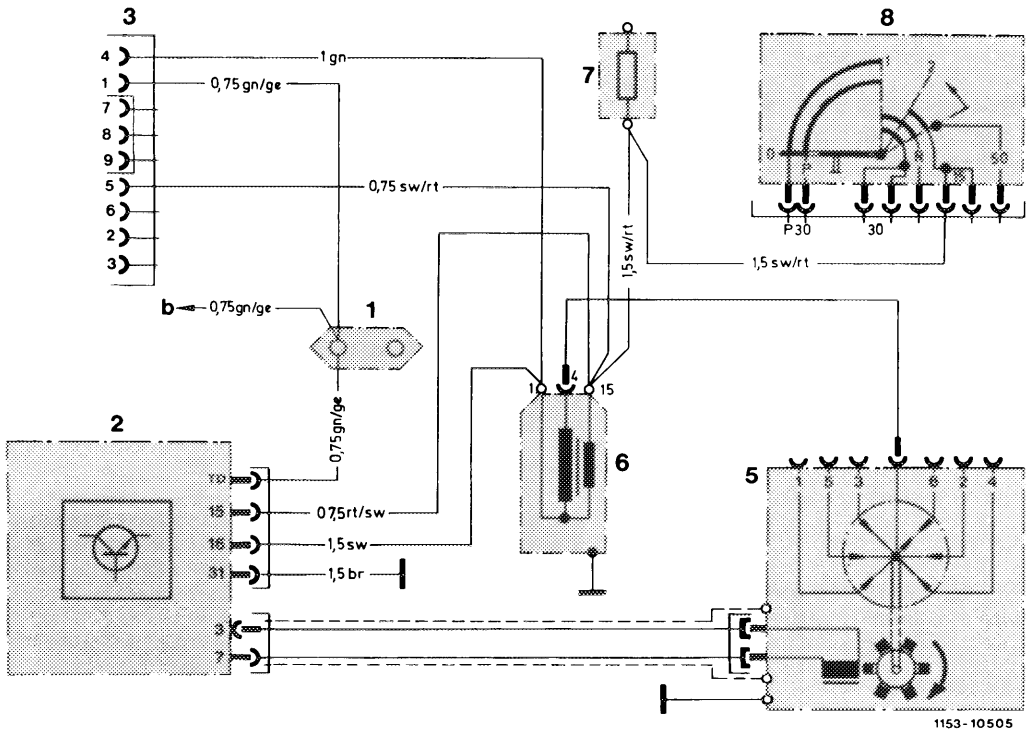


Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u in model 123

1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starting switch

a To fuse box, input terminal 15
b To fuel pump relay with rpm limitation

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black



Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u in model 107, 126

1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starting switch

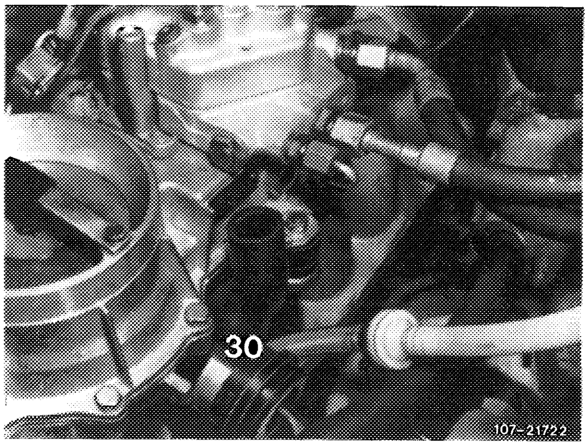
a To fuse box, input terminal 15
b To fuel pump relay with rpm limitation

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

10 Check intake system for leaks. For this purpose, spray all sealing points with Iso-Oktan DIN 51756 or benzine.

Attention!
Do not use conventional fuel for spraying (unhealthy vapors). Pay attention to inflammability and do not spray on red-hot parts or components of ignition system.

Checking decel shutoff:



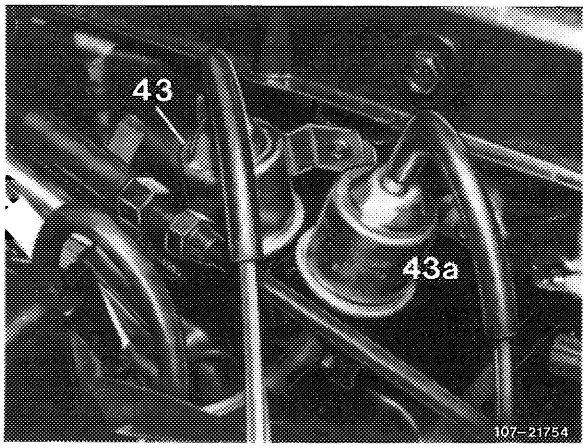
Checking on chassis dynamometer

Run on chassis dynamometer at approx. 70 km/h in 4th speed or driving position "D". Release accelerator pedal, air flow sensor plate will then move into zero position. When combustion starts again at approx. 1100 /min or approx. 1300/min with refrigerant compressor, the air flow sensor plate will move into idle speed position. Check decel shutoff valve and its activation, if required (07.3–140).

Checking without chassis dynamometer (07.3–140).

Run engine at idle.

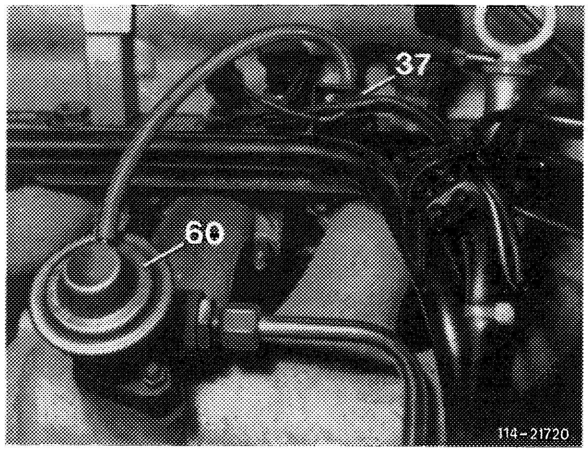
Pull vacuum lines from switchover valve (43a) and connect with each other. Decel shutoff valve (30) opens, engine should now stop. Check activation, if required.



43	Switchover valve air conditioning (identification: green cap)
43a	Switchover valve decel shutoff (identification: gray cap)

12 Check EGR.

Pull vacuum line from EGR valve (60), plug-on test hose and activate with a vacuum. If engine is not clearly running worse, replace EGR valve. Check activation, if required (14–475).

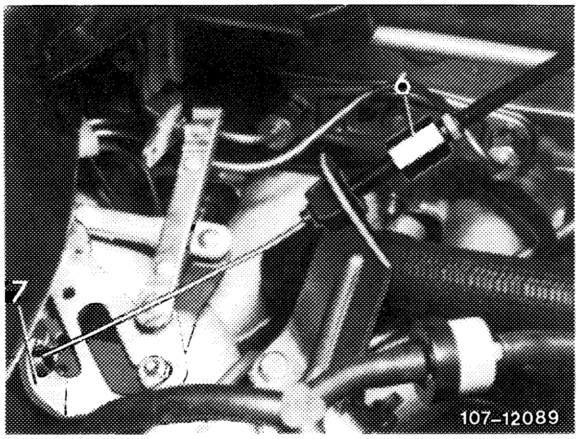


13 Run engine to 75–85 °C oil temperature.

14 Vehicles with cruise control/tempomat:

Cruise control/tempomat, pneumatic

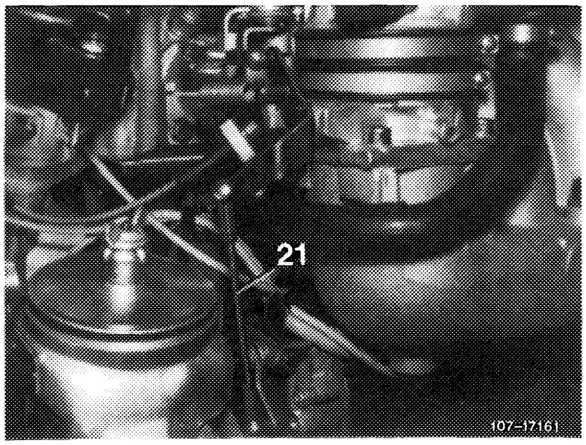
Check whether bowden wire for cruise control/tempomat rests free of tension against regulating lever (7). Adjust with adjusting nut (6), if required.



Cruise control/tempomat, electrical

Check whether actuator rests against idle stop of cruise control/tempomat. For this purpose, disconnect pull rod (21) and push lever of actuator clockwise against idle speed stop.

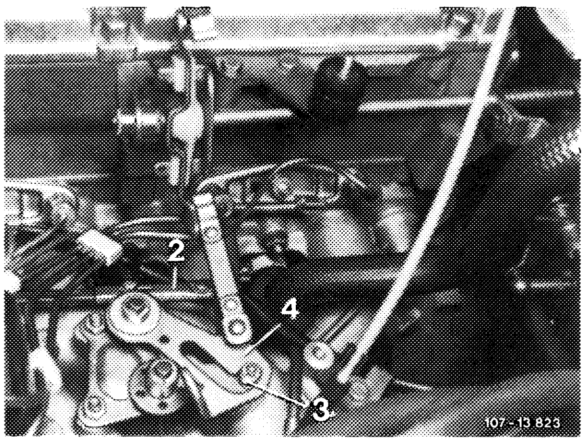
When connecting pull rod (21), make sure that the lever of the actuator is raised by approx. 1 mm from idle speed stop. Adjust pull rod, if required.



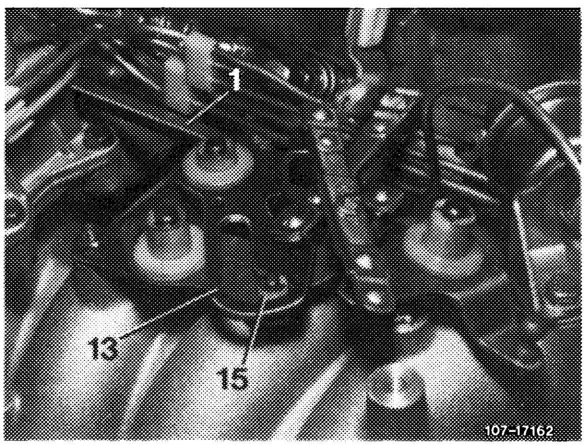
15 Check whether throttle valve rests against idle speed stop. Disconnect connecting rod for this purpose.

16 Check whether roller (3 and 15) on slotted lever (4 and 13) rests free of tension against final stop. Adjust with connecting rod (1 and 2), if required.

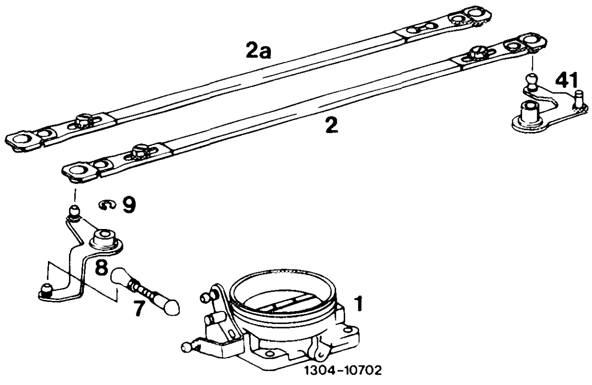
Model 123



Model 126

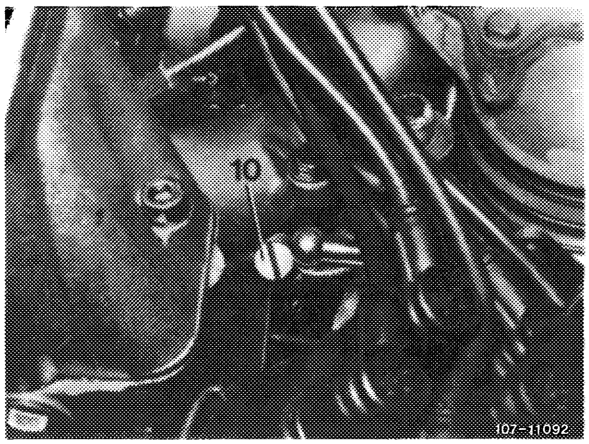


The connecting rod can now be adjusted on one side only. Pay attention to installation position (refer to Fig.).



2 Former version
2a Present version

17 Set to specified engine speed by means of idle speed air screw (10).

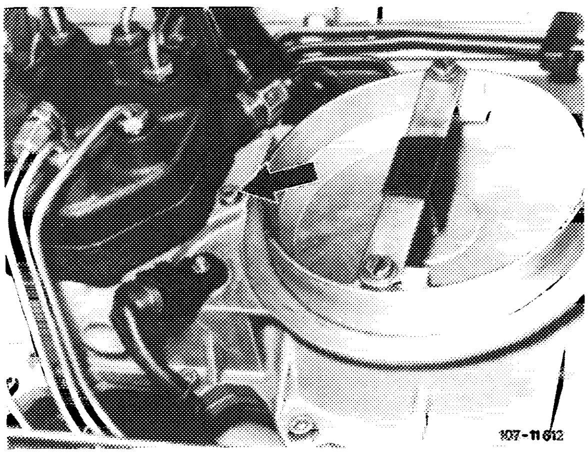


18 Adjust idle speed emission value:

With gray iron fuel distributor

For this purpose, unscrew closing plug (arrow).

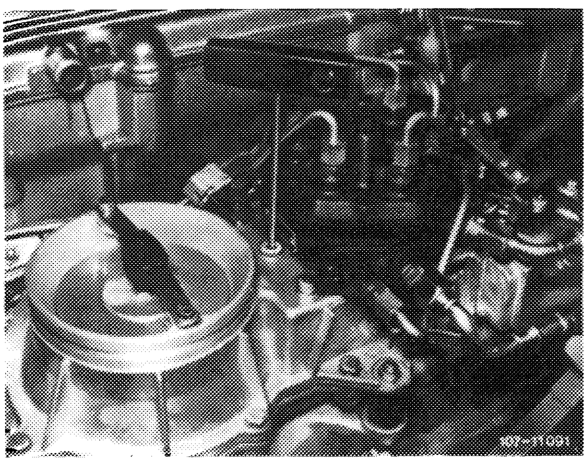
Attention!
On vehicles manufactured after 1.10.1976, remove safety plug first.



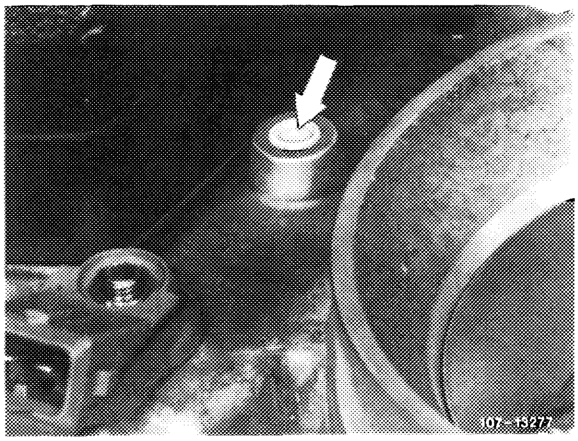
Insert screw driver through bore against idle speed mixture control screw and adjust emission value by turning screw.

Turning counterclockwise = leaner
Turning clockwise = richer

Close bore for closing plug. Accelerate for a short moment, check idle speed emission value and readjust, if required.



Following adjustment, install a blue safety plug (arrow), part no. 000 997 59 86 on vehicles manufactured after 1.10.1976.



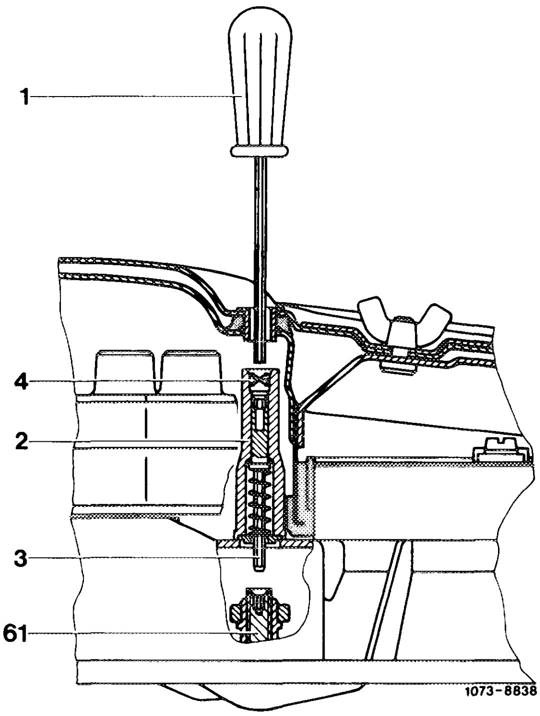
With light alloy fuel distributor

Pull out safety plug (4) by means of puller.

Push with screw driver (1) against adjusting device (2). Push adjusting device down with screw driver against force of spring, turn slightly until hexagon (3) enters mixture control screw (61).

Turning counterclockwise = leaner
Turning clockwise = richer

Release screw driver, the compression spring will disengage adjusting device from mixture control screw.



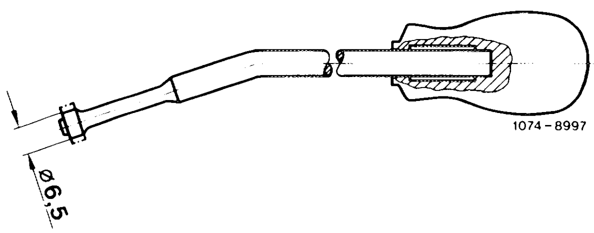
1 Screw driver
2 Adjusting device
3 Hexagon
4 Safety plug
61 Mixture control screw

Accelerate for a short moment, check idle speed emission value and readjust, if required.

Following adjustment, install a blue safety plug (4), part no. 000 997 56 86 by means of installer.

Note: The diameter of the installer for knocking back safety plug for protective cap of mixture control screw (61) had to be changed from 8 mm to 6.5 mm.

In spare parts sector only installers with changed diameter are now available. On former installers, grind diameter down to 6.5 mm.



19 Mount air cleaner. Check idle speed and idle speed emission value once again and readjust, if required.

20 Move selector lever into driving position, engage air conditioning, turn power steering to full lock, engine should run smoothly. Readjust engine speed, if required.

B. National version (AUS) (J) (S) (USA)

Identification: Label in national language on radiator cross member.
Adjust engines according to data of respective emission label.

Testing and adjusting values

National version and model year	Idle speed 1/min	Idle speed emission value % CO **without air injection**
(AUS) Label: Color code silver.		
1977–1980	800	0.5–1.5
1981/82	750–850	0.3–1.3
(J) Label: In Japanese language.		
1977–1980	800	0.4–2.0
(S) Label: Color code blue.		
1977–1980	800	0.5–1.5
1981/82	750–850	0.3–1.3
(USA) Label: Color code Federal black, California yellow.		
1977–1979	800	0.4–2.0

Battery voltages

Rest potential	12.2 V
Starting voltage min.	10 V

Voltages on ignition coil (with engine stopped and ignition switched on)

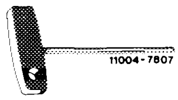
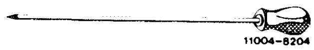
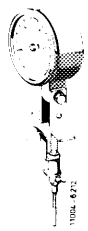
Transistorized ignition system TSZ 4

Voltage at terminal 15	approx. 4.5 V
Voltage at terminal 1	0.5 –2.0 V
Pre-resistance bridge (while starting)	10 V

Transistorized ignition system TSZ 8 u

Terminal 15 (bushing on diagnosis socket) against ground	Battery voltage
Terminal 1 and 15 (bushing 5 and 4 on diagnosis socket)	0 V

Special tools

Screw driver 3 mm with tommy handle for readjusting idle speed emission value		000 589 14 11 00
Puller		123 589 05 33 00
Installer		123 589 00 15 00
Oil telethermometer		116 589 27 21 00

Conventional testing instruments and accessories

CO-measuring instrument, revolution counter, stroboscope, oscilloscope, voltmeter	
Digital tester	e.g. made by Bosch, MOT 001.03

Note

Do not regulate engine when engine is too hot, e.g. immediately after a fast drive or after measuring output on chassis dynamometer.

Regulation

1 Switch-off air conditioning or automatic climate control. Move selector lever into position "P"

2 Remove air cleaner.

3 Check engine regulating linkage for easy operation and wear. Lubricate all bearing points and ball sockets.

4 Perform full throttle checkup from inside vehicle (30–300).

5 Connect test instruments: CO-measuring instrument, revolution counter, stroboscope, oscilloscope, digital tester, oil telethermometer.

6 Evaluate oscilloscope display.

7 Check firing point and adjust, if required. Check centrifugal and vacuum ignition adjustment (15–501).

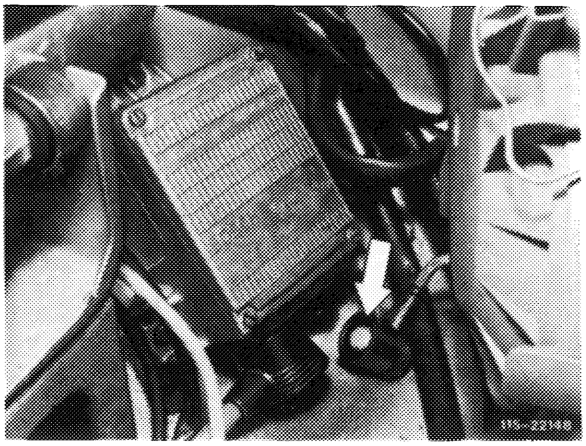
8 Test battery voltages.

Note: Voltmeter connection remains unchanged during tests a) and b).

a) Rest potential

Connect voltmeter to battery while paying attention to polarity and read voltages. Nominal value 12.2 Volts.

b) Starting voltage



Pull plug from transmitter of ignition distributor on switching unit (green cable) or plug protective plug, part no. 102 589 02 21 00 on diagnosis socket.

Operate starter for a short moment while reading voltage. Nominal value min. 10 Volts. If nominal value is not attained, test battery, charge and renew, if required.

9 Voltages on ignition coil:

Transistorized ignition system TSZ 4

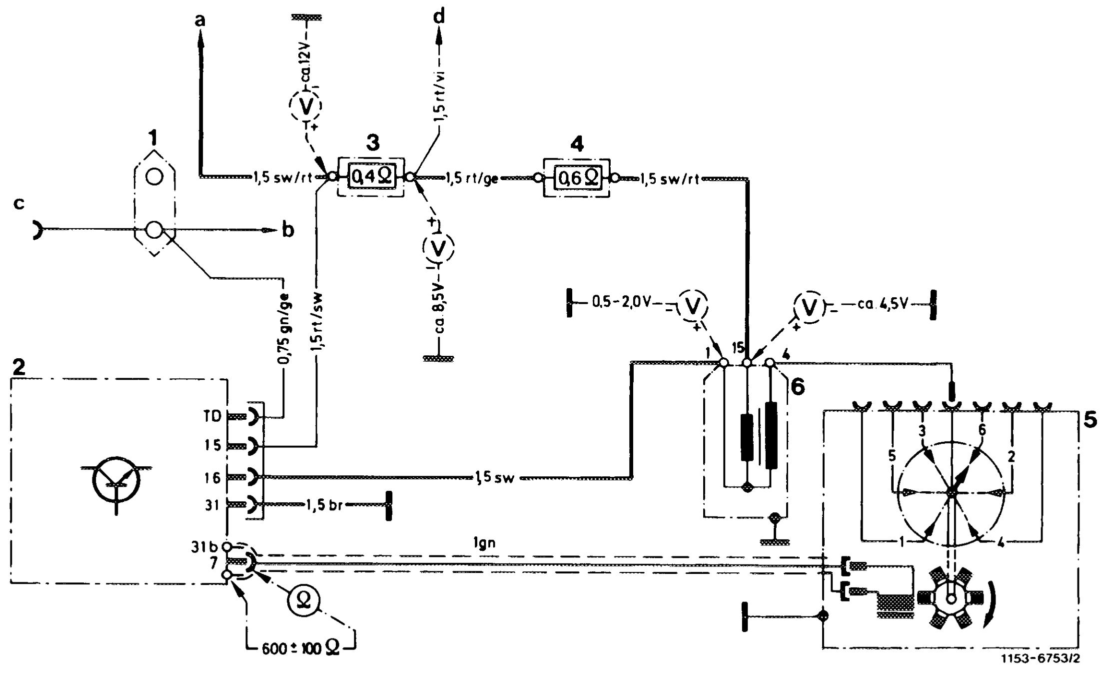
Test voltage on terminal 15 of ignition coil. For this purpose, disconnect voltmeter from battery and connect to terminal 15 of ignition coil.

Switch-on ignition and read voltage. Nominal value approx. 4.5 Volts.

Test voltage on terminal 1 of ignition coil. For this purpose, disconnect positive cable of voltmeter from terminal 15 and connect to terminal 1 of ignition coil.

Switch-on ignition and read voltage. Nominal value 0.5–2.0 Volts.

Test pre-resistance bridge by starting engine and read voltage during starting procedure. Nominal value 10 Volts.



Wiring diagram breakerless transistorized ignition system TSZ 4

1 2-point cable connector
2 Switching unit
3 Pre-resistor 0.4 Ω
4 Pre-resistor 0.6 Ω
5 Ignition distributor with transmitter section
6 Ignition coil

a Ignition starting switch
b Instrument cluster revolution counter
c Diagnosis socket
d Terminal 16 starter

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

Transistorized ignition system TSZ 8 u

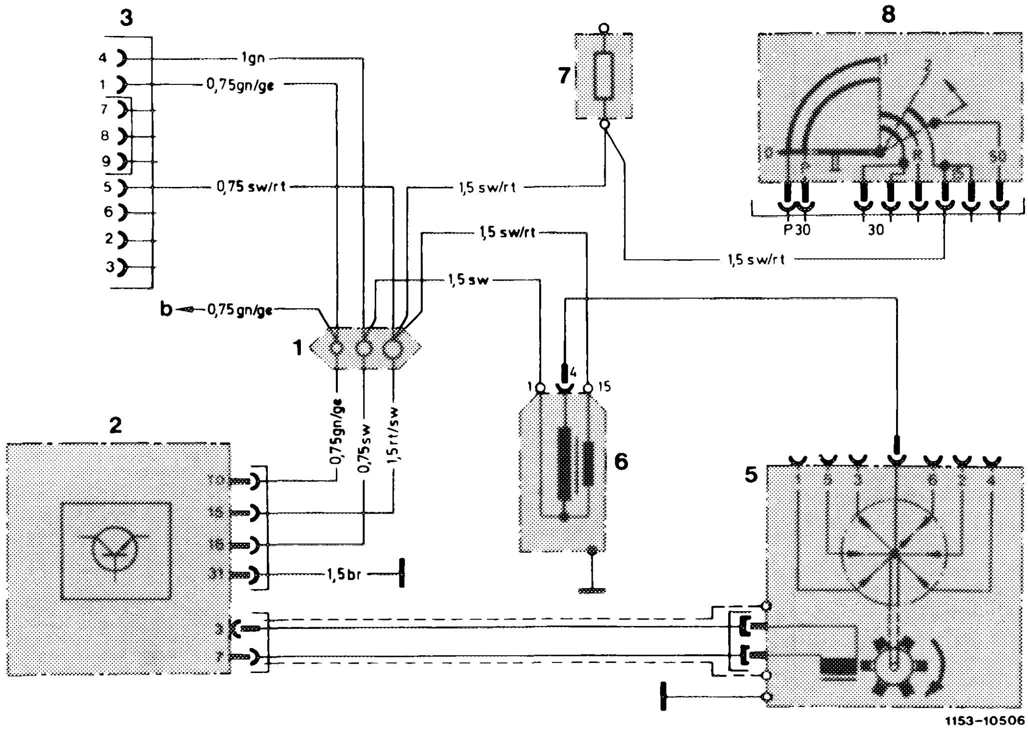
Switch-on ignition with engine stopped. On jack 5 of diagnosis socket (3) test voltage, terminal 15 against ground.

Nominal value: Battery voltage.

On jack 4 and 5 of diagnosis socket (3) test voltage difference between terminal 15 and terminal 1.

Nominal value: 0 Volt.

If nominal voltages are not attained, test ignition system (15–562).

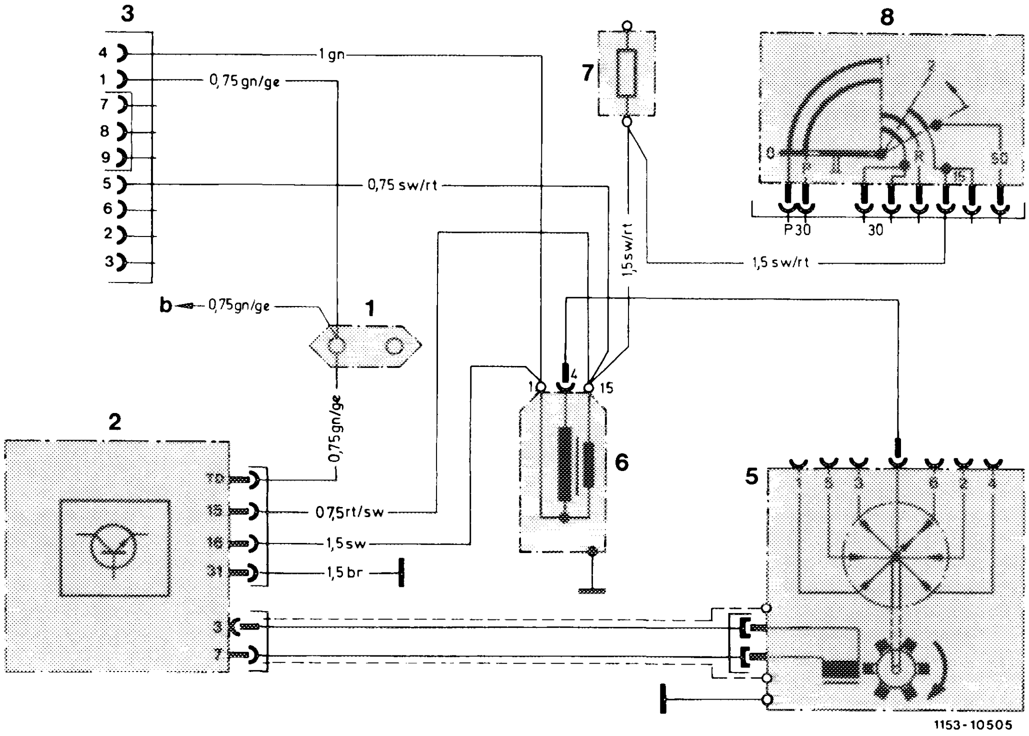


Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u in model 123

1 Line connector
2 Switching unit
3 Diagnosis plug
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starting switch

a To fuse box, input terminal 15
b To fuel pump relay with rpm limitation

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black



Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u in model 107, 126

1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starting switch

a To fuse box, input terminal 15
b To fuel pump relay with rpm limitation

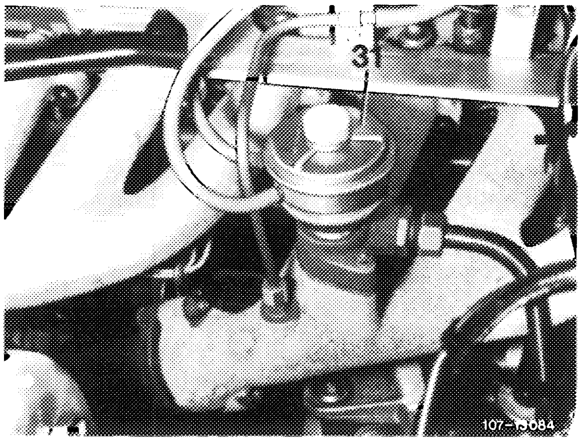
Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

10 Check intake system for leaks. For this purpose, spray all sealing points with Iso-Oktan DIN 51756 or benzine.

Attention!
Do not use conventional fuel for spraying (unhealthy vapors), pay attention to inflammability and do not spray on red-hot parts or components of ignition system.

11 Check EGR.

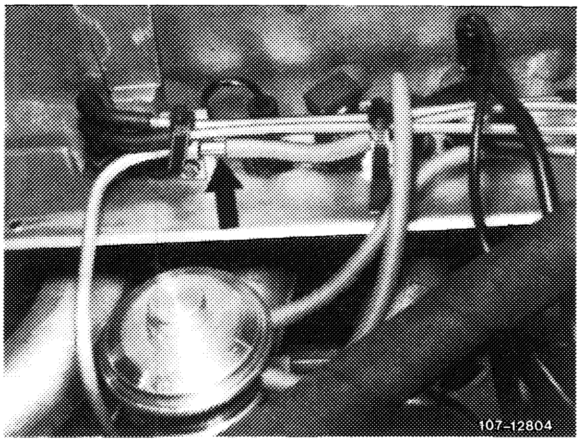
Pull red/purple vacuum line from EGR valve (31). Plug-on test hose and activate with a vacuum. If the engine is not running noticeably worse, replace EGR valve.



12 Run engine to 75–85 °C oil temperature.

13 Connect CO-measuring instrument.

For this purpose, pull connecting hose (arrow) of measuring point (exhaust back pressure line) on (J) and (USA) version.



Respective model years:
(J) 1977–1980
(USA) 1977–1979

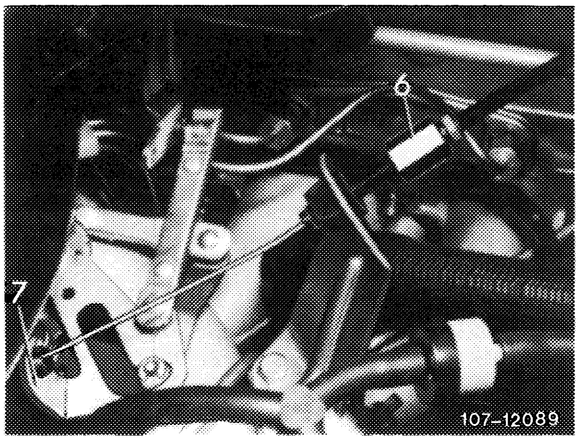
Connect CO-measuring instrument and exhaust back-pressure line by means of a hose.

No catalyst is installed on (USA) tourist vehicles, for this reason, the exhaust gas value can be measured on exhaust tail pipe.

14 Vehicles with cruise control/tempomat:

Cruise control/tempomat, pneumatic

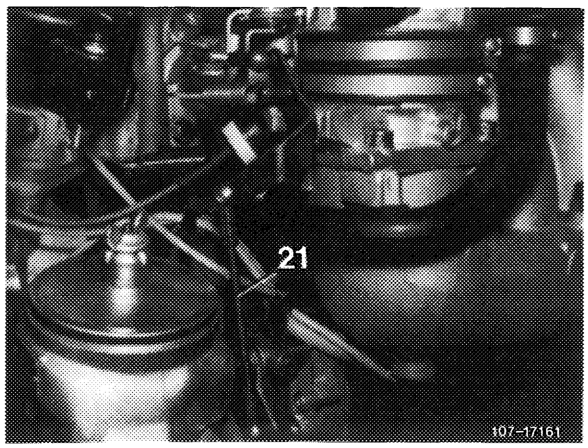
Check whether bowden wire for cruise control/tempomat rests free of tension against regulating lever (7). Adjust with adjusting screw (6), if required.



Cruise control/tempomat, electric

Check whether activator rests against idle speed stop of cruise control/tempomat. For this purpose, disconnect pull rod (21) and push lever of activator clockwise against idle speed stop.

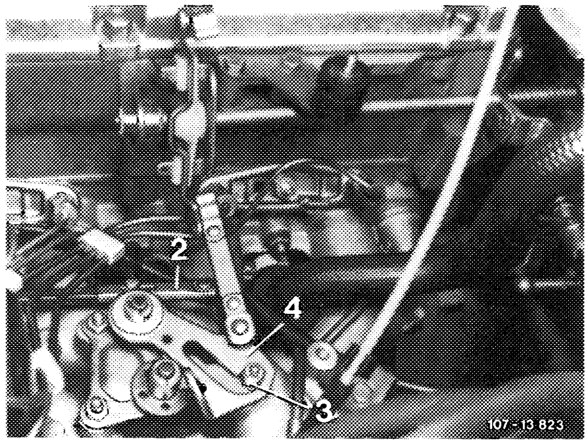
When connecting pull rod (21), make sure that lever of activator is raised by approx. 1 mm from idle speed stop. Adjust pull rod, if required.



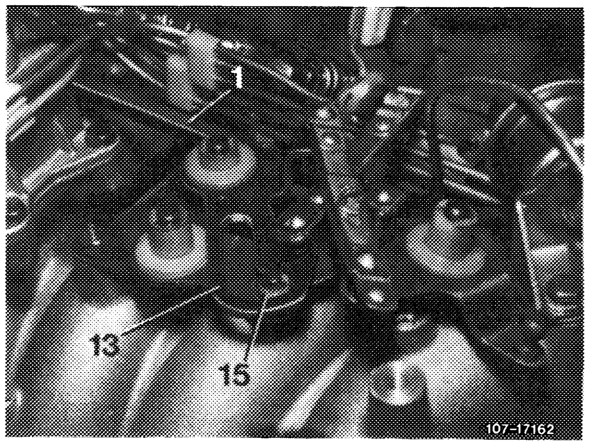
15 Check whether throttle valve rests against idle speed stop. Disconnect connecting rod for this purpose.

16 Check whether roller (3 and 15) in slotted lever (4 and 13) rests free of play against final stop. Adjust by means of connecting rod (1 and 2), if required.

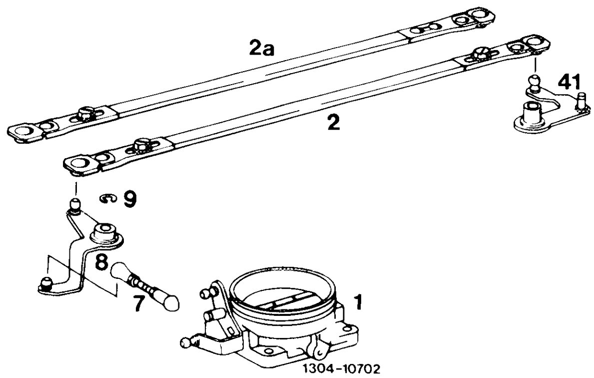
Model 123



Model 126

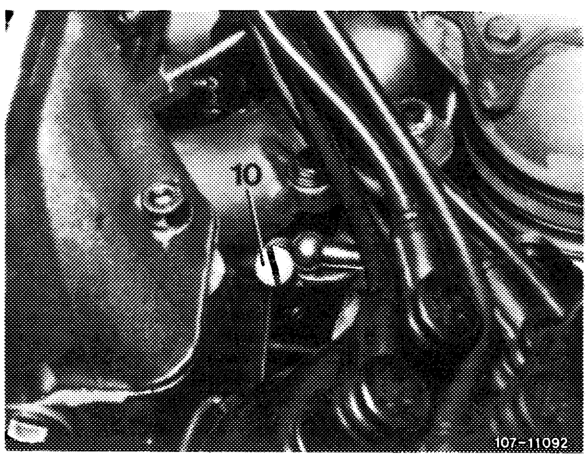


Connecting rod can now be adjusted on one side only. Pay attention to installation position (refer to Fig.).



2 Former version
2a Present version

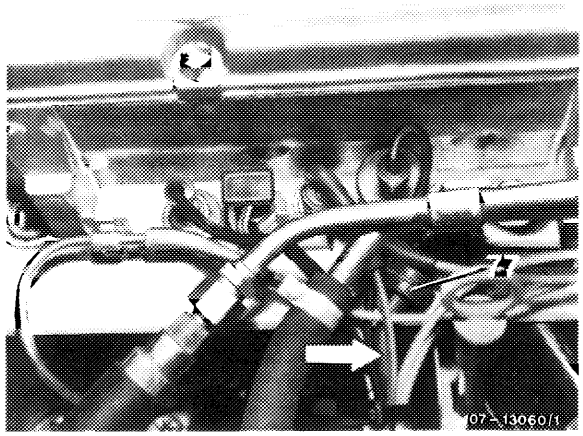
17 Adjust to specified engine speed by means of idle speed air screw (10).



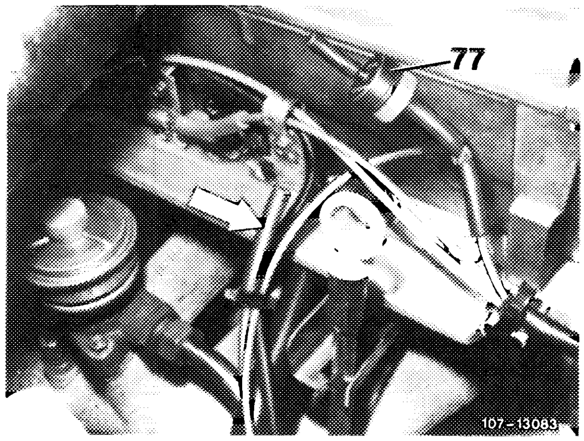
18 Check idle speed emission value:

(AUS) 1977–1982
(S) 1977–1982

Check idle speed emission value **without** injecting air. For this purpose, pull blue/purple vacuum line (arrow) from delay valve (77) and close small tube. The air injection is now disconnected.



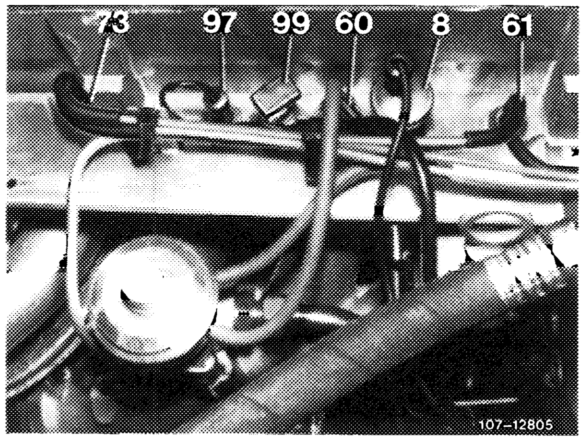
(AUS)



(S)

(J) 1977–1980
(USA) 1977–1979

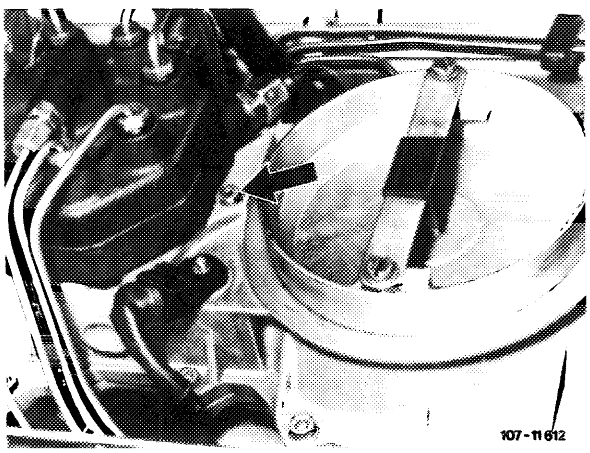
Check idle speed emission value **without** air injection in cylinder head. For this purpose, pull blue vacuum line from blue thermovalve (60) and close line. The air injection is now disconnected.



19 Adjust idle speed emission value:

With gray iron fuel distributor

Unscrew closing plug (arrow) for this purpose.



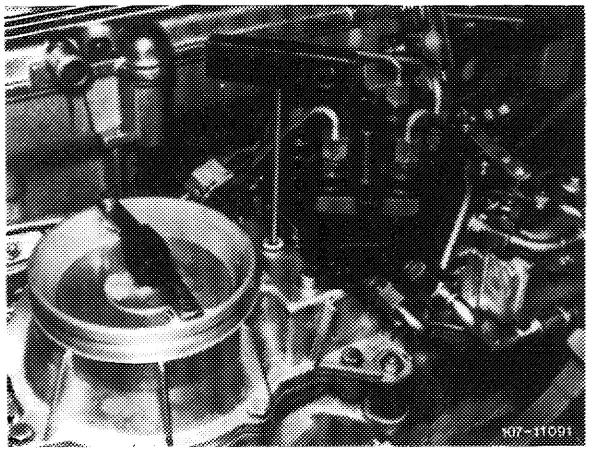
Insert screw driver through bore against idle speed mixture control screw and set emission value by turning screw.

Turning counterclockwise = leaner
Turning clockwise = richer

Close bore for closing plug. Accelerate for a short moment, check idle speed emission value once again and readjust, if required.

Put back vacuum line on thermovalve.

Check idle speed emission value once again (air injection operational). The idle speed emission value should be **below** previously set value.



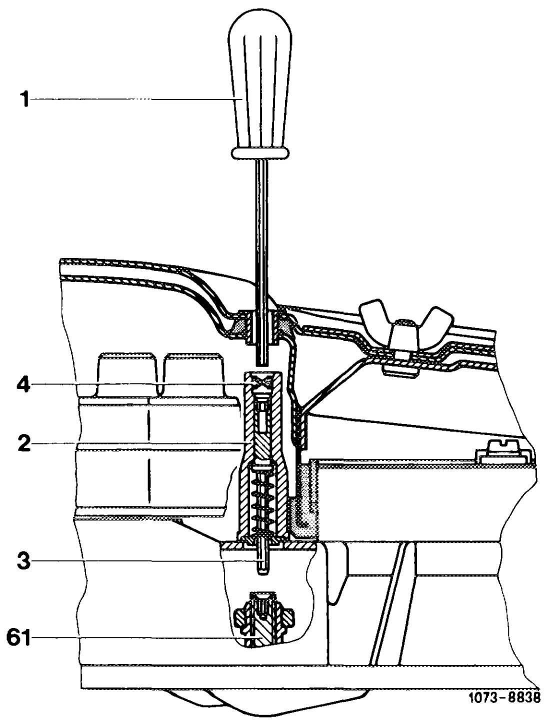
With light alloy fuel distributor

Pull out fuse plug (4) with puller.

Push with screw driver (1) against adjusting device (2). Push adjusting device down with screw driver against force of spring, turn slightly until hexagon (3) enters mixture control screw (61).

Turning counterclockwise = leaner
Turning clockwise = richer

Release screw driver, the coil spring will push adjusting device automatically out of mixture control screw.



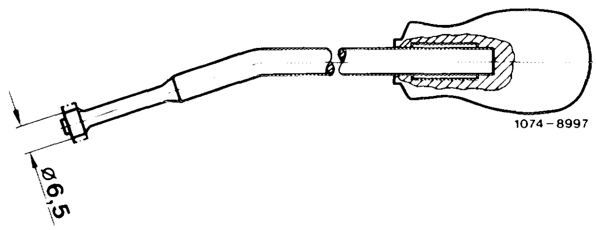
1 Screw driver
2 Adjusting device
3 Hexagon
4 Safety plug
61 Mixture control screw

Accelerate for a short moment, check idle speed emission value and readjust, if required.

Following adjustment, install a blue safety plug (4), part no. 000 997 56 86 by means of installer.

Note: The diameter of the installer for knocking-in safety plug for protective cap of mixture control screw (61) has been changed from 8 mm to 6.5 mm.

In spare parts sector only installers with reduced diameter are now available. On former installers, grind diameter down to 6.5 mm.



20 Mount air cleaner. Check idle speed and idle speed emission value once again and readjust, if required.

21 Place selector lever into driving position, engage air conditioning, turn power steering to full lock, engine should be running smoothly. Readjust engine speed, if required.

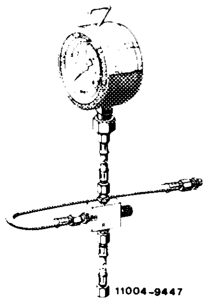
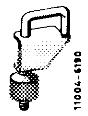
A. Standard version

Test values in bar gauge pressure

Engine		110.984/985 110.986/987	110.988/989 110.990
System pressure at idle with engine cold or at operating temperature		5.0–5.6	
Control pressure at idle with engine at operating temperature	Warm-up compensator stabilized	3.4–3.8 at 530 mbar[1])	3.6–4.0
	Full load enrichment at idle (vacuum hose pulled off)	2.8–3.2	
Control pressure according to ambient temperature at idle with engine cold		min. 0.5 (refer to diagram)	

1) If control pressure is not attained, check intake manifold vacuum (section "Checking control pressure at idle with engine at operating temperature").

Special tools

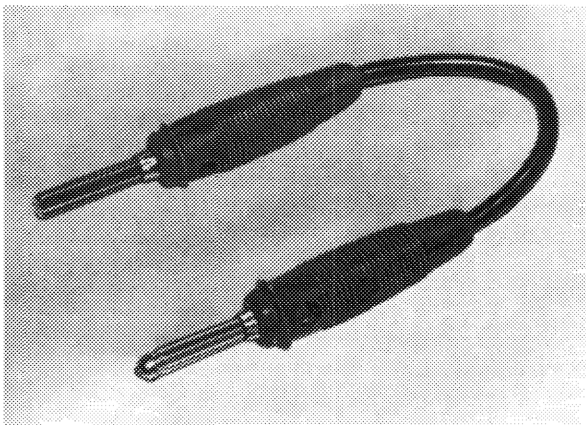
Pressure tester		102 589 00 21 00
Clamp for hose lines		000 589 40 37 00

Conventional tools

Voltmeter, ohmmeter	
Screw driver element 992–T 30	e.g. made by Hazet, D-5630 Remscheid

Self-made tool

Contact bridge


107-19204

Note:

Prior to working on injection system, check firing point, spark plugs and idle speed adjustment.

Perform leak test only in the event of complaints about hot starting.

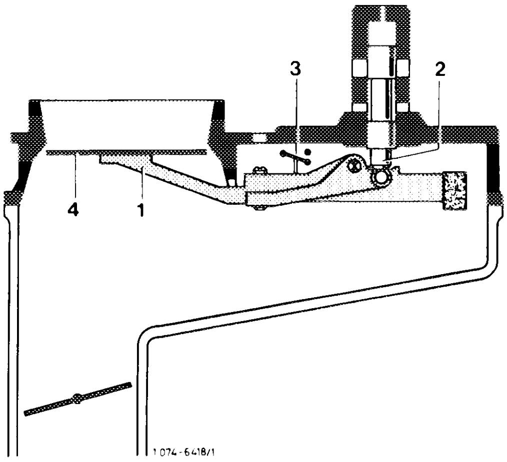
After stopping the engine, the fuel pressure should still amount to 2.5 bar gauge pressure after 30 minutes.

Visual checkup

1 Remove air cleaner.

2 Check all fuel connections for leaks.

3 Check for easy operation of adjusting lever (1) in air flow sensor and control piston (2) in fuel distributor For this purpose, proceed as follows:



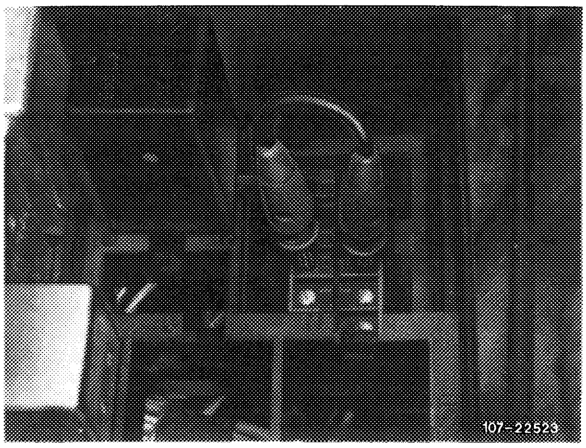
Mixture controller **with** safety switch

Pull plug from safety switch (3), switch-on ignition for a short moment to build up control pressure.

Mixture controller **without** safety switch

Pull off fuel pump relay and bridge the two jacks for a moment to build up control pressure.

Prior to September 1981: Jacks 1 and 2.
Starting September 1981: Jacks 7 and 8.



Push air flow sensor (4) down manually. A uniform resistance should then be felt along entire path. No resistance should be felt during fast upward moment, since the slowly following control piston lifts off from adjusting lever. If the upward movement is slow, a control piston should closely follow.

4 Check control piston in fuel distributor for leaks. Push air flow sensor for a short moment completely down and hold in this position, no fuel should then show up in air guide housing.

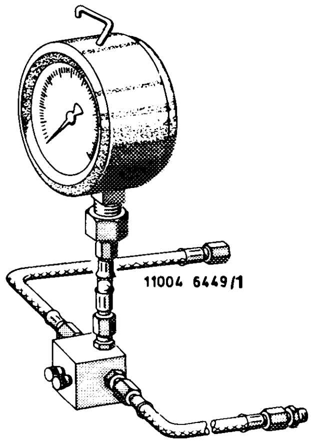
If fuel emerges, replace fuel distributor (07.3—205).

Connecting pressure measuring device

The pressure measuring device remains connected for all pressure measurements.

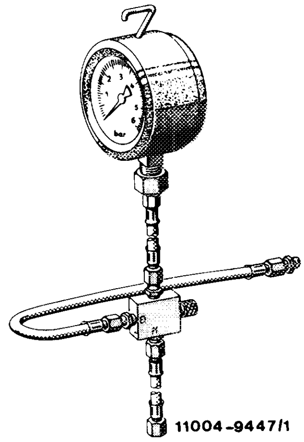
The pressure measuring device 102 589 00 21 00 now remains equipped with a valve screw on three-way *valve only.*

To relieve sealing rings, keep valve screw or valve screws always open. Connections of three-way valve are numbered.


11004 6449/1

Pressure measuring device 1st version

Connection 1 = hose line on fuel distributor
Connection 2 = hose line on pressure gauge
Connection 3 = hose line on released control pressure line

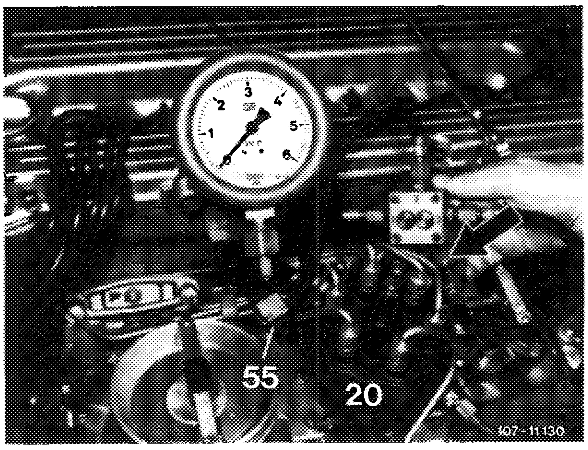

11004-9447/1

Pressure measuring device 2nd version

Connection A = hose line on fuel distributor
Connection B = hose line on released control pressure line

1 Unscrew control pressure line (arrow) on fuel distributor (20), while catching fuel with a rag.

2 Connect hose line from connection 1 or A to fuel distributor (20) and hose line of connection 3 or B to control pressure line (arrow).



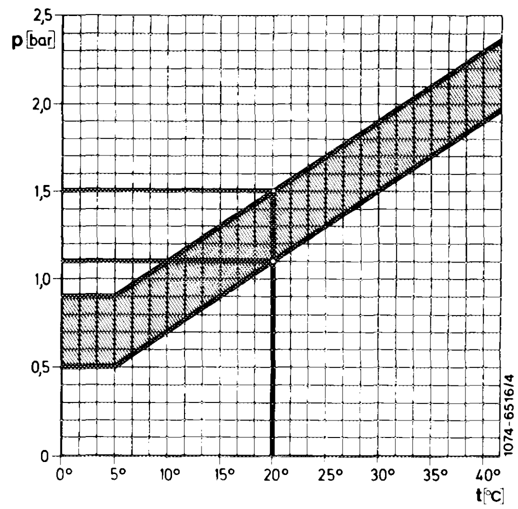
107-11130

Checking control pressure at idle in cold engine

3 Open valve screw or valve screws on pressure measuring device.

4 Run engine at idle and immediately read control pressure.

Take nominal pressure according to ambient temperature from control pressure diagram. If the nominal value is not attained, recondition system pressure regulator (07.3–210), or check input strainer in warm-up compensator. Replace warm-up compensator, if required.

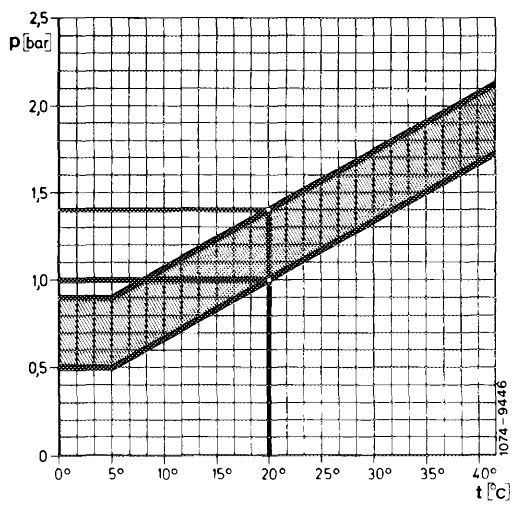


Example:

Warm-up compensator with Bosch end no. 010 and 057:
Ambient temperature +20 °C = 1.0–1.5 bar gauge pressure.

Warm-up compensator with Bosch end no. 103:
Ambient temperature +20 °C = 1.0–1.4 bar gauge pressure.

5 Check stabilizing time of warm-up compensator. Read initial control pressure at +20 °C. The stabilizing time at 3.4 bar gauge pressure should be within tolerance. Additional electric consumers switched off, minimum voltage 12 Volts.



Example:

Stabilizing time at +20 °C
Warm-up compensator with Bosch end no. 010 = 3–6 minutes
Warm-up compensator with Bosch end no. 057 and 103 = 2–4 minutes.

Checking system pressure at idle with engine cold or at operating temperature

6 Close valve screw on pressure measuring device. When measuring pressure, with 2 valve screws, close valve screw at connection 3.

7 The system pressure should amount to 5.0–5.6 bar gauge pressure.

8 If the system pressure of 5.0–5.6 bar gauge pressure is not attained or exceeded, perform the following checkups:

a) Check delivery capacity of fuel pump (07.3–130).

b) Recondition system pressure regulator (07.3–210).

c) Check fuel return flow line for passage.

9 Re-open valve screw.

Checking control pressure at idle with engine at operating temperature

10 Open both valve screws or valve screw on pressure measuring device.

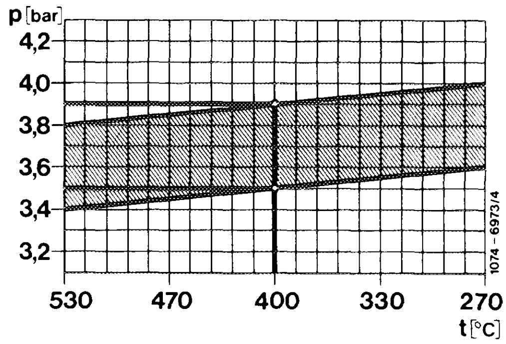
11 Control pressure should increase to 3.4–3.8 or 3.6–4.0 bar gauge pressure (warm-up compensator stabilized).

If the control pressure of 3.4–3.8 or 3.6–4.0 bar gauge pressure is not attained, perform the following checkups.

Engine 110.984/985/986/987

a) Check intake manifold vacuum. For this purpose, pull off vacuum hose (arrow in fig. item 12) on warm-up compensator and attach a T-fitting for pressure gauge.

   Read intake manifold vacuum and transfer to vacuum diagram.



   Example:

   Intake manifold vacuum 400 mbar = 3.5–3.9 bar gauge pressure.

Engine 110.988/989/990

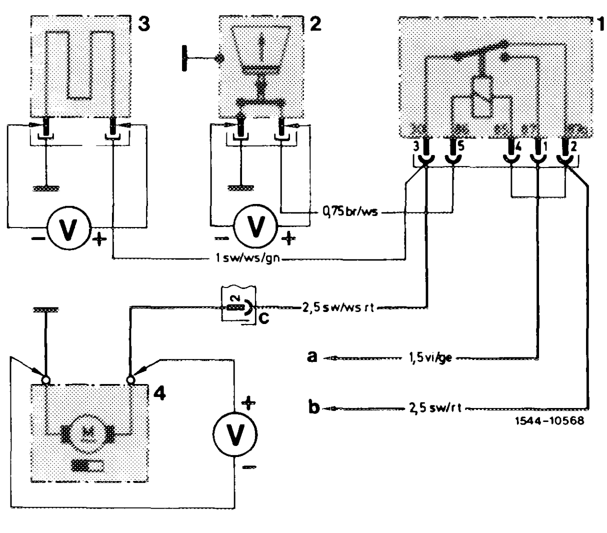
The control pressure is not influenced by vacuum from change on warm-up compensator.

b) Test voltage on warm-up compensator with engine running. Pull electrical connection from warm-up compensator and test voltage. Minimum voltage 12 Volts (without electrical consumers).

c) Test heater coil with an ohmmeter for passage. Resistance: 20–40 Ω.

   Replace warm-up compensator in the event of an interruption.

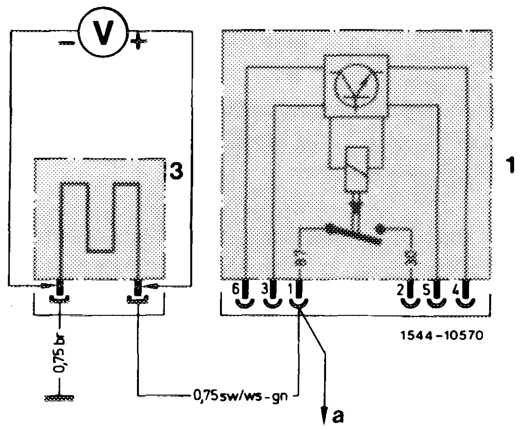
d) If the control pressure is above 3.6 or 3.8 bar gauge pressure, recondition system pressure regulator (07.3–210).



Mixture controller with safety switch

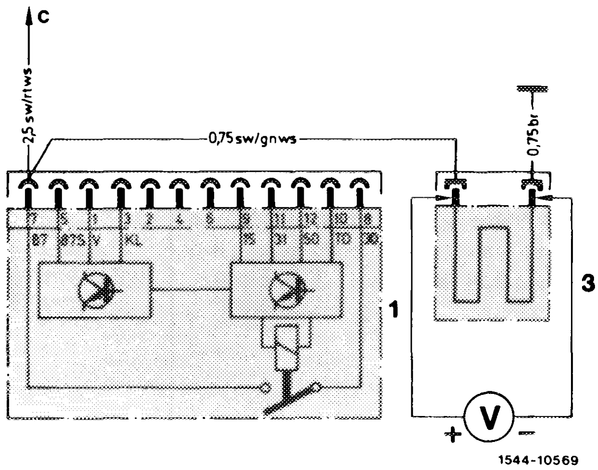
1 Fuel pump relay
2 Safety switch – air flow sensor plate
3 Warm-up compensator
4 Fuel pump
a Terminal 50 (starting)
b Terminal 15/54 (ignition)
c Plug connection 14-point tail lamp unit harness

Mixture controller **without** safety switch



Prior to September 1981

1 Fuel pump relay
3 Warm-up compensator
a To fuel pump

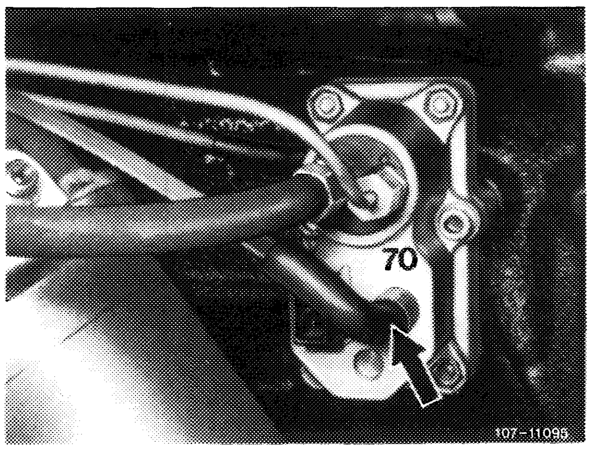


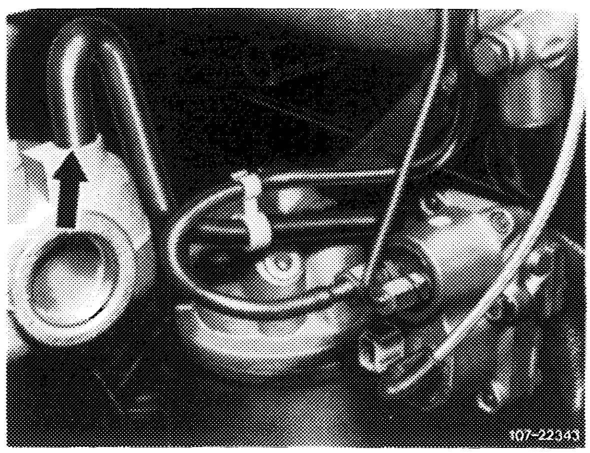
Starting September 1981

1 Fuel pump relay
3 Warm-up compensator
c To fuel pump

12 Check full load enrichment. For this purpose, pull vacuum hose (arrow) from warm-up compensator or at intake manifold, control pressure should then drop to 2.8–3.2 bar gauge pressure.

If a control pressure of 2.8–3.2 bar gauge pressure is not attained, replace warm-up compensator.





Checking fuel distributor and fuel pump for leaks

13 Stop engine. Control pressure will then drop below opening pressure of injection valves (approx. 2.8 bar gauge pressure).

14 If the control pressure drops immediately to 0 bar gauge pressure, replace check valve on fuel pump or subsequently install.

15 If the pressure drops slowly, unscrew fuel return line on fuel distributor. Fuel will emerge in the event of a leak on regulator piston or pressure compensating valve. If there is more than 1 drop in 4 seconds, recondition system pressure regulator or pressure compensating valve (07.3–210).

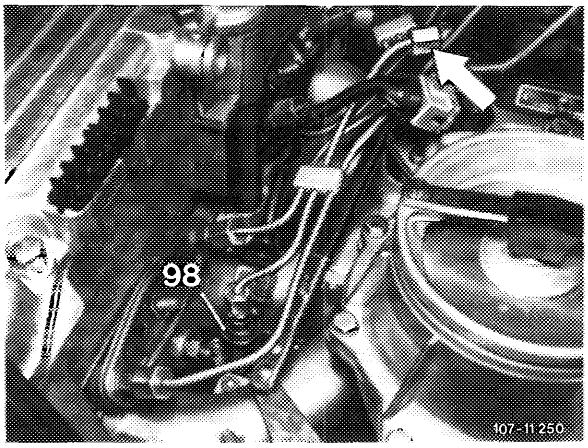
16 Check fuel reservoir for leaks (not included in time rate). For this purpose, disconnect leak line between fuel reservoir and intake damper.

17 Loosen leak line on intake damper and pull off. Loosen clamp, pressureless leaking is permissible. Replace fuel reservoir, if required (07.3–270).

18 Check cold-starting valve (98) for leaks. For this purpose, remove cold-starting valve (07.3–125, section Checking for leaks).

19 Close pressure measuring device, while catching fuel with a rag.

20 Connect fuel lines, run engine once again and check all fuel connections for leaks.



B. National version (AUS) (J) (S) (USA)

Test values in bar gauge pressure

Warm-up compensator Bosch end no.	System pressure at idle with engine cold or at operating temperature	Control pressure at idle with engine at operating temperature	
		Warm-up compensator stabilized at 530 mbar intake manifold vacuum[1])	Full load enrichment idle (vacuum hose pulled off)

(AUS) starting 1977
Identification: Label silver.

(S) starting 1977
Identification: Label blue.

030 056 057	5.0–5.6	3.4–3.8	2.8–3.2

(J) 1977–1980
Identification: Label in Japanese language.

031	5.0–5.6	3.0–3.4	2.8–3.2

(USA) 1977–1979
Identification: Label black.
Identification: **1979** label Federal black, California yellow.

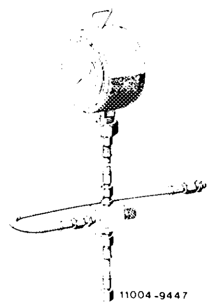
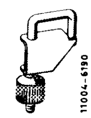
030 Federal	5.0–5.6	3.4–3.8	2.8–3.2
041 Federal high altitudes 1977		3.6–4.0	3.0–3.4
031 California		3.0–3.4	2.8–3.2

1) If the control pressure is not attained, check intake manifold vacuum (refer to section "Checking control pressure at idle with engine at operating temperature").

Warm-up compensator Bosch end no.	System pressure at idle with engine cold or at operating temperature	Control pressure at idle with engine at operating temperature	
		Warm-up compensator stabilized at 530 mbar intake manifold vacuum[1])	Acceleration enrichment with engine stopped and 0.5 bar vacuum at warm-up compensator
(J) starting 1981 Identification: Label in Japanese language.			
(USA) 1980/81 Identification: Label Federal black.			
067	5.0–5.8	3.4–3.8	1.4–1.8

[1]) If the control pressure is not attained, check intake manifold vacuum (refer to section "Checking control pressure at idle with engine at operating temperature").

Special tools

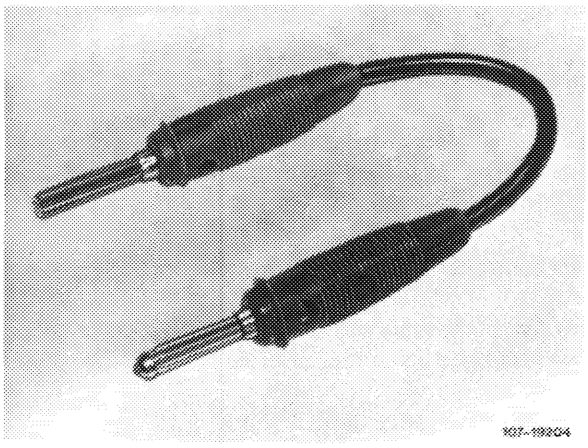
Pressure measuring device	 11004-9447	102 589 00 21 00
Clamp for hose lines	 11004-6190	000 589 40 37 00

Conventional tools

Voltmeter/ohmmeter	
Screw driver element 992–T 30	e.g. made by Hazet, D-5630 Remscheid

Self made tool

Contact bridge



Note

Prior to working on injection system, check firing point, spark plugs and idle speed adjustment.

Perform leak test only in the event of complaints about hot starting.

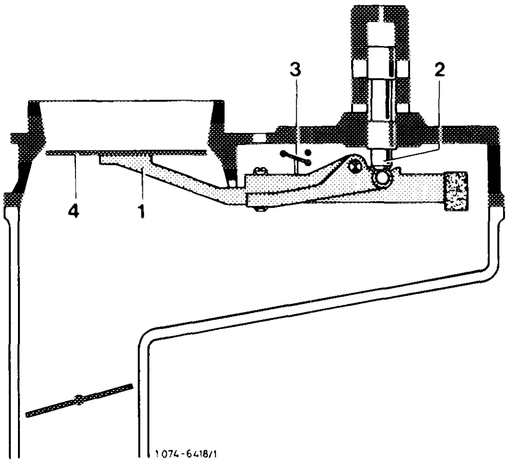
After stopping engine, the fuel pressure should still amount to 2.5 bar gauge pressure after 30 minutes.

Visual checkup

1 Remove air cleaner.

2 Check all fuel connections for leaks.

3 Check for easy operation of adjusting lever (1) in air flow sensor and control piston (2) in fuel distributor. For this purpose, proceed as follows:



Mixture controller **with** safety switch

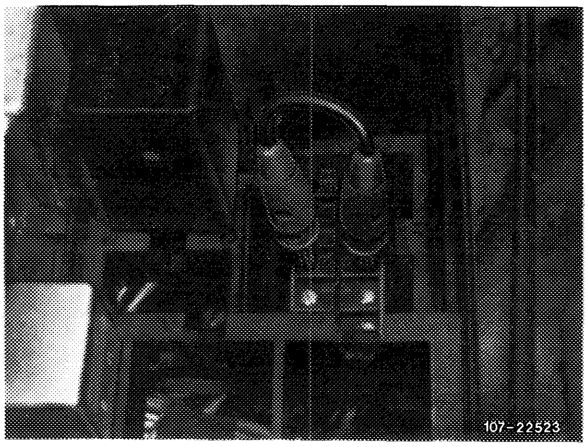
Pull plug from safety switch (3), switch-on ignition for a short moment to build up control pressure.

Mixture controller **without** safety switch

Pull off fuel pump relay and bridge the two jacks for a moment to build up control pressure.

Up to model year 1981: Jacks 1 and 2
Starting model year 1982: Jacks 7 and 8.

Push air flow sensor (4) down manually. A uniform resistance should then be felt along entire path. No resistance should be felt during fast upward movements, since the slowly following control piston lifts off from adjusting lever. If the upward movement is slow, a control piston should closely follow.



4 Check control piston in fuel distributor for leaks. Push air flow sensor for a short moment completely down and hold in this position, no fuel should then show up in air guide housing.

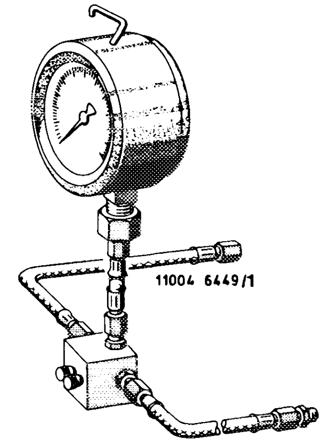
If fuel emerges, replace fuel distributor (07.3–205).

Connecting pressure measuring device

The pressure measuring device remains connected for all pressure measurements.

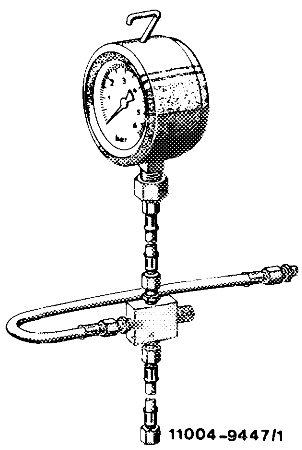
The pressure measuring device 102 589 00 21 00 now remains equipped with a valve screw on three-way valve only.

To relieve sealing rings, keep valve screw or valve screws always open. Connections of three-way valve are numbered.



Pressure measuring device 1st version

Connection 1 = hose line on fuel distributor
Connection 2 = hose line on pressure gauge
Connection 3 = hose line on released control pressure line

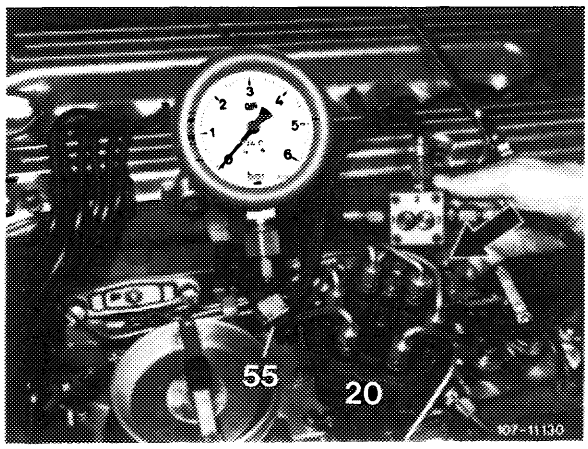


Pressure measuring device 2nd version

Connection A = hose line on fuel distributor
Connection B = hose line on released control pressure line

1 Unscrew control pressure line (arrow) on fuel distributor (20), while catching fuel with a rag.

2 Connect hose line from connection 1 or A to fuel distributor (20) and hose line of connection 3 or B to control pressure line (arrow).



Checking control pressure at idle in cold engine

3 Open valve screw or valve screws on pressure measuring device.

4 Run engine at idle and immediately read control pressure.

Take nominal pressure according to ambient temperature from control pressure diagram. If the nominal value is not attained, recondition system pressure regulator (07.3–210), or check input strainer in warm-up compensator. Replace warm-up compensator, if required.

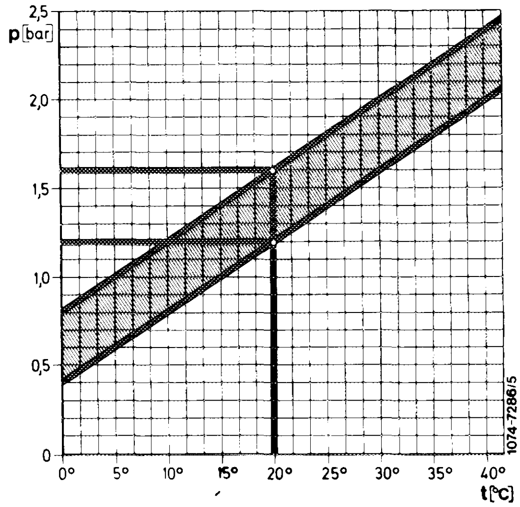
(J) (USA) **Federal and California 1976/77**
(AUS) (S) **1977**

Warm-up compensator Bosch end no.
030 (AUS) (S) (USA) Federal
031 (J) (USA) California

Example:

Ambient temperature 20 °C = 1.2–1.6 bar gauge pressure.

Stabilizing time at + 20 °C = 3–6 minutes.



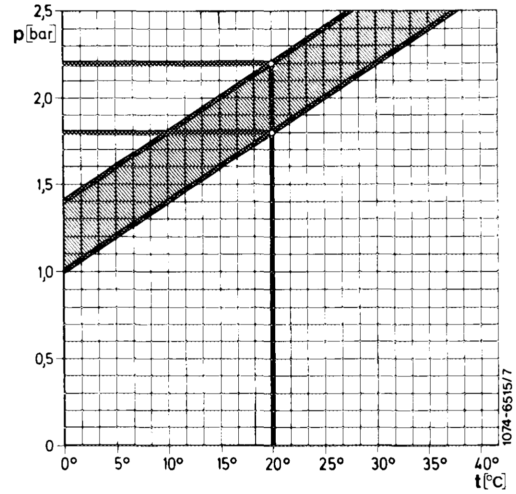
(USA) **Federal high altitudes 1977**

Warm-up compensator Bosch end no. 041

Example:

Ambient temperature 20 °C = control pressure 1.4–1.8 bar gauge pressure.

Stabilizing time at + 20 °C = 3–6 minutes.



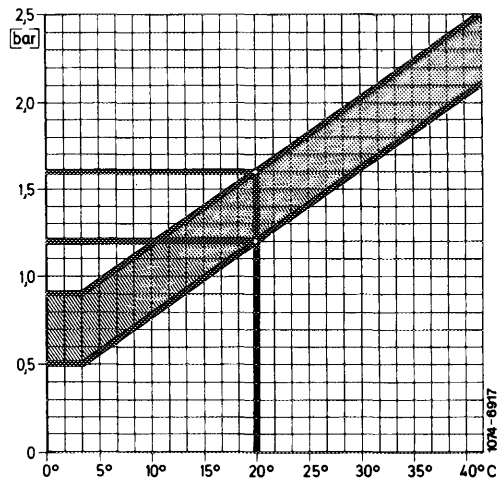
(AUS) (J) (S) (USA) **1978**
(J) **1979/80** (USA) **1979**

Warm-up compensator Bosch end no.
030 (AUS) (S) (USA) Federal
031 (J) (USA) California

Example:

Ambient temperature 20 °C = control pressure 1.2–1.6 bar gauge pressure.

Stabilizing time + 20 °C = 3–6 minutes.



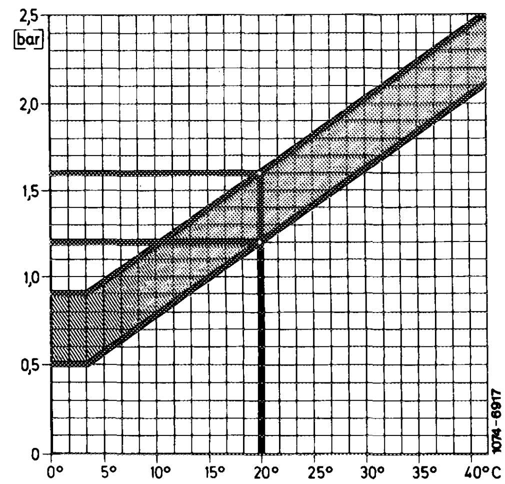
(AUS) (S) **1979/80**

Warm-up compensator Bosch end no. 056

Example:

Ambient temperature 20 °C = control pressure 1.2–1.6 bar gauge pressure.

Stabilizing time at + 20 °C = 2–4 minutes.



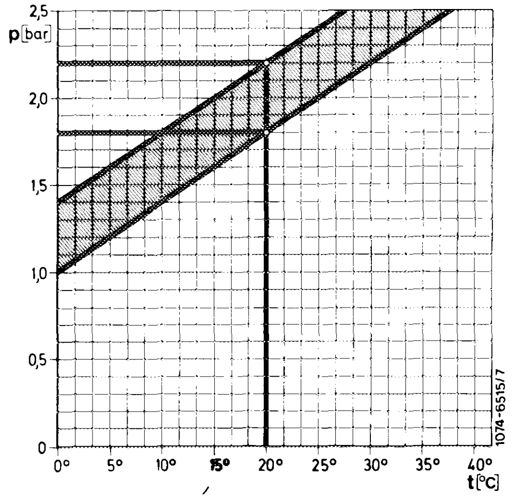
(J) starting 1981
(USA) 1980/81

Warm-up compensator Bosch end no. 067

Example:

Ambient temperature 20 °C = control pressure 1.4–1.8 bar gauge pressure.

Stabilizing time at + 20 °C = 2–4 minutes.



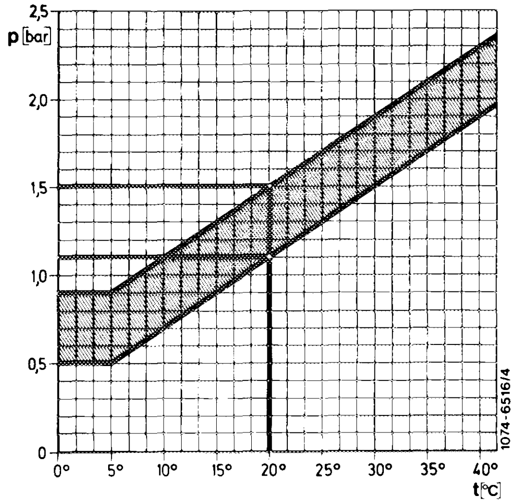
(AUS) (S) starting 1981

Warm-up compensator Bosch end no. 057

Example:

Ambient temperature 20 °C = control pressure 1.1–1.5 bar gauge pressure.

Stabilizing time at + 20 °C = 2–4 minutes.



5 Check stabilizing time of warm-up compensator. Read initial control pressure at + 20 °C. The stabilizing time at 3.4 bar gauge pressure should be within tolerance. Additional electric consumers switched off, minimum voltage 12 Volts.

Checking system pressure at idle with engine cold or at operating temperature

6 Close valve screw on pressure measuring device. When measuring pressure, with 2 valve screws, close valve screw at connection 3.

7 The system pressure should amount to 5.0–5.6 bar gauge pressure.

8 If the system pressure of 5.0–5.6 bar gauge pressure is not attained or exceeded, perform the following checkups:

a) Check delivery capacity of fuel pump (07.3–130).

b) Recondition system pressure regulator (07.3–210).

c) Check fuel return flow line for passage.

9 Re-open valve screw.

Checking control pressure at idle with engine at operating temperature

10 Open both valve screws or valve screw on pressure measuring device.

11 Control pressure should increase to specified value (warm-up compensator stabilized).

If the control pressure is not attained, perform the following checkups:

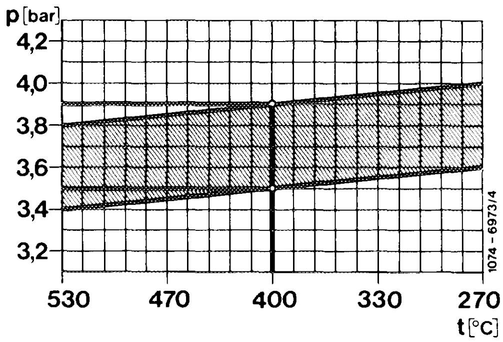
a) *Check intake manifold vacuum. For this purpose, pull off vacuum hose (arrow) on warm-up compensator and attach a T-fitting for pressure gauge.*

   Read intake manifold vacuum and transfer to vacuum diagram.

USA Federal 1977--1979
AUS S starting 1977

Example:

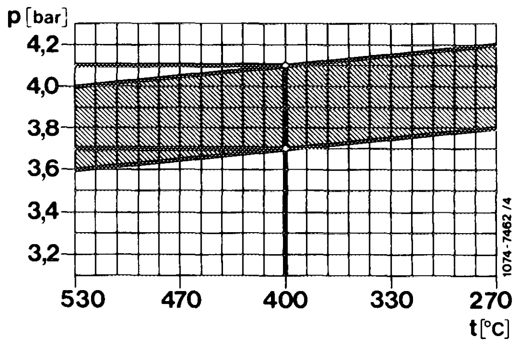
Intake manifold vacuum 400 mbar = control pressure 3.5–3.9 bar gauge pressure.



USA Federal high altitudes 1977

Example:

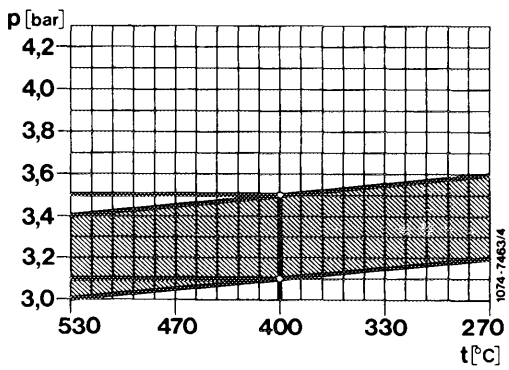
Intake manifold vacuum 400 mbar = control pressure 3.7–4.1 bar gauge pressure.



J 1977–1980
USA California 1977--1979

Example:

Intake manifold vacuum 400 mbar = control pressure 3.1–3.5 bar gauge pressure.

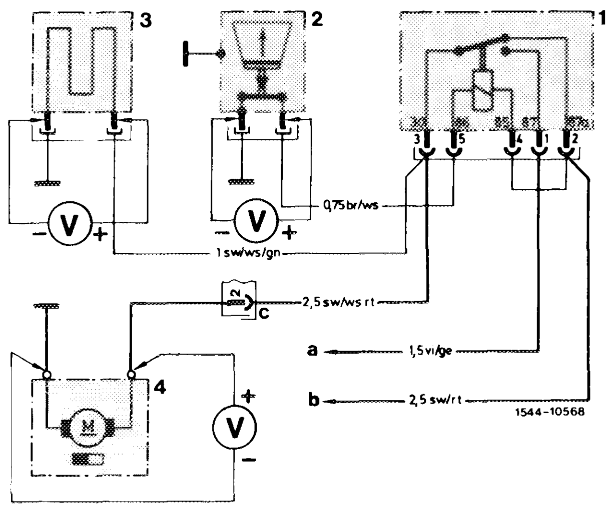


Note: Starting model year (J) 1981, (USA) 1980 the vacuum flow is straight. Control pressure is therefore independent of intake manifold vacuum.

b) Test voltage on warm-up compensator with engine running. Pull electrical connection from warm-up compensator and test for voltage. Minimum voltage 12 Volts (without electrical consumers).

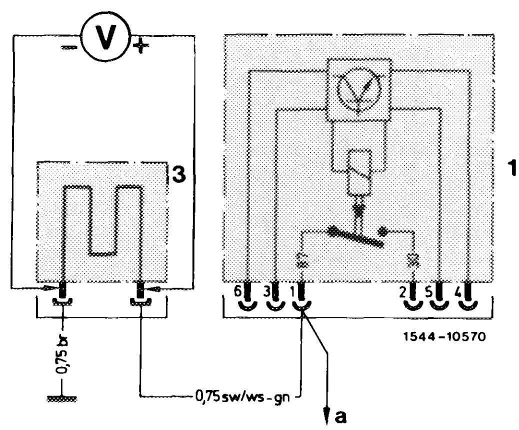
c) Test heater coil with an ohmmeter for passage. Resistance: 20–40 Ω. Replace warm-up compensator.

d) If control pressure is above nominal value, recondition system pressure regulator (07.3–210).

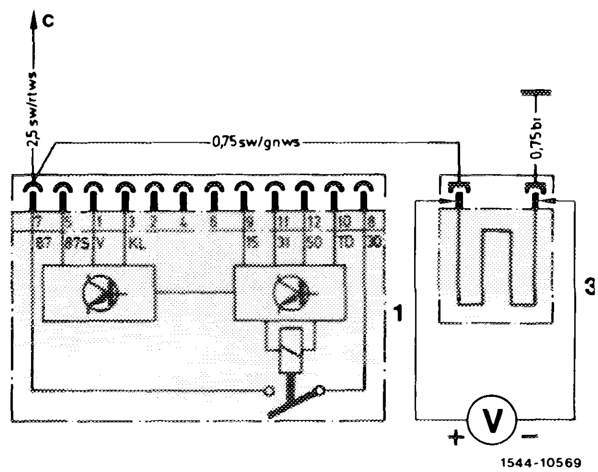


Mixture controller **with** safety switch
1 Fuel pump
2 Safety switch – air flow sensor plate
3 Warm-up compensator
4 Fuel pump
a Terminal 50 (starting)
b Terminal 15/54 (ignition)
c Plug connection 14-point tail lamp unit harness

Mixture controller **without** safety switch



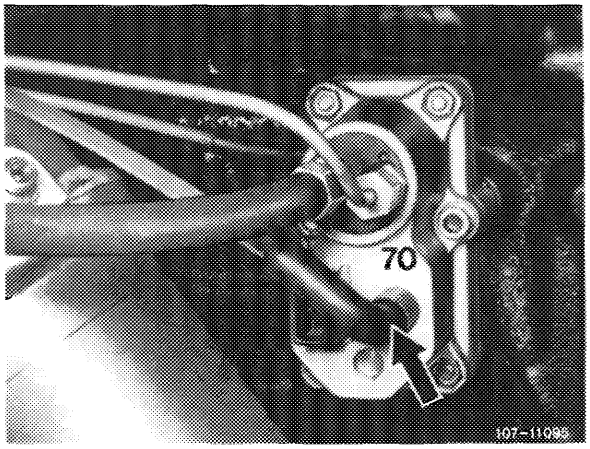
Up to model year 1981
1 Fuel pump relay
2 Warm-up compensator
a To fuel pump



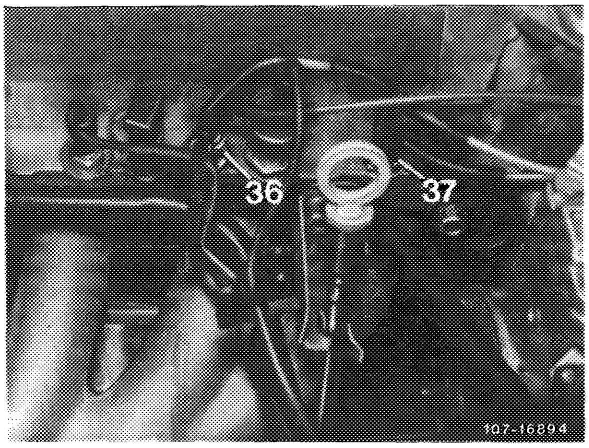
Starting model year 1981
1 Fuel pump relay
3 Warm-up compensator
c To fuel pump

12 Check full load enrichment. For this purpose, pull vacuum hose (arrow) from warm-up compensator, control pressure should now drop to specified value.

If the control pressure is not attained, replace warm-up compensator.

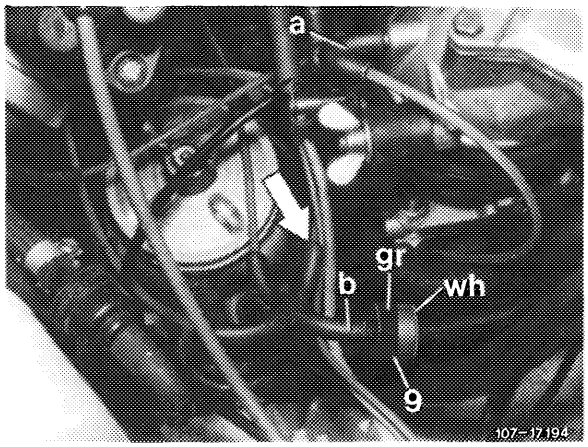


13 Check acceleration enrichment.

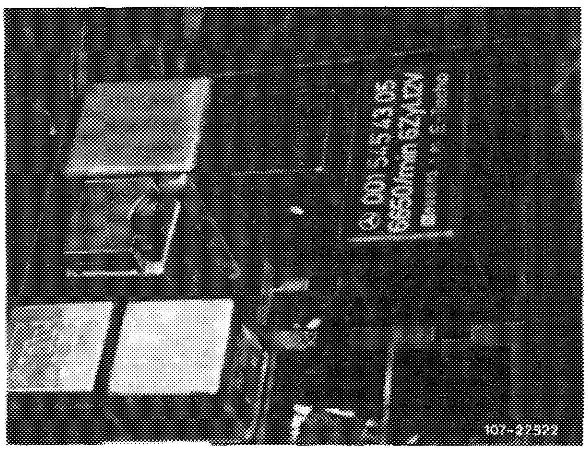


(J) starting 1981, (USA) 1980/81

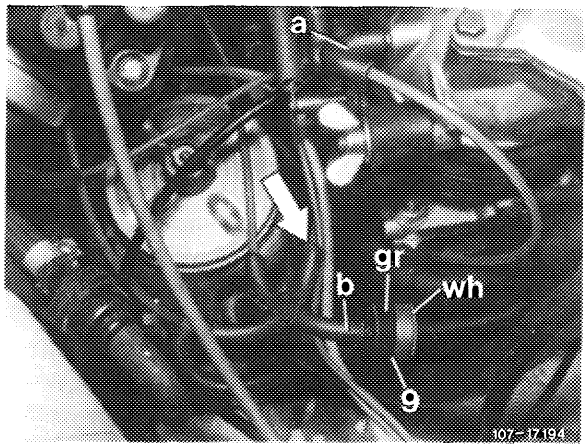
Check thermovalve (37) 50 °C for passage. For this purpose, pull off vacuum hoses (a and b). The thermovalve is closed below approx. 50 °C coolant temperature, above approx. 50 °C coolant temperature there should be passage, if not, replace thermovalve (37).



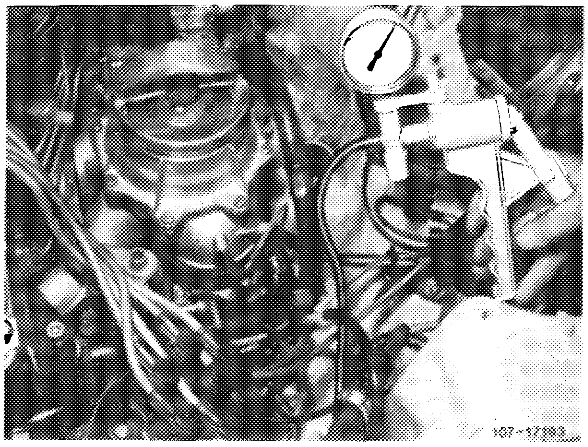
Stop engine, pull off fuel pump relay (arrow).



Pull vacuum line from distributor (arrow).

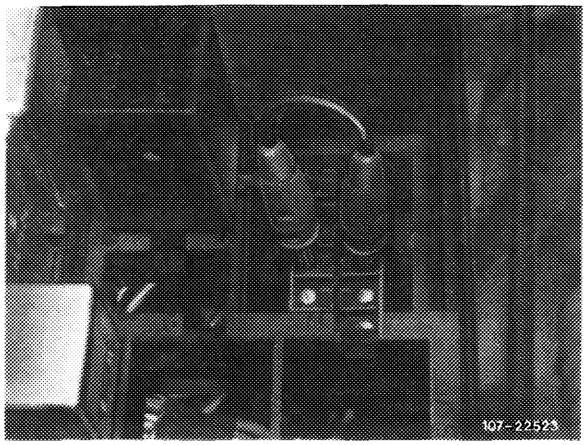


Plug vacuum pump to vacuum line toward warm-up compensator and activate warm-up compensator with 0.5 bar vacuum.

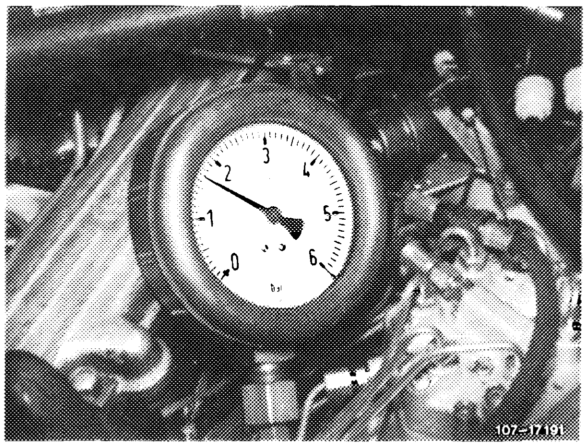


Bridge the two jacks on fuel pump relay coupler.

Up to model year 1981: Jacks 1 and 2.
Starting model year 1982: Jacks 7 and 8.



The control pressure should then amount to 1.4–1.8 bar gauge pressure. If the control pressure deviates from nominal value, replace warm-up compensator.



Checking fuel distributor and fuel pump for leaks

14 Stop engine. Control pressure will then drop below opening pressure on injection valves (approx. 2.8 bar gauge pressure).

15 If the control pressure drops inmediately to 0 bar gauge pressure, replace check valve on fuel pump or subsequently install.

16 If the pressure drops slowly, unscrew fuel return line on fuel distributor. Fuel will emerge in the event of a leak on regulator piston or pressure compensating valve. If there is more than 1 drop in 5 seconds, recondition system pressure regulator or pressure compensating valve (07.3–210).

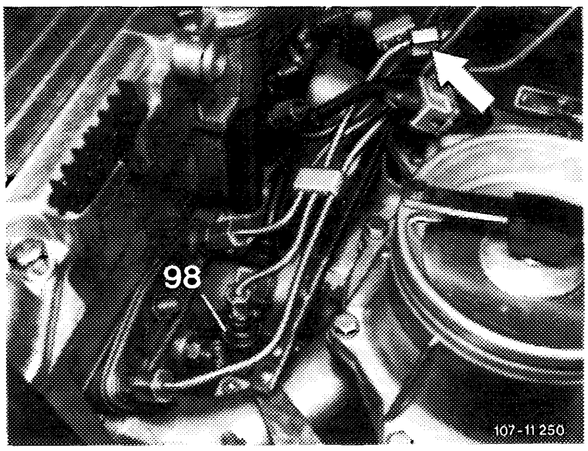
17 Check fuel reservoir for leaks (not included in time rate). For this purpose, disconnect leak line between fuel reservoir and intake damper.

18 Loosen leak line on intake damper and pull off. Loosen clamp, pressureless leaking is permissible. Replace fuel reservoir, if required (07.3–270).

19 Check cold-starting valve (98) for leaks. For this purpose, remove cold-starting valve (07.3–125, section "Checking for leaks").

20 Close pressure measuring device, while catching fuel with a rag.

21 Connect fuel lines, run engine once again and check fuel connections for leaks.



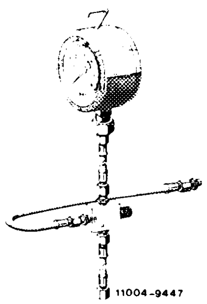
07.3–125 Checking choke system

Test values in bar gauge pressure

Engine		110.984/985 110.986/987	110.988/989 110.990
System pressure at idle with engine cold or at operating temperature		5.0–5.6	
Control pressure at idle with engine at operating temperature	Warm-up compensator stabilized	3.4–3.8 at 530 mbar [1])	3.6–4.0
	Full load enrichment at idle (vacuum hose pulled of)	2.8–3.2	
Control pressure according to ambient temperature at idle with engine cold		min. 0.5 (refer to diagram)	
Starting voltage		10 V	

[1]) If the control pressure is not attained, check intake manifold vacuum (section "Checking control pressure at idle with engine at operating temperature").

Special tool

Pressure measuring device	 11004-9447	102 589 00 21 00

Conventional tools

Voltmeter and ohmmeter
Revolution counter

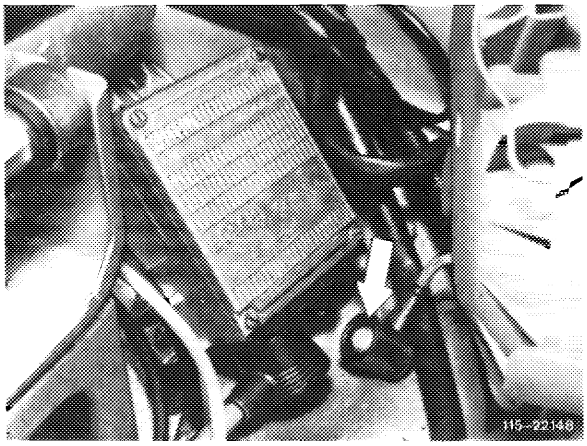
Checking

1 Pull cable plug from warm-up compensator and from cold starting valve.

2 Checking starting voltage.

Pull plug from ignition transmitter on switching unit (green cable) or plug protective plug, part no. 102 589 02 21 00, on diagnosis socket.

Operate starter for a short moment while reading voltage. Nominal value min. 10 Volts. If nominal value is not attained, test battery, charge or replace, if required.

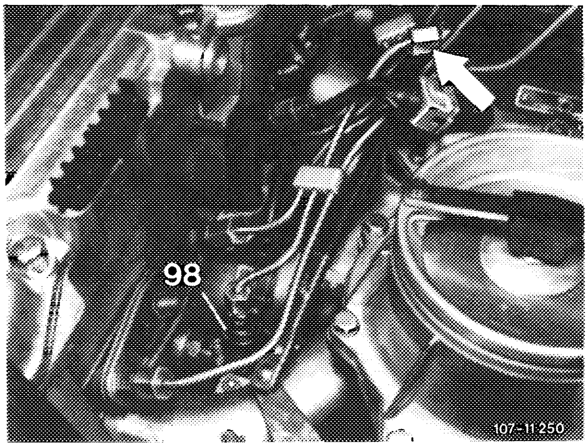


3 Check air flow sensor plate and control piston for easy operation, check fuel pressures and for internal leaks, as well as stabilizing time of warm-up compensator (07.3–120).

Checking cold-starting valve for function and leaks

4 Unscrew fuel line on cold-starting valve (98) and remove cold-starting valve.

5 Loosen fuel line (arrow) on fuel distributor and turn in such a manner that the cold starting valve can be again connected. Then hold cold starting valve into a container.



Checking function

6 Switch-on ignition.

7 Connect cold starting valve with separate cable to B + and ground. Cold starting valve should eject in shape of cone.

Attention!
Connect cable first to cold starting valve so that no sparking occurs.

No separate cable need be used below +15 °C, plug-on cable plug instead and pull cable plug from safety switch.

Checking for leaks

8 Loosen separate cable connection on cold starting valve. Dry cold starting valve on nozzle. No drops should form.

9 Switch off ignition.

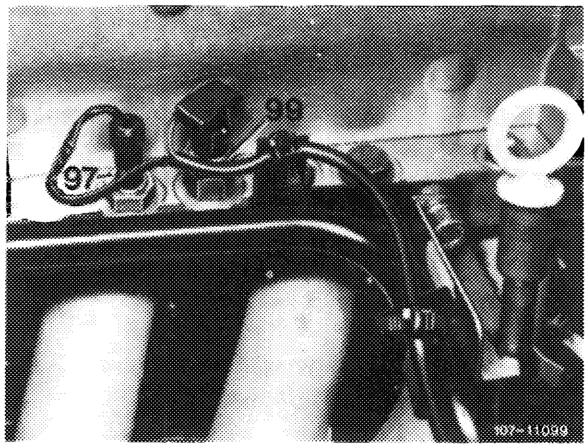
10 Mount cold starting valve with new seal.

11 Plug cable plug on safety switch and on cold-starting valve again.

Testing thermo time switch

The cold starting valve is actuated by closed thermo time switch only at coolant temperatures below +15 °C.

The actuating time increases with decreasing temperature and attains approx. 12 seconds at –20 °C.



99 Thermo time switch

Testing below +15 °C coolant temperature

12 Connect voltmeter to connection of cold starting valve.

13 Actuate starter. Depending on coolant temperature, voltmeter should then indicate 10 Volts for a given period.

The switching time increases with decreasing temperature by approx. 1.5 seconds per 5 °C.

e.g. + 15 °C = 0 seconds
+10 °C = 1.5 seconds

It is recommended to test thermo time switch additionally with an ohmmeter for this test.

Test value **below** +15 °C:

Connection G-ground = approx. 48 Ω
Connection W-ground = approx. 0 Ω

(Contacts in switch closed).

Testing above +15 °C coolant temperature

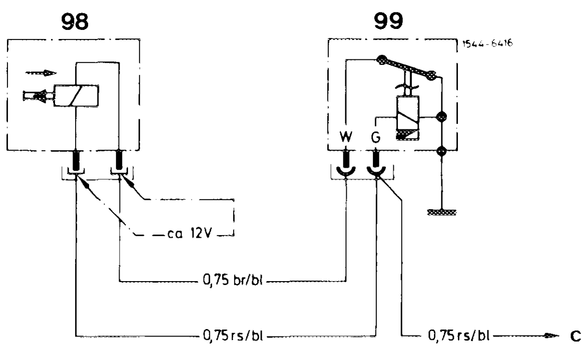
Above +15 °C coolant temperature the thermo time switch can be tested only by means of an ohmmeter. For this purpose, pull plug from thermo time switch.

Test values **above** +15 °C:

Connection G-ground = approx. 62 Ω
Connection W-ground = approx. 270 Ω

(Contacts in switch open).

Re-attach plug.



98 Cold starting valve
99 Thermo time switch
c To terminal 50

Testing cutoff point of auxiliary air valve

14 Following a cold start, the engine speed should amount to approx. 800–1000/min. The speed will then increase to approx. 1200–1300/min, and will drop to normal idle speed at approx. 70 °C.

15 Stop engine. Disconnect pressure measuring device while catching fuel with a rag.

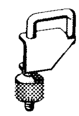
16 Connect fuel lines, run engine once again and check all fuel connections for leaks.

07.3–130 Checking delivery capacity of fuel pump

Test values

Voltage at fuel pump min.	11.5 V
Delivery capacity min.	1 liter/30 seconds

Special tool

Clamp for fuel hose	 11004-6190	000 589 40 37 00

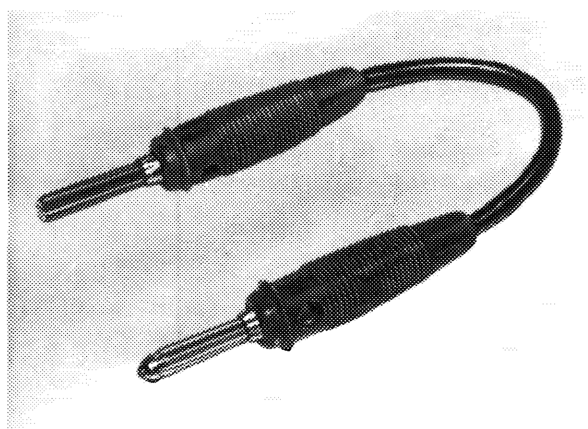
Conventional tools

Voltmeter, graduated measuring glass or measuring cup (at least 1 liter), stop watch

Self-made fuel hose

Fuel hose	500 mm long
Tube with sealing cone	
Coupling nut	M 14 x 1.5

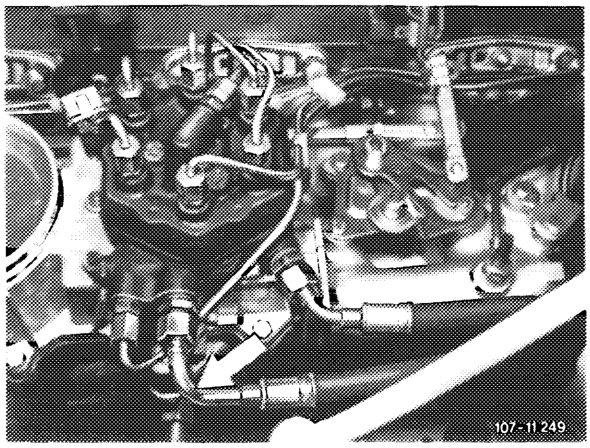
Contact bridge



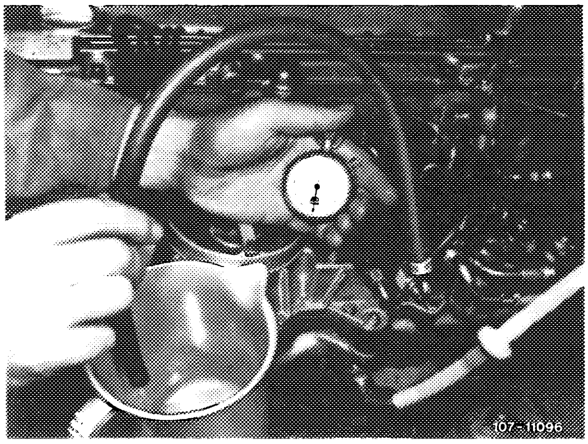
107–19204

Checking

1 Check delivery capacity of fuel pump during fuel return flow. For this purpose, unscrew fuel return hose (arrow) on fuel distributor.



2 Screw self-made fuel hose to fuel distributor and hold into measuring glass or cup.



3 Check delivery:

Mixture control unit **with** safety switch

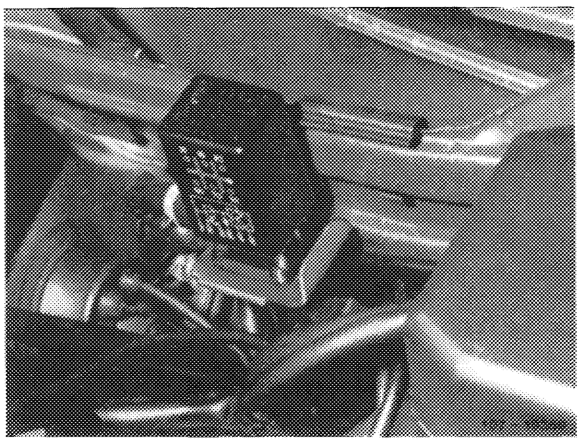
Switch-on ignition. Pull cable plug from safety switch in mixture control unit and put cable plug back again after 30 seconds.

Mixture control unit **without** safety switch

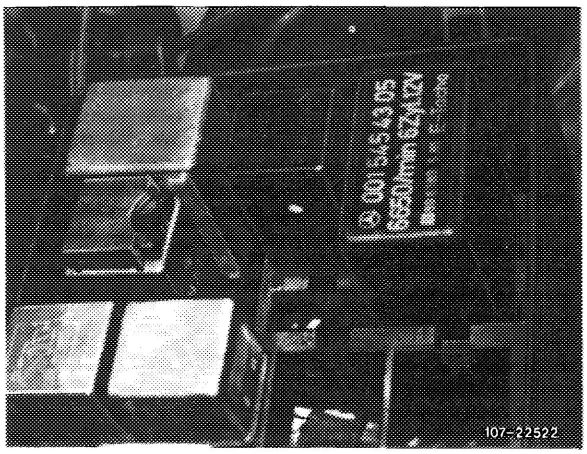
Pull off fuel pump relay and bridge the two bushings (wiring diagram 07.3–120). This will provide voltage for fuel pump.

Pull off contact bridge after 30 seconds.

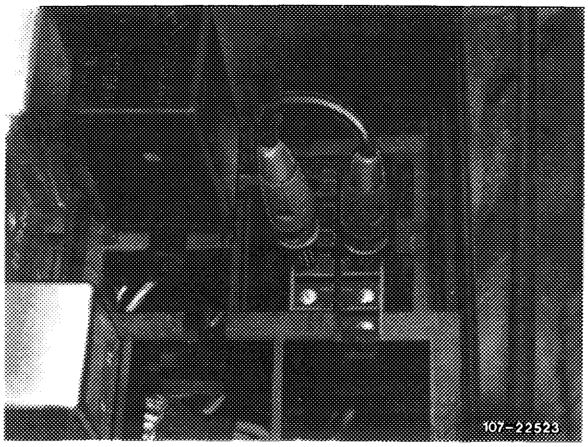
Prior to September 1981: Jacks 1 and 2.
Starting September 1981: Jacks 7 and 8.



Model 123



Model 126



4 If the delivery volume is less than 1 liter/30 seconds, check the following items:

a) Check strainer in feed connection of fuel distributor for passage.

b) Check voltage at fuel pump.
Nominal value = min. 11.5 Volts (with engine stopped).

c) Check fuel lines for restrictions (squeezed lines).

d) Pinch leak line between fuel reservoir and intake damper. Check delivery once again. If specified delivery volume is attained, replace fuel reservoir.

e) Replace fuel filter.

5 If delivery volume is still too low, replace fuel pump.

6 Connect fuel return flow hose. Mount relay.

Test values

Injection valves		Bosch no. 0 437 502 010
Opening pressure	with new injection valves	3.5–4.1 bar gauge pressure
	with used injection valves min.	3.0 bar gauge pressure

Tightening torques	Nm
Injection lines on fuel distributor (reference value)	10–12
Injection lines on injection valves (reference value)	10–15

Conventional test instruments and accessories

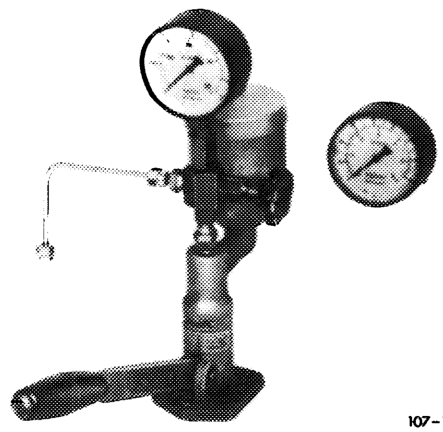
Valve tester Bosch KDJE–P 400	Bosch order designation KDJE–P 400
Nozzle tester EFEP 60 H[1])	Bosch no. 0 684 200 700
Pressure gauge 0–6 bar gauge pressure housing dia. = 100 mm Grade 1.0	Bosch no. 1 687 231 000
Pipe line	Bosch no. 1 680 750 001

[1]) Corresponds with former nozzle testers. For testing injection valves, a specified pressure gauge or pressure gauge of pressure measuring device 100 589 13 21 00 is required.

Note

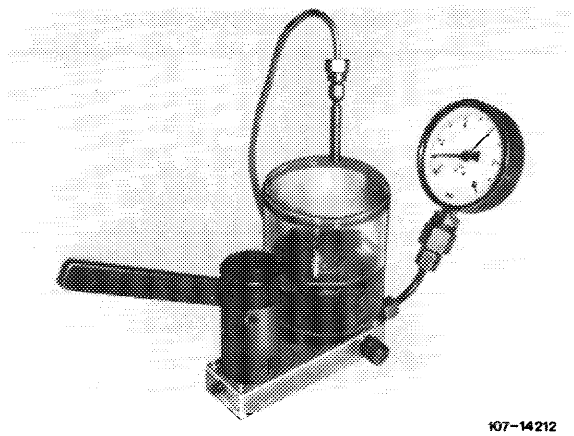
The nozzle or valve tester is used for testing opening pressure, for buzzing test, for evaluating jet and to test injection valves for leaks.

Prior to starting with injection valve test, the container of the tester must be filled and the unit must be bled. For testing, use kerosene only.



107–10592

Replace injection valves, which are exceeding tolerance. Injection valves can be individually replaced within a set.



107–14212

Testing

For testing, remove injection valves (07.3–215).

1 Coase leak test:

a) Connect removed injection valves to tester. Bleed pressure line with shutoff valve opened and coupling nut released. Then tighten coupling nut.

b) With shutoff valve opened, **slowly** operate hand lever (4 s/stroke) and built-up pressure up to max. 1.5 bar gauge pressure. If a leak on injection valve shows up, replace injection valve.

2 Check opening pressure.

Close shutoff valve. Flush injection valve by moving hand lever several times back and forth.

Open shutoff valve and check opening pressure by slowly moving hand lever back and forth.

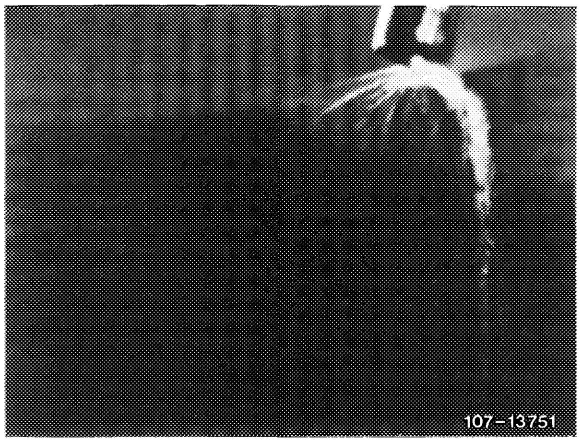
3 Fine leak test:

Close shutoff valve. Flush injection valve by moving hand lever several times back and forth. Open shutoff valve, increase pressure slowly up to 0.5 bar gauge pressure below previously determined opening pressure and hold. No drop should show up on injection valve within 15 seconds.

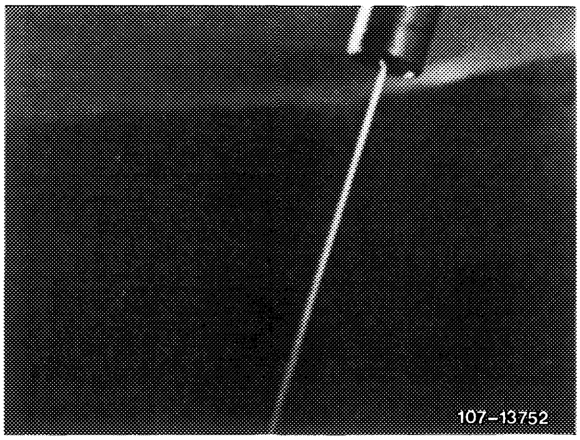
4 Buzzing test, evaluation of jet:

Close shutoff valve and flush valve by moving hand lever several times back and forth (0.5 s/stroke). Then reduce lever speed to approx. 1 s/stroke. Valve should now buzz. No drop should show up at mouth of valve. No cord-like jet should show up. One-sided, atomized jet formation within a total spray angle of approx. 35° is permitted.

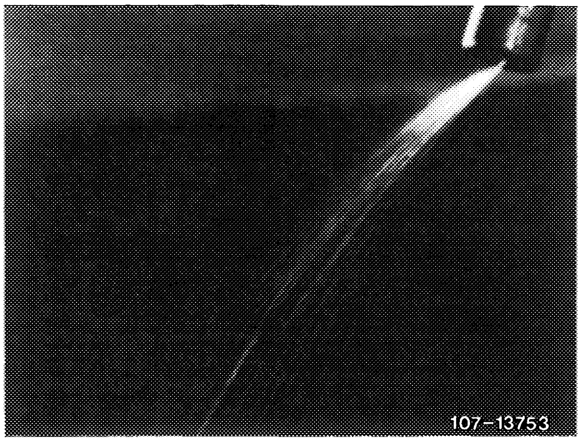
Damaged injection valves



Drop formation

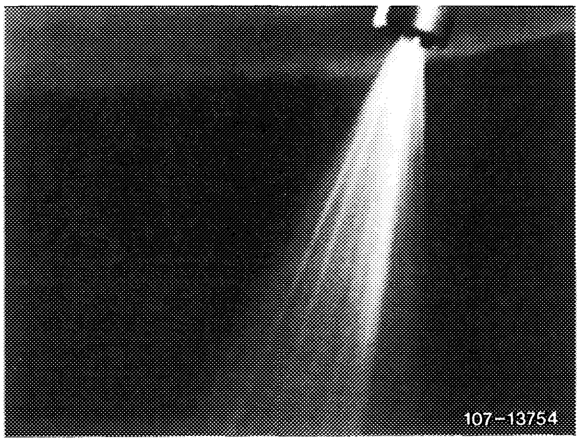


Cord-like jet



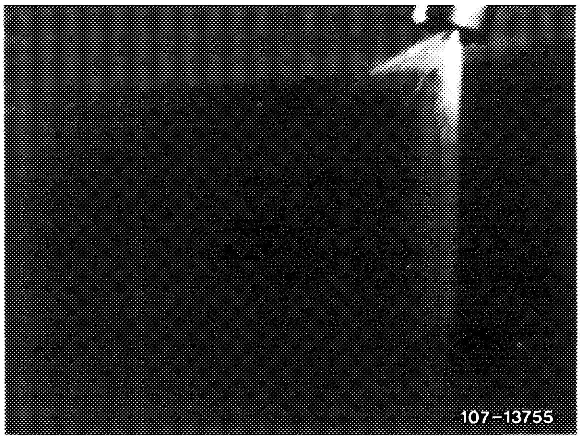
Spreading jet

Good injection valves



Good jet preparation

Slightly one-sided atomization



07.3–140 Checking decel shutoff

Test values

Speed km/h	Engine speed 1/min without refrigerant compressor	with refrigerant compressor
> 35	> 1100	> 1300

Conventional tools

Revolution counter, volt-ohmmeter
Digital multimeter with means for measuring AC (for impulse transmitter test)

Note

Since decel shutoff requires engine speed impulses and driving speeds, the respective component can be tested only on a dynamometer or on the road.

A function test of impulse transmitter can also be made by means of workshop oscilloscope Bosch MOT 300/400, 202 and SUN 1080, 1019, 2110 in position "Primary, special "or "Generator test".

Testing on dynamometer

Remove air cleaner.

Run on dynamometer at approx. 70 km/h in 4th speed or driving position "D". Release accelerator pedal, air flow sensor plate will move into zero position. As soon as combustion starts again at approx. 1100/min or approx. 1300/min with refrigerant compressor, the air flow sensor plate will move into idle position. Check decel shutoff valve and its activation, if required.

Testing without dynamometer (road test)

Run engine at idle.

Test decel shutoff valve (30).

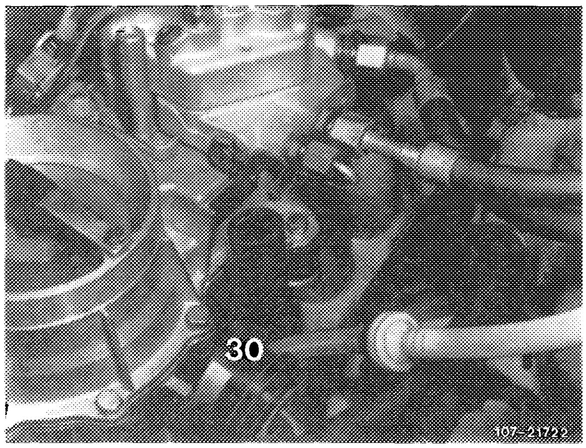
Test activation of switchover valve (43a).

Test speed-dependent control.

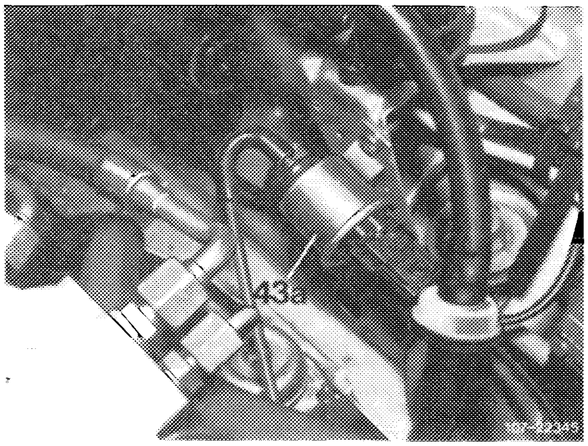
Testing

Testing decel shutoff valve (30)

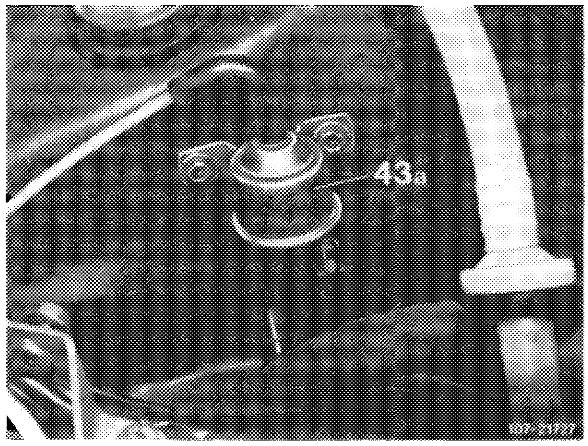
1 Run engine at idle. Pull off vacuum lines on switch over valve (43a) and connect with each other. Decel shutoff valve (30) will then open and the engine should stop.
If engine keeps running, check vacuum lines. Intake manifold vacuum should be available at idle. If vacuum is available, replace decel shutoff valve (30).



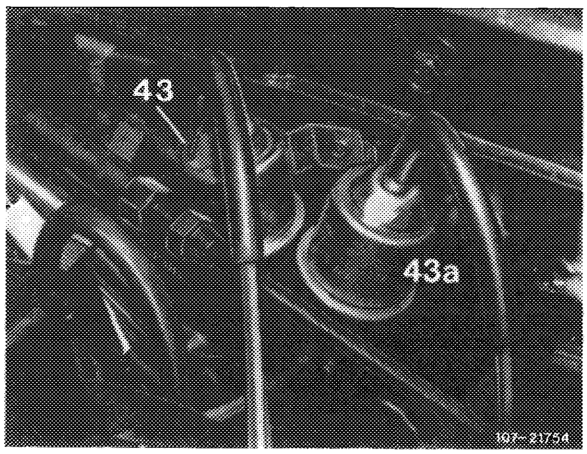
Layout switchover valves (43a)



Model 107



Model 123

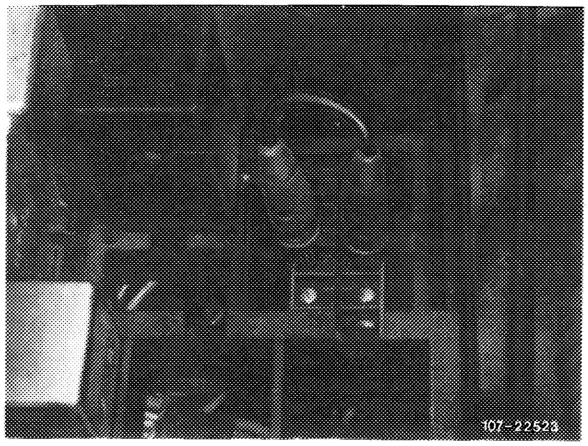


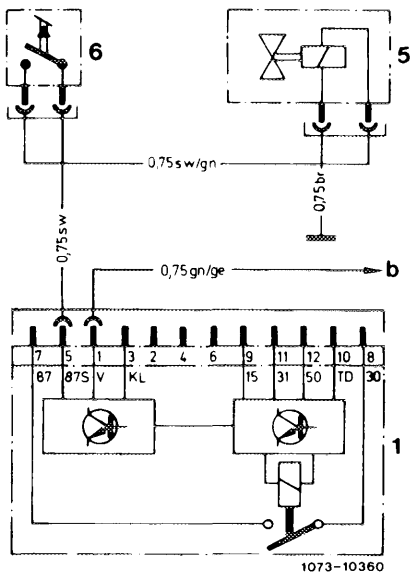
Model 126
43 Switchover valve air conditioning (identification: green cap)
43a Switchover valve decel shutoff (identification: gray cap)

Checking activation of switchover valve

2 Pull off fuel pump relay. Bridge jack 7 (terminal 87) and 8 (terminal 30), so that fuel pump will run. Start engine, connect jack 5 (terminal 87 S) of coupler with battery voltage. Engine should now stop.

If engine does not stop, check microswitch (3 or 6) or switchover valve (43a or 5).





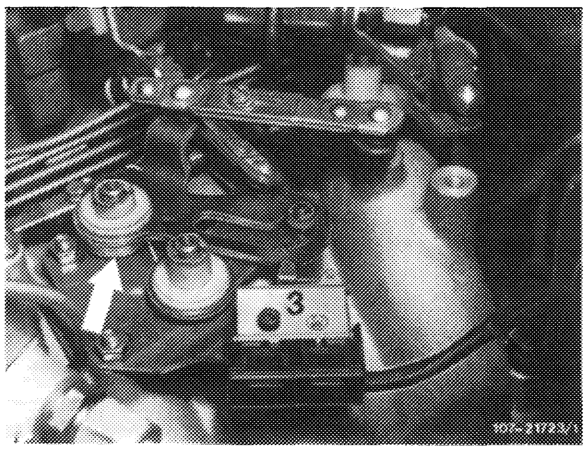
1 Electronic fuel pump relay
5 Switchover valve
6 Microswitch
b Tachometer transmitter

Testing microswitch (3)

Pull off coupler on microswitch. Connect ohmmeter.

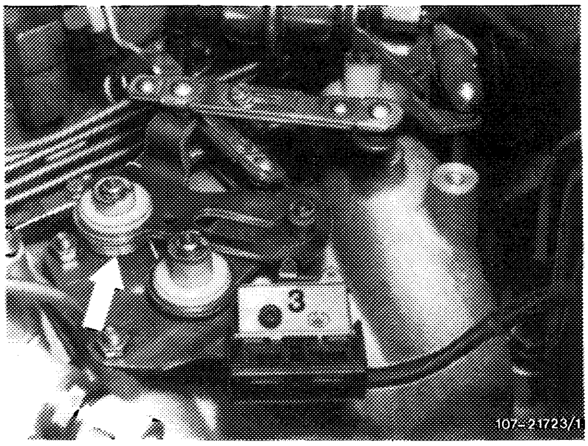
Readout: At idle 0 Ω
When accelerating ∞ Ω.

Check adjustment of slotted lever, if required. Roller *in slotted lever* should rest free of tension against final stop. Check rotary spring (arrow), if required.

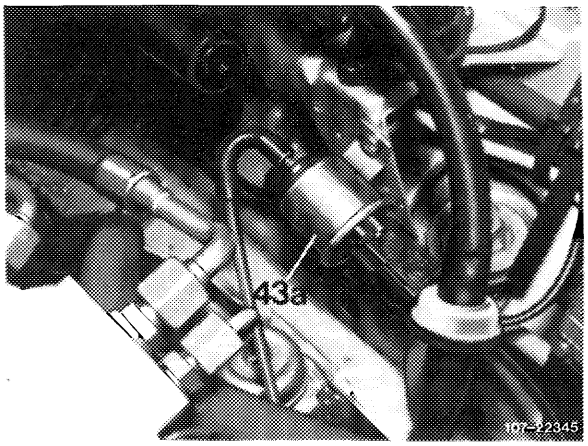


Testing switchover valve (43a)

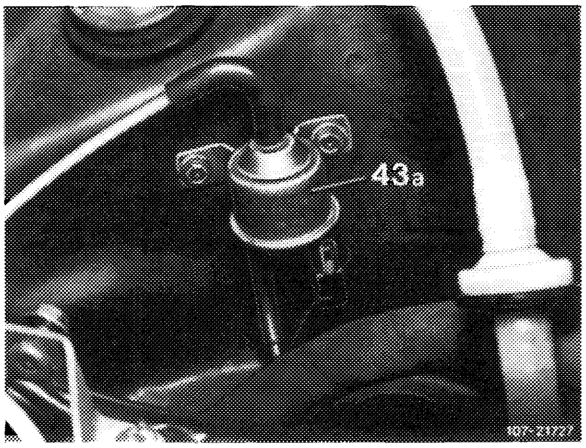
Pull coupler from microswitch (3) and connect cable, color black/green, to battery voltage, engine should now stop. If engine does not stop, test line with an ohmmeter for passage or replace switchover valve (43a).



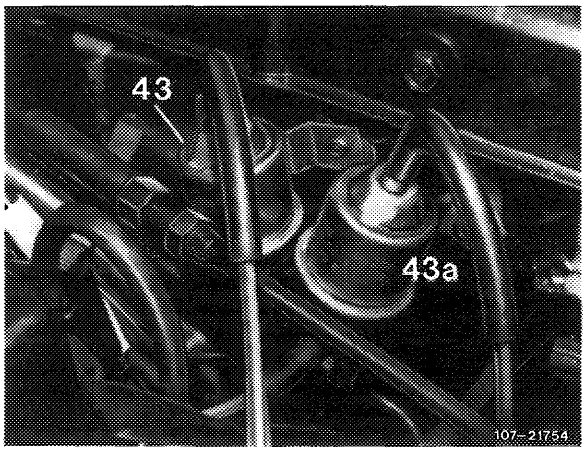
Layout switchover valves (43a)



Model 107

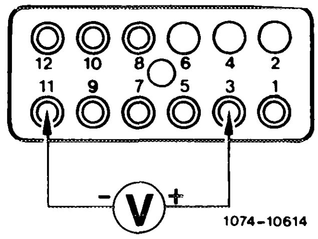


Model 123



Model 126
43 Switchover valve air conditioning (identifiaction: green cap)
43a Switchover valve decel shutoff (identifiaction: gray cap)

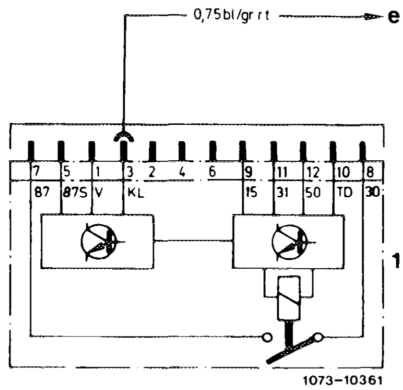
3 Check cutting-in impulse of refrigerant compressor. For this purpose, run engine at idle. Connect positive cable (red) of voltmeter to jack 3 (terminal KL) and negative cable (black) to jack 11 (terminal 31).



When switching-on refrigerant compressor, battery voltage should be available.

If no voltage is available, test line blue/gray/red (terminal KL) to refrigerant compressor for interruption.

Note: With air-conditioning system switched on, voltage should be available at jack 3 (terminal KL) of fuel pump relay (refer to wiring diagram group 83 air-conditioning system).



1 Fuel pump relay
e Refrigerant compressor

Test speed-dependent control

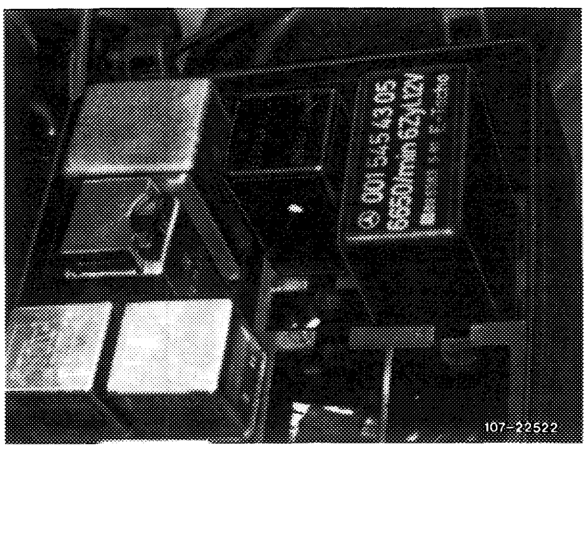
4 Pull coupler from switchover valve (43a) and connect voltmeter to coupler. Operate on dynamometer or on road in 4th gear, or in driving position "D" at 70 km/h. Release accelerator pedal, battery voltage should be available. If there is no voltage, test impulse transmitter on tachometer or replace fuel pump relay, if required.

There should be no voltage below approx. 1100/min or approx. 1300/min with refrigerant compressor.

Testing impulse transmitter on tachometer

5 A prerequisite for a signal is that the speed indicator is operational.

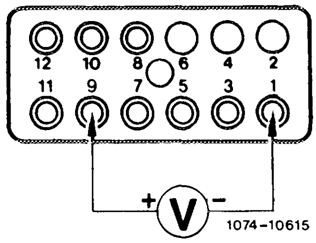
Test impulses for decel shutoff. Pull off fuel pump relay for this purpose.



Electronic tachometer

a) Testing output signal

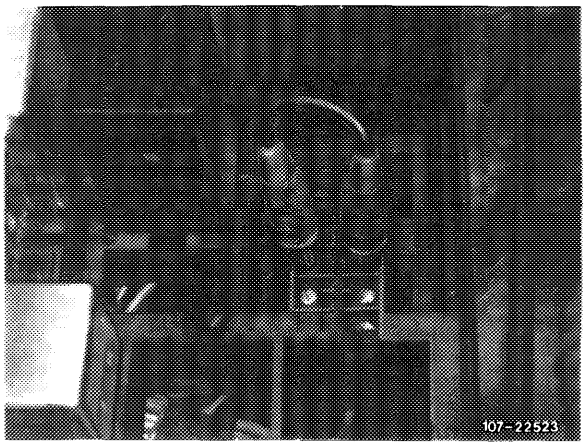
Connect digital multimeter (position V = DC). For this purpose, connect positive cable (red) to jack 9 (terminal 15), grounding cable (black) to jack 1 (terminal V).



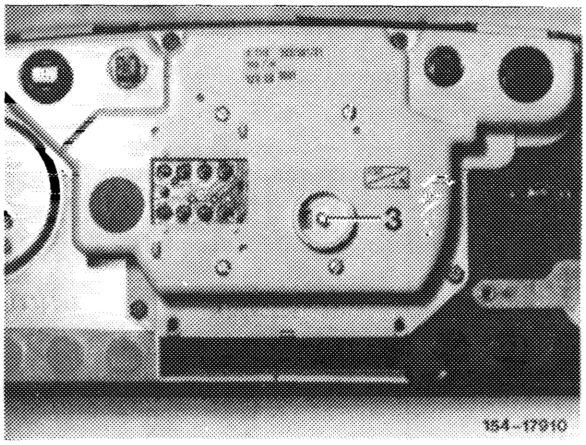
Attention!
Perform measurements in position V = only. Wrong handling will damage tachometer electronics.

Bridge jack 7 (terminal 87) and jack 8 (terminal 30), fuel pump will then run.

Operate on dynamometer or on road in 4th gear or in driving position "D" at 70 km/h. Readout should indicate $\geqq$ 1 Volt DC (in position V =). Measuring value increases with increasing vehicle speed.



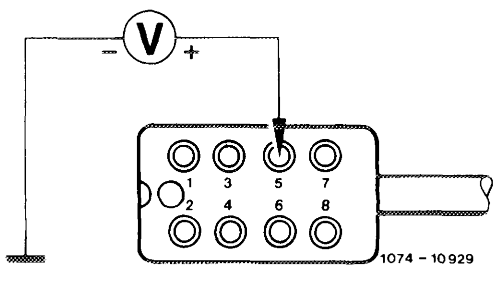
If there is no readout, test cable from jack 1 (terminal V) to impulse transmitter connection (3) by means of an ohmmeter for passage.



Model 107, 126
3 Impulse transmitter connection

Test speed readout of tachometer.

If there is no readout, remove instrument cluster. Remove 8-pole plug on tachometer.



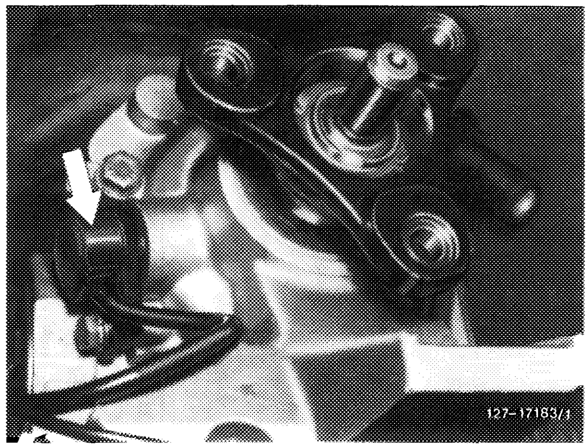
b) Testing input signal

Connect digital multimeter with means for measuring AC (in position V ~ or V ⏄) to jack 5.

Red = positive (jack 5)
Black = vehicle ground

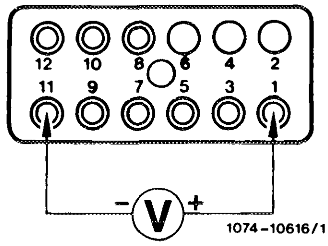
Operate on dynamometer or on road in 4th gear or in driving position "D" at 70 km/h. Readout ≧ should amount to 1 Volt AC (in position V ~). Measuring value increases with increasing driving speed.

If there is no readout, test cable for passage by means of an ohmmeter or replace cable or impulse transmitter (arrow) in transmission.



Impulse transmitter automatic transmission

Mechanical tachomater



Connect digital multimeter with means for measuring AC (in position V ~or V). For this purpose, connect position cable (red) to jack 1 (terminal V), grounding cable (black) to jack 11 (terminal 31).

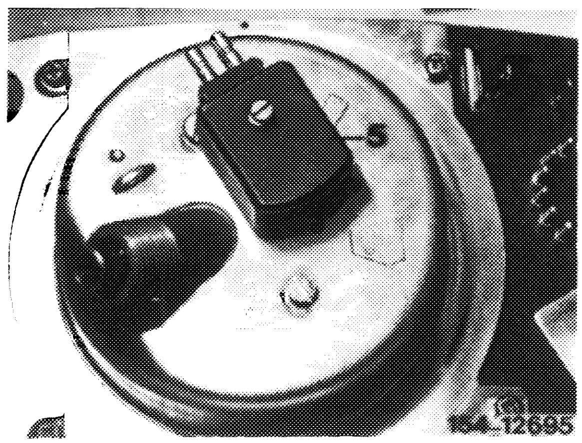
Bridge jack 7 (terminal 87) and jack 8 (terminal 30), fuel pump will now run.

Operate on dynamometer or on road in 4th gear or in driving position "D" at approx. 70 km/h. Readout ≧ should amount to 1 Volt AC (in position V ~). Measuring value increases with increasing vehicle speed. speed.

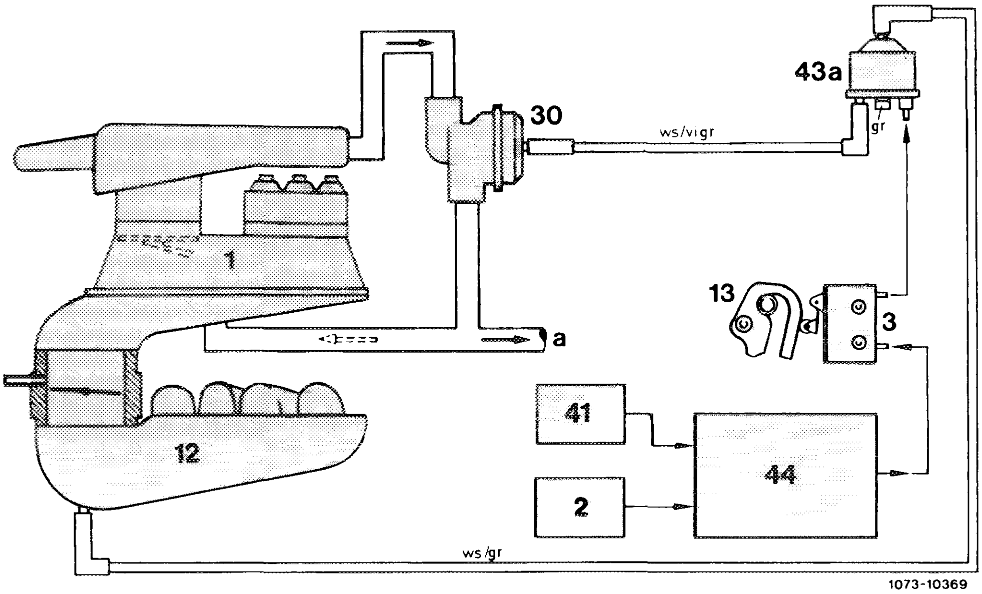
If there is no readout, test cable for passage by means of an ohmmeter. Replace cable or impulse transmitter (5) on tachometer, if required.

Test resistance of impulse transmitter (5). Nominal = 650 – 1370 Ω.

If the nominal value is exceeded or not attained, replace impulse transmitter.



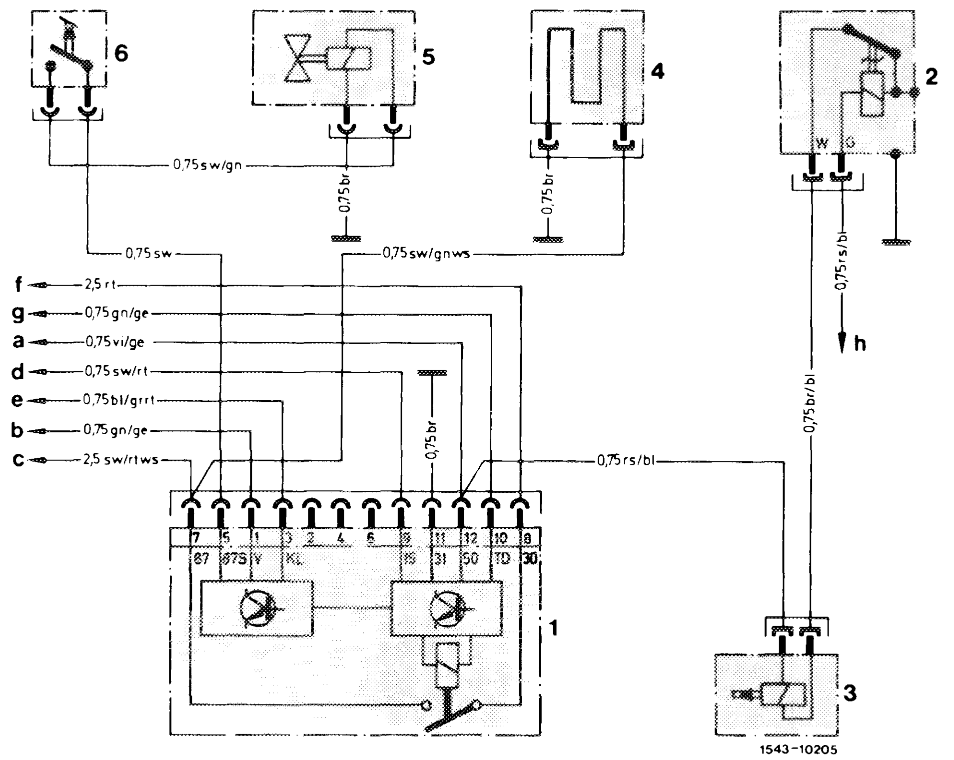
Model 123
5 Impulse transmitter



Function diagram decel shutoff

1	Mixture controller	41	Impulse transmitter mechanical tachometer	Color code
2	Transistorized switching unit	43a	Switchover valve decel shutoff	gr = gray
3	Microswitch	44	Fuel pump relay	vi = purple
12	Intake manifold	a	To idle speed air distributor	ws = white
13	Slotted lever			
30	Decel shutoff valve			

Note: For operation of decel shutoff and idle speed stabilization refer to 07.3–500.

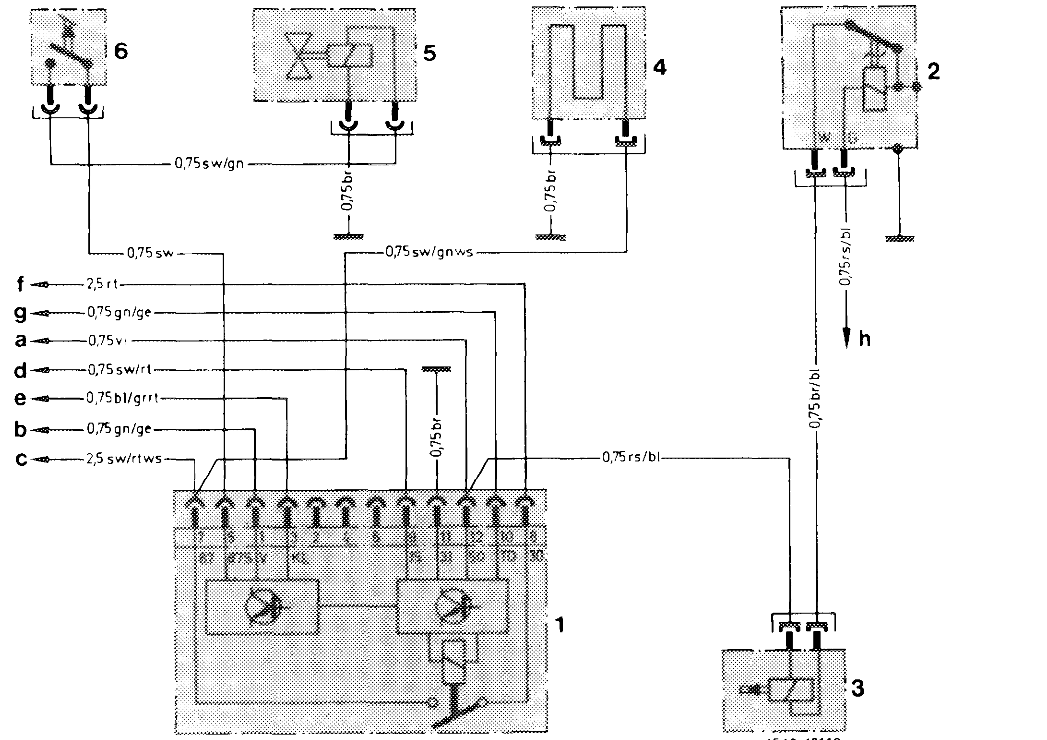


Wiring diagram decel shutoff model 123

1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up compensator
5 Switchover valve
6 Microswitch

a To output starter lockout and backup lamp switch
b Transmitter mechanical tachometer
c Fuel pump
d Fuse 12 terminal 15 access
e Refrigerant compressor
f Cable connector engine terminal 30
g Cable connector terminal TD
h Cable connector engine terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white



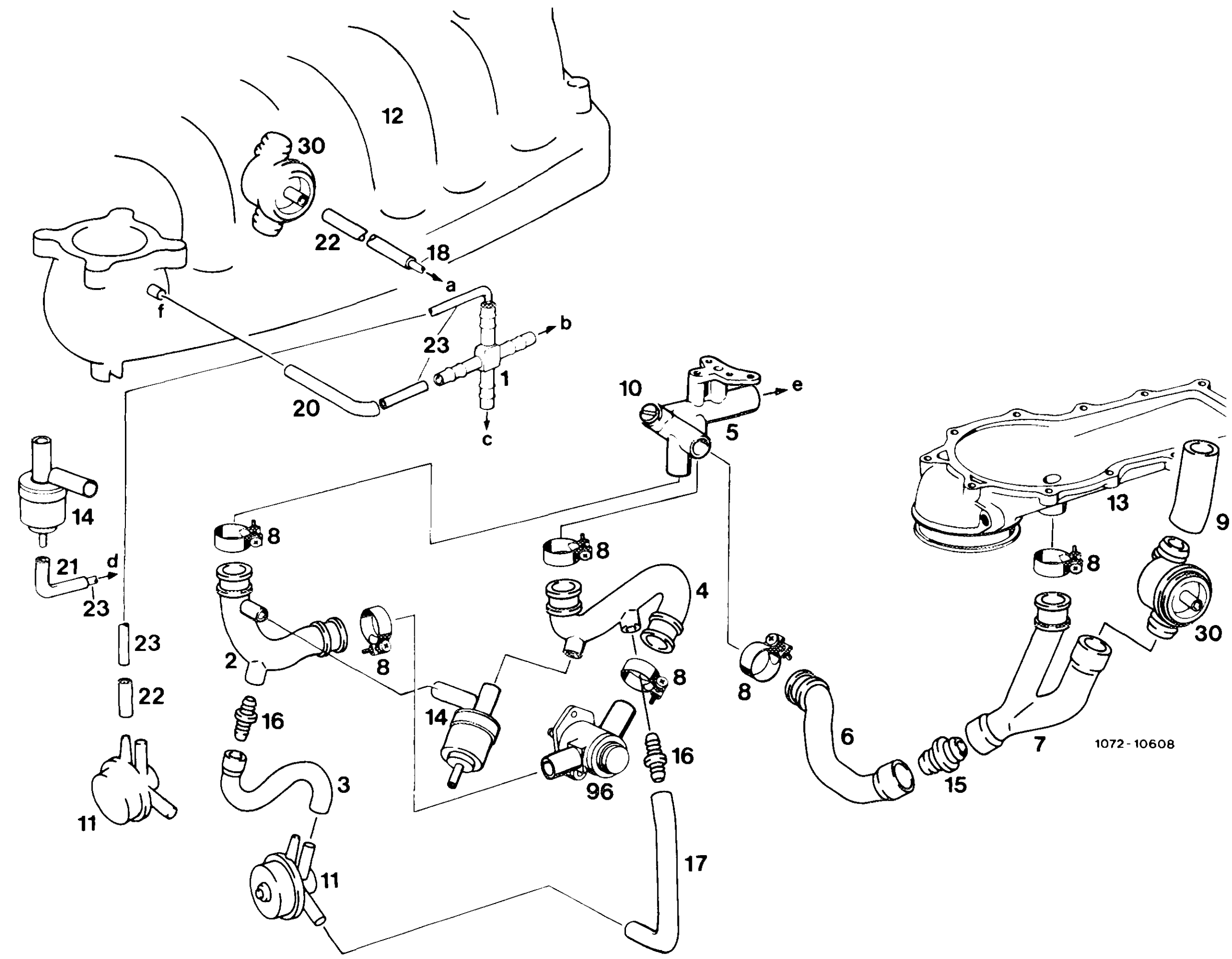
1543-10148

Wiring diagram decel shutoff model 107, 126

1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up compensator
5 Switchover valve
6 Microswitch

a Cable connector engine terminal 50
b Transmitter electronic tachometer
c Fuel pump
d Fuse 14 terminal 15 access
e Refrigerant compressor
f Cable connector terminal 30
g Cable connector terminal TD
h Cable connector engine terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white



Decel shutoff and idle speed stabilization

1 Multiple distributor
2 Contour hose
3 Contour hose
4 Contour hose
5 Idle speed air distributor
6 Contour hose
7 Contour hose
8 Hose clip
9 Contour hose for air filter
10 Idle speed air screw
11 Decel circulating air valve
12 Intake manifold
13 Air guide housing
14 Bypass valve air conditioning
15 Plug connection
16 Plug connection
17 Contour hose
20 Contour hose
21 Contour hose
22 Connecting hose
23 Vacuum line
30 Decel shutoff valve
96 Auxiliary air valve

a To switchover valve decel shutoff
b To switchover valve decel shutoff
c To switchover valve air conditioning
d To switchover valve air conditioning
e Connection idle speed air
f Vacuum connection intake manifold

Conventional tool

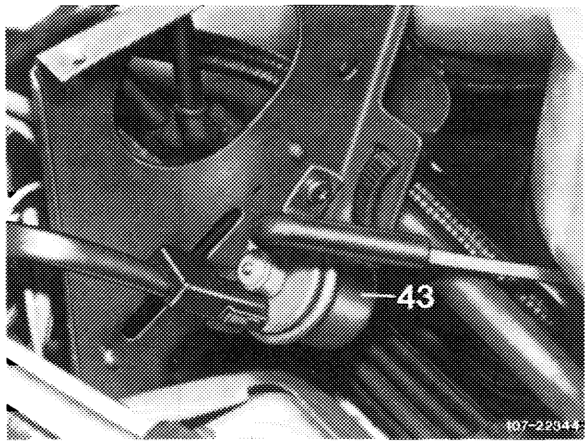
Voltmeter, revolution counter	
Digital tester	e.g. made by Bosch, MOT 001.03

Testing

1 Run engine at idle. When adding refrigerant compressor, the idle engine speed should increase by approx. 80/min.

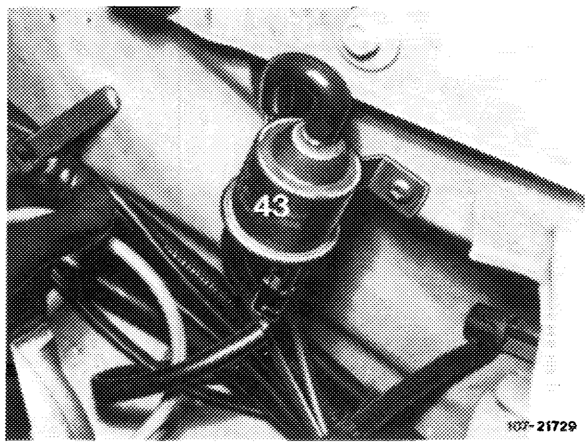
If the idle speed is not increasing, pull upper and lower vacuum line from switchover valve (43).

Vacuum should be available at upper line.

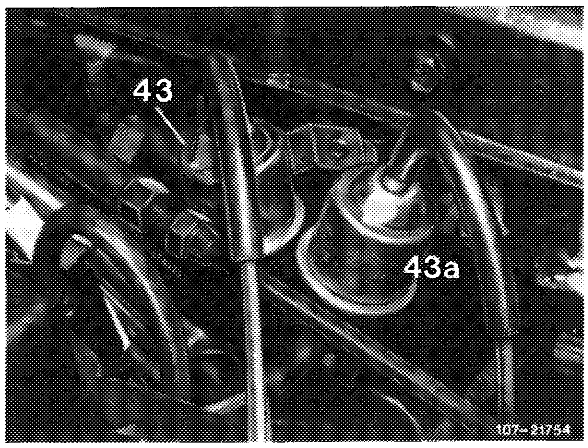


Model 107
43 Switchover valve (mounted on mounting bracket for coolant expansion tank).

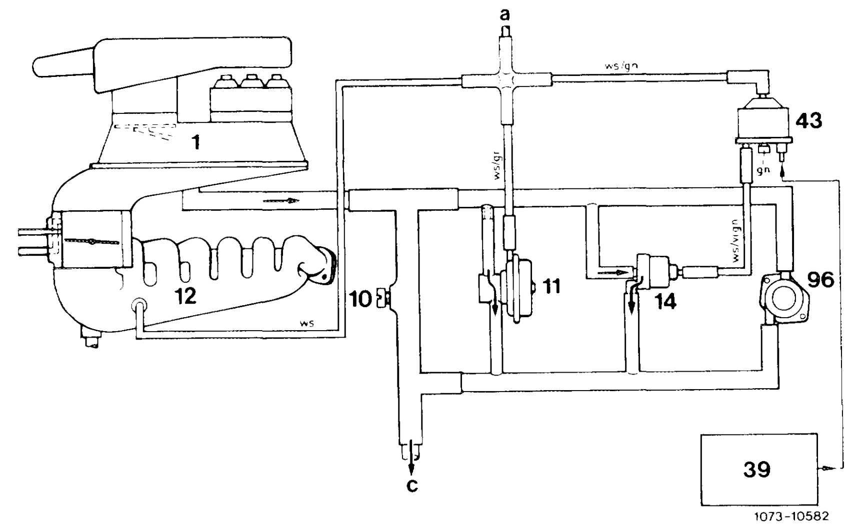
Layout switchover valves (43).



Model 123



Model 126
43 Switchover valve air conditioning (identification: green cap)
43a Switchover valve decel shutoff (identification: gray cap)



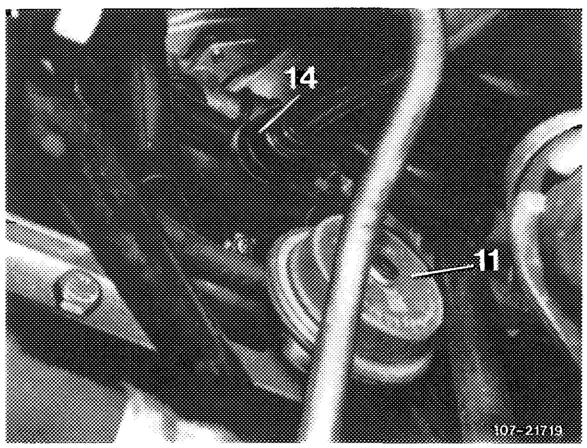
Function diagram idle speed stabilization on engines with refrigerant compressor

1 Mixture controller
10 Idle speed air screw
11 Decel circulating air valve
14 Bypass valve air conditioning
39 Relay air conditioning
43 Switchover valve rpm increase air conditioning
96 Supplementary air valve
a Connection switchover valve decel shutoff
c To idle speed air duct in intake manifold

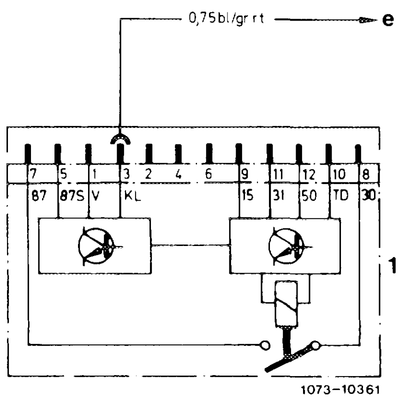
Color code
gn = green
vi = purple
ws = white

Note: For operation decel shutoff and idle speed stabilization refer to 07.3–500.

2 Connect both vacuum lines with each other, idle speed should then increase by approx. 80/min. If not, renew bypass valve (14).



3 If the engine speed increases, check electric activation of switchover valve (43). For this purpose, pull off coupler: with refrigerant compressor switched on, battery voltage should be available. If voltage is available, replace switchover valve. If no voltage is available, test voltage supply according to wiring diagram (refer to wiring diagram group 83 Air conditioning system).



1 Fuel pump relay
e Refrigerant compressor

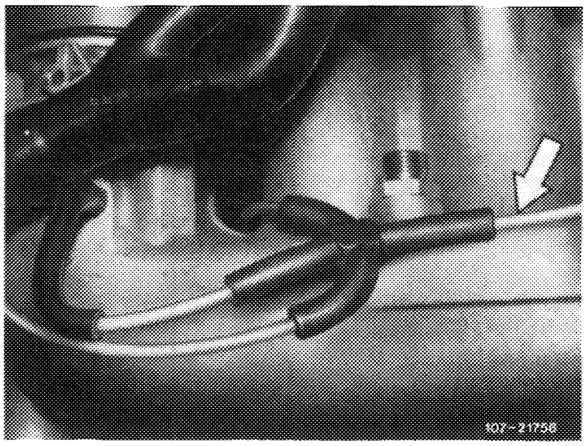
Conventional tools

Revolution counter	
Digital tester	e.g. made by Bosch, MOT 001.3

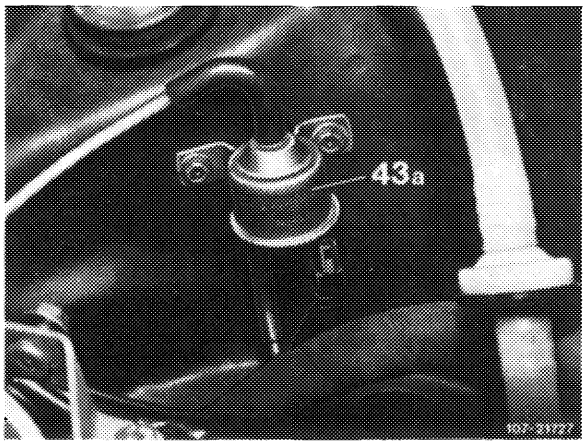
Testing

1 Run engine at idle.

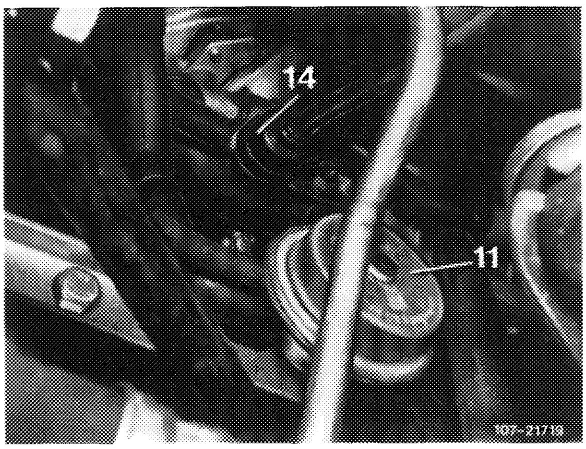
2 Pull off gray/black vacuum line (arrow) on 3 or 4-point rubber distributor (to reduce vacuum), put back again after approx. 3 seconds; idle speed should increase by approx. 500/min for a short period.

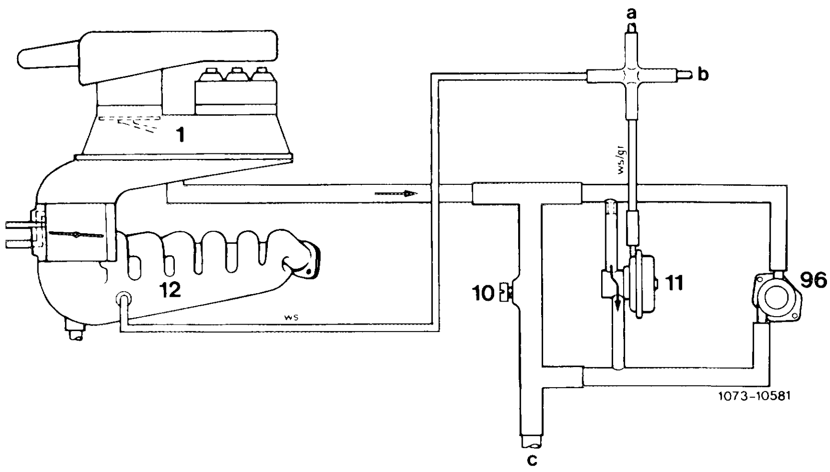


Note: On model 123 and 126, owing to better access, the upper vacuum line can be pulled from switchover valve (43a). As a result, the decel circulating air valve (11) is provided with atmospheric air via 3 or 4-point rubber distributor (refer to function diagram).



If there is no rpm increase, check line for passage. Renew decel circulating air valve (11), if required.





1 Mixture controller
10 Idle speed air screw
11 Decel circulating air valve
12 Intake manifold
96 Auxiliary air valve

a Connection switchover valve decel shutoff
b Connection switchover valve rpm increase air conditioning
c To idle speed air duct in intake manifold

Color code
gr = gray
ws = white

Note: For operation decel shutoff and idle speed stabilization refer to 07.3–500.

07.3–160 Checking fuel distributor for constant delivery

Test values

Load range	Fixation of air flow sensor plate at approx. . . cc/min	max. dissipation in cc/min
With gray iron fuel distributor		
Idle	6	1.2
Partial load	30	6.0
Full load	100	10.0
With light alloy fuel distributor		
Idle	6	0.8
Partial load	30	4.0
Full load	100	10.0

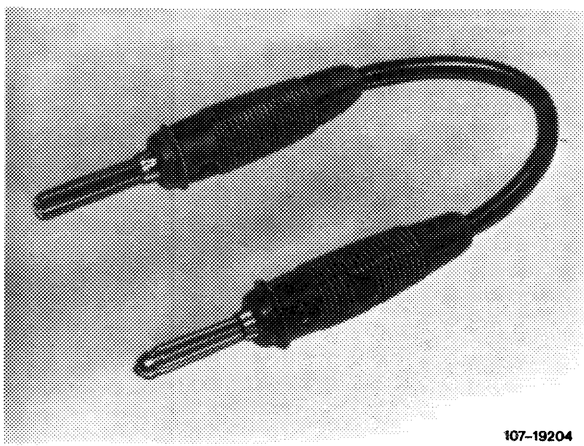
Conventional Bosch testers and accessories

Designation	order designation
Fuel distribution reference unit	KDJE–P 300
Tester carriage [1]	M 200/2 or KDJE–W 100

[1] If the tester carriage is used for fuel distribution reference unit, an additional angle plate is required. The plate can be self-made or obtained from a Bosch representative.

Self made tool

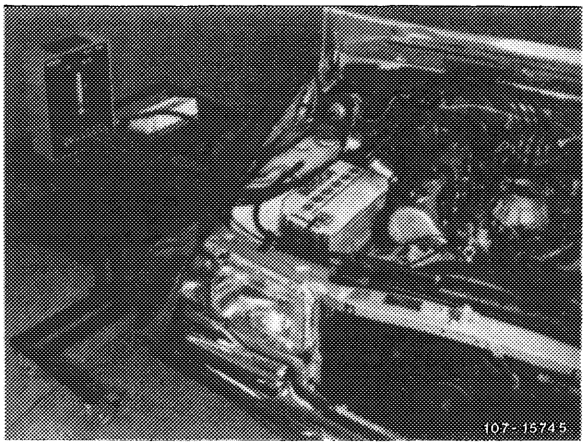
Contact bridge



107–19204

Note

A fuel distribution reference unit is available for testing fuel distributor in vehicle. The unit serves to measure the individual amounts of fuel which the fuel distributor dispenses to the injection valves. Measurements are made with engine stopped. Operating conditions (idle, partial or full load) are simulated and set in air flow sensor plate by means of an adjusting device.

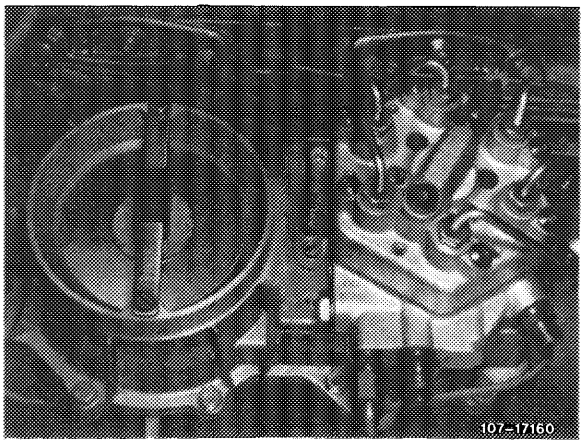


Testing

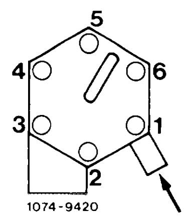
1 Set up fuel distribution reference unit horizontally adjacent to vehicle (tool or tester carriage).

2 Remove air cleaner.

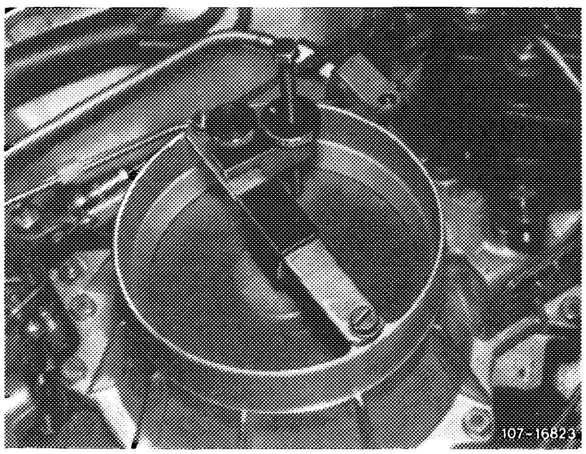
3 Unscrew injection lines on fuel distributor and loosen at injection valves, unscrew, if required.



4 Connect connecting lines of fuel distribution reference unit to fuel distributor (sequence according to Fig.) and plug fuel return line into filler neck of fuel tank.



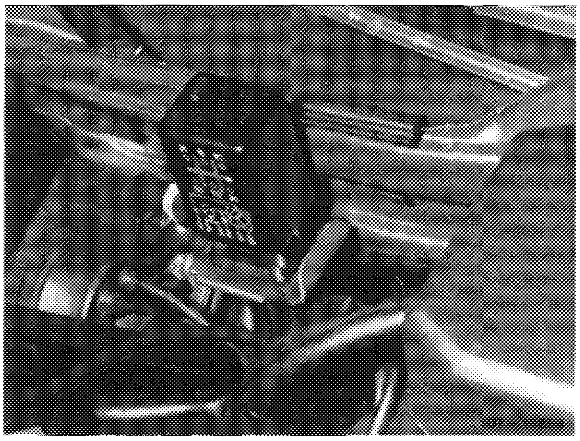
5 Clamp adjusting device for locating air flow sensor plate to stop bracket of air funnel (cone).



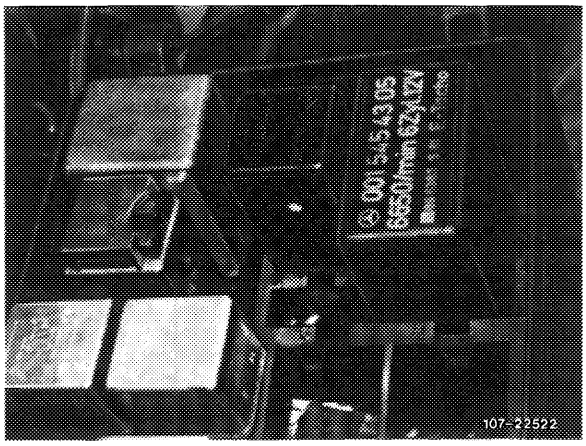
6 Switch-on ignition.

On vehicles without safety switch, pull off fuel pump relay and bridge the two jacks. This will connect the fuel pump to voltage.

Prior to September 1981: Jacks 1 and 2.
Starting September 1981: Jacks 7 and 8.



Model 123



Model 126

7 Deflect air flow sensor plate and push buttons 1 to 6 for venting unit individually for a short moment.

8 Keep one button pushed, deflect air flow sensor plate with adjusting device and locate at a flow rate of 6 cc/min (idle).

9 Push remaining buttons, read individual flow rates and enter on data sheet.

Note: Orders for data sheets, print no. 800.99.472.00 should be mailed by service establishments and representatives in the Federal Republic of Germany with punch cards to the "Drucksachen-Zentrallager in Stuttgart-Untertürkheim" and by the general representatives in export countries to "ZKD/F 2", Stuttgart-Untertürkheim. Data sheets are supplied in blocks of 50 sheets each.

10 Calculate difference between lowest and highest flow rate and compare with tolerance value (refer to test values).

11 For partial and full load, locate air flow sensor plate as described under item 7 at a flow rate of 30 cc/min or 100 cc/min. Then also calculate difference between lowest and highest flow rate and compare with tolerance value.

12 If the dispersion is outside tolerance, exchange fuel distributor.

13 Run engine and check all fuel connections for leaks.

14 Adjust idle speed (07.3–100).

07.3–165 Checking fuel pump relay with electronic rpm regulation (breakaway)

Breakaway speeds

Engine	MB-part no.	Breakaway speed 1/min	Speed signal

Without decel shutoff

Standard version and AUS J S USA starting model year 1981

110.984 110.986 110.987	001 545 07 05 001 545 14 05	6650 ± 50	–

With decel shutoff

Standard version

110.988	001 545 42 05	6650 ± 50	Mechanical tachometer
110.989 110.990	001 545 43 05		Electronic tachometer

Conventional testers

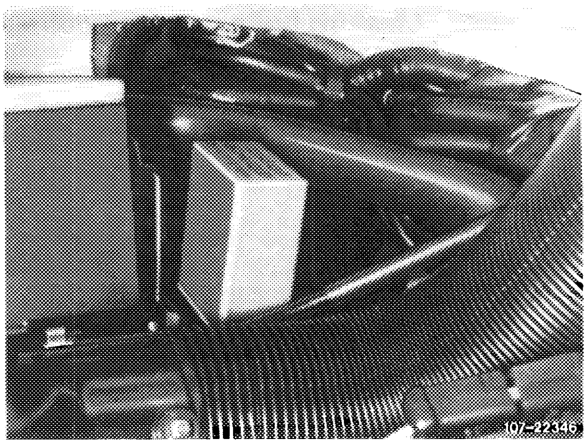
Voltmeter, revolution counter

Layout fuel pump relay

Model 107

Lefthand steering

At the right inside vehicle behind glove box. For repairs, remove glove box.



Model 107

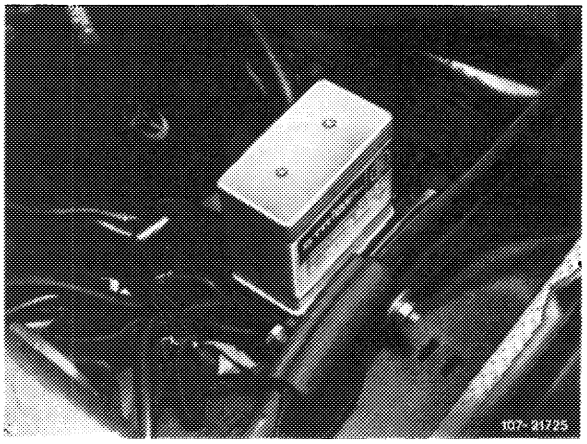
Righthand steering

At the right inside vehicle above pedals.

Model 123

Lefthand steering

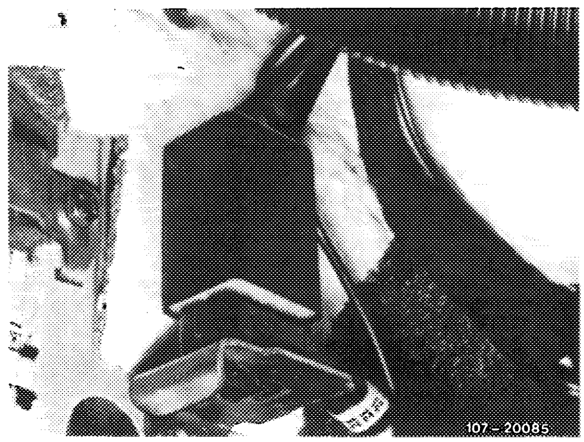
At the left on wheel house.



Model 123

Righthand steering

At the left inside vehicle behind side panelling. Remove cover for repairs.

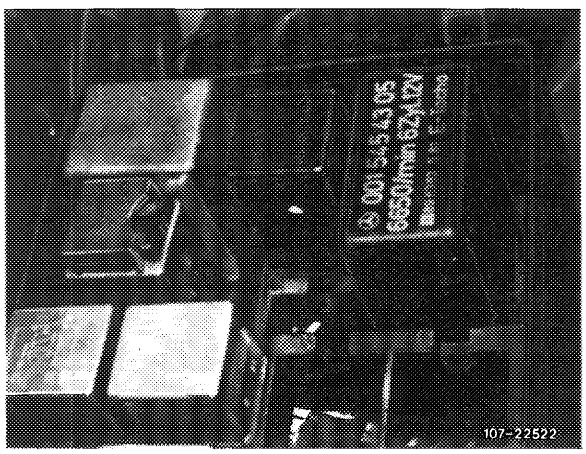


Model 123

Model 126

Lefthand and righthand steering

At the left in fuse box.



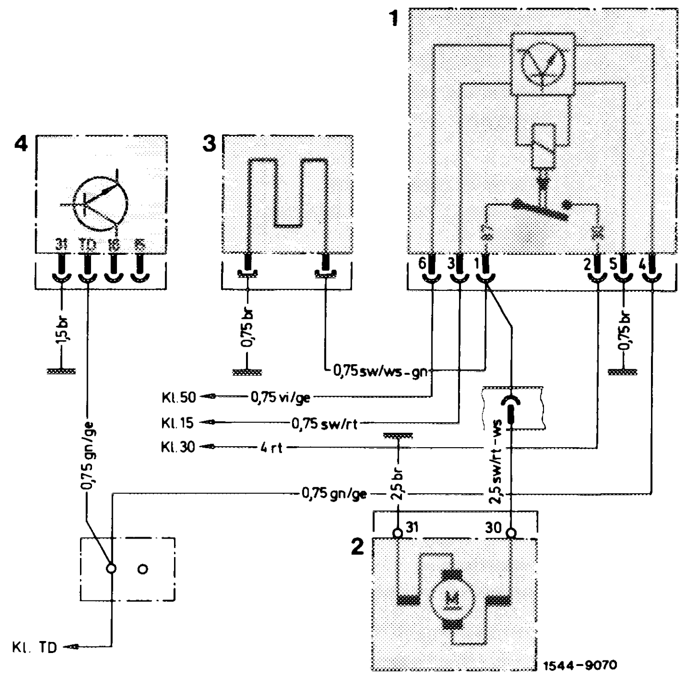
Model 126

A. Prior to September 1981

Testing

Test condition

Battery charged to min. 60 %.

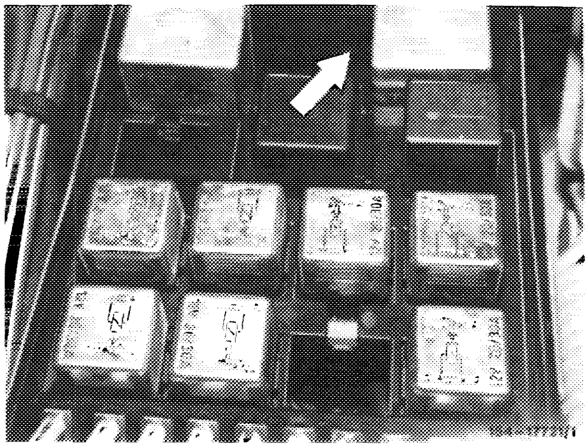


1 Fuel pump relay
2 Fuel pump
3 Warm-up compensator
4 TSZ (transistorized coil ignition) switching unit

Testing activation of fuel pump relay

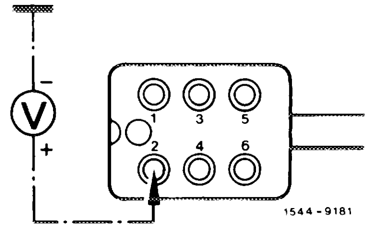
Remove fuel pump relay.
Connect negative cable (black) of voltmeter to vehicle ground). Measure voltage with positive cable (red) of voltmeter on jack 2 (terminal 30) of coupler.

approx. 12 Volts	0 Volt



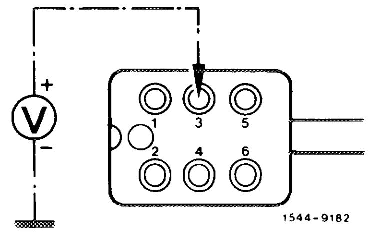
Test line (terminal 30, red) to cable connector engine harness for interruption.

Remove interruption.



Switch-on ignition.
Measure voltage by means of positive cable of voltmeter on jack 3 (terminal 15) of coupler.

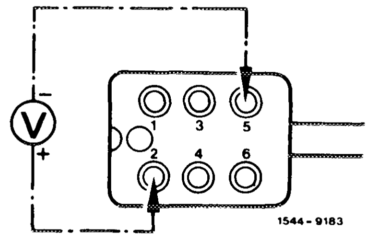
approx. 12 Volts	0 Volt



Test line (terminal 15, black/red) to ignition starting switch for interruption.

Remove interruption.

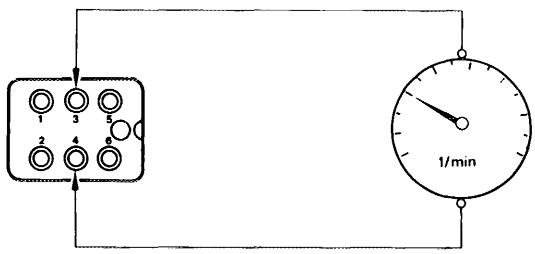
Connect positive cable (red) of voltmeter to jack 2 (terminal 30) and negative cable (black) of voltmeter to jack 5 (terminal 31) of coupler and measure voltage.	
approx. 12 Volts	0 Volt



Test line (terminal 31, brown) to grounding point for interruption.

Remove interruption.

Connect revolution counter to jack 3 (terminal 15) and jack 4 (terminal TD) of coupler. Operate starter.	
approx. 200/min	0/min



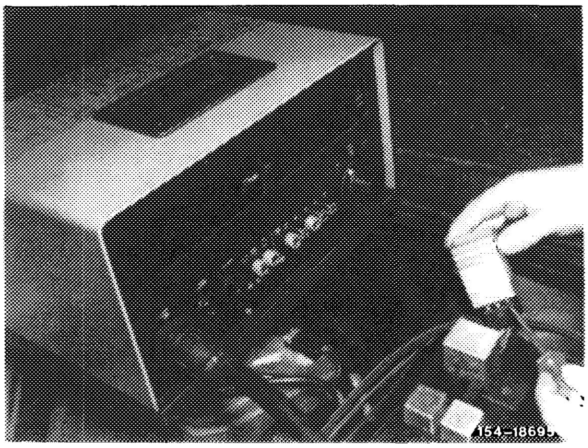
Test line (terminal TD, green/yellow) to TSZ (transistorized coil ignition) switching unit for interruption.

Replace switching unit, if line is in order.

Testing operation of fuel pump relay

Connect negative cable (black) of voltmeter to vehicle ground. Plug fuel pump relay on coupler in such a manner that the voltage can be measured at connection 1 (terminal 87) of fuel pump relay by means of positive cable (red) of voltmeter. For this purpose, operate starter.

approx. 12 Volts	0 Volt



0 Volt → Replace fuel pump relay.

Run engine at idle.

Engine running.	Engine not running

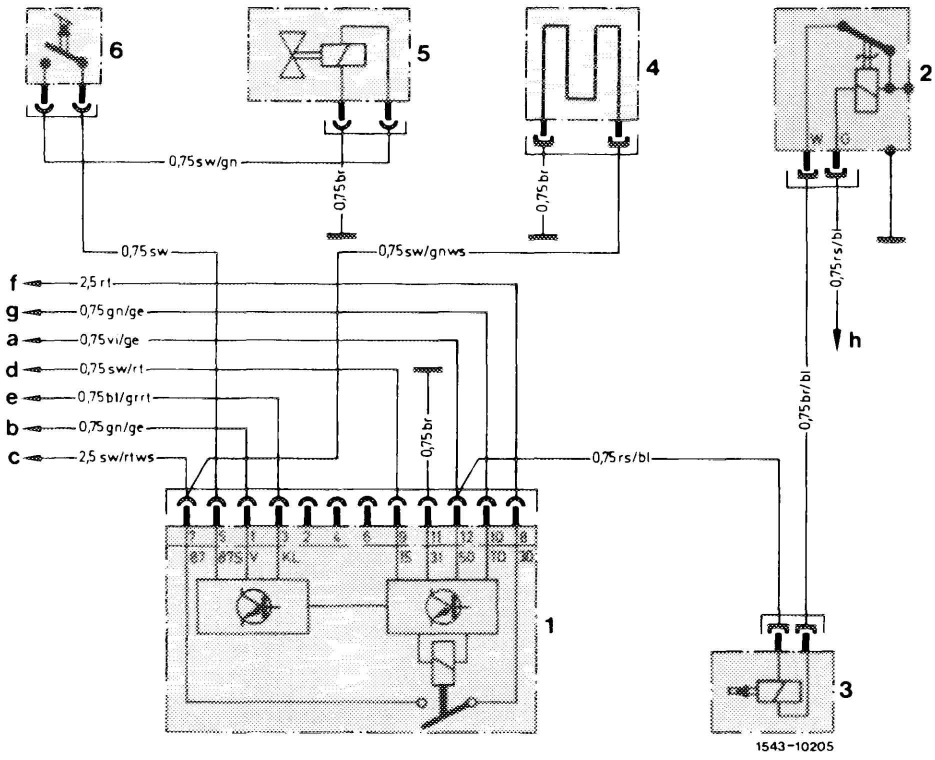
Engine not running → Replace fuel pump relay.

If engine is not regulated (breakaway) when attaining max. speed of engine, replace fuel pump relay.

The respective breakaway speed is punched into fuel pump relay.

End of test

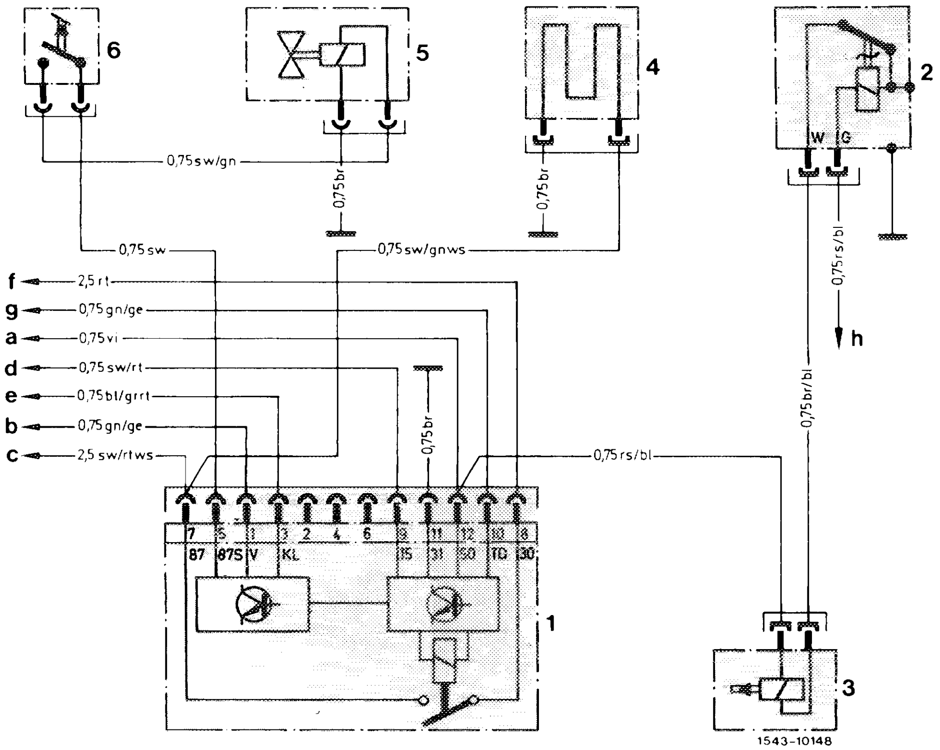
B. Starting September 1981



Wiring diagram model 123
1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up compensator
5 Switchover valve
6 Microswitch

a To output starter lockout and backup lamp switch
b Transmitter mechanical tachometer
c Fuel pump
d Fuse 12 terminal 15 access
e Refrigerant compressor
f Cable connector engine terminal 30
g Cable connector terminal TD
h Cable connector engine terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white



Wiring diagram model 107, 126

1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up regulator
5 Switchover valve
6 Microswitch

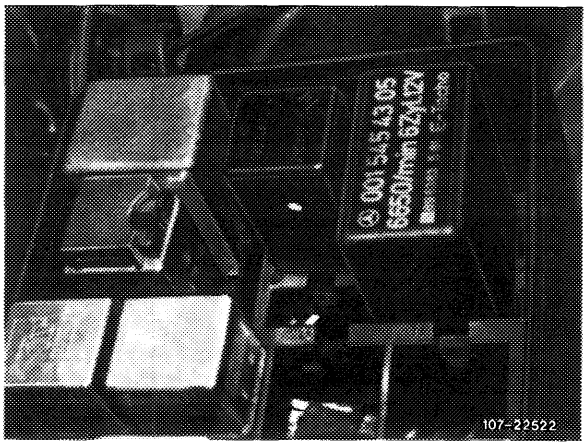
a Cable connector engine terminal 50
b Transmitter electronic tachometer
c Fuel pump
d Fuse 14 terminal 15 access
e Refrigerant compressor
f Cable connector terminal 30
g Cable connector terminal TD
h Cable connector terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white

Testing activation of fuel pump relay

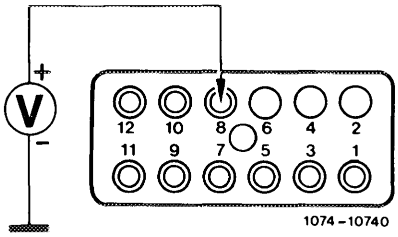
Remove fuel pump.
Connect negative cable (black) of voltmeter to vehicle ground. Measure voltage by means of positive cable (red) of voltmeter on jack 8 (terminal 30) of coupler.

approx. 12 Volts	0 Volt



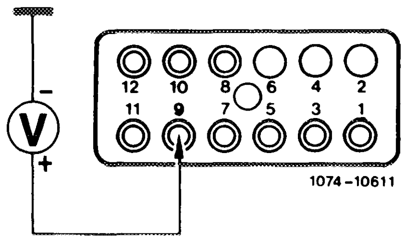
Test line (terminal 30, red) to cable connector engine harness for interruption.

Remove interruption.



Switch-on ignition.
Measure voltage by means of positive cable (red) of voltmeter on jack 9 (terminal 15) of coupler.

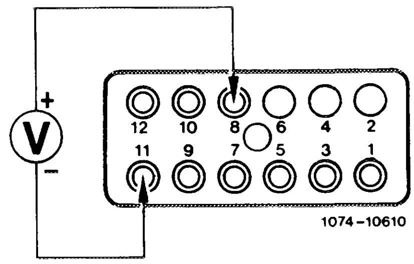
approx. 12 Volts	0 Volt



Test line (terminal 15, black/red) to fuse box for interruption.

Remove interruption.

Connect positive cable (red) of voltmeter to jack 8 (terminal 30) and negative cable (black) of voltmeter to jack 11 (terminal 31) of coupler and measure voltage.	
approx. 12 Volts	0 Volt



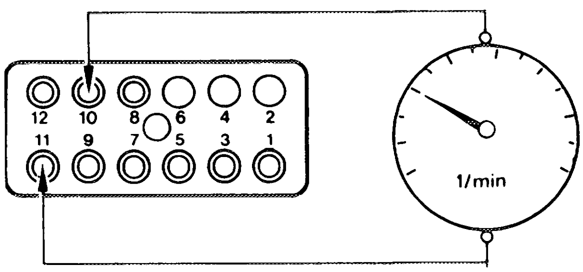
1074–10610

0 Volt:

Test line (terminal 31, brown) to ground connection point for interruption.

Remove interruption.

Connect revolution counter to jack 10 (terminal TD) and jack 11 (terminal 31) of coupler. Operate starter.	
approx. 200/min	0/min



1074–10612

0/min:

Test line (terminal TD, green/yellow) to TSZ (transistorized coil ignition) switching unit for interruption.

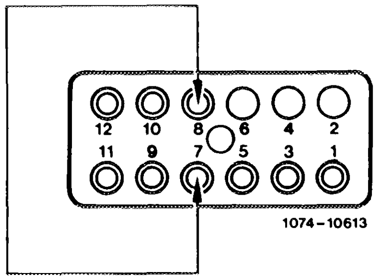
Replace switching unit if line is in order.

Testing operation of fuel pump relay

Bridge jack 7 (terminal 87) and 8 (terminal 30). Fuel pump should now be heard starting.

Fuel pump running.

Yes	No



(No:)

Test line (terminal 87, black/red/white) to fuel pump for interruption.

Remove interruption.

Fuel pump running.

Yes	No

(No:)

Renew fuel pump.

Fuel pump running.

Yes	No

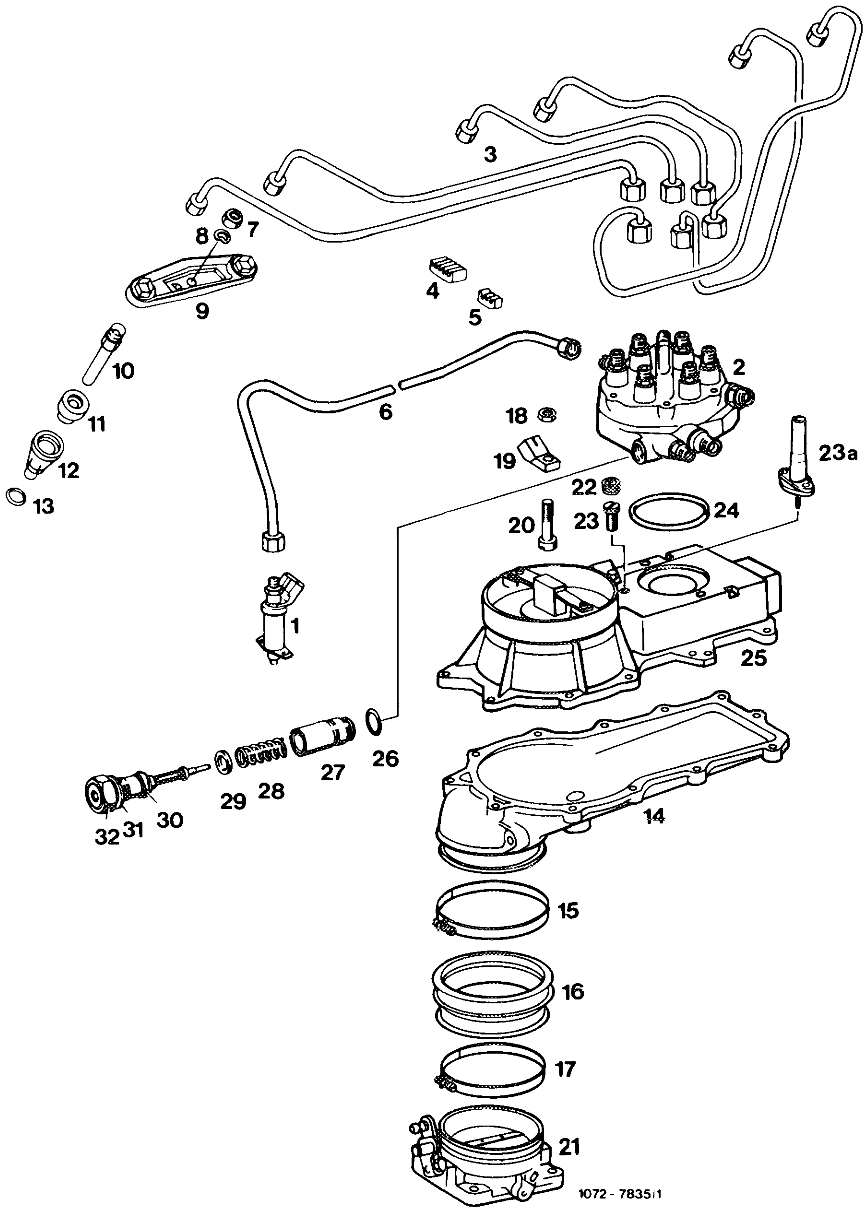
(No:)

Renew fuel pump

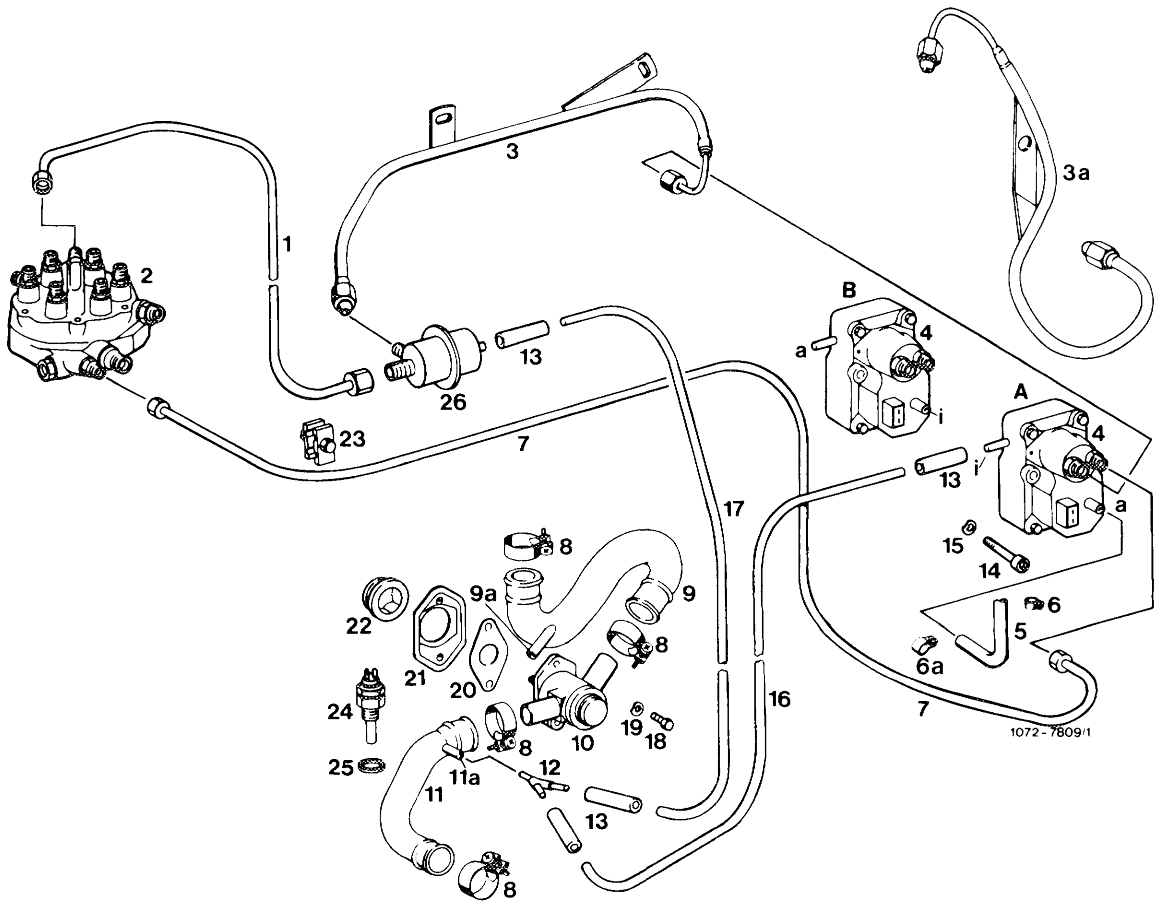
End of test

If engine is not regulated (breakaway) when engine max. speed is attained, replace fuel pump relay.

The respective breakaway speed is punched into fuel pump relay.



1 Cold starting valve
2 Fuel distributor
3 Injection lines
4 Plastic clip
5 Plastic clip
6 Fuel line
7 Nut
8 Corrugated washer
9 Fastening bridge
10 Injection valve
11 Rubber ring
12 Plastic sleeve
13 O-ring
14 Air guide housing
15 Hose clamp
16 Rubber sleeve
17 Hose clamp
18 Polystop nut
19 Safety switch
20 Screw
21 Throttle valve housing
22 Closing plug
23 Closing plug
23a Adjusting device
24 O-ring
25 Air flow sensor
26 O-ring
27 Regulator piston
28 Compression spring
29 Adjusting washers
30 O-ring
31 Copper sealing ring
32 Closing plug



1 Control pressure line
2 Fuel distributor
3 Control pressure line with Tecalan 1st version
3a Control pressure line with Tecalan 2nd version, starting with increased output
4 Warm-up compensator
5 Vacuum hose for full load enrichment
6 Hose clamp
6a Hose clamp for emission version only
7 Fuel return line
8 Hose clamp
9 Contour hose
9a Connection for ignition retard
10 Auxiliary air valve
11 Contour hose
11a Connection leak line 1st version
12 Distributor
13 Connecting hose
14 Screw
15 Corrugated washer
16 Leak line
18 Screw
19 Corrugated washer
20 Gasket
21 Flange
22 Closing plug
23 Fastening holder
24 Thermo time switch
25 Sealing ring
26 Pressure damper

A Warm-up compensator prior to September 1981
a Vacuum connection for full load enrichment
i Connection to leak line (atmosphere)

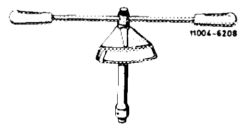
B Warm-up compensator starting September 1981
a Vacuum connection for full load enrichment
i Connection to leak line (atmosphere)

07.3–200 Removal and installation of mixture controller

Tightening torques	Nm
Hex. screws mixture controller to air guide housing	9–10
Hex. nuts mixture controller to intake manifold (rubber buffer)	9–10
Injection lines and fuel lines to fuel distributor (reference value)	10–12
Injection lines to injection valves (reference value)	10–15

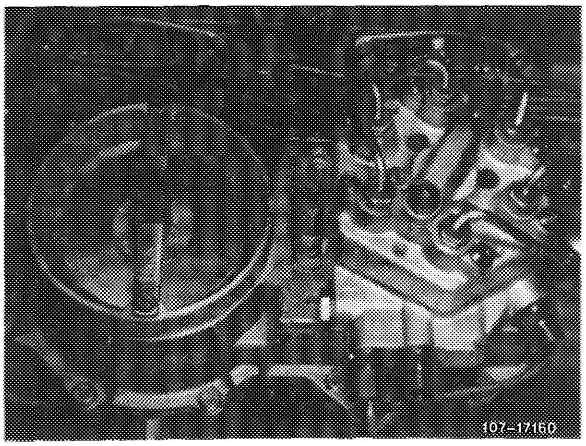
Special tool

Torque wrench 1/4" square, 4–16 Nm



000 589 67 21 00

Removal



1 Remove air cleaner.

2 Unscrew all fuel and injection lines on fuel distributor and on injection valves. Catch fuel with a rag.

Close fuel feed and return line blind.

3 Pull electric connecting cable, to the extend installed, from safety switch.

4 Unscrew all hex. screws and both hex. nuts from mixture controller.

5 Remove mixture controller.

6 Renew air guide housing according to condition. For this purpose, loosen hose clamp on rubber sleeve and on contour hose for idle air.

Installation

7 Mount air guide housing.

8 Install mixture controller with Curil K 2 or Hylomar in vice versa sequence.

9 Tighten hex. screws and hex. nuts to 9–10 Nm.

10 Connect injection lines and fuel lines. Pay attention to tightening torques as reference values.

Attention!
When tightening injection lines and fuel lines, apply counterhold to injection valves as well as to double thread connections on fuel distributor.

11 Run engine and check all fuel connections for leaks.

12 Adjust idle speed (07.3–100).

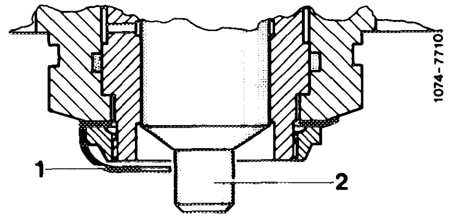
Tightening torques (reference values)	Nm
Injection lines to fuel distributor	
Fuel line for cold starting valve to fuel distributor	
Fuel return line from warm-up compensator to fuel distributor	10–12
Control pressure line to fuel distributor	
Control pressure line to pressure damper	
Injection lines to injection valves	10–15

Note

After stocks of fuel distributor made of gray iron have been used up, only fuel distributors made of light alloy are available as spare parts

Note that for engines 110.984/985/986 they are manufactured with the characteristic of the fuel distributor made of gray casting and without pressure compensating valve. This fuel distributor is not identical with the light alloy distributor installed in production vehicles (series).

The fuel distributor (gray iron starting Bosch production date 725 and light alloy fuel distributor) is provided with a sheet metal lock (1), which prevents control piston (2) from falling out. The sheet metal lock serves to facilitate assembly, as well as a safety device during transportation, and should not be removed.



Removal

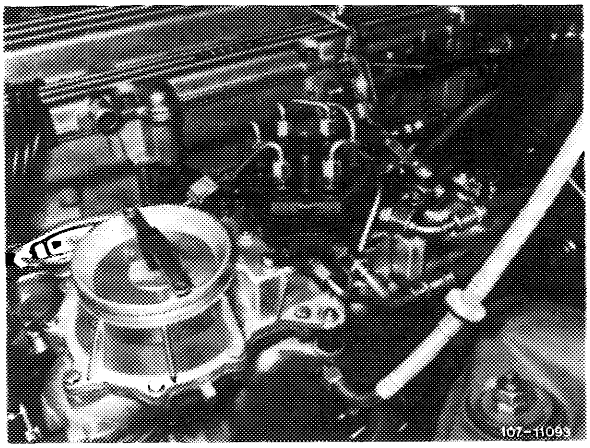
1 Remove air cleaner.

2 Unscrew all fuel and injection lines on fuel distributor and on injection valves. Catch fuel with a rag. Close fuel feed and return line blind.

3 Unscrew double thread connection for control pressure line on fuel distributor.

4 Unscrew the three fastening screws on fuel distributor.

5 Remove fuel distributor by turning distributor back and forth.

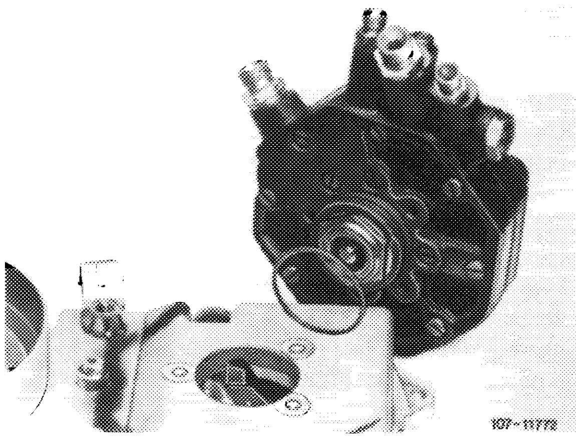


Attention!
When removing fuel distributor which is not provided with a sheet metal lock, make sure that the control piston is not falling out.

Installation

6 Slip new rubber ring on fuel distributor.

7 Slightly lubricate rubber ring and **carefully** mount fuel distributor.



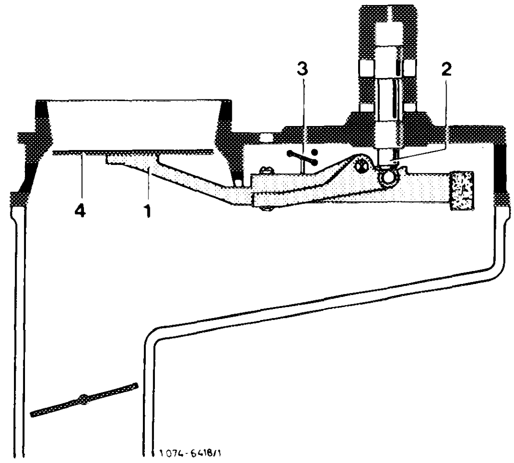
Attention!
Do not damage rubber ring during assembly, since otherwise false air will be sucked in.

8 Screw-in the three fastening screws on fuel distributor.

9 Screw-on double thread connection for control pressure line on fuel distributor.

10 Connect all fuel lines except injection lines.

11 Check adjusting lever (1) in air flow sensor and control piston (2) in fuel distributor for easy operation. In addition, on:



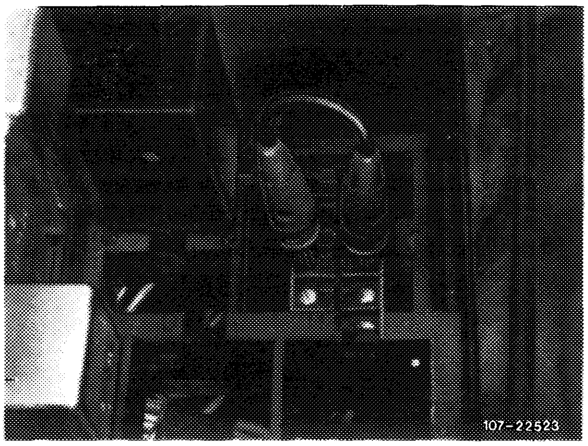
Mixture controller **with** safety switch

Pull plug from safety switch (3), switch-on ignition for a short moment to establish control pressure.

Mixture controller **without** safety switch

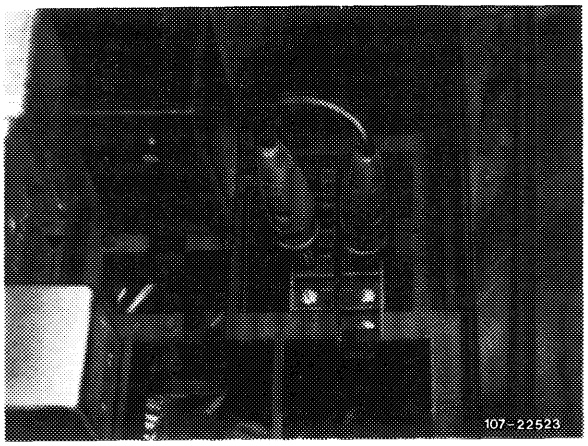
Pull-off fuel pump relay and bridge the two jacks for a short period to establish control pressure.

Prior to September 1981: Jacks 1 and 2.
Starting Spetember 1981: Jacks 7 and 8.



Push air flow sensor plate (4) manually down. A uniform resistance should be felt across entire path. During fast upward movement, no resistance should be felt, since the slowly following control piston lifts from adjusting lever. During a slow upward movement the control piston should follow closely.

12 Check association of control piston with air flow sensor plate and adjust, if required. For this purpose, switch-on ignition, pull cable plug from safety switch or pull off fuel pump relay and bridge the two jacks. The fuel should now just stop flowing at output connection to injection lines, adjust association by means of idle speed mixture control screw, if required.



Prior to September 1981: Jacks 1 and 2.
Starting September 1981: Jacks 7 and 8.

13 Mount injection lines.

14 Run engine and check all fuel connections, as well as rubber ring on fuel distributor for leaks by spraying.

15 Adjust idle speed (07.3–100).

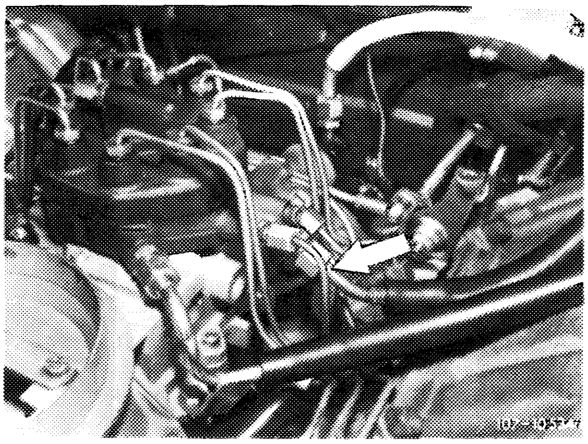
Test values

System pressure (engine cold or warm) at idle	5.0–5.6 bar gauge pressure

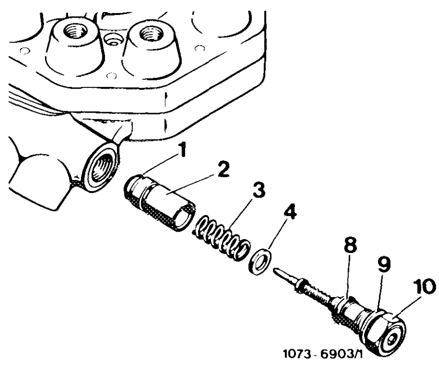
Conventional tools

Screw driver element 992–T 30	e.g. made by Hazet, D-5630 Remscheid

Reconditioning system pressure regulator



1 Discharge fuel pressure. For this purpose, unscrew fuel return flow hose (arrow) on fuel distributor. Catch fuel with a rag. Close fuel return flow hose blind.



2 Disassemble system pressure regulator. Unscrew closing plug (10). When screwing out, make sure that the compression spring (3) and the adjusting washers (4) are not falling out.

3 Remove regulator piston (2) with a magnet or a wooden stick (pencil).

4 Install parts from repair kit. O-ring (1) is also available as a single part.

Attention!
The regulator piston (2) is fitted for fuel distributor and should not be replaced. If required, completely replace fuel distributor.

Place new O-ring (1) on regulator piston (2), lubricate slightly and mount regulator piston with compression spring (3).

Mount assembly group with removed adjusting washers (4) and copper sealing ring (9) included in delivery.

5 Test system pressure (07.3–120). If system pressure deviates from nominal value, remove system pressure regulator once again and adjust system pressure by adding or removing adjusting washers (4).

Adjusting washers are available as follows:

0.1 mm
0.15 mm
0.3 mm
0.4 mm
0.5 mm thick

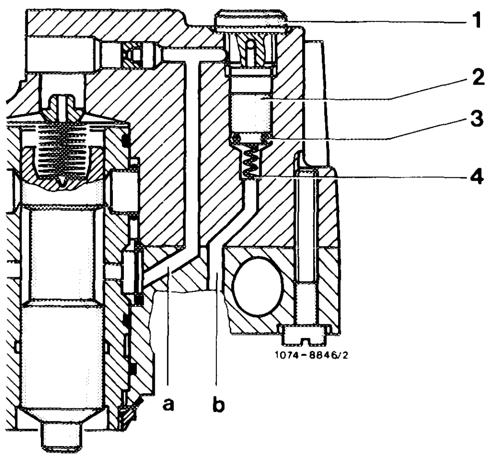
The adjusting washers are available in repair kit.

0.1 mm provides approx. 0.2 bar gauge pressure for system.

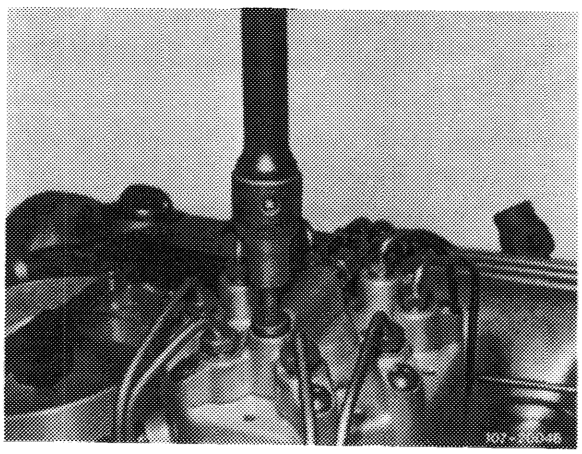
Reconditioning pressure compensating valve

6 Unscrew closing plug (1). Remove piston (2) with contour ring (3).

7 Install parts of repair kit.



For loosening closing plug (1), use screw driver element, e.g. made by Hazet, D-5630 Remscheid, order no. 992–T 30.



07.3–215 Removal and installation of injection valves

Tightening torques (reference values)	Nm
Injection lines to fuel distributor	10–12
Injection lines to injection valves	10–15

Removal

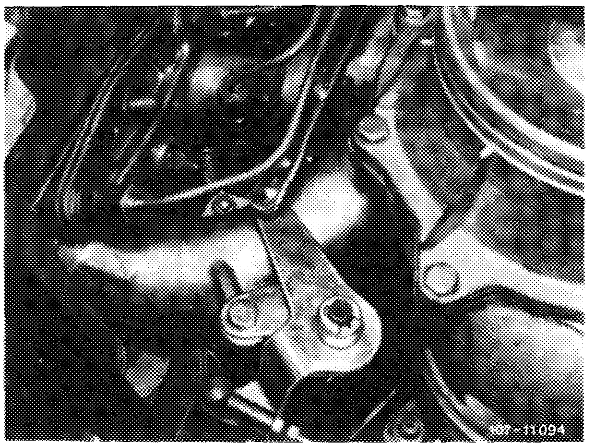
1 Remove air cleaner.

2 Unscrew injection lines from injection valves and on fuel distributor. When loosening injection lines, apply counterhold to injection valves.

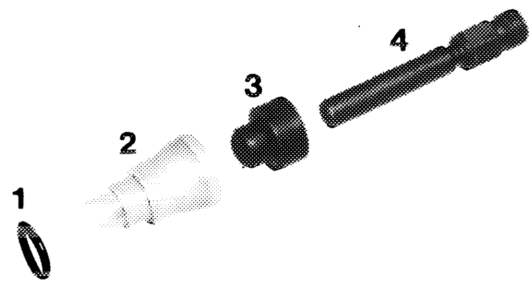
3 Loosen fastening nuts and remove fastening bridges.

For removing injection valves from cylinder 5, remove 6 pressure dampers.

Attention!
When removing fastening bridges, apply counterhold to injection valves, so that injection valves and insulating sleeves are not pulled out at the same time.



4 Pull out injection valves while applying counterhold to insulating sleeves (2). If the insulating sleeves are pulled out, install new O-rings (1).



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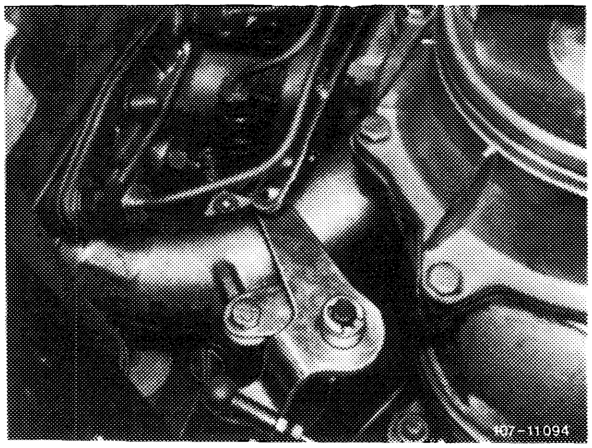
Installation



5 Install injection valves in vice versa sequence. For this purpose, transfer rubber sealing rings (3) or replace, if required.

Install fastening bridges in such a manner that the lugs are at the left.

Note: Mount pulled-out insulating sleeves with new O-rings.

6 Connect injection lines while paying attention to tightening torques as reference values.

Attention!
When tightening injection lines, apply counterhold to injection valves as well as to double thread connections on fuel distributor.

7 Run engine and check all fuel connections for leaks.

07.3–220 Replacement of air flow sensor

Note

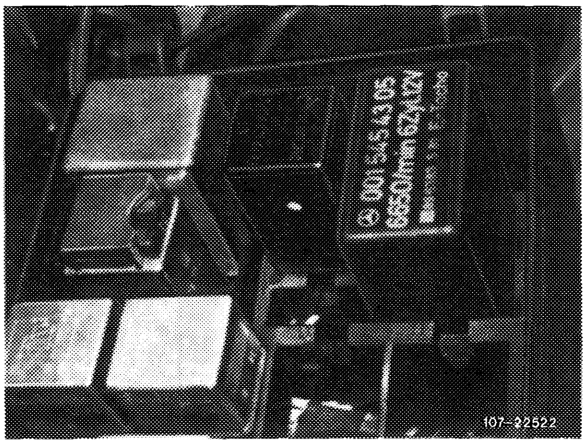
Following installation of light alloy fuel distributor in production vehicles (series), the safety switch on air flow sensor is no longer installed. An electronic relay is used instead (for operation, refer to 07.3–500).

Layout and testing of fuel pump relay (07.3–165).

For test jobs performed with engine stopped and fuel *pump running*, pull off fuel pump relay and bridge the *two jacks*.

Prior to September 1981: Jack 1 and 2.
Starting September 1981: Jack 7 and 8.

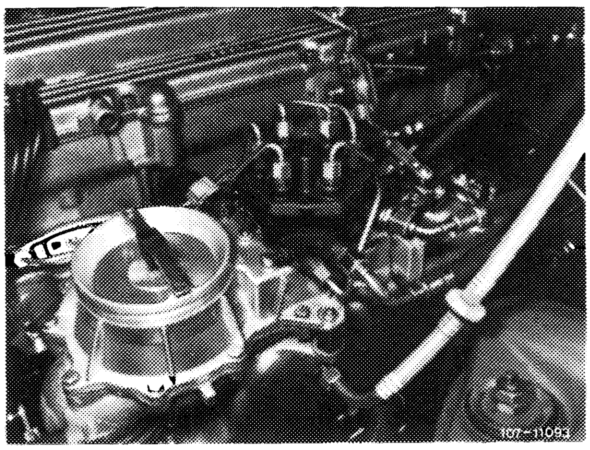
Model 126



Replacement

1 Remove and install mixture controller (07.3–200).

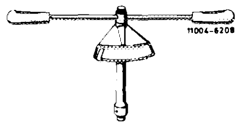
2 Remove and install fuel distributor (07.3–205).

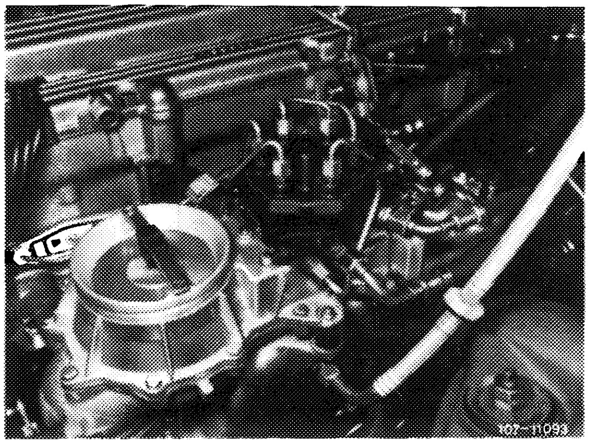


07.3–225 Removal and installation of mixture controller with air guide housing

Tightening torques	Nm
Hex. nuts mixture controller to intake manifold (rubber buffer)	9–10
Injection lines and fuel lines to fuel distributor (reference value)	10–12
Injection lines to injection valves (reference value)	10–15

Special tool

Torque wrench 1/4" square, 4–16 Nm		000 589 67 21 00



Removal

1 Remove air cleaner.

2 Unscrew all fuel and injection lines on fuel distributor and on injection valves. Catch fuel with a rag.

Close fuel feed and return flow line blind.

3 Pull electric connecting cables, to the extent installed, from safety switch.

4 Loosen hose clamp on rubber sleeve between air guide housing and throttle valve housing.

5 Unscrew both hex. nuts on rubber buffers.

6 Lift off mixture controller with air guide housing, while pulling off idle air hose.

Installation

7 For installation proceed vice versa.

8 Tighten both hex. nuts to specified tightening torques by means of a torque wrench.

9 Connect injection lines and fuel lines, while paying attention to tightening torques as reference values.

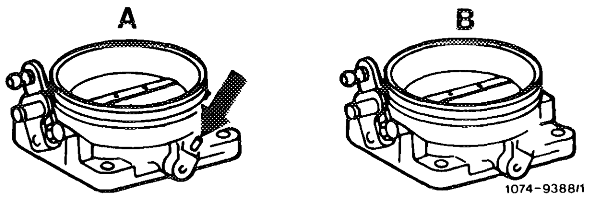
Attention!
When tightening injection lines and fuel lines, apply counterhold to injection valves as well as to double thread connections on fuel distributor.

10 Run engine and check all fuel connections for leaks.

11 Adjust idle speed (07.3–100).

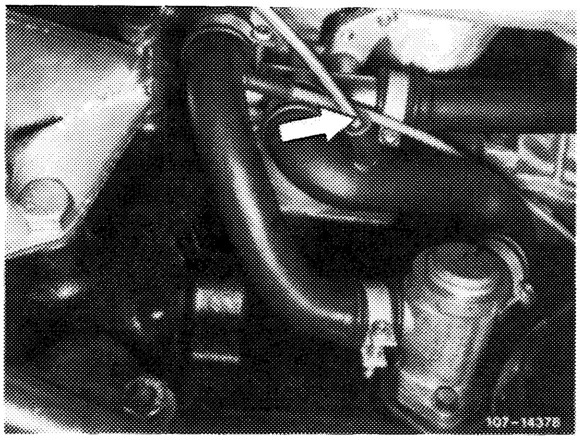
Note

Connection (arrow) for ignition retard on throttle valve housing is no longer installed.



A Former version
B Present version

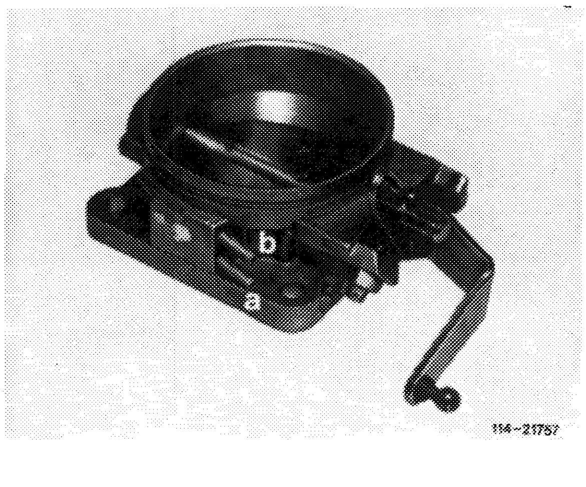
To obtain a higher speed following a cold start at low outside temperatures, the connection on throttle valve housing for ignition retard has been transferred from throttle valve housing to contour hose between auxiliary air valve and idle speed air distributor starting April 1978. In-between, the connection on throttle valve housing has been closed by means of a rubber cap.



Starting September 1981, the throttle valve housing is provided with 2 connections.

Connection "a" for EGR (function diagram refer to 14–500).

Connection "b" for ignition advance.



Removal

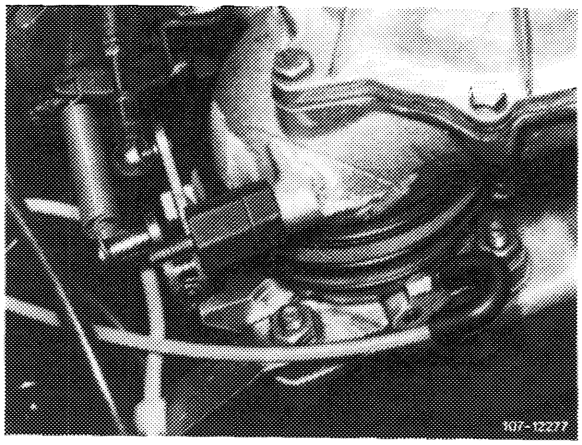
1 Remove mixture controller with air guide housing (07.3–225).

2 Loosen and remove rubber sleeve.

3 Disconnect regulating linkage and return spring.

4 Pull off vacuum connections.

5 Loosen fastening nuts and remove throttle valve housing.



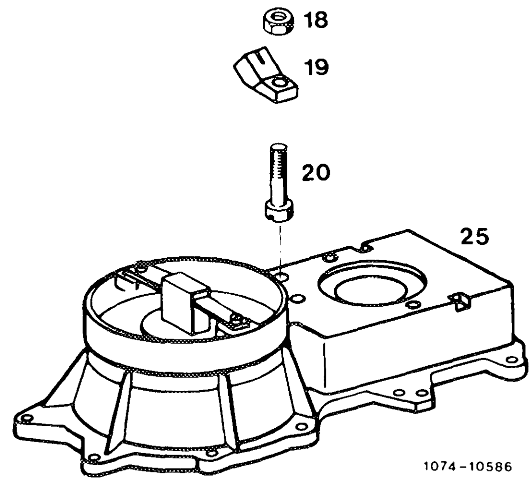
Installation

6 For installation proceed vice versa, using new gasket.

7 Adjust regulating linkage (30–300).

8 Adjust idle speed (07.3–100).

When installing a new engine or an exchange engine without safety switch (19) on air flow sensor and distributor rotor with rpm limitation in vehicles which have been installed with these components up to now, use safety switch and distributor rotor from old engine.



Installation

1 Remove mixture controller from new engine.

2 Install safety switch (19) as shown in Fig.. Do not use removed disk.

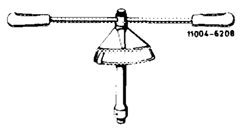
Attention!
When mounting safety switch, make sure that insulating disk is correctly mounted under leaf spring.

3 Install distributor rotor with rpm limitation into new engine.

07.3–245 Replacement, centering and zero position of air flow sensor plate

Tightening torque	Nm
Hex. screw	5.0–5.5

Special tool

Torque wrench 1/4" square, 4–16 Nm		000 589 67 21 00

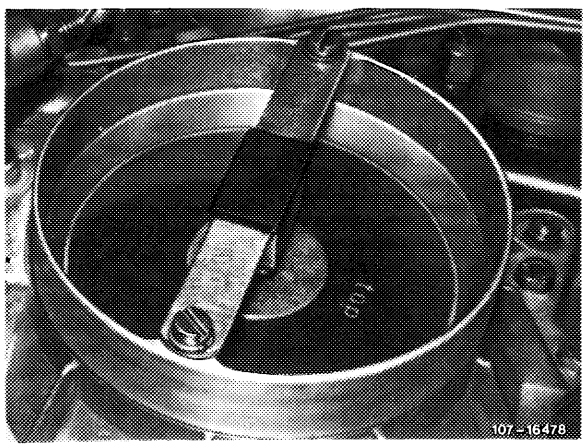
Conventional equipment and tools

Hot air blower, tap M 6

Removal

1 Remove air cleaner.

2 Unscrew stop bracket.



3 Heat fastening screw with a hot air blower and screw out with care (risk of tearing threads).

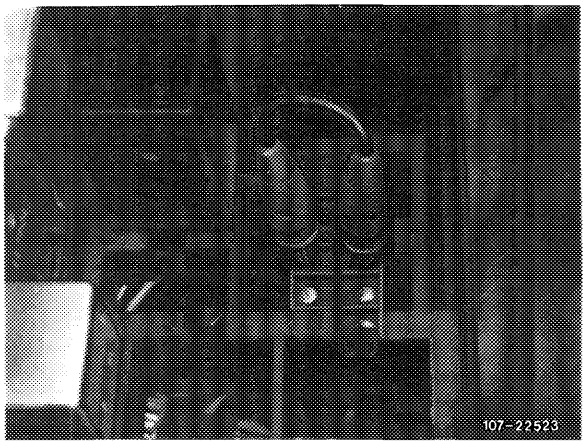
Attention!
The fastening screw is micro-encapsulated.

4 Clean bore for fastening air flow sensor plate with M 6 tap.

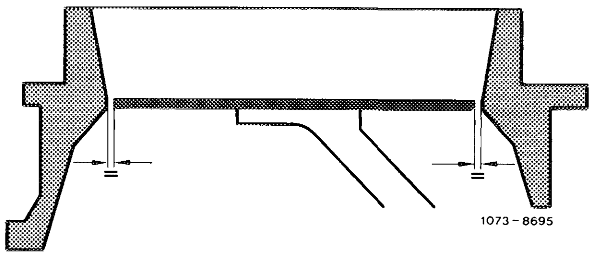
5 Install parts contained in repair kit. Make sure that the letters "TOP" are on top and insert air flow sensor plate. Lightly screw-in micro-encapsulated fastening screw (self-locking).

6 Center air flow sensor plate. For this purpose, pull off fuel pump relay (arrow) and bridge the two jacks **short**, or pull off plug on safety switch. Switch-on ignition for a short moment to establish control pressure.

Prior to September 1981: Jacks 1 and 2
Starting September 1981: Jacks 7 and 8



Use slip gauge 0.10–0.20 mm and make sure that the air flow sensor plate is accurately centered. Plate should not bind even under light lateral pressure (bearing play cancelled).

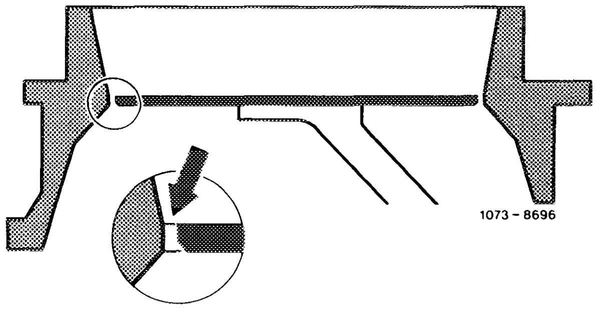


7 Tighten fastening screw to 5.0–5.5 Nm.

8 Check air flow sensor plate for easy operation. For this purpose, push plate down manually. Plate should not bind. Release plate, which should also not bind when moving back and should audibly abut against resilient contact. Center air flow sensor plate again, if required.

9 Check zero position (rest position) of air flow sensor plate. Upper edge of plate should close accurarately flush with cylindrical part of of air funnel (arrow) along entire circumference. A higher location up to max. 0.5 mm is permitted.

Note: To check zero position, bridge electric safety circuit (refer to item 6). This will provide control piston with control pressure.



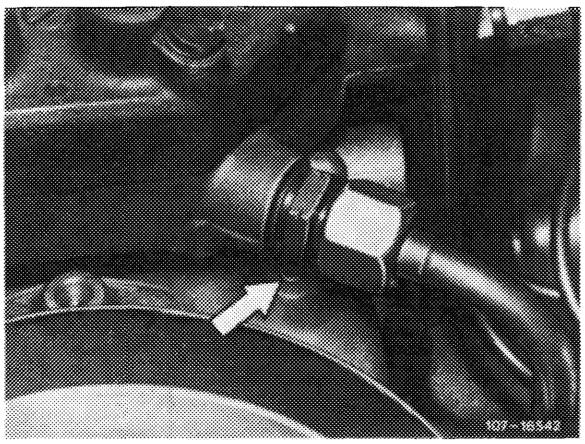
10 Adjust zero position of air flow sensor plate:

a) If too high, lock guide pin (arrow) by means of a mandrel to required depth.

b) If too low, remove mixture controller and knock-in guide pin from below (07.3–200).

Attention!
Do not knock-in guide pin too low.

Avoid repeated adjustments in both directions, since the press fit of the pin will become too loose.

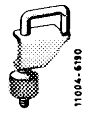


11 Mount stop bracket and fuel pump relay or attach plug to safety switch.

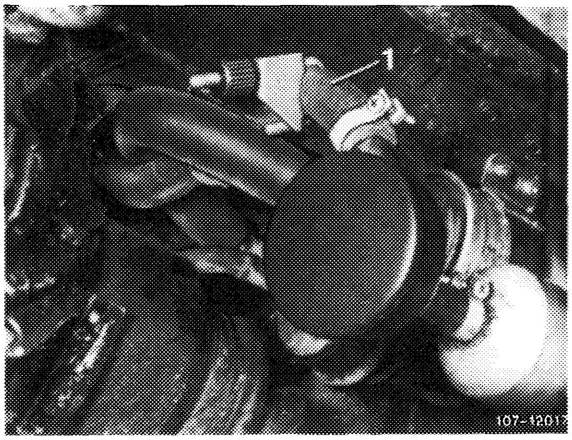
12 Adjust idle speed (07.3–100).

07.3–270 Removal and installation of fuel reservoir

Special tool

Clamp for fuel hose		000 589 40 37 00

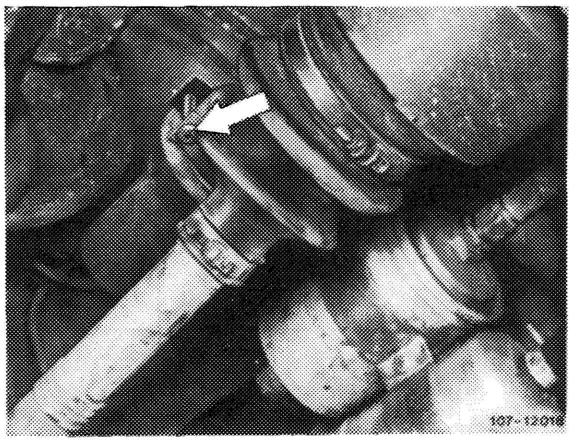
Removal



1 Unscrew protective case.

2 Pinch fuel intake hose (arrow) with a clamp.

1st version



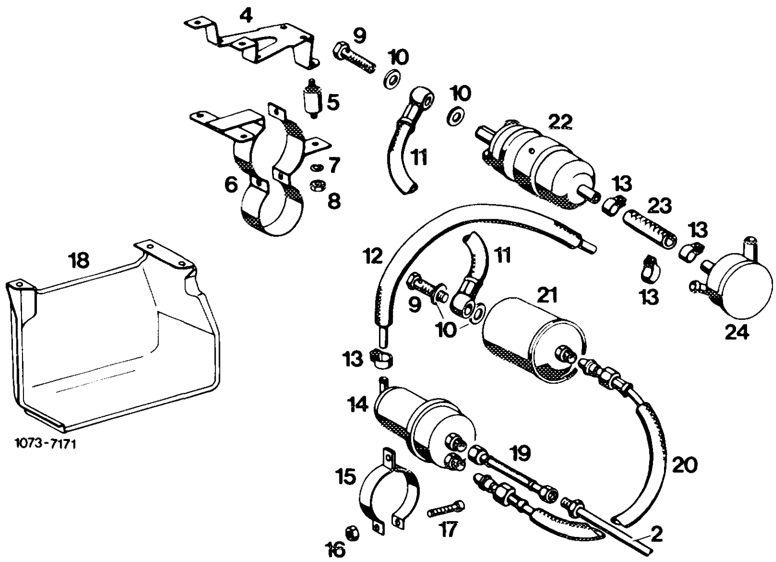
3 Pinch fuel feed hose.

4 Unscrew both fuel hoses on fuel reservoir, also pinch leak hose, loosen and pull off.

5 Loosen fastening screws (arrow) for clamp and remove fuel reservoir.

6 For installation proceed vice versa. Pay attention to correct connection of fuel hoses, fasten fuel feed hose to center connection of fuel reservoir.

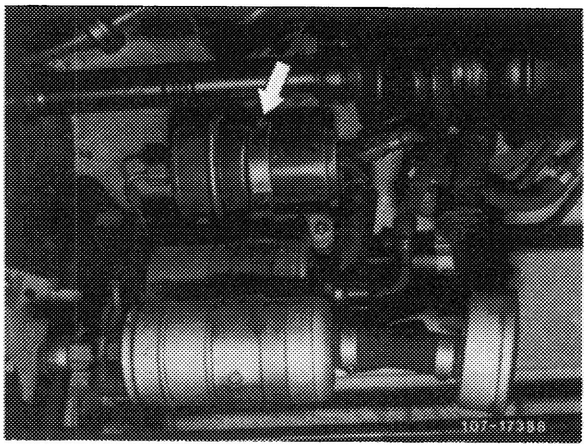
2 Fuel feed line
4 Mounting bracket
5 Anti-vibration buffer
6 Holder
7 Snap ring
8 Nut
9 Hollow screw
10 Sealing ring
11 Fuel hose
12 Fuel hose
13 Hose clamp
14 Fuel reservoir
15 Holder
16 Nut
17 Screw
18 Protective case
19 Fuel hose
20 Fuel hose
21 Fuel filter
22 Fuel pump
23 Fuel hose
24 Damper



2nd version

7 Unscrew fuel line on fuel reservoir, also pinch leak hose, loosen and pull off.

8 Loosen fastening screw (arrow) for clamp and remove fuel reservoir.



Installation

9 For installation proceed vice versa.

10 Remove clamp on fuel suction hose.

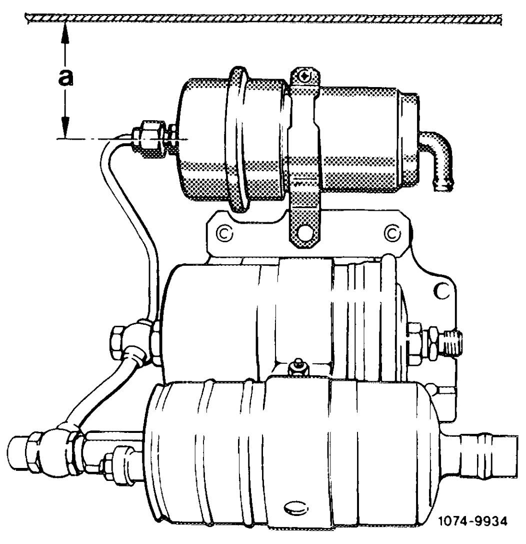
11 Run engine and check for leaks.

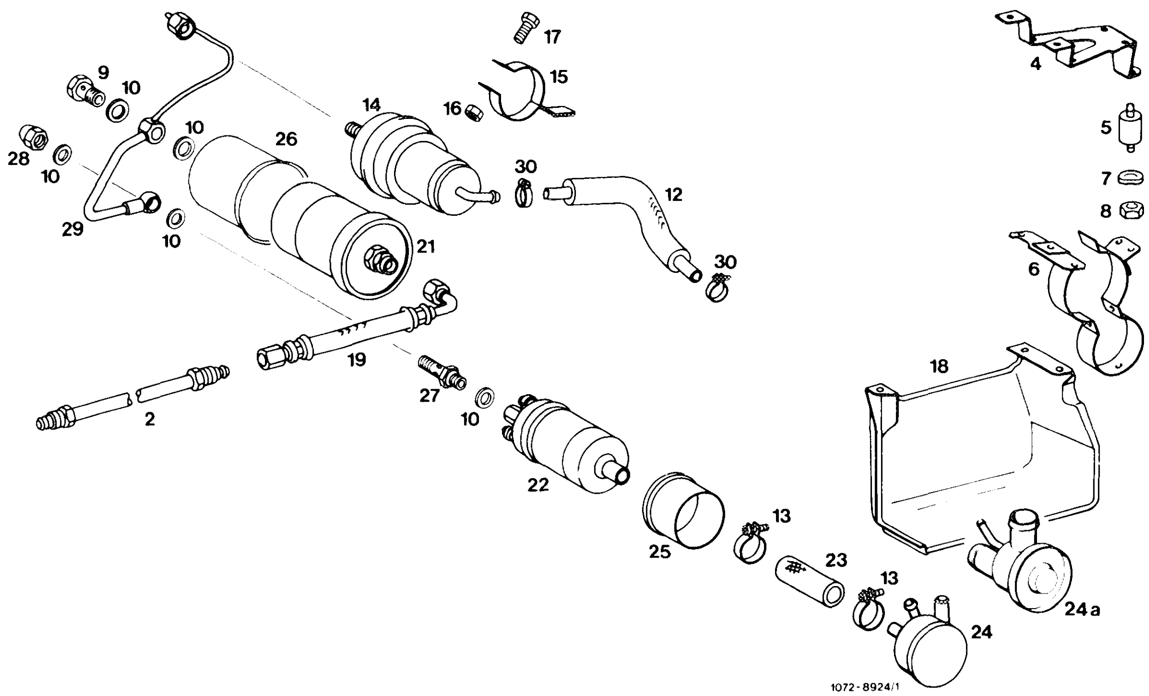
12 Mount protective case.

Note: On model 126, measure distance between fuel reservoir and body floor as shown in Fig.

Nominal dimension = 62 mm.

If required, push fuel reservoir in upward direction. For this purpose, apply manual counterhold against fuel pump.

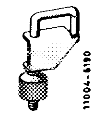




2	Fuel feed line	18	Protective case
4	Mounting bracket	19	Fuel hose
5	Anti-vibration buffer	21	Fuel filter
6	Holder	22	Fuel pump
7	Snap ring	23	Fuel hose
8	Nut	24	Damper 1st version
9	Hollow screw	24a	Diaphragm damper 2nd version
10	Sealing ring	25	Plastic sleeve
12	Fuel hose	26	Plastic sleeve
13	Hose clamp	27	Check valve
14	Fuel reservoir	28	Cap nut
15	Holder	29	Steel line
16	Nut	30	Hose clamp
17	Screw		

07.3–275 Removal and installation of fuel filter

Special tool

Clamp for hose lines		000 589 40 37 00

Note

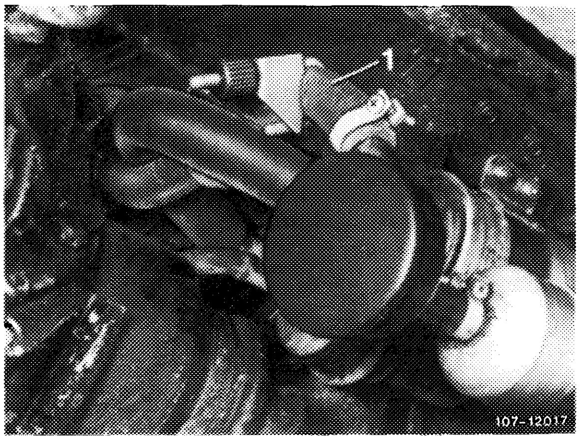
The fuel filter is especially provided with an integrated damper for silencing. To prevent contact corrosion, the fuel filter is provided with a plastic sleeve.

When exchanging fuel filter, make sure that the plastic sleeve is installed between fuel filter and mounting bracket. Also make sure that sleeve projects on both sides of bracket, since direct contact of fuel filter with bracket may result in contact corrosion.

Removal

1 Unscrew protective case.

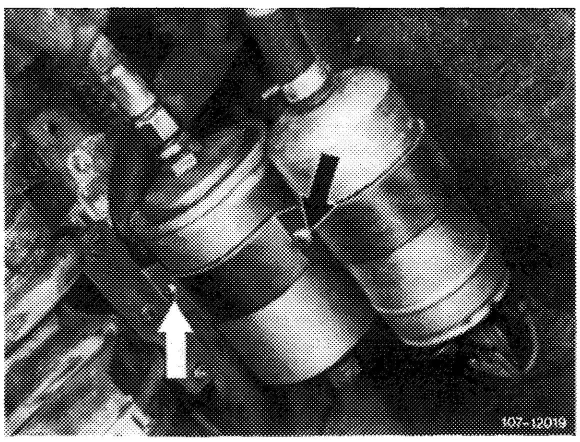
2 Pinch fuel suction hose (1) with a clamp.

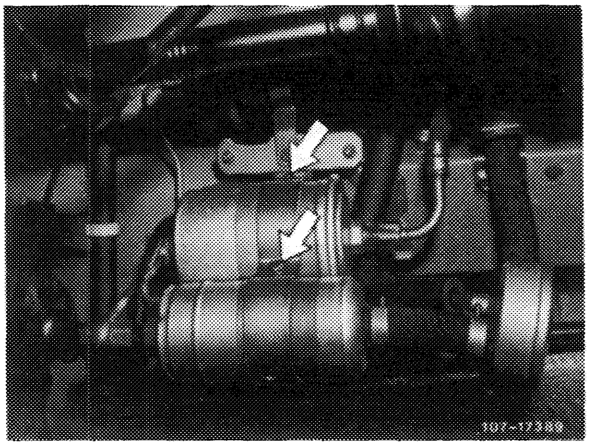


3 Unscrew fuel line and fuel hose from fuel filter.

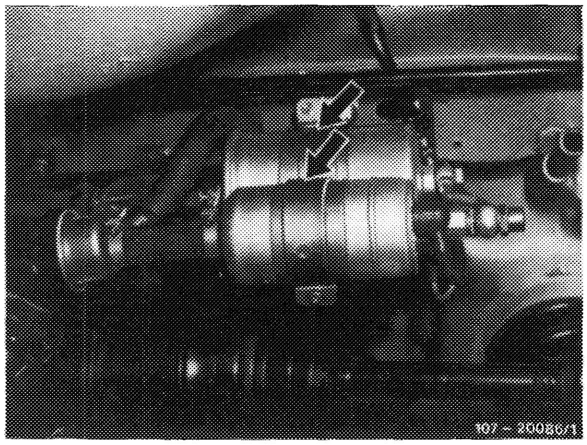
4 Loosen both fastening screws (arrow) and remove fuel filter.

1st version





2nd version

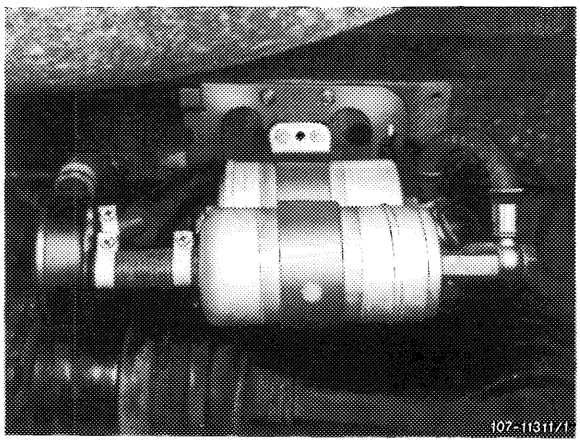


3rd version

Installation

5 For installation proceed vice versa, using new sealing rings.

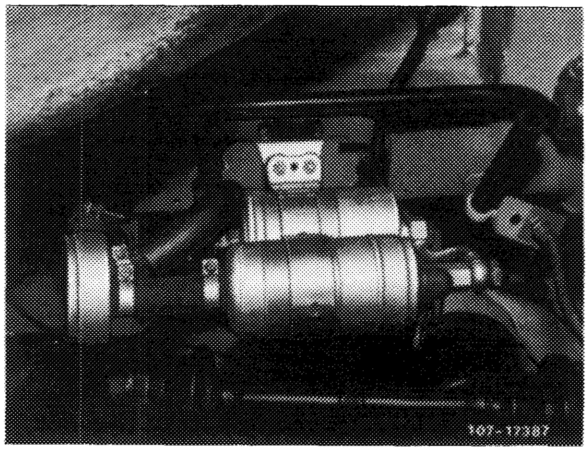
6 Locate fuel filter with plastic sleeve in holder. Plastic sleeve should project on both sides of holder, since direct contact of fuel filter with holder may lead to contact corrosion.



7 Remove clamp on fuel suction hose.

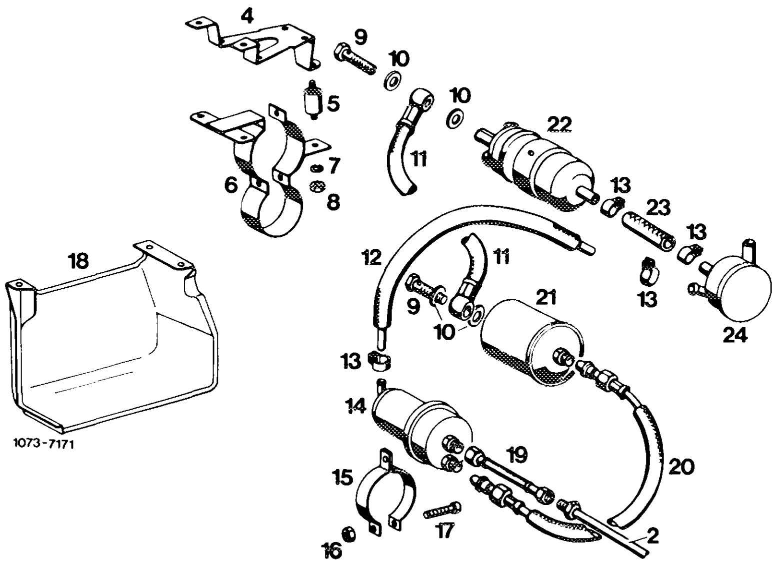
8 Run engine and check for leaks.

9 Mount protective case.

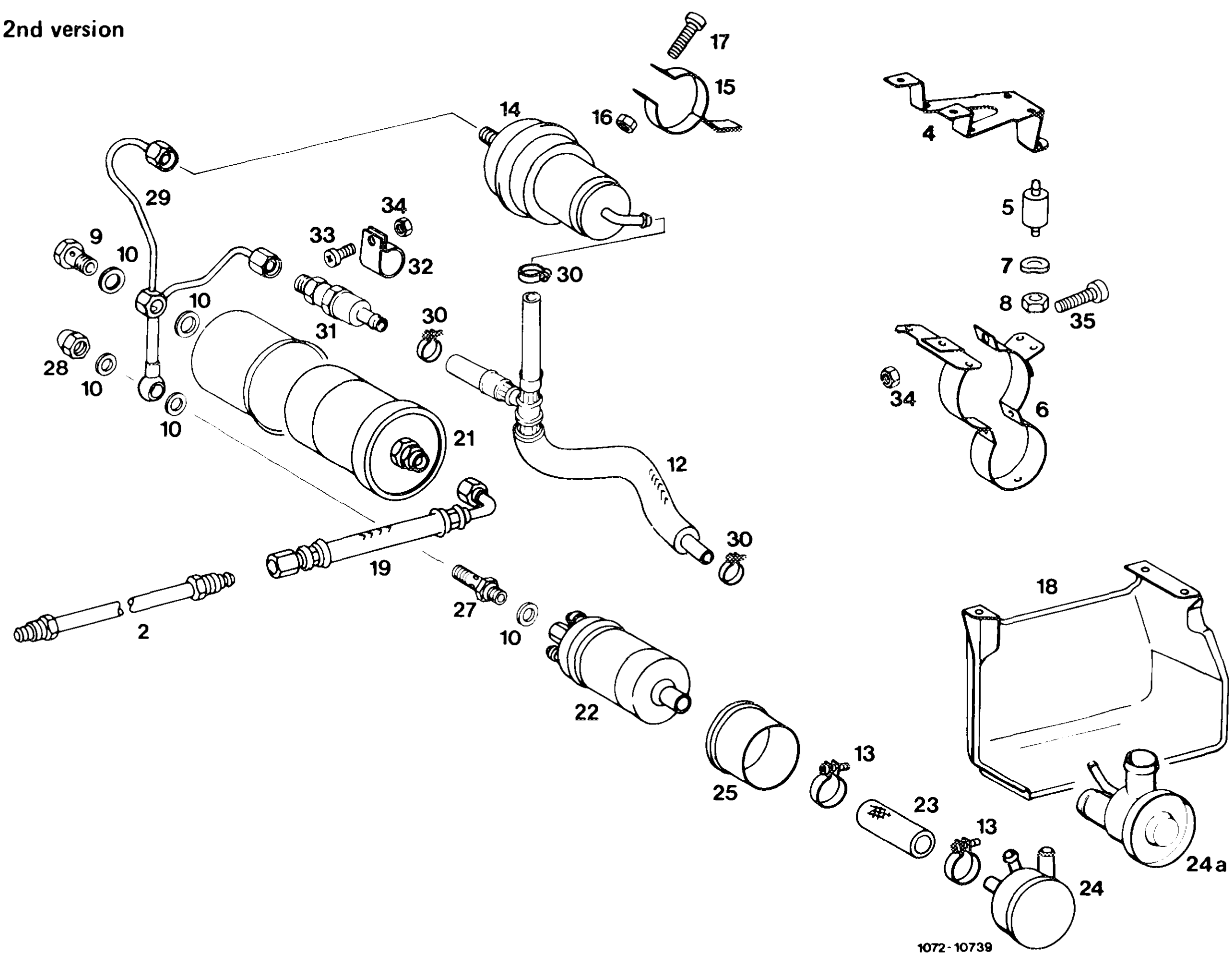


1st version

2 Fuel feed line
4 Mounting bracket
5 Anti-vibration buffer
6 Holder
7 Snap ring
8 Nut
9 Hollow screw
10 Sealing ring
11 Fuel hose
12 Fuel hose
13 Hose clamp
14 Fuel reservoir
15 Holder
16 Nut
17 Screw
18 Protective case
19 Fuel hose
20 Fuel hose
21 Fuel filter
22 Fuel pump
23 Fuel hose
24 Damper

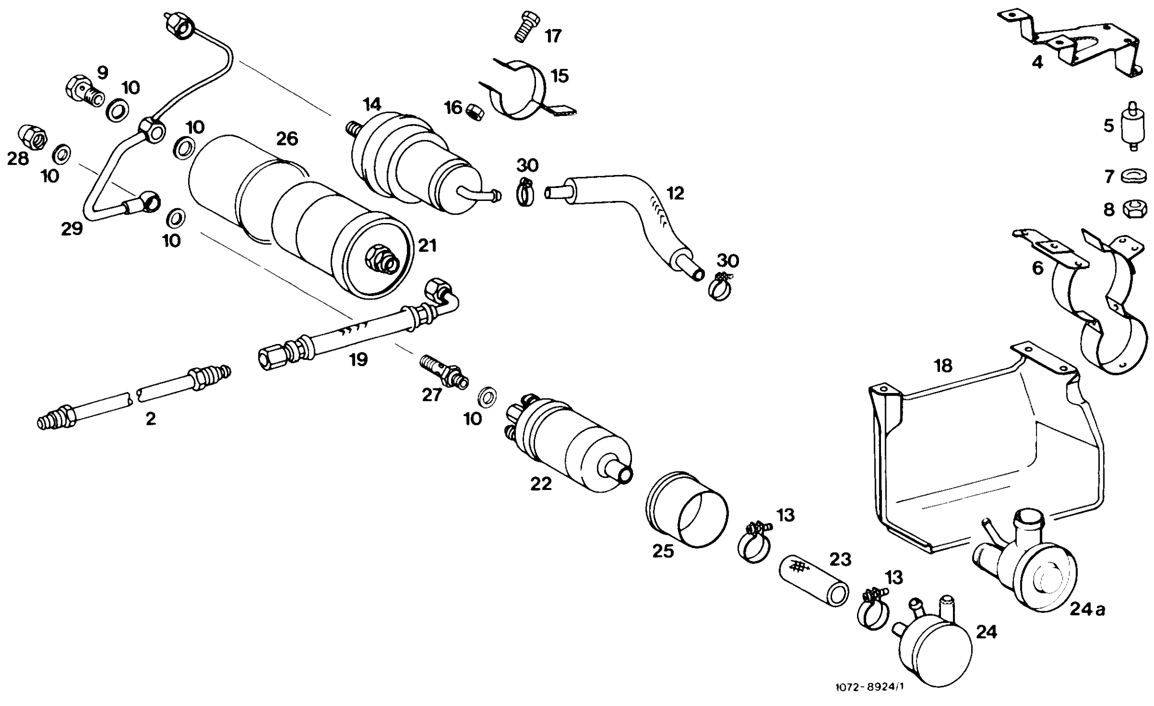


2nd version



2	Fuel feed line	16	Nut	27	Check valve
4	Mounting bracket	17	Screw	28	Cap nut
5	Anti-viration buffer	18	Protective case	29	Steel line
6	Holder	19	Fuel hose	30	Hose clamp
7	Snap ring	21	Fuel filter	31	Pressure relief valve
8	Nut	22	Fuel pump	32	Clamp
9	Hollow screw	23	Fuel hose	33	Screw
10	Sealing ring	24	Damper 1st version	34	Nut
12	Fuel hose	24a	Diaphragm damper 2nd version	35	Screw
13	Hose clamp	25	Plastic sleeve		
14	Fuel reservoir	26	Plastic sleeve		
15	Holder				

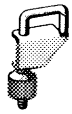
3rd version



2	Fuel feed line	14	Fuel reservoir	24a	Diaphragm damper 2nd version
4	Mounting bracket	15	Holder	25	Plastic sleeve
5	Anti-vibration buffer	16	Nut	26	Plastic sleeve
6	Holder	17	Screw	27	Check valve
7	Snap ring	18	Protective case	28	Cap nut
8	Nut	19	Fuel hose	29	Steel line
9	Hollow screw	21	Fuel filter	30	Hose clamp
10	Sealing ring	22	Fuel pump		
12	Fuel hose	23	Fuel hose		
13	Hose clamp	24	Damper 1st version		

07.3–280 Removal and installation of fuel pump

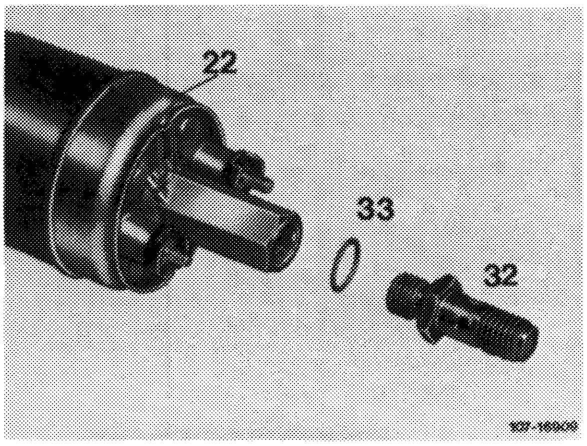
Special tools

Clamp for hose lines	 11004-6190	000 589 40 37 00

Note

The fuel pump is provided with a special coating on roller running surface, an exchangeable check valve and, to prevent contact corrosion, a plastic sleeve.

The check valve has been moved in outward direction and can be separately replaced in the event of failure.



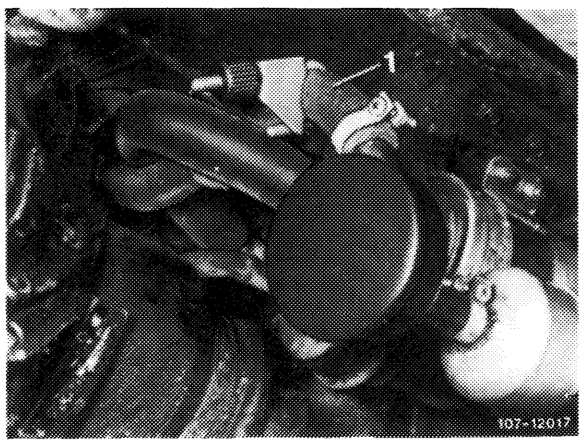
22 Fuel pump
32 Check valve
33 Sealing ring

When exchanging fuel pump, make sure that the plastic sleeve is mounted in-between fuel pump and holder. Sleeve should project on both sides of holder, since direct contact of fuel pump with holder may lead to contact corrosion.

Removal

1 Unscrew protective case.

2 Pinch fuel suction hose (1) with a clamp.

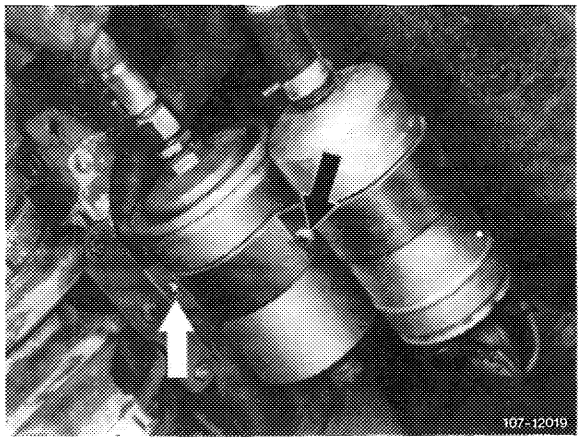


1st version

3 Loosen fuel hoses, pull off and unscrew.

4 Disconnect electric connecting cable.

5 Loosen fastening screw (arrow) and remove fuel pump.

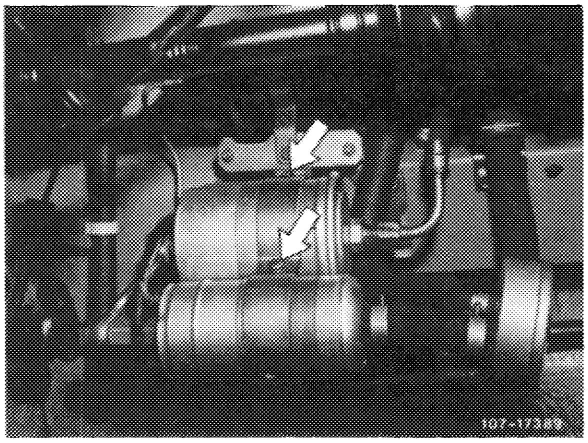


2nd version

6 Loosen fuel line on fuel filter and fuel reservoir. Loosen fuel line on fuel pump, pull off and unscrew.

7 Disconnect electric connecting cable.

8 Loosen fastening screw (arrow) and remove fuel pump.



Installation

9 For installation proceed vice versa using new sealing rings.

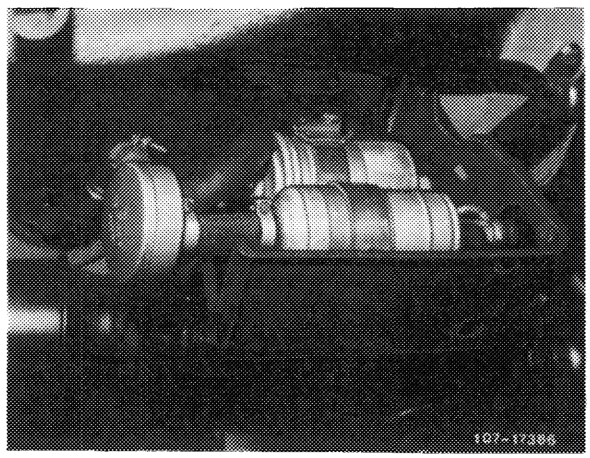
Pay attention to perfect installation of fuel hoses, also to correct polarity. In installation position, terminals should be horizontal.

10 Locate fuel pump in holder by means of plastic sleeve. Plastic sleeve should project on both sides of holder, since direct contact of fuel pump with holder may lead to contact corrosion.

11 Remove clamp on fuel suction hose.

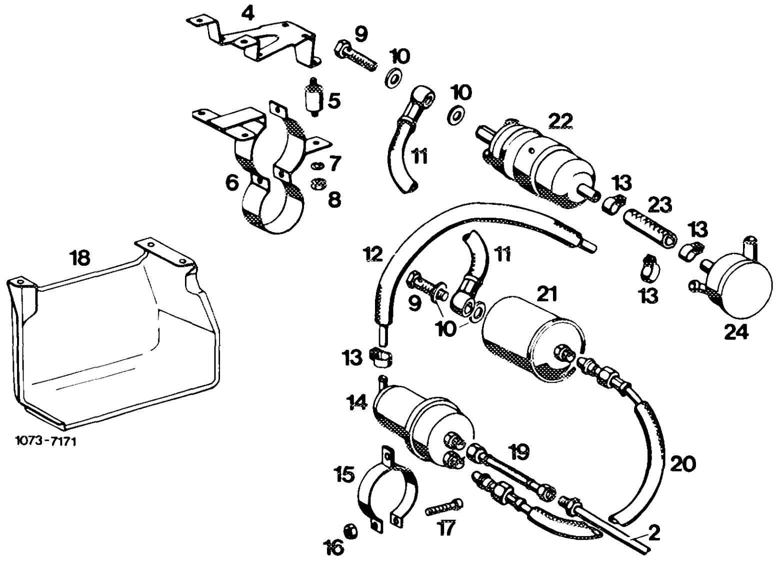
12 Run engine and check for leaks.

13 Mount protective case.

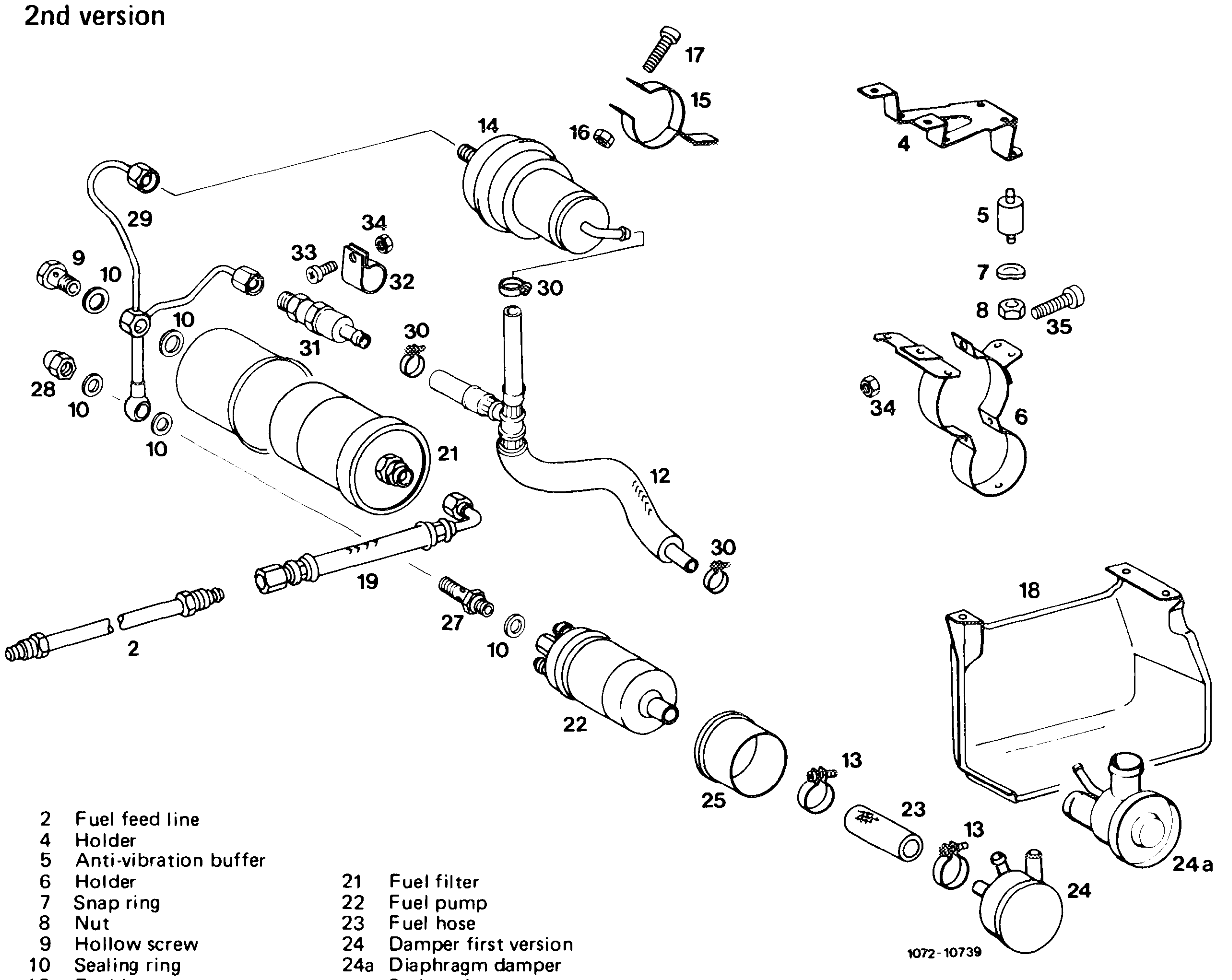


1st version

2 Fuel feed line
4 Holder
5 Anti-vibration buffer
6 Holder
7 Snap ring
8 Nut
9 Hollow screw
10 Sealing ring
11 Fuel hose
12 Fuel hose
13 Hose clamp
14 Fuel reservoir
15 Holder
16 Nut
17 Screw
18 Protective case
19 Fuel hose
20 Fuel hose
21 Fuel filter
22 Fuel pump
23 Fuel hose
24 Damper

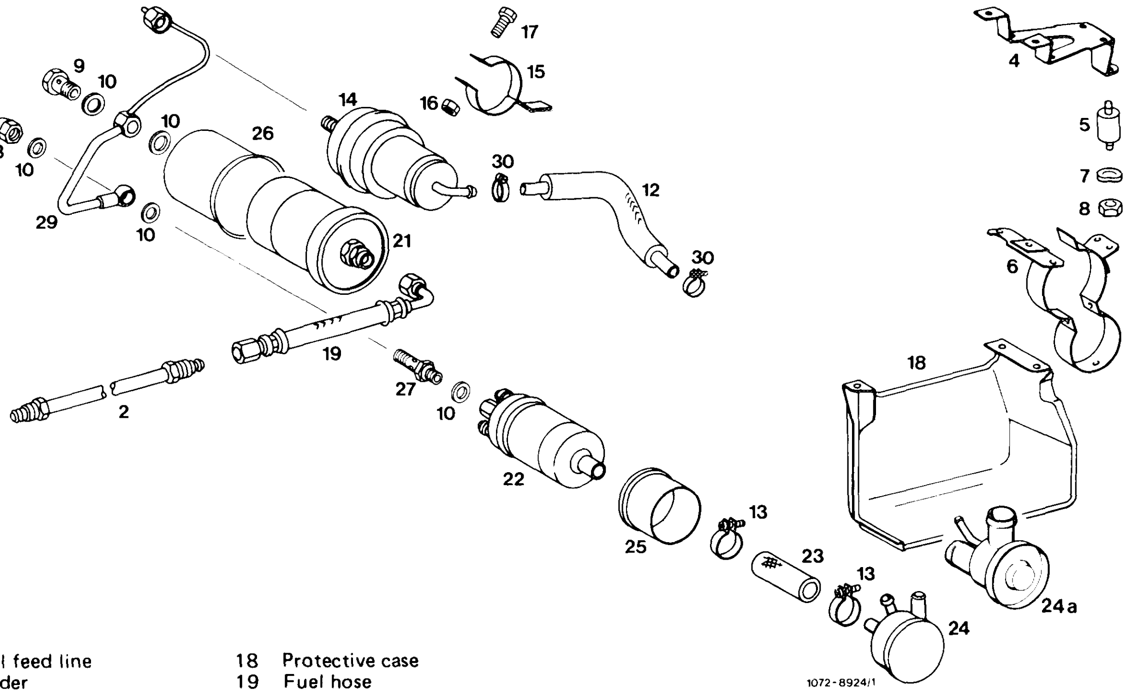


2nd version



2 Fuel feed line
4 Holder
5 Anti-vibration buffer
6 Holder
7 Snap ring
8 Nut
9 Hollow screw
10 Sealing ring
12 Fuel hose
13 Hose clamp
14 Fuel reservoir
15 Holder
16 Nut
17 Screw
18 Protective case
19 Fuel hose
21 Fuel filter
22 Fuel pump
23 Fuel hose
24 Damper first version
24a Diaphragm damper 2nd version
25 Plastic sleeve
26 Plastic sleeve
27 Check valve
28 Cap nut
29 Steel line
30 Hose clamp
31 Pressure relieve valve
32 Clamp
33 Screw
34 Nut
35 Screw

3rd version

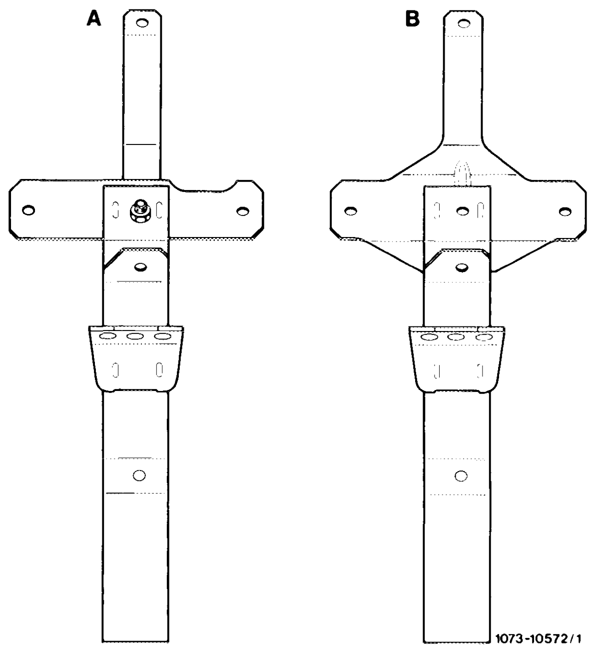


2	Fuel feed line	18	Protective case
4	Holder	19	Fuel hose
5	Anti-vibration buffer	21	Fuel filter
6	Holder	22	Fuel pump
7	Snap ring	23	Fuel hose
8	Nut	24	Damper 1st version
9	Hollow screw	24a	Diaphragm damper 2nd version
10	Sealing ring	25	Plastic sleeve
12	Fuel hose	26	Plastic sleeve
13	Hose clamp	27	Check valve
14	Fuel reservoir	28	Cap nut
15	Holder	29	Steel line
16	Nut	30	Hose clamp
17	Screw		

For renewing holder, remove
fuel reservoir (07.3–270),
fuel filter (07.3–275),
fuel pump (07.3–280).

Note

Holder has been modified to improve installation position and to increase rigidity.

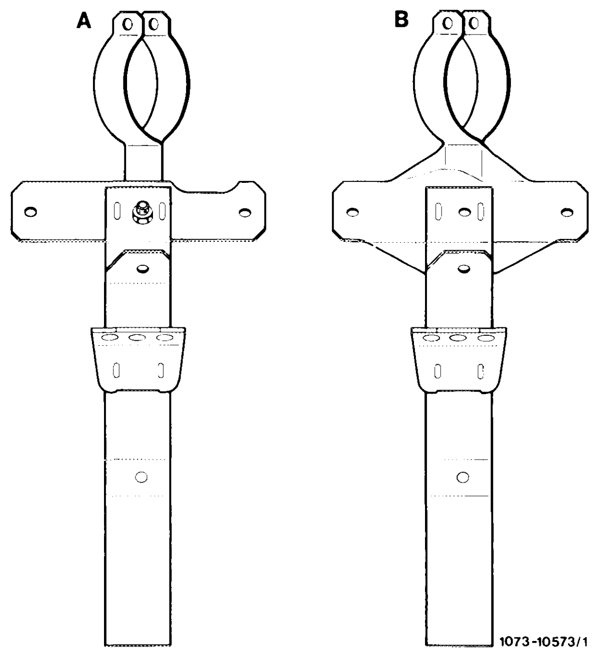


Model 107, 123
A Former version
B Present version

1073-10572/1

On model 126 the shape of the fuel line between pump, filter and reservoir has also been modified.

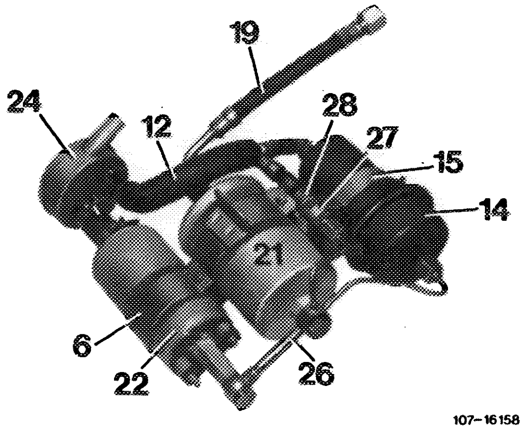
Start of series production: November 1981.



Model 126
A Former version
B Present version

1073-10573/1

In front of fuel filter (21) is an additional pressure compensating valve (27), which closes in the event of pressure in system. If the fuel volume in system is reduced when the fuel is cooling down, the pressure compensating valve will open. This will prevent that the control piston in fuel distributor will be pulled to full load under influence of vacuum, since otherwise during a cold start the full fuel quantity might be injected for a short period and the engine might be excessively enriched.

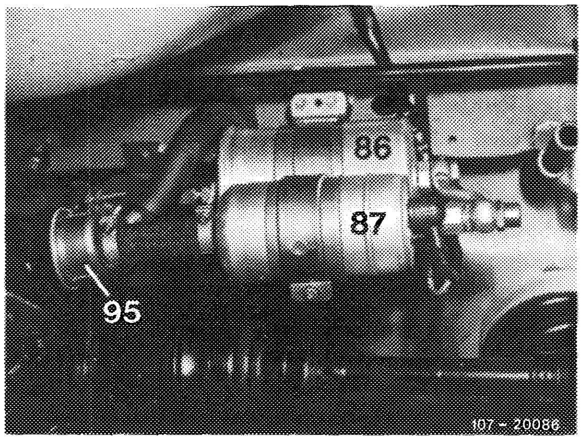


107–16158

B. Scope

Note

On models 107 and 126 fuel filters will be installed with damper (86), as well as a diaphragm damper (95). This will reduce noises caused by fuel pump.



86 Fuel filter with damper
87 Fuel pump
95 Diaphragm damper

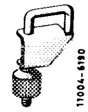
On vehicles in national version (AUS)(J)(S) and (USA) with CIS injection system prior to model year 1981, the respective components can also be installed. On vehicles of model year 1981, the changes are already in place. However, the fuel pump assembly differs by a fuel filter of larger diameter (owing to revised maintenance intervals).

Introduction into series

Model	Starting chassis end no.	Remarks
107.022 107.042	010166 010715	Fuel filter with damper and diaphragm damper (since April 1981)
126.022/023	004661	Fuel filter with damper (since April 1980)
126.022/023	016862	Diaphragm damper (since October 1980)

On vehicles with lower chassis end no. the components can be subsequently installed in the event of complaints about "Fuel pump loud".

Special tool

Clamp for hose lines		000 589 40 37 00

Spare parts

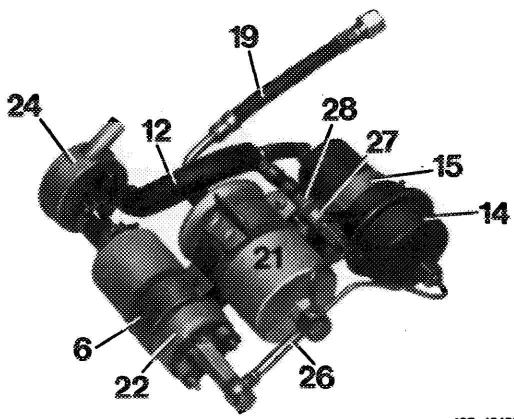
Designation	Part no.
Conversion kit	123 470 05 93
Steel line for engines with light alloy fuel distributor	126 470 01 64

Responsible for delivery: Plant 50 (PEW Sindelfingen)

Note

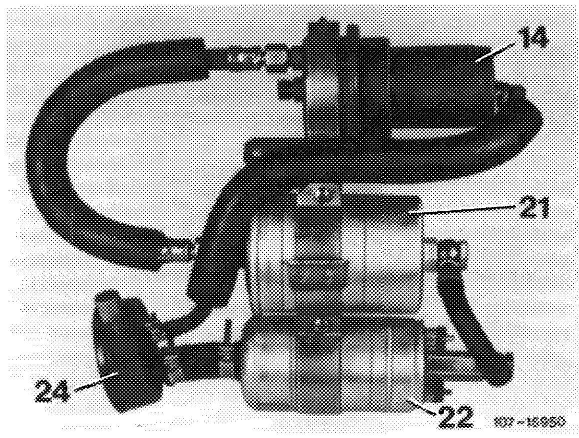
When exchanging fuel filter (21), fuel pump (22) or pressure compensating valve (27) make sure that a plastic sheet or plastic sleeve is mounted between these parts and holder (6, 15, 28). Sleeve should project on both sides of holder, since direct contact of parts with holder may lead to contact corrosion.

On vehicles in (AUS) and (J) version, a pressure compensating valve may not be subsequently installed.

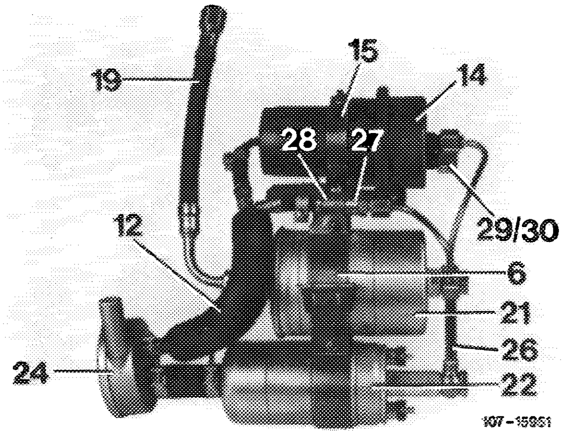


107–16156

Layout fuel pump assembly



Former layout
14 Pressure reservoir
21 Filter
22 Fuel pump
24 Damper



Present layout
6 Holder for fuel pump and filter
12 Leak line
14 Pressure reservoir
15 Holder for pressure reservoir
19 Fuel hose
21 Filter
22 Fuel pump
24 Damper
26 Fuel pressure line
27 Fuel compensating valve
28 Clamp for pressure compensating valve
29 Closing cone
30 Coupling nut

For conversion, the following parts may be used again:

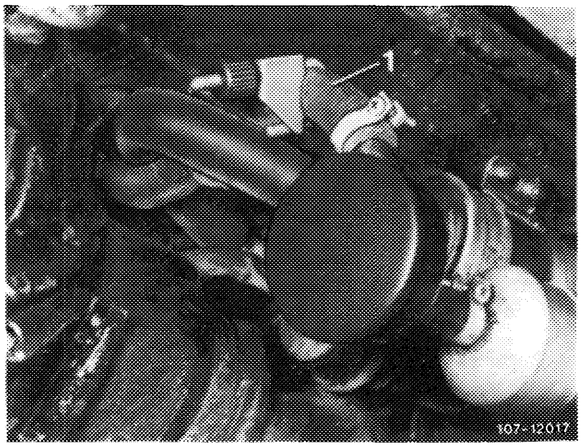
Fuel pump,
suction damper,
pressure reservoir,
fuel filter.

Conversion

1 Unscrew protective case.

2 Disconnect electric connections.

3 Pinch fuel suction hose (1) between fuel tank and suction damper by means of a clamp.

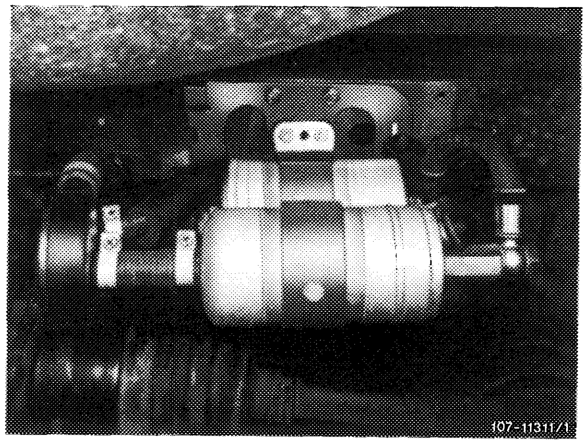


4 Loosen suction hose on suction damper and pull off.

5 Unscrew fuel pressure line from feed line to engine compartment. Clean screw connection first.

6 Unscrew fastening nuts of anti-vibration buffers and remove "fuel pump assembly".

7 Disassemble fuel pump assembly.

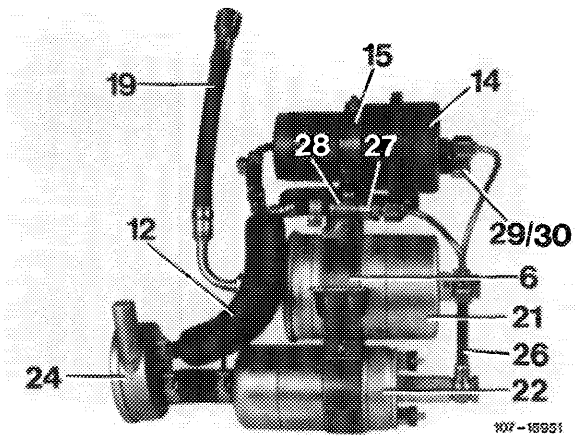


8 Clean fuel pump and fuel filter externally and mount in addition to plastic sleeve (slip up to bead of pump).

As an exception, a sheet (e.g. Tesafilm) may be glued on instead of plastic sleeve.

Attach plastic sleeve or sheet always in such a manner that it projects on both sides of holder. A direct contact of holder and pump or filter may lead to contact corrosion.

9 Assemble with components of conversion kit pump assembly, as shown in illustration. Slip fuel pump (22) up to bead into holder (6) and mount clamp (28) for pressure compensating valve (27) under holder of pressure reservoir. Prior to tightening screws of holder, position fuel pressure line (26) at pump, filter and pressure reservoir, align parts in relation to each other and tighten screws. On pressure reservoir, close the off-center connection with a closing cone (29) and a coupling nut (30).



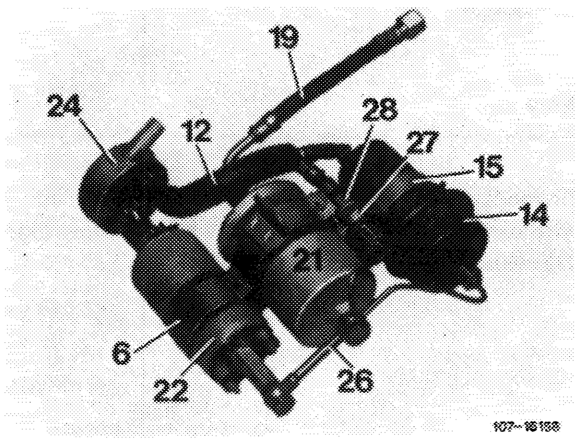
10 Install pump assembly and fuel hoses, and make electrical connections.

11 Remove clamp on suction hose, run engine and check system for leaks.

12 Mount protective case. Then make sure that fuel hoses are not exposed to chafing.

Note: On vehicles with auxiliary heater, the leak line is approx. 50 mm in front of suction damper. Insert a T-fitting. Here, the protective anti-chafing hose must be shortened.

A. General



Since February 1979 the pressure reservoir (14) is connected in front of fuel filter, and an additional pressure compensating valve (27) is also installed. As a result, the cold engine will fire much easier and smooth running directly following a cold start will be improved.

As a result of the installation of light alloy fuel distributor, the pressure compensating valve is integrated in fuel distributor.

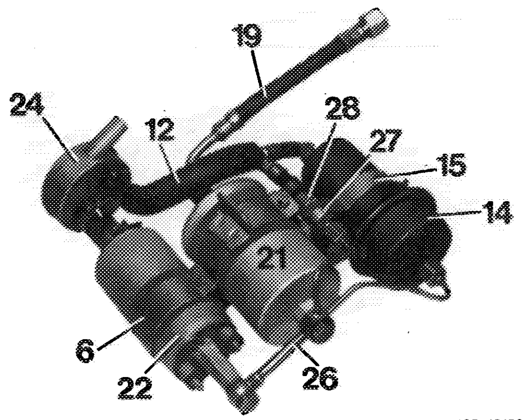
For **start of series production** refer to "Technical revisions".

Note: Since February 1981 the pressure reservoir (14) is connected in front of fuel filter on model 123.093. On this model, the pressure compensating valve (27) is not installed owing to installation position of fuel tank.

Operation

The pressure reservoir (14) has now only one connection and owing to a throttle is filled only slowly with fuel. From fuel filter the fuel flows directly into feed line toward engine. As a result, the fuel pressure is building up much faster at injection valves.

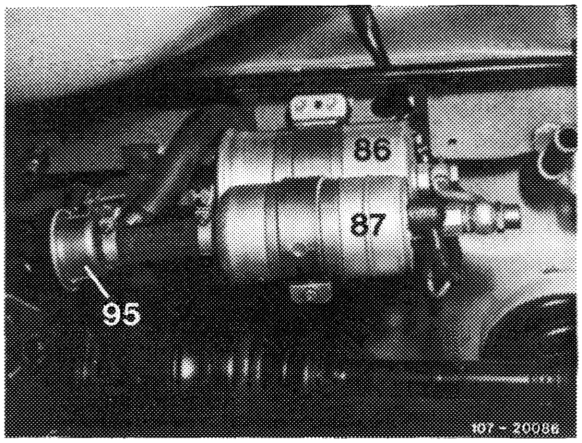
In front of fuel filter (21) is an additional pressure compensating valve (27), which closes in the event of pressure in system. If the fuel volume in system is reduced when the fuel is cooling down, the pressure compensating valve will open. This will prevent that the control piston in fuel distributor will be pulled to full load under influence of vacuum, since otherwise during a cold start the full fuel quantity might be injected for a short period and the engine might be excessively enriched.



B. Scope

Note

On models 107 and 126 fuel filters will be installed with damper (86), as well as a diaphragm damper (95). This will reduce noises caused by fuel pump.



86 Fuel filter with damper
87 Fuel pump
95 Diaphragm damper

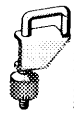
On vehicles in national version (AUS)(J)(S) and (USA) with CIS injection system prior to model year 1981, the respective components can also be installed. On vehicles of model year 1981, the changes are already in place. However, the fuel pump assembly differs by a fuel filter of larger diameter (owing to revised maintenance intervals).

Introduction into series

Model	Starting chassis end no.	Remarks
107.022 107.042	010166 010715	Fuel filter with damper and diaphragm damper (since April 1981)
126.022/023	004661	Fuel filter with damper (since April 1980)
126.022/023	016862	Diaphragm damper (since October 1980)

On vehicles with lower chassis end no. the components can be subsequently installed in the event of complaints about "Fuel pump loud".

Special tool

Clamp for hose lines	 11004-6190	000 589 40 37 00

Spare parts

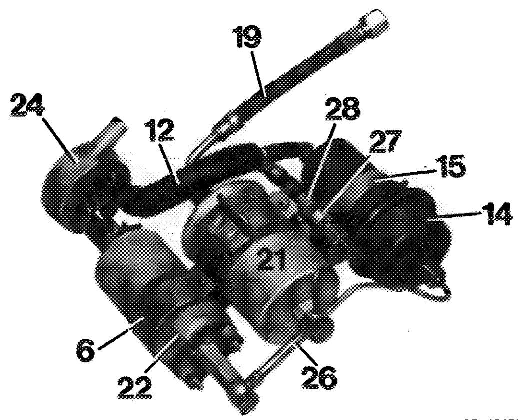
Designation	Part no.
Conversion kit	123 470 05 93
Steel line for engines with light alloy fuel distributor	126 470 01 64

Responsible for delivery: Plant 50 (PEW Sindelfingen)

Note

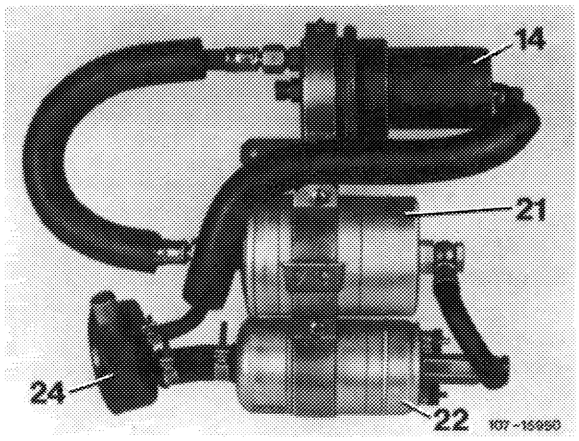
When exchanging fuel filter (21), fuel pump (22) or pressure compensating valve (27) make sure that a plastic sheet or plastic sleeve is mounted between these parts and holder (6, 15, 28). Sleeve should project on both sides of holder, since direct contact of parts with holder may lead to contact corrosion.

On vehicles in (AUS) and (J) version, a pressure compensating valve may not be subsequently installed.

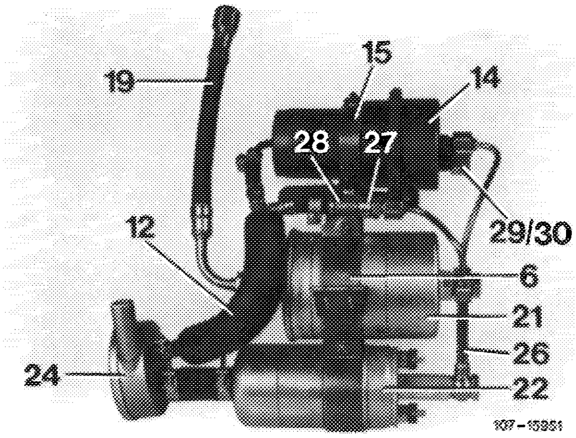


107–16158

Layout fuel pump assembly



Former layout
14 Pressure reservoir
21 Filter
22 Fuel pump
24 Damper

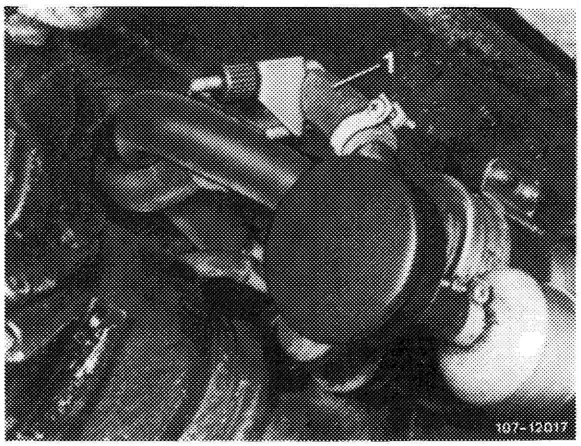


Present layout
6 Holder for fuel pump and filter
12 Leak line
14 Pressure reservoir
15 Holder for pressure reservoir
19 Fuel hose
21 Filter
22 Fuel pump
24 Damper
26 Fuel pressure line
27 Fuel compensating valve
28 Clamp for pressure compensating valve
29 Closing cone
30 Coupling nut

For conversion, the following parts may be used again:

Fuel pump,
suction damper,
pressure reservoir,
fuel filter.

Conversion



1 Unscrew protective case.

2 Disconnect electric connections.

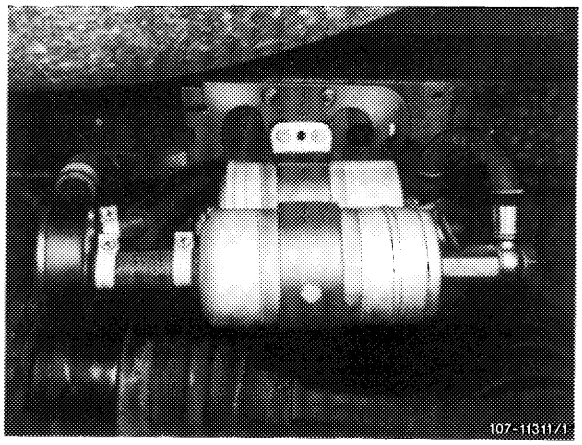
3 Pinch fuel suction hose (1) between fuel tank and suction damper by means of a clamp.

4 Loosen suction hose on suction damper and pull off.

5 Unscrew fuel pressure line from feed line to engine compartment. Clean screw connection first.

6 Unscrew fastening nuts of anti-vibration buffers and remove "fuel pump assembly".

7 Disassemble fuel pump assembly.

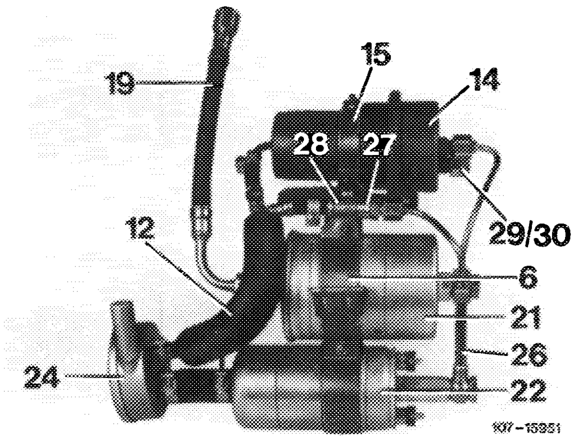


8 Clean fuel pump and fuel filter externally and mount in addition to plastic sleeve (slip up to bead of pump).

As an exception, a sheet (e.g. Tesafilm) may be glued on instead of plastic sleeve.

Attach plastic sleeve or sheet always in such a manner that it projects on both sides of holder. A direct contact of holder and pump or filter may lead to contact corrosion.

9 Assemble with components of conversion kit pump assembly, as shown in illustration. Slip fuel pump (22) up to bead into holder (6) and mount clamp (28) for pressure compensating valve (27) under holder of pressure reservoir. Prior to tightening screws of holder, position fuel pressure line (26) at pump, filter and pressure reservoir, align parts in relation to each other and tighten screws. On pressure reservoir, close the off-center connection with a closing cone (29) and a coupling nut (30).



10 Install pump assembly and fuel hoses, and make electrical connections.

11 Remove clamp on suction hose, run engine and check system for leaks.

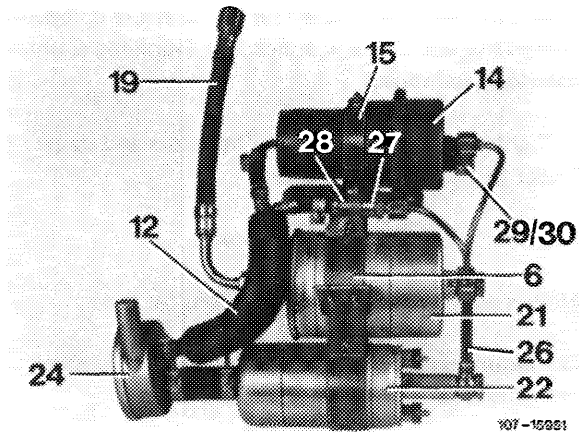
12 Mount protective case. Then make sure that fuel hoses are not exposed to chafing.

Note: On vehicles with auxiliary heater, the leak line is approx. 50 mm in front of suction damper. Insert a T-fitting. Here, the protective anti-chafing hose must be shortened.

Note

In the event of a complaint concerning "Engine fires poorly when warm" an internal leak of fuel pump shows up, a check valve can be subsequently mounted to fuel pump.

Installation

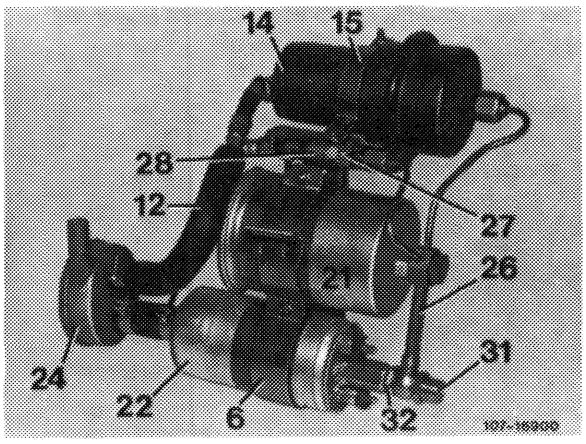


Fuel pump assembly with steel line between fuel pump and filter

1 Unscrew protective case.

2 Pinch fuel hoses (from fuel tank and to line toward engine) with one clamp each.

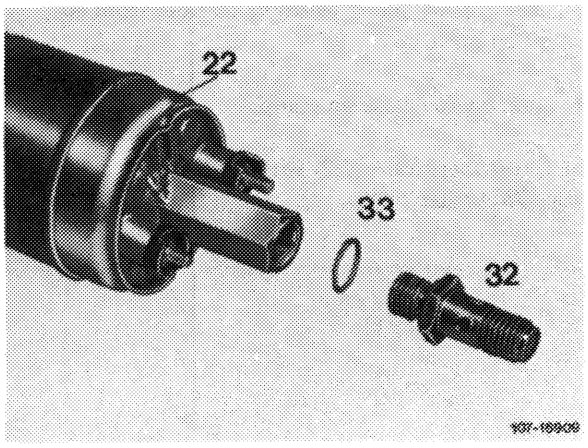
3 Unscrew fuel pump assembly on both front anti-vibration buffers.



6 Holder for fuel pump and filter
12 Leak line
14 Pressure reservoir
15 Holder for pressure reservoir
19 Fuel hose
21 Filter
22 Fuel pump
24 Damper
26 Fuel pressure line
27 Pressure compensating valve
28 Clamp for pressure compensating valve
29 Closing cone
30 Coupling nut
31 Closing nut
32 Check valve
33 Sealing ring

4 Unscrew steel line (26) on fuel pump, filter, reservoir and pressure compensating valve.

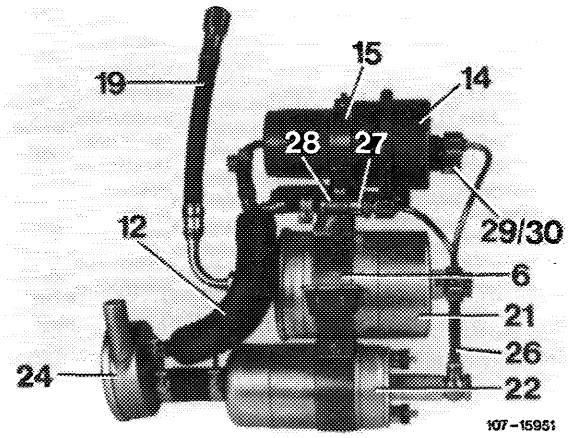
5 Screw check valve (32) with new copper sealing ring (33) to fuel pump.



6 Mount steel lines. For this purpose, slip fuel pump up to bead into holder. Connect steel line with new copper sealing rings and closing nut (screw-on closing nut only lightly). Hollow screw is no longer used.

Note: The plastic sheeting or plastic sleeve of pump and filter should project on holder of both sides. Be sure to replace if demaged. Remove pump and filter for this purpose.

7 Mount fuel filter in holder in such a manner that the steel line is in alignment with fuel pump.



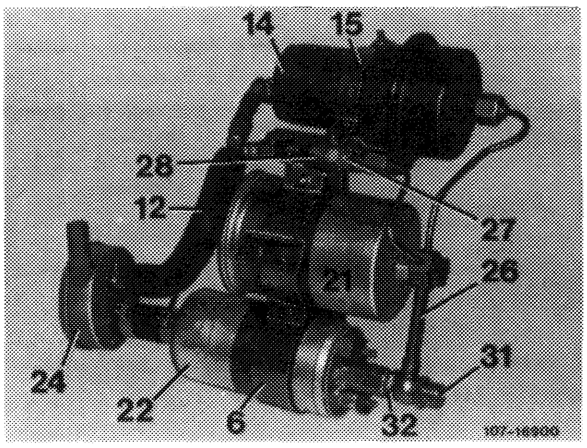
8 Mount steel line on reservoir and pressure compensating valve and tighten connections (applying counterhold to check valve).

9 Tighten fuel pump and filter in holder and screw holder to anti-vibration buffers.

10 Remove clamps from fuel hoses.

11 Run engine and check connections for leaks.

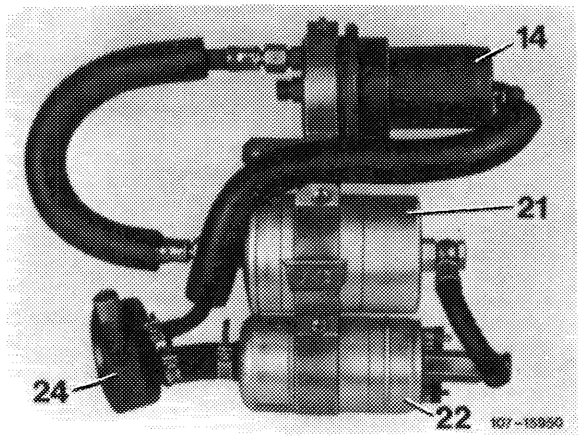
12 Mount protective case. Make sure that the steel line is not chafing against protective case.



Fuel pump assembly with hose between pump and filter

1 Unscrew protective case.

2 Pinch fuel hoses with clamps.

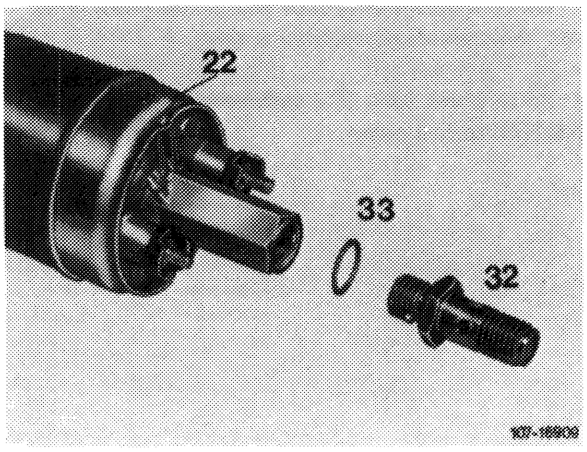


14 Pressure reservoir
21 Filter
22 Fuel pump
24 Damper

3 Unscrew fuel pump assembly on both front anti-vibration buffers.

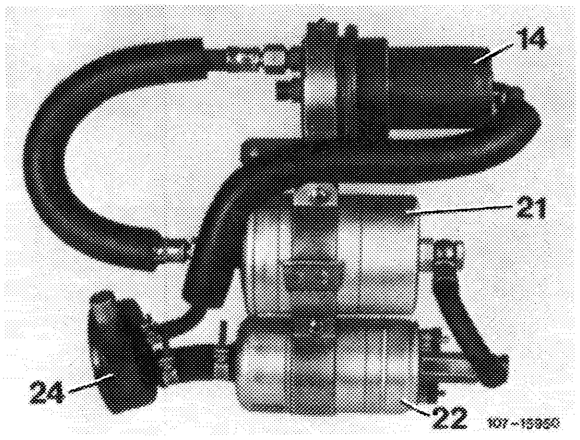
4 Unscrew fuel hose on pump.

5 Screw check valve (32) with new copper sealing ring (33) to fuel pump.



6 Clip fuel pump in holder approx. 15 mm to the left (so that closing nut is no longer chafing against protective case) and mount fuel hose with 2 new copper sealing rings and closing nut to check valve (while applying counterhold to check valve). Hollow screw is no longer installed.

Note: Plastic sheet or plastic sleeve of pump and filter should project on holder on both sides and must be replaced if damaged. For this purpose, remove pump and filter.



7 Tighten fuel pump and filter in holder and mount holder on anti-vibration buffers.

8 Remove clamps from fuel hoses.

9 Run engine and check system for leaks.

10 Mount protective case. Make sure that fuel hose is not chafing against protective case.

A. Decel shutoff

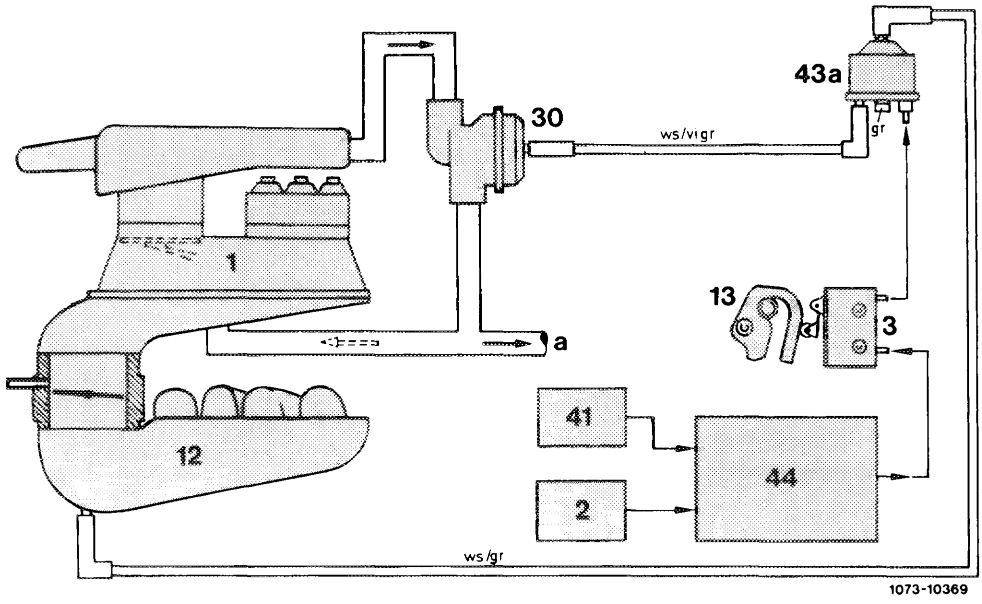
General

During deceleration, the switchover valve located in vacuum line between intake manifold and decel shutoff valve is activated by means of a microswitch and switched to passage.

The required air for decel operation is sucked in through decel shutoff valve switch which is opened by intake manifold vacuum, while bypassing the air flow sensor plate. The air flow sensor plate remains in zero position, that is, no fuel is injected.

Decel shutoff comprises the following components:

- Decel shutoff valve (30).
- Electronic control unit (fuel pump relay) for decel shutoff (44).
- Microswitch (3).
- Switchover valve (43a)
- Impulse transmitter (41) tachometer.



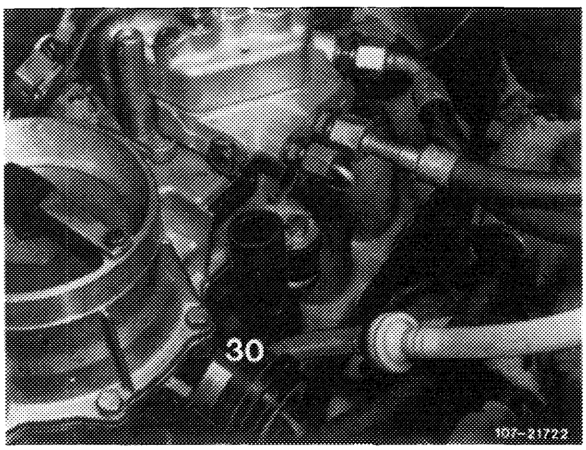
1 Mixture controller
2 Transistorized switching unit
3 Microswitch
12 Intake manifold
13 Slotted lever

30 Decel shutoff valve
41 Impulse transmitter tachometer
43a Switchover valve decel shutoff
44 Fuel pump relay
a To idle speed air distributor

Color code
gr = gray
vi = purple
ws = white

Decel shutoff valve

During deceleration (coasting) the decel shutoff valve (30) connects the air cleaner with the idle speed air system. As a result, with decel shutoff valve open, the air required by engine under deceleration is taken directly from air cleaner while bypassing the air flow sensor plate (refer to function diagram).



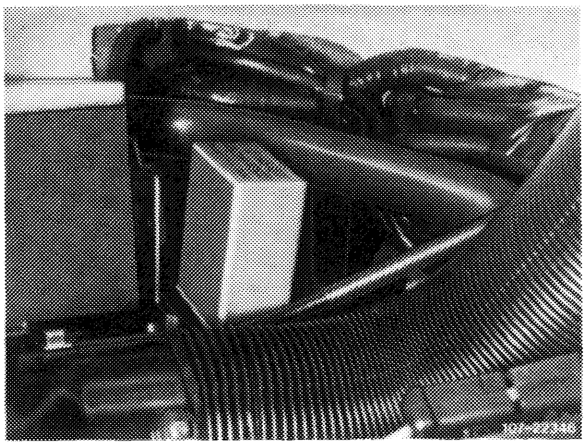
The air flow sensor plate is not deflected and is in zero position. The fuel feed to the injection valves is therefore interrupted (control slits closed).

The decel shutoff will be operational under the following conditions:

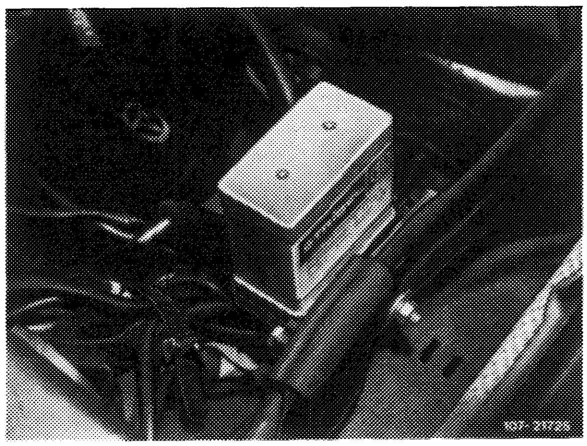
When decelerating (coasting) without air conditioning above 1100/min, and with air conditioning above 1300/min. At a driving speed above 30 km/h.

If these operating conditions are changed, e.g. by accelerating, the decel shutoff will become effective again when an engine speed of 1600/min without air conditioning, and of 1800/min with air conditioning, are exceeded first and the speed was higher than 35 km/h.

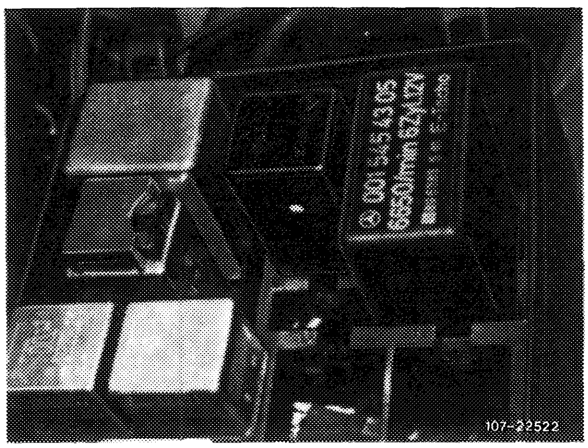
Decel shutoff is controlled by an electronic control unit (44), which is integrated in fuel pump relay.



Model 107



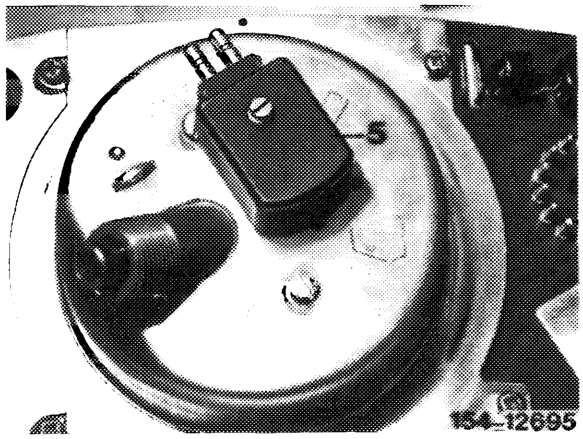
Model 123



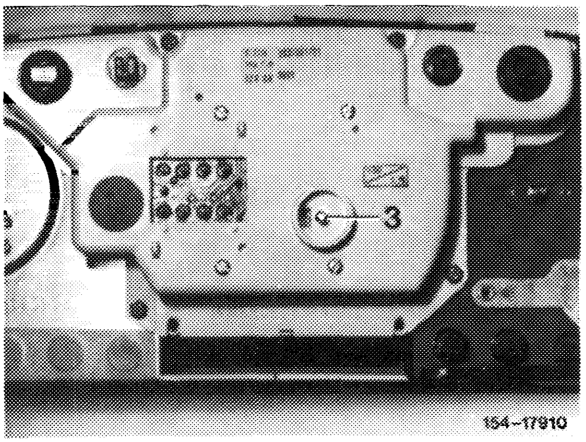
Model 126

The signal for the engine speed is tapped at switching unit of transistorized ignition system (TD).

On model 123 with mechanically driven tachometer, the vehicle speed is picked up by an impulse transmitter (5), on model 107 and 126 at electronic tachometer.



Model 123

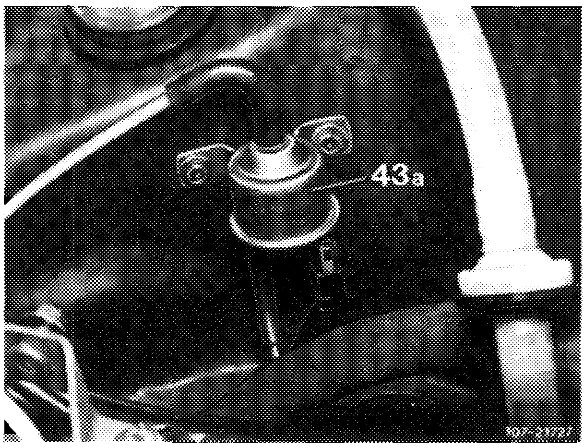


Model 107, 126

Switchover valve

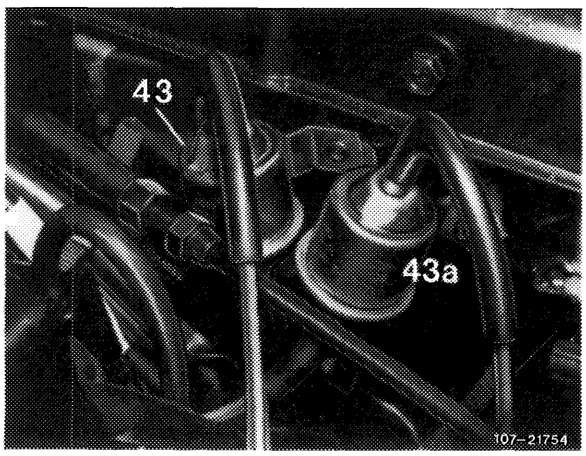
The switchover valve (43a) attached at front end is an electromagnetic valve.

With the microswitch closed and under the conditions named above, voltage is switched to switchover valve by way of control unit. The intake manifold vacuum acts on decel shutoff valve and opens the bypass line from air cleaner to air guide housing. The connection is interrupted the moment the voltage drops.



Model 123

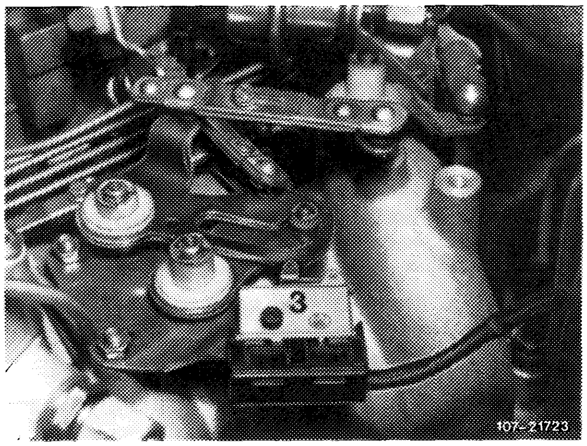
Layout model 107 (refer to 07.3–140).



Model 126

Microswitch

The microswitch is located at regulation in idle path range of slotted lever.

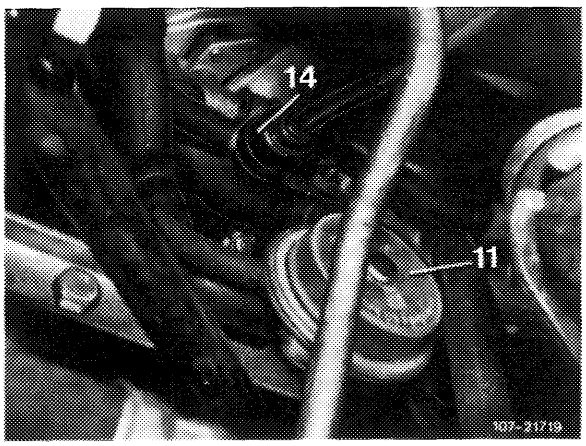


With the accelerator pedal in idle speed position and under the conditions named above, the circuit is closed and the decel shutoff is triggered.

When the accelerator pedal is operated, the switch opens already before the throttle valve opens and the decel shutoff will be interrupted. That is, combustion starts again before the throttle valve opens. As a result, any cutting-in jerk will be avoided.

B. Idle speed stabilization with rpm increase following start

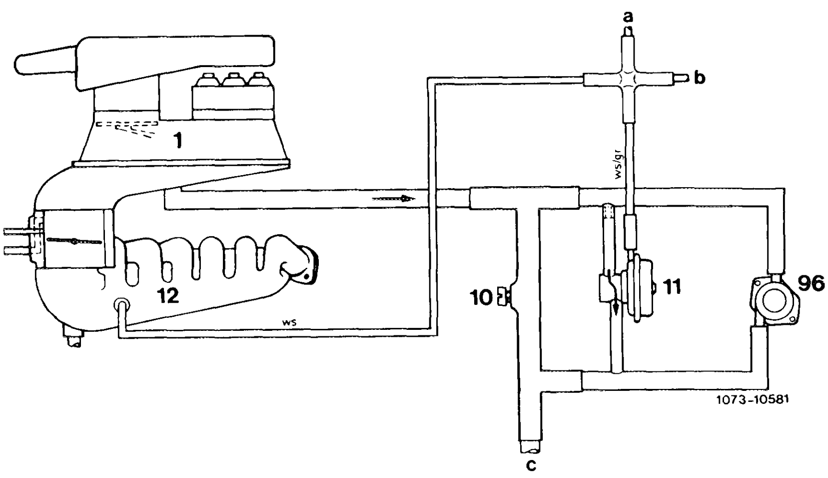
A decel circulating air valve (11) is installed for idle speed stabilization, as well as for an rpm increase after starting.



The valve is located on a holder behind ignition distributor below intake manifold.

Decel circulating air valve

The decel circulating air valve is controlled by the intake manifold vacuum. While bypassing the throttle valve and the idle speed adjusting screw, metered air from air guide housing is guided via contour hoses and the idle speed air distributor to the idle speed air ducts in intake manifold.



1 Mixture controller
10 Idle speed air screw
11 Decel circulating air valve
12 Intake manifold
96 Auxiliary air valve

a Conncetion switchover valve decel shutoff
b Connection switchover valve rpm increase air-conditioning system
c To idle speed air duct in intake manifold

Color code
gr = gray
ws = white

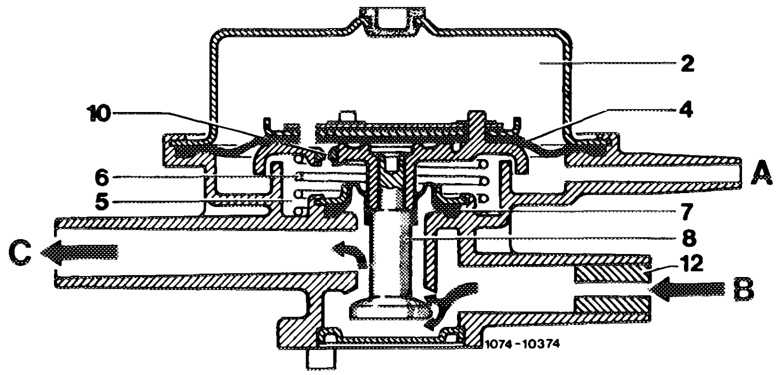
Operation

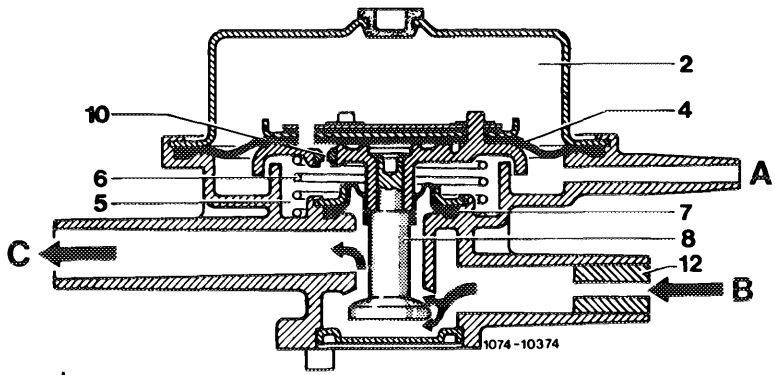
Rpm increase after start.

With engine stopped, atmopheric pressure prevails in lower and upper diaphragm chamber. When the engine is started, a vacuum will be built-in in lower diaphragm chamber (5) and will overcome the contact pressure of compression spring (6). Valve (8) is pushed in downward direction and the path for the bypass air from air guide housing to intake manifold will be cleared. This increased charge will also increase the engine speed at idle for a short period.

As soon as the vacuum in the two diaphragm chambers is again balanced by way of orifice (10), valve (8) will be pushed upwards by compression spring (6) and closed.

2 Upper diaphragm chamber
4 Diaphragm
5 Lower diaphragm chamber
6 Compression spring
7 Sealing diaphragm
8 Valve
10 Orifice
12 Throttle (restriction)
A Vacuum connection
B Air guide housing inlet
C To contour hose idle speed air distributor





Rpm stabilization from higher speed to idle speed

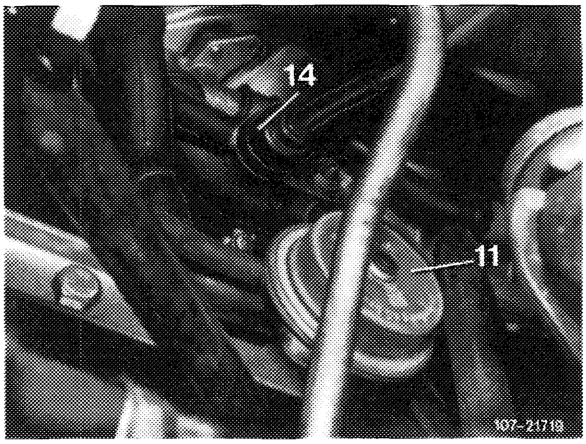
The decel circulating air valve delays adaptation to lower idle speed after accelerating, since the vacuum in the lower diaphragm chamber (5) increases faster than the compensating process by means of the upper diaphragm chamber via orifice (10).

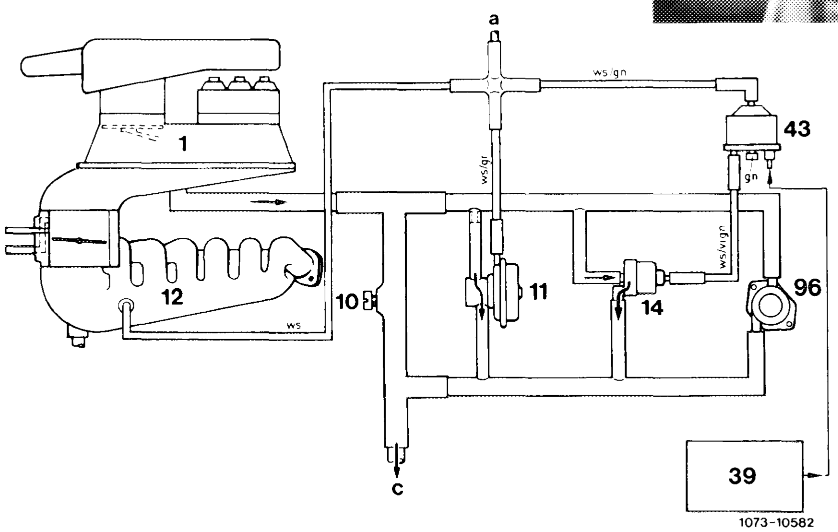
The adjusting force of the vacuum will overcome the contact pressure of compression spring (6). Valve (8) is pushed in downward direction and the bypass air can be sucked in by the engine through the idle speed ducts. Valve (8) will close following pressure compensation between upper and lower diaphragm chamber (2 and 5) via orifice (10).

C. Idle speed stabilization on engines with refrigerant compressor

Vehicles with air conditioning/automatic climate control are provided with a bypass valve (14) for rpm stabilization at idle.

Bypassing the throttle valve, the air measured by the air flow sensor plate is guided to intake manifold (12) by bypass valve (14). With the air-conditioning system/ automatic climate control switched on, the electric switchover valve (43) is energized and will connect the bypass valve (14) to the vacuum connection on intake manifold. The bypass valve will open under influence of intake manifold vacuum. Bypassing the throttle valve, the engine will aspirate more air and the idle speed will be increased.



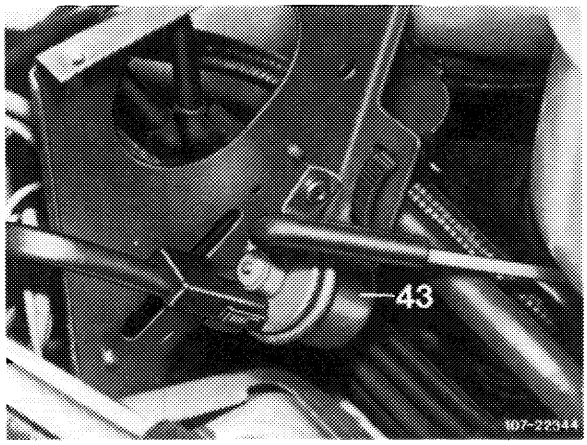


1 Mixture controller
10 Idle speed air screw
12 Intake manifold
14 Bypass valve air conditioning
39 Relay air conditioning
43 Switchover valve
rpm increase air conditioning
96 Auxiliary air valve

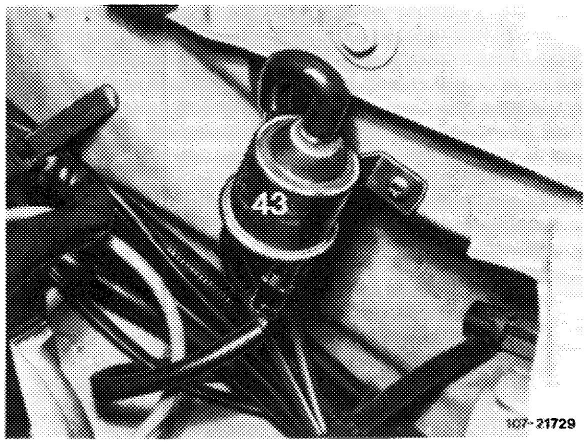
a Connection switchover valve-decel shutoff
c To idle air duct in intake manifold
d Connection decel circulating air valve

Color code
gn = green
vi = purple
ws = white

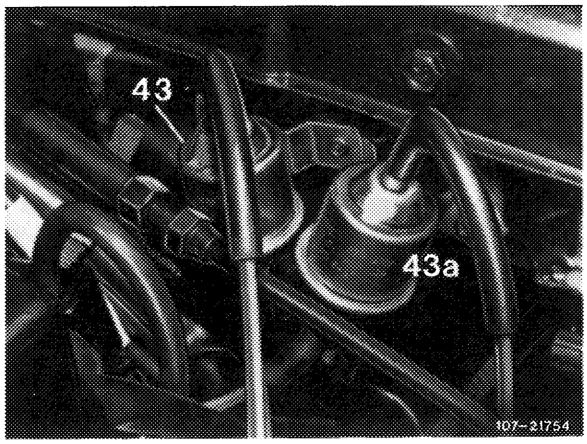
Layout of switchover valve (43)



Model 107

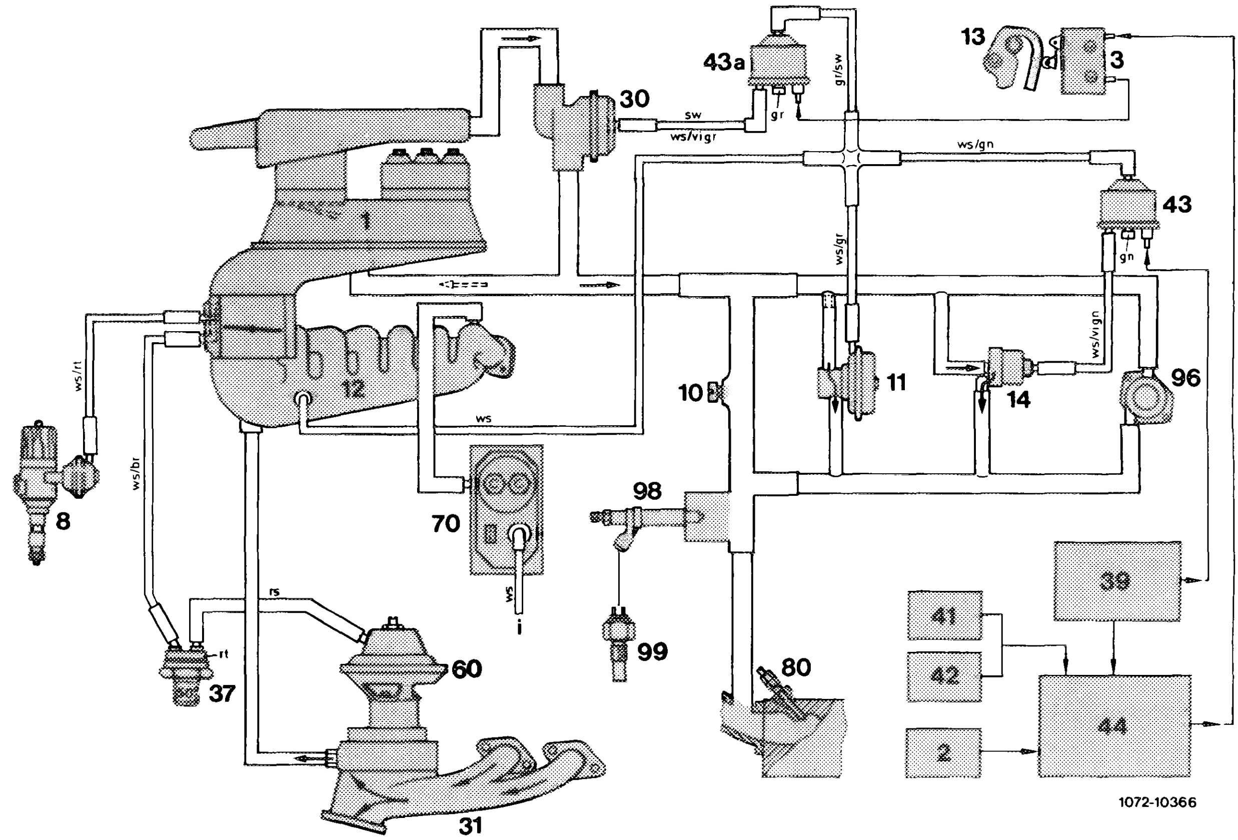


Model 123



Model 126

D. Function diagram decel shutoff, idle speed stabilization, EGR



1 Mixture controller	41	Impulse transmitter mechanical tachometer	Color code
2 Transistorized switching unit	42	Electronic tachometer	br = brown
3 Microswitch	43	Switchover valve rpm increase air conditioning	gn = green
8 Ignition distributor	43a	Switchover valve decel shutoff	gr = gray
10 Idle speed air screw	44	Fuel pump relay	rs = pink
11 Decel circulating air valve	60	EGR valve	rt = red
12 Intake manifold	70	Warm-up compensator	sw = black
13 Slotted lever	80	Injection valve	vi = purple
14 Bypass valve air conditioning	96	Auxiliary air valve	ws = white
30 Decel shutoff valve	98	Cold start valve	
31 Exhaust manifold	99	Thermo time switch	
37 Thermovalve 50 °C EGR	i	To leak line (atmosphere)	
39 Relay air conditioning			

E. Fuel pump relay

The fuel pump relay for supplying voltage to fuel pump has three or four functions:

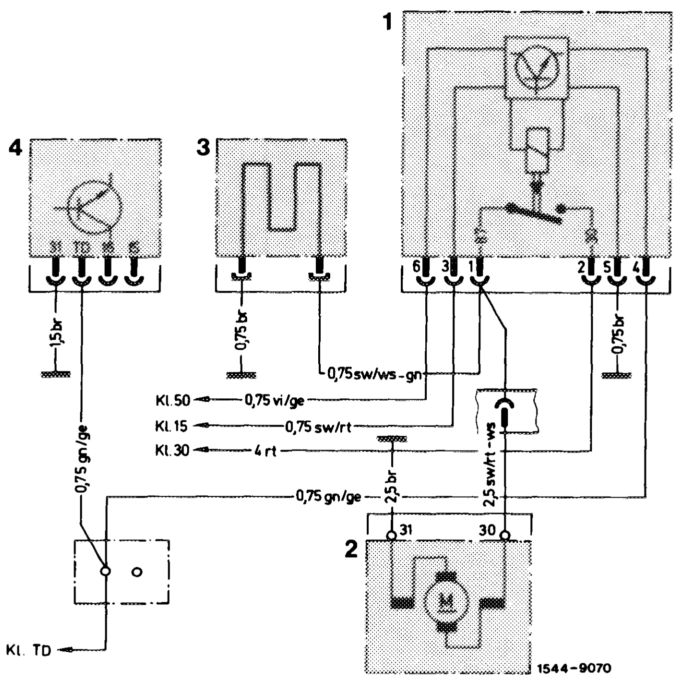
1. Activation of fuel pump while starting and with the engine running.

   In parallel with fuel pump, the warm-up compensator is likewise activated.

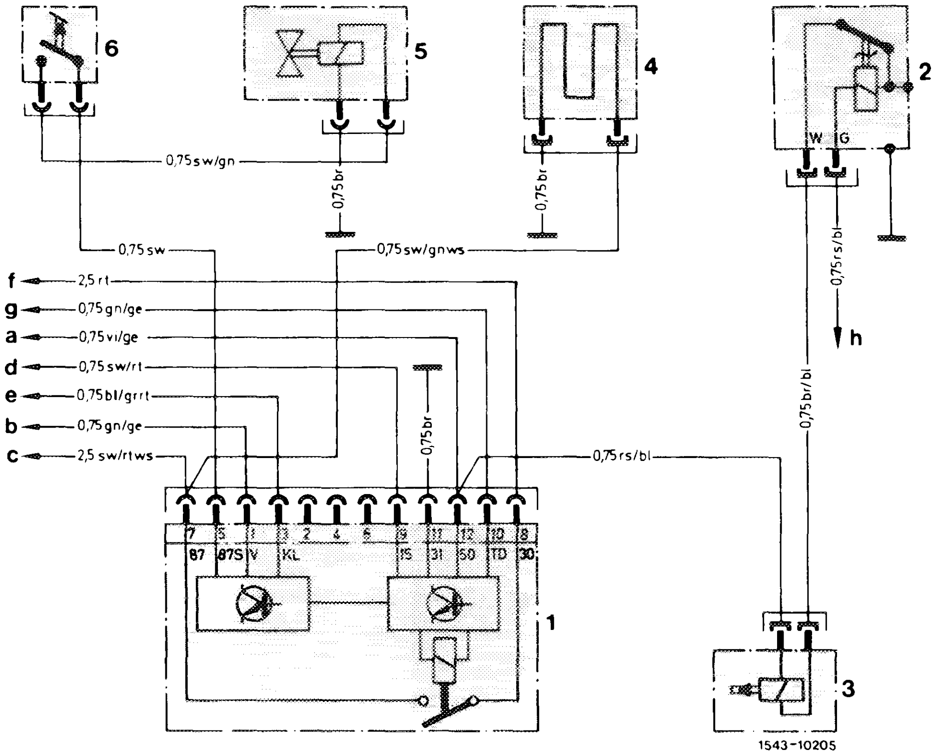
2. Rpm limitation after attaining max. engine speed.

3. Switching-off fuel pump as soon as there are no more impulses via terminal TD of switching unit: TD = transistor speed.

4. Control of decel shutoff. (starting September 1981).



Wiring diagram prior to September 1981
1 Fuel pump relay
2 Fuel pump
3 Warm-up compensator
4 Switching unit (TSZ)
TSZ = transistorized switching unit

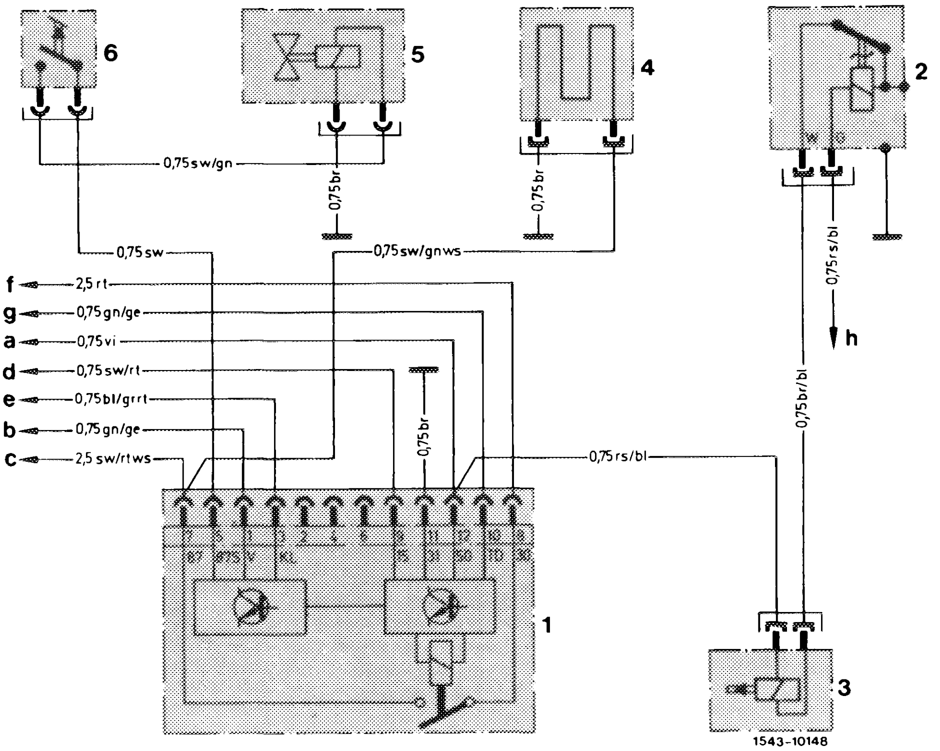


Wiring diagram starting September 1981 – model 123

1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up compensator
5 Switchover valve
6 Microswitch

a To output starter lockout and backup lamp switch
b Transmitter mechanical tachometer
c Fuel pump
d Fuse 12 terminal 15 access
e Refrigerant compressor
f Cable connector engine terminal 30
g Cable connector terminal TD
h Cable connector engine terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white



Wiring diagram starting September 1981 – model 107, 126

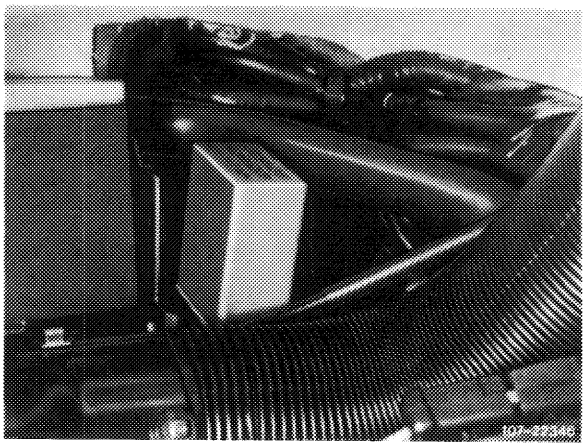
1 Fuel pump relay
2 Thermo time switch
3 Cold starting valve
4 Warm-up compensator
5 Switchover valve
6 Microswitch

a Cable connector engine terminal 50
b Transmitter electronic tachometer
c Fuel pump
d Fuse 14 terminal 15 access
e Refrigerant compressor
f Cable connector terminal 30
g Cable connector terminal TD
h Cable connector engine terminal 50

Color code
bl = blue
br = brown
ge = yellow
gn = green
gr = gray
rs = pink
rt = red
sw = black
vi = purple
ws = white

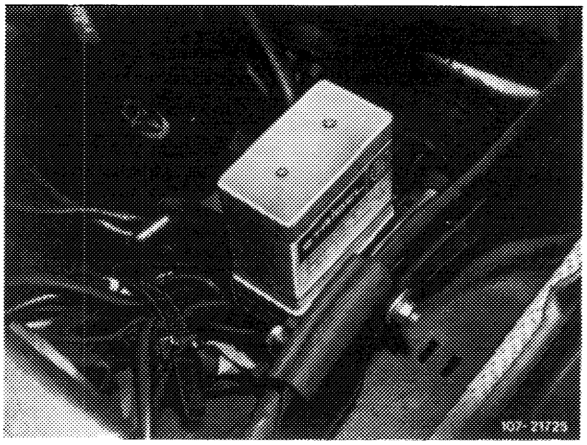
1. Activation of fuel pump while starting and with engine running

While starting, the fuel pump relay is activated via terminal 50 and with the engine running via terminal TD of ignition switching unit.



Model 107

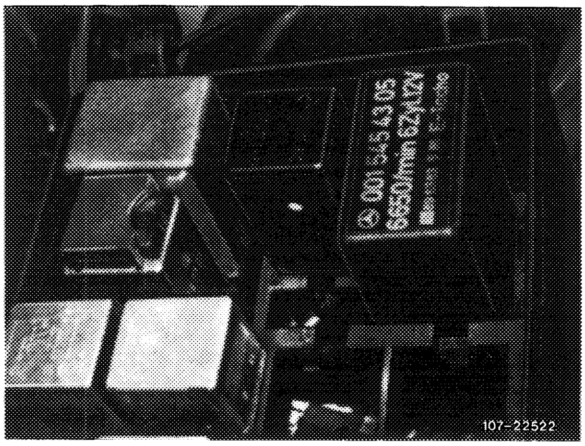
While starting, the fuel pump relay is activated via terminal 50, because the pertinent parallel activation of fuel pump relay via terminal TD is not enough at engine speed below approx. 80/min. The pulse sequence of terminal TD is too low to keep contacts 30 and 87 in pump relay continuously closed.



Model 123

At speeds above approx. 80/min, the frequency of the pulses is so high that contacts 30 and 87 in fuel pump relay remain continuously closed.

The warm-up compensator is also activated in parallel with fuel pump.



Model 126

2. Rpm limitation after attaining max. engine speed

After attaining a given pulse sequence according to max. engine speed, contacts 30 and 87 for fuel pump are interrupted. Fuel pump is deenergized and will switch off.

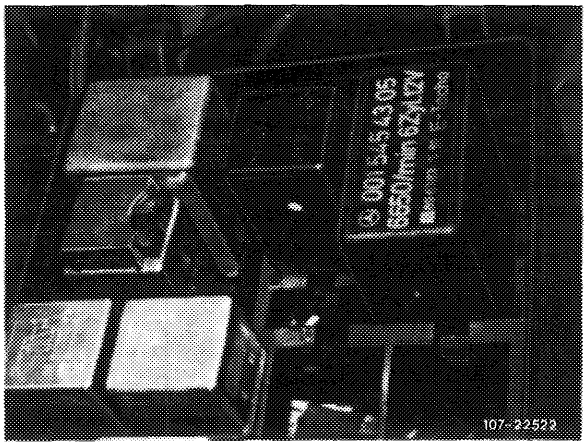
3. Switching-off fuel pump as soon as there are no pulses via terminal TD of switching unit

As a safety circuit, one second after last impulse of terminal TD, contacts 30 and 87 in fuel pump relay are interrupted. The pump is deenergized and switches off.

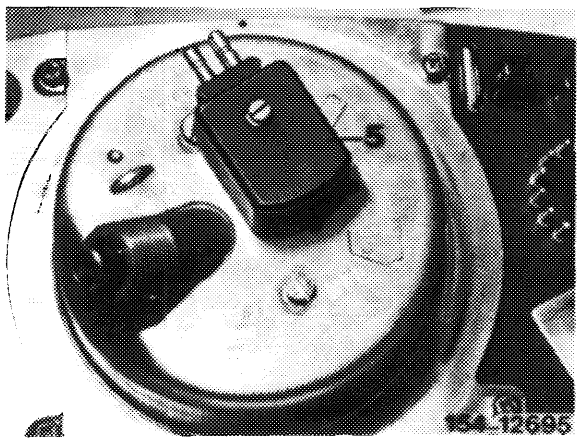
4. Control of decel shutoff starting September 1981

Decel shutoff is controlled by an electronic control unit which is integrated in fuel pump relay.

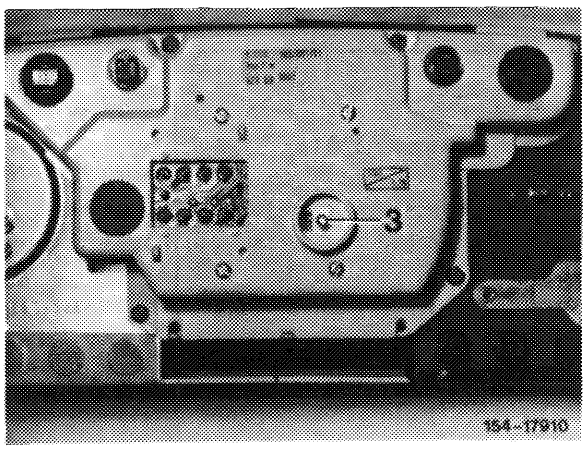
The signal for the engine speed is picked up at switching unit of transistorized ignition system (TD).



On model 123 with mechanically driven tachometer, the vehicle speed is picked up by an impulse transmitter (5), on model 107 and 126 on impulse transmitter connection (3) of electronic tachometer.



Model 123



Model 107, 126

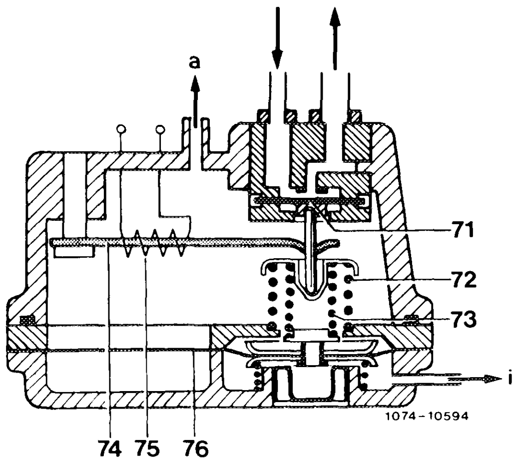
F. Warm-up compensator

The warm-up compensator regulates the control pressure which acts on control piston and serves for enriching the fuel mixture in warm-up stage and at full load.

The warm-up compensator is connected to two fuel lines, the control pressure line and the return flow line.

The control pressure acts on top of diaphragm valve (71), which throttles the outflow cross section of return flow line.

Two valve springs (72 and 73) operating at the bottom are adapted to normal control pressure.



71 Diaphragm valve
72 Outer valve spring
73 Inner valve spring
d To intake manifold (vacuum)
i To leak line (atmosphere)
74 Bimetallic strip
75 Heater coil
76 Vacuum diaphragm

A bimetallic strip (74) provided with a heater coil (75) is installed for enrichment during warm-up stage. The cold bimetallic strip acts against valve springs (72 and 73), so that diaphragm (71) will open and the control pressure will be reduced. Heating up will successively reduce the effect of the bimetallic spring until the control pressure has attained its normal value.

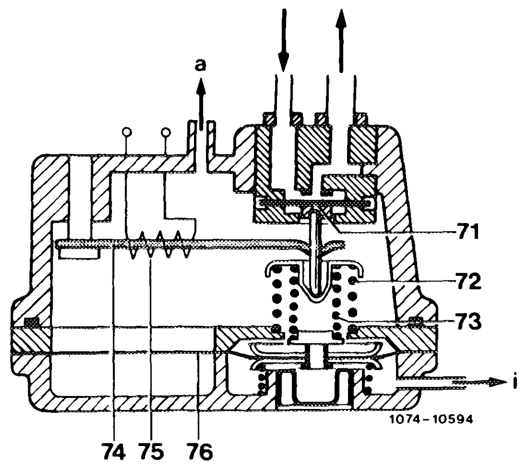
Full load enrichment

Prior to September 1981

For full load enrichment, the warm-up compensator is separated into two chambers by means of a vacuum diaphragm (76). Intake vacuum "a" is effective in upper chamber. The lower chamber is vented via connection "i".
To prevent the entry of dirt or water, the vent connection is connected to leak line of fuel damper.

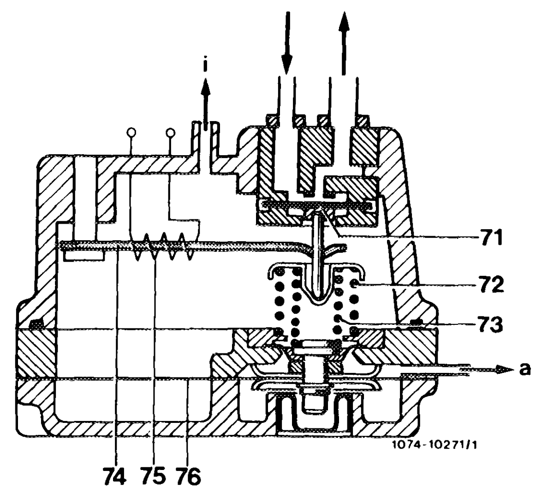
At idle and in partial load range the upper chamber is under influence of vacuum and vacuum diaphragm (76) rests against upper stop. In this position, the spring force establishes the normal value of the control pressure.

At full load, the vacuum in upper chamber is exhausted and the vacuum diaphragm (76) is moving in downward direction. The force of the inner valve spring (73) is getting less, and the control pressure is thereby reduced to full load value.



Starting September 1981

The lower chamber of the warm-up compensator has a vacuum diaphragm (76) which is controlled by the vacuum. Vacuum connection "a" is in lower chamber. The inner compression spring is relieved under influence of decreasing vacuum (increasing load).



71 Diaphragm valve
72 Outer valve spring
73 Inner valve spring
74 Bimatallic strip
75 Heater coil
76 Vacuum diaphragm
a To intake manifold (vacuum)
i To leak line (atmosphere)

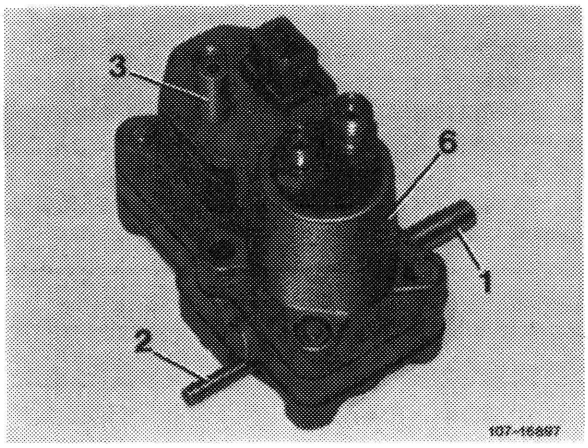
Under influence of resulting low control pressure (increase of outflow cross section) a low force is acting on control piston in fuel distributor. As a result, the air flow sensor plate is further deflected at the same air flow rate and a larger quantity of fuel will be supplied (mixture enrichment).

Connection "i" on upper chamber serves for venting. To prevent the entry of dirt or water, the vent connection is connected to leak line of fuel damper.

Acceleration enrichment

Ⓙ starting 1981
(USA) 1980/81

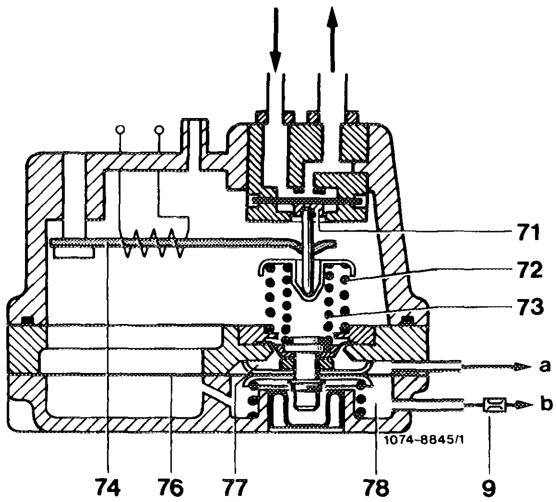
To obtain an additional mixture enrichment in warm-up stage during acceleration, the warm-up compensator has been provided with an acceleration enrichment.



1 Connection upper chamber
2 Connection lower chamber
3 Vent to atmosphere
6 Warm-up compensator

The full load enrichment via warm-up compensator is no longer employed and is now activated via throttle valve switch.

Acceleration enrichment is controlled in dependence of vacuum under a coolant temperature of 50 °C.



9 Throttle (restriction)
71 Diaphragm valve
72 Outer valve spring
73 Inner valve spring
74 Bimetallic spring
77 Vacuum diaphragm
77 Upper chamber
78 Lower chamber

a Connection upper chamber
b Connection lower chamber

Two springs are pressing down on control diaphragm (71) in warm-up compensator, the outer spring (72) is firmly supported in housing and the inner spring (73) is loaded or unloaded in dependence of vacuum.

A chamber in warm-up compensator housing-lower half is divided into an upper chamber (77) and a lower chamber (78) by a diaphragm. Both chambers are connected to intake manifold vacuum, with a choke (9) located in vacuum line to lower chamber.

At constant speed, the diaphragm (76) rests against upper stop. As a result, the vacuum in upper and lower chamber is the same.

During acceleration, the vacuum in the upper chamber decreases faster than in the lower chamber under influence of choke (9).

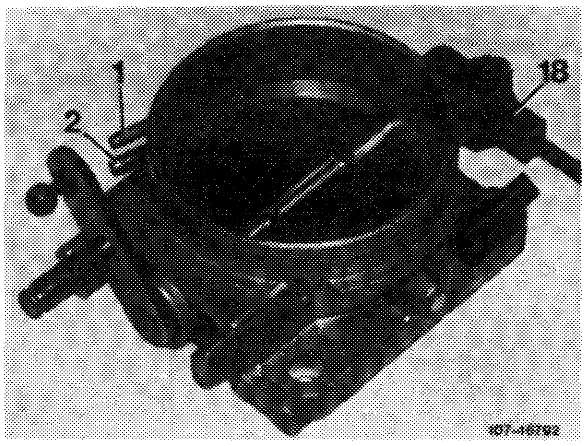
The inner spring is relieved up to pressure compensation of the two chambers and the pressure on control diaphragm is therefore lower.

As a result of the now lower control pressure (enlargement of outflow cross section) a lower force will act on control piston in fuel distributor. Consequently, the air flow sensor plate is further deflected while the air flow rate remains the same, so that a larger amount of fuel will be supplied (mixture enrichment).

Thermo valve (37) opens at a coolant temperature of 50 °C. The lower diaphragm chamber of the warm-up compensator is vented and the acceleration enrichment is cancelled. Both springs are pressing against control diaphragm and the control pressure obtains its normal value.

Full load enrichment by throttle valve switch

The throttle valve switch is attached to throttle valve housing and has two functions: Idle speed and full load contact.



1 Connection vacuum advance
2 Draw-off connection charcoal canister
18 Throttle valve switch

Idle speed contact

The idle speed contact on throttle valve switch results in a narrowing-down of the control range in control unit and thereby in a stabilization of the idle speed.

Full throttle contact

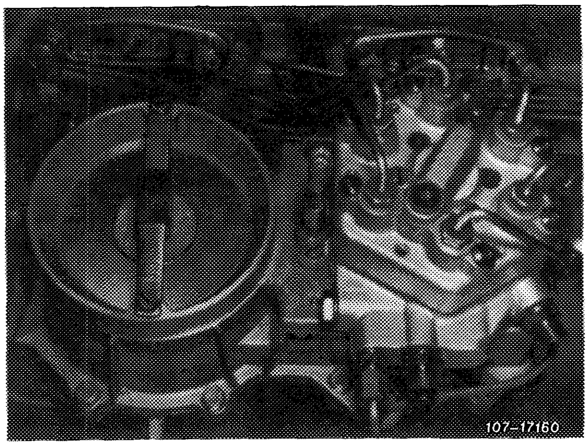
If the vehicle is driven in full throttle range (throttle valve against full throttle stop), a fixed on-off ratio of 60 to 40 (slightly richer) is set in control unit via the full throttle contact.

G. Light alloy fuel distributor

The characteristic of the fuel distributor and the air funnel in air flow sensor has been changed in full load range. Consumption in full load range has been reduced as a result of improved adaptation.

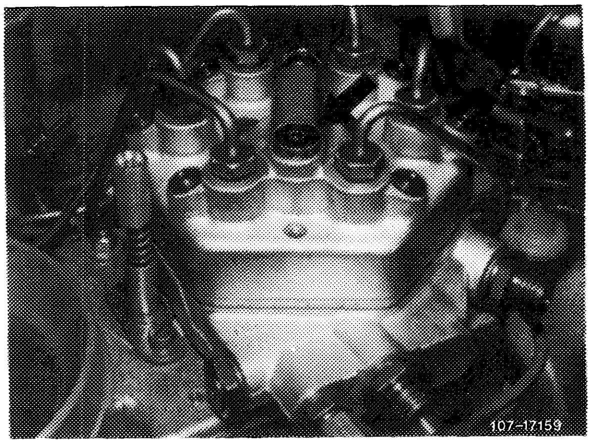
A fabric diaphragm is installed between upper and lower half. On top of fuel distributor are 6 closing screws with adjusting screws for differential pressure valves underneath. The differential pressure valves are set by manufacturer, adjustments are not permitted.

The connecting system of the injection line has been changed and now corresponds to that of 8-cylinder engines.



In addition, the fuel distributor upper half has been provided with a pressure compensating valve (arrow), as well as a compression spring above control piston.

On gray iron fuel distributor the compression spring is installed since February 1979, and on light alloy fuel distributor since start of series.

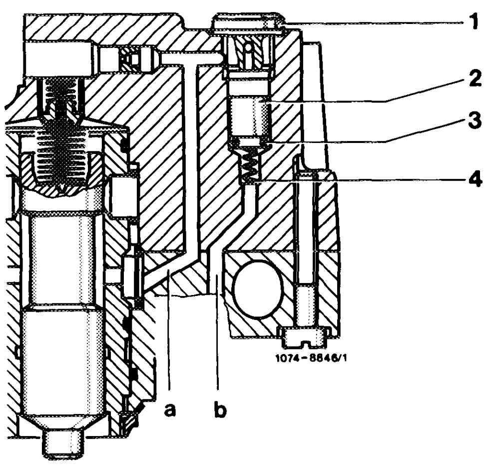


The pressure compensating valve is closed as long as the fuel system is under pressure.

The pressure compensating valve will open in the event of a pressure drop "after a long period of inoperation and cooling-down of fuel "below 0.3–0.5 bar gauge pressure.

Piston (2) is lifted, pressure compensation proceeds between system pressure and return flow pressure via piston gap.

This will prevent that the control piston in fuel distributor is lifted in direction of full load with the engine stopped and that a heavy mixture enrichment occurs during cold start.



1 Closing plug
2 Piston
3 O-ring
4 Compression spring
a System pressure
b Return flow

Closing angle (dwell angle)

Normal coil ignition (S)

Closing angle (dwell angle) Testing and **adjusting value** at idle[1])	Change between idle and 3000/min
39–42°	max. ± 3°

[1]) When installing new breaker points, adjust closing angle (dwell angle) to 42 ± 1°.

Transistorized ignition system (J) (USA)

Identification: blue ignition coil, two pre-resistors and transistorized switchgear.

Closing angle (dwell angle) Testing and **adjusting value** at idle[2])	Change between idle and 3000/min
30–40°	max. ± 3°

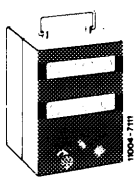
[2]) When installing new and when adjusting used breaker points, adjust closing angle (dwell angle) to 34 ± 1°.

Firing point

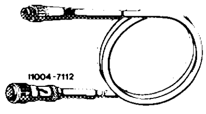
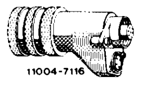
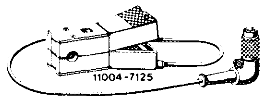
Ignition distributor Bosch no.	Adjusting value of firing point	Test value Ignition adjustment without vacuum			Vacuum adjustment after		Installation value of ignition distributor at starting speed
	with vacuum at idle	1500/min	3000/min	4500/min	"retard" at idle	"advance" at 4500/min (total)	without vacuum
(S) 1976							
0 231 309 001	TDC	11–17°	26–30°	26–30°	4–6°	8–12° (34–42°)	5° before TDC
(J) 1976							
0 231 311 001	7° before TDC	10–16°	26–33°	29–35°	–	–	7° before TDC
(USA) 1973/74							
0 231 310 002	4° after TDC	13–17°	31–35°	37–41°	9–13°	–	7° before TDC
(USA) 1975/76							
0 231 311 001	7° before TDC	10–16°	26–33°	29–35°	–	–	7° before TDC

Special tools

Digital tester



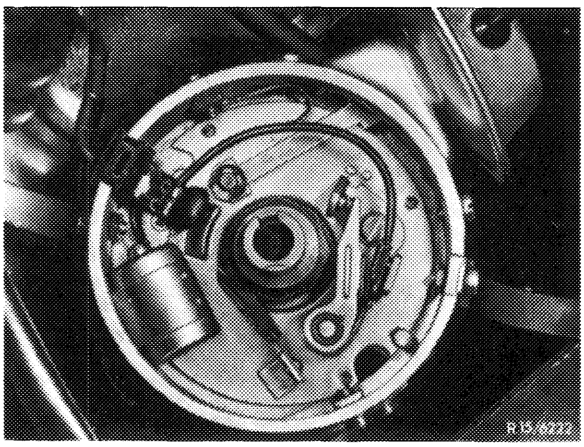
001 589 54 21 00

Connecting cable		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00

Conventional tools

Revolution counter, stroboscope, closing angle (dwell angle) measuring instrument

Checking and adjusting closing angle (dwell angle)



1 Measure closing angle (dwell angle) at idle speed.

2 Measure closing angle (dwell angle) change between idle speed and 3000/min, max. change ± 3°.

3 Adjust closing angle (dwell angle), if required or replace breaker points (07.5–505).

With used breaker points, the closing angle (dwell angle) can be adjusted only with transistorized ignition.

Large dwell angle – small point spacing
Small dwell angle – large point spacing

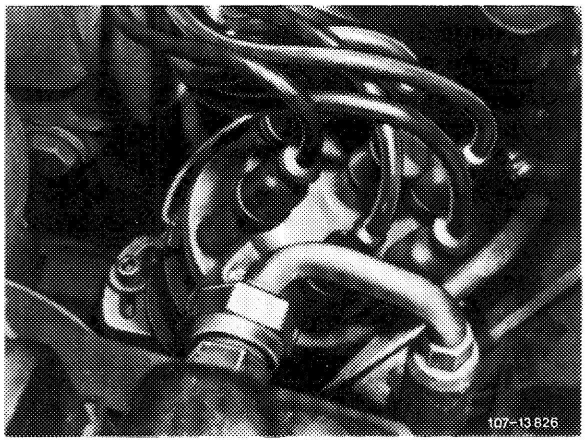
Checking and adjusting firing point

4 Measure firing point with stroboscope or digital tester at specified speed with or without vacuum.

5 Loosen ignition distributor and set adjusting value of firing point by turning ignition distributor.

Screw down ignition distributor and check firing point.

6 Check centrifugal and vacuum adjustment of ignition distributor. For this purposê, run through specified test values with or without vacuum adjustment.



07.5–503 Removing, preventing formation of layer on breaker points (breaker-controlled transistorized ignition)

Conventional tool

Voltmeter with measuring range	0–3 volts

The formation of a blue or a dark grey layer on breaker points of transistorized ignition systems may result in misfiring when in a progressive stage due to the insulating characteristics of such a layer – no matter whether a GE or an SI switchgear is installed. Pertinent complaints resulted in an unjustified exchange of switchgear.

The formation of layers on breaker points is the result of various influences which are shortly explained below:

Blue layer

The blue layer (tungsten oxide) is formed by the arch occurring during the closing stage and the resulting burning of contact material. This arch is above all caused by the discharge of the anti-interference capacitor in ignition distributor.

A large closing angle (small contact spacing) favors the intensity of the arch and thereby the formation of a layer.

Dark grey layer

The dark grey layer is the result of burnt grease, oil or dirt particles formed between breaker points.

A remedy with regard to complaints concerning the formation of layers requires the following jobs:

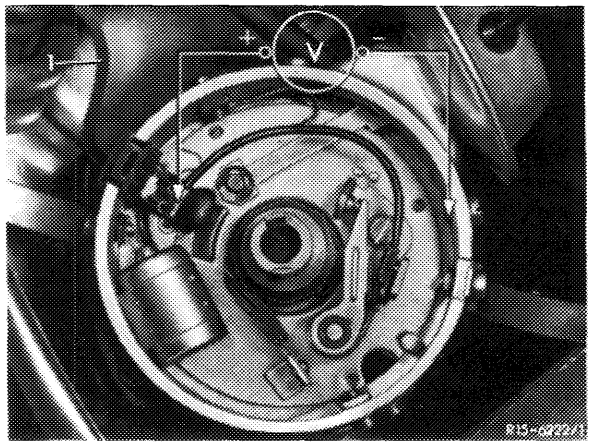
1. Check on ignition distributor whether

   a) a layer shows up on breaker point,

   b) the cams are showing score marks (check with finger nail).

2. If a visual checkup shows no distinct fault, check function of points by measuring voltage drop. Use voltmeter with measuring range of 0–3 volts.

The voltage drop may amount to 0.5 volt with contact closed. A larger voltage drop is already indicating the formation of a layer.



1 Control line with capacitor

Remedies

1. Lining on breaker points:

   a) Exchange breaker points.

   b) Remove control line with capacitor (1) and replace by **shielded control line without capacitor.**

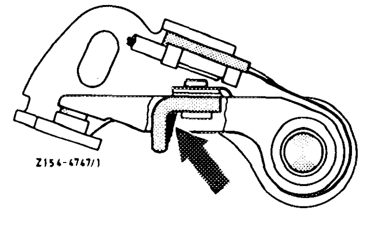
2. Score marks in distributor cam or rubbed-through lubricator felt:

   Exchange ignition distributor. Prior to installation, fit a shielded control line without capacitor to new ignition distributor.

Repair instructions

Breaker points

When renewing breaker points, be sure to coat slide piece (arrow) with a special grease pencil (special grease Bosch Ft 1 v 4). Without grease, the dwell angle will increase (smaller contact gap) due to the heavier wear of the slide piece. This in turn will favor the formation of a layer and may result in misfiring.



Arrow: point to be greased

Closing angle (dwell angle)

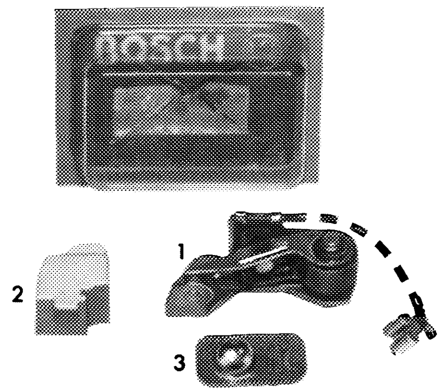
Set dwell angle to lower tolerance limit (07.5–500). This will guarantee that the dwell angle will not change beyond the specified value after running-in period of slide piece.

Adjusting values (lower tolerance) 34°

Protective breaker cap

Always mount protective breaker cap. Cap protects breaker point against grease, oil or dirt.

To make sure that during installation of breaker points the slide piece is greased and the protective cap is mounted, the breaker points are supplied with grease capsule and protective cap from now on.



1 Breaker point
2 Protective cap
3 Grease capsule

115–10764

Closing angle (dwell angle)

Normal coil ignition (S)

Closing angle (dwell angle) Testing and **adjusting value** at idle[1])	Change between idle and 3000/min
39–42°	max. ± 3°

1) When installing new breaker points, adjust closing angle (dwell angle) to 42 ± 1°.

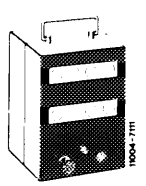
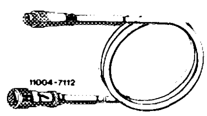
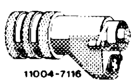
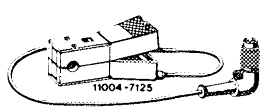
Transistorized ignition system (J) (USA)

Identification: blue ignition coil, two pre-resistors and transistorized switchgear.

Closing angle (dwell angle) Testing and **adjusting value** at idle[2])	Change between idle and 3000/min
34–40°	max. ± 3°

2) When installing new and when adjusting used breaker points, adjust dwell angle to 34 ± 1°.

Special tools

Digital tester		001 589 54 21 00
Connecting cable		000 589 04 90 00
Intermediate plug (adaptor)		000 589 72 63 00
Trigger		000 589 71 63 00

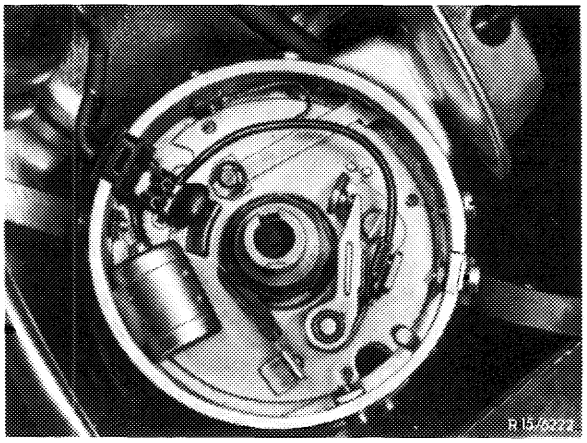
Conventional tools

Closing angle (dwell angle) measuring instrument

Installation

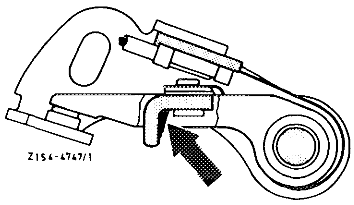
When renewing contacts, proceed as follows:

1 Wipe contacts prior to installation with a lintfree cloth to remove moisture or grease.



2 Coat slide piece of contact breaker, its bearing point and the cams of the distributor shaft with some Bosch special grease Ft 1 v 4.

3 When closed, contact breakers must be in parallel and at similar level in relation to each other.

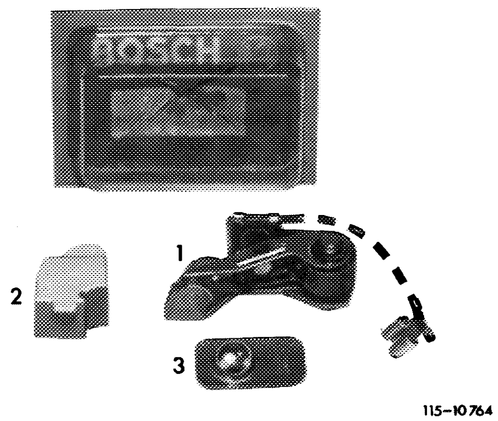


Arrow: spot to be greased

4 Set closing angle (dwell angle) to specified value.

Mount protective breaker cap. Cap protects contact against grease, oil or dirt particles.

To make sure that during installation of breaker points the slide piece is greased and the protective cap is mounted, the breaker points are supplied with grease capsule and protective cap from now on.



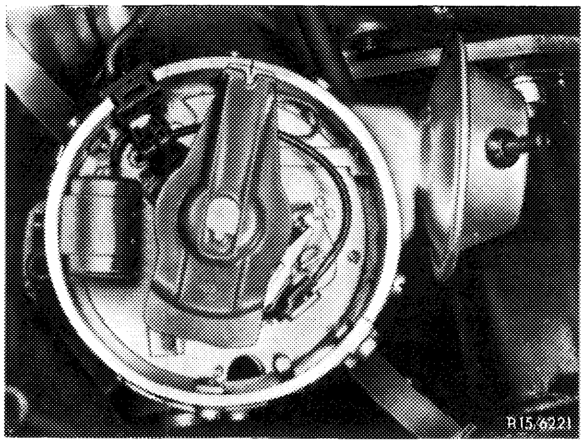
1 Breaker point
2 Protective cap
3 Grease capsule

5 Check firing point and adjust (07.5–500).

Removal

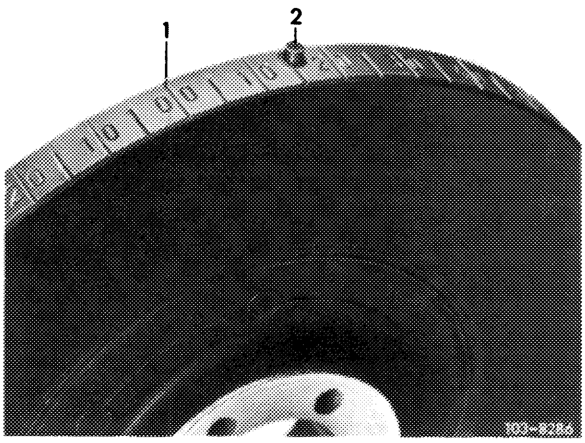
1 Remove protective cap, distributor cover, cable plug connections and vacuum line.

2 Set engine to ignition TDC of 1st cylinder. For this purpose, the markings on the distributor rotor and on distributor housing should be in alignment.



In addition, the pointer on crankcase should be above TDC mark of vibration damper.

Attention!
On engines where the vibration damper carries a "0I0" mark also for BDC in addition to mark for TDC, the TDC mark is adjacent to pin in vibration damper.

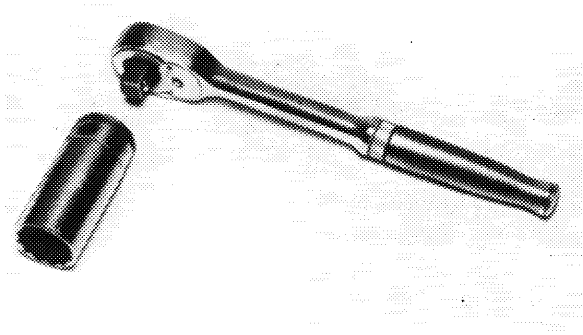


1 TDC mark

Rotate engine with combination tool.

Attention!
Do **not** rotate engine at fastening bolts of camshaft gears. Do not **rotate** engine **in reverse.**

3 Loosen hex. socket screw of distributor attachment and remove ignition distributor.



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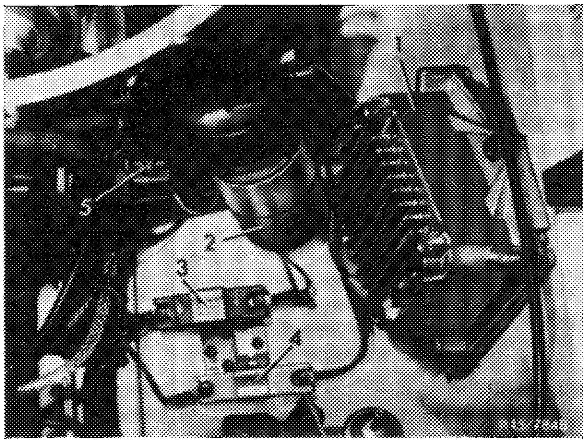
Installation

4 For installation proceed vice versa. Pay special attention to markings (refer to item 2).

5 Check closing angle (dwell angle) and firing point and adjust (07.5–500).



Layout of transistorized ignition

The system comprises:

Switchgear
Ignition coil
Pre-resistor 0.4 ohm (3)
Pre-resistor 0.6 ohm (4)

Operation

The ignition coil current is controlled by a transistorized circuit instead of the breaker point. The transistorized circuit is controlled by the breaker point.

With the breaker point closed, the switching transistor is conductive. When the breaker point opens, the transistor locks and the ignition coil current is interrupted. As a result of the interrupted circuit in the primary winding, the ignition voltage is induced in the secondary winding as before for conventional coil ignition.

To increase the ignition voltage, the 0.4 ohm pre-resistor is bridged by contact 16 on starter while starting.

Switchgear (1)

The switchgear has several transistors, resistors and other electronic components in a metal housing. This housing protects the components against mechanical damage and splash water and also serves to dissipate the heat due to energy losses. Contact on switchgear is made by a 4-way round plug connection with separate coaxial connection for activation.

In the event of repairs, only the complete switchgear can be exchanged.

Ignition coil (2)

Layout and external dimensions of ignition coil correspond to those of a normal heavy-duty ignition coil. But the design of the winding is different. The ratio amounts to approx. 1:185 as compared with 1:100 for conventional ignition coils.

External identification: painted blue.

Pre-resistors

Resistors 0.4 ohm and 0.6 ohm are designed similar to the ignition coil pre-resistors installed up to now: A ceramic body encloses the resistor winding, with extending connections.

A sheet metal clamp is placed around ceramic body for attachment. The color of this clamp informs about the resistance value, which is additionally punched in as a number.

Color	Code number	Resistor
blue, anodised	0.4	0.4 ohm
metallic, anodised	0.6	0.6 ohm

General information

On vehicles with transistorized systems, do not operate engine without battery connected.

When using rapid charging units for charging vehicle battery, separate battery from other vehicle circuits.

Starting assistance with rapid chargers is not permitted.

When installing battery, pay attention to correct polarity.

Do not confuse line connections on switchgear (e.g. when testing switchgear in installed condition).

Switchgear may suffer damage if these instructions are not observed.

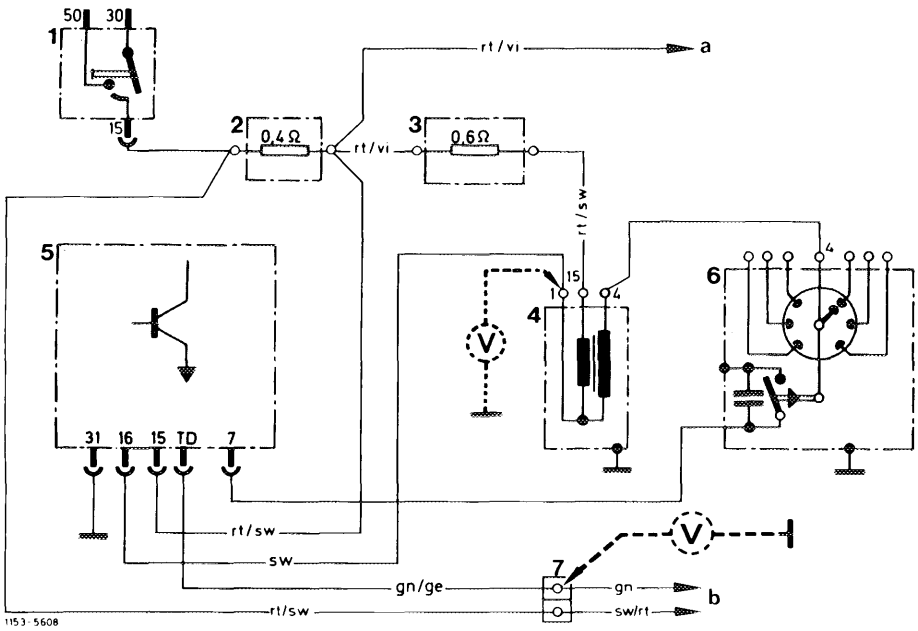
Instructions concerning test jobs

On engines with transistorized coil ignition, speed and dwell angle cannot always be measured in the usual manner.

Depending on type of tester used, connection at different points of ignition system is required. Always refer to operating instructions for tester. To facilitate connection of speed and dwell angle testers, an empty, offset cable shoe is screwed underneath cable connector 7.

Transistorized switchgear – standard switchgear – with SI transistor

Bosch order no.	installed in model	
0 227 051 014	114.060/073	(USA) up to including model year 1974
0 227 051 024	114.060/073 116.020	(J) model year 1976 (USA) model year 1975/76

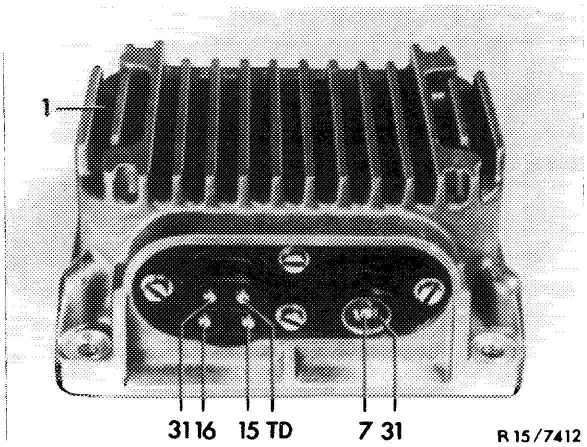


Wiring diagram

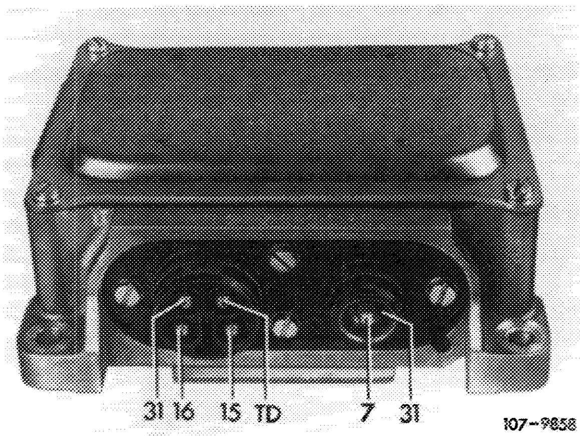
1 Ignition starting switch
2 Pre-resistor 0.4 ohm
3 Pre-resistor 0.6 ohm
4 Ignition coil
5 Switchgear
6 Ignition distributor
7 Cable connector with test terminal TD
a To starter terminal 16

ge = yellow
gn = green
rt = red
sw = black
vi = purple

Switchgear 0 227 051 014



Switchgear 0 227 051 024



Conventional tools

1 voltmeter, measuring range 0–3 V, 0–15 V with 0.1 V scale graduation
1 ohmmeter, measuring range starting 0.1 ohm

1. Testing pre-resistors

Loosen line connection on one connection of resistor about to be tested.

Measure resistance with ohmmeter.

Pre-resistor	Resistor rated value at 20 °C
0.4 ohm	0.4 ± 0.05 ohm
0.6 ohm	0.6 ± 0.05 ohm

Values on warmer pre-resistors will be slightly higher.

2. Testing ignition coil

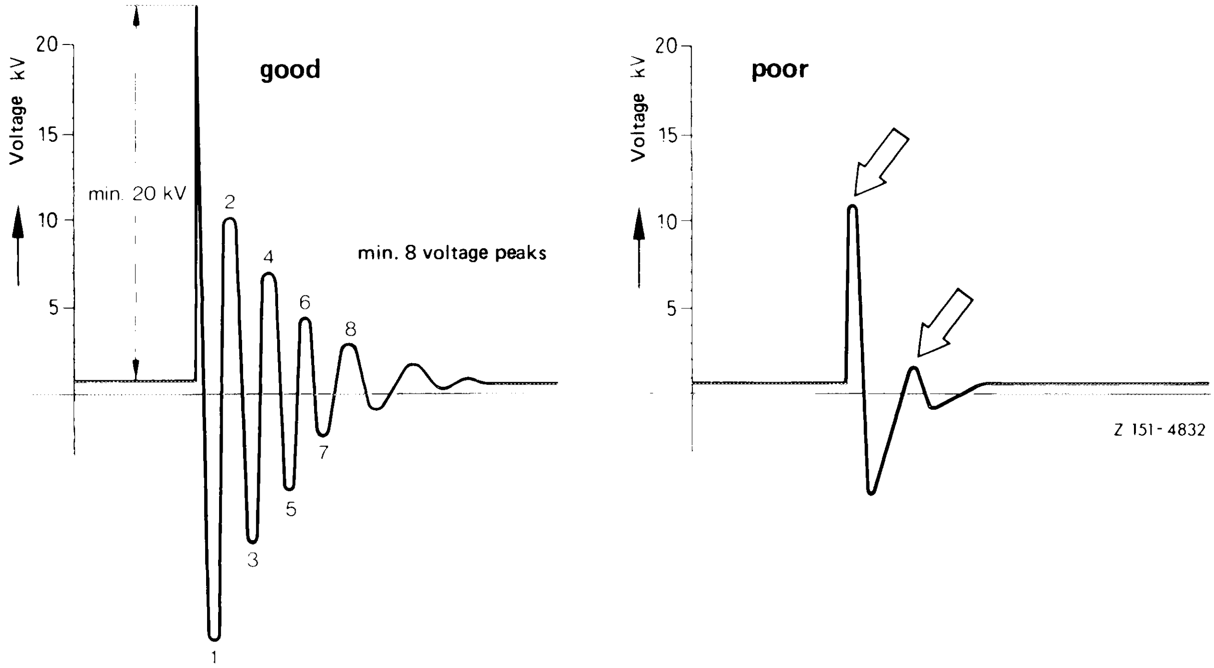
Insulation test

Separate ignition coil from vehicle circuits by removing terminals 1, 15 and 4.

Connect engine tester to ignition coil. Perform test according to operating instructions.

Whenever possible, test ignition coil with a suitable engine tester (e.g. SUN 745 or 1130) under operating conditions. This will show above all insulation damage, ground and winding shorts.

Evaluate voltage flow on scope according to the following illustration.



Selection Line-up
Fault Voltage below 20 kv, less than 8 voltage peaks
Cause Interrupted winding, winding short or insulation damage against ground
Remedy Renew ignition coil

Evaluation

The ignition coil is perfect, if the first oscillation attains 20 kv, followed by min. 8 voltage peaks. If this value is not attained, replace ignition coil.

Resistance test

Resistance rated value at 20 °C	
Primary winding measured between terminal 1 and terminal 2	0.38–0.45 ohm
Secondary winding measured between terminal 1 and terminal 4	8–11 kohm

Measuring values are slightly higher when ignition coil is warm.

3. Testing breaker point

For perfect functioning of transistorized systems the transfer resistance on breaker point should not be too high. To check, measure voltage drop at closed breaker point.

Connect voltmeter: + to cable connector (= terminal 7 or TD on switchgear)
– to ground

Voltage readout max. 0.3 volt.

If this value is exceeded, install a new breaker point.

4. Testing switchgears and line connections

Test for voltage on switchgear and whether the switching transistor permits passage of ignition coil primary current or locks at pertinent activation. The primary current will not be measured directly, but the voltage drop caused by this current for the sake of simplicity.

The test is made with the engine stopped and the ignition switched on.

Test voltage drop at input of 0.4 ohm resistor with breaker point closed.

Connect voltmeter: + to input pre-resistor 0.4 ohm
– to ground

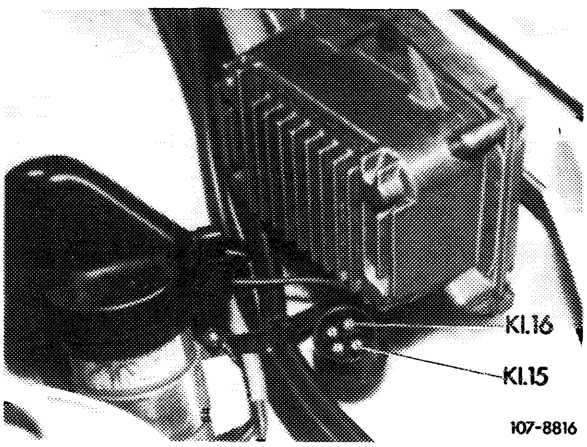
The voltage drop may amount to max. 0.4 volt.

If voltage drop is too high, test cable and cable connections.

4.1 Standard switchgears (SI)

Checking line connections

Pull 4-pole connecting plug from switchgear and test with voltmeter whether a battery voltage of 11.8–13 volts is available at terminal 15 and terminal 16 on 4-point plug with the ignition switched on.



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Connect voltmeter: + to terminal 15 or
terminal 16
– to ground

If no voltage is measured, check all connections from input 0.4 ohm resistor to switchgear.

Then reattach 4-point round plug to switchgear.

Voltage with breaker point open

This will test tripping characteristics of transistor.

Connect voltmeter: + to terminal 1 ignition coil
– to ground

Battery voltage should be available at terminal 1, i.e. **readout = 11.8–13 volts.**

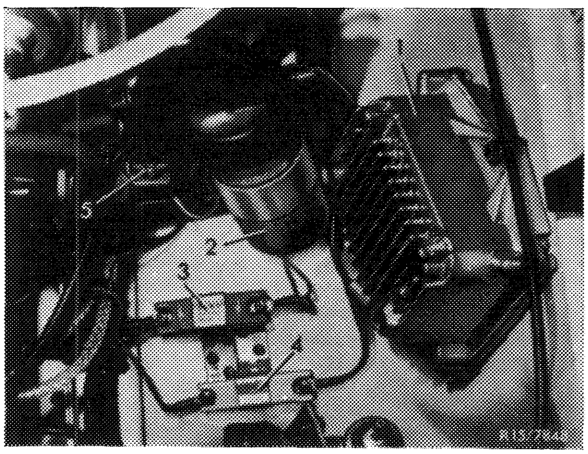
If not, replace switchgear.

Voltage with breaker contact closed

Voltmeter connected as before.
Voltage at terminal 1 ignition coil = 0.7–1.5 volts.

With breaker point closed, terminal 15 of ignition coil will show 3.6–4.6 volts, with open breaker point battery voltage.

If not, replace switchgear.



Layout of transistorized system with switchgear in model 114.060/073

1 Standard switchgear
2 Ignition coil
3 Pre-resistor 0.4 ohm
4 Pre-resistor 0.6 ohm
5 Cable shoe for test connection (cable color green/yellow)

Test values for switchgear test

Measuring points of associated voltage values for transistorized systems

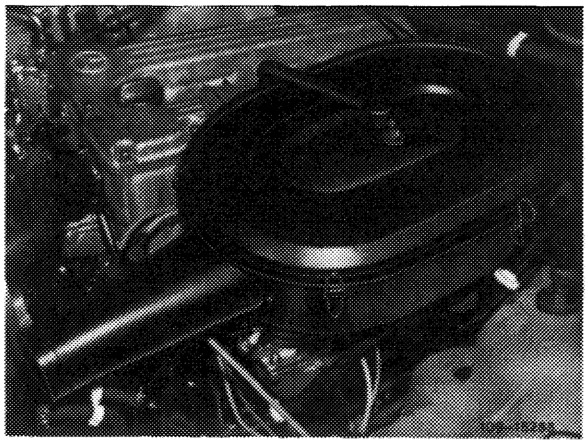
Voltmeter Plus to	 Minus to	Breaker point	Rated voltage values SI standard transistorized system	Voltage values beyond rated range: causes, remedies
Pre-resistor 0.4 ohm input	ground	closed	max. 0.4 V under battery voltage	With correct battery voltage: voltage drop battery – 0.4 ohm pre-resistor too high caused by transfer resistances (corrosion), line interruption etc.
Pulled off switchgear plugs terminal 15 terminal 16	ground	without significance	battery voltage	With correct voltage on 0.4 ohm pre-resistor: Parallel resistance or circuit interruption between 0.4 ohm pre-resistor input and terminal 15 or terminal 16
Cable connector terminal 7 or TD	ground	closed	0–0.3 V	Voltage value higher: transfer resistance on breaker point too high. Replace breaker point
Ignition coil terminal 15	ground	closed	3.6–4.6 V	With correct voltage value on switchgear and on terminal 7 or TD:
		open	battery voltage	Switchgear defective Replace switchgear
Ignition coil terminal 1	ground	closed	0.7–1.5 V	
		open	battery voltage	

Note

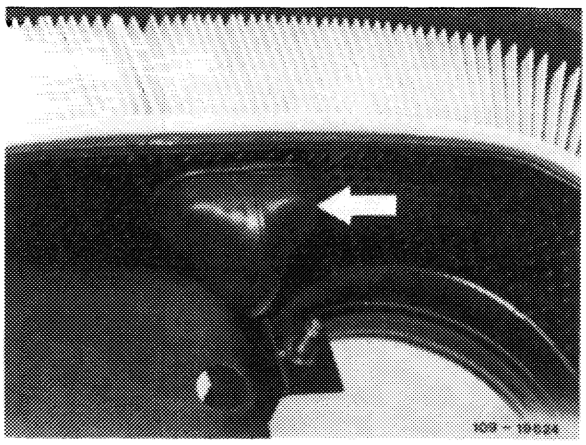
The air cleaner top is provided with a recess (arrow) for adjusting idle speed mixture.

As a result, the air cleaner need no longer be removed for adjusting idle speed mixture.

On air cleaner 2nd version the air intake proceeds directly at air cleaner, the connecting hose is no longer required.



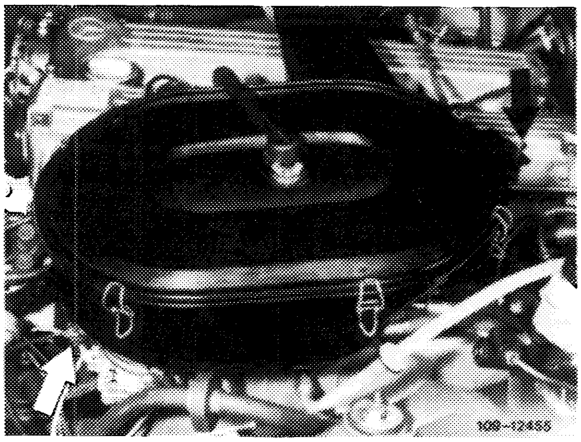
The connection for the decel shutoff valve is at air cleaner lower half.
Air intake is by way of a rubber scoop (arrow) at clean air side.



Removal

1 Unscrew both fastening nuts on vibration dampers.

2 Remove air cleaner, while pulling off contour hose for crankcase breather.

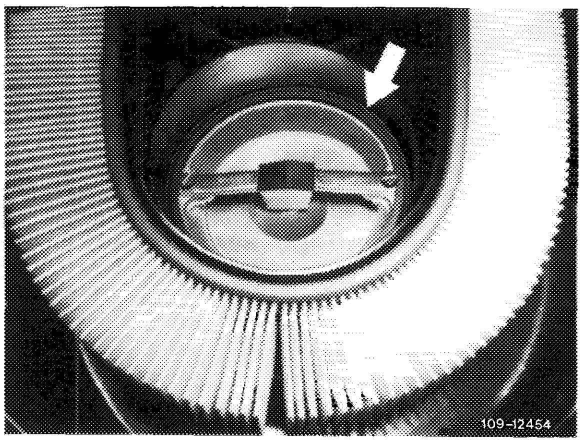


Installation

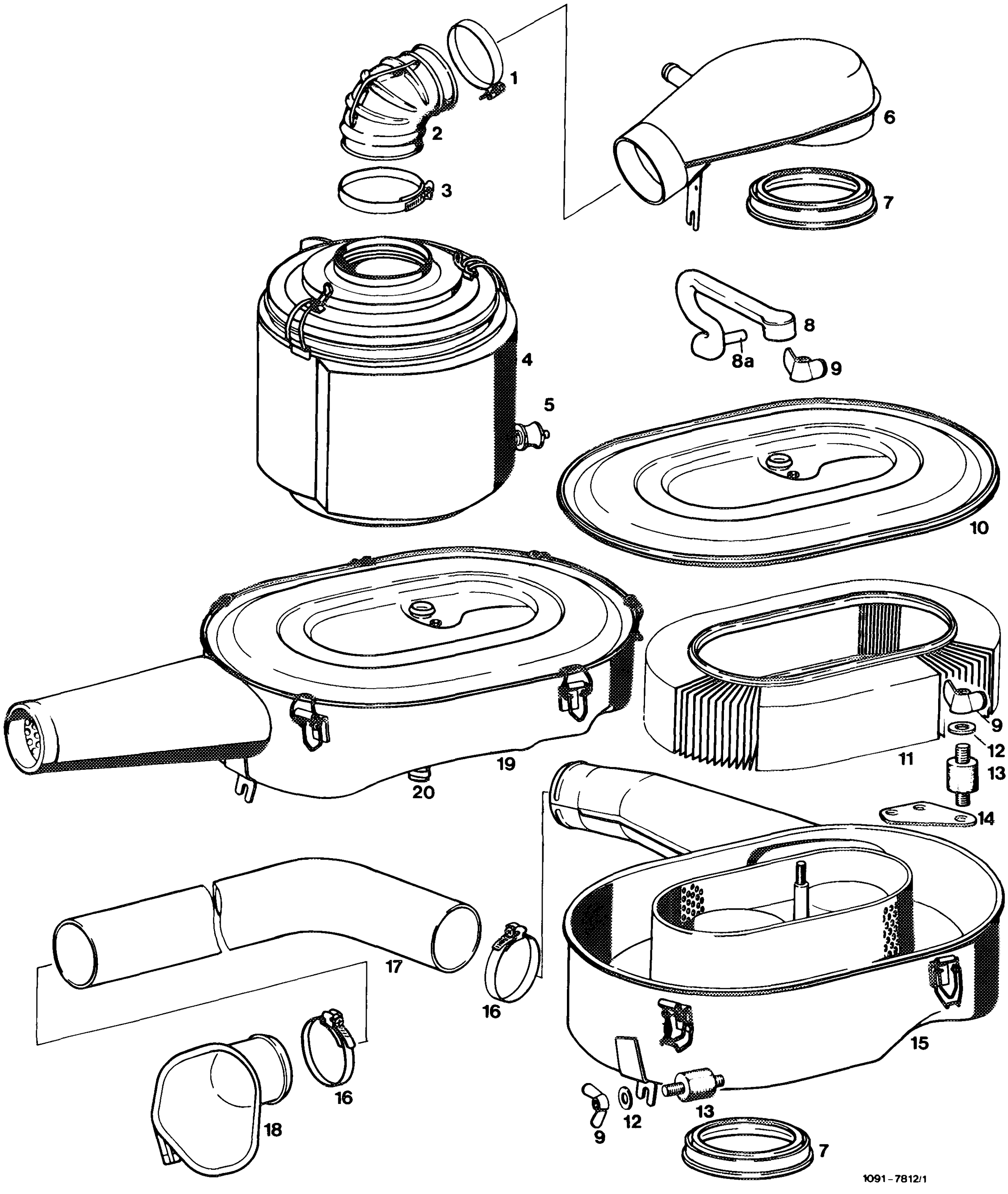
3 Remove air cleaner cover.

4 Mount air cleaner. Pay attention to correct seat of sealing ring (arrow) between air flow sensor and air cleaner.

5 Mount air cleaner cover.



Air cleaner



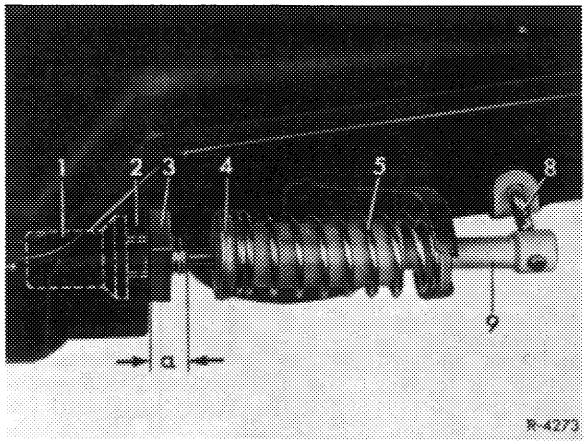
Model 107

1 Hose clamp
2 Rubber scoop
3 Hose clamp
4 Air cleaner
5 Vibration damper
6 Intake pipe

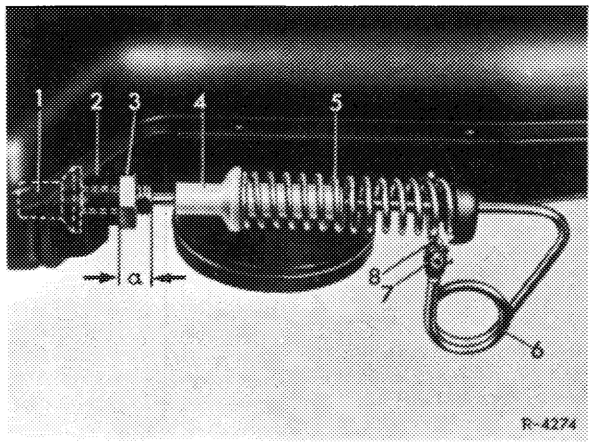
Models 116, 123, 126

7 Rubber sealing ring
8 Vent line
9 Wing nut
10 Air cleaner cover
11 Air cleaner element
12 Washer
13 Vibration damper
14 Holder
15 Air cleaner lower half 1st version
16 Hose clamp
17 Intake hose
18 Intake scoop
19 Air cleaner 2nd version
20 Connection for decel shutoff

Preheating of the intake air is automatically controlled by a termostat (1) installed in intake pipe of air filter and by an air valve (8).



Knecht version

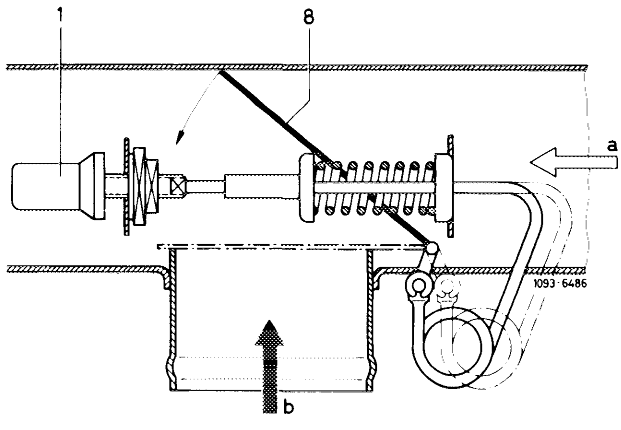


Mann und Hummel version

At thermostat temperature:

Below + 15 °C the fresh air input is closed by air valve (8) via duct "a". The warm air input via duct "b" is opened by the air valve, so that air preheated by the exhaust manifold will be drawn in.

Above + 35 °C the warm air supply is closed by air valve (8) via duct "b", so that only fresh air will be drawn in via duct "a".

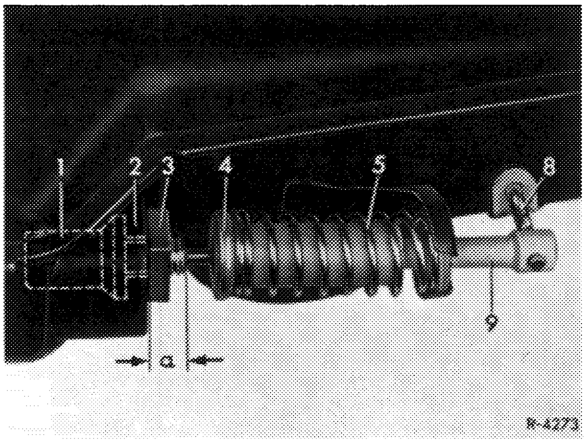


Testing and adjusting value

Thermostat, dimension "a"	7–8 mm

A. Knecht version

Removal



1 Compress compression spring (5) and push actuating bolt (9) from air valve shaft (8) and out of fastening eye.

2 Pull actuating bolt (9) together with guide sleeve (4) out of actuating pin of thermostat.

3 Unscrew square nut (3) and remove air filter cover.

4 Remove thermostat from inside out of intake pipe.

Attention!
Do not turn or push out plastic fastening nut (2).

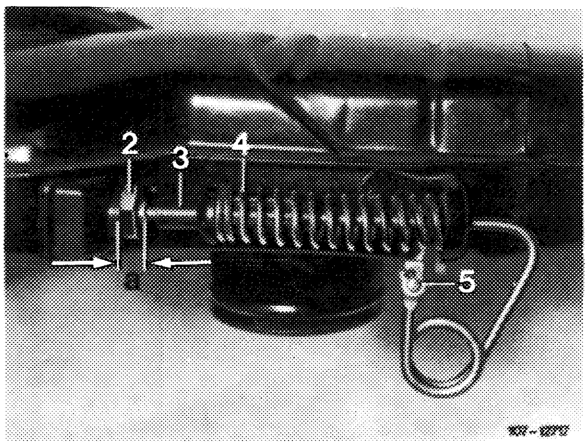
Installation

5 Screw thermostat (1) from inside into plastic fastening nut (2) until dimension "a" = **7–8 mm** is attained. Lock thermostat by means of square counternut (3).

6 Install actuating bolt (9) with guide sleeve (4) and compression spring (5).

B. Mann und Hummel version

Removal



1 Push guide sleeve (3) against spring (4) and disconnect from pressure pin.

2 Remove air filter cover. Unscrew hex nut (2), unscrew thermostat from inside out of air filter housing.

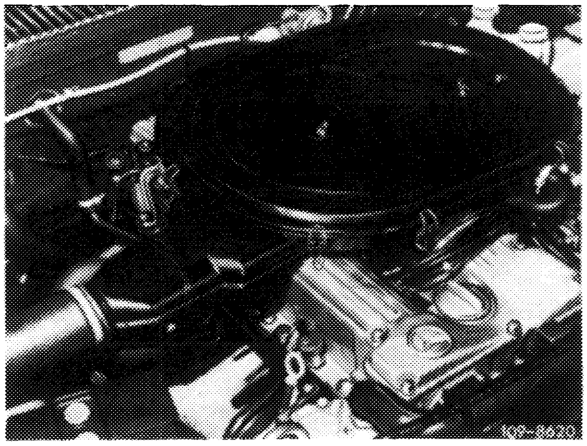
Installation

3 Install thermostat in vice versa sequence and set dimension "a".

Removal

1 Pull off fresh air, warm air and crankcase breather hose.

2 Loosen fastening nut as well as wing nut and remove air filter.



Installation

3 Install air filter in vice versa sequence. Pay attention to correct seat of sealing ring between carburetor and air filter and replace sealing ring, if required.

Removal

1 Partially drain coolant.

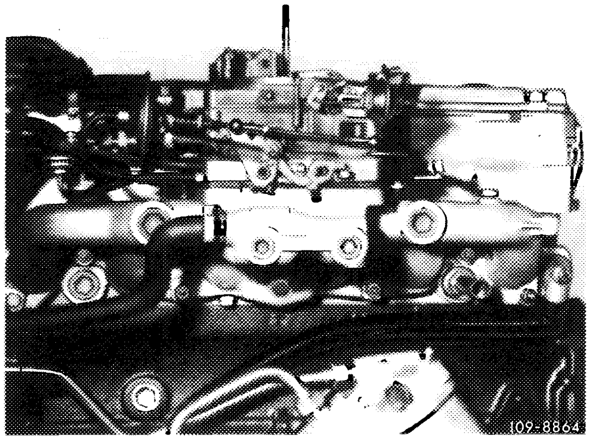
2 Remove air filter.

3 Remove carburetor (07.2–194).

4 Disconnect engine longitudinal regulating shaft and regulating rods.

5 Loosen all connections on intake pipe.

6 Loosen intake pipe fastening nuts or screws and remove intake pipe.



Installation

Install intake pipe in vice versa sequence as follows:

7 Install new intake pipe flange gasket.

8 Add coolant and check cooling system for leaks.

9 Adjust idle speed, while checking intake system for leaks (07.2–100).

Adjusting values

V-belts (width of profile in mm)	New V-belts (KG-scale on measuring instrument)	Used V-belts (KG-scale on measuring instrument)
9.5	30	20–25
12.5	50	40–45

Conventional tool

Measuring instrument (Krikit)	e.g. made by Gates GmbH, Gravener Straße 191–193, D-4018 Langenfeld 2
	e.g. Gates Rubber Company 999 S. Broadway USA-80217 Denver/Colorado

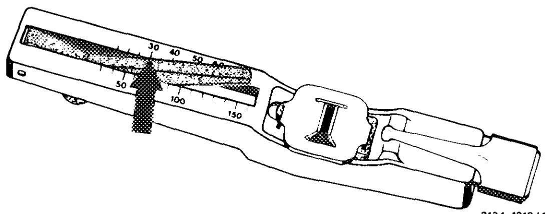
Checking condition of V-belts

Renew cracked, porous, burnt or worn V-belts.

Checking tension

For handling of instrument refer to operating instructions and tensioning V-belts (13–340).

The specified adjusting values refer to KG-scale of measuring instrument (arrow).



2134-1218/1

Used V-belts

Check tension of V-belts and compare with values for used V-belts (e.g. V-belt, width of profile 9.5 mm = adjusting value 20–25) shown on table and retension accordingly, if required.

Mounting and tensioning of new V-belts

Perfect assembly of a V-belt requires loosening of respective secondary unit or tensioning device of V-belt to the extent that the V-belt can be easily mounted. In addition, the running surfaces on V-belt pulleys should be free of burr, rust and dirt.

Keep away from oil, grease, chemicals. Do not use belt wax or similar compounds. Then make sure of optimal adjustment of belt tension (for adjusting values refer to table) to avoid complaints such as squealing V-belts and short life.

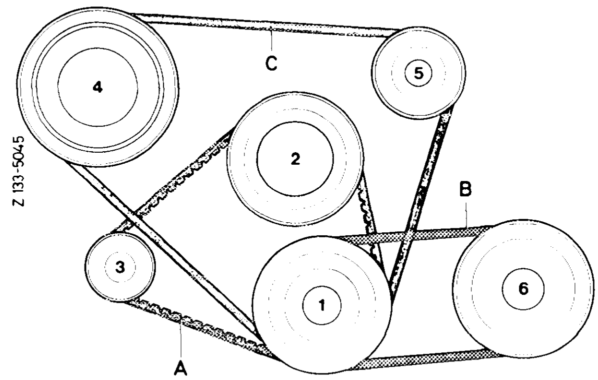
During maintenance jobs, mount V-belt **prior** to engine checkup and tension to value for **new V-belts** named in table (e.g. V-belt, width of profile 9.5 mm = adjusting value 30).

If possible, run engine approx. 10–15 minutes with all consumers connected. Then check tension. The value measured in this manner should be in agreement with value for **used V-belts** shown on table (e.g. V-belt, width of profile 9.5 mm = adjusting value 20–25). If it is less, retension V-belt to this value.

If the engine cannot be run in shop, check V-belt tension during final inspection or following a test drive.

V-belt	Models 107, 114, 116	107[1]), 116[1])	123, 126	Adjusting value KG-scale on measuring instrument
A Alternator	9.5 x 960		9.5 x 930	20–25
B Power steering pump	12.5 x 784 12.5 x 818[2])	12.5 x 825 12.5 x 818[2])		40–45
C Refrigerant compressor	12.5 x 1375[3])	12.5 x 1285		

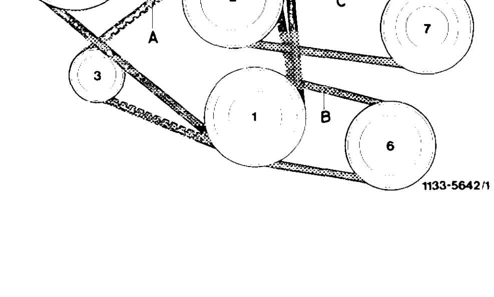
[1]) Power steering pump with cast-on reservoir.
[2]) Standard starting 5.1978.
[3]) Version 1 (swivelling tensioning roller), of models 114.060/062/072/073.



1 Crankshaft
2 Water pump
3 Alternator
4 Refrigerant compressor
5 Tensioning roller
6 Power steering pump

V-belt	California Model year 1974	California Model year 1975 J S USA Model year 1976	AUS J S USA Model year 1977/78	Adjusting value KG-scale on measuring instrument
A Alternator	9.5 x 960 9.5 x 980[1])			20–25
B Power steering pump	12.5 x 725	12.5 x 715	12.5 x 825 12.5 x 818[2])	40–45
C Air pump	9.5 x 910 optional 9.5 x 913		9.5 x 825	20–25
D Refrigerant compressor	12.5 x 1285			40–45

[1]) On 65-A alternator J 1979, with KW-pulley 110 032 08 04 (formerly 123 032 01 04).
[2]) Standard starting 5.1978.

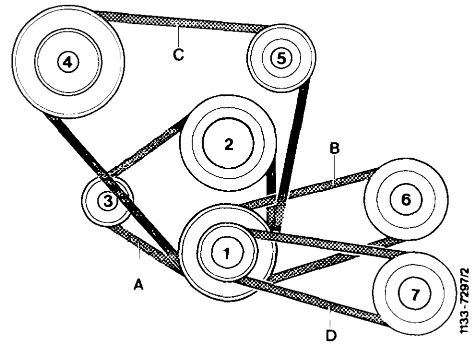


Model year 1974—1976

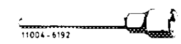
1 Crankshaft
2 Water pump
3 Alternator
4 Refrigerant compressor
5 Tensioning roller
6 Power steering pump
7 Air pump

Model year 1977/78

1 Crankshaft	5 Roller
2 Water pump	6 Power steering pump
3 Alternator	7 Air pump
4 Compressor	



Special tools

Wrench socket 8 mm, 1/2" square, 130 mm long		000 589 33 07 00

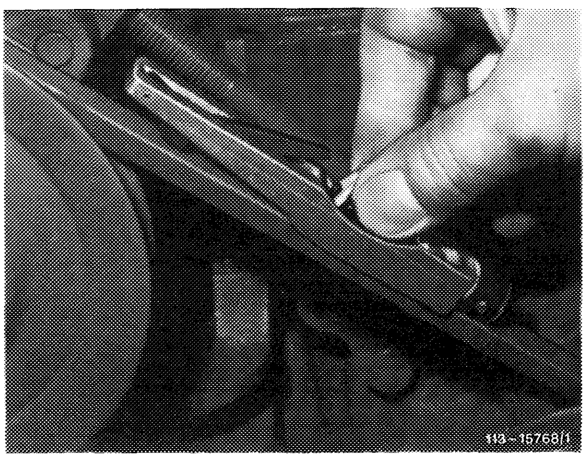
Note

Measuring instrument "Krikit" is recommended for checking V-belt tension.

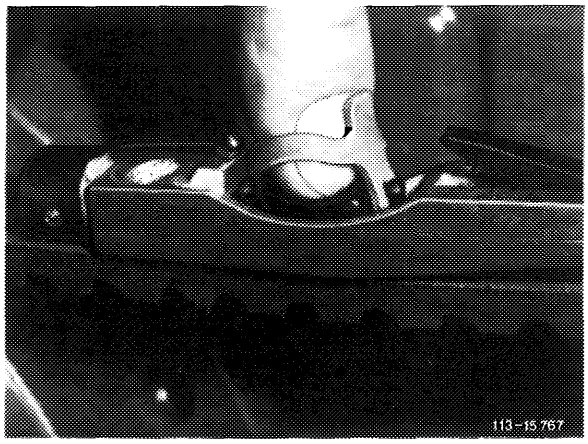
Handling of measuring instrument

For checking V-belt tension the measuring instrument can be held in different ways:

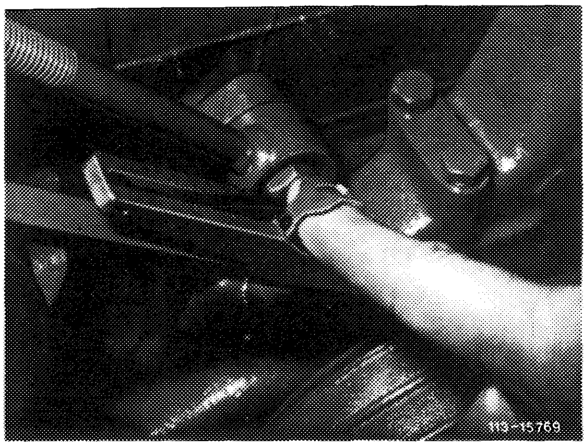
a) With thumb and forefinger on rubber loop, with finger tips resting on push button.



b) With forefinger from above in rubber loop.



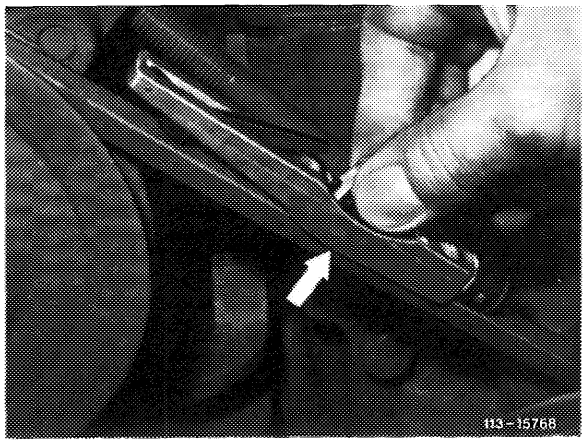
c) With forefinger laterally between rubber loop and push button.



Checkup

1 Lower indicating arm on measuring instrument.

2 Place measuring instrument on V-belt in center between pulleys. Lateral stop on measuring instrument should rest laterally against V-belt (arrow).



Attention!
On double belt drive make sure that measuring instrument rests only on one V-belt.

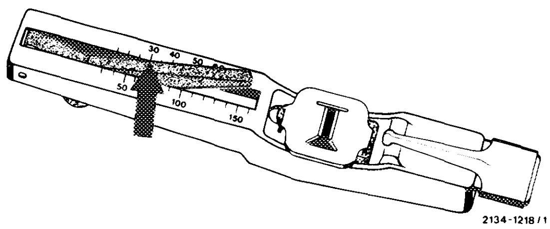
3 Exert uniform vertical pressure on top of V-belt by means of push button until click spring disengages audibly (or noticeably).

Note: Upon disengagement of click spring do not continue pushing measuring instrument, since this will result in a wrong indication.

4 Lift measuring instrument **carefully** from V-belt. Prevent impacts which may change position of indicating arm.

5 Read tension value on point of intersection of indicating arm on upper scale (arrow).

The specified adjusting values refer to KG-scale of measuring instrument.



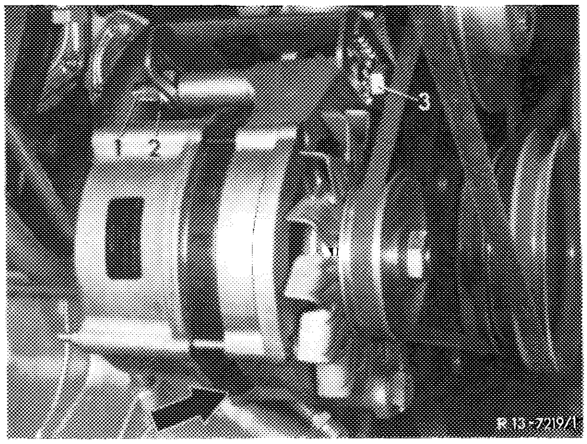
Tensioning

Belt A Alternator – coolant pump up to and including 1974

1 Loosen nut (2) and mounting bolt (arrow).

2 Adjust belt tightness at 6 mm square (1) or hexagon of tightening bolt (3).

3 Tighten nut (2) and mounting bolt (arrow).

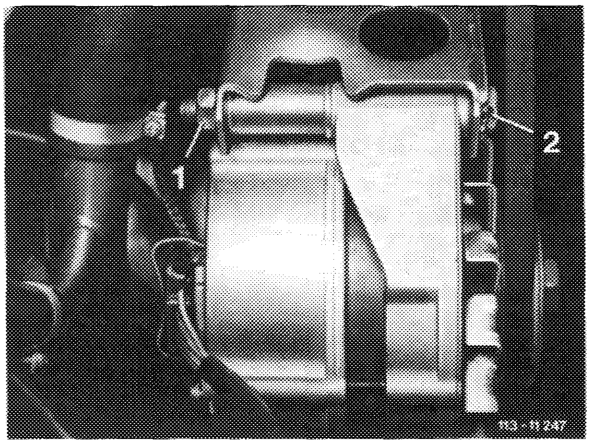


Belt A Alternator – coolant pump starting 1975

1 Loosen nut (1).

2 Adjust belt tightness with tightening bolt (2).

3 Tighten nut (1).

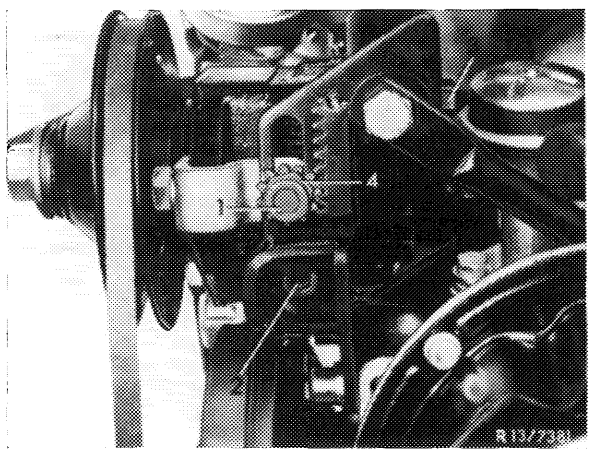


Belt B Power steering pump

1 Loosen mounting bolts (1, 2 and 3).

2 Adjust belt tightness with toothed disc (4).

3 Tighten mounting bolts (1, 2 and 3).

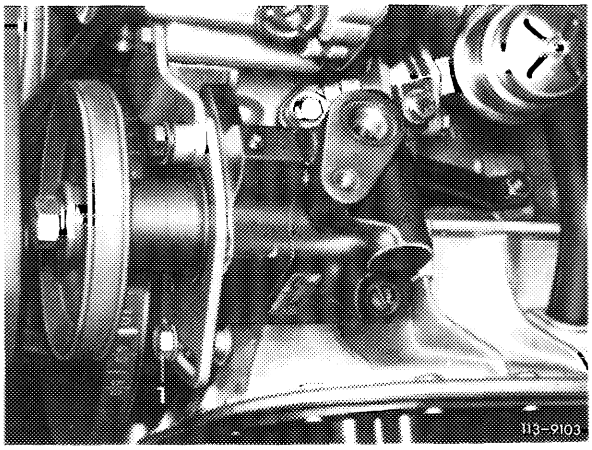


Belt B **Power steering pump USA version 1974 models**

1 Loosen mounting bolt (1).

2 Adjust belt tightness by swinging out power steering pump.

3 Tighten mounting bolt (1).

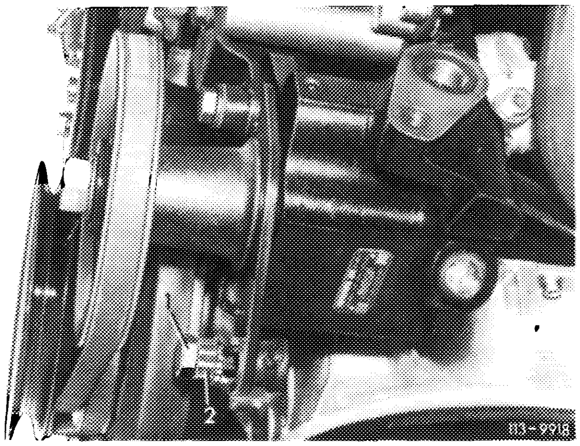


Belt B **Power steering pump USA version 1975/76 models Sweden, Japan version 1976 models**

1 Loosen mounting bolt (1).

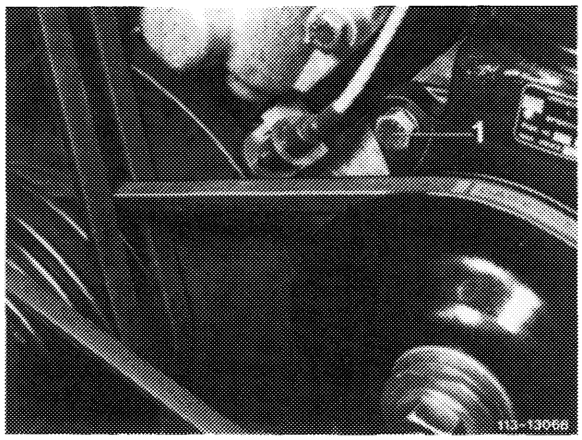
2 Adjust belt tightness with toothed disc (2).

3 Tighten mounting bolt (1).



Belt B **Power steering pump model 123 Standard version and starting model year 1977**

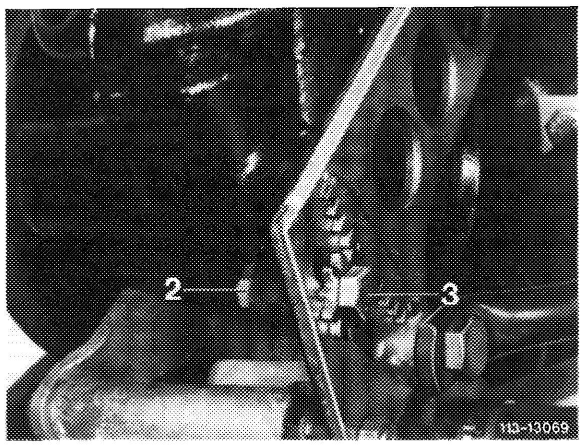
1 Loosen screw (1) on face of power steering.



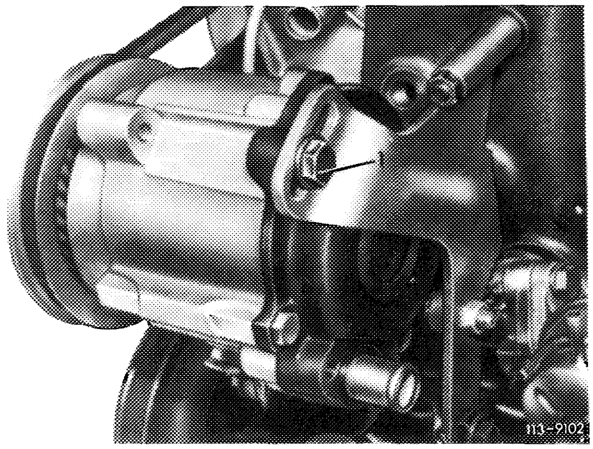
2 Loosen nut (2).

3 Tension belt with tensioning screw (3).

4 Tighten nut (2) and screw (1).



Belt C Air pump
USA version from 1974 – 1976 models
Sweden version from
1976 models
Japan version from
1976 models

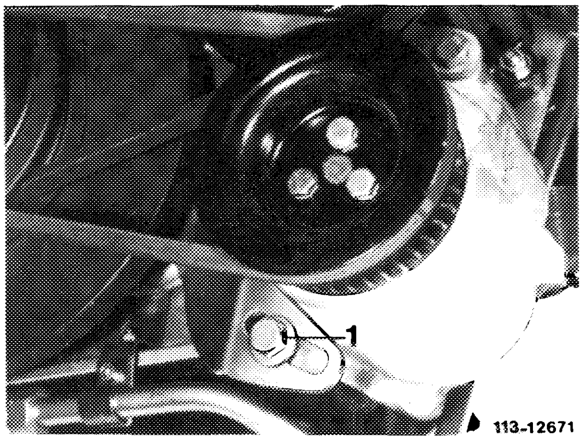


1 Loosen mounting bolt (1).

2 Adjust belt tightness by swinging out air pump.

3 Tighten mounting bolt (1).

Belt C Air pump starting model year 1977
Australia, Japan, Sweden,
USA version



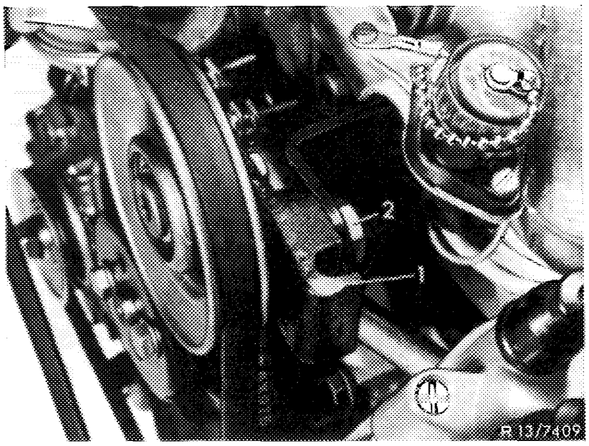
113-12671

1 Loosen mounting bolt (1).

2 Adjust belt tightness by swinging out air pump.

3 Tighten mounting bolt (1).

Belt D 1st version compressor



1 Guide an appropriate tool with an approx. 8 mm dia. into opening of holder (1).

2 Loosen mounting bolt (2).

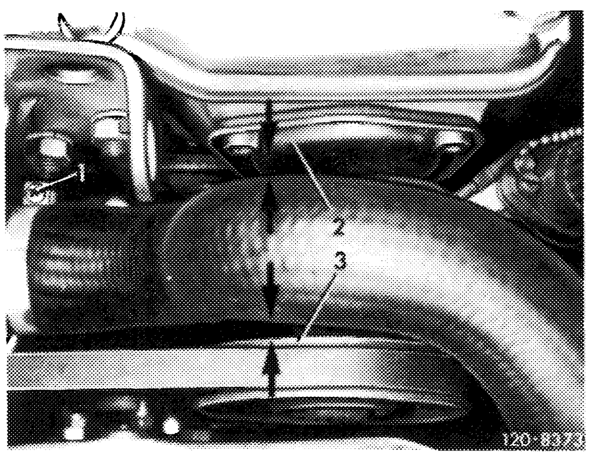
3 Adjust belt tightness by swinging holder (1) clockwise.

4 Tighten mounting bolt (2).

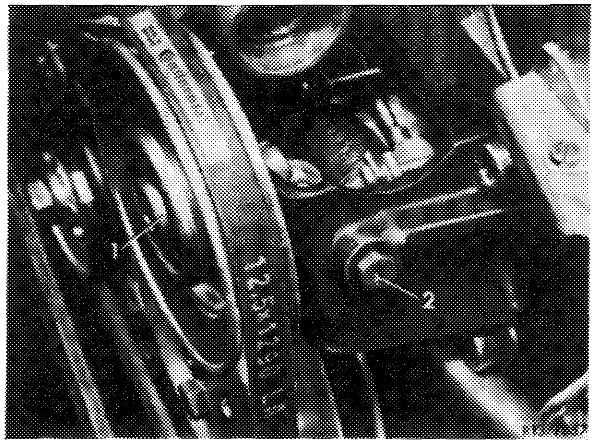
Attention!
Check the following distances of a re-tightened belt.
Distance from coolant hose to cover (2) is approx. 5 mm.

Distance from coolant hose to belt roller (3) is approx. 10 mm.

If these distances cannot be reached by loosening the hose clamp (1) and twisting the coolant hose, the tightening device must be converted to the 2nd version.



Belt D Refrigerant compressor version 2



1 Loosen expansion bolt (1).

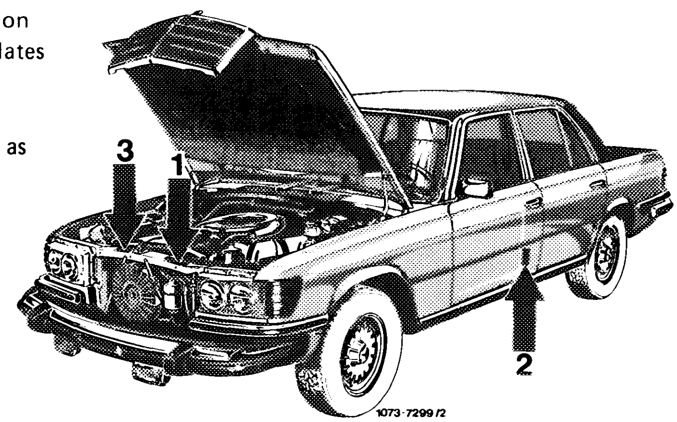
2 Adjust belt tightness with tightening bolt (2).

3 Torque expansion bolt (1) to 16 Nm.

Note: A number of vehicles has been delivered with the counternut on the tightening bolt (2). For this version the belt tightness is adjusted with the counter-nut. However, it would be more advantageous to exchange the M 6 x 90 adjusting bolt against a M 6 x 75 bolt, part number 000 933 006 176, and to install this bolt without a counternut.

The various emission control systems of USA version vehicles are identified by respective information plates (arrows 1, 2 and 3).

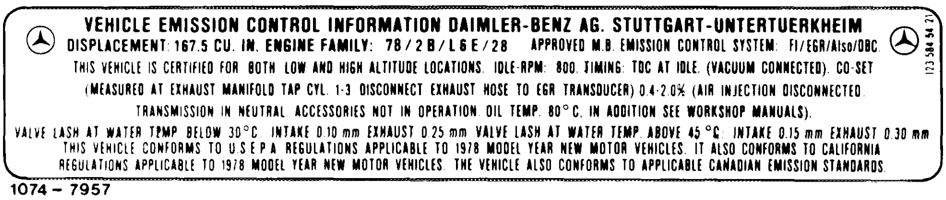
The respective plate shows the identification data, as well as all the important engine adjusting data.



Recognising emission control system from color of information plate – basic color/lettering

Model year	Federal version	California version	Federal version high altitudes	Federal version tourist vehicles	California version tourist vehicles
1973		black/silver	–	–	–
1974	black/silver	green/silver	–	–	–
1975		green/silver	–	yellow/silver	yellow/silver
1976					
1977			red/black		
1978	black/white	yellow/black	–	black/white	yellow/black
1979			–		
1980		black/white	–		black/white
1981					

1. Information plate on cross-member in front of radiator


VEHICLE EMISSION CONTROL INFORMATION DAIMLER-BENZ AG. STUTTGART-UNTERTUERKHEIM
DISPLACEMENT: 167.5 CU. IN. ENGINE FAMILY: 78 / 2 B / L 6 E / 28 APPROVED M.B. EMISSION CONTROL SYSTEM: FI/EGR/AIso/OBC.
THIS VEHICLE IS CERTIFIED FOR BOTH LOW AND HIGH ALTITUDE LOCATIONS. IDLE-RPM: 800. TIMING: TDC AT IDLE. (VACUUM CONNECTED). CO-SET
(MEASURED AT EXHAUST MANIFOLD TAP CYL. 1-3 DISCONNECT EXHAUST HOSE TO EGR TRANSDUCER) 0.4-2.0% (AIR INJECTION DISCONNECTED.
TRANSMISSION IN NEUTRAL. ACCESSORIES NOT IN OPERATION. OIL TEMP. 80° C. IN ADDITION SEE WORKSHOP MANUALS).
VALVE LASH AT WATER TEMP BELOW 30°C. INTAKE 0.10 mm EXHAUST 0.25 mm VALVE LASH AT WATER TEMP. ABOVE 45 °C: INTAKE 0.15 mm EXHAUST 0.30 mm
THIS VEHICLE CONFORMS TO U.S.E.P.A. REGULATIONS APPLICABLE TO 1978 MODEL YEAR NEW MOTOR VEHICLES. IT ALSO CONFORMS TO CALIFORNIA
REGULATIONS APPLICABLE TO 1978 MODEL YEAR NEW MOTOR VEHICLES. THE VEHICLE ALSO CONFORMS TO APPLICABLE CANADIAN EMISSION STANDARDS.
123 584 54 21

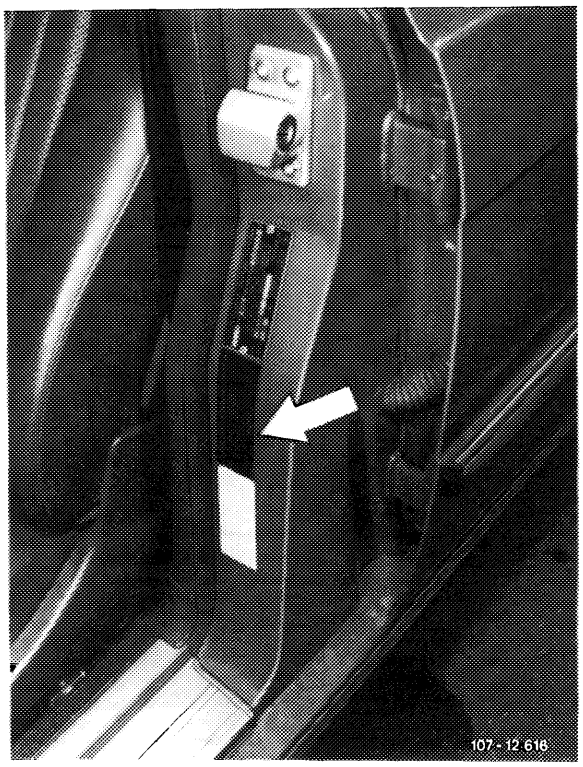
1074 – 7957

Recognising catalyst from color of information plate
Basic color/lettering

<table>
<tr><th>Model year</th><th>Federal version</th><th>California version</th><th>Federal version high altitudes</th><th>Federal version tourist vehicles</th><th>California version tourist vehicles</th></tr>
<tr><td>1977</td><td rowspan="5">black/silver</td><td>green/silver</td><td>black/silver</td><td rowspan="5">red/silver</td><td>blue/silver</td></tr>
<tr><td>1978</td><td rowspan="2">red/silver</td><td>–</td><td rowspan="4">red/silver</td></tr>
<tr><td>1979</td><td>–</td></tr>
<tr><td>1980</td><td rowspan="2">black/silver</td><td rowspan="2">–</td></tr>
<tr><td>1981</td></tr>
</table>

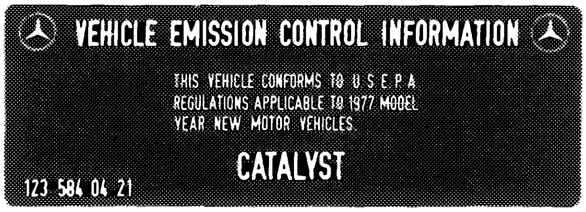
2. Information plate on door post of driver's door

This plate shows whether vehicle is provided with or without catalyst (s).



Information plates

This vehicle is provided with catalyst(s).



1074 – 8259

Tourist vehicle

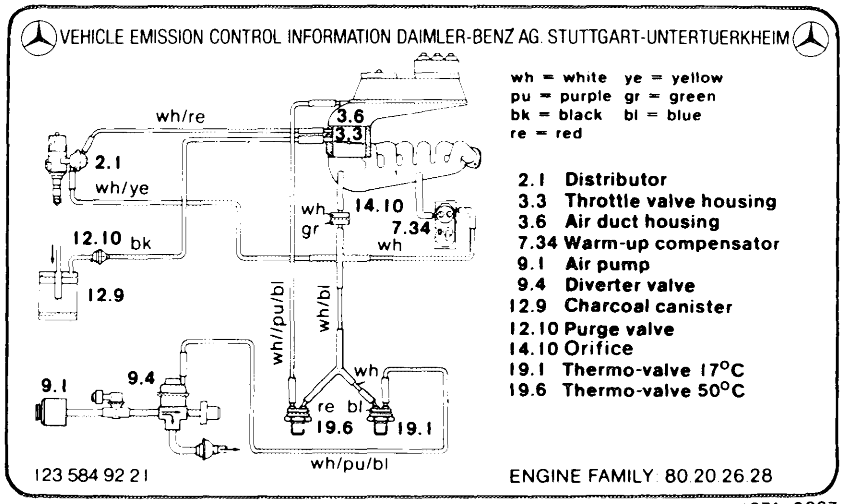
This vehicle is not provided with catalyst(s) by manufacturer.

Catalyst(s) must be installed following import into USA.

1074 – 8260

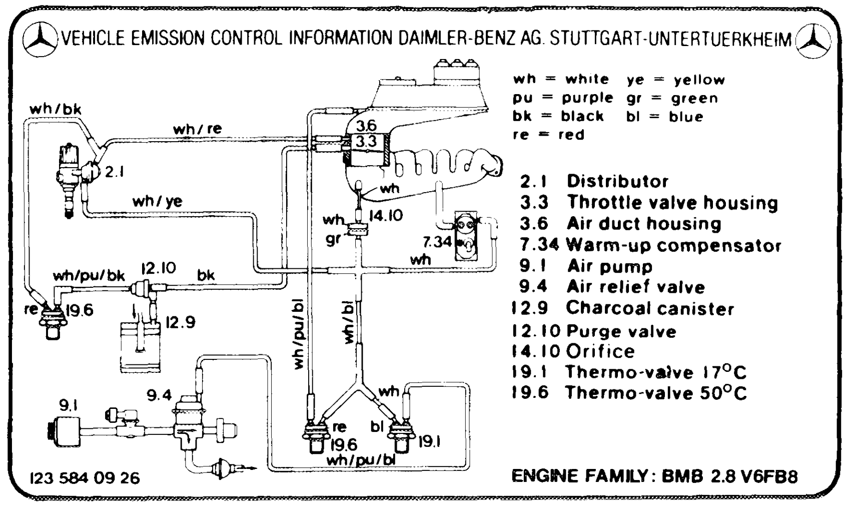
3. Information plate for vacuum line layout on cross member in front of radiator (for California only starting model year 1980).

This plate shows the vacuum line layout for all emission system components in engine compartment.



Model year 1980

1074–9067



Model year 1981

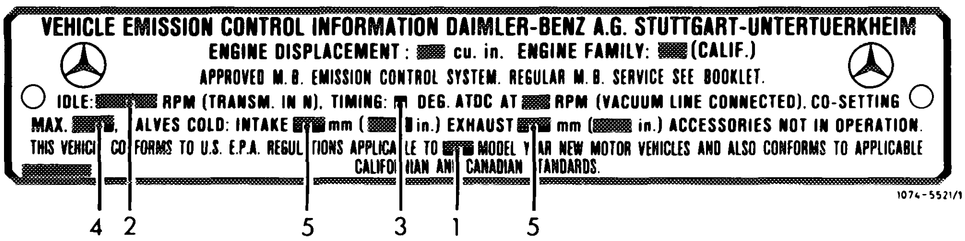
1143 – 9843

Federal and California version model year 1975/76

A. General

Information plate

Federal version basic color black
California version basic color green



1 Designation of model year
2 Idle speed
3 Firing point at a speed of . . .
4 Emission value at idle
5 Valve clearance

Identification of vacuum lines

Starting model year 1975 a new identification system for all vacuum lines in vehicle has been introduced.

The basic color of the vacuum lines for emission control system is transparent (white).

To facilitate recognition of the individual functions, additional color stripes will be used similar to the model years before.

Lines originating at a vacuum source (originating lines) **have one color stripe only.** These lines, to the extent they are part of a switch-over valve, are plugged to the center connection of the switch-over valve having the same color.

Lines terminating at a vacuum-operated device (terminating lines) have **two color stripes.** Purple is always the second color. These lines are plugged outside to switch-over valves having the same color.

Emission control unit	Color of vacuum originating line	Color of vacuum terminating line
EGR	brown	brown/purple
Air injection	blue	blue/purple
Fuel evaporation control		
Purge valve	black	black/purple
Float chamber vent	green	green/purple

Color coding of cable connections

Cable connections of switch-over valves are color-coded with tape according to their function (e.g. blue for air injection).

Vacuum switch-over valve

For easy identification, the filter caps are color-coded according to valve function.

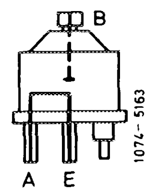
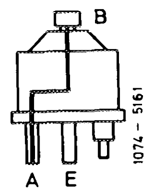
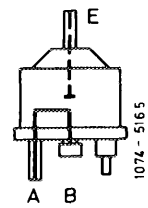
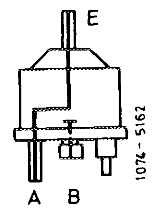
Blue cap — valve for air injection

Brown cap — valve for EGR

Green cap — valve for float chamber vent

White cap — valve for automatic choke

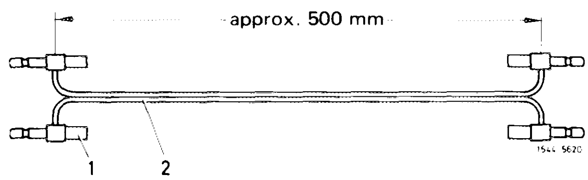
Do not confuse vacuum connections when mounting valves. Always slip vacuum-carrying line (originating line) on center connection. It is unimportant whether this connection is at top or bottom of valve.

Operation	Part No.	Color	De-energized	Energized
In a de-energized condition, connection B is closed. Vacuum connections A and E are connected to each other. When energized, port E is closed and only connection A is open to atmosphere. Never confuse connections E and A.	001 540 04 97 001 540 08 97 001 540 18 97	white brown blue		
In a de-energized condition, connection A is open to atmosphere. Connection E is closed. When energized, connections A and E are connected to each other and connection B (atmosphere) is closed. Never confuse connections E and A.	001 540 19 97	green		

A = connection to vacuum unit
B = connection to atmosphere
E = connected to vacuum source

Test cable

To test the individual components of emission control system use a self-made cable according to drawing.



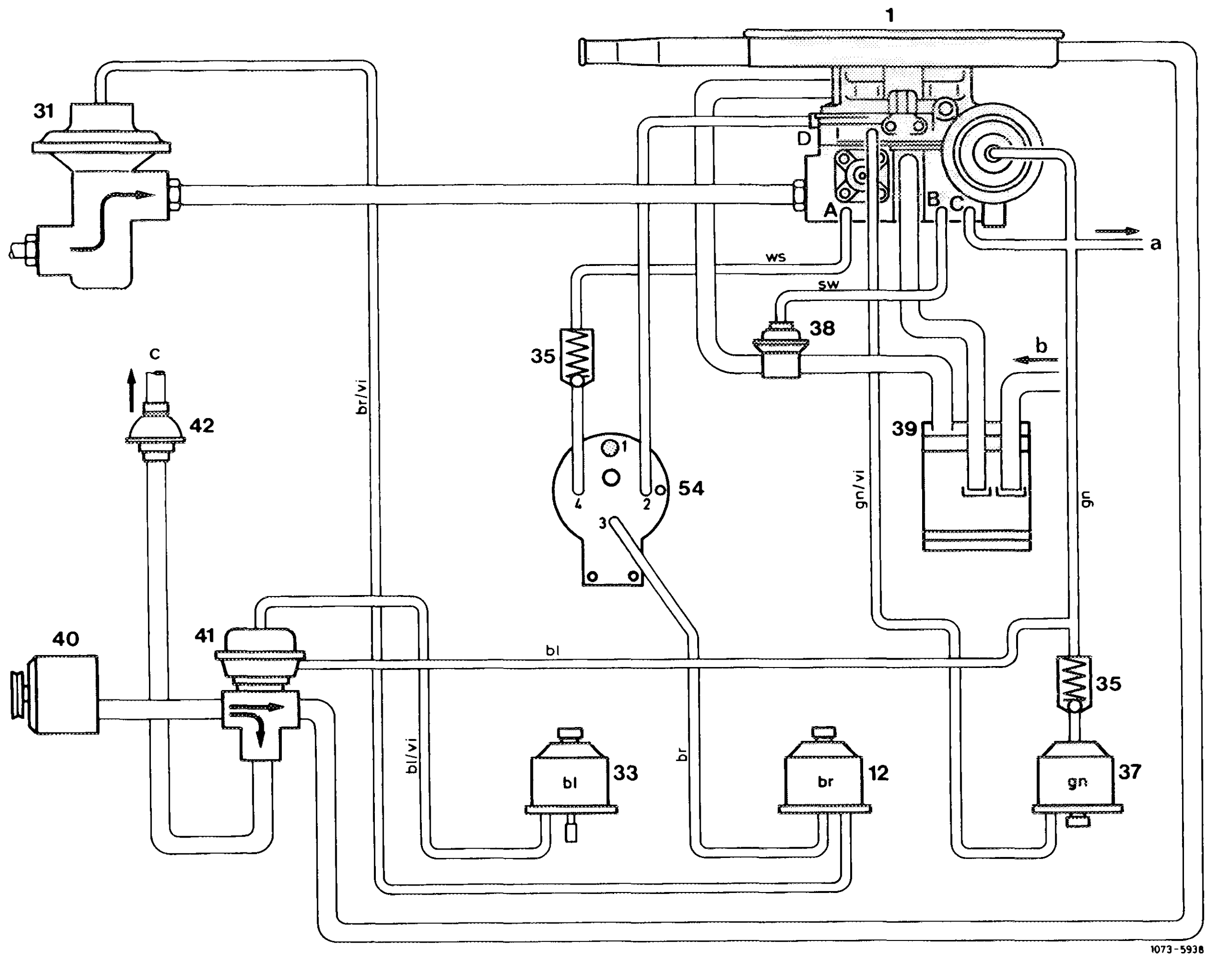
1 Plug part no. 003 545 28 28 (housing omitted)
2 Cable 1.5 mm²

B. EGR (exhaust gas recirculation)

To reduce nitrogen oxides in exhaust gases, a portion of the gases from the exhaust manifold is returned to the intake pipe through a valve.

The quantity of the returned exhaust gas is limited and cut off completely in some driving conditions, so that the driving characteristics of the vehicle are not influenced.

Function diagram



1 Carburetor
12 Switch-over valve EGR
31 EGR valve
33 Switch-over valve air injection
35 Check valve
37 Switch-over valve float chamber vent
38 Purge valve
39 Charcoal canister

40 Air pump
41 Anti-backfire valve
42 Check valve air injection
54 Vacuum booster

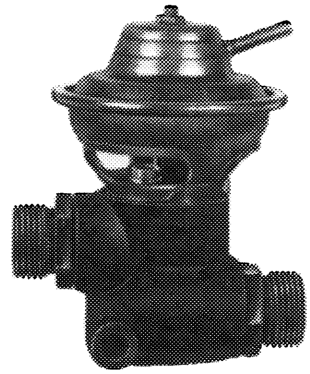
a Connection fuel return valve
b Connection tank vent
c Air injection line

bl = blue
br = brown
gn = green
sw = black
vi = purple
ws = white

EGR components:

EGR valve

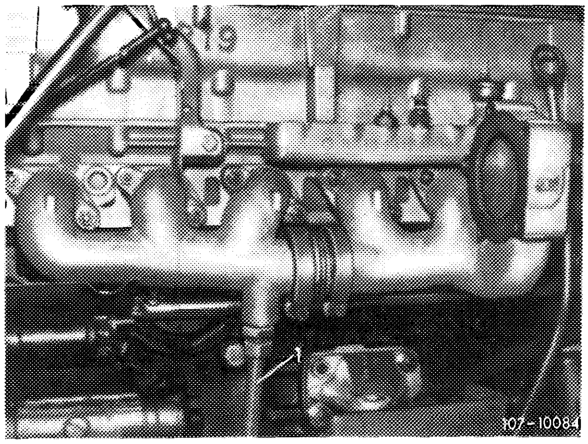
The EGR valve controls the volume (amount) of the returned (recirculated) exhaust gases in dependence of the coolant temperature and the vacuum.



107–10006

EGR line

The EGR line (1) runs from exhaust manifold underneath engine to EGR valve on intake pipe.



EGR is activated:

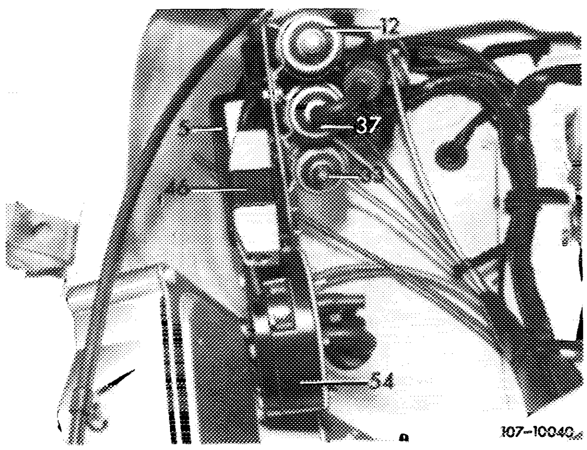
- above 65 °C coolant temperature.
- in all driving positions of selector lever.

Operation

The EGR system is electrically controlled via the switch-over valve (12) and pneumatically via the vacuum booster (54) in dependence of vacuum in carburetor.

Above 65 °C coolant temperature, the temperature switch (32) closes, the switch-over valve (12) is de-energized. If the Venturi vacuum is adequate, the EGR valve (31) is activated via the vacuum booster.

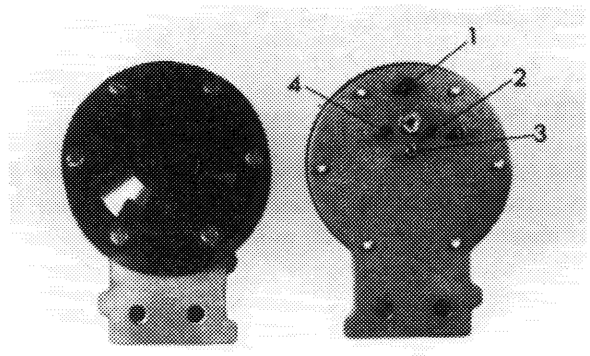
In selector lever positions "N" or "P" starter lockout and back-up lamp switch is closed, the switch-over valve (12) is connected to ground via relay box (5). The vacuum line to EGR valve (31) is interrupted.



107–10040

Vacuum booster

The vacuum booster serves the purpose of controlling the vacuum for the EGR valve in accordance with Venturi vacuum.



1 Connection closed by rubber cap
2 Connection Venturi vacuum
3 Connection switch-over valve EGR
4 Connection intake manifold vacuum

107-9852

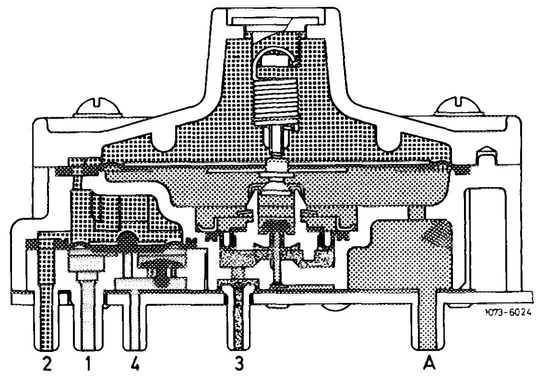
Operation

The Venturi vacuum activates the large Venturi diaphragm (a) from above via connection (2). The Venturi diaphragm (a) is connected to the small governor diaphragm (b). The governor diaphragm (b) is activated from below by the vacuum which activates the EGR valve.

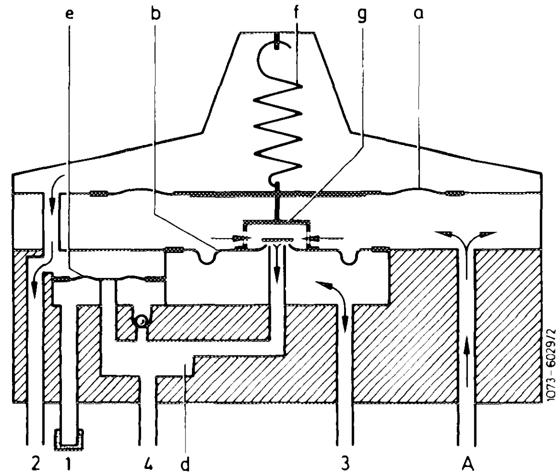
Since the surfaces of the large diaphragm in relation to the small diaphragm are at a ratio of 10:1, the Venturi vacuum will be boosted at a ratio of 10:1.

A small vacuum supply tank (d) is installed in connection (4) of vacuum booster. If the vacuum is less than the max. intake manifold vacuum attained before, the check valve closes and only the vacuum from the vacuum storage tank (d) is applied.

Spring (f) serves to set the pressure in such a manner that the EGR valve is already activated with a slight vacuum at idle speed, with valve unopened. As a result, the EGR valve will react without delay as soon as it is activated by an additional vacuum.



There are three control positions of vacuum booster:



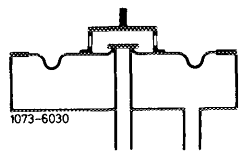
Diagram

1 Connection closed by rubber cap
2 Connection Venturi vacuum
3 Connection switch-over valve EGR
4 Connection intake manifold vacuum
A Vent bore
a Venturi diaphragm
b Governor diaphragm
d Vacuum storage tank
e Shut-off diaphragm
f Spring
g Double valve

1. **Equilibrium between Venturi diaphragm (a) and governor diaphragm (b)**

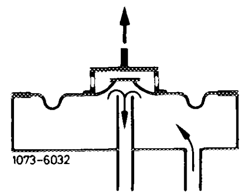
The forces acting on large Venturi diaphragm (a) and on small governor diaphragm (b) are in balance.

The EGR valve remains in its momentary position.



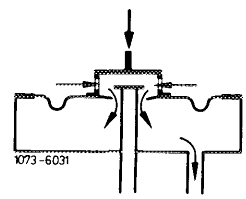
2. **Venturi diaphragm (a) is moving in upward direction**

Venturi vacuum increases when throttle valve is opened. Vacuum above Venturi diaphragm (a) increases. Governor diaphragm (b) is lifted by Venturi diaphragm and opens double valve (g). Vacuum can now act on EGR valve. Emissions are recirculated.



3. **Venturi diaphragm (a) is moving in downward direction**

Venturi vacuum decreases when throttle valve is closed. The vacuum under governor diaphragm pulls governor diaphragm in downward direction. Double valve (g) opens and vents space under governor diaphragm (b) until balance is re-established. No emissions are recirculated.



C. Air injection

To reduce the incompletely burnt components in exhaust gas, air is injected into hot zone behind exhaust valves.

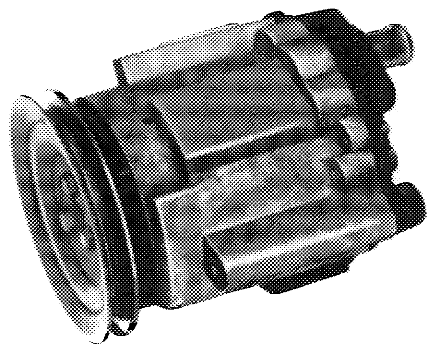
Afterburning is controlled by means of the engine temperature and vacuum conditions in intake pipe (manifold).

To prevent backfiring in exhaust, as well as overheating of reactor, the air injection is switched off in given driving ranges.

Components of air injection:

Air pump (Saginaw pump)

The air pump is an impeller pump with a maintenance-free centrifugal filter which cleans the drawn-in air.

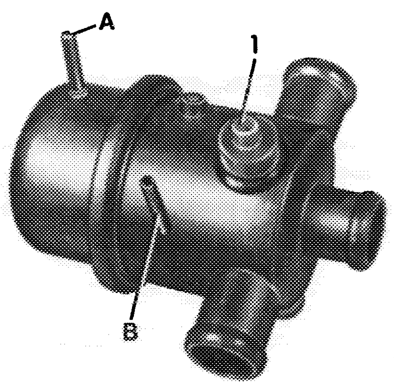


107-8959/1

Anti-backfire valve

The anti-backfire valve serves the purpose of controlling the air volume in dependence of operating condition of engine.

Since there is no safety valve on air pump, a safety valve (1) is mounted on anti-backfire valve.

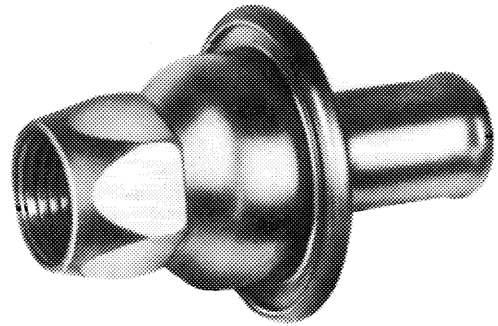


A Connection to switch-over valve
B Connection to carburetor
1 Safety valve

107-10004

Check valve

The check valve prevents hot exhaust gases from flowing into air line.

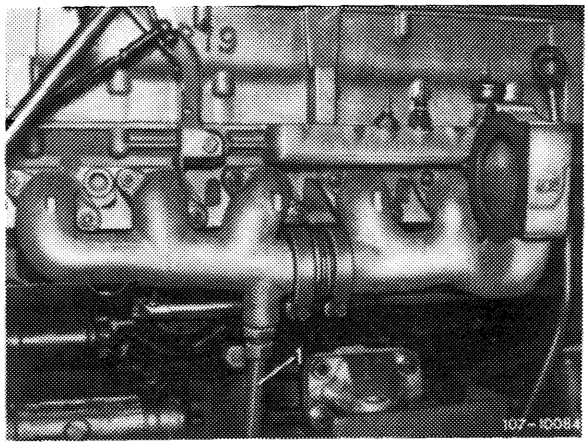


107-9193

Exhaust manifold

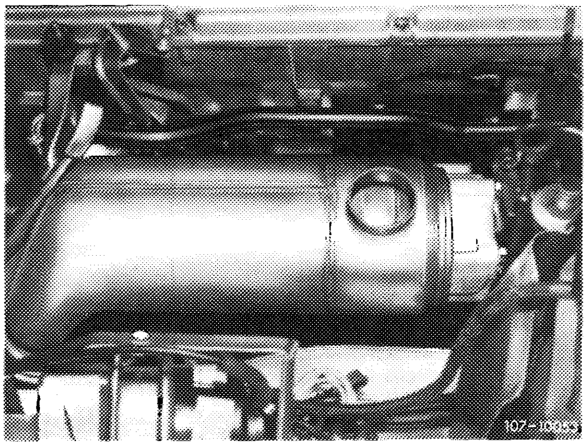
The delivered air is injected directly into exhaust manifold.

An exhaust manifold with bellows is mounted to improve heat expansion.



Catalyst

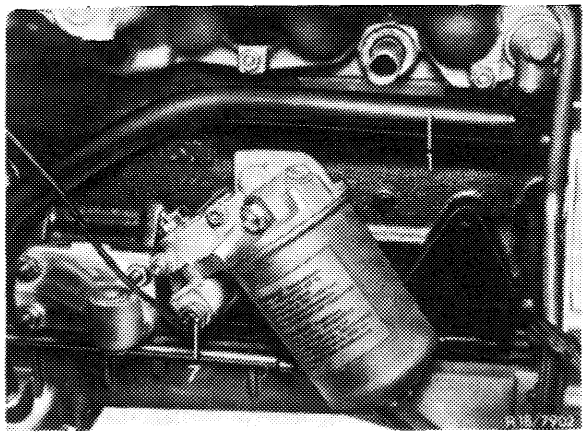
The catalyst is a cylindrical tank. Two ceramic bodies are elastically suspended inside tank. A noble metal is evaporated on these ceramic bodies so that HC and CO emissions are considerably reduced by catalytic oxidation.



Operation

For afterburning, air is injected into exhaust ducts of cylinders with the engine running and an oil temperature of 17 °C.

The oxygen in the air will combine with the hot exhaust gases for reaction in catalyst.



7 Temperature switch 17 °C

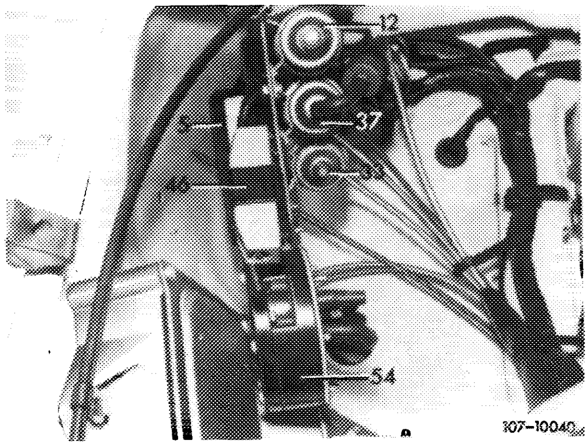
At oil temperatures below 17 °C the delivered air is blown into air filter for silencing.

The air injection is electrically controlled via the blue switch-over valve (33).

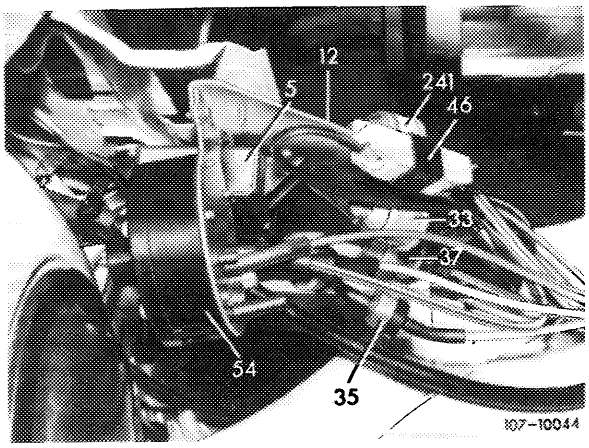
Air can be injected:

- above 17 °C oil temperature.

The temperature switch (7) in oil filter housing is open. The relay in relay box (5) switches, the switch-over valve (33) is de-energized. Air is injected into exhaust manifold via anti-backfire valve (41).



The air injection is pneumatically controlled by means of anti-backfire valve (41).



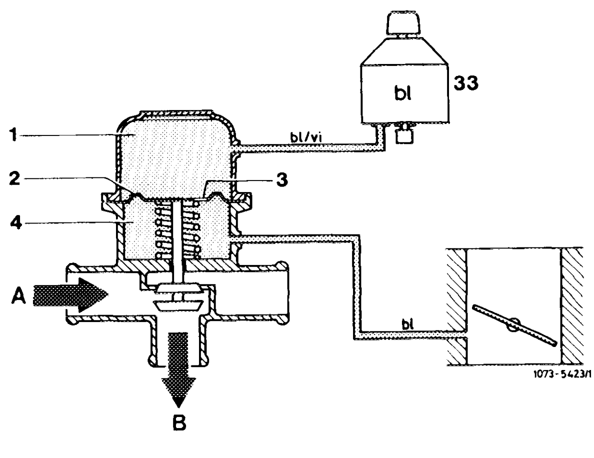
Model 116

5 Relay box
12 Switch-over valve EGR (brown)
33 Switch-over valve air injection (blue)
37 Switch-over valve float chamber vent (green)
46 Resistance choke cover
54 Vacuum booster
241 Switch-over valve automatic choke (white)

Control of valve provides 3 different operating positions:

1. Air injection in driving range above 17 °C oil temperature

The lower diaphragm chamber (4) of anti-backfire valve (41) is connected directly to carburetor via a blue vacuum line. The vacuum tapping bore in carburetor is under throttle valve. The lower diaphragm chamber is vented while the engine is running. Simultaneously, the upper diaphragm chamber (1) is vented via compensating bore (3) in diaphragm when the switch-over valve (33) closes the positive venting line. The valve disc is lifted by the spring and the duct for air injection (B) is opened.

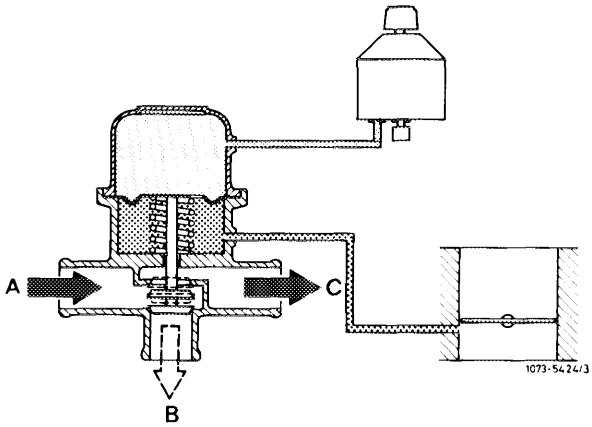


Anti-backfire valve

1 Upper diaphragm chamber
2 Diaphragm
3 Compensating bore
4 Lower diaphragm chamber
33 Switch-over valve air injection
A Air line from air pump
B Air injection line

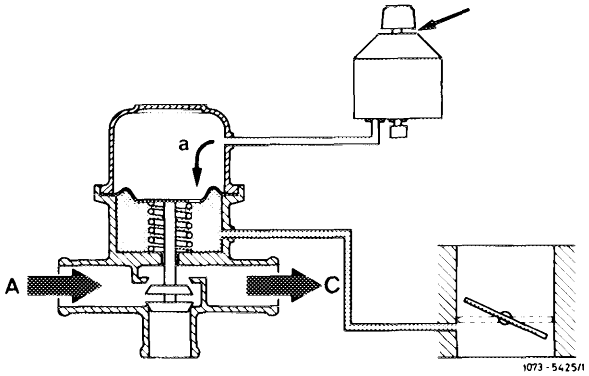
2. **Air discharge during transition to deceleration (coasting) above 17 °C oil temperature**

The high vacuum during deceleration interferes with the pressure ratio of the two diaphragm chambers. The lower diaphragm chamber (4) is now under influence of a high vacuum. This vacuum can be equalized by compensating orifice but slowly. Diaphragm (2) is pulled downwards and closes the port for air injection (B). The delivered air is discharged (in direction C toward air filter).



3. **Air discharge while driving below 17 °C oil temperature**

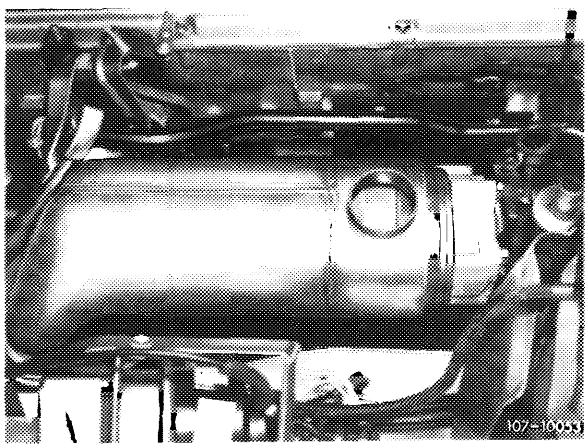
At oil temperatures below 17 °C the switch-over valve (33) is energized via a relay in relay box (5). The upper diaphragm chamber is positively vented via switch-over valve (33). The air pressure overcomes the spring, the valve closes the air injection duct (B) and opens the discharge duct (C).



D. Catalyst

The catalyst is flanged to exhaust manifold.

The catalyst comprises two monoliths elastically supported in a wire netting, a honeycomb-shaped cylindrical body of ceramic material. The noble metal evaporated on monoliths, the actual catalyst, accelerates the oxidation of CO and hydrocarbons while adding fresh air at the proper temperature.



To maintain function of catalyst, the engine should be operated with lead-free fuel only. Since lead-free fuel is available in low quantities only outside the USA, **these vehicles (outside the USA) are operated with leaded fuel.** When these fuels are imported into the USA, a new catalyst is installed and the fuel system is flushed. As an acknowledgement of these jobs, the yellow emission control information plate on vehicles of model years 1975/76 is replaced by the green information plate valid in the USA.

Avoid overheating of catalyst.

Extended overheating of the catalyst will result in catalyst damage, i.e. the monoliths in catalyst may melt.

Overheating of catalyst may occur if:

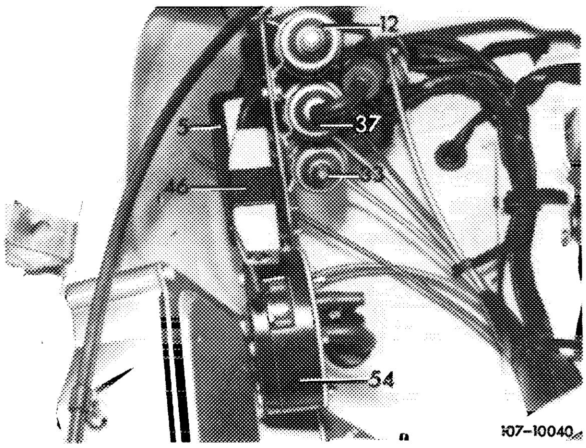
a) The specified engine service is not performed.

   Perfect spark plugs are important for life of catalyst.

b) The fuel air mixture is excessively enriched by irregular operation of engine.

c) The exhaust emission control system has been arbitrarily modified.

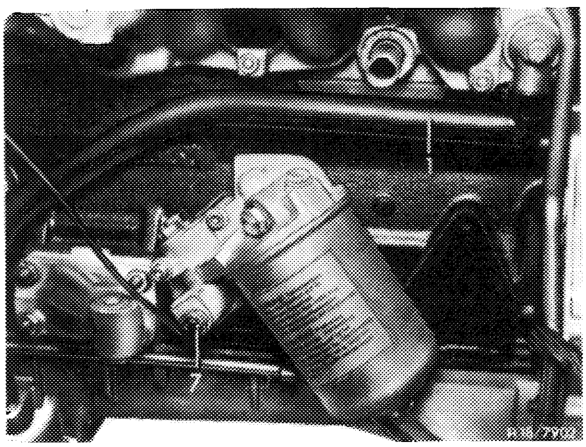
E. Choke cover-stepped heater



The choke cover of the automatic choke on carburetor is heated in two steps. Below 17 °C oil temperature at reduced output, above 17 °C oil temperature the choke cover is directly heated. Below 17 °C oil temperature the temperature switch (7) in oil filter housing and the relay in relay box (5) are closed.

The resistance (46) for reduced heater capacity is connected.

Above 17 °C oil temperature the temperature switch (7) is open, the relay in relay box (5) disconnects the resistance, the choke cover is directly heated.

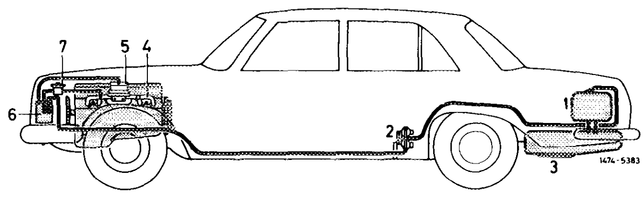


F. Fuel evaporation control system

A fuel evaporation system has been installed to improve emission characteristics which have nothing to do with engine combustion.

Function diagram

1 Expansion tank
2 Valve system
3 Fuel tank
4 Intake pipe
5 Carburetor with vent valve
6 Charcoal canister
7 Purge valve



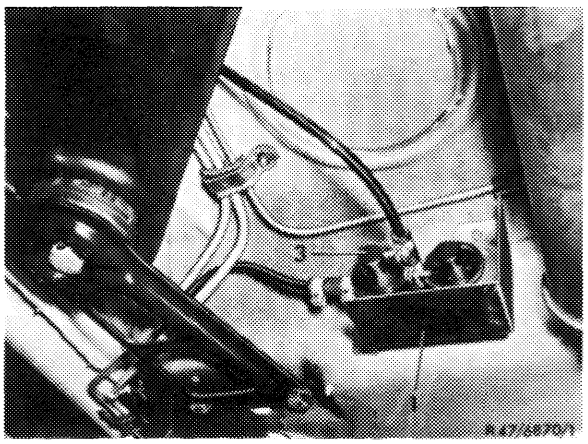
Components of fuel evaporation system:

Valve system

The valve system is mounted inside vehicle at level of rear leg room.

The valve system comprises three valves:

1. Negative vent valve
2. Pressure relief valve
3. Positive vent valve

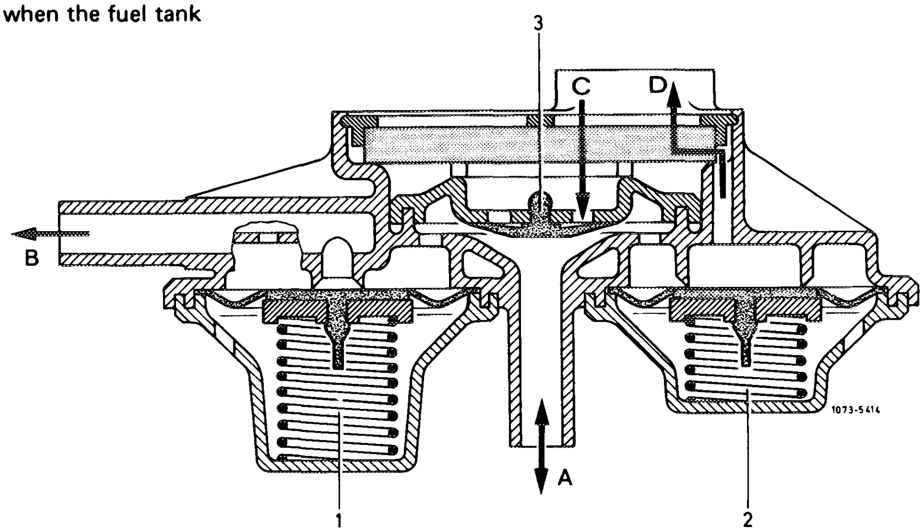


1 Protective box
3 Valve system

The **negative vent valve** opens at a slight overpressure. The evaporation vapours will flow through negative vent valve (1) (direction B) into a line to charcoal canister.

The **pressure relief valve** is a safety valve and opens in the event of an overpressure in fuel evaporation system. The fuel vapours are vented directly into the open air.

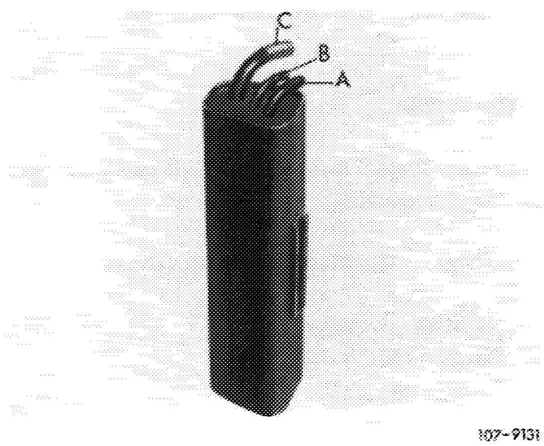
The **positive vent valve** opens in the event of an underpressure (vacuum) caused when the fuel tank is cooling down.



1 Negative vent valve
2 Pressure relief valve
3 Positive vent valve
A To valve/to expansion tank
B To charcoal canister
C Fresh air inlet
D Outlet pressure relief valve

Charcoal canister

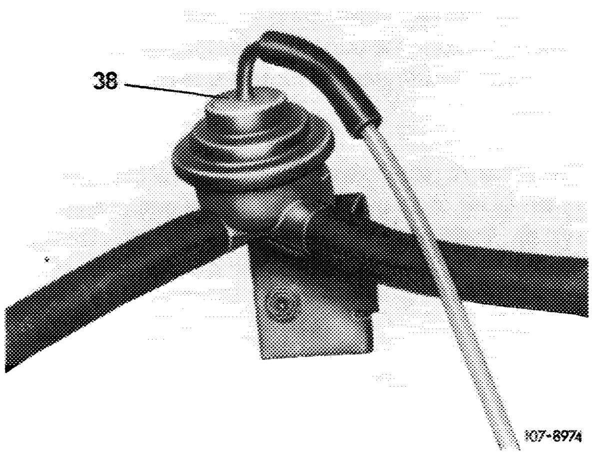
The fuel evaporation vapours from fuel tank and from float chamber are stored in charcoal canister and are drawn off again when driving.



A Connection tank vent
B Connection purge valve
C Connection float chamber positive vent valve

Purge valve

The purge valve controls the amount of fuel evaporation vapours which are drawn off via a connection in front of carburetor throttle valve depending on throttle valve position.



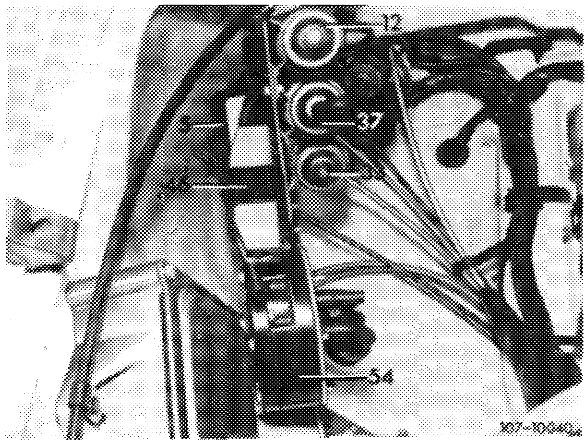
Operation

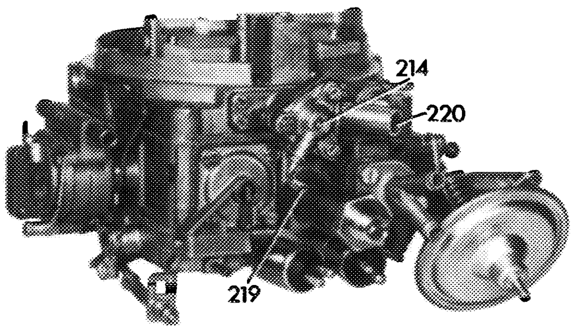
The fuel evaporation vapours from fuel tank and from carburetor float chamber are stored in charcoal canister when the engine is stopped, and they are drawn from charcoal canister when the engine is running in dependence of the intake pipe vacuum.

The fuel evaporation vapours from fuel tank are routed directly into charcoal canister.

The fuel evaporation vapours from float chamber are stored in charcoal canister only when the engine is stopped and the valve is open.

When the engine is running, the switch-over valve is energized and the diaphragms of the float chamber positive vent valve are provided with a vacuum, the valve will then close and interrupt the connection to charcoal canister.



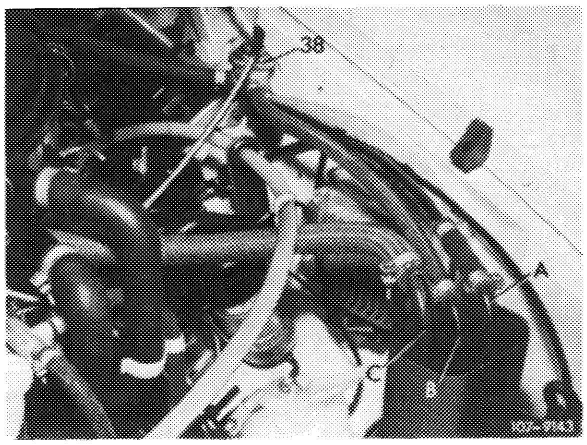


214 Float chamber positive vent valve
219 Vacuum connection
220 Negative vent connection

107–10093

The diaphragm of the purge valve (38) is provided with a vacuum in dependence of the throttle valve position of carburetor stage I and the valve will open.

The intake pipe vacuum will then draw the stored vapours from the charcoal canister.



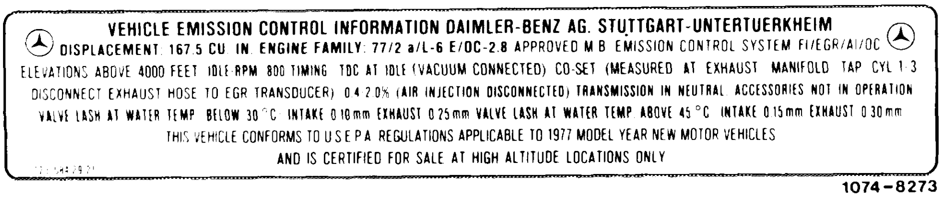
38 Purge valve
A Connection tank vent
B Connection purge valve
C Connection float chamber vent valve

Federal and California version model year 1977/78/79

A. General

Information plate

Federal version basic color black
California version basic color yellow
Federal version high altitudes basic color red



1074–8273

Identification of vacuum lines

The basic color of vacuum lines for emission control system is transparent (white).

Additional color stripes are used to facilitate identification of the individual functions.

Lines originating at a vacuum source (originating lines) **have only one color stripe.**

Lines terminating at a vacuum-operated device (terminating lines) **have two color stripes.** Purple is always the second color.

Emission control system	Color coding of originating vacuum line	Color coding of terminating vacuum line
Ignition		
Advance	red	—
Retard	yellow	yellow/purple
EGR	red	—
Air injection	blue	blue/purple

Engine 110 is available with two different emission control systems:

1. Federal emission control system (black information plate).

2. California emission control system (yellow information plate).

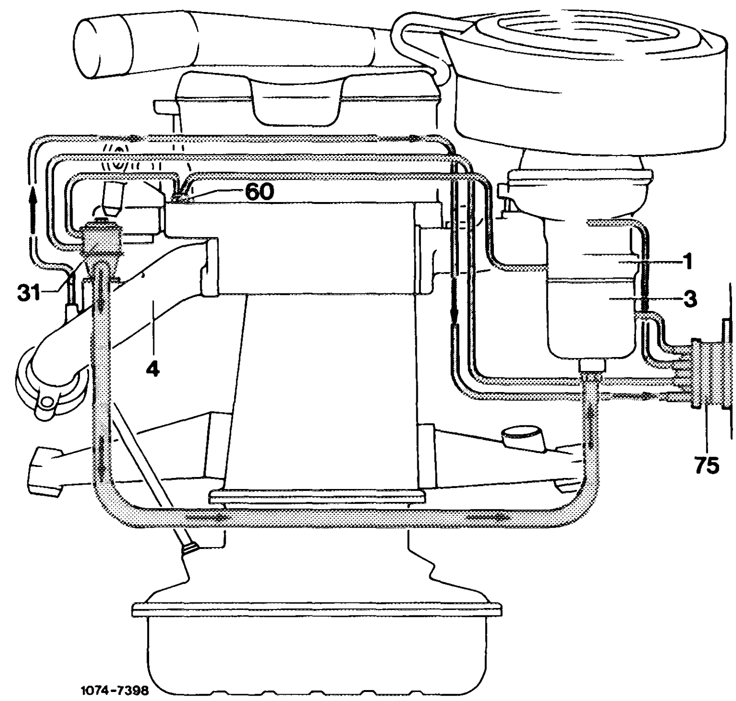
The two emission control systems differ with regard to air injection and catalysts.

B. EGR

To reduce nitrogen oxides in exhaust gases, a portion of the gases from the exhaust manifold is returned to the intake pipe through a valve.

The quantity of the returned exhaust gas is limited and cut off completely in some driving conditions, so that the driving characteristics of the vehicle are not influenced.

Function diagram

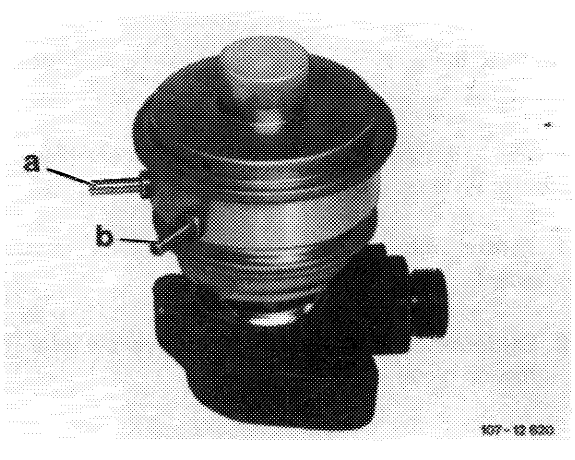


1 Throttle valve housing
3 Intake pipe
4 Exhaust manifold
31 EGR valve
60 Thermo valve 40 °C
75 Pressure transducer

Components of EGR:

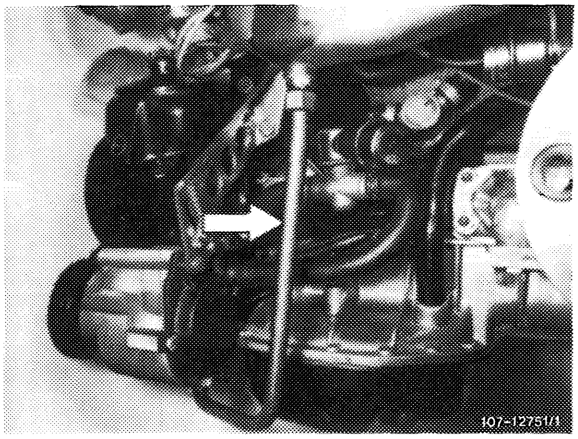
EGR valve

The EGR valve is designed as a three-diaphragm valve for better adaptation of EGR.



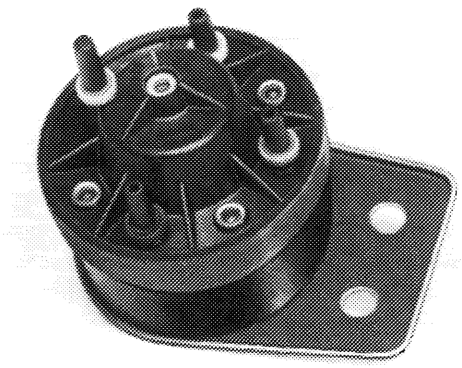
EGR line

The exhaust gases are guided by the EGR valve at the front around the engine through the EGR line (arrow) into intake pipe.



Pressure transducer

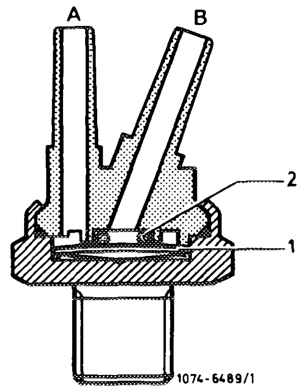
The pressure transducer controls the EGR volume in dependence of the exhaust backpressure.



107-12314

Thermovalve 40 °C (color code black)

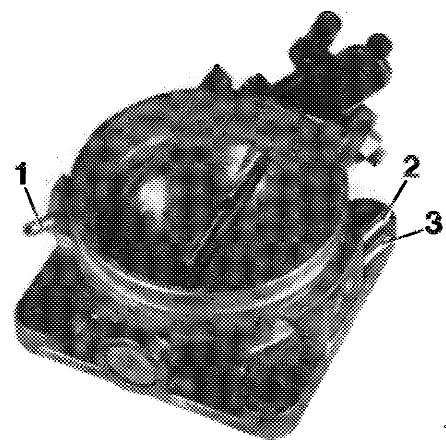
The thermovalve is screwed into sensor box and opens at approx. 40 °C coolant temperature.



1 Bimetallic plate
2 O-ring
A To EGR valve
B To throttle valve housing

Throttle valve housing

A tapping pipe (2) is attached to throttle valve housing to draw the vacuum required for controlling the EGR and the vacuum advance of the firing point.



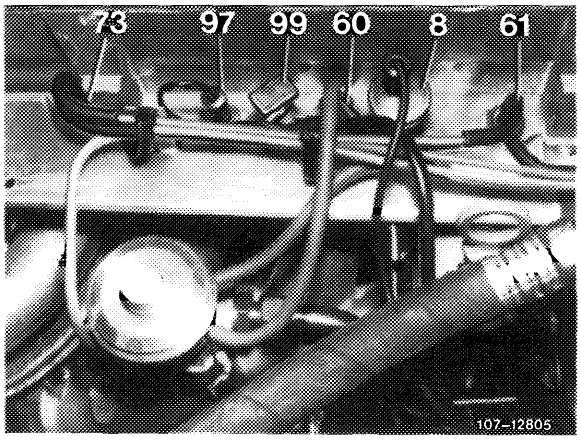
1 Vacuum connection ignition retard
2 Vacuum connection ignition advance
3 Vacuum connection charcoal canister

107-13053

EGR is activated:

- above 40 °C coolant temperature.
- during acceleration.
- during partial load operation.
- during transition to deceleration (coasting).

Operation



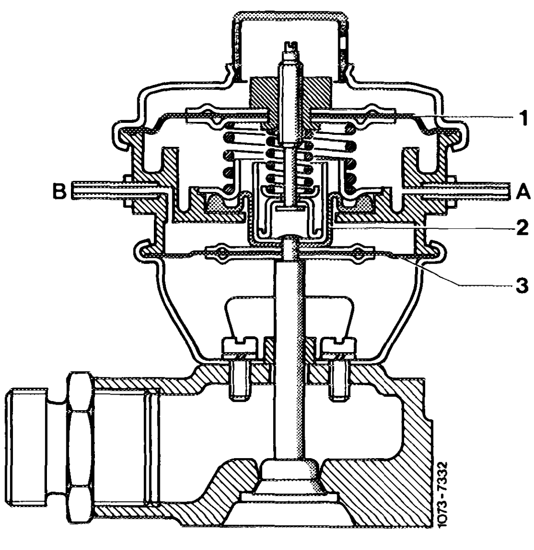
Above 40 °C, in the driving ranges named above, a part of the exhaust gases is returned from the exhaust manifold to the intake pipe.

The amount of recirculated exhaust gases depends on the throttle valve position (vacuum tapped at throttle valve housing) and the exhaust backpressure in exhaust manifold. Depending on throttle valve position the center diaphragm chamber of the EGR valve is more or less supplied with vacuum via thermovalve 40 °C (60) in cylinder head.

The upper diaphragm chamber is continuously connected to atmosphere by means of a vent bore.

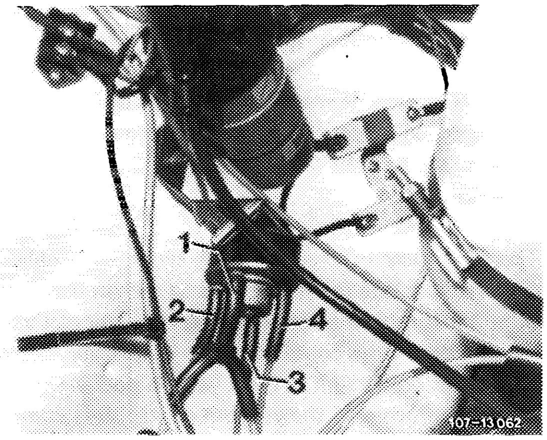
Depending on vacuum, the shut-off diaphragm (1) is pushed with coupling pin downwards against spring force and the valve can open.

Opening and closing of valve is controlled by pressure transducer which provides the positive or negative ventilation for diaphragm chamber above working diaphragm (3) depending on pressure of exhaust gases in exhaust manifold.



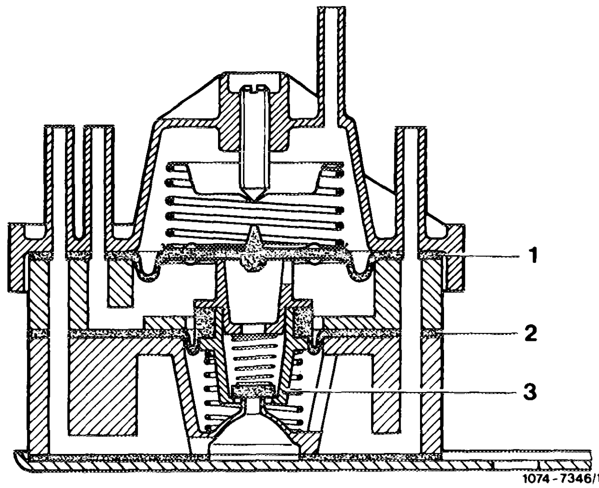
1 Shut-off diaphragm
2 Cup-type diaphragm
3 Working diaphragm
A Connection vacuum line to thermo valve
B Connection vacuum line from pressure transducer

The pressure transducer is subdivided into three chambers by means of two spring-loaded diaphragms, the upper diaphragm (1) and the lower diaphragm (2). Both diaphragms are connected to each other by means of a diaphragm cup.



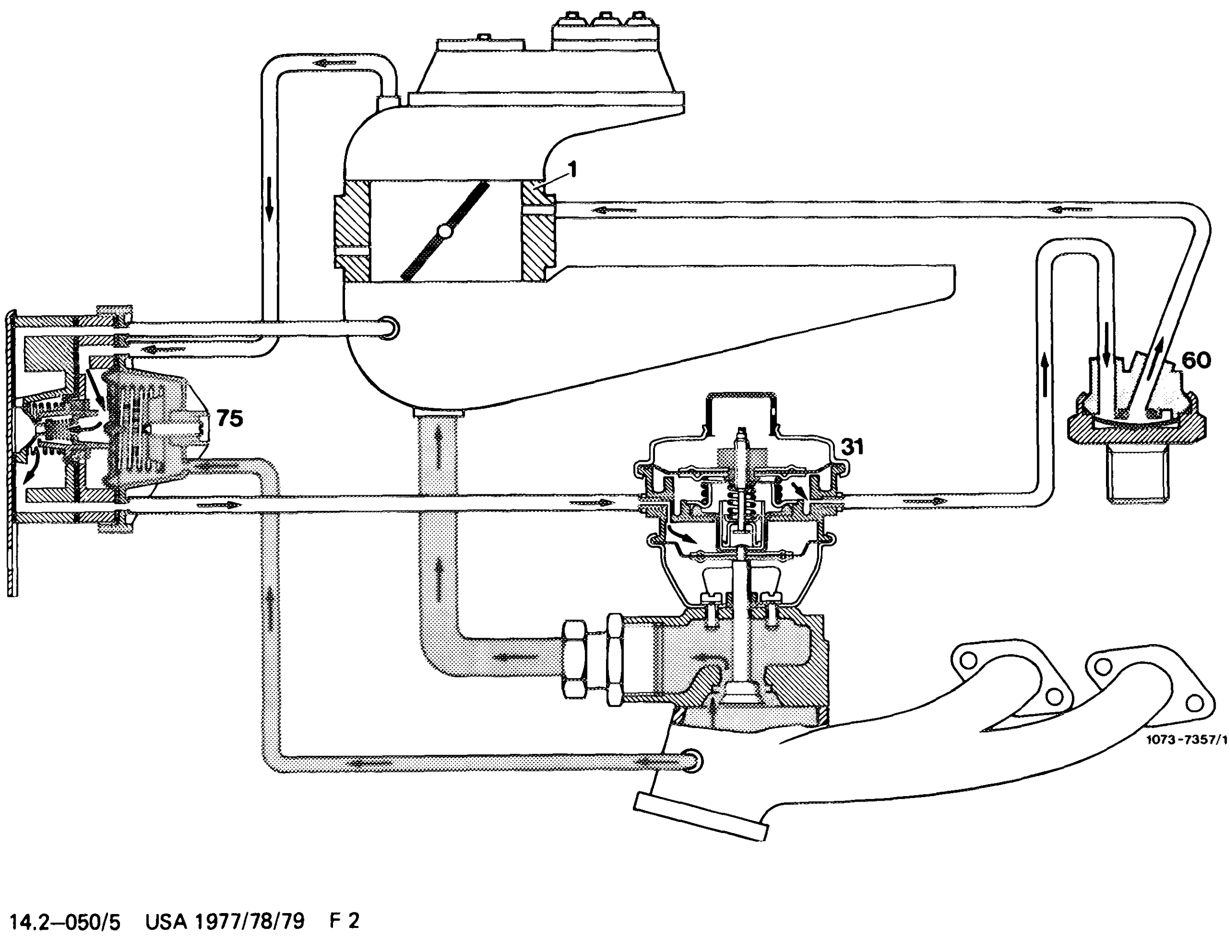
1 Connection intake pipe vacuum (blue)
2 Connection vent line (white)
3 Connection exhaust gas backpressure line (orange)
4 Connection vacuum control line to EGR valve (brown)

The exhaust gas backpressure is effective in upper diaphragm chamber. The center diaphragm chamber is continuously and positively vented through air guide housing. This will not influence the position of the diaphragms. The lower diaphragm chamber is positively or negatively vented depending on exhaust gas backpressure.



1 Upper diaphragm
2 Lower diaphragm
3 Diaphragm cup

Function diagram EGR valve opened



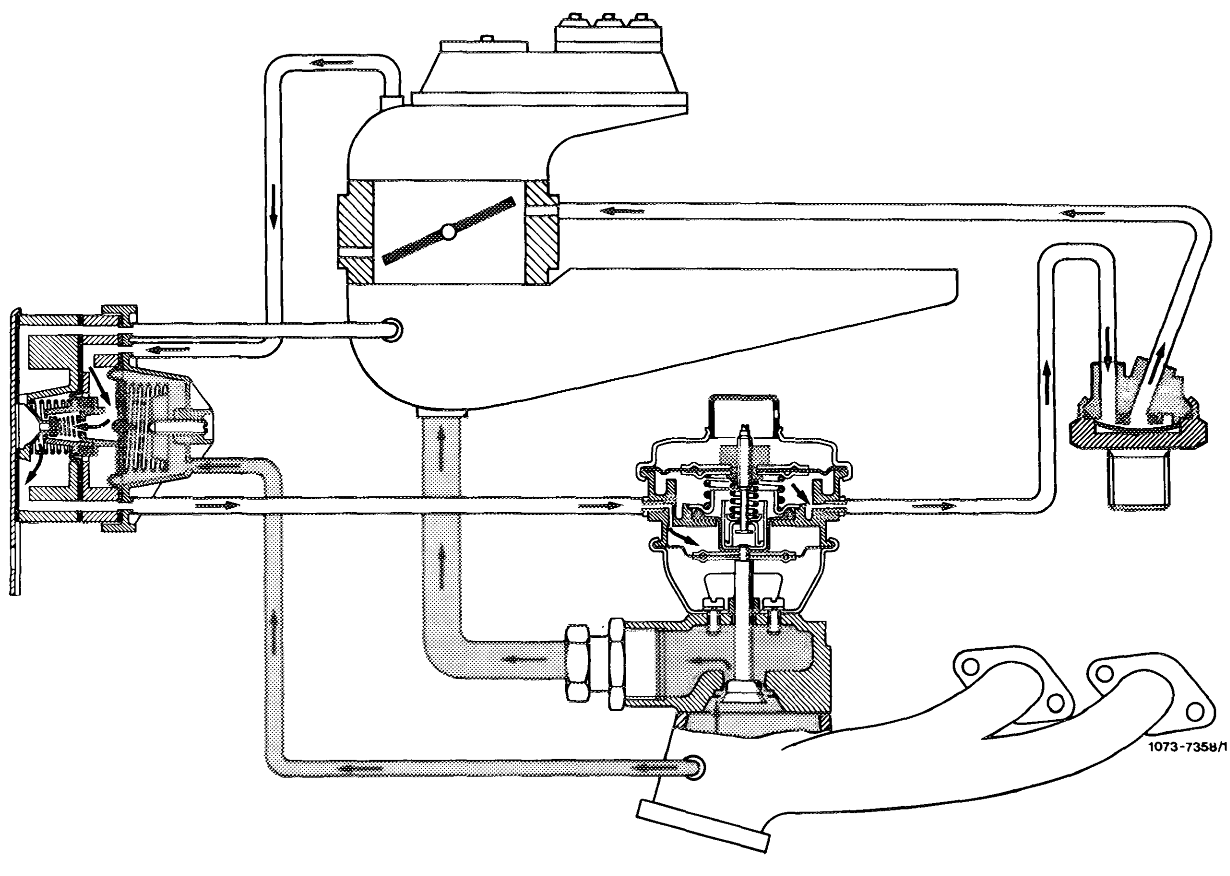
The different driving conditions provide three positions for pressure transducer:

1. **During acceleration** the exhaust gas backpressure increases and forces the upper diaphragm with diaphragm cup and the lower diaphragm in downward direction.

The valve plate in diaphragm cup closes the intake pipe vacuum line in lower diaphragm chamber. Simultaneously, the valve plate opens the positive venting bore from center to lower diaphragm chamber. The lower diaphragm in EGR valve is positively vented by means of the vacuum control line coming from lower diaphragm schamber. The spring in EGR valve pushes the working diaphragm with valve down. The valve opens completely and the largest possible quantity of exhaust gases flows to intake pipe.

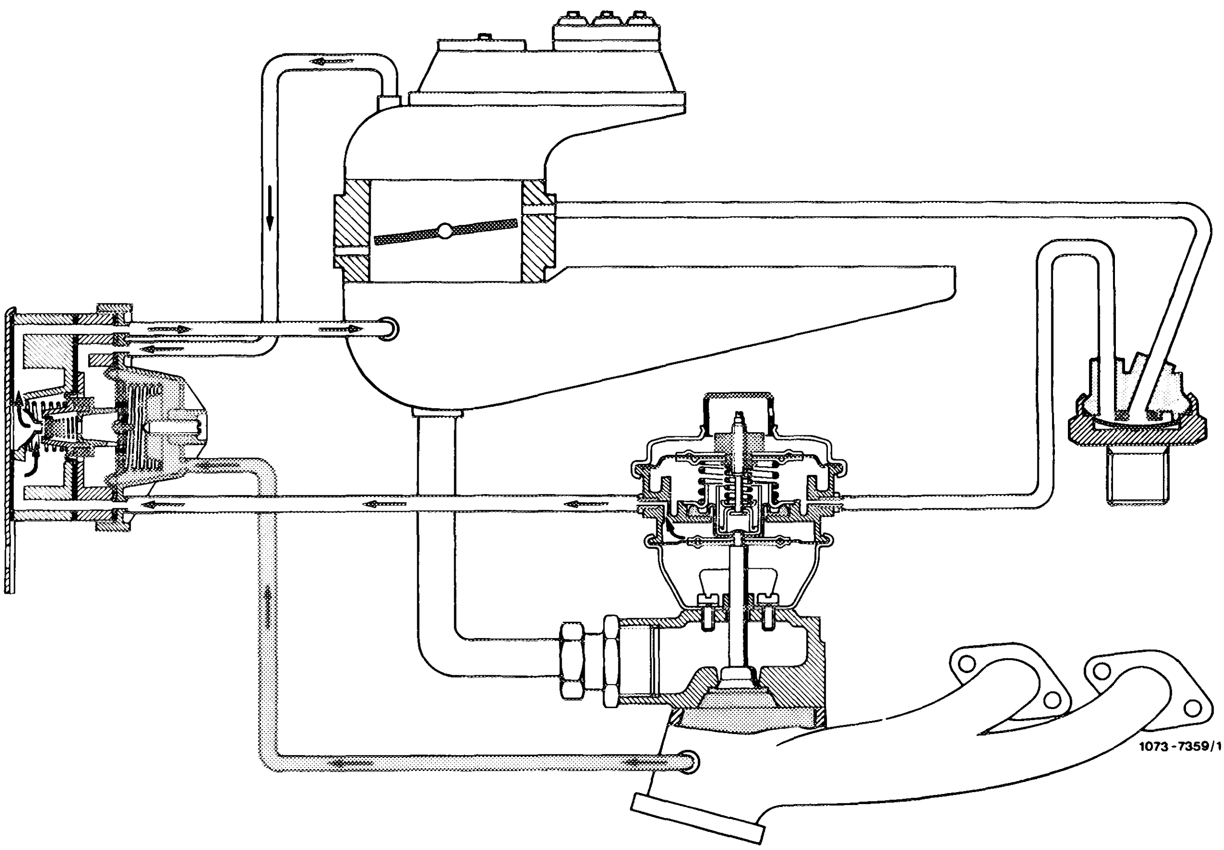
2. **During transition to deceleration** (coasting) the exhaust gas backpressure decreases. The upper diaphragm (1) including the diaphragm cup and the lower diaphragm are returning to their starting position. The valve plate opens the intake pipe vacuum line and seats on lower part of diaphragm cup. This will interrupt the positive venting of the lower diaphragm chamber. The intake pipe vacuum now prevailing in this diaphragm chamber provides the negative ventilation for the lower diaphragm in EGR valve via the vacuum control line. Depending on size of vacuum the valve is pulled in closing direction against the spring force. The quantity of fed exhaust gas increases.

Function diagram EGR valve in center position



3. **During constant driving** the pressure conditions in upper and lower diaphragm chamber are in balance. The EGR valve remains in its momentary position. The recirculated quantity of exhaust gases remains constant.

Function diagram EGR valve closed



In this case, the upper diaphragm chamber in EGR valve is not provided with a vacuum and the shut-off diaphragm is not releasing the required valve stroke.

C. Air injection Federal version

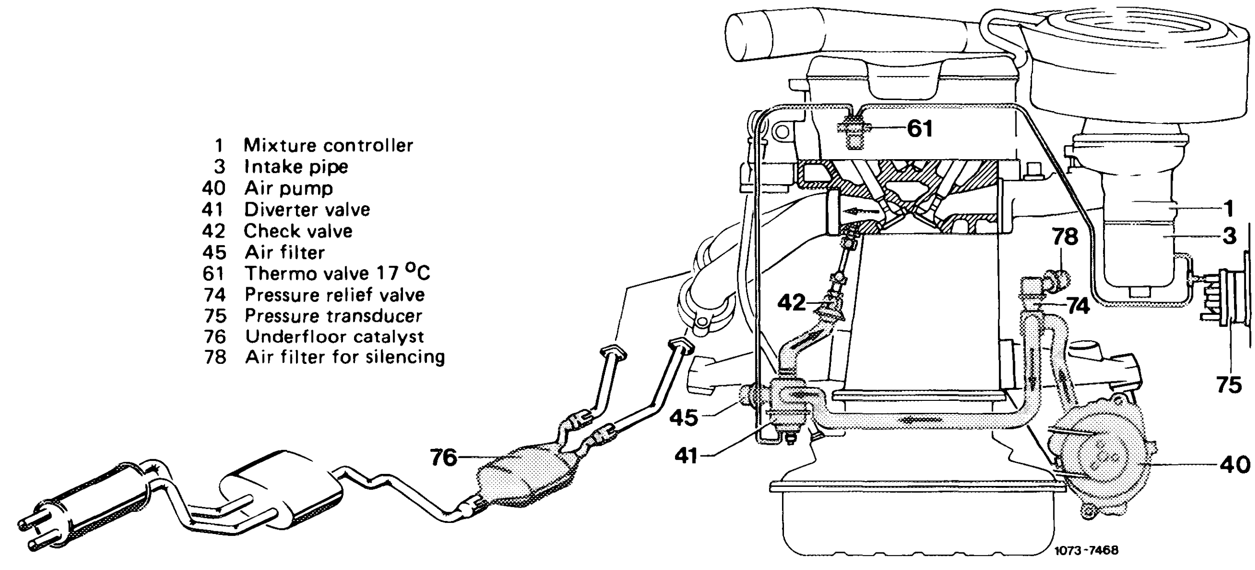
To reduce the incompletely burnt components in the exhaust gases, air is injected into hot zone behind exhaust valves.

Afterburning is controlled by way of the engine temperature and pressure conditions in intake pipe.

To avoid backfiring in exhaust, as well as over-heating of catalyst, the air injection is shut off in given driving ranges.

Function diagram

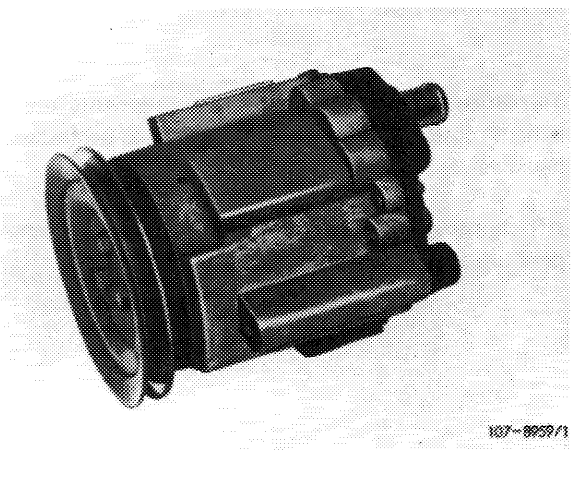
1 Mixture controller
3 Intake pipe
40 Air pump
41 Diverter valve
42 Check valve
45 Air filter
61 Thermo valve 17 °C
74 Pressure relief valve
75 Pressure transducer
76 Underfloor catalyst
78 Air filter for silencing



Components of air injection:

Air pump (Saginaw pump)

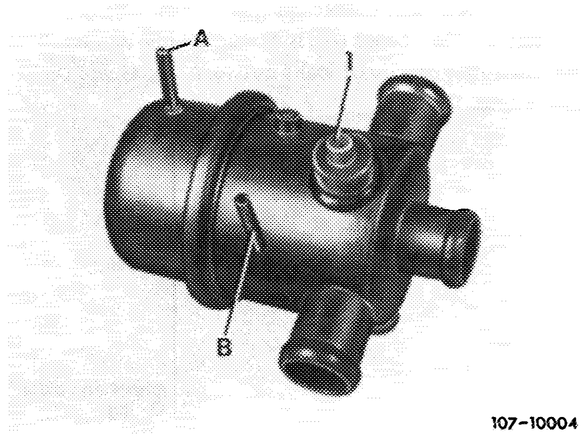
The air pump is an impeller pump with maintenance-free centrifugal filter which cleans the drawn-in air.



Anti-backfire valve

The anti-backfire valve serves the purpose of controlling the air volume in dependence of operating condition of engine.

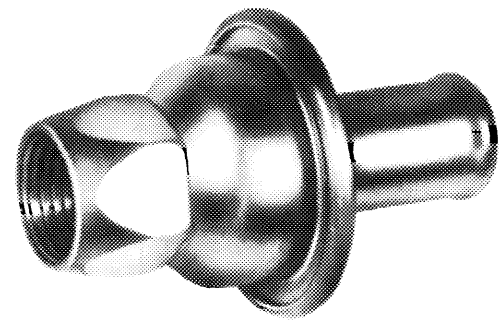
Since there is no safety valve on air pump, the safety valve (1) is attached to anti-backfire valve.



107-10004

Check valve

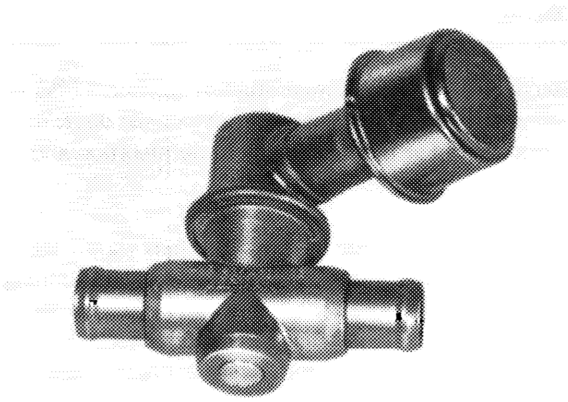
The check valve prevents hot exhaust gases from flowing into air line.



107-9193

Pressure relief valve

The excess air delivered by the air pump at high engine speeds is discharged into the open air by the pressure relief valve starting at a line backpressure of approx. 0.266 bar gauge pressure. An air filter is attached to pressure relief valve for silencing.

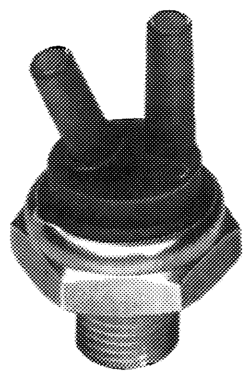


107-13007

Thermo valve 17 °C (color code blue)

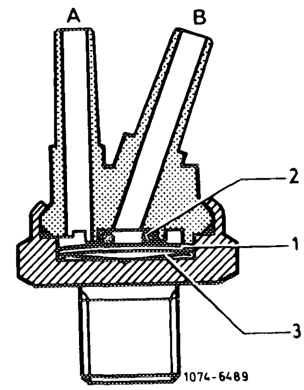
The thermovalve is screwed into cylinder head and opens at approx. 17 °C coolant temperature. Below 17 °C coolant temperature the bimetallic plate rests against O-ring and closes connection "B".

Above 17 °C coolant temperature the bimetallic plate snaps downward when heated. Both connections are connected to each other.



107-10895

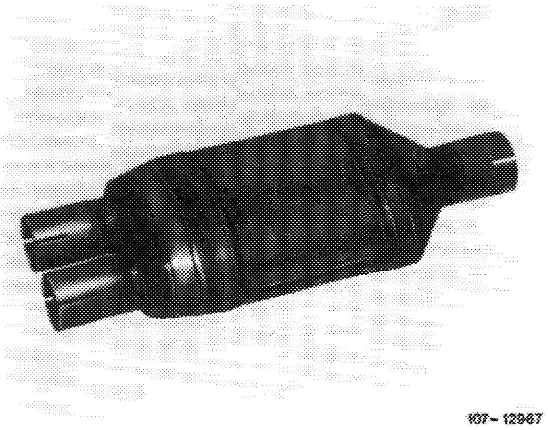
The vacuum line to intake pipe should be plugged to connection "B", since this is the only way to guarantee the absolute absence of leaks between bimetallic plate and O-ring.



1 Bimetallic plate
2 O-ring

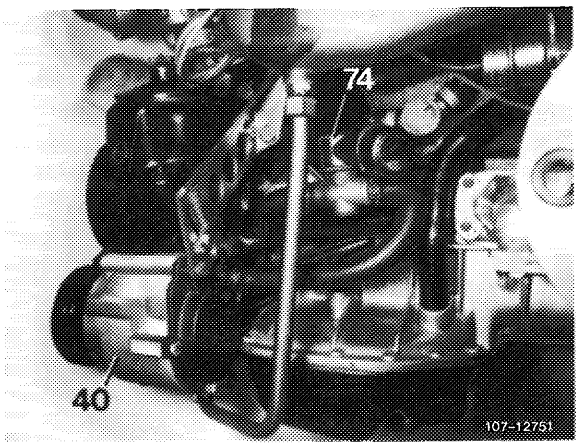
Catalyst

The catalyst is designed as an underfloor catalyst and is located in exhaust system in front of mufflers.



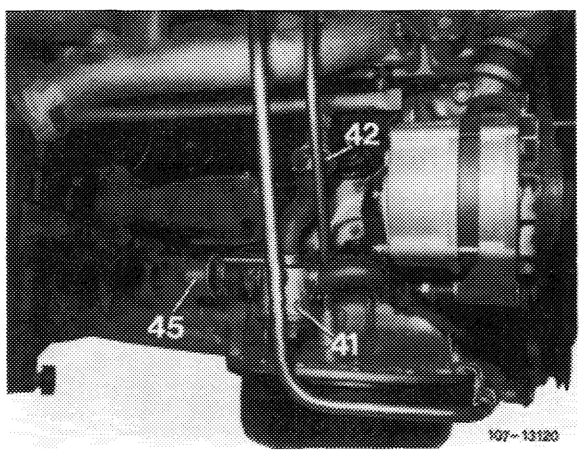
Operation

Starting at a coolant temperature of approx. 17 °C in cylinder head air is discharged into exhaust ducts of cylinder head at idle speed, during deceleration and under partial load.



The air pump is driven by the crankshaft via a V-belt and delivers constantly air when the engine in running. The air flows to pressure relief valve (74) which discharges the excess air delivered at high speeds into the open air starting at a back-pressure of approx. 0.266 bar.

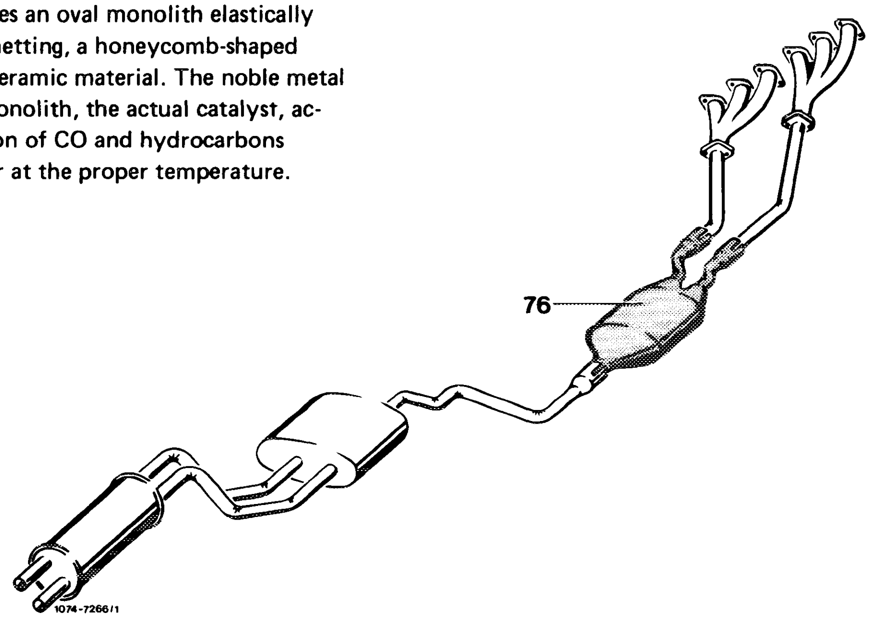
From pressure relief valve (74) the excess air is diverted into the exhaust ducts of the cylinder head via the diverter valve (41), and starting at approx. 17 °C coolant temperature via the check valve (42), while below approx. 17 °C coolant temperature the excess air is discharged into the open air through the air filter for silencing (45).



The exhaust gases and the diverted air are routed through exhaust pipes into catalyst (76).

The oxygen in the diverted (injected) air encounters the hot exhaust gases for reaction in catalyst.

The catalyst comprises an oval monolith elastically supported in a wire netting, a honeycomb-shaped cylindrical body of ceramic material. The noble metal evaporated on the monolith, the actual catalyst, accelerates the oxidation of CO and hydrocarbons while adding fresh air at the proper temperature.



To maintain function of catalyst, the engine should be operated with lead-free fuel only.

Avoid overheating of catalyst

Extended overheating of the catalyst will result in catalyst damage, i.e. the monoliths in catalyst may melt.

Overheating of catalyst may occur if:

a) The specified engine service is not performed.

   Perfect spark plugs are important for life of catalyst.

b) The fuel air mixture is excessively enriched by irregular operation of engine.

c) The exhaust emission control system has been arbitrarily modified.

D. Air injection California version

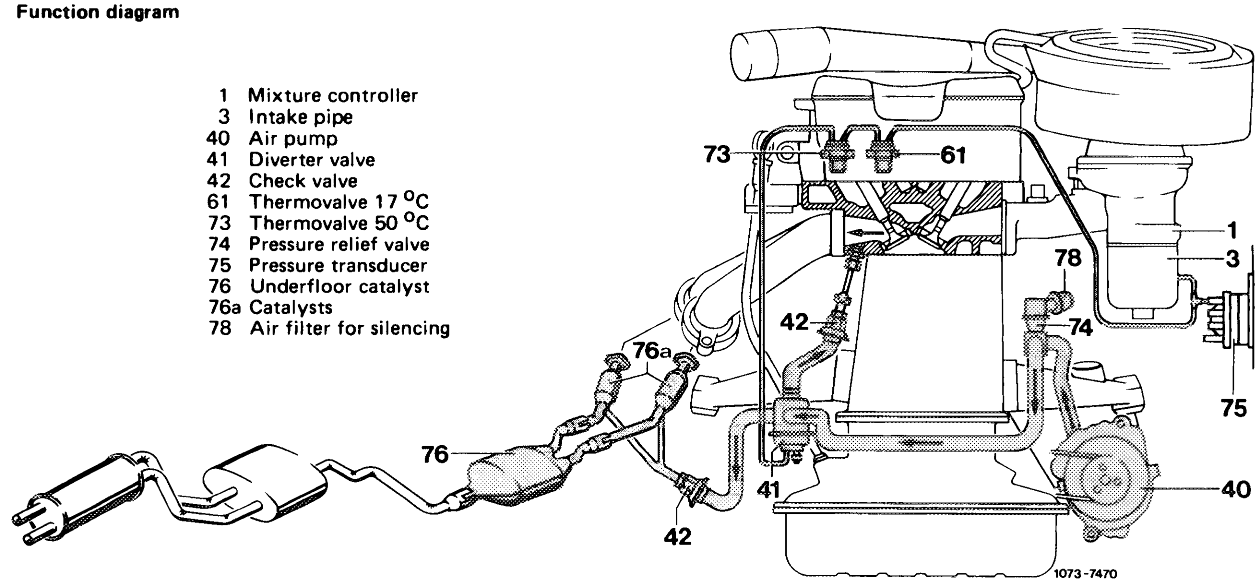
To reduce the incompletely burnt components in exhaust gas, air is injected into hot zone behind exhaust valves.

Afterburning is controlled by means of the engine temperature and vacuum conditions in intake pipe.

To prevent backfiring in exhaust, as well as overheating of reactor, the air injection is switched off in given driving ranges.

Function diagram

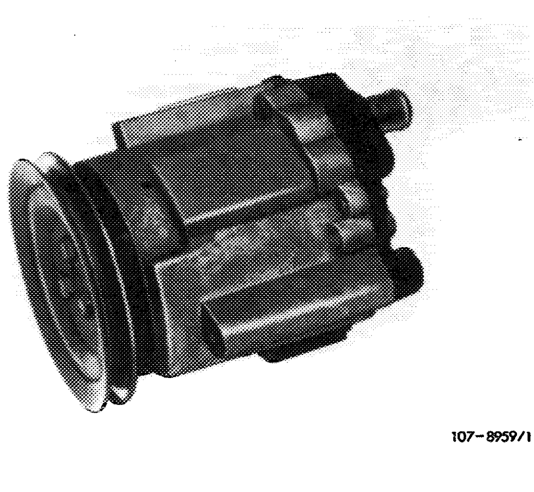
1 Mixture controller
3 Intake pipe
40 Air pump
41 Diverter valve
42 Check valve
61 Thermovalve 17 °C
73 Thermovalve 50 °C
74 Pressure relief valve
75 Pressure transducer
76 Underfloor catalyst
76a Catalysts
78 Air filter for silencing



Components of air injection:

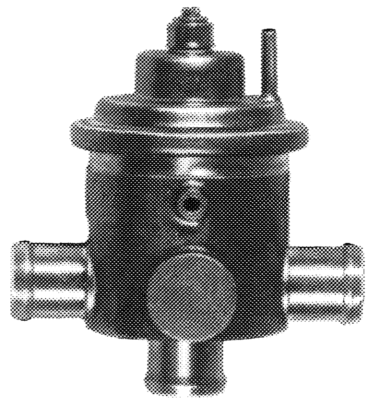
Air pump (Saginaw pump)

The air pump is an impeller pump with maintenance-free centrifugal filter which cleans the drawn-in air.



Air switch-over valve (diverter valve)

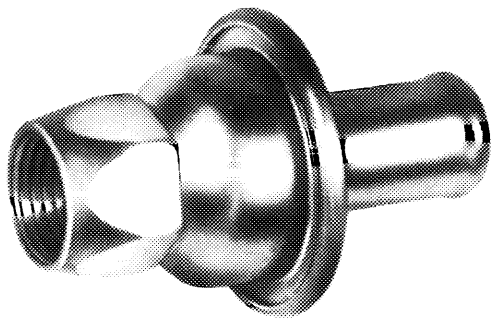
Design and function of air switch-over valve (41) corresponds to the already known diverter valve with vent, except that this valve is used here to switch over the air injection.



107-9139

Check valve

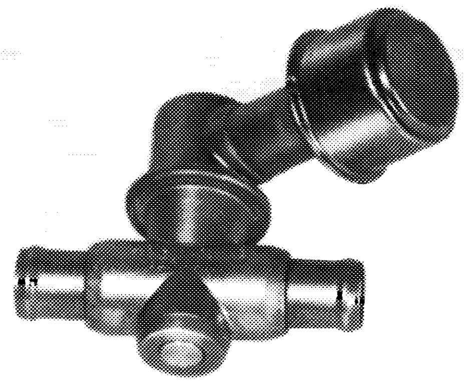
The check valve prevents hot exhaust gases from flowing into air line.



107-9193

Pressure relief valve

The excess air delivered by the air pump at high engine speeds is discharged into the open air by the pressure relief valve starting at a line backpressure of approx. 0.266 bar gauge pressure. An air filter is attached to pressure relief valve for silencing.

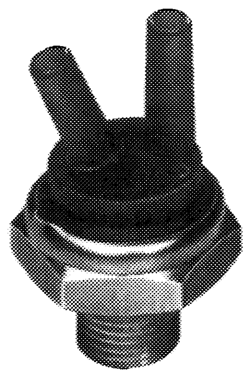


107-13007

Thermo valve 17 °C (color code blue)

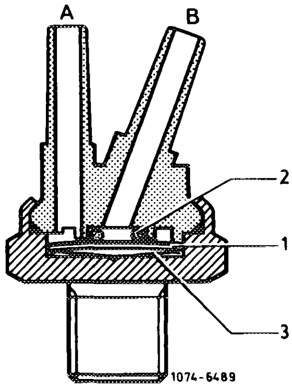
The thermovalve (61) is screwed into cylinder head (sensor box) and opens at approx. 17 °C coolant temperature. Below 17 °C coolant temperature the bimetallic plate rests against O-ring and closes connection "B".

Above 17 °C coolant temperature the bimetallic plate snaps downward when heated. Both connections are connected to each other.



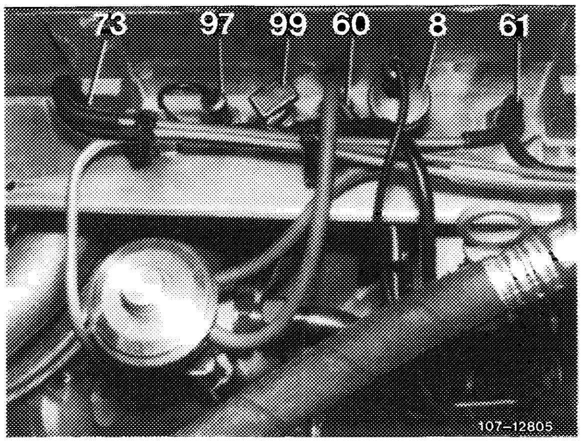
107-10895

The vacuum line to intake pipe should be plugged to connection "B", since this is the only way to guarantee the absolute absence of leaks between bimetallic plate and O-ring.



1 Bimetallic plate
2 O-ring
A Vacuum terminating line
B Vacuum originating line

Thermovalve 50 °C (color code black with green dot)



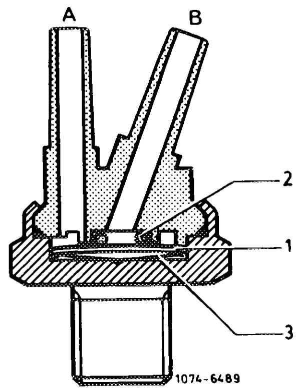
The thermovalve (73) is also screwed into cylinder and **closes** at a coolant temperature of approx. 50 °C.

Below 50 °C coolant temperature the vacuum from prior thermovalve 17 °C (61) can act directly on diverter valve (41) via thermo valve 50 °C (73).

Above approx. 50 °C coolant temperature the bimetallic plate snaps over under influence of heat and the connection to thermovalve 17 °C (61) is closed.

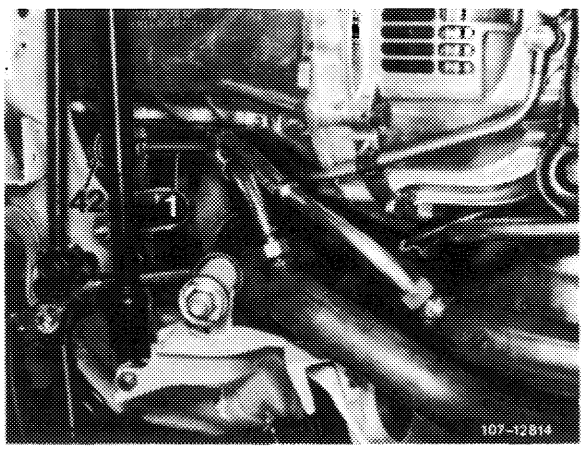
The vacuum hose of thermovalve 17 °C (61) should always be plugged to diagonal connection (B) since this alone guarantees absolute protection against leaks when valve is closed.

Note: Color code starting model year 1978 is **green,** designation "50 AC 13".



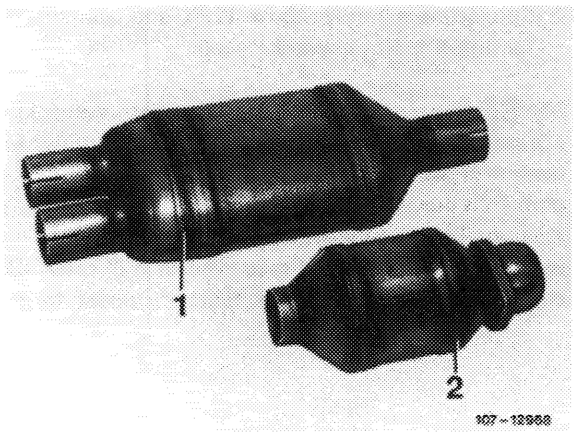
Air injection line

An air line (1) is installed on engine for air injection between catalysts.



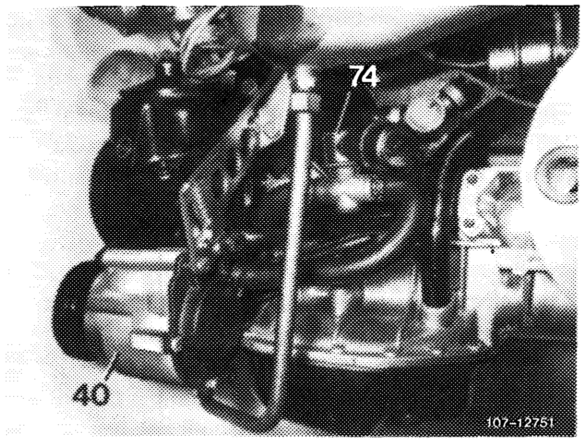
Catalysts

Three catalysts are installed in exhaust system in front of mufflers (silencers).
One small catalyst (2) each for three cylinders is mounted directly on exhaust manifold and one underfloor catalyst (1) for all six cylinders under vehicle floor.



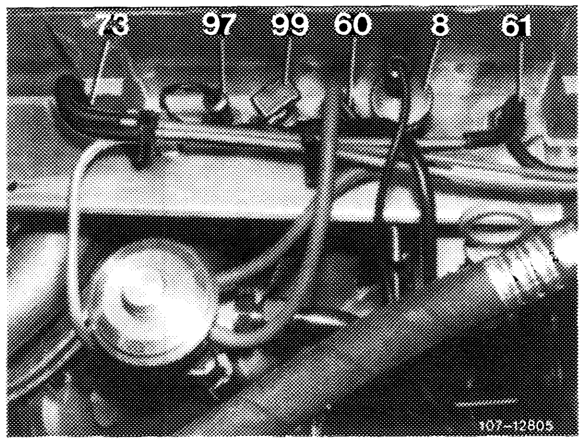
Operation

The air pump (40) is driven by the crankshaft via a V-belt and delivers constantly air when the engine is running. The air flows to pressure relief valve (74) which discharges the excess air delivered at high speeds into the open air starting at a backpressure of approx. 0.266 bar.



From pressure relief valve (74) the excess air is diverted into the exhaust ducts of the cylinder head via the air switch-over valve (41) or behind the small catalysts into the exhaust pipes.

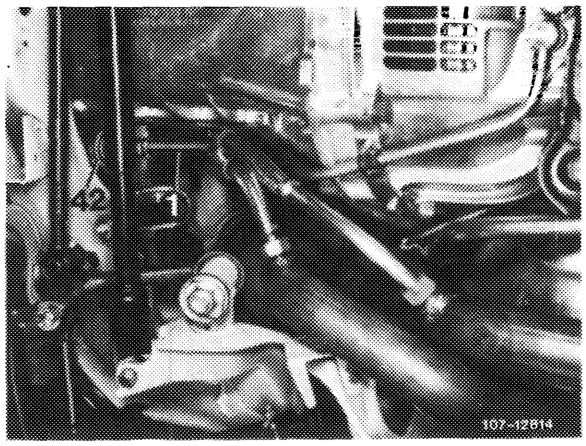
The air switch-over by means of the air switch-over valve is controlled by thermovalves 17 °C (61) and 50 °C (73).



There are three temperature ranges:

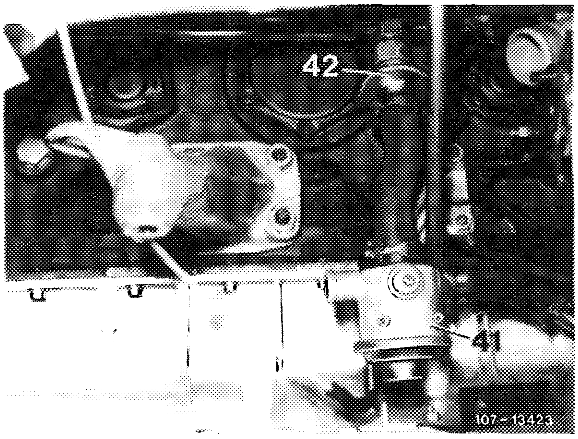
1. **Coolant temperature below 17 °C** (air injection behind small catalysts in exhaust pipes)

The thermovalve 17 °C (61) is closed, the thermovalve 50 °C (73) is open. No vacuum flows to diaphragms of air switch-over valve (41), the diaphragm is positively vented by the vent cap on valve. The compression spring in air switch-over valve closes the injection line to cylinder head. The delivered air is injected into exhaust pipes behind the small catalysts.



2. **Coolant temperature above 17 °C and below 50 °C** (air injection into cylinder head)

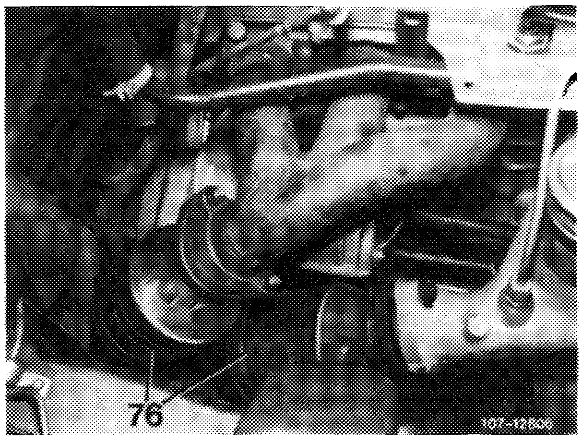
The thermovalve 17 °C (61) and the thermovalve 50 °C (73) are open. The vacuum from intake pipe flows to diaphragm of air switch-over valve (41) and the diaphragm is pushed upwards against force of spring. The injection line to cylinder head is opened, the line between the catalysts is closed. The air is injected via check valve (42) into exhaust ducts of cylinder head.



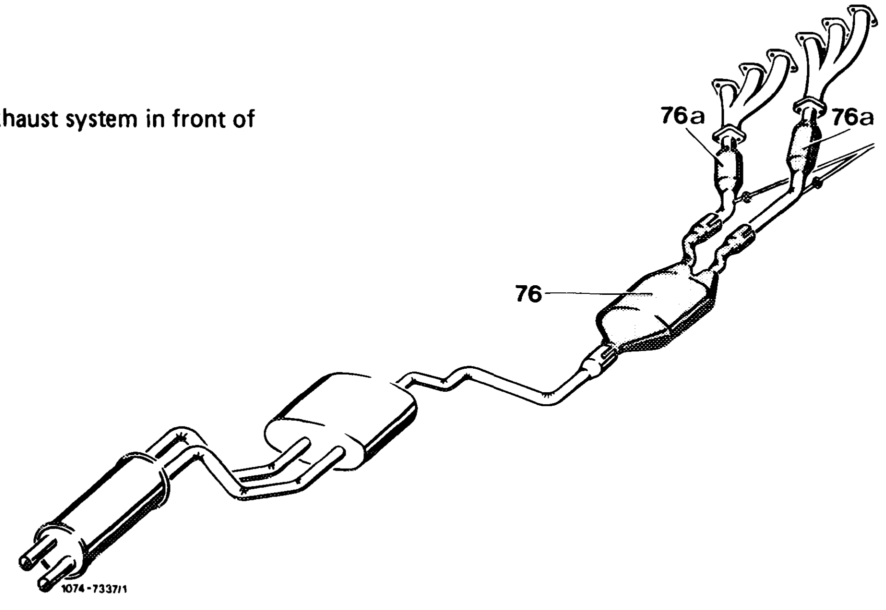
3. **Coolant temperature above 50 °C** (air injection into exhaust pipes behind small catalysts)

Thermovalve 17 °C (61) is open, thermovalve 50 °C (73) is closed. No additional vacuum flows to diaphragm of air switch-over. The diaphragm chamber is positively vented (connected to atmosphere) via vent cap on valve. The compression spring in air switch-over valve closes the injection line to cylinder head. The delivered air is injected into the exhaust pipes behind small catalysts via check valve (42).

The oxygen in the injected air encounters the hot exhaust gases for reaction in underfloor catalyst.

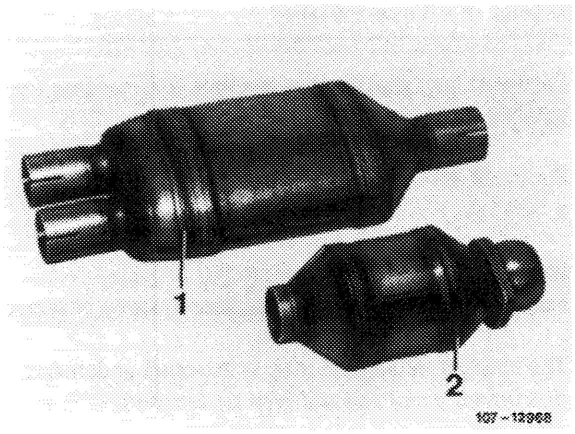


The catalysts are in exhaust system in front of mufflers (silencers).



The catalyst comprises a monolith elastically supported in a wire netting, a honeycomb-shaped cylindrical body of ceramic material. The noble metal evaporated on the monolith, the actual catalyst, accelerates the oxidation of CO and hydrocarbons while adding fresh air at the proper temperature.

To maintain function of the catalyst, the engine should be operated with lead-free fuel only.



Avoid overheating of catalyst.

Extended overheating of the catalyst will result in catalyst damage, i.e. the monoliths in catalyst may melt.

Overheating of catalyst may occur if:

a) The specified engine service is not performed.

   Perfect spark plugs are important for life of catalyst.

b) The fuel air mixture is excessively enriched by irregular operation of engine.

c) The exhaust emission control system has been arbitrarily modified.

The three catalysts should be changed after 37 500 miles.

The required change of catalyst is indicated by means of a warning lamp in instrument cluster.

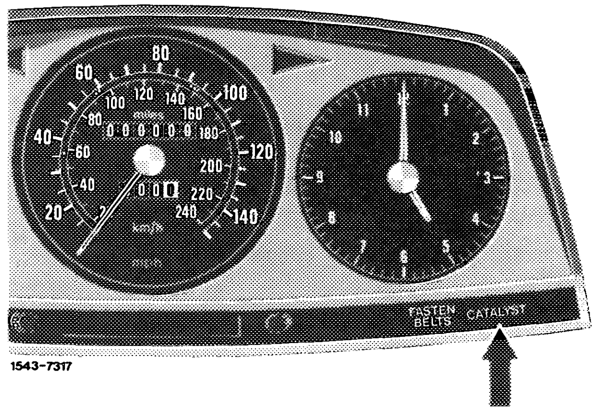
Change of catalyst indicator

Pertinent laws specify that the time for changing the catalyst must be indicated.

On these vehicles the required change is indicated by a "CATALYST" warning lamp.

Note: Since tourist vehicles are not provided with catalysts, the following instructions must be observed:

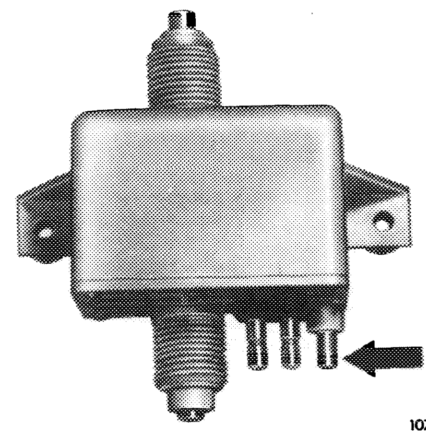
The catalyst mileage counter is attached underneath instrument panel and is driven by tachometer shaft. When the required mileage is attained, a contact closes and the "CATALYST" warning lamp lights up.



1543-7317

Model 123

When the "CATALYST" warning lamp lights up, open contact in mileage counter by means of pin (arrow) to extinguish warning lamp.



107-10093

E. Air injection tourist vehicles Federal version

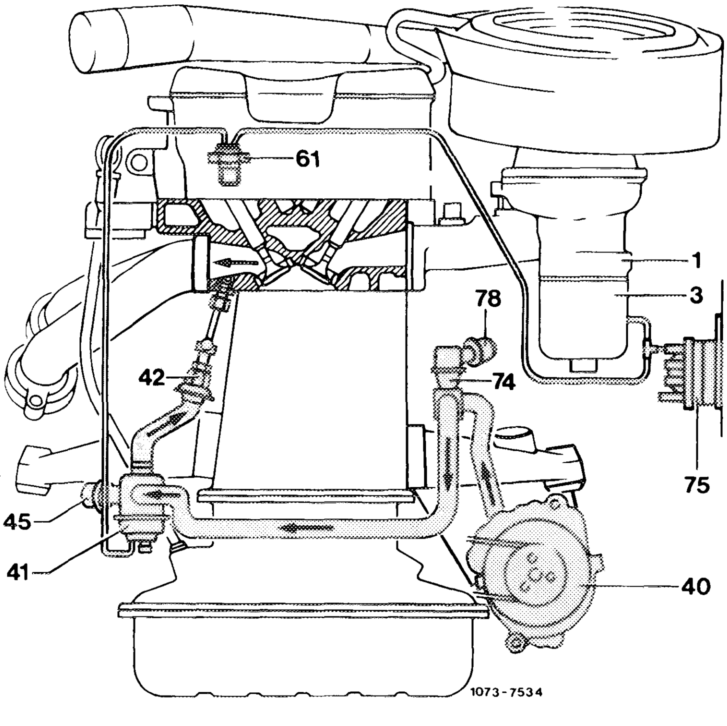
Tourist vehicles are supplied ex factory without a catalyst.

For this reason, only the air injection is different from standard equipment.

To reduce the incompletely burnt components in exhaust gas, air is injected into hot zone behind exhaust valves.

Afterburning is controlled via the engine temperature and vacuum conditions in intake pipe.

To prevent backfiring in exhaust, the air injection is shut off in given driving ranges.



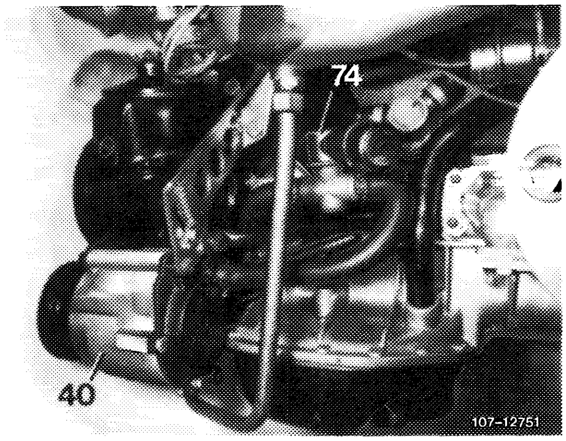
1 Mixture controller
3 Intake pipe
40 Air pump
41 Diverter valve (air switch-over valve)
42 Check valve
45 Air filter
61 Thermovalve 17 °C
74 Pressure relief valve
75 Pressure transducer
78 Air filter for silencing

Components of air injection:

Except for catalyst, components are similar to Federal version.

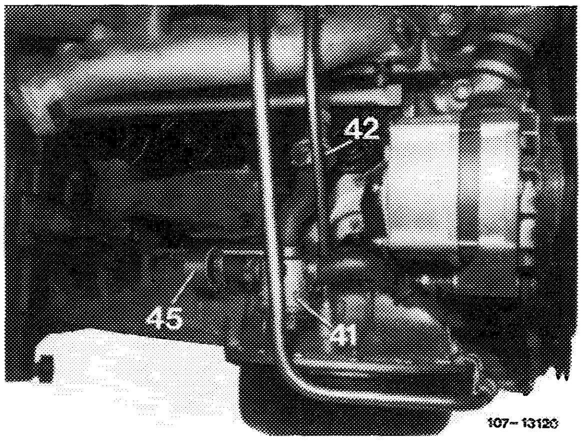
Operation

Starting at a coolant temperature of approx. 17 °C in cylinder head air is discharged into exhaust ducts of cylinder head at idle speed, during deceleration and under partial load.



The air pump is driven by the crankshaft via a V-belt and delivers constantly air when the engine is running. The air flows to pressure relief valve (74) which discharges the excess air delivered at high speeds into the open air starting at a backpressure of approx. 0.266 bar.

From pressure relief valve (74) th excess air is diverted into the exhaust ducts of the cylinder head via the diverter valve (41), and starting at approx. 17 °C coolant temperature via the check valve (42), while below approx. 17 °C coolant temperature the excess air is discharged into the open air through the air filter for silencing (45).



F. Air injection tourist vehicles California version

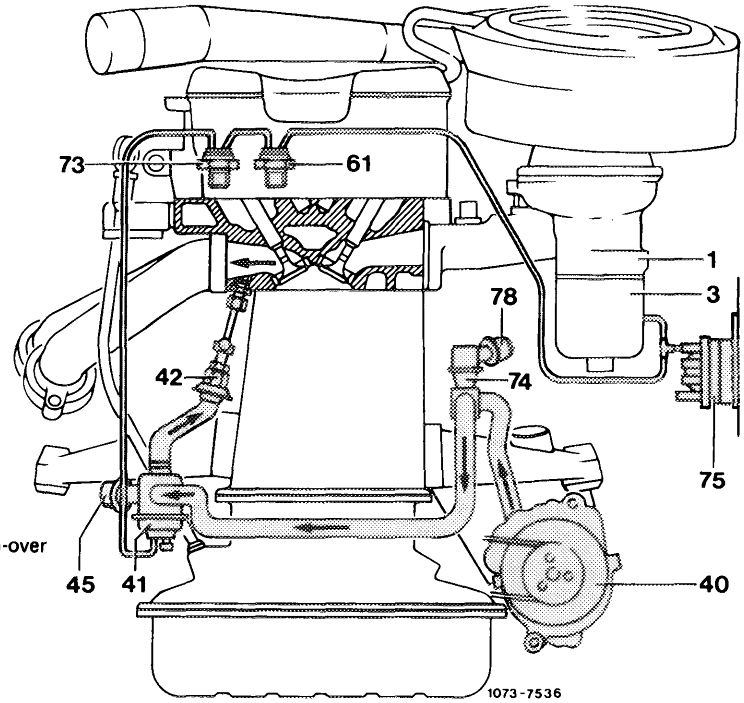
Tourist vehicles are supplied ex factory without a catalyst.

For this reason, only the air injection is different from standard equipment.

To reduce the incompletely burnt components in exhaust gas, air is injected into hot zone behind exhaust valves.

Afterburning is controlled via the engine temperature and vacuum conditions in intake pipe.

To prevent backfiring in exhaust, the air injection is shut off in given driving ranges.



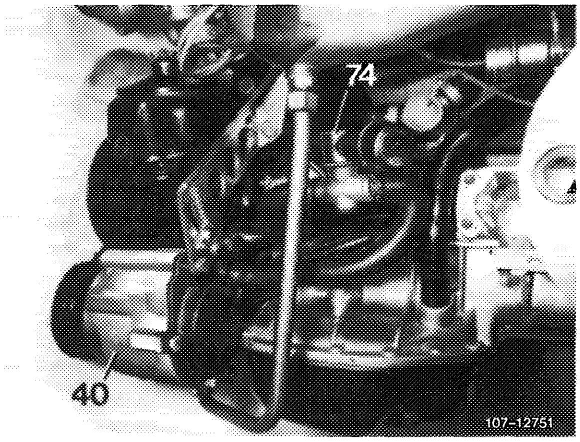
1 Mixture controller
3 Intake pipe
40 Air pump
41 Diverter valve (air switch-over valve)
42 Check valve
61 Thermovalve 17 °C
74 Pressure relief valve
75 Pressure transducer
78 Air filter for silencing

Components of air injection:

Except for catalyst and the air injection line in-between the small catalysts, the components are similar to the California version.

Operation

The air pump (40) is driven by the crankshaft via a V-belt and delivers constantly air when the engine is running. The air flows to pressure relief valve (74) which discharges the excess air delivered at high speeds into the open air starting at a backpressure of approx. 0.266 bar.



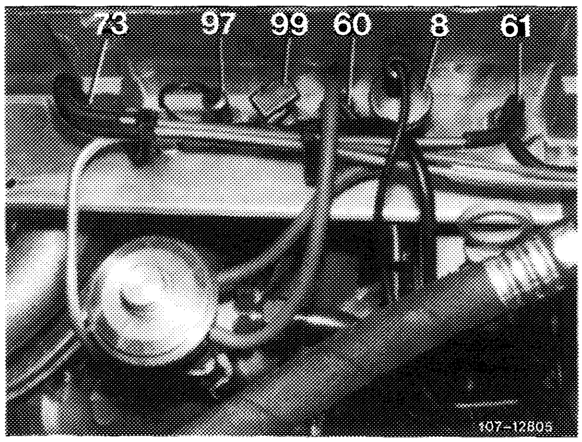
From pressure relief valve (74) the air is diverted via air switch-over valve (41) either into injection ducts in cylinder head or is discharged into the open air through air filter (for silencing).

The air switch-over by means of air switch-over valve is controlled by thermovalve 17 °C (61) and 50 °C (73).

There are three temperature ranges:

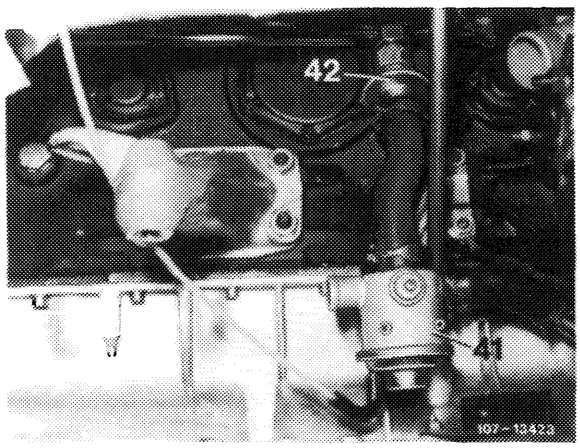
1. **Coolant temperature below 17 °C** (air discharge into open air)

The thermovalve 17 °C (61) is closed, the thermovalve 50 °C (73) is open. No vacuum flows to diaphragm of air switch-over valve (41), the diaphragm is positively vented by the vent cap on valve. The compression spring in air switch-over valve closes the injection line to cylinder head. The delivered air is discharged into the open air through the air filter (for silencing).



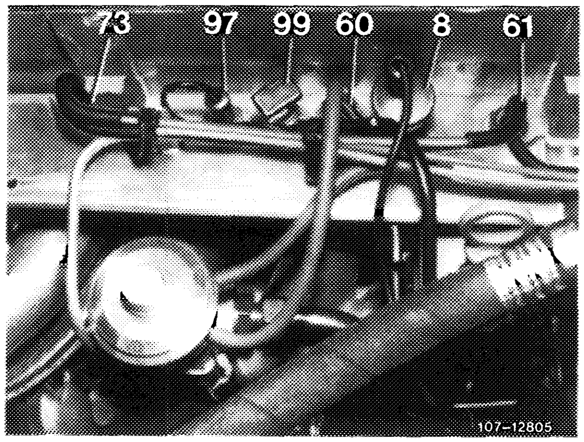
2. **Coolant temperature above 17 °C and below 50 °C** (air injection into cylinder head)

The thermovalve 17 °C (61) and the thermovalve 50 °C (73) are open. The vacuum from intake pipe flows to diaphragm of air switch-over valve (41) and the diaphragm is pushed upwards against force of spring. The injection line to cylinder head is opened, the discharge line into the open air is closed. The air is injected via check valve (42) into exhaust ducts of cylinder head.



3. Coolant temperature above 50 °C (air discharge into the open air)

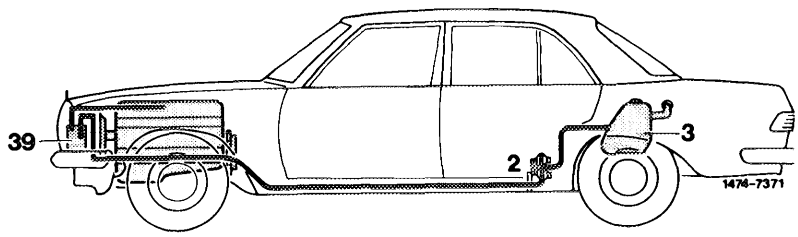
Thermovalve 17 °C (61) is open, thermovalve 50 °C (73) is closed. No additional vacuum flows to diaphragm of air switch-over valve. The diaphragm chamber is positively vented (connected to atmosphere) via vent cap on valve. The compression spring in air switch-over valve closes the injection line to cylinder head. The delivered air is discharged into the open air through air filter (for silencing).



G. Fuel evaporation control model year 1977

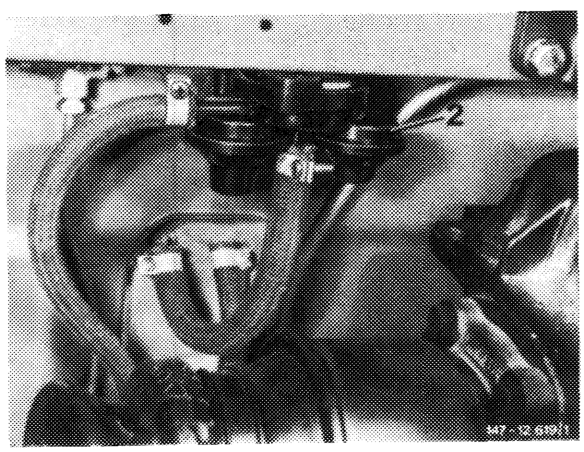
A fuel evaporation control system has been installed to improve emissions which are not directly connected with engine combustion.

Function diagram



2 Valve system
3 Fuel tank
39 Charcoal canister

Components of fuel evaporation control system:



Valve system

The valve system is mounted underneath vehicle at level of rear leg room.

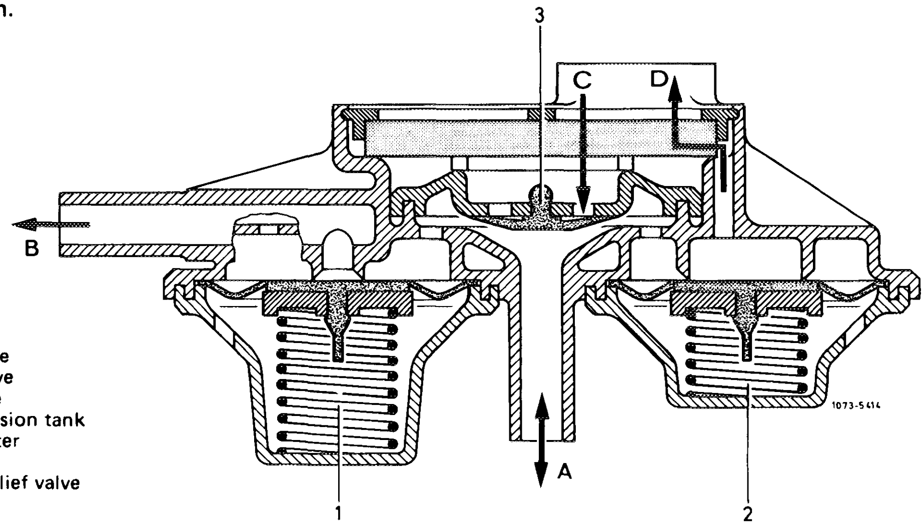
The valve system comprises three valves:

1. Negative vent valve
2. Pressure relief valve
3. Positive vent valve

The **negative vent valve** opens at a slight overpressure. The evaporation vapours are flowing via negative vent valve (1, direction B) into a line toward charcoal canister.

The **pressure relief valve** opens as a safety valve in the event of an overpressure in fuel evaporation system. The fuel vapours are bled directly into the open air.

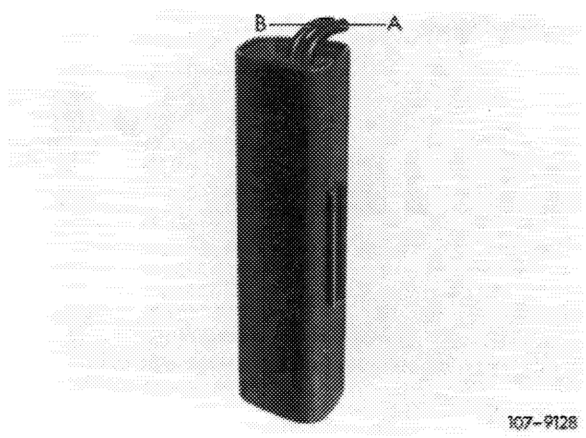
The **positive vent valve** opens whenever cooling down of fuel tank results in a vacuum.



1 Negative vent valve
2 Pressure relief valve
3 Positive vent valve
A To valve/to expansion tank
B To charcoal canister
C Fresh air inlet
D Outlet pressure relief valve

Charcoal canister

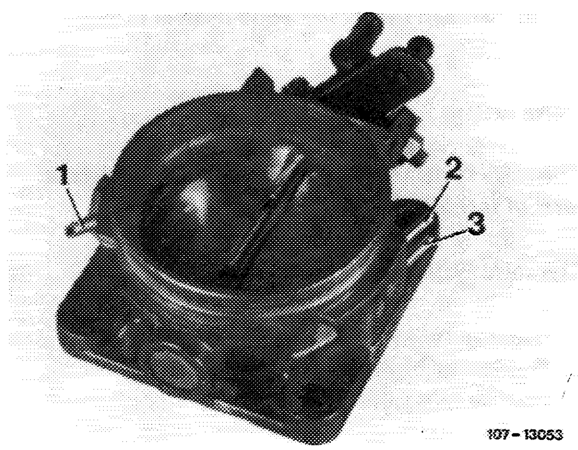
The fuel evaporation vapours from fuel tank are stored in charcoal canister and are drawn again out of canister when driving.



A Connection tank vent
B Draw-off connection

Throttle valve housing

The throttle valve housing is provided with a connection to draw evaporation vapours from charcoal canister.



1 Vacuum connection ignition adjustment retard
2 Vacuum connection ignition adjustment advance
3 Vacuum connection charcoal canister

Operation

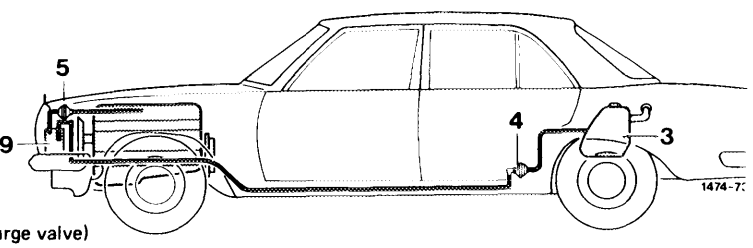
The fuel evaporation vapours from fuel tank are routed to charcoal canister via valve system (2).

In the charcoal canister the fuel evaporation vapours are stored when the engine is stopped and are drawn off into throttle valve housing starting at a given throttle valve position when the engine is running.

H. Fuel evaporation control system model year 1978/79

A fuel evaporation control system has been installed to improve emissions which are not directly connected with engine combustion.

Function diagram

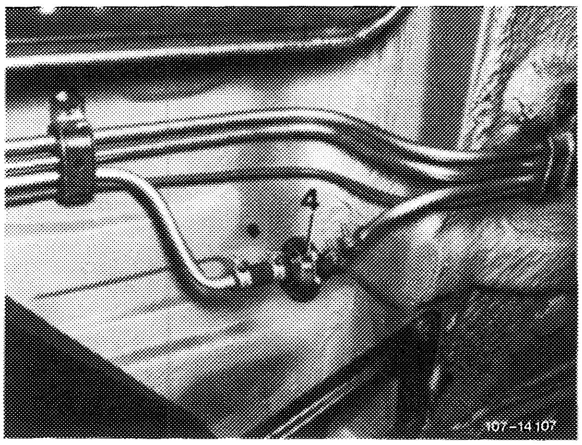


3 Fuel tank
4 Vent valve unit
5 Regenerating valve (purge valve)
39 Charcoal canister

Components of fuel evaporation control system:

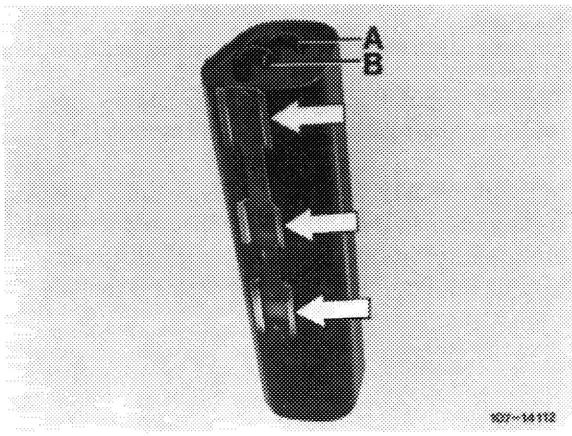
Vent valve unit

The vent valve unit is mounted underneath vehicle at level of rear leg room and replaces the valve system known from model year 1977. The unit comprises a pressure relief valve and a vacuum relief valve.



Charcoal canister

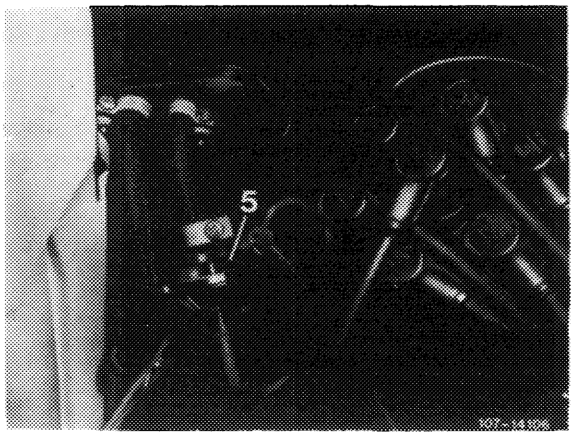
The fuel evaporation vapours from fuel tank are stored in charcoal canister and are drawn again out of canister when driving.



A Draw-off connection
B Tank vent connection

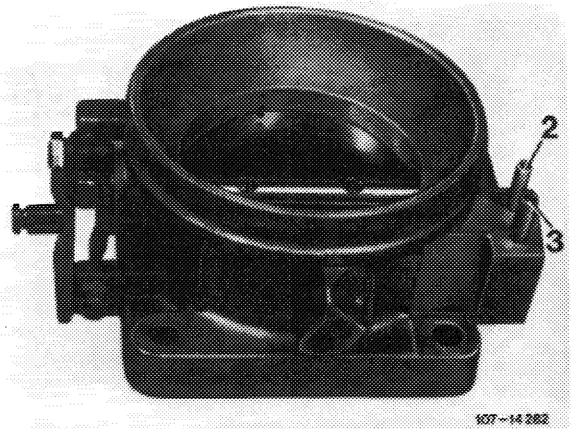
Regenerating valve (purge valve)

The regenerating valve (5) is located in regenerating line (purge line) from charcoal canister to throttle valve housing.



Throttle valve housing

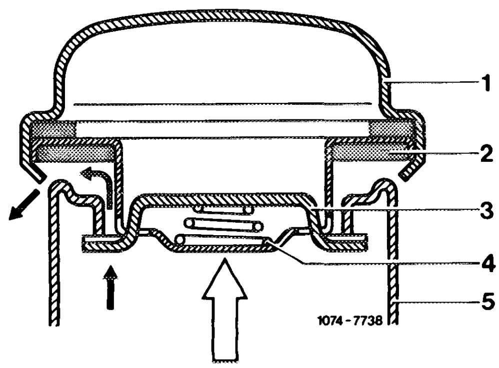
To avoid mixing up of vacuum connections, the OD of the vacuum connection (3) to charcoal canister has been increased from 4 to 5 mm. Two regenerating bores (purge bores) were mounted above throttle valve for drawing off evaporation vapours from charcoal canister.



2 Vacuum connection ignition advance
3 Vacuum connection charcoal canister

Fuel tank cap

To avoid increased overpressure in fuel tank, the fuel tank cap has been modified.



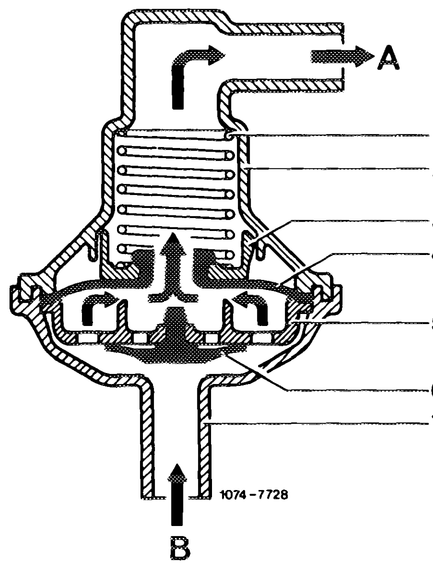
1 Cap
2 Sealing ring
3 Clamp
4 Compression spring
5 Filler neck

Operation

Evaporation system

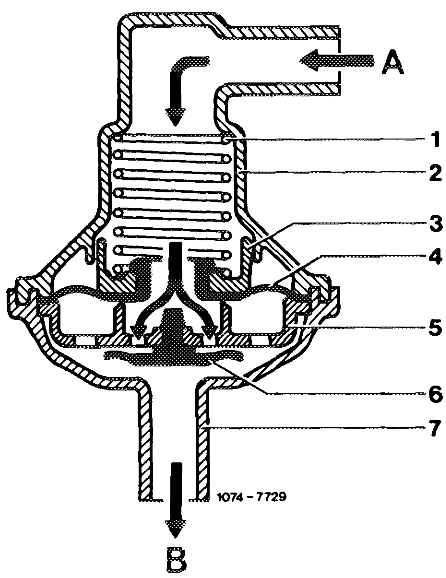
When the pressure in the fuel tank reaches 30–50 mbar, the pressure relief valve (4) in vent unit opens allowing the fuel vapours to flow to the charcoal canister where they are stored if the engine is not running.

The pressure in fuel tank is increased to 30–50 mbar by the vent valve unit (4). As a result, less fuel vapours can escape from fuel tank.



Vent valve unit open to charcoal canister

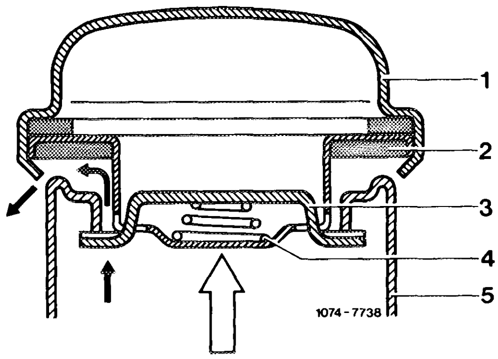
1 Compression spring
2 Valve housing
3 Spring seat
4 Pressure relief valve
5 Valve disc
6 Positive vent valve
7 Connection
A Connection charcoal canister
B Connection fuel tank



Vent valve unit open to fuel tank

When the fuel cools down, the smaller volume is compensated by the intake of air or fuel evaporation vapours from charcoal canister via vacuum relief valve (6) starting at a vacuum of 1–16 mbar. If the vacuum in fuel tank drops below 1 mbar, the vacuum relief valve (6) will close.

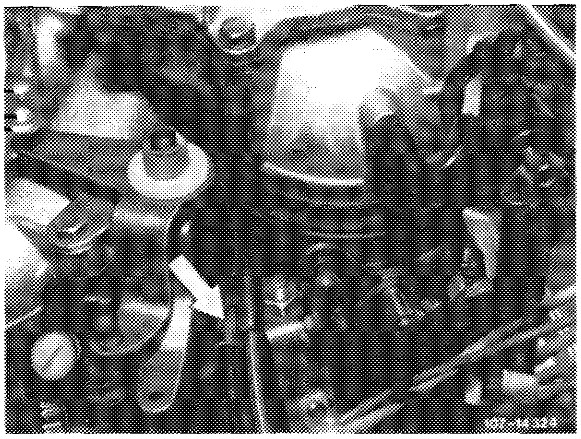
If the pressure in the fuel tank increases above 0.1–0.3 bar due to a malfunction in the fuel evaporation system, the fuel vapours escape via the fuel tank cap.



1 Tank cap
2 Sealing ring
3 Clamp
4 Compression spring
5 Filler neck

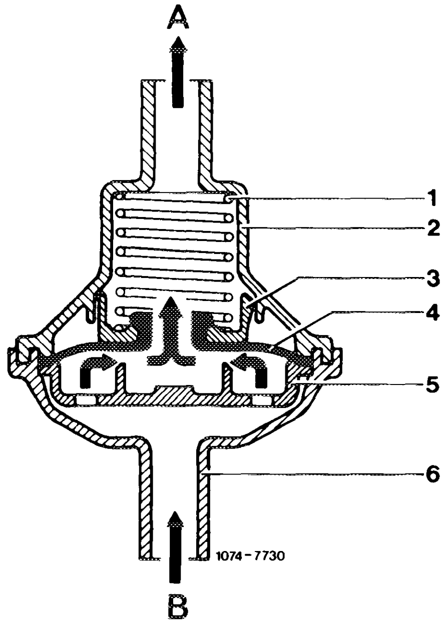
Regenerating system (purge system)

The charcoal canister is connected to the throttle valve housing by means of a line in which the regenerating valve (purge valve) is enclosed.



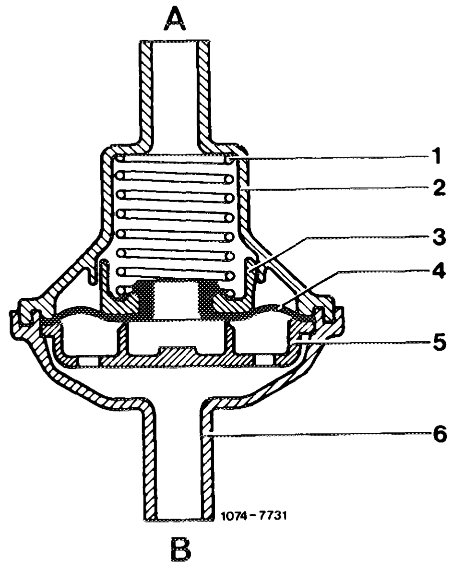
Arrow = throttle valve draw-off connection

When the engine is running and the vacuum in the regenerating line (purge line) exceeds 30–50 mbar, the regenerating valve (purge valve) opens. The fuel vapours stored in charcoal canister can be drawn off depending on the throttle valve position.



Regenerating valve (purge valve) open

1 Compression spring
2 Valve housing
3 Spring seat
4 Pressure relief valve
5 Valve disc
6 Connection
A Connection throttle valve housing
B Connection charcoal canister



Regenerating valve (purge valve) closed

When opening the throttle valve the two regenerating bores (purge bores) in throttle valve housing which are entering a common duct are both passed over one after the other. As a result, regeneration in lower partial load range begins in dosages which are not influencing the driving characteristics.

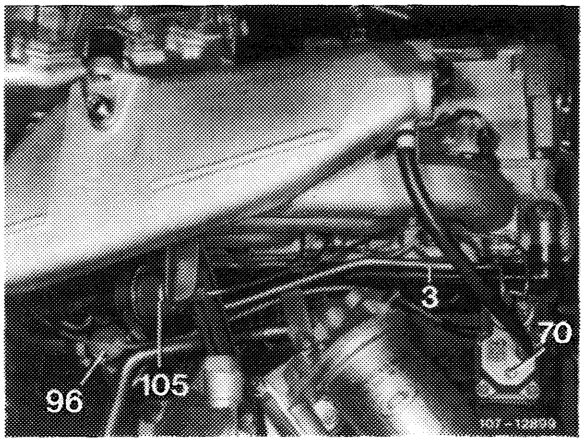
At idle and during deceleration (throttle valve closed) the two regenerating bores are at atmospheric side of throttle valve. The regenerating valve is closed, there is no regeneration of charcoal in canister.

I. Vehicles for Federal control system higher altitudes model year 1977

Vehicles for Federal control system for higher altitudes are provided with the Federal emission control system and differ only by the warming-up governor (70).

The warming-up governor carries the following designation:

MB part no.	000 070 12 61
Bosch no.	0 438 140 041

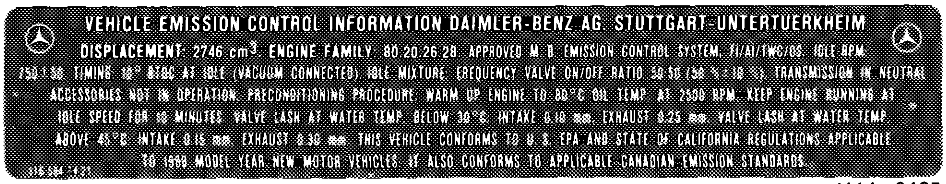


Model year 1980/81

A. General information

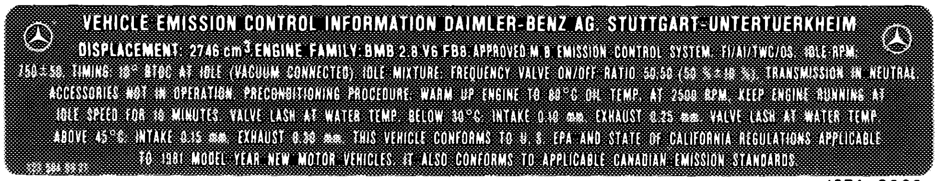
Contrary to model years 1977–1979 a uniform emission control system is installed for Federal system and California.

Information plate model year 1980



1144–9407

Information plate model year 1981



1074–9906

For model year 1980, the engine identification data are encoded in an 8-digit code number.

Example: Engine Family 80.20.26.28 (model year 1980)

80 20 2 6 28

Model year

National code number

20 = Federal and California
21 = Federal
22 = California

Combustion system

1 = Carburetor
2 = Injection, gasoline
3 = Diesel
4 = Diesel, turbo

Number of cylinders

Displacement
approx. 2800 cc

For model year 1981 the engine identification data are encoded in a 10-digit code.

Example: Engine Family B MB 2,8 V6FB8 (model year 1981)

B MB 2,8 V G F B 8

Model year
A = 1980, B = 1981 etc.

Manufacturer's code
Mercedes-Benz

Displacement
approx. 2800 cc

Vehicle class
D = Passenger car with diesel engine
V = Passenger car with gasoline engine

Type of fuel delivery
6 = Injection, mechanical
9 = Injection, mechanical with turbocharger

Catalyst version
F = 3-way catalyst in combination with lambda control
J = No catalyst (diesel)

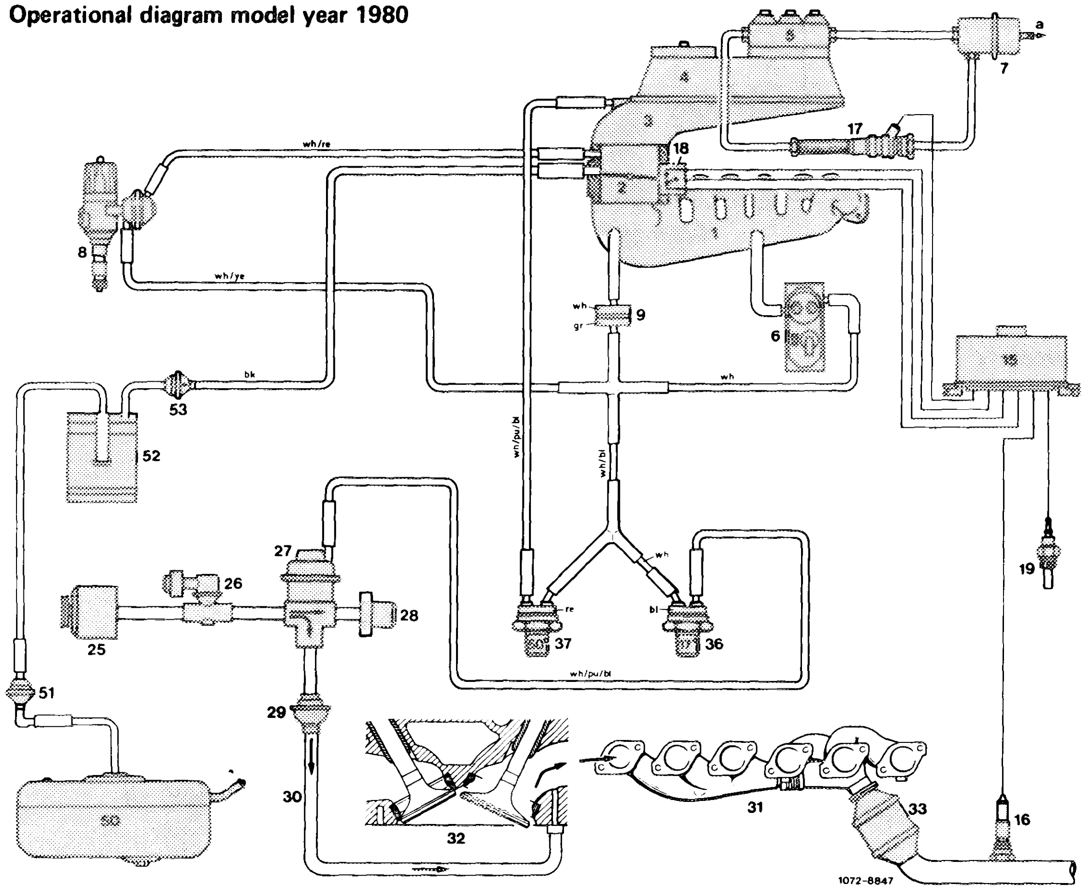
Placed at disposal by manufacturer

Check number

Identification of vacuum lines model year 1980

The basic color of vacuum lines for emission control system is transparent (white).	Additional color stripes are used for easier identification of individual functions.
Emission control device	
Ignition	
Ignition advance	red
Ignition retard	yellow/purple
Air injection	blue

Operational diagram model year 1980



1	Intake manifold	16	Oxygen sensor	31	Exhaust manifold	Color code	
2	Throttle valve housing	17	Frequency valve	32	Cylinder head	bk	= black
3	Air guide housing	18	Throttle valve switch	33	Primary catalyst	bl	= blue
4	Air flow sensor	19	Temperature switch oil 16 °C/60 °F	36	Thermovalve 17 °C/62 °F	gr	= green
5	Fuel distributor	25	Air pump	37	Thermovalve 50 °C/122 °F	ye	= yellow
6	Warm-up compensator	26	Pressure relief valve	50	Fuel tank	re	= red
7	Damper	27	Air relief valve	51	Vent valve unit	wh	= white
8	Ignition distributor	28	Silencer	52	Charcoal canister	pu	= purple
9	Orifice	29	Check valve	53	Purge valve		
15	Control unit	30	Intake line	a	Leak-off connection		

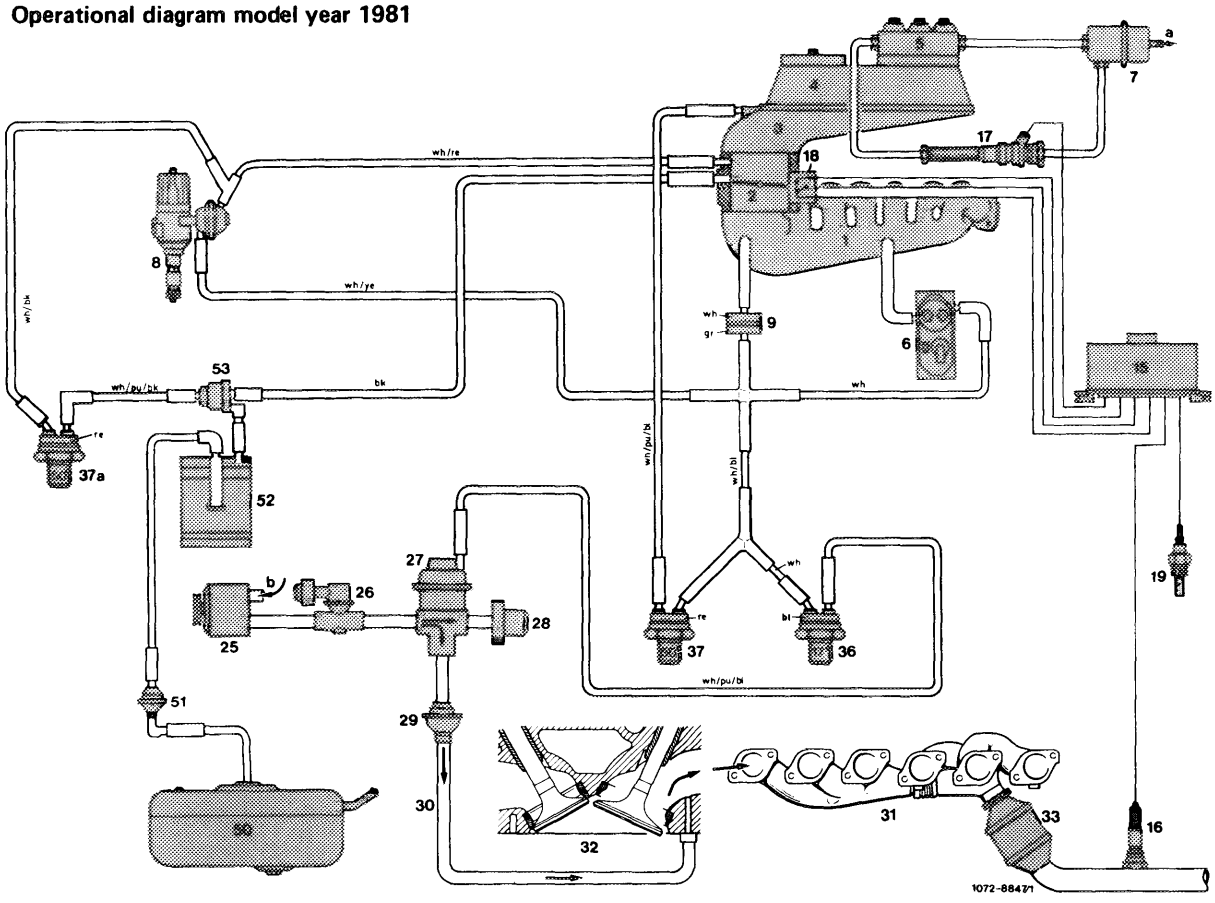
Identification of vacuum lines model year 1981

The basic color of vacuum lines for emission control system is transparent (white).

Additional color stripes are used for easier identification of individual functions.

Emission control device	Color coding of originating vacuum line	Color coding of terminating vacuum line
Ignition		
Ignition advance	red	
Ignition retard	yellow	
Air injection	blue	purple/blue
Fuel evaporation control system Thermovalve 50 °C/122 °F	black	purple/black

Operational diagram model year 1981

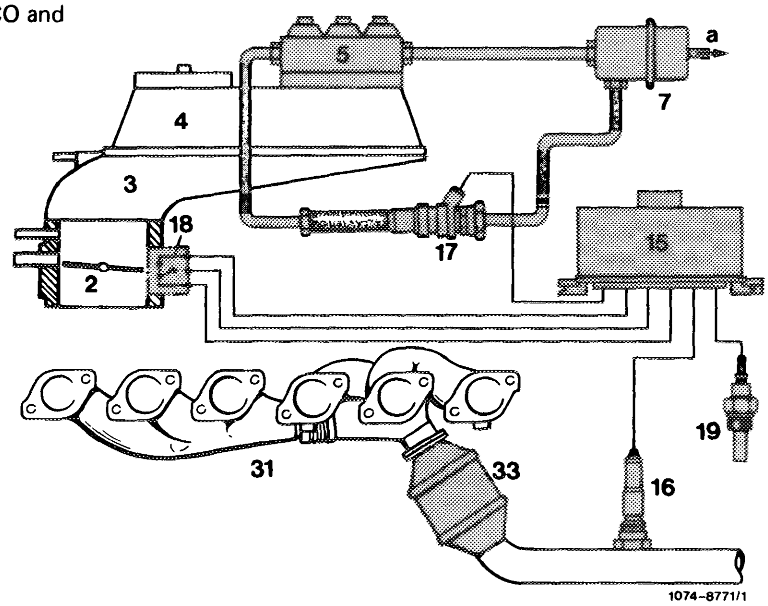


1	Intake manifold	18	Throttle valve switch	36	Thermovalve 17 °C/62 °F	Color code	
2	Throttle valve housing	19	Temperature switch oil 16 °C/60 °F	37	Thermovalve 50 °C/122 °F	bk	= black
3	Air guide housing	25	Air pump	37a	Thermovalve 50 °C/122 °F	bl	= blue
4	Air flow sensor	26	Pressure relief valve	50	Fuel tank	gr	= green
5	Fuel distributor	27	Air relief valve	51	Vent valve unit	ye	= yellow
6	Warm-up compensator	28	Damper valve	52	Charcoal canister	re	= red
7	Damper	29	Check valve	53	Pruge valve	wh	= white
8	Ignition distributor	30	Intake line	a	Leak-off connection	pu	= purple
9	Orifice	31	Exhaust manifold	b	from air cleaner		
15	Control unit	32	Cylinder head				
16	Oxygen sensor	33	Primary catalyst				
17	Frequency valve						

B. Lambda control (λ = lambda)

To comply with stricter emission regulations for internal combustion engines, it is necessary to meter the air-fuel mixture more accurately.

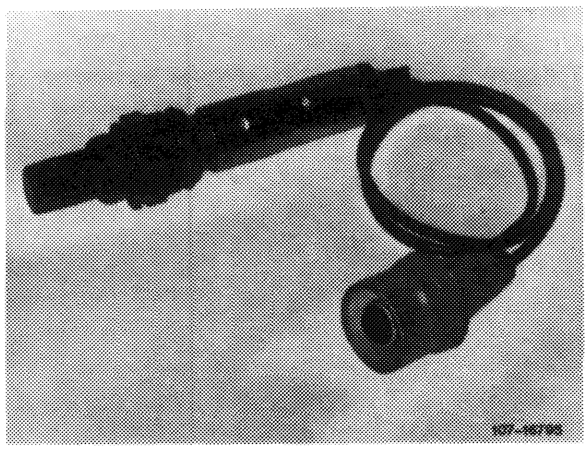
Lambda control ensures that a constant air-fuel ratio is maintained at approx. 14.5:1 (λ = 1). This means that an exact proportioning between the injected fuel and the air drawn-in can be obtained. This is the ideal mixture ratio which reduces, in conjunction with the 3-way catalysts, the emissions of HC, CO and NO_x in the exhaust gas to a minimum.



2 Throttle valve housing
3 Air guide housing
4 Air flow sensor
5 Fuel distributor
7 Silencer (damper)
15 Control unit
16 Oxygen sensor
17 Frequency valve
18 Throttle valve switch
19 Temperature switch, oil 16 °C/61 °F
31 Exhaust manifold
33 Primary catalyst
a Leak-off connection

Components of lambda control

Oxygen sensor

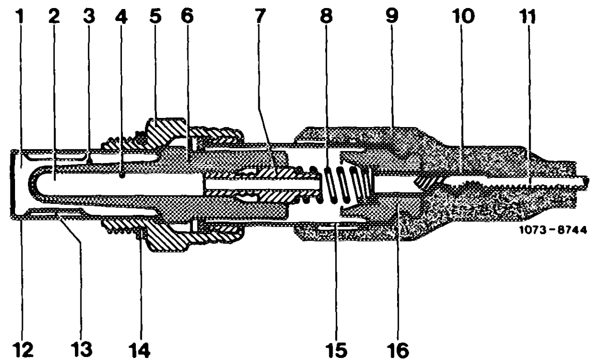


The oxygen sensor is screwed into front part of exhaust pipe and measures the oxygen content in exhaust gases.

Construction

The protective casing (12) protects the ceramic probe (6) against mechanical influences. The outer part of the ceramic body is in contact with the exhaust gases, the inner side with the surrounding air. The ceramic surfaces are coated with a thin layer of gas permeable platinum. In addition, a porous ceramic layer has been added on the exhaust side, which protects the platinum surface underneath against fouling from combustion materials, ensuring a long life of the oxygen sensor.

1	Exhaust gas side	8	Contact spring
2	Outside air side	9	Protective hood
3	Outer electro-conductive layer	10	Crimp connector
4	Inner electro-conductive layer	11	Connecting lead
5	Probe body with hexagon	12	Case
6	Ceramic probe	13	Exhaust gas intake slots
7	Contact bushing	14	Sealing ring
		15	Fresh air intake
		16	Insulator

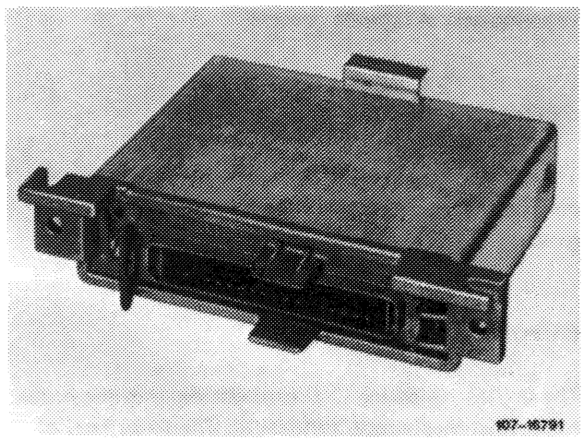


Function

At a temperature of approx. 300 °C/580 °F, the ceramic material becomes conductive to the oxygen ions. A different amount of oxygen between either side (exhaust gas side and fresh air side) of the adjoining surfaces and induces an electrical potential. The value of this potential represents the measurement for oxygen differential on both sides of the oxygen sensor. The oxygen sensor is highly sensitive at a range of $\lambda = 1$ and transmits this output signal as actual value into control unit.

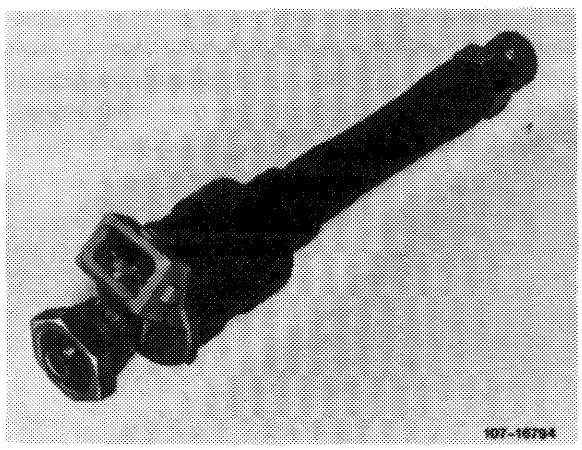
Control unit

The control unit is located in righthand legroom behind lateral paneling. The unit comprises a printed circuit which controls the air-fuel mixture to the ideal value of $\lambda = 1$.



Frequency valve

The frequency valve is attached to the air flow sensor housing. It is connected to a fuel line from the lower chamber of the fuel distributor via pressure damper (silencer) to the return line of the warm-up compensator.



Throttle valve switch

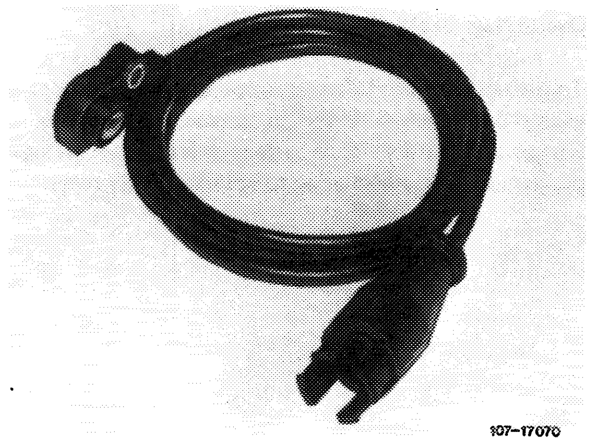
The throttle valve switch is attached to throttle valve housing and has two functions: idle speed and full load contact.

Idle speed contact

The idle speed contact on throttle valve switch limits the control range and thereby serves to stabilize idle speed.

Full throttle contact

When the vehicle is driven in full throttle range (throttle valve at full throttle stop) the full throttle contact in control unit serves to set a fixed on/off ratio 60 : 40 (slightly richer).

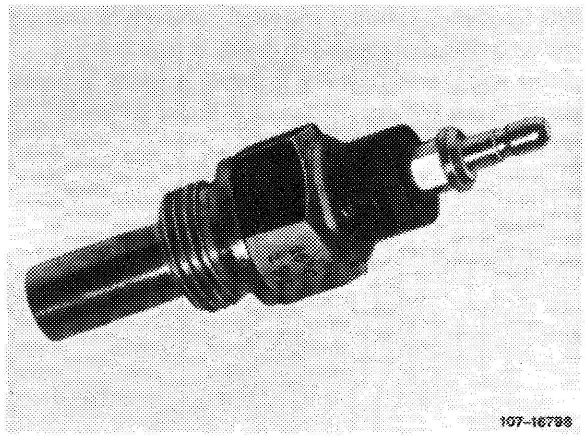


107–17070

Temperature switch oil 16 ± 3 °C/61 ± 5.4 °F

The temperature switch is screwed into oil filter top. Below approx. 16 °C/61 °F engine oil temperature the control unit is connected to minus by way of the closed temperature switch and is set to a fixed on/off ratio of 60/40.

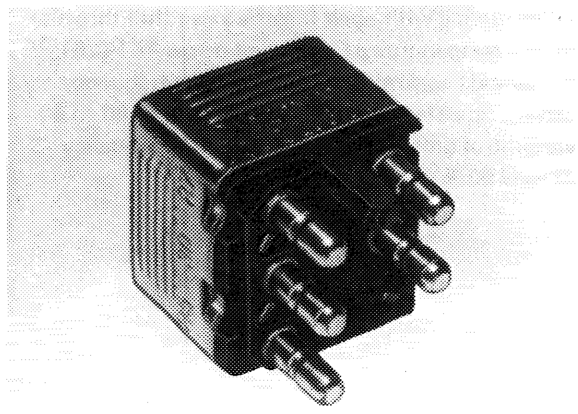
The temperature switch opens at approx. 16 °C/ 61 °F engine oil temperature and interrupts the minus connection. The control unit will then take charge of on/off ratio.



107–16788

Voltage supply relay

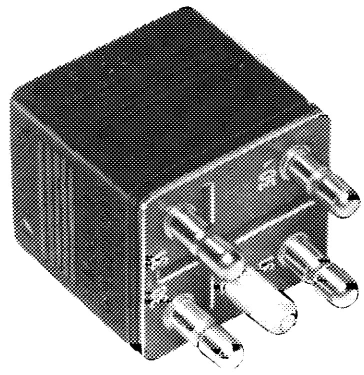
A relay is installed under instrument panel behind glove box for voltage supply to lambda control.



107–17461

Overvoltage protection

To prevent damage to components of lambda control caused by increased voltage of vehicle circuit (quick-charging of battery, loose battery pole) an overvoltage protection is attached prior to voltage supply relay.

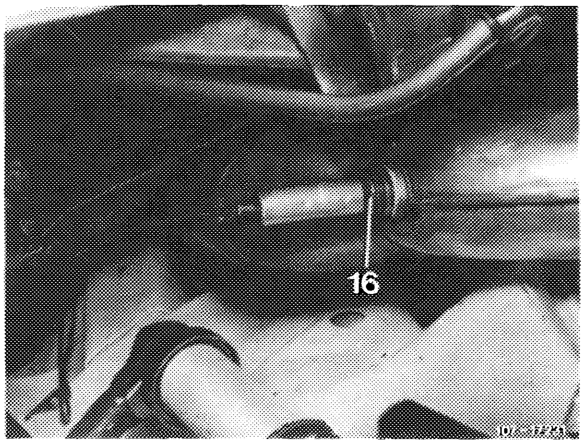


154-17174

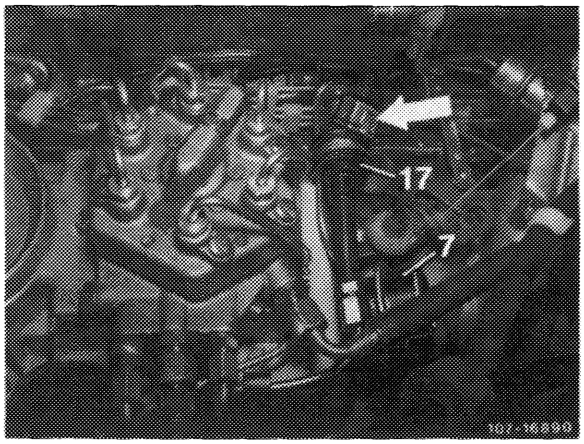
Operation

The oxygen probe (16) is screwed into front exhaust pipe and provides a voltage at an operating temperature above 300 °C/572 °F depending on oxygen content in exhaust gas and thereby informs the control unit whether the air-fuel mixture is richer or leaner than $\lambda = 1$.

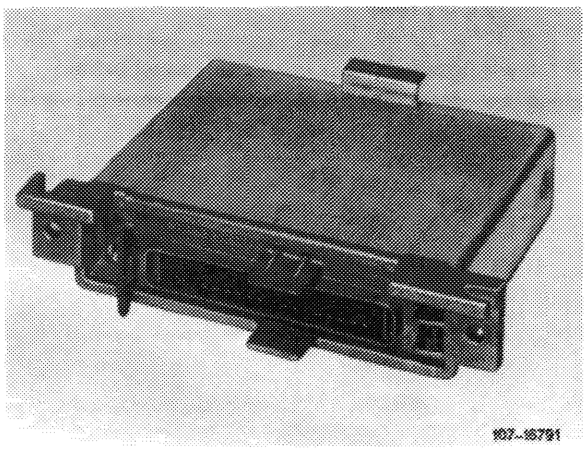
The signal coming from the oxygen probe is converted in control unit into voltage signals which are then transmitted to the frequency valve (17).



The frequency valve is a magnetic valve which changes the differential pressure on control slot of control piston and thereby the injected fuel quantity in dependence of the arriving voltage signals (on/off ratio) (refer to 07.3 Fuel distributor).



When driving with open throttle valve (full throttle) or at a temperature of engine oil below 16 °C/61 °F the lambda control is inoperative. The frequency valve is operated at a fixed on/off ratio of 60 to 40 via control unit, which means that the frequency valve is 60 % opened and 40 % closed.

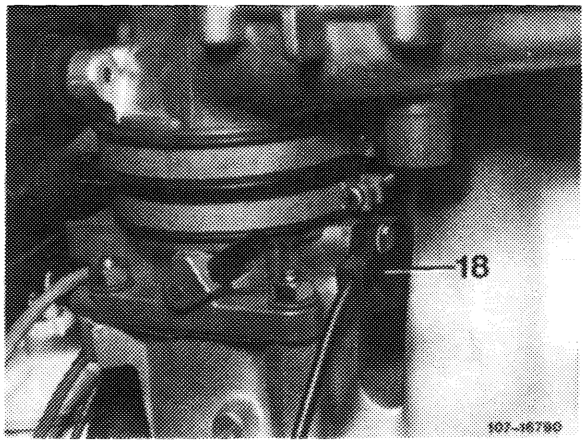


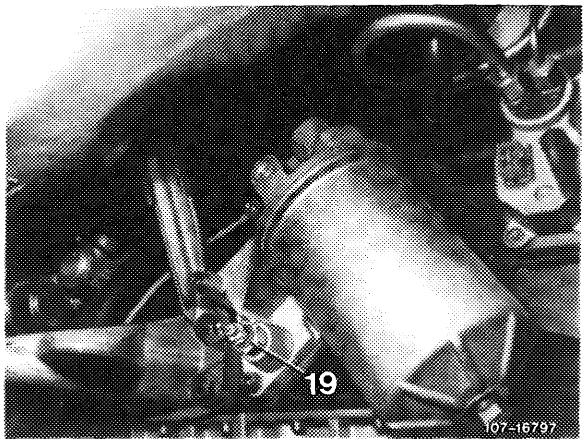
107-16791

The two operating conditions are activated by the throttle valve switch (18) or the temperature switch for oil (19).

After driving 30 000 miles, a warning lamp "oxygen probe" in instrument cluster indicates that replacement is required.

We are therefore recommending replacement of oxygen probe every 30 000 miles.



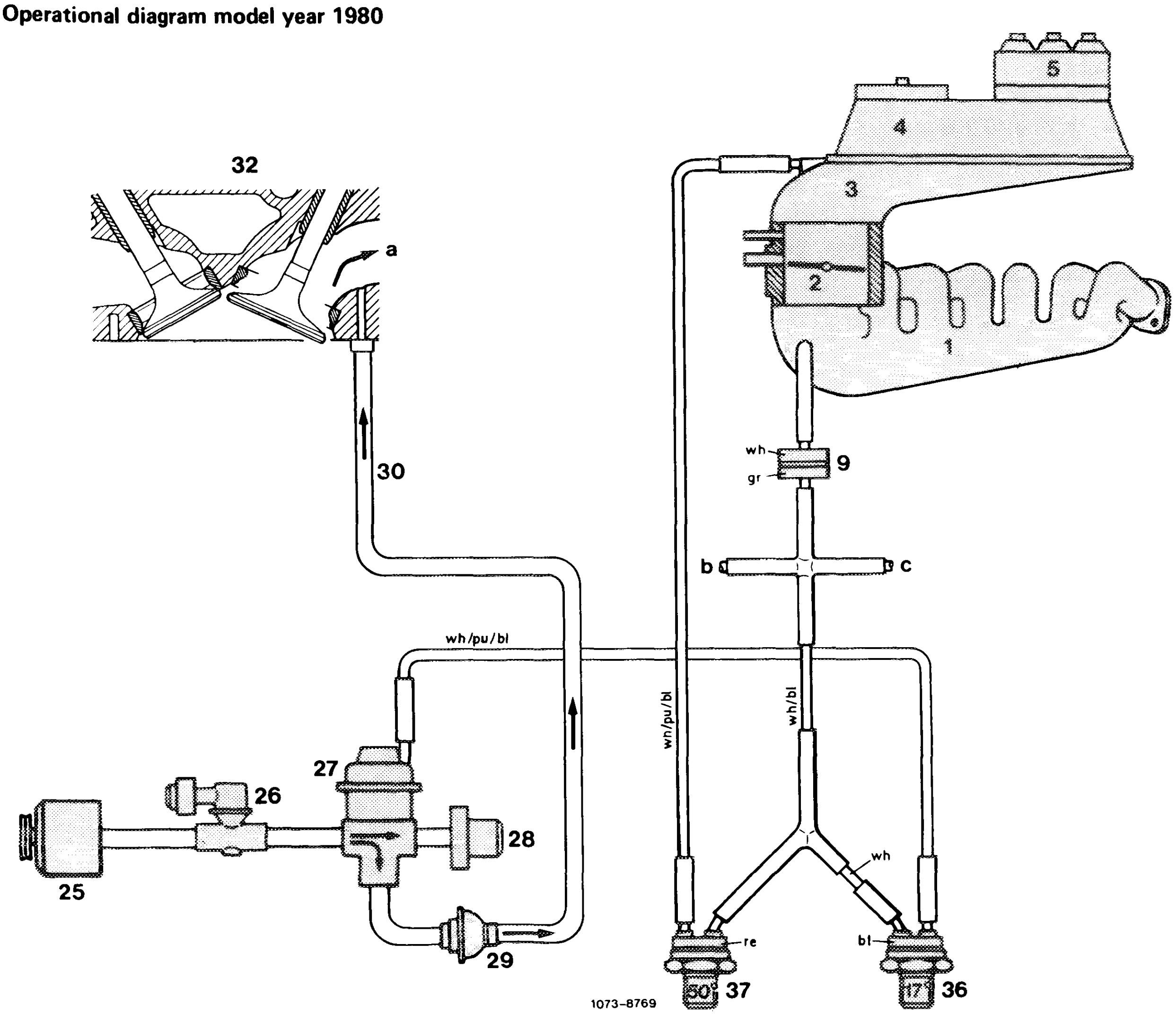


C. Air injection

For maximum warm-up characteristics of engine we recommend the injection of air into hot zone behind exhaust valves at a coolant temperature between 17 °C/62 °F and 50 °C/122 °F.

The oxygen probe will then detect a lean mixture and the air-fuel mixture will be slightly enriched via control unit.

Operational diagram model year 1980



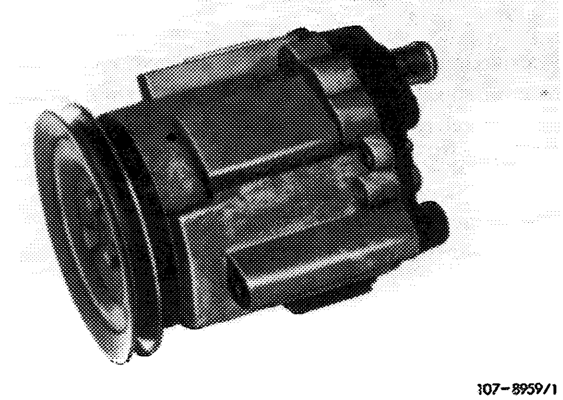
1 Intake manifold	26 Pressure relief valve	a To exhaust manifold	Color code
2 Throttle valve housing	27 Air relief valve	b To ignition distributor	bl = blue
3 Air guide housing	28 Silencer	c To warm-up compensator	gr = green
4 Air flow sensor	29 Check valve		pu = purple
5 Fuel distributor	30 Intake line		re = red
9 Orifice	32 Cylinder head		wh = white
25 Air pump	36 Thermovalve 17 °C/62 °F		
	37 Thermovalve 50 °C/122 °F		

Components of air injection system:

Air pump model year 1980

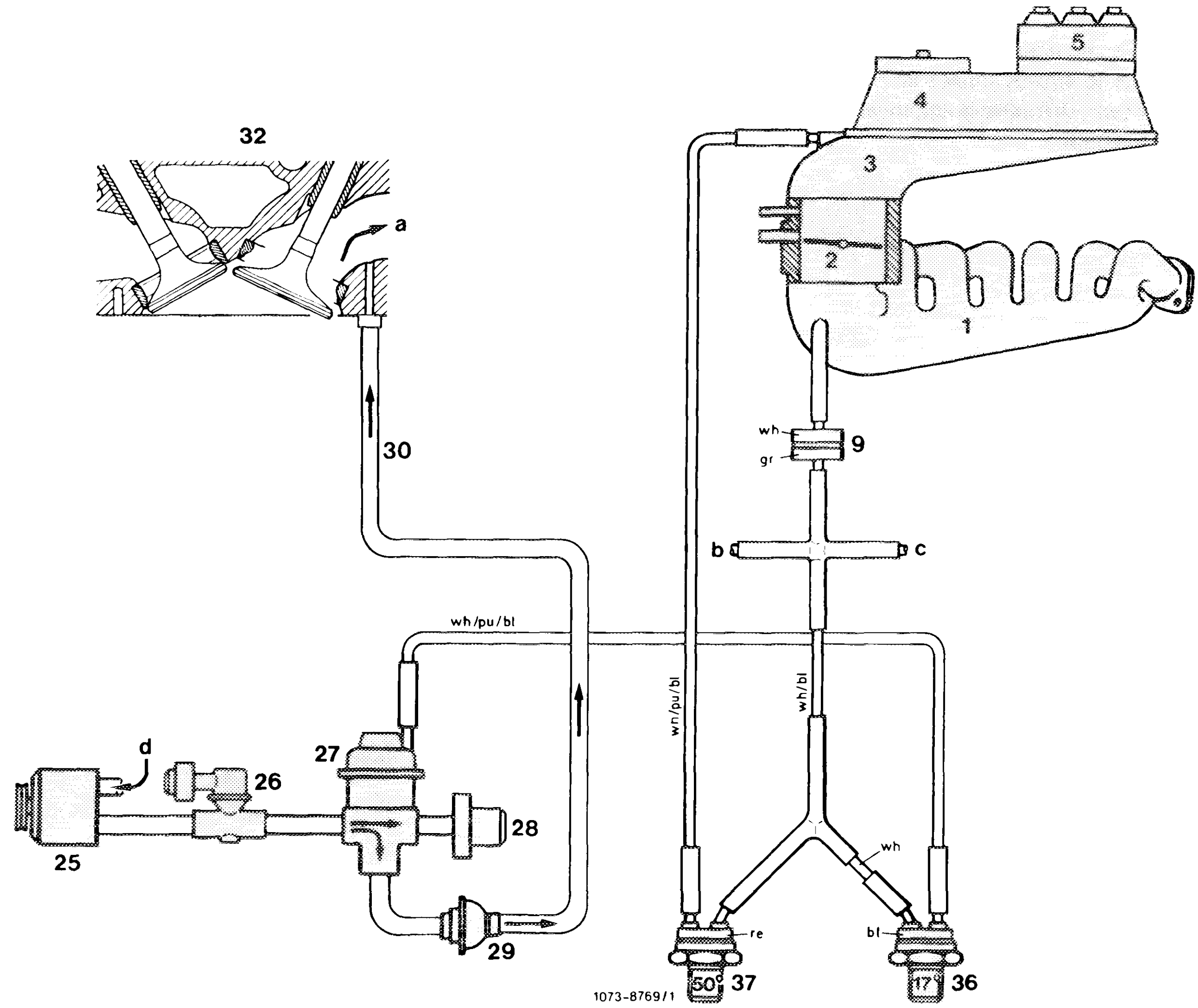
The air pump is a vane-type (impeller) pump with maintenance-free rotary filter, which cleans the sucked-in air.

Fastening of air pump has been changed from inch to metric threads. As a result, the fastening bracket has also been changed.



107-8959/1

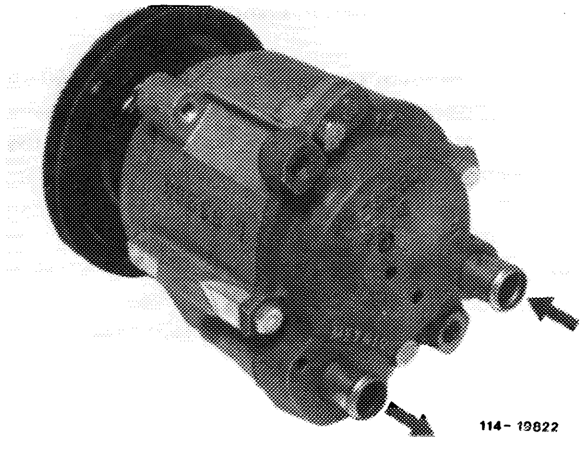
Operational diagram model year 1981



1 Intake manifold	26 Pressure relief valve	a To exhaust manifold	Color code
2 Throttle valve housing	27 Air relief valve	b To ignition distributor	bl = blue
3 Air guide housing	28 Silencer	c To warm-up compensator	gr = green
4 Air flow sensor	29 Check valve	d From air cleaner	pu = purple
5 Fuel distributor	30 Intake line		re = red
9 Orifice	32 Cylinder head		wh = white
25 Air pump	36 Thermovalve 17 °C/62 °F		
	37 Thermovalve 50 °C/122 °F		

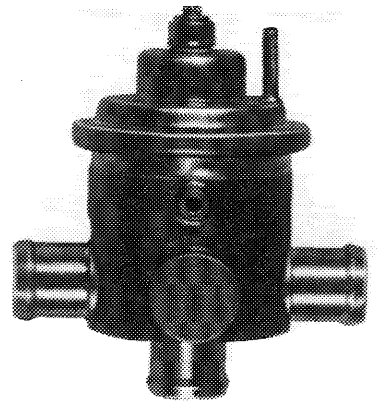
Air pump model year 1981

The air pump sucks the intake air from clean air end of air cleaner. To make sure that no oil or condensate is sucked up by engine breather, a rubber hood is mounted inside in air cleaner. The air cleaner and the air pump are provided with one connection each.



Air switchover valve (air relief valve)

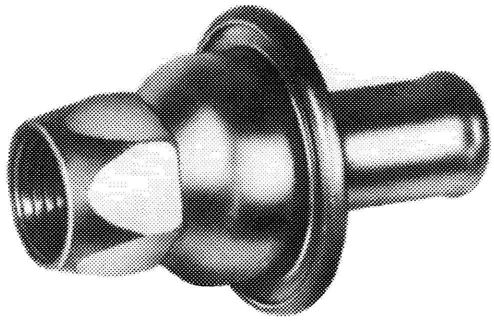
Design and operation of air switchover valve (41) is similar to already known air relief valves with breather. However, this valve is employed here to switch over air injection.



107-9139

Check valve

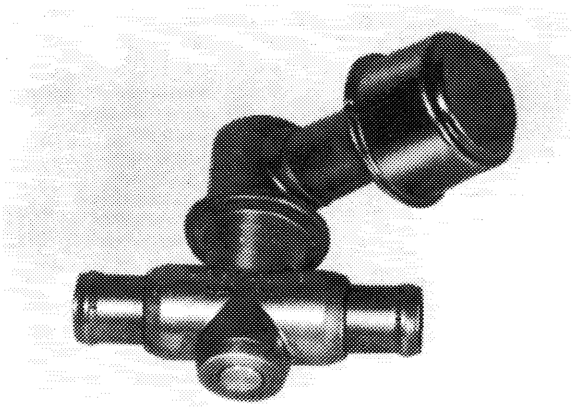
The check valve prevents hot exhaust gases from entering air line.



107-9193

Pressure relief valve

Excess air delivered by air pump at high engine speeds is diverted into the open air by the pressure relief valve starting at a line backpressure of approx. 0.266 bar gauge pressure. An air filter is mounted on pressure relief valve for silencing.

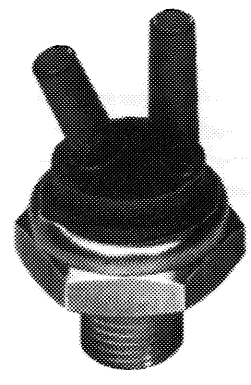


107-13007

Thermovalve 17 °C/62 °F (color code blue)

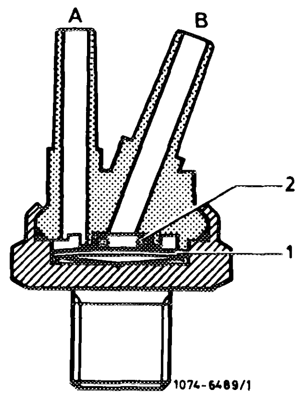
The thermovalve is screwed into sensor box of cylinder head and **opens** at approx. 17 °C/62 °F coolant temperature. Below 17 °C/62°F coolant temperature the bimetallic strip rests against O-ring and closes connection "B".

Above 17 °C/62 °F coolant temperature the bimetallic strip will snap downwards under influence of heat. Both connections are connected to each other.



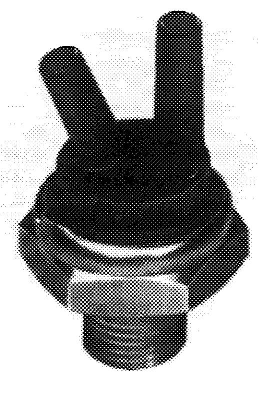
107-10895

The vacuum line to intake manifold should be plugged to connection "B", since this alone will guarantee absolutely tight sealing between bimetallic strip and O-ring.



1 Bimetallic strip
2 O-ring
A Vacuum terminating line
B Vacuum originating line

Thermovalve 50 °C/122 °F (color code red)



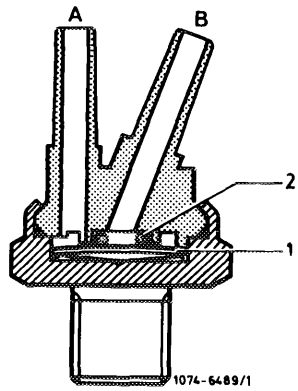
107-10895

The thermovalve is also screwed into sensor box of cylinder head and **opens** at approx. 50 °C/122 °F.

Below 50 °C/122 °F the vacuum of primary thermovalve 17 °C/62 °F cannot be reduced via thermovalve 50 °C/122 °F.

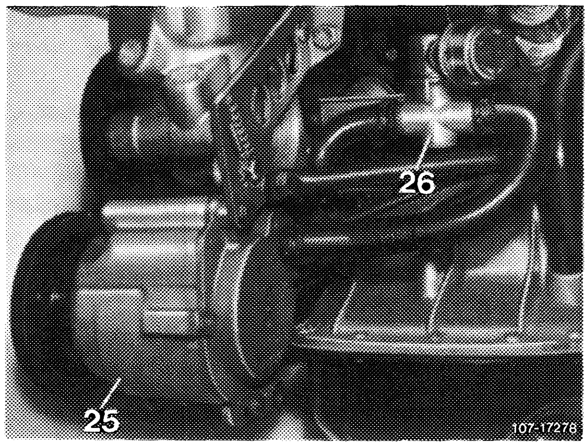
Above approx. 50 °C/122 °F coolant temperature the bimetallic strip reverses under influence of heat and connection (A) to air guide housing is cleared.

The vacuum hose from thermovalve 17 °C/62 °F or intake manifold should always be plugged to diagonal connection (B), since this alone will guarantee absolutely tight sealing with valve closed.

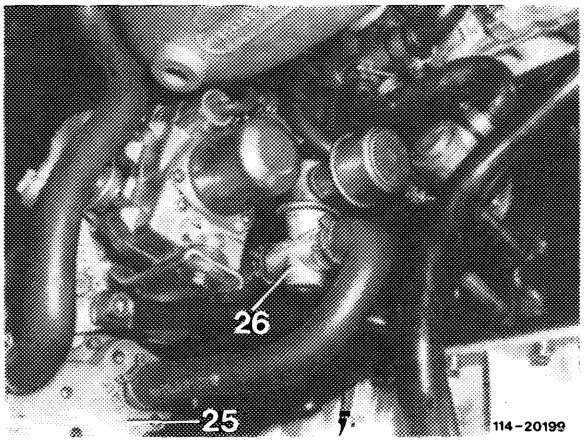


Operation

The air pump (25) driven by the crankshaft by means of a V-belt is continuously delivering air when the engine is running. The air flows to pressure relief valve (26), which diverts excess air delivered at high engine speeds into the open air starting at a backpressure of approx. 0.266 bar.

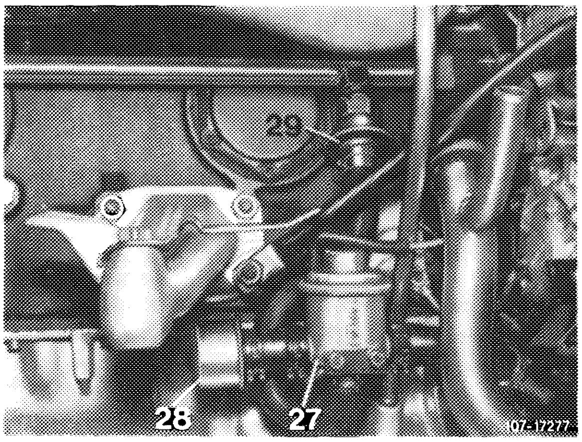


Model year 1980

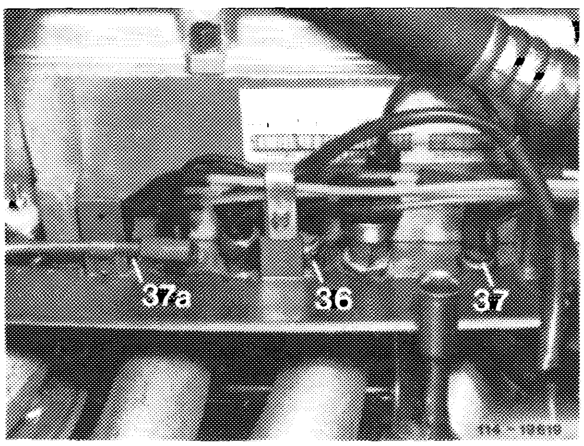


Model year 1981

From pressure relief valve (26) the air is either blown into the injection ports in cylinder head or through silencer (28) into the atmosphere.

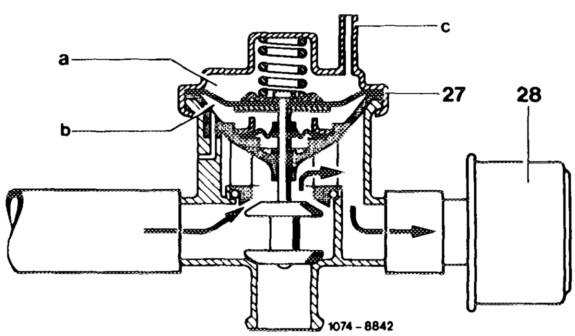


The air switchover by means of diverter valve is controlled via thermovalves 17 °C/62 °F (36) and 50 °C/ 122 °F (37).



Three temperature ranges will result:

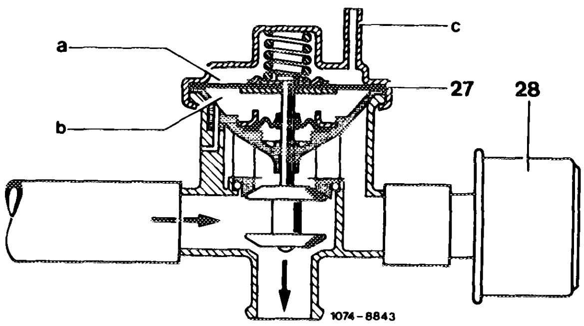
1. Coolant temperature below 17 °C/62 °F
(air diverted to atmosphere)



Thermovalves (36 and 37) are closed and the upper diaphragm chamber (a) of diverter valve (27) is positively vented. The injection line to cylinder head is closed by compression spring in diaphragm chamber (a), the delivered air is diverted to atmosphere via silencer (28).

This will prevent any thermic overload of catalysts through increased mixture preparation during warm-up.

2. Coolant temperature between 17 °C/62 °F and 50 °C/122 °F
(air injected into cylinder head)



In this temperature range, the thermovalve (36) is open, the intake manifold vacuum will activate the diaphragms of diverter valve (27).

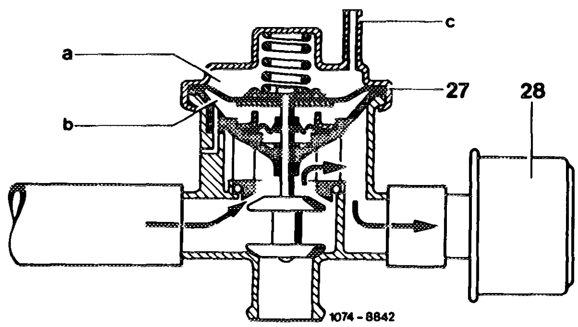
The connection to damper valve (28) is closed and the delivered air is injected via check valve (29), injection line (30) into cylinder head.

The air injection provides an optimal mixture composition during warm-up, because:

1. The mixture enrichment is not cancelled by warm-up compensator upon start of lambda control (approx. 300 °C/572 °F of oxygen sensor).

2. The air injection for the 3-way catalysts, which are already effective at warm-up, is operating at $\approx \lambda = 1$ to provide the exhaust gas composition required for optimal operation of catalysts, even though the engine is operated at $< \lambda = 1$ (richer).

3. Coolant temperature above 50 °C/122 °F
(air diverted to atmosphere)



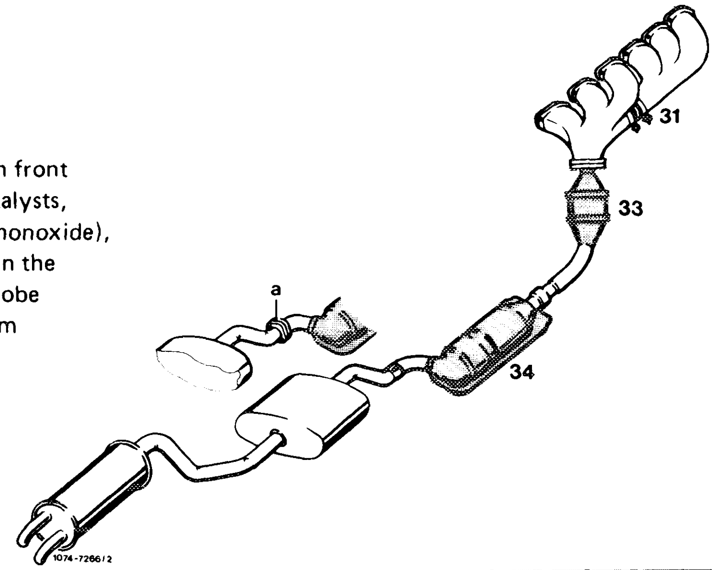
Thermovalves (36 and 37) are open and the vacuum line system (warm-up compensator, ignition retard and air injection) is positively vented.

The compression spring in upper diaphragm chamber (a) of diverter valve (27) closes the connection to air injection line. The air delivered by the air pump is now blown into the atmosphere via silencer (28).

This will prevent any thermic overload of catalysts.

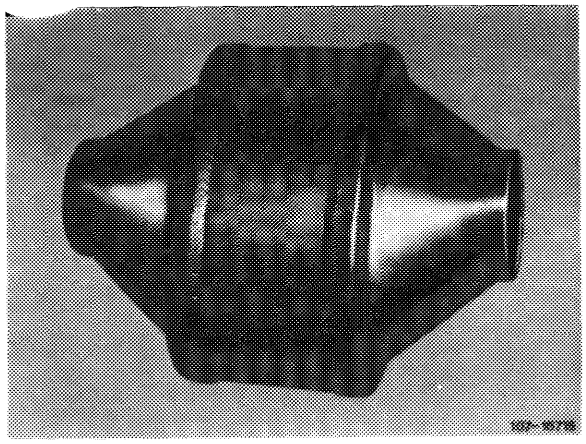
D. Catalysts

The catalysts are located in exhaust system in front of the mufflers and are designed as 3-way catalysts, which means that the shares of CO (carbon monoxide), CH (hydrocarbons) and NO_x (nitric oxides) in the exhaust gases in combination with oxygen probe (at $\lambda = 1$) are uniformly reduced to a minimum quantity.

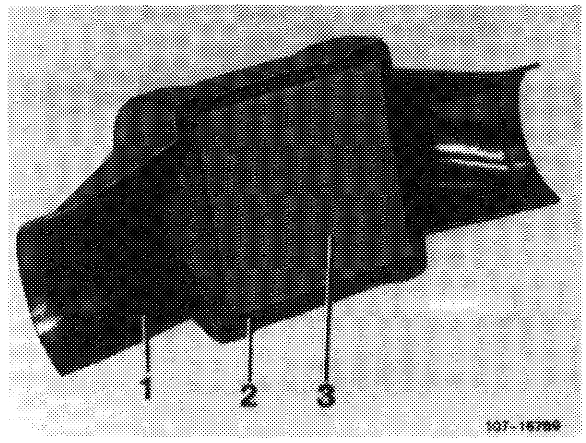


31 Exhaust manifold
33 Primary catalyst
34 Underfloor catalyst
a Flange connection on model 123

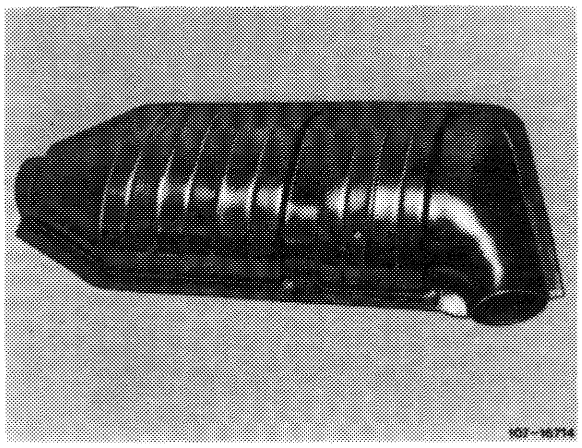
We distinguish between primary catalyst and underfloor catalyst.



Primary catalyst

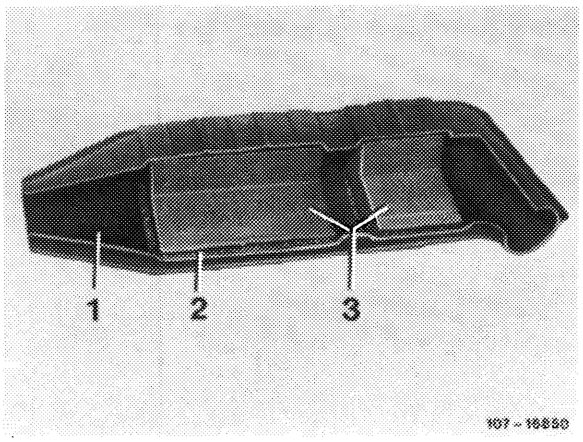


1 Housing
2 Wire mesh
3 Monolith



Underfloor catalyst

The catalysts consist of a monolith (3), a honeycomb structure of ceramic material, which is elastically mounted in a wire mesh structure (2).



1 Housing
2 Wire mesh
3 Monolith

The precious-metal coating on the monolith, the actual catalyst, accelerates the reduction or oxidation of toxic materials.

Operate engine only on unleaded gasoline to keep the catalysts operational.

Avoid overheating the catalysts.

Continued overheating destroys the catalysts, which means that the monoliths may melt.

Catalysts may overheat for the following reasons:

a) Lack of engine maintenance.

   Spark plugs in proper condition are important for the life of catalysts.

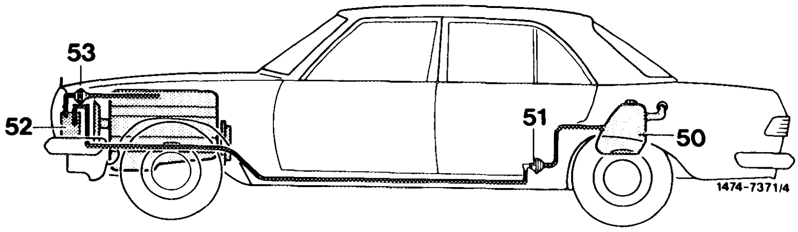
b) Due to irregular firing, the fuel-air mixture becomes too rich.

c) Emission control system has been tampered with.

E. Fuel evaporation control system

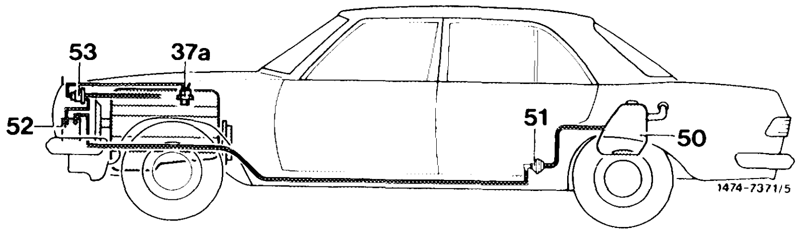
The fuel evaporation control system is installed to improve emissions which are not related to engine combustion.

Operational diagram model year 1980



50 Fuel tank
51 Vent valve unit
52 Charcoal canister
53 Purge valve

Operational diagram model year 1981

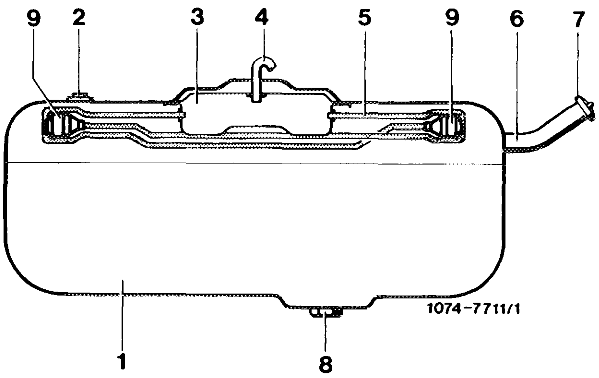


37a Thermovalve 50 °C/122 °F
50 Fuel tank
51 Vent valve unit
52 Charcoal canister
53 Purge valve

Components of fuel evaporation control system:

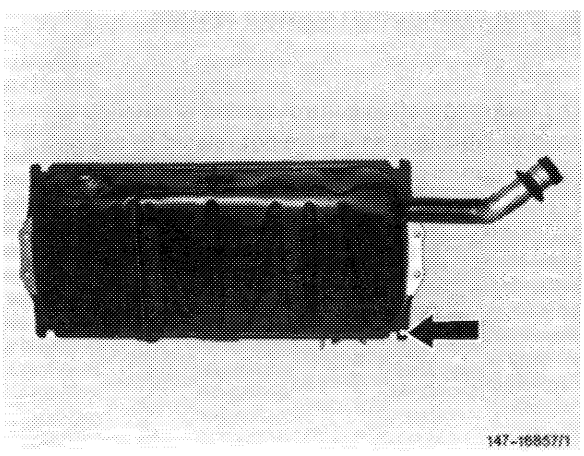
Fuel tank

The positive and negative venting system on model 123 has been modified. One breaker vessel each has been attached at outer ends of tube system.



1 Fuel tank
2 Immersion tube transmitter
3 Compensating tank
4 Connection vent valve unit
5 Tube system
6 Filler neck
7 Closing cap
8 Connecting fuel feed line
9 Breaker vessel

To identify fuel tank with breaker vessels, a 6 mm hole has been drilled below into righthand rim (arrow). If a fuel tank with this designation is replaced, make sure that the spare tank also has this identification for breaker vessels.

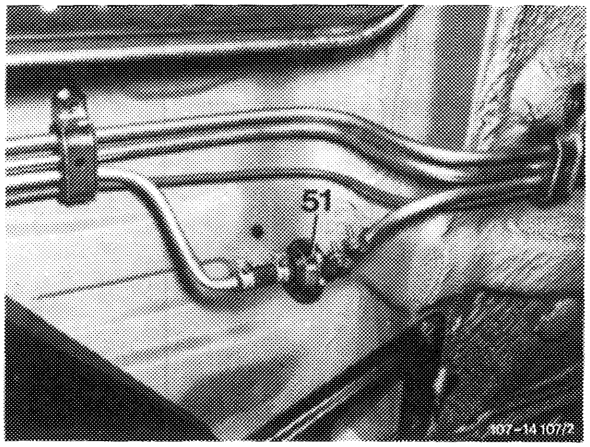


Vent valve unit

The vent valve unit (51) is located under vehicle at level of rear legroom.

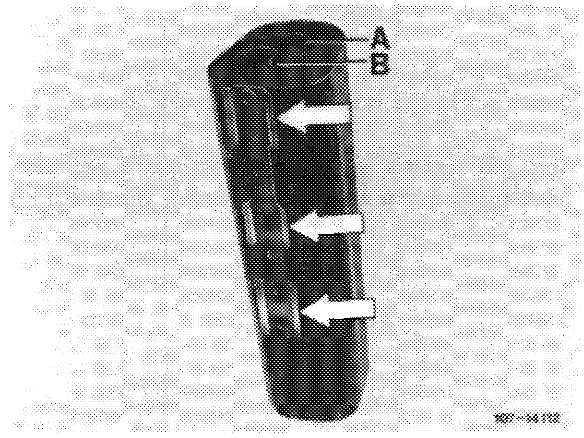
The unit comprises a negative vent valve and a positive vent valve.

Note: The vent valve unit is optionally available in two versions which are, however, identical in function and operation.



Charcoal canister

The fuel evaporation vapors from fuel tank are stored in charcoal canister and drawn-off again from tank while driving.

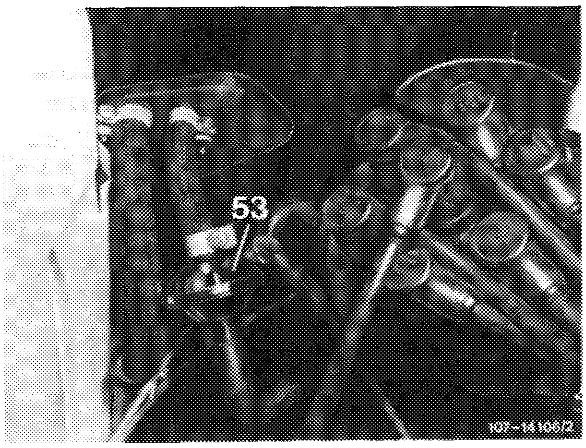


A Draw-off connection
B Connection tank ventilation

Purge valve model year 1980

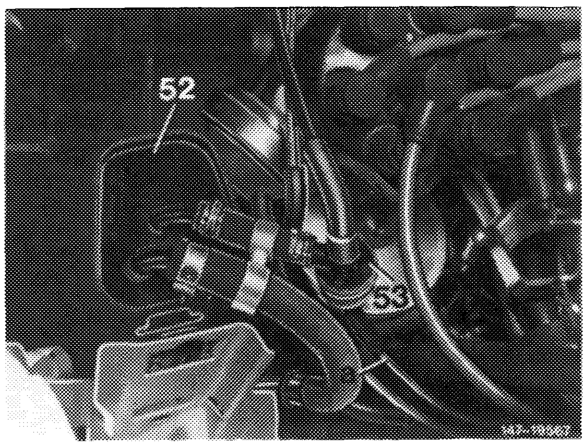
The purge valve (53) is located in the draw-off line from charcoal canister to throttle valve housing.

Note: The purge valve is optionally available in two versions which are, however, identical in function and operation.



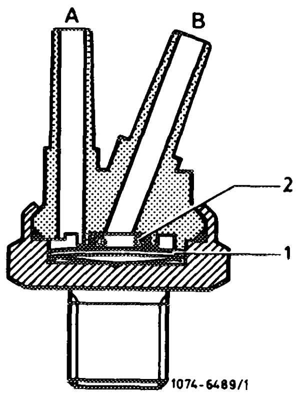
Purge valve model year 1981

The purge valve is also installed in draw-off line from charcoal canister to throttle valve housing. It is identified by the vacuum connection (to thermo-valve 50 °C/122 °F).



Thermovalve 50 °C/122 °F (color code red) model year 1981

The thermovalve is installed in sensor box of cylinder head and opens at 50 °C/122 °F coolant temperature.

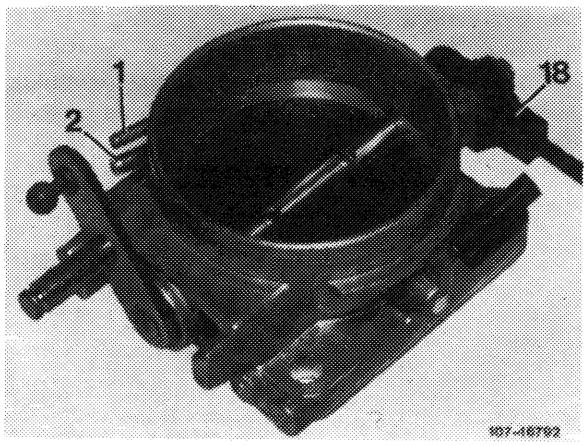


1 Bimetallic strip
2 O-ring
A To purge valve
B To throttle valve housing

Throttle valve housing

Connection (2) on throttle valve housing serves for drawing-off evaporation vapors from charcoal canister.

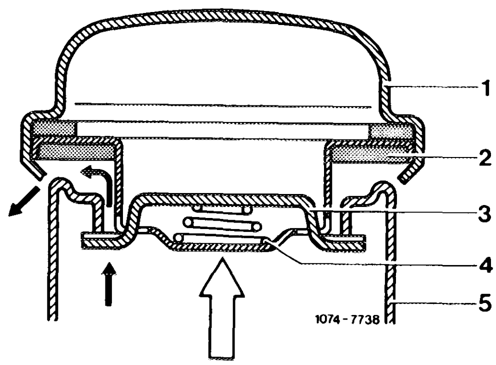
The throttle valve switch (18) is attached for controlling lambda control (idle speed and full throttle stop).



1 Connection vacuum advance
2 Draw-off connection charcoal canister
18 Throttle valve switch

Fuel tank closing cap

The fuel tank cap has been modified starting model year 1978 to prevent increased overpressure in fuel tank.



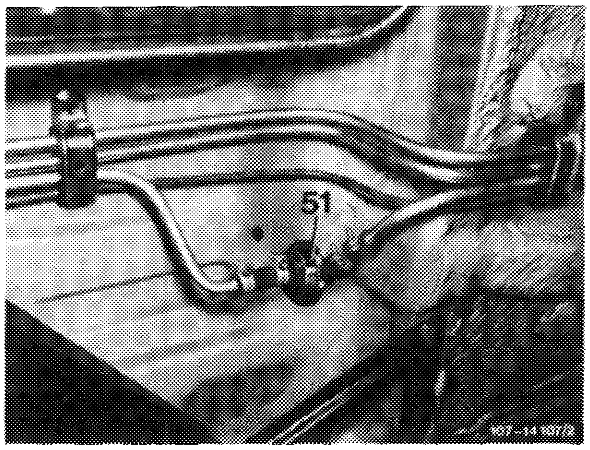
1 Closing cap
2 Sealing ring
3 Clamp
4 Compression spring
5 Filler neck

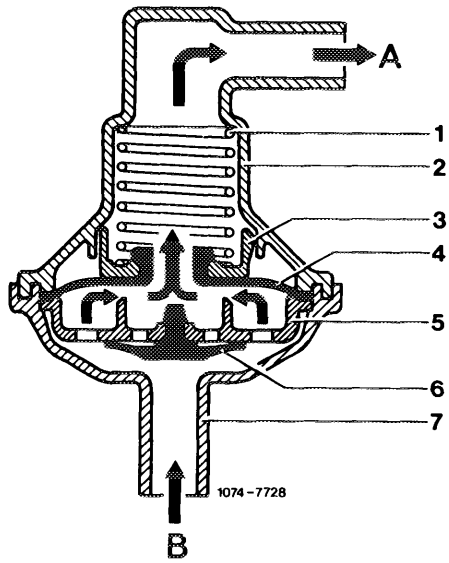
Operation

Evaporation control system model year 1980/81

The vent valve unit (51) increases the pressure in fuel tank to 30–50 mbar. As a result, less fuel evaporation vapors will escape from the fuel tank.

If the pressure in fuel tank attains 30–50 mbar the pressure relief valve (negative vent valve) (4) opens so that the fuel evaporation vapors can flow to charcoal canister where they are stored with the engine stopped.

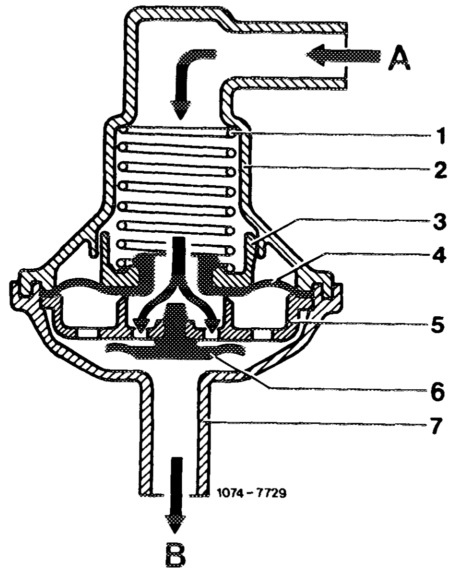




Vent valve unit to charcoal canister open

1 Compression spring
2 Valve housing
3 Spring retainer
4 Pressure relief valve (negative vent valve)
5 Valve disc
6 Vacuum relief valve (positive vent valve)
7 Connection

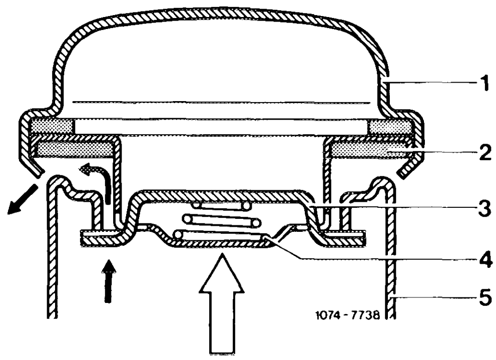
A Connection, charcoal canister
B Connection, fuel tank



Vent valve unit to fuel tank open

When the fuel is cooling down, the reduced volume is compensated by the intake of air or fuel vapors from the charcoal canister via vacuum relief valve (positive vent valve) (6) starting at a vacuum of 1–16 mbar. If the vacuum in the fuel tank drops below 1 mbar, the vacuum relief valve (positive vent valve((6) will close.

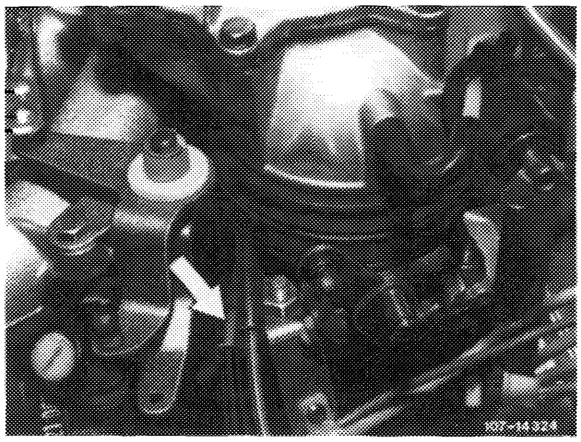
If, as a result of a malfunction in evaporation control system, the pressure in fuel tank increases by more than 0.1–0.3 bar, the fuel evaporation vapors can escape from fuel tank by way of closing cap.



1 Closing cap
2 Sealing ring
3 Clamp
4 Compression spring
5 Filler neck

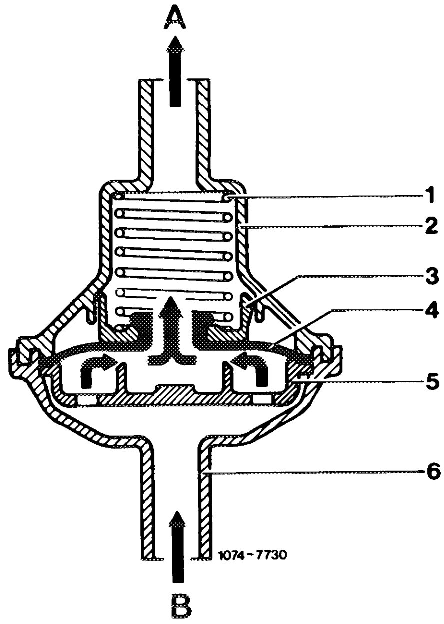
Purge system model year 1980

The charcoal canister is connected to throttle valve housing by means of a line, in which the purge valve is installed.



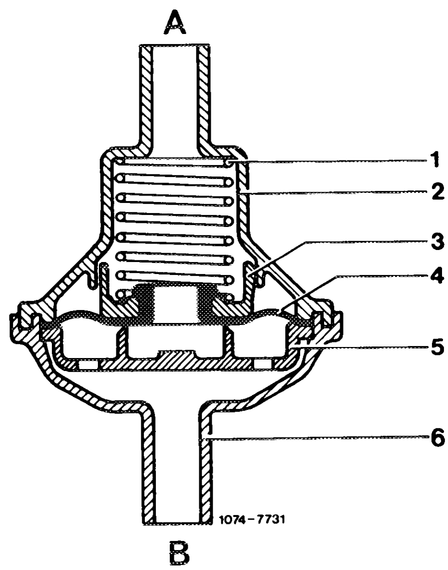
Arrow = drawn-off connection throttle valve

If, with the engine running, the vacuum of 30–50 mbar in purge line is exceeded, the purge valve will open. The fuel evaporation vapors stored in charcoal canister can be drawn off depending on position of throttle valve.



Purge valve opened

1 Compression spring
2 Valve housing
3 Spring retainer
4 Pressure relief valve (negative vent valve)
5 Valve disc
6 Connection
A Connection, throttle valve housing
B Connection, charcoal canister



Purge valve closed

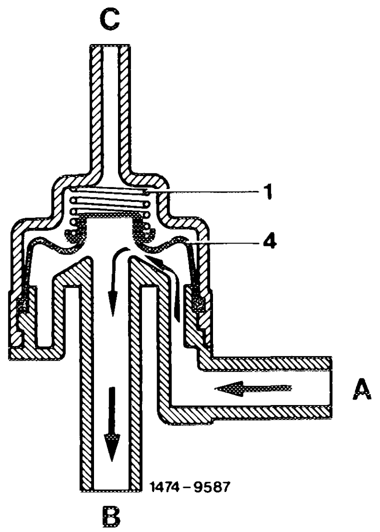
When the throttle valve is opened, the two purge openings, which terminate in a common passage, are progressively exposed to the venturi vacuum. This will result in a metered purging in the lower partial load operating range of the engine without influencing the driving characteristics.

At idle and during deceleration (throttle valve closed) the two purge openings are on atmospheric side of throttle valve. The purge valve is closed, there is no purging of charcoal canister.

Purge system model year 1981

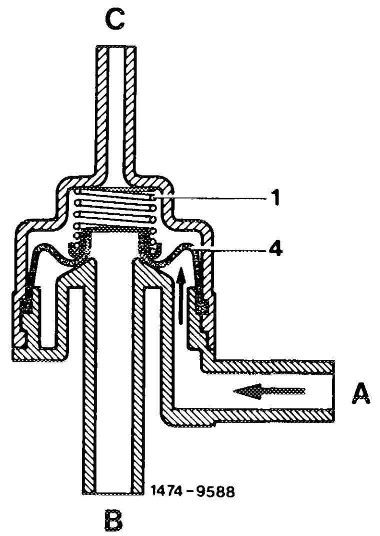
The charcoal canister is connected to throttle valve housing by a line in which the purge valve is installed.

With the engine running and at a coolant temperature above approx. 50 °C/122 °F, intake manifold vacuum is applied to the purge valve through the thermovalve with the throttle valve slightly raised. Diaphragm (4) is pulled in upward direction against the spring force and connection from A to B is made.



Purge valve opened

1 Compression spring
4 Diaphragm
A Connection, charcoal canister
B Connection, throttle valve housing
C Vacuum connection

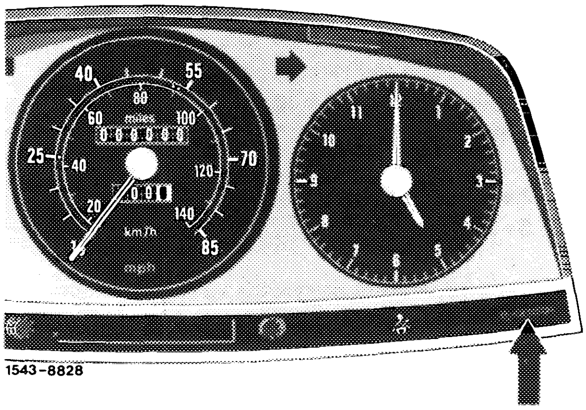


Purge valve closed

F. Oxygen sensor renewal indicator

Emission control legislation specifies that the oxygen sensor must be renewed once after 30 000 miles. This is indicated by an „oxygen sensor" indicator lamp (arrow) in instrument cluster lighting up.

The oxygen sensor is renewed in the USA and in Canada only.



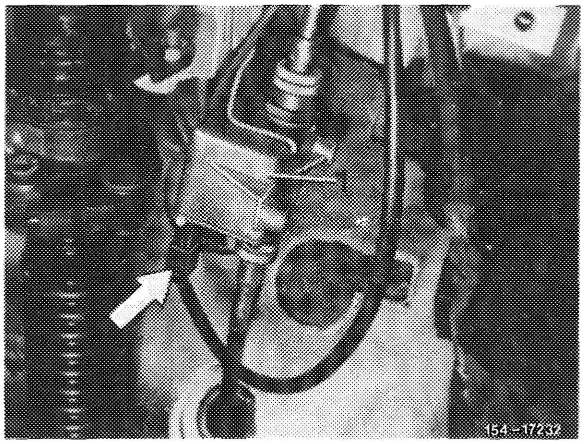
1543-8828

The mileage indicator is attached under instrument panel and is driven by tachometer shaft. When the respective number of miles is attained, a contact will close and the "oxygen sensor" indicator lamp will light up.

After replacing the oxygen sensor, the indicator lamp is made inoperative by pulling-off plug (arrow) on mileage counter.

Note: Prior to installing oxygen sensor, coat its threads with hot lubricating paste 000 989 88 51.

The tightening torque of oxygen sensor is 50–60 Nm.



154-17232

G. Hints for troubleshooting lambda control

For complaints such as:

Poor warm-up characteristics of engine, hunting at idle, not accepting gas or splashing during acceleration, proceed as follows:

1 Check frequency valve while running engine at operating temperature and at idle, place hand on output end (fuel hose) of frequency valve to check for noticeable operation. If frequency valve is not operating, perform test program (14–100).

2 Check on/off ratio and regulate, if required (07.3–105).

3 Check adjustment of throttle valve switch and correct, if required (07.3–170).

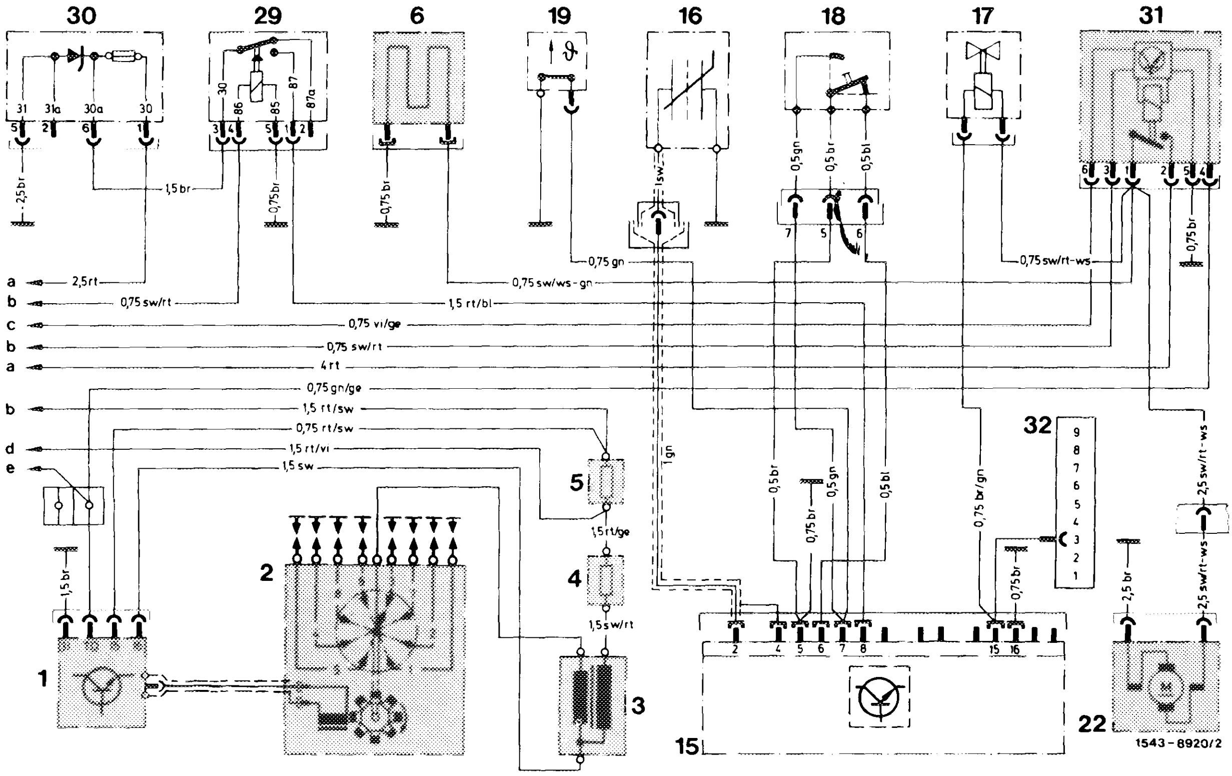
4 Check acceleration enrichment of warm-up compensator (07.3–175).

5 Check fuel pressures and firing point and correct, if required (07.3–120 or 15–500).

6 Check engine for mechanical condition and eliminate faults, if required.

There should be no more faults upon completion of these complaints.

H. Electric wiring diagram lambda control



1 Transistorized ignition switching unit
2 Ignition distributor (engine 117)
3 Ignition coil
4 Pre-resistance 0.6 ohm
5 Pre-resistance 0.4 ohm
6 Warm-up compensator
15 Lambda control unit
16 Oxygen sensor
17 Frequency valve
18 Throttle valve switch
19 Temperature switch 16 °C/61 °F
22 Fuel delivery pump
29 Relay voltage supply
30 Overvoltage protection
31 Fuel pump relay (electronic)
32 Diagnosis socket
a Cable connector, terminal 30
b Fuse box, terminal 15
c Relay air conditioning/starter terminal 87
d Starter, terminal 16
e Diagnosis socket, bushing 1

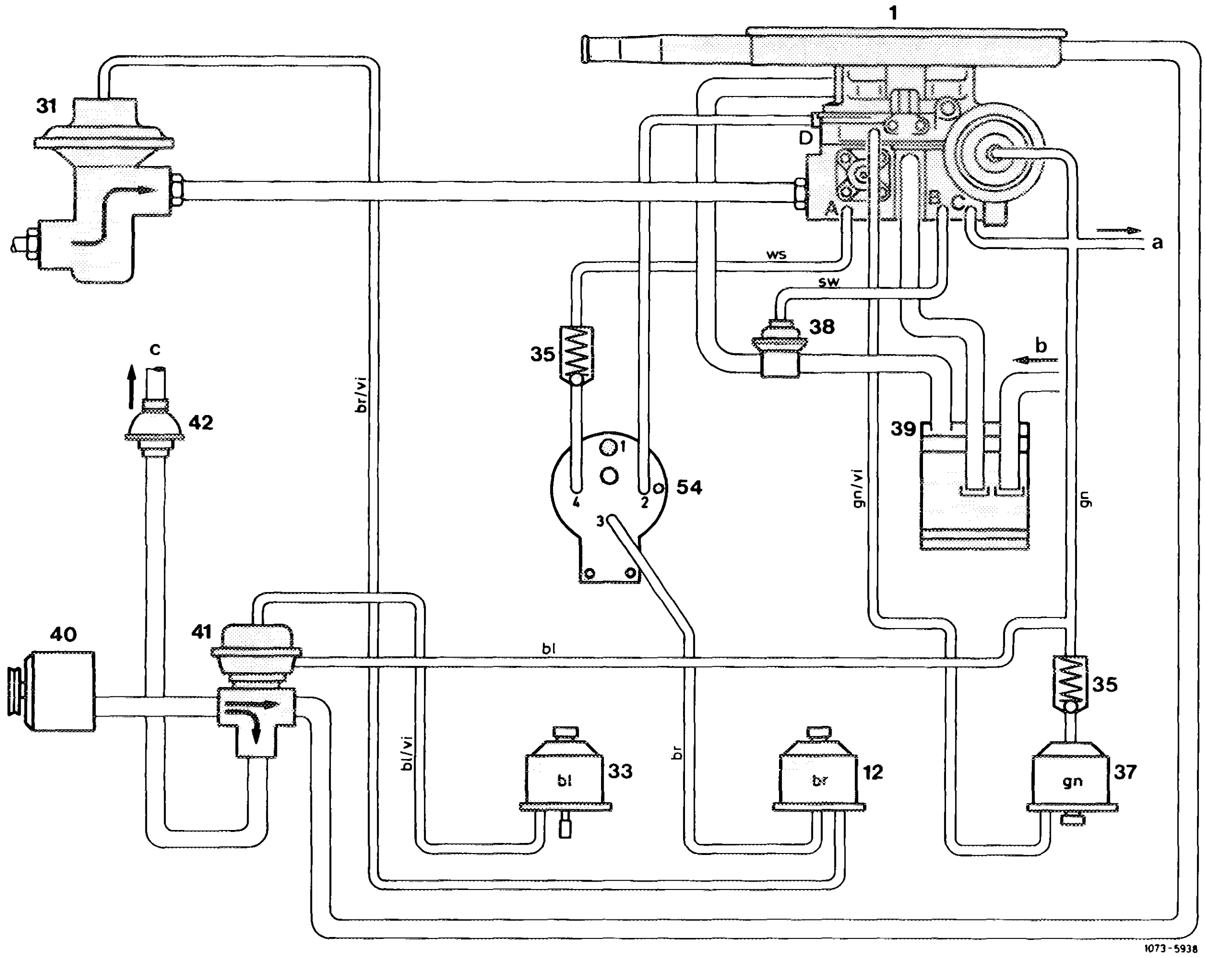
Federal and California version model year 1975/76

For complaints such as: Poor warming-up characteristics of engine, poor idle speed, engine not accelerating or splashing during acceleration, check emission control system for function.

Test conditions: All fuses in order, engine at operating temperature, run engine at idle speed.

Test the following: EGR, air injection, starter cover-stepped heater and fuel evaporation system.

Function diagram



1 Carburetor
12 Switch-over valve EGR
31 EGR valve
33 Switch-over valve air injection
35 Check valve
37 Switch-over valve float chamber vent
38 Purge valve
39 Charcoal canister

40 Air pump
41 Anti-backfire valve
42 Check valve air injection
54 Vacuum booster

a Connection fuel check valve
b Connection tank vent
c Air injection

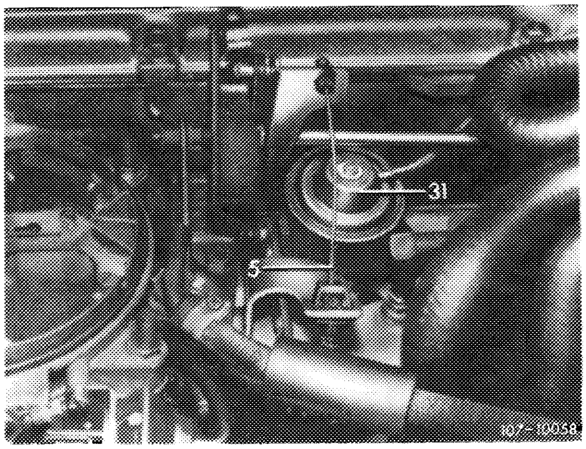
bl = blue
br = brown
gn = green
sw = black
vi = purple
ws = white

Testing EGR

Selector lever in position "N" or "P".

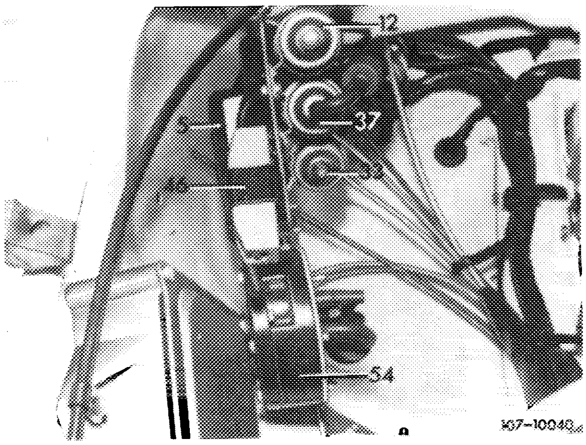
Pull-off brown/purple vacuum line on EGR valve (31), blow out line.

Passage in order.	No passage.



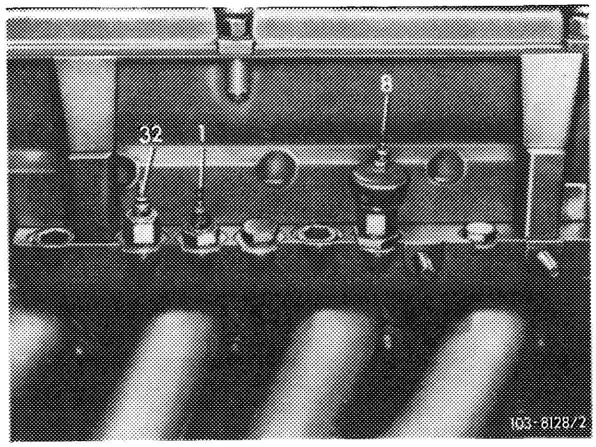
Test vacuum lines

The brown vacuum line of vacuum booster (connection 3) should be plugged on center connection of brown switch-over valve (12), the brown/purple vacuum line to EGR valve should be plugged to outer connection of switch-over valve.



Test relay box (5)

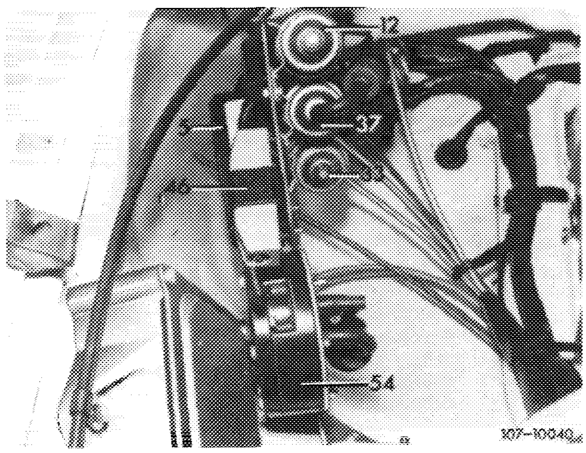
Pull coupler from switch-over valve (12), connect voltmeter to coupler. Pull plug from temperature switch (32) and connect to ground. With the ignition switched on, voltmeter should indicate approx. 13 Volts. If no voltage is indicated, renew relay box (5).



Testing switch-over valve (12)

Pull coupler from relay box (5). Connect terminal 3 and 4 with test cable.

Switch on ignition. Switch-over valve (12) should audibly or noticeably switch.

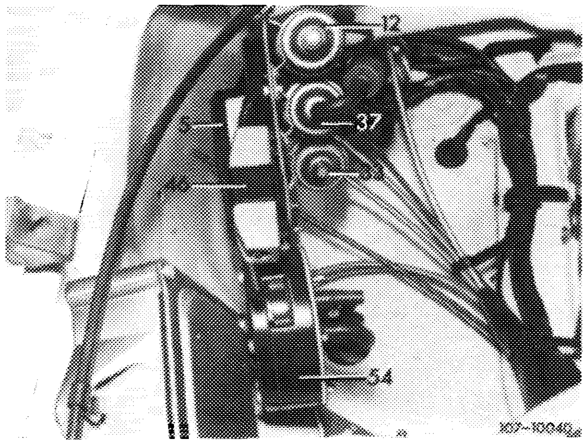


Test starter lockout and back-up lamp switch

Pull coupler from relay box (5) and connect voltmeter to terminal 2 and 5. Switch on ignition. In selector lever position "N" or "P" the voltmeter should indicate approx. 12 Volts.

If voltmeter indicates voltage, replace relay box (5).

If voltmeter indicates no voltage, renew starter lockout and back-up lamp switch.



Testing EGR

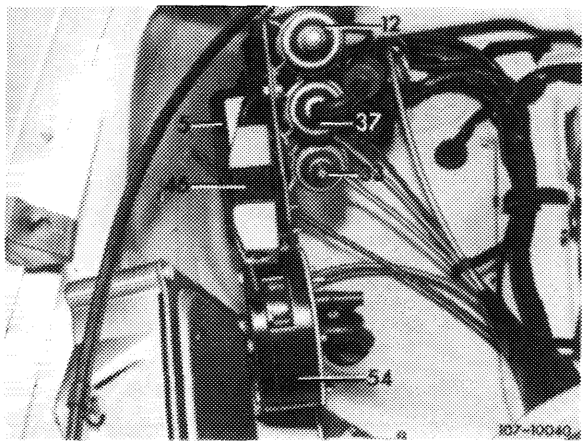
Selector lever in driving position **(step down on pedal of parking brake).**

Pull brown/purple vacuum line from EGR valve (31), blow through line.

No passage.	Passage in order.

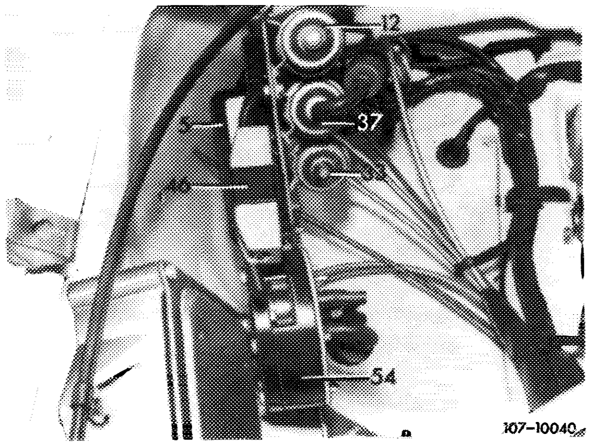
Test starter lockout and back-up lamp switch

Pull coupler from relay box (5) and connect voltmeter to terminal 2 and 5. Switch on ignition. In a driving position, voltmeter should indicate 0 Volt.



If voltmeter indicates 0 Volt, renew relay box (5).

If voltmeter indicates voltage, renew starter lockout and back-up lamp switch.



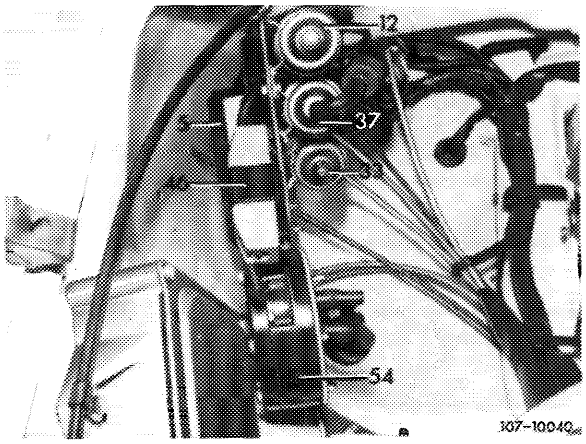
Testing EGR

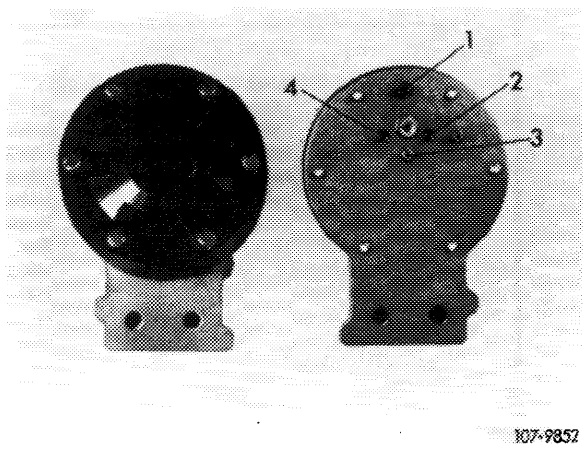
Selector lever in position "N" or "P".

Pull-off brown line on carburetor, connection "D" and green line on carburetor. Plug-on brown line instead of green line.

Engine speed remains the same.	Engine speed drops, engine stops.

Test vacuum lines on vacuum booster (54)





1 Connection closed by rubber cap
2 Connection Venturi vacuum
3 Connection switch-over valve EGR
4 Connection intake manifold vacuum (carburetor connection A)

Unused connections are for venting.

Testing EGR

Selector lever in driving position **(step down on pedal of parking brake).**

Pull-off brown line on carburetor, connection "D" and green line on carburetor. Plug-on brown line instead of green line.

Engine speed drops, engine stops.	Engine speed remains the same.

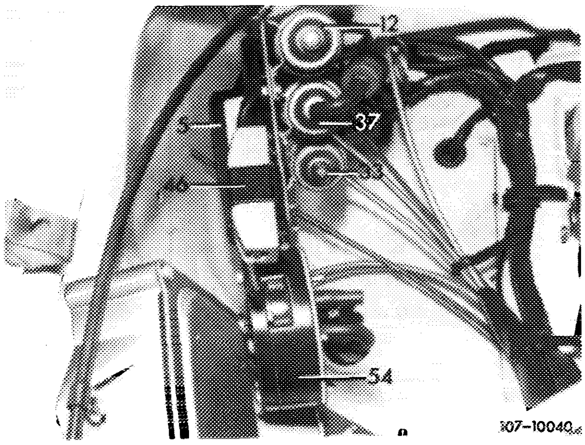
Test connection for Venturi vacuum for passage

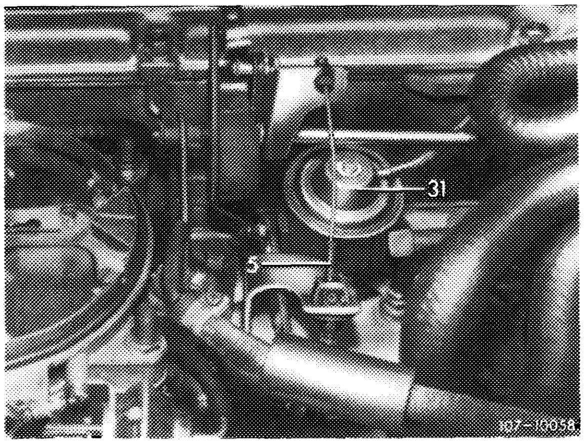
Test EGR valve (31)

Pull-off brown/purple line on brown switch-over valve (12), start engine. Pull-off green line on green switch-over valve (37). Connect brown/purple line to green line. Engine should run irregularly or stop.

If engine speed is not changing, renew EGR valve (31).

If engine speed changes, renew vacuum booster (54).





Testing air injection

Pull-off connecting hose of air injection on air filter (center hose).

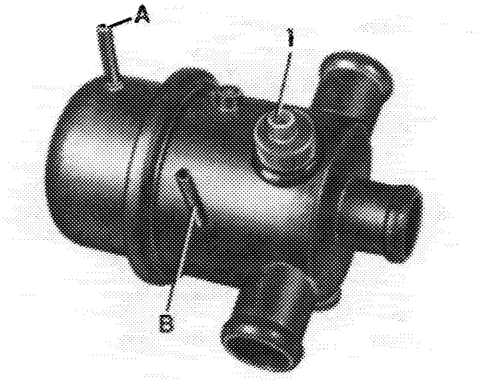
Connecting hose remains pulled-off for next test.

Air flowing out.	No air flowing out.

Pull-off hose of air discharge line on air filter. If an air flow shows up:

Test vacuum lines

The blue vacuum line should be connected to connection "B" of anti-backfire valve (41), the blue/purple line to connection "A".

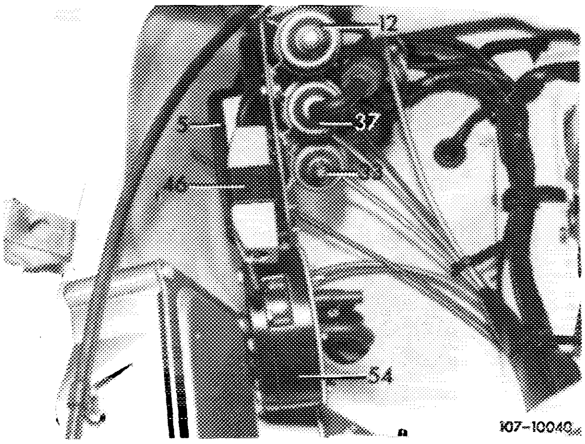


107–10004

Test switch-over valve (33)

Pull-off coupler on relay box (5), connect terminal 2 and 9 with test cable. With ignition switched on, the blue switch-over valve should audibly or noticeably switch.

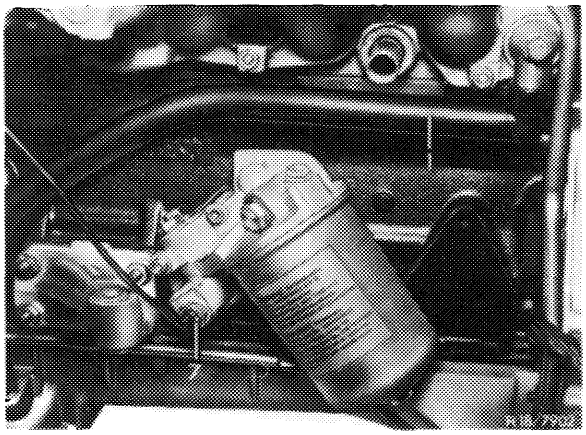
If in spite of perfect function of these components air is discharged at idle, renew anti-backfire valve.



Testing air injection

Separate plug connection of electric line to temperature switch 17 °C (7) in oil filter housing and connect to ground.

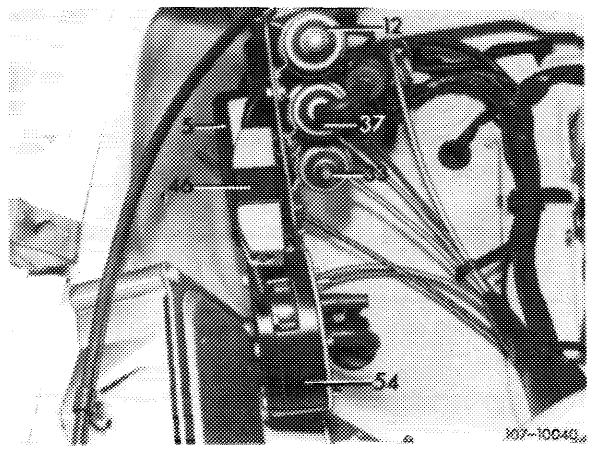
Air injection is interrupted.	Air injection is not interrupted.



Test relay box (5)

Pull coupling from blue switch-over valve (33). Connect voltmeter. Separate plug connection of electric line to temperature switch (7) and connect with test cable to ground. Switch on ignition. Voltmeter should indicate approx. 12 Volts.

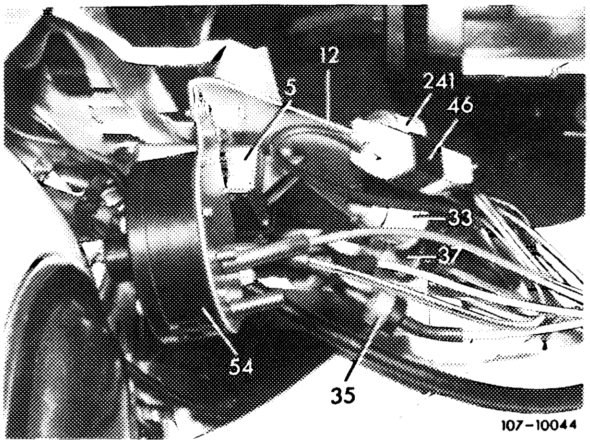
If no voltage is indicated, renew relay box (5).



Testing choke cover-stepped heater

Connect voltmeter to output of resistance (46) and to ground. Separate plug connection of electric line to temperature switch 17 °C (7) and connect to ground.

Voltmeter indicates 7–8 Volts.	Voltmeter does not indicate 7–8 Volts.

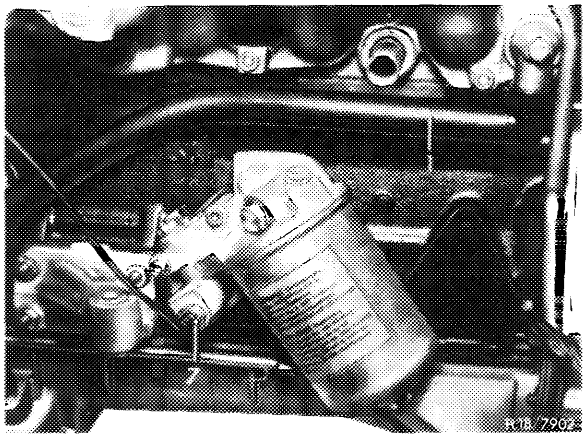


Testing relay box (5)

Connect voltmeter to input of resistance (46) and to ground.

Connect plug connection of temperature switch to ground. Voltmeter should indicate 7–8 Volts.

If no voltage is indicated, renew relay box (5).

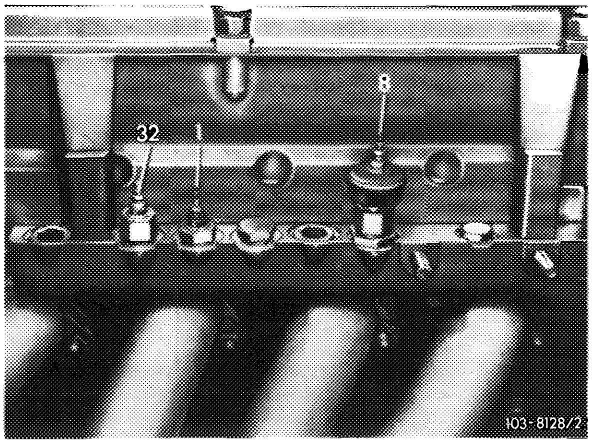


Testing choke cover-stepped heater

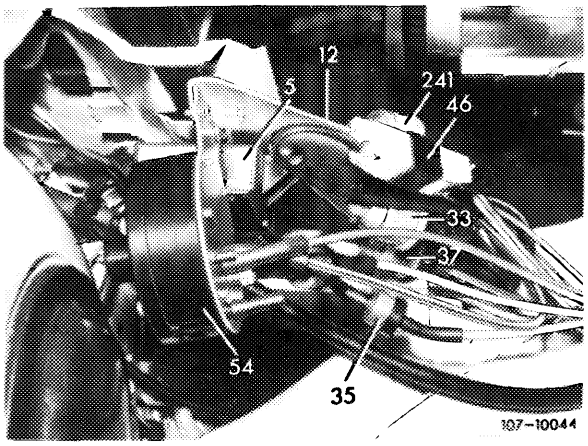
Connect voltmeter to output of resistance (46) and to ground.

Pull plug from temperature switch 65 °C.

Voltmeter indicates approx. 12 Volts.	Voltmeter does not indicate approx. 12 Volts.



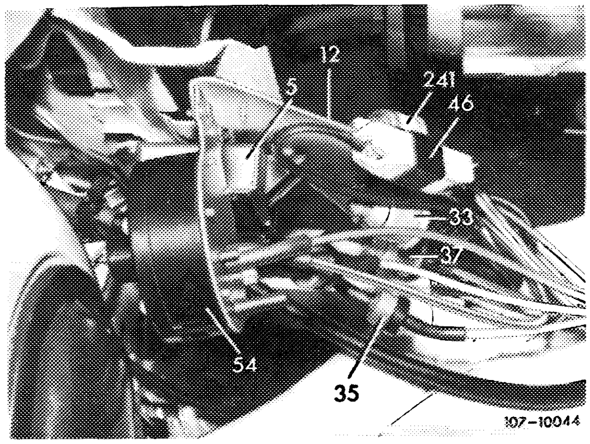
Renew relay box (5).



Testing fuel evaporation system Install vacuum pressure gauge into green/purple vacuum line to float chamber vent valve. Accelerate engine for a short moment.	
Vacuum available, remains constant.	No vacuum, vacuum drops.

Test vacuum lines

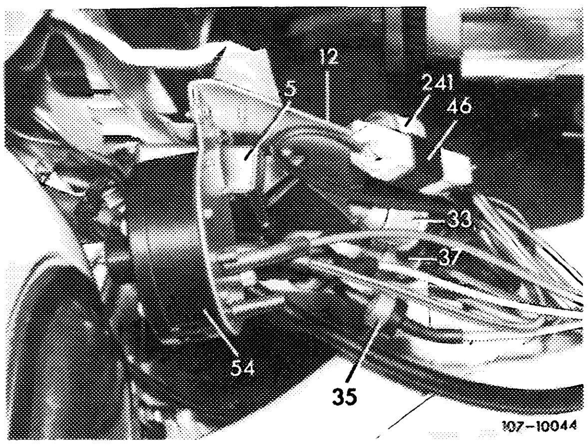
The green vacuum line of carburetor should be plugged at top to switch-over valve (37), the green/purple vacuum line to float chamber vent valve at bottom to switch-over valve (37).



Test switch-over valve (37)

Pull coupler from switch-over valve (37) and connect voltmeter. With the ignition switched on, voltmeter should indicate approx. 12 Volts.

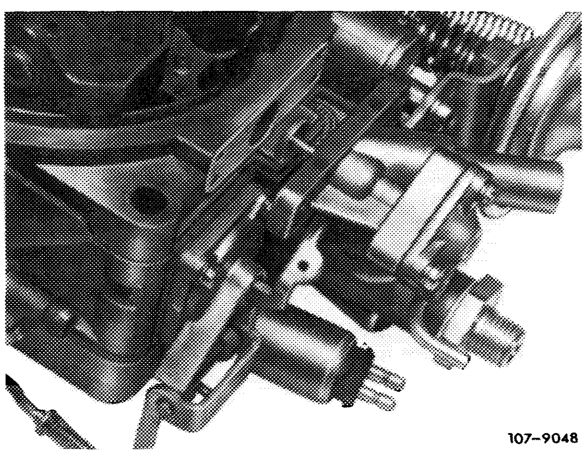
If coupler is connected to voltage, slip coupler on valve. Switch-over valve should audibly or noticeably switch.



If vacuum is not remaining constant:

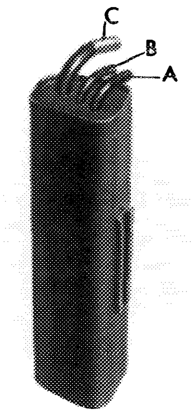
Test float chamber vent valve for leaks

Unscrew float chamber vent valve. With vacuum line connected, run engine at idle, keep vent bore on carburetor closed, if required, piston rod of valve should then move. Renew vacuum diaphragms of valve, if required.

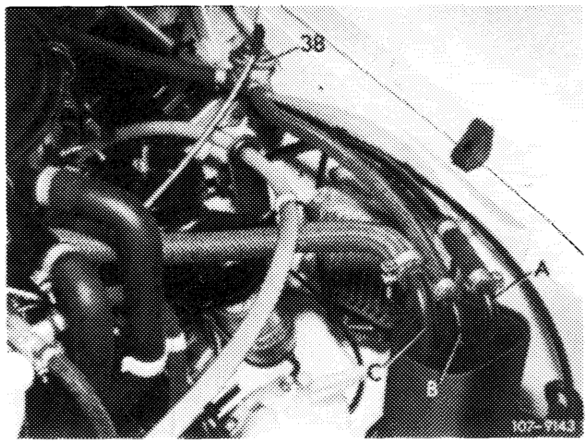


107–9048

Testing vacuum evaporation control system Pull center (thin) hose from charcoal canister and keep hose opening closed with finger. Increase engine speed slowly above approx. 2000/min.	
Vacuum available, vacuum increases with increasing speed.	No vacuum.



107-9131



Test draw-off line to intake pipe

For this purpose, loosen hose to charcoal canister on purge valve (38) and blow out valve in direction of intake pipe by means of compressed air. Renew purge valve (38), if required.

If vacuum is not increasing at increasing speed:

Test vacuum at purge valve (38)

Pull-off black vacuum line on purge valve (38). Connect vacuum pressure gauge or keep hose opening closed with finger. Slowly accelerate engine speed. No vacuum should be available at idle. At increasing speed, a vacuum should be established.

If vacuum is available, renew purge valve (38).

If no vacuum is available, blow out vacuum line to carburetor with compressed air.

End of test

Model year 1977/78/79

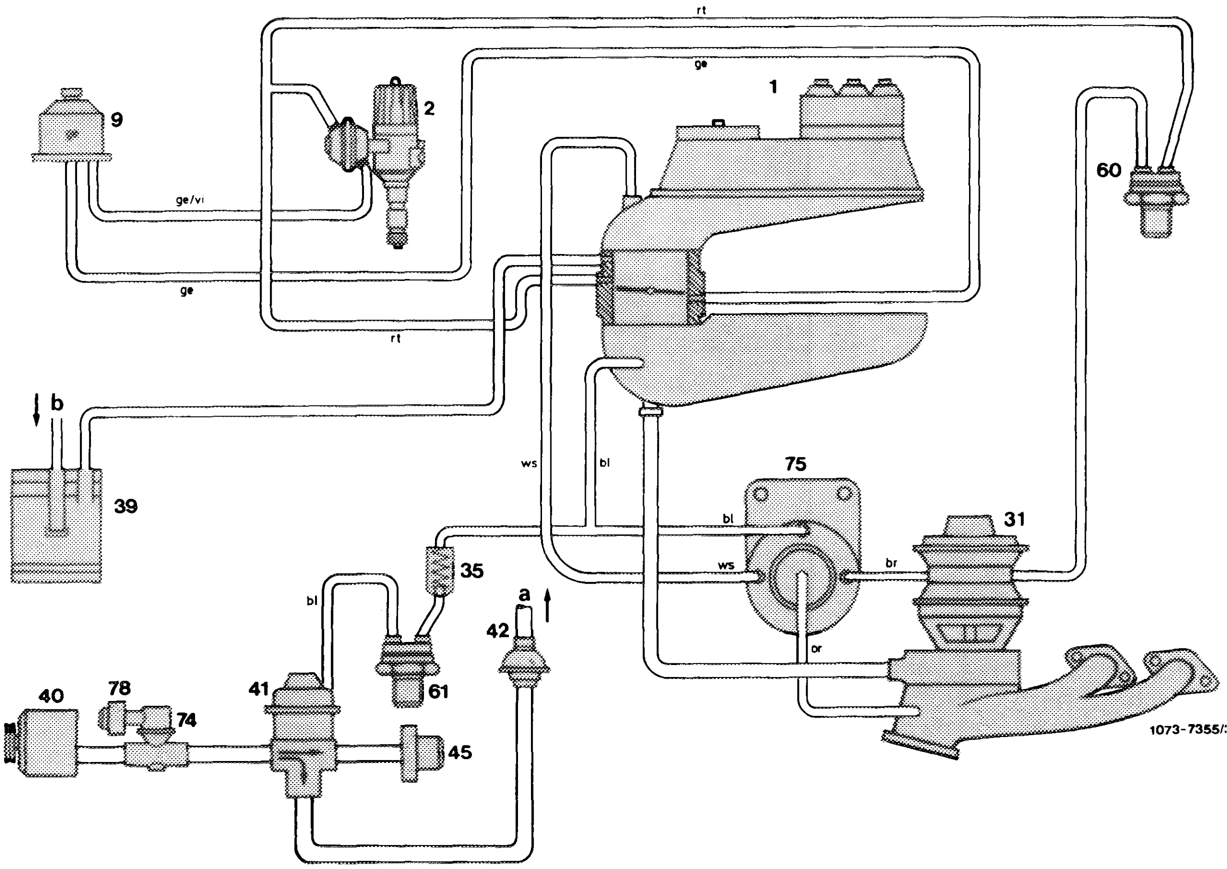
A. Federal version, tourist vehicles Federal version

For complaints such as: Poor warming-up characteristics of engine, poor idle speed, engine not accelerating or splashing during acceleration, check emission control system for function.

Test conditions: Engine at operating temperature, run engine at idle speed.

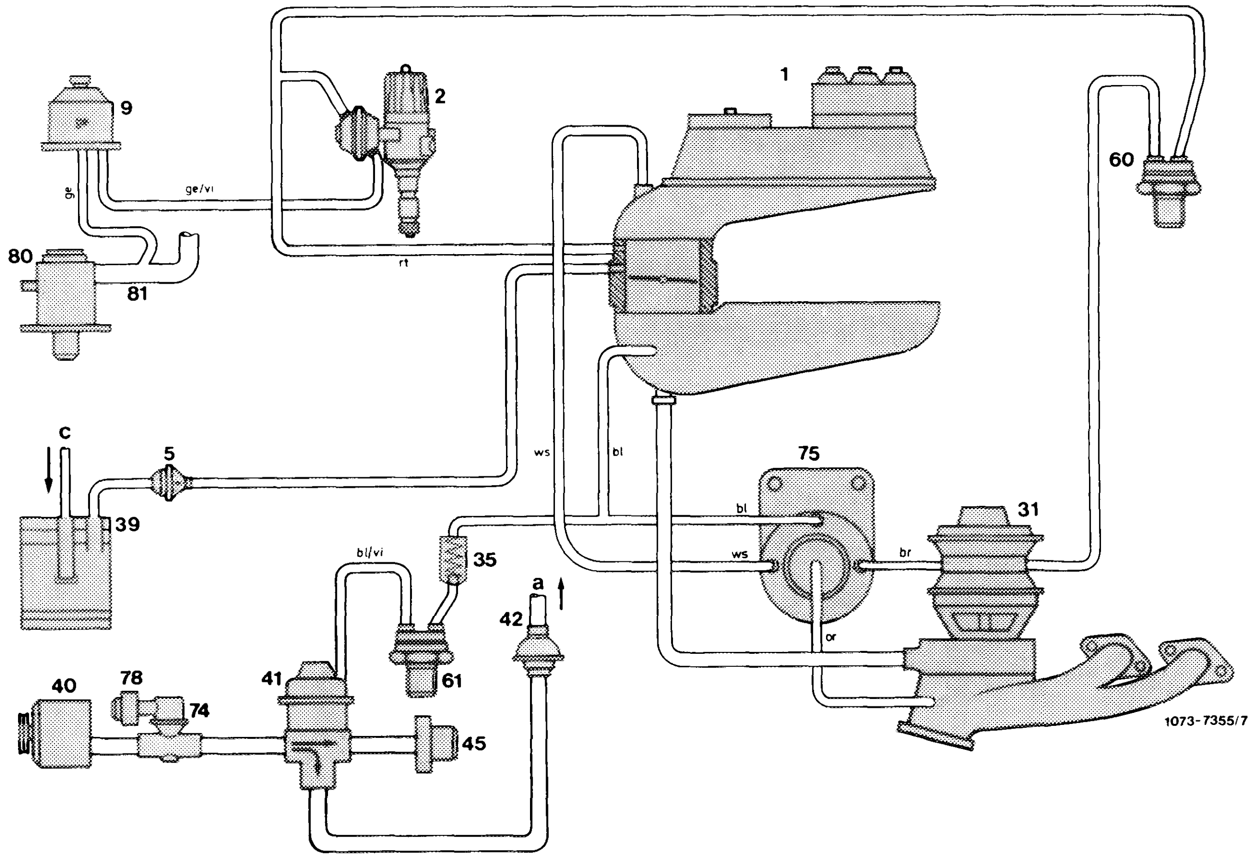
Test the following: EGR, air injection and fuel evaporation control system.

Function diagram model year 1977



1 Mixture controller 2 Ignition distributor 9 Switch-over valve ignition 31 EGR valve 35 Check valve	39 Charcoal canister 40 Air pump 41 Diverter valve (air switch-over valve) 42 Check valve 45 Air filter	60 Thermovalve 40 °C 61 Thermovalve 17 °C 74 Pressure relief valve 75 Pressure transducer 78 Air filter for silencing	a Air injection line b Connection tank vent

Function diagram model year 1978/79

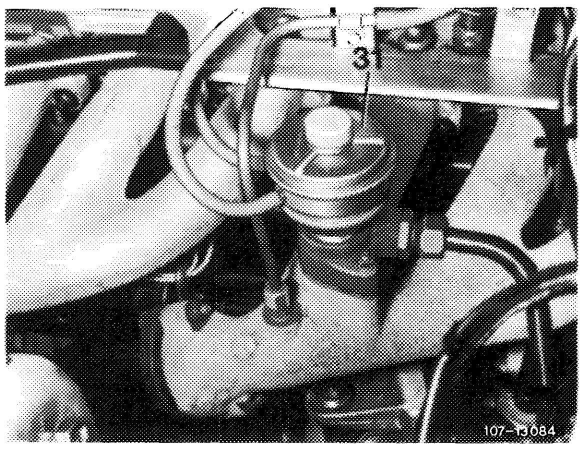


1	Mixture controller	35	Check valve	45	Air filter	78	Air filter for silencing
2	Ignition distributor	39	Charcoal canister	60	Thermovalve 40 °C	80	Auxiliary air valve
5	Regenerating valve (purge valve)	40	Air pump	61	Thermovalve 17 °C	81	Contour hose
9	Switch-over valve ignition	41	Diverter valve (air switch-over valve)	74	Pressure relief valve	a	Air injection line
31	EGR valve	42	Check valve	75	Pressure transducer	b	Connection tank vent

Testing EGR

Pull brown vacuum line from EGR valve (31) and slowly increase idle speed.

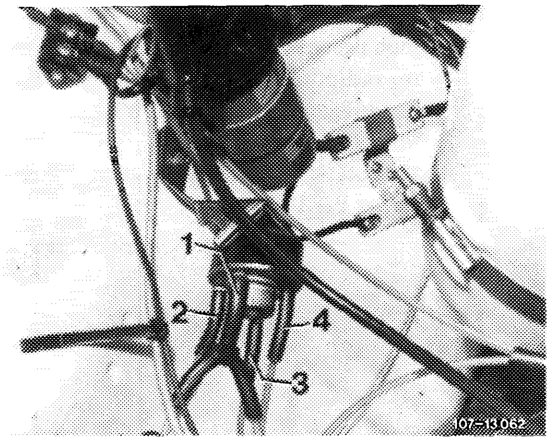
Engine runs irregularly starting at approx. 1200/min or stops.	Engine runs without change.



Testing vacuum lines

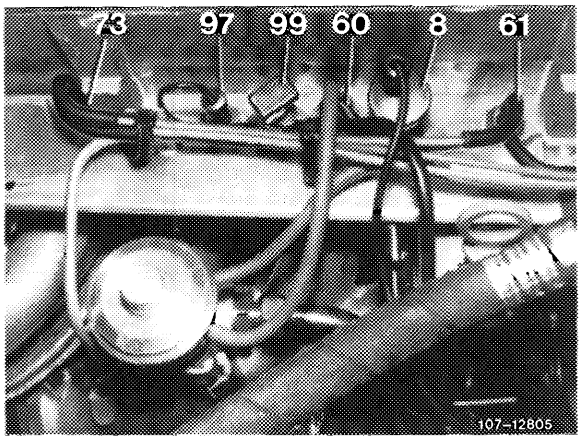
Test layout of vacuum lines on pressure transducer and intake pipe.

Note that connections on pressure transducer are identified with color rings. The attached vacuum lines should have the same color.



1 Connection intake pipe vacuum (blue)
2 Connection vent line (white)
3 Connection exhaust gas backpressure line (orange)
4 Connection vacuum line to EGR valve (brown)

On black thermovalve 40 °C (60) the red vacuum line should be plugged to diagonal connection, and the rubber hose to straight connection. Check all pertinent vacuum lines for leaks and blow out vacuum connections.



Testing thermovalve 40 °C (60)

The thermovalve is identified by a black plastic section and the designation "50 AA 4" punched into metal section. Pull-off vacuum hose at straight connection, let engine run and accelerate.

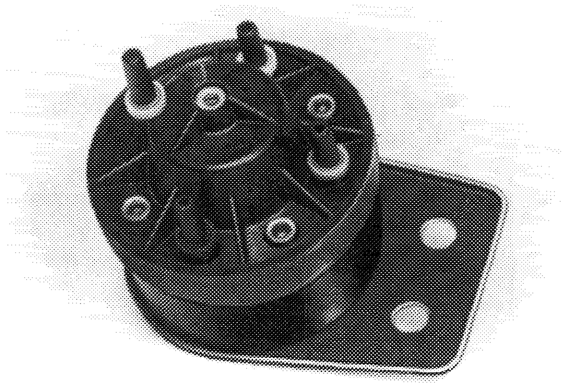
Vacuum should be felt at free connection.

During removal and installation of thermovalve make sure that the small connecting pipes are not damaged.

Testing pressure transducer (75)

Run engine at idle speed. Pull-off brown vacuum line on EGR valve. Connect vacuum pressure gauge or keep vacuum line closed with finger. Vacuum should be available at idle speed.

If there is no vacuum, renew pressure transducer.



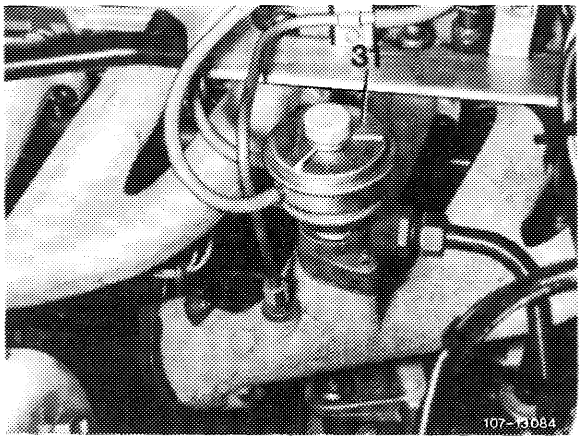
107-12314

Testing EGR valve (31)

Run engine at idle speed. Pull-off both hoses on EGR valve.

Plug brown vacuum line to connection for red/purple vacuum line. Engine should run irregularly or come to a stop.

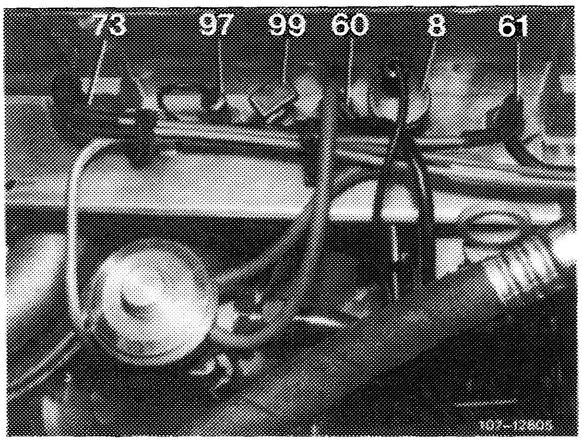
If operation of engine is not changing, renew EGR valve.



Testing air injection

Connect CO measuring instrument and read exhaust gas value. Pull vacuum line from straight connection of thermovalve (61) and close connection.

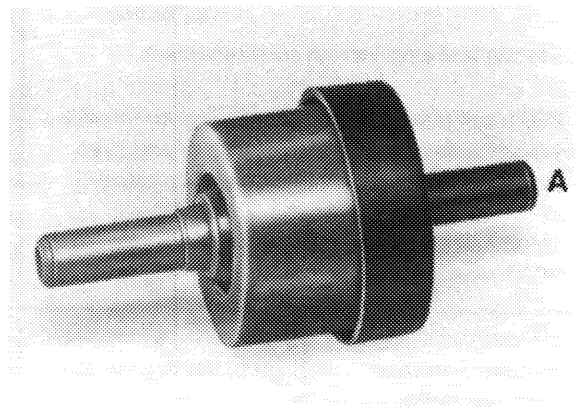
Exhaust gas value increasing.	Exhaust gas value not increasing.



Testing vacuum lines

The blue vacuum line from intake pipe should be connected to blue line and diagonal connection of thermovalve (61) by means of a distributor and check valve. The check valve should be plugged on with connection (A) in direction of intake pipe.

The blue/purple vacuum line of straight connection of thermovalve (61) leads to diverter valve (41).

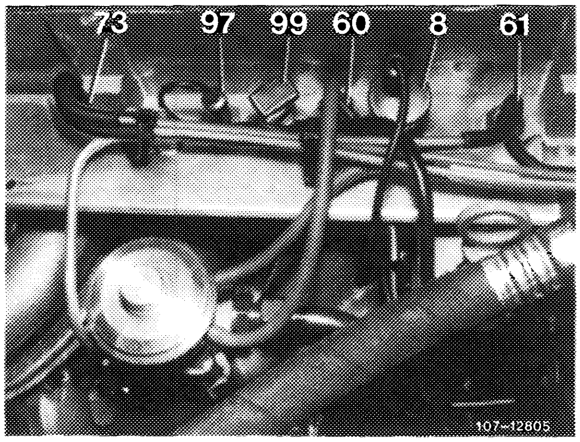


107–12 701/1

Testing vacuum

Pull vacuum line from diagonal connection of thermovalve (61), connect vacuum gauge or keep closed with finger. Vacuum should be available at idle speed. If not, test vacuum lines for leaks and blow out vacuum draw-off line (tapping line) at intake pipe.

If vacuum is available, test thermovalve (61) and renew, if required.



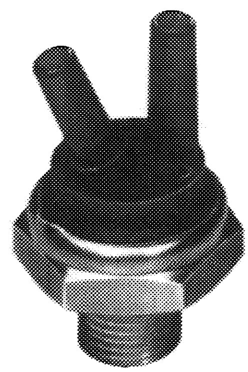
Testing thermovalve 17 °C (61)

The thermovalve is identified by a blue plastic section and the designation "50 AB 5" punched into metal section.

Pull-off blue/purple vacuum line, run engine.

Vacuum should be available at free connection.

If thermovalve is in order, renew diverter valve (41).



107–10895

Testing fuel evaporation control system

Pull black plastic line (draw-off line) to throttle valve housing from charcoal canister and keep closed with finger or connect vacuum gauge.

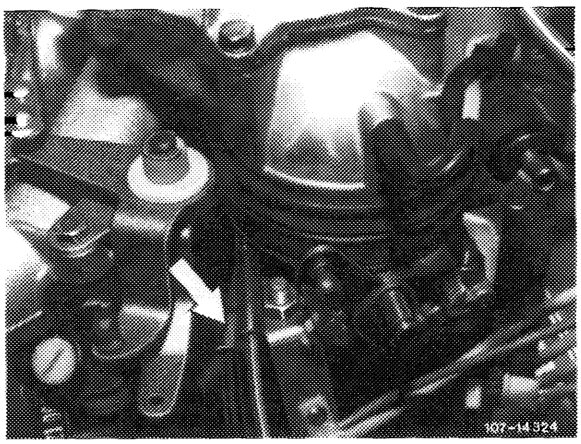
Slowly increase engine speed to above approx. 2000/min.

No vacuum at idle. Vacuum increases with increasing speed.	No vacuum increase at increasing speed.

Model year 1977

Testing draw-off hose

The draw-off hose should be plugged to throttle valve housing (arrow). Check hose for leaks and blow out connection on throttle valve housing.



Model year 1978/79

Testing draw-off hose and regenerating valve

The draw-off hose should be plugged to throttle valve housing (arrow). Check hose for leaks and blow out connection on throttle valve housing.

If there is still no vacuum, pull draw-off hose in front of regenerating valve and repeat test.

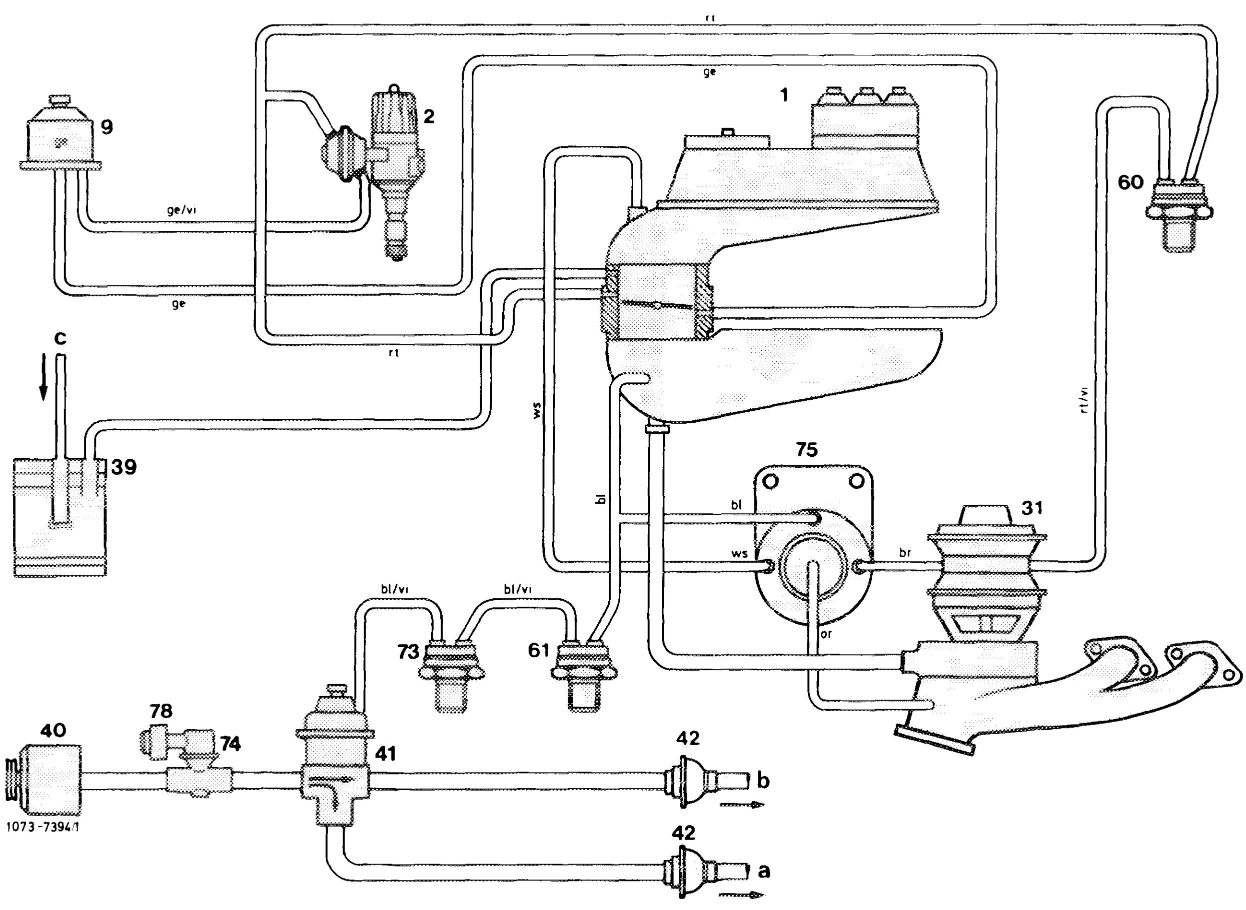
If vacuum is available, renew regenerating valve.

End of test

B. California version

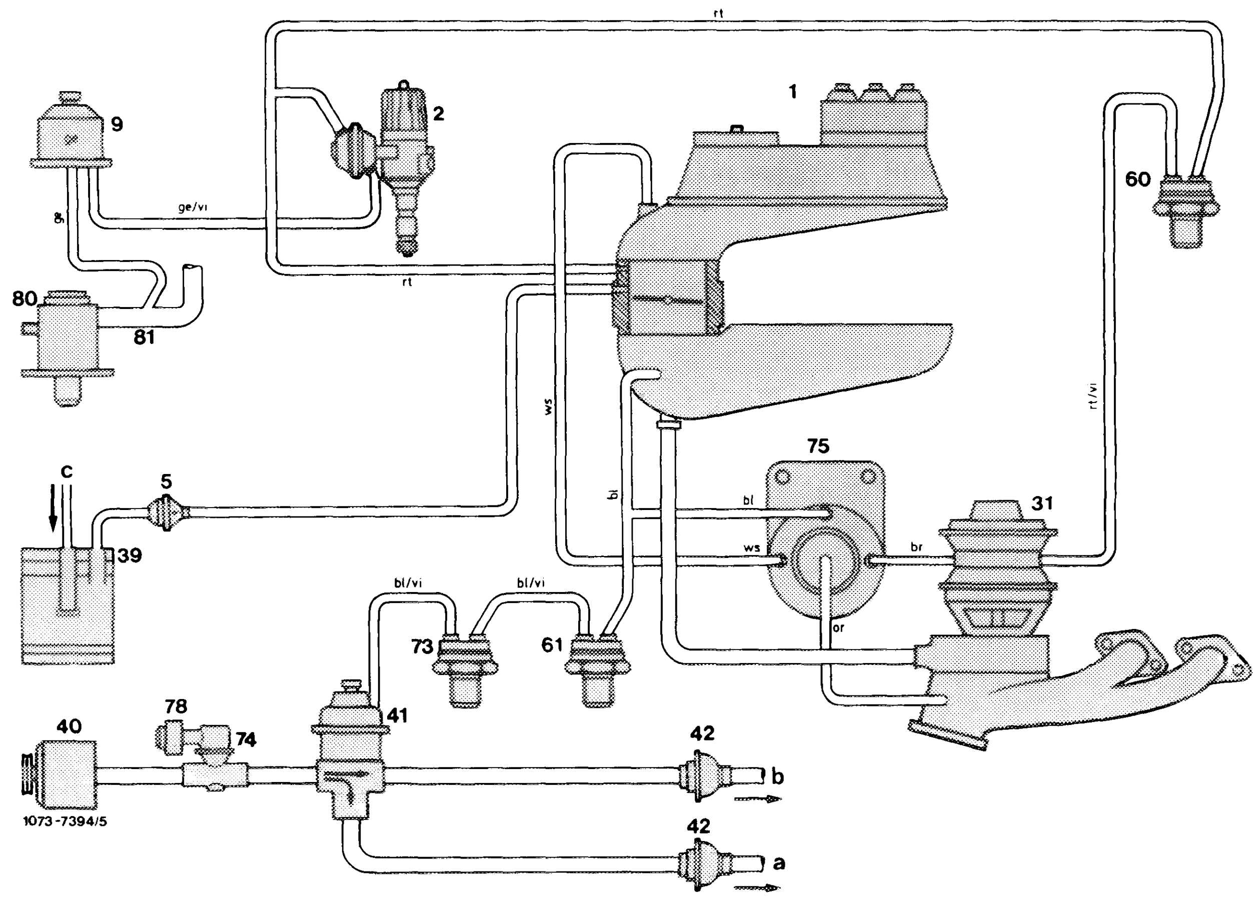
For complaints such as:	Poor warming-up characteristics of engine, poor idle speed, engine not accelerating or splashing during acceleration, check emission control system for function.
Test conditions:	Engine at operating temperature, run engine at idle speed.
Test the following:	EGR, air injection and fuel evaporation control system.

Function diagram model year 1977



1 Mixture controller
2 Ignition distributor
9 Switch-over valve ignition
31 EGR valve
39 Charcoal canister
40 Air pump
41 Air switch-over valve
42 Check valve
60 Thermovalve 40 °C
61 Thermovalve 17 °C
73 Thermovalve 50 °C
74 Pressure relief valve
75 Pressure transducer
78 Air filter for silencing
a Air injection line cylinder head
b Air injection line between catalysts
c Connection tank vent

Function diagram model year 1978/79

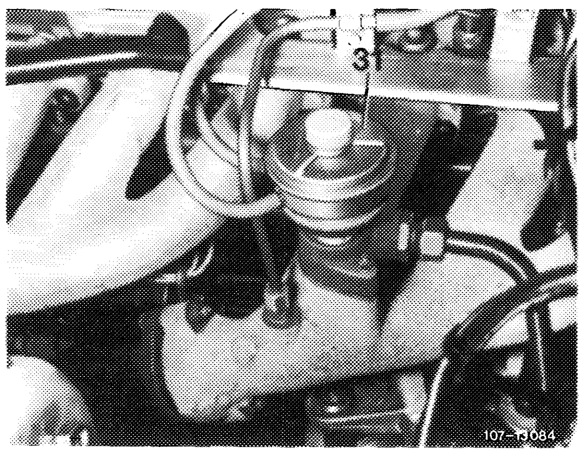


1 Mixture controller
2 Ignition distributor
5 Regenerating valve
9 Switch-over valve ignition
31 EGR valve
39 Charcoal canister
40 Air pump
41 Air switch-over valve
42 Check valve
60 Thermovalve 40 °C
61 Thermovalve 17 °C
73 Thermovalve 50 °C
74 Pressure relief valve
75 Pressure transducer
78 Air filter for silencing
80 Auxiliary air valve
81 Contour hose
a Air injection line cylinder head
b Air injection line between catalysts
c Connection tank vent

Testing EGR

Pull-off brown vacuum line on EGR valve (31) and slowly increase idle speed.

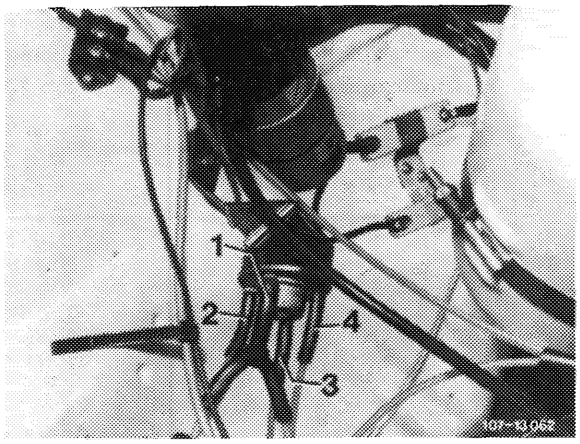
Engine runs irregularly starting at approx. 1200/min or comes to a stop.	Engine operation continues without stop.



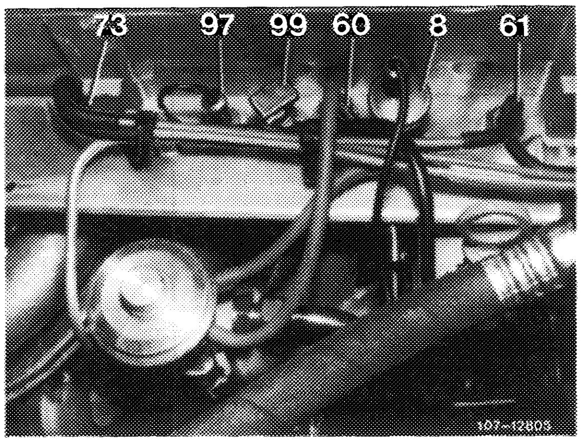
Testing vacuum lines

Test layout of vacuum lines on transducer and intake pipe.

Note that connections on pressure transducer are identified with color rings. The plugged-on vacuum lines should have the same color.



1 Connection intake pipe vacuum (blue)
2 Connection vent line (white)
3 Connection exhaust gas backpressure line (orange)
4 Connection vacuum line to EGR valve (brown)



On black thermovalve 40 °C (60) the red vacuum line should be connected to diagonal connection, and the rubber hose to straight connection. Check all pertinent vacuum lines for leaks and blow out vacuum draw-off connections.

Testing thermovalve 40 °C (60)

The thermovalve is identified by black plastic section and by the designation "50 AA 4" punched into metal section. Pull-off vacuum hose at straight connection, keep engine running and accelerate.

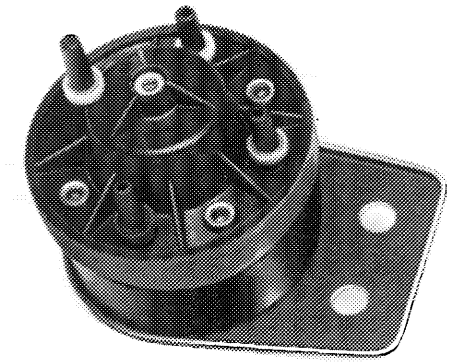
Vacuum should be available at free connection.

When removing and installing thermovalve, make sure that the small connecting pipes are not damaged.

Test pressure transducer (75)

Run engine at idle. Pull-off brown vacuum line on EGR valve. Connect vacuum gauge or keep vacuum line closed with finger. Vacuum should be available at idle speed.

If there is no vacuum, renew pressure transducer.



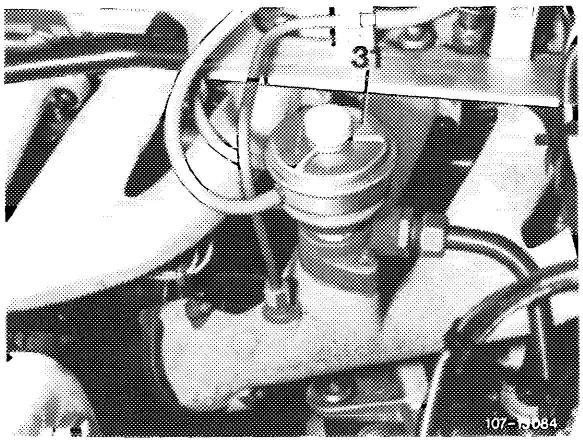
107–12314

Test EGR valve (31)

Run engine at idle speed. Pull-off both hoses on EGR valve.

Plug brown vacuum line to connection for red/purple vacuum line. Engine should run irregularly or come to a stop.

If operation of engine is not changing, renew EGR valve.

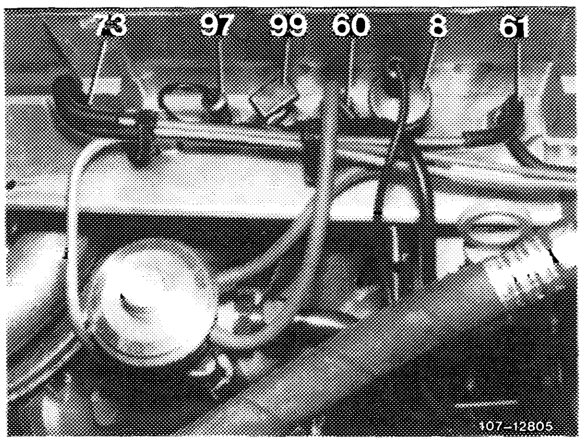


107–13084

Testing air injection

Connect CO measuring instrument to exhaust gas backpressure line and read exhaust gas emission value. Change vacuum hose from straight plug connection of thermovalve (73) to straight plug connection of thermovalve (61).

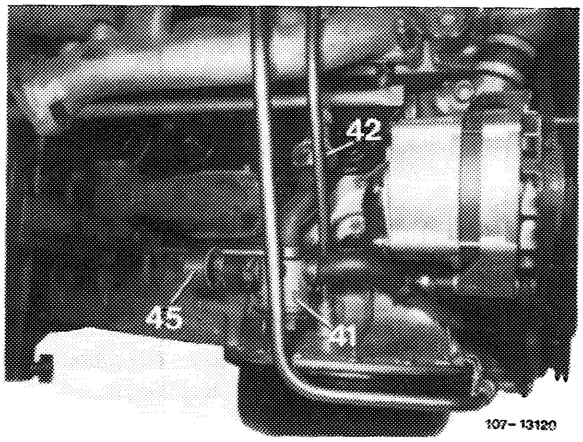
Exhaust gas value clearly decreasing.	Exhaust gas value not decreasing.



107–12805

Test vacuum lines

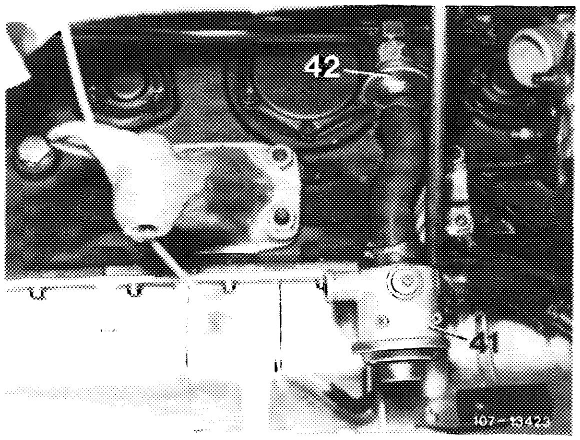
The blue vacuum line from intake pipe should be connected to diagonal connection of thermovalve (61) by means of a distributor. The purple/blue vacuum line leads from straight connection of thermovalve (61) to diagonal connection of thermovalve (73) and from straight connection of thermovalve (73) to air switch-over valve (41).



107–13120

Test vacuum

Check at straight connection of thermovalve (61) for vacuum. If vacuum is available, renew air switch-over valve (41).



107–13423

If there is no vacuum:

Pull-off blue vacuum line on thermovalve (61) and check for vacuum.

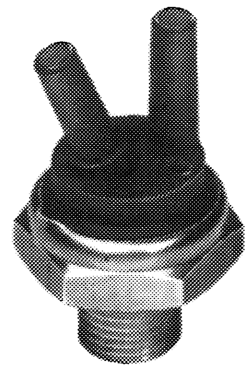
If vacuum is available:

Renew thermovalve (61).

If there is no vacuum:

Remove vacuum line to intake pipe and blow out with compressed air.

Test thermovalve (73)


107–10895

If upon completion of the above jobs the exhaust gas value is still not decreasing, test thermovalve (73) for passage and renew, if required.

Below approx. 50 °C thermovalve is open, above approx. 50 °C valve is closed.

The thermovalve is identified by black plastic section with a green color dot and by the designation "50 AA 13" punched into metal section.

Note: Starting model year 1978 the identifying color is **green**, designation "50 AC 13".

Testing fuel evaporation control system

Pull-off black plastic line (draw-off line) to throttle valve housing from charcoal canister and keep closed with finger or connect vacuum gauge.

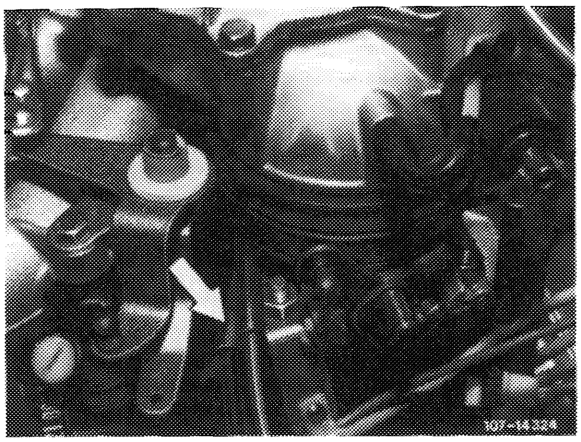
Slowly increase engine speed to above approx. 2000/min.

No vacuum at idle. Vacuum increasing at increasing speed.	Vacuum not increasing at increasing speed.

Model year 1977

Test draw-off hose

Draw-off hose must be plugged to throttle valve housing (arrow). Check hose for leaks and blow out connection on throttle valve housing.



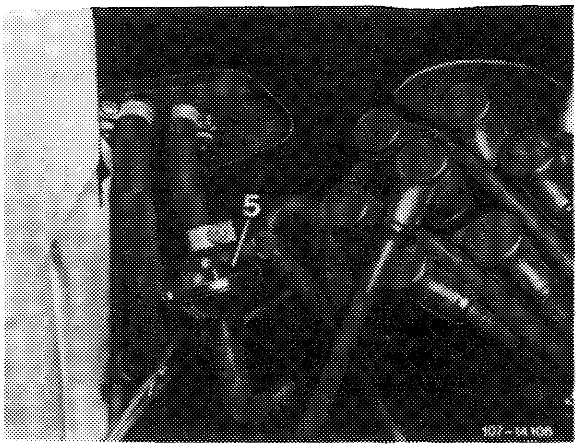
Model year 1978/79

Test draw-off hose and regenerating valve (purge valve)

Draw-off hose should be plugged to throttle valve housing (arrow). Check hose for leaks and blow out connection on throttle valve housing.

If there is still no vacuum, pull-off draw-off hose in front of regenerating valve and repeat test.

If vacuum is available, renew regenerating valve (purge valve).

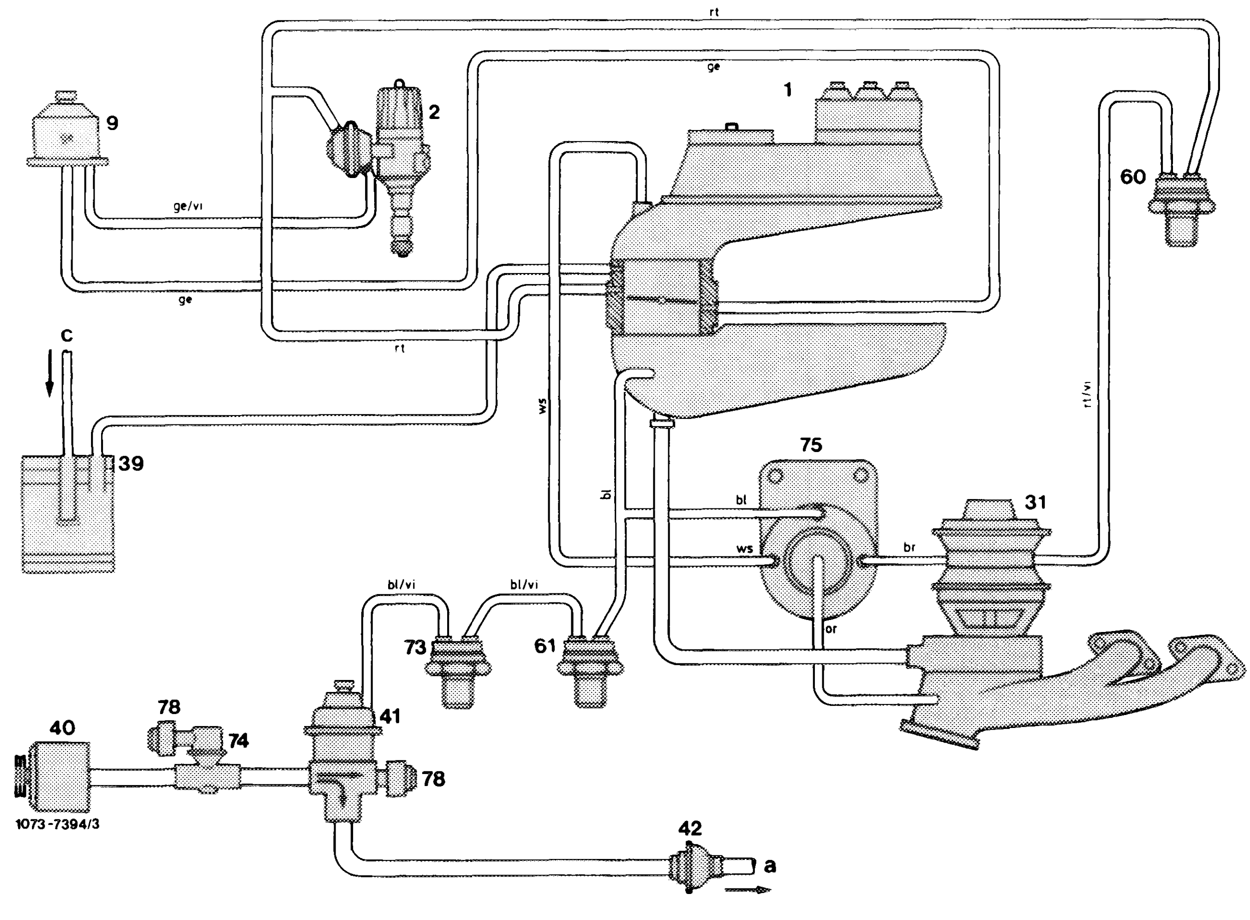


End of test

C. Tourist vehicles California version

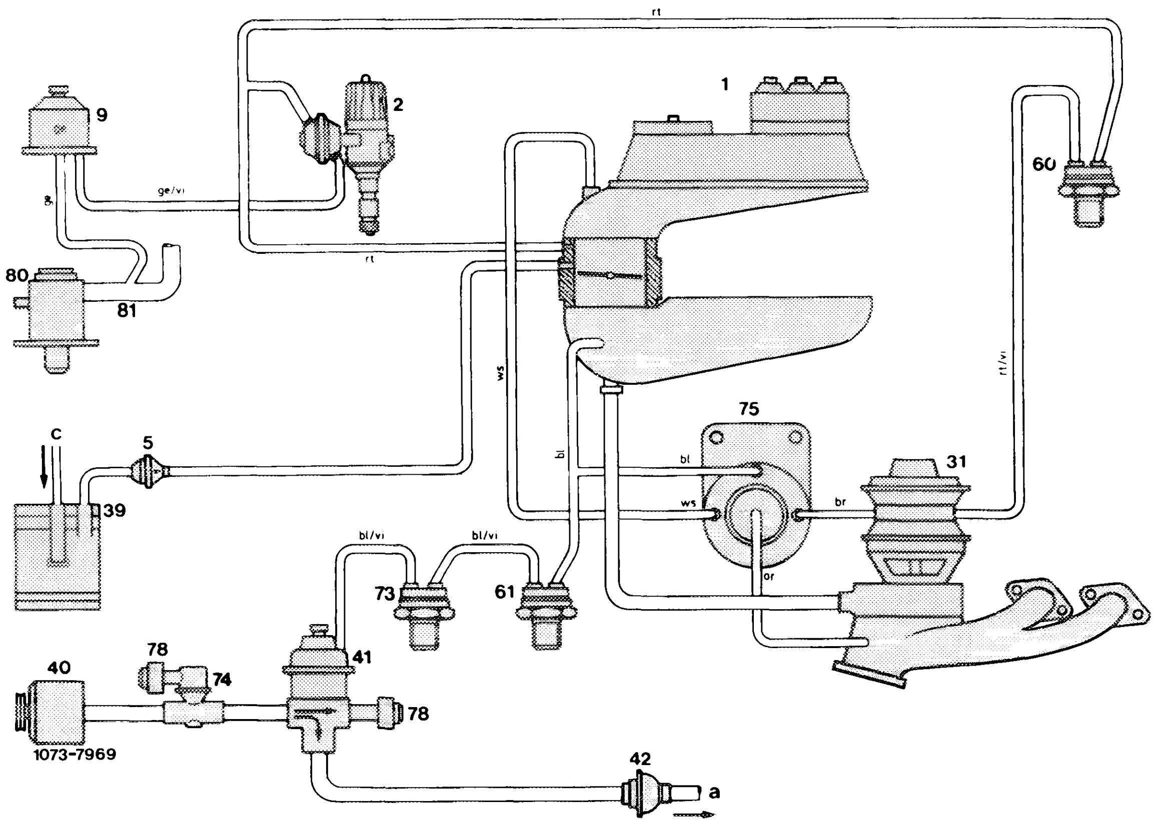
For complaints such as:	Poor warming-up characteristics of engine, poor idle speed, engine not accelerating or splashing during acceleration, check emission control system for function.
Test conditions:	Engine at operating temperature, run engine at idle speed.
Test the following:	EGR, air injection and fuel evaporation control system.

Function diagram model year 1977



1	Mixture controller	39	Charcoal canister	60	Thermovalve 40 °C	75	Pressure transducer
2	Ignition distributor	40	Air pump	61	Thermovalve 17 °C	78	Air filter for silencing
9	Switch-over valve ignition	41	Air switch-over valve	73	Thermovalve 50 °C	a	Air injection line cylinder head
31	EGR valve	42	Check valve	74	Pressure relief valve	c	Connection tank vent

Function diagram model year 1978/79



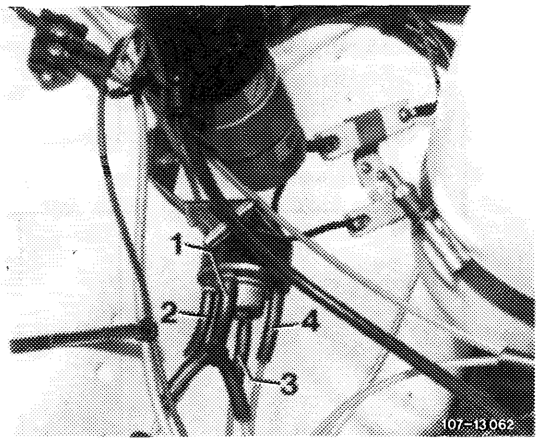
1	Mixture controller	39	Charcoal canister	61	Thermovalve 17 °C	80	Auxiliary air valve
2	Ignition distributor	40	Air pump	73	Thermovalve 50 °C	81	Contour hose
5	Regenerating valve	41	Air switch-over valve	74	Pressure relief valve	a	Air injection line cylinder head
9	Switch-over valve ignition	42	Check valve	75	Pressure transducer		
31	EGR valve	60	Thermovalve 40 °C	78	Air filter for silencing	c	Connection tank vent

Testing EGR Pull brown vacuum line from EGR valve (31) and slowly increase idle speed.	
Engine runs irregularly starting at approx. 1200/min or comes to a stop.	Engine operation continues without stop.

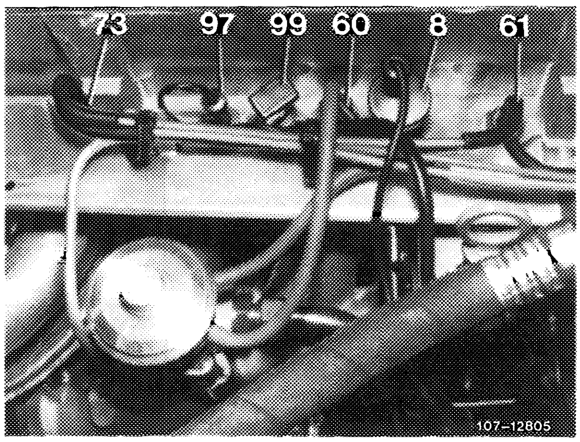
Test vacuum lines

Test layout of vacuum lines on transducer and intake pipe.

Note that connections on pressure transducer are identified with color rings. The plugged-on vacuum lines should have the same color.



1 Connection intake pipe vacuum (blue)
2 Connection vent line (white)
3 Connection exhaust gas backpressure line (orange)
4 Connection vacuum control line to EGR valve (brown)



On black thermovalve 40 °C (60) the red vacuum line should be connected to diagonal connection, and the rubber hose to straight connection. Check all pertinent vacuum lines for leaks and blow out vacuum draw-off connections.

Test thermovalve 40 °C (60)

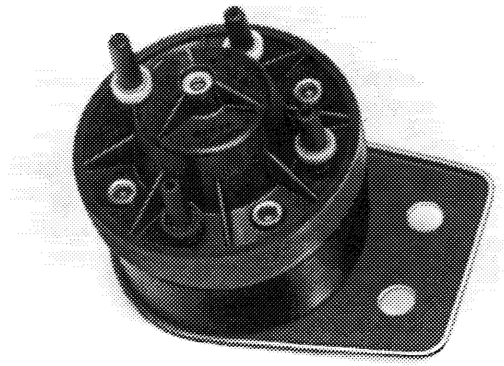
The thermovalve is identified by black plastic section and by the designation "50 AA 4" punched into metal section.

Pull-off vacuum hose at straight connection, keep engine running and accelerate.

Vacuum should be available at free connection.

When removing and installing thermovalve, make sure that the small connecting pipes are not damaged.

Test pressure transducer (75)



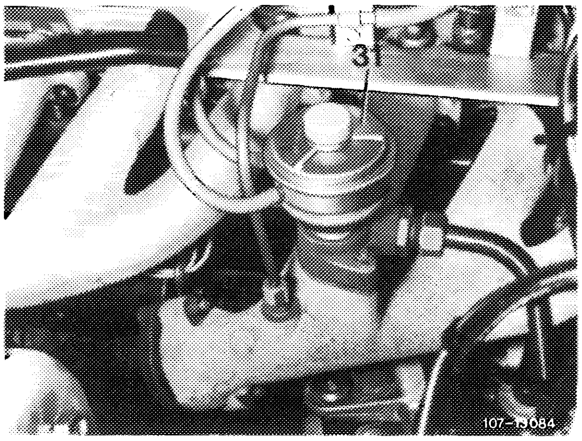
107–12314

Run engine at idle. Pull-off brown vacuum line on EGR valve. Connect vacuum gauge or keep vacuum line closed with finger. Vacuum should be available at idle speed.

If there is no vacuum, renew pressure transducer.

Test EGR valve (31)

Run engine at idle speed. Pull-off both hoses on EGR valve.



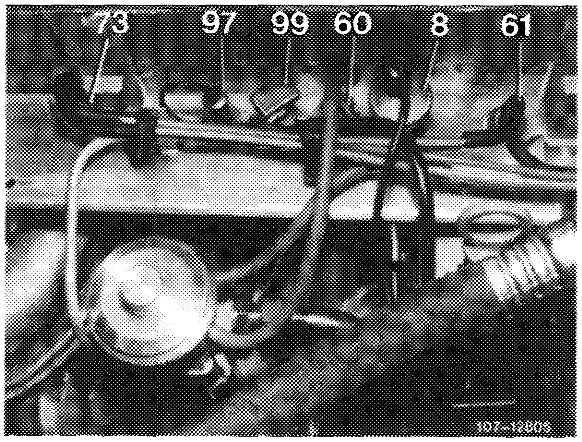
Plug brown vacuum line to connection for red/purple vacuum line. Engine should run irregularly or come to a stop.

If operation of engine is not changing, renew EGR valve.

Testing air injection Connect CO measuring instrument and read exhaust gas emission value. Change vacuum hose from straight plug connection of thermo-valve (73) to straight plug connection of thermovalve (61).	
Exhaust gas value clearly decreasing.	Exhaust gas value not decreasing.

Test vacuum lines

The blue vacuum line from intake pipe should be connected to diagonal connection of thermovalve (61) by means of a distributor. The purple/blue vacuum line leads from straight connection of thermovalve (61) to diagonal connection of thermovalve (73) and from straight connection of thermovalve (73) to air switch-over valve (41).



Test vacuum

Check at straight connection of thermovalve (61) for vacuum. If vacuum is available, renew air switch-over valve (41).

If there is no vacuum:

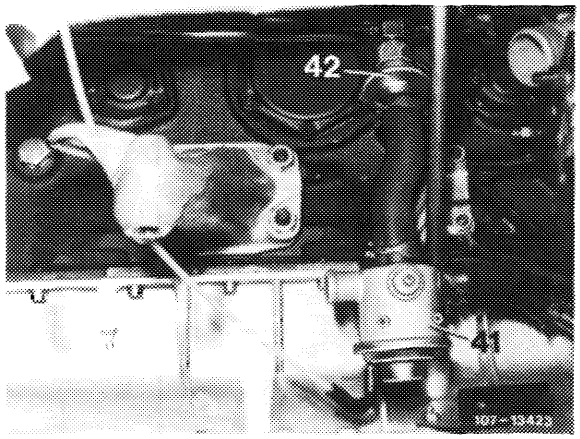
Pull-off blue vacuum line on thermovalve (61) and check for vacuum.

If vacuum is available:

Renew thermovalve (61).

If there is no vacuum:

Remove vacuum line to intake pipe and blow out with compressed air.



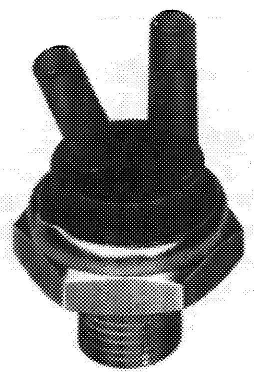
Test thermovalve (73)

If upon completion of the above jobs the exhaust gas value is still not decreasing, test thermovalve (73) for passage and renew, if required.

Below approx. 50 °C thermovalve is open, above approx. 50 °C valve is closed.

The thermovalve is identified by black plastic section with a green color dot and by the designation "50 AA 13" punched into metal section.

Note: Starting model year 1978 the identifying color is **green**, designation "50 AC 13".



107–10895

Testing fuel evaporation control system

Pull-off black plastic line (draw-off line) to throttle valve housing from charcoal canister and keep closed with finger or connect vacuum gauge.

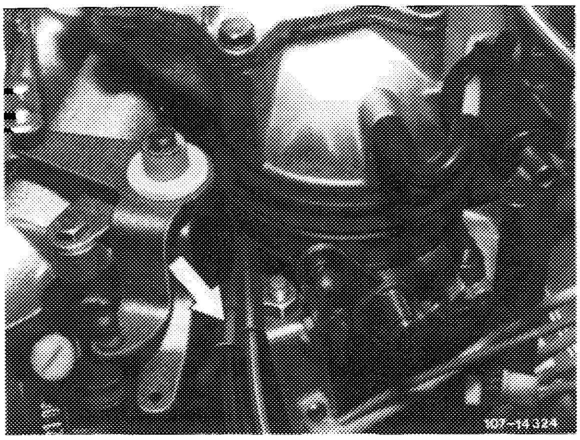
Slowly increase engine speed to above approx. 2000/min.

No vacuum at idle. Vacuum increasing at increasing speed.	Vacuum not increasing at increasing speed.

Model year 1977

Test draw-off hose

Draw-off hose must be plugged to throttle valve housing (arrow). Check hose for leaks and blow out connection on throttle valve housing.



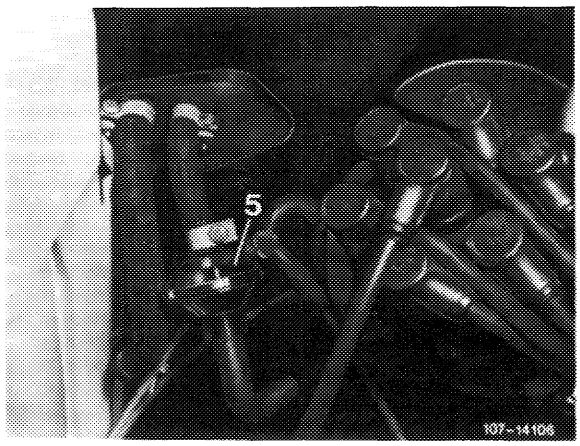
Model year 1978/79

Test draw-off hose and regenerating valve (purge valve)

Draw-off hose should be plugged to throttle valve housing (arrow). Check hose for leaks and blow out connection on throttle valve housing.

If there is still no vacuum, pull-off draw-off hose in front of regenerating valve and repeat test.

If vacuum is available, renew regenerating valve (purge valve).



End of test

For conplaints such as: On/off ratio cannot be regulated, poor warm-up characteristics of engine, hunting at idle, engine not accepting gas or splashing during acceleration, proceed as follows:

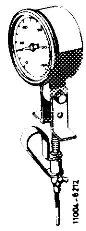
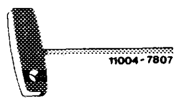
Check lambda control.

Check air injection.

Check fuel evaporation control system.

Assumption: CIS injection system and ignition system in order.

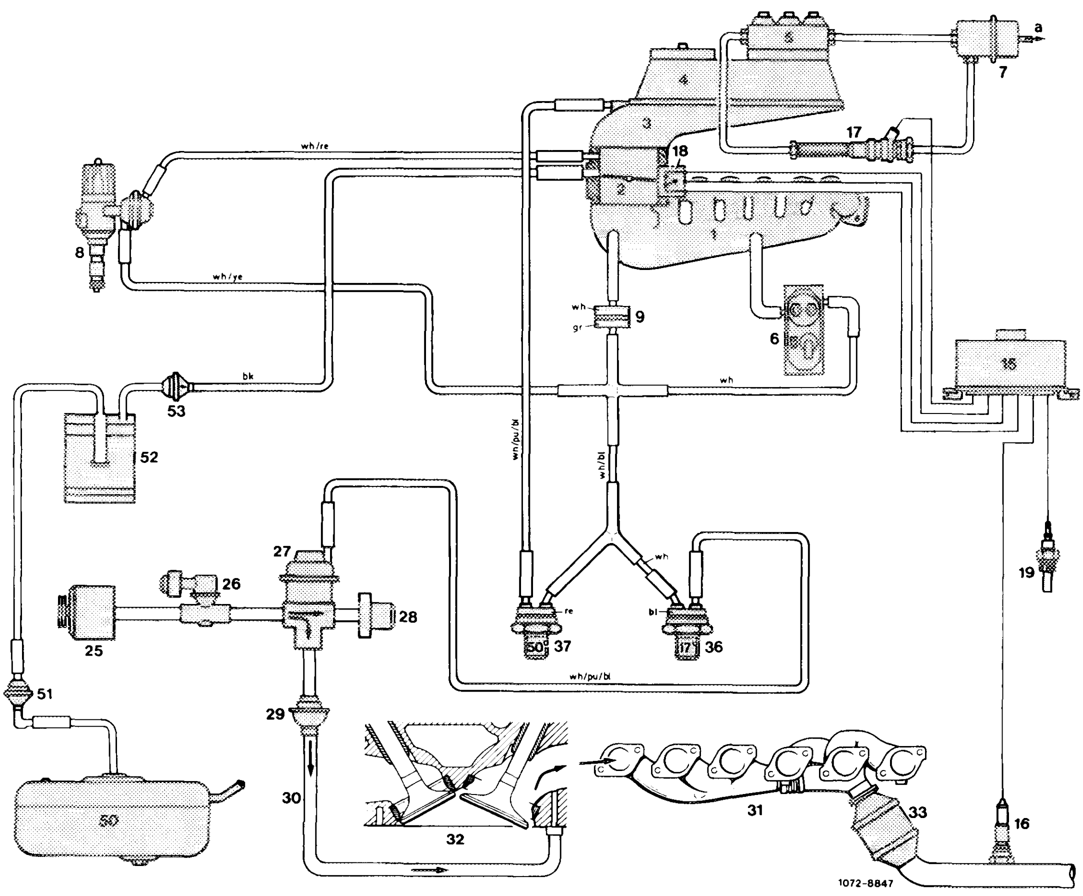
Special tools

Oil telethermometer		116 589 27 21 00
Allen wrench for hex socket screw 3 mm		000 589 14 11 00
Adapter for checking electric lines and components		110 589 14 21 00

Conventional tools

Revolution counter, multimeter (volt-ohmmeter)	
Lambda control tester	KDJE–P 600

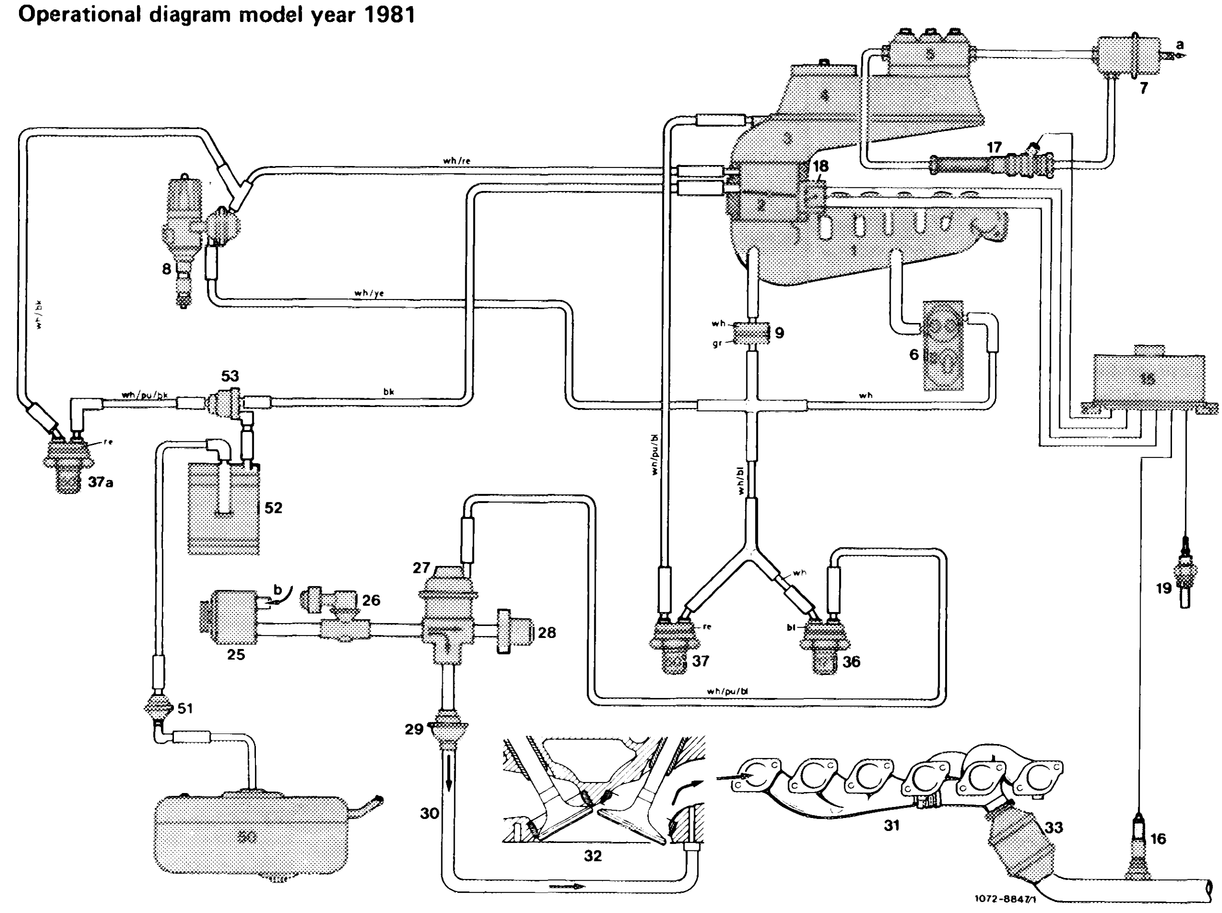
Operational diagram model year 1980



1 Intake manifold
2 Throttle valve housing
3 Air guide housing
4 Air flow sensor
5 Volume distributor
6 Warm-up compensator
7 Damper
8 Ignition distributor
9 Orifice
15 Control unit
16 Oxygen sensor
17 Frequency valve
18 Throttle valve switch
19 Temperature switch oil 16 °C/61 °F
25 Air pump
26 Pressure relief valve
27 Diverter valve
28 Damper filter (silencer)
29 Check valve
30 Injection line
31 Exhaust manifold
32 Cylinder head
33 Primary catalyst
36 Thermovalve 17 °C/62 °F
37 Thermovalve 50 °C/122 °F
50 Fuel tank
51 Vent valve unit
52 Charcoal canister
53 Purge valve
a Leak-off connection

Color code
bk = black
bl = blue
gr = green
ye = yellow
re = red
wh = white
pu = purple

Operational diagram model year 1981



1 Intake manifold
2 Throttle valve housing
3 Air guide housing
4 Air flow sensor
5 Fuel distributor
6 Warm-up compensator
7 Damper
8 Ignition distributor
9 Orifice
15 Control unit
16 Oxygen sensor
17 Frequency valve
18 Throttle valve switch
19 Temperature switch oil 16 °C/61 °F
25 Air pump
26 Pressure relief valve
27 Diverter valve
28 Damper filter (silencer)
29 Check valve
30 Injection line
31 Exhaust manifold
32 Cylinder head
33 Primary catalyst
36 Thermovalve 17 °C/62 °F
37 Thermovalve 50 °C/122 °F
37a Thermovalve 50 °C/122 °F
50 Fuel tank
51 Vent valve unit
52 Charcoal canister
53 Purge valve
a Leak-off connection
b From air cleaner

Color code
bk = black
bl = blue
gr = green
ye = yellow
re = red
wh = white
pu = purple

A. Quick test with lambda control tester KDJE–P 600

The lambda control tester can be used for adjusting on/off ratio at idle, but also for a quick diagnosis of lambda control.

Connect lambda control tester to diagnosis socket and revolution counter. Connect oil telethermometer.

Note: If the specified nominal value is not attained, refer to quick test with adapter.

Scope of test	Actuation	Readout/nominal value
a) Engine oil temperature < 13 °C/55 °F	Engine at idle	Constant between 56–64 %
b) Simulation	Pull plug from temperature switch 16 °C/61 °F and connect to ground	Readout as above

Warm-up control

a) Engine oil temperature > 20 °C/68 °F, oxygen sensor not yet ready for operation (< approx. 300 °C/572 °F)	Engine at idle	Constant between 46–54 %
b) Simulation	Separate plug of oxygen sensor	Readout as above

Control at operating temperature

Engine oil temperature approx. 80 °C, oxygen sensor ready for operation (> approx. 300 °C)	Engine at idle	50 % ± 10 % slowly swinging needle
Idle contact closed	Throttle valve at idle stop	Deflection of needle approx. 8–12 % around nominal value
Idle contact open	Slightly open throttle valve	Deflection of needle approx. 13–23 % around nominal value
Full throttle contact closed	Apply full throttle for a short moment	Constant between 56–64 %
Lean stop control unit	Separate plug of oxygen sensor, connect plug of control unit to 2 volt output of tester **for a short moment**	Constant < approx. 20 % < approx. 20 %
Rich stop control unit	Separate plug of oxygen sensor, connect plug for control unit to ground **for a short moment**	Constant > approx. 87 %
Air injection	Pull blue/purple vacuum line from air guide housing and close **for a short moment**	Constant approx. 87 %

B. Quick test with adapter

Connect adapter to plug, control unit and multimeter to adapter.

Test set-up	Circuit or component tested	Setting of controls	Specified value . . . If deviating, see individual component test program sections
Adapter to position 1 with voltmeter	Supply voltage	Ignition turned on	U = 12 ± 2 V light on If deviating, see section I.
Adapter to position 2 with ohmmeter	Throttle valve switch	Ignition off Idle position . . . Full throttle position . . .	R = ∞ Ω R = 0 Ω If deviating, see sections IV and V.
	Switch 16 °C/ 61 °F	Ignition off	< 13 °C R = 0 Ω > 19 °C R = ∞ Ω If deviating, see sections II and III.
Adapter to position 3 with ohmmeter	Throttle valve switch	Ignition off Idle position . . . Advance slightly throttle linkage . . .	R = 0 Ω R = ∞ Ω If deviating, see sections IV and V.
Adapter to position 4 with voltmeter	Frequency valve	Ignition on Crank engine	U = 12 ± 2 V If deviating, see sections VI and IX.
Adapter to position 5 with ohmmeter	Oxygen sensor probe cable and connection to electronic control unit	Ignition off Pull off oxygen sensor connection and bridge plug going to electronic control unit	R = ∞ Ω R = 0 Ω If deviating, see sections VII and VIII.
Disconnect adapter and re-insert plug into control unit. Connect lambda control tester		Run engine until operating temperature is attained	On/off ratio = 50 % ± 10 % If deviating, see section X.
Pull blue/purple vacuum line from air guide housing and close		Start engine for a short moment	On/off ratio = > 80 % If deviating, see section XI.
Pull draw-off line (purge line) to throttle valve housing from charcoal canister		Start engine Idle approx. 2000/min	No vacuum Vacuum available If deviating, see section XII.

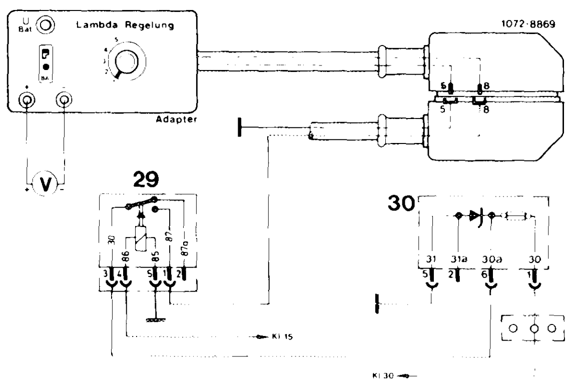
C. Component test program

Test section A

Test conditions: Connect adapter to plug, control unit and multimeter to adapter.

Connect oil telethermometer.

I. Testing voltage supply of control unit



Rotary switch on adapter to position 1, multimeter to measuring range 0–30 volts, ignition switched on, read indicator.

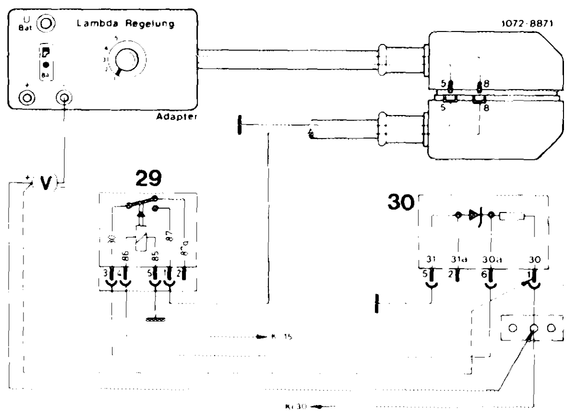
Indicator lamp of adapter:

Lighting up	Not lighting up
Readout	
approx. 12 volts	0 volt

Pull plus (positive) cable of voltmeter from adapter. Measure voltage: on connector of engine harness (terminal 30), on plug of overload protection (30) jack 1.

Readout	
approx. 12 volts	0 volt

Check line for break and correct, if required. Readout approx. 12 volts.



Attach overload protection (30) to plug in such a manner that the voltage on terminal 6 can be measured with plus (positive) cable of voltmeter.

Readout

approx. 12 volts	0 volt

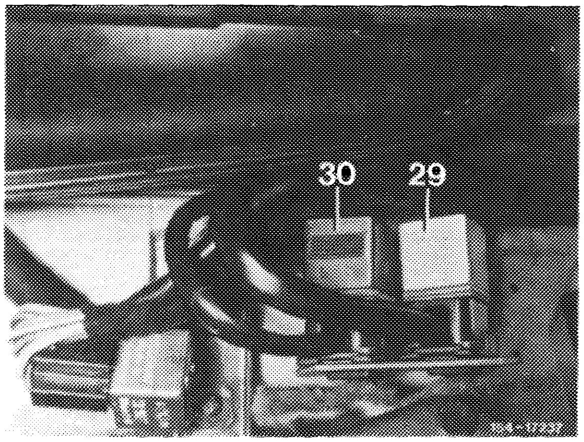
Renew overload protection (30).
Readout approx. 12 volts

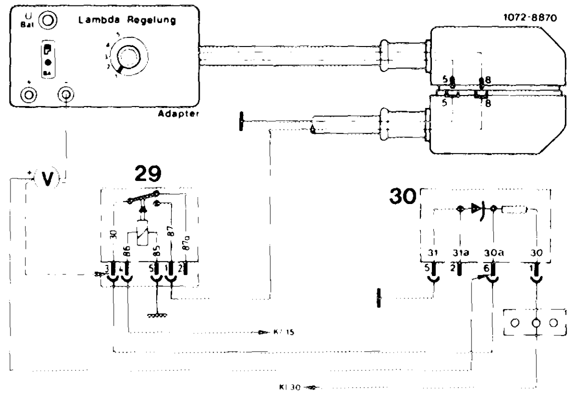
Attach relay for voltage supply (29) to plug in such a manner that voltage on jack 3 can be measured with plus (positive) cable of voltmeter.

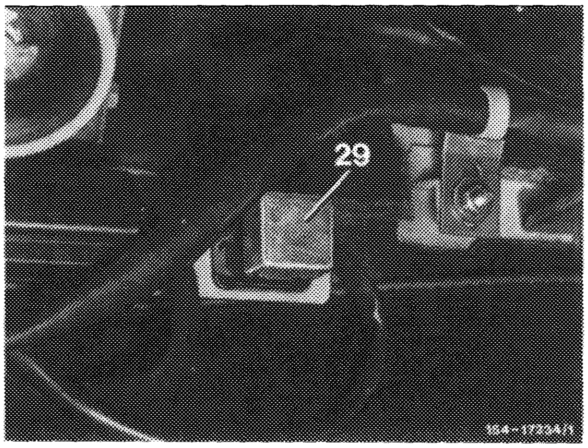
Readout

approx. 12 volts	0 volt

Check line to overload protection for break and correct, if required.
Readout approx. 12 volts.





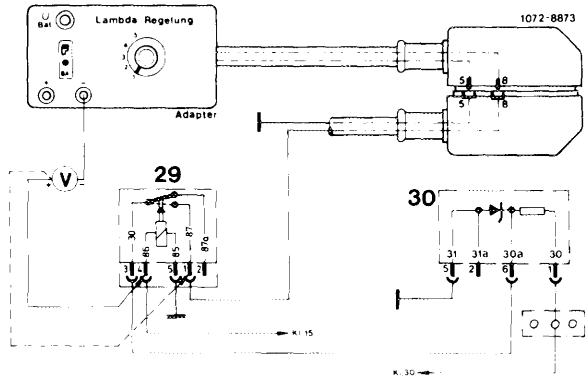


Check voltage on jack 4 with ignition switched on.

Readout

approx. 12 volts | 0 volt

Check line to terminal 15 for break and correct, if required.
Readout approx. 12 volts.

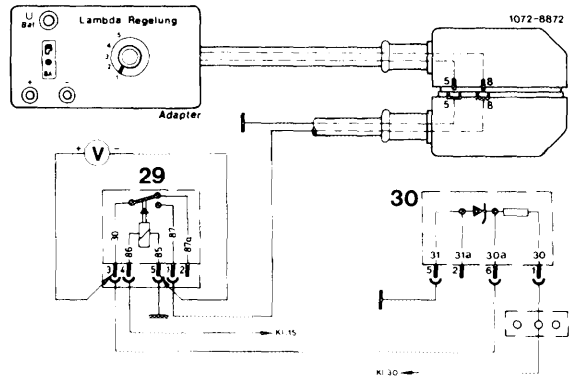


Connect voltmeter to jack 3 and 5.

Readout

approx. 12 volts | 0 volt

Check ground connection line (jack 5) for break and correct, if required.
Readout approx. 12 volts.

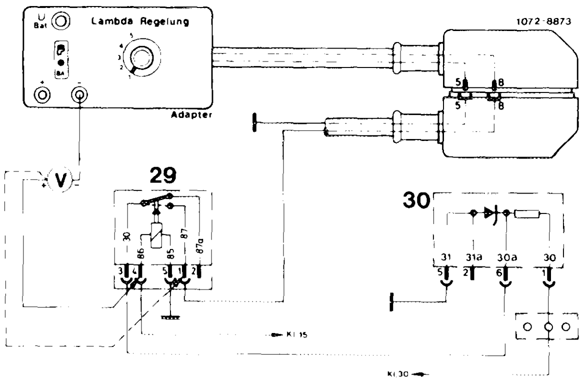


Attach relay for voltage supply (29) to plug in such a manner that voltage on jack 1 can be measured.

Readout

approx. 12 volts | 0 volt

Renew relay.
Readout approx. 12 volts.

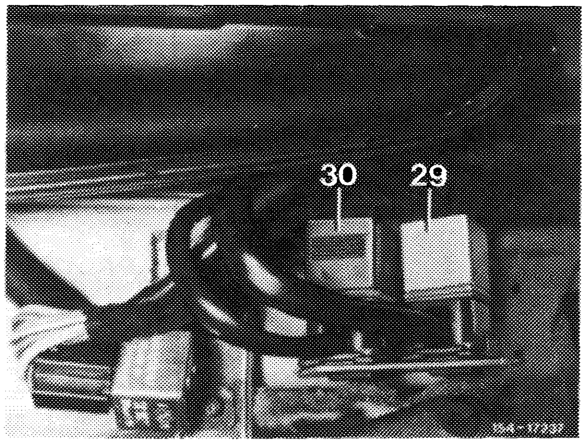


Connect voltmeter to adapter and check voltage.

Readout	
approx. 12 volts	0 volt

Check line from plug of relay voltage supply (29) to plug of control unit for break and correct, if required. Readout 12 volts.

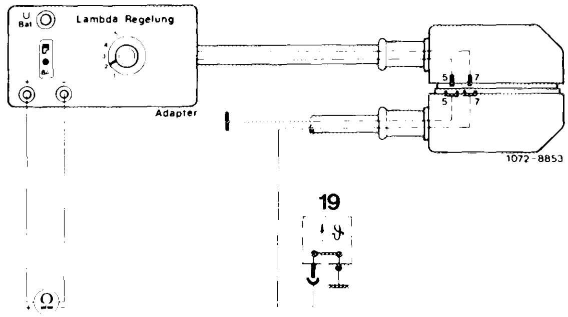
End of test



II. Testing temperature switch oil 16 °C/61 °F (engine oil temperature < 13 °C/55 °F)

Rotary switch on adapter in position 2, multimeter on measuring range 0 – ∞ ohm, ignition switched off, disconnect plug of throttle valve switch, read indicator.

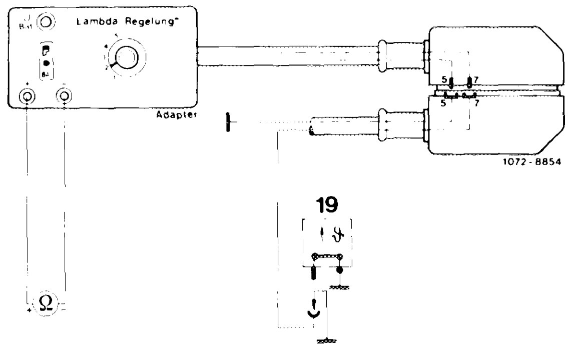
Readout	
0 ohm	∞ ohm

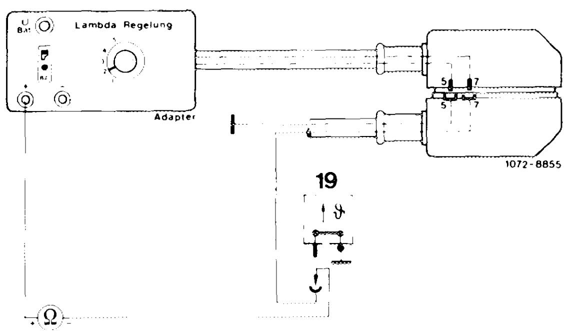


Pull plug of temperature switch and connect to ground.

If readout is 0 ohm, renew temperature switch.

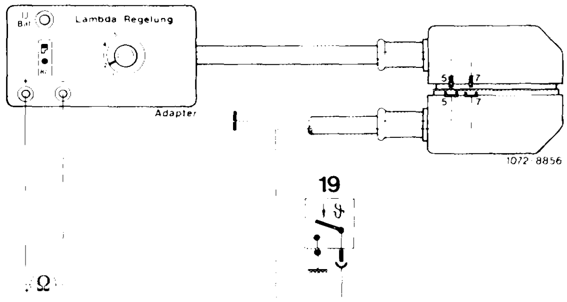
If readout is ∞ ohm, check line of control unit plug (terminal 7) to temperature switch for break.





End of test

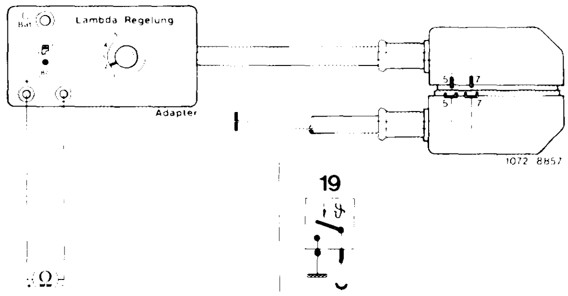
III. Testing temperature switch oil 16 °C/61 °F (engine oil temperature > 20 °C/68 °F)



Rotary switch on adapter in position 2, multimeter on measuring range 0—∞ ohm, ignition switched off.

Disconnect plug of throttle valve switch (arrow). Read indicator.

Readout	
∞ ohm	0 ohm



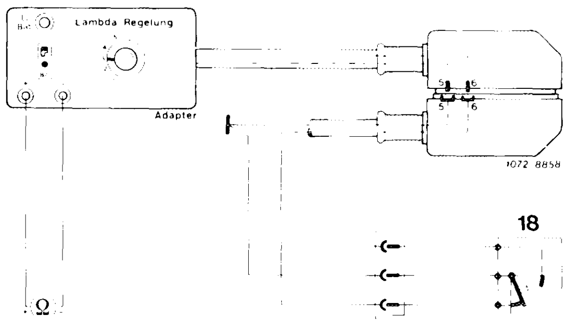
Pull plug on temperature switch.

If readout is ∞ ohm, renew temperature switch.

If readout is 0 ohm, check line from plug of control unit (terminal 7) to temperature switch for ground connection.

End of test

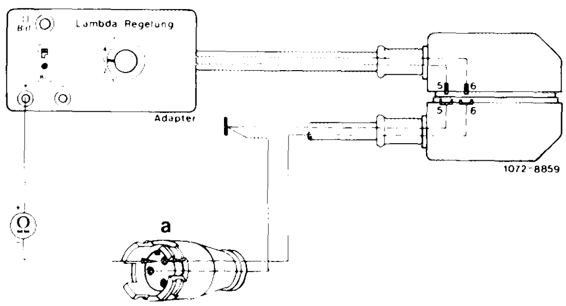
IV. Testing throttle valve switch (idle speed stop, engine oil temperature > 20 °C/68 °F)



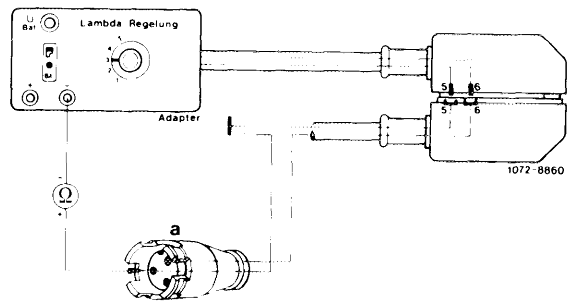
Rotary switch on adapter in position 3, multimeter on measuring range 0—∞ ohm, ignition switched off.

Regulating linkage at idle speed stop. Read indicator.

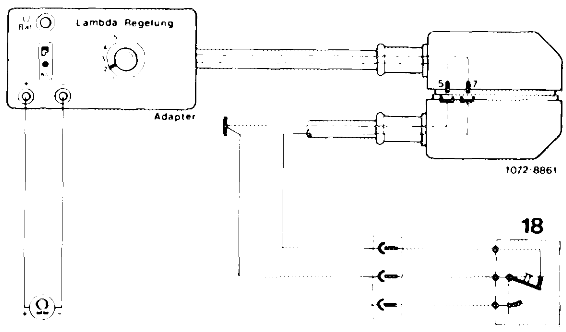
Readout	
Idle speed stop 0 ohm	∞ ohm
Lightly operate regulating linkage ∞ ohm	0 ohm



Disconnect plug of throttle valve switch.
Check lines from plug (a) to plug of control unit (terminal 6 or 15) for break according to wiring diagram.
If lines are in order, renew throttle valve switch.



End of test



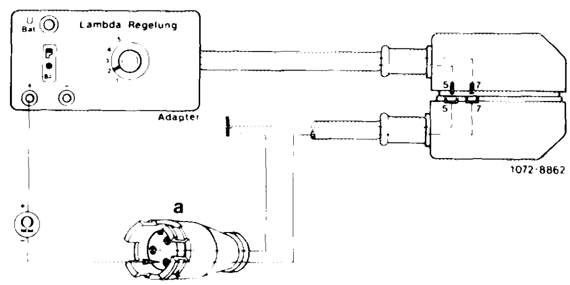
V. Testing throttle valve switch (full throttle stop, engine oil temperature > 20 °C/68 °F)

Rotary switch on adapter in position 2, multimeter on measuring range 0—∞ ohm, ignition switched off.

Plug on temperature switch oil pulled off. Regulating linkage at full throttle stop. Read indicator.

Readout	
Full throttle stop 0 ohm	∞ ohm
Slightly release regulating linkage ∞ ohm	0 ohm

Disconnect plug of throttle valve switch. Check line from plug (a) to plug of control unit (terminal 7) for break. If line is in order, renew throttle valve switch.

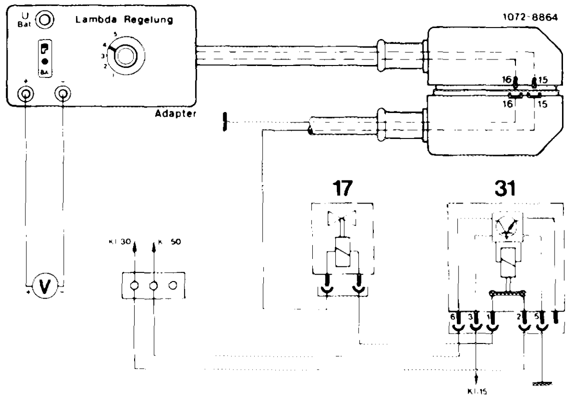


End of test

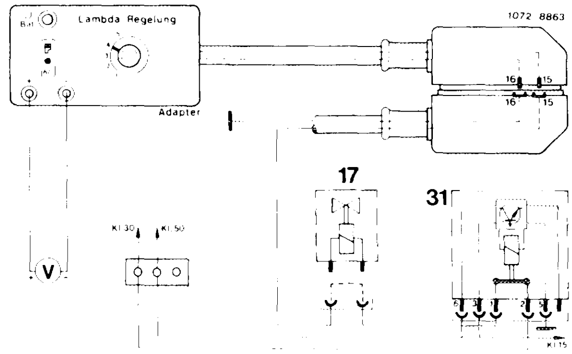
VI. Testing frequency valve

Rotary switch of adapter in position 4, multimeter on measuring range 0–30 volts, ignition switched on, operate starter. Read indicator.

Readout	
approx. 12 volts	0 volt

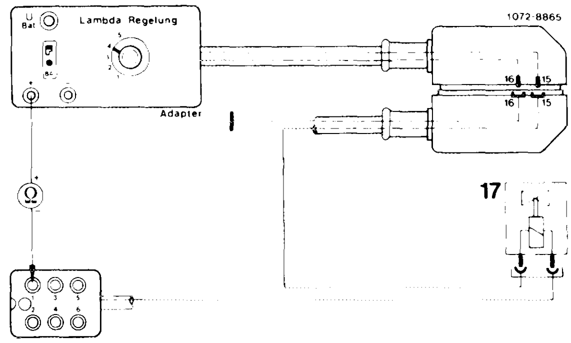


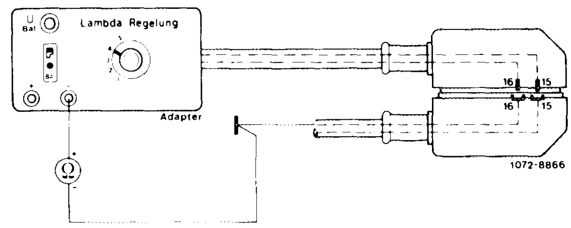
Pull plug from frequency valve and bridge. Operate starter. Readout 12 volts: replace frequency valve.



Readout 0 volt: switch off ignition, multimeter to measuring range 0–∞ ohm.

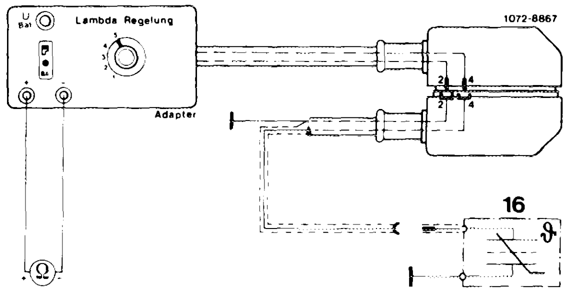
Test line from plug (control unit, terminal 15) to plug of electronic fuel pump relay (terminal 1), as well as line from plug of control unit (terminal 16) to ground connection point in legroom at the right under instrument panel for break.





End of test

VII. Testing supply line to oxygen sensor



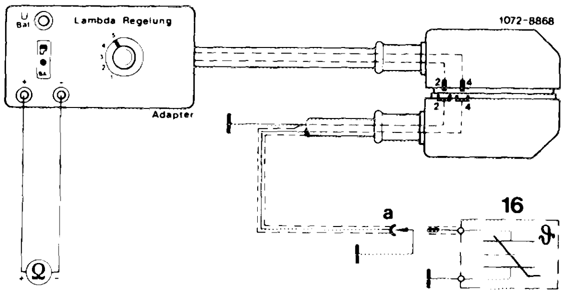
Rotary switch on adapter in position 5, multimeter on measuring range 0—∞ ohm, ignition switched off, plug oxygen sensor disconnected. Read indicator.	
Readout	
∞ ohm	0 ohm

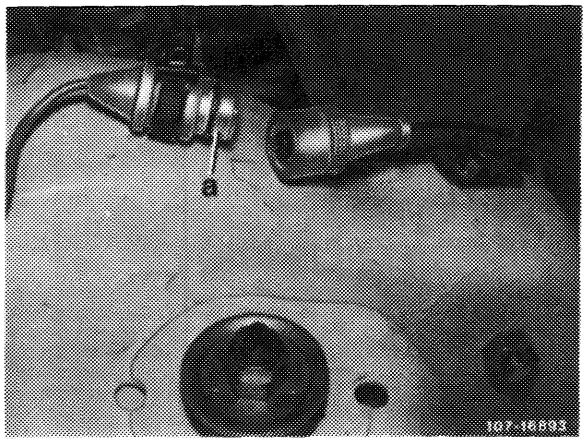
Line from plug of oxygen sensor to plug of control unit shorted.

Connect plug member (a) to ground.

Readout 0 ohm, line in order.

Readout ∞ ohm, line interrupted.





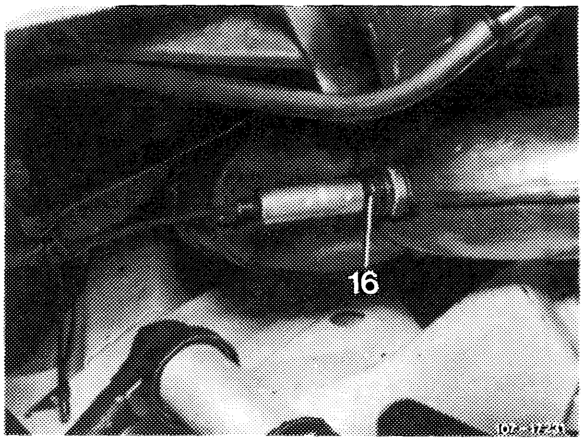
End of test

Test section B

Test conditions: Remove adapter, connect plug to control unit. Connect tester on/off ratio to diagnosis socket.

Start engine (plug of oxygen sensor connected).

VIII. Testing oxygen sensor



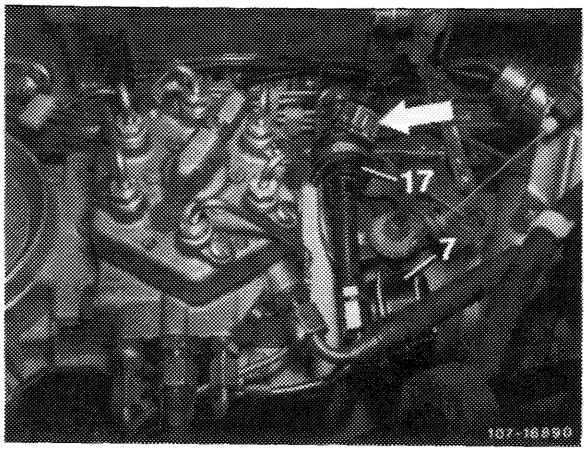
Temperature of oxygen sensor below + 300 °C/ 572 °F. Read indicator on/off ratio.

Readout

constant 50 %	constant 92 %
	Oxygen sensor shorted, renew oxygen sensor.

End of test

IX. Testing frequency valve (17)



Engine oil temperature > 20 °C/68 °F. Engine at idle.

Place one hand on frequency valve.

Frequency valve noticeably operating.	Frequency valve not operating.
	Renew frequency valve.

End of test

X. Testing lambda control

Engine oil temperature approx. 80 °C/176 °F. Engine at idle (750 ± 50/min). Read indicator on/off ratio.

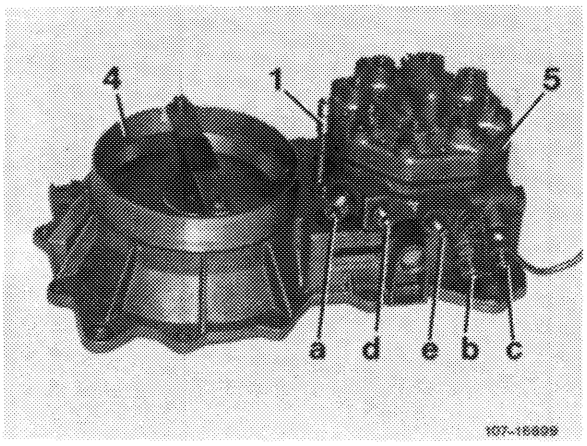
Readout	
between 40–60 %	< 40 % or > 60 % Constant 50 %

Adjust on/off ratio on mixture regulating screw (1) in such a manner that readout is around 50 ± 5 %.

If on/off ratio cannot be regulated, check thermovalve 50 °C/122 °F (37) for passage. If passage is clear, renew control unit.

Readout constant 50 %, oxygen sensor defective, renew.

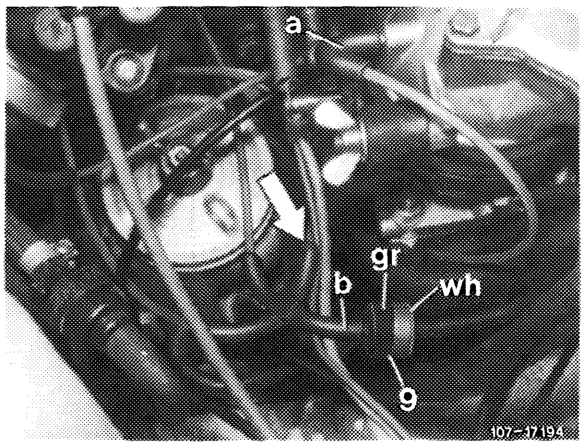
End of test



XI. Testing air injection

Engine oil temperature approx. 80 °C/176 °F, engine at idle (750 ± 50/min), pull blue/purple vacuum line (a) from air guide housing. Close vacuum line with finger for a short moment. Read indicator on/off ratio.

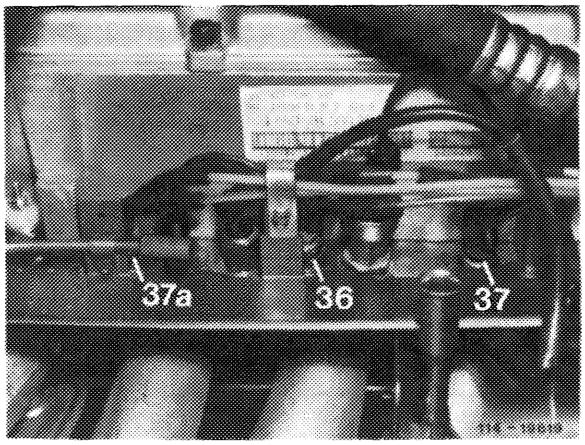
Readout	
Constant > approx. 87 %	Remains constant



Testing vacuum lines

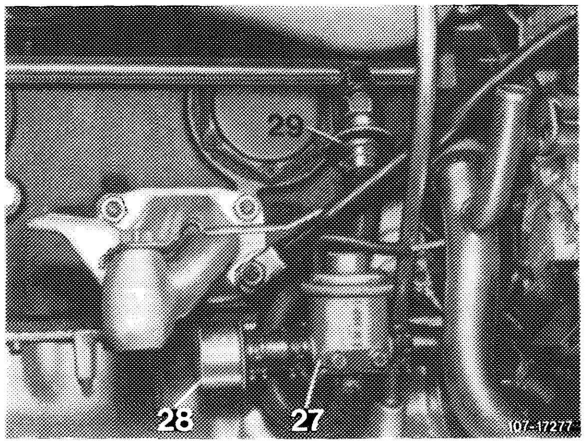
The blue/purple vacuum line from air guide housing leads to straight connection of thermovalve (37), the blue/purple vacuum line from diverter valve (27) leads to straight connection of thermovalve (36).

Thermovalves (36 and 37) are connected to the diagonal connections by means of a 3-point distributor. From there, a blue vacuum line leads to 4-point distributor, which is connected to the intake manifold by means of orifice (9) and a rubber hose.



Testing vacuum

Pull 3-point distributor from diagonal connections of thermovalves (36 and 37) and check for presence of vacuum at distributor. If there is no vacuum: blow out connection on intake manifold with compressed air.

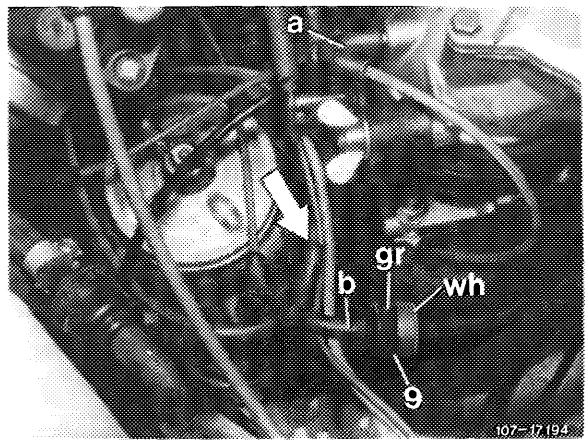


Check 3-point distributor, blue vacuum line, 4-point distributor, orifice (9) and rubber hose for passage.

If vacuum is present: check thermovalves (36 and 37) for passage and renew, if required.

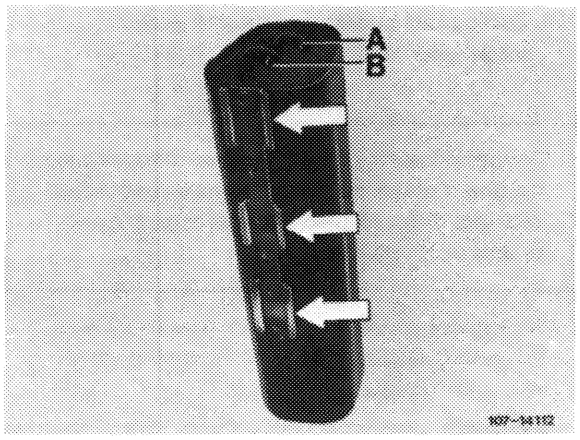
If passage is available on both thermovalves, renew diverter valve (27).

If readout of on/off ratio is still constant upon completion of these tests, check V-belt tension and delivery capacity of air pump.



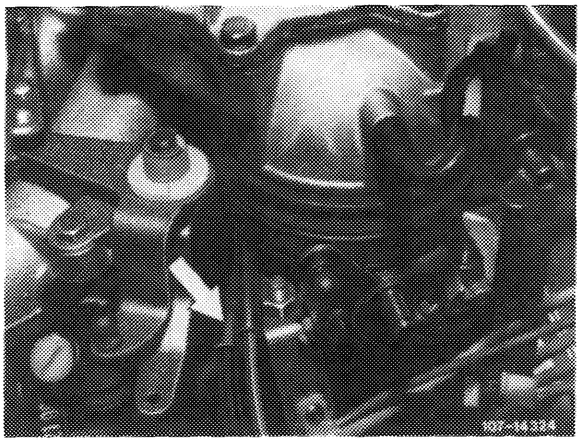
End of test

XII. Testing fuel evaporation control system model year 1980

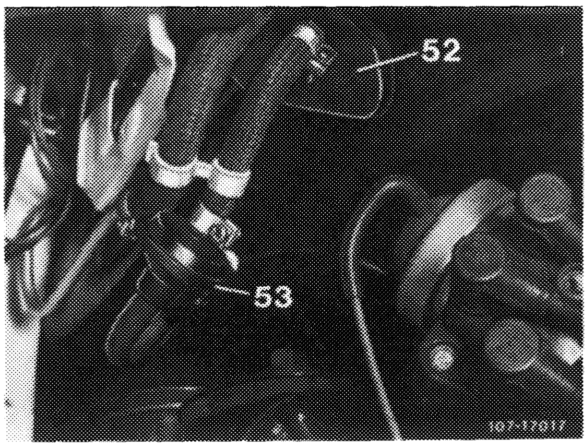


Pull draw-off hose (A) toward throttle valve housing from charcoal canister and keep closed with one finger. Slowly increase engine speed above approx. 2000/min.	
No vacuum at idle. Increasing vacuum with increasing speed.	No vacuum increase with increasing speed.

Checking draw-off connection and purge valve



Draw-off connection should be plugged to throttle valve housing (arrow). Check hose for leaks and blow out connection on throttle valve housing.

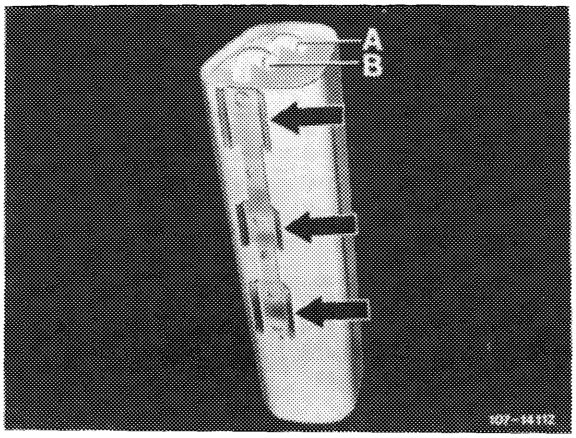


If there is still no vacuum, pull off draw-off hose in front of purge valve (53) and repeat checkup.

If vacuum is present, renew purge valve.

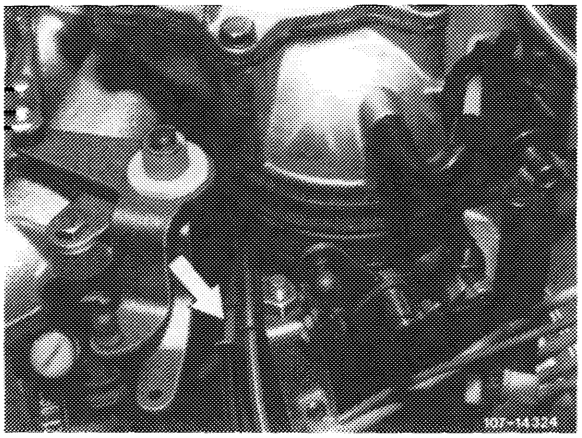
End of test

XII. Testing fuel evaporation control system model year 1981



Pull off draw-off hose (A) toward throttle valve housing from charcoal canister and keep closed with one finger. Slowly increase engine speed to approx. 2000/min.	
No vacuum at idle. Increasing vacuum at increasing speed.	No vacuum increase at increasing speed.

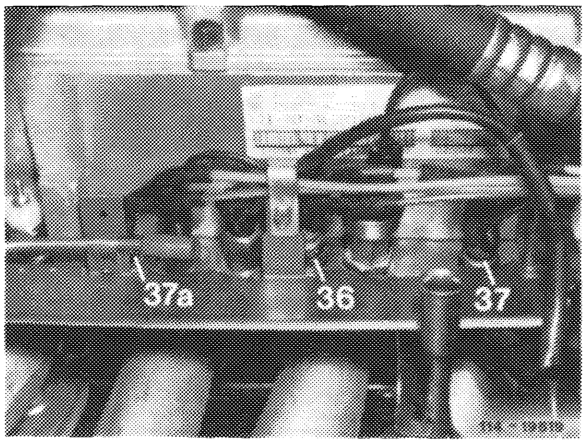
Checking draw-off connection



Draw-off connection should be plugged to throttle valve housing (arrow). Check hose for leaks and blow through connection on throttle valve housing.

If there is still no vacuum:

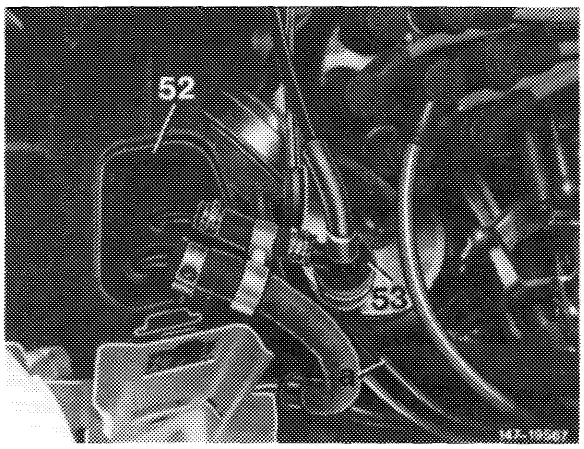
Checking thermovalve (37a) and purge valve (53)



Pull off white/purple/black vacuum line on purge valve and check for presence of vacuum.

If vacuum is present, renew purge valve, if not, renew thermovalve.

End of test



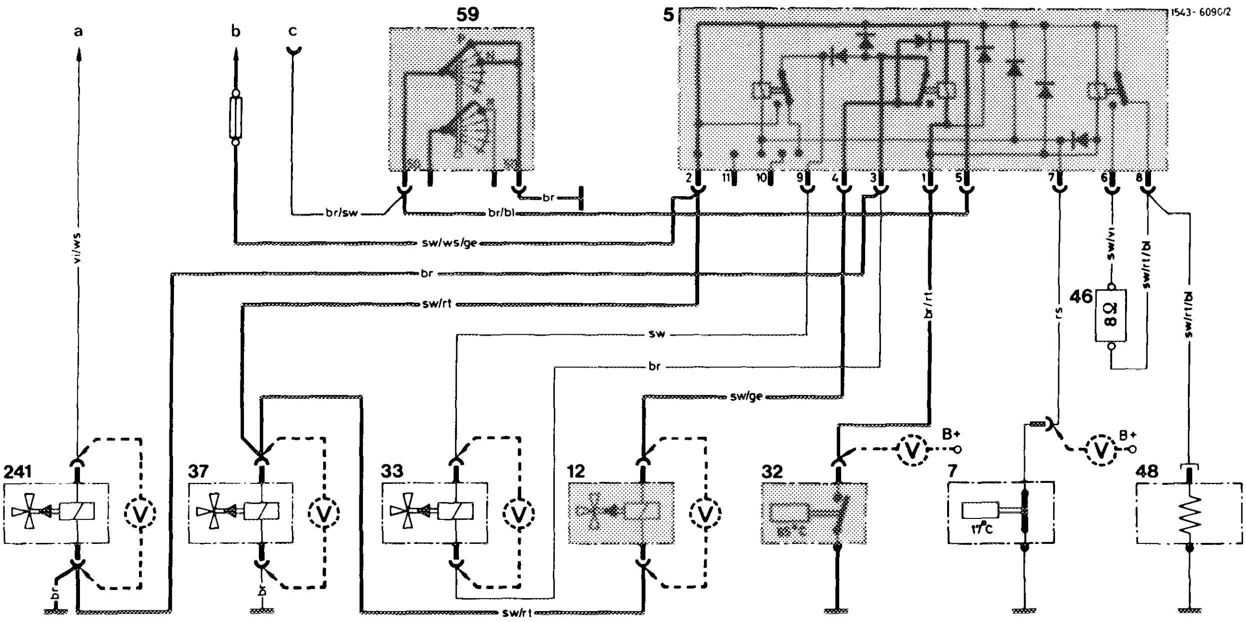
Federal and California version model year 1975/76

Models 114.060, 114.073, 116.020

Shown with ignition switched off and under 17 °C oil temperature.
The connection of test instruments is shown by dashed lines.

Color code

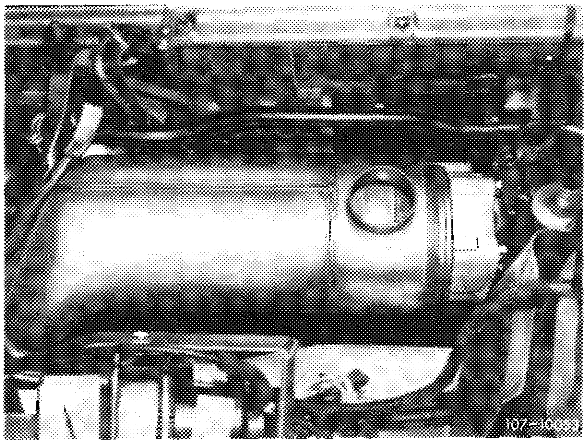
bl = blue	rs = pink	vi = purple	a Terminal 50 starter
br = brown	rt = red	ws = white	b Fuse no. 4
ge = yellow	sw = black		c Terminal 30 emergency starter



5 Relay box
7 Temperature switch 17 °C
12 Switch-over valve EGR (brown)
32 Temperature switch 65 °C
33 Switch-over valve air injection (blue)
37 Switch-over valve float chamber vent (green)
46 Resistance 8 Ohm
48 Choke cover
59 Starter lockout and back-up lamp switch
241 Switch-over valve automatic choke (white)

Federal and California version model year 1975/76

Removal



1 Loosen exhaust on catalyst flange and on transmission holder and remove.

2 Remove air filter

3 Disconnect regulating linkage on guide lever right and remove regulating bracket.

4 Unscrew catalyst holder.

5 Remove shielding plate on battery.

6 Unscrew fastening screws on flange of catalyst. For this purpose, on model 114, remove holder for air injection line and oil dipstick. Remove catalyst.

Installation

Install catalyst with new screws and a new gasket, install removed parts in vice versa sequence.

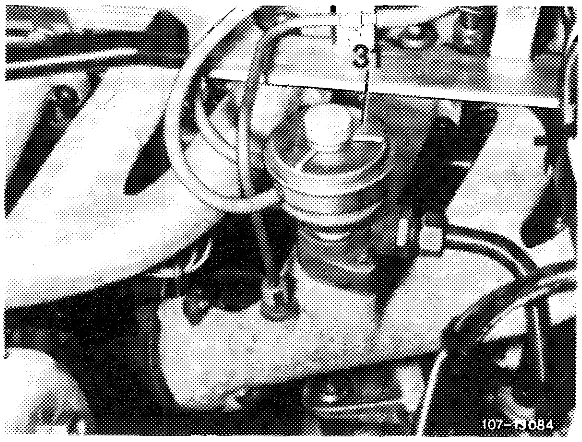
Nota: After flanging-on exhaust system, release tension in exhaust system, if required.

Model year 1977/78/79

A. Federal version

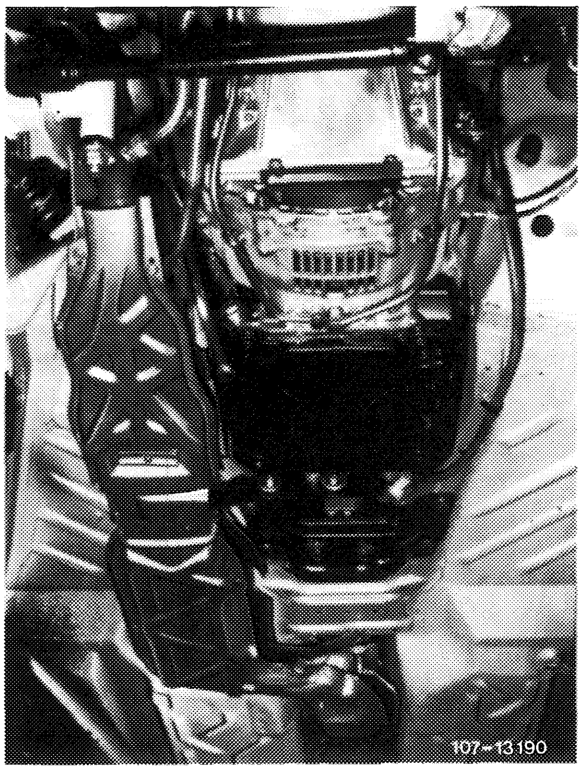
Removal

1 Loosen nuts of flange connections on exhaust manifold and unscrew.



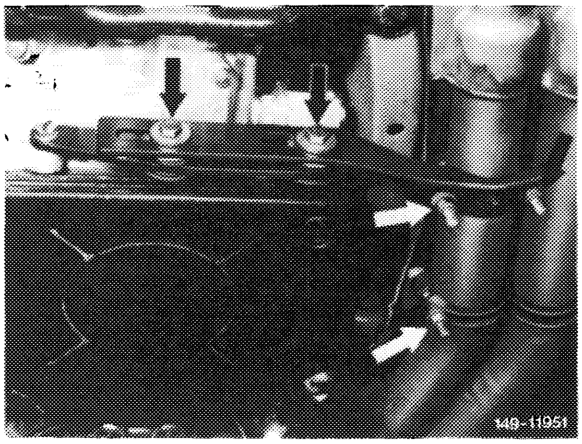
107–13084

2 Remove heat shields.



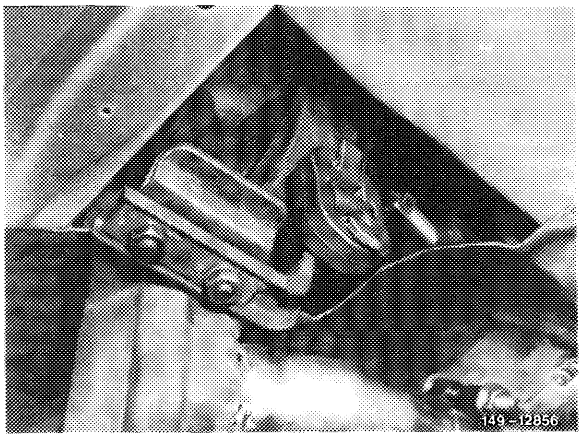
107–13190

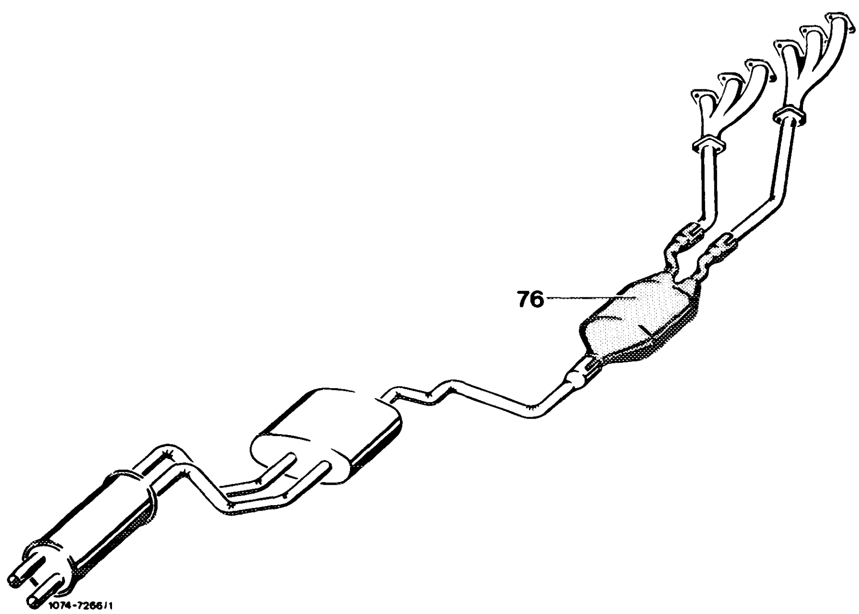
3 Remove lateral support on transmission suspension.



4 Remove rubber damper between catalyst and center muffler. Disconnect rubber rings on resonance damper and remove exhaust system in downward direction.

5 Loosen clamps of underfloor catalyst plug connections. Heat plug connections with a blow torch and remove underfloor catalyst.



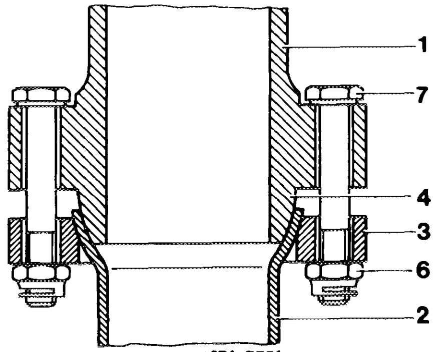


Installation

6 Plug catalyst into exhaust system (renew self-locking hex nuts of clamps, as well as those of flange connections). Slightly tighten plug connections.

Install exhaust system and align.

For further installation proceed vice versa. Tightening torque of self-locking hex nuts (6) is 20 Nm (2 kpm).

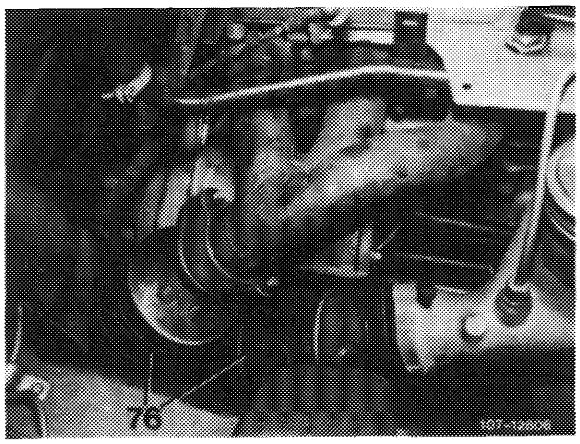


1074-7751

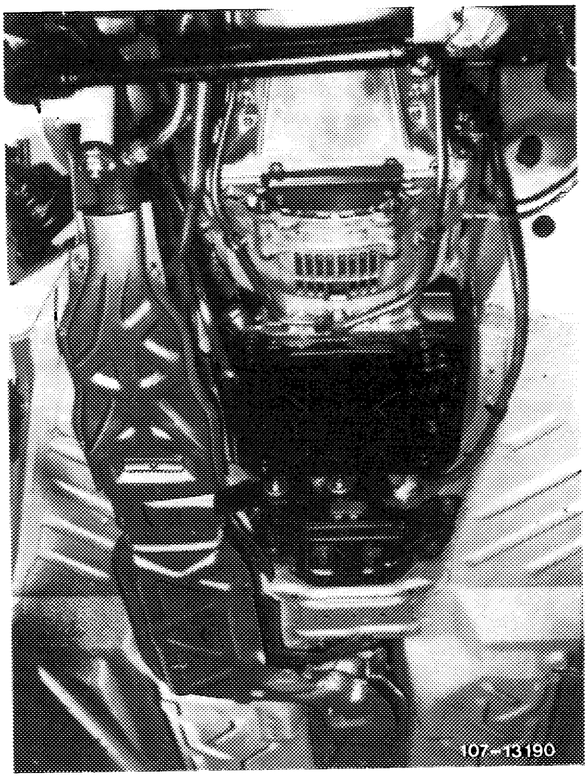
B. California version

Removal

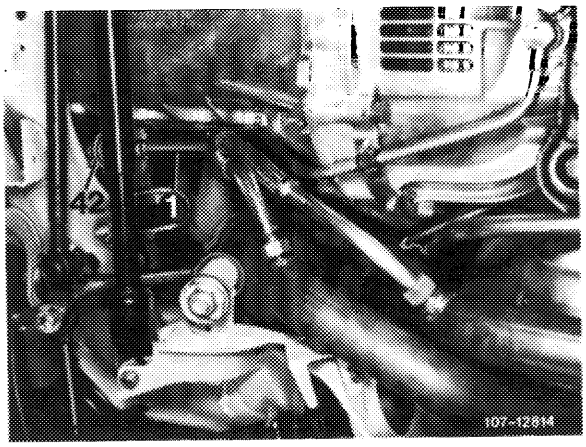
1 Loosen nuts of flange connections on exhaust manifold and screw off.



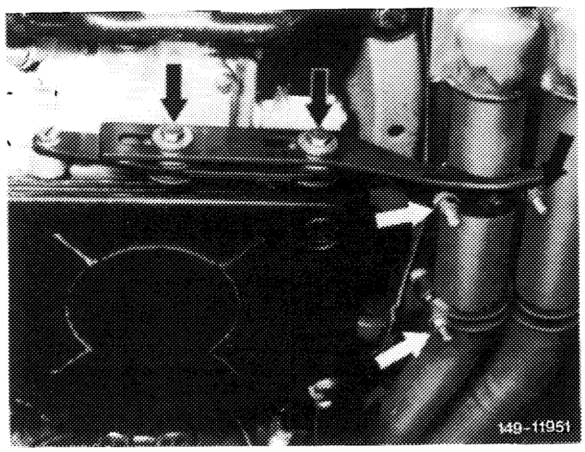
2 Remove heat shields.



3 Unscrew air injection lines behind small catalysts.

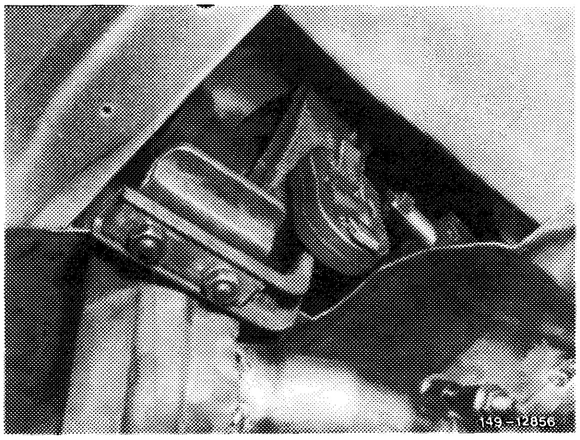


4 Disconnet lateral support on transmission suspension.



5 Remove rubber damper between catalyst and center muffler. Disconnect rubber rings on resonance damper and remove exhaust system in downward direction.

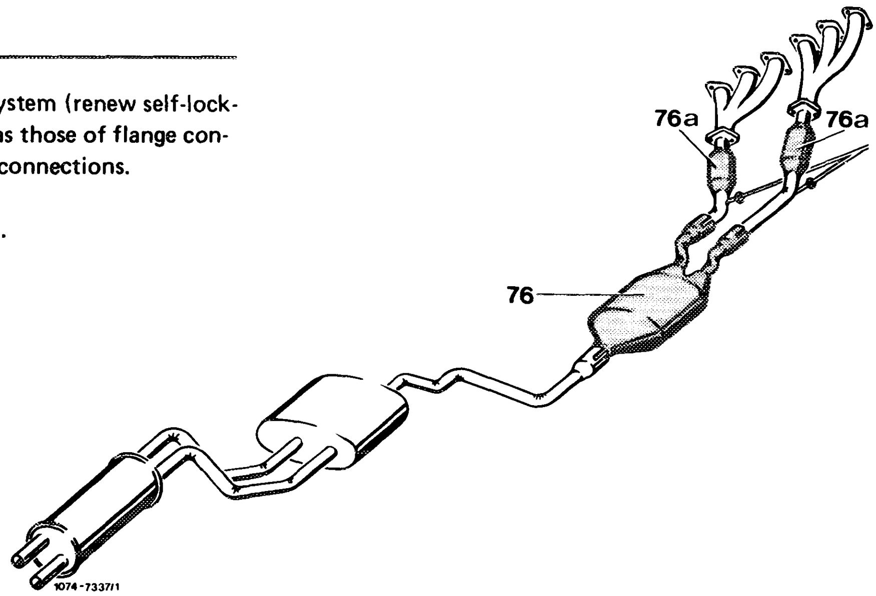
6 Loosen clamps of underfloor catalyst plug connections. Heat plug connections with a blow torch and remove front catalysts as well as underfloor catalyst.



Installation

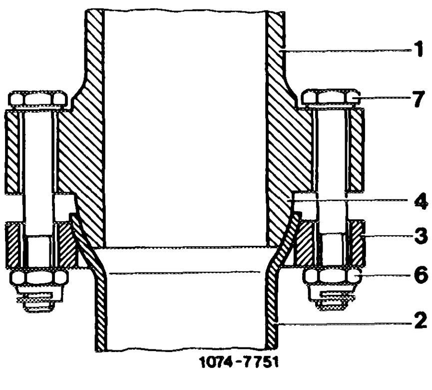
7 Plug catalysts into exhaust system (renew self-locking hex nuts of clamps, as well as those of flange connections). Slightly tighten plug connections.

Install exhaust system and align.



For further installation proceed vice versa. Tightening torque of self-locking hex nuts (6) is 20 Nm (2 kpm).

1 Exhaust manifold
2 Exhaust pipe
3 Flange
4 Cone connection
6 Self-locking hex nut
7 Hex screw



Tightening torques	Nm
Self-locking nuts on exhaust manifold to exhaust flange	20–25
Self-locking hex nuts on lateral support of clamp	7
Hex bolts of flange connection	20
Oxygen sensor	50–60

Removal

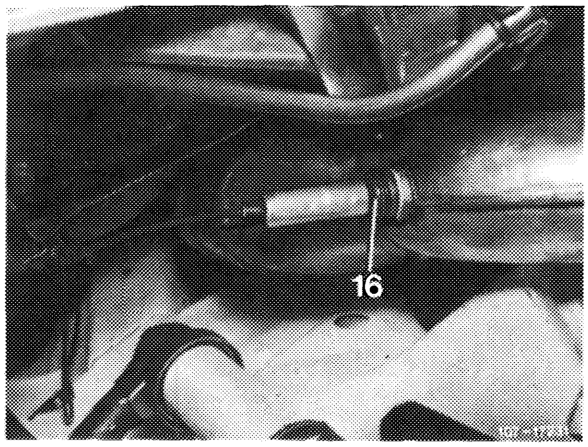
1 Remove oxygen sensor (16).

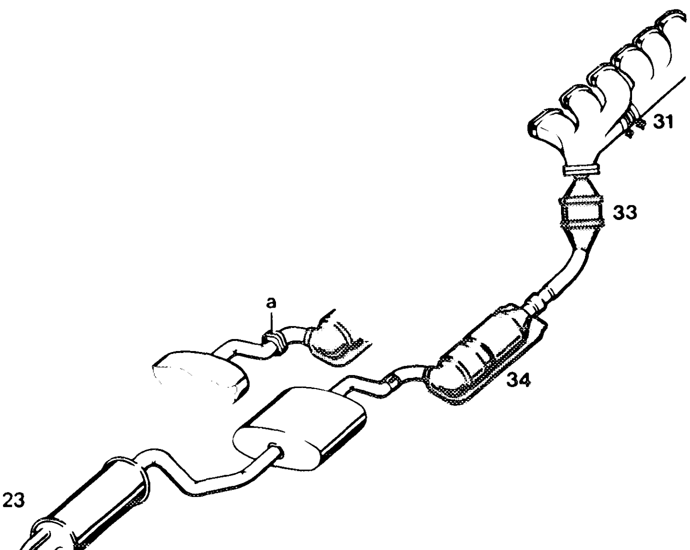
2 Remove exhaust system (49–100).

3 On model 116, loosen plug flange connection between underfloor catalyst and center muffler and remove catalysts by means of a slight turning motion.

Note: If the plug flange connection cannot be separated, heat exhaust pipe. For safety reasons, place a protective panel against frame floor prior to heating pipe.

4 On model 123, loosen flange connection (a) and remove catalysts.





31 Exhaust manifold
33 Primary catalyst
34 Underfloor catalyst
a Flange connection on model 123

Installation

5 Flange catalysts to exhaust system or on model 116 slip catalysts into plug flange connection. Slightly tighten bolts of flange connection.

6 Install exhaust system (49–100).

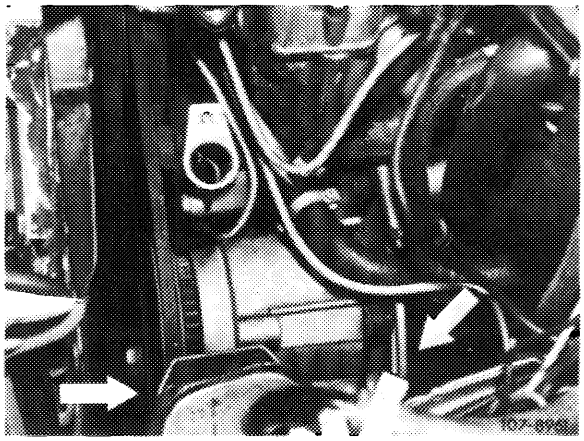
7 Coat threads of oxygen sensor with hot lubricating paste, part no. 000 989 88 51.

8 Install oxygen sensor.

9 Start engine and check exhaust system for leaks.

Federal and California version model year 1975/76

Removal



1 Remove fluid tank for windshield washer.

2 Remove ignition distributor while paying attention to marking.

3 Loosen clamping screw for tensioning V-belt, remove V-belt.

4 Completely unscrew lower screw (arrow) on holder while pushing radiator in forward direction. Loosen hose from anti-backfire valve.

5 Remove pump in upward direction.

Installation

6 For installation proceed vice versa.

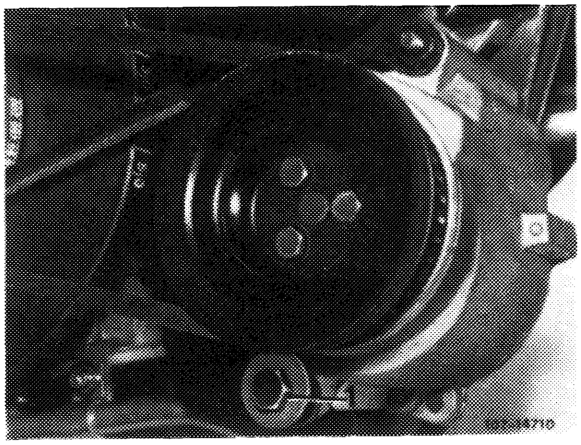
Note: Following installation of ignition distributor, adjust ignition.

Federal and California version model year 1977/78/79

Removal

1 Loosen fastening screw (1) and screw out.

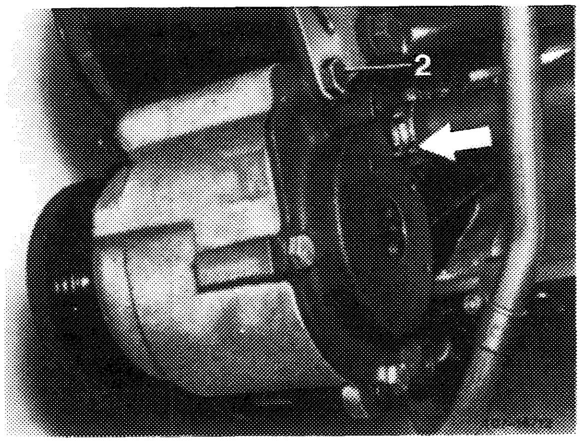
2 Swivel air pump inwards and remove V-belt.



3 Compress hose clamp (arrow) on contour hose with combination pliers and push approx. 2 cm to the rear.

4 Pull contour hose from air pump connection.

5 Loosen fastening screw (2) and unscrew, remove air pump in downward direction.



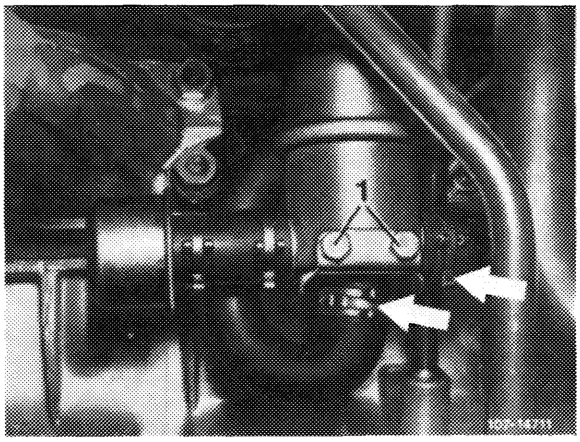
Installation

6 For installation proceed vice versa.

Note: V-belt is correctly tensioned if it will resiliently yield under energetic thumb pressure.

Federal and California version model year 1977/78/79

Removal



1 Pull blue/purple vacuum line from anti-backfire valve.

2 Set hose clamps (arrows) back for approx. 2 cm.

3 Pull-of lower contour hose leading to air injection line for cylinder head.

4 Loosen both fastening screws (1) and unscrew.

5 Push anti-backfire valve in upward direction and remove from connecting hose of air injection line in rearward direction.

Installation

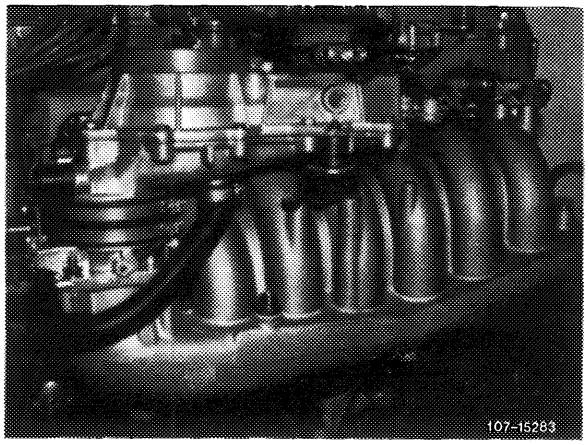
6 For installation proceed vice versa.

Note

When removing and installing intake manifold, the mixture controller with air guide housing need not be removed.

Layout and shape of intake manifold have been changed starting from date of increased output. As a result, the following additional changes were made:

1. Injection lines for cylinders 4–6.
2. Control pressure line from fuel distributor to pressure damper.
3. Control pressure line from warm–up compensator to pressure damper.
4. Return line from warm-up compnesator to fuel distributor.
5. Connection for idle air on air guide housing.
6. Additional holder for supporting mixture controller.
7. Holder for fastening pressure damper to intake manifold.
8. Regulating lever.
9. Air guide housing.
10. Contour hose.
11. Support for intake manifold.
12. Rubber hose for full load enrichment.



Installation: April 1978

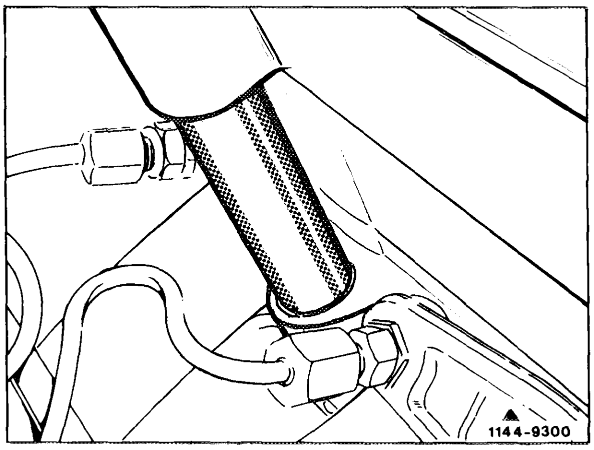
Model	Starting chassis end No.
107.022	005201
107.042	004222
116.024/025	113919
123.033	039906 (035262)[1])
123.053	008540 (006171)[1])
123.093	000021
126.022/023	Start of series

[1]) Righthand steering in England version.

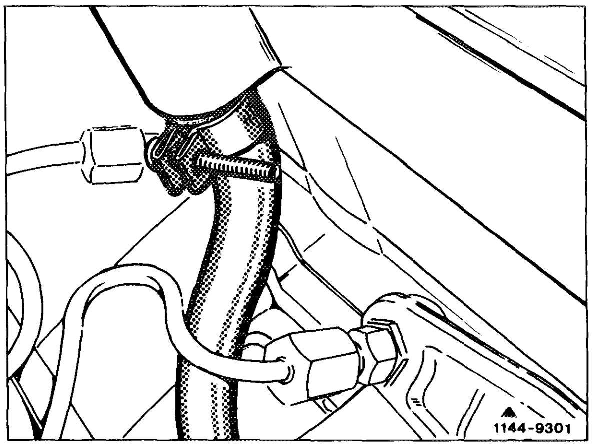
Vent connection to intake manifold
Engine 110.984/985/986

Connection has been changed for better distribution of vent vapors. This required a modification of contour hose.

After the former intake manifold has been used up, only the modified intake manifold together with contour hose will be available.



1st version



2nd version

Installation: September 1979

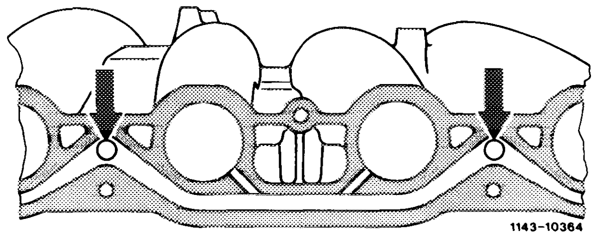
Model	Engine	Engine end No. manual transmission	automatic transmission	Chassis end No.
107.022 107.042	110.986	003146	007150	007614 006812
116.024 116.025	110.985	014021 069693		151315
123.033 123.053 123.093	110.984	019774	066923	064566 017098 004432
126.022 126.023	110.987	start of series		

Idle air feed

The idle air feed now proceeds via 2 connections instead of the former central air intake.

Air distribution to the individual cylinders will be improved.

Smooth running of engine following a cold start is also improved by the said measure.


1143–10364

Installation: September 1981

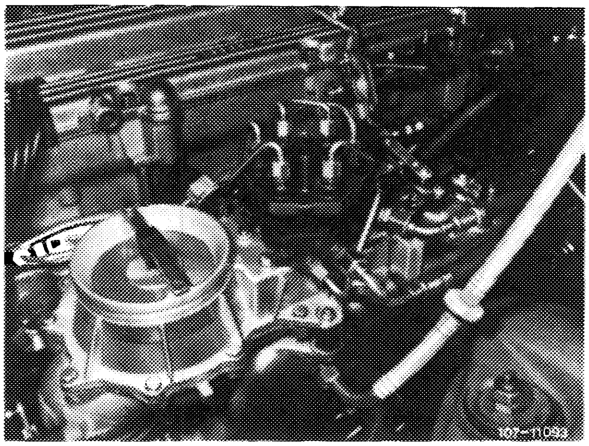
Model	Engine	Engine end No. manual transmission	automatic transmission	Chassis end No. Installation mixed	Installation continuous
107.042	110.990	start of series		010107–011567	011569
123.007 123.033 123.053 123.093	110.988	start of series		085174–096468 024129–024416 010064–010252	096496 024417 010253
126.022 126.023	110.989	start of series		021381–043198 039922–042786	043199 042787

Removal

1 Remove air cleaner.

2 Drain coolant.

3 Unscrew all fuel and injection lines while catching fuel with a rag. Close fuel lines blind.


107–11093

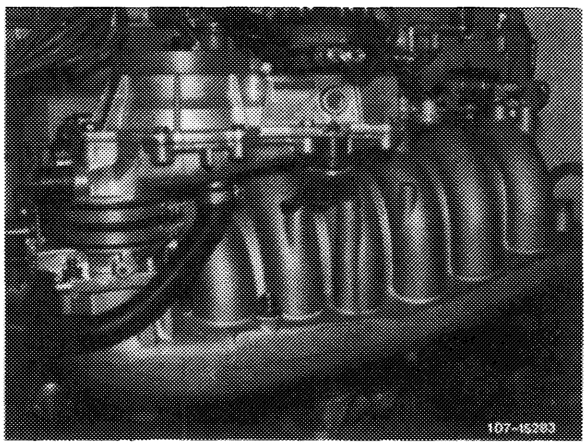
1st version

4 Pull cable plug from mixture controller (if installed) and from cold start valve.

5 Disconnect connecting rod for longitudinal regulating shaft. On model 126, remove longitudinal regulating shaft (30–310).

6 Pull off vacuum line for automatic transmission and central locking system.

7 Unscrew cable strap for electric cable harness (cold start valve, warm-up compensator, safety switch).


107–15283

2nd version

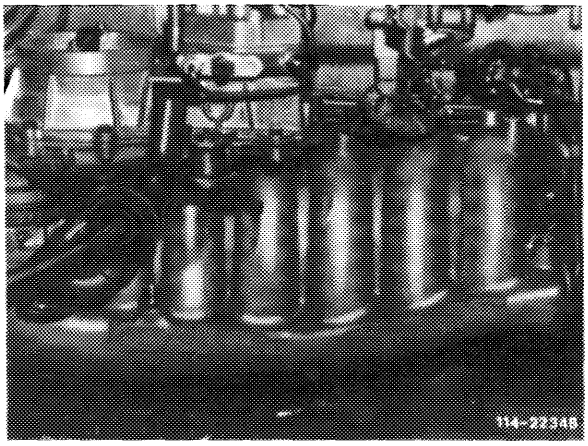
8 Remove heater hose from dashboard.

9 Pull off vacuum line for ignition timing.

10 Unscrew line for diagnosis plug.

11 Unscrew vacuum line for brake unit.

12 Remove decel shutoff valve.

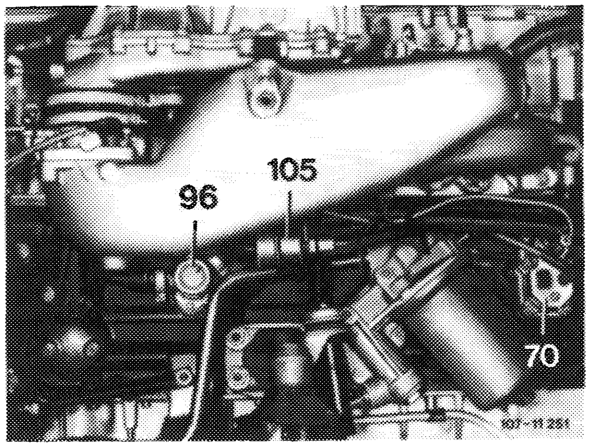


3rd version
with decel shutoff

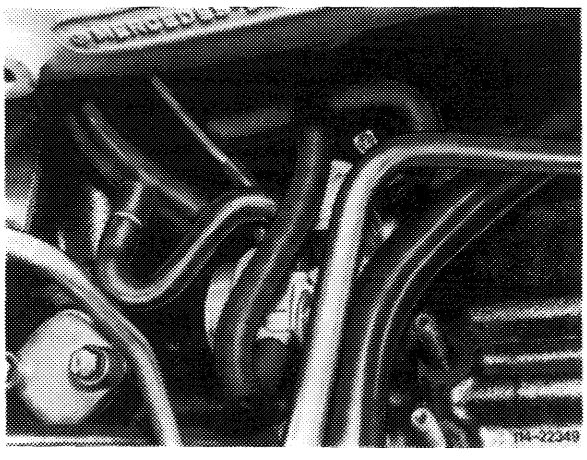
13 Pull off contour hoses after loosening hose clamp and leak line on idle air distributor.

14 On engines prior to increased output, unscrew control pressure line on diaphragm damper (105) and return flow line on warm-up compensator (70).

On model 126, unscrew high-pressure oil line for power steering pump.



15 Unscrew all fastening nuts and screws on intake manifold as well as on support.



16 Unscrew both fastening screws for engine mounts and engine damper. Lift engine with pitlift until intake manifold can be taken off.

On model 126, pull engine to the right and remove intake manifold.

17 Clean intake manifold and check flange faces with straightedge, refinish on surface plate, if required.

Installation

18 For installation proceed vice versa, using a new gasket.

Prior to tightening intake manifold, introduce return flow line from warm-up compensator.

19 Tighten fastening screws for engine mounts to 75 Nm.

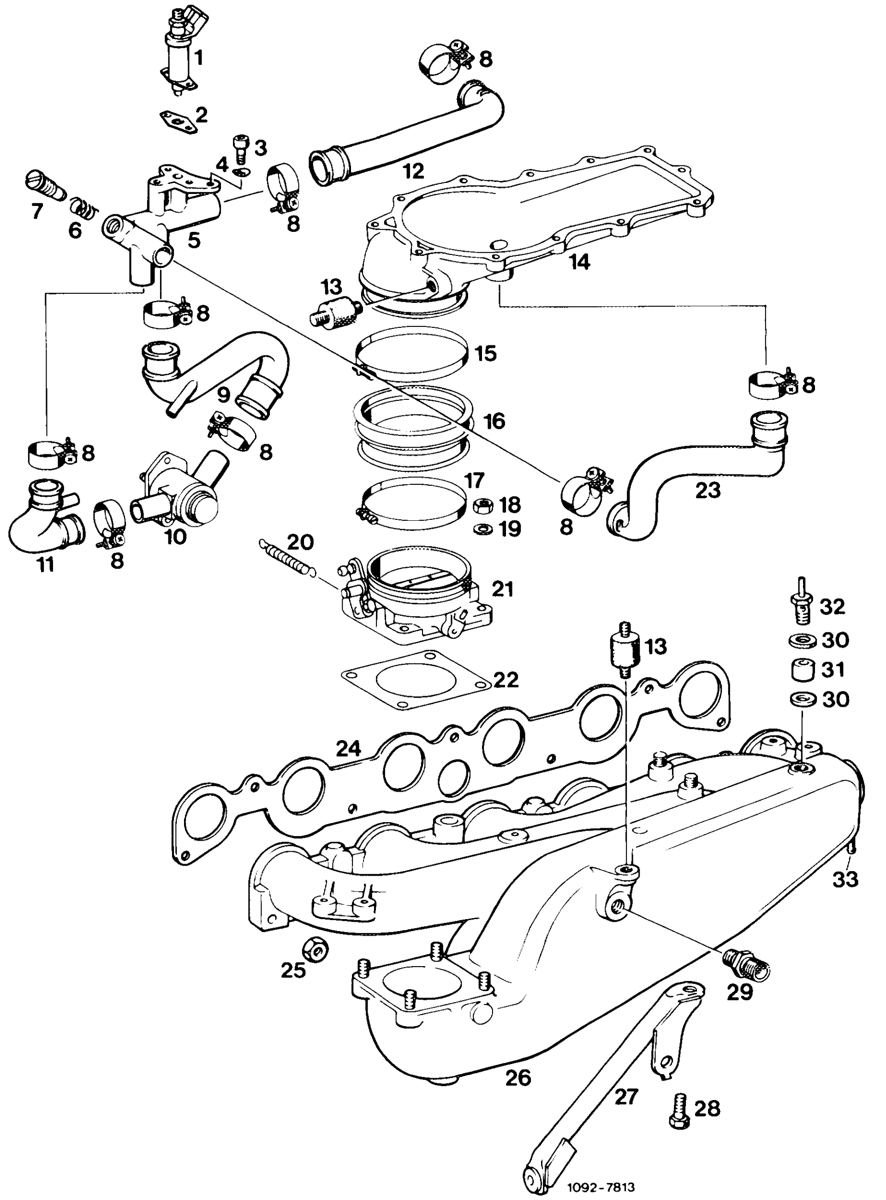
20 Fill-in coolant.

21 Adjust regulating linkage (30–300). Check for easy operation.

22 Run engine, check fuel lines for leaks. Check intake system, fuel distributor and injection valves for leaks by spraying with Iso-Oktan or benzine.

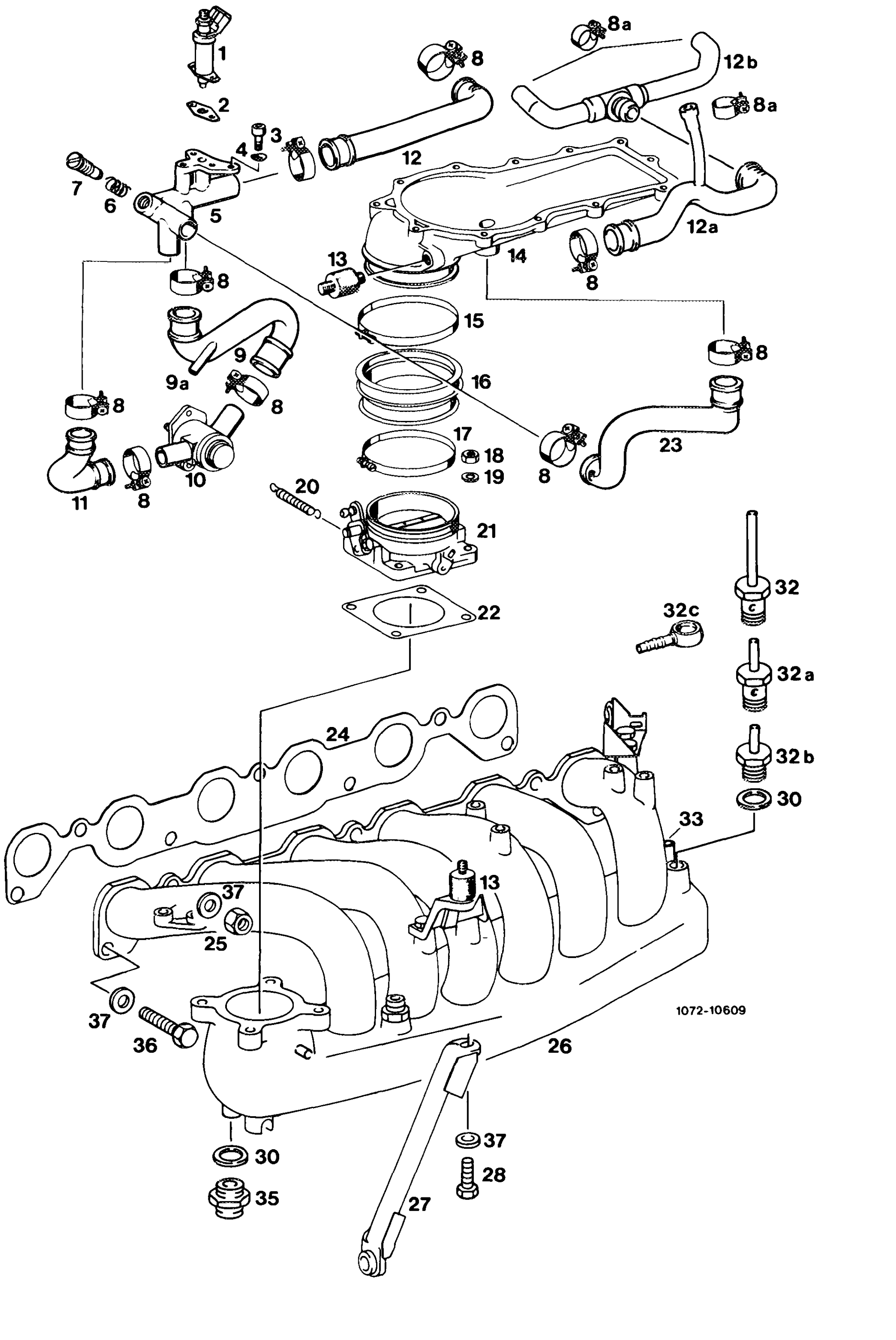
23 Adjust idle speed (07.3–100).

Intake manifold
1st version
up to increased output



1	Cold start valve	12	Contour hose	23	Contour hose
2	Gasket	13	Vibration damper	24	Gasket
3	Hex. socket screw	14	Air guide housing	25	Nut
4	Corrugated washer	15	Hose clamp	26	Intake manifold
5	Idle speed air distributor	16	Rubber sleeve	27	Supporting bracket
6	Compression spring	17	Hose clamp	28	Hex. bolt
7	Idle speed air screw	18	Nut	29	Double connection
8	Hose clamp	19	Washer	30	Sealing ring
9	Contour hose	20	Return spring	31	Spacing sleeve
10	Auxiliary valve	21	Throttle valve housing	32	Vacuum connection
11	Contour hose	22	Gasket	33	Vacuum connection for full load enrichment

2nd version
starting with increased output



1 **Cold start valve**
2 Gasket
3 Hex. socket screw
4 Corrugated washer
5 Idle speed air distributor
6 Compression spring
7 Idle speed air screw
8 Hose clamp
8a Hose clamp
9 Contour hose
9a Connection ignition retard
10 Auxiliary air valve
11 Contour hose
12 Contour hose 1st version
12a } Contour hose
12b } 2nd version starting September 1981
13 Vibration damper
14 Air guide housing
15 Hose clamp
16 Rubber sleeve
17 Hose clamp
18 Nut
19 Washer
20 Return spring
21 Throttle valve housing
22 Gasket
23 Contour hose
24 Gasket
25 Nut
26 Intake manifold
27 Supporting bracket
28 Hex. screw
30 Sealing ring
32 Vacuum connection
32a } e. g.: automatic transmission
32b } Central locking system, light
32c } range control
33 Vacuum connection for full load enrichment
35 Double connection for EGR
36 Screw
37 Washer

Renewing

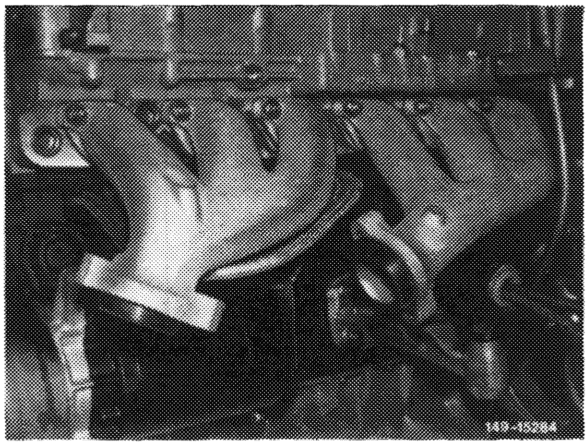
1 Remove and install intake manifold (09–400).

2 Remove and install mixture controller with air guide housing (07.3–230).

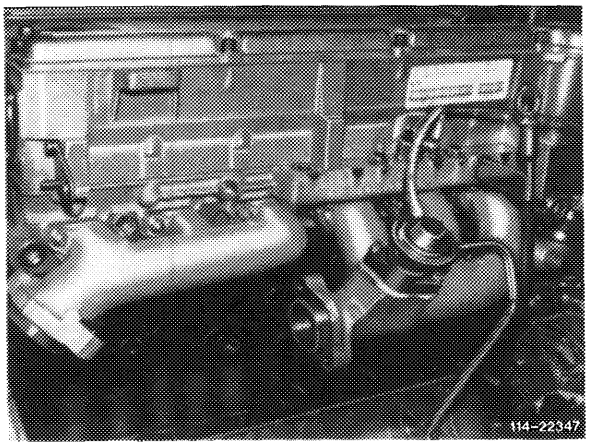
3 Unscrew all unscrewable parts on removed intake manifold and mount to new intake manifold together with new gaskets.

Note

Starting with increased output, the cross section of the exhaust manifold has been slightly enlarged and the connection for the exhaust pipes was changed to outer ball (up to now inner ball). For installation date refer to 14–450.



Prior to September 1981

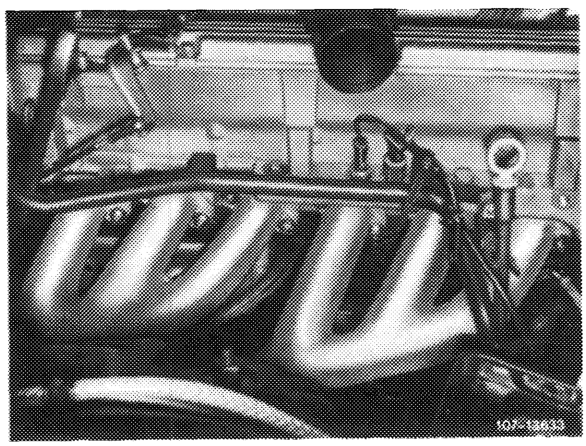


Starting September 1981

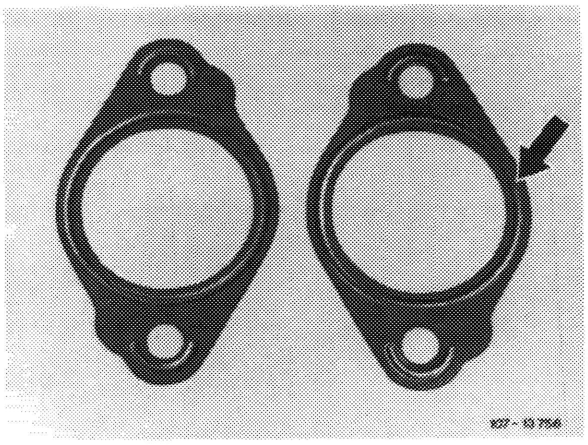
Removal and installation

1 Remove and install exhaust system (49–100).

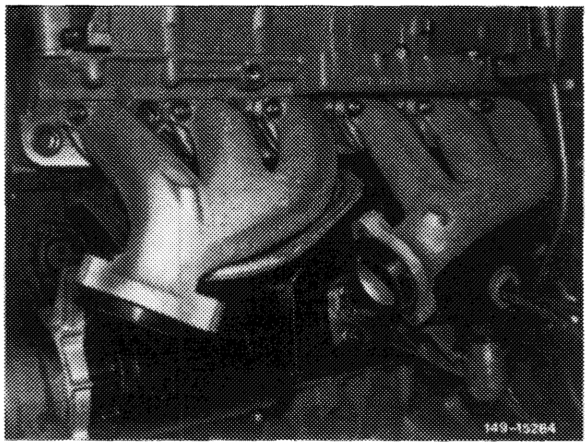
2 Unscrew all exhaust nuts and remove exhaust manifold.



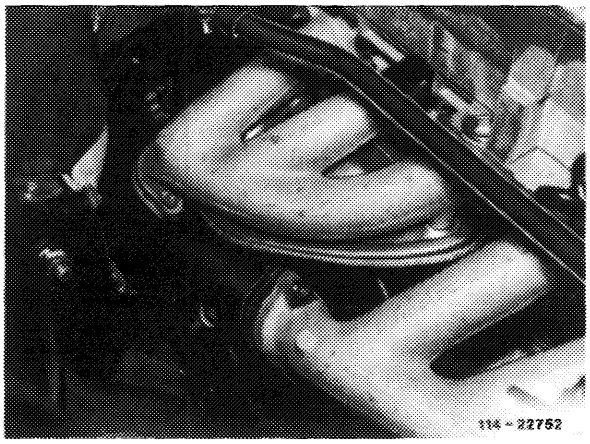
3 Mount exhaust manifold with new gaskets. Make sure that the bead (arrow) points toward exhaust manifold.



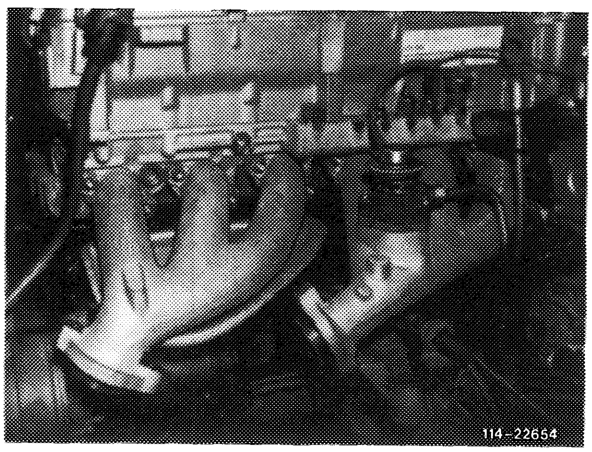
A. Lefthand steering



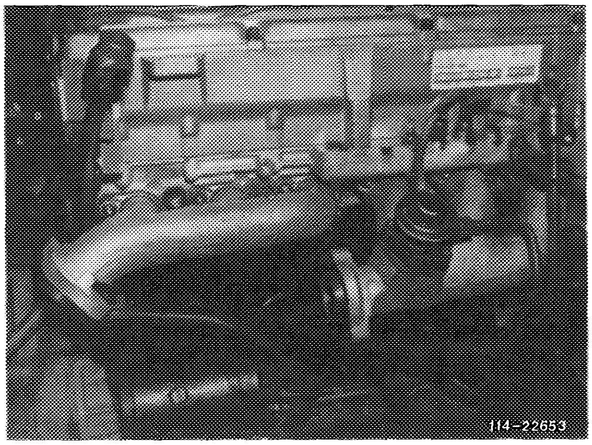
Engine 110.984



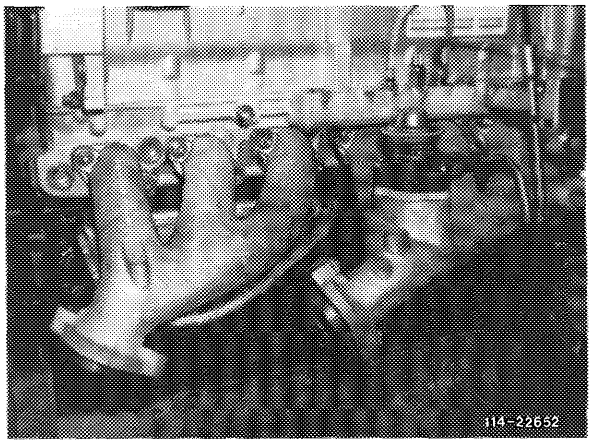
Engine 110.987



Engine 110.988

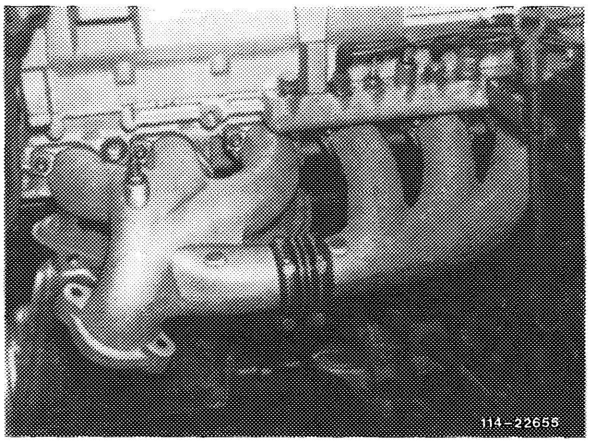


Engine 110.989



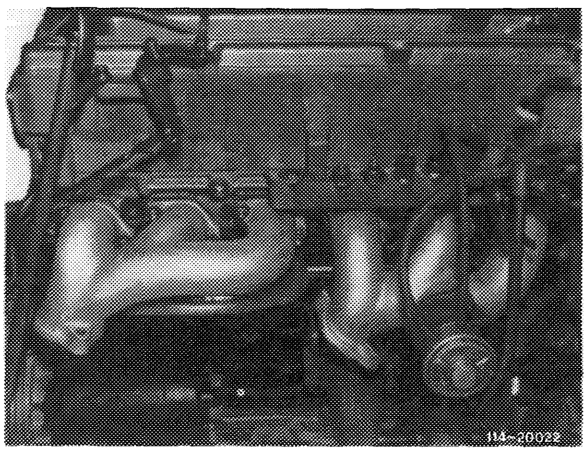
Engine 110.990

Ⓙ **model year 1982**



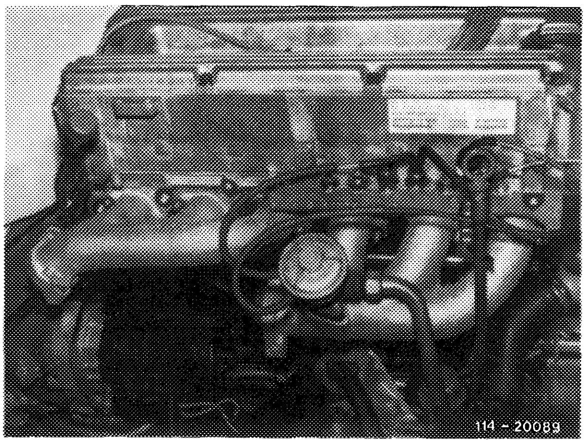
Engine 110.988

Ⓢ **model year 1982**



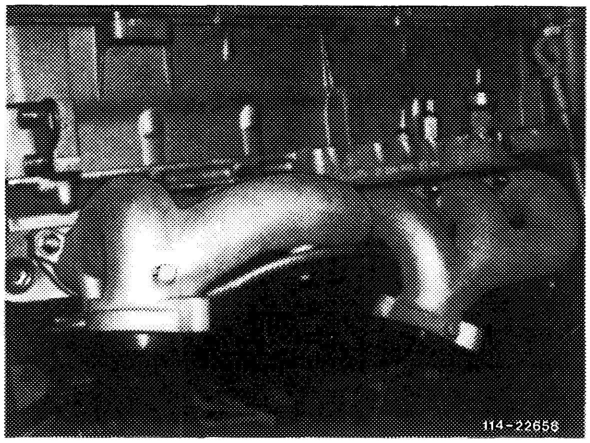
Engine 110.988

Ⓢ **model year 1982**

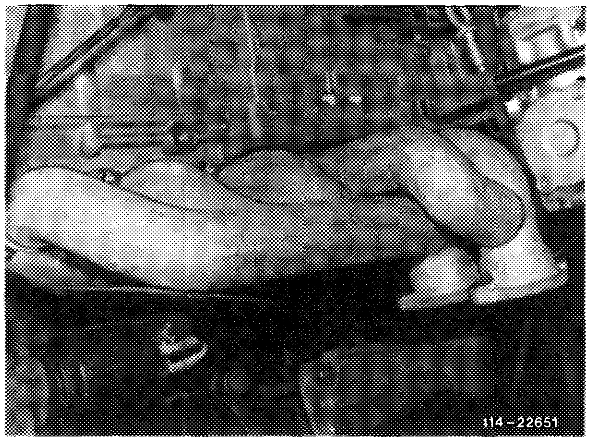


Engine 110.989

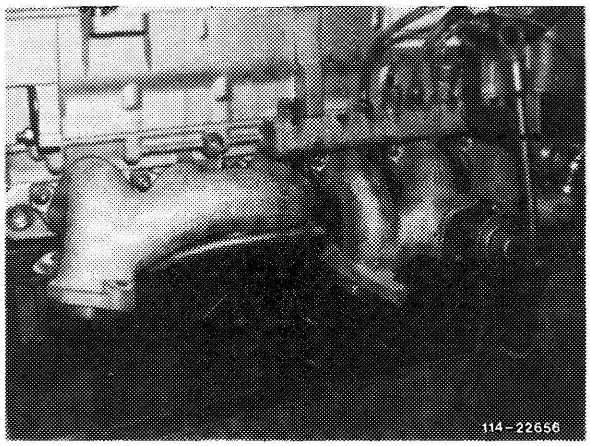
B. Righthand steering



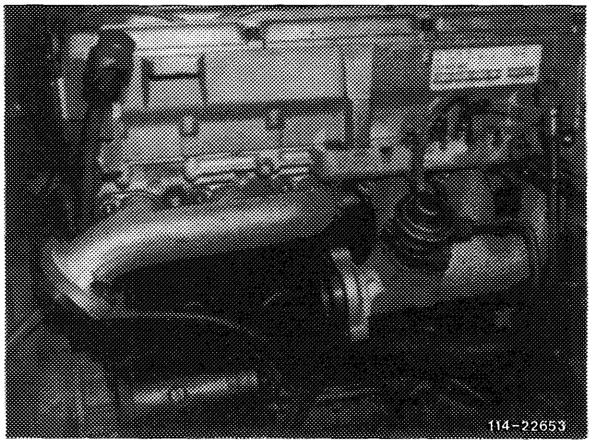
Engine 110.984



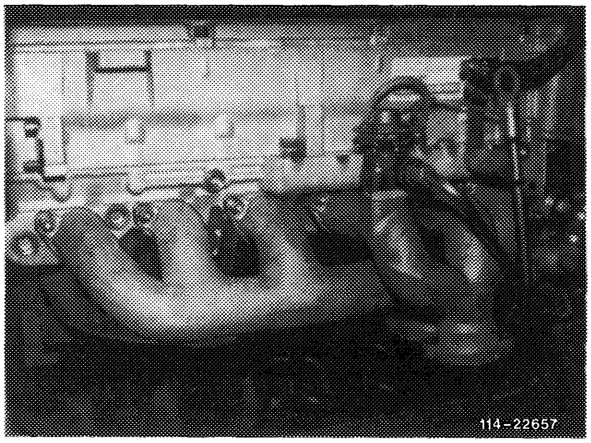
Engine 110.986



Engine 110.988

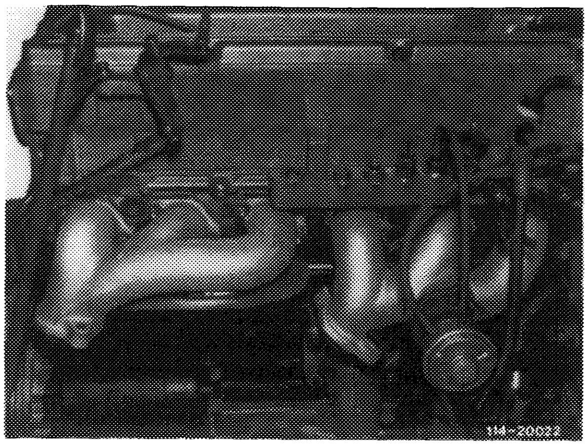


Engine 110.989



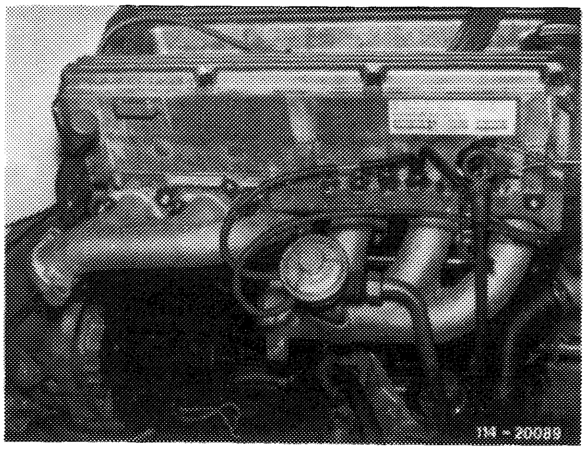
Engine 110.990

(AUS) **model year 1982**



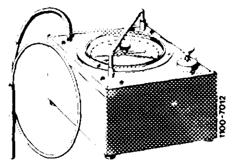
Engine 110.988

(AUS) **model year 1982**



Engine 110.989

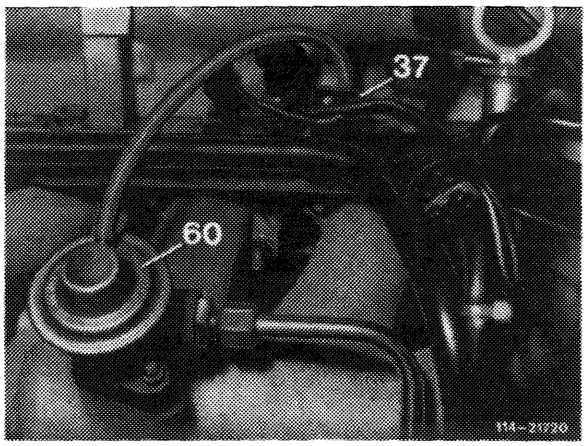
Special tool

Vaccum tester		116 589 25 21 00

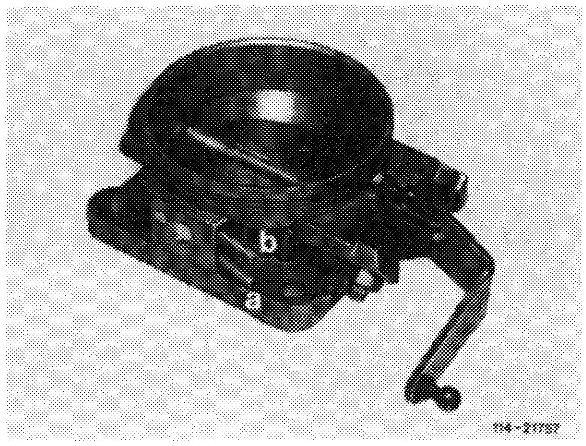
Conventional tool

Revolution counter

Testing EGR



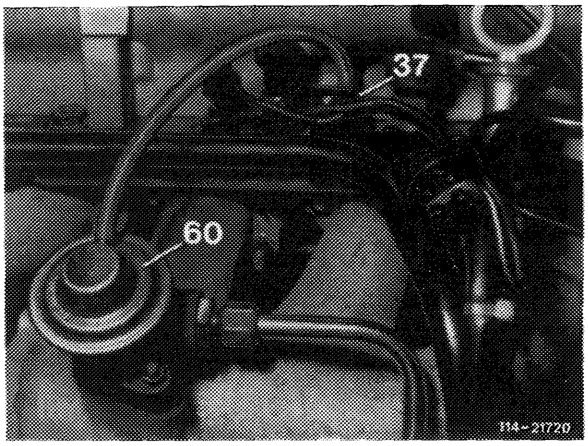
1 Pull vacuum line from EGR valve (60), plug-on test hose and activate with vacuum. If operation of engine is not getting clearly worse, replace EGR valve.



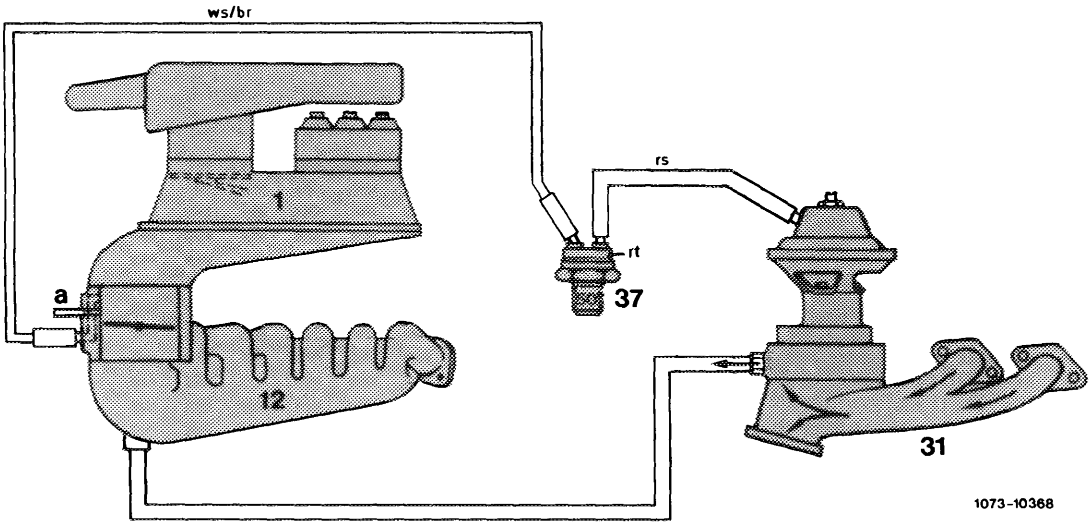
2 Check activation of EGR valve. Pull off vacuum line at EGR valve (60) and connect to vacuum tester. Increase engine speed slowly to approx. 3000 rpm. There should be no vacuum up to approx. 1800 rpm. Vacuum connections on throttle valve housing may be mixed up.

a To thermovalve for EGR
b To ignition distributor

3 Check thermovalve (37) 50 °C. Pull vacuum line white/brown/purple from EGR valve and activate with vacuum. At coolant temperatures < 50 °C no passage on thermovalve.

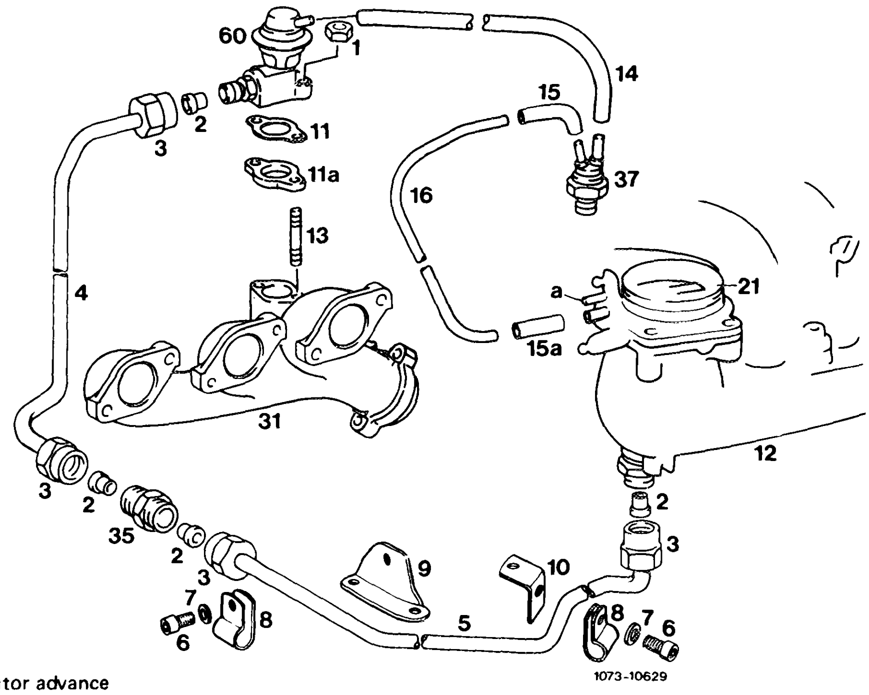


Function diagram EGR



1	Mixture controller	37	Thermovalve 50 °C	Color code
12	Intake manifold	60	EGR valve	br = brown
31	Exhaust manifold	a	To ignition distributor	rs = pink
				rt = red
				ws = white

EGR



1 Nut
2 Sealing cone
3 Coupling nut
4 EGR line
5 EGR line
6 Screw
7 Washer
8 Clamp
9 Holder
10 Holder
11 Gasket
11a Asbestos gasket
12 Intake manifold
13 Stud
14 Vacuum hose
15 Contour hose
15a Contour hose
16 Vacuum line
21 Throttle valve housing
31 Exhaust manifold
35 Double thread connection
37 Thermovalve 50 °C
60 EGR valve

a Connection ignition distributor advance

Installation: September 1981

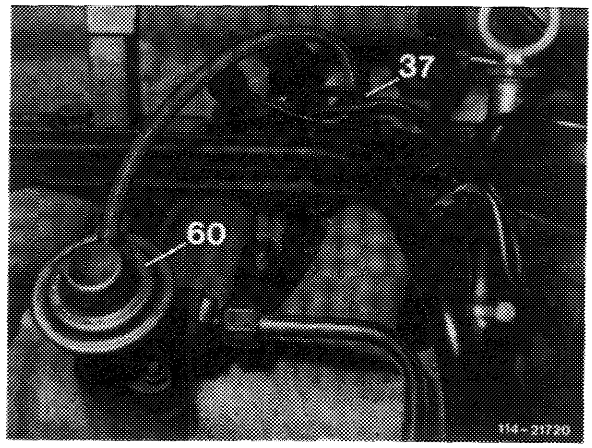
Model	Engine	Engine end No. manual transmission	automatic transmission	Chassis end No. Installation mixed	Installation continuous
107.042	110.990			010107–011567	011569
123.007 123.033 123.053 123.093	110.988	start of series		085174–096468 024129–024416 010064–010252	096496 024417 010253
126.022 126.023	110.989			021381–043198 039922–042786	043199 042787

Description of operation

To reduce the forming of nitric oxides (NO_x) a portion of the exhaust gases is recirculated out of exhaust manifold by way of a valve into the intake manifold.

The recirculated exhaust gases are adapted to the load conditions of the engine in such a manner that no operating faults will occur.

Starting from a coolant temperature of approx. 50 °C in cylinder head a portion of the exhaust gases is recirculated into the intake manifold in medium and upper partial load range. Adding exhaust gases to the fuel/air mixture will decrease the combustion temperature and thereby reduce forming of nitric oxides. The amount of recirculated exhaust gases is dependent on the valve position (vacuum at throttle valve).



37 Thermovalve 50 °C
60 EGR valve

Depending on the throttle valve position, more or less vacuum will act on the EGR valve (60).

The EGR valve (60) which is mounted on the exhaust manifold opens and a given amount of exhaust gases is routed via recirculating line into intake manifold.

EGR proceeds:

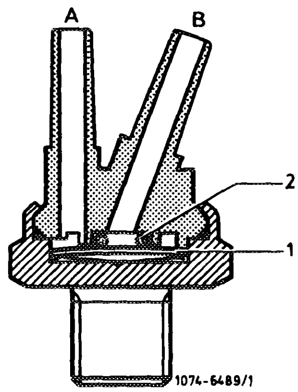
Above 50 °C coolant temperature.
In medium and upper partial load range.

No exhaust gas is recirculated at idle, during deceleration and in low partial load range. There will also not be enough vacuum at full load to keep EGR valve open.

Below 50 °C coolant temperature the bimetallic strip rests against O-ring and closes connection "B".

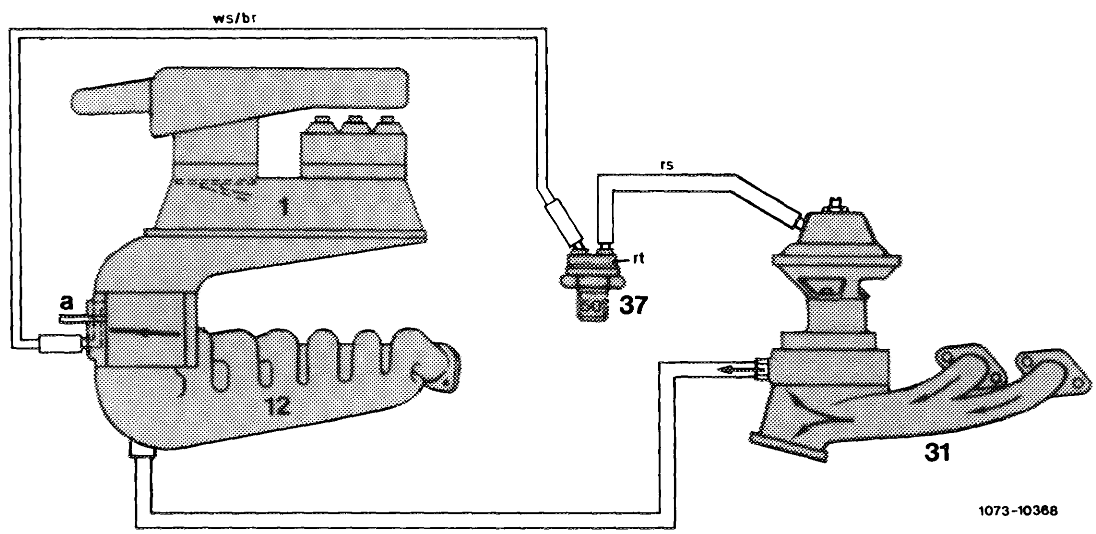
Above 50 °C coolant temperature the bimetallic strip will snap downwards under influence of heat. Both connections are connected to each other.

The vacuum line to EGR valve must be plugged to connection "A", since this alone will guarantee absolute tightness between bimetallic strip and O-ring.



1 Bimetallic strip
2 O-ring
A To EGR valve
B To throttle valve housing (vacuum side)

Function diagram EGR



1 Mixture controller	37 Thermovalve 50 °C	Color code
12 Intake manifold	60 EGR valve	br = brown
31 Exhaust manifold	a To ignition distributor	rs = pink
		rt = red
		ws = white

Testing and adjusting values

Standard version

Engine	Ignition distributor Bosch No.	Adjusting value[1]) of firing point without vacuum 3500/min	Test value Ignition adjustment with/without vacuum: Idle with	1500/min without	3000/min without	Vacuum adjustment in direction of: "retard" at idle	"advance" at 3500/min	Installation value of ignition distributor at starting speed without vacuum
110.984 110.985 110.986 110.987 110.994	0 237 302 002	30° [2])	OT ± 3° [3])	16–20°	30°	8–12°	8–12°	10° before TDC
	0 237 302 003			18–23°				
	0 237 302 005 0 237 304 003 0 237 302 017 0 237 304 012		OT ± 3° [3])	15–25°	30°	8–12°	8–12°	
110.988 110.989 110.990	0 237 306 045		7–13°	20–24°	29–33°	–	10–14°	12° before TDC

[1]) If normally compressed engines are operated with fuel uder 98 RON (min. 88 MON), adjust firing point in direction of "retard" and match to octane rating of fuel used. The reference value for this adjustment is: set firing point back by 1–2 ° crank angle per 1 RON. Max. setback should not exceed 6 ° crank angle.
Attention!
Taking firing point back is considered an **"emergency measure"**. Reduced output and increased fuel consumption will result. In addition, the engine should not be fully loaded. As soon as fuel with specified octane number is available, set again to full advance.

[2]) To set firing point, pull off both vacuum lines for ignition adjustment.

[3]) Switch off air conditioner, automatic transmission in position "N" or "P".

National version

Ignition distributor Bosch No.	Adjusting value of firing point with vacuum at idle	Test values Ignition adjustment without vacuum 1500/min	3000/min	Vacuum adjustment in direction of "retard" at idle	"advance" at 3000/min	Installation value of ignition distributor at starting speed without vacuum
AUS 1977 Identification: silver information plate on cross member in front of radiator.						
0 237 302 002	TDC	14–19°	25–35°	8–12°	8–12°	10° before TDC
AUS 1978/79/80						
0 237 302 005 0 237 302 017	TDC	15–25°	26–35°	8–12°	8–12°	10° before TDC
AUS 1981						
0 237 304 018	2° after TDC	12–18°	25–31° 3500/min	9–11°	8–12°	10° before TDC

Ignition distributor Bosch No.	Adjusting value of firing point with vacuum at idle	Test values Ignition adjustment without vacuum 1500/min	3000/min	Vacuum adjustment in direction of "retard" at idle	"advance" at 3000/min	Installation value of ignition distributor at starting speed without vacuum

AUS 1982

0 237 304 021	2° after TDC	8–12°	19–23° 3500/min	9–11°	8–12°	10° before TDC

J 1977/78/79

Identification: Information plate on cross member in front of radiator in Japanese language.

0 237 304 001	TDC	16–20°	28–34°	8–12°	8–12°	10° before TDC

J 1980

0 237 304 003 0 237 304 010	TDC	15–25°	27–34°	8–12°	8–12°	10° before TDC

J 1981

0 237 304 018	10° before TDC[1])	18–22°	28–34°	9–11°	8–12°	10° before TDC

J 1982

0 237 304 021	10° before TDC[1])	8–12°	19–23° 3500/min	9–11°	8–12°	TDC

S 1977

Identification: Blue information plate in Swedish language on cross member in front of radiator.

0 237 302 002	TDC	14–19°	28–34°	8–12°	8–12°	10° before TDC

S 1978/79/80

0 237 302 005	TDC	15–20°	26–35°	8–12°	8–12°	10° before TDC

S 1981

0 237 304 018	2° after TDC	12–18°	25–31° 3500/min	9–11°	8–12°	10° before TDC

S 1982

0 237 304 021	2° after TDC	8–12°	19–23° 3500/min	9–11°	8–12°	TDC

Ignition distributor Bosch No.	Adjusting value of firing point with vacuum at idle	Test values Ignition adjustment without vacuum 1500/min	3000/min	Vacuum adjustment in direction of "retard" at idle	"advance" at 3000/min	Installation value of ignition distributor at starting speed without vacuum
USA 1977						
Identification: green/black information plate in English language on cross member in front of radiator						
0 237 304 001	TDC	16–20°	28–34°	8–12°	8–12°	10° before TDC
USA 1978/79						
0 237 304 003	TDC	15–25°	27–34°	8–12°	8–12°	10° before TDC
USA 1980						
0 237 304 003	10° before TDC[1])	15–25°	27–34°	8–12°	8–12°	10° before TDC
USA 1981						
0 237 304 018	10° before TDC[1])	18–22°	28–34°	9–11°	8–12°	10° before TDC

[1]) Adjusted with engine at operating temperature. Vacuum retard will be switched off above 50 °C engine temperature.

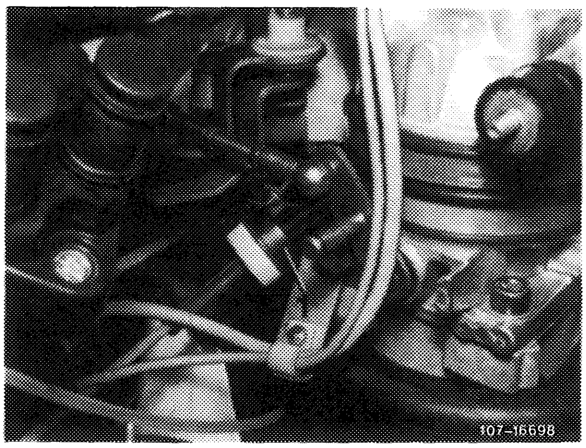
Conventional tool

Digital tester	e. g. made by Bosch, MOT 001.03

Note

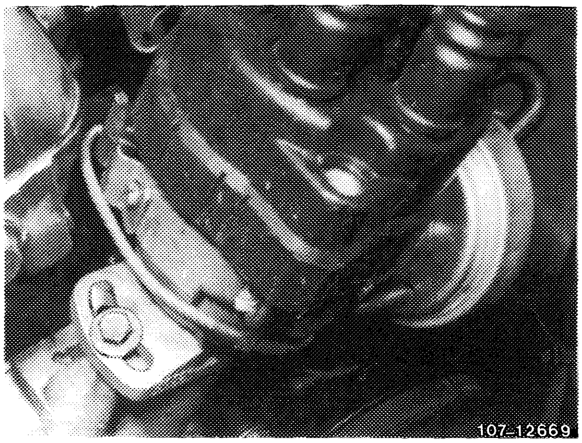
To improve emission values, standard engines are provided with a delay valve which is installed into vacuum line for vacuum advance.

When the throttle valve is quickly opened, the vacuum control unit will be activated with a vacuum under delay.



1 Delay valve

Testing and adjusting



1 Test firing point with stroboscope or digital tester at specified speed and with or without vacuum.

2 Loosen ignition distributor fastening, if required, and set adjusting value of firing point by turning ignition distributor.

Screw down ignition distributor and check firing point once again.

3 Check centrifugal and vacuum adjustment of ignition distributor. For this purpose, run through specified test values with or without vacuum adjustment.

When testing vacuum advance, note that on engines with delay valve the vacuum will be established slightly slower.

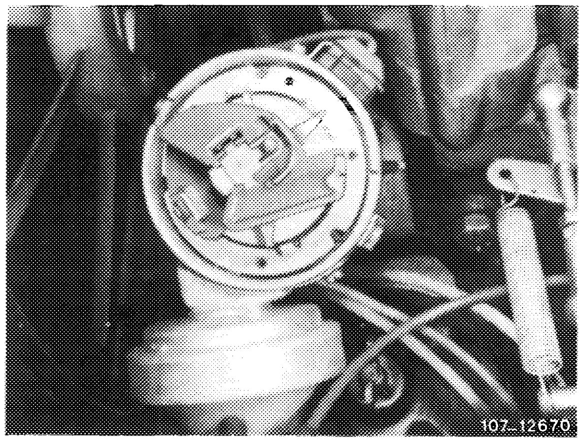
Note

Turn crankshaft in direction of engine rotation at fastening screw of V-belt pulley only.

Removal

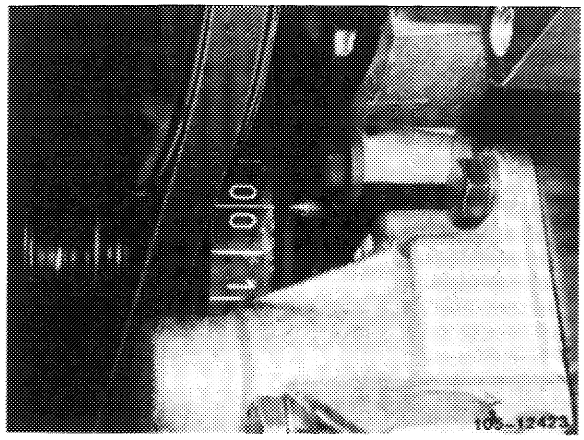
1 Remove ignition distributor cap, cable plug connections and vacuum lines.

2 Set engine to ignition TDC of 1st cylinder. For this purpose, the markings on the distributor rotor and on distributor housing should be in alignment.



3 In addition, the pointer on crankcase should be above TDC mark of vibration damper.

4 Loosen ignition distributor attachment and pull out ignition distributor.



Installation

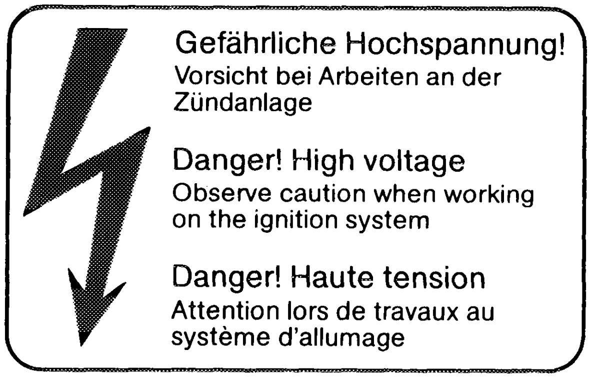
5 For installation proceed vice versa. Pay special attention to ignition TDC of 1st cylinder and to markings on distributor housing and vibration damper.

6 Adjust firing point (15–501).

Note

Attention!
When working on breakerless transistorized ignition system, be sure to observe the following safety instructions:

- Persons with heart stimulators should not work on such ignition systems.



Information plate in engine compartment

1154-9352

- With the engine running or at starting speed, do not touch, pull off etc. components of ignition system, ignition cable, ignition coil, spark plug connector.

- Perform assembly jobs on ignition system only with engine stopped and ignition switched off.

Also connect and disconnect test instruments only with engine stopped and ignition switched off (15–531).

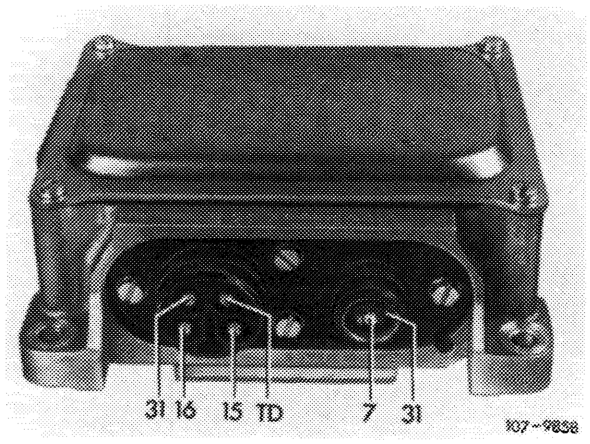
- Do not install adapters or transmitters, e. g. for stroboscope, into ignition cable, e. g. cylinder 1, which are metallically bright.

A. TSZ 4

Note

This ignition system is widely free of maintenance requirements and guarantees adequate ignition voltage even at max. speeds and a more accurate adherence to firing point.

Identification: Yellow paint dot on housing top up to production date 930 and Bosch No. 0227 100 001.



Components of ignition system

Ignition coil

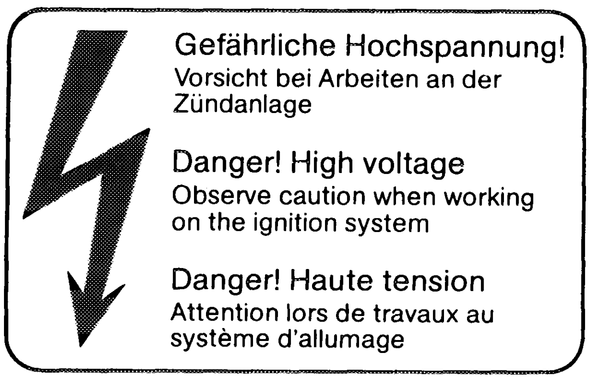
Design and external dimensions of the ignition coil are similar to those of a normal high-performance ignition coil. However, the coil layout is different. The transformation ratio amounts to approx. 1:185 as compared with 1:100 for conventional ignition coils.

Identification: blue paintwork and sticker Transistor Bosch No. 0 221 12201.

Pre-resistors (series resistors)

Pre-resistors 0.4 Ω and 0.6 Ω are similar to those of former ignition coil resistors: The resistance coil is surrounded by a ceramic body with projecting connections.

A sheet-metal clamp is placed around ceramic body for attachment. The color of this clamp provides information with regard to resistance value, which is also punched in as a number.



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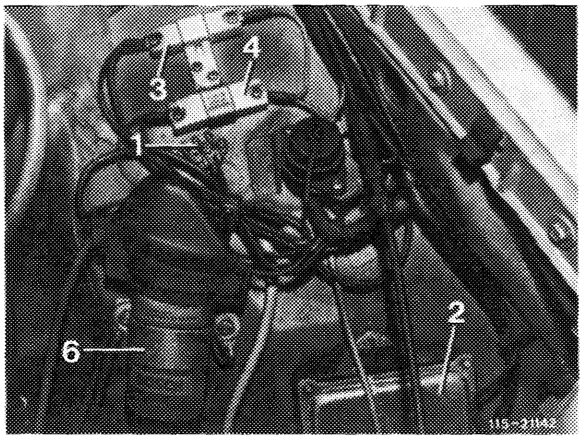
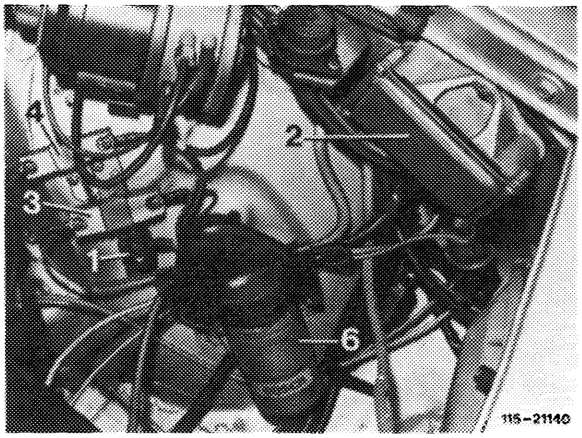


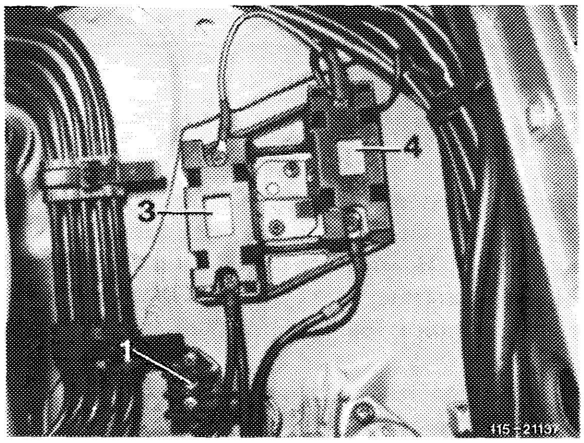
Model 126

1 Cable connector
2 Switching unit TSZ 4
3 Pre-resistor 0.6 Ω
4 Pre-resistor 0.4 Ω
6 Ignition coil



Model 123

1 Cable connector
2 Switching unit
3 Pre-resistor 0.6 Ω
4 Pre-resistor 0.4 Ω
6 Ignition coil



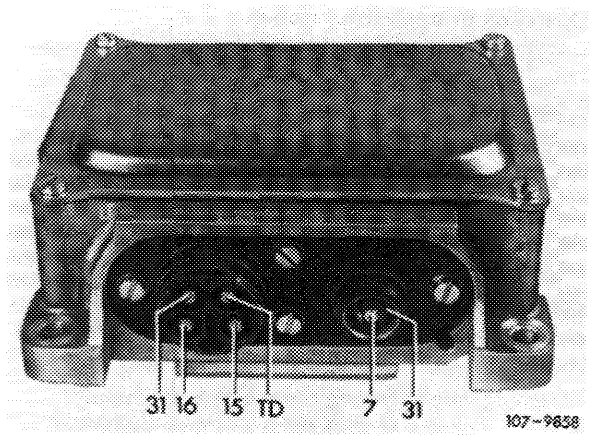
Model 126

3 Covered pre-resistors
4 Covered pre-resistors

Color	Code No.	Resistance
Anodized, blue	0.4	0.4 Ω
Anodized, metallic	0.6	0.6 Ω

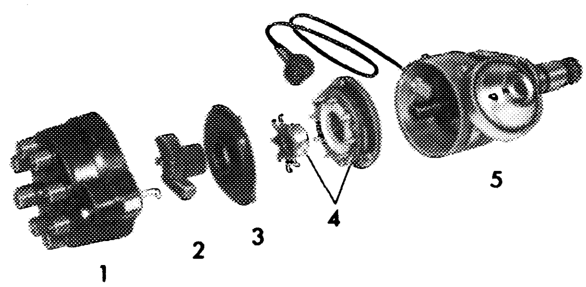
Switching unit

The switching unit contains several transistors, resistors and other electronic components in a metal housing. This metal housing protects the components against mechanical damage and splash water and serves also for eliminating dissipated electric heat. In the event of repairs, only the complete switching unit can be replaced.



Ignition distributor

Instead of the contact breaker, the ignition distributor is provided with a transmitter section, which operates according to the induction principle. Ignition timing by centrifugal force and vacuum is similar to former ignition distributors.

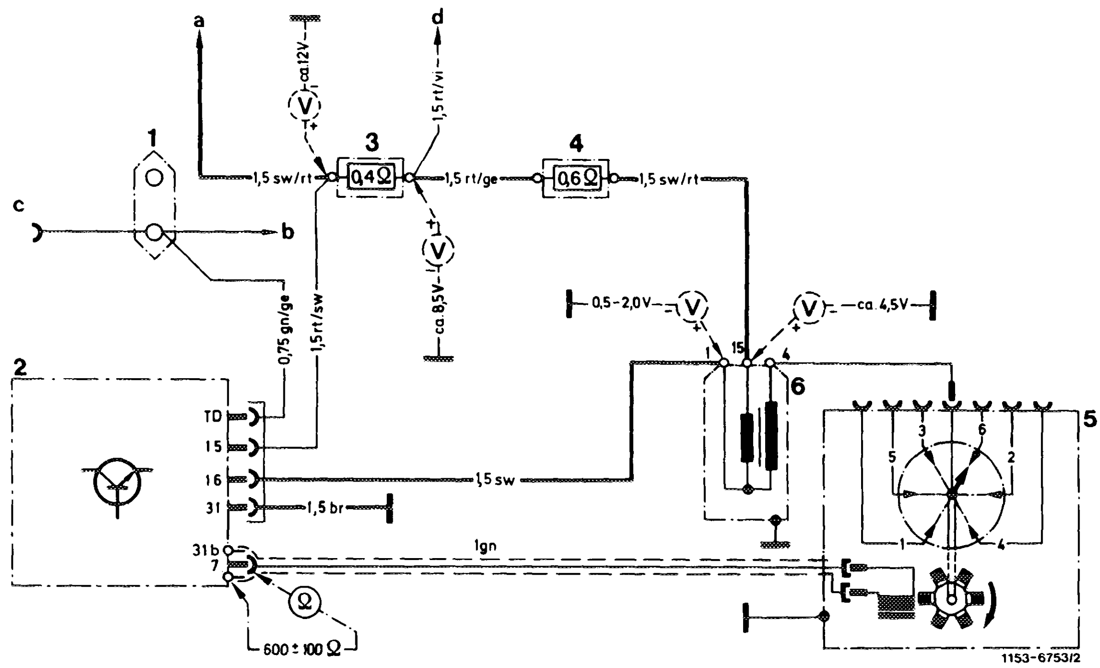


1 Ignition distributor cap
2 Ignition distributor rotor
3 Shielding cap
4 Transmitter section
5 Ignition distributor housing

Operation of transmitter section

A rotor with its number of teeth corresponding to number of engine cylinders produces during its rotation per tooth a change of magnetic flux in a magnetic field established by a permanent magnet. As a result, an induction coil located in magnetic field established a control voltage (0.3 V – 100 V) which depends in its size on engine speed, with a steep change from positive to negative half wave. This steep change of polarity of control voltage is used in switching unit following zero passage for impulse shaping, impulse amplification and interruption of primary current.

If the primary current is interrupted, the ignition voltage is induced in secondary winding of ignition coil. The dwell angle control in switching unit adapts the current flow time of primary current to the engine speed, that is, the dwell angle will also become larger with increasing speed, so that adequate ignition voltage is assured also in upper speed range.



Wiring diagram breakerless transistorized ignition system TSZ 4

1 2-point cable connector
2 Switching unit
3 Pre-resistor 0.4 Ω
4 Pre-resistor 0.6 Ω
5 Ignition distributor with transmitter section
6 Ignition coil

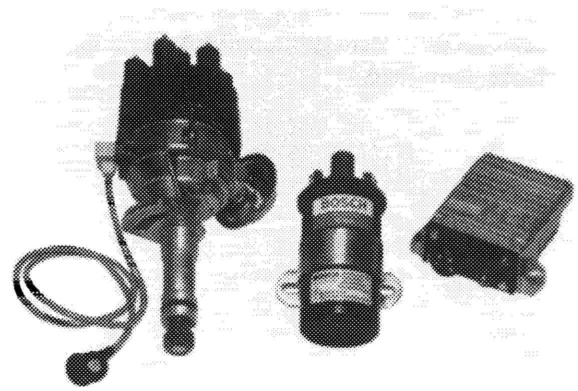
a Ignition starter switch
b Instrument cluster, revolution counter
c Diagnosis socket
d Terminal 16 starter

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

B. TSZ 8 u

Notes concerning jobs on ignition system

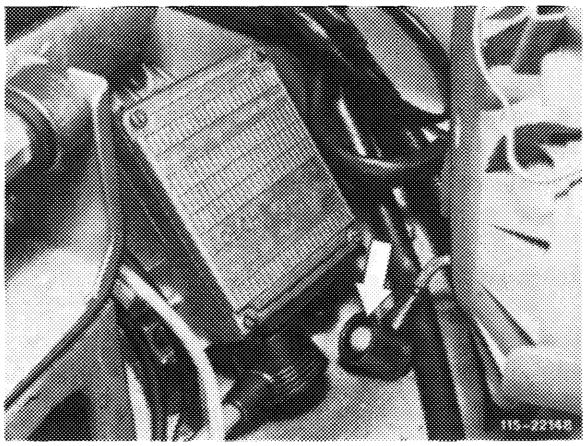
Since model year 1981 national versions and standard version since September 1981, engines 110 are provided with the breakerless transistorized ignition system without rest potential and without pre-resistors TSZ 8 u. Compared with systems known up to now the output of this ignition system has been increased.



115–21530

- Prior to jobs at starting speed and jobs with ignition cables pulled off e. g. when testing compression pressure, switch off ignition and pull off plug (transmitter in ignition distributor) on switching unit (green cable) or attach protective plug ignition system, part No. 102 589 02 21 00 on diagnosis socket.

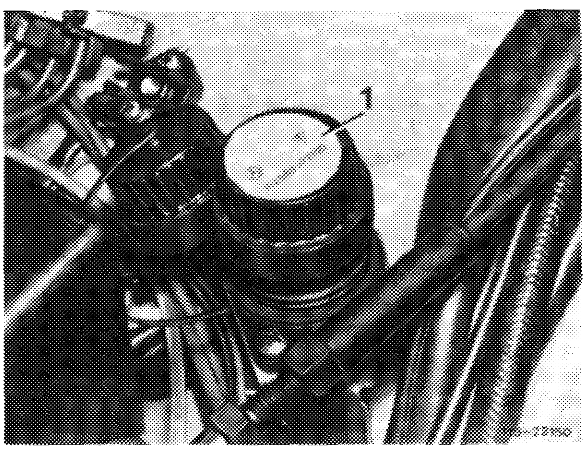
- Prior to rotating engine — e. g. for testing pressure loss, adjust valve clearance — switch off ignition, pull off plug (transmitter in ignition distributor) on switching unit (green cable) or attach protective plug ignition system, part No. 102 589 02 21 00 to diagnosis socket.



Note concerning prevention of damage on ignition system

- Do not connect e. g. a suppression capacitor or test lamp to terminal 1 of ignition coil.

- Do not short terminal 1 and 15 of ignition coil against ground (e. g. as a burglar alarm).



- Do not disconnect battery with the engine running.

- Install only original components of ignition system (refer to components of ignition system).

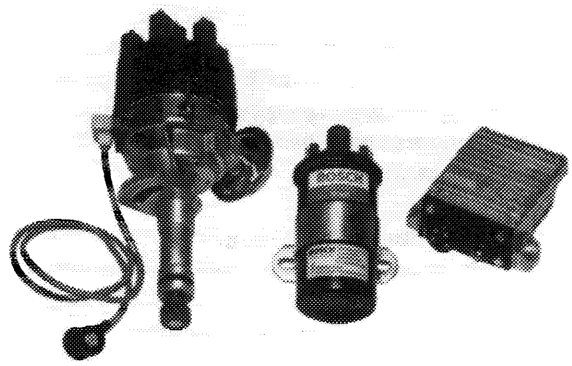
  Do not operate ignition system at starting speed without completely connected ignition harness.

- With the engine running, tests like, e. g., testing ignition cable 4 at a distance against ground (spark gap at starting speed) as well as pulling off of a spark plug connector are no longer permitted.
  If insulation damage is suspected, evaluate scope pattern at idle speed and with driving position engaged.

- Testing of ignition voltage while starting with cable 4 pulled from ignition distributor is no longer permitted.

Components of ignition system

The ignition system comprises the ignition coil, the ignition distributor, the ignition harness and the switching unit:



115-21530

Ignition coil

The ignition coil is adapted to the TSZ switching unit and designed for a higher ignition performance.

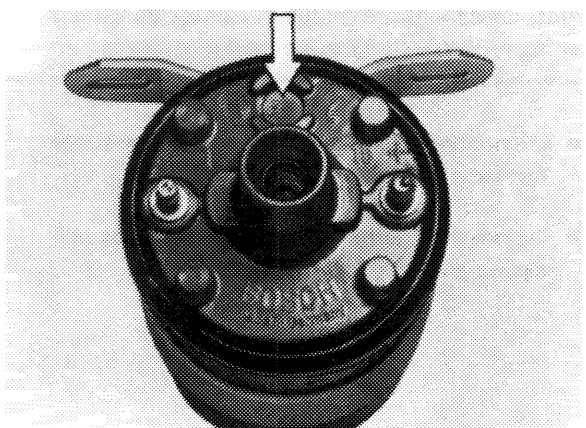
Different characteristics in relation to former ignition coils are:

1. The safety plug in cover of ignition coil (arrow).

2. A higher dome.

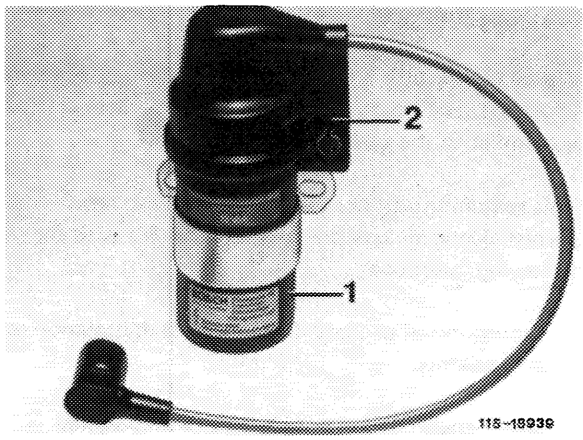
3. Cable connection to terminal 1 with thread M 5.

4. Cable connection to terminal 15 with thread M 6.



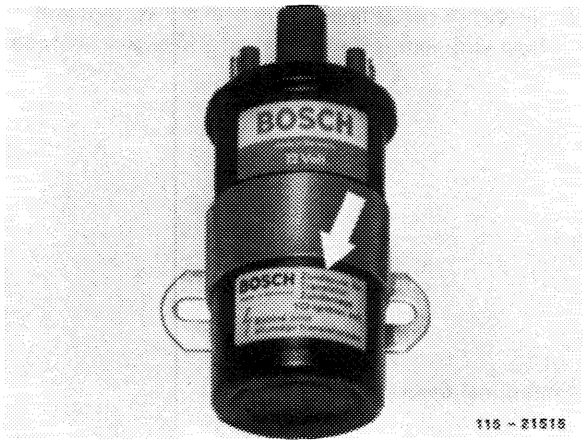
115-21388

The cover of ignition coil has an opening of 5.5 mm dia. which is closed with a plug. This plug will be released in the event of overpressure in switching unit caused by an intensive development of heat under influence of a defective final stage. To prevent uncontrolled release of plug or of sealing compound out of ignition coil, the ignition coil is provided with a protective cover.



To prevent mixups, the ignition coil of the TSZ 8 u has a yellow information label (arrow) Bosch No. 0221 111 83 07.

Never replace ignition coil by one of the former ignition coils.

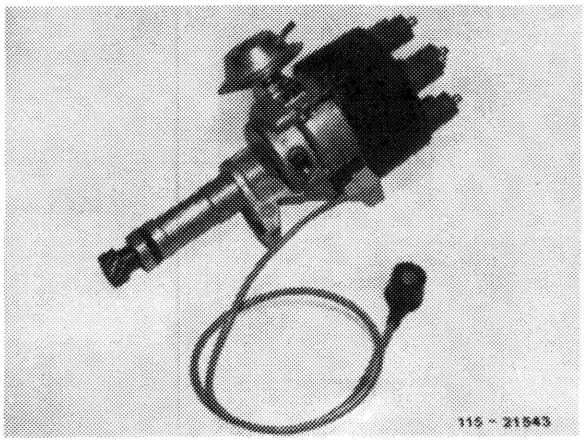


Ignition distributor

In principle, this ignition distributor with inductance transmitter corresponds with the version already known, except that its characteristic has been changed, together with a simplified vacuum control unit for ignition advance.

The line of the inductance transmitter from distributor to switching unit is a two-core line, it is insulated against ground and shielded.

The distributor rotor has an interference suppression resistor of 1 kΩ (code number R 1, on distributor rotor).



Ignition harness

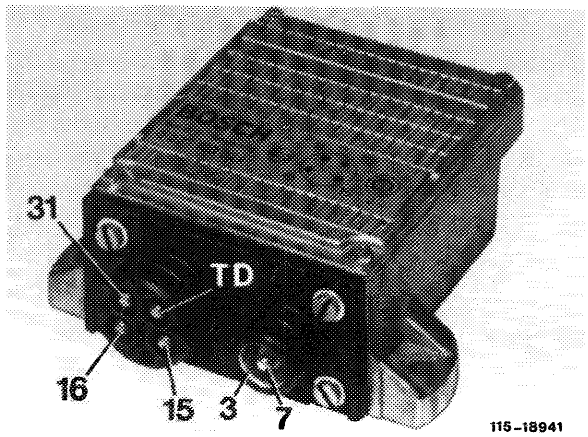
The partially shielded spark plug connections and offset distributor plugs are designed to the higher ignition voltage.

An interference suppression resistor of 1 kΩ is installed in spark plug connectors.

They can be screwed off (thread M 4).

Switching unit

The switching unit is considerably smaller and lighter in weight. The housing has no vent bores. Connections are similar to the version already known.



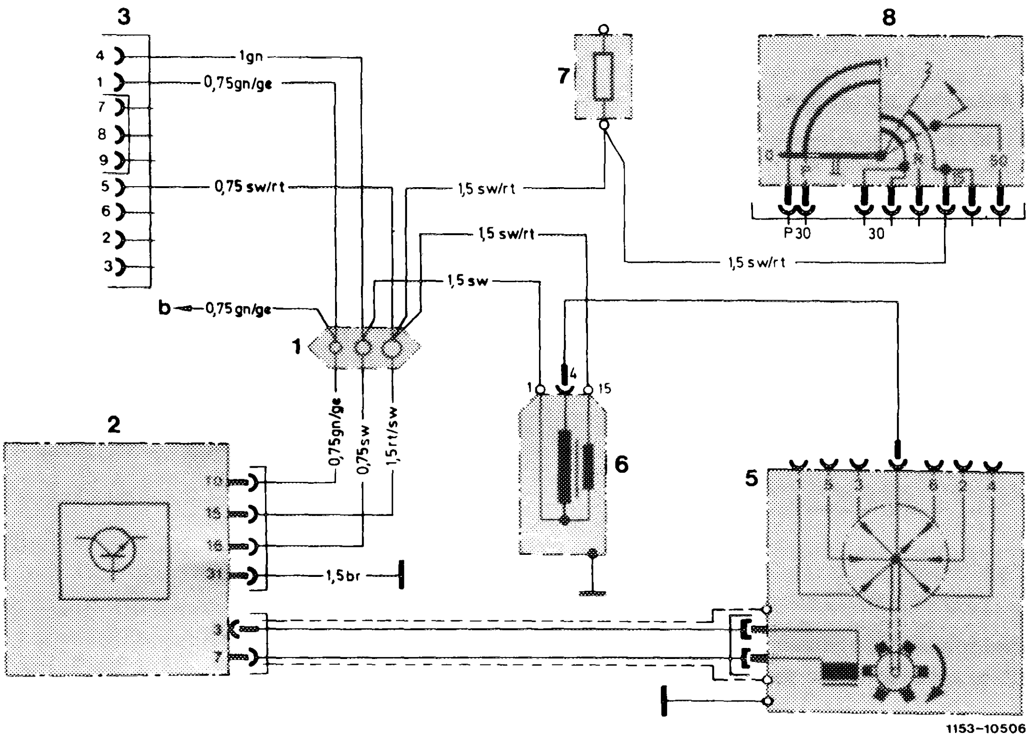
This switching unit has been provided with new, special electronic components (control IC) with the following functions:

1. Limitation of primary current; there elimination of pre-resistors.

2. Dwell angle control at different battery voltage and engine speed, by max. primary current.

3. Cutout of rest potential; no primary current will flow with ignition switched on and engine stopped.

Functional description



Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u

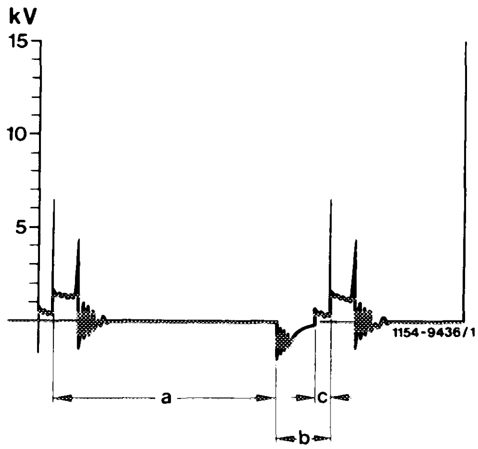
1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starter switch

b To fuel pump relay with rpm limitation

Color code
br = brown
ge = yellow
gr = green
rt = red
sw = black

The max. primary current of the ignition coil is no longer determined by pre-resistors, but by a current limitation in switching unit. This current limitation is applied after the max. possible primary current has been attained.

The current limitation is indicated on oscilloscope at idle.



kV Voltage

a Opening
b Dwell angle
c Current limitation

The optimal output of the ignition system is attained by the dwell angle control in switching unit. Within range of possible regulation, the dwell angle is regulated in such a manner that the same primary current will always be approximately attained in any operating condition, that is, at varying battery voltages and engine speeds.

With the engine stopped and the ignition switched on the primary current is switched off via switching unit (rest potential cutout). The primary current is switched on only in the event of a given impulse sequence from transmitter in ignition distributor.

The revolution counter in instrument cluster is connected to terminal TD.

- Connect and disconnect test instruments only with engine stopped and ignition system switched off.
- Engine tester or individual instruments for measuring rpm and dwell angle which cannot be connected to diagnosis socket may be connected for tapping signals to cable connector of switching unit terminal TD only.
- To prevent faulty measurements the trigger clamp should be attached directly behind ignition distributor to ignition cable cylinder 1.
- The shorting equipment in engine testers (comparing cylinders, cylinder balance) which are stopping the engine upon actuation may no longer be used, since the current flow through ignition coil might lead to destruction of ignition coil.
- The separate ignition coil test may now be made only with the additional adapter cable, with a defined ignition coil load, to prevent damage to ignition coil.

A. TSZ 4

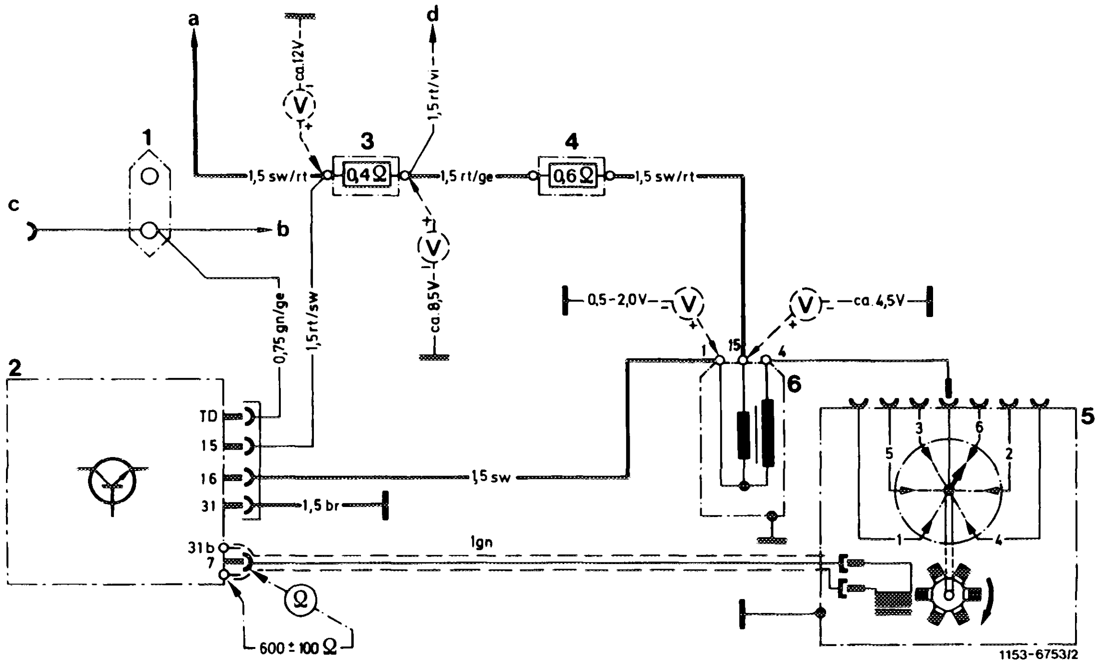
Conventional testers

Voltmeter, ohmmeter, dwell angle measuring instrument, revolution counter

Test values

Rest potential battery		approx. 12 V
Voltage ignition coil	Terminal 1 and ground	0.5–2.0 V
	Terminal 15 and ground	approx. 4.5 V
Input voltage pre-resistor (series resistor)		approx. 12 V
	primary terminal 1 and 15	0.33–0.46 Ω
	secondary terminal 1 and 4	7–12 kΩ
Transmitter resistance between terminal 7 and 31d		600 ± 100 Ω
Transmitter coil with control line terminal 7 and ground		∞
Dwell angle at	approx. 1500 rpm	33–51 °
	approx. 5000 rpm [1])	45–55°

[1]) Perform dwell angle test at 5000 rpm only if complaints refer to misfiring at high speeds.



Wiring diagram breakerless transistorized ignition TSZ 4

1 Double cable connector
2 Switching unit
3 Pre-resistor 0.4 Ω
4 Pre-resistor 0.6 Ω
5 Ignition distributor with transmitter section
6 Ignition coil

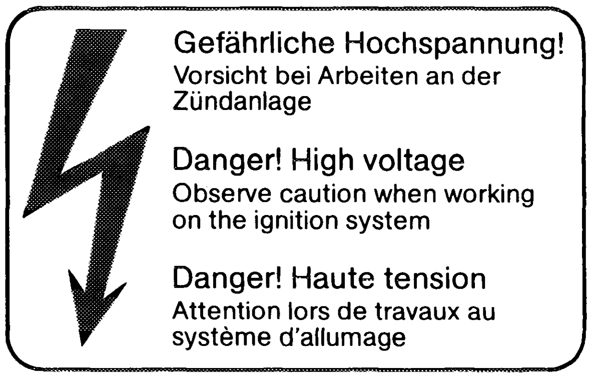
a Ignition switch terminal 15
b Instrument cluster, revolution counter
c Diagnosis socket
d Terminal 16 starter

Color code
br = brown
ge = yellow
gn = green
rt = red
sw = black

Note

In the event of complaints about misfiring, test high voltage side of ignition system first (spark plugs, ignition cable, spark plug connectors).

If the complaints refer to firing of engine, complete the following tests on ignition system in addition to tests at fuel end:



1154-9352

Visual checkup

Check electrical screw connections and plug connections of ignition system for tight seat.

Voltage test

Note: With the ignition switched on and the engine stopped a primary current of approx. 8 amps will flow continuously through system.

1 Input voltage at series resistor 0.4
Cable color black/red:

Rated value approx. 12 volts

2 Voltage at ignition coil at approx. 20 °C:

Terminal 15 and ground = approx. 4.5 volts
Terminal 1 and ground = 0.5–2.0 volts

a) If value at terminal 1 is exceeded, the switching unit is defective and should be replaced.

b) If value at terminal 1 is attained, but no ignition voltage (ignition spark) is induced, check transmitter section in ignition distributor and secondary winding of ignition coil.

Resistance values of ignition coil:

Primary winding terminal 15 and terminal 1 =
0.33–0.46 Ω .

Secondary winding terminal 1 and terminal 4 =
7–12 kΩ

Testing dwell angle

Note: The dwell angle cannot be adjusted. Testing is a functional inspection of switching unit (dwell angle control).

Connect dwell angle measuring unit (connection similar to SI standard switching unit).

Rated value at

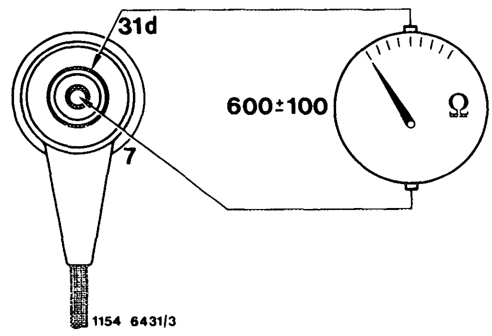
Engine speed	Dwell angle
1500 ± 50/min	33–51 °
5000 ± 50/min[1])	45–55 °

[1]) Test at 5000/min only in the event of complaints about misfiring at high speeds.

If this value is not attained when measuring dwell angle, check ignition distributor transmitter section first. If transmitter section is in order, replace switching unit.

Testing ignition distributor transmitter section

Pull control line of ignition distributor from switching unit and connect ohmmeter.

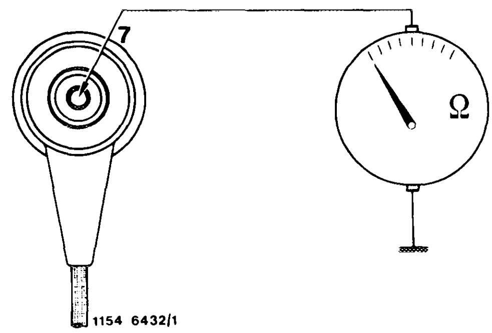


1 Check transmitter resistance between terminal 7 and 31 d.

Rated value: 600 ± 100 Ω

Note: On cold engine, the ohmic value should be in lower half of specified value, on warm engine in upper half.

2 Test transmitter coil including control line for ground connection between terminal and ground.



Rated value: ∞

3 Check transmitter for mechanical damage. Check foı presence of air gap between rotor and stator.

Note: If the transmitter section is defective, replace complete ignition distributor.

B. TSZ 8 u

Conventional test instruments

Voltmeter, ohmmeter, dwell angle measuring instrument, revolution counter	
Digital tester	e. g. made by Bosch, MOT 001.03

Test values

Resistors

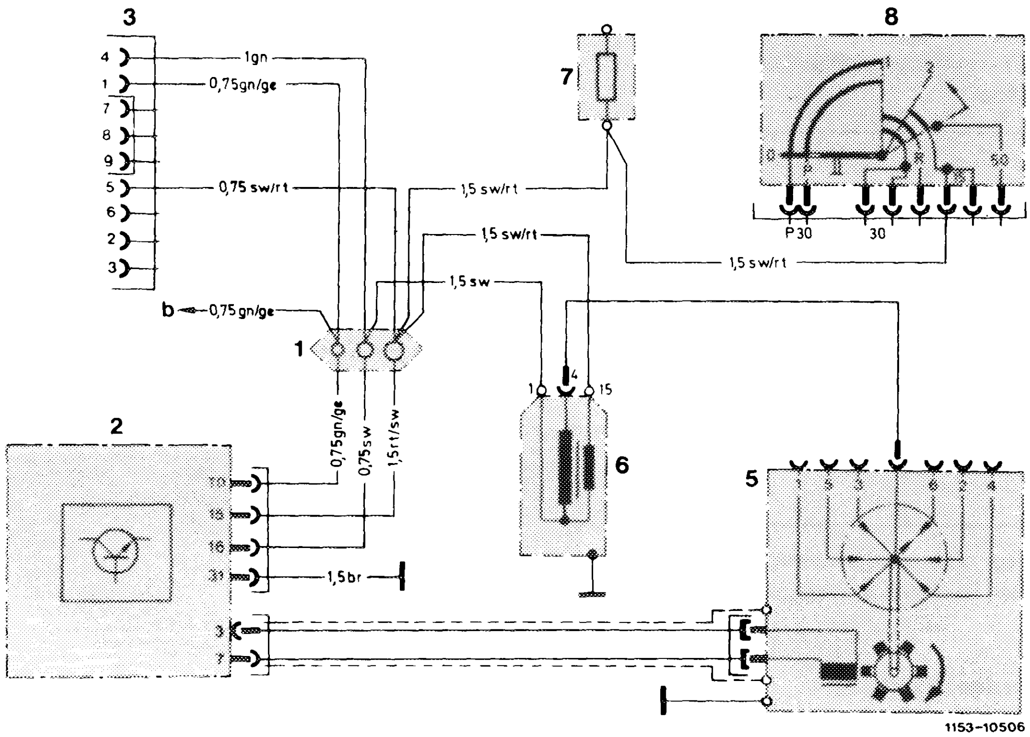
Ignition coil	primary (terminal 1 and 15)	approx. 0.5–0.9 Ω
	secondary (terminal 1 and 4)	6–16 kΩ
Distributor cap		1 kΩ
Distributor rotor, spark plug connector		1 kΩ
Ignition distributor transmitter section	Resistance of winding	600 ± 100 Ω
	Resistance against ground	≧ 200 kΩ

Voltages, stopped engine, ignition switched on

Terminal 15 (jack 5 diagnosis socket)	Battery voltage
between terminal 15 and 1 (jack 5 and 4 diagnosis socket)	0 Volt

Dwell angle

Terminal TD at starting speed	from 7 ° to 25 °



Wiring diagram breakerless transistorized ignition without pre-resistors TSZ 8 u

1 Line connector
2 Switching unit
3 Diagnosis socket
5 Ignition distributor
6 Ignition coil
7 Fuse box terminal 15
8 Ignition starter switch

b To fuel pump relay with rpm limitation

Color code
br = brown
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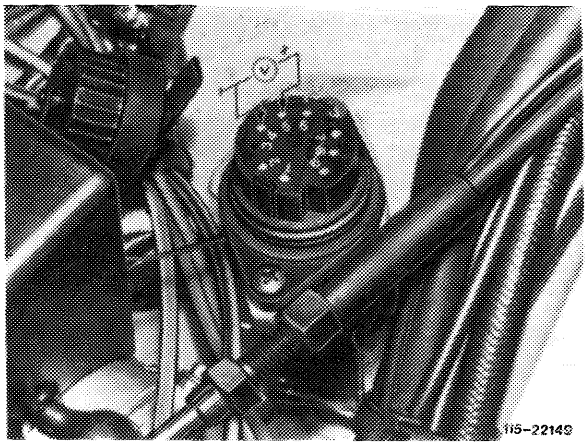
Test



Test voltage (terminal 15) against ground at jack 5 of diagnosis socket. Ignition switched on. Nominal value: battery voltage	
Nominal value correct.	Nominal value wrong.

Test voltage supply via ignition lock.

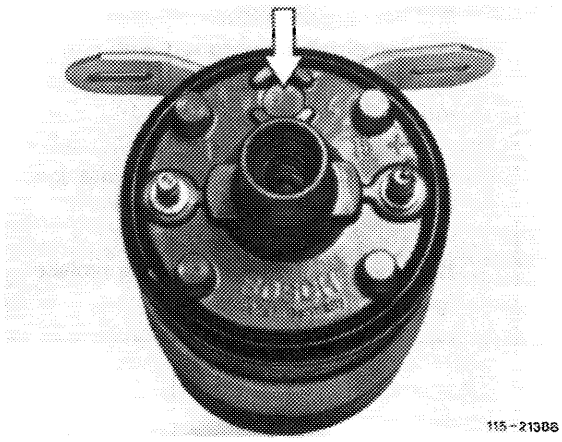
Test voltage difference between jack 5 and 4 (terminal 15 and 1) of diagnosis socket. Nominal value: 0 volt	
Nominal value correct.	Nominal value wrong (voltage > 0.1 volt). Switch off ignition immediately.

Replace switching unit.

Test plug in ignition coil and primary resistance of ignition coil (between terminal 1 and 15) 0.5–0.9 Ω.

With plug ejected or wrong ohmic value, replace ignition coil.

End of test.



115–21388

Test dwell angle at starting speed at diagnosis socket or terminal TD.

Nominal value: from 7–25°.

Nominal value correct.	Nominal value not indicated.	Nominal value higher than 34°

Replace switching unit.

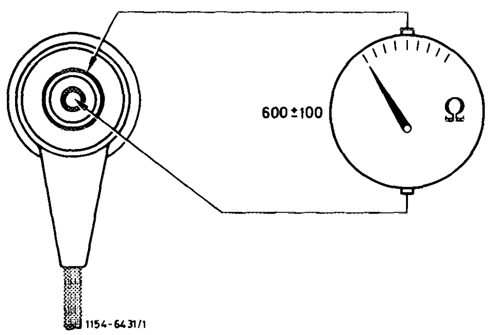
End of test

Test ignition distributor transmitter section for interruption and interturn short.

Pull off green control line on switching unit. Test resistance with ohmmeter between terminal 7 and 3.

Nominal value: 600 ± 100 Ω

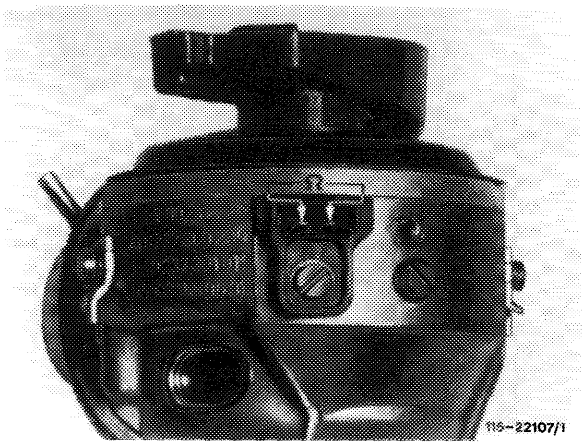
Nominal value correct.	Nominal value wrong.



Pull off plug connection of green cable on ignition distributor and test with ohmmeter at plugs whether 600 ± 100 Ω is indicated.

If nominal value is attained, replace green cable.

If nominal value is not attained, replace ignition distributor.

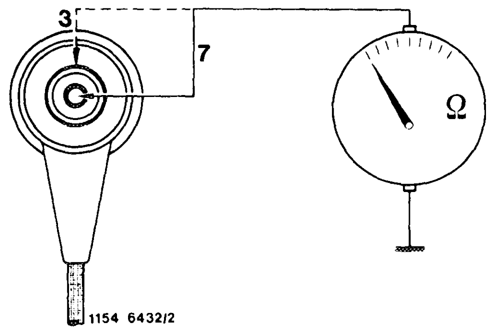


Test ignition distributor transmitter section for ground connection.

Pull off green cable on switching unit. Connect ohmmeter to terminal 3 or 7 and to ground.

Nominal value: $\geqq$ 200 kΩ

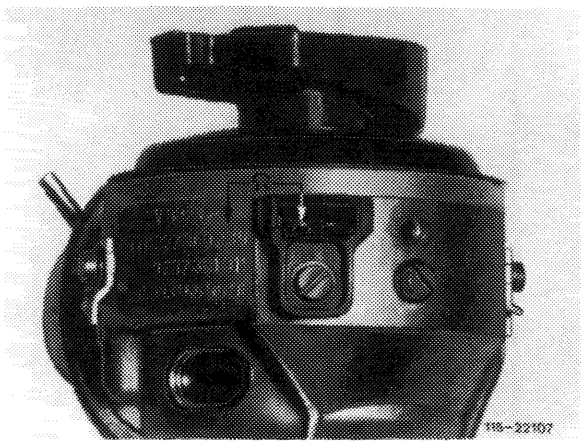
Nominal value correct.	Nominal value wrong.



Pull off plug connection of green cable on ignition distributor. Test resistance against ground.

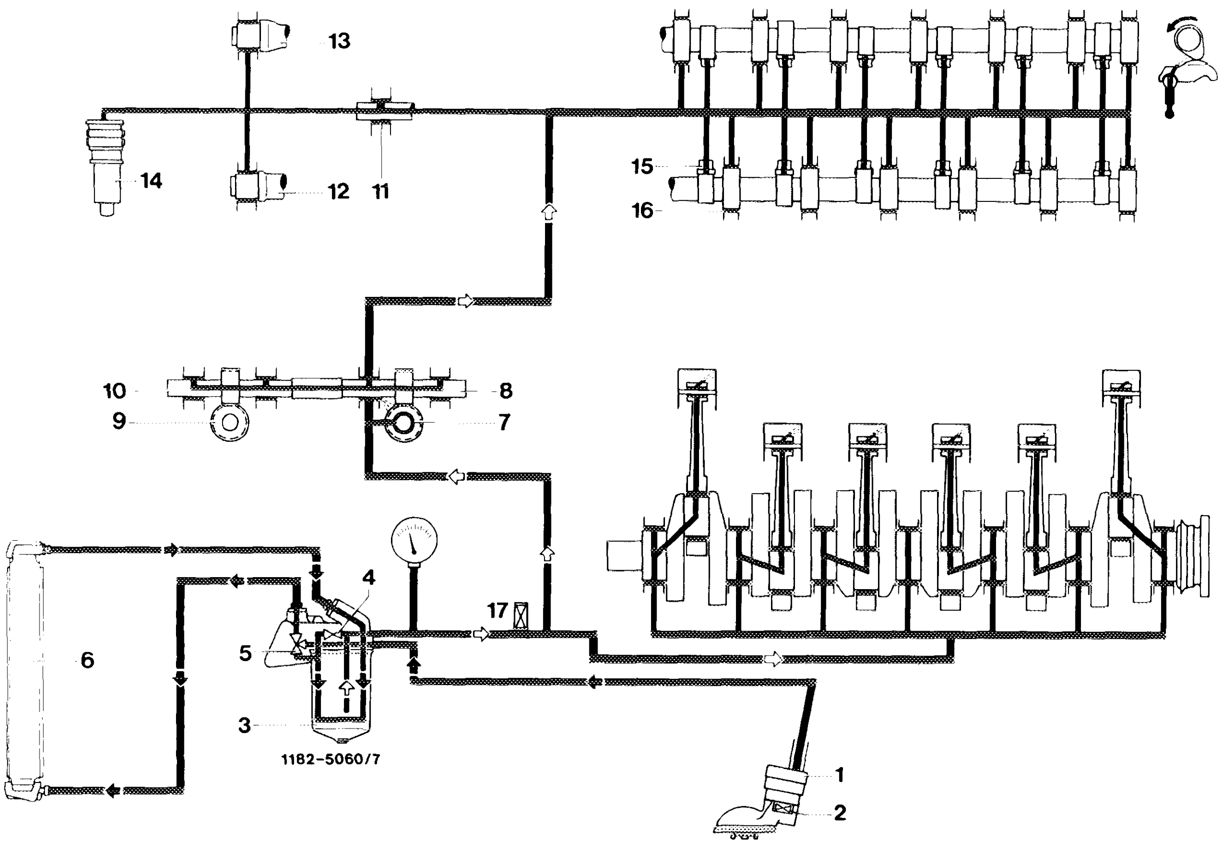
Nominal value at both plugs: $\geqq$ 200 kΩ

If nominal value is not attained at one plug, replace ignition distributor.



End of test

Oil circuit with air oil cooler



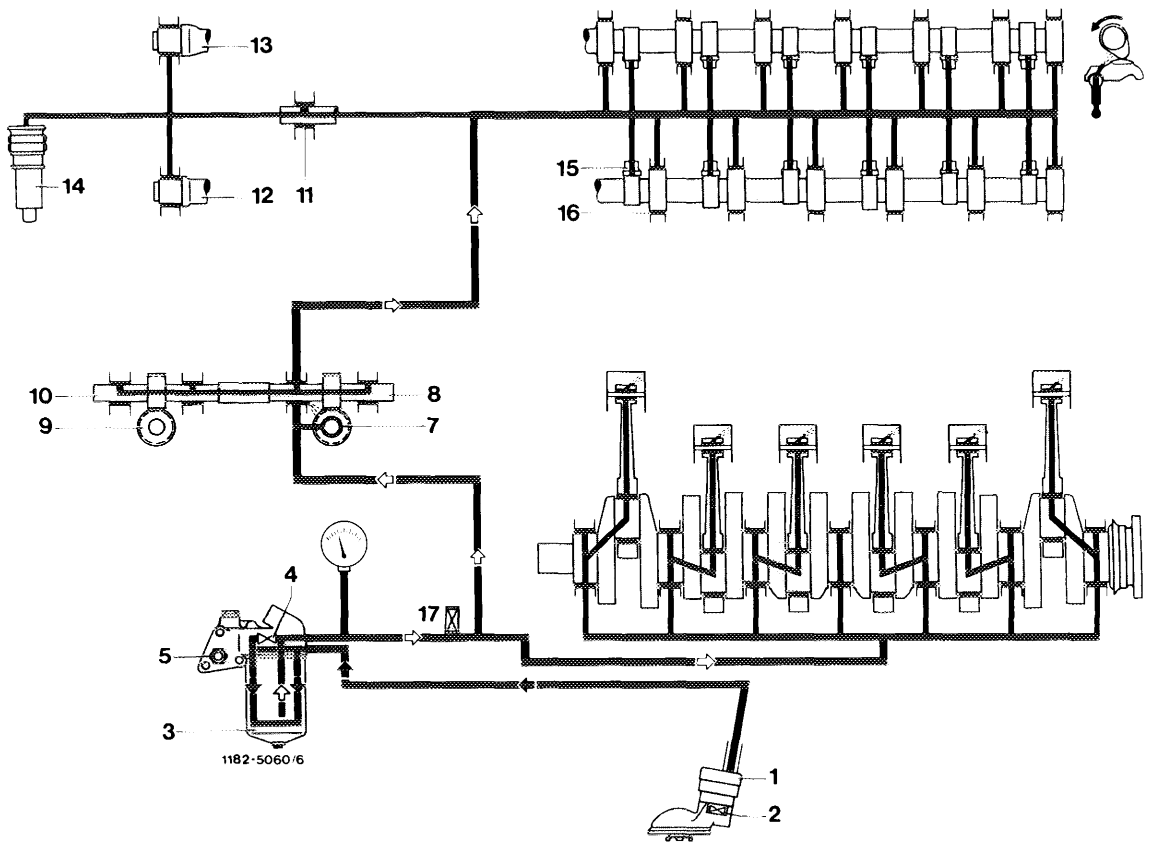
1 Oil pump
2 Pressure relief valve (7 bar) (built-in oil pump)
3 Oil filter
4 Bypass valve filter element
5 Thermostat with control valve
6 Air oil cooler
7 Oil pump drive
8 Intermediate wheel shaft
9 Distributor drive
10 Intermediate wheel shaft
11 Guide wheel
12 Intake camshaft
13 Exhaust camshaft
14 Chain tensioner
15 Rocker arms
16 Camshaft bearings
17 Pressure relief valve in front main oil bore (5 bar)

Attention!
The oil circuit is controlled by a thermostat (5) in the oil filter upper section.

Starting at an oil temperature of approx. 95 °C or 110 °C (203 °F or 230 °F) beginning with model 126, the oil flows via air oil cooler. The bypass circuit is only opened as long os the oil temperature is below approx. 95 °C or 110 °C (203 °F or 230 °F).

If for any reason the air oil cooler (6) is disconnected or the connections on oil filter top are closed blind, **removal of thermostat with control valve and compression spring is absolutely required** (18–125). If this is not done, the oil supply to the bearing points will be interrupted at oil temperatures above approx. 95 °C or 110 °C (203 °F or 230 °F).

Oil circuit without air oil cooler



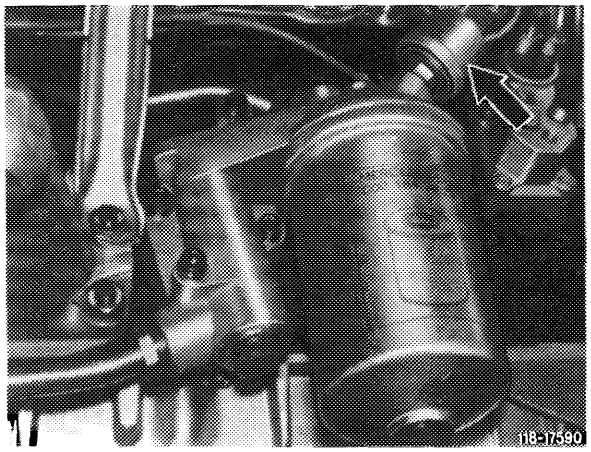
1 Oil pump
2 Pressure relief valve (7 bar) (built in oil pump)
3 Oil filter
4 Bypass valve filter element
5 17°C temperature switch
7 Oil pump drive
8 Intermediate wheel shaft
9 Distributor drive
10 Intermediate wheel shaft
11 Guide wheel
12 Intake camshaft
13 Exhaust camshaft
14 Chain tensioner
15 Rocker arms
16 Camshaft bearings
17 Pressure relief valve in front main oil bore (5 bar)

Oil pressure

At operating temperature the oil pressure at idle may drop to 0.5 bar gauge pressure.

Upon acceleration the oil pressure should immediately increase again and should attain min. 3 bar gauge pressure at 3000 rpm.

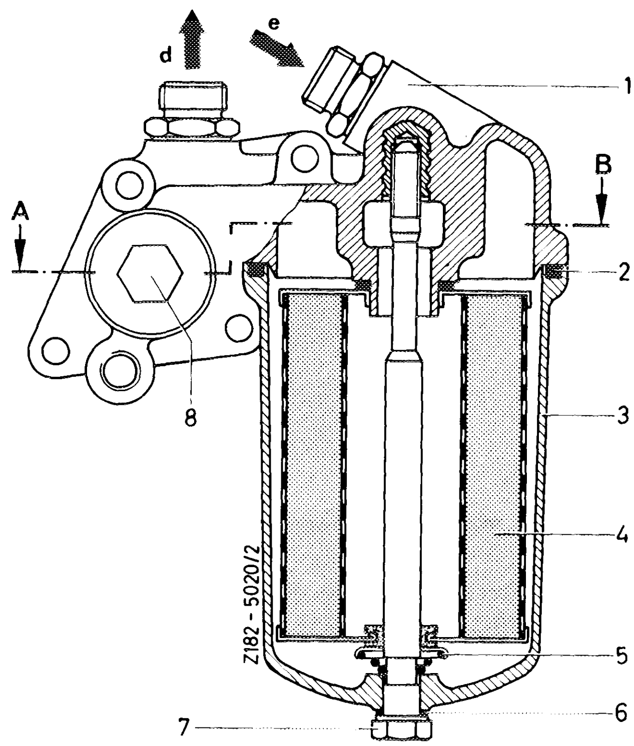
On model 126 the oil pressure is not indicated as before by means of a capillary tube connected to a pressure gauge in instrument cluster, but by means of a pressure transmitter which is electrically activated. The pressure transmitter is screwed to oil filter top (arrow).



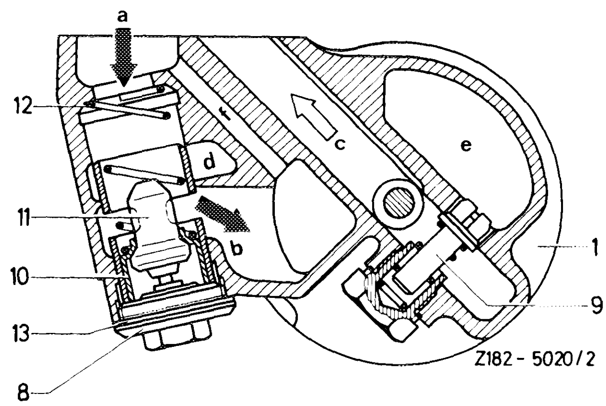
Oil filter with pressure transmitter

Opening pressures of pressure relief and bypass valve	bar relief pressure
Pressure relief valve (2) for oil pump	7
Bypass valve (4) for filter cartridge	3.5
Pressure relief valve (17) in front main oil bore	5

Oil filter models 107, 114, 116



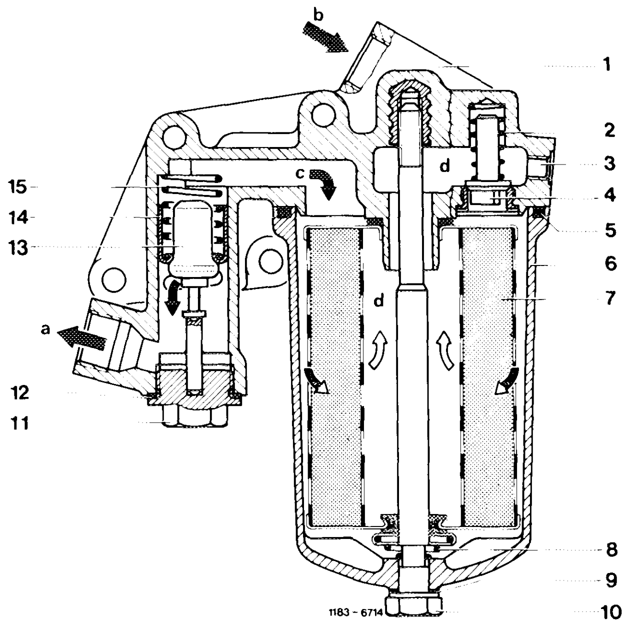
Section A–B



1 Filter upper section
2 Seal
3 Filter lower section
4 Filter cartridge
5 Spring with spring retainer
6 Seal
7 Hex. head screw
8 Plug
9 Bypass valve – filter cartridge
10 Control valve
11 Thermostat
12 Spring
13 Seal

a from oil pump
b to filter lower section
c to bearings
d to air oil cooler
e from air cooler to filter lower section
f bypass bore

Oil filter model 123 and models 107, 116 with continuous fuel injection, 2nd version carburetor engine

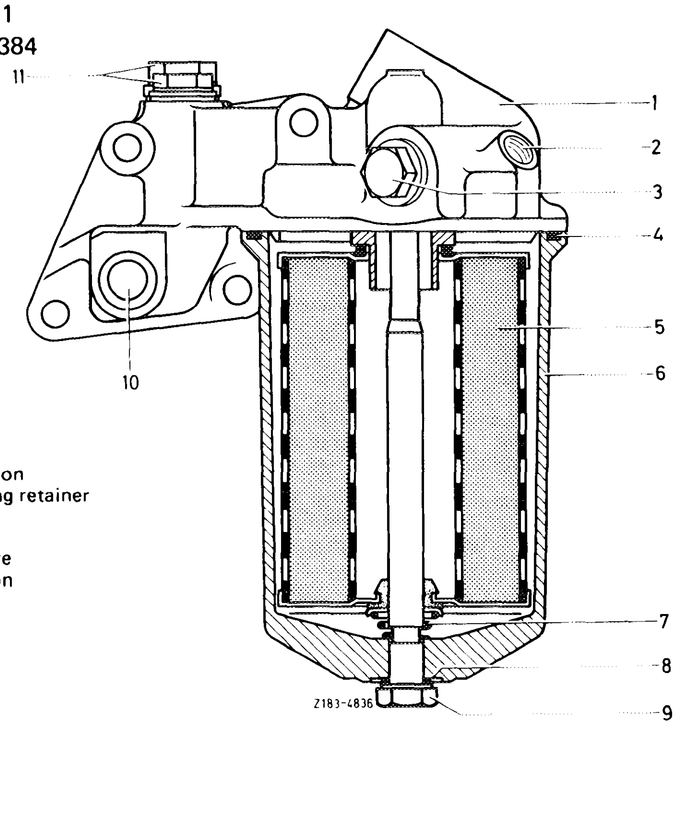


1 Filter upper section
2 Spring
3 Oil pressure gage connection
4 Bypass valve/filter cartridge
5 Seal
6 Filter lower section
7 Filter cartridge
8 Spring with spring retainer
9 Seal
10 Hex. head screw
11 Plug
12 Seal
13 Thermostat
14 Control valve
15 Spring

a to air oil cooler
b from air oil cooler
c from oil pump
d to bearings

Oil filter, model 114 USA version

Model 280 (114.060) up to chassis end No. 014 231
Model 280 C (114.073) up to chassis end No. 003 384

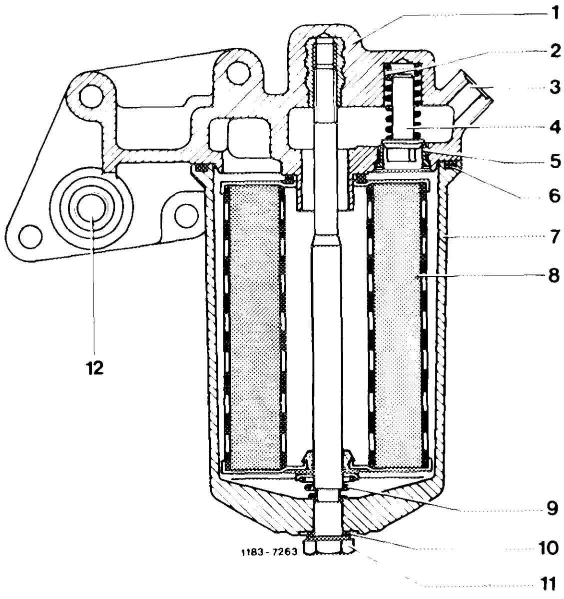


1 Filter upper section
2 Oil pressure gage connection
3 Plug for filter cartridge bypass valve
4 Seal
5 Filter cartridge
6 Filter lower section
7 Spring with spring retainer
8 Seal
9 Hex. head screw
10 17°C temperature switch connection
11 Plugs

Oil filter models 114 and 116.020
USA and Sweden version

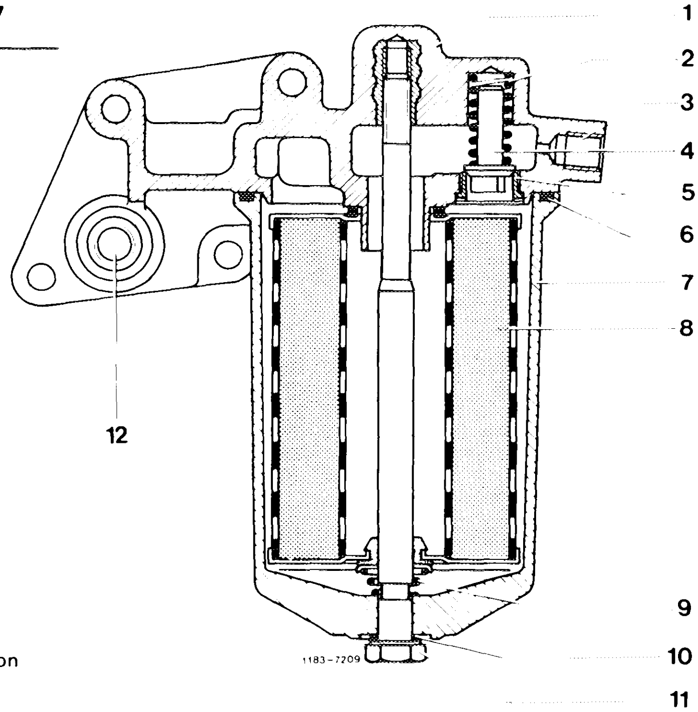
Model 280 (114.060) from chassis end No. 014 232
Model 280 C (114.073) from chassis end No. 003 385

Note: Oil filters up to and from the specified chassis end numbers are interchangeable.



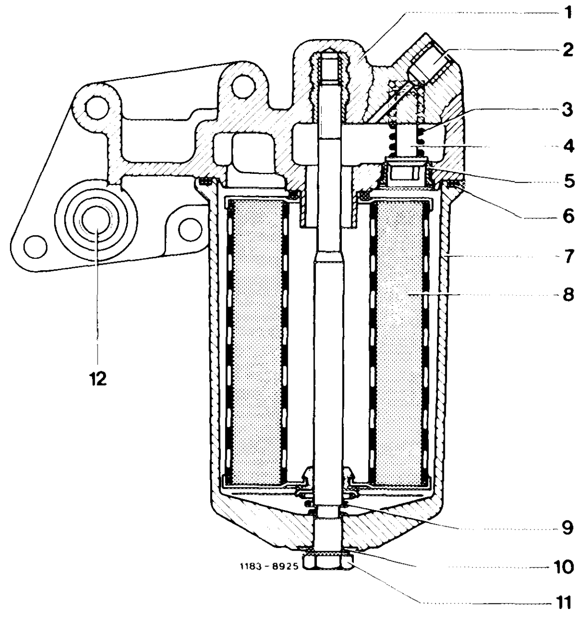
1 Filter upper section
2 Spring
3 Oil pressure gage connection
4 Filter cartridge bypass valve
5 Valve seat
6 Seal
7 Filter lower section
8 Filter cartridge
9 Spring with spring retainer
10 Seal
11 Hex. head screw
12 17°C temperature switch connection

Oil filter without air oil cooler, model year 1977



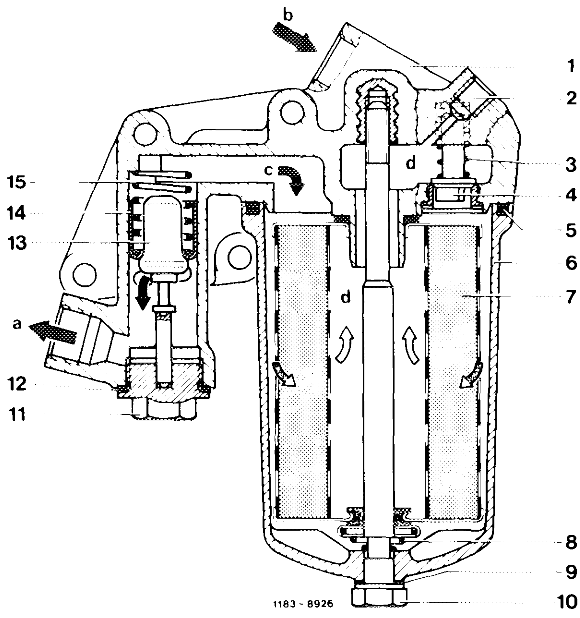
1 Filter upper section
2 Spring
3 Oil pressure gage connection
4 Filter cartridge bypass valve
5 Valve seat
6 Seal
7 Filter lower section
8 Filter cartridge
9 Spring with spring retainer
10 Seal
11 Hex. head screw
12 17°C temperature switch connection

Oil filter model 126 without air oil cooler



1 Filter top
2 Connection for oil pressure transmitter
3 Compression spring
4 Filter cartridge bypass valve
5 Valve seat
6 Sealing ring
7 Filter lower section
8 Filter cartridge
9 Compression spring with spring retainer
10 Sealing ring
11 Hex. head screw
12 17 °C temperature switch connection

Oil filter model 126 with air oil cooler



1 Filter upper section
2 Connection for oil pressure transmitter
3 Compression spring
4 Filter cartridge bypass valve
5 Sealing ring
6 Filter lower section
7 Filter cartridge
8 Compression spring with spring retainer
9 Sealing ring
10 Hex. head screw
11 Closing plug
12 Sealing ring
13 Thermostat
14 Control valve
15 Compression spring

a To air oil cooler
b From air oil cooler
c From oil pump
d To bearing points

Note

Engines 110 are provided with oil filter elements of engines 116, 117 as standard equipment. The part no. of the filter element on oil filter bowl has been changed from the former 000 184 98 25 to 00 184 99 25.

The former filter element, part no. 000 184 98 25 is valid as a running-in filter up to 1st inspection.

Starting 1980, the oil filters, part no. 001 184 64 25 are valid as running-in filters or 001 184 65 25 as constant operation filters.

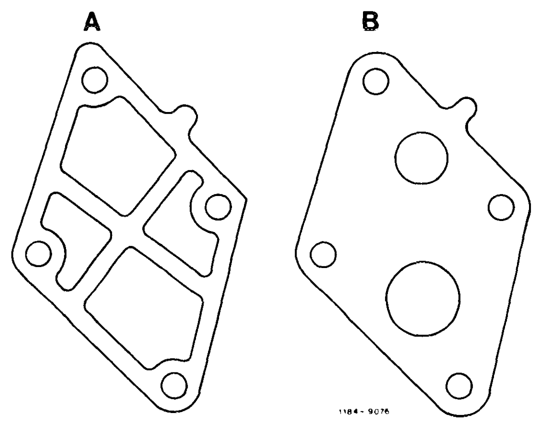
When the oil filter is removed, remainders of gasket may stick to flange surface of cylinder crankcase.

To prevent such remainders from entering the pure oil duct of the cylinder crankcase during removal (e.g. by scraping), the bores should be covered or closed first.

New oil filters are supplied with running-in filter elements which may be used on new engines up to first inspection.

These filter elements have a restricted operating life and should be exchanged against normal filter elements when new oil filters are installed on run-in engines.

To prevent that the former gasket (A), part no. 110 184 03 80, is pushed out and thereby made leaking, the present version (B), part no. 110 184 05 80, is perforated only in range of forward or return flow.



Standard application

Engine	starting engine end no. manual transmission	automatic transmission
110.922	040354	067119
110.923	013226	017239
110.932	010320	002765
110.984	019263	065273
110.985	013841	068010
110.986	003040	006862

Oil filling capacity in liters	Oil dipstick color code	pink/wine red	yellow/green
Refill capacity (dry engine)		7.5[1])	7[1])
Total filling capacity during oil and filter change		6.5	6
Oil pan max./min.		6/4.5	5.5/4

[1]) On vehicles without air oil cooler deduct 0.5 liter refill capacity from total filling capacity.

Oil level checkup

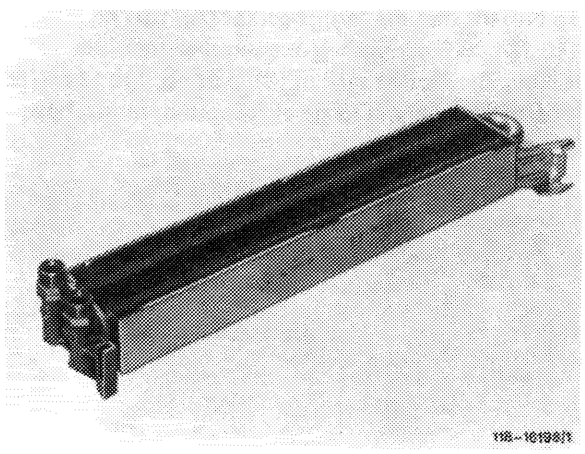
The oil level depends, among others, from oil temperature and return flow period of oil after stopping the engine. For this reason, measure oil level only approx. 2 minutes after stopping worn engine.

Prior to checking oil level, always pull out dipstick first and wipe off.

Air oil cooler

Model 126.021 with engine 110.924 is not provided with an air oil cooler.

Models 126.022/023 are provided with a double tube light alloy air oil cooler.



Double tube light alloy air oil cooler

18–020 Additional installation of oil pressure relief valve in main oil duct

Tightening torques	Nm
Pulley bolts M 8	35
Pressure relief valve	40
Plug (5)	50

Spare parts	
Pressure relief valve	114 180 02 15
Plug	110 184 00 56
Plug[1])	110 184 01 56

[1]) only for models with fuel evaporation system, which have connection at plug.

Note

In the event of repairs or when installing an oil pump drive, part no. 110 050 02 06, install a 5 bar pressure relief valve, part no. 114 118 02 15 into main oil duct front in addition to pressure relief valve in oil pump. For this purpose, use a new closing plug.

On vehicles with fuel evaporation control system without charcoal canister, install line of evaporation control system from cylinder crankcase to cylinder head.

Standard installation 5 bar pressure relief valve in main oil duct

Engine	starting engine end no.
110.921 – 10 –	008705
– 12 –	035819
110.922 – 10 –	015494
– 12 –	022259
110.923 – 10 –	starting begin of series
– 12 –	starting begin of series
110.931 – 10 –	001058
– 12 –	000126

110.932 – 10 –	002153	
– 12 –	000350	
110.981 – 10 –	009994	
– 12 –	020700	
110.982 – 10 –	000109	
– 12 –	000285	
110.983 – 10 –	011397	
– 12 –	028536	
110.984	starting begin of series	
110.985	starting begin of series	
110.986	starting begin of series	
110.991 – 10 –	000065	
– 12 –	000030	
110.992	starting begin of series	
110.993 – 10 –	000043	
– 12 –	000010	

All exchange engines starting unit no. 464130 are provided with 5 bar pressure relief valve in main oil duct.

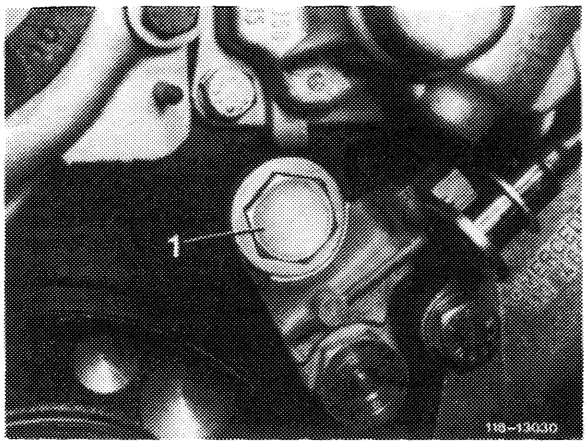
Removal

1 Remove radiator (20–420).

2 Remove fan clutch.

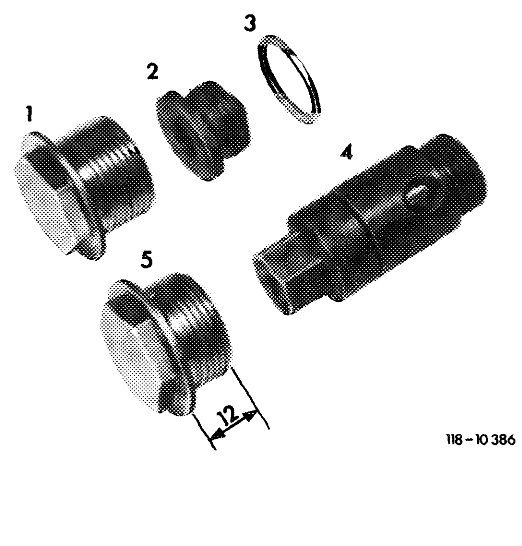
3 Remove pulley and vibration damper (03–340).

4 Remove plug (1).



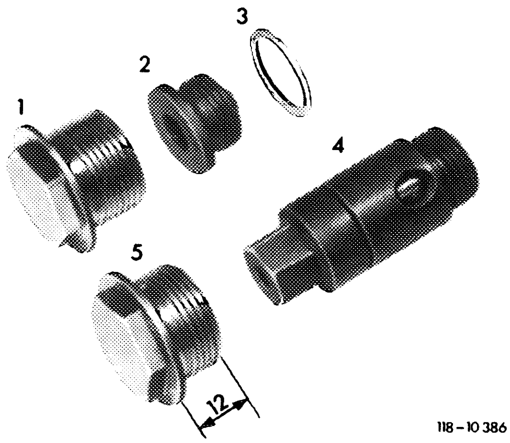
5 Unscrew plug (2) for oil bore with a lubricated 8 mm internal socket wrench and pull out carefully.

6 For protection insert a long piece of welding wire in oil bore and remove the press fit aluminium seal (3) from countersink of oil bore with a screwdriver.



Attention!
Do not use old closing plug (1), 16 mm long, together with pressure relief valve (4).

When installing a 5 bar pressure relief valve, use screw connection (5), part no. 110 184 0056 (or part no. 110 184 0156 with tank breather on vehicles for (AUS), (J), (USA)), since otherwise the pressure relief valve will not operate.

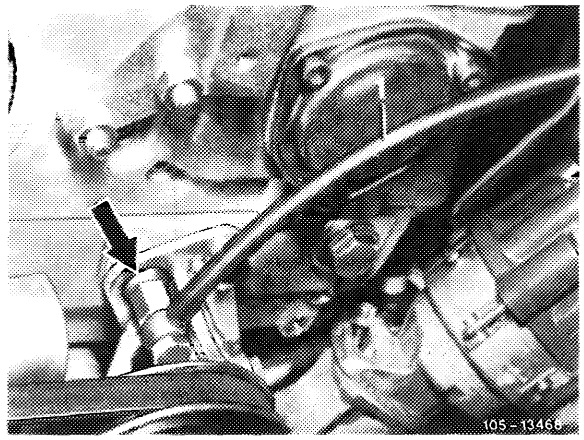


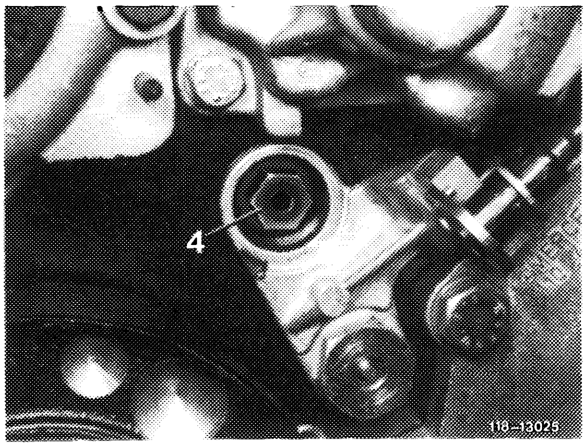
118–10 386

For subsequent installation of a 5 bar pressure relief valve into the following vehicle models, connect line of fuel evaporation control system to cylinder head (arrow):

Model years
(AUS) starting 10.1974 up to start of model year 1977.
(J) starting 1.1973 up to start of model year 1976.
(USA) starting model year 1972 to 1974.

For this purpose, use conversion set, part no. 114 010 26 99. Also refer to repair instructions engine 110, combustion III, programmed repairs, group 47.


105–13468



118–13025

Installation

7 Install pressure relief valve (4) and torque to 40 Nm.

8 Coat threads of new plug (5) with a sealing compound, install and torque to 50 Nm.

9 Install vibration damper and pulley.

10 Install fan clutch.

11 Install and tighten belt.

12 Install radiator housing and radiator.

13 Add coolant.

14 Run engine, check oil pressure and for leaks.

Note

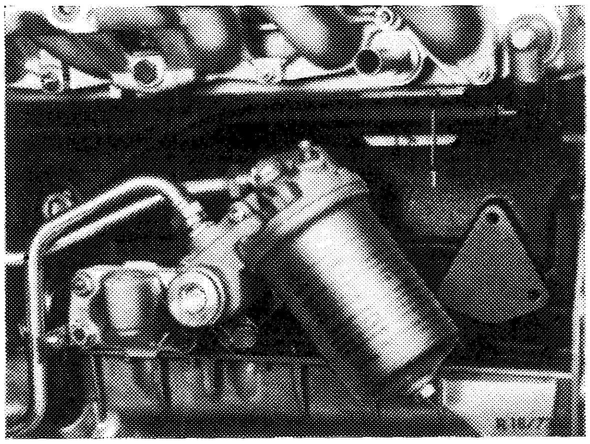
The intake manifold of fuel injection engines has to be detached for replacement of the return line (1).

Removal

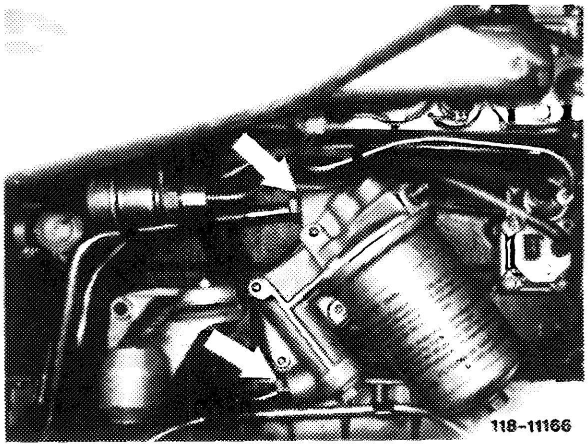
1 Detach oil return adaptor at cylinder head.

2 Detach both oil lines to air oil cooler at filter upper section and loosen clamps (arrows).

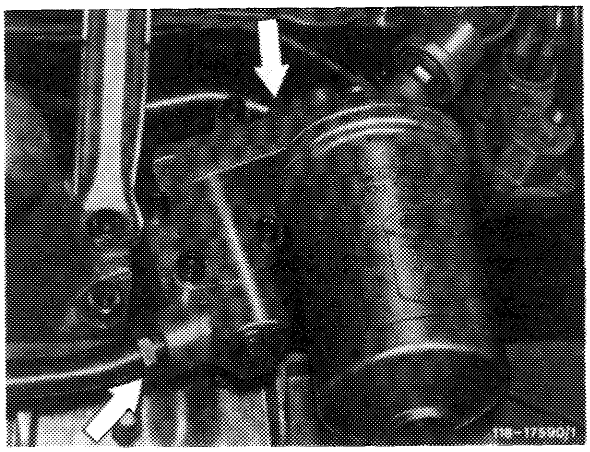
3 Pull oil return line off of adaptor at oil pan and oil return adaptor.



Models 114 and 116



Models 116 with CIS and 123



Model 126

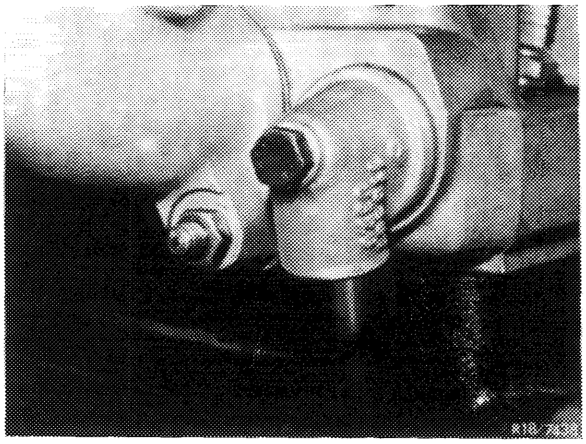
Installation

4 Install new oil return line on oil return adaptor.

5 Soften lower end of oil return line by placing in boiling water and then install on oil pan adaptor up to stop without delay.

6 Install oil return adaptor with new gasket and both oil lines.

7 Run engine and check for leaks.



Thermostat opening temperatures

Application	Begin of opening °C	Fully opened °C/mm
Up to December 1979	95 ± 4	approx. 110/8 + 2
Starting January 1980	110 ± 4	approx. 125/8 + 2

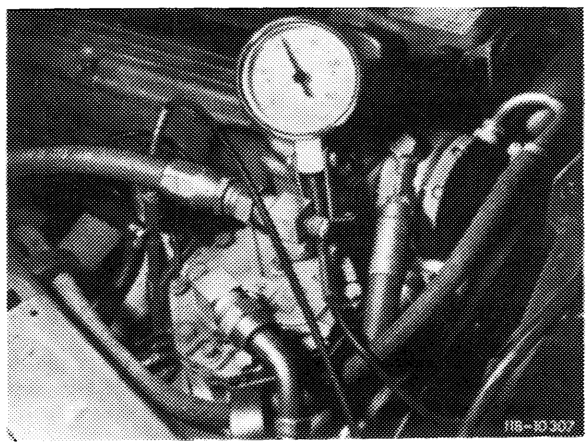
Special tool

Temperature sensor for measuring engine oil temperature		116 589 27 21 00

Note

Engines without air oil cooler have no thermostat in oil filter.

Checking



1 Exchange oil dipstick against flexible temperature sensor.

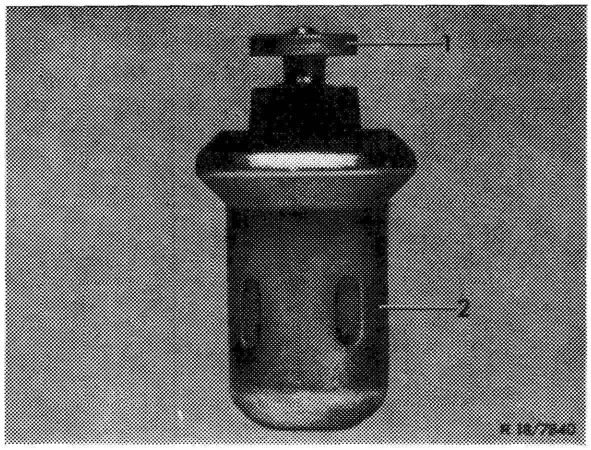
2 Run engine at high speed and watch temperature gage.

3 At 95 °C ± 110 °C engine oil temperature the start of the opening period of thermostat should be clearly noticeable manually by the increasing oil temperature on oil cooler.

Tightening torques	Nm
Closing plug oil thermostɛ	120–140
Oil drain plug on air oil cooler, models 107, 114, 116	30–35

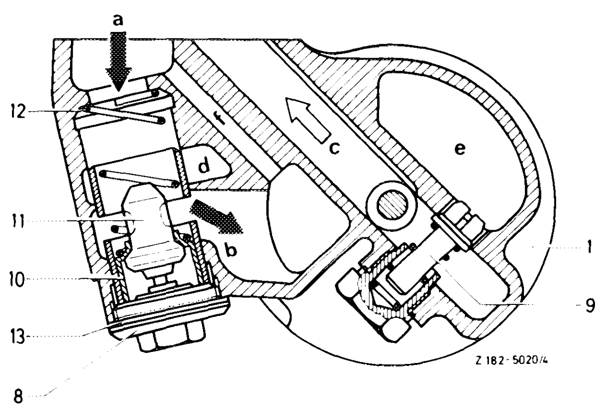
Attention!
A well functioning thermostat may only be removed at temperatures **below 60°C,** since otherwise the pressure pin will be pressed out.

Pressure pin (1) must never be pulled out of wax thermostat (2), since otherwise the function cannot be guaranteed.



Models 107, 114, 116

Section A – B

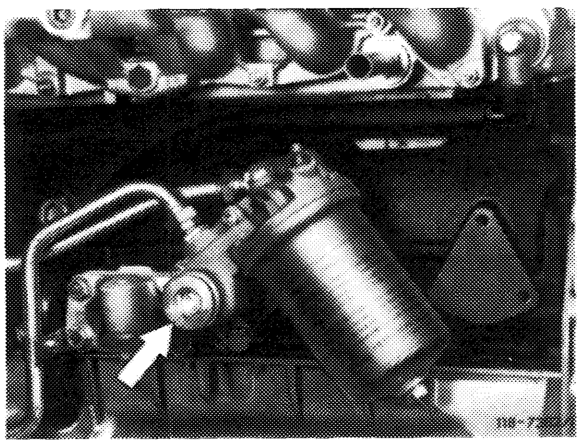


8 Plug
10 Control valve
11 Thermostat
12 Spring
13 Seal

Removal

1 Unscrew plug (arrow) and catch escaping engine oil.

2 Remove thermostat (11) with control valve (10) and spring (12).



Installation

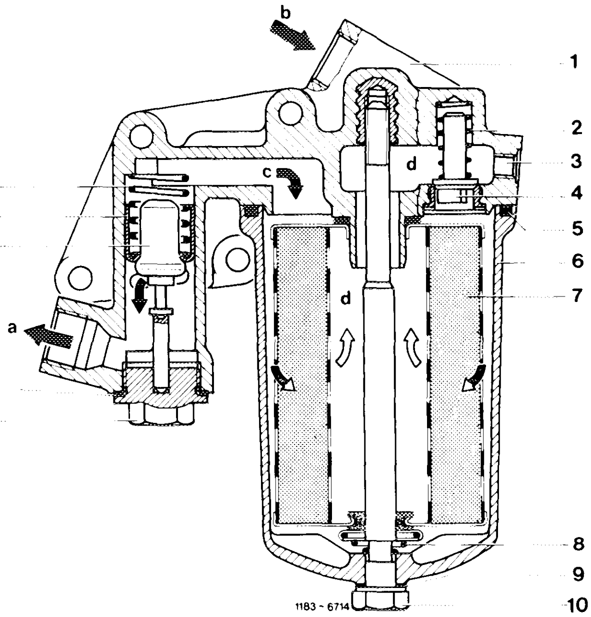
3 Guide thermostat (11) with control valve (10) and spring (12) into filter upper section and position spring in housing by turning the control valve.

4 Torque plug to 120—140 Nm.

5 Check function of thermostat (18—120) and check plug for leaks.

6 Correct oil level.

Model 123 and models 107, 116 with continuous fuel injection
Model 116.020 2nd version and Model 126

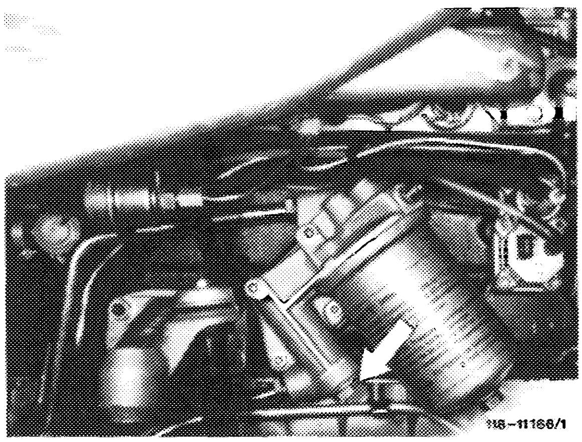


11 Plug
12 Seal
13 Thermostat
14 Control valve
15 Spring

Removal

1 Unscrew plug (arrow) and catch escaping engine oil.

2 Remove thermostat (13) with control valve (14) and spring (15).



Installation

3 Guide thermostat (13) with control valve (14) and spring (15) into filter upper section.

4 Torque plug (11) to 120—140 Nm.

5 Check function of thermostat (18—120) and plug for leaks.

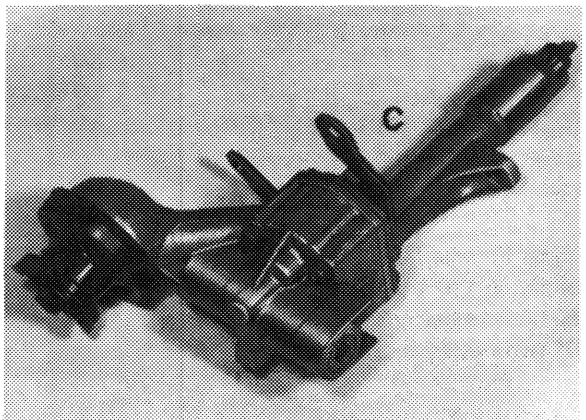
6 Correct oil level.

Tightening torques	Nm
Pressure relief valve for oil pump	40
Plug for built-in pressure relief valve	30
Oil pump to crankcase and bearing caps	30
Oil pan lower section to upper section	11
Crankshaft bearing bolt	80

Note

In the event of repairs or when installing an oil pump drive, part no. 110 050 02 06, install oil pump, part no. 110 180 27 01 (version C).

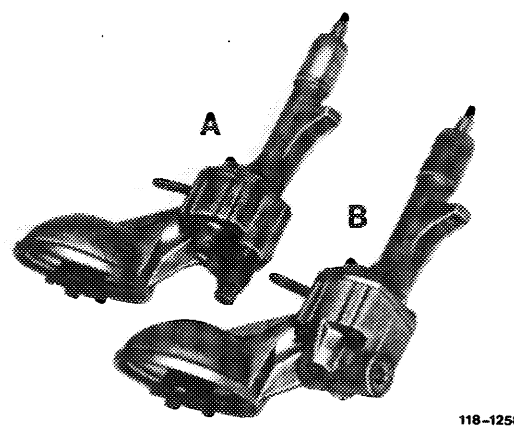
This oil pump has a strainer of 60 mm dia. and **two screwed-on holders.** Install pump only in combination with a 5-bar pressure relief valve in main oil duct (18–020).



Version C

118–13022

Oil pumps (version A and B) used up to now are provided with a strainer of 110 mm dia. and **one screwed-on holder.**

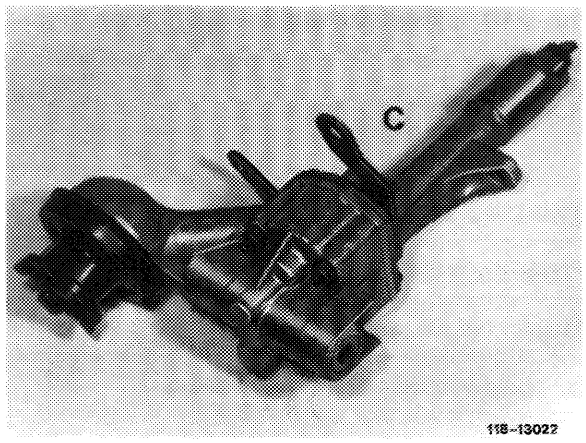


Version A and B

118–12585

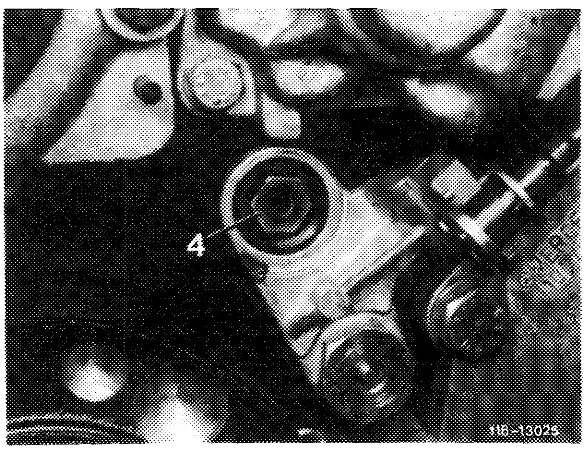
Standard installation oil pump version C

Engine	Starting engine no.
110.921 – 10 –	010368
– 12 –	045651
110.922 – 10 –	024583
– 12 –	041571
110.923 – 10 –	003252
– 12 –	004341
110.931 – 10 –	001115
– 12 –	000152
110.932 – 10 –	004456
– 12 –	000841
110.981 – 10 –	010906
– 12 –	023759
110.982 – 10 –	001323
– 12 –	002835
110.983 – 10 –	017358
– 12 –	050438
110.984 – 10 –	002646
– 12 –	006072
110.985	starting begin of series
110.986	starting begin of series



All exchange engines starting unit no. 464130 are provided with oil pump version C with 60 mm dia. strainer.

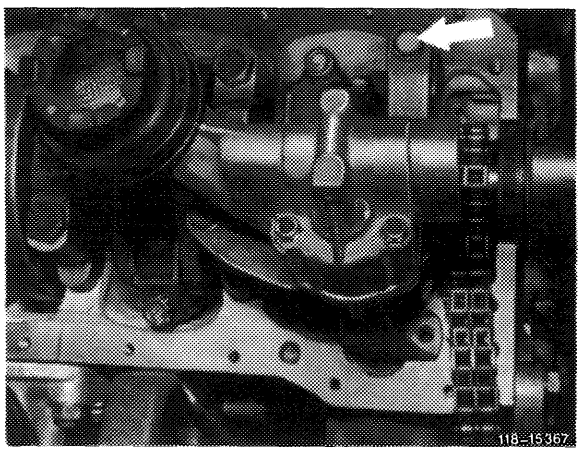
Install oil pump version C only in combination with a 5-bar pressure relief valve in main oil duct (4) (18–020).



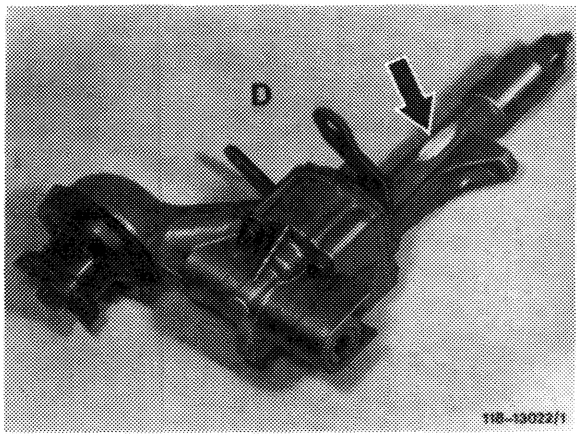
Note: Standard installation for carburetor engines is oil pump 110 180 27 01 **with** a drive cam for fuel pump, and for injection engines oil pump 110 180 26 01 **without** drive cam.

As a spare part, only oil pump 110 180 27 01 with drive cam will be supplied.

For subsequent installation of oil pump 110 180 27 01 mount a crankshaft bearing bolt 108 011 00 71 with internal threads for additional holder (arrow) on 1st crankshaft bearing cap and tighten to 80 Nm.



To save space, the oil pump has been modified by means of an additional weight on crankshaft. The pump has a recess (arrow) on housing shaft, to provide enough distance between crankshaft and oil pump.

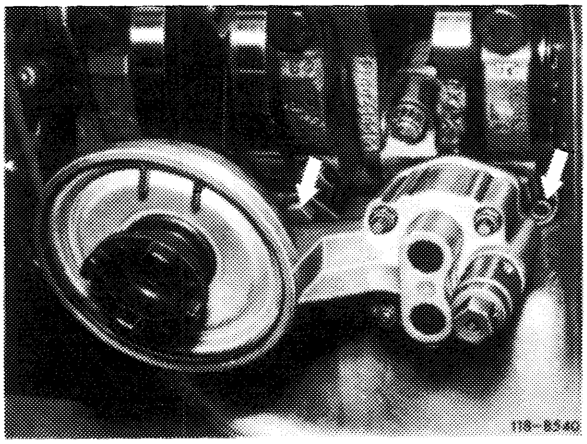


When changing the oil pump, check whether a crankshaft with additional weight is installed. If yes, install only modified oil pump, part no. 110 180 33 01 for injection engines or 110 180 32 01 for carburetor engines with recess in housing shaft.

Standard application

Model	starting chassis end no.
107.022	006288
107.042	005285
116.020	112253
116.024/025	131270
123.030	025657
123.033	050600
123.050	002801
123.053	013292
123.093	001229

Removal



1 Remove fuel pump of carburetor engine.

2 Take off oil pan lower section.

3 Unscrew mounting bolt on crankcase and bearing cap.

4 Pull out oil pump.

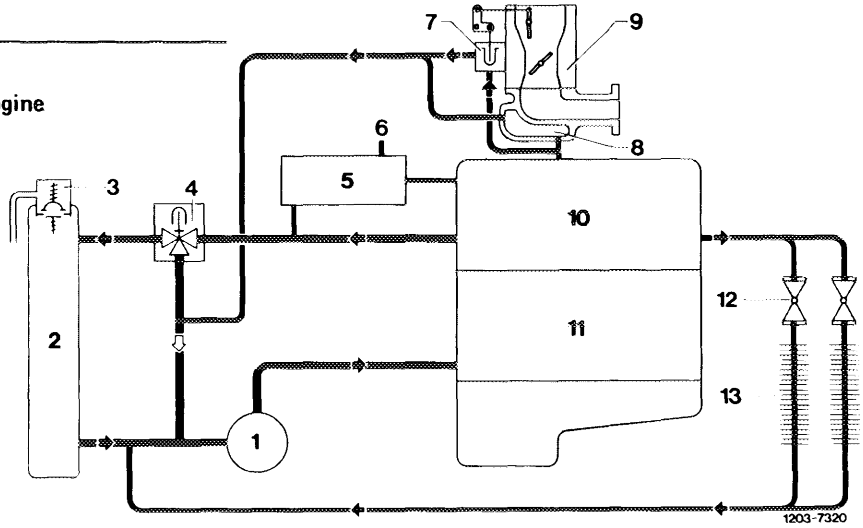
Installation

5 For installation proceed vice versa.

6 Correct oil level and check engine for leaks.

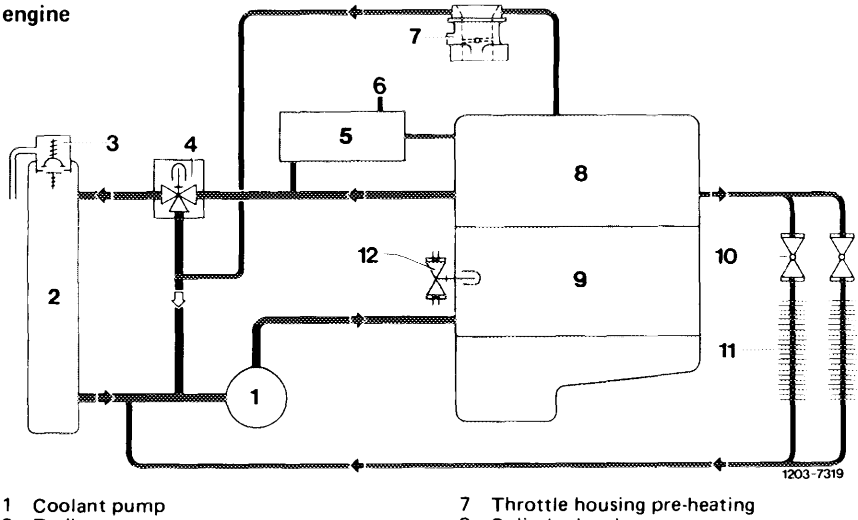
Coolant circuit

Coolant circuit for carburetor engine



1 Coolant pump
2 Radiator
3 Radiator cap, code number 100
4 Thermostat 87 °C
5 Measuring sensor box
6 Temperature sensor for temperature gage
7 Automatic choke heating
8 Intake manifold heating
9 Carburetor
10 Cylinder head
11 Crankcase
12 Control cocks for car heating
13 Heat exchanger

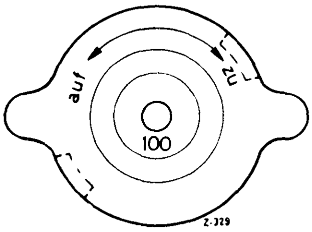
Coolant circuit for fuel injection engine



1 Coolant pump
2 Radiator
3 Radiator cap, code number 100
4 Thermostat 87 °C
5 Measuring sensor box
6 Temperature sensor for temperature gage
7 Throttle housing pre-heating
8 Cylinder head
9 Crankcase
10 Control cocks for car heating
11 Heat exchanger
12 Warm-up throttle bypass valve

Note: The line for pre-heating the throttle housing (7) is omitted on engines with continuous fuel injection (CIS).

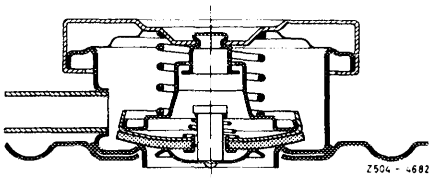
Engine cooling



The spring-loaded radiator cap establishes a gauge pressure of approx. 1 bar in cooling system.

The factory fills the cooling system with an all year coolant, which consists of about 55% water and 45% anti-freeze by volume.

This provides protection against freezing at temperatures down to –30°C and the additives in the anti-freeze will prevent corrosion in the cooling system. Since the additives are subject to an aging process, the coolant must be replaced every two years.



To provide adequate protection against corrosion, the concentration of anti-freeze must offer protection against freezing of at least –20°C (30% by volume).

If an anti-freeze is not available and only water is filled, it is essential to add 1% of anti-corrosion oil (10 cc/liter water).

For the model 114 1 % or 10 cc/liter of anti-corrosion oil must be added even when using an anti-freeze to lubricate the heater cocks thoroughly.

The anti-freeze of the mixture filled at the factory will increase the boiling point, which is about 118°C for water at gauge a pressure of 1 bar, to approximately 125 °C.

The red mark on the temperature gauge begins at 122 (since the middle of may 1975, previously 115 °C).

This point deserves special attention, if only water with an anti-corrosion oil is used. Coolant could be thrown out, before the coolant temperature gauge needle reaches the red mark.

For full throttle, mountainous and caravan driving, high speed highway driving followed by traffic jams or when driving in areas with high outside temperatures, the coolant temperature gauge needle could move to the red mark when the anti-freeze protection is at least –30°C without throwing out coolant or having any engine trouble.

If the engine of a stationary car has to run for a long time, i.e. in traffic jams, it would be advantageous to move the selector lever of models with an automatic transmission to "N". This will reduce the development of heat in the transmission and thus any additional heating of the coolant via the transmission oil cooler.

An appropriately mixed coolant must be added when there is any loss of coolant through a leak in the cooling system or throwing out due to overheating.

The amount missing due to evaporation can be replaced with drinking water.

Mixing ratio of anti-freeze[1]) and water[2])[3])

	Anti-freeze/water in liters for models				
Protection down to	107	114	116	123	126
–20 °C	4.25/7.75	3.75/7.25	3.75/7.25	3.5/6.5	3.75/6.75
–30 °C	5.5/6.5	5.0/6.0	5.0/6.0	4.5/5.5	4.75/5.75
–40 °C	6.25/5.75	5.75/5.25	5.75/5.25	5.25/4.75	5.50/5.0
Total amount in liters	12	11	11	10	10.5

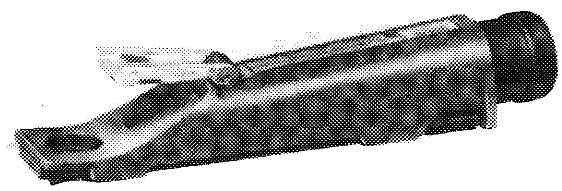
[1]) see service product specifications on page 325.
[2]) see service product specifications on page 310.
[3]) add 1 % or 10 cc of anti-corrosion oil/liter to water for model 114, even when using an anti-freeze (see service product specifications on page 311).

Tightening torques	Nm
Radiator drain plug, models 107, 114, 116	6–10
Radiator drain plug, model 123	1.5–2[1])

[1]) This torque can be established by means of a washer or coin.

Conventional tool

Antifreeze tester
Prestone-VU-Check (Union-Carbide)
e.g. made by Philipp Gather, D-4020 Mettmann 2

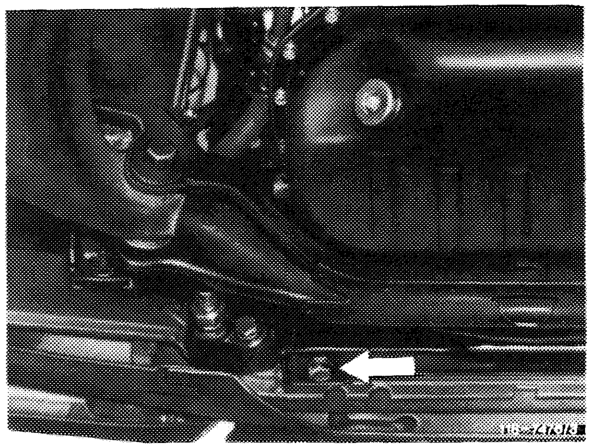


R-4789

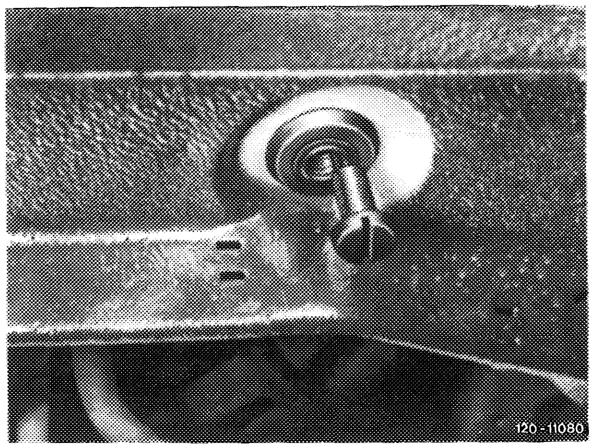
Draining

1 Open radiator cap or expansion tank in steps **(only below 90 °C)** (194 °F).

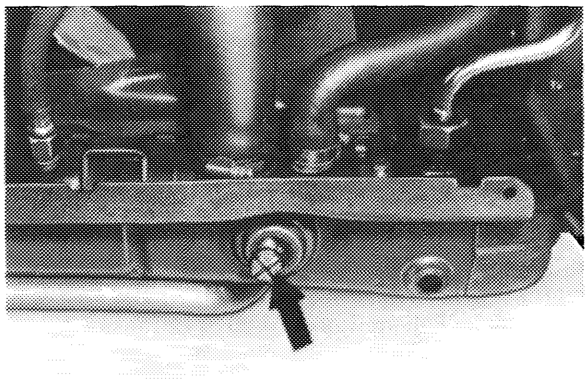
2 Unscrew radiator drain plug.



Models 107, 114, 116



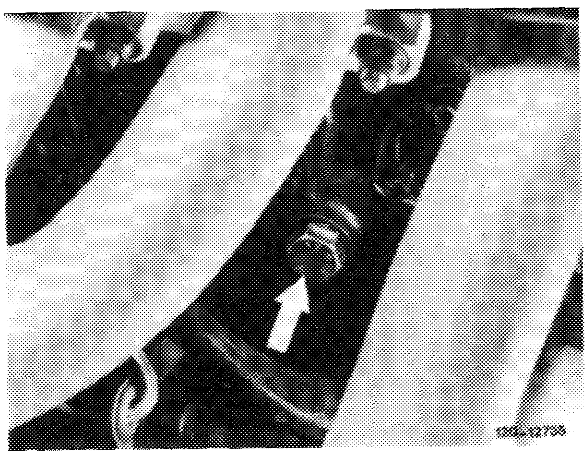
Model 123



Model 126

120-17587

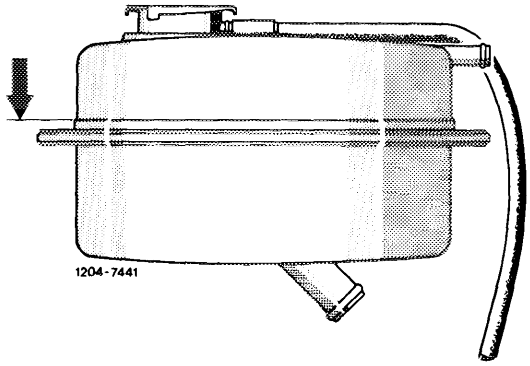
3 Remove drain plug on right side of engine block behind engine carrier.



Filling

4 Set both heater levers or temperature dials on model 126 to "warm" position.

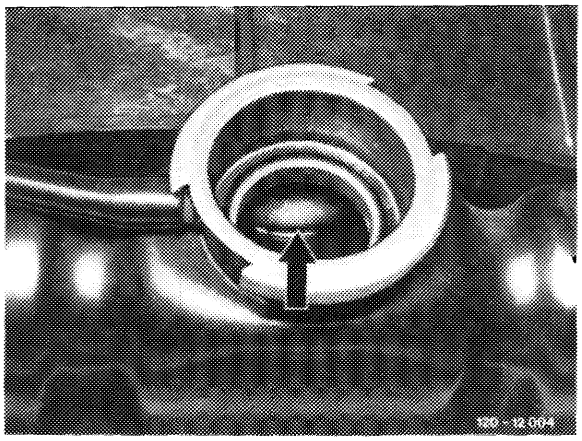
5 Add coolant **slowly** until level is at mark.



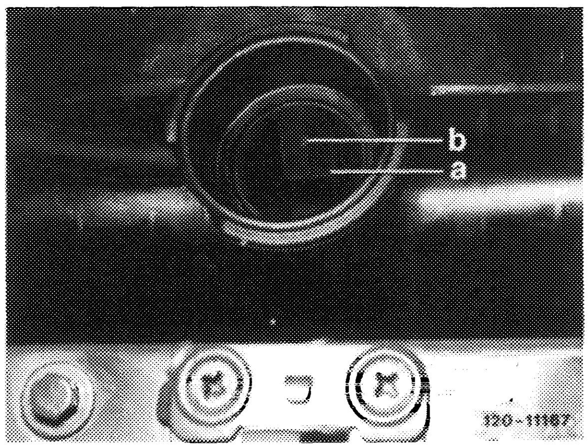
Model 107

6 Run engine warm by intermittent acceleration and keep radiator cap closed as from 70 °C (158 °F) until thermostat opens.

7 Check coolant level and correct to specified level.



Models 114, 116



Model 123, 126
a cold
b warm

A. Removing oil

1 Drain all of coolant.

2 Remove thermostat and set heater lever or temperature dials to warm.

3 Fill cooling system with a 5 % solution of water and neutral cleaner or with an alcaline cleaner such as P 3-Croni (supplier: Henkel or Grisiron 7220 (supplier: Farbwerke Hoechst).

Attention!
On these vehicles **(light alloy cylinder head and light alloy radiator)** do not use heavily alcaline cleaner such as P 3-Standard (supplier: Henkel).

4 Run engine warm at medium speed until at about 80 °C (176 °F) and hold at this temperature for about 5 minutes.

5 Switch off engine and let cooling system cool down to about 50 °C (122 °F).

6 Drain entire solution.

7 Flush cooling system twice immediately afterwards with clear water, run engine warm (about 5 minutes) and drain.

B. Deliming and removing rust

Attention!
The cooling system must be removed of oil before deliming, even if there is no visible indication of oil.

1 After flushing the cooling system for the 2nd time during oil removing operations fill cooling system with a 10 % (100 g/l) solution of water and citric, tartaric or oxalic acid (supplied by chemical companies), whereby the citric acid should be preferred.

2 Run engine warm at medium speed until at about 80°C (176°F) and hold at this temperature for about 10 minutes.

3 Switch off engine and let coolant cool down to about 50°C (122°F).

4 Drain all of deliming solution.

5 Flush cooling system with clear water at least three times, running the engine for 5 minutes after each flushing action.

It might be necessary to repeat this treatment for a seriously limed cooling system. This would mean using a fresh batch of deliming solution and repeating the flushing operations.

6 Install thermostat with a new seal.

7 Add specified coolant to cooling system (service product specifications on pages 310–325).

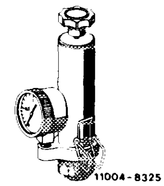
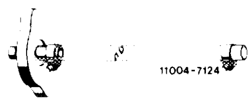
Note: Commercial products, which consist of the above mentioned acids, can also be used for deliming and removing rust.

Chromic acids or products containing chromic acids must not be used to prevent contamination of sewage systems.

Tightening torques		Nm
Radiator drain plug	Models 107, 114, 116	6–10
	Models 123, 126	1.5–2[1])
Air oil cooler drain plug		30–35
Vibration damper mounting bolts		35
Coolant pump to coolant pump housing		9
Visco-fan clutch to coolant pump		25
Magnetic fan clutch to coolant pump		20–25

[1]) This torque can be established by means of a washer or coin.

Special tools

Tester for cooling system		001 589 48 21 00
Radiator cap with hose for leak test		605 589 00 25 00
Socket wrench with 7 mm hex. head on flexible shaft for hose clamps with worm drive		123 589 12 09 00

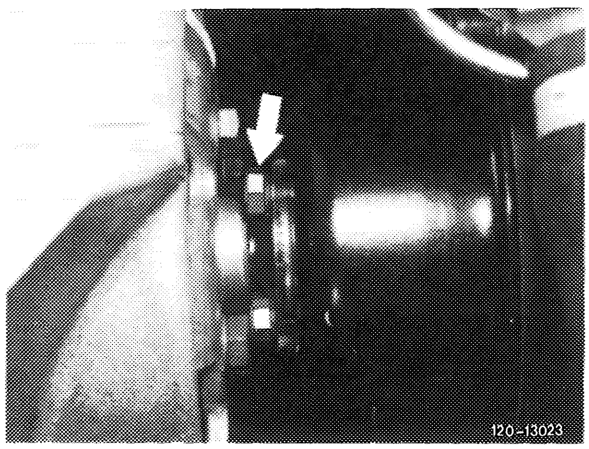
Removal

1 Drain coolant (20–010).

2 Remove radiator (20–420).

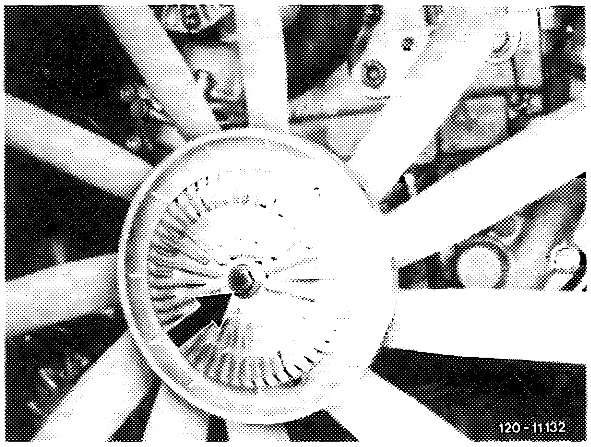
Models 107, 114, 116

3 Remove fan with visco-fan clutch.



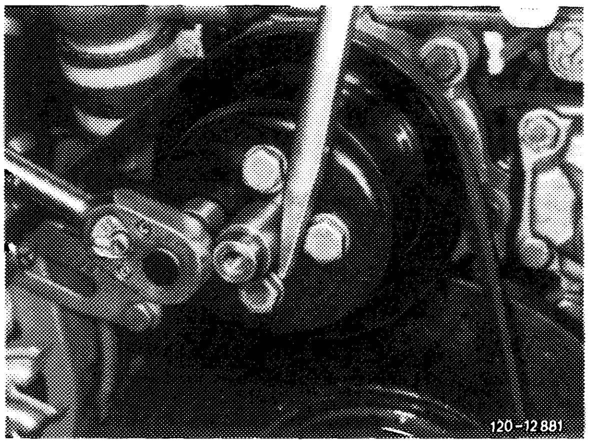
Models 123, 126

3 Detach magnetic fan clutch.



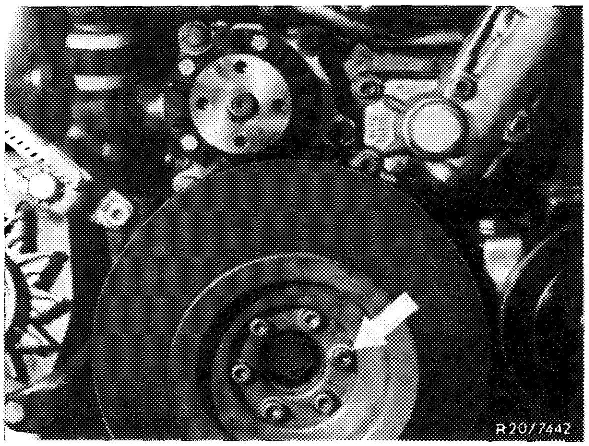
Magnetic fan clutch

4 Unscrew pulley.



5 Unscrew vibration damper.

6 Remove coolant pump.



Installation

7 Install in reverse sequence of removal.

Function

The visco-fan clutch is a service free, hydraulic clutch which operates independent of temperature and free of steps.

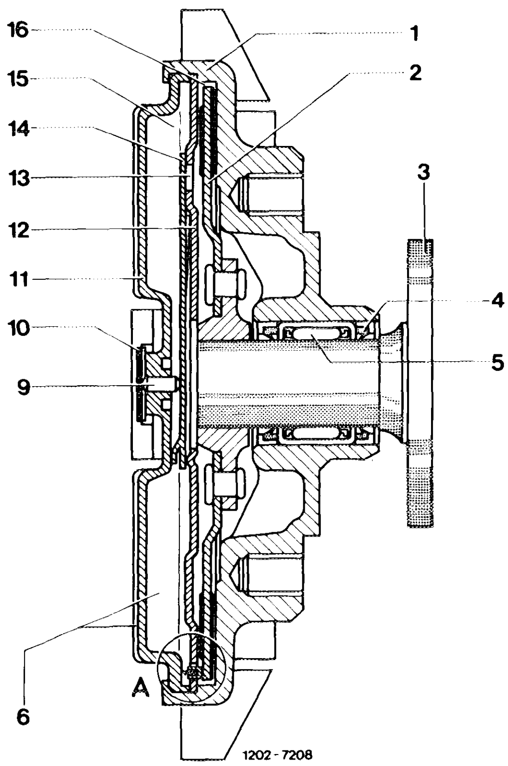
When starting engine (cold start), fan will initially start at higher speed until oil has flown back from working chamber (16) into reservoir (15) (approx. 1–3 minutes). Visco-fan clutch will then switch off. Fan speed in disconnected condition depends on engine speed, but a fan speed of approximately 2100/min should not be exceeded.

This condition remains intact as long as engine keeps its normal operating temperature.

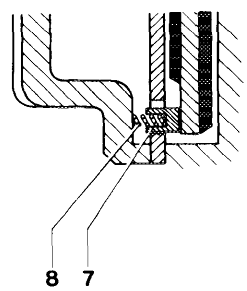
If the cooling water temperature increases as the result of a higher load or high outside temperature, the air flowing through the radiator and influencing the bimetallic strip will become warmer. The bimetallic strip (10) will change its shape at increasing heat and will open a valve at approximately 73°C by means of a thrust pin (9), so that the oil can flow from the reservoir (15) to the working chamber (16) to engage fan.

During the sequence, the water temperature is between 90 and 95°C.

With the clutch engaged, the fan speed in the lower range increases approximately proportionally with the increasing speed, but will not exceed the upper speed range of 3500/min.



Detail A



1 Clutch body (secondary part)
2 Drive plate (primary part)
3 Flanged shaft
4 Seal
5 Needle bearing
6 Cooling fins
7 Oil scraper
8 Spring
9 Thrust pin
10 Bimetallic strip
11 Cover with holder
12 Intermediate washer
13 Feed bore
14 Valve lever
15 Reservoir
16 Working chamber

Checking cut-in temperature

Run engine at 4000–4500/min. When cooling water temperature is at 90–95°C, fan speed should increase by approximately 1000/min which can be checked clearly acoustically.

Repairing

A defective clutch cannot be repaired with normal workshop equipment; it must be replaced by a new clutch.

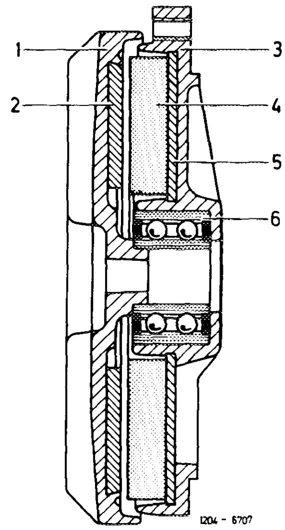
Transport and storage

Temperature controlled visco-fan clutches must be transported and stored in upright position. Clutch may be placed on flange end for short moments (for example during assembly), but never on front end.

Function

The main parts of a torque controlled magnetic fan clutch are the so-called hysteresis disc (2) made of a permanently magnetized material on the primary or drive side and a disc shaped permanent magnet (4) on the secondary side. Both clutch discs are divided into 8 magnetic segments with 4 each north and south poles, which are opposite each other alternately in a unloaded condition.

When under load both clutch discs will turn agains each other somewhat, so that the magnetic field characteristics receive a component even in circumferential direction and thus transmit a torque of up to 1.8 Nm.

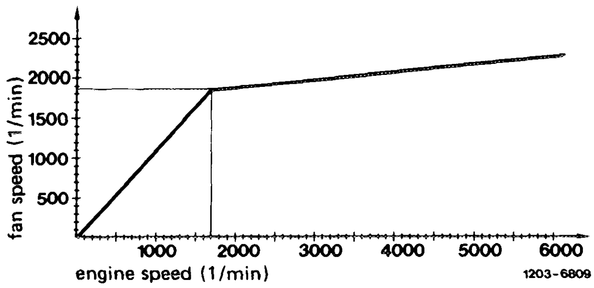


1 Primary disc
2 Hysteresis disc
3 Secondary disc
4 Permanent magnet
5 Steel disc
6 Bevelled ball bearing

At an engine speed of about 1700/min the fan moment will be higher than the torque transmitted by the magnetic clutch. The clutch "tears off" and begins to slip.

The now existing difference in speed leads to a permanent demagnetization of the hysteresis disc by way of the secondary side permanent magnets. In this manner there is an additional eddy current, because of which the transmitted torque and thus the fan speed will increase slightly as the engine speed increases (as shown in the diagram).

The switching in and off of the fan cannot be heard.



Checking magnetic fan clutch

To check, turn fan by hand with the engine stopped. There must be a springy, definitely noticeable resistance.

Fan clutches, which can be turned without resistance or produce a noise when turned, are defective and must be replaced.

Handling magnetic fan clutches

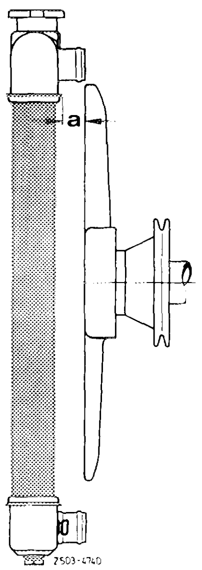
Attention!
The magnetic fan clutch must be removed before performing any work on engine or front end, during which grinding or filing burrs could fall on the fan.

Protect fan clutches against falling or serious knocks.

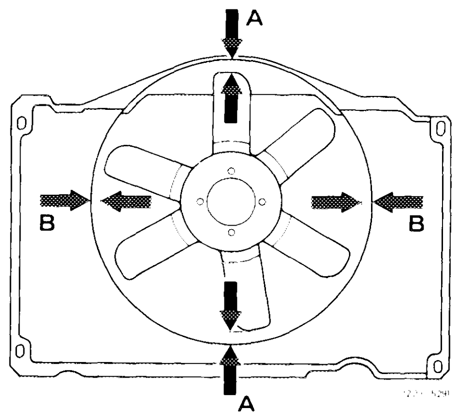
The magnetic clutch is free of maintenance, cannot be repaired with normal workshop equipment and must never be disassembled. Replace a defective magnetic clutch.

Installation dimensions for radiator, fan and fan cover

Model	Fan distance "a" to radiator, approx. mm	Fan distance to fan cover A	B
107.022/042	23		
114.060/062	15		
116.020/024/025	31	25	15
123.007/030/033/050/053/093	35		
126.021/022/023	50	28	



Radiator/fan

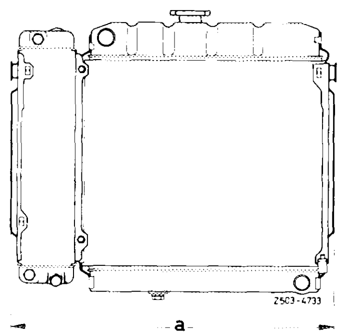


Fan cover/fan

Installation dimensions for radiator—air oil cooler

Model	dimension "a"
107	730 ± 1
114	555 ± 1[1]) 633 ± 1[2])
116	685 ± 1
123	608 ± 4
126	

[1]) At 565 mm front end width.
[2]) At 643 mm front end width.

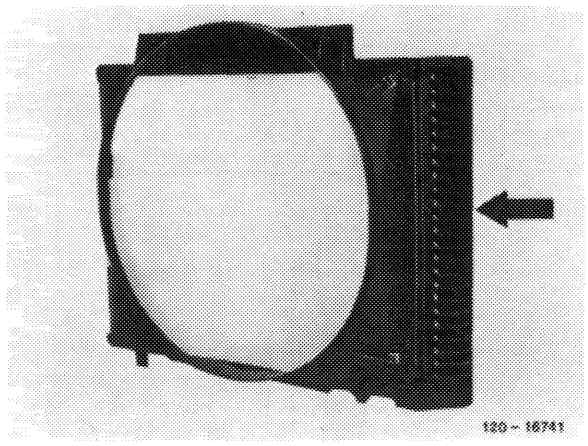


Tightening torques		Nm
Radiator plug	Models 107, 114, 116	6–10
	Models 123, 126	1.5–2[1])
Air oil cooler drain plug	Models 107, 114, 116	30–35

[1]) This torque can be established by means of a washer or coin.

Note

Starting November 1979 the fan cover of model 123 is provided with a lateral covering (arrow) as a protection against engine compartment contamination.



Removal

1 Drain coolant from radiator (20–010).

Models 107, 114, 116

2 Drain oil from air oil cooler by loosening coupling nut of upper oil hose.

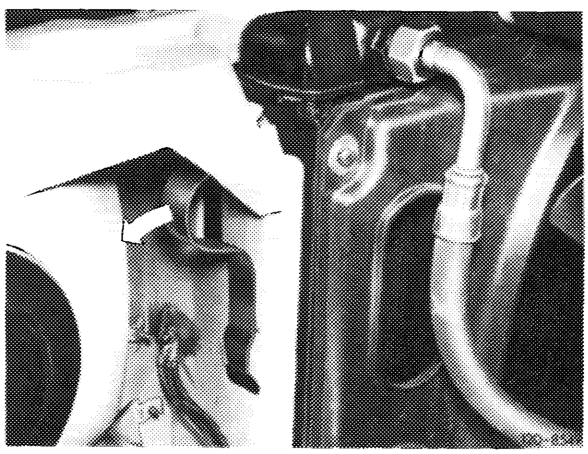
3 Detach coolant hoses and hose connections at cooler. Plug oil hoses and connections with plastic caps.

4 Unscrew top of radiator housing, pull down out of clips and place above fan.

Models 107, 116

5 Press holder (arrow) outward.

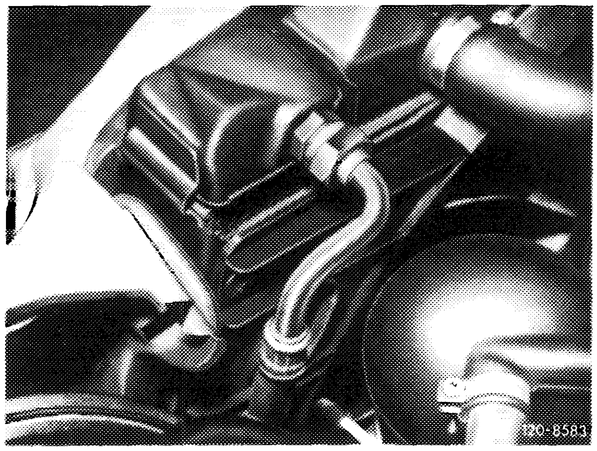
6 Lift out radiator with air oil cooler.



Model 114

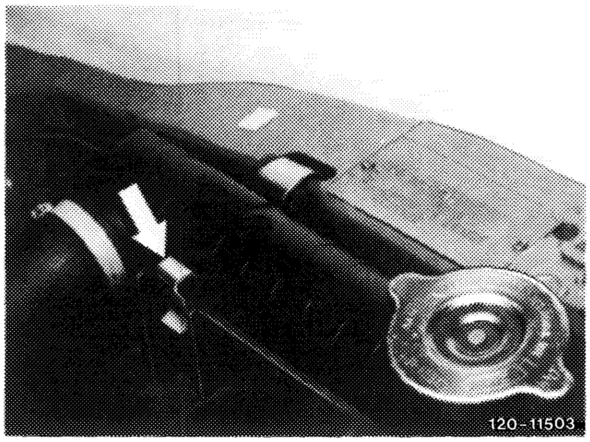
7 Press rubber straps (arrow) out of holder.

8 Remove radiator with air oil cooler in upward direction.

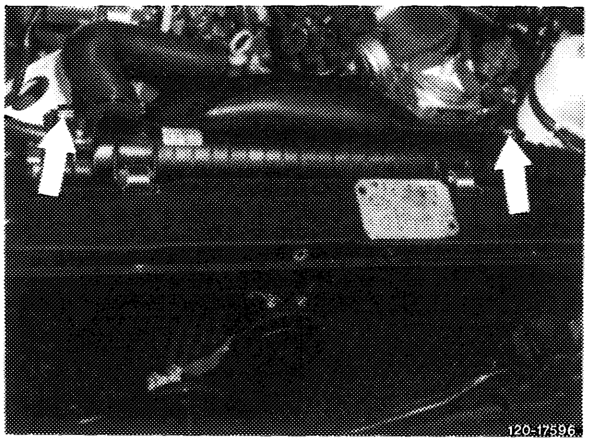


Models 123, 126

9 Pull two clips (arrow) up and out of radiator housing.

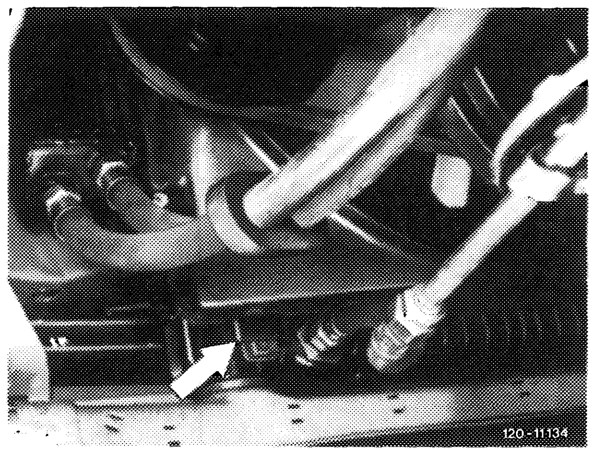


Model 123

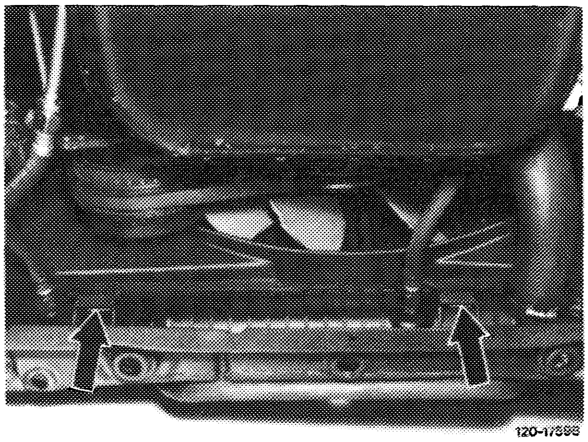


Model 126

10 Lift radiator housing out of lower straps (arrow) and place behind fan.

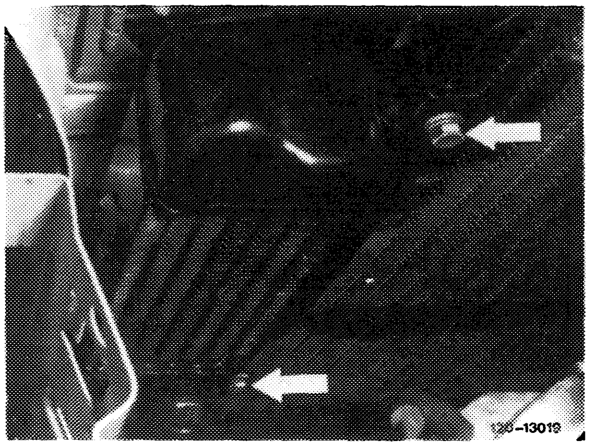


Model 123



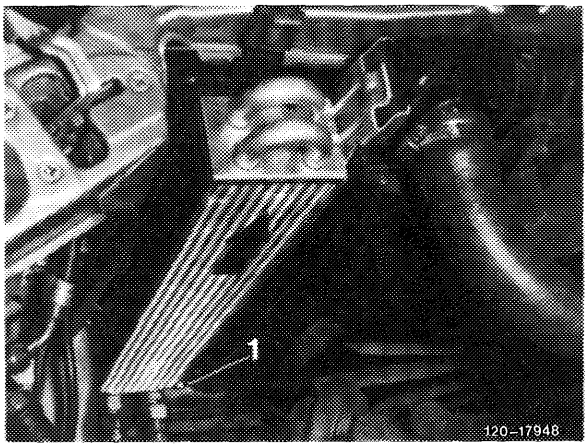
Model 126

11 Unscrew air oil cooler (arrows).



Model 123

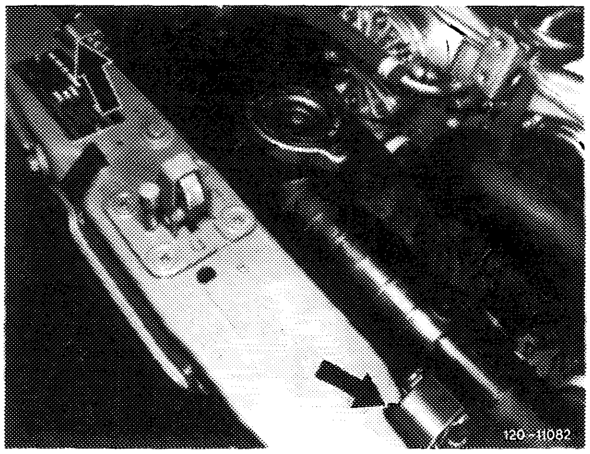
Unscrew screw (1) and pull air oil cooler out of guide on radiator in upward direction (arrow) and put aside (model 126 only).



Model 126

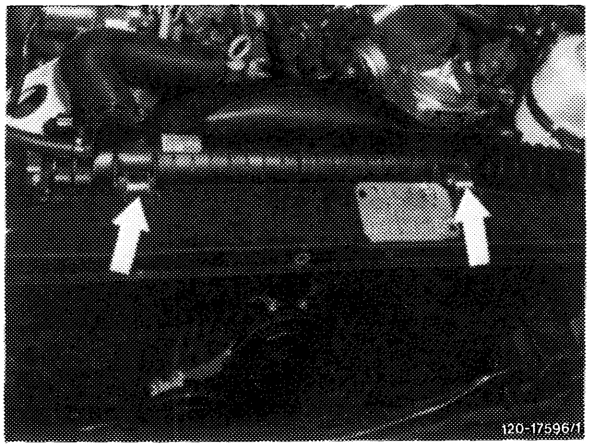
12 Disconnect coolant hoses and transmission oil cooler hoses for models with an automatic transmission.

13 Pull off holder (arrows) upward and lift out radiator.



Model 123

Model 126



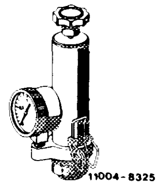
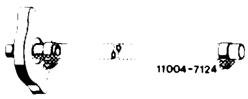
Installation

14 For installation proceed vice versa.

Pay attention to distance of fan in relation to radiator and fan cover.

15 Test cooling system with pressure tester.

Special tools

Tester for cooling system		001 589 48 21 00
Radiator closing cap with hose for leak test		605 589 00 25 00
Socket wrench hexagon 7 mm on flexible shaft for hose clips		123 589 12 09 00

Note

Since light alloy radiators with plastic coolant tanks cannot be repaired by soldering, a sealing compound has been developed and approved.

Heavy-metal (non ferrous) radiators can also be sealed with this compound.

The sealing compound is a product on silicone caoutchouc base which is permanently elastic in its final condition. Temperature resistance from —50 °C to +200 °C.

Due to the different accessibility on radiator (e.g. more difficult in core than on coolant tank), the sealing compound is available diluted and non-diluted.

The different sealing compound versions and the priming fluid are combined in a repair set, part Nr. 123 989 00 20.

Designation	Purpose
Priming fluid	Preparation of adhesive base (wash primer).
Sealing compound non-diluted	For sealing easily accessible areas.
Sealing compound diluted	For sealing poorly accessible areas (e.g. laterally on cooling tubes).

Sealing compound and priming fluid have a shelf life of approx. 1 year, if they are always closed airtight upon use.

Cloudy priming fluid should no longer be used.

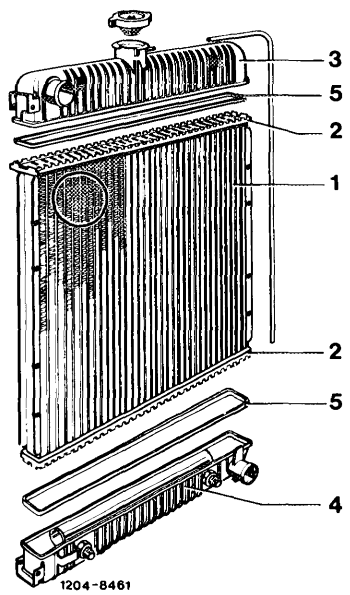
Individually, the following parts or areas in coolant circuit can be sealed with sealing compound:

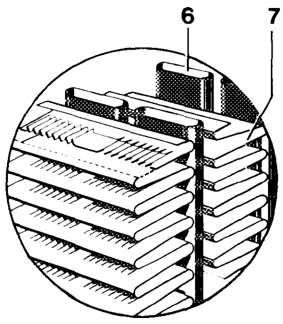
a) Plastic coolant tanks (3 and 4).

b) Heavy-metal coolant tanks (holes up to 1.5 mm dia.).

c) Light alloy and heavy-metal cooling tubes (6).

d) Tube plate (2).





1 Radiator core
2 Tube plate
3 Coolant tank top
4 Coolant tank bottom
5 Gasket
6 Cooling tubes
7 Ribs

e) Beaded flange (connection between radiator core and coolant tank).

f) Heat exchanger of heating system.

Damaged parts on coolant tanks which are exposed to higher loads, such as torn or broken fastening plates, cracks in fillet of connections, breaks and very long or large cracks on top should not be repaired, since the sealing compound can absorb very light loads only.

Plastic coolant tanks of radiators made by Behr can be exchanged by means of special tools or fixtures in Behr radiator repair shops or Inter-Radia service stations.
If required, contact nearest Behr repair shop or Inter-Radia service station to find out whether such repairs can be made there.

If this is not possible, the radiator must be replaced.

On heavy-metal radiators with plastic coolant tanks, soldering jobs on core may be performed only up to a distance of 20 mm from coolant tank, since otherwise the high soldering temperature will damage the gasket (5) and the coolant tanks (3 or 4). Leaks which are closer to coolant tank, should be sealed with sealing compound.

If the leaky spot can be clearly localized in installed condition, the radiator need not be removed. In such a case it will be enough to drain the coolant and to pressure-test the cooling system upon sealing.

When handling priming fluid and sealing compound observe the following:

The priming fluid is easily inflammable (observe safety rules, dangerous materials class A 1).

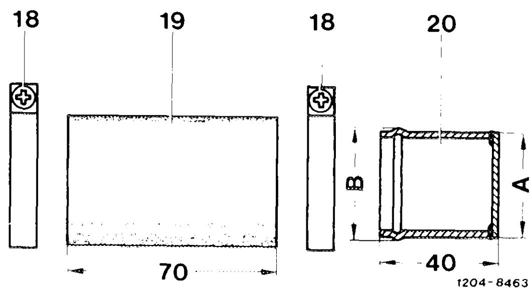
Acetic acid will be released up to complete cross linking (setting) of sealing compound. For this reason, avoid skin contact. Clean affected spots immediately with water and soap, rinse eyes with water and see doctor, if required.

Sealing

1 If the leaking spot cannot be accurately localized in installed condition, remove radiator (20–420).

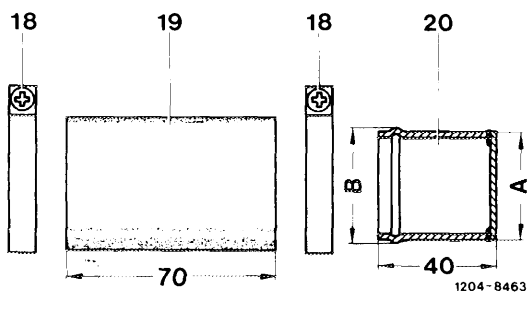
2 Clean radiator.

3 Connect hose connections to self-made closing caps.



18 Clamp L 36–46 (part no. 916 026 036 000)
19 Hose section (part no. 123 501 13 82)
20 Cap made of 36 mm dia. tubing

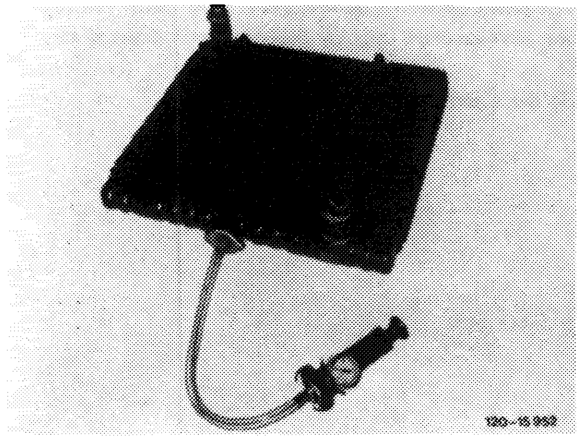
On model 107, additionally close pipe connection for coolant flow from expansion tank on radiator.



18 Clamp L 20–27 (part no. 916 026 020 001)
19 Hose section (part no. 900 271 018 063)
20 Cap made of a piece of tubing
A = 18 mm dia., B = 19 mm dia.

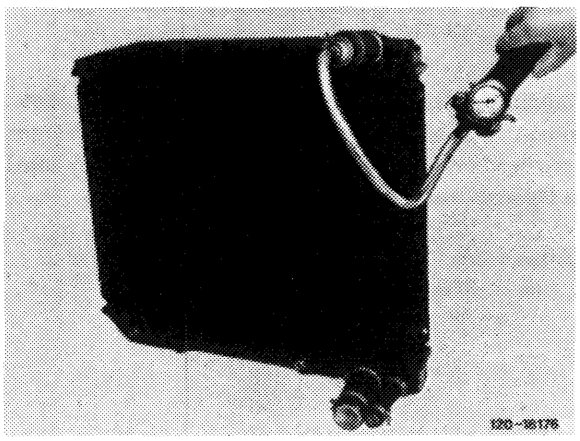
4 Close oil cooler connections with plastic caps or plugs from old oil cooler lines. For this purpose, saw off the oil cooler lines directly behind nipple and close by soldering.

5 Connect tester to radiator.



Radiator with filler neck

Note: On model 107.026 pull hose from radiator cap for leak test and attach to radiator overflow connection.



Radiator without filler neck

6 Place radiator into a water bath.

7 Put radiator under pressure with tester and watch where air bubbles are rising.

8 Mark leak.

9 Remove radiator and release pressure.

10 Blow radiator dry with compressed air.

11 Clean spot to be sealed with a commercially available cleaner (e.g. Tri or benzine). Always clean slightly larger area than the spot to be sealed (e.g. for cracks approx. 20–30 mm beyond end of crack).

The paint need not be removed. Then blow radiator dry at respective spot by means of compressed air.

No dust and grease residue should remain.

12 Apply priming fluid uniformly and very thinly by means of a brush.

Similar to cleaning, apply priming fluid beyond spot about to be sealed. To prevent the priming fluid from getting dirty in tank, pour the required quantity into a separate vessel.

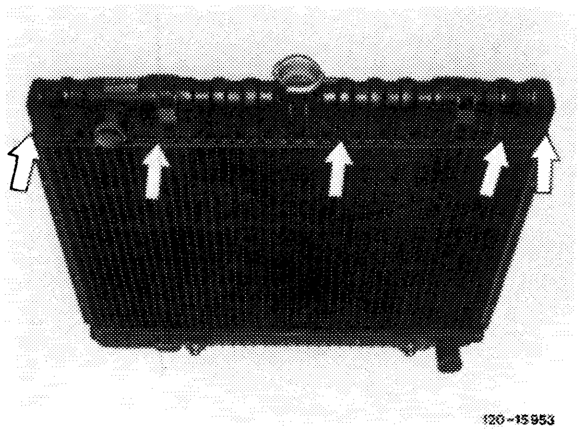
Attention!
Observe safety rules!

13 Let priming fluid dry at ambient temperature for approx. 10 minutes.

14 Set up radiator in such a manner that the sealing compound cannot run away from spot to be sealed.

15 Depending on accessibility, apply diluted or non-diluted sealing compound. Use a brush, a spatula or the like for distributing the sealing compound.

Attention!
During application and distribution make sure that no air pockets will occur.


120–15953

Similar to cleaning and priming, apply sealing compound beyond spot about to be sealed.
If there are several leaking spots on beaded flange (arrows), it will be of advantage to seal beaded flange all around.

Seal leaks in core from both sides.

At end of sealing procedure, close tube immediately. Acetic acid will be released up to complete cross linking (setting) of sealing compound. Avoid skin contact. Clean affected spots immediately with water and soap, rinse eyes with water, see doctor, if required.

16 Leave radiator lying or standing at least for 3 hours to dry sealing compound. Depending on quantity of applied sealing compound and size of sealed spot, complete cross linking (setting) of sealing compound into a permanent, elastic connection if completed after max. 24 hours at ambient temperature.

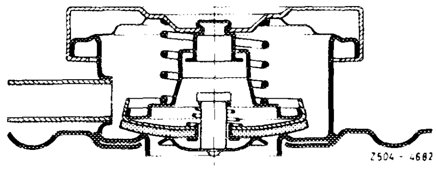
17 Pressuretest radiator in water bath for approx. 5 minutes at 1.5 bar gauge pressure.

If leaks are still showing up, repeat sealing procedure starting item 7.

18 Remove tester and locks.

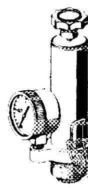
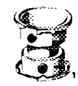
19 Upon reinstallation of radiator, pressuretest cooling system with tester.

Radiator or expansion tank closing cap

Pressure relief valve opens at	new cap $1.0\ ^{+0.15}_{-0.1}$ bar gauge pressure	
	used cap 1.0–0.2 bar gauge pressure	
Vacuum valve opens starting at	0.1 bar vacuum	

Z504 - 4682

Special tools

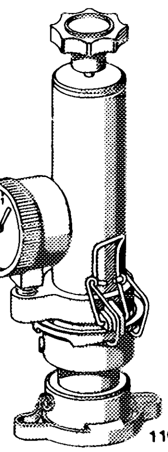
Tester for cooling system and radiator cap	 11004-8325	001 589 48 21 00
Double connection for radiator cap in combination with cooling system tester	 11004-8326	000 589 73 63 00

Checking pressure relief valve

1 Attach double connection to leak tester by means of holding clips.

2 Place radiator cap on double connection.

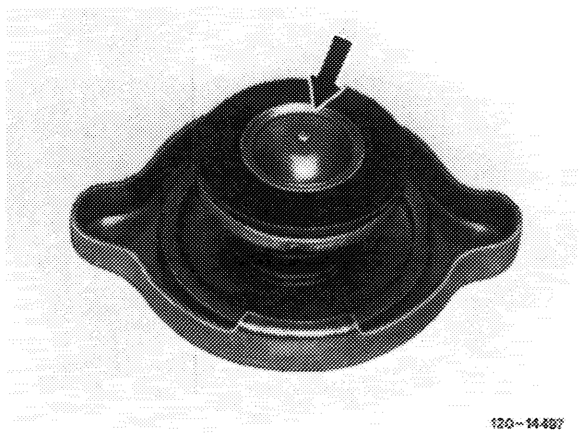
3 Check opening pressure by pumping.



11004–8666

Checking vacuum valve

Vacuum valve (arrow) should rest against rubber seal, should lift off easily and snap back following release.



120–14487

Model 107

1 Unscrew screw (11).

2 Turn holder (10) and shielding plate (13) away in lateral direction.

3 Unscrew engine mount (19) from cross member.

4 Lift engine with pit lift at oil pan.

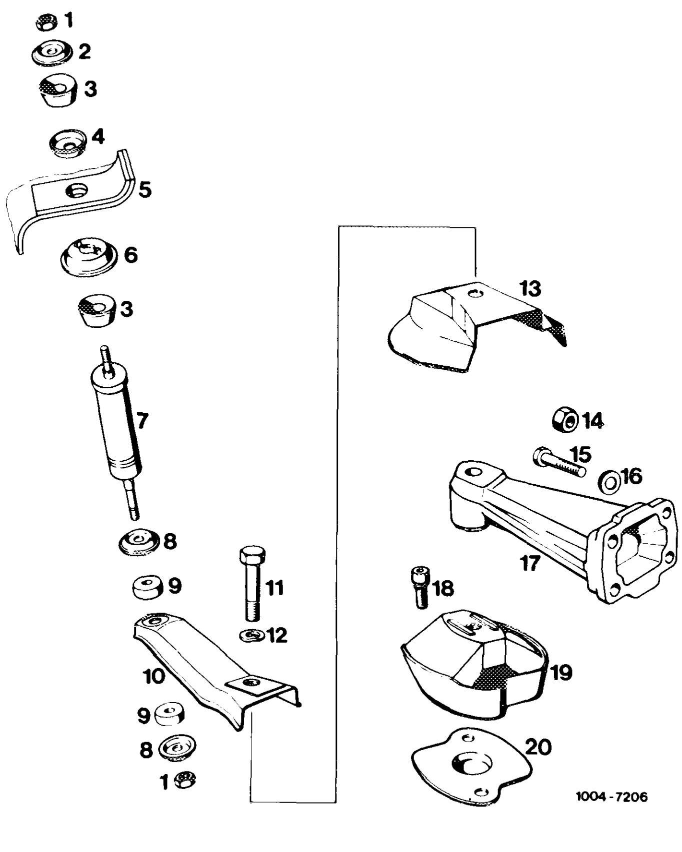
Note: Use wooden block to prevent damaging oil pan.

5 Remove engine mount together with shim (20).

6 For installation proceed vice versa.

7 Tighten screw (11) to 75 Nm.

Attention!
Check regulating linkage for function.



1 Nut
2 Cup spring 30 mm dia.
3 Rubber buffer 26 mm dia.
4 Cup spring 26 mm dia.
5 Holder
6 Cup spring 32 mm dia.
7 Engine shock absorber
8 Cup spring 26 mm dia.
9 Rubber buffer 22 mm dia.
10 Holder
11 Screw M 12 x 65
12 Spring washer
13 Shielding plate
14 Nut M 10 (7 each)
15 Screw M 10 x 65 (1 each)
16 Washer A 10.5 (6 each)
17 Engine carrier
18 Combination screw M 8 x 18
19 Engine mount
20 Shim

1 Unscrew screw (1).

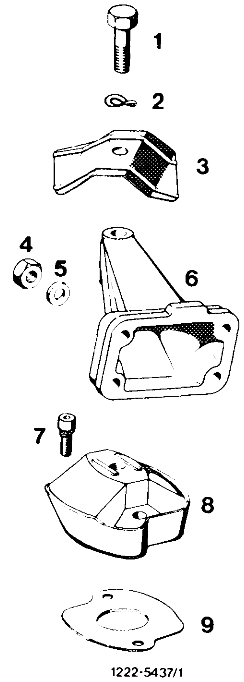
2 Lift engine with pit lift at oil pan.

Note: Use wooden block to prevent damaging oil pan.

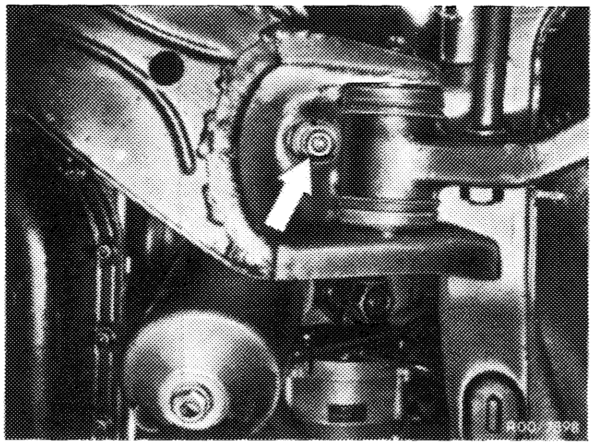
3 Unscrew screws from engine carrier and remove engine mount with shim.

4 For installation proceed vice versa.

5 Tighten screw (1) to 75 Nm.



1 Screw M 12 x 55
2 Spring washer B 12
3 Shielding plate (right)
4 Nut M 10
5 Washer A 10.5
6 Engine carrier
7 Combination screw M 8 x 18
8 Engine mount
9 Shim



1 Unscrew screw (11, arrow) from underside of vehicle.

2 Unscrew nut (12) below on engine shock absorber.

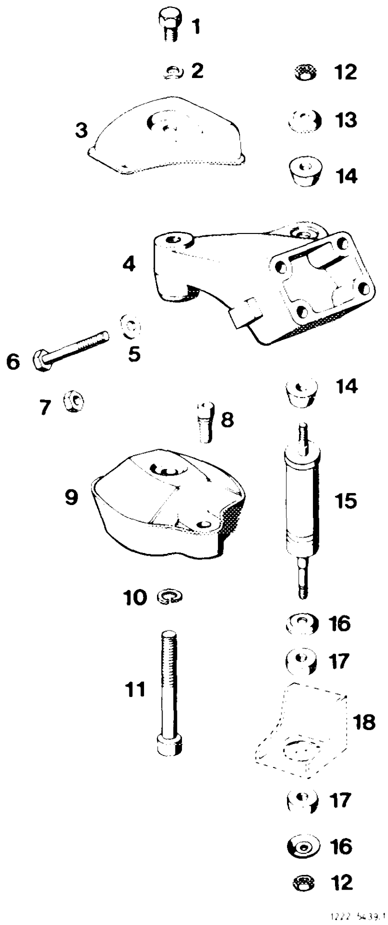
3 Lift engine with pit lift at oil pan.

Note: Use wooden block to prevent damaging oil pan.

4 Unscrew screws (8) and remove engine mount (9).

5 For installation proceed vice versa.

6 Tighten screw (11) to 75 Nm.



1 Screw
2 Spring washer
3 Shielding plate (right)
4 Engine carrier
5 Washer A 10.5 (6 each)
6 Screw M 10 x 65 (1 each)
7 Nut M 10 (7 each)
8 Combination screw M 8 x 18
9 Engine mount
10 Snap ring 12
11 Screw M 12 x 40
12 Nut M 6
13 Cup spring 30 mm dia.
14 Rubber buffer 26 mm dia.
15 Engine shock absorber
16 Cup spring 26 mm dia.
17 Rubber buffer 22 mm dia.
18 Holder

Model 123

1 Unscrew screw (11, arrow) from underside of vehicle.

2 Unscrew nut below on engine shock absorber.

3 Lift engine with pit lift at oil pan.

Note: Use wooden block to prevent damaging oil pan.

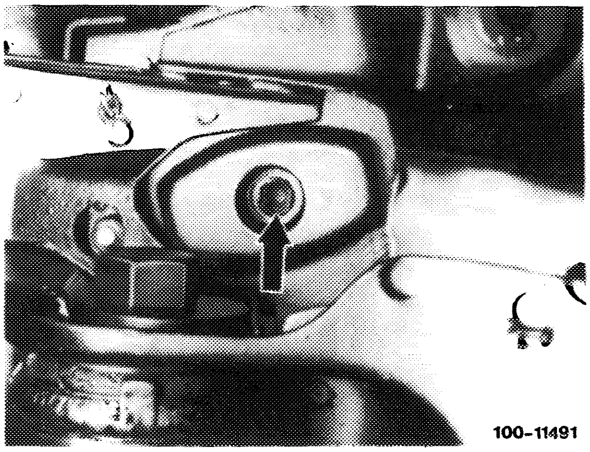
4 Unscrew screws (8) and remove engine mount.

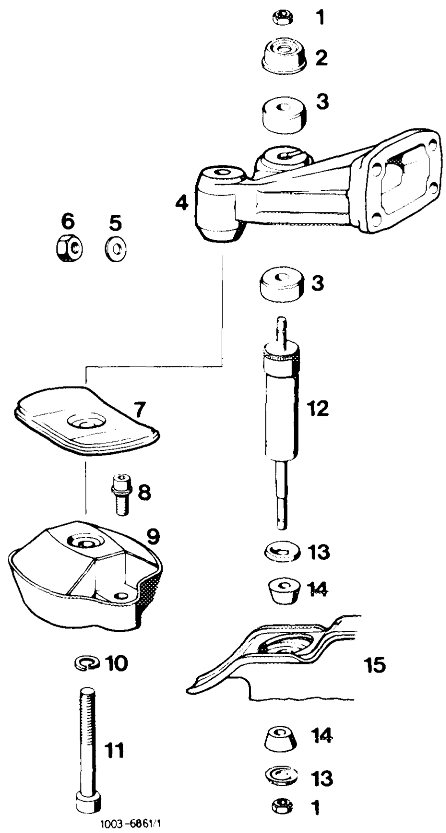
5 For installation proceed vice versa.

Note: Engine mounts left and right are different.

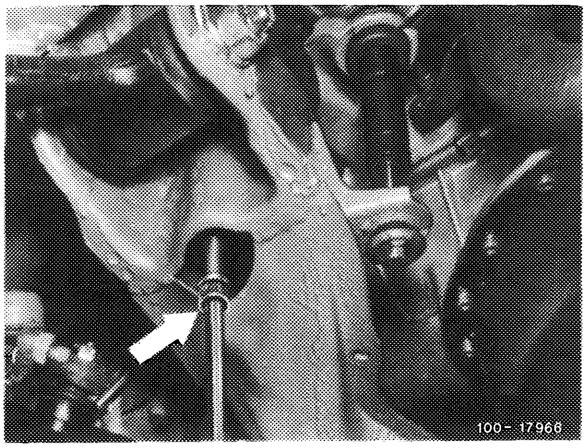
The shielding plate is located at the right.

6 Tighten screw (11) to 75 Nm.





1 Nut M 6
2 Cup spring 44 mm dia.
3 Rubber buffer 36 mm dia.
4 Engine carrier
5 Washer A 10.5 (6 each)
6 Nut M 10 (8 each)
7 Shielding plate
8 Combination screw M 8 x 18
9 Engine mount 123 241 10 13 (right)
Engine mount 123 241 12 13 (left)
10 Snap ring 12
11 Screw M 12 x 35
12 Engine shock absorber
13 Cup spring 30 mm dia.
14 Rubber buffer 27 mm dia.
15 Holder



1 Unscrew screw (15, arrow) from underside of vehicle.

2 Unscrew nut (1) below on engine shock absorber.

3 Lift engine with pit lift at oil pan.

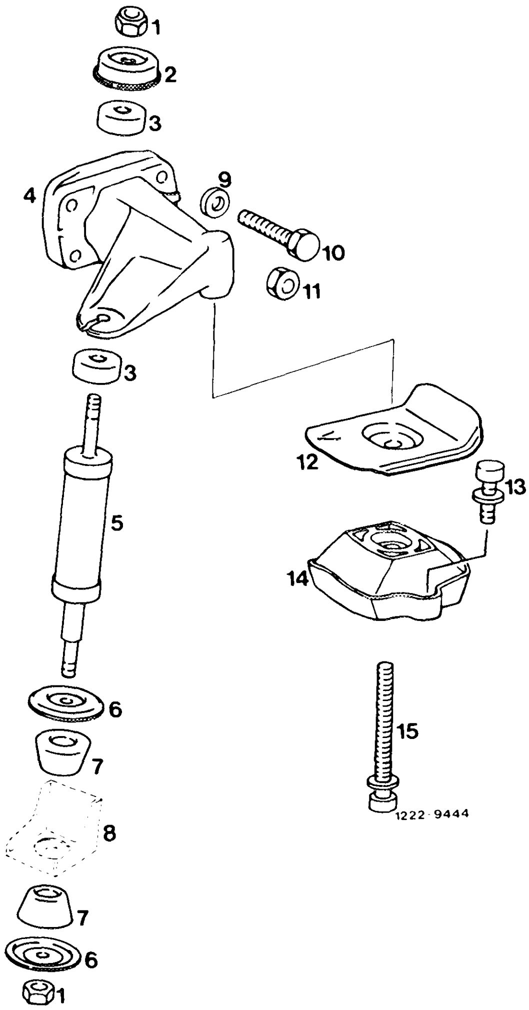
Note: Use wooden block to prevent damaging oil pan.

4 Unscrew screws (13) and remove engine mount.

5 For installation proceed vice versa.

Note: The shielding plate is located at the left.

6 Tighten screw (15, arrow) to 70 Nm.



1 Nut M 6
2 Cup spring
3 Rubber buffer
4 Engine carrier
5 Engine shock absorber
6 Cup spring
7 Rubber buffer
8 Holder
9 Washer
10 Screw
11 Nut
12 Shielding plate
13 Combination screw
14 Engine mount
15 Screw

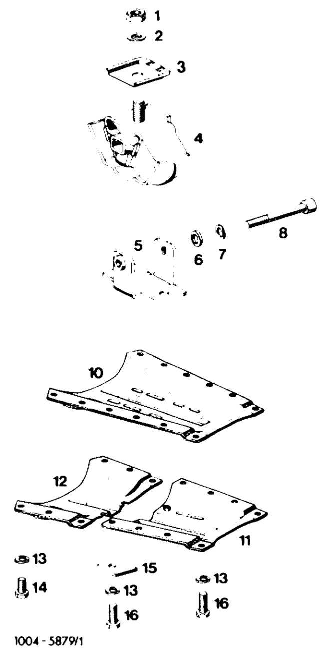
Model 107

Attention!
For removal of engine mount (4) do not unscrew closing plate (10 or 12).

Attach engine mount free of tension to closing plate.

After installing engine mount, run engine at idle for a short period with adjusting screw released. With engine stopped, tighten adjusting screw (8) to 40 Nm.

Attention!
Check regulating linkage for function.



1	Nut M 12 x 1.5	10	Closing plate manual transmission
2	Spring washer B 12	11	Closing plate automatic transmission
3	Holding plate	12	Closing plate automatic transmission
4	Holder	13	Snap ring A 8
6	Washer 8.4	14	Screw M 8 x 20
7	Snap ring A 8	15	Shim
8	Adjusting screw M 8 x 75	16	Screw M 8 x 32

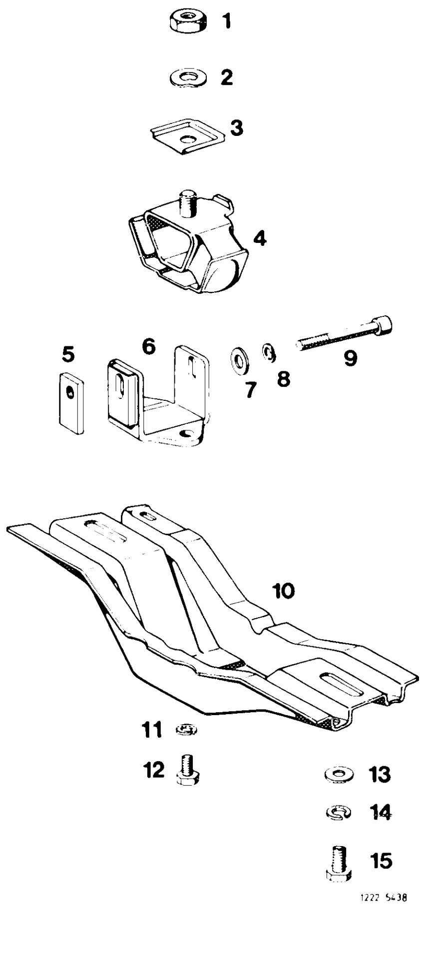
Model 114

Note: The engine mount for automatic transmission and for 5-speed transmission is provided with a stop.

For removing engine mount (4), do not unscrew engine carrier (10).

Following installation of engine mount, run engine for a short period at idle with adjusting screw (9) released. With engine stopped, tighten adjusting screw (9) to 40 Nm.

Attention!
Shims between engine carrier and frame floor are decisive for alignment of propeller shafts and should be added again at the same spot.

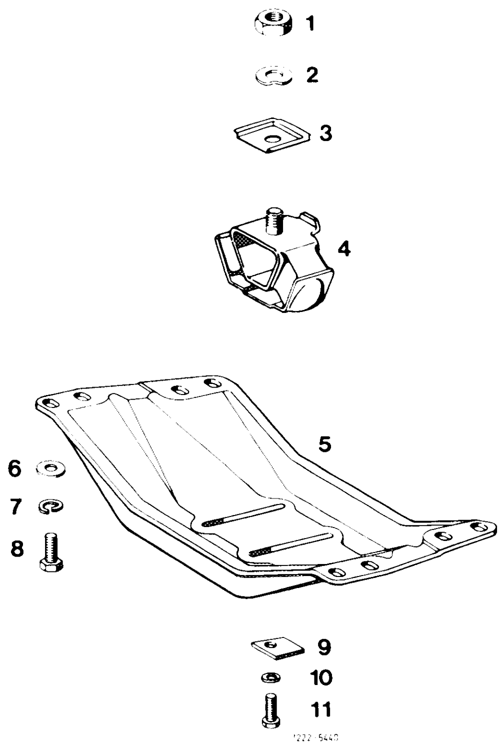


1	Nut M 12 x 1.5	9	Adjusting screw M 8 x 75
2	Spring washer B 12	10	Engine carrier
3	Holding plate	11	Snap ring B 10
4	Engine mount	12	Screw M 8 x 12
5	Threaded plate	13	Washer
6	Holder	14	Snap ring B 10
7	Washer	15	Screw M 10 x 25
8	Snap ring		

Model 116

Attention!
For removal of engine mount (4) do not unscrew engine carrier (5).

Attach engine mount free of tension to engine carrier.



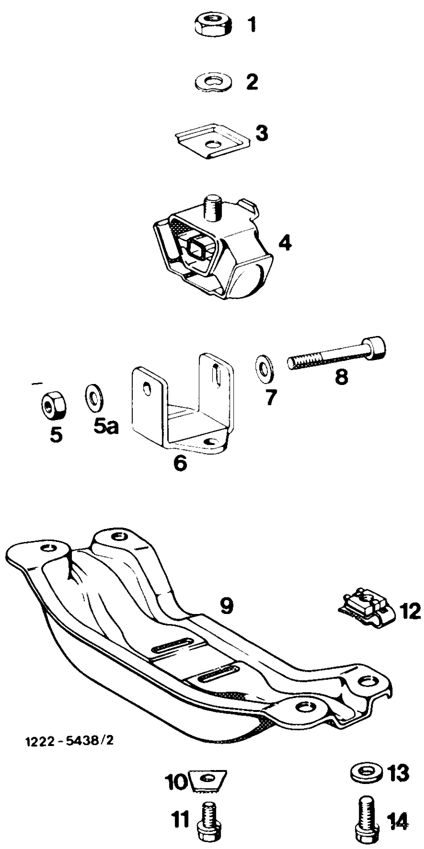
1	Nut M 12 x 1.5	7	Snap ring A 8
2	Spring washer	8	Screw M 8 x 20
3	Holding plate	9	Shim
4	Engine mount	10	Snap ring A 8
5	Engine carrier	11	Screw M 8 x 18
6	Washer 8.4		

Model 123

Attention!
For removal of engine mount (4) do not unscrew engine carrier (9).

Upon installation of engine mount run engine at idle for a short period with adjusting screw released.

With engine stopped, tighten adjusting screw (8) to 40 Nm.



1	Nut 12 x 1.5	9	Engine carrier
2	Spring washer B 12	10	Washer
3	Holding plate	11	Combination screw M 8 x 18
4	Engine mount 123 240 22 18	12	Cage nut 123 990 05 91
5	Nut	13	Washer
5a	Washer	14	Combination screw M 10 x 22
6	Holder		
7	Washer		
8	Screw M 8 x 75		

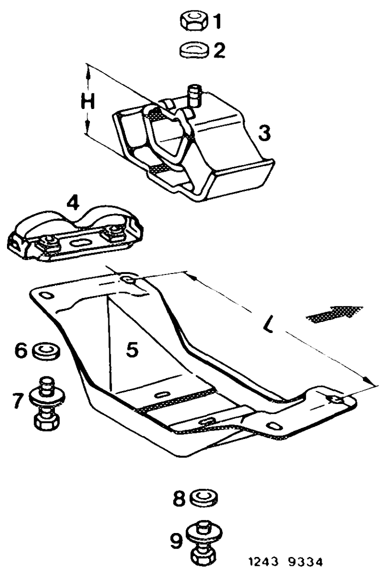
Attention!
To remove engine mount (3) do not unscrew engine carrier (5).

Engine mount (3) and engine carrier (5) are different for manual and automatic transmission.

Differences:

Transmission	manual	automatic
Engine mount	H = 62–64 mm	H = 67–69 mm
Engine carrier	L = 356 mm	L = 301 mm

When installing engine mount (3) attach free of tension to engine carrier (5) with oblong holes by means of screws (9).



1 Nut M 12 x 1.5
2 Spring washer
3 Engine mount
manual 123 240 25 18
automatic 116 240 04 18
4 Nut holder
5 Engine carrier
6 Washer 10.5
7 Combination screw M 10 x 22
8 Washer
9 Combination screw M 8 x 15

Model 107, engine shock absorber left and right

1 For removing righthand engine shock absorber, remove expansion tank.

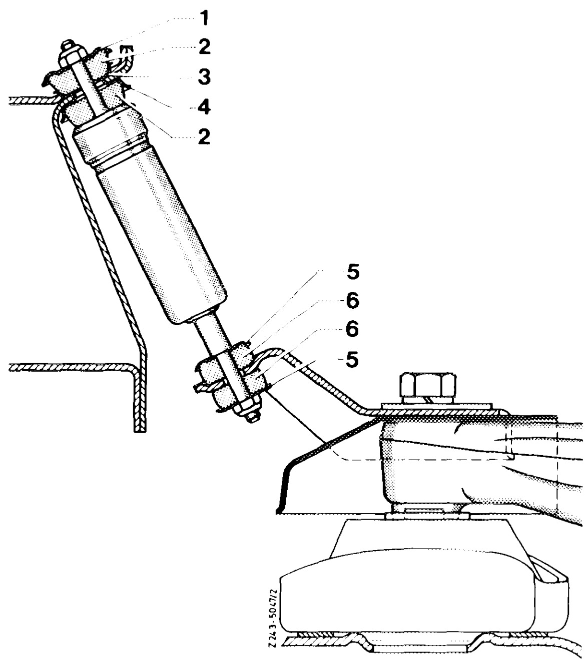
2 For removing lefthand engine shock absorber, remove pressure regulator (injection engine).

3 Unscrew screw for attaching engine from engine mount and engine shock absorber.

4 Remove engine shock absorber together with holder.

Attention!
During installation, pay attention to position of rubber buffers and cup springs (22–211).

On USA vehicles starting model year 1975, use the upper rubber buffers made of heat-resistant material.



Engine shock absorber right, seen from the front

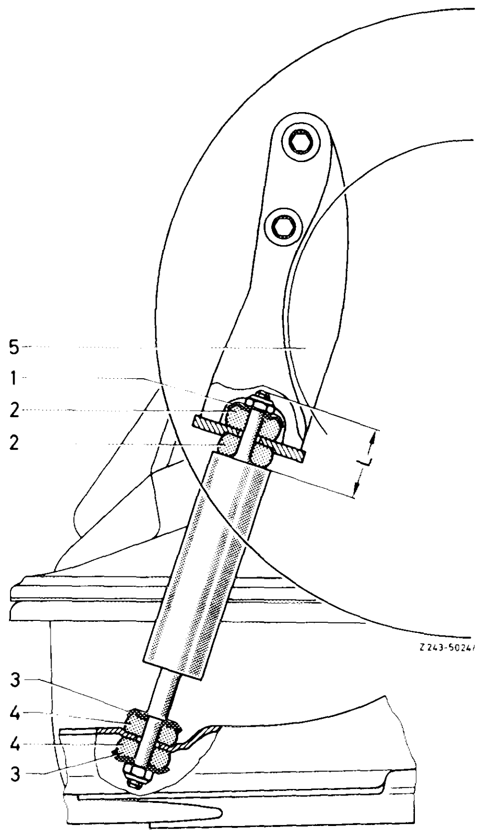
1 Cup spring 30 mm dia.
2 Rubber buffer 26 mm dia.
3 Cup spring 26 mm dia.
4 Cup spring 32 mm dia.
5 Cup spring 26 mm dia.
6 Rubber buffer 22 mm dia.

Model 114, engine shock absorber right

On engines with **air conditioning**, remove radiator and vibration damper (03–340) for removal of righthand engine shock absorber with holder.

On engines **without air conditioning**, remove alternator with holder and carrier for removing righthand engine shock absorber.

Attention!
During installation, pay attention to position of rubber buffer and cup springs.



Engine shock absorber right, seen from the front

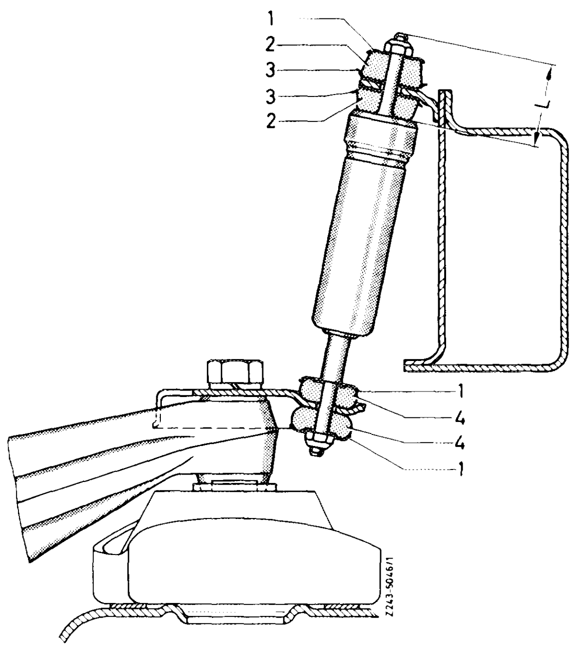
1st version L	= 28 mm	3	Cup spring	26 mm dia.
1 Cup spring	26 mm dia.	4	Rubber buffer	22 mm dia.
2 Rubber buffer	22 mm dia.	5	Holder part no.	110 241 02 02
2nd version L	= 34 mm	3	Cup spring	26 mm dia.
1 Cup spring	31 mm dia.	4	Rubber buffer	22 mm dia.
2 Rubber buffer	26 mm dia.	5	Holder part no.	110 241 03 02

Model 114, engine shock absorber left

1 Unscrew screw from engine mount. Loosen engine shock absorber at top.

2 Remove engine shock absorber together with holder.

Attention!
During installation, pay attention to position of rubber buffers and cup springs.



Engine shock absorber left, seen from the front
L = 34 mm

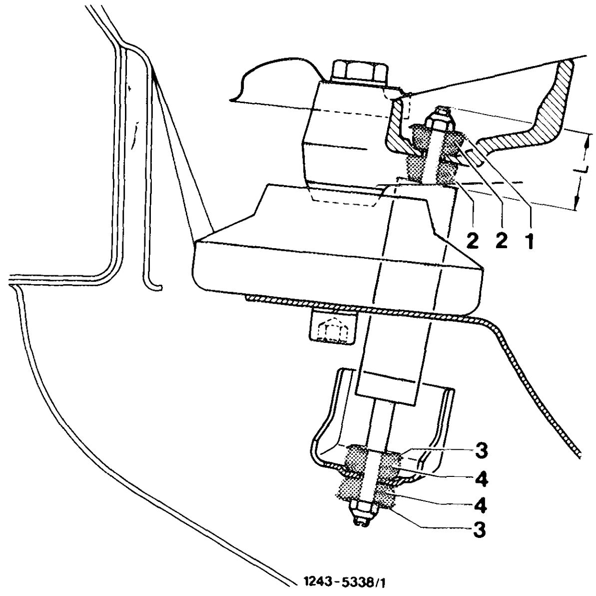
1	Cup spring	108 241 00 12	26 mm dia.
2	Rubber buffer	123 241 03 65	26 mm dia.
3	Cup washer	115 241 08 12	31 mm dia.
4	Rubber buffer	107 241 00 65	22 mm dia.

Model 116, engine shock absorber left and right

During installation, pay attention to position of rubber buffers and cup springs.

On USA vehicles starting model year 1975, use the two upper rubber buffers part no. 115 241 17 65.

Engine shock absorber and layout are similar at the left and right.



Engine shock absorber right, seen from the front

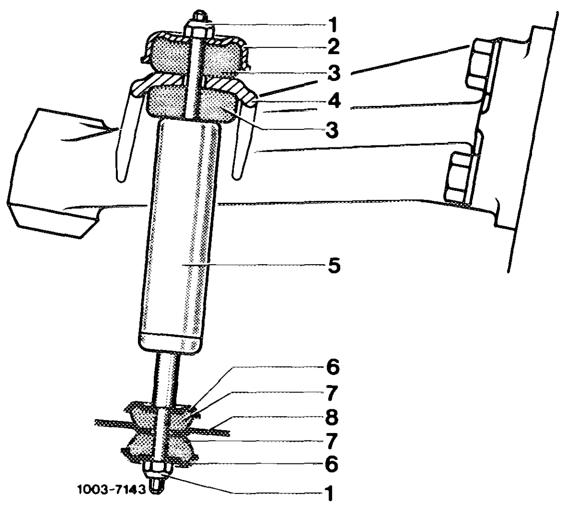
L = 34 mm

1	Cup spring	30 mm dia.
2	Rubber buffer	26 mm dia.
3	Cup spring	26 mm dia.
4	Rubber buffer	32 mm dia.

Model 123, engine shock absorber left and right

During installation, pay attention to position of rubber buffers and cup springs.

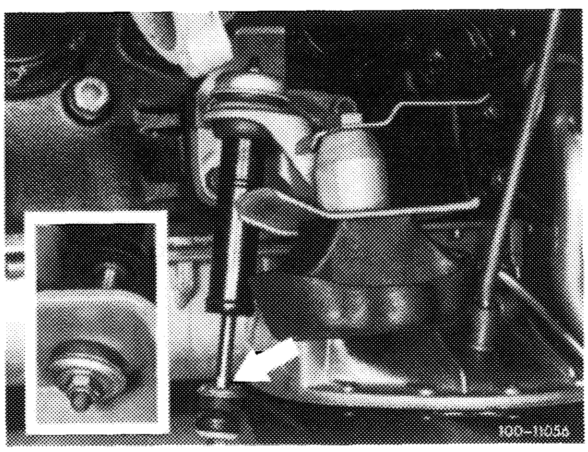
Engine shock absorber and layout are similar at left and right.



Engine shock absorber left, seen from the rear

1	Nut	
2	Cup spring	44 mm dia.
3	Rubber buffer	36 mm dia.
4	Engine carrier	
5	Engine shock absorber	
6	Cup spring	30 mm dia.
7	Rubber buffer	27 mm dia.

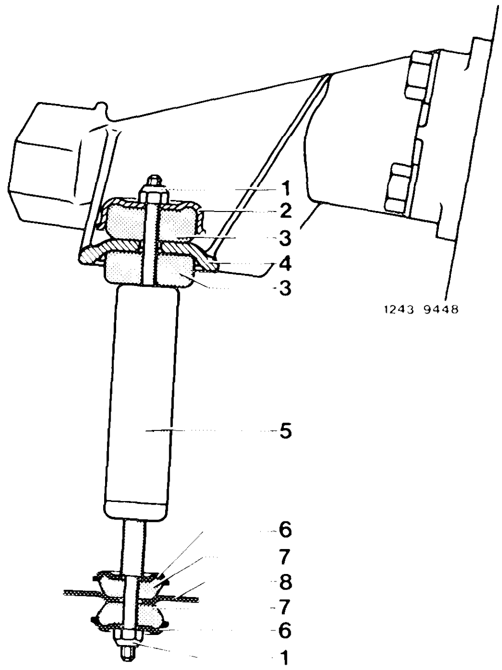
Attention!
For removal and installation of engine shock absorber, hold piston rod in position at flat provided (arrow).



Model 126, engine shock absorber left and right

During installation, pay attention to position of rubber buffers and cup springs.

Engine shock absorber and layout are similar at left and right.



Engine shock absorber right seen from the front

A. Lefthand steering models 107, 116, 123, 126
Righthand steering models 107, 116, 126

Adjusting values in mm

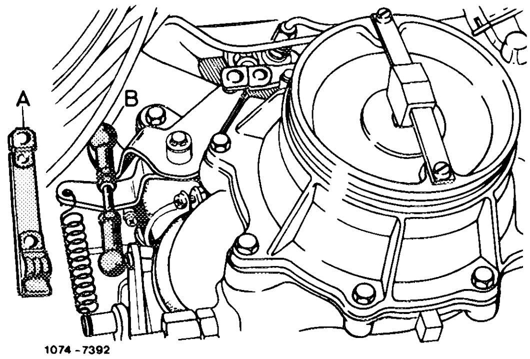
Model	107	116	123	126
Length of connecting rod (B) from throttle valve housing to guide lever	75			
Length of connecting rod (2) from guide lever to slotted lever	345			
Length of connecting rod (10) via cylinder head cover (automatic transmission 722.1 (W 4 B 025) only)	306			
Length of pushrod (5) from longitudinal regulating shaft to accelerator pedal	105	68	186	220

Adjustment

1 Check regulating linkage for easy operation and bends. Replace linkage, if required.

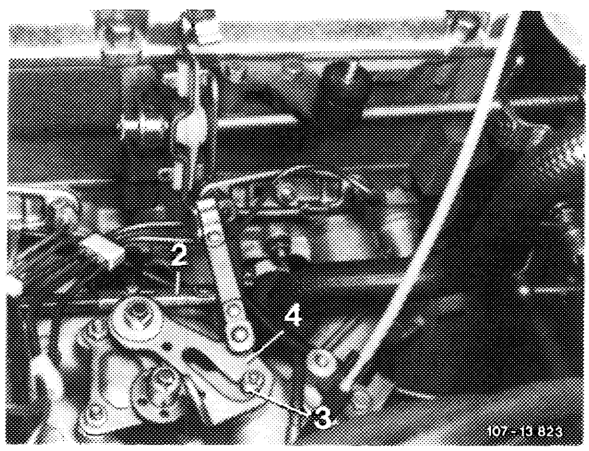
2 Disconnect connecting rod (B) on throttle valve housing. Check whether throttle valve rests against idle speed stop. Reconnect connecting rod free of tension, adjust to specified length, if required.

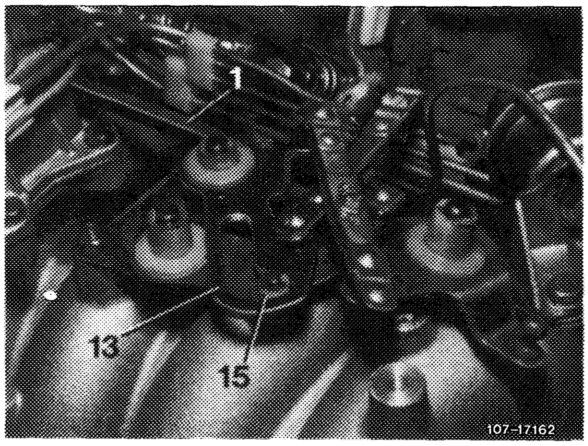
Note: The connecting rod (B) should be made of round material with screwed-on ball sockets. Replace profilated sheet metal-connecting rod (A).



3 Adjust connecting rod (1, 2) in such a manner that the rollers (3, 15) in slotted lever (4, 13) are resting free of tension against final stop.

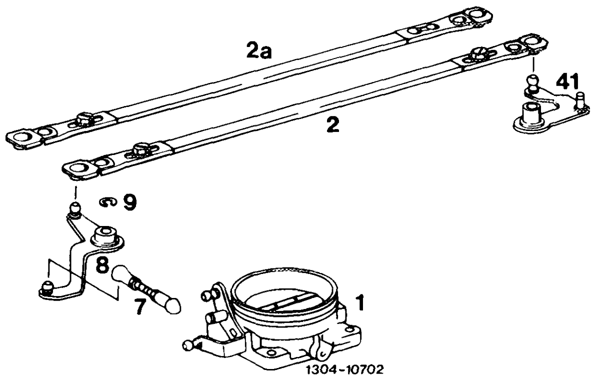
Model 123





Model 126

The connecting rod (2a) can now be adjusted on one side only. Pay attention to installation position (refer to Fig.).



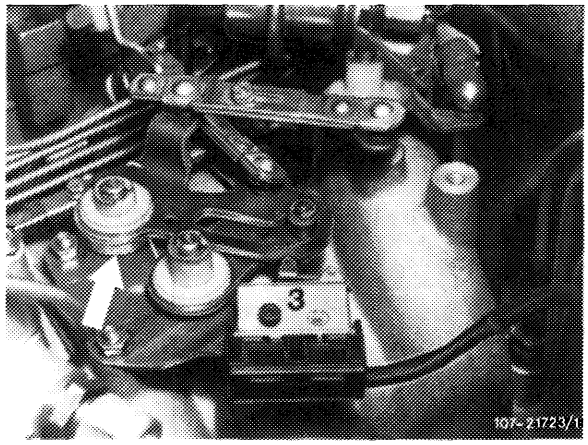
2 1st version
2a 2nd version

Installation: January 1982

Model	Engine	Engine end No. manual transmission	automatic transmission	Chassis end No.
107	110.990	000 333	000 727	012 560
123.033 123.053 123.093	110.988	001 431	004 447	099 669 025 300 010 978
126.022 126.023	110.989	001 665	009 354	053 569

Engines with decel shutoff

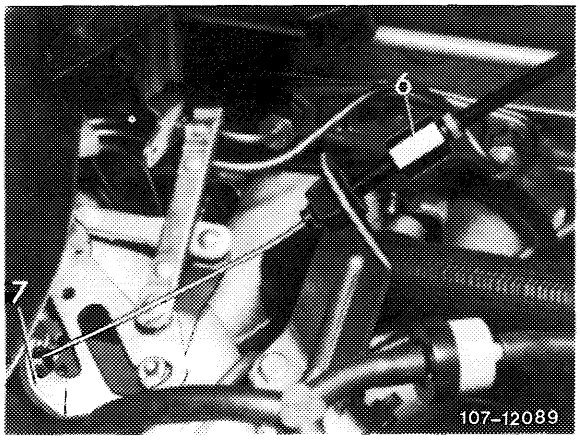
To guarantee operation of microswitch (3) the slotted lever (13) is provided with a restoring spring (arrow). As a result, the slotted lever will return reliably against final stop.



4 Vehicles with cruise control/Tempomat:

Cruise control/Tempomat, pneumatical

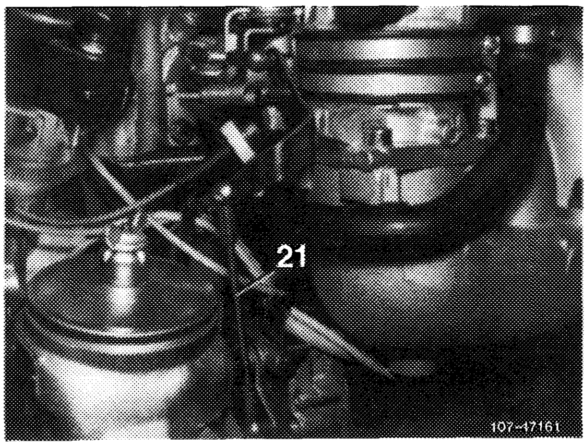
Check whether Bowden wire for cruise control/ Tempomat rests free of tension against regulating lever (7). Adjust by means of adjusting nut (6), if required.



Cruise control/Tempomat, electrical

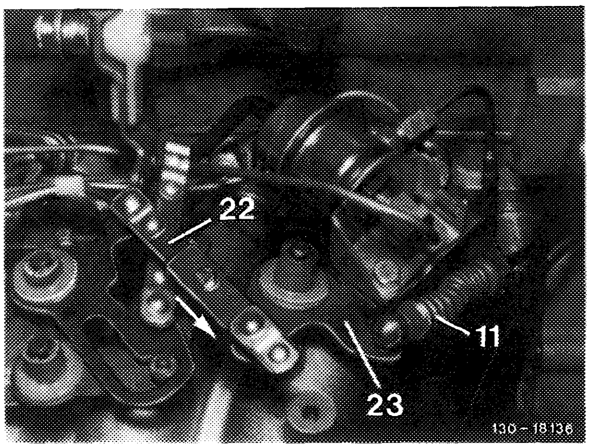
Check whether actuator rests against idle speed stop of cruise control/Tempomat. For this purpose, disconnect pullrod (21) and push lever of actuator clockwise against idle speed stop.

When connecting pullrod (21) make sure that lever of actuator is lifted by approx. 1 mm from idle speed stop. Adjust pullrod, if required.



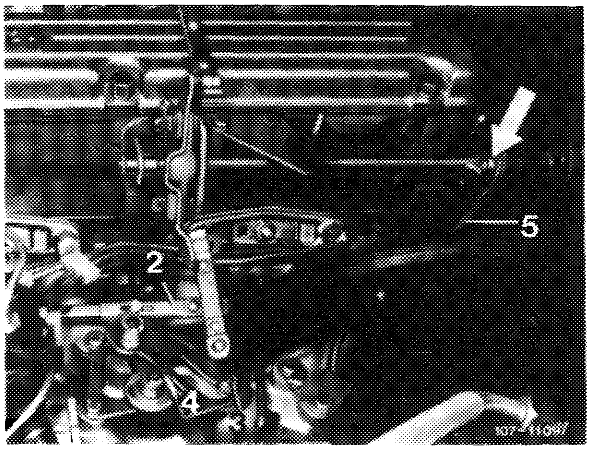
Testing and adjusting full throttle stop

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.



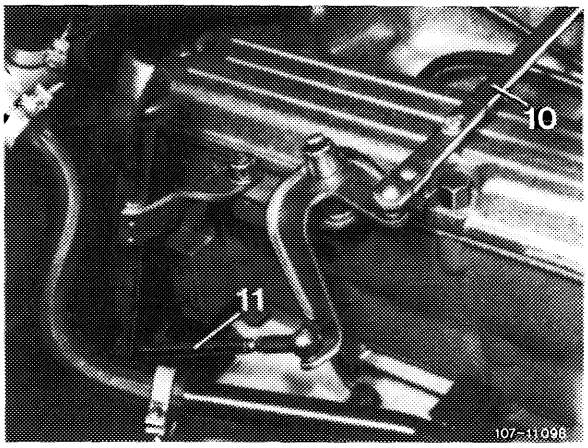
5 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or on automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, loosen adjusting screw (arrow). Adjust regulating linkage in such a manner that throttle valve lever rests against full throttle stop.

If the full throttle or idle speed stop is not attained with this adjustment, set pushrod (5) from longitudinal regulating shaft to accelerator pedal to specified length, measured from center of ball socket to center of damping ring.



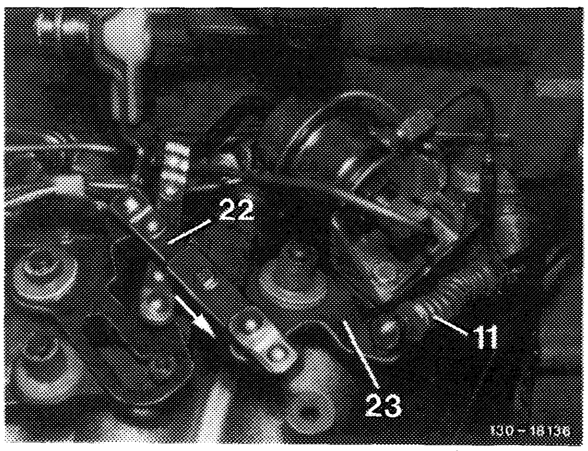
6 Vehicles with automatic transmission:

a) Adjust control pressure rod (11) with engine stopped. For this purpose, disconnect control pressure rod, push completely toward the rear against stop and reconnect free of tension. Adjust ball socket, if required.



Control pressure rod with automatic transmission 722.1 (W 4 B 025)

b) Adjust Bowden wire (11) with engine stopped. For this purpose, disconnect connecting rod (22) and pull guide lever (23) in direction of arrow noticeably against idle speed stop on automatic transmission. Reconnect connecting rod (22) free of tension and adjust, if required.



Bowden wire with automatic transmission 722.3 (W 4 A 040)

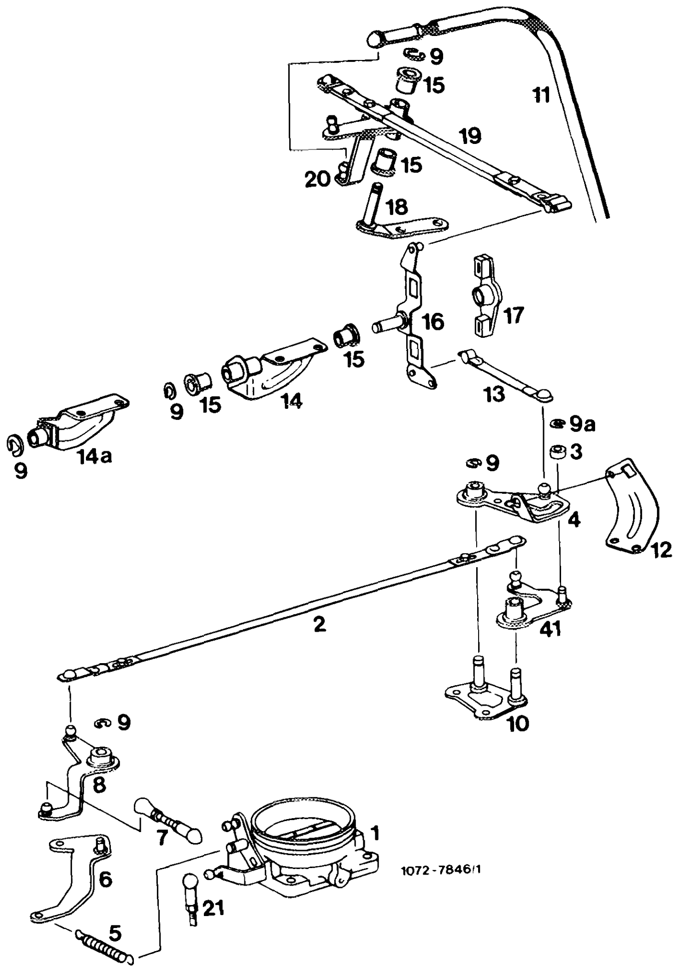
Engine regulating

Lefthand steering models 107, 116, 123, 126

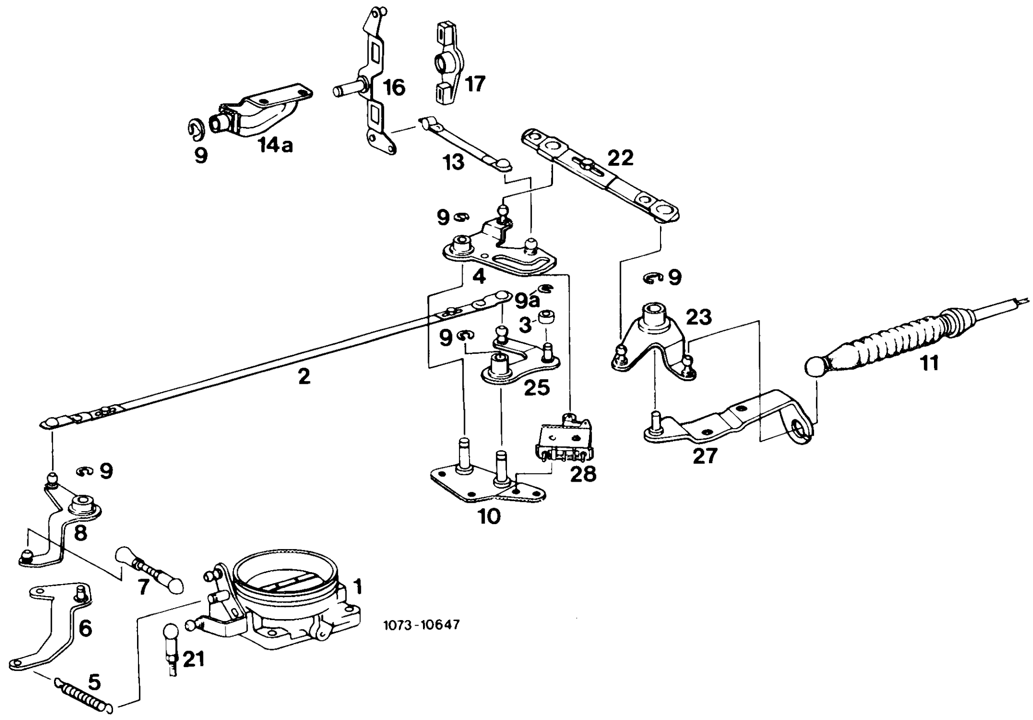
Righthand steering models 107, 116

Prior to September 1981

1 Throttle valve housing
2 Connecting rod
3 Roller
4 Slotted lever
5 Restoring spring
6 Lever
7 Connecting rod
8 Guide lever
9 Lock
9a Lock
10 Bearing bracket
11 Control pressure rod
12 Holder for Bowden wire
Cruise control/Tempomat, pneumatical
13 Connecting rod
14 Holder 1st version
14a Holder 2nd version
15 Plastic sleeve 1st version
16 Lever
17 Plastic link
18 Bearing bracket
19 Connecting rod
20 Guide lever
21 Connecting rod
Cruise control/Tempomat, electrical
41 Guide lever



Starting September 1981



1 Throttle valve housing
2 Connecting rod
3 Roller
4 Slotted lever
5 Restoring spring
6 Lever
7 Connecting rod
8 Guide lever
9 Lock
9a Lock
11 Bowden wire automatic transmission
13 Connecting rod
14a Holder
16 Lever
17 Plastic link
21 Connecting rod
Cruise control/Tempomat, electrical
22 Connecting rod
23 Guide lever
25 Guide lever
27 Holder
28 Microswitch

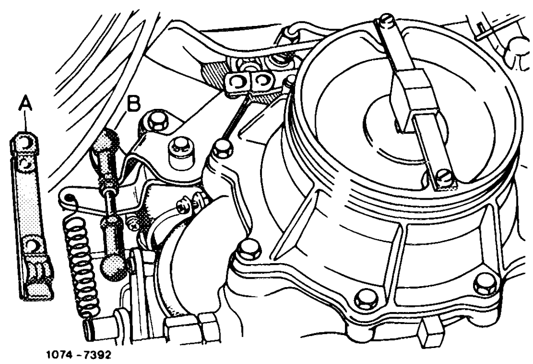
B. Righthand steering model 123

Adjusting values in mm

Length of connecting rod (B) from throttle valve housing to guide lever	75
Length of connecting rod (2) from guide lever to slotted lever	345
Length of connecting rod (10) above cylinder head cover (automatic transmission 722.1 (W 4 B 025) only)	306

Adjustment

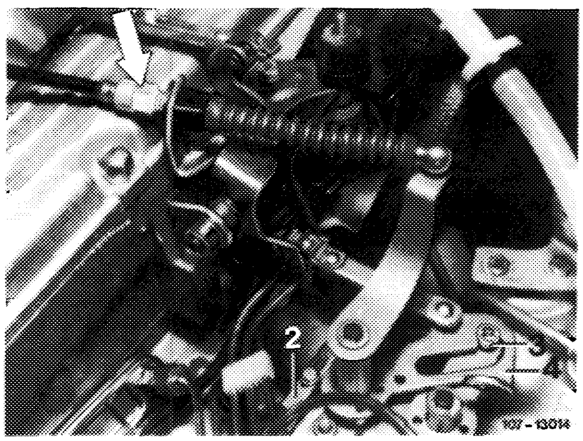
1 Check regulating linkage and Bowden wire for easy operation, distortion and absence of kinks. Replace individual parts, if required.



2 Disconnect connecting rod (B) on throttly valve housing. Check whether throttle valve rests against idle speed stop. Reconnect connecting rod free of tension and adjust to specified length, if required.

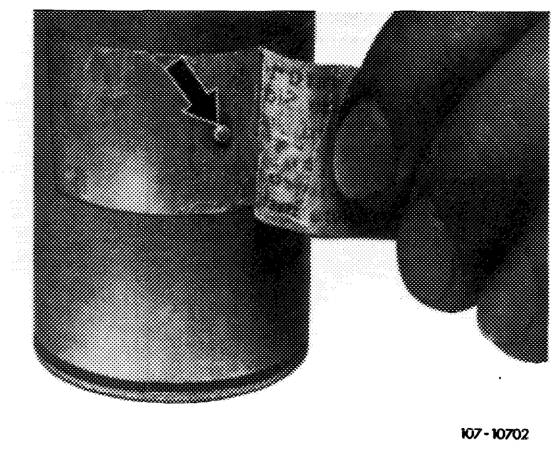
Note: Connecting rod (B) should be made of round material with screwed on ball sockets. Replace profilated sheet metal-connecting rod (A).

3 Adjust connecting rod (2) in such a manner that roller (3) in slotted lever (4) rests free of tension against final stop.



The connecting rod can now be adjusted on one side only. Pay attention to installation position (refer to Fig.).

For installation date refer to section "A" Lefthand steering.

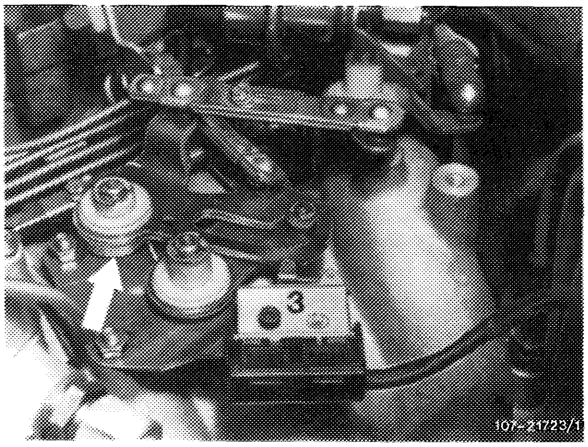


2 1st version
2a 2nd version

107-10702

Engines with decel shutoff

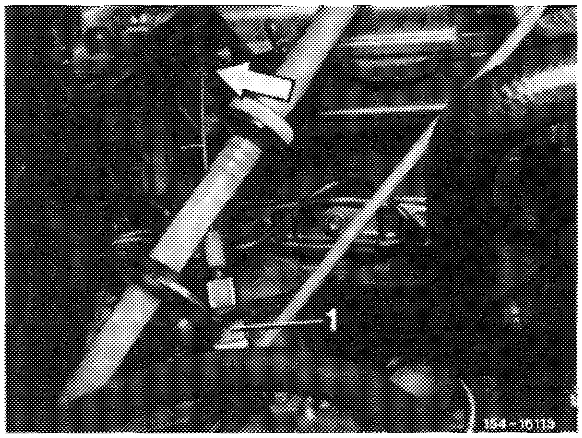
To guarantee operation of microswitch (3), the slotted lever (13) is provided with a restoring spring (arrow). As a result, the slotted lever will return reliably to end stop.



4 Vehicles with cruise control/Tempomat:

Tempomat, pneumatical

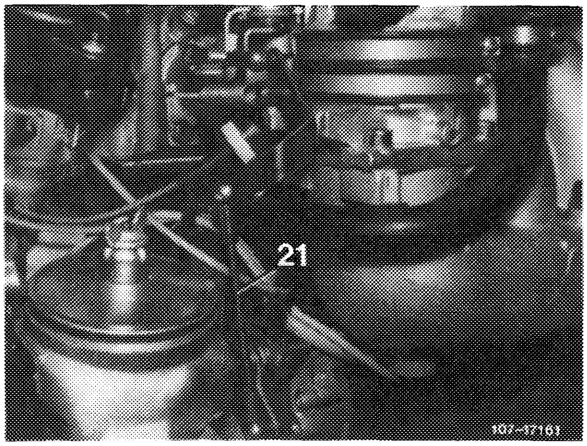
Check whether Bowden wire for cruise control/ Tempomat rests free of tension against regulating lever (arrow). Adjust with adjusting nut (1), if required.



Cruise control/Tempomat, electrical

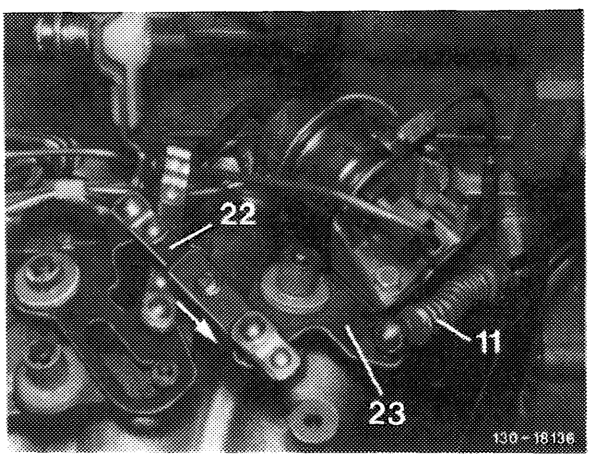
Check whether actuator rests against idle speed stop of cruise control/Tempomat. For this purpose, disconnect pullrod (21) and push lever of actuator clockwise against idle speed stop.

When connecting pullrod (21), make sure that the lever of the actuator is lifted by approx. 1 mm from idle speed stop. Adjust pullrod, if required.

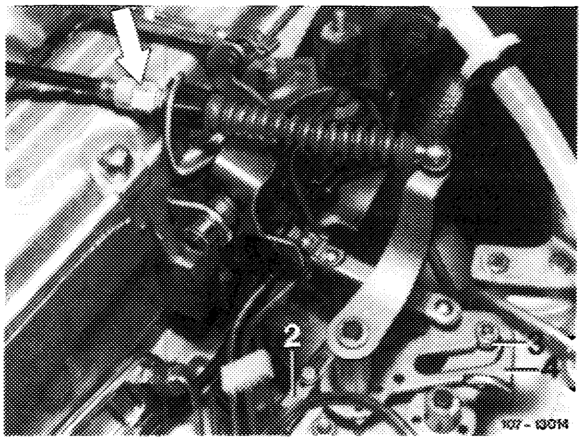


Checking full throttle stop

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11), reconnect after adjusting full throttle stop.

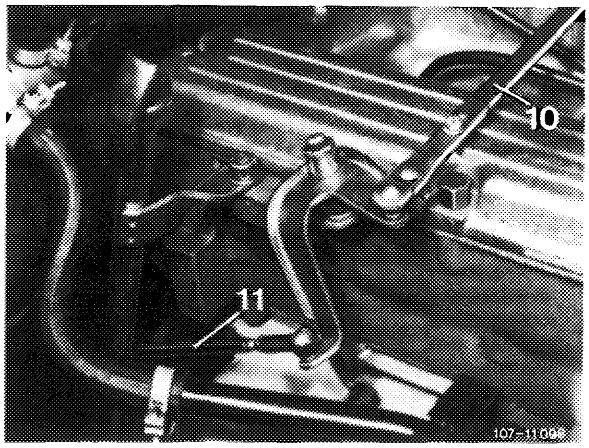


5 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or on automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.



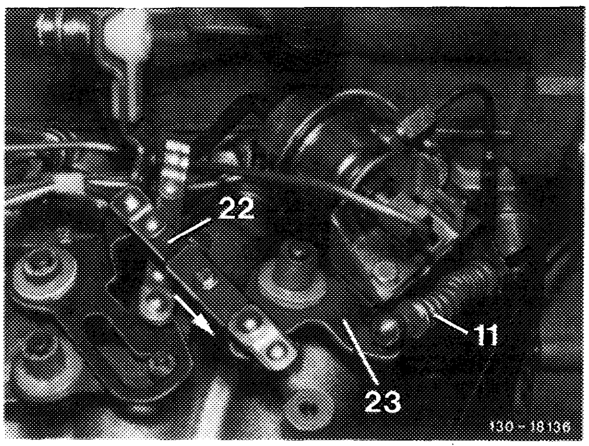
6 Vehicles with automatic transmission:

a) Adjust control pressure rod (11) with engine stopped. For this purpose, disconnect control pressure rod, push completely toward the rear against stop and reconnect free of tension. Adjust ball socket, if required.



Control pressure rod with automatic transmission 722.1 (W 4 B 025)

b) Adjust Bowden wire (11) with engine stopped. For this purpose, disconnect connecting rod (22) and pull guide lever (23) in direction of arrow noticeably against idle speed stop on automatic transmission. Reconnect connecting rod (22) free of tension and adjust, if required.

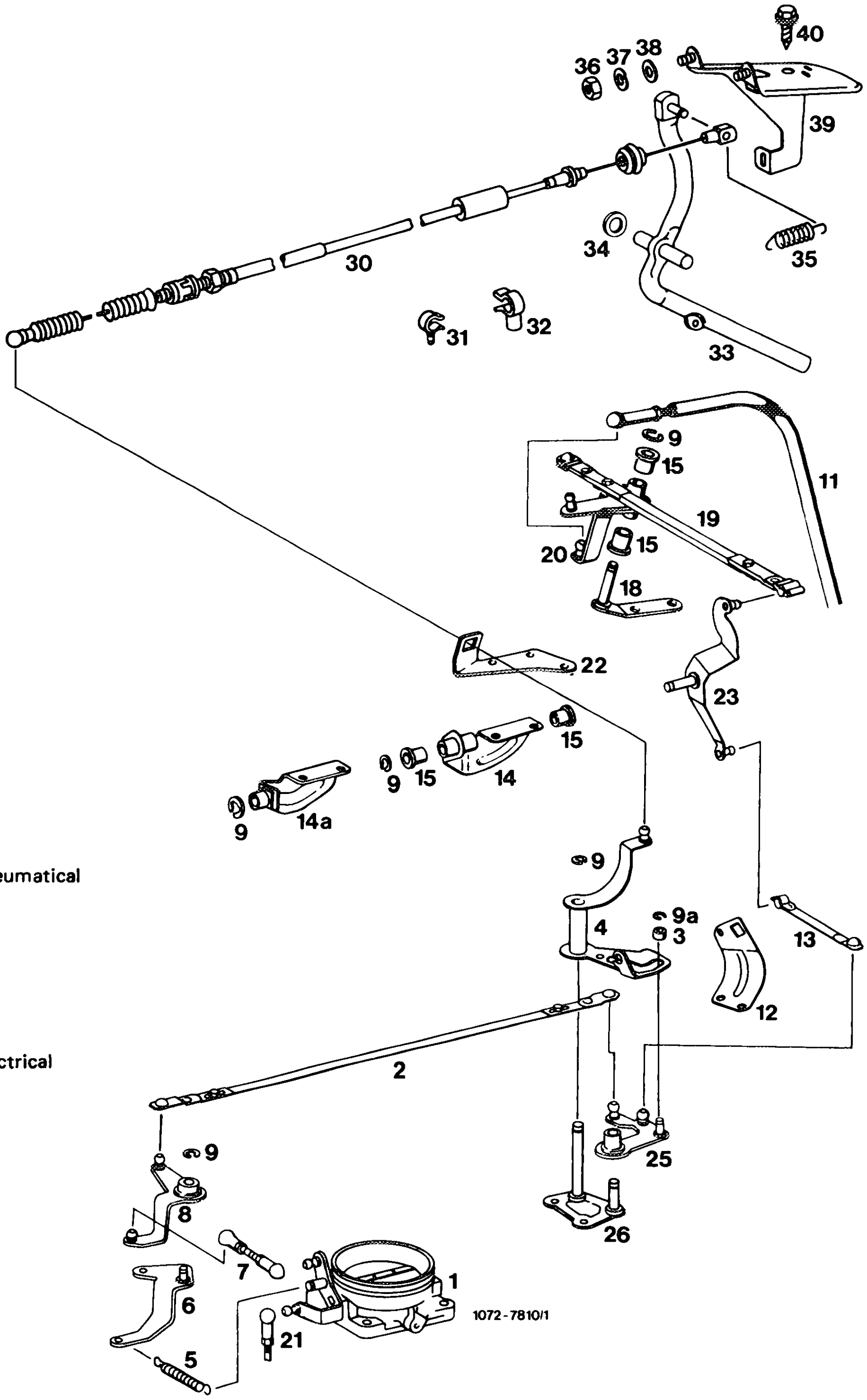


Bowden wire with automatic transmission 722.3 (W 4 A 080)

Engine and chassis regulation

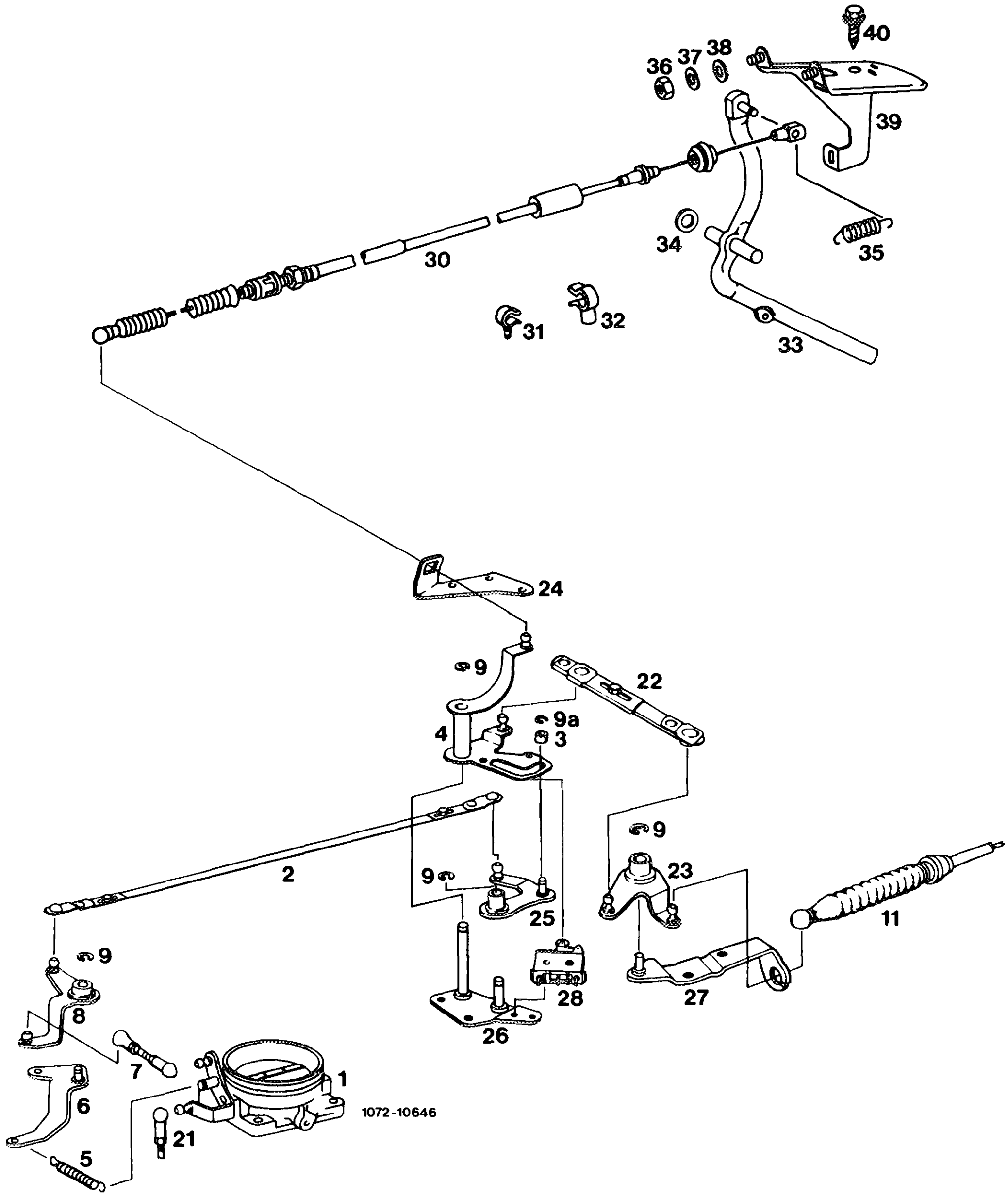
Righthand steering model 123

Prior to September 1981



1 Throttle valve housing
2 Connecting rod
3 Roller
4 Slotted lever
5 Restoring spring
6 Lever
7 Connecting rod
8 Guide lever
9 Lock
9a Lock
11 Control pressure rod
12 Holder for Bowden wire
Cruise control/Tempomat, pneumatical
13 Connecting rod
14 Holder 1st version
14a Holder 2nd version
15 Plastic sleeve
18 Bearing bracket
19 Connecting rod
20 Guide lever
21 Connecting rod
Cruise control/Tempomat, electrical
22 Holder
23 Guide lever
25 Guide lever
26 Bearing bracket
30 Bowden wire
31 Clip
32 Clip
33 Accelerator lever
34 Spacer ring
35 Restoring spring
36 Nut
37 Corrugated washer
38 Washer
39 Holder
40 Screw

Starting September 1981

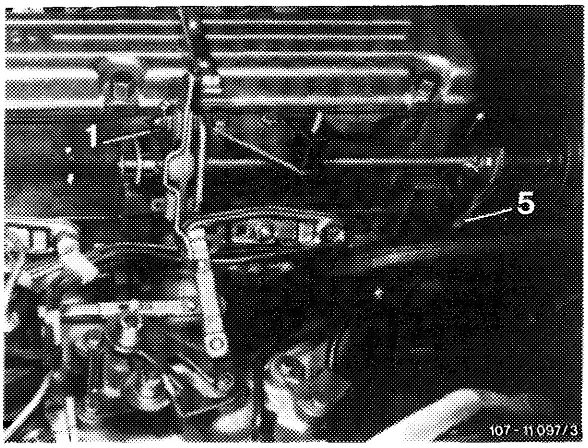


1	Throttle valve housing	25	Guide lever
2	Connecting rod	26	Bearing bracket
3	Roller	27	Holder
4	Slotted lever	28	Microswitch
5	Restoring spring	30	Bowden wire
6	Lever	31	Clip
7	Connecting rod	32	Clip
8	Guide lever	33	Accelerator lever
9	Lock	34	Spacing ring
9a	Lock	35	Restoring spring
11	Bowden wire automatic transmission	36	Nut
21	Connecting rod Cruise control/Tempomat, electrical	37	Corrugated washer
22	Connecting rod	38	Washer
23	Guide lever	39	Holder
24	Holder	40	Screw

Removal

1 Disconnect regulating rod (5).

2 Remove lock (1) and remove longitudinal regulating shaft toward the rear.



Installation

3 For installation proceed vice versa. Grease bearing points as well as ball sockets of regulation with Molykote-Longterm 2.

4 Adjust regulating linkage (30–300).

A. Model 107

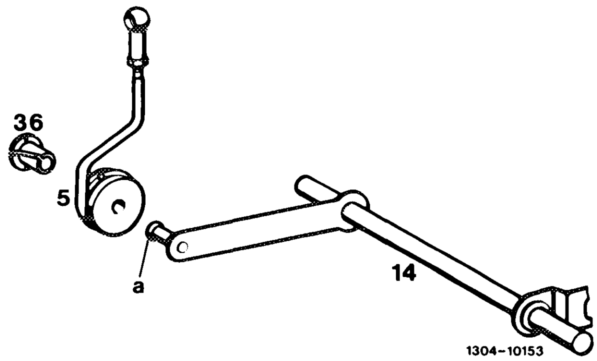
Adjusting value in mm

Length of pushrod (5)	105

Note

Since February 1981, pushrod (5) is mounted with a bearing bushing and collar (36) on front wall regulating shaft (14).

Subsequent installation is possible as follows:



Installation: February 1981

Model	Engine	Chassis end No.
107.022	110.986	009866
107.042		010249

1 Slightly grease knob bolt (a) with Molykote-Longterm 2.

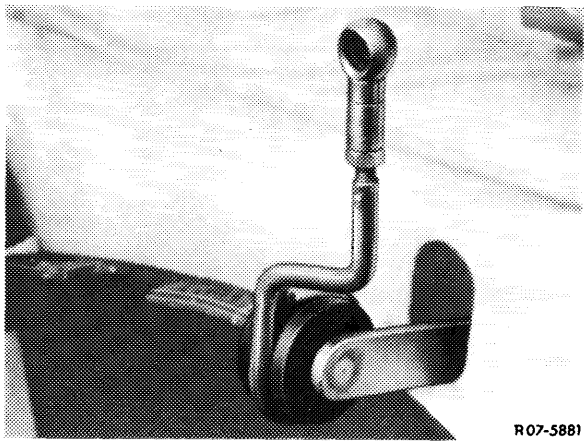
2 Insert bearing bushing with collar (36) in pushrod (5) and press pushrod on knob bolt (a). Pay attention to correct seat of bearing bushing.

Removal

1 Push regulating rod with damping ring from lever of regulating shaft.

2 Remove accelerator pedal (30–330).

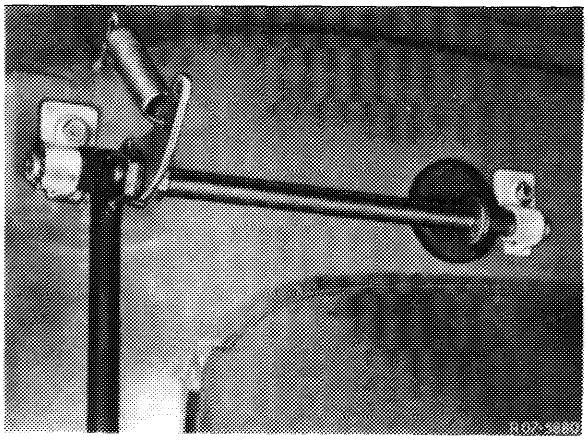
3 Remove heater box (83–100).



R07-5881

4 Disconnect restoring spring and unscrew fastening screws from plastic bearings.

5 Push out plastic bearings in upward direction and remove regulating shaft with bearing.



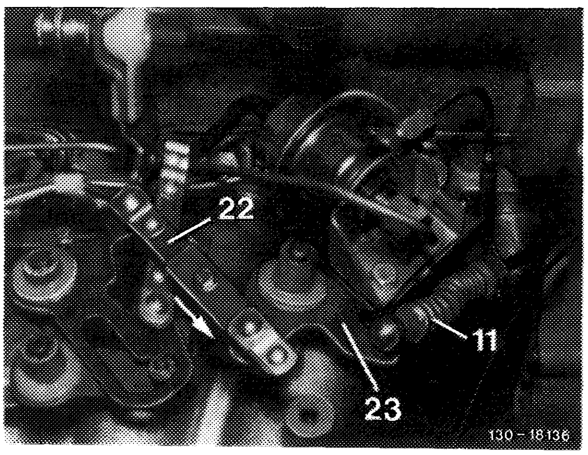
Installation

For installation proceed vice versa, while attaching restoring spring to inner hole.

Grease bearing points as well as ball sockets of regulation with Molykote-Longterm 2.

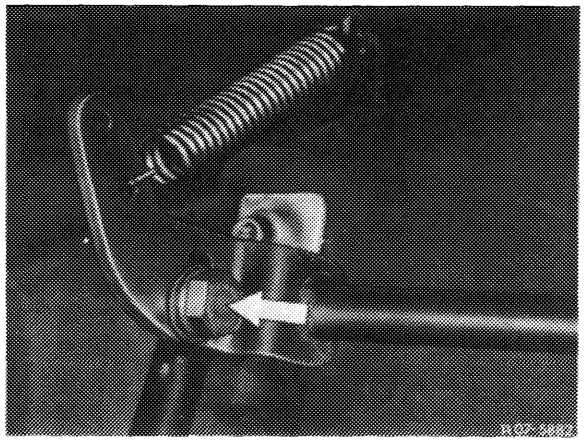
Checking and adjusting full throttle stop

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.



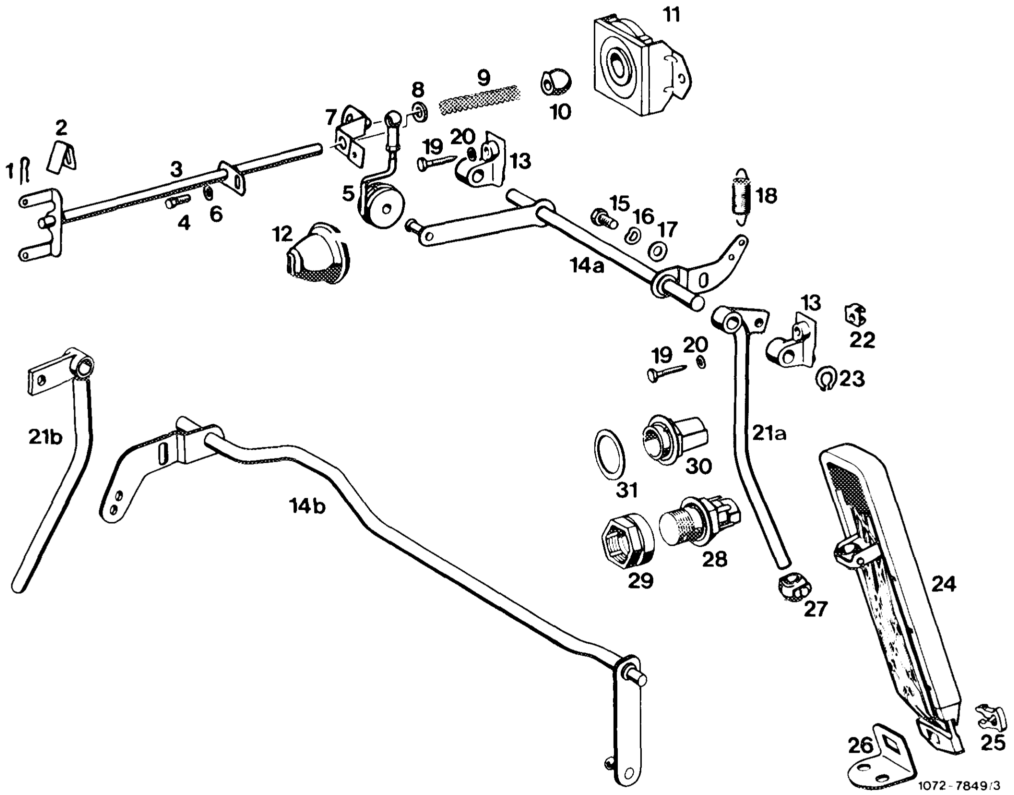
6 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.

If the full throttle or idle speed stop is not attained with this adjustment, set pushrod from longitudinal regulating shaft to accelerator pedal to 105 mm length, measured from center of ball socket to center of damping ring (refer to Fig. item 1).



Chassis regulation

Model 107



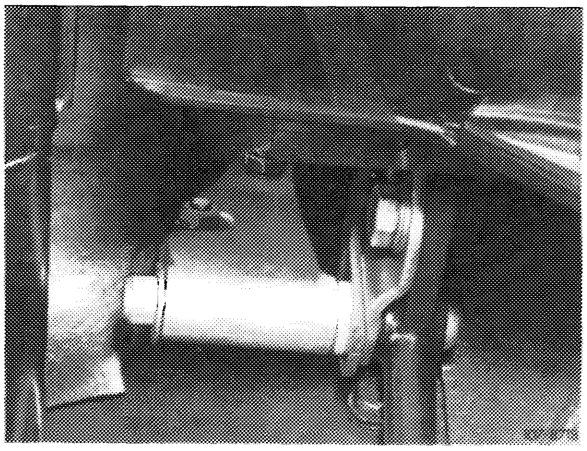
1 Lock
2 Spring
3 Longitudinal regulating shaft
4 Hex. screw
5 Pushrod
6 Washer
7 Guide lever for full throttle adjustment
8 Plastic spacer ring
9 Compression spring
10 Plastic ball
11 Bearing for longitudinal regulating shaft
12 Hex. screw
13 Bearing
14a Front wall regulating shaft lefthand steering
14b Front wall regulating shaft righthand steering
15 Hex. screw
16 Corrugated washer
17 Washer
18 Restoring spring
19 Screw
20 Washer
21a Accelerator lever lefthand steering
21b Accelerator lever righthand steering
22 Cage nut
23 Lock
24 Accelerator pedal
25 Clip
26 Fastening plate
27 Joint
28 Transition switch (kickdown)
29 Adjusting nut
30 Full throttle stop
31 Washer

B. Model 116

Adjusting value in mm

Length of connecting rod from accelerator pedal to guide lever	122
Length of pushrod (5)	68

Removal



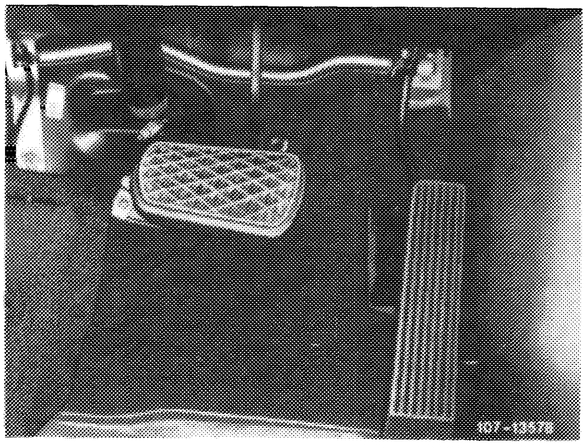
1 Remove accelerator pedal (07.3–330).

2 Disconnect connecting rod.

3 Disconnect restoring spring, unscrew fastening nuts from bearing bracket and remove regulating shaft with bearing bracket.

Lefthand steering

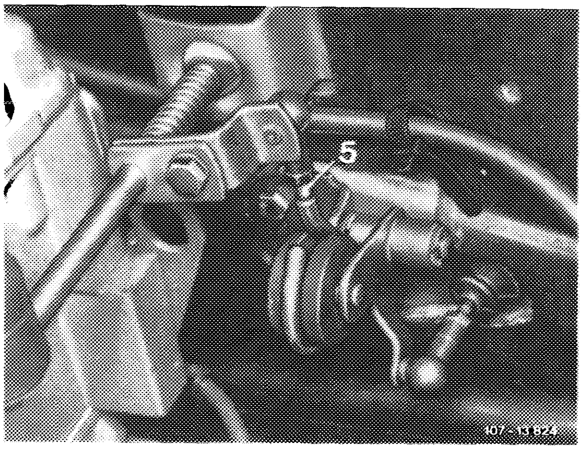
Installation



4 For installation proceed vice versa, while connecting restoring spring to inner hole. Grease bearing points as well as ball sockets of regulation with Molykote-Longterm 2.

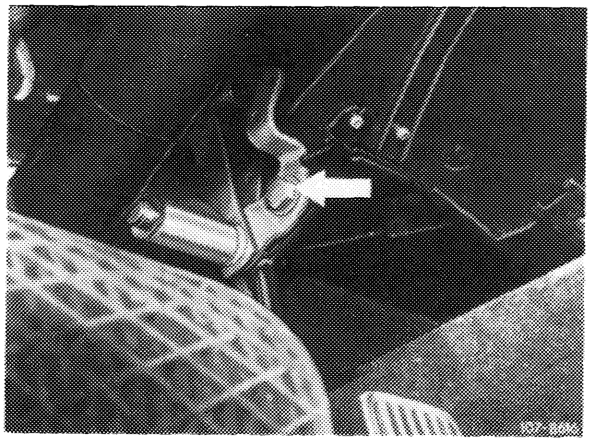
Righthand steering

Checking and adjusting full throttle stop



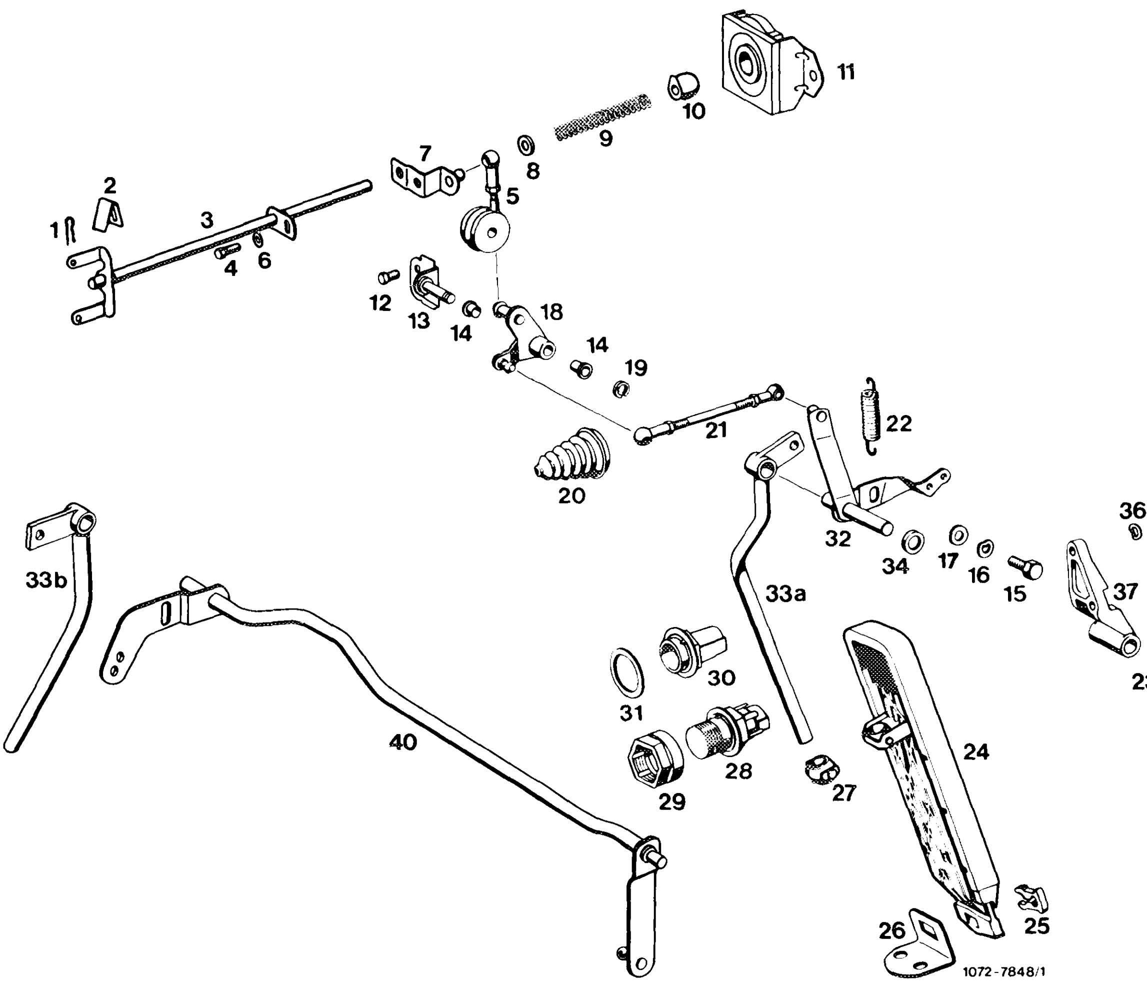
5 With engine stopped, step on accelerator from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.
If the full throttle or idle speed stop is not attained with this adjustment, adjust pushrod (5) from longitudinal regulating shaft to accelerator pedal to 68 mm in length, measured from center of ball socket to center of damping ring.

If the full throttle or idle speed stop is not attained with this adjustment, adjust connecting rod from guide lever engine compartment to accelerator pedal to 122 mm, measured from center of ball socket to center of ball socket. If required, adjust regulating lever inside vehicle. For this purpose, loosen fastening screw (arrow), pull accelerator pedal slightly in upward direction and tighten fastening screw again.



Chassis regulation

Model 116



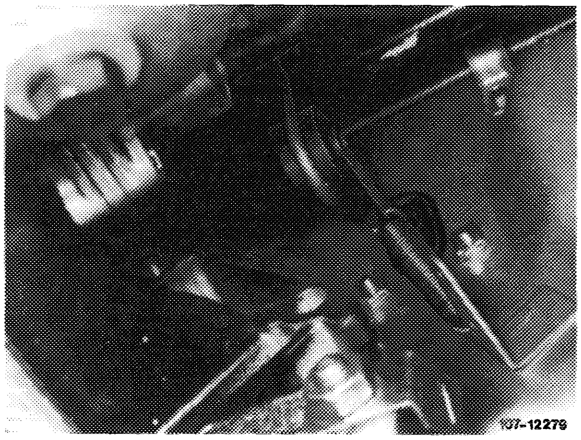
1 Lock
2 Spring
3 Longitudinal regulating shaft
4 Hex. screw
5 Pushrod
6 Washer
7 Guide lever for full throttle adjustment
8 Plastic spacer ring
9 Compression spring
10 Plastic ball
11 Bearing for longitudinal regulating shaft
12 Hex. screw
13 Bearing
14 Plastic bushing
15 Hex. screw
16 Corrugated washer
17 Washer
18 Guide lever
19 Lock
20 Rubber grommet
21 Connecting rod
22 Restoring spring
23 Lock
24 Accelerator pedal
25 Clip
26 Fastening plate
27 Joint
28 Kickdown switch
29 Adjusting nut
30 Full throttle stop
31 Washer
32 Guide lever
33a Accelerator lever lefthand steering
33b Accelerator lever righthand steering
34 Plastic spacer ring
40 Front wall regulating shaft righthand steering

C. Model 123

Removal

1 Remove accelerator pedal (07.3–330).

2 Disconnect restoring spring and pushrod.

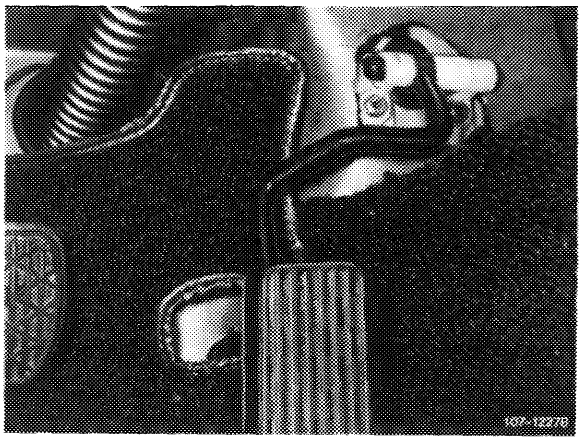


3 Unscrew plastic bearing inside vehicle and remove shaft by turning.

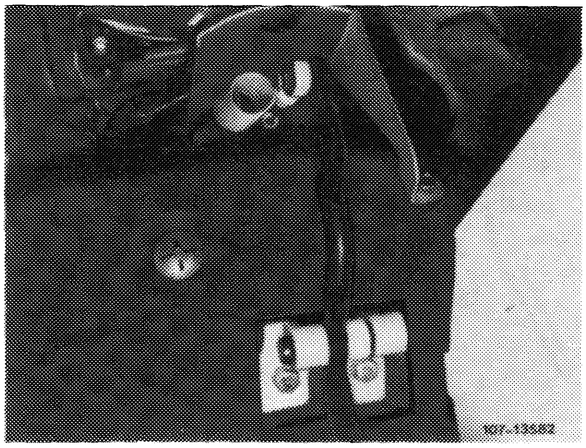
Installation

4 For installation proceed vice versa, while connecting restoring spring to inside hole. Grease bearing points as well as ball socket of regulation with Molykote-Longterm 2.

Lefthand steering

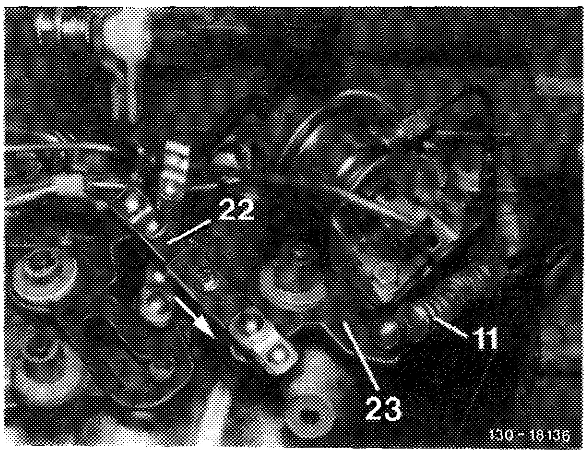


Righthand steering



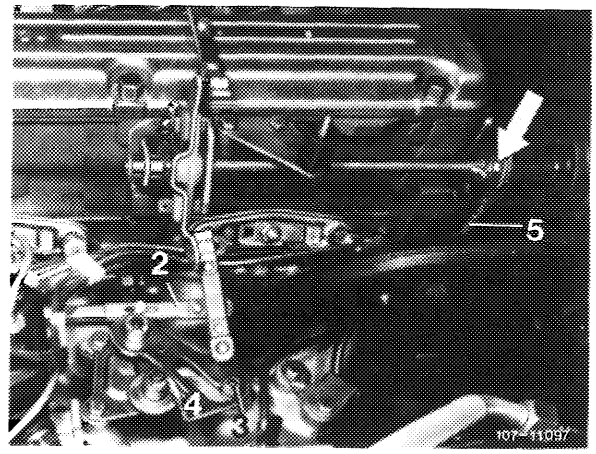
Checking and adjusting full throttle stop

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.



5 With the engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.

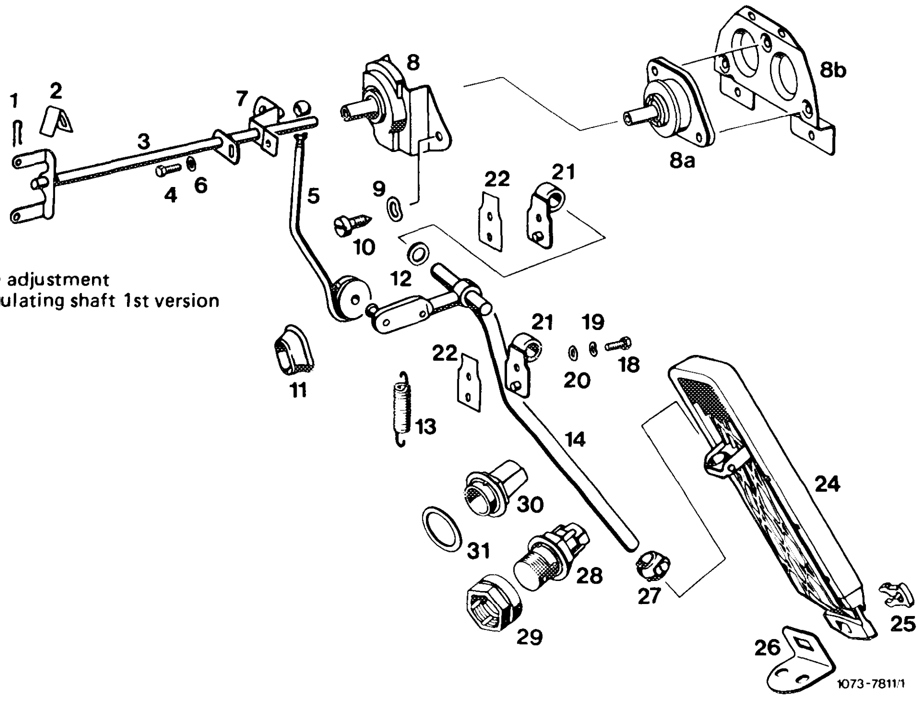
If the full throttle or idle speed stop is not attained with this adjustment, adjust pushrod (5) from longitudinal regulating shaft to accelerator pedal to 186 mm length, measured from center of ball socket to center of damping ring.



Chassis regulation

Model 123

1 Lock
2 Spring
3 Longitudinal regulating shaft
4 Hex screw
5 Pushrod
6 Washer
7 Guide lever for full throttle adjustment
8 Bearing for longitudinal regulating shaft 1st version
8a Bearing 2nd version
8b Fastening plate 2nd version
9 Corrugated washer
10 Screw
11 Rubber grommet
12 Plastic spacer ring
13 Restoring spring
14 Accelerator lever
18 Hex. screw
19 Corrugated washer
20 Washer
21 Bearing
22 Gasket
24 Accelerator pedal
25 Clip
26 Fastening plate
27 Joint
28 Kickdown switch
29 Adjusting nut
30 Full throttle stop
31 Washer



D. Model 126

Adjusting values in mm

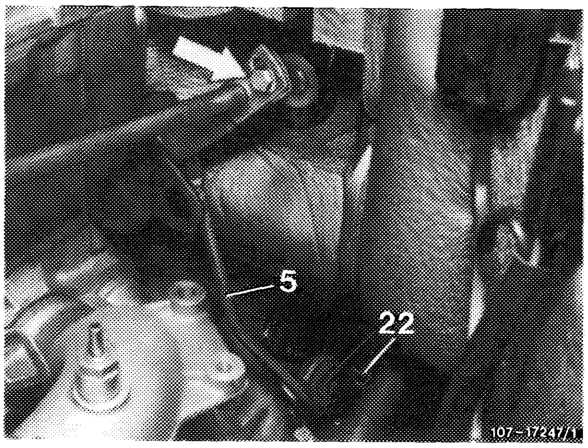
Lefthand steering

Length of pushrod (5) from longitudinal regulating shaft to accelerator pedal	220
Righthand steering	
Length of connecting rod (21) from accelerator pedal to guide lever	172
Length of connecting rod (40)	597

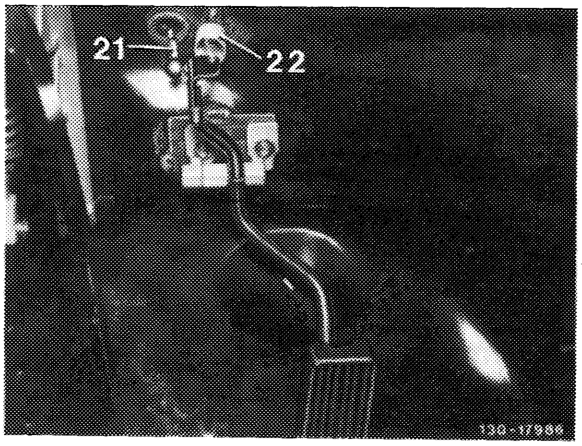
Removal

1 Disconnect restoring spring (22) and push off connecting rod (5 or 21).

2 Remove accelerator pedal (30–330).

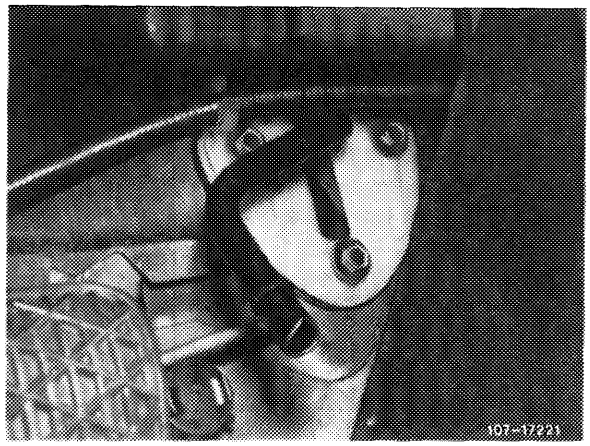


Lefthand steering

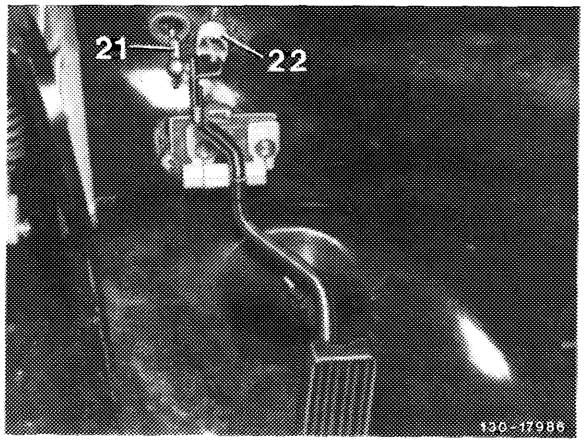


Righthand steering

3 Unscrew fastening screws on bearing bracket, remove bearing bracket and accelerator lever.



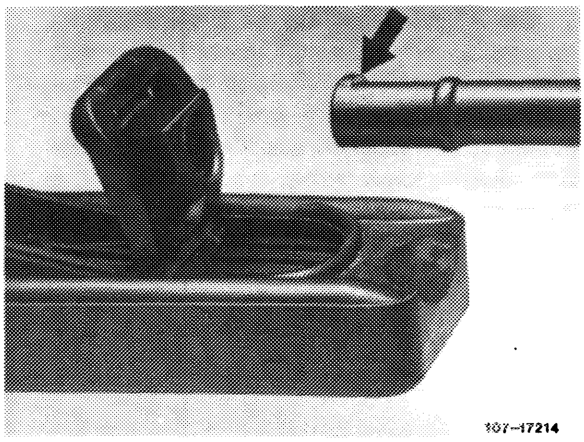
Lefthand steering



Righthand steering

Installation

4 For installation proceed vice versa.



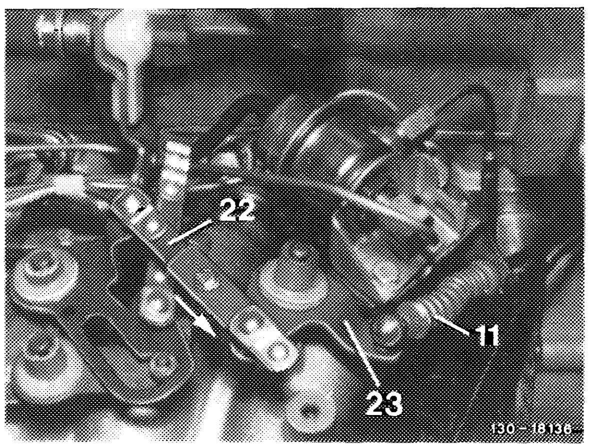
Grease bearing points as well as ball sockets of regulation with Molykote-Longterm 2.

The connection from accelerator lever to accelerator pedal is maintenance-free and requires no lubrication.

Checking and adjusting full throttle stop

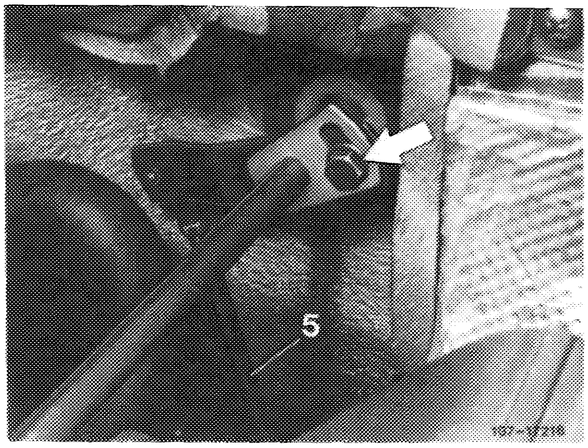
Lefthand steering

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.



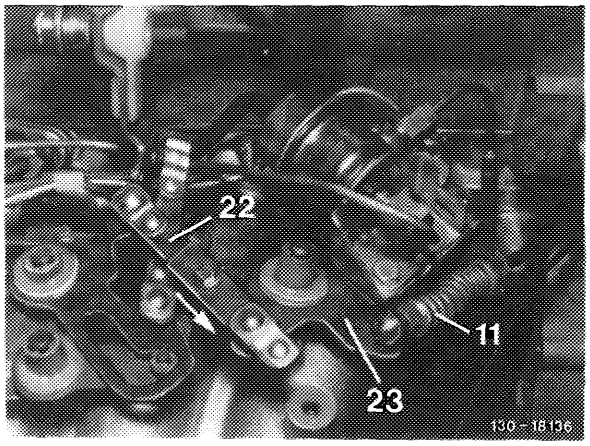
5 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.

If the full throttle or idle stop is not attained with this adjustment, adjust pushrod (5) from longitudinal regulating shaft to accelerator pedal to 220 mm in length measured from center of ball socket to center of damping ring.

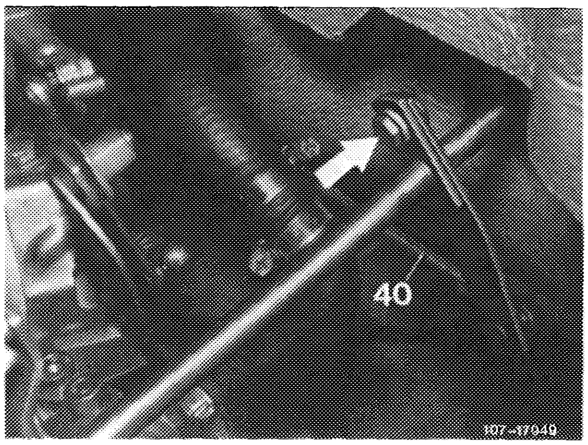


Righthand steering

Attention!
On vehicles with automatic transmission 722.3 (W 4 A 040) disconnect Bowden wire (11) and reconnect after adjusting full throttle stop.

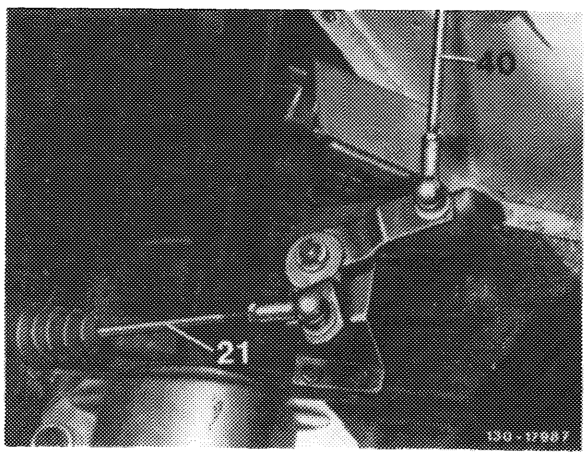


6 With engine stopped, step on accelerator pedal from inside vehicle up to full throttle stop or with automatic transmission up to stop on kickdown switch. Throttle valve lever should rest against full throttle stop. If required, adjust regulating linkage with adjusting screw (arrow) in such a manner that the throttle valve lever rests against full throttle stop.



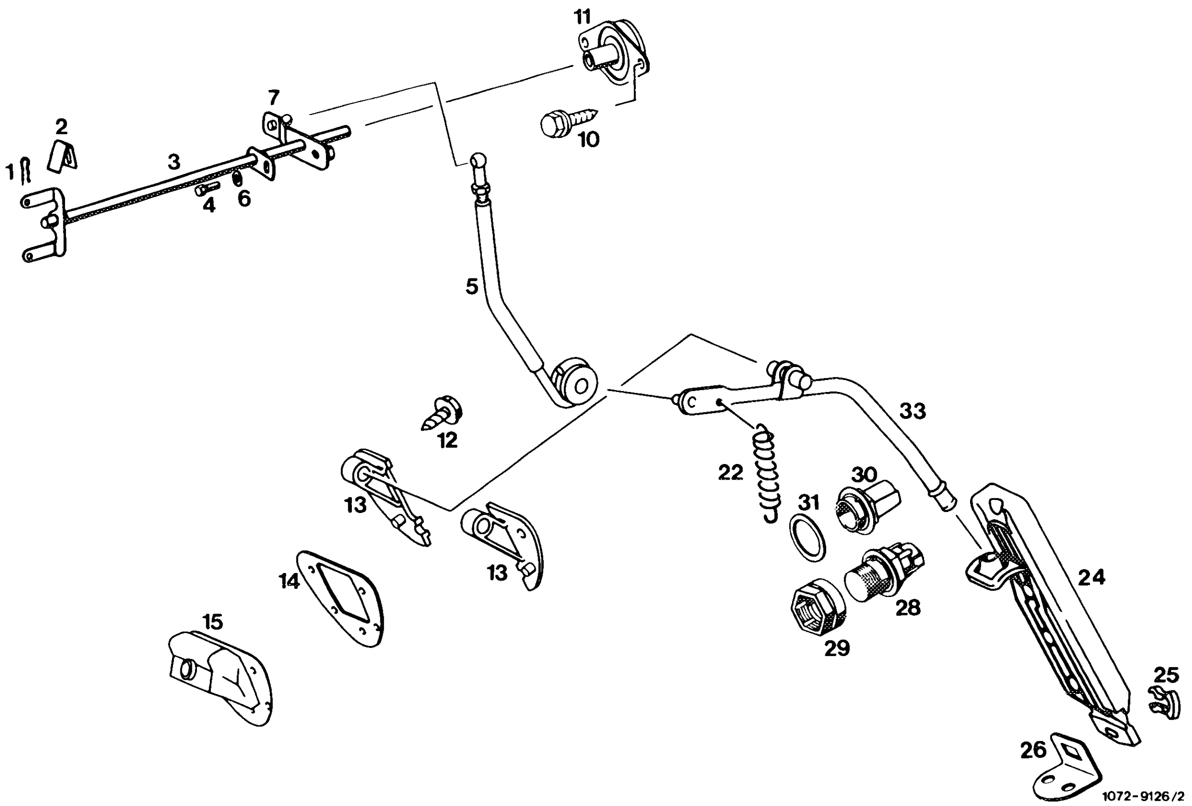
If the full throttle or idle speed stop is not attained with the previous adjustment, adjust connecting rod (21) from guide lever engine compartment to accelerator pedal and connecting rod (40) to specified length, measured from center of ball socket to center of ball socket.

Connecting rod (21) 172 mm
Connecting rod (40) 597 mm



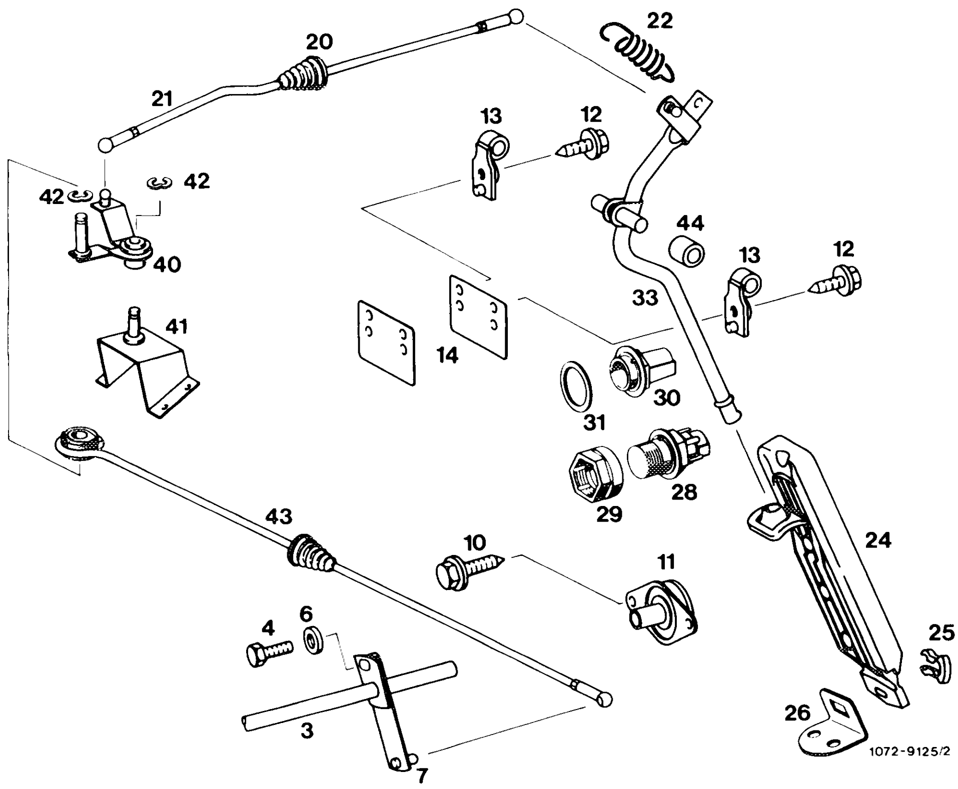
Chassis regulation

Lefthand steering model 126



1 Lock
2 Spring
3 Longitudinal regulating shaft
4 Hex. screw
5 Pushrod
6 Washer
7 Guide lever for full throttle adjustment
10 Hex. screw
11 Bearing for longitudinal regulating shaft
12 Hex. screw
13 Bearing
14 Intermediate plate
15 Rubber sleeve
22 Restoring spring
24 Accelerator pedal
25 Clip
26 Fastening plate
28 Kickdown switch
29 Adjusting nut
30 Full throttle stop
31 Washer
33 Accelerator lever

Righthand steering model 126

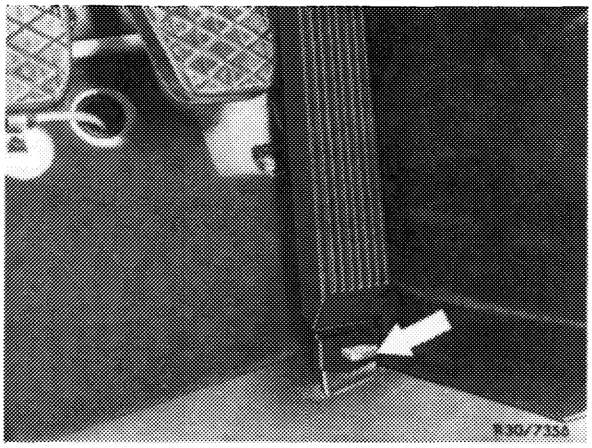


3	Longitudinal regulating shaft	24	Accelerator pedal
4	Hex. screw	25	Clip
5	Pushrod	26	Fastening plate
6	Washer	28	Kickdown switch
7	Guide lever for full throttle adjustment	29	Adjusting nut
10	Hex. screw	30	Full throttle stop
11	Bearing for longitudinal regulating shaft	31	Washer
12	Hex. screw	33	Accelerator lever
13	Bearing	40	Guide lever
14	Intermediate plate	41	Bearing bracket
15	Rubber sleeve	42	Lock
20	Rubber sleeve	43	Connecting rod
21	Connecting rod	44	Spacer sleeve
22	Restoring spring		

A. Models 107, 116, 123

Removal

1 Compress expanding clip (arrow) behind accelerator pedal and pull out.



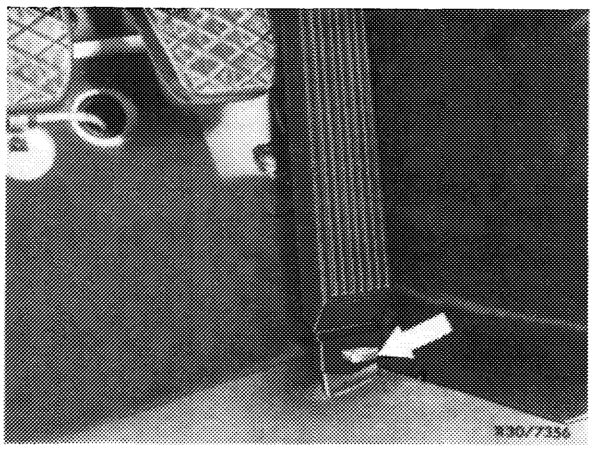
Installation

2 During installation, make sure that expanding clip is securely engaging.

B. Model 126

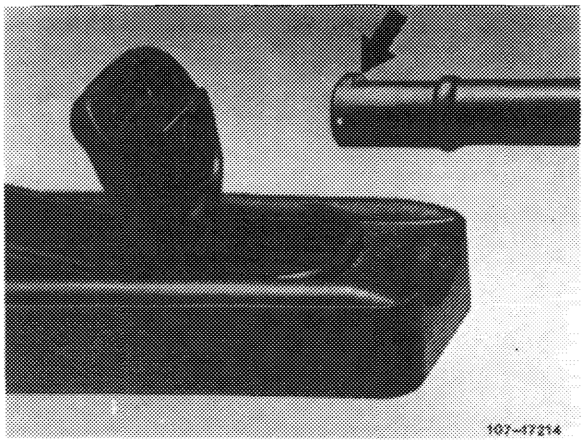
Removal

1 Compress expanding clip (arrow) behind accelerator pedal and pull out.



2 Push accelerator pedal up and turn around by 180°.

3 Pull off accelerator pedal in downward direction, lug (arrow) on accelerator lever should be in alignment with groove in accelerator pedal.



Installation

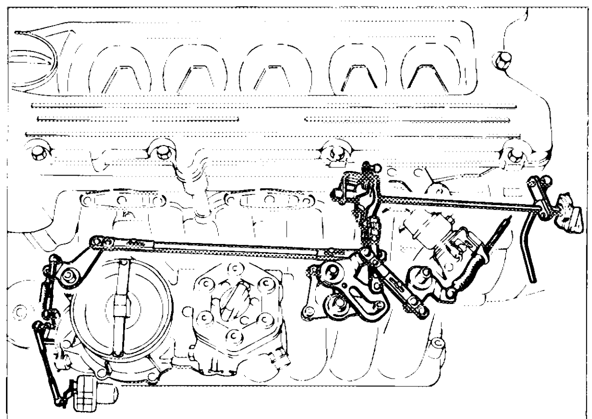
4 For installation proceed vice versa, making sure that the expanding clip is securely engaging.

The connection from accelerator lever to accelerator pedal is maintenance-free and requires no lubrication.

Following each car wash and preservation of engine compartment, lubricate **all bearing points of all regulating shafts, regulating levers, joints of regulating linkage and cable controls by means of an oil can.**

On **USA version** vehicles only the following hydraulic fluids may be used:

BP Aero-Hydraulik 1
Castrol DB Hydraulik Fluid
Esso Univers J-13
Mobil Aero HFA
Shell Aero Fluid 4


1073-9107

Filling capacities in liters

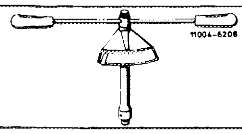
Model	107	116	123.03/05	123.09	126
Full readout	approx. 85	approx. 96	approx. 80	approx. 70	approx. 90
Warning lamp – reserve	approx.11,5	approx. 13	approx.11,5	approx. 11	approx.12,5

Tightening torques Nm

Fastening screws or fastening nuts for fuel tank	17–25			26–34	17–25
Immersion tube transmitter	35–43				
Fuel strainer					
Suction hose	24–32				
Return hose					31–39

Special tool

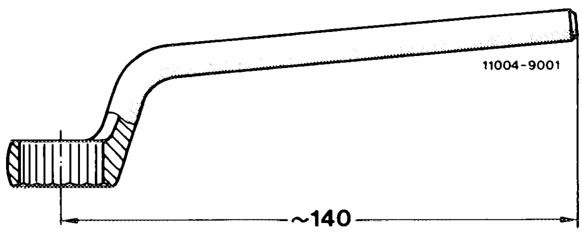
Torque wrench, double-arm, 15–63 Nm



00 589 27 21 00

Self made tool – model 126

Conventional, offset box-end wrench (SW 19), length according to drawing



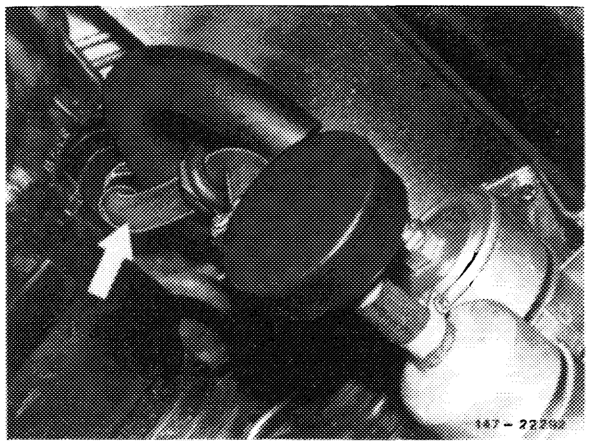
Attention!
When removing fuel tank, pay attention to safety rules.

Removal

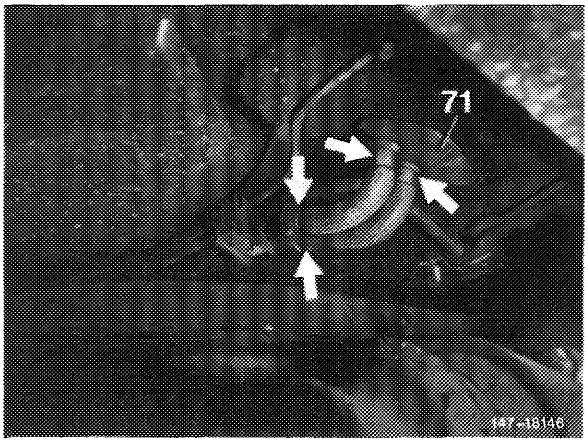
1 Disconnect grounding line on battery.

2 Drain fuel tank. Carefully pump out fuel, so that no residual fuel remains in fuel tank.

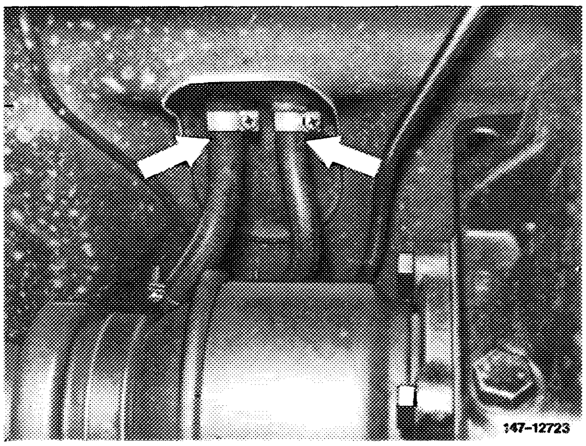
3 Loosen suction hose, fuel return hose and vent hose. Catch residual fuel from hoses. Close hoses and connections.



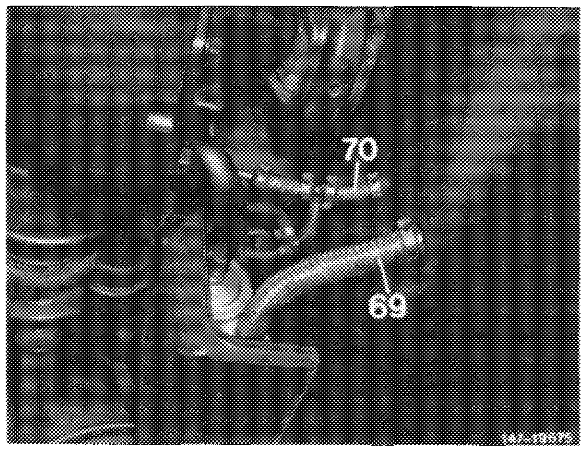
Model 107, 116, 123
Suction hose



Model 107.02
Vent and return flow hose

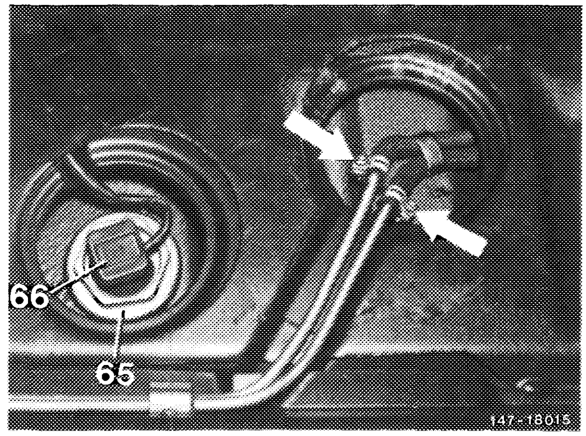


Model 116, 123.03/05
Vent and return flow hose



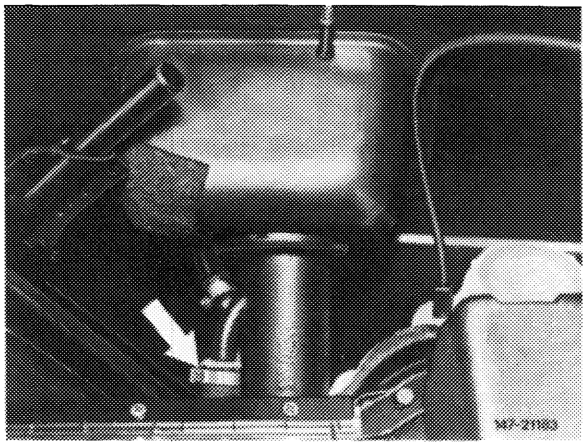
Model 123.09
69 Suction hose
70 Return flow hose

4 On T-sedan, remove luggage compartment floor and intermediate compartment. Pull off vent hoses (arrows) and coupling (66).

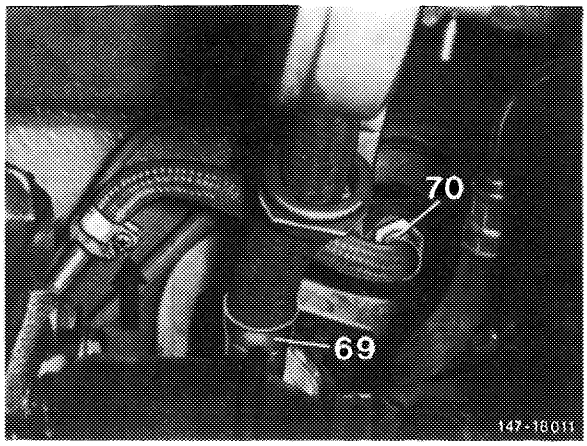


Model 123.09

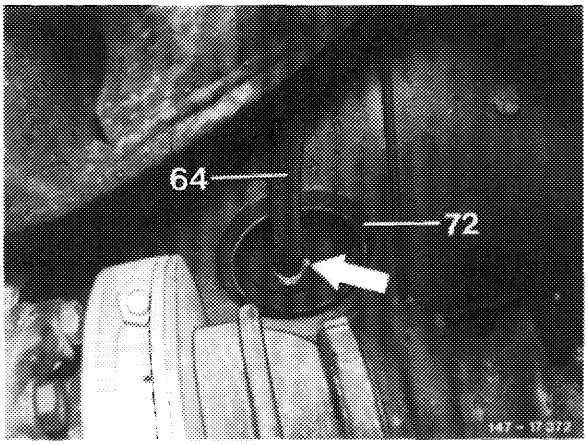
5 Loosen hose clamp (arrow) and pull off vent hose. Close hose and pipe connection.



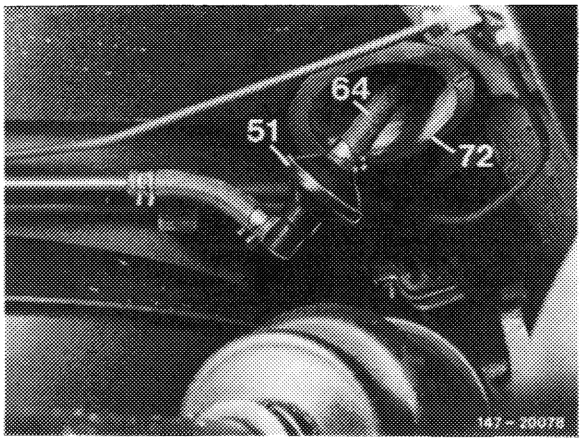
Model 123.09
Vent hose



Model 126
69 Suction hose
70 Return flow hose



Model 126
64 Vent hose



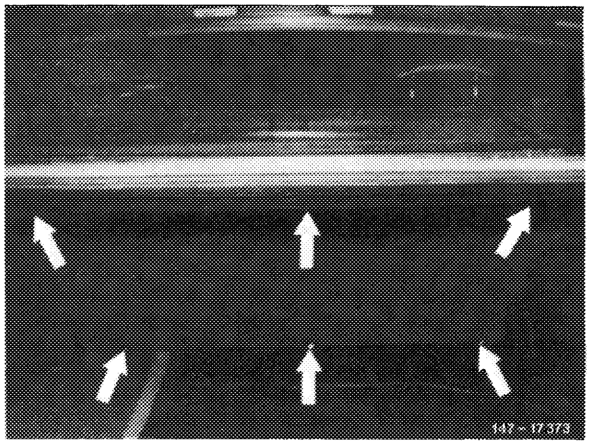
Model 126 (J)

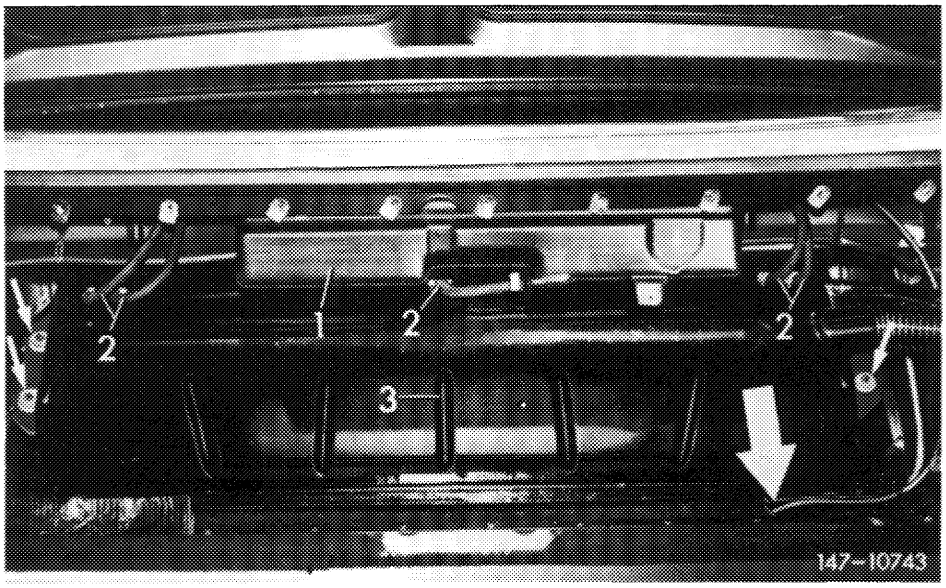
51 Vent valve
64 Vent hose
72 Sealing sleeve

6 Remove luggage compartment mat.

7 Unscrew rear wall and remove.

8 On model 107.04, remove fuel expansion tank (1) (47–705).





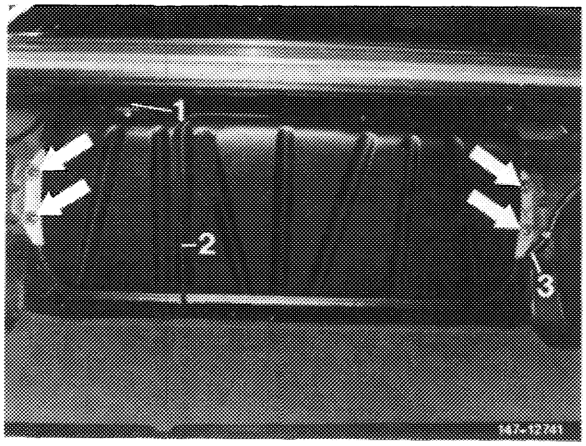
Model 107.04

1 Fuel expansion tank
2 Fuel hoses
3 Fuel tank
Arrow = Vent line

9 Unscrew fastening nuts.

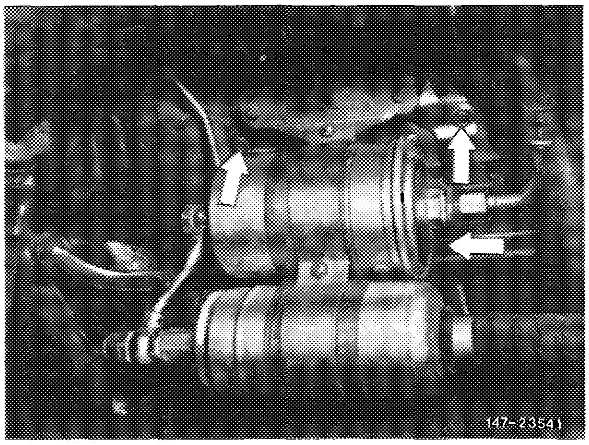
10 Slightly pull out fuel tank and pull off coupling for fuel readout on immersion tube transmitter.

11 Remove fuel tank.



1 Coupling immersion tube transmitter
Arrows = Fastening nuts

Note: On T-sedans, for removing fuel tank remove protective casing for pump assembly. Then unscrew the three fastening screws (arrows) for combination holder pump assembly/fuel tank. Disconnect harness for fuel pump at edge of fuel tank.

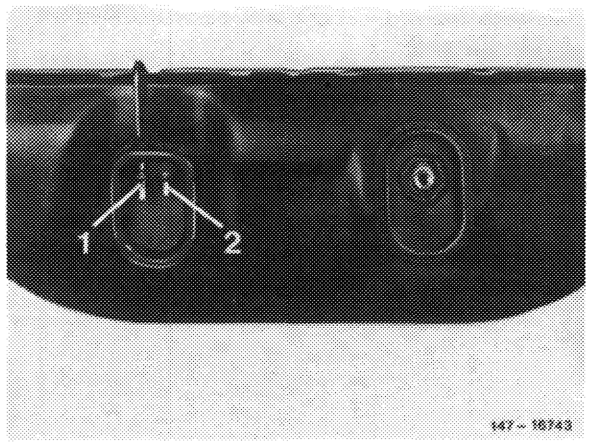


Model 123.09

Installation

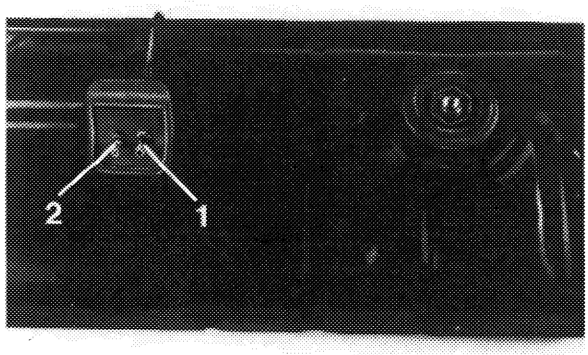
12 Install fuel tank in vice versa sequence, proceed as follows:

a) Glue both gaskets to bottom of fuel tank by means of MB universal glue, part No. 000 989 92 71. For installation, coat both gaskets on sealing surface or bead with sliding compound (talcum, wax or the like).



Model 107.02/123

1 Positive and negative vent line
2 Return flow line



Model 116

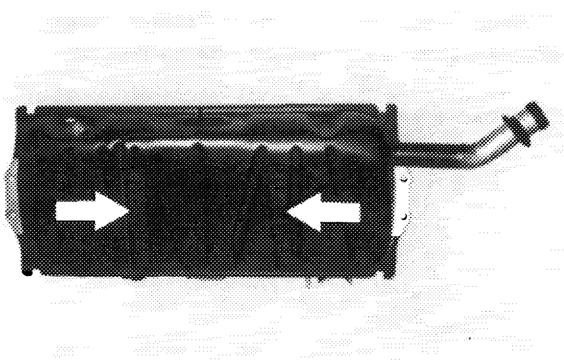
1 Positive and negative vent line
2 Return flow line

147-16744

b) Check whether foam rubber strip on fuel tank is rigidly attached and glue down with MB universal glue, part No. 009 989 02 71, if required.

c) On model 123.09, glue foam rubber strips on fuel tank at level of filler neck crosswise to driving direction.

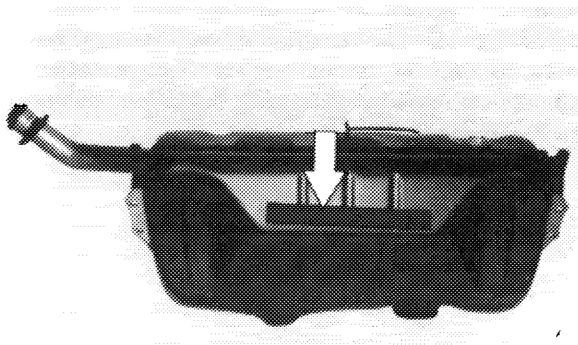
Note: Never use felt or similar material, since otherwise corrosion damage may occur.



147-18857

d) Blow out strainer (b) and check for damage. Renew sealing ring (a). Install fuel strainer (68) and tighten to 35–43 Nm.

Note: The strainer jacket (b) comprises a square mesh fabric with 0.1 mm mesh width. To prevent mixups, the word "Benzin" (gasoline) is printed on metal section.

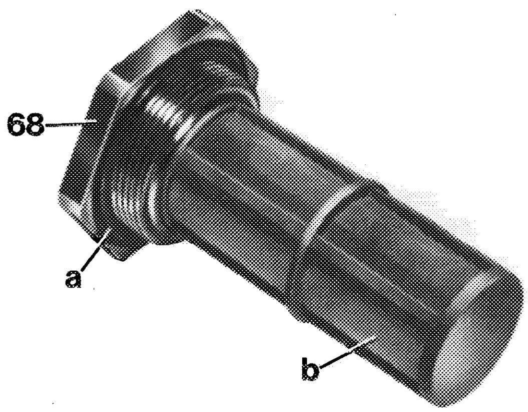


147-18858

e) Install fuel tank with specified reinforcing sheet metal and washers. Tighten fastening nuts to 17–25 Nm.
On model 123.09, tighten self-locking fastening nuts to 26–34 Nm.

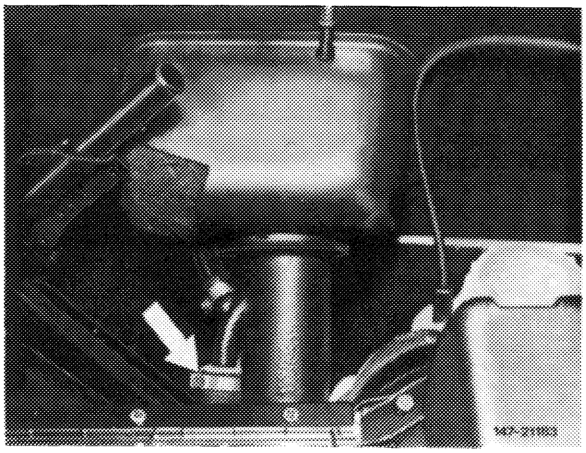
f) Install vent hose (arrow) between fuel tank and filler neck free of kinks and with a continuous slope toward fuel tank.
The slipped-on O-ring serves for sealing at passage toward interior.

g) Pay attention to correct seat of sleeves on filler neck.



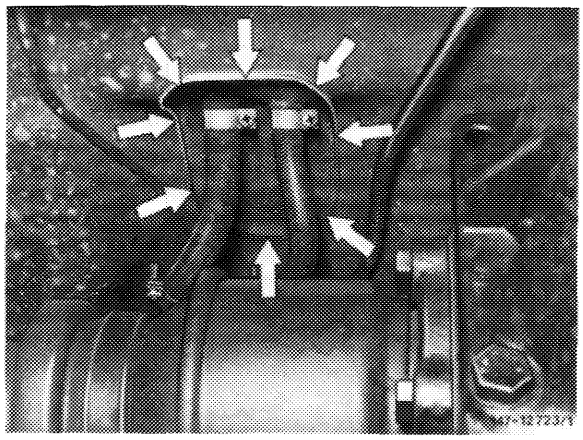
147-17012/1

Model 123.09



147-21183

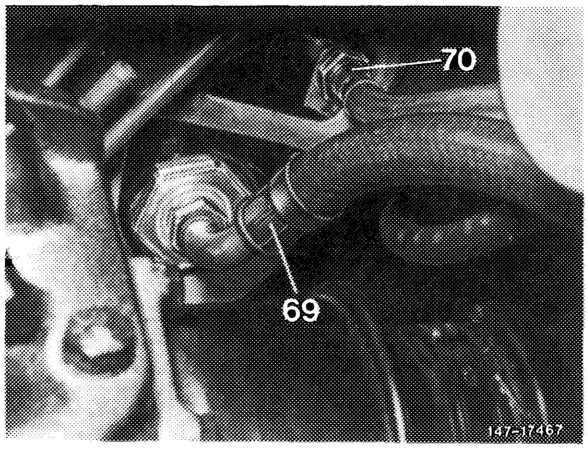
h) On model 123, check seal between fuel tank and rear floor and seal again, if required. For this purpose, carefully apply Unionzement by means of a brush or the like against circumference of opening (arrows).



i) Check fuel hoses and renew, if required.

j) On model 126, renew copper seal between fuel tank and return flow hose (70).

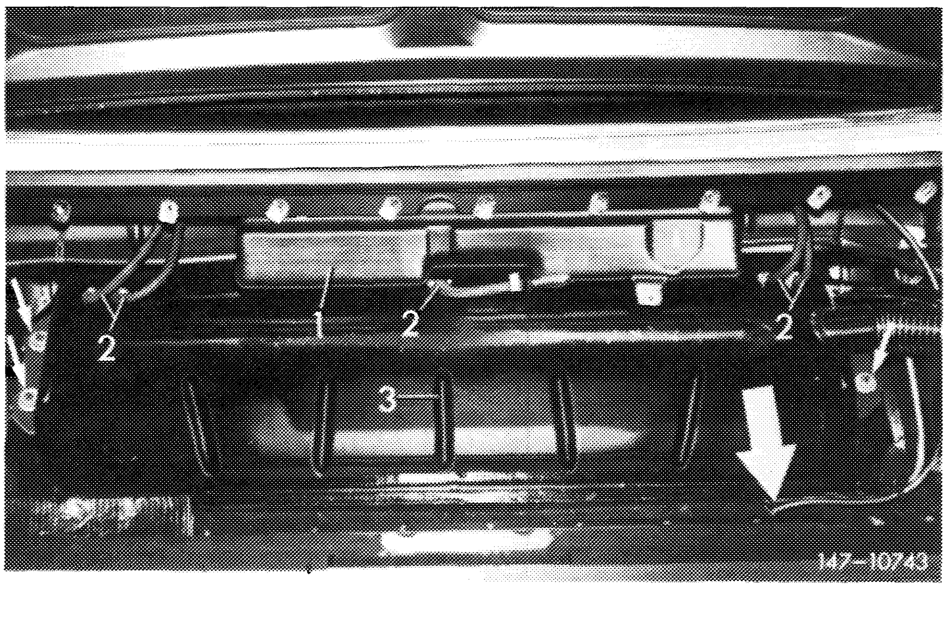
Model 126



k) For installing expansion tank on model 107.04, install vent line behind filler neck first.

l) When tightening hose clamps, apply counterhold to connections of expansion tank.

m) Plug on protective sleeve at end of vent line.



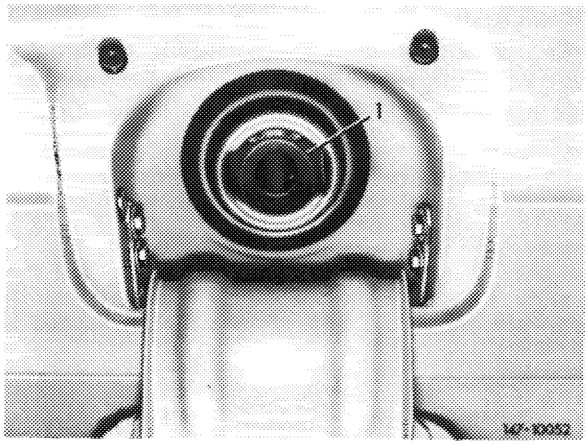
1 Fuel expansion tank
2 Fuel hoses
3 Fuel tank
Large arrow = Vent line

n) Check function of fuel readout (ground connection on battery connected).

o) Check fuel system for leaks.

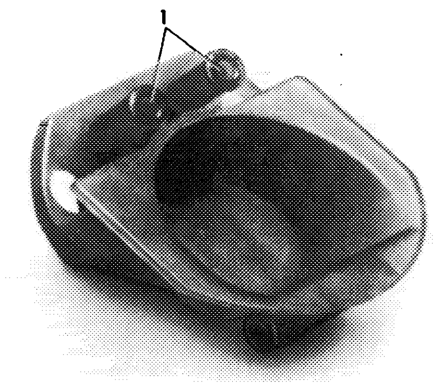
(USA) starting 1977

On these vehicles a guide funnel (1) is installed in filler neck to accommodate the small fuelling guns for lead-free fuel.



147-10032

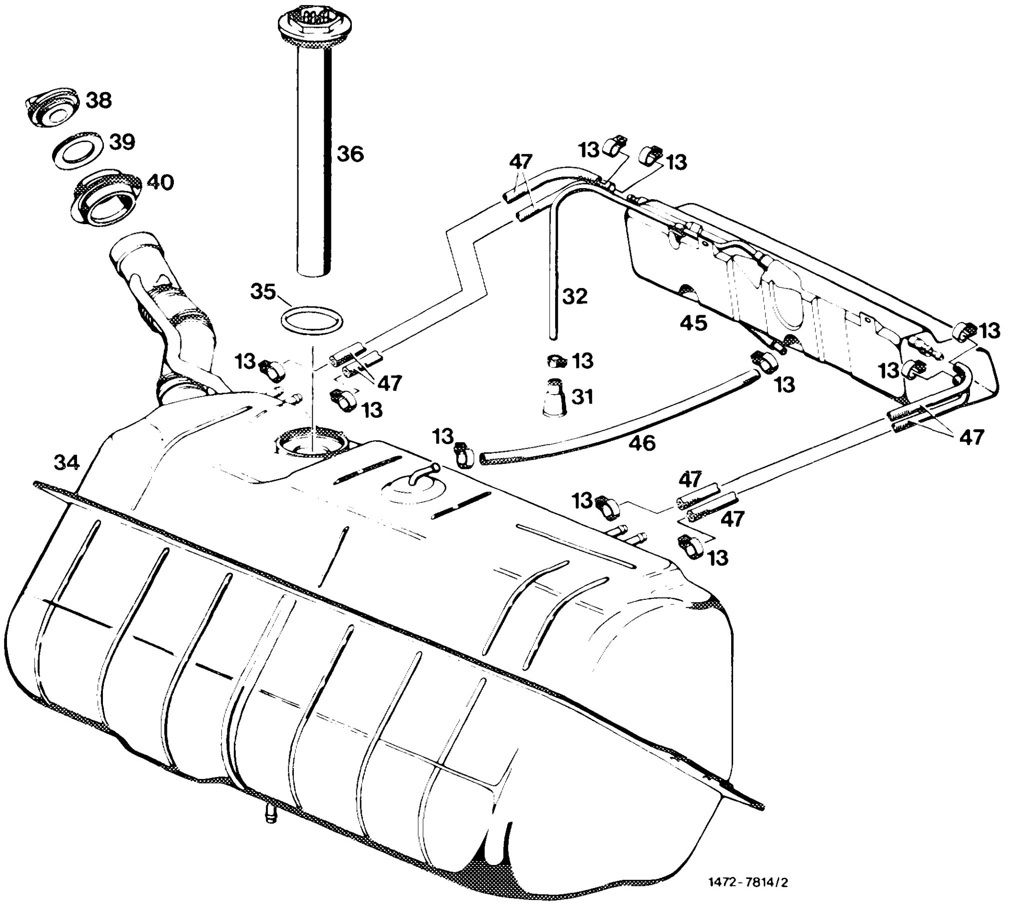
If a fuel tank on these vehicles is renewed, simultaneously install a guide funnel **in USA vehicles only.** For this purpose, prior to assembly of fuel tank, insert guide funnel into filler neck and knock in fastening rivet (1) up to stop by means of a mandrel.



147-10021

Fuel tank positive and negative venting lines

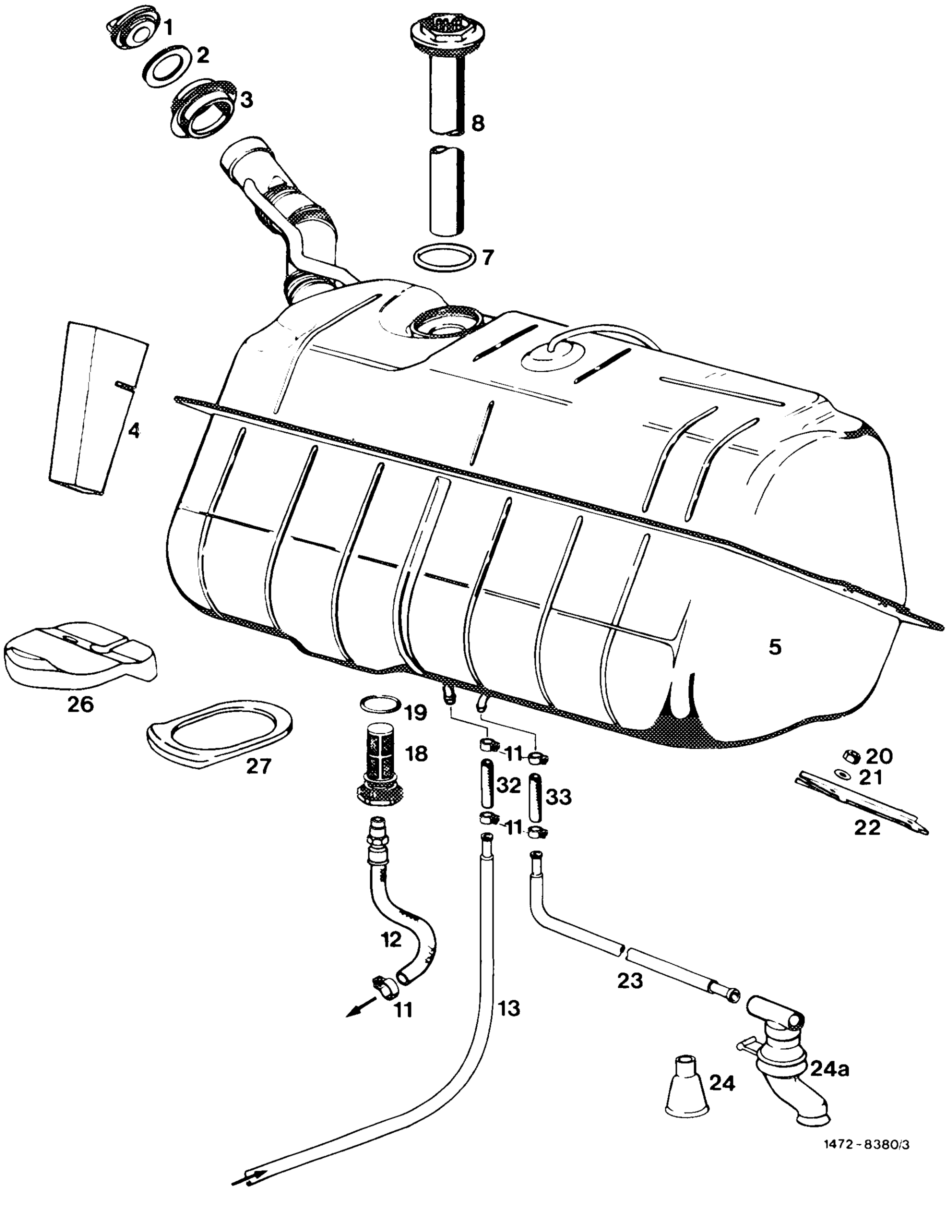
Model 107.04



13	Hose clamps	38	Closing cap
31	Protective sleeve	39	Seal
32	Vent line	40	Rubber grommet
34	Fuel tank	45	Expansion tank
35	Sealing ring	46	Fuel hose
36	Immersion tube transmitter	47	Fuel hose

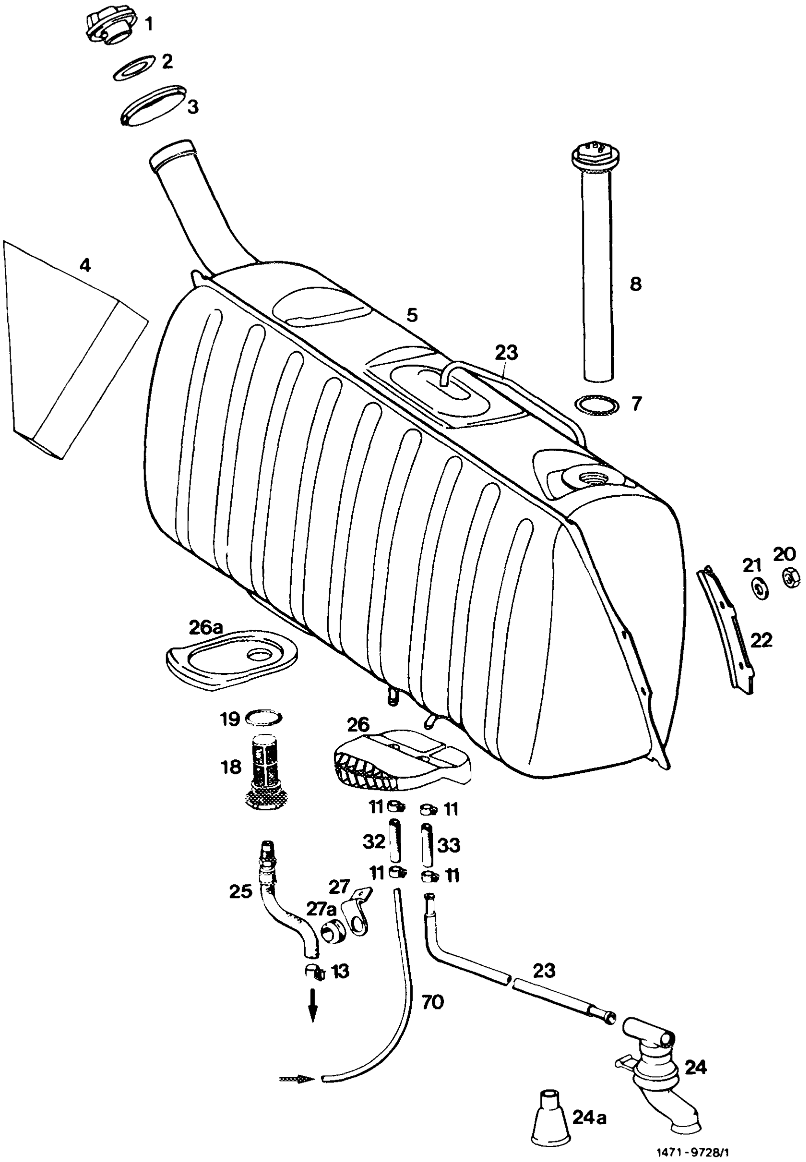
Fuel tank

Model 107.02, 116



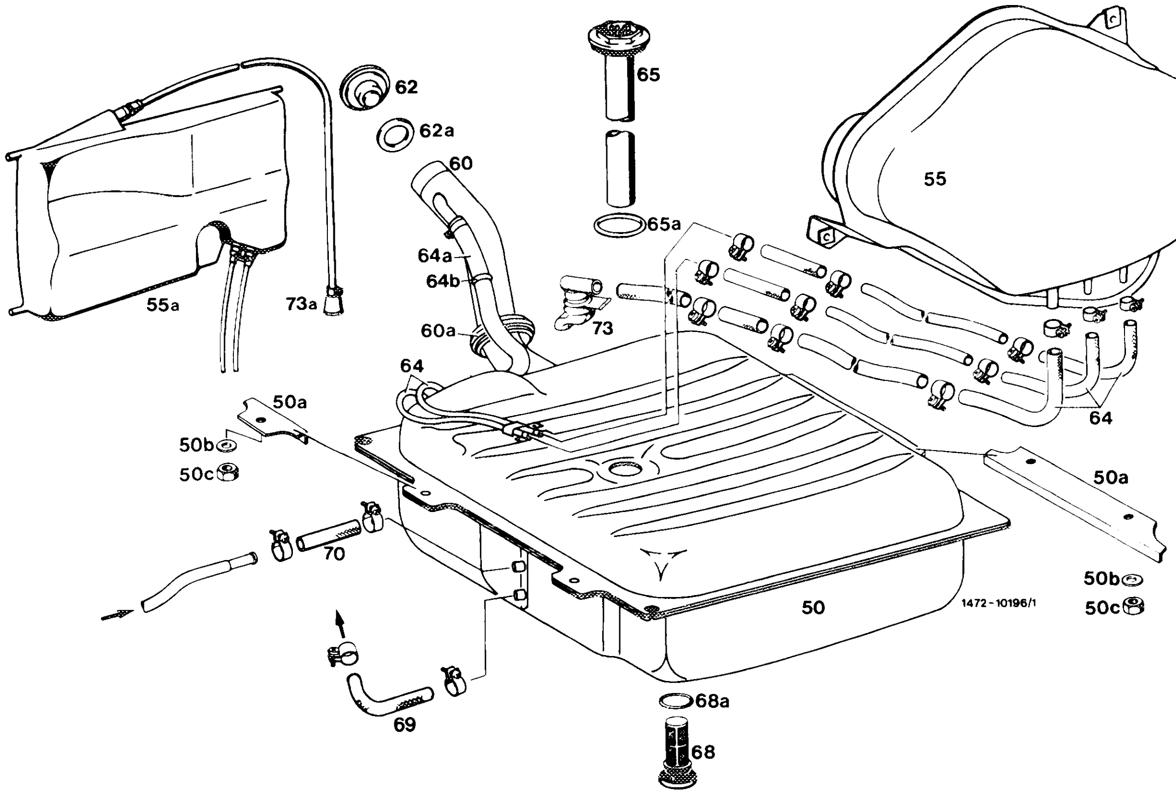
1	Filler cap	12	Fuel feed	24	Vent sleeve 1st version
2	Seal	13	Fuel return flow	24a	Vent sleeve 2nd version
3	Rubber sleeve	18	Fuel strainer	26	Rubber gasket
4	Damping shim	19	Sealing ring	27	Rubber gasket
5	Fuel tank	20	Nut	32	Fuel hose
7	Sealing ring	21	Washer	33	Fuel hose
8	Immersion tube transmitter	22	Reinforcing strip		
11	Hose clamp	23	Vent line		

Fuel system, fuel tank positive and negative vent lines
Model 123 sedan and coupe



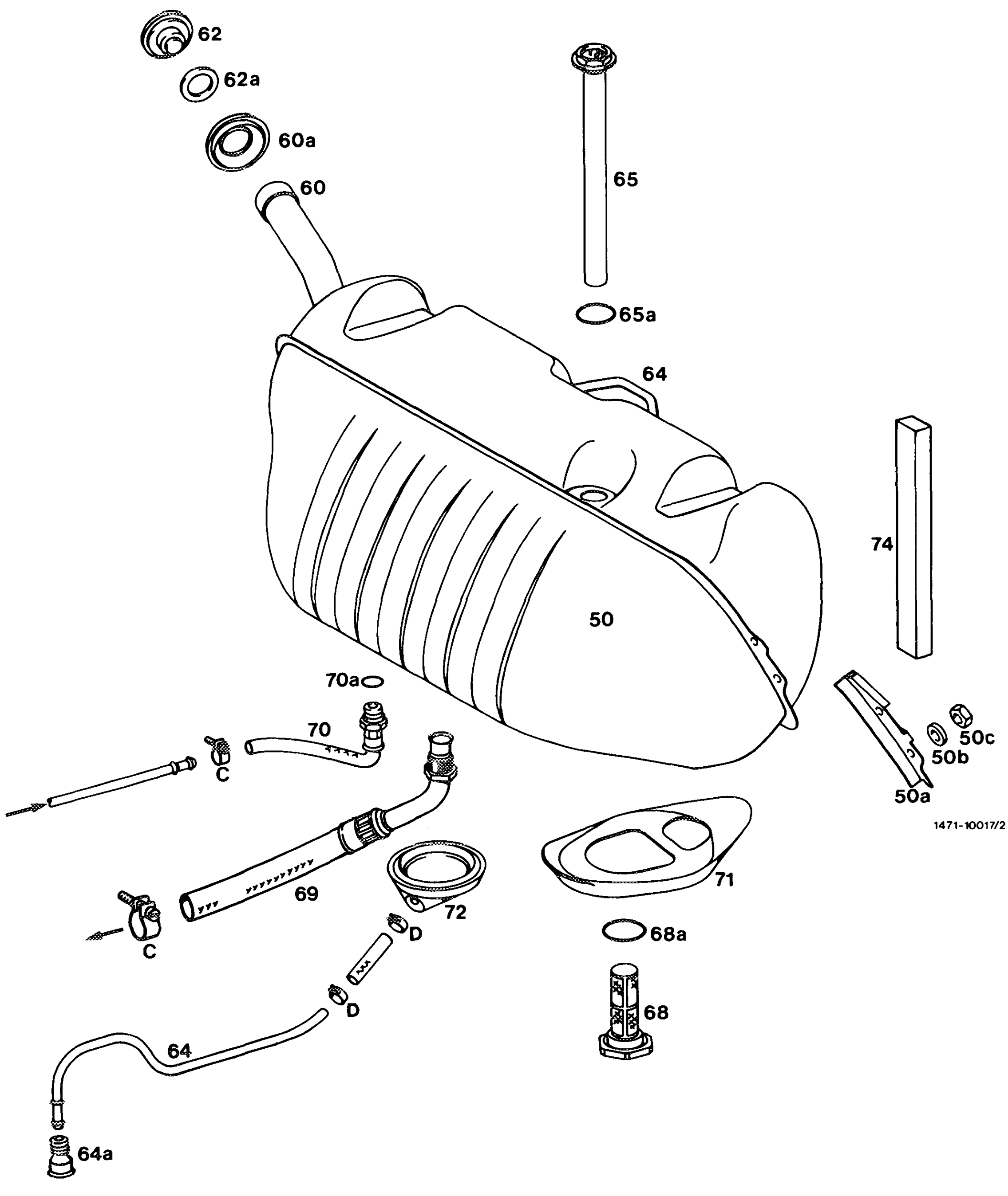
1	Filler cap	18	Fuel strainer	26	Rubber gasket
2	Seal	19	Sealing ring	26a	Rubber gasket
3	Rubber sleeve	20	Nut	27	Holder
4	Damping shim	21	Washer	27a	Grommet
5	Fuel tank	22	Reinforcing strip	32	Fuel hose
7	Sealing ring	23	Vent line	33	Fuel hose
8	Immersion tube transmitter	24	Vent sleeve (2nd version)	70	Fuel return flow line
11	Hose clamp	24a	Vent sleeve (1st version)		
13	Hose clamp	25	Fuel suction hose		

Fuel system, fuel tank positive and negative vent lines
Model 123 T-sedan and special vehicles with special body



50	Fuel tank	60	Filler neck	68	Fuel strainer
50a	Reinforcing sheet metal	60a	Sealing sleeve (2 each)	68a	Sealing ring
50b	Washer	62	Closing cap	69	Feed
50c	Nut, self-locking	62a	Sealing ring	70	Return flow
55	Expansion tank T-sedan and 2nd version Special vehicles with special body	64	Vent lines	73	Vent sleeve 2nd version
		64a	Vent line	73a	Protective sleeve 1st version
		64b	Sealing ring		
55a	Expansion tank 1st version Special vehicles with special body	65	Immersion tube transmitter		
		65a	Sealing ring		

Fuel tank
Model 126



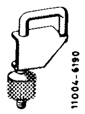
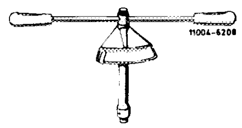
50	Fuel tank	62a	Sealing ring	69	Suction hose
50a	Reinforcing sheet metal	64	Vent line	70	Return flow line
50b	Shim	64a	Protective sleeve	70a	Copper sealing ring
50c	Nut	65	Immersion tube transmitter	71	Gasket
60	Filler neck	65a	Sealing ring	72	Sealing sleeve
60a	Sealing sleeve	68	Fuel strainer	74	Damping shim
62	Closing cap	68a	Sealing ring		

A. Model 114

Filling capacity in liters	J S USA 1973/74	USA 1975/76
Full readout	65	78
Warning lamp reserve approx.	9	9

Tightening torques	Nm	(kpm)
Fastening nuts for fuel tank	20–25	(2–2.5)
Self-locking fastening nuts	26–34	(2.6–3.4)
Fuel drain plug	35–43	(3.5–4.3)

Special tools

Clamp for fuel hose		000 589 40 37 00
Torque wrench, double arm, 1/2" square, 15–65 Nm (150–650 kpcm)		000 589 27 21 00
Torque wrench, double arm, 1/4" square, 4–16 Nm (40–160 kpcm)		000 589 67 21 00

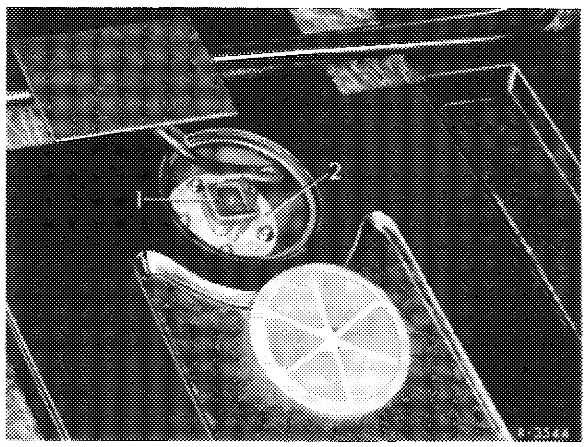
Attention!
When removing fuel tank, pay attention to safety rules.

Removal

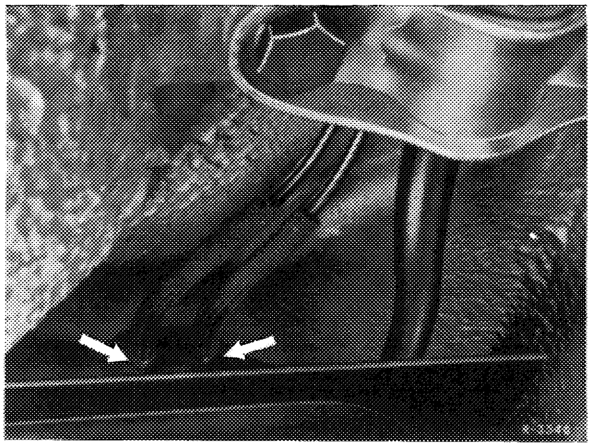
1 Disconnect ground line on battery.

2 Drain fuel tank while unscrewing fuel drain plug (4 in fig. item 5).

3 Pull coupler (1) for fuel readout from immersion tube transmitter (2).

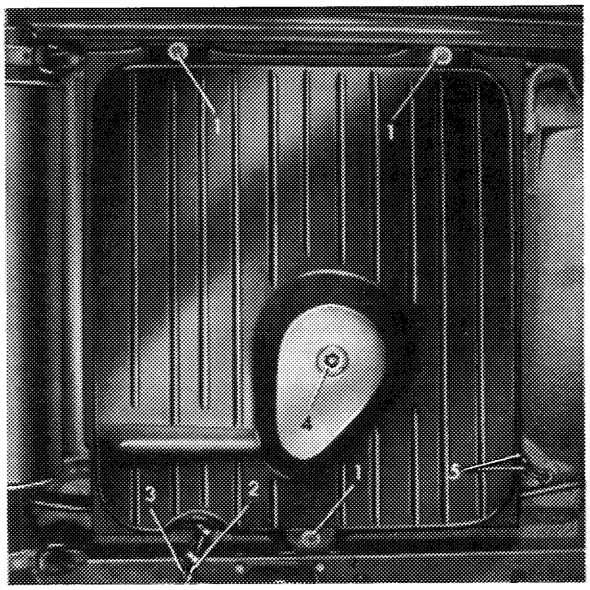


4 Pull off positive and negative venting line on fuel tank (arrows).



5 Pinch fuel hoses (2 and 3) with a clamp. Loosen hose clips and pull fuel hoses from fuel tank.

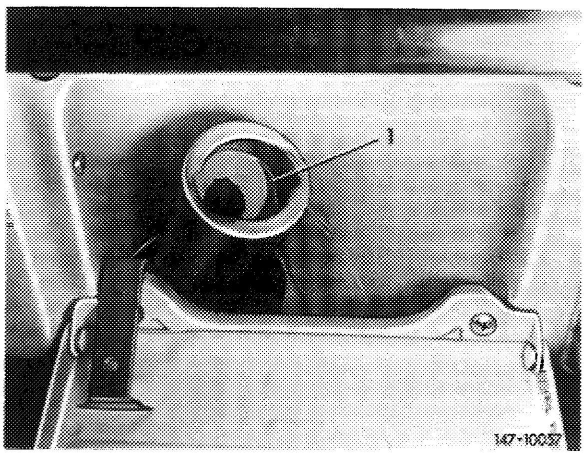
6 Loosen fastening nuts (1) and remove fuel tank.



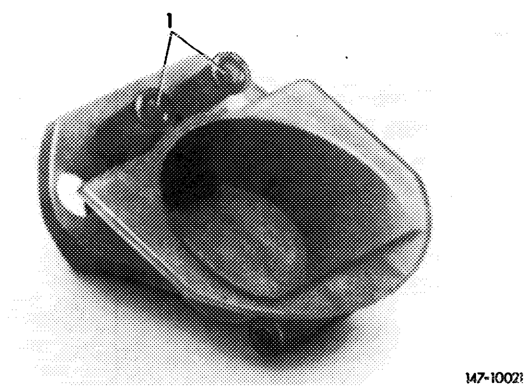
Installation

(USA) 1975/76

Due to the small fuelling guns for lead-free fuel (catalyst operation) on these vehicles, specified in the USA starting model year 1975, a guide funnel (1) is installed in filler neck.



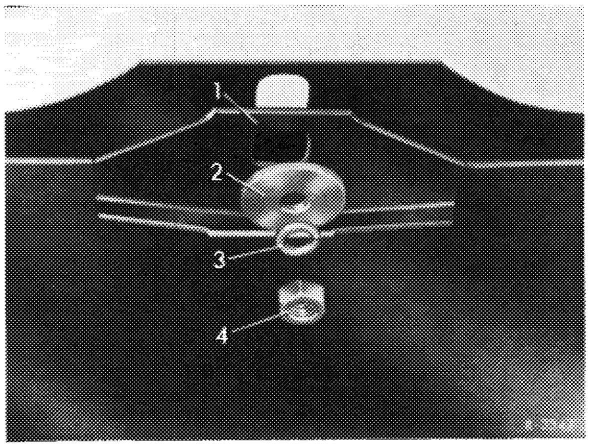
If a fuel tank is replaced on these vehicles, install a guide funnel **in the USA only**. For this purpose, place guide funnel into filler neck prior to installation of fuel tank and knock-in fastening rivets up to stop by means of a punch.



1 Fastening rivets

Install fuel tank in reverse order. Pay attention to the following items:

7 Mount fuel tank with reinforcing panels (1) and washers (2) provided.

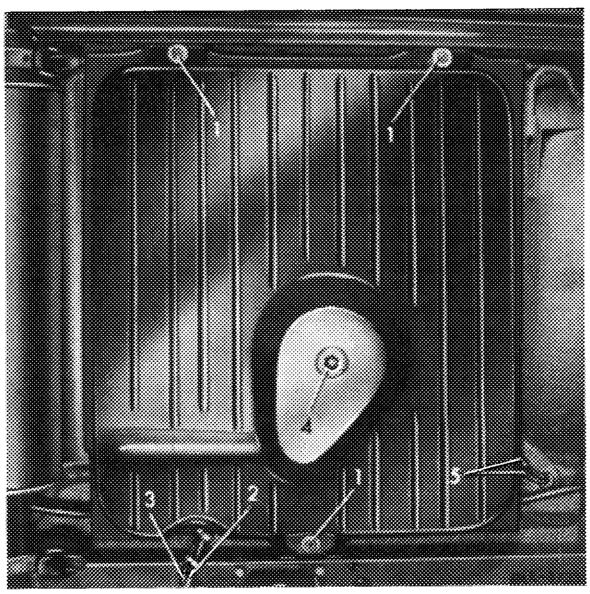


If the reinforcing panels are left out or the washers used are too small, the holding brackets on fuel tank may be torn off.

8 Check whether foam rubber strips on fuel tank are tight and glue down with MB universal glue part no. 000 989 92 71, if required.

Note: Never use felt or similar material, since this may lead to corrosion damage.

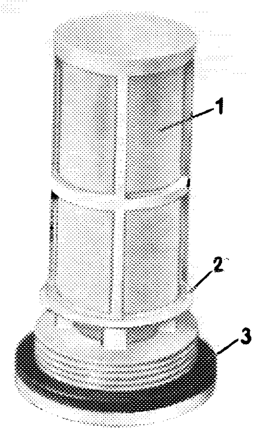
9 Tighten the three fastening nuts (1) to 20–25 Nm (2–2.5 kpm). When using self-locking nuts, tighten to 26–34 Nm (2.6–3.4 kpm).



10 Blow out strainer jacket (1) of fuel drain plug and check for damage. Install closing plug and tighten to 35–43 Nm (3.5–4.3 kpm).

Note: The filter is made of square mesh fabric of **0.1 mm mesh width.** To prevent mixing up closing plug, the word "diesel" is punched-in on diesel engines.

11 Connect ground line to battery. Check function of fuel readout.

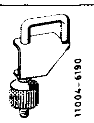
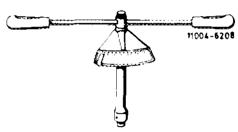


R-1330

B. Model 116

Full readout	approx. 96	
Warning lamp – reserve	approx. 13	
Tightening torques	Nm	(kpm)
Fastening nuts for fuel tank	17–25	(1.7–2.5)
Immersion tube transmitter	19–27	(1.9–2.7)

Special tools

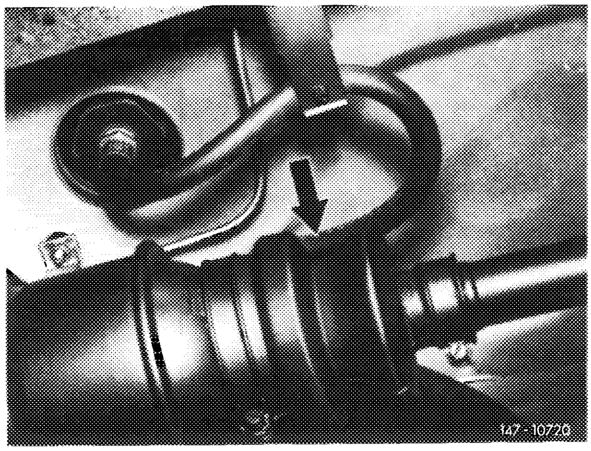
Clamp for fuel hose		000 589 40 37 00
Torque wrench, double arm, 1/2" square 15–65 Nm (150–650 kpcm)		000 589 27 21 00

Attention!
When removing fuel tank, pay attention to safety rules.

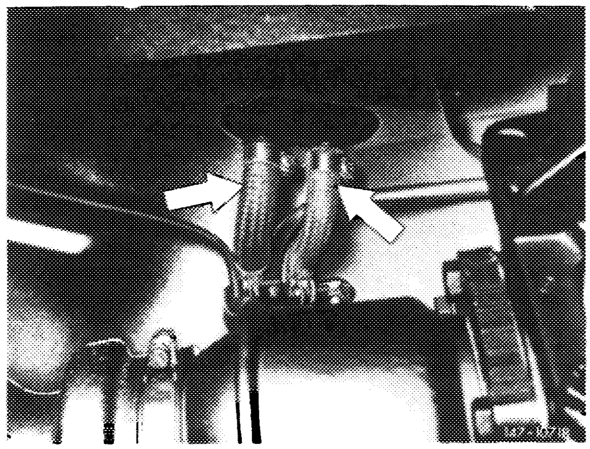
Removal

1 Disconnect ground line on battery.

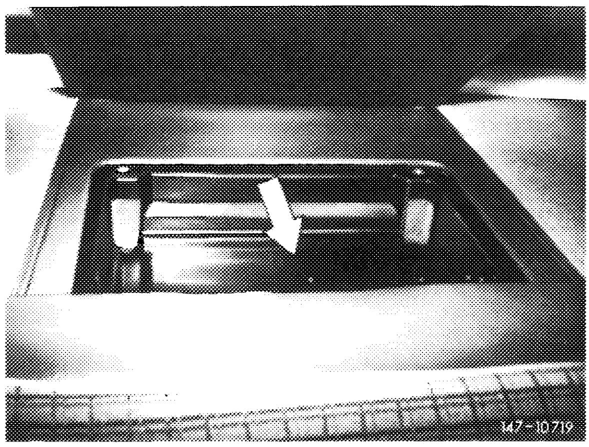
2 Drain fuel tank. For this purpose, pinch fuel suction hose (arrow) with clamp. Loosen hose clamp on fuel feed line, pull off hose and drain fuel.



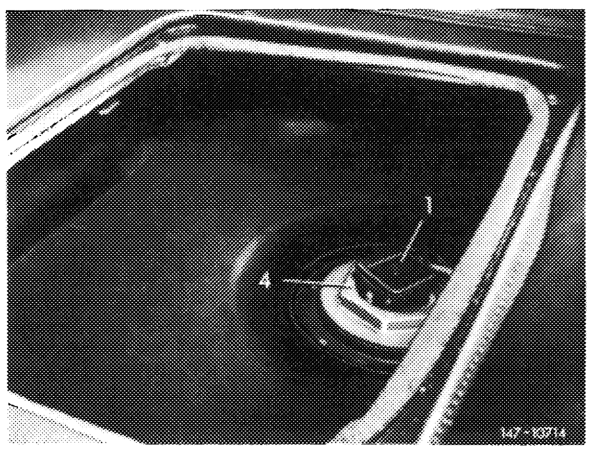
3 Loosen hose clamps on fuel return hose and fuel tank vent hose (arrows) and pull hoses from fuel tank.



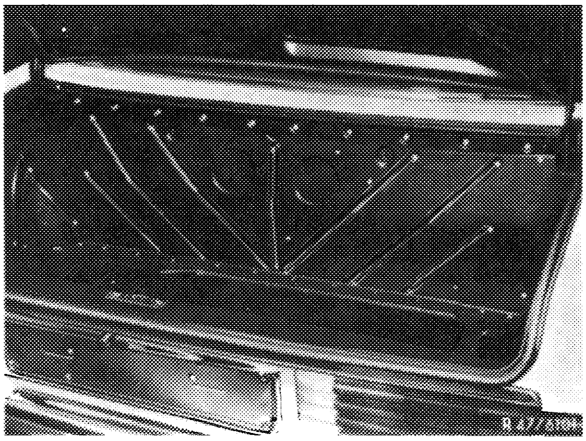
4 Remove first aid kit and first aid kit mounting tray (arrow).



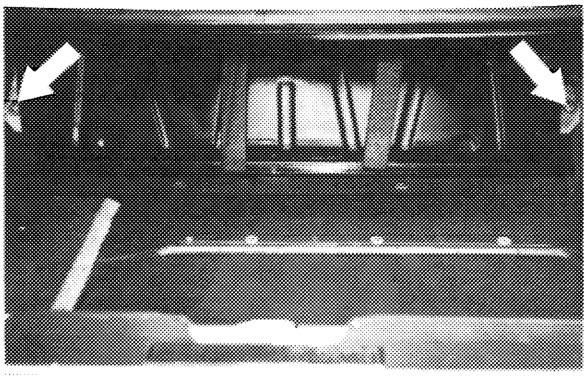
5 Pull coupler (1) for fuel readout from immersion tube transmitter (4) and protect against slipping off with a wire.



6 Remove rear wall for fuel tank cover.



7 Unscrew fuel tank fastening nuts (arrows) and remove fuel tank.

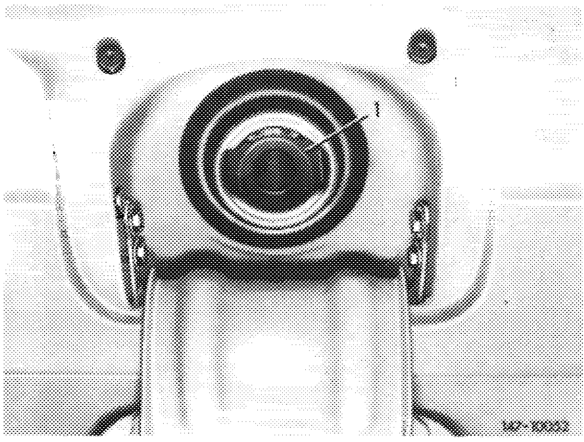


147-10715

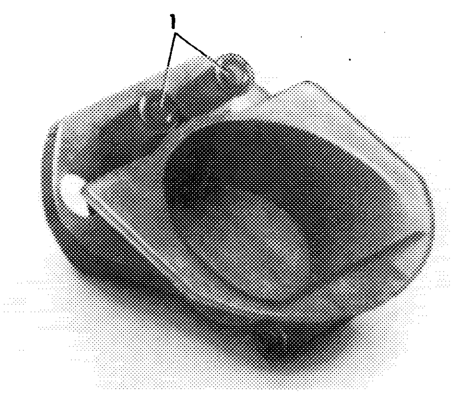
Installation

(USA) **1975/76 only**

Due to the small fuelling guns for lead-free fuel (catalyst operation) on these vehicles, specified in the USA starting model year 1975, a guide funnel (1) is installed in filler neck.



If a fuel tank is replaced on these vehicles, install a guide funnel **in the USA only**. For this purpose, place guide funnel into filler neck prior to installation of fuel tank and knock-in fastening rivets up to stop by means of a punch.

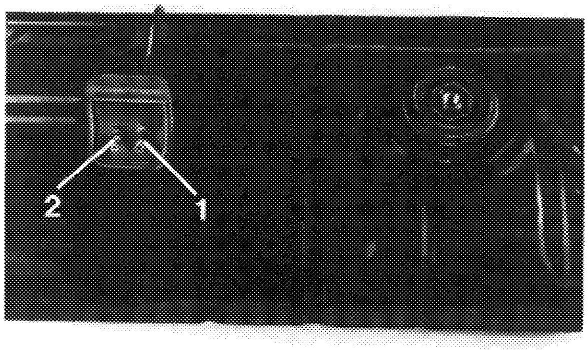


1 Fastening rivets

147-10021

8 Install fuel tank in reverse order as follows:

a) Glue both gaskets to bottom of fuel tank with MB universal glue, part no. 000 989 92 71. For installation, coat both gaskets on sealing surface or bead with sliding agent (talcum, wax or the like).



1 Positive and negative vent line
2 Fuel return line

147 – 16744

b) Check whether foam rubber strips on fuel tank are tight; if required, glue down for example with MB universal glue, part no. 000 989 92 71.

c) Mount fuel tank with specified reinforcing panels and washers. Tighten fastening nuts to 20–25 Nm (2–2.5 kpm). When using self-locking nuts, tighten to 26–34 Nm (2.6–3.4 kpm).

d) Pay attention to correct seat of rubber sleeve on filler neck.

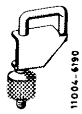
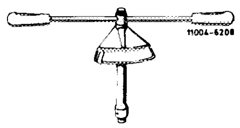
e) Mount coupler for fuel readout and check for function.

A. Model 114

Filling capacity in liters	(J) (S) (USA) 1973/74	(USA) 1975/76
Full readout	65	78
Warning lamp reserve approx.	9	9

Tightening torques	Nm	(kpm)
Fastening nuts for fuel tank	20–25	(2–2.5)
Self-locking fastening nuts	26–34	(2.6–3.4)
Fuel drain plug	35–43	(3.5–4.3)

Special tools

Clamp for fuel hose		000 589 40 37 00
Torque wrench, double arm, 1/2" square, 15–65 Nm (150–650 kpcm)		000 589 27 21 00
Torque wrench, double arm, 1/4" square, 4–16 Nm (40–160 kpcm)		000 589 67 21 00

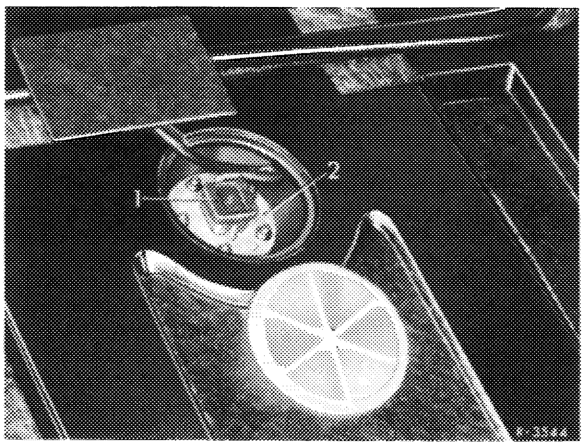
Attention!
When removing fuel tank, pay attention to safety rules.

Removal

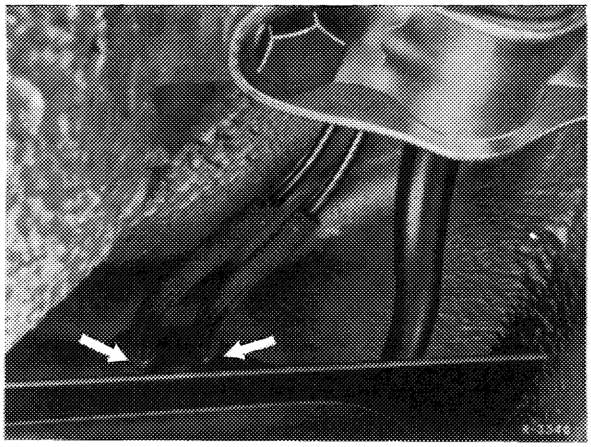
1 Disconnect ground line on battery.

2 Drain fuel tank while unscrewing fuel drain plug (4 in fig. item 5).

3 Pull coupler (1) for fuel readout from immersion tube transmitter (2).

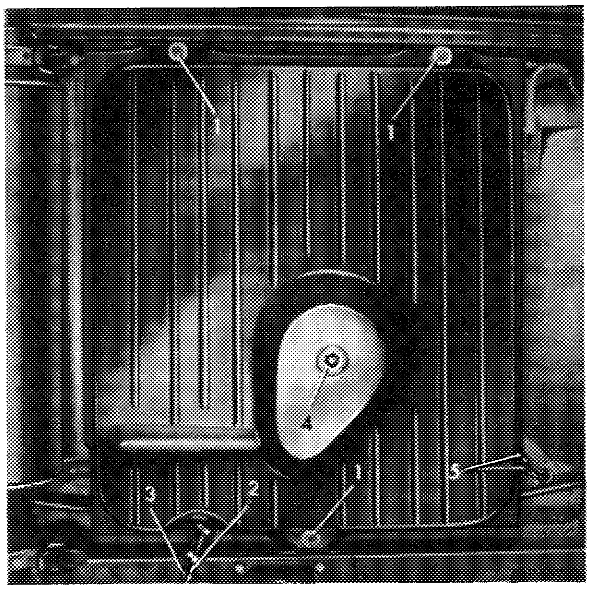


4 Pull off positive and negative venting line on fuel tank (arrows).



5 Pinch fuel hoses (2 and 3) with a clamp. Loosen hose clips and pull fuel hoses from fuel tank.

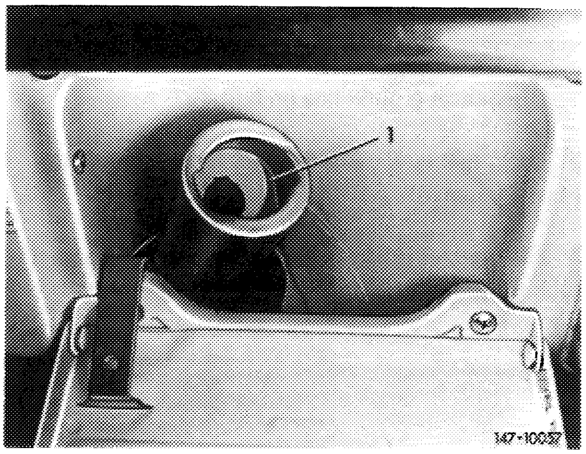
6 Loosen fastening nuts (1) and remove fuel tank.



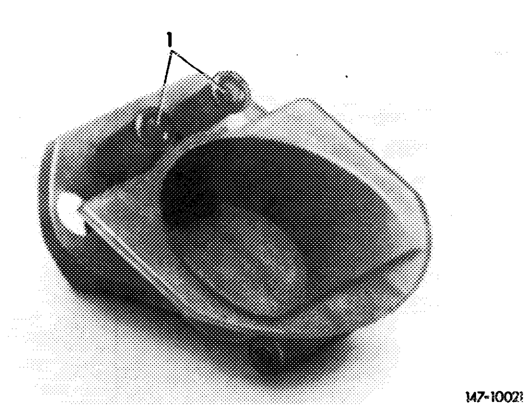
Installation

(USA) **1975/76**

Due to the small fuelling guns for lead-free fuel (catalyst operation) on these vehicles, specified in the USA starting model year 1975, a guide funnel (1) is installed in filler neck.



If a fuel tank is replaced on these vehicles, install a guide funnel **in the USA only**. For this purpose, place guide funnel into filler neck prior to installation of fuel tank and knock-in fastening rivets up to stop by means of a punch.

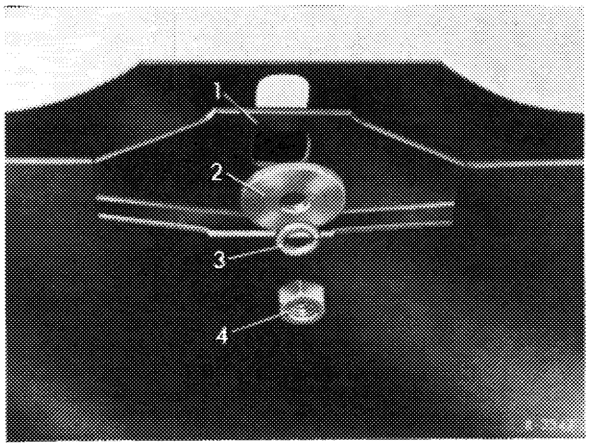


1 Fastening rivets

Install fuel tank in reverse order. Pay attention to the following items:

7 Mount fuel tank with reinforcing panels (1) and washers (2) provided.

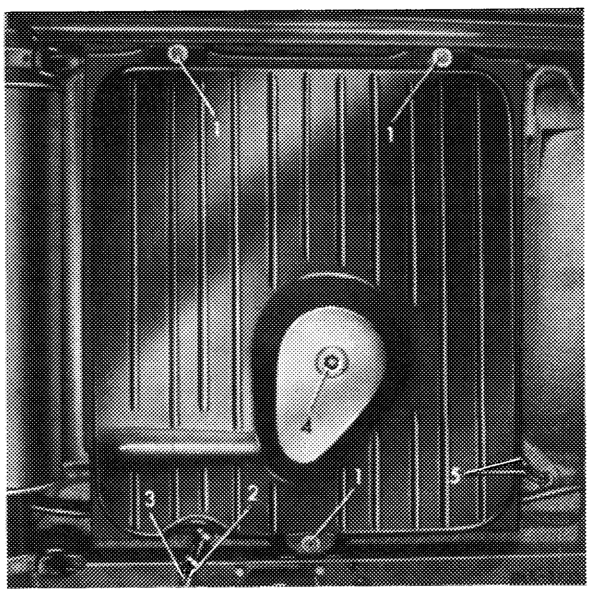
If the reinforcing panels are left out or the washers used are too small, the holding brackets on fuel tank may be torn off.



8 Check whether foam rubber strips on fuel tank are tight and glue down with MB universal glue part no. 000 989 92 71, if required.

Note: Never use felt or similar material, since this may lead to corrosion damage.

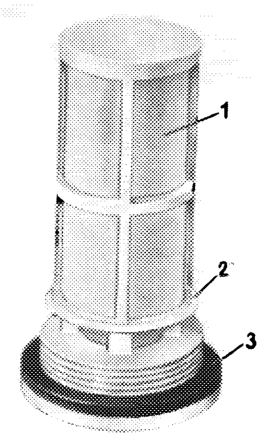
9 Tighten the three fastening nuts (1) to 20–25 Nm (2–2.5 kpm). When using self-locking nuts, tighten to 26–34 Nm (2.6–3.4 kpm).



10 Blow out strainer jacket (1) of fuel drain plug and check for damage. Install closing plug and tighten to 35–43 Nm (3.5–4.3 kpm).

Note: The filter is made of square mesh fabric of **0.1 mm mesh width.** To prevent mixing up closing plug, the word "diesel" is punched-in on diesel engines.

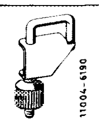
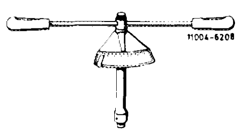
11 Connect ground line to battery. Check function of fuel readout.



B. Model 116

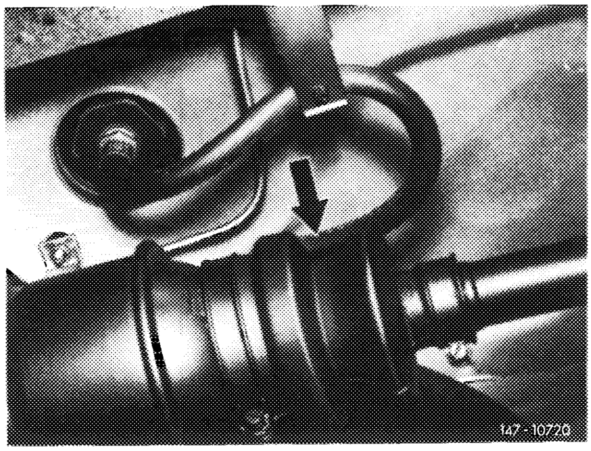
Full readout	approx. 96	
Warning lamp – reserve	approx. 13	
Tightening torques	Nm	(kpm)
Fastening nuts for fuel tank	17–25	(1.7–2.5)
Immersion tube transmitter	19–27	(1.9–2.7)

Special tools

Clamp for fuel hose		000 589 40 37 00
Torque wrench, double arm, 1/2" square 15–65 Nm (150–650 kpcm)		000 589 27 21 00

Attention!
When removing fuel tank, pay attention to safety rules.

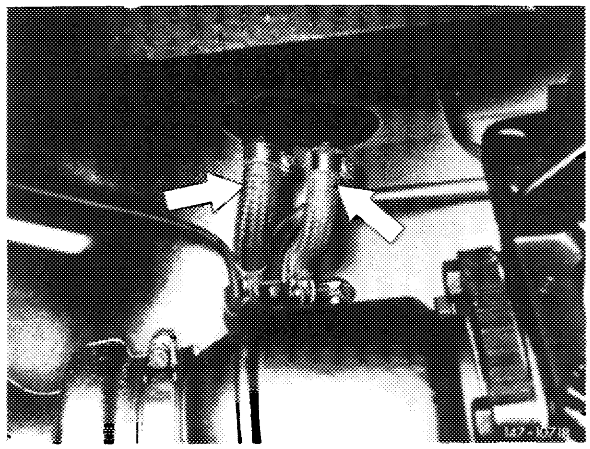
Removal



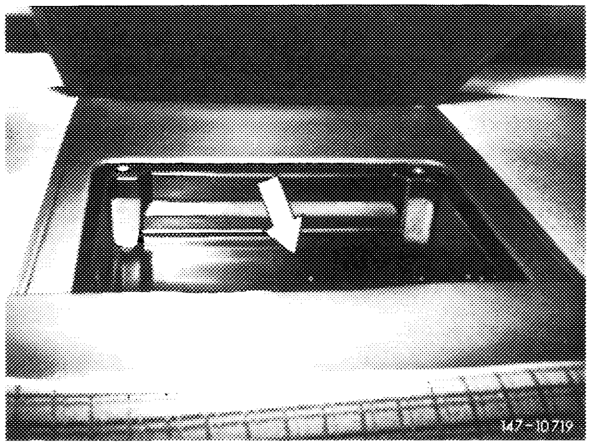
1 Disconnect ground line on battery.

2 Drain fuel tank. For this purpose, pinch fuel suction hose (arrow) with clamp. Loosen hose clamp on fuel feed line, pull off hose and drain fuel.

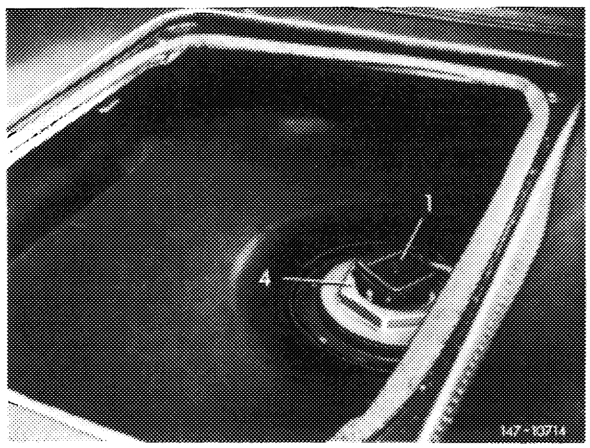
3 Loosen hose clamps on fuel return hose and fuel tank vent hose (arrows) and pull hoses from fuel tank.



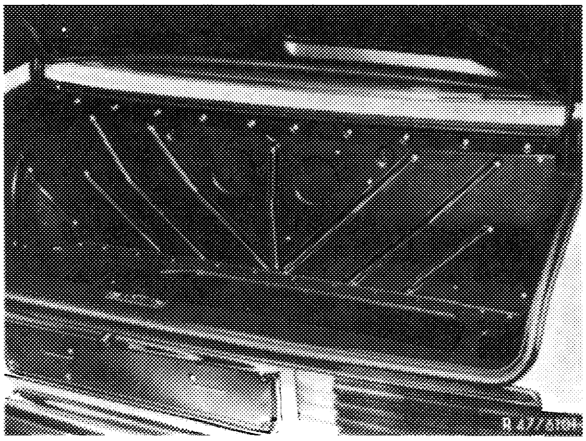
4 Remove first aid kit and first aid kit mounting tray (arrow).



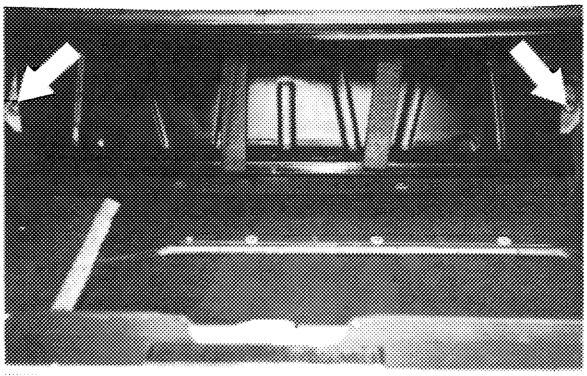
5 Pull coupler (1) for fuel readout from immersion tube transmitter (4) and protect against slipping off with a wire.



6 Remove rear wall for fuel tank cover.



7 Unscrew fuel tank fastening nuts (arrows) and remove fuel tank.

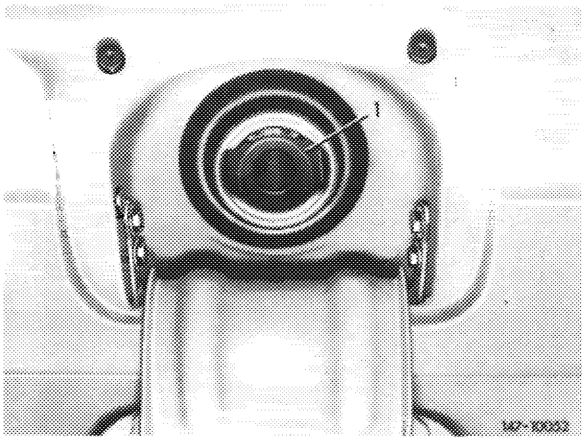


147-10715

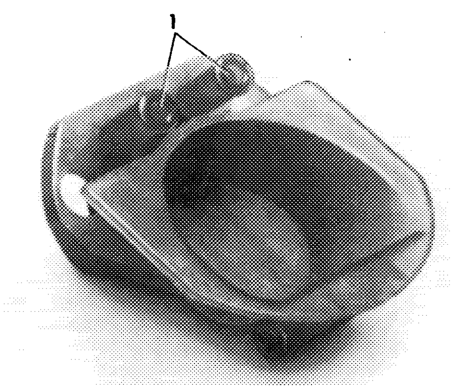
Installation

USA **1975/76 only**

Due to the small fuelling guns for lead-free fuel (catalyst operation) on these vehicles, specified in the USA starting model year 1975, a guide funnel (1) is installed in filler neck.



If a fuel tank is replaced on these vehicles, install a guide funnel **in the USA only**. For this purpose, place guide funnel into filler neck prior to installation of fuel tank and knock-in fastening rivets up to stop by means of a punch.

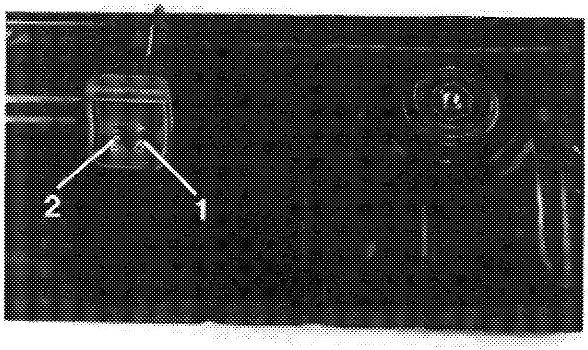


1 Fastening rivets

147-10021

8 Install fuel tank in reverse order as follows:

a) Glue both gaskets to bottom of fuel tank with MB universal glue, part no. 000 989 92 71. For installation, coat both gaskets on sealing surface or bead with sliding agent (talcum, wax or the like).



1 Positive and negative vent line
2 Fuel return line

147 – 16744

b) Check whether foam rubber strips on fuel tank are tight; if required, glue down for example with MB universal glue, part no. 000 989 92 71.

c) Mount fuel tank with specified reinforcing panels and washers. Tighten fastening nuts to 20–25 Nm (2–2.5 kpm). When using self-locking nuts, tighten to 26–34 Nm (2.6–3.4 kpm).

d) Pay attention to correct seat of rubber sleeve on filler neck.

e) Mount coupler for fuel readout and check for function.

A. Model 107.04

Note

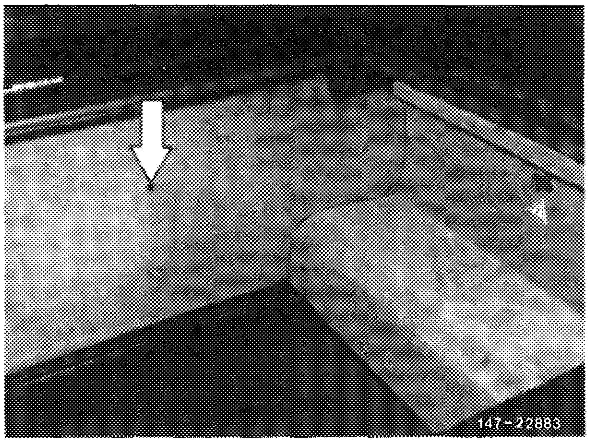
On models 107.02, 116, 123 and 126 sedan and coupe the fuel expansion tank is integrated in fuel tank and cannot be disassembled.

Removal

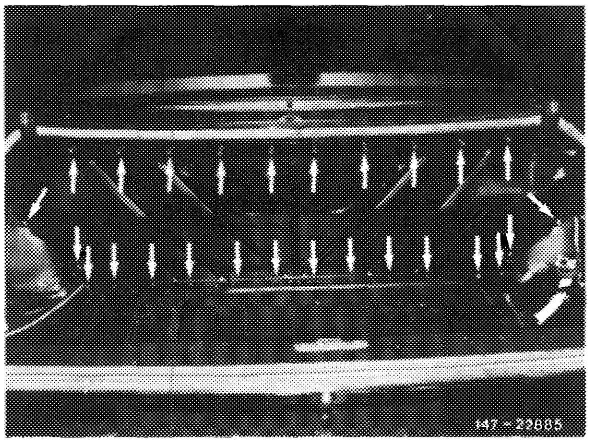
1 Remove hard top. Open top lock and remove top.

2 Remove trunk mat.

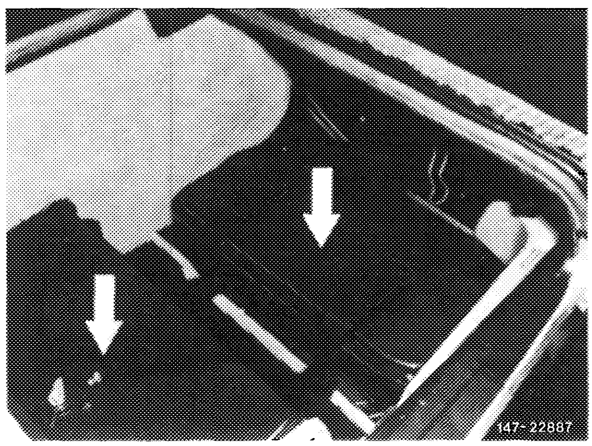
3 Unscrew fastening screw (arrow) for expansion tank.



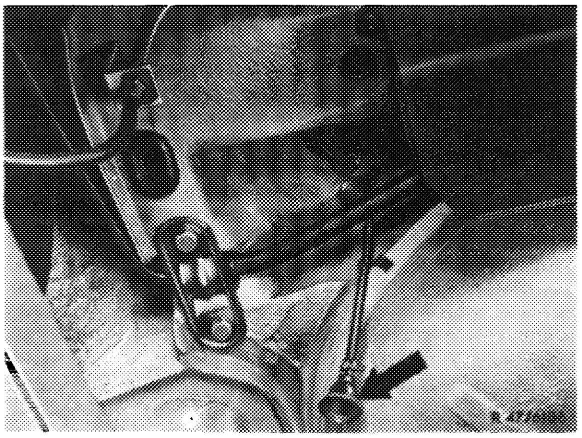
4 Unscrew rear wall and remove. For this purpose, loosen lining in upper edge range and laterally and unscrew fastening screws (arrows).



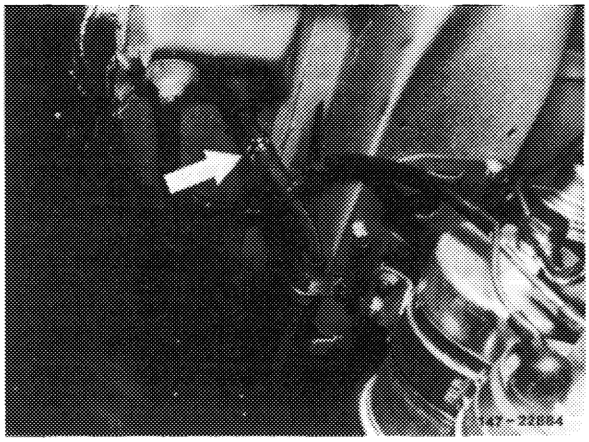
5 On vehicles with battery in trunk, remove battery and battery encasing (arrows).



6 Remove protective sleeve (arrow) and unclip vent line from holding clamp.

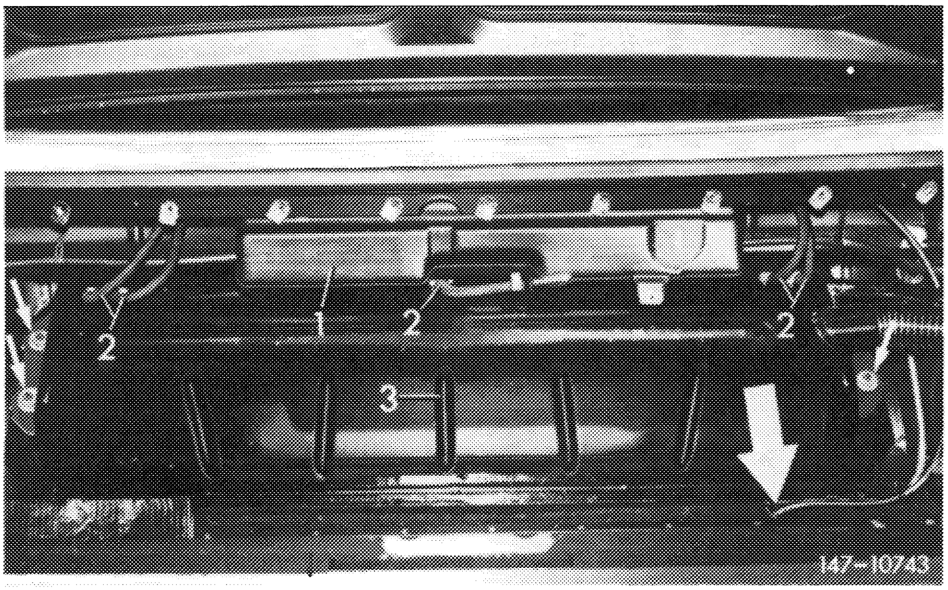


7 On AUS , J and USA version vehicles, pull fuel hose (arrow) from vent line.



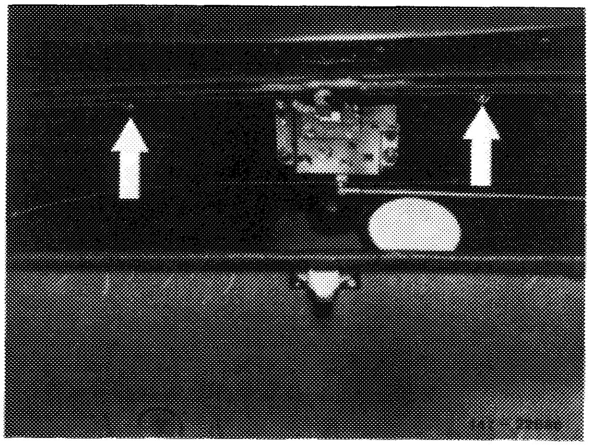
8 Remove fuel hoses (2) on fuel tank or on expansion tank.

Note: If the fuel hoses are removed or mounted on expansion tank, apply counterhold to connections when loosening or tightening hose clamps.



1 Expansion tank
2 Fuel hoses
3 Fuel tank
Large arrow
= Vent line

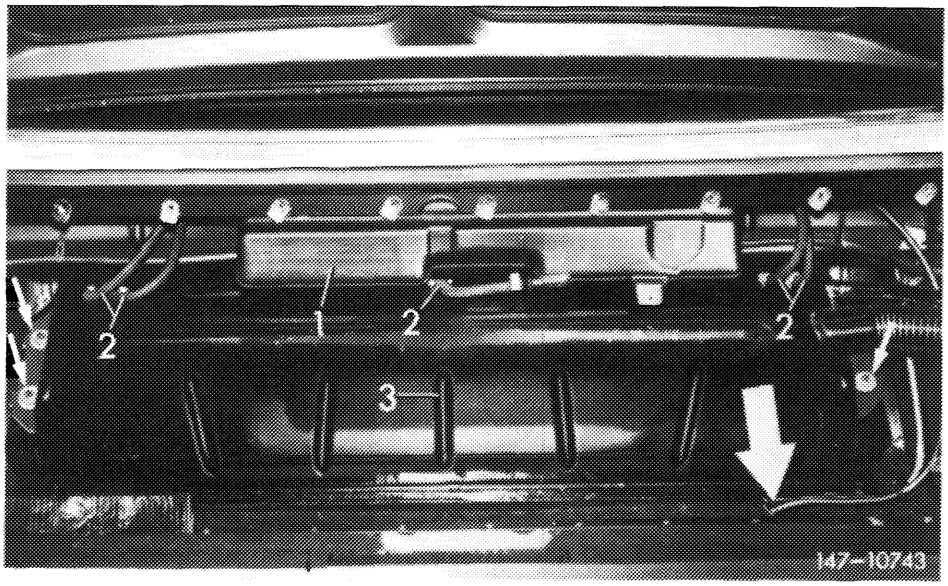
9 Unscrew fastening screws (arrows) and remove expansion tank, while pulling out black vent line in upward direction through trunk floor.



Installation

10 For installation proceed vice versa. Make sure that the vent line is installed first behind filler neck of fuel tank.

Note: Check fuel system for leaks.

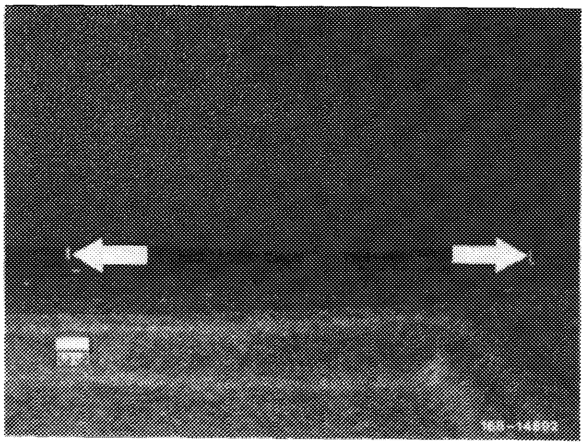


Large arrow
= Vent line

B. Model 123.09 T-sedan

Removal

1 Remove spare wheel casing and spare wheel.

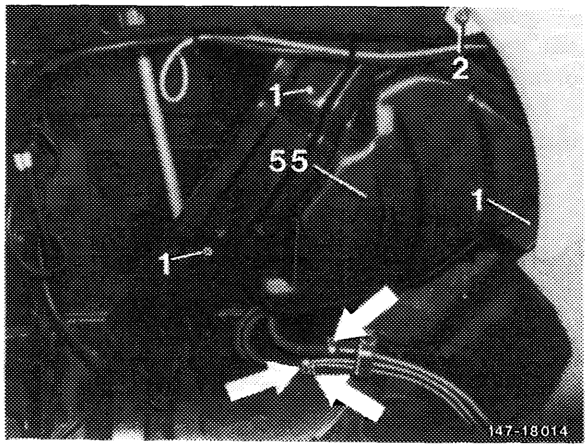


Slightly lift spare wheel casing during removal until pins (arrows) are disengaging.

2 Unscrew fastening screw (2) of lateral lining.

3 Loosen hose clamps (arrows) on vent lines and pull off hoses, tightly close lines and hoses.

4 Unscrew fastening screws (1) of expansion tank (55). For this purpose, slightly lift side and wheel house panelling at front fastening screw seen in driving direction. Remove expansion tank.



Installation

5 For installation proceed vice versa.

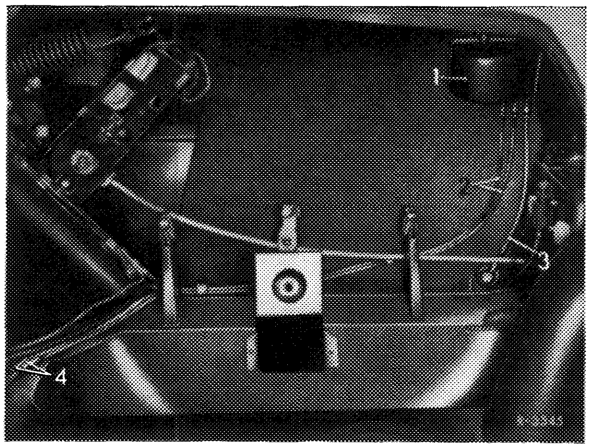
Note: Check hose connections for leaks.

Removal

1 Remove spare wheel and plastic cover rail for vent lines (2).

2 Pull vent lines (2) out of connecting hoses (4).

3 Remove fuel expansion tank (1) complete with positive and negative vent line.



1 Fuel expansion tank
2 Positive vent lines to fuel tank
3 Negative vent line to atmosphere
4 Connecting hoses

Installation

4 For installation proceed vice versa.

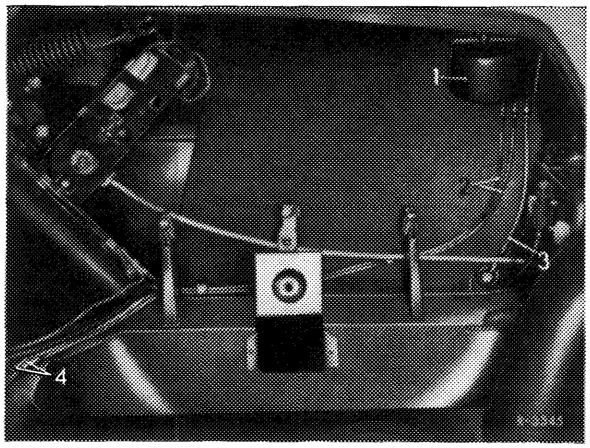
Attencion!
Avoid sharp bends in positive and negative vent lines during installation.

Removal

1 Remove spare wheel and plastic cover rail for vent lines (2).

2 Pull vent lines (2) out of connecting hoses (4).

3 Remove fuel expansion tank (1) complete with positive and negative vent line.



1 Fuel expansion tank
2 Positive vent lines to fuel tank
3 Negative vent line to atmosphere
4 Connecting hoses

Installation

4 For installation proceed vice versa.

Attencion!
Avoid sharp bends in positive and negative vent lines during installation.

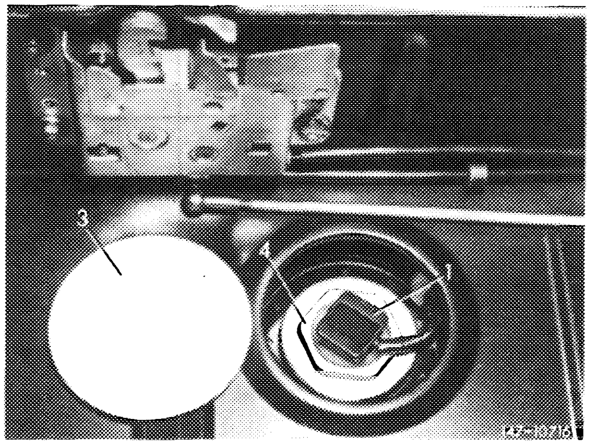
Tightening torque	Nm
Immersion tube transmitter	35–43

Removal

Model 107, 116, 123 sedan and coupe

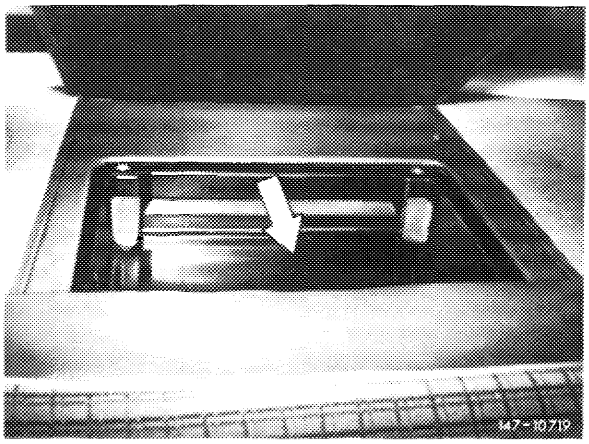
1 Remove hard top on 107.04, open top lock and unfold top.

2 Remove closing cover (3).



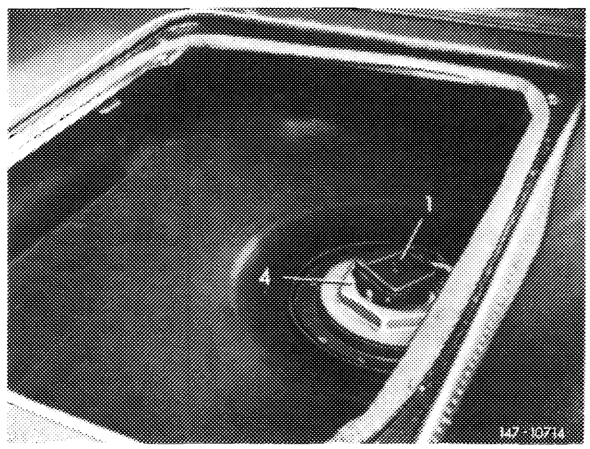
Model 107.04

3 Remove first aid kit and plastic tray (arrow) on models 107.02, 116 and 123.



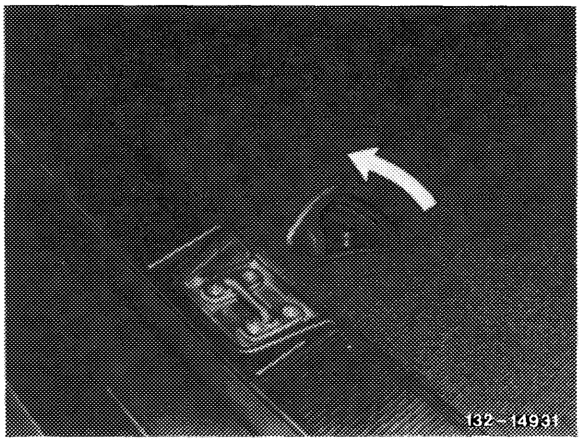
4 Pull off coupling (1) on immersion tube transmitter (4) and secure with a wire against slipping off.

5 Unscrew immersion tube transmitter.

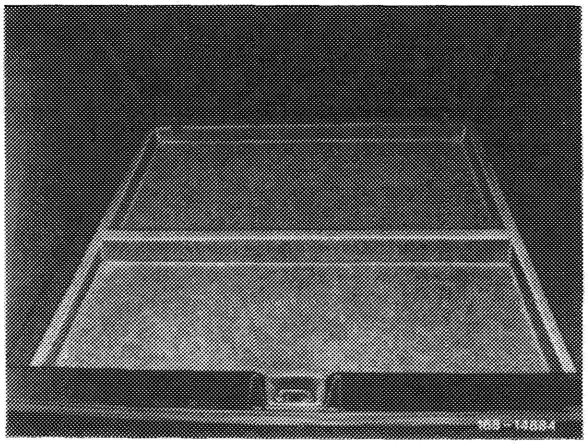


Model 123 T-sedan

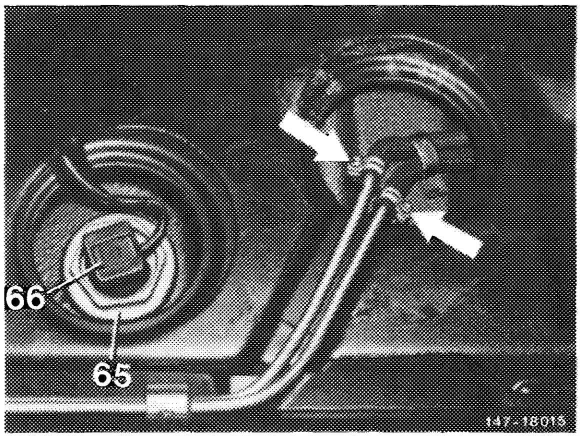
1 Loosen luggage compartment floor by turning toggle lock and remove.



2 Remove storage compartment.



3 Pull off coupling (66) for fuel gage and unscrew immersion tube transmitter (65).



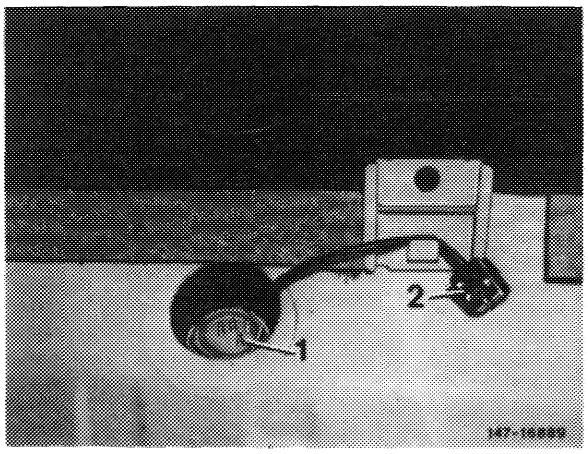
Model 126

1 Remove rear seat bench and backrest (refer to body).

2 Remove closing cover.

3 Pull off coupling (66) and protect against slipping off.

4 Unscrew immersion tube transmitter (65).



Installation

All models

4 For installation proceed vice versa as follows:

a) Use new rubber sealing ring.

147-10810

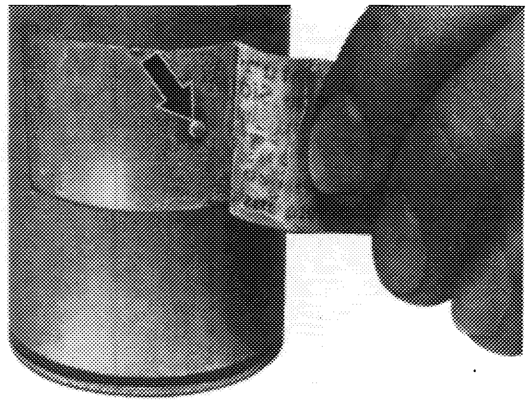
b) Remove locking pin (arrow) prior to installing immersion tube transmitter.

c) Check function of fuel gage.

d) Tighten immersion tube transmitter to 35–43 Nm.

e) Plug on coupling for fuel gage.

f) Check for leaks.



107-10702

A. Model 114

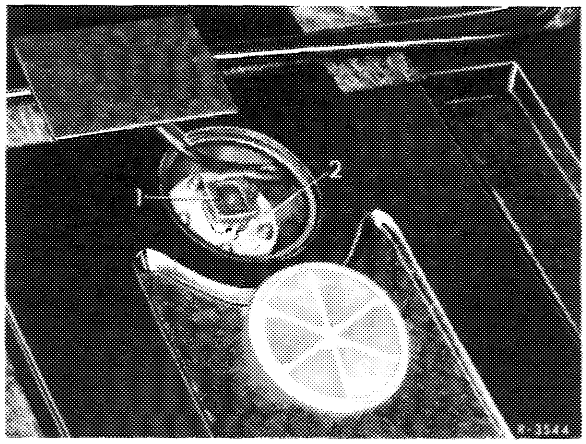
Removal

1 Take rubber mat from trunk and remove closing cover from floor of trunk.

2 Pull plug (1) from immersion tube transmitter (2).

3 Unscrew fastening nuts and pull out immersion tube transmitter.

4 Remove gasket from fuel tank, making sure that no remains of gasket are dropping into tank.



Installation

5 For installation proceed vice versa as follows:

a) Use new gasket.

b) Tighten fastening nuts crosswise to 3.5–4 Nm (35–40 kpcm).

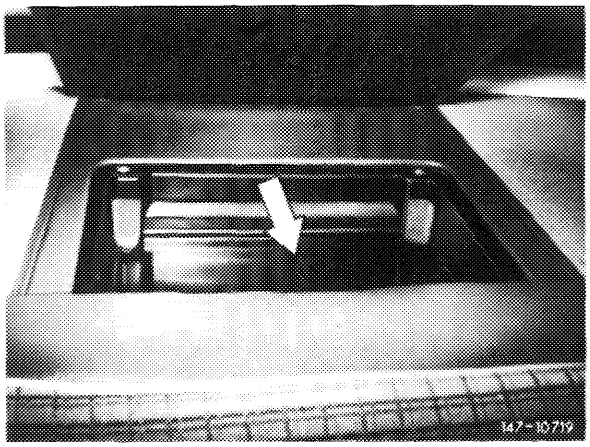
c) Check function of fuel gauge.

B. Model 116

Tightening torques	Nm	(kpm)
Hex. closing plug for immersion tube transmitter or screw-type immersion tube transmitter	19–27	(1.9–2.7)

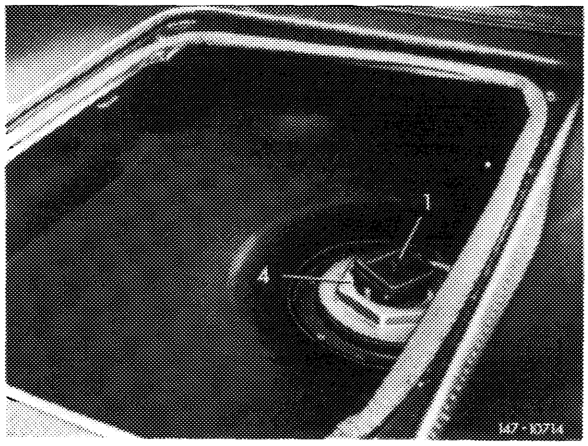
Removal

1 Remove first aid kit and first aid kit holding tray (arrow).



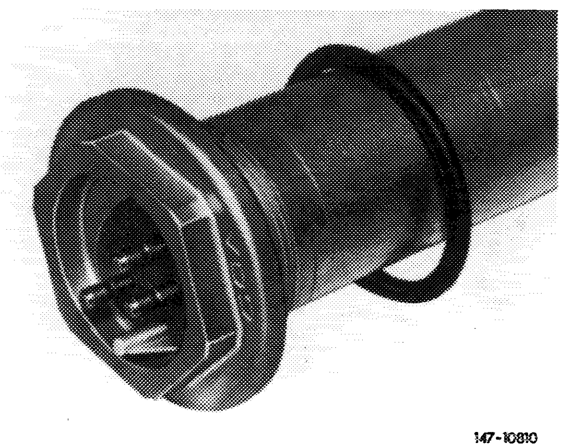
2 Pull plug (1) for fuel gauge from immersion tube transmitter and protect with a wire against slipping off.

3 Unscrew hex. closing plug (4) and remove immersion tube transmitter.



Immersion tube transmitter version 1

Immersion tube transmitter of the latest version are directly screwed into fuel tank.



Immersion tube transmitter version 2

147-10810

Installation

4 For installation proceed vice versa as follows:

a) There are two different immersion tube transmitter versions for model 116 available from spare parts stockroom. During replacement, make sure to install like for like.

b) Use new rubber sealing ring.

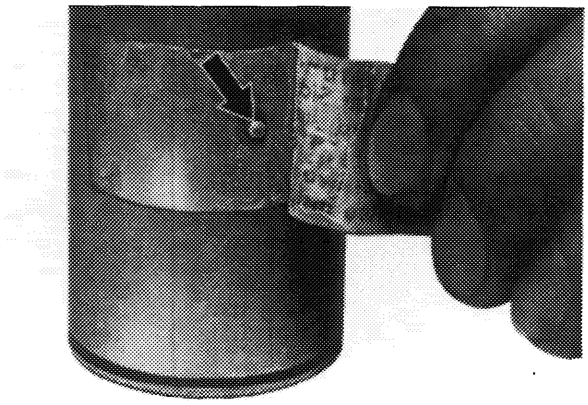
c) Prior to installing immersion tube transmitter, remove locking pin (arrow).

d) Install immersion tube transmitter in such a manner that the locking cam engages in recess of fuel tank or that brass locating pin for electric plug points in driving direction to the rear.

The above is not necessary on immersion tube transmitters of the latest version.

Note: If an immersion tube transmitter with locking cams is installed in a fuel tank without recess, remove locking cam.

e) Check function of fuel gauge.



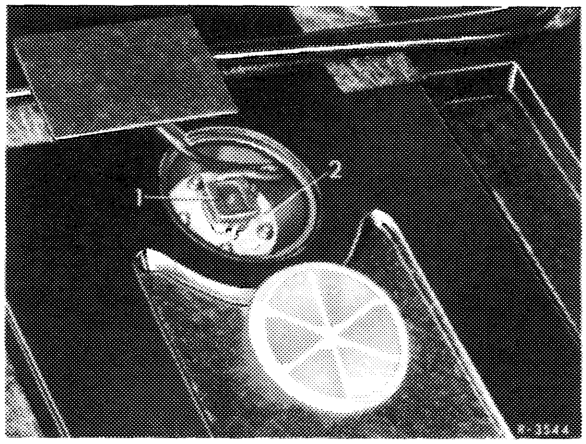
107-10702

A. Model 114

Removal

1 Take rubber mat from trunk and remove closing cover from floor of trunk.

2 Pull plug (1) from immersion tube transmitter (2).



3 Unscrew fastening nuts and pull out immersion tube transmitter.

4 Remove gasket from fuel tank, making sure that no remains of gasket are dropping into tank.

Installation

5 For installation proceed vice versa as follows:

a) Use new gasket.

b) Tighten fastening nuts crosswise to 3.5–4 Nm (35–40 kpcm).

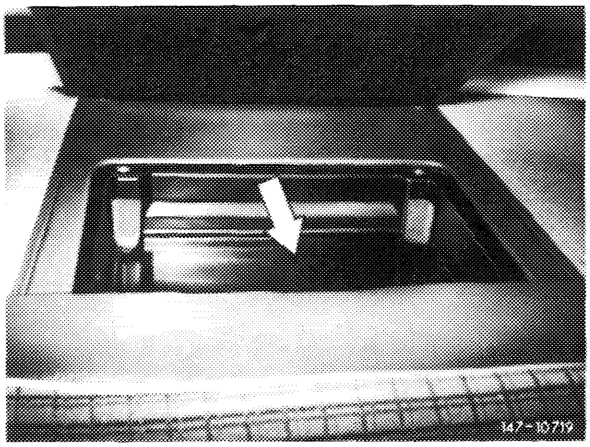
c) Check function of fuel gauge.

B. Model 116

Tightening torques	Nm	(kpm)
Hex. closing plug for immersion tube transmitter or screw-type immersion tube transmitter	19–27	(1.9–2.7)

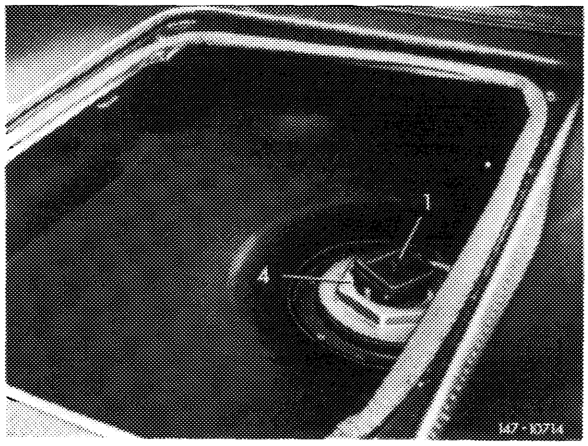
Removal

1 Remove first aid kit and first aid kit holding tray (arrow).



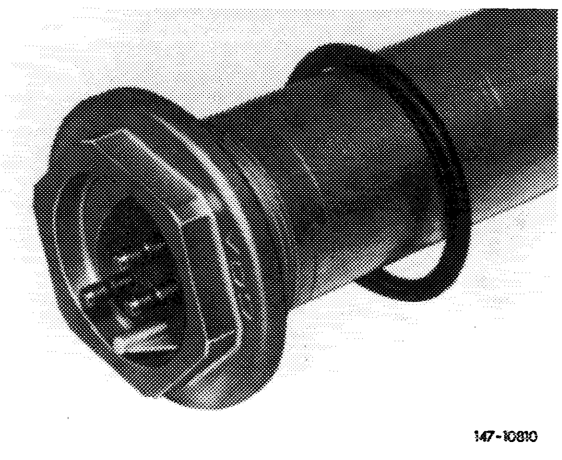
2 Pull plug (1) for fuel gauge from immersion tube transmitter and protect with a wire against slipping off.

3 Unscrew hex. closing plug (4) and remove immersion tube transmitter.



Immersion tube transmitter version 1

Immersion tube transmitter of the latest version are directly screwed into fuel tank.



147-10810

Immersion tube transmitter version 2

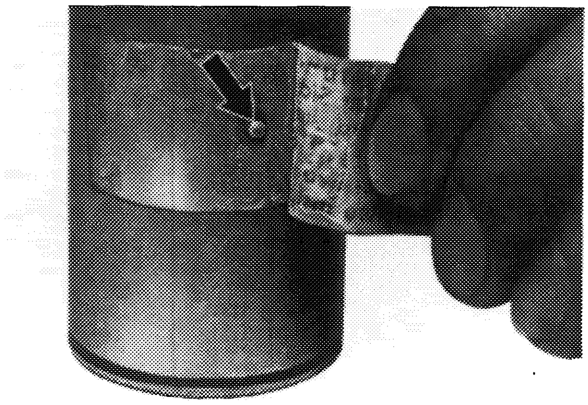
Installation

4 For installation proceed vice versa as follows:

a) There are two different immersion tube transmitter versions for model 116 available from spare parts stockroom. During replacement, make sure to install like for like.

b) Use new rubber sealing ring.

c) Prior to installing immersion tube transmitter, remove locking pin (arrow).



107-10702

d) Install immersion tube transmitter in such a manner that the locking cam engages in recess of fuel tank or that brass locating pin for electric plug points in driving direction to the rear.

The above is not necessary on immersion tube transmitters of the latest version.

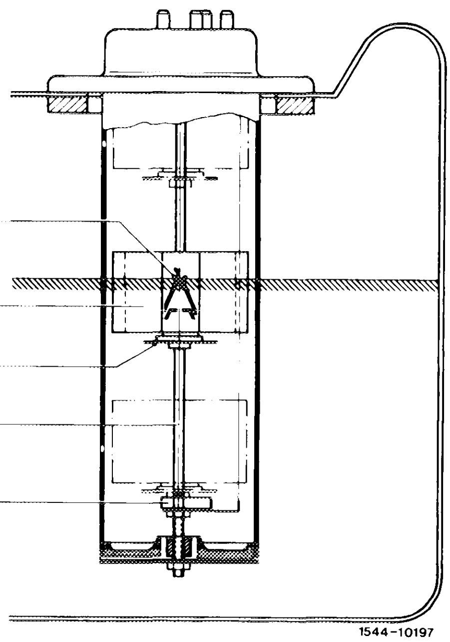
Note: If an immersion tube transmitter with locking cams is installed in a fuel tank without recess, remove locking cam.

e) Check function of fuel gauge.

All models

When the fuel drops, the sliding contact (1) on float (2) of immersion tube transmitter increases the resistance, the voltage drops and the needle in the instrument will swing back.

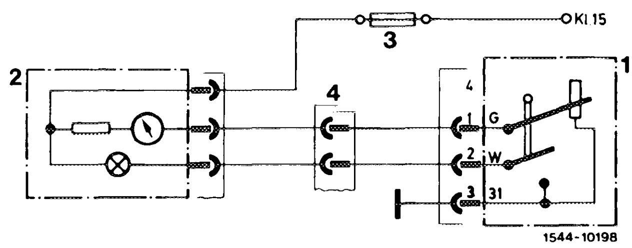
When the fuel level drops still further, the reserve warning contact (5) in immersion tube transmitter is closed and will connect the reserve warning light to ground.



Immersion tube transmitter

1 Sliding contact
2 Float
3 Contact plate
4 Guide and contact rod
5 Reserve warning contact

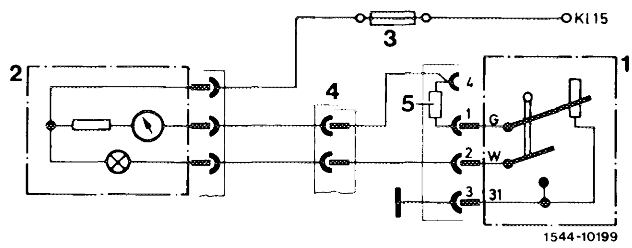
When the ignition is switched on, the indicating instrument and the reserve warning lamp will be energized via fuse.



Sedan

1 Immersion tube transmitter
2 Fuel gage
3 Fuse
4 Cable connector

On T-sedans and special vehicles with special body a compensating resistor 4.7 Ω (color rings yellow/purple/gold/gold) is installed in coupling of immersion tube transmitter, so that in spite of different fuel tanks the same fuel gage can be used.



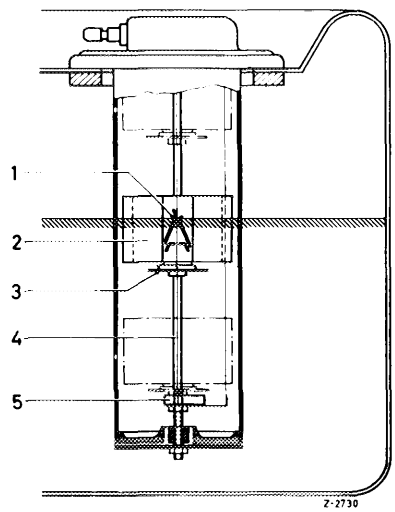
T-sedan and special vehicles with special body

1 Immersion tube transmitter
2 Fuel gage
3 Fuse
4 Cable connector
5 Resistor 4.7 Ω

Check fuel gage (54–269).

When the fuel level drops, the sliding contact (1) on float (2) of immersion tube transmitter increases the resistance, the voltage drops and the needle in instrument will swing back.

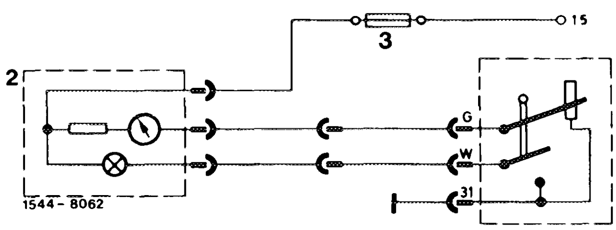
When the fuel level drops still further, the reserve warning contact (5) in immersion tube transmitter is closed and will connect the reserve warning light to ground.



Immersion tube transmitter

1 Sliding contact
2 Float
3 Contact plate
4 Guide and contact rod
5 Reserve warning contact

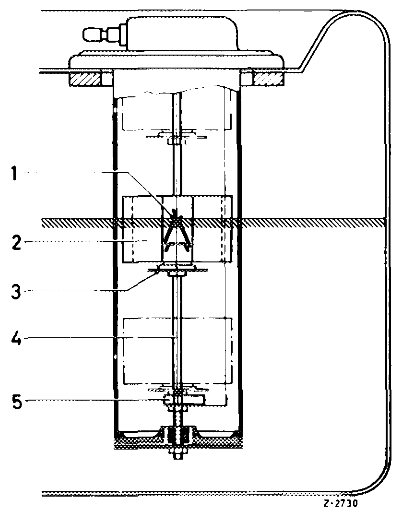
When the ignition is switched on, the indicating instrument and the reserve warning lamp will be energized.



1 Immersion tube transmitter
2 Fuel gauge with warning lamp in instrument cluster
3 Fuse

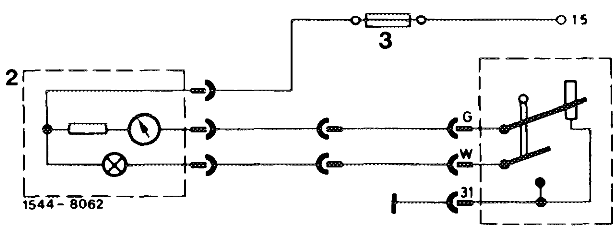
When the fuel level drops, the sliding contact (1) on float (2) of immersion tube transmitter increases the resistance, the voltage drops and the needle in instrument will swing back.

When the fuel level drops still further, the reserve warning contact (5) in immersion tube transmitter is closed and will connect the reserve warning light to ground.



Immersion tube transmitter
1 Sliding contact
2 Float
3 Contact plate
4 Guide and contact rod
5 Reserve warning contact

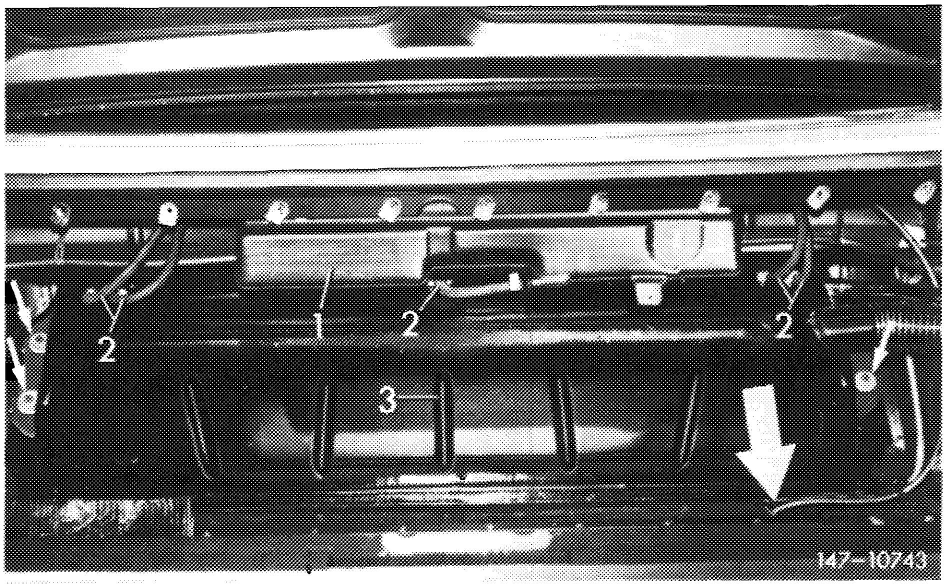
When the ignition is switched on, the indicating instrument and the reserve warning lamp will be energized.



1 Immersion tube transmitter
2 Fuel gauge with warning lamp in instrument cluster
3 Fuse

On model 107.04 and 123.09 an expansion tank is located outside fuel tank.

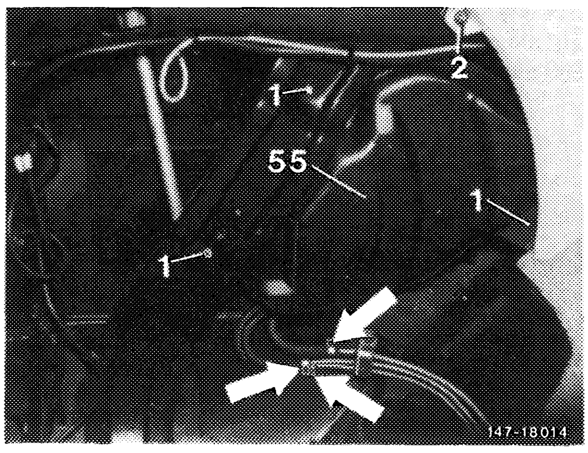
Model 107.02 is provided with an expansion tank which is installed in fuel tank and can therefore not be removed.



Model 107.04

1 Expansion tank
2 Fuel hoses
3 Fuel tank
Large arrow = Vent line

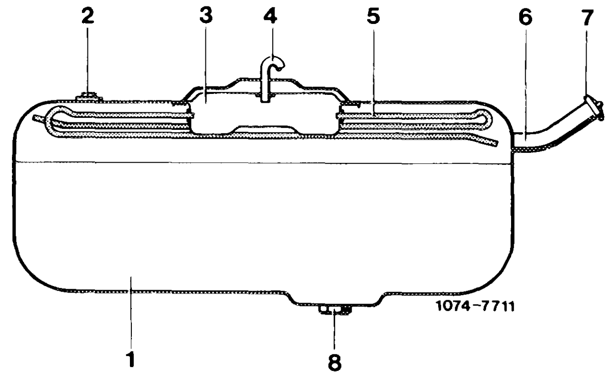
The fuel vapors escape from fuel tank into expansion tank and from there through vent line into atmosphere.



Model 123.09

55 Expansion tank
Arrows = Connecting lines to fuel tank and vent line

Models 116, 123 and 126 are provided with a vent system comprising a collecting tray and a pipe system.



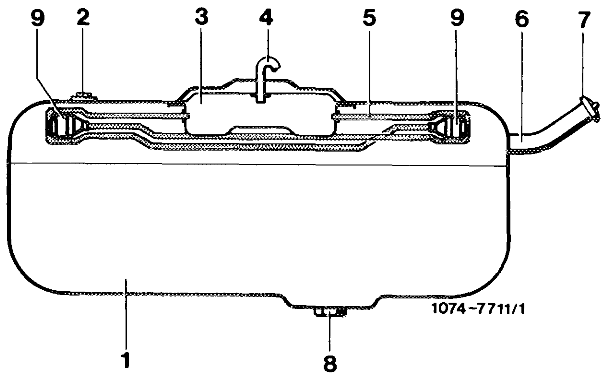
3 Collecting tray
4 Vent line
5 Pipe system

Since April 1980 additional check vessels are attached to ends of pipe system of model 126.

The following national version vehicles are also provided with check vessels:

(J) 1979 entering production model 123
1980 model 116

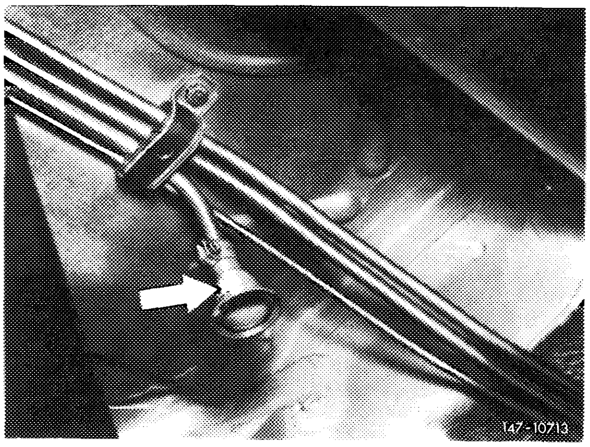
(USA) 1980/81, model 123



9 Check vessels

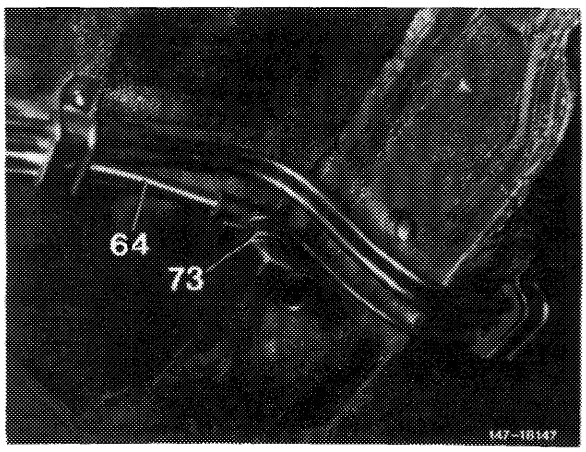
The fuel vapors escape through vent system to vent line and from there into atmosphere.

A protective sleeve (arrow) is plugged on at end of vent line on models 107.04, 126 and on all vehicles manufactured up to February 1979.



Model 126
Arrow = Protective sleeve

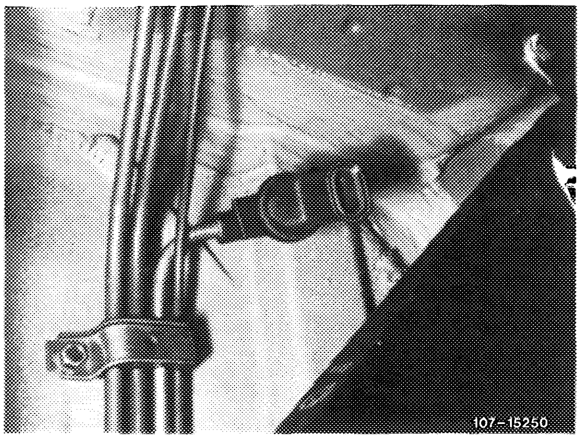
Starting March 1979 all vehicles (except model 107.04 and 126) are provided with a vent sleeve at end of vent line.

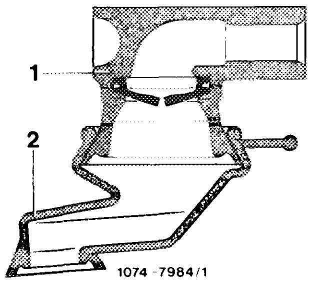


64 Vent line
73 Vent sleeve

When repairing older vehicles, also install only vent sleeve with diaphragm. In such a case, the vent line must be rebent with a suitable mandrel in such a manner that the vent sleeve is pointing downwards.

Attention!
Avoid kinks in vent line when rebending.

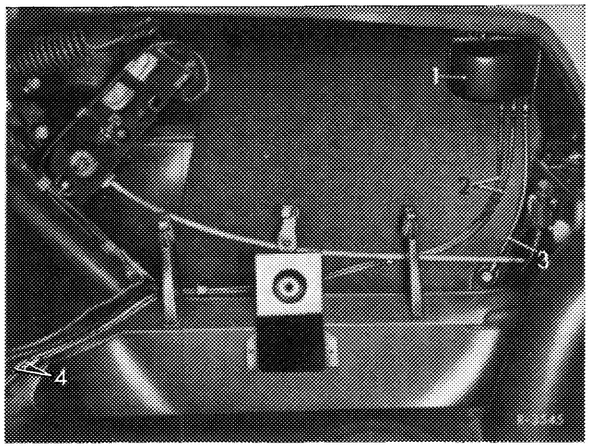




Vent sleeve with diaphragm

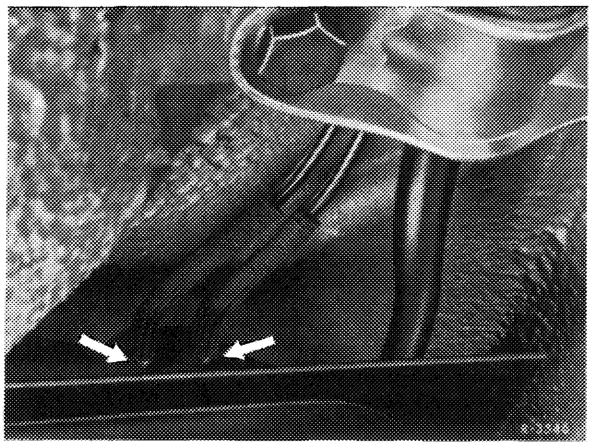
(J) up to January 1973
(S) up to end of series

An expansion tank (1) in trunk serves for positive and negative venting of fuel tank.



1 Expansion tank
2 Positive venting line to fuel tank
3 Negative venting line to atmosphere
4 Connecting hoses

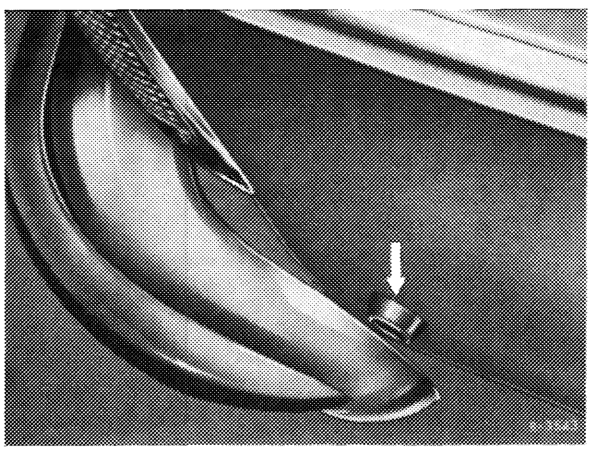
The expansion tank is connected to two positive venting lines (arrows) entering the fuel tank and with one negative venting line (3) to atmosphere.



Arrows = positive venting lines on fuel tank

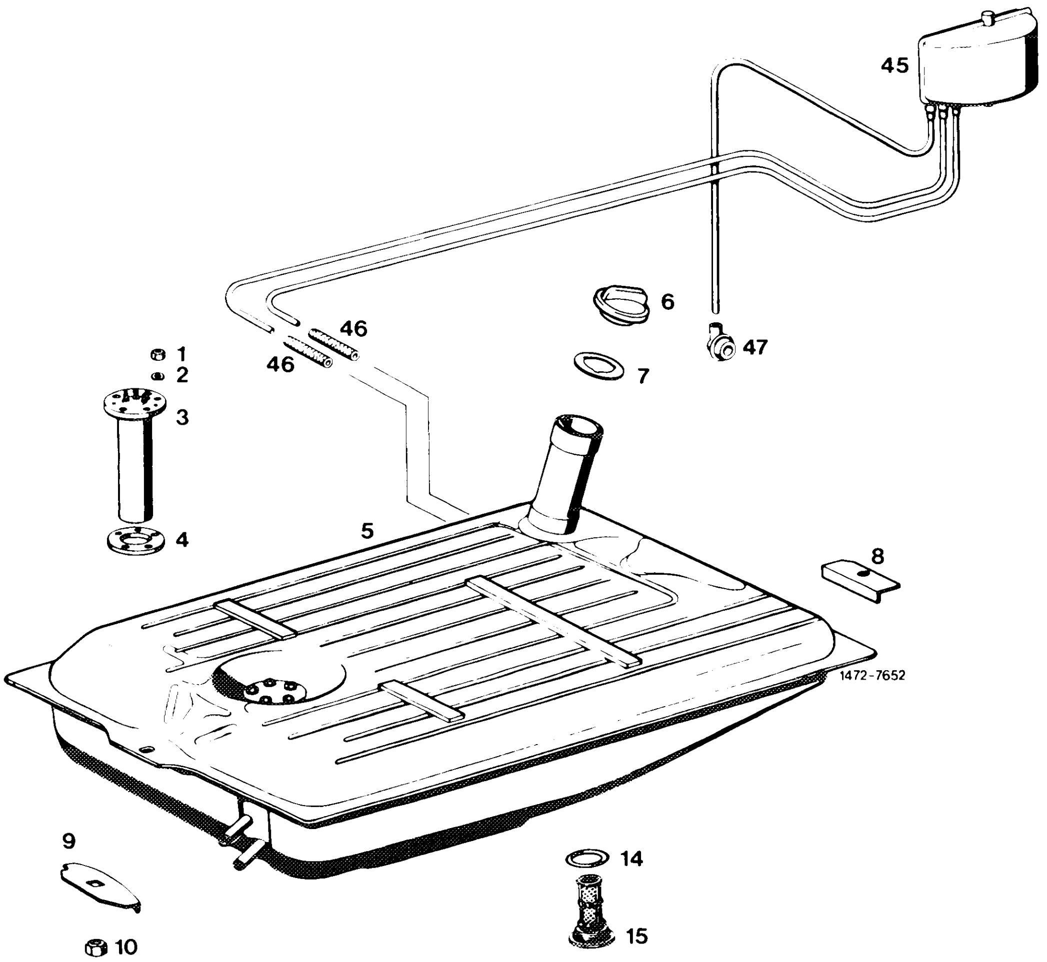
If with the fuel tank filled, fuel is forced into positive venting line (2), the fuel can rise up to expansion tank. As soon as one of the two positive venting lines is free of fuel, the fuel will immediately flow back into fuel tank, while the fuel vapors escape into the open air through negative venting line (3).

The fuel vapors escape into the atmosphere at point shown in illustration (arrow).



Arrow = outlet of fuel vapors into the atmosphere

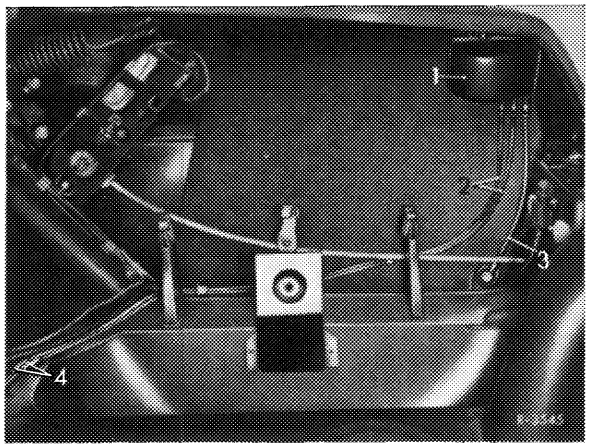
Model 114 Fuel system, fuel tank positive and negative venting



1 Nut
2 Spring washer
3 Immersion tube transmitter
4 Gasket
5 Fuel tank
6 Filler lock
7 Gasket
8,9 Reinforcing panel
10 Hex. nut
14 Sealing ring
15 Fuel drain plug with filter
45 Fuel expansion tank
46 Fuel hose
47 Rubber sleeve

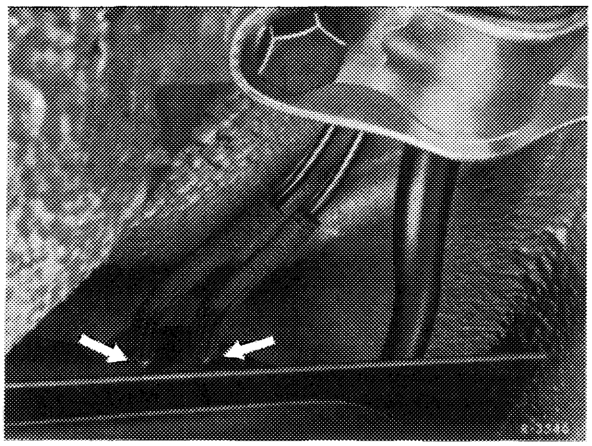
(J) up to January 1973
(S) up to end of series

An expansion tank (1) in trunk serves for positive and negative venting of fuel tank.



1 Expansion tank
2 Positive venting line to fuel tank
3 Negative venting line to atmosphere
4 Connecting hoses

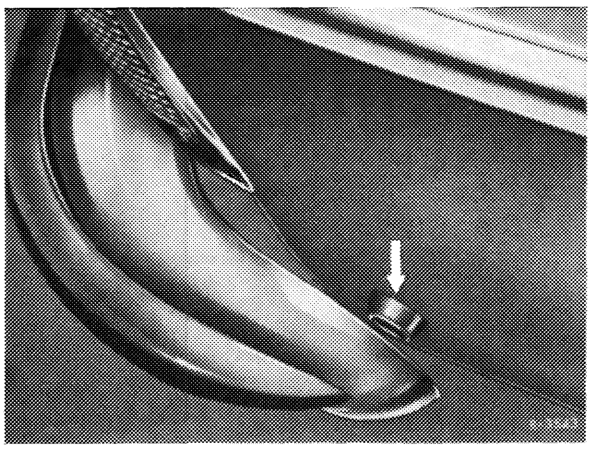
The expansion tank is connected to two positive venting lines (arrows) entering the fuel tank and with one negative venting line (3) to atmosphere.



Arrows = positive venting lines on fuel tank

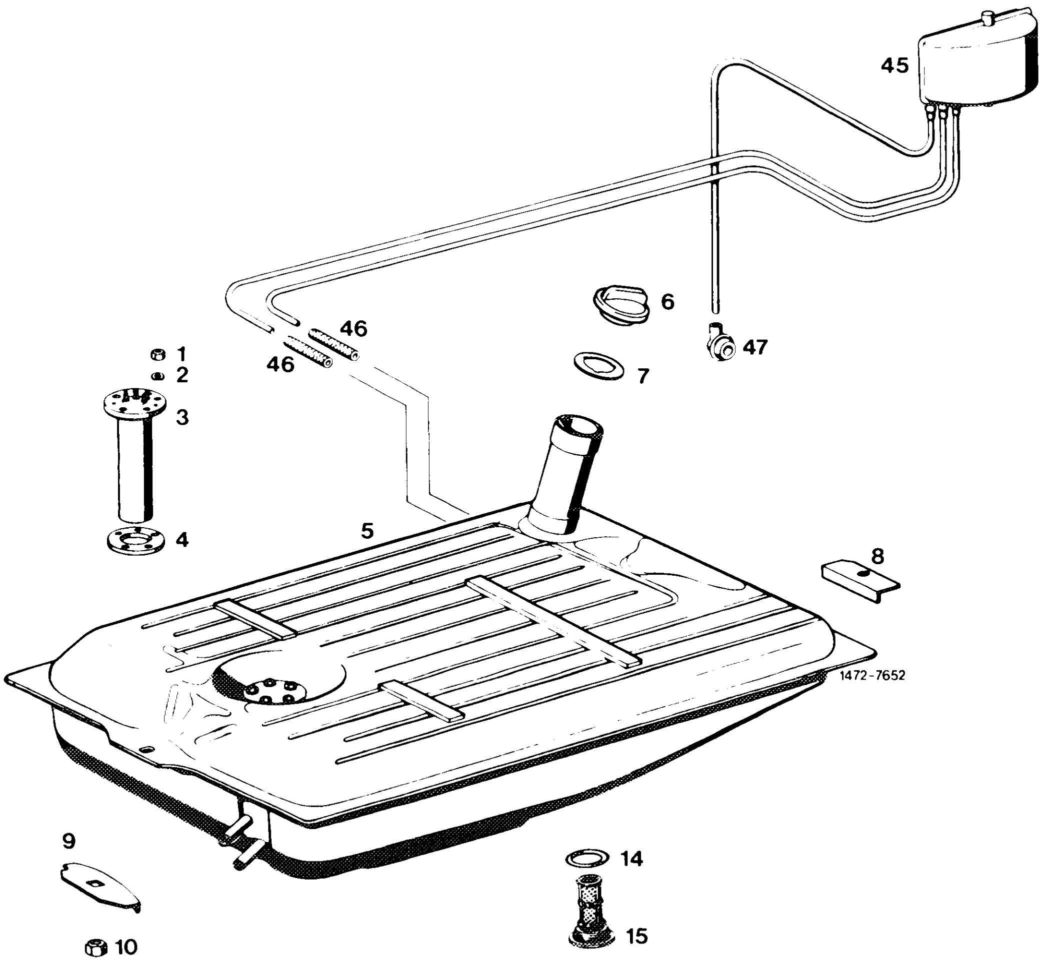
If with the fuel tank filled, fuel is forced into positive venting line (2), the fuel can rise up to expansion tank. As soon as one of the two positive venting lines is free of fuel, the fuel will immediately flow back into fuel tank, while the fuel vapors escape into the open air through negative venting line (3).

The fuel vapors escape into the atmosphere at point shown in illustration (arrow).



Arrow = outlet of fuel vapors into the atmosphere

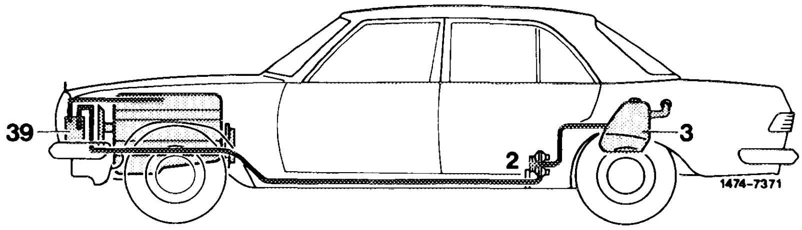
Model 114 Fuel system, fuel tank positive and negative venting



1 Nut
2 Spring washer
3 Immersion tube transmitter
4 Gasket
5 Fuel tank
6 Filler lock
7 Gasket
8,9 Reinforcing panel
10 Hex. nut
14 Sealing ring
15 Fuel drain plug with filter
45 Fuel expansion tank
46 Fuel hose
47 Rubber sleeve

(AUS) (USA) 1977
(J) 1977/78

The fuel evaporation control system which prevents the escape of evaporation vapors from fuel system into the atmosphere comprises the following components:



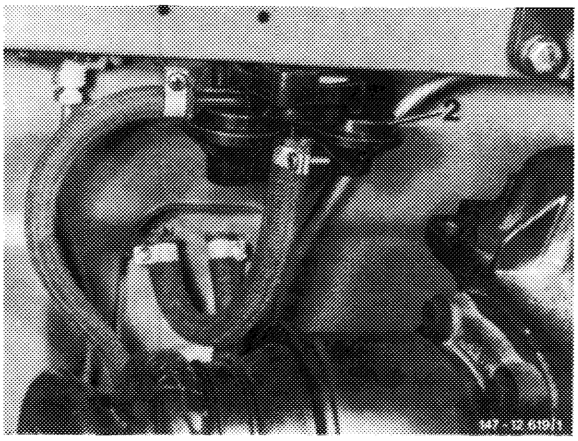
2 Valve system
3 Fuel tank
39 Charcoal canister

Valve system

The valve system is mounted underneath vehicle at level of rear legroom.

The valve system comprises three valves:

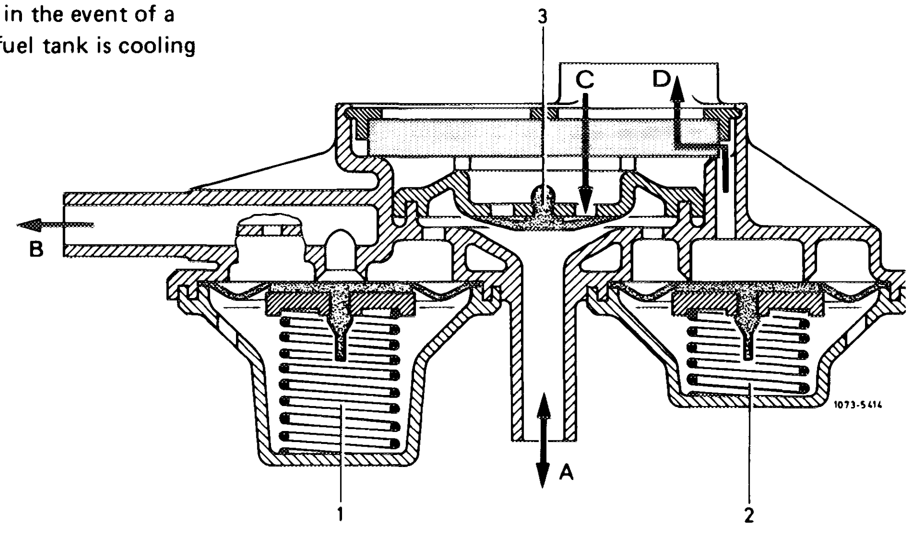
1. Pressure relief valve (negative vent valve)
2. Safety valve
3. Vacuum relief valve (positive vent valve)



The **pressure relief valve** opens at a slight overpressure. The evaporation vapors will flow through pressure relief valve (1) (direction B) in a line toward charcoal canister.

The **safety valve** opens in the event of overpressure in fuel evaporation control system. The fuel vapors will be vented directly into the atmosphere.

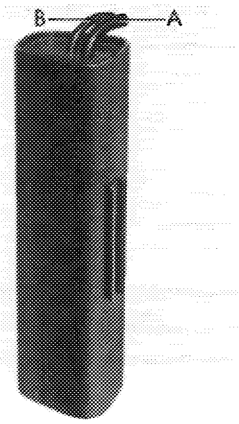
The **vacuum relief valve** opens in the event of a vacuum established when the fuel tank is cooling down.



1 Pressure relief valve
2 Safety valve
3 Vacuum relief valve
A To valve/to expansion tank
B To charcoal canister
C Fresh air inlet
D Outlet safety valve

Charcoal canister

The fuel evaporation vapors from fuel tank are stored in charcoal canister and drawn off again while driving.

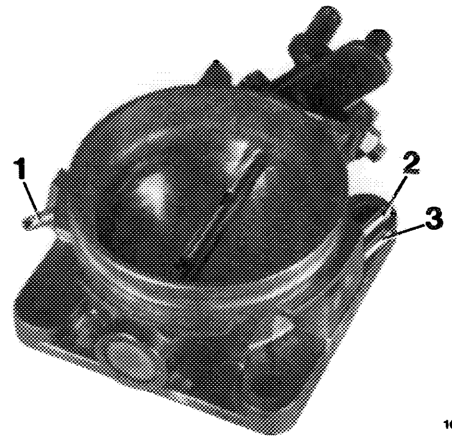


A Connection, fuel vapors from tank
B Connection, throttle valve housing

107-9128

Throttle valve housing

The throttle valve housing is provided with a connection for drawing evaporation vapors from charcoal canister.



1 Vacuum connection ignition retard
2 Vacuum connection ignition advance
3 Vacuum connection charcoal canister

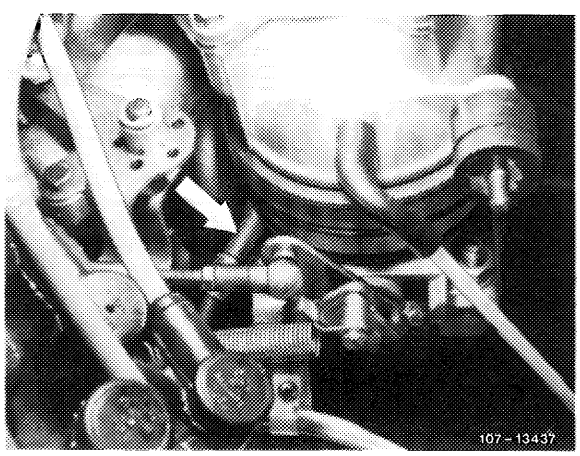
107-13053

The fuel tank with fuel expansion tank and the valve system correspond to the already known version.

Description of operation

The fuel vapors from fuel tank are routed to charcoal canister via valve system (2). The fuel evaporation vapors are stored in charcoal canister when the engine is stopped and are drawn off into throttle valve housing when the engine is running as from a given throttle valve position.

For checkup refer to: Exhaust gas test program

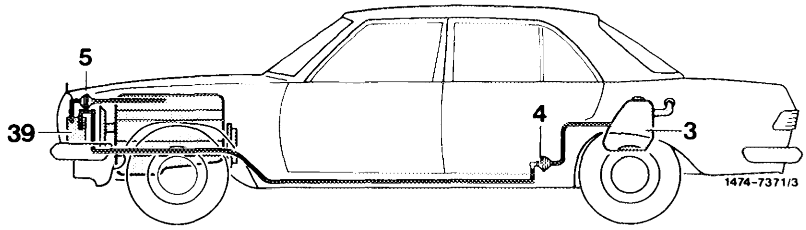


Arrow = Draw-off line to throttle valve housing

107-13437

(AUS) (USA) **1978–1980**
(J) **1979/80**

The fuel evaporation control system has been completely revised to meet the new limits specified by law.

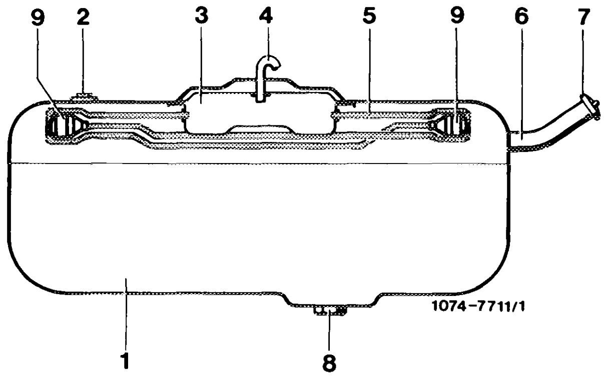


3 Fuel tank
4 Vent valve unit
5 Purge valve
39 Charcoal canister

The system comprises the following components:

Fuel tank

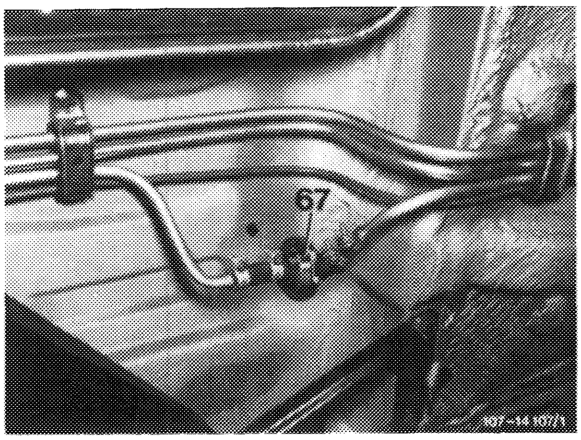
The fuel tank with the tube system and the collecting tray are identical to the already known versions.



1 Fuel tank
2 Immersion tube transmitter
3 Expansion tank
4 Connection vent valve unit
5 Tube system
6 Filler neck
7 Closing cover
8 Connection fuel feed line
9 Check vessels entering production starting 1979 (J) (model 123) (USA) starting 1980 (model 123) (J) (USA) model 126 starting 1981

Vent valve unit

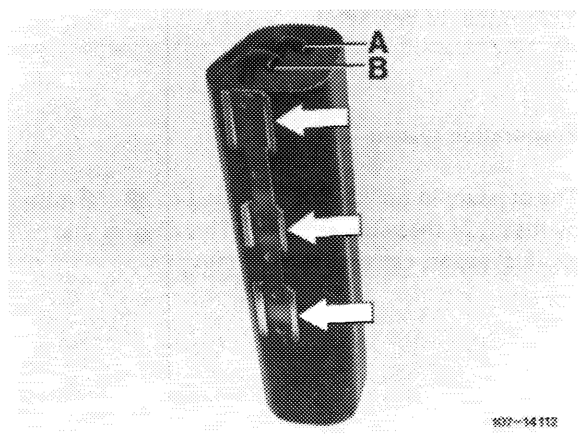
The vent valve unit (67) is mounted underneath vehicle at level or rear legroom and replaces the valve system known from model year 1977.



The unit comprises a pressure relief valve (negative vent valve) and a vacuum relief valve (positive vent valve).

Charcoal canister

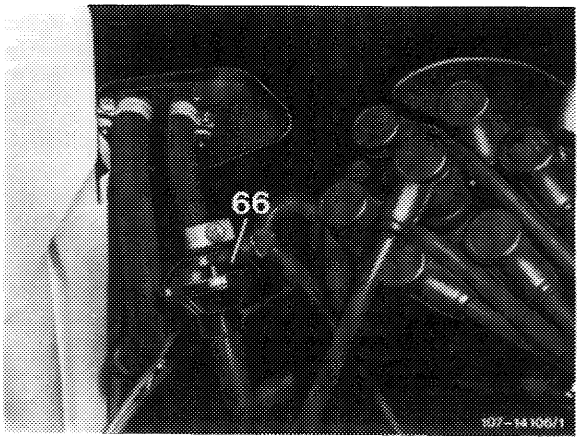
The charcoal canister is identical with the already known version, except that the fastening bracket (arrows) has been modified.



A Draw-off line to throttle valve housing
B Fuel tank vent line

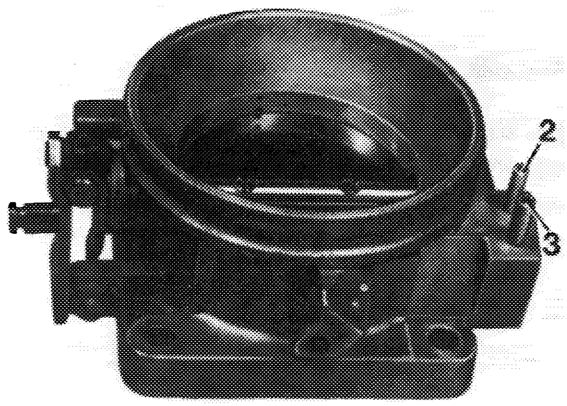
Purge valve

The purge valve (66) is located in purge line from charcoal canister to throttle valve housing.



Throttle valve housing

In comparison to model year 1977 the throttle valve housing has been slightly modified. To prevent a mix-up of the vacuum lines, the outside diameter of the vacuum line to the charcoal canister has been increased from 4 to 5 mm. To purge the fuel vapors from the charcoal canister, two purge bores are provided above the throttle valve.

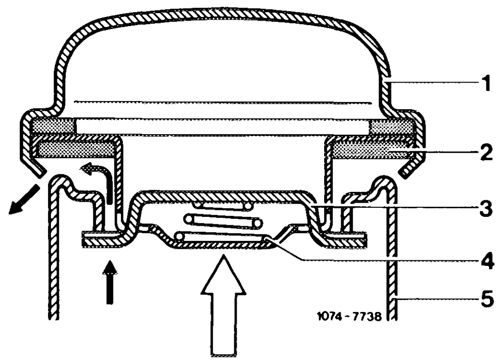


2 Vacuum connection, ignition advance
3 Vacuum connection, charcoal canister

107–14282

Fuel tank cap

To avoid excessive pressure in fuel tank, the fuel tank cap has been modified.



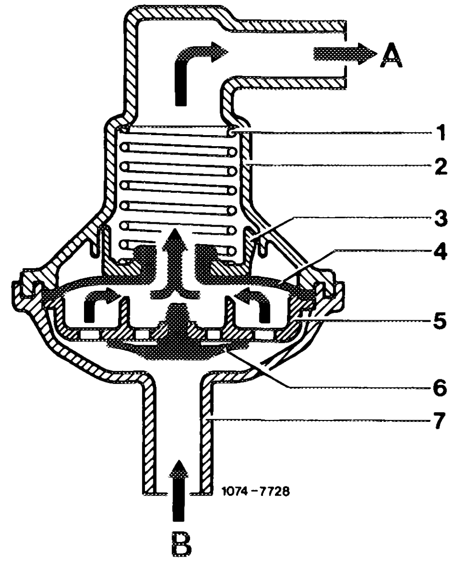
1 Fuel tank cap
2 Gasket
3 Locking tab
4 Compression spring
5 Filler neck

Description of operation

Evaporation system

The pressure in fuel tank is increased to 30–50 mbar by means of the vent valve (67). This ensures that less fuel vapors can escape from tank.

If a pressure of 30–50 mbar is reached in the fuel tank, the pressure relief valve (4) opens and permits the fuel vapors to travel to the charcoal canister, where they are stored if the engine is not running.

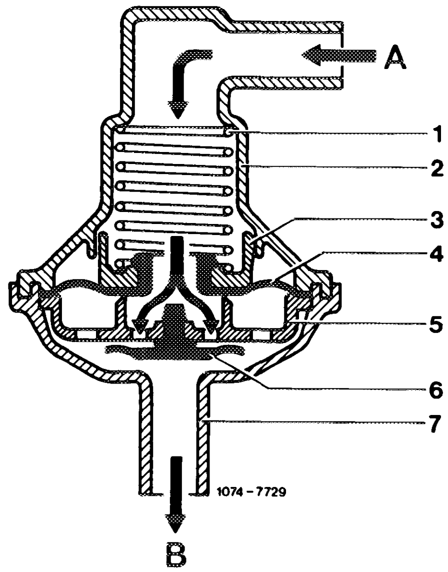


Vent valve unit, open to charcoal canister

1 Compression spring
2 Valve housing
3 Spring seat
4 Pressure relief valve
5 Valve disk
6 Vacuum relief valve
7 Connection fitting

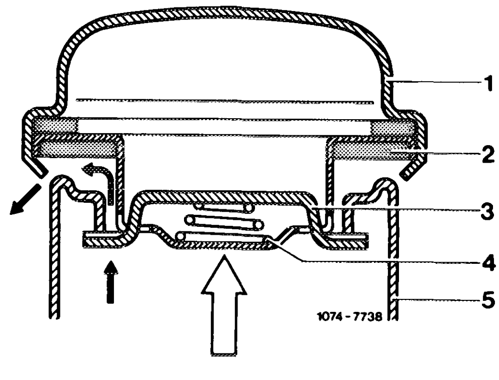
A Connection, charcoal canister
B Connection, fuel tank

When the fuel cools down, the decreasing volume is balanced by the intake of air or of fuel evaporation vapors from charcoal canister via vacuum relief valve (6) starting at a vacuum of 1–16 mbar. If the vacuum in the fuel tank drops below 1 mbar, the vacuum relief valve (6) closes.



Vent valve unit, open to fuel tank

If the pressure in the fuel tank increases above 100–300 mbar due to a malfunction in the fuel evaporation system, the fuel vapors can escape via the fuel filler cap.

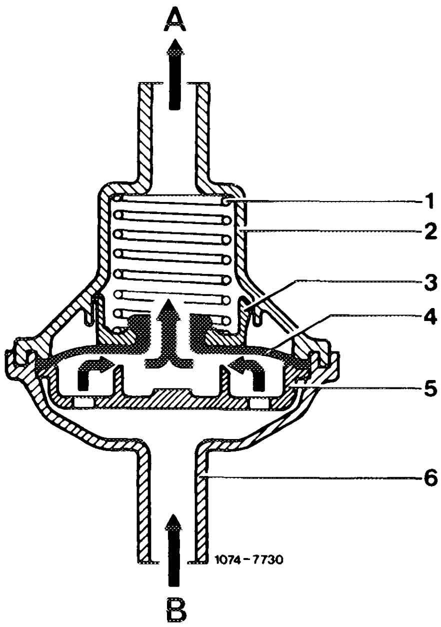


1 Fuel tank cap
2 Sealing ring
3 Locking tab
4 Compression spring
5 Filler neck

Purge system

The charcoal canister is connected with the throttle valve housing by a hose in which the purge valve is installed.

When the engine is running and the vacuum in the purge line exceeds 30—50 mbar, the purge valve opens. The fuel vapors stored in the charcoal canister can be drawn into the throttle valve housing depending on the throttle valve position.

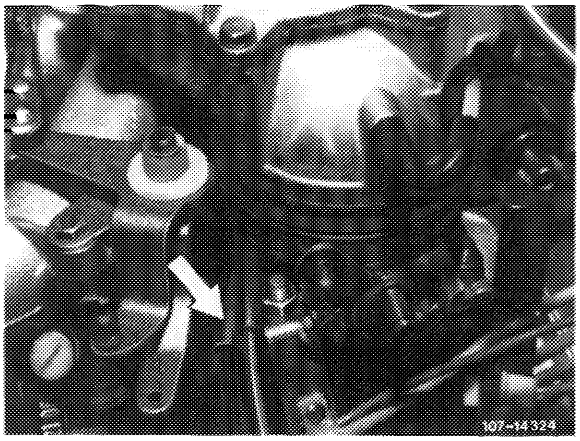


Purge valve open

1 Compression spring
2 Valve housing
3 Spring seat
4 Pressure relief valve
5 Valve disk
6 Connection fitting

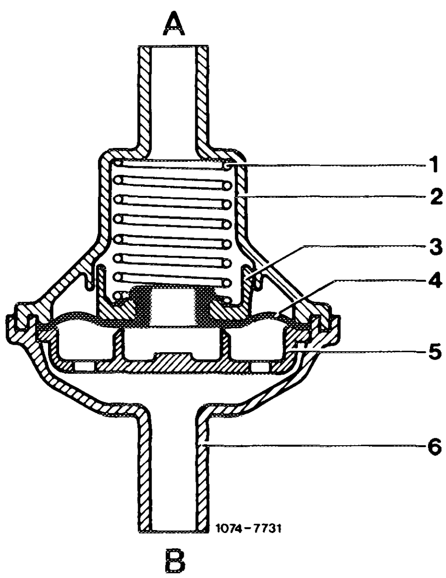
A Connection, throttle valve housing
B Connection, charcoal canister

As the throttle valve is opened, the two purge bores in the throttle valve housing, which terminate in a common passage, are progressively exposed to the venturi vacuum. This will result in a metered purging in the lower partial load operating range of the engine without influencing the driving characteristics.



Arrow = Draw-off connection of throttle valve

At idle and during coasting (throttle valve closed) both purge bores are located on the atmosphere side of the throttle valve. The purge valve is closed and, therefore, no purging of fuel vapors from the charcoal canister takes place.



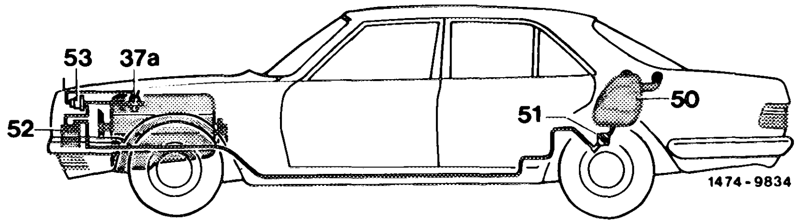
Purge valve, closed

(AUS), (J) starting 1981, (USA) 1981

The fuel evaporation control system has been revised in comparison to model year 1980. The purge system is controlled by means of a thermovalve and is effective only above approx. 50 °C/122 °F coolant temperature.

Functional diagram

37a Thermovalve 50 °C/122 °F
50 Fuel tank
51 Vent valve unit
52 Charcoal canister
53 Purge valve

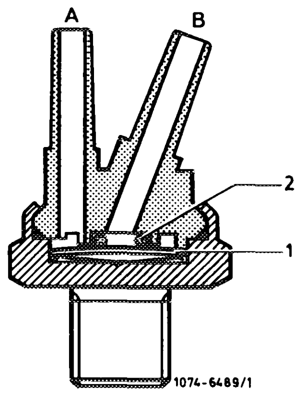


Components of fuel evaporation control system

Only the new components are shown here.

Thermovalve 50 °C/122 °F (37a, color code red)

The thermovalve is installed in the sensor box on the cylinder head and opens at an engine cooling temperature of 50 °C/122 °F.

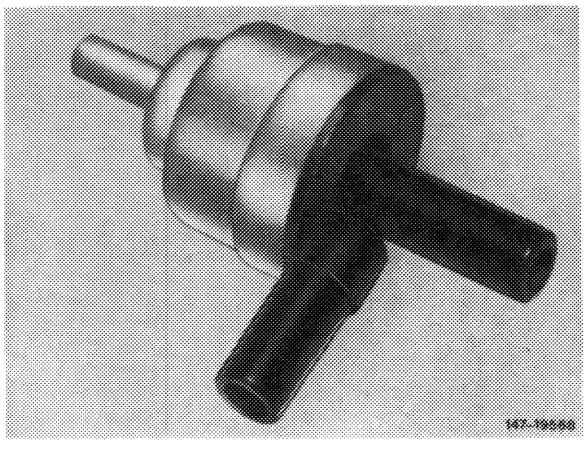


1 Bimetallic plate
2 O-ring

A To purge valve
B To throttle valve housing

Purge valve (53, vacuum-controlled)

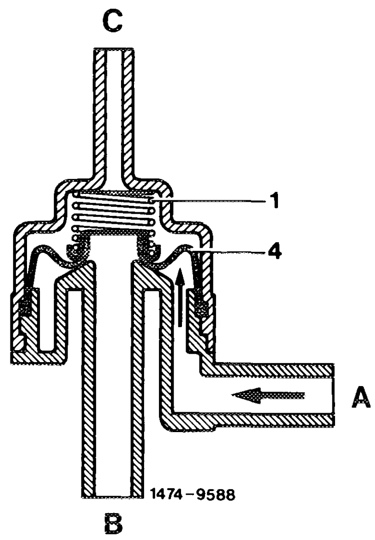
The purge valve is installed in the purge line from the charcoal canister to the throttle valve housing. It can be recognized by the vacuum connection to thermovalve 50 °C.



Description of operation

Purge system

The charcoal canister is connected to the throttle valve housing by a line in which the purge valve is installed.

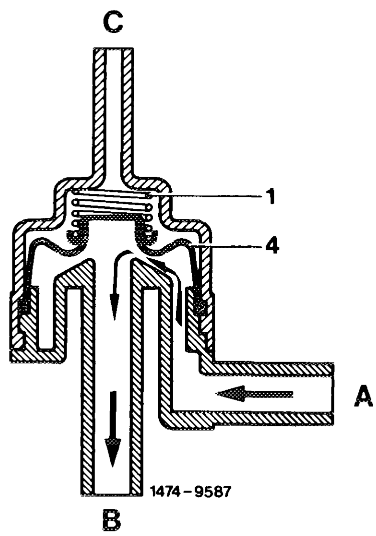


Purge valve closed

A Connection, charcoal canister
B Connection, throttle valve housing
C Vacuum connection
1 Compression spring
4 Diaphragm

When the engine is running at a coolant temperature above approx. 50 °C/122 °F, intake manifold vacuum is applied to the purge valve through the thermovalve with the throttle valve slightly raised. The diaphragm (4) is pulled in upward direction against the spring force and connection from A to B is made.

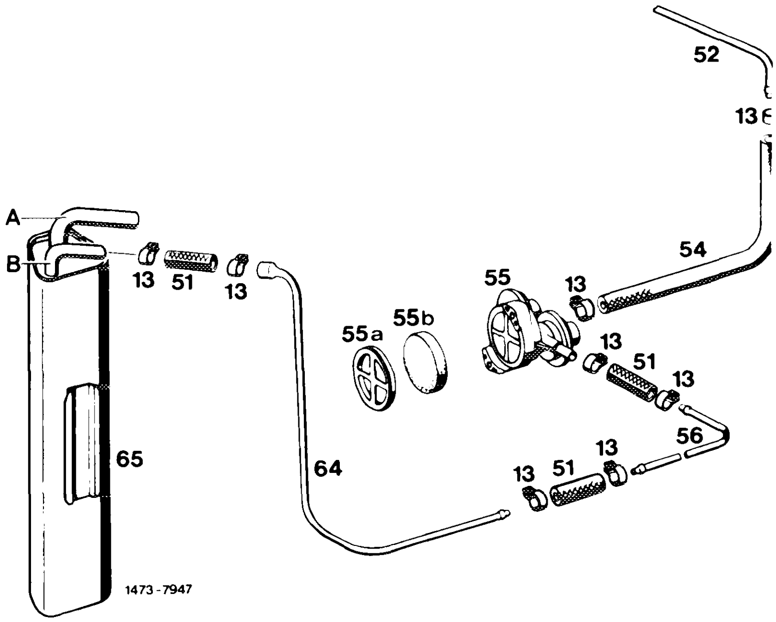
When the throttle valve is opened still further, the two purge openings, which terminate in a common passage, are progressively exposed to the venturi vacuum. This will result in a metered purging in the lower partial load operating range of the engine without influencing the driving characteristics.



Purge valve, open

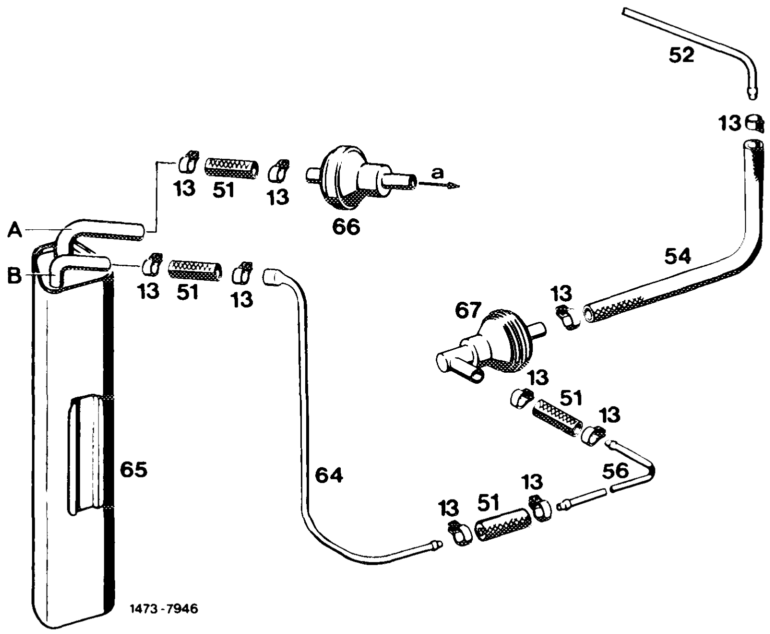
Fuel evaporation control system

(AUS) (USA) 1977
(J) 1977/78



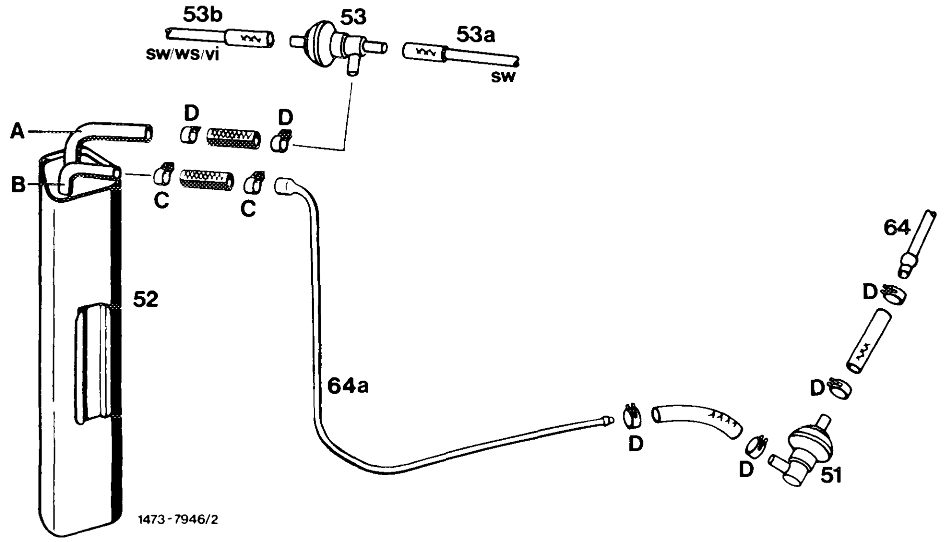
13	Hose clamp
51	Fuel hose
52	Vent line from fuel tank
54	Fuel hose
55	Valve system
55a	Cover
55b	Filter
56	Vent line
64	Vent line
65	Charcoal canister
A	Draw-off line to throttle valve housing
B	Fuel tank vent line

(AUS) (USA) 1978–1980
(J) 1979/80



13	Hose clamp
51	Fuel hose
52	Vent line from fuel tank
54	Fuel hose
56	Vent line
64	Vent line
65	Charcoal canister
66	Purge valve
67	Vent valve unit
a	To throttle valve housing
A	Draw-off line to purge valve
B	Fuel tank vent line

(AUS)(J) starting 1981
(USA) 1981



51 Vent valve
52 Charcoal canister
53 Purge valve
53a Draw-off line to throttle valve
53b Vacuum line
64 Vent line from fuel tank
64a Vent line to charcoal canister

A To purge valve
B To fuel tank
C Hose clamp
D Clamp

Color code
sw = black
vi = purple
ws = white

Note

(J) starting January 1973 up to production model year 1976
(USA) 1973, 1974 Federal

High outside temperatures and self-heating of returning fuel will also heat fuel tank. Legislation in a number of countries does not permit these fuel evaporation vapors to escape into the atmosphere.

For this reason, the fuels are drawn from fuel tank via crankcase breather into the combustion chambers when the engine is running, and they are stored in crankcase when the engine is stopped.

Model 114

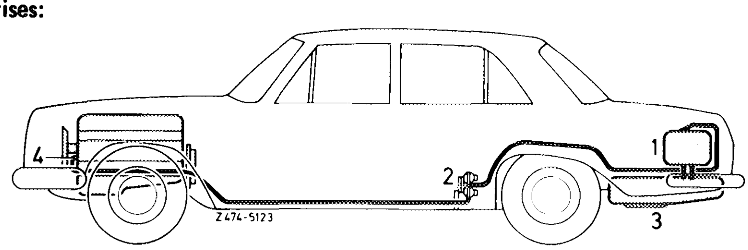
From fuel tank, two lines are leading to expansion tank (capacity 4.5 l). The expansion tank is mounted at the right in trunk.

Both lines serve as venting, overflow or discharge lines depending on position of fuel level in fuel tank, on fuel volume and on temperature.

At the highest point of the expansion tank is the connection for the positive and negative venting line to valve system (2).

The fuel evaporation control system comprises:

Fuel expansion tank (1)
Valve system (2)
Fuel tank (3)
Draw-off connection on crankcase (4)

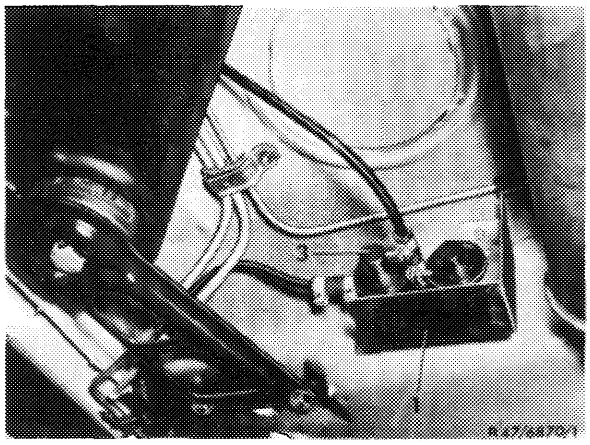


Valve system

The valve system is mounted underneath vehicle at level of rear legroom.

The valve system comprises three valves:

1. Negative vent valve
2. Pressure relief valve
3. Positive vent valve

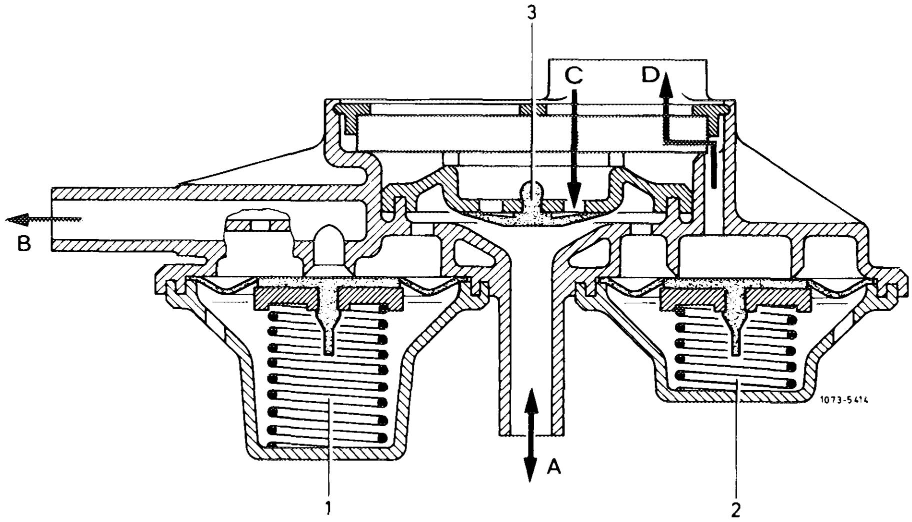


1 Protective box
3 Valve system

The **negative vent valve** (1) opens at slight overpressure. The evaporation vapors are flowing via a negative vent valve (1, direction B) into a line toward engine. The line enters into cylinder crankcase at connection point.

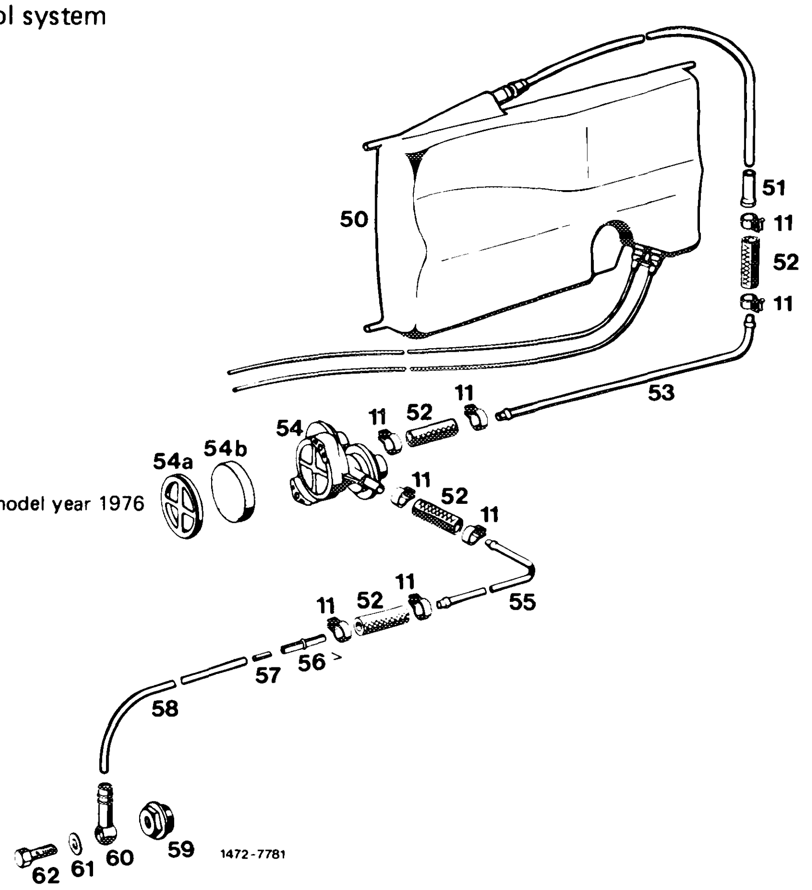
The **pressure relief valve** (2) opens as a safety valve in the event of overpressure in fuel evaporation system. The fuel vapors are bled directly into the open air.

The **positive vent valve** (3) opens whenever cooling down of fuel tank results in a vacuum.



1 Negative vent valve
2 Pressure relief valve
3 Positive vent valve
A To valve/to expansion tank
B To crankcase
C Fresh air inlet
D Outlet pressure relief valve

Model 114 Fuel evaporation control system



Ⓙ starting January 1973 up to production model year 1976

ⓊⓈⒶ 1973, 1974 Federal

11 Hose clamp
50 Fuel expansion tank
51 Connecting pipe
52 Fuel hose
53 Negative venting line
54 Valve system
54a Cover
54b Filter
55 Negative vent line
56 Connecting pipe
57 Throttle
58 Negative vent line
59 Closing plug
60 Ring fitting
61 Sealing ring
62 Hollow screw

USA California 1974 and USA 1975/76
J 1976

A fuel evaporation control system has been installed to improve emissions which are not directly connected with engine combustion.

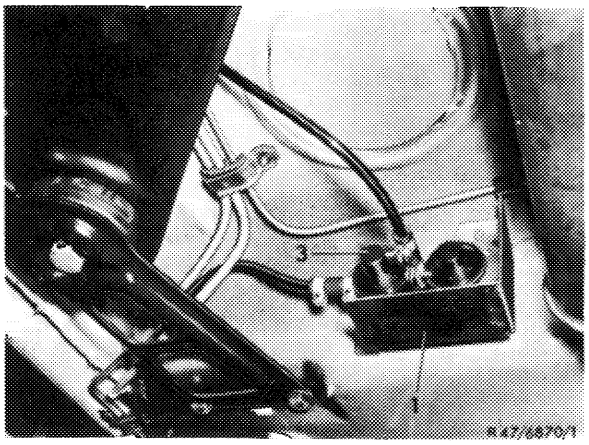
Components of fuel evaporation control system

Valve system

The valve system is mounted underneath vehicle in level of rear legroom.

The valve system comprises three valves:

1. Negative vent valve
2. Pressure relief valve
3. Positive vent valve

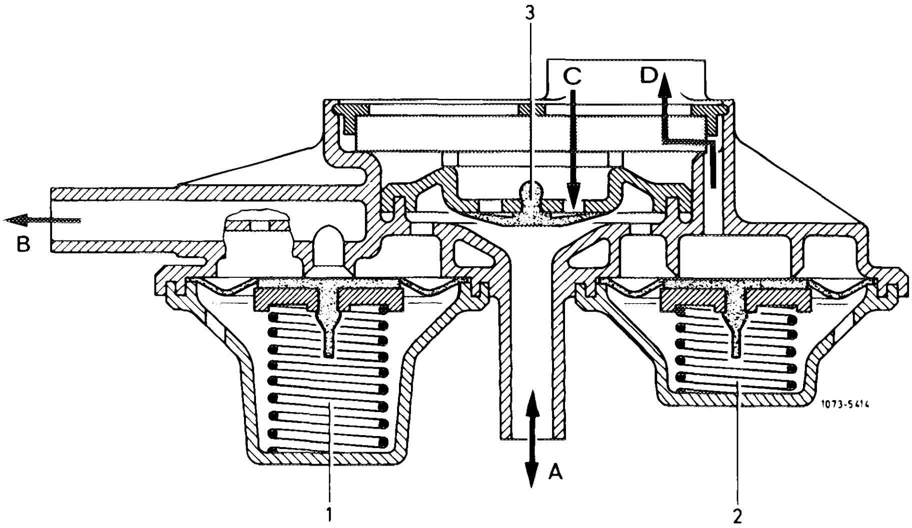


1 Protective box
3 Valve system

The **negative vent valve** opens at a slight overpressure. The evaporation vapors are flowing via negative vent valve (1, direction B) into the line toward charcoal canister.

The **pressure relief valve** opens as a safety valve in the event of an overpressure in fuel evaporation system. The fuel vapors are bled directly into the open air.

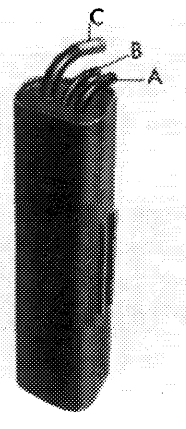
The **positive vent valve** opens whenever cooling down of fuel tank results in a vacuum.



1 Negative vent valve
2 Pressure relief valve
3 Positive vent valve
A To valve/to expansion tank
B To charcoal canister
C Fresh air inlet
D Outlet pressure relief valve

Charcoal canister

The fuel evaporation vapors from fuel tank and from float chamber are stored in charcoal canister and are drawn again out of canister when driving.

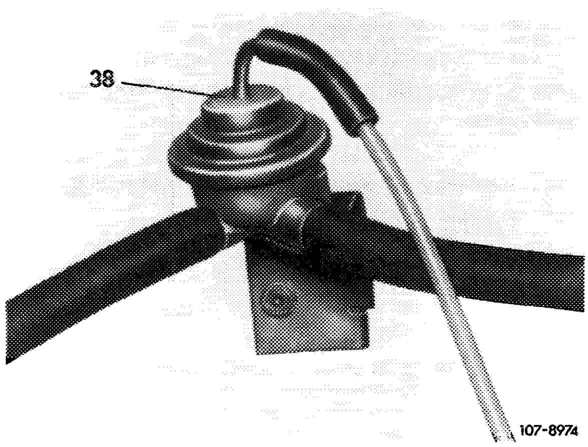


A Tank vent connection
B Draw-off valve connection
C Float chamber-positive vent valve connection

107–9131

Draw-off valve (purge valve)

The draw-off valve (purge valve) controls the volume of the fuel evaporation gases, which are drawn off by way of a connection in front of carburetor throttle valve depending on throttle valve position.

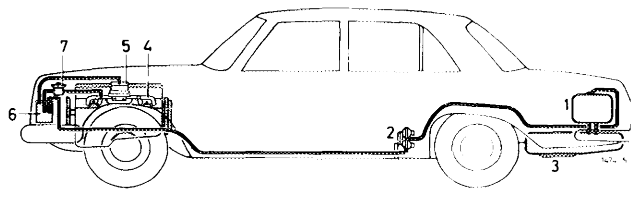


107-8974

Operation

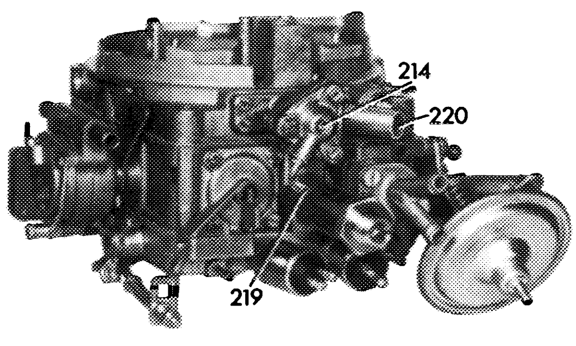
Function diagram

1 Expansion tank
2 Valve system
3 Fuel tank
4 Intake pipe
5 Carburetor with positive vent valve
6 Charcoal canister
7 Draw-off valve (purge valve)



The fuel evaporation gases from fuel tank and from float chamber of carburetor are stored in charcoal canister when the engine is stopped, and are drawn from charcoal canister when the engine is running, depending on intake pipe vacuum.

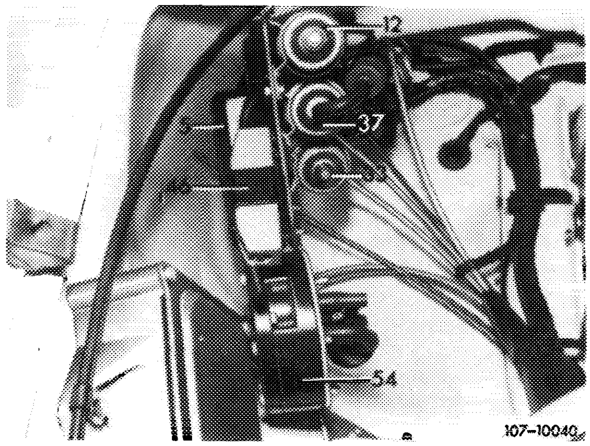
The fuel evaporation vapors are routed directly into charcoal canister.



214 Float chamber positive vent valve
219 Vacuum connection
220 Negative vent connection

107–10093

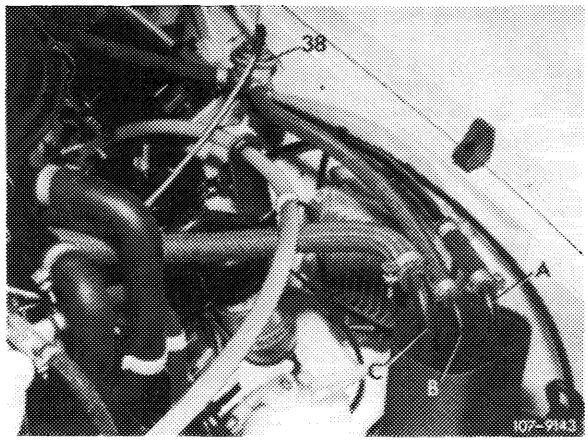
The fuel evaporation vapors from float chamber are flowing to charcoal canister only when the engine is stopped and the float chamber positive vent valve is open and are stored in charcoal canister.



With the engine running, the switchover valve (37) is energized and the diaphragm of the float chamber positive vent valve is provided with a vacuum, the valve will close and interrupt the connection to charcoal canister.

In dependence of the throttle valve position of the I. stage of the carburetor the diaphragm of the draw-off valve (38) is provided with a vacuum, the valve opens.

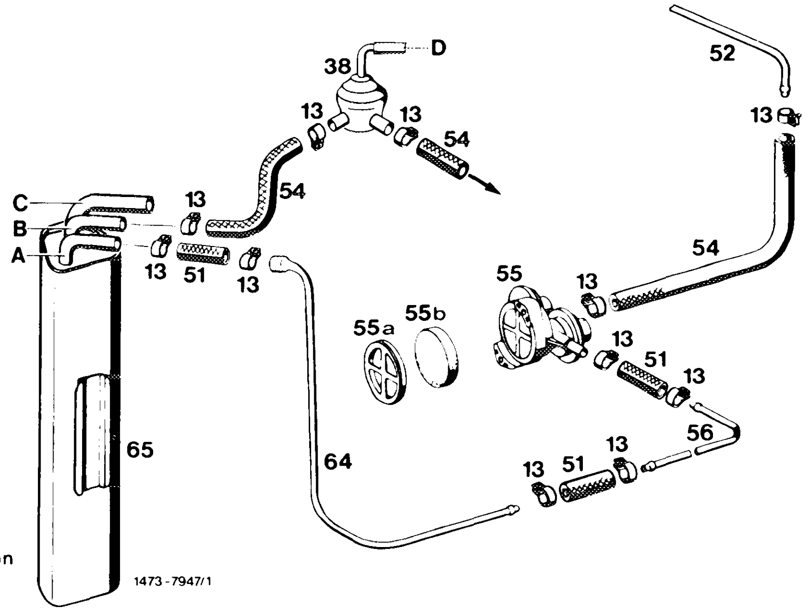
The intake pipe vacuum will draw the stored vapors from charcoal canister for burning.



38 Draw-off valve (purge valve)
A Tank vent connection
B Draw-off valve connection
C Float chamber-positive vent valve connection

Fuel evaporation control system
(USA) 1974 California, 1975/76 Federal and California
(J) 1976

13 Hose clamp
38 Draw-off valve (purge valve)
51 Fuel hose
52 Negative vent line from fuel tank
54 Fuel hose
55 Valve system
55a Cover
55b Filter
56 Negative vent line
64 Negative vent line
65 Charcoal canister
A Tank vent connection
B Draw-off valve connection
C Float chamber-positive vent valve connection
D Vacuum line
Arrow = draw-off connection carburetor



Note

(J) starting January 1973 up to production model year 1976
(USA) 1973, 1974 Federal

High outside temperatures and self-heating of returning fuel will also heat fuel tank. Legislation in a number of countries does not permit these fuel evaporation vapors to escape into the atmosphere.

For this reason, the fuels are drawn from fuel tank via crankcase breather into the combustion chambers when the engine is running, and they are stored in crankcase when the engine is stopped.

Model 114

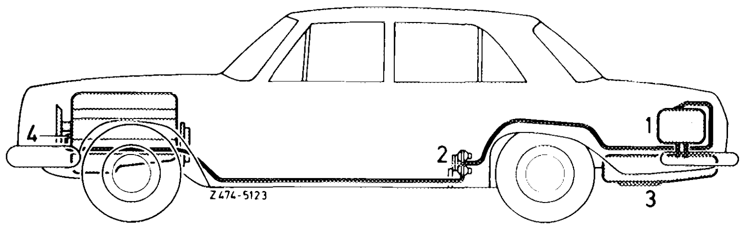
From fuel tank, two lines are leading to expansion tank (capacity 4.5 l). The expansion tank is mounted at the right in trunk.

Both lines serve as venting, overflow or discharge lines depending on position of fuel level in fuel tank, on fuel volume and on temperature.

At the highest point of the expansion tank is the connection for the positive and negative venting line to valve system (2).

The fuel evaporation control system comprises:

Fuel expansion tank (1)
Valve system (2)
Fuel tank (3)
Draw-off connection on crankcase (4)

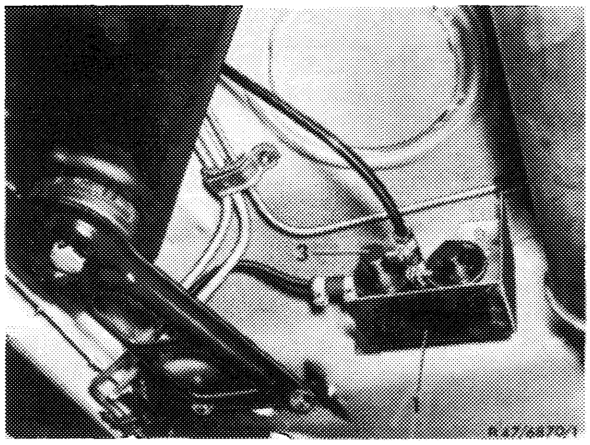


Valve system

The valve system is mounted underneath vehicle at level of rear legroom.

The valve system comprises three valves:

1. Negative vent valve
2. Pressure relief valve
3. Positive vent valve

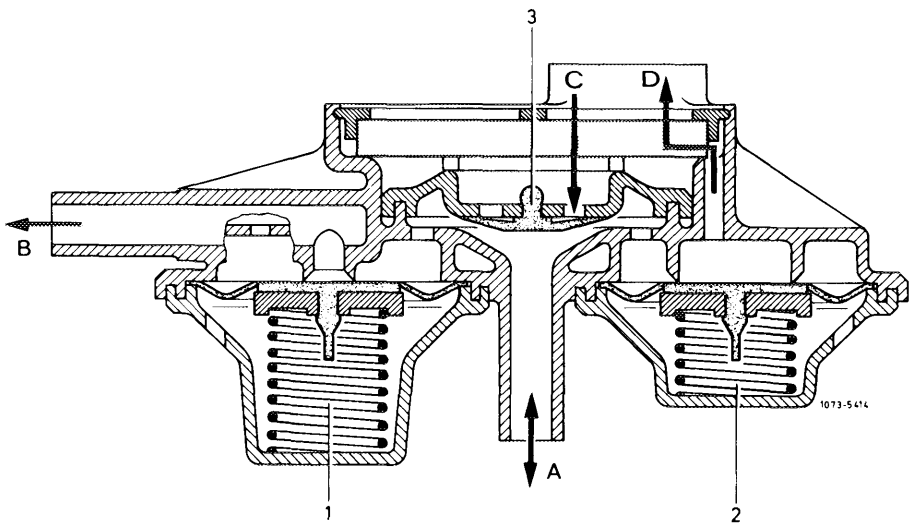


1 Protective box
3 Valve system

The **negative vent valve** (1) opens at slight overpressure. The evaporation vapors are flowing via a negative vent valve (1, direction B) into a line toward engine. The line enters into cylinder crankcase at connection point.

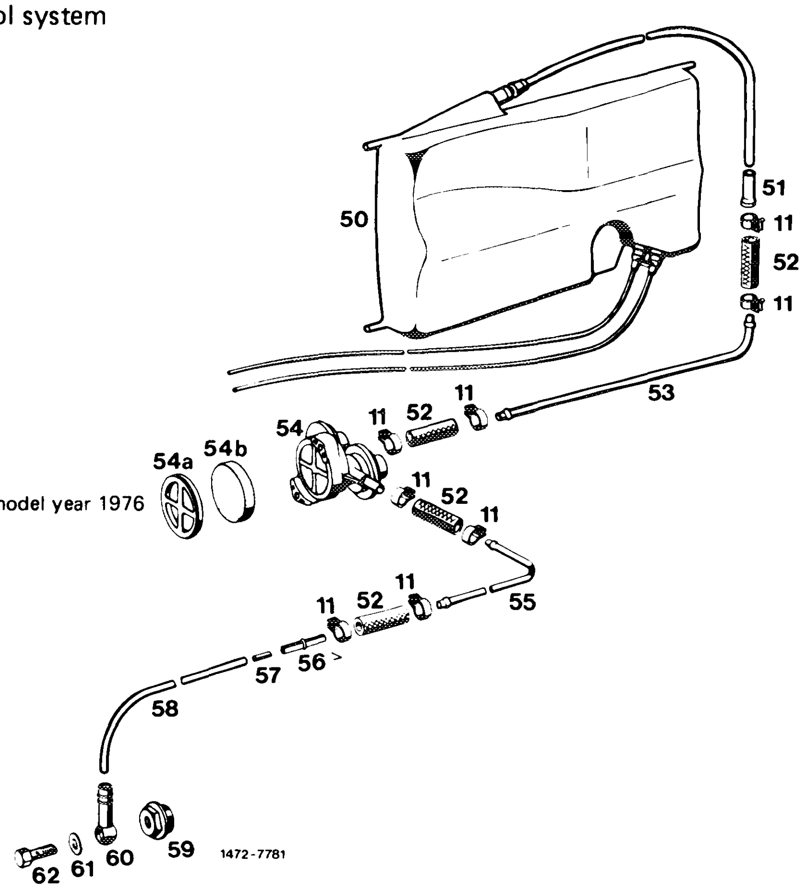
The **pressure relief valve** (2) opens as a safety valve in the event of overpressure in fuel evaporation system. The fuel vapors are bled directly into the open air.

The **positive vent valve** (3) opens whenever cooling down of fuel tank results in a vacuum.



1 Negative vent valve
2 Pressure relief valve
3 Positive vent valve
A To valve/to expansion tank
B To crankcase
C Fresh air inlet
D Outlet pressure relief valve

Model 114 Fuel evaporation control system



(J) starting January 1973 up to production model year 1976

(USA) 1973, 1974 Federal

11 Hose clamp
50 Fuel expansion tank
51 Connecting pipe
52 Fuel hose
53 Negative venting line
54 Valve system
54a Cover
54b Filter
55 Negative vent line
56 Connecting pipe
57 Throttle
58 Negative vent line
59 Closing plug
60 Ring fitting
61 Sealing ring
62 Hollow screw

(USA) California 1974 and (USA) 1975/76
(J) 1976

A fuel evaporation control system has been installed to improve emissions which are not directly connected with engine combustion.

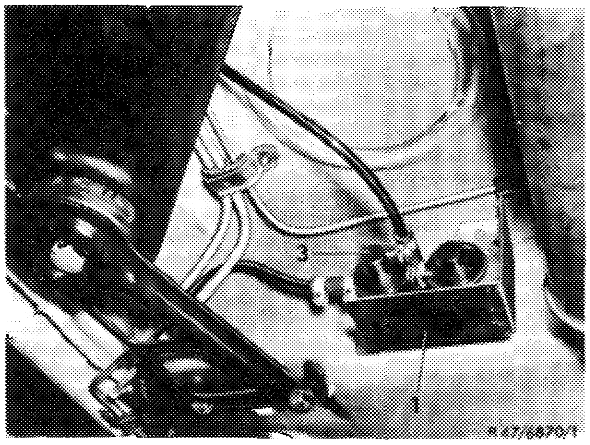
Components of fuel evaporation control system

Valve system

The valve system is mounted underneath vehicle in level of rear legroom.

The valve system comprises three valves:

1. Negative vent valve
2. Pressure relief valve
3. Positive vent valve

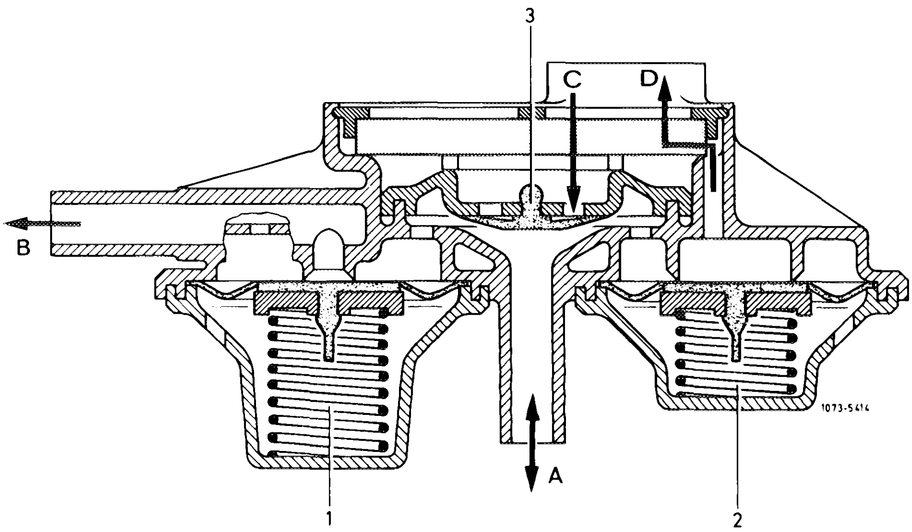


1 Protective box
3 Valve system

The **negative vent valve** opens at a slight overpressure. The evaporation vapors are flowing via negative vent valve (1, direction B) into the line toward charcoal canister.

The **pressure relief valve** opens as a safety valve in the event of an overpressure in fuel evaporation system. The fuel vapors are bled directly into the open air.

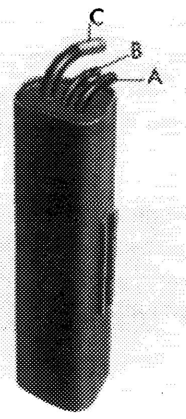
The **positive vent valve** opens whenever cooling down of fuel tank results in a vacuum.



1 Negative vent valve
2 Pressure relief valve
3 Positive vent valve
A To valve/to expansion tank
B To charcoal canister
C Fresh air inlet
D Outlet pressure relief valve

Charcoal canister

The fuel evaporation vapors from fuel tank and from float chamber are stored in charcoal canister and are drawn again out of canister when driving.

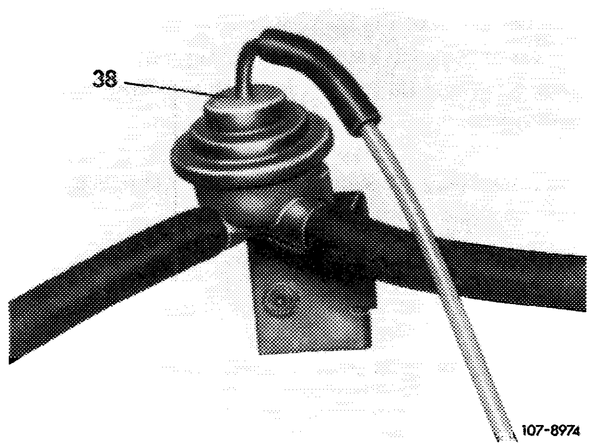


A Tank vent connection
B Draw-off valve connection
C Float chamber-positive vent valve connection

107–9131

Draw-off valve (purge valve)

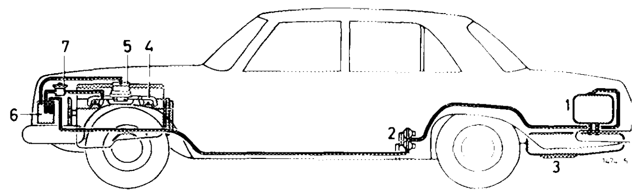
The draw-off valve (purge valve) controls the volume of the fuel evaporation gases, which are drawn off by way of a connection in front of carburetor throttle valve depending on throttle valve position.



107-8974

Operation

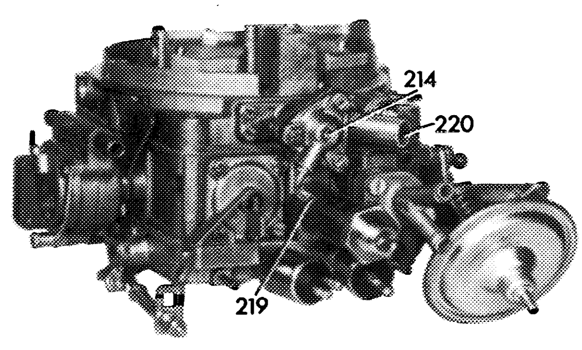
Function diagram



1 Expansion tank
2 Valve system
3 Fuel tank
4 Intake pipe
5 Carburetor with positive vent valve
6 Charcoal canister
7 Draw-off valve (purge valve)

The fuel evaporation gases from fuel tank and from float chamber of carburetor are stored in charcoal canister when the engine is stopped, and are drawn from charcoal canister when the engine is running, depending on intake pipe vacuum.

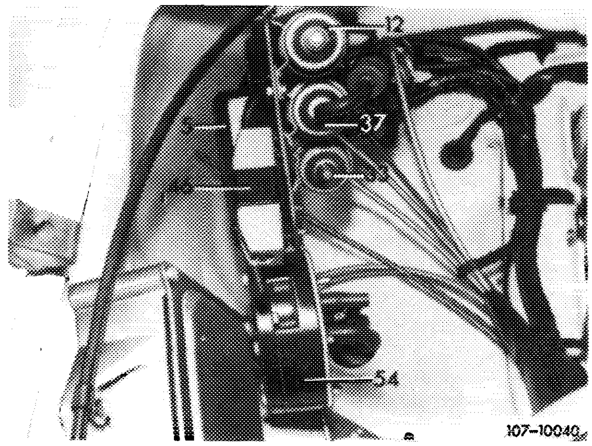
The fuel evaporation vapors are routed directly into charcoal canister.



214 Float chamber positive vent valve
219 Vacuum connection
220 Negative vent connection

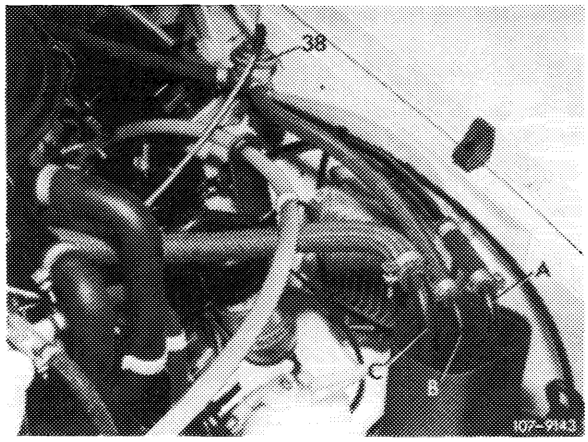
107–10093

The fuel evaporation vapors from float chamber are flowing to charcoal canister only when the engine is stopped and the float chamber positive vent valve is open and are stored in charcoal canister.



With the engine running, the switchover valve (37) is energized and the diaphragm of the float chamber positive vent valve is provided with a vacuum, the valve will close and interrupt the connection to charcoal canister.

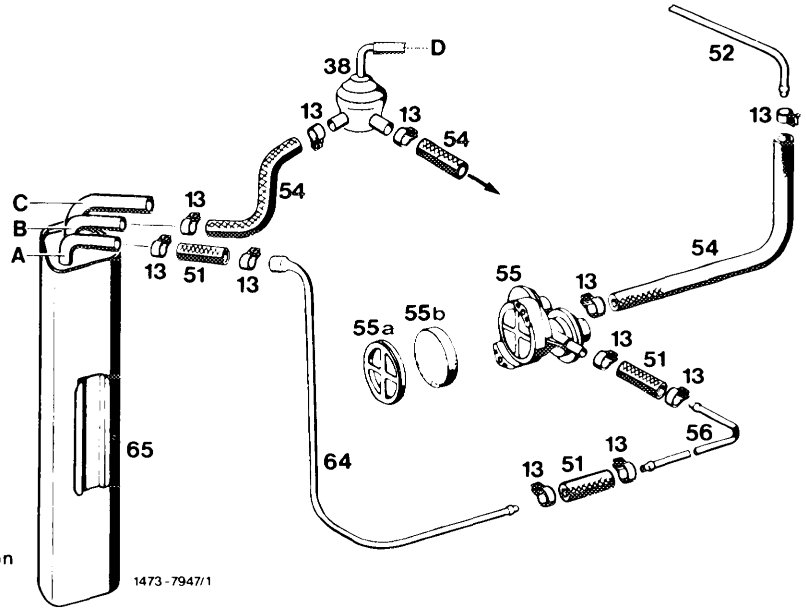
In dependence of the throttle valve position of the I. stage of the carburetor the diaphragm of the draw-off valve (38) is provided with a vacuum, the valve opens.



The intake pipe vacuum will draw the stored vapors from charcoal canister for burning.

38 Draw-off valve (purge valve)
A Tank vent connection
B Draw-off valve connection
C Float chamber-positive vent valve connection

Fuel evaporation control system
(USA) 1974 California, 1975/76 Federal and California
(J) 1976



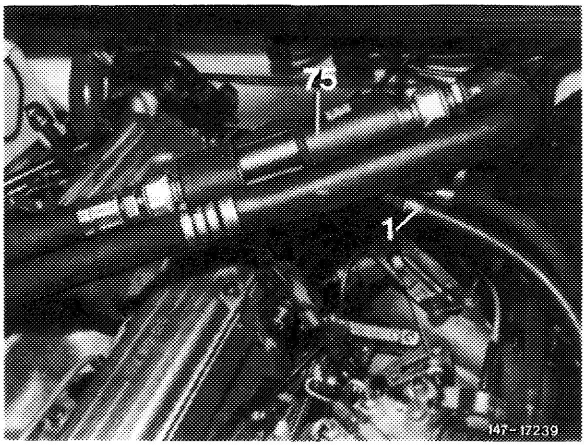
13 Hose clamp
38 Draw-off valve (purge valve)
51 Fuel hose
52 Negative vent line from fuel tank
54 Fuel hose
55 Valve system
55a Cover
55b Filter
56 Negative vent line
64 Negative vent line
65 Charcoal canister
A Tank vent connection
B Draw-off valve connection
C Float chamber-positive vent valve connection
D Vacuum line
Arrow = draw-off connection carburetor

(J) starting 1979, (USA) starting 1980

Model 116, 123, 126

General

To keep the fuel temperature as low as possible also at high outside temperatures, a fuel cooler is installed in refrigerant line from evaporator to refrigerant compressor. This is essentially a double tube version, with the refrigerant (R 12) flowing through the inner tube and the fuel to be cooled through the annular space between outer and inner tube.

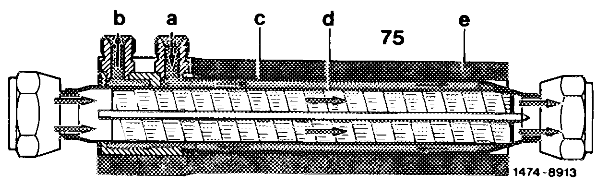


1 Return flow line
75 Fuel cooler

Operation

With the engine running, the excess fuel in fuel distributor flows without pressure through return flow line (1) and fuel cooler (75) back into fuel tank.

As long as the refrigerant compressor is switched on, the gaseous refrigerant, which flows through the inner tube of the fuel cooler, will extract heat from the fuel.



a Fuel inlet
b Fuel outlet
c Outer tube
d Inner tube
e Armaflex hose

A. Model 107, 116, 123

Tightening torques	Nm
Self-locking nut at lateral support of clamp	7
Self-locking nut at exhaust manifold and exhaust flange connection	30
Hex. bolts of lateral support on transmission	20

Removal and installation of exhaust system is not fully explained, only a few particularly important items are described which must be observed during removal and installation or during partial renewal, e. g. of rear muffler with plug connection.

Removal

1 If a plug connection is hard to separate, heat exhaust pipes. For safety reasons, place a protective shield between frame floor and exhaust pipes of vehicle prior to heating pipes.

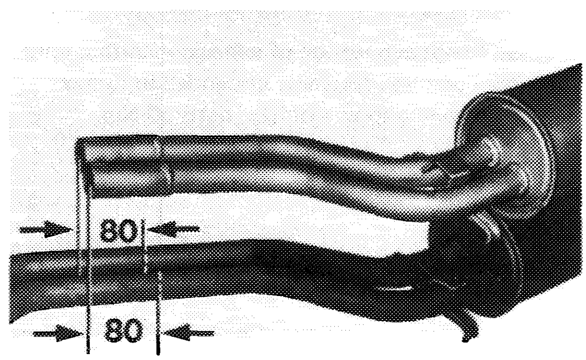
2 Check fastening member for re-use and replace, if required.

Installation

Renewal of rear muffler.

3 Place new rear muffler with plug connection accurately above removed system and mark pipe length of new rear muffler on removed unit.

Cut pipe 80 mm minus 10 mm from mark in direction of rear muffler to guarantee a plug-in depth of 70–80 mm.

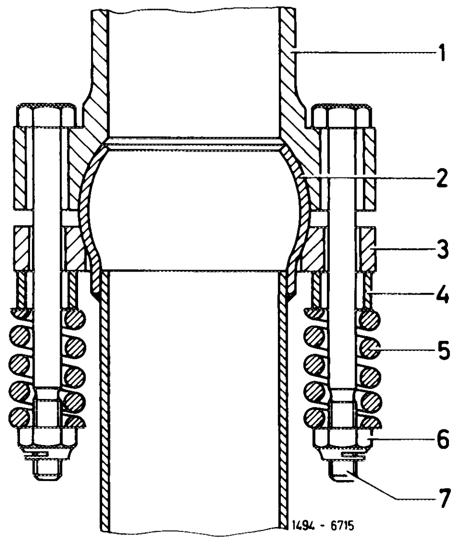


149-13369

4 Always replace self-locking hex. nuts on principle.

5 Exhaust pipe – manifold connection of 1st version.

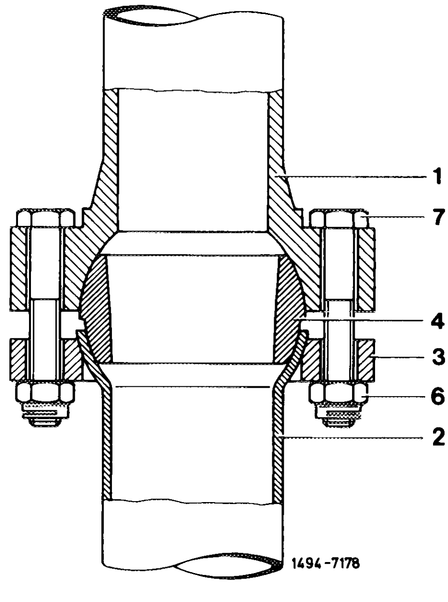
Uniformly tighten spring (5) coil to coil, then loosen again by 2–3 turns.



1 Exhaust manifold
2 Exhaust pipe with ball
3 Flange
4 Spacing member
5 Spring
6 Self-locking hex. nut
7 Hex. bolt

6 Exhaust pipe – manifold connection of 2nd version.

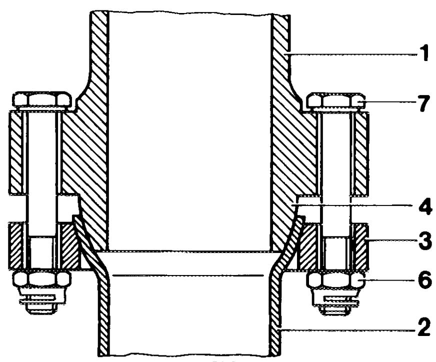
Tighten flange connection to exhaust manifold only after the complete system is suspended in rubber rings. Pay attention to correct seat of ball connection (4). Tightening torque of hex. bolts 30 Nm.



1 Exhaust manifold
2 Flared exhaust pipe
3 Flange
4 Ball connection
6 Self-locking hex. nut
7 Hex. bolt

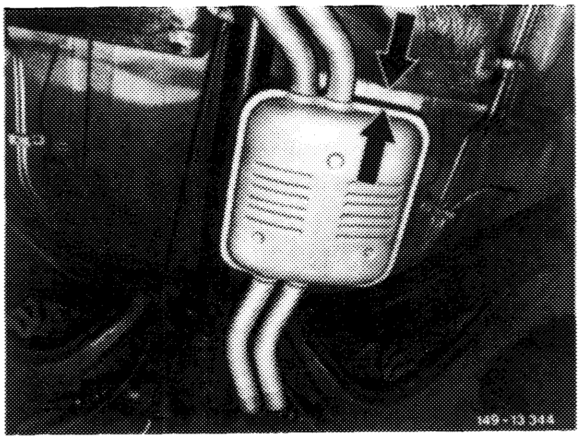
7 Exhaust pipe – manifold connection of 3rd version.

Tighten flange connection of exhaust manifold only after the complete system is suspended in rubber rings. Tightening torque of hex. bolts 30 Nm.

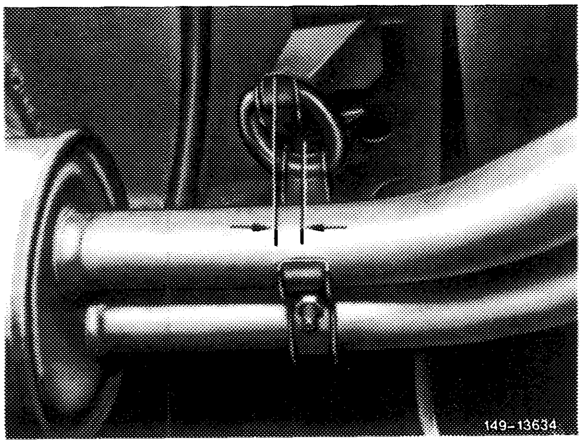


1 Exhaust manifold with outer ball
2 Flared exhaust pipe
3 Flange
4 Ball connection firmly connected to exhaust manifold
6 Self-locking hex. nut
7 Hex. bolt

8 Pay attention to distance between center muffler and frame floor (distance approx. 20 mm, arrows).

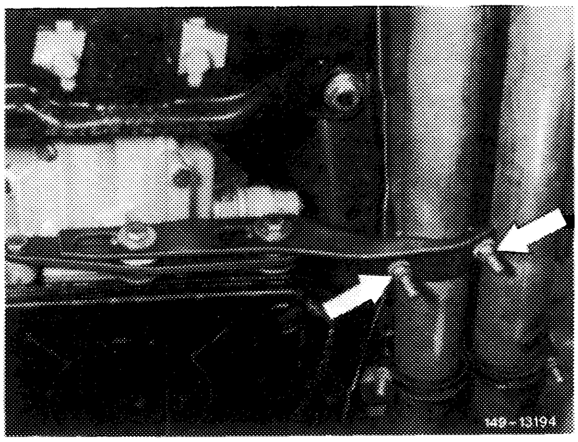


9 Mount rear muffler in such a manner that the clamps of the rear muffler are located **approx. 10 mm in front of** holders on frame floor (arrows), so that the correct installation position is assured if the system becomes elongated.

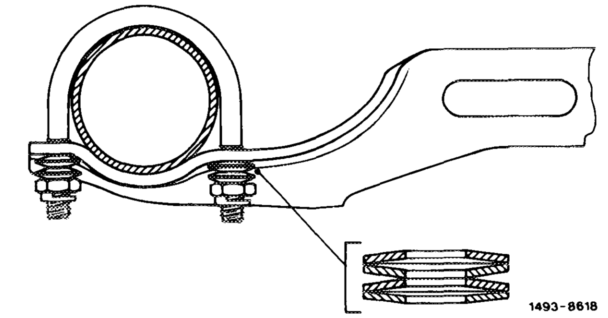


10 On vehicles with lateral support on transmission, mount lateral support free of tension. Mount clamps with 4 cup springs each in front of self-locking hex. nuts and tighten to 7 Nm (arrows).

Model 123



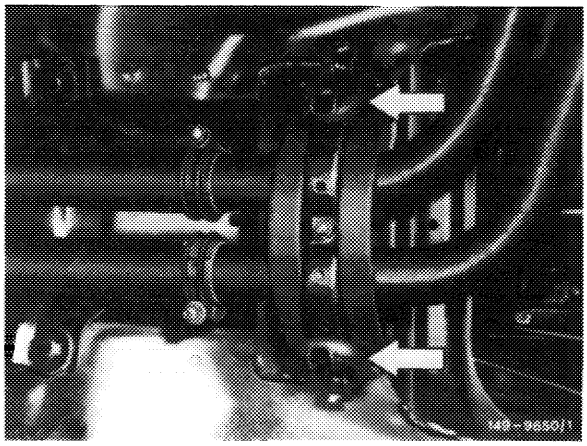
Note: Mount 4 cup springs each per side on holding bracket in such a manner that the respective crowns are opposite each other (as shown in illustration).



Layout of 4 cup springs on clamp

Note: Rubber rings are available in two versions of shore hardness. Hardness is recognized by compressing rings.

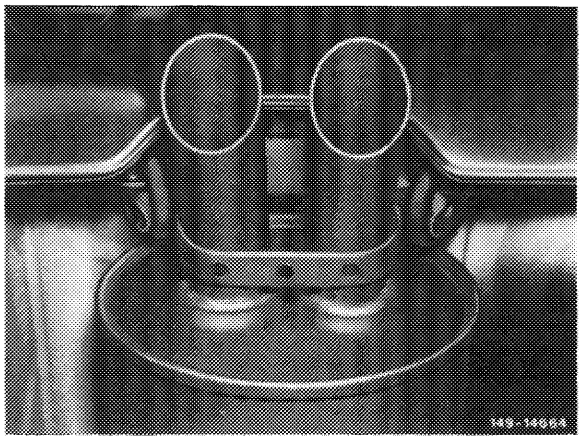
11 On front suspension of exhaust on model 116 use softer rubber rings only (arrows).



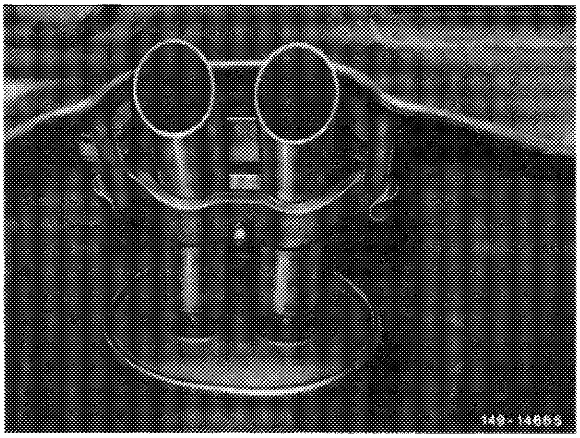
Model 116

12 Repair solution for rear muffler on model 116.

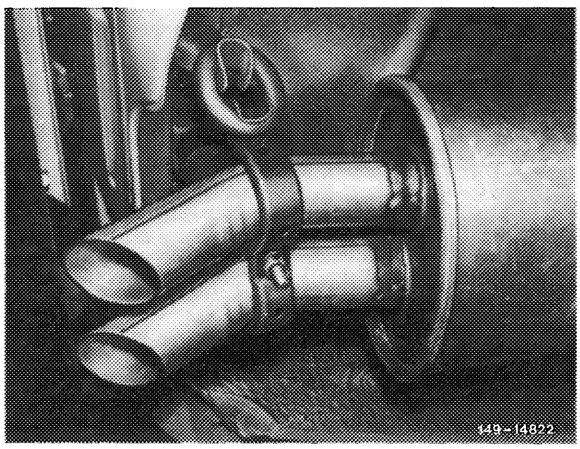
Since the end of October 1977 rear mufflers are installed with tailpipes sloping in downward direction. Only this type of pipes may be used as a spare part, also for vehicles with straight tailpipes. Since the rear muffler is delivered without the rear holder, two different holding bracket repair kits are available.



Rear holding bracket, welded
Rear muffler modified from start of series



Rear holding bracket, screw-type
Rear muffler modified up to start of series



Rear holding bracket, screw-type
Rear muffler modified from start of series

13 Run engine and check exhaust system for leaks.

B. Model 126

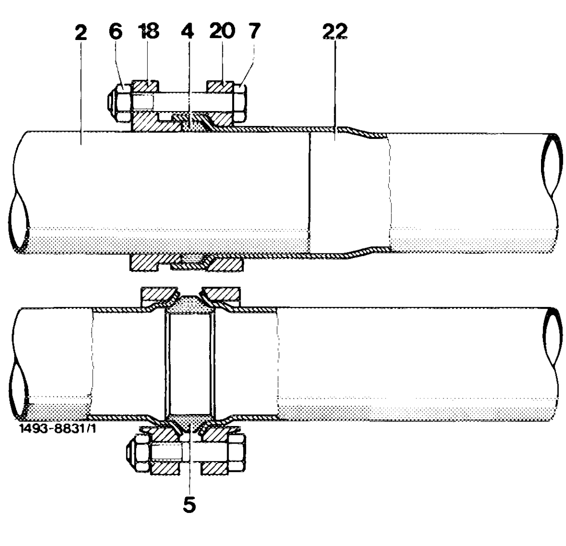
Tightening torques	Nm
Self-locking hex. nuts at lateral support of clamp	7
Self-locking hex. nuts at exhaust manifold and exhaust flange connection	30
Self-locking hex. nut of exhaust pipe flange connection	20
Hex. bolts of lateral support on transmission	20

Removal and installation of exhaust system is not fully explained, only a few particularly important items are described which must be observed during removal and installation or during partial renewal, e. g. of rear muffler with plug connection.

Removal

1 Check suspension members for re-use and replace, if required.

2 Prior to assembly of exhaust system make sure that the flanges for exhaust manifold are not distorted and straighten flange, if required. If required, clean cone connections of pipes (2 and 22) with emery cloth from combustion or corrosion residue.

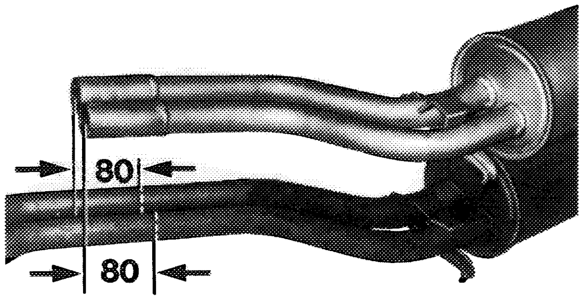


Installation

Replacement of rear muffler

3 Place new rear muffler with plug connection accurately above removed unit and mark pipe length of new rear muffler on removed unit.

Cut pipe 80 mm minus 10 mm from mark in direction of rear muffler to guarantee a plug-in depth of 70–80 mm.



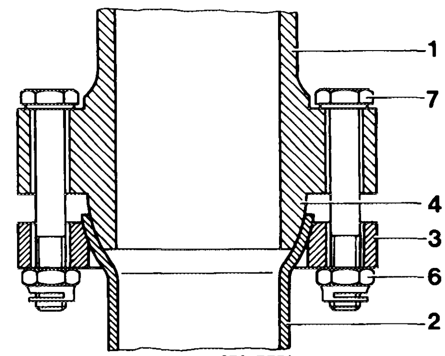
149 – 13369

4 Always replace self-locking hex. nuts and sintered sealing ring on principle.

5 Exhaust pipe – manifold connection.

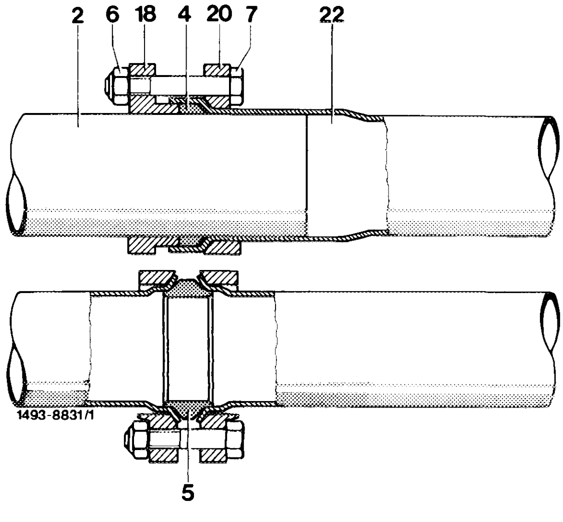
Tighten flange connection to exhaust manifold only after the complete system is suspended in rubber rings. Tightening torque of hex. bolts 30 Nm.

1 Exhaust manifold with outer ball
2 Flared exhaust pipe
3 Flange
4 Ball connection rigidly connected to exhaust manifold
6 Self-locking hex. nut
7 Hex. bolt



1074-7751

6 Mount sealing ring (4) and sintered sealing ring (5) on flange connection and pay attention to correct seat. Tightening torque of self-locking hex. nuts 20 Nm.

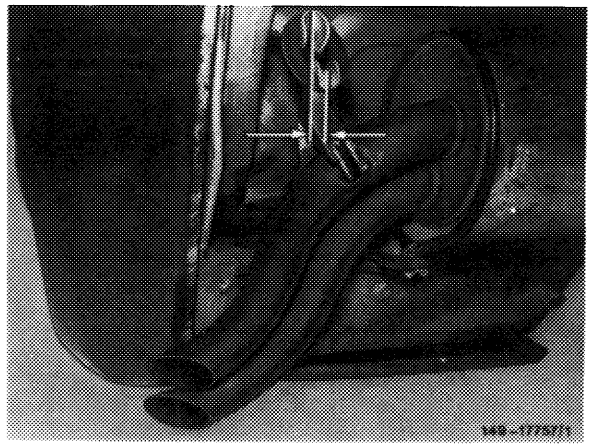


1493-8831/1

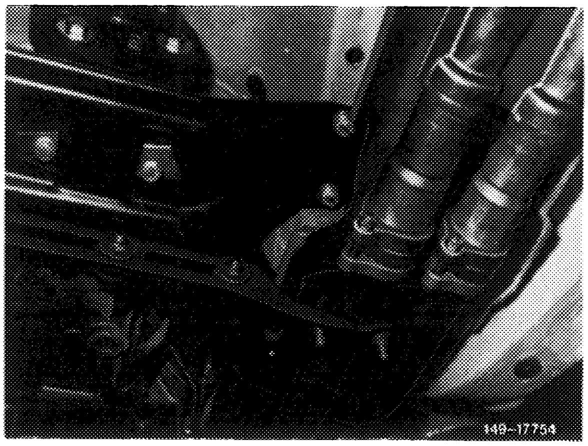
2 Front exhaust pipe
4 Sealing ring
5 Sintered sealing ring
6 Self-locking hex. nut
7 Hex. bolt
18 Flange, front
20 Flange, rear
22 Rear exhaust pipe

7 Mount rear muffler in such a manner that the clamps of the rear muffler are located approx. 10 mm in front of holders on frame floor (arrow), so that the correct installation position is assured if the system becomes elongated.

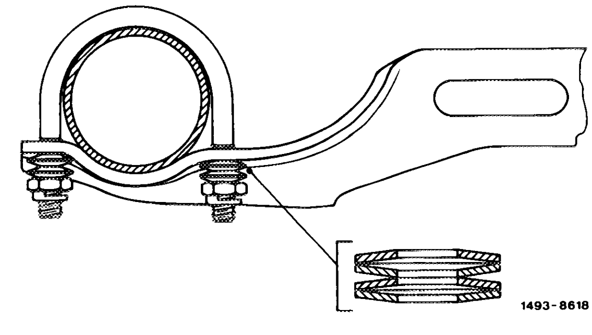
Note: The above applies only to mufflers of the repair version with plug connection between center and rear muffler.



8 Mount exhaust lateral support free of tension. Tightening torque of self-locking hex. nuts on clamp 7 Nm, hex. bolts of lateral support on transmission 20 Nm.

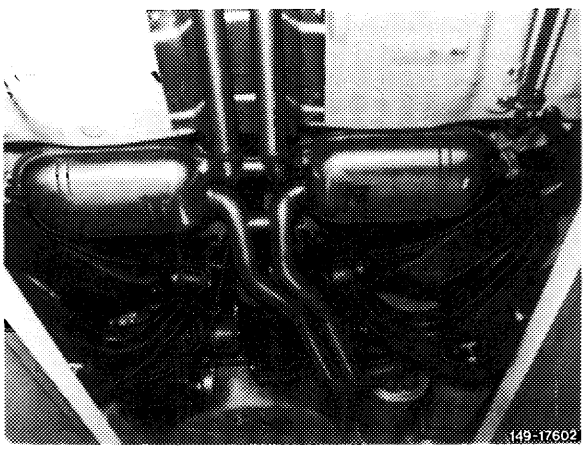


Note: Mount 4 cup springs each per side on clamp in such a manner that their respective crowns are opposite to each other (as shown in Fig.).

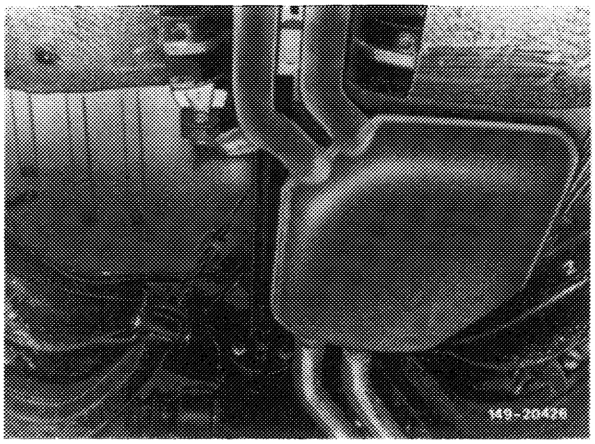


Layout of 4 cup springs on clamp

9 Center muffler 1st version (up to September 1980).



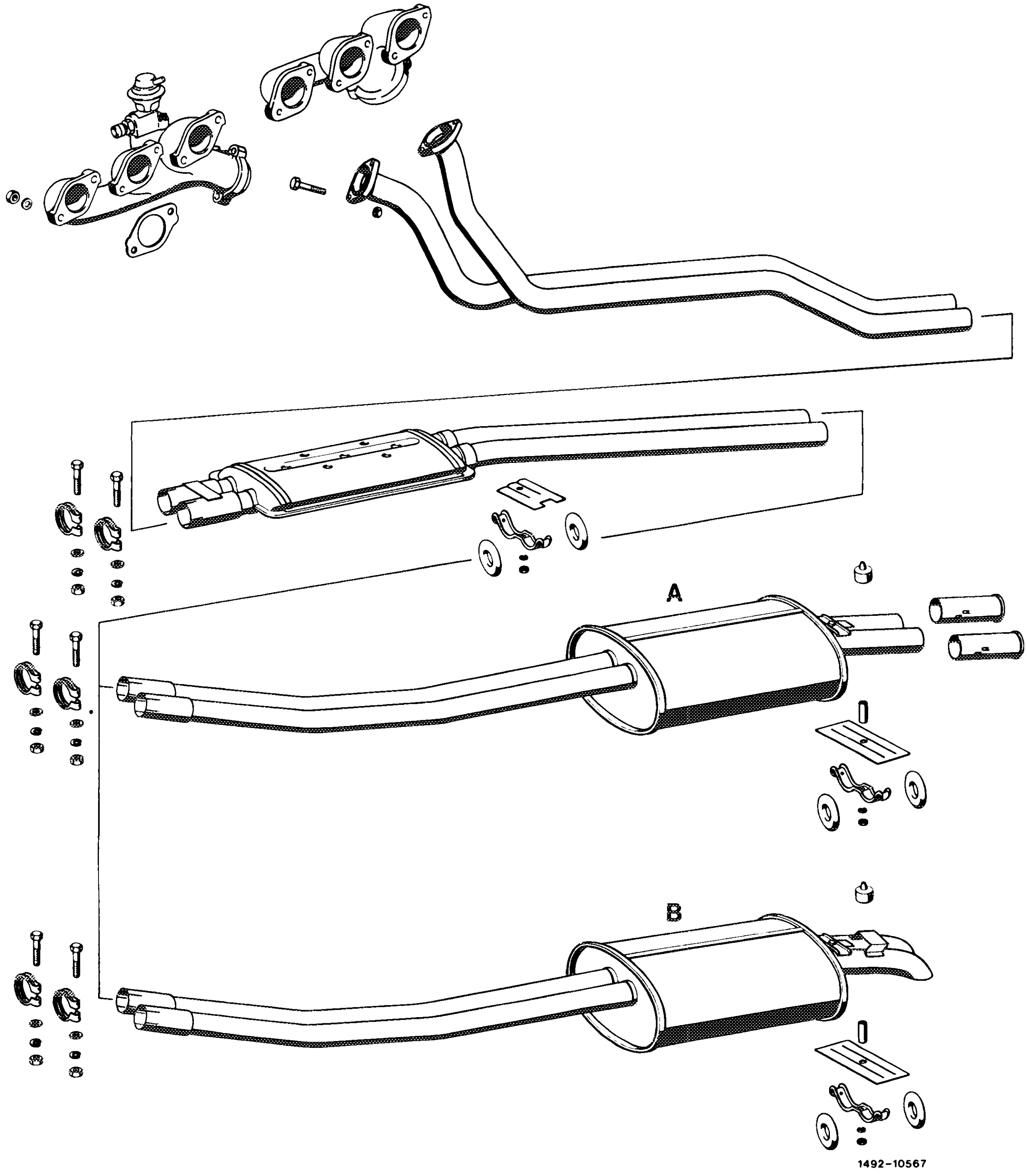
10 Center muffler 2nd version (starting October 1980).



11 Run engine and check exhaust system for leaks.

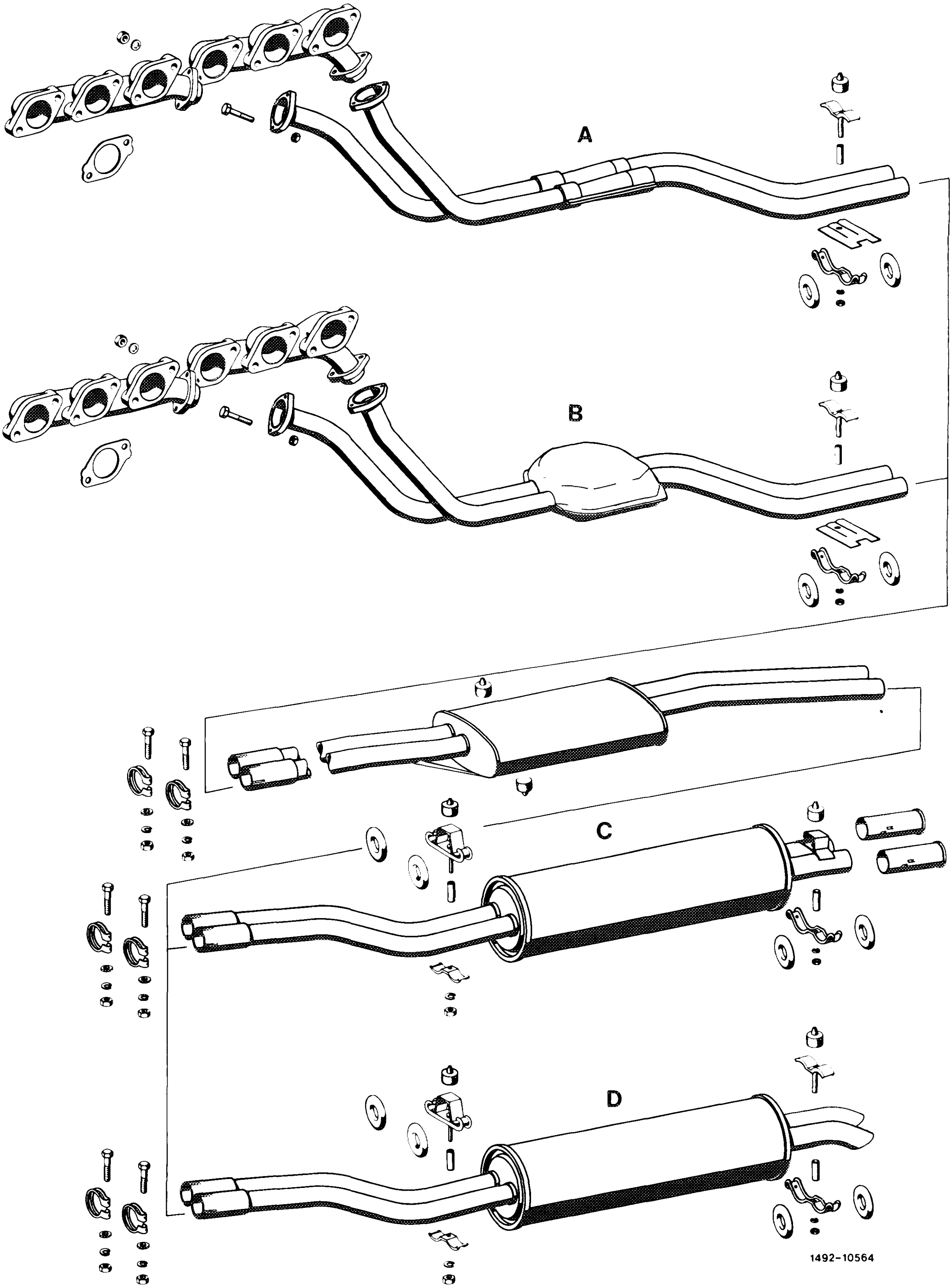
Exhaust manifold with complete exhaust system

Model 107.022/042



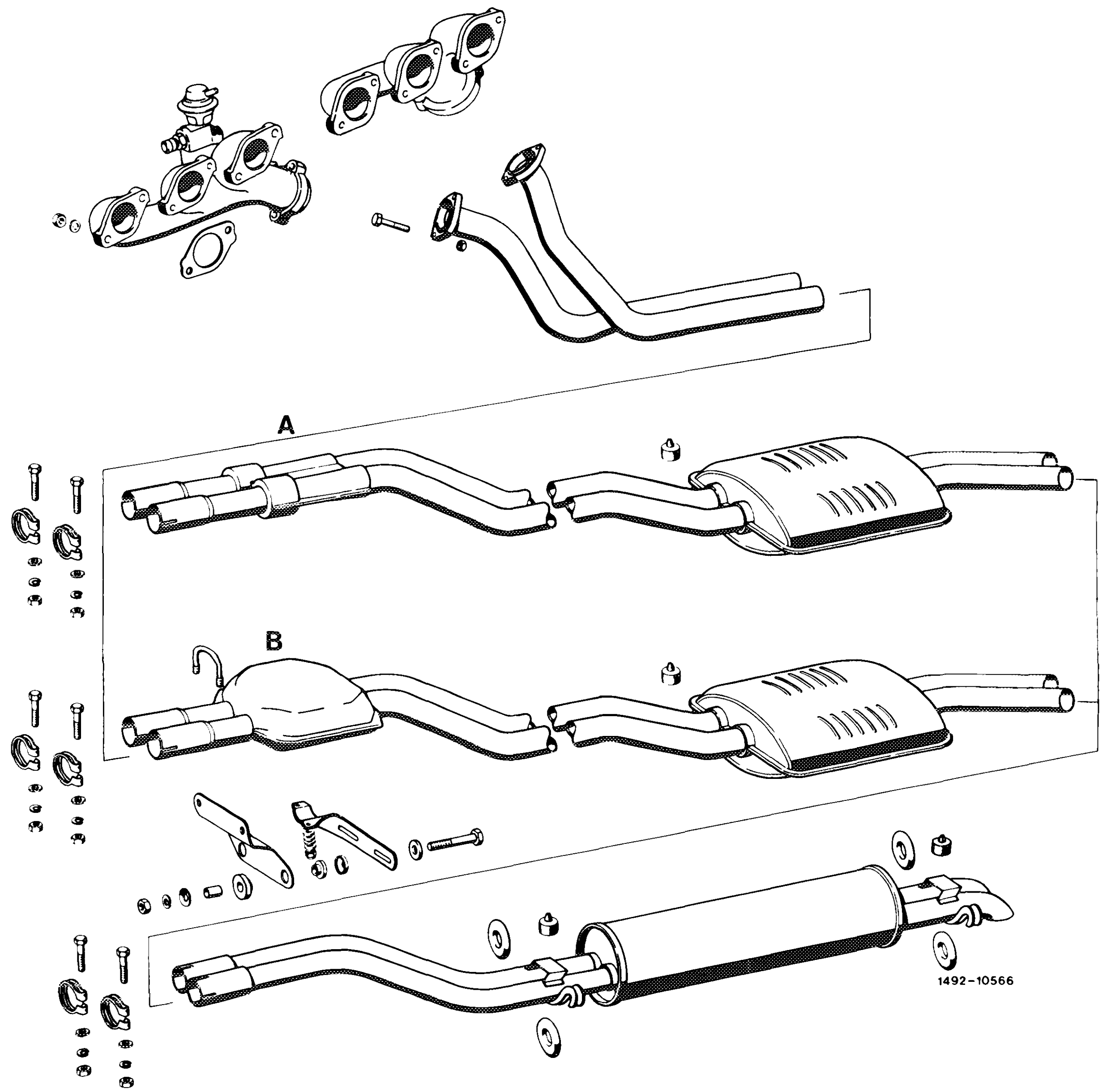
A Rear muffler with straight tailpipes (up to September 1977)
B Rear muffler with tailpipes sloping in downward direction (starting October 1977)

Model 116.024/025

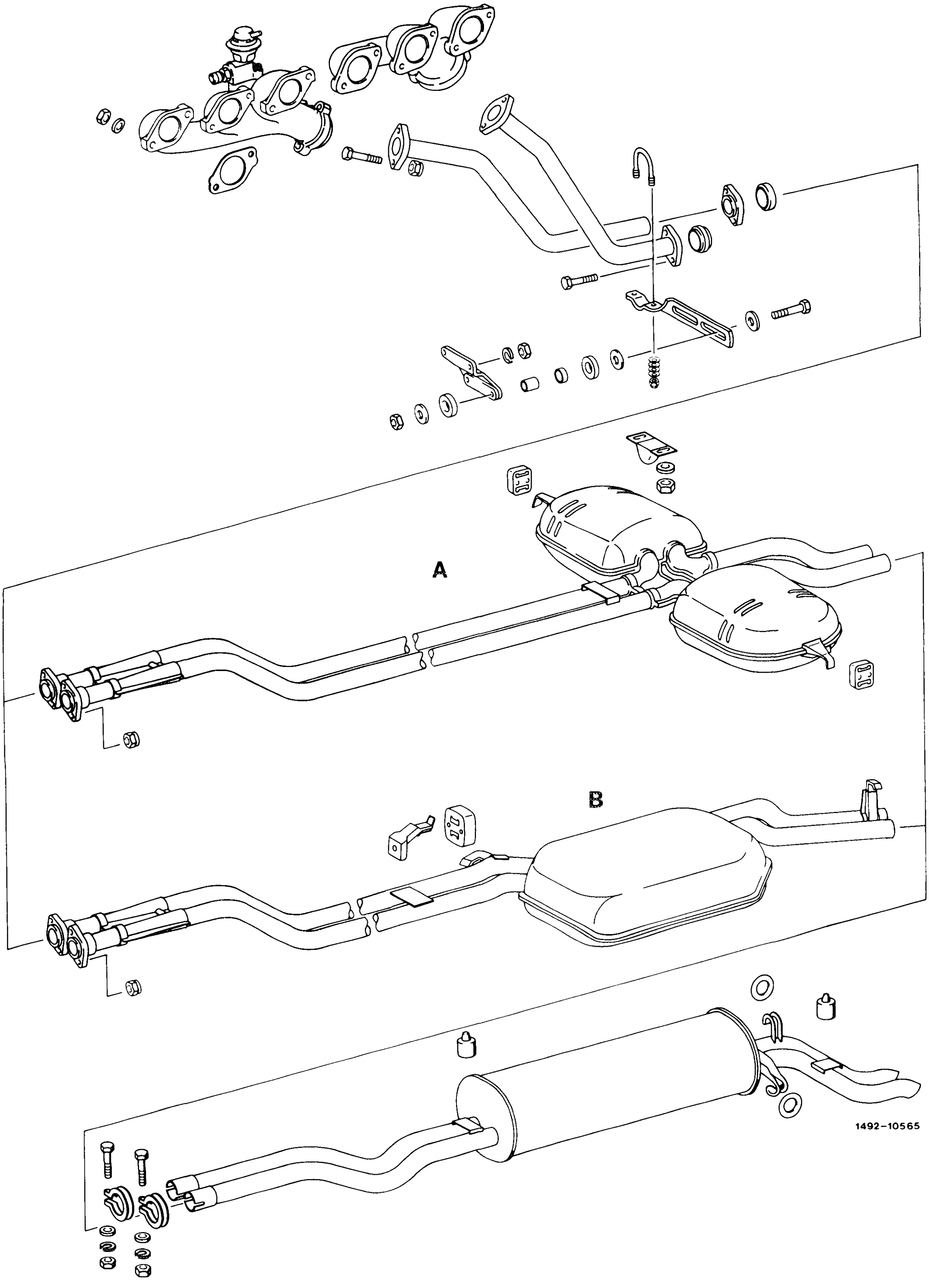


A 1st version (up to March 1978)
B 2nd version (starting April 1978)
C Rear muffler with straight tailpipes (up to September 1977)
D Rear muffler with tailpipes sloping in downward direction (starting October 1977)

Model 123.03/05/09



A 1st version (up to April 1978)
B 2nd version (starting May 1978)



A 1st version (up to September 1980)
B 2nd version (starting October 1980)