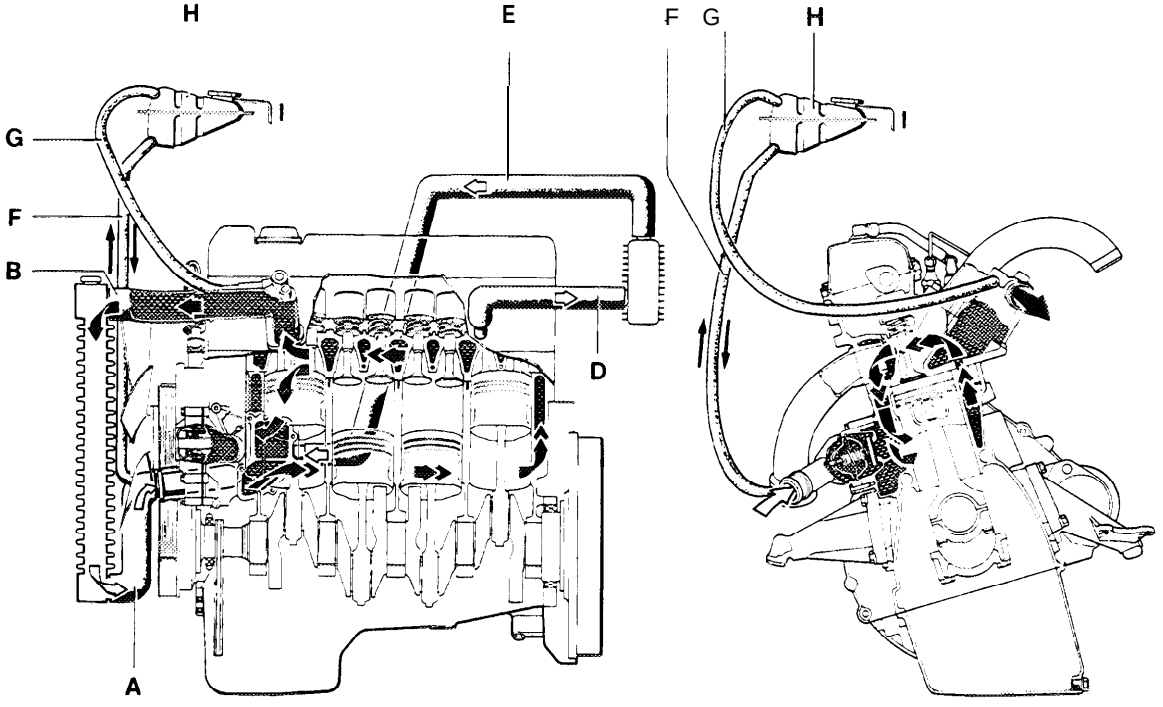
20 Engine cooling

Coolant circuit



A From radiator to coolant thermostat
B From outlet connection to radiator
D Inlet to heater (heat exchanger)
E Return flow from heater (heat exchanger)
F Filling hose
G Vent line
H Expansion tank
I Overflow pipe

Thermostat

Engine	Thermostat begins to open	fully opened
601	85”	100”

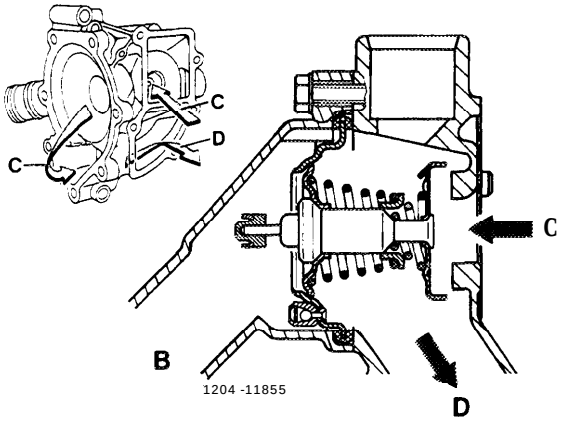
Note

These engines are provided with a thermostat which begins to open at 85 °C.

Operation

Warm-up period – coolant temperature up to approx. 85 °C.

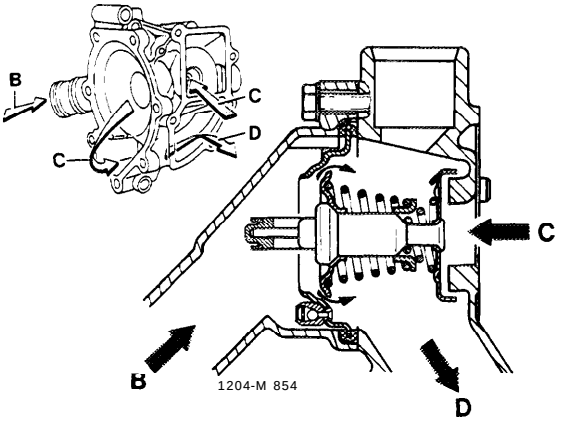
Up to a coolant temperature of approx. 85 °C the main valve is closed and the bypass disk is fully open. Inflow (B) from radiator is therefore interrupted. The coolant flows via bypass line (C) directly through coolant pump into cylinder crankcase (D).



D From crankcase (bypass line)
D To crankcase

Partial load operation – coolant temperature approx. 85 °C to max. 100 °C

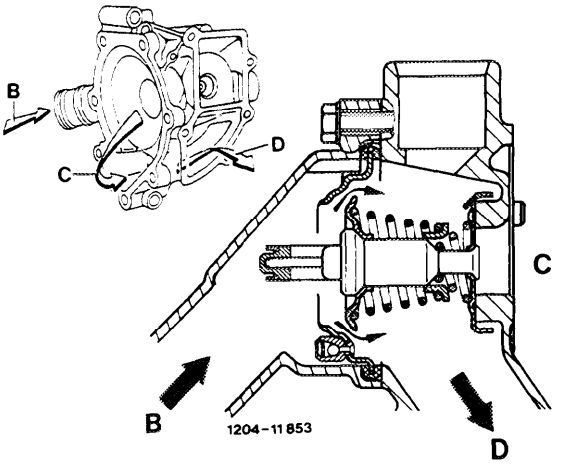
At coolant temperatures from approx. 85-100 °C the main valve as well as the bypass section are more or less opened depending on engine load. The coolant flows from radiator (B) and via bypass line (C) through coolant pump into cylinder crankcase (D).



B From radiator
C From crankcase (bypass line)
D To crankcase

Full load operation — high outside temperature (above 100 °C)

At coolant temperatures above approx. 100 °C the main valve is completely opened. The bypass line (C) is closed by bypass disk. All the coolant will flow through radiator.



The cooling system is automatically vented by ball valve in coolant thermostat when refilling while engine is operating.

20-010 Draining and filling in coolant — Antifreeze table

Total filling capacities of cooling system with heater and mixing ratio

Antifreeze[1])/water[2]) in liters

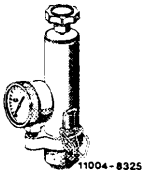
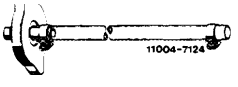
Total filling capacity of cooling system with heater	Mixing ratio antifreeze/water for antifreeze protection up to	
	-30 °C	-40 °C
8.5	3.75/4.75	4.5/4.0

[1]) Refer to Specifications for Service Products sheet 325.
[2]) Refer to Specifications for Service Products sheet 310 and 311.

Tightening torques

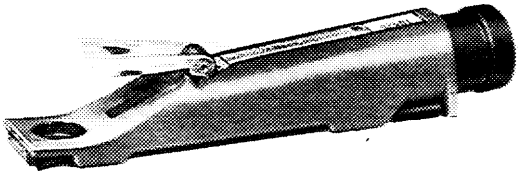
Drain **plug**	Radiator	1.5
	Cylinder crankcase	**30**

Special tools

Tester for **cooling system**	 11004-8325	001 589 48 21 00
Radiator cap with hose for leak test	 11004-7124	605 589 00 25 00

Conventional tool

Antifreeze tester
Prestone-VU-Check (Union **Cabride**)
e. g. Philipp Gather, D-4020 Mettmann 2



R -A789

Note

To prevent corrosion in cooling system, the concentration of the antifreeze should not drop below -20 °C antifreeze (30 % by volume).

If no antifreeze is available and if only water is filled in, be sure to add 1 % refining agent (anti-corrosion oil, 10 cc/l water).

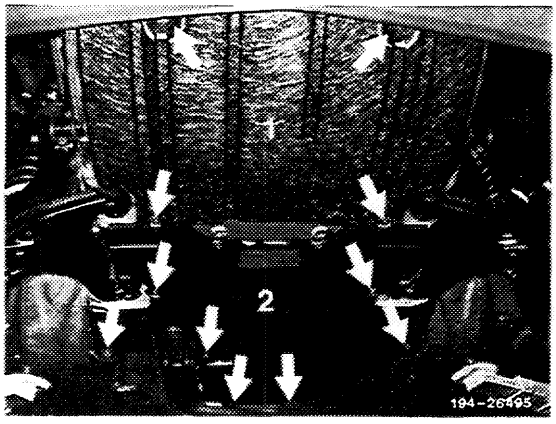
Attention!
To prevent corrosion damage on light alloy components, use only approved antifreeze compounds (Specifications for Service Products sheet 325) and refining agents (Specifications for Service Products sheet 311).

Draining

1 **Open cap on expansion tank in steps.**

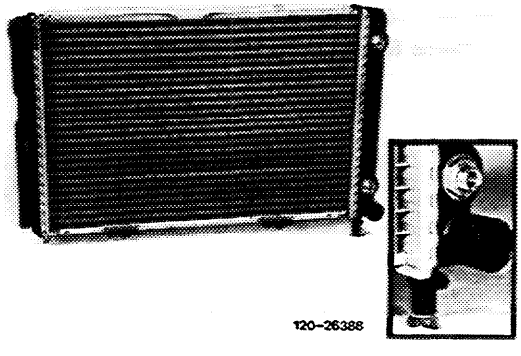
Attention!
Open cap only at coolant temperatures below 90 °C.

2 Completely remove noise capsule.



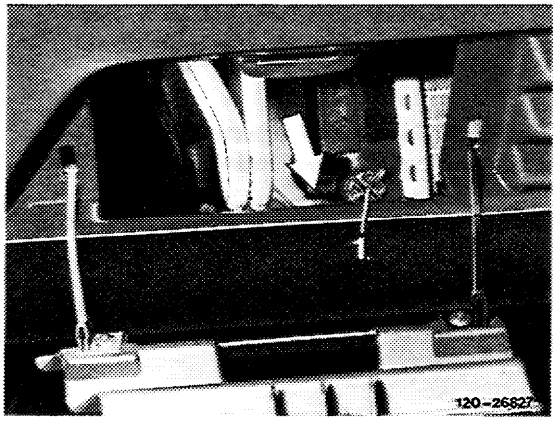
3 Open drain plug on radiator.

Note: For catching coolant, a pertinent extension hose may be plugged on drain connection.



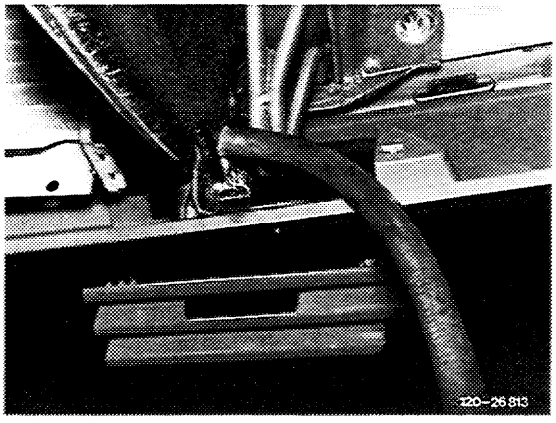
Drain plug on vehicles without air conditioning system

On vehicles with air conditioning, open flap for towing eye at front right in front skirt.



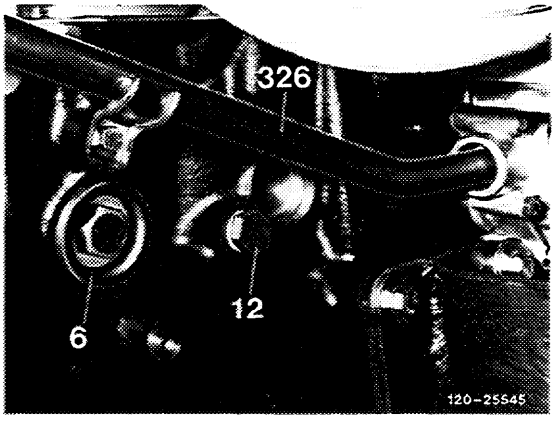
1 Drain plug on vehicles with air conditioning

Note: On vehicles with air conditioning, remove closing plug under righthand wheelhouse on noise capsule. An extension hose can be inserted through this opening and plugged on drain connection of radiator.



Extension hose, plugged on

4 Unscrew drain plug (12) on cylinder crankcase.

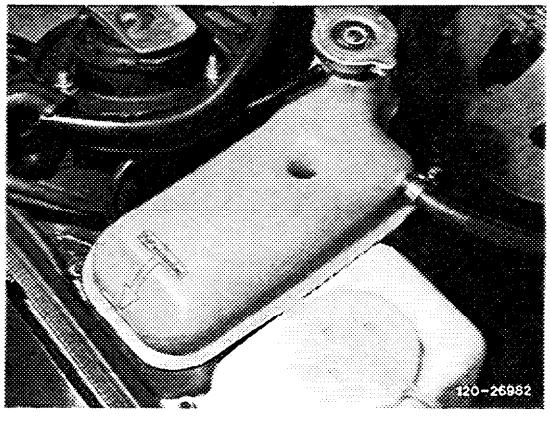


12 Drain plug on cylinder crankcase

Filling in

5 Set both heater switches on vehicles with and without air conditioning to max. heating capacity.

6 Slowly fill in coolant up to mark on expansion rank.



Mark on expansion tank

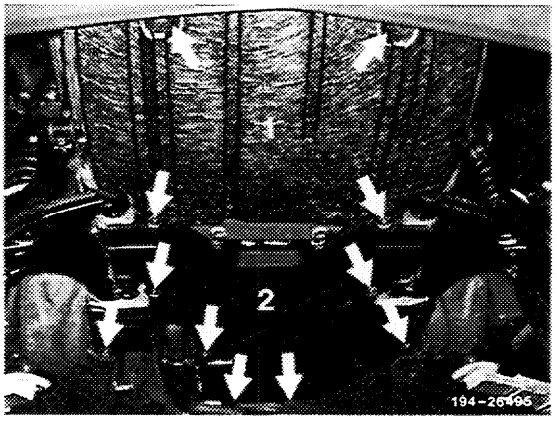
7 Run engine at intermittent acceleration until coolant thermostat opens (coolant temperature approx. 90-100 °C).

Note: Close filler neck on expansion tank starting at a coolant temperature of approx. 60-70 °C.

8 Check coolant level and fill up to specified mark, if required.

9 Pressure-test cooling system with tester.

10 Install noise capsule.



A. De-oiling
(required only if anti-corrosion oil had been filled in)

1 **Completely drain coolant (20-010).**

2 **Remove coolant thermostat (20-I 10).**

3 **On vehicles with and without air conditioning, set heater control to full capacity.**

4 **Fill cooling system with a 5 % solution of water and a neutral cleaning agent or with a mildly alcaline cleaner, such as P 3-Croni (supplier: Henkel) or Grisiron 7220 (supplier: Farbwerke Hoechst).**

Attention!
On these vehicles (light alloy radiator) do not use heavily alcaline cleaning agents such as P 3-Standard (supplier: Henkel).

5 **Run engine warm at medium speed up to approx. 80 °C (176 °F) and hold at this temperature for approx. 5 minutes.**

6 **Stop engine and let cooling system cool down to approx. 50 °C (122 °F).**

7 **Completely drain solution.**

8 **Immediately thereafter, fill cooling system twice with fresh water, run warm (approx. 5 minutes) and drain.**

B. Decalcification, derusting

Prior to decalcification and if anti-corrosion oil has been filled in, de-oil even if there is no visible oiling up.

1 Fill cooling system with a 10 % (100 g/l) solution of citric acid (available from the chemical trade).

2 Run engine warm at medium speed up to approx. 80 °C (176 °F) and hold for approx. 10 minutes at this temperature, while proceeding according to item 3 section A "De-oiling".

3 Stop engine and let cool down to approx. 50 °C (122 °F).

4 Completely drain decalcification solution.

5 Flush cooling system at least 3 times with fresh water while running engine for at least 5 minutes with each flushing charge.

Badly calcified cooling system may require a repetition of the treatment. Always prepare a fresh decalcification solution and repeat flushing steps.

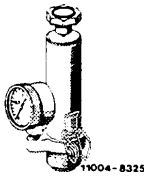
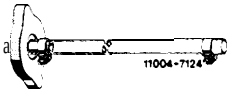
6 Install coolant thermostat with new sealing ring (20-110).

7 Fill in coolant (20-010).

20-I 10 Removal and installation of thermostat

Tightening torques		Nm
Screws for thermostat housing cover		10
Drain plug	Radiator	1.5
	Cylinder crankcase	30

Special tools

Tester for cooling system	 11004-8325	001 589 48 21 00
Radiator cap with hose for leak test	 11004-7124	605589002500

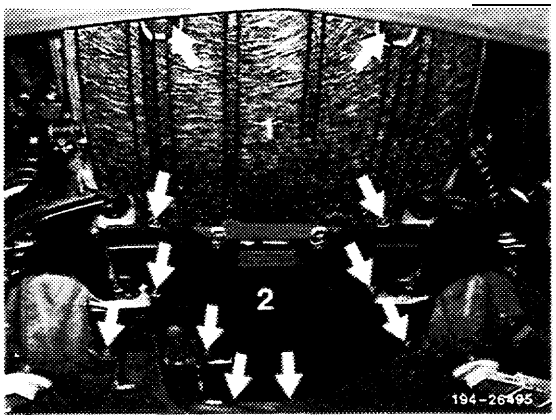
Removal

1 Open closing cap on expansion tank in steps.

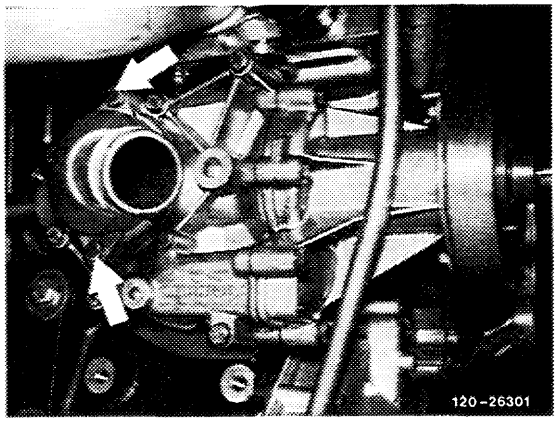
Attention!
Open closing cap only at coolant temperatures below 90 °C.

2 Remove noise capsule.

3 Drain coolant (20–010).



4 Unscrew thermostat housing cover and remove thermostat (arrows).

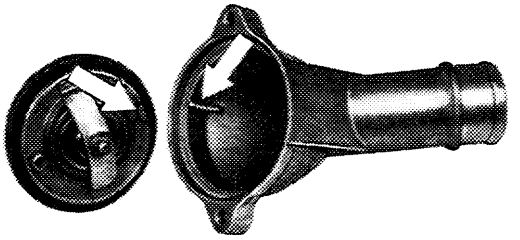


Installation

5 When installing a new thermostat, place new seal on thermostat housing.

6 Insert thermostat with sealing ring into cover in such a manner that the recess on thermostat corresponds with cast-on rib in cover (arrows).

7 Screw on cover and tighten to 10 Nm.

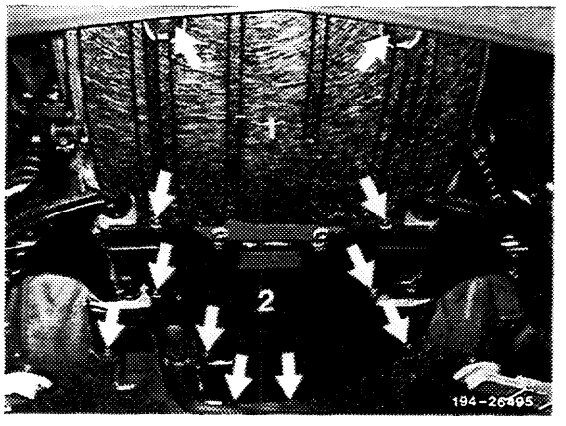


120-26839

8 Fill in coolant (20-010).

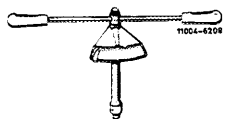
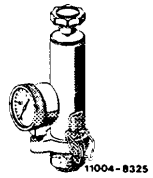
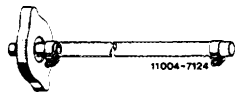
9 Pressure-test cooling system with tester.

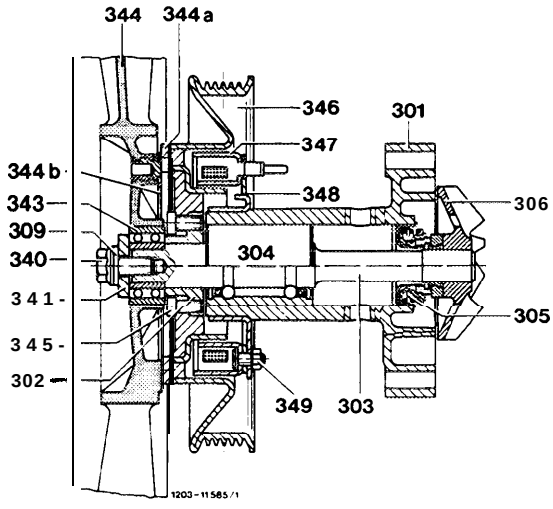
10 Install noise capsule.



20-210 Removal and installation of coolant pump

Tightening torques		Nm
Drain plug	Radiator	1.5
	Cylinder crankcase	30
Fan on coolant pump shaft (central bolt)		25
Pulley on coolant pump		10
Coolant pump on coolant pump housing		10

Special tools		
Torque wrench, double arm, 1/4'' square, 4-16 Nm		000 589 67 21 00
Torque wrench, double arm, 3/8'' square, 8-32 Nm		001 589 51 21 00
Tester for cooling system		001 5894821 00
Radiator cap with hose for leak test		605 589 00 25 00



Layout of magnetic fan coupling and coolant pump

301	Coolant pump housing	343	Ball bearing
302	Flange	344	Fan
303	Shaft	344a	Armature
304	Bearing	344b	Leaf spring
305	Cassette seal	345	Screw M 6 x 12
306	Impeller	346	Pulley
309	Washer	347	Magnet, body
340	Collar srew	348	Magnet carrier
241	Disk	349	Hex. nut

Removal

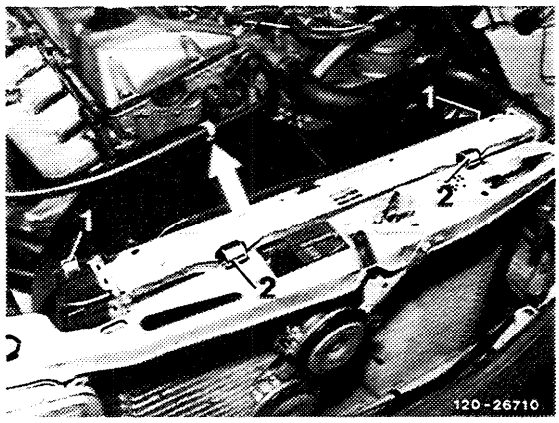
1 Completely. drain coolant (20–010).

2 Disengage overflow hose on fan cover (arrow).

3 Disengage fan cover and place over fan.

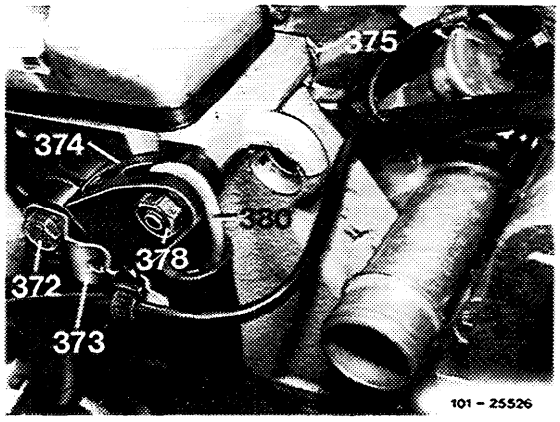
4 Unscrew collar screw (340) for fan and remove fan.

5 Remove fan cover.

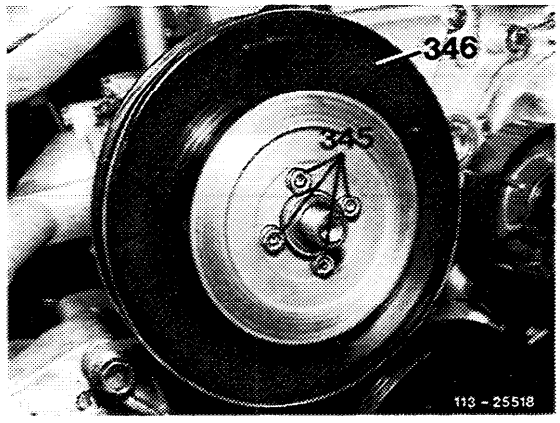


6 Slacken V-belt and remove. For this purpose, unscrew collar nut (378). Insert a mandrel into spring tensioning lever (374) and relieve hex. screw (375) against force of draw spring (380) until screw can be pushed back in direction of intake manifold.

Release spring tensioning lever and remove V-belt.

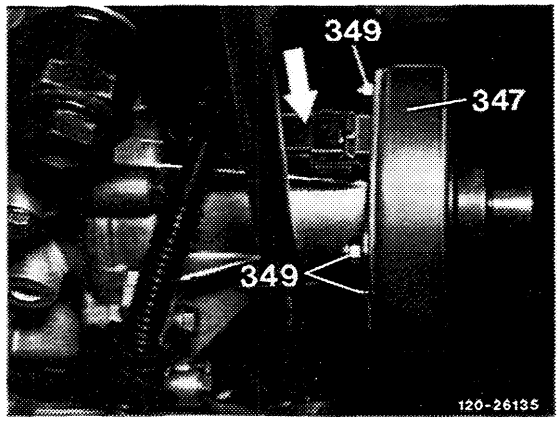


7 Unscrew fastening screws (345) and remove pulley (346).

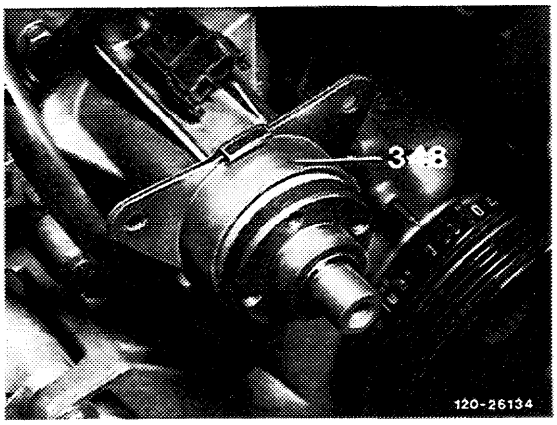


8 Pull cable from body of magnet (arrow).

9 Unscrew hex. nuts (349) and remove magnet carrier (347).



Note: Magnet carrier (348) is glued to coolant pump housing and may not be pulled off.



10 Unscrew coolant pump housing.

11 Clean sealing surfaces.

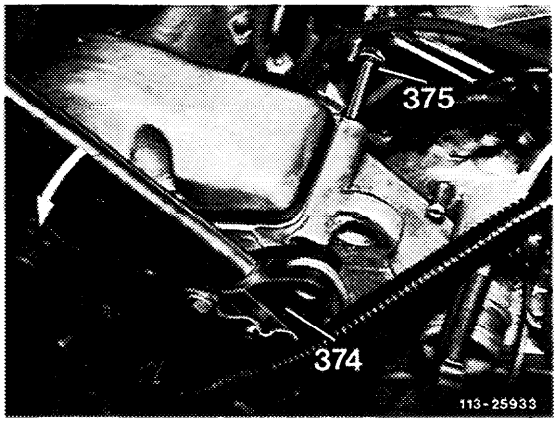
Installation

12 Insert coolant pump with new gasket and tighten combination screws to 10 Nm.

13 Mount magnetic body and plug on cable.

14 Mount pulley and tighten fastening screws to 10 Nm.

15 Mount V-belt and engage spring tensioning lever. For this purpose, swivel spring tensioning lever (374) with a mandrel against force of draw spring to the left until the screw (375) can be slipped through spring tensioning lever. Screw on collar nut and tighten.



16 Place fan cover over coolant pump.

17 Mount fan and tighten center screw to 25 Nm.

18 Fasten fan cover and attach overflow hose.

19 Fill in coolant (20-010).

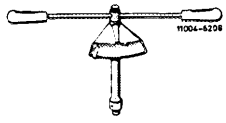
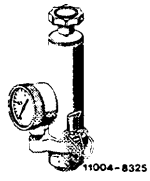
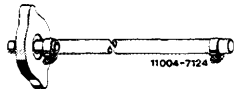
20 Pressure-test cooling system with tester.

21 Install noise capsule.

20-230 Removal and installation of coolant pump

Tightening torques		Nm
Drain plug	Radiator	1,5
	Cylinder crankcase	30
Fan to coolant pump (collar screw)		25
Pulley to coolant pump		10
Coolant pump to coolant pump housing		10
Coolant pump housing to cylinder crankcase		10
Alternator to carrier		45
Carrier for alternator to cylinder crankcase		25

Special tools

Torque wrench, double arm, 1/4" square, 4-16 Nm		000589 67 2100
Torque wrench, double arm, 3/8" square, 8-32 Nm		001 589 51 21 00
Torque wrench with plug-in ratchet, 1/2" square, 25-130 Nm		001 589 66 21 00
Tester for cooling system		001 589 48 21 00
Radiator cap with hose for leak test		605589002500

Conventional tool

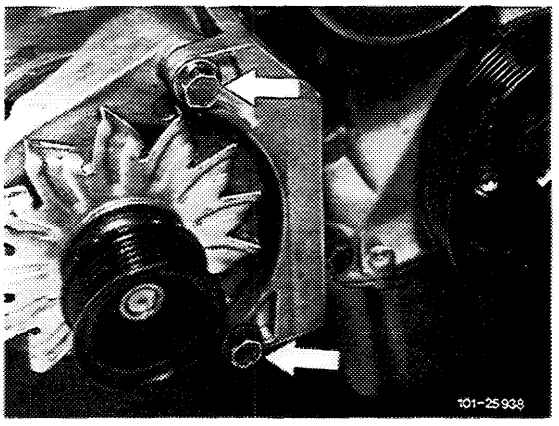
7 mm socket wrench hex. head on flexible shaft for hose clamps with worm drive	e. g. Hazet, D-5630 Remscheid Order No. 426-7

Removal

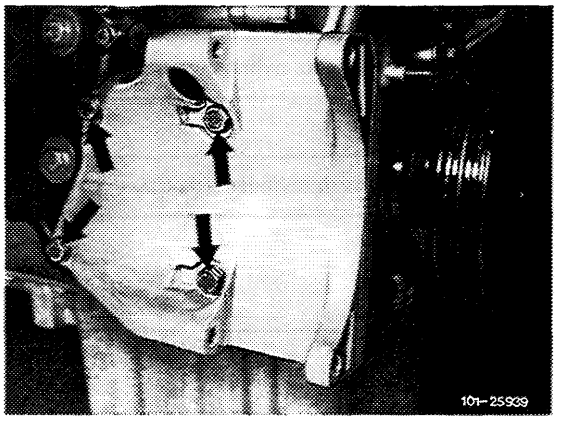
1 Remove coolant pump (20–210).

2 Disconnect negative terminal on battery.

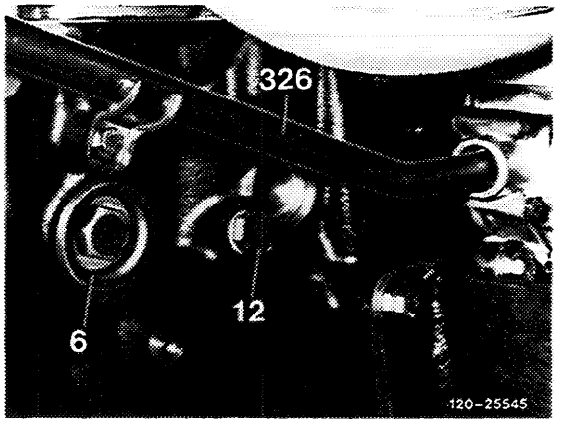
3 Unscrew alternator (arrows) and put aside.



4 Unscrew carrier for alternator (arrows).



5 Unscrew return line (326) on cylinder crankcase and pull out of coolant pump housing.



6 Unscrew coolant pump housing.

7 Clean sealing surfaces.

Installation

8 Renew O-ring on return line (326).

9 Plug coolant pump housing on return line, screw with a seal to cylinder crankcase and tighten to 10 Nm.

10 Screw return line (326) to cylinder crankcase.

11 Mount carrier for alternator and tighten screws to 25 Nm.

12 Mount alternator and tighten screws to 45 Nm. Connect negative terminal to battery.

13 Install coolant pump (20-210).

14 Fill in coolant (20-010).

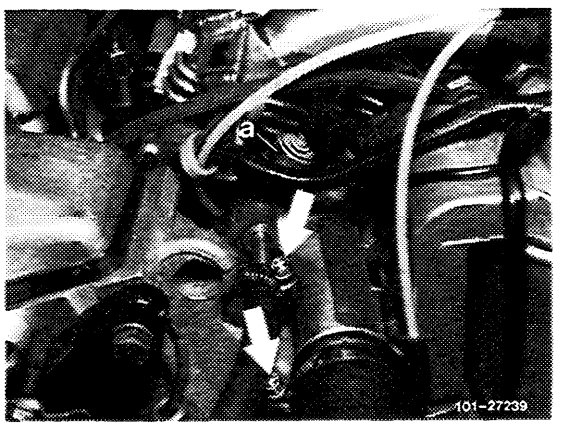
15 Pressure-test cooling system with tester.

General

The engines are provided with an electromagnetic fan coupling which is controlled in dependence on temperature.

The coupling is switched on or off by means of a 100 °C temperature switch, which is screwed into outlet connection (a).

The electromagnetic fan coupling is service-free.

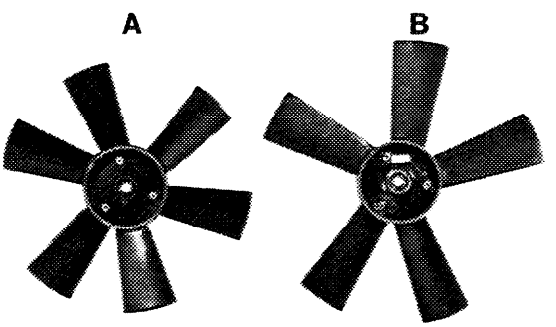


Fan

The fan (344) is seated on a shank on coolant pump bearing and is fastened by means of a collar screw M 8 x 18.

Fan (A) has 6 blades and a diameter of 380 mm.

On vehicles with air conditioning the fan (B) has 5 blades and a diameter of 430 mm.



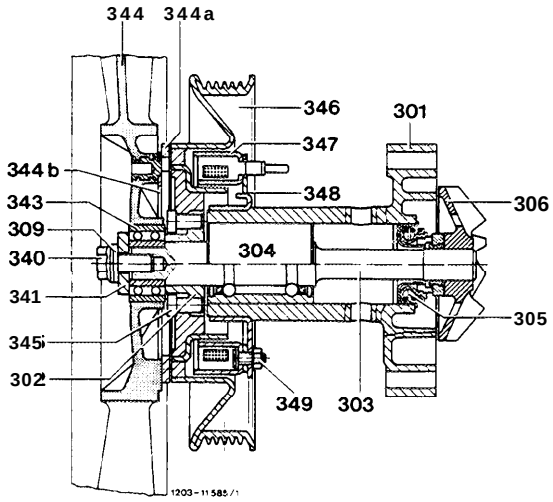
The armature (344a) and the ball bearing (343) are attached to or in fan, respectively.

The ball bearing is sealed on both sides with covering disks.

Body of electromagnetic fan coupling

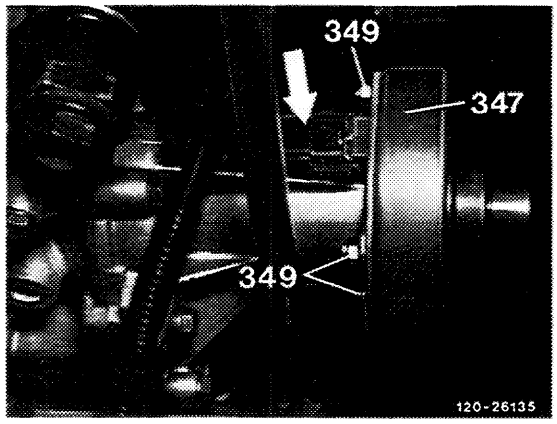
The body of the magnet (347) is fastened to magnet carrier with 3 nuts (349).

The magnet carrier is glued to coolant pump housing.



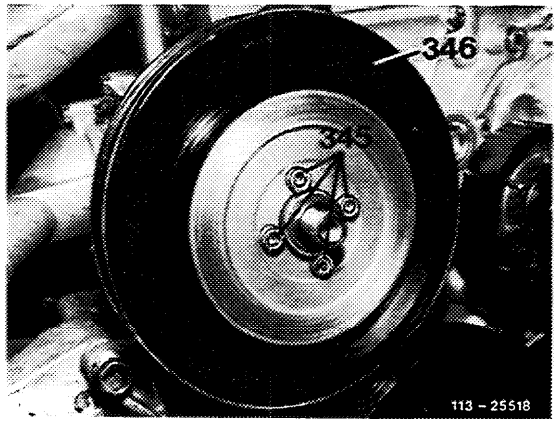
301	Coolant pump housing	344	Fan
302	Flange	344a	Armature
303	Shaft	344b	Leaf spring
304	Bearing	345	Hex. socket screw M 6 x 12
305	Cassette seal	346	Pulley
306	impeller	347	Magnet, body
309	Washer	348	Magnet carrier
340	Collar screw	349	Hex. nut
341	Disk		
343	Bearing		

The electric line is connected to body of magnet by means of a coupling (arrow).



Pulley (346) is seated on coolant pump shaft (303) in front of magnet body.

The pulley (346) is screwed to flange of coolant pump by means of 4 hex. socket screws (345).



Operation

The fan is switched on only with the ignition engaged and at a coolant temperature of above 98-102 °C.

The body of the magnet (347) is constantly connected to positive via fuse No. 10 terminal 15.

Below 98-102 °C coolant temperature the fan is switched off and will run along only under influence of headwind or bearing friction.

At the latest, starting from 102 °C coolant temperature, negative is connected via temperature switch (1) in runout socket (330).

The armature (344a) is attracted by magnet body (347) and presses against face of pulley (346).

The fan is now rigidly connected to pulley and runs along in accordance with coolant pump speed.

If the coolant temperature drops below 98-93 °C, the temperature switch opens and the armature (344a) is lifted from pulley (346) by leaf springs (344b).

On vehicles with air conditioning, the fan and the electric auxiliary fan is switched on by way of a double contact relay which is activated by the temperature switch 52 °C on receiver dehydrator.

When the air conditioning system is switched off, a temperature switch 100 °C in runout connection will again switch fan on or off.

20-335 Removal and installation of magnetic fan coupling

Tightening torques	Nm
Fan to coolant pump (collar screw)	25
Pulley to coolant pump	10
Magnet body to magnet carrier (reference value)	10

Special tool

Torque wrench with plug-in ratchet, 1/2'' square, 25-l 30 Nm		001 589966 21 00

Removal

1 Disconnect vent line on fan cover.

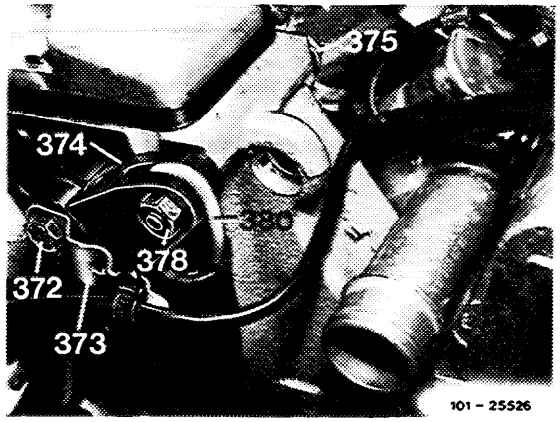
2 Disconnect fan cover and place over fan.

3 Unscrew collar screw for fan and remove fan.

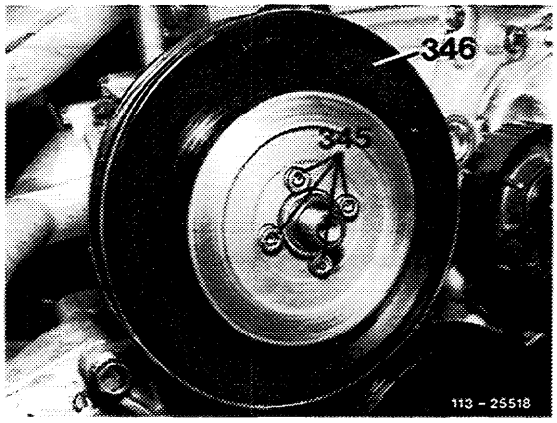
4 Remove fan cover.

5 Slacken V-belt and remove. For this purpose, unscrew collar nut (378). Insert a mandrel into spring tensioning lever (374) and relieve hex. screw (375) against force of draw spring (380) until screw can be pushed back in direction of intake manifold.

Release spring tensioning lever and remove V-belt.

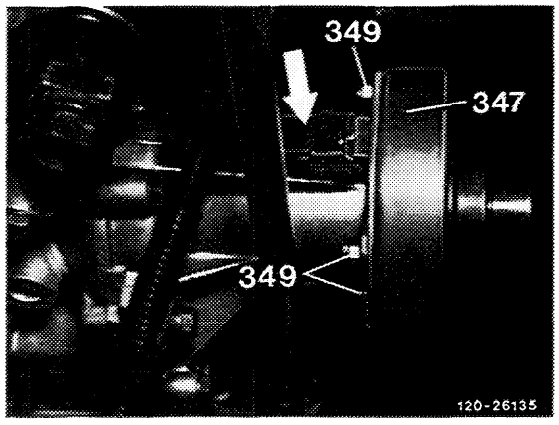


6 Unscrew fastening screws (345) and remove pulley (346).

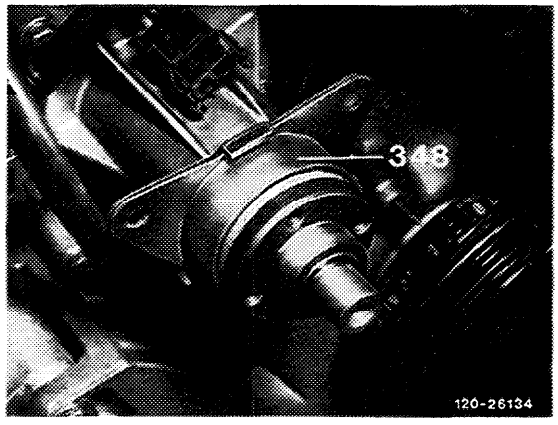


7 Pull coupling of electric line from magnet body (arrow).

8 Unscrew magnet body (347) from magnet carrier on fastening screws (349).



Note: Magnet carrier (348) is glued to coolant pump housing and may not be pulled off.



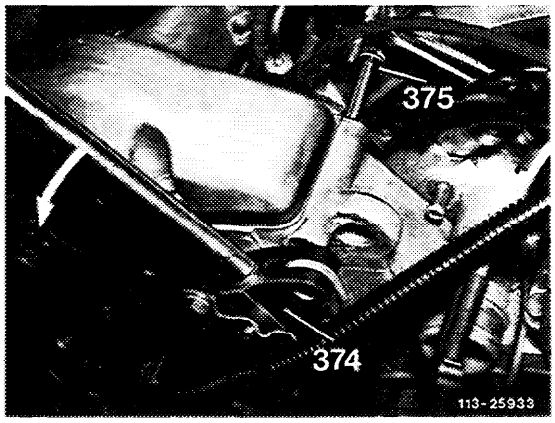
Installation

9 Mount magnet body and plug on cable.

10 Mount pulley and tighten fastening screws to 10 Nm.

11 **Mount V-belt. Pay attention to layout of unit.**

Swivel spring tensioning lever (374) with a mandrel (arrow). against force of draw spring to the left until the screw (375) can be slipped through spring tensioning lever. Screw on collar nut and tighten.



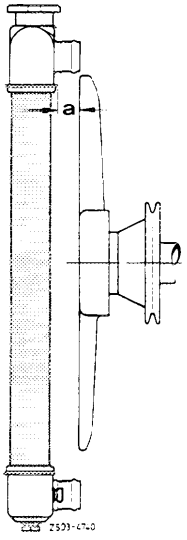
12 **Insert fan cover and place over coolant pump.**

13 **Mount fan and tighten collar screw to 25 Nm.**

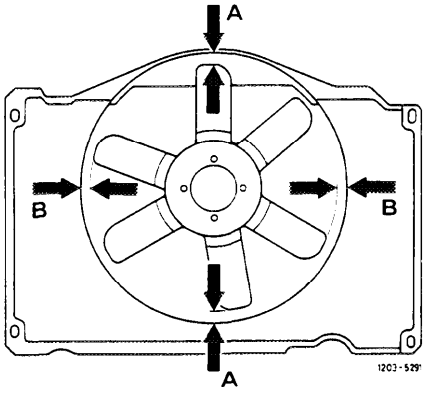
14 **Fasten fan cover and attach vent line.**

Installation dimensions for radiator, fan and fan cover

	Fan distance "a" to radiator, approx. mm	Fan distance to fan cover, approx. mm A	B
	90	25	20



Radiator/Fan

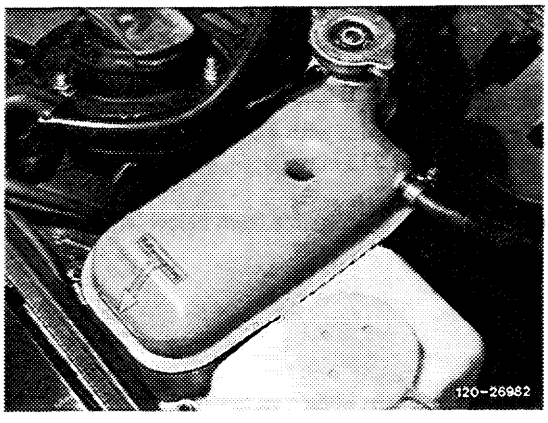


Fan cover/Fan

Radiator and expansion tank

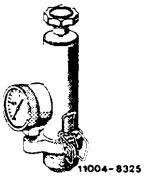
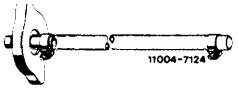
These vehicles are **provided** with an expansion tank which is attached to wheelhouse at the right.

Different radiators **are** installed depending on vehicle equipment (without or with air conditioning).



Tightening torques		Nm
Drain plug	Radiator	1.5
	Cylinder crankcase	30

Special tools

Torque wrench with plug-in ratchet, 1/2'' square, 25-l 30 Nm		001 589 66 21 00
Clamp for hose lines		000589403700
Tester for cooling system		001 589 48 21 00
Radiator cap with hose for leak test		605589002500

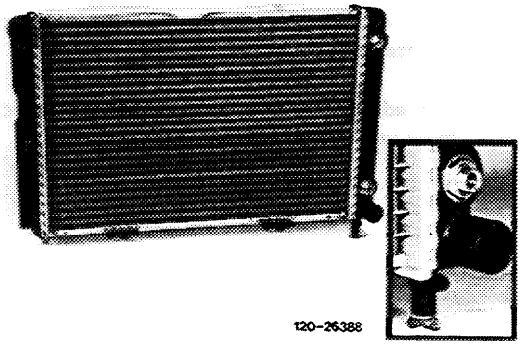
Conventional tool

7 mm socket wrench hex. head on flexible shaft for hose clamps with worm drive	e. g. Hazet, D-5630 Remscheid Order No. 426-7

Note

Vehicles without air conditioning are provided with a cross flow radiator with a core depth of 34 mm and a height of 373 mm.

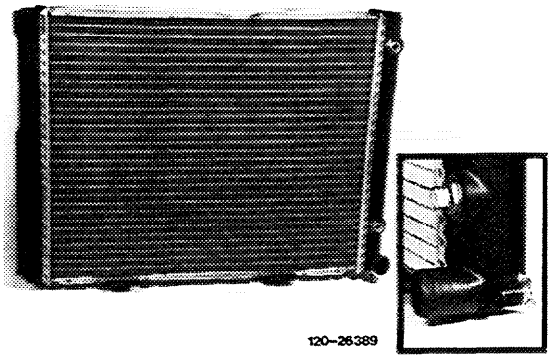
The drain plug is accessible from below (enlarged cutout).



Radiator for vehicles without air conditioning

Vehicles with air conditioning are also provided with a cross flow radiator, the radiator has a core depth of 42 mm and is 29 mm higher. The cooling capacity is thereby increased.

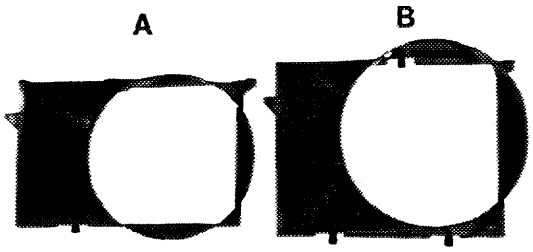
The drain plug is accessible from the front via flap in front-end skirt (enlarged cutout).



Radiator for vehicles with air conditioning

Fan cover

There are two fan cover versions in accordance with different radiators.



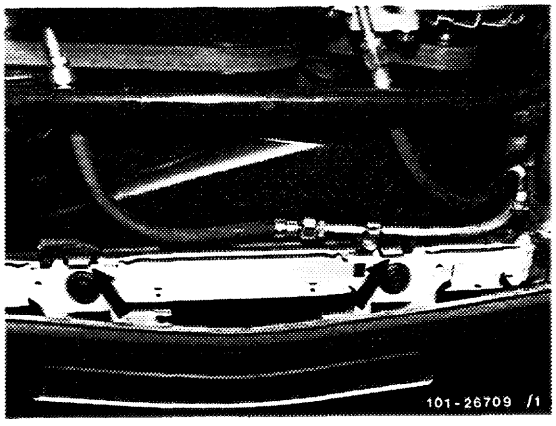
Version "A"

On vehicles without air conditioning (low radiator).

Version "B"

On vehicles with air conditioning (high radiator).

The fan covers are plugged below into one or two holding lugs on radiator (arrows) and are fastened to radiator at top or laterally with holding clamps.



Removal

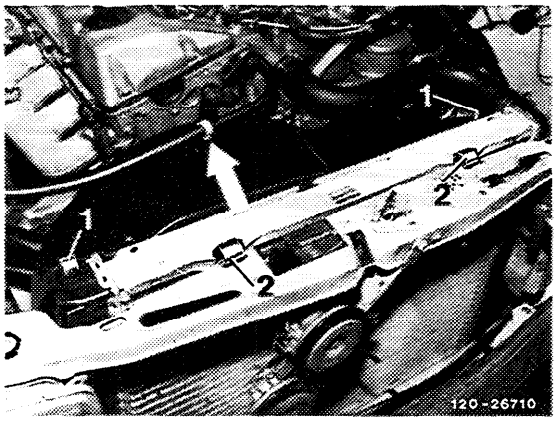
1 Drain coolant (20–010).

2 On vehicles with automatic transmission, disconnect oil lines from or to transmission and unscrew on radiator.

3 Disconnect coolant hoses on radiator.

4 Pull out flat contour springs (1) for fan cover, slightly lift fan cover and place over fan.

5 Pull out flat contour springs (2) for radiator and lift out radiator.

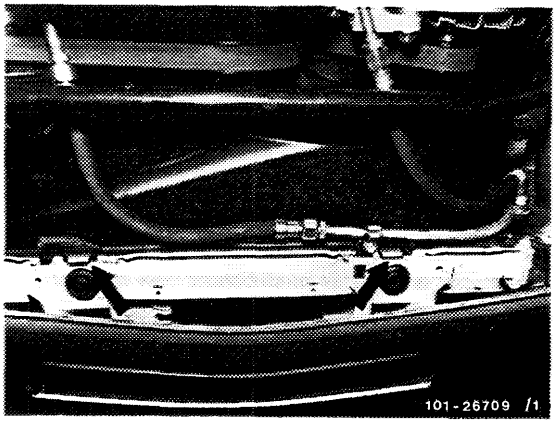


Installation

6 For installation proceed vice versa to removal.

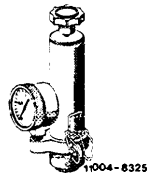
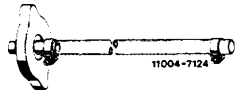
Note that the fastening mounts of the radiator are correctly introduced into rubber grommets of lower holder and the holders of the fan cover into holding lugs on radiator (arrows).

7 Fill in coolant (20–010), pressure-test cooling system with tester and check for leaks.



20-425 Repairing radiator

Special tools

Tester for cooling system		001 589482100
Radiator cap with hose for leak test		605 589 00 25 00

Conventional tool

7 mm socket wrench hex. head with flexible shaft for hose clamps with worm drive	e. g. Hazet, D-5630 Remscheid Order No. 426-7

Note

Since light alloy radiators with plastic water tanks cannot be repaired by soldering, a sealing compound has been developed and approved.

The compound can also be used to seal radiators made of heavy-metal (nonferrous metal radiator).

The sealing compound is a product on a silicone rubber base, which remains permanently elastic in its final condition. Temperature stability extends from -50 °C to +200 °C.

Owing to different accessibility on radiator (e. g. more difficult in core than on water tank) the sealing compound is available in a diluted and an undiluted shape.

The different sealing compound versions and the priming fluid are included in a repair kit, part No. 123 989 00 20.

Designation	Purpose
Priming fluid	Preparation of wash primer.
Sealing compound, undiluted	For sealing easily accessible areas.
Sealing compound, diluted	For sealing poorly accessible areas (e. g. laterally on cooling pipes).

Sealing compound and priming fluid have a shelf life of approx. 1 year, provided they are always closed airtight.

Cloudy priming fluid should no longer be used.

Individually, the sealing compound serves to seal the following parts or areas in coolant circuit:

a) Plastic water tanks (3 and 4).

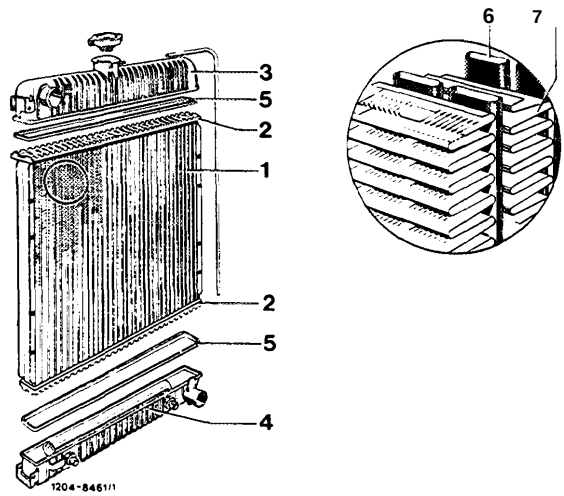
b) Heavy-metal water tanks (holes up to 1.5 mm dia.).

c) Light and heavy-metal cooling pipes (6).

d) Pipe plate (2).

e) Beaded flange (connection between radiator core and water tank).

f) Heat exchanger of heating system.



1 Radiator core
2 Pipe plate
3 Water box, top
4 Water box, bottom
5 Gasket
6 Cooling pipes
7 Ribs

Damages spots on water tanks, which are exposed to increased stress caused by e. g. torn or broken fastening lugs, cracks in fillets of connections, fractures and very long or wide cracks on top should not be repaired, since the sealing compound can accept very light loads only.

Plastic water 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, consult the nearest Behr repair shop or Inter-Radia service station for such a possibility and if such a repair can be made.

If there is no such a possibility, renew radiator.

On heavy-metal radiators with plastic water tanks, soldering on core may be performed only at a distance of 20 mm from water tank, since otherwise the high soldering temperature will damage the gasket (5) and the water tank (3 or 4). Seal leaks which are closer to water tank with sealing compound only.

If the leaking spot can be clearly located in installed condition, the radiator need not be removed. In such a case, it will be enough to drain the coolant and, after sealing, to pressure-test the cooling system with tester (1.0-1.2 bar gauge pressure).

When handling priming fluid and sealing compound observe the following:

The priming fluid is easily inflammable (adhere to safety rules, dangerous materials class A 1).

Up to complete interlacing (bonding) of sealing compound, acetic acid will be released. For this reason, avoid skin contact. Clean affected parts immediately with water and soap. Rinse eyes with water, see a doctor, if required.

Sealing

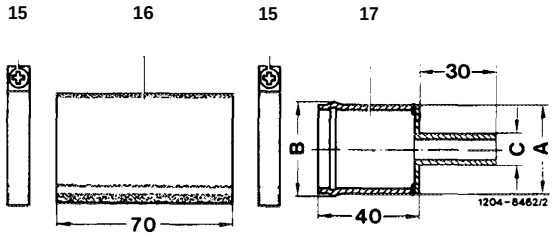
1 If the leaking point cannot be accurately localized in installed condition, remove radiator (20-420).

2 Clean radiator.

3 Close hose connections with self-made closing caps.

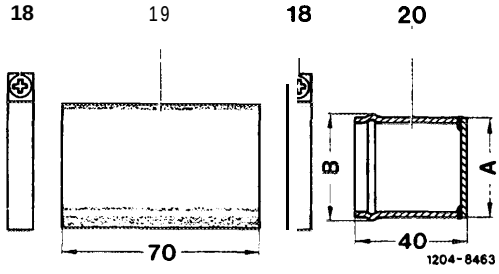
Required parts for upper hose connection:

15 2 clamps L 36-46, part No. 976026 036000
16 Length of hose, part No. 201 501 38 82
17 Reduction piece made of two lengths of pipe
A 35 mm dia.
B 39 mm dia.
C 12 mm dia.



Required parts for lower hose connection.

18 2 clamps L 36-46, part No. 916026 036000
19 Length of hose, part No. 201 501 38 82
20 Cap made of length of pipe
A 35 mm dia.
B 39 mm dia.



4 Close connections of gear oil cooler with plastic caps or plugs made of old oil cooler lines. For this purpose, saw off oil cooler lines directly behind nipple and close with solder.

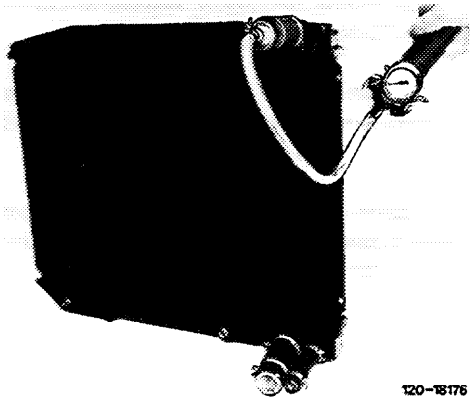
5 Connect tester to radiator.

6 Place radiator into a water bath.

7 Pressurize radiator with tester and watch where air bubbles are rising.

8 Mark leaking point.

9 Remove radiator and reduce pressure.



10 Blow radiator dry with compressed air.

11 Clean spot to be sealed with a conventional cleaning agent (e. g. Tri or bentine). Always clean a spot slightly larger than the area to be sealed (e. g. clean cracks approx. 20-30 mm beyond ends of cracks).

There is no need to remove paint. Then blow respective radiator area dry with compressed air.

There should be no more dust and grease residue.

12 Apply priming fluid with a brush uniformly and very thinly.

Similar to cleaning, apply priming fluid slightly beyond area to be sealed. To make sure that the priming fluid is not soiled in tank, pour the quantity required for repair into a separate vessel.

Attention!
Pay attention to safety rules!

13 Let priming fluid dry at ambient temperature for approx. 10 minutes.

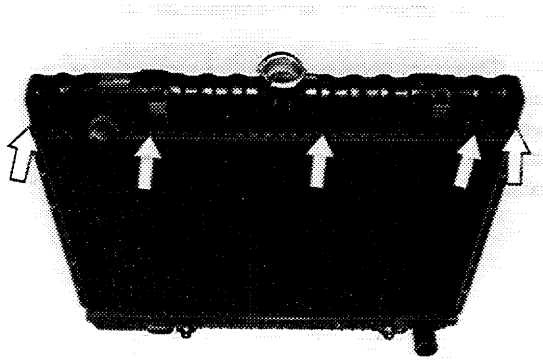
14 Position radiator in such a manner that the sealing compound cannot flow away from area to be sealed.

15 Depending on accessibility, apply sealing compound diluted or undiluted. Use brush, spatula or the like for distributing sealing compound.

Attention!
During application and distribution make sure that no air pockets will occur.

Similar to cleaning and priming, apply sealing compound beyon area to be sealed. If there are several leaking spots on beaded flange (arrows), it is recommended to seal the beaded flange all-around.

Seal leaks in core from both sides.



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At end of sealing procedure, close tube immediately. Up to complete interlacing (bonding) of sealing compound, acetic acid will be released. For this reason, avoid skin contact. Clean affected parts immediately with water and soap. Rinse eyes with water, see a doctor, if required.

16 Leave radiator alone for at least 3 hours to permit drying of sealing compound. Depending on quantity of applied sealing compound and size of spot to be sealed, complete interlacing (bonding) of sealing compound into a lasting elastic connection will be completed after max. 24 hours at ambient temperature.

17 Pressure-test radiator in water bath for approx. 5 minutes at 1.5 bar gauge pressure.

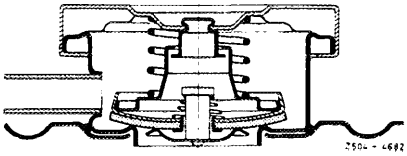
If leaks are still showing up, repeat pressure test as from item 7.

18 Remove tester and closing plugs.

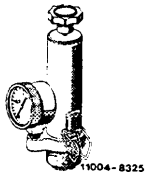
19 Upon re-installation of radiator, pressure-test cooling system with tester.

20-430 Checking expansion tank closing cap

Closing cap

Open pressure relief valve at	new radiator closing cap **1.2** $^{+0.15}_{-0.1}$ bar gauge pressure	
	used radiator closing cap 1 **.O-0.2** bar gauge pressure	
Vacuum valve opens at	0.1 bar gauge vacuum	

Special tools

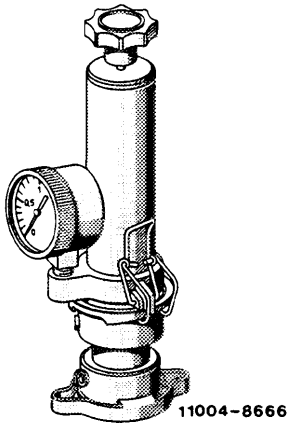
Tester for cooling system and radiator cap		001 589 48 21 00
Double connection for closing cap		**000589736300**

Checking pressure relief valve

1 Fasten double connection to leak tester by means of holding clips.

2 Place expansion tank closing cap on double connection.

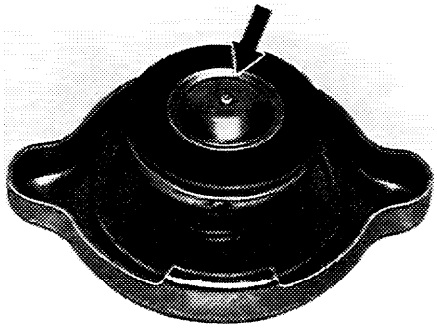
3 Check opening pressure by pumping.



Checking vacuum valve

Vacuum valve (arrow) should rest against rubber seal, which should permit easy lifting and should then snap back upon release.

Note: Replace corroded (slightly rusted) expansion tank closing caps.



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