

Cooling system components, removing and installing

WARNING!

The cooling system is pressurized when the engine is warm. When opening the expansion tank, wear gloves and other appropriate protection, cover the cap with a cloth and open carefully to relieve system pressure slowly.

Notes:

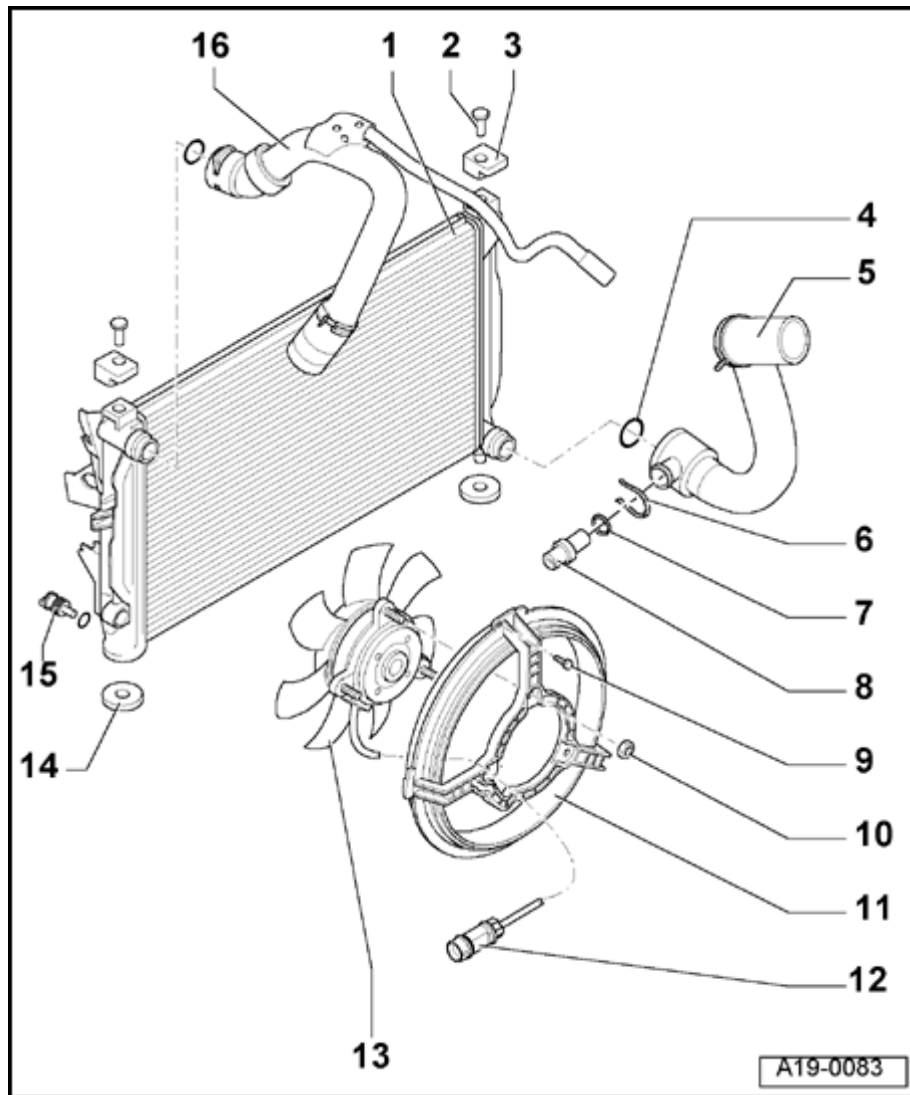
- ◆ *Hoses are secured with spring-type clips. If servicing, only use the same type of spring-type clip.*

⇒ *Parts catalog*

- ◆ *VAG1921 pliers are recommended when installing spring-type clips.*
- ◆ *The O-rings installed at the quick-release connections must be replaced if damaged or leaking.*
- ◆ *Seals and gaskets must always be replaced.*

- ◆ *When installing coolant hoses, make sure they are free of stress and do not come into contact with other components (the arrows which are located on the coolant pipes and coolant hoses must be opposite each other).*

Perform cooling system leakage test using VAG 1274 cooling system tester and 1274/9 adapter.



Cooling system components (on body)

1 - Radiator

- ◆ Removing and installing ⇒ [page 19-17](#)
- ◆ After replacing, completely replace coolant
- ◆ With ATF cooler on vehicles with automatic transmission

2 - Securing clip

3 - Securing rubber

4 - O-ring

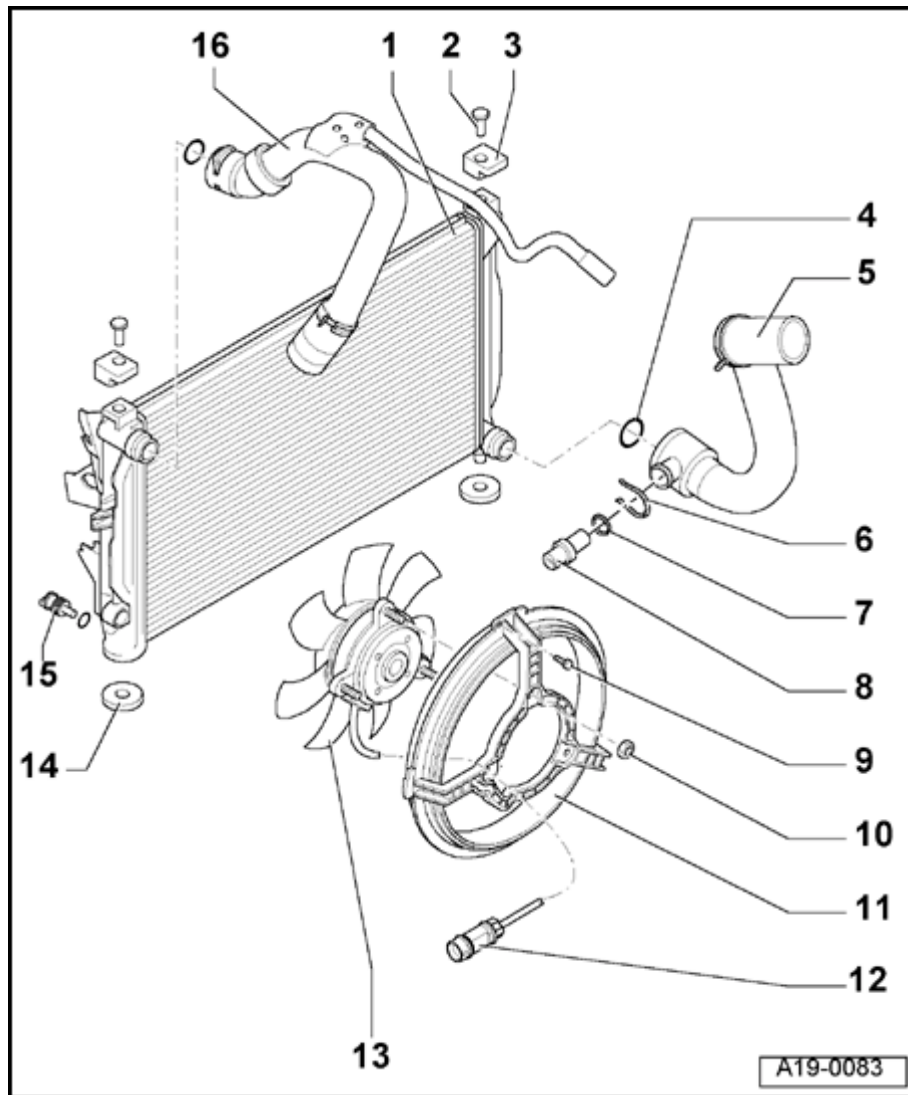
- ◆ Replace if damaged

5 - Lower coolant hose

- ◆ Secured to radiator with retaining clip
- ◆ Make sure hose is securely seated
- ◆ Coolant hose connection diagram ⇒ [page 19-9](#)

6 - Securing clip

- ◆ To secure temperature switch in coolant hose

**7 - O-ring**

- ◆ Replace if damaged

8 - Coolant Fan Control (FC) thermal switch - F18-

- ◆ 35 Nm (26 ft lb)
- ◆ For electric coolant fan

Switching temperatures, stage 1:

- ◆ On: 92-97 °C (198-207 °F)
- ◆ Off: 84-91 °C (183-196 °F)

Switching temperatures, stage 2:

- ◆ On: 99-105 °C (210-221 °F)
- ◆ Off: 91-98 °C (196-208 °F)

9 - Locking bolt**10 - 10 Nm (7 ft lb)****11 - Fan ring**

- ◆ Clipped into air ducting and secured with locking 9 bolt

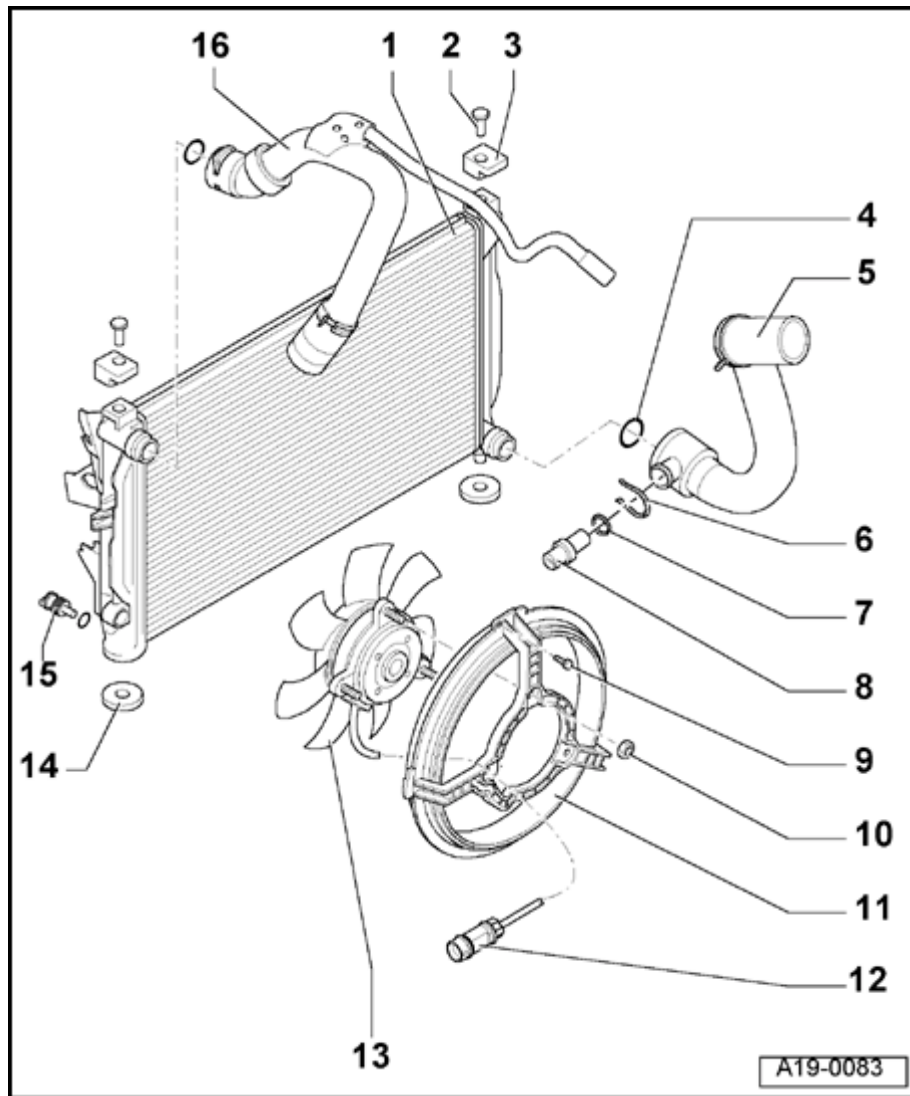
12 - 2-pin harness connector**13 - Coolant fan -V7-**

- ◆ Checking ⇒ [page 19-26](#)

14 - Rubber washer

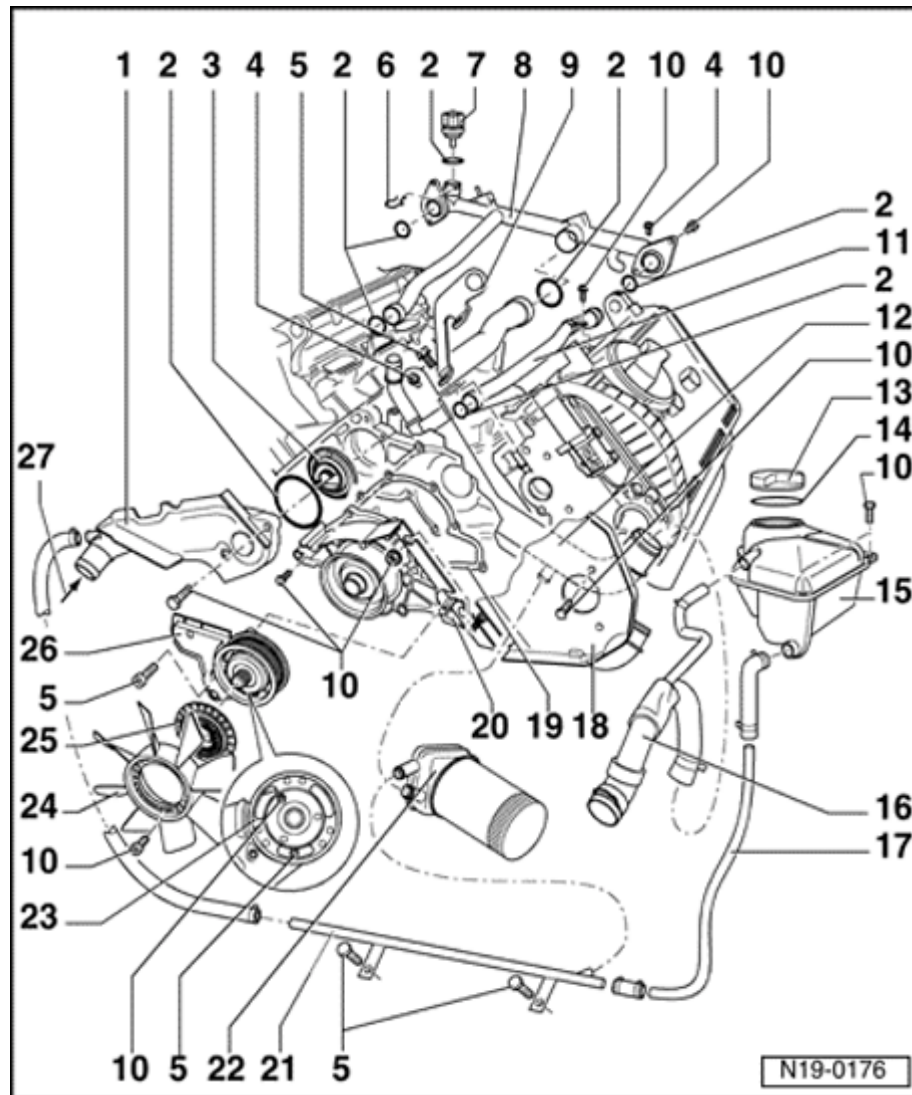
15 - Coolant drain plug

◆ 10 Nm (7 ft lb)



16 - Upper coolant hose

- ◆ Secured to radiator with retaining clip
- ◆ Make sure hose is securely seated
- ◆ Coolant hose connection diagram ⇒ [page 19-9](#)



Cooling system components (on engine)

1 - Connection

- ◆ For thermostat

2 - O-ring

- ◆ Always replace

3 - Coolant thermostat

- ◆ Removing and installing ⇒ [page 19-23](#)
- ◆ Note installation position ⇒ [page 19-23](#)

Checking:

- ◆ Heat thermostat in water
- ◆ Opening begins at approx. 86° C (187° F)
- ◆ Min. opening: 7 mm (0.28 in.)

4 - Bleeder screw

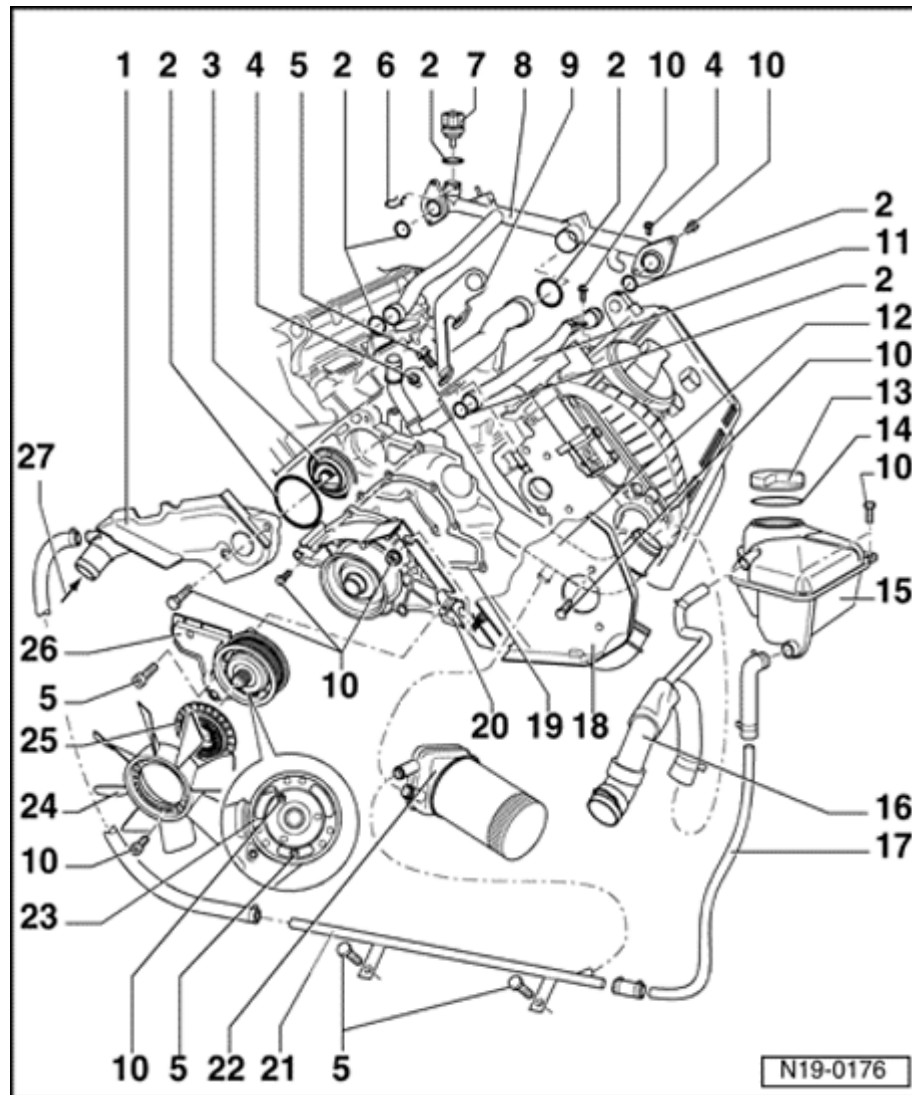
- ◆ 20 Nm (15 ft lb)

5 - Bolt

- ◆ 25 Nm (18 ft lb)

6 - Retaining clip

- ◆ Make sure clip is seated securely



7 - Engine Coolant Temperature (ECT) sensor -G62-

- ◆ For Engine Control Module (ECM)
- ◆ If necessary, release pressure in cooling system before removing
- ◆ Checking ⇒ Repair Manual, 2.8 Liter V6 5V Fuel Injection & Ignition, Repair Group 01

8 - Rear coolant line

- ◆ Coolant hose connection diagram ⇒ [page 19-9](#)

9 - Lifting eye

10 - 10 Nm (7 ft lb)

11 - Coolant line

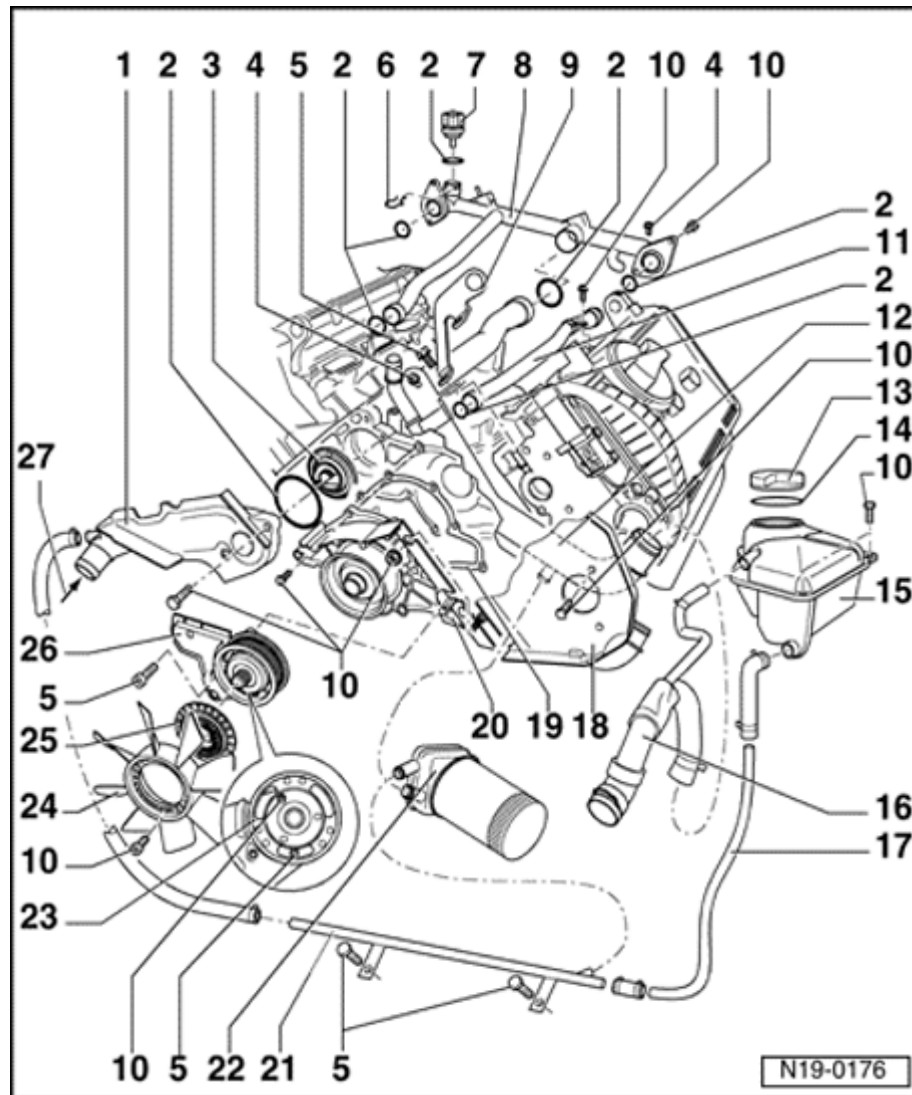
- ◆ Coolant hose connection diagram ⇒ [page 19-9](#)

12 - Front coolant hose

- ◆ Coolant hose connection diagram ⇒ [page 19-9](#)

13 - Sealing cap

- ◆ Check using VAG1274 cooling system tester with VAG1274/8 adapter
- ◆ Test pressure: 1.4-1.6 bar (20-23 psi)

**14 - O-ring**

- ◆ Replace if damaged

15 - Expansion tank

- ◆ Check using VAG1274 cooling system tester with VAG1274/9 adapter

16 - Upper coolant hose

- ◆ Secured to radiator with retaining clip
- ◆ Make sure hose is securely seated
- ◆ Coolant hose connection diagram ⇒ [page 19-9](#)

17 - Coolant line

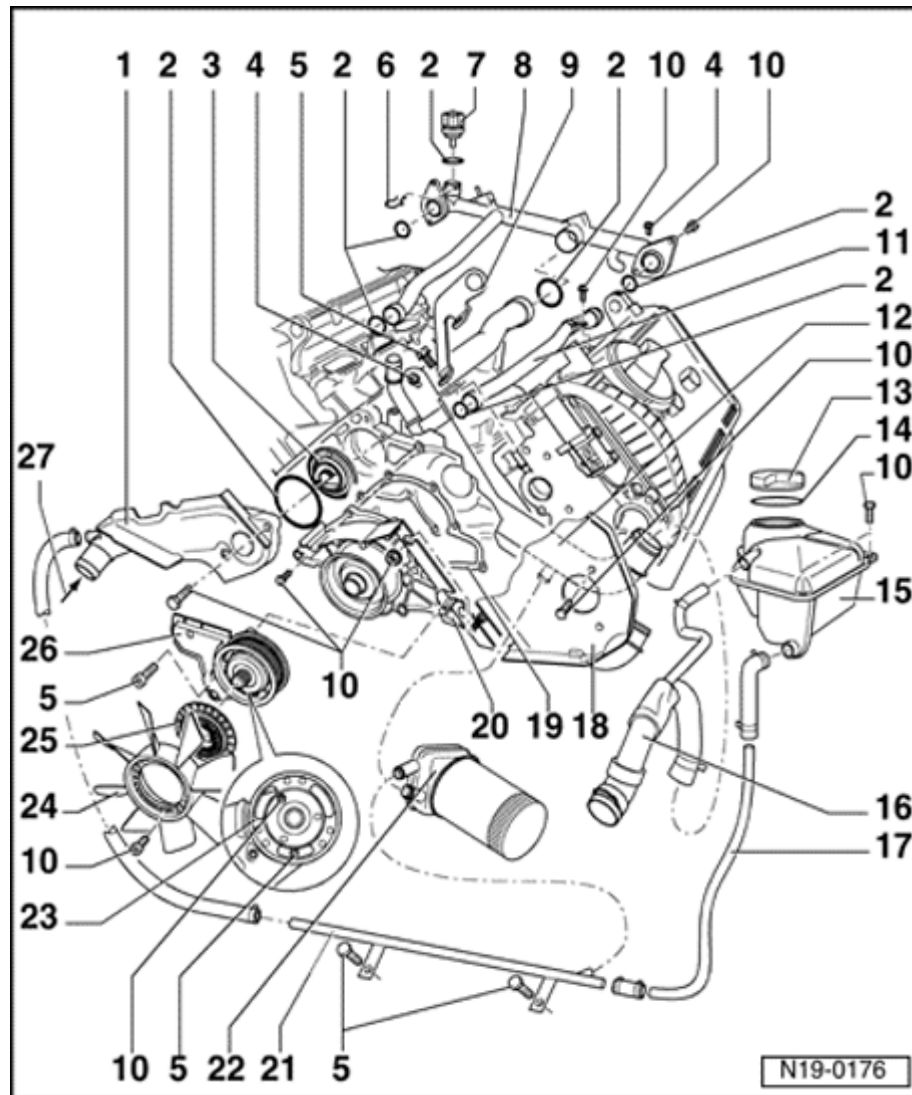
- ◆ Coolant hose connection diagram ⇒ [page 19-9](#)

18 - Rear toothed belt guard**19 - Gasket**

- ◆ Always replace

20 - Coolant pump

- ◆ Check for ease of movement
- ◆ Completely replace if damaged or leaking
- ◆ Removing and installing ⇒ [page 19-20](#)

**21 - Lower coolant line**

- ◆ Coolant hose connection diagram ⇒ [page 19-9](#)

22 - Oil cooler**23 - Belt pulley**

- ◆ For viscous fan

24 - Fan wheel for viscous fan**25 - Viscous fan coupling**

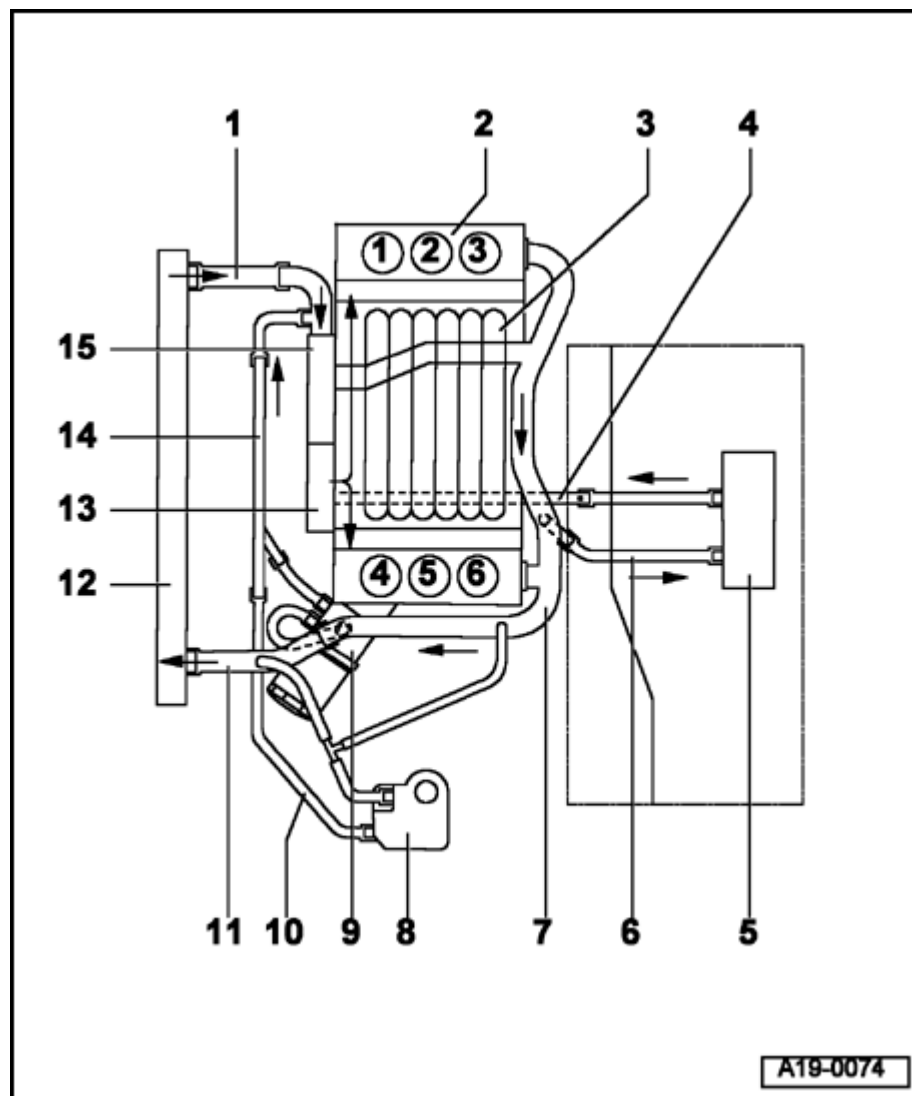
- ◆ Note left-hand thread
- ◆ Tightening torque only valid when using 3312 open end spanner.
- ◆ Tighten to 40 Nm (30 ft lb)
- ◆ Removing and installing ⇒ [page 19-25](#)

26 - Bracket

- ◆ For viscous fan

27 - From bottom of radiator

- ◆ Coolant hose connection diagram ⇒ [page 19-9](#)



Coolant hose connection diagram

1 - Lower coolant hose

◆ From radiator to engine

2 - Cylinder head/cylinder block

3 - Intake manifold

4 - Coolant line

◆ From heat exchanger to engine block

5 - Heater core

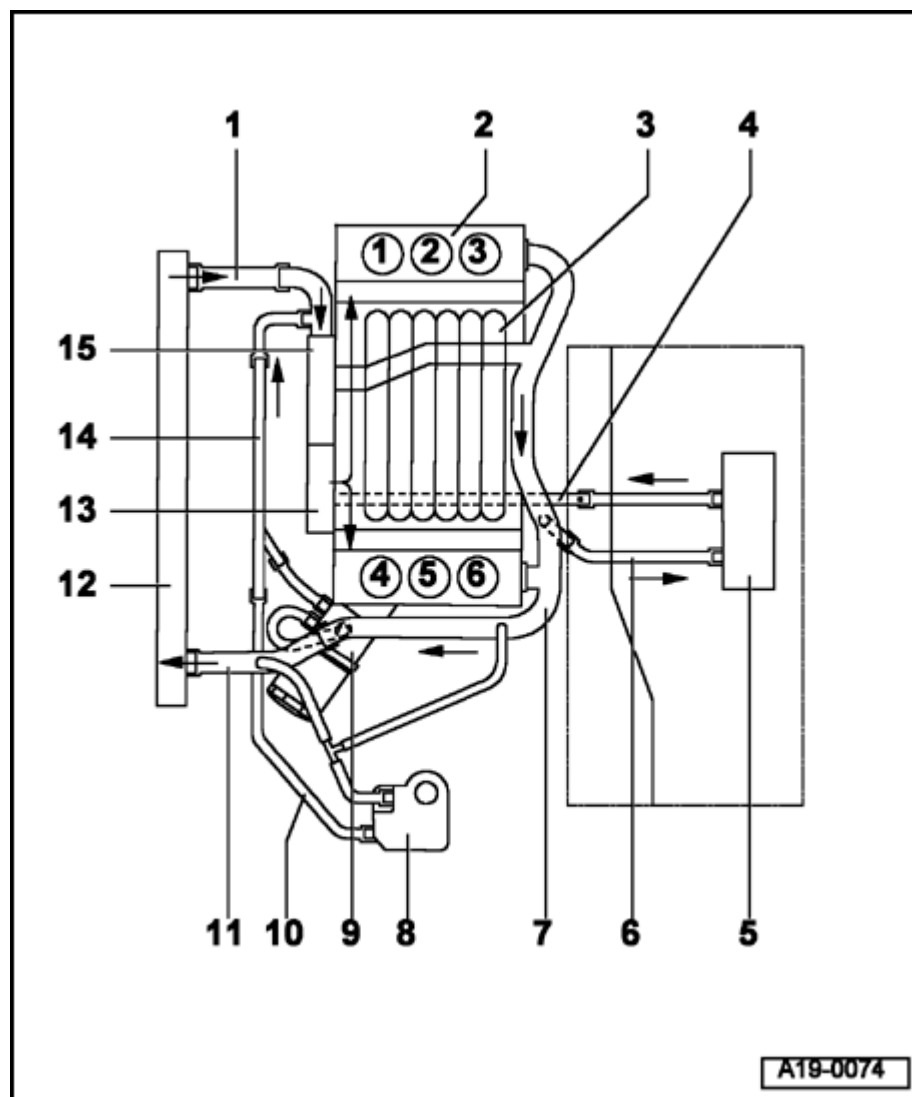
6 - Coolant hose

◆ To heat exchanger

7 - Rear coolant line

8 - Expansion tank

19-10



9 - Oil cooler

10 - Coolant line

◆ From expansion tank to lower coolant pipe

11 - Upper coolant hose

12 - Radiator

13 - Coolant pump

14 - Lower coolant line

15 - Connection

◆ For thermostat

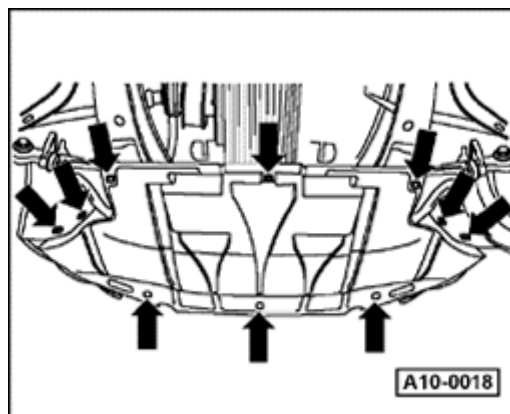
Cooling system, draining and refilling

Draining

WARNING!

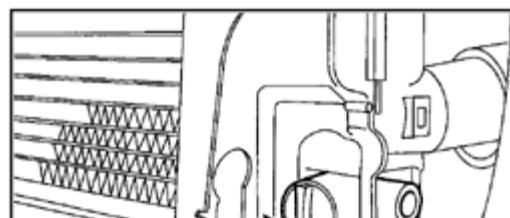
The cooling system is pressurized when the engine is warm. When opening the expansion tank, wear gloves and other appropriate protection, cover the cap with a cloth and open carefully to relieve system pressure slowly.

- Open coolant expansion tank cap.



A

- Remove noise insulation panel.
- Place VAG1306 drip tray underneath engine.



A

- With bumper removed, open coolant drain plug (arrow) on lower left of radiator by turning it counterclockwise. If necessary, attach accessory hose to connection.
- With bumper installed, pull off retaining clamp for lower right radiator

hose (from radiator to engine) and disconnect radiator hose from radiator.

CAUTION!

Follow disposal regulations for coolant.



A

- Drain engine coolant at drain plug (arrow).

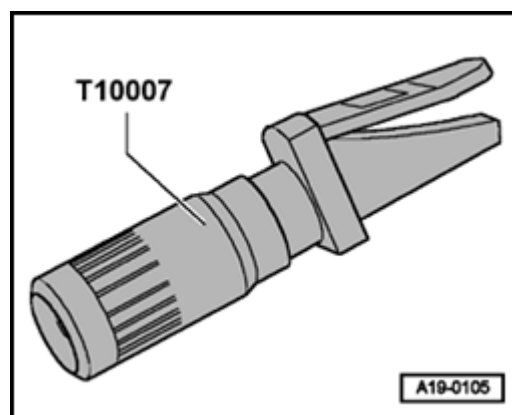
Filling

Notes:

- ◆ *Only use coolant additive G12 (according to TL VW 7745 D). G12 is red in color.*
- ◆ *Do not mix G12 with any other coolant additive!*
- ◆ *If the fluid in expansion tank is brown, G12 has been mixed with other coolant. In this case, the coolant must be flushed and replaced.*
- ◆ *"G12" and coolant additives marked in accordance with "TL VW 774 D" prevent frost and corrosion damage, scaling and also raise the boiling point of the coolant. Therefore, the cooling system must be filled year round with frost and corrosion protection additives.*
- ◆ *A higher boiling point improves engine reliability under heavy load particularly in countries with tropical climates.*
- ◆ *Frost protection additives protect against frost to about -25°C (about -35°C in arctic climates).*
- ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The anti-freeze ratio must be at least 40%.*

Note (continued from page ⇒ [Page 19-12](#)):

- ◆ *If for climatic reasons greater frost protection is required, the amount of G 12 can be increased, but only up to 60% (frost protection to about -40 ° C), otherwise frost protection and cooling effectiveness will be reduced.*
- ◆ *If the radiator, heat exchanger, cylinder head or cylinder head gasket is replaced, completely replace the engine coolant.*



⚡ Test coolant frost protection using T10007 special tool.

Recommended mixture ratios:

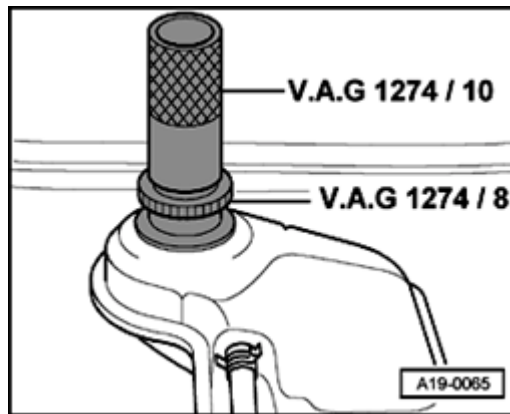
Frost protection to	Anti-freeze amount	G 121)	Water 1)
-25 ° C (-13 ° F)	40 %	2.5 l (2.7 qt.)	3.5 l (3.7 qt.)
-35 ° C (-31 ° F)	50 %	3.0 l (3.2 qt.)	3.0 l (3.2 qt.)

¹⁾ The quantity of coolant can vary depending upon the equipment installed in the vehicle.

- Replace coolant drain plug O-ring and install coolant drain plug into engine.

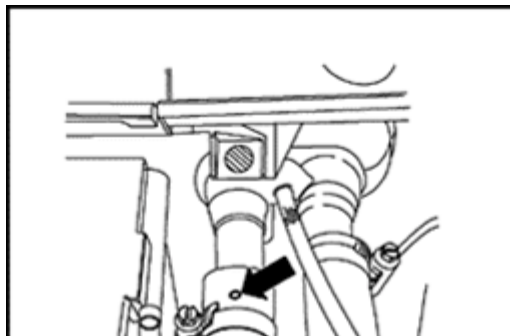
Tightening torque: 20 Nm (15 ft lb).

- Install lower right coolant hose and secure with retaining clip.
- Secure coolant drain valve to radiator.



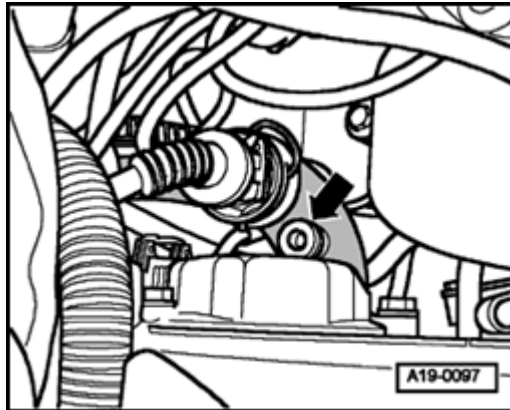
A

- Screw VAG1274/9 onto expansion tank and insert VAG1274/10 into adapter.



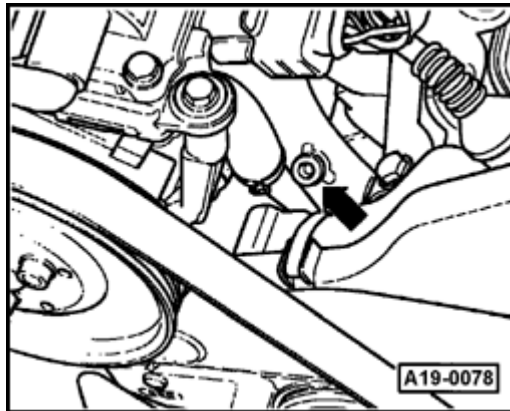
A

- Loosen clamp on coolant hose on heater core and pull back hose until bleeder hole in coolant hose (arrow) is no longer sealed by connection.
- Top off coolant until it flows out from bleeder hole in coolant hose.
- Push coolant hose onto connection and tighten.



A

- Loosen bleeder screw on lower coolant line (arrow) under expansion tank (if necessary, unbolt expansion tank).
- Top off coolant until it flows out from bleeder screw.
- Close bleeder screw and tighten to 20 Nm (15 ft lb).



A

- Loosen bleeder screw on front coolant line (arrow) between power steering pump and left-side of cylinder head.
- Top off coolant until it flows out from bleeder hole in coolant line.
- Close bleeder screw and tighten to 20 Nm (15 ft lb).
- Top up coolant to MAX mark.
- Install coolant expansion tank cap.
- Set heater controls to maximum heat position.
- Start engine and let run at idle for approx. 10 minutes.

- Raise engine speed to approx. 2000 rpm for approx. 5 minutes.
- Allow engine to idle until lower coolant hose on radiator is hot.
- Check coolant level and top-off if necessary. When engine is at normal operating temperature, coolant level must be on MAX mark. When engine is cold, coolant level must be between MIN and MAX marks.

WARNING!

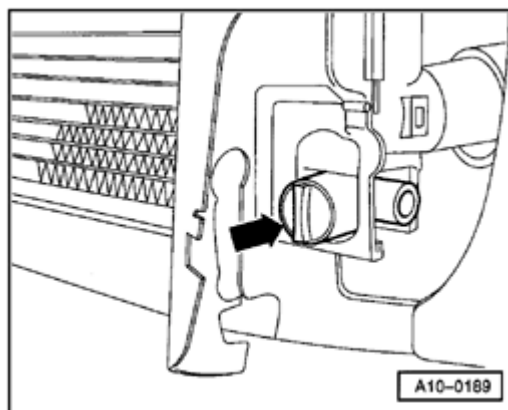
The cooling system is pressurized when the engine is warm. When opening the expansion tank, wear gloves and other appropriate protection, cover the cap with a cloth and open carefully to relieve system pressure slowly.

Radiator, removing and installing

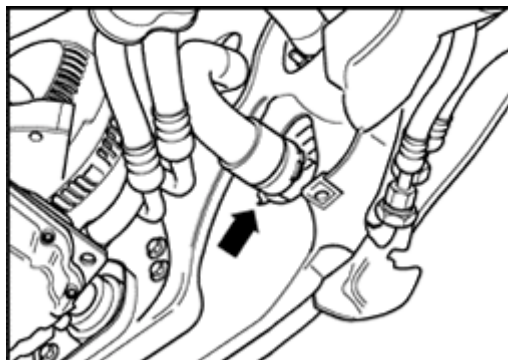
Removing

- Remove front bumper.

⇒ [Repair Manual, Body Exterior, Repair Group 63](#)



- A** - Drain coolant at drain plug (arrow) ⇒ [page 19-11](#) .

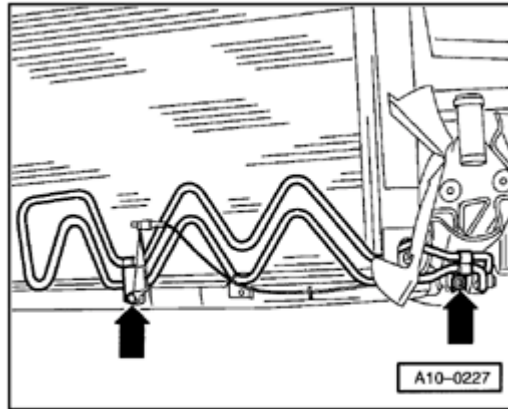


- A** - Disconnect coolant hoses at radiator, unhinge clamp from connection flange (arrow).
- Disconnect connector from temperature switch at bottom-left of radiator.

Vehicles with automatic transmission

- Remove ATF lines from radiator.

⇒ [Repair Manual, 5 Spd. Automatic Transmission 01V, Repair Group 37](#)



All models

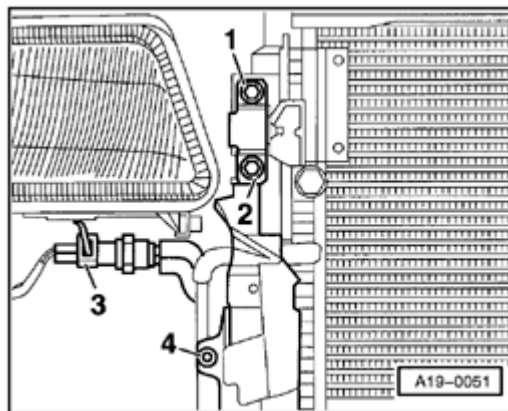
A

- Unbolt power steering hydraulic oil cooling line (arrows).

Vehicles with air conditioning

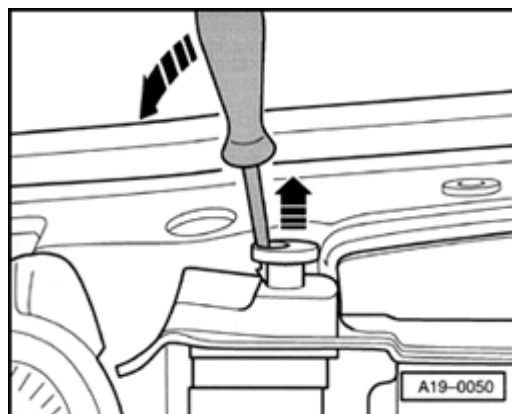
CAUTION!

- ♦ **DO NOT open the air conditioning refrigerant circuit.**
- ♦ **Disconnect A/C refrigerant lines at brackets and support points only.**
- ♦ **Avoid damage from bending. Refrigerant lines kink easily.**



A

- Unbolt air guides at radiator -4- on left and right-sides.
- Unbolt retaining bolts -1- and -2- from condenser.
- Disconnect harness connector -3- at A/C pressure switch -F129-.
- Pull condenser upward out of retaining bracket, swing to side and hang at right-front wheel using wire loop.



All models

A

- Release both radiator retaining bolts, pull up and remove (arrows).
- Tilt radiator toward front, lift up and remove.

Installing

Installation is the reverse of removal, noting the following:

- Fill up coolant ⇒ [page 19-11](#) .

Vehicles with automatic transmission

- Check ATF level.

⇒ [Repair Manual, 5 Spd. Automatic Transmission 01V, Repair Group 37](#)

Tightening torques

Component	Tightening torque
Condenser to radiator	10 Nm (7 ft lb)
Coolant line to radiator	10 Nm (7 ft lb)

Coolant pump, removing and installing

Notes:

- ◆ *Always replace seals and gaskets.*
- ◆ *Cover the toothed belt with a cloth to protect it from coolant before removing the coolant pump.*

Removing

- Remove front bumper.

⇒ [Repair Manual, Body Exterior, Repair Group 63](#)

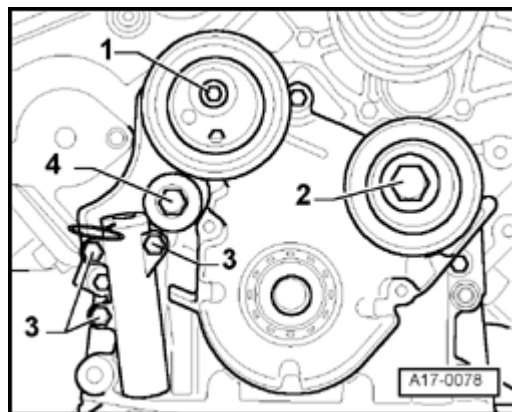
- Move lock carrier into service position.

⇒ [Repair Manual, Body Exterior, Repair Group 50](#)

- Remove ribbed belt ⇒ [page 13-8](#) .
- Remove toothed belt ⇒ [page 13-12](#) .

- Drain coolant ⇒ [page 19-11](#) .

19-21



A

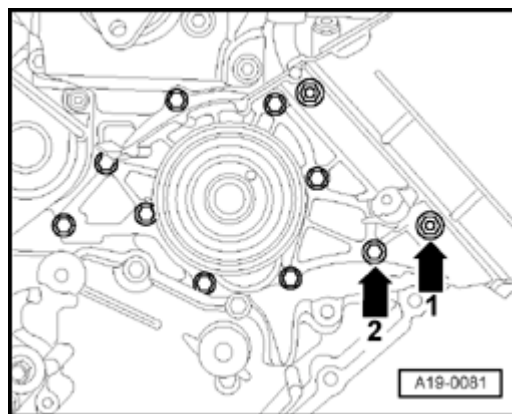
- Remove the following components before removing coolant pump:

1 - Toothed belt tensioner roller

Tightening torque: 20 Nm (15 ft lb)

2 - Idler roller

Tightening torque: 45 Nm (33 ft lb)



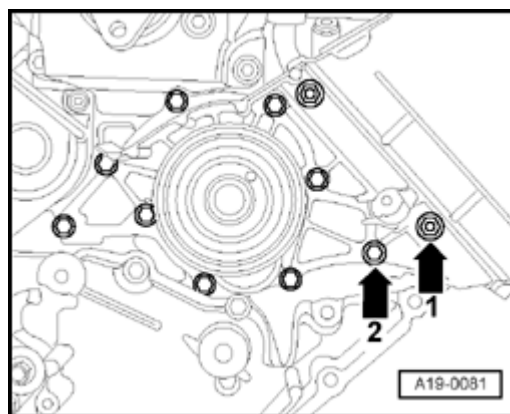
A

- Remove coolant pump mounting bolts -1- and remove coolant pump -2-.

Installing

Installation is the reverse of removal, noting the following:

- Remove any remaining sealant from sealing surfaces of coolant pump and cylinder block.
- Clean sealing surfaces so they are completely free of any oil or grease.
- Install new gasket on water pump flange.



A

- Install coolant pump -2- into cylinder block and tighten all 9 mounting bolts (arrow -2-) to 10 Nm (7 ft lb).
- Install rear toothed belt guard on water pump housing (arrow -1-).
Tightening torque: 10 Nm (7 ft lb).
- Install and tension toothed belt ⇒ [page 13-12](#) .
- Install toothed belt guard.
- Install ribbed belt ⇒ [page 13-8](#) .
- Fill cooling system with coolant ⇒ [page 19-11](#) .

Thermostat, removing and installing

Notes:

- ◆ *Always replace seals and gaskets.*
- ◆ *Cover the toothed belt with a cloth to protect it from coolant before removing thermostat.*

Removing

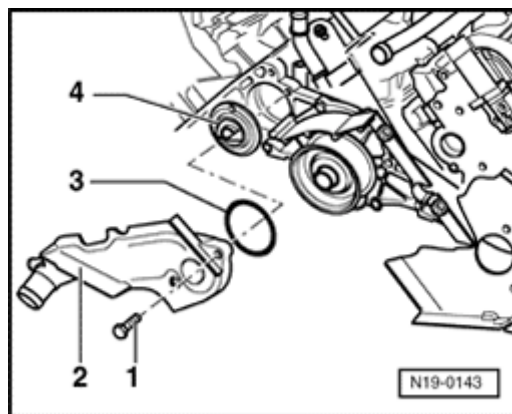
- Drain coolant ⇒ [page 19-11](#) .
- Remove front bumper.

⇒ [Repair Manual, Body Exterior, Repair Group 63](#)

- Lock carrier in service position

⇒ [Repair Manual, Body Exterior, Repair Group 50](#)

- Remove ribbed belt ⇒ [page 13-8](#) .

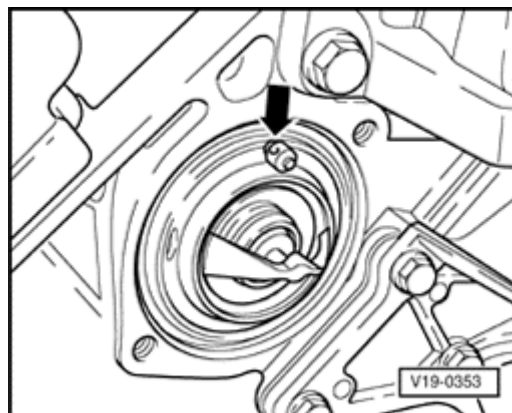


A

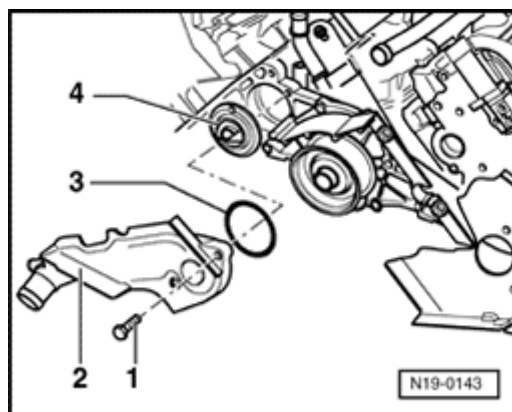
- Remove toothed belt ⇒ [page 13-12](#) .
- Remove connection mounting bolts -1- and remove connection -2-.
- Remove thermostat -4-.

Installing

Installation is the reverse of removal, noting the following:



- A
- Bleeder valve for thermostat (arrow) must be at the top.
 - Install thermostat -4- into engine block.
 - Moisten new O-ring -3- with coolant.



- A
- Install connection -2- for thermostat and tighten bolt -1- to 10 Nm (7 ft lb).
 - Install and tension toothed belt ⇒ [page 13-12](#) .
 - Install ribbed belt ⇒ [page 13-8](#) .
 - Fill cooling system with coolant ⇒ [page 19-11](#) .

Viscous fan, removing and installing

Removing

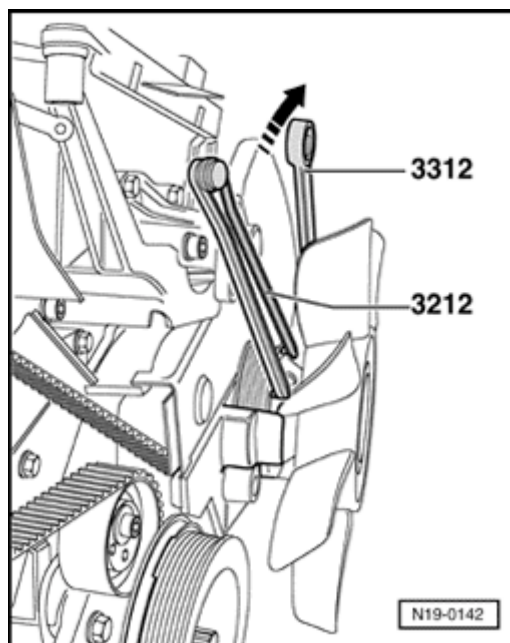
A

- Counterhold pulley for viscous fan using 3212 spanner wrench and remove viscous fan using 3312 open-end spanner (left thread).
- Carefully lift out viscous fan.

Installing

Installation is the reverse of removal, noting the following:

Tightening torque for viscous fan	Nm
1331 torque wrench and 3312 open-end spanner	37 Nm (27 ft lb)
1331 torque wrench without 3312 open-end spanner	70 Nm (52 ft lb)



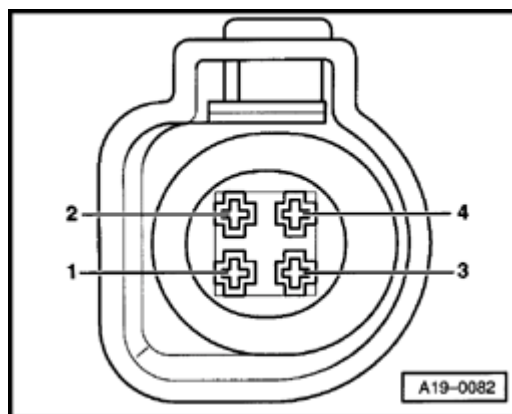
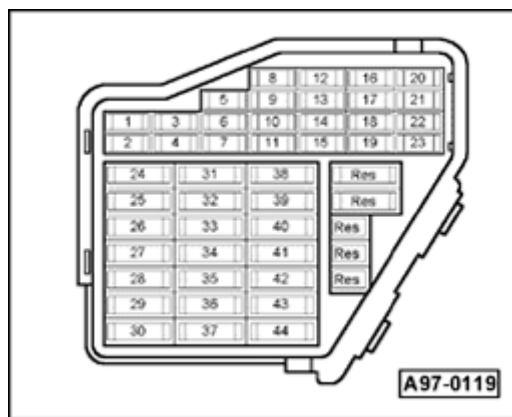
Coolant fan, checking

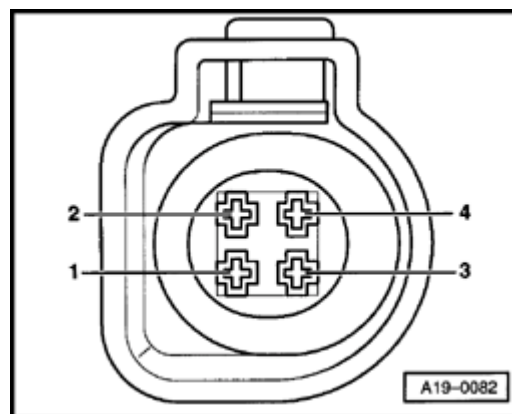
Test requirements

- A
- Fuse No. 34 OK
 - Coolant Fan Control (FC) thermal switch -F18- OK

Test procedure

- Disconnect 3-pin harness connector from coolant Fan Control (FC) thermal switch -F18- at bottom left of radiator.
 - Switch ignition on.
- A
- Bridge terminal -1- and terminal -2- of harness connector using auxiliary cables from VW1594 connector test kit.
- Coolant fan -V7- must run on 1st speed.





A

- Bridge terminal -1- and terminal -3- of harness connector using auxiliary cables from VW1594 connector test kit.

Coolant fan -V7- must run on 2nd speed.

If 1st or 2nd fan speed does not run:

- Locate and repair open circuit using wiring diagram:

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

If no open circuit can be found:

- Replace coolant fan -V7-.

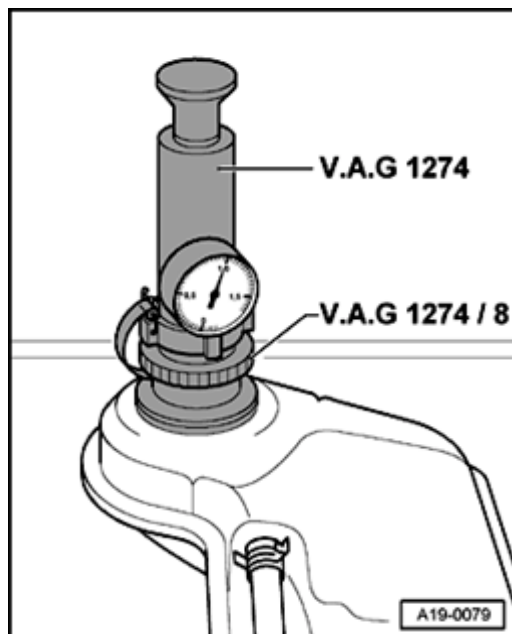
Cooling system, pressure test

- Engine at operating temperature

WARNING!

The cooling system is pressurized when the engine is warm. When opening the expansion tank, wear gloves and other appropriate protection, cover the cap with a cloth and open carefully to relieve system pressure slowly.

- Open cap on coolant expansion tank.

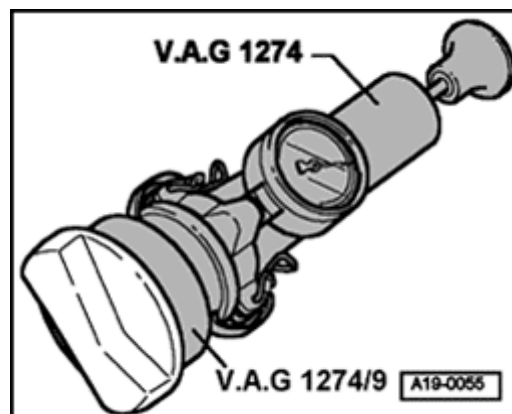


A

- Using VAG1274/8 adapter attach VAG1274 cooling system tester to coolant expansion tank.
- Use tester hand pump to create a pressure of approx. 1.0 bar (14.5 psi).
- If pressure falls, check for leaks and repair.

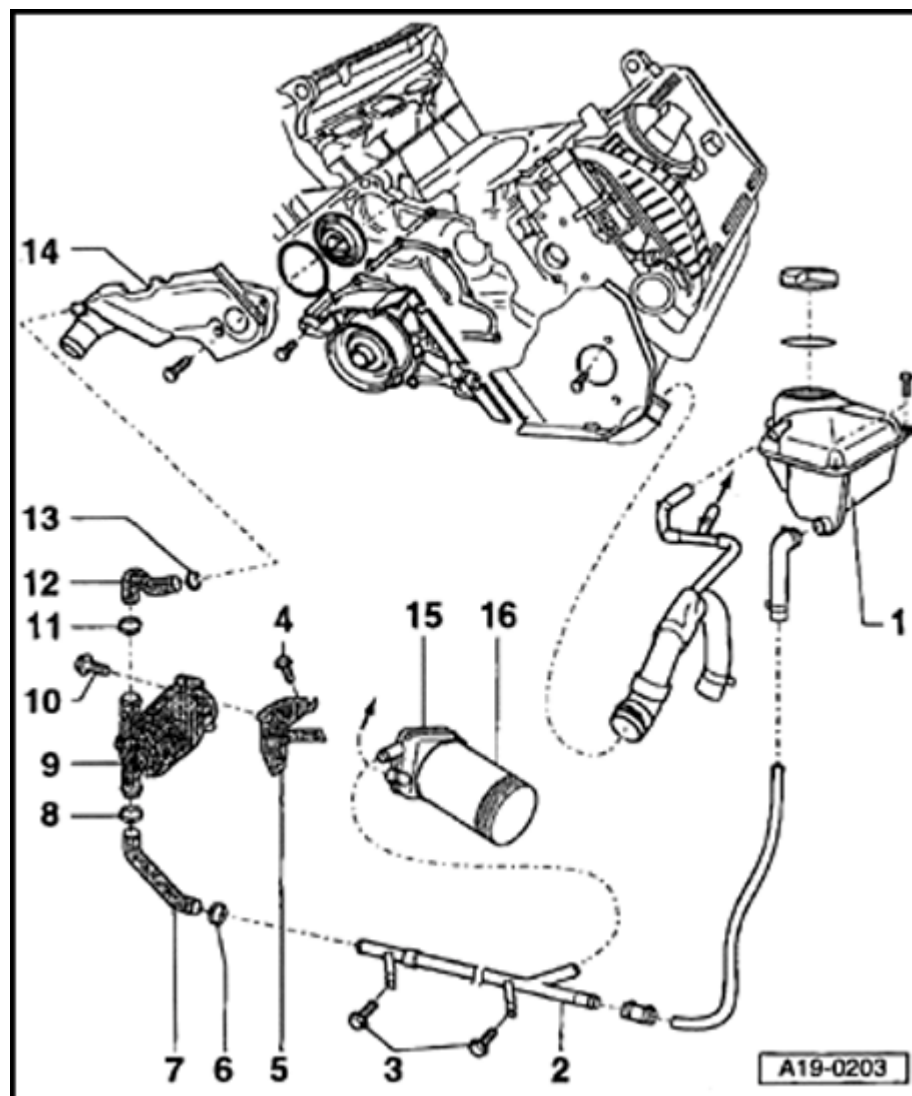
Pressure relief valve in cap, checking

- Attach sealing cap to tester using VAG1274/9 adapter.



A

- Install hand pump and pump.
- Pressure relief valve must open at pressure between 1.4-1.6 bar (20.3-23.2 psi).



After-run coolant pump

1 - Coolant reservoir

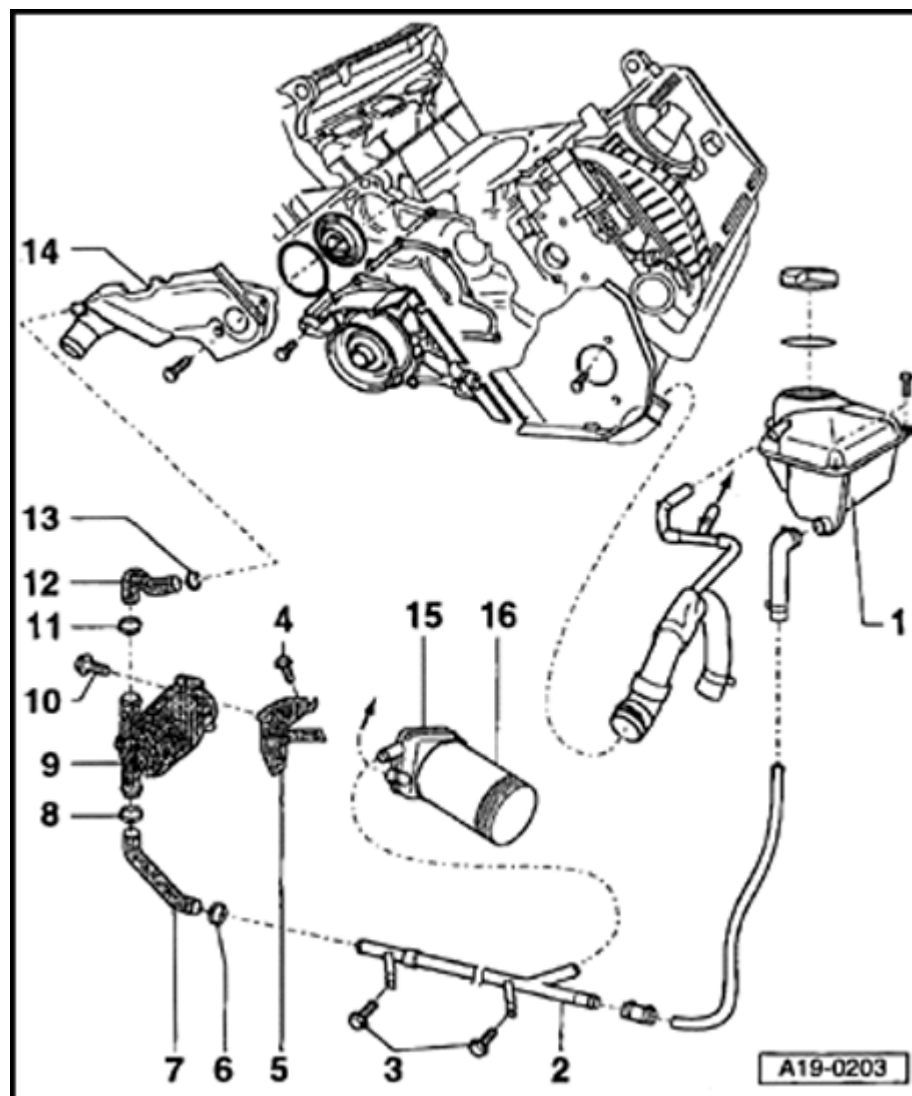
- ◆ Perform coolant system leak test using VAG1274 cooling system tester and VAG1274/9 adapter.

2 - Lower coolant pipe

3 - 25 Nm

4 - 25 Nm

5 - Bracket for after-run coolant pump



6 - Spring clamp

7 - Coolant hose

8 - Spring clamp

9 - Electrical after-run coolant pump

◆ Checking ⇒ [page 19-32](#)

◆ Removing and installing ⇒ [page 19-34](#)

10 - 10 Nm

11 - Spring clamp

12 - Coolant hose

13 - Spring clamp

14 - Connection

◆ For thermostat

15 - Oil cooler

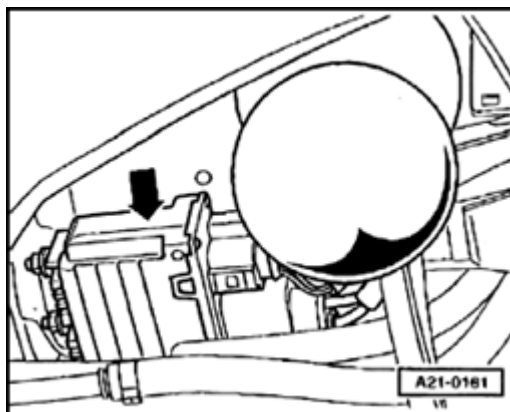
16 - Oil filter

After-run coolant pump, checking

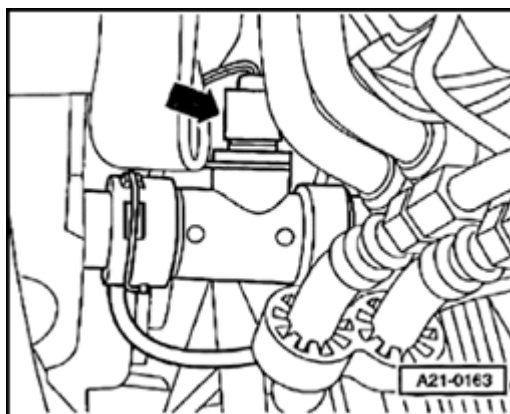
Note:

- ◆ *Control modules with an after-run time of 15 seconds after engine is turned off were installed since start of production. As a running change in m.y. 1999, control modules with an after-run time of 3 minutes were installed.*
- ◆ *The coolant after-run pump also continues to run after the engine is started again before the 15 second or 3 minute cycle is completed.*
- ◆ *The coolant after-run pump and the after-run fan are controlled via the same control module.*

After switching off the engine, the after-run pump always runs for 15 seconds or 3 minutes after the engine has been switched off. If during this time the switch-on temperature of 102 ° C (coolant temperature) is reached at the thermostat of the second fan stage, the after-run pump continues to run and the coolant fan continues to run in the after-run stage until the switch-off temperature of 91 ° C of the coolant at thermostat has been reached. The maximum running time of the after-run pump is 10 minutes.

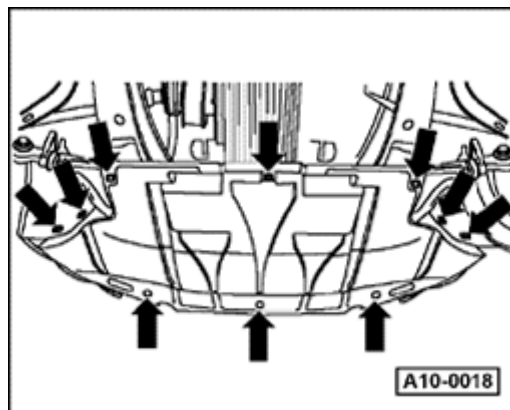


- ▲ The control module for the after-run pump and coolant fan is installed below the longmember (left side)



- ▲ The thermostat is installed in the coolant return hose.

After-run coolant pump, removing and installing

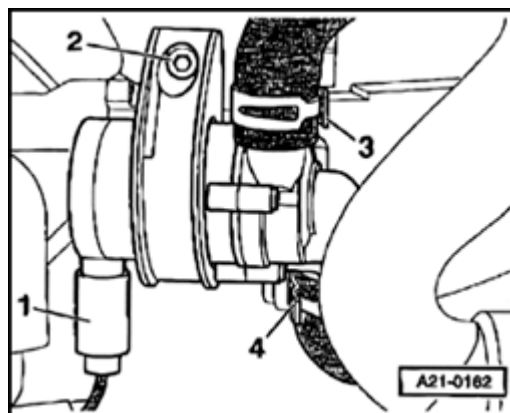


- A
- Remove noise insulation panel.

Note:

The electrical coolant pump is located on the right side behind the generator.

- Drain coolant ⇒ [page 19-11](#) .



- A
- Disconnect connection -1-.
 - Disconnect both hoses -3- and -4- from pump.
 - Unbolt pump from bracket -2-.