

170 Radiator and Cooling System

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GENERAL

This repair group covers component repair information for the engine cooling system.

See also:

- **020 Maintenance** for coolant hose inspection
- **100 Engine-General** for engine code and application information
- **Fuel Injection (M54 Engine)** for engine coolant temperature (ECT) sensor service
- **131 Fuel Injection (N52 Engine)** for engine coolant temperature (ECT) sensor service
- **132 Fuel Injection (N54 Engine)** for engine coolant temperature (ECT) sensor service
- **133 Fuel Injection (V8 Engine)** for engine coolant temperature (ECT) sensor service

170-2 Radiator and Cooling System

Coolant pump

Coolant pump

M54, V8 (N62) engines

A centrifugal coolant pump is mounted to the front of the engine. The belt-driven pump circulates coolant through the system whenever the engine is running.

N52, N54 engines

- ◀ An externally mounted electric coolant pump is bolted to the right front of the engine block. The electric pump allows for more efficient heating and cooling of the engine. It can operate regardless of whether the engine is ON or OFF.

A low coolant flow rate is used during cold start situations to speed engine warm-up. A high flow rate (including flow with engine OFF) is used for rapid cool-down. In this way the electric coolant pump helps ensure engine efficiency and longevity.

The pump is DME controlled. The DME uses engine load, engine operating range and various temperature sensors to determine coolant pump operation and speed.

The electric coolant pump is self-diagnosable and can identify and store the following faults:

- Impeller speed deviation
- Stiff operation or blocked by foreign objects
- Incorrect mixture ratio coolant / water
- Air in cooling system

Electrically heated thermostat

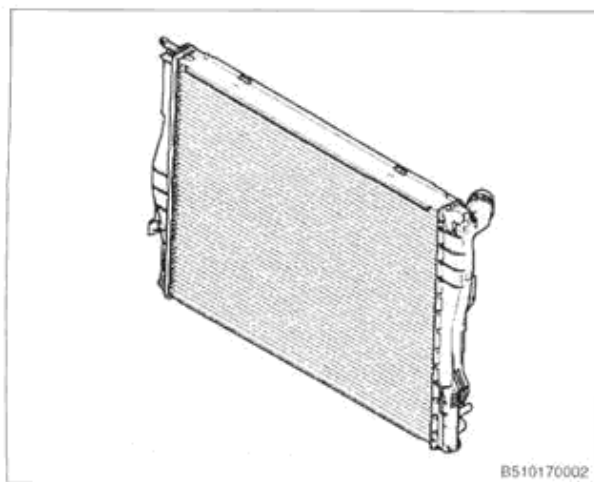
An electrically heated, DME-controlled thermostat is externally mounted above the coolant pump. The engine control module (ECM) activates the thermostat to maintain engine coolant temperature within a narrow range.

If the electronics fail, the mechanical function of the thermostat acts as a fail-safe.

Radiator and expansion tank

- ◀ The radiator is a crossflow design. An expansion tank provides for coolant expansion at higher temperatures and easy monitoring of the coolant level.

Automatic transmission fluid (ATF) is circulated through an additional heat exchanger (ATF cooler).



Electric cooling fan

- Models covered by this manual use an electric cooling fan mounted on the engine side of the radiator.

The electric cooling fan is controlled by the engine control module (ECM) via the output final stage.

The output final stage is mounted on the fan housing, next to the fan motor. The fan is operated using a pulse width modulated signal. Fan circuit wiring is protected by a high-amp fuse. Electric fan activation is based on the following inputs to the ECM:

- Radiator outlet temperature
- Calculated catalytic converter temperature
- Vehicle speed
- Battery voltage
- Calculated refrigerant pressure

When the vehicle is first started, the ECM activates the electric fan briefly at 20% of its maximum speed, then switches OFF. This is for diagnostic monitoring. The voltage generated by the fan when it slows down (acting as a generator) must match the stored rpm values in the fan output stage to confirm that the fan is operating correctly.

NOTE —

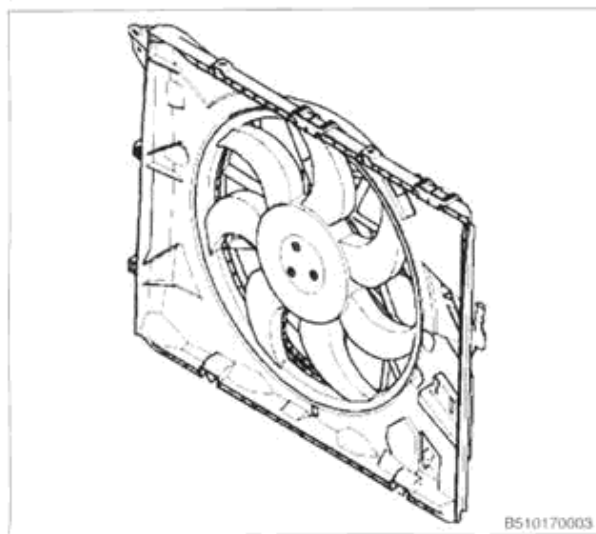
- If the ECM fault memory indicates a cooling fan fault, check that the fan is not seized and that it spins freely.
- When A/C is switched ON, the electric fan is not immediately turned on.
- After the engine is switched OFF, the fan may continue to run at varying speeds for up to 10 minutes, based on calculated catalyst temperature.

Automatic transmission fluid (ATF) cooler

ATF lines connect the transmission to the ATF cooler (heat exchanger) at back of radiator.

On cold engine start-up, the engine coolant is heated more quickly than the transmission fluid. Heat from engine coolant is used to warm up the ATF faster, reducing drag in the transmission and improving fuel mileage.

Once ATF reaches normal operating temperature, it is hotter than the engine coolant. The ATF heat exchanger then acts as a cooling device.



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Warnings and Cautions

Warnings and Cautions

Observe the following warnings and cautions when working on the cooling system.

WARNING—

- *At normal operating temperature the cooling system is pressurized. Allow the system to cool as long as possible before opening (a minimum of one hour), then release the cap slowly to allow safe release of pressure.*
- *Releasing cooling system pressure lowers the coolant boiling point. The coolant may boil suddenly. Use heavy gloves and wear eye and face protection to guard against scalding.*
- *Use extreme care when draining and disposing of engine coolant. Coolant is poisonous and lethal to humans and pets. Pets are attracted to coolant because of its sweet smell and taste. Seek medical attention immediately if coolant is ingested.*

CAUTION—

- *Avoid adding cold water to the coolant while the engine is hot or overheated. If it is necessary to add coolant to a hot system, do so only with the engine running and coolant pump operating.*
- *To avoid excess silicate gel precipitation in the cooling system and loss of cooling capacity, use BMW coolant or equivalent low silicate antifreeze.*
- *If oil enters the cooling system, the radiator, expansion tank and heating circuit must be flushed with cleaning agent. BMW recommends removal of the radiator and expansion tank to flush.*
- *When working on the cooling system, cover the alternator to protect it against coolant drips.*
- *Prior to disconnecting the battery, read the battery disconnection cautions given in **001 Warnings and Cautions**.*
- *Replace aluminum fasteners when loosened.*
- *For reliable identification test fastener with magnet for aluminum composition.*

TROUBLESHOOTING

Begin the diagnosis of cooling system problems with a thorough visual inspection. If no visual faults are found, check the engine control module (ECM) fault memory for stored diagnostic trouble codes (DTCs) using BMW scan tool.

Common cooling system faults can be grouped into one of 4 categories:

- Cooling system leaks
- Poor coolant circulation
- Radiator cooling fan faults
- Electrical / electronic faults

Cooling system inspection

- Check operation of electric radiator fan:
 - Start engine, turn A/C on, MAX setting. Electric fan should run.
- Check coolant hoses for cracks or softness. Check clamps for looseness. Check coolant level and check for evidence of coolant leaks from engine.
- Check that radiator fins are not blocked with dirt or debris. Clean radiator using low-pressure water or compressed air. Blow outward from engine side out.
- To check mechanical coolant pump:
 - Remove cooling fan. See **Electric cooling fan, removing and installing** in this repair group.
 - Remove accessory belt from coolant pump pulley. See **020 Maintenance**.
 - Firmly grasp opposite sides of pulley and check for play in all directions.
 - Spin pulley and check that shaft runs smoothly without play.

NOTE —

- *The coolant provides lubrication for the pump shaft, so an occasional drop of coolant leaking from the pump is acceptable. If coolant drips steadily from the vent hole, replace the pump.*

- Check operation of electric coolant pump:
 - Turn ignition key on.
 - Adjust heat to max. setting.
 - Press accelerator pedal to floor.
 - Pump should audibly run after about 10 seconds.
- At normal operating temperature, cooling system is pressurized. This raises boiling point of coolant. Leaks may prevent system from becoming pressurized. Pressure test cooling system to help pinpoint hard-to-find leaks. See **Cooling system pressure test**.

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Cooling system pressure test

- If cooling system is full of coolant and holds pressure:
 - Use an appropriate scan tool to interrogate engine control module (ECM) for radiator fan or DME control circuit faults.
 - Check for failed thermostat or coolant pump impeller.
 - Check for clogged / plugged radiator or coolant passages.

Cooling system pressure test

A cooling system pressure tester is used to test for coolant leaks, including internal ones. Common sources of internal coolant leaks are a faulty cylinder head gasket, a cracked cylinder head, or a cracked engine block.

WARNING—

- *At normal operating temperature the cooling system is pressurized. Allow the system to cool before opening. Remove the cap slowly to allow safe release of pressure.*

- With engine cold, install pressure tester (BMW special tools 17 0 101 / 17 0 113 or equivalent) to expansion tank. Pressurize system to specification listed in **Table a**.
 - Pressure should not drop more than 0.1 bar (1.45 psi) for at least two minutes.
 - If pressure drops rapidly and there is no sign of external leakage, cylinder head gasket may be faulty. Perform compression and leak-down tests.
 - Test expansion tank cap using pressure tester with correct adapter (BMW special tool 17 0 114 or equivalent). Replace faulty cap or cap gasket.

CAUTION—

- *Exceeding the specified test pressure could damage the radiator or other system components.*

Table a. Cooling system test pressures

Component	Test pressure
Radiator	1.5 bar (21.75 psi)
Radiator cap	2 bar (29 psi)

Combustion chamber leak test

- If you suspect that combustion chamber pressure is leaking into the cooling system past the cylinder head gasket, use an exhaust gas analyzer to test the vapors rising from the coolant at the expansion tank.

CAUTION—

- *Use an extension tube above the reservoir neck to maintain distance between the top of the coolant and the gas analyzer nozzle. The gas analyzer is easily damaged if it is allowed to inhale liquid coolant.*
- *While running engine to check for causes of overheating, observe coolant temperature carefully in order to avoid engine damage.*

Thermostat

If the engine overheats or runs too cool and no other cooling system tests indicate trouble, the thermostat may be faulty.

The electrically heated thermostat is monitored by the OBD II diagnostic software. The fault may lie in the DME software or hardware, or it may lie in the wiring to the thermostat. See **OBD On-Board Diagnostics**.

COOLING SYSTEM SERVICE

Coolant, draining and filling

WARNING —

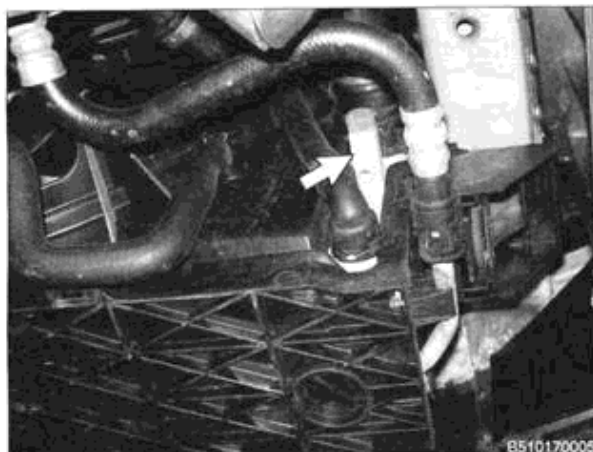
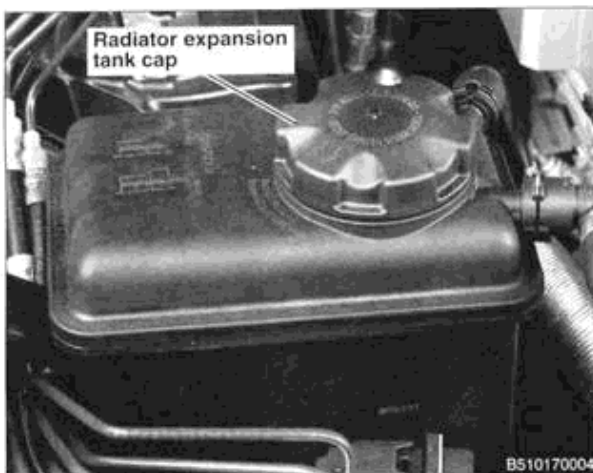
- Allow the cooling system to cool before opening or draining the cooling system.

- Raise front of car and support safely.

WARNING —

- Make sure the car is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove splash shield from under engine. See **020 Maintenance**.
- Remove cap from radiator expansion tank.
- Place 5-gallon pail underneath radiator.



- Loosen drain plug (**arrow**) on petcock at bottom of radiator and allow coolant to drain.

NOTE —

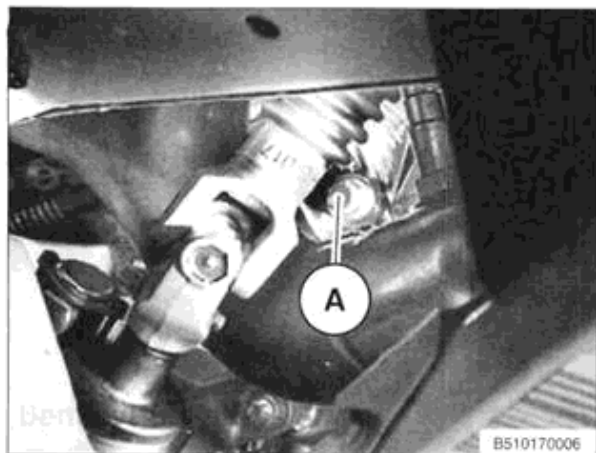
- For radiators without drain plug, remove lower hose to drain radiator.

WARNING —

- Coolant is poisonous. It is especially lethal to pets. Clean up spills immediately and rinse the area with water. If coolant is ingested, immediately seek medical attention.

170-8 Radiator and Cooling System

Coolant, draining and filling



➤ M54 engine block drain plug is located on right side of engine block near cylinder 2. V8 engine block drain plug (A) is located on left side of engine block.

- Place 5-gallon pail underneath engine block coolant drain plug.
- Remove engine block coolant drain plug and drain coolant.
- Before refilling radiator:
 - Switch ignition ON. Do not start engine.
 - Set temperature controls to full warm.
 - Set blower control to low.
 - Set seat heat control to maximum.
- Using a coolant mixture of 50% antifreeze and 50% distilled water, fill expansion tank slowly. Continue until coolant emerges from bleed screw. Cooling system capacities are in **Table b**.

NOTE —

- Tap water may cause corrosion of radiator, engine and coolant hoses.
 - Coolant can be reused provided it is clean and less than two years old. Do not reuse coolant when replacing damaged engine parts.
- Bleed cooling system. See **Cooling system, bleeding** in this repair group.

Table b. Cooling system capacities

Engine	Capacity
M54: • Automatic transmission • Manual transmission	10.6L (11.2 US qt) 10L (10.56 US qt)
N52, N54: • Manual transmission • Automatic transmission	10.6L (11.2 US qt) 10L (10.56 US qt)
V8 (N62): • Automatic transmission • Manual transmission	14.2L (15 US qt) 13.8L (14.58 US qt)

Tightening torques

Block drain plug to engine block: • M14 x 1.5 • M16 x 1.5 • M18 x 1.5	25 Nm (18 ft-lb) 35 Nm (26 ft-lb) 40 Nm (30 ft-lb)
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Radiator and Cooling System 170-9

Cooling system, bleeding (M54, V8 engines)

Cooling system, bleeding (M54, V8 engines)

Trapped air in the cooling system can prevent proper coolant circulation and cause overheating. Whenever the coolant is drained and filled, bleed the cooling system.

CAUTION—

- Carry out this procedure when replacing cooling system components or refilling the cooling system. Failure to follow this procedure may result in incomplete filling of cooling system, overheating and engine damage.

— Before refilling radiator:

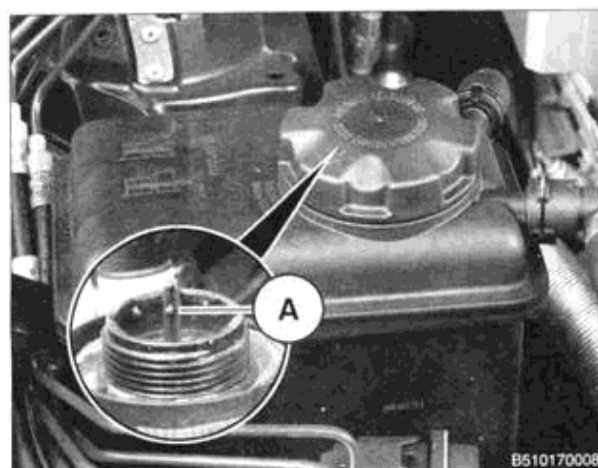
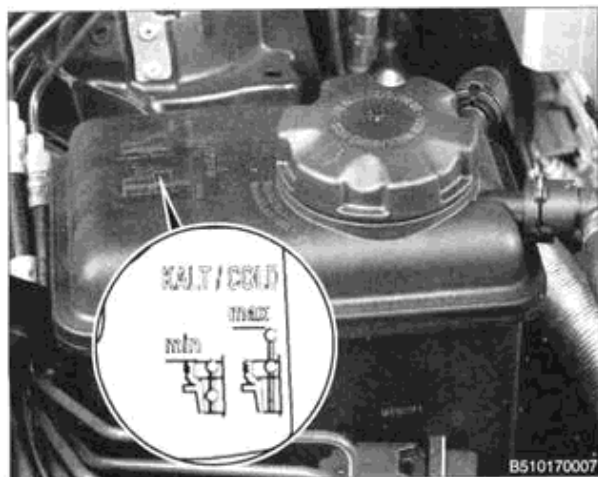
- Switch ignition ON. (Do not start engine).
- Set temperature controls to full warm.
- Set blower control to low.
- Set seat heat control to maximum.



Using a coolant mixture of 50% antifreeze and 50% distilled water, fill expansion tank slowly to MAX.

CAUTION—

- Use genuine BMW coolant or its equivalent to avoid the formation of harmful, clogging deposits in the cooling system.



Start engine and run at idle speed for one minute (cap open). Adjust coolant level to MAX (A). Close cap.

- Run engine until it reaches operating temperature.
- After engine has cooled, recheck coolant level.
- Top up so that coolant level indicator is at MAX.
- If trapped air cannot be bled manually, pressure-bleed system using cooling system pressure tester.

Cooling system capacities

Engine	Capacity
M54:	
• Automatic transmission	10.6L (11.2 US qt)
• Manual transmission	10L (10.56 US qt)
V8 (N62):	
• Automatic transmission	14.2L (15 US qt)
• Manual transmission	13.8L (14.58 US qt)

170-10 Radiator and Cooling System

Cooling system, bleeding (N52, N54 engines)

Cooling system, bleeding (N52, N54 engines)

Trapped air in the cooling system can prevent proper coolant circulation and cause overheating. Whenever the coolant is drained and filled, bleed the cooling system.

5 series models equipped with N52 and N54 engines feature an electric coolant pump. The bleeding procedure operates the coolant pump for approximately 12 minutes to remove trapped air and ensure that the cooling system is filled to capacity.

CAUTION—

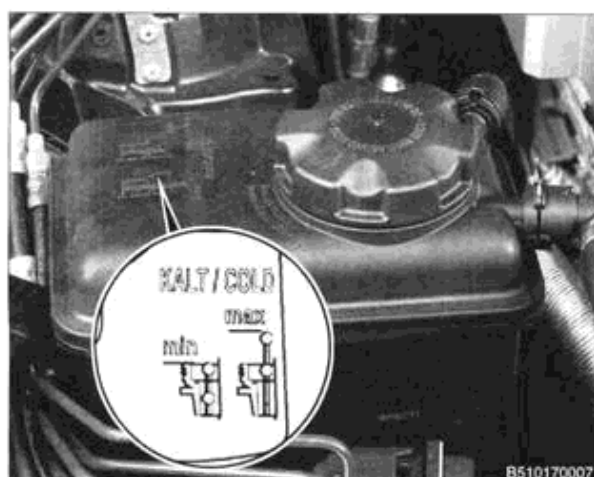
• Carry out this procedure out when replacing cooling system components or refilling the cooling system. Failure to follow this procedure may result in incomplete filling of cooling system, overheating and engine damage.

- Before refilling radiator:
 - Switch ignition ON. (Do not start engine).
 - Set temperature controls to full warm.
 - Set blower control to low.
 - Set seat heat control to maximum.

◀ Using a coolant mixture of 50% antifreeze and 50% distilled water, fill expansion tank slowly to MAX.

CAUTION—

• Use genuine BMW coolant or its equivalent to avoid the formation of harmful, clogging deposits in the cooling system.



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◀ Close cap on coolant expansion tank and perform the following steps:

1. Connect vehicle power supply. See **600 Electrical System—General**.
2. Switch ignition ON.
3. Set heater to MAX temperature and turn fan to lowest speed.
4. Press accelerator pedal to floor for 10 seconds.
5. Bleeding procedure begins when accelerator pedal is pressed and takes approximately 12 minutes. (Electric coolant pump turns ON and OFF automatically after approx. 12 minutes).

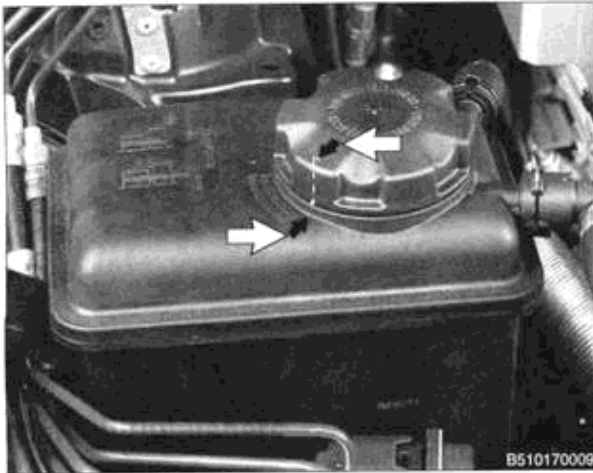
CAUTION—

• Do not open expansion tank cap while electric coolant pump is ON.

6. Fill coolant expansion tank 100 ml above MAX (dimension A).
7. Check cooling system for leaks
8. If leaks are found, remove ignition key and wait approximately 3 minutes before repeating cooling system bleeding procedure.

Radiator and Cooling System 170-11

Radiator, removing and installing



- ⚠ When bleeding procedure is complete, close coolant expansion tank cap until marks on cap and tank (**arrows**) line up.

Cooling system capacities

Engine	Capacity
N52, N54:	
• Manual transmission	10.6L (11.2 US qt)
• Automatic transmission	10L (10.56 US qt)

Radiator, removing and installing

- Raise car and support safely

WARNING —

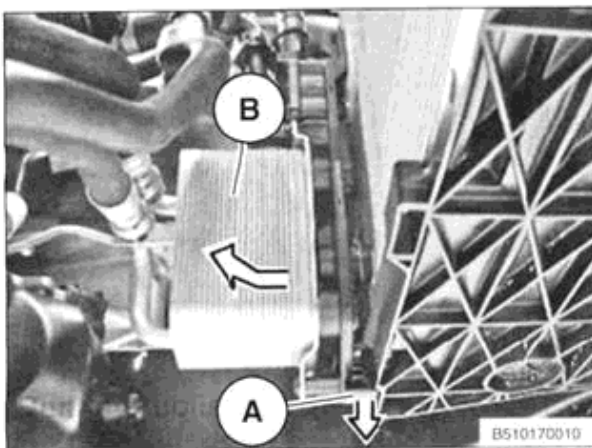
- Make sure the car is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove splash shield from under engine.
- Drain radiator. See **Coolant draining and filling** in this repair group.

WARNING —

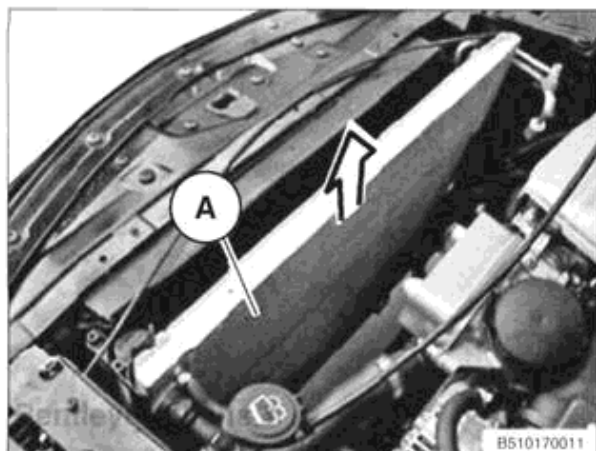
- Allow cooling system to cool before opening or draining system.

- Remove fan cowl. See **Electric cooling fan and cowl, removing and installing** in this repair group.
- Unlock coolant hoses and detach from radiator.
- ⚠ Automatic transmission: Unlock catch (**A**) in direction of **arrow**. Remove ATF heat exchanger (**B**) from radiator in direction of **arrow**.
- Installation is reverse of removal. Remember to:
 - Bleed cooling system
 - Check cooling system for leaks.



170-12 Radiator and Cooling System

Electric cooling fan and cowl, removing and installing



- ⚡ Carefully lift radiator (A) up and out of engine compartment. N52 engine shown, other engines similar.
- Installation is reverse of removal. Make sure:
 - Radiator seats firmly in lower mounts.
 - Electric cooling fan cowl clips securely at bottom.
 - Refill and bleed cooling system. See **Cooling system, bleeding** in this repair group.
 - Check cooling system for leaks.

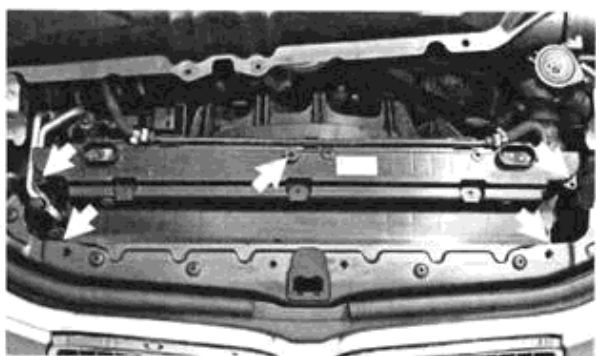


Electric cooling fan and cowl, removing and installing

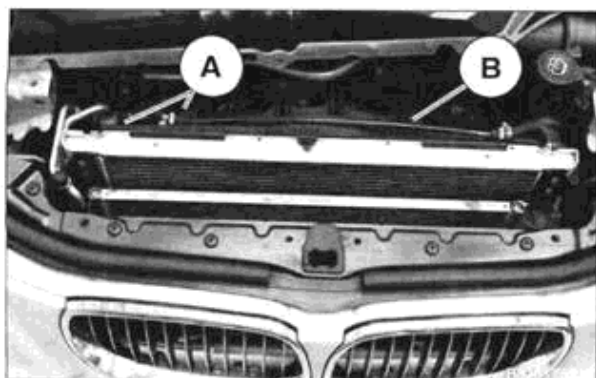
- ⚡ Working above radiator remove center panel fasteners (arrows).
- Lift center panel towards engine. Be careful not to kink hood release bowden cable. Lay center panel to one side.

WARNING—

- Do not place center panel on or near jump start terminals.



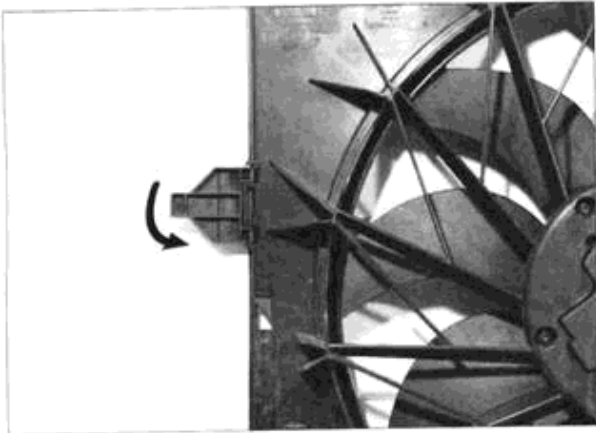
- ⚡ Remove Torx screws (arrows) from radiator cover and pull radiator cover up and off.



- ⚡ Disconnect electrical connectors from AUC sensor (where applicable) and fan motor (A).
- Raise cooling fan cowl (B) 3 cm (1.1 in)

Radiator and Cooling System 170-13

Coolant expansion tank, removing and installing



➤ Fold in retaining tab (**arrow**) on left (driver's) side of fan housing.

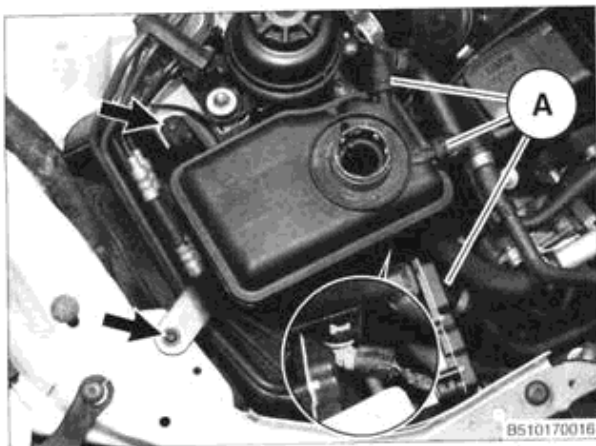
- Remove cooling fan cowl by lifting up and out.
- Installation is reverse of removal. Remember to:
 - Correctly route all electric harnesses.
 - Check and clear fault codes from ECM memory.

Coolant expansion tank, removing and installing

- Drain cooling system. See **Coolant, draining and filling** in this repair group.

WARNING—

- Allow cooling system to cool before opening or draining system.



➤ Release clamps on coolant hoses (**A**).

- Remove expansion tank fasteners (**arrows**).
- Raise tank slightly (if necessary) and release electrical connector for coolant level switch (**inset**) and remove expansion tank.
- Installation is reverse of removal. Remember to:
 - Make sure locating pin at bottom of tank fits securely into rubber grommet.
 - Fill and bleed cooling system. See **Cooling system, bleeding** in this repair group.
 - Check cooling system for leaks.

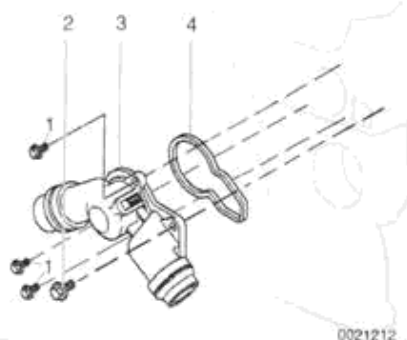
Tightening torque

Expansion tank to body	8 Nm (71 in-lb)
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170-14 Radiator and Cooling System

Thermostat, removing and installing (M54 engine)

Coolant thermostat housing assembly



Thermostat, removing and installing (M54 engine)

The electrically-heated thermostat is an integral part of the thermostat housing. The operation of the thermostat is monitored by the ECM. If a faulty thermostat is suspected, interrogate the ECM for stored fault codes using a BMW scan tool.

Thermostat housing assembly

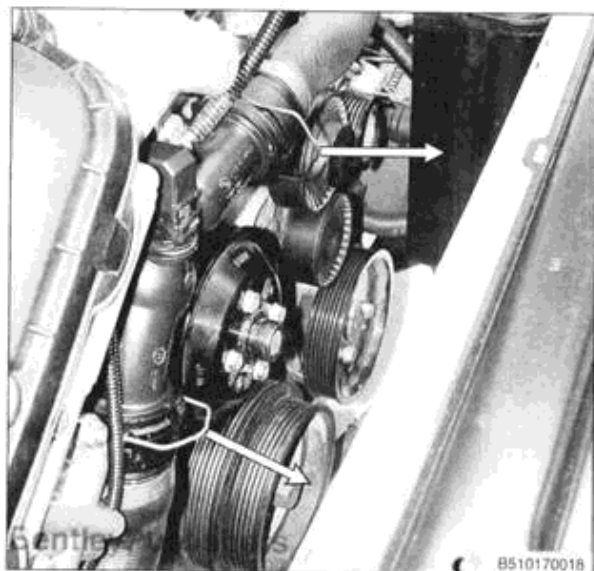
1. Bolt M6
2. Bolt M8
3. Housing with heated thermostat
4. Gasket

- Drain radiator and engine block. See **Coolant, draining and filling** in this repair group.

WARNING—

- Allow cooling system to cool before opening system.

- Remove cooling cowl. See **Electric cooling fan and cowl, removing and installing** in this repair group.
- Disconnect electrical harness connector from thermostat housing.
- Cover alternator to prevent damage from coolant.
- Lever out retaining clips (**arrows**) and pull hose fittings off housing.
- Unbolt and remove thermostat housing from front of engine. Loosen nut at top of engine lifting eye to facilitate removal.
- Installation is reverse of removal, noting the following:
 - Keep sealing faces free of oil.
 - Use new sealing gasket.
- Fill system with coolant and bleed. See **Coolant, draining and filling** in this repair group.



Tightening torques

Block drain plug to engine block:	
• M14 x 1.5	25 Nm (18 ft-lb)
• M16 x 1.5	35 Nm (26 ft-lb)
• M18 x 1.5	40 Nm (30 ft-lb)
Radiator drain plug to radiator	2.5 Nm (22 in-lb)

Cooling system capacities

Engine	Capacity
M54:	
• Automatic transmission	10.6L (11.2 US qt)
• Manual transmission	10L (10.56 US qt)

Radiator and Cooling System 170-15

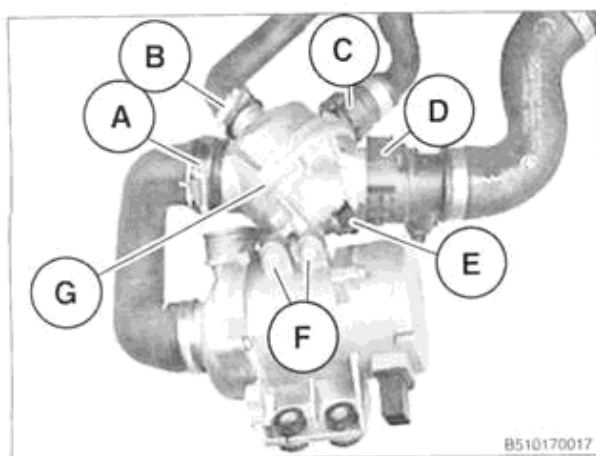
Thermostat, removing and installing (N52, N54 engines)

Thermostat, removing and installing (N52, N54 engines)

- Remove splash shield from under engine.
- Drain cooling system. See **Coolant, draining and filling** in this repair group.

WARNING—

- Allow cooling system to cool before opening or draining system.



- ◀ Working above engine coolant pump, release hose clamps (A, B) and disconnect hoses.

- Unlock fasteners (C, D) and remove hoses.
- Disconnect electrical connector (E).
- Remove bolts (F) and remove thermostat (G).
- Installation is reverse of removal. Remember to:
 - Refill and bleed cooling system. See **Cooling system, bleeding** in this repair group.
 - Check cooling system for leaks.

Tightening torques

Thermostat to coolant pump:

- N52 engine
- N54 engine

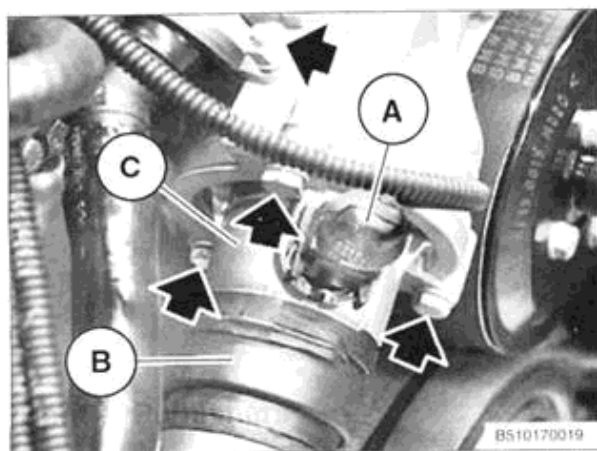
9 Nm (80 in-lb)
8 Nm (71 in-lb)

Thermostat, removing and installing (V8 engine)

- Remove splash shield from under engine.
- Drain cooling system. See **Coolant, draining and filling** in this repair group.

- ◀ Working below coolant pump:
 - Disconnect electrical connector (A).
 - Unlock and remove hose (B).
 - Remove fasteners (arrows).
 - Remove thermostat (C).

- Installation is reverse of removal. Remember to:
 - Replace sealing O-ring.
 - Refill and bleed cooling system. See **Cooling system, bleeding** in this repair group.
 - Check cooling system for leaks.



Tightening torque

Thermostat to coolant pump

10 Nm (88.5 in-lb)

170-16 Radiator and Cooling System

Coolant pump, removing and installing (M54 engine)

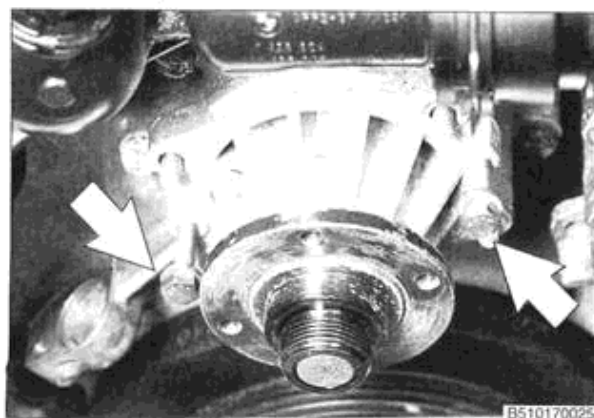
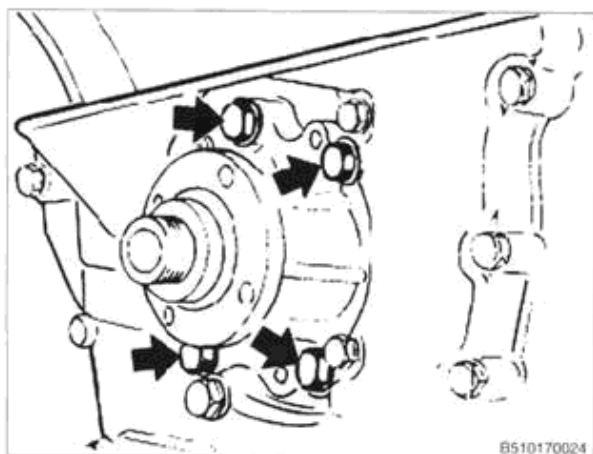
Coolant pump, removing and installing (M54 engine)

- Remove cooling cowl. See **Electric cooling fan and cowl, removing and installing** in this repair group.
- Drain cooling system. See **Coolant, draining and filling** in this repair group.

WARNING —

- Allow cooling system to cool before opening or draining system.

- Remove alternator drive belt. See **020 Maintenance**. Mark direction of rotation on belt.
- Cover alternator to prevent damage from coolant.
- Remove coolant pump pulley bolts and remove pulley from pump.
- Remove coolant pump fasteners (**arrows**).



- Insert two M6 screws (**arrows**) in tapped bores and tighten uniformly until pump is free from timing chain cover.
- Installation is reverse of removal. Remember to:
 - Replace sealing O-ring and gaskets.
 - Coat O-ring with lubricant during installation.
 - Refill and bleed cooling system. See **Cooling system, bleeding (M54, N62 engines)** in this repair group.
 - Check cooling system for leaks

Tightening torques

Coolant pump to timing chain cover	10 Nm (89 in-lb)
Coolant pump pulley to coolant pump	10 Nm (89 in-lb)

Radiator and Cooling System 170-17

Coolant pump, removing and installing (N52, N54 engines)

Coolant pump, removing and installing (N52, N54 engines)

- Remove splash shield from under engine.
- Drain cooling system. See **Coolant, draining and filling** in this repair group.

WARNING—

- Allow cooling system to cool before opening or draining system.

- Cover alternator to prevent damage from coolant.
- Remove coolant thermostat. See **Thermostat, removing and installing** in this repair group.
- Release hose clamps (1) and disconnect coolant hoses from back of pump.
- Disconnect electrical connector (4) at front of pump.
- Remove bolts (5) and remove pump from side of engine.

CAUTION—

- If coolant pump is to be reused, fill with mixture of 50% antifreeze and 50% distilled water immediately after removing, and plug openings to avoid contamination.

- Installation is reverse of removal. Remember to:
 - Replace aluminum fasteners (fasteners with heads painted blue) with new.

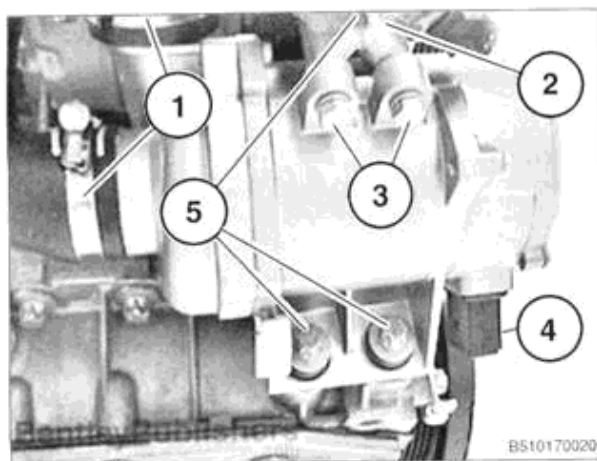
CAUTION—

- Do not use steel fasteners in place of aluminum. Electrochemical corrosion will result.

- Reinstall thermostat.
- Refill and bleed cooling system. See **Cooling system, bleeding** in this repair group.
- Check cooling system for leaks.

Tightening torques

Thermostat to coolant pump	
• N52 engine	9 Nm (80 in-lb)
• N54 engine	8 Nm (71 in-lb)
Coolant pump to engine block (replace aluminum fasteners with new and observe torque angle)	10 Nm (89 in-lb) + 90° turn



170-18 Radiator and Cooling System

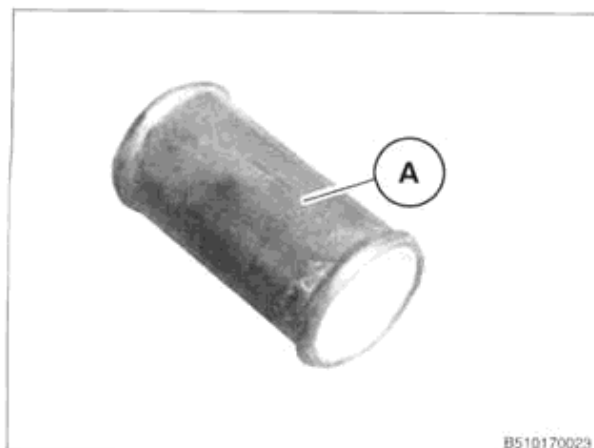
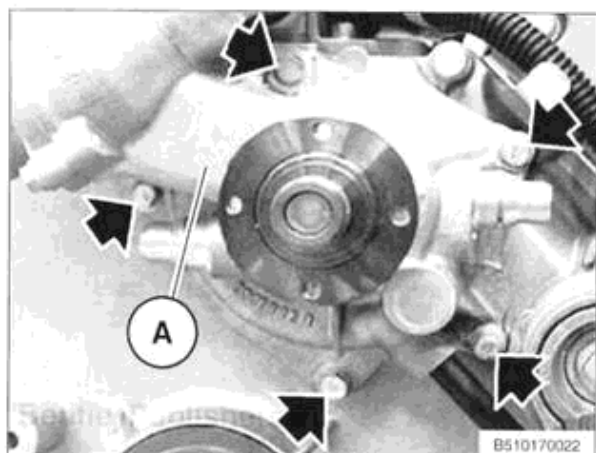
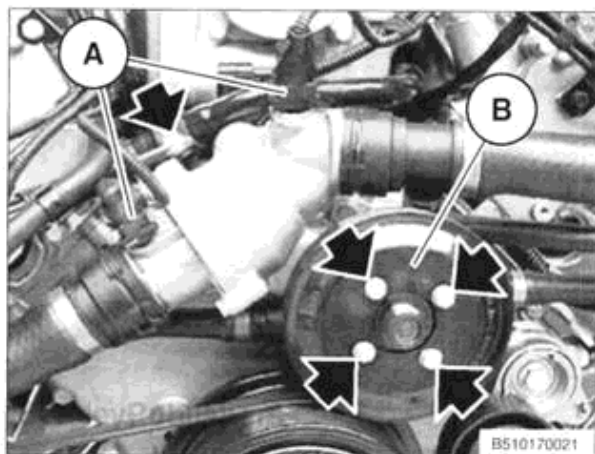
Coolant pump, removing and installing (V8 engine)

Coolant pump, removing and installing (V8 engine)

- Remove cooling cowl. See **Electric cooling fan and cowl, removing and installing** in this repair group.
- Drain cooling system. See **Coolant, draining and filling** in this repair group.

WARNING —

- Allow cooling system to cool before opening or draining system.



- Remove alternator drive belt. See **020 Maintenance**. Mark direction of rotation on belt.
- Cover alternator to prevent damage from coolant.
- ◀ Working at coolant pump:
 - Disconnect electrical connectors (A).
 - Remove vacuum line holder (arrow).
 - Unlock and remove coolant hose.
 - Remove drive belt pulley (B) fasteners (arrows).
- Remove crankshaft damper. See **117 Camshaft Timing Chain**.
- ◀ Remove coolant pump (A) fasteners (arrows).

- ◀ Installation is reverse of removal. Remember to:
 - Clean all sealing surfaces.
 - Replace coolant pipe (A) located behind coolant pump.
 - Rotate coolant pump impeller one full revolution before installing.
 - Refill and bleed cooling system. See **Cooling system, bleeding** in this repair group.
 - Check cooling system for leaks.

Tightening torques

Coolant pump to engine block:

- M6
- M7
- M8

10 Nm (89 in-lb)
15 Nm (11 ft-lb)
22 Nm (16.2 ft-lb)

Radiator and Cooling System 170-19

Automatic transmission fluid (ATF) cooler, removing and installing

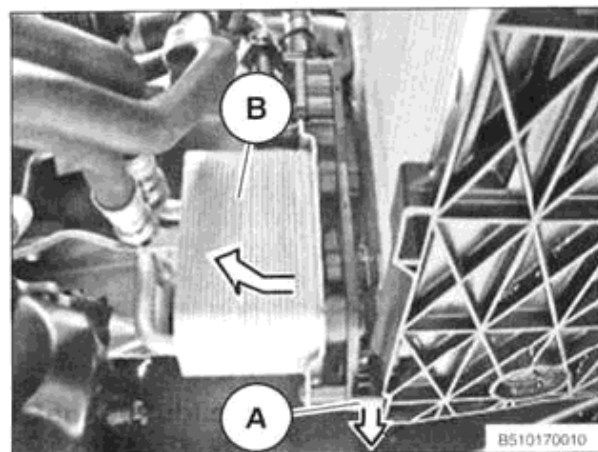
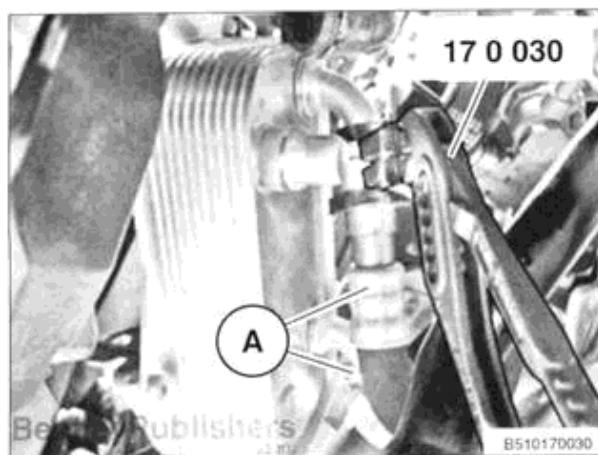
Automatic transmission fluid (ATF) cooler, removing and installing

- Remove splash shield from under engine.
- Drain cooling system. See **Coolant, draining and filling** in this repair group.

CAUTION—

- Cover alternator when working on oil, coolant or fuel circuits to protect from damage.

- Remove coolant hoses from ATF cooler.
- Use BMW special tool 17 0 030 to unlock transmission fluid from hydraulic lines from cooler.



- Unlock catch (A) in direction of **arrow**. Remove ATF heat cooler (B) from radiator in direction of **arrow**.
- Installation is reverse of removal. Remember to:
 - Check automatic transmission fluid level. See **240 Automatic Transmission**.
 - Refill and bleed cooling system. See **Cooling system, bleeding** in this repair group.
 - Check cooling system for leaks.

170-20 Radiator and Cooling System

Power steering cooling loop, removing and installing

Power steering cooling loop, removing and installing

- Raise car and support safely

WARNING—

- Make sure the car is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove splash shield from under engine.
- Drain radiator. See **Coolant draining and filling** in this repair group.

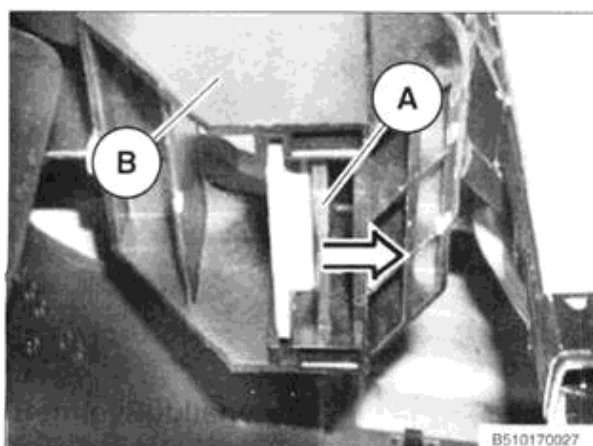
WARNING—

- Allow cooling system to cool before opening or draining system.

- Remove fan cowl. See **Electric cooling fan and cowl, removing and installing** in this repair group.
- Remove radiator. See **Radiator, removing and installing** in this repair group.
- Place a suitable container beneath power steering cooling loop connections to catch dripping fluid. Dispose of properly.
- Using a fluid recovery machine, suction fluid from power steering fluid reservoir.
- Press hydraulic line towards cooling loop. Pull back on locking ring and remove line.
- Secure A/C condenser in place to protect from falling and damage.

CAUTION—

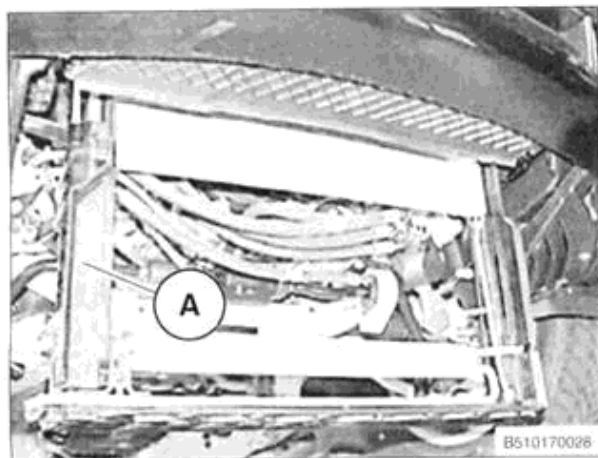
- Do not disconnect A/C refrigerant lines.



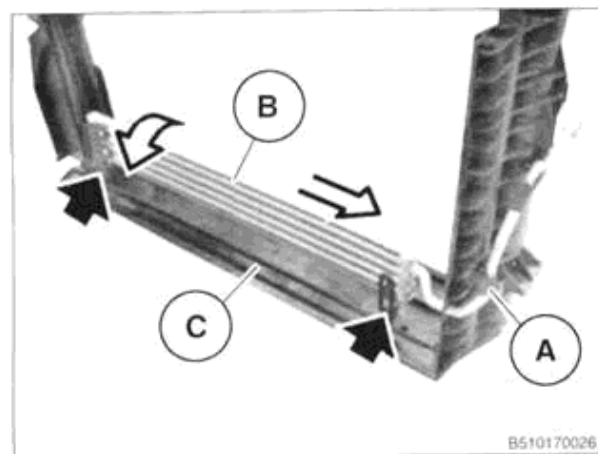
- ◀ Press lock (A) and remove bracket (B) downwards. Illustration shows left bracket. Same procedure applies to opposite side.

Radiator and Cooling System 170-21

Intercooler, removing and installing (N54 engine)



- Remove cooling module carrier (A) towards bottom.



- Release cooler line mounting catch (A). Remove fasteners (black arrows).
- Carefully press cooling loop (B) on right towards front, then unclip on left and remove from module carrier (C).
- Installation is reverse of removal. Remember to:
 - Make sure cooling loop hydraulic lines connect securely.
 - Check that cooling loop lines snap securely into holder (A).
 - Refill and bleed cooling system. See **Cooling system, bleeding** in this repair group.
 - Refill and bleed power steering system. See **320 Steering and Wheel Alignment**.
 - Check cooling system for leaks.

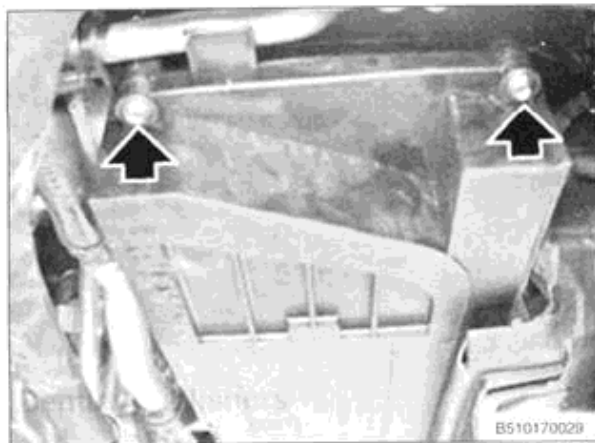
Intercooler, removing and installing (N54 engine)

- Raise car and support safely

WARNING —

• Make sure the car is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove splash shield from under engine.
- Disconnect intake air duct from left and right side of intercooler. See **132 Fuel Injection (N54 engine)**.
- Release screws. (Picture shows right side). Open quick-connect couplings on charge-air hoses.
- Remove intercooler from cooling module carrier.



170-22 Radiator and Cooling System

Intercooler, removing and installing (N54 engine)

- When installing, coat sealing rings of intake air ducts with antiseize paste.

NOTE—

- *Fitting air ducts to intercooler without antiseize paste is nearly impossible.*

- ◀ Reattach intake air ducts using BMW special tool 11 8 670. Ducts must snap audibly into place.

CAUTION—

- *Special clamping jaws (special tool 11 8 670) are strongly recommended for proper installation and to prevent damage to air ducts.*
- *Right side shown. Left side is similar.*

