SQRD4G15B COOLING SYSTEM

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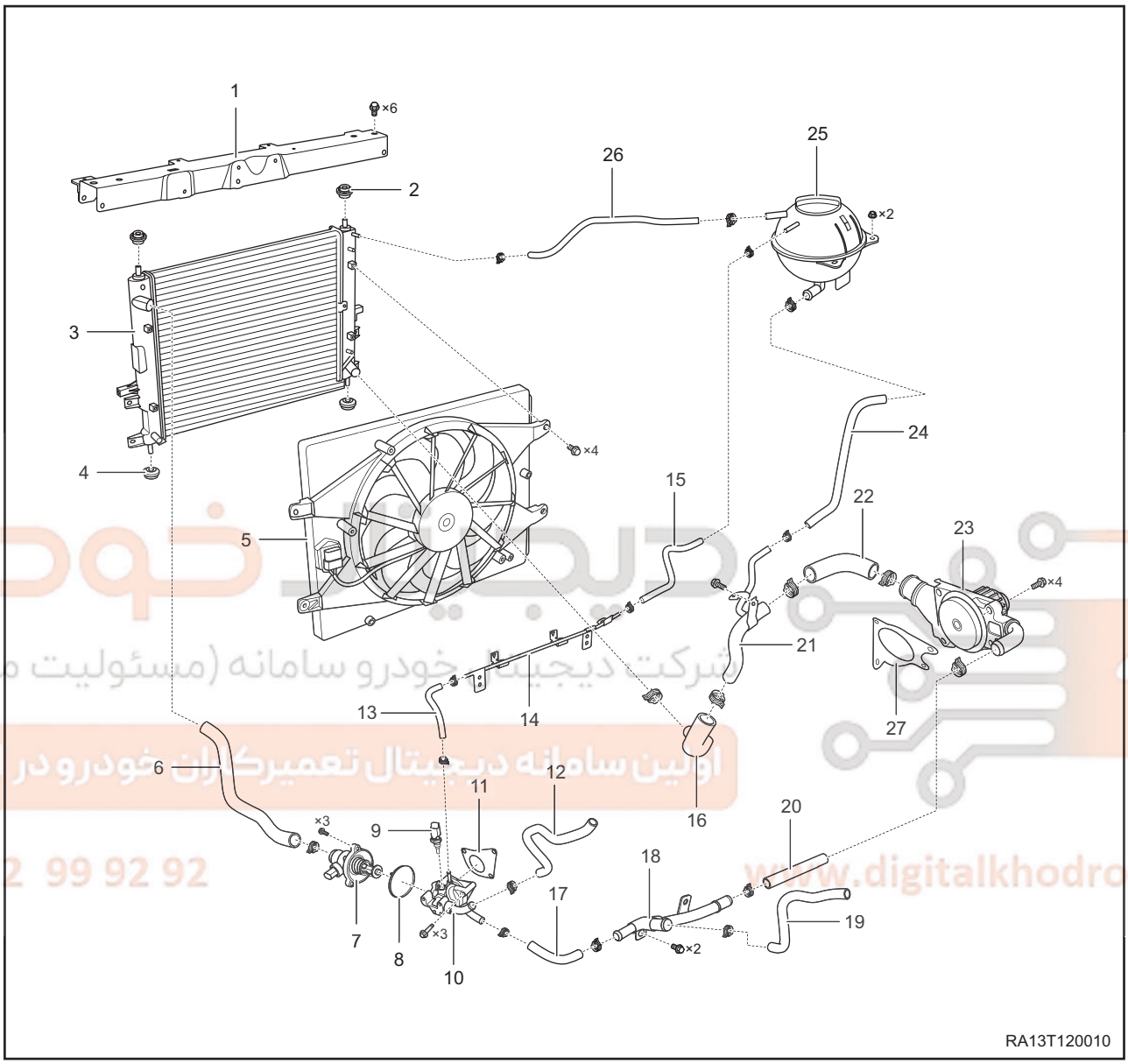
GENERAL INFORMATION

Description



1 - Tank Upper Crossmember	2 - Rubber Bushing
3 - Radiator	4 - Rubber Bushing
5 - Cooling Fan Assembly	6 - Engine Outlet Pipe
7 - Electronic Thermostat	8 - Electronic Thermostat Gasket
9 - Coolant Temperature Sensor	10 - Thermostat Seat
11 - Thermostat Seat Gasket	12 - Heater Inlet Pipe
13 - Engine to Expansion Tank II Water Pipe	14 - Discharge Steel Pipe
15 - Discharge Hose I	16 - Engine Inlet Pipe I
17 - Hose	18 - Cooling Pipe Assembly
19 - Heater Outlet Pipe	20 - Small Circulation Hose II
21 - Engine Inlet Pipe II	22 - Engine Inlet Pipe III
23 - Water Pump Assembly	24 - Engine Inlet Pipe IV
25 - Expansion Tank	26 - Discharge Hose III
27 - Water Pump Assembly Gasket	

Engine cooling system adjusts engine operating temperature by flow of coolant and makes engine operate normally under various operating conditions.

Engine cooling system is a forced circulation system, which supplies circulation pressure for cooling system by water pump and forces coolant to circulate in the engine cylinder block, and distributes excessive heat to radiator by the flow of coolant, and radiates it to the air by cooling fan. Also, engine cooling system provides heat to heater core in cabin to improve driving comfort.

Specifications

Torque Specifications

Description	Torque (N·m)
Expansion Tank Fixing Nut	5 ± 1
Thermostat Housing Fixing Bolt	9.5 ± 1.5
Thermostat Seat Fixing Bolt	9.5 ± 1.5
Coolant Temperature Sensor	11 - 16
Cooling Fan Assembly Fixing Bolt	7 ± 1.5
Radiator Upper Crossmember Fixing Bolt	9 ± 1
Water Pump Fixing Bolt	25 ± 3

Coolant Capacity

Item	Capacity (L)
Cooling System	6.5 ± 0.4

Coolant Concentration

G11 Additive	Soft Water
50%	50%

Coolant Freezing Point

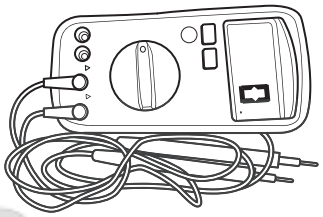
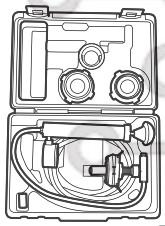
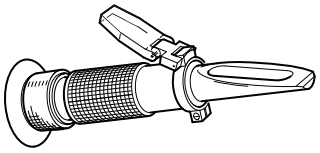
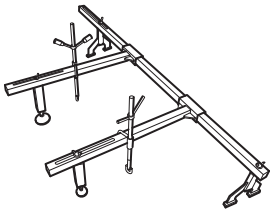
Item	Freezing Point Value (°C)
Coolant	-35

Cooling System Pressure

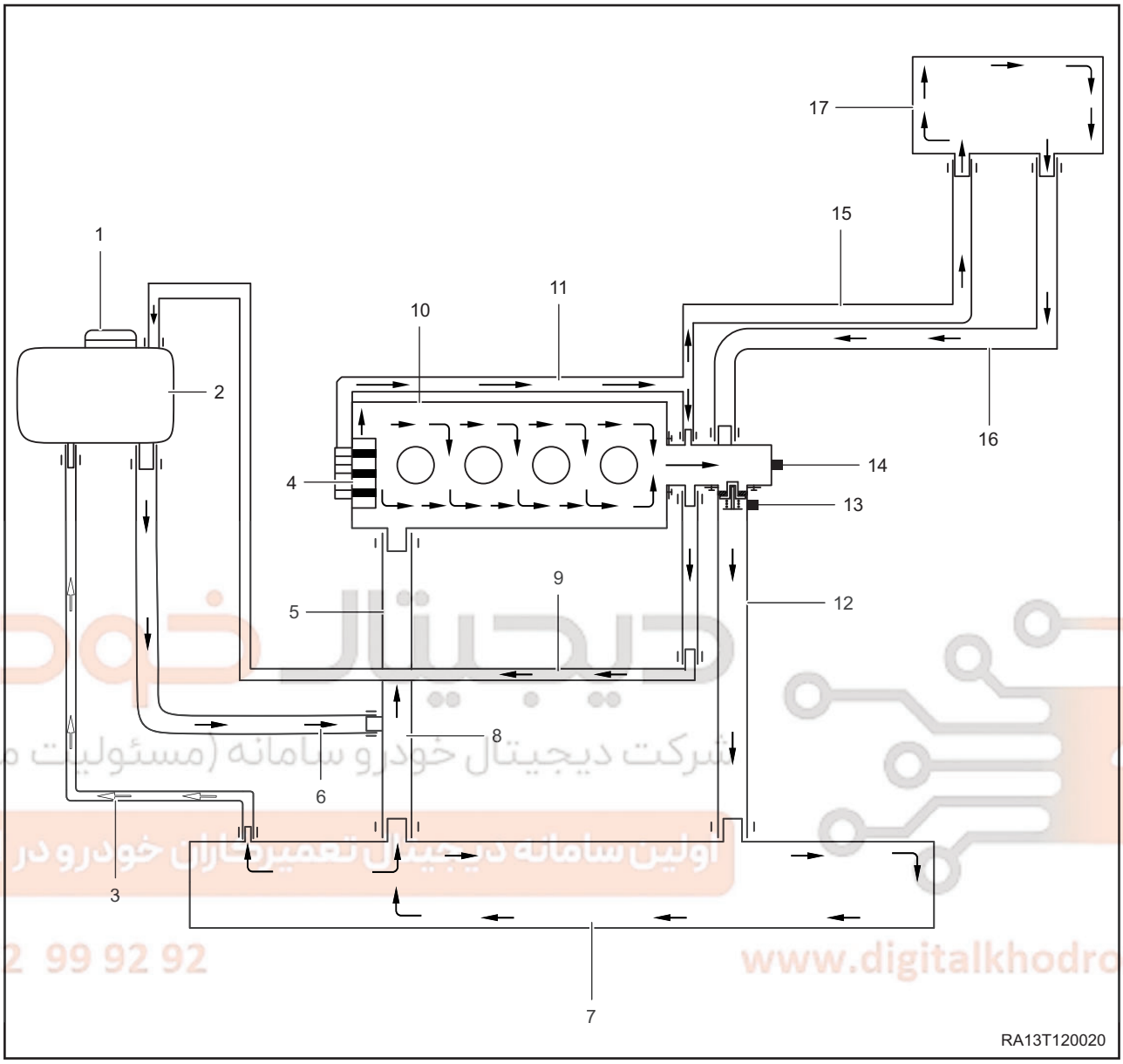
Item	System Pressure (bar)
Cooling System (Test Pressure)	1.3 ± 0.2

Tools

General Tools

Digital Multimeter	 RCH0000002
Cooling System Pressure Tester	 RCH0000055
Freezing Point Tester	 RCH0000007
Engine Equalizer	 RCH0000026

Cooling System Operation Flowchart



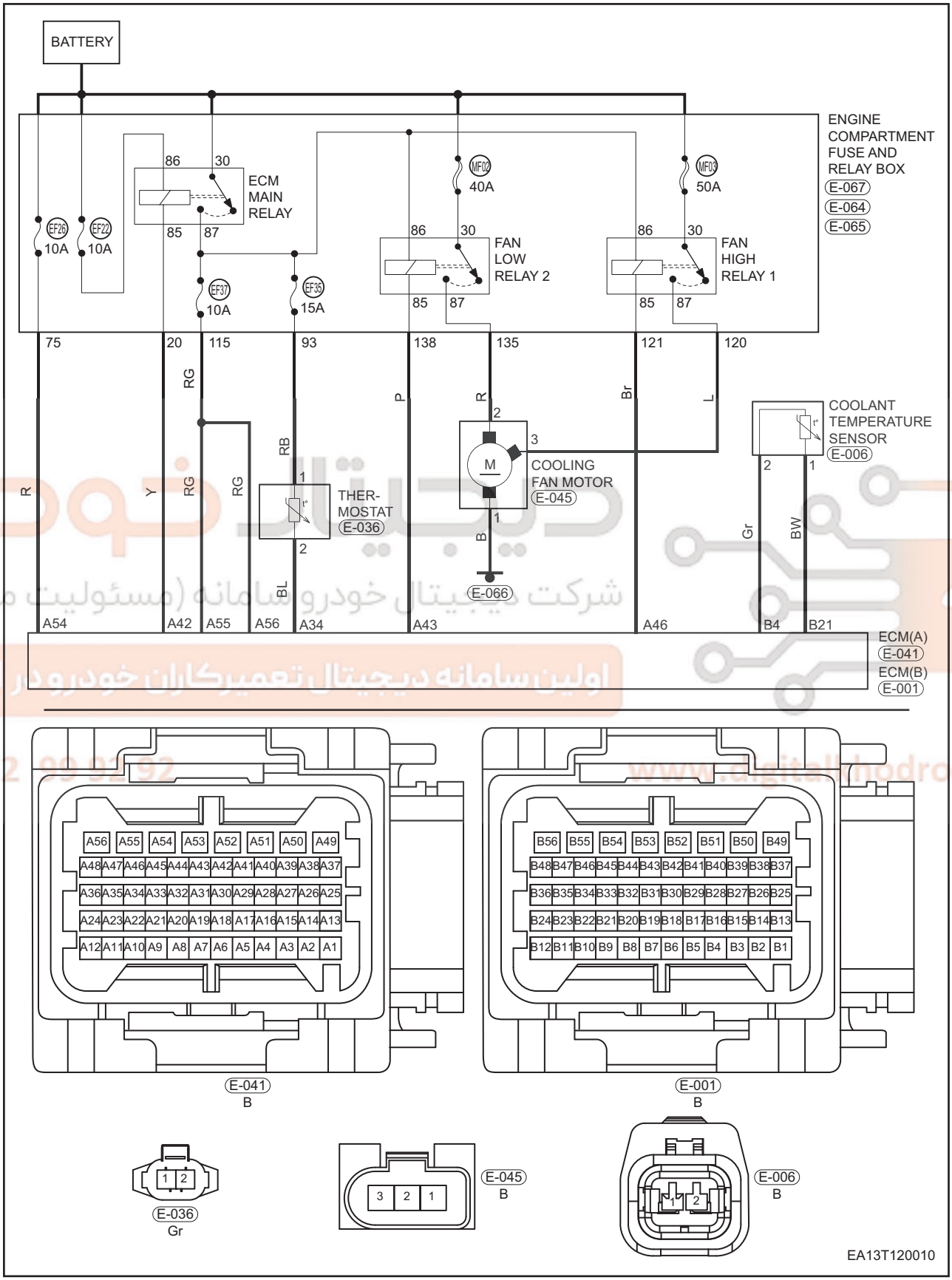
1 - Expansion Tank Cap	2 - Expansion Tank
3 - Discharge Hose III	4 - Water Pump
5 - Engine Inlet Pipe III	6 - Engine Inlet Pipe IV
7 - Radiator	8 - Engine Inlet Pipe II
9 - Discharge Steel Pipe	10 - Cylinder Block
11 - Cooling Pipe	12 - Engine Outlet Pipe
13 - Electronic Thermostat	14 - Coolant Temperature Sensor
15 - Heater Inlet Pipe	16 - Heater Outlet Pipe
17 - Heater Core	

Cooling fan operates under following conditions:

1. When coolant temperature is higher than 92°C in low temperature range (large load), cooling fan starts to operate at low speed.
2. When coolant temperature is higher than 95°C in low temperature range (large load), cooling fan starts to operate at high speed.
3. When coolant temperature is below 89°C in low temperature range (large load), cooling fan stops operating at low speed.
4. When coolant temperature is below 93°C in low temperature range (large load), cooling fan stops operating at high speed.
5. When coolant temperature is higher than 107°C in high temperature range (small load), cooling fan starts to operate at low speed.
6. When coolant temperature is higher than 109°C in high temperature range (small load), cooling fan starts to operate at high speed.
7. When coolant temperature is higher than 107°C in high temperature range (small load), cooling fan starts to operate at low speed.
8. When coolant temperature is higher than 104°C in high temperature range (small load), cooling fan stops operating at high speed.

Circuit Diagram

Cooling System



DIAGNOSIS & TESTING

Problem Symptoms Table

Symptom	Suspected Area	See page
Insufficient coolant	Coolant pipe (deteriorated and leaked)	-
	Expansion tank (leaked)	12-17
	Radiator (leaked)	12-24
	Water pump (bearing loose and leaked)	12-25
	Engine cylinder head gasket (damaged)	07-18
	Engine cylinder head (water jacket leaked)	07-18
	Engine cylinder block (water jacket leaked)	07-48
Engine overheating	Low coolant level	12-13
	Air resistance exists in pipe	-
	Expansion tank cap (damaged)	-
	Cooling fan	12-22
	Radiator	12-24
	Electronic Thermostat	12-18
	Leakage in engine	-
Unable to reach normal engine temperature	Cooling fan (constantly operating)	12-22
	Electronic Thermostat	12-18
Cooling fan does not operate or abnormal air speed	Fuse open circuit	-
	Relay malfunction	-
	Cooling fan	12-22
	Wire harness	-
	Engine Control Module (ECM) failure	-

Cooling System Pressure Test

WARNING

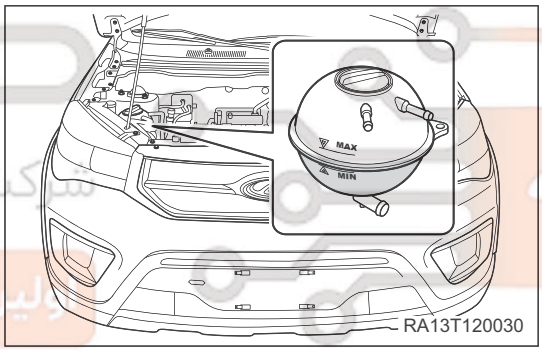
- Always make sure engine is in low temperature before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system overheats. High-pressurized hot engine coolant and steam may flow out and cause serious personal injury.

CAUTION

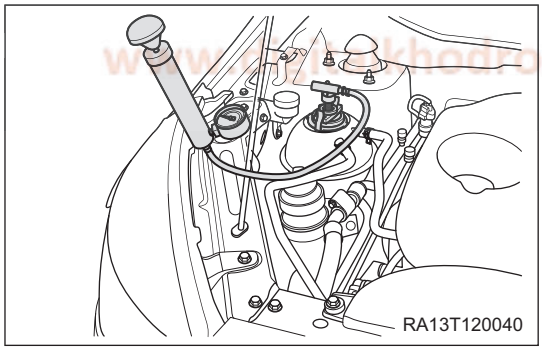
- When testing cooling system, please pressurize system to specified pressure. Otherwise, it may damage system components.
- Before testing cooling system, do not perform operation until coolant temperature drops to normal level. Otherwise, it may cause scald.

Test Procedures

1. Turn off all electrical equipment and the ignition switch.
2. Check if coolant level is between "MAX" and "MIN" lines. If coolant level is below "MIN" line, add coolant.



3. Connect cooling system pressure tester to coolant pressure release cap port (expansion tank cap port) and tighten it slowly.



CAUTION

- Make sure there is no leakage in connecting part of coolant system pressure tester, in order to avoid pressure leakage during test.

4. Pressurize cooling system to 1.3 ± 0.2 bar with cooling system pressure tester, and then observe if pressure changes. If system pressure does not drop within 2 minutes, it indicates there is no leakage in system. If pressure changes greatly, it indicates that there is a leakage in system; find the leaking area and perform troubleshooting.

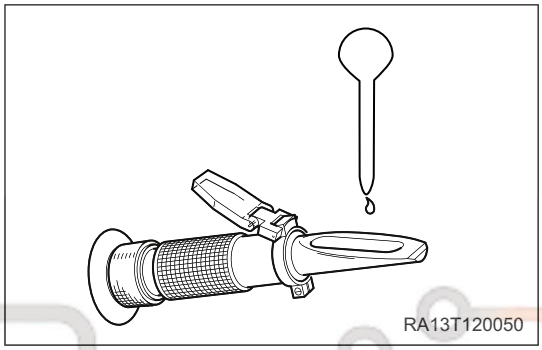
Coolant Freezing Point Test

CAUTION

- DO NOT mix coolant with different colors and specifications.
- Please select coolant that is suitable for local climate in different areas.
- Please read measured value at the scale line. In order to distinguish scale line more clearly, drip a drop of water on glass of freezing point tester with a pipette, then scale line can be clearly distinguished via a "waterline".

Test Procedures

1. As shown in illustration, drip a drop of coolant on glass of freezing point tester with a pipette, and then observe freezing point value of coolant.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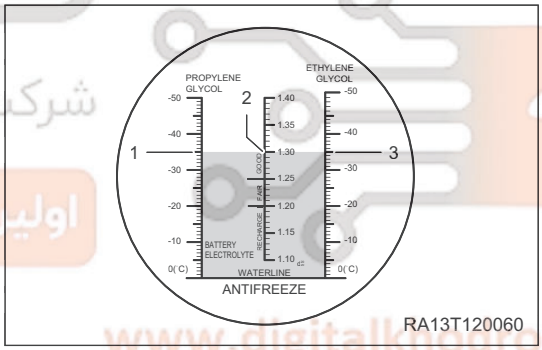
2. As shown in illustration, observe scale 3 of freezing point tester to read ethylene glycol coolant freezing point value. Freezing point value must be kept at -35°C or lower.

   If freezing point is beyond specified value, replace coolant.

   HINT:

   Scale 1 is used to measure freezing point value of propylene glycol coolant, and scale 2 is used to measure density of battery electrolyte.



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ON-VEHICLE SERVICE

Coolant Replacement

Coolant Draining

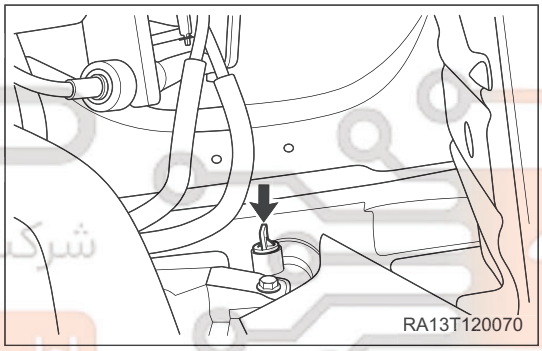
WARNING

- Always make sure engine is in low temperature before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system overheats. High-pressurized hot engine coolant and steam may flow out and cause serious personal injury.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove expansion tank cap when engine temperature and radiator temperature are low.
4. Remove the air filter assembly (See page 10-10).
5. Put a coolant collector under vehicle, rotate radiator drain cock plug (arrow), then drain coolant in radiator and expansion tank.

   HINT:

   Put a drainage device or similar tool at radiator outlet, so that coolant can flow into collector smoothly.



6. After coolant stops flowing, retighten radiator drain cock plug.

CAUTION

- Tighten drain cock plug to prevent leakage.

ENVIRONMENTAL PROTECTION

- Wasted coolant should be handled by the specialized department according to local laws and regulations. Never discard it at will.

Coolant Adding

Only use coolant that meets Chery specifications.

Coolant Capacity

Item	Capacity (L)
Cooling System	6.5 ± 0.4

Coolant Concentration

G11 Additive	Soft Water
50%	50%

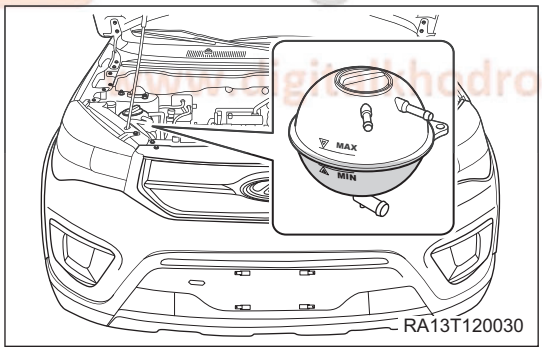
⚠ WARNING

- If it is necessary to add coolant when engine is hot, loosen expansion tank cap slightly first to release internal pressure and loosen cap completely after waiting for a while, and then add coolant.
- If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.

CAUTION

- DO NOT use inferior coolant.
- DO NOT mix coolant with different colors and specifications.
- Be careful when adding coolant, avoid spilling coolant on any area of engine.

1. Open expansion tank cap and add coolant until coolant level reaches "MAX" line.



2. Tighten expansion tank cap, start and run engine. Maintain engine speed between 2000 and 2500 rpm to warm up engine until cooling fan operates.

CAUTION

If there is no coolant in expansion tank after engine just starts, perform the followings:

- Stop engine;
- Wait until coolant cools down;
- Add coolant to "MAX" line on expansion tank.

Run the engine at 2500 rpm until coolant level becomes stable.

3. Stop engine and wait until coolant temperature drops to the ambient temperature. Check that coolant level is between "MAX" and "MIN" lines. If coolant level is below "MIN" line, repeat all the above procedures. If coolant level is above "MAX" line, drain coolant until level is between "MAX" and "MIN" lines.

Tank Upper Crossmember Assembly

Removal

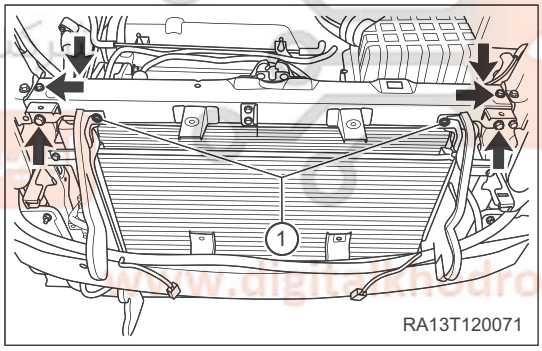
WARNING

- Perform removal procedures with engine compartment at low temperature, after cooling fan stops completely; otherwise rotating cooling fan or hot components of engine compartment may cause serious injury.

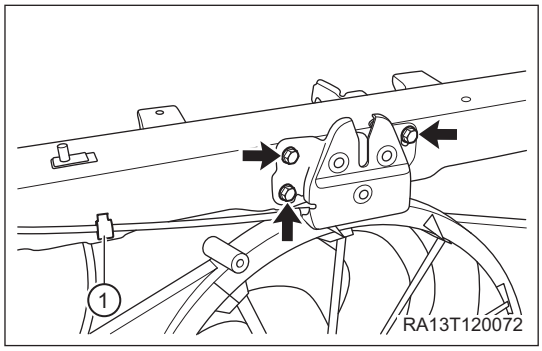
CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

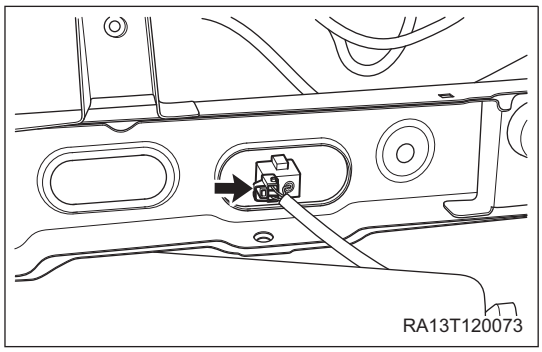
1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the front bumper (See page 49-7).
4. Remove the air direct pipe assembly (See page 10-10).
5. Remove the tank upper crossmember assembly.
   a. Remove 6 fixing bolts (arrow) from tank upper crossmember deflector.
      (Tightening torque: 9± 1 N·m)
   b. Remove 2 fixing screws (1) from deflector.



   c. Remove 3 hood lock fixing bolts (arrow) from tank upper crossmember, and move away cable clip (1).
      (Tightening torque: 9 ± 1 N·m)

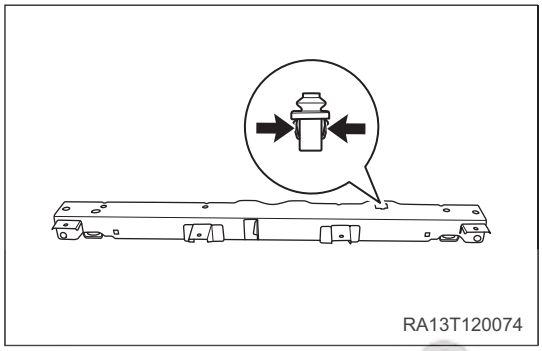


d. Turn over tank upper crossmember, and disconnect engine compartment contact switch connector (arrow).



e. Remove the tank upper crossmember assembly.

6. Remove engine compartment contact switch (arrow) from tank upper crossmember.



Installation

Installation is in the reverse order of removal.

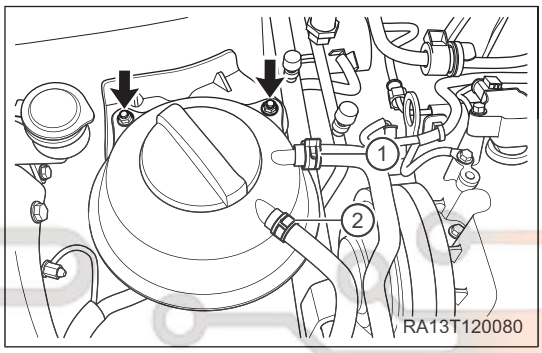
Expansion Tank

Removal

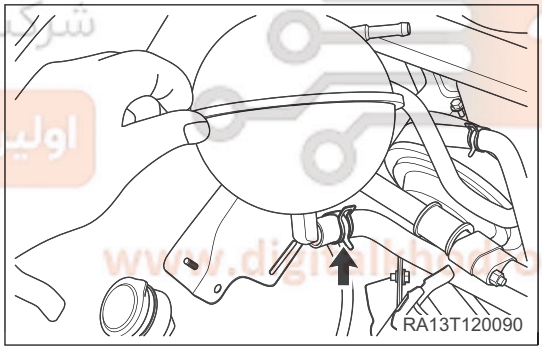
⚠ WARNING

- Always make sure engine is in low temperature before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system overheats. High-pressurized hot engine coolant and steam may flow out and cause serious personal injury.

1. Turn off all electrical equipment and the ignition switch.
2. Drain the coolant (See page 12-12).
3. Remove the expansion tank.
   a. Loosen elastic clamp (1), and disconnect expansion tank and discharge hose.
   b. Loosen elastic clamp (2), and disconnect expansion tank and radiator discharge hose.
   c. Remove 2 fixing bolts (arrow) from expansion tank.
   (Tightening torque: 5 ± 1 N·m)



   d. Pull out expansion tank upward, loosen elastic clamp (arrow), and disconnect expansion tank and expansion tank outlet hose.



   e. Remove the expansion tank.

Installation

Installation is in the reverse order of removal.

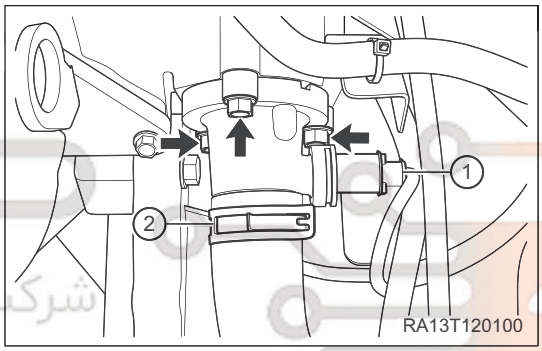
Electronic Thermostat

Removal

WARNING

- Always make sure engine is in low temperature before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system overheats. High-pressurized hot engine coolant and steam may flow out and cause serious personal injury.

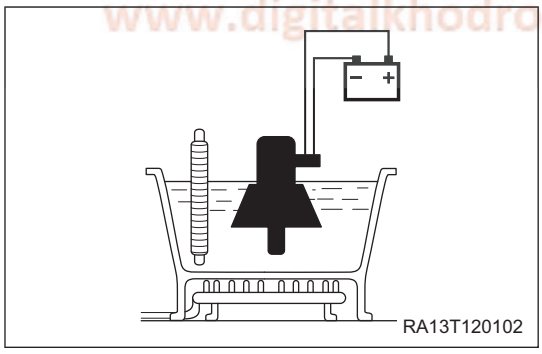
1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the air filter assembly (See page 10-10).
4. Drain the coolant (See page 12-12).
5. Remove the electronic thermostat.
   a. Remove the electronic thermostat connector (1).
   b. Loosen engine outlet hose elastic clamp (2), and disconnect engine outlet hose and electronic thermostat.
   c. Remove 3 fixing bolts (arrow) from electronic thermostat cover.
      (Tightening torque: 9.5 ± 1.5 N·m)



   d. Remove the electronic thermostat.

Inspection

1. Measured resistance is 15 Ω at normal temperature.
2. Heat thermostat in water and energized it, and check if it can be opened.

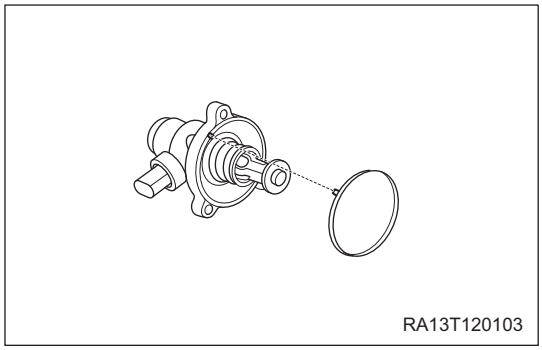


CAUTION

- Energized time should not be too long each time.

Installation

Installation is in the reverse order of removal.



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CAUTION

- During installation, align protrusion of thermostat grommet with groove of thermostat as shown in the illustration.
- Check that coolant has been added to the specified level after installation.

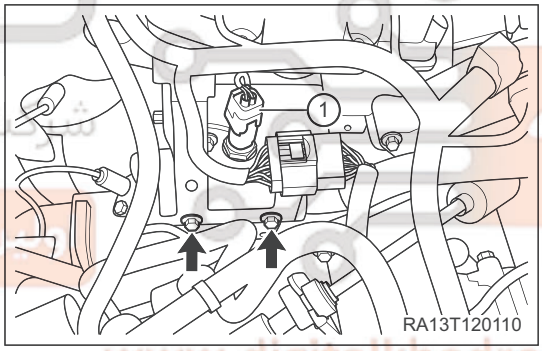
Thermostat Seat

Removal

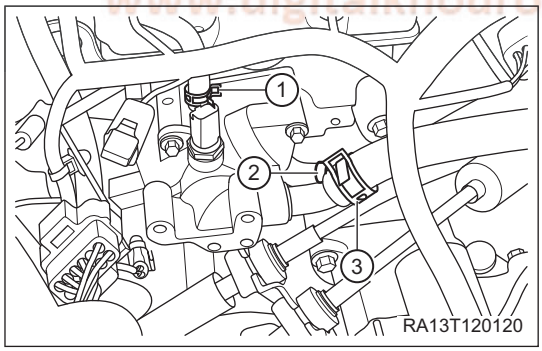
⚠ WARNING

- Always make sure engine is in low temperature before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system overheats. High-pressurized hot engine coolant and steam may flow out and cause serious personal injury.

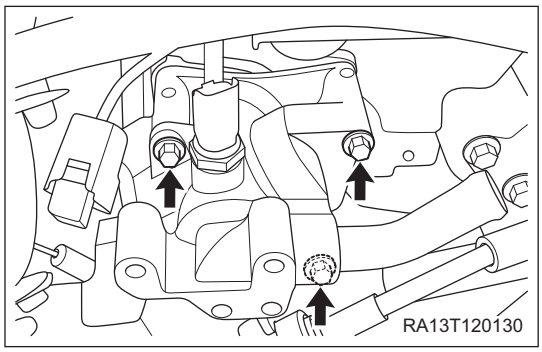
1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the air filter assembly (See page 10-10).
5. Remove the battery (See page 16-7).
6. Remove the battery tray (See page 16-9).
7. Drain the coolant (See page 12-12).
8. Remove the electronic thermostat (See page 12-20).
9. Remove the thermostat seat.
   a. Disconnect the coolant temperature sensor connector (1).
   b. Remove 2 fixing bolts (arrow), move wire harness bracket sideways to one side.
   (Tightening torque: 7.5 ± 1 N·m)



   c. Loosen elastic clamp (1), and disconnect thermostat seat and engine discharge hose.
   d. Loosen elastic clamp (2), and disconnect thermostat seat and hose.
   e. Loosen elastic clamp (3), and disconnect thermostat seat and heater inlet pipe.

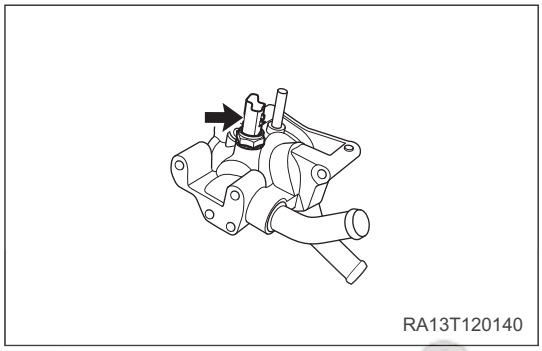


f. Remove 3 fixing bolts (arrow) from thermostat seat.
(Tightening torque: 9.5 ± 1.5 N·m)



g. Remove thermostat seat and thermostat seat washer.

10. Remove coolant temperature sensor (arrow) from thermostat seat.
(Tightening torque: 11 - 16 N·m)



Installation

Installation is in the reverse order of removal.

CAUTION

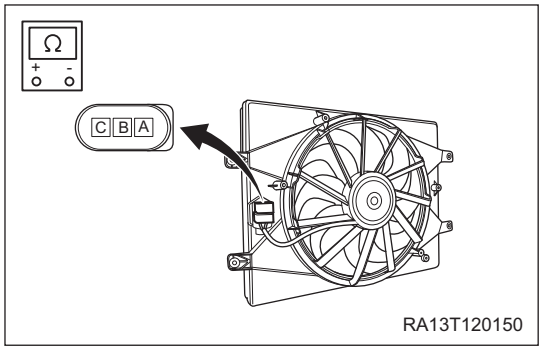
- Check that coolant has been added to the specified level after installation.
- Replace thermostat seat washer with a new one during installation, and removed washer cannot be reused.

Cooling Fan Assembly

On-vehicle Inspection

1. Measure cooling fan resistance with a digital multimeter.
   a. Cooling fan

Multimeter Connection	Condition	Specification (Ω)
Terminal A - Terminal B	Normal temperature	0.8 ± 0.1
Terminal A - Terminal C	Normal temperature	0.6 ± 0.1



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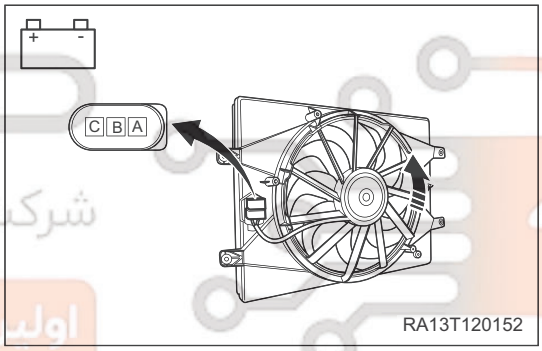
If inspection result is not as specified, replace cooling fan assembly (See page 12-22).

2. Apply battery voltage to specified connector terminals of cooling fan respectively according to table below, and check that cooling fan operates smoothly when applying battery voltage.
   a. Cooling fan

Measurement Condition	Condition	Specified Condition
Battery positive (+) - Terminal B Battery negative (-) - Terminal A	Always	Operates smoothly at low speed
Battery positive (+) - Terminal C Battery negative (-) - Terminal A	Always	Operates smoothly at high speed



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If inspection result is not as specified, replace cooling fan assembly (See page 12-22).

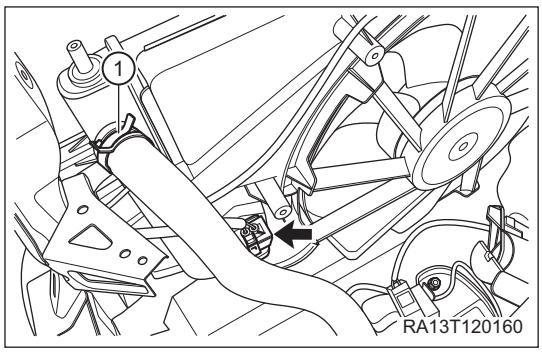
Removal

⚠ WARNING

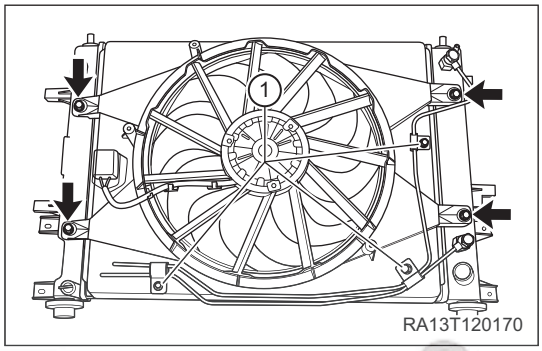
- Always make sure engine is in low temperature before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system overheats. High-pressurized hot engine coolant and steam may flow out and cause serious personal injury.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Drain the coolant (See page 12-12).
5. Remove the tank upper crossmember assembly (See page 12-15).
6. Remove the air filter assembly (See page 10-10).

7. Remove the cooling fan assembly.
   a. Loosen elastic clamp (1), and disconnect engine outlet hose and radiator assembly.
   b. Disconnect the cooling fan assembly connector (arrow).



   c. Remove 3 fixing bolts (1) from oil pipe (for AT model).
      (Tightening torque: 7 ± 1.5 N·m)
   d. Remove 4 fixing bolts (arrow) from cooling fan assembly.
      (Tightening torque: 7 ± 1.5 N·m)



   e. Remove cooling fan assembly from radiator assembly.

Installation

Installation is in the reverse order of removal.

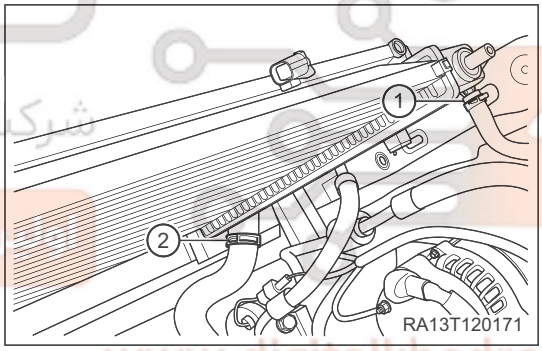
Radiator

Removal

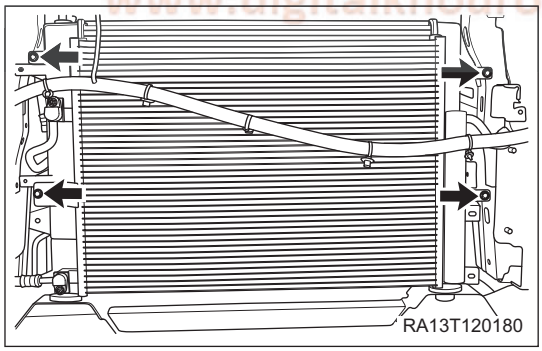
⚠ WARNING

- Always make sure engine is in low temperature before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system overheats. High-pressurized hot engine coolant and steam may flow out and cause serious personal injury.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the air filter (See page 10-9).
5. Remove the front bumper (See page 49-7).
6. Remove the front anti-collision crossmember (See page 49-13).
7. Drain the coolant (See page 12-12).
8. Remove the cooling fan assembly (See page 12-22).
9. Remove the radiator.
   a. Loosen elastic clamp (1), and disconnect radiator discharge hose III and radiator assembly.
   b. Loosen elastic clamp (2), and disconnect engine inlet pipe and radiator assembly.



   c. Remove 4 coupling bolts (arrow) between tank and condenser.
   (Tightening torque: 9± 1 N·m)



   d. Remove the radiator.

Installation

Installation is in the reverse order of removal.

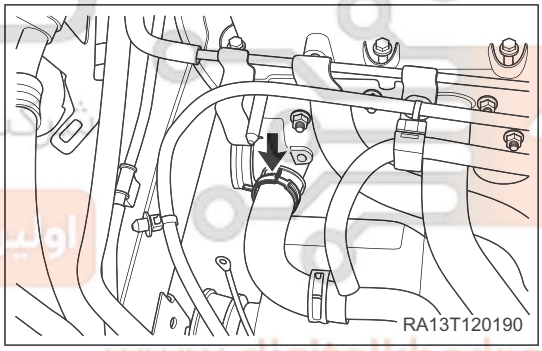
Water Pump

Removal

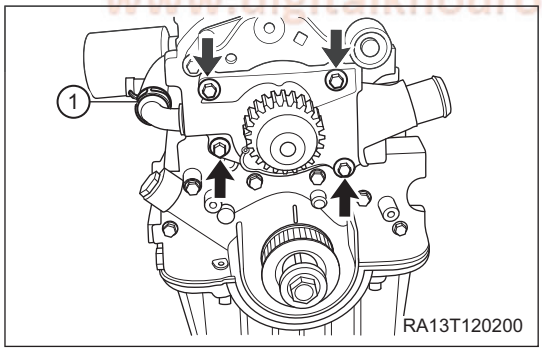
⚠ WARNING

- Always make sure engine is in low temperature before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system overheats. High-pressurized hot engine coolant and steam may flow out and cause serious personal injury.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Drain the coolant (See page 12-12).
4. Remove the drive belt (See page 07-19).
5. Remove alternator and alternator bracket (See page 16-10).
6. Remove the engine timing belt (See page 07-23).
7. Use the engine equalizer to hang the engine.
8. Remove the right mounting bracket (See page 07-55).
9. Remove the water pump.
   a. Loosen elastic clamp (arrow), and disconnect engine inlet hose and water pump.



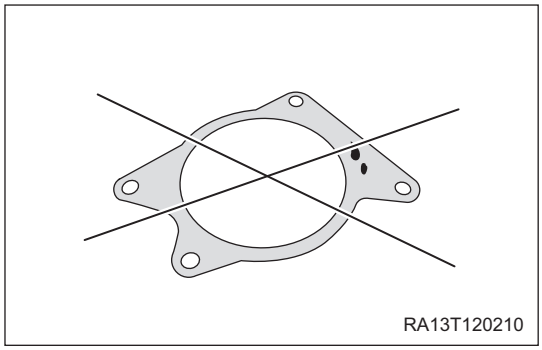
   b. Remove the water pump fixing bolt (arrow).
   (Tightening torque: 25 ± 3 N·m)
   c. Loosen elastic clamp (1), and disconnect water pump and hose.



   d. Remove water pump and gasket.

Inspection

1. Check water pump gasket for wear or bend. If wear or bend is found, replace gasket.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2. Check if water pump bearing is loose. If it is loose, replace water pump assembly.

Installation

Installation is in the reverse order of removal.

CAUTION

- If water pump is damaged, replace rather than attempt to repair it.
- Check that coolant has been added to the specified level after installation.