SECTION HCO
HIGH VOLTAGE COOLING SYSTEM

CONTENTS

PRECAUTION

PRECAUTIONS

Precaution for Technicians Using Medical Electric

INFOID:0000000007072236

OPERATION PROHIBITION

WARNING:

- **Parts with strong magnet is used in this vehicle.**
- **Technicians using a medical electric device such as pacemaker must never perform operation on the vehicle, as magnetic field can affect the device function by approaching to such parts.**

NORMAL CHARGE PRECAUTION

WARNING:

- **If a technician uses a medical electric device such as an implantable cardiac pacemaker or an implantable cardioverter defibrillator, the possible effects on the devices must be checked with the device manufacturer before starting the charge operation.**
- **As radiated electromagnetic wave generated by on board charger at normal charge operation may effect medical electric devices, a technician using a medical electric device such as implantable cardiac pacemaker or an implantable cardioverter defibrillator must not enter the vehicle compartment (including luggage room) during normal charge operation.**

Precaution at telematics system operation

WARNING:

- **If a technician uses implantable cardiac pacemaker or implantable cardioverter defibrillator (ICD), avoid the device implanted part from approaching within approximately 220 mm (8.66 in) from interior/exterior antenna.**
- **The electromagnetic wave of TCU might affect the function of the implantable cardiac pacemaker or the implantable cardioverter defibrillator (ICD), when using the service, etc.**
- **If a technician uses other medical electric devices than implantable cardiac pacemaker or implantable cardioverter defibrillator(ICD), the electromagnetic wave of TCU might affect the function of the device. The possible effects on the devices must be checked with the device manufacturer before TCU use.**

Precaution at intelligent key system operation

WARNING:

- **If a technician uses implantable cardiac pacemaker or implantable cardioverter defibrillator (ICD), avoid the device implanted part from approaching within approximately 220 mm (8.66 in) from interior/exterior antenna.**
- **The electromagnetic wave of intelligent key might affect the function of the implantable cardiac pacemaker or the implantable cardioverter defibrillator (ICD), at door operation, at each request switch operation, or at engine starting.**
- **If a technician uses other medical electric devices than implantable cardiac pacemaker or implantable cardioverter defibrillator (ICD), the electromagnetic wave of intelligent key might affect the function of the device. The possible effects on the devices must be checked with the device manufacturer before intelligent key use.**

Point to Be Checked Before Starting Maintenance Work

INFOID:0000000007079397

The high voltage system may starts automatically. It is required to check that the timer air conditioner and timer charge (during EVSE connection) are not set before starting maintenance work.
NOTE:
If the timer air conditioner or timer charge (during EVSE connection) is set, the high voltage system starts automatically even when the power switch is in OFF state.

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:0000000007014520

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS

system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted.
Information necessary to service the system safely is included in the “SRS AIR BAG” and “SEAT BELT” of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see “SRS AIR BAG”.**
- **Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

Always observe the following items for preventing accidental activation.

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the power switch ON, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the power switch OFF, disconnect the 12V battery, and wait at least 3 minutes before performing any service.**

Precaution for Removing 12V Battery

INFOID:0000000007053706

When removing the 12V battery, turn ON/OFF the power switch and check that the charging status indicator does not blink. The 12V battery must be removed within one hour after checking the indicator lamp.

NOTE:

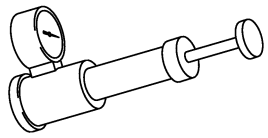
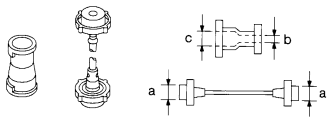
- The automatic 12V battery charge control may start even when the power switch is in OFF state.
- The automatic 12V battery charge control does not start within approximately one hour when the power switch is turned ON/OFF.

PREPARATION

PREPARATION

Commercial Service Tools

INFOID:0000000006917760

Tool name	Description
Radiator cap tester  PBIC1982E	Cooling system leakage test
Radiator cap tester adapter  S-NT564	Adapting radiator cap tester to radiator cap and radiator filler neck **a: 28 (1.10) dia.** **b: 31.4 (1.236) dia.** **c: 41.3 (1.626) dia.** Unit: mm (in)

SYSTEM DESCRIPTION

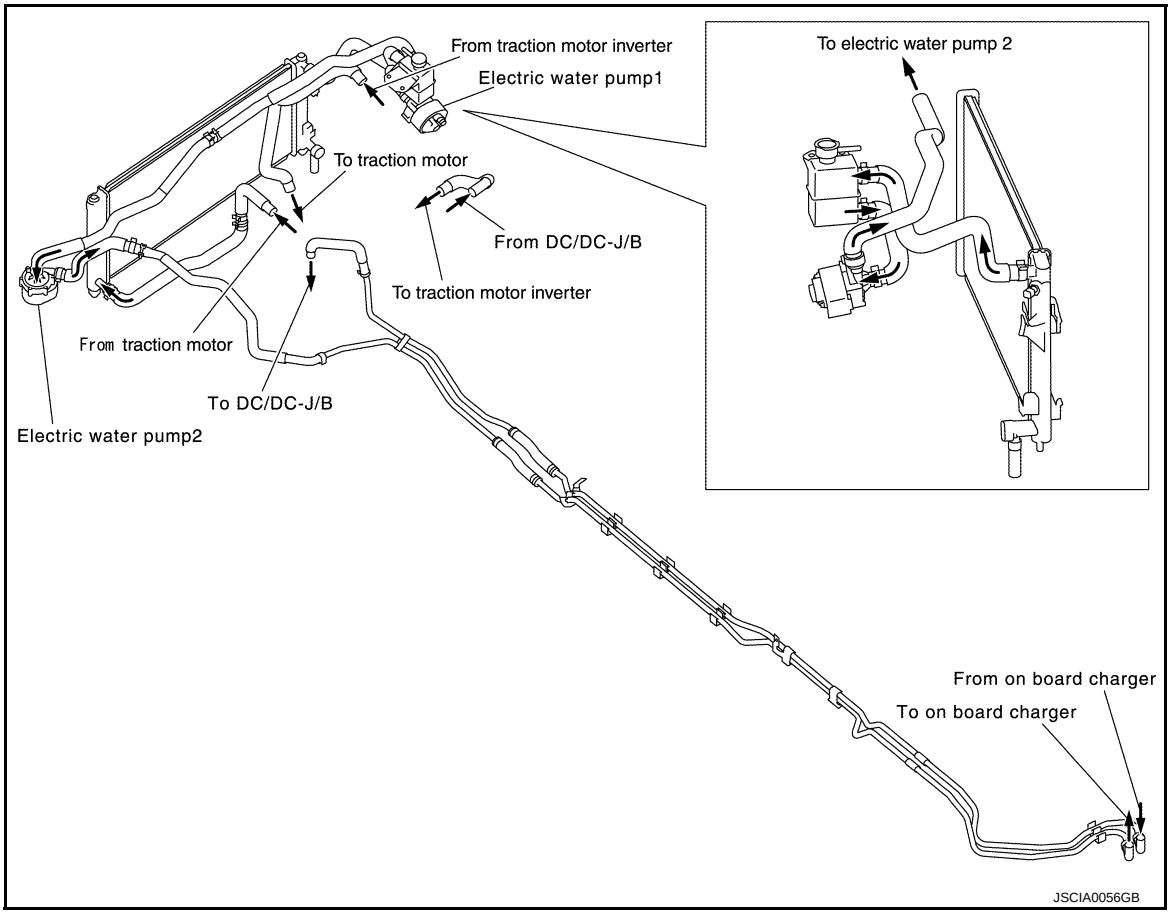
SYSTEM

High Voltage Cooling System

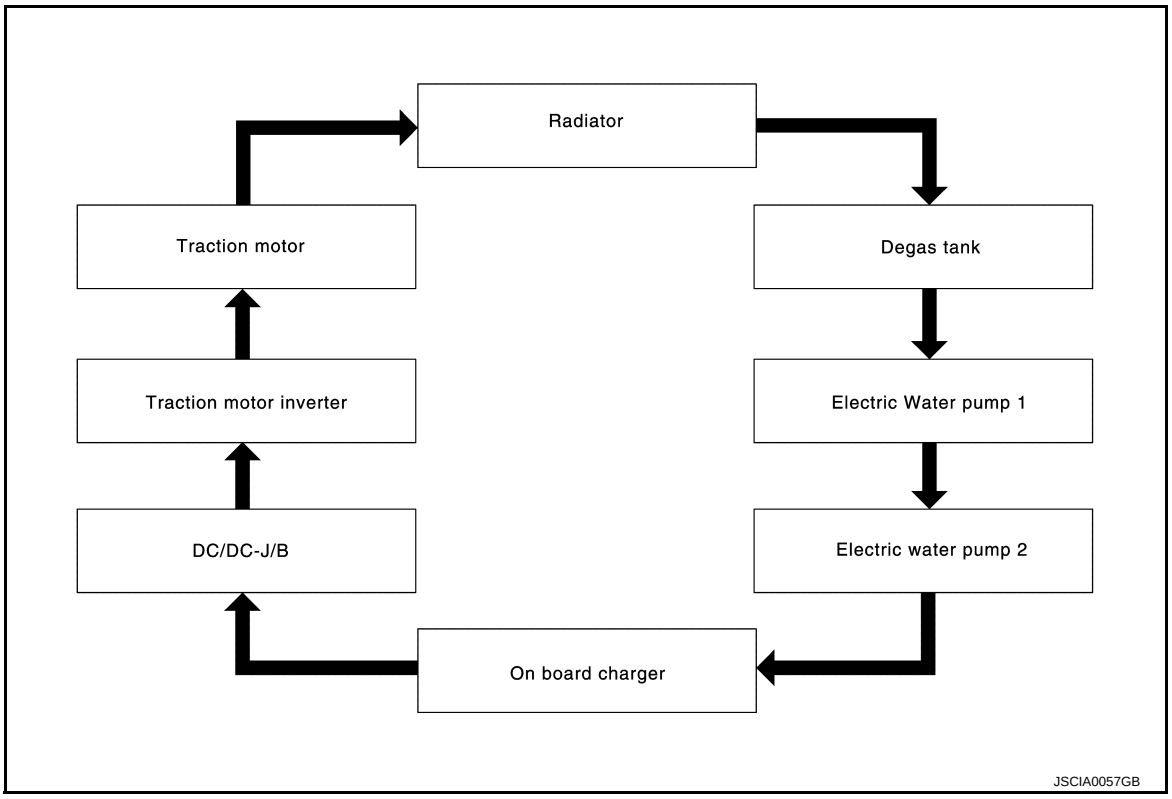
INFOID:0000000006917761

- High voltage cooling system is a system which cools high voltage components below:
- Traction motor
- Traction motor inverter
- DC/DC-J/B
- On board charger
- Coolant is circulated by electric water pump, which is controlled by VCM (vehicle control module).

HIGH VOLTAGE COOLING SYSTEM



HIGH VOLTAGE COOLING SYSTEM SCHEMATIC



BASIC INSPECTION

RADIATOR

Inspection

INFOID:0000000006917762

Check radiator for mud or clogging. If necessary, clean radiator as follows.

CAUTION:

- **Be careful not to bend or damage radiator fins.**
- **When radiator is cleaned without removal, remove all surrounding parts such as radiator cooling fan assembly and horns. Then tape harness and harness connectors to prevent water from entering.**

1. Apply water by hose to the back side of the radiator core vertically downward.
2. Apply water again to all radiator core surfaces once per minute.
3. Stop washing if any stains no longer flow out from radiator.
4. Blow air into the back side of radiator core vertically downward.
   - Use compressed air lower than 490 kPa (5 kg/cm^2, 71 psi) and keep distance more than 30 cm (11.81 in).
5. Blow air again into all the radiator core surfaces once per minute until no water sprays out.

SYMPTOM DIAGNOSIS

OVERHEATING CAUSE ANALYSIS

Troubleshooting Chart

INFOID:0000000006917763

	Symptom		Check items	
Cooling system parts malfunction	Poor heat transfer	Water pump malfunction	—	—
		Damaged fins	Dust contamination or paper clogging	
			Physical damage	
		Clogged radiator cooling tube	Excess foreign material (rust, dirt, sand, etc.)	
	Reduced air flow	Cooling fan does not operate	Fan assembly	—
		High resistance to fan rotation		
		Damaged fan blades		
	Damaged radiator shroud	—	—	—
	Improper coolant mixture ratio	—	—	—
	Poor coolant quality	—	Coolant viscosity	—
	Insufficient coolant	Coolant leakage	Cooling hose	Loose clamp
				Cracked hose
			Water pump	Poor sealing
			Reservoir tank cap	Loose
				Poor sealing
			Radiator	O-ring for damage, deterioration or improper fitting
				Cracked radiator tank
				Cracked radiator core
			Reservoir tank	Cracked reservoir tank
Except cooling system parts malfunction	Blocked or restricted air flow	Blocked bumper	—	—
		Blocked radiator grille	Installed car brassiere	
			Mud contamination or paper clogging	
		Blocked radiator	—	
		Blocked condenser	Blocked air flow	
		Installed large fog lamp		

PERIODIC MAINTENANCE

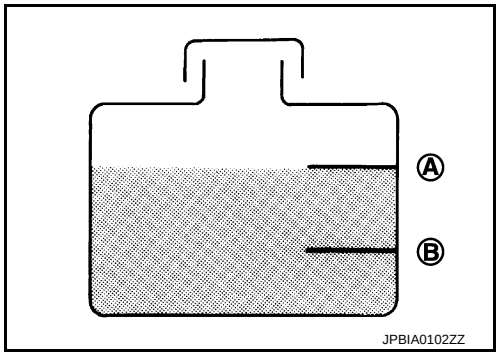
COOLANT

Inspection

INFOID:0000000007014056

COOLANT AMOUNT INSPECTION

- When coolant temperature is low (about 50°C or less), confirm that the coolant level of the reservoir tank is in the range from MIN (B) to MAX (A).



A : MAX
B : MIN

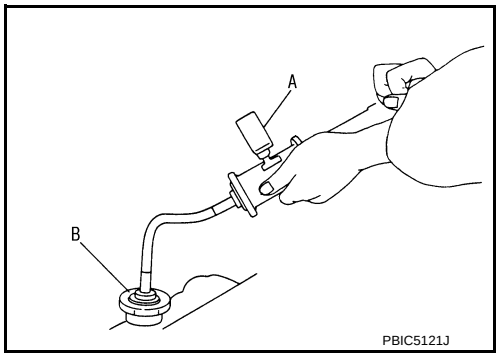
- Adjust level if it is outside the range.

CAUTION:
- **Refill genuine NISSAN coolant or equivalent in its quality mixed with water (distilled or demineralized).**
- **Make sure not to dilute it with water.**

- Confirm that the reservoir tank cap is tightened.

LEAKAGE CHECK

- Apply pressure to the cooling system using radiator cap tester (A) (commercial service tool). Check system for coolant leakage.



Maximum pressure : Refer to HCO-25, "Radiator".

CAUTION:
- **Remove the degas tank cap when coolant temperature is low.**
- **Perform the inspection with the radiator filled with water.**
- **Use hose adapter (B) (commercial service tool) between radiator cap tester (A) (commercial service tool) and the filler neck so that the degas tank filler neck is not deformed.**
- **Be sure to observe the maximum pressure standards. Otherwise, radiator may be damaged.**

- If there is a malfunction, repair and replace applicable part.

Draining and Refilling

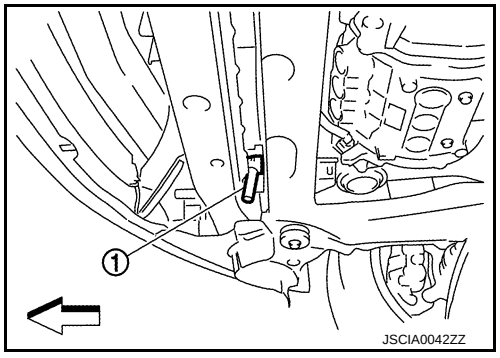
INFOID:0000000007014057

CAUTION:
- **Do not put additive such as waterleak preventive, since it may cause cooling waterway clogging.**
- **When refilling use genuine NISSAN coolant or equivalent in its quality mixed with water (distilled or demineralized).**

DRAIN

CAUTION:
- **Be sure to drain when coolant temperature is cold.**
- **This should be performed so that coolant does not come in contact with surrounding parts.**

1. Remove undercover, radiator drain plug (1) and degas tank cap and drain coolant.



1 : Radiator drain plug
⇦ : Vehicle front

2. Remove reservoir tank and drain the coolant as per the following procedure.
   1. Remove radiator upper grille cover.
   2. Remove reservoir tank hose and reservoir tank mounting bolts.

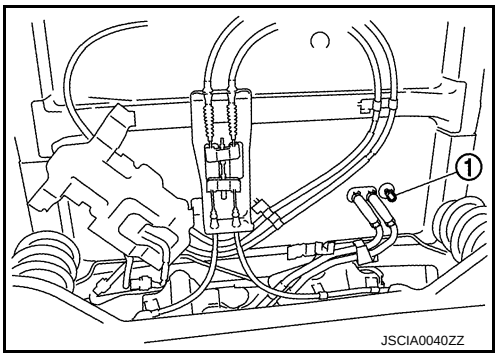
3. Pull out the lower reservoir tank toward vehicle front. Remove the insertion area and raise the tank for removal.

REFILLING

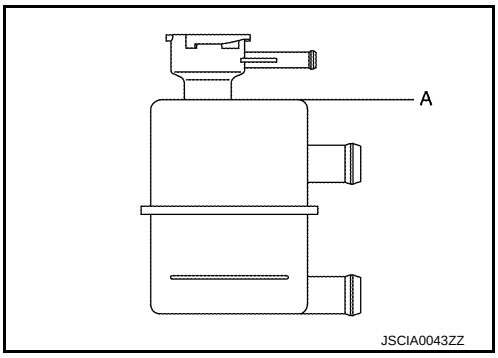
1. Install reservoir tank. (Install in the reverse order of removal.)
2. Install radiator drain plug.
   CAUTION:
   Be sure to clean drain plug and install with new O-ring.

   Tightening torque : Refer to HCO-13, "Exploded View".

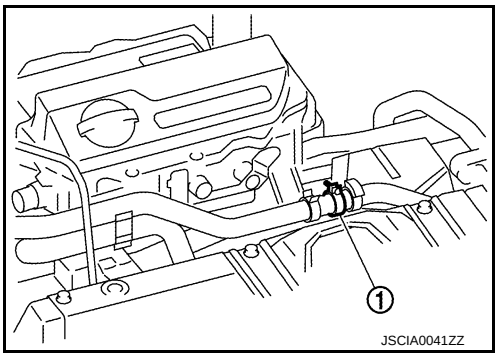
3. Check tightening of hose clamp.
4. Remove bleeder plug (1) of the on board charger.



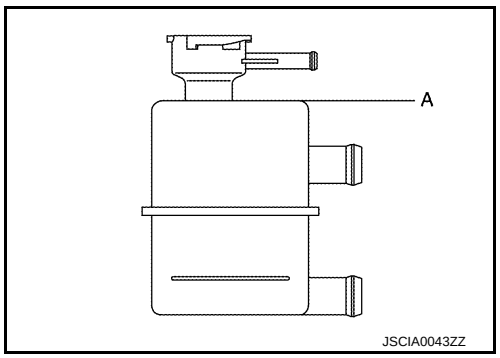
5. Fill cooling water to line (A) from the degas tank cap.



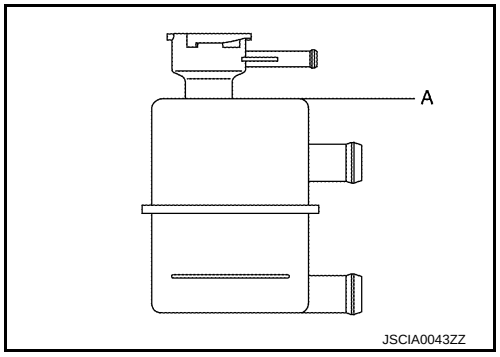
6. Remove the hose joint (1) at the traction motor inverter front and bleed air. Check water flow visually and reconnect the hose.



7. Fill cooling water to line (A) from the degas tank cap.



8. Close the bleeder plug of the on board charger and close the degas tank cap.
9. Set the vehicle to READY and operate the electric water pump.
10. When the degas tank level is low, open the degas tank cap and refill the tank with cooling water to line (A).



11. When the level is not lowered, close the degas tank cap and turn OFF the power switch (stop the electric water pump).
    NOTE:
    If the electric water pump is stopped with the degas tank open, LLC may be spilled.
12. Refill coolant to "MAX" line of reservoir tank.

CHECK WATER FLOW SOUND

CAUTION:

Prior to check, be sure to close windows, doors, and hood, and turn off audio system and other electrical loads.

1. Operate the electric water pump for 1 minute.
2. Check if water flow sound can be heard from the back of the compartment (near the on board charger).
3. If water flow sound is heard, operate the electric water pump until it cannot be heard.
4. When water flow sound cannot be heard, fill the reservoir tank up to "MAX" line.

CAUTION:

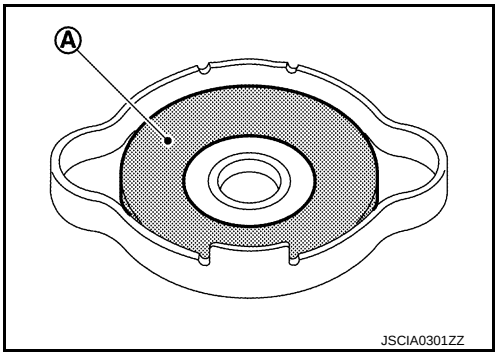
- **Insufficient coolant may cause low power or stop of vehicle due to insufficient cooling of the traction motor inverter. Be sure to bleed air thoroughly.**
- **Never operate the electric water pump without coolant.**

DEGAS TANK CAP

Degas Tank Cap Inspection

INFOID:0000000007014058

Visually check packing (A) of the degas tank cap for dirt and damage.



REMOVAL AND INSTALLATION

RADIATOR

Exploded View

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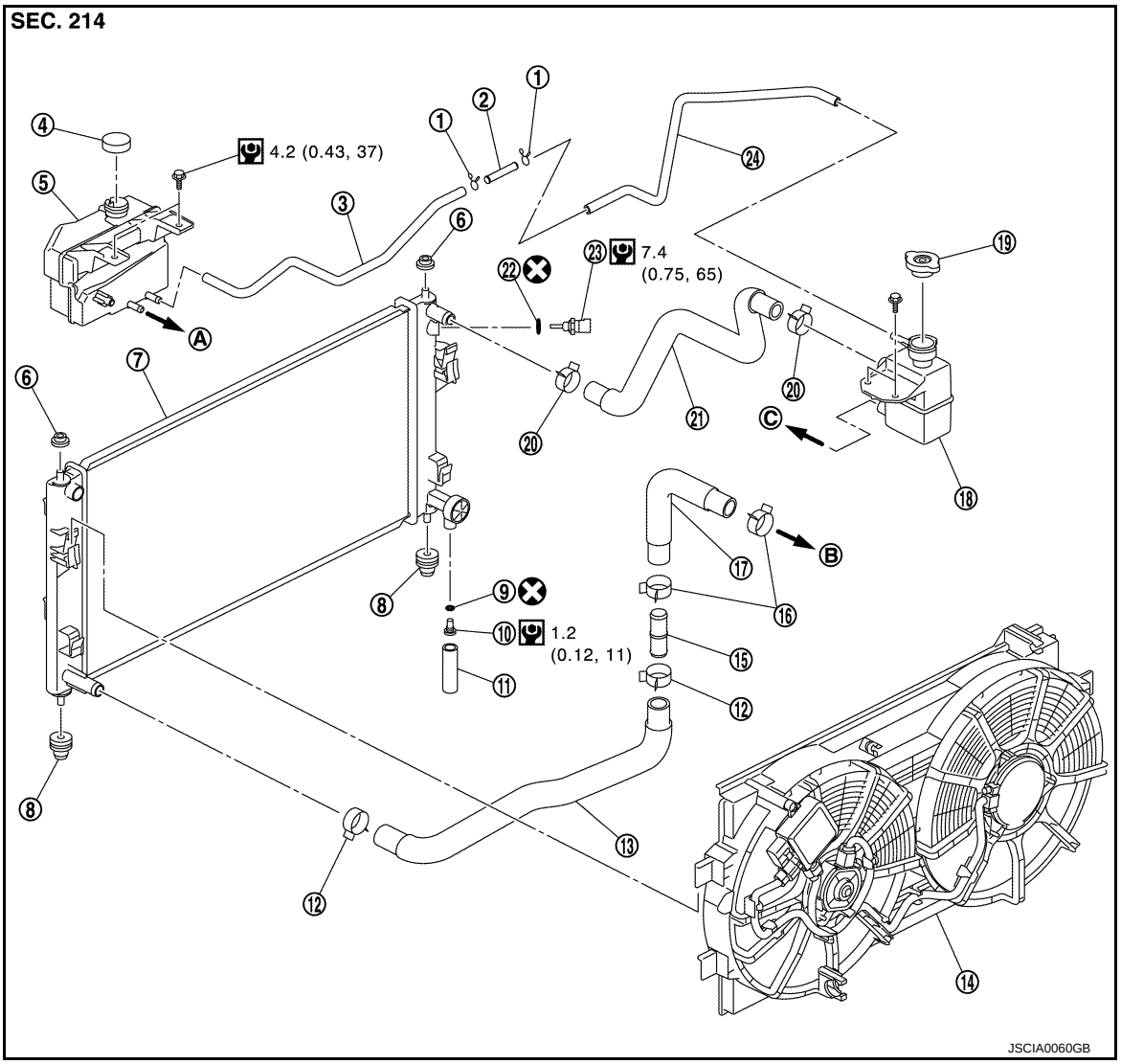


1. Clamp
2. Adapter
3. Reservoir tank hose
4. Reservoir tank cap
5. Reservoir tank
6. Mounting rubber (upper)
7. Radiator
8. Mounting rubber (lower)
9. O-ring
10. Drain plug
11. Water Drain tube
12. Clamp
13. Radiator hose (lower)
14. Radiator cooling fan assembly
15. Adapter
16. Clamp
17. Water hose
18. Degas tank
19. Degas tank cap
20. Clamp
21. Radiator hose (upper)
22. O-ring
23. Water temperature sensor
24. Degas tank hose

A: Degas tank (to heater)
B: To traction motor
C: To electric water pump 1

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:0000000006917768

REMOVAL

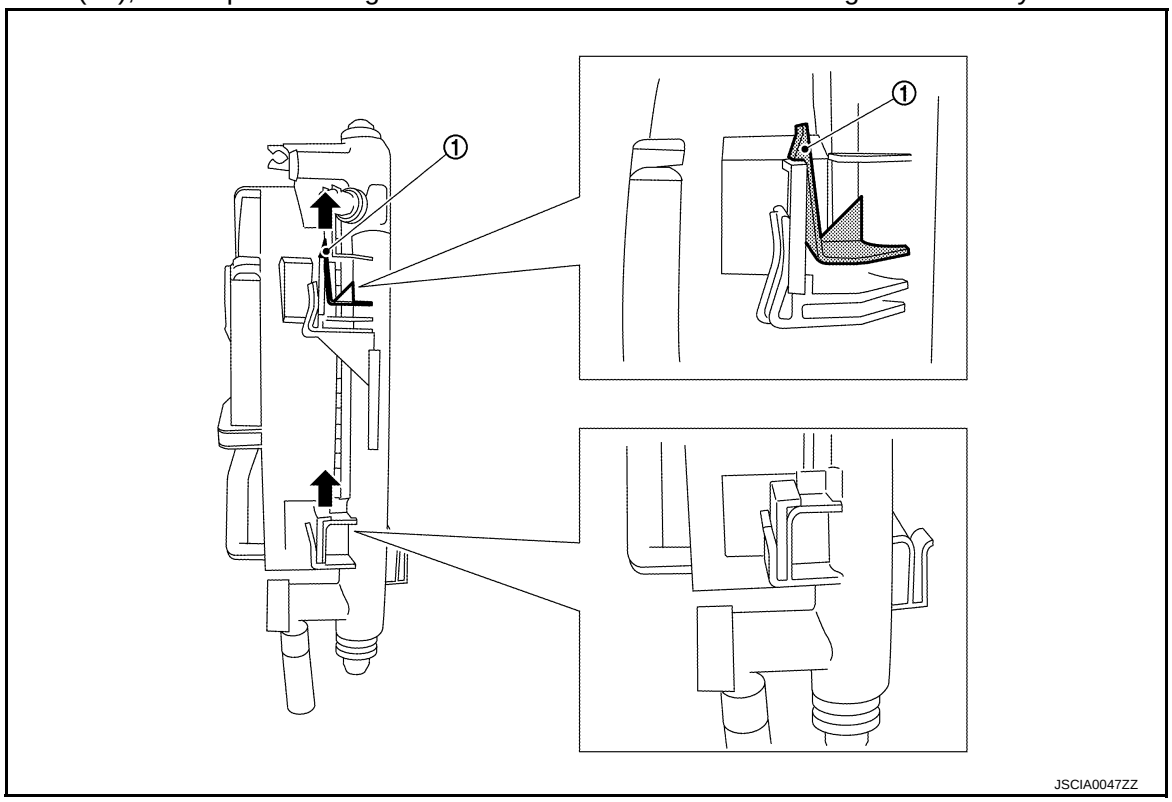
WARNING:

Never remove the radiator cap if a high voltage part including traction motor is hot. Hot liquid may spray out from the radiator, causing serious injury.

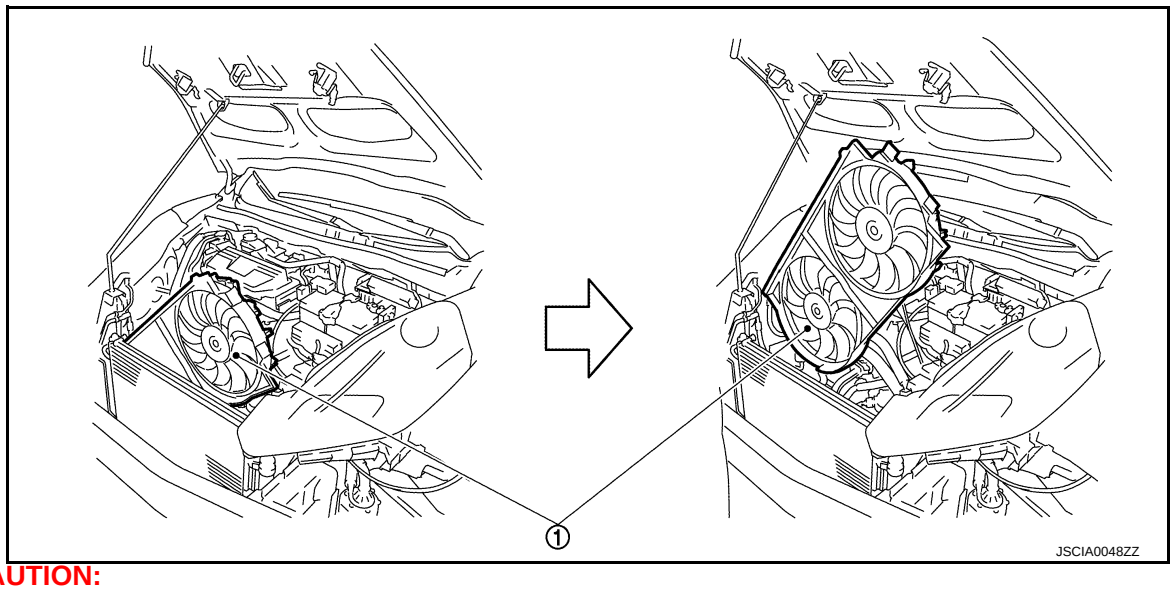
1. Drain coolant from radiator drain plug. Refer to HCO-9, "Draining and Refilling".
2. Radiator core support upper: Refer to DLK-144, "RADIATOR CORE SUPPORT UPPER : Removal and Installation".
3. Remove radiator hoses (upper, lower) and reservoir tank hose.: Refer to HCO-13, "Exploded View".
4. Remove cooling fan shroud with the following procedure.

a. Disconnect the harness between cooling fan and vehicle body at fan control module.

b. While pressing left and right pawls (1) of the radiator, raise the radiator cooling fan assembly in upward direction (⬅), and separate fitting of the radiator and the radiator cooling fan assembly.



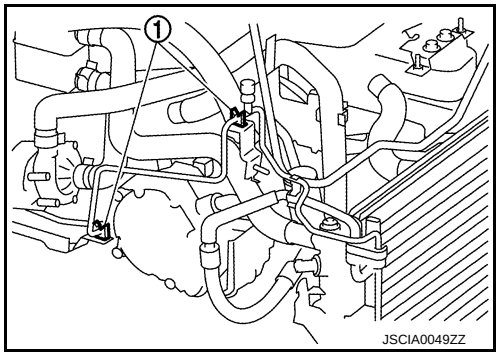
c. Pull out and remove the cooling fan shroud with the left side of radiator cooling fan assembly (1) facing upward.



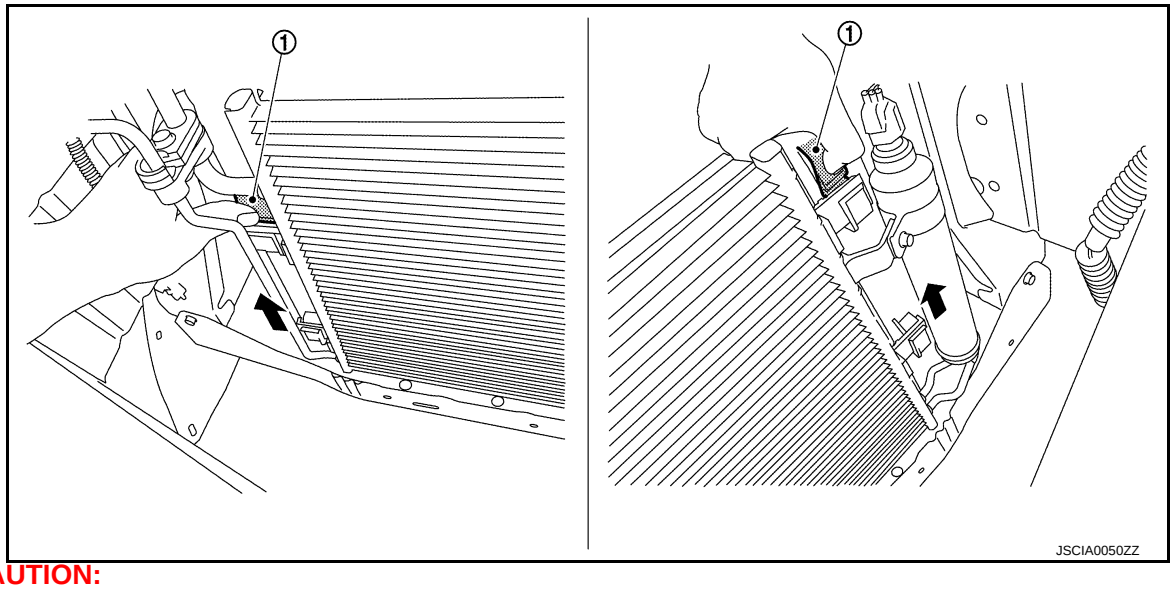
CAUTION:
Be careful not to damage radiator core.

5. Remove radiator assembly with the following procedure.

a. Remove air conditioner pipe from clip (1). (2 positions)

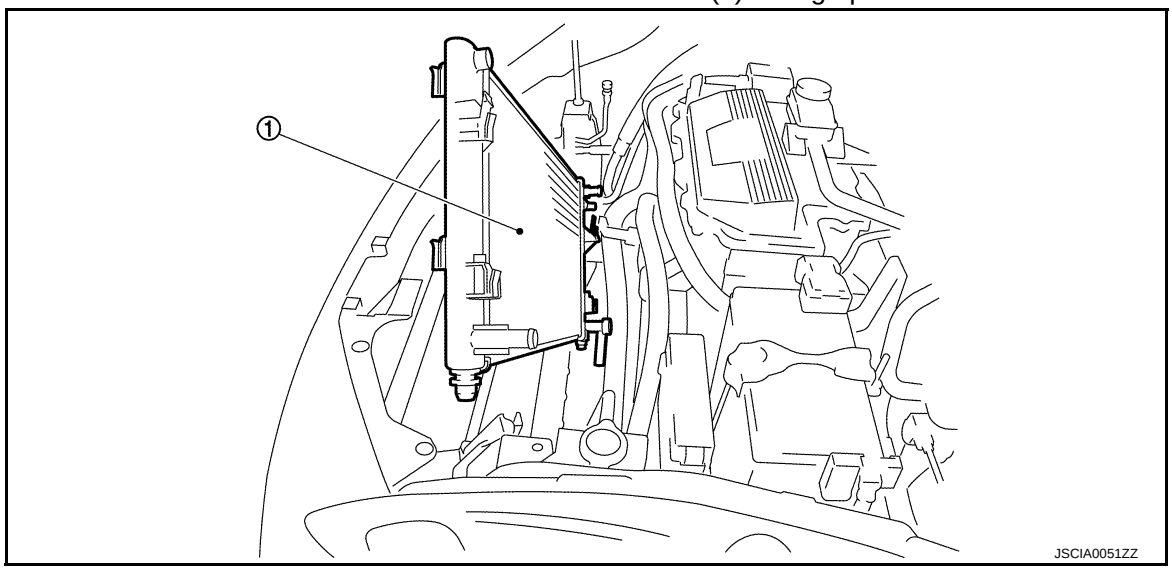


b. While pressing left and right pawls (1) of the radiator, raise the condenser upward, and separate fitting of the radiator and the condenser.



CAUTION:
Since the piping of air conditioner may be bent, never lift condenser more than necessary.

c. Pull out and remove the radiator with the left side of radiator (1) facing upward.



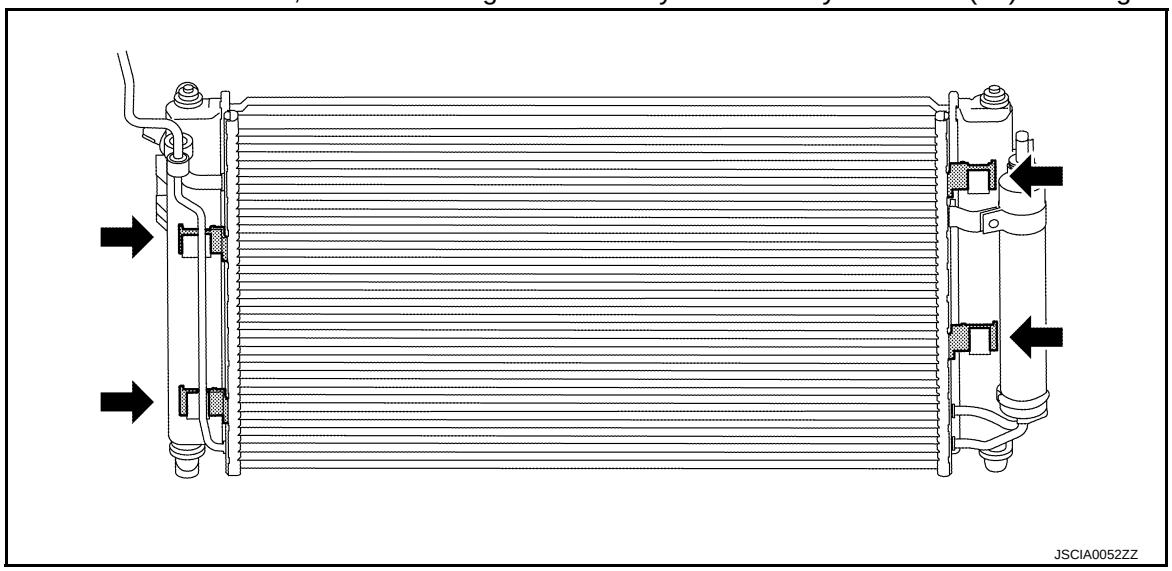
INSTALLATION

Note the following, and install in the reverse order of removal.

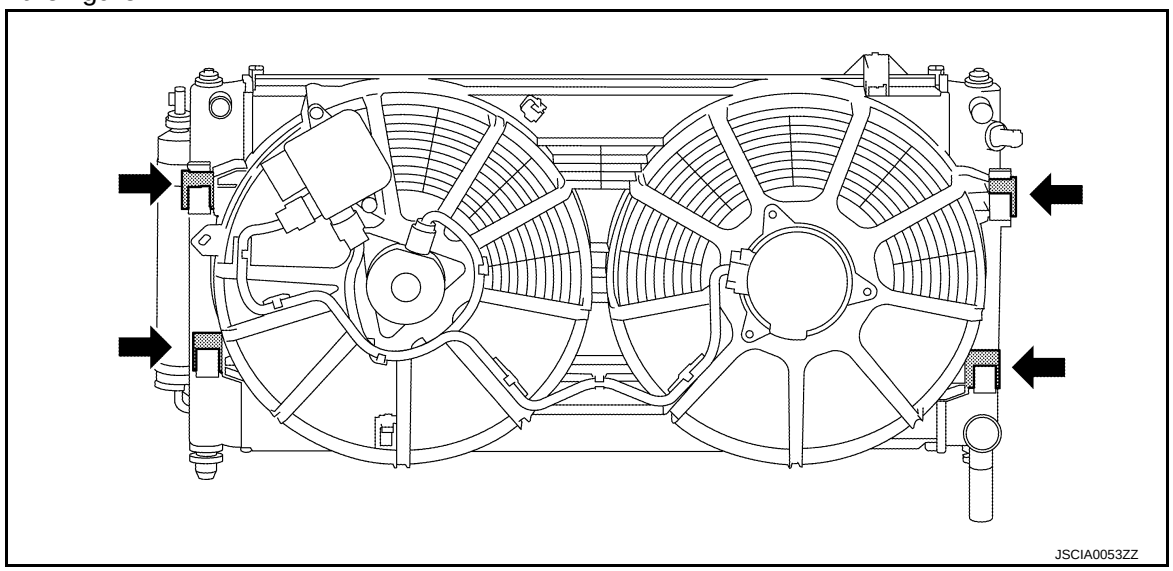
CAUTION:

Be sure to perform the air bleeding. HCO-9, "Draining and Refilling".

- When the radiator is installed, insert the fitting area securely as shown by the arrow (⬅) in the figure.



- When the radiator cooling fan assembly is installed, insert the fitting area securely as shown by the arrow (⬅) in the figure.



Inspection

INFOID:0000000006917769

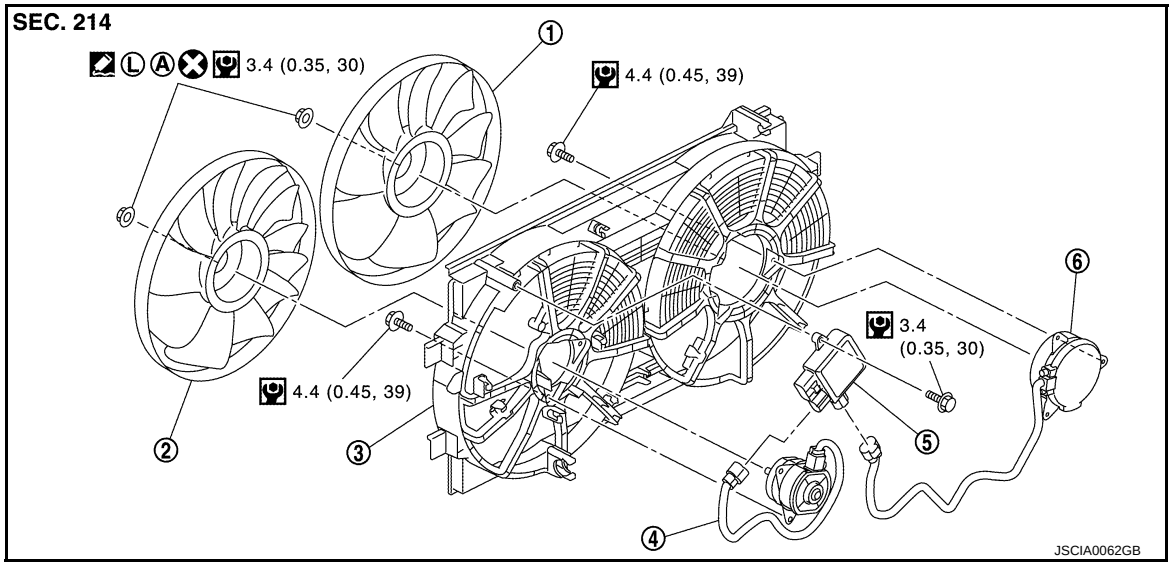
INSPECTION AFTER INSTALLATION

- Check that the reservoir tank cap and the degas tank cap are tightened.
- With a radiator cap tester (commercial service tool), check that there is no leakage of coolant. HCO-9, "Inspection".
- Start the electric pump, and check the joints for coolant leakage.

COOLING FAN

Exploded View

INFOID:0000000006917770



1.	Cooling fan (RH)	2.	Cooling fan (LH)	3.	Fan shroud
4.	Fan motor (LH)	5.	Cooling fan control module	6.	Fan motor (RH)

A: Apply on fan motor shaft

: Apply high strength thread locking sealant or equivalent.

: N·m(kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

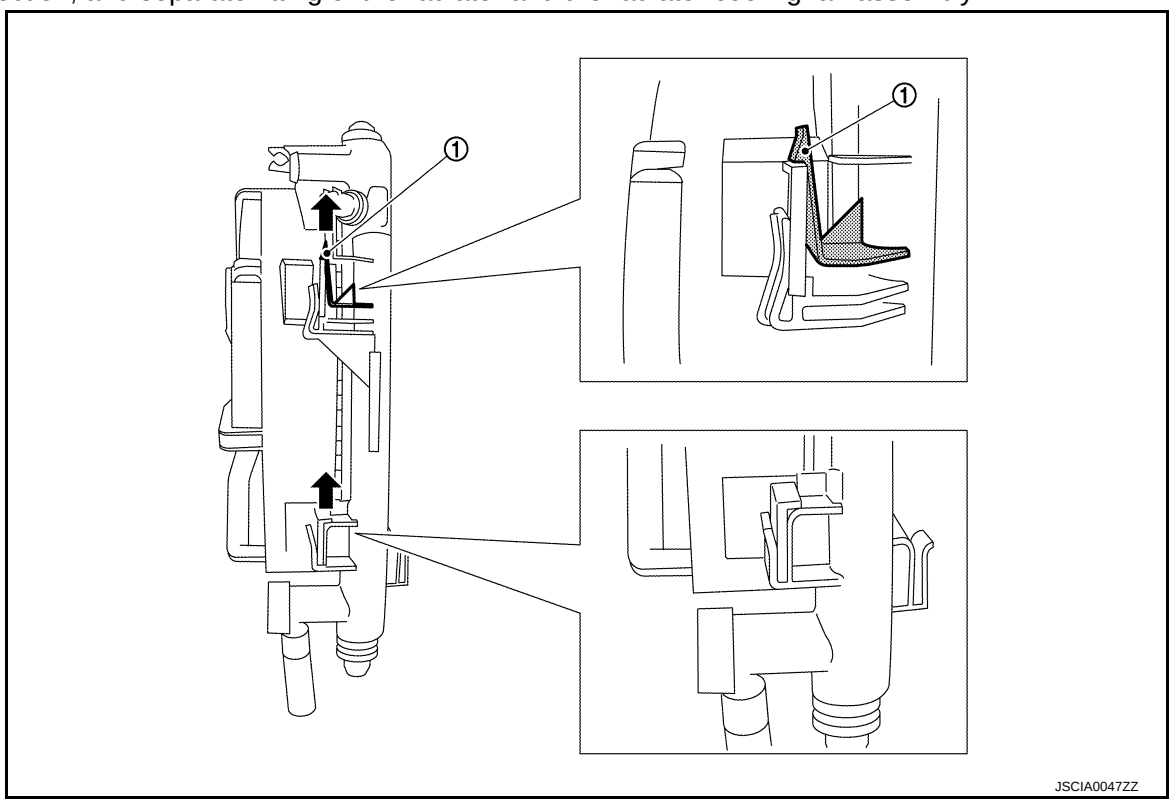
INFOID:0000000006917771

REMOVAL

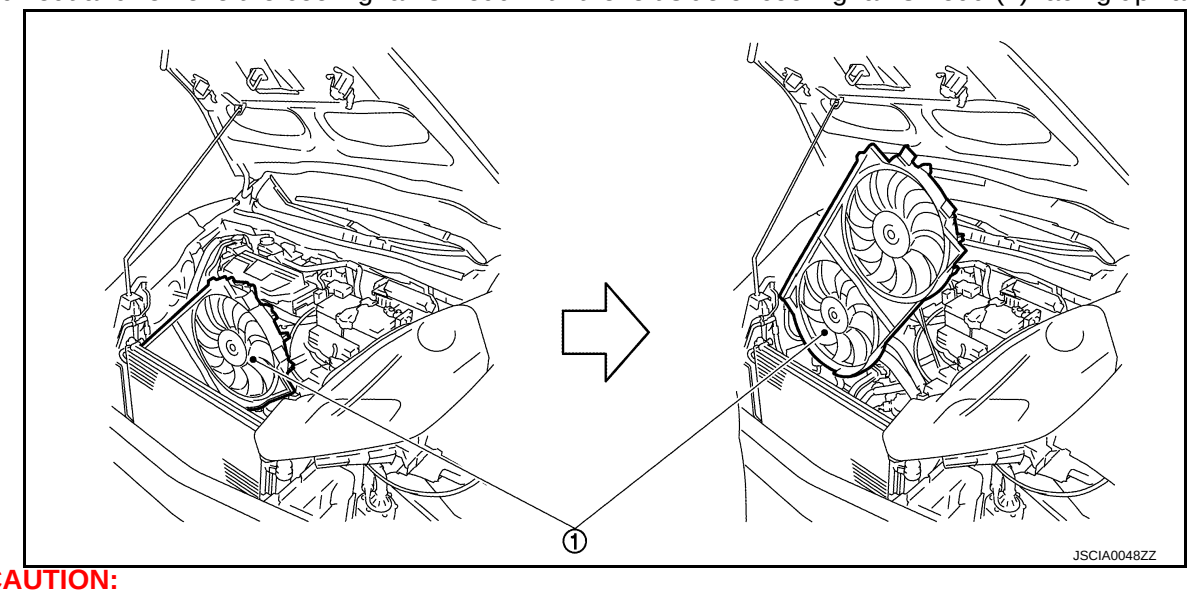
1. Radiator core support upper. Refer to DLK-144, "RADIATOR CORE SUPPORT UPPER : Removal and Installation".
2. Remove water hose bracket from front side of traction motor inverter. Refer to HCO-21, "Exploded View".
3. Remove radiator cooling fan assembly with the following procedure.

a. Disconnect the harness between cooling fan and vehicle body at fan control module.

b. While pressing left and right pawls (1) of the radiator, raise the radiator cooling fan assembly in upward direction, and separate fitting of the radiator and the radiator cooling fan assembly.



c. Pull out and remove the cooling fan shroud with the left side of cooling fan shroud (1) facing upward.

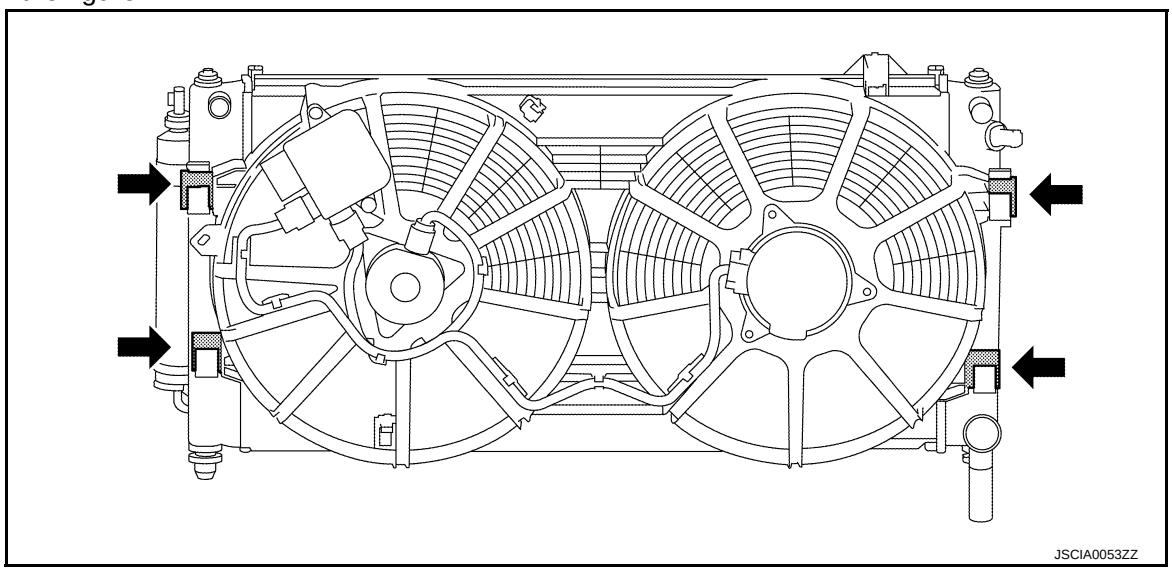


CAUTION:
Be careful not to damage radiator core.

INSTALLATION

Note the following, and install in the reverse order of removal.

- When the radiator cooling fan assembly is installed, insert the fitting area securely as shown by the arrow (⬅) in the figure.



Disassembly and Assembly

INFOID:0000000006917772

DISASSEMBLY

1. Disconnect sub-harness from fan motor and cooling fan control module.
2. Remove cooling fan control module from fan shroud.
   CAUTION:
   Handle cooling fan control module carefully and never subjecting it to impact.
3. Remove fan mounting nuts, and then remove the fan.
4. Remove fan motor.
   - Identify installation position of each valve. Arrange removed valves so that they cannot be mixed up.

ASSEMBLY

Note the following, and assemble in the reverse order of disassembly.

CAUTION:

RH and LH cooling fans are different. Be careful not to misassemble them.

- If fan motor is reused, install in its original position.
- Install each fan in the following position.

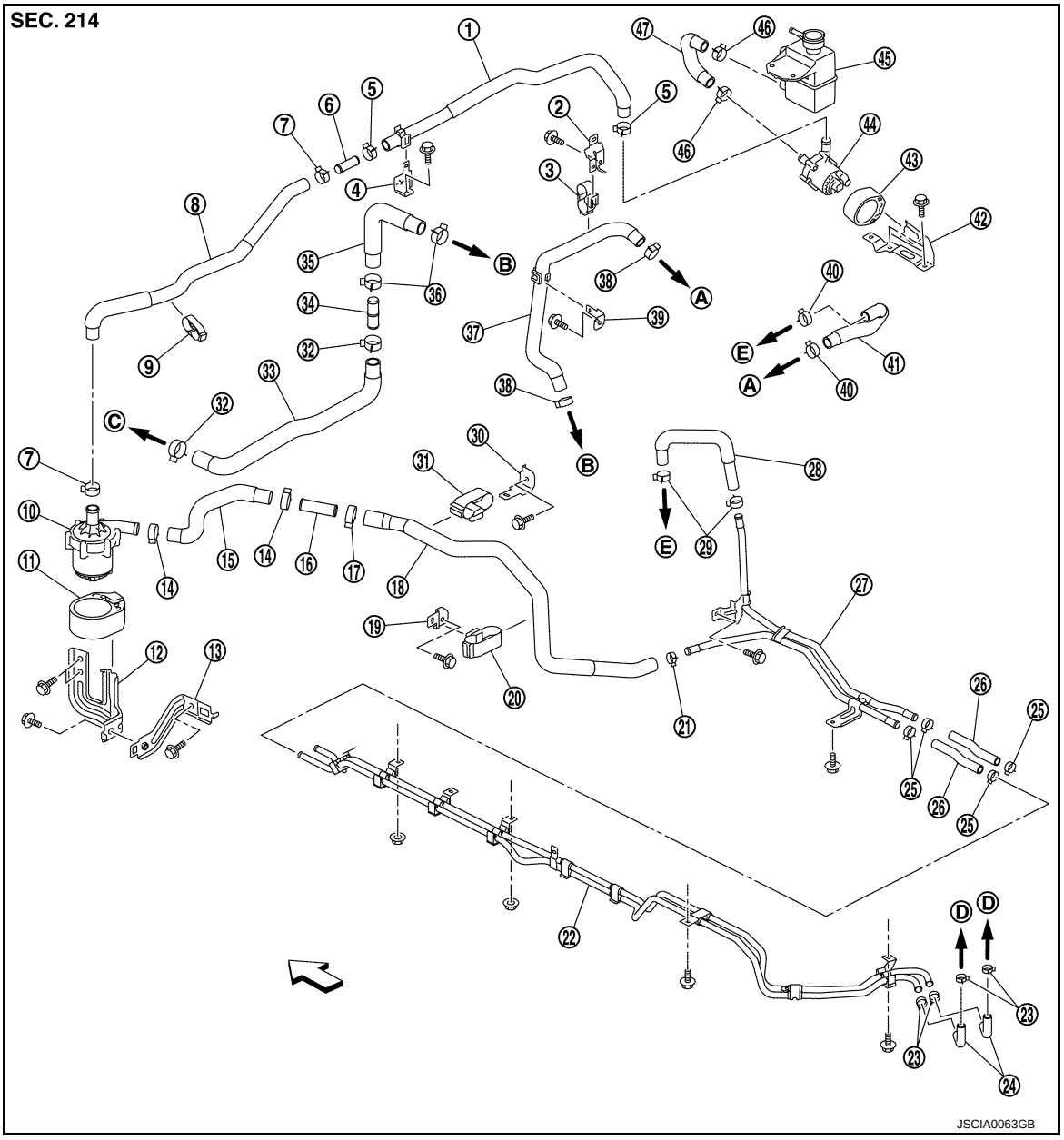
Right side	**: 9 blades**
Left side	**: 11 blades**

- Apply thread locking adhesive to the threads of the fan motor shaft and tighten fan mounting nuts.
- Secure the sub-harness tightly to the fan shroud to prevent it from interfering with the fan rotation area.

WATER PUMP

Exploded View

INFOID:0000000006917773



1. Water hose
2. Bracket
3. Hose clip
4. Bracket
5. Clamp
6. Adapter
7. Clamp
8. Water hose
9. Hose clip
10. Electric water pump 2
11. Mounting rubber
12. Pump bracket
13. Bracket
14. Clamp
15. Water hose
16. Adapter
17. Clamp
18. Water hose
19. Bracket
20. Hose clip
21. Clamp
22. Water pipe
23. Clamp
24. Water hose
25. Clamp
26. Water hose
27. Water pipe
28. Water hose
29. Clamp
30. Bracket
31. Hose clip
32. Clamp
33. Water hose
34. Adapter
35. Water hose
36. Clamp

37.	Water hose	38.	Clamp	39.	Bracket
40.	Clamp	41.	Water hose	42	Pump bracket
43.	Mounting rubber	44.	Electric water pump 1	45.	Degas tank
46.	Clamp	47.	Water hose		
A.	To traction motor inverter	B.	To traction motor	C.	To radiator
D.	To on board charger	E.	To DC/DC-J/B		

⇦ : Vehicle front

Removal and Installation

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CAUTION:
Replace the electric water pump if it has been dropped or sustained an impact.

REMOVAL

Water Pump 1 (Right)

1. Drain coolant from radiator. Refer to HCO-9, "Draining and Refilling".
   CAUTION:
   Perform the operation when the motor is cold.
2. Remove the connector and water hose of the water pump.
   CAUTION:
   - **Take care that coolant does not contact the high voltage harness connectors.**
   - **If coolant contacts a high voltage harness connector, immediately use an air blow and fully remove the liquid.**
3. Remove bolts, and remove the electric water pump together with bracket.
   CAUTION:
   - **Take care that coolant does not contact the high voltage harness connectors.**
   - **If coolant contacts a high voltage harness connector, immediately use an air blow and fully remove the liquid.**

Water Pump 2 (Left)

1. Remove the left fender protector. Refer to EXT-19, "FENDER PROTECTOR : Removal and Installation".
2. Drain coolant from radiator. Refer to HCO-9, "Draining and Refilling".
   CAUTION:
   Perform the operation when the motor is cold.
3. Remove the connector of the water pump.
4. Remove the connector and water hose of the water pump.
5. Remove bolts, and remove the electric water pump together with bracket.

INSTALLATION

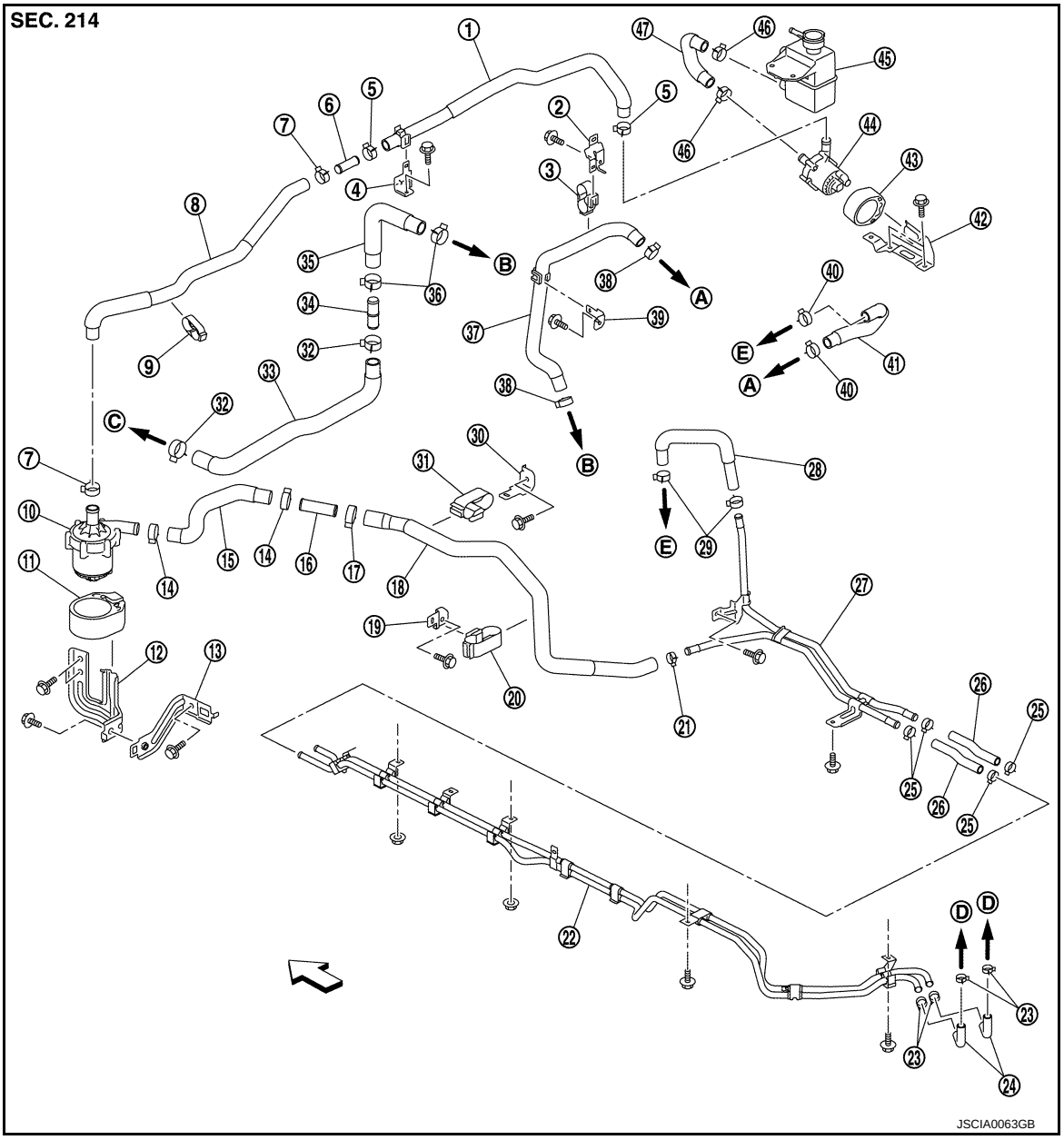
Note the following, and install in the reverse order of removal.

CAUTION:
- **When installing the water hose to electric water pump, be sure to hold the electric water pump by hand.**
- **Be sure to perform the air bleeding. Refer to HCO-9, "Draining and Refilling".**

WATER HOSE AND PIPING

Exploded View

INFOID:0000000006917775



1. Water hose
2. Bracket
3. Hose clip
4. Bracket
5. Clamp
6. Adapter
7. Clamp
8. Water hose
9. Hose clip
10. Electric water pump 2
11. Mounting rubber
12. Pump bracket
13. Bracket
14. Clamp
15. Water hose
16. Adapter
17. Clamp
18. Water hose
19. Bracket
20. Hose clip
21. Clamp
22. Water pipe
23. Clamp
24. Water hose
25. Clamp
26. Water hose
27. Water pipe
28. Water hose
29. Clamp
30. Bracket
31. Hose clip
32. Clamp
33. Water hose
34. Adapter
35. Water hose
36. Clamp

37. Water hose
38. Clamp
39. Bracket
40. Clamp
41. Water hose
42 Pump bracket
43. Mounting rubber
44. Electric water pump 1
45. Degas tank
46. Clamp
47. Water hose
A. To traction motor inverter
B. To traction motor
C. To radiator
D. To on board charger
E. To DC/DC-J/B
⇦ : Vehicle front

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Periodical Maintenance Specification

INFOID:0000000006917776

COOLANT CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

Coolant capacity (With reservoir tank at “MAX” level)	6.6 (7, 5-6/8)
Reservoir tank coolant capacity (At “MAX” level)	0.8 (7/8, 6/8)

Radiator

INFOID:0000000006917777

Unit: kPa (kg/cm^2, psi)

Leakage testing pressure	32 (0.3, 5)