

ENGINE COOLING SYSTEM

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PRECAUTION

PRECAUTIONS

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

INFOID:000000009642934

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 ignition ON or engine running, 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 ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.

PREPARATION

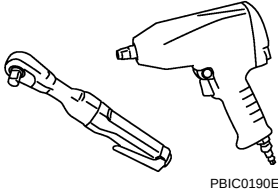
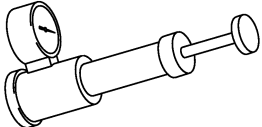
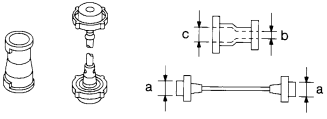
PREPARATION

Commercial Service Tools

INFOID:000000009234020

A

CO

Tool name	Description
Power tool  PBIC0190E	Loosening nuts and bolts
Radiator cap tester  PBIC1982E	Checking radiator and radiator cap
Radiator cap tester adapter  S-NT564	Adapting radiator cap tester to radiator cap and water outlet (front) filler neck a: 28 (1.10) dia. b: 31.4 (1.236) dia. c: 41.3 (1.626) dia. Unit: mm (in)

C

D

E

F

G

H

I

J

K

L

M

N

O

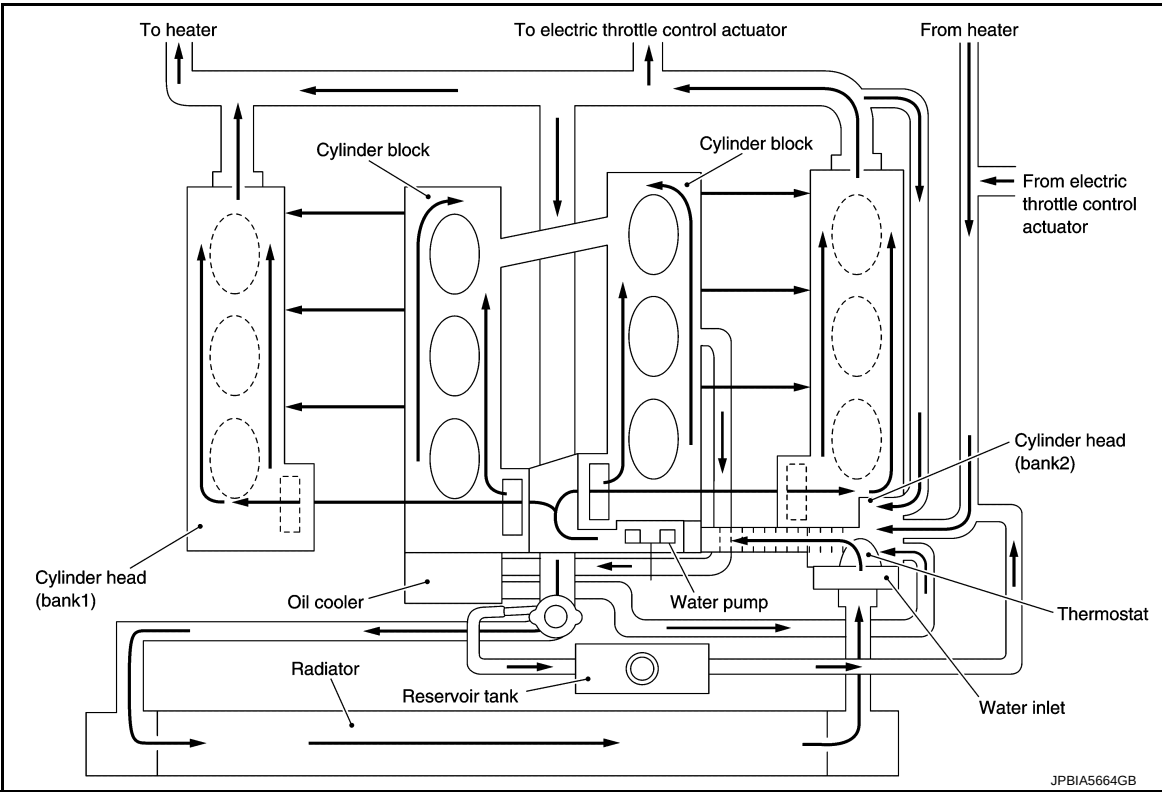
P

SYSTEM DESCRIPTION

DESCRIPTION

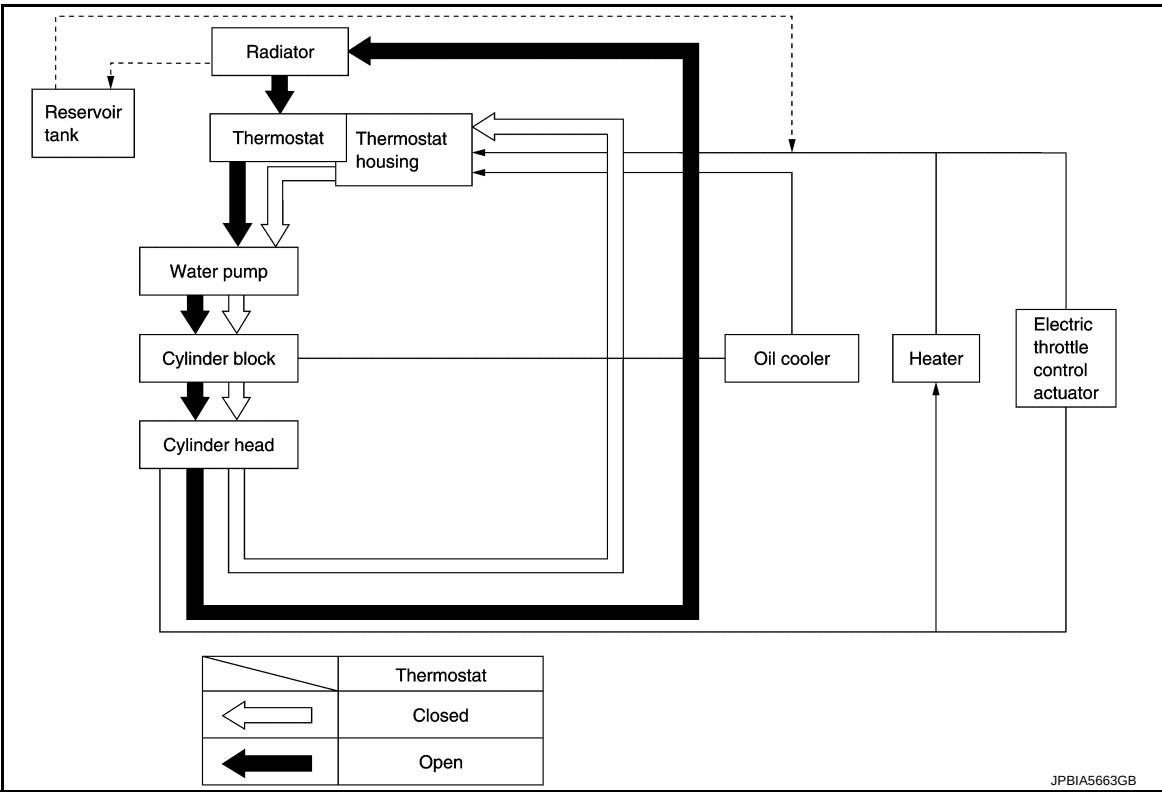
Engine Cooling System

INFOID:000000009234021



Engine Cooling System Schematic

INFOID:000000009234022



OVERHEATING CAUSE ANALYSIS

< SYMPTOM DIAGNOSIS >

[VQ37VHR]

SYMPTOM DIAGNOSIS

OVERHEATING CAUSE ANALYSIS

Troubleshooting Chart

INFOID:000000009234023

Symptom		Check items	
Cooling system parts malfunction	Poor heat transfer	Water pump malfunction	Worn or loose drive belt
		Thermostat stuck closed	—
		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 engine coolant mixture ratio	—	—
	Poor engine coolant quality	—	Engine coolant density
	Insufficient engine coolant	Cooling hose	Loose clamp
			Cracked hose
		Water pump	Poor sealing
		Radiator cap	Loose
			Poor sealing
		Radiator	O-ring for damage, deterioration or improper fitting
			Cracked radiator tank
			Cracked radiator core
		Reservoir tank	Cracked reservoir tank
	Overflowing reservoir tank	Exhaust gas leakage into cooling system	Cylinder head deterioration
			Cylinder head gasket deterioration

OVERHEATING CAUSE ANALYSIS

< SYMPTOM DIAGNOSIS >

[VQ37VHR]

	Symptom		Check items	
Except cooling system parts malfunction	—	Overload on engine	Abusive driving	High engine rpm under no load
				Driving in low gear for extended time
				Driving at extremely high speed
			Powertrain system malfunction	—
			Installed improper size wheels and tires	
			Dragging brakes	
			Improper ignition timing	
	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

ENGINE COOLANT

Inspection

INFOID:000000009234024

LEVEL

- Check if the reservoir tank engine coolant level is within the "MIN" to "MAX" when the engine is cool.

Ⓐ : MAX

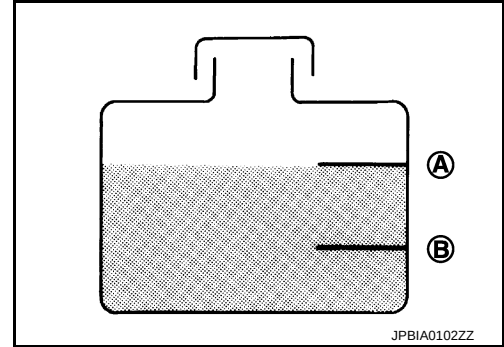
Ⓑ : MIN

- Adjust the engine coolant level if necessary.

CAUTION:

Refill Genuine NISSAN Long Life Antifreeze/Coolant (blue) or equivalent in its quality mixed with water (distilled or demineralized). Refer to [MA-14, "FOR NORTH AMERICA : Fluids and Lubricants"](#) (FOR NORTH AMERICA), [MA-15, "FOR MEXICO : Fluids and Lubricants"](#) (FOR MEXICO).

- Check that the reservoir tank cap is tightened.



LEAKAGE

- To check for leakage, apply pressure to the cooling system with the radiator cap tester (commercial service tool) (A) and radiator cap tester adapter (commercial service tool) (B).

Testing pressure : Refer to [CO-26, "Radiator"](#).

WARNING:

Never remove radiator cap and reservoir tank cap when engine is hot. Serious burns could occur from high-pressure engine coolant escaping from engine cooling system.

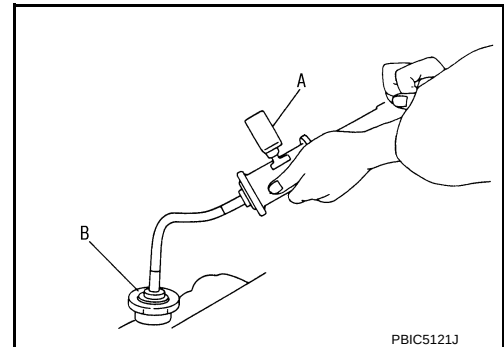
CAUTION:

Higher test pressure than specified may cause radiator damage.

NOTE:

In a case that engine coolant decreases, replenish radiator with engine coolant.

- If anything is found, repair or replace damaged parts.



Draining

INFOID:000000009234025

WARNING:

- To avoid being scalded, never change engine coolant when the engine is hot.
- Wrap a thick cloth around reservoir tank cap and carefully remove reservoir tank cap. First, turn reservoir tank cap a quarter of a turn to release built-up pressure. Then turn reservoir tank cap all the way.
- Never spill engine coolant on drive belt.

- Remove front under cover. Refer to [EXT-32, "FRONT UNDER COVER : Exploded View"](#).
- Connect drain hose.

NOTE:

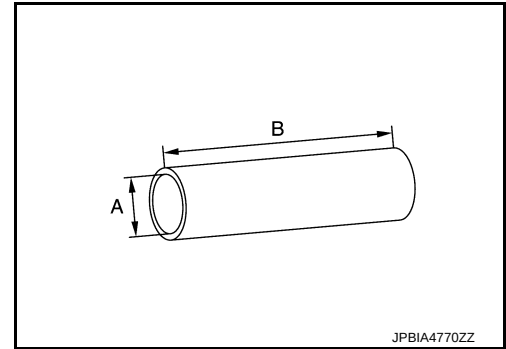
ENGINE COOLANT

< PERIODIC MAINTENANCE >

[VQ37VHR]

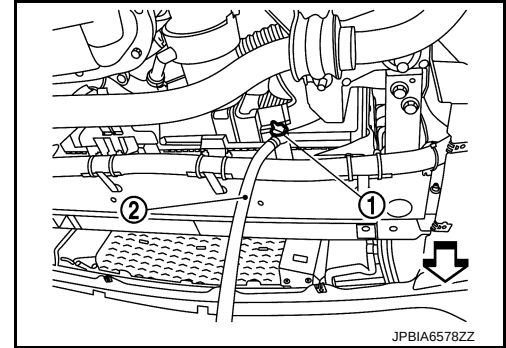
Use a general-purpose hose with the dimensions shown in the figure.

- A : ϕ 8 - 9 mm (0.31 - 0.35 in)
B : 145 mm (5.71 in)



3. Open radiator drain cock ① at the bottom of radiator, and then remove reservoir tank cap.

- ② : Drain hose
⇐ : Vehicle front



When draining all of engine coolant in the system, open water drain plugs on cylinder block. Refer to [EM-87, "Setting"](#).

4. Check drained engine coolant for contaminants such as rust, corrosion or discoloration.
If contaminated, flush the engine cooling system. Refer to [CO-9, "Flushing"](#).
5. Disconnect drain hose.

Refilling

INFOID:000000009234026

CAUTION:

- Do not reuse O-rings.
- Do not put additive such as waterleak preventive, since it may cause cooling waterway clogging.
- When refilling use Genuine NISSAN Long Life Antifreeze/Coolant (blue) or equivalent in its quality mixed with water (distilled or demineralized). Refer to [MA-14, "FOR NORTH AMERICA : Fluids and Lubricants"](#) (FOR NORTH AMERICA), [MA-15, "FOR MEXICO : Fluids and Lubricants"](#) (FOR MEXICO).

1. Remove air duct (inlet). Refer to [EM-29, "Exploded View"](#).
2. Install reservoir tank if removed, and radiator drain cock.

CAUTION:

Be sure to clean drain cock and install with new O-ring.

Tightening torque : Refer to [CO-13, "Exploded View"](#).

If water drain plugs on cylinder block are removed, close and tighten them. Refer to [EM-129, "Dis-assembly and Assembly"](#).

3. Check that each hose clamp has been firmly tightened.

ENGINE COOLANT

< PERIODIC MAINTENANCE >

[VQ37VHR]

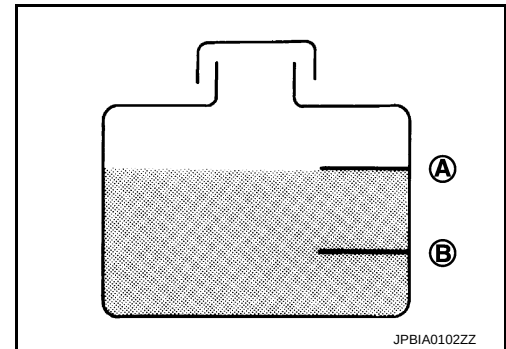
4. Fill up the engine cooling system with engine coolant.

- Ⓐ : MAX
Ⓑ : MIN

Pour engine coolant through reservoir tank filler neck slowly of less than 3 ℓ (3-1/8 US qt, 2-5/8 Imp qt) a minute to allow air in system to escape.

Engine coolant capacity
(With reservoir tank at
"MAX" level)

: Refer to [CO-26,](#)
["Periodical Maintenance](#)
[Specification".](#)



Reservoir tank engine coolant capacity
(At "MAX" level)

:Refer to [CO-26,](#)
["Periodical Maintenance Specification"](#)

5. Install reservoir tank cap.
6. Start engine, and stop at once.
7. Leave engine for about 10sec. Then check the coolant level at the reservoir tank.
8. Refill reservoir tank to "MAX" level line with engine coolant.
9. Repeat step 5 through 8 until engine coolant level no longer drops.
10. Install reservoir tank cap.
11. Warm up engine until opening thermostat. Standard for warming-up time is approximately 10 minutes at 2,000 rpm.
• Check thermostat opening condition by touching radiator hose (lower) to see a flow of warm water.
CAUTION:
Watch water temperature gauge so as not to overheat engine.
12. Stop the engine and cool down to less than approximately 50°C (122°F).
• Cool down using fan to reduce the time.
• Check the engine coolant level. If the level is low, refill with engine coolant and repeat the steps from Step 4.
13. Refill reservoir tank to "MAX" level line with engine coolant.
14. Check cooling system for leakage with engine running.
15. Check flow noise, according to the following steps.
CAUTION:
To check flow noise, turn OFF the radio and close the windows, doors, and the hood.
a. Allow the engine to become cold [approximately 50°C (122°F) or less].
b. Start the engine, maintain 1000 rpm for approximately 30 seconds, and increase the engine speed from 1000 to 3000 rpm. Repeat this cycle three times.
c. Check that flow noise can be heard from the heater core during the Step b operation.
d. If flow noise can be heard, repeat from Step 15 of Refilling to Step c of Flow Noise Verification Method.
e. Check that the reservoir tank cap is tightened.
16. Install air duct (inlet). Refer to [EM-29, "Exploded View".](#)

Flushing

INFOID:000000009234027

1. Install reservoir tank if removed, and radiator drain cock.

CAUTION:

Be sure to clean drain cock and install with new O-ring.

Tightening torque : Refer to [CO-13, "Exploded View".](#)

If water drain plugs on cylinder block are removed, close and tighten them. Refer to [EM-87, "Setting".](#)

2. Fill radiator and reservoir tank with water and reinstall reservoir tank cap.

Tightening torque : Refer to [CO-13, "Exploded View"](#).

3. Run the engine and warm it up to normal operating temperature.
4. Rev the engine two or three times under no-load.
5. Stop the engine and wait until it cools down.
6. Drain water from the system. Refer to [CO-7, "Draining"](#).
7. Repeat steps 1 through 6 until clear water begins to drain from radiator.
8. Check that the reservoir tank cap is tightened.

RADIATOR

RESERVOIR TANK CAP

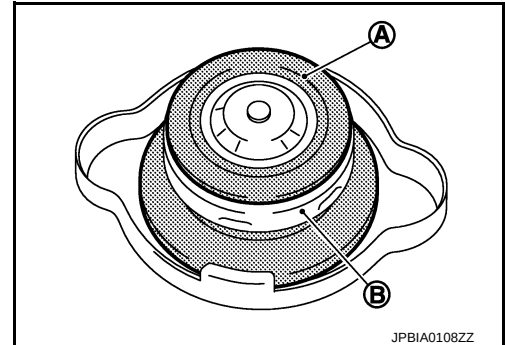
RESERVOIR TANK CAP : Inspection

INFOID:000000009234028

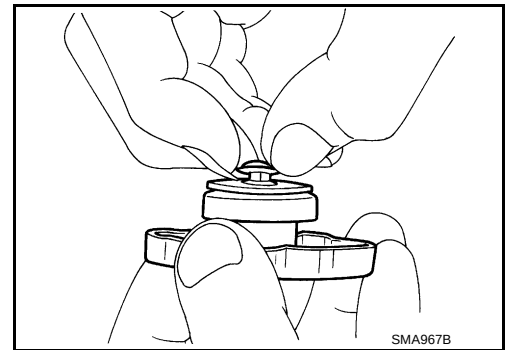
- Check valve seat ① of reservoir tank cap.

② : Metal plunger

- Check if valve seat is swollen to the extent that the edge of the plunger ② cannot be seen when watching it vertically from the top.
- Check if valve seat has no soil and damage.



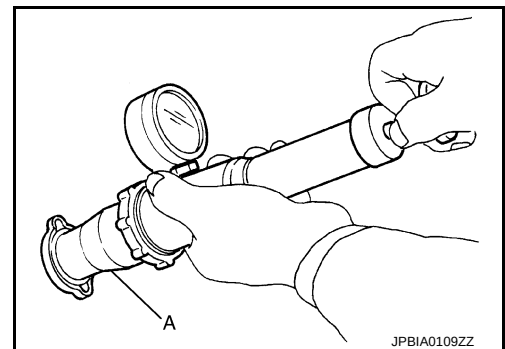
- Pull negative-pressure valve to open it, and check that it close completely when released.
- Check that there is no dirt or damage on the valve seat of reservoir tank cap negative-pressure valve.
- Check that there are no unusualness in the opening and closing conditions of negative-pressure valve.



- Check reservoir tank cap relief pressure.

Standard and limit : Refer to [CO-26, "Radiator"](#).

- When connecting reservoir tank cap to the radiator cap tester and the radiator cap tester adapter (commercial service tool) (A), apply engine coolant to the cap seal surface.



- Replace reservoir tank cap if there is an unusualness related to the above three.

CAUTION:

When installing reservoir tank cap, thoroughly wipe out the reservoir tank to remove any waxy residue or foreign material.

RADIATOR

RADIATOR : Inspection

INFOID:000000009234029

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

- 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 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.

RADIATOR

< PERIODIC MAINTENANCE >

[VQ37VHR]

- Use compressed air lower than 490 kPa (5 kg/cm², 71 psi) and keep distance more than 30 cm (11.8 in).
5. Blow air again into all the radiator core surfaces once per minute until no water sprays out.

RADIATOR

< REMOVAL AND INSTALLATION >

[VQ37VHR]

REMOVAL AND INSTALLATION

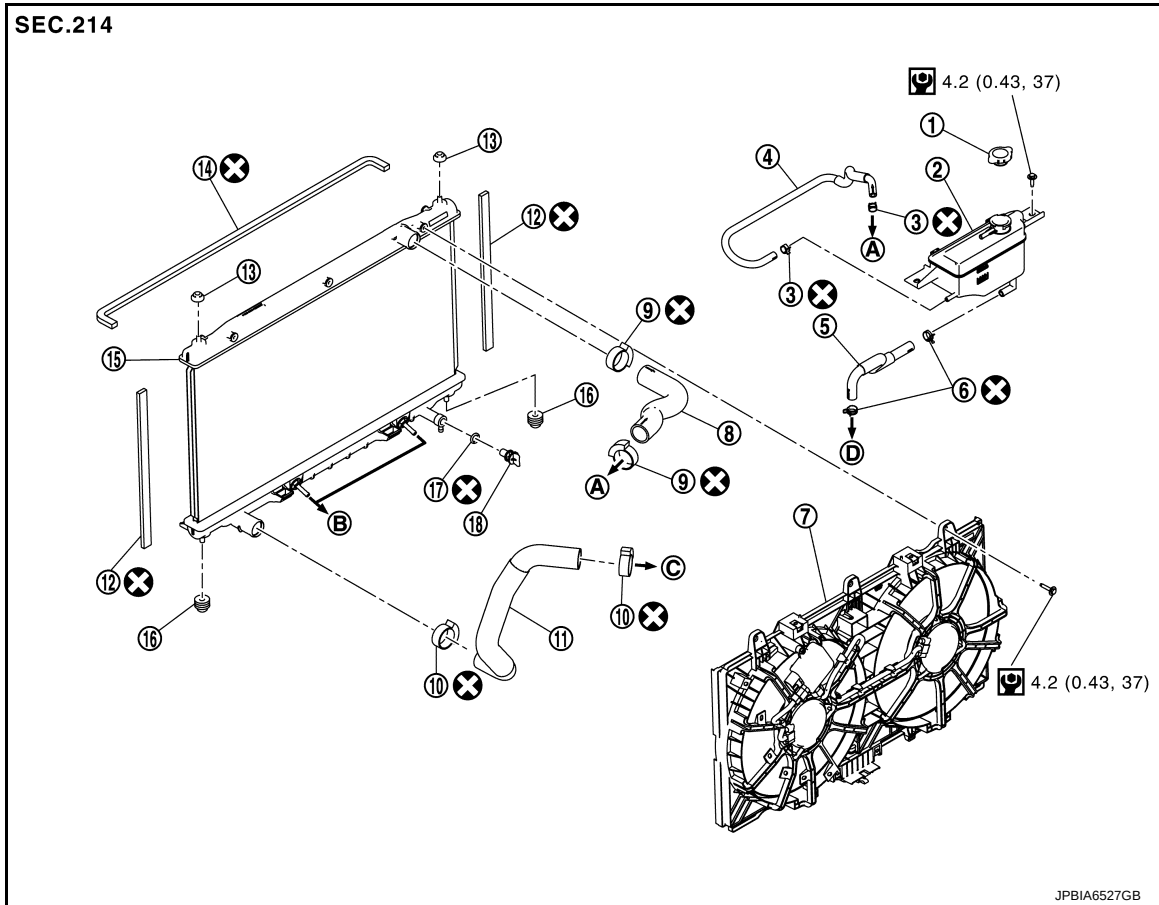
RADIATOR

Exploded View

INFOID:000000009234030

A

CO



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- | | | |
|-----------------------------|-------------------------|--------------------|
| ① Reservoir tank cap | ② Reservoir tank | ③ Clamp |
| ④ Reservoir tank hose | ⑤ Reservoir tank hose | ⑥ Clamp |
| ⑦ Cooling fan assembly | ⑧ Radiator hose (Upper) | ⑨ Clamp |
| ⑩ Clamp | ⑪ Radiator hose (lower) | ⑫ Seal |
| ⑬ Mounting rubber (upper) | ⑭ Seal | ⑮ Radiator |
| ⑯ Mounting rubber (lower) | ⑰ O-ring | ⑱ Drain cock |
| (A) To water outlet (front) | (B) To transmission | (C) To water inlet |
| (D) To heater pipe | | |

: N·m (kg·m, in-lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:000000009234031

REMOVAL

WARNING:

Never remove radiator cap and reservoir tank cap when engine is hot. Serious burns could occur from high-pressure engine coolant escaping from engine cooling system. Wrap a thick cloth around the cap. Slowly turn it a quarter of a turn to release built-up pressure. Carefully remove radiator cap and reservoir tank cap by turning it all the way.

RADIATOR

< REMOVAL AND INSTALLATION >

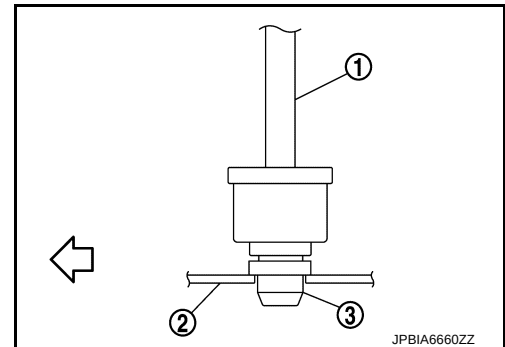
[VQ37VHR]

NOTE:

When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

1. Remove the following parts:
 - Front under cover with power tool: Refer to [EXT-34, "FRONT UNDER COVER : Removal and Installation"](#).
 - Engine cover: Refer to [EM-26, "Exploded View"](#).
 - Air duct (inlet): Refer to [EM-29, "Exploded View"](#).
2. Drain engine coolant from radiator. Refer to [CO-7, "Draining"](#).
CAUTION:
 - Perform this step when the engine is cold.
 - Never spill engine coolant on drive belt.
3. Remove reservoir tank and reservoir tank hose.
4. Disconnect A/T fluid cooler hoses from radiator.
5. Remove radiator hoses (upper and lower).
6. Remove cooling fan assembly. Refer to [CO-17, "Exploded View"](#).
CAUTION:
Never damage or scratch radiator core when removing.
7. Remove radiator core support ornament. Refer to [DLK-181, "Exploded View"](#).
8. Move condenser as following steps:
 - a. Remove condenser mounting screw.
 - i. Lift up and pull the radiator ① with condenser backward, and then remove the mounting rubber (lower) ③ from the radiator core support ②.

← : Vehicle front



- ii. Remove condenser mounting screw.
- b. Set the radiator with condenser to the radiator core support.
- c. Lift the lower left side of condenser ① to remove it from the condenser mounting part A of radiator.

NOTE:

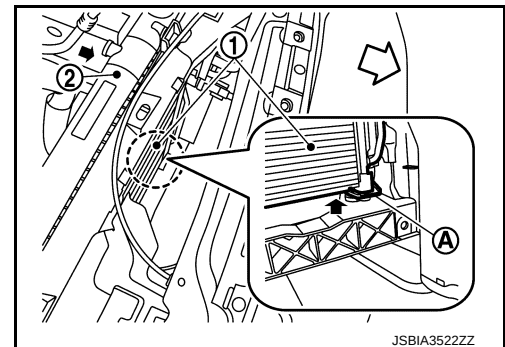
Hold radiator ② to prevent it from leaning backward.

- Remove lower right side in the same manner.

9. Remove radiator.

CAUTION:

Be careful not to damage radiator core.



INSTALLATION

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

CAUTION:

- Do not reuse O-rings.
- Replace water hose clamp if it is removed.
- Use genuine mounting bolts for the cooling fan assembly and strictly observe the tightening torque. (Breakage prevention for radiator)

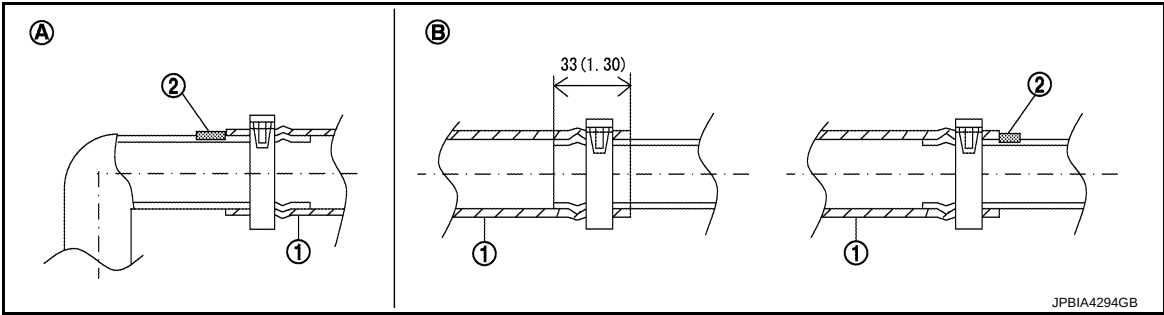
NOTE:

- Insert the radiator hose ① all the way to the stopper ② or by 33 mm (1.30 in) (hose without a stopper).

RADIATOR

< REMOVAL AND INSTALLATION >

[VQ37VHR]

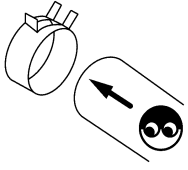
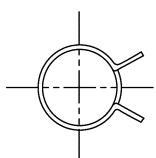
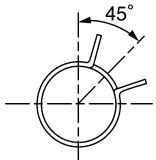
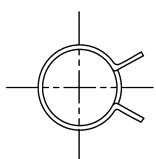
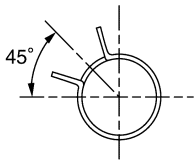


Unit mm (in)

Ⓐ Radiator side

Ⓑ Engine side

- Refer to the following table when installing the hose clamps.

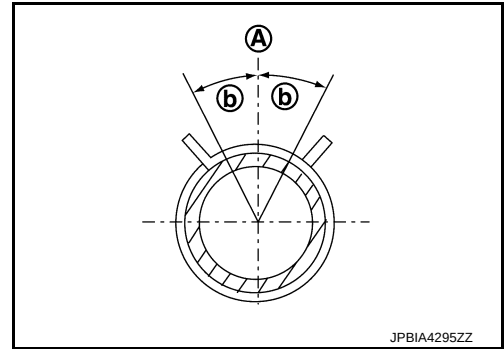
Hose location	Hose end	Direction of paint mark	Direction of hose clamp tabs  JPCIA0366ZZ ⇐: Vehicle upper ⇐: Vehicle front
Radiator hose (upper)	Radiator side	Vehicle upper	 JPCIA0360ZZ
	Engine side	Vehicle upper	 JPCIA0363ZZ
Radiator hose (lower)	Radiator side	Vehicle lower	 JPCIA0360ZZ
	Engine side	Vehicle upper left	 JPCIA0365ZZ

RADIATOR

< REMOVAL AND INSTALLATION >

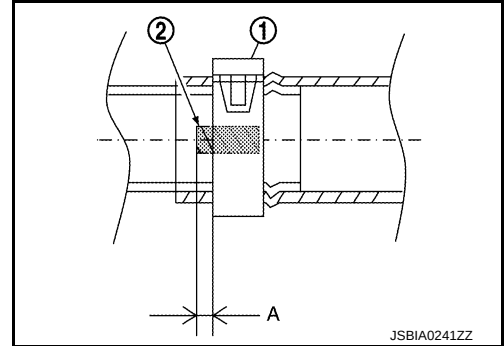
[VQ37VHR]

- The direction of the hose clamp tabs must be within $\pm 30^\circ$ (b) of the indicated position (A).



- When installing hose clamp (1), check that the distance "A" between the end of the radiator hose paint mark (2) and the hose clamp is within the standard range.

**Dimension "A" : (-1) - (+1) mm
(-0.04) - (+0.04) in**



Inspection

INFOID:000000009234032

INSPECTION AFTER INSTALLATION

- Check that the reservoir tank cap is tightened.
- Check for leakage of engine coolant using the radiator cap tester adapter and the radiator cap tester (commercial service tool). Refer to [CO-7, "Inspection"](#).
- Start and warm up the engine. Visually check that there is no leakage of engine coolant and A/T fluid (A/T models).

COOLING FAN

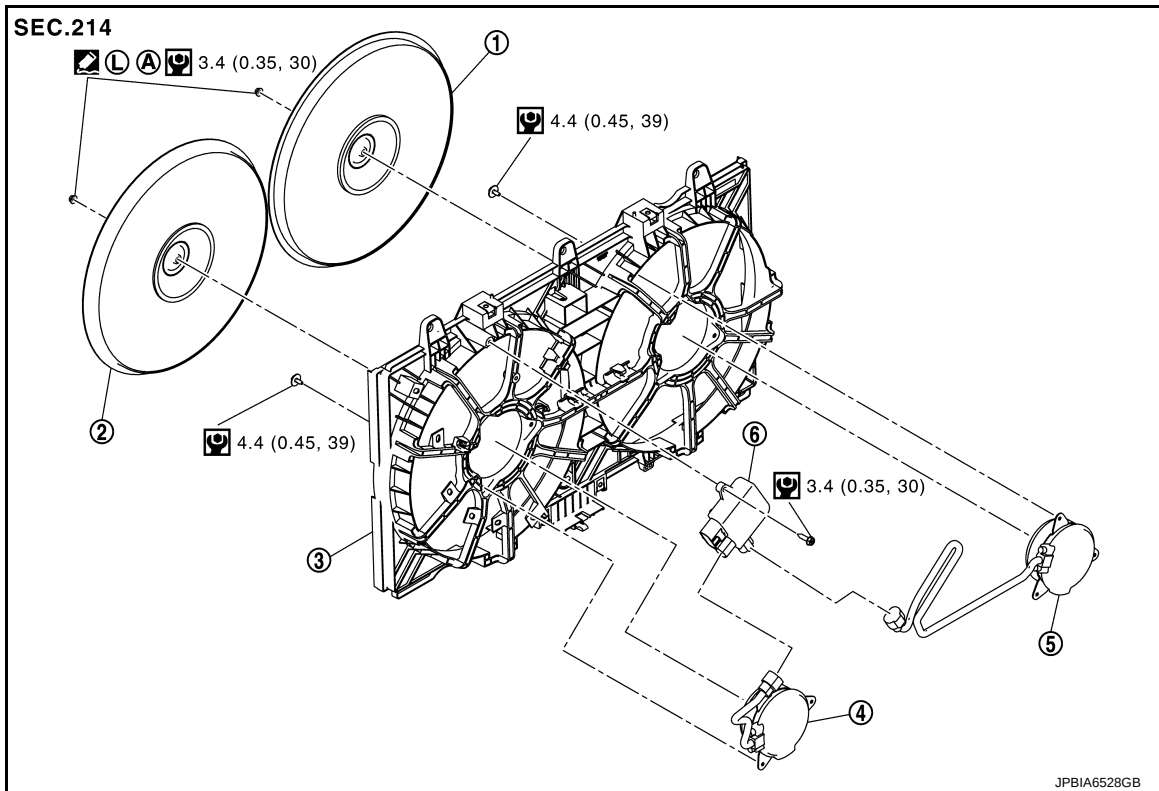
< REMOVAL AND INSTALLATION >

[VQ37VHR]

COOLING FAN

Exploded View

INFOID:000000009234033



- | | | |
|---|--------------------|------------------------------|
| ① Cooling fan (RH) | ② Cooling fan (LH) | ③ Fan shroud |
| ④ Fan motor 1 | ⑤ Fan motor 2 | ⑥ Cooling fan control module |
| Ⓐ Apply on fan motor shaft | | |
| Ⓛ : Apply Genuine High Strength thread Locking Sealant or equivalent. | | |
| : N·m (kg-m, in-lb) | | |

Removal and Installation

INFOID:000000009234034

REMOVAL

1. Remove front under cover, using a power tool. Refer to [EXT-34, "FRONT UNDER COVER : Removal and Installation"](#).
2. Drain engine coolant. Refer to [CO-7, "Draining"](#).
3. Remove reservoir tank and reservoir tank hose. Refer to [CO-13, "Exploded View"](#)
4. Remove air duct (inlet) and air cleaner assembly (bank 1 and bank 2). Refer to [EM-29, "Exploded View"](#).
5. Disconnect harness connector from cooling fan control module, and move harness to aside.
6. Remove harness clips.
7. Remove radiator hose (upper). Refer to [CO-13, "Exploded View"](#).
8. Remove A/T oil cooler tube from fanshroud.
9. Remove cooling fan assembly.

CAUTION:

Be careful not to damage or scratch on radiator core.

INSTALLATION

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

CAUTION:

COOLING FAN

< REMOVAL AND INSTALLATION >

[VQ37VHR]

Only use genuine parts for cooling fan mounting bolt and observe the specified torque (to prevent core support from being damaged).

Disassembly and Assembly

INFOID:000000009234035

DISASSEMBLY

1. Disconnect fan motor harness connectors from cooling fan control module.
2. Remove cooling fan control module from cooling fan assembly.
CAUTION:
Handle carefully to avoid dropping and shocks.
3. Remove cooling fan mounting nuts, and then remove the cooling fan (RH and LH).
4. Remove fan motors (1 and 2).

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.

- Install each fan in the following position.

Right side : 9 blades

Left side : 7 blades

- Secure the harness tightly to the fan shroud to prevent the fan rotation area from being loose.

Inspection

INFOID:000000009234036

INSPECTION AFTER REMOVAL

Check that fan motors operate normally.

NOTE:

Cooling fans are controlled by cooling fan control module. For details, refer to [EC-50. "COOLING FAN CONTROL : System Description"](#).

INSPECTION AFTER DISASSEMBLY

Cooling Fan

Inspect cooling fan for crack or unusual bend.

- If anything is found, replace cooling fan.

WATER PUMP

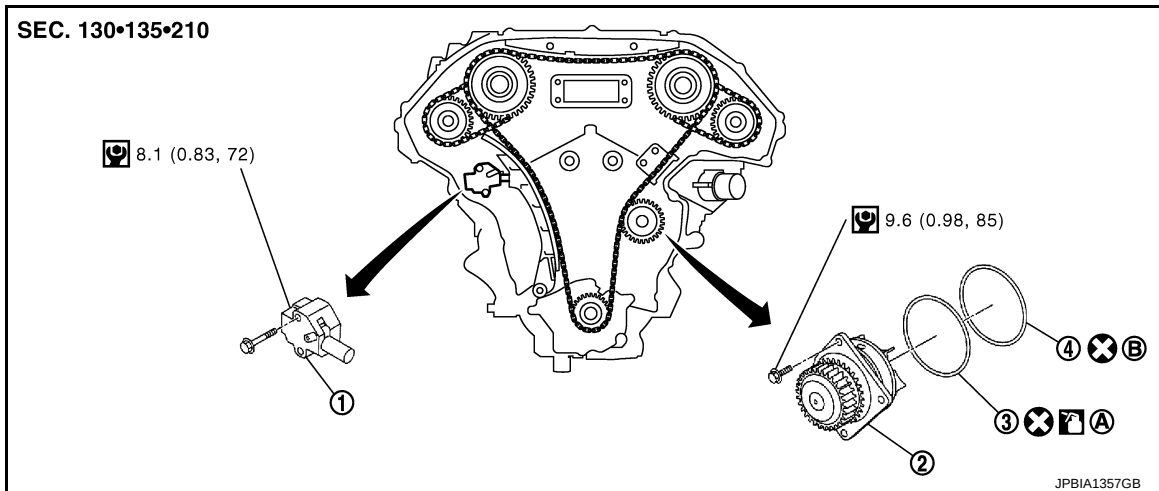
< REMOVAL AND INSTALLATION >

[VQ37VHR]

WATER PUMP

Exploded View

INFOID:000000009234037



① Timing chain tensioner (primary)

② Water pump

③ O-ring

④ O-ring

(A) Identify with yellow paint mark

(B) Identify with light blue paint mark
Apply engine coolant

⊗ : Always replace after every disassembly.

🔧 : Should be lubricated with oil.

🔧 : N·m (kg·m, in·lb)

Removal and Installation

INFOID:000000009234038

CAUTION:

- When removing water pump assembly, be careful not to get engine coolant on drive belt.
- Water pump cannot be disassembled and should be replaced as a unit.
- After installing water pump, connect hose and clamp securely, then check for leakage using the radiator cap tester and the radiator cap tester adapter (commercial service tool).

REMOVAL

1. Remove engine cover. Refer to [EM-26, "Exploded View"](#).
2. Release the fuel pressure. Refer to [EC-167, "Work Procedure"](#).
3. Disconnect the battery cable from the negative terminal.
4. Remove air duct (inlet) and air cleaner assembly (bank 1 and bank 2). Refer to [EM-29, "Exploded View"](#).
5. Separate engine harness removing their brackets from front timing chain case.
6. Remove front under cover, using a power tool. Refer to [EXT-34, "FRONT UNDER COVER : Removal and Installation"](#).
7. Drain engine oil. Refer to [CO-7, "Draining"](#).
CAUTION:
 - Perform this step when the engine is cold.
 - Never spill engine oil on drive belt.
8. Drain engine coolant from radiator. Refer to [CO-7, "Draining"](#).
CAUTION:
 - Perform this step when the engine is cold.
 - Never spill engine coolant on drive belt.
9. Remove reservoir tank. Refer to [CO-13, "Exploded View"](#).
10. Remove cooling fan assembly. Refer to [CO-17, "Exploded View"](#).

WATER PUMP

[VQ37VHR]

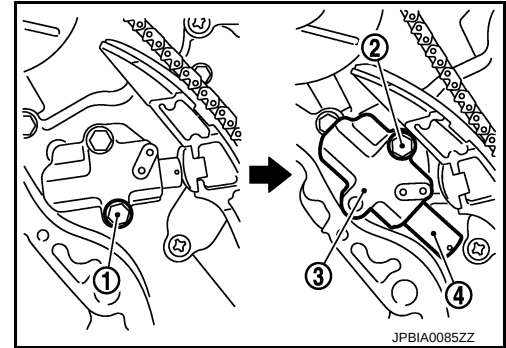
< REMOVAL AND INSTALLATION >

11. Remove radiator hose (lower). Refer to [CO-13, "Exploded View"](#).
12. Remove front timing chain case. Refer to [EM-53, "Exploded View"](#).
13. Remove timing chain tensioner (primary) ③ as follows:

- a. Remove lower mounting bolt ①.
- b. Loosen upper mounting bolt ② slowly, and then turn chain tensioner (primary) on the upper mounting bolt so that plunger ④ is fully expanded.

NOTE:

Even if plunger is fully expanded, it is not dropped from the body of timing chain tensioner (primary).



- c. Remove upper mounting bolt, and then remove timing chain tensioner (primary).

14. Remove water pump as follows:

- a. Remove three water pump mounting bolts. Secure a gap between water pump gear and timing chain, by turning crankshaft counterclockwise until timing chain looseness on water pump sprocket becomes maximum.

- b. Screw M8 bolts ① [pitch: 1.25 mm (0.049 in) length: approx. 50 mm (1.97 in)] into water pumps upper and lower mounting bolt holes until they reach timing chain case. Then, alternately tighten each bolt for a half turn, and pull out water pump ①.

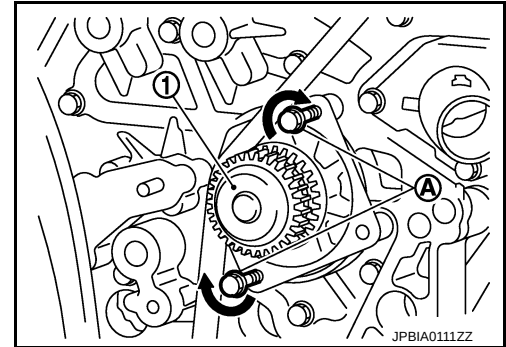
CAUTION:

- Pull straight out while preventing vane from contacting socket in installation area.
- Remove water pump without causing sprocket to contact timing chain.

- c. Remove M8 bolts and O-rings from water pump.

CAUTION:

Never disassemble water pump.



INSTALLATION

CAUTION:

Do not reuse O-rings.

1. Install new O-rings to water pump.

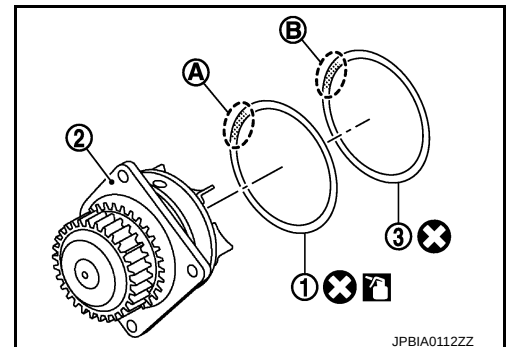
CAUTION:

Do not reuse O-rings.

- Apply engine oil to O-ring ① and engine coolant to O-ring ③ as shown in the figure.

② : Water pump

- Locate O-ring with yellow paint mark ① to front side.
- Locate O-ring with light blue paint mark ③ to rear side.



2. Install water pump.

CAUTION:

Never allow cylinder block to nip O-rings when installing water pump.

- Check timing chain and water pump sprocket are engaged.
- Insert water pump by tightening mounting bolts alternately and evenly.

3. Install timing chain tensioner (primary) as follows:

WATER PUMP

< REMOVAL AND INSTALLATION >

[VQ37VHR]

a. Turn crankshaft clockwise so that timing chain on the timing chain tensioner (primary) side is loose.

b. Pull plunger stopper tab (A) up (or turn lever downward) so as to remove plunger stopper tab from the ratchet of plunger (D).

NOTE:

Plunger stopper tab and lever (C) are synchronized.

c. Push plunger into the inside of tensioner body.

d. Hold plunger in the fully compressed position by engaging plunger stopper tab with the tip of ratchet.

e. To secure lever, insert stopper pin (E) through hole of lever into tensioner body hole (B).

- The lever parts and the tab are synchronized. Therefore, the plunger will be secured under this condition.

NOTE:

Figure shows the example of 1.2 mm (0.047 in) diameter thin screwdriver being used as the stopper pin.

f. Install timing chain tensioner (primary).

- Remove dust and foreign material completely from backside of timing chain tensioner (primary) and from installation area of rear timing chain case.

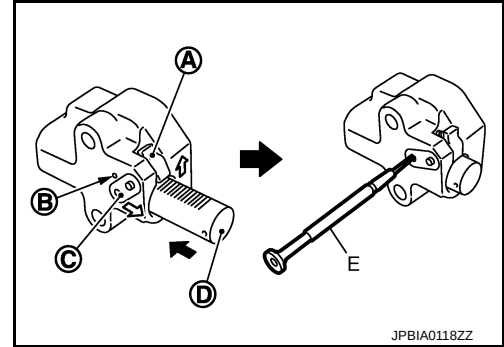
g. Remove stopper pin.

h. Check again that timing chain and water pump sprocket are engaged.

4. Install in the reverse order of removal for remaining parts.

CAUTION:

After starting engine, let idle for three minutes, then rev engine up to 3,000 rpm under no load to purge air from the high-pressure chamber of chain tensioner. Engine may produce a rattling noise. This indicates that air still remains in the chamber and is not a matter of concern.

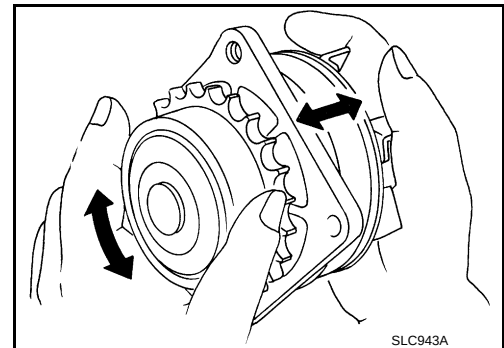


Inspection

INFOID:000000009234039

INSPECTION AFTER REMOVAL

- Check for badly rusted or corroded water pump body assembly.
- Check for rough operation due to excessive end play.
- If anything is found, replace water pump.



INSPECTION AFTER INSTALLATION

- Check that the reservoir tank cap is tightened.
- Check for leakage of engine coolant using the radiator cap tester adapter and the radiator cap tester (commercial service tool). Refer to [CO-7, "Inspection"](#).
- Start and warm up the engine. Visually check that there is no leakage of engine coolant.

WATER INLET AND THERMOSTAT ASSEMBLY

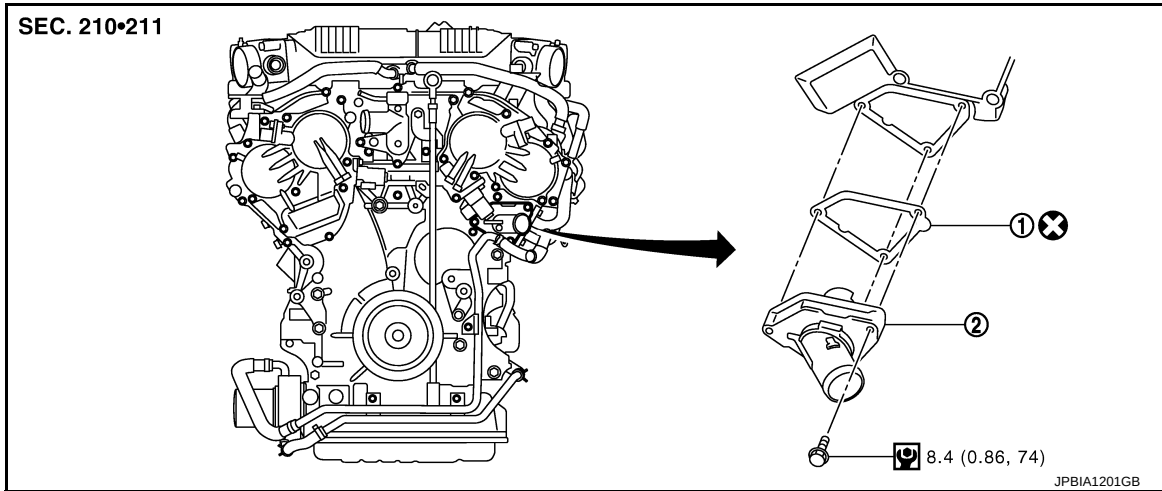
< REMOVAL AND INSTALLATION >

[VQ37VHR]

WATER INLET AND THERMOSTAT ASSEMBLY

Exploded View

INFOID:000000009234040



- ① Gasket ② Water inlet and thermostat assembly

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

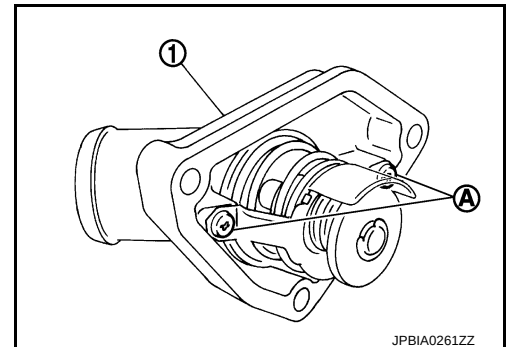
INFOID:000000009234041

REMOVAL

1. Remove engine cover. Refer to [EM-26, "Exploded View"](#).
2. Remove air duct (inlet) and air cleaner assembly (bank 2). Refer to [EM-29, "Exploded View"](#).
3. Remove front under cover, using a power tool. Refer to [EXT-34, "FRONT UNDER COVER : Removal and Installation"](#).
4. Drain engine coolant. Refer to [CO-7, "Draining"](#).
CAUTION:
 - Perform this step when the engine is cold.
 - Never spill engine coolant on drive belt.
5. Remove reservoir tank. Refer to [CO-13, "Exploded View"](#).
6. Disconnect radiator hose (lower). Refer to [CO-13, "Exploded View"](#).
7. Disconnect intake valve timing control valve harness connector (LH), and remove intake valve timing control solenoid.
8. Remove water inlet and thermostat assembly ①.

Ⓐ : Do not loosen these screw.

CAUTION:
Never disassemble water inlet and thermostat assembly.
Replace them as a unit, if necessary.



INSTALLATION

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

CAUTION:

WATER INLET AND THERMOSTAT ASSEMBLY

< REMOVAL AND INSTALLATION >

[VQ37VHR]

Be careful not to spill engine coolant over engine room. Use rag to absorb engine coolant.

Inspection

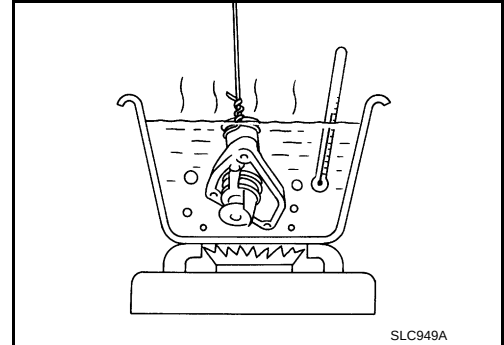
INFOID:000000009234042

INSPECTION AFTER REMOVAL

1. Check valve seating condition at ordinary room temperatures. It should seat tightly.
2. Check valve operation.

Thermostat (Standard) : Refer to [CO-26, "Thermostat"](#).

- If the malfunctioning condition, when valve seating at ordinary room temperature, or measured values are out of the standard, replace water inlet and thermostat assembly.



INSPECTION AFTER INSTALLATION

- Check that the reservoir tank cap is tightened.
- Check for leakage of engine coolant using the radiator cap tester adapter and the radiator cap tester (commercial service tool). Refer to [CO-7, "Inspection"](#).
- Start and warm up the engine. Visually check that there is no leakage of engine coolant.

WATER OUTLET AND WATER PIPING

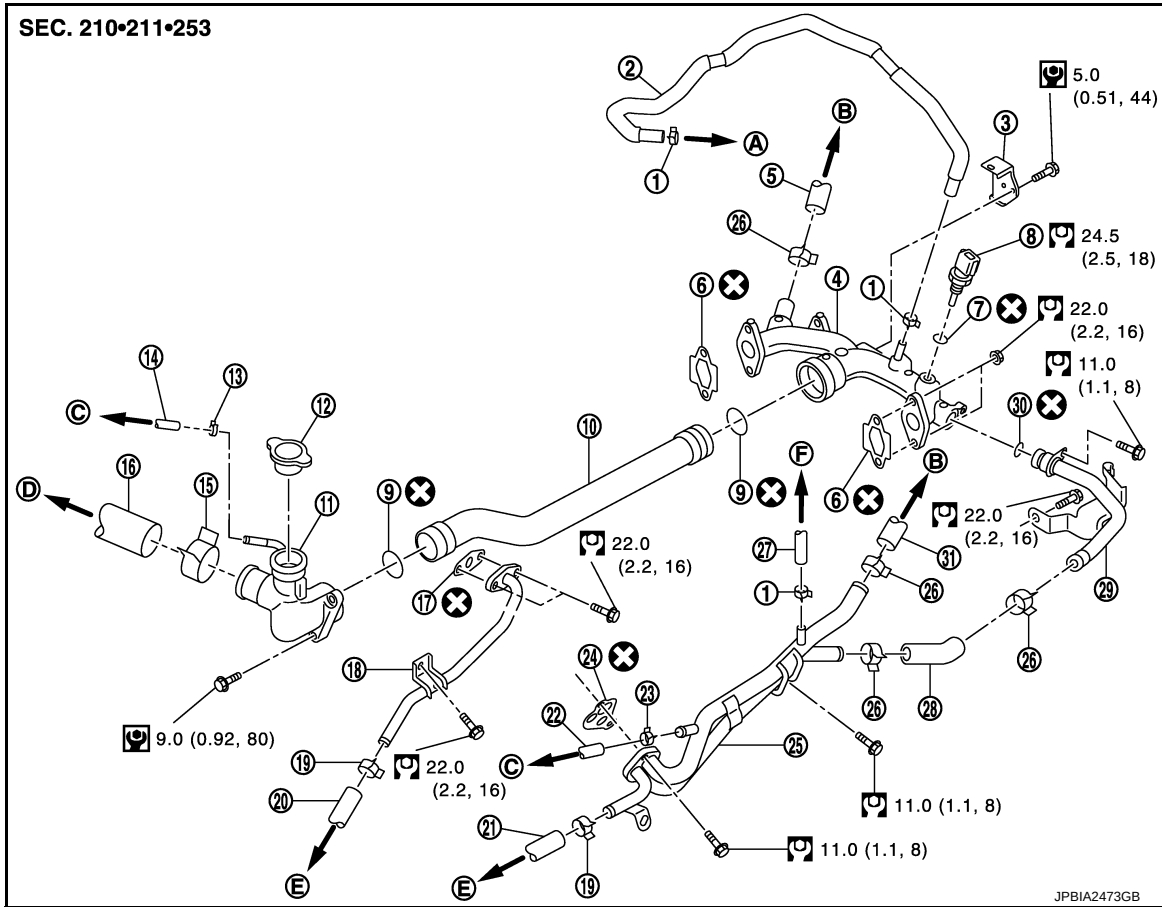
< REMOVAL AND INSTALLATION >

[VQ37VHR]

WATER OUTLET AND WATER PIPING

Exploded View

INFOID:000000009234043



- | | | |
|--|-------------------------------------|--|
| ① Clamp | ② Water hose | ③ Harness bracket |
| ④ Water outlet (rear) | ⑤ Heater hose | ⑥ Gasket |
| ⑦ Washer | ⑧ Engine coolant temperature sensor | ⑨ O-ring |
| ⑩ Water outlet pipe | ⑪ Water outlet (front) | ⑫ Radiator cap |
| ⑬ Clamp | ⑭ Reservoir tank hose | ⑮ Clamp |
| ⑯ Radiator hose (upper) | ⑰ Gasket | ⑱ Water pipe |
| ⑲ Clamp | ⑳ Water hose | ㉑ Water hose |
| ㉒ Reservoir tank hose | ㉓ Clamp | ㉔ Gasket |
| ㉕ Heater pipe | ㉖ Clamp | ㉗ Water hose |
| ㉘ Water hose | ㉙ Water bypass pipe | ㉚ O-ring |
| ㉛ Heater hose | | |
| Ⓐ To electric throttle control actuator (bank 1) | Ⓑ To heater core | Ⓒ To reservoir tank |
| Ⓓ To radiator | Ⓔ To oil cooler | Ⓕ To electric throttle control actuator (bank 2) |

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

WATER OUTLET AND WATER PIPING

< REMOVAL AND INSTALLATION >

[VQ37VHR]

Removal and Installation

INFOID:000000009234044

REMOVAL

1. Remove engine cover. Refer to [EM-26, "Exploded View"](#).
2. Remove oil level gauge and guide. Refer to [EM-89, "2WD : Exploded View"](#) (2WD models) or [EM-92, "AWD : Exploded View"](#) (AWD models).
3. Remove air duct (inlet) and air cleaner assembly (bank 1 and bank 2). Refer to [EM-29, "Exploded View"](#).
4. Remove front under cover, using a power tool. Refer to [EXT-34, "FRONT UNDER COVER : Removal and Installation"](#).
5. Drain engine coolant. Refer to [CO-7, "Draining"](#).
CAUTION:
 - Perform this step when the engine is cold.
 - Never spill engine coolant on drive belts.
6. Remove reservoir tank. Refer to [CO-13, "Exploded View"](#).
7. Remove radiator hose (upper) and heater hose. Refer to [CO-13, "Exploded View"](#).
8. Separate engine harness removing their bracket from water outlet (rear).
9. Remove engine coolant temperature sensor if necessary.
CAUTION:
Be careful not to damage engine coolant temperature sensor.
10. Remove heater pipe, water bypass pipe and water outlet pipe.
11. Remove water outlet (rear) if necessary.
NOTE:
Removing engine assembly is required. Refer to [EM-76, "2WD : Exploded View"](#) (2WD models) or [EM-81, "AWD : Exploded View"](#) (AWD models).

INSTALLATION

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

- CAUTION:**
- Do not reuse O-rings.
 - Never allow water outlet (rear) to nip O-rings when installing water outlet pipe and water bypass pipe.
 - Securely insert each hose, and install clamp at a position where it does not interfere with the pipe bulge.
 - When inserting water outlet pipe and water bypass pipe into water outlet, apply neutral detergent to O-ring.

Inspection

INFOID:000000009234045

INSPECTION AFTER INSTALLATION

- Check that the reservoir tank cap is tightened.
- Check for leakage of engine coolant using the radiator cap tester adapter and the radiator cap tester (commercial service tool). Refer to [CO-7, "Inspection"](#).
- Start and warm up the engine. Visually check that there is no leakage of engine coolant.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ37VHR]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Periodical Maintenance Specification

INFOID:000000009234046

ENGINE COOLANT CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

Engine coolant capacity [With reservoir tank ("MAX" level)]	10.9 (11-4/8, 9-5/8)
Reservoir tank engine coolant capacity (At "MAX" level)	0.9 (1, 6/8)

Radiator

INFOID:000000009234047

Unit: kPa (kg/cm², psi)

Cap relief pressure	Standard	122.3 - 151.7 (1.2 - 1.5, 18 - 22)
	Limit	107 (1.1, 16)
Leakage testing pressure		220 (2.2, 32)

Thermostat

INFOID:000000009234048

Thermostat	Standard
Valve opening temperature	82°C (180°F)
Maximum valve lift	8.6 mm/95°C (0.339 in/203°F)
Valve closing temperature	77°C (171°F)