SECTION CO
ENGINE COOLING SYSTEM

CONTENTS

VQ37VHR

VK56VD

PRECAUTION

PRECAUTIONS

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

INFOID:0000000012350283

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.**

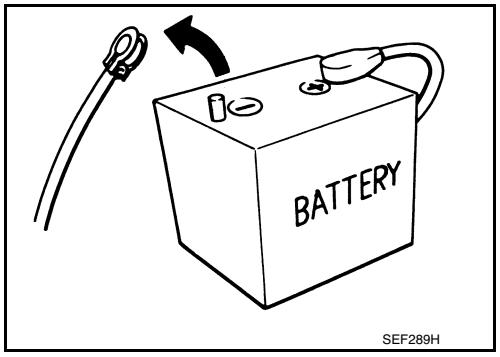
Precautions for Removing Battery Terminal

INFOID:0000000013042206

When disconnecting the battery terminal, pay attention to the following.

- Always use a 12V battery as power source.
- Never disconnect battery terminal while engine is running.
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
- For vehicles with the engine listed below, remove the battery terminal after a lapse of the specified time:

D4D engine	: 20 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		
V9X engine	: 4 minutes		
YD25DDTi	: 2 minutes		



NOTE:

ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.

- After high-load driving, if the vehicle is equipped with the V9X engine, turn the ignition switch OFF and wait for at least 15 minutes to remove the battery terminal.

NOTE:

- Turbocharger cooling pump may operate in a few minutes after the ignition switch is turned OFF.
- Example of high-load driving
  - Driving for 30 minutes or more at 140 km/h (86 MPH) or more.
  - Driving for 30 minutes or more on a steep slope.

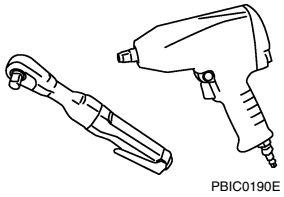
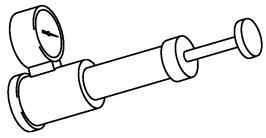
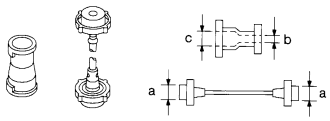
- For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch.
  NOTE:
  If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.
- After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.
  NOTE:
  The removal of 12V battery may cause a DTC detection error.

PREPARATION

PREPARATION

Commercial Service Tools

INFOID:0000000012350285

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)

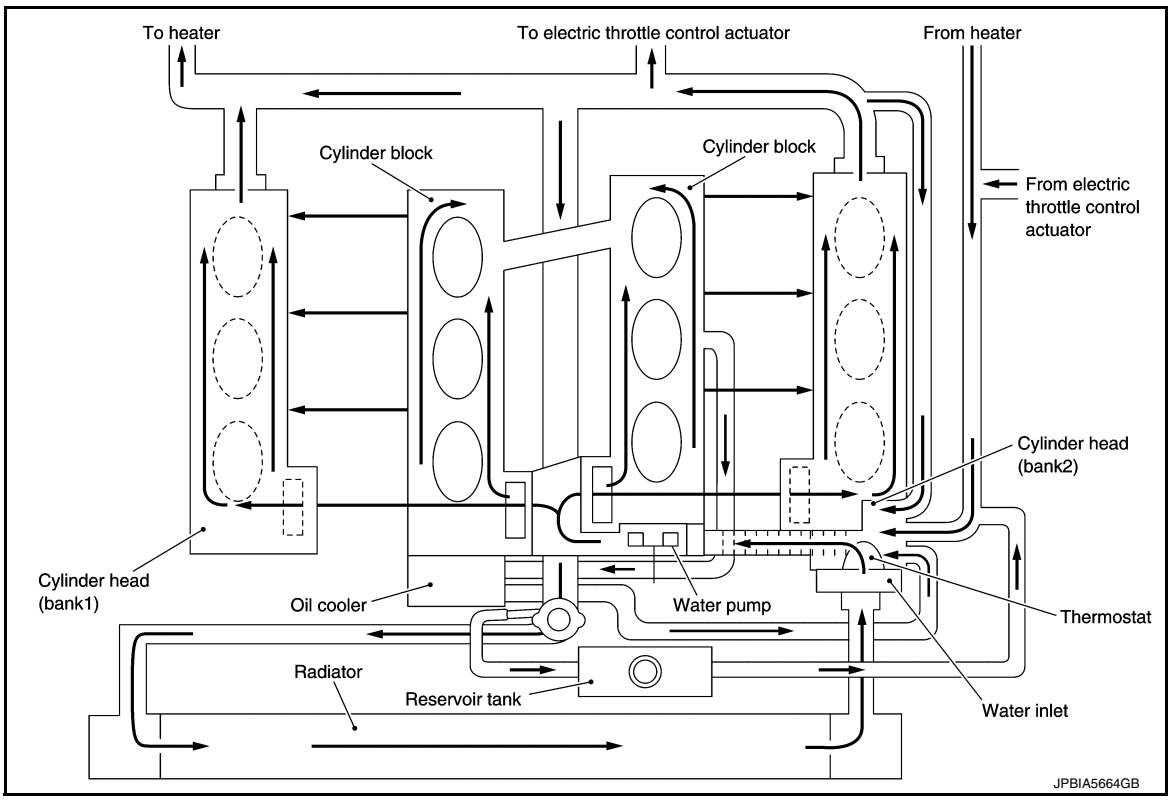
SYSTEM DESCRIPTION

DESCRIPTION

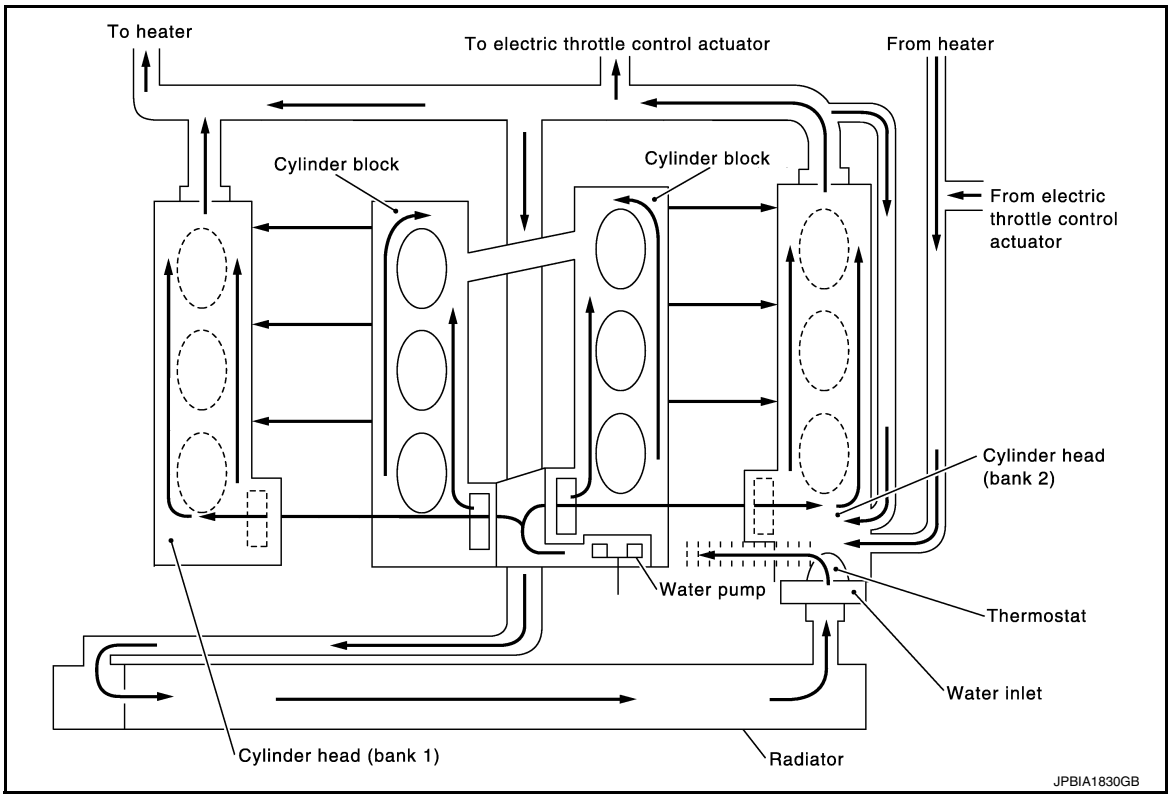
Engine Cooling System

INFOID:0000000012350286

WITH PRESSURIZED RADIATOR RESERVOIR TANK



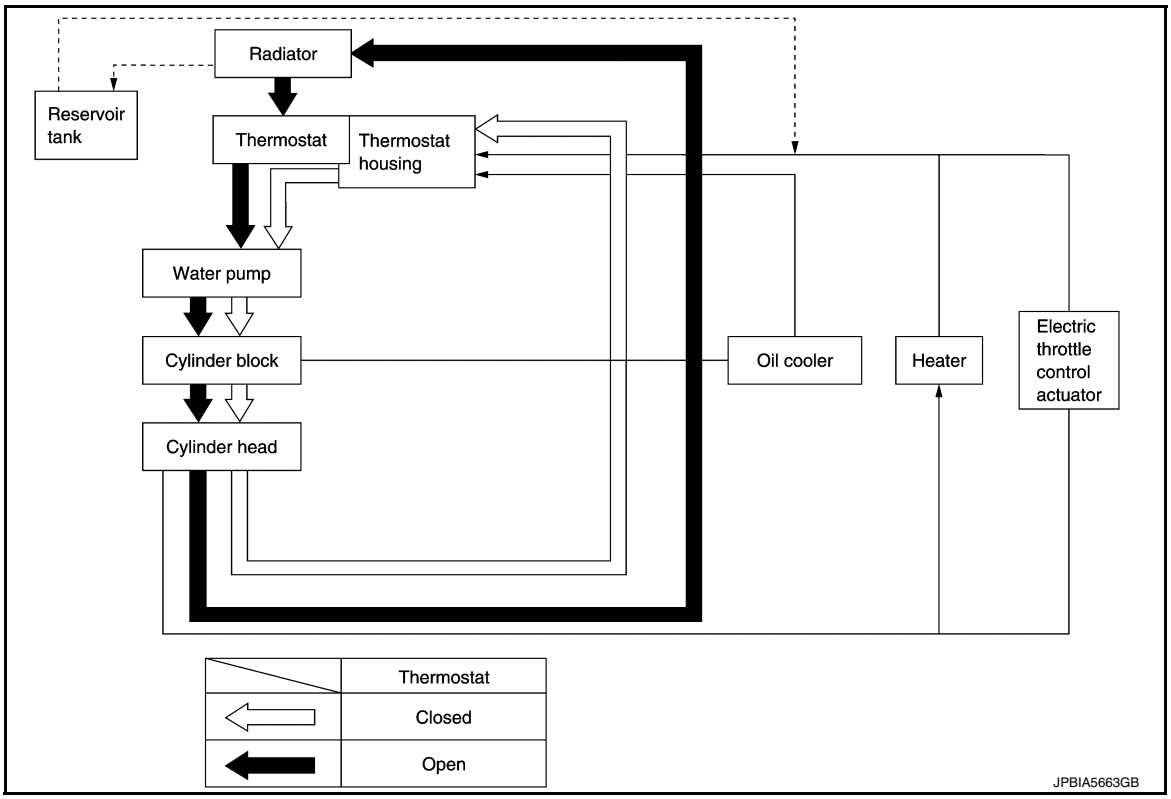
WITH NON-PRESSURIZED RADIATOR RESERVOIR TANK



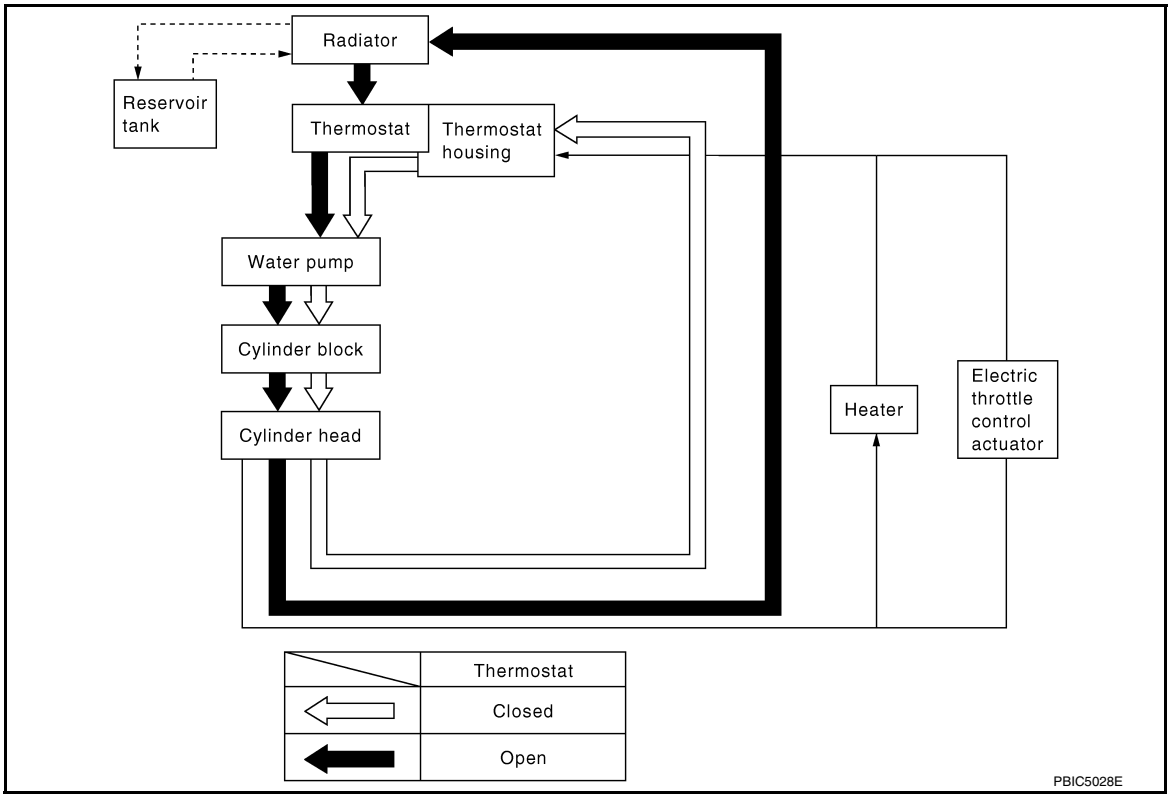
Engine Cooling System Schematic

INFOID:0000000012350287

WITH PRESSURIZED RADIATOR RESERVOIR TANK



WITH NON-PRESSURIZED RADIATOR RESERVOIR TANK



SYMPTOM DIAGNOSIS

OVERHEATING CAUSE ANALYSIS

Troubleshooting Chart

INFOID:0000000012350288

	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	Engine coolant leakage	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

	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

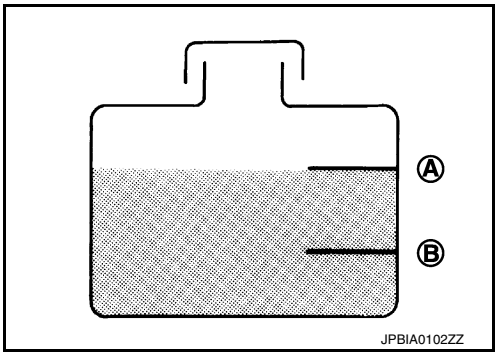
ENGINE COOLANT

Inspection

INFOID:0000000012350289

LEVEL

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



A : MAX
B : MIN

- Adjust the engine coolant level if necessary.

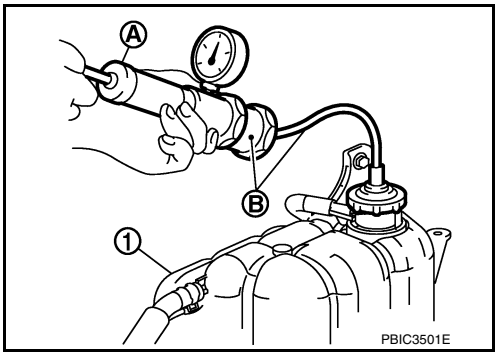
CAUTION:
Refill Genuine NISSAN Long Life Antifreeze/Coolant (blue) or equivalent in its quality mixed with water (distilled or demineralized). Refer to MA-16, "FOR NORTH AMERICA : Fluids and Lubricants" (FOR NORTH AMERICA), MA-18, "FOR MEXICO : Fluids and Lubricants" (FOR MEXICO).

- Check that the reservoir tank cap is tightened.

LEAKAGE

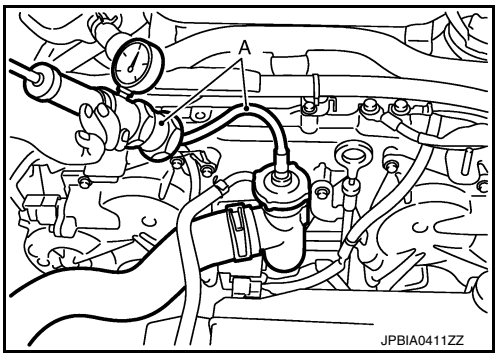
- To check for leakage, apply pressure to the cooling system with the radiator cap tester and radiator cap tester adapter (commercial service tool).

- With Pressurized Radiator Reservoir Tank



1 : Reservoir tank
A : Radiator cap tester
B : Radiator cap tester adapter

- With Non-Pressurized Radiator Reservoir Tank



A : Radiator cap tester

Testing pressure : Refer to CO-31, "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.

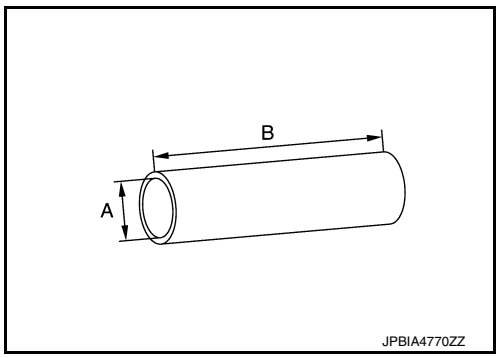
Draining

INFOID:0000000012350290

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

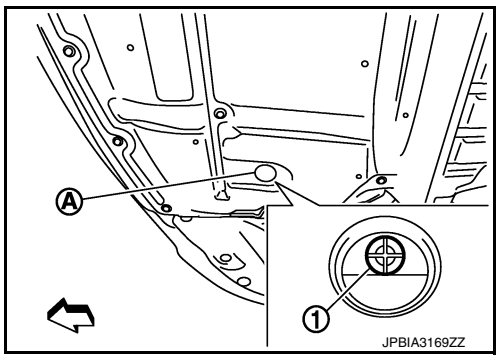
1. Connect drain hose.
   NOTE:
   Use a general-purpose hose with the dimmensions shown in the figure.

   A : ϕ 15 - 16 mm (0.59 - 0.63 in)
   B : 145 mm (5.17 in)



2. Open radiator drain plug (1) at the bottom of radiator, and then remove radiator cap.

   A : Radiator drain plug hole
   ⇦ : Vehicle front



   When draining all of engine coolant in the system, open water drain plugs on cylinder block. Refer to EM-86, "Setting".

3. Remove reservoir tank if necessary, and drain engine coolant and clean reservoir tank before installing.
4. Check drained engine coolant for contaminants such as rust, corrosion or discoloration.
   If contaminated, flush the engine cooling system. Refer to CO-13, "Flushing".
5. Disconnect drain hose.

Refilling

INFOID:0000000012350291

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-16, "FOR NORTH AMERICA : Fluids and Lubricants" (FOR NORTH AMERICA), MA-18, "FOR MEXICO : Fluids and Lubricants" (FOR MEXICO).**

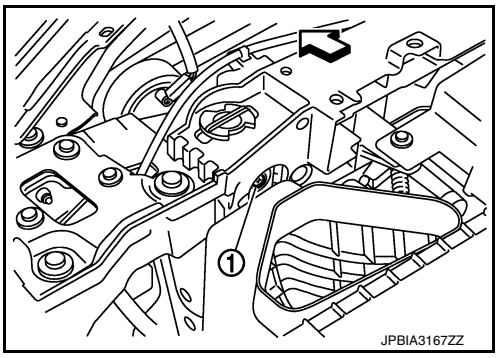
1. Remove air cleaner case (LH) and air duct (inlet). Refer to EM-29, "Exploded View".
2. Install reservoir tank if removed, and radiator drain plug.
   CAUTION:
   Be sure to clean drain plug and install with new O-ring.

   Tightening torque : Refer to CO-16, "Exploded View".

   If water drain plugs on cylinder block are removed, close and tighten them. Refer to EM-86, "Setting".

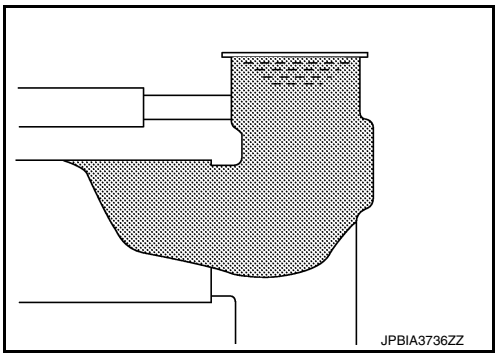
3. Check that each hose clamp has been firmly tightened.
4. Remove air relief plug (1) on radiator left side.

⇦ : Vehicle front



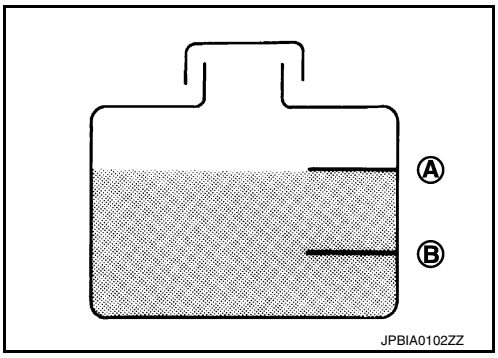
5. Fill up the radiator with cooling water.
Pour engine coolant through engine coolant filler neck slowly of less than 2 ℓ (2-1/8 US qt, 1-3/4 lmp qt) a minute to allow air in system to escape.

Engine coolant capacity (With reservoir tank at "MAX" level) **: Refer to CO-31, "Periodical Maintenance Specification".**



Reservoir tank engine coolant capacity (At "MAX" level) **:Refer to CO-31, "Periodical Maintenance Specification"**

A : MAX
B : MIN



6. When engine coolant overflows air relief hole on radiator, install air relief plug with new O-ring.
CAUTION:
Do not reuse O-rings.

Tightening torque : Refer to CO-16, "Exploded View".

7. Refill reservoir tank to "MAX" level line with engine coolant.
8. Install air cleaner case (LH) and air duct (inlet). Refer to EM-29, "Exploded View".
9. Install radiator cap and reservoir tank cap.
10. Warm up engine until opening thermostat. Standard for warming-up time is approximately 10 minutes at 3,000 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.
11. Stop the engine and cool down to less than approximately 50°C (122°F).
    • Cool down using fan to reduce the time.
    • If necessary, refill radiator up to filler neck with engine coolant.
    • Remove the radiator cap to check the fluid level. If the fluid level is low, refill with cooling water and repeat the steps from Step 7.
12. Refill reservoir tank to "MAX" level line with engine coolant.
13. Check cooling system for leakage with engine running.
14. 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 12 of Refilling to Step c of Flow Noise Verification Method.
e. Check that the reservoir tank cap is tightened.

Flushing

INFOID:0000000012350292

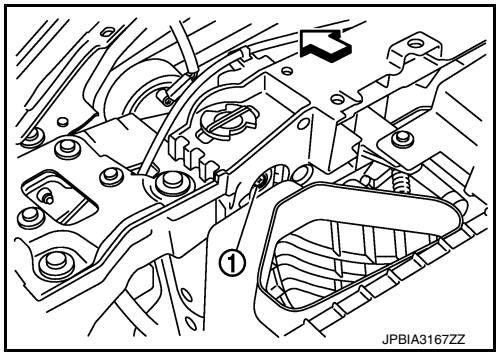
1. Install reservoir tank if removed, and radiator drain plug.
CAUTION:
Be sure to clean drain plug and install with new O-ring.

Tightening torque : Refer to CO-16, "Exploded View".

If water drain plugs on cylinder block are removed, close and tighten them. Refer to EM-86, "Setting".

2. Remove air relief plug (1) on radiator.

⇦ : Vehicle front



3. Fill radiator with water until water spills from the air relief holes, then close air relief plugs. Fill radiator and reservoir tank with water and reinstall radiator cap.

Tightening torque : Refer to CO-16, "Exploded View".

4. Run the engine and warm it up to normal operating temperature.
5. Rev the engine two or three times under no-load.
6. Stop the engine and wait until it cools down.
7. Drain water from the system. Refer to CO-11, "Draining".
8. Repeat steps 1 through 7 until clear water begins to drain from radiator.
9. Check that the reservoir tank cap is tightened.

RADIATOR

RADIATOR CAP

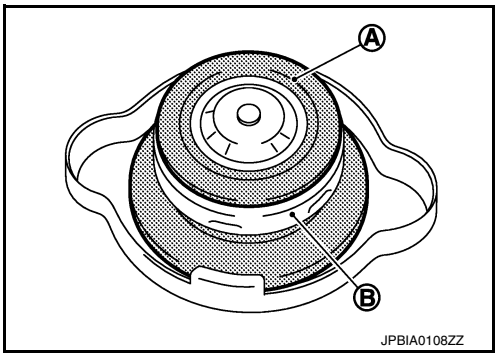
RADIATOR CAP : Inspection

INFOID:0000000012350293

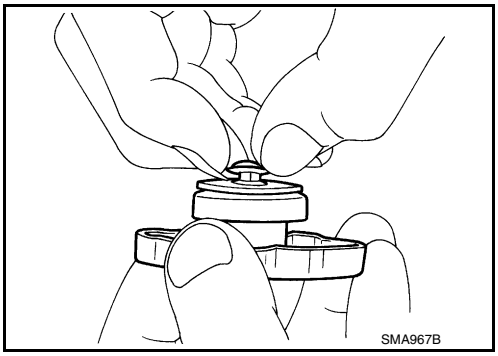
- Check valve seat (A) of radiator cap.

B : Metal plunger

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



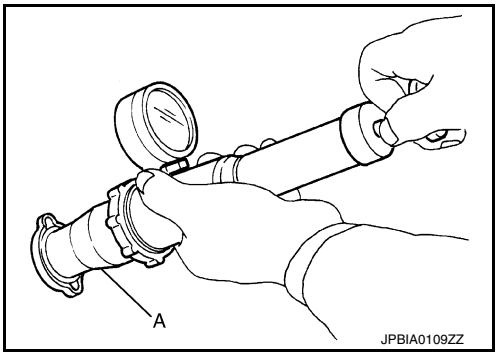
- Pull negative-pressure valve to open it, and check that it close completely when released.
- Check that there is no dirt or damage on the valve seat of radiator cap negative-pressure valve.
- Check that there are no unusualness in the opening and closing conditions of negative-pressure valve.



- Check radiator cap relief pressure.

Standard and limit : Refer to CO-31, "Radiator".

- When connecting radiator 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 radiator cap if there is an unusualness related to the above three.

CAUTION:

When installing radiator cap, thoroughly wipe out the water outlet (front) filler neck to remove any waxy residue or foreign material.

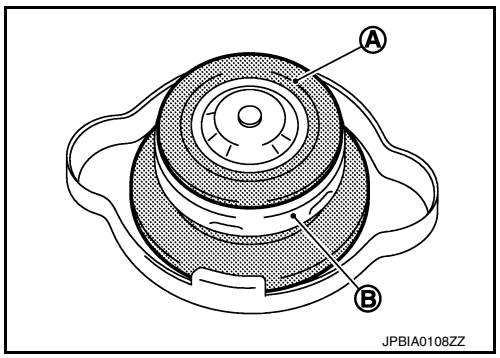
RESERVOIR TANK CAP

RESERVOIR TANK CAP : Inspection

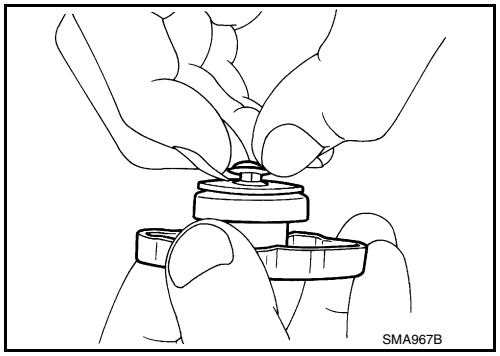
INFOID:0000000012350294

- Check valve seat of reservoir tank cap.

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

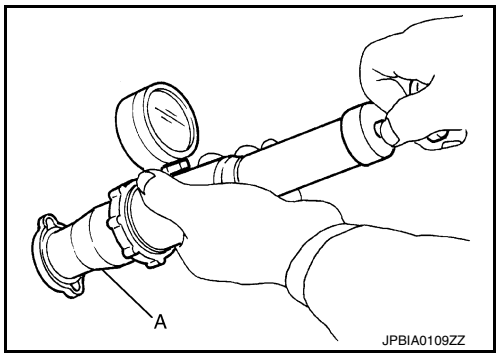


- Pull negative-pressure valve to open it, and check that it close completely when released.
- Check that there is no dirt or damage on the valve seat of reservoir tank cap negative-pressure valve.
- Check that there are no unusualness in the opening and closing conditions of negative-pressure valve.



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

Standard and limit : Refer to CO-31, "Radiator".



- 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 filler neck to remove any waxy residue or foreign material.

RADIATOR

RADIATOR : Inspection

INFOID:0000000012350295

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.
   - Use compressed air lower than 490 kPa (5 kg/cm^2, 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.

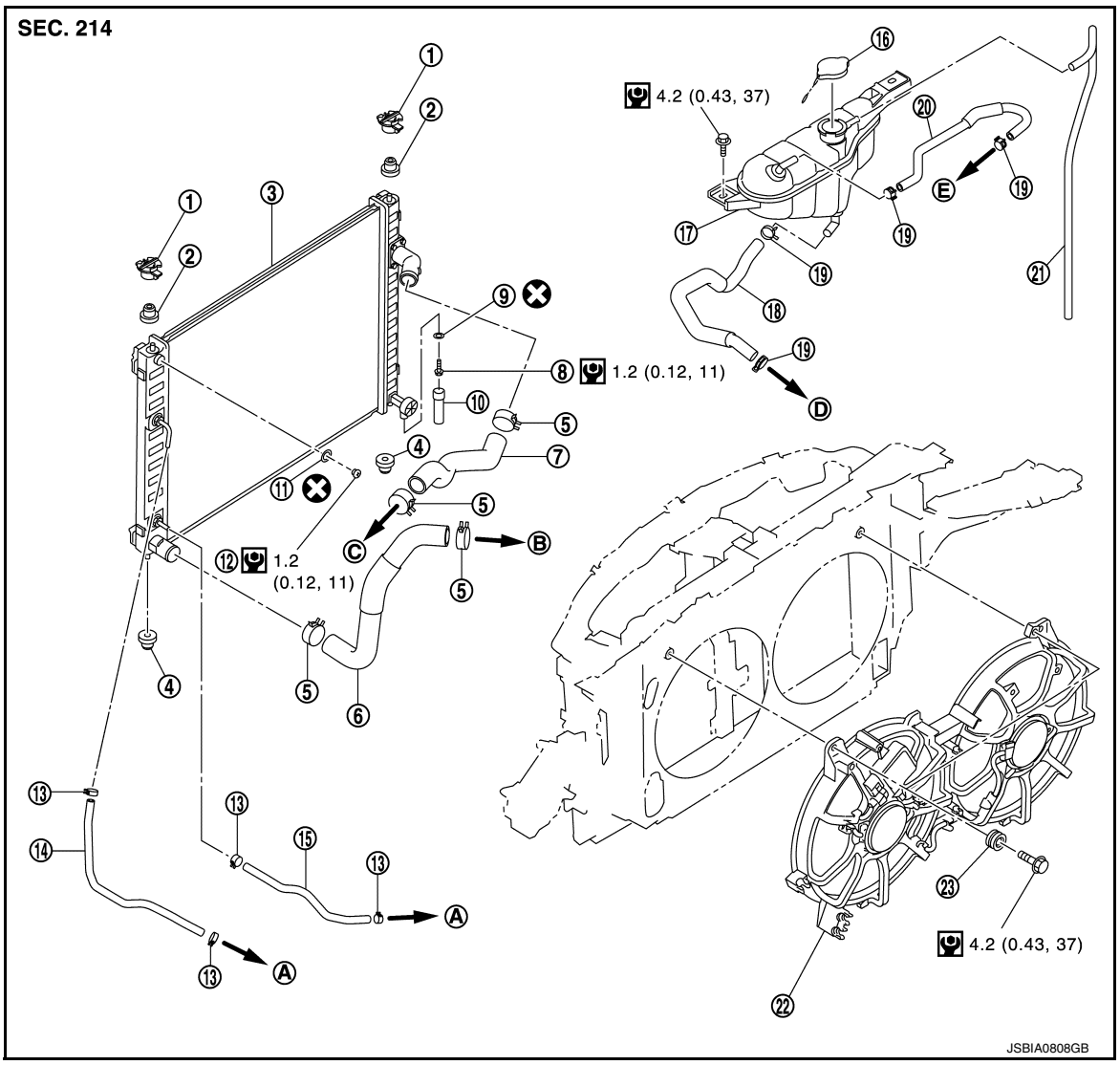
REMOVAL AND INSTALLATION

RADIATOR

Exploded View

INFOID:0000000012350296

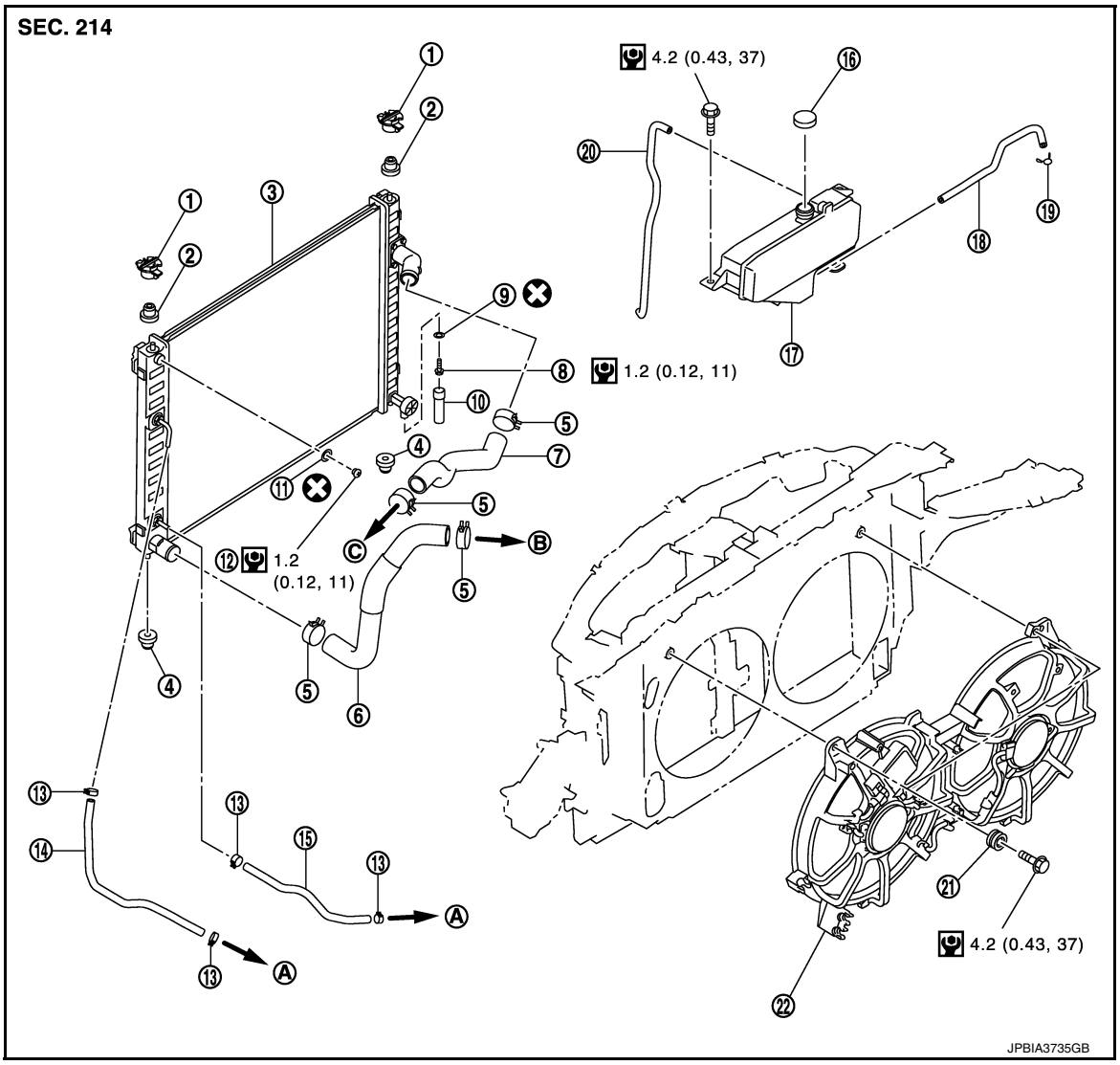
WITH PRESSURIZED RADIATOR RESERVOIR TANK



1. Upper mount bracket	2. Mounting rubber (upper)	3. Radiator
4. Mounting rubber (lower)	5. Clamp	6. Radiator hose (lower)
7. Radiator hose (Upper)	8. Drain plug	9. O-ring
10. Water drain hose	11. O-ring	12. Air relief plug
13. Clamp	14. A/T fluid cooler hose	15. A/T fluid cooler hose
16. Reservoir tank cap	17. Reservoir tank	18. Reservoir tank hose
19. Clamp	20. Reservoir tank hose	21. Reservoir tank hose
22. Radiator cooling fan assembly	23. Grommet	
A. To transmission	B. To water inlet and thermostat assembly	C. To water outlet
D. To heater pipe	E. To water outlet (front)	

Refer to GI-4, "Components" for symbols in the figure.

WITH NON-PRESSURIZED RADIATOR RESERVOIR TANK



1. Upper mount bracket	2. Mounting rubber (upper)	3. Radiator
4. Mounting rubber (lower)	5. Clamp	6. Radiator hose (lower)
7. Radiator hose (Upper)	8. Drain plug	9. O-ring
10. Water drain hose	11. O-ring	12. Air relief plug
13. Clamp	14. A/T fluid cooler hose	15. A/T fluid cooler hose
16. Reservoir tank cap	17. Reservoir tank	18. Reservoir tank hose
19. Clamp	20. Reservoir tank hose	21. Grommet
22. Radiator cooling fan assembly		
A. To transmission	B. To water inlet and thermostat assembly	C. To water outlet

Refer to GI-4, "Components" for symbols in the figure.

Removal and Installation

INFOID:0000000012350297

REMOVAL

WARNING:

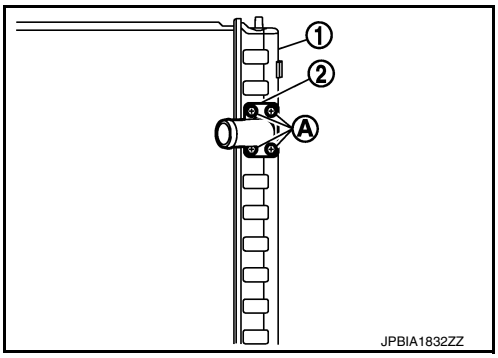
Never remove radiator cap when engine is hot. Serious burns could occur from high-pressure engine coolant escaping from engine cooling system. Wrap a thick cloth around the cap. Slowly turn it a quarter of a turn to release built-up pressure. Carefully remove radiator cap by turning it all the way.

NOTE:

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

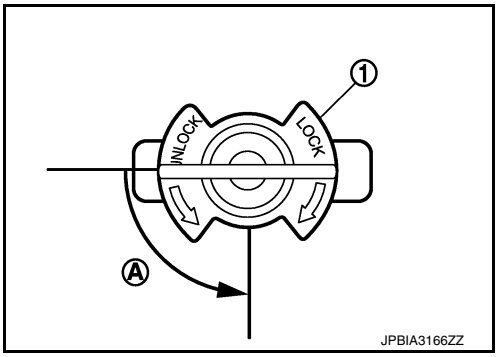
1. Remove the following parts:
   - Engine under cover with power tool.
   - Engine cover: Refer to EM-27, "Exploded View".
   - Air cleaner case (RH and LH) and air duct (inlet) : Refer to EM-29, "Exploded View".
   - Reservoir tank: Refer to CO-16, "Exploded View".
   - Radiator core support ornament, radiator core support center: Refer to EXT-13, "Exploded View".
   - Horn: Refer to HRN-7, "Exploded View".
2. Remove condenser pipe assembly. Refer to HA-40, "Exploded View".
3. Drain engine coolant from radiator. Refer to CO-11, "Draining".
   CAUTION:
   - **Perform this step when the engine is cold.**
   - **Never spill engine coolant on drive belt.**
4. Disconnect A/T fluid cooler hoses from radiator.
   - Install blind plug to avoid leakage of A/T fluid.
5. Remove radiator hoses (upper and lower) and reservoir tank hose.
   CAUTION:
   - **Be careful not to allow engine coolant to contact drive belt.**
   - **Never loosen radiator water inlet pipe mounting screw (A). if loosened, replace radiator (1.)**

   2 : Radiator water inlet pipe



6. Remove cooling fan assembly. Refer to CO-21, "Exploded View".
   CAUTION:
   Never damage or scratch radiator core when removing.
7. Rotate two radiator upper mount brackets 90 degrees in direction as shown in the figure, and remove them.

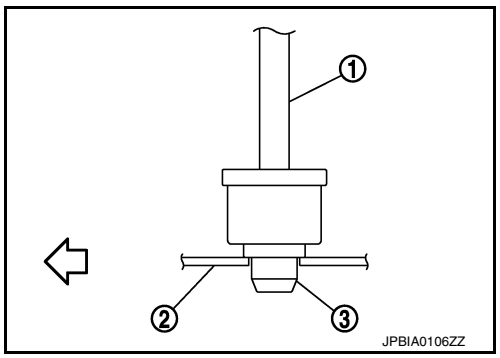
   1 : Radiator upper mount bracket
   A : Turn 90° counterclockwise



8. Remove condenser.
9. Remove radiator as follows:
   CAUTION:
   Be careful not to damage radiator core.

a. Lift up and pull the radiator (1) forward, and then remove the mounting rubber (lower) (3) from the radiator core support (2).

⇦ : Vehicle front



INSTALLATION

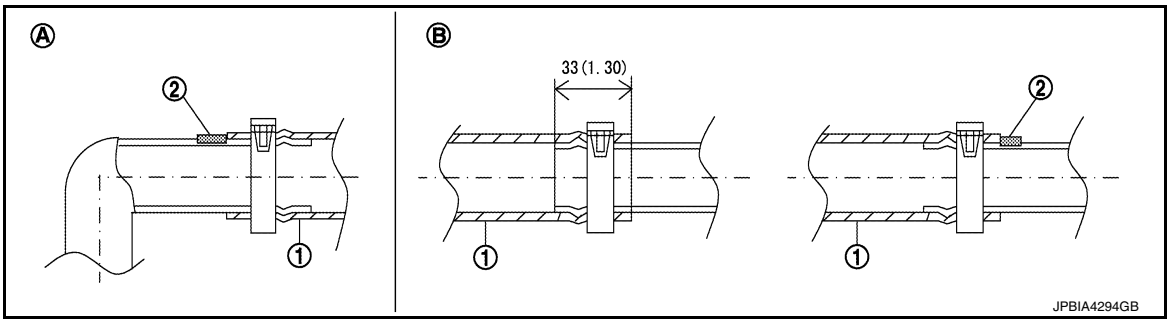
Note the following, and install in the reverse order of removal.

CAUTION:

- **Do not reuse O-rings.**
- **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).



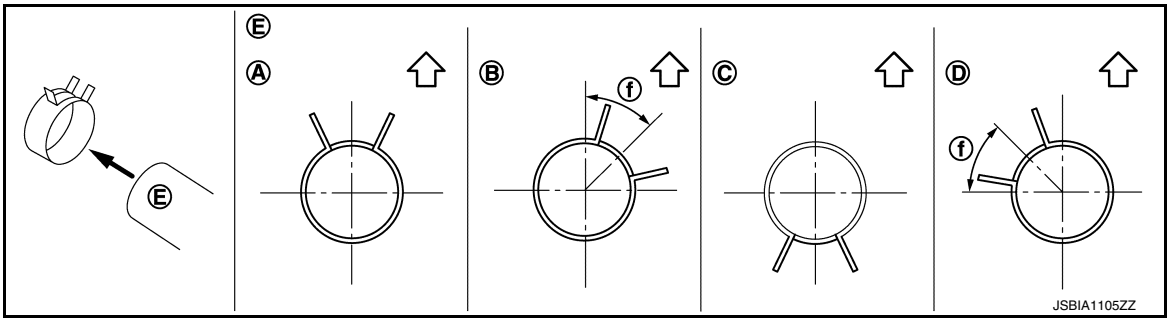
Unit mm (in)

A. Radiator side B. Engine side

- For the orientation of the hose clamp pawl, refer to the figure.

Radiator hose	Hose end	Paint mark	Position of hose clamp*
Radiator hose (upper)	Radiator side	Upper	A
	Engine side	Upper	B
Radiator hose (lower)	Radiator side	Lower	C
	Engine side	Right side	D

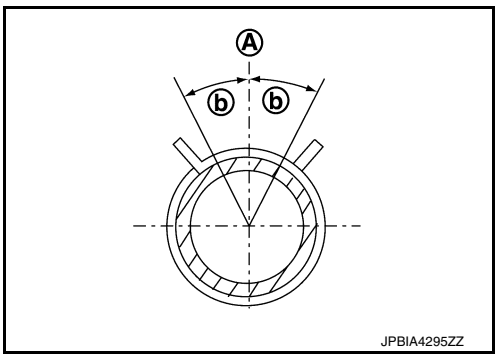
*Refer to the illustrations for the specific position each hose clamp tab.



E. View E f. 45°

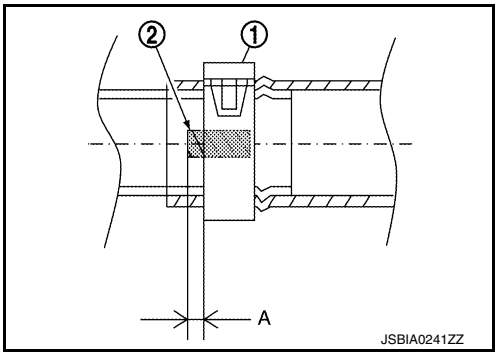
⇦ Vehicle upper

- The angle (b) created by the hose clamp pawl and the specified line (A) must be within ±30° as shown in the figure.



- To install hose clamps (1), check that the dimension (A) from the end of the paint mark (2) on the radiator hose to the hose clamp is within the reference value.

Dimension "A" **(−1) – (+1) mm**
(−0.04) – (+0.04) in



Inspection

INFOID:0000000012350298

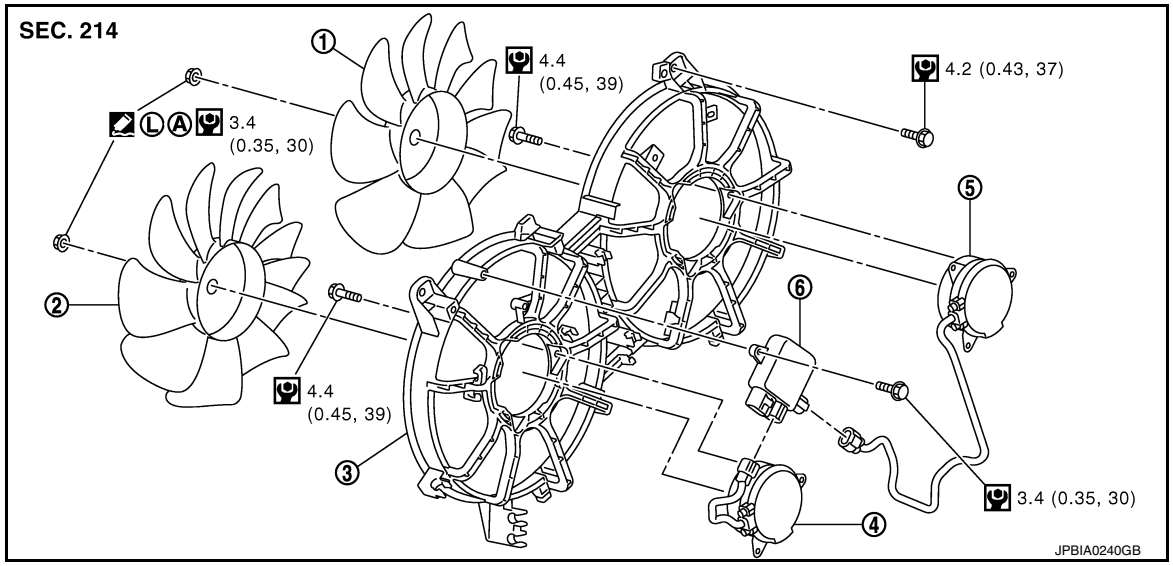
INSPECTION AFTER INSTALLATION

- 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-10, "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

Exploded View

INFOID:0000000012350299



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

A. Apply on fan motor shaft

: Apply Genuine High Strength thread Locking Sealant or equivalent.

: N·m (kg-m, in-lb)

Removal and Installation

INFOID:0000000012350300

REMOVAL

1. Remove reservoir tank and drain hose. Refer to CO-16, "Exploded View"
2. Remove air cleaner case (LH) and air duct (inlet). Refer to EM-29, "Exploded View".
3. Disconnect harness connector from cooling fan control module, and move harness to aside.
4. Remove harness clips.
5. Remove A/T oil cooler tube from fanshroud.
6. Remove cooling fan assembly from under the vehicle.
   CAUTION:
   Be careful not to damage or scratch on radiator core.

INSTALLATION

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

CAUTION:

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:0000000012350301

DISASSEMBLY

1. Disconnect harness 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 : 11 blades

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

Inspection

INFOID:0000000012350302

INSPECTION AFTER REMOVAL

Check that fan motors operate normally.

NOTE:

Cooling fans are controlled by cooling fan control module. For details, refer to EC-63, "COOLING FAN CONTROL : System Diagram" (VQ37VHR FOR USA AND CANADA), EC-593, "COOLING FAN CONTROL : System Diagram" (VQ37VHR FOR MEXICO).

INSPECTION AFTER DISASSEMBLY

Cooling Fan

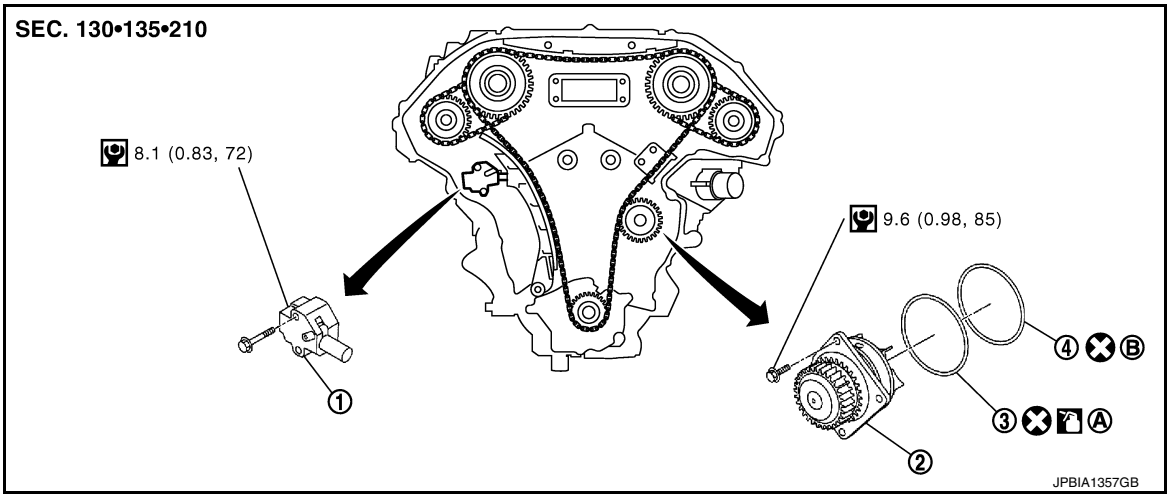
Inspect cooling fan for crack or unusual bend.

- If anything is found, replace cooling fan.

WATER PUMP

Exploded View

INFOID:0000000012350303



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:0000000012350304

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).**

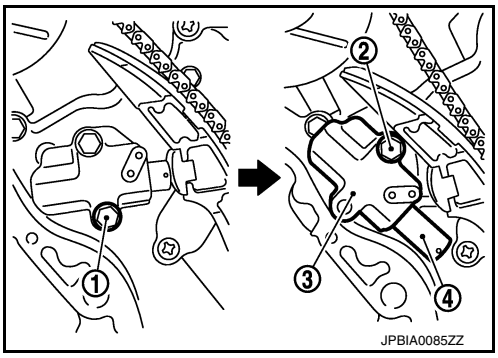
REMOVAL

1. Remove engine cover. Refer to EM-27, "Exploded View".
2. Release the fuel pressure. Refer to EC-180, "Work Procedure".
3. Disconnect the battery cable from the negative terminal.
4. Remove air duct and air cleaner case assembly (RH and LH). Refer to EM-29, "Exploded View".
5. Remove reservoir tank. Refer to CO-16, "Exploded View".
6. Separate engine harness removing their brackets from front timing chain case.
7. Remove engine undercover with power tool.
8. Drain engine oil. Refer to CO-11, "Draining".
   CAUTION:
   - **Perform this step when the engine is cold.**
   - **Never spill engine oil on drive belt.**
9. Drain engine coolant from radiator. Refer to CO-11, "Draining".
   CAUTION:
   - **Perform this step when the engine is cold.**
   - **Never spill engine coolant on drive belt.**
10. Remove cooling fan assembly. Refer to CO-21, "Exploded View".
11. Remove radiator hose (upper and lower). Refer to CO-16, "Exploded View".

12. Remove front timing chain case. Refer to EM-57, "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).

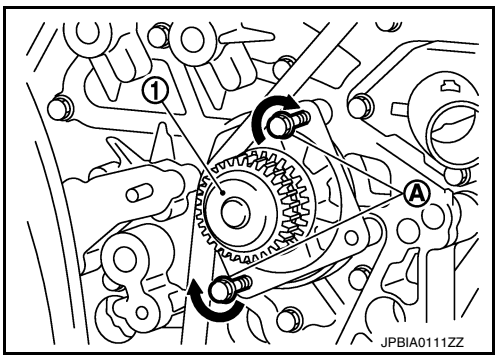


c. Remove upper mounting bolt, and then remove timing chain tensioner (primary).

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 (A) [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.

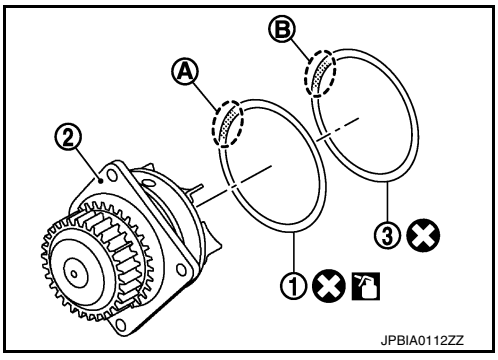
INSTALLATION

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 (A) to front side.
- Locate O-ring with light blue paint mark (B) to rear side.

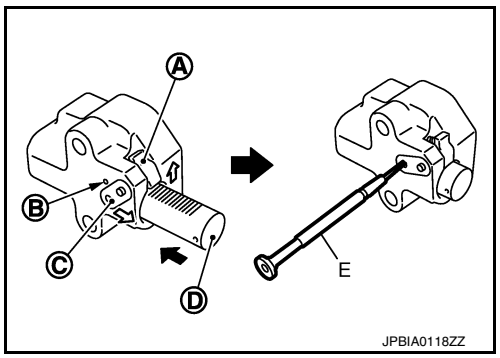


2. Install water pump.
CAUTION:
Never allow cylinder block to nip O-rings when installing water pump.
- Check timing chain and water pump sprocket are engaged.
- Insert water pump by tightening mounting bolts alternately and evenly.

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

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.



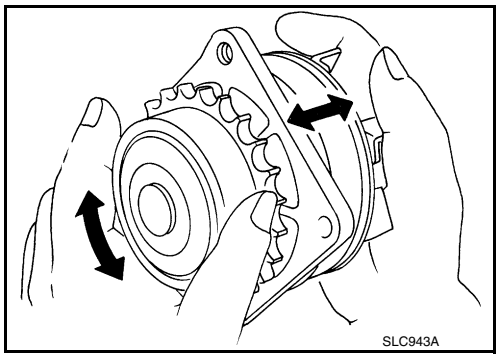
c. Push plunger into the inside of tensioner body.
d. Hold plunger in the fully compressed position by engaging plunger stopper tab with the tip of ratchet.
e. To secure lever, insert stopper pin (E) through hole of lever into tensioner body hole (B).
  • The lever parts and the tab are synchronized. 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:0000000012350305

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.



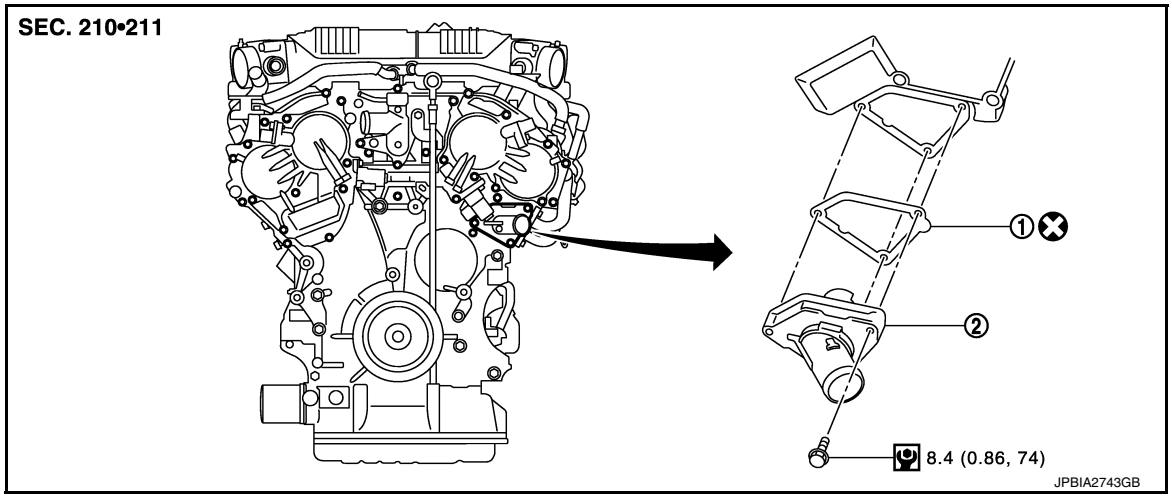
INSPECTION AFTER INSTALLATION

- 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-10, "Inspection".
- Start and warm up the engine. Visually check that there is no leakage of engine coolant.

WATER INLET AND THERMOSTAT ASSEMBLY

Exploded View

INFOID:0000000012350306



1. Gasket
2. Water inlet and thermostat assembly

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

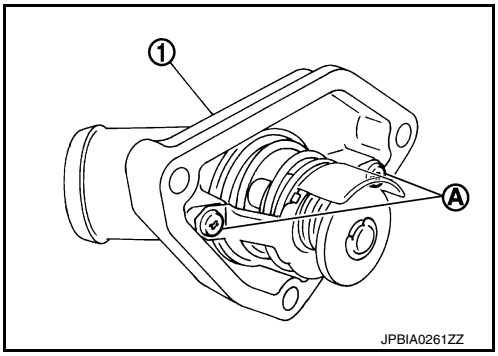
INFOID:0000000012350307

REMOVAL

1. Remove engine cover. Refer to EM-27, "Exploded View".
2. Remove air duct and air cleaner case assembly (LH). Refer to EM-29, "Exploded View".
3. Remove reservoir tank.Refer to CO-16, "Exploded View".
4. Remove engine undercover with power tool.
5. Drain engine coolant from radiator drain plug at the bottom of radiator. Refer to CO-11, "Draining".
   CAUTION:
   - **Perform this step when the engine is cold.**
   - **Never spill engine coolant on drive belt.**
6. Disconnect radiator hose (lower).
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).

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

Inspection

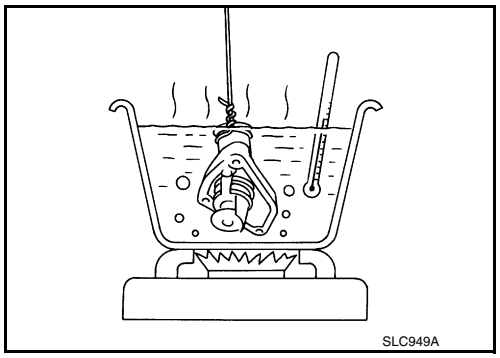
INFOID:0000000012350308

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-31, "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

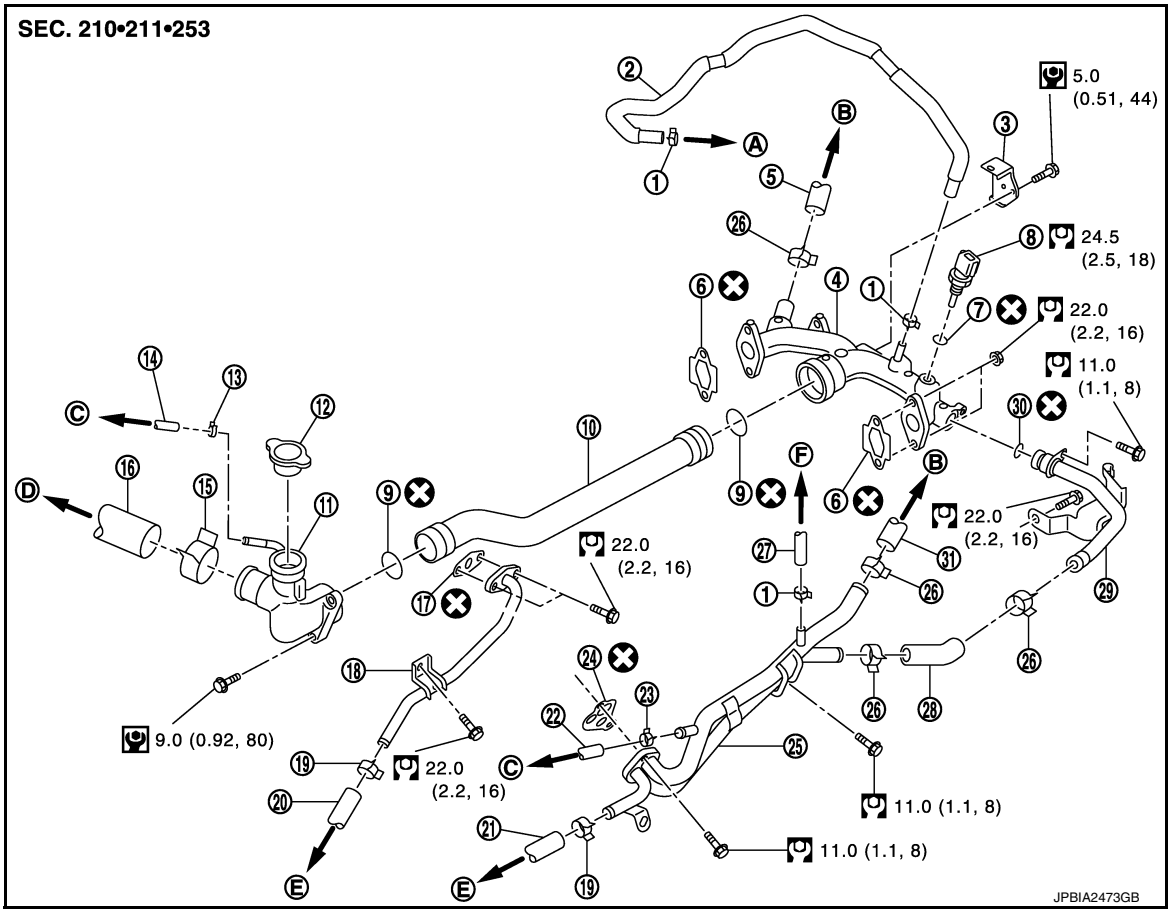
- Check that the reservoir tank cap is tightened.
- Check for leakage of engine coolant using the radiator cap tester adapter and the radiator cap tester (commercial service tool). Refer to CO-10, "Inspection".
- Start and warm up the engine. Visually check that there is no leakage of engine coolant.

WATER OUTLET AND WATER PIPING

Exploded View

INFOID:0000000012350309

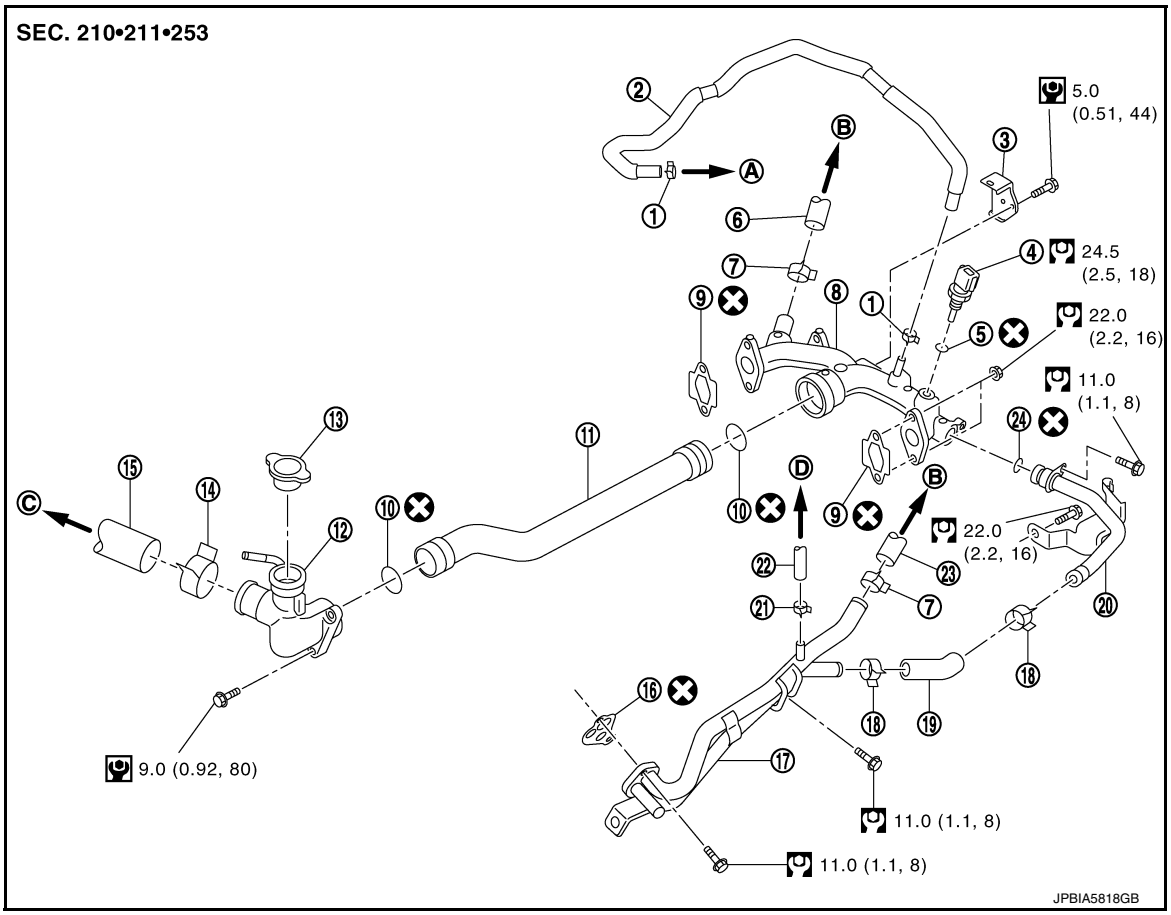
WITH PRESSURIZED RADIATOR RESERVOIR TANK



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				
A.	To electric throttle control actuator (bank 1)	B.	To heater core	C.	To reservoir tank
D.	To radiator	E.	To oil cooler	F.	To electric throttle control actuator (bank 2)

Refer to GI-4, "Components" for symbols in the figure.

WITH NON-PRESSURIZED RADIATOR RESERVOIR TANK



1.	Clamp	2.	Water hose	3.	Harness bracket
4.	Engine coolant temperature sensor	5.	Washer	6.	Heater hose
7.	Clamp	8.	Water outlet (rear)	9.	Gasket
10.	O-ring	11.	Water outlet pipe	12.	Water outlet (front)
13.	Radiator cap	14.	Clamp	15.	Radiator hose (upper)
16.	Gasket	17.	Heater pipe	18.	Clamp
19.	Water hose	20.	Water bypass pipe	21.	Clamp
22.	Water hose	23.	Heater hose	24.	O-ring
A.	To electric throttle control actuator (bank 1)	B.	To heater core	C.	To radiator
D.	To electric throttle control actuator (bank 2)				

Refer to GI-4, "Components" for symbols in the figure.

Removal and Installation

INFOID:0000000012350310

REMOVAL

1. Remove engine cover. Refer to EM-27, "Exploded View".
2. Remove reservoir tank. Refer to CO-16, "Exploded View".
3. Remove oil level gauge and guide. Refer to EM-89, "2WD : Exploded View" (2WD models) or EM-93, "AWD : Exploded View" (AWD models).
4. Remove air duct and air cleaner case assembly (RH and LH). Refer to EM-29, "Exploded View".
5. Remove engine undercover with power tool.
6. Drain engine coolant from radiator drain plug at the bottom of radiator. Refer to CO-11, "Draining".
   CAUTION:
   - **Perform this step when the engine is cold.**

- **Never spill engine coolant on drive belts.**

7. Remove radiator hose (upper) and heater hose.
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:0000000012350311

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-10, "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)

Periodical Maintenance Specification

INFOID:0000000012350312

ENGINE COOLANT CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

Engine coolant capacity [With reservoir tank (“MAX” level)]	Models with pressurized radiator reservoir tank	9 (9-1/2, 7-7/8)
	Models with non-pressurized radiator reservoir tank	8.4 (8-7/8, 7-3/8)
Reservoir tank engine coolant capacity (At “MAX” level)	0.8 (7/8, 3/4)	

Radiator

INFOID:0000000012350313

RADIATOR CAP

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

Cap relief pressure	Standard	122.3 - 151.7 (1.2 - 1.5, 18 - 22)
	Limit	107 (1.1, 16)

RESERVOIR TANK CAP

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

Cap relief pressure	Standard	78.2 - 97.8 (0.8 - 1.0, 11 - 14)
	Limit	59 (0.6, 9)

RADIATOR

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

Leakage testing pressure	157 (1.6, 23)

Thermostat

INFOID:0000000012350314

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)

PRECAUTION

PRECAUTIONS

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

INFOID:0000000012350315

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.**

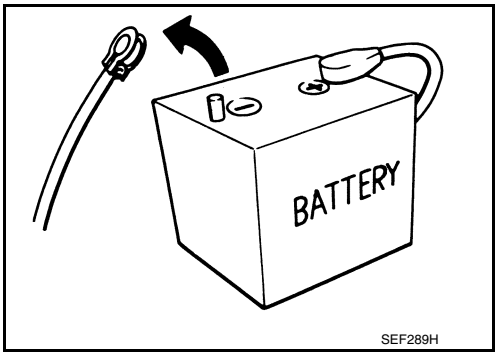
Precautions for Removing Battery Terminal

INFOID:0000000013042208

When disconnecting the battery terminal, pay attention to the following.

- Always use a 12V battery as power source.
- Never disconnect battery terminal while engine is running.
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
- For vehicles with the engine listed below, remove the battery terminal after a lapse of the specified time:

D4D engine	: 20 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		
V9X engine	: 4 minutes		
YD25DDTi	: 2 minutes		



NOTE:

ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.

- After high-load driving, if the vehicle is equipped with the V9X engine, turn the ignition switch OFF and wait for at least 15 minutes to remove the battery terminal.

NOTE:

- Turbocharger cooling pump may operate in a few minutes after the ignition switch is turned OFF.
- Example of high-load driving
  - Driving for 30 minutes or more at 140 km/h (86 MPH) or more.
  - Driving for 30 minutes or more on a steep slope.

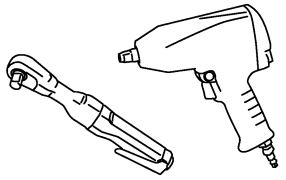
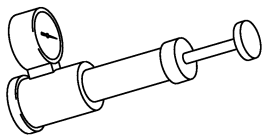
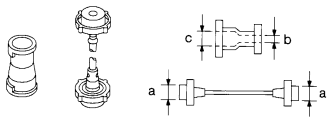
- For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch.
  NOTE:
  If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.
- After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.
  NOTE:
  The removal of 12V battery may cause a DTC detection error.

PREPARATION

PREPARATION

Commercial Service Tools

INFOID:0000000012350317

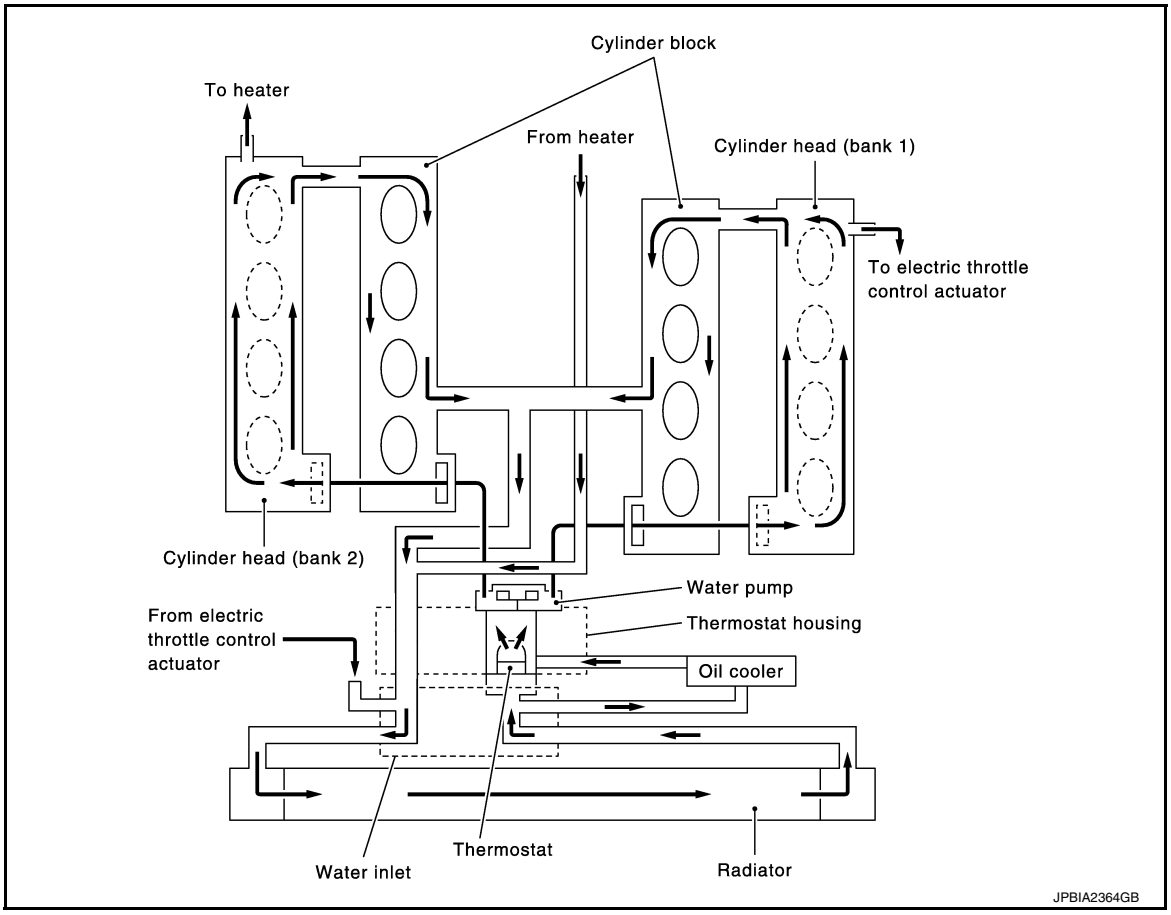
Tool name	Description
Power tool  PBIC0190E	Loosening bolts and nuts
Radiator cap tester  PBIC1982E	Checking radiator and radiator cap
Radiator cap tester adapter  S-NT564	Adapting radiator cap tester to radiator cap and water inlet filler neck **a: 28 (1.10) dia.** **b: 31.4 (1.236) dia.** **c: 41.3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

SYSTEM DESCRIPTION

DESCRIPTION

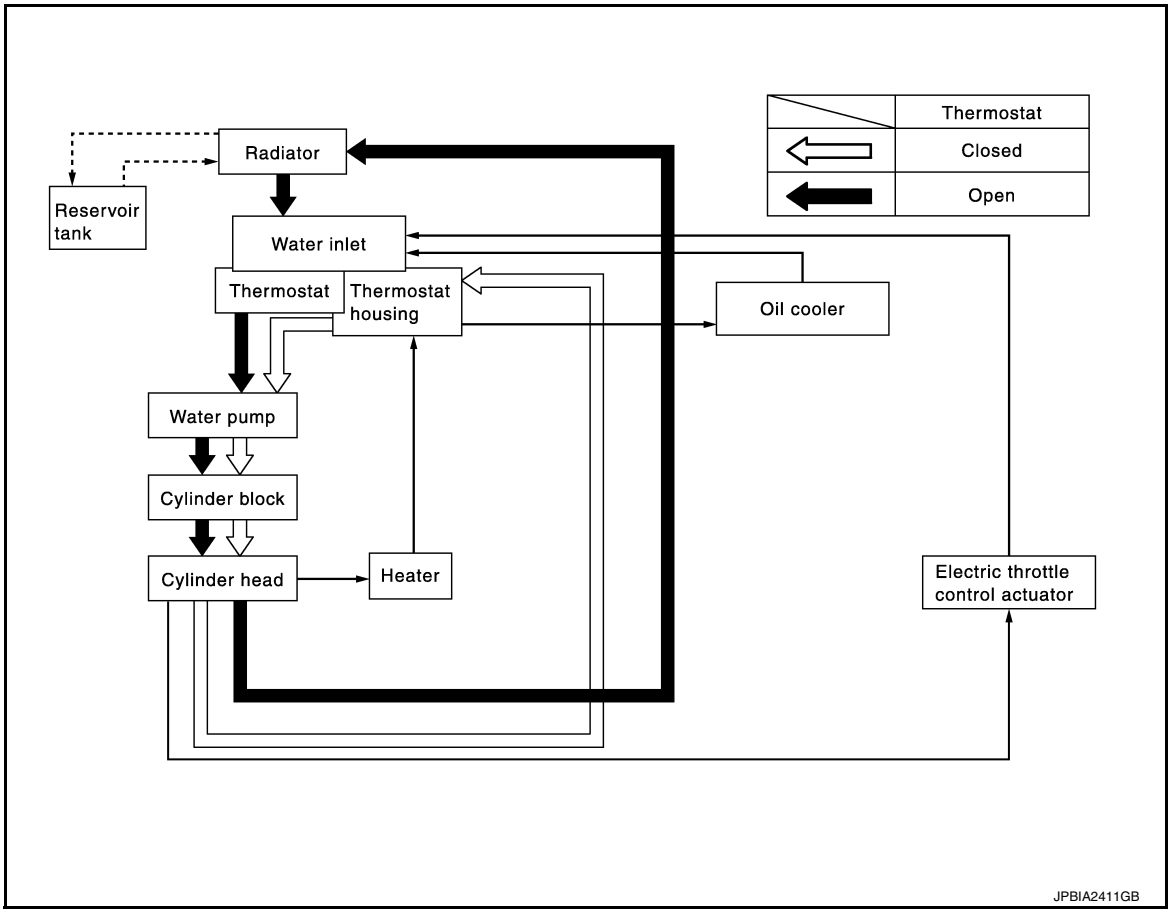
Engine Cooling System

INFOID:0000000012350318



Engine Cooling System Schematic

INFOID:0000000012350319



SYMPTOM DIAGNOSIS

OVERHEATING CAUSE ANALYSIS

Troubleshooting Chart

INFOID:0000000012350320

	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	Engine coolant leakage	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

	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

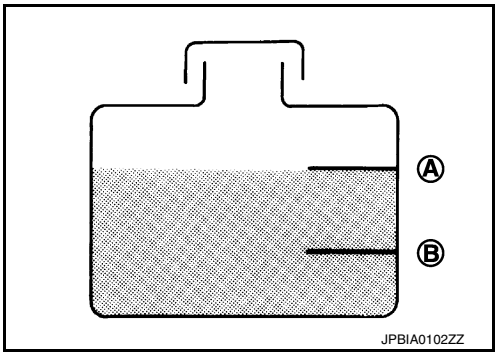
ENGINE COOLANT

Inspection

INFOID:0000000012350321

LEVEL

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



A : MAX
B : MIN

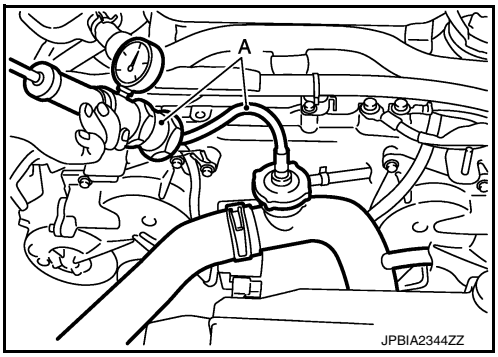
- Adjust the engine coolant level if necessary.

CAUTION:
Refill Genuine NISSAN Long Life Antifreeze/Coolant (blue) or equivalent in its quality mixed with water (distilled or demineralized). Refer to MA-16, "FOR NORTH AMERICA : Fluids and Lubricants" (FOR NORTH AMERICA), MA-18, "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 and radiator cap tester adapter (commercial service tool) (A).



Testing pressure : Refer to CO-56, "Radiator".

WARNING:
Never remove radiator 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, fill radiator with engine coolant.

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

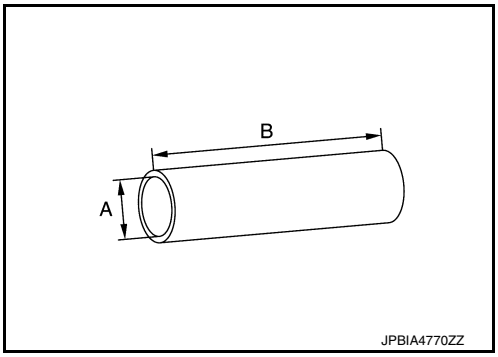
Draining

INFOID:0000000012350322

WARNING:

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

1. Connect drain hose.
   NOTE:
   Use a general-purpose hose with the dimmensions shown in the figure.

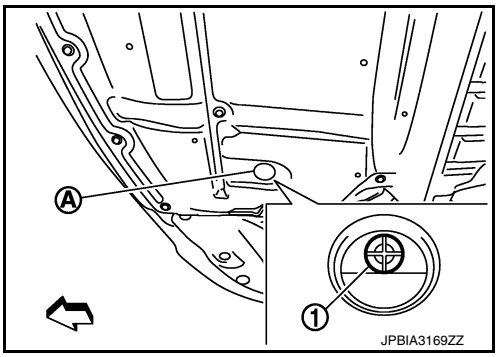


A : ϕ 15 - 16 mm (0.59 - 0.63 in)
B : 145 mm (5.17 in)

2. Open radiator drain plug (1) at the bottom of radiator, and then remove radiator cap.

A : Radiator drain plug hole

⇦ : Vehicle front



When draining all of engine coolant in the system, open water drain plug on cylinder block. Refer to EM-283, "Disassembly and Assembly".

3. Remove reservoir tank if necessary, and drain engine coolant and clean reservoir tank before installing.
4. Check drained engine coolant for contaminants such as rust, corrosion or discoloration. If contaminated, flush the engine cooling system. Refer to CO-42, "Flushing".
5. Disconnect drain hose.

Refilling

INFOID:0000000012350323

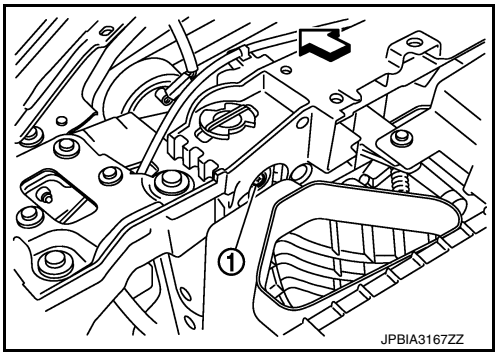
CAUTION:
- **Do not put additive such as waterleak preventive, since it may cause cooling waterway clogging.**
- **When refilling use Genuine NISSAN Long Life Antifreeze/Coolant (blue) or equivalent in its quality mixed with water (distilled or demineralized). Refer to MA-16, "FOR NORTH AMERICA : Fluids and Lubricants" (FOR NORTH AMERICA), MA-18, "FOR MEXICO : Fluids and Lubricants" (FOR MEXICO).**

1. Remove air cleaner case (LH) and air duct (inlet). Refer to EM-192, "Exploded View".
2. Install reservoir tank if removed, and radiator drain plug.
   CAUTION:
   Be sure to clean drain plug and install with new O-ring.

   : 1.2 N·m (0.12 kg-m, 11 in-lb)

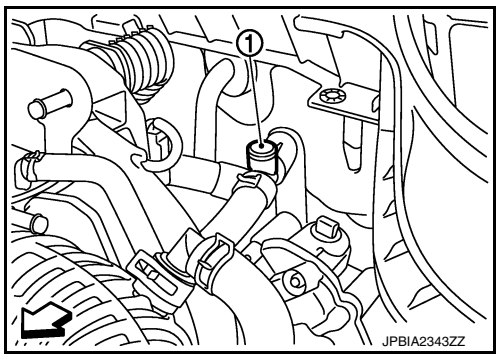
   If water drain plug on cylinder block is removed, close and tighten it. Refer to EM-283, "Disassembly and Assembly".
3. Check that each hose clamp is firmly tightened.
4. Remove air relief plug (1) on radiator left side.

⇦ : Vehicle front



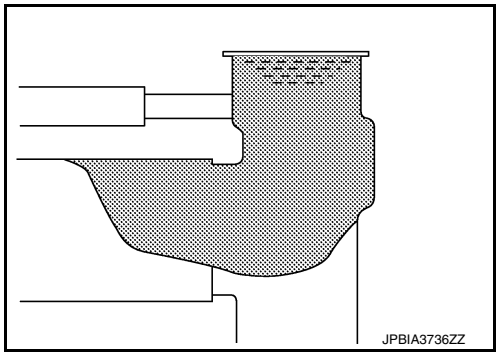
5. Remove air relief plug (1) on heater hose side.

⇦ : Vehicle front



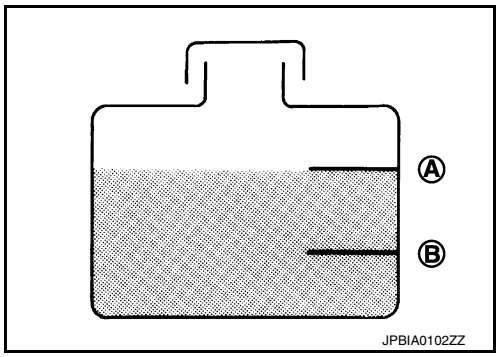
6. Fill up the radiator with cooling water.
Pour engine coolant through engine coolant filler neck slowly of less than 2 ℓ (2-1/8 US qt, 1-3/4 Imp qt) a minute to allow air in system to escape.

Engine coolant capacity (With reservoir tank at "MAX" level)	**: Refer to CO-56, "Periodical Maintenance Specification".**



Reservoir tank engine coolant capacity (At "MAX" level)	**: Refer to CO-56, "Periodical Maintenance Specification".**

A : MAX
B : MIN



7. When engine coolant overflows air relief hole on radiator, install air relief plug with new O-ring.

: 1.2 N·m (0.12 kg-m, 11 in-lb)

8. Refill reservoir tank to "MAX" level line with engine coolant.
9. When engine coolant overflows air relief hole on heater hose, install air relief plug with new O-ring. Then refill radiator with engine coolant.
CAUTION:
Do not reuse O-rings.

: 1.2 N·m (0.12 kg-m, 11 in-lb)

10. Install air cleaner case (LH) and air duct (inlet).
11. Install radiator cap.
12. Warm up engine until opening thermostat. Standard for warming-up time is approximately 10 minutes at 3,000 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.
13. Stop the engine and cool down to less than approximately 50°C (122°F).
• Cool down using fan to reduce the time.
• If necessary, refill radiator up to filler neck with engine coolant.

- Remove the radiator cap to check the fluid level. If the fluid level is low, refill with cooling water and repeat the steps from Step 8.

14. Refill reservoir tank to “MAX” level line with engine coolant.
15. Check cooling system for leakage with engine running.
16. 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 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 12 of Refilling to Step c of Flow Noise Verification Method.
e. Check that the reservoir tank cap is tightened.

Flushing

INFOID:0000000012350324

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

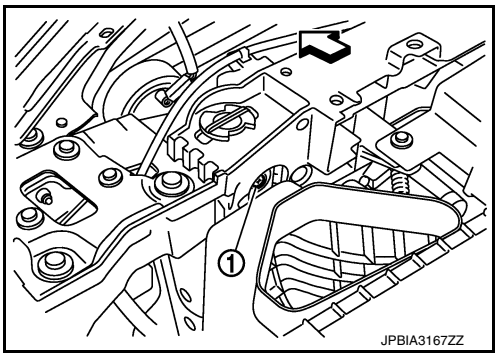
CAUTION:
Be sure to clean drain plug and install with new O-ring.

: 1.2 N·m (0.12 kg-m, 11 in-lb)

If water drain plug on cylinder block is removed, close and tighten it. Refer to EM-283, "Disassembly and Assembly".

2. Remove air relief plug (1) on radiator.

⇦ : Vehicle front



3. Fill water inlet with water until water spills from the air relief holes, then close air relief plugs. Fill water inlet and reservoir tank with water and reinstall radiator cap.

: 1.2 N·m (0.12 kg-m, 11 in-lb)

4. Run the engine and warm it up to normal operating temperature.
5. Rev the engine two or three times under no-load.
6. Stop the engine and wait until it cools down.
7. Drain water from the system. Refer to CO-39, "Draining".
8. Repeat steps 1 through 7 until clear water begins to drain from radiator.
9. Check that the reservoir tank cap is tightened.

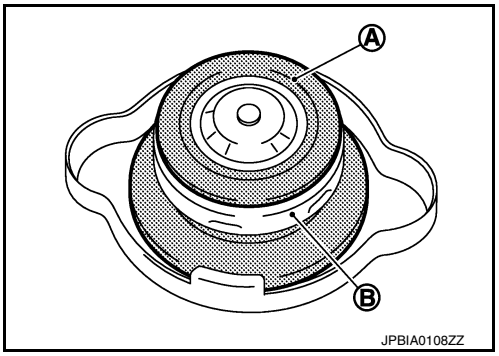
RADIATOR

RADIATOR CAP

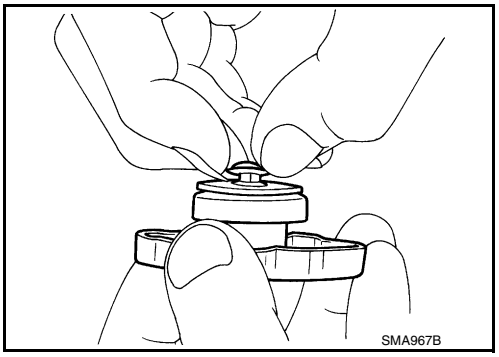
RADIATOR CAP : Inspection

INFOID:0000000012350325

- Check valve seat of radiator cap.
- Check if valve seat (A) is swollen to the extent that the edge of the metal plunger (B) cannot be seen when watching it vertically from the top.
- Check if valve seat has no soil and damage.

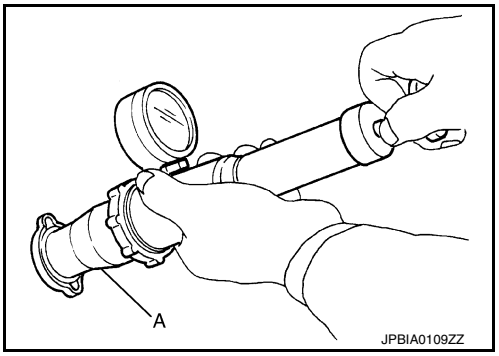


- Pull negative-pressure valve to open it, and check that it close completely when released.
- Check that there is no dirt or damage on the valve seat of radiator cap negative-pressure valve.
- Check that there are no unusualness in the opening and closing conditions of negative-pressure valve.



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

Standard and limit : Refer to CO-56, "Radiator".



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

CAUTION:

When installing radiator cap, thoroughly wipe out the water inlet filler neck to remove any waxy residue or foreign material.

RADIATOR

RADIATOR : Inspection

INFOID:0000000012350326

Check radiator for mud or clogging. If necessary, clean radiator as per the following:

- 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.
   - Use compressed air lower than 490 kPa (5 kg/cm^2, 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.

REMOVAL AND INSTALLATION

RADIATOR

Exploded View

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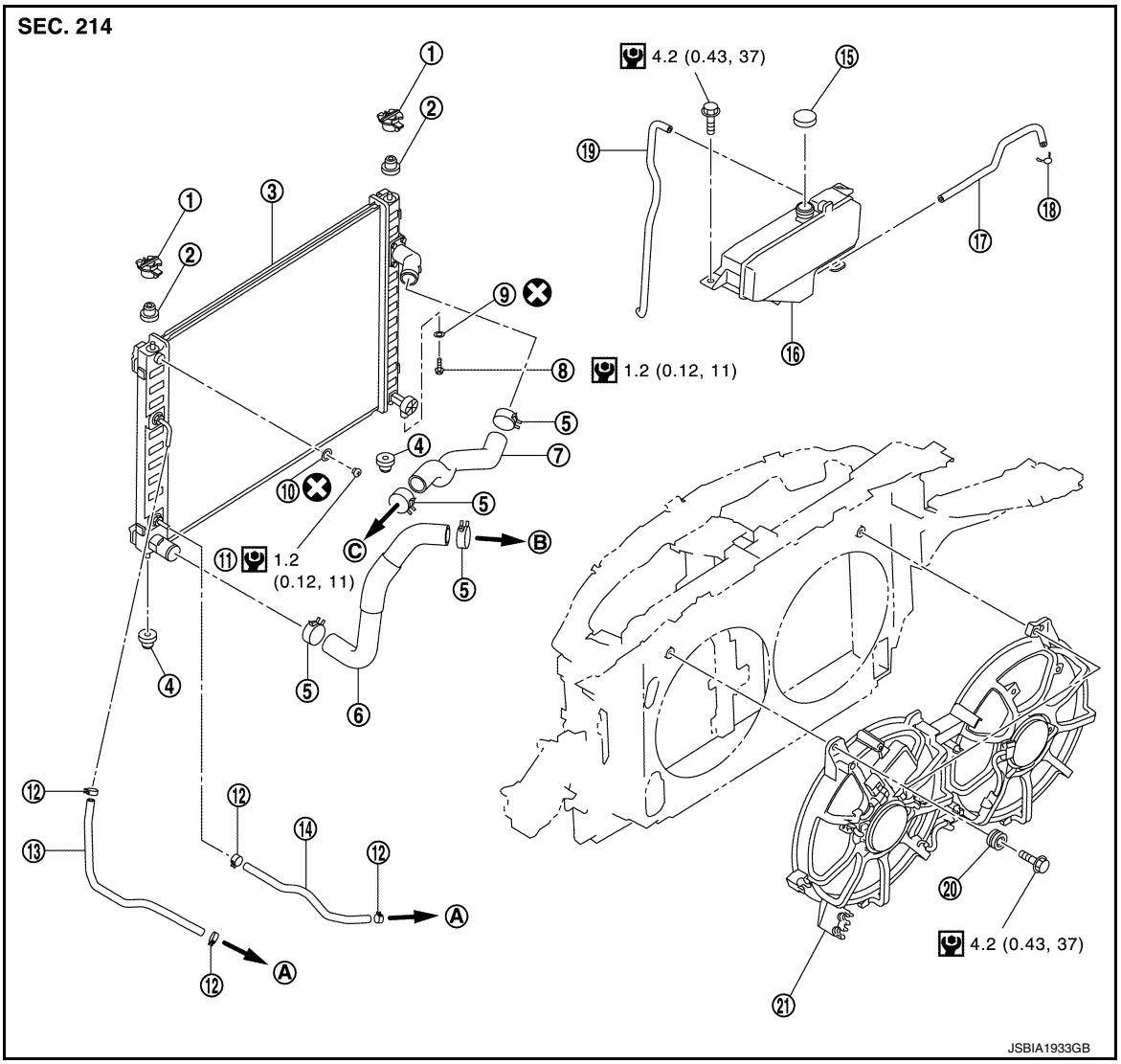


1. Upper mount bracket	2. Mounting rubber (upper)	3. Radiator
4. Mounting rubber (lower)	5. Clamp	6. Radiator hose (lower)
7. Radiator hose (upper)	8. Drain plug	9. O-ring
10. O-ring	11. Air relief plug	12. Clamp
13. A/T fluid cooler hose	14. A/T fluid cooler hose	15. Reservoir tank cap
16. Reservoir tank	17. Reservoir tank hose	18. Clamp
19. Reservoir tank hose	20. Grommet	21. Cooling fan assembly
A. To transmission	B. To water inlet and thermostat assembly	C. To water outlet

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

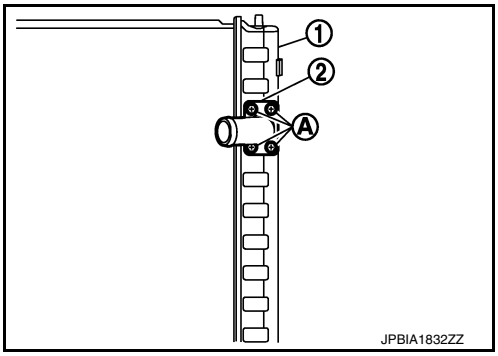
INFOID:0000000012350328

REMOVAL

WARNING:
Never remove radiator 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 by turning it all the way.
NOTE:
When removing components such as hoses, tube/lines, etc., cap or plug openings to prevent fluid from spilling.

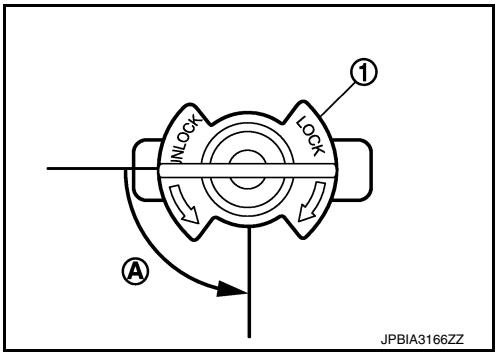
1. Remove the following parts:
   - Engine under cover, using a power tool.
   - Front engine cover : Refer to EM-189, "Exploded View".
   - Air cleaner case: Refer to EM-192, "Exploded View".
   - Air duct (inlet): Refer to EM-194, "Exploded View".
   - Hood lock stay assembly and horn: Refer to DLK-205, "Exploded View" and HRN-7, "Exploded View".
   - Reservoir tank.
   - Radiator core support.
2. Remove condenser pipe assembly. Refer to HA-40, "Exploded View".
3. Drain engine coolant from radiator. Refer to CO-39, "Draining".
   CAUTION:
   - **Perform this step when the engine is cold.**
   - **Never spill engine coolant on drive belts.**
4. Disconnect A/T fluid cooler hoses from radiator.
   - Install blind plug to avoid leakage of A/T fluid.
5. Remove radiator hoses (upper and lower) and reservoir tank hose.
   CAUTION:
   - **Be careful not to allow engine coolant to contact drive belts.**
   - **Never loosen radiator water inlet pipe mounting screw (A). If loosened, replace radiator (1).**

   2 : Radiator water inlet pipe



6. Rotate two radiator upper mount brackets 90 degrees in direction as shown in the figure, and remove them.

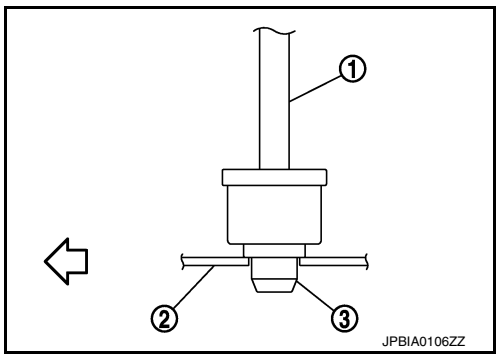
   1 : Radiator upper mount bracket
   A : Turn 90° counterclockwise



7. Remove radiator as per the following:
   CAUTION:
   Be careful not to damage radiator core.

a. Lift up and pull the radiator (1) forward, and then remove the mounting rubber (lower) (3) from the radiator core support (2).

⇦ : Vehicle front



INSTALLATION

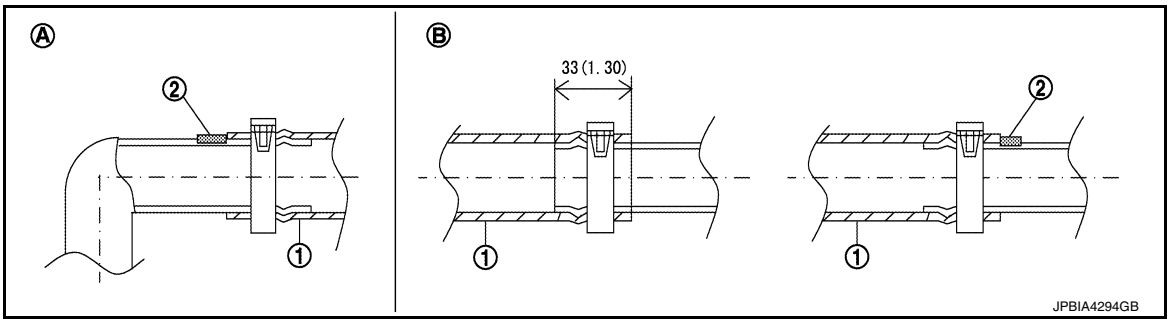
Note the following, and install in the reverse order of removal.

CAUTION:

- **Do not reuse O-rings.**
- **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).



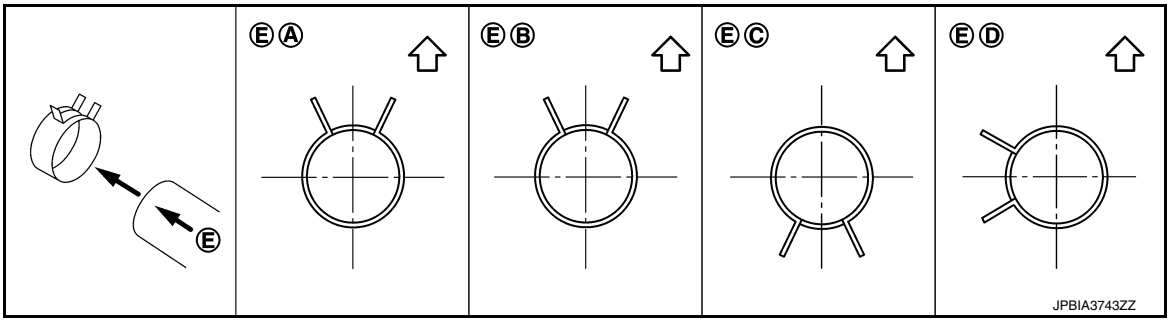
Unit mm (in)

A. Radiator side B. Engine side

- For the orientation of the hose clamp pawl, refer to the figure.

Radiator hose	Hose end	Paint mark	Position of hose clamp*
Radiator hose (upper)	Radiator side	Upper	A
	Engine side	Upper	B
Radiator hose (lower)	Radiator side	Lower	C
	Engine side	Front side	D

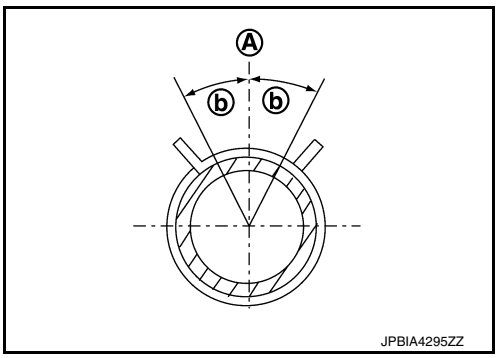
*Refer to the illustrations for the specific position each hose clamp tab.



E. View E

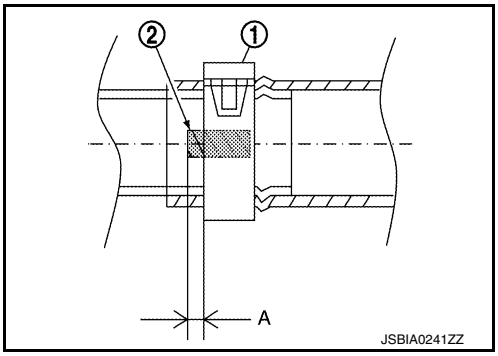
⇦ Vehicle upper

- The angle (b) created by the hose clamp pawl and the specified line (A) must be within ±30° as shown in the figure.



- To install hose clamps (1), check that the dimension (A) from the end of the paint mark (2) on the radiator hose to the hose clamp is within the reference value.

Dimension "A" **(–1) – (+1) mm**
(–0.04) – (+0.04) in



Inspection

INFOID:0000000012350329

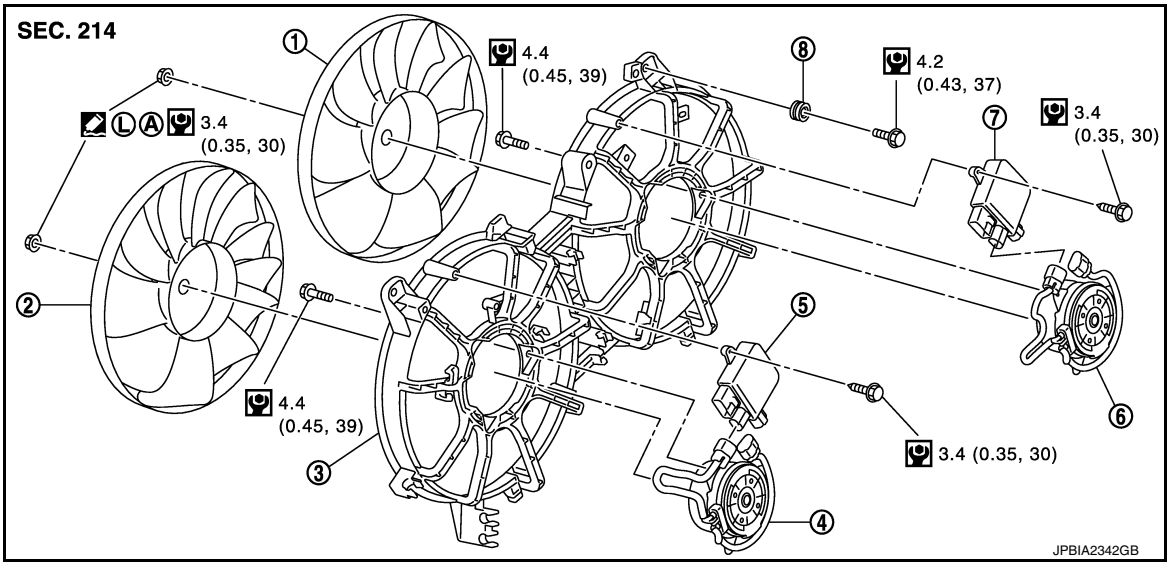
INSPECTION AFTER INSTALLATION

- Check for leakage of engine coolant using the radiator cap tester adapter (commercial service tool) and the radiator cap tester (commercial service tool). Refer to CO-39, "Inspection".
- Start and warm up the engine. Visually check that there is no leakage of engine coolant and A/T fluid.
- Check that the reservoir tank cap is tightened.

COOLING FAN

Exploded View

INFOID:0000000012350330



1.	Cooling fan (RH)	2.	Cooling fan (LH)	3.	Fan shroud
4.	Fan motor 1	5.	Cooling fan control module 1	6.	Fan motor 2
7.	Cooling fan control module 2	8.	Grommet		
A.	Apply on fan motor shaft				

: Apply high strength thread locking sealant or equivalent.

: N·m (kg-m, in-lb)

Removal and Installation

INFOID:0000000012350331

REMOVAL

1. Remove air cleaner case (LH) and air duct (inlet). Refer to EM-192, "Exploded View".
2. Remove reservoir tank and drain hose. Refer to CO-45, "Exploded View".
3. Remove A/T fluid cooler tube from fan shroud.
4. Remove harness clips from fan shroud.
5. Disconnect harness connector from cooling fan control modules (1 and 2), and move harness to aside.
6. 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:
Only use genuine parts for cooling fan mounting bolt and observe the specified torque (to prevent radiator from being damaged).

Disassembly and Assembly

INFOID:0000000012350332

DISASSEMBLY

1. Disconnect harness connector from fan shroud.
2. Remove cooling fan control modules (1 and 2) from fan shroud.

CAUTION:
Handle carefully to avoid dropping and impact.

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 : 11 blades

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

Inspection

INFOID:0000000012350333

INSPECTION AFTER REMOVAL

Check that fan motors operate normally.

NOTE:

Cooling fans are controlled by cooling fan control module. For details, refer to EC-1013, "COOLING FAN CONTROL : System Diagram" (VK56VD FOR USA AND CANADA), EC-1604, "COOLING FAN CONTROL : System Diagram" (VK56VD FOR MEXICO).

INSPECTION AFTER DISASSEMBLY

Cooling Fan

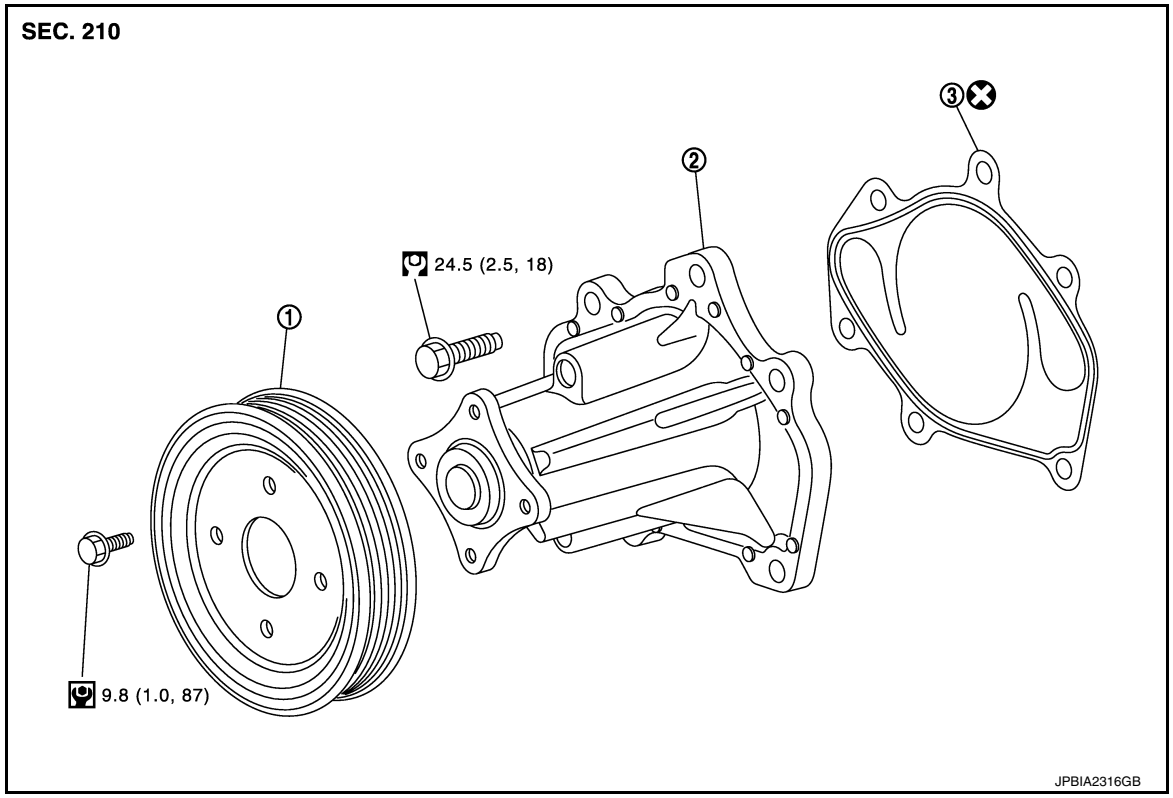
Inspect cooling fan for crack or unusual bend.

- If anything is found, replace cooling fan.

WATER PUMP

Exploded View

INFOID:0000000012350334



1. Water pump pulley
2. Water pump
3. Gasket

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:0000000012350335

CAUTION:
- **When removing water pump assembly, be careful not to get engine coolant on drive belts.**
- **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 (commercial service tool) and the radiator cap tester adapter (commercial service tool).**

REMOVAL

1. Remove following parts:
   - Engine undercover, using a power tool.
   - Front engine cover. Refer to EM-189, "Exploded View".
   - Air duct (inlet): Refer to EM-192, "Exploded View".
   - Reservoir tank. Refer to CO-45, "Exploded View".
2. Loosen water pump pulley mounting bolts.
3. Remove drive belt: Refer to EM-183, "Removal and Installation".
4. Remove water pump pulley.
5. Drain engine coolant from drain plugs on radiator and cylinder block. Refer to CO-39, "Draining" and EM.
   CAUTION:
   - **Perform this step when engine is cold.**

- **Never spill engine coolant on drive belt.**

6. Remove water pump. Refer to CO-51, "Exploded View".
   - Engine coolant will leak from cylinder block, so have a receptacle ready under vehicle.

   CAUTION:
   - **Handle the water pump vane so that it does not contact any other parts.**
   - **Never disassemble water pump.**

INSTALLATION

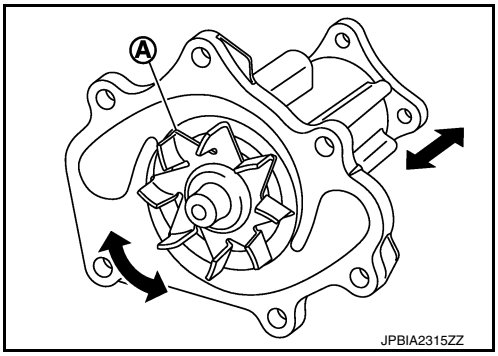
Install in the reverse order of removal.

Inspection

INFOID:0000000012350336

INSPECTION AFTER REMOVAL

- Visually check that there is no significant dirt or rusting on water pump body and vane (A).
- Check there is no slack in vane shaft, and that it turns smoothly when rotated by hand.
- If anything is found, replace water pump.



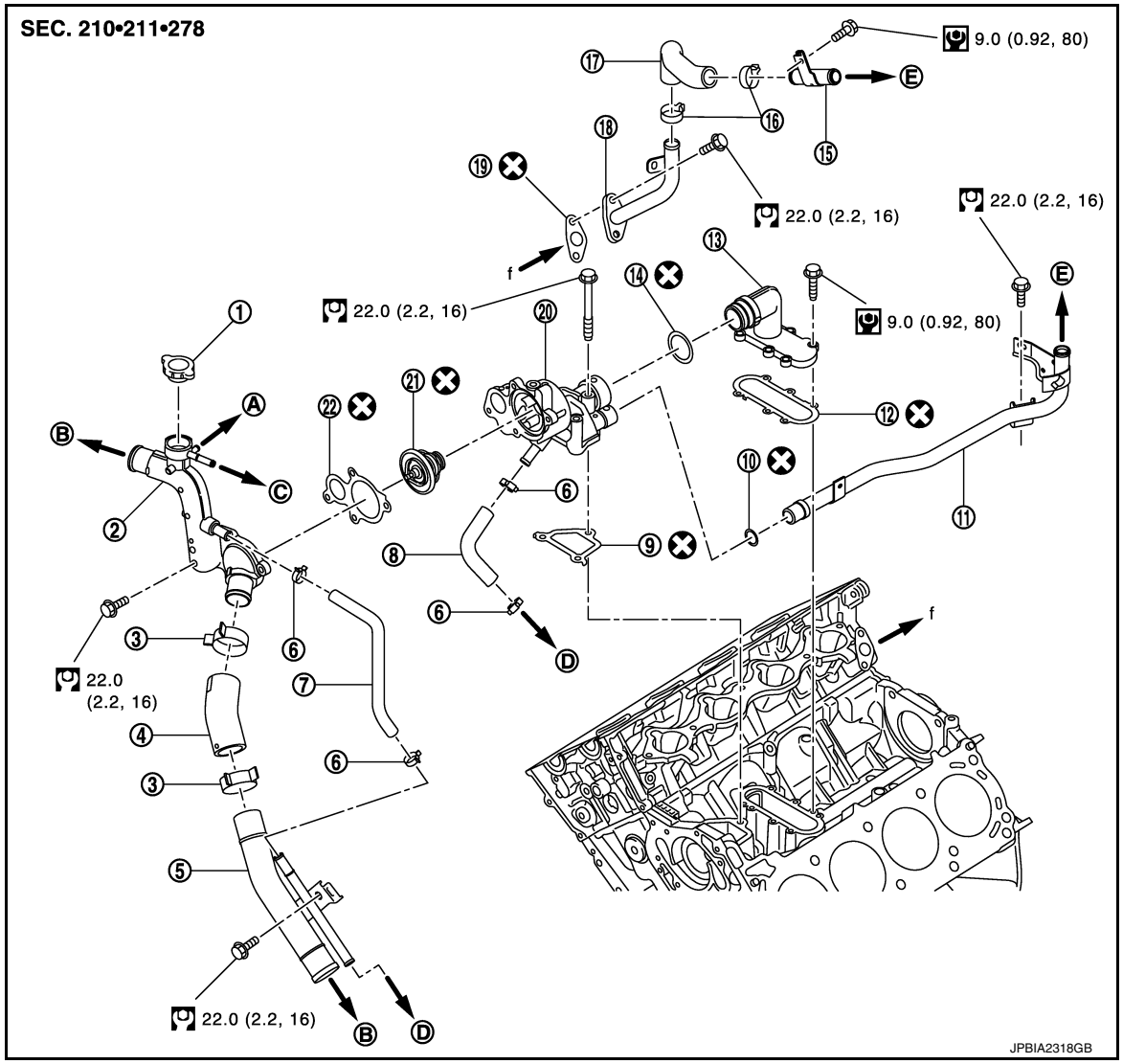
INSPECTION AFTER INSTALLATION

- Check that the reservoir tank cap is tightened.
- Check for leakage of engine coolant using the radiator cap tester adapter (commercial service tool) and the radiator cap tester (commercial service tool). Refer to CO-39, "Inspection".
- Start and warm up the engine. Visually check that there is no leakage of engine coolant.

WATER INLET AND THERMOSTAT ASSEMBLY

Exploded View

INFOID:0000000012350337



1.	Radiator cap	2.	Water inlet	3.	Clamp
4.	Water suction hose	5.	Water suction pipe	6.	Clamp
7.	Water hose	8.	Water hose	9.	Gasket
10.	O-ring	11.	Heater pipe	12.	Gasket
13.	Water connector	14.	O-ring	15.	Water pipe
16.	Clamp	17.	Water hose	18.	Water pipe
19.	Gasket	20.	Thermostat housing	21.	Thermostat
22.	Gasket				
A.	To electric throttle control actuator	B.	To radiator	C.	To reservoir tank
D.	To oil cooler	E.	To heater		

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

: Always replace after every disassembly.

Removal and Installation

INFOID:0000000012350338

REMOVAL

1. Remove front engine cover. Refer to EM-189, "Exploded View".
2. Remove air duct (inlet). Refer to EM-192, "Exploded View".
3. Remove reservoir tank. Refer to CO-45, "Exploded View".
4. Remove engine undercover with a power tool.
5. Drain engine coolant from drain plugs on radiator and cylinder block. Refer to CO-39, "Draining" and EM-283, "Disassembly and Assembly".
   CAUTION:
   - **Perform this step when engine is cold.**
   - **Never spill engine coolant on drive belts.**
6. Disconnect radiator hose (upper and lower). Refer to CO-45, "Exploded View".
7. Remove water suction pipe and water suction hose.
8. Remove intake manifold. Refer to EM-198, "Exploded View".
9. Remove the following parts: Move injector harness to the position without the hindrance for work.
   - Harness connector
   - Harness clip
10. Remove fuel tube insulator.
11. Remove fuel feed tube (pump side) and fuel feed tube (bank side).
12. Remove water inlet and thermostat.
13. Remove water connector, heater pipes and heater hoses.
14. Remove thermostat housing.

INSTALLATION

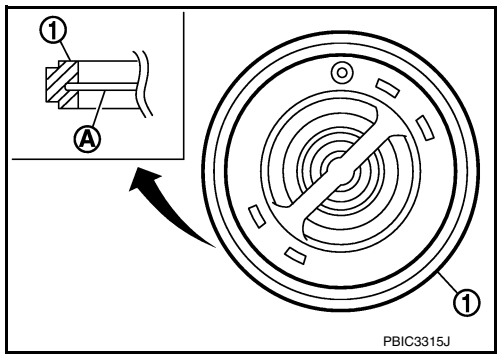
Note the following, and install in the reverse order of removal.

CAUTION:

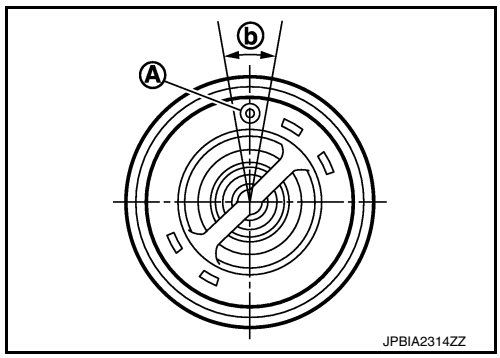
- **Do not reuse O-rings.**
- **Be careful not to spill engine coolant over engine room. Use rag to absorb engine coolant.**

Thermostat

- Install thermostat with the whole circumference of each flange part (A) fit securely inside rubber ring (1).



- Install thermostat with jiggle valve (A) facing upwards. The position deviation may be within the range of 20 degrees (b).



Water Connector and Heater Pipe

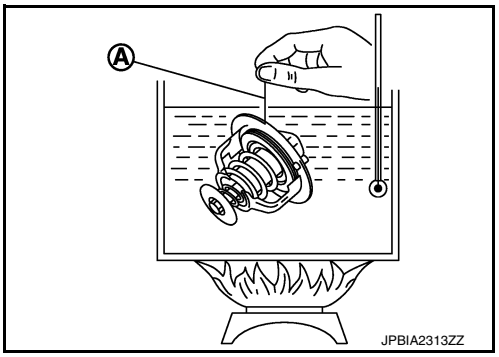
- First apply a neutral detergent to O-rings, then quickly insert the insertion parts of the water connector and heater pipe into the installation holes.

Inspection

INFOID:0000000012350339

INSPECTION AFTER REMOVAL

- Check that valve in thermostat is completely closing at normal temperature.
- Place a thread (A) so that it is caught in the valve of the thermostat. Immerse fully in a container filled with water. Heat while stirring.
- The valve opening temperature is the temperature at which the valve opens and falls from the thread.
- After checking the maximum valve lift, lower the water temperature and check the valve closing temperature.



Thermostat (Standard) : Refer to CO-56, "Thermostat".

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

INSPECTION AFTER INSTALLATION

- Check that the reservoir tank cap is tightened.
- Check for leakage of engine coolant using the radiator cap tester adapter (commercial service tool) and the radiator cap tester (commercial service tool). Refer to CO-39, "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)

Periodical Maintenance Specification

INFOID:0000000012350340

ENGINE COOLANT CAPACITY (APPROXIMATELY)

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)	0.8 (7/8, 3/4)

Radiator

INFOID:0000000012350341

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

Cap relief pressure	Standard	122.3 - 151.7 (1.2 - 1.5, 18 - 22)
	Limit	107 (1.1, 16)
Leakage testing pressure		157 (1.6, 23)

Thermostat

INFOID:0000000012350342

Thermostat	Standard
Valve opening temperature	82°C (180°F)
Maximum valve lift	10.0 mm/95°C (0.394 in/203°F)
Valve closing temperature	77°C (171°F)