SECTION CO
ENGINE COOLING SYSTEM

CONTENTS

VQ35DE

PRECAUTION

PRECAUTIONS

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

INFOID:0000000011569100

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. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which 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 the SR section.**
- **Do not 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:

- **When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT 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 three minutes before performing any service.**

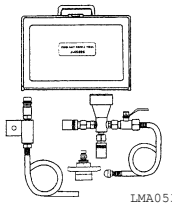
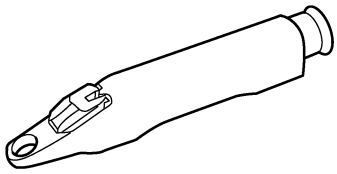
PREPARATION

PREPARATION

Special Service Tools

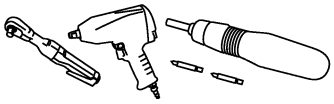
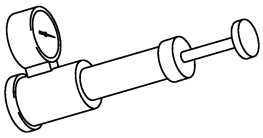
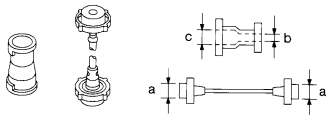
INFOID:0000000011569102

The actual shape of the tools may differ from those illustrated here.

Tool number (TechMate No.) Tool name	Description
KV991J0070 (J-45695-A) Coolant refill tool  LMA053	Refilling engine cooling system
KV991J0010 (J-23688) Engine coolant refractometer  WBIA0539E	Checking concentration of ethylene glycol in engine coolant

Commercial Service Tools

INFOID:0000000011569104

Power tool  PIIB1407E	Loosening nuts, screws 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 radiator pipe (upper) filler neck **a: 28 (1.10) diameter** **b: 31.4 (1.236) diameter** **c: 41.3 (1.626) diameter** Unit: mm (in)

SYSTEM DESCRIPTION

OVERHEATING CAUSE ANALYSIS

Troubleshooting Chart

INFOID:0000000011220719

	Symptom		Check items	
Cooling system parts malfunction	Poor heat transfer	Water pump malfunction	Worn or loose drive belt	Engine coolant circulation
		Thermostat stuck closed	Thermostat	
		Damaged radiator fins	Dust contamination or paper clogging	—
			Physical damage	
		Clogged radiator cooling tube	Excess foreign material (rust, dirt, sand, etc.)	
	Reduced air flow	Cooling fan motor assembly does not operate.	Cooling fan motor assembly	—
		High resistance to fan rotation		
		Damaged fan blades		
	Damaged radiator shroud	—	Radiator shroud	—
	Improper engine coolant mixture ratio	—	Engine coolant viscosity	—
	Poor engine coolant quality	—	Engine coolant density	—
	Insufficient engine coolant	Engine coolant leaks	Radiator and heater hoses	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
			Coolant reservoir tank	Cracked coolant reservoir tank
		Overflowing coolant reservoir tank	Exhaust gas leaks 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	—
			Improper size wheels and tires installed	
			Brakes dragging	
			Improper ignition timing	
	—	Blocked or restricted air flow	Blocked bumper	—
			Blocked condenser	
			Blocked radiator	
			Blocked radiator grille	
			Car brassiere installed	
			Large fog lamp installed	
			Mud contamination or paper clogging	

COOLING SYSTEM

Cooling Circuit

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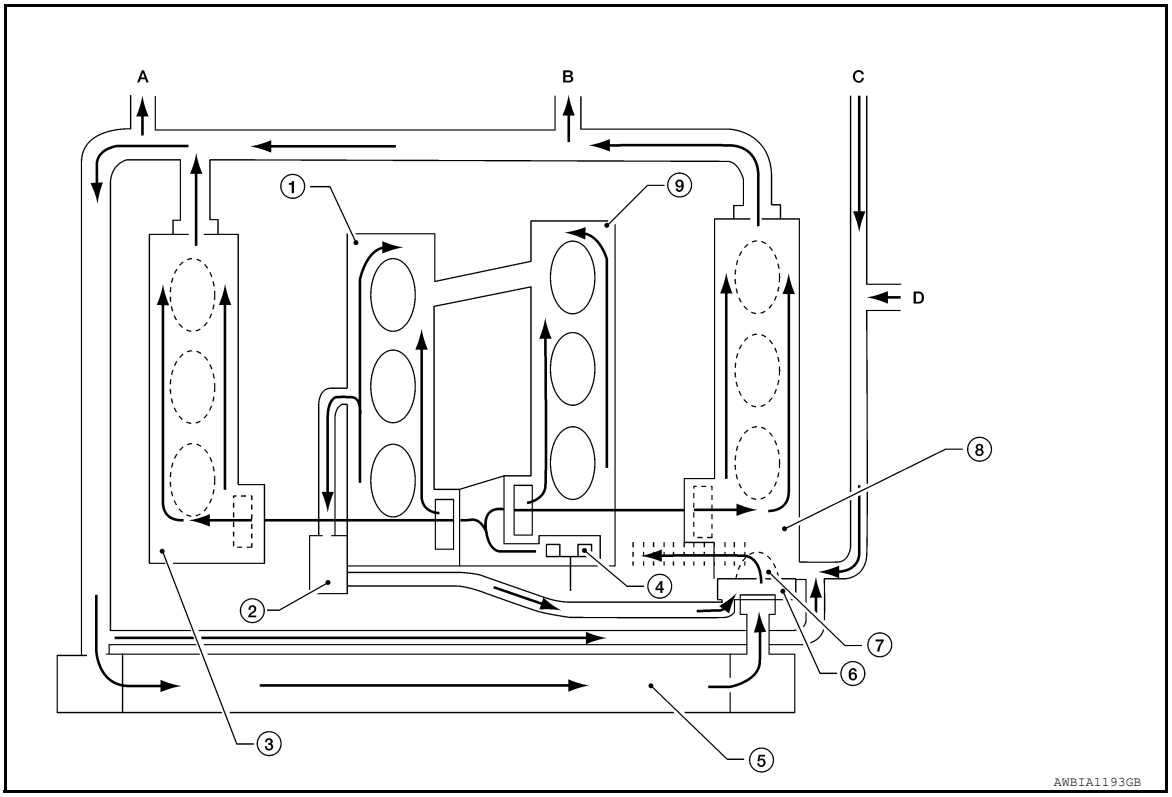
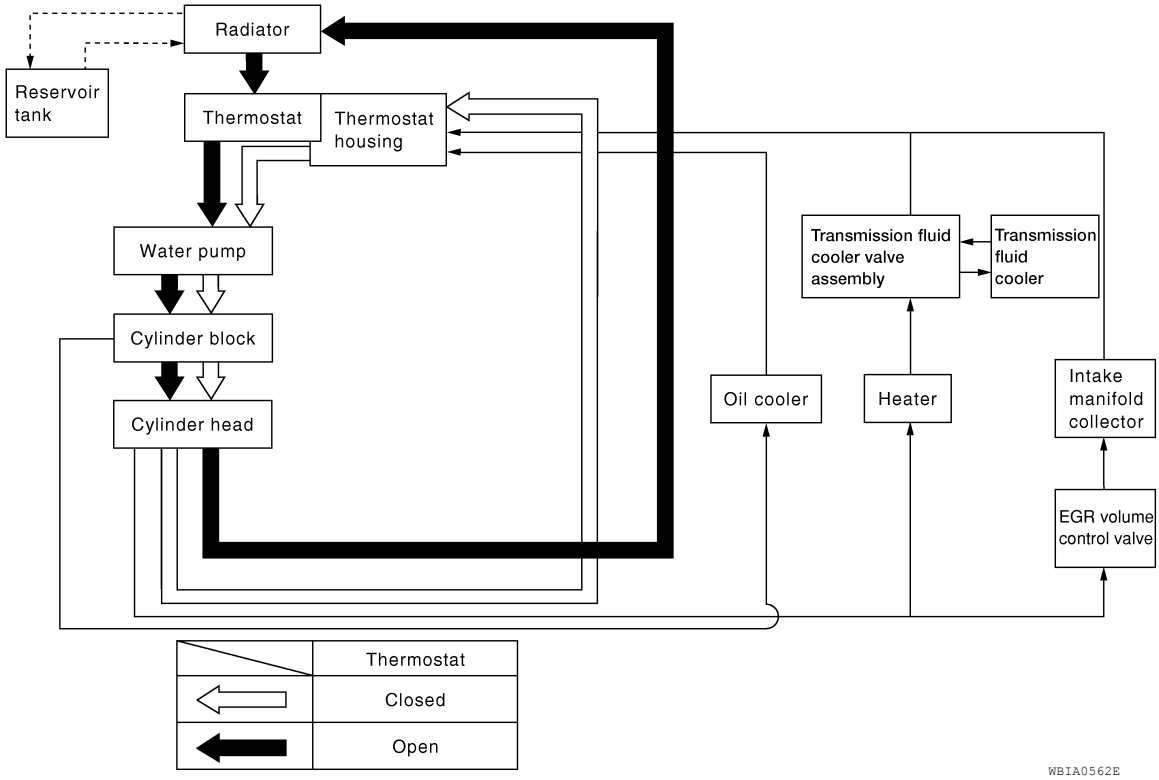


1. Cylinder block (bank 1)
2. Oil cooler
3. Cylinder head (bank 1)
4. Water pump
5. Radiator
6. Water outlet
7. Thermostat
8. Cylinder head (bank 2)
9. Cylinder block (bank 2)

A. To heater
B. To electric throttle control
C. From heater
D. From electric throttle control

Schematic

INFOID:0000000011220721



PERIODIC MAINTENANCE

ENGINE COOLANT

System Inspection

INFOID:0000000011569111

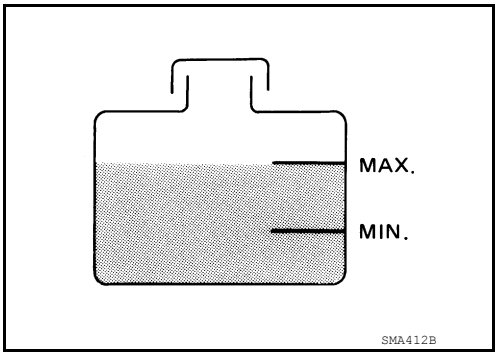
WARNING:
Do not remove the radiator cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from the radiator. Wrap a thick cloth around the cap. Slowly push down and turn it a quarter turn to allow built-up pressure to escape. Carefully remove the cap by pushing it down and turning it all the way.

CHECKING COOLING SYSTEM HOSES

Check hoses for the following:
- Improper attachment
- Leaks
- Cracks
- Damage
- Loose connections
- Chafing
- Deterioration

CHECKING RESERVOIR LEVEL

- Check if the reservoir tank coolant level is within MIN to MAX range when the engine is cool.
- Adjust coolant level if it is too much or too little.

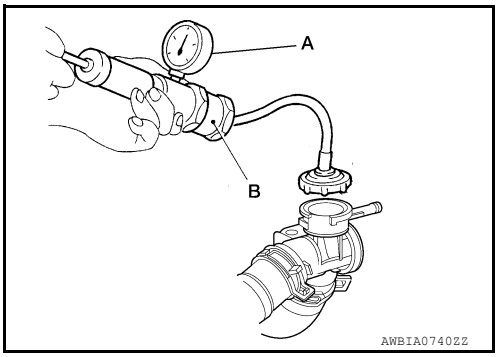


CHECKING COOLING SYSTEM FOR LEAKS

To check for leaks, apply pressure to the cooling system using suitable tools (A/B).

Testing pressure : Refer to CO-26, "Radiator".

WARNING:
Do not remove the radiator cap when the engine is hot. Serious burns could occur from high-pressure coolant escaping from the radiator.
CAUTION:
Higher pressure than specified may cause radiator damage.

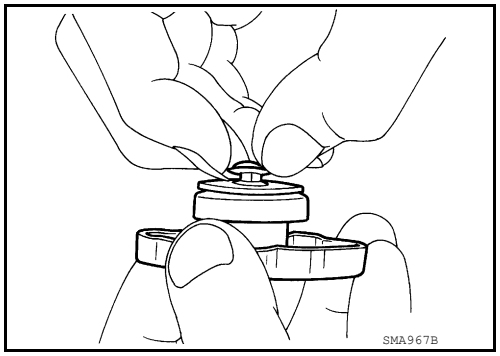


CHECKING RADIATOR CAP

1. Inspect the radiator cap.
   - Replace the cap if the metal plunger cannot be seen around the edge of the black rubber gasket.
   - Replace the cap if deposits of waxy residue or other foreign material are on the black rubber gasket or the metal retainer.

   NOTE:
   Thoroughly wipe out the radiator filler neck to remove any waxy residue or foreign material.

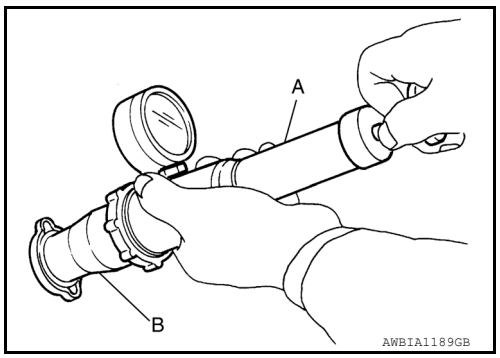
2. Pull the negative-pressure valve to open it and check that it closes completely when released.
   - Check that there is no dirt or damage on the valve seat of the radiator cap negative-pressure valve.
   - Check that there are no abnormalities in the opening and closing conditions of the negative-pressure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



3. Check radiator cap relief pressure using suitable tools (A/B).

Standard : Refer to CO-26, "Radiator".

   - When connecting the radiator cap to the tester, apply water or coolant to the cap seal surface.
   - Replace the radiator cap if there is an abnormality in the negative-pressure valve or if the open-valve pressure is outside the standard values.



CHECKING RADIATOR

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

CAUTION:
- **Be careful not to bend or damage the radiator fins.**
- **When radiator is cleaned on-vehicle, remove surrounding parts in order to access the radiator core. Tape the harness and electrical connectors to prevent water from entering.**

1. Spray water to the back side of the radiator core using a side-to-side motion from the top down.
2. Stop spraying when debris no longer flows from radiator core.
3. Blow air into the back side of radiator core using a side-to-side motion from the top down.
   - Use compressed air lower than 490 kPa (5 kg/cm^2, 71 psi) and keep a distance of more than 30 cm (11.8 in).
4. Continue to blow air until no water sprays out.
5. Check for coolant leaks. Repair as necessary.

Changing Engine Coolant

INFOID:0000000011569115

WARNING:
Do not remove the radiator cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from the radiator. Wrap a thick cloth around the cap. Slowly push down and turn it a quarter turn to allow built-up pressure to escape. Carefully remove the cap by pushing it down and turning it all the way.

DRAINING ENGINE COOLANT

1. Remove the front under cover. Refer to EXT-40, "FRONT UNDER COVER : Removal and Installation".
2. Open the radiator drain plug at the bottom of the radiator and remove the radiator filler cap. This is the only step required when partially draining the cooling system (radiator only).
   CAUTION:
   - **Do not allow the coolant to contact the drive belts.**
   - **Perform this step when engine is cold.**
3. Follow this step for heater core removal/replacement only. Disconnect the upper heater hose at the engine side and apply moderate air pressure [103.46 kPa (1.055 kg/cm^2, 15 psi) maximum air pressure] into the hose for 30 seconds to blow the excess coolant out of the heater core.
4. When draining all of the coolant in the system, remove the reservoir tank and drain the coolant then clean the reservoir tank before installation.

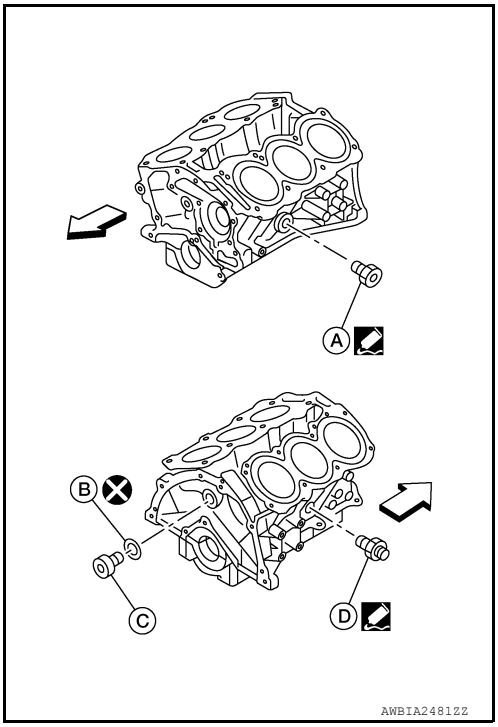
CAUTION:
- **Do not allow the coolant to contact the drive belts.**
- **Perform this step when engine is cold.**

5. When performing a complete cooling system drain, remove the water drain plug (A), connector bolt (D), water drain plug (C) and water drain plug O-ring (B) on the cylinder block.

CAUTION:
Do not reuse water drain plug O-ring (B).
NOTE:
For Canada, connector bolt (D) is a block heater, not a water drain plug.

6. Check the drained coolant for contaminants, such as rust, corrosion or discoloration.
   If the coolant is contaminated, flush the engine cooling system.

⇦ : Engine front



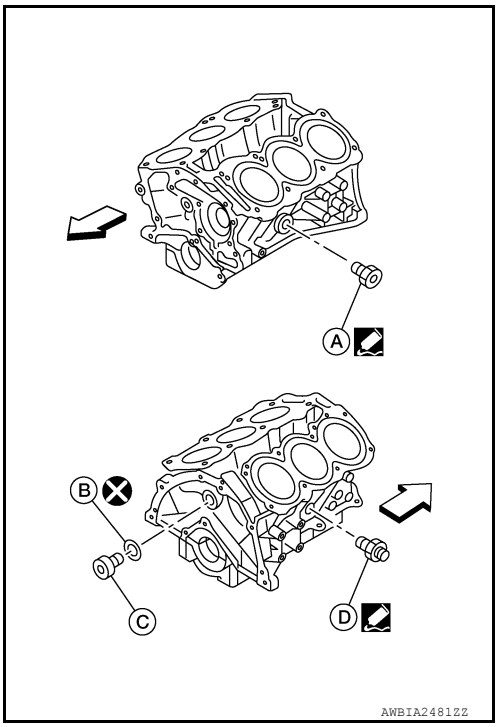
REFILLING ENGINE COOLANT

1. Install the radiator drain plug and the reservoir tank (if removed).
2. Install the cylinder block drain plugs (if removed).
   - Apply sealant to the threads of the water drain plug (A) and connector bolt (D) (if removed).
     CAUTION:
     Do not reuse water drain plug O-ring (B).

     ⇦ : Engine front

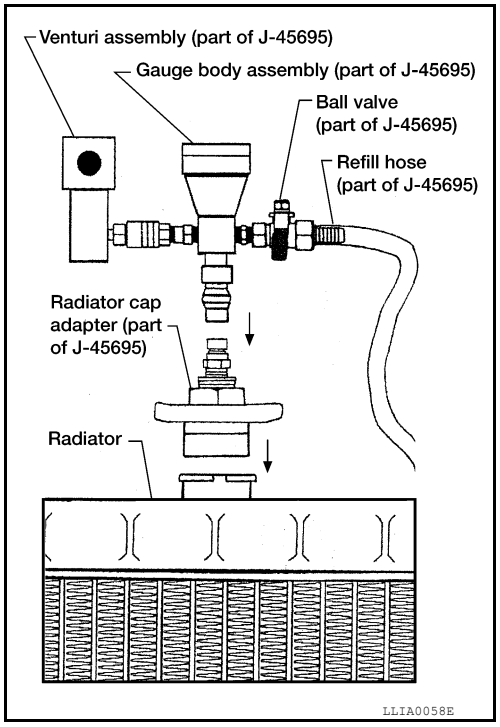
     NOTE:
     - For Canada, connector bolt (D) is a block heater, not a water drain plug.
     - Use Genuine High Performance Thread Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".
   - Tighten each plug and connector bolt to specification.

Water drain plug (B) (except Canada)	**: 62.0 N·m (6.3 kg-m, 46 ft-lb)**
Block heater (B) (Canada)	**: 39.0 N·m (4.0 kg-m, 29 ft-lb)**
Connector Bolt (C)	**: 27.0 N·m (2.8 kg-m, 20 ft-lb)**
Water drain plug (D)	**: 78.0 N·m (8.0 kg-m, 58 ft-lb)**



3. If disconnected, reattach the upper radiator hose at the engine side.
4. Set the vehicle heater controls to the full HOT and heater ON positions. Turn the vehicle ignition ON with the engine OFF as necessary to activate the heater mode.

5. Install the Tool by installing the radiator cap adapter onto the radiator neck opening. Then attach the gauge body assembly with the refill tube and the venturi assembly to the radiator cap adapter.



Tool number : KV991J0070 (J-45695)

6. Insert the refill hose into the coolant mixture container that is placed at floor level. Make sure the ball valve is in the closed position.

CAUTION:
Use recommended coolant or equivalent.
Refer to MA-11, "Fluids and Lubricants".

Engine coolant capacity (with reservoir tank) : Refer to CO-26, "Capacity".

CAUTION:
Do not use any cooling system additives such as radiator sealer. Additives may clog the cooling system and cause damage to the engine, transmission and/or cooling system.

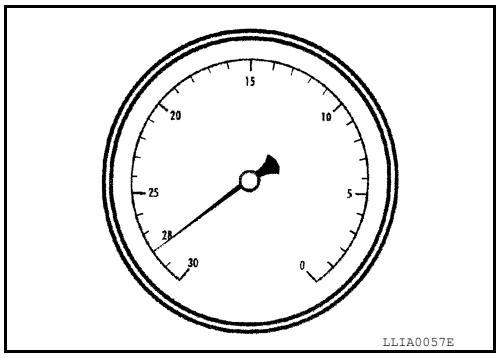
7. Install an air hose to the venturi assembly; the air pressure must be within specification.

Compressed air supply pressure : 549 - 824 kPa (5.6 - 8.4 kg/cm^2, 80 - 119 psi)

CAUTION:
The compressed air supply must be equipped with an air dryer.

8. The vacuum gauge will begin to rise and there will be an audible hissing noise. During this process, open the ball valve on the refill hose slightly. Coolant will be visible rising in the refill hose. Once the refill hose is full of coolant, close the ball valve. This will purge any air trapped in the refill hose.

9. Continue to draw the vacuum until the gauge reaches 28 inches of vacuum. The gauge may not reach 28 inches in high-altitude locations; use the vacuum specifications based on the altitude above sea level.



Altitude above sea level	Vacuum gauge reading
0 - 100 m (328 ft)	: 28 inches of vacuum
300 m (984 ft)	: 27 inches of vacuum
500 m (1,641 ft)	: 26 inches of vacuum
1,000 m (3,281 ft)	: 24 - 25 inches of vacuum

10. When the vacuum gauge has reached the specified amount, disconnect the air hose and wait 20 seconds to see if the system loses any vacuum. If the vacuum level drops, perform any necessary repairs to the system and repeat steps 6 - 8 to bring the vacuum to the specified amount. Recheck for any leaks.
11. Place the coolant container (with the refill hose inserted) at the same level as the top of the radiator. Then open the ball valve on the refill hose so the coolant will be drawn up to fill the cooling system. The cooling system is full when the vacuum gauge reads zero.

CAUTION:
Do not allow the coolant container to get too low when filling to avoid air from being drawn into the cooling system.

12. Remove the Tool from the radiator neck opening.
13. Fill the cooling system reservoir tank to the specified level and install the radiator cap. Run the engine to warm the cooling system and top off the system as necessary.
14. Install the front under cover. Refer to EXT-40, "FRONT UNDER COVER : Removal and Installation".

FLUSHING COOLING SYSTEM

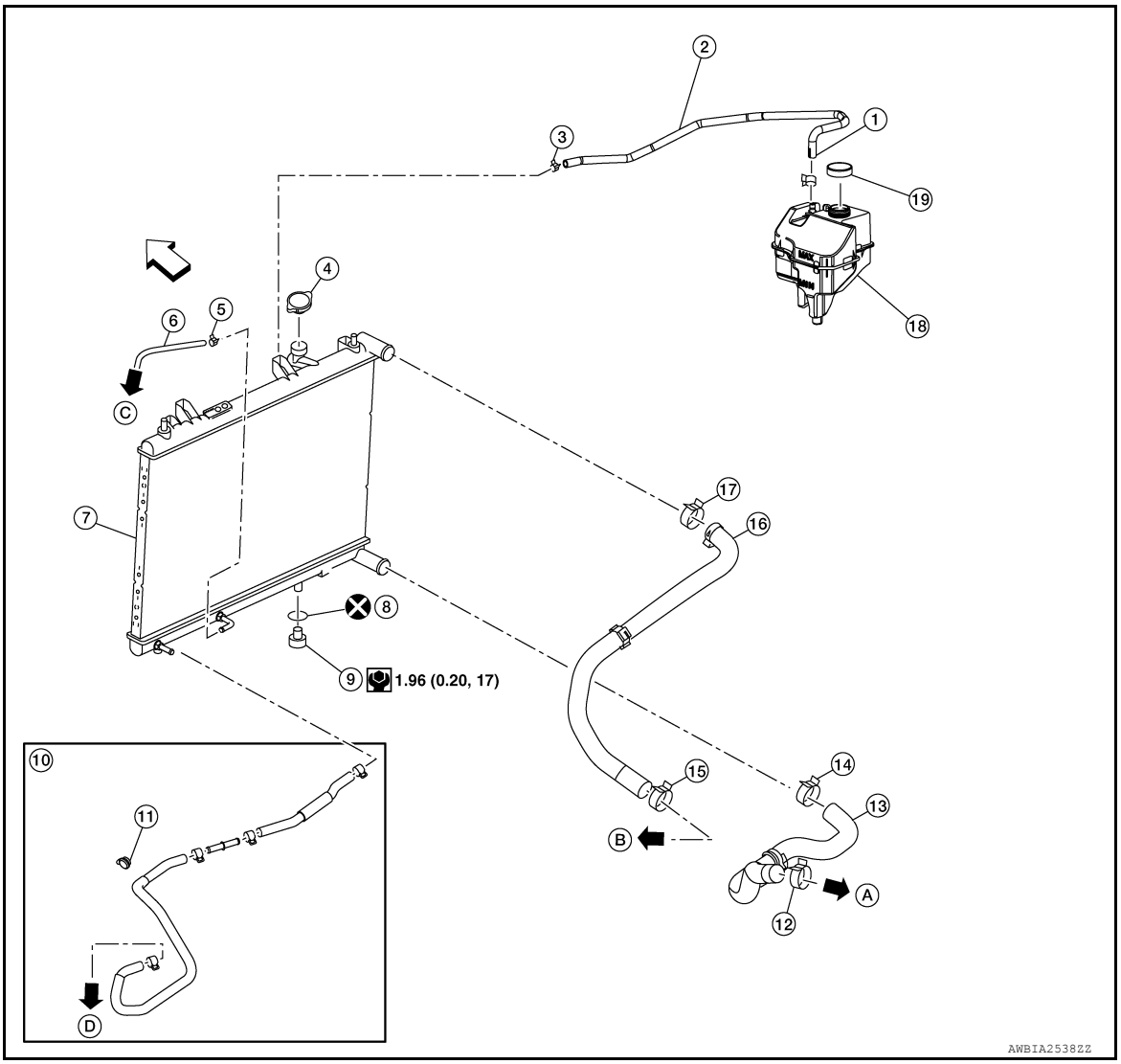
1. Fill the radiator from the filler neck above the radiator upper hose and reservoir tank with clean water and reinstall radiator filler cap.
2. Run the engine until it reaches normal operating temperature.
3. Rev the engine two or three times under no-load.
4. Stop the engine and wait until it cools down.
5. Drain the water from the system. Refer to CO-9, "Changing Engine Coolant".
6. Repeat steps 1-5 until clear water begins to drain from the radiator.

REMOVAL AND INSTALLATION

RADIATOR

Exploded View

INFOID:0000000011220724



1.	Clamp	2.	Reservoir tank hose	3.	Clamp
4.	Radiator cap	5.	Clamp	6.	CVT fluid cooler hose A
7.	Radiator	8.	O-ring	9.	Radiator drain plug
10.	CVT fluid cooler hose B	11.	Retainer	12.	Clamp
13.	Radiator hose (lower)	14.	Clamp	15.	Clamp
16.	Radiator hose (upper)	17.	Clamp	18.	Reservoir tank
19.	Reservoir tank cap	A.	To water outlet	B.	To water inlet
C.	To CVT warmer	D.	To CVT warmer		

Removal and Installation

INFOID:0000000011220725

WARNING:

Do not remove the radiator cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from the radiator. Wrap a thick cloth around the cap. Slowly turn it a quarter turn to allow built-up pressure to escape. Carefully remove the cap by turning it all the way.

NOTE:

- When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.
- The radiator hose clamps on the radiator hose (upper) and on the radiator hose (lower) are not serviced separately. Radiator hose clamps are part of the radiator hose assembly and serviced as one unit with the radiator hose.

REMOVAL

1. Drain engine coolant from radiator. Refer to CO-9, "Changing Engine Coolant".
   CAUTION:
   - **Perform this step when the engine is cold.**
   - **Do not spill engine coolant on the drive belt.**
2. Remove front under cover. Refer to EXT-40, "FRONT UNDER COVER : Removal and Installation".
3. Remove front air duct. Refer to EM-26, "Removal and Installation".
4. Disconnect coolant reservoir hose from the radiator.
5. Remove front under cover. Refer to EXT-40, "FRONT UNDER COVER : Removal and Installation".
6. Remove the wheel and tire (RH) using a power tool. Refer to WT-68, "Removal and Installation".
7. Remove the fender protector (LH/RH): Refer to EXT-36, "FENDER PROTECTOR : Removal and Installation".
8. Disconnect radiator hose (upper) and radiator hose (lower) from the radiator.
   CAUTION:
   Do not allow the engine coolant to contact the drive belt.
9. Remove active grille shutter. Refer to EXT-32, "Removal and Installation".
10. Remove harness connector from ICC sensor. Refer to CCS-148, "Exploded View".
11. Disconnect CVT fluid cooler hose A from radiator.
12. Disconnect CVT fluid cooler hose B from radiator.
13. Disconnect hood lock switch and cable. Refer to DLK-288, "HOOD LOCK RELEASE CABLE : Removal and Installation".
14. Remove harness connector from ambient temperature sensor.
15. Remove the hood lock assembly. Refer to DLK-287, "Exploded View".
16. Remove the front bumper fascia. Refer to EXT-24, "Exploded View".
17. Remove the core support center brace.
18. Remove A/C condenser. Refer to HA-36, "Removal and Installation".
    CAUTION:
    Be careful not to damage condenser core.
19. Remove the radiator mounts (upper).
20. Remove radiator.
21. Replace radiator cap (if necessary).

CAUTION:
- **Do not damage or scratch the radiator core when removing.**

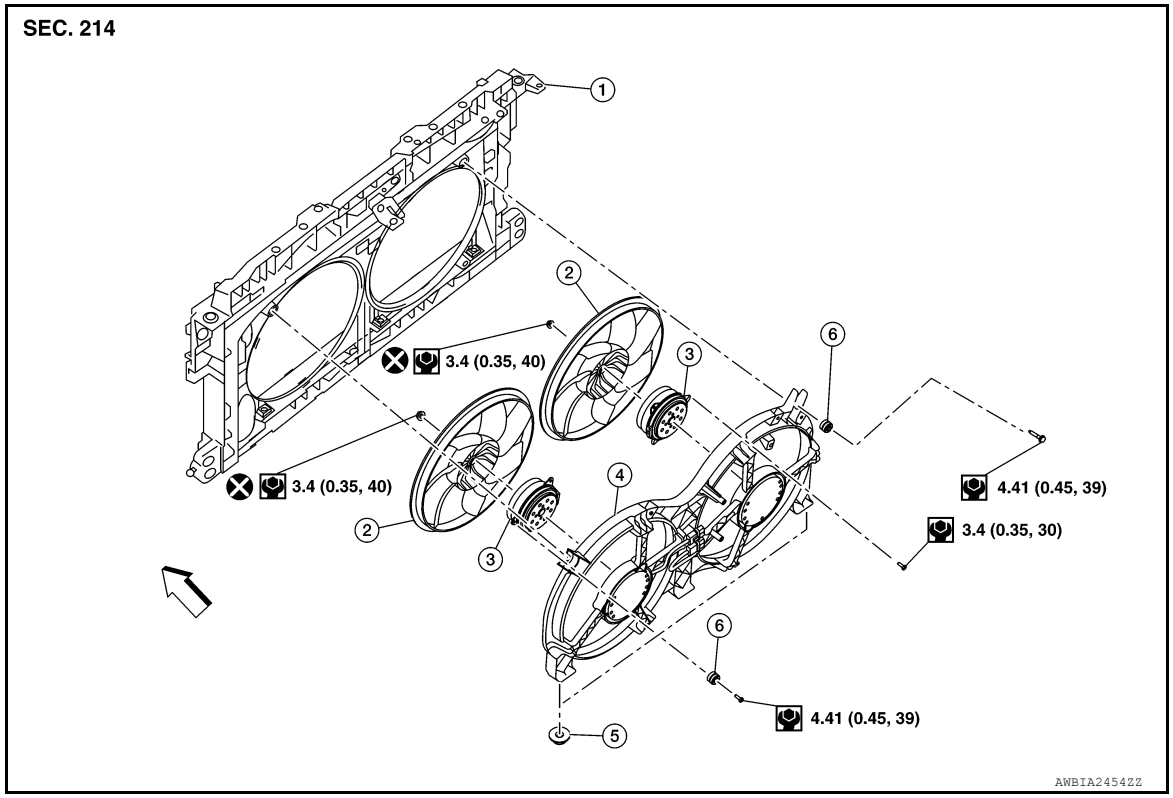
INSTALLATION

Installation is in the reverse order of removal.
- After installation, refill engine coolant and check for leaks. Refer to CO-9, "Changing Engine Coolant" and CO-8, "System Inspection".
  CAUTION:
  Do not spill engine coolant in engine compartment. Use a shop cloth to absorb engine coolant.
- After installation, inspect CVT fluid level. Refer to TM-189, "Inspection".
  CAUTION:
  Do not spill engine coolant in engine compartment. Use a shop cloth to absorb engine coolant.

COOLING FAN

Exploded View

INFOID:0000000011220726



1. Radiator core support
2. Fan
3. Fan motor
4. Fan shroud and motor assembly
5. Isolator (lower)
6. Grommet

⇦ Front

Removal and Installation

INFOID:0000000011220727

WARNING:
Do not remove the radiator cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from the radiator. Wrap a thick cloth around the cap. Slowly turn it a quarter turn to allow built-up pressure to escape. Carefully remove the cap by turning it all the way.
NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL

1. Partially drain engine coolant from radiator. Refer to CO-9, "Changing Engine Coolant".
   CAUTION:
   - **Perform when engine is cold.**
   - **Do not spill engine coolant on the drive belt.**
2. Remove engine room cover. Refer to EM-25, "Removal and Installation".
3. Remove sub tank bracket from cowl top extension.
4. Remove brake fluid level sensor harness connector from brake fluid level sensor.
5. Remove air cleaner and air duct assembly. Refer to EM-26, "Removal and Installation".
6. Remove blow by hose. Refer to EM-45, "Exploded View".
7. Remove battery tray. Refer to PG-86, "Removal and Installation".
8. Remove fan motor.

9. Remove fan from fan motor (if necessary).

INSTALLATION

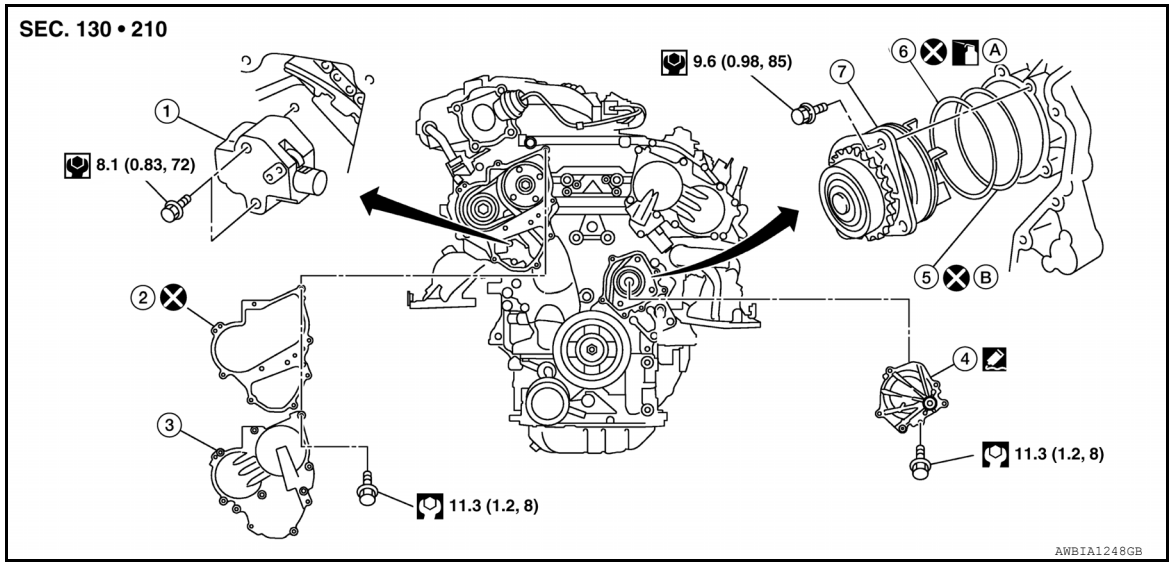
Installation is in the reverse order of removal.

- Cooling fan motor assembly is controlled by ECM. For details, refer to EC-535, "Diagnosis Procedure".

WATER PUMP

Exploded View

INFOID:0000000011220728



1. Timing chain tensioner (primary)
2. Valve timing control cover gasket (bank 1)
3. Valve timing control cover (bank 1)
4. Water pump cover
5. O-ring
6. O-ring
7. Water pump
A. Apply engine coolant.
B. Identify with white mark.

Removal and Installation

INFOID:0000000011220729

WARNING:
Do not remove the radiator cap when the engine is hot. Serious burns could occur from high pressure engine coolant escaping from the radiator. Wrap a thick cloth around the cap. Slowly turn it a quarter turn to allow built-up pressure to escape. Carefully remove the cap by turning it all the way.
CAUTION:
- **When removing water pump assembly, be careful not to get engine coolant on drive belt.**
- **Water pump cannot be disassembled and must be replaced as a unit.**
- **After installing the water pump, connect hose and clamp securely, then check for leaks. Repair as necessary.**

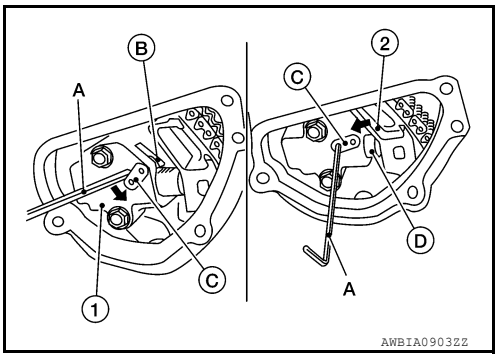
NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL

1. Disconnect the negative battery terminal. Refer to PG-86, "Removal and Installation".
2. Remove the engine room cover. Refer to EM-25, "Removal and Installation".
3. Remove engine under cover. Refer to EXT-40, "FRONT UNDER COVER : Removal and Installation".
4. Drain engine coolant from the radiator. Refer to CO-9, "Changing Engine Coolant".
   CAUTION:
   Perform when the engine is cold.
5. Drain power steering fluid. Refer to ST-30, "Draining and Refilling".
6. Remove the cowl top cover and the cowl top extension. Refer to EXT-34, "Exploded View".
7. Remove sub tank bracket from cowl top extension.
8. Remove brake fluid level sensor harness connector from brake fluid level sensor.
9. Remove strut tower brace.
10. Remove front air duct. Refer to EM-26, "Removal and Installation".

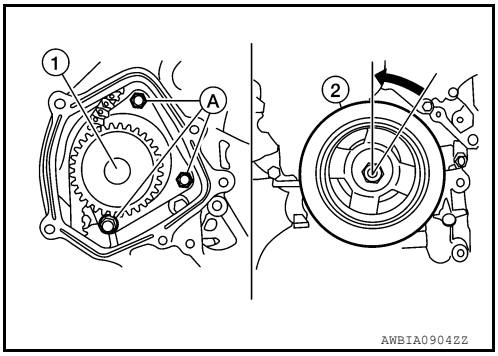
11. Remove the front road wheel and tire (RH) using a power tool. Refer to WT-68, "Removal and Installation".
12. Remove the fender protector (RH). Refer to EXT-36, "FENDER PROTECTOR : Removal and Installation".
13. Disconnect engine coolant reservoir hose and remove engine coolant reservoir tank.
14. Set No. 1 cylinder at TDC on its compression stroke.
    - Align pointer with TDC mark on crankshaft pulley.
15. Remove drive belt. Refer to EM-14, "Removal and Installation".
16. Remove the drive belt auto-tensioner assembly. Refer to EM-16, "Removal and Installation of Drive Belt Auto-tensioner".
17. Drain engine coolant from cylinder block (if necessary). Refer to CO-9, "Changing Engine Coolant".
18. Remove the E-PSF cover, bracket and motor. Refer to ST-38, "Removal and Installation".
19. Support engine and remove the RH engine insulator and bracket. Refer to EM-108, "AWD : Exploded View".
20. Disconnect the A/C lines at the junction. Refer to HA-33, "Exploded View".
21. Disconnect RH valve timing control connectors and remove valve timing control cover (bank 1). Refer to EM-54, "Exploded View".
22. Remove water pump cover. Refer to EM-57, "Exploded View".
23. Remove the timing chain tensioner (primary) as follows:

a. Pull the lever (C) down to release the plunger stopper tab (B).
b. Insert the stopper pin (A) into the tensioner body hole to hold the lever (C) and keep the plunger stopper tab (B) released.
   NOTE:
   An allen wrench (1.2 mm (0.047 in) is used for a stopper pin (A) as an example.
c. Compress the plunger (D) into the tensioner body (1) by pressing the slack guide (2).
d. Keep the slack guide (2) pressed and lock the plunger (D) in by pushing the stopper pin (A) through the lever (C) and into the chain tensioner body hole.



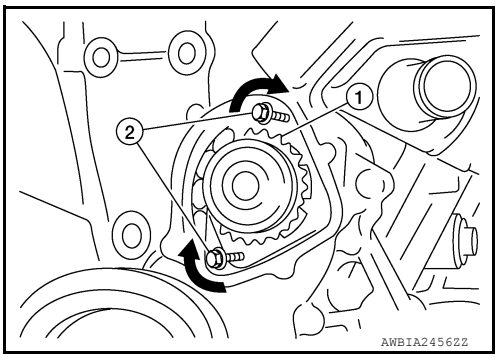
e. Remove timing chain tensioner bolts and then remove the timing chain tensioner.
   CAUTION:
   Be careful not to drop timing chain tensioner bolts inside timing chain case.

24. Remove the three water pump bolts (A). Make a gap between water pump sprocket (1) and timing chain by carefully turning crankshaft pulley (2) counterclockwise until timing chain loosens on water pump sprocket (1).



25. Remove water pump:

a. Screw M8 bolts (2) approximately 50 mm (1.97 in) into water pump (1) upper and lower bolt holes until they reach the timing chain case [M8 bolt pitch 1.25 mm (0.49 in) length].
   CAUTION:
   - **Place a suitable shop cloth below the water pump housing to prevent any engine coolant from dripping into the timing chain case.**
   - **Pull water pump (1) straight out while preventing vane from contacting sprocket in installation area.**

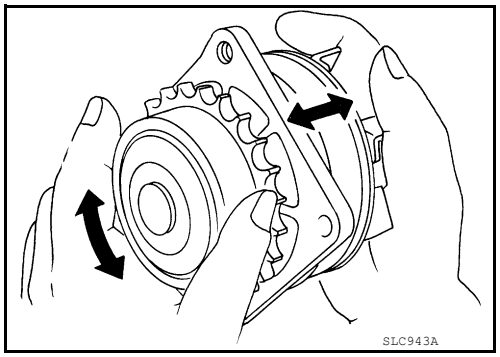


- **Remove water pump (1) without causing sprocket to contact timing chain.**

b. Remove M8 bolts (2) and O-rings from water pump (1).
CAUTION:
Do not reuse O-rings.

INSPECTION AFTER REMOVAL

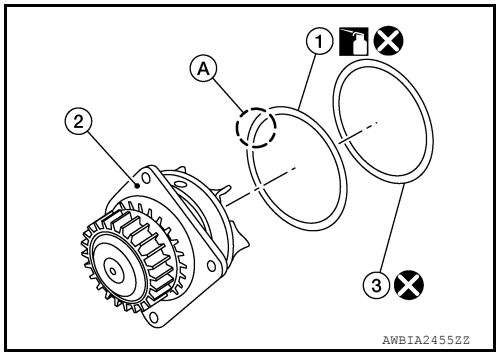
- Visually check for significant dirt or rust on the water pump body and vane.
- Check that the vane shaft turns smoothly by hand and is not excessively loose.
- Replace the water pump assembly if the water pump does not perform properly.



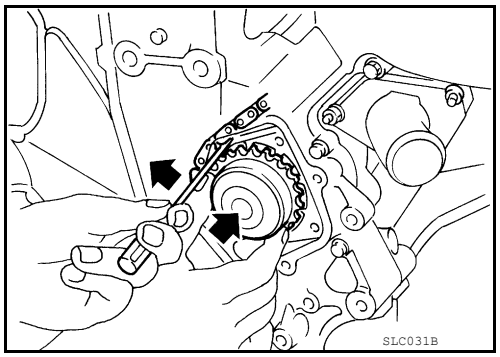
INSTALLATION

1. Install new O-rings (1/3) on water pump (2).
CAUTION:
Do not reuse O-rings.
- **Apply clean engine oil to the O-rings (1/3).**

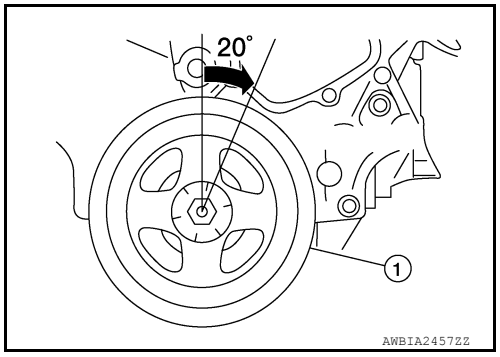
1. O-ring (black)
2. Water pump
3. O-ring (black)
A. White paint



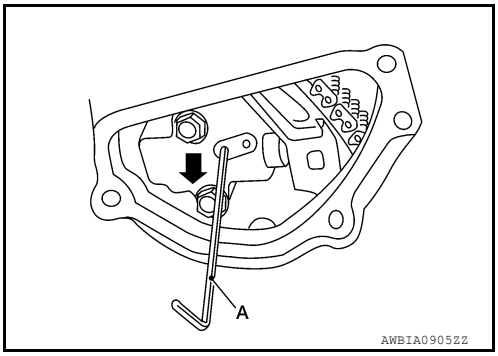
2. Hold timing chain to the side (⬅) and install the water pump (⬅).
CAUTION:
Do not allow the O-rings to be damaged by the cylinder block when installing the water pump.
- Check that timing chain and water pump sprocket are engaged.
- Tighten water pump bolts alternately and evenly to specification.



3. Remove dust and foreign material completely from installation area of timing chain tensioner and rear timing chain case.
4. Turn crankshaft pulley (1) approximately 20° clockwise so that timing chain on timing chain tensioner side is loose.



5. Apply engine oil to the oil feed hole and timing chain tensioner and install the timing chain tensioner.
6. Remove the stopper pin (A).



7. Install valve timing control cover (bank 1) and water pump cover.

a. Before installing, remove all traces of liquid gasket from mating surface of water pump cover and IVT cover using a scraper.
Also remove traces of liquid gasket from the mating surface of the front cover.

b. Apply a continuous bead of liquid gasket to mating surface of IVT cover and water pump cover. **Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".**
CAUTION:
- **Installation should be done within 5 minutes after applying liquid gasket.**
- **Do not fill the engine with engine oil for at least 30 minutes after the components are installed to allow the sealant to cure.**

8. Installation of remaining components is in the reverse order of removal.
- After installation, refill engine coolant and check for leaks. Refer to CO-9, "Changing Engine Coolant" and CO-8, "System Inspection".
CAUTION:
Do not spill engine coolant in engine compartment. Use a shop cloth to absorb engine coolant.
- Refill power steering fluid. Refer to ST-30, "Draining and Refilling".
- 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 the chain tensioner. The engine may produce a rattling noise. This indicates that air still remains in the chamber and is not a matter of concern.

INSPECTION AFTER INSTALLATION

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to MA-11, "Fluids and Lubricants".
- Use procedure below to check for fuel leaks.
- Turn ignition switch ON (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leaks at connection points.
- Start engine. With engine speed increased, check again for fuel leaks at connection points.
- Run engine to check for unusual noise and vibration.
NOTE:
If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.
- Warm up engine thoroughly to make sure there are no leaks of fuel, exhaust gas, or any oils/fluids including engine oil and engine coolant.
- Bleed air from passages in lines and hoses, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to specified level, if necessary.
- Summary of the inspection items:

Item		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission/ transaxle fluid	A/T and CVT Models	Leakage	Level/Leakage	Leakage
	M/T Models	Level/Leakage	Leakage	Level/Leakage

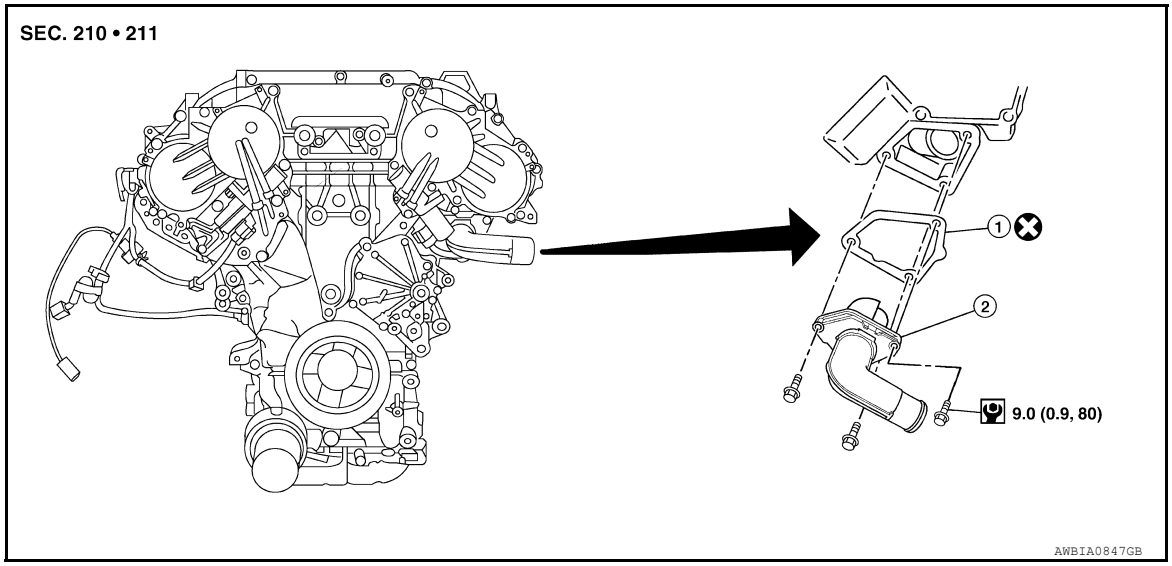
Item	Before starting engine	Engine running	After engine stopped
Other oils and fluids*	Level	Leakage	Level
Fuel	Leakage	Leakage	Leakage
Exhaust gas	—	Leakage	—

*Power steering fluid, brake fluid, etc.

THERMOSTAT AND THERMOSTAT HOUSING

Exploded View

INFOID:0000000011220730



1. Gasket
2. Thermostat assembly (water inlet)

Removal and Installation

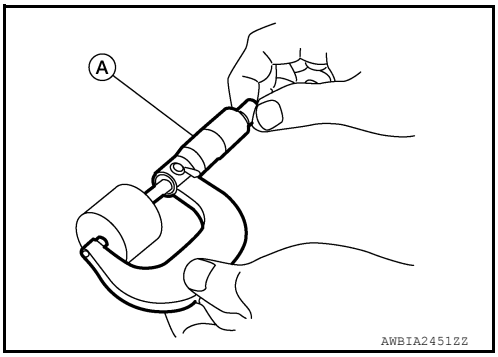
INFOID:0000000011220731

WARNING:
Do not remove the radiator cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from the radiator. 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.
CAUTION:
- **Perform when engine is cold.**
- **Do not spill engine coolant on the drive belt.**
- **Do not spill engine oil on rubber parts such as the drive belt or engine mount insulators.**

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

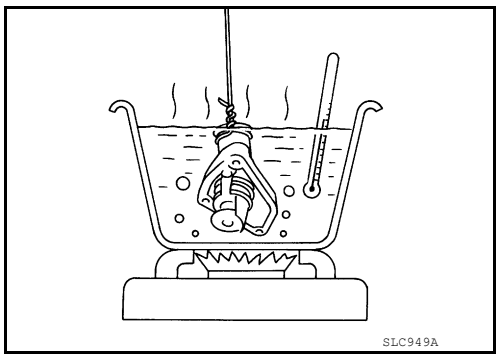
REMOVAL

1. Drain engine coolant from radiator. Refer to CO-9, "Changing Engine Coolant".
2. Drain power steering fluid. Refer to ST-30, "Draining and Refilling".
3. Remove front under cover. Refer to EXT-40, "FRONT UNDER COVER : Removal and Installation".
4. Disconnect intake valve timing control solenoid valve (LH) harness connector.
5. Remove the E-PSF cover, bracket and motor. Refer to ST-38, "Removal and Installation".
6. Remove the lower radiator hose.
7. Remove thermostat assembly (water inlet) (1).
   - **Do not disassemble thermostat assembly (water inlet) (1). Replace as a unit, (if necessary).**



INSPECTION AFTER REMOVAL

- Place a thread so that it is caught in the valves 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 the thermostat falls from the thread.
- Continue heating. Check the full-open lift amount.
  NOTE:
  The full-open lift amount standard temperature for the thermostat is the reference value.
- After checking the full-open lift amount, lower the water temperature and check the valve closing temperature.



Thermostat	Standard values
Valve opening temperature	Refer to CO-26, "Thermostat".
Full-open lift amount	Refer to CO-26, "Thermostat".
Valve closing temperature	Refer to CO-26, "Thermostat".

- If thermostat values are out of standard range, replace water inlet and thermostat assembly.

INSTALLATION

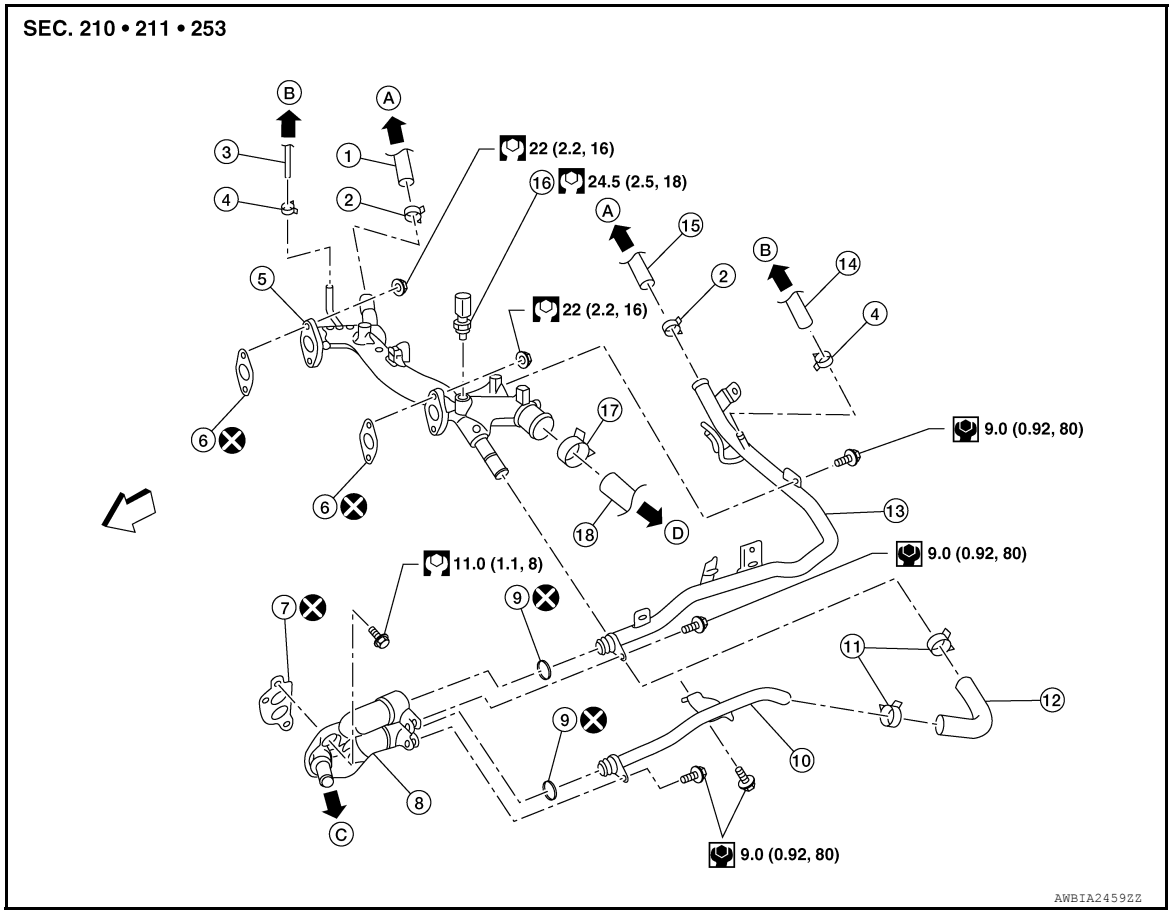
Installation is in the reverse order of removal.

- After installation, refill engine coolant and check for leaks. Refer to CO-9, "Changing Engine Coolant" and CO-8, "System Inspection".
  CAUTION:
  - **Do not reuse themostat assembly (water inlet) gasket.**
  - **Do not spill engine coolant in engine compartment. Use a shop cloth to absorb engine coolant.**

WATER OUTLET AND WATER PIPING

Exploded View

INFOID:0000000011220732



1.	Heater hose	2.	Clamp	3.	Water hose
4.	Clamp	5.	Water outlet	6.	Gasket
7.	Gasket	8.	Water connector	9.	O-ring
10.	Water bypass pipe	11.	Clamp	12.	Water hose
13.	Heater pipe	14.	Water hose	15.	Heater hose
16.	Engine coolant temperature sensor	17.	Clamp	18.	Radiator hose (upper)
A.	To heater core	B.	To electric throttle control actuator	C.	To CVT oil warmer
D.	To radiator	⇦	Engine front		

Removal and Installation

INFOID:0000000011220733

WARNING:
Do not remove the radiator cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from the radiator. 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, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL

CAUTION:
Perform when the engine is cold.

1. Remove engine room cover. Refer to EM-25, "Removal and Installation".
2. Remove battery tray. Refer to PG-88, "Removal and Installation".

3. Partially drain engine coolant from radiator. Refer to CO-9, "Changing Engine Coolant".
4. Remove sub tank bracket from cowl top extension.
5. Remove brake fluid level sensor harness connector from brake fluid level sensor.
6. Remove front air duct and air cleaner case assembly. Refer to EM-26, "Removal and Installation".
7. Remove the electric throttle control actuator engine coolant hoses.
8. Remove radiator hose (upper) and both heater hoses.
9. Remove connector(s) from heater pipe.
10. Remove engine coolant temperature sensor on water outlet.
11. Remove water outlet, heater pipe, water connector, and water bypass pipe nuts and bolts.

INSTALLATION

1. Installation is in the reverse order of removal.
   - Securely insert each hose, and install a clamp at a position where it does not interfere with the pipe bulge.
     CAUTION:
     Do not reuse gasket.
   - When inserting heater pipe and water bypass pipe into water connector, apply mild soap to new O-rings.
     CAUTION:
     Do not reuse O-rings.
   - After installation, refill engine coolant and check for leaks. Refer to CO-9, "Changing Engine Coolant" and CO-8, "System Inspection".

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Capacity

INFOID:0000000011220734

ℓ (US qt, Imp qt)

Engine coolant capacity*	8.7 (9-1/4, 7-5/8)

*: Includes 0.8L with coolant reservoir tank at MAX level.

Thermostat

INFOID:0000000011220735

Valve opening temperature	82°C (180°F)
Full-open lift amount	8.6 mm / 95°C (0.339 in / 203°F)
Valve closing temperature	77°C (171°F)

Radiator

INFOID:0000000011220736

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

Cap relief pressure	Standard	88 (0.9, 12.8)
Test pressure		157 (1.6, 23)