ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

Precautions

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) “AIR BAG” AND “SEAT BELT PRE-TENSIONER”

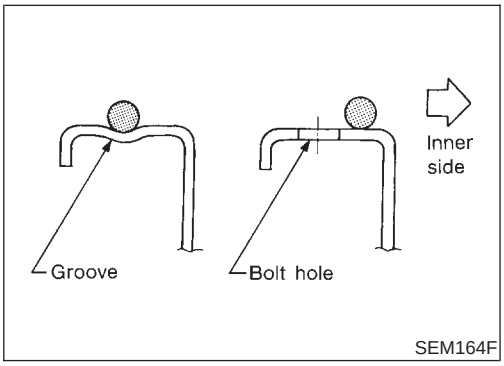
NFLC0036

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS composition which is available to NISSAN MODEL A33 is as follows:

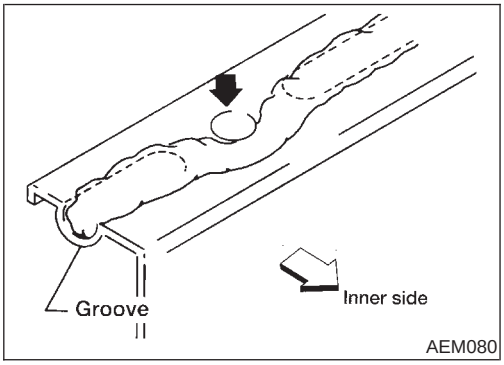
- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioners, a diagnosis sensor unit, crash zone sensor, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), satellite sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

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 should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **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 harness connector.**



SEM164F



AEM080

LIQUID GASKET APPLICATION PROCEDURE

NFLC0001

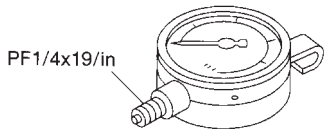
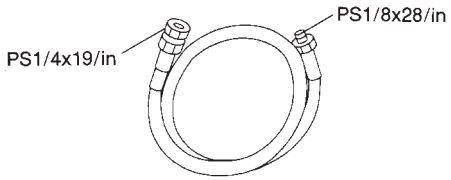
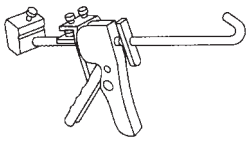
1. Use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.
2. Apply a continuous bead of liquid gasket to mating surfaces. **(Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-52.)**
   - For oil pan, be sure liquid gasket diameter is 3.5 to 4.5 mm (0.138 to 0.177 in) or 4.5 to 5.5 mm (0.177 to 0.217 in) as specified in this manual.
3. Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
4. Assembly should be done within 5 minutes after coating.
5. Wait at least 30 minutes before refilling engine oil and engine coolant.

Preparation

SPECIAL SERVICE TOOLS

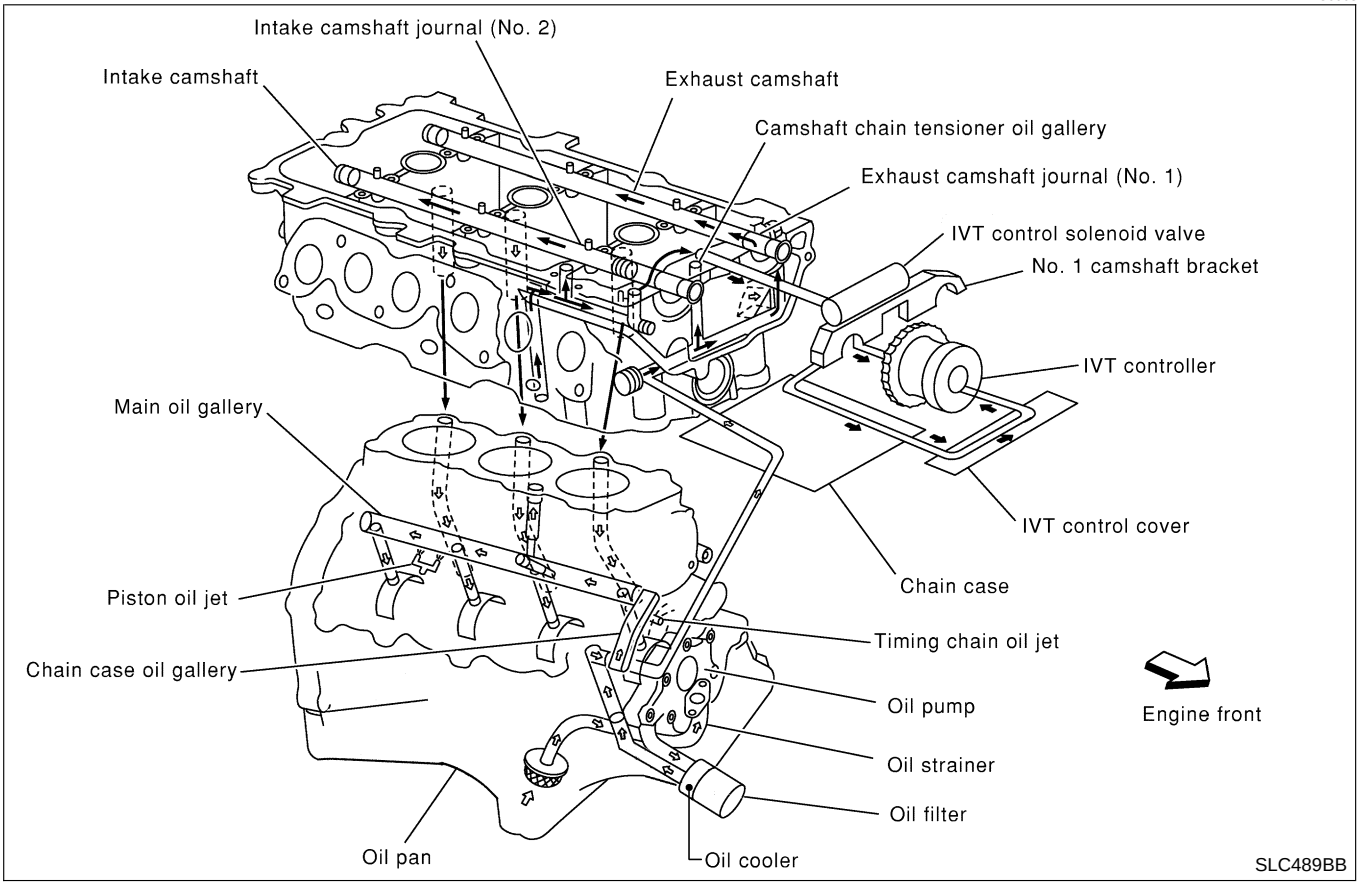
=NFLC0002

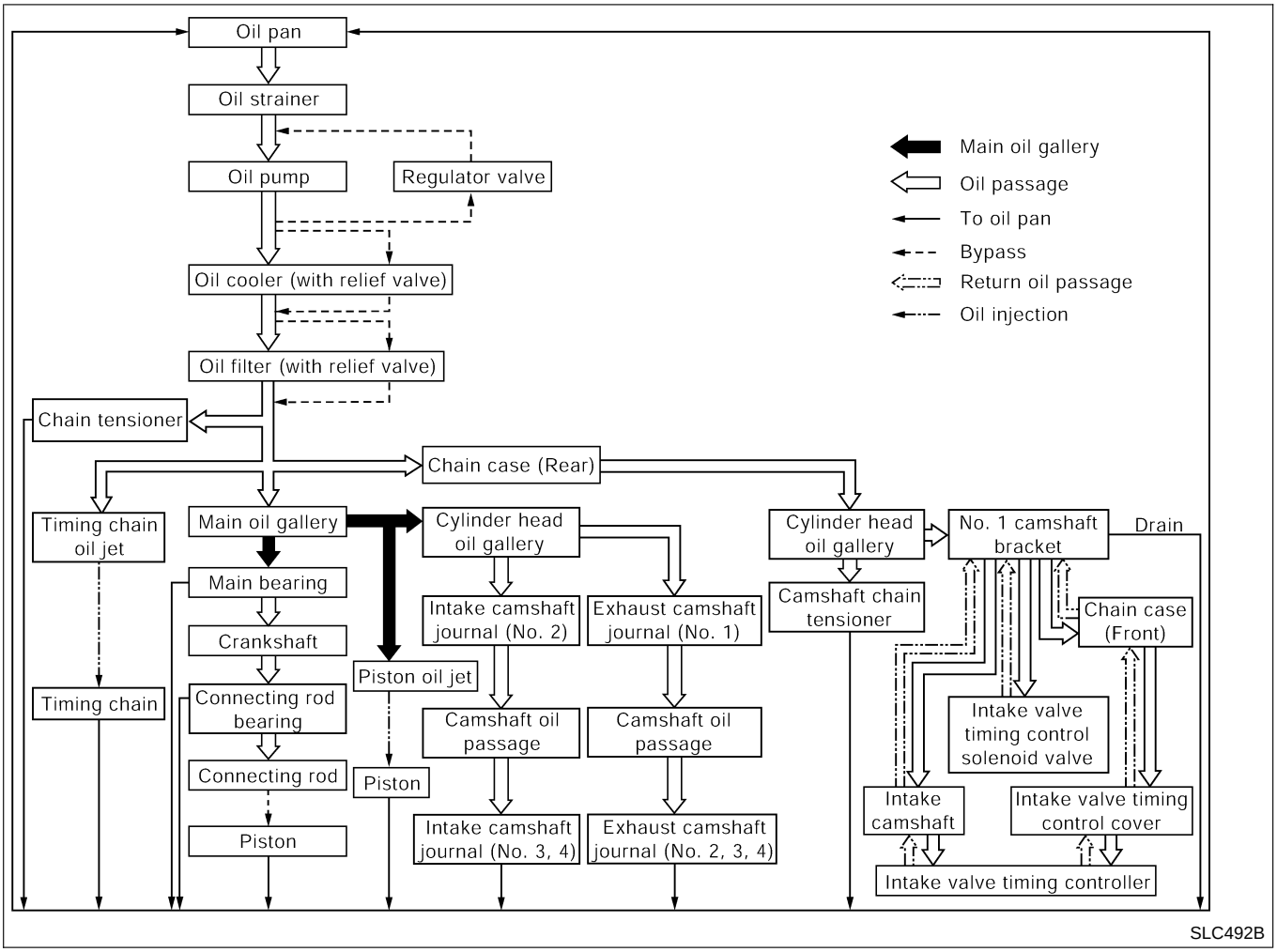
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

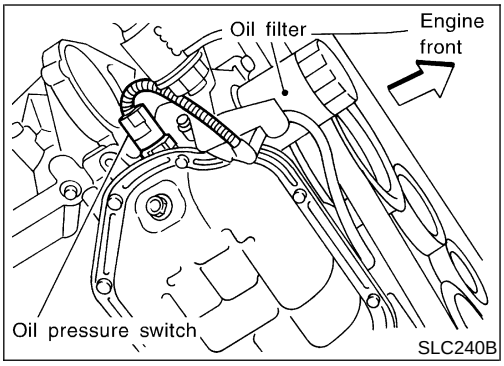
Tool number (Kent-Moore No.) Tool name	Description	
ST25051001 (J25695-1) Oil pressure gauge	 NT558	Measuring oil pressure **Maximum measuring range:** **2,452 kPa (25 kg/cm^2, 356 psi)**
ST25052000 (J25695-2) Hose	 NT559	Adapting oil pressure gauge to upper oil pan
WS39930000 (—) Tube pressure	 NT052	Pressing the tube of liquid gasket

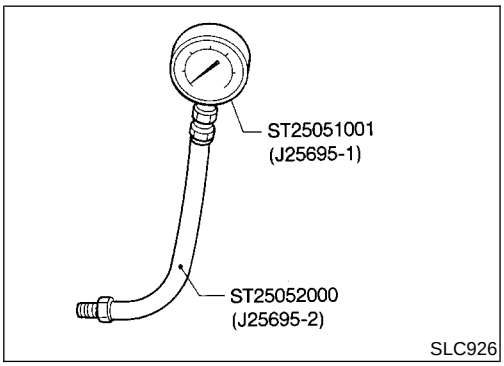
Lubrication Circuit

NFLC0003




Oil pan
Oil strainer
Oil pump
Regulator valve
Oil cooler (with relief valve)
Oil filter (with relief valve)
Chain tensioner
Chain case (Rear)
Timing chain oil jet
Main oil gallery
Cylinder head oil gallery
Cylinder head oil gallery
No. 1 camshaft bracket
Drain
Main bearing
Intake camshaft journal (No. 2)
Exhaust camshaft journal (No. 1)
Camshaft chain tensioner
Chain case (Front)
Crankshaft
Piston oil jet
Timing chain
Connecting rod bearing
Camshaft oil passage
Camshaft oil passage
Intake valve timing control solenoid valve
Connecting rod
Piston
Intake camshaft
Intake valve timing control cover
Piston
Intake camshaft journal (No. 3, 4)
Exhaust camshaft journal (No. 2, 3, 4)
Intake valve timing controller
Main oil gallery
Oil passage
To oil pan
Bypass
Return oil passage
Oil injection
SLC492B





Oil Pressure Check

=NFLC0004

WARNING:

- **Be careful not to burn yourself, as the engine and oil may be hot.**
- **Oil pressure check should be done in "Neutral position" (M/T) or "Parking position" (A/T).**

1. Check oil level.
2. Remove oil pressure switch.
3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine speed rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed 2,000	More than 98 (1.0, 14) 294 (3.0, 43)

If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.

Oil Pump

REMOVAL AND INSTALLATION

NFLC0005

CAUTION:

When removing the oil pans, oil pump assembly and timing chain from engine, first remove the crankshaft position sensor (POS) from the assembly.
Be careful not to damage sensor edge.

1. Drain engine oil.

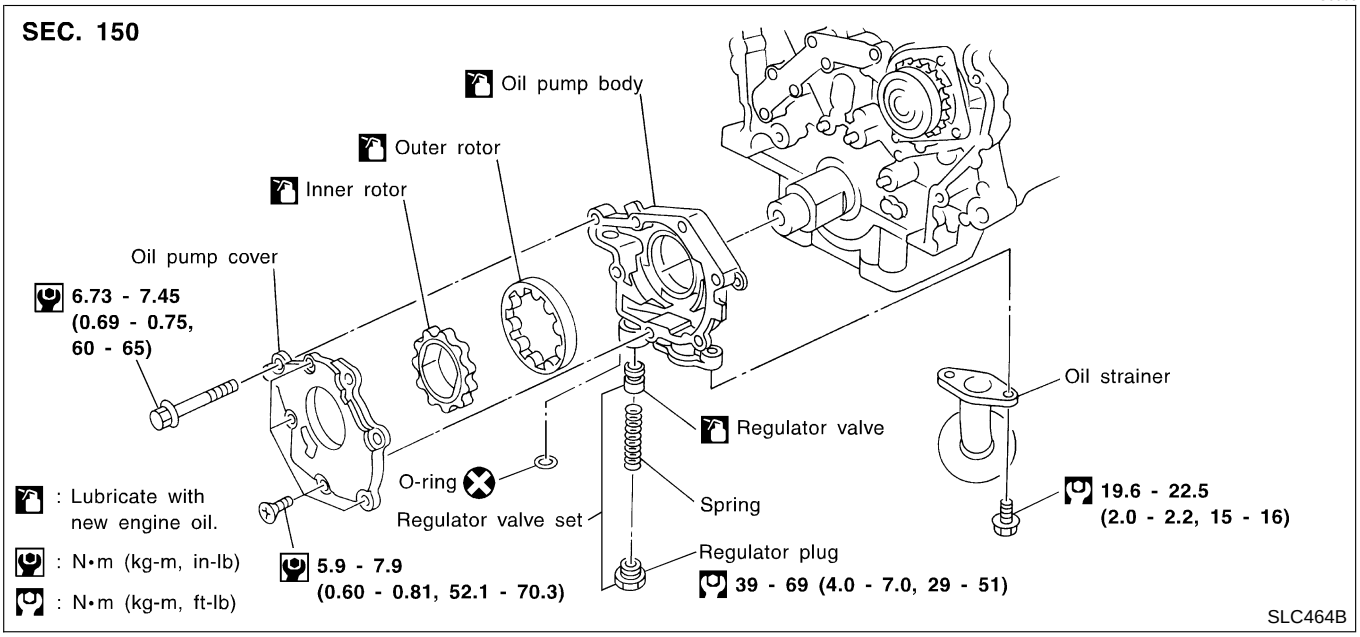
WARNING:

To avoid the danger of being scalded, never drain the engine oil when the engine oil is hot.

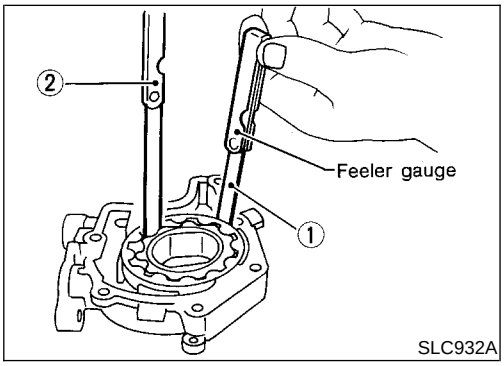
2. Remove drive belts. Refer to MA-13, "Checking Drive Belts".
3. Remove crankshaft position sensor (POS). Refer to EM-14, "Components".
4. Remove engine under covers.
5. Remove crankshaft pulley. Refer to EM-14, "Removal".
6. Remove front exhaust tube and its support. Refer to FE-9, "Removal and Installation".
7. Support engine at right and left side engine slingers with a suitable hoist. Refer to EM-63, "Removal".
8. Remove engine right side mounting insulator and bracket bolts and nuts. Refer to EM-62, "Removal and Installation".
9. Remove center member assembly.
10. Remove air conditioner compressor assembly and bracket.
11. Remove oil pans. Refer to EM-14, "Removal".
12. Remove water pump cover.
13. Remove front cover assembly.
14. Remove timing chain. Refer to EM-24, "Removal".
15. Remove oil pump assembly.
16. Reinstall any parts removed in reverse order of removal.

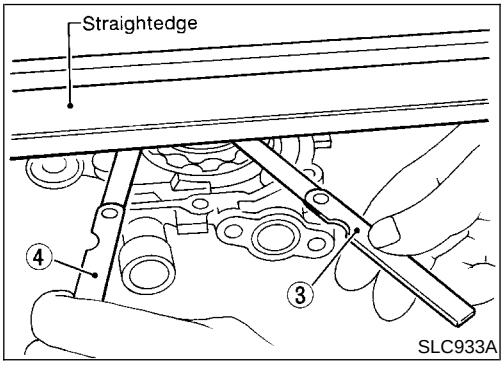
DISASSEMBLY AND ASSEMBLY

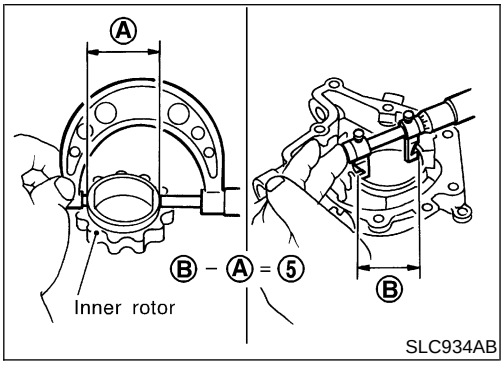
NFLC0006



- **When installing oil pump, apply engine oil to rotors.**







OIL PUMP INSPECTION

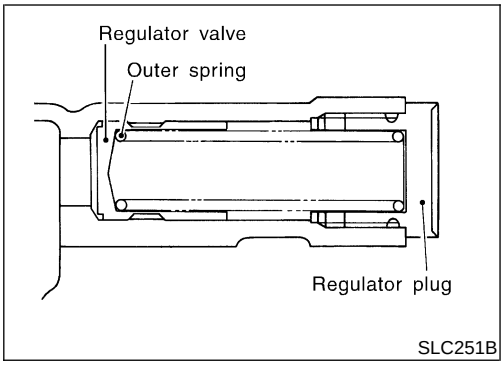
NFLC0007

Using a feeler gauge, straightedge and micrometers, check the following clearances:

Unit: mm (in)

Body to outer rotor radial clearance 1	0.114 - 0.260 (0.0045 - 0.0102)
Inner rotor to outer rotor tip clearance 2	Below 0.18 (0.0071)
Body to inner rotor axial clearance 3	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance 4	0.050 - 0.110 (0.0020 - 0.0043)
Inner rotor to brazed portion of housing clearance 5	0.045 - 0.091 (0.0018 - 0.0036)

- **If the tip clearance (2) exceeds the limit, replace rotor set.**
- **If body to rotor clearances (1, 3, 4, 5) exceed the limit, replace oil pump body assembly.**

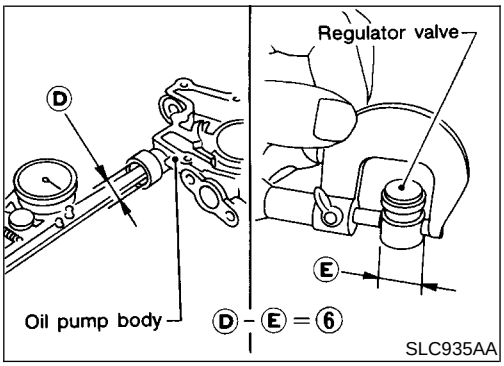


REGULATOR VALVE INSPECTION

NFLC0008

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil. Check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump body.

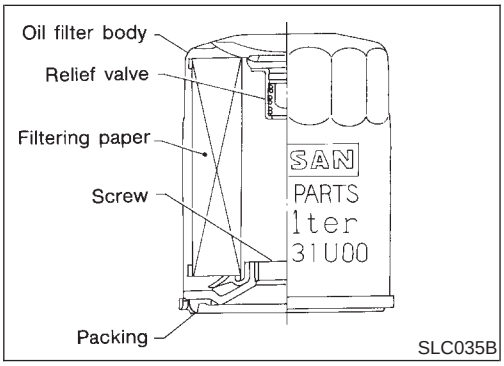


4. Check regulator valve to oil pump body clearance.

Clearance:

6 : 0.040 - 0.097 mm (0.0016 - 0.0038 in)

If it exceeds the limit, replace oil pump body.



Oil Filter

NFLC0009

The oil filter is a small, full-flow cartridge type and is provided with a relief valve.

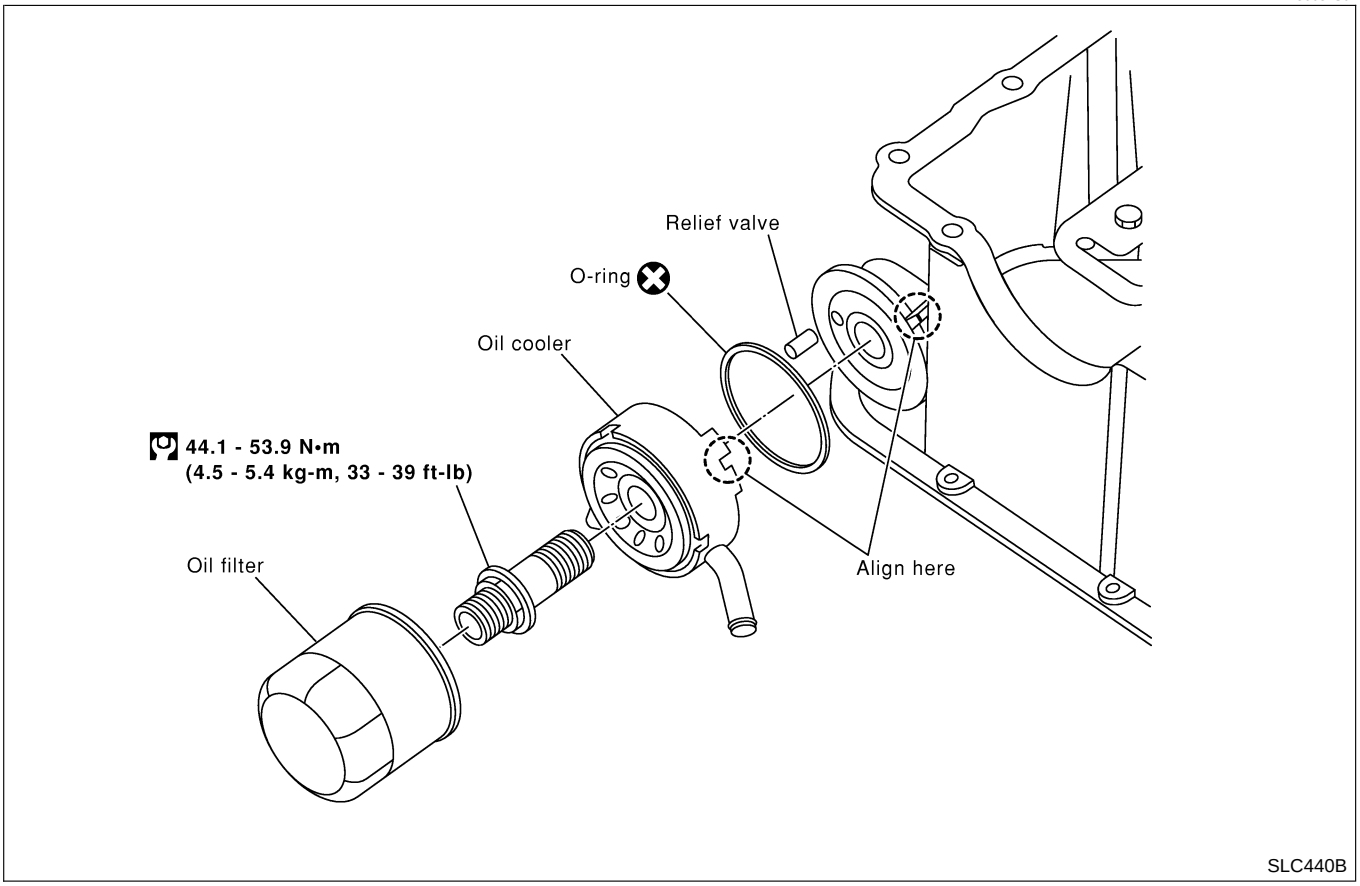
- **Use Tool specified in MA-17 for changing oil filter.**

Oil Cooler

NFLC0037

REMOVAL AND INSTALLATION

NFLC0037S01



1. Remove water hoses pinching them near oil cooler to prevent coolant spill out.
2. Remove oil cooler.
3. Installation is in reverse order of removal.

- **Do not spill coolant on the drive belt.**
- **Install oil cooler to oil pan aligning the protrusion of flange as shown.**
- **Check oil and coolant level after refilling engine oil and coolant.**

INSPECTION

NFLC0037S02

Oil Cooler

NFLC0037S0201

1. Check oil cooler for cracks.
2. Check oil cooler for clogging by blowing through coolant inlet. If necessary, replace oil cooler assembly.

Relief Valve

NFLC0037S0202

Inspect relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a suitable tool. Install a new valve in place by tapping it.

Service Data and Specifications (SDS)

OIL PRESSURE

=NFLC0010

Engine speed rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed 2,000	More than 98 (1.0, 14) 294 (3.0, 43)

REGULATOR VALVE

NFLC0011

Unit: mm (in)

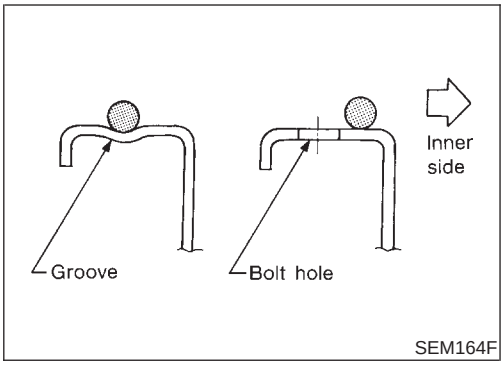
Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)

OIL PUMP

NFLC0012

Unit: mm (in)

Body to outer rotor radial clearance	0.114 - 0.260 (0.0045 - 0.0102)
Inner rotor to outer rotor tip clearance	Below 0.18 (0.0071)
Body to inner rotor axial clearance	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance	0.050 - 0.110 (0.0020 - 0.0043)
Inner rotor to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)



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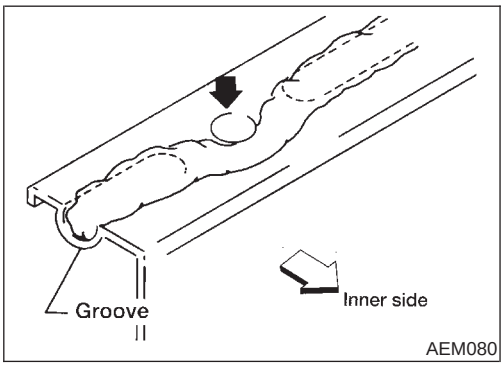


AEM080

Precautions

LIQUID GASKET APPLICATION PROCEDURE

NFLC0013

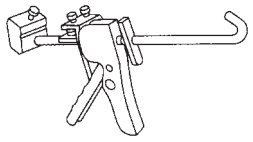
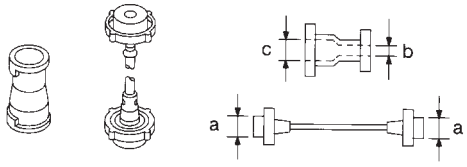
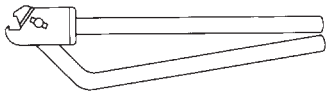
1. Use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.
2. Apply a continuous bead of liquid gasket to mating surfaces. **(Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-52.)**
   - Be sure liquid gasket diameter is 2.3 to 3.3 mm (0.091 to 0.130 in).
3. Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
4. Assembly should be done within 5 minutes after coating.
5. Wait at least 30 minutes before refilling engine oil and engine coolant.

Preparation

SPECIAL SERVICE TOOLS

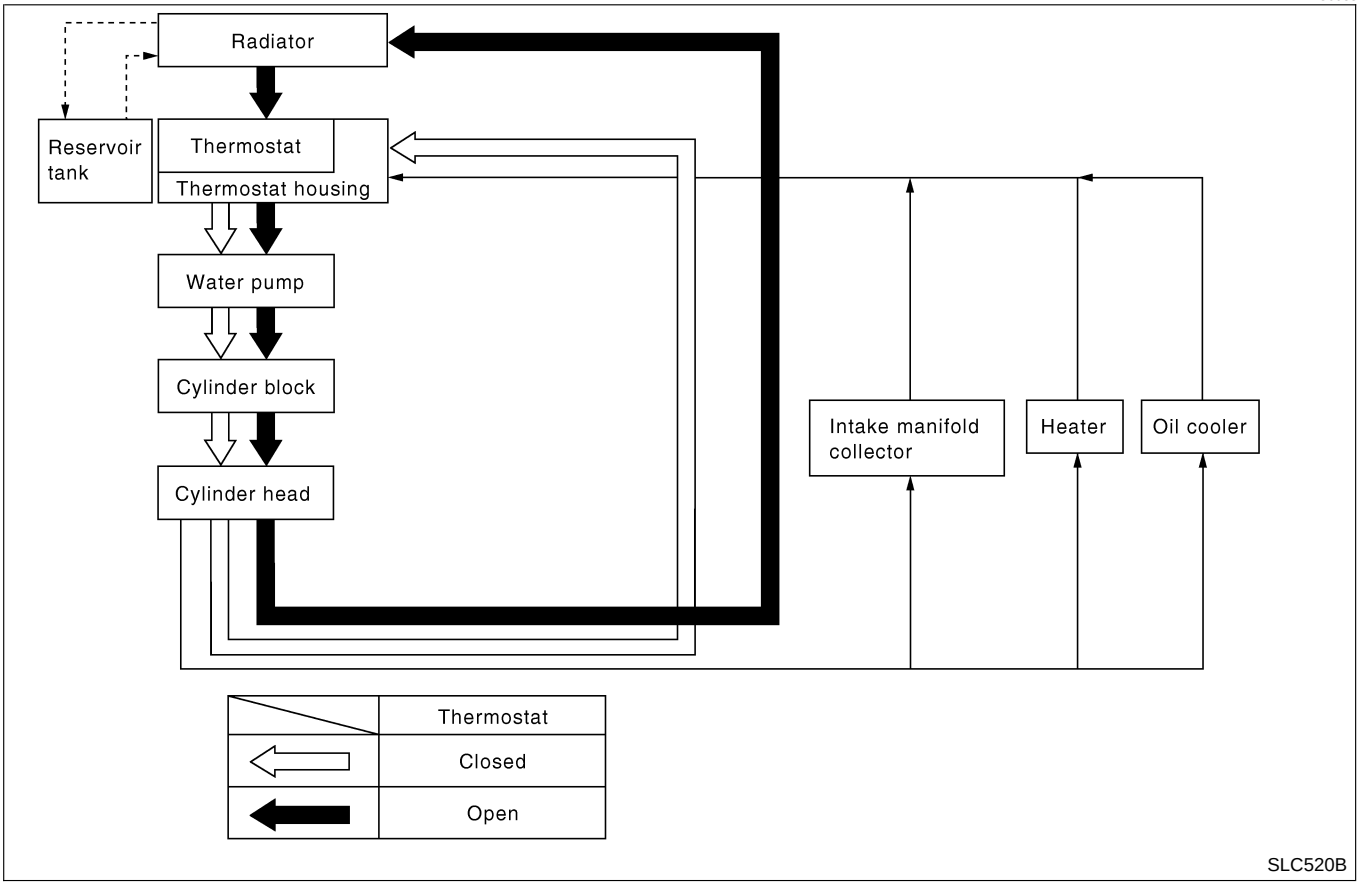
NFLC0014

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description	
WS39930000 (—) Tube pressure	 NT052	Pressing the tube of liquid gasket
EG17650301 (J33984-A) Radiator cap tester adapter	 NT564	Adapting radiator cap tester to radiator filler neck **a: 28 (1.10) dia.** **b: 31.4 (1.236) dia.** **c: 41.3 (1.626) dia.** Unit: mm (in)
KV99103510 (—) Radiator plate pliers A	 NT224	Installing radiator upper and lower tanks
KV99103520 (—) Radiator plate pliers B	 NT225	Removing radiator upper and lower tanks

Cooling Circuit

NFLC0038



System Check

NFLC0016

WARNING:

Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around the cap and carefully remove it by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.

CHECKING COOLING SYSTEM HOSES

NFLC0016S01

Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

CHECKING RADIATOR

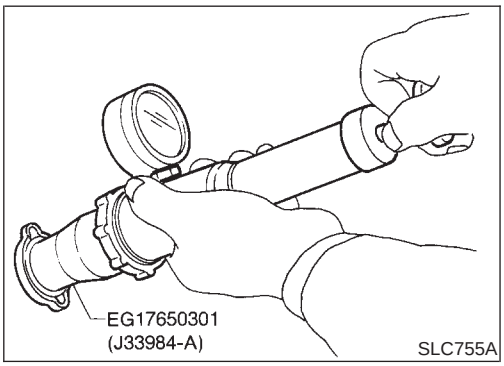
NFLC0016S02

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

- Be careful not to bend or damage the radiator fins.
- When radiator is cleaned without removal, remove all surrounding parts such as cooling fan, radiator shroud and horns. Then tape the 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 the 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.

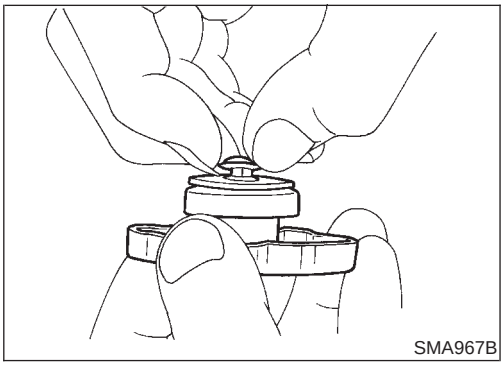


CHECKING RADIATOR CAP

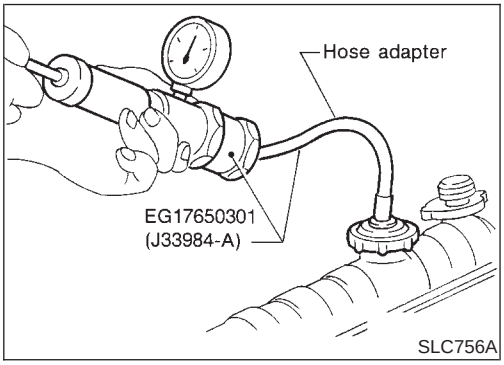
NFLC0016S03

To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:
Standard
78 - 98 kPa
(0.8 - 1.0 kg/cm^2, 11 - 14 psi)
Limit
59 kPa
(0.6 kg/cm^2, 9 psi)



Pull the negative pressure valve to open it.
Check that it closes completely when released.



CHECKING COOLING SYSTEM FOR LEAKS

NFLC0016S04

To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:
157 kPa (1.6 kg/cm^2, 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.

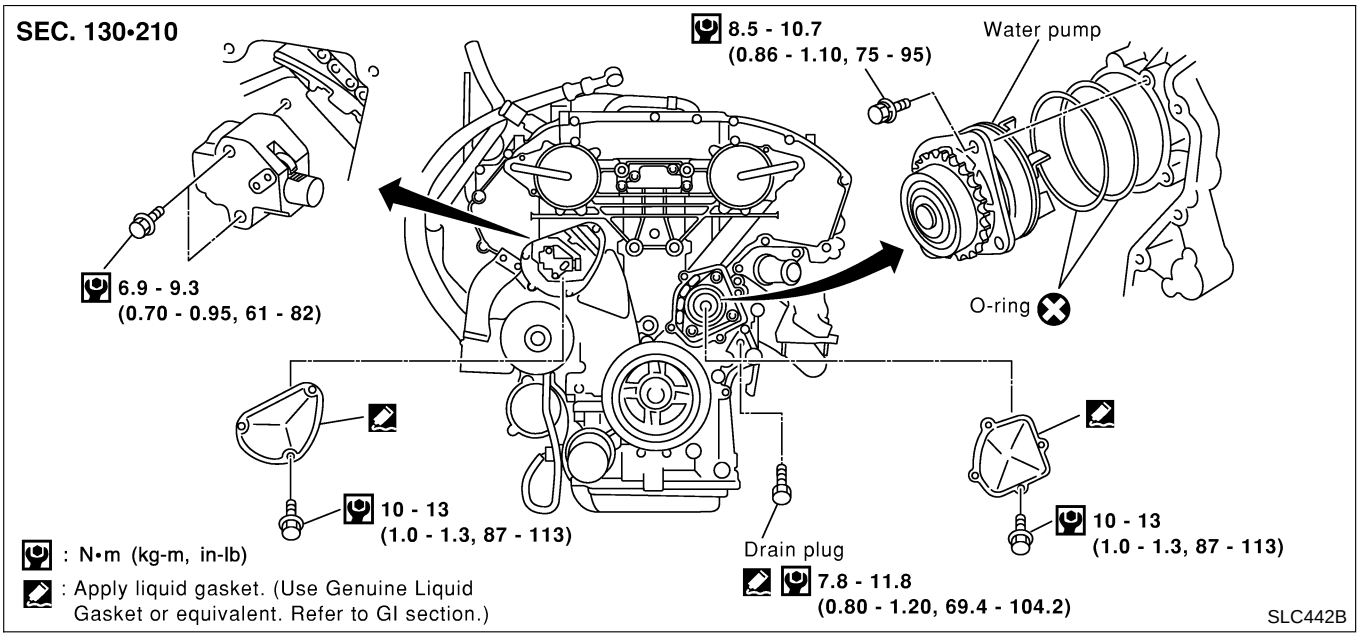
Water Pump

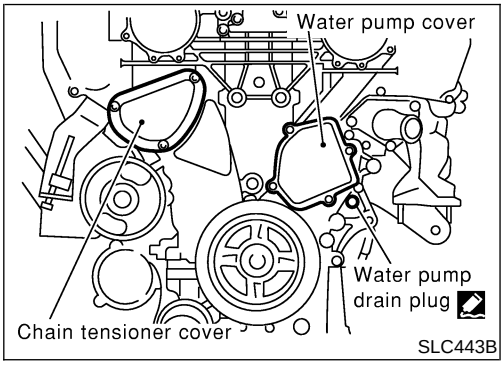
REMOVAL AND INSTALLATION

=NFLC0017

CAUTION:

- **When removing water pump assembly, be careful not to get 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 leaks using radiator cap tester.**

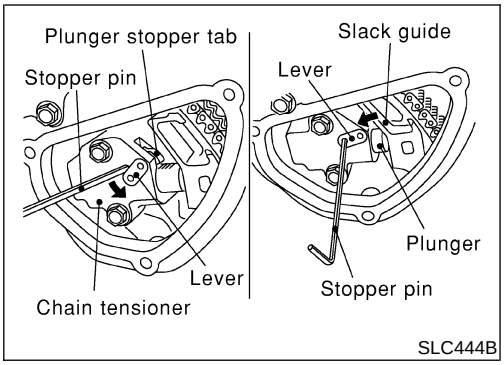




REMOVAL

NFLC0018

1. Drain coolant from drain plugs on radiator and right side of cylinder block. Refer to MA-14, “Changing Engine Coolant”.
2. Remove right side engine mounting, mounting bracket and nuts.
3. Remove drive belts and idler pulley bracket.
4. Remove water pump drain plug.
5. Remove chain tensioner cover and water pump cover.

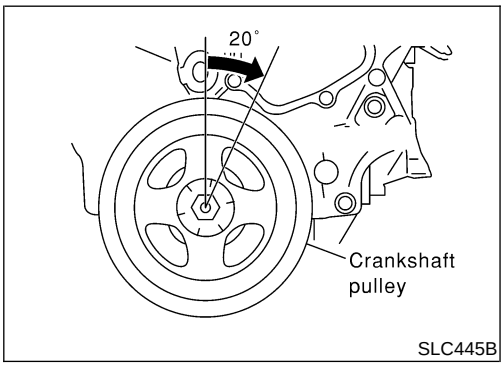


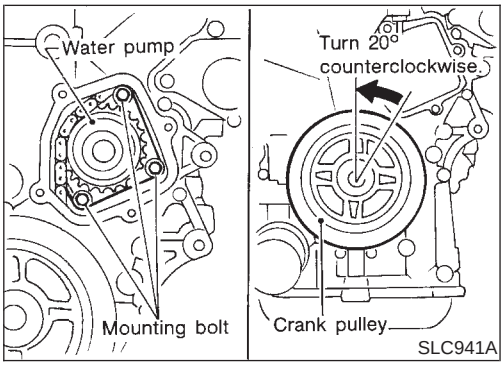
6. Pull lever down, and release plunger stopper tab.
- Plunger stopper tab can be pushed up to release (coaxial structure with lever).

7. Insert stopper pin into tensioner body hole to fix lever, and keep the tab released.
8. Insert plunger into tensioner body by pressing slack guide.
9. Keep slack guide pressed, and fix it by pushing stopper pin through lever hole and body hole.
10. Turn crankshaft pulley approx. 20° clockwise so that the timing chain on the chain tensioner side is loose.
11. Remove chain tensioner.

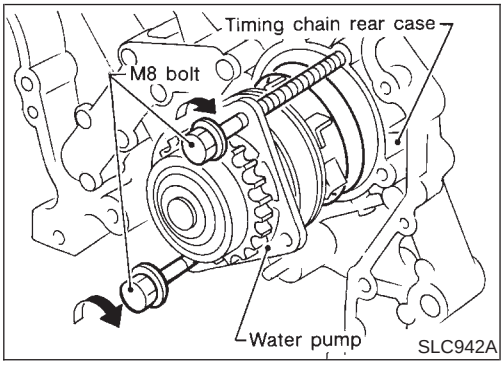
CAUTION:

Be careful not to drop mounting bolts inside chain case.

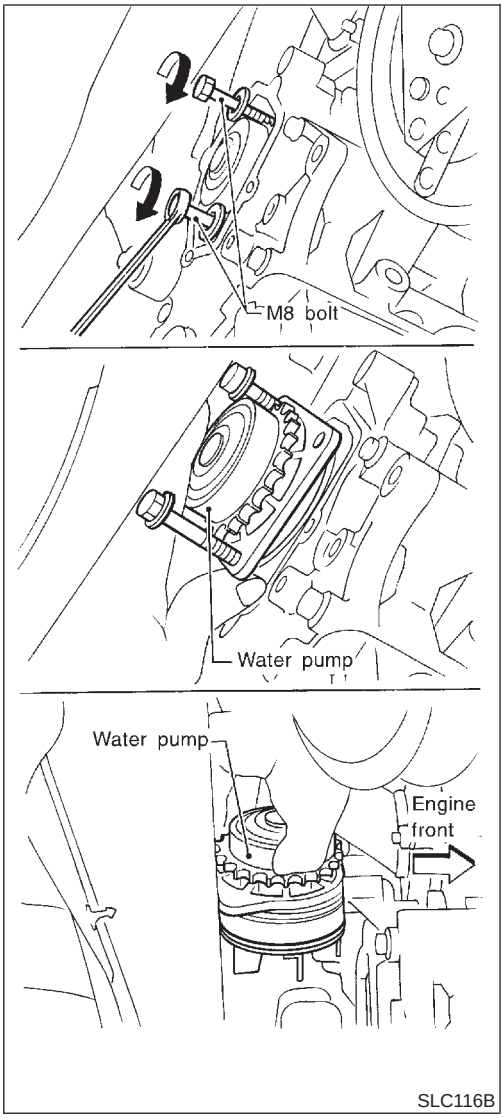




12. Remove the 3 water pump fixing bolts. Secure a gap between water pump gear and timing chain, by turning crankshaft pulley 20° backwards.

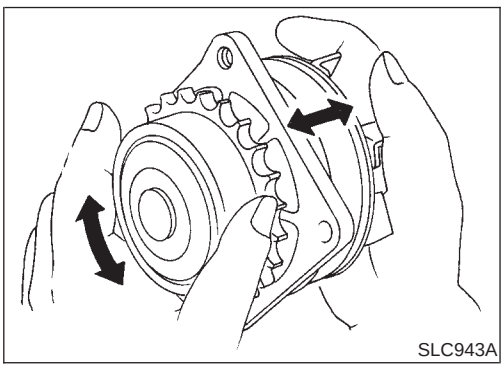


13. Put M8 bolts to two M8-threaded holes out of 3 water pump fixing bolt holes.



14. Tighten M8 bolts by turning half turn alternately until they reach timing chain rear case.
- In order to prevent damages to water pump or timing chain rear case, do not tighten one bolt continuously. Always turn each bolt half turn each time.

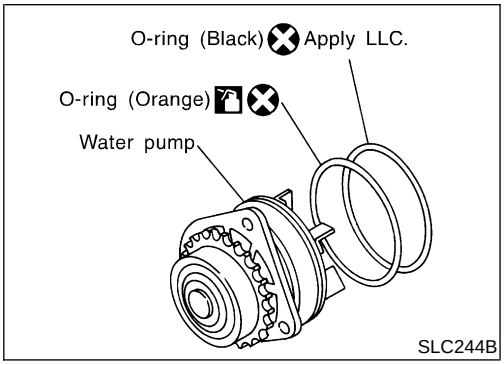
15. Lift up water pump and remove it.
- When lifting up water pump, do not allow water pump gear to hit timing chain.



INSPECTION

NFLC0019

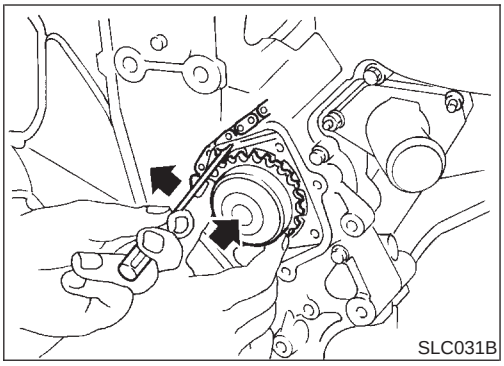
1. Check for badly rusted or corroded body assembly.
2. Check for rough operation due to excessive end play.



INSTALLATION

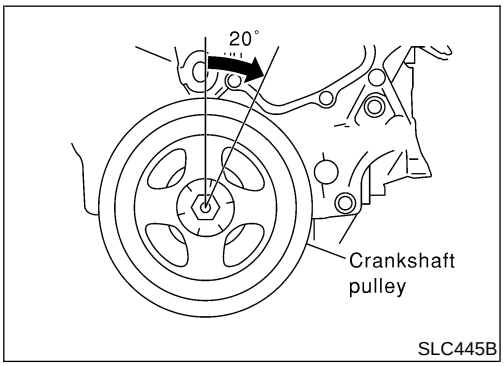
NFLC0020

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


SLC031B

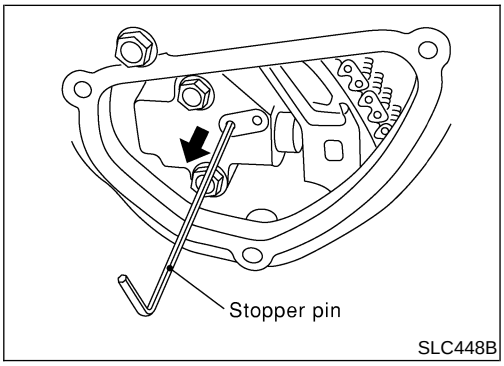
2. Install water pump.

- **Do not allow cylinder block to nip O-rings when installing water pump.**



SLC445B

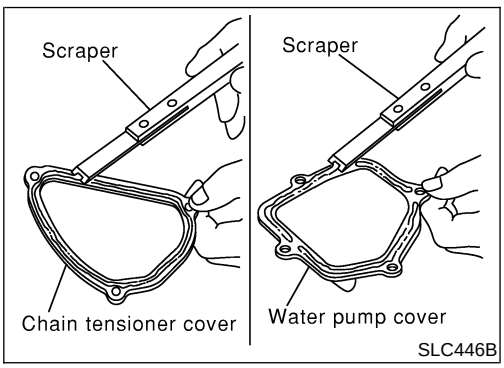
3. Return the crankshaft pulley to its original position by turning it 20° forward.



SLC448B

4. Install timing chain tensioner, then remove the stopper pin.

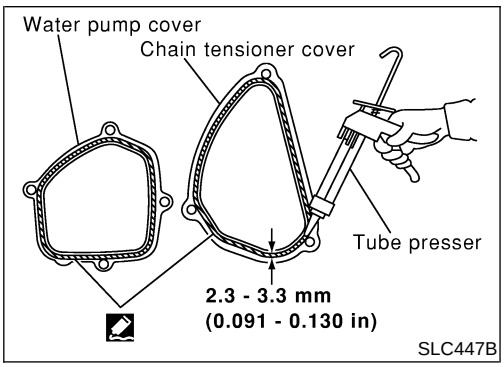
- **When installing the timing chain tensioner, engine oil should be applied to the oil hole and tensioner.**



SLC446B

5. Install chain tensioner cover and water pump cover.

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



SLC447B

b. Apply a continuous bead of liquid gasket to mating surface of chain tensioner cover and water pump cover.

6. Install drain plug on cylinder block.

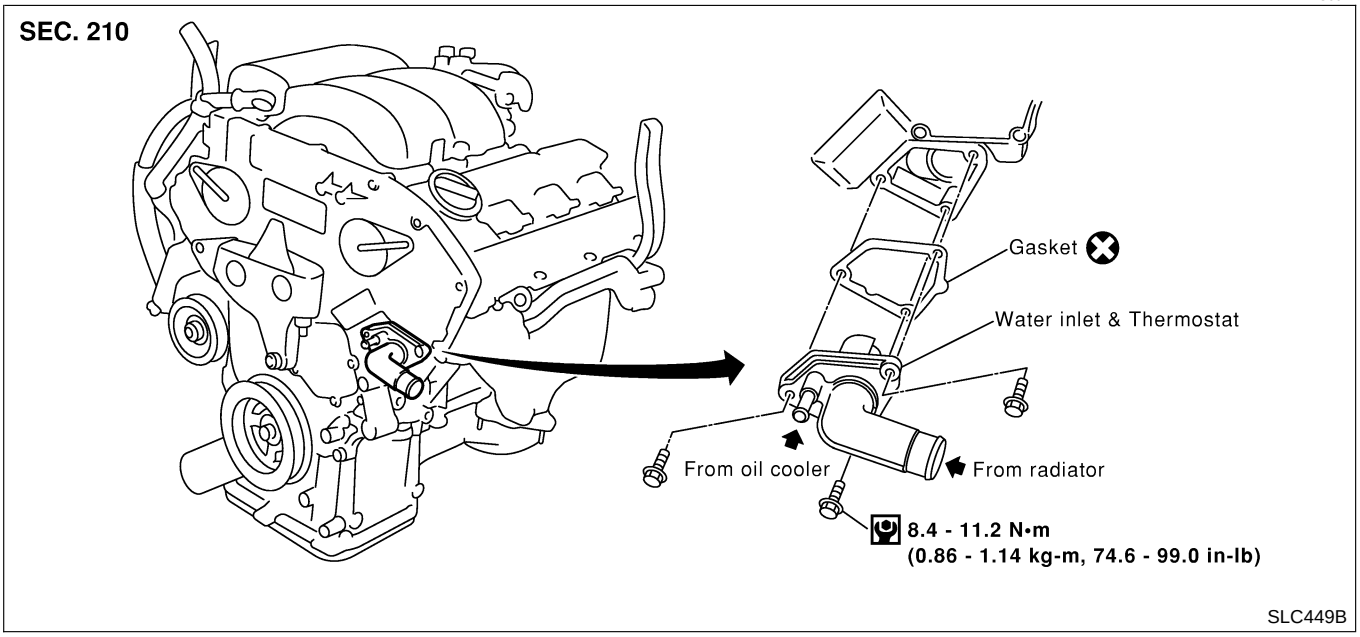
7. Reinstall any parts removed in reverse order of removal.

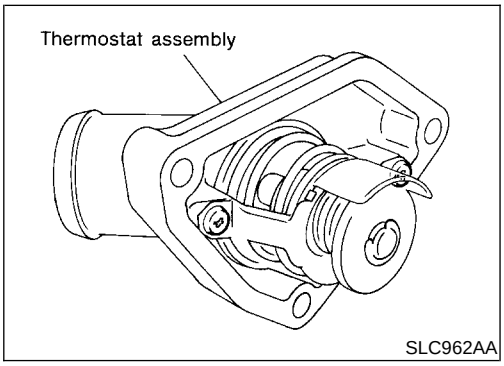
- **After starting engine, let idle for three minutes, then rev engine up to 3,000 rpm under no load to purge air from the high-pressure chamber of the chain tensioners. The engine may produce a rattling noise. This indicates that air still remains in the chamber and is not a matter of concern.**

Thermostat

REMOVAL AND INSTALLATION

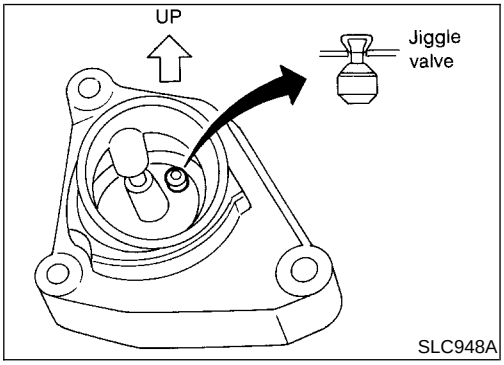
NFLC0021





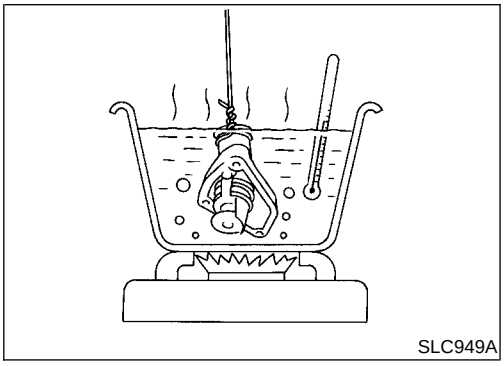
1. Drain coolant from drain plugs on radiator and both sides of cylinder block.
2. Remove drive belts and idler pulley bracket.
3. Remove water pump drain plug on pump side of cylinder block.
4. Remove lower radiator hose.
5. Remove water inlet and thermostat assembly.

- **Do not disassemble water inlet and thermostat. Replace them as a unit, if necessary.**



6. Install thermostat with jiggle valve facing upward.

- **After installation, run engine for a few minutes, and check for leaks.**
- **Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.**



INSPECTION

NFLC0022

1. Check valve seating condition at ordinary room temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

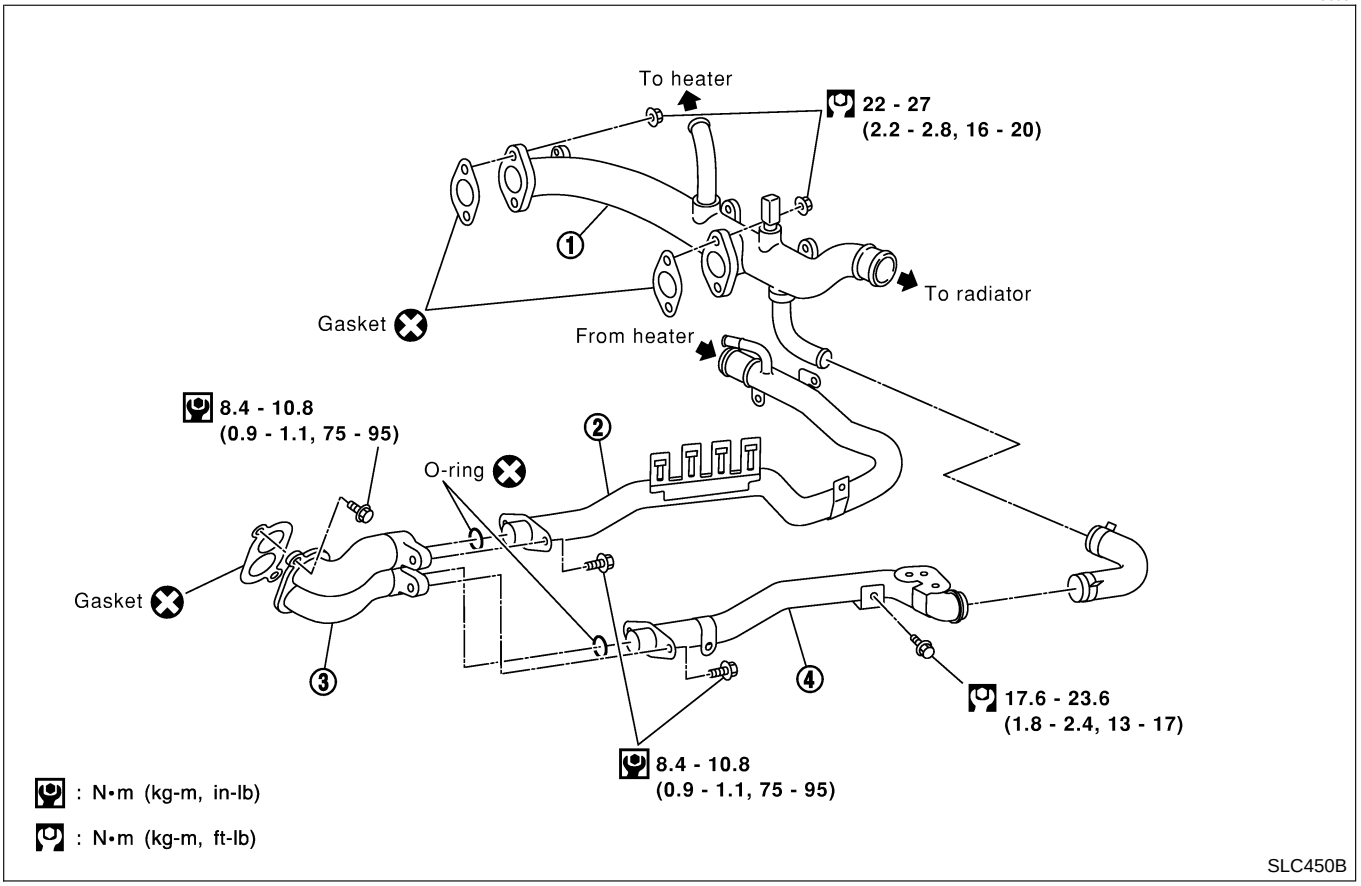
	Standard
Valve opening temperature	82°C (180°F)
Valve lift	More than 8.6 mm/95°C (0.339 in/203°F)

3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

Water Outlet and Water Piping

REMOVAL AND INSTALLATION

NFLC0032



1. Water outlet
2. Heater pipe
3. Water connector
4. Water bypass pipe

1. Drain coolant from drain plugs on radiator and both sides of cylinder block.
2. Remove water connector, heater pipe and water bypass pipe.
3. Install in the reverse order of removal.

- **After installation, run engine for a few minutes, and check for leaks.**
- **Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.**

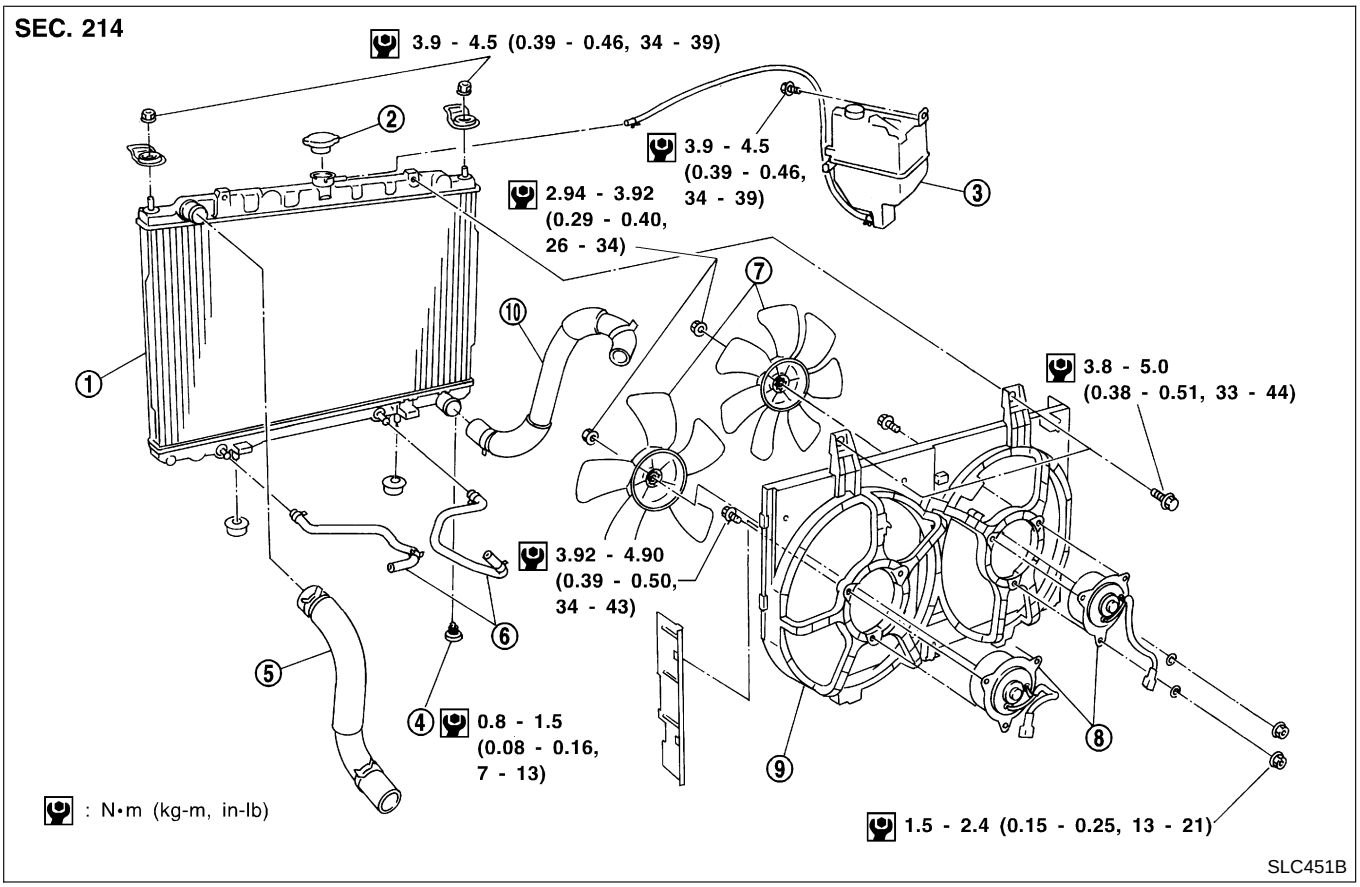
Radiator

REMOVAL AND INSTALLATION

=NFLC0023

1. Remove under cover.
2. Drain coolant from radiator.
3. Disconnect radiator upper and lower hoses.
4. Remove radiator shroud.
5. Remove A/T oil cooler hoses. (A/T models only)
6. Disconnect reservoir tank hose.
7. Remove radiator mounting bracket.
8. Remove radiator.
9. After repairing or replacing radiator, install any part removed in reverse order of removal.

When filling radiator with coolant, refer to MA-14, “Changing Engine Coolant”.



1. Radiator
2. Radiator filler cap
3. Reservoir tank
4. Radiator drain cock
5. Upper radiator hose
6. Oil cooler hoses (A/T models)
7. Cooling fans
8. Cooling fan motors
9. Radiator shroud
10. Lower radiator hose

Cooling Fan Control System

NFLC0024

Cooling fans are controlled by ECM. For details, refer to EC-530, “COOLING FAN CONTROL”.

Refilling Engine Coolant

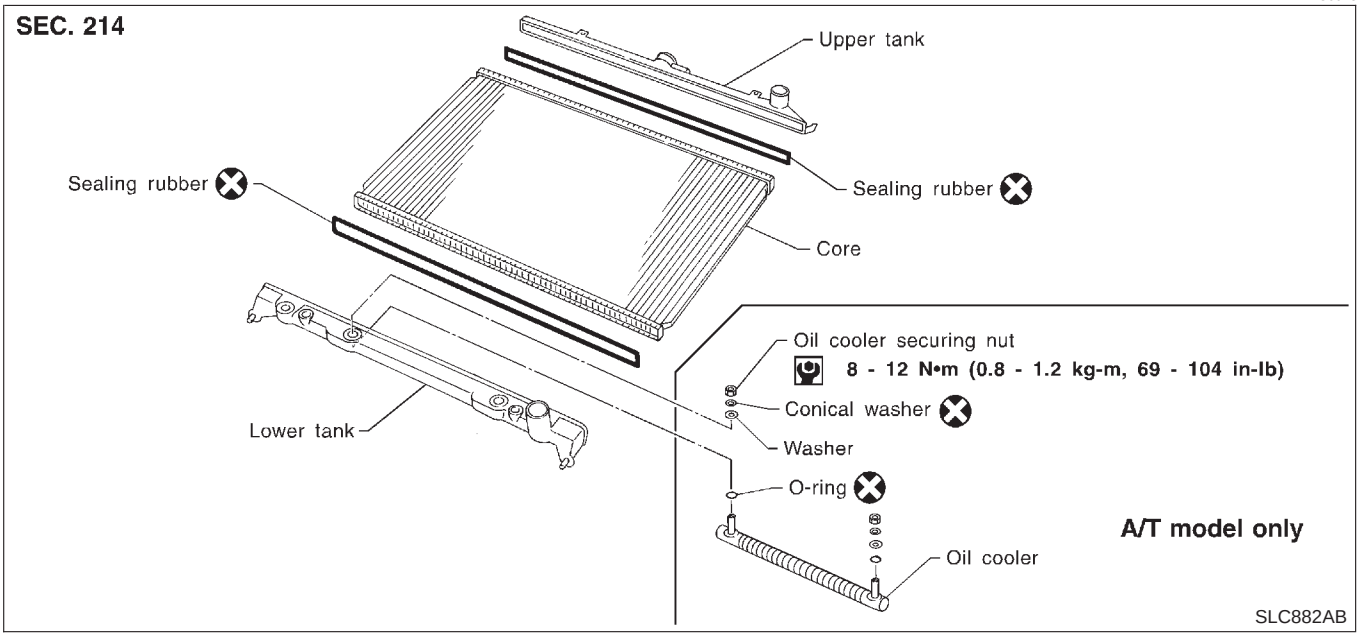
NFLC0034

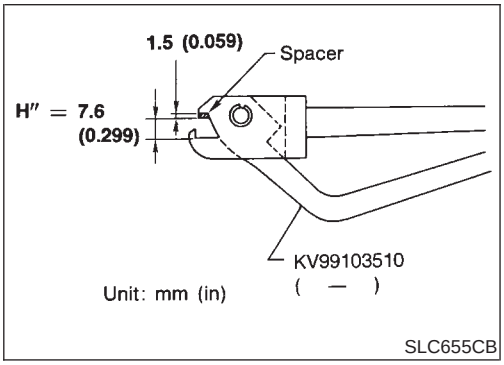
For details on refilling engine coolant, refer to MA-14, “REFILLING ENGINE COOLANT”.

Radiator (Aluminum type)

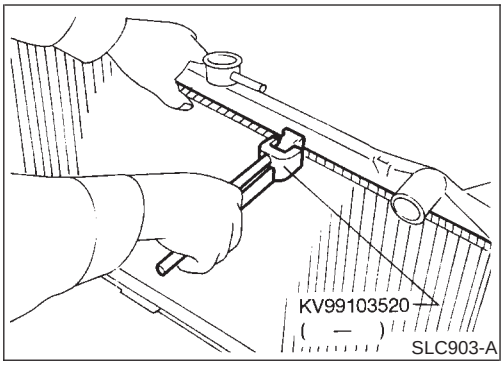
PREPARATION

NFLC0025





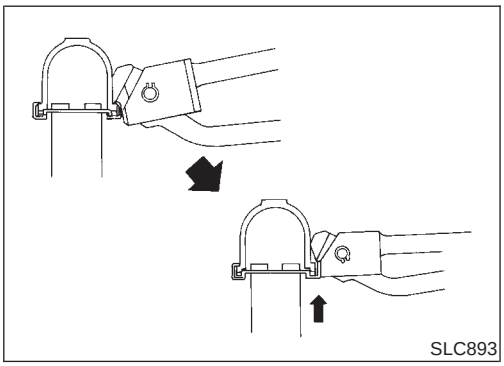
1. Attach the spacer to the tip of the radiator plate pliers A. Spacer specification: 1.5 mm (0.059 in) thick x 18 mm (0.71 in) wide x 8.5 mm (0.335 in) long.
2. Make sure that when radiator plate pliers A are closed dimension H″ is approx. 7.6 mm (0.299 in).
3. Adjust dimension H″ with the spacer, if necessary.



DISASSEMBLY

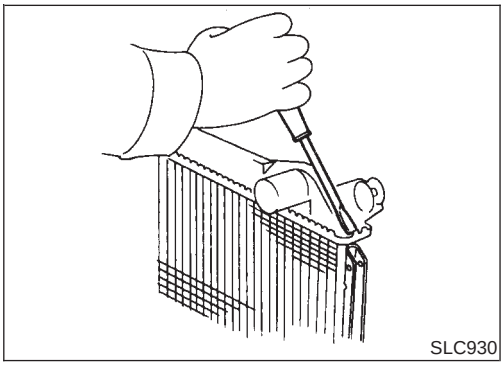
NFLC0026

1. Remove upper and lower tanks with Tool.



- Grip the crimped edge and bend it upwards so that Tool slips off.

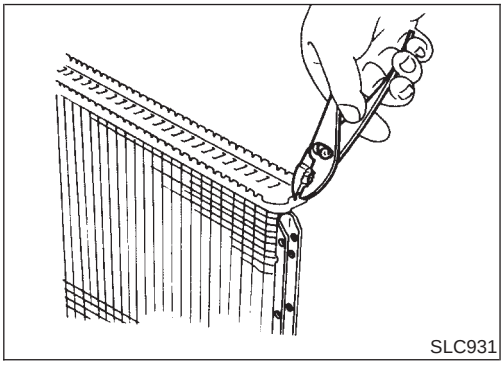
Do not bend excessively.



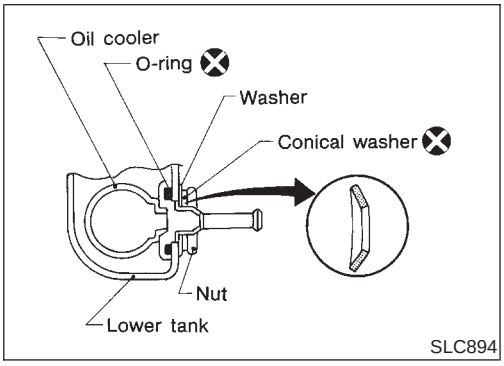
- In areas where Tool cannot be used, use a screwdriver to bend the edge up.

Be careful not to damage tank.

2. Remove sealing rubbers.



3. Make sure the edge stands straight up.
4. Remove oil cooler from tank. (A/T models only)

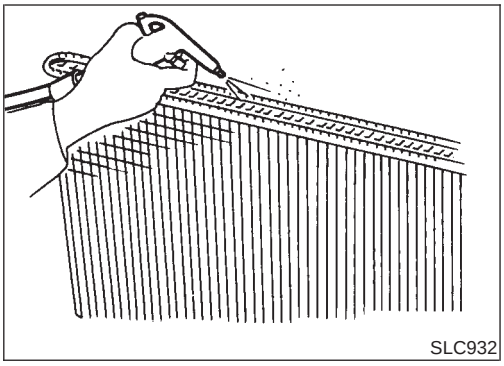


ASSEMBLY

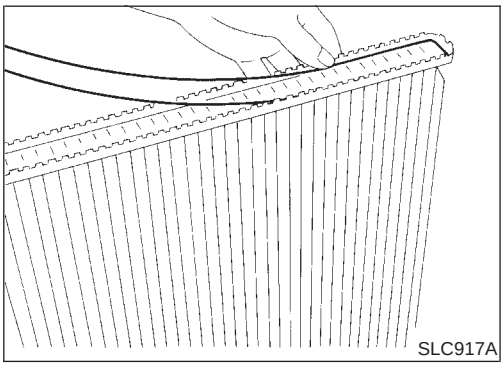
NFLC0027

1. Install oil cooler. (A/T models only)

Pay attention to direction of conical washer.

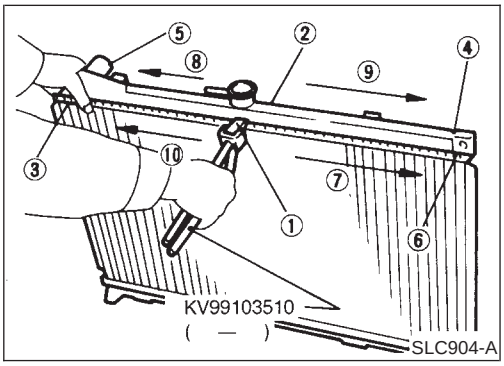

SLC932

2. Clean contact portion of tank.


SLC917A

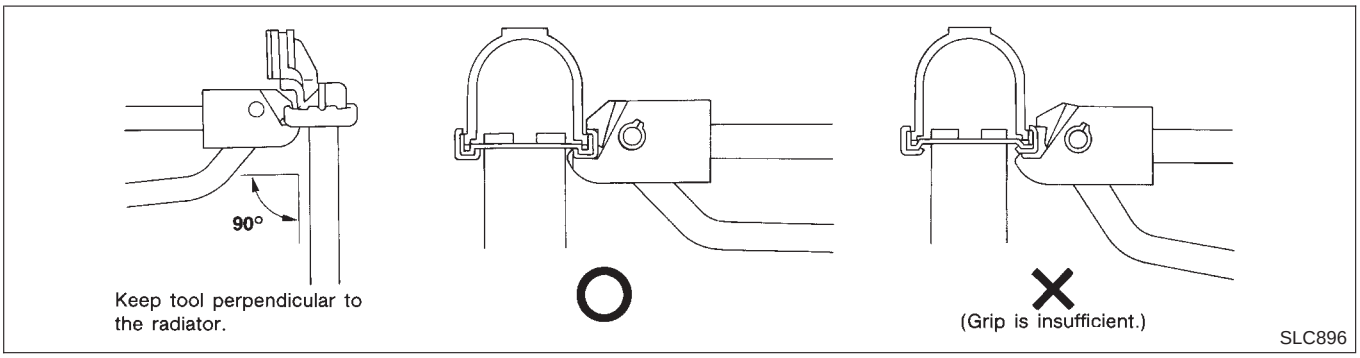
3. Install sealing rubber.

Push it in with fingers.
Be careful not to twist sealing rubber.

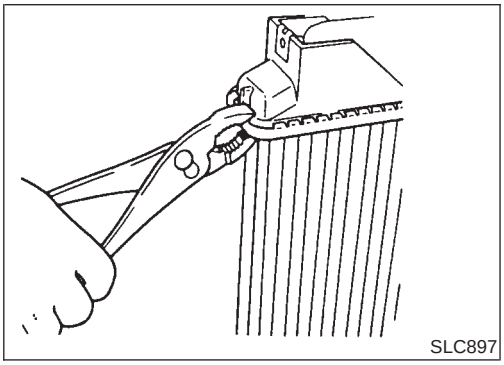


SLC904-A

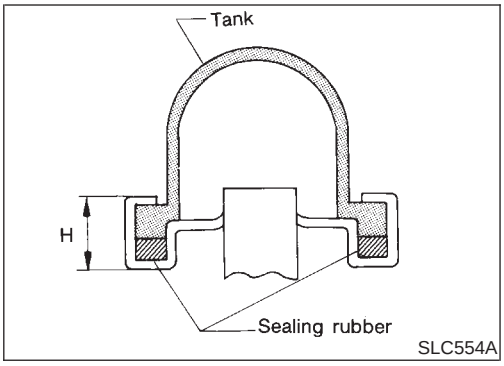
4. Caulk tank in specified sequence with Tool.



SLC896

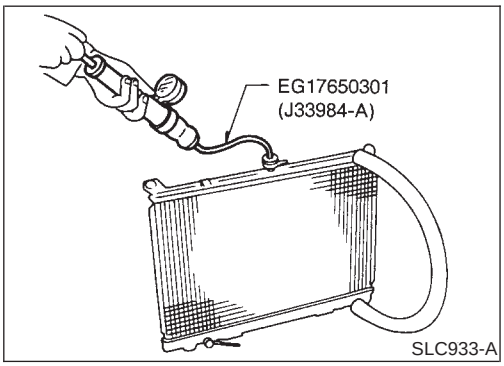

SLC897

- Use pliers in the locations where Tool cannot be used.



5. Make sure that the rim is completely crimped down.
   Standard height "H":
   8.0 - 8.4 mm (0.315 - 0.331 in)
6. Confirm that there is no leakage.

Refer to Inspection.

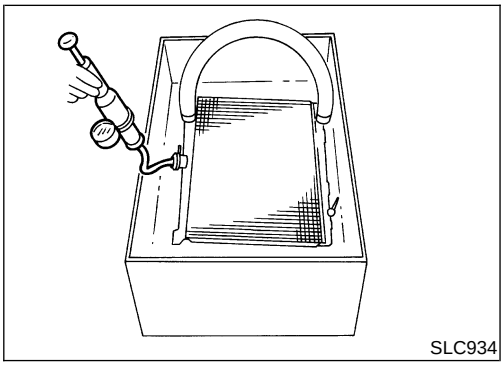


INSPECTION

NFLC0028

1. Apply pressure with Tool.
   Specified pressure value:
   157 kPa (1.6 kg/cm^2, 23 psi)

WARNING:
To prevent the risk of the hose coming undone while under pressure, securely fasten it down with a hose clamp.
Attach a hose to the oil cooler to seal its inlet and outlet. (A/T models only)



2. Check for leakage by soaking radiator in water container.

Overheating Cause Analysis

NFLC0029

	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	Refer to DTC P1217 in EC section.	—
		High resistance to fan rotation	Fan assembly	
		Damaged fan blades		
	Damaged radiator shroud	—	—	—
	Improper coolant mixture ratio	—	—	—
	Poor coolant quality	—	Coolant density	—
	Insufficient coolant	Coolant leaks	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 leaks into cooling system	Cylinder head deterioration
				Cylinder head gasket deterioration

Overheating Cause Analysis (Cont'd)

	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		

Service Data and Specifications (SDS)

THERMOSTAT

NFLC0030

Valve opening temperature	82°C (180°F)
Valve lift	More than 8.6 mm/95°C (0.339 in/203°F)

RADIATOR

NFLC0031

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

Cap relief pressure	Standard	78 - 98 (0.8 - 1.0, 11 - 14)
	Limit	59 (0.6, 9)
Leakage test pressure		157 (1.6, 23)