ENGINE LUBRICATION & COOLING SYSTEMS

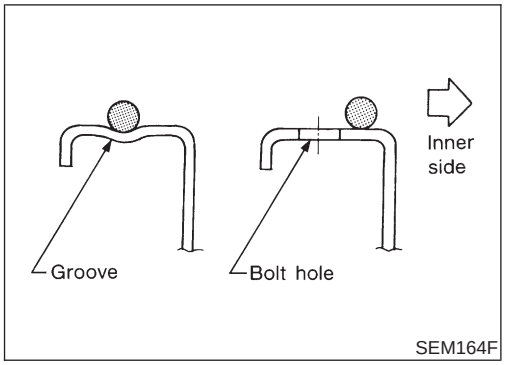
SECTION LC

CONTENTS

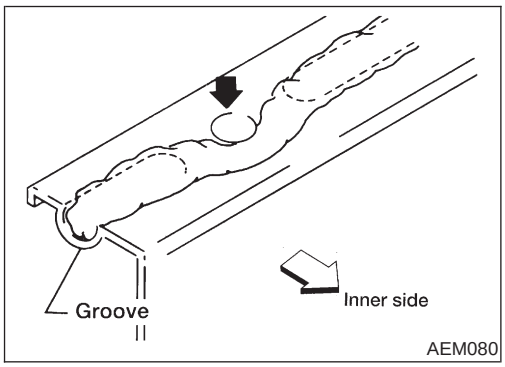
QG

YD

CONTENTS (Cont'd)



SEM164F



AEM080

Precautions

LIQUID GASKET APPLICATION PROCEDURE

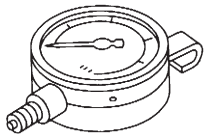
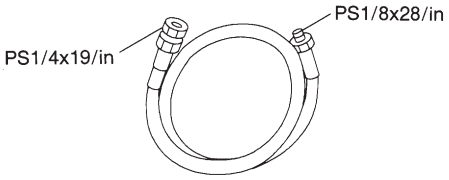
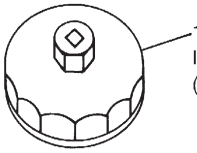
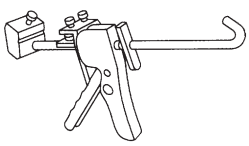
NJLC0001

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 Liquid Gasket or equivalent.)
   - For oil pan, be sure liquid gasket diameter is 3.5 to 4.5 mm (0.138 to 0.177 in).
   - For areas except oil pan, be sure liquid gasket diameter is 2.0 to 3.0 mm (0.079 to 0.118 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

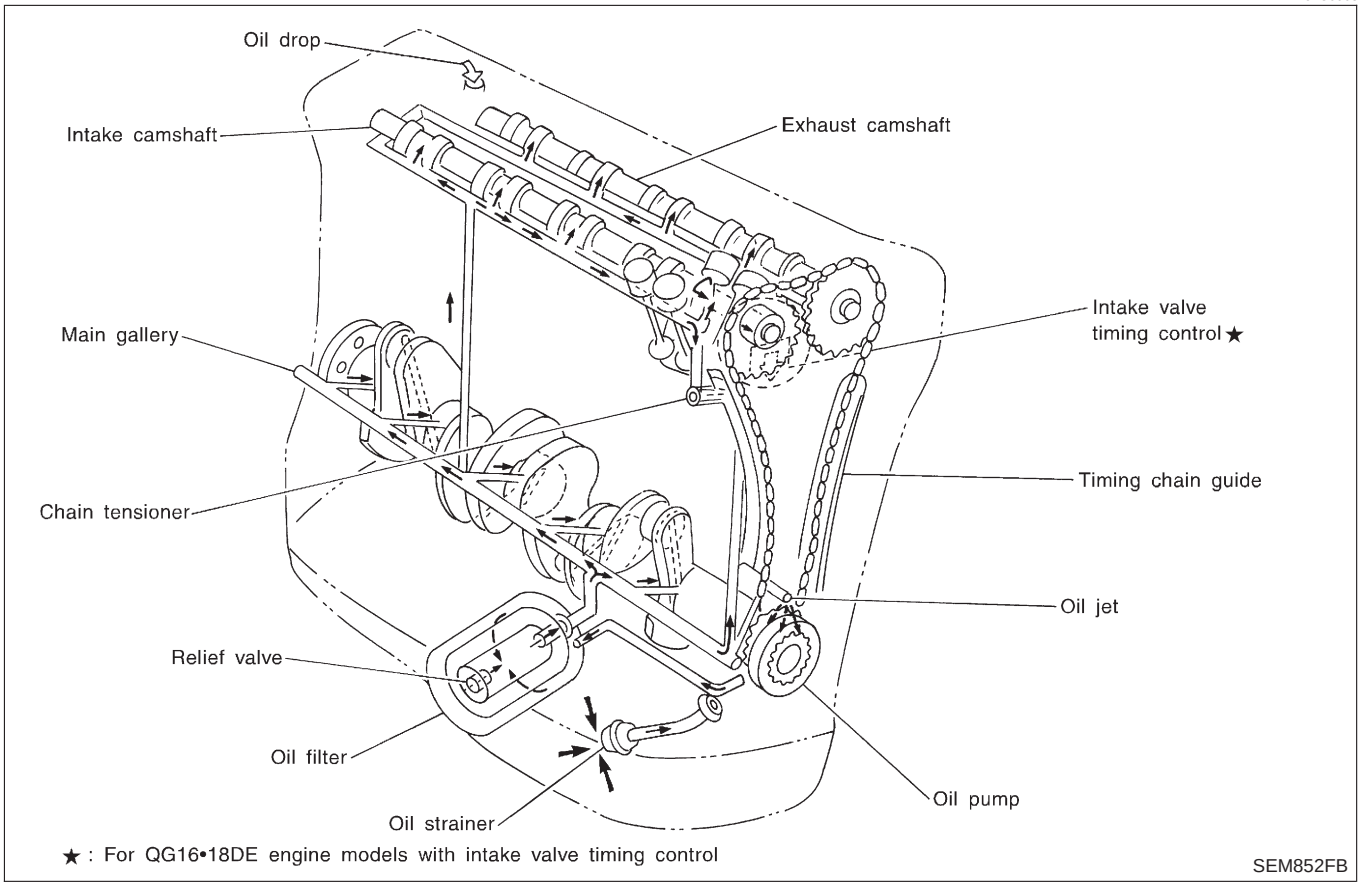
SPECIAL SERVICE TOOLS

NJLC0002

Tool number Tool name	Description	
ST25051001 Oil pressure gauge	 NT050	Measuring oil pressure
ST25052000 Hose	 NT559	Adapting oil pressure gauge to cylinder block
KV10115801 Oil filter wrench	 NT772	Removing oil filter
WS39930000 Tube presser	 NT052	Pressing the tube of liquid gasket

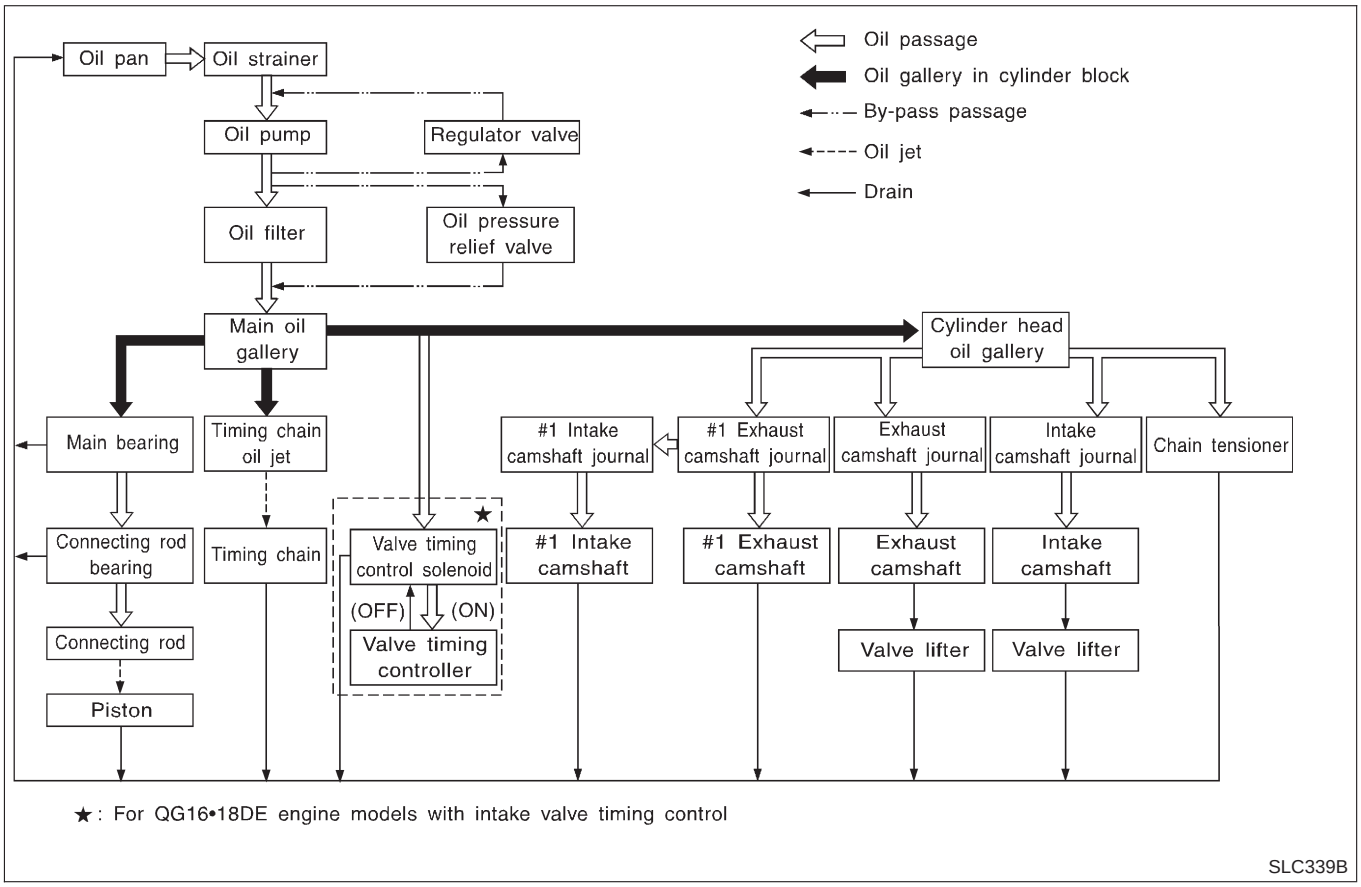
Lubrication Circuit

NJLC0003



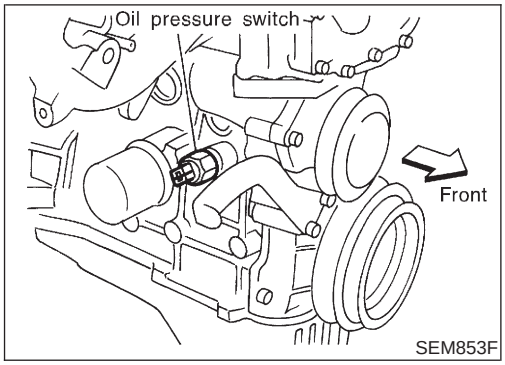
★ : For QG16•18DE engine models with intake valve timing control

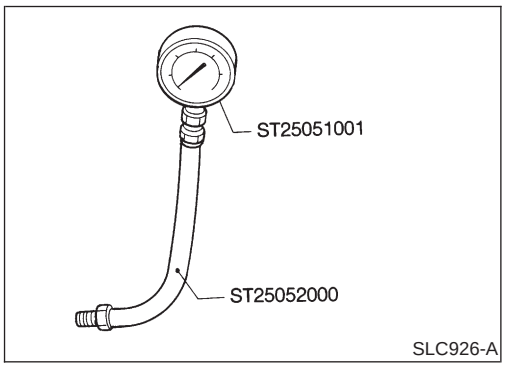
SEM852FB



★ : For QG16•18DE engine models with intake valve timing control

SLC339B





Oil Pressure Check

NJLC0004

WARNING:

- **Be careful not to burn yourself, as the engine and oil may be hot.**
- **For M/T models, put gearshift lever in Neutral “N” position. For A/T models, put selector lever in Park “P” position.**

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.

For Sedan

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
600	More than 69 (0.69, 0.7, 10)
2,000	More than 284 (2.84, 2.9, 41)
6,000	More than 422 (4.22, 4.3, 61)

For Hatchback

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
600	More than 98 (0.98, 1.0, 14)
2,000	More than 294 (2.94, 3.0, 43)
6,000	More than 392 (3.92, 4.0, 57)

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

6. Install oil pressure switch with sealant.
   : 13 - 17 N·m (1.25 - 1.75 kg-m, 9 - 12 ft-lb)

Oil Pump

REMOVAL AND INSTALLATION

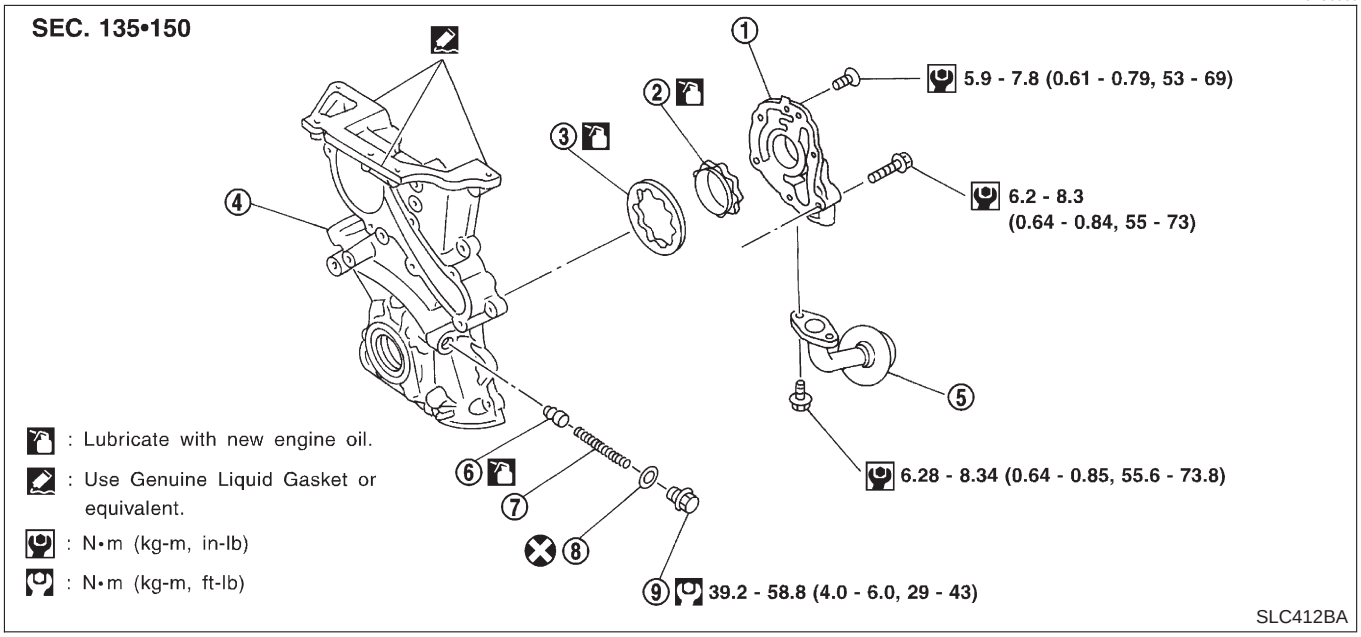
NJLC0005

- **Make sure that O-ring is fitted properly.**

1. Drain engine oil.
2. Remove drive belts.
3. Remove oil pan. Refer to EM-20, “OIL PAN”.
4. Remove oil strainer.
5. Remove front cover. Refer to EM-23, “TIMING CHAIN”.
6. Install front cover.
7. Reinstall parts in reverse order of removal.

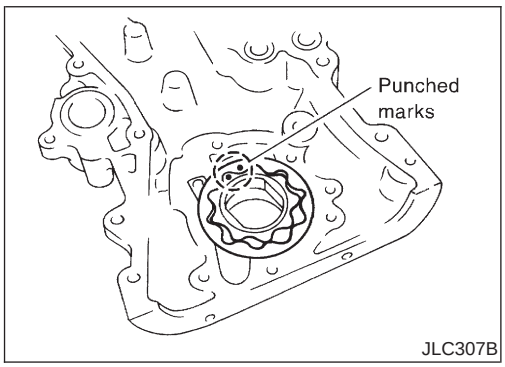
DISASSEMBLY AND ASSEMBLY

NJLC0006

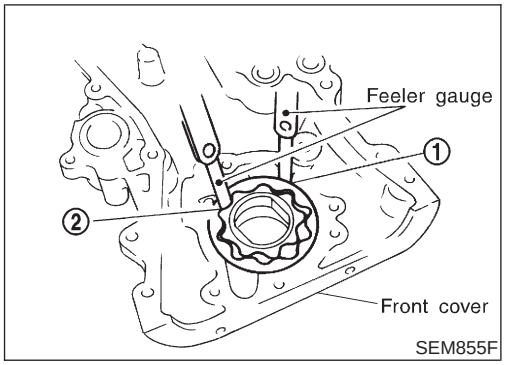


1. Oil pump cover
2. Inner rotor
3. Outer rotor
4. Front cover
5. Oil strainer
6. Regulator valve
7. Spring
8. Washer
9. Plug

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



- **Install the inner rotor and outer rotor with the punched marks on the oil pump cover side.**



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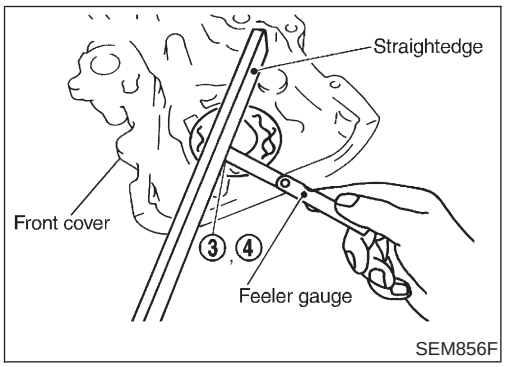


SEM856F

INSPECTION

NJLC0007

Using a feeler gauge, check the following clearances.

Standard clearance:

For Sedan

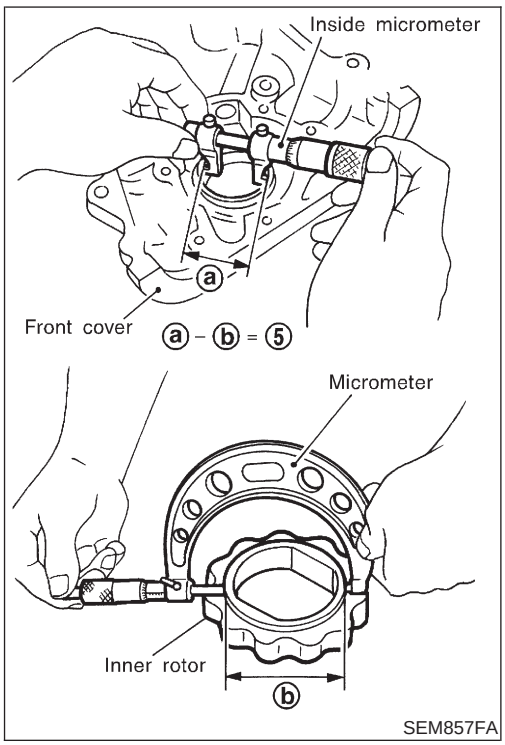
Unit: mm (in)

Body to outer rotor radial clearance **1**	0.114 - 0.200 (0.0045 - 0.0079)
Inner rotor to outer rotor tip clearance **2**	Below 0.18 (0.0071)
Body to inner rotor clearance **3**	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance **4**	0.030 - 0.090 (0.0012 - 0.0035)
Inner rotor to brazed portion of housing clearance **5**	0.045 - 0.091 (0.0018 - 0.0036)

For Hatchback

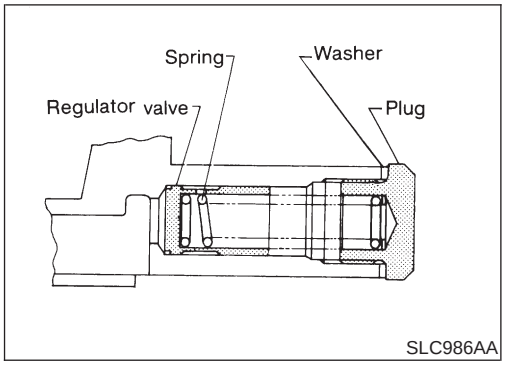
Unit: mm (in)

Body to outer rotor radial clearance **1**	0.250 - 0.325 (0.0098 - 0.0128)
Inner rotor to outer rotor tip clearance **2**	Below 0.18 (0.0071)
Body to inner rotor clearance **3**	0.030 - 0.085 (0.0012 - 0.0033)
Body to outer rotor axial clearance **4**	0.030 - 0.090 (0.0012 - 0.0035)
Inner rotor to brazed portion of housing clearance **5**	0.045 - 0.091 (0.0018 - 0.0036)



SEM857FA

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

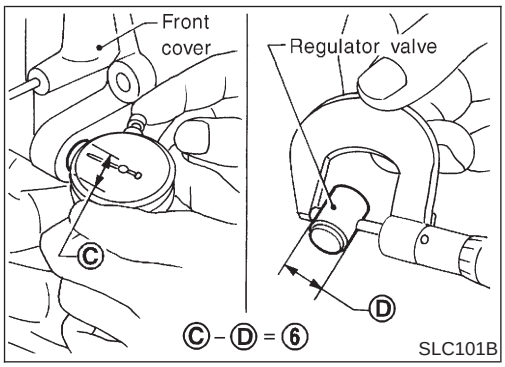


REGULATOR VALVE INSPECTION

NJLC0008

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 front cover assembly.



4. Check regulator valve to front cover clearance.

Clearance 6:

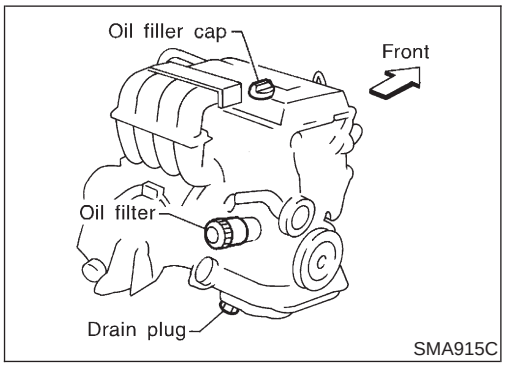
For Sedan

0.040 - 0.097 mm (0.0016 - 0.0038 in)

For Hatchback

0.052 - 0.088 mm (0.0020 - 0.0035 in)

If it exceeds the limit, replace front cover assembly.



Changing Engine Oil

NJLC0035

WARNING:

- **Be careful not to burn yourself, as the engine oil is hot.**
- **Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**

1. Warm up engine, and check for oil leakage from engine components.
2. Stop engine and wait more than 10 minutes.
3. Remove drain plug and oil filler cap.
4. Drain oil and refill with new engine oil.

Oil specification and viscosity:

- **API grade SG, SH or SJ**
- **ILSAC grade GF-I & GF-II**

  Refer to MA-16, "RECOMMENDED FLUIDS AND LUBRICANTS".

Refill oil capacity (Approximate):

Unit: ℓ (Imp qt)

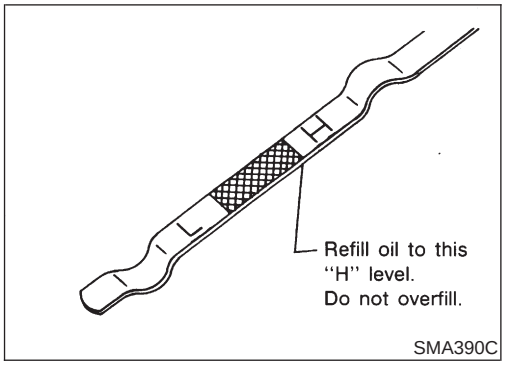
With oil filter change	2.7 (2-3/8)
Without oil filter change	2.5 (2-1/4)
Dry engine (engine overhaul)	3.1 (2-3/4)

CAUTION:

- **Be sure to clean drain plug and install with new washer.**

  Drain plug:

  : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
- **The refill capacity changes depending on the oil temperature and drain time, use these values as a reference and be certain to check with the dipstick when changing the oil.**



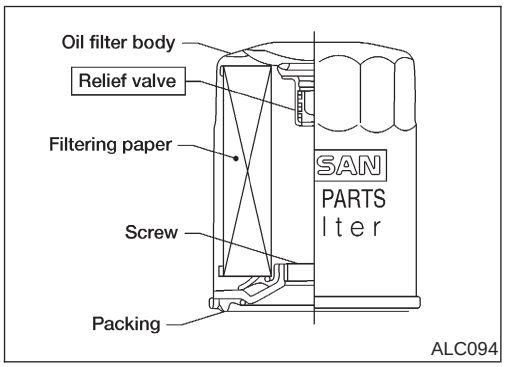
5. Check oil level.
6. Start engine and check area around drain plug and oil filter for oil leakage.
7. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

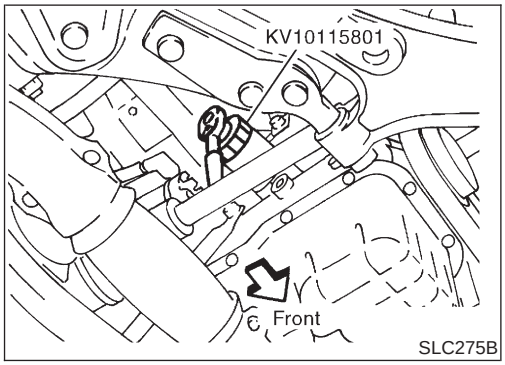
Changing Oil Filter

NJLC0010

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

- **Use Tool KV10115801 for removing oil filter.**

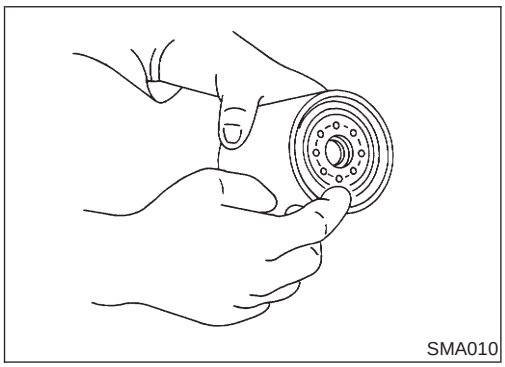




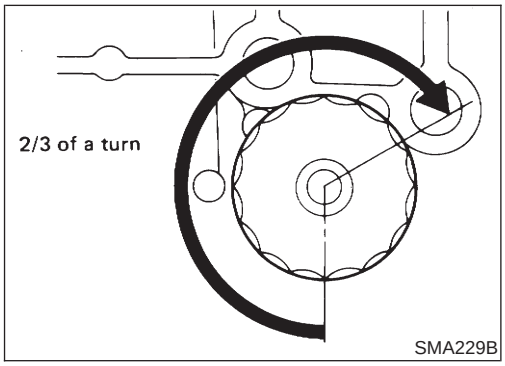
1. Remove oil filter with Tool.

WARNING:

Be careful not to burn yourself, as the engine and the engine oil are hot.



2. Clean oil filter mounting surface on cylinder block. Coat rubber seal of new oil filter with engine oil.



3. Screw in the oil filter until a slight resistance is felt, then tighten an additional 2/3 turn.
4. Add engine oil.
   Refer to Changing Engine Oil.

- **Clean excess oil from engine.**

Service Data and Specifications (SDS)

OIL PRESSURE CHECK

NJLC0011

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)	
	Sedan	Hatchback
600	More than 69 (0.69, 0.7, 10)	More than 98 (0.98, 1.0, 14)
2,000	More than 284 (2.84, 2.9, 41)	More than 294 (2.94, 3.0, 43)
6,000	More than 422 (4.22, 4.3, 61)	More than 392 (3.92, 4.0, 57)

OIL PUMP INSPECTION

NJLC0013

Unit: mm (in)

Model	Sedan	Hatchback
Body to outer rotor radial clearance	0.114 - 0.200 (0.0045 - 0.0079)	0.250 - 0.325 (0.0098 - 0.0128)
Inner rotor to outer rotor tip clearance	Below 0.18 (0.0071)	
Body to inner rotor clearance	0.030 - 0.070 (0.0012 - 0.0028)	0.030 - 0.085 (0.0012 - 0.0033)
Body to outer rotor axial clearance	0.030 - 0.090 (0.0012 - 0.0035)	
Inner rotor to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)	

REGULATOR VALVE INSPECTION

NJLC0012

Unit: mm (in)

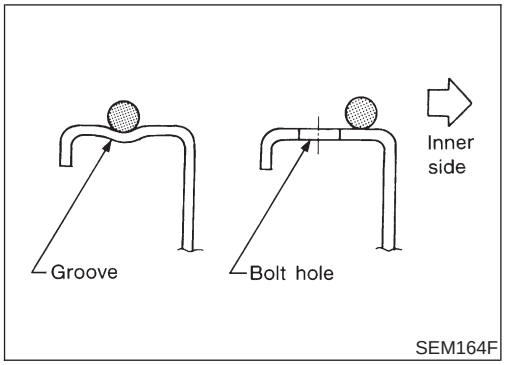
Model	Sedan	Hatchback
Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0382)	0.052 - 0.088 (0.0020 - 0.0035)

OIL CAPACITY

NJLC0036

Unit: ℓ (Imp qt)

With oil filter change	2.7 (2-3/8)
Without oil filter change	2.5 (2-1/4)
Dry engine (engine overhaul)	3.1 (2-3/4)



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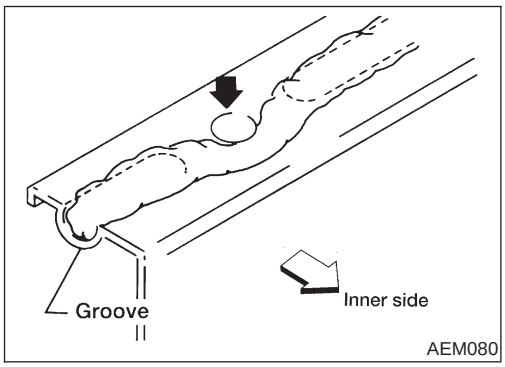


AEM080

Precautions

LIQUID GASKET APPLICATION PROCEDURE

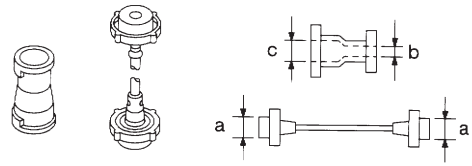
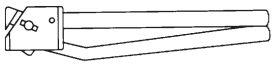
NJLC0014

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 Liquid Gasket or equivalent.)**
   - For oil pan, be sure liquid gasket diameter is 3.5 to 4.5 mm (0.138 to 0.177 in).
   - For areas except oil pan, be sure liquid gasket diameter is 2.0 to 3.0 mm (0.079 to 0.118 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

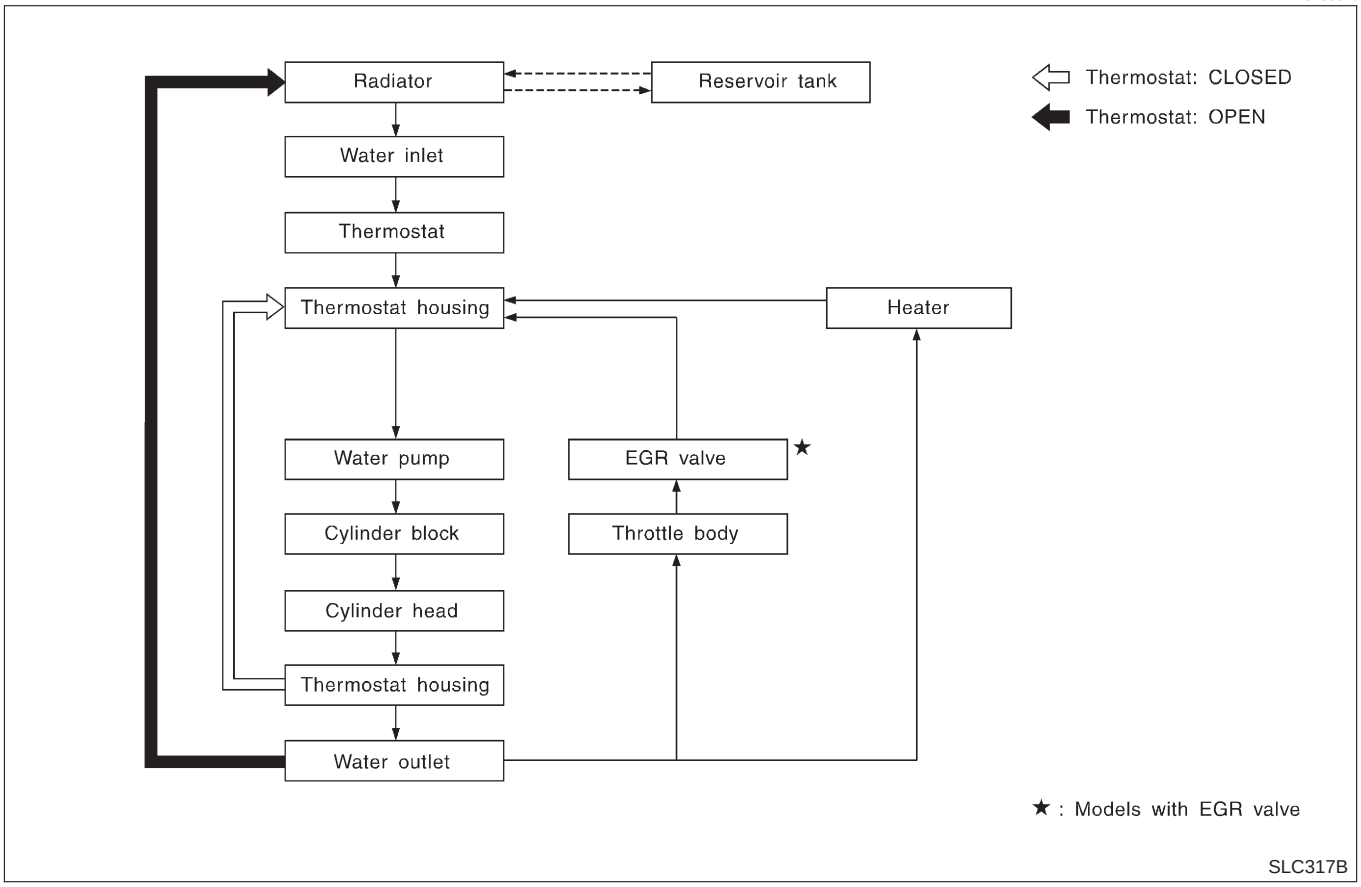
SPECIAL SERVICE TOOLS

NJLC0015

Tool number Tool name	Description	
EG17650301 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

NJLC0016



System Check

NJLC0017

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could occur from high pressure fluid 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.

CHECKING COOLING SYSTEM HOSES

NJLC0017S01

Check hoses for the following:

- Improper attachment
- Leaks
- Cracks
- Damage
- Loose connections
- Chafing
- Deterioration

CHECKING RADIATOR

NJLC0017S04

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, rediator 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 download.
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 download.
   - Use compressesd air lower than 490 kPa (4.9 bar, 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

NJLC0017S03

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

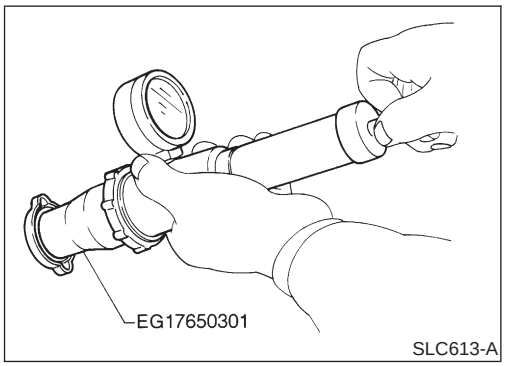
Radiator cap relief pressure:

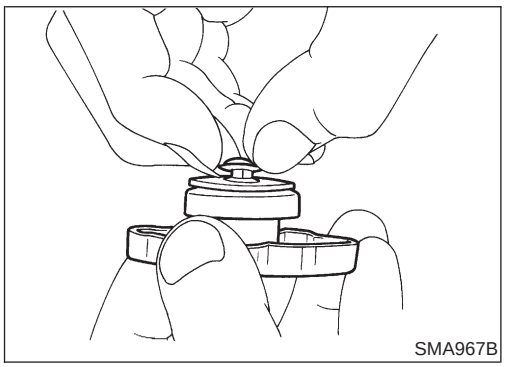
Standard

78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)

Limit

59 - 98 kPa
(0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)





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

CHECKING COOLING SYSTEM FOR LEAKS

NJLC0017S02

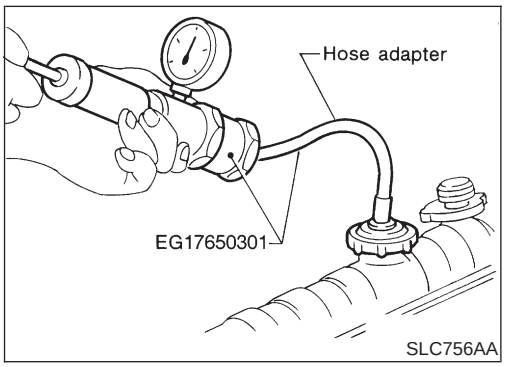
To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:

157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

CAUTION:

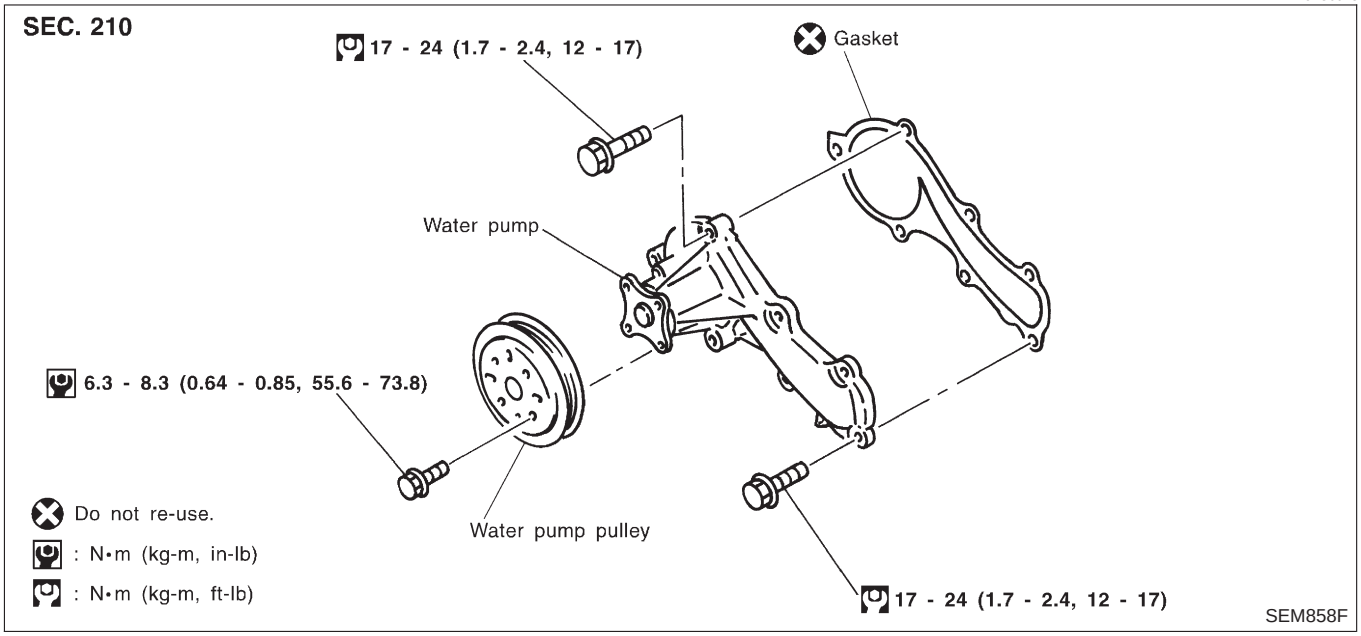
Higher pressure than specified may cause radiator damage.

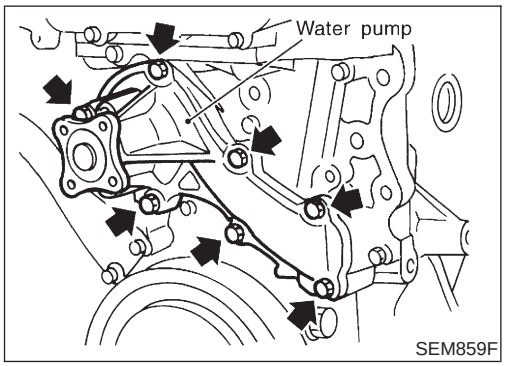


Water Pump

REMOVAL AND INSTALLATION

NJLC0018

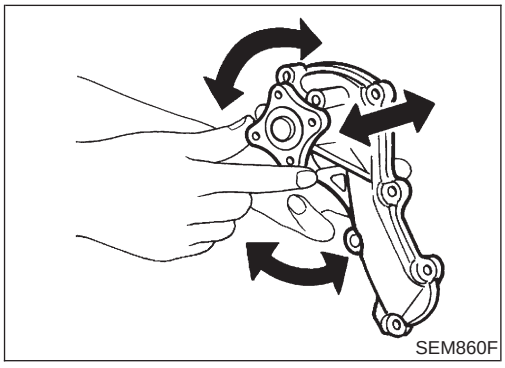




CAUTION:

- **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, and check for leaks using radiator cap tester.**

1. Drain engine coolant.
   Refer to LC-18, “Changing Engine Coolant”.
2. Remove drive belts and idler pulley.
3. Loosen water pump pulley bolts.
4. Remove water pump pulley.
5. Remove front right wheel.
6. Remove front right undercover and front right fender protector.
7. Remove water pump bolts.
8. Remove water pump.
9. Reinstall parts in reverse order of removal.



INSPECTION

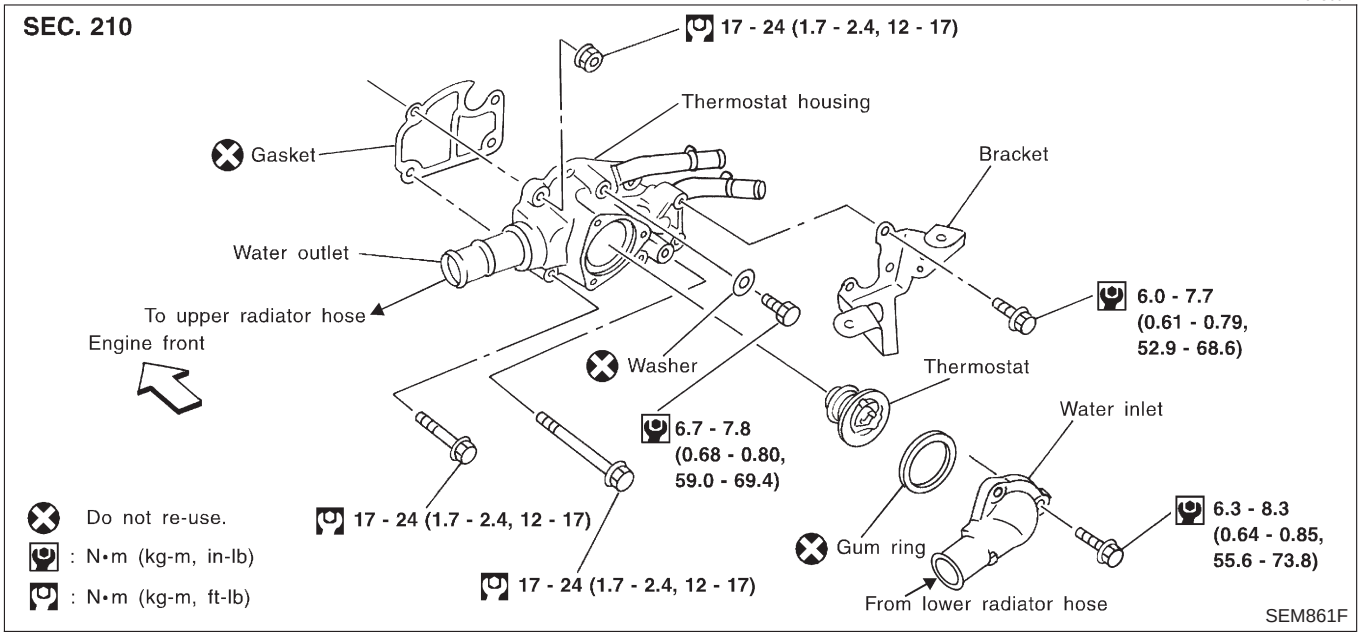
NJLC0019

- Check body assembly and vane for rust or corrosion.
- Check for rough operation due to excessive end play.

Thermostat

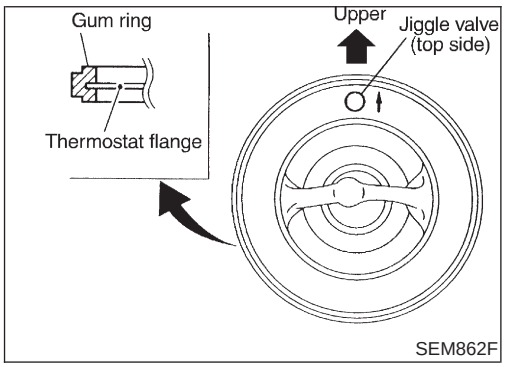
REMOVAL AND INSTALLATION

NJLC0021

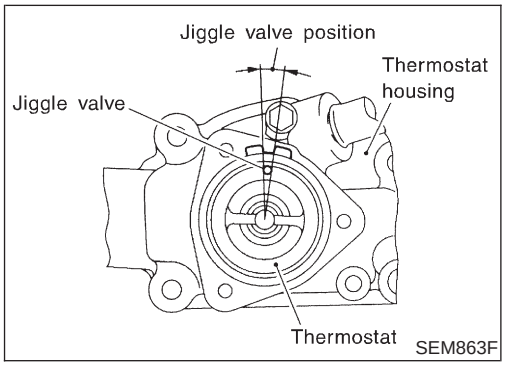


Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.

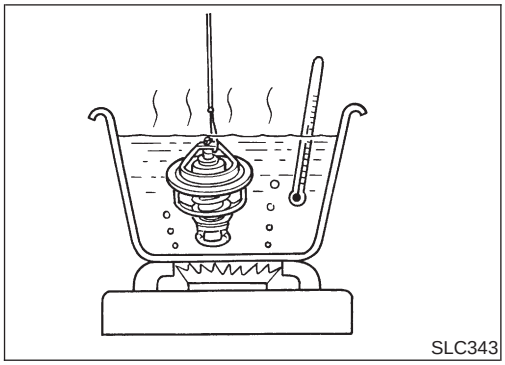
1. Drain engine coolant.
   Refer to LC-18, “Changing Engine Coolant”.
2. Remove water inlet, then take out thermostat.



3. Install gum ring to thermostat.



4. Install thermostat with jiggle valve or air bleeder at upper side.
   After installation, run engine for a few minutes, and check for leaks.


SLC343

INSPECTION

NJLC0022

1. Check for valve seating condition at normal room temperature. It should seat tightly.
2. Check valve opening temperature and valve lift.

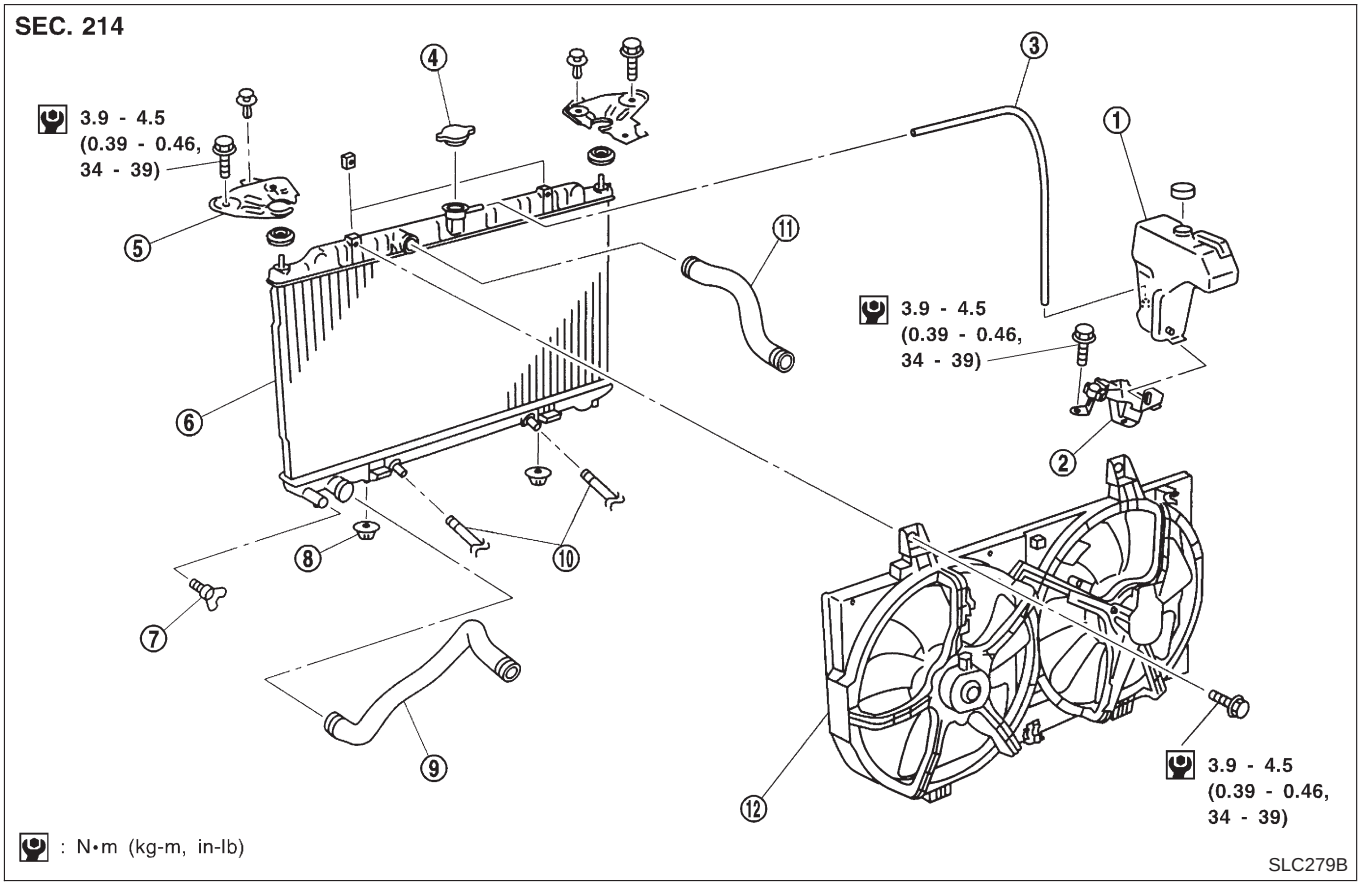
Valve opening temperature °C (°F)	82 (180)
Valve lift mm/°C (in/°F)	More than 8/95 (0.31/203)

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

Radiator

COMPONENTS

NJLC0025



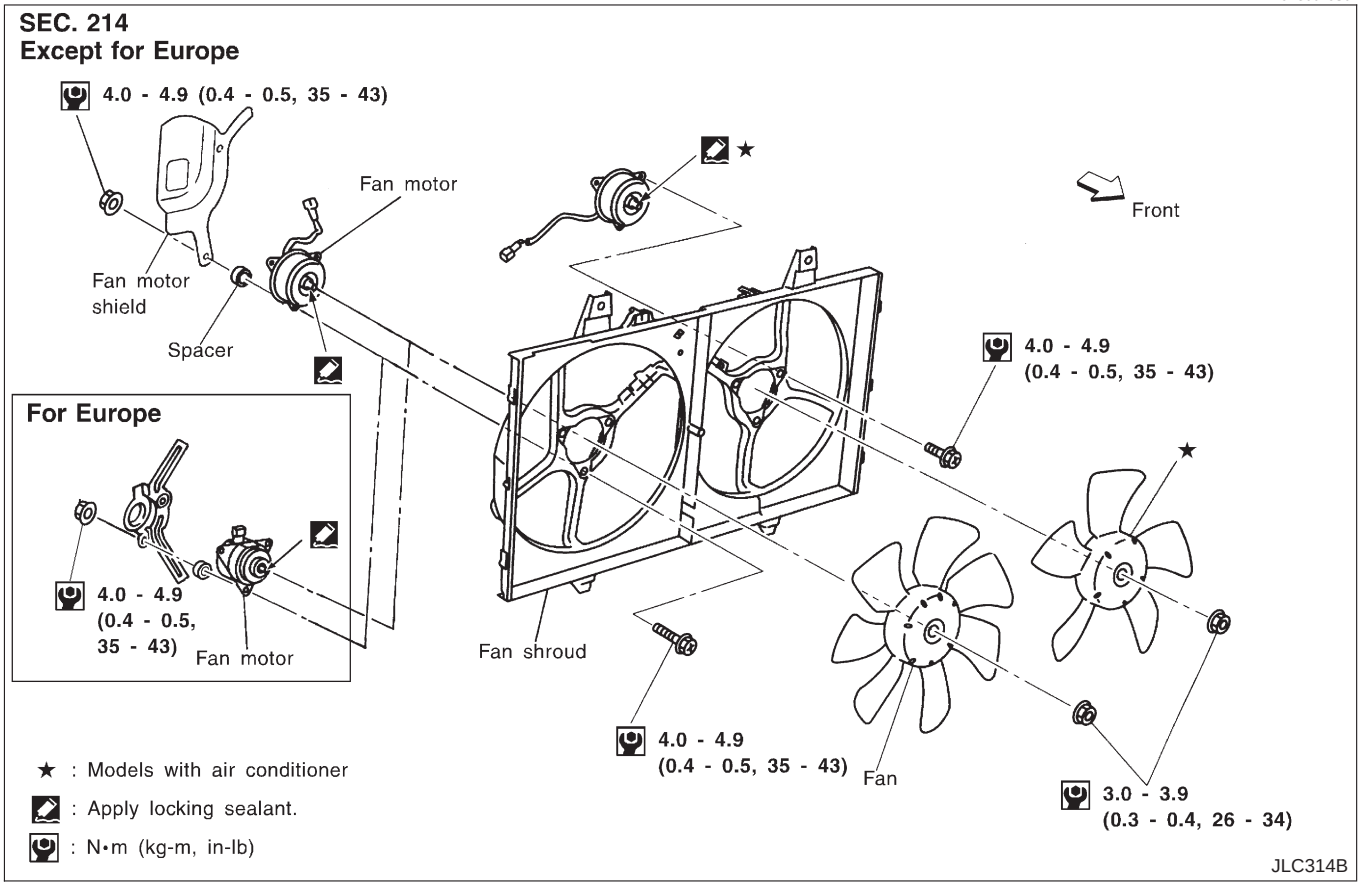
1. Reservoir tank
2. Reservoir tank bracket
3. Reservoir hose
4. Radiator cap
5. Mounting bracket
6. Radiator
7. Radiator drain cock (For Sedan)
8. Mounting rubber
9. Lower radiator hose
10. Oil cooler hose (A/T models)
11. Upper radiator hose
12. Cooling fan assembly

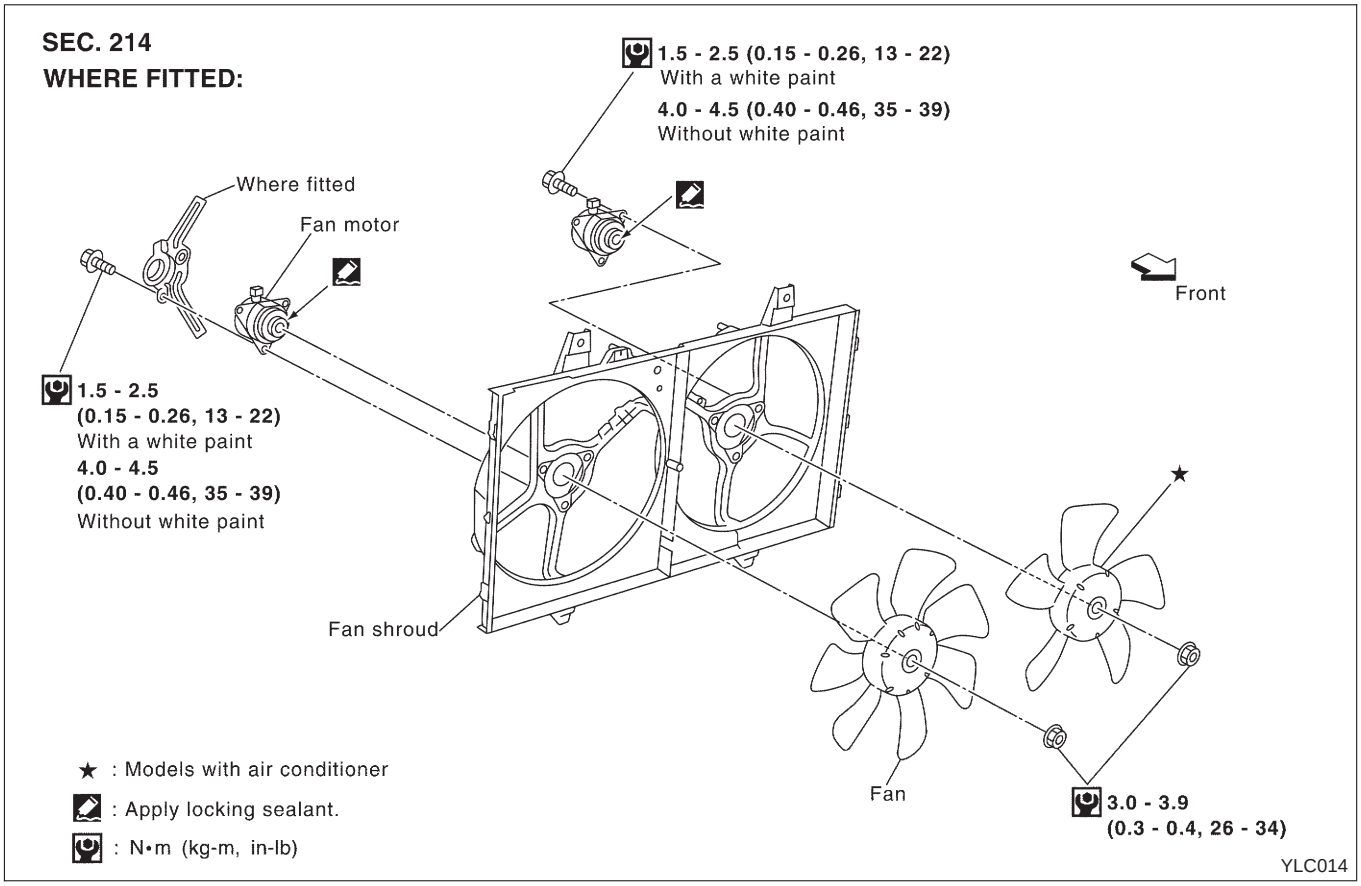
Cooling Fan

NJLC0026

COMPONENTS

NJLC0026S01

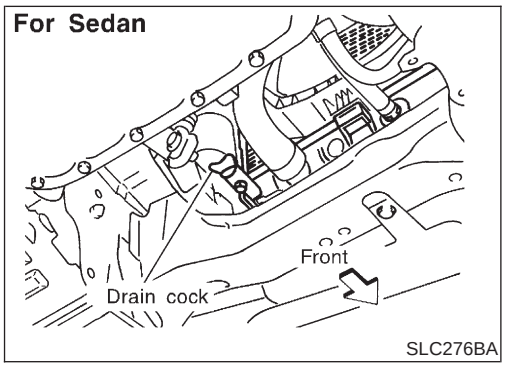




CONTROL SYSTEM

NJLC0026S02

Cooling fans are controlled by the ECM. For details, refer to EC-406, TROUBLE DIAGNOSIS FOR OVERHEAT (COOLING SYSTEM).



Changing Engine Coolant

NJLC0037

WARNING:

To avoid the danger of being scalded, never change the coolant when the engine is hot.

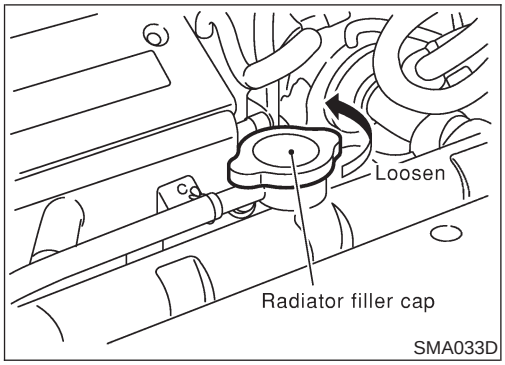
— DRAINING ENGINE COOLANT —

NJLC0037S01

1. Set air conditioning system as follows to prevent coolant from remaining in the system.

a. Turn ignition switch ON and set temperature controller to maximum hot position.

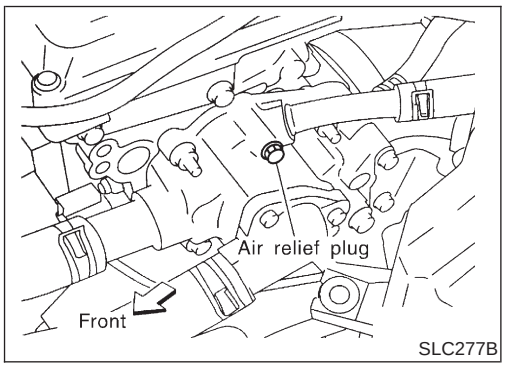
b. Wait 10 seconds before turning ignition switch OFF.



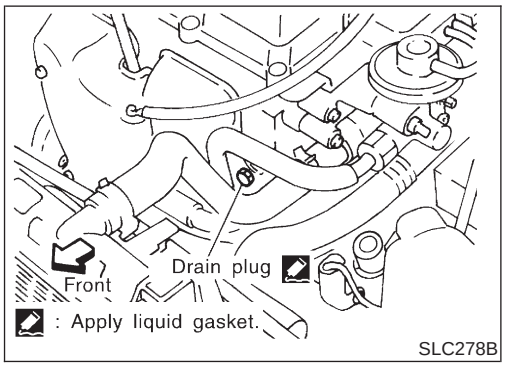
2. Open radiator drain cock at the bottom of radiator or remove lower radiator hose, and remove radiator filler cap to drain coolant.
3. Remove reservoir tank, drain coolant, then clean reservoir tank.

- **Be careful not to allow coolant to contact drive belts.**

4. Cover the exhaust tube heat shield to prevent from splashing coolant.



5. Remove drain plug on cylinder block and air relief plug.
6. Check drained coolant for contaminants such as rust, corrosion or discoloration. If contaminated flush engine cooling system, refer to LC-20, "FLUSHING COOLING SYSTEM".
7. Blow the coolant around the exhaust tube heat shield.



— REFILLING ENGINE COOLANT —

NJLC0037S02

1. Install reservoir tank, radiator drain cock or lower radiator hose and cylinder block drain plug.

- **Apply sealant to the thread of cylinder block drain plug.**

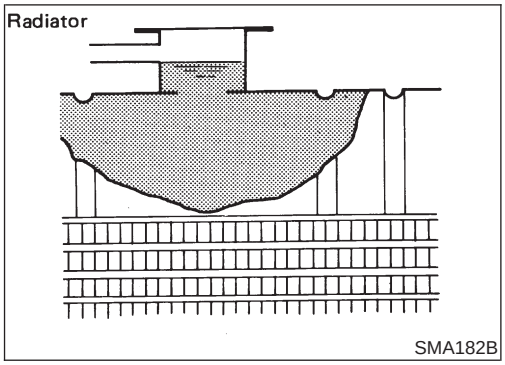
: 35 - 44 N·m (3.50 - 4.50 kg-m, 26 - 32 ft-lb)

2. Fill radiator slowly with coolant until coolant spills from the air relief plug, then install air relief plug.

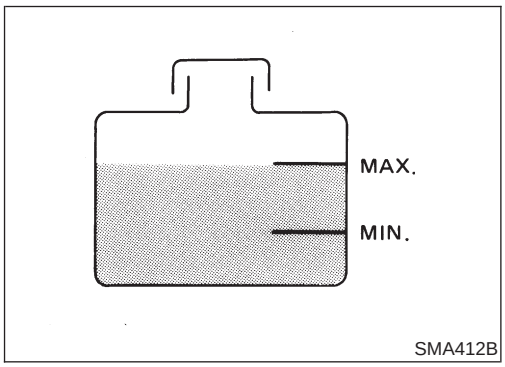
Air relief plug:

: 6.7 - 7.8 N·m (0.68 - 0.80 kg-m, 59 - 69 in-lb)

- **Use genuine Nissan anti-freeze coolant or equivalent mixed with water (distilled or demineralized).**



SMA182B



SMA412B

Refer to MA-16, "RECOMMENDED FLUIDS AND LUBRICANTS".

Coolant capacity (With reservoir tank):

Unit: ℓ (Imp qt)

M/T		6.7 (5-7/8)
A/T	For Sedan	6.6 (5-7/8)
	For Hatchback	6.7 (5-7/8)

Reservoir tank capacity:
0.7 ℓ (5/8 Imp qt)

- **Pour coolant through coolant filler neck slowly to allow air in system to escape.**

3. Fill radiator and reservoir tank to specified level.
4. Warm up engine to normal operating temperature without radiator cap installed.

- **If coolant overflows radiator filler hole, install filler cap.**

5. Run engine at 2,500 rpm for 10 seconds and return to idle speed with radiator cap installed.

- Repeat two or three times.

Watch coolant temperature gauge so as not to overheat the engine.

6. Stop engine and cool it down.

- Cool down using a fan to reduce the time.
- If necessary, refill radiator up to filler neck with coolant.

7. Refill reservoir tank to MAX level line with coolant.
8. Repeat steps 4 through 7 two or more times with radiator cap installed until coolant level no longer drops.
9. Check cooling system for leaks with engine running.
10. Warm up engine, and check for sound of coolant flow while running engine from idle up to 3,000 rpm with heater temperature controller set at several positions between COOL and HOT.

- Sound may be noticeable at heater water cock.

11. If sound is heard, bleed air from cooling system by repeating steps 4 through 7 until coolant level no longer drops

- **Clean excess coolant from engine.**

— FLUSHING COOLING SYSTEM —

NJLC0037S03

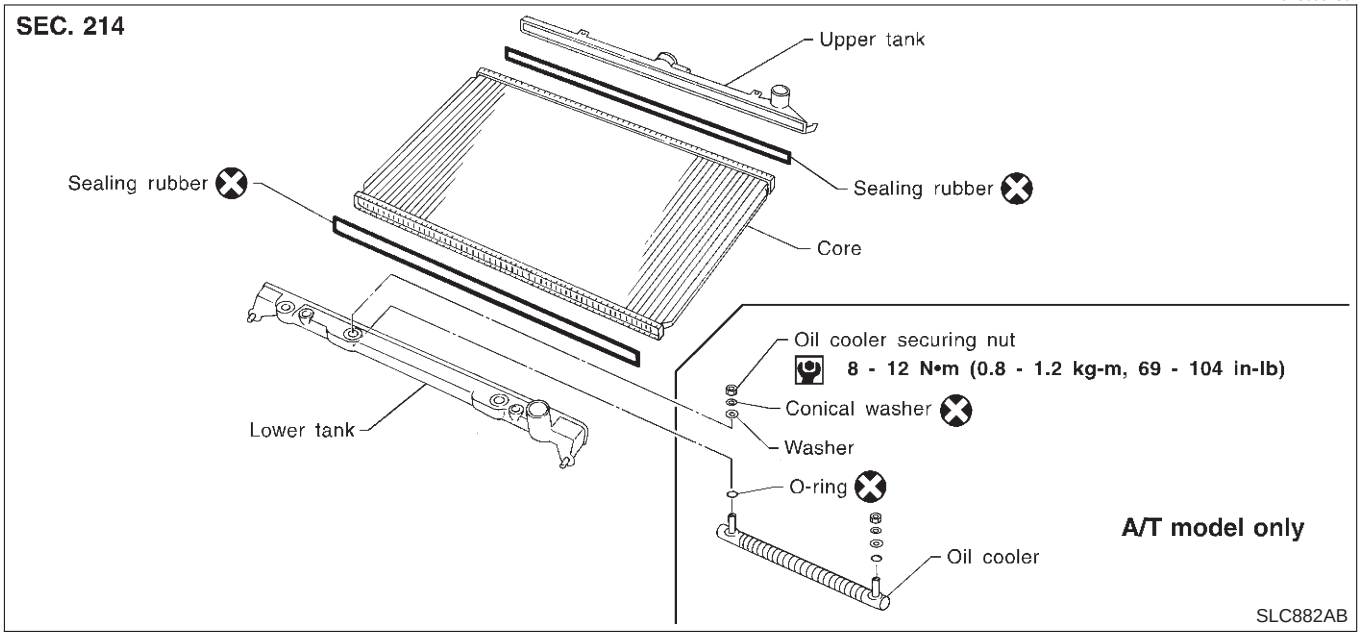
1. Open air relief plug.
2. Fill radiator with water until water spills from the air relief hole, then close air relief plug. Fill radiator and reservoir tank with water and reinstall radiator cap.
3. Run engine and warm it up to normal operating temperature.
4. Rev engine two or three times under no-load.
5. Stop engine and wait until it cools down.
6. Drain water.
7. Repeat steps 1 through 6 until clear water begins to drain from radiator.

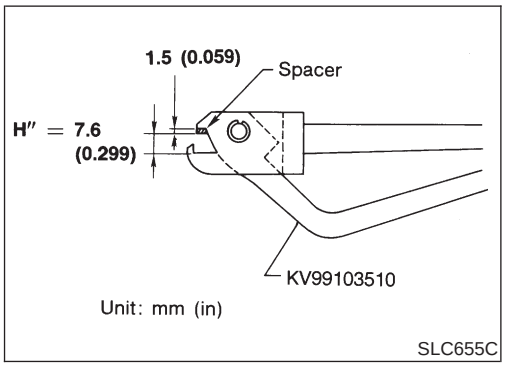
Radiator (Aluminum type)

NJLC0081

PREPARATION

NJLC0081S01



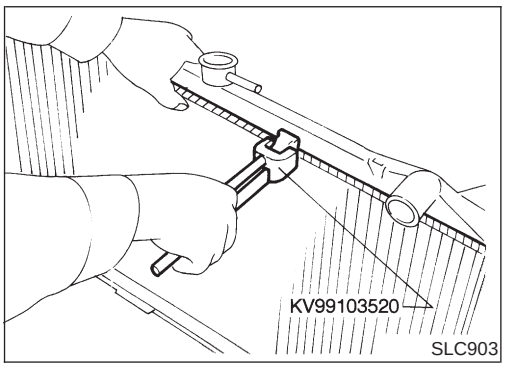


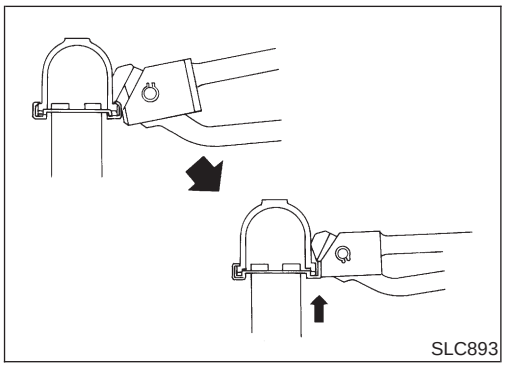
1. Attach the spacer to the tip of the radiator plate pliers A. Spacer specification: 1.5 mm (0.059 in) thick x 18 mm (0.71 in) wide x 8.5 mm (0.335 in) long.
2. Make sure that when radiator plate pliers A are closed dimension H″ is approx. 7.6 mm (0.299 in).
3. Adjust dimension H″ with the spacer, if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

DISASSEMBLY

NJLC0081S02

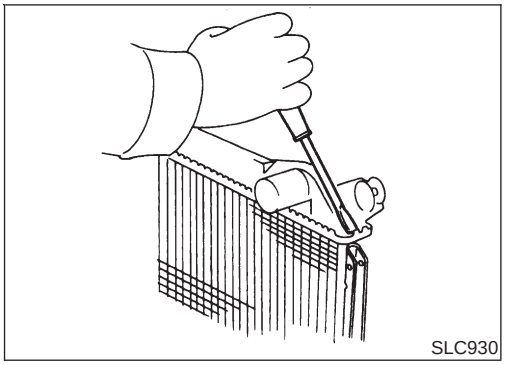
1. Remove tank with Tool.





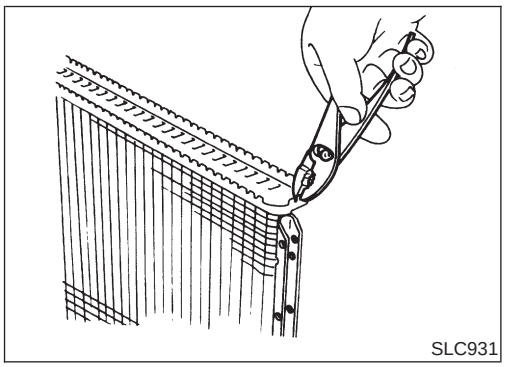
- Grip the crimped edge and bend it upwards so that Tool slips off.

Do not bend excessively.


SLC930

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

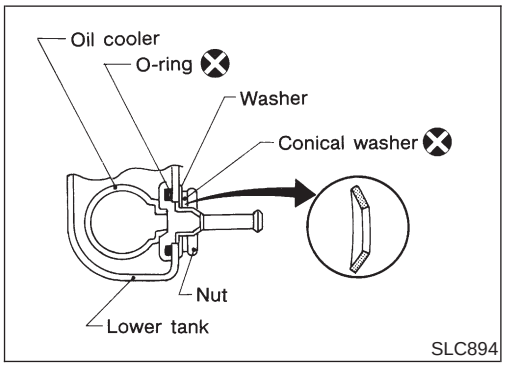
Be careful not to damage tank.


SLC931

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

ASSEMBLY

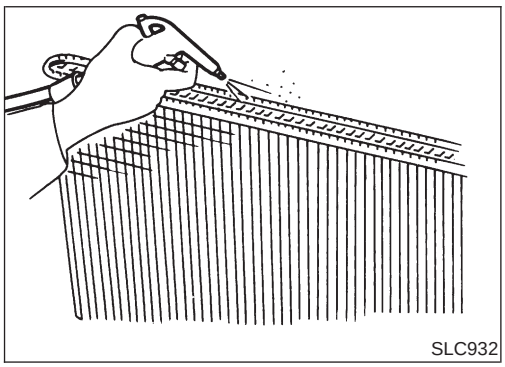
NJLC0081S03



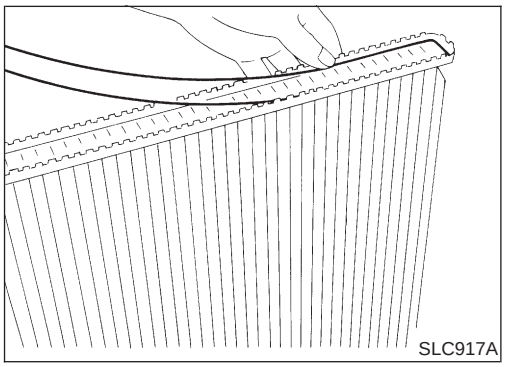
SLC894

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

Pay attention to direction of conical washer.

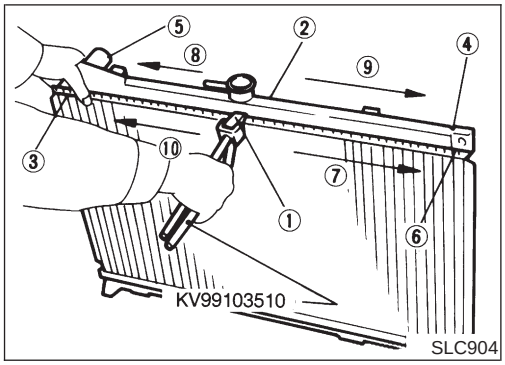

SLC932

2. Clean contact portion of tank.

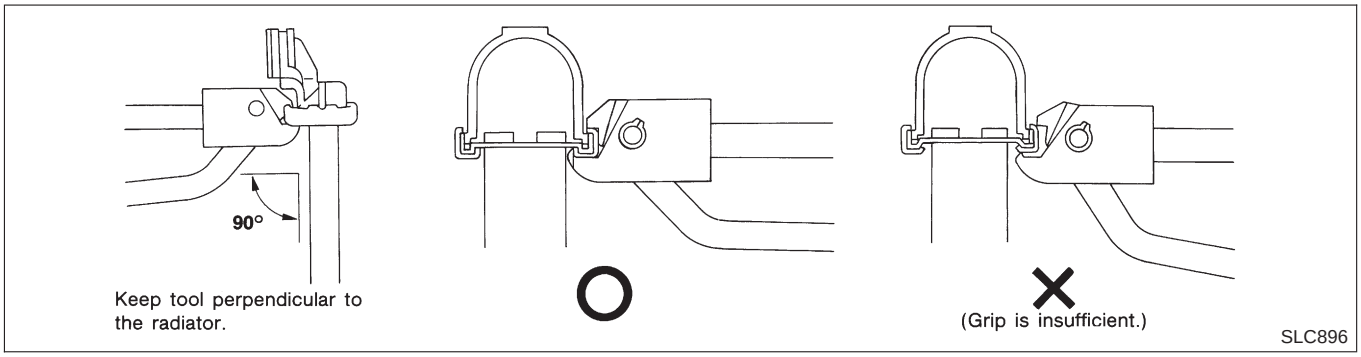

SLC917A

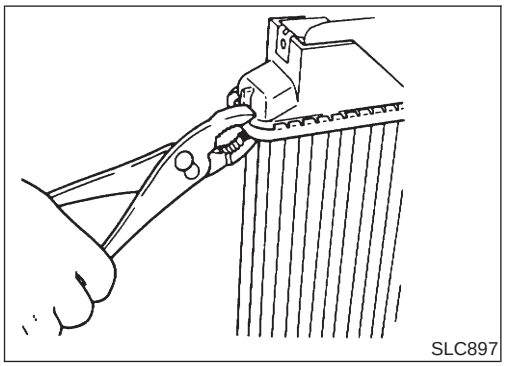
3. Install sealing rubber.

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

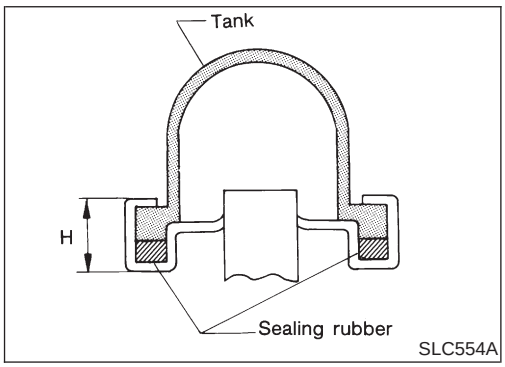


4. Caulk tank in specified sequence with Tool.



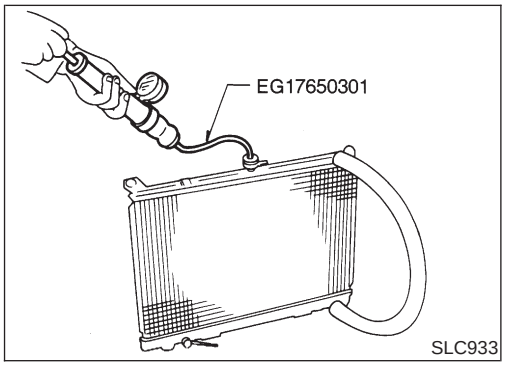


- Use pliers in the locations where Tool cannot be used.



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.

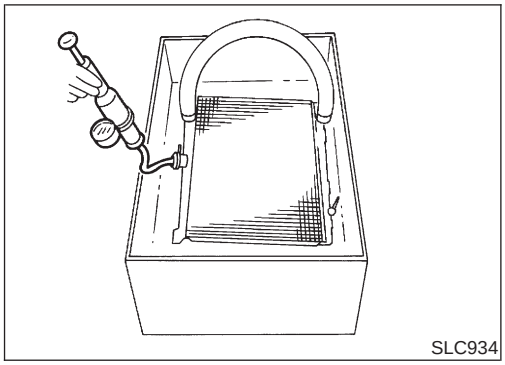


INSPECTION

NJLC0081S04

1. Apply pressure with Tool.
   Specified pressure value:
   157 kPa (1.57 bar, 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 as well. (A/T model only)


SLC934

2. Check for leakage.

Overheating Cause Analysis

NJLC0028

	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	
			Mechanical damage	
		Clogged radiator cooling tube	Excess foreign material (rust, dirt, sand, etc.)	
	Reduced air flow	Cooling fan does not operate	—	—
		High resistance to fan rotation		
		Damaged fan blades		
	Damaged radiator shroud	—	—	—
	Improper coolant mixture ratio	—	—	—
	Poor coolant quality	—	—	—
	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

	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	—	
		Installed large fog lamp		

Service Data and Specifications (SDS)

THERMOSTAT

NJLC0029

Valve opening temperature °C (°F)	82 (180)
Valve lift mm/°C (in/°F)	More than 8/95 (0.31/203)

RADIATOR

NJLC0030

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

Cap reliefpressure	Standard	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)
	Limit	59 - 98 (0.59 - 0.98, 0.6 - 1.0, 9 - 14)
Leakage test pressure		157 (1.57, 1.6, 23)

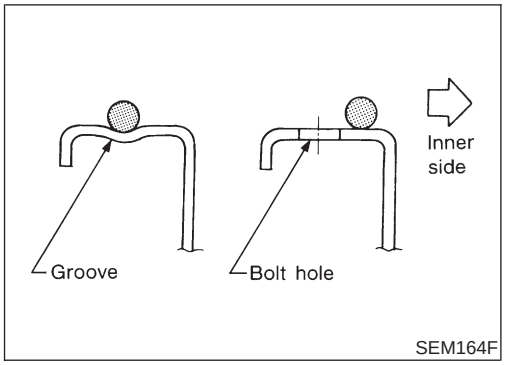
COOLANT CAPACITY

NJLC0038

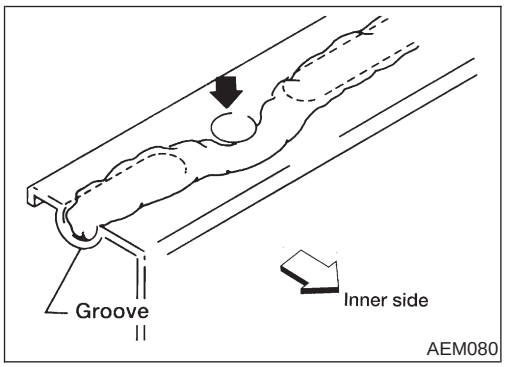
Unit: ℓ (Imp qt)

M/T*		6.7 (5-7/8)
A/T*	Sedan	6.6 (5-7/8)
	Hatchback	6.7 (5-7/8)
Reservoir tank		0.7 (5/8)

*: With reservoir tank



SEM164F



AEM080

Precautions

LIQUID GASKET APPLICATION PROCEDURE

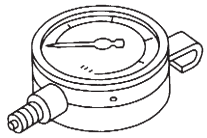
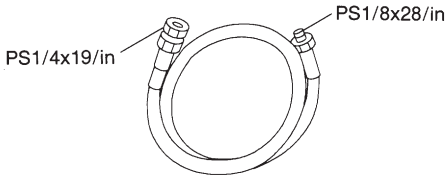
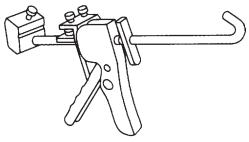
NJLC0039

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 Liquid Gasket or equivalent.)
- For oil pan, be sure liquid gasket diameter is 4.0 to 5.0 mm (0.157 to 0.197 in).
- For areas except oil pan, be sure liquid gasket diameter is 2.0 to 3.0 mm (0.079 to 0.118 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

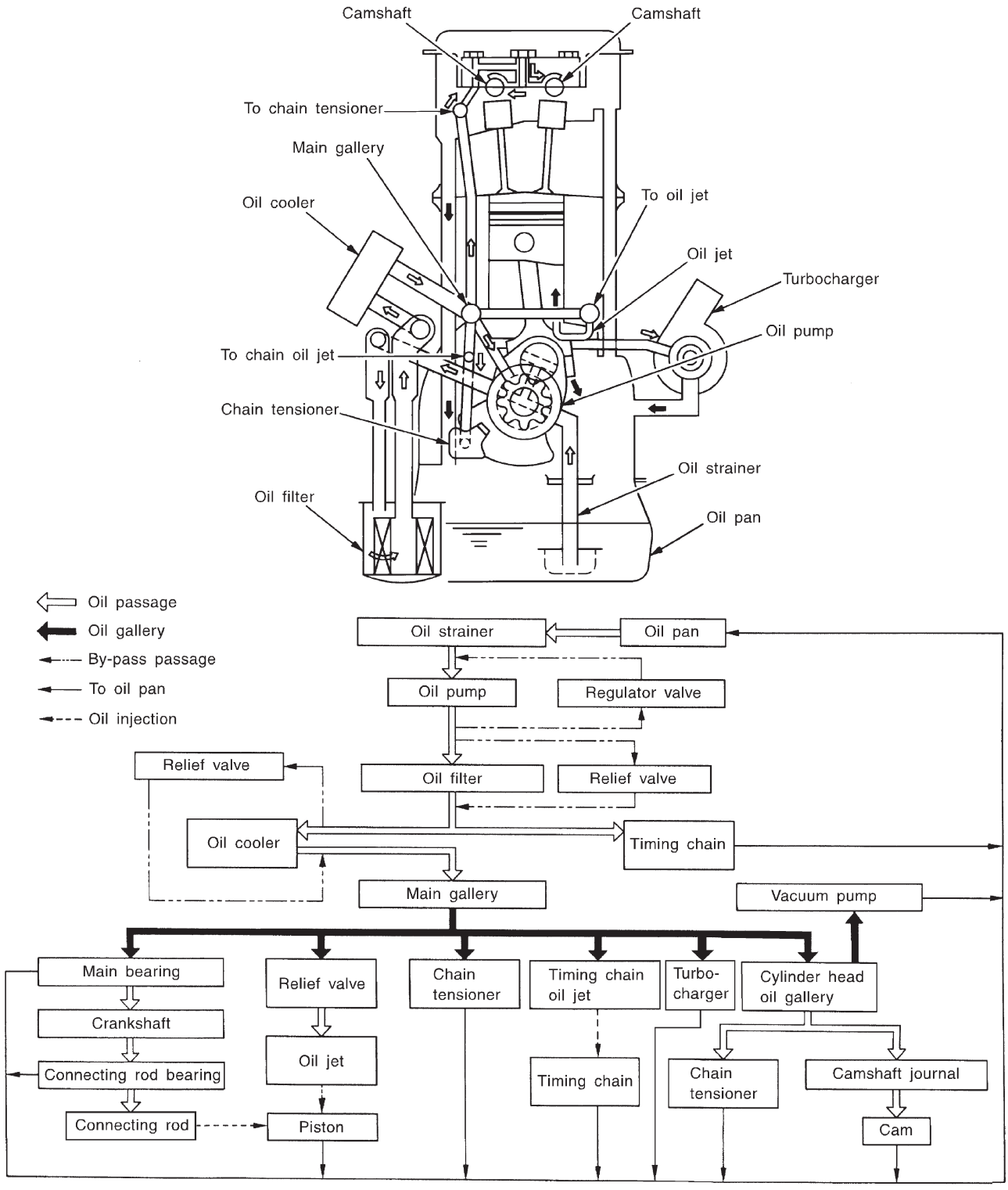
SPECIAL SERVICE TOOLS

NJLC0040

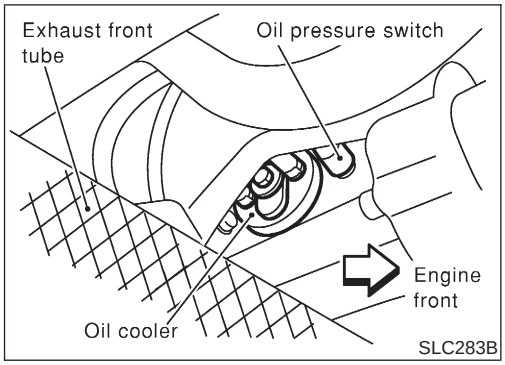
Tool number Tool name	Description	
ST25051001 Oil pressure gauge	 NT050	
ST25052000 Hose	 NT559	Adapting oil pressure gauge to upper oil pan
WS39930000 Tube pressure	 NT052	Pressing the tube of liquid gasket

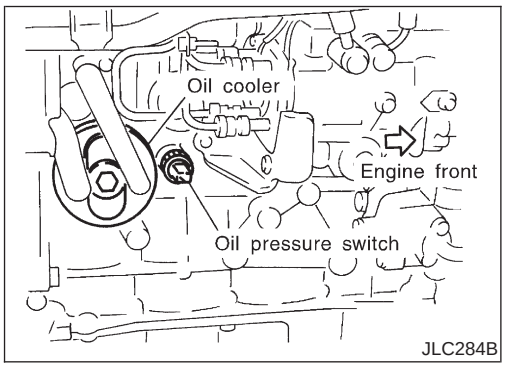
Lubrication Circuit

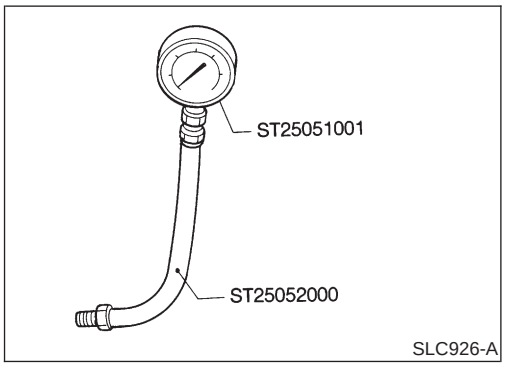
NJLC0041



JLC315B







Oil Pressure Check

NJLC0042

WARNING:

- **Be careful not to burn yourself, as the engine and oil may be hot.**
- **Oil pressure check should be done in "Neutral position".**

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

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 140 (1.40, 1.43, 20.3)
2,000	More than 270 (2.69, 2.75, 39.1)
4,000	More than 430 (4.29, 4.38, 62.3)

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

8. After the inspections, install the oil pressure switch as follows.

a. Remove the old sealant adhering to the switch and engine.

b. Apply Genuine Liquid Gasket or equivalent to the thread and tighten.

: 13 - 17 N·m (1.25 - 1.75 kg-m, 9 - 12 ft-lb)

Oil Pump

REMOVAL AND INSTALLATION

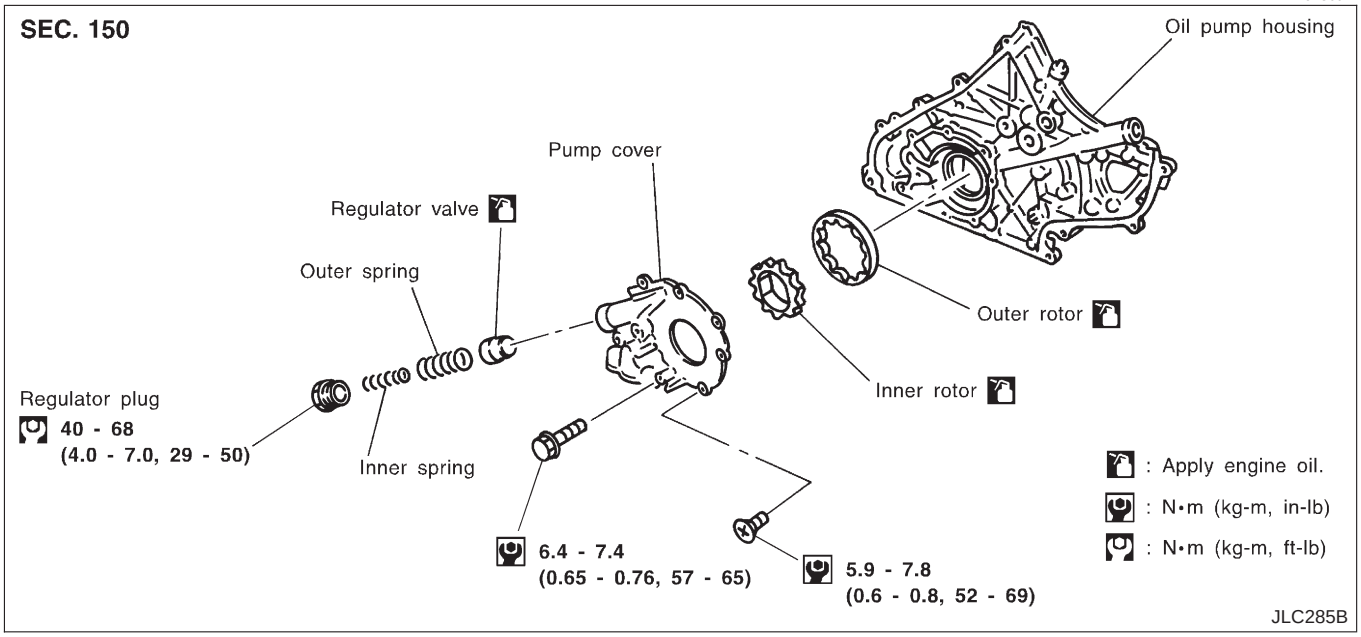
NJLC0043

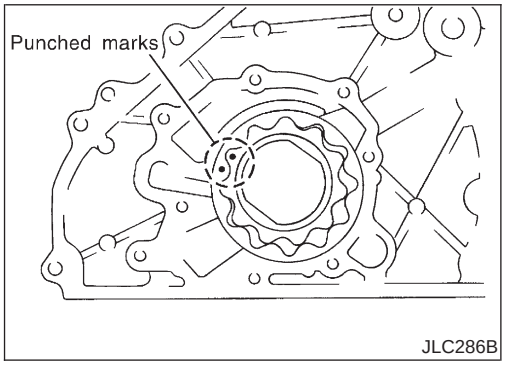
- **When installing oil pump, apply engine oil to rotors.**

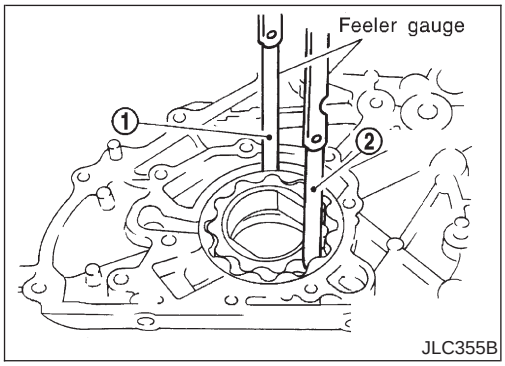
Refer to EM-99, "Primary Timing Chain" for removal.
Reinstall all parts in the reverse order of removal.

DISASSEMBLY AND ASSEMBLY

NJLC0044







OIL PUMP INSPECTION

NJLC0045

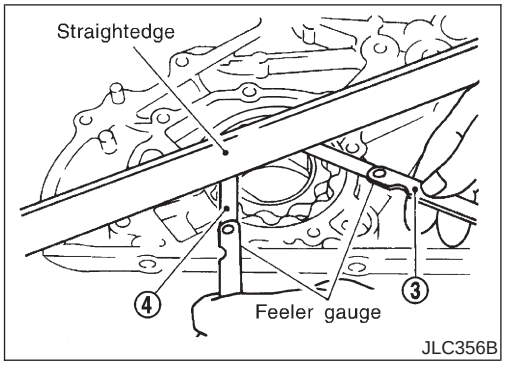
- **Install the inner rotor and outer rotor with the punched marks on the pump cover side.**

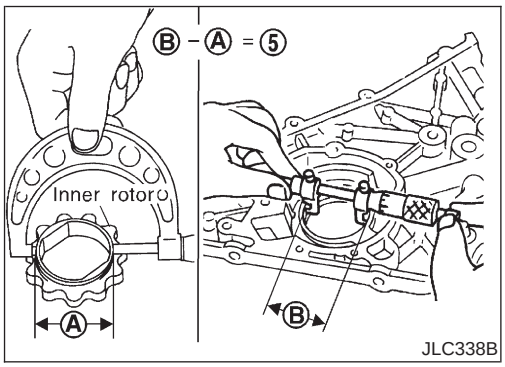
Using a feeler gauge, straightedge and micrometers, check the following clearances:

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**	0.050 - 0.090 (0.0020 - 0.0035)
Body to outer rotor axial clearance **4**	0.030 - 0.190 (0.0012 - 0.0075)
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.**



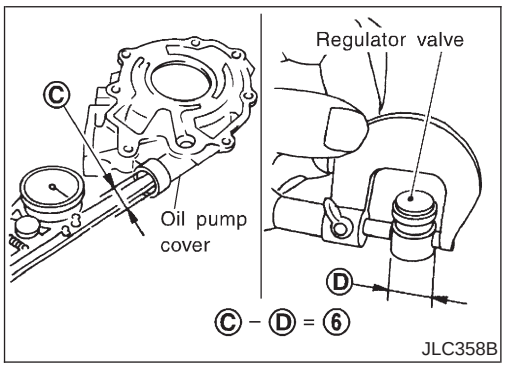


REGULATOR VALVE INSPECTION

NJLC0046

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.

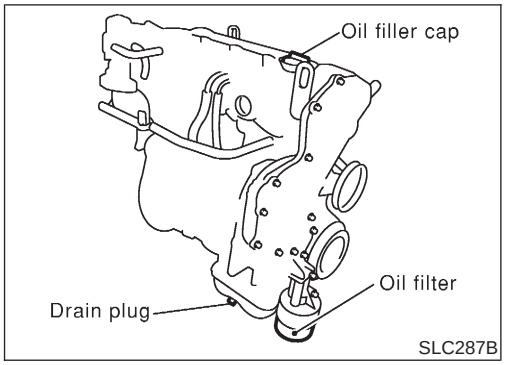


4. Check regulator valve to oil pump body clearance.

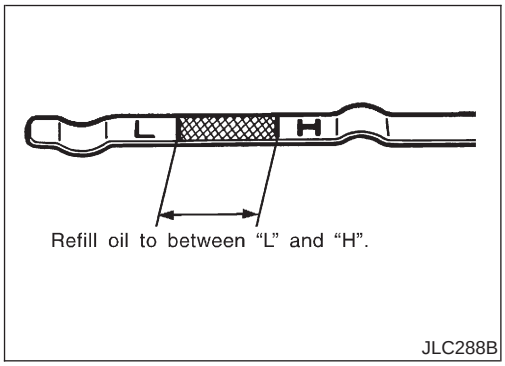
Clearance 6:

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

If it exceeds the limit, replace oil pump body.



SLC287B



JLC288B

Changing Engine Oil

NJLC0074

WARNING:

- **Be careful not to burn yourself, as the engine oil is hot.**
- **Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**

1. Warm up engine, and check for oil leakage from engine components.
2. Stop engine and wait more than 10 minutes.
3. Remove drain plug and oil filler cap.
4. Drain oil and refill with new engine oil.

Oil Specification and Viscosity:

- **API grade CF-4**

  Refer to MA-16, “RECOMMENDED FLUIDS AND LUBRICANTS”.

Refill oil capacity (Approximately):

Unit: ℓ (Imp qt)

Drain and refill	Without oil filter change	4.9 (4-3/8)
	With oil filter change	5.2 (4-5/8)
Dry engine (engine overhaul)		6.3 (5-1/2)

CAUTION:

- **Be sure to clean drain plug and install with new washer.**

  Drain plug:

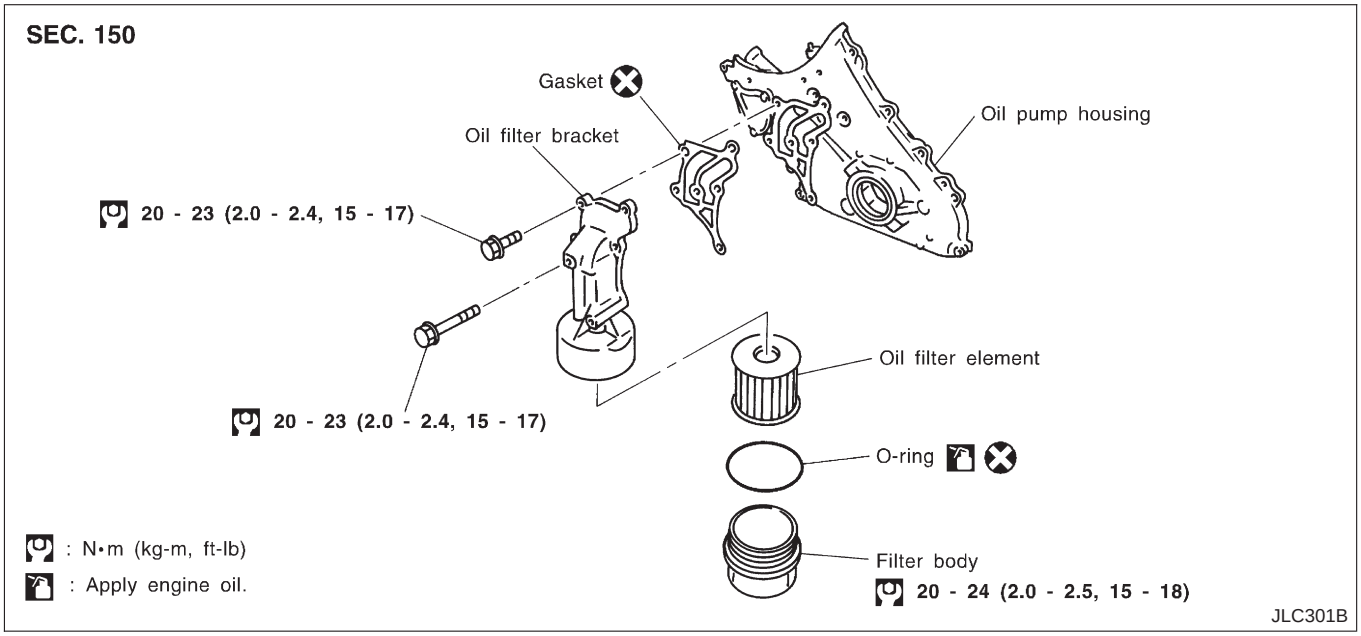
  : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

- **The refill capacity depends on the oil temperature and drain time. Use these specifications for reference only. Always use the dipstick to determine when the proper amount of oil is in the engine.**

5. Check oil level.
6. Start engine and check area around drain plug and oil filter for oil leakage.
7. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

Oil Filter Bracket

NJLC0075

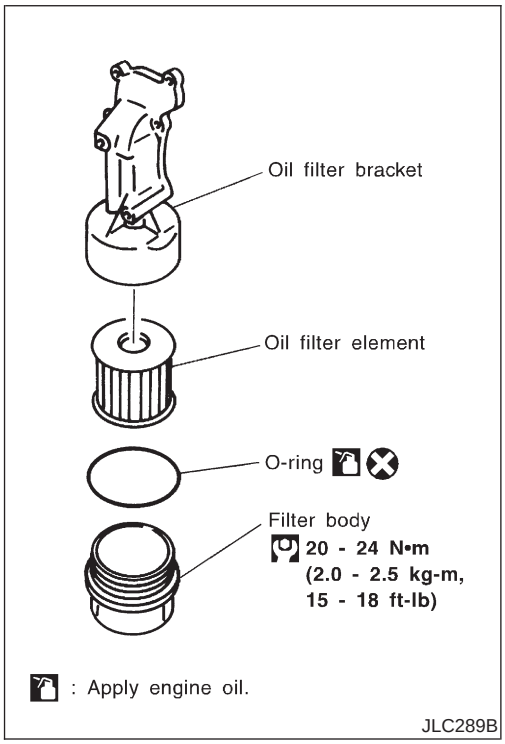


REMOVAL AND INSTALLATION

NJLC0075S01

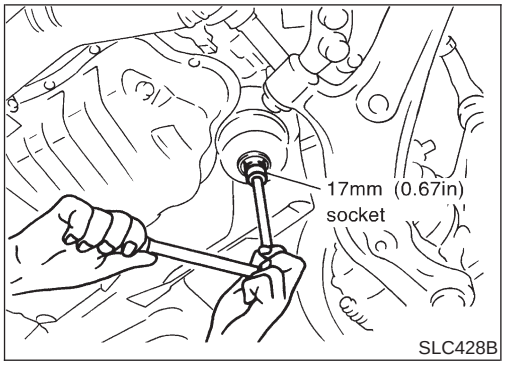
1. Remove the undercover.
2. Steer the front wheel to the right.
3. Remove the right splash cover.
4. Remove the oil filter bracket bolt.
5. Reinstall all removed parts in the reverse order of removal.

- Insert the top mounting bolt to the oil filter bracket beforehand, and set the oil filter bracket to the installation location.



Changing Oil Filter

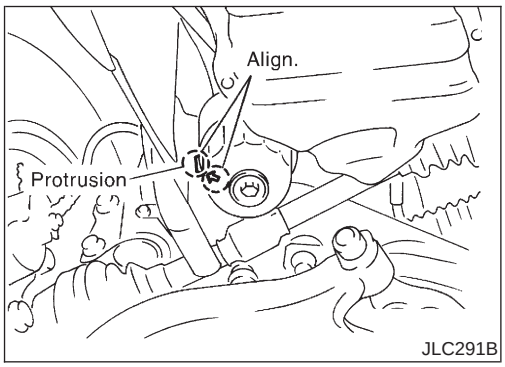
NJLC0076



REMOVAL

NJLC0076S01

1. Using a socket wrench [plane-to-plane width: 17 mm (0.67 in)], loosen the filter body approximately four turns.



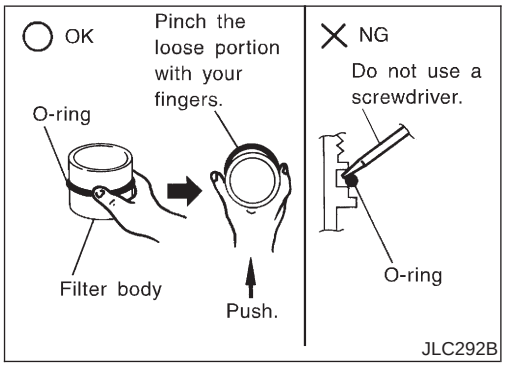
2. Drain the oil after matching the "DRAIN" arrow mark at the bottom of the filter body to the protrusion on the oil filter bracket.

- Catch the oil with a pan or cloth.

CAUTION:

- **The drained oil flows over the right surface of the filter body.**
- **Completely wipe clean any engine oil remaining on the filter body or vehicle.**

3. Remove the filter body, then remove the oil filter element.



4. Remove the O-ring from the filter body.

- Push the O-ring in one direction, lift the slack part using fingers, and remove the O-ring from the filter body.

CAUTION:

Do not use wires or flat-bladed screwdrivers etc. as they may cause damage to the filter body.

INSTALLATION

NJLC0076S02

1. Completely remove all foreign objects adhering to the inside of the filter body or O-ring mounting area (body side and bracket side).
2. Install the oil filter element and O-ring to the filter body.

- Push the oil filter element into the filter body completely.

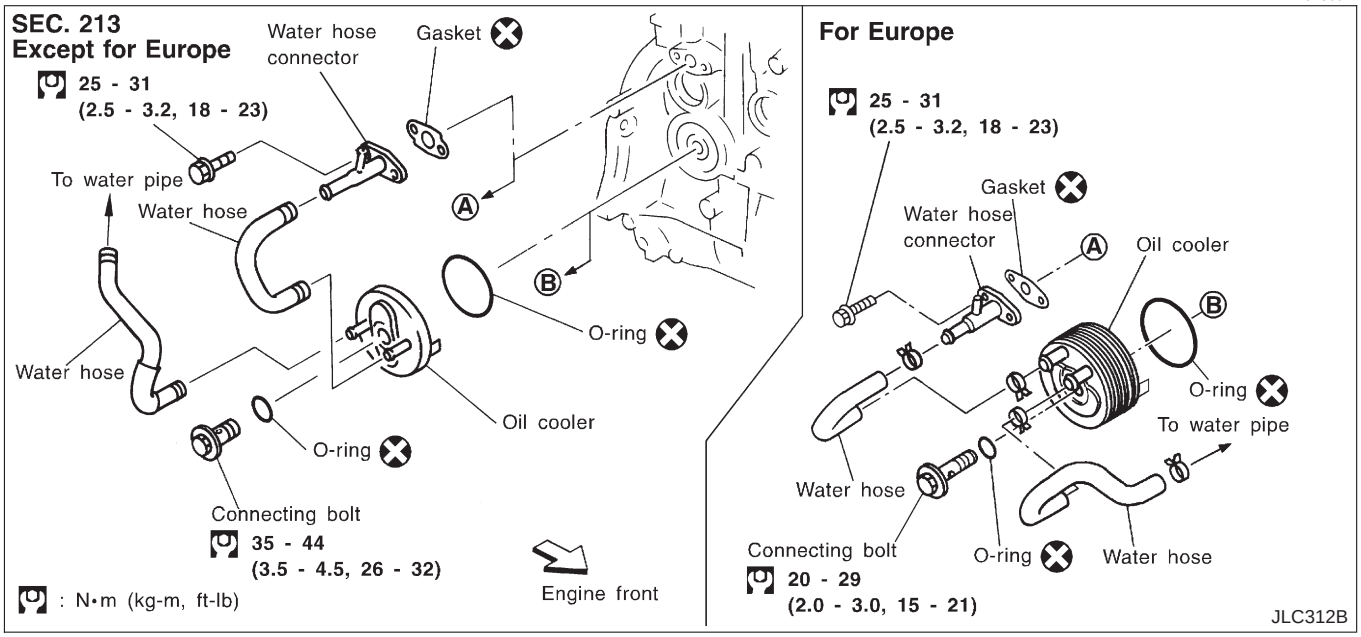
3. Install the filter body to the oil filter bracket.

: 20 - 24 N·m (2.0 - 2.5 kg-m, 15 - 18 ft-lb)

4. After warming up the engine, check for engine oil leakage.

Oil Cooler

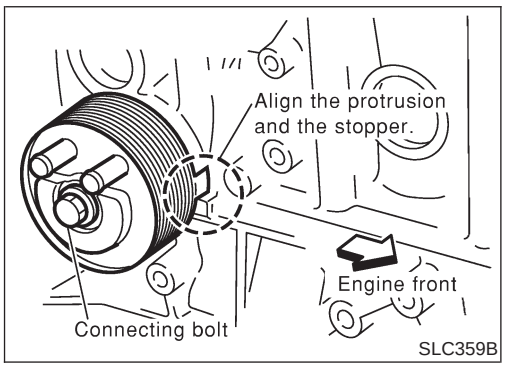
NJLC0077



REMOVAL AND INSTALLATION

NJLC0077S01

1. Draining the coolant
   Refer to LC-44, “Changing Engine Coolant”.
2. Remove the exhaust front tube.



3. Reinstall all removed parts in the reverse order of removal.

- Confirm that no foreign objects are adhering to the installation planes of the oil cooler or block.
- Tighten the connecting bolt after aligning the stopper on the cylinder block side with protrusion of the oil cooler.

Service Data and Specifications (SDS)

OIL PRESSURE CHECK

=NJLC0048

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)	
	Sedan	Hatchback
Idle speed	More than 98 (0.98, 1.0, 14)	More than 140 (1.40, 1.43, 20.3)
2,000	More than 265 (2.65, 2.7, 38)	More than 270 (2.69, 2.75, 39.1)
4,000	More than 402 (4.02, 4.1, 58)	More than 430 (4.29, 4.38, 62.3)

REGULATOR VALVE INSPECTION

NJLC0049

Unit: mm (in)

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

OIL PUMP INSPECTION

NJLC0050

Unit: mm (in)

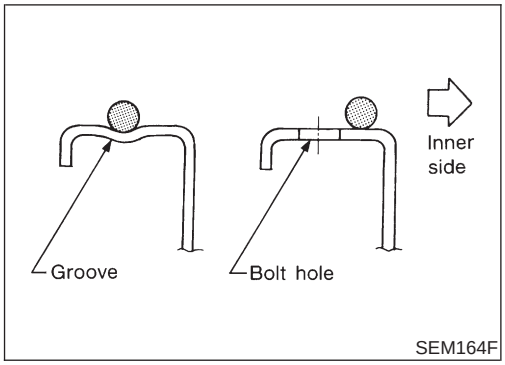
Body to outer rotor radial clearance	0.114 - 0.260 (0.0045 - 0.0102)
Inner rotor to outer rotor tip clearance	Below 0.18 (0.0071)
Body to inner rotor axial clearance	0.050 - 0.090 (0.0020 - 0.0035)
Body to outer rotor axial clearance	0.030 - 0.190 (0.0012 - 0.0075)
Inner rotor to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

ENGINE OIL CAPACITY

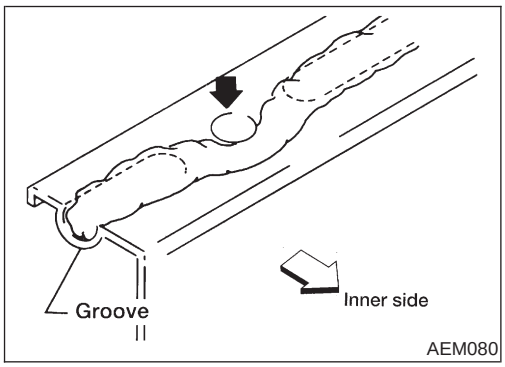
NJLC0078

Unit: ℓ (Imp qt)

Drain and refill (Approximately)	Without oil filter change	4.9 (4-3/8)
	With oil filter change	5.2 (4-5/8)
Dry engine (engine overhaul)		6.3 (5-1/2)



SEM164F



AEM080

Precautions

LIQUID GASKET APPLICATION PROCEDURE

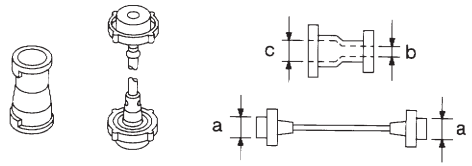
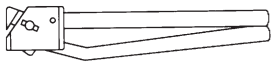
NJLC0051

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 Liquid Gasket.)
   - For oil pan, be sure liquid gasket diameter is 4.0 to 5.0 mm (0.157 to 0.197 in).
   - For areas except oil pan, be sure liquid gasket diameter is 2.0 to 3.0 mm (0.079 to 0.118 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

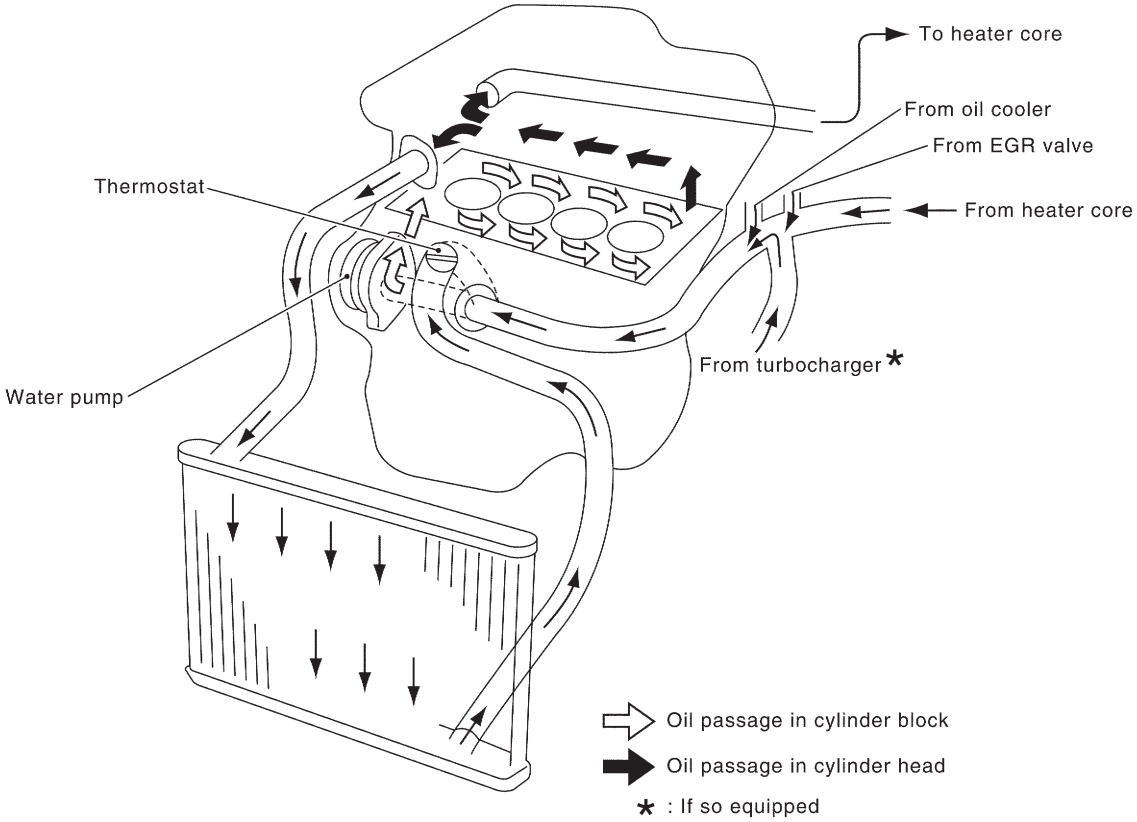
SPECIAL SERVICE TOOLS

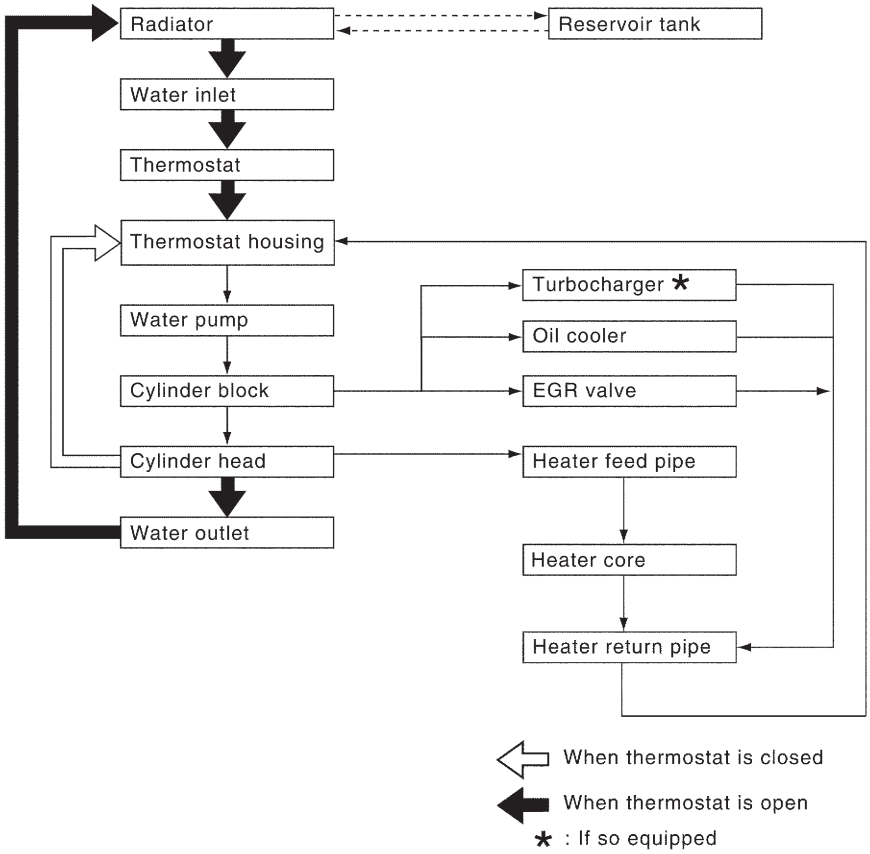
NJLC0052

Tool number Tool name	Description	
EG17650301 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

NJLC0053





NLC098

System Check

NJLC0054

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

NJLC0054S01

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

CHECKING RADIATOR

NJLC0054S02

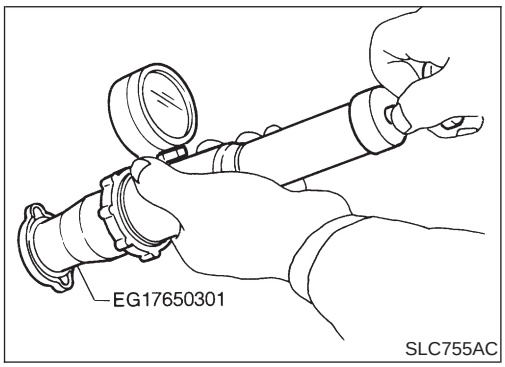
Check radiator for mud or clogging. If necessary, clean radiator as follows.

- 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 (4.9 bar, 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.



SLC755AC

CHECKING RADIATOR CAP

NJLC0054S03

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

Radiator cap relief pressure:

Standard

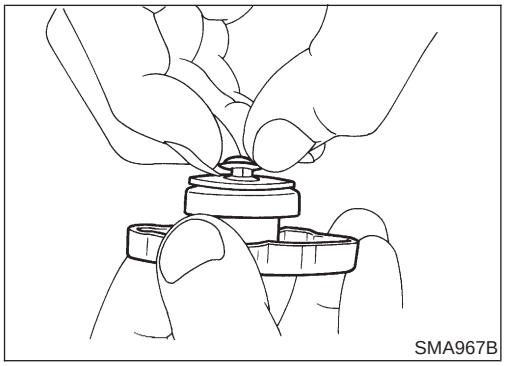
78 - 98 kPa

(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)

Limit

59 - 98 kPa

(0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)


SMA967B

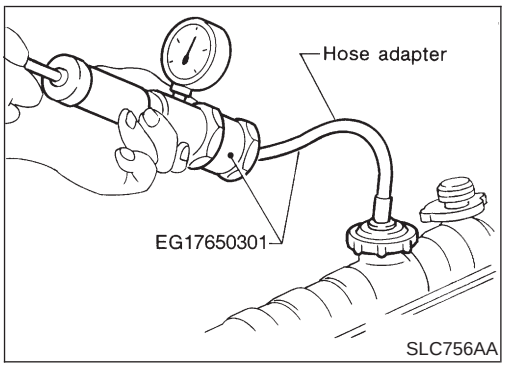
Pull the negative pressure valve to open it.
Check that it closes completely when released.

- Check the radiator cap negative pressure valve for contamination or damage to the valve seat.
- Move the negative pressure valve to check for abnormalities to the opening/shutting operation.

CAUTION:

- **Be sure to perform the inspections after cooling down the engine.**
- **Before connecting the radiator cap to the tester, apply water or LLC to the cap sealing.**

- Replace the radiator cap if abnormalities are found with the negative pressure valve, or if the valve opening pressure is out of the standard range.



CHECKING COOLING SYSTEM FOR LEAKS

NJLC0054S04

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

Testing pressure:

157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

CAUTION:

- **Higher than the specified pressure may cause radiator damage.**
- **Be sure to perform the inspections after cooling down the engine.**
- **Use a hose adapter between the cap tester and filler neck to prevent the radiator filler neck from deforming.**
- If any abnormalities are found, repair or replace the malfunctioning parts.

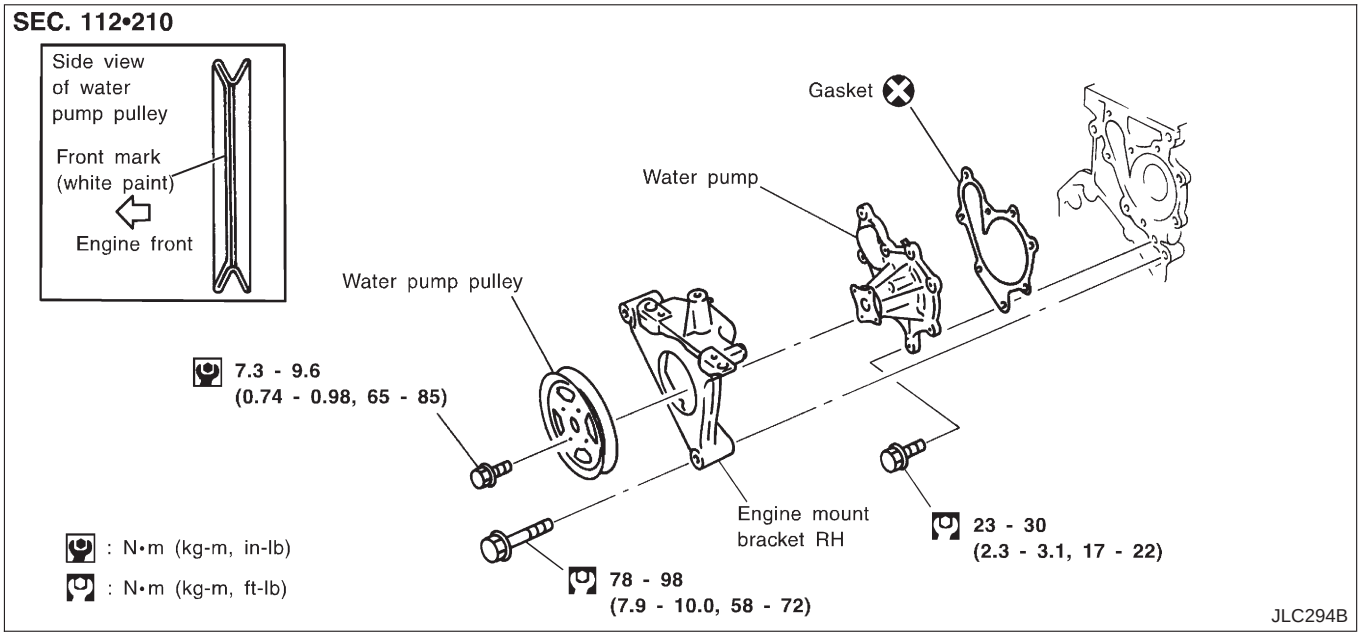
Water Pump

REMOVAL AND INSTALLATION

NJLC0055

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

NJLC0056

1. Remove the undercover, splash cover (right), and accessory belt.
2. Drain engine coolant. Refer to LC-44, "Changing Engine Coolant".
3. Support the bottom of the oil pan with a floor jack etc., and remove the right engine mount bracket (front side of the engine).
4. Remove the water pump pulley.

- Loosen the pulley bolts after fixing the pulley using a screwdriver etc.

5. Remove engine mount brackets.
6. Remove the water pump.

INSPECTION

NJLC0057

- Check for rust and contamination adhering to the water pump and vane.
- Turn the pump shaft by hand, and check that the pump turns smoothly without looseness.

INSTALLATION

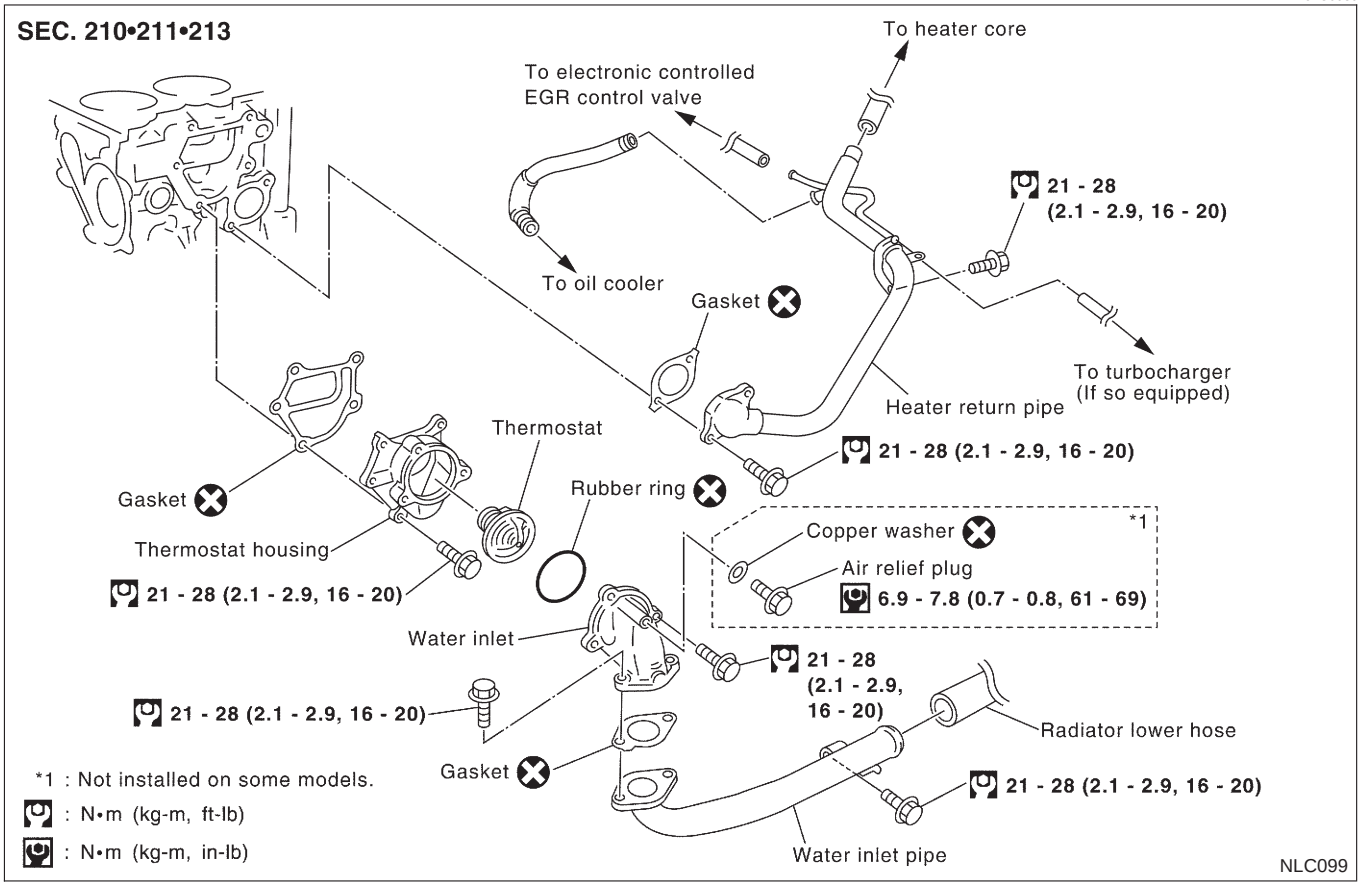
NJLC0058

- Install the parts in the reverse order of removal.
- Install the water pump pulley with the front mark (painted white, used to prevent errors during assembly) facing the front of the engine. Refer to the figure above.

Thermostat

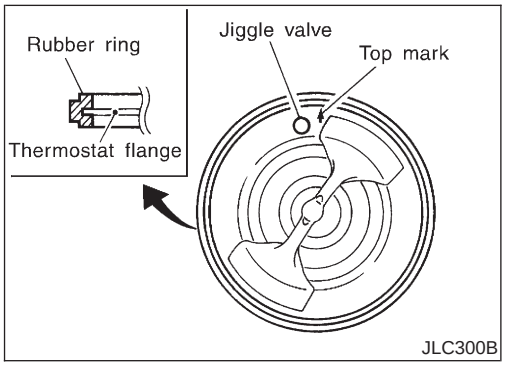
REMOVAL AND INSTALLATION

NJLC0059

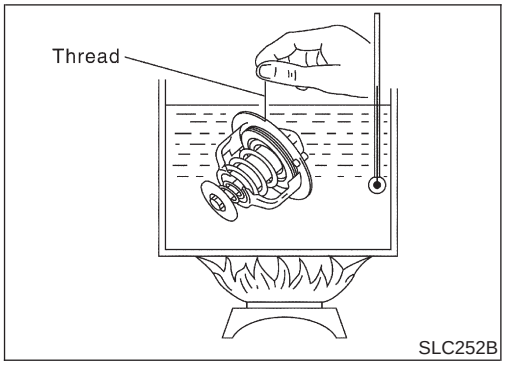


- **Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.**

1. Drain engine coolant. Refer to LC-44, “Changing Engine Coolant”.
2. Remove exhaust manifold cover.
3. Remove water inlet.
4. Remove thermostat.



5. Install thermostat with jiggle valve facing upward.
- **Carefully install the rubber ring to the flange of the thermostat, making sure it does not slip out of place.**
6. After installation and refilling coolant, run engine for a few minutes, and check for leaks.



INSPECTION

NJLC0060

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

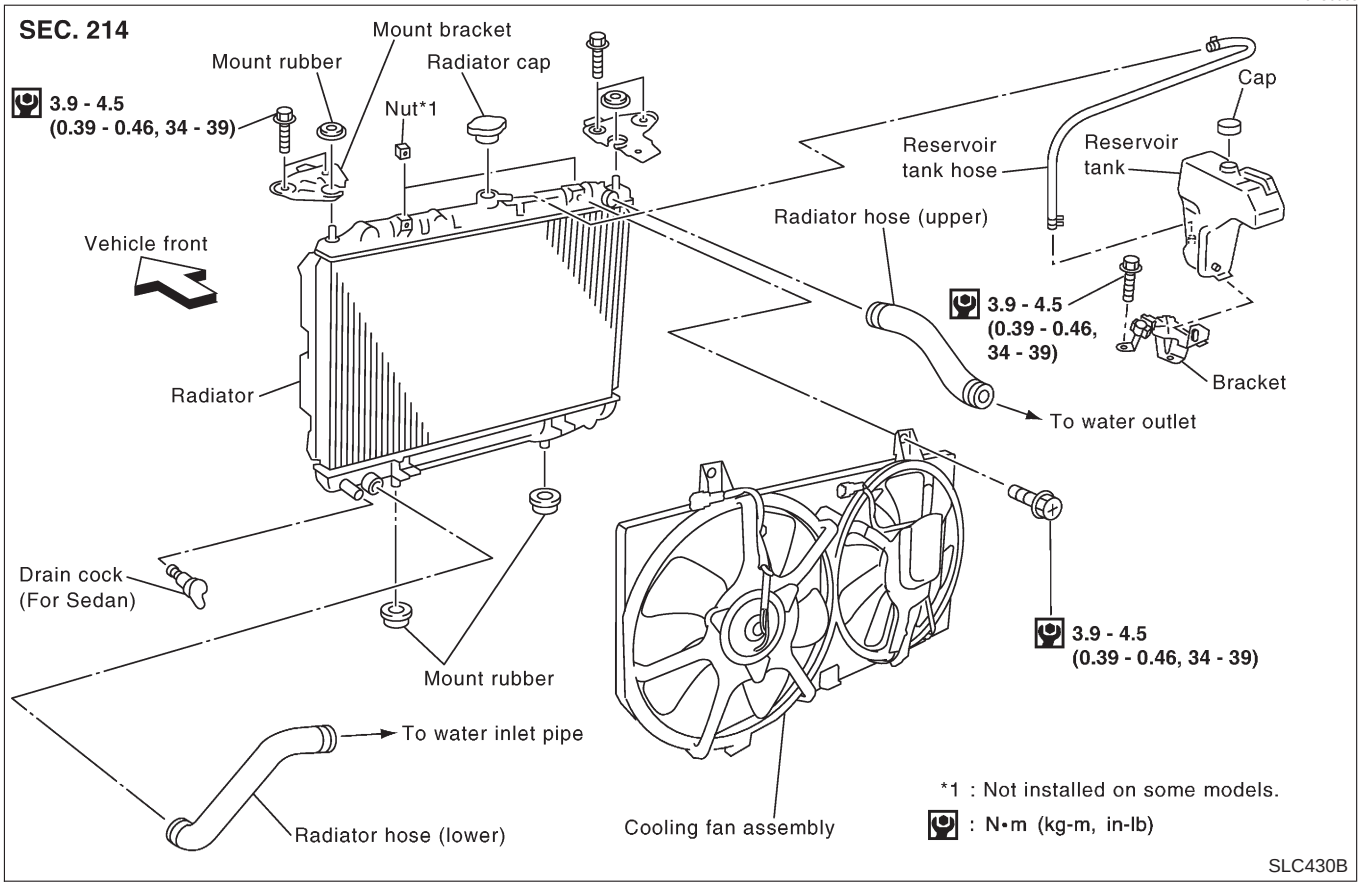
	Standard
Valve opening temperature	Above 80.5 - 83.5°C (177 - 182°F)
Valve lift	More than 9 mm/95°C (0.354 in/203°F)

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

Radiator

COMPONENTS

NJLC0083



REMOVAL AND INSTALLATION

=NJLC0063

1. Remove under cover.
2. For Sedan, drain coolant from radiator by drain cock, and for Hatchback, drain coolant by removing lower radiator hose.
3. Disconnect radiator upper and lower hoses.
4. Remove radiator shroud.
5. Disconnect reservoir tank hose.
6. Remove radiator mounting bracket.
7. Remove radiator.
8. After repairing or replacing radiator, install any part removed in reverse order of removal.

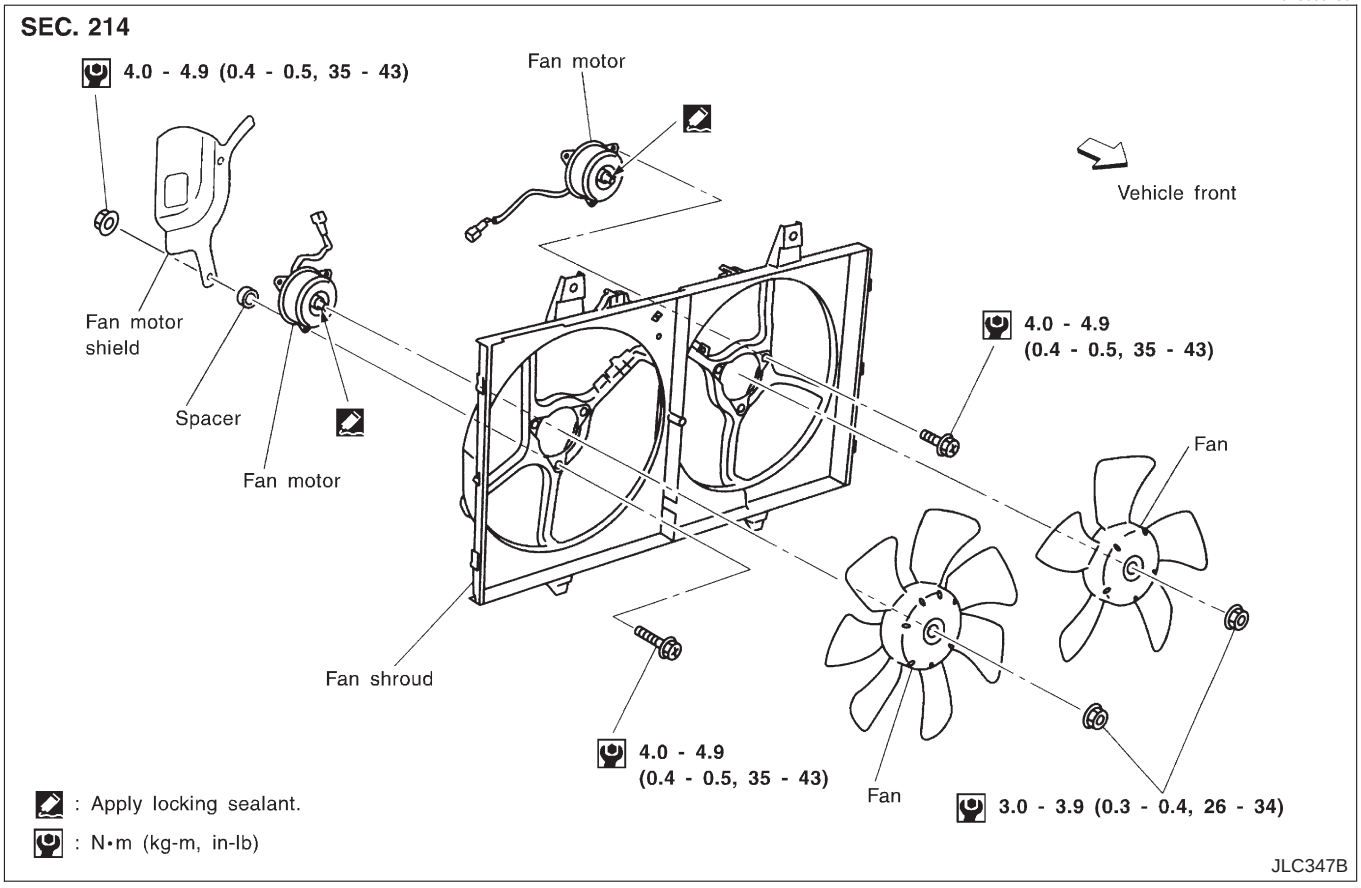
When filling radiator with coolant, refer to LC-44, "Changing Engine Coolant".

Cooling Fan

COMPONENTS

NJLC0064

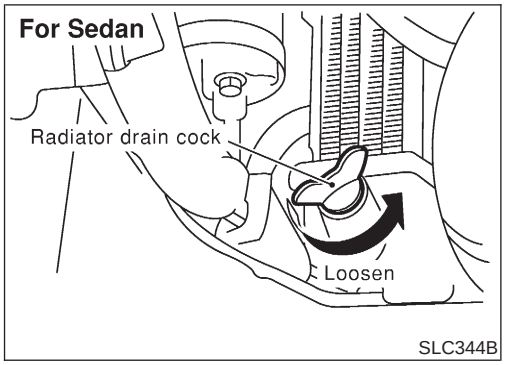
NJLC0064S01

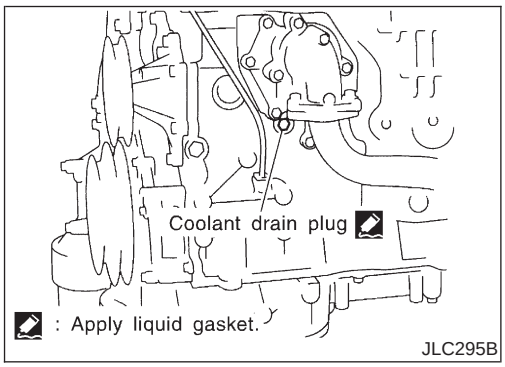


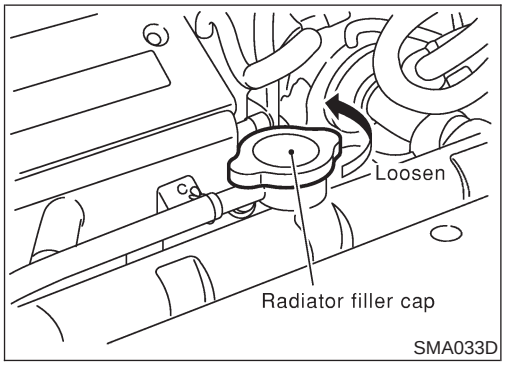
CONTROL SYSTEM

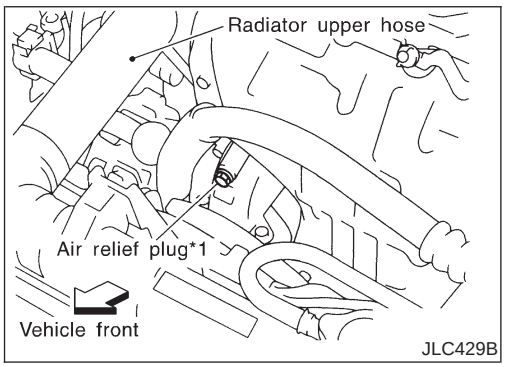
NJLC0064S02

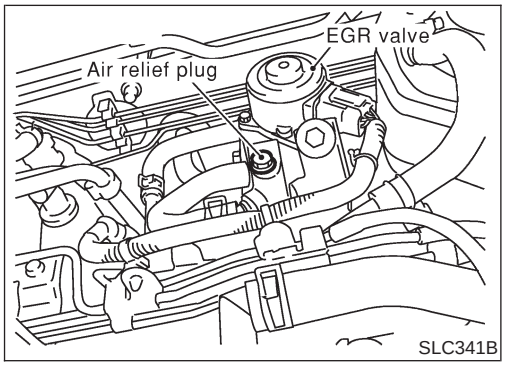
Cooling fans are controlled by ECM. For details, refer to EC-730, "TROUBLE DIAGNOSIS FOR OVERHEAT".











Changing Engine Coolant

NJLC0079

WARNING:

To avoid the danger of being scalded, never change the coolant when the engine is hot.

— DRAINING ENGINE COOLANT —

NJLC0079S01

1. Set air conditioning system as follows to prevent coolant from remaining in the system.

a. Turn ignition switch ON and set temperature controller to maximum hot position.

b. Wait 10 seconds before turning ignition switch OFF.

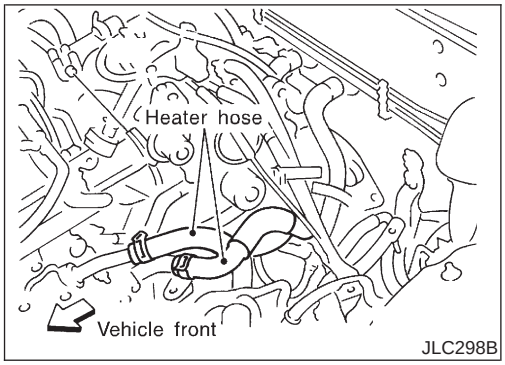
2. Open radiator drain cock at the bottom of radiator or remove lower radiator hose, and remove radiator filler cap to drain coolant.
3. Remove reservoir tank, drain coolant, then clean reservoir tank.

- **Be careful not to allow coolant to contact drive belts.**

4. Cover the exhaust tube heat shield to prevent from splashing coolant.
5. Remove drain plug of cylinder block and air relief plug.
6. Check drained coolant for contaminants such as rust, corrosion or discoloration. If contaminated flush engine cooling system, refer to LC-46, “FLUSHING COOLING SYSTEM”.
7. Blow the coolant around the exhaust tube heat shield.

NOTE:

An asterisk (*1) in the figure means “Not installed on some models”.



JLC298B

— REFILLING ENGINE COOLANT —

NJLC0079S02

1. Install reservoir tank, radiator drain cock or lower radiator hose and cylinder block drain plug.

- **Apply sealant to the thread of cylinder block drain plugs.**

: 8 - 11 N·m (0.8 - 1.2 kg-m, 70 - 104 in-lb)

2. Fill radiator slowly with coolant until coolant spills from the air relief plugs, then install air relief plugs.

- Location of air relief plugs
  Water inlet and rear side intake manifold water tubes

3. Disconnect heater hose at engine, pour coolant into the hose so that it flows toward the heater core.

- While filling, if coolant from engine side spills out, be sure to reconnect the heater hose.
- Fill coolant to the level of the radiator cap at a rate of 2ℓ (1-3/4 Imp qt)/min or lower.
  (Close the air relief plugs in order starting with the location from where the coolant began spilling out.)

CAUTION:

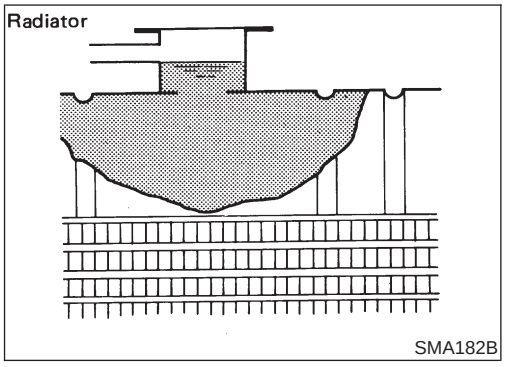
If the filling rate is too fast, this could lead to air being mixed in the coolant. Be sure to fill the coolant slowly according to the rate indicated above.

- Replace the copper washer of the air bleeding plug.

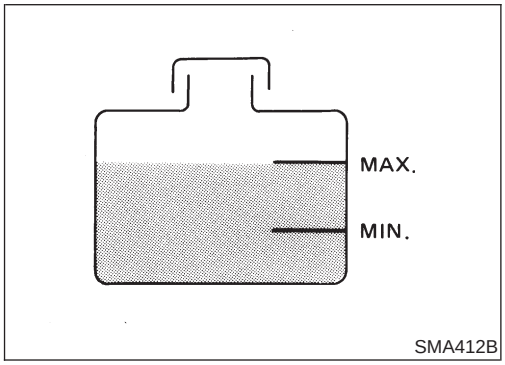
Air relief plug:

: 6.7 - 7.9 N·m (0.68 - 0.81 kg-m, 59 - 70 in-lb)

- **Use genuine Nissan anti-freeze coolant or equivalent mixed with water (distilled or demineralized).**



SMA182B



SMA412B

Refer to MA-16, "RECOMMENDED FLUIDS AND LUBRICANTS".

Engine coolant capacity (With reservoir tank):
8.7 ℓ (7-5/8 Imp qt)
Reservoir tank capacity:
0.7 ℓ (5/8 Imp qt)

- **Pour coolant through coolant filler neck slowly to allow air in system to escape.**

4. Fill radiator and reservoir tank to specified level.
5. Warm up engine to normal operating temperature without radiator cap installed.

- **If coolant overflows radiator filler hole, install radiator cap.**

6. Run engine at 3,000 rpm for 10 seconds and return to idle speed with radiator cap installed.

- Repeat two or three times.

Watch coolant temperature gauge so as not to overheat the engine.

7. Stop engine and cool it down.

- Cool down using a fan to reduce the time.
- If necessary, refill radiator up to filler neck with coolant.

8. Refill reservoir tank to MAX level line with coolant.

9. Repeat steps 4 through 7 two or more times with radiator cap installed until coolant level no longer drops.
10. Check cooling system for leaks with engine running.
11. Warm up engine, and check for sound of coolant flow while running engine from idle up to 3,000 rpm with heater temperature controller set at several positions between COOL and HOT.

- Sound may be noticeable at heater water cock.

12. If sound is heard, bleed air from cooling system by repeating steps 4 through 7 until coolant level no longer drops

- **Clean excess coolant from engine.**

— FLUSHING COOLING SYSTEM —

NJLC0079S03

1. Open air relief plug.
2. Fill radiator with water until water spills from the air relief hole, then close air relief plug. Fill radiator and reservoir tank with water and reinstall radiator cap.
3. Run engine and warm it up to normal operating temperature.
4. Rev engine two or three times under no-load.
5. Stop engine and wait until it cools down.
6. Drain water.
7. Repeat steps 1 through 6 until clear water begins to drain from radiator.

Radiator (Aluminum type)

=NJLC0082

Refer to LC-21, “Radiator (Aluminum type)”.

Overheating Cause Analysis

NJLC0070

	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	
			Mechanical damage	
		Clogged radiator cooling tube	Excess foreign material (rust, dirt, sand, etc.)	
	Reduced air flow	Cooling fan does not operate	—	—
		High resistance to fan rotation		
		Damaged fan blades		
	Damaged radiator shroud	—	—	—
	Improper coolant mixture ratio	—	—	—
	Poor coolant quality	—	—	—
	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	—	
		Installed large fog lamp		

Service Data and Specifications (SDS)

THERMOSTAT

NJLC0071

Valve opening temperature	Above 80.5 - 83.5°C (177 - 182°F)
Valve lift	More than 9.0 mm/95°C (0.354 in/203°F)

RADIATOR

NJLC0073

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

Cap relief pressure	Standard	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)
	Limit	59 - 98 (0.59 - 0.98, 0.6 - 1.0, 9 - 14)
Leakage test pressure		157 (1.57, 1.6, 23)

ENGINE COOLANT CAPACITY

NJLC0080

Unit: ℓ (Imp qt)

With reservoir tank	8.7 (7-5/8)
Reservoir tank	0.7 (5/8)