ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

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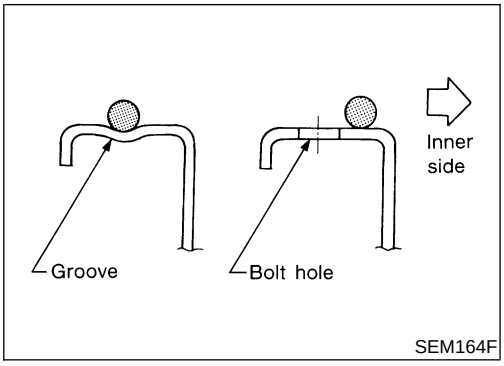

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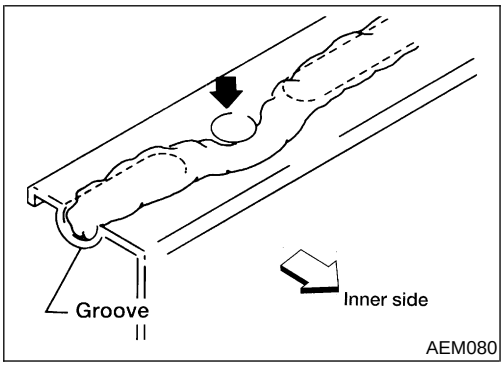


AEM080

Precautions

LIQUID GASKET APPLICATION PROCEDURE

NILC0001

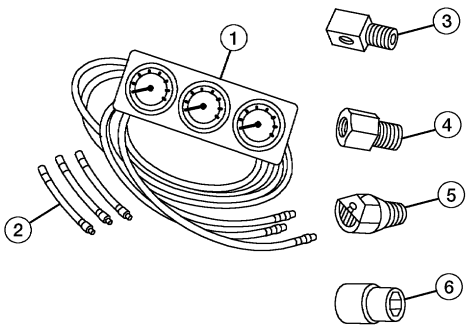
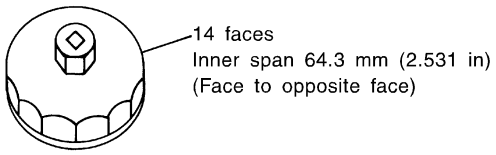
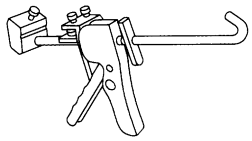
1. Use a scraper to remove all traces of old sealant from mating surfaces and grooves. Also, completely clean any oil from these areas.
2. Apply a continuous bead of Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent to mating surfaces.
   - For oil pan, be sure RTV silicone sealant diameter is 3.5 to 4.5 mm (0.138 to 0.177 in).
   - For areas except oil pan, be sure RTV silicone sealant diameter is 2.0 to 3.0 mm (0.079 to 0.118 in).
3. Apply RTV silicone sealant 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

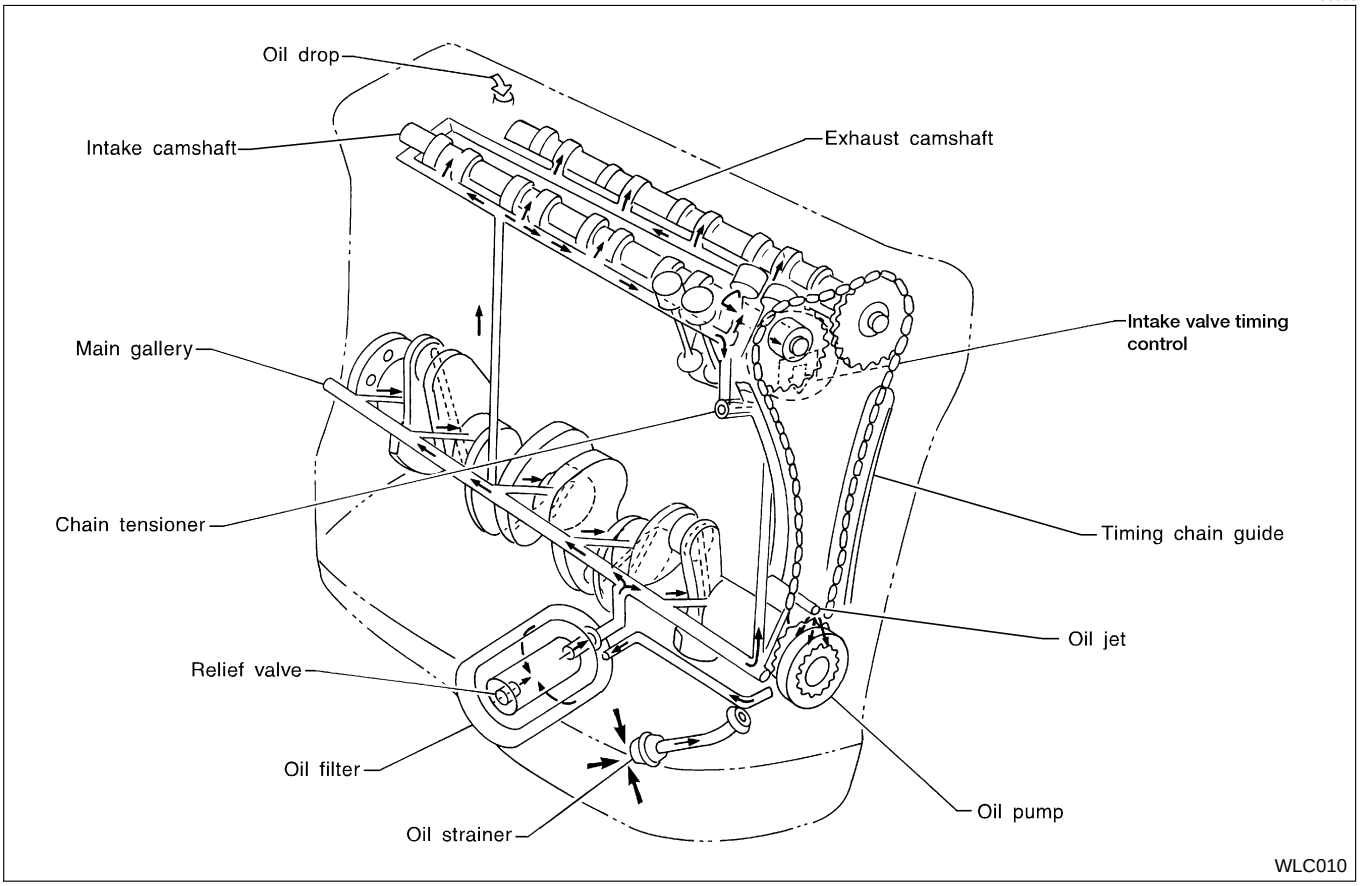
NILC0002

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

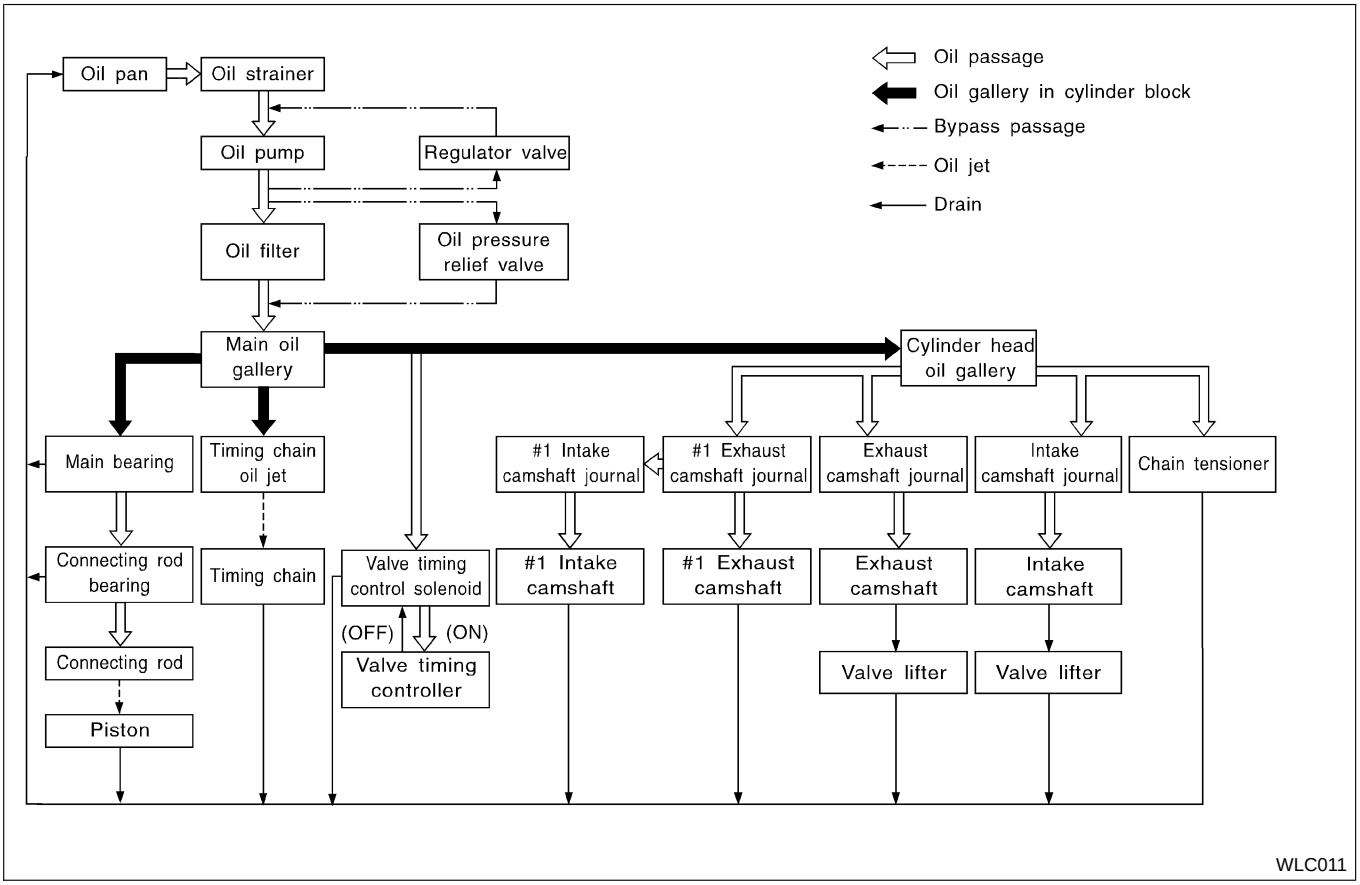
Tool number (Kent-Moore No.) Tool name	Description	
(J34301-C) Oil pressure gauge set 1 (J34301-1) Oil pressure gauge 2 (J34301-2) Hoses 3 (J34298) Adapter 4 (J34282-1) Adapter 5 (790-301-1230-A) 60° adapter 6 (J34301-15) Square socket	 AAT896	Measuring oil pressure **Maximum measuring range:** **1,373 kPa (14 kg/cm^2, 199 psi)**
KV10115800 (J-37140-A) Oil filter wrench	 NT772	Removing oil filter
WS39930000 (—) Tube presser	 NT052	Pressing the tube of liquid gasket

Lubrication Circuit

NILC0003



WLC010



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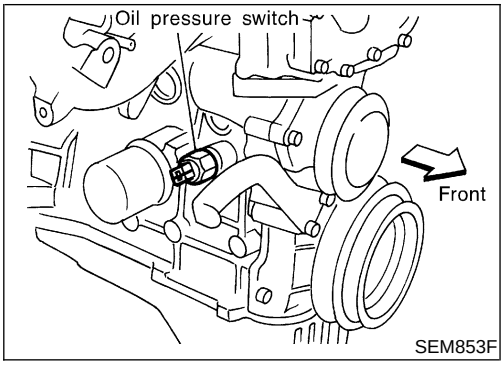
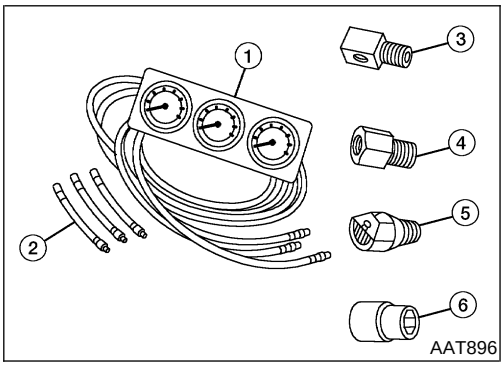




Oil Pressure Check

NILC0004

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, Tool No. J34301-1 or equivalent.
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)
600	More than 98 (1.0, 14)
2,000	More than 294 (3.0, 43)
6,000	More than 392 (4.0, 57)

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

6. Install oil pressure switch with suitable thread sealant.

Oil Pump

REMOVAL AND INSTALLATION

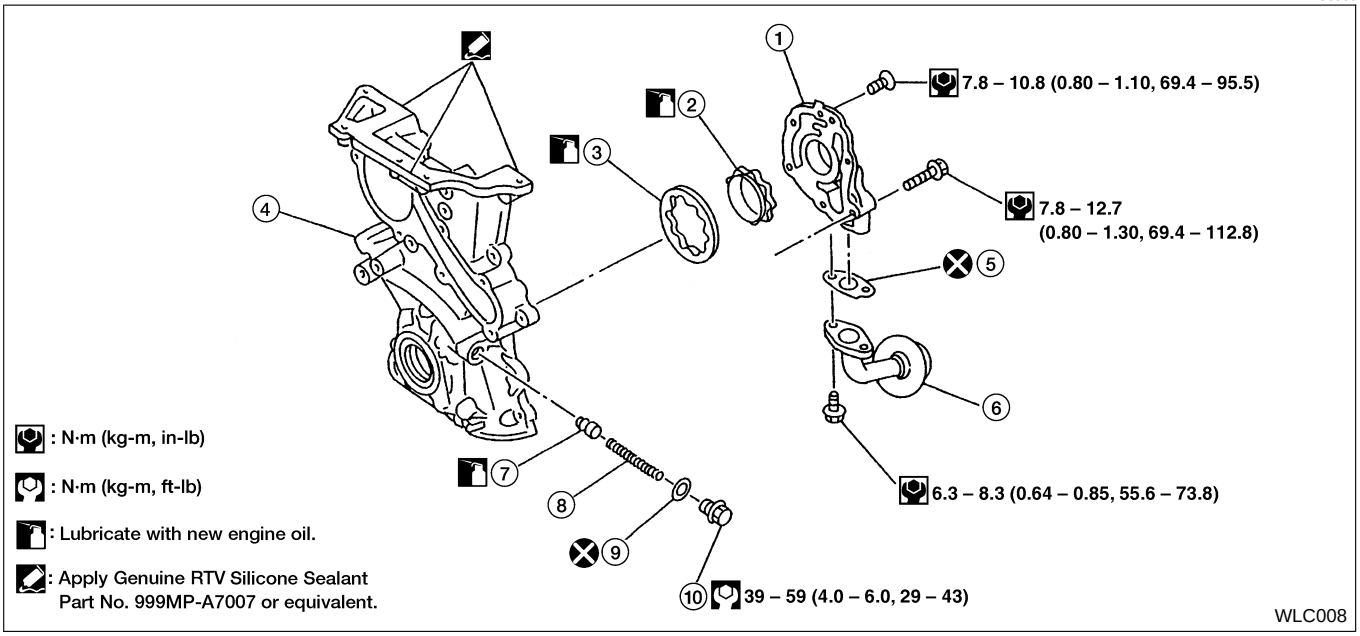
NILC0005

- **When installing oil pump, apply engine oil to rotor.**
- **Make sure that O-ring is fitted properly.**
- **Use a scraper to remove old RTV silicone sealant from mating surface of front cover.**
- **Also remove traces of old RTV silicone sealant from mating surface of cylinder block.**

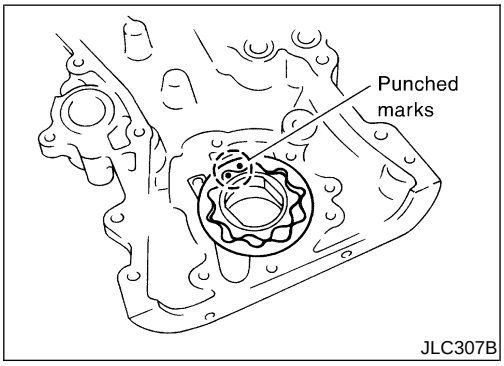
1. Remove drive belts.
2. Remove oil pan. Refer to ***EM-17***, “OIL PAN”.
3. Remove oil strainer.
4. Remove front cover. Refer to ***EM-20***, “TIMING CHAIN”.
5. Install front cover, applying a continuous bead of RTV silicone sealant to mating surface of front cover assembly. (Use Genuine RTV silicone sealant Part No. 999MP-A7007.)
6. Reinstall parts in reverse order of removal.

DISASSEMBLY AND ASSEMBLY

NILC0006



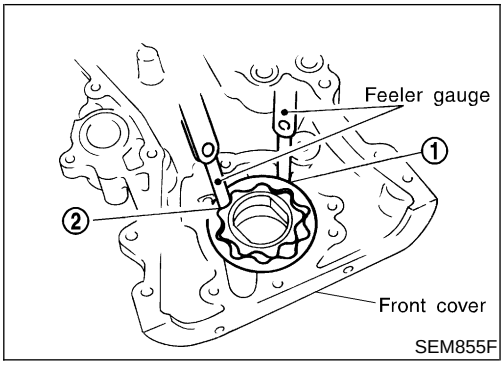
1. Oil pump cover
2. Inner rotor
3. Outer rotor
4. Front cover
5. Gasket
6. Oil strainer
7. Regulator valve
8. Spring
9. Washer
10. Plug



INSPECTION

NILC0007

- **Install the oil pump rotors with the punched marks on the oil pump cover side.**

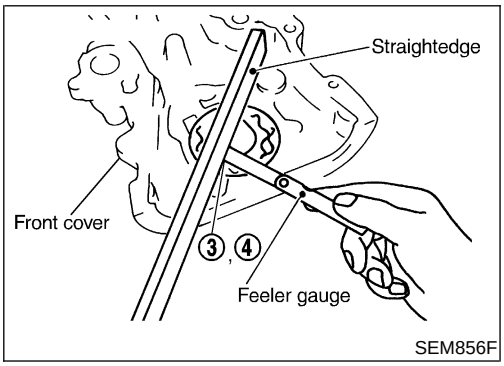


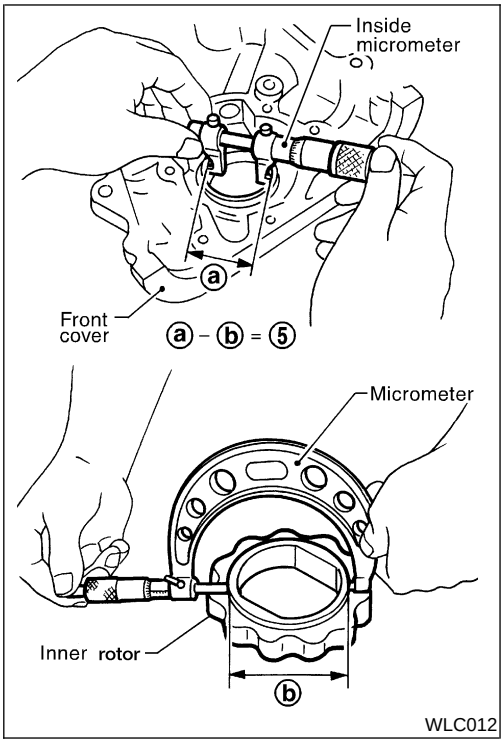
Using a feeler gauge, check the following clearances.

Standard clearance:

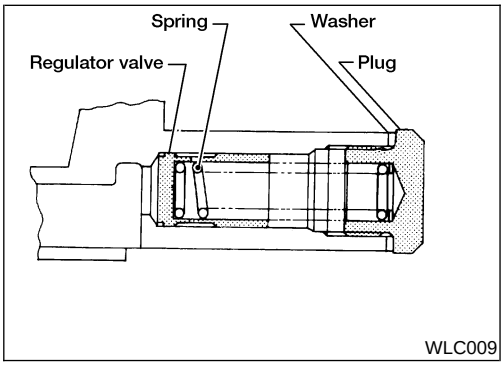
Unit: mm (in)

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)





- **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.**

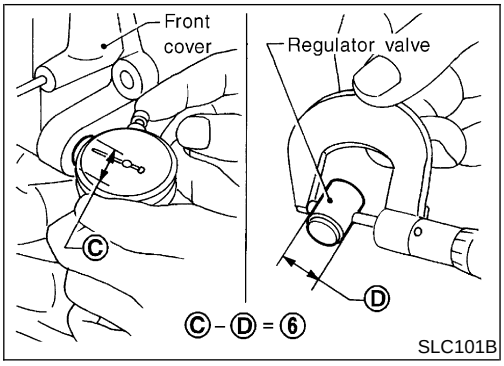


REGULATOR VALVE INSPECTION

NILC0008

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.**

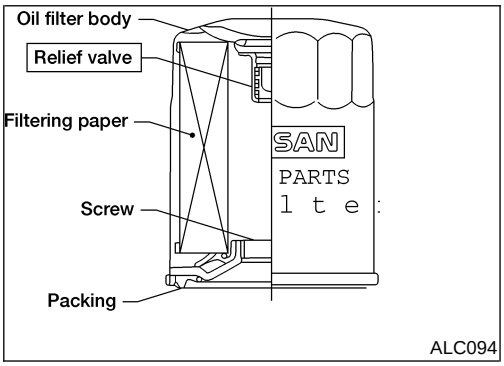


4. Check regulator valve to front cover clearance.

Clearance:

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

- **If it exceeds the limit, replace front cover assembly.**



Oil Filter

NILC0009

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

- **The new and previous oil filter designs differ from each other and are not interchangeable.**
- **Use Tool KV10115800 (J-37140-A) for removing oil filter.**

Service Data and Specifications (SDS)

OIL PRESSURE CHECK

NILC0010

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

OIL PUMP INSPECTION

NILC0011

Unit: mm (in)

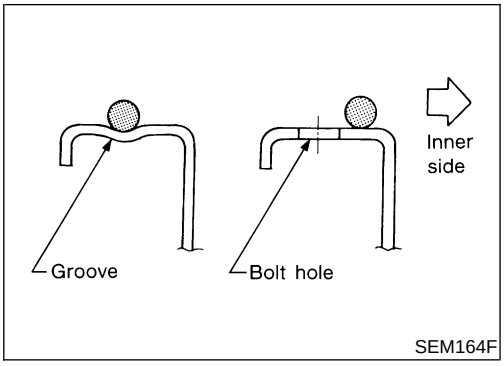
Body to outer rotor radial clearance	0.114 - 0.200 (0.0045 - 0.0079)
Inner rotor to outer rotor tip clearance	Below 0.18 (0.0071)
Body to inner rotor clearance	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance	0.030 - 0.090 (0.0012 - 0.0035)
Inner rotor to brazed portion of housing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

REGULATOR VALVE INSPECTION

NILC0012

Unit: mm (in)

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



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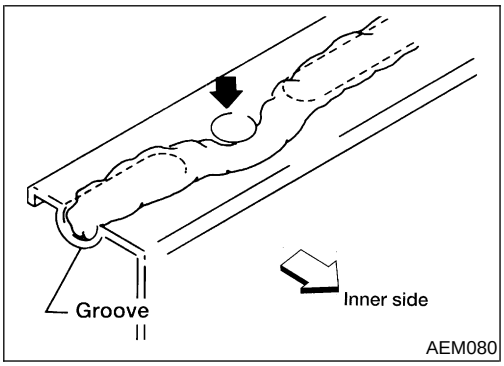


AEM080

Precautions

LIQUID GASKET APPLICATION PROCEDURE

NILC0013

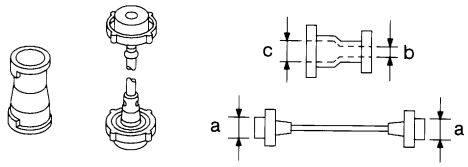
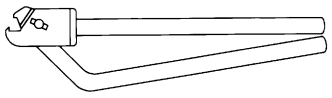
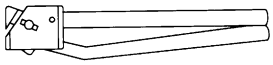
1. Use a scraper to remove all traces of old RTV silicone sealant from mating surfaces and grooves. Also, completely clean any oil from these areas.
2. Apply a continuous bead of Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent to mating surfaces.
   - For oil pan, be sure RTV silicone sealant diameter is 3.5 to 4.5 mm (0.138 to 0.177 in).
   - For areas except oil pan, be sure RTV silicone sealant diameter is 2.0 to 3.0 mm (0.079 to 0.118 in).
3. Apply RTV silicone sealant 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

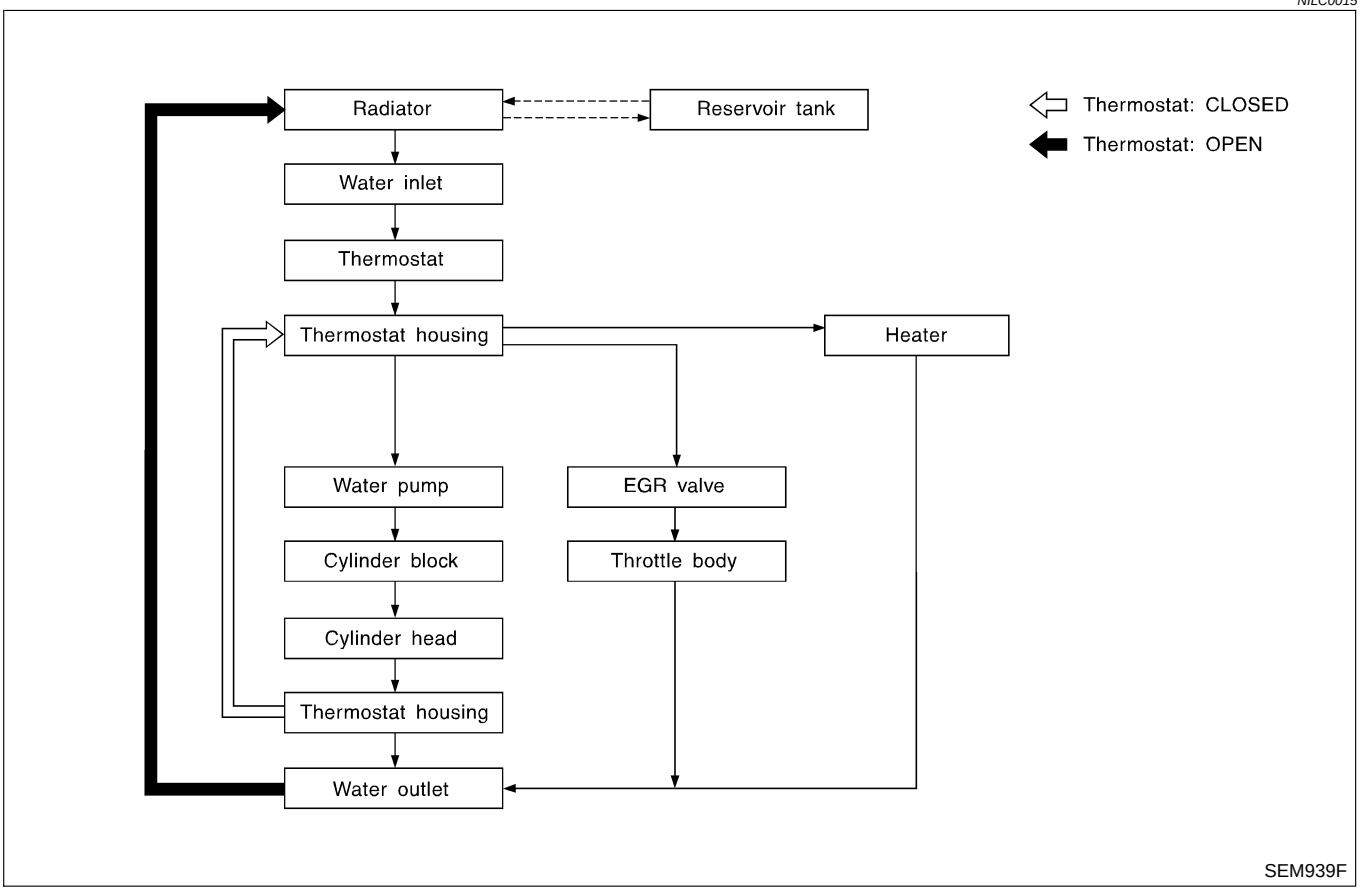
NILC0014

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	
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

NILC0015



System Check

NILC0016

WARNING:

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

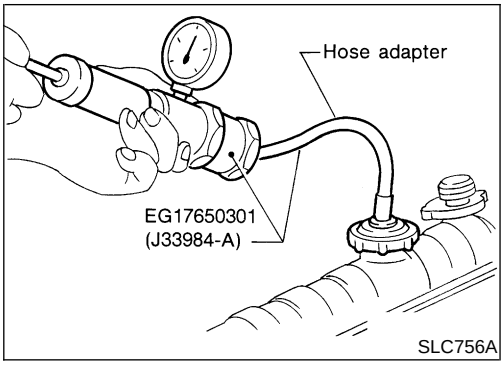
Wrap a thick cloth around the cap. Slowly turn it a quarter turn to allow built-up pressure to escape. Carefully remove the cap by turning it all the way.

CHECKING COOLING SYSTEM HOSES

NILC0016S01

Check hoses for the following:

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



CHECKING COOLING SYSTEM FOR LEAKS

NILC0016S02

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 pressure than specified may cause radiator damage.

CHECKING RADIATOR

NILC0016S03

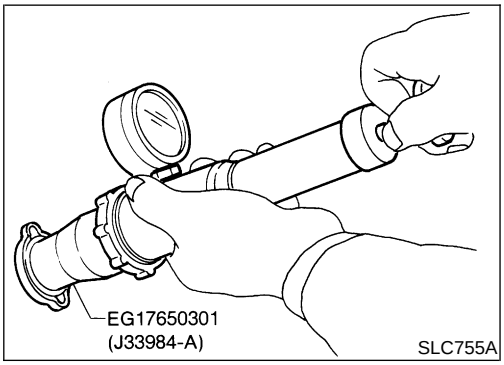
Check radiator for mud or clogging. If necessary, clean radiator as follows.

- 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 300 mm (11.8 in).

5. Blow air again into all the radiator core surfaces once per minute until no water sprays out.



CHECKING RADIATOR CAP

NILC0016S04

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

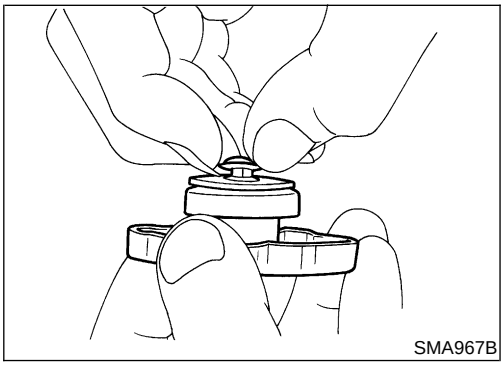
Radiator cap relief pressure:

Standard

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

Limit

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

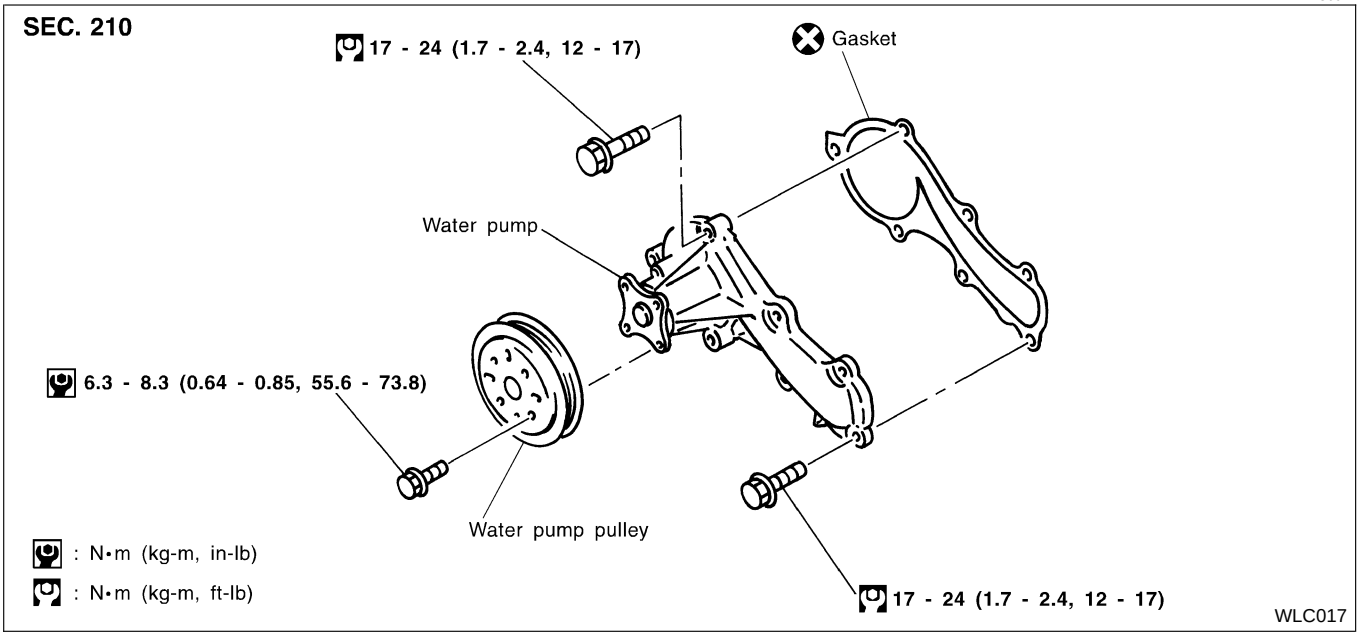


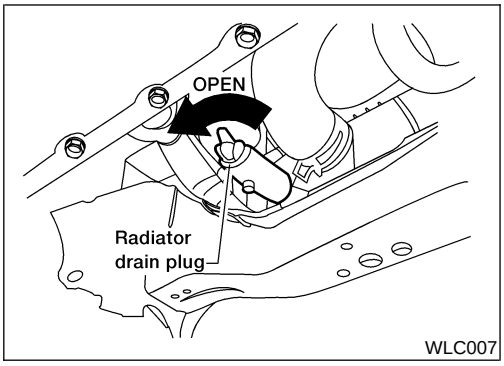
Pull the negative pressure valve to open it.
Check that it closes completely when released.

Water Pump

REMOVAL AND INSTALLATION

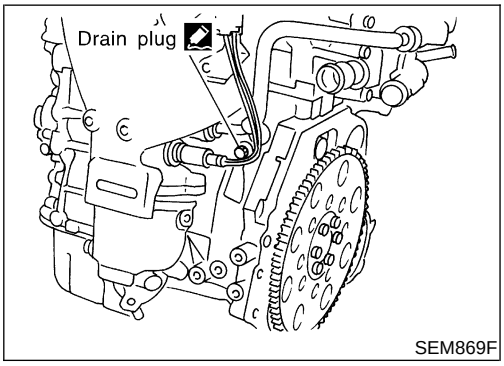
NILC0017



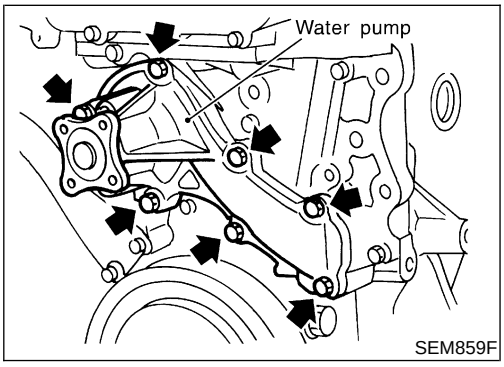


CAUTION:

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



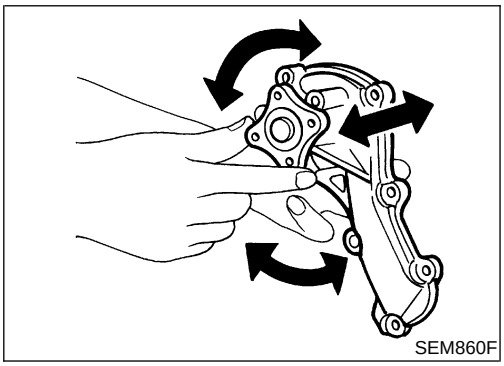
1. Drain coolant from radiator and cylinder block. Refer to ***MA-17***, “Draining Engine Coolant”.
2. Remove front RH wheel.
3. Remove engine side cover.
4. Remove drive belts and idler pulley.
5. Loosen water pump pulley bolts.
6. Remove water pump pulley.



7. Remove water pump bolts.
8. Remove water pump.
9. Reinstall parts in reverse order of removal.

- Also remove RTV silicone sealant from water pump and mating surface of cylinder block using a scraper.
- When applying RTV silicone sealant to mating surface of water pump, use Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent.
- When filling radiator with coolant, refer to ***MA-18***, “Refilling Engine Coolant”.

- When installing drive belts, refer to ***MA-16***, "Checking Drive Belts".


SEM860F

INSPECTION

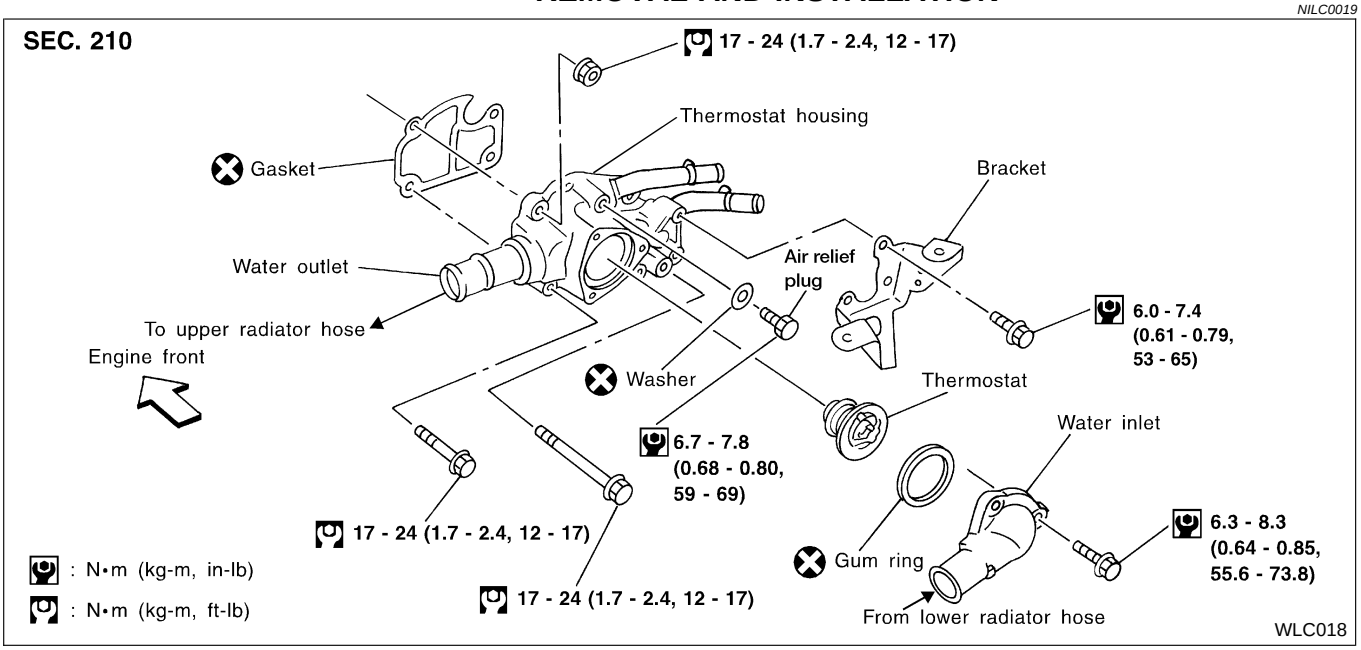
NILC0018

1. Rotate water pump shaft.
- **Check body assembly and vane for rust or corrosion.**
- **Check for rough operation due to excessive end play.**

Thermostat

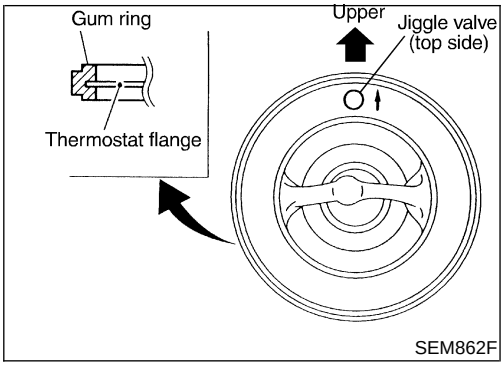
REMOVAL AND INSTALLATION

NILC0019

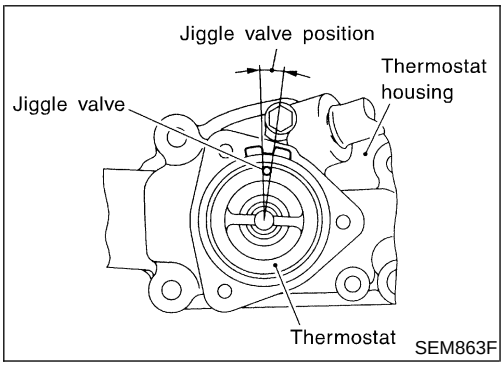


Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.

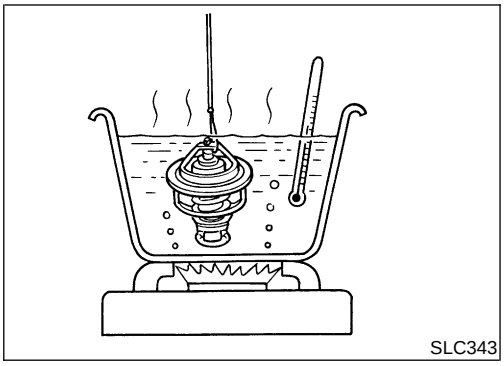
1. Drain engine coolant. Refer to ***MA-17***, "Draining Engine Coolant".
2. Remove lower radiator hose.
3. Remove water inlet, then take out thermostat.



4. Install gum ring to thermostat.



5. Install thermostat with jiggle valve or air bleeder at upper side.
6. Refill engine coolant. Refer to ***MA-18***, "Refilling Engine Coolant".
   After installation, run engine for a few minutes, and check for leaks.



INSPECTION

NILC0020

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

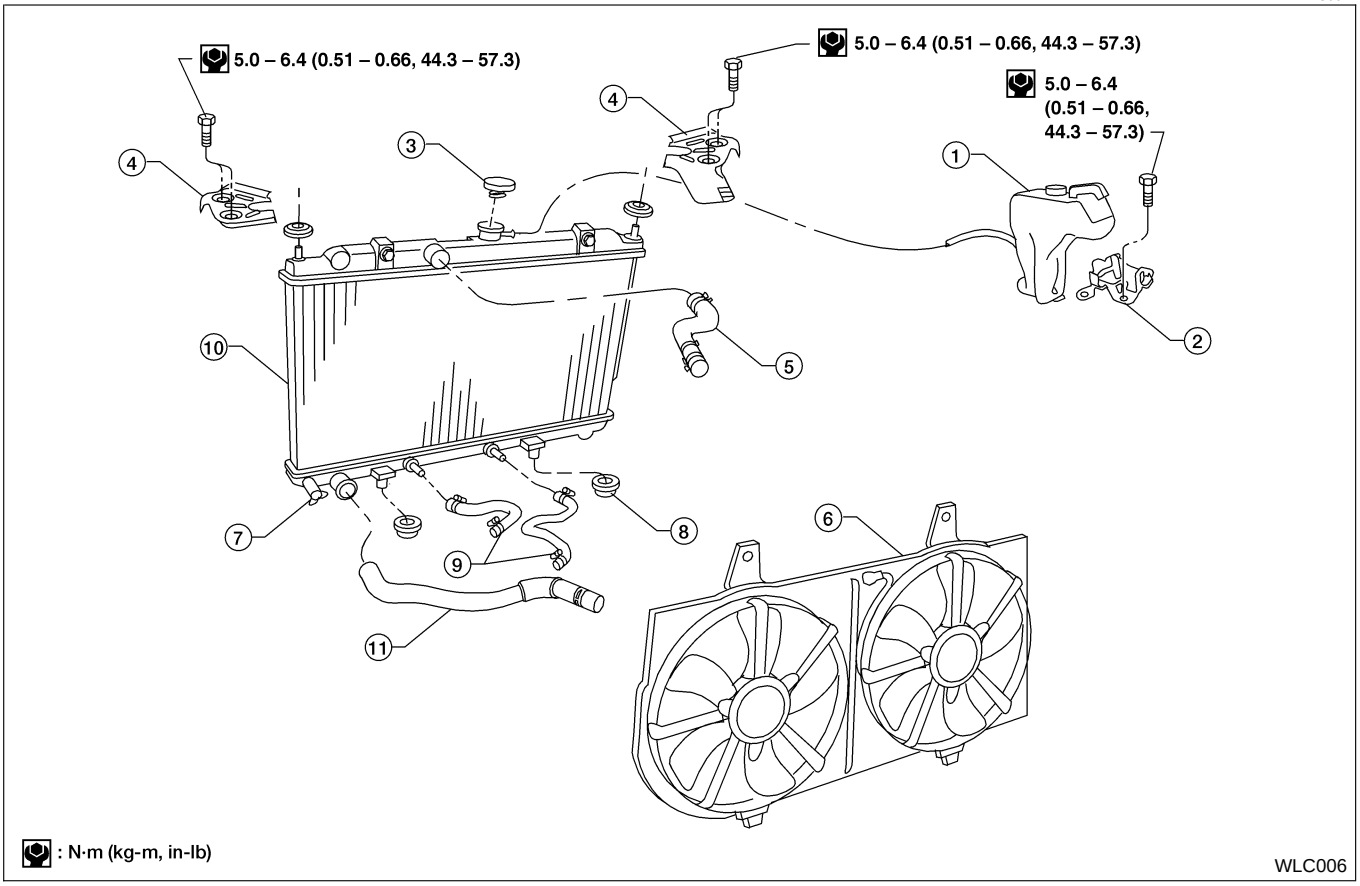
Valve opening temperature °C (°F)	76.5 (170)
Valve lift mm/°C (in/°F)	More than 9/90 (0.35/194)

3. Then check if valve closes at 5°C (41°F) below valve opening temperature.

Radiator

COMPONENTS

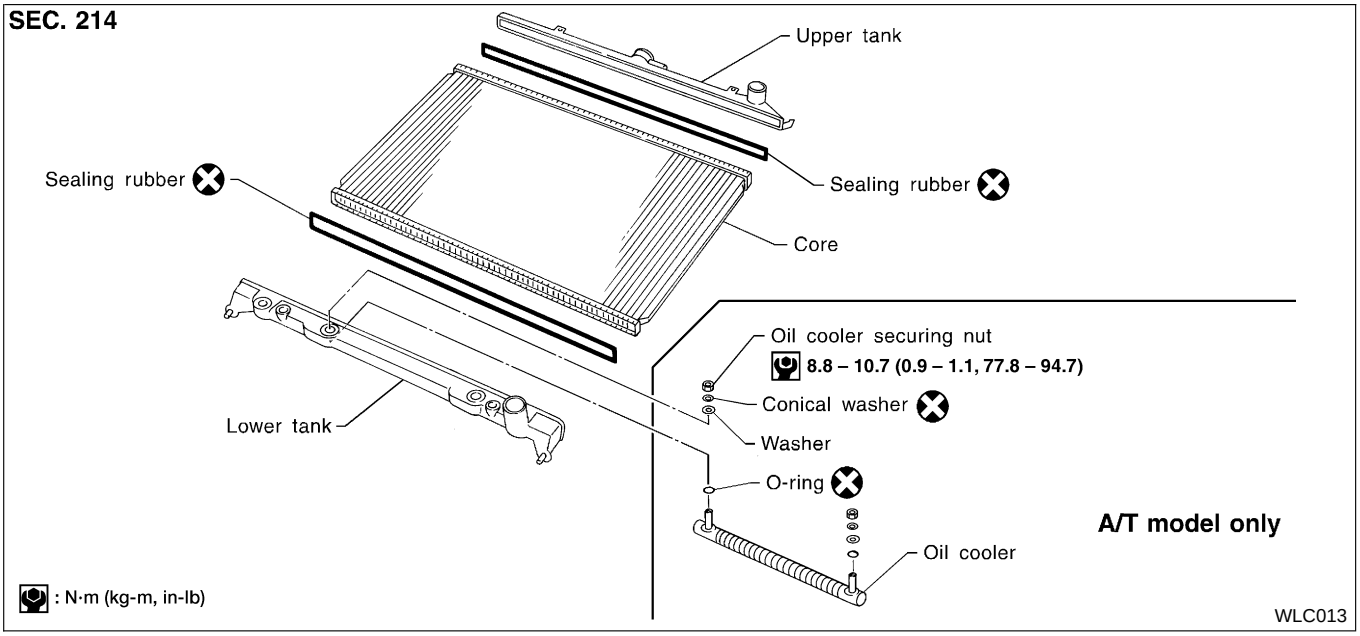
=NILC0021

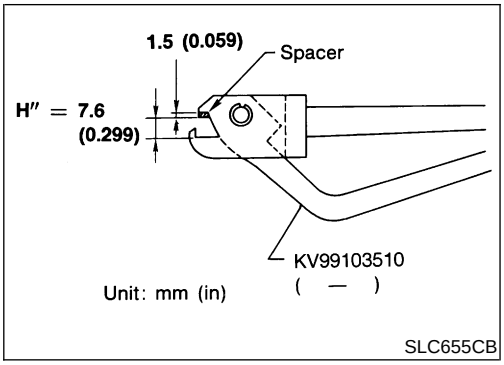


1. Reservoir tank
2. Reservoir tank bracket
3. Radiator cap
4. Mounting bracket
5. Upper radiator hose
6. Cooling fans
7. Radiator drain plug
8. Mounting rubber
9. Oil cooler hose (A/T models)
10. Radiator
11. Lower radiator hose

PREPARATION

NILC0022



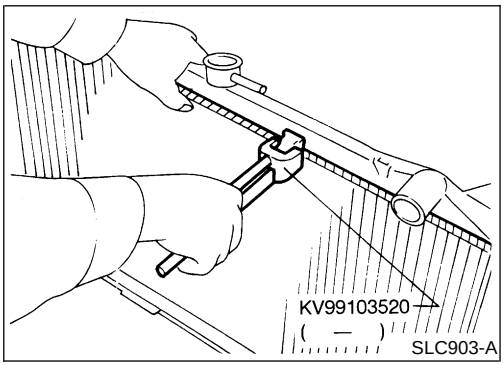


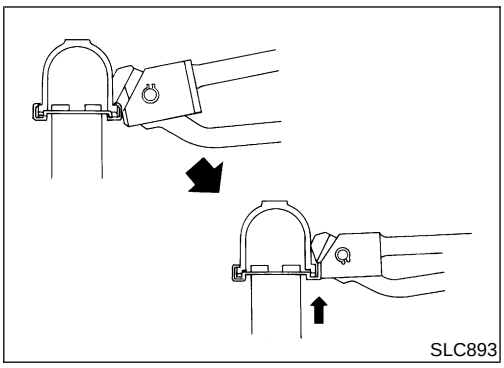
1. Attach the spacer to the tip of the radiator plate pliers A. Spacer specification: 1.5 mm (0.059 in) thick x 18 mm (0.71 in) wide x 8.5 mm (0.335 in) long.
2. Make sure that when radiator plate pliers A are closed dimension H″ is approx. 7.6 mm (0.299 in).
3. Adjust dimension H″ with the spacer, if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

DISASSEMBLY

NILC0023

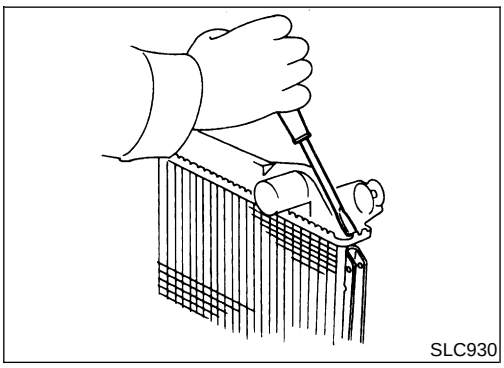
1. Remove tank with Tool.





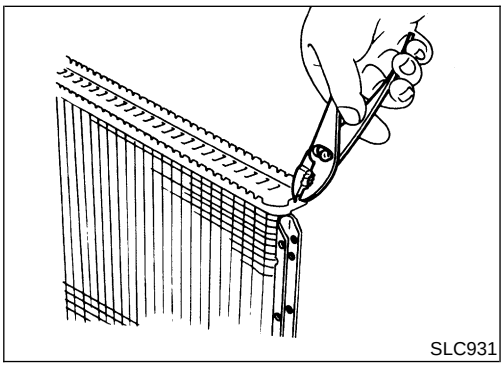
- Grip the crimped edge and bend it upwards so that Tool slips off.

  Do not bend excessively.



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

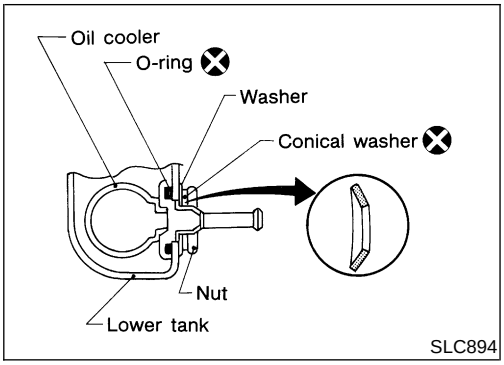
  Be careful not to damage tank.



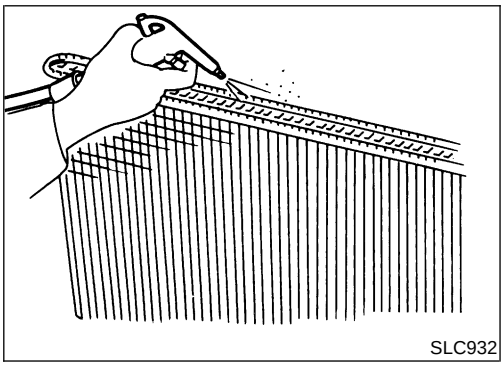
2. Make sure the edge stands straight up.
3. Remove oil cooler from tank. (A/T model only)

ASSEMBLY

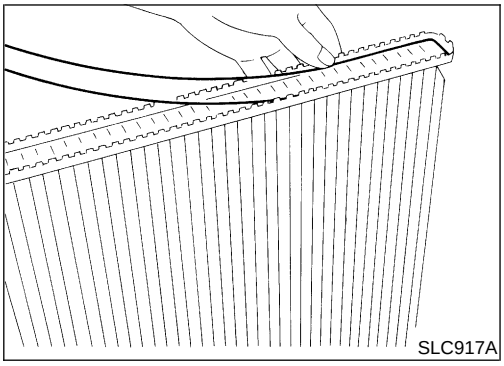
NILC0024



1. Install oil cooler. (A/T model only)
- **Pay attention to direction of conical washer.**

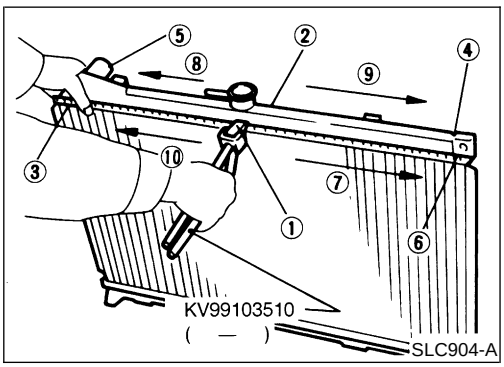


2. Clean contact portion of tank.

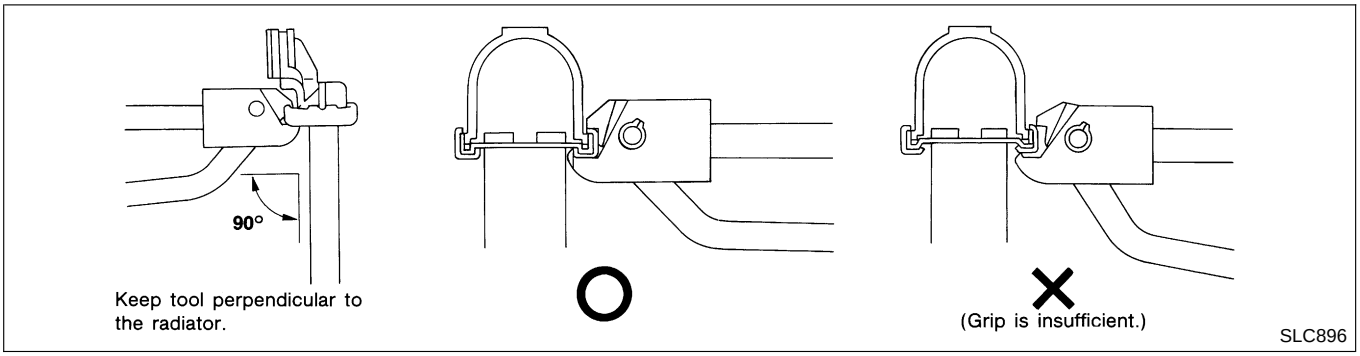


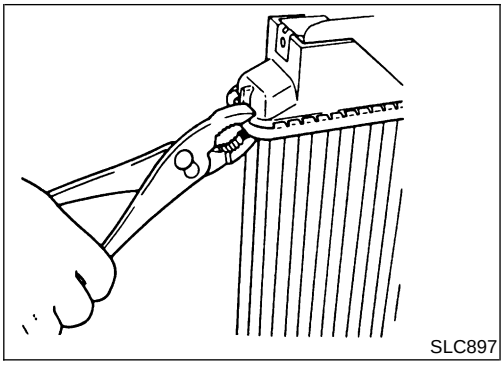
3. Install sealing rubber.
- **Push it in with fingers.**

Be careful not to twist sealing rubber.

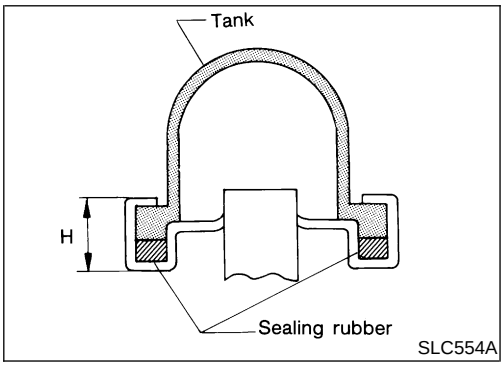


4. Crimp tank in specified sequence with Tool.




SLC897

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



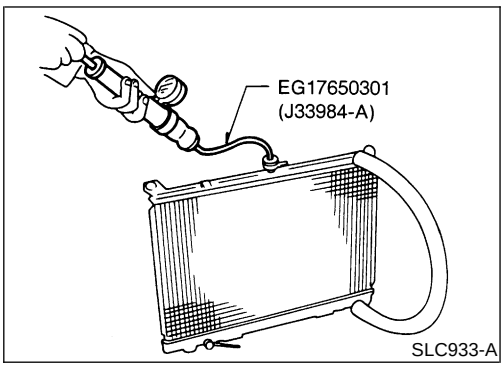
SLC554A

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", LC-18.

INSPECTION

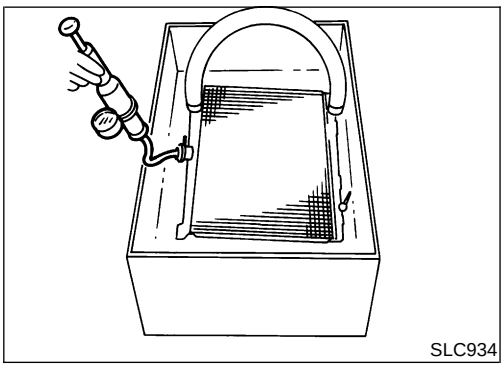
NILC0025



SLC933-A

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 as well. (A/T model only)


SLC934

2. Check for leakage.

Cooling Fan Control System

NILC0026

Cooling fans are controlled by the ECM. Refer to ***EC-530***, [QG18DE (except Calif. CA Model)], ***EC-1173***, [QG18DE (Calif. CA Model)], "TROUBLE DIAGNOSIS FOR OVERHEAT (COOLING SYSTEM)".

Refilling Engine Coolant

NILC0027

For details on refilling engine coolant, refer to ***MA-18***, “Refilling Engine Coolant”.

Overheating Cause Analysis

NILC0028

	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

NILC0029

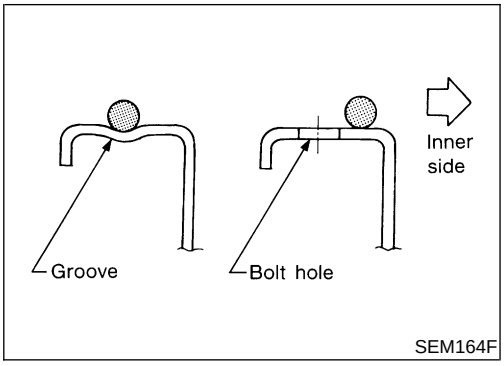
Valve opening temperature °C (°F)	76.5 (170)
Valve lift mm/°C (in/°F)	More than 9/90 (0.35/194)

RADIATOR

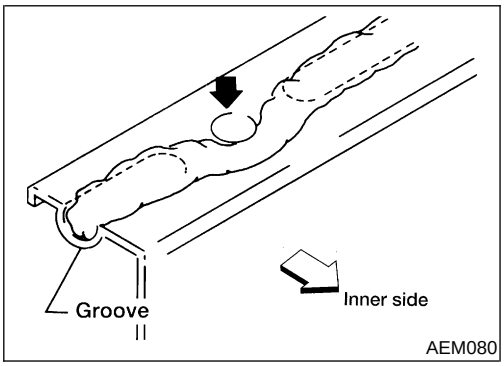
NILC0030

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

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



SEM164F



AEM080

Precautions

LIQUID GASKET APPLICATION PROCEDURE

NILC0031

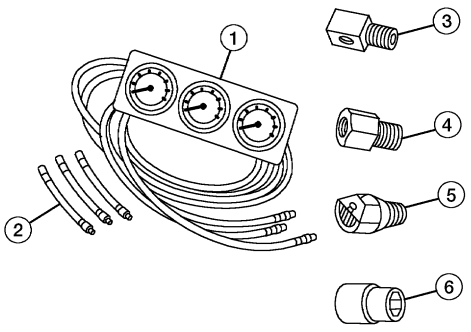
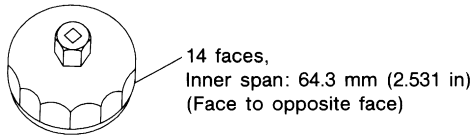
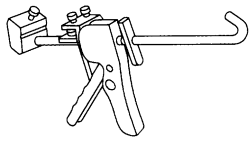
1. Use a scraper to remove all traces of old RTV silicone sealant from mating surfaces and grooves. Also, completely clean any oil from these areas.
2. Apply a continuous bead of Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent to mating surfaces.
   - For oil pan, be sure RTV silicone sealant diameter is 4.0 to 5.0 mm (0.157 to 0.197 in).
   - For areas except oil pan, be sure RTV silicone sealant diameter is 2.0 to 3.0 mm (0.079 to 0.118 in).
3. Apply RTV silicone sealant 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

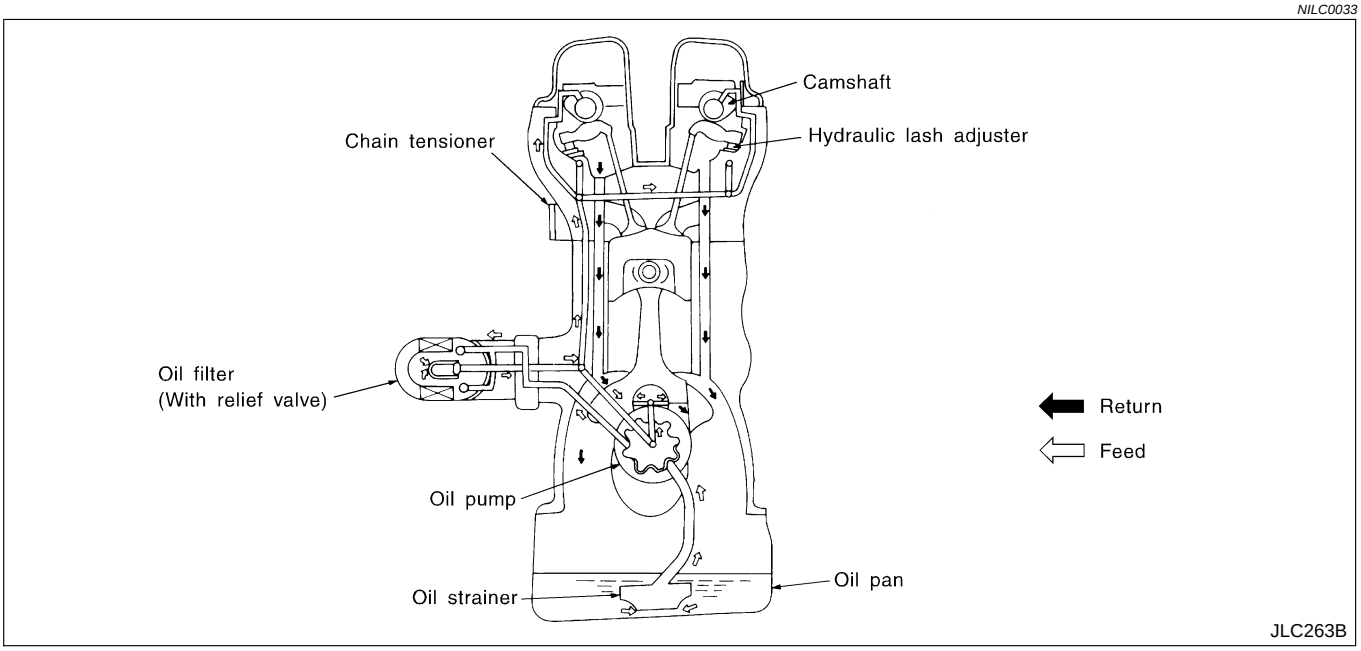
NILC0032

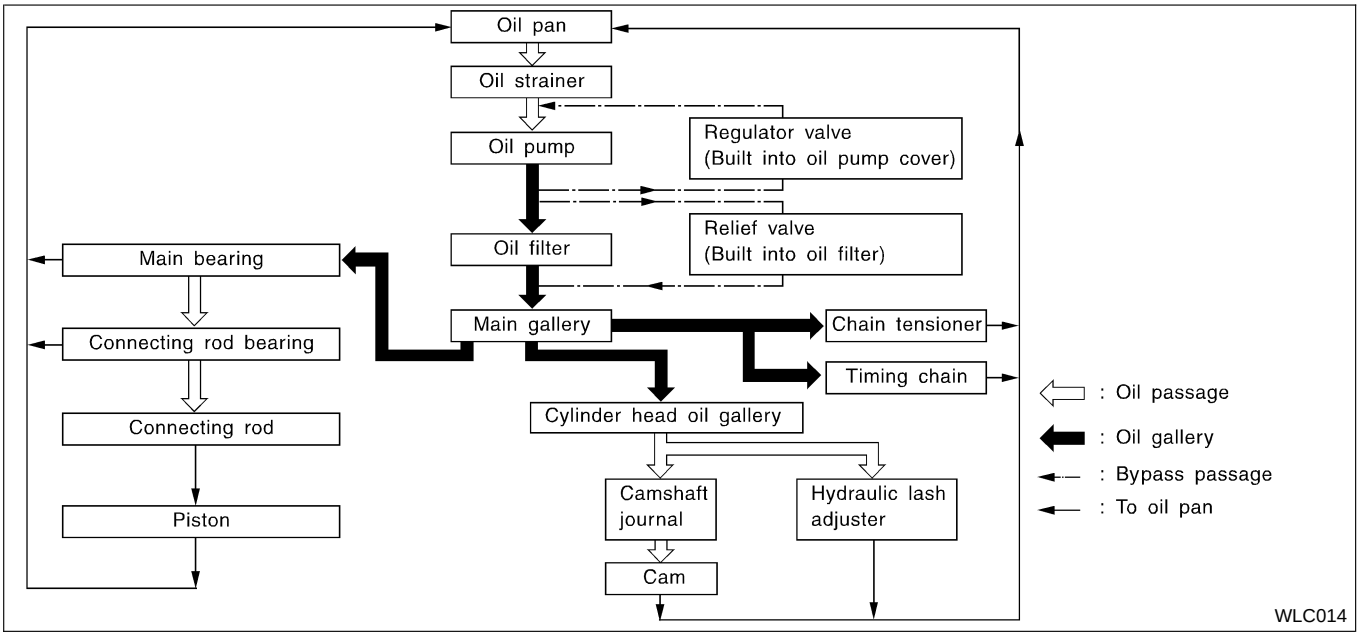
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

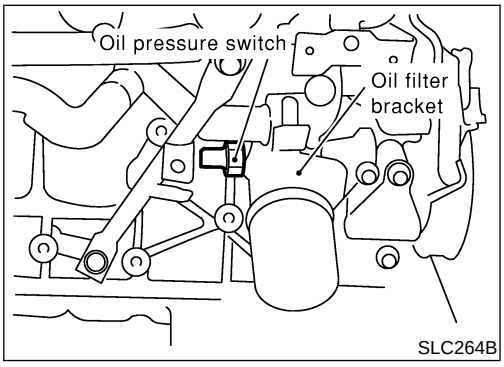
Tool number (Kent-Moore No.) Tool name	Description	
(J34301-C) Oil pressure gauge set 1 (J34301-1) Oil pressure gauge 2 (J34301-2) Hoses 3 (J34298) Adapter 4 (J34282-1) Adapter 5 (790-301-1230-A) 60° adapter 6 (J34301-15) Square socket	 AAT896	Measuring oil pressure **Maximum measuring range:** **1,373 kPa (14 kg/cm^2, 199 psi)**
KV10115800 (J-37140-A) Oil filter wrench	 NT362	Removing oil filter
WS39930000 (—) Tube presser	 NT052	Pressing the tube of liquid gasket

Lubrication Circuit

NILC0033







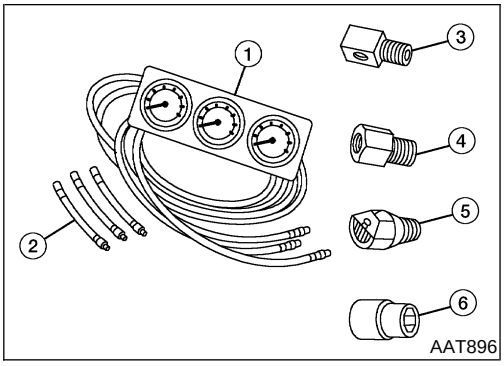
Oil Pressure Check

NILC0034

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, Tool No. J34301-1 or equivalent.
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	More than 80 (0.82, 11.6)
3,200	314 - 392 (3.2 - 4.0, 46 - 57)

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

6. Install oil pressure switch with suitable thread sealant.

Oil Pump

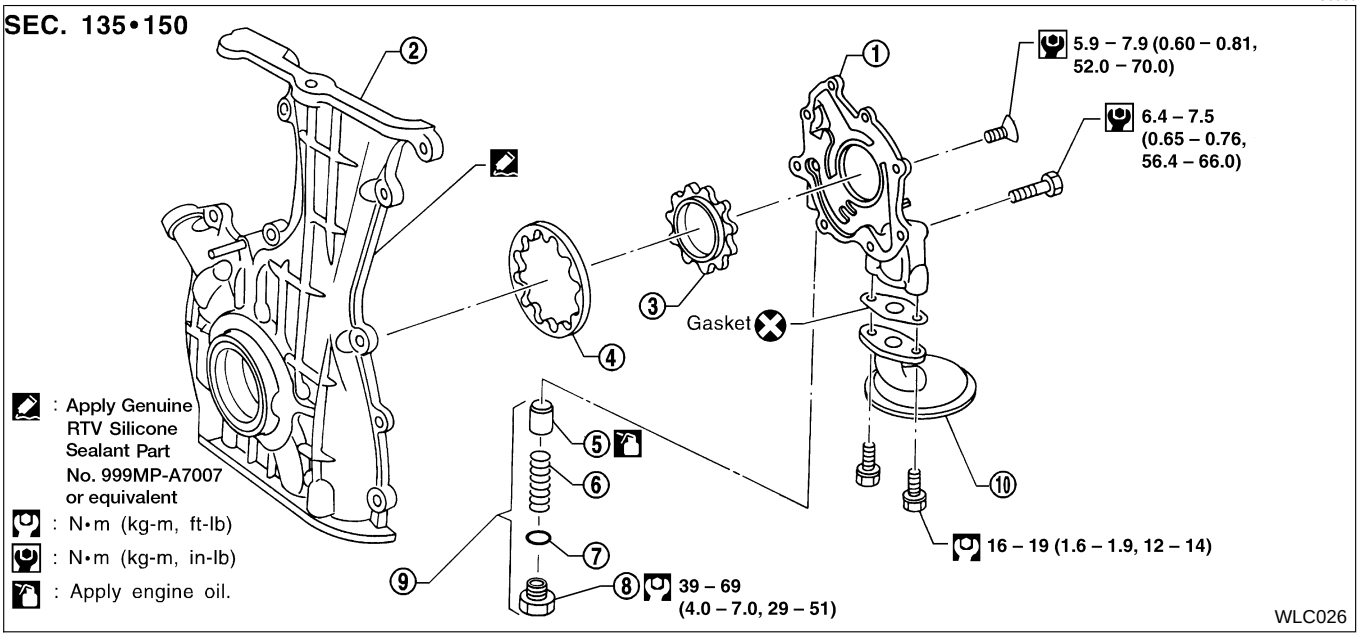
REMOVAL

NILC0035

1. Remove drive belts.
2. Remove oil pan. Refer to ***EM-89***, "Removal".
3. Remove oil strainer and baffle plate.
4. Remove front cover assembly. Refer to ***EM-94***, "TIMING CHAIN".

DISASSEMBLY AND ASSEMBLY

NILC0036



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

INSPECTION

NILC0037

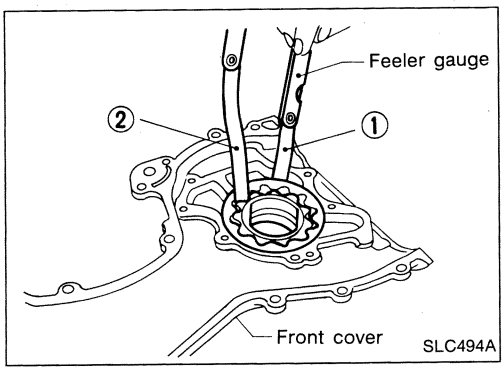
Using a feeler gauge, check the following clearances:

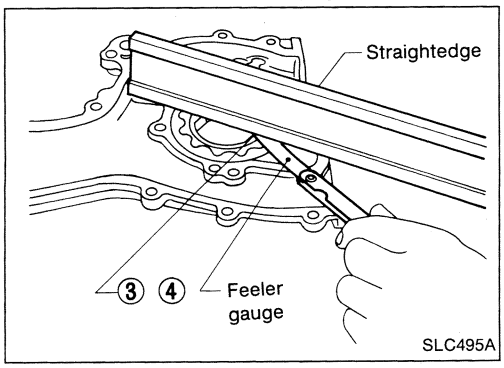
Standard clearance:

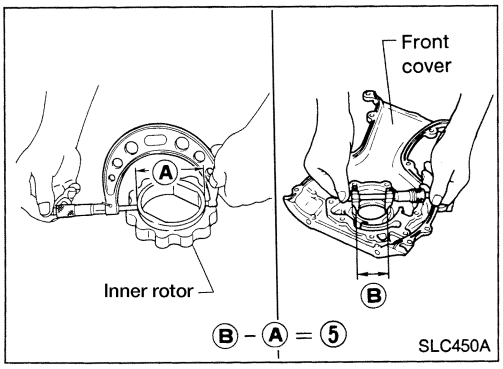
Unit: mm (in)

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	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer rotor axial clearance 4	0.05 - 0.11 (0.0020 - 0.0043)
Inner rotor to brazed portion of housing clearance 5	0.045 - 0.091 (0.0018 - 0.0036)

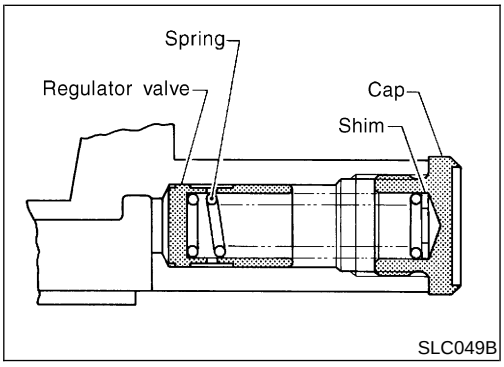
- **If the tip clearance (2) exceeds the limit, replace rotor set.**
- **If body to rotor clearances (1, 3, 4, 5) exceed the limit, replace front cover assembly.**







WLC021

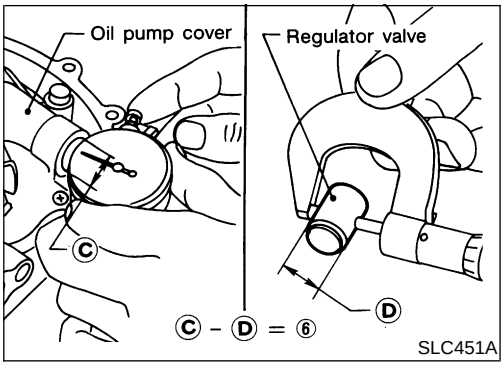


REGULATOR VALVE INSPECTION

NILC0038

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 assembly.**



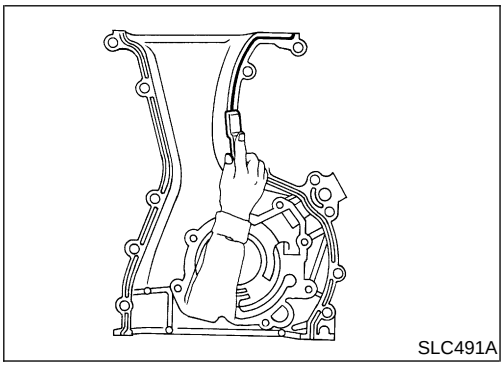
SLC451A

4. Check regulator valve to oil pump cover clearance.

Clearance:

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

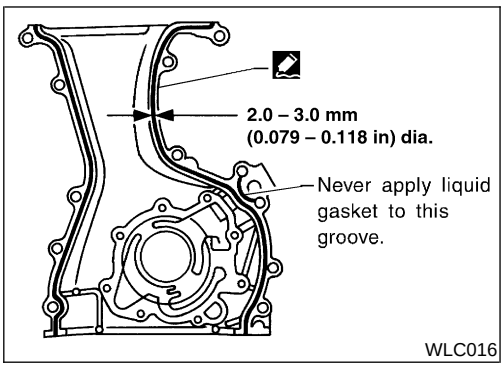
- **If it exceeds the limit, replace oil pump cover.**


SLC491A

INSTALLATION

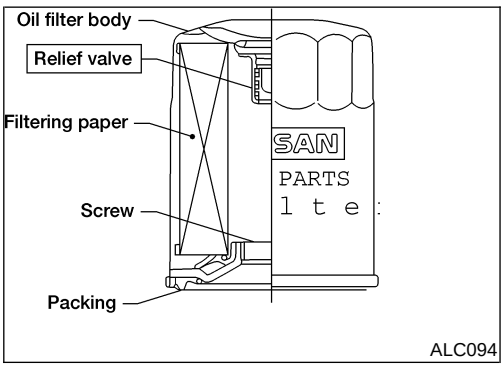
NILC0039

- **Always replace oil seal and O-ring with new ones. Refer to *EM-29*, "FRONT OIL SEAL".**
- **When installing oil pump, apply engine oil to rotors.**
- **Be sure that O-rings are properly fitted.**
- **Use a scraper to remove old RTV silicone sealant from mating surface of front cover.**
- **Also remove traces of RTV silicone sealant from mating surface of cylinder block.**



WLC016

1. Apply a continuous bead of RTV silicone sealant to mating surface of front cover assembly. Use Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent.
2. Installation is in the reverse order of removal.



ALC094

Oil Filter

NILC0040

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

- **Use Tool KV10115800 (J37140–A) for removing oil filter.**

Service Data and Specifications (SDS)

OIL PRESSURE CHECK

NILC0041

Engine speed rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	More than 80 (0.82, 11.6)
3,200	314 - 392 (3.2 - 4.0, 46 - 57)

Service Data and Specifications (SDS) (Cont'd)

REGULATOR VALVE INSPECTION

NILC0042

Unit: mm (in)

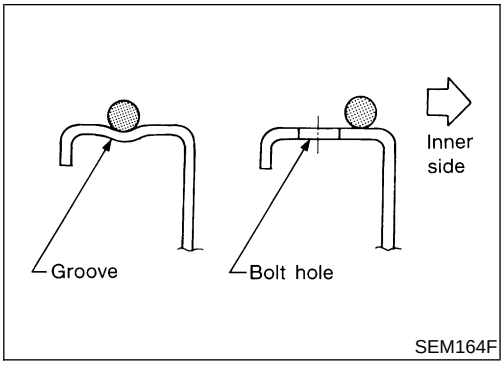
Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)

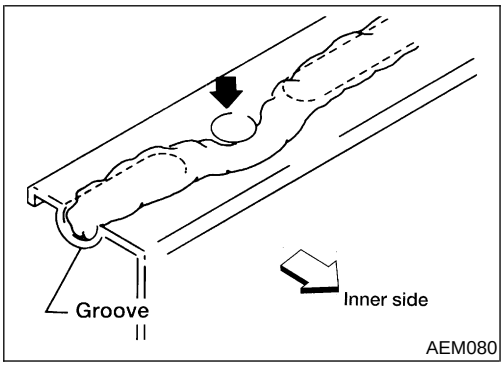
OIL PUMP INSPECTION

NILC0043

Unit: mm (in)

Body to outer rotor radial clearance	0.114 - 0.200 (0.0045 - 0.0079)
Inner rotor to outer rotor tip clearance	Below 0.18 (0.0071)
Body to inner rotor clearance	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer rotor axial clearance	0.05 - 0.11 (0.0020 - 0.0043)
Inner rotor to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)





Precautions

LIQUID GASKET APPLICATION PROCEDURE

NILC0044

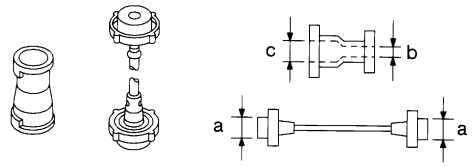
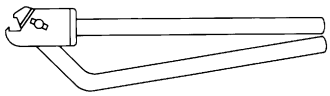
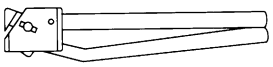
1. Use a scraper to remove all traces of old RTV silicone sealant from mating surfaces and grooves. Also, completely clean any oil from these areas.
2. Apply a continuous bead of Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent to mating surfaces.
   - For oil pan, be sure RTV silicone sealant diameter is 4.0 to 5.0 mm (0.157 to 0.197 in).
   - For areas except oil pan, be sure RTV silicone sealant diameter is 2.0 to 3.0 mm (0.079 to 0.118 in).
3. Apply RTV silicone sealant 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 TOOL

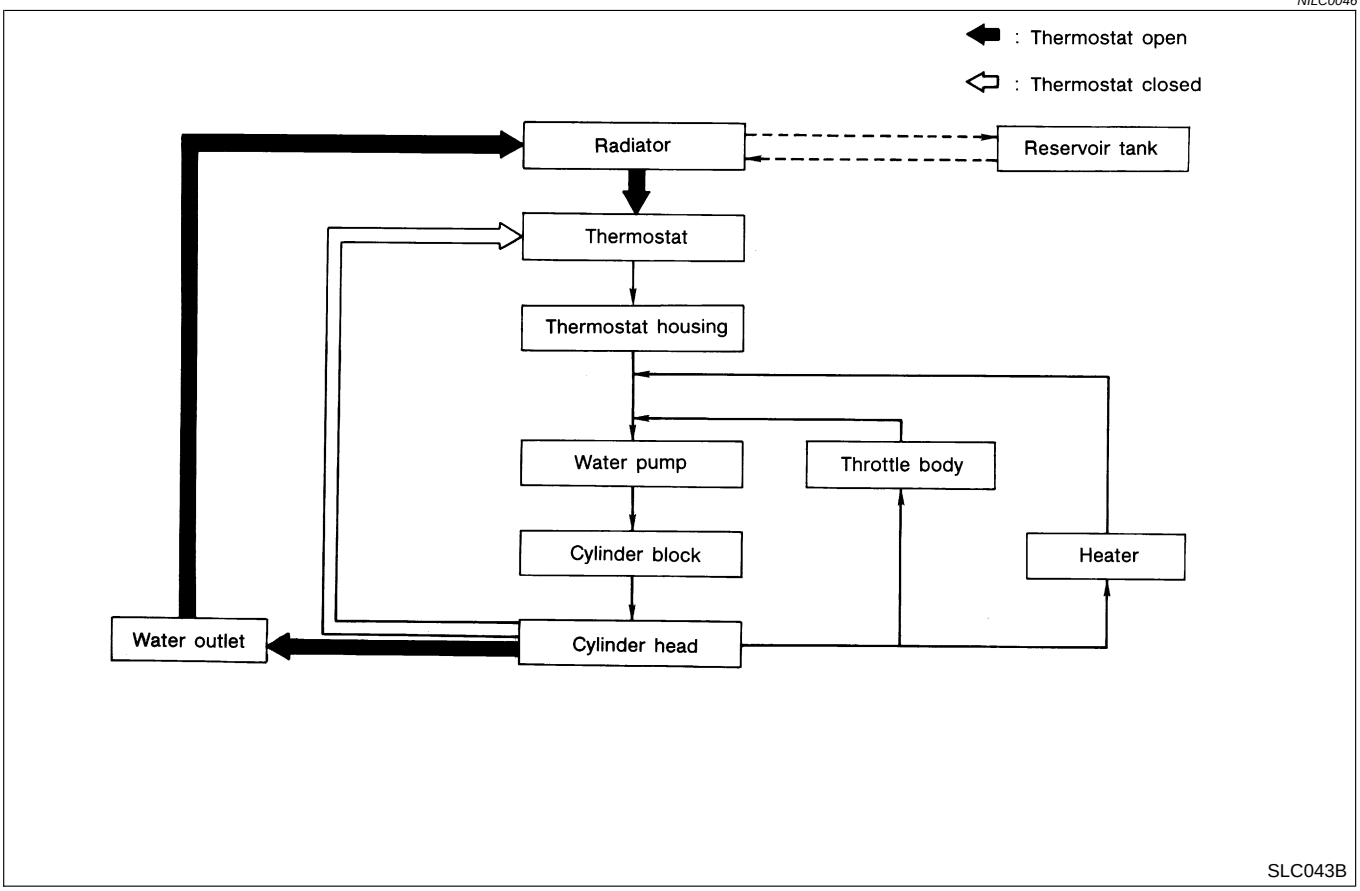
NILC0045

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	
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

NILC0046



System Check

NILC0047

WARNING:

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

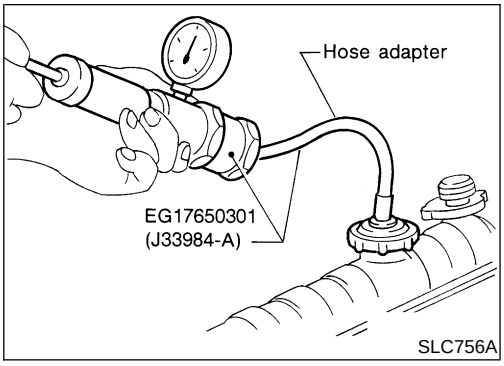
Wrap a thick cloth around the cap. Slowly turn it a quarter turn to allow built-up pressure to escape. Carefully remove the cap by turning it all the way.

CHECKING COOLING SYSTEM HOSES

NILC0047S01

Check hoses for the following:

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



CHECKING COOLING SYSTEM FOR LEAKS

NILC0047S02

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 pressure than specified may cause radiator damage.

CHECKING RADIATOR

NILC0047S03

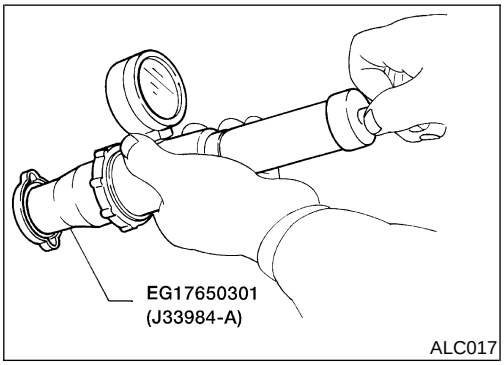
Check radiator for mud or clogging. If necessary, clean radiator as follows.

- 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 300 mm (11.8 in).

5. Blow air again into all the radiator core surfaces once per minute until no water sprays out.



CHECKING RADIATOR CAP

NILC0047S04

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

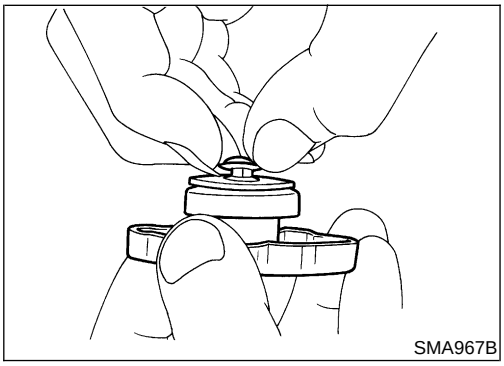
Radiator cap relief pressure:

Standard

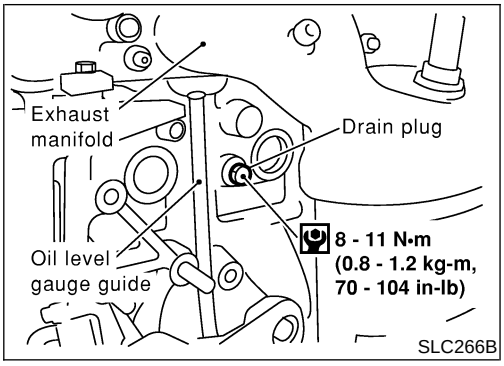
78 - 98 kPa (0.8 - 1.0 kg/cm^2, 11 - 14 psi)

Limit

59 - 98 kPa (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.

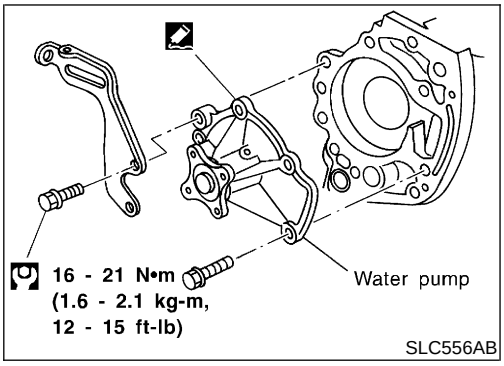


Water Pump

REMOVAL

NILC0048

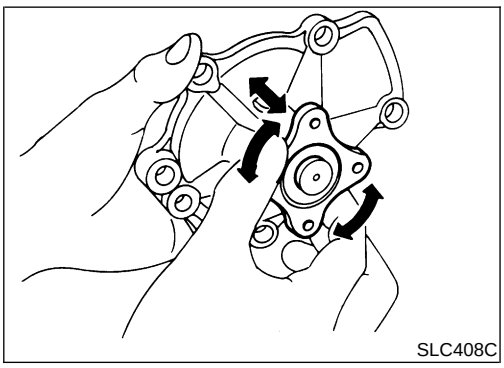
1. Drain coolant from radiator.
2. Remove cylinder block drain plug located at left front of cylinder block and drain coolant. Refer to ***MA-26***, “Draining Engine Coolant”.
3. Remove front RH wheel and engine side cover.
4. Remove drive belts. Refer to ***MA-25***, “Checking Drive Belts”.
5. Remove water pump pulley.
6. Remove RH engine mounting. Refer to ***EM-127***, “Removal and Installation”.



7. Remove water pump.

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.**

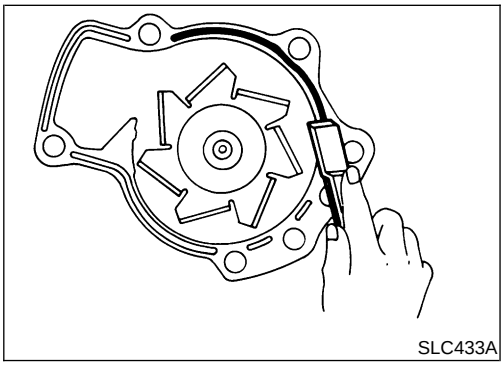


INSPECTION

NILC0049

1. Rotate water pump shaft.

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

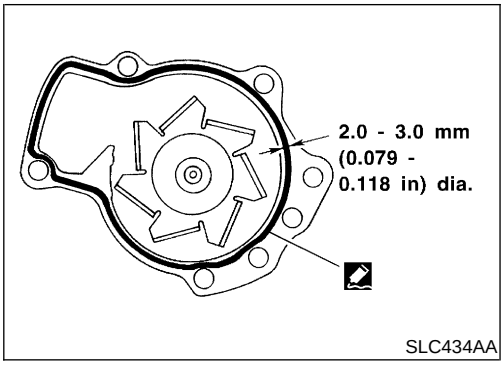


INSTALLATION

NILC0050

1. Use a scraper to remove RTV silicone sealant from water pump.

- **Also remove traces of RTV silicone sealant from mating surface of cylinder block.**



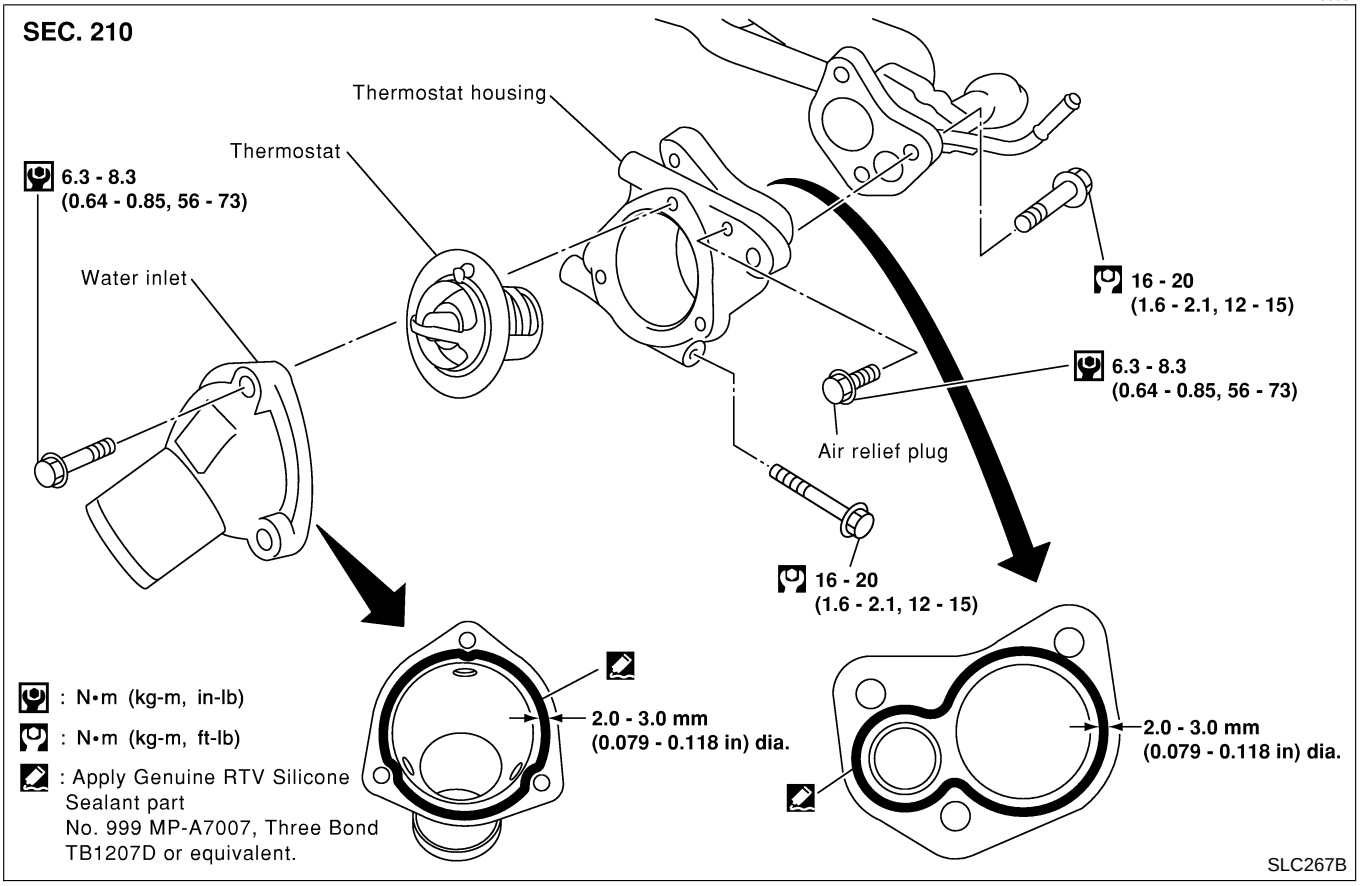
2. Apply a continuous bead of RTV silicone sealant to mating surface of water pump. Use Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent.

When filling radiator with coolant, refer to *MA-27*, "Refilling Engine Coolant".
When installing drive belts, refer to *MA-25*, "Checking Drive Belts".

Thermostat

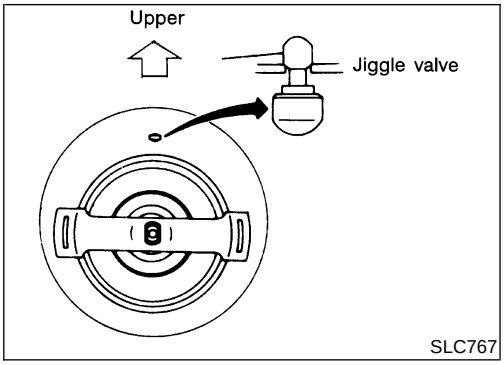
REMOVAL AND INSTALLATION

NILC0051

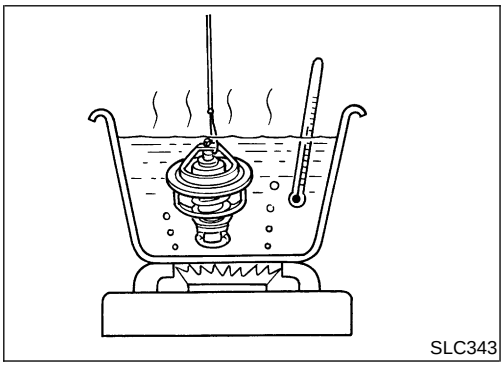


Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.

1. Drain engine coolant. Refer to ***MA-26***, "Draining Engine Coolant".
2. Remove lower radiator hose.
3. Remove water inlet, then take out thermostat.



4. Install thermostat with jiggle valve or air bleeder at upper side.
- **Apply a continuous bead of Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent to mating surface of water inlet.**
5. Refill engine coolant. Refer to ***MA-27***, "Refilling Engine Coolant".
- **After installation, run engine for a few minutes, and check for leaks.**

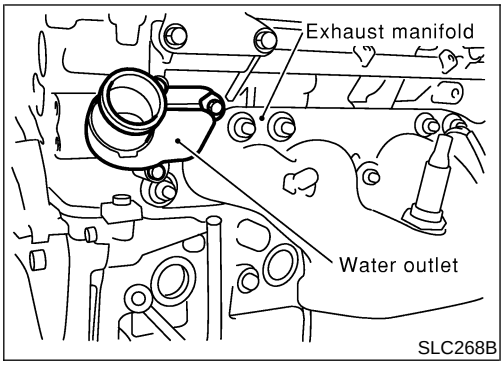


INSPECTION
NILC0052

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)	76.5 (170)
Valve lift mm/°C (in/°F)	More than 8/90 (0.31/194)

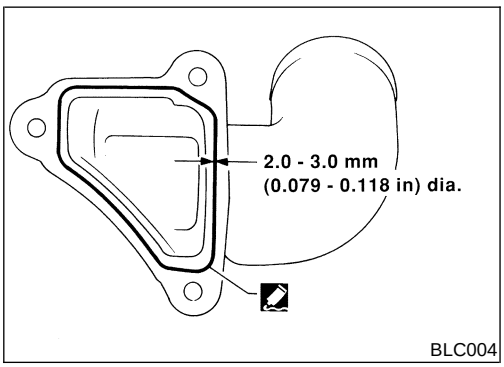
3. Then check if valve closes at 5°C (9°F) below valve opening temperature.



Water Outlet

INSPECTION
NILC0053

Visually inspect for water leaks. If there is leakage, apply Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent.



INSTALLATION
NILC0054

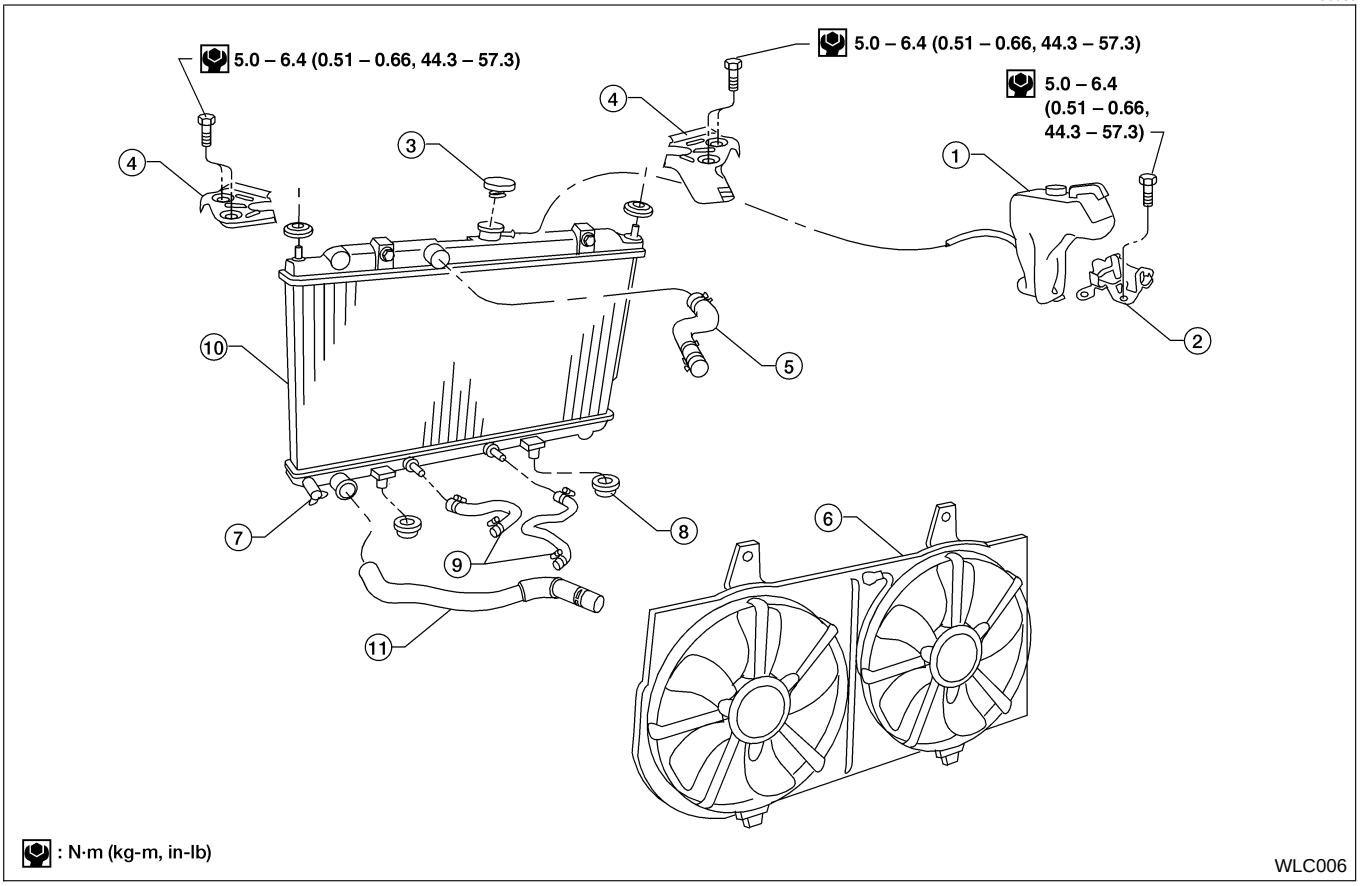
1. Use a scraper to remove old RTV silicone sealant from water outlet.
- **Also remove traces of RTV silicone sealant from mating surface of cylinder head.**
2. Apply a continuous bead of RTV silicone sealant to mating surface of water outlet. Use Genuine RTV silicone sealant Part No. 999MP-A7007 or equivalent.
- **When installing, tighten water outlet bolts to the specified torque.**

: 6.3 - 8.3 N·m (0.64 - 0.85 kg-m, 56 - 73 in-lb)

Radiator

COMPONENTS

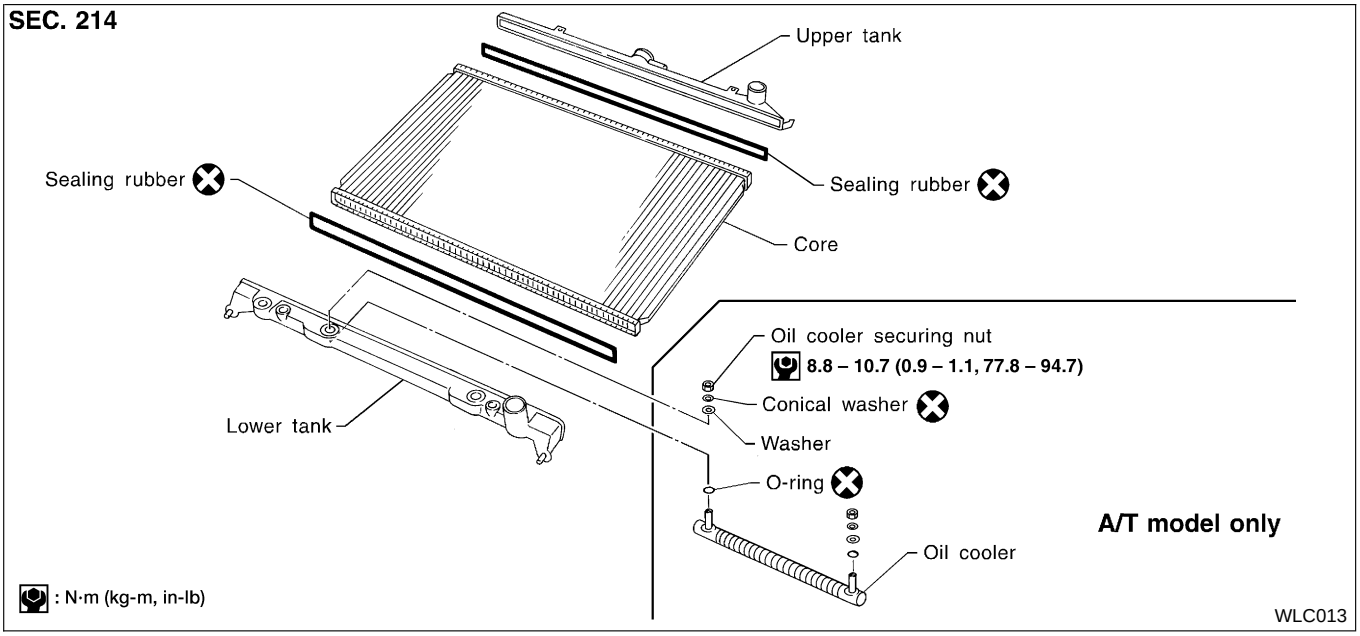
NILC0055

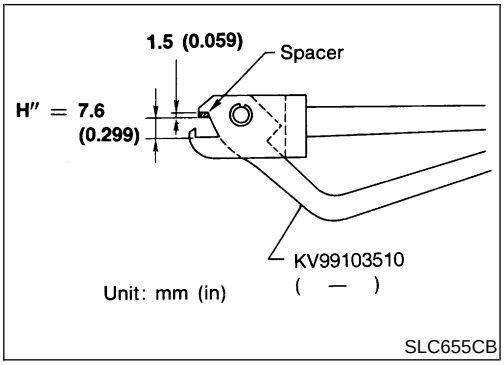


1. Reservoir tank
2. Reservoir tank bracket
3. Radiator cap
4. Mounting bracket
5. Upper radiator hose
6. Cooling fans
7. Radiator drain plug
8. Mounting rubber
9. Oil cooler hose (A/T models)
10. Radiator
11. Lower radiator hose

PREPARATION

NILC0061



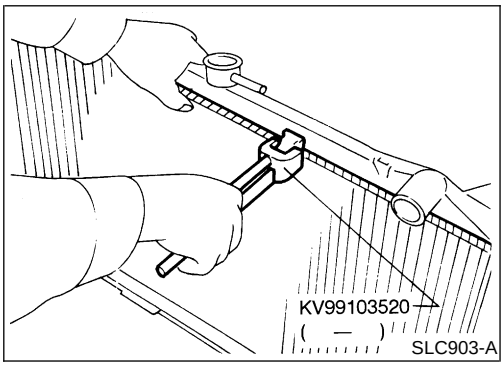


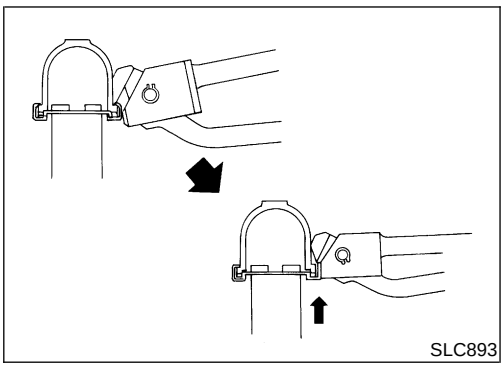
1. Attach the spacer to the tip of the radiator plate pliers A. Spacer specification: 1.5 mm (0.059 in) thick x 18 mm (0.71 in) wide x 8.5 mm (0.335 in) long.
2. Make sure that when radiator plate pliers A are closed dimension H″ is approx. 7.6 mm (0.299 in).
3. Adjust dimension H″ with the spacer, if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

DISASSEMBLY

NILC0063

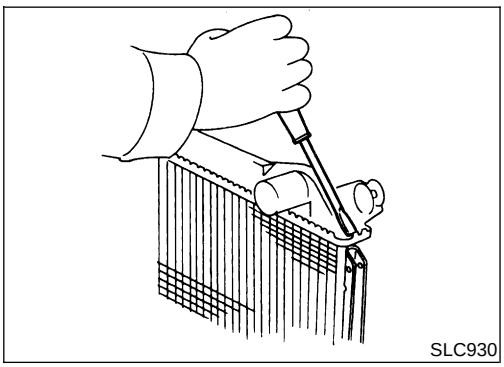
1. Remove tank with Tool.





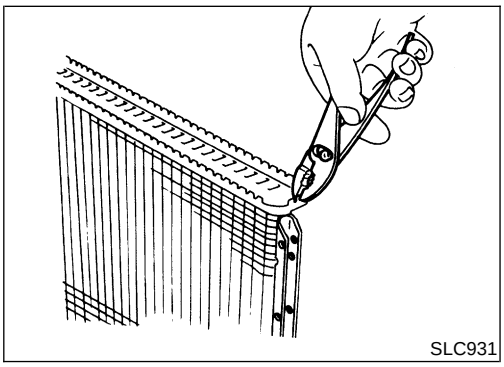
- Grip the crimped edge and bend it upwards so that Tool slips off.

Do not bend excessively.



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

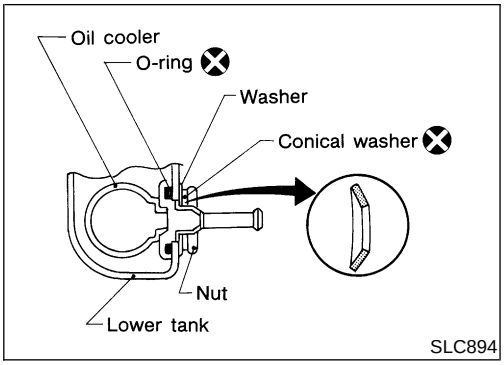
Be careful not to damage tank.



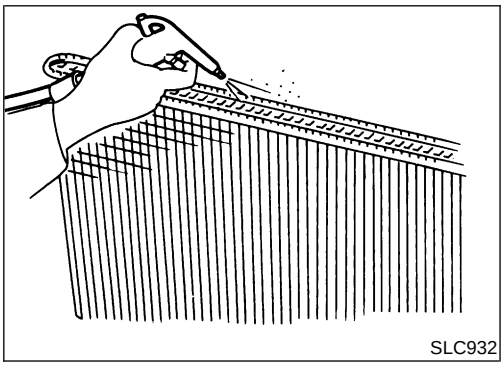
2. Make sure the edge stands straight up.
3. Remove oil cooler from tank. (A/T model only)

ASSEMBLY

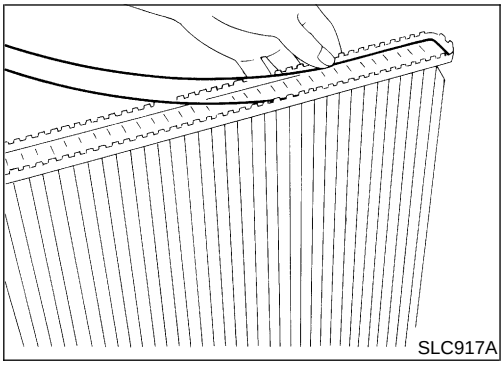
NILC0064



1. Install oil cooler. (A/T model only)
- **Pay attention to direction of conical washer.**

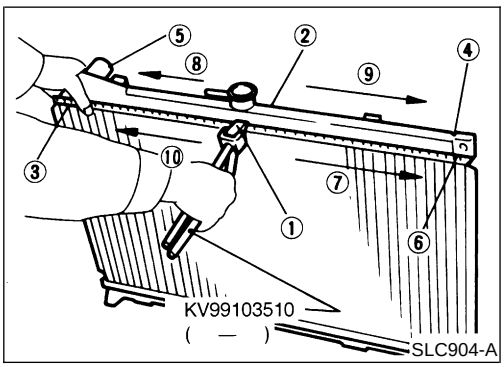


2. Clean contact portion of tank.

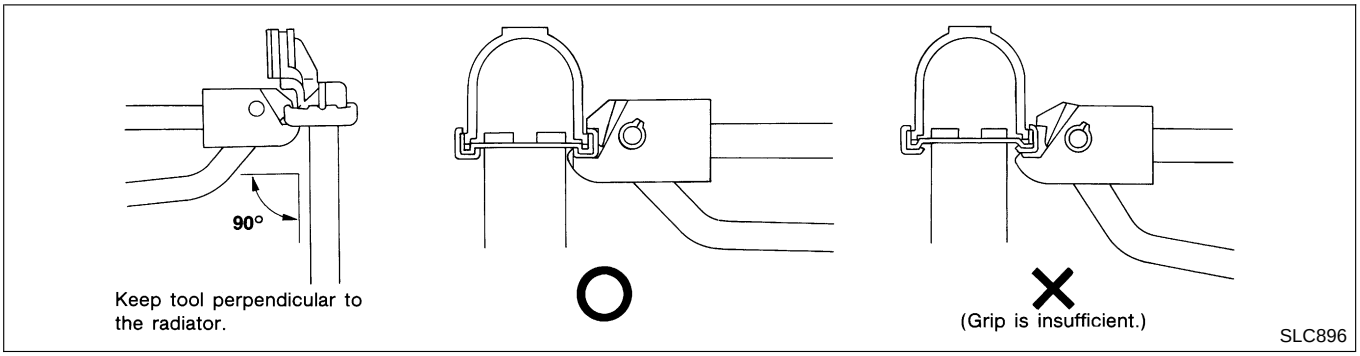


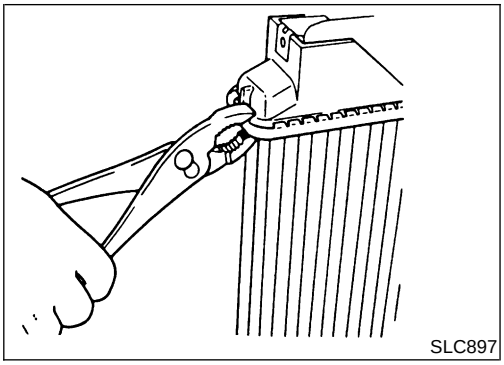
3. Install sealing rubber.
- **Push it in with fingers.**

Be careful not to twist sealing rubber.

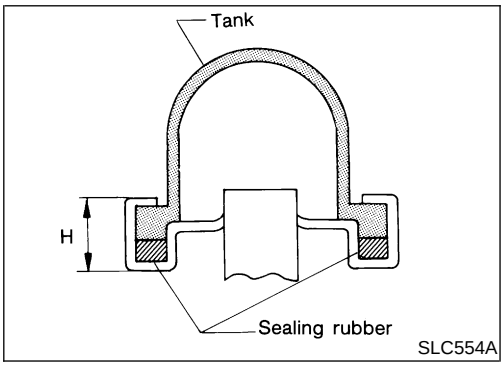


4. Crimp tank in specified sequence with Tool.




SLC897

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



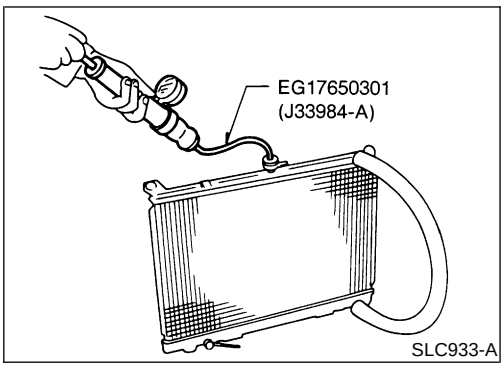
SLC554A

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

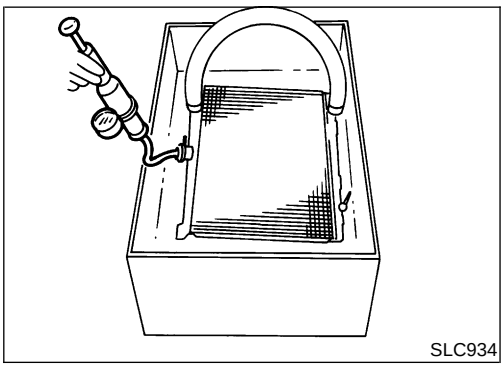
NILC0065



SLC933-A

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 as well. (A/T model only)


SLC934

2. Check for leakage.

Cooling Fan Control System

NILC0056

Cooling fans are controlled by the ECM. Refer to ***EC-1790***, SR20DE, "SYSTEM DESCRIPTION".

Refilling Engine Coolant

NILC0057

For details on refilling engine coolant, refer to ***MA-27***, “Refilling Engine Coolant”.

Overheating Cause Analysis

NILC0058

	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

NILC0059

Valve opening temperature °C (°F)	76.5 (170)
Valve lift mm/°C (in/°F)	More than 8/90 (0.31/194)

RADIATOR

NILC0060

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

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