

SECTION **LC**

**MODIFICATION NOTICE:**

- KA24DE engine has been added for Europe. For specifications other than those described here, refer to D22 Supplement-II Service Manual (SM9E-D22BG0).
- YD25DDTi engine model has been added.
- ZD30DDT engine model has been added.

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**QD & TD**

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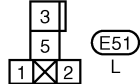
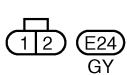
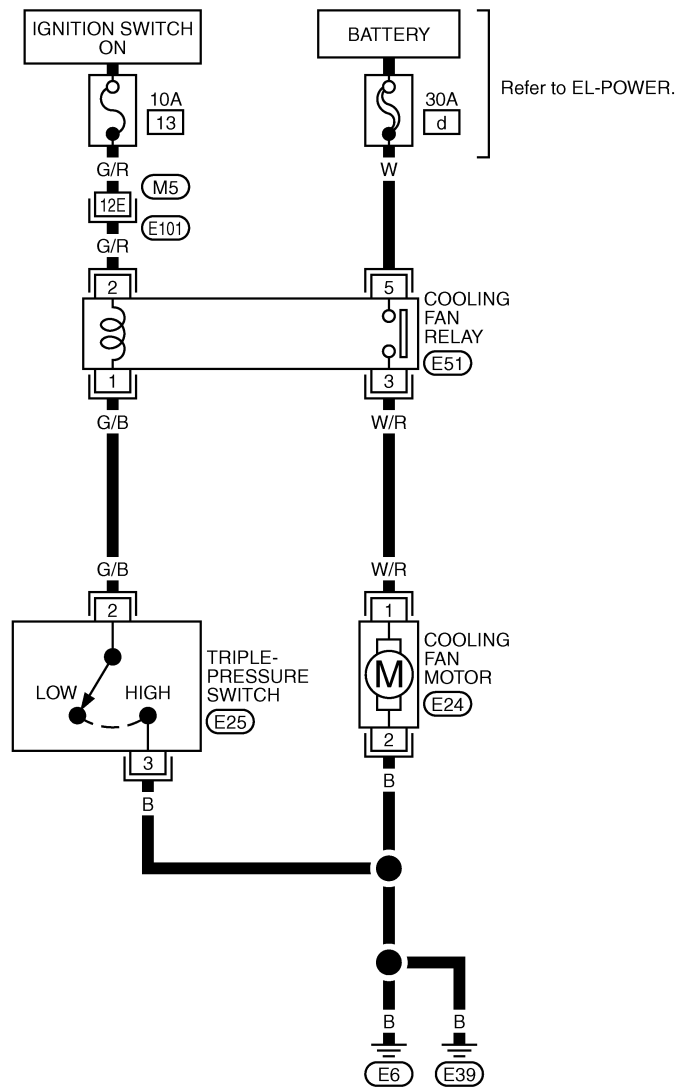
**ZD**

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## Wiring Diagram

LC-COOL/F-01

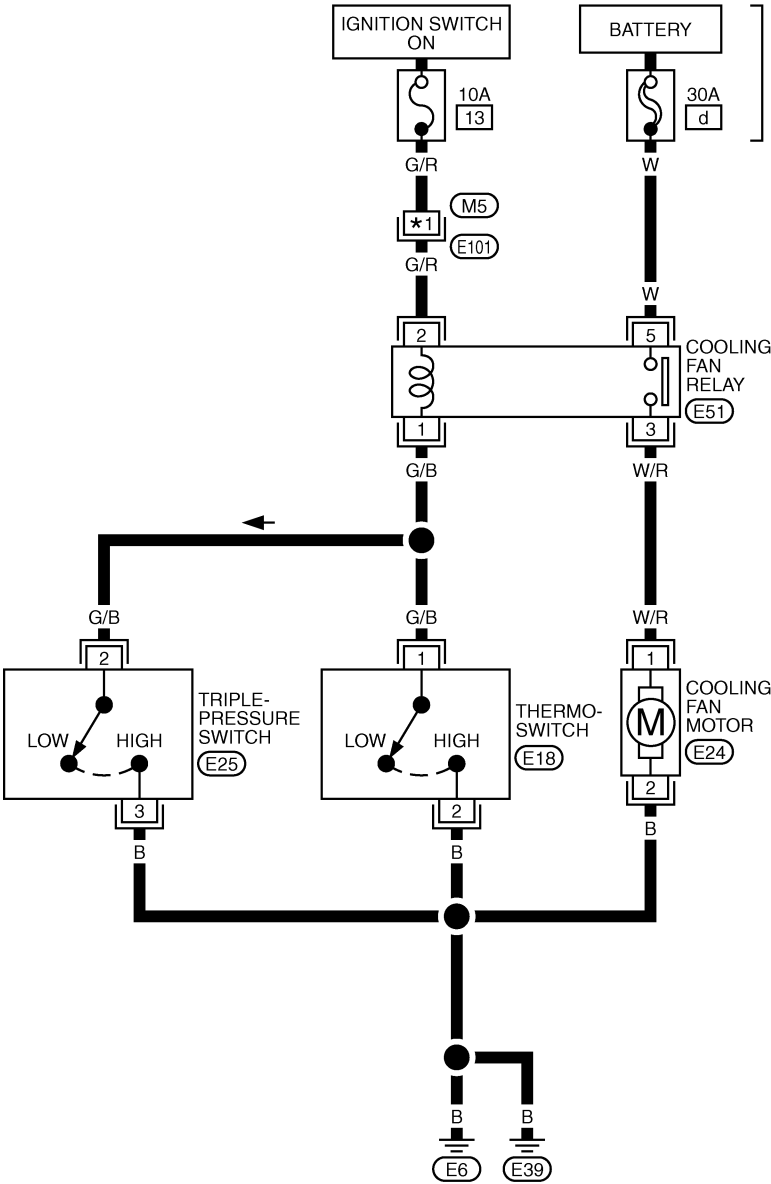


Refer to last page (Foldout page).

(M5), (E101)

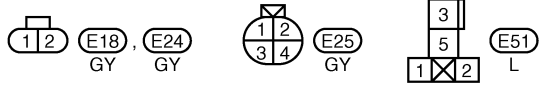
Wiring Diagram

LC-COOL/F-01



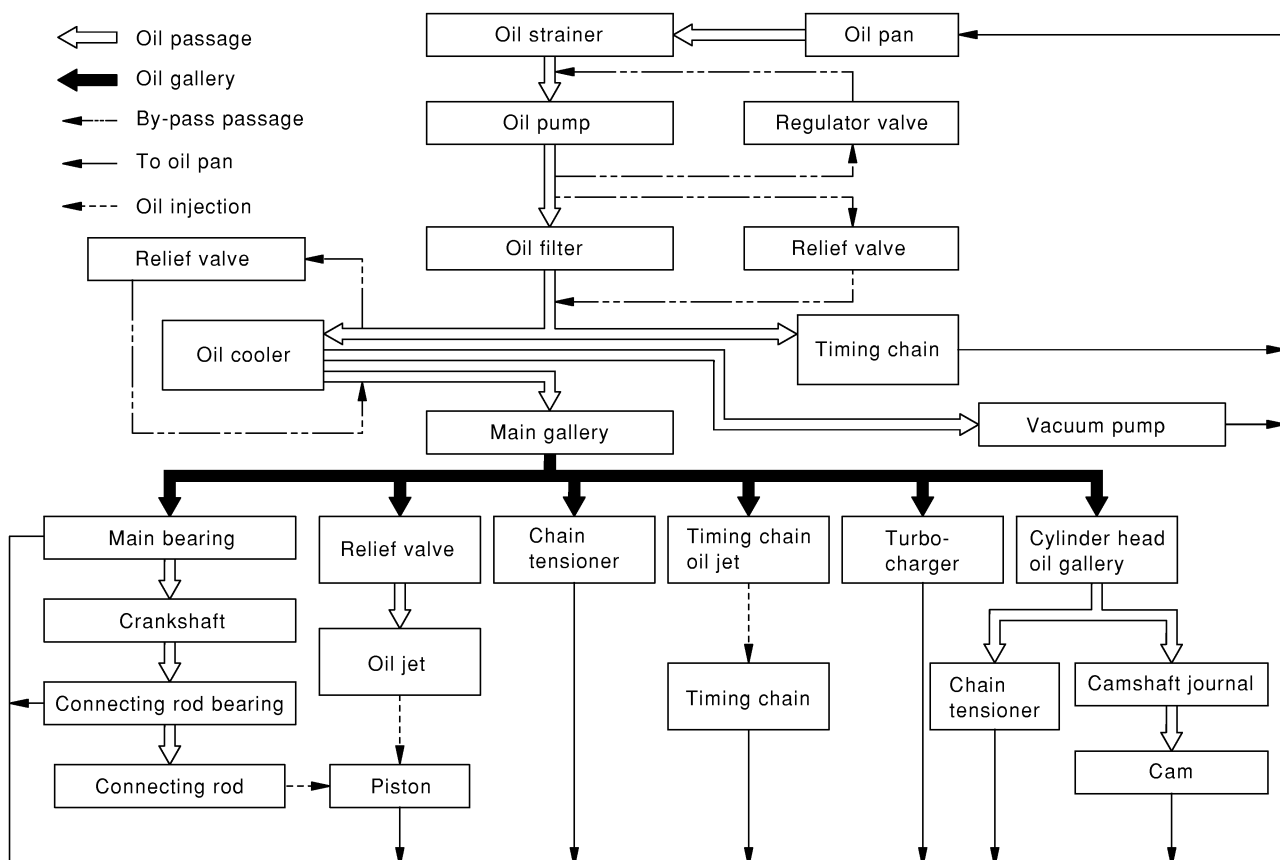
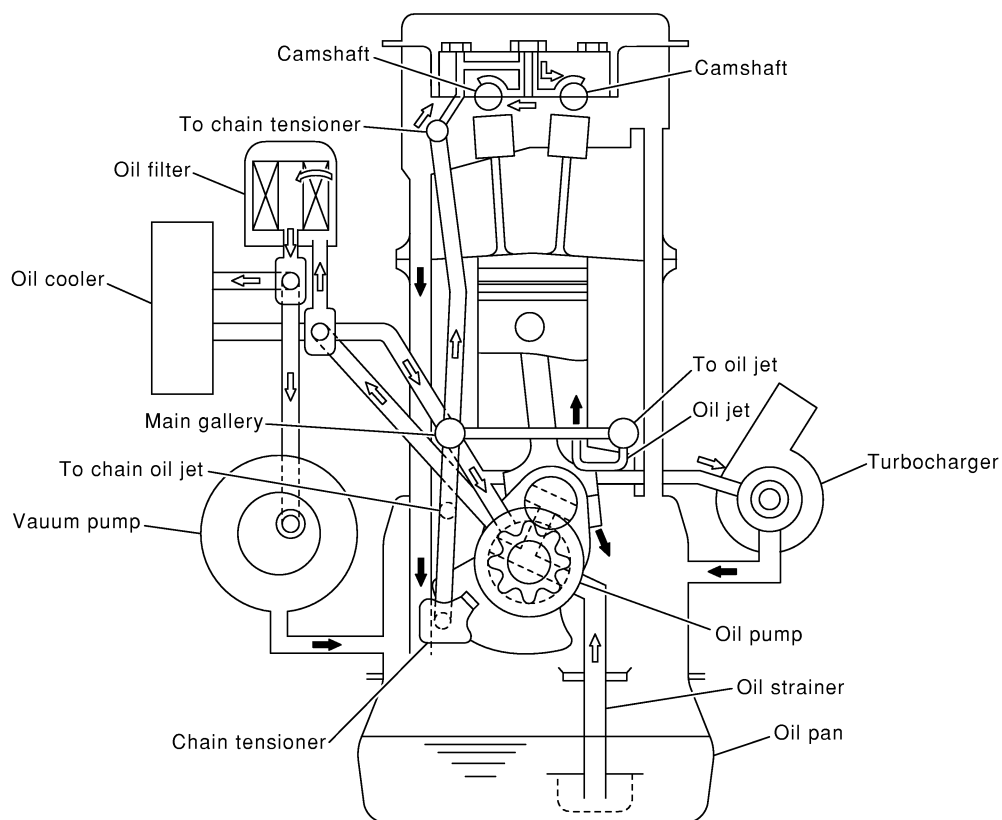
Refer to EL-POWER.

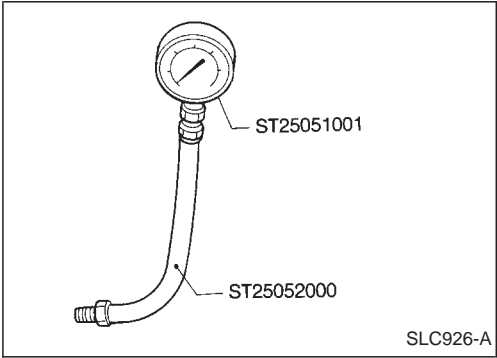
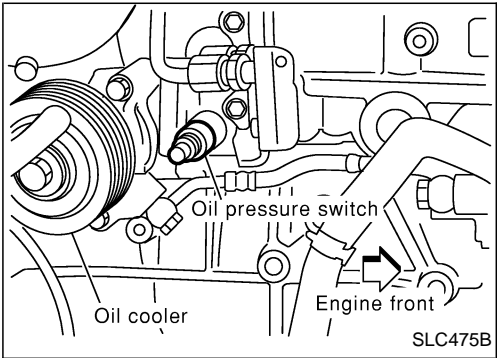
L : LHD models  
R : RHD models  
\*1 12E : L  
12D : R



Refer to last page (Foldout page).  
M5, E101

## Lubricating Circuit





Oil Pressure Check

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

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm <sup>2</sup> , 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.

6. 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.

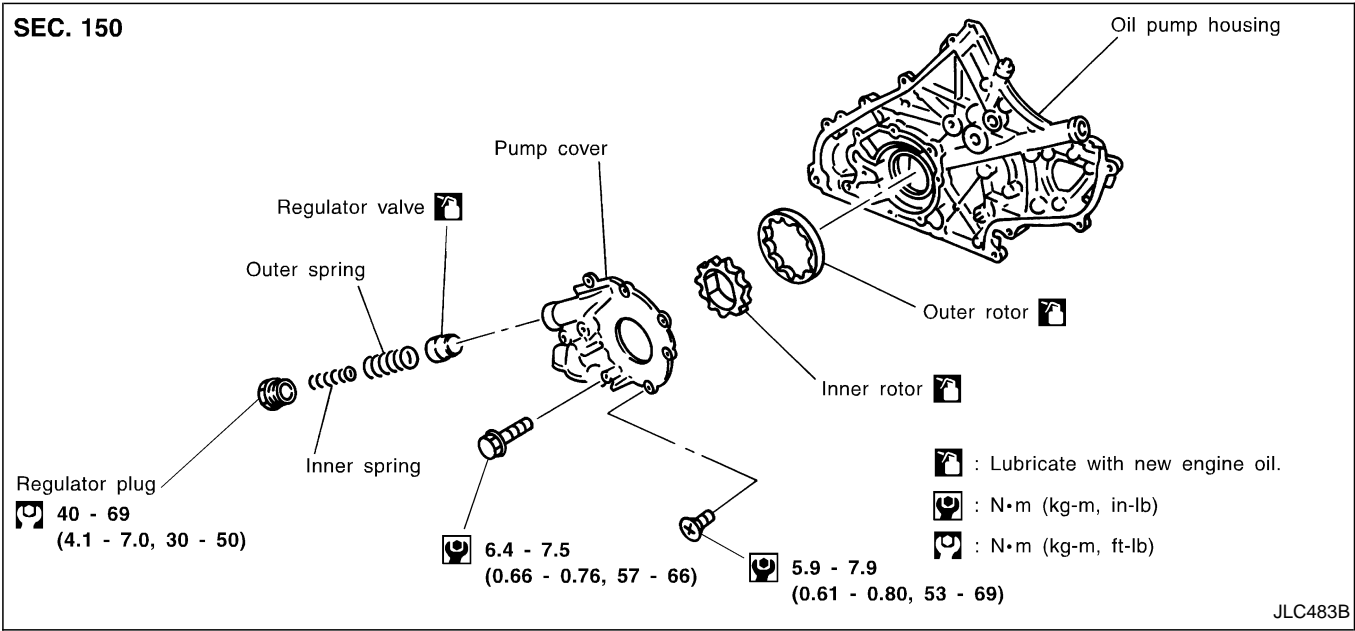
: 13 - 17 N·m (1.25 - 1.75 kg·m, 9 - 12 ft·lb)

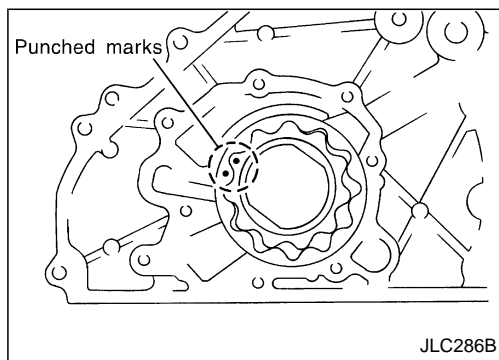
Oil Pump

REMOVAL AND INSTALLATION

- When installing oil pump, apply engine oil to rotors. Refer to “Primary Timing Chain” in EM section. Reinstall all parts in the reverse order of removal.

DISASSEMBLY AND ASSEMBLY





## Oil Pump (Cont'd)

### OIL PUMP INSPECTION

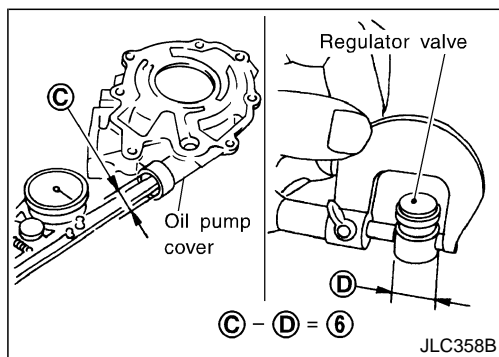
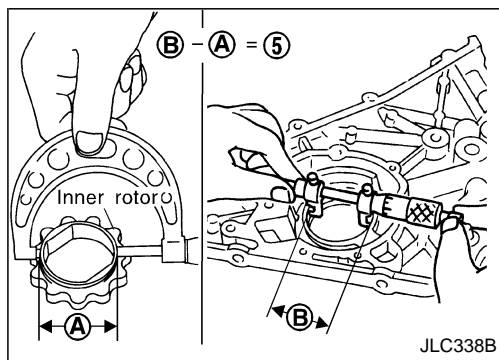
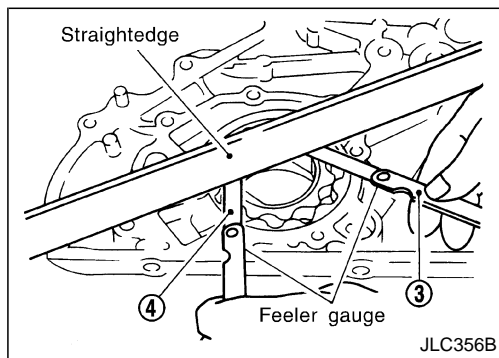
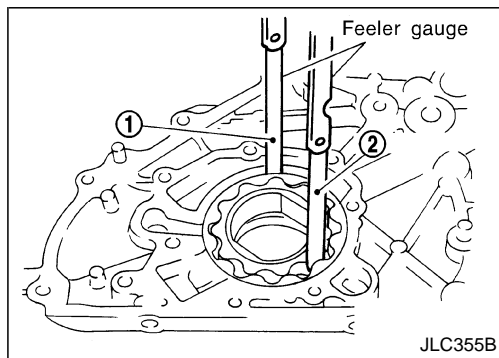
- Install the inner rotor and outer rotor with the punched marks on the pump cover side.

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

Unit: mm (in)

Housing to outer rotor radial clearance 1	0.114 - 0.260 (0.0045 - 0.0102)
Inner rotor to outer rotor tip clearance 2	Below 0.180 (0.0071)
Housing to inner rotor axial clearance 3	0.050 - 0.090 (0.0020 - 0.0035)
Housing 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 housing to rotor clearances (1, 3, 4, 5) exceed the limit, replace oil pump housing assembly.



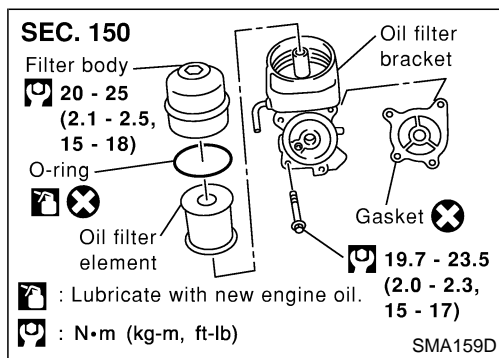
### REGULATOR VALVE INSPECTION

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.
4. Check regulator valve to oil pump cover clearance.

**Clearance 6:**

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

If it exceeds the limit, replace oil pump housing.



## Oil Filter Bracket

### REMOVAL

1. Remove oil filter. Refer to "Changing Oil Filter" in MA section.
2. Loosen mounting bolts of oil filter bracket to drain the oil.
  - Catch the oil with a pan or cloth.
3. Remove oil filter bracket.

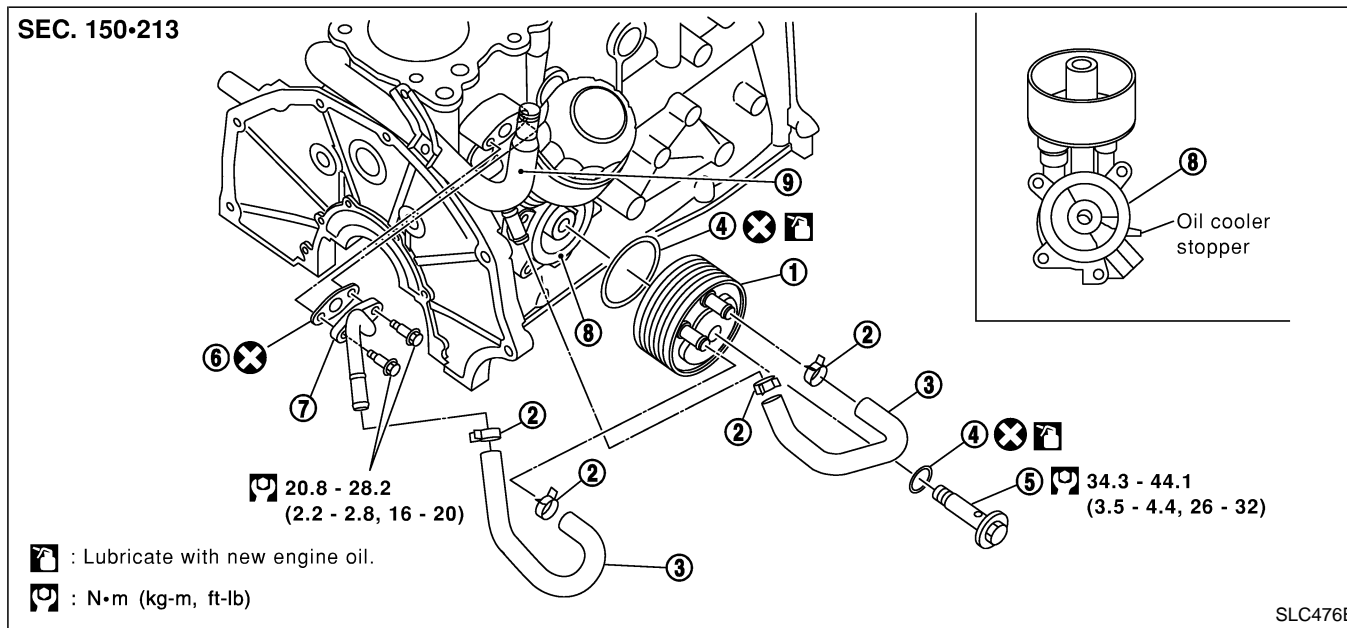
### INSTALLATION

1. Completely remove all foreign objects adhering to mounting surfaces (cylinder block and bracket sides).
2. Install oil filter bracket with new gasket.
3. Install oil filter. Refer to "Changing Oil Filter" in MA section.

### OIL FILTER

The oil filter is an element type. Refer to "Changing Oil Filter" in MA section.

## Oil Cooler



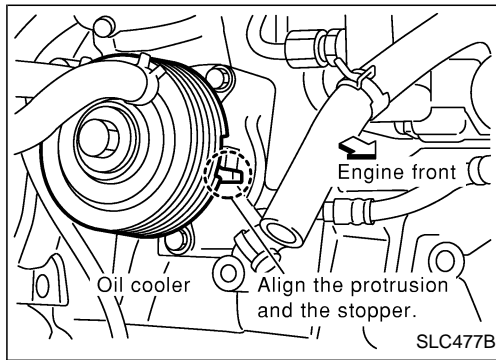
1. Oil cooler
2. Clamp
3. Water hose
4. O-ring

5. Connecting bolt
6. Gasket
7. Water hose connector

8. Oil filter bracket
9. Heater pipe

### REMOVAL AND INSTALLATION

1. Draining the coolant  
Refer to "Changing Engine Coolant" in MA section.

**Oil Cooler (Cont'd)**

2. 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.



## Overheating Cause Analysis

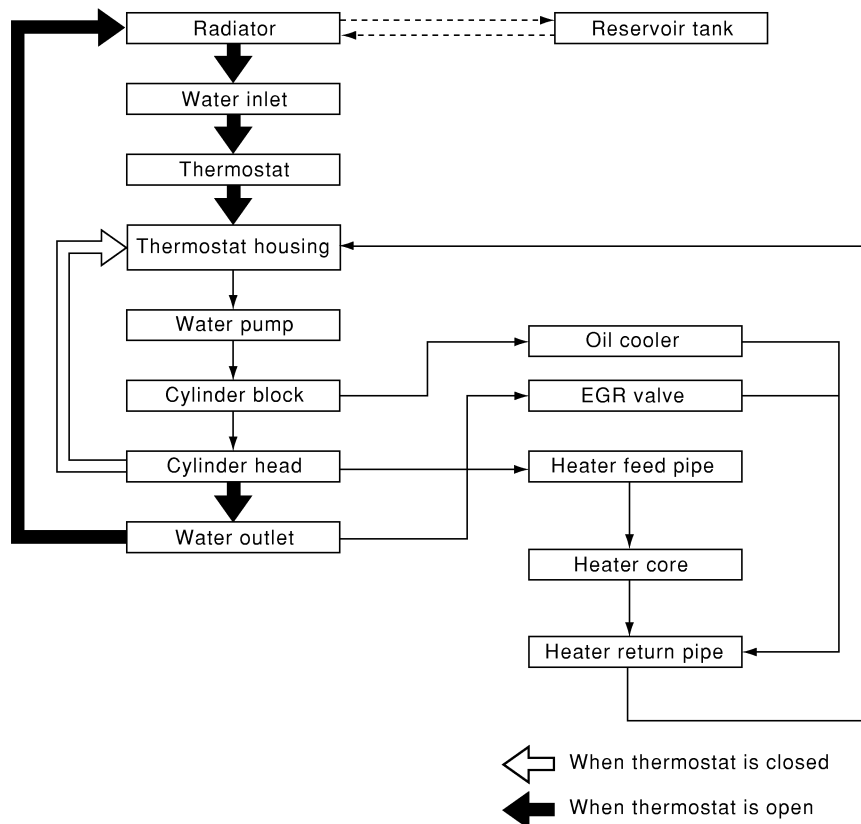
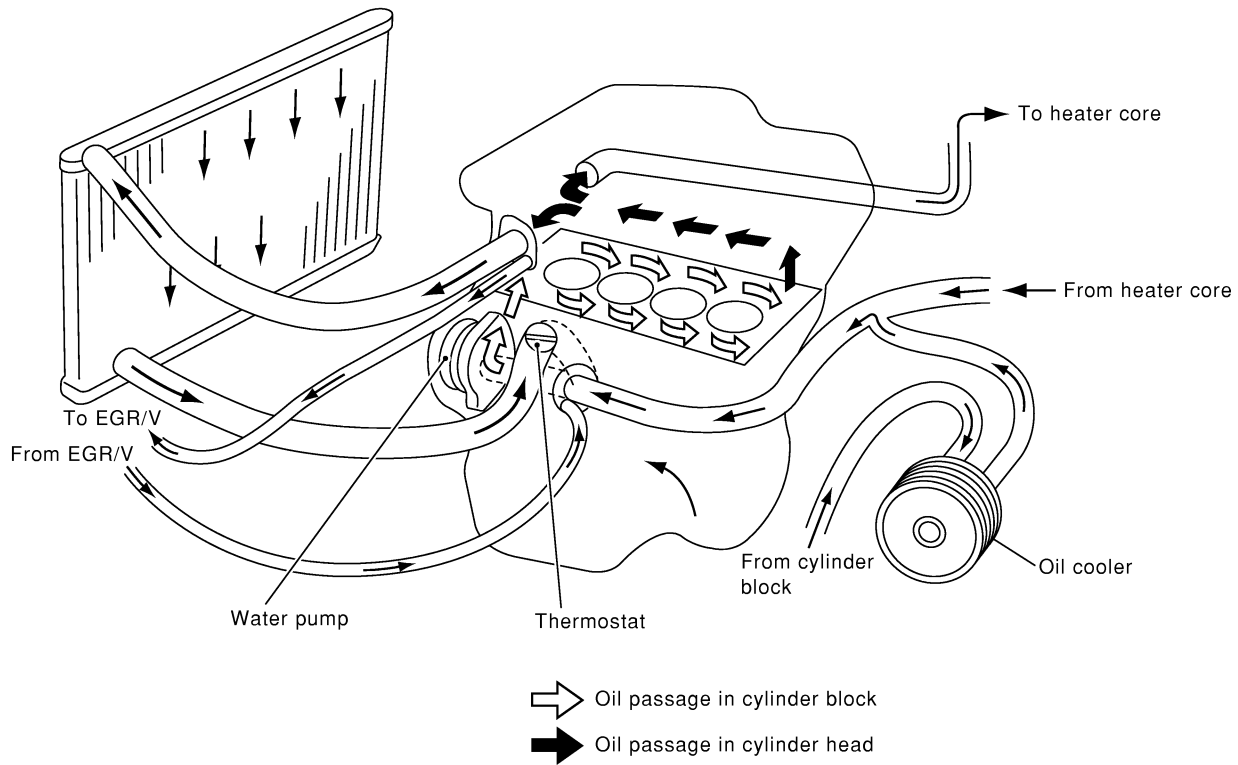
### TROUBLESHOOTING CHART

	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
			Power train 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		

## Cooling Circuit

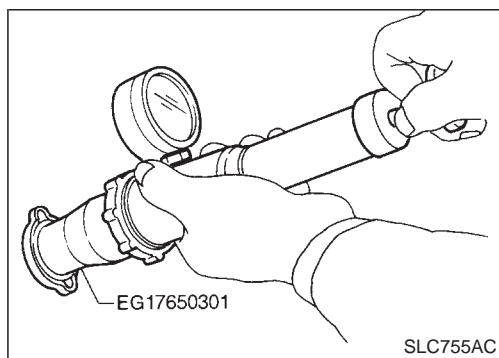


## System Check

### **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 RADIATOR CAP

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

#### Radiator cap relief pressure:

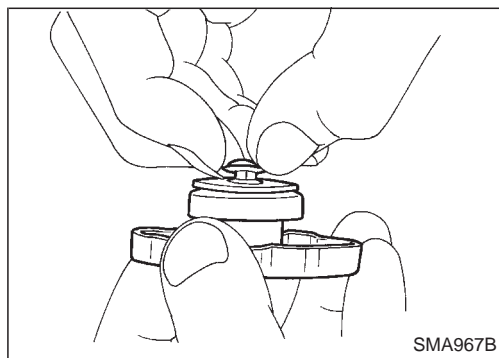
##### Standard

78 - 98 kPa

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

##### Limit

59 kPa (0.59 bar, 0.6 kg/cm<sup>2</sup>, 9 psi)



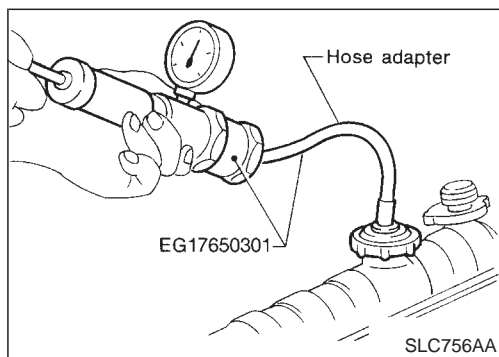
Pull the negative pressure valve to open it.

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

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

#### Testing pressure:

157 kPa (1.57 bar, 1.6 kg/cm<sup>2</sup>, 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.

## System Check (Cont'd)

- If any abnormalities are found, repair or replace the malfunctioning parts.

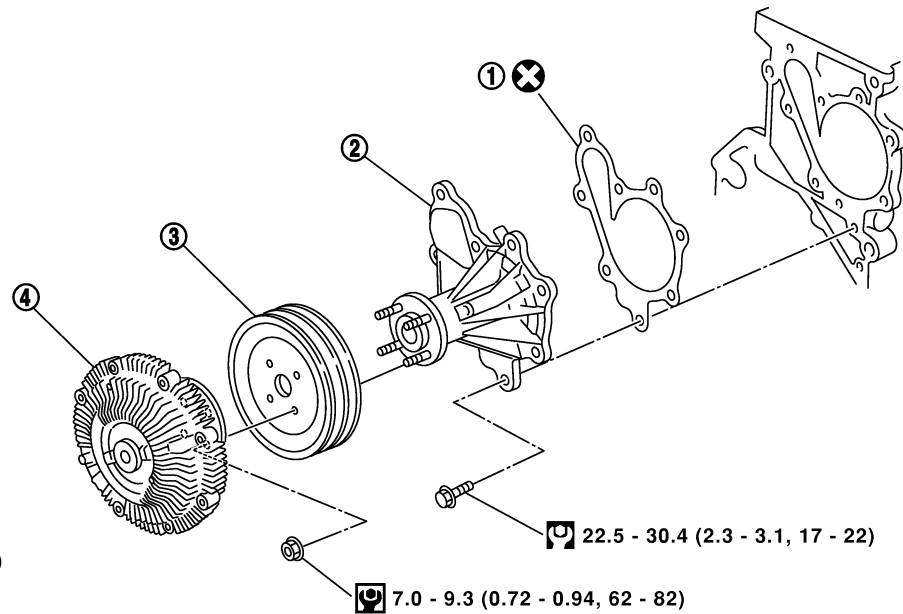
## Water Pump

## REMOVAL AND INSTALLATION

**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.

SEC. 210



SLC479B

1. Gasket
2. Water pump

3. Water pump pulley

4. Coupling

**REMOVAL**

1. Drain engine coolant. Refer to "Changing Engine Coolant" in MA section.
2. Remove radiator shroud.
3. Remove cooling fan and coupling.
4. Remove drive belts. Refer to "Drive Belts" in EM section.
5. Remove the water pump pulley.
6. Remove the water pump.

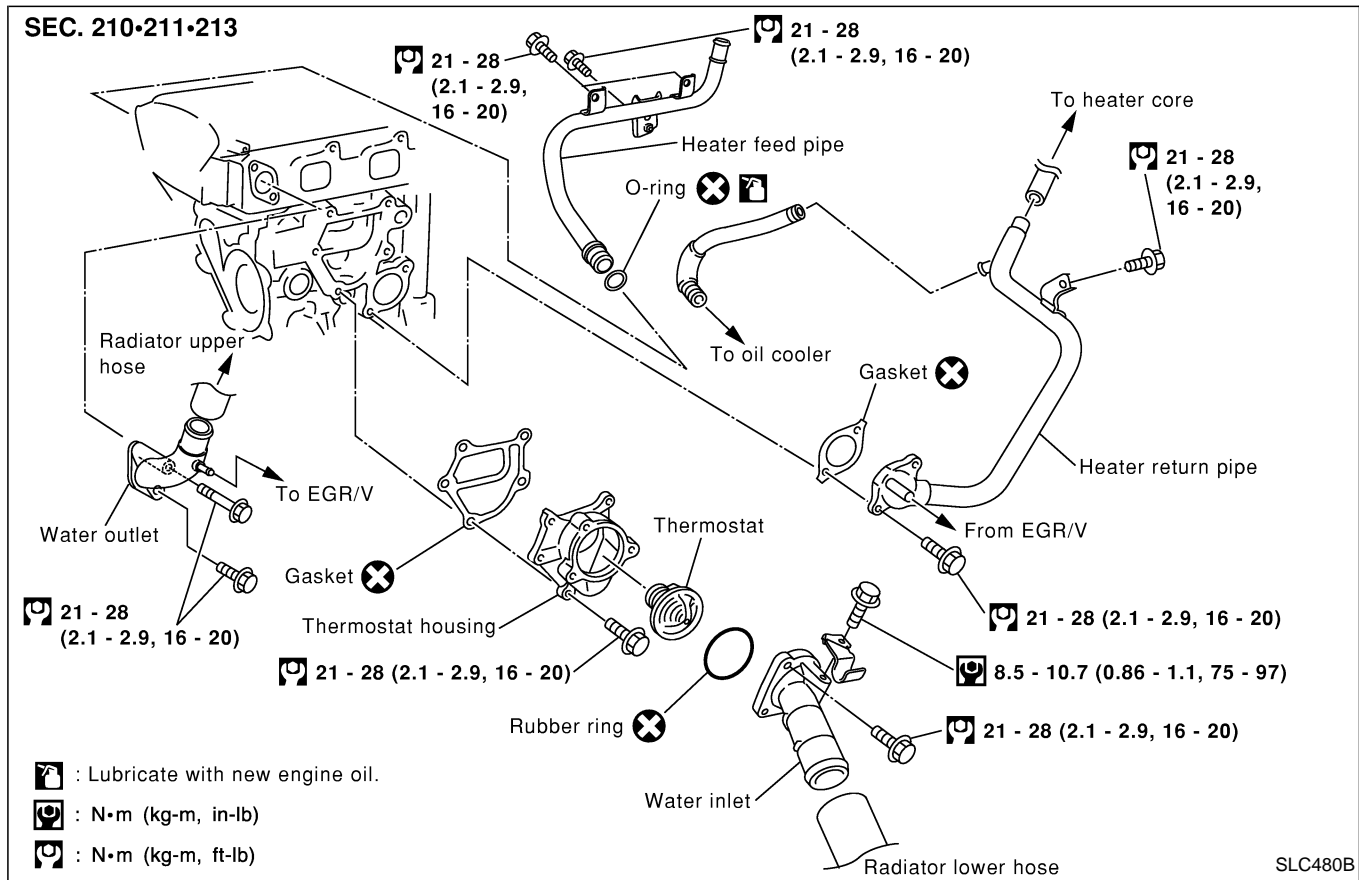
**INSPECTION**

- 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.

**CAUTION:****Do not disassemble cooling fan coupling.****INSTALLATION**

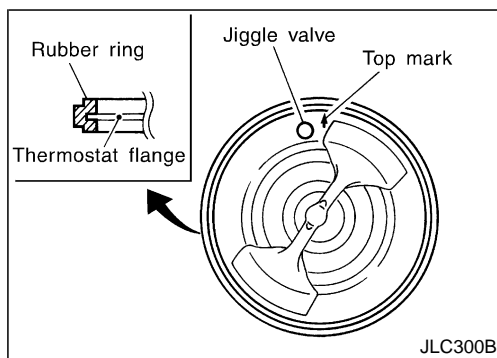
- Install the parts in the reverse order of removal.
- Install the water pump pulley with the front mark (painted white, used to prevent errors during assembly) facing the front of the engine. Refer to the figure above.

## Thermostat and Water Piping REMOVAL AND INSTALLATION



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

1. Drain engine coolant. Refer to "Changing Engine Coolant" in MA section.
2. Remove water inlet.
3. Remove thermostat.



4. 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.
5. After installation and refilling coolant, run engine for a few minutes, and check for leaks.

## Thermostat and Water Piping (Cont'd)

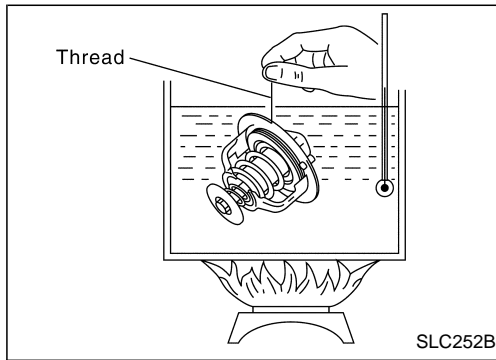
## INSPECTION

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 - 84°C (176 - 183°F)
Valve lift	More than 10 mm/95°C (0.39 in/203°F)

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

## Radiator



GI

MA

EM

LC

EC

FE

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FA

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BR

ST

RS

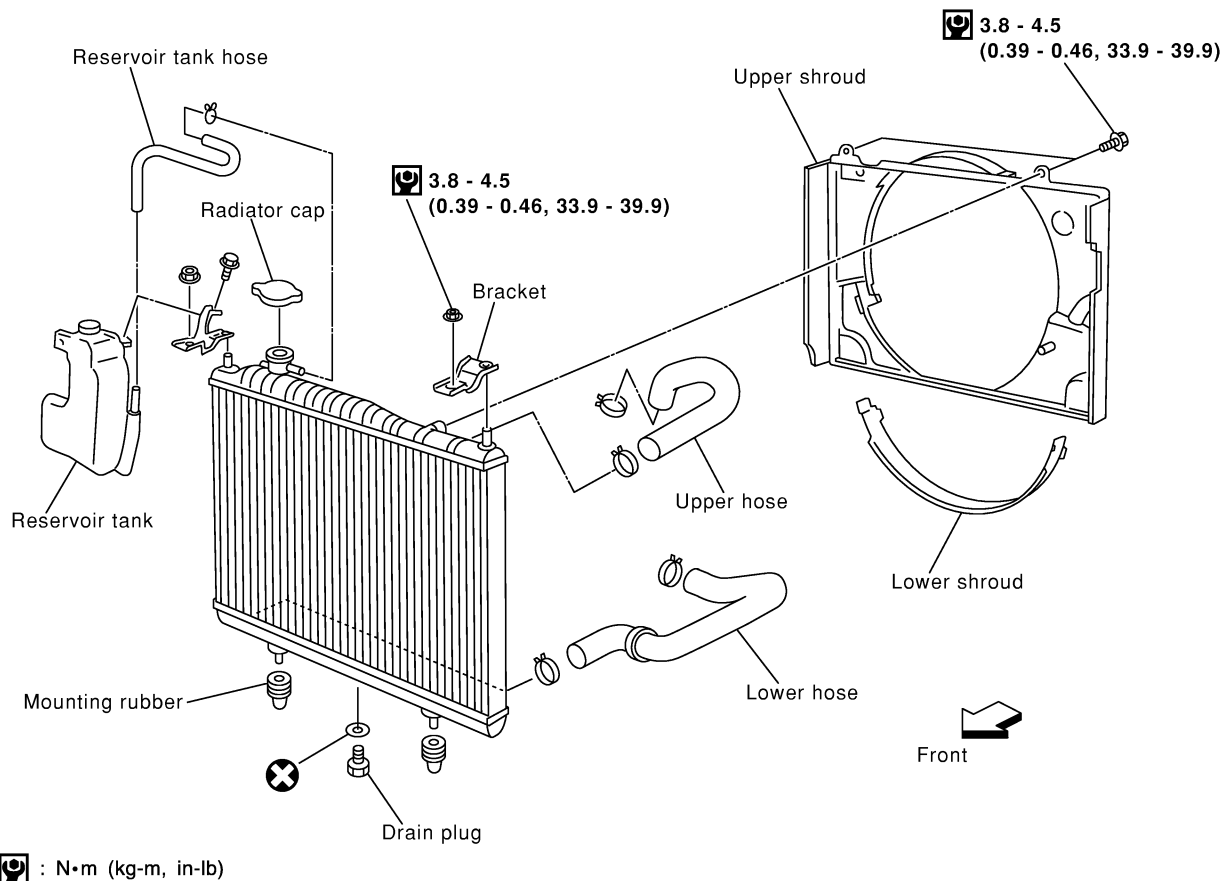
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## SEC. 214



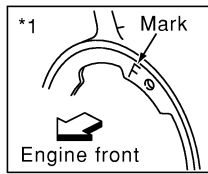
## REMOVAL AND INSTALLATION

1. Remove under guard.
2. Drain engine coolant. Refer to MA section, "Changing Engine Coolant".
3. Remove radiator shroud (lower).
4. Remove radiator shroud (upper).
5. Disconnect radiator hose (upper and lower).
6. Disconnect reservoir tank hose.
7. Remove radiator.
8. After repairing or replacing radiator, install all removed parts in reverse order of removal.

## Cooling Fan (Crankshaft driven)

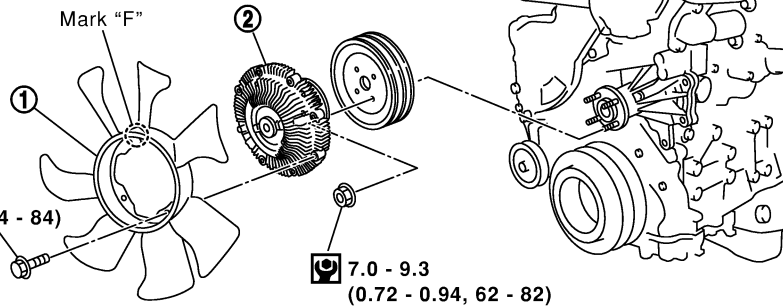
### DISASSEMBLY AND INSTALLATION

## SEC. 210-214



7.2 - 9.6  
(0.74 - 0.97, 64 - 84)

: N·m (kg-m, in-lb)



SLC482B

1. Cooling fan

2. Coupling

- Do not release the drive belt tension by removing the fan/water pump pulley.
- Fan coupling cannot be disassembled and should be replaced as a unit. If front mark (F) is present, install fan so that side marked (F) faces the front.
- Proper alignment of these components is essential. Improper alignment will cause them to wobble and may eventually cause the fan to separate from the water pump causing extensive damage.

## Cooling Fan (Motor driven)

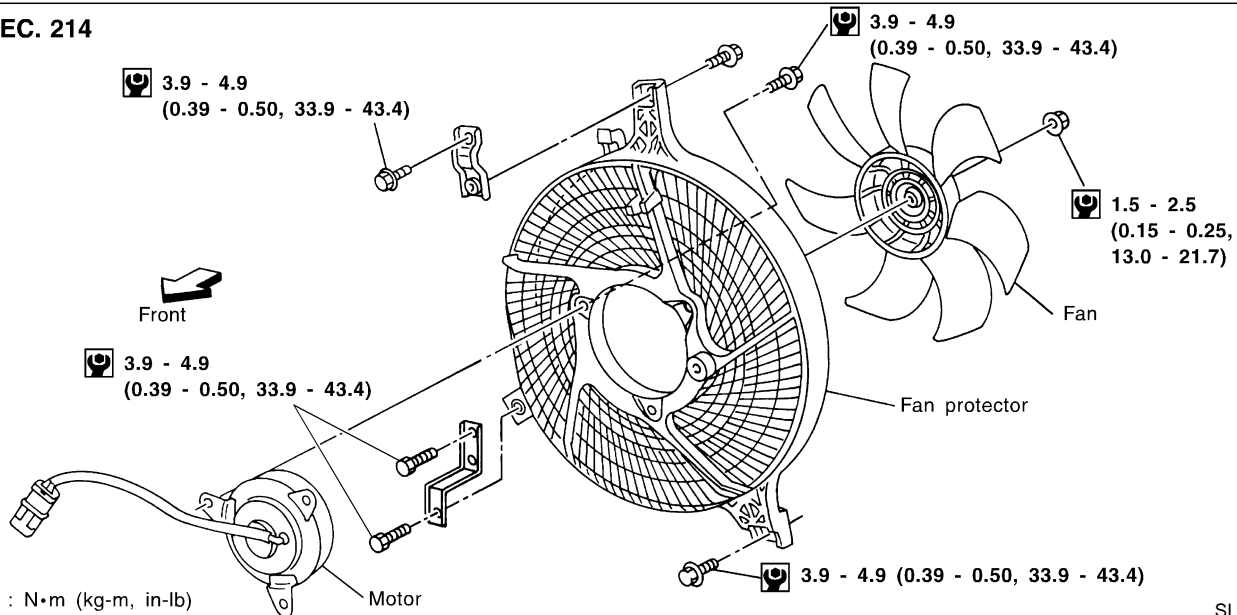
## SEC. 214

3.9 - 4.9  
(0.39 - 0.50, 33.9 - 43.4)



3.9 - 4.9  
(0.39 - 0.50, 33.9 - 43.4)

: N·m (kg-m, in-lb)



SLC460BA

## REMOVAL AND INSTALLATION

- Remove front grille.
- Disconnect harness connector from fan motor.
- Remove cooling fan.

### CAUTION:

Take care to avoid scratching or damaging the air conditioner condenser.

- Install in the reverse order of removal.



Cooling Fan (Motor driven) (Cont'd)  
COOLING FAN CONTROL SYSTEM

Cooling fan is controlled by ECM. For details, refer to EC section, "DTC 0208 OVERHEAT".

GI

MA

EM

LC

EC

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PD

FA

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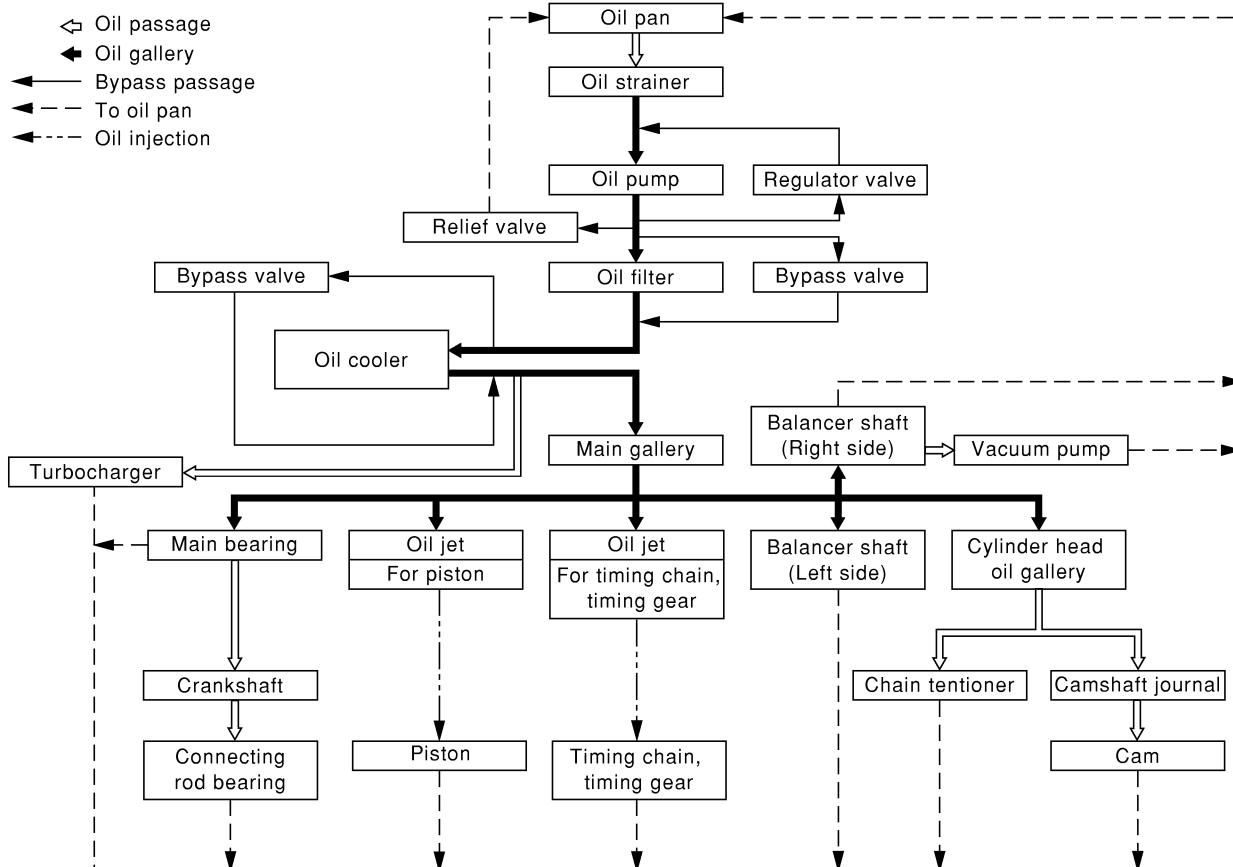
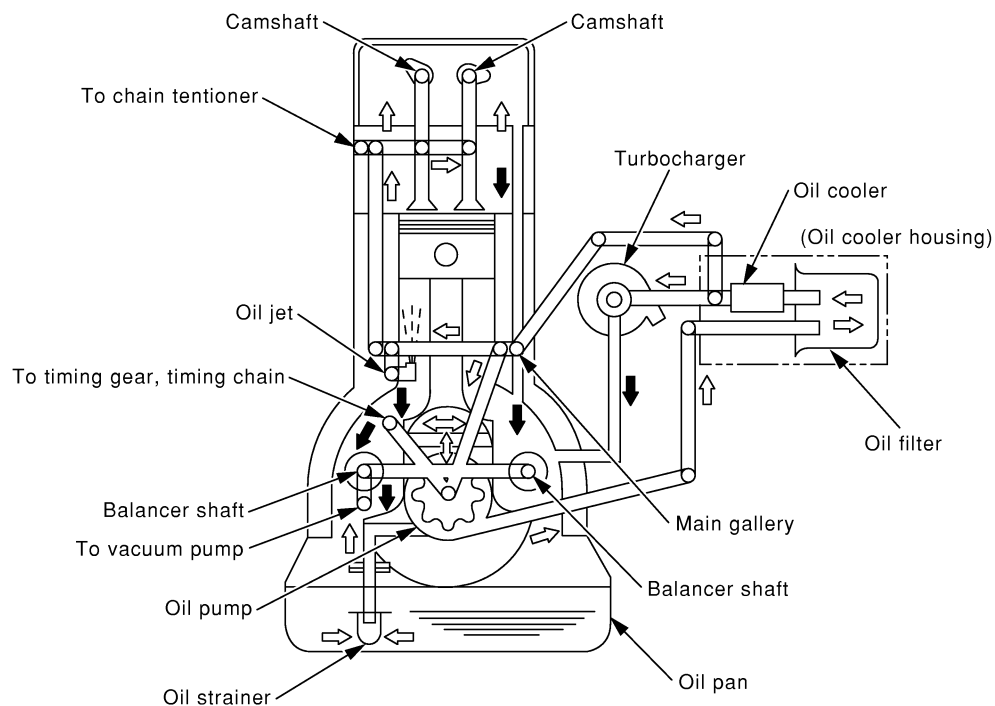
BT

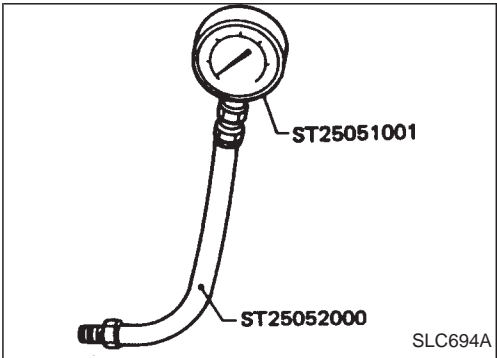
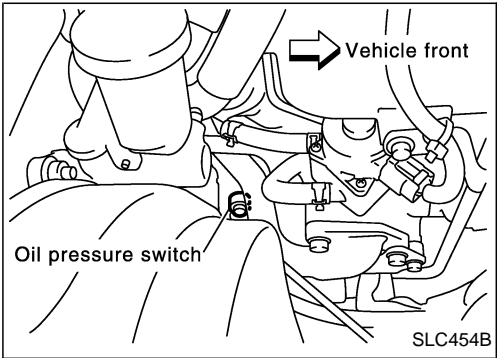
HA

EL

IDX

## Lubricating Circuit





Oil Pressure Check

**WARNING:**

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

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm <sup>2</sup> , psi)
Idle speed	More than 98 (0.98, 1.0, 14)
2,000	More than 196 (1.96, 2.0, 28)
3,400	More than 324 (3.24, 3.3, 47)

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

6. Install oil pressure switch with sealant.

**Oil pressure switch:**

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

GI

MA

EM

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EC

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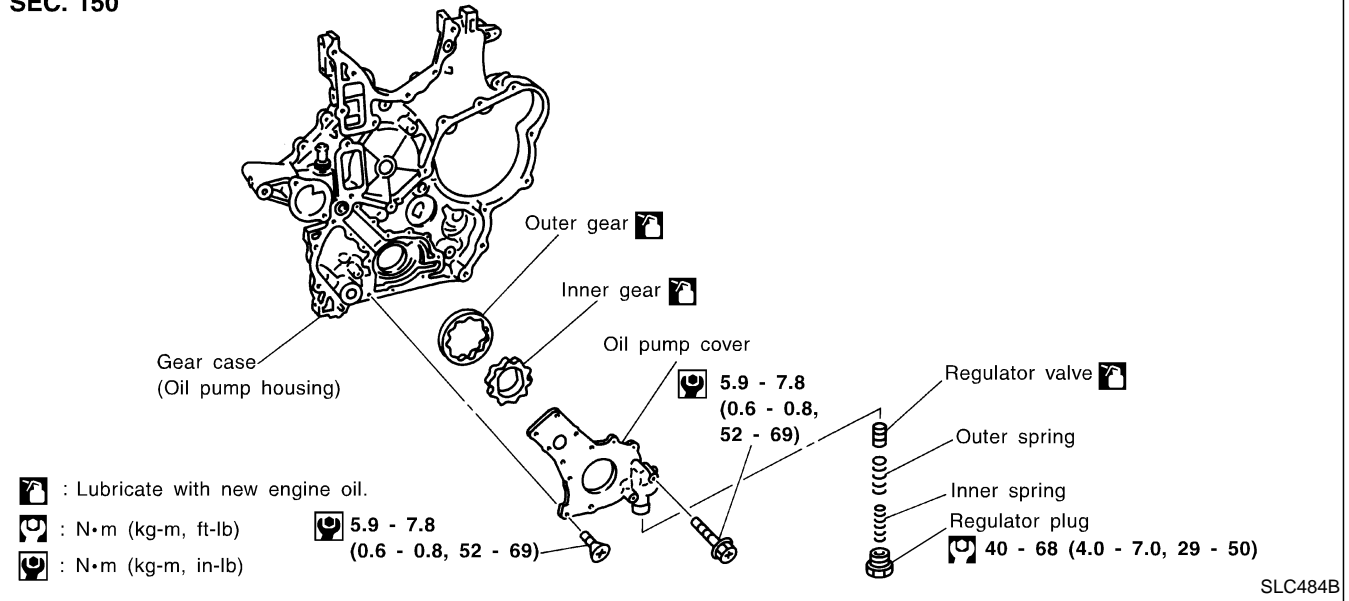
## Oil Pump

## REMOVAL AND INSTALLATION

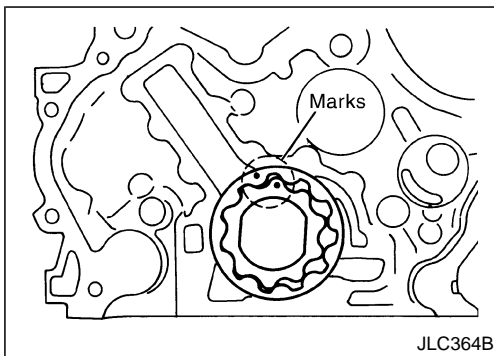
Refer to "TIMING GEAR" in EM section.

## DISASSEMBLY AND ASSEMBLY

SEC. 150



- When installing oil pump, apply new engine oil to gears.



- When installing the inner and outer gear, face mating mark toward the oil pump cover as shown (left).

## Oil Pump (Cont'd)

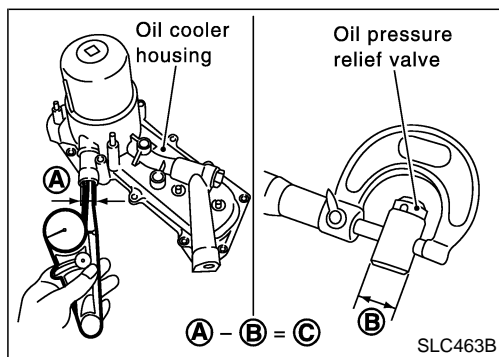
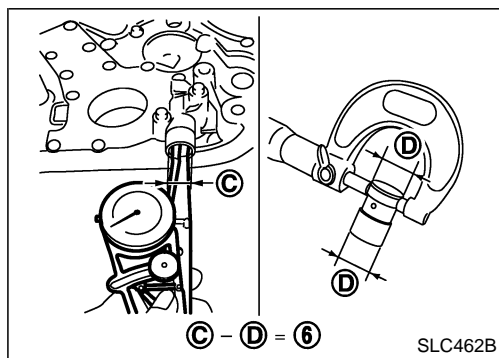
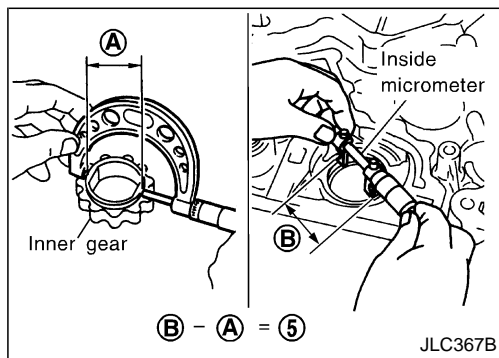
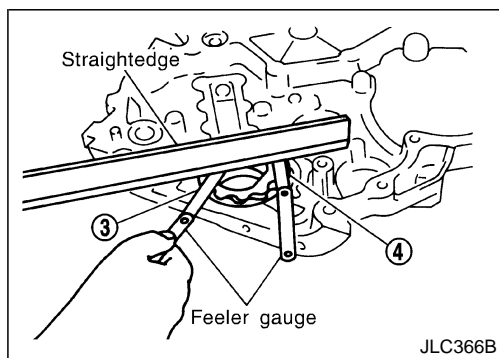
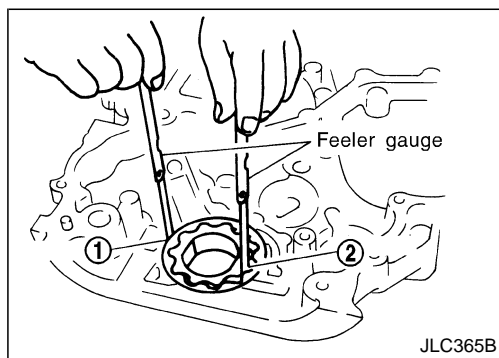
## OIL PUMP INSPECTION

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

Unit: mm (in)

Body to outer gear radial clearance ①	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance ②	Less than 0.180 (0.0071)
Body to inner gear axial clearance ③	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear axial clearance ④	0.050 - 0.105 (0.0020 - 0.0041)
Inner gear to brazed portion of housing clearance ⑤	0.045 - 0.091 (0.0018 - 0.0036)

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



## REGULATOR VALVE INSPECTION

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 cover.

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.

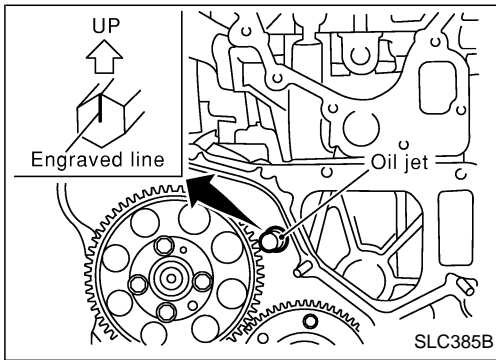
## OIL PRESSURE RELIEF VALVE AND BYPASS VALVE INSPECTION (For oil cooler)

1. Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with suitable tool. Install a new valve in place by tapping it.
2. Check oil pressure relief valve to oil cooler housing clearance.

Clearance:

⑦ : 0.032 - 0.068 mm (0.0013 - 0.0027 in)

If it exceeds the limit, replace oil cooler housing.

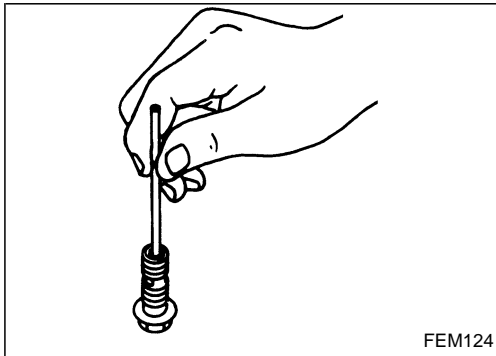


## Oil Jet

### INSPECTION (For timing chain)

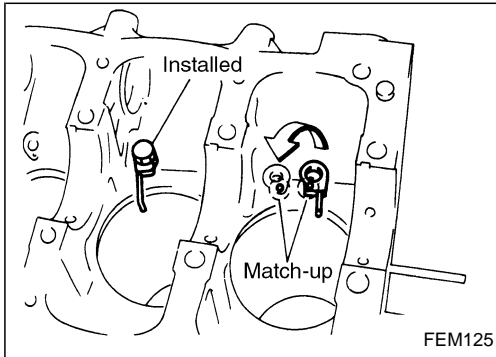
Make sure that the holes are not clogged. Clean them with a wire if necessary.

Drive oil jet into place after positioning alignment mark on.




### INSPECTION (For piston)

1. Push cut-off valve of oil jet bolt with a clean resin or brass rod and make sure that cut-off valve moves smoothly with proper repulsion.
2. Make sure that the oil jet passage is not clogged. Clean with a wire if necessary.



When installing oil jet, align oil jet's boss with hole on cylinder block.

Oil jet:

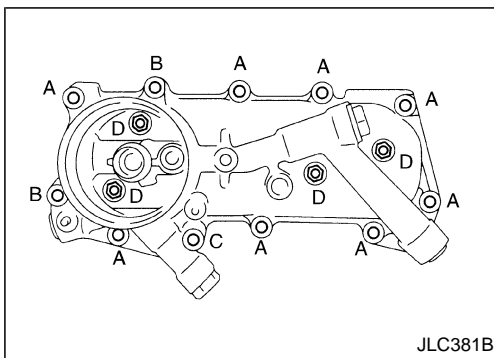
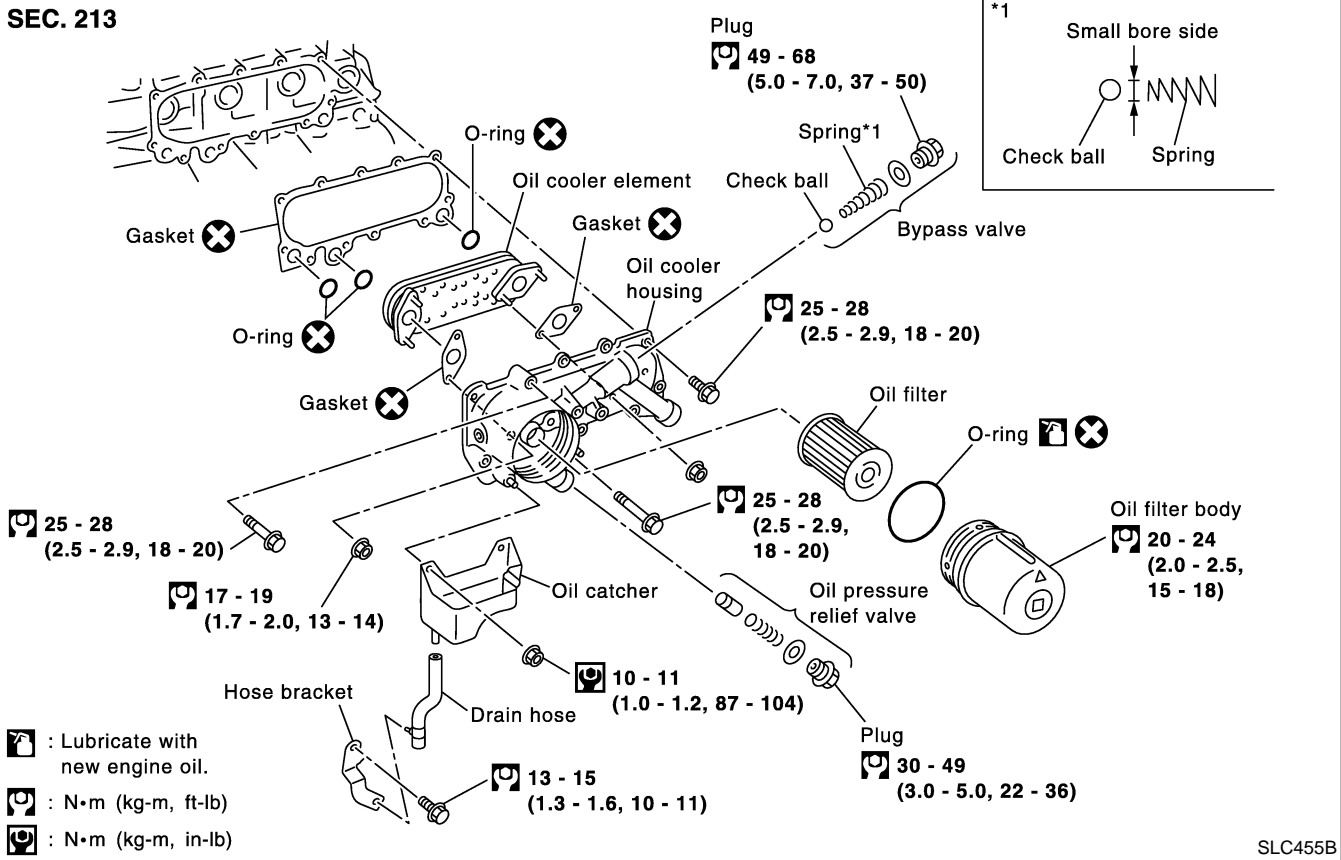
: 30 - 39 N·m (3.0 - 4.0 kg-m, 22 - 28 ft-lb)

## Oil Filter

The oil filter is an element type. Refer to "Changing Oil Filter" in MA section.

## Oil Cooler

## SEC. 213



## REMOVAL AND INSTALLATION

1. Drain engine oil and coolant. Remove catalyst and turbocharger. Refer to "CATALYST AND TURBOCHARGER" in EM section.
2. Remove bolts A to C then remove oil cooler assembly.
  - **Do not remove "D" nuts when removing oil cooler assembly.**

## Bolt length:

A: 20 mm (0.79 in)

B: 55 mm (2.17 in)

C: 70 mm (2.76 in)

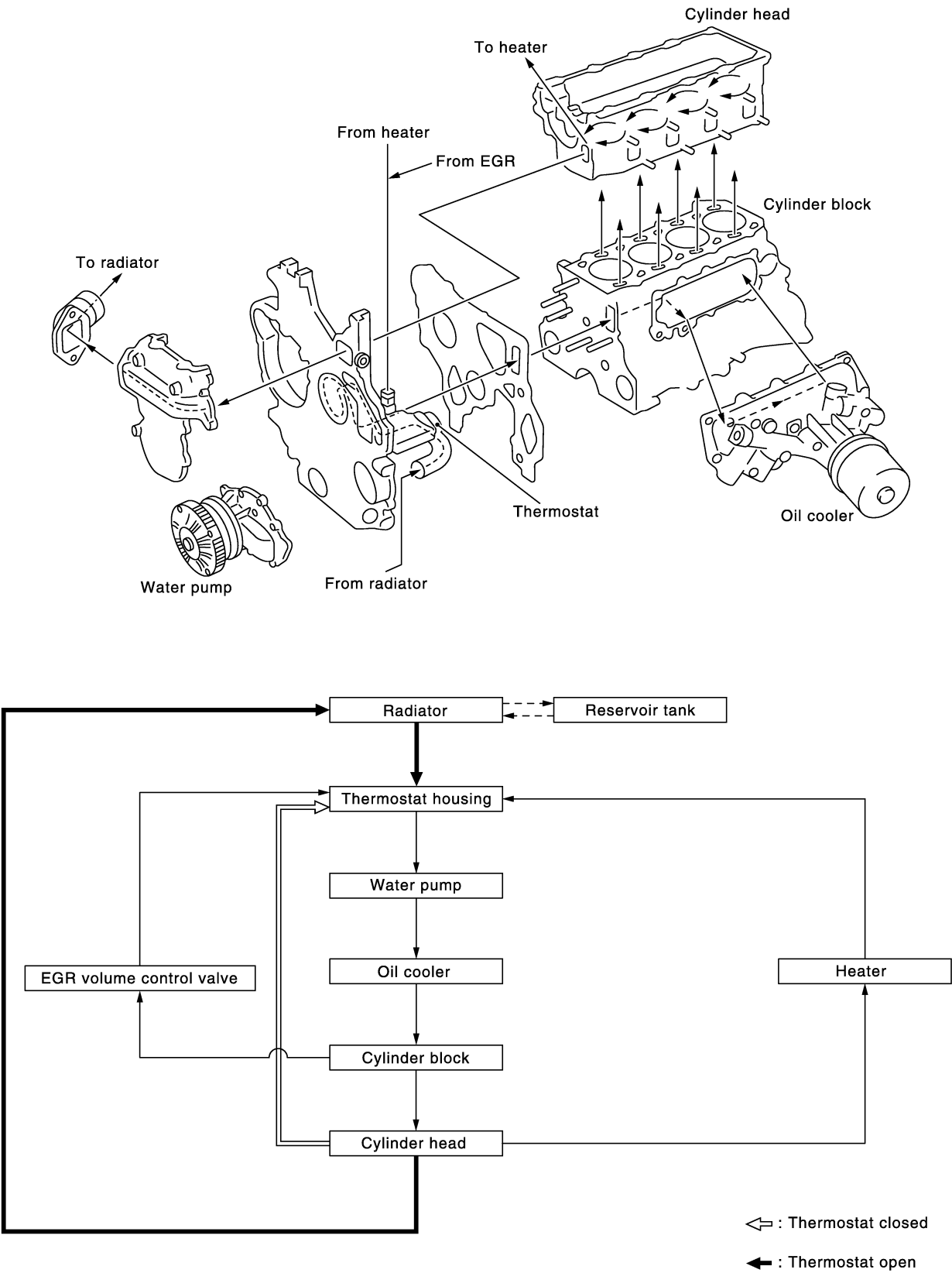
3. Installation is in reverse order of removal.

- **Do not spill coolant on the drive belt.**

## INSPECTION

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

Cooling Circuit





## System Check

### **WARNING:**

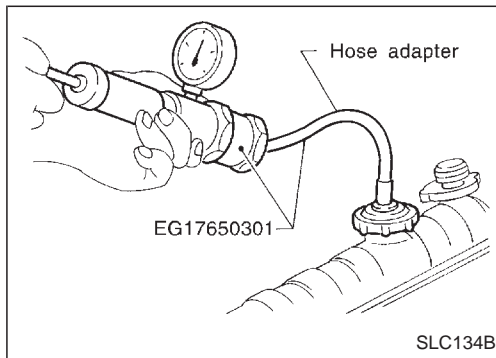
Never remove the radiator cap when the engine is hot. Serious burns could occur from high pressure coolant escaping from the radiator.

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

Check hoses for the following:

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



## CHECKING COOLING SYSTEM FOR LEAKS

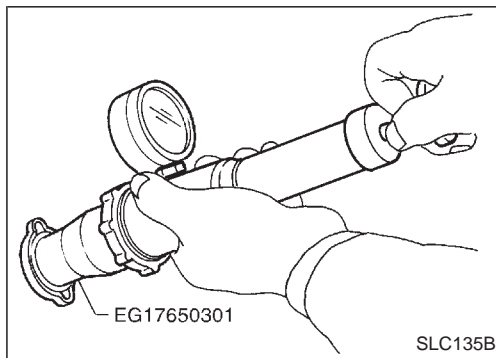
To check for leakage, apply pressure to the cooling system with a tester.

**Testing pressure:**

157 kPa (1.57 bar, 1.6 kg/cm<sup>2</sup>, 23 psi)

### **CAUTION:**

Higher pressure than specified may cause radiator damage.



## CHECKING RADIATOR CAP

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

**Radiator cap relief pressure:**

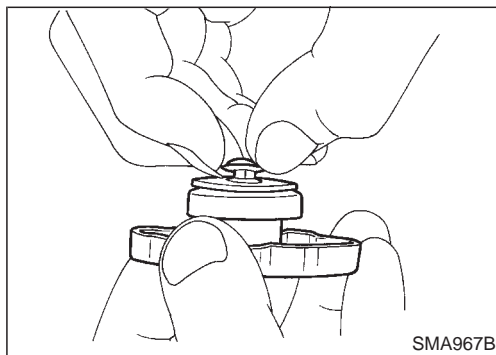
**Standard**

78 - 98 kPa

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

**Limit**

59 kPa (0.59 bar, 0.6 kg/cm<sup>2</sup>, 9 psi)

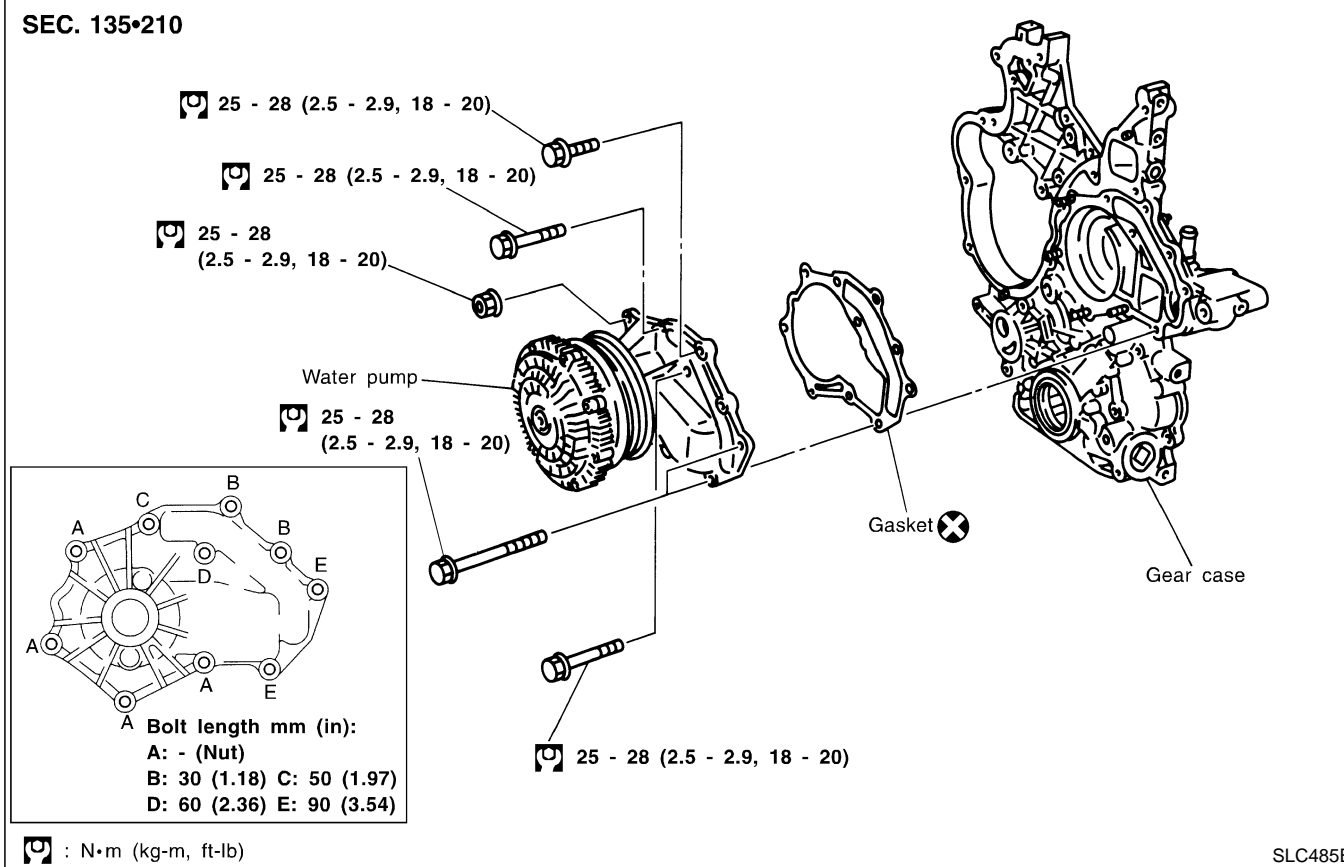


## Water Pump

### 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.
- Always replace with new gasket.
- After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester. Refer to LC-25.

### SEC. 135•210



## REMOVAL AND INSTALLATION

1. Drain coolant from radiator and cylinder block. Refer to MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE").
2. Remove radiator upper hose.
3. Remove radiator shroud.
4. Remove cooling fan.
5. Remove drive belt. Refer to MA section, "Checking Drive Belt".
6. Remove insulator.
7. Remove TDC sensor. Refer to "TDC sensor removal and installation", "TIMING GEAR" in EM section.
8. Remove fan coupling with water pump.
9. Install in the reverse order of removal.

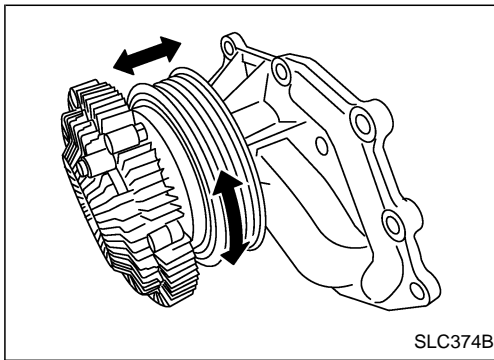
## Water Pump (Cont'd)

### INSPECTION

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

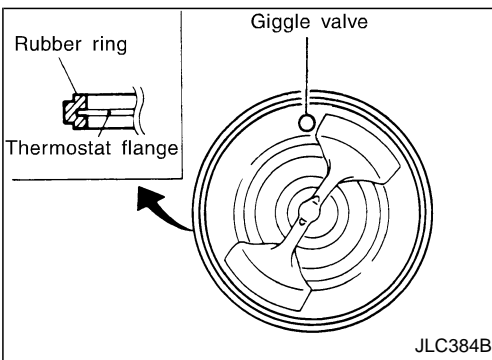
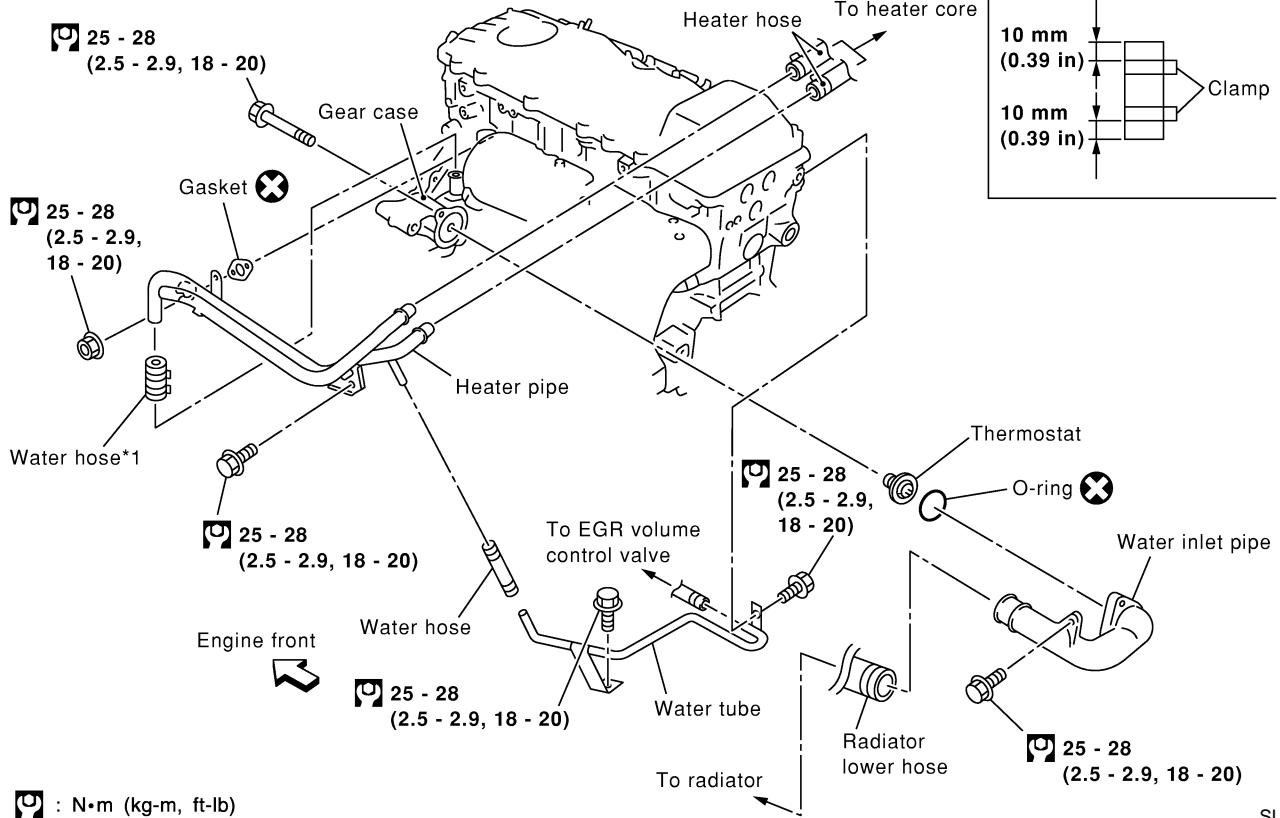
### CAUTION:

Do not disassemble water pump coupling assembly.



## Thermostat

### SEC. 210-211



## REMOVAL AND INSTALLATION

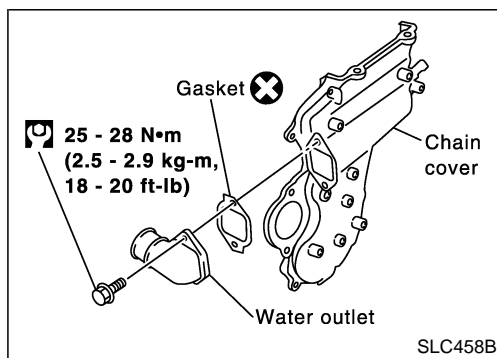
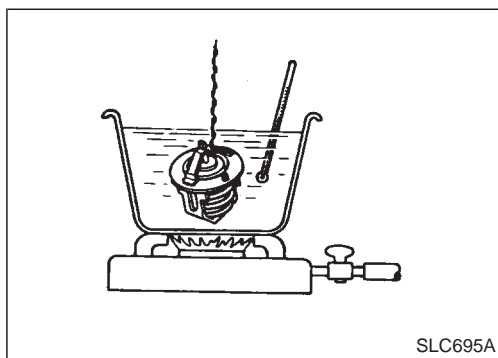
1. Drain engine coolant. Refer to MA section, "Changing Engine Coolant".
  2. Remove left side battery. (If so equipped)
  3. Remove radiator upper hose.
  4. Remove radiator shroud.
  5. Remove intake air duct, inlet pipe.
  6. Remove harness and connectors.
  7. Install in reverse order of removal.
- Place rubber ring securely around entire circumference of thermostat flange. Install thermostat so that jiggle valve faces upward.
  - After installation, run engine for a few minutes and check for leaks.
  - Be careful not to spill coolant in engine compartment. Use a rag to absorb coolant.

**Thermostat (Cont'd)****INSPECTION**

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

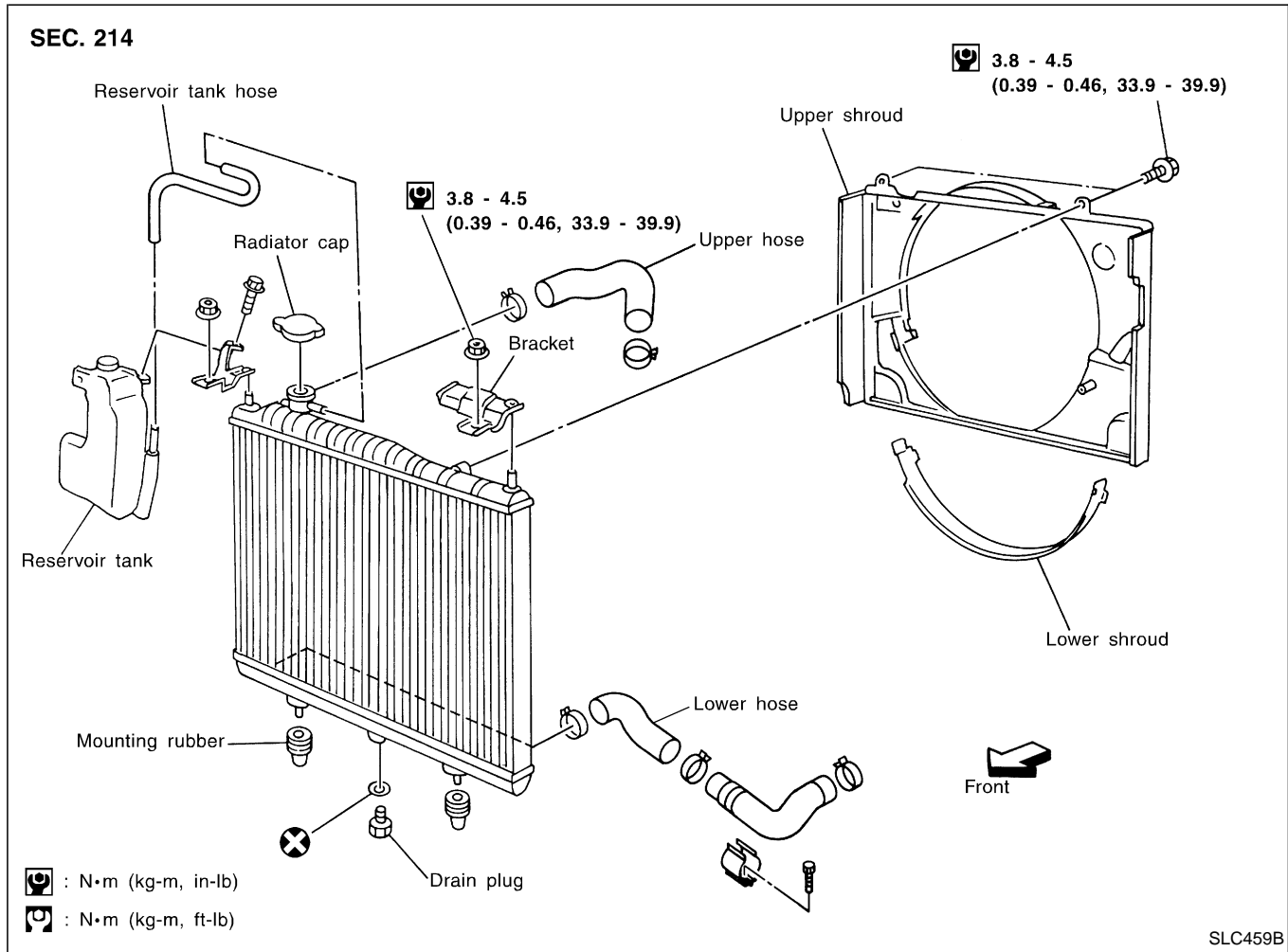
Valve opening temperature	°C (°F)	82 (180)
Maximum valve lift	mm/°C (in/°F)	10/95 (0.39/203)

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

**Water Outlet****INSPECTION**

Visual inspection for water leaks. If there is leakage, replace gasket.

## Radiator



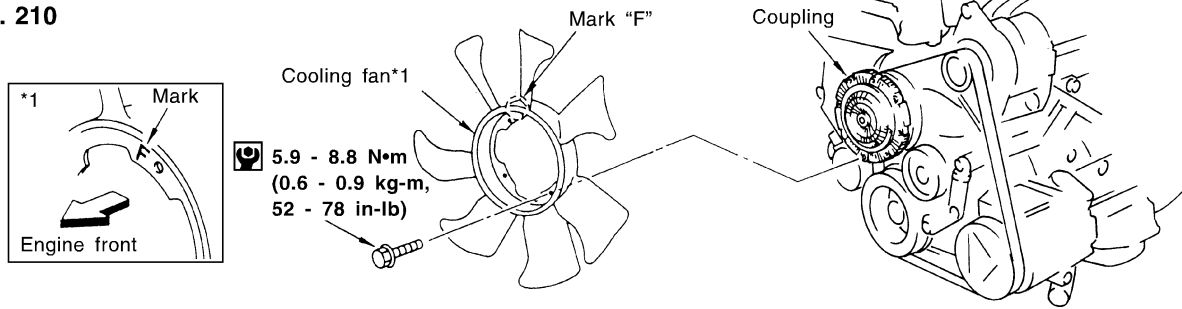
## REMOVAL AND INSTALLATION

1. Remove under guard.
2. Drain engine coolant. Refer to MA section, "Changing Engine Coolant".
3. Remove radiator shroud (lower).
4. Remove radiator shroud (front).
5. Disconnect radiator hose (upper and lower).
6. Disconnect reservoir tank hose.
7. Remove radiator.
8. After repairing or replacing radiator, install all removed parts in reverse order of removal.

## Cooling Fan (Crankshaft driven)

## DISASSEMBLY AND INSTALLATION

## SEC. 210

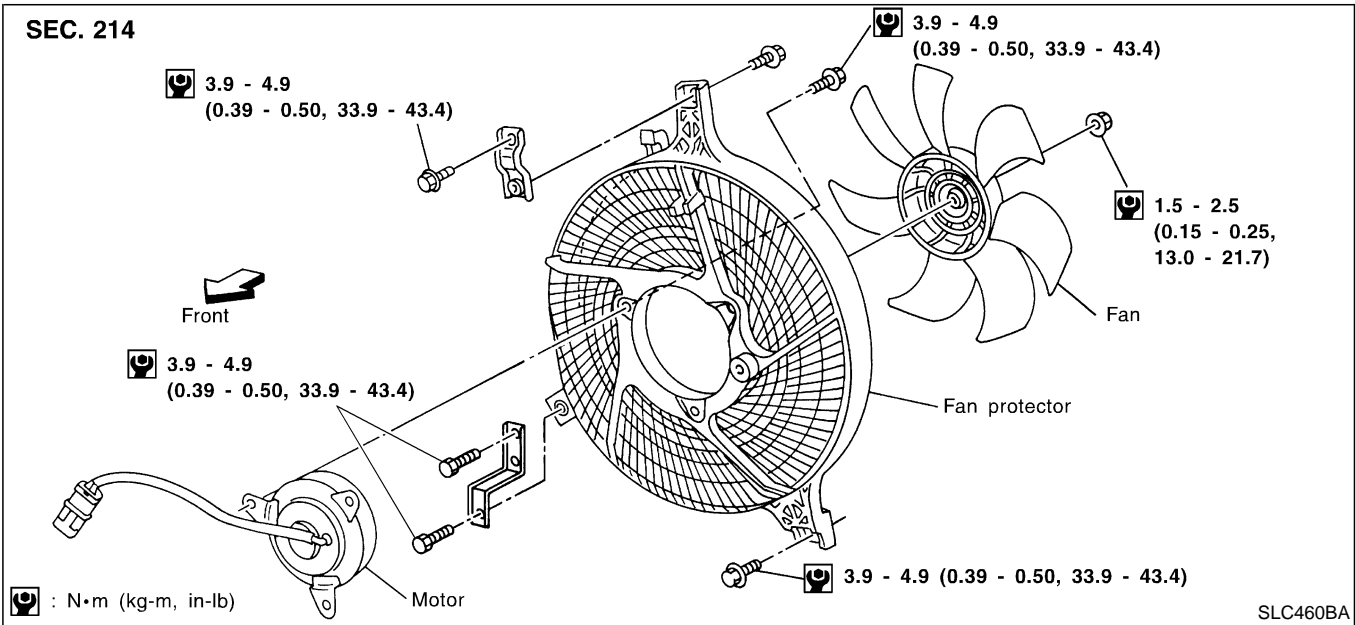


JLC379B

- Do not release the drive belt tension by removing the fan/water pump pulley.
- Fan coupling cannot be disassembled and should be replaced as a unit. If front mark  $\textcircled{F}$  is present, install fan so that side marked  $\textcircled{F}$  faces the front.
- Proper alignment of these components is essential. Improper alignment will cause them to wobble and may eventually cause the fan to separate from the water pump causing extensive damage.

## Cooling Fan (Motor driven)

## SEC. 214



SLC460BA

## REMOVAL AND INSTALLATION

1. Remove front grille.
2. Disconnect harness connector from fan motor.
3. Remove cooling fan.

**CAUTION:**

Take care to avoid scratching or damaging the air conditioner condenser.

4. Install in the reverse order of removal.

Cooling Fan (Motor driven) (Cont'd)  
COOLING FAN CONTROL SYSTEM

Cooling fan is controlled by ECM. For details, refer to EC section, "DTC 0208 OVERHEAT".

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

EL

IDX

## SERVICE DATA AND SPECIFICATIONS (SDS)

### Engine Lubrication System (YD engine)

#### OIL PRESSURE CHECK

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm <sup>2</sup> , 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)

#### OIL PUMP

Unit: mm (in)

Housing to outer rotor radial clearance <b>1</b>	0.114 - 0.260 (0.0045 - 0.0102)
Inner rotor to outer rotor tip clearance <b>2</b>	Below 0.180 (0.0071)
Housing to inner rotor axial clearance <b>3</b>	0.050 - 0.090 (0.0020 - 0.0035)
Housing to outer rotor axial clearance <b>4</b>	0.030 - 0.190 (0.0012 - 0.0075)
Inner rotor to brazed portion of housing clearance <b>5</b>	0.045 - 0.091 (0.0018 - 0.0036)

#### OIL PUMP REGULATOR VALVE

Unit: mm (in)

Regulator valve to oil pump cover clearance <b>6</b>	0.040 - 0.097 (0.0016 - 0.0038)
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### Engine Cooling System (YD engine)

#### RADIATOR

Unit: kPa (bar, kg/cm<sup>2</sup>, psi)

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

#### THERMOSTAT

Valve opening temperature	Above 80 - 84°C (176 - 183°F)
Valve lift	More than 10 mm/95°C (0.394 in/203°F)



## SERVICE DATA AND SPECIFICATIONS (SDS)

### Engine Lubrication System (ZD engine)

#### OIL PRESSURE CHECK

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm <sup>2</sup> , psi)
Idle speed	More than 98 (0.98, 1.0, 14)
2,000	More than 196 (1.96, 2.0, 28)
3,400	More than 324 (3.24, 3.3, 47)

#### OIL PUMP

Unit: mm (in)

Body to outer gear radial clearance ①	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance ②	Less than 0.180 (0.0071)
Body to inner gear axial clearance ③	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear axial clearance ④	0.050 - 0.105 (0.0020 - 0.0041)
Inner gear to brazed portion of housing clearance ⑤	0.045 - 0.091 (0.0018 - 0.0036)

#### OIL PUMP REGULATOR VALVE

Unit: mm (in)

Regulator valve to oil pump cover clearance ⑥	0.040 - 0.097 (0.0016 - 0.0038)
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### Engine Cooling System (ZD engine)

#### RADIATOR

Unit: kPa (bar, kg/cm<sup>2</sup>, psi)

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

#### THERMOSTAT

Valve opening temperature °C (°F)	82 (180)
Valve lift mm/°C (in/°F)	More than 10/95 (0.39/203)