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# SECTION LU

## ENGINE LUBRICATION SYSTEM

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# PRECAUTIONS

## PRECAUTIONS

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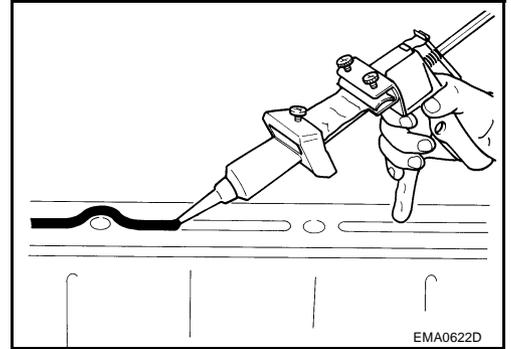
### Precautions for Liquid Gasket LIQUID GASKET APPLICATION PROCEDURE

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1. Remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
  - Remove liquid gasket completely from the liquid gasket application surface, mounting bolts, and bolt holes.
2. Wipe the liquid gasket application surface and the mating surface with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.
3. Attach liquid gasket tube to tube presser [SST: WS39930000 ( — )].

**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46. "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#) .**

- Within five minutes of liquid gasket application, install the mating component.
- If liquid gasket protrudes, wipe it off immediately.
- Do not retighten mounting bolts or nuts after the installation.
- After 30 minutes or more have passed from the installation, fill engine oil and engine coolant.



# PREPARATION

## PREPARATION

PFP:00002

### Special Service Tools

ABS00010

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

Tool number (Kent-Moore No.) Tool name	Description
ST25051001 (J25695-1) Oil pressure gauge	Measuring oil pressure <b>Maximum measuring range: 2,452 kPa (25 kg/cm<sup>2</sup> , 356 psi)</b>
ST25052000 (J25695-2) Hose	Adapting oil pressure gauge to upper oil pan (upper)
KV10115801 (J38956) Oil filter wrench	Removing oil filter <b>a: 64.3 mm (2.531 in)</b>
WS39930000 ( — ) Tube presser	Pressing the tube of liquid gasket

### Commercial Service Tools

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Tool name	Description
Deep socket	Removing and installing oil pressure switch (2WD model) <b>a: 27 mm (1.06 in)</b>
Power tool	Loosening bolts and nuts

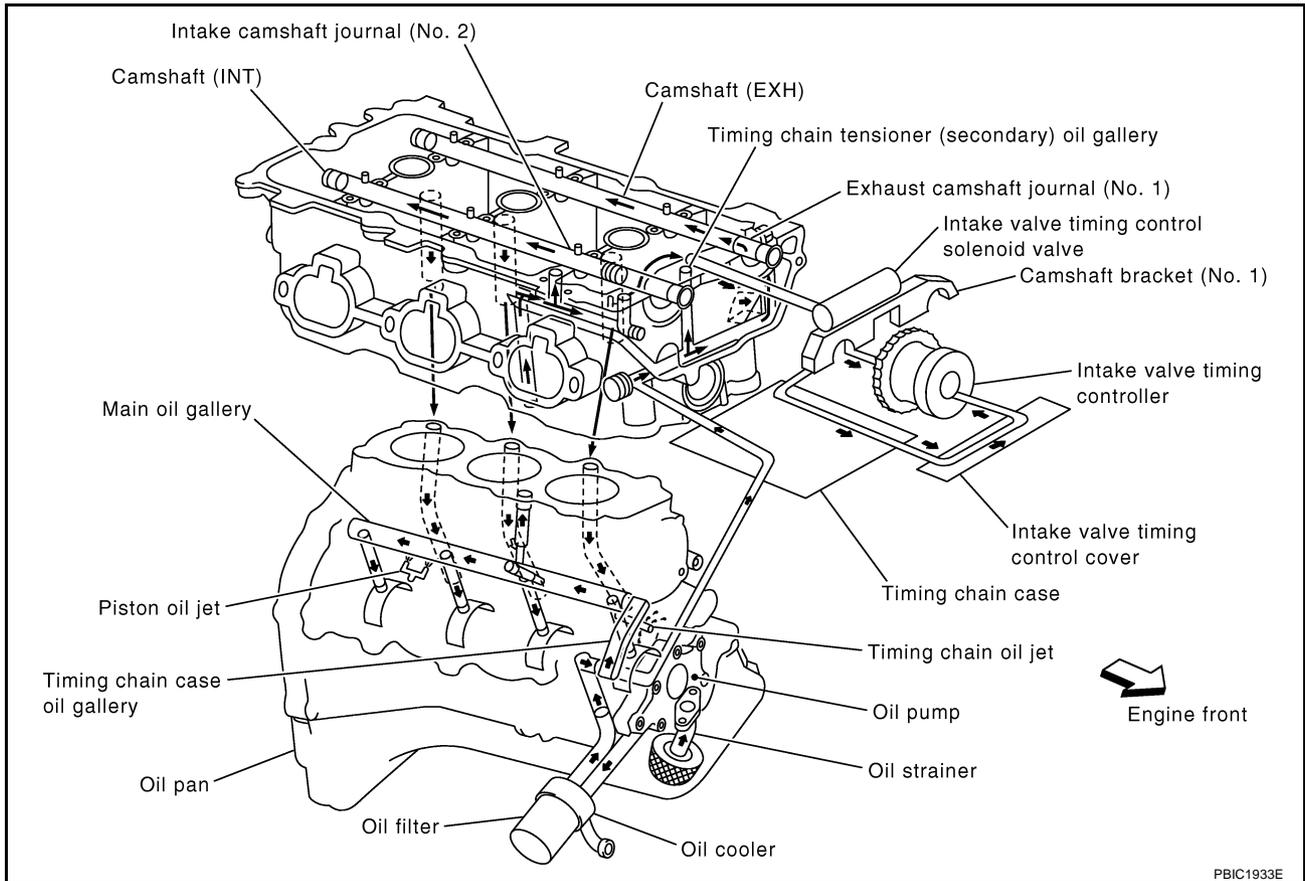
# LUBRICATION SYSTEM

## LUBRICATION SYSTEM

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### Lubrication Circuit

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# ENGINE OIL

## ENGINE OIL

PFM:KLA92

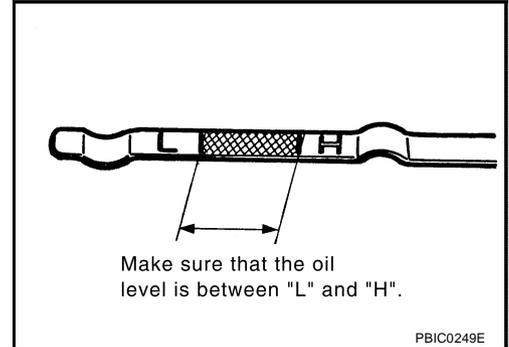
### Inspection OIL LEVEL

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#### NOTE:

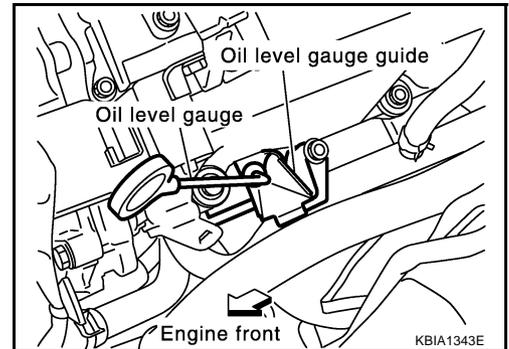
Before starting engine, put vehicle horizontally and check the oil level. If engine is already started, stop it and allow 10 minutes before checking.

1. Pull out oil level gauge and wipe it clean.
2. Insert oil level gauge and make sure the oil level is within the range shown in the figure.
3. If it is out of range, adjust it.



#### NOTE:

When checking oil level, insert oil level gauge with its tip aligned with oil level gauge guide on cylinder head. (In the figure, air cleaner case and air duct are removed.)



### OIL APPEARANCE

- Check the engine oil for white turbidity or heavy contamination.
- If the engine oil becomes turbid and white, it is highly probable that it is contaminated with engine coolant. Repair or replace damaged parts.

### OIL LEAKAGE

Check for oil leakage around the following areas:

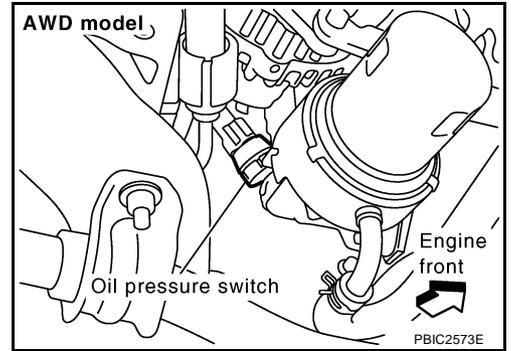
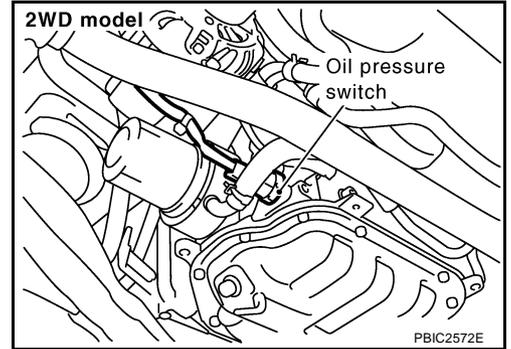
- Oil pan
- Oil pan drain plug
- Oil pressure switch
- Oil filter
- Oil cooler
- Water pump cover
- Chain tensioner cover
- Intake valve timing control cover and intake valve timing control solenoid valve
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and rocker cover
- Mating surface between front timing chain case and rear timing chain case
- Mating surface between rear timing chain case and cylinder block
- Crankshaft oil seals (front and rear)

# ENGINE OIL

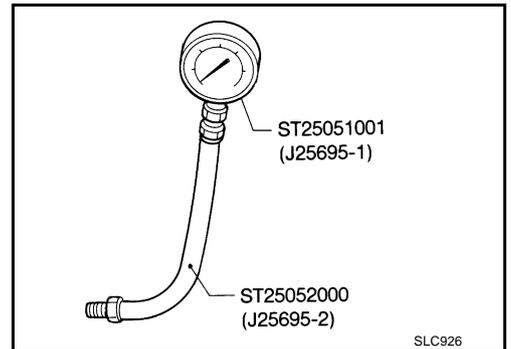
## OIL PRESSURE CHECK

### WARNING:

- Be careful not to burn yourself, as engine oil may be hot.
  - Oil pressure check should be done in “Neutral position” (M/T models) or “Parking position” (A/T models).
1. Check oil level. Refer to [LU-6, "OIL LEVEL"](#).
  2. Remove undercover with power tool.
  3. Disconnect oil pressure switch harness connector.



4. Remove oil pressure switch.
5. Install oil pressure gauge and hose (SST).



6. Start engine and warm it up to normal operating temperature.
7. Check oil pressure with engine running under no-load.

### NOTE:

When engine oil temperature is low, engine oil pressure becomes high.

### Engine oil pressure [Engine oil temperature at 80°C (176°F)]

Engine speed rpm	Approximate discharge pressure kPa (kg/cm <sup>2</sup> , psi)
Idle speed	More than 100 (1.0, 15)
2,000	More than 290 (3.0, 42)

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

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## ENGINE OIL

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8. After the inspections, install oil pressure switch as follows:
  - a. Remove the old liquid gasket adhering to oil pressure switch and engine.
  - b. Apply thread sealant and tighten oil pressure switch to specification.  
**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#) .**

: 14.8 N·m (1.5 kg-m, 11 ft-lb)

# ENGINE OIL

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## Changing Engine Oil

### WARNING:

- Be careful not to burn yourself, as the engine oil may be hot.
  - Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used engine oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.
1. Warm up engine, put vehicle horizontally and check for oil leakage from engine components. Refer to [LU-6, "OIL LEAKAGE"](#).
  2. Stop engine and wait for 10 minutes.
  3. Loosen oil filler cap and then remove drain plug.
  4. Drain engine oil.
  5. Install drain plug with new washer. Refer to [EM-30, "OIL PAN AND OIL STRAINER"](#).

### CAUTION:

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

#### Oil pan drain plug:

: 34.3 N·m (3.5 kg-m, 25 ft-lb)

6. Refill with new engine oil.  
**Engine oil specification and viscosity:**  
Refer to [MA-11, "RECOMMENDED FLUIDS AND LUBRICANTS"](#).

#### Engine oil capacity (Approximate):

Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	4.7 (5, 4-1/8)
	Without oil filter change	4.4 (4-5/8, 3-7/8)
Dry engine (Overhaul)		5.4 (5-3/4, 4-3/4)

### CAUTION:

- When filling engine oil, do not pull out oil level gauge.
  - The refill capacity depends on the engine oil temperature and drain time. Use these specifications for reference only.
7. Warm up engine and check area around drain plug and oil filter for oil leakage.
  8. Stop engine and wait for 10 minutes.
  9. Check the engine oil level. Refer to [LU-6, "OIL LEVEL"](#).

# OIL FILTER

## OIL FILTER

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### Removal and Installation

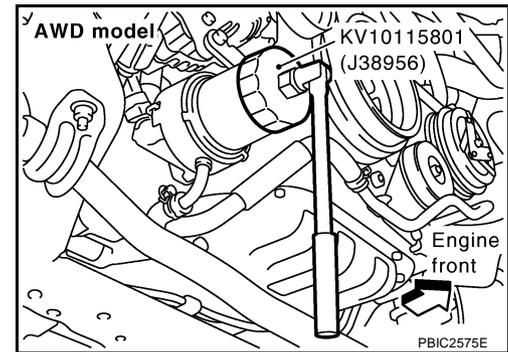
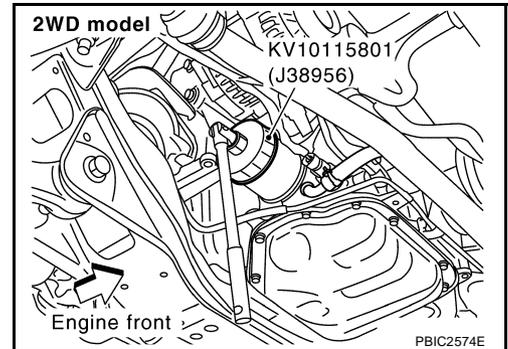
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#### REMOVAL

1. Remove undercover with power tool.
2. Using oil filter wrench (SST), remove oil filter.

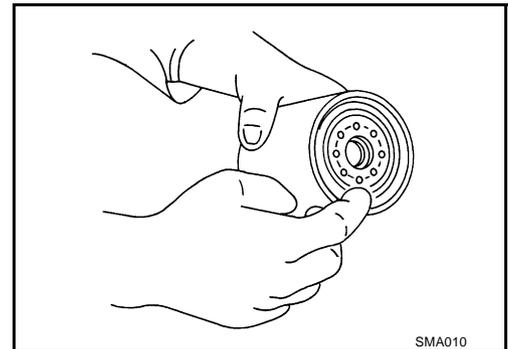
#### CAUTION:

- Oil filter is provided with relief valve. Use Genuine NISSAN Oil Filter or equivalent.
- Be careful not to get burned when engine and engine oil may be hot.
- When removing, prepare a shop cloth to absorb any engine oil leakage or spillage.
- Do not allow engine oil to adhere to drive belts.
- Completely wipe off any engine oil that adheres to the engine and the vehicle.



#### INSTALLATION

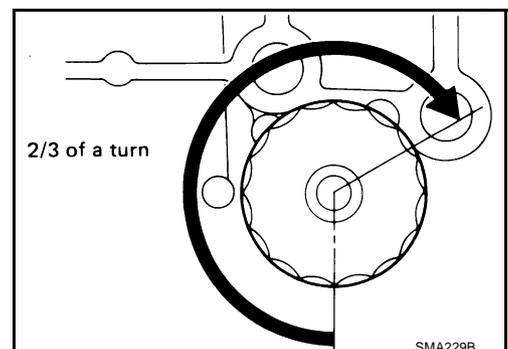
1. Remove foreign materials adhering to oil filter installation surface.
2. Apply engine oil to the oil seal contact surface of new oil filter.



3. Screw oil filter manually until it touches the installation surface, then tighten it by 2/3 turn. Or tighten to specification.

#### Oil filter:

: 17.6 N·m (1.8 kg-m, 13 ft-lb)



# OIL FILTER

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## INSPECTION AFTER INSTALLATION

1. Check the engine oil level. Refer to [LU-6, "ENGINE OIL"](#) .
2. Start engine, and check there is no leaks of engine oil.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level and add engine oil. Refer to [LU-6, "ENGINE OIL"](#) .

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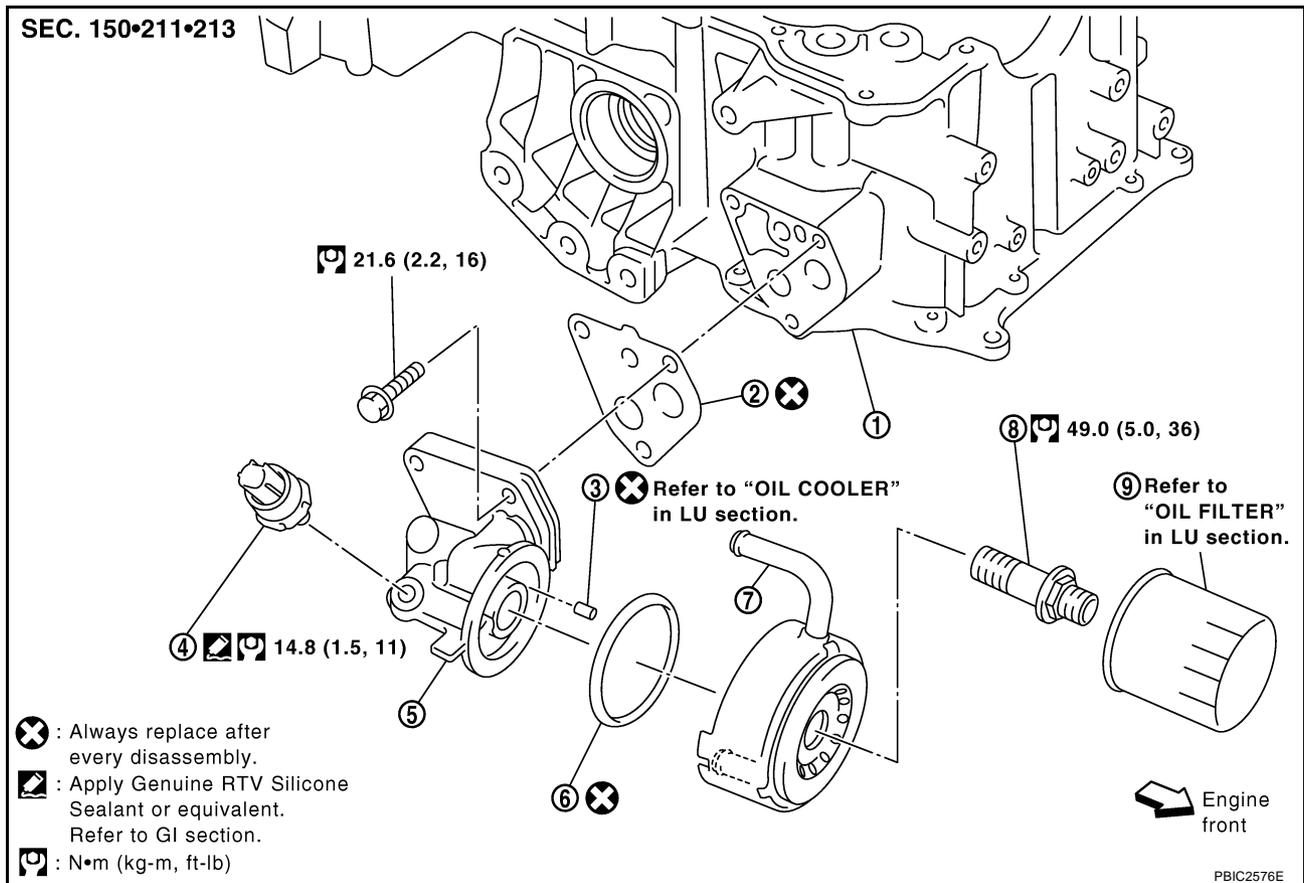
# OIL FILTER BRACKET (AWD)

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## OIL FILTER BRACKET (AWD)

### Removal and Installation



- |                        |                       |                 |
|------------------------|-----------------------|-----------------|
| 1. Oil pan (upper)     | 2. Gasket             | 3. Relief valve |
| 4. Oil pressure switch | 5. Oil filter bracket | 6. O-ring       |
| 7. Oil cooler          | 8. Connector bolt     | 9. Oil filter   |

### WARNING:

Be careful not to burn yourself, as engine oil and engine coolant may be hot.

### REMOVAL

1. Remove front engine undercover with power tool.
2. Remove oil filter. Refer to [LU-10, "OIL FILTER"](#).
3. Disconnect water hoses from oil cooler while pinching water hoses near oil cooler to prevent engine coolant spilling.

### CAUTION:

- Perform this step when engine is cold.
- Do not spill engine coolant on drive belts.

4. Remove connector bolt, and remove oil cooler.

### CAUTION:

Do not spill engine oil to rubber parts such as drive belts and engine mounting insulator.

5. Disconnect oil pressure switch harness connector.
6. Remove oil filter bracket from oil pan (upper).
7. Remove oil pressure switch from oil filter bracket.

### INSTALLATION

Note to the following, and install in the reverse order of removal.

- Install oil pressure switch as follows:
  - Remove old liquid gasket adhering to oil pressure switch and oil filter bracket.

## OIL FILTER BRACKET (AWD)

- 
- Apply thread sealant and install oil pressure switch.  
**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#) .**
  - Make sure that no foreign objects are adhering to the installation surfaces of oil cooler, oil filter bracket and oil pan (upper).
  - Align cutout on oil cooler with protrusion on oil filter bracket. Refer to [LU-16, "AWD Model"](#) .

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### INSPECTION AFTER INSTALLATION

1. Check the engine oil level and the engine coolant level, and add engine oil and engine coolant. Refer to [LU-6, "ENGINE OIL"](#) and [CO-10, "ENGINE COOLANT"](#) .
2. Start engine, and make sure that there is no leak of engine oil and engine coolant.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level and engine coolant level again. Refer to [LU-6, "ENGINE OIL"](#) and [CO-10, "ENGINE COOLANT"](#) .

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# OIL COOLER

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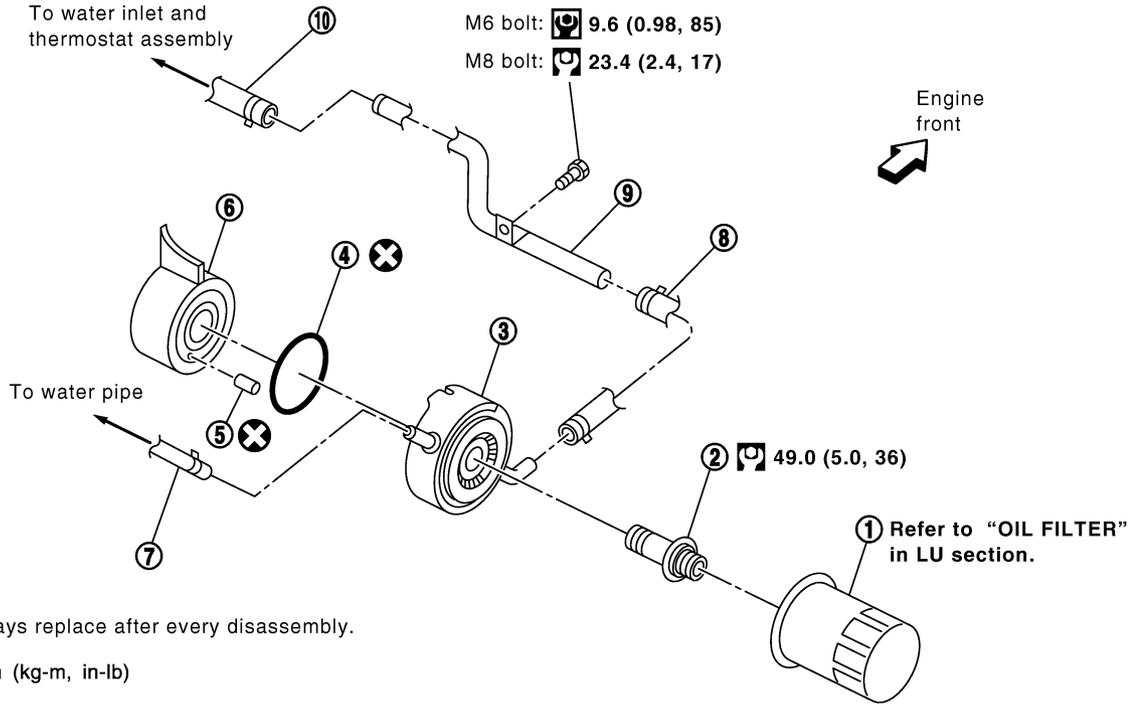
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## OIL COOLER

### Removal and Installation

#### 2WD MODEL

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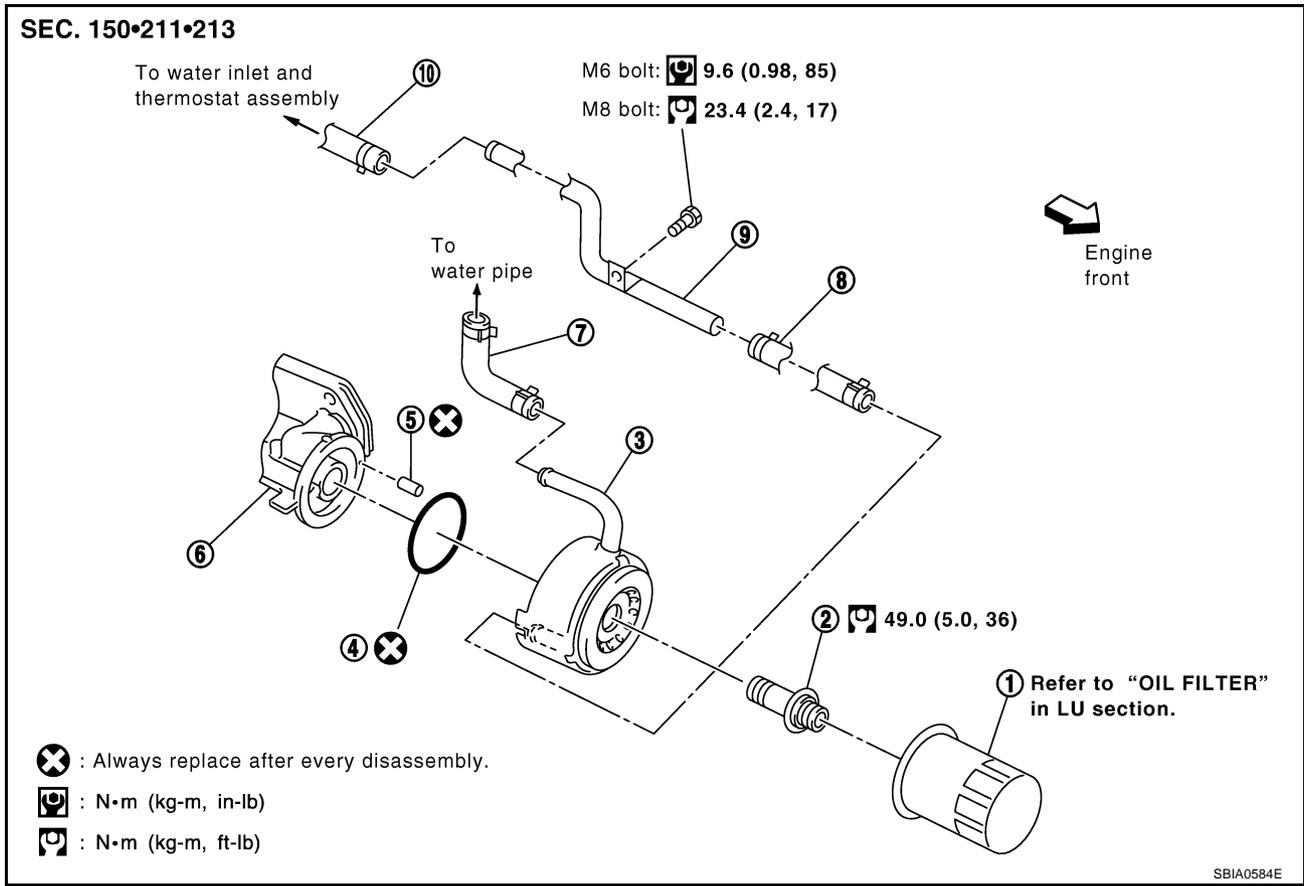


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- |                |                   |                               |
|----------------|-------------------|-------------------------------|
| 1. Oil filter  | 2. Connector bolt | 3. Oil cooler                 |
| 4. O-ring      | 5. Relief valve   | 6. Oil pan (upper) right side |
| 7. Water hose  | 8. Water hose     | 9. Water pipe                 |
| 10. Water hose |                   |                               |

# OIL COOLER

## AWD MODEL



- |                |                   |                       |
|----------------|-------------------|-----------------------|
| 1. Oil filter  | 2. Connector bolt | 3. Oil cooler         |
| 4. O-ring      | 5. Relief valve   | 6. Oil filter bracket |
| 7. Water hose  | 8. Water hose     | 9. Water pipe         |
| 10. Water hose |                   |                       |

### **WARNING:**

**Be careful not to get burn yourself, as engine oil and engine coolant may be hot.**

### **REMOVAL**

#### **NOTE:**

When removing oil cooler only, step 2 is unnecessary.

- Remove undercover with power tool.
- Drain engine coolant from radiator and cylinder block. Refer to [CO-10, "Changing Engine Coolant"](#) and [EM-121, "CYLINDER BLOCK"](#).

#### **NOTE:**

Perform this step when removing water pipes.

- Remove oil filter. Refer to [LU-10, "OIL FILTER"](#).

#### **CAUTION:**

**Do not spill engine oil on drive belts.**

- Disconnect water hoses from oil cooler.
  - When removing oil cooler only, pinching water hoses near oil cooler to prevent engine coolant spilling.

#### **CAUTION:**

- Perform this step when engine is cold.
- Do not spill engine coolant on the drive belts.

- Remove connector bolt, and remove oil cooler.

#### **CAUTION:**

**Do not spill engine oil to rubber parts such as drive belts and engine mounting insulator.**

- Remove water pipes, as necessary.

# OIL COOLER

## INSPECTION AFTER REMOVAL

### Oil Cooler

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

### Relief Valve

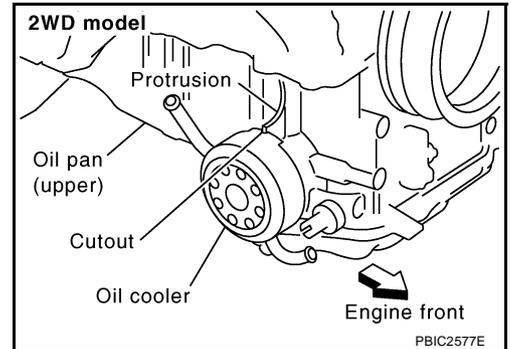
Check relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove relief valve by prying it out with suitable tool. Install a new relief valve in place by tapping it.

## INSTALLATION

Note the following, and install in the reverse order of removal.

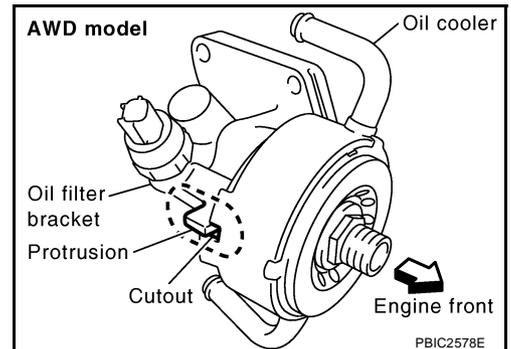
### 2WD Model

- Make sure that no foreign objects are adhering to the installation surfaces of oil cooler and oil pan (upper).
- Align cutout on oil cooler with protrusion on oil pan (upper) side, and tighten connector bolt.



### AWD Model

- Make sure that no foreign objects are adhering to the installation surfaces of oil cooler and oil pan (upper).
- Align cutout on oil cooler with protrusion on oil filter bracket side, and tighten connector bolt.



## INSPECTION AFTER INSTALLATION

1. Check the engine oil level and engine coolant level, and add engine oil and engine coolant. Refer to [LU-6, "ENGINE OIL"](#) and [CO-10, "ENGINE COOLANT"](#).
2. Start engine, and make sure that there is no leaks of engine oil or engine coolant.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level and the engine coolant level again. Refer to [LU-6, "ENGINE OIL"](#) and [CO-10, "ENGINE COOLANT"](#).

# OIL PUMP

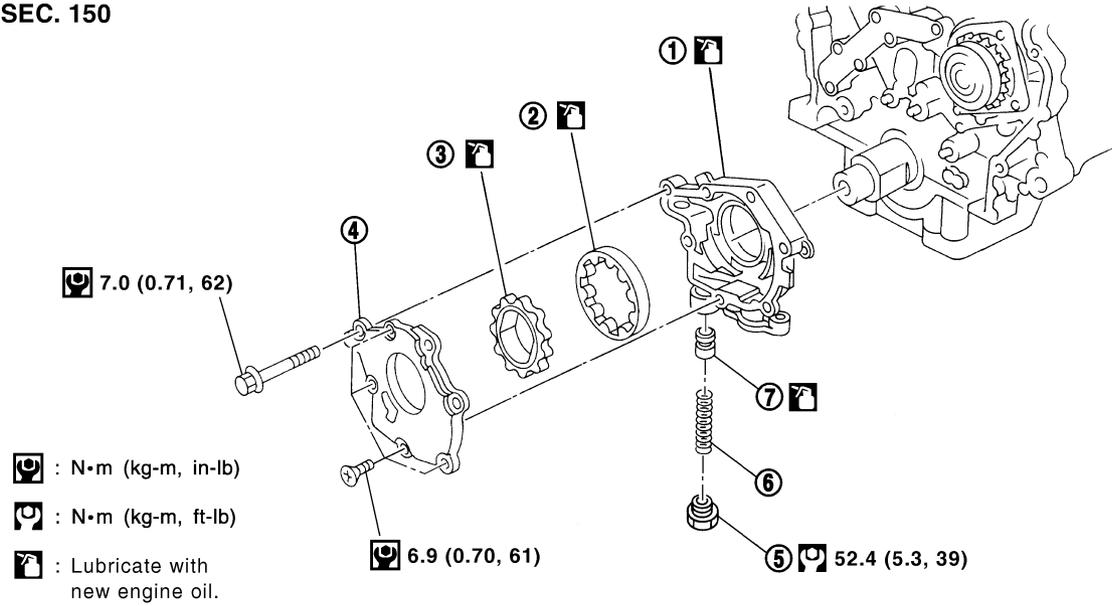
## OIL PUMP

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### Removal and Installation

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- |                    |                         |                           |
|--------------------|-------------------------|---------------------------|
| 1. Oil pump body   | 2. Oil pump outer rotor | 3. Oil pump inner rotor   |
| 4. Oil pump cover  | 5. Regulator valve plug | 6. Regulator valve spring |
| 7. Regulator valve |                         |                           |

### REMOVAL

1. Remove oil pans (lower and upper) and oil strainer. Refer to [EM-30, "OIL PAN AND OIL STRAINER"](#).
2. Remove front timing chain case and timing chain (primary). Refer to [EM-64, "TIMING CHAIN"](#).
3. Remove oil pump assembly.

### INSTALLATION

Note the following, and install in the reverse order of removal.

- When installing, align crankshaft flat faces with inner rotor flat faces.

### INSPECTION AFTER INSTALLATION

1. After warming up engine, check for engine oil leakage.
2. Check the engine oil level and add engine oil. Refer to [LU-6, "ENGINE OIL"](#).

### Disassembly and Assembly

#### DISASSEMBLY

1. Remove oil pump cover.
2. Remove inner rotor and outer rotor from oil pump body.
3. After removing regulator plug, remove regulator spring and regulator valve.

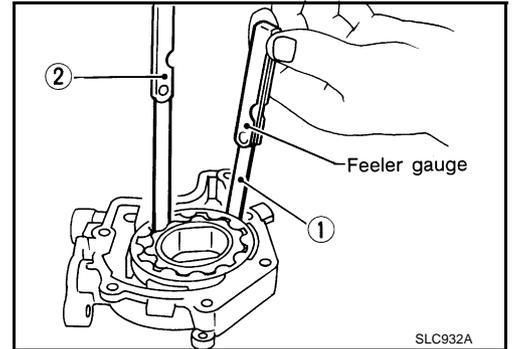
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# OIL PUMP

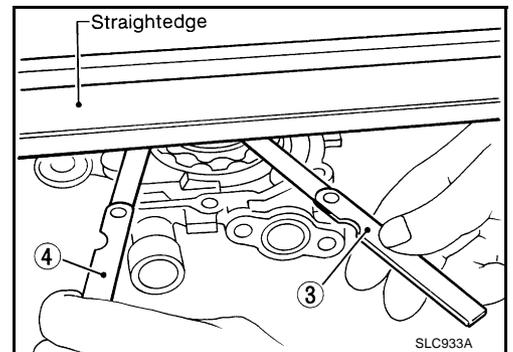
## INSPECTION AFTER DISASSEMBLY

### Clearance of Oil Pump Parts

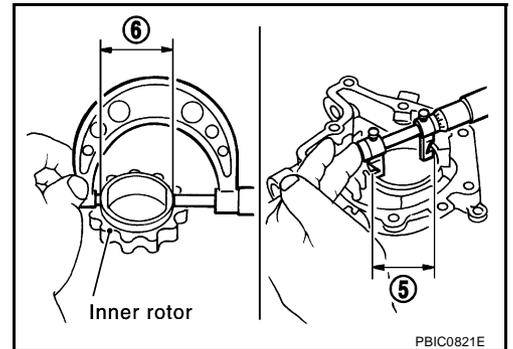
- Measure the clearance with feeler gauge.
  - Clearance between outer rotor and oil pump body (position 1)  
**Standard : 0.114 - 0.260 mm (0.0045 - 0.0102 in)**
  - Tip clearance between inner rotor and outer rotor (position 2)  
**Standard : Below 0.180 mm (0.0071 in)**



- Measure the clearance with feeler gauge and straightedge.
  - Side clearance between inner rotor and oil pump body (position 3)  
**Standard : 0.030 - 0.070 mm (0.0012 - 0.0028 in)**
  - Side clearance between outer rotor and oil pump body (position 4)  
**Standard : 0.050 - 0.110 mm (0.0020 - 0.0043 in)**



- Calculate the clearance between inner rotor and oil pump body as follows:
  - Measure the inner diameter of oil pump body with inside micrometer (Position 5)
  - Measure the outer diameter of protruded portion of inner rotor with micrometer (Position 6)
  - (Clearance) = (Inner diameter of oil pump body) – (Outer diameter of inner rotor)**Standard : 0.045 - 0.091 mm (0.0018 - 0.0036 in)**
- If measured/calculated values are out of the standard, replace oil pump assembly.



### Regulator Valve Clearance

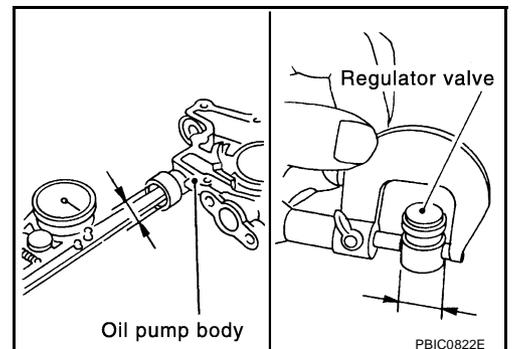
(Clearance) = (Valve hole diameter) – (Regulator valve outer diameter)

**Standard : 0.040 - 0.097 mm (0.0016 - 0.0038 in)**

- If out of the standard, replace oil pump assembly.

### CAUTION:

- Coat regulator valve with engine oil.
- Make sure that it falls smoothly into valve hole by its own weight.

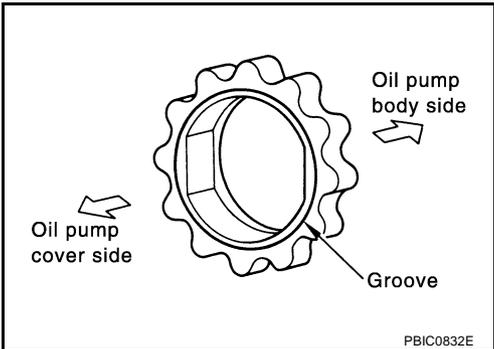


# OIL PUMP

## ASSEMBLY

Note the following, and assemble in the reverse order of disassembly.

- Install inner rotor with the groove faced to oil pump cover side.



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# SERVICE DATA AND SPECIFICATIONS (SDS)

## SERVICE DATA AND SPECIFICATIONS (SDS)

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### Standard and Limit OIL PRESSURE

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Engine speed rpm	Approximate discharge pressure* kPa (kg/cm <sup>2</sup> , psi)
Idle speed	More than 100 (1.0, 15)
2,000	More than 290 (3.0, 42)

\*: Engine oil temperature at 80°C (176°F).

### OIL CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	4.7 (5, 4-1/8)
	Without oil filter change	4.4 (4-5/8, 3-7/8)
Dry engine (Overhaul)		5.4 (5-3/4, 4-3/4)

### OIL PUMP

Unit: mm (in)

Body to outer rotor radial clearance	0.114 - 0.260 (0.0045 - 0.0102)
Inner rotor to outer rotor tip clearance	Below 0.180 (0.0071)
Body to inner rotor side clearance	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor side clearance	0.050 - 0.110 (0.0020 - 0.0043)
Inner rotor to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

### REGULATOR VALVE

Unit: mm (in)

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

### Tightening Torque

ABS0099T

Unit: N·m (kg·m, ft·lb)  
Unit: N·m (kg·m, in·lb)\*

Oil pressure switch	14.8 (1.5, 11)	
Oil pan drain plug	34.3 (3.5, 25)	
Oil cooler connector bolt	49.0 (5.0, 36)	
Water pipe	M6 bolt	9.6 (0.98, 85)*
	M8 bolt	23.4 (2.4, 17)
Oil filter bracket (AWD)	21.6 (2.2, 16)	
Oil pump body	7.0 (0.71, 62)*	
Oil pump cover	6.9 (0.70, 61)*	
Regulator valve plug	52.4 (5.3, 39)	