

# SECTION LU

## ENGINE LUBRICATION SYSTEM

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**PRECAUTIONS**

PFP:00001

**Precautions for Liquid Gasket**

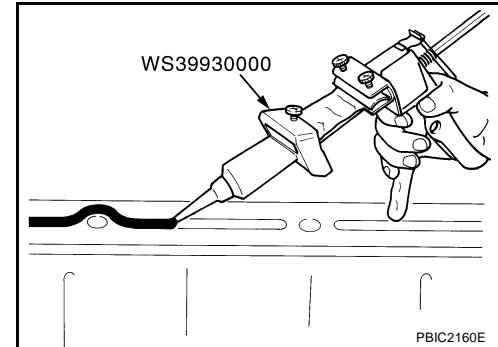
BBS00178

**LIQUID GASKET APPLICATION PROCEDURE**

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 the tube presser (SST).

**Use Genuine Liquid Gasket or equivalent.**

- 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.
- Wait 30 minutes or more after installation before refilling engine oil and engine coolant.



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# PREPARATION

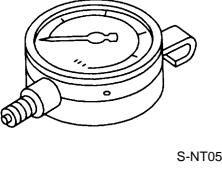
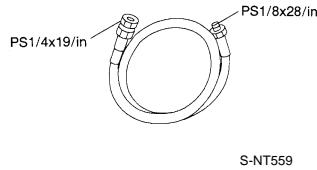
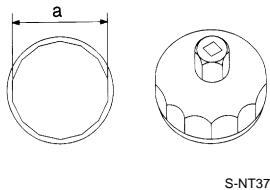
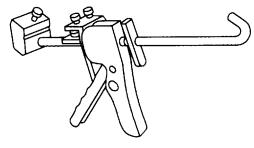
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## PREPARATION

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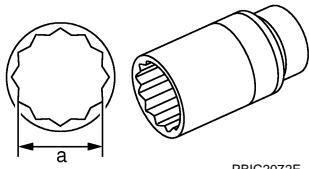
### Special Service Tools

BBS00179

Tool number Tool name	Description
ST25051001 Oil pressure gauge	<p>Measuring oil pressure <b>Maximum measuring range:</b> <b>2,452 kPa (24.52 bar, 25 kg/cm<sup>2</sup> , 356 psi)</b></p> 
ST25052000 Hose	<p>Adapting oil pressure gauge to cylinder block</p> 
KV10115801 Oil filter wrench	<p>Removing and installing oil filter <b>a: 64.3 mm (2.531 in)</b></p> 
WS39930000 Tube presser	<p>Pressing the tube of liquid gasket</p> 

### Commercial Service Tools

BBS0017A

Tool name	Description
Deep socket	<p>Removing and installing oil pressure switch <b>a: 26 mm (1.02 in)</b></p> 

# LUBRICATION SYSTEM

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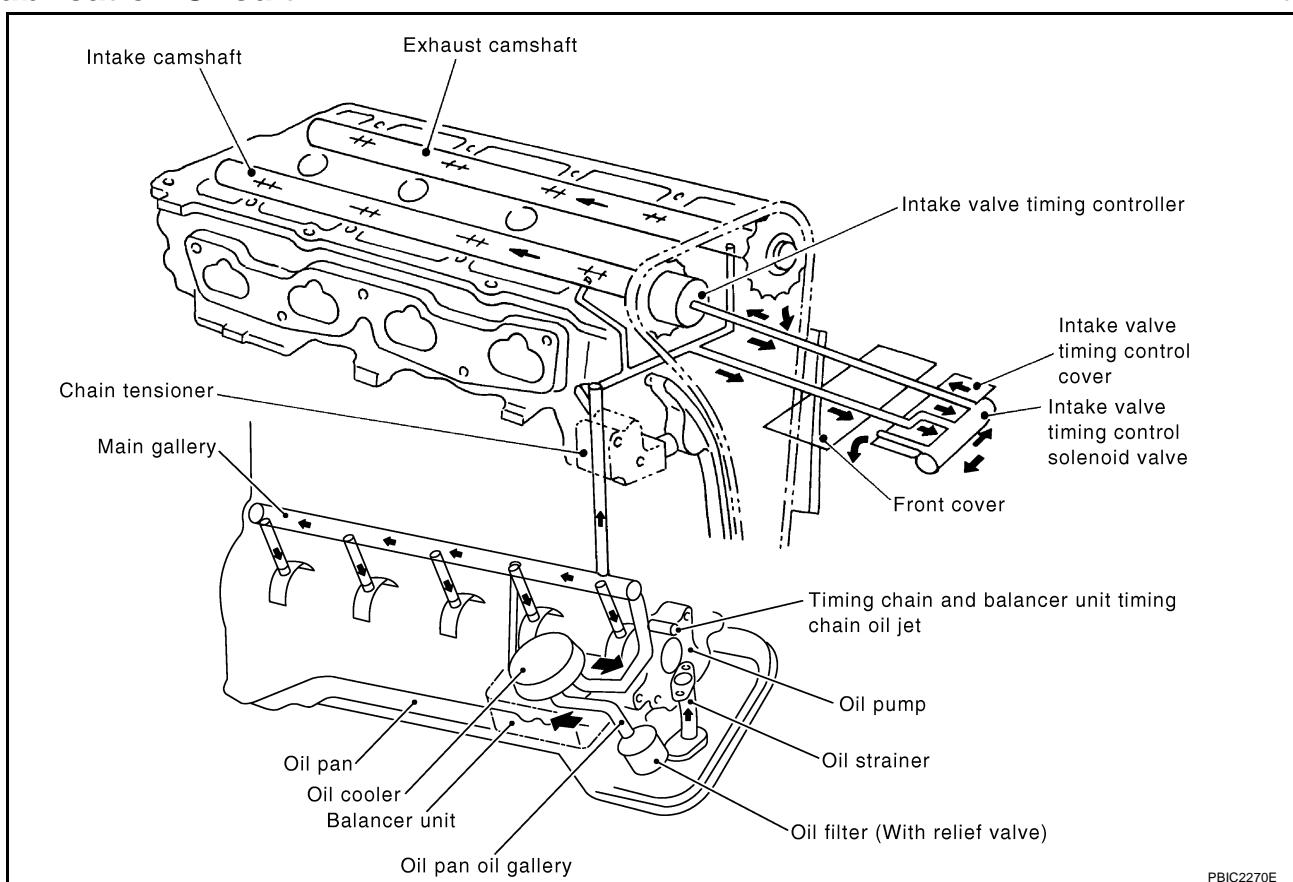
## LUBRICATION SYSTEM

PFP:15010

### Lubrication Circuit

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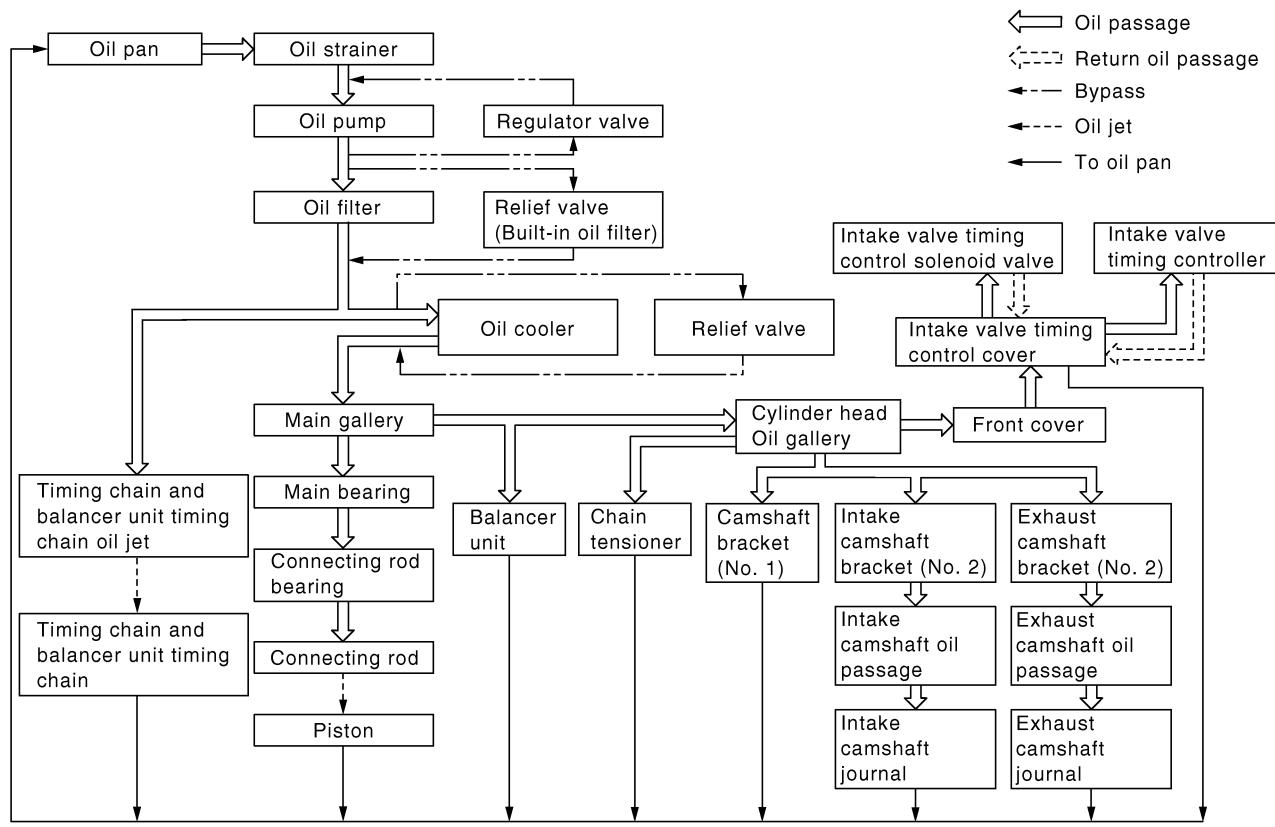
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## System Chart

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**ENGINE OIL**

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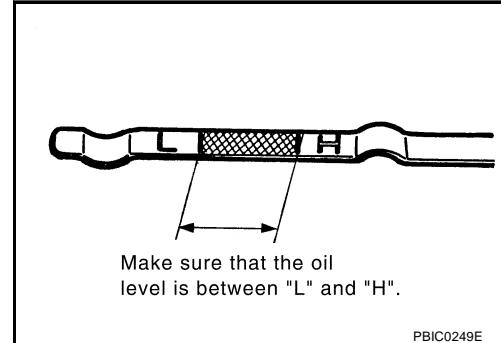
**Inspection****ENGINE OIL LEVEL**

BBS0017D

**NOTE:**

Before starting engine, put vehicle horizontally and check the engine 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 engine oil level is within the range shown in the figure.
3. If it is out of range, adjust it.

**ENGINE OIL APPEARANCE**

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

**ENGINE OIL LEAKAGE**

Check for engine oil leakage around the following area.

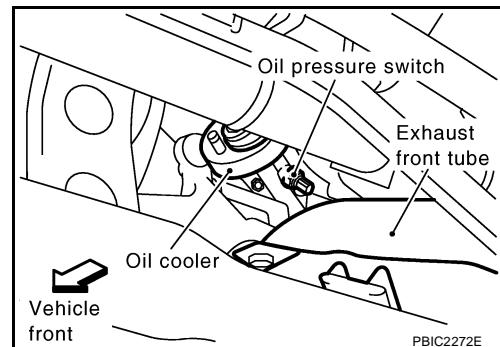
- Oil pan
- Oil pan drain plug
- Oil pressure switch
- Oil filter
- Oil cooler
- Intake valve timing control cover and intake valve timing control solenoid valve
- Front cover
- Mating surface between cylinder block and lower cylinder block
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and rocker cover
- Crankshaft oil seals (front and rear)

**OIL PRESSURE CHECK****WARNING:**

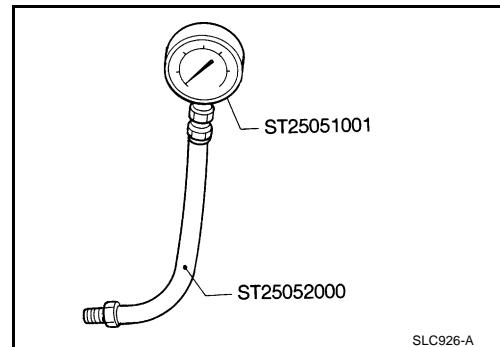
- Be careful not to burn yourself, as engine oil may be hot.
- Engine oil pressure check should be in "Parking position" (A/T models) or "Neutral position" (M/T models), and should apply parking brake securely.

1. Check engine oil level. Refer to [LU-7, "ENGINE OIL LEVEL"](#) .
2. Remove RH undercover.

3. Disconnect harness connector at oil pressure switch, and remove oil pressure switch using a deep socket (commercial service tool).



4. Install oil pressure gauge and hose (SST).



5. Start engine and warm it up to normal operating temperature.  
 6. 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 (bar, kg/cm <sup>2</sup> , psi)
Idle speed	More than 98 (0.98, 1.0, 14)
2,000	More than 294 (2.94, 3.0, 43)

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

7. After the inspections, install oil pressure switch as follows:  
 a. Remove old liquid gasket adhering to oil pressure switch and engine.  
 b. Apply liquid gasket and tighten oil pressure switch to specification.  
**Use Genuine Thread Sealant or equivalent.**

: 14.8 N·m (1.5 kg·m, 11 ft-lb)

c. After warming up engine, make sure there is no leaks of engine oil with running engine.

## Changing Engine Oil

BBS0017E

**WARNING:**

- Be careful not to burn yourself, as 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-7, "ENGINE 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-27, "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)

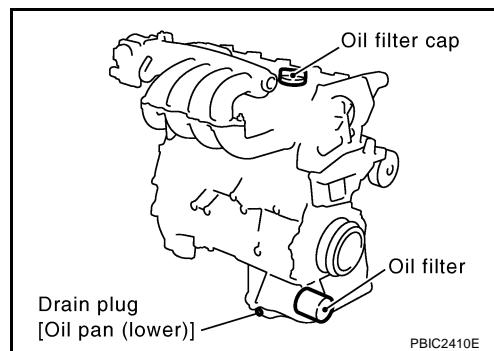
6. Refill with new engine oil.

**Engine oil specification and viscosity:**

Refer to [MA-17, "RECOMMENDED FLUIDS AND LUBRICANTS"](#).

**Engine oil capacity (Approximate):**

Unit:  $\ell$  (Imp qt)



Drain and refill	With oil filter change	4.1 (3-5/8)
	Without oil filter change	3.7 (3-1/4)
Dry engine (Overhaul)		4.7 (4-1/8)

**CAUTION:**

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

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-7, "ENGINE OIL LEVEL"](#).

## OIL FILTER

PFP:15208

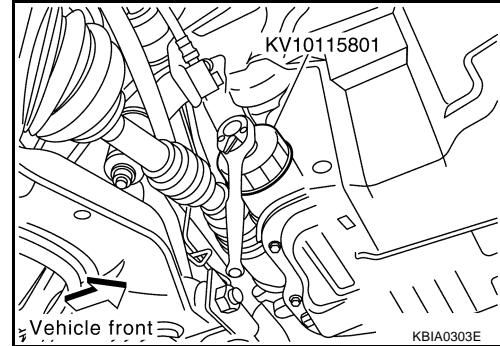
## Removal and Installation

## REMOVAL

1. Open oil filter installation/removal cover on RH undercover.
2. Using an oil filter wrench (SST), remove oil filter.

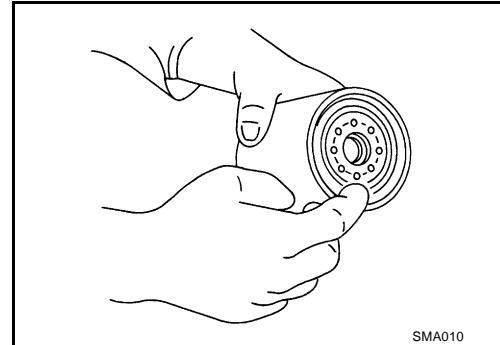
## CAUTION:

- Oil filter is provided with relief valve. Use Genuine NIS-SAN 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 belt.
- Completely wipe off any engine oil that adheres to engine and vehicle.



## INSTALLATION

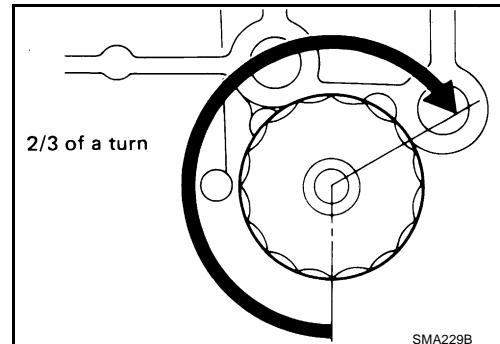
1. Remove foreign materials adhering to the oil filter installation surface.
2. Apply new engine oil to the oil seal contact surface of new oil filter.



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)



## INSPECTION AFTER INSTALLATION

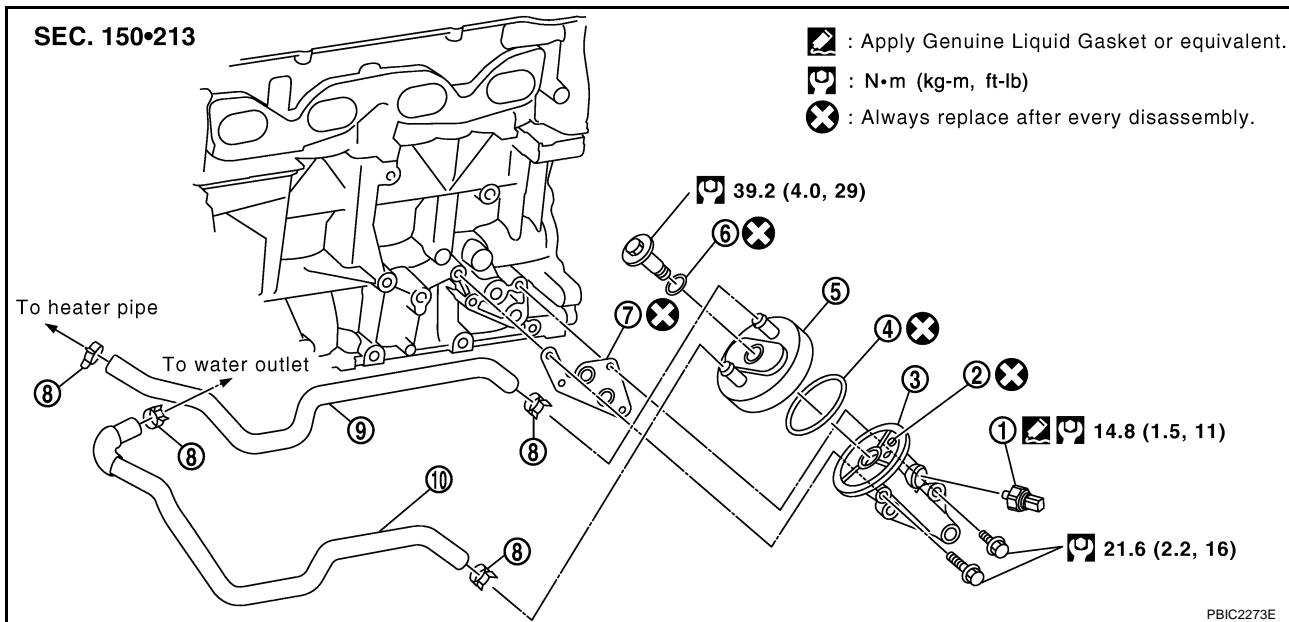
1. Start engine, and make sure there is no leaks of engine oil.
2. Stop engine and wait for 10 minutes.
3. Check the engine oil level and adjust engine oil. Refer to [LU-7, "ENGINE OIL"](#).

## OIL COOLER

PFP:21305

## Removal and Installation

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1. Oil pressure switch
2. Relief valve
3. Oil cooler bracket
4. O-ring
5. Oil cooler
6. O-ring
7. Gasket
8. Clamp
9. Water hose
10. Water hose

**WARNING:**

Be careful not to get burned when engine and engine oil may be hot.

**CAUTION:**

- When removing oil cooler and oil cooler bracket, prepare a shop cloth to absorb any engine oil leakage or spillage.
- Completely wipe off any engine oil that adhere to engine and vehicle.

**REMOVAL**

1. Remove RH front road wheel and tyre and RH undercover.
2. Drain engine coolant by removing water drain plug on cylinder block and radiator drain plug. Refer to [EM-89, "CYLINDER BLOCK"](#) and [CO-9, "Changing Engine Coolant"](#).
3. Disconnect water hoses from oil cooler.
4. Remove oil cooler and oil cooler bracket.

**NOTE:**

For reference when installing, put a mating mark on oil cooler and oil cooler bracket.

**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 assembly.

**Relief Valve**

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

**INSTALLATION**

Installation is the reverse order of removal.

**INSPECTION AFTER INSTALLATION**

1. Check the engine oil level and the engine coolant level, and adjust engine oil and engine coolant. Refer to [LU-7, "ENGINE OIL"](#) and [CO-9, "ENGINE COOLANT"](#).

## OIL COOLER

[QR]

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2. Start engine, and make sure 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-7, "ENGINE OIL"](#) and [CO-9, "ENGINE COOLANT"](#).

**OIL PUMP**

PFP:15010

**Removal and Installation****REMOVAL**Remove front cover. Refer to [EM-46, "TIMING CHAIN"](#) .**NOTE:**

Oil pump is built into front cover.

**INSTALLATION**

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

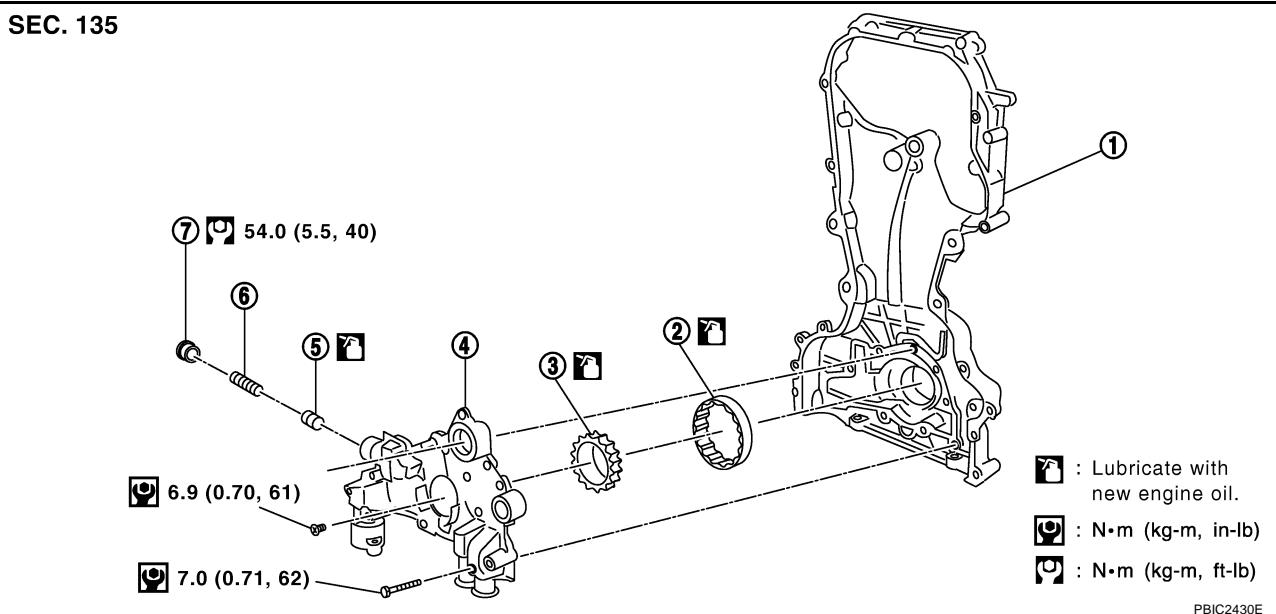
- When installing, align crankshaft flat faces with inner rotor flat faces.

**INSPECTION AFTER INSTALLATION**

- After warming up engine, make sure there is no leaks of engine oil.
- Stop engine and wait for 10 minutes.
- Check the engine oil level and adjust engine oil. Refer to [LU-7, "ENGINE OIL"](#) .

**Disassembly and Assembly**

BBS0017I



1. Front cover (Oil pump body is united)	2. Outer rotor	3. Inner rotor
4. Oil pump cover	5. Regulator valve	6. Regulator valve spring
7. Regulator valve plug		

**DISASSEMBLY**

- Remove oil pump cover.
- Remove inner rotor and outer rotor from front cover.
- After removing regulator valve plug, remove regulator spring and regulator valve.

**INSPECTION AFTER DISASSEMBLY****Clearance of Oil Pump Parts**

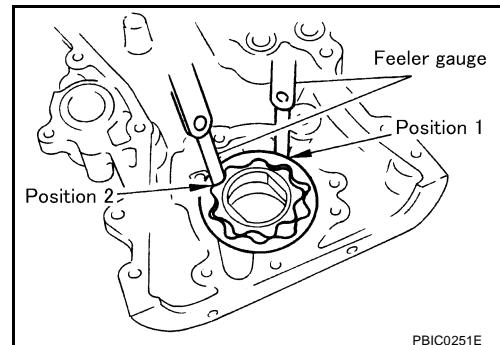
- Measure the clearance with feeler gauge.
- Clearance between outer rotor and front cover (Position "1")

**Standard : 0.114 - 0.179 mm (0.0045 - 0.0070 in)**

- If out of the standard, replace oil pump assembly.
- Tip clearance between inner rotor and outer rotor (Position "2")

**Standard : Below 0.220 mm (0.0087 in)**

- If out of the standard, replace inner rotor and outer rotor.



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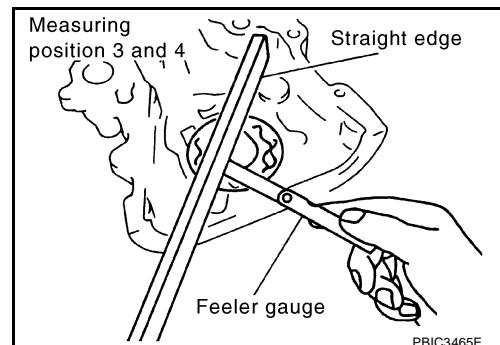
- Measure the clearance with feeler gauge and straightedge.
- Side clearance between inner rotor and front cover (Position "3")

**Standard : 0.030 - 0.070 mm (0.0012 - 0.0028 in)**

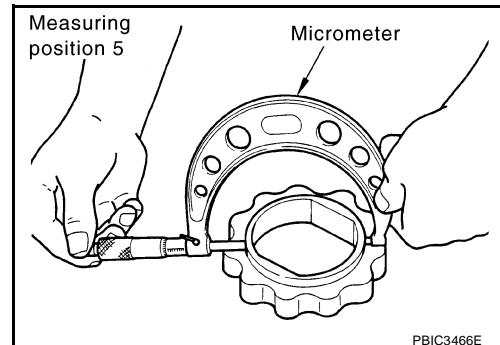
- If out of the standard, replace oil pump assembly.
- Side clearance between outer rotor and front cover (Position "4")

**Standard : 0.060 - 0.110 mm (0.0024 - 0.0043 in)**

- If out of the standard, replace oil pump assembly.
- Calculate the clearance between inner rotor and front cover with the following procedure:
- Measure the outer diameter of protruded portion of inner rotor with micrometer. (Position "5")

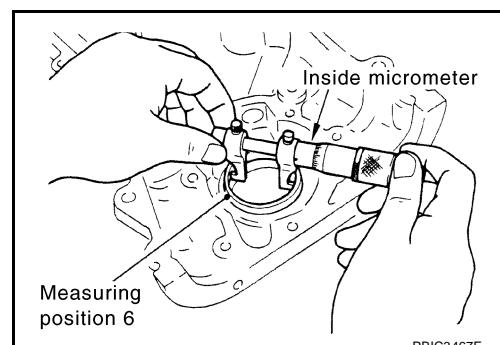


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PBIC3466E

- Measure the inner diameter of front cover with inside micrometer. (Position "6")



PBIC3467E

- (Clearance) = (Inner diameter of front cover) – (Outer diameter of inner rotor)

**Standard : 0.035 - 0.070 mm (0.0014 - 0.0028 in)**

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

**Regulator Valve Clearance**

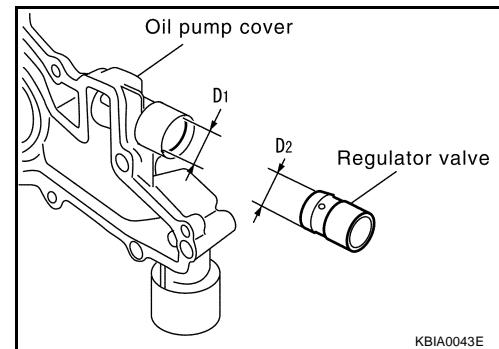
(Clearance) = (Valve hole diameter "D1") – (Regulator valve outer diameter "D2")

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

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

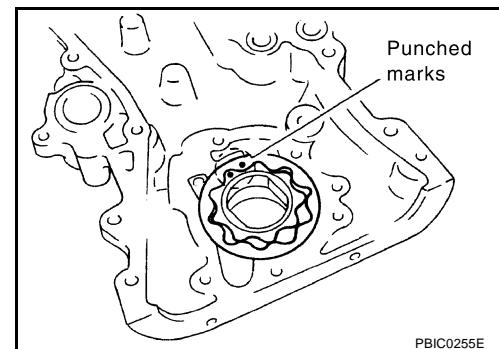
**CAUTION:**

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

**ASSEMBLY**

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

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



# SERVICE DATA AND SPECIFICATIONS (SDS)

[QR]

## SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

### Standard and Limit OIL PRESSURE

BBS0017J

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 294 (2.94, 3.0, 43)

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

### ENGINE OIL CAPACITY (APPROXIMATE)

Unit: ℥ (Imp qt)

Drain and refill	With oil filter change	4.1 (3-5/8)
	Without oil filter change	3.7 (3-1/4)
Dry engine (Overhaul)		4.7 (4-1/8)

### OIL PUMP

Unit: mm (in)

Front cover to outer rotor radial clearance	0.114 - 0.179 (0.0045 - 0.0070)
Inner rotor to outer rotor tip clearance	Below 0.220 (0.0087)
Front cover to inner rotor side clearance	0.030 - 0.070 (0.0012 - 0.0028)
Front cover to outer rotor side clearance	0.060 - 0.110 (0.0024 - 0.0043)
Inner rotor to front cover clearance	0.035 - 0.070 (0.0014 - 0.0028)

### REGULATOR VALVE

Unit: mm (in)

Regulator valve to valve hole clearance	0.040 - 0.097 (0.0016 - 0.0038)
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### Tightening Torque

BBS0017K

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 filter		17.6 (1.8, 13)
Oil pump cover	Bolt	7.0 (0.71, 62)*
	Screw	6.9 (0.70, 61)*
Regulator valve plug		54.0 (5.5, 40)
Oil cooler		39.2 (4.0, 29)
Oil cooler bracket		21.6 (2.2, 16)

### PRECAUTIONS

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#### Precautions for Liquid Gasket

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#### LIQUID GASKET APPLICATION PROCEDURE

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1. Remove the old liquid gasket adhering to the gasket application surface and the mating surface.
- Remove the liquid gasket completely from the 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 the tube presser [SST].

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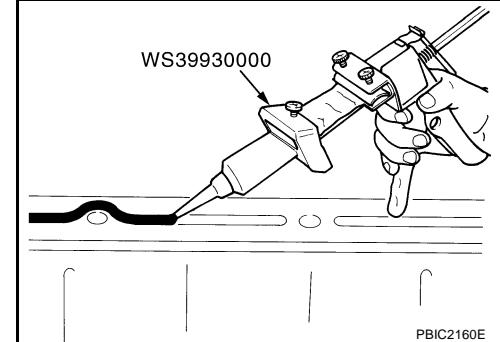
#### Use Genuine Liquid Gasket or equivalent.

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- Within five minutes of gasket application, install the mating component.
- If the liquid gasket protrudes, wipe it off immediately.
- Do not retighten mounting bolts and nuts after the installation.
- Wait 30 minutes or more after installation before filling the engine with engine oil and engine coolant.

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# PREPARATION

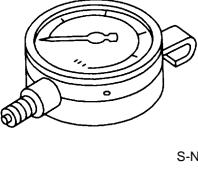
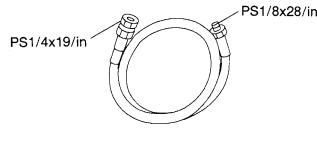
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## PREPARATION

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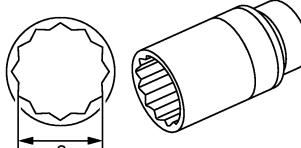
### Special Service Tools

BBS0017M

Tool number Tool name	Description
ST25051001 Oil pressure gauge	<p>Measuring oil pressure <b>Maximum measuring range:</b> 2,452 kPa (25 kg/cm<sup>2</sup>, 356 psi)</p> 
ST25052000 Hose	<p>Adapting oil pressure gauge to cylinder block</p> 

### Commercial Service Tools

BBS0017N

Tool name	Description
Deep socket	<p>Removing and installing oil pressure switch <b>a: 26 mm (1.02 in)</b></p> 

## LUBRICATION SYSTEM

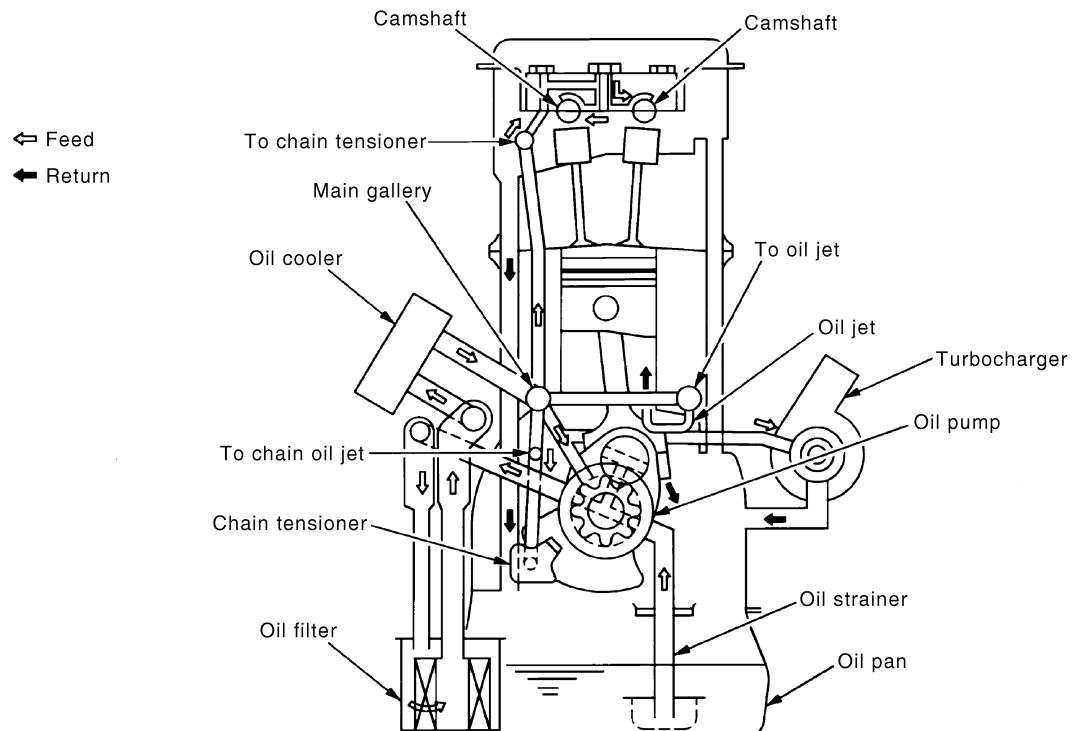
### Lubrication Circuit

PFP:15010

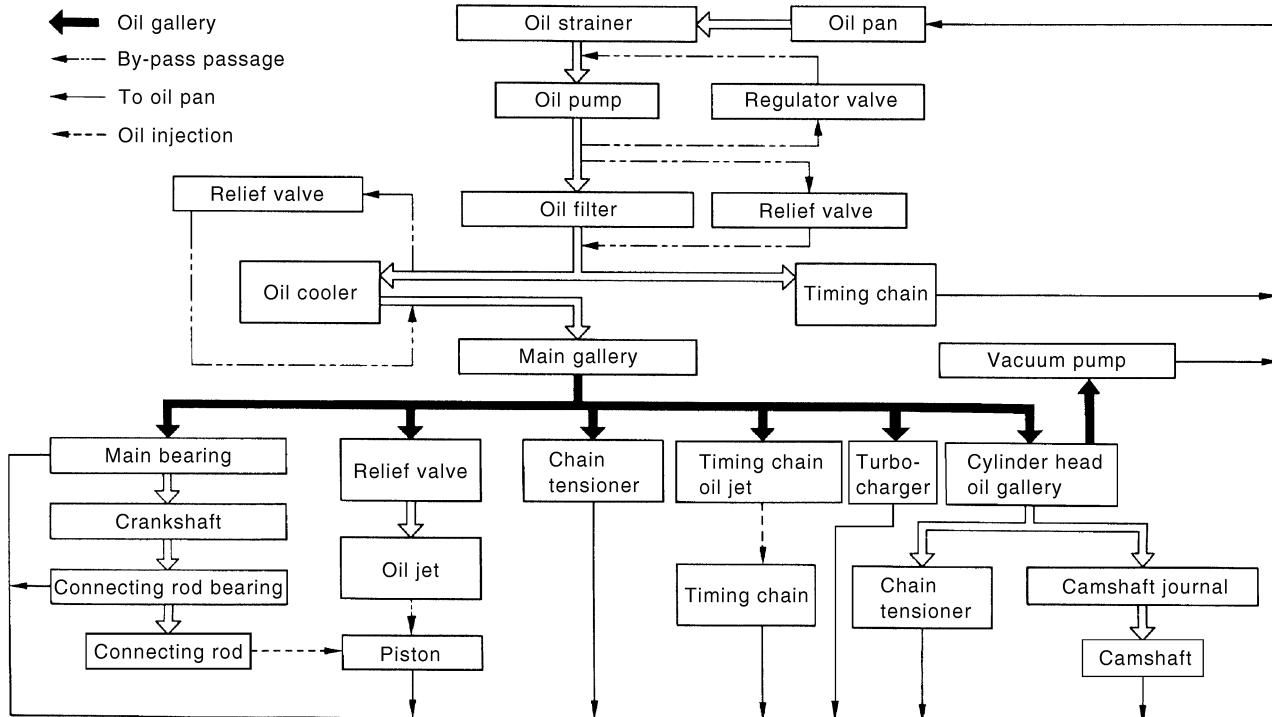
BBS00170

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- ↔ Feed
- ← Return
- Oil passage
- Oil gallery
- By-pass passage
- To oil pan
- Oil injection



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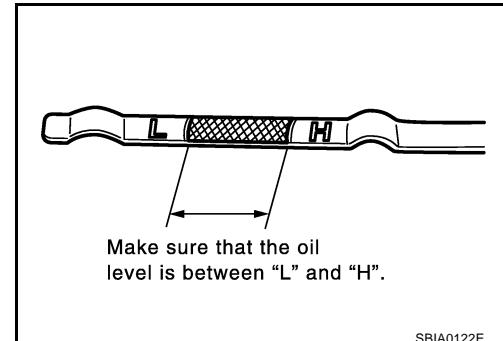
**ENGINE OIL**

PFP:KLA92

**Inspection****ENGINE OIL LEVEL****NOTE:**

Before starting engine, put vehicle horizontally and check the engine 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 engine oil level is within the range shown in the figure.
3. If it is out of range, adjust it.

**ENGINE OIL APPEARANCE**

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

**ENGINE OIL LEAKAGE**

Check for engine oil leakage around the following area.

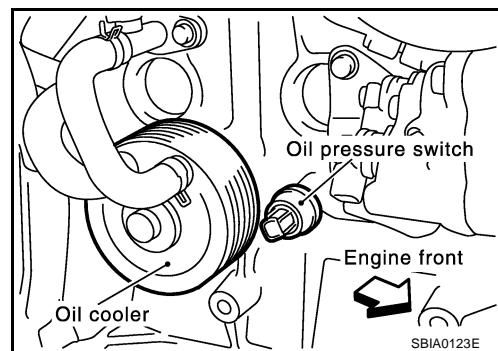
- Oil pan (upper and lower)
- Oil pan drain plug
- Oil pressure switch
- Oil filter bracket
- Oil cooler
- Oil pump housing
- Vacuum pump
- Cylinder head rear cover assembly
- Front and rear chain cases
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and rocker cover
- Front and rear oil seals
- Turbocharger
- Oil tube connecting parts from turbocharger

**ENGINE OIL PRESSURE CHECK****WARNING:**

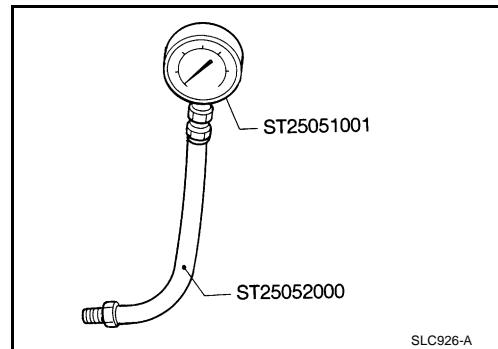
- Be careful not to burn yourself, as the engine oil is hot.
- Be sure to check oil pressure in "Neutral position" and parking brake should be applied securely.

1. Check the engine oil level. Refer to [LU-20, "ENGINE OIL LEVEL"](#) .
2. Remove RH engine undercover.
3. Remove exhaust front tube. Refer to [EX-2, "EXHAUST SYSTEM"](#) .

4. Disconnect harness connector at oil pressure switch, and using deep socket (commercial service tool), remove oil pressure switch.



5. Install the oil pressure gauge and hose [SST].



6. Install exhaust front tube. Refer to [EX-2, "EXHAUST SYSTEM"](#)  
 7. After warming up engine, make sure that oil pressure corresponding to the engine speed is produced.

**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)	Idle speed	2,000
Engine pressure kPa (bar, kg/cm <sup>2</sup> , psi)	140 (1.40, 1.43, 20.3) or more	270 (2.70, 2.75, 39.2) or more

8. After checking, install oil pressure switch as follows.

**CAUTION:**

**Be careful not to get burned when engine is hot.**

- Remove old liquid gasket adhering to oil pressure switch and engine.
- Apply liquid gasket and tighten oil pressure switch to specification.

**Use Genuine Thread Sealant or equivalent.**

**Oil pressure switch:**

**15 N·m (1.5 kg-m, 11 ft-lb)**

c. After warming up engine, check for oil leakage with running engine.

**Changing Engine Oil**

BBS0017Q

**WARNING:**

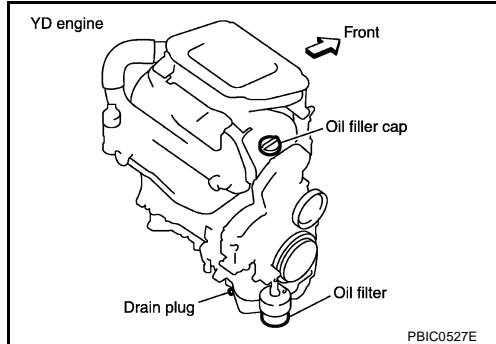
- Be careful not to burn yourself, as the engine oil is hot.**
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used engine oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**

- Warm up engine, put vehicle horizontally and check for engine oil leakage from engine components. Refer to [LU-20, "ENGINE OIL LEAKAGE"](#).
- Stop engine and wait for 10 minutes.

## ENGINE OIL

[YD22DDTi]

3. Loosen oil filler cap and then remove drain plug.



4. Drain engine oil.
5. Install drain plug with new washer. Refer to [EM-161, "OIL PAN AND OIL STRAINER"](#).

**CAUTION:**

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

**Oil pan drain plug:**

: 34 N·m (3.5 kg·m, 25 ft-lb)

6. Refill with new engine oil.

**Engine oil specification and viscosity:**

Refer to [MA-17, "RECOMMENDED FLUIDS AND LUBRICANTS"](#).

**Engine oil capacity (Approximate):**

Unit:  $\ell$  (Imp qt)

Drain and refill	With oil filter change	5.4 (4-3/4)
	Without oil filter change	4.9 (4-1/4)
Dry engine (Overhaul)		6.5 (5-3/4)

**CAUTION:**

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

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-20, "ENGINE OIL LEVEL"](#).

**OIL FILTER**

PFP:15208

**Removal and Installation (TYPE A)**

BBS0017R

**REMOVAL**

1. Open oil filter installation/removal cover on RH engine undercover.
2. Using the oil filter wrench, remove oil filter.

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**CAUTION:**

- Be careful not to get burned when engine and engine oil are 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 adhere to engine and vehicle.
- Oil filter is provided with a relief valve.

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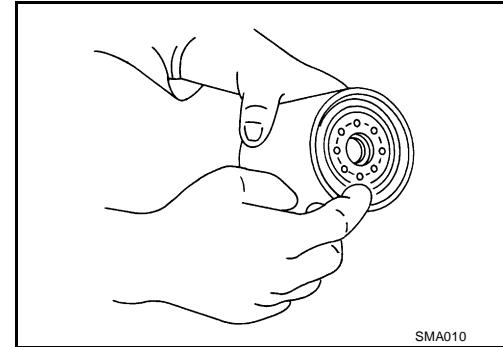
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**INSTALLATION**

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



3. Screw oil filter manually until it touches the installation surface, then tighten it by 1/2 turn. Or tighten to specification.

**Oil filter:** **18 N·m (1.8 Kg·m, 13 ft-lb)****INSPECTION AFTER INSTALLATION**

1. Check the engine oil level and adjust engine oil. Refer to [LU-20, "ENGINE OIL"](#) .
2. Start engine, and check there is no leakage of engine oil.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level and adjust engine oil. Refer to [LU-20, "ENGINE OIL"](#) .

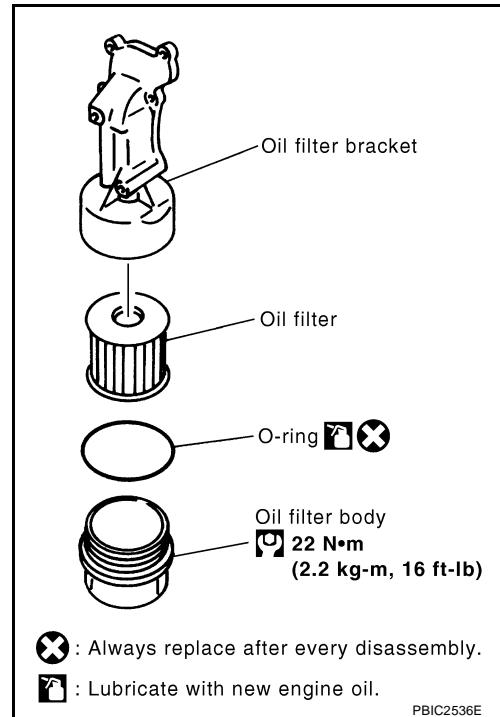
## Removal and Installation (TYPE B)

BBS0017S

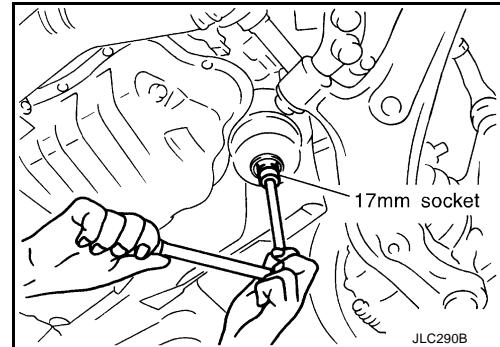
## REMOVAL

## CAUTION:

- Be careful not to get burned when engine and engine oil are 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 adhere to engine and vehicle.



1. Open oil filter installation/removal cover on RH engine undercover.
2. Using a socket wrench [plane-to-plane width: 17 mm (0.67 in)], loosen oil filter body approximately four turns.

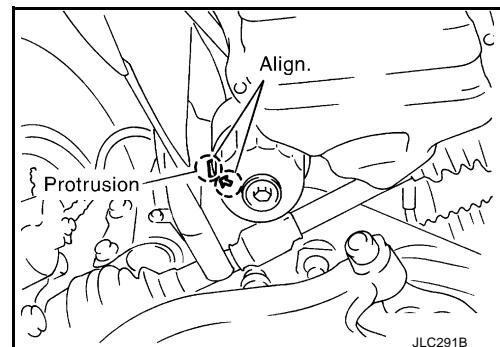


3. Drain engine oil after matching the "DRAIN" arrow mark at the bottom of oil filter body to the protrusion on oil filter bracket.
- Catch engine oil with a pan or cloth.

## CAUTION:

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

4. Remove oil filter body, then remove oil filter.

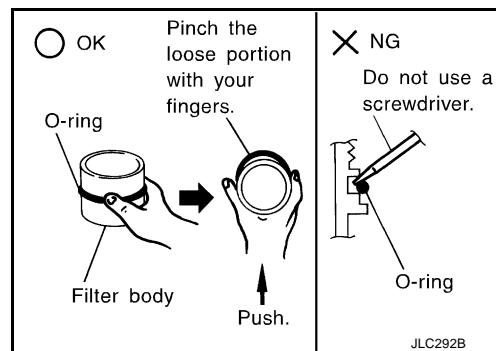


## 5. Remove O-ring from oil filter body.

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

**CAUTION:**

**Do not use a screwdrivers etc. as they may cause damage to oil filter body.**

**INSTALLATION**

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

**Oil filter body:**

: 22 N·m (2.2 Kg-m, 16 ft-lb)

**INSPECTION AFTER INSTALLATION**

- Check the engine oil level and adjust engine oil. Refer to [LU-20, "ENGINE OIL"](#) .
- After warming up engine, check there is no leaks of engine oil.
- Stop engine and wait for 10 minutes.
- Check the engine oil level and adjust engine oil. Refer to [LU-20, "ENGINE OIL"](#) .

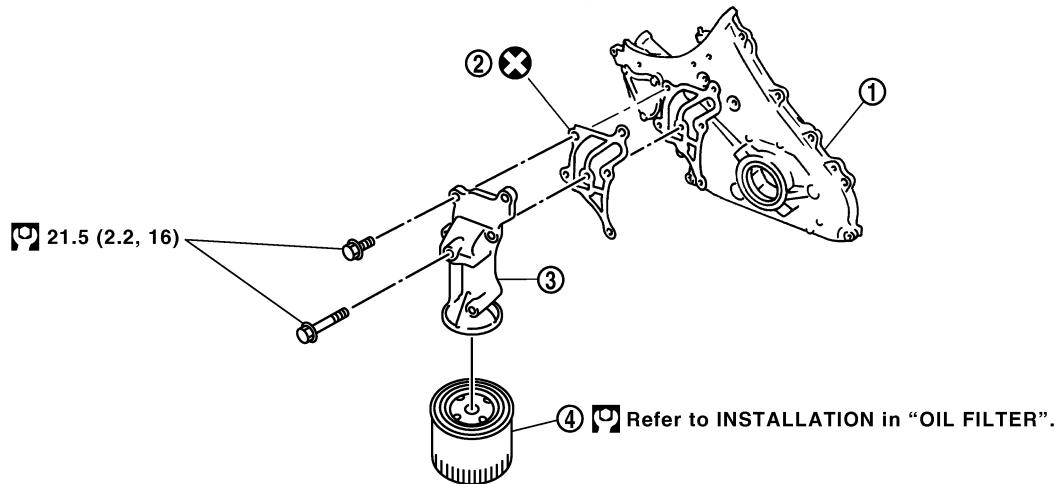
## OIL FILTER BRACKET

PFP:15238

## Removal and Installation (TYPE A)

BBS0017T

SEC. 150



PBIC2380E

1. Oil pump housing
2. Gasket
3. Oil filter bracket
4. Oil filter

## REMOVAL

## CAUTION:

Be careful not to get burned when engine is hot.

1. Remove RH engine undercover.
2. Remove oil filter. Refer to [LU-23, "Removal and Installation \(TYPE A\)"](#).
3. Remove oil filter bracket.

## INSTALLATION

Install all removed parts in the reverse order of removal.

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

## INSPECTION AFTER INSTALLATION

1. After warming up engine, check there is no leaks of engine oil.
2. Stop engine and wait for 10 minutes.
3. Check the engine oil level and adjust engine oil. Refer to [LU-20, "ENGINE OIL"](#).

## Removal and Installation (TYPE B)

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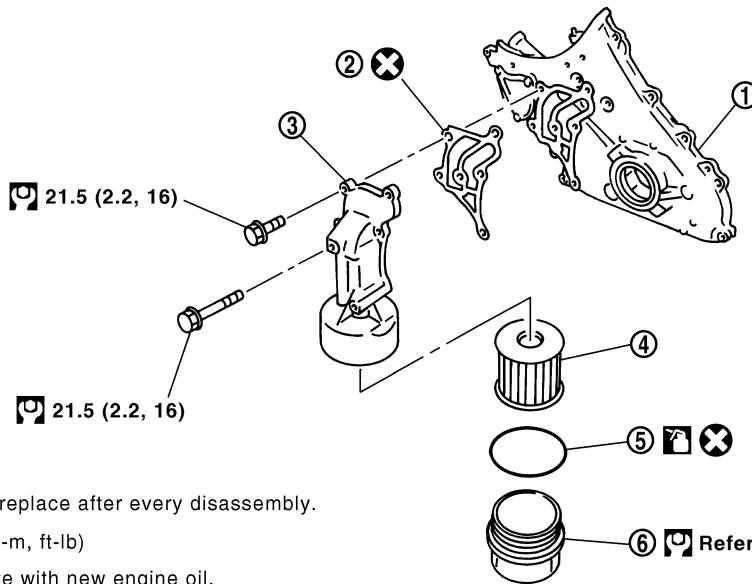
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SEC. 150



PBIC2537E

1. Oil pump housing
2. Gasket
3. Oil filler bracket
4. Oil filter
5. O-ring
6. Oil filter body

## REMOVAL

## CAUTION:

Be careful not to get burned when engine is hot.

1. Remove RH engine undercover.
2. Remove oil filter. Refer to [LU-24, "Removal and Installation \(TYPE B\)"](#).
3. Remove oil filter bracket.

## INSTALLATION

Install all removed parts in the reverse order of removal.

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

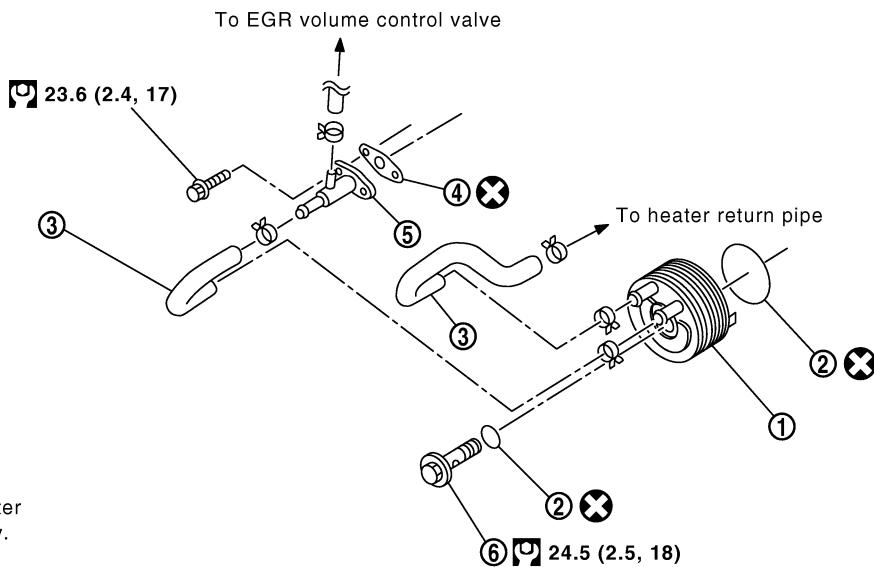
## INSPECTION AFTER INSTALLATION

1. After warming up engine, check there is no leaks of engine oil.
2. Stop engine and wait for 10 minutes.
3. Check the engine oil level and adjust engine oil. Refer to [LU-20, "ENGINE OIL"](#).

## OIL COOLER

## Removal and Installation

**SEC. 213**



PBIC2441E

1. Oil cooler	2. O-ring	3. Water hose
4. Gasket	5. Water hose connector	6. Connecting bolt

## CAUTION:

- Be careful not to get burned when engine and engine oil are hot.
- When removing, prepare a shop cloth to absorb any engine oil leakage or spillage.
- Completely wipe off any engine oil that adhere to engine and vehicle.

## **REMOVAL**

1. Remove engine undercover.
2. Drain engine coolant by removing cylinder block drain plug and radiator drain plug. Refer to [CO-32, "DRAINING ENGINE COOLANT"](#) and [EM-235, "CYLINDER BLOCK"](#) .
3. Remove exhaust front tube. Refer to [EX-2, "EXHAUST SYSTEM"](#) .
4. Remove water hoses.
5. Loosen connecting bolt and remove oil cooler.

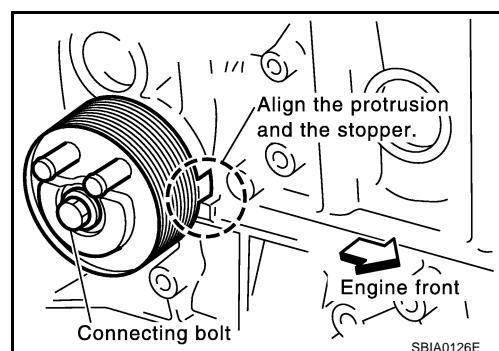
## INSPECTION AFTER REMOVAL

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

## INSTALLATION

Installation is the reverse order of removal.

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



#### INSPECTION AFTER INSTALLATION

1. Check the engine oil level and the engine coolant level, and adjust engine oil and engine coolant. Refer to [LU-20 "ENGINE OIL"](#) and [CO-32 "ENGINE COOLANT"](#).

## OIL COOLER

[YD22DDTi]

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- 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-20, "ENGINE OIL"](#) and [CO-32, "ENGINE COOLANT"](#).

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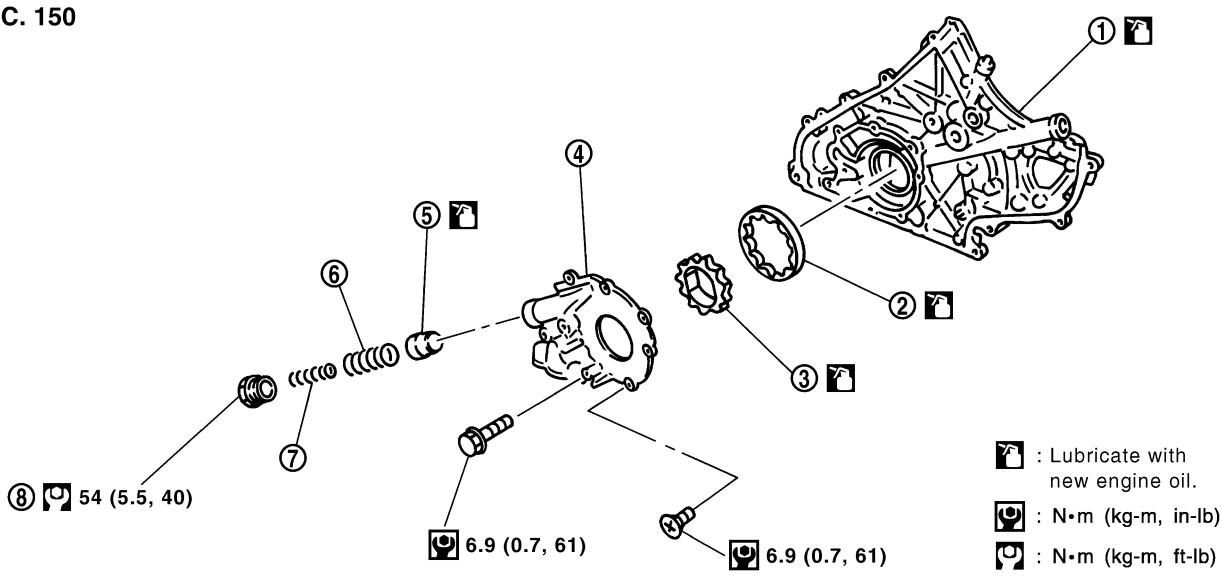
## OIL PUMP

PFP:15010

## Removal and Installation

BBS0017W

SEC. 150



PBIC2381E

1. Oil pump housing
2. Outer rotor
3. Inner rotor
4. Oil pump cover
5. Regulator valve
6. Outer regulator spring
7. Inner regulator spring
8. Regulator plug

## REMOVAL

Remove oil pump assembly. Refer to [EM-203, "PRIMARY TIMING CHAIN"](#) .

## INSTALLATION

Installation is the reverse order of removal.

## INSPECTION AFTER INSTALLATION

1. After warming up engine, check there is no leaks of engine oil.
2. Stop engine and wait for 10 minutes.
3. Check the engine oil level and adjust engine oil. Refer to [LU-20, "ENGINE OIL"](#) .

## Disassembly and Assembly

## DISASSEMBLY

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

## INSPECTION AFTER DISASSEMBLY

## Clearance of Oil Pump Parts

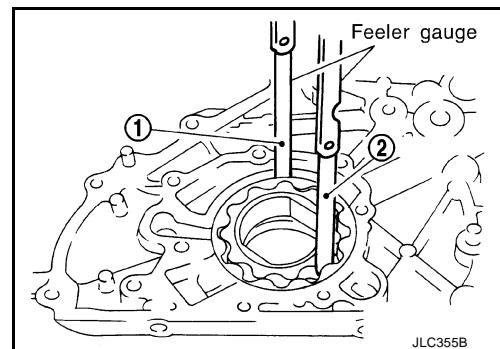
- Measure the clearance with feeler gauge.
- Clearance between outer rotor and oil pump housing (position 1)

**Standard : 0.114 - 0.260 mm (0.0045 - 0.0102 in)**

- If out of the standard, replace oil pump assembly.
- Tip clearance between inner rotor and outer rotor (position 2)

**Standard : Below 0.18 mm (0.0071in)**

- If out of standard, replace oil pump assembly.



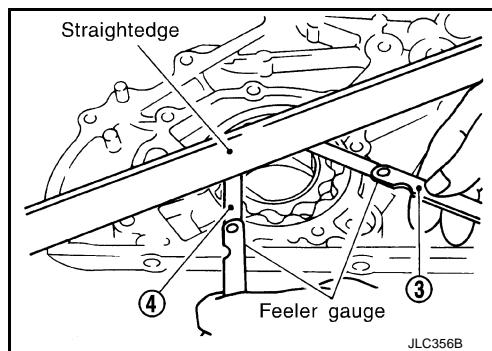
JLC35B

- Measure the clearance with the feeler gauge and the straight-edge.
- Side clearance between inner rotor and oil pump housing (position 3)

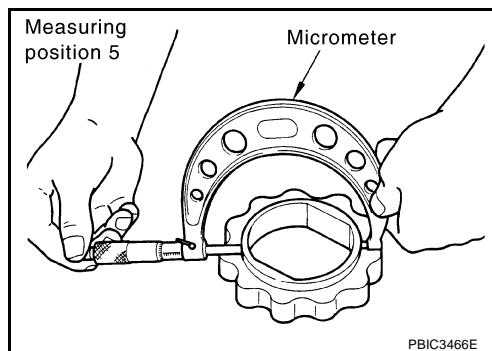
**Standard : 0.050 - 0.090 mm (0.0020 - 0.0035 in)**

- If out of the standard, replace oil pump assembly.
- Side clearance between outer rotor and oil pump housing (position 4)

**Standard : 0.030 - 0.190 mm (0.0012 - 0.0075 in)**



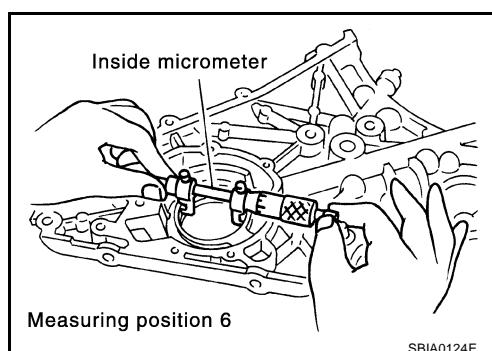
- If out of the standard, replace oil pump assembly.
- Calculate the clearance between inner rotor and oil pump housing as follows.
- Measure the outer diameter of protruded portion of inner rotor (position 5).



- Measure the inner diameter of oil pump housing with the inside micrometer (position 6).  
(Clearance) = (Inner diameter of oil pump housing) – (Outer diameter of inner rotor)

**Standard : 0.045 - 0.091mm (0.0018 - 0.0036 in)**

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



### Regulator Valve Clearance

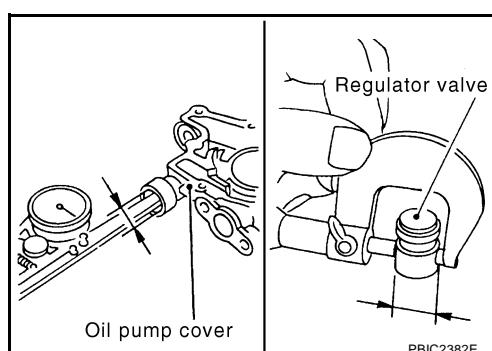
(Clearance) = (Valve hole diameter) – (Regulator valve outer diameter)

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

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

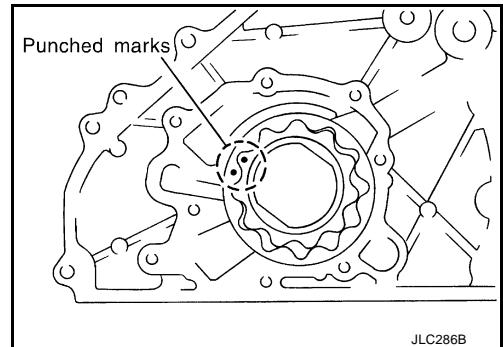
**CAUTION:**

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



## ASSEMBLY

- Assembly is the reverse order of disassembly.
- Install inner rotor and outer rotor with the punched marks on the oil pump cover side.



# SERVICE DATA AND SPECIFICATIONS (SDS)

[YD22DDTi]

## SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

### Standard and Limit

#### OIL PRESSURE

BBS0017Y

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm <sup>2</sup> , psi)	LU
Idle speed 2,000	140 (1.40, 1.43, 20.3) or more 270 (2.70, 2.75, 39.2) or more	

#### OIL PUMP

Unit: mm (in)

Oil pump housing to outer rotor radial clearance	0.114 - 0.260 (0.0045 - 0.0102)	D
Inner rotor to outer rotor tip clearance	Below 0.18 (0.0071)	
Oil pump housing to inner rotor side clearance	0.050 - 0.090 (0.0020 - 0.0035)	E
Oil pump housing to outer rotor side clearance	0.030 - 0.190 (0.0012 - 0.0075)	
Inner rotor to oil pump housing clearance	0.045 - 0.091 (0.0018 - 0.0036)	

#### REGULATOR VALVE

Unit: mm (in)

Regulator valve to valve hole clearance	0.040 - 0.097 (0.0016 - 0.0038)	
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#### OIL CAPACITY (APPROXIMATE)

Unit: ℥ · (Imp qt)

With oil filter change	5.4 (4-3/4 Imp qt)	H
Without oil filter change	4.9 (4-1/4 Imp qt)	
Dry engine (engine overhaul)	6.5 (5-3/4 Imp qt)	

# **SERVICE DATA AND SPECIFICATIONS (SDS)**

**[YD22DDTi]**

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