SECTION LU

ENGINE LUBRICATION SYSTEM

CONTENTS

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PRECAUTIONS

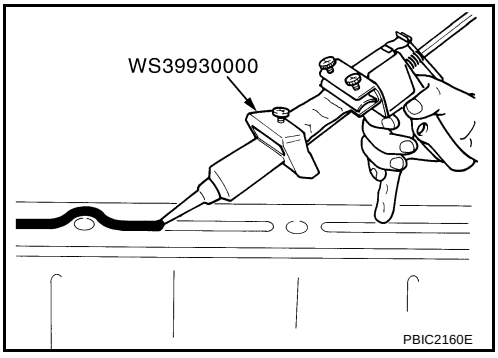
PFP:00001

Precautions for Liquid Gasket

EBS011UN

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 (special service tool).
   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.

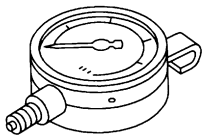
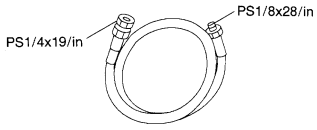
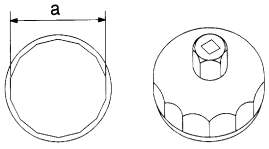
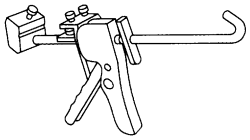


PREPARATION

PFP:00002

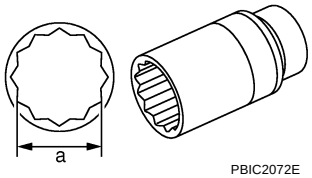
Special Service Tools

EBS00KO0

Tool number Tool name	Description
ST25051001 Oil pressure gauge  S-NT050	Measuring oil pressure **Maximum measuring range:** **2,452 kPa (24.52 bar, 25 kg/cm^2 , 356 psi)**
ST25052000 Hose  S-NT559	Adapting oil pressure gauge to cylinder block
KV10115801 Oil filter wrencha  S-NT375	Removing and installing oil filter **a: 64.3 mm (2.531 in)**
WS39930000 Tube presser  S-NT052	Pressing the tube of liquid gasket

Commercial Service Tools

EBS011TG

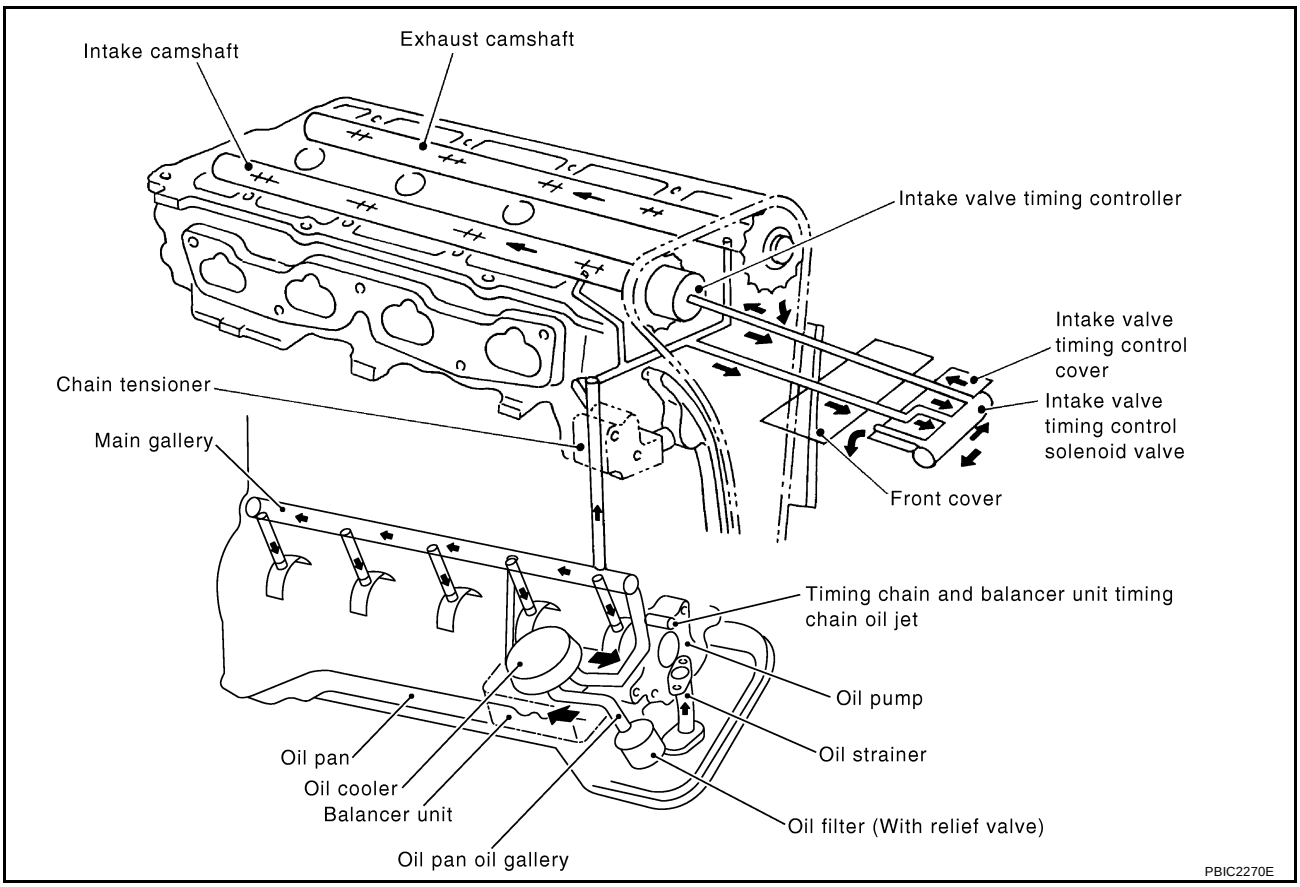
Tool name	Description
Deep socket  PBIC2072E	Removing and installing oil pressure switch **a: 27 mm (1.06 in)**

LUBRICATION SYSTEM

PFP:15010

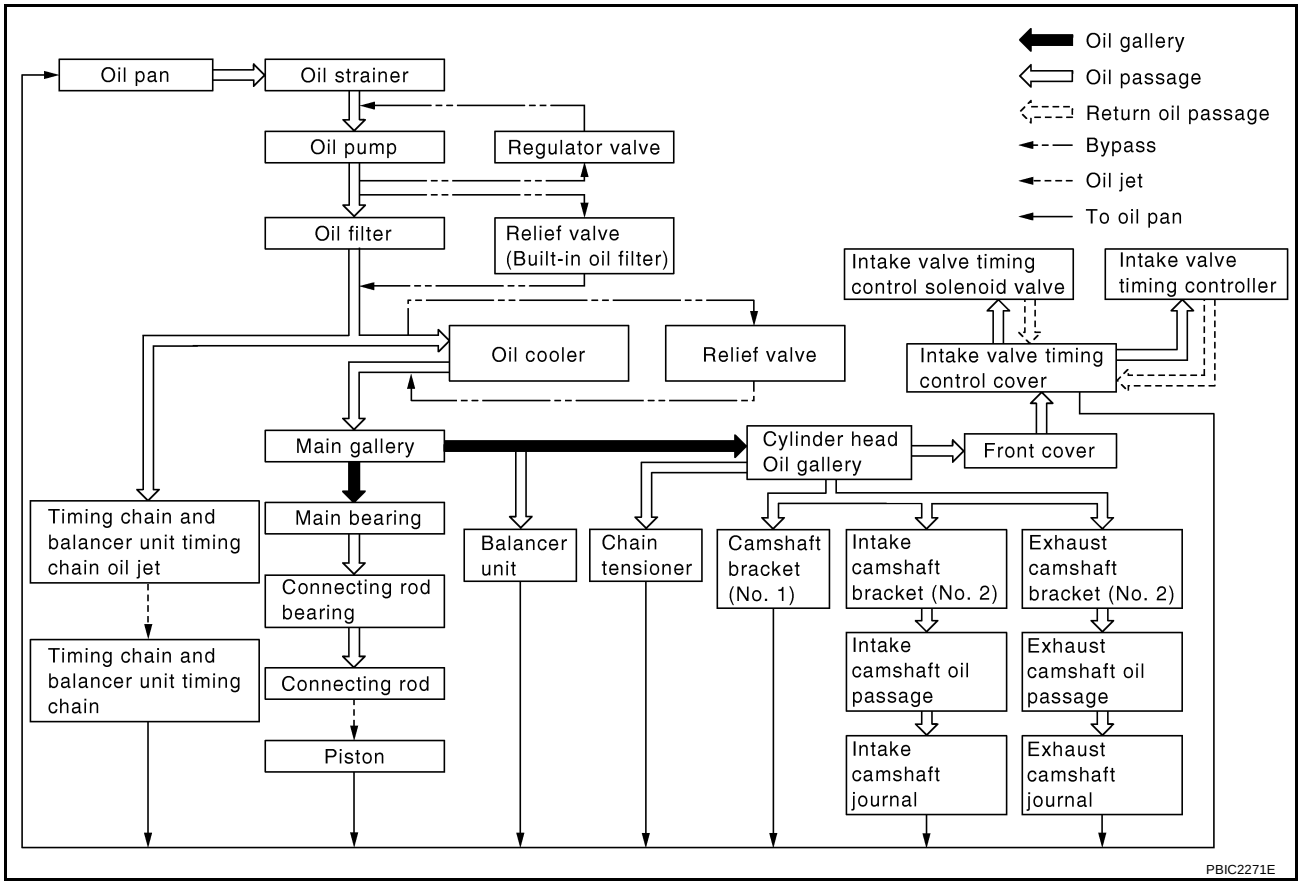
Lubrication Circuit

EBS00KO1



System Chart

EBS00KO2



ENGINE OIL

PFP:KLA92

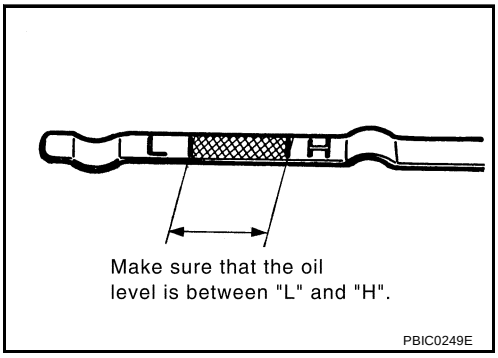
Inspection

EBS00KO3

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
- 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)

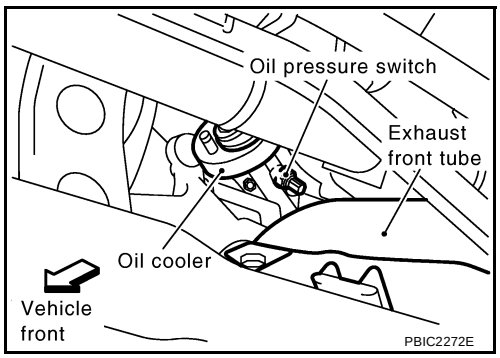
OIL PRESSURE CHECK

WARNING:

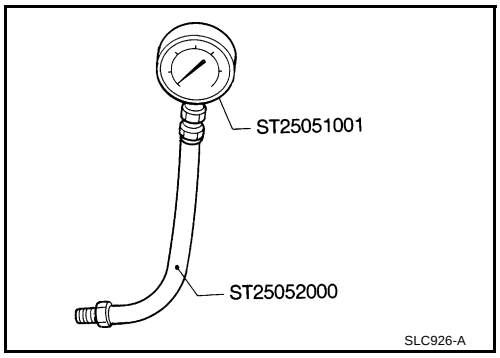
- **Be careful not to burn yourself, as engine oil may be hot.**
- **Engine oil pressure check should be in " Parking position" (A/T models) or "Neutral position" (M/T models), and should apply parking brake securely.**

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 (special service tool).



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^2 , 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

EBS00KO4

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.**

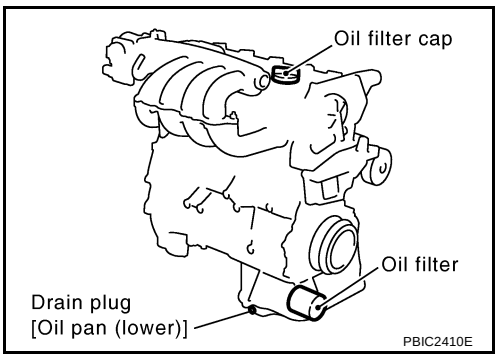
1. Warm up engine, put vehicle horizontally and check for oil leakage from engine components. Refer to LU-7, "ENGINE OIL LEAKAGE" .
2. Stop engine and wait for 10 minutes.

3. Loosen oil filler cap and then remove drain plug.
4. Drain engine oil.
5. Install drain plug with new washer. Refer to EM-25, "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: ℓ (lmp qt)

Drain and refill	With oil filter change	3.9 (3-3/8)
	Without oil filter change	3.5 (3-1/8)
Dry engine (Overhaul)		4.5 (4)

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 the determine when the proper amount of engine oil is 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

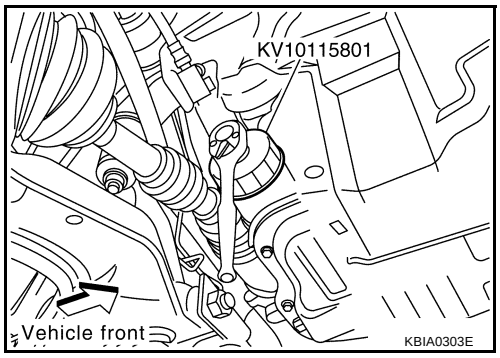
PFP:15208

Removal and Installation

EBS011TI

REMOVAL

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

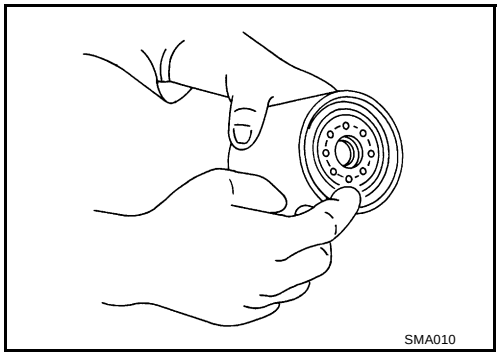


CAUTION:

- **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 belt.**
- **Completely wipe off any engine oil that adheres to engine and vehicle.**

INSTALLATION

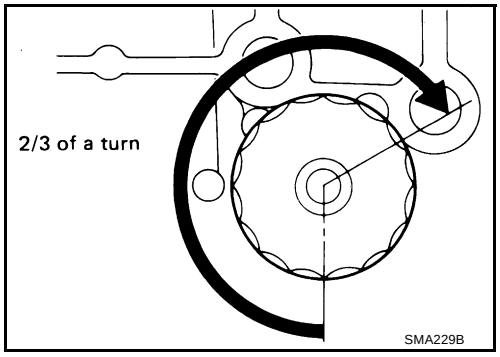
1. Remove foreign materials adhering to the oil filter installation surface.
2. Apply new engine oil to the oil seal contact surface of new oil filter.



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

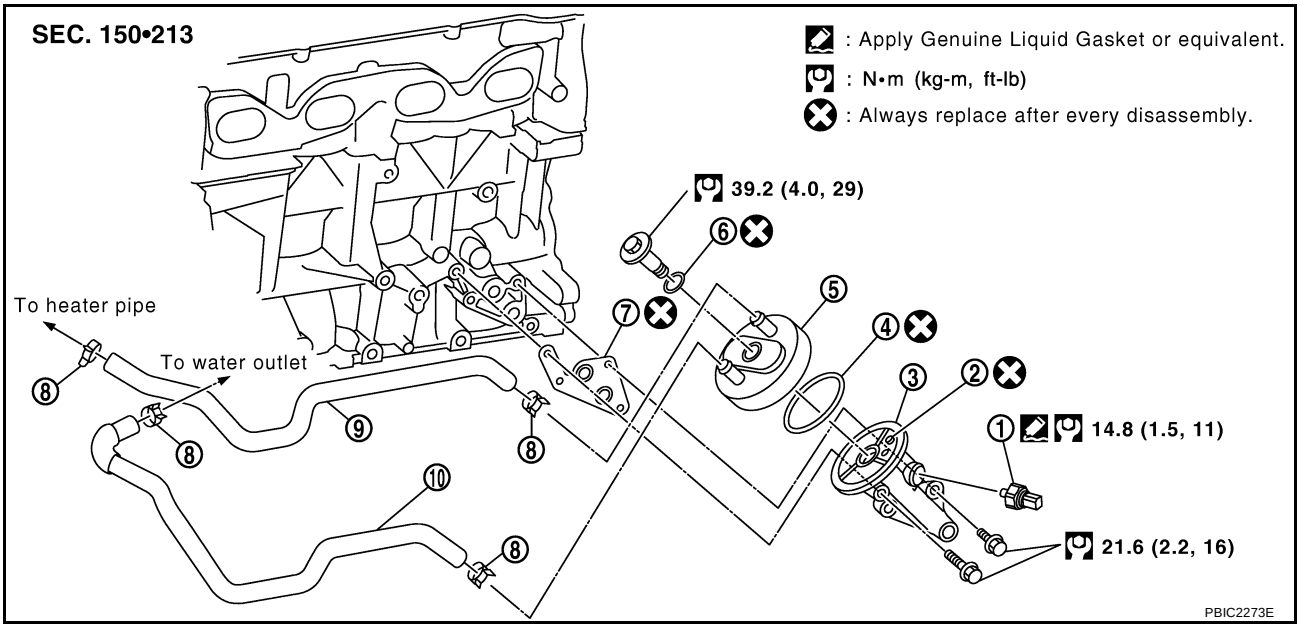
1. Start engine, and make sure there is no leaks of engine oil.
2. Stop engine and wait for 10 minutes.
3. Check the engine oil level and add engine oil. Refer to LU-7, "ENGINE OIL" .

OIL COOLER

PFP:21305

Removal and Installation

EBS00KO8



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-82, "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

Install in the reverse order of removal.

INSPECTION AFTER INSTALLATION

1. Check the engine oil level and the engine coolant level, and add engine oil and engine coolant. Refer to LU-7, "ENGINE OIL" and CO-9, "ENGINE COOLANT" .

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

EBS00KO6

REMOVAL

Remove front cover. Refer to EM-44, "TIMING CHAIN" .

NOTE:
Oil pump is built into front cover.

INSTALLATION

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

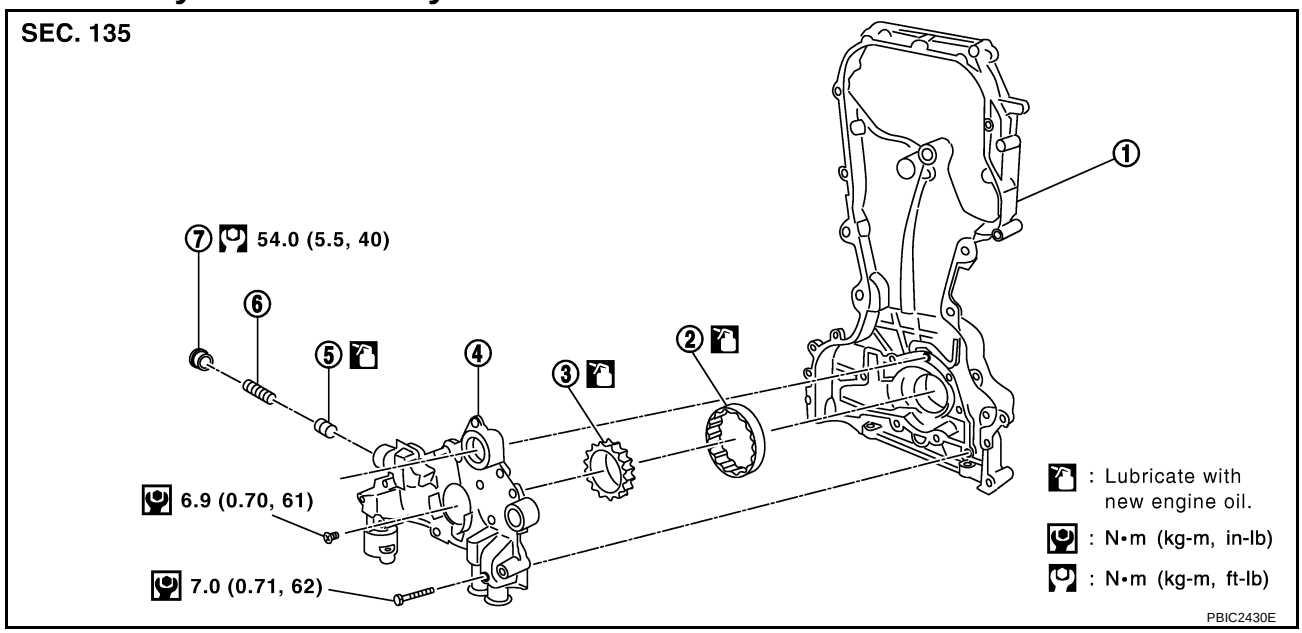
- When installing, align crankshaft flat faces with inner rotor flat faces.

INSPECTION AFTER INSTALLATION

1. After warming up engine, make sure there is no leaks of engine oil.
2. Stop engine and wait for 10 minutes.
3. Check the engine oil level and add engine oil. Refer to LU-7, "ENGINE OIL" .

Disassembly and Assembly

EBS00KO7



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

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

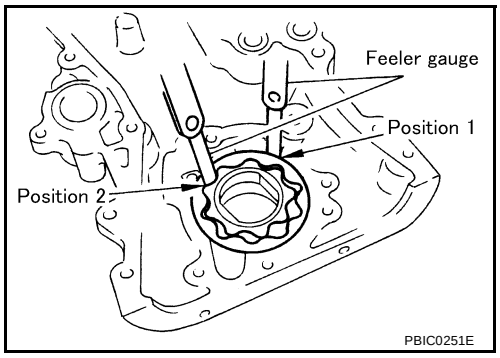
INSPECTION AFTER DISASSEMBLY

Clearance of Oil Pump Parts

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

    Standard : 0.114 - 0.179 mm (0.0045 - 0.0070 in)
  - Tip clearance between inner rotor and outer rotor (position 2)

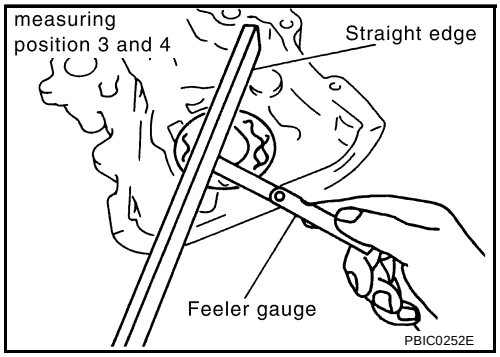
    Standard : Below 0.220 mm (0.0087 in)



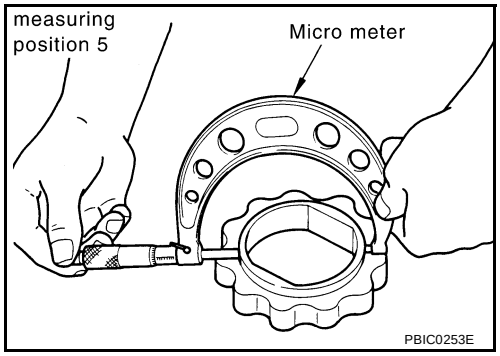
- Measure the clearance with a feeler gauge and straightedge.
  - Side clearance between inner rotor and oil pump body (position 3)

    Standard : 0.030 - 0.070 mm (0.0012 - 0.0028 in)
  - Side clearance between outer rotor and oil pump body (position 4)

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

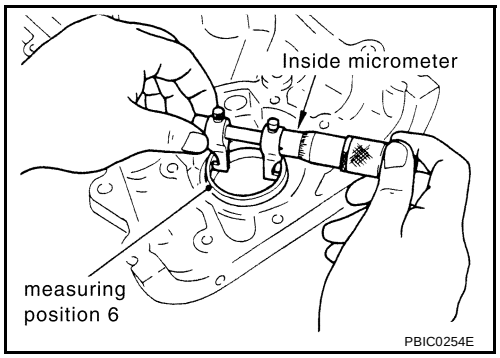


- Calculate the clearance between inner rotor and oil pump body with the following procedure:
  - Measure the outer diameter of protruded portion of inner rotor with a micrometer. (position 5)



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

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



- If measured/calculated values are out of the standard, replace oil pump assembly.

Regulator Valve Clearance

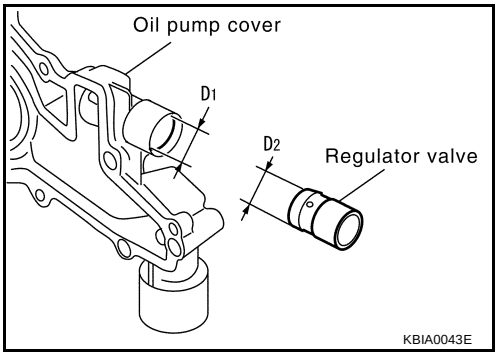
(Clearance) = (Valve hole diameter “D1”) – (Regulator valve outer diameter “D2”)

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

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

CAUTION:

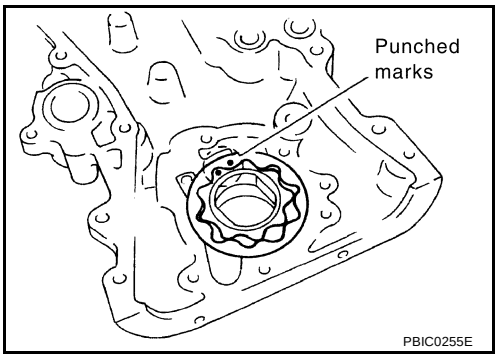
- **Coat regulator valve with new engine oil.**
- **Make sure that it falls smoothly into valve hole by its own weight.**



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)

PFP:00030

Standard and Limit

EBS00KO9

OIL PRESSURE

Engine speed rpm	Approximate discharge pressure* kPa (bar, kg/cm^2 , 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: ℓ (Imp qt)

Drain and refill	With oil filter change	3.9 (3-3/8)
	Without oil filter change	3.5 (3-1/8)
Dry engine (Overhaul)		4.5 (4)

OIL PUMP

Unit: mm (in)

Oil pump body 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)
Oil pump body to inner rotor side clearance	0.030 - 0.070 (0.0012 - 0.0028)
Oil pump body to outer rotor side clearance	0.060 - 0.110 (0.0024 - 0.0043)
Inner rotor to oil pump body 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)

Tightening Torque

EBS00KOA

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

PFP:00001

Precautions for Liquid Gasket

EBS011SZ

LIQUID GASKET APPLICATION PROCEDURE

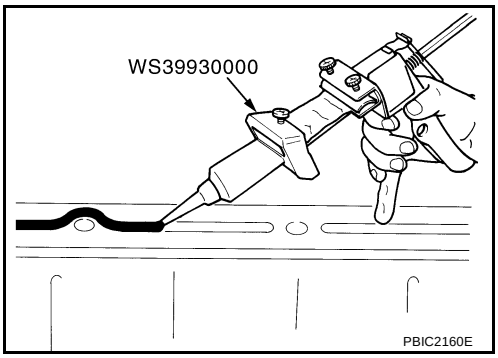
1. Remove the old liquid gasket adhering to the gasket application surface and the mating surface.

- 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 (special service tool).

Use Genuine Liquid Gasket or equivalent.

- 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.

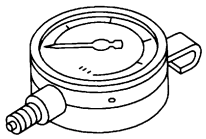
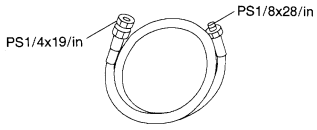
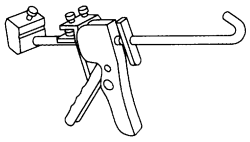


PREPARATION

PFP:00002

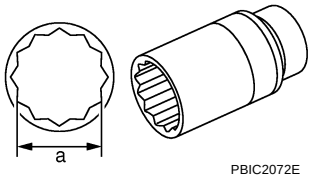
Special Service Tools

EBS00B01

Tool number Tool name	Description
ST25051001 Oil pressure gauge  S-NT050	Measuring oil pressure **Maximum measuring range:** **2,452 kPa (25 kg/cm2, 356 psi)**
ST25052000 Hose  S-NT559	Adapting oil pressure gauge to cylinder block
WS39930000 Tube presser  S-NT052	Pressing the tube of liquid gasket

Commercial Service Tools

EBS011WH

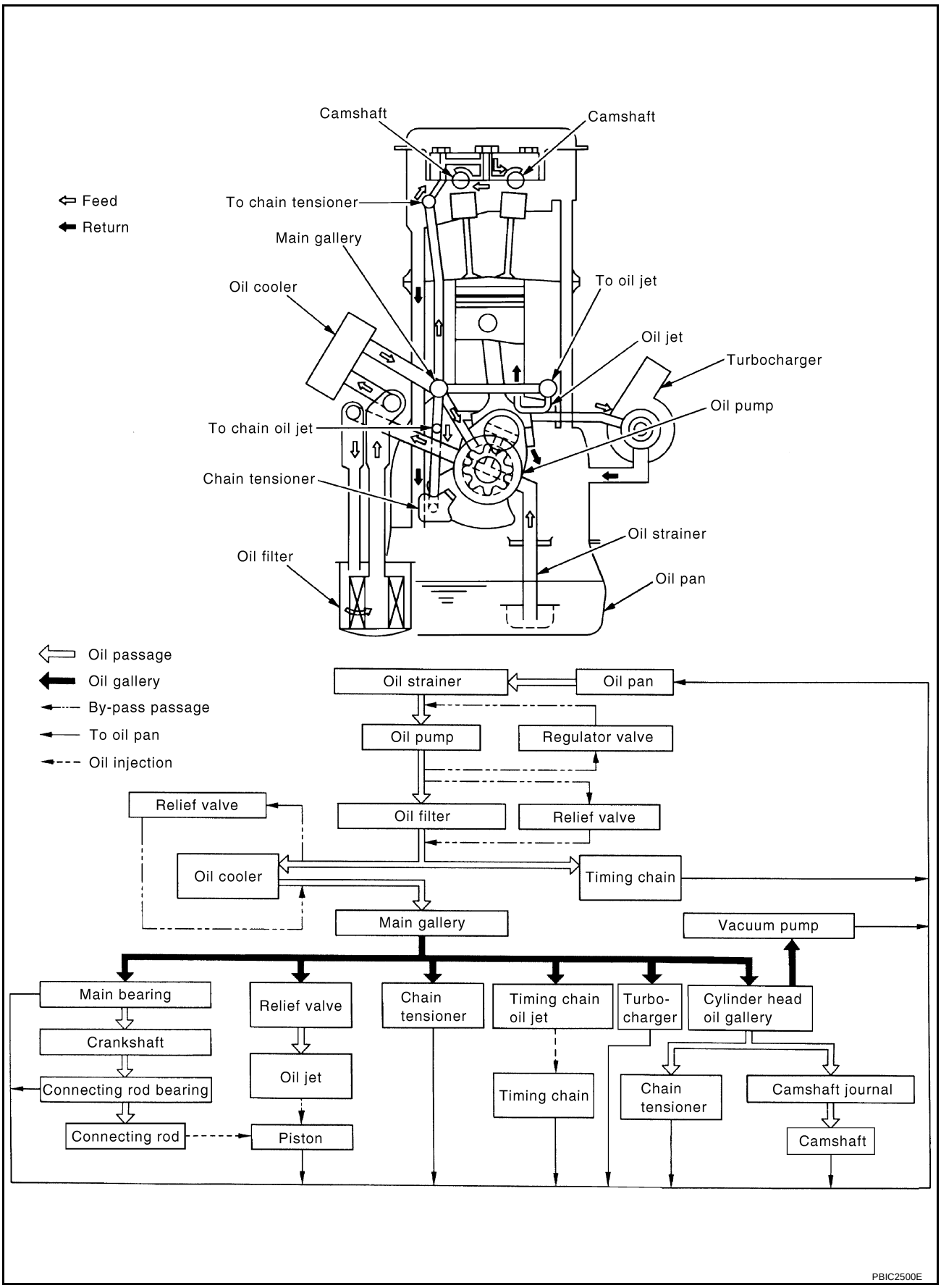
Tool name	Description
Deep socket  PBIC2072E	Removing and installing oil pressure switch **a: 24 mm (0.94 in)**

LUBRICATION SYSTEM

PFP:15010

Lubrication Circuit

EBS00B02



ENGINE OIL

PFP:KLA92

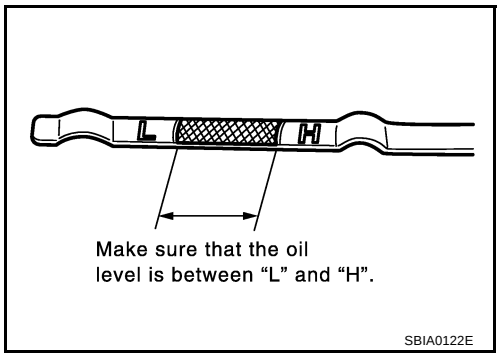
Inspection

EBS00B03

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
- 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

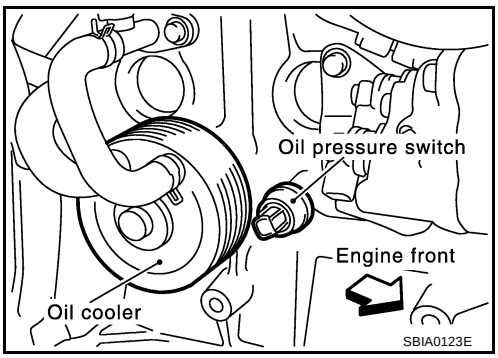
ENGINE OIL PRESSURE CHECK

WARNING:

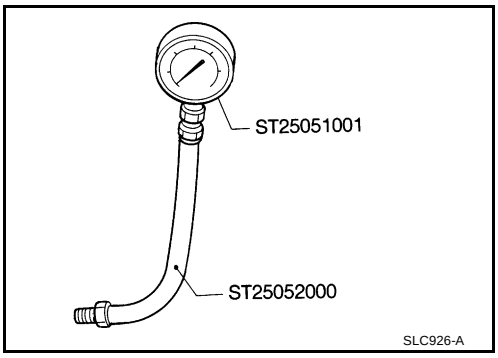
- **Be careful not to burn yourself, as the engine oil is hot.**
- **Be sure to check oil pressure in “ Neutral position” and parking brake should be applied securely.**

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 (special service tool).



6. 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^2 , psi)	140 (1.40, 1.43, 20.3) or more	270 (2.70, 2.75, 39.2) or more

7. After checking, 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.

Oil pressure switch:

: 13.0 - 17.0 N·m (1.4 - 1.7 kg-m, 10 - 12 ft-lb)

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

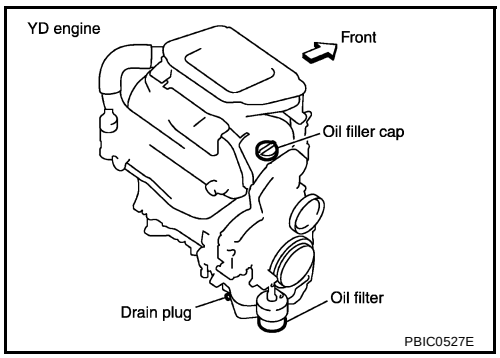
Changing Engine Oil

EBS00B04

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.**

1. Warm up engine, put vehicle horizontally and check for engine oil leakage from engine components. Refer to LU-20, "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-147, "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: ℓ (Imp qt)

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

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 when the proper amount of engine oil is 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)

EBS00B05

REMOVAL

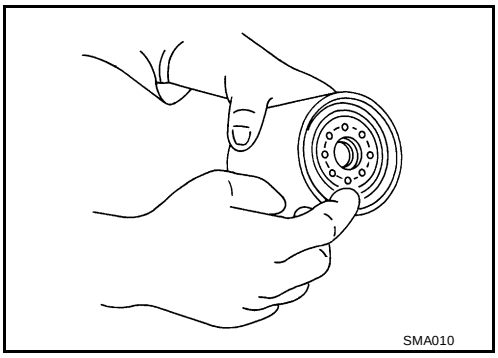
1. Open oil filter installation/removal cover on RH engine undercover.
2. Using the oil filter wrench, remove oil filter.

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.**

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. Start engine, and check there is no leakage of engine oil.
2. Stop engine and wait for 10 minutes.
3. Check the engine oil level and add engine oil. Refer to LU-20, "ENGINE OIL" .

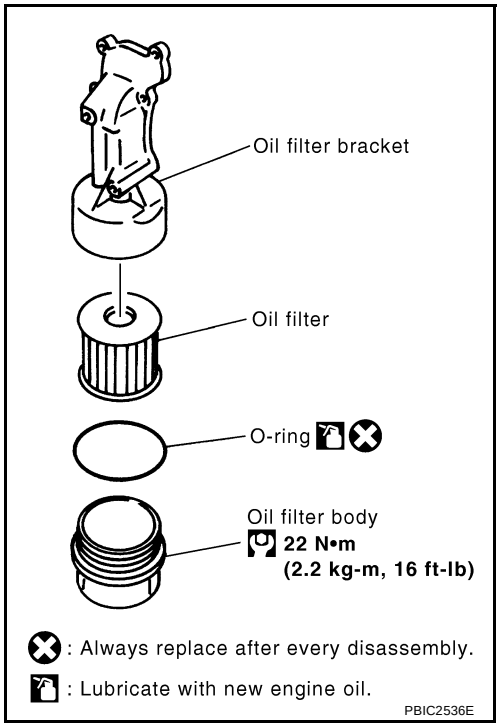
Removal and Installation (TYPE B)

EBS011WI

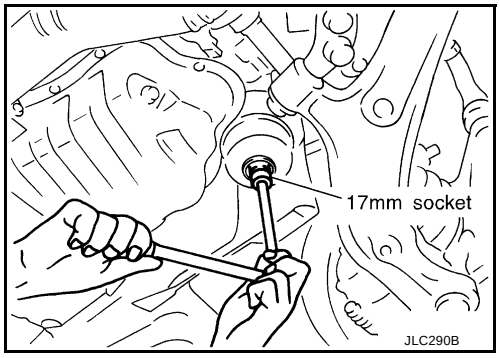
REMOVAL

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.**

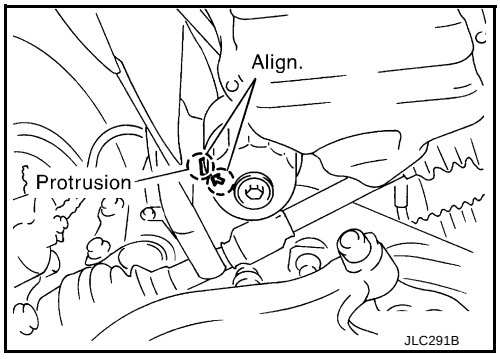


1. Open oil filter installation/removal cover on RH engine undercover.
2. Using a socket wrench [plane-to-plane width: 17 mm (0.67 in)], loosen oil filter body approximately four turns.



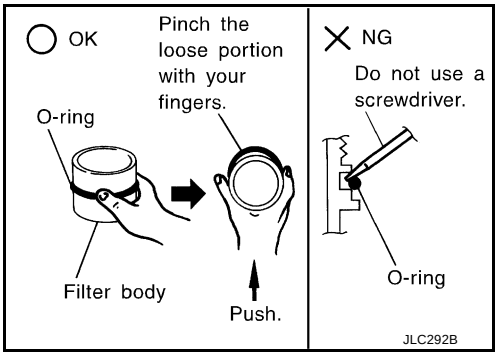
3. Drain engine oil after matching the "DRAIN" arrow mark at the bottom of oil filter body to the protrusion on oil filter bracket.
   - Catch engine oil with a pan or cloth.

   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

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

   Oil filter body:

   : 22 N·m (2.2 Kg-m, 16 ft-lb)

INSPECTION AFTER INSTALLATION

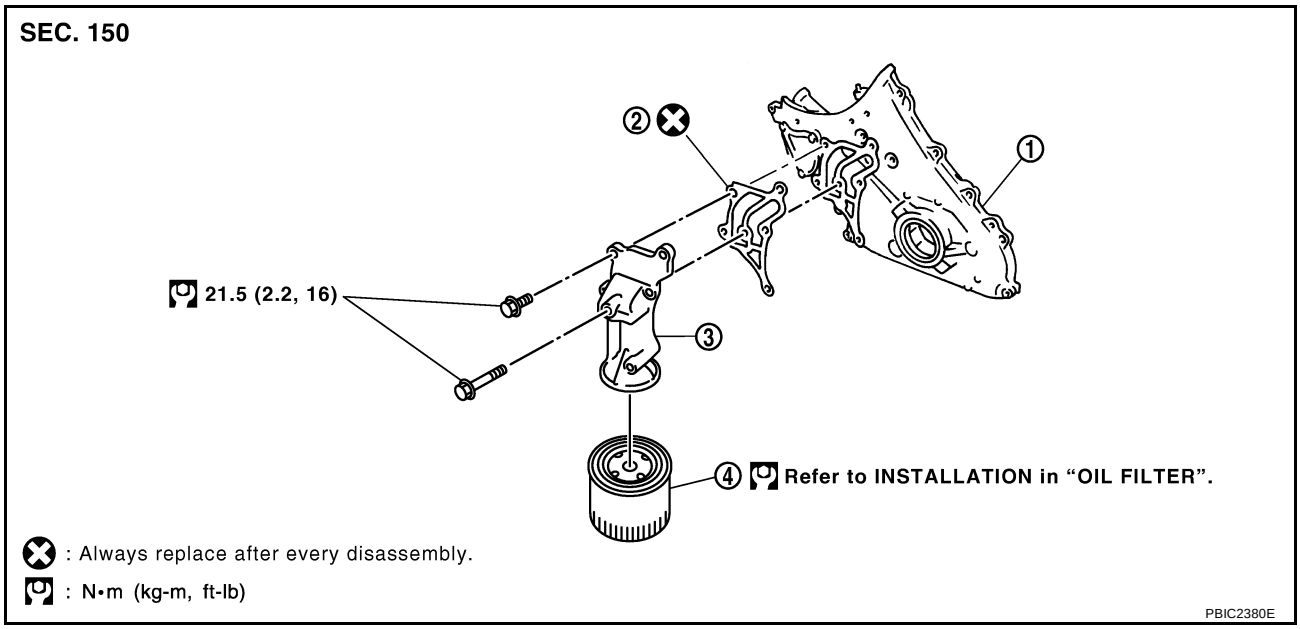
1. After warming up engine, check there is no leaks of engine oil.
2. Stop engine and wait for 10 minutes.
3. Check the engine oil level and add engine oil. Refer to LU-20, "ENGINE OIL" .

OIL FILTER BRACKET

PFP:15238

Removal and Installation (TYPE A)

EBS00BL8



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

REMOVAL

1. Remove RH engine undercover.
2. Steer front wheel to the right.
3. Remove oil filter. Refer to LU-23, "OIL FILTER" .
4. Remove oil filter bracket.

INSTALLATION

Install all removed parts in the reverse order of removal.

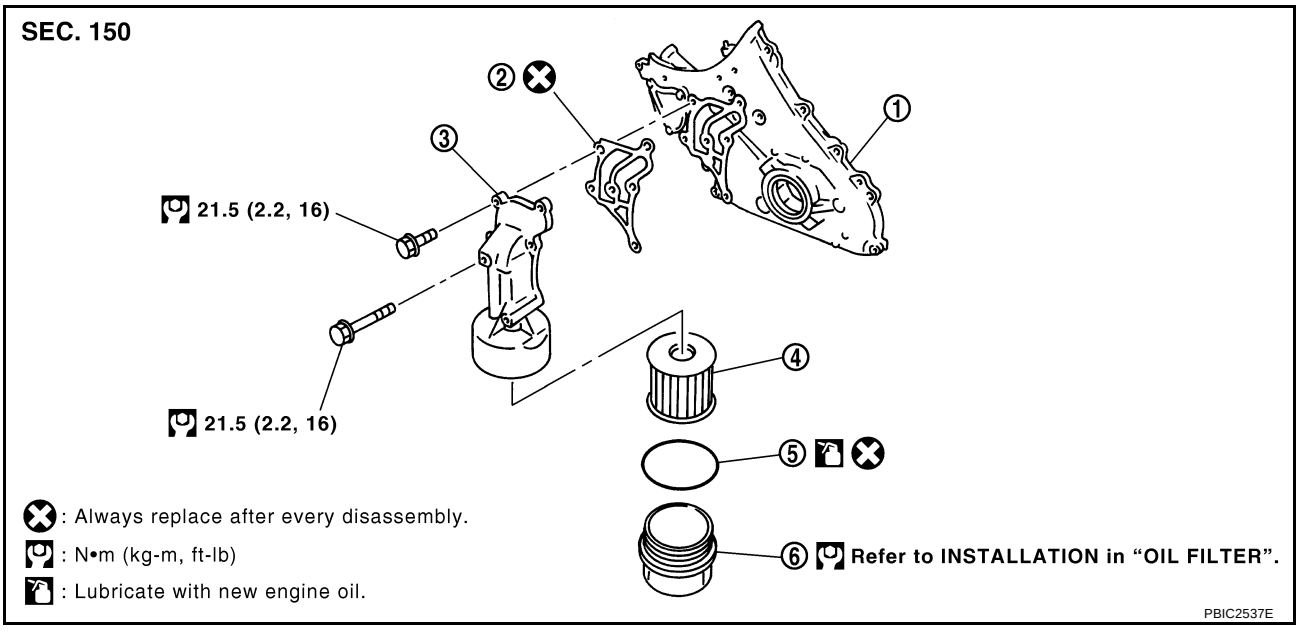
- Insert the top mounting bolt to oil filter bracket beforehand, and set oil filter bracket to the installation location.

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 add engine oil. Refer to LU-20, "ENGINE OIL" .

Removal and Installation (TYPE B)

EBS011WJ



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

REMOVAL

1. Remove RH engine undercover.
2. Steer front wheel to the right.
3. Remove oil filter. Refer to LU-24, "Removal and Installation (TYPE B)" .
4. 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

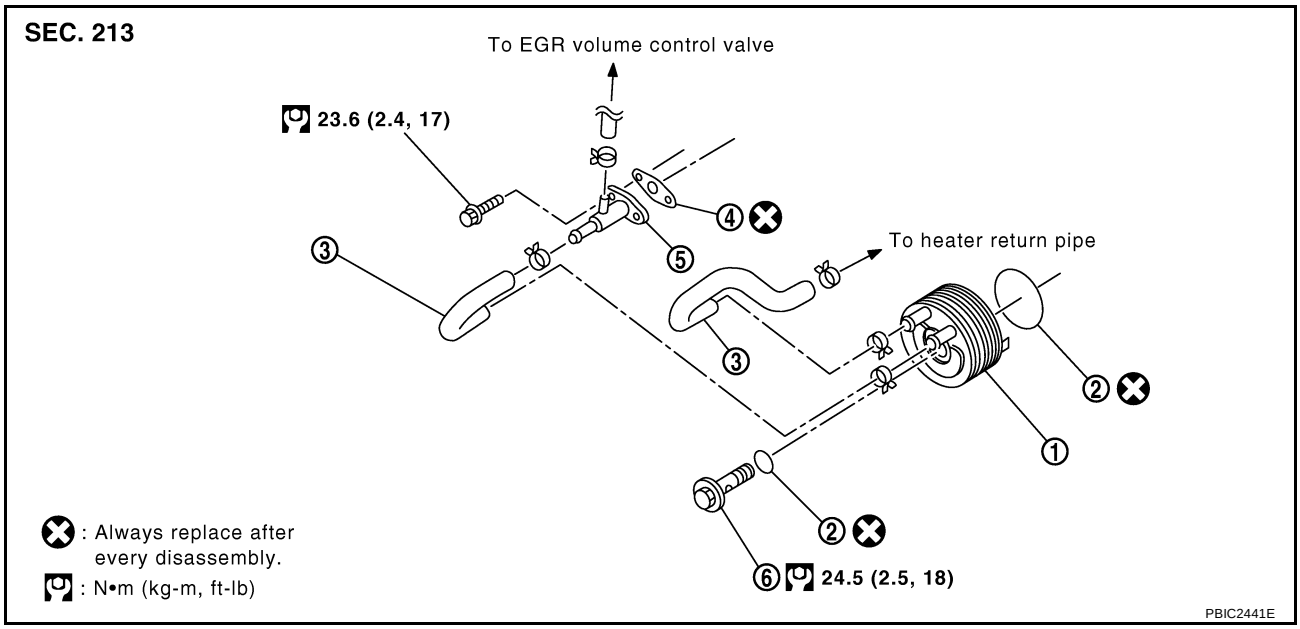
1. After warming up engine, check there is no leaks of engine oil.
2. Stop engine and wait for 10 minutes.
3. Check the engine oil level and add engine oil. Refer to LU-20, "ENGINE OIL" .

OIL COOLER

PFP:21305

Removal and Installation

EBS00OE8



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-31, "DRAINING ENGINE COOLANT" and EM-212, "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.

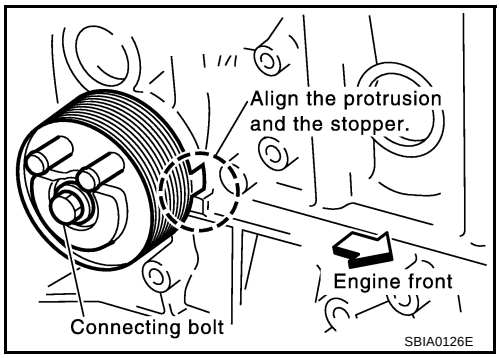
INSPECTION AFTER REMOVAL

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

INSTALLATION

Installation is in 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 add engine oil and engine coolant. Refer to LU-20, "ENGINE OIL" and CO-31, "ENGINE COOLANT" .

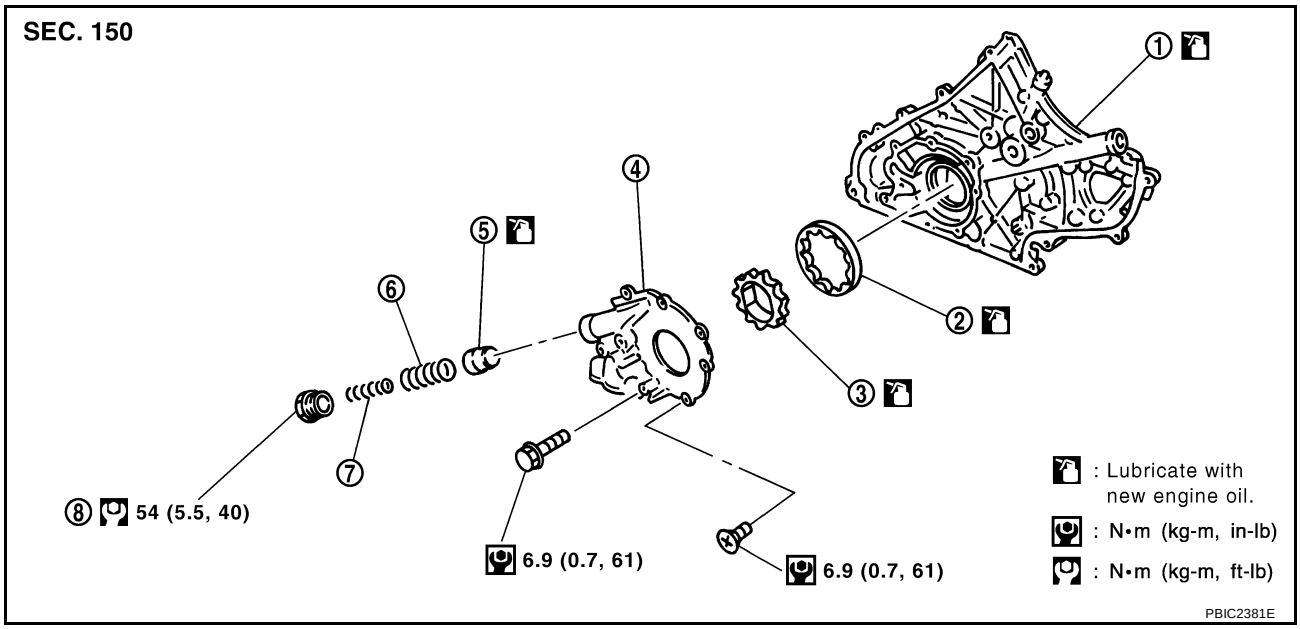
2. Start engine, and make sure that there is no leaks of engine oil or engine coolant.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level and the engine coolant level again. Refer to LU-20, "ENGINE OIL" and CO-31, "ENGINE COOLANT" .

OIL PUMP

PFP:15010

Removal and Installation

EBS01AJ3



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 housing. Refer to EM-185, "PRIMARY TIMING CHAIN" .

INSTALLATION

Install in 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 add engine oil. Refer to LU-20, "ENGINE OIL" .

Disassembly and Assembly

EBS01AI7

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

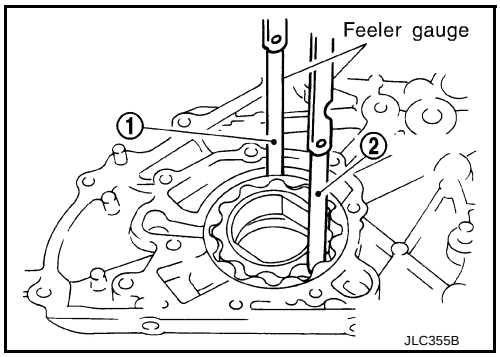
Clearance of Oil Pump Parts

- 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)

  Tip clearance between inner rotor and outer rotor (position 2)

  Standard : Below 0.18 mm (0.0071in)

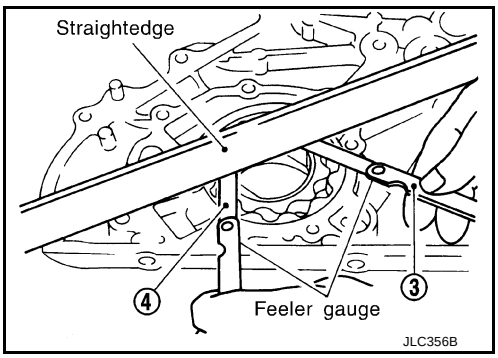


- Measure the clearance with the feeler gauge and the straightedge.
  Side clearance between inner rotor and oil pump housing (position 3)

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

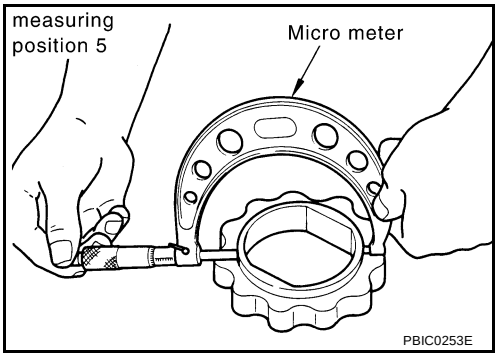
  Side clearance between outer rotor and oil pump housing (position 4)

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



- Calculate the clearance between inner rotor and oil pump housing as follows.

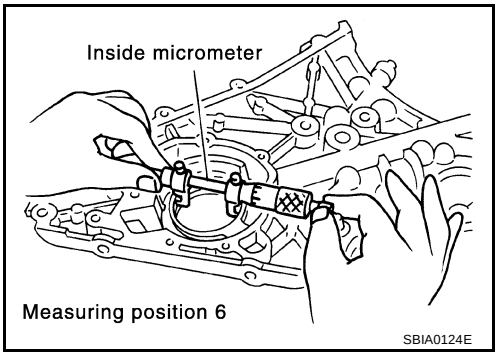
– Measure the outer diameter of protruded portion of inner rotor (position 5).



– 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 measured/calculated values are out of the standard, replace oil pump assembly.



Regulator Valve Clearance

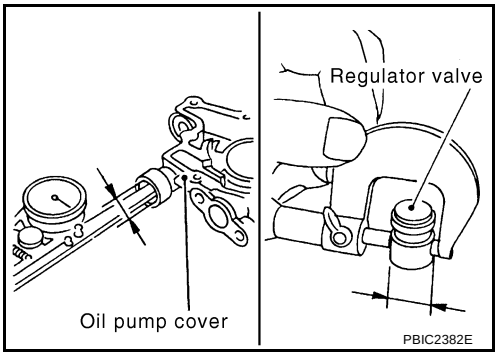
(Clearance) = (Valve hole diameter) – (Regulator valve outer diameter)

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

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

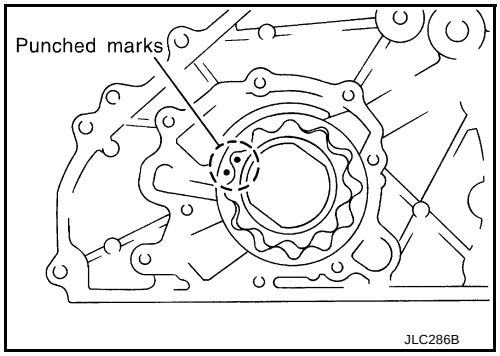
CAUTION:

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



ASSEMBLY

- 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)

PFP:00030

Standard and Limit

EBS00CTZ

OIL PRESSURE

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2 , psi)
Idle speed	140 (1.40, 1.43, 20.3) or more
2,000	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)
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)
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)

OIL CAPACITY (APPROXIMATE)

Unit: ℓ · (Imp qt)

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

Tightening Torque

EBS00B0F

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

Oil pressure switch		13.0 - 17.0 (1.4 - 1.7, 10 - 12)
Oil pan drain plug		34 (3.5, 25)
Oil filter bracket		21.5 (2.2, 16)
Oil filler body (TYPE B)		22 (2.2, 16)
Oil filter (TYPE A)		18 (1.8, 13)
Oil pump cover	Bolts	6.9 (0.7, 61)*
	Screws	6.9 (0.7, 61)*
Regulator plug		54 (5.5, 40)
Water hose connector		23.6 (2.4, 17)
Oil cooler		24.5 (2.5, 18)