SECTION LU

ENGINE LUBRICATION SYSTEM

CONTENTS

PRECAUTIONS

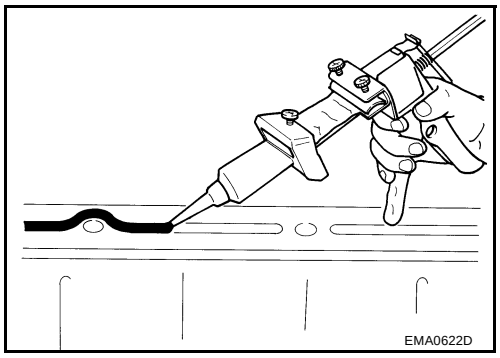
PFP:00001

Precautions for Liquid Gasket

ABS004S3

LIQUID GASKET APPLICATION PROCEDURE

1. Remove the old liquid gasket adhering to the gasket application surface and the mating surface.
2. Wipe the gasket application surface and the mating surface with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.
3. Attach the liquid gasket tube to the tube presser [special service tool: WS39930000 (—)].
   Use Genuine Thread Sealant or equivalent. Refer to GI-45, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS".
4. Apply the liquid gasket without breaks to the specified location with the specified dimensions.
   - Within five minutes of gasket application, install the mating component.
   - If the liquid gasket protrudes, wipe it off immediately.
   - Do not retighten after the installation.
   - After 30 minutes or more have passed from the installation, fill the engine oil and engine coolant.



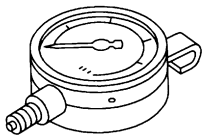
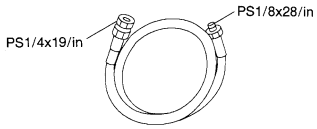
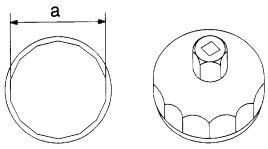
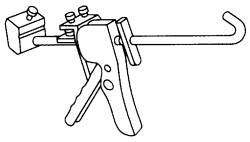
PREPARATION

PFP:00002

Special Service Tools

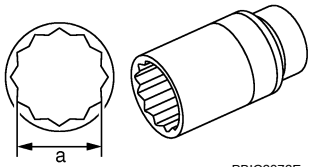
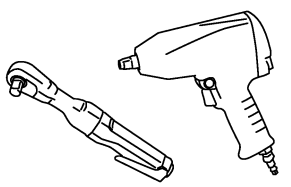
ABS00010

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  NT050	Measuring oil pressure **Maximum measuring range: 2,452 kPa (25 kg/cm^2 , 356 psi)**
ST25052000 (J25695-2) Hose  S-NT559	Adapting oil pressure gauge to upper oil pan (upper)
KV10115801 (J38956) Oil filter wrench  S-NT375	Removing and installing oil filter **a: 64.3 mm (2.531 in)**
WS39930000 (—) Tube presser  NT052	Pressing the tube of liquid gasket

Commercial Service Tools

ABS00011

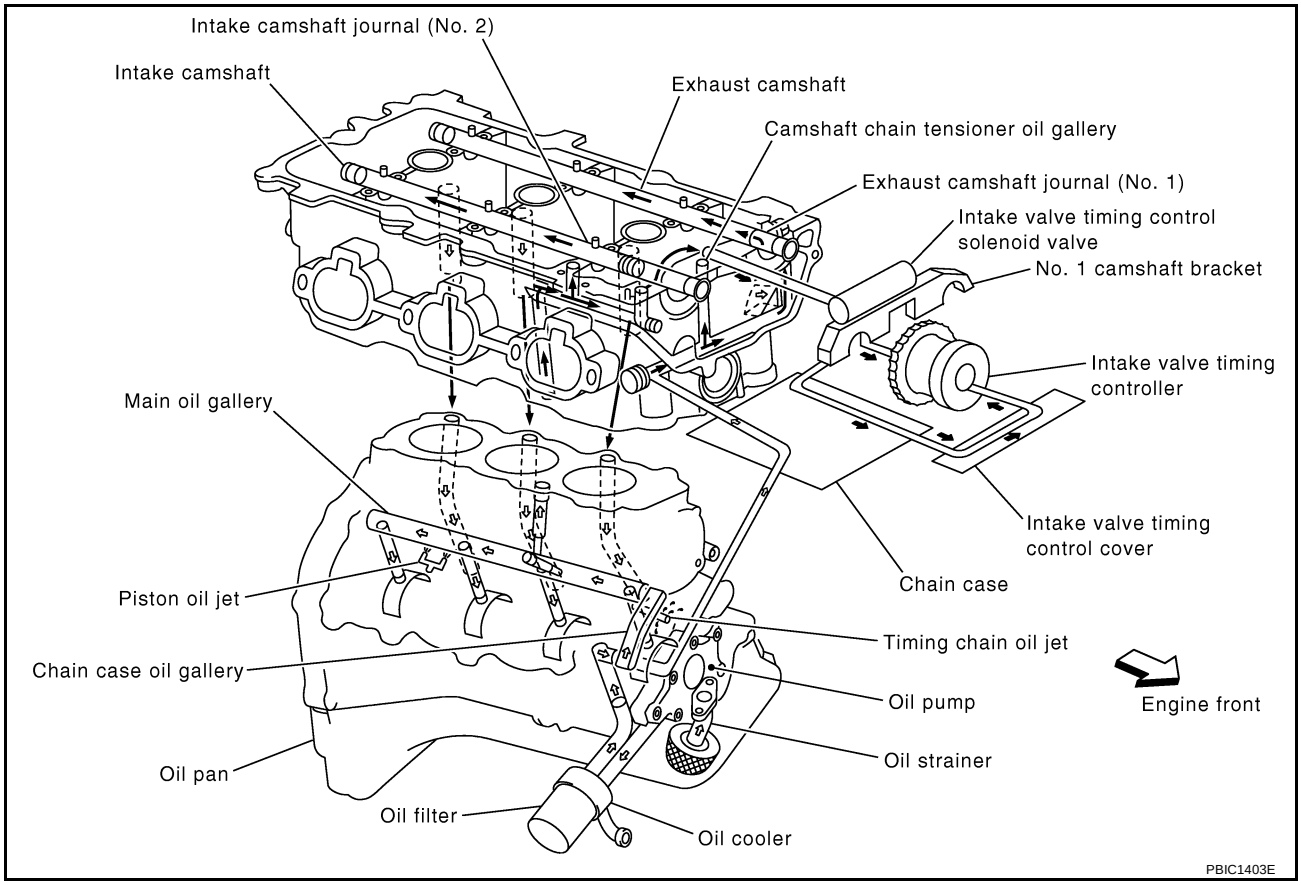
Tool name	Description
Deep socket  PBIC2072E	Removing and installing oil pressure switch **a: 27 mm (1.06 in)**
Power tool  PBIC0190E	Loosening nuts and bolts

LUBRICATION SYSTEM

PFP:15010

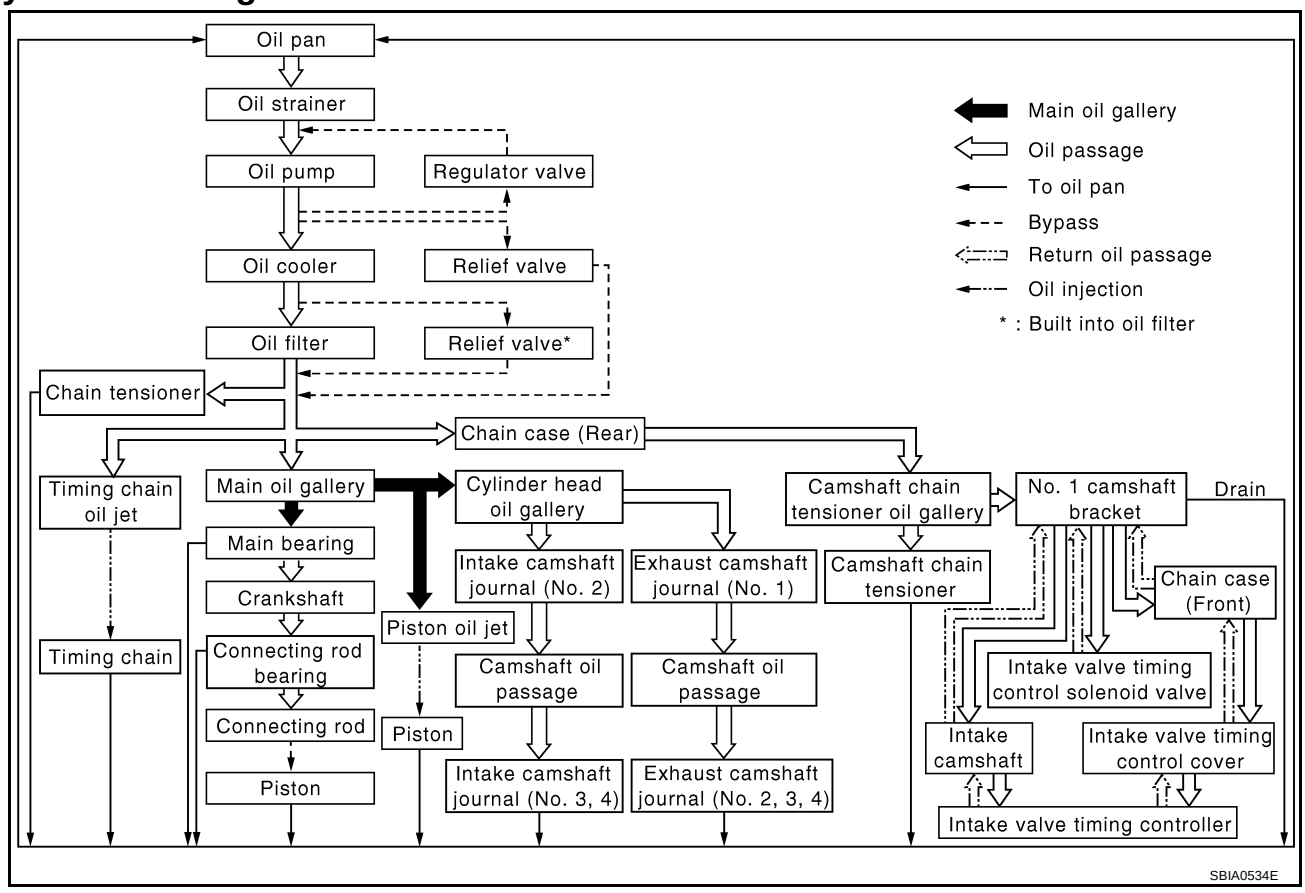
Lubrication Circuit

ABS00012



System Drawing

ABS00013



ENGINE OIL

PFP:KLA92

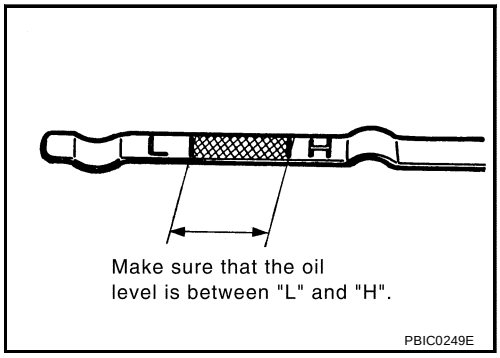
Inspection

ABS00014

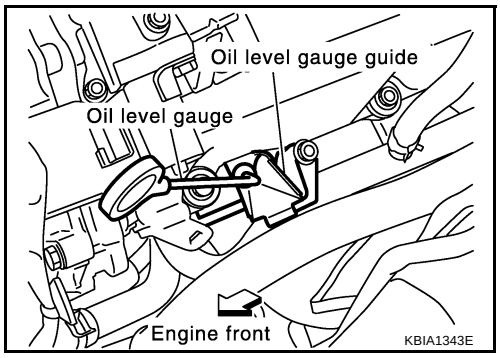
OIL LEVEL

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.



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



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 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)

OIL PRESSURE CHECK

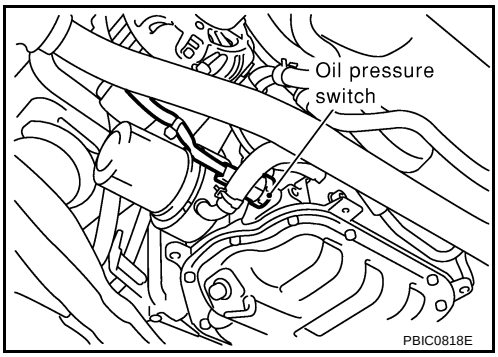
WARNING:

- **Be careful not to burn yourself, as engine oil may be hot.**

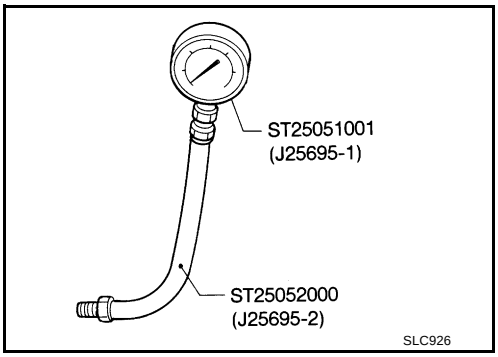
- **Oil pressure check should be done in “Neutral position” (M/T models) or “Parking position” (A/T models).**

1. Check oil level. Refer to LU-6, "Inspection" .
2. Remove undercover with power tool.
3. Disconnect oil pressure switch harness connector.
4. Remove oil pressure switch using deep socket (commercial service tool).

CAUTION:
Do not drop or shock oil pressure switch.



5. Install oil pressure gauge and hose (special service tool).



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^2 , psi)
Idle speed	More than 98 (1.0, 14)
2,000	More than 294 (3.0, 43)
6,000	More than 392 (4.0, 57)

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

8. After the inspections, install the oil pressure switch as follows:

a. Remove the old liquid gasket adhering to switch and engine.
b. Apply liquid gasket and tighten oil pressure sensor to specification.
Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-45, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

: 12.3 - 17.2 N·m (1.25 - 1.75 kg-m, 9 - 12 ft-lb)

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

Changing Engine Oil

ABS00015

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 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.
2. Stop engine and wait for 10 minutes.
3. Remove drain plug and oil filler cap.
4. Drain engine oil.
5. Install drain plug with new washer. Refer to EM-28, "OIL PAN AND OIL STRAINER" .

   CAUTION:

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

   Oil pan drain plug:

   : 29.4 - 39.2 N·m (3.0 - 4.0 kg-m, 22 - 28 ft-lb)

6. Refill with new engine oil.
   Oil specification and viscosity:
   Refer to MA-11, "RECOMMENDED FLUIDS AND LUBRICANTS" .
   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 oil, do not pull out oil level gauge.**
- **The refill capacity depends on the oil temperature and drain time. Use these specifications for reference only.**
- **Always use oil level gauge to determine the proper amount of 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 oil level. Refer to LU-6, "Inspection" .

OIL FILTER

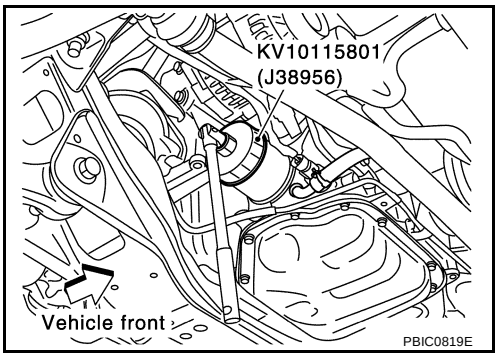
PFP:15208

Removal and Installation

ABS00016

REMOVAL

1. Remove undercover with power tool.
2. Using an oil filter wrench (special service tool), remove the oil filter.

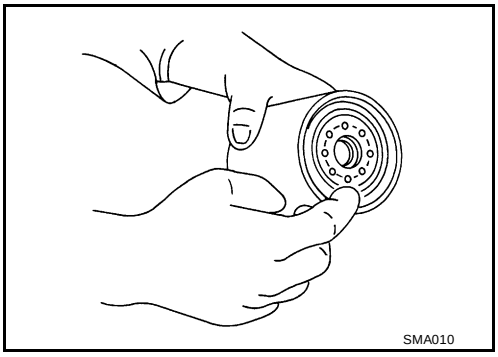


CAUTION:

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

INSTALLATION

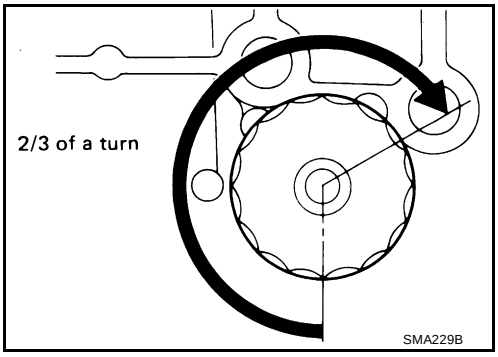
1. Remove foreign materials adhering to the oil filter installation surface.
2. Apply engine oil to the oil seal contact surface of the new oil filter.



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

Oil filter:

: 14.7 - 20.5 N·m (1.5 - 2.0 kg-m, 11 - 15 ft-lb)



INSPECTION AFTER INSTALLATION

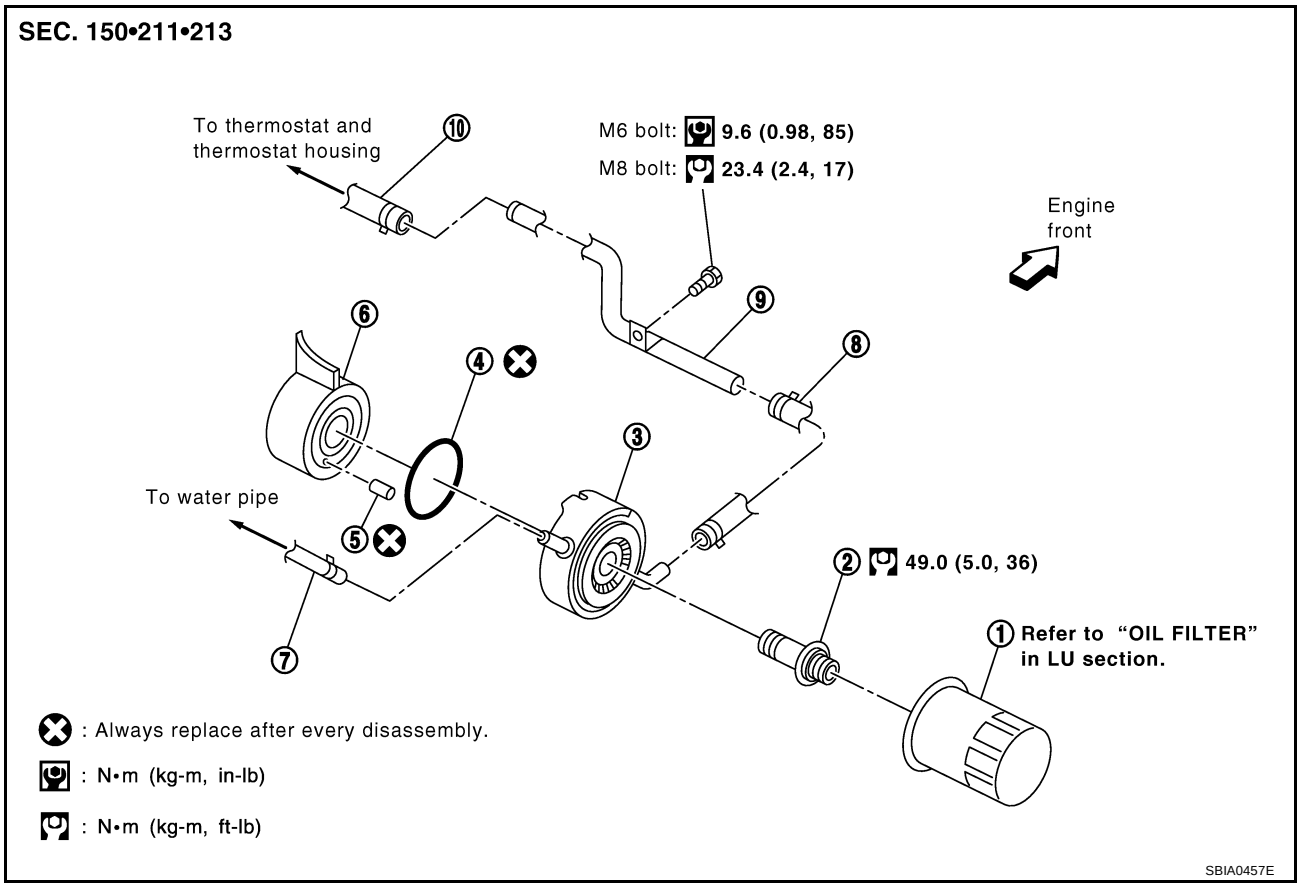
1. Start the engine and check for engine oil leakage.
2. Check oil level and add engine oil. Refer to LU-6, "ENGINE OIL" .

OIL COOLER

PFP:21305

Removal and Installation

ABS00019



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

REMOVAL

NOTE:
When removing oil cooler only, step 2 is unnecessary.

1. Remove undercover with power tool.
2. Drain engine coolant from radiator and cylinder block. Refer to CO-11, "Changing Engine Coolant" and EM-106, "DISASSEMBLY" .

   NOTE:
   Perform this step when removing water pipes.
3. Remove oil filter. Refer to LU-9, "OIL FILTER" .

   CAUTION:
   Do not spill engine oil on drive belts.
4. 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 drive belts.**
5. Remove connector bolt, and remove oil cooler.

   CAUTION:
   Do not spill engine oil to rubber parts such as drive belts and engine mounting insulator.
6. Remove water pipes, as necessary.

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.

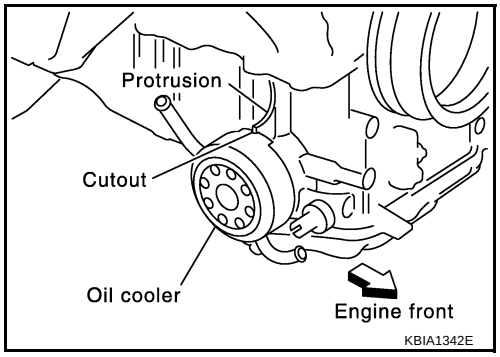
Relief Valve

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

INSTALLATION

Install in the reverse order of removal paying attention to the following.

- Align cutout on oil cooler with protrusion on oil pan (upper) side, and tighten connector bolt.



INSPECTION AFTER INSTALLATION

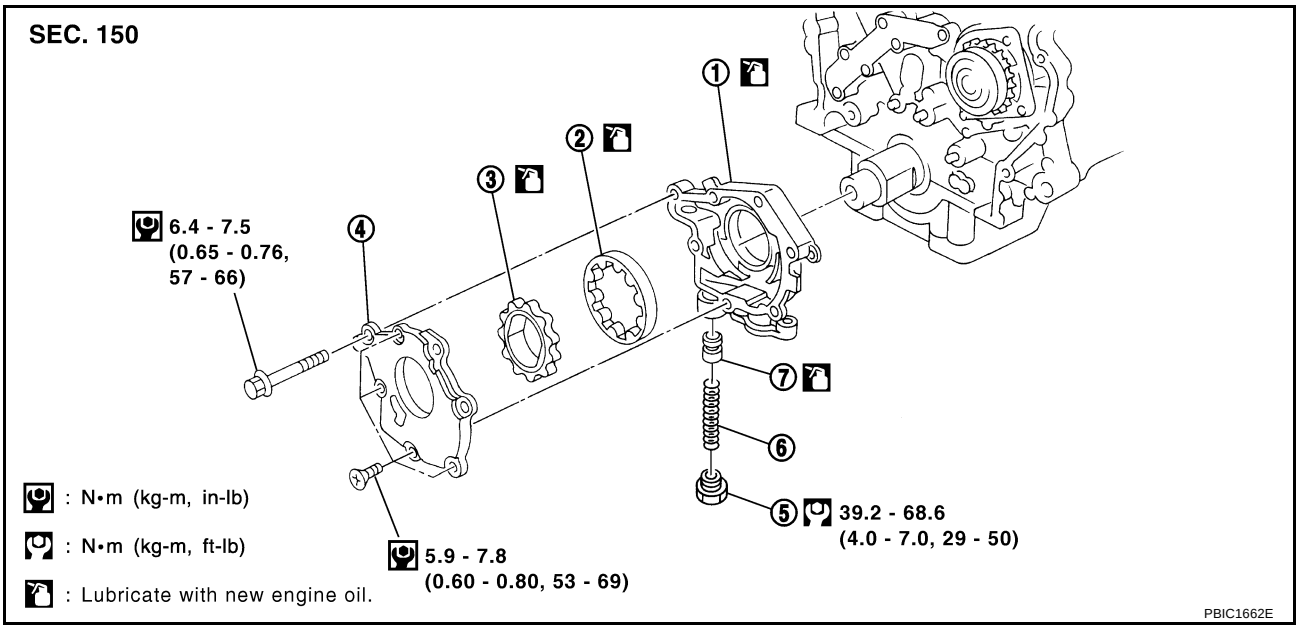
- Start the engine, and check there is no leak of engine oil or engine coolant.
- Check level of engine oil and engine coolant, and add engine oil and engine coolant. Refer to LU-6, "ENGINE OIL" and CO-11, "ENGINE COOLANT" .

OIL PUMP

PFP:15010

Removal and Installation

ABS0002T



1. Oil pump body
2. Outer rotor
3. Inner rotor
4. Oil pump cover
5. Regulator valve plug
6. Spring
7. Regulator valve

REMOVAL

1. Remove oil pan and oil strainer. Refer to EM-28, "OIL PAN AND OIL STRAINER" .
2. Remove front timing chain case and timing chain (primary). Refer to EM-54, "TIMING CHAIN" .
3. Remove oil pump assembly.

INSTALLATION

Install in the reverse order of removal paying attention to the following:

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

INSPECTION AFTER INSTALLATION

1. Start the engine and check for engine oil leakage.
2. Check oil level and add engine oil. Refer to LU-6, "ENGINE OIL" .

Disassembly and Assembly

ABS0002U

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.

INSPECTION AFTER DISASSEMBLY

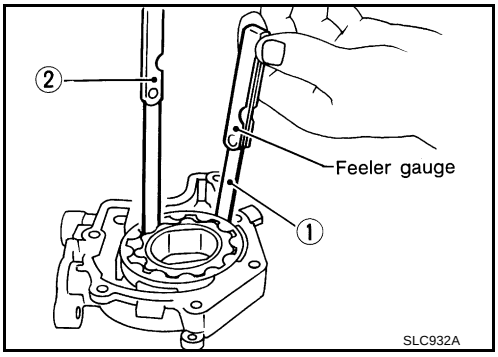
Clearance of Oil Pump Parts

- Measure 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 (0.0071in)

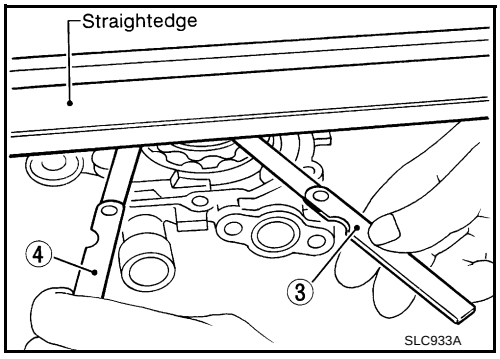


- Measure clearance with feeler gauge and straightedge.
  Side clearance between inner rotor and oil pump body (position 3)

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

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

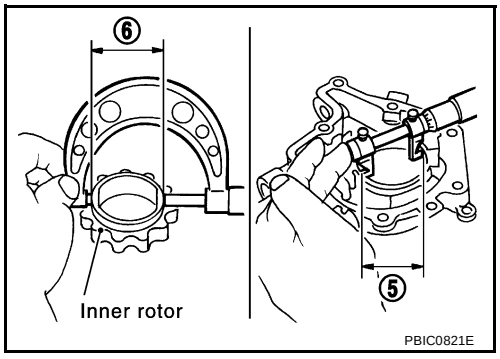
  Standard : 0.050 - 0.110 mm (0.0020 - 0.0043 in)



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 (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)



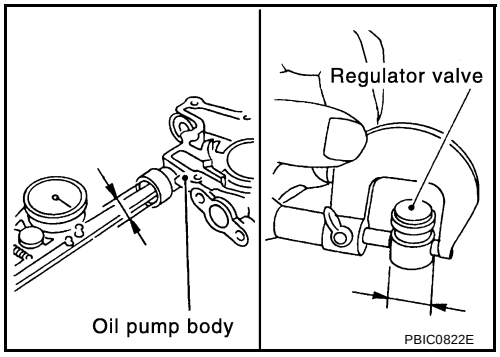
Regulator Valve Clearance

(Clearance) = (Valve hole diameter) – (Outer diameter of valve)

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

CAUTION:

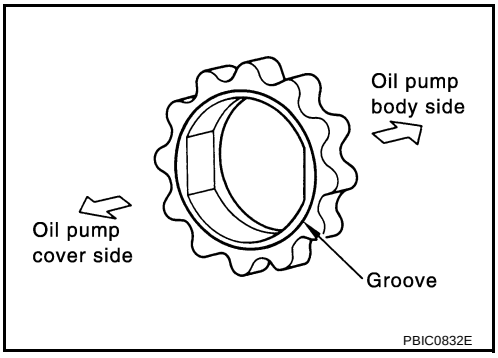
- **Coat regulator valve with engine oil.**
- **Check that it falls smoothly into the valve hole by its own weight.**



ASSEMBLY

Assemble in the reverse order of disassembly paying attention to the following.

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



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Standard and Limit

ABS0002V

OIL PRESSURE

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

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 axial clearance	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial 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 cover clearance	0.040 - 0.097 (0.0016 - 0.0038)

OIL CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

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)

Tightening Torque

ABS0002W

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

Oil pressure switch	12.3 - 17.2 (1.25 - 1.75, 10 - 12)
Oil pan drain plug	29.4 - 39.2 (3.0 - 4.0, 22 - 29)
Oil cooler connector bolt	49.0 (5.0, 36)
Oil pump body	6.4 - 7.5 (0.65 - 0.76, 57 - 66)*
Oil pump cover	5.9 - 7.8 (0.60 - 0.80, 53 - 69)*
Regulator valve plug	39.2 - 68.6 (4.0 - 7.0, 29 - 50)