SECTION LU
ENGINE LUBRICATION SYSTEM

CONTENTS

PRECAUTION

PRECAUTIONS

Liquid Gasket

INFOID:0000000006289611

LIQUID GASKET APPLICATION PROCEDURE

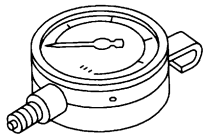
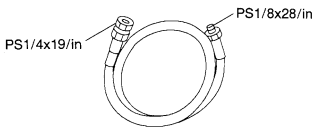
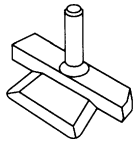
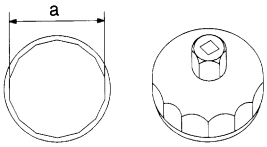
1. Remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
   - Remove liquid gasket completely from the liquid gasket application surface, mounting bolts, and bolt holes.
2. Wipe the liquid gasket application surface and the mating surface with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.
3. Apply liquid gasket to the liquid gasket application surface.
   Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".
   - Within five minutes of liquid gasket application, install the mating component.
   - If liquid gasket protrudes, wipe it off immediately.
   - Do not retighten mounting bolts or nuts after the installation.
   - After 30 minutes or more have passed from the installation, fill engine oil and engine coolant.

PREPARATION

PREPARATION

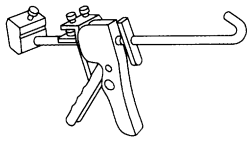
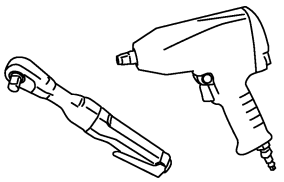
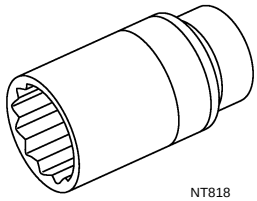
Special Service Tool

INFOID:0000000006289612

Tool number (Kent-Moore No.) Tool name	Description
ST25051001 (J-25695-1) Oil pressure gauge  S-NT050	Measuring oil pressure **Maximum measuring range:** **2,452 kPa (25 kg/cm^2, 356 psi)**
ST25052000 (J-25695-2) Hose  S-NT559	Adapting oil pressure gauge to cylinder block
KV10111100 (J-37228) Seal cutter  NT046	Removing steel oil pan and rear timing chain case
KV10115801 (J-38956) Oil filter wrench  S-NT375	Removing and installing oil filter **a: 64.3 mm (2.531 in)**

Commercial Service Tool

INFOID:0000000006289613

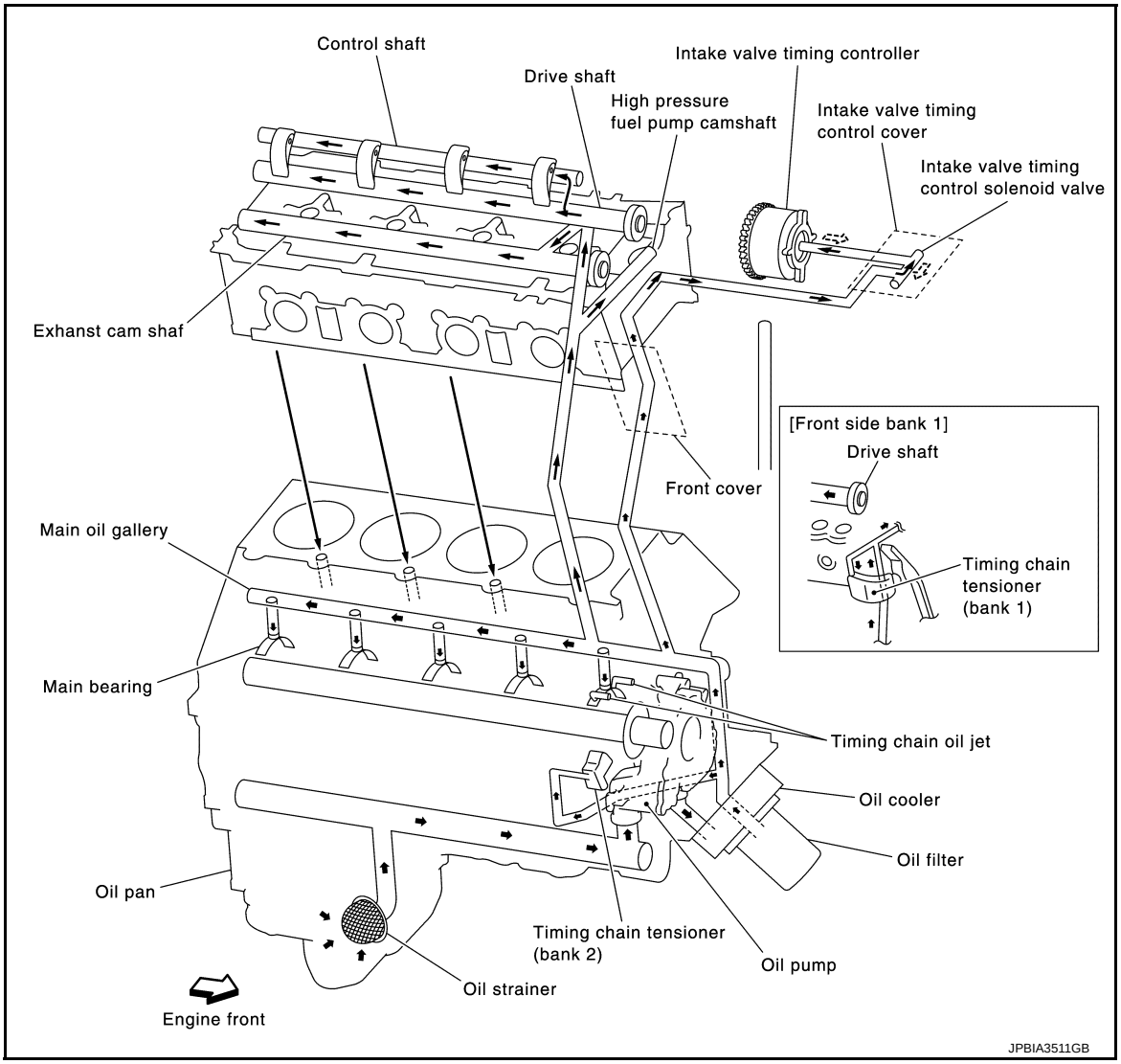
Tool name	Description
Tube presser  S-NT052	Pressing the tube of liquid gasket
Power tool  PBIC0190E	Loosening bolts and nuts
Deep socket  NT818	Removing and installing oil pressure switch Deep socket 26 mm

SYSTEM DESCRIPTION

LUBRICATION SYSTEM

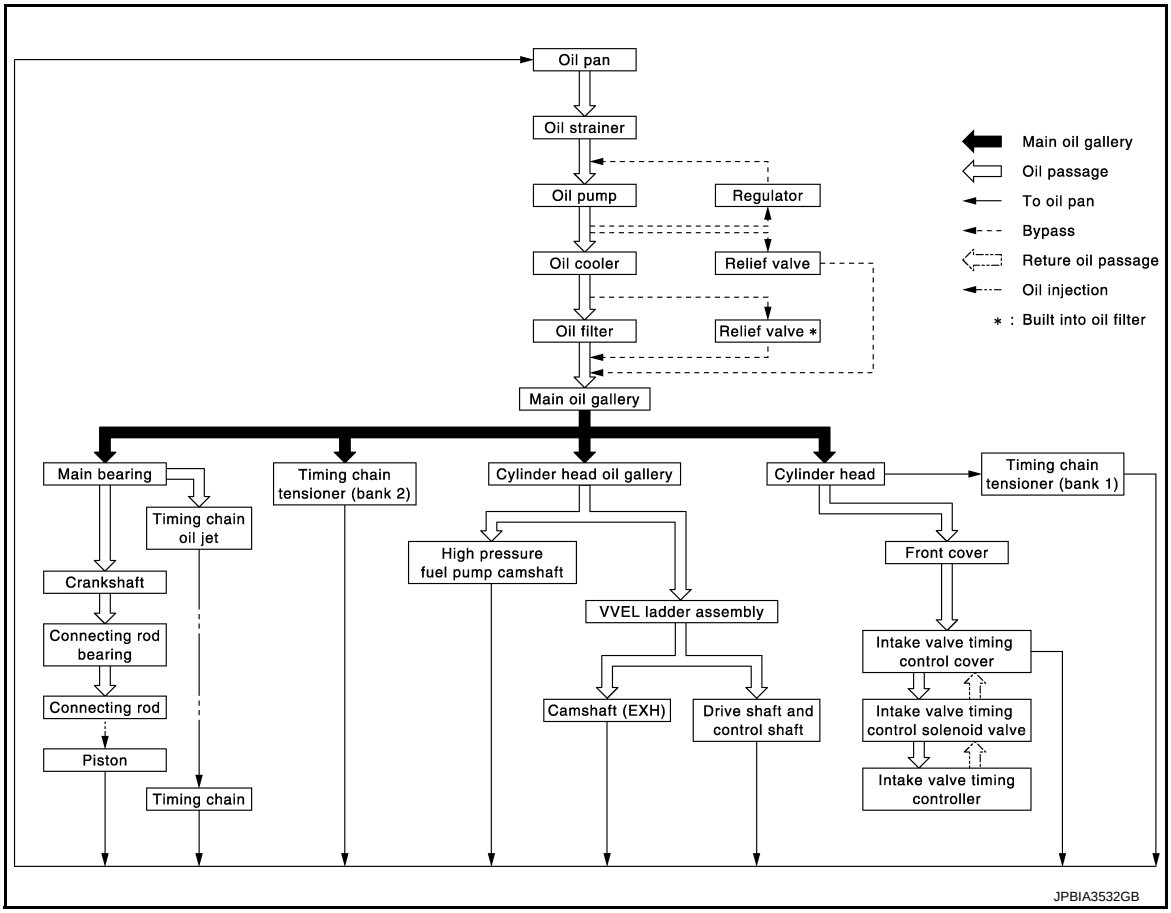
Engine Lubrication System

INFOID:0000000006289614



Engine Lubrication System Schematic

INFOID:0000000006289615



PERIODIC MAINTENANCE

ENGINE OIL

Inspection

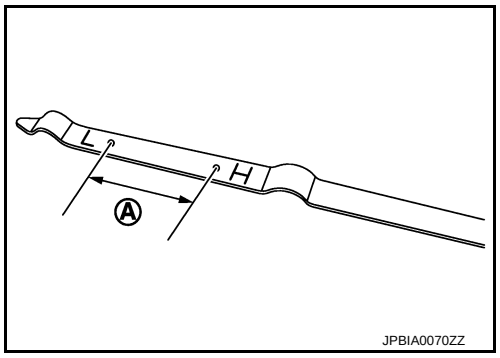
INFOID:0000000006289616

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 check the engine oil level is within the range (A) shown in the figure.
3. If it is out of range, adjust it.

CAUTION:
Do not overfill the engine with oil.



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OIL APPEARANCE

- Check the engine oil for a white milky appearance or excessive contamination.
- If the engine oil is milky, it is highly probable that it is contaminated with engine coolant. Repair or replace damaged parts.

OIL LEAKAGE

Check for oil leakage around the following areas:

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

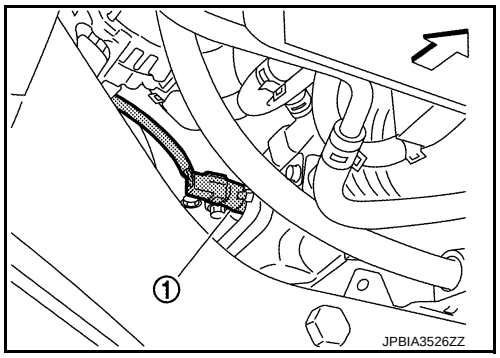
OIL PRESSURE CHECK

WARNING:

- **Be careful not to burn yourself, as the engine and engine oil may be hot.**
- **Put the A/T shift selector in the Park "P" position.**

1. Check the engine oil level.
2. Remove front under cover.
3. Disconnect the oil pressure switch (1) harness connector.

⇦ :Vehicle front



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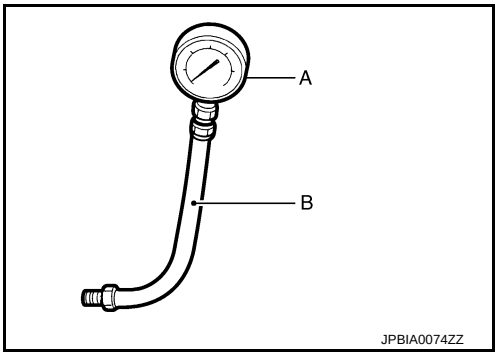
4. Remove the oil pressure switch.
   CAUTION:
   Do not drop or shock oil pressure switch.

5. Install the oil pressure gauge [SST: ST25051001 (J25695-1)] (A) and hose [SST: ST25052000 (J25695-2)] (B).



6. Start the engine and warm it up to normal operating temperature.
7. Check the engine oil pressure with engine running under no-load. Refer to LU-17, "Engine Oil Pressure".
   CAUTION:
   If the difference is extreme, check the oil passages and oil pump for leaks and blockages.
8. 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 the specification.
   Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".

Oil pressure switch torque : Refer to EM-57, "Exploded View".

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

Draining

INFOID:0000000006289617

WARNING:
- **Be careful not to burn yourself, as the engine and 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 the engine, and check for any oil leaks.
2. Stop the engine and wait for at least 10 minutes.
3. Remove drain plug and oil filler cap to drain the old oil.

Refilling

INFOID:0000000006289618

1. Install drain plug with new washer.
   CAUTION:
   Be sure to clean drain plug and install with new washer.

Tightening torque : Refer to EM-54, "Exploded View".

2. Refill with new engine oil.
   Engine oil specification and viscosity:
   Refer to MA-10, "Fluids and Lubricants".

Engine oil capacity : Refer to LU-17, "Periodical Maintenance Specification".

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 engine.**

3. Warm up the engine and check area around drain plug and oil filter for engine oil leakage.
4. Stop the engine and wait for 10 minutes.
5. Check the engine oil level. Refer to LU-7, "Inspection".

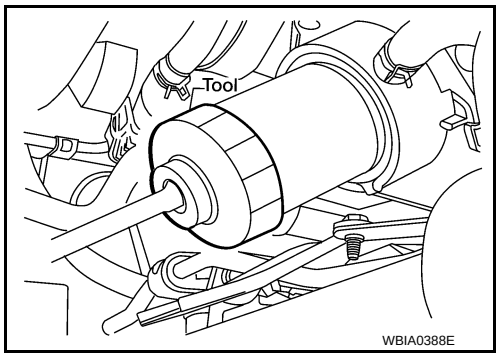
OIL FILTER

Removal and Installation

INFOID:0000000006289619

REMOVAL

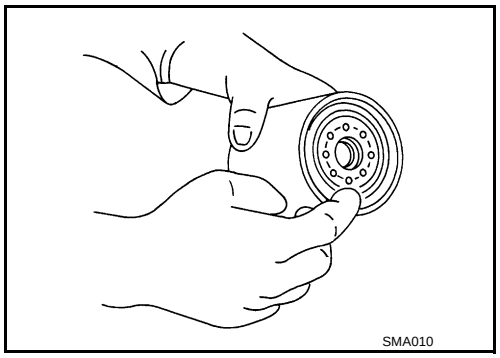
1. Remove front under cover.
2. Drain engine oil. Refer to LU-8, "Draining".
3. Remove oil filter using oil filter wrench [SST: KV10115801 (J-38956)].



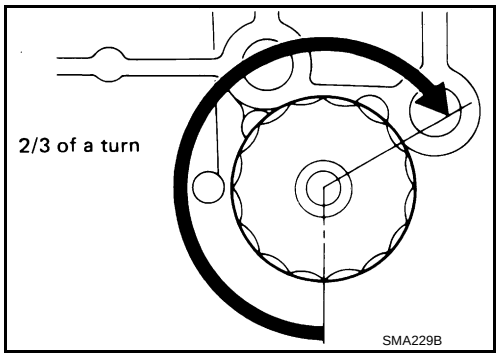
WARNING:
Be careful not to burn yourself, as the engine and engine oil may be hot.
CAUTION:
- **The oil filter is equipped with a pressure relief valve.**
- **Use Genuine NISSAN oil filter or equivalent.**
- **When removing, prepare a shop cloth to absorb any engine oil leaks or spills.**
- **Do not allow engine oil to adhere to the drive belts.**
- **Completely wipe off any engine oil that adheres to the engine and the vehicle.**

INSTALLATION

1. Remove foreign materials adhering to the oil filter seal mating surface.
2. Apply clean engine oil to the oil filter seal circumference of the new oil filter as shown.



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



Oil filter : 17.7 N·m (1.8 kg-m, 13 ft-lb)

4. Refill engine with new engine oil. Refer to LU-8, "Refilling".
5. Inspect engine for oil leaks. Refer to LU-7, "Inspection".
6. Install front under cover.

Inspection

INFOID:0000000006289620

INSPECTION AFTER INSTALLATION

1. Check engine oil level. Refer to LU-7, "Inspection".
2. Start engine and check for engine oil leaks.
3. Stop engine and wait for 10 minutes.

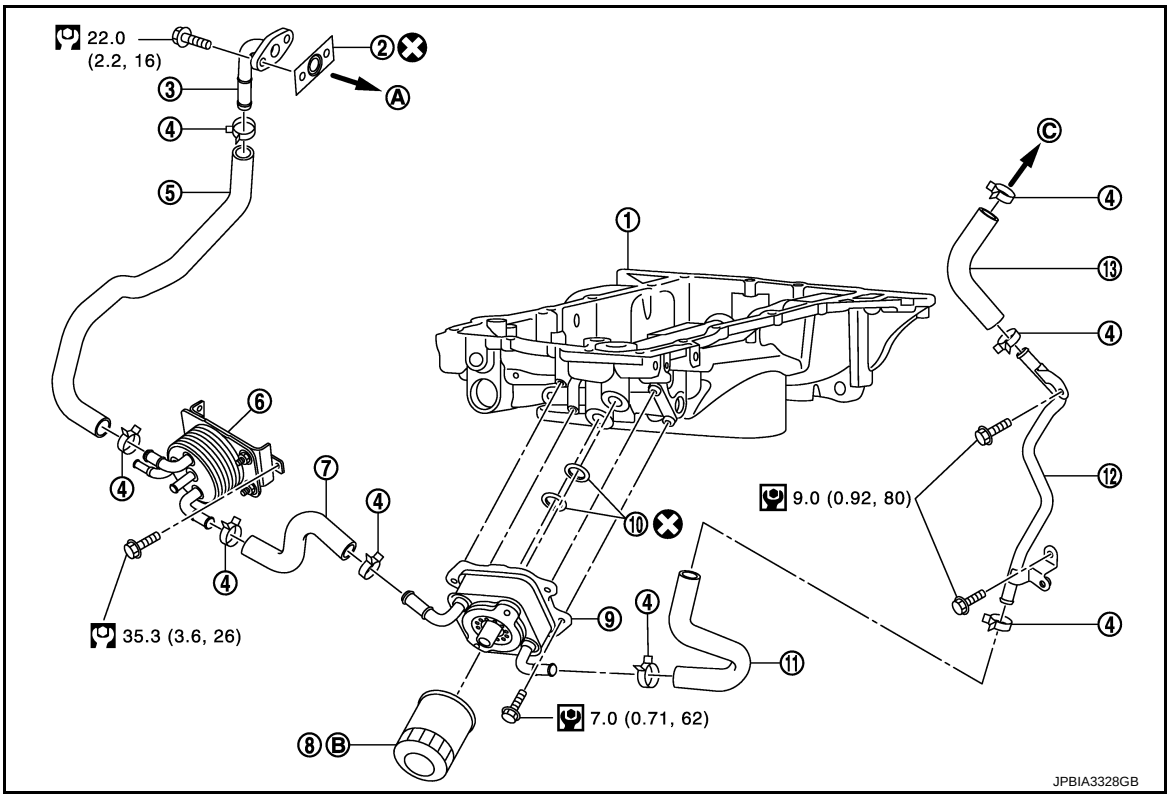
4. Check engine oil level and add engine oil as required.

REMOVAL AND INSTALLATION

OIL COOLER

Exploded View

INFOID:0000000006289621



1. Oil pan (upper)	2. Gasket	3. Connector pipe
4. Clamp	5. Water hose	6. A/T fluid warmer
7. Water hose	8. Oil filter	9. Oil cooler
10. O-ring	11. Water hose	12. Water pipe
13. Water hose		
A. To cylinder block	B. Refer to LU-9	C. To thermostat housing

Refer to GI-4, "Components" for symbols in the figure.

Removal and Installation

INFOID:0000000006289622

WARNING:
Be careful not to burn yourself, as the engine oil and engine coolant may be hot.
CAUTION:
- **Do not spill engine coolant on the drive belt.**
- **Do not spill engine oil on rubber parts such as drive belts and engine mounting insulator.**

REMOVAL

NOTE:
When removing oil cooler only, step 1 is unnecessary.

1. Drain engine coolant from radiator and cylinder block. Refer to CO-8, "Draining" and EM-107, "Disassembly and Assembly".
   NOTE:
   Perform this step only when removing water pipes and hoses.
2. Remove front under cover.
3. Disconnect water hoses from oil cooler, pinching hoses near oil cooler to prevent engine coolant from spilling.

CAUTION:
Perform this step when engine is cold.

4. Remove oil filter. Refer to LU-9, "Removal and Installation".
5. Remove connector bolt, and remove oil cooler.

INSTALLATION

Installation is in the reverse order of removal, paying attention to the following:
- Confirm that no foreign objects are adhering to the sealing surfaces of the oil cooler and oil pan.

Inspection

INFOID:0000000006289623

INSPECTION AFTER REMOVAL

Oil Cooler

Check oil cooler for cracks. Check oil cooler for clogging by blowing compressed air 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 the valve by prying it out using a suitable tool. Install a new valve in place by tapping it in.

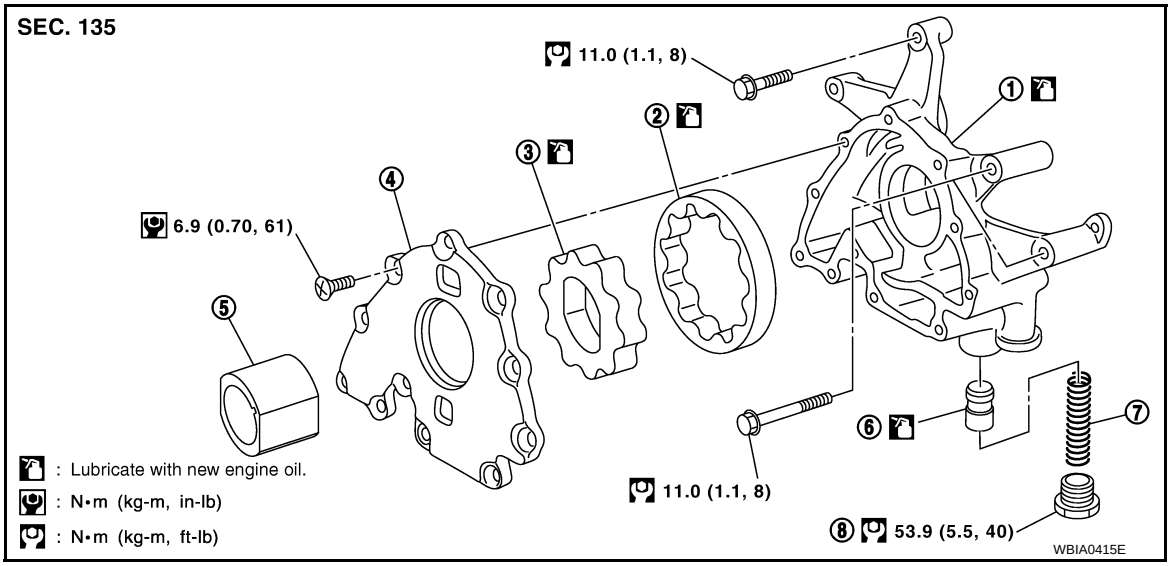
INSPECTION AFTER INSTALLATION

1. Check engine oil and engine coolant levels and add engine oil and engine coolant. Refer to LU-7, "Inspection" and CO-8, "Inspection".
2. Start the engine, and check for leaks of engine oil or engine coolant.
3. Stop the engine and wait for 10 minutes.
4. Check the engine oil level and engine coolant level again. Refer to LU-7, "Inspection" and CO-8, "Inspection"

OIL PUMP

Exploded View

INFOID:0000000006289624



1. Oil pump body
2. Outer rotor
3. Inner rotor
4. Oil pump cover
5. Oil pump drive spacer
6. Regulator valve
7. Regulator spring
8. Regulator plug

Removal and Installation

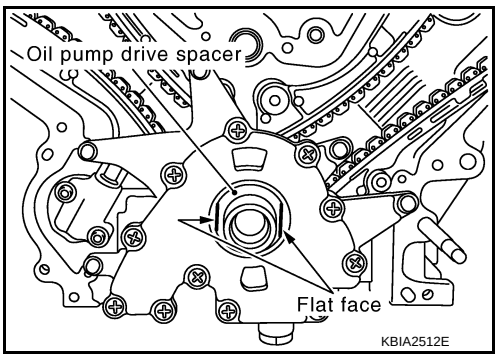
INFOID:0000000006289625

REMOVAL

NOTE:
Do not remove the engine assembly to perform this procedure.

1. Disconnect battery cable from negative terminal. Refer to PG-165, "Exploded View".
2. Drain engine oil. Refer to LU-8, "Draining".
3. Drain engine coolant from radiator. Refer to CO-8, "Draining".
   CAUTION:
   - **Perform this step when engine is cold.**
   - **Never spill engine coolant on drive belts.**
4. Remove the following components and related parts:
   - Air cleaner case assembly and air duct. Refer to EM-27, "Exploded View".
   - Drive belt auto tensioner and idler pulley. Refer to EM-26, "Exploded View".
   - Fan shroud. Refer to CO-13, "Exploded View".
   - Cooling fan, fan coupling and fan bracket. Refer to CO-16, "Exploded View".
   - Front under cover. Refer to EXT-25, "Exploded View".
   - Protector A and B. Refer to SCS-32, "FRONT TUBE ASSEMBLY : Exploded View".
   - Front suspension rear cross member. Refer to TM-205, "2WD : Exploded View" (2WD models) or TM-208, "4WD : Exploded View" (4WD models).
   - Steering gear assembly. Refer to ST-41, "Exploded View".
   - Front final drive assembly. Refer to DLN-162, "Exploded View".
   - Power steering oil pump. Refer to ST-48, "Exploded View".
   - Alternator, alternator bracket and alternator stay. Refer to CHG-25, "Exploded View".
   - Oil pan (lower) and oil strainer. Refer to EM-54, "Exploded View".
   - Oil pan (upper). Refer to EM-57, "Exploded View".
   - Electric throttle control actuator. Refer to EM-30, "Exploded View".
   - Radiator hoses. Refer to CO-13, "Exploded View".
   - Water suction hose and water suction pipe. Refer to CO-20, "Exploded View".
   - Water pump pulley. Refer to CO-18, "Exploded View".
   - Rocker cover. Refer to EM-33, "Exploded View".

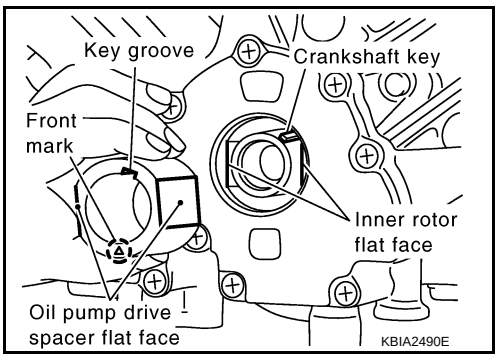
5. Remove the oil pump drive spacer.
   - Hold and remove the flat space of the oil pump drive spacer by pulling it forward.



6. Remove the oil pump. Refer to LU-13, "Exploded View".

INSTALLATION

1. Install the oil pump.
2. Install the oil pump drive spacer as follows:
   - When inserting the oil pump drive spacer, align the crankshaft key and the flat face of the inner rotor.
   - If they are not aligned, rotate the oil pump inner rotor by hand.
   - Make sure that each part is aligned and tap lightly until it reaches the end.



3. Installation of the remaining components is in the reverse order of removal.

Disassembly and Assembly

INFOID:0000000006289626

DISASSEMBLY

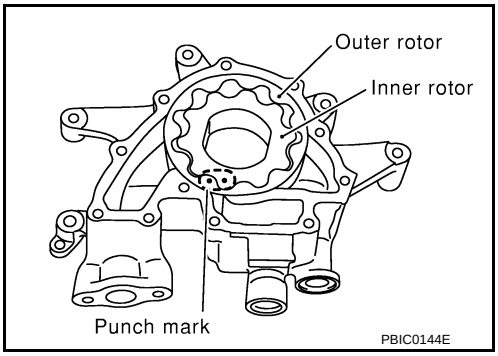
1. Remove oil pump cover.
2. Remove inner rotor and outer rotor from oil pump body.
3. Remove the regulator valve plug, regulator valve spring and regulator valve.

ASSEMBLY

Installation is in the reverse order of removal.

NOTE:

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



Inspection

INFOID:0000000006289627

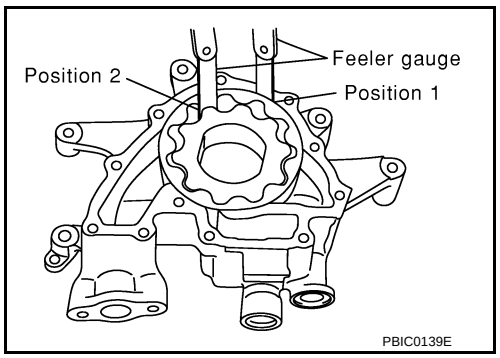
INSPECTION AFTER DISASSEMBLY

Clearance of Oil Pump Parts

- Measure radial clearance using a suitable tool.

Body to outer rotor (position 1) : **Refer to LU-17, "Oil Pump".**

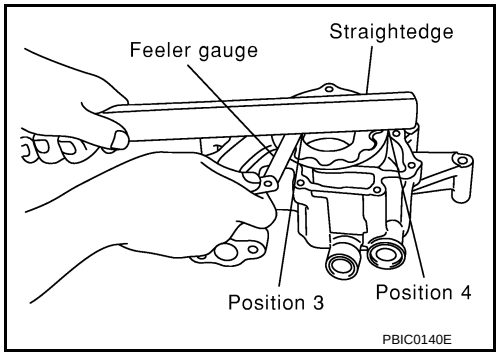
Inner rotor to outer rotor tip (position 2) : **Refer to LU-17, "Oil Pump".**



- Measure side clearance using suitable tools.

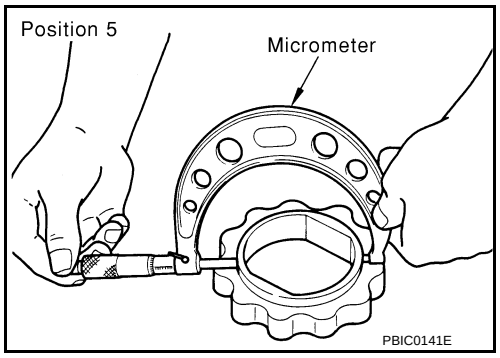
Body to inner rotor (position 3) : **Refer to LU-17, "Oil Pump".**

Body to outer rotor (position 4) : **Refer to LU-17, "Oil Pump".**

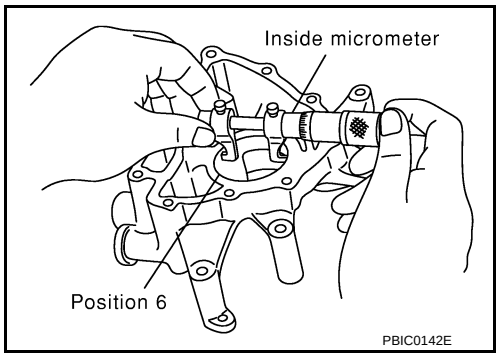


- Calculate the clearance between inner rotor and oil pump body as follows.

1. Measure the outer diameter of protruded portion of inner rotor (position 5) using suitable tool.



2. Measure the inner diameter of oil pump body to brazed portion (position 6) using suitable tool.



3. Calculate the clearance using the following formula.
   - (Clearance) = (Inner diameter of oil pump body) - (Outer diameter of inner rotor)

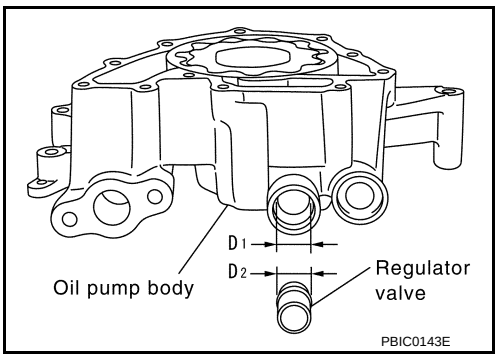
Inner rotor to brazed portion of housing clearance : **Refer to LU-17, "Oil Pump".**

Regulator Valve Clearance

Check regulator valve to oil pump cover clearance using the following formula.

- (Clearance) = D_1 (Valve hole diameter) - D_2 (Outer Diameter of valve)

Regulator valve to oil pump cover : **Refer to LU-17, "Regulator Valve".**



CAUTION:

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

INSPECTION AFTER INSTALLATION

1. Check the engine oil level. Refer to LU-7, "Inspection"
2. Start the engine and check for engine oil leaks.
3. Stop the engine and wait 10 minutes.
4. Check the engine oil level and adjust the engine oil level as required. Refer to LU-7, "Inspection".

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Periodical Maintenance Specification

INFOID:0000000006289628

ENGINE OIL CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	6.5 (6-7/8, 5-3/4)
	Without oil filter change	6.2 (6-4/8, 5-1/2)
Dry engine (engine overhaul)		7.6 (8, 6-3/4)

Engine Oil Pressure

INFOID:0000000006289629

Unit: kPa (kg/cm^2, psi)

Engine speed	Approximate discharge pressure*
Idle speed	More than 98 (1.0, 14)
2,000 rpm	More than 294 (3.0, 43)

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

Oil Pump

INFOID:0000000006289630

Unit: mm (in)

Oil pump body to oil pump outer rotor radial clearance	0.114 - 0.200 (0.0045 - 0.0079)
Oil pump inner rotor to oil pump outer rotor tip clearance	Below 0.180 (0.0071)
Oil pump body to oil pump inner rotor axial clearance	0.030 - 0.070 (0.0012 - 0.0028)
Oil pump body to oil pump outer rotor axial clearance	0.030 - 0.090 (0.0012 - 0.0035)
Oil pump inner rotor to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

Regulator Valve

INFOID:0000000006289631

Unit: mm (in)

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