

SECTION

LU

ENGINE LUBRICATION SYSTEM

CONTENTS

<b>PRECAUTIONS</b> .....	<b>2</b>	<b>OIL COOLER</b> .....	<b>11</b>	
Precautions for Battery Service .....	2	Removal and Installation .....	11	
Precautions for Liquid Gasket .....	2	REMOVAL .....	11	
LIQUID GASKET APPLICATION PROCEDURE....	2	INSPECTION AFTER REMOVAL .....	12	
<b>PREPARATION</b> .....	<b>3</b>	INSTALLATION .....	12	
Special Service Tools .....	3	INSPECTION AFTER INSTALLATION .....	12	
Commercial Service Tools .....	3	<b>OIL PUMP</b> .....	<b>13</b>	
<b>LUBRICATION SYSTEM</b> .....	<b>4</b>	Removal and Installation .....	13	
Lubrication Circuit .....	4	REMOVAL .....	13	
System Chart .....	6	INSTALLATION .....	13	
<b>ENGINE OIL</b> .....	<b>7</b>	INSPECTION AFTER INSTALLATION .....	13	
Inspection .....	7	Disassembly and Assembly .....	13	
ENGINE OIL LEVEL .....	7	DISASSEMBLY .....	13	
ENGINE OIL APPEARANCE .....	7	INSPECTION AFTER DISASSEMBLY .....	14	
ENGINE OIL LEAKAGE .....	7	ASSEMBLY .....	15	
OIL PRESSURE CHECK .....	8	<b>SERVICE DATA AND SPECIFICATIONS (SDS) .....</b>	<b>16</b>	
Changing Engine Oil .....	8	Standard and Limit .....	16	
<b>OIL FILTER</b> .....	<b>10</b>	OIL PRESSURE .....	16	
Removal and Installation .....	10	OIL CAPACITY (APPROXIMATE) .....	16	
REMOVAL .....	10	OIL PUMP .....	16	
INSTALLATION .....	10	REGULATOR VALVE .....	16	
INSPECTION AFTER INSTALLATION .....	10	Tightening Torque .....	16	

# PRECAUTIONS

## PRECAUTIONS

PFP:00001

### Precautions for Battery Service

NBS00018

Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.

### Precautions for Liquid Gasket

NBS00019

#### LIQUID GASKET APPLICATION PROCEDURE

1. Removal 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-47, "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

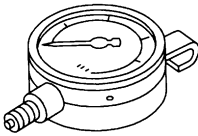
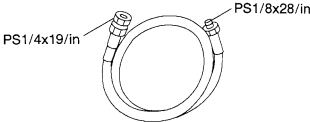
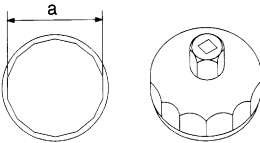
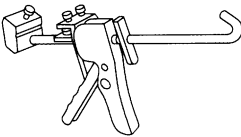
## PREPARATION

PPF:00002

### Special Service Tools

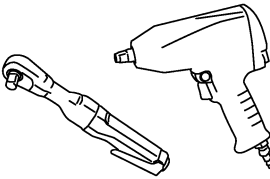
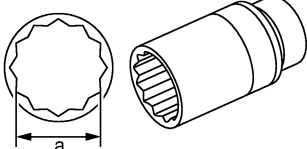
NBS0001A

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

Tool number (Kent-Moore No.) Tool name	Description
ST25051001 (J25695-1) Oil pressure gauge	Measuring oil pressure <b>Maximum measuring range: 2,452 kPa (25 kg/cm<sup>2</sup> , 356 psi)</b>
NT050	
ST25052000 (J25695-2) Hose	Adapting oil pressure gauge to oil pan (upper)
S-NT559	
KV10115801 (J38956) Oil filter wrench	Removing oil filter <b>a: 64.3 mm (2.531 in)</b>
S-NT375	
WS39930000 ( — ) Tube presser	Pressing the tube of liquid gasket
NT052	

### Commercial Service Tools

NBS0001B

Tool name	Description
Power tool	Loosening nuts and bolts
PBIC0190E	
Deep socket	Removing and installing oil pressure sensor <b>a: 24 mm (0.94 in)</b>
PBIC2072E	

# LUBRICATION SYSTEM

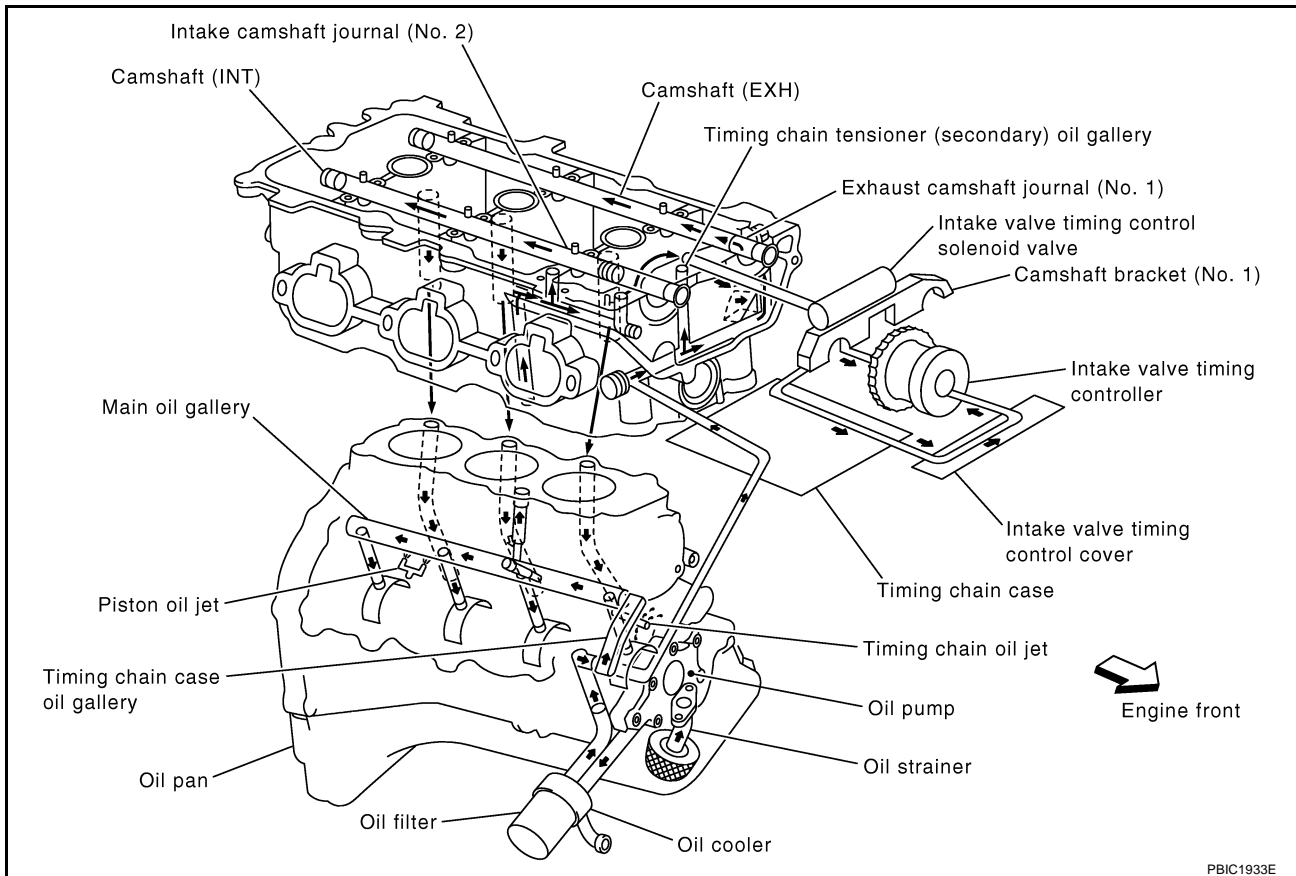
## LUBRICATION SYSTEM

PFP:15010

### Lubrication Circuit

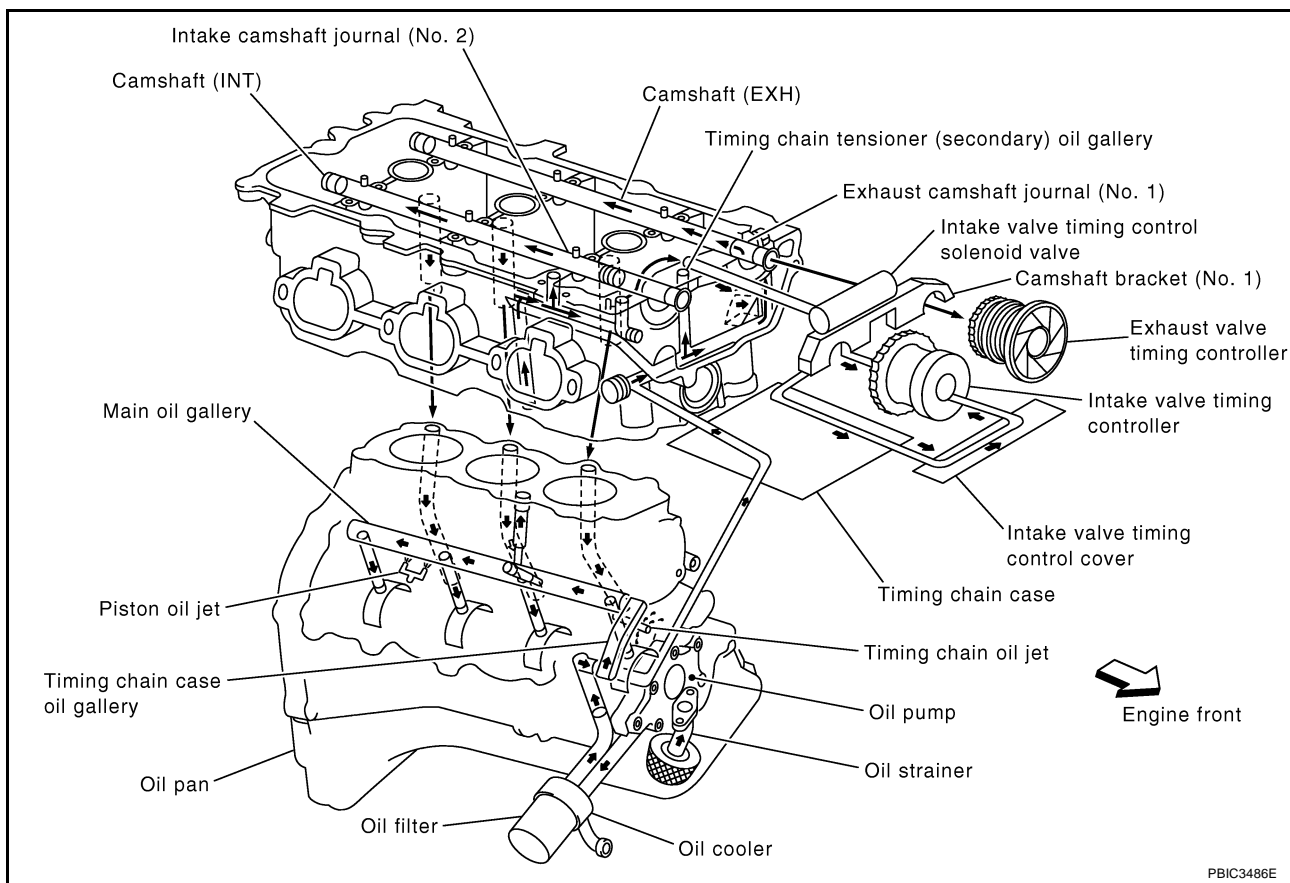
NBS0001C

#### A/T MODELS



# LUBRICATION SYSTEM

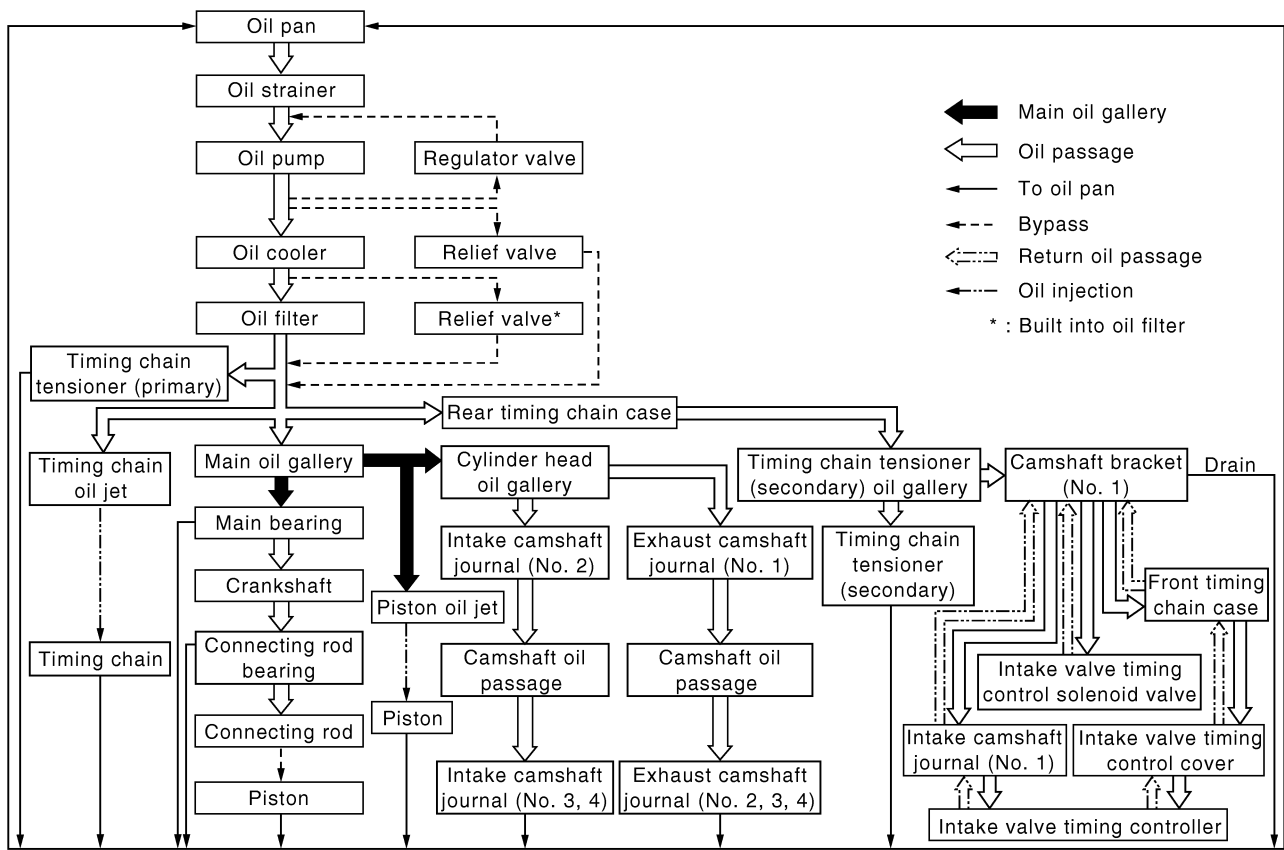
## M/T MODELS



## System Chart

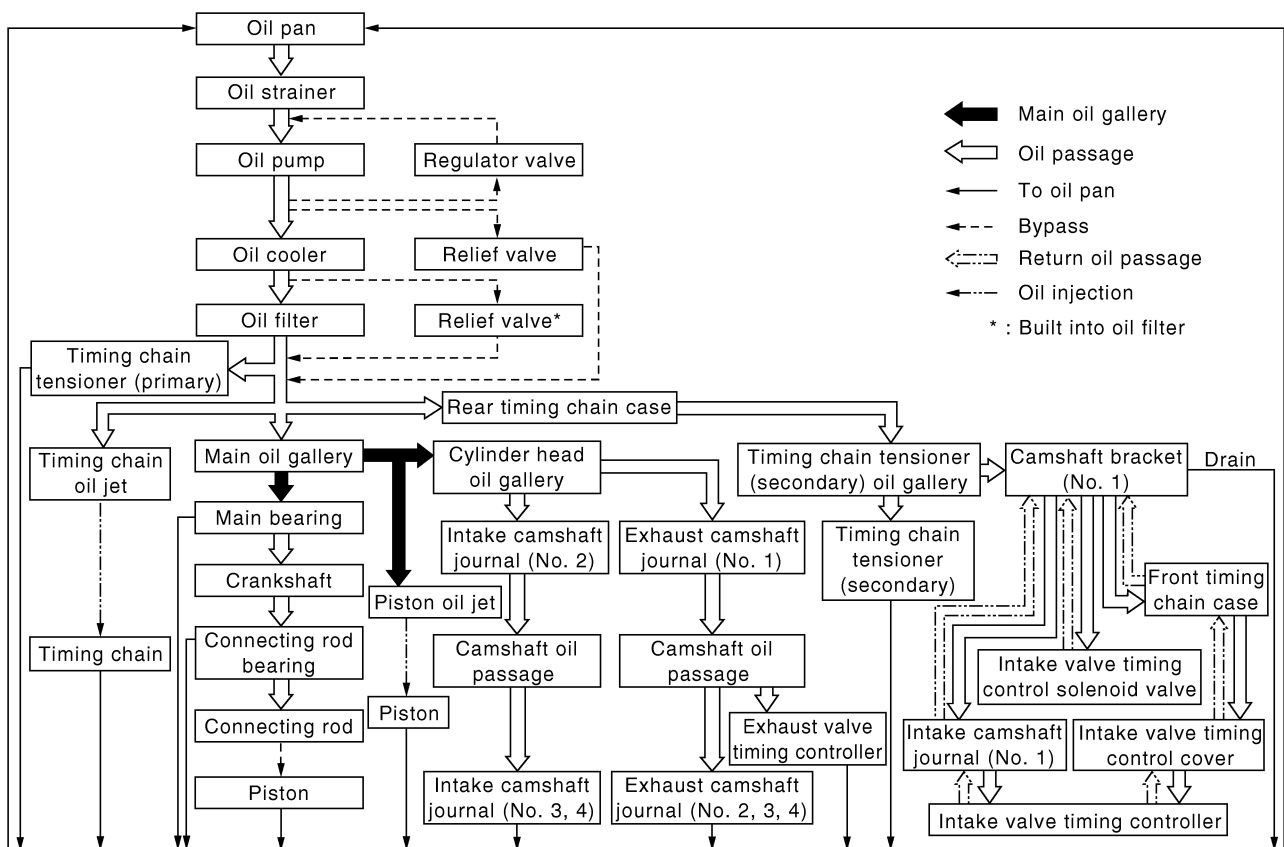
NBS0001D

## A/T MODELS



PBIC2071E

## M/T MODELS



PBIC3487E

## ENGINE OIL

PFP:KLA92

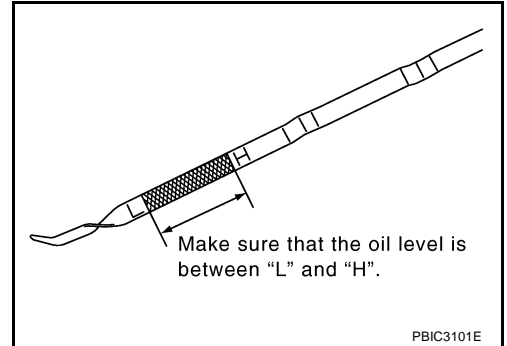
### Inspection ENGINE OIL LEVEL

NBS0001E

#### NOTE:

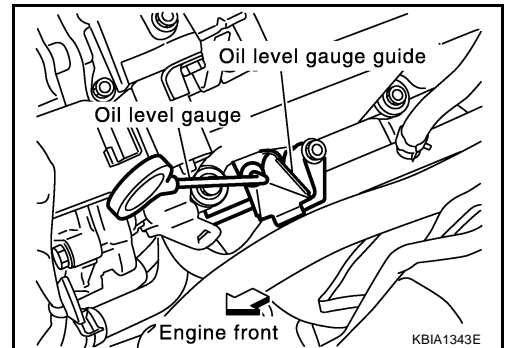
Before starting engine, put vehicle horizontally and check the engine oil level. If engine is already started, stop it and allow 10 minutes before checking.

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 the 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 oil leakage around the following areas:

- Oil pans (lower and upper)
- Oil pan drain plug
- Oil pressure sensor
- Oil filter
- Oil cooler
- Water pump cover
- Chain tensioner cover
- Intake valve timing control solenoid valve
- Intake valve timing control cover (A/T models)
- Valve timing control cover (M/T models)
- 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 head
- Mating surface between rear timing chain case and cylinder block.
- Mating surface between rear timing chain case and oil pan (upper)
- Mating surface between cylinder block and cylinder head

# ENGINE OIL

- Crankshaft oil seals (front and rear)
- Camshaft position sensor (PHASE)

## OIL PRESSURE CHECK

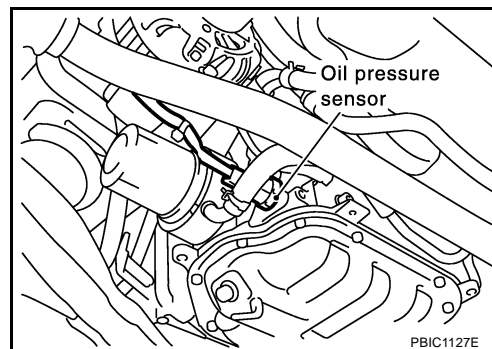
### WARNING:

- 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).

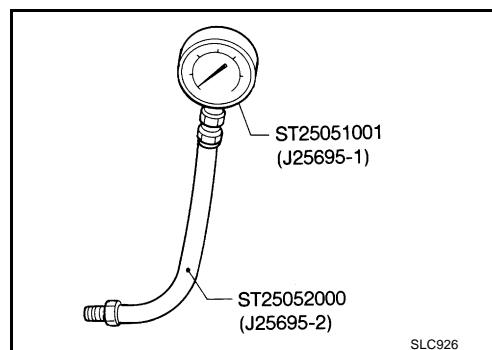
1. Check the engine oil level. Refer to [LU-7, "ENGINE OIL LEVEL"](#).
2. Remove undercover with power tool.
3. Disconnect harness connector at oil pressure sensor, and remove oil pressure sensor using deep socket (commercial service tool).

### CAUTION:

Do not drop or shock oil pressure sensor.



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



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

### NOTE:

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

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

Engine speed (rpm)	Approximate discharge pressure [kPa (kg/cm <sup>2</sup> , psi)]
Idle speed	More than 98 (1.0, 14)
2,000	More than 294 (3.0, 43)

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

7. After the inspections, install oil pressure sensor as follows:
  - a. Remove old liquid gasket adhering to oil presser sensor and the mating surface.
  - b. Apply liquid gasket and tighten oil pressure sensor to the specification.  
**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-47, "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

NBS0001F

### WARNING:

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




## ENGINE OIL

- **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 the 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-29, "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.  
**Engine oil specification and viscosity:**  
Refer to [MA-12, "RECOMMENDED FLUIDS AND LUBRICANTS"](#).

### **Engine oil capacity (Approximate):**

Unit: ℓ (US qt, Imp qt)

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

### **CAUTION:**

- **When filling engine oil, do not pull out oil level gauge.**
  - **The refill capacity depends on the engine oil temperature and drain time. Use these specifications for reference only.**
  - **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

NBS0001G

#### REMOVAL

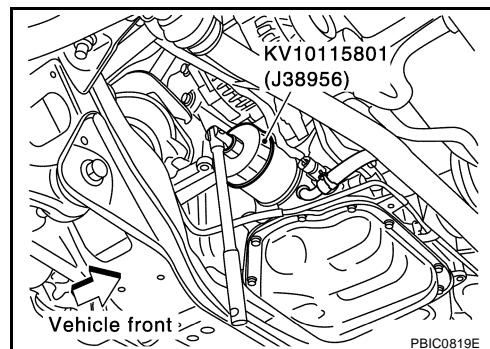
1. Remove undercover with power tool.
2. Using oil filter wrench [SST], remove oil filter.

#### **WARNING:**

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

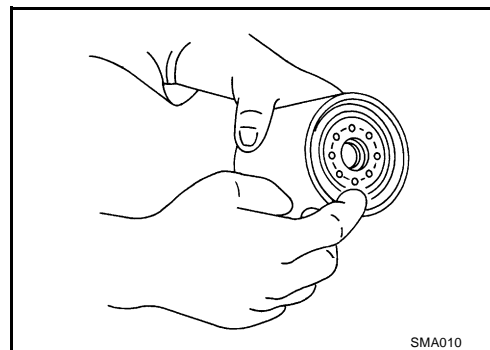
#### **CAUTION:**

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



#### INSTALLATION

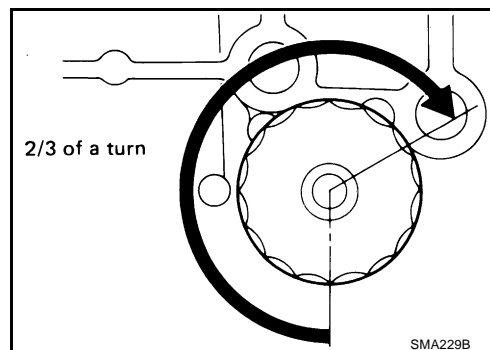
1. Remove foreign materials adhering to oil filter installation surface.
2. Apply engine oil to the oil seal contact surface of new oil filter.



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

#### **Oil filter:**

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



#### INSPECTION AFTER INSTALLATION

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

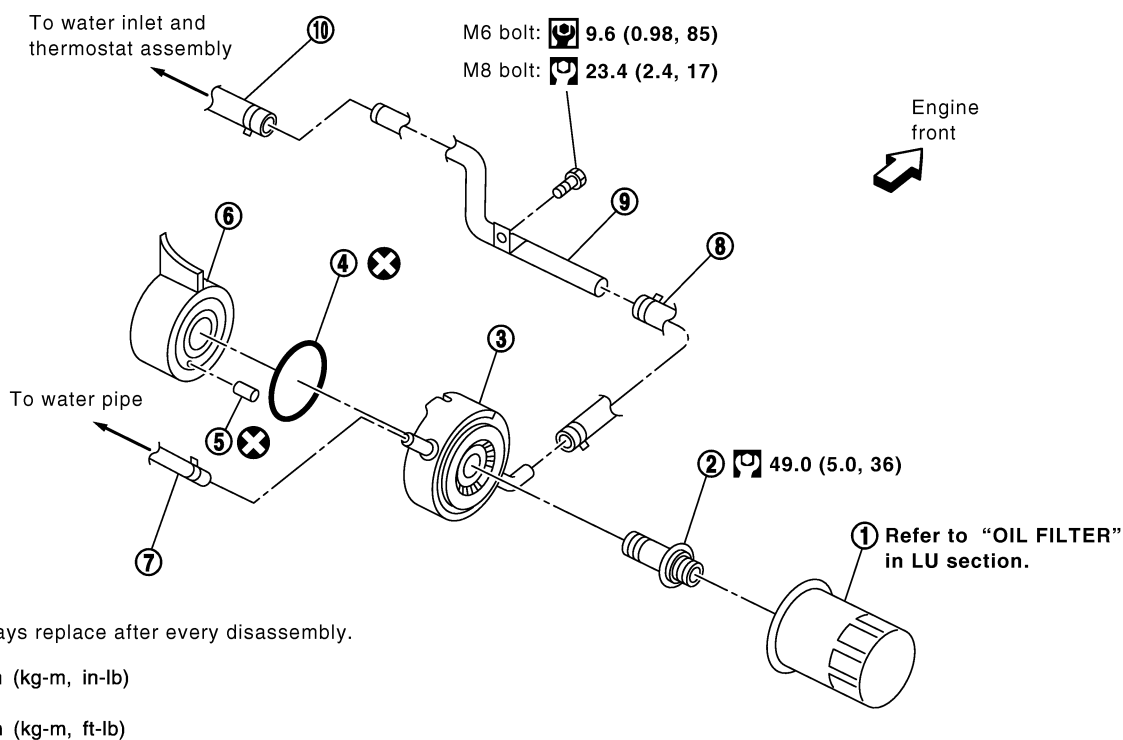
## OIL COOLER

PFP:21305

## Removal and Installation

NBS0001H

SEC. 150•211•213



PBIC2403E

- |                |                   |                               |
|----------------|-------------------|-------------------------------|
| 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 |                   |                               |

### WARNING:

Be careful not to get burn yourself, as engine oil and engine coolant are hot.

### REMOVAL

#### NOTE:

When removing oil cooler only, step 2 is unnecessary.

- Remove undercover with power tool.
- Drain engine coolant from radiator and cylinder block. Refer to [CO-10, "Changing Engine Coolant"](#) and [EM-138, "DISASSEMBLY"](#).

#### NOTE:

Perform this step when removing water pipes.

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

### CAUTION:

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

- Disconnect water hoses from oil cooler.

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

### CAUTION:

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

- Remove connector bolt, and remove oil cooler.

# 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.

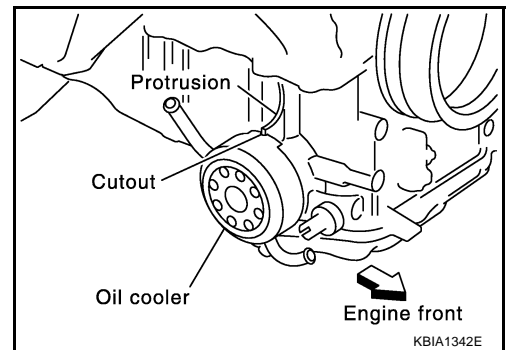
### Relief Valve

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

## INSTALLATION

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

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



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

# OIL PUMP

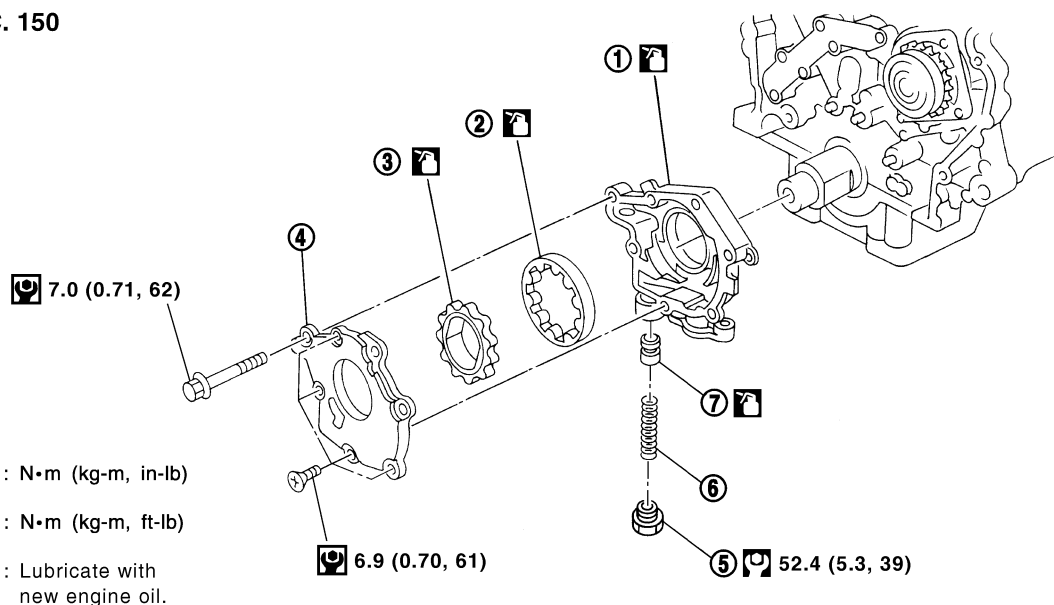
## OIL PUMP

PFP:15010

### Removal and Installation

NBS00011

SEC. 150



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

### REMOVAL

1. Remove oil pans (lower and upper) and oil strainer. Refer to [EM-29, "OIL PAN AND OIL STRAINER"](#).
2. Remove front timing chain case and timing chain (primary). Refer to [EM-59, "TIMING CHAIN"](#).
3. Remove oil pump assembly.

### INSTALLATION

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

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

### INSPECTION AFTER INSTALLATION

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

### Disassembly and Assembly

#### DISASSEMBLY

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

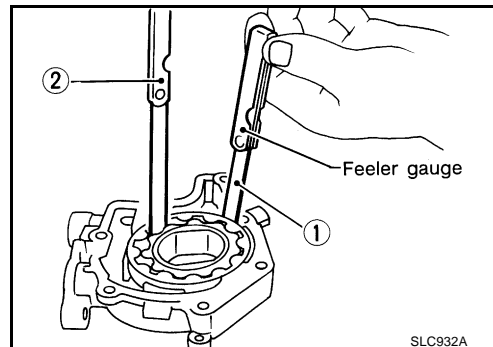
NBS0001J

# OIL PUMP

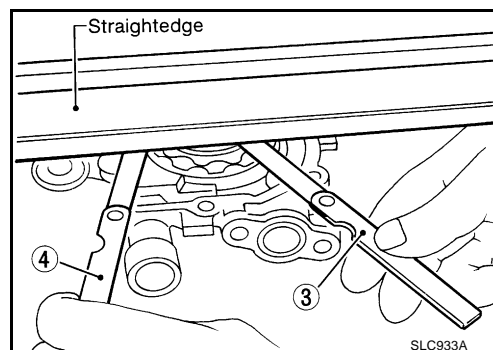
## INSPECTION AFTER DISASSEMBLY

### Oil Pump Clearance

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



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



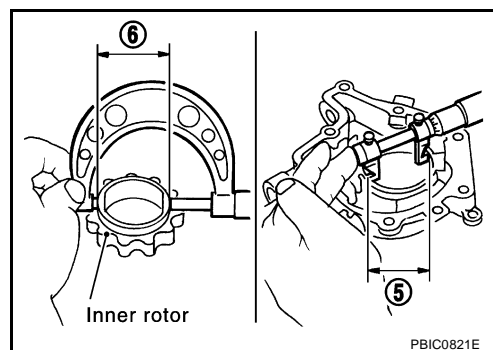
- Calculate the clearance between oil pump inner rotor and oil pump body as follows:

### OIL PUMP BODY INNER DIAMETER

- Measure the inner diameter of oil pump body with inside micrometer. (Position “5”)

### OIL PUMP INNER ROTOR OUTER DIAMETER

- Measure the outer diameter of protruded portion of oil pump inner rotor with micrometer. (Position “6”)



### OIL PUMP INNER ROTOR TO OIL PUMP BODY CLEARANCE

- (Clearance) = (Oil pump body inner diameter) – (Oil pump inner rotor outer diameter)  
**Standard : 0.045 - 0.091 mm (0.0018 - 0.0036 in)**
- If measured/calculated values are out of the standard, replace oil pump assembly.

# OIL PUMP

## Regulator Valve Clearance

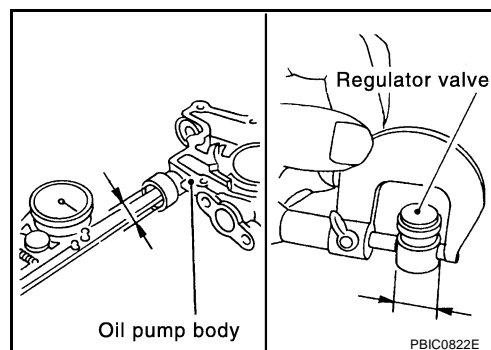
(Clearance) = (Valve hole diameter) – (Regulator valve outer diameter)

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

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

### CAUTION:

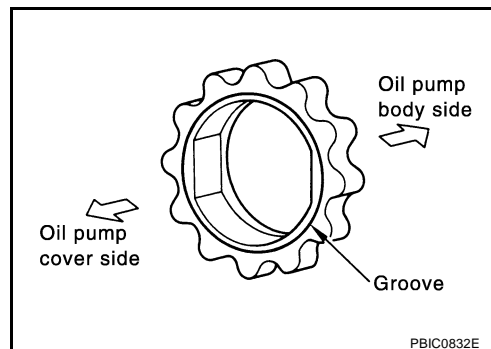
- Coat regulator valve with engine oil.
- Make sure that it falls smoothly into valve hole by its own weight.



## ASSEMBLY

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

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



# SERVICE DATA AND SPECIFICATIONS (SDS)

## SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

### Standard and Limit OIL PRESSURE

NBS0001K

Engine speed rpm	Approximate discharge pressure* kPa (kg/cm <sup>2</sup> , psi)
Idle speed	More than 98 (1.0, 14)
2,000	More than 294 (3.0, 43)

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

### OIL CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

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

### OIL PUMP

Unit: mm (in)

Oil pump body to oil pump outer rotor radial clearance	0.114 - 0.260 (0.0045 - 0.0102)
Oil pump inner rotor to oil pump outer rotor tip clearance	Below 0.180 (0.0071)
Oil pump body to oil pump inner rotor side clearance	0.030 - 0.070 (0.0012 - 0.0028)
Oil pump body to oil pump outer rotor side clearance	0.050 - 0.110 (0.0020 - 0.0043)
Oil pump inner rotor to oil pump body clearance	0.045 - 0.091 (0.0018 - 0.0036)

### REGULATOR VALVE

Unit: mm (in)

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

### Tightening Torque

NBS0001L

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

Oil pressure sensor		12.3 - 17.2 (1.25 - 1.75, 9 - 12)
Oil pan drain plug		29.4 - 39.2 (3.0 - 4.0, 22 - 28)
Oil cooler connector bolt		49.0 (5.0, 36)
Water pipe	M6 bolt	9.6 (0.98, 85)*
	M8 bolt	23.4 (2.4, 17)
Oil pump body		6.9 (0.70, 61)*
Oil pump cover		7.0 (0.71, 62)*
Regulator valve plug		52.4 (5.3, 39)