SECTION LU

ENGINE LUBRICATION SYSTEM

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PRECAUTIONS

PFP:00001

Precautions for Liquid Gasket

EBS00DVN

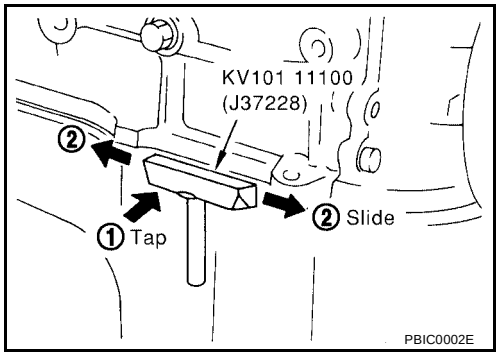
REMOVAL OF LIQUID GASKET

- After removing the mounting bolts and nuts, separate the mating surface using a seal cutter and remove the sealant.

CAUTION:
Be careful not to damage the mating surfaces.

- In areas where the cutter is difficult to use, use a plastic hammer to lightly tap the areas where the sealant is applied.

CAUTION:
If for some unavoidable reason a tool such as a flat-bladed screwdriver is used, be careful not to damage the mating surfaces.

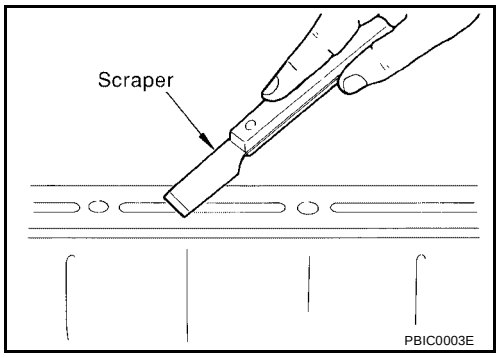


LIQUID GASKET APPLICATION PROCEDURE

1. Using a scraper, remove the old sealant adhering to the mating surface.

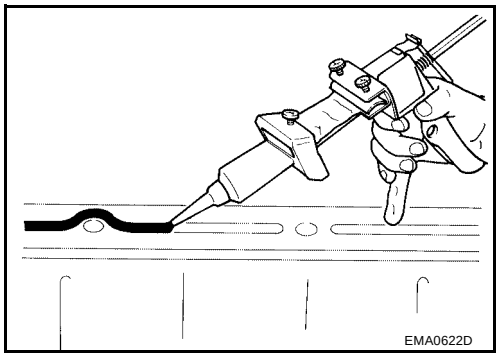
- Remove the sealant completely from the groove, mounting bolts, and bolt holes.

2. Clean the mating surface thoroughly to remove adhering moisture, grease and foreign materials.
3. Install the sealant tube into the tube presser.
   Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-43, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

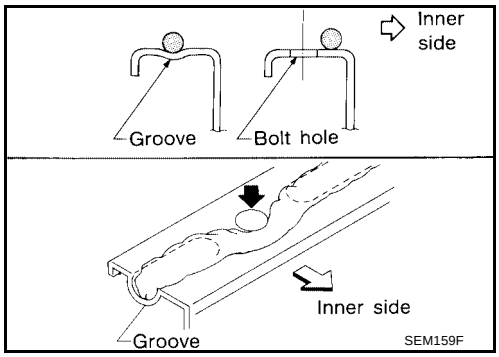


4. Apply the sealant without breaks to the specified area with the specified dimensions.

- If there is a groove for the sealant application, apply the sealant to the groove.



- As for the bolt holes, normally apply the sealant inside the holes. If specified, it should be applied outside the holes. Make sure to read the instructions in this manual.
- Within five minutes of sealant application, install the mating component.
- If the sealant protrudes, wipe it off immediately.
- Do not retighten after the installation.
- After 30 minutes or more have passed from the installation, fill the engine with the correct oil and coolant. Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .



CAUTION:
If there are specific instructions in the service manual, observe them.

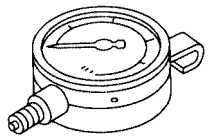
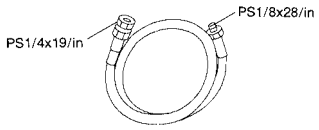
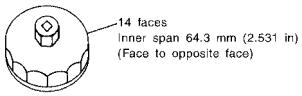
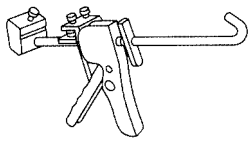
PREPARATION

PFP:00002

Special Service Tools

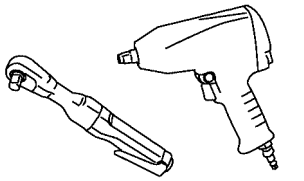
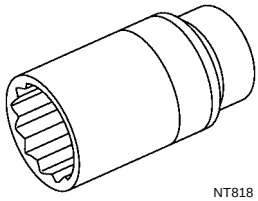
EBS00DVO

The actual shape of the Kent-Moore tools may differ from those tools illustrated here.

Tool number (Kent Moore No.) Tool name	Description
ST25051001 (J25695-1) Oil pressure gauge  S-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 cylinder block
KV10115801 (J-38956) Oil filter wrench  S-NT772	Removing and installing oil filter
WS39930000 (—) Tube presser  S-NT052	Pressing the tube of liquid gasket

Commercial Service Tools

EBS00DVP

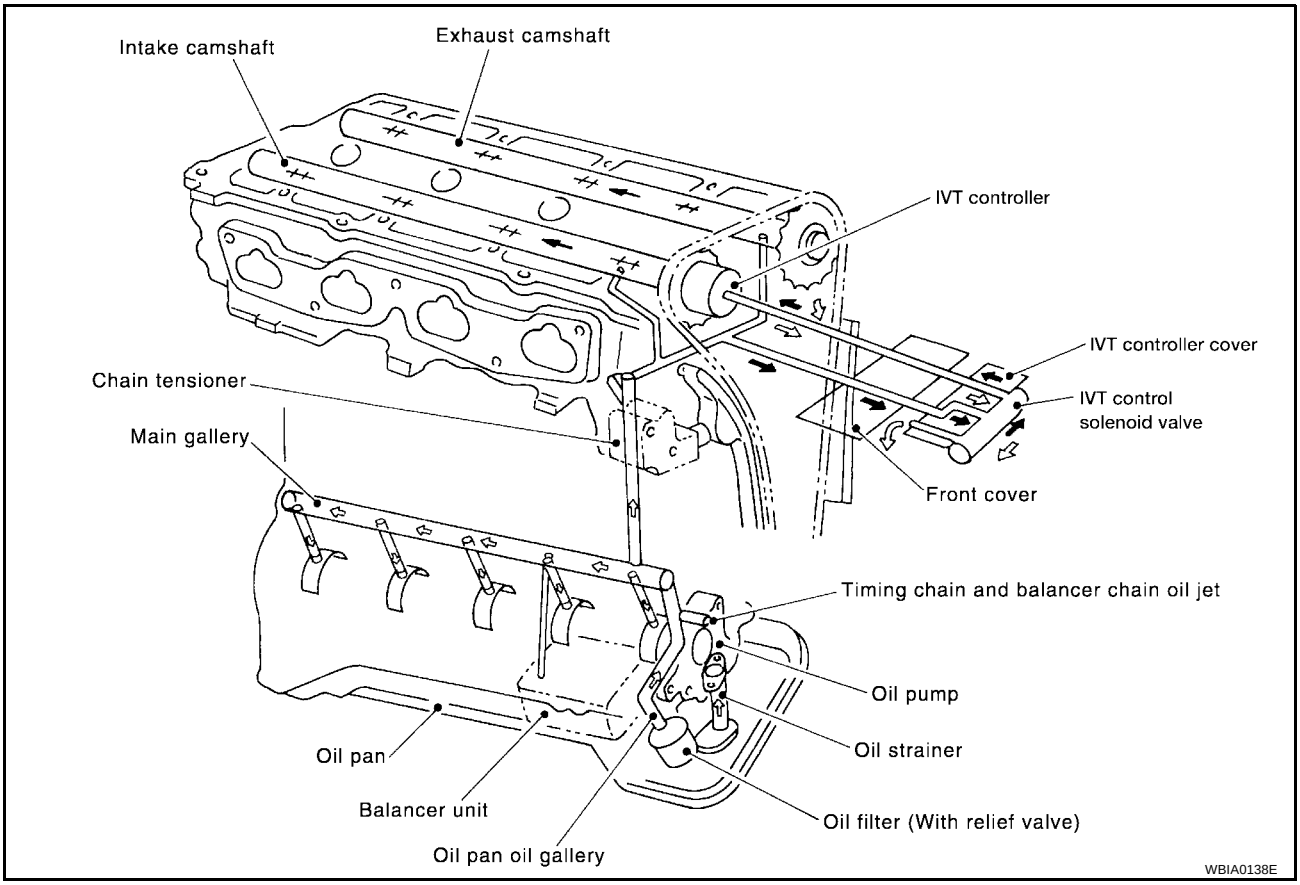
Tool name	Description
Power tool  PBIC0190E	Loosening bolts and nuts
Deep socket  NT818	Removing and installing oil pressure sensor Deep socket 26 mm, 3/8 drive

LUBRICATION SYSTEM

PFP:15010

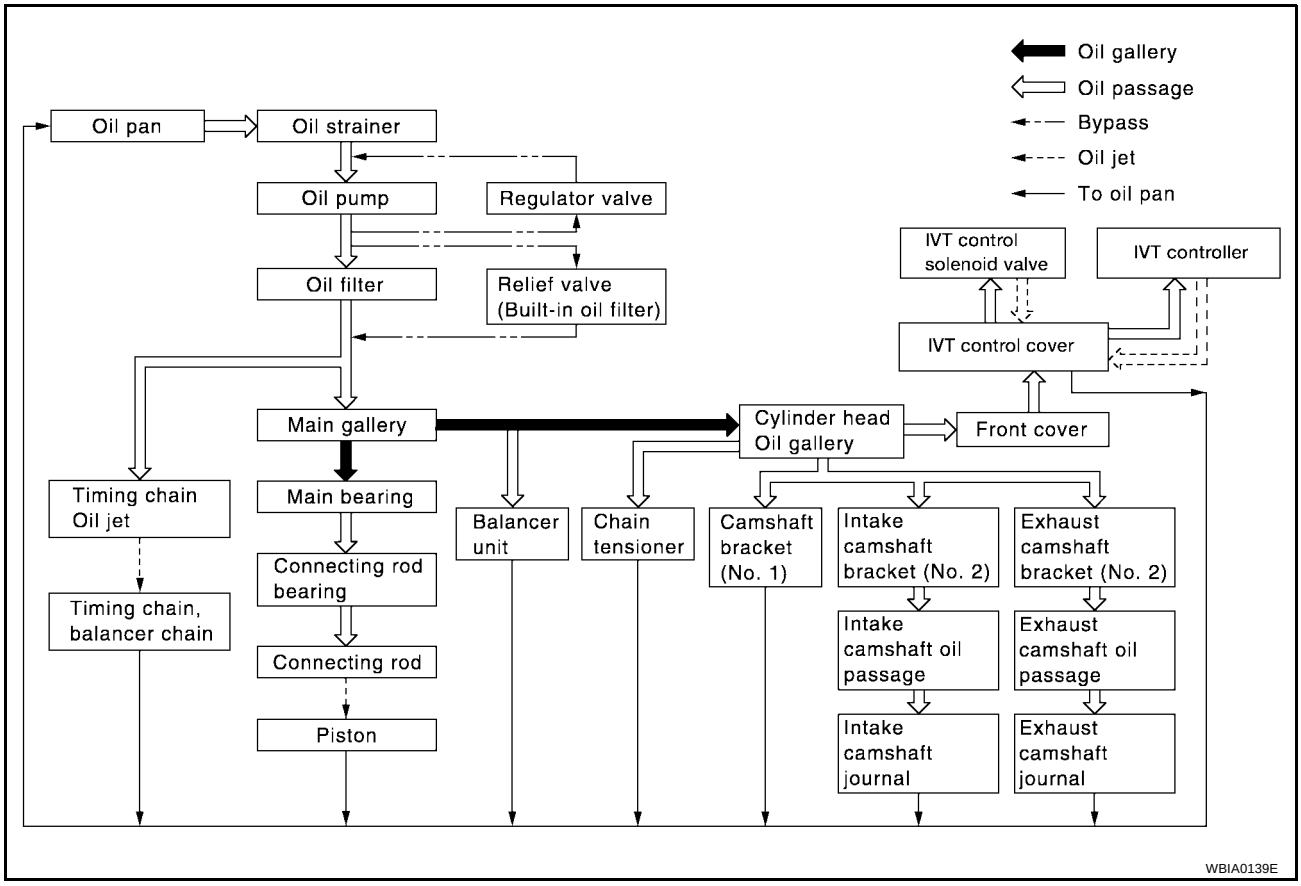
Lubrication Circuit

EBS00DVQ



System Drawing

EBS00DVR



ENGINE OIL

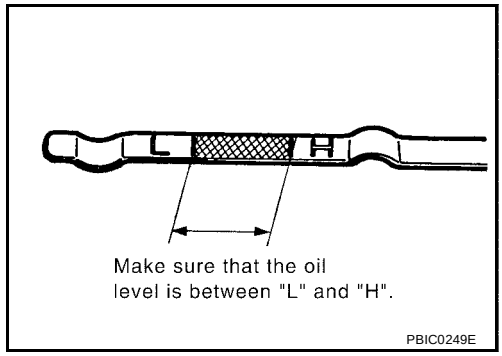
PFP:KLA92

Inspection

EBS00DVS

OIL LEVEL

- Before starting the engine, check the oil level. If the engine is already started, stop it and allow 10 minutes before checking.
- Check that the oil level is within the range on the dipstick.
- If it is out of range, add oil as necessary. Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .



OIL APPEARANCE

- Check the oil for white turbidity or heavy contamination.
- If the oil becomes turbid and white, it is highly probable that it is contaminated with coolant. Determine the cause and correct as necessary.

OIL LEAKAGE

Check for oil leakage around the following areas:

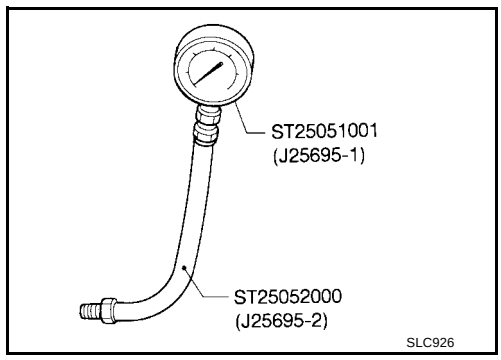
- Oil pan
- Oil pan drain plug
- Oil pressure switch
- Oil filter
- IVTC cover
- Front cover
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and rocker cover
- Crankshaft oil seal

OIL PRESSURE CHECK

WARNING:

- **Be careful not to burn yourself, as the engine oil may be hot.**
- **For M/T models, put the gearshift lever in the Neutral "N" position. For A/T models, put the selector lever in the Park “P” position.**

1. Check the oil level.
2. Remove the under cover, using power tools.
3. Remove the oil pressure switch to connect the oil pressure gauge.
4. After warming up the engine, check that oil pressure corresponding to the engine speed is produced.



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

Engine speed (rpm)	Idle speed	2,000	6,000
Engine pressure kPa (kg/cm^2 , psi)	Approx. 98 (1.0, 14) or more	Approx. 294 (3.0, 43) or more	Approx. 392 (4.0, 57) or more

5. After checking, install the oil pressure switch as follows.

a. Remove old sealant adhering to the switch and engine.
b. Apply High Performance Thread Sealant.
Use Genuine High Performance Thread Sealant or equivalent. Refer to GI-43, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

Oil pressure switch : 12.3 - 17.2 N·m (1.25 - 1.75 kg-m, 10 - 12 ft-lb)

Changing Engine Oil

EBS00DVT

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. Make sure vehicle is on level surface, then warm up engine.
2. Check for oil leakage from engine components.
3. Stop engine and wait for 10 minutes.
4. Remove drain plug and oil filler cap.
5. Drain oil and refill with new engine oil.
Oil specification and viscosity
   - Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .

Oil capacity (Approximate):

Drain and refill	With oil filter change	4.2 ℓ (4 1/2 qt.)
	Without oil filter change	4.0 ℓ (4 1/4 qt.)
Dry engine (engine overhaul)		4.6 ℓ (4 7/8 qt.)

CAUTION:
- **Be sure to clean the drain plug and install using a new washer.**

Oil pan drain plug : 29.4 - 39 N·m (3.0 - 4.0 kg-m, 22 - 28 ft-lb)

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

6. Warm up the engine and check the area around the drain plug and oil filter for oil leakage.
7. Stop the engine and wait for 10 minutes.
8. Check the oil level using the dipstick.

OIL FILTER

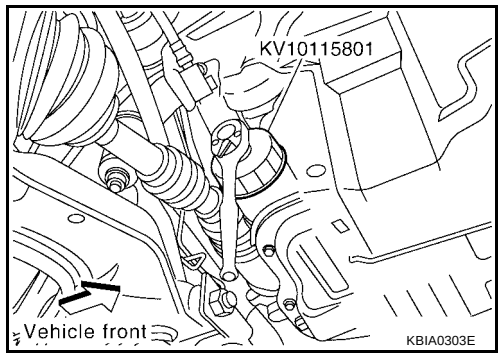
PFP:15208

Removal and Installation

EBS00DVU

REMOVAL

1. Using an oil filter wrench, remove the oil filter.

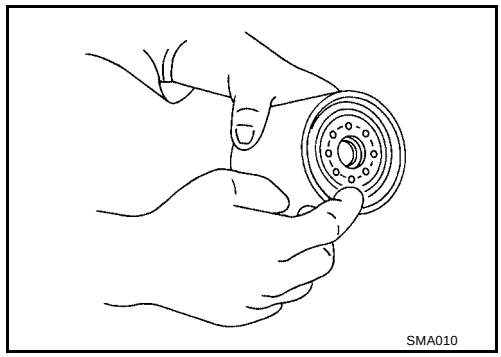


CAUTION:

- **Be careful not to get burned when the engine and engine oil are hot.**
- **The oil filter has a built in pressure relief valve. Use a genuine NISSAN oil filter or equivalent**
- **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.**

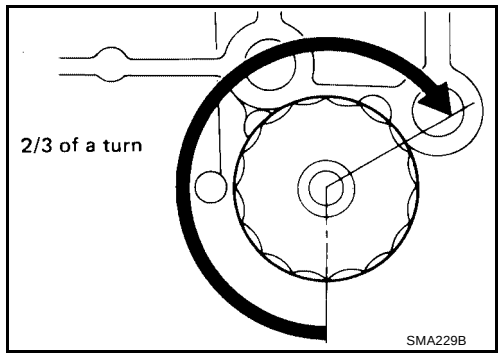
INSTALLATION

1. Clean off any foreign materials adhering to the oil filter installation surface.
2. Apply engine oil to the oil seal surface of the new oil filter.

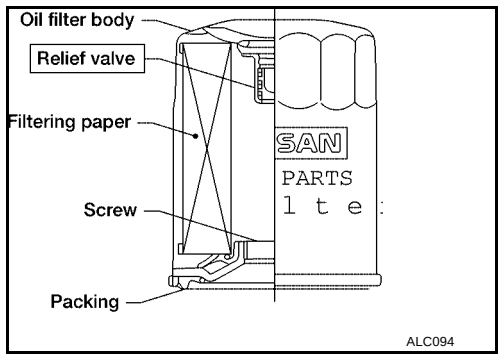


3. Screw the oil filter manually until it touches the installation surface, then tighten it by 2/3 turn. Or tighten to specification below.

Oil filter : 14.7 - 20.5 N·m (1.5 - 2.1 kg-m, 11 - 15 ft-lb)



4. After warming up the engine, check for oil leaks.
5. Check oil level and add engine oil as necessary. Refer to LU-6, "ENGINE OIL" .



OIL PUMP

PFP:15010

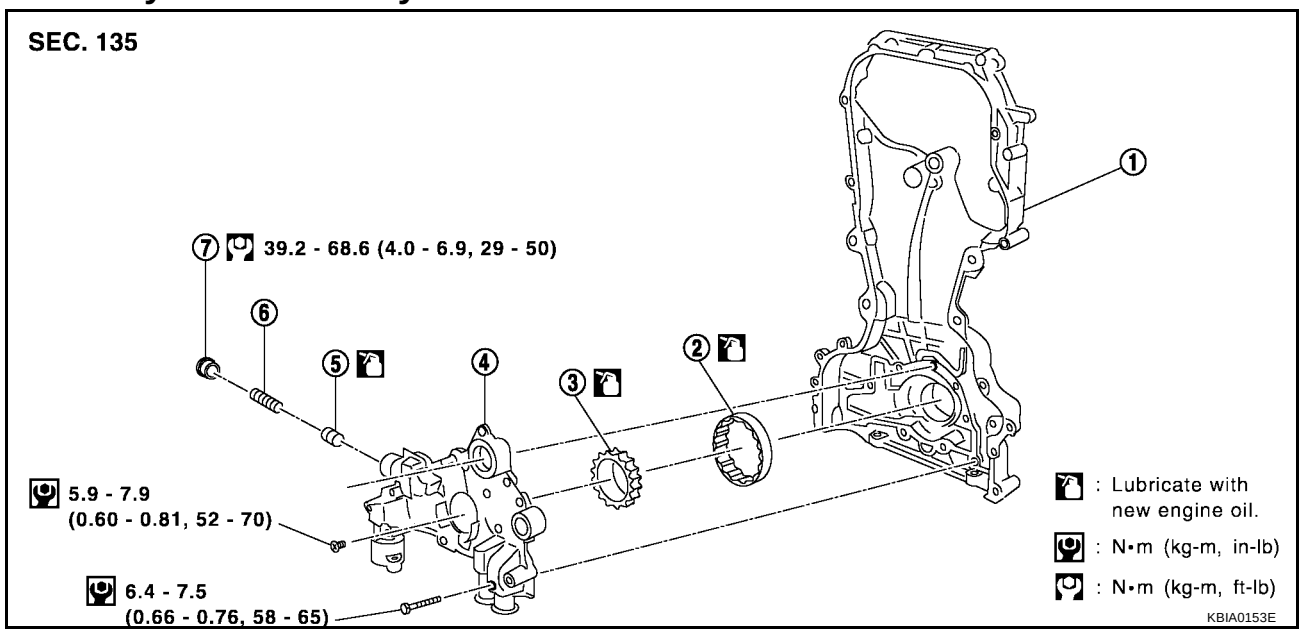
Removal and Installation

EBS00DVV

- Remove the front cover. Refer to EM-49, "TIMING CHAIN" .

Disassembly and Assembly

EBS00DVW



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

CAUTION:

Before installation, apply new engine oil to the parts as instructed in the figure above.

DISASSEMBLY

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

INSPECTION AFTER DISASSEMBLY

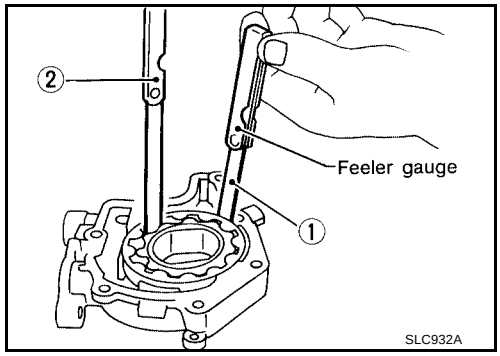
Measure the clearance of the oil pump parts.

- Measure clearance with 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)

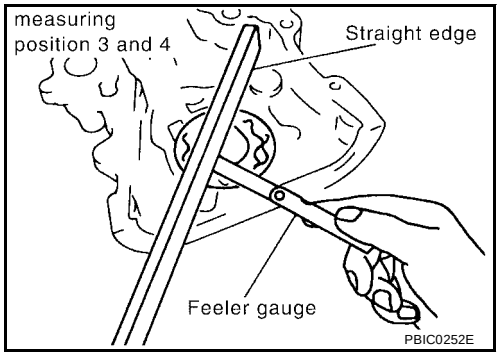


- Measure clearance with feeler gauge and straightedge.
- Side clearance between inner rotor and oil pump body (position 3).

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

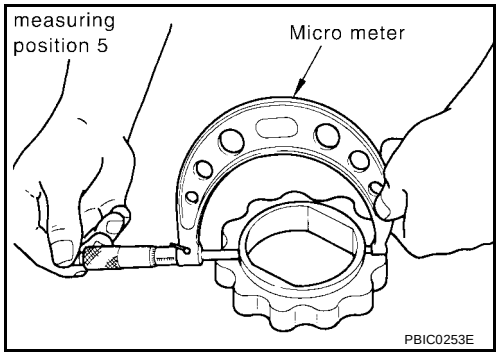
- Side clearance between outer rotor and oil pump body (position 4).

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



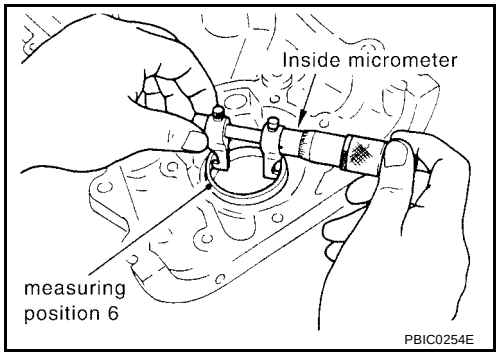
- Calculate the clearance between inner rotor and oil pump body as follows:

1. Measure the outer diameter of protruded portion of inner rotor (Position 5).



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

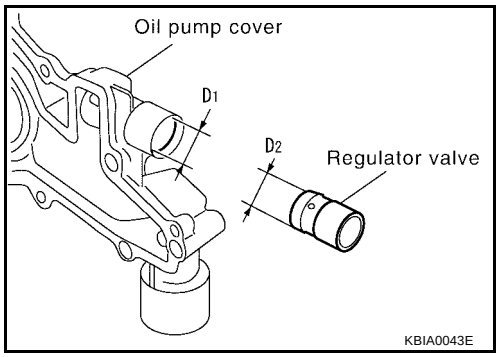
Standard : 0.035 - 0.070 mm (0.0014 - 0.0028 in)



- Regulator valve clearance:
(Clearance) = D1(Valve hole diameter) – D2 (Outer diameter of valve)

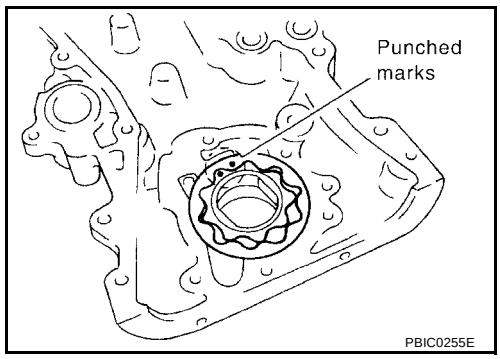
Standard : 0.040 - 0.097 mm (0.0016 - 0.0038 in)

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



ASSEMBLY

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



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Oil Pressure

EBS00DVX

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

Oil Pump

EBS00DVY

Unit: mm (in)

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)
Body to inner rotor axial clearance	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance	0.060 - 0.110 (0.0024 - 0.0043)
Inner rotor to brazed portion of housing clearance	0.035 - 0.070 (0.0014 - 0.0028)

Regulator Valve

EBS00DVZ

Unit: mm (in)

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

Oil Capacity

EBS00DW0

Unit: ℓ (qt.)

Drain and refill	With oil filter change	Approximately 4.2 (4 1/2)
	Without oil filter change	Approximately 4.0 (4 1/4)
Dry engine (engine overhaul)		Approximately 4.6 (4 7/8)

PRECAUTIONS

PFP:00001

Precautions for Liquid Gasket

EBS00DW1

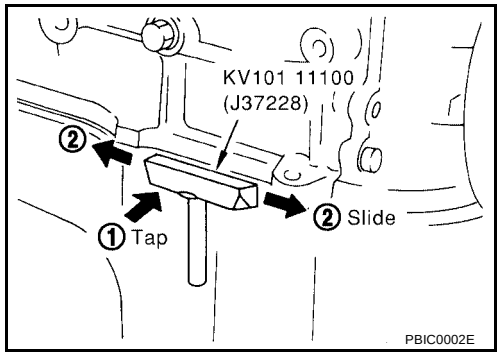
REMOVAL OF LIQUID GASKET SEALING

- After removing the mounting bolts and nuts, separate the mating surface using a seal cutter and remove the sealant.

CAUTION:
Be careful not to damage the mating surfaces.

- In areas where the cutter is difficult to use, use a plastic hammer to lightly tap the areas where the sealant is applied.

CAUTION:
If for some unavoidable reason a tool such as a flat-bladed screwdriver is used, be careful not to damage the mating surfaces.

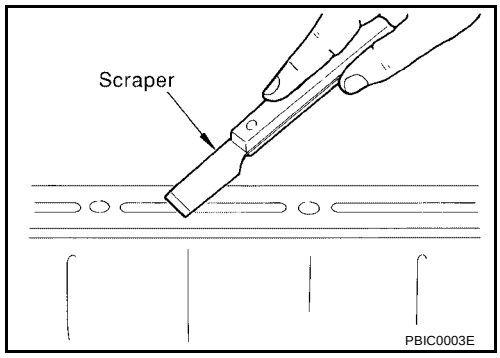


LIQUID GASKET APPLICATION PROCEDURE

1. Using a scraper, remove the old sealant adhering to the mating surface.

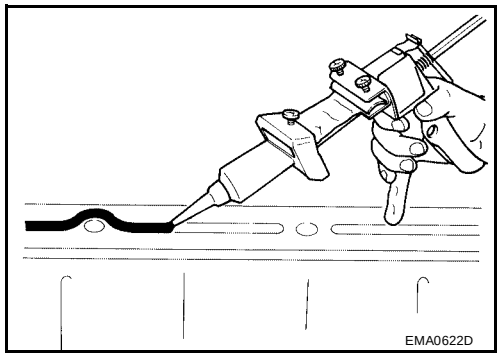
- Remove the sealant completely from the groove, mounting bolts, and bolt holes.

2. Thoroughly clean the mating surface removing any adhering moisture, grease and foreign material.
3. Attach the sealant tube to the tube presser.
   Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-43, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

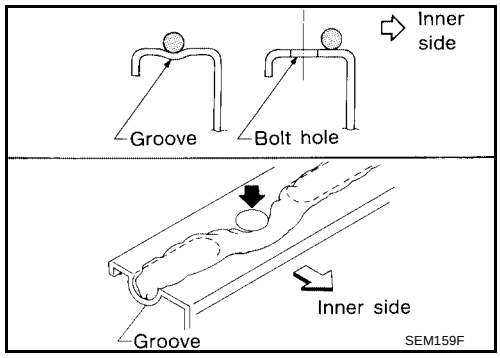


4. Apply the sealant without breaks to the specified location with the specified dimensions.

- If there is a groove for the sealant application, apply the sealant to the groove.



- As for the bolt holes, normally apply the sealant inside the holes. Occasionally, it should be applied outside the holes. Make sure to read the text of service manual.
- Within five minutes of sealant application, install the mating component.
- If the sealant protrudes, wipe it off immediately.
- Do not retighten after the installation.
- After 30 minutes or more have passed from the installation, fill the engine with the proper oil and coolant. Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .



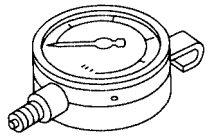
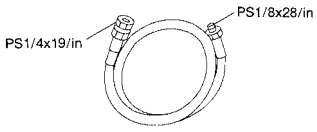
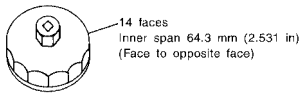
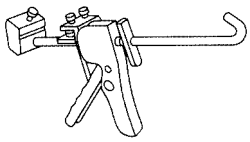
PREPARATION

PFP:00002

Special Service Tools

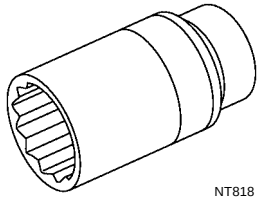
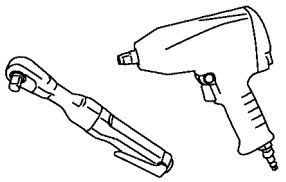
EBS00DW2

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 (J-25695-1) Oil pressure gauge  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 upper oil pan
KV10115801 (J-38956) Oil filter wrench  S-NT772	Removing and installing oil filter
WS39930000 (—) Tube presser  NT052	Pressing the tube of liquid gasket

Commercial Service Tool

EBS00DW3

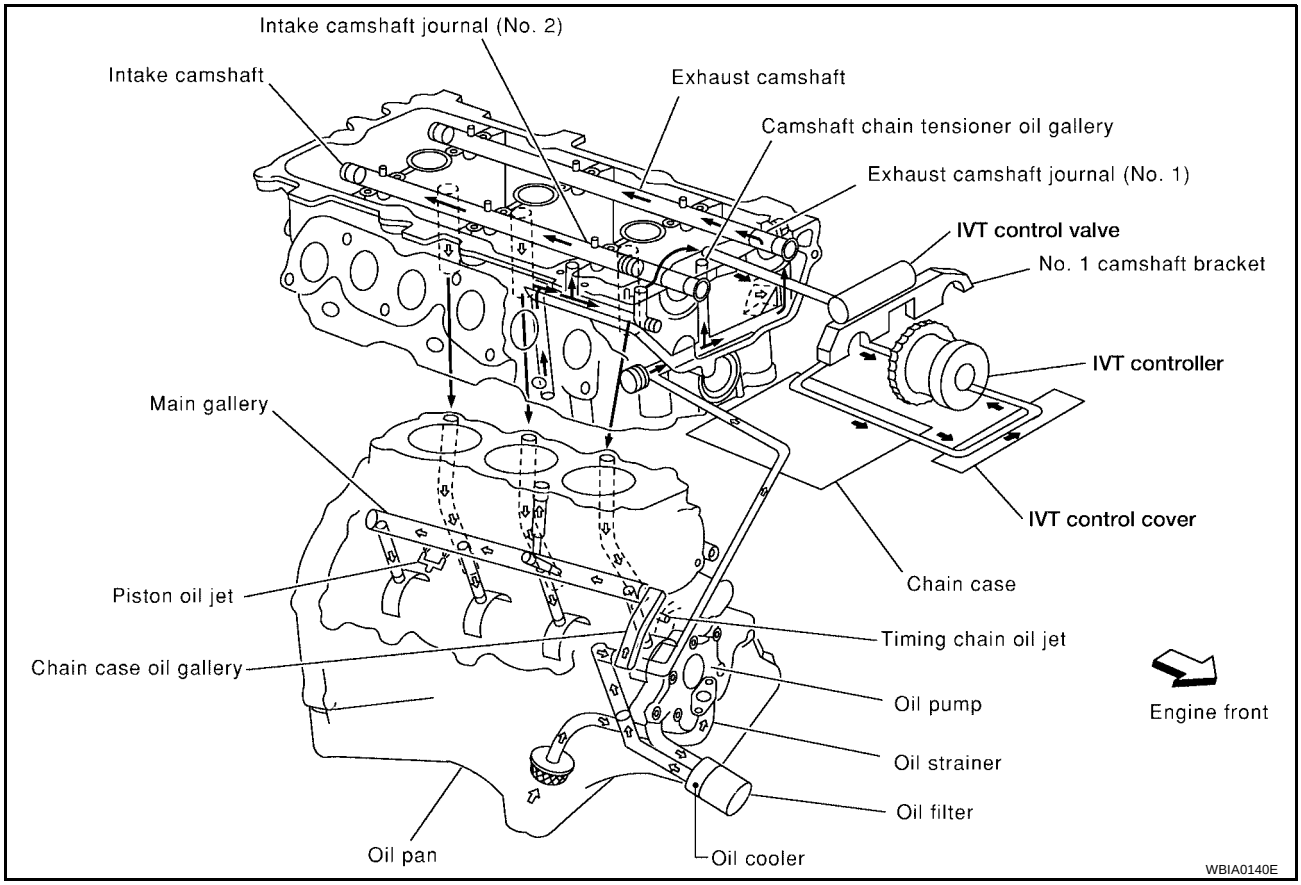
Tool name	Description
Deep socket  NT818	Removing and installing oil pressure switch Deep socket 26 mm, 3/8 drive
Power tools  PBIC0190E	Loosening nuts and bolts

LUBRICATION SYSTEM

PFP:15010

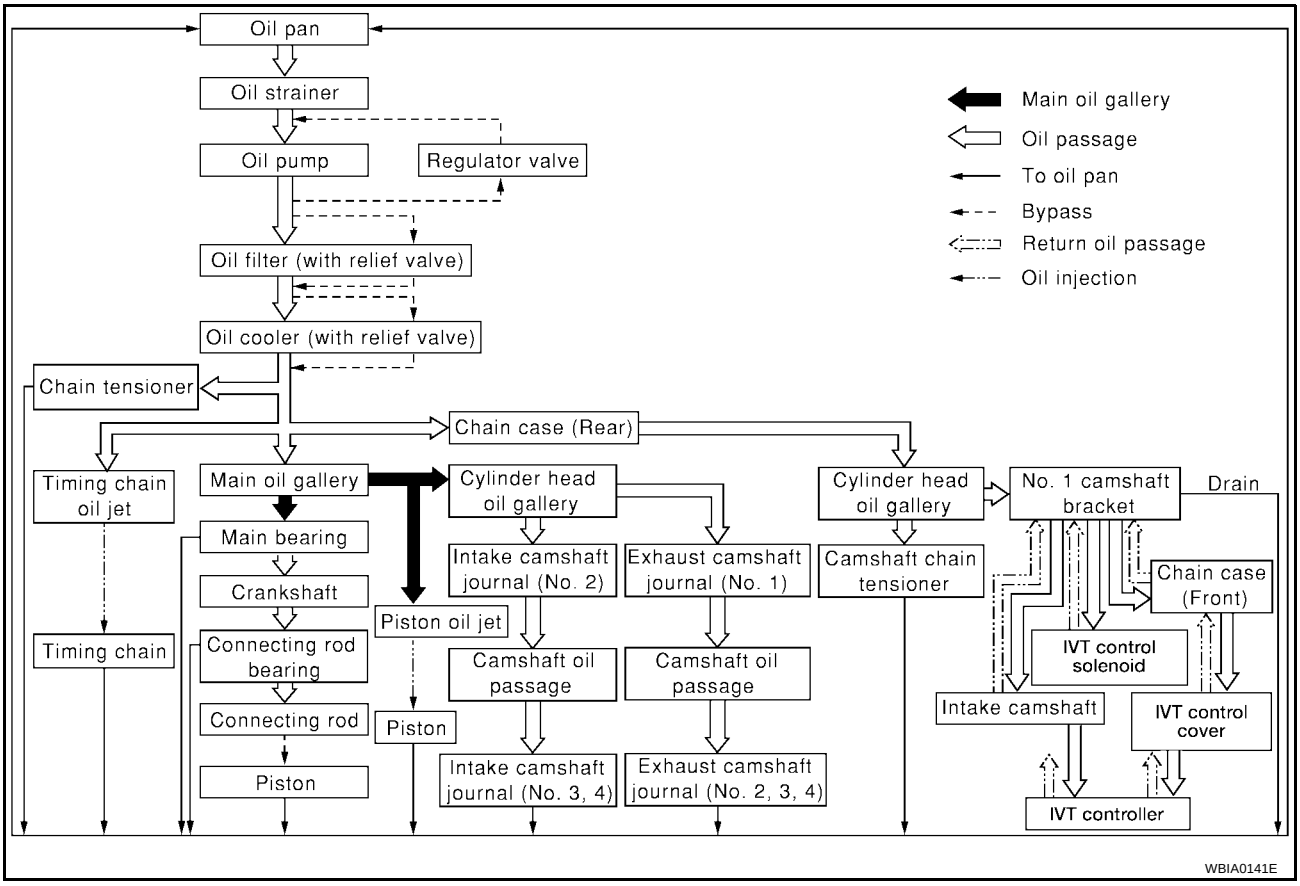
Lubrication Circuit

EBS00DW4



System Drawing

EBS00DW5



ENGINE OIL

PFP:KLA92

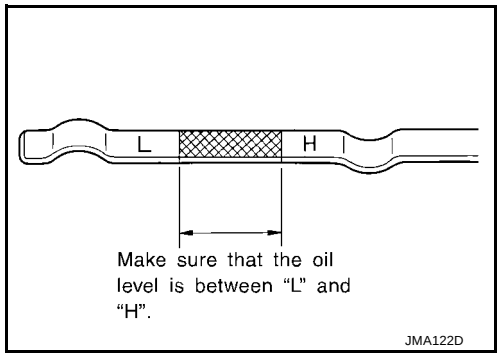
Inspection

EBS00DW6

OIL LEVEL

NOTE:

- Before starting the engine, check the oil level. If the engine is already started, stop it and allow 10 minutes before checking.
- Check that the oil level is within the range as indicated on the dipstick.
- If it is out of range, add oil as necessary. Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .



OIL APPEARANCE

- Check the oil for white turbidity or heavy contamination.
- If the oil becomes turbid and white, it is highly probable that it is contaminated with coolant.

OIL LEAKAGE

Check for oil leakage around the following areas:

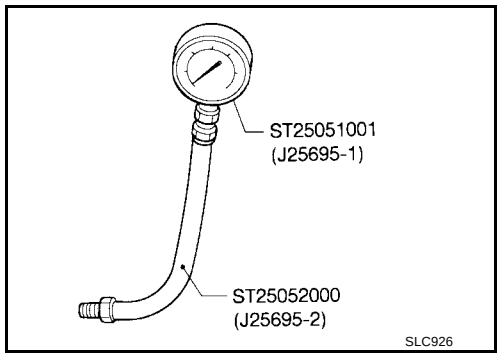
- Oil pan
- Oil pan drain plug
- Oil pressure switch
- Oil filter
- Oil cooler
- IVTC cover
- Intake valve timing control cover
- Front cover
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and rocker cover
- Crank oil seal (front and rear)

OIL PRESSURE CHECK

WARNING:

- **Be careful not to burn yourself, as engine oil may be hot.**
- **For M/T models, put the gearshift lever in the Neutral "N" position. For A/T models, put the selector lever in the Park “P” position.**

1. Check the oil level.
2. Disconnect oil pressure switch harness connector.
3. Remove oil pressure switch.
4. Install the pressure gauge.
5. Start the engine and warm it up to normal operating temperature.
6. Check oil pressure with engine running under no-load.



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

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

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

a. Remove the old sealant adhering to switch and engine.

b. Apply thread sealant and tighten the oil pressure switch to specification.
Use Genuine High Performance Thread Sealant, or equivalent. Refer to GI-43, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

Oil pressure switch : 13 - 17 N·m (1.25 - 1.75 kg-m, 9 - 12 ft-lb)

Changing Engine Oil

EBS00DW7

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. Make sure vehicle is on level surface, then warm up engine.
2. Check for oil leakage from engine components.
3. Stop engine and wait for 10 minutes.
4. Remove drain plug and oil filler cap.
5. Drain engine oil.
6. Install drain plug and refill with new engine oil.
   - Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .

Oil capacity (Approximate):

Drain and refill	With oil filter change	Approximately 4.0 ℓ (4 1/4 qt.)
	Without oil filter change	Approximately 3.7 ℓ (3 7/8 qt.)
Dry engine (engine overhaul)		Approximately 5.0 ℓ (5 1/4 qt.)

CAUTION:

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

Oil pan drain plug : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

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

OIL FILTER

PFP:15208

Removal and Installation

EBS00DW8

REMOVAL

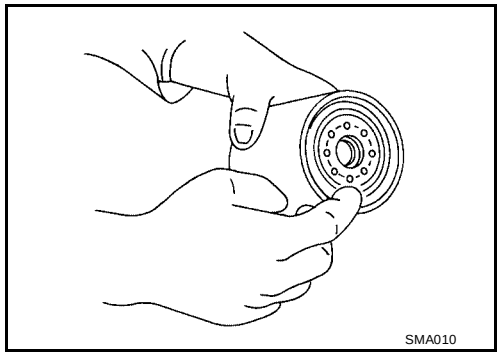
1. Using an oil filter wrench, remove the oil filter.

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.**

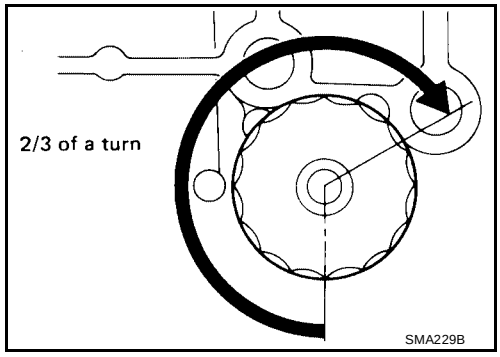
INSTALLATION

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 - 2.1 kg-m, 11 - 15 ft-lb)



4. After warming up the engine, check for engine oil leakage.
5. Check oil level and add engine oil. Refer to LU-17, "ENGINE OIL" .

OIL PUMP

PFP:15010

Removal and Installation

EBS00DW9

REMOVAL

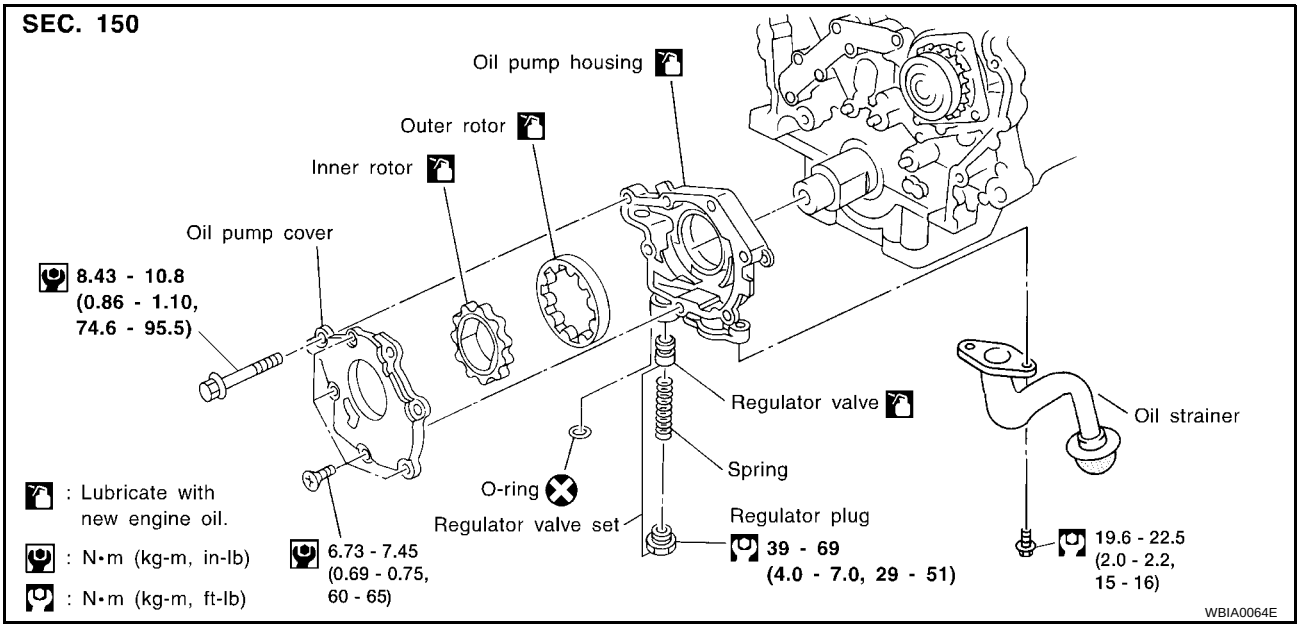
1. Remove the timing chain. Refer to EC-1247, "Engine Coolant Temperature Sensor" .
2. Remove oil pump assembly.

INSTALLATION

- Installation is in the reverse order of removal.

Disassembly and Assembly

EBS00DWA



- **Disassemble as shown.**
- **Assembly is in the reverse order of Disassembly. When assembling the oil pump, apply engine oil to the rotors.**

INSPECTION AFTER DISASSEMBLY

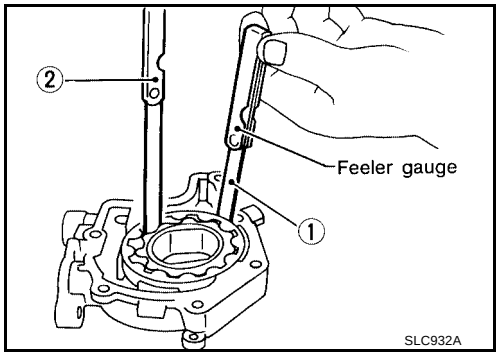
Clearance of Oil Pump Parts

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

  Standard : 0.114 - 0.200 mm (0.0045 - 0.0079 in)

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

  Standard : Below 0.180 mm (0.0071 in)

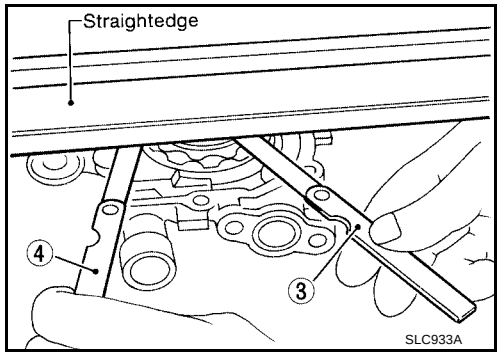


- Measure clearance with feeler gauge and straightedge.
  Side clearance between inner rotor and oil pump body (position 3).

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

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

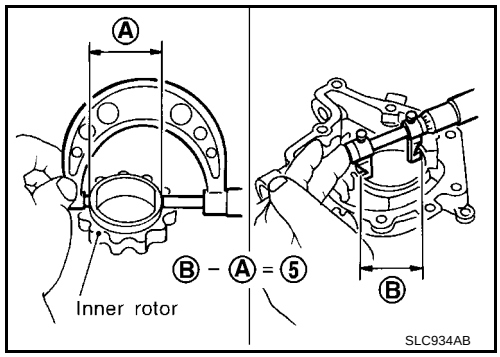
  Standard : 0.050 - 0.110 mm (0.0020 - 0.0043 in)



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

1. Measure the outer diameter of protruded portion of inner rotor (position A).
2. Measure the inner diameter of oil pump body with inside micrometer (position B).
   (clearance 5) = (inner diameter of oil pump body B) – (outer diameter of inner rotor A)

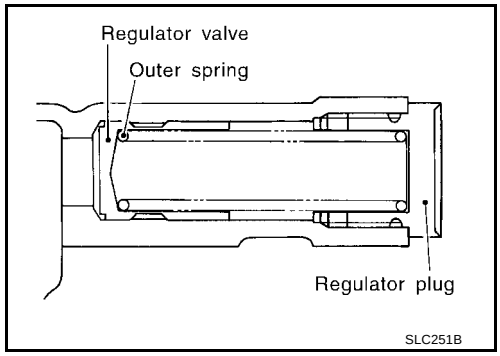
   Standard : 0.045 - 0.091 mm (0.0018 - 0.0036 in)



Regulator Valve

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil. Check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump body.



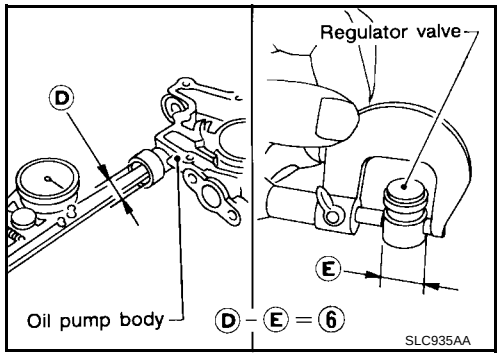
Regulator Valve Clearance

(Clearance 6) = D (Valve hole diameter) – E (Outer diameter of valve)

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

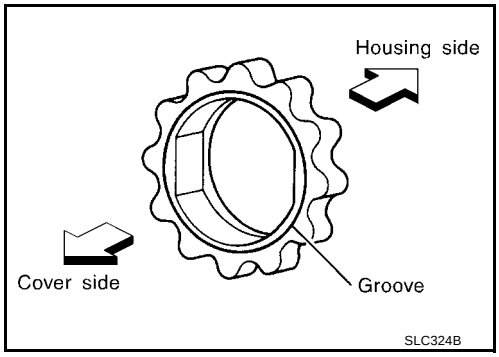
If it exceeds the standard, replace the oil pump body.

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



ASSEMBLY

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

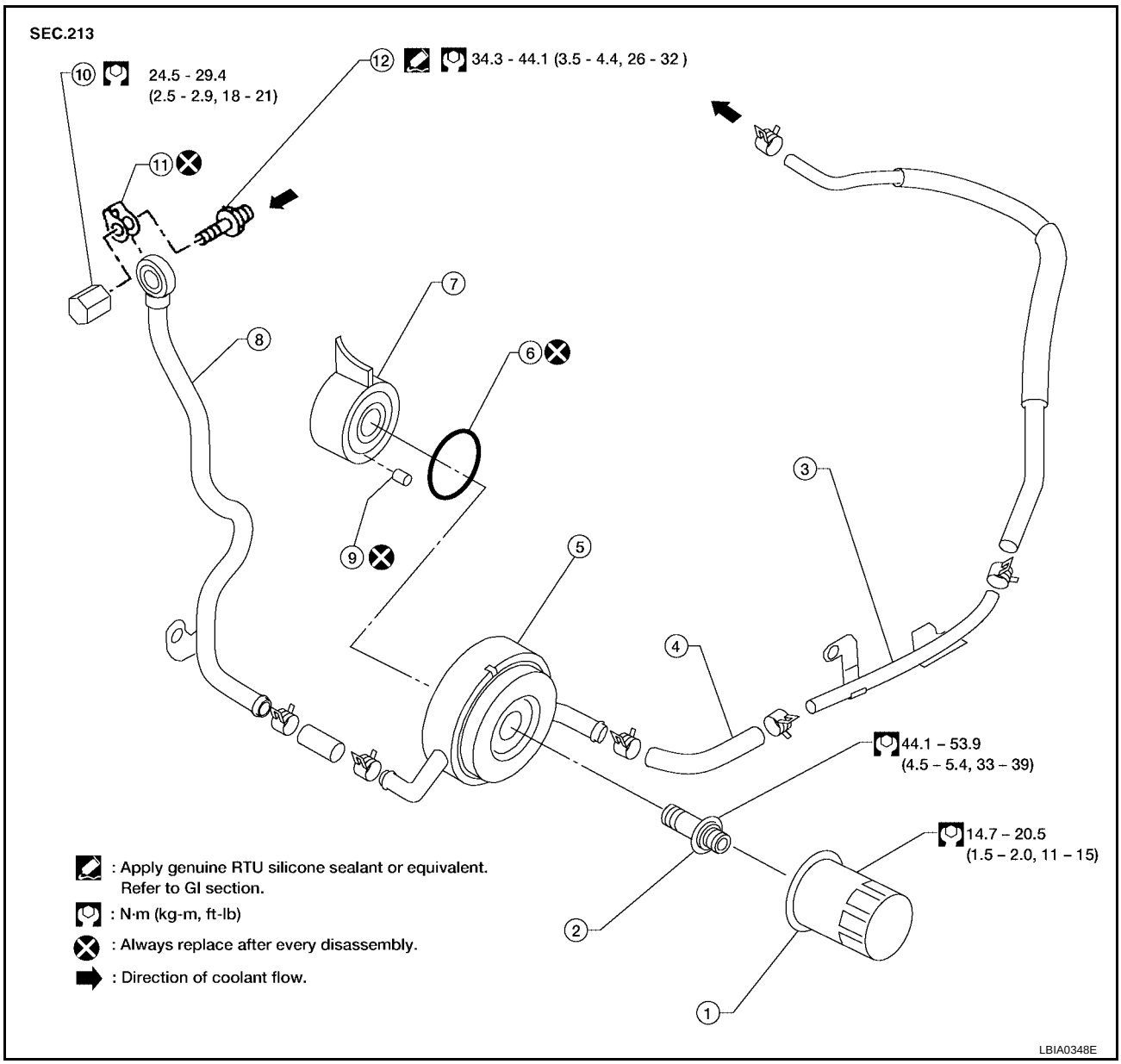


OIL COOLER

PFP:21305

Removal and Installation

EBS00JAA



1. Oil filter	2. Oil cooler bolt	3. Oil inlet pipe
4. Oil inlet hose	5. Oil cooler	6. O-ring
7. Oil pan	8. Oil outlet pipe	9. Relief valve
10. Drain plug	11. Copper gasket	12. Water connector

REMOVAL

1. Drain the engine oil. Refer to MA-26, "Changing Engine Oil" .
2. Drain the engine coolant. Refer to MA-24, "DRAINING ENGINE COOLANT" .
3. Remove the oil filter. Refer to MA-26, "Changing Engine Oil" .
4. Remove the wheel and tire using power tool.
5. Remove the splash shield using power tool.
6. Disconnect the coolant hoses from the oil cooler.

   CAUTION:
   Do not spill coolant on the drive belt.
7. Remove the oil cooler from the upper oil pan.

INSPECTION AFTER REMOVAL

Oil Cooler

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

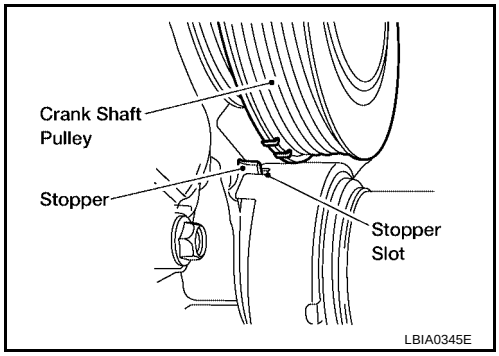
Relief Valve

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

INSTALLATION

Installation is in the reverse order of removal.

- When installing the oil cooler, align the oil cooler stopper slot with the oil cooler stopper on the oil pan.



INSPECTION AFTER INSTALLATION

Start the engine and while it is running check for any oil or coolant leaks.

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00100

Oil Pressure

EBS00DWC

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

Regulator Valve

EBS00DWD

Unit: mm (in)

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

Oil Pump

EBS00DWE

Unit: mm (in)

Body to outer rotor radial clearance	0.114 - 0.200 (0.0045 - 0.0079)
Inner rotor to outer rotor tip clearance	Below 0.18 (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)

Oil Capacity

EBS00EZ2

Unit: ℓ (qt.)

Drain and refill	With oil filter change	Approximately 4.0 (4 1/4)
	Without oil filter change	Approximately 3.7 (3 7/8)
Dry engine (engine overhaul)		Approximately 5.0 (5 1/4)