

ENGINE LUBRICATION SYSTEM

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PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

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The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.

Precaution Necessary for Steering Wheel Rotation After Battery Disconnect

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NOTE:

- This Procedure is applied only to models with Intelligent Key system and NATS (NISSAN ANTI-THEFT SYSTEM).
- Remove and install all control units after disconnecting both battery cables with the ignition knob in the "LOCK" position.
- Always use CONSULT-III to perform self-diagnosis as a part of each function inspection after finishing work. If DTC is detected, perform trouble diagnosis according to self-diagnostic results.

For models equipped with the Intelligent Key system and NATS, an electrically controlled steering lock mechanism is adopted on the key cylinder.

For this reason, if the battery is disconnected or if the battery is discharged, the steering wheel will lock and steering wheel rotation will become impossible.

If steering wheel rotation is required when battery power is interrupted, follow the procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.

NOTE:

Supply power using jumper cables if battery is discharged.

2. Use the Intelligent Key or mechanical key to turn the ignition switch to the "ACC" position. At this time, the steering lock will be released.
3. Disconnect both battery cables. The steering lock will remain released and the steering wheel can be rotated.
4. Perform the necessary repair operation.

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PRECAUTIONS

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< PRECAUTION >

- When the repair work is completed, return the ignition switch to the "LOCK" position before connecting the battery cables. (At this time, the steering lock mechanism will engage.)
- Perform a self-diagnosis check of all control units using CONSULT-III.

Precaution for Liquid Gasket

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REMOVAL OF LIQUID GASKET SEALING

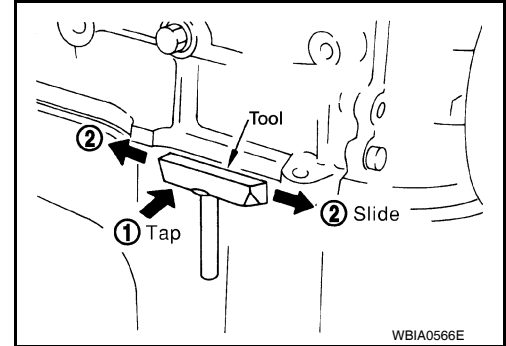
- After removing the bolts and nuts, separate the mating surface and remove the old liquid gasket sealing using Tool.

Tool number : KV10111100 (J-37228)

CAUTION:

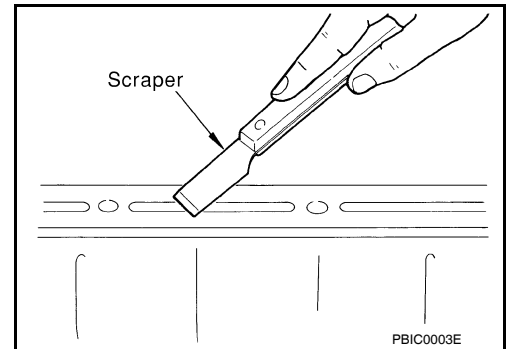
Do not damage the mating surfaces.

- Tap (1) the Tool to insert it.
- In areas where the Tool is difficult to use, lightly tap to slide (2) it.



LIQUID GASKET APPLICATION PROCEDURE

- Remove the old liquid gasket adhering to the gasket application surface and the mating surface using suitable tool.
 - Remove the liquid gasket completely from the groove of the liquid gasket application surface, bolts, and bolt holes.
- Thoroughly clean the mating surfaces and remove adhering moisture, grease and foreign material.

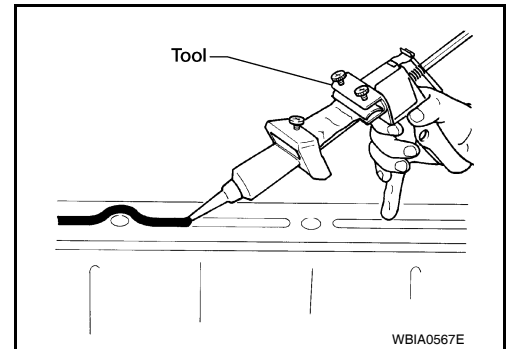


- Attach the liquid gasket tube to the Tool.

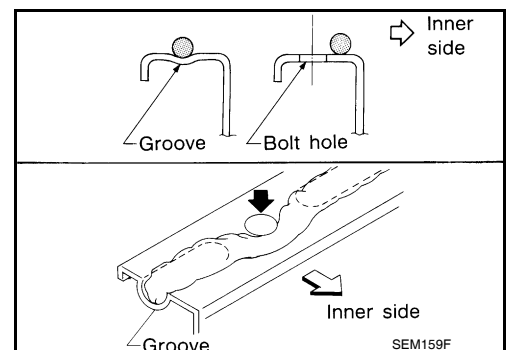
Tool number : WS39930000 (—)

Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-14, "Recommended Chemical Products and Sealants".

- Apply the liquid gasket without breaks to the specified location with the specified dimensions.



- If there is a groove for the liquid gasket application, apply the liquid gasket to the groove.
- As for the bolt holes, normally apply the liquid gasket inside the holes. If specified in the procedure, it should also be applied outside the holes.
- Within five minutes of liquid gasket application, install the mating component.
- If the liquid gasket protrudes, wipe it off immediately.
- Do not retighten after the installation.
- Wait 30 minutes or more after installation before refilling the engine with engine oil and engine coolant.



CAUTION:

If there are specific instructions in this manual, observe them.

PREPARATION

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PREPARATION

PREPARATION

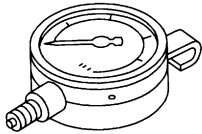
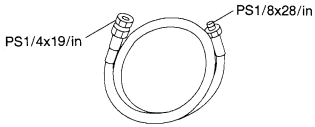
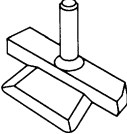
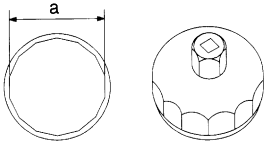
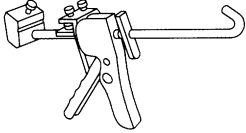
Special Service Tool

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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  S-NT050	Measuring oil pressure Maximum measuring range: 2,452 kPa (25 kg/cm², 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)
WS39930000 (—) Tube presser  S-NT052	Pressing the tube of liquid gasket

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Commercial Service Tool

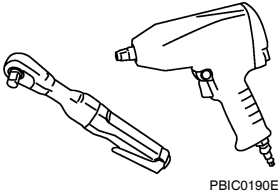
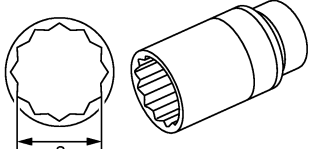
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PREPARATION

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

LUBRICATION SYSTEM

< FUNCTION DIAGNOSIS >

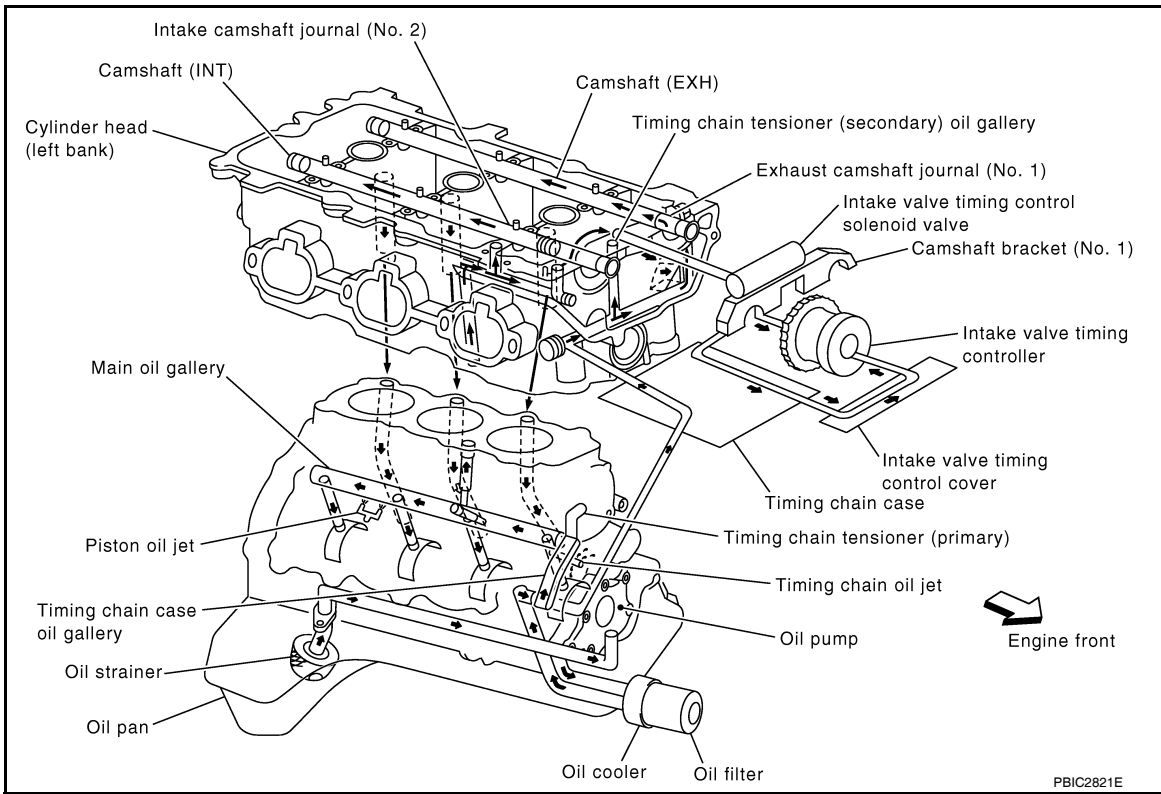
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FUNCTION DIAGNOSIS

LUBRICATION SYSTEM

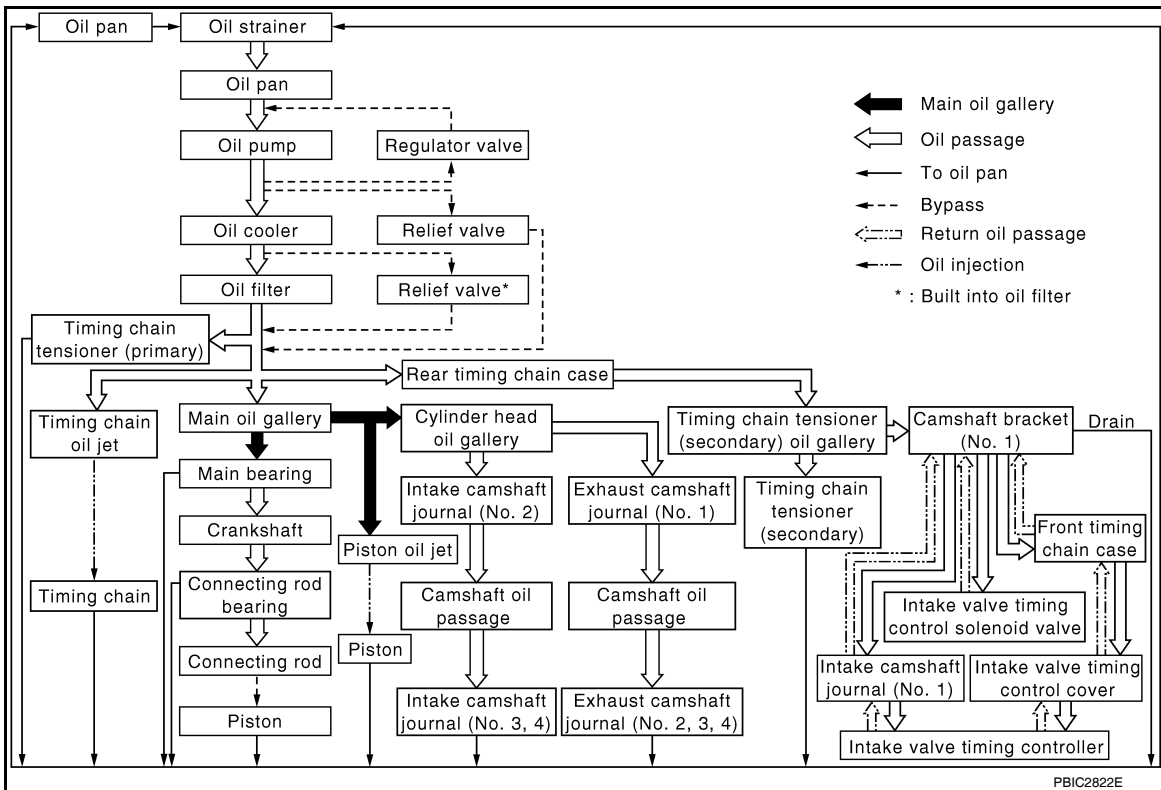
Lubrication Circuit

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System Chart

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ON-VEHICLE MAINTENANCE

ENGINE OIL

Inspection

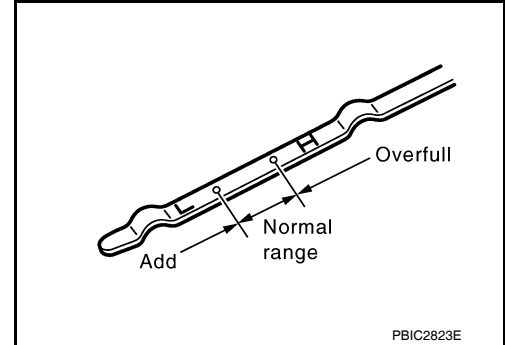
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OIL LEVEL

- Before starting the engine make sure the vehicle is parked on a flat and level surface, then check the oil level. If the engine is already running, turn it off and allow 10 minutes before checking.
- Pull out oil level gauge and wipe clean.
- Insert oil level gauge.
- Check that the oil level is within the low (L) and high (H) range as indicated on the dipstick.
- If the engine oil level is out of range, add oil as necessary. Refer to [MA-16, "For North America"](#).

CAUTION:

Do not overfill the engine with oil.



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 pans (lower and upper)
- 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 lower cylinder block and cylinder block
- 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 lower cylinder block
- Mating surface between rear timing chain case and oil pan (upper)
- Crankshaft oil seals (front and rear)
- Oil level gauge guide
- Camshaft position sensor (PHASE)

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 engine oil level. Refer to [LU-8, "Inspection"](#).
 2. Remove engine undercover using power tool.

ENGINE OIL

< ON-VEHICLE MAINTENANCE >

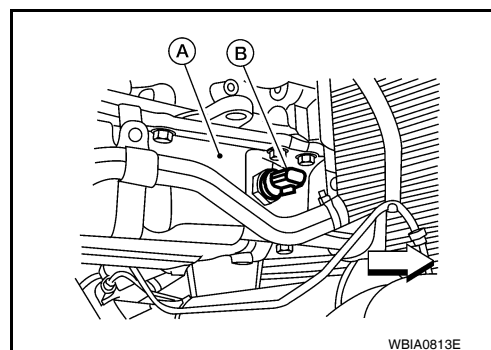
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3. Disconnect the oil pressure switch (B) harness connector.
 - A: Oil pan (upper)
 - ←→: Front

4. Remove the oil pressure switch (B).

CAUTION:

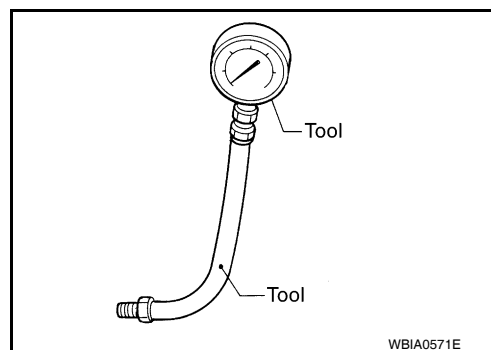
Do not drop or shock oil pressure switch.



5. Install Tools.

Tool numbers : ST25051001 (J-25695-1)

: ST25052000 (J-25695-2)



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, "Standard and Limit"](#).

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-14, "Recommended Chemical Products and Sealants"](#).

Oil pressure switch torque : 14.7 N·m (1.5 kg-m, 11 ft-lb)

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

Changing Engine Oil

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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 the oil drain plug and oil filler cap to drain the old oil.
4. Install a new washer on the oil drain plug, then install the oil drain plug in the oil pan.

Oil drain plug : Refer to [EM-36, "Removal and Installation"](#).

CAUTION:

Clean the drain plug and install with a new washer.

5. Refill the engine with new specified engine oil.

Oil grade and viscosity : Refer to [MA-16, "For North America"](#).

Oil capacity : Refer to [MA-16, "For North America"](#).

ENGINE OIL

< ON-VEHICLE MAINTENANCE >

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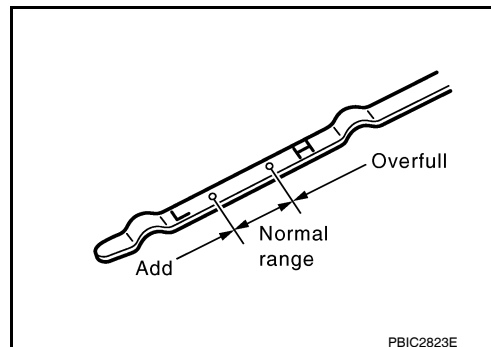
CAUTION:

The refill capacity depends on the oil temperature and drain time. Use the "Refill oil capacity" values as a reference and check the oil level using the dipstick when filling the engine with oil.

6. Warm up the engine and check the area around the drain plug and oil filter for any oil leaks.
7. Stop the engine and wait for more than 10 minutes.
8. Check the oil level using the dipstick as shown. Add oil as necessary and install the oil filler cap. Refer to [LU-8. "Inspection"](#).

CAUTION:

Do not overfill the engine with oil.



OIL FILTER

< ON-VEHICLE MAINTENANCE >

[VQ40DE]

OIL FILTER

Removal and Installation

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REMOVAL

1. Remove the engine front undercover using power tool.
2. Drain engine oil. Refer to [LU-9, "Changing Engine Oil"](#).
3. Remove the oil filter using Tool as shown.

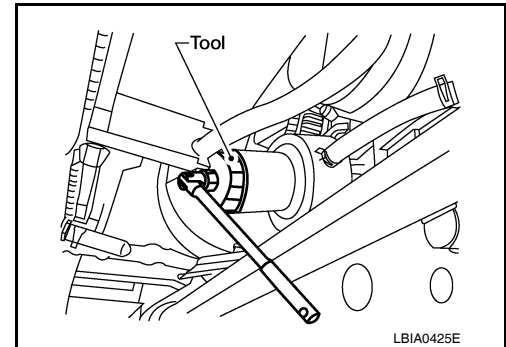
Tool number : KV10115801 (J-38956)

WARNING:

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

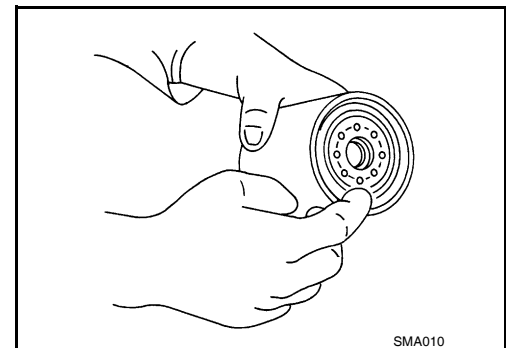
CAUTION:

- 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 drive belts.
- Completely wipe off any engine oil that adheres to the engine and the vehicle.



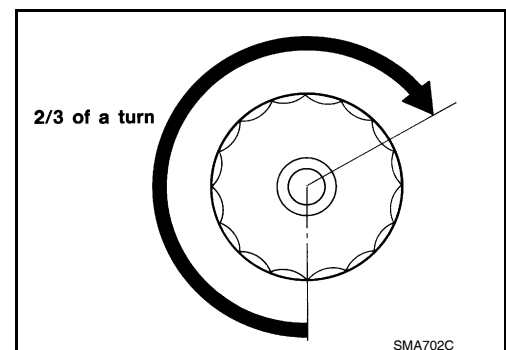
INSTALLATION

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-9, "Changing Engine Oil"](#).
5. Inspect the engine for oil leaks. Refer to [LU-8, "Inspection"](#).
6. Install the engine front undercover using power tool.

INSPECTION AFTER INSTALLATION

1. Check the engine oil level. Refer to [LU-8, "Inspection"](#).
2. Start the engine and check for engine oil leaks.
3. Stop the engine and wait for 10 minutes.
4. Check the engine oil level and add engine oil as required.

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OIL COOLER

< ON-VEHICLE REPAIR >

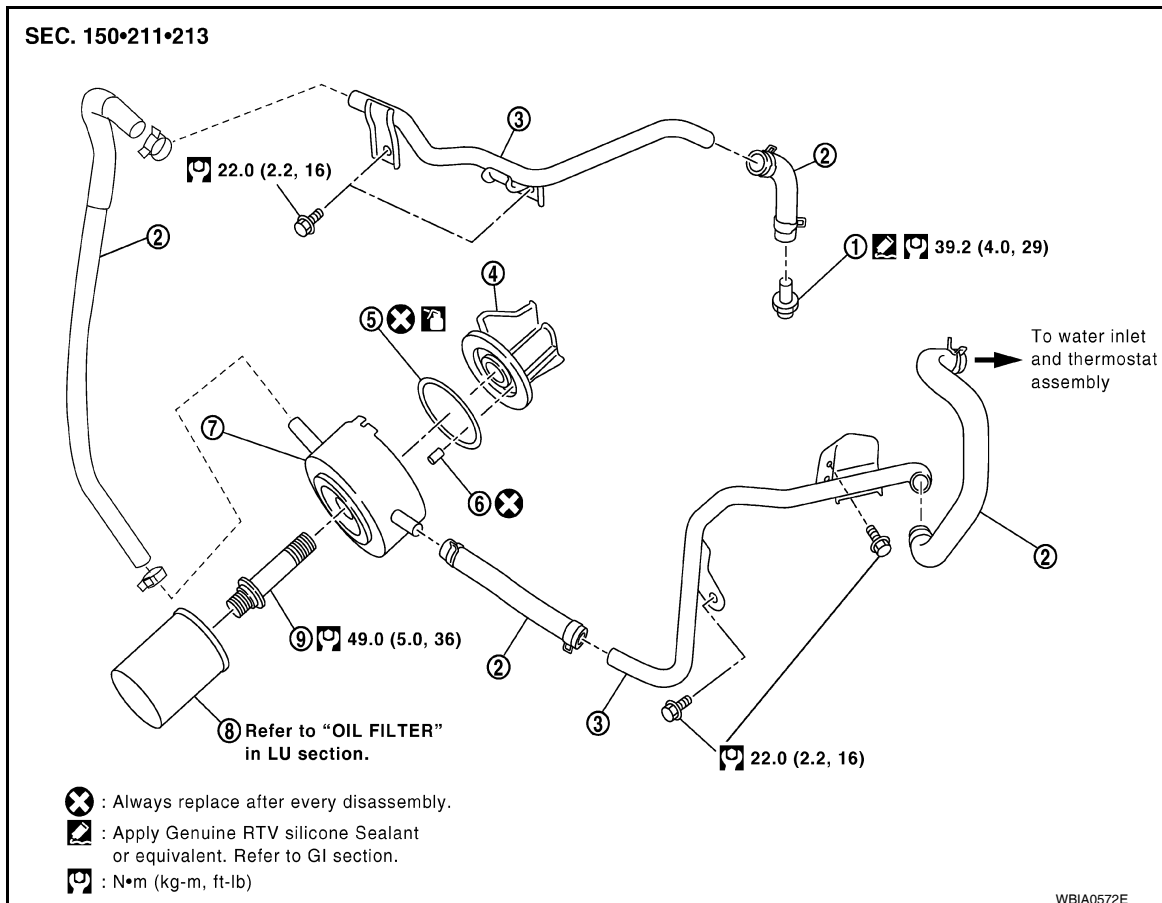
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ON-VEHICLE REPAIR

OIL COOLER

Exploded View

INFOID:000000005260602



- | | | |
|-------------------------------|---------------|-------------------|
| 1. Water connector | 2. Water hose | 3. Water pipe |
| 4. Oil pan (upper) front side | 5. O-ring | 6. Relief valve |
| 7. Oil cooler | 8. Oil filter | 9. Connector bolt |

Removal and Installation

INFOID:000000005260603

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-12. "Changing Engine Coolant"](#) and [EM-102. "Disassembly and Assembly"](#).

NOTE:

Perform this step only when removing water pipes and hoses.

2. Remove engine front undercover using power tool.
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-11, "Removal and Installation"](#).
5. Remove connector bolt, and remove oil cooler.

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.

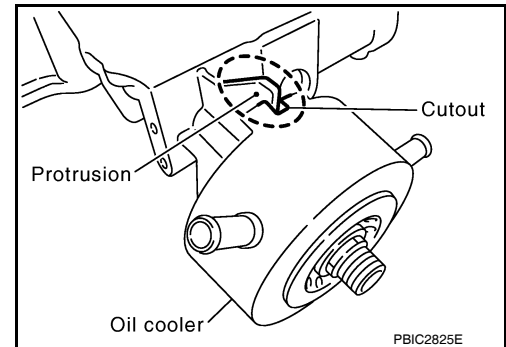
Relief Valve

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

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 (upper).
- Tighten connector bolt after aligning cutout on oil cooler with protrusion on oil pan (upper) side.



INSPECTION AFTER INSTALLATION

1. Check engine oil and engine coolant levels and add engine oil and engine coolant. Refer to [LU-8, "Inspection"](#) and [CO-11, "System Inspection"](#).
2. Start the engine, and check for 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-8, "Inspection"](#) and [CO-11, "System Inspection"](#).

OIL PUMP

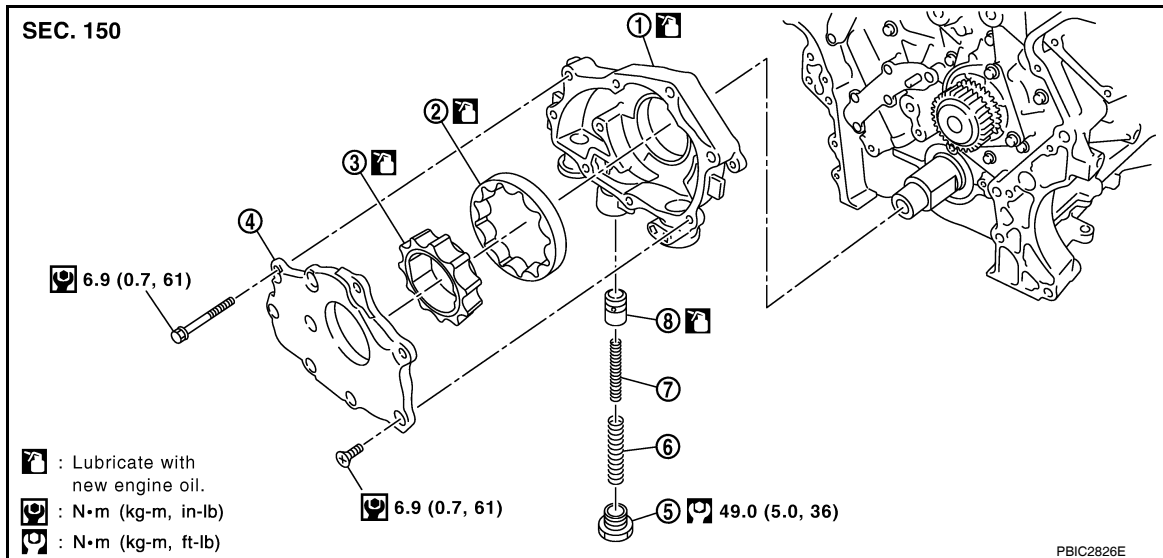
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[VQ40DE]

OIL PUMP

Exploded View

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|---------------------------|-------------------------|---------------------------|
| 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 spring | 8. Regulator valve | |

Removal and Installation

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REMOVAL

1. Disconnect the battery negative terminal. Refer to [PG-78, "Removal and Installation"](#).
2. Remove the RH and LH wheels and tires. Refer to [WT-49, "Rotation"](#).
3. Remove the RH and LH front fender protectors. Refer to [EXT-23, "Removal and Installation of Front Fender Protector"](#).
4. Remove the air duct and resonator assembly and the air cleaner case (upper). Refer to [EM-26, "Exploded View"](#).
5. Remove timing chain (primary) only. Refer to [EM-60, "Removal and Installation"](#).
6. Remove the oil pump assembly.

INSTALLATION

Installation is 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. Check the engine oil level. Refer to [LU-8, "Inspection"](#).
2. Start the engine and check for engine oil leaks.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level and adjust engine oil level as required. Refer to [LU-8, "Inspection"](#).

DISASSEMBLY AND ASSEMBLY**OIL PUMP****Disassembly and Assembly**

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DISASSEMBLY

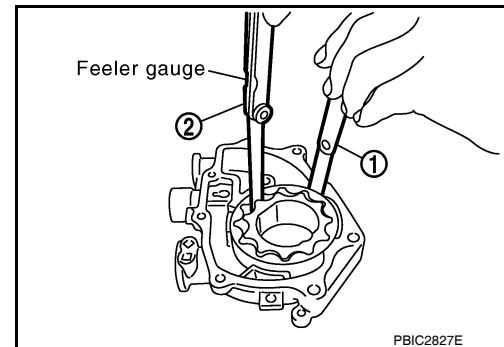
1. Remove oil pump cover.
2. Remove inner rotor and outer rotor from oil pump body.
3. Remove the regulator valve plug, regulator valve spring and regulator valve.

INSPECTION AFTER DISASSEMBLY**Clearance of Oil Pump Parts**

- Measure radial clearance using a suitable tool.

Body to outer rotor (position 1)
: 0.120 - 0.195 mm (0.0047 - 0.0077 in)

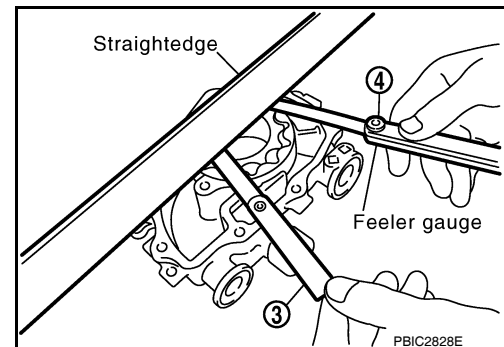
Inner rotor to outer rotor tip (position 2)
: 0.060 - 0.160 mm (0.0024 - 0.0063 in)



- Measure side clearance using suitable tools.

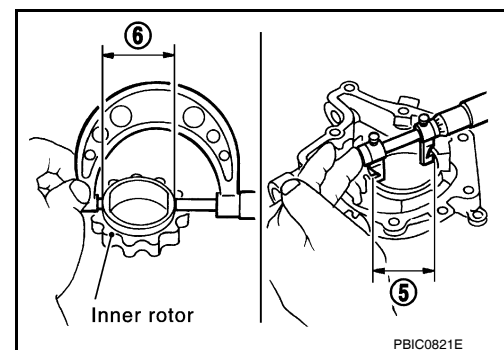
Body to inner rotor (position 3)
: 0.030 - 0.070 mm (0.0012 - 0.0028 in)

Body to outer rotor (position 4)
: 0.050 - 0.090 mm (0.0020 - 0.0035 in)



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

1. Measure the inner diameter of oil pump body to brazed portion (position 5) using suitable tool.
2. Measure the outer diameter of protruded portion of inner rotor (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
: 0.045 - 0.091 mm (0.0018 - 0.0036 in)

Regulator Valve Clearance

OIL PUMP

[VQ40DE]

< DISASSEMBLY AND ASSEMBLY >

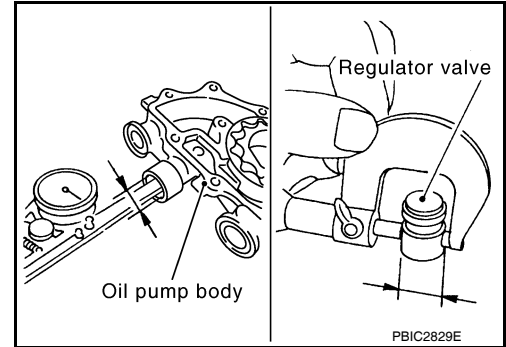
Check regulator valve to oil pump cover clearance using the following formula.

- (Clearance) = D1 (Valve hole diameter) - D2 (Outer Diameter of valve)

Regulator valve to oil pump cover
: 0.025 - 0.070 mm (0.0010 - 0.0028 in)

CAUTION:

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

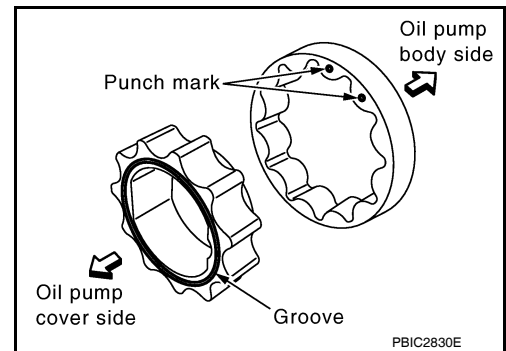


ASSEMBLY

Installation is in the reverse order of removal.

NOTE:

Install oil pump inner rotor with the grooved face and oil pump outer rotor with the punch mark to oil pump cover side.



SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ40DE]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Standard and Limit

INFOID:000000005260607

A

LU

OIL PRESSURE

Unit: kPa (kg/cm², psi)

Engine speed	Approximate discharge oil 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

Unit: mm (in)

Body to outer rotor	0.120 - 0.195 (0.0047 - 0.0077)
Inner rotor to outer rotor tip	0.060 - 0.160 (0.0024 - 0.0063)
Body to inner rotor	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor	0.050 - 0.090 (0.0020 - 0.0035)
Inner rotor to brazed portion of housing	0.045 - 0.091 (0.0018 - 0.0036)

REGULATOR VALVE

Unit: mm (in)

Regulator valve to oil pump cover	0.025 - 0.070 (0.0010 - 0.0028)
-----------------------------------	---------------------------------

ENGINE OIL CAPACITY (APPROXIMATE)

Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	5.1 (5-3/8, 4-1/2)
	Without oil filter change	4.8 (5-1/8, 4-1/4)
Dry engine (Overhaul)		6.3 (6-5/8, 5-1/2)

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< PRECAUTION >

PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000005531977

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.

Precaution Necessary for Steering Wheel Rotation After Battery Disconnect

INFOID:000000005260609

NOTE:

- This Procedure is applied only to models with Intelligent Key system and NATS (NISSAN ANTI-THEFT SYSTEM).
- Remove and install all control units after disconnecting both battery cables with the ignition knob in the "LOCK" position.
- Always use CONSULT-III to perform self-diagnosis as a part of each function inspection after finishing work. If DTC is detected, perform trouble diagnosis according to self-diagnostic results.

For models equipped with the Intelligent Key system and NATS, an electrically controlled steering lock mechanism is adopted on the key cylinder.

For this reason, if the battery is disconnected or if the battery is discharged, the steering wheel will lock and steering wheel rotation will become impossible.

If steering wheel rotation is required when battery power is interrupted, follow the procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.

NOTE:

Supply power using jumper cables if battery is discharged.

2. Use the Intelligent Key or mechanical key to turn the ignition switch to the "ACC" position. At this time, the steering lock will be released.
3. Disconnect both battery cables. The steering lock will remain released and the steering wheel can be rotated.
4. Perform the necessary repair operation.

PRECAUTIONS

[VK56DE]

< PRECAUTION >

- When the repair work is completed, return the ignition switch to the "LOCK" position before connecting the battery cables. (At this time, the steering lock mechanism will engage.)
- Perform a self-diagnosis check of all control units using CONSULT-III.

Precaution for Liquid Gasket

INFOID:000000005260610

LU

REMOVAL OF LIQUID GASKET SEALING

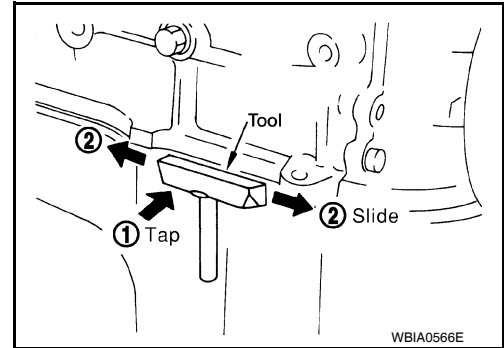
- After removing the bolts and nuts, separate the mating surface and remove the old liquid gasket sealing using Tool.

Tool number : KV10111100 (J-37228)

CAUTION:

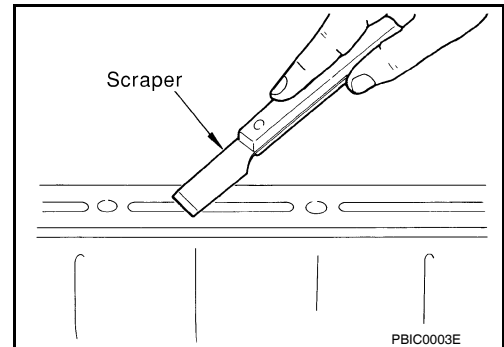
Do not damage the mating surfaces.

- Tap (1) the Tool to insert it.
- In areas where the Tool is difficult to use, lightly tap to slide (2) it.



LIQUID GASKET APPLICATION PROCEDURE

- Remove the old liquid gasket adhering to the gasket application surface and the mating surface using suitable tool.
 - Remove the liquid gasket completely from the groove of the liquid gasket application surface, bolts, and bolt holes.
- Thoroughly clean the mating surfaces and remove adhering moisture, grease and foreign material.

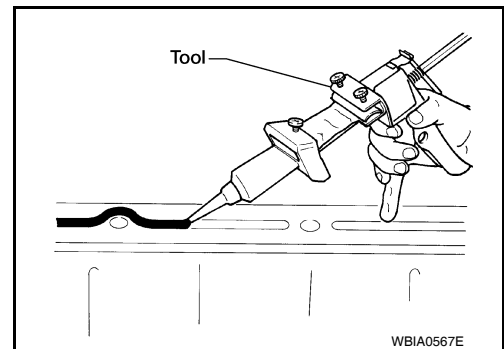


- Attach the liquid gasket tube to the Tool.

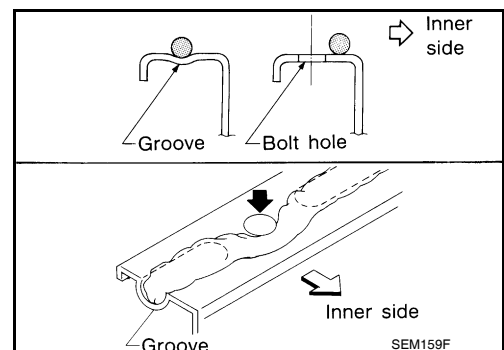
Tool number : WS39930000 (—)

Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-14, "Recommended Chemical Products and Sealants"](#).

- Apply the liquid gasket without breaks to the specified location with the specified dimensions.



- If there is a groove for the liquid gasket application, apply the liquid gasket to the groove.
- As for the bolt holes, normally apply the liquid gasket inside the holes. If specified in the procedure, it should also be applied outside the holes.
- Within five minutes of liquid gasket application, install the mating component.
- If the liquid gasket protrudes, wipe it off immediately.
- Do not retighten after the installation.
- Wait 30 minutes or more after installation before refilling the engine with engine oil and engine coolant.



CAUTION:

If there are specific instructions in this manual, observe them.

PREPARATION

< PREPARATION >

[VK56DE]

PREPARATION

PREPARATION

Special Service Tool

INFOID:000000005260611

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	Measuring oil pressure Maximum measuring range: 2,452 kPa (25 kg/cm², 356 psi)
ST25052000 (J-25695-2) Hose	Adapting oil pressure gauge to cylinder block
KV10111100 (J-37228) Seal cutter	Removing steel oil pan and rear timing chain case
KV10115801 (J-38956) Oil filter wrench	Removing and installing oil filter a: 64.3 mm (2.531 in)
WS39930000 (—) Tube presser	Pressing the tube of liquid gasket

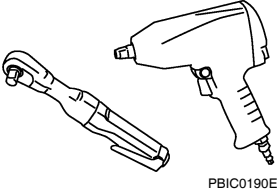
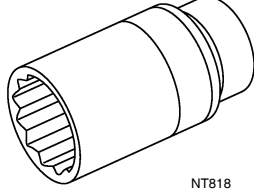
Commercial Service Tool

INFOID:000000005260612

PREPARATION

< PREPARATION >

[VK56DE]

Tool name	Description
<p>Power tool</p> <div style="text-align: center;">  <p>PBIC0190E</p> </div>	<p>Loosening bolts and nuts</p>
<p>Deep socket</p> <div style="text-align: center;">  <p>NT818</p> </div>	<p>Removing and installing oil pressure switch Deep socket 26 mm</p>

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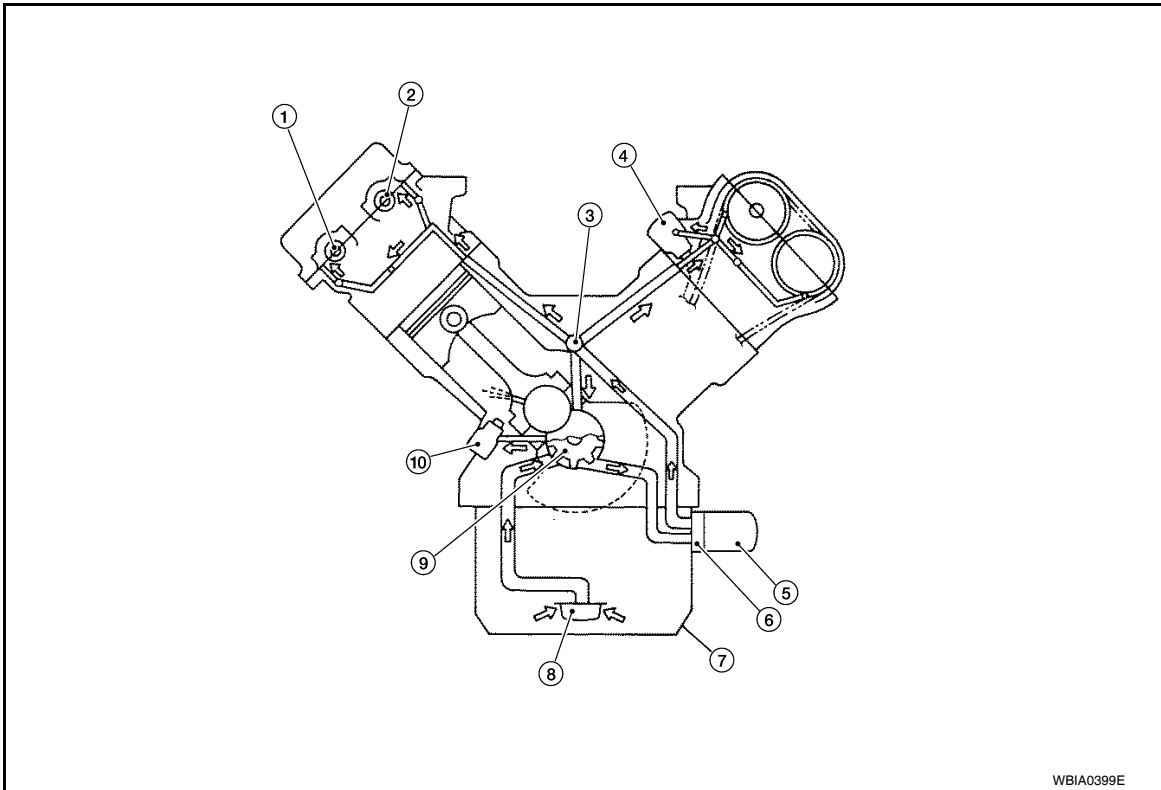
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FUNCTION DIAGNOSIS

LUBRICATION SYSTEM

Lubrication Circuit

INFOID:000000005260613



WBIA0399E

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|----------------------------------|--------------------|--------------------|
| 1. Exhaust camshaft | 2. Intake camshaft | 3. Main oil galley |
| 4. Chain tensioner (Left bank) | 5. Oil filter | 6. Oil cooler |
| 7. Oil pan | 8. Oil strainer | 9. Oil pump |
| 10. Chain tensioner (Right bank) | | |

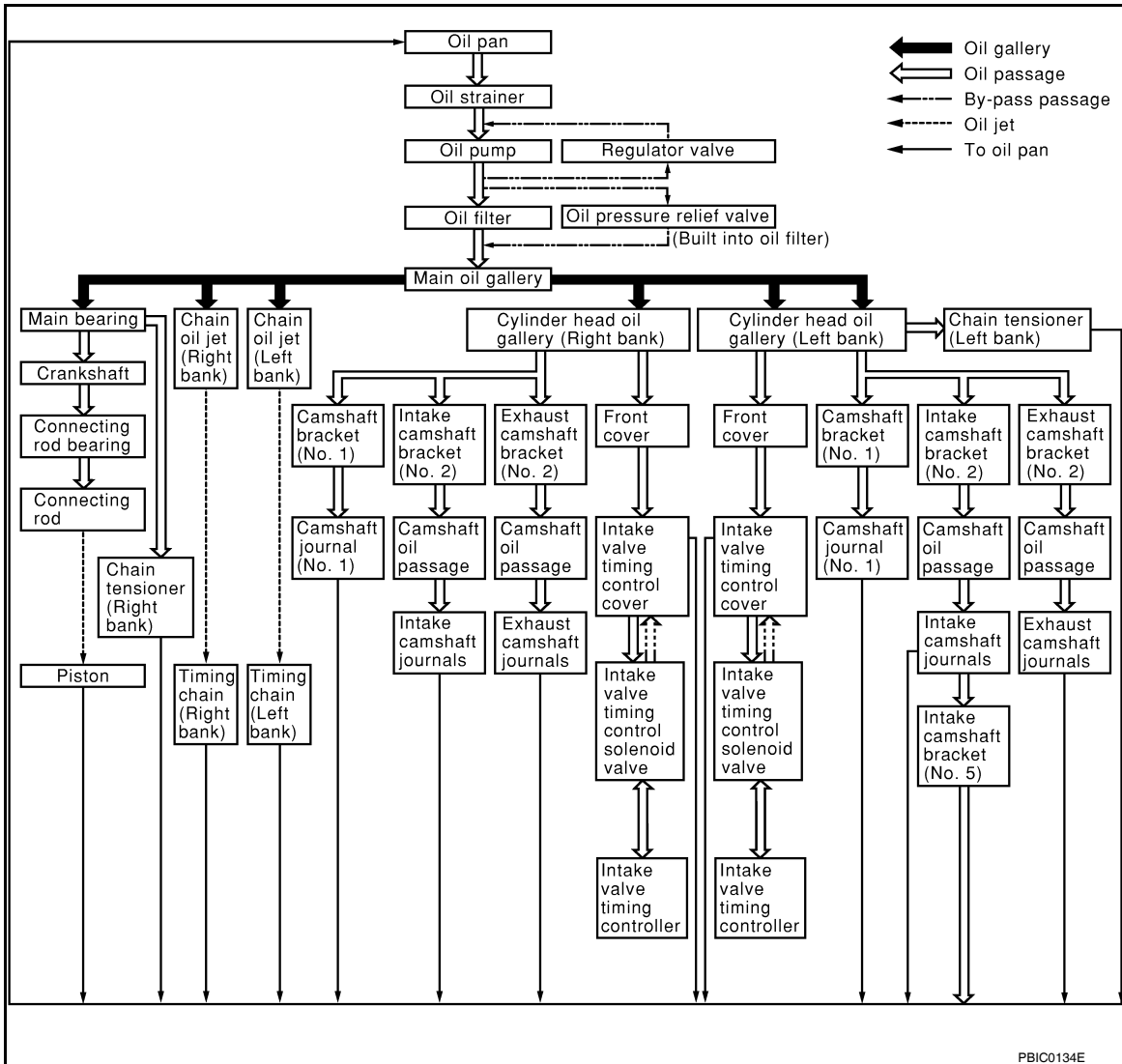
LUBRICATION SYSTEM

< FUNCTION DIAGNOSIS >

[VK56DE]

System Chart

INFOID:000000005260614



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ON-VEHICLE MAINTENANCE

ENGINE OIL

Inspection

INFOID:000000005260615

OIL LEVEL

- Before starting the engine make sure the vehicle is parked on a flat and level surface, then check the oil level. If the engine is already running, turn it off and allow 10 minutes before checking.
- Pull out oil level gauge and wipe clean.
- Insert oil level gauge.
- Check that the oil level is within the low (L) and high (H) range as indicated on the dipstick.
- If the engine oil level is out of range, add oil as necessary. Refer to [MA-16, "For North America"](#).

CAUTION:

Do not overfill the engine with oil.



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

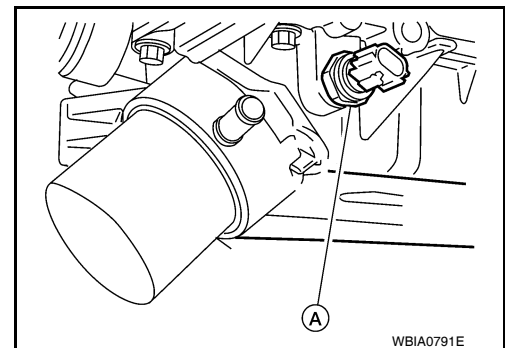
WARNING:

- **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. Refer to [LU-24, "Inspection"](#).
2. Remove engine front undercover using power tool.
3. Disconnect the oil pressure switch (A) harness connector.
4. Remove the oil pressure switch (A).

CAUTION:

Do not drop or shock oil pressure switch.



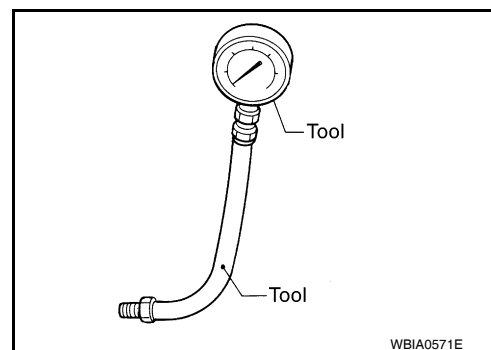
ENGINE OIL

< ON-VEHICLE MAINTENANCE >

[VK56DE]

5. Install Tools.

Tool number : ST25051001 (J-25695-1)
: ST25052000 (J-25695-2)



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-36, "Standard and Limit"](#).
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-14, "Recommended Chemical Products and Sealants"](#).

Oil pressure switch torque : 14.7 N·m (1.5 kg-m, 11 ft-lb)

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

Changing Engine Oil

INFOID:000000005260616

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 the oil drain plug and oil filler cap to drain the old oil.
 4. Install a new washer on the oil drain plug, then install the oil drain plug in the oil pan.

Oil drain plug : Refer to [EM-169, "Removal and Installation"](#).

CAUTION:

Clean the drain plug and install with a new washer.

5. Refill the engine with new specified engine oil.

Oil grade and viscosity : Refer to [MA-16, "For North America"](#).

Oil capacity : Refer to [MA-16, "For North America"](#).

CAUTION:

The refill capacity depends on the oil temperature and drain time. Use the "Refill oil capacity" values as a reference and check the oil level using the dipstick when filling the engine with oil.

6. Warm up the engine and check the area around the drain plug and oil filter for any oil leaks.
7. Stop the engine and wait for more than 10 minutes.

ENGINE OIL

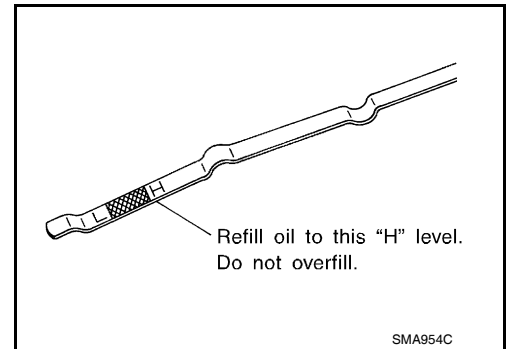
[VK56DE]

< ON-VEHICLE MAINTENANCE >

8. Check the oil level using the dipstick as shown. Add oil as necessary and install the oil filler cap. Refer to [LU-24, "Inspection"](#).

CAUTION:

Do not overfill the engine with oil.



OIL FILTER

Removal and Installation

INFOID:000000005260617

REMOVAL

1. Remove the engine front undercover access plate using power tool.
2. Drain engine oil. Refer to [LU-25, "Changing Engine Oil"](#).
3. Remove the oil filter using Tool as shown.

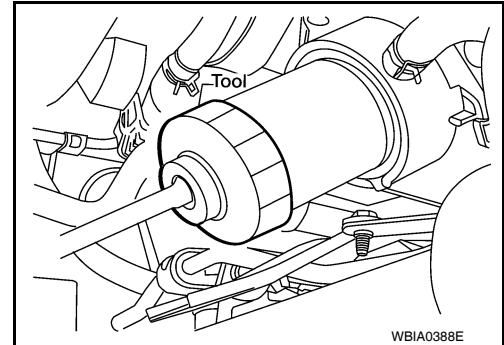
Tool number : KV10115801 (J-38956)

WARNING:

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

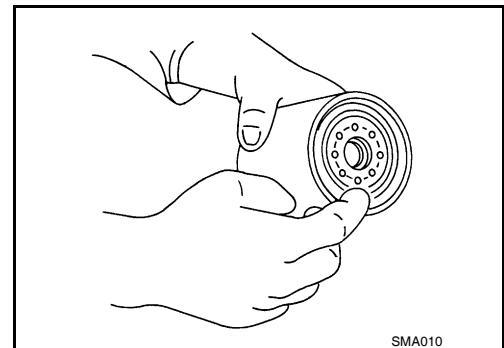
CAUTION:

- 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.



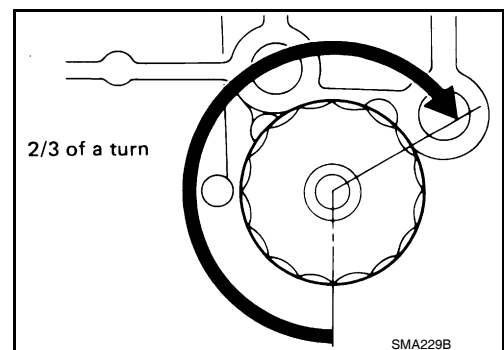
INSTALLATION

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-25, "Changing Engine Oil"](#).
5. Inspect the engine for oil leaks. Refer to [LU-24, "Inspection"](#).
6. Install the engine front undercover access plate using power tool.

INSPECTION AFTER INSTALLATION

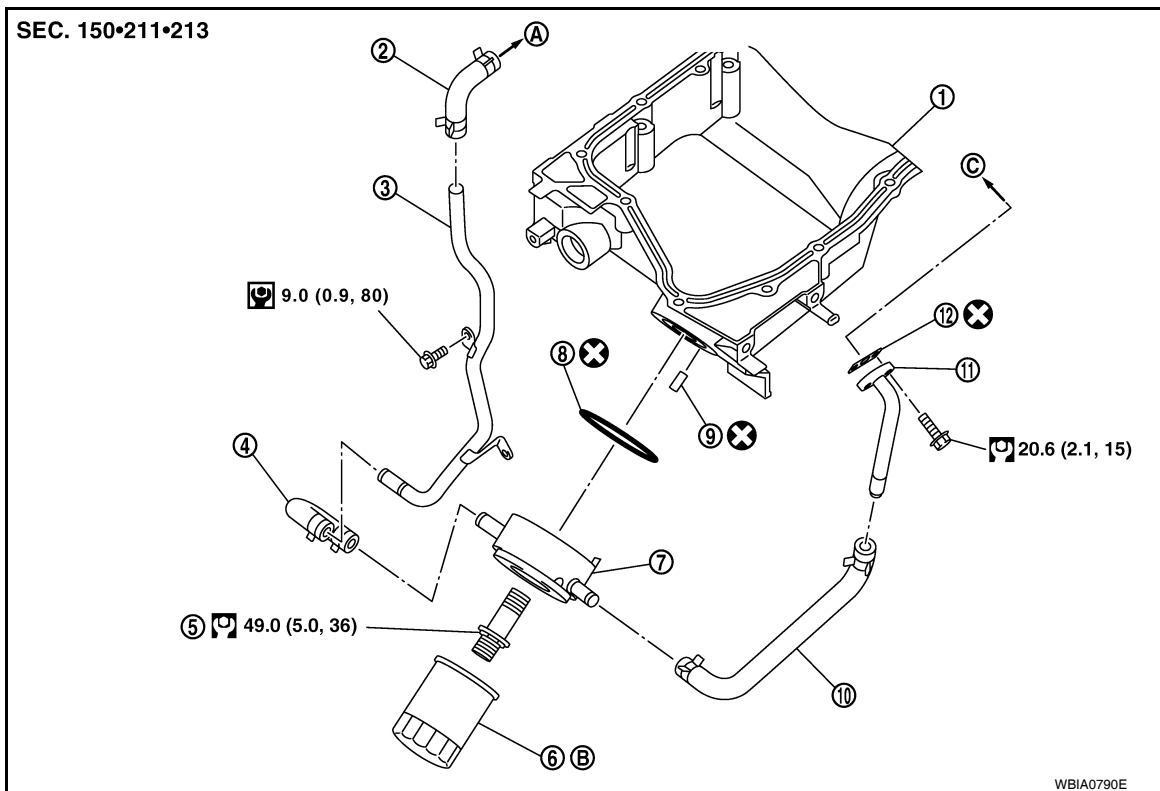
1. Check the engine oil level. Refer to [LU-24, "Inspection"](#).
2. Start the engine and check for engine oil leaks.
3. Stop the engine and wait for 10 minutes.
4. Check the engine oil level and add engine oil as required.

ON-VEHICLE REPAIR

OIL COOLER

Exploded View

INFOID:000000005260618



- | | | |
|--------------------------|-----------------------------------|----------------------|
| 1. Oil pan | 2. Water hose | 3. Water pipe |
| 4. Water hose | 5. Connector bolt | 6. Oil filter |
| 7. Oil cooler | 8. O-ring | 9. Relief valve |
| 10. Water hose | 11. Connector pipe | 12. Gasket |
| A. To thermostat housing | B. Refer to LU-27 | C. To cylinder block |

Removal and Installation

INFOID:000000005260619

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-40, "Changing Engine Coolant"](#) and [EM-219, "Disassembly and Assembly"](#).

NOTE:

Perform this step only when removing water pipes and hoses.

2. Remove engine front undercover using power tool.
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-27, "Removal and Installation"](#).

OIL COOLER

[VK56DE]

< ON-VEHICLE REPAIR >

5. Remove connector bolt, and remove oil cooler.

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.

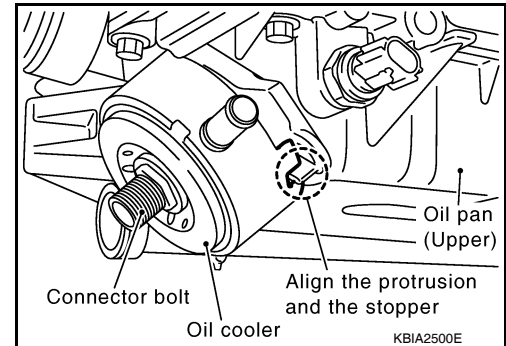
Relief Valve

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.

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.
- Tighten the connecting bolt after aligning the stopper on the oil pan side with protrusion of the oil cooler.



INSPECTION AFTER INSTALLATION

1. Check engine oil and engine coolant levels and add engine oil and engine coolant. Refer to [LU-24. "Inspection"](#) and [CO-39. "System 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-24. "Inspection"](#) and [CO-39. "System Inspection"](#)

OIL PUMP

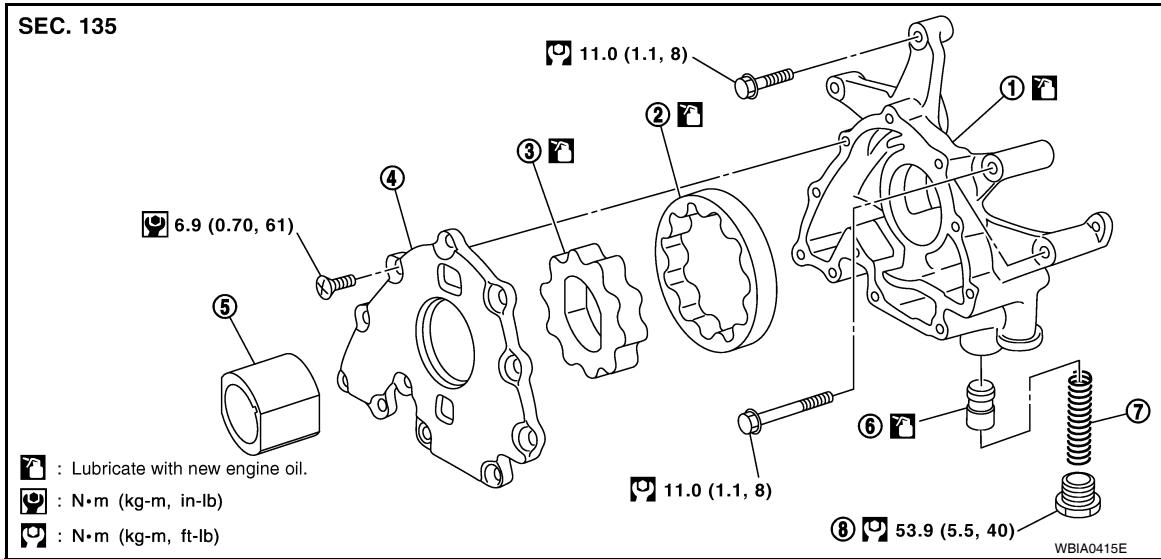
< ON-VEHICLE REPAIR >

[VK56DE]

OIL PUMP

Exploded View

INFOID:000000005260620



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| 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

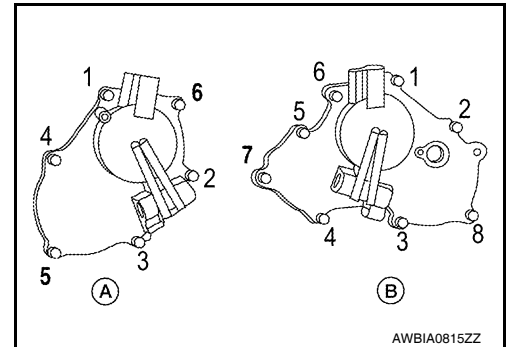
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REMOVAL

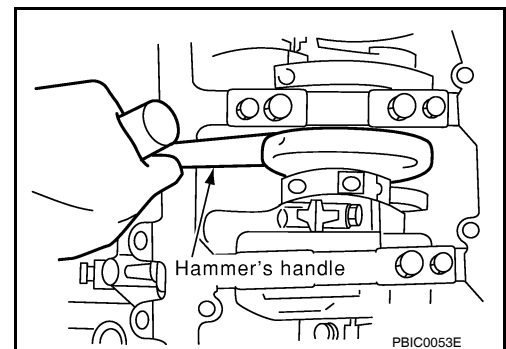
- Remove the engine assembly from the vehicle. Refer to [EM-214, "Removal and Installation"](#).
- Remove the following components and related parts:
 - Drive belt auto tensioner and idler pulley. Refer to [EM-150, "Drive Belt Auto Tensioner and Idler Pulley"](#).
 - Oil pan (lower), (upper) and oil strainer. Refer to [EM-169, "Removal and Installation"](#).
 - Water pump. Refer to [CO-51, "Removal and Installation"](#).
- Remove the Intake valve control solenoid valve cover (RH) (A) and Intake valve control solenoid valve cover (LH) (B) as follows:
 - Loosen and remove the bolts in the reverse order as shown.
 - Cut the liquid gasket and remove the covers using Tool.

Tool number : KV10111100 (J-37228)

CAUTION:
Do not damage mating surfaces.



- Remove the crankshaft pulley.
 - Loosen the crankshaft pulley bolts using a hammer handle to secure the crankshaft.



OIL PUMP

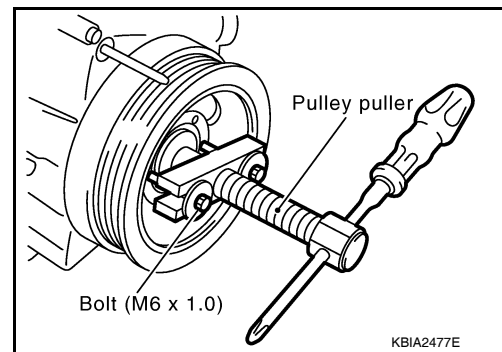
[VK56DE]

< ON-VEHICLE REPAIR >

- b. Remove the crankshaft pulley from the crankshaft using tool.
 - Remove the crankshaft pulley using suitable tool. Set the bolts in the two bolt holes [M6 x 1.0 mm (0.04 in)] on the front surface.

NOTE:

The dimension between the centers of the two bolt holes is 61 mm (2.40 in).



5. Remove the front cover.
 - a. Loosen and remove the bolts in the reverse of order shown.
 - b. Cut the liquid gasket and remove the covers using Tool.

Tool number : KV10111100 (J-37228)

CAUTION:

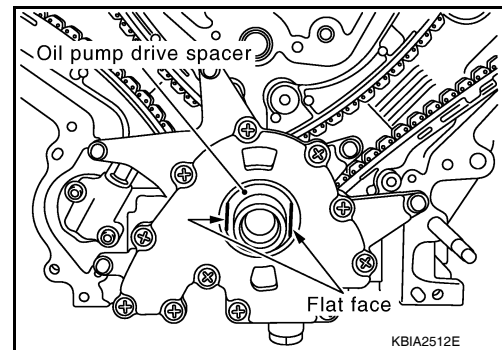
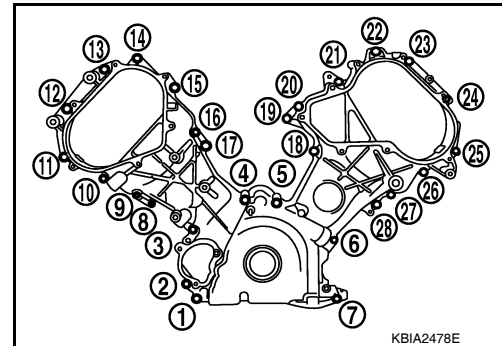
Do not damage mating surfaces.

6. Remove the front oil seal using suitable tool.

CAUTION:

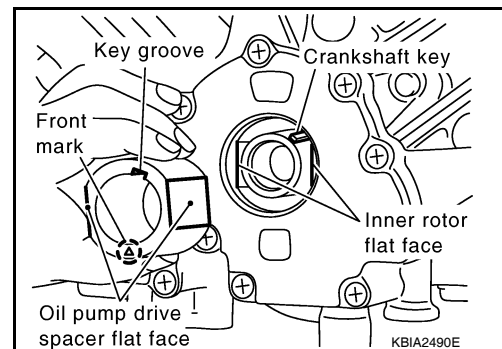
Do not damage front cover.

7. Remove the oil pump drive spacer.
8. Remove the oil pump assembly.



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.



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OIL PUMP

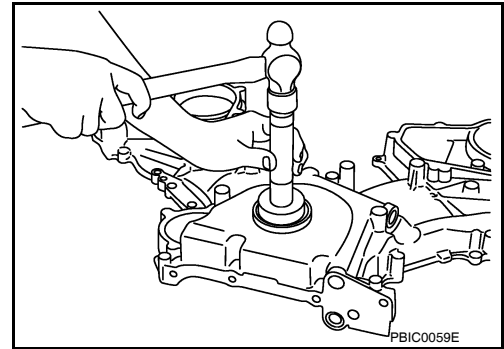
[VK56DE]

< ON-VEHICLE REPAIR >

3. Install the front oil seal using suitable tool.

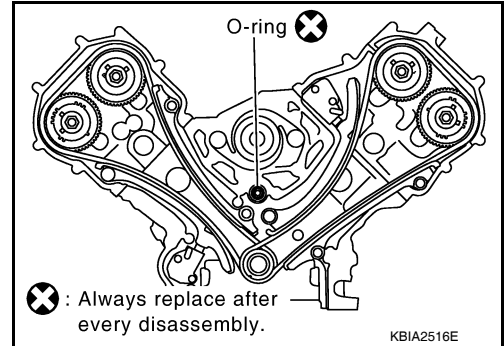
CAUTION:

Do not scratch or make burrs on the circumference of the oil seal.



4. Install the front cover as follows:

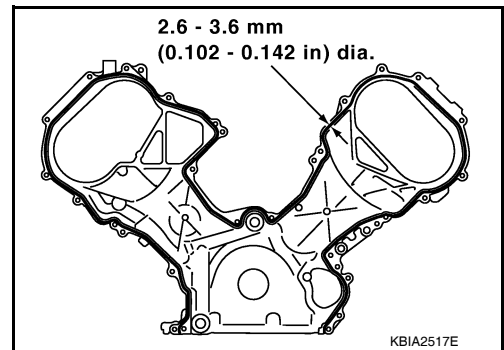
- a. Install a new O-ring on the cylinder block.



- b. Apply liquid gasket as shown.

Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-14, "Recommended Chemical Products and Sealants"](#).

- c. Check again that the timing alignment marks on the timing chain and on each sprocket are aligned. Then install the front cover.



- d. Install the bolts in the numerical order shown.

M6 × 50 mm (1.97 in) : No. 1, 20, 25, 26, 27

M6 × 80 mm (3.15 in) : No. 4, 5, 7

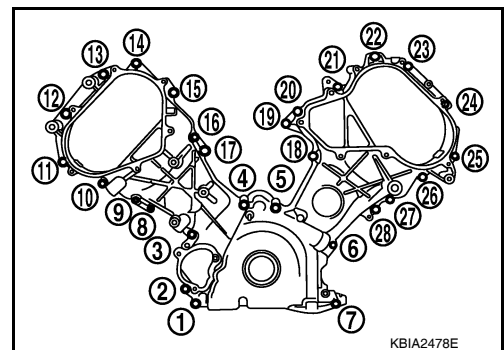
M6 × 20 mm (0.79 in) : Except the above

Front cover bolts : 11.0 N·m (1.1 kg-m, 8 ft-lb)

- e. After tightening, re-tighten to the specified torque.

CAUTION:

Be sure to wipe off any excessive liquid gasket leaking onto surface mating with oil pan.



OIL PUMP

[VK56DE]

< ON-VEHICLE REPAIR >

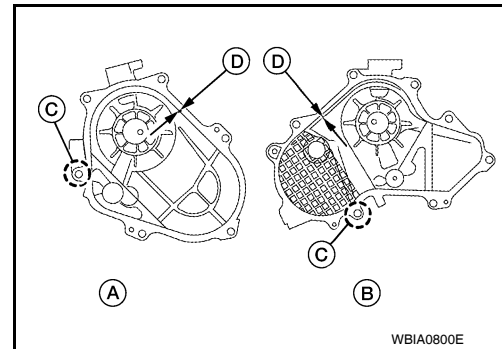
5. Install the Intake valve control solenoid valve cover (RH) (A) and Intake valve control solenoid valve cover (LH) (B) as follows:
 - a. Apply liquid gasket (D) as shown.

Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-14, "Recommended Chemical Products and Sealants"](#).

CAUTION:

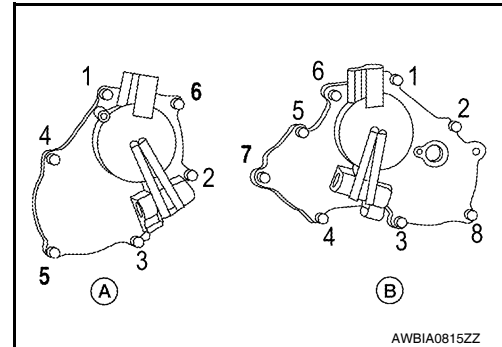
The start and end of the application of the liquid gasket should be crossed at a position (C) that cannot be seen after attaching the Intake valve control solenoid valve cover.

D : 2.6 - 3.6 mm (0.102 - 0.142 in) dia.



- b. Install the bolts and tighten them to specification in the numerical order shown.
 - A: Intake valve control solenoid valve cover (RH)
 - B: Intake valve control solenoid valve cover (LH)

Intake valve control solenoid valve cover bolts : 11.0 N·m (1.1 kg-m, 8 ft-lb)



6. Install the crankshaft pulley.
 - Install the key of the crankshaft.
 - Insert the pulley by lightly tapping it.

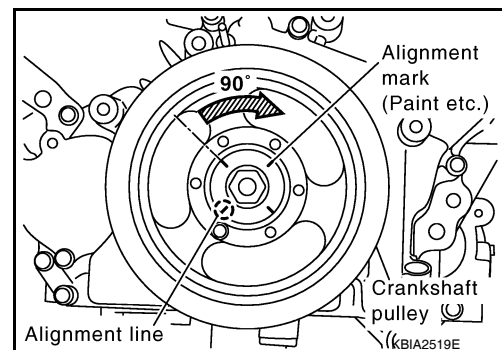
CAUTION:
Do not tap pulley on the side surface where the belt is installed (outer circumference).
7. Tighten the crankshaft pulley bolt.
 - Lock the crankshaft using suitable tool, then tighten the bolt.
 - Perform the following steps for angular tightening:

- a. Apply engine oil onto the threaded parts of the bolt and seating area.
 - b. Select the one most visible notch of the four on the bolt flange. Corresponding to the selected notch, put an alignment mark (such as paint) on the crankshaft pulley.

Crankshaft pulley bolt

Step 1 : 93.1 N·m (9.5 kg-m, 69 ft-lb)

Step 2 : additional 90° (angle tightening)



8. Rotate the crankshaft pulley in normal direction (clockwise when viewed from engine front) to check for parts interference.
9. Installation of the remaining components is in the reverse order of removal.

INSPECTION AFTER INSTALLATION

1. Check the engine oil level. Refer to [LU-24, "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-24, "Inspection"](#).

DISASSEMBLY AND ASSEMBLY

OIL PUMP

Disassembly and Assembly

INFOID:000000005260622

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.

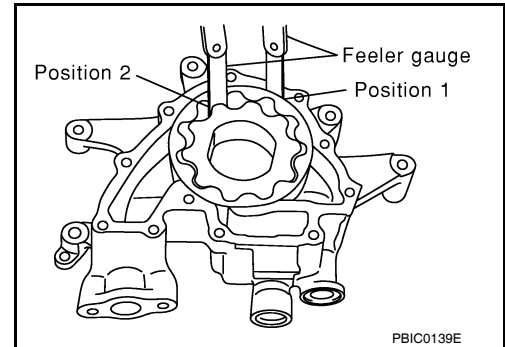
INSPECTION AFTER DISASSEMBLY

Clearance of Oil Pump Parts

- Measure radial clearance using a suitable tool.

Body to outer rotor (position 1)
: 0.114 - 0.200 mm (0.0045 - 0.0079 in)

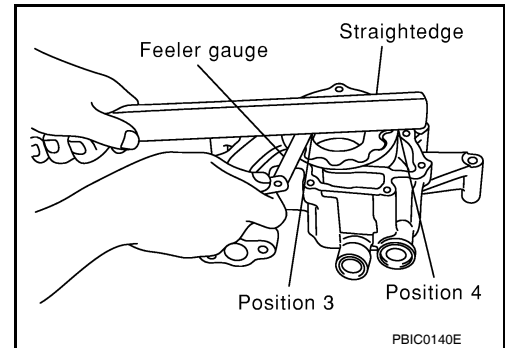
Inner rotor to outer rotor tip (position 2)
: Below 0.180 mm (0.0071 in)



- Measure side clearance using suitable tools.

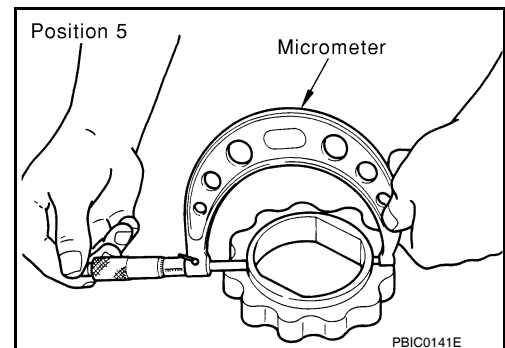
Body to inner rotor (position 3)
: 0.030 - 0.070 mm (0.0012 - 0.0028 in)

Body to outer rotor (position 4)
: 0.030 - 0.090 mm (0.0012 - 0.0035 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) using suitable tool.

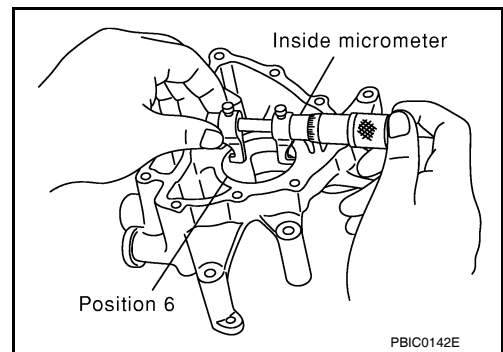


OIL PUMP

[VK56DE]

< DISASSEMBLY AND ASSEMBLY >

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

: 0.045 - 0.091 mm (0.0018 - 0.0036 in)

Regulator Valve Clearance

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

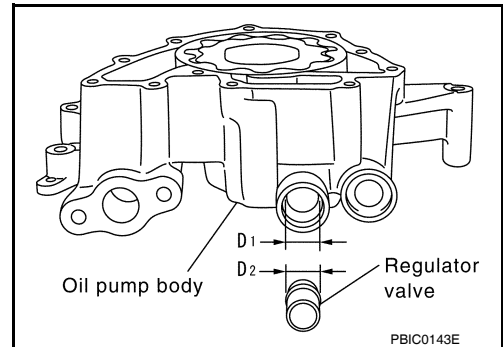
- (Clearance) = D1 (Valve hole diameter) - D2 (Outer Diameter of valve)

Regulator valve to oil pump cover

: 0.040 - 0.097 mm (0.0016 - 0.0038 in)

CAUTION:

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

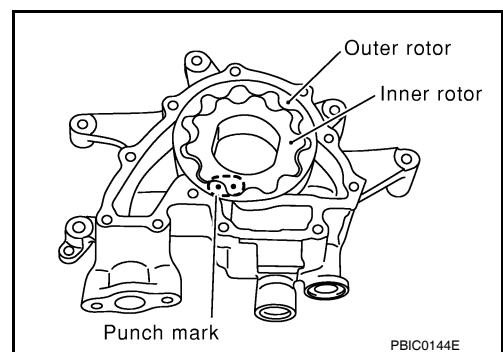


ASSEMBLY

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.



A
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P

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VK56DE]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Standard and Limit

INFOID:000000005260623

OIL PRESSURE

Unit: kPa (kg/cm², psi)

Engine speed	Approximate discharge oil 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

Unit: mm (in)

Body to outer rotor	0.114 - 0.200 (0.0045 - 0.0079)
Inner rotor to outer rotor tip	Below 0.180 (0.0071)
Body to inner rotor	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor	0.030 - 0.090 (0.0012 - 0.0035)
Inner rotor to brazed portion of housing	0.045 - 0.091 (0.0018 - 0.0036)

REGULATOR VALVE

Unit: mm (in)

Regulator valve to oil pump cover	0.040 - 0.097 (0.0016 - 0.0038)
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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 (6-1/2, 5-1/2)
Dry engine (engine overhaul)		7.6 (8, 6-3/4)