

SECTION

EM

ENGINE MECHANICAL

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PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

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

INFOID:000000003787007

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.

Precaution for Drain Engine Coolant

INFOID:000000003787008

Drain engine coolant when engine is cooled.

Precaution for Disconnecting Fuel Piping

INFOID:000000003787009

- Before starting work, make sure no fire or spark producing items are in the work area.
- Release fuel pressure before disconnecting and disassembly.
- After disconnecting pipes, plug openings to stop fuel leakage.

Precaution for Removal and Disassembly

INFOID:000000003787010

- When instructed to use special service tools, use the specified tools. Always be careful to work safely, avoid forceful or uninstructed operations.
- Exercise maximum care to avoid damage to mating or sliding surfaces.
- Cover openings of engine system with tape or the equivalent, if necessary, to seal out foreign materials.
- Mark and arrange disassembly parts in an organized way for easy troubleshooting and assembly.
- When loosening nuts and bolts, as a basic rule, start with the one furthest outside, then the one diagonally opposite, and so on. If the order of loosening is specified, do exactly as specified. Power tools may be used where noted in the step.

Precaution for Inspection, Repair and Replacement

INFOID:000000003787011

Before repairing or replacing, thoroughly inspect parts. Inspect new replacement parts in the same way, and replace if necessary.

Precaution for Assembly and Installation

INFOID:000000003787012

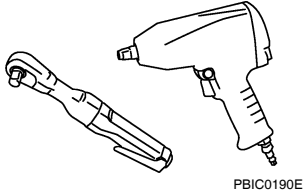
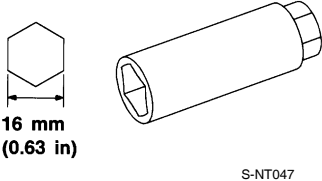
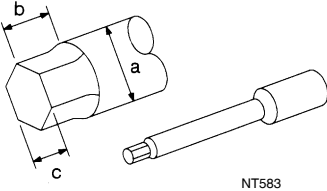
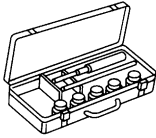
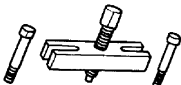
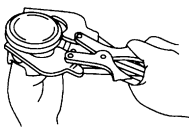
- Use torque wrench to tighten bolts or nuts to specification.
- When tightening nuts and bolts, as a basic rule, equally tighten in several different steps starting with the ones in center, then ones on inside and outside diagonally in this order. If the order of tightening is specified, do exactly as specified.
- Replace with new gasket, packing, oil seal or O-ring.
- Thoroughly wash, clean, and air-blow each part. Carefully check engine oil or engine coolant passages for any restriction and blockage.
- Avoid damaging sliding or mating surfaces. Completely remove foreign materials such as cloth lint or dust. Before assembly, oil sliding surfaces well.

PREPARATION

< PREPARATION >

Commercial Service Tool

INFOID:000000003787016

(Kent-Moore No.) Tool name	Description
Power tool  PBIC0190E	Loosening bolts and nuts
Spark plug wrench  16 mm (0.63 in) S-NT047	Removing and installing spark plug
(J-24239-01) Cylinder head bolt wrench  NT583	Loosening and tightening cylinder head bolt, and use with angle wrench [SST: KV10112100 (BT-8653-A)] a: 13 (0.51) dia. b: 12 (0.47) c: 10 (0.39) Unit: mm (in)
Valve seat cutter set  S-NT048	Finishing valve seat dimensions
Pulley puller  ZZA0010D	Removing crankshaft pulley
Piston ring expander  S-NT030	Removing and installing piston ring

DRIVE BELTS

< ON-VEHICLE MAINTENANCE >

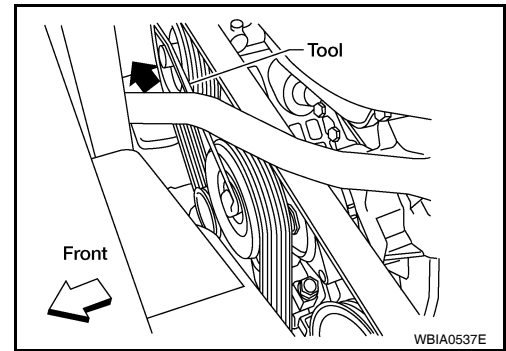
2. Install Tool on drive belt auto tensioner pulley bolt, move in the direction of arrow (loosening direction of tensioner) as shown.

Tool number : — (J-46535)

CAUTION:

Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes off.

3. Remove the drive belt.



INSTALLATION

Installation is in the reverse order of removal.

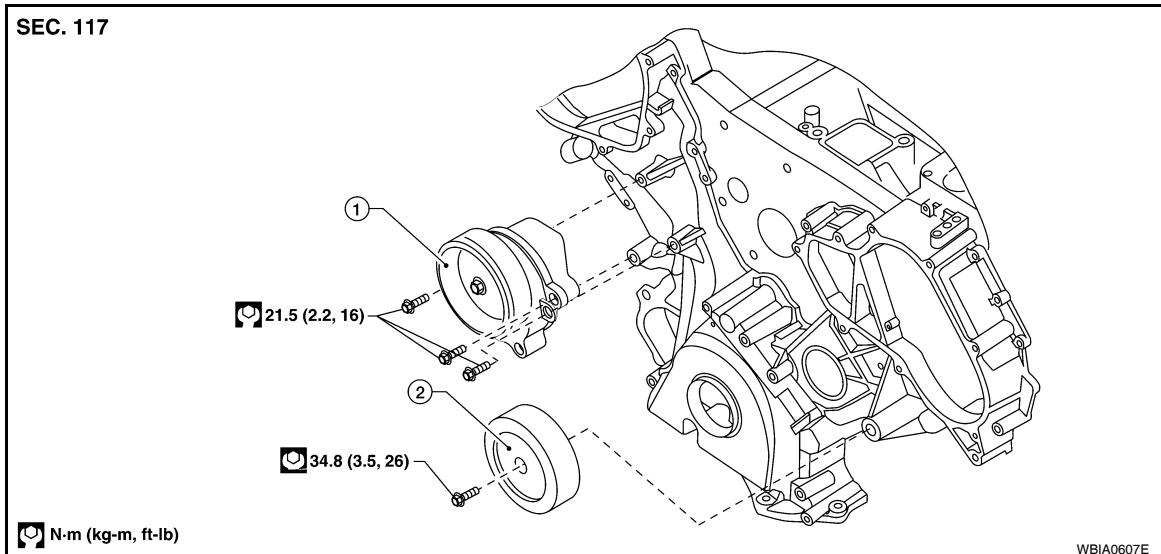
CAUTION:

Make sure belt is securely installed around all pulleys.

- Rotate the crankshaft pulley several turns clockwise to equalize belt tension between pulleys.
- Make sure belt tension is within the allowable working range, using the indicator notch on the drive belt auto tensioner. Refer to [EM-13, "Checking Drive Belts"](#).

Drive Belt Auto Tensioner and Idler Pulley

INFOID:000000003787021



1. Drive belt auto tensioner

2. Idler pulley

REMOVAL

1. Remove the air duct and resonator assembly. Refer to [EM-25, "Removal and Installation"](#).
2. Remove the drive belt. Refer to [EM-13, "Removal and Installation"](#).
3. Remove the drive belt auto tensioner and idler pulley using power tool.




INSTALLATION

Installation is in the reverse order of removal.

CAMSHAFT VALVE CLEARANCE

< ON-VEHICLE MAINTENANCE >

7. Measure valve clearances at the locations marked "x" as shown in the table below (locations indicated with black arrow).

- : Engine front
-  (black): Measurable at No.1 cylinder compression top dead center
-  (white): Measurable at No. 3 cylinder compression top dead center
- A: RH
- B: LH
- C: Exhaust
- D: Intake

NOTE:

Firing order 1-8-7-3-6-5-4-2

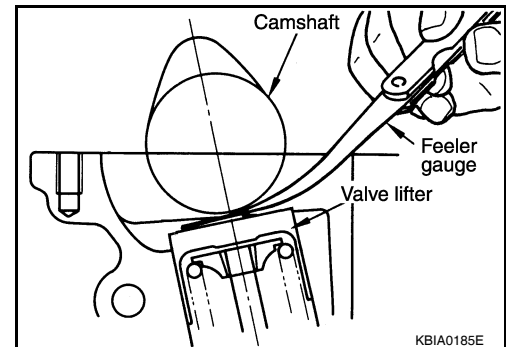
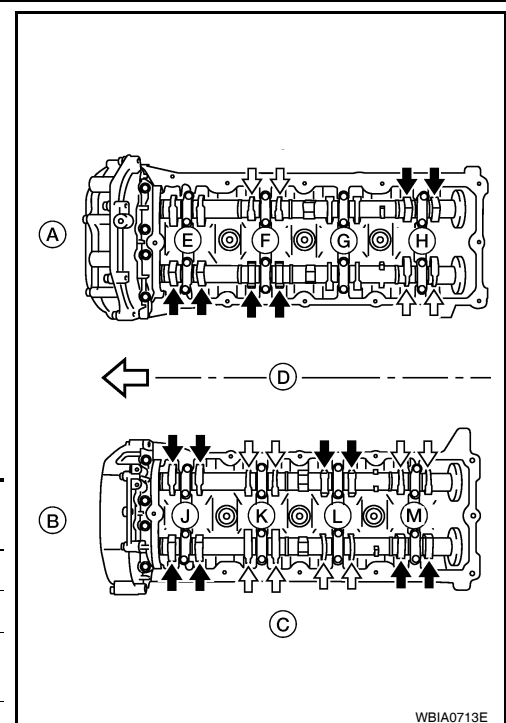
- No. 1 cylinder compression TDC

Measuring position (RH bank)		No. 2 cyl (E)	No. 4 cyl (F)	No. 6 cyl (G)	No. 8 cyl (H)
No. 1 cylinder at TDC	EXH				x
	INT	x	x		
Measuring position (LH bank)		No. 1 cyl (J)	No. 3 cyl (K)	No. 5 cyl (L)	No. 7 cyl (M)
No. 1 cylinder at TDC	INT	x		x	
	EXH	x			x

- Measure valve clearance using suitable tool. Refer to [EM-108](#), "Standard and Limit".

CAUTION:

If the inspection was carried out with a cold engine, make sure the values with a fully warmed up engine are still within specifications.



8. Turn the crankshaft pulley clockwise 270° from the position of No. 1 cylinder compression TDC to obtain No. 3 cylinder compression TDC.

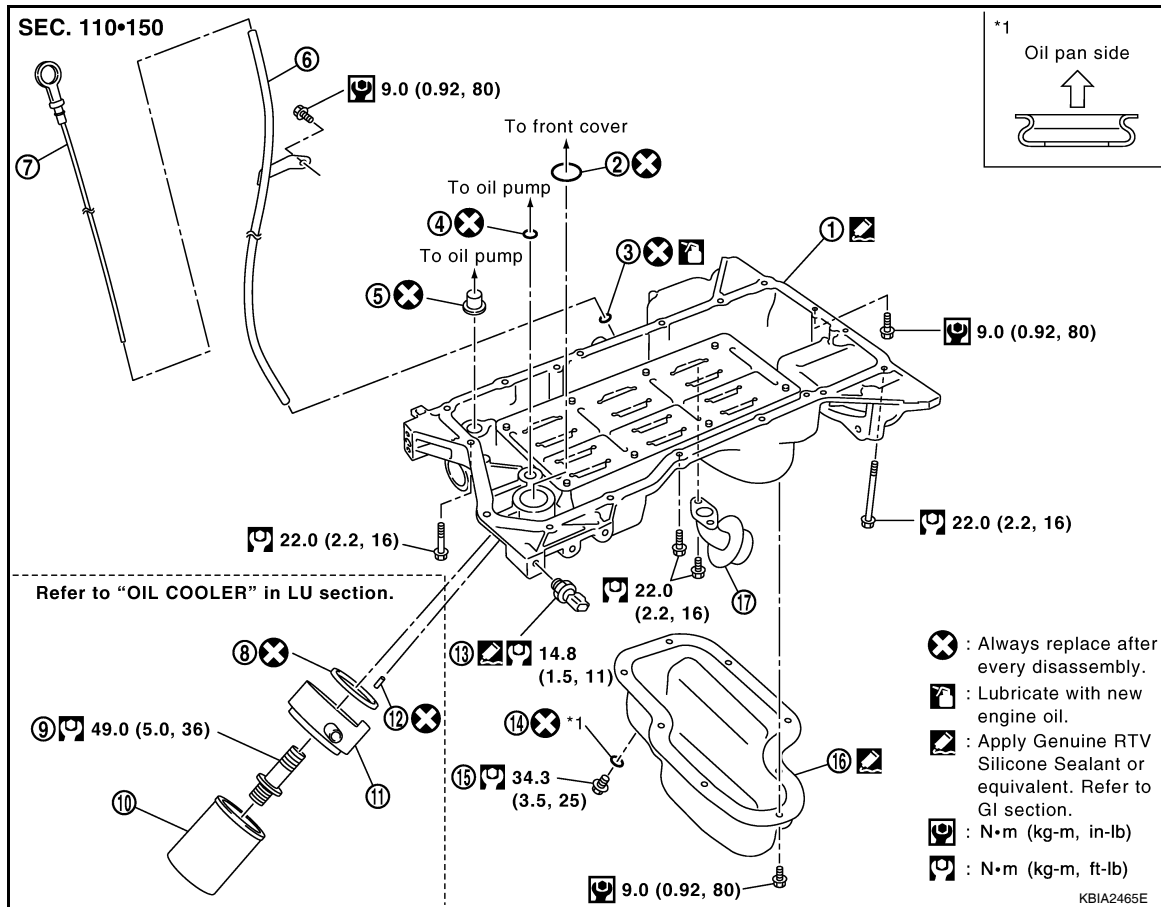
OIL PAN AND OIL STRAINER

< ON-VEHICLE REPAIR >

OIL PAN AND OIL STRAINER

Exploded View

INFOID:000000003787035



- | | | |
|-------------------------|-------------------------|--------------------------|
| 1. Oil pan (upper) | 2. O-ring | 3. O-ring |
| 4. O-ring | 5. O-ring (with collar) | 6. Oil level gauge guide |
| 7. Oil level gauge | 8. O-ring | 9. Connector bolt |
| 10. Oil filter | 11. Oil cooler | 12. Relief valve |
| 13. Oil pressure switch | 14. Gasket | 15. Drain plug |
| 16. Oil pan (lower) | 17. Oil strainer | |

Removal and Installation

INFOID:000000003787036

REMOVAL

WARNING:

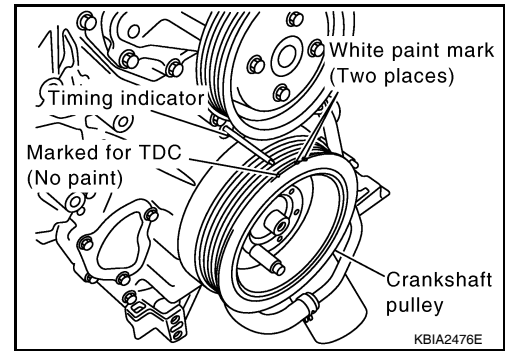
To avoid the danger of being scalded, never drain the engine oil when the engine is hot.

1. Remove the engine. Refer to [EM-78. "Removal and Installation"](#).
2. Remove the oil pan (lower) using the following steps.

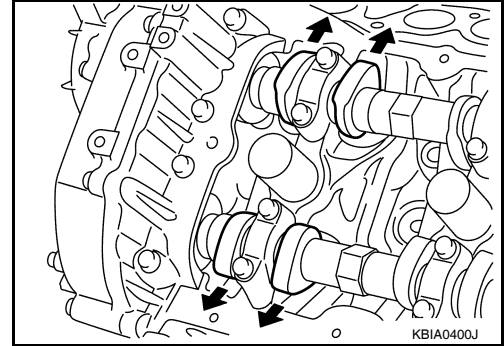
TIMING CHAIN

< ON-VEHICLE REPAIR >

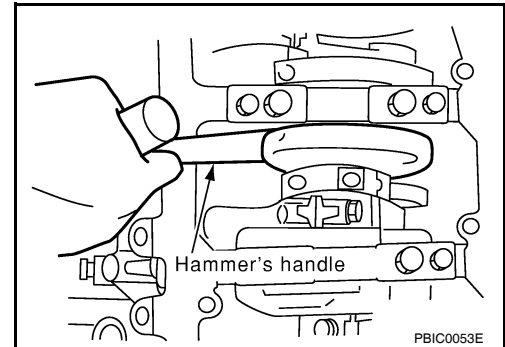
4. Obtain compression TDC of No. 1 cylinder as follows:
 - a. Turn the crankshaft pulley clockwise to align the TDC identification notch (without paint mark) with the timing indicator on the front cover.



- b. At this time, make sure both intake and exhaust cam lobes of No. 1 cylinder (top front on LH bank) point outside.
 - If they do not point outside, turn crankshaft pulley once more.



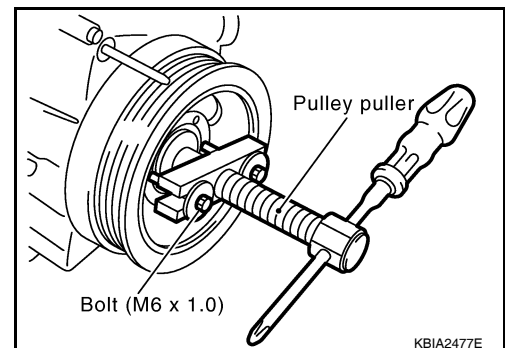
5. Remove the crankshaft pulley.
 - a. Loosen the crankshaft pulley bolts using a hammer handle to secure the crankshaft.



- 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).



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

Tool number : KV10111100 (J-37228)

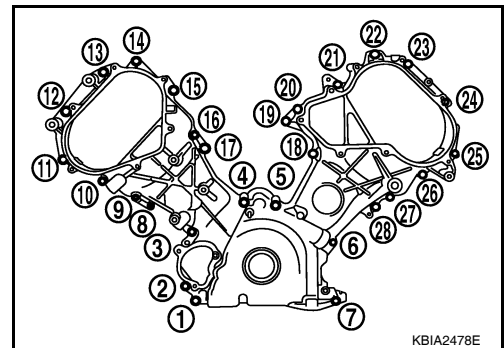
CAUTION:

Do not damage mating surfaces.

7. Remove the front oil seal using suitable tool.

CAUTION:

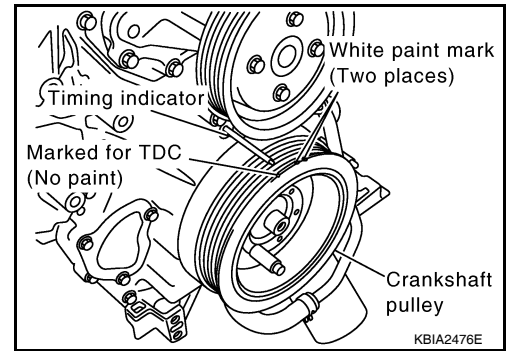
Do not damage front cover.



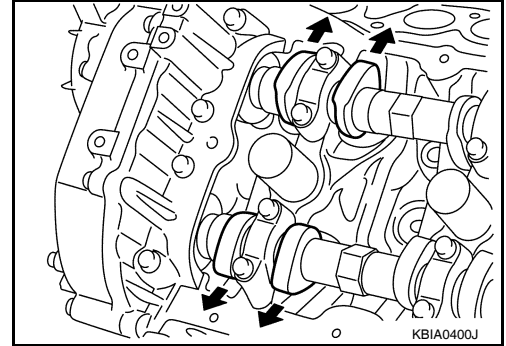
CAMSHAFT

< ON-VEHICLE REPAIR >

2. Obtain compression TDC of No. 1 cylinder as follows:
 - a. Turn the crankshaft pulley clockwise to align the TDC identification notch (without paint mark) with the timing indicator on the front cover.



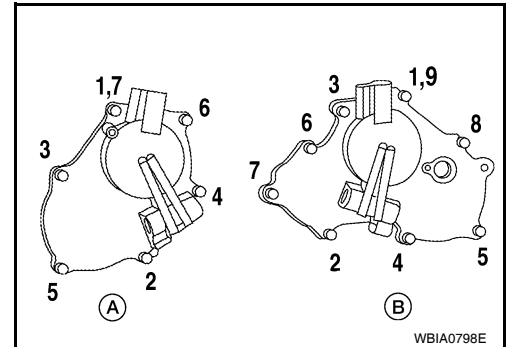
- b. At this time, make sure both intake and exhaust cam lobes of No. 1 cylinder (top front on LH bank) point outside.
 - If they do not point outside, turn crankshaft pulley once more.



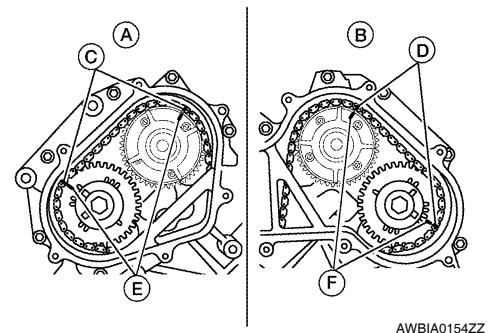
3. Remove the intake valve timing control solenoid valve cover (RH) (A) and intake valve timing control solenoid valve cover (LH) (B) as follows:
 - a. Loosen and remove the bolts as shown.
 - b. Cut the liquid gasket and remove the covers using Tool.

Tool number : KV10111100 (J-37228)

CAUTION:
Do not damage mating surfaces.



4. Paint alignment marks on the RH bank (A) timing chain links (C) and LH bank (B) timing chain links (D) and align with the camshaft sprocket alignment marks (E) and (F).



5. Remove the chain tensioner (LH) using the following steps.

WARNING:
Plunger, spring, and spring seat pop out when squeezing return-proof clip without holding plunger head. It may cause serious injuries. Always hold plunger head when removing.

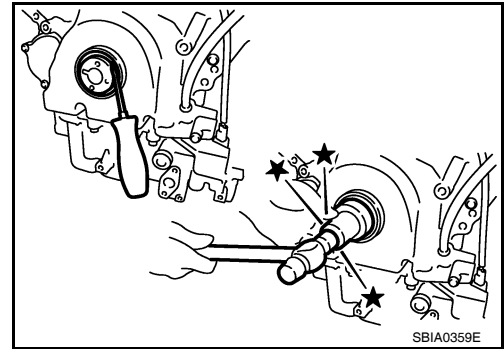
OIL SEAL

< ON-VEHICLE REPAIR >

3. Remove the front oil seal using suitable tool.

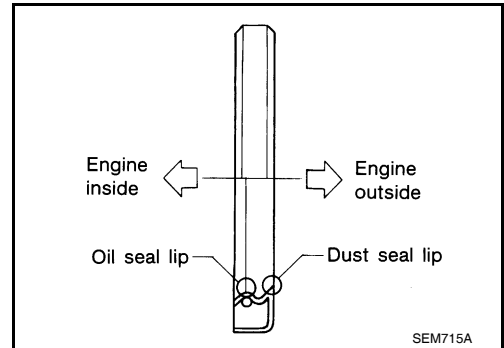
CAUTION:

Do not damage front cover and oil pump drive spacer.



INSTALLATION

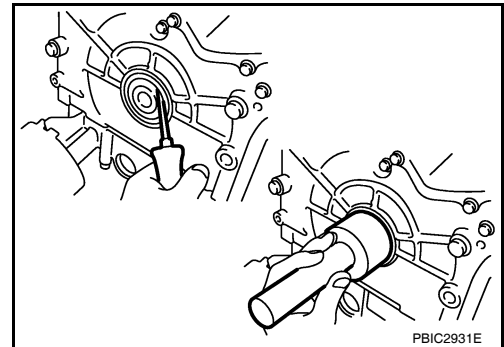
1. Apply new engine oil to both the oil seal lip and dust seal lip of the new front oil seal.
2. Install the front oil seal.
 - Install the front oil seal so that each seal lip is oriented as shown.



- Press-fit until the height of the front oil seal is level with the mounting surface using suitable tool.

CAUTION:

- **Do not damage front timing chain case and crankshaft.**
- **Press-fit straight and avoid causing burrs or tilting oil seal.**



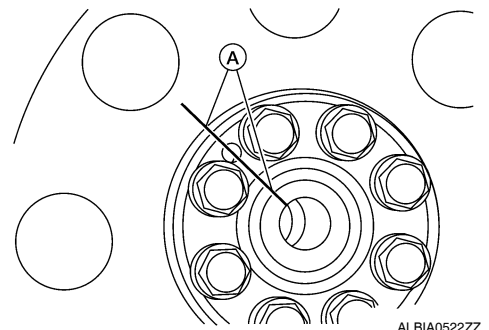
3. Installation of the remaining components is in the reverse order of removal.

Removal and Installation of Rear Oil Seal

INFOID:000000003787050

REMOVAL

1. Remove the transmission assembly. Refer to [TM-234, "Removal and Installation \(2WD\)"](#) or [TM-236, "Removal and Installation \(4WD\)"](#).
2. Before removing the drive plate, put a match mark (A) on the crankshaft and drive plate for alignment during installation.



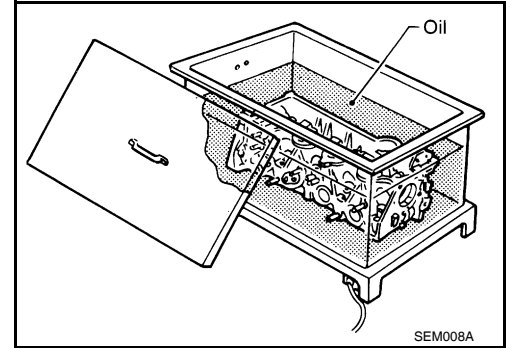
CYLINDER HEAD

< ON-VEHICLE REPAIR >

VALVE GUIDE REPLACEMENT

When the valve guide is removed, replace it with an oversized (0.2 mm, 0.008 in) valve guide.

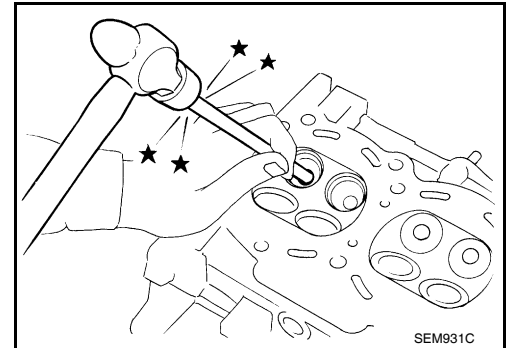
1. To remove the valve guide, heat the cylinder head to 110° to 130°C (230° to 266°F) by soaking it in heated oil.



2. Remove the valve guide using suitable tool.

CAUTION:

Cylinder head contains heat. When working, wear protective equipment to avoid getting burned.



3. Ream the cylinder head valve guide hole using suitable tool.

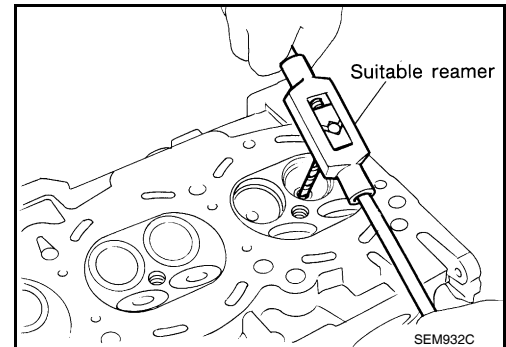
Valve guide hole diameter:

Standard

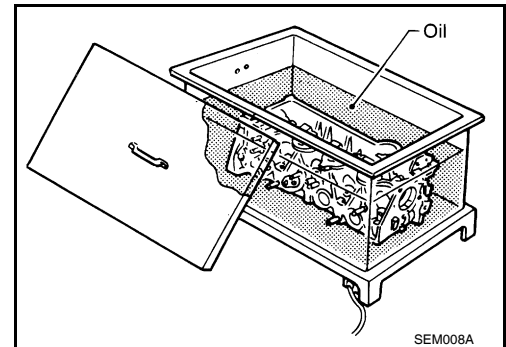
Intake and exhaust : 9.975 - 9.996 mm (0.3927 - 0.3935 in)

Oversize (service)

Intake and exhaust : 10.175 - 10.196 mm (0.4006 - 0.4014 in)



4. Heat the cylinder head to 110° to 130°C (230° to 266°F) by soaking it in heated oil.



ENGINE ASSEMBLY

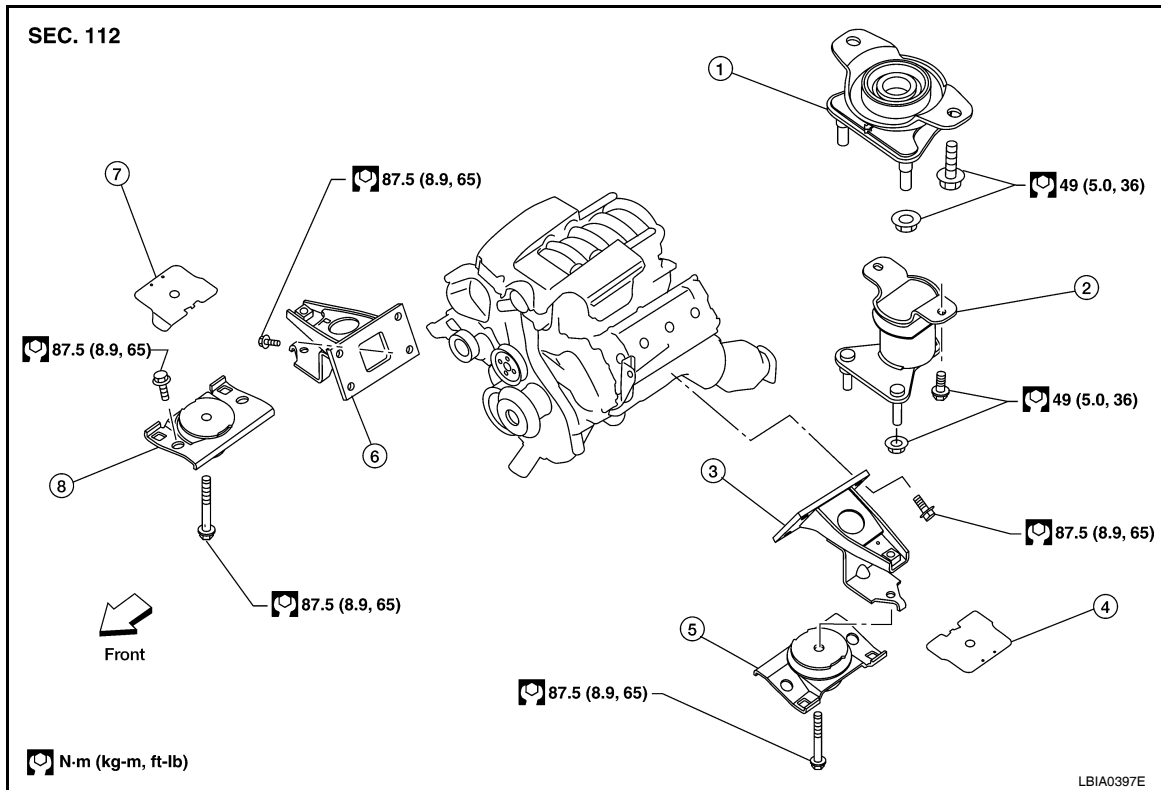
< REMOVAL AND INSTALLATION >

REMOVAL AND INSTALLATION

ENGINE ASSEMBLY

Exploded View

INFOID:000000003787056



- | | | |
|---------------------------------------|---------------------------------------|-------------------------------|
| 1. Rear engine mounting insulator 4WD | 2. Rear engine mounting insulator 2WD | 3. LH engine mounting bracket |
| 4. LH heat shield plate | 5. LH engine mounting insulator | 6. RH engine mounting bracket |
| 7. RH heat shield plate | 8. RH engine mounting insulator | |

Removal and Installation

INFOID:000000003787057

WARNING:

- Situate vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.
- For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:

- Always be careful to work safely, avoid forceful or uninstructed operations.
- Do not start working until exhaust system and engine coolant are cooled sufficiently.
- If items or work required are not covered by the engine section, follow the applicable procedures.
- Always use the support point specified for lifting.
- Use either 2-point lift type or separate type lift. If board-on type is used for unavoidable reasons, support at the rear axle jacking point with transmission jack or similar tool before starting work, in preparation for the backward shift of center of gravity.
- For supporting points for lifting and jacking point at rear axle, refer to [GI-30, "Garage Jack and Safety Stand"](#).

REMOVAL

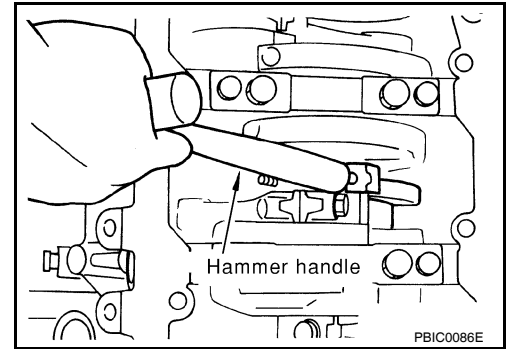
Preparation

1. Drain the engine coolant. Refer to [CO-11, "Changing Engine Coolant"](#).

ENGINE UNIT

< DISASSEMBLY AND ASSEMBLY >

- c. Push the piston and connecting rod assembly out to the cylinder head side using suitable tool.



8. Remove connecting rod bearings.

CAUTION:

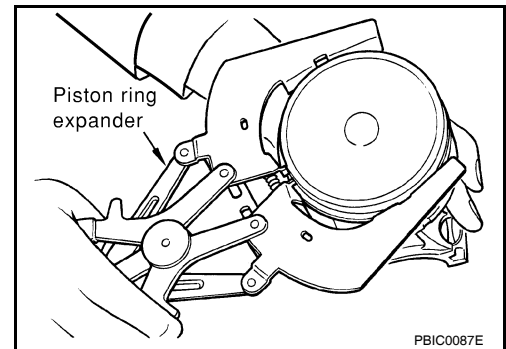
When removing them, note the installation position. Keep them in the correct order.

9. Check piston ring side clearance. Refer to [EM-90, "Inspection After Disassembly"](#).

10. Remove piston rings from piston using suitable tool.

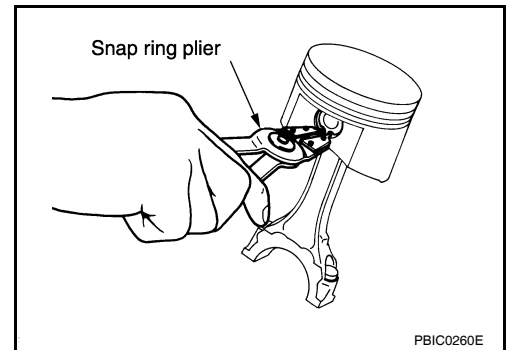
CAUTION:

- Do not damage piston.
- Do not damage piston rings by expanding them excessively.

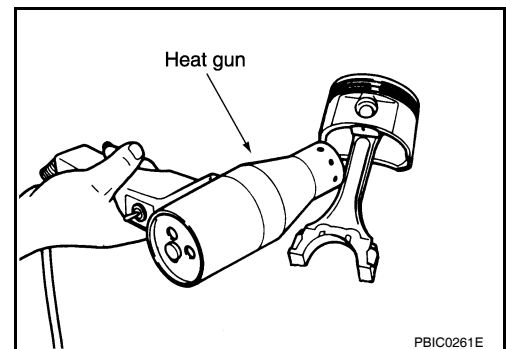


11. Remove piston from connecting rod as follows.

- a. Remove snap ring using suitable tool.



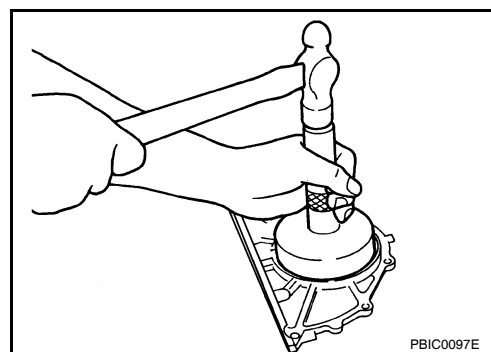
- b. Heat piston to 60° to 70°C (140° to 158°F) using suitable tool.



ENGINE UNIT

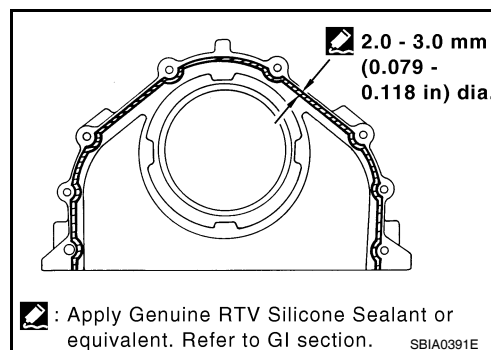
< DISASSEMBLY AND ASSEMBLY >

- Tap until flattened with the front edge of the rear oil seal retainer using suitable tool.
- Fit the rear oil seal until it is level with the rear end surface of rear oil seal retainer.



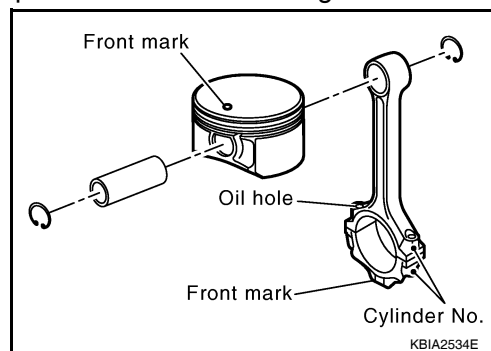
9. Install rear oil seal retainer.

- Apply liquid gasket thoroughly to rear oil seal retainer as shown.
- **Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-14, "Recommended Chemical Products and Sealants"](#).**
- Apply new engine oil on the lips of rear oil seal. Do not touch.



10. Install the piston to the connecting rod.

- Install the snap ring to the grooves of the piston rear side.
 - Insert it fully into the groove to install.
- Install the piston to the connecting rod.
 - Heat piston until piston pin can be pushed in by hand without excess force [approx. 60° to 70 C° (140° to 158 °F)]. From the front to the rear, insert the piston pin into the piston and the connecting rod.
 - Assemble so that the front mark on the piston crown and the oil holes and cylinder No. on the connecting rod are positioned as shown.
- Install the snap ring to the grooves of the piston front side.
 - Insert it fully into the groove to install.
 - After installing, make sure connecting rod moves smoothly.



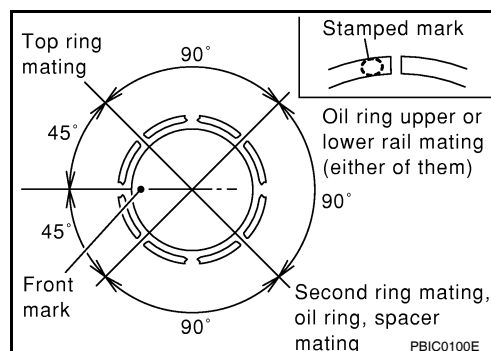
11. Install piston rings.

CAUTION:

Do not damage piston.

- Position each ring with the gap as shown, referring to the piston front mark.
- Install the second ring with the stamped surface facing upward.

Stamped mark Second ring : 2N



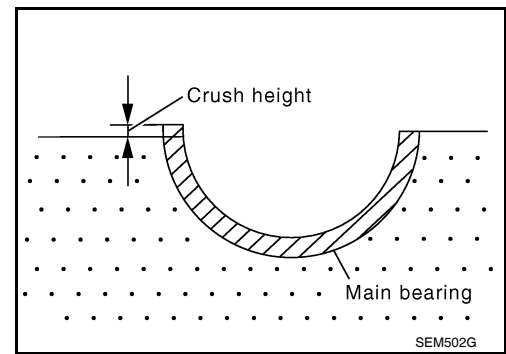
ENGINE UNIT

< DISASSEMBLY AND ASSEMBLY >

- When the bearing cap is removed after being tightened to the specified torque with main bearings installed, the tip end of the bearing must protrude. Refer to [EM-83, "Disassembly and Assembly"](#) for the tightening procedure.

Standard : There must be crush height

- If standard is not met, replace main bearings.

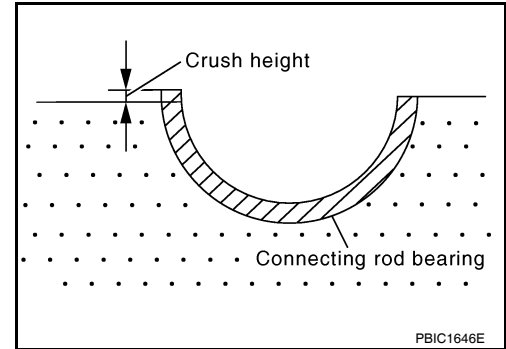


CRUSH HEIGHT OF CONNECTING ROD BEARING

- When connecting rod bearing cap is removed after being tightened to the specified torque with the connecting rod bearings installed, the tip end of the bearing must protrude. Refer to [EM-83, "Disassembly and Assembly"](#) for tightening procedure.

Standard : There must be crush height.

- If standard is not met, replace connecting rod bearings.



MAIN BEARING CAP BOLT DIAMETER

- Check for bolts (M9 and M12) installed from lower side using the following procedure.

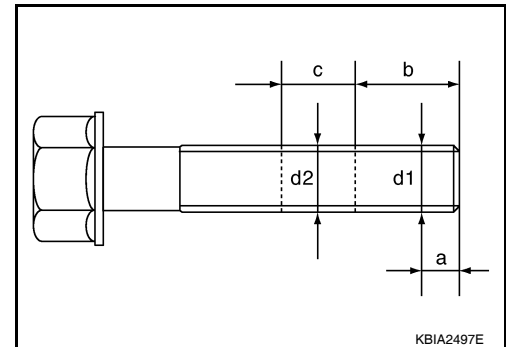
NOTE:

- Side bolt (M10) is outside the target.
- Figure shows M12 bolt.
- Measure bolt diameter "d1" from tip of the bolt to dimension "a".
- Measure bolt diameter "d2" from the dimension between tip of the bolt and dimension "b" as base station to dimension "c".

NOTE:

If a narrower part in the threads is determined by visual check, measure "d2" at that point.

- Calculate the difference between "d1" and "d2".



M9 bolt

Dimension "a"	: 9 mm (0.35 in)
Dimension "b"	: 15 mm (0.59 in)
Dimension "c"	: 20 mm (0.79 in)
Limit	: 0.10 mm (0.0039 in)

M12 bolt

Dimension "a"	: 12 mm (0.47 in)
Dimension "b"	: 55 mm (2.17 in)
Dimension "c"	: 20 mm (0.79 in)
Limit	: 0.15 mm (0.0059 in)

- Replace applicable bolts if outside the limit.

CONNECTING ROD BOLT DIAMETER

- Measure diameter "d" at position shown.