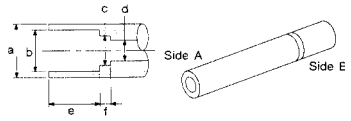
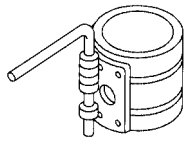
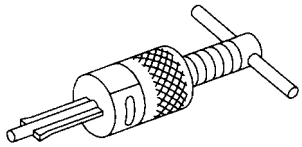
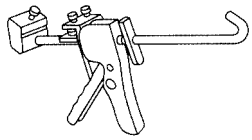
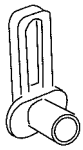
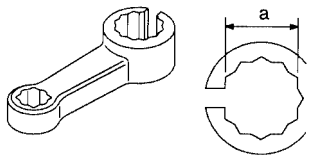
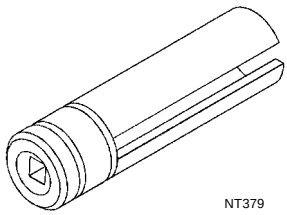
SECTION EM
ENGINE MECHANICAL

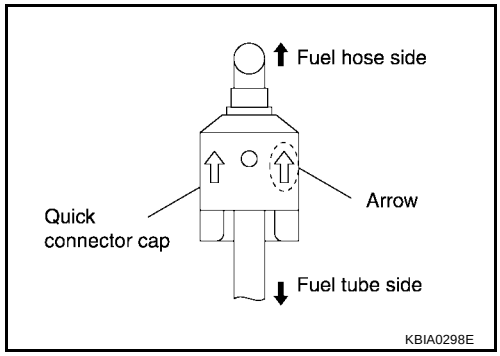
CONTENTS

QR25DE

VQ35DE

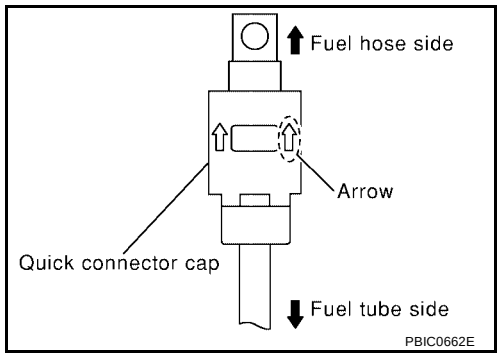
Tool number (Kent-Moore No.) Tool name	Description
KV10115600 (J-38958) Valve oil seal drift  S-NT603	Installing valve oil seal **Use side A.** **a: 20 (0.79) dia.** **d: 8 (0.31) dia.** **b: 13 (0.51) dia.** **e: 10.7 (0.421) dia.** **c: 10.3 (0.406) dia.** **f: 5 (0.20) dia.** Unit: mm (in)
EM03470000 (J-8037) Piston ring compressor  S-NT044	Installing piston assembly into cylinder bore
ST16610001 (J-23907) Pilot bushing puller  S-NT045	Removing crankshaft pilot bushing
WS39930000 (—) Tube presser  S-NT052	Pressing the tube of liquid gasket
16441 6N210 (J-45488) Quick connector release  PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
KV10114400 (J-38365) Heated oxygen sensor wrench  NT636	Loosening or tightening rear heated oxygen sensor **a: 22 mm (0.87 in)**
KV10117100 (J-36471-A) Heated oxygen sensor wrench  NT379	Loosening or tightening heated oxygen sensor **For 22 mm (0.87 in) hexagon nut**

5. Install quick connector cap on quick connector joint.
   - Direct arrow mark on quick connector cap to upper side (fuel hose side).
6. Install fuel hose to hose clamp.



CONNECTING QUICK CONNECTOR ON THE FUEL HOSE (VEHICLE PIPING SIDE)

1. Make sure no foreign substances are deposited in and around the fuel tube and quick connector, and there is no damage to them.
2. Align center to insert quick connector straight into fuel tube.
   - Insert fuel tube until a click is heard.
   - Install quick connector cap on quick connector joint. Direct arrow mark on quick connector cap upper side.
   - Install fuel hose to hose clamp.



INSPECTION AFTER INSTALLATION

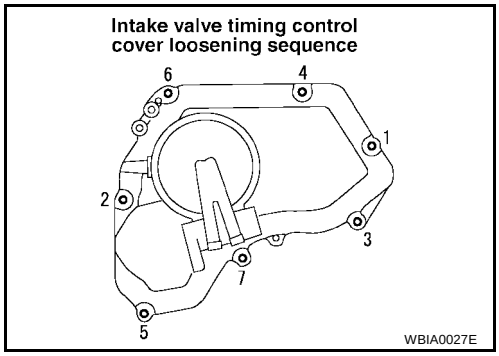
Make sure there is no fuel leakage at connections as follows:

1. Apply fuel pressure to fuel lines by turning ignition switch ON (with engine stopped). Then check for fuel leaks at connections.
2. Start the engine and rev it up and check for fuel leaks at connections.

   NOTE:
   Use mirrors for checking on connections out of the direct line of sight.

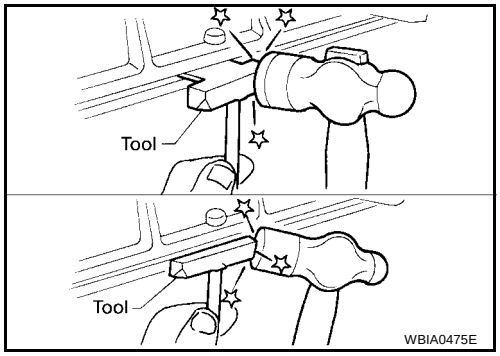
   CAUTION:
   Do not touch engine immediately after stopping as engine is extremely hot.
   - Perform procedures for “Throttle Valve Closed Position Learning” after finishing repairs. Refer to EC-93, "Throttle Valve Closed Position Learning" .
   - If electric throttle control actuator is replaced, perform procedures for “Idle Air Volume Learning” after finishing repairs. Refer to EC-93, "Idle Air Volume Learning" .

7. Loosen the bolts in the order as shown.



- Remove the IVT control cover by cutting the sealant using Tool.

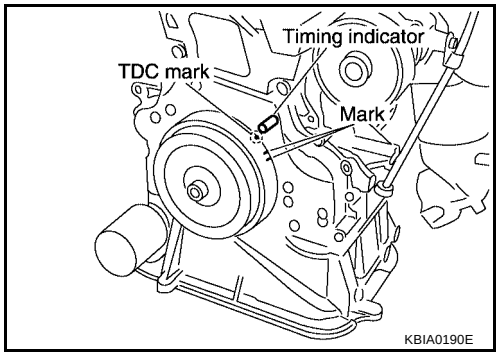
Tool number : KV10111100 (J-37228)



8. Set the No.1 cylinder at TDC on its compression stroke with the following procedure:

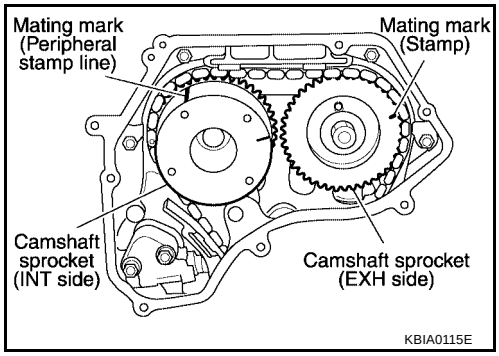
a. Open the splash cover on RH under cover.

b. Rotate crankshaft pulley clockwise, and align mating marks for TDC with timing indicator on front cover, as shown.



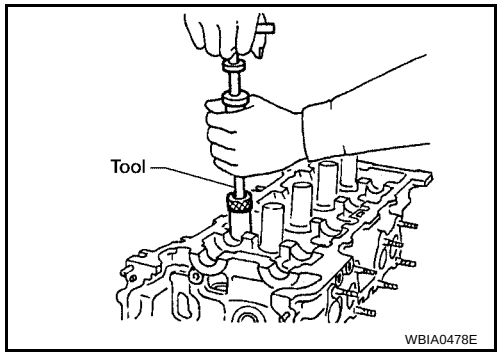
c. At the same time, make sure that the mating marks on camshaft sprockets are lined up with the yellow links in the timing chain, as shown.

- If not, rotate crankshaft pulley one more turn to line up the mating marks to the yellow links, as shown.



9. Pull the timing chain guide out between the camshaft sprockets through front cover.

Tool number : KV10107902 (J-38959)



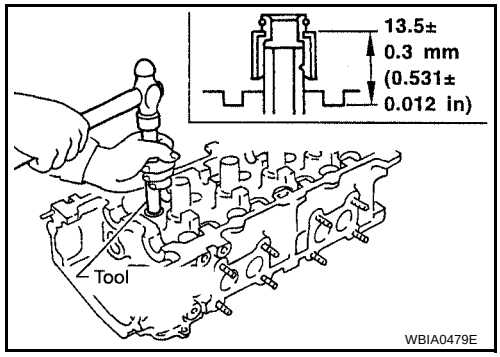
5. When valve seat must be replaced, refer to EM-68, "VALVE SEAT REPLACEMENT" .
6. When valve guide must be replaced, refer to EM-66, "VALVE GUIDE REPLACEMENT" .
7. Remove spark plug using suitable tool.
8. Remove spark plug tubes, if necessary using suitable tool.

CAUTION:
- **Be careful not to damage cylinder head.**
- **Do not remove spark plug tube if not necessary. Once removed, the spark plug tube cannot be reused because of deformation.**

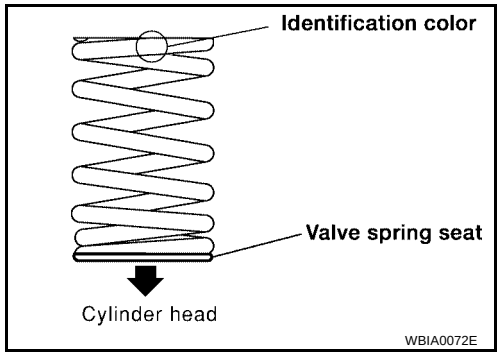
ASSEMBLY

1. Install valve guide. Refer to EM-66, "VALVE GUIDE REPLACEMENT" .
2. Install valve seat. Refer to EM-68, "VALVE SEAT REPLACEMENT" .
3. Install new valve oil seal using Tool.

Tool number : KV10115600 (J-38958)



4. Install valve.
   - Install larger diameter to intake side.
5. Install valve spring.
   - Install smaller pitch (valve spring seat side) to cylinder head side.
   - Confirm the identification color of the valve spring:
     Intake: blue
     Exhaust: yellow

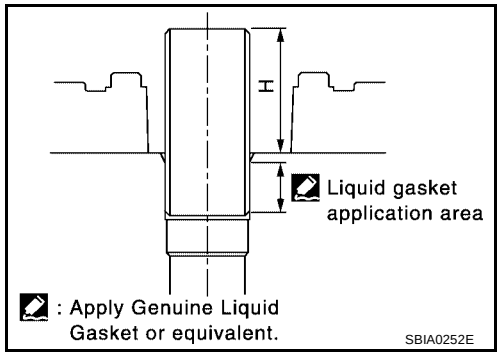


6. Install valve spring retainer.
7. Install valve collet using Tool.
   - Compress valve spring with valve spring compressor. Install valve collet with magnet hand.
   - Tap stem edge lightly with plastic hammer after installation to check its installed condition.
8. Install valve lifter.
9. Install spark plug tube.

a. Remove old liquid gasket from cylinder head side mounting hole.

b. Apply liquid gasket all around on spark plug tube with a 12 mm (0.47 in) width from edge of spark plug tube on the press fit side.
   - Use Genuine Anaerobic Liquid Gasket or equivalent. Refer to MA-12, "RECOMMENDED FLUIDS AND LUBRICANTS" .

c. Press fit spark plug tube so that height is to "H" as shown.



Press fit height "H" standard value : 38.55 - 38.65 mm (1.518 - 1.522 in)

CAUTION:
- **When press fitting be careful not to deform spark plug tube.**
- **After press fitting, wipe off any protruding liquid gasket on top surface of cylinder head.**

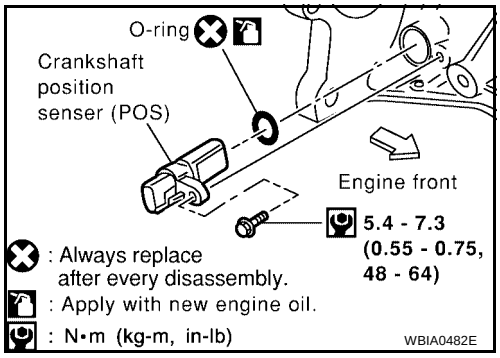
CAUTION:
Apply new engine oil to parts marked in illustration before installation.

DISASSEMBLY

1. Remove the engine and transaxle as an assembly from the vehicle, and separate the transaxle from the engine. Refer to EM-71, "Removal and Installation" .
2. Mount the engine on a suitable engine stand.
3. Drain any remaining engine oil and coolant from the engine.
4. Remove the following components and associated parts.
   - Exhaust manifold and three way catalyst assembly. Refer to EM-24, "Removal and Installation" .
   - Intake manifold collector. Refer to EM-19, "Removal and Installation" .
   - Intake manifold and fuel tube assembly. Refer to EM-19, "Removal and Installation" .
   - Ignition coils. Refer to EM-29, "Removal and Installation" .
   - Rocker cover. Refer to EM-35, "Removal and Installation" .
   - Front cover, timing chain, and balancer unit. Refer to EM-48, "Removal and Installation" .
   - Cylinder head. Refer to EM-61, "Removal and Installation" .
5. Remove the knock sensor.

   CAUTION:
   Carefully handle the sensor and do not drop the sensor.
6. Remove crankshaft position sensor (POS).

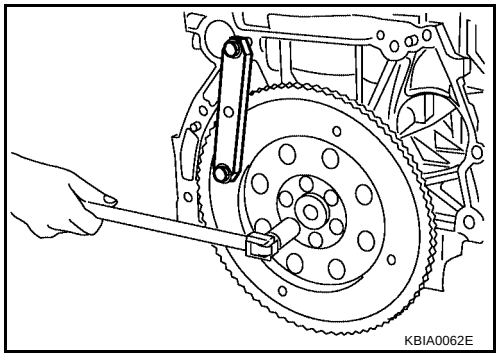
   CAUTION:
   - **Avoid impacts such as a dropping.**
   - **Do not disassemble.**
   - **Keep it away from metal particles.**
   - **Do not place sensor close to magnetic materials.**



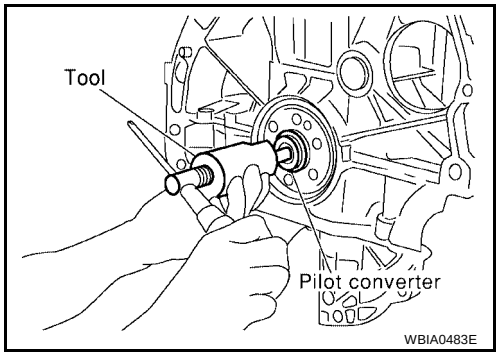
7. Remove the flywheel (M/T models) or drive plate (A/T models). Hold the crankshaft with a stopper plate and use a suitable tool to remove the bolts.

   CAUTION:
   - **Be careful not to damage the flywheel contact surface for the clutch disc.**

   NOTE:
   - The flywheel two-block construction allows movement in response to transmission side pressure, or when twisted in its rotational direction, therefore, some amount of noise is normal.



8. Remove pilot converter using Tool (A/T models).



4. Hone cylinders to obtain specified piston-to-bore clearance.
5. Measure finished cylinder bore for out-of-round and taper.

- **Measurement should be done after cylinder bore cools down.**

OUTER DIAMETER OF CRANKSHAFT JOURNAL

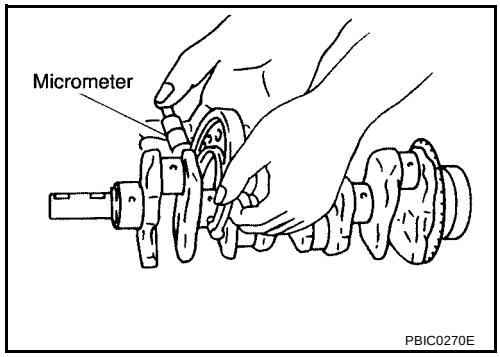
- Measure outer diameter of crankshaft journals.

Standard : 54.955 - 54.979 mm (2.1636 - 2.1645 in)

OUTER DIAMETER OF CRANKSHAFT PIN

- Measure outer diameter of crankshaft pin.

Standard : 44.956 - 44.974 mm (1.7699 - 1.7706 in)



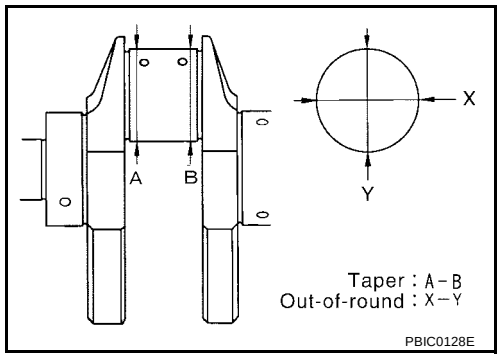
OUT-OF-ROUND AND TAPER OF CRANKSHAFT

- Measure the dimensions at four different points as shown on each journal and pin using a micrometer.
- Out-of-round is indicated by the difference in dimensions between "X" and "Y" at "A" and "B".
- Taper is indicated by the difference in dimension between "A" and "B" at "X" and "Y".

Limit

Out-of-round (X - Y) : 0.005 mm (0.0002 in)

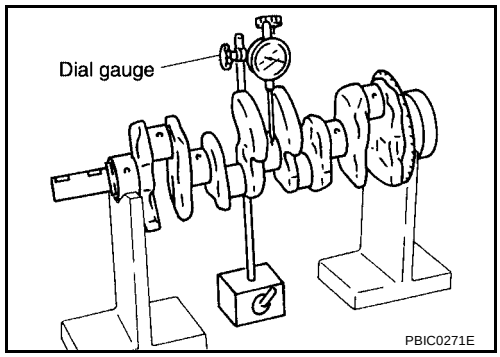
Taper (A - B) : 0.005 mm (0.0002 in)



CRANKSHAFT RUNOUT

- Place a V-block on a precise flat table to support the journals on both ends of the crankshaft.
- Place a dial gauge straight up on the No. 3 journal.
- While rotating the crankshaft, read the movement of the pointer on the dial gauge, the total indicator reading.

Limit : Less than 0.05 mm (0.002 in)



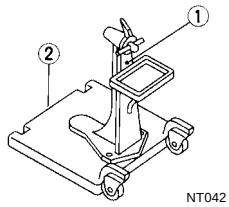
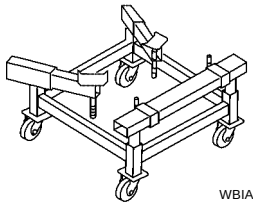
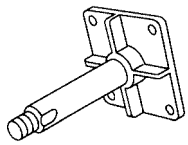
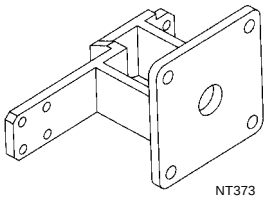
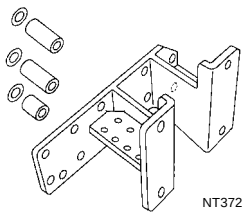
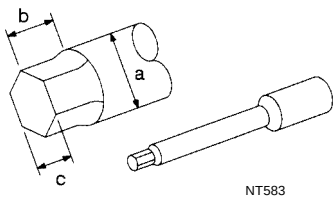
PREPARATION

PFP:00002

Special Service Tools

EBS00J5L

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

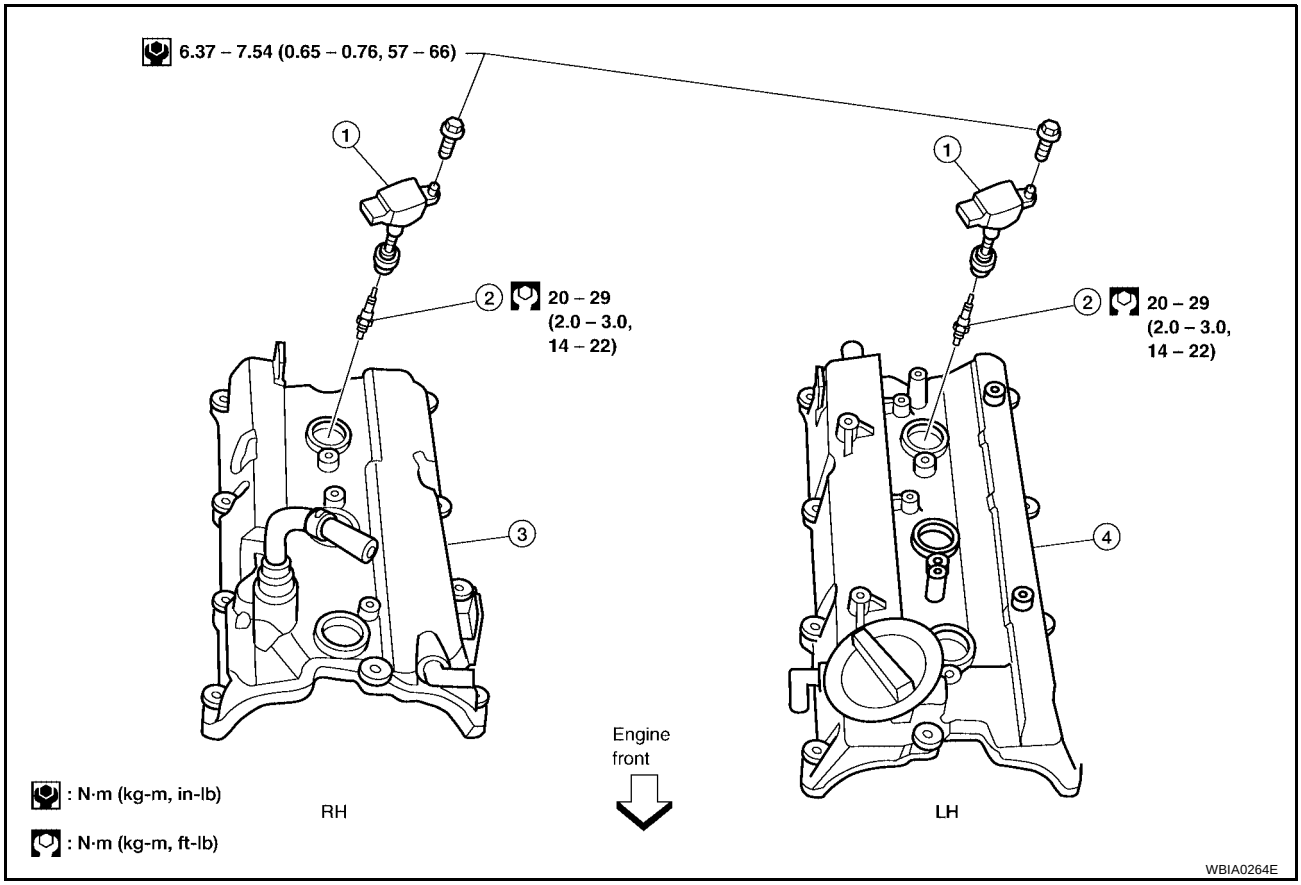
Tool number (Kent-Moore No.) Tool name		Description
ST0501S000 (—) Engine stand assembly 1 ST05011000 (—) Engine stand 2 ST05012000 (—) Base	 NT042	Disassembling and assembling
KV101J0010 (J-47242) Engine support table	 WBIA0658E	Engine and transmission assembly removal
KV10106500 (—) Engine stand shaft	 NT028	
KV10117000 (J-41262) Engine sub-attachment	 NT373	KV10117000 has been replaced with KV10117001 (KV10117000 is no longer in production, but it is usable).
KV10117001 (—) Engine sub-attachment	 NT372	Installing on the cylinder block
ST10120000 (J-24239-01) Cylinder head bolt wrench	 NT583	Loosening and tightening cylinder head bolt **a: 13 (0.51) dia.** **b: 12 (0.47)** **c: 10 (0.39)** Unit: mm (in)

SPARK PLUG (PLATINUM-TIPPED TYPE)

PFP:22401

Removal and Installation

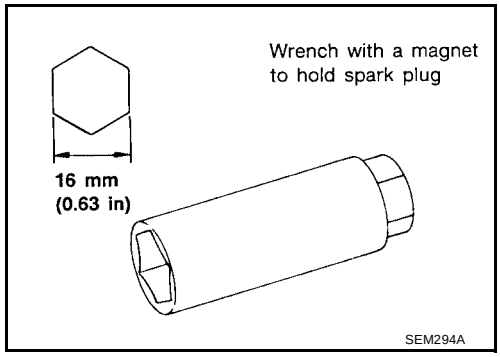
EBS00J5X



1. Ignition coil
2. Spark plug
3. Rocker cover (right bank)
4. Rocker cover (left bank)

REMOVAL

1. Remove the engine cover, with power tool.
2. Drain engine coolant. Refer to MA-22, "DRAINING ENGINE COOLANT" .
3. Disconnect the mass air flow sensor electrical connector and remove the air cleaner assembly and air intake tubes. Refer to EM-120, "Removal and Installation" .
4. Remove the windshield wiper arms and motor assembly and the front cowl panel. Refer to EI-19, "Removal and Installation" .
5. Remove the intake manifold collector, gasket, and throttle body. Refer to EM-129, "Removal and Installation" .
6. Remove the six ignition coils.
7. Remove the six spark plugs with a suitable tool.
   - If replacing the spark plugs use the correct spark plug for maximum performance. Refer to MA-26, "Changing Spark Plugs (Platinum - Tipped Type)" .

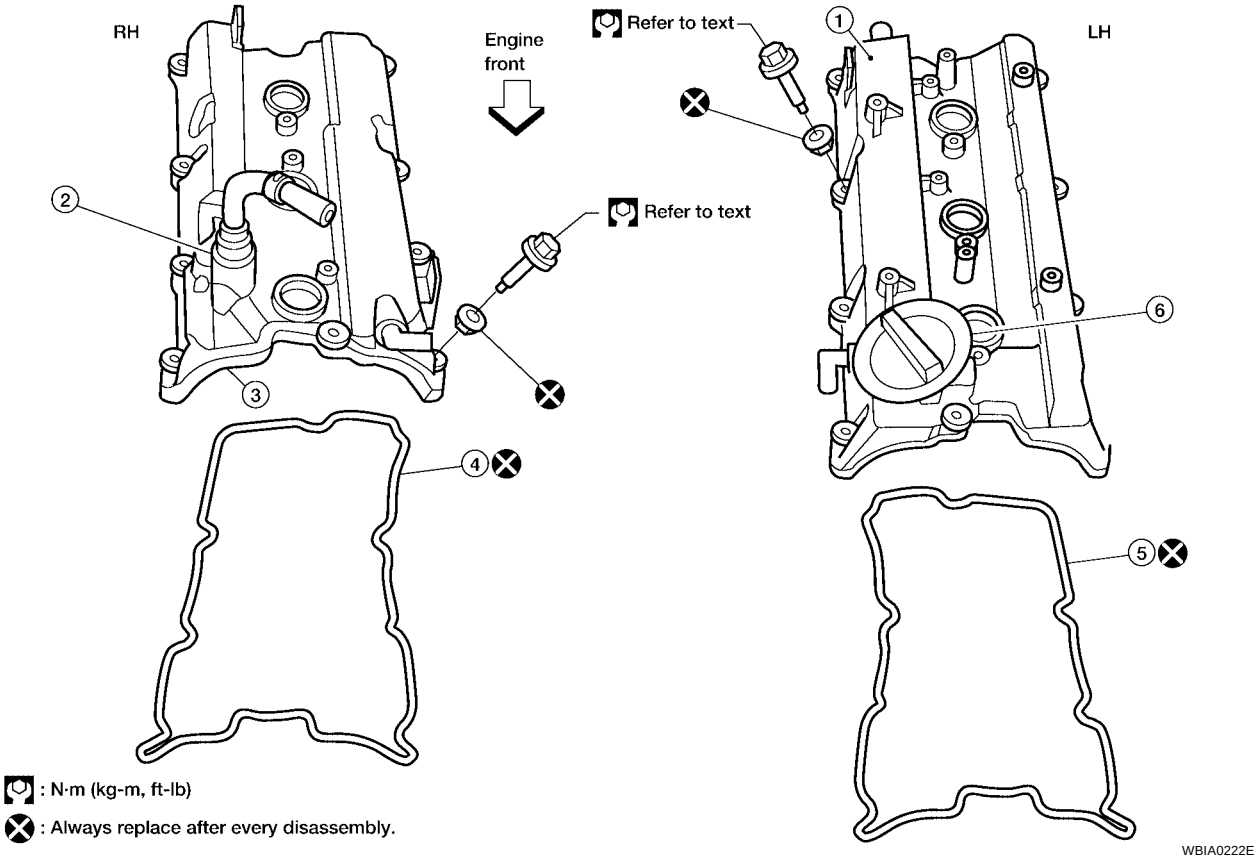


ROCKER COVER

PFP:13264

Removal and Installation

EBS00J5Z

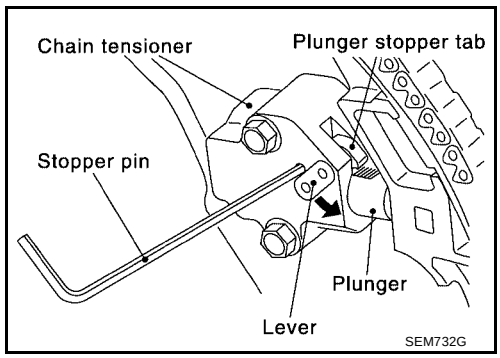


1. Rocker cover (left bank)
2. PCV valve
3. Rocker cover (right bank)
4. Rocker cover gasket (right bank)
5. Rocker cover (left bank)
6. Oil filler cap

REMOVAL

1. Remove the engine cover, using power tool.
2. Disconnect the mass air flow sensor electrical connector and remove the air cleaner assembly and air intake tubes. Refer to EM-120, "Removal and Installation" .
3. Remove the windshield wiper arms and motor assembly and the front cowl panel. Refer to WW-27, "Removal and Installation of Wiper Motor and Linkage" .
4. Remove the intake manifold collector using power tool. Remove gasket and the electric throttle control actuator. Refer to EM-129, "Removal and Installation" .
5. Remove the six ignition coils. Refer to EM-144, "Removal and Installation" .
6. Remove the two intake valve timing control solenoid valves and gaskets. Refer to EC-1065, "INTAKE VALVE TIMING CONTROL SOLENOID VALVE" .

a. Pull lever down and release plunger stopper tab. Plunger stopper tab can be pushed up to release (coaxial structure with lever).

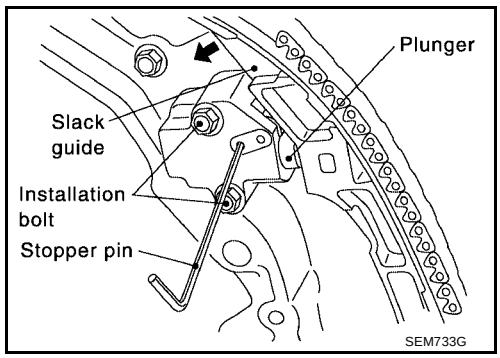


b. Insert stopper pin into tensioner body hole to hold lever, and keep the tab released. An Allen wrench [2.5 mm (0.098 in)] is used for a stopper pin as an example.

c. Insert plunger into tensioner body by pressing the slack side chain guide.

d. Keep the slack side chain guide pressed and hold it by pushing the stopper pin through the lever hole and body hole.

e. Remove the bolts and remove the timing chain tensioner.

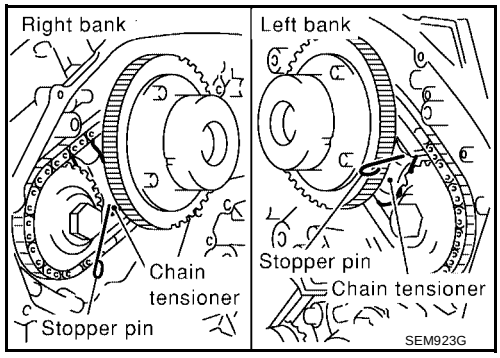


41. Remove primary timing chain and crankshaft sprocket.

CAUTION:

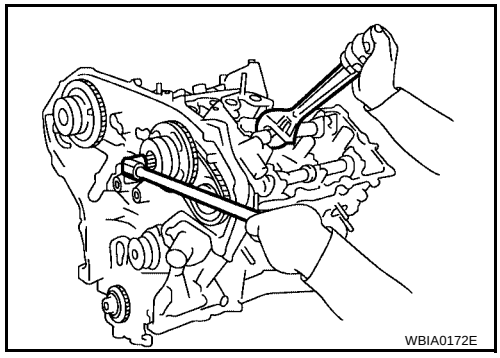
After removing timing chain, do not turn the crankshaft and camshaft separately, or the valves will strike the pistons.

42. Attach a suitable stopper pin to the right and left camshaft chain tensioners (for secondary timing chains).



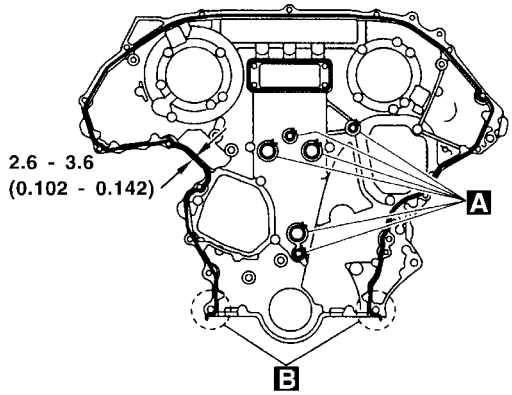
43. Remove the intake and exhaust camshaft sprocket bolts.

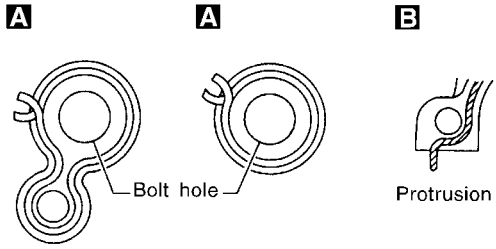
- Apply paint to the timing chain and camshaft sprockets for alignment during installation.
- Secure the hexagonal portion of the camshaft using a wrench to loosen the bolts.



- Use Genuine Silicone RTV Sealant, or equivalent. Refer to MA-12, "RECOMMENDED FLUIDS AND LUBRICANTS" .

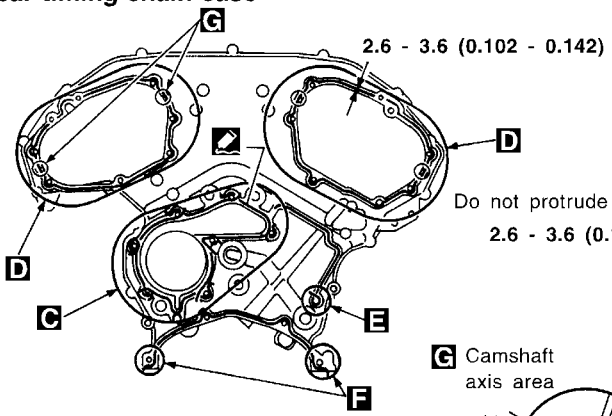
Front timing chain case

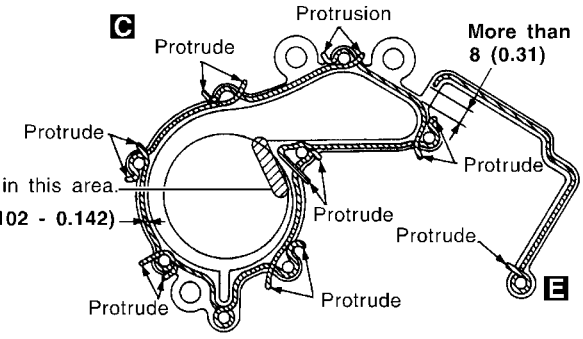


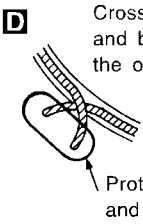


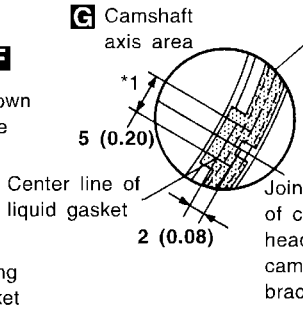
Sealant protrusion away from bolt hole

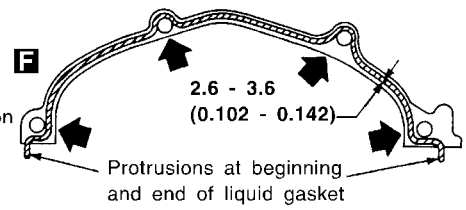
Rear timing chain case





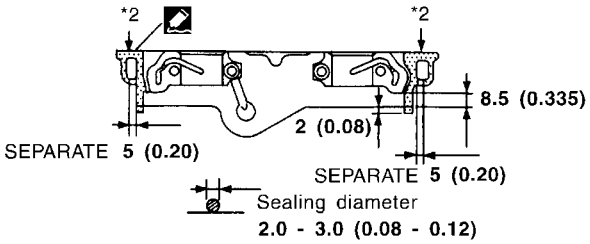






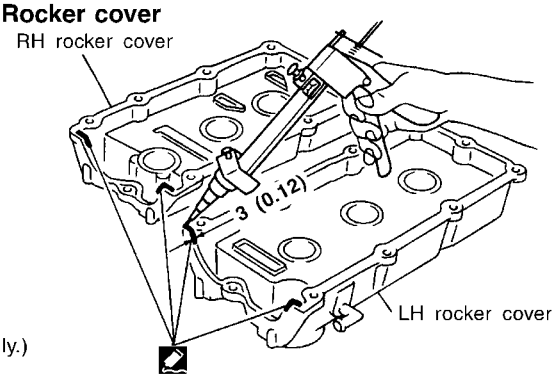
*1: Apply liquid gasket to the chamfered surface between camshaft bracket and cylinder head.

Camshaft bracket



*2: Remove the protruding sealant from front face.
(Remove the hardened sealant from surface only.)

Rocker cover



Unit: mm (in)

SEM411G

- **Before installation, wipe off the protruding sealant.**