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PRECAUTIONS

PRECAUTION

PRECAUTIONS

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

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. 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 three minutes before performing any service.

Precaution for Drain Coolant

• Drain coolant when engine is cooled.

Precaution for Disconnecting Fuel Piping

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

Precaution for Removal and Disassembly

• When instructed to use special service tools, use the specified tools. Always be careful to work safely, avoid forceful or un instructed 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

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

Precaution for Assembly and Installation

• Use torque wrench to tighten bolts or nuts to specification.
PRECAUTIONS

- 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 oil or 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.
- Release air within route after draining coolant.
- Before starting engine, apply fuel pressure to fuel lines with turning ignition switch ON (with engine stopped). Then make sure that there are no leaks at fuel line connections.
- After repairing, start engine and increase engine speed to check coolant, fuel, oil, and exhaust systems for leakage.

Special Cautions to Ensure the Safe Disposal of Sodium-filled Exhaust Valves

Handling and disposal of sodium-filled exhaust valves requires special care and consideration. Under conditions such as breakage with subsequent contact with water, metal sodium which lines the inner portion of exhaust valve will react violently, forming sodium hydroxide and hydrogen which may result in an explosion. Sodium-filled exhaust valve is identified on the top of its stem as shown in illustration.

(A) : Identification mark of sodium-filled exhaust valve

DEALER DISPOSAL INSTRUCTIONS

CAUTION:
- Use approved shatter-resistant eye protection when performing this procedure.
- Perform this and all subsequent disposal work procedures in an open room, away from flammable liquids. Keep a fire extinguisher, rated at least 10 ABC, in close proximity to the work area.
- Be sure to wear rubber gloves when performing the following operations.
- Make sure the resultant (high alkalinity) waste water does not contact your skin. If the waste water does contact you, wash the contacted area immediately with large quantities of water.
- Dealers should check their respective state and local regulations concerning any chemical treatment or waste water discharge permits which may be required to dispose of the resultant (high alkalinity) waste water.

1. Clamp valve stem in a vice.
2. The valve has a specially-hardened surface. To cut through it, first remove a half-round section, approximately 30 mm (1.18 in) long using air-powered grinder until black color is removed and silver color appears.

(A) : Black color
(B) : Silver color
(c) : 47 mm (1.85 in)
(d) : 17 mm (0.67 in)
3. Use hacksaw to cut through approximately half the diameter of valve stem. Make the serration at a point 40 mm (1.57 in) from the end of valve stem.

   (a)  : 40 mm (1.57 in)

4. Cover the serrated end of the valve with a large shop towel (A). Strike the valve face end with a hammer, separating it into two pieces.

5. Fill a bucket, such as a 20 ℓ (5-1/4 US gal, 4-3/8 Imp gal) oil can, with at least 10 ℓ (2-5/8 US gal, 2-1/4 Imp gal) of water. Carefully place the already cut (serrated) valves into the water one-at-a-time using a set of large tweezers and quickly move away at least 2.7 m (9 ft).

6. The valves should be placed in a standing position as shown in the illustration to allow complete reaction. After the bubbling action has subsided, additional valves can be placed into the bucket allowing each subsequent chemical reaction to subside. However, no more than 8 valves should be placed in the same 10 ℓ (2-5/8 US gal, 2-1/4 Imp gal) amount of water. The complete chemical reaction may take as long as 4 to 5 hours. Remove the valves using a set of large tweezers after the chemical reaction has stopped. Afterwards, valves can be disposed as ordinary scrap.

   A  :  Bucket [Such as 20 ℓ (5-1/4 US gal, 4-3/8 Imp gal) oil can]

Parts Requiring Angular Tightening

- Use an angle wrench for the final tightening of the following engine parts:
  - Cylinder head bolts
  - Main bearing cap bolts
  - Connecting rod cap nuts
- Crankshaft pulley bolt (No angle wrench is required as the bolt flange is provided with notches for angular tightening)

- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.

Precaution for Liquid Gasket

REMOVAL OF LIQUID GASKET SEALING
PRECAUTIONS

- After removing the bolts and nuts, separate the mating surface and remove the liquid gasket using Tool (A).

  Tool Number : KV10111100 (J-37228)

CAUTION:
Be careful not to damage the mating surfaces.

- In areas where the cutter is difficult to use, use a plastic hammer to lightly tap (1) the cutter where the liquid gasket is applied. Use a plastic hammer to slide (2) the cutter by tapping on the side.

CAUTION:
Do not damage the mating surfaces.

LIQUID GASKET APPLICATION PROCEDURE

1. Using suitable tool (A), remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
   - Remove liquid gasket completely from the groove of the liquid gasket application surface, mounting bolts, and bolt holes.

2. Thoroughly clean the mating surfaces and remove adhering moisture, grease and foreign materials.

3. Attach liquid gasket tube to the suitable tool.
   Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".

4. Apply liquid gasket without gaps to the specified location according to the specified dimensions.
   - If there is a groove for liquid gasket application, apply liquid gasket to the groove.

   • As for bolt holes (B), normally apply liquid gasket inside the holes. Occasionally, it should be applied outside the holes. Check to read the text of this manual.

   (A) : Groove

   ➔ : Inside

   • Within five minutes of liquid gasket application, install the mating component.
   • If liquid gasket protrudes, wipe it off immediately.
   • Do not retighten mounting bolts or nuts after the installation.
   • After 30 minutes or more have passed from the installation, fill engine oil and engine coolant. Refer to LU-9, "Changing Engine Oil" and CO-12, "Changing Engine Coolant".

CAUTION:
If there are more specific instructions in the procedures contained in this manual concerning liquid gasket application, observe them.
### Special Service Tools

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

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<tr>
<th>Tool number</th>
<th>Description</th>
</tr>
</thead>
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<td>(J-43897-18)</td>
<td>Oxygen sensor thread cleaner Reconditioning the exhaust system threads before installing a new oxygen sensor (Use with anti-seize lubricant shown below.) J-43897-18 (18 mm dia.) for zirconia oxygen sensor</td>
</tr>
<tr>
<td>(J-50288)</td>
<td>Ring gear stopper Removing and installing crankshaft pulley</td>
</tr>
<tr>
<td>16441 6N210 (J-45488)</td>
<td>Quick connector release Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)</td>
</tr>
<tr>
<td>(J-48891)</td>
<td>Spark plug socket Removing and installing spark plug</td>
</tr>
<tr>
<td>KV10111100 (J-37228)</td>
<td>Seal cutter Removing oil pan and timing chain case</td>
</tr>
<tr>
<td>KV991J0050 (J-44626)</td>
<td>Air fuel sensor Socket Loosening or tightening air fuel ratio A/F sensor a: 22 mm (0.87 in)</td>
</tr>
</tbody>
</table>
### Commercial Service Tool

<table>
<thead>
<tr>
<th>Tool number (TechMate No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
</table>
| KV10116200 (J-26336-A)    | Valve spring compressor | Disassembling valve mechanism  
Part (1) is a component of KV10116200 (J-26336-A), but part (2) is not. |
| 1. KV10115900 (J-26336-20) | Attachment | |
| 2. KV10109220              | Adapter   | |
| Manual lift table caddy    |            | Removing and installing engine |

---

**Heated oxygen sensor wrench**

- **KV10114400 (J-38365)**
- Description: Loosening or tightening rear heated oxygen sensor
  - **a**: 22 mm (0.87 in)

**Seal installer**

- **(J-37066)**
- **(J-47128)**

**Valve spring compressor**

- **KV10116200 (J-26336-A)**
- Parts: 1. KV10115900 (J-26336-20) - Attachment, 2. KV10109220 - Adapter
- Description: Disassembling valve mechanism
  - Part (1) is a component of KV10116200 (J-26336-A), but part (2) is not.

**Tightening bolts for bearing cap, cylinder head, etc.**

- **KV10112100 (BT-8653-A)**

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<td>Removing crankshaft pilot converter</td>
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<td>(J-23907)</td>
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<tr>
<td>Pilot converter puller</td>
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<tr>
<td>Tube presser</td>
<td>Pressing the tube of liquid gasket</td>
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<tr>
<td>Piston ring compressor</td>
<td>Installing piston assembly into cylinder bore</td>
</tr>
<tr>
<td>Pulley holder</td>
<td>Crankshaft pulley removing and installing</td>
</tr>
<tr>
<td>Pulley puller</td>
<td>Removing crankshaft pulley</td>
</tr>
<tr>
<td>Valve seat cutter set</td>
<td>Finishing valve seat dimensions</td>
</tr>
<tr>
<td>Piston ring expander</td>
<td>Removing and installing piston ring</td>
</tr>
</tbody>
</table>
## PREPARATION

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<th>Description</th>
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<td>KV10115600</td>
<td>Installing valve oil seal</td>
</tr>
<tr>
<td>(J-38958)</td>
<td>Use side A.</td>
</tr>
<tr>
<td>Valve oil seal drift</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a: 20 (0.79) dia.</td>
</tr>
<tr>
<td></td>
<td>b: 13 (0.51) dia.</td>
</tr>
<tr>
<td></td>
<td>c: 10.3 (0.406) dia.</td>
</tr>
<tr>
<td></td>
<td>d: 8 (0.31) dia.</td>
</tr>
<tr>
<td></td>
<td>e: 10.7 (0.421) dia.</td>
</tr>
<tr>
<td></td>
<td>f: 5 (0.20) dia.</td>
</tr>
<tr>
<td></td>
<td>Unit: mm (in)</td>
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<tr>
<td>KV10107902</td>
<td>Removing valve oil seal</td>
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<tr>
<td>(J-38959)</td>
<td></td>
</tr>
<tr>
<td>Valve oil seal puller with adapter (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a: 9.5 mm (0.374 in) dia.</td>
</tr>
<tr>
<td></td>
<td>b: 5.5 mm (0.217 in) dia.</td>
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<td>Intake &amp; Exhaust:</td>
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<tr>
<td></td>
<td>a: 9.5 mm (0.374 in) dia.</td>
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<tr>
<td></td>
<td>b: 5.5 mm (0.217 in) dia.</td>
</tr>
<tr>
<td></td>
<td>Intake &amp; Exhaust:</td>
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<tr>
<td></td>
<td>d1: 6.0 mm (0.236 in) dia.</td>
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<td></td>
<td>d2: 10.2 mm (0.402 in) dia.</td>
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<td>Lubricating oxygen sensor thread cleaning tool</td>
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<td>when reconditioning exhaust system threads</td>
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<td>Anti-seize lubricant (Permatex 133AR or equivalent meeting MIL specification MIL-A-907)</td>
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</tr>
<tr>
<td></td>
<td>Installing valve oil seal</td>
</tr>
<tr>
<td></td>
<td>Use side A.</td>
</tr>
<tr>
<td></td>
<td>a: 20 (0.79) dia.</td>
</tr>
<tr>
<td></td>
<td>b: 13 (0.51) dia.</td>
</tr>
<tr>
<td></td>
<td>c: 10.3 (0.406) dia.</td>
</tr>
<tr>
<td></td>
<td>d: 8 (0.31) dia.</td>
</tr>
<tr>
<td></td>
<td>e: 10.7 (0.421) dia.</td>
</tr>
<tr>
<td></td>
<td>f: 5 (0.20) dia.</td>
</tr>
<tr>
<td></td>
<td>Unit: mm (in)</td>
</tr>
<tr>
<td>KV10107902</td>
<td>Removing valve oil seal</td>
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<tr>
<td>(J-38959)</td>
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<tr>
<td>Valve oil seal puller with adapter (1)</td>
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<td>Power tool</td>
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<td></td>
<td>Loosening nuts, screws, and bolts</td>
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<td></td>
<td>KV10107902</td>
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<tr>
<td></td>
<td>Removing valve oil seal</td>
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<tr>
<td></td>
<td>KV10115600</td>
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<tr>
<td></td>
<td>Installing valve oil seal</td>
</tr>
<tr>
<td></td>
<td>Use side A.</td>
</tr>
<tr>
<td></td>
<td>a: 20 (0.79) dia.</td>
</tr>
<tr>
<td></td>
<td>b: 13 (0.51) dia.</td>
</tr>
<tr>
<td></td>
<td>c: 10.3 (0.406) dia.</td>
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<tr>
<td></td>
<td>d: 8 (0.31) dia.</td>
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<tr>
<td></td>
<td>e: 10.7 (0.421) dia.</td>
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<td>Unit: mm (in)</td>
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<tr>
<td>KV10107902</td>
<td>Removing valve oil seal</td>
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<td>(J-38959)</td>
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<tr>
<td>Valve oil seal puller with adapter (1)</td>
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<td>Tool number (TechMate No.)</td>
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<table>
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<th>Tool number</th>
<th>Description</th>
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<tr>
<td>ST0501S000</td>
<td>Disassembling and assembling</td>
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<td>Engine stand assembly</td>
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<tr>
<td>1. ST05011000</td>
<td>Engine stand</td>
</tr>
<tr>
<td>2. ST05012000</td>
<td>Base</td>
</tr>
<tr>
<td>KV10106500</td>
<td>Engine supporting</td>
</tr>
<tr>
<td>Engine stand shaft</td>
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</tr>
<tr>
<td>KV10115300</td>
<td>Disassembling and assembling</td>
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<tr>
<td>Engine sub-attachment</td>
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<tr>
<td>(J-45816)</td>
<td>Removing and installing CVT drive plate bolts</td>
</tr>
<tr>
<td>E20 @Socket</td>
<td></td>
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</tbody>
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NVH Troubleshooting - Engine Noise

1. Camshaft bearing noise
2. Piston pin noise
3. Piston slap noise
4. Main bearing noise
5. Connecting rod bearing noise
6. Water pump noise

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### Use the Chart Below to Help You Find the Cause of the Symptom

1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of engine.
4. Check specified noise source. Repair or replace the identified part as necessary.

<table>
<thead>
<tr>
<th>Location of noise</th>
<th>Type of noise</th>
<th>Operating condition of engine</th>
<th>Source of noise</th>
<th>Check item</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of engine</td>
<td>Ticking or clicking</td>
<td>Before warm-up</td>
<td>C</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Rocker cover</td>
<td>Rattle</td>
<td>After warm-up</td>
<td>C</td>
<td>—</td>
<td>A</td>
</tr>
<tr>
<td>Rocker cover</td>
<td>Slap or knock</td>
<td>When starting</td>
<td>—</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Cylinder head</td>
<td>Slap or rap</td>
<td>When idling</td>
<td>—</td>
<td>A</td>
<td>—</td>
</tr>
<tr>
<td>Knock</td>
<td>Knock</td>
<td>When racing</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Knock</td>
<td>Knock</td>
<td>While driving</td>
<td>A</td>
<td>B</td>
<td>—</td>
</tr>
<tr>
<td>Timing chain cover</td>
<td>Tapping or ticking</td>
<td>Before warm-up</td>
<td>A</td>
<td>A</td>
<td>—</td>
</tr>
<tr>
<td>Front of engine</td>
<td>Squeaking or fizzing</td>
<td>After warm-up</td>
<td>A</td>
<td>B</td>
<td>—</td>
</tr>
<tr>
<td>Front of engine</td>
<td>Creaking</td>
<td>When idling</td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Front of engine</td>
<td>Creaking</td>
<td>When idling</td>
<td>A</td>
<td>B</td>
<td>—</td>
</tr>
</tbody>
</table>

A: Closely related  B: Related  C: Sometimes related  —: Not related
Removal and Installation

REMOVAL
1. Remove the ignition coil. Refer to EM-45, "Removal and Installation (LH)" and EM-45, "Removal and Installation (RH)".  
2. Remove the spark plug with the Tool.

   Tool number : (J-48891)

   (a): 14 mm (0.55 in)

INSPECTION AFTER REMOVAL
SPARK PLUG

< PERIODIC MAINTENANCE >

- Do not use a wire brush for cleaning the spark plugs.

- If plug is covered with carbon, a spark plug cleaner may be used.

  Cleaner air pressure : less than 588 kPa (6 kg/cm², 85 psi)
  Cleaning time : less than 20 seconds

- Checking and adjusting spark plug gap is not required between change intervals. Do not adjust the gap; replace the spark plug as necessary if out of specification.

INSTALLATION

Installation is in the reverse order of removal.

<table>
<thead>
<tr>
<th>Make</th>
<th>DENSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type*</td>
<td>FXE22HR11</td>
</tr>
<tr>
<td>Gap (nominal)</td>
<td>1.1 mm (0.043 in)</td>
</tr>
</tbody>
</table>

*: Always check with the Parts Department for the latest parts information.
**Checking Drive Belt**

**WARNING:**
Inspect and check the drive belt with the engine off.

1. Visually check entire drive belt for wear, damage or cracks.
2. Check that the drive belt auto-tensioner indicator is within the possible use range.

**NOTE:**
- When new drive belt is installed, the drive belt auto-tensioner indicator should be within the new drive belt range.
- Check the drive belt auto-tensioner indicator when the engine is cold.
3. If the drive belt auto-tensioner indicator is out of the possible use range or drive belt is damaged, replace drive belt.

**Tension Adjustment**

- Drive belt tension is not manually adjustable, it is automatically adjusted by the drive belt auto-tensioner.

**Removal and Installation**

**REMOVAL**

1. Remove the front wheel and tire (RH) using power tool. Refer to MA-37, "WHEELS : Adjustment".
2. Remove the fender protector side cover (RH). Refer to EXT-28, "Exploded View".
< PERIODIC MAINTENANCE >

3. While securely holding the hexagonal part in pulley center of drive belt auto-tensioner, move in the direction of arrow (loosening direction of drive belt auto-tensioner) using suitable tool.

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

**CAUTION:**
Do not loosen the drive belt auto-tensioner pulley bolt. (Do not turn it counterclockwise. If turned counterclockwise, the complete drive belt auto-tensioner must be replaced as a unit, including pulley.)

4. Insert a rod approximately 6 mm (0.24 in) in diameter through the rear of drive belt auto-tensioner into retaining boss to lock drive belt auto-tensioner pulley.

**NOTE:**
Leave drive belt auto-tensioner pulley arm locked until drive belt is installed.

5. Remove drive belt from crankshaft pulley and then remove it from the other pulleys.

INSTALLATION

1. Install the drive belt onto all of the pulleys.

**CAUTION:**
Confirm belt is completely set on the pulleys.

2. Release drive belt auto-tensioner, and apply tension to drive belt.

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

**CAUTION:**
Do not loosen the drive belt auto-tensioner pulley bolt. (Don’t turn it counterclockwise. If turned counterclockwise, the complete drive belt auto-tensioner must be replaced as a unit, including pulley.)

3. Turn crankshaft pulley clockwise several times to equalize tension between each pulley.

4. Confirm drive belt auto-tensioner indicator is within the possible use range. Refer to EM-16, “Checking Drive Belt”.

5. Install the fender protector side cover (RH). Refer to EXT-28, “Exploded View”.

6. Install the front wheel and tire (RH). Refer to MA-37, “WHEELS : Adjustment”.

Revision: October 2015
1. Drive belt auto-tensioner

REMOVAL

CAUTION:
The complete drive belt auto-tensioner must be replaced as a unit, including the pulley.
1. Remove the drive belt. Refer to EM-16, "Removal and Installation".
2. Remove the drive belt auto-tensioner.

CAUTION:
Do not loosen the drive belt auto-tensioner pulley bolt. (Do not turn it counterclockwise. If turned
clockwise, the complete drive belt auto-tensioner must be replaced as a unit, including pulley).

INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
• If there is damage greater than peeled paint, replace drive belt auto-tensioner unit.
• Do not swap the pulley between the new and old drive belt auto-tensioner units.
• The complete drive belt auto-tensioner must be replaced as a unit, including the pulley.
CHANGING THE AIR CLEANER FILTER
NOTE:
It is not necessary to remove the front air duct to replace the air cleaner filter.
1. Unhook the air cleaner case side clips.
2. Remove the air cleaner filter.
3. Install a new air cleaner filter.
4. Lock the air cleaner case side clips.

| 1. Air duct hose and resonator assembly | 2. Front air duct      | 3. Air cleaner case (lower) |
| A. To electric throttle control actuator| B. Air cleaner case side clips |                           |
CHECKING

NOTE:
• Perform inspection as follows after removal, installation or replacement of camshaft or valve related parts, or if there are unusual engine conditions regarding valve clearance.
• Check valve clearance while engine is cold and not running.

1. Remove the front air duct with air cleaner case, collectors, hoses, wires, harnesses, and connectors. Refer to EM-26, "Removal and Installation".
2. Remove the intake manifold collectors. Refer to EM-27, "Removal and Installation".
3. Remove the ignition coils and spark plugs. Refer to EM-45, "Exploded View".
4. Remove the rocker covers. Refer to EM-51, "Exploded View".
5. Set No.1 cylinder at TDC on its compression stroke.

a. Align pointer with TDC mark (A) on crankshaft pulley.

b. Check that the valve lifters on No.1 cylinder, bank 1 (A) are loose and valve lifters on No.4 are tight. If not, turn the crankshaft one full revolution (360°) and align as shown.
CAMSHAFT VALVE CLEARANCE

< PERIODIC MAINTENANCE >

6. Check only the valves as shown.

<table>
<thead>
<tr>
<th>Crank Position</th>
<th>Valve No. 1</th>
<th>Valve No. 2</th>
<th>Valve No. 3</th>
<th>Valve No. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1 TDC</td>
<td>Intake</td>
<td>Exhaust</td>
<td>Exhaust</td>
<td>Intake</td>
</tr>
</tbody>
</table>

(A). : Bank 1 cylinder head
(B). : Bank 2 cylinder head
(C). : Bank 2 exhaust camshaft
(D). : Bank 2 intake camshaft
(E). : Bank 1 intake camshaft
(F). : Bank 1 exhaust camshaft

\[\leftrightarrow\] : Engine front

6. Check only the valves as shown.

- Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

**Valve clearance** : Refer to EM-139, "General Specification".

- Record any valve clearance measurements which are out of specification. They will be used later to determine the required replacement lifter size.

7. Turn crankshaft 240°.

8. Set No.3 cylinder at TDC on its compression stroke.
9. Check only those valves as shown.

<table>
<thead>
<tr>
<th>Crank Position</th>
<th>Valve No. 2</th>
<th>Valve No. 3</th>
<th>Valve No. 4</th>
<th>Valve No. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 3 TDC</td>
<td>Intake</td>
<td>Intake</td>
<td>Exhaust</td>
<td>Exhaust</td>
</tr>
</tbody>
</table>

(A). : Bank 1 cylinder head  
(B). : Bank 2 cylinder head  
(C). : Bank 2 exhaust camshaft  
(D). : Bank 2 intake camshaft  
(E). : Bank 1 intake camshaft  
(F). : Bank 1 exhaust camshaft  
← : Engine front

10. Turn the crankshaft 240° and align as above.  
11. Set No.5 cylinder at TDC on its compression stroke.  
12. Check only those valves as shown.

<table>
<thead>
<tr>
<th>Crank Position</th>
<th>Valve No. 1</th>
<th>Valve No. 4</th>
<th>Valve No. 5</th>
<th>Valve No. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 5 TDC</td>
<td>Exhaust</td>
<td>Intake</td>
<td>Intake</td>
<td>Exhaust</td>
</tr>
</tbody>
</table>

(A). : Bank 1 cylinder head  
(B). : Bank 2 cylinder head  
(C). : Bank 2 exhaust camshaft  
(D). : Bank 2 intake camshaft  
(E). : Bank 1 intake camshaft  
(F). : Bank 1 exhaust camshaft  
← : Engine front

13. Perform adjustment if the measured values are out of the specification range.  
14. Installation of components is in the reverse order of removal.

**VALVE ADJUSTING**  
**CAUTION:**  
Adjust valve clearance while engine is cold.  
**NOTE:**  
• Perform adjustment by selecting the correct head thickness of the valve lifter (adjusting shims are not used).
The specified valve lifter thickness dimension is measured at room temperature.
Use specifications for hot engine for hot engine condition to confirm valve clearances.

1. Remove the camshaft.
2. Remove the valve lifter that was measured as being outside the standard specifications.
3. Measure the center thickness of the removed lifter with suitable tool (A) as shown.

4. Use the equation below to calculate the replacement valve lifter thickness.

Valve lifter thickness calculation: \( (C_1 - C_2) + t_1 = t \)

- \( C_1 \) = measured valve clearance
- \( C_2 \) = standard valve clearance
- \( t_1 \) = thickness of the removed lifter
- \( t \) = thickness of the replacement lifter

a. The thickness of the new valve lifter can be identified by the stamp mark (A) on the reverse side (inside the lifter).

NOTE:
Available thicknesses of the valve lifters (B) are: 3.00 - 3.50 mm (0.1181 - 0.1378 in), in 0.02 mm (0.0008 in) increments. Refer to EM-140, "Camshaft".

5. Install the selected replacement valve lifter.
6. Install the camshaft.
7. Rotate the crankshaft a few turns by hand.
8. Confirm that the valve clearances are within specification.
9. After the engine has been run to full operating temperature, confirm that the valve clearances are within specification.

<table>
<thead>
<tr>
<th>Standard Valve Clearance</th>
<th>Cold (^1) (reference data)</th>
<th>Hot (^2) (reference data)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
<td>0.26 - 0.34 mm (0.010 - 0.013 in)</td>
<td>0.304 - 0.416 mm (0.012 - 0.016 in)</td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.29 - 0.37 mm (0.011 - 0.015 in)</td>
<td>0.308 - 0.432 mm (0.012 - 0.017 in)</td>
</tr>
</tbody>
</table>

\(^1\) : Approximately 20°C (68°F)
\(^2\) : Approximately 80°C (176°F)
CHECKING COMPRESSION PRESSURE

1. Run the engine until it reaches normal operating temperature.
2. Turn the ignition switch to OFF.
3. Release fuel pressure. Refer to FL-4, "Inspection".
4. Remove all six spark plugs. Refer to EM-14, "Removal and Installation".
5. Attach a compression tester to No. 1 cylinder.

6. Depress accelerator pedal fully to keep the electric throttle control actuator butterfly-valve wide open to maximize air intake flow.
7. Crank the engine and record the highest gauge indication. **CAUTION:** Always use a fully charged battery to obtain specified engine speed.
8. Repeat the test for each cylinder (steps 5 - 7).

<table>
<thead>
<tr>
<th>Standard</th>
<th>Minimum</th>
<th>Differential limit between cylinders</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,275 (13.0, 185) / 300</td>
<td>981 (10.0, 142) / 300</td>
<td>98 (1.0, 14) / 300</td>
</tr>
</tbody>
</table>

- If the engine speed is out of the specified range, check the battery and recharge as necessary. Check the engine speed again with the battery properly charged.
- If some cylinders have low compression pressure, pour a small amount of engine oil into the spark plug hole of the cylinder to recheck it for compression.
- If the added engine oil improves the compression, piston rings may be worn out or damaged. Check the piston rings and replace if necessary.
- If the compression pressure remains at low level despite the addition of engine oil, the valves may be malfunctioning. Check the valves for damage. Replace the valve or valve seat accordingly.
- If two adjacent cylinders have respectively low compression pressure and their compression remains low, even after the addition of engine oil, cylinder head gaskets may be leaking, or a valve in adjacent cylinders may be damaged. Inspect and repair as required.
- If the compression pressure is below the minimum value, check the valve clearances and parts associated with the combustion chamber (valve, valve seat, piston, piston ring, cylinder bore, cylinder head, cylinder head gasket). After the checking, measure the compression pressure again.
9. Installation of the remaining components is in the reverse order of removal.
REMOVAL AND INSTALLATION

ENGINE ROOM COVER

Exploded View

Removal and Installation

REMOVAL

CAUTION:
Do not damage or scratch engine room cover when installing or removing.

1. Remove the engine room cover bolts.
2. Release the engine room locking tabs, then remove the engine room cover.

INSTALLATION

Installation is in the reverse order of removal.

1. Engine room cover
2. Front rocker cover
3. Intake manifold

A. Engine room locking tabs

INFOID:0000000012504438

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EM-25

2016 Maxima NAM
Removal and Installation

**REMOVAL**
1. Remove the front air duct.
2. Disconnect the breather hose.
3. Disconnect the hose from the upper intake manifold.
4. Disconnect the electric throttle control actuator tube clamp and the air duct hose and resonator tube clamp, then remove the air duct hose and resonator assembly.
5. Disconnect mass air flow/intake air temperature sensor electrical connector.
6. Remove mass air flow/intake air temperature from air cleaner case (upper).

CAUTION:
- Handle sensor with care.
- Do not shock it.
- Do not disassemble it.
- Do not touch its sensor.

7. Disconnect transaxle breather hose.
8. Separate the harness connectors from the air cleaner case.
9. Remove air cleaner case assembly.

**INSTALLATION**
Installation is in the reverse order of removal.
WARNING:
To avoid the danger of being scalded, do not drain the coolant when the engine is hot.

CAUTION:
Do not remove power valves.

CAUTION:
Cover any engine openings to avoid the entry of any foreign material.

NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL
1. Remove the cowl top extension. Refer to EXT-25, "Removal and Installation".
2. Remove the engine room cover. Refer to EM-25, "Removal and Installation".
3. Remove front air duct and air duct hose and resonator assembly. Refer to EM-26, "Removal and Installation".
4. Remove the breather hose.
5. Remove the air duct hose.
6. Disconnect the throttle control actuator electrical connector, then remove the electric throttle control actuator bolts in the reverse order as shown. Remove the electric throttle control actuator and position aside.  
   CAUTION:  
   • Handle carefully to avoid any shock to the electric throttle control actuator.  
   • Do not disassemble.
7. Disconnect the power brake booster vacuum hose and the PCV hose.
8. Disconnect the EVAP canister purge volume solenoid hoses, then remove the EVAP canister purge volume solenoid bracket bolts. Position the valves aside.
9. Remove the VIAS control solenoid bolts, disconnect the VIAS electrical connectors and position aside.
10. Loosen the intake manifold collector bolts in the reverse order as shown.
11. Remove the intake manifold collector, then remove and discard the intake manifold collector gasket.

INSTALLATION  
CAUTION:  
Do not reuse intake manifold collector gasket or electric throttle control actuator gasket. Installation is in the reverse order of removal.  
• Tighten intake manifold collector bolts in the order as shown.  

Intake manifold collector nuts and bolts  
11.0 N·m (1.1 kg-m, 8 ft-lb)
Tighten electric throttle control actuator bolts in the order shown.

Electric throttle control actuator bolts 8.4 N·m (0.86 kg-m, 74 in-lb)

**NOTE:**
After installation, it is necessary to re-calibrate the electric throttle control actuator as follows:

1. Perform the “Throttle Valve Closed Position Learning” when harness connector of the electric throttle control actuator is disconnected. Refer to EC-159, "Description".
2. Perform the “Idle Air Volume Learning” when the electric throttle control actuator is replaced. Refer to EC-160, "Description".

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Removal and Installation

REMOVAL

**WARNING:**
To avoid the danger of being scalded, do not drain the coolant when the engine is hot.

**NOTE:**
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

1. Remove fuel injectors and fuel tube. Refer to EM-46, "Removal and Installation".
2. Remove the intake manifold and the intake manifold gaskets. Loosen nuts and bolts in reverse order as shown.

**CAUTION:**
Cover the engine openings to avoid the entry of foreign materials.

**INSPECTION AFTER REMOVAL**

**Surface Distortion**
INTAKE MANIFOLD

< REMOVAL AND INSTALLATION >

• Using straightedge and feeler gauge, inspect the surface distortion of the intake manifold.

    Standard : 0.1 mm (0.004 in)

INSTALLATION

Installation is in the reverse order of removal. Follow the procedure below for specific tightening sequences and procedures.

CAUTION:

Do not reuse intake manifold gaskets.

• Install intake manifold nuts and bolts in two steps in the numerical order as shown.

    Step 1 : 7.4 N·m (0.75 kg-m, 65 in-lb)
    Step 2 : 25.5 N·m (2.6 kg-m, 19 ft-lb)

INSPECTION AFTER INSTALLATION

Make sure there are no fuel leaks at the 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.

WARNING:

Do not touch engine immediately after stopping as engine is extremely hot.

NOTE:

Use mirrors for checking on connections out of the direct line of sight.
Removal and Installation (bank 2)

REMOVAL

WARNING:
• Perform the work when the exhaust system has completely cooled down.
• When removing the front and rear engine mounting through bolts and nuts, lift the engine up slightly for safety.

NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

1. Remove the radiator. Refer to CO-14, "Removal and Installation".
2. Remove the three way catalyst. Refer to EM-36, "Removal and Installation (bank 2)".
3. Loosen and remove the exhaust manifold nuts in the reverse order as shown.

   NOTE:
   Number 7 and 8 are not applicable to removal.
4. Remove the exhaust manifold (bank 2) and gasket.

INSPECTION AFTER REMOVAL
Surface Distortion
• Use suitable tools (A/B) to check the flatness of the exhaust manifold mating surfaces.

   Limit : 0.3 mm (0.012 in)
• Replace the exhaust manifold if the measurement exceeds specifications.

INSTALLATION
Installation is in the reverse order of removal.
1. Install the studs in the exhaust manifold (if removed), and tighten to specification.

   Exhaust manifold studs : 15.4 N·m (1.6 kg-m, 11 ft-lb)
2. Install the exhaust manifold gasket in the direction shown.
   CAUTION:
   Do not reuse exhaust manifold gaskets.

   (A) : Bank 1
   (B) : Triangle press
   (C) : Bank 2
   : Engine front

3. Install the exhaust manifold (bank 2) nuts and tighten to specification in the order shown.

   : Engine front

   NOTE:
   Number 7 and 8 are tightened a second time.
EXHAUST MANIFOLD AND THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

CAUTION:
• Before installing a heated oxygen sensor 2 or air fuel ratio (A/F) sensor 1, clean the exhaust manifold threads using the oxygen sensor thread cleaner tool and apply anti-seize lubricant.

Oxygen sensor thread cleaner : (J-43897-18)
Oxygen sensor thread cleaner : (J-43897-12)

• Do not over-tighten the air fuel ratio (A/F) sensor 1 or heated oxygen sensors 2. Doing so may cause damage.

Tool numbers
: KV10114400 (J-38365)
: KV991J0050 (J-44626)

Removal and Installation (bank 1)

REMOVAL

WARNING:
• Perform the work when the exhaust and cooling system have completely cooled down.
• When removing the front and rear engine mounting through bolts and nuts, lift the engine up slightly for safety.

1. Remove the engine and transaxle assembly. Refer to EM-107, "Removal and Installation".
2. Remove the three way catalyst support (bank 1).
3. Remove rear engine mount bracket. Refer to EM-107, "Removal and Installation".
4. Remove heated oxygen sensor 2 (bank 1), air fuel ratio (A/F) sensor 1 (bank 1).
   a. Remove harness connector from heated oxygen sensor 2 (bank 1) and air fuel ratio (A/F) sensor 1, and disconnect the harness from the bracket and middle clamp.
   b. Remove both heated oxygen sensors 2 (bank 1) and air fuel ratio (A/F) sensors 1 using Tool.

Tool numbers
: KV10114400 (J-38365)
: KV991J0050 (J-44626)

CAUTION:
• Be careful not to damage heated oxygen sensors 2 or air fuel ratio (A/F) sensors 1.
• Discard any heated oxygen sensor 2 which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; replace with a new sensor.

5. Remove exhaust manifold heat shield (bank 1) and three way catalyst heat shields (bank 1) using power tool.
6. Remove the three way catalyst (bank 1) by loosening the bolts first and then removing the nuts and through bolts.
7. Loosen the exhaust manifold nuts in the reverse order as shown and remove the exhaust manifold (bank 1).

NOTE:
Number 7 and 8 are not applicable to removal.

INSPECTION AFTER REMOVAL
Surface Distortion

INFOID:0000000011933755
• Use suitable tools (A/B) to check the flatness of the exhaust manifold mating surfaces.

  Limit : 0.3 mm (0.012 in)

• Replace the exhaust manifold if the measurement exceeds specifications.

INSTALLATION
Installation is in the reverse order of removal.

CAUTION:
Do not reuse exhaust manifold gaskets.

• Install the exhaust manifold nuts in the order as shown (A).

NOTE:
Number 7 and 8 are tightened a second time.

CAUTION:
• Before installing a heated oxygen sensor 2 or air fuel ratio (A/F) sensor 1, clean the exhaust manifold threads using the oxygen sensor thread cleaner tool, and apply anti-seize lubricant.

  Tool numbers : J-43897-18
  : J-43897-12

• Do not over-tighten the air fuel ratio (A/F) sensor 1 or heated oxygen sensors 2. Doing so may cause damage.

  Tool numbers : KV10114400 (J-38365)
  : KV991J0050 (J-44626)
< REMOVAL AND INSTALLATION >

THREE WAY CATALYST

Exploded View

Removal and Installation (bank 2)

REMOVAL

WARNING:
Perform the work when the exhaust system has completely cooled down.

NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

1. Remove the radiator cooling fan assembly. Refer to CO-16, "Removal and Installation".
THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

2. Remove hoodledge covers (LH/RH).
3. Remove radiator hose (upper). Refer to CO-25, "Exploded View".
4. Remove heater pipe. Refer to CO-25, "Exploded View".
5. Remove water bypass pipe. Refer to CO-25, "Exploded View".
6. Remove heater hose.
7. Remove engine under cover. Refer to EXT-16, "Exploded View".
8. Remove the front exhaust pipe. Refer to EX-5, "Exploded View".
9. Remove the three way catalyst support (bank 2).
10. Disconnect harness connectors from heated oxygen sensor 2 (bank 2) and air fuel ratio (A/F) sensor 1 (bank 2).
11. Remove heated oxygen sensor 2 (bank 2) (if necessary), using suitable tool.

CAUTION:
• Be careful not to damage heated oxygen sensor 2 (bank 2).
• Discard any heated oxygen sensor 2 which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; replace with a new sensor.

12. Remove exhaust manifold heat shield (bank 2).
13. Remove the three way catalyst (bank 2) by loosening the bolts first and then removing the nuts and through bolts.
14. Remove the three way catalyst (bank 2) heat shield (if necessary).

INSTALLATION
Installation is in the reverse order of removal.

CAUTION:
• Before installing heated oxygen sensor 2 (bank 2), clean the exhaust manifold threads using the oxygen sensor thread cleaner tool and apply anti-seize lubricant.

Oxygen sensor thread cleaner : (J-43897-18)

• Do not over-tighten the heated oxygen sensor 2 (bank 2). Doing so may cause damage.

NOTE:
After installation, it is necessary to re-calibrate the electric throttle control actuator as follows:
• Perform the "Throttle Valve Closed Position Learning" when harness connector of the ECM is disconnected. Refer to EC-159, "Description".
• Perform the "Accelerator Pedal Released Position Learning" when harness connector of the ECM is disconnected. Refer to EC-158, "Description".

Removal and Installation (bank 1)

REMOVAL

WARNING:
• Perform the work when the exhaust system has completely cooled down.
• When removing the front and rear engine mounting through bolts and nuts, lift the engine up slightly for safety.

NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

1. Remove hoodledge covers (LH/RH).
2. Remove intake manifold collector. Refer to EM-27, "Removal and Installation".
3. Remove the front fender protector side cover. Refer to EXT-28, "Exploded View".
4. Remove drive shaft (RH). Refer to FAX-20, "Removal and Installation (RH)".
5. Remove the front exhaust tube. Refer to EX-5, "Exploded View".
6. Disconnect harness connectors from heated oxygen sensor 2 (bank 1) and air fuel ratio (A/F) sensor 1 (bank 1).
7. Remove heated oxygen sensor 2 (bank 1) (if necessary), using suitable tool.

CAUTION:
• Be careful not to damage heated oxygen sensor 2 (bank 1).
THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

• Discard any heated oxygen sensor 2 which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; replace with a new sensor.

8. Remove exhaust manifold heat shield (bank 1).
9. Remove the three way catalyst support (bank 1).
10. Remove the three way catalyst (bank 1) by loosening the bolts first and then removing the nuts and through bolts.
11. Remove the three way catalyst (bank 1) heat shield (if necessary).

INSTALLATION
Installation is in the reverse order of removal.

CAUTION:
• Before installing heated oxygen sensor 2 (bank 1), clean the exhaust manifold threads using the oxygen sensor thread cleaner tool and apply anti-seize lubricant.

   Oxygen sensor thread cleaner  : (J-43897-18)

• Do not over-tighten the heated oxygen sensor 2 (bank 1). Doing so may cause damage.

NOTE:
After installation, it is necessary to re-calibrate the electric throttle control actuator as follows:
• Perform the "Throttle Valve Closed Position Learning" when harness connector of the electric throttle control actuator is disconnected. Refer to EC-159, "Description".
• Inspect CVT fluid level. Refer to TM-184, "Inspection".
Removal and Installation (Lower Oil Pan)

**WARNING:**
- Do not remove the oil pan until the exhaust system and cooling system have completely cooled off.

1. Drain the engine oil. Refer to LU-9, "Changing Engine Oil".
2. Loosen the lower oil pan bolts in the reverse order as shown.
3. Remove the lower oil pan.

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OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

a. Insert Tool (A) between the lower oil pan and the upper oil pan.

    Tool number : KV10111100 (J-37228)

    CAUTION:
    • Be careful not to damage the mating surface.
    • Do not insert a screwdriver or similar tool, this will damage the mating surfaces.

b. In areas where the cutter is difficult to use, use a plastic hammer to lightly tap (1) the cutter where the liquid gasket is applied. Use a plastic hammer to slide (2) the cutter by tapping on the side.

4. If re-installing the original lower oil pan, remove the old liquid gasket from the mating surfaces using a scraper.
   • Also remove the old liquid gasket from mating surface of the upper oil pan.
   • Remove the old liquid gasket from the bolt holes and threads.

    CAUTION:
    Do not scratch or damage the mating surfaces when cleaning off the old liquid gasket.

INSPECTION AFTER REMOVAL
Clean oil strainer if any object is attached.

INSTALLATION

1. Apply a continuous bead of liquid gasket to the lower oil pan groove (A) and bolt hole (B) as shown.
   • Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".
   • Be sure the liquid gasket is 4.5 - 5.5 mm (0.177 - 0.217 in) wide.
   • Installation must be done within 5 minutes after applying liquid gasket.

2. Install the lower oil pan. Tighten the lower oil pan bolts in order as shown.
   • Wait at least 30 minutes before refilling the engine with oil.

INSPECTION AFTER INSTALLATION
• Start the engine and check for leaks.
• Inspect the engine oil level. Refer to LU-8, "Inspection".

Removal and Installation (Upper Oil Pan)

INFOID:0000000012229528

REMOVAL

WARNING:
• Do not remove the oil pan until the exhaust system and cooling system have completely cooled off.
• When removing the front and rear engine through bolts and nuts, lift the engine up slightly for safety.
  For engine slingers, refer to EM-107, "Removal and Installation".

CAUTION:
When removing the upper oil pan from the engine, first remove the crankshaft position sensor (POS). Be careful not to damage sensor edges or signal plate teeth.

NOTE:
OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

1. Remove the engine from the vehicle. Refer to EM-107, "Removal and Installation".
2. Drain the engine oil. Refer to LU-9, "Changing Engine Oil".
3. Remove the oil level gauge guide.
4. Remove the drive belt. Refer to EM-16, "Removal and Installation".
5. Disconnect the A/C compressor harness connector.
6. Remove the A/C compressor bolts and remove the A/C compressor. Refer to HA-34, "Removal and Installation".
7. Remove the drive plate. Refer to EM-115, "Exploded View".
8. Remove coolant pipe bolts. Refer to CO-25, "Exploded View".
9. Disconnect the coolant lines from the engine oil cooler.
10. Remove the oil filter and engine oil cooler from the upper oil pan.
11. Remove the oil pressure sensor, and the crankshaft position sensor (POS) from the upper oil pan.
12. Remove the lower oil pan. Refer to EM-39, "Removal and Installation (Lower Oil Pan)".
13. Remove the upper oil pan.
   a. Loosen the bolts in the order as shown, using power tool.
   b. Insert a suitable tool (A) into the notch (B) of the upper oil pan (1) as shown.
   c. Pry off the upper oil pan (1) by moving the suitable tool up and down (2) as shown.

14. Remove the O-rings (2) from the bottom of the cylinder block (1) and oil pump housing. Use new O-rings for installation.

CAUTION:
Do not reuse O-rings.
OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

15. Remove front cover gasket (A) and rear oil seal retainer gasket (B).

CAUTION:
Do not reuse gaskets.

16. Remove the oil strainer.

17. If reinstalling the original oil pan, remove the old sealant from the mating surfaces using a suitable tool (A).
   • Also remove the old sealant from mating surface of the cylinder block.
   • Remove the old sealant from the bolt holes and threads.

CAUTION:
Do not scratch or damage the mating surfaces when cleaning off the old sealant.

INSPECTION AFTER REMOVAL
Clean oil strainer if any object is attached.

INSTALLATION

1. Install oil strainer and tighten bolts to specified torque. Refer to EM-39, "Exploded View".

2. Apply Genuine Silicone RTV Sealant or equivalent (A) to the front cover gasket and the rear oil seal retainer gasket as shown. Refer to GI-22, "Recommended Chemical Products and Sealants".

CAUTION:
• Installation should be done within 5 minutes after applying liquid gasket.
• Do not fill the engine with oil for at least 30 minutes after the components are installed to allow the sealant to cure.

3. Install the front cover gasket (A) and rear oil seal retainer gasket (B) as shown.

CAUTION:
Do not reuse front cover gasket or rear oil seal retainer gasket.
4. Apply a bead of sealant to the cylinder block mating surface of the upper oil pan as shown.

**CAUTION:**
- Installation should be done within 5 minutes after applying liquid gasket.
- Do not fill the engine with oil for at least 30 minutes after the components are installed to allow the sealant to cure.

**NOTE:**
- Apply liquid gasket to the outside of bolt holes 5, 6, 10, 11 and 12.
- Apply liquid gasket to the inside of the other bolt holes.

   a. Be sure the sealant is applied 5.0 mm (0.197 in) as shown (A). Increase the bead to 4.5 - 5.5 mm (0.177 - 0.217 in) at the four places indicated (B).

   b. Use Genuine Silicone RTV Sealant, or equivalent at groove (A) and bolt hole (B) as shown. Refer to GI-22, "Recommended Chemical Products and Sealants".

5. Install new O-rings (2) on the cylinder block (1) and oil pump body.

**CAUTION:**
Do not reuse O-rings.

6. Install the upper oil pan.
   - Tighten upper oil pan bolts in the order as shown.

**CAUTION:**
Do not fill the engine with oil for at least 30 minutes after the components are installed to allow the sealant to cure.

7. Install the lower oil pan. Refer to EM-39, "Removal and Installation (Lower Oil Pan)".

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

**INSPECTION AFTER INSTALLATION**
- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If there is less than required quantity, fill to the specified level. Refer to MA-16, "FOR USA AND CANADA : Fluids and Lubricants" or MA-17, "FOR MEXICO : Fluids and Lubricants".
- Use procedure below to check for fuel leaks.
- Turn ignition switch ON (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leaks at connection points.
- Start engine. With engine speed increased, check again for fuel leaks at connection points.
OIL PAN AND OIL STRAINER

< REMOVAL AND INSTALLATION >

• Run engine to check for unusual noise and vibration.

NOTE:
If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.
• Warm up engine thoroughly to make sure there is no leaks of fuel, exhaust gas, or any oils/fluids including engine oil and engine coolant.
• Bleed air from passages in lines and hoses, such as in cooling system.
• After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to specified level, if necessary.
• Summary of the inspection items:

<table>
<thead>
<tr>
<th>Item</th>
<th>Before starting engine</th>
<th>Engine running</th>
<th>After engine stopped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine coolant</td>
<td>Level</td>
<td>leaks</td>
<td>Level</td>
</tr>
<tr>
<td>Engine oil</td>
<td>Level</td>
<td>leaks</td>
<td>Level</td>
</tr>
<tr>
<td>Transmission/ transaxle fluid</td>
<td>A/T and CVT Models</td>
<td>leaks</td>
<td>Level/leaks</td>
</tr>
<tr>
<td></td>
<td>M/T Models</td>
<td>Level/leaks</td>
<td>leaks</td>
</tr>
<tr>
<td>Other oils and fluids*</td>
<td>Level</td>
<td>leaks</td>
<td>Level</td>
</tr>
<tr>
<td>Fuel</td>
<td>leaks</td>
<td>leaks</td>
<td>leaks</td>
</tr>
<tr>
<td>Exhaust gas</td>
<td>—</td>
<td>leaks</td>
<td>—</td>
</tr>
</tbody>
</table>

*Power steering fluid, brake fluid, etc.
Removal and Installation (LH)

REMOVAL
1. Remove engine room cover. Refer to EM-25, "Removal and Installation".
2. Disconnect ignition coil harness connector.
3. Remove the ignition coil.
   **CAUTION:**
   Do not shock ignition coil.

INSTALLATION
Installation is in the reverse order of removal.

Removal and Installation (RH)

REMOVAL
1. Remove the intake manifold collector. Refer to EM-27, "Removal and Installation".
2. Disconnect ignition coil harness connector.
3. Remove the ignition coil.
   **CAUTION:**
   Do not shock ignition coil.

INSTALLATION
Installation is in the reverse order of removal.
REMVAL

WARNING:
• Put a “CAUTION: FLAMMABLE” sign in the workshop.
• Be sure to work in a well ventilated area and furnish workshop with a CO2 fire extinguisher.
• Do not smoke while servicing fuel system. Keep open flames and sparks away from the work area.
• To avoid the danger of being scalded, do not drain engine coolant when engine is hot.

CAUTION:
• Apply new engine oil when installing the parts as specified to do so.
• Do not remove or disassemble parts unless instructed as shown.

NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

1. Release the fuel pressure. Refer to EC-168, "Work Procedure".
2. Disconnect the battery negative terminal. Refer to PG-106, "Exploded View".
3. Remove intake manifold collector. Refer to EM-27, "Removal and Installation".

1. Fuel feed hose 2. Quick connector cap 3. Fuel tube
10. O-ring (green) A. Refer to INSTALLATION
4. When separating fuel feed hose and fuel tube connection, disconnect quick connector using tool as follows:

   Tool number : 16441 6N210 (J-45488)

   a. Remove quick connector cap from quick connector.
   b. Disconnect quick connector from fuel tube as follows:
      CAUTION:
      Disconnect quick connector by special service tool, not by picking out retainer tabs.
      i. With the sleeve side of Tool facing toward the quick connector, install the Tool onto fuel tube.
      ii. Insert the Tool (A) into quick connector (2) until sleeve (B) contacts and goes no further. Hold Tool on that position.

      (C) : Insert and retain

      CAUTION:
      Inserting Tool hard will not disconnect quick connector. Hold quick connector release where it contacts and goes no further.

      iii. Draw and pull out quick connector straight from fuel tube (1).
      CAUTION:
      • Do not reuse O-ring.
      • Pull quick connector (E) holding position (D) as shown.
      • Do not pull with lateral force applied. O-ring inside quick connector may be damaged.
      • Prepare container and cloth beforehand as fuel will leak out.
      • Avoid fire and sparks.
      • Keep parts away from heat source. Especially, be careful when welding is performed around them.
      • Do not expose parts to battery electrolyte or other acids.
      • Do not bend or twist connection between quick connector and fuel feed hose (with damper) during installation/removal.
      • To keep clean the connecting portion and to avoid damage and foreign materials, cover them completely with plastic bags, etc. (A) or something similar.

5. Disconnect harness connector from fuel injector.
6. Loosen bolts in reverse order as shown, and remove fuel tube and fuel injector assembly.

   : Engine front

   CAUTION:
   Do not tilt fuel tube, or remaining fuel in pipes may flow out from pipes.

7. Remove fuel injector from fuel tube as follows:
FUEL INJECTOR AND FUEL TUBE

< REMOVAL AND INSTALLATION >

a. Open and remove clip (1).

(3) : O-ring (green)
(4) : O-ring (black)
(A) : Installed condition
(B) : Clip groove

b. Remove fuel injector (2) from fuel tube (5) by pulling straight.

CAUTION:
- Do not reuse O-rings.
- Be careful with remaining fuel that may go out from fuel tube.
- Be careful not to damage injector nozzle during removal.
- Do not bump or drop fuel injector.
- Do not disassemble fuel injector.

8. Remove fuel damper from fuel tube, (if necessary).

INSTALLATION

1. Install fuel damper as follows:

a. Install new O-ring (2) to fuel tube (1) as shown. When handling new O-ring, be careful of the following:

CAUTION:
- Do not reuse O-ring.
- Handle O-ring with bare hands. Do not wear gloves.
- Lubricate O-ring with new engine oil.
- Do not clean O-ring with solvent.
- Check that O-ring and its mating part are free of foreign material.
- When installing O-ring, be careful not to scratch it with tool or fingernails. Also be careful not to twist or stretch O-ring. If O-ring was stretched while it was being attached, do not insert it quickly into fuel tube.
- Insert new O-ring straight into fuel tube. Do not twist it.

b. Install spacer (3) to fuel damper (4).

c. Insert fuel damper straight into fuel tube.

CAUTION:
- Insert straight, checking that the axis is lined up.
- Do not pressure-fit with excessive force.

Reference value : 130 N (13.3 kg, 29.2 lb)

- Insert fuel damper until (B) is touching (A) of fuel tube.

2. Install new O-rings to fuel injector paying attention to the following.

CAUTION:
- Do not reuse O-rings.
- Upper and lower O-rings are different. Be careful not to confuse them.

Fuel tube side : Black
Nozzle side : Green

- Handle O-ring with bare hands. Do not wear gloves.
- Lubricate O-ring with new engine oil.
- Do not clean O-ring with solvent.
- Check that O-ring and its mating part are free of foreign material.
- When installing O-ring, be careful not to scratch it with tool or fingernails. Also be careful not to twist or stretch O-ring. If O-ring was stretched while it was being attached, do not insert it quickly into fuel tube.
- Insert O-ring straight into fuel injector. Do not twist it.
3. Install fuel injector to fuel tube as follows:
   a. Insert clip (3) into clip groove (F) on fuel injector (5).
   - Insert clip so that protrusion (E) of fuel injector matches cutout (C) of clip.
   \[ \textbf{CAUTION:} \]
   - Do not reuse O-rings.
   - Do not reuse clip. Replace it with new one.
   - Be careful to keep clip from interfering with O-ring. If interference occurs, replace O-ring.
   b. Insert fuel injector into fuel tube (1) with clip attached.
   - Insert it while matching it to the axial center.
   - Insert fuel injector so that protrusion (A) of fuel tube matches cutout (B) of clip.
   - Check that fuel tube flange (G) is securely fixed in flange fixing groove (D) on clip.
   c. Check that installation is complete by checking that fuel injector does not rotate or come off.
   - Check that protrusions of fuel injectors and fuel tubes are aligned with cutouts of clips after installation.

4. Install fuel tube and fuel injector assembly to intake manifold.
   \[ \textbf{CAUTION:} \]
   - Be careful not to let tip of injector nozzle come in contact with other parts.
   - Tighten bolts in two steps in numerical order as shown.
   - : Engine front
   - 1st step : 10.1 N·m (1.0 kg-m, 7 ft-lb)
   - 2nd step : 22.0 N·m (2.2 kg-m, 16 ft-lb)

6. Install intake manifold collector. Refer to EM-27, "Removal and Installation".
7. Connect quick connector between fuel feed hose and fuel tube connection with the following procedure:
   a. Check no foreign substances are deposited in and around fuel tube and quick connector, and that there is no damage on them.
   b. Thinly apply new engine oil around fuel tube from tip end to spool end.
   c. Align center to insert quick connector straight into fuel tube.
      - Insert quick connector (1) to fuel tube until top spool (2) is completely inside quick connector, and 2nd level spool (3) exposes right below quick connector.
      \[ \textbf{CAUTION:} \]
      - Do not reuse O-ring.
      - Hold (A) position as shown when inserting fuel tube into quick connector.
FUEL INJECTOR AND FUEL TUBE

< REMOVAL AND INSTALLATION >

- Carefully align center to avoid inclined insertion to prevent damage to O-ring inside quick connector.
- Insert until you hear a “click” sound and actually feel the engagement.
- To avoid misidentification of engagement with a similar sound, be sure to perform the next step.

d. Pull quick connector by hand holding position. Check it is completely engaged (connected) so that it does not come out from fuel tube.

e. Install quick connector cap (3) to quick connector.

(1) : Fuel feed hose
(2) : Fuel tube
(B) : Upper view

- Install quick connector cap with arrow (A) on surface facing in direction of quick connector (fuel feed hose side).

CAUTION:
If quick connector cap cannot be installed smoothly, quick connector may have not been installed correctly. Check connection again.

f. Secure fuel feed hose to clamp of quick connector cap.

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

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.

WARNING:
Do not touch engine immediately after stopping as engine is extremely hot.

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

Inspection

INSPECTION AFTER INSTALLATION
Check For Fuel Leaks

1. Turn ignition switch “ON” with the engine stopped. With fuel pressure applied to fuel piping, check for fuel leaks at connection points. Repair as necessary.

NOTE:
Use mirrors for checking at points out of clear sight.

2. Start the engine. With engine speed increased, check again for fuel leaks at connection points. Repair as necessary.

CAUTION:
Do not touch the engine immediately after stopped, as the engine becomes extremely hot.
Removal and Installation (LH)

REMOVAL
1. Remove the engine room cover. Refer to EM-25, "Removal and Installation".
2. Remove front air duct. Refer to EM-26, "Removal and Installation".
3. Remove blow by hose from rocker cover.
4. Remove camshaft position sensors.  
   **CAUTION:**
   - Handle carefully to avoid dropping and shocks.
   - Do not disassemble.
   - Do not allow metal powder to adhere to magnetic part at sensor tip (A).
   - Do not place sensors in a location where they are exposed to magnetism.

5. Remove the ignition coils. Refer to EM-45, "Removal and Installation (LH)".  
   **CAUTION:**
   Do not shock ignition coils.
ROCKER COVER

< REMOVAL AND INSTALLATION >

6. Remove oil level gauge guide.
7. Remove (LH) rocker cover bolts from cylinder head in the reverse order as shown.

\[ \Rightarrow \text{: Engine front} \]
8. Remove the rocker cover and gasket.

INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
Do not reuse rocker cover gasket.

- Apply sealant to the areas on the front corners using a suitable tool.
- Use Genuine Silicone RTV Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".

CAUTION:
- Installation should be done within 5 minutes after applying liquid gasket.
- Do not fill the engine with oil for at least 30 minutes after the components are installed to allow the sealant to cure.

- Tighten the rocker cover bolts in two steps in the order shown.

\[ \Rightarrow \text{: Engine front} \]

Rocker cover bolts
Step 1 : 1.96 N·m (0.20 kg-m, 17 in-lb)
Step 2 : 8.33 N·m (0.85 kg-m, 74 in-lb)

Removal and Installation (RH)

REMOVAL
1. Remove the engine room cover. Refer to EM-25, "Removal and Installation".
ROCKER COVER

< REMOVAL AND INSTALLATION >

2. Remove the front air duct and air duct hose and resonator assembly. Refer to EM-26, "Removal and Installation".

3. Remove the intake manifold collector. Refer to EM-30, "Removal and Installation".

4. Remove ignition coils. Refer to EM-45, "Removal and Installation (RH)".
   **CAUTION:**
   Do not shock ignition coils.

5. Remove camshaft position sensors.
   **CAUTION:**
   • Handle carefully to avoid dropping and shocks.
   • Do not disassemble.
   • Do not allow metal powder to adhere to magnetic part at sensor tip (A).
   • Do not place sensors in a location where they are exposed to magnetism.

6. Remove RH rocker cover bolts from cylinder head in the reverse order as shown.

   ↔ : Engine front

7. Remove the rocker cover and gasket.

INSTALLATION

Installation is in the reverse order of removal.

**CAUTION:**
Do not reuse gaskets.

• Apply sealant to the areas on the front corners using a suitable tool.

• Use Genuine Silicone RTV Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".

**CAUTION:**
• Installation should be done within 5 minutes after applying liquid gasket.
• Do not fill the engine with oil for at least 30 minutes after the components are installed to allow the sealant to cure.
ROCKER COVER

< REMOVAL AND INSTALLATION >

- Tighten the rocker cover bolts in two steps in the order shown.

← : Engine front

Rocker cover bolts

Step 1 : 1.96 N·m (0.20 kg-m, 17 in-lb)
Step 2 : 8.33 N·m (0.85 kg-m, 74 in-lb)
VALVE TIMING CONTROL

VALVE TIMING CONTROL

Exploded View

1. Front timing chain case
2. Valve timing control cover gasket (bank 1)
3. O-ring
4. O-ring
5. Intake valve timing intermediate lock control solenoid valve (bank 1)
6. Exhaust valve timing control solenoid valve (bank 1)
7. Intake valve timing control solenoid valve (bank 1)
8. Valve timing control cover (bank 1)
9. Valve timing control cover (bank 2)
10. Intake valve timing control solenoid (bank 2)
11. Exhaust valve timing control solenoid (bank 2)
12. Intake valve timing intermediate lock control solenoid valve (bank 2)
13. Valve timing control cover gasket (bank 2)

Valve Timing Control Cover (bank 1)

REMOVAL

1. Disconnect battery negative terminal. Refer to PG-101, "Exploded View".
2. Remove core support cover. Refer to EXT-22, "Exploded View".

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3. Remove front air duct. Refer to EM-26, "Removal and Installation".
4. Remove cowl top and cowl top extension. Refer to EXT-25, "Removal and Installation".
5. Remove coolant reservoir tank. Refer to CO-14, "Exploded View".
6. Remove power steering oil pump. Refer to ST-43, "Removal and Installation".
7. Support engine (1) and transaxle (2) using suitable jack (A).
   **CAUTION:**
   - Position a suitable jack under the engine and transaxle assembly as shown.
   - Do not damage the front exhaust tube or transaxle oil pan with the jack.

8. Remove upper torque rod, engine mounting insulator (RH), and engine mounting bracket (RH). Refer to EM-107, "Removal and Installation".
9. Disconnect intake valve timing intermediate lock control solenoid valve (bank 1) harness connector.
10. Disconnect exhaust valve timing control solenoid valve (bank 1) harness connector.
11. Disconnect intake valve timing control solenoid valve (bank 1) harness connector.
12. Remove intake valve timing intermediate lock control solenoid valve (bank 1), exhaust valve timing control solenoid valve (bank 1), and intake valve timing control solenoid valve (bank 1) from valve timing control cover (bank 1).
   **CAUTION:**
   Do not reuse O-rings.
13. Remove valve timing control cover (bank 1).

**INSTALLATION**

- Install valve timing control cover (bank 1). Refer to EM-55, "Exploded View".
- Tighten the timing cover bolts (A) in the order shown.
- Installation of remaining components is in the reverse order of removal.
  **CAUTION:**
  - Do not reuse O-rings.
  - Lubricate O-rings with clean engine oil prior to installation.

**Valve Timing Control Cover (bank 2)**

**REMOVAL**

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VALVE TIMING CONTROL

< REMOVAL AND INSTALLATION >

1. Disconnect battery negative terminal. Refer to PG-106, "Exploded View".
2. Remove core support cover. Refer to EXT-22, "Exploded View".
3. Remove front air duct. Refer to EM-26, "Removal and Installation".
4. Remove coolant reservoir tank. Refer to CO-14, "Exploded View".
5. Remove power steering oil pump. Refer to ST-43, "Removal and Installation".
6. Disconnect intake valve timing intermediate lock control solenoid valve (bank 2) harness connector.
7. Disconnect exhaust valve timing control solenoid valve (bank 2) harness connector.
8. Disconnect intake valve timing control solenoid valve (bank 2) harness connector.
9. Remove intake valve timing intermediate lock control solenoid valve (bank 2), exhaust valve timing control solenoid valve (bank 2), and intake valve timing control solenoid valve (bank 2) from valve timing control cover (bank 2).

**CAUTION:**
Do not reuse O-rings.

10. Remove valve timing control cover (bank 2).

INSTALLATION

• Install valve timing control cover (bank 2).
• Install the valve timing control cover bolts (A) and tighten as shown.
• Installation of remaining components is in the reverse order of removal.

**CAUTION:**
• Do not reuse O-rings.
• Lubricate O-rings with clean engine oil prior to installation.
Front Timing Chain Case

Exploded View

Removal and Installation

NOTE:
- This section describes the procedure for removal/installation of the front timing chain case without removing the engine from the vehicle.
- When rear timing chain case must be removed, remove the engine from the vehicle. Refer to EM-107, "Removal and Installation". Then remove front timing chain case, timing chain related parts, and rear timing chain case in this order, and install in reverse order of removal.
- When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL
1. Drain the engine coolant from the radiator. Refer to CO-12, "Changing Engine Coolant".
2. Drain the engine oil. Refer to LU-9, "Changing Engine Oil".
3. Remove the drive belt auto tensioner. Refer to EM-18, "Removal and Installation of Drive Belt Auto-tensioner".
4. Remove the generator. Refer to CHG-28, "Removal and Installation".
5. Remove the generator bracket. Refer to CHG-28, "Removal and Installation".
6. Remove valve timing control cover (bank 1). Refer to EM-55, "Valve Timing Control Cover (bank 1)".
7. Remove valve timing control cover (bank 2). Refer to EM-56, "Valve Timing Control Cover (bank 2)".
8. Remove cowl top, cowl top extension, and cowl top brace (RH). Refer to EXT-25, "Removal and Installation".
9. Remove upper radiator hose. Refer to CO-14, "Exploded View".
10. Remove lower radiator hose. Refer to CO-14, "Exploded View".
11. Disconnect the A/C tubes from the A/C compressor and position aside. Refer to HA-36, "Exploded View".
12. Disconnect the harness connector from the electronic controlled engine mount control solenoid valve.
13. Disconnect the vacuum tube from the electronic controlled engine mount control solenoid valve.
14. Remove the electronic controlled engine mount control solenoid valve.
15. Remove the rocker covers, if necessary. Refer to EM-51, "Removal and Installation (LH)" (bank 2) and EM-52, "Removal and Installation (RH)" (bank 1).

**NOTE:**
Necessary only when removing timing chains.

16. If removing the timing chains, obtain compression TDC of No. 1 cylinder as follows:
   a. Rotate crankshaft pulley clockwise to align timing mark (grooved line without color) with timing indicator.
   b. Check that intake and exhaust camshaft lobes on No. 1 cylinder (right bank of engine) are located as shown.
      • If not, turn the crankshaft one revolution (360°) and align as shown.

17. Remove the access plate and lock the ring gear using Tool.

   **Tool number:** — (J-50288)

   **CAUTION:**
   Do not damage the ring gear teeth, or the signal plate teeth behind the ring gear, when installing Tool.

18. Remove the crankshaft pulley as follows:
   a. Loosen crankshaft pulley and locate bolt seating surface at 10 mm (0.39 in) from its original position.
   b. Position a pulley puller at recess hole of crankshaft pulley to remove crankshaft pulley.

   **CAUTION:**
   Do not use a puller claw on crankshaft pulley periphery.
19. Remove the lower oil pan. Refer to EM-39, "Removal and Installation (Lower Oil Pan)".
20. Remove upper oil pan bolts (1) and (2) as shown. Refer to EM-40, "Removal and Installation (Upper Oil Pan)".

21. Disconnect the oil pressure switch harness connector.
22. If necessary, remove the water pump cover.
23. Remove the front timing chain case.
   a. Loosen the front timing chain case bolts in reverse order as shown.

   b. Insert the appropriate size suitable tool into the notch (A) at the top of the front timing chain case as shown.
   c. Pry off the case by moving the suitable tool (B) as shown.
      • Cut liquid gasket for removal using Tool.

      Tool number: KV10111100 (J-37228)

      CAUTION:
      • Do not use a screwdriver or similar tool.
      • After removal, handle carefully so it does not bend, or warp under a load.

24. Remove O-rings (1) from rear timing chain case.

   (A) : Bank 1 (RH)
   (B) : Bank 2 (LH)

      CAUTION:
      Do not reuse O-rings.
FRONT TIMING CHAIN CASE

< REMOVAL AND INSTALLATION >

25. Remove the front oil seal from the front timing chain case using suitable tool.  
   **CAUTION:**  
   Do not damage the front cover.

26. Remove all old Silicone RTV Sealant (A) from all the bolt holes (B) and bolts.  
   **CAUTION:**  
   Do not damage the threads or mating surfaces.

27. Use a scraper to remove all of the old Silicone RTV Sealant from the front timing chain case and opposite mating surfaces.  
   **CAUTION:**  
   Do not damage the mating surfaces.

28. Remove front timing chain case oil filters (if necessary).

INSTALLATION

1. Install front timing chain case oil filter (2) (if necessary).  
   **CAUTION:**  
   • Insert front timing chain case oil filter (2) into the front timing chain case (1) to specified distance (A).  
   • Ensure oil filter mesh remains intact during insertion into the front timing chain case (1).  
   • Ensure oil filter mesh does not protrude from front timing chain case (1).

   (A) : 1.0 - 1.5 mm (0.039 - 0.059 in)
2. Install dowel pins (right and left) into front timing chain case up to a point close to taper in order to shorten protrusion length.

**NOTE:**
Be sure to place the dowel pins in original hole locations in the front timing chain case.

3. Install the new front oil seal on the front timing chain case. Apply new engine oil to the oil seal edges.

**NOTE:**
Install it so that each seal lip is oriented as shown.

a. Install the new front oil seal so that it becomes flush with the face with front timing chain case using suitable tool.

**CAUTION:**
Press fit straight and avoid causing burrs or tilting the oil seal.

**NOTE:**
Make sure the garter spring is in position and seal lip is not inverted.

4. Install new O-rings (1) on rear timing chain case.

   (A) : Bank 1 (RH)
   (B) : Bank 2 (LH)

**CAUTION:**
Do not reuse O-rings.
5. Apply Silicone RTV Sealant to front timing chain case as shown.
   • Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".
   • Before installation, wipe off the protruding sealant.
   • (C): 2.6 - 3.6 mm (0.102 - 0.142 in) dia.

6. Install dowel pin on the front timing chain case into dowel pin hole in the rear timing chain case.

7. Loosely install the front timing chain case bolts.

<table>
<thead>
<tr>
<th>Bolt position</th>
<th>Bolt diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>8 mm (0.31 in)</td>
</tr>
<tr>
<td>3 – 22</td>
<td>6 mm (0.24 in)</td>
</tr>
</tbody>
</table>

8. Tighten the front timing chain case bolts in the order as shown.
   • Retighten the front timing chain case bolts in the order as shown.

<table>
<thead>
<tr>
<th>Bolt position</th>
<th>Tightening specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>28.4 N·m (2.9 kg-m, 21 ft-lb)</td>
</tr>
<tr>
<td>3 – 22</td>
<td>12.7 N·m (1.3 kg-m, 9 ft-lb)</td>
</tr>
</tbody>
</table>

9. Install upper oil pan bolts (1) and (2) as shown. Refer to EM-40, "Removal and Installation (Upper Oil Pan)".

10. Install lower oil pan. Refer to EM-39, "Removal and Installation (Lower Oil Pan)".

11. Install intake valve timing control solenoid valve covers as follows:
   a. Install new O-rings in shaft grooves.
      **CAUTION:**
      Do not reuse O-rings.
   b. Being careful not to move O-rings from the installation grooves, align dowel pins on front timing chain case with the holes to install valve timing control covers.
< REMOVAL AND INSTALLATION >

c. Tighten intake valve timing control solenoid valve cover bolts in numerical order as shown.

(A) : Bank 1 (RH)
(B) : Bank 2 (LH)
(C) : Dowel pin hole

Intake valve timing control solenoid valve cover bolts : 11.3 N·m (1.2 kg-m, 8 ft-lb)

12. Apply liquid gasket and install the water pump cover, if removed.
   • Use Genuine Silicone RTV Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".

13. Install crankshaft pulley (A) and tighten the bolt in two steps.
   • Lubricate thread and seat surface of the bolt with new engine oil.
   • Apply a paint mark for the second step of angle tightening.

Step 1 : 44 N·m (4.5 kg-m, 32 ft-lb)
Step 2 : 84° - 90° degrees clockwise

Tool Number : KV10112100 (BT-8653-A)

14. Remove Tool and install the access plate.

   Tool number : — (J-50288)

CAUTION:
Do not damage the ring gear teeth, or the signal plate teeth behind the ring gear, when removing the Tool.

15. Rotate crankshaft pulley in normal direction (clockwise when viewed from front) to confirm it turns smoothly.

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

INSPECTION AFTER INSTALLATION

• Before starting engine, check oil/fluid levels including engine coolant and engine oil. If there is less than required quantity, fill to the specified level. Refer to MA-16, "FOR USA AND CANADA : Fluids and Lubricants" or MA-17, "FOR MEXICO : Fluids and Lubricants".

• Use procedure below to check for fuel leaks.

• Turn ignition switch ON (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leaks at connection points.

• Start engine. With engine speed increased, check again for fuel leaks at connection points.

• Run engine to check for unusual noise and vibration.

NOTE:
If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.

• Warm up engine thoroughly to make sure there is no leaks of fuel, exhaust gas, or any oils/fluids including engine oil and engine coolant.

• Bleed air from passages in lines and hoses, such as in cooling system.

• After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to specified level, if necessary.

• Summary of the inspection items:
## < REMOVAL AND INSTALLATION >

<table>
<thead>
<tr>
<th>Item</th>
<th>Before starting engine</th>
<th>Engine running</th>
<th>After engine stopped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine coolant</td>
<td>Level</td>
<td>leaks</td>
<td>Level</td>
</tr>
<tr>
<td>Engine oil</td>
<td>Level</td>
<td>leaks</td>
<td>Level</td>
</tr>
<tr>
<td>Transmission/ transaxle fluid</td>
<td>A/T and CVT Models</td>
<td>leaks</td>
<td>Level/leaks</td>
</tr>
<tr>
<td></td>
<td>M/T Models</td>
<td>Level/leaks</td>
<td>level/leaks</td>
</tr>
<tr>
<td>Other oils and fluids*</td>
<td>Level</td>
<td>leaks</td>
<td>Level</td>
</tr>
<tr>
<td>Fuel</td>
<td>leaks</td>
<td>leaks</td>
<td>leaks</td>
</tr>
<tr>
<td>Exhaust gas</td>
<td>—</td>
<td>leaks</td>
<td>—</td>
</tr>
</tbody>
</table>

*Power steering fluid, brake fluid, etc.
CAUTION:
• After removing timing chains, do not turn the crankshaft and camshaft separately or the valves will strike the pistons.
• When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.
• Apply new engine oil to bolt threads and seat surfaces when installing camshaft sprockets, camshaft brackets, and crankshaft pulley.

REMOVAL
1. Remove front timing chain case. Refer to EM-58, "Removal and Installation".
2. Remove the intake manifold collector. Refer to EM-27, "Removal and Installation".
3. Remove the spark plugs. Refer to EM-14, "Removal and Installation".
4. Place paint marks on the timing chain and sprockets to indicate the correct position of the components for installation.
5. Disconnect the camshaft position sensor harness connectors.
6. Remove the timing chain tensioner (primary).
TIMING CHAIN

< REMOVAL AND INSTALLATION >

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

(B) : Timing chain tensioner (primary)
(C) : Stopper pin

b. Insert stopper pin (D) into timing chain tensioner (primary) body hole to hold lever, and keep the tab released. An Allen wrench [1.2 mm (0.047 in)] is used for a stopper pin (D) as an example.

c. Insert plunger (A) into tensioner body by pressing the slack guide (B).

d. Keep the slack guide (B) pressed and hold it by pushing the stopper pin (D) through the lever hole and body hole.

e. Remove the bolts (C) and remove the timing chain tensioner (primary).

7. Remove internal chain guide (A), tension guide (C) and slack guide (B).

NOTE:
Tension guide can be removed after removing timing chain (primary).

8. Remove timing chain (primary) and crankshaft sprocket.

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

9. Remove timing chain (secondary) and camshaft sprockets as follows:
TIMING CHAIN

< REMOVAL AND INSTALLATION >

a. Attach a suitable stopper pin (B) to the timing chain tensioner [secondary (bank 1)] (1) and timing chain tensioner [secondary (bank 2)] (2).

NOTE:
• Use approximately 0.5 mm (0.02 in) diameter hard metal pin as a stopper pin.
• Removal of camshaft bracket (No. 1) is required prior to removing the timing chain tensioner (secondary).

b. Remove camshaft sprockets (INT/EXH) bolts.
• Secure the hexagonal portion of camshaft using a suitable tool to loosen bolts.

CAUTION:
Do not loosen bolts using anything other than the camshaft hexagonal portion. Do not apply tension to the timing chain.

c. Remove timing chain (secondary) together with camshaft sprockets.
• Turn camshaft slightly to keep the chain tight when removing the timing chain (secondary).
• Insert 0.5 mm (0.020 in) thick metal or resin plate between timing chain and timing chain tensioner plunger (guide) (E). Remove timing chain (secondary) (2) together with camshaft sprockets with timing chain loose from guide groove.

CAUTION:
Be careful of plunger coming off when removing timing chain (secondary). The plunger of timing chain tensioner (secondary) moves during operation, which could cause the stopper pin to fall out.
• Bank 1 shown.

d. Camshaft sprocket (INT) is two-for-one structure of sprockets for timing chain (primary) and for timing chain (secondary).

CAUTION:
• Handle camshaft sprocket (INT) carefully to avoid any shock to camshaft sprocket.
• Do not disassemble. [Do not loosen bolts (A) as shown].
Check for cracks and any excessive wear of the timing chain. Replace the timing chain as necessary.

**INSTALLATION**

1. **Internal chain guide**
2. **Camshaft sprocket (INT)**
3. **Mating mark (pink link)**
4. **Mating mark (punched)**
5. **Timing chain tensioner (secondary)**
6. **Mating mark (orange link)**
7. **Timing chain (secondary)**
8. **Camshaft sprocket (EXH)**
9. **Tension guide**
10. **Water pump**
11. **Crankshaft sprocket**
12. **Mating mark (notched)**
13. **Timing chain (primary)**
14. **Slack guide**
15. **Timing chain tensioner (primary)**
16. **Mating mark (back side)**
17. **Crankshaft key**

**NOTE:**
This illustration shows the relationship between the mating mark on each timing chain and on the corresponding sprocket with the components installed.

1. Install timing chain tensioners (secondary) with a new O-ring and the stopper pin attached. **CAUTION:** Do not reuse O-ring.
2. Check that dowel pin (A) and crankshaft key (1) are located as shown. (No. 1 cylinder at compression TDC) **NOTE:** Though camshaft does not stop at the position as shown, for the placement of cam nose, it is generally accepted camshaft is placed in the same direction.

   **Camshaft dowel pin**
   - At cylinder head upper face side in each bank

   **Crankshaft key**
   - At cylinder head side of bank 1

3. Install timing chain (secondary) and camshaft sprockets (INT and EXH) as follows: **CAUTION:** Mating marks between timing chain and sprockets slip easily. Confirm all mating mark positions repeatedly during the installation process.
TIMING CHAIN

< REMOVAL AND INSTALLATION >

a. Push plunger of timing chain tensioner (secondary) and keep it pressed in with stopper pin (A).

b. Install timing chain (secondary) (2) and camshaft sprockets [INT (1) and EXH (3)].

   - Align the mating marks on timing chain (secondary) (orange link) with the mating marks on camshaft sprockets (INT and EXH), and install them.
   - Align dowel pin on camshafts with the groove on sprockets, and install them.
   - Tighten the bolts for the camshaft sprockets by hand enough to prevent the dowel pins from falling out of the grooves.

   - It may be difficult to visually check the dislocation of mating marks during and after installation. To make the matching easier, make a mating mark (A) on the top of sprocket teeth and its extended line with paint.

   - Secure the camshaft using a wrench at the hexagonal portion to tighten the bolts.

4. After confirming the mating marks are aligned, tighten the camshaft sprocket bolts.
5. Pull stopper pins (B) out from timing chain tensioner [secondary (bank 1)] (1) and timing chain tensioner [secondary (bank 2)] (2).

6. Install the crankshaft sprocket (C) on the crankshaft.
   • Make sure the mating marks (D) on the crankshaft sprocket (C) face the front of the engine (B).
   • The flat side of the crankshaft sprocket (C) is on the crankshaft side (A).

7. Install the timing chain (primary).
   • Install timing chain (primary) so the mating mark (punched) (B) on camshaft sprocket (C) is aligned with the pink link (A) on the timing chain, while the mating mark (notched) (E) on the crankshaft sprocket (D) is aligned with the orange one (F) on the timing chain, as shown.
   • When it is difficult to align mating marks of the timing chain (primary) with each sprocket, gradually turn the camshaft using a wrench on the hexagonal portion to align it with the mating marks.
   • During alignment, be careful to prevent dislocation of mating mark alignments of the secondary timing chains.

(G) : Water pump
8. Install the internal chain guide (1) and slack guide (2).

(3) : Tension guide

CAUTION:
Do not over tighten slack guide mounting bolt (2). It is normal for a gap (A) to exist under the bolt seat when bolt is tightened to specification.

(1) : Slack guide
(3) : Cylinder block

9. Install the timing chain tensioner (primary) with the following procedure:
a. Pull plunger stopper tab (A) up (or turn lever downward) so as to remove plunger stopper tab from the ratchet of plunger (D).
   NOTE:
   Plunger stopper tab and lever (C) are synchronized.
b. Push plunger into the inside of tensioner body.
c. Hold plunger in the fully compressed position by engaging plunger stopper tab with the tip of ratchet.
d. To secure lever, insert stopper pin (E) through hole of lever into tensioner body hole (B).
   • The lever parts and the tab are synchronized. Therefore, the plunger will be secured under this condition.
   NOTE:
   Illustration shows the example of 1.2 mm (0.047 in) diameter thin screwdriver being used as the stopper pin.
e. Install timing chain tensioner (primary) (1).
   • Remove any dirt and foreign materials completely from the back and the mounting surfaces of timing chain tensioner (primary).

f. Pull out stopper pin (A) after installing, and then release plunger.

10. Reconfirm that the matching marks on the sprockets and the timing chain have not slipped out of alignment.

11. Install the spark plugs. Refer to EM-14, "Removal and Installation".

12. Install the intake manifold collector. Refer to EM-27, "Removal and Installation".

13. Install the front timing chain case. Refer to EM-58, "Removal and Installation".
REMVAL AND INSTALLATION

REAR TIMING CHAIN CASE

Exploded View

CAUTION:

• After removing timing chain, do not turn the crankshaft and camshaft separately, or the valves will strike the pistons.
• Before removing the upper oil pan, remove the crankshaft position sensor (POS).
• Be careful not to damage sensor edges.

REMOVAL

1. Remove the engine assembly. Refer to EM-107, "Removal and Installation".
2. Remove upper oil pan. Refer to EM-40, "Removal and Installation (Upper Oil Pan)".
3. Remove the front timing chain case. Refer to EM-58, "Removal and Installation".
4. Remove the timing chains (primary) and (secondary). Refer to EM-66, "Exploded View".

1. O-ring
2. Oil temperature sensor
3. Rear timing chain case
4. Cylinder block
5. O-ring
6. O-ring
A. Refer to INSTALLATION

Engine front
5. Remove the rear timing chain case.

CAUTION:
• Do not remove the plate metal cover for the oil passage.
• After removing the chain case, do not apply any load to the case that might bend it.

a. Loosen and remove the rear timing chain case bolts in the reverse order shown.

b. Cut the sealant using Tool and remove the rear timing chain case.
  • After removing the bolts, separate the mating surface and remove the old liquid gasket using Tool.

  Tool number : KV1011100 (J-37228)

CAUTION:
Do not damage the mating surfaces.
• Tap the seal cutter to insert it (1).
• In areas where the Tool is difficult to use, lightly tap to slide it (2).
6. Remove O-rings (1) from cylinder block.

   ![Diagram of engine front showing O-ring removal](image1)

   **CAUTION:**
   Do not reuse O-rings.

7. Use a scraper (A) to remove all of the old Silicone RTV Sealant from the front and rear timing chain case (B) and opposite mating surfaces.

   ![Diagram of scraper removing Silicone RTV Sealant](image2)

   **CAUTION:**
   Do not damage the mating surfaces.

8. Remove all old Silicone RTV Sealant (A) from all the bolt holes (B) and threads.

   ![Diagram of screw with Silicone RTV Sealant](image3)

   **CAUTION:**
   Do not damage the threads or mating surfaces.

**INSTALLATION**

1. Install O-rings (1) on cylinder block.

   ![Diagram of engine front showing O-ring installation](image4)

   **CAUTION:**
   Do not reuse O-rings.

2. Apply Genuine Silicone RTV Sealant or equivalent, to the rear timing chain case using suitable tool as shown. Refer to GI-22, "Recommended Chemical Products and Sealants".

   **CAUTION:**
   • Installation should be done within 5 minutes after applying liquid gasket.
   • Do not fill the engine with oil for at least 30 minutes after the components are installed to allow the sealant to cure.
   • Wipe off liquid gasket where it touches the engine coolant passage at point “a”.
   • Follow the installation instructions for applying the liquid gasket. Pay particular attention to the water pump and cylinder area.
3. Align the rear timing chain case and water pump assembly with the dowel pins (RH/LH) on the cylinder block and install the case. Make sure the O-rings stay in place during installation.

a. Tighten the bolts in the numerical order as shown. There are two bolt lengths used. Follow the chart below for proper bolt length specifications.
b. After all bolts are initially tightened, retighten them to the specification in the numerical order as shown. **NOTE:**
   If liquid gasket protrudes, wipe it off immediately.

4. Install the timing chains (primary and secondary). Refer to EM-66, "Exploded View".

5. Install the front timing chain case. Refer to EM-58, "Removal and Installation".

6. Install the upper oil pan. Refer to EM-40, "Removal and Installation (Upper Oil Pan)".

7. Install the engine assembly. Refer to EM-107, "Removal and Installation".

<table>
<thead>
<tr>
<th>Bolt length</th>
<th>Bolt position</th>
<th>Torque specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mm (0.79 in)</td>
<td>1, 2, 3, 6, 7, 8, 9, 10</td>
<td>12.7 N·m (1.3 kg-m, 9 ft-lb)</td>
</tr>
<tr>
<td>16 mm (0.63 in)</td>
<td>All except the above</td>
<td>12.7 N·m (1.3 kg-m, 9 ft-lb)</td>
</tr>
</tbody>
</table>
CAUTION:
Apply new engine oil to parts marked in illustration before installation.

Removal and Installation

REMOVAL
1. Remove the timing chains. Refer to EM-66, "Removal and Installation".

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EM-79

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2. Remove camshaft position brackets (RH shown, LH similar).

3. Remove the camshaft brackets and the camshafts.
   • Mark the camshafts, camshaft brackets, and bolts so they are placed in the same position and direction for installation.
   • Equally loosen the camshaft bracket bolts in several steps in the reverse order as shown.

   (1) : Cylinder head (RH)
   (A) : Camshaft (EXH) (RH)
   (B) : Camshaft (INT) (RH)
   (C) : Camshaft bracket
   ⇐ : Engine front

   (2) : Cylinder head (LH)
   (A) : Camshaft (INT) (LH)
   (B) : Camshaft bracket
   (C) : Camshaft (EXH) (LH)
   ⇐ : Engine front

4. Remove valve lifters, if necessary.
   **NOTE:**
   Identify installation positions to ensure proper installation.

5. Remove secondary timing chain tensioner (2/5) from bank 1/ bank 2 (A/B)
   • Remove secondary tensioner (2/5) with its stopper pin (4) attached.
   **NOTE:**
   • Stopper pin (4) was attached when secondary timing chain (2/5) was removed.
   • Do not reuse O-rings (1/3).

**INSTALLATION**
1. Before installation, remove any old Silicone RTV Sealant (A) from component mating surfaces using a suitable tool.
   - Remove the old Silicone RTV Sealant (A) from the bolt holes (B) and threads.
   - Do not scratch or damage the mating surfaces.

2. Before installing the front cam bracket, remove the old Silicone RTV Sealant (B) from the mating surface using a suitable tool (A).
   - Do not scratch or damage the mating surface.

3. Turn the crankshaft until No. 1 piston is set at TDC on the compression stroke.
   - The crankshaft key (A) should line up with the right bank cylinder center line (B) as shown.

4. Install camshaft chain tensioners (1/2) at bank 1 (A) and bank 2 (B). Refer to EM-79, "Exploded View".
   **CAUTION:**
   Do not reuse O-rings.

5. Install valve lifters, if removed.
   **NOTE:**
   Install them in original positions.

6. Install exhaust camshaft (A) and intake camshaft (B) and camshaft brackets.
CAMSHAFT

< REMOVAL AND INSTALLATION >

- Follow your identification marks made during removal, or follow the identification marks that are present on the new camshafts components for proper placement and direction of the components.

ęb :Engine front

<table>
<thead>
<tr>
<th>Bank</th>
<th>INT/EXH</th>
<th>ID mark (A)</th>
<th>Paint marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>M1 (E)</td>
</tr>
<tr>
<td>1 (B)</td>
<td>INT</td>
<td>1A</td>
<td>Purple</td>
</tr>
<tr>
<td></td>
<td>EXH</td>
<td>1C</td>
<td>No</td>
</tr>
<tr>
<td>2 (C)</td>
<td>INT</td>
<td>1B</td>
<td>Purple</td>
</tr>
<tr>
<td></td>
<td>EXH</td>
<td>1D</td>
<td>No</td>
</tr>
</tbody>
</table>

- Position the camshaft dowel pins (A) as shown.

(1) :Crankshaft key

7. Apply sealant to mating surface of camshaft brackets (1) of bank 1 (A) and bank 2 (B) cylinder heads.
   - Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".
   - Before installation, wipe off any protruding sealant from front face of camshaft bracket.
   - Refer to EM-5, "Precaution for Liquid Gasket".

ęb :Engine front
CAMSHAFT

< REMOVAL AND INSTALLATION >

- Install bank 1 (B) and bank 2 (C) camshaft brackets in their original positions and direction. Align the stamp marks (A) as shown.
- If checking and adjusting any part of valve assembly or camshaft, check valve clearance according to the reference data. Refer to EM-20, "Valve Clearance".

![Diagram](AWBA0390ZZ)

:Engine front

Valve clearance (cold) Intake : 0.26 - 0.34 mm (0.010 - 0.013 in)
Valve clearance (cold) Exhaust : 0.29 - 0.37 mm (0.011 - 0.015 in)

- Locate the camshaft (EXH) (bank 1) (A) and camshaft (INT) (bank 1) (B). Tighten the camshaft brackets (C) in the three steps, in numerical order as shown.

![Diagram](AWBA0388ZZ)

- Locate the camshaft (EXH) (bank 2) (B) and camshaft (INT) (bank 2) (A). Tighten the camshaft brackets (C) in the three steps, in numerical order as shown.

![Diagram](AWBA0389ZZ)

8. Measure difference in levels between front end faces of No. 1 camshaft bracket and cylinder head.

   Standard : − 0.14 (− 0.0055 in)
- If measurement is outside the specified range, reinstall camshaft and camshaft bracket.

![Diagram](AWBA0389ZZ)

9. Install camshaft position sensor bracket (PHASE) (RH and LH bank.)
10. Install the timing chains. Refer to EM-66, "Removal and Installation".

INSPECTION AFTER REMOVAL

<p>| | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.96 N·m (0.20 kg-m, 17 in-lb)</td>
<td>Tighten No. 7 - 10, then tighten 1 - 6 in numerical order as shown.</td>
</tr>
<tr>
<td>2</td>
<td>5.88 N·m (0.60 kg-m, 52 in-lb)</td>
<td>Tighten all in numerical order as shown.</td>
</tr>
<tr>
<td>3</td>
<td>10.41 N·m (1.1 kg-m, 8 ft-lb)</td>
<td>Tighten No. 1 - 10 in numerical order as shown.</td>
</tr>
</tbody>
</table>

Revision: October 2015
Camshaft Visual Check
Check camshaft for scratches, seizure and wear. Replace if necessary.

Camshaft Runout
1. Put V-block on precise flat bed and support No. 2 and No. 4 journal of camshaft as shown.
2. Set dial gauges vertically to No. 3 journal as shown.
3. Turn camshaft in one direction slowly by hand, measure the camshaft runout on the dial gauges.
   • Runout is the largest indicator reading after one full revolution.
   • Refer to EM-140, "Camshaft".
4. If actual runout exceeds the limit, replace the camshaft.

Camshaft Cam Lobe Height
1. Measure camshaft cam lobe height as shown. Refer to EM-140, "Camshaft".
2. If wear has reduced the lobe height below specifications, replace the camshaft.

Camshaft Journal Clearance

**Outer Diameter of Camshaft Journal**
• Measure outer diameter of camshaft journal as shown. Refer to EM-140, "Camshaft".

**Inner Diameter of Camshaft Bracket**
1. Tighten camshaft bracket bolt with specified torque.
2. Using inside micrometer, measure inner diameter (A) of camshaft bearing. Refer to EM-140, "Camshaft".

**Calculation of Camshaft Journal Clearance**
CAMSHAFT

< REMOVAL AND INSTALLATION >

(Journal clearance) = (inner diameter of camshaft bracket) – (outer diameter of camshaft journal). Refer to EM-140, "Camshaft".

• When out of the specified range, replace either or both camshaft and cylinder head.

NOTICE:
Inner diameter of camshaft bracket is manufactured together with cylinder head. Replace the whole cylinder head assembly.

Camshaft End Play

1. Install the camshaft in the cylinder head.
2. Install dial gauge in thrust direction on front end of camshaft. Measure end play when camshaft is moved forward/backward (in direction to axis) as shown. Refer to EM-140, "Camshaft".
• If out of the specified range, replace with new camshaft and measure again.
• If out of the specified range again, replace with new cylinder head.

Camshaft Sprocket Runout

1. Put V-block on precise flat bed and support No. 2 and No. 4 journal of camshaft as shown.
2. Install camshaft sprocket on camshaft.
3. Measure camshaft sprocket runout. Refer to EM-140, "Camshaft".
4. If sprocket runout exceeds the limit, replace camshaft sprocket.

Valve Lifter
• Check if the surface of the valve lifter has any excessive wear or cracks, replace as necessary.

Valve Lifter Clearance

Outer Diameter of Valve Lifter
• Measure the outer diameter of the valve lifter with a suitable tool (A). Refer to EM-140, "Camshaft".
• If out of the specified range, replace the valve lifter.
Valve Lifter Bore Diameter

- Using inside micrometer, measure diameter of valve lifter bore of cylinder head. Refer to EM-140, "Camshaft".
- If out of the specified range, replace the cylinder head assembly.

Calculation of Valve Lifter Clearance

- \( (\text{Valve lifter clearance}) = (\text{hole diameter for valve lifter}) - (\text{outer diameter of valve lifter}) \) Refer to EM-140, "Camshaft".
- If out of specified range, replace either or both valve lifter and cylinder head assembly.

Inspection after Installation

INSPECTION OF CAMSHAFT SPROCKET (INT) OIL GROOVE

**CAUTION:**
- Perform this inspection only when DTC P0011 is detected in self-diagnostic results of CONSULT III and it is directed according to inspection procedure of EC section. Refer to EC-198, "Diagnosis Procedure".
- Check when engine is cold so as to prevent burns from any splashing engine oil.

1. Check engine oil level. Refer to LU-8, "Inspection".
2. Perform the following procedure so as to prevent the engine from being unintentionally started while checking.
   a. Release fuel pressure. Refer to FL-4, "Inspection".
   b. Disconnect ignition coil and injector harness connectors if practical.
3. Remove intake valve timing control solenoid valve.
4. Crank engine, and then make sure that engine oil comes out from intake valve timing control solenoid valve cover oil hole. End cranking after checking.
   **WARNING:**
   Be careful not to touch rotating parts (drive belts, idler pulley, and crankshaft pulley, etc.).
   **CAUTION:**
   - Engine oil may squirt from intake valve timing control solenoid valve installation hole during cranking. Use a shop cloth to prevent engine oil from splashing on worker, engine components and vehicle.
   - Do not allow engine oil to get on rubber components such as drive belts or engine mount insulators. Immediately wipe off any splashed engine oil.
5. Clean oil groove between oil strainer and intake valve timing control solenoid valve if engine oil does not come out from intake valve timing control solenoid valve cover oil hole.
6. Remove components between intake valve timing control solenoid valve and camshaft sprocket (INT), and then check each oil groove for clogging.
   - Clean oil groove if necessary.
7. After inspection, installation of the remaining components is in the reverse order of removal.
Removal and Installation of Valve Oil Seal

**REMOVAL**

1. Turn crankshaft until the cylinder requiring new oil seals is at TDC. This will prevent valve from dropping into cylinder.
   **CAUTION:**
   When rotating crankshaft, be careful to avoid scarring the front cover with the timing chain.
2. Remove camshaft relating to valve oil seal to be removed. Refer to EM-79, "Removal and Installation".
3. Remove valve lifters.
4. Remove valve collet, valve spring retainer and valve spring using suitable tool (A). Remove valve collet using suitable tool.
   **CAUTION:**
   • Be careful not to damage valve lifter bore.

   - Install a suitable tool (A) in the center of the valve spring retainer (1) to install it.

5. Remove valve oil seal using suitable tool (A).

**INSTALLATION**

**NOTE:**
The valve spring is not equipped with the valve spring seat. Install the valve spring seat into the cylinder head before valve spring installation.
• Install the valve spring with the identification color facing upward.
• Install the smaller pitch to the cylinder head side.
• Intake and exhaust springs are the same.
1. Apply new engine oil to new valve oil seal joint surface and seal lip.
2. Press in valve oil seal to height (H) using suitable tool (A).

NOTE:
Dimension (H): height measured before valve spring seat installation.

Intake and exhaust (H) : 14.3 - 14.9 mm (0.563 - 0.587 in)

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

Removal and Installation of Front Oil Seal

REMOVAL
1. Remove drive belt. Refer to EM-16, "Removal and Installation".
2. Lock the drive plate using Tool.

   Tool number : — (J-50288)

CAUTION:
Do not damage the ring gear teeth or the signal plate teeth behind the ring gear when setting the Tool.

3. Remove the crankshaft pulley as follows:
   a. Loosen crankshaft pulley and locate bolt seating surface at 10 mm (0.39 in) from its original position.
   b. Position a pulley puller at recess hole of crankshaft pulley to remove crankshaft pulley.

   CAUTION:
Do not use a puller claw on the outer diameter of the crankshaft pulley.

4. Remove front oil seal from front cover using a suitable tool.

   CAUTION:
Be careful not to damage front cover or crankshaft.

INSTALLATION
OIL SEAL

< REMOVAL AND INSTALLATION >

1. Apply new engine oil to new oil seal and install using suitable tool (A).
   • Install new oil seal in the direction as shown.
   **CAUTION:**
   Press fit straight and avoid causing burrs or tilting the oil seal.
   • Press-fit oil seal until it becomes flush with the timing chain case end face, using suitable tool.
   • Make sure the garter spring in the oil seal is in position and seal lip is not inverted.

2. Install crankshaft pulley and tighten the bolt in two steps.
   • Lubricate thread and seat surface of the bolt with new engine oil.
   • For the second step angle tighten using Tool.
   **CAUTION:**
   • Do not damage the front oil seal when inserting crankshaft pulley.
   • Use only brass or plastic hammer if tapping on the crankshaft pulley.
   • Do not hammer on pulley grooves.

   **Step 1**: 44.1 N·m (4.5 kg-m, 33 ft-lb)
   **Step 2**: 90°(+0°/-6°) degrees clockwise

   **Tool number**: KV10112100 (BT-8653-A)

3. Remove the Tool to unlock the drive plate.
   **Tool number**: — (J-50288)

   **CAUTION:**
   Do not damage the ring gear teeth, or the signal plate teeth behind the ring gear, when removing the Tool.

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

Removal and Installation of Rear Oil Seal

**REMOVAL**

1. Remove the upper oil pan. Refer to EM-40, "Removal and Installation (Upper Oil Pan)".
2. Remove drive plate. Refer to EM-115, "Exploded View".
3. Remove rear oil seal retainer using Tool (A).

   **Tool Number**: KV10111100 (J-37228)

   **CAUTION:**
   • Be careful not to damage mating surface.
   • If rear oil retainer is removed, replace it with a new one.

**NOTE:**
Rear oil seal and retainer form a single part and are replaced as an assembly.

**INSTALLATION**

1. Remove old liquid gasket material from mating surface of cylinder block and oil pan using a suitable scraper.
2. Install the rear oil seal retainer using Tool (A).

   Tool number   : — (J-47128)

   a. Loosen the wing nut (B) on the end of the Tool (A).
   b. Insert the arbor (D) into the crankshaft pilot hole until the outer lip (C) of the Tool (A) covers the edge of the crankshaft sealing surface.
   c. Tighten the wing nut (B) to secure the Tool (A) to the crankshaft.

   d. Apply sealant to rear oil seal retainer as shown. Use Genuine Silicone RTV Sealant or equivalent. Refer to GI-22, “Recommended Chemical Products and Sealants”.

   CAUTION:
   • Installation should be done within 5 minutes after applying liquid gasket.
   • Do not fill the engine with oil for at least 30 minutes after the components are installed to allow the liquid gasket to cure.

   e. Lubricate the sealing surface of the new rear main seal with new engine oil.
   f. Slide the new rear main seal (1) over the Tool (A) and onto the crankshaft.
   g. Loosen the wing nut and push the threaded rod into the handle to remove the Tool (A).
   h. Tighten the rear oil seal retainer bolts to specification.

   Rear oil seal retainer bolts : 8.8 N·m (0.9 kg-m, 78 in-lb)

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

   CAUTION:
   • When replacing an engine or transmission you must make sure the dowels are installed correctly during re-assembly.
   • Improper alignment caused by missing dowels may cause vibration, oil leaks or breakage of drivetrain components.
Removal and Installation

REMOVAL

1. Remove the engine from the vehicle. Refer to EM-107, "Removal and Installation".
2. Remove the rear timing chain case. Refer to EM-74, "Removal and Installation".
3. Remove the intake manifold. Refer to EM-30, "Removal and Installation".
4. Remove the exhaust manifold and three way catalyst (bank 1/bank 2). Refer to EM-36, "Exploded View".
5. Remove the intake and exhaust camshafts. Refer to EM-79, "Removal and Installation".
6. Remove the water outlet housing. Refer to CO-25, "Exploded View".
7. Remove the bolts from bank 1 cylinder head (A) and bank 2 cylinder head (B).
   • The bolts should be loosened gradually in three stages.
   • Loosen the bolts in the reverse tightening sequence as shown.

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EM-91

2016 Maxima NAM
8. Remove cylinder head (A) and cylinder head gasket.
   **CAUTION:**
   Do not reuse cylinder head gaskets.

   ![Diagram of cylinder head](image1)

   ![Diagram of engine front](image2)

**INSTALLATION**

1. Turn the crankshaft until No. 1 piston is set at TDC on the compression stroke.
   - The crankshaft key (A) should line up with the bank 1 cylinder head center line (B) as shown.

   ![Diagram showing crankshaft key alignment](image3)

2. Install new cylinder head gaskets.
   **CAUTION:**
   Do not reuse cylinder head gaskets.

3. Inspect the cylinder head bolts (B) before installing the cylinder heads.
   **CAUTION:**
   Cylinder head bolts (B) are tightened by degree rotation tightening method. Observing measuring points (A), whenever the size difference between d1 and d2 exceeds the limit, replace the bolts with new ones.

   Limit (d1 - d2) : 0.11 mm (0.0043 in)

   - Lubricate threads and seat surfaces of the bolts with new engine oil.

   ![Diagram showing bolt measurements](image4)

4. Install the bank 1 cylinder head (A) and bank 2 cylinder head (B) on the cylinder block. Tighten the cylinder head bolts in the five steps in the numerical order as shown using Tool.
   **CAUTION:**
   Do not rotate crankshaft and camshaft separately or valves will strike piston heads.

   ![Diagram showing cylinder head installation](image5)

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Tool Number : KV10112100 (BT-8653-A)

• Tightening procedure:

Cylinder head bolts
Step 1 : 98.1 N·m (10 kg-m, 72 ft-lb) in order
Step 2 : Loosen bolts in the reverse order of tightening.
Step 3 : 39.2 N·m (4.0 kg-m, 29 ft-lb) in order
Step 4 : 103° degrees rotation in order
Step 5 : 103° degrees rotation in order

arus : Engine front

5. Installation of the remaining components is in the reverse order of removal.
CAUTION:

- When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.
- Apply new engine oil to threads and seat surface when installing cylinder head, camshaft sprocket, crankshaft pulley, and camshaft bracket.
CYLINDER HEAD

< REMOVAL AND INSTALLATION >

• Attach tags to valve lifters so as not to mix them up.

DISASSEMBLY

1. Remove spark plug.
2. Remove valve lifter.
   • Identify installation positions and store them without mixing them up.
3. Remove valve collet.
   • Compress valve spring and remove valve collet with magnet hand using suitable tool (A)
   CAUTION:
   When working, take care not to damage valve lifter bore.

4. Remove valve spring retainer, valve spring and valve spring seat.
5. Push valve stem to combustion chamber side and remove valve.
   • Identify installation positions, and store them without mixing them up.
6. Remove valve oil seals using suitable tool (A).

7. If valve seat must be replaced, refer to EM-97, "Inspection After Disassembly".
8. If valve guide must be replaced, refer to EM-97, "Inspection After Disassembly".
9. Remove spark plug tube, as necessary.
   • Using pair of pliers, pull spark plug tube out of cylinder head.
   CAUTION:
   • Take care not to damage cylinder head.
   • Once removed, spark plug tube will be deformed and cannot be reused. Do not remove it unless absolutely necessary.

ASSEMBLY

1. When valve guide is removed, install it. Refer to EM-97, "Inspection After Disassembly".
2. When valve seat is removed, install it. Refer to EM-97, "Inspection After Disassembly".

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3. Install valve oil seals using suitable tool (A).

   **Height (H) (Without valve spring seat installed)**
   
   **Intake and exhaust**: 14.3 - 14.9 mm (0.563 - 0.587 in)

4. Install valve spring seat.

5. Install valves.
   - Install it in the original position.
   **NOTE:**
   Larger diameter valves are for intake side.

6. Install valve spring.
   - Install the valve spring so that the identification color facing upward (A).
   - Install smaller pitch to cylinder head side (B).
   - Confirm the identification color of the valve spring.
   - Intake and exhaust springs are the same.

7. Install valve spring retainer.
   - Install a suitable tool (A) in the center of the valve spring retainer (1) to install.

8. Install valve collet.
   - Compress valve spring using suitable tool (A), attachment and adapter. Install valve collet with magnet hand.
   **CAUTION:**
   *When working, take care not to damage valve lifter bore.*
   - Tap valve stem edge lightly with plastic hammer after installation to check its installed condition.

9. Install valve lifter.
   - Install it in the original position.

10. Install spark plug tube.
    - Press-fit spark plug tube as follows:
      a. Remove old liquid gasket adhering to cylinder head mounting hole.
b. Apply sealant to area (A) within approximately 12 mm (0.47 in) from edge of spark plug tube press-fit side. **Use Genuine High Strength Locking Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".**

c. Press-fit spark plug tube so that its height (H) is as specified. Refer to EM-91, "Removal and Installation". **CAUTION:**
- When press-fitting, take care not to deform spark plug tube.
- After press-fitting, wipe off liquid gasket protruding onto cylinder-head upper face.

11. Install spark plug. Refer to EM-14, "Exploded View".

**Inspection After Disassembly**

**CYLINDER HEAD DISTORTION**

Clean the surface of the cylinder head. Use a reliable straightedge and feeler gauge to check the flatness of cylinder head surface. Check along six positions as shown. Refer to EM-94, "Disassembly and Assembly".

If it exceeds the limit, replace the cylinder head. **The limit for cylinder head resurfacing is determined by the cylinder block resurfacing.** Refer to EM-142, "Cylinder Head"

After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

**VALVE GUIDE CLEARANCE**

1. Measure valve deflection (D) using a suitable tool (C) as shown (Valve and valve guide mostly wear in this direction). Measuring direction (E) should be 90° (B) of camshaft direction (A). Refer to EM-142, "Cylinder Head".

   **Maximum deflection : 0.25 mm (0.010 in)**

2. If it exceeds the limit, check valve to valve guide clearance with a suitable tool (A).
   
a. Measure valve stem diameter and valve guide inner diameter. Refer to EM-142, "Cylinder Head".
   
b. Check that clearance is within specification. (Valve guide clearance) = (Valve guide inner diameter) - (Valve stem diameter). Refer to EM-142, "Cylinder Head".
   
c. If it exceeds the limit, replace valve or valve guide.
When valve guide is removed, replace with oversized [0.2 mm (0.008 in)] valve guide.

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

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

2. Drive out the valve guide with a press [under a 20 kN (2.2 US ton) pressure] or hammer and suitable tool.

3. Ream cylinder head valve guide hole using suitable tool (A). Refer to EM-142, "Cylinder Head".

4. Heat cylinder head to 110 - 130°C (230 - 266°F) by soaking in heated oil and press new valve guide from camshaft side into the cylinder head to the dimensions (L) as shown. Refer to EM-142, "Cylinder Head".

**WARNING:**
Cylinder head contains heat. When working, wear protective equipment to avoid getting burned.
5. Using a suitable tool (A), apply a reamer finish to the valve guide.

   Intake and exhaust : 6.000 - 6.018 mm
   finished size       : (0.2362 - 0.2369 in)

VALVE SEAT CONTACT
- After confirming that the dimensions of valve guides and valves are within specifications, perform this procedure.
- Apply Prussian blue onto contacting surface of valve seat to check the condition of the valve contact on the surface.
- Check if the contact area band is continuous all around the circumference.
- If not, grind to adjust valve fitting and check again. If the contacting surface still has NG conditions even after the recheck, replace valve seat.

VALVE SEAT REPLACEMENT
1. Bore out old seat (A) until it collapses. Boring should not continue beyond the bottom face of the seat recess in cylinder head. Set the machine depth stop to ensure this.
2. Ream cylinder head recess for service valve seat. Refer to EM-142, "Cylinder Head"
   Be sure to ream in circles concentric to the valve guide center. This will enable valve seat to fit correctly.
3. Heat cylinder head to 110 - 130°C (230 - 266°F) by soaking in heated oil (A).
   WARNING: Cylinder head contains heat. when working, wear protective equipment to avoid getting burned.
4. Press fit valve seat until it seats on the bottom.
5. Cut or grind valve seat using suitable tool to the specified dimensions. Refer to EM-142, "Cylinder Head".
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seating condition. Refer to EM-142, "Cylinder Head".

8. Use a depth gauge to measure the distance between the mounting surface of the cylinder head spring seat and the valve stem end on the exhaust (A) and intake (B) sides. If the distance is shorter than specified, repeat step 5 to adjust it. If it is longer, replace the valve seat with a new one. Refer to EM-142, "Cylinder Head".

**VALVE SPRING SQUARENESS**

Set try square (A) along the side of valve spring and rotate the spring. Measure the maximum clearance (d) between the top of valve spring and try square.

- (B) : Contact
- (C) : V-block

Limit : Refer to EM-142, "Cylinder Head".

- If it exceeds the limit, replace valve spring.

**VALVE SPRING DIMENSIONS AND VALVE SPRING PRESSURE LOAD**

Check valve spring pressure at specified spring height. If it is not within specifications, replace the spring. Refer to EM-142, "Cylinder Head".
WARNING:
• Do not start work until the engine and exhaust system are cooled completely.

CAUTION:
Do not damage or spill oil on the engine mount (Front) insulator.

NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL
1. Remove the air cleaner assembly, front air duct, and air duct hose and resonator tube assembly. Refer to EM-26, "Removal and Installation".
2. Remove the battery. Refer to PG-103, "Removal and Installation (Battery Tray)".
3. Remove the battery tray assembly. Refer to PG-103, "Removal and Installation (Battery Tray)".
4. Remove the transmission control module (TCM). Refer to TM-191, "Removal and Installation".
5. Remove the engine control module (ECM). Refer to EC-586, "Removal and Installation".
6. Disconnect the harness from the ECM and TCM bracket, then remove the ECM and TCM bracket.
7. Remove the coolant from the radiator. Refer to CO-12, "Changing Engine Coolant".
8. Remove the upper radiator hose.
9. Remove the inlet heater pipe (lower)
10. Remove the fan shroud and motor assembly. Refer to CO-16, "Removal and Installation".
11. Remove the exhaust manifold heat shield (bank 2). Refer to EM-36, "Removal and Installation (bank 2)".
12. Support the engine (1) and transaxle (2) using a suitable jack (A) as shown.
   **CAUTION:**
   • Position a suitable jack under the engine and transaxle assembly as shown.
   • Do not damage the front exhaust tube or transaxle oil pan with the jack.

13. Disconnect the air/fuel ratio sensor electrical connector.
14. Disconnect the engine mount insulator (front) vacuum hose.
15. Remove the engine mount insulator (front) nut (A).
16. Loosen the engine mount bracket (front) bolts in the reverse order shown.

17. Remove the engine mount bracket (front).

18. Remove the engine mount insulator (front) bolts in the reverse order as shown.

19. Remove the engine mount insulator (front).

**INSTALLATION**

1. Install the engine mount insulator (front).
2. Install the engine mount insulator (front) bolts and tighten to specification in the order shown.

   ➙ : Front

   Engine mount insulator (front) : 43 N·m (4.4 kg-m, 32 ft-lb)

   CAUTION:
   Check engine mount insulator (front) is seated properly before tightening.

3. Install the engine mount bracket (front) to the engine block.

4. Tighten the engine mount bracket (front) bolts to specification in the order shown.

   ➙ : Engine front

   Engine mount bracket (front) : 40 N·m (4.1 kg-m, 30 ft-lb)

5. Install the engine mount insulator (front) nut (A) and tighten to specification.

   Engine mount insulator (front) nut : 103 N·m (11 kg-m, 76 ft-lb)

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

ENGINE MOUNT (REAR)

WARNING:
• Do not start work until the engine and exhaust system are cooled completely.

CAUTION:
Do not damage or spill oil on the engine mount insulator (rear).

NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL
1. Disconnect the battery negative terminal. Refer to PG-101, "Exploded View".
2. Remove cowl top extension. Refer to EXT-25, "Removal and Installation".
3. Remove the air cleaner and air duct. Refer to EM-26, "Removal and Installation".
4. Remove the strut brace.
5. Remove engine room cover. Refer to EM-25, "Removal and Installation".
6. Remove the air cleaner assembly. Refer to EM-26, "Removal and Installation".
7. Remove the engine under cover. Refer to EXT-26, "Removal and Installation".
8. Remove the tire and wheel. Refer to WT-67, "Removal and Installation".

9. Use a suitable jack (A) to securely support the bottom of the engine (1) and the transaxle assembly (2).

   **CAUTION:**
   Put a piece of wood or an equivalent as the supporting surface and secure in a stable condition.

10. Disconnect the brake booster vacuum hose.
11. Disconnect the RH sway bar link from the front strut.
12. Remove the RH front drive shaft assembly. Refer to FAX-20, "Removal and Installation (RH)".
13. Remove front exhaust tube. Refer to EX-5, "Exploded View".
14. Disconnect the air/fuel ratio sensor electrical connector.
15. Remove the LH TWC heat shield.
16. Disconnect the VIAS control solenoid electrical connector.
17. Disconnect the following:
   - Vacuum hose at the power valve.
   - Vacuum hose at the intake collector.
   - EVAP vacuum hose.
18. Disconnect the EVAP canister purge control solenoid electrical connector, then remove the EVAP canister purge control solenoid.
19. Disconnect the throttle actuator electrical connector, then set the throttle body aside. Discard the gasket.
20. Disconnect the PCV breather hose.
21. Remove the intake manifold collector. Refer to EM-30, "Removal and Installation".
22. Remove the engine mount insulator nut (A).

23. Loosen the engine mount bracket bolts in the reverse order shown.

   ➡️ : Engine front

24. Remove the engine mount bracket.
25. Remove the engine mount insulator bolts in the reverse order as shown.

\[ \rightarrow \text{: Vehicle front} \]

26. Remove the engine mount insulator.

**NOTE:**
Raise or lower engine and transaxle assembly as required with shop crane.

**INSTALLATION**
Installation is in the reverse order of removal.

**NOTE:**
Do not allow oil to get on mounting insulators. Be careful not to damage mounting insulators.

1. Install the engine mount insulator (rear).

2. Remove front drive shaft assemblies from vehicle. Refer to FAX-18, "Removal and Installation (LH)" and FAX-20, "Removal and Installation (RH)".

3. Install the engine mount insulator (rear) to the front suspension member as follows:

\[ \leftrightarrow \text{: Front} \]

a. Temporarily tighten the bolts in the sequence as shown.

b. Tighten the engine mount insulator (rear) bolts to specification in the sequence as shown. Refer to EM-103, "ENGINE MOUNT (REAR) : Removal and Installation".

**CAUTION:**
Check engine mount insulator is seated properly before tightening.
ENGINE MOUNT

< REMOVAL AND INSTALLATION >

4. Tighten engine mount insulator (rear) ground strap bolt to specification. Refer to EM-103, "ENGINE MOUNT (REAR) : Removal and Installation".

5. Install the engine mount bracket (rear) to the engine block.

6. Tighten the engine mount bracket (rear) to the engine as follows:

   ← : Engine front

   a. Temporarily tighten the bolts in the sequence as shown.
   b. Tighten the engine mount bracket (rear) bolts to specification in the sequence as shown. Refer to EM-103, "ENGINE MOUNT (REAR) : Removal and Installation".

7. Install the engine mount insulator nut (rear) (A) and tighten to specification. Refer to EM-103, "ENGINE MOUNT (REAR) : Removal and Installation".

8. Install a new throttle body gasket.
1. Engine mounting bracket (rear)  2. Rear torque rod  3. Rear torque rod bracket
ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

13. Engine mounting bracket support (rear)
   A. Refer to INSTALLATION
   B. Refer to EM-101, "ENGINE MOUNT (FRONT) : Removal and Installation" (Engine Mount - Front)
   C. Refer to EM-103, "ENGINE MOUNT (REAR) : Removal and Installation" (Engine Mount - Rear)

WARNING:
• Place chocks at front and back of rear wheels.
• For engines not equipped with engine slingers, attach proper slingers and bolts as described in the NISSAN Parts Catalog.

CAUTION:
• Do not start working until exhaust system and coolant are cool.
• If items or work required are not covered by the engine main body section, follow the applicable procedures.
• Use the correct supporting points for lifting and jacking. Refer to GI-29, "Garage Jack and Safety Stand and 2-Pole Lift".
• In removing the drive shafts, be careful not to damage any transaxle grease seals.
• Before separating the engine and transaxle, remove the crankshaft position sensor (POS). Refer to EM-66, "Exploded View".
• Do not damage the edge of the crankshaft position sensor (POS) or the ring gear teeth.

NOTE:
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

REMOVAL
1. Release fuel pressure. Refer to EC-168, "Work Procedure".
2. Drain coolant. Refer to CO-12, "Changing Engine Coolant".
3. Drain power steering fluid. Refer to ST-29, "Draining and Refilling".
4. Remove the front under cover. Refer to EXT-26, "Removal and Installation".
5. Remove the fender protector (LH/RH). Refer to EXT-28, "Removal and Installation".
6. Remove the engine room cover. Refer to EM-25, "Removal and Installation".
7. Remove front air duct, air duct hose and resonator assembly and air cleaner case assembly. Refer to EM-26, "Removal and Installation".
8. Remove the cowl top cover, cowl top extension, and cowl top brace (RH). Refer to EXT-25, "Removal and Installation".
9. Disconnect the harness connector from the battery current sensor. Refer to PG-106, "Exploded View".
10. Remove battery tray. Refer to PG-103, "Removal and Installation (Battery Tray)".
11. Remove IPDM E/R. Refer to PCS-36, "Removal and Installation".
12. Remove the relay-fuse box cover and release the harness connectors.
13. Remove the ground wire from the side of the transaxle assembly.
14. Remove the ground wire from the front timing cover.
15. Disconnect the coolant reservoir hose, then remove the coolant reservoir.
16. Remove upper radiator hose. Refer to CO-14, "Exploded View".
17. Disconnect CVT oil warmer hoses from CVT oil warmer.
18. Disconnect fuel hose quick connection at vehicle piping side. Refer to FL-4, "Quick Connector".
19. Disconnect EVAP vacuum hose.
20. Disconnect heater hoses (engine side). Refer to CO-25, "Exploded View".
22. Remove lower radiator hose. Refer to CO-14, "Exploded View".
23. Disconnect brake booster vacuum hose from the intake manifold collector.
24. Remove power steering oil pump. Refer to ST-43, "Removal and Installation".
25. Remove the upper torque rod bolts in the reverse order as shown.

26. Remove the upper torque rod.

27. Remove engine mounting insulator (RH) bolts in reverse order as shown.

28. Remove the engine mounting insulator (RH).

29. Discharge and recover the R134a refrigerant. Refer to HA-25, "Recycle Refrigerant".

30. Disconnect the A/C high side and low side hoses from the A/C compressor. Refer to HA-37, "LOW-PRESSURE PIPE : Removal and Installation" and HA-38, "HIGH-PRESSURE PIPE : Removal and Installation".

31. Disconnect the stabilizer connecting rods at the strut (LH/RH). Refer to FSU-15, "Exploded View".

32. Remove the front drive shafts. Refer to FAX-18, "Removal and Installation (LH)" (LH) and FAX-20, "Removal and Installation (RH)" (RH).

33. Remove cotter pin from outer socket stud.

34. Loosen outer socket nut and separate outer socket from steering knuckle (RH/LH) using suitable tool. **CAUTION:**

   Leave outer socket nut half threaded on outer socket to prevent damage to threads and to prevent suitable tool from coming off suddenly.

35. Remove outer socket nut and separate outer socket from steering knuckle (RH/LH). Refer to ST-39, "Exploded View".

36. Remove front strut bolts at steering knuckle (RH/LH). Refer to FSU-10, "Exploded View".

37. Remove steering knuckle lower pinch bolt and nut and separate transverse link from steering knuckle (RH/LH).

38. Remove steering knuckle (RH/LH).

39. Remove rear torque rod bolts in reverse order as shown.

40. Remove rear torque rod.
ENGINE ASSEMBLY

41. Remove the front exhaust tube. Refer to EX-5, "Removal and Installation".

42. Remove the steering gear heat shield.

43. Remove the power steering line from the sub frame.

44. Remove the steering gear bolts, then support the steering gear.

45. Install engine slingers into front of cylinder head (LH) and rear of cylinder head (RH) then tighten to specified torque.
   • (A): cylinder head (RH)
     \[
     \text{Bolts (B)} : 28 \text{ N·m (2.9 kg-m, 21 ft-lb)}
     \]
   • (B): cylinder head (LH)
     \[
     \text{Bolts (A)} : 28 \text{ N·m (2.9 kg-m, 21 ft-lb)}
     \]

46. Remove rear cover plate.

47. Remove the torque converter nuts.

48. Disconnect vacuum hoses from engine mounting insulator (front) and engine mounting insulator (rear).

49. Position a suitable support table under suspension member and engine assembly.

50. For additional safety, secure the engine in position with suitable tool.

51. Remove suspension member bolts. Refer to FSU-18, "Removal and Installation".

52. Carefully lower the engine, transaxle assembly and suspension member using suitable tool, avoiding interference with the vehicle body.
   **CAUTION:**
   • Before and during this procedure, always check if any harnesses are left connected.
   • Avoid any damage to, or any oil/grease smearing or spills onto the engine mount insulators.

53. Remove the starter motor. Refer to STR-19, "Removal and Installation".

54. Remove the crankshaft position sensor (POS). Refer to EM-66, "Removal and Installation".


56. Separate the engine from the transaxle assembly.

57. Remove engine mount insulator (front). Refer to EM-101, "ENGINE MOUNT (FRONT) : Removal and Installation".
   **CAUTION:**
   To remove engine mount components, partially support weight of engine assembly with shop crane.

58. Remove engine mount insulator (rear). Refer to EM-103, "ENGINE MOUNT (REAR) : Removal and Installation".
   **CAUTION:**
   To remove engine mount components, partially support weight of engine assembly with shop crane.
59. Lift the engine from the suspension member.

60. Remove engine mounting bracket (RH) bolts in reverse order as shown (if necessary).

61. Remove engine mounting bracket (RH) (if necessary).

62. Remove rear torque rod bracket bolts in reverse order as shown (if necessary).

63. Remove rear torque rod bracket (if necessary).

64. Remove engine mounting bracket (front) bolts in reverse order as shown (if necessary).

65. Remove engine mounting bracket (front) (if necessary).

66. Remove engine mounting bracket (rear) bolts in reverse order as shown (if necessary).

67. Remove engine mounting bracket (rear) (if necessary).
68. Remove engine mounting insulator (LH) bolts in reverse order as shown (if necessary).

69. Remove engine mounting insulator (LH) (if necessary).

INSTALLATION
Installation is in the reverse order of removal.

CAUTION:
• Do not allow oil to get on mounting insulators.
• Be careful not to damage mounting insulators.

NOTE:
• Tighten transmission bolts to specification. Refer to TM-212, "Exploded View".

1. Install engine mounting insulator (LH) as follows:
   a. Temporarily tighten bolt located at position 1.
   b. Tighten the remaining bolts in sequence as shown to the specified torque.

   Bolt : 80 N·m (8.2 kg-m, 59 ft-lb)

2. Install engine mounting bracket (rear) as follows:
   a. Temporarily tighten bolt located at position 1.
   b. Tighten the remaining bolts in sequence as shown to the specified torque.

   Bolt : 40 N·m (4.1 kg-m, 30 ft-lb)

3. Install engine mounting bracket (front) as follows:
   a. Temporarily tighten bolt located at position 1.
   b. Tighten the remaining bolts in sequence as shown to the specified torque.

   Bolt : 40 N·m (4.1 kg-m, 30 ft-lb)
4. Install rear torque rod bracket as follows:
   a. Tighten the bolts in sequence as shown to the specified torque.

   ![Diagram of torque rod bracket]

   **Bolts**: 40 N·m (4.1 kg-m, 30 ft-lb)

5. Install engine mounting bracket (RH) as follows:
   a. Temporarily tighten bolt located at position 1.
   b. Tighten the remaining bolts in sequence as shown to the specified torque.

   ![Diagram of engine mounting bracket]

   **Bolts**: 90 N·m (9.2 kg-m, 66 ft-lb)

6. Install rear torque rod as follows:
   a. Temporarily tighten bolt located at position 1.
   b. Tighten the remaining bolts in sequence as shown to the specified torque.

   ![Diagram of rear torque rod]

   **Bolts**: Positions 2, 3: 35 N·m (3.6 kg-m, 26 ft-lb)
   **Bolt**: Position 4: 50 N·m (5.1 kg-m, 37 ft-lb)
   **Bolt**: Position 5: 103 N·m (11 kg-m, 76 ft-lb)

7. Install engine mounting insulator (RH) as follows:
   a. Temporarily tighten bolt located at position 1.
   b. Tighten the remaining bolts in sequence as shown to the specified torque.

   ![Diagram of engine mounting insulator]

   **Nut and Bolts**: 50 N·m (5.1 kg-m, 37 ft-lb)
8. Install upper torque rod as follows:
   a. Tighten the bolts in sequence as shown to the specified torque.

   : Front

   : 85 N·m (8.7 kg-m, 63 ft-lb)

**INSPECTION AFTER INSTALLATION**

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to MA-16, "FOR USA AND CANADA : Fluids and Lubricants" (United States and Canada) or MA-17, "FOR MEXICO : Fluids and Lubricants" (Mexico).
- Use procedure below to check for fuel leakage.
- Turn ignition switch ON (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
- Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

   **NOTE:**
   If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.
- Warm up engine thoroughly to make sure there is no leakage of fuel, exhaust gas, or any oils/fluids including engine oil and engine coolant.
- Bleed air from passages in lines and hoses, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to specified level, if necessary.
- Check wheel alignment. Refer to FSU-7, "Inspection".
- Adjust neutral position of steering angle sensor. Refer to BRC-248, "Description".
- Adjust control cable as necessary. Refer to TM-85, "Inspection".

**Summary of the inspection items:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Before starting engine</th>
<th>Engine running</th>
<th>After engine stopped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine coolant</td>
<td>Level</td>
<td>Leakage</td>
<td>Level</td>
</tr>
<tr>
<td>Engine oil</td>
<td>Level</td>
<td>Leakage</td>
<td>Level</td>
</tr>
<tr>
<td>Transmission/ transaxle fluid</td>
<td>A/T and CVT Models</td>
<td>Leakage</td>
<td>Level/Leakage</td>
</tr>
<tr>
<td>Transmission/ transaxle fluid</td>
<td>M/T Models</td>
<td>Level/Leakage</td>
<td>Leakage</td>
</tr>
<tr>
<td>Other oils and fluids*</td>
<td>Level</td>
<td>Leakage</td>
<td>Level</td>
</tr>
<tr>
<td>Fuel</td>
<td>Leakage</td>
<td>Leakage</td>
<td>Leakage</td>
</tr>
<tr>
<td>Exhaust gas</td>
<td>—</td>
<td>Leakage</td>
<td>—</td>
</tr>
</tbody>
</table>

*Power steering fluid, brake fluid, etc.
Disassembly and Assembly

CAUTION:
• Apply new engine oil to parts as marked in illustrations before installation.
• Place removed parts such as bearings and bearing caps in their proper order and direction.
• When installing the connecting rod nuts and main bearing cap bolts, apply new engine oil to the threads and mating surfaces.
• Do not allow any magnetic materials to contact the signal plate teeth on the drive plate.

DISASSEMBLY
1. Remove the engine assembly. Refer to EM-107, "Removal and Installation".
2. Remove the drive plate.
3. Remove pilot converter using suitable tool (A).

4. Cut away liquid gasket and remove rear oil seal retainer using suitable tool. Refer to EM-5, "Precaution for Liquid Gasket".

   Tool number : KV10111100 (J-37228)

CAUTION:
• Be careful not to damage mounting surface.
• If rear oil seal retainer is removed, replace it with a new one.

INFOID:0000000012233763
5. Install the engine on engine stand (A). Any commercially available engine stand (A) can be used.  
   **CAUTION:**  
   • Use an engine stand that has a load capacity [approximately 240kg (529 lb) or more] large enough for supporting the engine weight.  
   • Before removing the hanging chains, make sure the engine stand is stable and there is no risk of overturning.

6. Remove the knock sensor.  
   **CAUTION:**  
   Carefully handle sensor to avoid shocking it.

7. Drain engine coolant. Refer to CO-12, "Changing Engine Coolant".

8. Drain engine oil. Refer to LU-9, "Changing Engine Oil".

9. Remove the upper oil pan. Refer to EM-40, "Removal and Installation (Upper Oil Pan)".

10. Remove the crankshaft pulley.  
     • Use a suitable tool to prevent the crankshaft from turning.

11. Remove the timing chain. Refer to EM-66, "Removal and Installation".

12. Remove the cylinder head. Refer to EM-91, "Removal and Installation".

13. Remove the piston and connecting rod assemblies.  
     a. Position the crankshaft pin corresponding to the connecting rod to be removed onto the bottom dead center.  
     b. Remove the connecting rod cap.  
     c. Using a suitable tool, push the piston and connecting rod assembly out to the cylinder head side.  
        • Before removing the piston and connecting rod assembly, check the connecting rod side clearance. Refer to EM-150, "Connecting Rod Bearing".

14. Remove the connecting rod bearings.  
   **CAUTION:**  
   • When removing the connecting rod side bearings, note the installation position. Keep them in the correct order.

15. Remove the piston rings from the piston.  
    • Use a piston ring expander (A).  
    **CAUTION:**  
    • When removing the piston rings, be careful not to damage the piston. Do not expand the rings excessively.  
    • Be careful to mark the rings if they are to be reused so they are installed in their original position.  
    • Before removing the piston rings, check the piston ring side clearance. Refer to EM-126, "Inspection".
16. Remove the piston from the connecting rod as follows.
   a. Using a suitable tool (A), remove the snap ring.
      **CAUTION:**
      Do not reuse snap rings, always replace with new ones.

   b. Heat the pistons to 60° - 70°C (140° - 158°F). utilizing suitable
      tool (A)
      **WARNING:**
      Pistons contain heat. When working, wear protective equip-
      ment to avoid getting burned.

   c. Push out the piston pin with a suitable tool with an outer diame-
      ter of approximately 20 mm (0.8 in).

17. Remove the baffle plate from the main bearing beam.
18. Loosen the bolts in the reverse order shown and remove the
    main bearing beam, bearing caps and crankshaft.
   • Before loosening the main bearing cap bolts, measure the
     crankshaft side clearance.
     Refer to EM-126, "Inspection".

   : Engine front
19. Remove the oil jets (A) and dowel pins.

20. Remove the main bearings and thrust bearings from the cylinder block and main bearing caps.
   • When removing them, note the direction and position. Keep them in the correct order for installation.

21. Remove the water drain plug (B) and (F), connector bolt (E), and copper sealing washer (A) and (G) on the cylinder block.
   
   **CAUTION:**
   • Do not reuse copper sealing washers.
   • Do not reuse water drain plug O-ring (C).
   **NOTE:**
   For Canada, connector bolt (E) is a block heater, not a water drain plug.

ASSEMBLY

1. Blow out the coolant and oil passages and cylinder bore to remove any foreign materials.
   **CAUTION:**
   Use goggles to protect your eyes.
2. Install the cylinder block drain plugs.
   • Install the water drain plug (B) and (F), connector bolt (E), and copper sealing washer (A) and (G) on the cylinder block.
   • Install water drain plug (D) and copper sealing washer (C) during engine overhaul.
   • Tighten each plug and connector bolt to specifications.

   **CAUTION:**
   • Use Genuine High Performance Thread Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".
   • Do not reuse copper sealing washers.
   • Installation should be done within 5 minutes of applying liquid gasket.
   • Do not fill the engine with engine coolant for at least 30 minutes after the components are installed to allow the sealant to cure.

3. Install the oil jets (A).
   • Insert the oil jet dowel pin into the cylinder block dowel pin hole, and tighten the bolts.

4. Install the main bearings and the thrust bearings (C).
   a. Remove dust, dirt, and oil on the bearing mating surfaces of the cylinder block and the main bearing cap.
   b. Install the thrust bearings (C) to both sides (D) of the No. 3 journal housing on the cylinder block (A) and the main bearing cap.
      • Install the thrust bearings (C) with the oil groove facing the crankshaft arm (outside).
      • Install bearing with a projection on one end on cylinder block and bearing with a projection at center on cap. Align each projection with mating notch.
5. Set the upper main bearings (A) and lower main bearings (B) in their proper positions on the cylinder block.
   • Confirm the correct main bearings are used. Refer to EM-126, “Inspection”.

   ![Diagram of main bearings](image1)

6. Instructions for the re-use of the main bearing cap bolts.
   • A plastic zone tightening method is used for tightening the main bearing cap bolts. Measure (d1) and (d2) as shown.
   • For (d2), select the minimum diameter in the measuring area.
   • If the difference between (d1) and (d2) exceeds the limit, replace the bolts for assembly.

   Limit (d1 - d2) : 0.11 mm (0.0043 in)

   ![Diagram of tightening measurement](image2)

7. After installing the crankshaft, lower main bearings, main bearing caps, main bearing beam, and bearing cap bolts. Tighten the bearing cap bolts in the numerical order as shown.

   ![Diagram of bearing cap bolts](image3)

   a. Make sure that the front marks on the main bearing beam faces the front of the engine.
   b. Prior to tightening all the bearing cap bolts, place the bearing beam in its proper position by shifting the crankshaft in the axial position.
   c. After tightening the bearing cap bolts, make sure the crankshaft turns smoothly.
   d. Lubricate the threads and seat surfaces of the bolts with new engine oil.
   e. Tighten the bolts in two stages:

   CAUTION:
   Measure the tightening angle in two stages using Tool (A). Do not measure with eyes only, be sure to use Tool.

   | Stage 1 | 32.3 - 38.3 N·m (3.3 - 3.9 kg-m, 24 - 28 ft-lb) |
   | Stage 2 | 90° - 95° degrees clockwise |

   Tool number : KV10112100 (BT-8653-A)
8. Measure crankshaft end play.
   • If beyond the limit, replace the thrust bearing with a new one.
     Refer to EM-146, "Cylinder Block".

9. Install the piston to the connecting rod.
   a. Using suitable snap ring pliers, install the snap ring fully into the
      pin-groove of the piston rear side.
      CAUTION:
      Do not reuse snap rings.

      (A) : Piston front mark
      (B) : Oil hole
      (C) : Connecting rod front mark
      (D) : Cylinder No.

   b. Install the piston to the connecting rod.
      • Heat the piston using suitable tool (A) until the piston pin can
        be pushed in by hand without excess force [approximately 60 -
        70°C (140 - 158°F)]. From the front to the rear, insert the pis-
        ton pin into the piston and through the connecting rod.
      WARNING:
      Pistons contain heat. When working, wear protective
      equipment to avoid getting burned.
Assemble so that the piston front mark (B) and the crown and the oil hole (D), connecting rod front mark (G) and cylinder No. (H) on the connecting rod are positioned as shown.

- Engine front
- Piston grade number
- Piston front mark
- Pin grade
- Crown and oil hole
- Small end grade number
- Mass grade number
- Connecting rod front mark
- Cylinder No.
- Crown I.D. code

**CAUTION:**
Do not reuse snap rings, always replace with new ones.

10. Using a piston ring expander, install the piston rings.

- Top ring
- Second ring

**CAUTION:**
- Be careful not to damage the piston.
- When the piston rings are not replaced, remount the rings in their original positions.
- When replacing the piston rings, those without stamped surface (A) can be mounted either side up.
- Install the second ring with the stamped surface (B) facing upward. If the ring is not stamped it can face in either direction.
Position each ring with the gap as shown, referring to the piston front mark.

(A) : Top ring gap
(B) : Front mark
(C) : Oil ring upper or lower rail gap
(D) : Second ring and oil ring spacer gap
(E) : Oil ring upper or lower rail gap

11. Install the connecting rod bearings (A) to the connecting rod and the connecting rod cap (B).
   • When installing the connecting rod bearings (A), apply engine oil to the bearing surface (crankshaft side). Do not apply oil to the back surface (connecting rod and cap side), but thoroughly clean it.
   • When installing, align the connecting rod bearing (A) protrusion with the notch of the connecting rod to install.
   • Check that the oil holes on the connecting rod (B) and on the corresponding bearing (A) are aligned.

12. Install the piston and connecting rod assembly into the corresponding cylinder.
   • Position the crankshaft pin corresponding to the connecting rod to be installed onto the bottom dead center.
   • Apply engine oil sufficiently to the cylinder bore, piston, and crankshaft pin.
   • Match the cylinder position with the cylinder No. (B) on the connecting rod to install.
   • Install the piston with the piston front mark (A) on the crown facing the front of the engine (➡️) using a suitable tool.

(C) : Oil hole

CAUTION:
Be careful not to damage the crankshaft pin and cylinder wall, resulting from interference of the connecting rod big end.

13. Install the connecting rod cap.
   • Observing the sample codes (A), match the stamped cylinder number marks (F) on the connecting rod with those on the cylinder cap for installation.
   • Install the piston connecting rod assembly and cap so that the front mark on the cap and piston are facing the front of the engine.
   • Lubricate the threads and seat surfaces with new engine oil.

(B) : Small end diameter grade
(C) : Weight grade
(D) : Management code
(E) : Front mark
14. Check the connecting rod cap bolts before reusing, then install in their original position in the connecting rod. The bolts should screw in smoothly by hand.
   • Measure the outer diameter of the connecting rod cap bolt as shown.

   **Outer diameter (d) of the connecting rod bolt**
   **Standard** : 7.90 - 8.00 mm (0.3110 - 0.3150 in)
   **Limit** : 7.75 mm (0.3051 in)
   **(A)** : 19 mm (0.75 in)

15. Tighten the connecting rod nuts in two stages using Tool:

   **Stage 1** : 19 - 21 N·m (1.9 - 2.1 kg·m, 14 - 15 ft-lb)
   **Stage 2** : 90° - 95° degrees clockwise

   **CAUTION:**
   • Always use either an angle wrench or protractor. Avoid tightening based on visual check alone.

   **Tool number** : KV10112100 (BT-8653-A)
   • Apply engine oil to the threads and seats of the connecting rod bolts and nuts.
   • After tightening the nuts, make sure that the crankshaft rotates smoothly.
   • Check the connecting rod side clearance. If beyond the limit, replace the connecting rod and/or crankshaft. Refer to EM-146, "Cylinder Block".

16. Install the baffle plate to the main bearing beam.
17. Install the knock sensor (A).
   • Make sure that there is no foreign material on the cylinder block mating surface and the back surface of the knock sensor (A).
   • Install the knock sensor (A) with the connector facing the rear of the engine.
   • Do not tighten the bolts while holding the connector.
   • Make sure that the knock sensor (A) does not interfere with other parts.

   **CAUTION:**
   If any impact by dropping occurs to the knock sensor, replace it with new one.

18. Install the cylinder head. Refer to EM-91, "Removal and Installation".
19. Install the timing chain. Refer to EM-66, "Removal and Installation".
20. Install the oil pan. Refer to EM-39, "Removal and Installation (Lower Oil Pan)" and EM-40, "Removal and Installation (Upper Oil Pan)".
21. Remove the engine from the stand.
22. Install the pilot converter with its chamfer facing crankshaft as shown.

23. Install the rear oil seal retainer using Tool (A).
   - Tool number : — (J-47128)
   - a. Loosen the wing nut (B) on the end of the Tool (A).
   - b. Insert the arbor (D) into the crankshaft pilot hole until the outer lip (C) of the Tool (A) covers the edge of the crankshaft sealing surface.
   - c. Tighten the wing nut (B) to secure the Tool (A) to the crankshaft.
   - d. Apply sealant to rear oil seal retainer as shown.
     Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".
     CAUTION:
     • Installation should be done within 5 minutes after applying liquid gasket.
     • Do not fill the engine with oil for at least 30 minutes after the components are installed to allow the sealant to cure.
   - e. Lubricate the sealing surface of the new rear main seal with new engine oil.
   - f. Slide the new rear main seal (1) over the Tool (A) and onto the crankshaft.
   - g. Loosen the wing nut and push the threaded rod into the handle to remove the Tool (A).
   - h. Tighten the rear oil seal retainer bolts to specification. Refer to EM-115, "Exploded View".

24. Install the drive plate. Refer to EM-115, "Exploded View".
25. Install the engine assembly into the vehicle. Refer to EM-107, "Removal and Installation".

Inspection

PISTON AND PISTON PIN CLEARANCE

Inner Diameter of Piston Pin Hole
• Measure the inner diameter of piston pin hole (dp). Refer to EM-146, "Cylinder Block".

Outer Diameter of Piston Pin
• Measure outer diameter of piston pin (Dp). Refer to EM-146, "Cylinder Block".

Piston and Piston Pin Interference Fit
Standard Interference Fit = (Dp) – (dp)

**Standard**: 0.002 – 0.010 mm (0.0001 – 0.0004 in)

• If clearance is exceeds specification, replace either or both of piston/piston pin assembly and connecting rod assembly with reference to specification of each part.

PISTON RING SIDE CLEARANCE
< UNIT DISASSEMBLY AND ASSEMBLY >

CYLINDER BLOCK

• Measure side clearance of piston ring and piston ring groove with feeler gauge.
• If out of specification, replace piston ring assembly. If clearance exceeds maximum limit with new rings, replace piston. Refer to EM-146, "Cylinder Block".

PISTON RING END GAP

• Insert piston ring until it is in the middle of the cylinder bore and measure the end gap.
• If out of specification, replace piston ring. Refer to EM-146, "Cylinder Block".

CONNECTING ROD BEND AND TORSION

• If it exceeds the limit, replace connecting rod assembly. Refer to EM-146, "Cylinder Block".

CONNECTING ROD BEARING HOUSING DIAMETER (BIG END)

• Install the connecting rod cap without the connecting rod bearing installed. After tightening the connecting rod nut to the specified torque, measure the connecting rod bearing housing big end inner diameter using an inside micrometer. Refer to EM-146, "Cylinder Block".
**CYLINDER BLOCK**

< UNIT DISASSEMBLY AND ASSEMBLY >

**CONNECTING ROD BUSHING OIL CLEARANCE (SMALL END)**

Inner Diameter of Connecting Rod (Small End)
- Measure inner diameter of piston pin bushing. Refer to EM-146, "Cylinder Block".

Outer Diameter of Piston Pin
- Measure outer diameter of piston pin. Refer to EM-146, "Cylinder Block".

Connecting Rod Bushing Oil Clearance (Small End)
(Connecting rod small end oil clearance) = (Inner diameter of connecting rod small end) – (Outer diameter of piston pin). Refer to EM-146, "Cylinder Block".
- If the measured value exceeds the standard, replace the connecting rod assembly and/or piston and piston pin assembly.
- If replacing the piston and piston pin assembly, use the Table for Selective Fitting for Piston to select the piston corresponding to the applicable bore grade of the cylinder block to be used. Follow the "PISTON-TO-CYLINDER BORE CLEARANCE" procedure.

Factory installed parts grading:
CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

Service parts apply only to grade 0.

<table>
<thead>
<tr>
<th>Grade</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Connecting rod small end inner diameter</td>
<td>Piston pin outer diameter</td>
</tr>
<tr>
<td></td>
<td>22.000 - 22.006 (0.8661 - 0.8664)</td>
<td>21.989 - 21.995 (0.8657 - 0.8659)</td>
</tr>
<tr>
<td></td>
<td>22.006 - 22.012 (0.8664 - 0.8666)</td>
<td>21.995 - 22.001 (0.8659 - 0.8662)</td>
</tr>
<tr>
<td></td>
<td>Piston pin hole diameter</td>
<td>Connecting rod mark</td>
</tr>
<tr>
<td></td>
<td>21.993 - 21.999 (0.8659 - 0.8661)</td>
<td>21.999 - 22.005 (0.8661 - 0.8663)</td>
</tr>
</tbody>
</table>

CYLINDER BLOCK DISTORTION

- Using a scraper, remove any old gasket material on the cylinder block surface and remove any oil, scale, carbon, or other contamination.
  **CAUTION:**
  Be careful not to allow gasket flakes to enter the oil or coolant passages.

- Measure the distortion on the block upper face at different points in six directions. Refer to **EM-146, "Cylinder Block"**.

- If out of specification, resurface the cylinder block. The allowable amount of resurfacing is dependent on the amount of any cylinder head resurfacing. The resurfacing limit is [amount of cylinder head resurfacing] + [amount of cylinder head resurfacing] = 0.2 mm (0.008 in).

  **Cylinder block height** : 214.95 - 215.05 mm (8.4626 - 8.4665 in)

INNER DIAMETER OF MAIN BEARING HOUSING

- Install the main bearing caps with the main bearings removed, and tighten the bolts to the specified torque.

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CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

- Using a bore gauge, measure the inner diameter of the main bearing housing (A). Refer to EM-146, "Cylinder Block".
- If out of the standard, replace the cylinder block and main bearing caps as an assembly.

**NOTE:**
These components cannot be replaced as a single unit, because they were processed together.

PISTON-TO-CYLINDER BORE CLEARANCE

1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper at (A), (B) and (C). The X axis is in the longitudinal direction of the engine.

   Cylinder bore inner diameter

<table>
<thead>
<tr>
<th>Grade No.</th>
<th>Standard inner diameter</th>
<th>Wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>95.500 - 95.510 mm (3.7598 - 3.7602 in)</td>
<td>0.20 mm (0.0079 in)</td>
</tr>
<tr>
<td>No. 2</td>
<td>95.510 - 95.520 mm (3.7602 - 3.7606 in)</td>
<td></td>
</tr>
<tr>
<td>No. 3</td>
<td>95.520 - 95.530 mm (3.7606 - 3.7610 in)</td>
<td></td>
</tr>
</tbody>
</table>

   If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary. Refer to EM-146, "Cylinder Block".

2. Check for scratches and seizure. If seizure is found, hone it.
   - If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block rear position. These numbers are punched in either Arabic or Roman numerals.
3. Measure piston skirt diameter. Refer to EM-146, "Cylinder Block".

4. Check that piston-to-bore clearance is within specification. Refer to EM-146, "Cylinder Block".
   • The piston-to-bore clearance is measured at the (B) level in the cylinder as shown.

5. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter (A).

   **Rebored size calculation**: \( D = A + B - C \)

   where,
   - \( D \) : Bored diameter
   - \( A \) : Piston diameter as measured
   - \( B \) : Piston-to-bore clearance
   - \( C \) : Honing allowance 0.02 mm (0.0008 in)

6. Install main bearing caps, and tighten to the specified torque. Otherwise, cylinder bores may be distorted after boring.

7. Cut cylinder bores.
   • *When any cylinder needs boring, all other cylinders must also be bored.*
   • *Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.*

8. Hone cylinders to obtain specified piston-to-bore clearance.

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

**CRANKSHAFT**

1. Check the crankshaft main and pin journals for scoring, wear, or cracks.

2. Measure the journals for taper and out-of-round. Refer to EM-146, "Cylinder Block".
3. Measure crankshaft runout.
   a. Place a V-block on a precise flat table to support the journals on the both ends of the crankshaft.
   b. Place a dial gauge straight up on the No. 3 journal.
   c. While rotating the crankshaft, read the movement of the pointer on the dial gauge. Refer to EM-146, "Cylinder Block".

BEARING CLEARANCE

- Use either of the following two methods, however method (A) gives more reliable results and so is the preferred method.

**Method A (Using Bore Gauge and Micrometer)**

**Main Bearing**

1. Set the main bearings in their proper positions on the cylinder block and the main bearing cap.
2. Install the main bearing caps and bearing beam to the cylinder block. Tighten all bolts in the numerical order as specified. Refer to EM-116, "Disassembly and Assembly".
3. Measure the inner diameters (A) of each main bearing as shown.
4. Measure the outer diameters (Dm) of each crankshaft main journal as shown.
5. Calculate the main bearing clearance. Refer to EM-149, "Main Bearing".
   - If it exceeds the limit, replace the bearing.
   - If clearance cannot be adjusted using any standard bearing grade, grind crankshaft journal and use an undersized bearing.
When grinding the crankshaft journal, confirm that the (L) dimension in the fillet role is more than the specified limit. Refer to EM-146, "Cylinder Block".

6. If the crankshaft or the cylinder block is replaced with a new one, select thickness of the main bearings as follows:
   a. The grade number of each cylinder block main journal is punched on the respective cylinder block. These numbers are punched in either Arabic or Roman numerals. If measured diameter is out of the grade punched, decide suitable grade from available main bearings.
   b. The grade number of each crankshaft main journal is punched on the crankshaft end. These numbers are punched in either Arabic or Roman numerals. If measured diameter is out of grade punched, decide the suitable grade from available main bearings.
c. Select the main bearing suitable thickness according to the following table:

<table>
<thead>
<tr>
<th>Mark</th>
<th>Axle diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>59.975 - 59.974 (2.3612 - 2.3612)</td>
</tr>
<tr>
<td>B</td>
<td>59.974 - 59.973 (2.3612 - 2.3611)</td>
</tr>
<tr>
<td>C</td>
<td>59.973 - 59.972 (2.3611 - 2.3611)</td>
</tr>
<tr>
<td>D</td>
<td>59.972 - 59.971 (2.3611 - 2.3611)</td>
</tr>
<tr>
<td>E</td>
<td>59.971 - 59.970 (2.3610 - 2.3610)</td>
</tr>
<tr>
<td>F</td>
<td>59.970 - 59.969 (2.3610 - 2.3609)</td>
</tr>
<tr>
<td>G</td>
<td>59.969 - 59.968 (2.3610 - 2.3609)</td>
</tr>
<tr>
<td>H</td>
<td>59.968 - 59.967 (2.3609 - 2.3609)</td>
</tr>
<tr>
<td>J</td>
<td>59.967 - 59.966 (2.3609 - 2.3609)</td>
</tr>
<tr>
<td>K</td>
<td>59.966 - 59.965 (2.3609 - 2.3608)</td>
</tr>
<tr>
<td>L</td>
<td>59.965 - 59.964 (2.3608 - 2.3608)</td>
</tr>
<tr>
<td>M</td>
<td>59.964 - 59.963 (2.3608 - 2.3607)</td>
</tr>
<tr>
<td>N</td>
<td>59.963 - 59.962 (2.3607 - 2.3607)</td>
</tr>
<tr>
<td>P</td>
<td>59.962 - 59.961 (2.3607 - 2.3607)</td>
</tr>
<tr>
<td>R</td>
<td>59.961 - 59.960 (2.3607 - 2.3606)</td>
</tr>
<tr>
<td>S</td>
<td>59.960 - 59.959 (2.3606 - 2.3605)</td>
</tr>
<tr>
<td>T</td>
<td>59.959 - 59.958 (2.3605 - 2.3605)</td>
</tr>
<tr>
<td>U</td>
<td>59.958 - 59.957 (2.3605 - 2.3605)</td>
</tr>
<tr>
<td>V</td>
<td>59.957 - 59.956 (2.3605 - 2.3605)</td>
</tr>
<tr>
<td>W</td>
<td>59.956 - 59.955 (2.3605 - 2.3604)</td>
</tr>
<tr>
<td>X</td>
<td>59.955 - 59.954 (2.3604 - 2.3604)</td>
</tr>
<tr>
<td>Y</td>
<td>59.954 - 59.953 (2.3604 - 2.3603)</td>
</tr>
<tr>
<td>1</td>
<td>59.953 - 59.952 (2.3603 - 2.3603)</td>
</tr>
<tr>
<td>7</td>
<td>59.952 - 59.951 (2.3603 - 2.3603)</td>
</tr>
</tbody>
</table>

Connecting Rod Bearing (Big End)
1. Install the connecting rod bearing to the connecting rod and cap.
2. Install the connecting rod cap to the connecting rod. Tighten to specification. Refer to EM-116, "Disassembly and Assembly".
3. Measure the inner diameter (C) of each connecting rod (big end) as shown.
4. Measure the outer diameter \((D_p)\) of each crankshaft pin journal.

5. Calculate the connecting rod bearing clearance. Refer to EM-150, "Connecting Rod Bearing".  
   **Connecting rod bearing clearance = \((C) - (D_p)\)**

6. If the calculated clearance exceeds the specified limit, replace the bearings.

7. If the clearance cannot be adjusted within the standard of any bearing, grind the crankshaft journal and use undersized bearings.

8. If the crankshaft is replaced with a new one, select the connecting rod bearings according to the following table: 

   **Connecting Rod Bearing Grade Number (Identification Color)**

<table>
<thead>
<tr>
<th>Crankshaft pin journal grade number</th>
<th>Connecting rod bearing grade number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 (black)</td>
</tr>
<tr>
<td>1</td>
<td>1 (brown)</td>
</tr>
<tr>
<td>2</td>
<td>2 (green)</td>
</tr>
</tbody>
</table>

   These numbers are punched in either Arabic or Roman numerals.

**Method B (Using Plastigage)**

- Remove oil and dust on the crankshaft pin and the surfaces of each bearing completely.
- Cut a Plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Install the connecting rod bearings to the connecting rod cap, and tighten the connecting rod nuts to the specified torque.

   **CAUTION:**
   Do not rotate the crankshaft.

- Remove the connecting rod cap and bearings, and using the scale on the Plastigage bag, measure the Plastigage width.

   **NOTE:**
   The procedure when the measured value exceeds the repair limit is same as that described in "Method A (Using Bore Gauge and Micrometer)".

**DRIVE PLATE RUNOUT**

Use a suitable tool to measure the runout (Total Indicator Reading) as shown. Refer to EM-151, "Drive Plate".

   **CAUTION:**
   The signal plate is built into the drive assembly. Be careful not to damage the signal plate, particularly the teeth.
• Check the drive plate and signal plate for deformation or cracks.
• Keep all magnetized objects away from the signal plate, particularly the teeth.

OIL JET
• Check nozzle for deformation and damage.
• Blow compressed air from nozzle, and check for clogs.
• If it is not operating properly, replace oil jet.

OIL JET RELIEF VALVE
• Using a clean plastic stick, press check valve in oil jet relief valve. Make sure that valve moves smoothly with proper reaction force.
• If it is not operating properly, replace oil jet relief valve.

Dowel Pin Alignment

REMOVAL
1. Use suitable tool to lock the drive plate and match mark (A) the drive plate before removing the bolts.
   CAUTION:
   Do not damage the ring gear teeth, or the signal plate teeth behind the ring gear.

2. Remove drive plate.
   • Loosen the drive plate in a diagonal order.
   CAUTION:
   • Do not place drive plate with signal plate facing down.
   • When handling the signal plate, take care not to damage or scratch it.
   • Handle the signal plate in a manner that prevents it from becoming magnetized.

INSTALLATION
Installation is in the reverse order of removal.
• When installing the drive plate to the crankshaft, use the match mark (A) as shown to correctly align the crankshaft side dowel pin to the drive plate side dowel pin hole.

• Install the drive plate and the reinforcement plate in the direction as shown.

• Tighten the drive plate bolts in a diagonal pattern in two steps. Refer to EM-116, "Disassembly and Assembly".
  - Use a suitable tool to lock the drive plate.
### GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder arrangement</td>
<td>V-6</td>
</tr>
<tr>
<td>Displacement</td>
<td>3,498 cm³ (213.45 cu in)</td>
</tr>
<tr>
<td>Bore and stroke</td>
<td>95.5 x 81.4 mm (3.760 x 3.205 in)</td>
</tr>
<tr>
<td>Valve arrangement</td>
<td>DOHC</td>
</tr>
<tr>
<td>Firing order</td>
<td>1-2-3-4-5-6</td>
</tr>
<tr>
<td>Number of piston rings</td>
<td>Compression 2</td>
</tr>
<tr>
<td></td>
<td>Oil 1</td>
</tr>
<tr>
<td>Number of main bearings</td>
<td>4</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>10.6:1</td>
</tr>
<tr>
<td>Compression pressure</td>
<td>Standard 1,275 kPa (13.0, 185 psi)</td>
</tr>
<tr>
<td></td>
<td>Minimum 981 kPa (10.0, 142 psi)</td>
</tr>
<tr>
<td></td>
<td>Differential limit between cylinders 98 (1.0, 14)</td>
</tr>
</tbody>
</table>

### Cylinder number

![Cylinder Diagram](SEM713A)

### Valve timing

(Valve timing control - "OFF")

![Valve Timing Diagram](PBIC0187E)

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>256</td>
<td>240</td>
<td>-10</td>
<td>70</td>
<td>8</td>
<td>68</td>
</tr>
</tbody>
</table>

### Drive Belt

**DRIVE BELT**

- Tension of drive belt: Drive belt tension is not necessary, as it is automatically adjusted by drive belt auto-tensioner.

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2016 Maxima NAM
# SERVICE DATA AND SPECIFICATIONS (SDS)

**Spark Plug**

**SPARK PLUG**

<table>
<thead>
<tr>
<th>Make</th>
<th>DENSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type*</td>
<td>FXE22HR11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gap</th>
<th>Standard</th>
<th>Limit (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.1 (0.043)</td>
<td>1.35 (0.53) (for USA and Canada)</td>
</tr>
<tr>
<td></td>
<td>Limit</td>
<td>1.25 (0.49) (for Mexico)</td>
</tr>
</tbody>
</table>

*: Always check with the Parts Department for the latest parts information.

## Intake Manifold

**INTAKE MANIFOLD**

<table>
<thead>
<tr>
<th>Items</th>
<th>Limit (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake manifold</td>
<td>0.1 (0.004)</td>
</tr>
</tbody>
</table>

## Exhaust Manifold

**EXHAUST MANIFOLD**

<table>
<thead>
<tr>
<th>Items</th>
<th>Limit (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhaust manifold</td>
<td>0.3 (0.012)</td>
</tr>
</tbody>
</table>

## Camshaft

**CAMSHAFT**

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Limit (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camshaft journal oil clearance</td>
<td>No. 1: 0.045 - 0.086 (0.0018 - 0.0034)</td>
<td>0.15 (0.0059)</td>
</tr>
<tr>
<td>Camshaft cam height “A”</td>
<td>Intake: 45.475 - 45.665 (1.7904 - 1.7978)</td>
<td>0.2 (0.008)*1</td>
</tr>
<tr>
<td>Camshaft journal diameter</td>
<td>No. 2, 3, 4: 23.445 - 23.465 (0.9230 - 0.9238)</td>
<td>—</td>
</tr>
<tr>
<td>Camshaft bracket inner diameter</td>
<td>No. 1: 26.000 - 26.021 (1.0236 - 1.0244)</td>
<td>—</td>
</tr>
<tr>
<td>Camshaft runout [TIR*2]</td>
<td>Less than 0.02 (0.0008)</td>
<td>0.05 (0.0020)</td>
</tr>
<tr>
<td>Camshaft sprocket runout [TIR*2]</td>
<td>Less than 0.15 (0.0059)</td>
<td>—</td>
</tr>
</tbody>
</table>
**SERVICE DATA AND SPECIFICATIONS (SDS)**

- **Difference in level between front end faces of No. 1 camshaft bracket and cylinder head**
  - Standard: -0.14 (-0.0055)
  - Actual: —

---

**VALVE LIFTER**

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve lifter outer diameter</td>
<td>33.977 - 33.987 (1.3377 - 1.3381)</td>
</tr>
<tr>
<td>Valve lifter hole diameter</td>
<td>34.000 - 34.016 (1.3386 - 1.3392)</td>
</tr>
<tr>
<td>Valve lifter clearance</td>
<td>0.013 - 0.039 (0.0005 - 0.0015)</td>
</tr>
</tbody>
</table>

**VALVE CLEARANCE**

<table>
<thead>
<tr>
<th>Items</th>
<th>Cold</th>
<th>Hot* (reference data)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
<td>0.26 - 0.34 (0.010 - 0.013)</td>
<td>0.304 - 0.416 (0.012 - 0.016)</td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.29 - 0.37 (0.011 - 0.015)</td>
<td>0.308 - 0.432 (0.012 - 0.017)</td>
</tr>
</tbody>
</table>

*: Approximately 80°C (176°F)

**AVAILABLE VALVE LIFTER**

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Cold</th>
<th>Hot* (reference data)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00 (0.1181)</td>
<td>3.02 (0.1189)</td>
<td>3.04 (0.1197)</td>
</tr>
<tr>
<td>3.06 (0.1205)</td>
<td>3.08 (0.1213)</td>
<td>3.10 (0.1220)</td>
</tr>
<tr>
<td>3.12 (0.1228)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EM-142

SERVICE DATA AND SPECIFICATIONS (SDS)

Cylinder Head

**CYLINDER HEAD**

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head surface distortion</td>
<td>Less than 0.03 (0.0012)</td>
<td>0.1 (0.004)</td>
</tr>
<tr>
<td>Normal cylinder head height &quot;H&quot;</td>
<td>126.4 - 126.5 (4.97 - 4.98)</td>
<td>—</td>
</tr>
</tbody>
</table>

*: Always check with the Parts Department for the latest parts information.

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2016 Maxima NAM
## SERVICE DATA AND SPECIFICATIONS (SDS)

### VALVE DIMENSIONS

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spark plug tube installation height</td>
<td>37.7 - 39.1 (1.484 - 1.539)</td>
<td></td>
</tr>
</tbody>
</table>

### VALVE OIL SEAL

<table>
<thead>
<tr>
<th>Description</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve oil seal installation height</td>
<td>14.3 - 14.9 (0.563 - 0.587)</td>
</tr>
</tbody>
</table>
### SERVICE DATA AND SPECIFICATIONS (SDS)

**Unit: mm (in)**

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Oversize (Service) [0.2 (0.008)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer diameter</td>
<td>10.023 - 10.034 (0.3946 - 0.3950)</td>
<td>10.223 - 10.234 (0.4025 - 0.4029)</td>
</tr>
<tr>
<td>Inner diameter (Finished size)</td>
<td>6.000 - 6.018 (0.2362 - 0.2369)</td>
<td></td>
</tr>
<tr>
<td>Cylinder head valve guide hole diameter</td>
<td>9.975 - 9.996 (0.3927 - 0.3935)</td>
<td>10.175 - 10.196 (0.4006 - 0.4014)</td>
</tr>
<tr>
<td>Interference fit of valve guide</td>
<td>0.027 - 0.059 (0.0011 - 0.0023)</td>
<td></td>
</tr>
<tr>
<td>Valve guide clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td>0.020 - 0.053 (0.0008 - 0.0021)</td>
<td>0.08 (0.0031)</td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.040 - 0.073 (0.0016 - 0.0029)</td>
<td>0.01 (0.004)</td>
</tr>
<tr>
<td>Valve deflection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td>—</td>
<td>0.24 (0.0094)</td>
</tr>
<tr>
<td>Exhaust</td>
<td>—</td>
<td>0.28 (0.0110)</td>
</tr>
<tr>
<td>Projection length &quot;L&quot;</td>
<td></td>
<td>12.6 - 12.8 (0.496 - 0.504)</td>
</tr>
</tbody>
</table>

**VALVE SEAT**
## SERVICE DATA AND SPECIFICATIONS (SDS)

### VALVE SPRING

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Oversize (Service) [0.5 (0.02)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder head seat recess diameter &quot;D&quot;</td>
<td>38.000 - 38.016 (1.4961 - 1.4967)</td>
<td>38.500 - 38.516 (1.5157 - 1.5164)</td>
</tr>
<tr>
<td>Exhaust (B)</td>
<td>31.600 - 31.616 (1.2441 - 1.2447)</td>
<td>32.100 - 32.116 (1.2638 - 1.2644)</td>
</tr>
<tr>
<td>Valve seat outer diameter</td>
<td>38.097 - 38.113 (1.4999 - 1.5005)</td>
<td>38.597 - 38.613 (1.5196 - 1.5202)</td>
</tr>
<tr>
<td>Exhaust</td>
<td>31.680 - 31.696 (1.2472 - 1.2479)</td>
<td>32.180 - 32.196 (1.2669 - 1.2676)</td>
</tr>
<tr>
<td>Valve seat interference fit</td>
<td>0.081 - 0.113 (0.0032 - 0.0044)</td>
<td></td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.064 - 0.096 (0.0025 - 0.0038)</td>
<td></td>
</tr>
<tr>
<td>Height &quot;h&quot;</td>
<td>5.9 - 6.0 (0.232 - 0.236)</td>
<td>5.0 - 5.1 (0.197 - 0.201)</td>
</tr>
<tr>
<td>Exhaust (B)</td>
<td>5.9 - 6.0 (0.232 - 0.236)</td>
<td>4.9 - 5.0 (0.193 - 0.197)</td>
</tr>
<tr>
<td>Contacting width &quot;W&quot;*</td>
<td>1.18 - 1.22 (0.0465 - 0.0480)</td>
<td></td>
</tr>
<tr>
<td>Exhaust (B)</td>
<td>1.38 - 1.42 (0.0543 - 0.0559)</td>
<td></td>
</tr>
<tr>
<td>Cylinder head seat recess depth (H)</td>
<td>6.0 (0.236)</td>
<td></td>
</tr>
<tr>
<td>Depth &quot;L&quot;</td>
<td>41.16 - 41.76 (1.6205 - 1.6441)</td>
<td></td>
</tr>
<tr>
<td>Exhaust (B)</td>
<td>41.09 - 41.69 (1.6177 - 1.6413)</td>
<td></td>
</tr>
</tbody>
</table>

*:Machining data

---

**VALVE SPRING**

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free height</td>
<td>47.07 mm (1.8531 in)</td>
</tr>
<tr>
<td>Installation height</td>
<td>37.00 mm (1.4567 in)</td>
</tr>
<tr>
<td>Installation load</td>
<td>166 - 188 N (16.9 - 19.2 kg, 37 - 42 lb)</td>
</tr>
</tbody>
</table>

Revision: October 2015

2016 Maxima NAM
### Cylinder Block

#### CYLINDER BLOCK

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height during valve open</td>
<td>27.20 mm (1.0709 in)</td>
</tr>
<tr>
<td>Load with valve open</td>
<td>373 - 421 N (38.0 - 42.9 kg, 84 - 95 lb)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Items</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squareness</td>
<td>2.0 (0.079)</td>
</tr>
</tbody>
</table>

#### Main bearing housing inner diameter

<table>
<thead>
<tr>
<th>Grade No. 1</th>
<th>95.500 - 95.510 (3.7598 - 3.7602)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade No. 2</td>
<td>95.510 - 95.520 (3.7602 - 3.7606)</td>
</tr>
<tr>
<td>Grade No. 3</td>
<td>95.520 - 95.530 (3.7606 - 3.7610)</td>
</tr>
</tbody>
</table>

| Wear limit  | 0.20 (0.0079) |

<table>
<thead>
<tr>
<th>Surface distortion</th>
<th>Standard</th>
<th>Less than 0.03 (0.0012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit</td>
<td>0.10 (0.0039)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cylinder bore Inner diameter</th>
<th>Standard*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade No. 1</td>
<td>95.500 - 95.510 (3.7598 - 3.7602)</td>
</tr>
<tr>
<td>Grade No. 2</td>
<td>95.510 - 95.520 (3.7602 - 3.7606)</td>
</tr>
<tr>
<td>Grade No. 3</td>
<td>95.520 - 95.530 (3.7606 - 3.7610)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Out-of-round</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.015 (0.0006)</td>
</tr>
</tbody>
</table>
### SERVICE DATA AND SPECIFICATIONS (SDS)

**AVAILABLE PISTON**  Unit: mm (in)

<table>
<thead>
<tr>
<th>Items</th>
<th>Grade*</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston skirt diameter &quot;A&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade No. 1</td>
<td></td>
<td>95.480 - 95.490 (3.7590 - 3.7594)</td>
</tr>
<tr>
<td>Grade No. 2</td>
<td></td>
<td>95.490 - 95.500 (3.7594 - 3.7598)</td>
</tr>
<tr>
<td>Grade No. 3</td>
<td></td>
<td>95.500 - 95.510 (3.7602)</td>
</tr>
<tr>
<td>&quot;a&quot; dimension</td>
<td></td>
<td>38.0 (1.496)</td>
</tr>
<tr>
<td>Piston pin hole diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade No. 0</td>
<td></td>
<td>21.993 - 21.999 (0.8659 - 0.8661)</td>
</tr>
<tr>
<td>Grade No. 1</td>
<td></td>
<td>21.999 - 22.005 (0.8661 - 0.8663)</td>
</tr>
<tr>
<td>Piston to cylinder bore clearance</td>
<td></td>
<td>0.010 - 0.030 (0.0004 - 0.0012)</td>
</tr>
</tbody>
</table>

*: Always check with the Parts Department for the latest parts information.

### PISTON RING

**Unit: mm (in)**

- **Side clearance**
  - Top: 0.045 - 0.080 (0.0018 - 0.0031)
  - 2nd: 0.030 - 0.070 (0.0012 - 0.0028)
  - Oil ring: 0.065 - 0.125 (0.0049 - 0.0049)

- **Limit**: 0.11 (0.0043) for Top, 0.1 (0.004) for 2nd, and No limit for Oil ring.

*: Always check with the Parts Department for the latest parts information.

---

**Main bearing housing inner diameter grade (Without bearing)**

<table>
<thead>
<tr>
<th>Grade No.</th>
<th>Grade</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>63.993 - 63.994 (2.5194 - 2.5194)</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>63.994 - 63.995 (2.5194 - 2.5195)</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>63.995 - 63.996 (2.5195 - 2.5195)</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>63.996 - 63.997 (2.5195 - 2.5196)</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>63.997 - 63.998 (2.5196 - 2.5196)</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>63.998 - 63.999 (2.5196 - 2.5196)</td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>63.999 - 64.000 (2.5196 - 2.5197)</td>
</tr>
<tr>
<td>H</td>
<td></td>
<td>64.000 - 64.001 (2.5197 - 2.5197)</td>
</tr>
<tr>
<td>J</td>
<td></td>
<td>64.001 - 64.002 (2.5197 - 2.5198)</td>
</tr>
<tr>
<td>K</td>
<td></td>
<td>64.002 - 64.003 (2.5198 - 2.5198)</td>
</tr>
<tr>
<td>L</td>
<td></td>
<td>64.003 - 64.004 (2.5198 - 2.5198)</td>
</tr>
<tr>
<td>M</td>
<td></td>
<td>64.004 - 64.005 (2.5198 - 2.5199)</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>64.005 - 64.006 (2.5199 - 2.5199)</td>
</tr>
<tr>
<td>P</td>
<td></td>
<td>64.006 - 64.007 (2.5199 - 2.5200)</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td>64.007 - 64.008 (2.5200 - 2.5200)</td>
</tr>
<tr>
<td>S</td>
<td></td>
<td>64.008 - 64.009 (2.5200 - 2.5200)</td>
</tr>
<tr>
<td>T</td>
<td></td>
<td>64.009 - 64.010 (2.5200 - 2.5201)</td>
</tr>
<tr>
<td>U</td>
<td></td>
<td>64.010 - 64.011 (2.5201 - 2.5201)</td>
</tr>
<tr>
<td>V</td>
<td></td>
<td>64.011 - 64.012 (2.5201 - 2.5202)</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>64.012 - 64.013 (2.5202 - 2.5202)</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>64.013 - 64.014 (2.5202 - 2.5202)</td>
</tr>
<tr>
<td>Y</td>
<td></td>
<td>64.014 - 64.015 (2.5202 - 2.5203)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>64.015 - 64.016 (2.5203 - 2.5203)</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>64.016 - 64.017 (2.5203 - 2.5203)</td>
</tr>
</tbody>
</table>

*: Always check with the Parts Department for the latest parts information.
SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

PISTON PIN

### End gap

<table>
<thead>
<tr>
<th></th>
<th>Top</th>
<th>2nd</th>
<th>Oil (rail ring)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit: mm (in)</td>
<td>0.23 - 0.028 (0.0091 - 0.0110)</td>
<td>0.33 - 0.43 (0.0130 - 0.0169)</td>
<td>0.20 - 0.45 (0.0079 - 0.0177)</td>
</tr>
<tr>
<td></td>
<td>0.50 (0.0197)</td>
<td>0.62 (0.0244)</td>
<td>0.80 (0.0315)</td>
</tr>
</tbody>
</table>

*: Always check with the Parts Department for the latest parts information.

### CONNECTING ROD

<table>
<thead>
<tr>
<th>Items</th>
<th>Grade</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston pin outer diameter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piston pin outer diameter grade No. 0</td>
<td></td>
<td>21.989 - 21.995 (0.8657 - 0.8659)</td>
<td>—</td>
</tr>
<tr>
<td>Piston pin outer diameter grade No. 1</td>
<td></td>
<td>21.995 - 22.001 (0.8659 - 0.8662)</td>
<td>—</td>
</tr>
<tr>
<td>Piston to piston pin oil clearance</td>
<td></td>
<td>0.002 - 0.010 (0.0001 - 0.0004)</td>
<td>—</td>
</tr>
<tr>
<td>Connecting rod bushing oil clearance</td>
<td></td>
<td>0.005 - 0.017 (0.0002 - 0.0007)</td>
<td>0.030 (0.0012)</td>
</tr>
</tbody>
</table>

*: Always check with the Parts Department for the latest parts information.

1: Always check with the Parts Department for the latest parts information.

2: After installing in connecting rod

CRANKSHAFT

Included diagrams and measurements.

Taper: (Difference between "A" and "B")
Out-of-round: (Difference between "X" and "Y")
## SERVICE DATA AND SPECIFICATIONS (SDS)

### Main Bearing

**MAIN BEARING**

---

### Main journal diameter. "Dm" grade

<table>
<thead>
<tr>
<th>Grade</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade No. A</td>
<td>59.975 - 59.974 (2.3612 - 2.3612)</td>
</tr>
<tr>
<td>Grade No. B</td>
<td>59.974 - 59.973 (2.3612 - 2.3611)</td>
</tr>
<tr>
<td>Grade No. C</td>
<td>59.973 - 59.972 (2.3611 - 2.3611)</td>
</tr>
<tr>
<td>Grade No. D</td>
<td>59.972 - 59.971 (2.3611 - 2.3611)</td>
</tr>
<tr>
<td>Grade No. E</td>
<td>59.971 - 59.970 (2.3611 - 2.3610)</td>
</tr>
<tr>
<td>Grade No. F</td>
<td>59.970 - 59.969 (2.3610 - 2.3610)</td>
</tr>
<tr>
<td>Grade No. G</td>
<td>59.969 - 59.968 (2.3610 - 2.3609)</td>
</tr>
<tr>
<td>Grade No. H</td>
<td>59.968 - 59.967 (2.3609 - 2.3609)</td>
</tr>
<tr>
<td>Grade No. J</td>
<td>59.967 - 59.966 (2.3609 - 2.3609)</td>
</tr>
<tr>
<td>Grade No. K</td>
<td>59.966 - 59.965 (2.3609 - 2.3608)</td>
</tr>
<tr>
<td>Grade No. L</td>
<td>59.965 - 59.964 (2.3608 - 2.3608)</td>
</tr>
<tr>
<td>Grade No. M</td>
<td>59.964 - 59.963 (2.3608 - 2.3607)</td>
</tr>
<tr>
<td>Grade No. N</td>
<td>59.963 - 59.962 (2.3607 - 2.3607)</td>
</tr>
<tr>
<td>Grade No. P</td>
<td>59.962 - 59.961 (2.3607 - 2.3607)</td>
</tr>
<tr>
<td>Grade No. R</td>
<td>59.961 - 59.960 (2.3607 - 2.3606)</td>
</tr>
<tr>
<td>Grade No. S</td>
<td>59.960 - 59.959 (2.3606 - 2.3606)</td>
</tr>
<tr>
<td>Grade No. T</td>
<td>59.959 - 59.958 (2.3606 - 2.3605)</td>
</tr>
<tr>
<td>Grade No. U</td>
<td>59.958 - 59.957 (2.3605 - 2.3605)</td>
</tr>
<tr>
<td>Grade No. V</td>
<td>59.957 - 59.956 (2.3605 - 2.3605)</td>
</tr>
<tr>
<td>Grade No. W</td>
<td>59.956 - 59.955 (2.3604 - 2.3604)</td>
</tr>
<tr>
<td>Grade No. X</td>
<td>59.955 - 59.954 (2.3604 - 2.3604)</td>
</tr>
<tr>
<td>Grade No. Y</td>
<td>59.954 - 59.953 (2.3604 - 2.3603)</td>
</tr>
<tr>
<td>Grade No. 4</td>
<td>59.953 - 59.952 (2.3603 - 2.3603)</td>
</tr>
<tr>
<td>Grade No. 7</td>
<td>59.952 - 59.951 (2.3603 - 2.3603)</td>
</tr>
</tbody>
</table>

### Pin journal diameter. "Dp" grade

<table>
<thead>
<tr>
<th>Grade</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade No. 0</td>
<td>51.968 - 51.974 (2.0460 - 2.0462)</td>
</tr>
<tr>
<td>Grade No. 1</td>
<td>51.962 - 51.968 (2.0457 - 2.0460)</td>
</tr>
<tr>
<td>Grade No. 2</td>
<td>51.956 - 51.962 (2.0445 - 2.0457)</td>
</tr>
</tbody>
</table>

### Center distance "r"

- 40.66 - 40.74 (1.6008 - 1.6039)

### Taper (Difference between “A” and “B”)

- Limit: Less than 0.002 (0.0001)

### Out-of-round (Difference between “X” and “Y”)

- Limit: Less than 0.002 (0.0001)

### Crankshaft runout [TIR²]

- Standard: Less than 0.05 (0.0020)
- Limit: 0.10 (0.0039)

### Crankshaft end play

- Standard: 0.10 - 0.25 (0.0039 - 0.0098)
- Limit: 0.30 (0.0118)

### Fillet role of crankshaft journal

- Standard: More than 0.10 (0.0039)

---

1: Always check with the Parts Department for the latest parts information.

2: Total indicator reading

---

**Revision:** October 2015

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**EM-149**

---

2016 Maxima NAM
**SERVICE DATA AND SPECIFICATIONS (SDS)**

### MAIN BEARING OIL CLEARANCE

<table>
<thead>
<tr>
<th>Items</th>
<th>Thickness</th>
<th>Main journal diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 (0.0098)</td>
<td>2.132 - 2.140 (0.0839 - 0.0843)</td>
<td>Grind so that bearing clearance is the specified value.</td>
</tr>
</tbody>
</table>

### MAIN BEARING OIL CLEARANCE

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main bearing oil clearance</td>
<td>0.012 - 0.022 (0.0005 - 0.0009)*</td>
<td>0.065 (0.0026)</td>
</tr>
</tbody>
</table>

*: Actual clearance

**Connecting Rod Bearing**

**CONNECTING ROD BEARING**

<table>
<thead>
<tr>
<th>Grade number*</th>
<th>Thickness</th>
<th>Identification color (mark)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.500 - 1.503 (0.0591 - 0.0592)</td>
<td>Black</td>
</tr>
<tr>
<td>1</td>
<td>1.503 - 1.506 (0.0592 - 0.0593)</td>
<td>Brown</td>
</tr>
<tr>
<td>2</td>
<td>1.506 - 1.509 (0.0593 - 0.0594)</td>
<td>Green</td>
</tr>
</tbody>
</table>

*: Always check with the Parts Department for the latest parts information.

### UNDERSIZE

<table>
<thead>
<tr>
<th>Items</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 (0.0098)</td>
<td>1.626 - 1.634 (0.0640 - 0.0643)</td>
</tr>
</tbody>
</table>

Grind so that bearing clearance is the specified value.
**SERVICE DATA AND SPECIFICATIONS (SDS)**

**CONNECTING ROD BEARING OIL CLEARANCE**

Unit: mm (in)

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecting rod bearing oil clearance</td>
<td>0.020 - 0.045 (0.0008 - 0.0018)*</td>
<td>0.070 (0.0028)</td>
</tr>
</tbody>
</table>

*: Actual clearance

**Drive Plate**

Unit: mm (in)

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive plate runout [TIR]* - on torque converter mounting surface</td>
<td></td>
<td>Less than 0.35 (0.0138)</td>
</tr>
<tr>
<td>Drive plate runout [TIR]* - on ring gear</td>
<td></td>
<td>0.5 (0.0197)</td>
</tr>
</tbody>
</table>

*: Total indicator reading