

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# SECTION **EM**

## ENGINE MECHANICAL

### CONTENTS

**QR25DE**

<b>PRECAUTION</b> .....	4		
<b>PRECAUTIONS</b> .....	4	Tension Adjustment .....	19
Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" .....	4	Removal and Installation .....	19
Precaution for Draining Coolant .....	4	Removal and Installation of Drive Belt Auto-tensioner .....	20
Precaution for Disconnecting Fuel Piping .....	4	<b>AIR CLEANER FILTER</b> .....	<b>22</b>
Precaution for Removal and Disassembly .....	4	Exploded View .....	22
Precaution for Inspection, Repair and Replacement .....	4	Removal and Installation .....	22
Special Cautions to Ensure the Safe Disposal of Sodium-filled Exhaust Valves .....	5	<b>CAMSHAFT VALVE CLEARANCE</b> .....	<b>23</b>
Precaution for Assembly and Installation .....	6	Camshaft valve clearance .....	23
Parts Requiring Angular Tightening .....	6	<b>COMPRESSION PRESSURE</b> .....	<b>26</b>
Precaution for Liquid Gasket .....	6	Compression pressure .....	26
<b>PREPARATION</b> .....	<b>8</b>	<b>REMOVAL AND INSTALLATION</b> .....	<b>28</b>
<b>PREPARATION</b> .....	<b>8</b>	<b>ENGINE ROOM COVER</b> .....	<b>28</b>
Special Service Tool .....	8	Exploded View .....	28
Commercial Service Tool .....	10	Removal and Installation .....	28
<b>SYMPTOM DIAGNOSIS</b> .....	<b>13</b>	<b>AIR CLEANER AND AIR DUCT</b> .....	<b>29</b>
<b>NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING</b> .....	<b>13</b>	Exploded View .....	29
NVH Troubleshooting - Engine Noise .....	13	Removal and Installation .....	29
Use the Chart Below to Help You Find the Cause of the Symptom .....	14	<b>INTAKE MANIFOLD</b> .....	<b>30</b>
<b>PERIODIC MAINTENANCE</b> .....	<b>16</b>	Exploded View .....	30
<b>SPARK PLUG</b> .....	<b>16</b>	Removal and Installation .....	30
Exploded View .....	16	<b>EXHAUST MANIFOLD AND THREE WAY CATALYST</b> .....	<b>33</b>
Removal and Installation .....	16	Exploded View .....	33
<b>DRIVE BELTS</b> .....	<b>19</b>	Removal and Installation .....	33
Exploded View .....	19	<b>OIL PAN AND OIL STRAINER</b> .....	<b>36</b>
Checking Drive Belts .....	19	Exploded View .....	36
		Removal and Installation .....	36
		<b>IGNITION COIL</b> .....	<b>40</b>
		Exploded View .....	40
		Removal and Installation .....	40
		<b>FUEL INJECTOR AND FUEL TUBE</b> .....	<b>41</b>

Exploded View .....	41	Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" .....	123
Removal and Installation .....	41	Precaution for Draining Coolant .....	123
<b>ROCKER COVER .....</b>	<b>45</b>	Precaution for Disconnecting Fuel Piping .....	123
Exploded View .....	45	Precaution for Removal and Disassembly .....	123
Removal and Installation .....	45	Precaution for Inspection, Repair and Replacement .....	123
<b>CAMSHAFT .....</b>	<b>47</b>	Precaution for Assembly and Installation .....	123
Exploded View .....	47	Parts Requiring Angular Tightening .....	124
Removal and Installation .....	47	Precaution for Liquid Gasket .....	124
Inspection After Installation .....	56		
<b>VALVE TIMING CONTROL .....</b>	<b>58</b>	<b>PREPARATION .....</b>	<b>126</b>
Exploded View .....	58	<b>PREPARATION .....</b>	<b>126</b>
Intake Valve Timing Intermediate Lock Control Solenoid Valve, Intake Valve Timing Control Solenoid Valve, and Exhaust Valve Timing Control Solenoid Valve .....	58	Special Service Tool .....	126
Valve Timing Control Cover .....	59	Commercial Service Tool .....	127
<b>TIMING CHAIN .....</b>	<b>61</b>	<b>SYSTEM DESCRIPTION .....</b>	<b>130</b>
Exploded View .....	61	<b>NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING .....</b>	<b>130</b>
Removal and Installation .....	62	NVH Troubleshooting - Engine Noise .....	130
<b>OIL SEAL .....</b>	<b>70</b>	Use the Chart Below to Help You Find the Cause of the Symptom .....	131
Removal and Installation of Valve Oil Seal .....	70		
Removal and Installation of Front Oil Seal .....	71	<b>PERIODIC MAINTENANCE .....</b>	<b>132</b>
Removal and Installation of Rear Oil Seal .....	72	<b>SPARK PLUG .....</b>	<b>132</b>
<b>CYLINDER HEAD .....</b>	<b>74</b>	Exploded View .....	132
Exploded View .....	74	Removal and Installation .....	132
Removal and Installation .....	74	<b>DRIVE BELTS .....</b>	<b>134</b>
Disassembly and Assembly .....	76	Exploded View .....	134
Inspection After Disassembly .....	78	Checking Drive Belts .....	134
<b>UNIT REMOVAL AND INSTALLATION ....</b>	<b>83</b>	Tension Adjustment .....	134
<b>ENGINE ASSEMBLY .....</b>	<b>83</b>	Removal and Installation .....	134
Exploded View .....	83	Removal and Installation of Drive Belt Auto-tensioner .....	135
Removal and Installation .....	84	<b>AIR CLEANER FILTER .....</b>	<b>137</b>
<b>UNIT DISASSEMBLY AND ASSEMBLY ...</b>	<b>87</b>	Exploded View .....	137
<b>CYLINDER BLOCK .....</b>	<b>87</b>	Removal and Installation .....	137
Exploded View .....	87	<b>CAMSHAFT VALVE CLEARANCE .....</b>	<b>138</b>
Disassembly and Assembly .....	88	Valve Clearance .....	138
Inspection After Disassembly .....	96	<b>COMPRESSION PRESSURE .....</b>	<b>142</b>
<b>HOW TO SELECT PISTON AND BEARING ..</b>	<b>105</b>	On-Vehicle Service .....	142
How to Select Piston and Bearing .....	105	<b>REMOVAL AND INSTALLATION .....</b>	<b>143</b>
<b>SERVICE DATA AND SPECIFICATIONS (SDS) .....</b>	<b>111</b>	<b>ENGINE ROOM COVER .....</b>	<b>143</b>
<b>SERVICE DATA AND SPECIFICATIONS (SDS) .....</b>	<b>111</b>	Exploded View .....	143
Standard and Limit .....	111	Removal and Installation .....	143
<b>VQ35DE</b>		<b>AIR CLEANER AND AIR DUCT .....</b>	<b>144</b>
<b>PRECAUTION .....</b>	<b>123</b>	Exploded View .....	144
<b>PRECAUTIONS .....</b>	<b>123</b>	Removal and Installation .....	144
		<b>INTAKE MANIFOLD COLLECTOR .....</b>	<b>146</b>
		Exploded View .....	146

Removal and Installation .....	146	Exploded View .....	194	A
<b>INTAKE MANIFOLD .....</b>	<b>149</b>	Removal and Installation .....	194	
Exploded View .....	149	Inspection after Installation .....	202	
Removal and Installation .....	149	<b>OIL SEAL .....</b>	<b>203</b>	<b>EM</b>
<b>EXHAUST MANIFOLD AND THREE WAY</b>		Removal and Installation of Valve Oil Seal .....	203	
<b>CATALYST .....</b>	<b>151</b>	Removal and Installation of Front Oil Seal .....	203	C
Exploded View .....	151	Removal and Installation of Rear Oil Seal .....	205	
Removal and Installation (LH) .....	152	<b>CYLINDER HEAD .....</b>	<b>207</b>	D
Removal and Installation (RH) .....	153	Exploded View .....	207	
<b>OIL PAN AND OIL STRAINER .....</b>	<b>156</b>	Removal and Installation .....	207	D
Exploded View .....	156	Disassembly and Assembly .....	210	
Removal and Installation (Lower Oil Pan) .....	156	Inspection After Disassembly .....	212	E
Removal and Installation (Upper Oil Pan) .....	157	<b>ENGINE MOUNT .....</b>	<b>217</b>	
<b>IGNITION COIL .....</b>	<b>162</b>	<b>ENGINE MOUNT (FRONT) .....</b>	<b>217</b>	F
Exploded View .....	162	ENGINE MOUNT (FRONT) : Removal and Instal-		
Removal and Installation LH .....	162	lation .....	217	
Removal and Installation RH .....	162	<b>UNIT REMOVAL AND INSTALLATION ...</b>	<b>220</b>	G
<b>FUEL INJECTOR AND FUEL TUBE .....</b>	<b>163</b>	<b>ENGINE ASSEMBLY .....</b>	<b>220</b>	H
Exploded View .....	163	Exploded View .....	220	
Removal and Installation .....	163	Removal and Installation .....	220	
<b>ROCKER COVER .....</b>	<b>168</b>	<b>UNIT DISASSEMBLY AND ASSEMBLY .</b>	<b>224</b>	I
Exploded View .....	168	<b>CYLINDER BLOCK .....</b>	<b>224</b>	J
Removal and Installation LH .....	168	Disassembly and Assembly .....	224	
Removal and Installation RH .....	169	Inspection .....	234	
<b>INTAKE VALVE TIMING CONTROL .....</b>	<b>172</b>	Dowel Pin Alignment .....	244	K
Exploded View .....	172	<b>SERVICE DATA AND SPECIFICATIONS</b>		
Intake Valve Timing Control Solenoid Valve (LH)		<b>(SDS) .....</b>	<b>246</b>	L
(bank 2) .....	172	<b>SERVICE DATA AND SPECIFICATIONS</b>		
Intake Valve Timing Control Solenoid Valve (RH)		<b>(SDS) .....</b>	<b>246</b>	M
(bank 1) .....	173	General Specification .....	246	
<b>FRONT TIMING CHAIN CASE .....</b>	<b>174</b>	Drive Belt .....	246	
Exploded View .....	174	Spark Plug .....	247	
Removal and Installation .....	174	Intake Manifold .....	247	
<b>TIMING CHAIN .....</b>	<b>182</b>	Exhaust Manifold .....	247	
Exploded View .....	182	Camshaft .....	247	
Removal and Installation .....	182	Cylinder Head .....	249	
<b>REAR TIMING CHAIN CASE .....</b>	<b>189</b>	Cylinder Block .....	252	N
Exploded View .....	189	Main Bearing .....	255	
Removal and Installation .....	189	Connecting Rod Bearing .....	256	
<b>CAMSHAFT .....</b>	<b>194</b>	Drive Plate .....	257	O
				P

## PRECAUTION

### PRECAUTIONS

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

INFOID:000000009951675

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 Draining Coolant

INFOID:000000009460453

- Drain coolant when engine is cooled.

#### Precaution for Disconnecting Fuel Piping

INFOID:000000009460454

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

#### Precaution for Removal and Disassembly

INFOID:000000009460455

- When instructed to use special service tools, use the specified tools. Always be careful to work safely, avoid forceful operations.
- Use maximum care to avoid damage to mating or sliding surfaces.
- Cover openings of engine system with tape or 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, follow the specifications.

#### Precaution for Inspection, Repair and Replacement

INFOID:000000009460456

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



# PRECAUTIONS

< PRECAUTION >

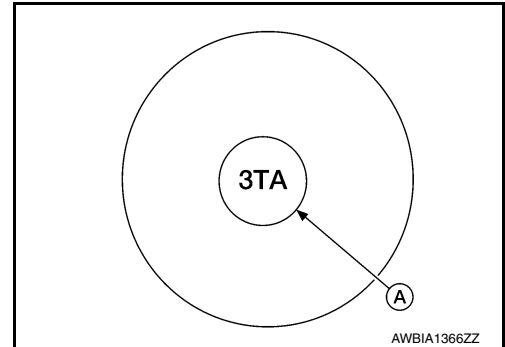
[QR25DE]

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

INFOID:000000009460457

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



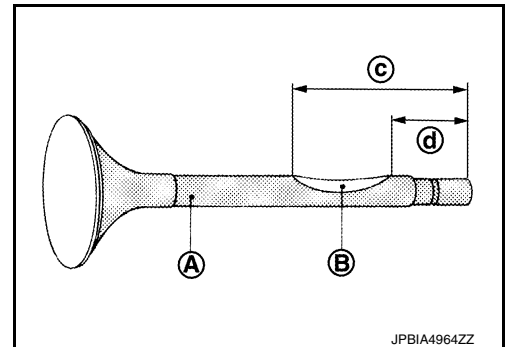
### DEALER DISPOSAL INSTRUCTIONS

#### 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.

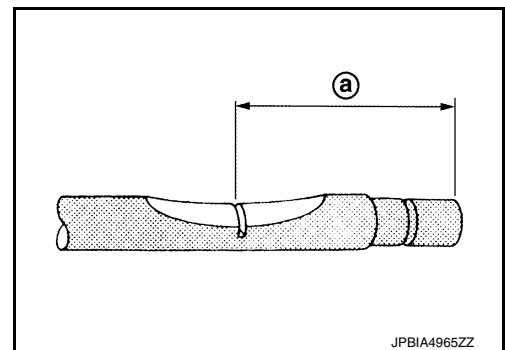
1. Clamp valve stem in a vice.
2. The valve has a specially-hardened surface. To cut through it, first remove a half-round section, approximately 30 mm (1.18 in) long using air-powered grinder until black color is removed and silver color appears.

- (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)

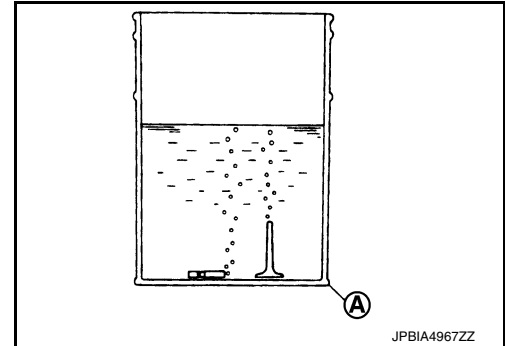
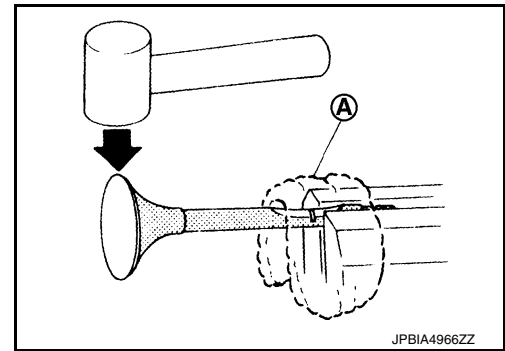


## PRECAUTIONS

[QR25DE]

### < PRECAUTION >

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]

### Precaution for Assembly and Installation

INFOID:000000009460459

- Use torque wrench to tighten bolts or nuts.
- 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, follow the specifications.
- Always replace the old with a 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.
- Bleed the air trapped within the system after draining the 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 or rattles.

### Parts Requiring Angular Tightening

INFOID:000000009460459

- Use an angle wrench for the final tightening of the following engine parts.
  - Cylinder head bolts
  - Lower cylinder block bolts
  - Connecting rod cap bolts
  - 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

INFOID:000000009460460

### REMOVAL OF LIQUID GASKET

# PRECAUTIONS

[QR25DE]

## < PRECAUTION >

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

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

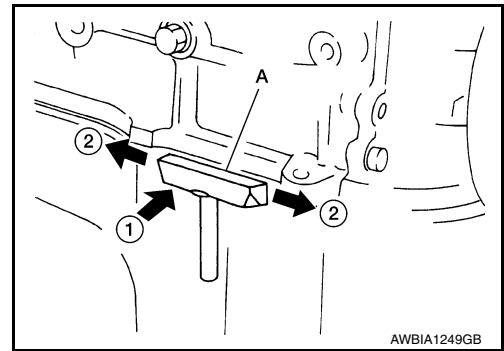
### CAUTION:

**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.

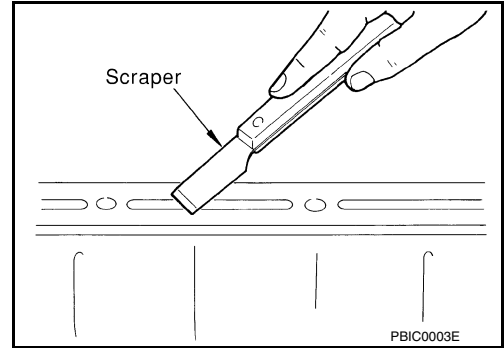
### CAUTION:

**Do not damage the mating surfaces.**

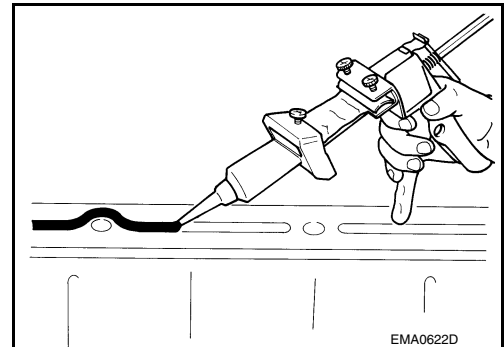


## LIQUID GASKET APPLICATION PROCEDURE

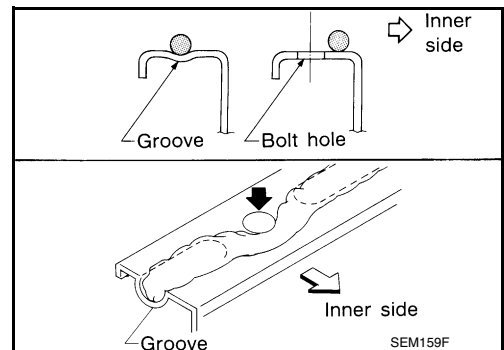
1. Using a scraper, remove the old liquid gasket adhering to the gasket application surface and the mating surface.
  - Remove the liquid gasket completely from the groove of the gasket application surface, mounting bolts, and bolt holes.
2. Thoroughly clean the gasket application surface and the mating surface and remove adhering moisture, grease and foreign materials.
3. Attach the liquid gasket tube to the tube presser.  
**Use Genuine Silicone RTV Sealant or equivalent. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).**



4. Apply the liquid gasket using suitable tool without breaks to the specified location.
  - If there is a groove for the liquid gasket application, apply the liquid gasket to the groove.
  - As for the bolt holes, normally apply the liquid gasket inside the holes. If specified, it should be applied outside the holes. Make sure to read the text of this manual.
  - Within five minutes of the liquid gasket application, install the mating component.
  - If the liquid gasket protrudes, wipe it off immediately.
  - Do not retighten after the installation.



- After 30 minutes or more have passed from the installation, fill the engine with the specified oil and coolant. Refer to [MA-11, "FOR USA AND CANADA : Fluids and Lubricants"](#).



### CAUTION:

**If there are more specific instructions in the procedures contained in this manual concerning liquid gasket application, observe them.**

# PREPARATION

< PREPARATION >

[QR25DE]

## PREPARATION

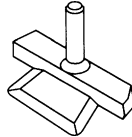
### PREPARATION

#### Special Service Tool

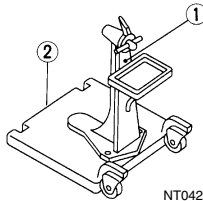
INFOID:000000009460461

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

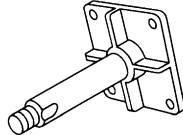
Tool number (TechMate No.) Tool name	Description
KV10111100 (J-37228) Seal cutter	Removing oil pan
ST0501S000 Engine stand assembly ( — ) 1. ST05011000 ( — ) Engine stand 2. ST05012000 ( — ) Base	Disassembling and assembling
KV10106500 ( — ) Engine stand shaft	Engine supporting
KV10115300 ( — ) Engine sub-attachment	Disassembling and assembling
KV10116200 (J-26336-A) Valve spring compressor 1. KV10115900 (J-26336-20) Attachment 2. KV10109220 ( — ) Adapter	Disassembling and assembling valve mechanism Part (1) is a component of KV10116200 (J-26336-A), but Part (2) is available separately.
KV10112100 (BT-8653-A) Angle wrench	Tightening bolts for bearing cap, cylinder head, etc.



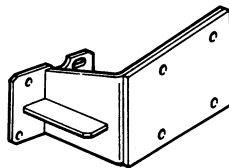
S-NT046



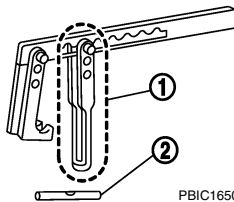
NT042



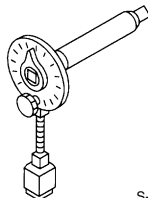
NT028



ZZA1078D



PBIC1650E

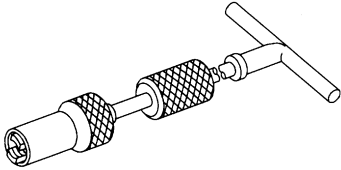
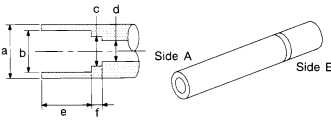
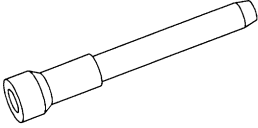
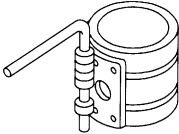
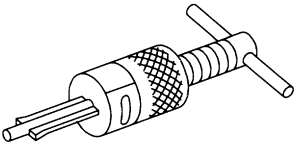

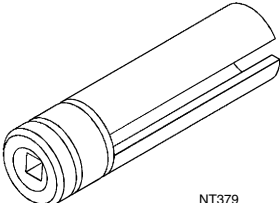


S-NT014

# PREPARATION

< PREPARATION >

[QR25DE]

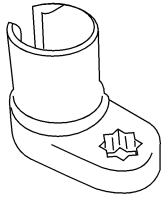
Tool number (TechMate No.) Tool name	Description	
KV10107902 (J-38959) Valve oil seal puller	Removing valve oil seal	A  EM  C
 S-NT011		
KV10115600 (J-38958) Valve oil seal drift	Installing valve oil seal <b>Use side A.</b> a: 20 (0.79) dia.      d: 8 (0.31) dia. b: 13 (0.51) dia.      e: 10.7 (0.421) dia. c: 10.3 (0.406) dia.      f: 5 (0.20) dia. Unit: mm (in)	D  E  F
 S-NT603		
— (J-39386) Valve oil seal drift	Installing valve oil seal	G  H
 NT024		
EM03470000 (J-8037) Piston ring compressor	Installing piston assembly into cylinder bore	I  J
 S-NT044		
ST16610001 (J-23907) Pilot converter puller	Removing crankshaft pilot converter	K  L  M
 S-NT045		
16441 6N210 (J-45488) Quick connector release	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)	N  O
 PBIC0198E		
KV10117100 (J-36471-A) Heated oxygen sensor wrench	Loosening or tightening heated oxygen sensor <b>For 22 mm (0.87 in) hexagon nut</b>	P
 NT379		

# PREPARATION

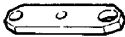
< PREPARATION >

[QR25DE]

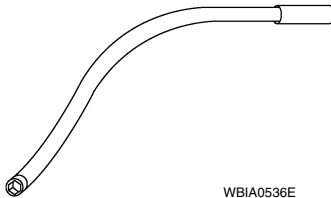
Tool number (TechMate No.) Tool name	Description
KV991J0050 (J-44626) Air fuel ratio (A/F) sensor wrench	Loosening or tightening air fuel ratio (A/F) sensor 1
KV11105210 (J-44716) Stopper plate	Holding drive plate and flywheel static
— (J-46535) Drive belt tension releaser	Releasing drive belt tension



LEM054



ZZA0009D

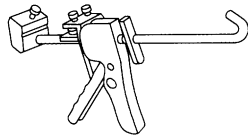


WBIA0536E

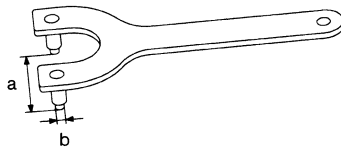
## Commercial Service Tool

INFOID:000000009460462

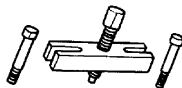
Tool name	Description
Tube presser	Pressing the tube of liquid gasket
Pulley holder	Removing and installing crankshaft pulley (Holding crankshaft pulley) <b>a: 68 mm (2.68 in) dia.</b> <b>b: 8 mm (0.31 in) dia.</b>
Crank puller	Removing crankshaft pulley



S-NT052



NT628

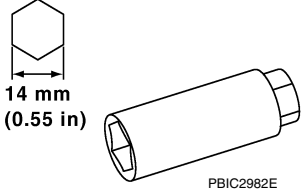

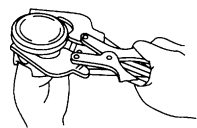
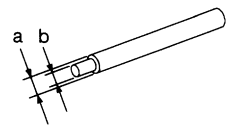
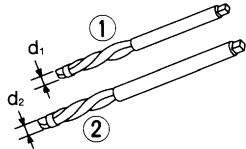
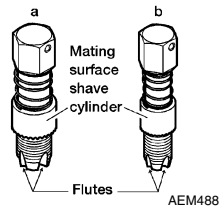
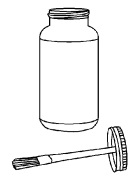


ZZA0010D

# PREPARATION

< PREPARATION >

[QR25DE]


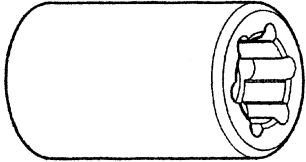
Tool name	Description
<p>Spark plug wrench</p>  <p style="text-align: center;">PBIC2982E</p>	<p>Removing and installing spark plug</p>
<p>Valve seat cutter set</p>  <p style="text-align: center;">S-NT048</p>	<p>Finishing valve seat dimensions</p>
<p>Piston ring expander</p>  <p style="text-align: center;">S-NT030</p>	<p>Removing and installing piston ring</p>
<p>Valve guide drift</p>  <p style="text-align: center;">S-NT015</p>	<p>Removing and installing valve guide  <b>Intake &amp; Exhaust:</b>  <b>a: 9.5 mm (0.374 in) dia.</b>  <b>b: 5.5 mm (0.217 in) dia.</b></p>
<p>Valve guide reamer</p>  <p style="text-align: center;">S-NT016</p>	<p>1: Reaming valve guide inner hole                  2: Reaming hole for oversize valve guide  <b>Intake &amp; Exhaust:</b>  <b>d1: 6.0 mm (0.236 in) dia.</b>  <b>d2: 10.2 mm (0.402 in) dia.</b></p>
<p>(J-43897-18)                  (J-43897-12)                  Oxygen sensor thread cleaner</p>  <p style="text-align: center;">AEM488</p>	<p>Reconditioning the exhaust system threads before installing a new heated oxygen sensor (Use with anti-seize lubricant shown below.)  <b>a: J-43897-18 [18 mm (0.71 in) dia.] for zirconia heated oxygen sensor</b>  <b>b: J-43897-12 [12 mm (0.47 in) dia.] for titania heated oxygen sensor</b></p>
<p>Anti-seize lubricant (Permatex 133AR or equivalent meeting MIL specification MIL-A-907)</p>  <p style="text-align: center;">AEM489</p>	<p>Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads</p>

A  
 EM  
 C  
 D  
 E  
 F  
 G  
 H  
 I  
 J  
 K  
 L  
 M  
 N  
 O  
 P

# PREPARATION

< PREPARATION >

[QR25DE]

Tool name	Description
<p>Power tool</p>  <p>PIB1407E</p>	<p>Loosening nuts, screws, and bolts</p>
<p>(J-45816) E20 ®Socket</p>  <p>LBIA0285E</p>	<p>Removing and installing CVT drive plate bolts</p>



# SYMPTOM DIAGNOSIS

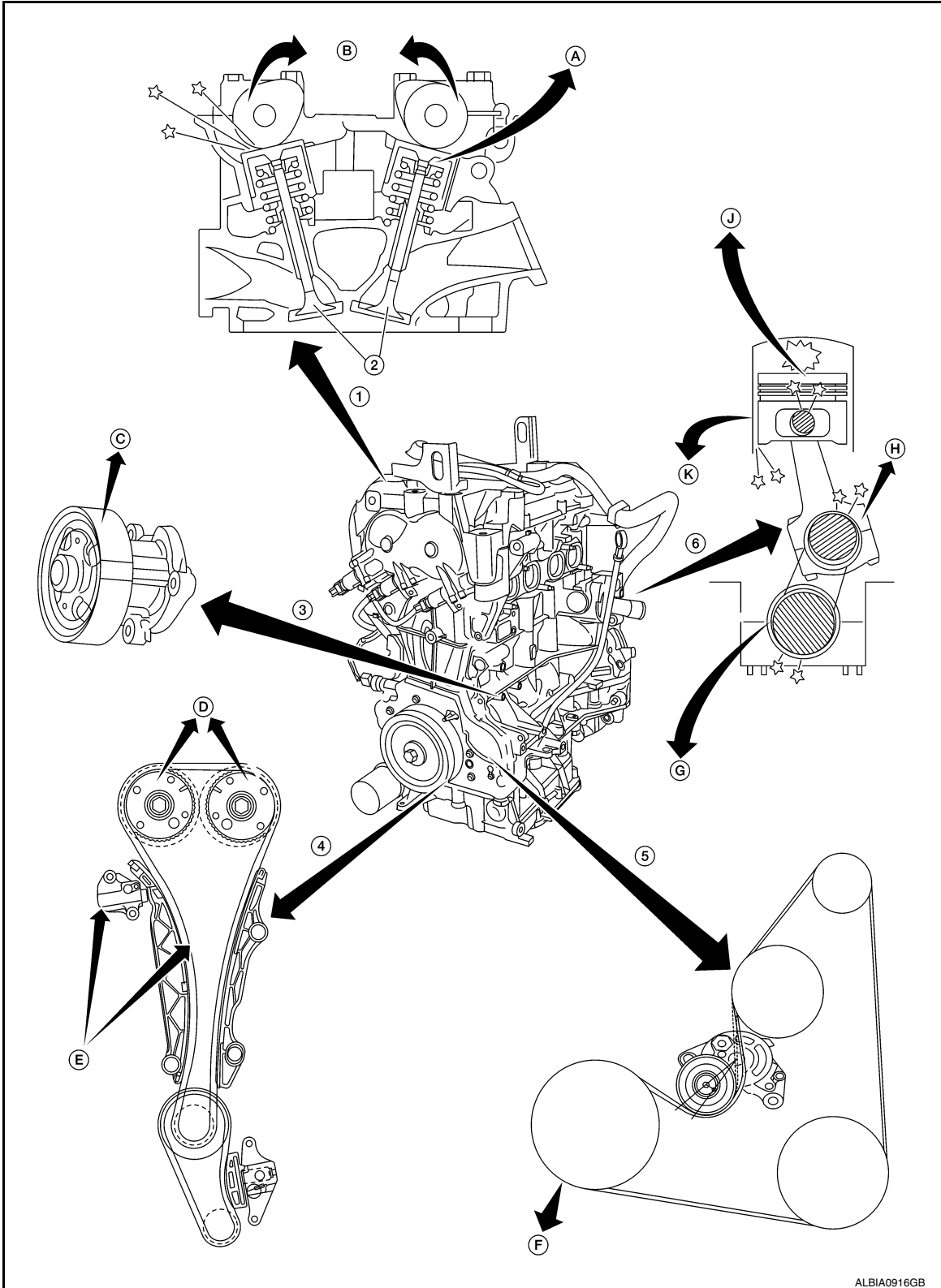
## NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

### NVH Troubleshooting - Engine Noise

INFOID:000000009460463

A

EM



C

D

E

F

G

H

I

J

K

L

M

N

O

P

# NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[QR25DE]

- |                       |   |                                |
|-----------------------|---|--------------------------------|
| 1. Valve mechanism    | 2. Intake and exhaust valve               | 3. Water pump                  |
| 4. Timing chain       | 5. Drive belt                             | 6. Rotation mechanism          |
| A. Tappet noise       | B. Camshaft bearing noise                 | C. Water pump noise            |
| D. VTC noise          | E. Timing chain and chain tensioner noise | F. Drive belt noise (slipping) |
| G. Main bearing noise | H. Connecting rod bearing noise           | J. Piston pin noise            |
| K. Piston slap noise  |   |                                |

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

INFOID:000000009460464

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.

If necessary, repair or replace these parts.

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warm-up	After warm-up	When starting	When idling	When racing	While driving			
Top of engine Rocker cover Cylinder head	Ticking or clicking	C	A	—	A	B	—	Tappet noise	Valve clearance	<a href="#">EM-23</a>
	Rattle	C	A	—	A	B	C	Camshaft bearing noise	Camshaft journal clearance Camshaft runout	<a href="#">EM-47</a> <a href="#">EM-47</a>
Crankshaft pulley Cylinder block (Side of engine) Oil pan	Slap or knock	—	A	—	B	B	—	Piston pin noise	Piston and piston pin clearance Connecting rod bushing clearance	<a href="#">EM-96</a> <a href="#">EM-96</a>
	Slap or rap	A	—	—	B	B	A	Piston slap noise	Piston-to-bore clearance Piston ring side clearance Piston ring end gap Connecting rod bend and torsion	<a href="#">EM-96</a> <a href="#">EM-96</a> <a href="#">EM-96</a> <a href="#">EM-96</a>
	Knock	A	B	C	B	B	B	Connecting rod bearing noise	Connecting rod bushing clearance (Small end) Connecting rod bearing clearance (Big end)	<a href="#">EM-96</a> <a href="#">EM-96</a>
	Knock	A	B	—	A	B	C	Main bearing noise	Main bearing oil clearance Crankshaft runout	<a href="#">EM-96</a> <a href="#">EM-96</a>
Front of engine Timing chain cover	Tapping or ticking	A	A	—	B	B	B	Timing chain and chain tensioner noise	Timing chain cracks and wear Timing chain tensioner operation	<a href="#">EM-62</a>

# NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

< SYMPTOM DIAGNOSIS >

[QR25DE]

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warm-up	After warm-up	When starting	When idling	When racing	While driving			
Front of engine	Squeaking or fizzing	A	B	—	B	—	B	Drive belts (Sticking or slipping)	Drive belts deflection	<a href="#">EM-19</a>
	Creaking	A	B	A	B	A	B	Drive belts (Slipping)	Idler pulley bearing operation	
	Squall Creak	A	B	—	B	A	B	Water pump noise	Water pump operation	<a href="#">CO-20</a>
	Rattle	—	—	A	—	—	—	VTC	VTC sprockets	<a href="#">EM-61</a>

A: Closely related B: Related C: Sometimes related —: Not related

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# SPARK PLUG

< PERIODIC MAINTENANCE >

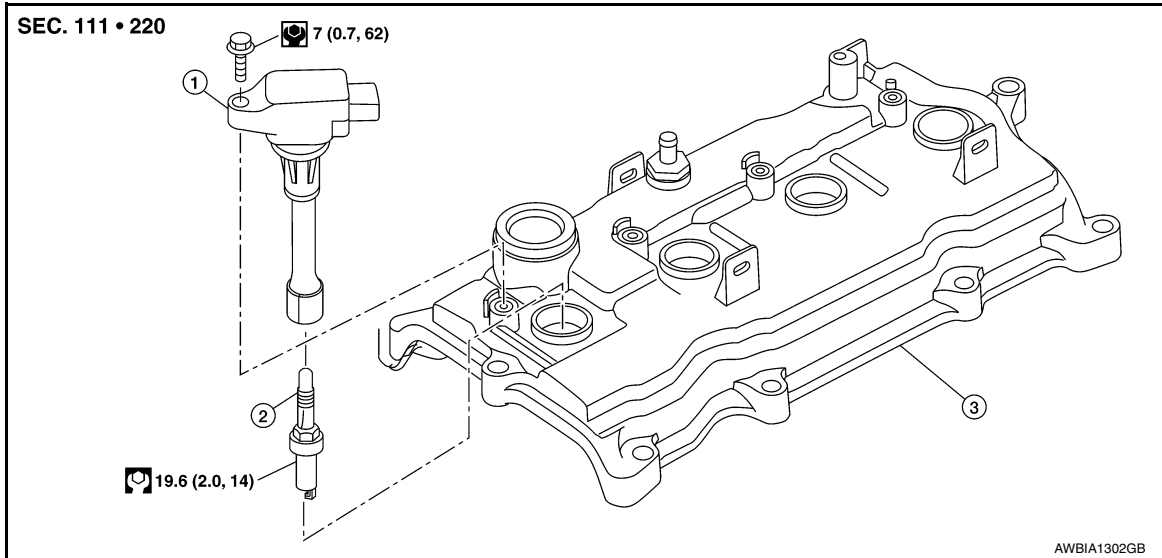
[QR25DE]

## PERIODIC MAINTENANCE

### SPARK PLUG

#### Exploded View

INFOID:000000009460465



1. Ignition coil

2. Spark plug

3. Rocker cover

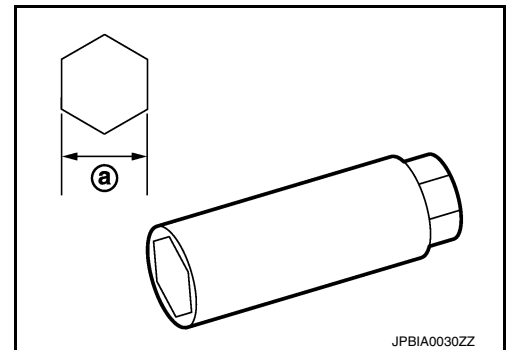
### Removal and Installation

INFOID:000000009460466

#### REMOVAL

1. Remove engine room cover. Refer to [EM-28. "Removal and Installation"](#).
2. Remove the ignition coil. Refer to [EM-40. "Removal and Installation"](#).
3. Remove the spark plug with a suitable tool.

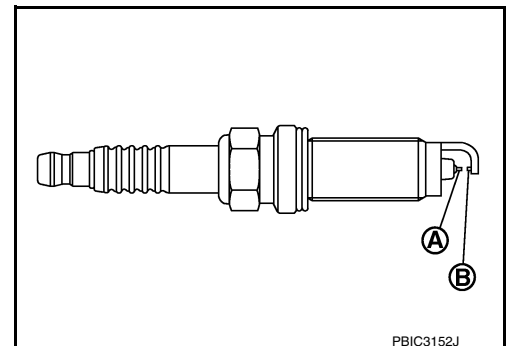
(a): 14 mm (0.55 in)



#### INSPECTION AFTER REMOVAL

Visually check the electrode for dirt and wear and the insulator for burning.

- (A) : Iridium alloy
- (B) : Platinum alloy

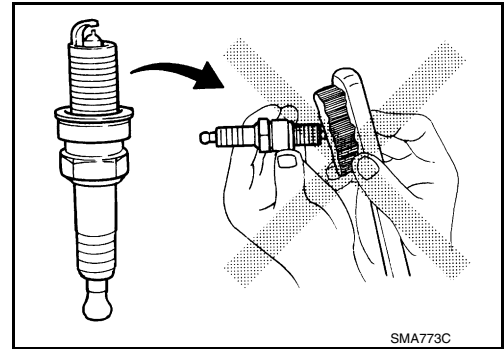


# SPARK PLUG

< PERIODIC MAINTENANCE >

[QR25DE]

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



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

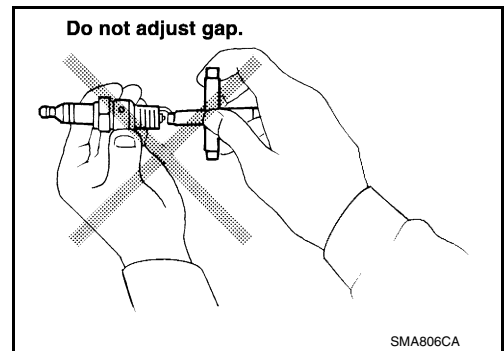
**Cleaner air pressure : less than 588 kPa (6 kg/cm<sup>2</sup>, 85 psi)**

**Cleaning time : less than 20 seconds**

- Checking and adjusting plug gap is not required between change intervals. If the gap is out of specification, replace the spark plug.

**CAUTION:**

**Do not drop or shock plug.**



## INSTALLATION

Installation is in the reverse order of removal.

Standard type*	DENSO
	FXE20HE11C
Gap (nominal)	1.1 mm (0.043 in)

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

**CAUTION:**

**Always tighten the spark plug to specified torque to align the orientation of electrodes. The ground electrode of a genuine spark plug is positioned in the area of maximum ignitability by tightening to the specified torque. When replacing spark plugs, use genuine spark plugs of which the ground electrode is adjusted.**

**NOTE:**

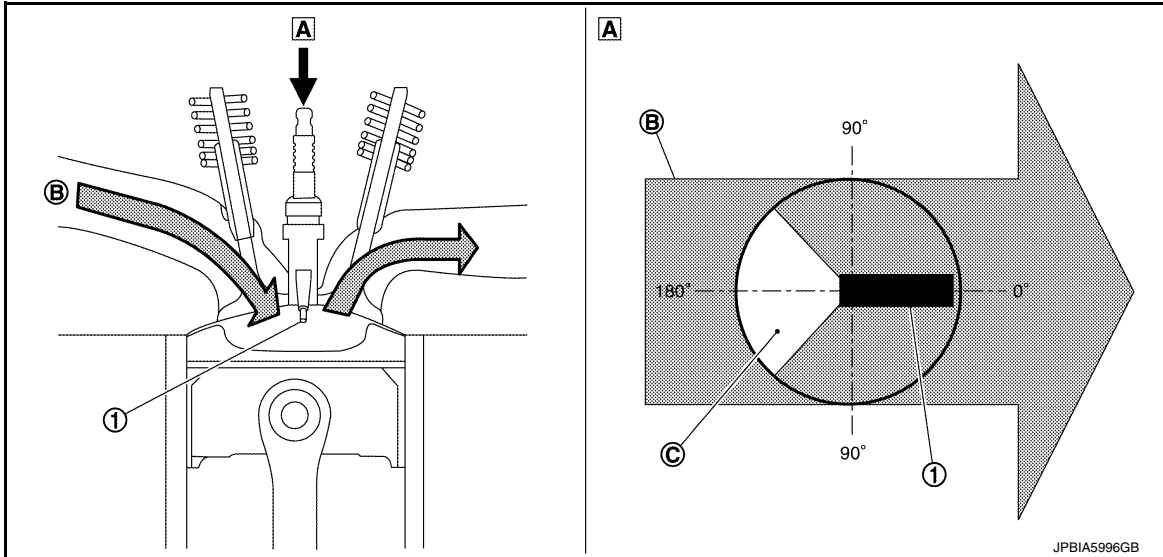
A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# SPARK PLUG

< PERIODIC MAINTENANCE >

[QR25DE]

The ground electrode of the spark plug is positioned in the area of maximum ignitability to improve combustion efficiency in the cylinder, reduce CO<sub>2</sub> (carbon dioxide) emission and improve fuel economy.



- 1. Ground electrode of spark plug
- C. Poor ignitability region

A. Top view

B. Air-fuel mixture flow

# DRIVE BELTS

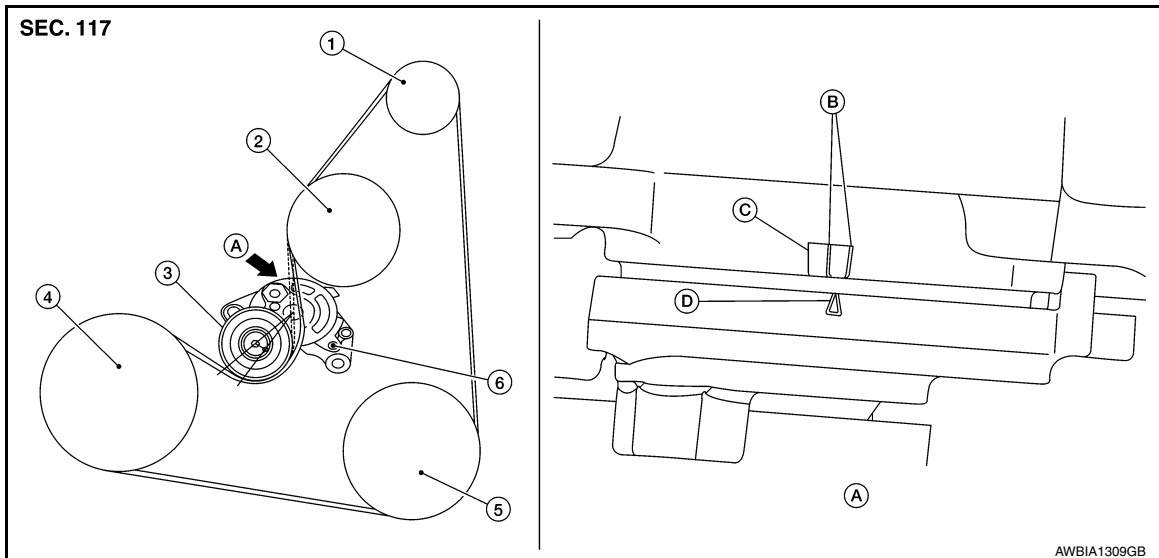
< PERIODIC MAINTENANCE >

[QR25DE]

## DRIVE BELTS

### Exploded View

INFOID:000000009460467



- |                      |                          |                              |
|----------------------|--------------------------|------------------------------|
| 1. Generator pulley  | 2. Water pump pulley     | 3. Drive belt auto-tensioner |
| 4. Crankshaft pulley | 5. A/C compressor pulley | 6. Drive belt retainer boss  |
| A. View A            | B. New drive belt range  | C. Possible use range        |
| D. Indicator (notch) |                          |                              |

### Checking Drive Belts

INFOID:000000009460468

#### **WARNING:**

**Inspect the drive belt only when the engine is stopped.**

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 belt is damaged, replace drive belt.

### Tension Adjustment

INFOID:000000009460469

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

### Removal and Installation

INFOID:000000009460470

#### REMOVAL

1. Remove the fender protector side cover (RH). Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).

## DRIVE BELTS

< PERIODIC MAINTENANCE >

[QR25DE]

- Securely hold the hexagonal part (A) of drive belt auto-tensioner (1) using suitable tool, and move in the direction of arrow (loosening direction of tensioner).

**WARNING:**

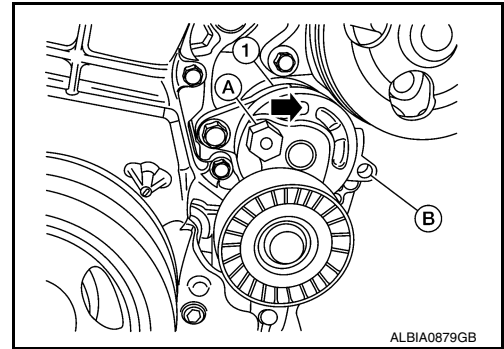
**Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes off.**

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

**NOTE:**

Leave drive belt auto-tensioner pulley arm locked until drive belt is installed again.

- Loosen drive belt from drive belt auto-tensioner and then remove it from the other pulleys.



### INSTALLATION

- Install the drive belt onto all of the pulleys except for the drive belt auto-tensioner. Then install the drive belt onto drive belt auto-tensioner last.

**CAUTION:**

**Confirm belts are completely set on the pulleys.**

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

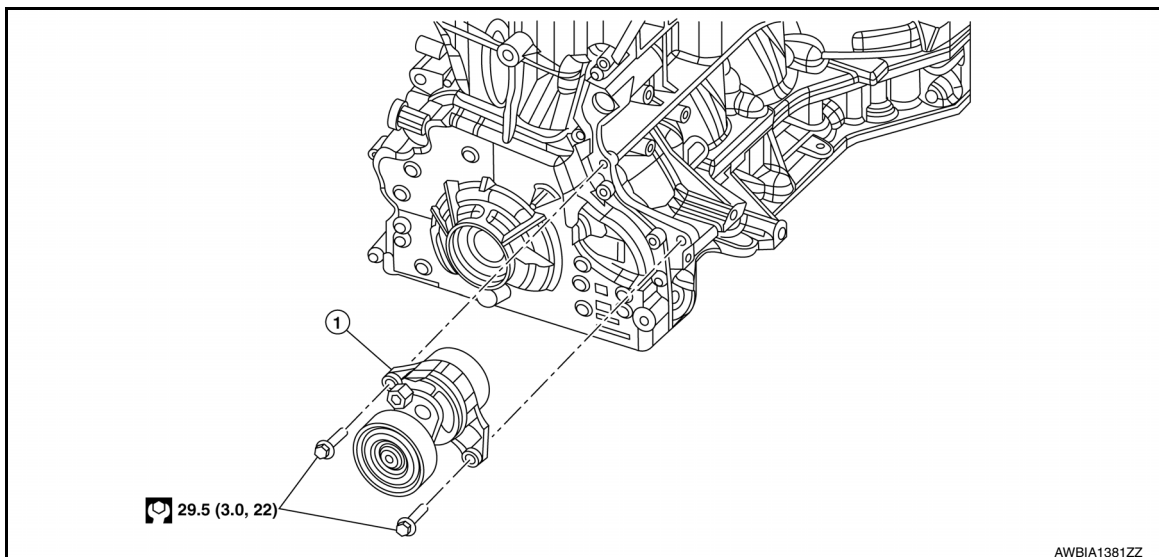
**WARNING:**

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

- Turn crankshaft pulley clockwise several times to equalize tension between each pulley.
- Confirm the indicator is within the possible use range. Refer to [EM-19, "Checking Drive Belts"](#).
- Install the fender protector side cover (RH). Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).

### Removal and Installation of Drive Belt Auto-tensioner

INFOID:000000009460471



1. Drive belt auto-tensioner

### REMOVAL

**CAUTION:**

**The complete drive belt auto-tensioner must be replaced as a unit, including the pulley.**

- Remove the front RH wheel and tire assembly. Refer to [WT-55, "Adjustment"](#).
- Remove the fender protector side cover (RH). Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).



# DRIVE BELTS

[QR25DE]

< PERIODIC MAINTENANCE >

3. Remove the engine room cover. Refer to [EM-28, "Removal and Installation"](#).
4. Remove the drive belt. Refer to [EM-19, "Removal and Installation"](#).
5. Remove the drive belt auto-tensioner using power tool.

A

## INSTALLATION

Installation is in the reverse order of removal.

### CAUTION:

- If there is damage greater than peeled paint, replace drive belt auto-tensioner unit.
- Install the drive belt auto-tensioner carefully so not to damage the water pump pulley.

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

# AIR CLEANER FILTER

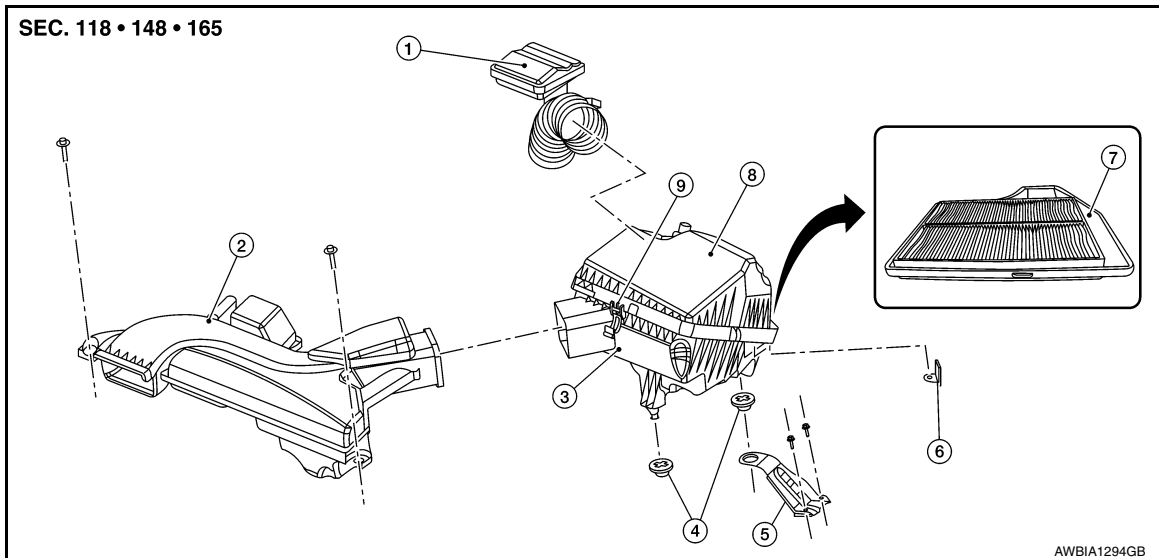
< PERIODIC MAINTENANCE >

[QR25DE]

## AIR CLEANER FILTER

### Exploded View

INFOID:000000009460472



- |                                |                                 |                                 |
|--------------------------------|---------------------------------|---------------------------------|
| 1. Air duct hose and resonator | 2. Front air duct               | 3. Air cleaner case (bottom)    |
| 4. Grommets                    | 5. Air cleaner mounting bracket | 6. Air cleaner mounting bracket |
| 7. Air cleaner filter          | 8. Air cleaner case (top)       | 9. Air cleaner case clips       |

### Removal and Installation

INFOID:000000009460473

#### CHANGING THE AIR CLEANER FILTER

1. Release the air cleaner case clips.
2. Open the air cleaner case (top).
3. Remove the air cleaner filter.
4. Install a new air cleaner filter.
5. Close the air cleaner case (top).
6. Secure the air cleaner case clips.

#### INSPECTION AFTER REMOVAL

Examine the air cleaner filter for stains, clogging, or damage.

- Remove dirt and foreign objects (such as dead leaves) on air cleaner filter surface and inside cleaner case.
- If clogging or damage is observed, replace the air cleaner filter.

#### **CAUTION:**

**Do not clean the viscous paper type air cleaner filter by blowing as there is a risk of deterioration of its performance.**

#### MAINTENANCE INTERVAL

Refer to [MA-7, "FOR USA AND CANADA : Introduction of Periodic Maintenance"](#).

# CAMSHAFT VALVE CLEARANCE

< PERIODIC MAINTENANCE >

[QR25DE]

## CAMSHAFT VALVE CLEARANCE

### Camshaft valve clearance

INFOID:000000009460474

A

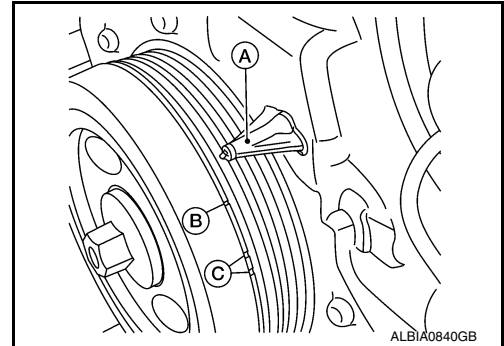
EM

- Perform this inspection as follows after removal, installation, or replacement of the camshaft or any valve-related parts, or if there are any unusual engine conditions due to changes in valve clearance over time (starting, idling, and/or noise).

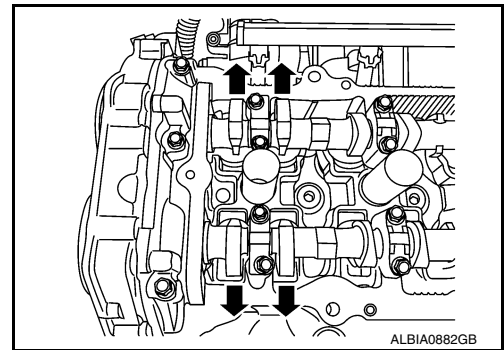
1. Remove the fender protector side cover (RH). Refer to [EXT-26. "FENDER PROTECTOR : Removal and Installation"](#).
2. Remove the rocker cover using power tool. Refer to [EM-45. "Removal and Installation"](#).
3. Turn crankshaft pulley clockwise when viewed from front to align TDC identification mark (B) with timing indicator (A).

**NOTE:**

Do not confuse TDC mark (B) with paint marks (C).

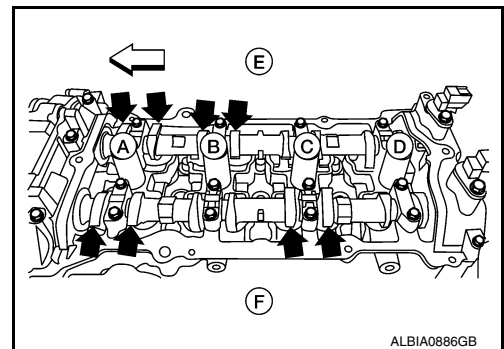


4. At this time, check that the both intake and exhaust cam lobes of No. 1 cylinder face outside.
  - If they do not face outside, turn crankshaft pulley once more.



5. Measure valve clearances with a feeler gauge at locations marked (X) in the table below.
  - No.1 cylinder compression TDC.

Cylinder	No.1 (A)		No.2 (B)		No.3 (C)		No.4 (D)	
	INT (E)	EXH (F)	INT (E)	EXH (F)	INT (E)	EXH (F)	INT (E)	EXH (F)
Measure	x	x	x			x		



← : Engine front

C

D

E

F

G

H

I

J

K

L

M

N

O

P

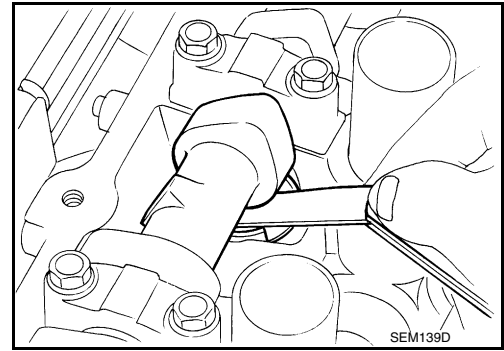
# CAMSHAFT VALVE CLEARANCE

[QR25DE]

## < PERIODIC MAINTENANCE >

- Use a feeler gauge to measure the clearance between valve lifter and camshaft.

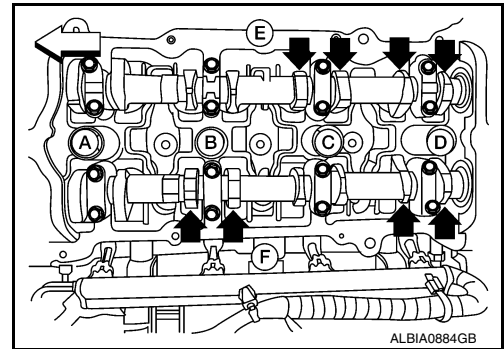
Valve clearance: Refer to [EM-111, "Standard and Limit"](#).



- Turn crankshaft one complete revolution (360°) and align mark on crankshaft pulley with pointer.
- Measure valve clearances with a feeler gauge at locations marked (X) in the table below.
  - No.4 cylinder compression TDC.

Cylinder	No.1 (A)		No.2 (B)		No.3 (C)		No.4 (D)	
Valve	INT (E)	EXH (F)	INT (E)	EXH (F)	INT (E)	EXH (F)	INT (E)	EXH (F)
Measure				X	X		X	X

If out of specifications, make necessary adjustment.

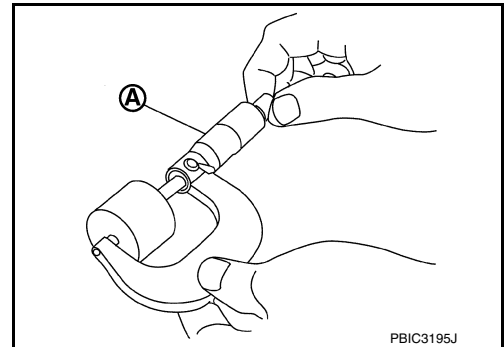


← : Engine front

## ADJUSTMENT

### NOTE:

- Perform adjustment by selecting the valve lifter with the correct head thickness.
- Remove camshaft. Refer to [EM-47, "Removal and Installation"](#).
  - Remove the valve lifters at the locations that are outside the standard.
  - Measure the center thickness of the removed valve lifters with a micrometer (A).



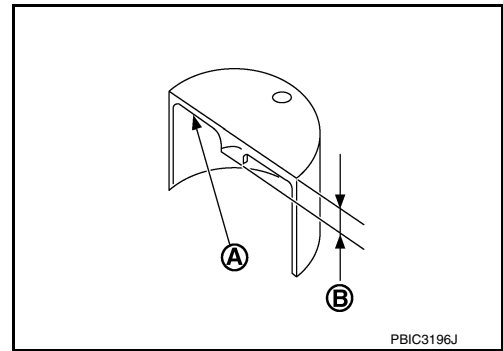
- Use the equation below to calculate valve lifter thickness for replacement.
  - Valve lifter thickness calculation.
$$t = t1 + (C1 - C2)$$
  - t = Thickness of replacement valve lifter.
  - t1 = Thickness of removed valve lifter.
  - C1 = Measured valve clearance.
  - C2 = Standard valve clearance.

# CAMSHAFT VALVE CLEARANCE

[QR25DE]

< PERIODIC MAINTENANCE >

- Thickness of a new valve lifter (B) can be identified by stamp marks (A) on the reverse side (inside the cylinder).  
Stamp mark 300 indicates a thickness of 3.00 mm (0.1181 in)  
**Available thickness of valve lifter: 26 sizes with a range of 3.00 to 3.50 mm (0.1181 to 0.1378 in), in steps of 0.02 mm (0.0008 in), when assembled at the factory.**



5. Install the selected valve lifter.
6. Install camshaft. Refer to [EM-47, "Removal and Installation"](#).
7. Install timing chain and related parts. Refer to [EM-62, "Removal and Installation"](#).
8. Manually rotate crankshaft pulley a few rotations.
9. Check that valve clearances for cold engine are within specifications by referring to the specified values.

**Valve clearance** Refer to [EM-111, "Standard and Limit"](#).

10. Install all removed parts in the reverse order of removal.
11. Warm up the engine, and check for unusual noise and vibration.

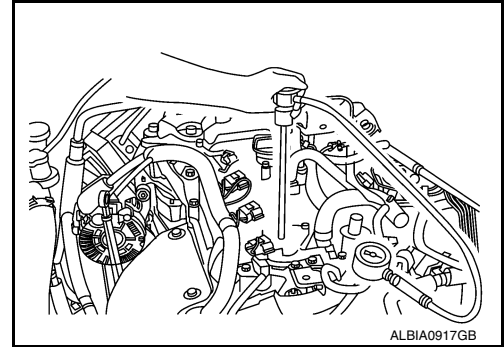
## COMPRESSION PRESSURE

### Compression pressure

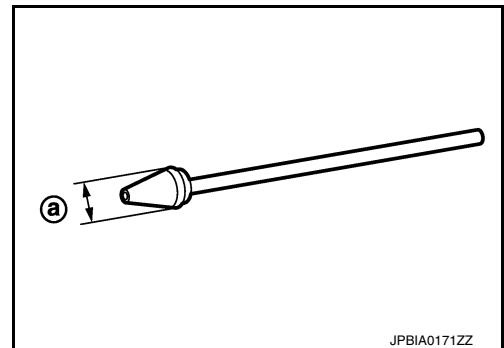
INFOID:000000009460475

#### CHECKING COMPRESSION PRESSURE

1. Warm up the engine to full operating temperature.
2. Release the fuel pressure. Refer to [EC-182, "Work Procedure"](#).
3. Remove the ignition coil and spark plug from each cylinder. Refer to [EM-40, "Removal and Installation"](#).
4. Connect engine tachometer (not required in use of CONSULT).
5. Disconnect the fuel injector harness connector to avoid any residual fuel injection during the measurement.
6. Install the compression tester with the adapter into the spark plug hole.



- Use compression tester whose end (a) (rubber portion) is smaller than 20 mm (0.79 in) in diameter. Otherwise, it may be caught by cylinder head during removal.



7. With the accelerator pedal fully depressed, turn the ignition switch to the "START" position to crank over the engine. When the gauge pointer stabilizes, read the compression pressure and engine rpm. Perform these steps to check each cylinder.

Unit: kPa (kg/cm<sup>2</sup>, psi) / rpm

Standard	Minimum	Difference limit between cylinders
1410 (14.4, 204.5) / 250	1220 (12.4, 176.9) / 250	100 (1.0, 14) / 250

**CAUTION:**

**Always use a fully charged battery to obtain specified engine cranking speed.**

- If the engine speed is out of specified rpm range, check the battery. Check engine speed again with a fully charged battery.
- If compression pressure is below minimum value, check valve clearances and parts associated with combustion chamber (valve, valve seat, piston, piston ring, cylinder bore, cylinder head, cylinder head gasket). After the checking, measure compression pressure again.
- If some cylinders have low compression pressure, pour small amount of engine oil into the spark plug hole of the cylinder to re-check it for compression.
- If the added engine oil improves the compression, the piston rings may be worn 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.

# COMPRESSION PRESSURE

< PERIODIC MAINTENANCE >

[QR25DE]

- If two adjacent cylinders have respectively low compression pressure and their compression remains low even after the addition of engine oil, the head gasket is leaking. In such a case, replace the cylinder head gasket.
- 8. Install spark plug, ignition coil and harness connectors. Refer to [EM-16. "Removal and Installation"](#).

A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

# ENGINE ROOM COVER

< REMOVAL AND INSTALLATION >

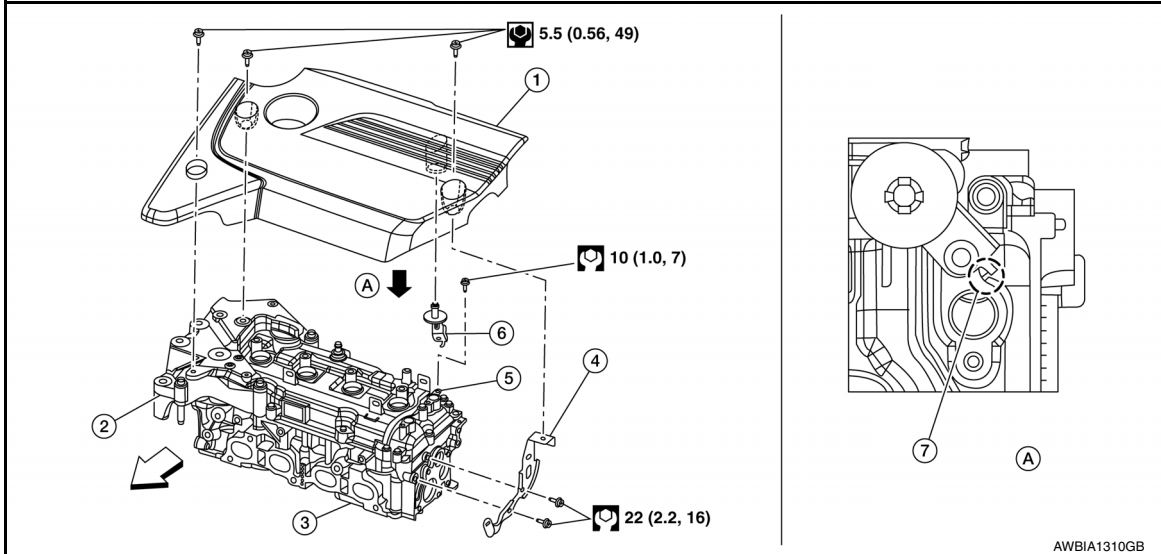
[QR25DE]

## REMOVAL AND INSTALLATION

### ENGINE ROOM COVER

Exploded View

INFOID:000000009460476



- |                              |                               |                              |
|------------------------------|-------------------------------|------------------------------|
| 1. Engine room cover         | 2. RH engine mounting bracket | 3. Cylinder head             |
| 4. Engine room cover bracket | 5. Camshaft bracket           | 6. Engine room cover bracket |
| 7. Bracket stopper           | A. View A                     | ⇐ Front                      |

### Removal and Installation

INFOID:000000009460477

#### CAUTION:

**Do not damage or scratch engine room cover.**

#### REMOVAL

1. Remove the engine room cover bolts using power tool.
2. Lift up on engine room cover firmly to dislodge snap fit mounts.
3. Remove engine room cover.

#### INSTALLATION

Installation is in the reverse order of removal.



# AIR CLEANER AND AIR DUCT

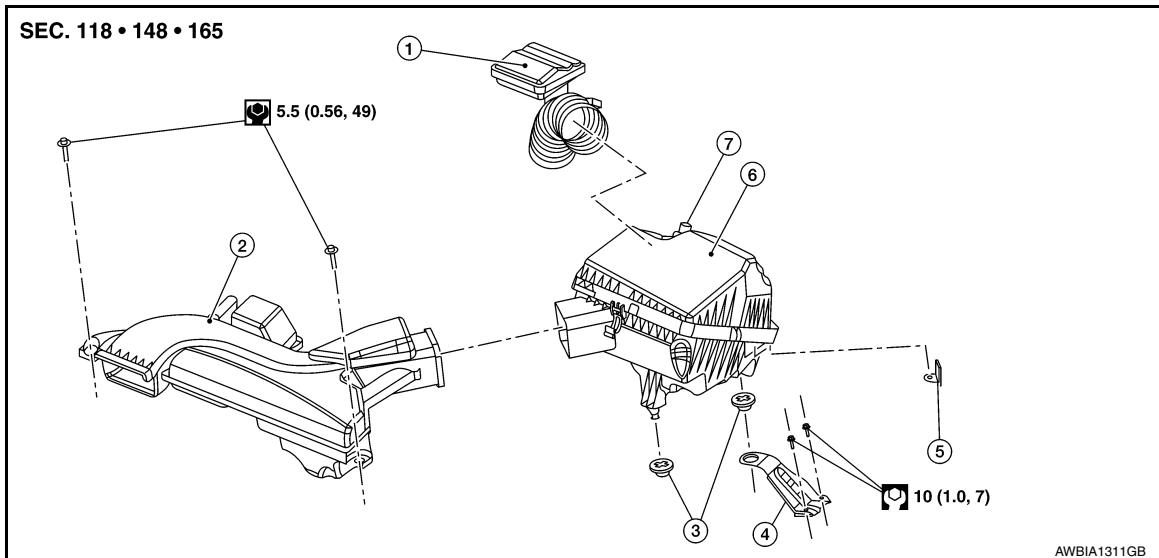
< REMOVAL AND INSTALLATION >

[QR25DE]

## AIR CLEANER AND AIR DUCT

### Exploded View

INFOID:000000009460478



- |                                 |                                 |                              |
|---------------------------------|---------------------------------|------------------------------|
| 1. Air duct hose and resonator  | 2. Front air duct               | 3. Grommets                  |
| 4. Air cleaner mounting bracket | 5. Air cleaner mounting bracket | 6. Air cleaner case assembly |
| 7. Mass air flow sensor         |                                 |                              |

### Removal and Installation

INFOID:000000009460479

#### REMOVAL

1. Remove the core support cover. Refer to [EXT-17, "Removal and Installation"](#).
2. Remove front air duct.
3. Remove the engine room cover. Refer to [EM-28, "Removal and Installation"](#).
4. Disconnect the air duct hose clamps at the electric throttle control actuator and the air cleaner case assembly.
5. Disconnect the blow-by hose.
6. Remove air duct hose and resonator.
7. Disconnect the mass air flow sensor and remove the harness retainers from the air cleaner case assembly.
8. Disconnect the transaxle breather hose from the air cleaner case assembly.
9. Remove mass air flow sensor from air cleaner case assembly, as necessary.

#### **CAUTION:**

**Handle the mass air flow sensor with care:**

- Do not shock it.
- Do not disassemble it.
- Do not touch the internal sensor.

10. Remove the air cleaner case assembly.

#### INSTALLATION

Installation is in the reverse order of removal.

# INTAKE MANIFOLD

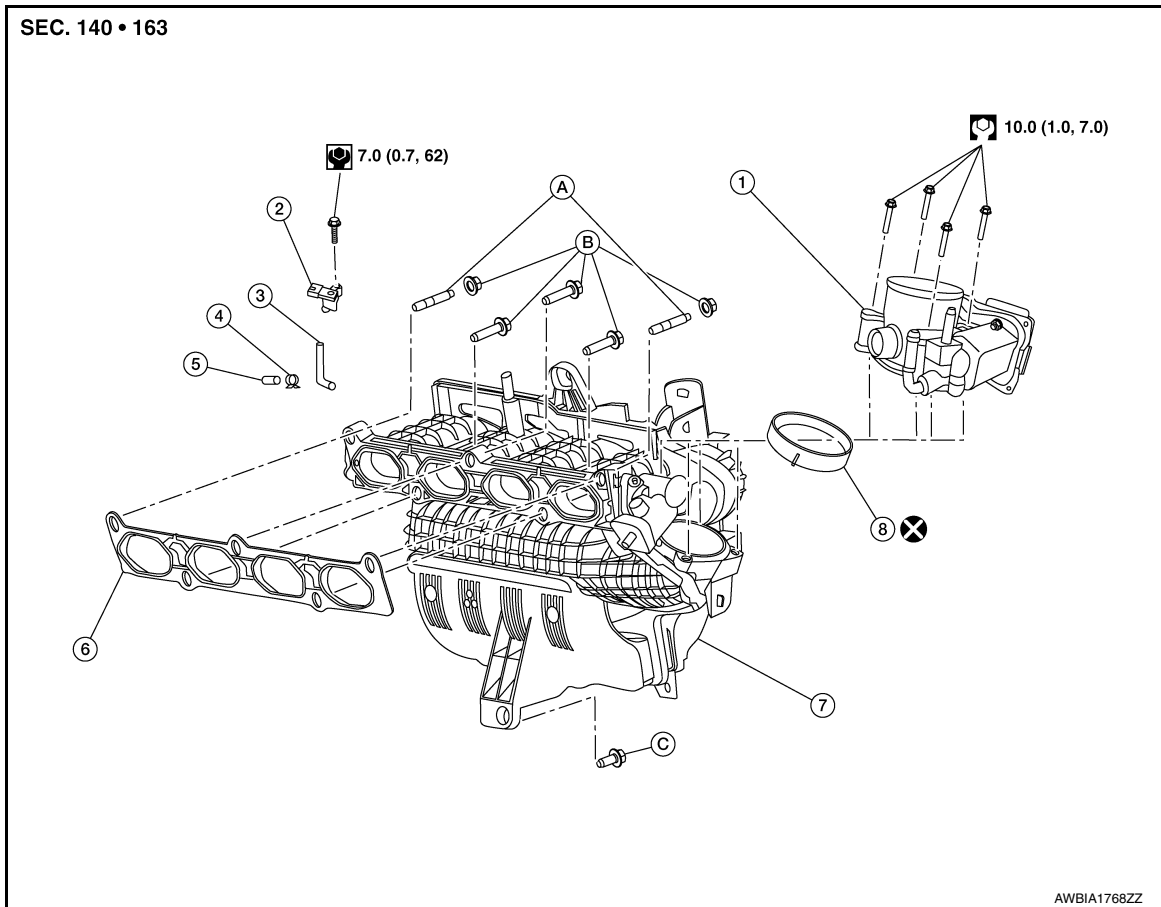
< REMOVAL AND INSTALLATION >

[QR25DE]

## INTAKE MANIFOLD

### Exploded View

INFOID:000000009460480



- |                                       |  |                               |
|---------------------------------------|--|-------------------------------|
| 1. Electric throttle control actuator | 2. Map sensor (California only)              | 3. Map hose (California only) |
| 4. Clamp                              | 5. Cap (except California)                   | 6. Intake manifold gasket     |
| 7. Intake manifold                    | 8. Electric throttle control actuator O-ring | A. Refer to INSTALLATION      |
| B. Refer to INSTALLATION              | C. Refer to INSTALLATION                     |                               |

## Removal and Installation

INFOID:000000009460481

### REMOVAL

#### **WARNING:**

To avoid the danger of being scalded, never 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. Disconnect battery negative terminal. Refer to [PG-73, "Removal and Installation \(Battery\)"](#).
2. Release the fuel pressure. Refer to [EC-182, "Work Procedure"](#).
3. Partially drain engine coolant. Refer to [CO-12, "Changing Engine Coolant"](#).
4. Remove the air cleaner and air duct. Refer to [EM-29, "Removal and Installation"](#).
5. Remove cowl top finisher. Refer to [EXT-24, "Removal and Installation"](#).
6. Remove strut tower bar. Refer to [FSU-19, "Exploded View"](#).
7. Disconnect the PCV hose from the intake manifold.
8. Disconnect the EVAP hose and EVAP canister purge volume control solenoid.

# INTAKE MANIFOLD

[QR25DE]

## < REMOVAL AND INSTALLATION >

9. Disconnect the brake booster vacuum hose from the intake manifold.
10. Disconnect the fuel quick connector from the fuel tube assembly. Refer to [EM-41, "Removal and Installation"](#).
11. Disconnect the water hoses from the electric throttle control actuator.

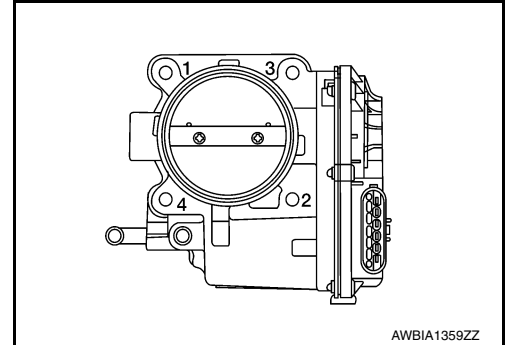
**NOTE:**

When removing only intake manifold, position electric throttle control actuator aside without disconnecting the water hose.

12. Loosen bolts in reverse order as shown, then remove electric throttle control actuator and electric throttle control actuator O-ring.

**CAUTION:**

Handle carefully to avoid any damage.



13. Disconnect the radiator hose (upper) from the water outlet. Refer to [CO-16, "Exploded View"](#).
14. Disconnect electrical harness connectors from the tumble control valve, tumble control valve position sensor, and power valve motor.
15. Remove the fuel tube assembly. Refer to [EM-41, "Removal and Installation"](#).

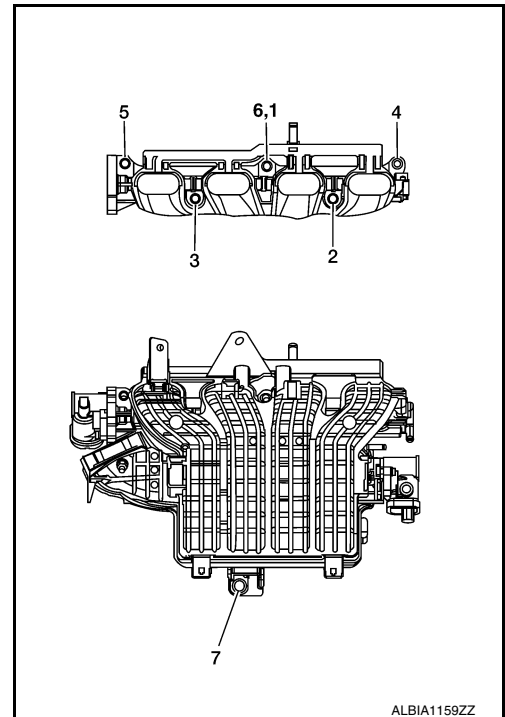
16. Remove the bolts and nuts in the reverse order shown using power tools and remove the intake manifold assembly with gasket.

**CAUTION:**

Cover engine openings to prevent entry of foreign materials.

**NOTE:**

Disregard No. 6 when loosening.



## INSTALLATION

Installation is in the reverse order of removal. Follow the tightening sequences and specifications below and perform the following:

- Perform the "Throttle Valve Closed Position Learning" when harness connector of electric throttle control actuator is disconnected. Refer to [EC-178, "Work Procedure"](#).
- Perform the "Idle Air Volume Learning" and "Throttle Valve Closed Position Learning" when electric throttle control actuator is replaced. Refer to [EC-179, "Work Procedure"](#) or [EC-178, "Work Procedure"](#).

### Intake Manifold

1. Securely install gasket to the mounting groove.

**CAUTION:**

Do not reuse gasket.

# INTAKE MANIFOLD

[QR25DE]

## < REMOVAL AND INSTALLATION >

- If studs were removed, install them and tighten to specification.

**Studs : 9.4 N·m (0.96 kg-m, 83 in-lb)**

- Tighten in numerical order as shown.

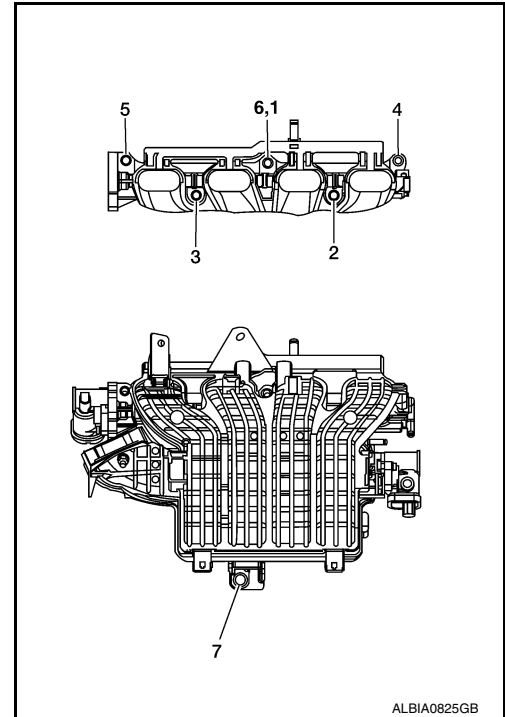
**CAUTION:**

After tightening the five bolts in the order shown, the 1, 6 position designates that the first bolt tightened is to be retightened to specification.

**Bolts 1, 2, 3, 4, 5, 6 : 25.0 N·m (2.6 kg-m, 18 ft-lb)**

**Nuts 4, 5 : 25.0 N·m (2.6 kg-m, 18 ft-lb)**

**Bolt 7 : 45.0 N·m (4.6 kg-m, 33 ft-lb)**



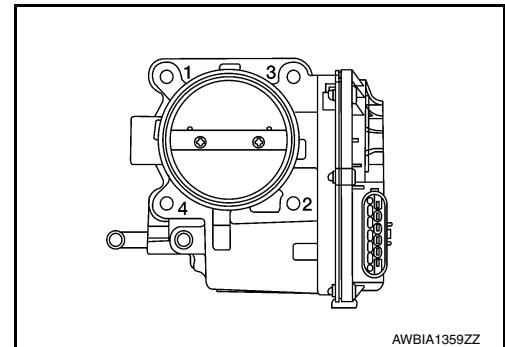
## Electric Throttle Control Actuator

- Install a new O-ring on the electric throttle control actuator.

**CAUTION:**

**Do not reuse electric throttle control actuator O-ring.**

- Tighten the bolts of electric throttle control actuator equally and diagonally in several steps in numerical order as shown.



## INSPECTION AFTER INSTALLATION

Make sure there are no fuel leaks at connections as follows:

- Apply fuel pressure to fuel lines by turning ignition switch ON (with engine stopped). Then check for fuel leaks at connections.

**NOTE:**

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

- 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.**

# EXHAUST MANIFOLD AND THREE WAY CATALYST

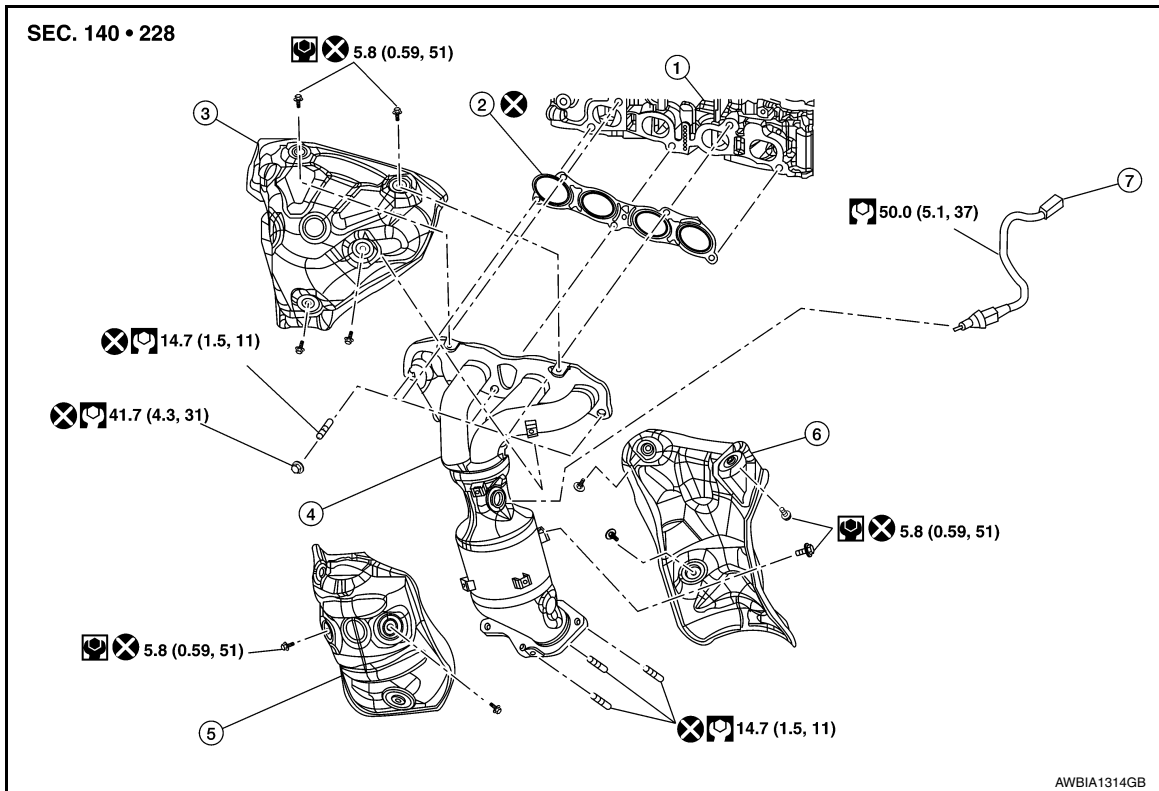
< REMOVAL AND INSTALLATION >

[QR25DE]

## EXHAUST MANIFOLD AND THREE WAY CATALYST

### Exploded View

INFOID:000000009460482



- |   |   |  |
|---|---|--|
| 1. Cylinder head                                    | 2. Exhaust manifold gasket              | 3. Exhaust manifold cover (upper)      |
| 4. Exhaust manifold and three way catalyst assembly | 5. Exhaust manifold cover (lower front) | 6. Exhaust manifold cover (lower rear) |
| 7. Air fuel ratio (A/F) sensor 1                    |   |  |

### Removal and Installation

INFOID:000000009460483

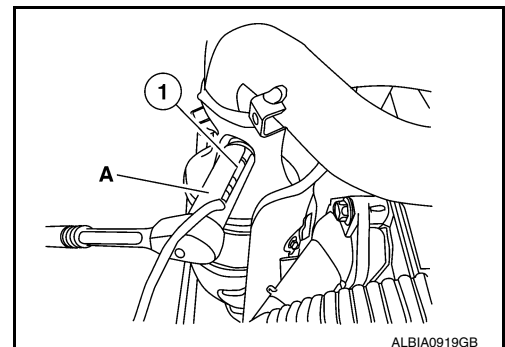
#### REMOVAL

1. Remove the engine under cover. Refer to [EXT-17, "Removal and Installation"](#).
2. Remove the exhaust front tube. Refer to [EX-5, "Exploded View"](#).
3. Remove the front air duct and air cleaner assembly. Refer to [EM-29, "Removal and Installation"](#).
4. Disconnect the air fuel ratio (A/F) sensor 1 electrical harness connector.
5. Remove the exhaust manifold cover (upper).
6. Remove the air fuel ratio (A/F) sensor 1 (1) using Tools (A), (if necessary).

**Tool numbers** : KV991J0050 (J-44626)  
: KV10117100 (J-36471-A)

#### CAUTION:

- Be careful not to damage air fuel ratio (A/F) sensor.
- Discard any air fuel ratio (A/F) sensor 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 one.



7. Remove the oil level gauge and oil level gauge guide. Refer to [EM-36, "Exploded View"](#).
8. Remove the exhaust manifold cover (lower front).

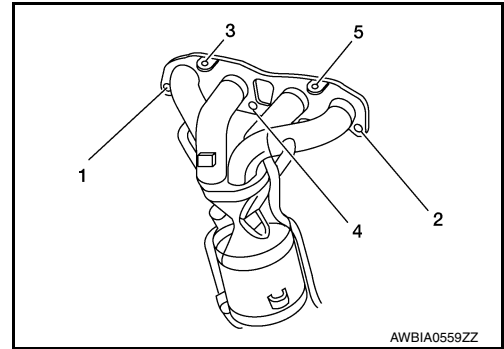
# EXHAUST MANIFOLD AND THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

[QR25DE]

- Loosen the exhaust manifold and three way catalyst nuts in the reverse order as shown.

⇐ : Engine front



- Remove the exhaust manifold and three way catalyst assembly and gasket. Discard the gasket.
- Remove the exhaust manifold cover (lower rear).

## INSPECTION AFTER REMOVAL

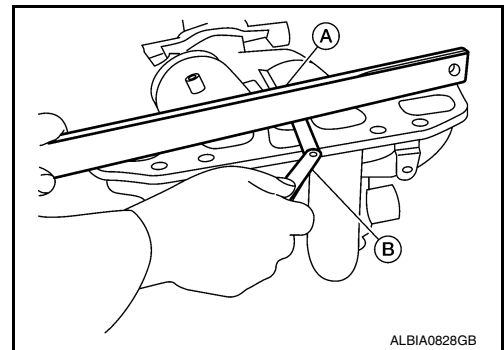
### Surface Distortion

- Use a reliable straightedge (A) and feeler gauge (B) to check the flatness of exhaust manifold mating surface.

#### NOTE:

Place the straightedge (A) diagonally and measure in several locations.

Limit : 0.3 mm (0.012 in)



## INSTALLATION

### Exhaust Manifold

- Install studs in cylinder head and exhaust manifold (if removed). Then tighten to specification.

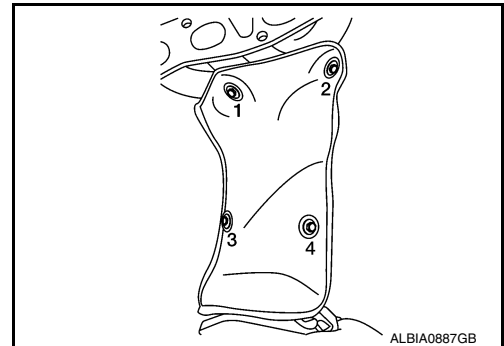
#### CAUTION:

**Do not reuse cylinder head or exhaust manifold studs.**

- Install exhaust manifold cover (lower rear) (if removed) and bolts. Then tighten the bolts to specification in the numerical order shown.

#### CAUTION:

**Do not reuse bolts.**

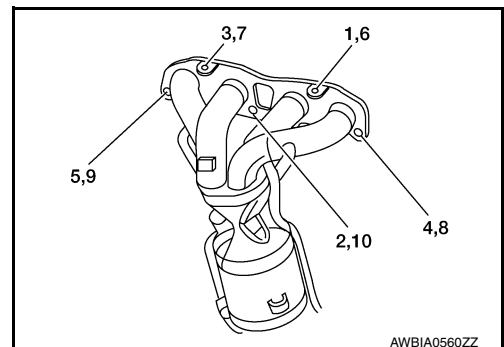


- Install the exhaust manifold and gasket. Then tighten the nuts to specification in the numerical order shown.

#### CAUTION:

**Do not reuse gasket.**

⇐ : Engine front



# EXHAUST MANIFOLD AND THREE WAY CATALYST

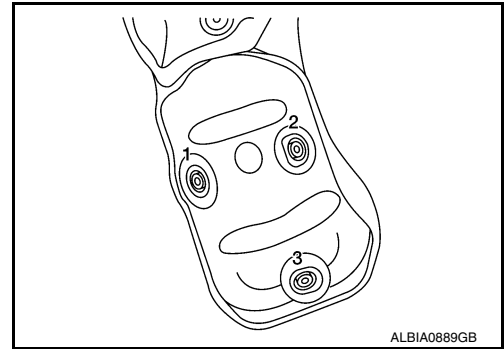
< REMOVAL AND INSTALLATION >

[QR25DE]

4. Install the exhaust manifold cover (lower front) and bolts. Then tighten the bolts to specification in the numerical order shown.

**CAUTION:**

**Do not reuse bolts.**



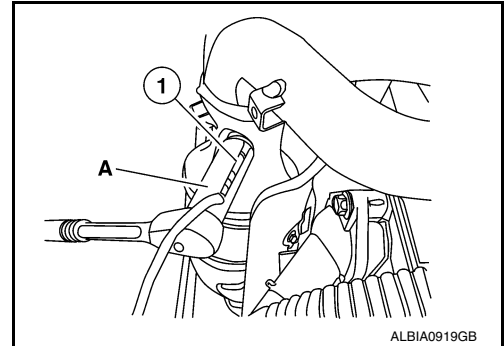
5. Install the air fuel ratio (A/F) sensor 1 (1) using Tools (A) and tighten to specification.

**Tool numbers** : KV991J0050 (J-44626)

: KV10117100 (J-36471-A)

**CAUTION:**

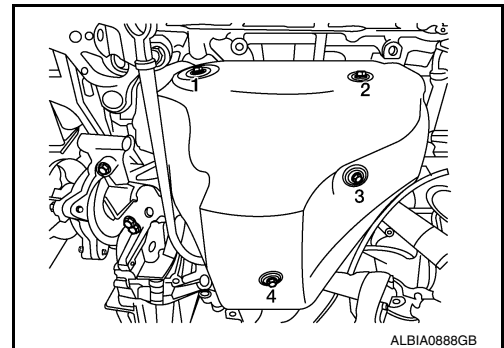
- Be careful not to damage air fuel ratio (A/F) sensor.
- Discard any air fuel ratio (A/F) sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; replace with a new one.
- Do not over-tighten the air fuel ratio (A/F) sensor 1. Doing so may cause damage to the air fuel ratio (A/F) sensor 1, resulting in a malfunction and the MIL coming on.



6. Install the exhaust manifold cover (upper). Then tighten the bolts to specification in the numerical order shown.

**CAUTION:**

**Do not reuse bolts.**



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

# OIL PAN AND OIL STRAINER

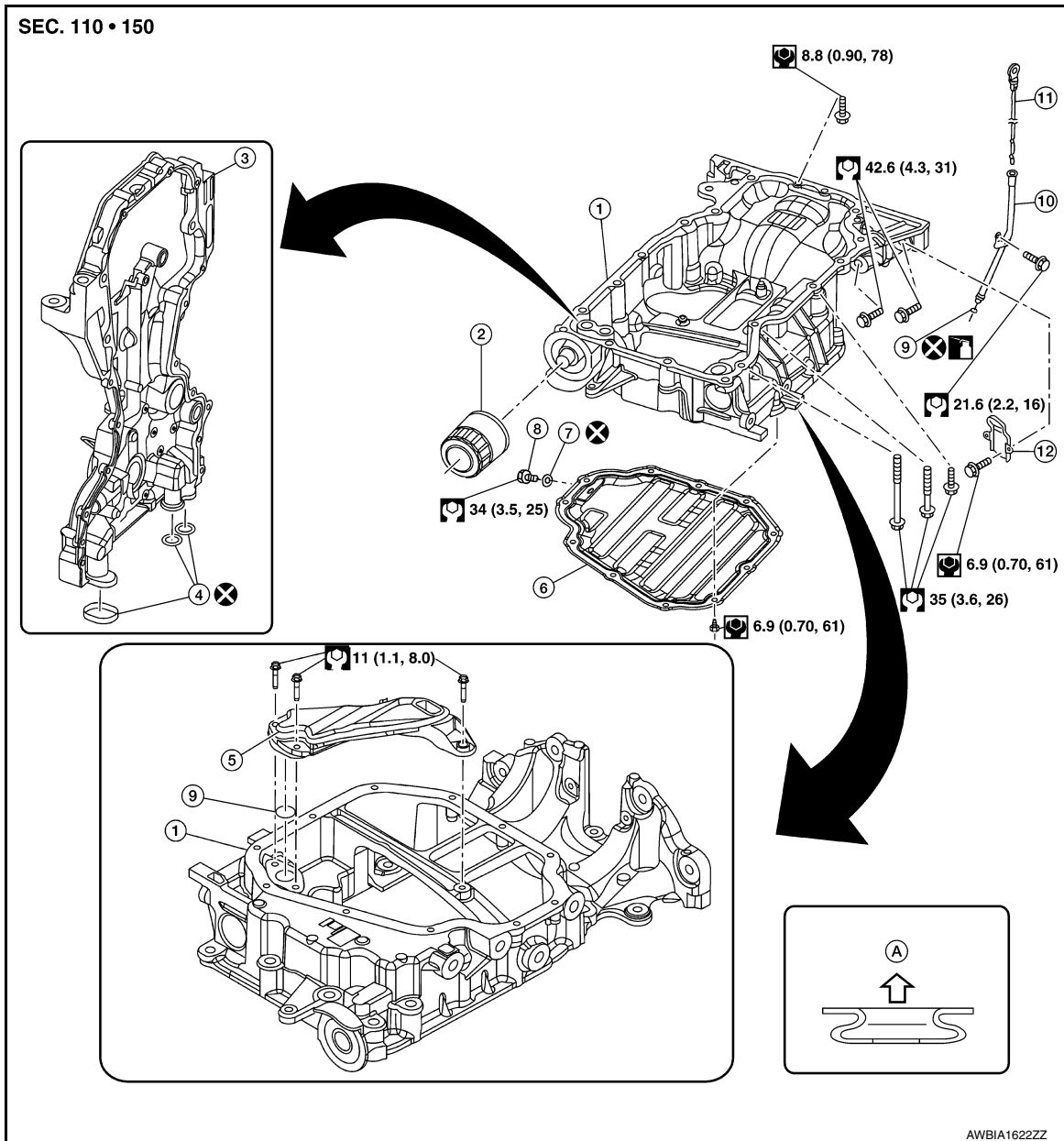
< REMOVAL AND INSTALLATION >

[QR25DE]

## OIL PAN AND OIL STRAINER

Exploded View

INFOID:000000009460484



- |                           |                     |                      |
|---------------------------|---------------------|----------------------|
| 1. Oil pan, upper         | 2. Oil filter       | 3. Front cover       |
| 4. O-ring                 | 5. Oil strainer     | 6. Oil pan, lower    |
| 7. Washer                 | 8. Drain plug       | 9. O-ring            |
| 10. Oil level gauge guide | 11. Oil level gauge | 12. Rear cover plate |
| A. To Oil pan, lower      |                     |                      |

## Removal and Installation

INFOID:000000009460485

### REMOVAL

#### **WARNING:**

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

1. Drain engine oil. Refer to [LU-10, "Changing Engine Oil"](#).
2. Remove the oil filter. Refer to [LU-11, "Removal and Installation"](#).



# OIL PAN AND OIL STRAINER

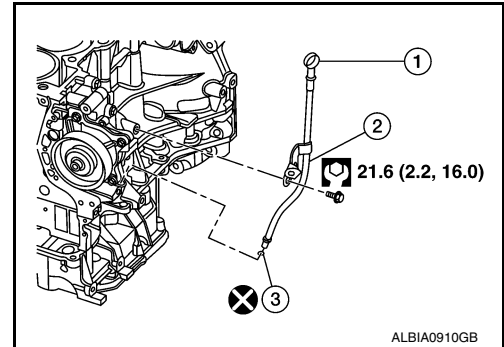
[QR25DE]

## < REMOVAL AND INSTALLATION >

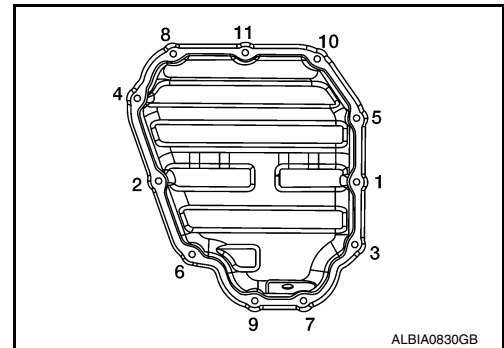
3. Remove the front exhaust tube and gaskets. Refer to [EX-5, "Exploded View"](#).
4. Remove the fender protector side cover (RH). Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).
5. Remove oil level gauge (1), oil level gauge guide (2), and O-ring (3).

**CAUTION:**

**Do not reuse O-ring.**



6. Disconnect the air fuel ratio sensor 1 electrical harness connector.
7. Remove the front driveshaft (LH) and front driveshaft (RH). Refer to [FAX-10, "Removal and Installation \(LH\)"](#) and [FAX-12, "Removal and Installation \(RH\)"](#).
8. Remove the connecting rod (LH) and the connecting rod (RH). Refer to [FSU-19, "Exploded View"](#).
9. Remove the tie rod end from the steering knuckle (RH) and the tie rod end from the steering knuckle (LH). Refer to [ST-36, "Exploded View"](#).
10. Remove the power steering gear bolts and support the power steering gear. Refer to [ST-36, "Removal and Installation"](#).
11. Remove the rear engine mount torque rod bracket. Refer to [EM-84, "Removal and Installation"](#).
12. Remove the front suspension member for clearance to remove the oil pan. Refer to [FSU-20, "Removal and Installation"](#).
13. Disconnect the A/C compressor electrical harness connector.
14. Remove the drive belt. Refer to [EM-19, "Removal and Installation"](#).
15. Remove the A/C compressor bolts, position the A/C compressor aside and support. Refer to [HA-30, "COMPRESSOR : Removal and Installation"](#).
16. Remove the lower oil pan bolts in the reverse order as shown, using power tool.



17. Remove the lower oil pan using Tool (A).

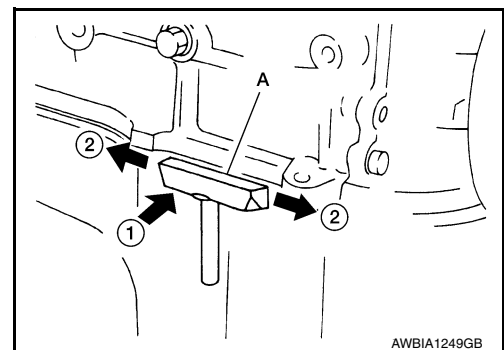
**CAUTION:**

**Be careful not to damage the mating surfaces.**

**NOTE:**

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.

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

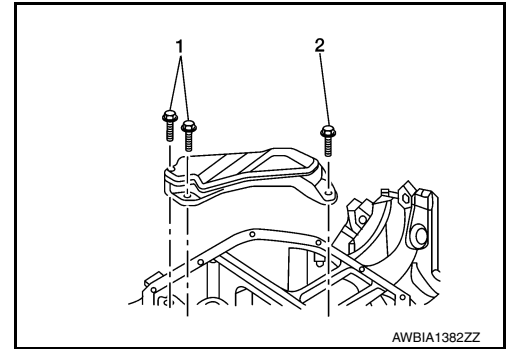


# OIL PAN AND OIL STRAINER

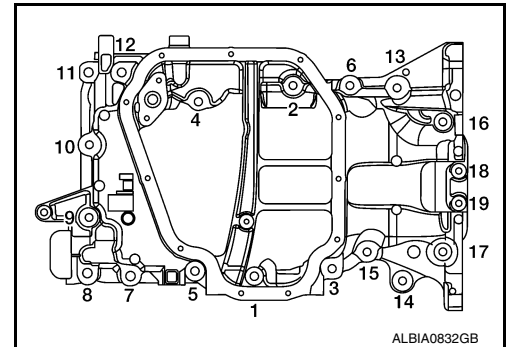
## < REMOVAL AND INSTALLATION >

[QR25DE]

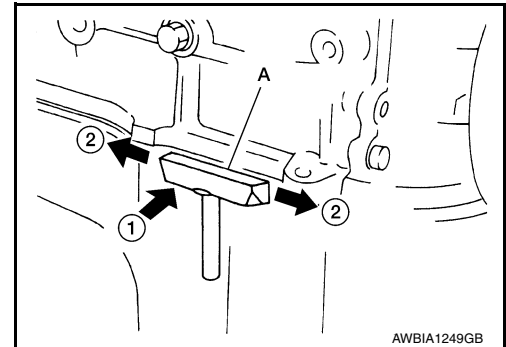
18. Remove the oil strainer bolts in the reverse order as shown then remove the oil strainer.



19. Remove rear cover plate, and four engine-to transaxle bolts, using power tool.  
20. Loosen the upper oil pan bolts in the order shown using power tool.



21. Remove upper oil pan using Tool (A).  
• Remove the three O-rings from the upper oil pan and front cover.  
**CAUTION:**  
**Be careful not to damage the mating surfaces.**  
**NOTE:**  
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.



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

## INSPECTION AFTER REMOVAL

Clean the oil strainer screen to remove any foreign material.

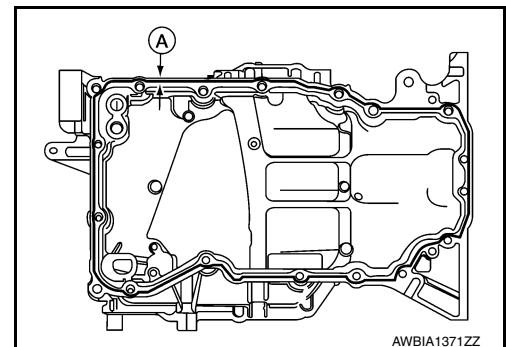
## INSTALLATION

1. Apply Genuine Silicone RTV Sealant or equivalent to the upper oil pan at the specified sealant bead diameter (A) as shown. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).

**Sealant bead diameter (A) : 4.0 - 5.0 mm (0.157 - 0.197 in)**

### **CAUTION:**

- Install two new O-rings in the upper oil pan and a new O-ring in the front cover.
- Do not reuse O-rings.
- 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.



# OIL PAN AND OIL STRAINER

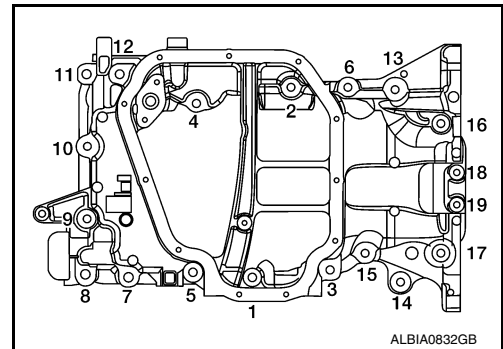
[QR25DE]

## < REMOVAL AND INSTALLATION >

2. Install the upper oil pan to the block and tighten the upper oil pan bolts to specification in the order shown.

**All bolts except 18 and 19 : 21.6 N·m (2.2 kg-m, 16.0 ft-lb)**

**Bolts 18 and 19 : 8.8 N·m (0.90 kg-m, 78.0 in-lb)**

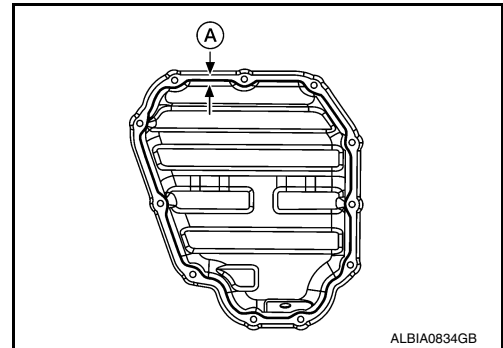


3. Apply Genuine Silicone RTV Sealant or equivalent to the lower oil pan at the specified sealant bead diameter (A) as shown. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).

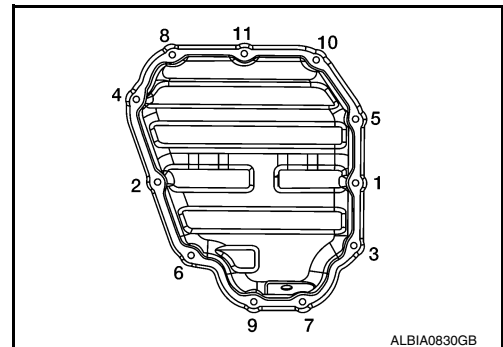
**CAUTION:**

- 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.

**Sealant bead : 4.0 - 5.0 mm (0.157 - 0.197 in) diameter (A)**



4. Install the lower oil pan to the upper oil pan and tighten the lower oil pan bolts to specification in the numerical order shown.



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

## INSPECTION AFTER INSTALLATION

Check for engine oil leaks with the engine at operating temperature and running at idle.

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# IGNITION COIL

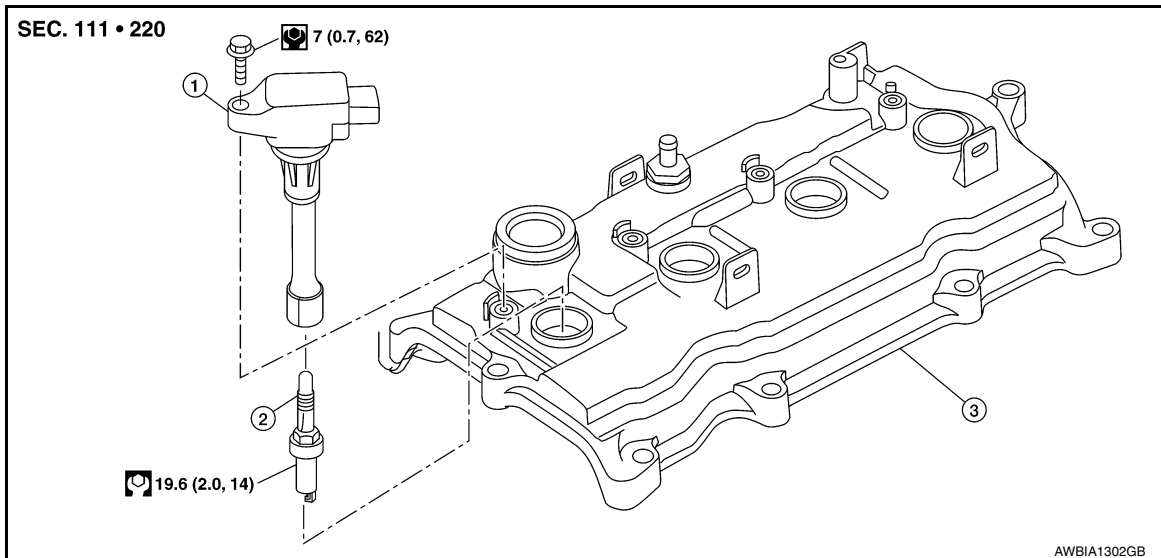
< REMOVAL AND INSTALLATION >

[QR25DE]

## IGNITION COIL

### Exploded View

INFOID:000000009460486



1. Ignition coil

2. Spark plug

3. Rocker cover

## Removal and Installation

INFOID:000000009460487

### REMOVAL

1. Remove the engine room cover. Refer to [EM-28. "Removal and Installation"](#).
2. Disconnect the harness connector from the ignition coil.
3. Remove the ignition coil.

#### **CAUTION:**

**Do not drop or shock it.**

### INSTALLATION

Installation is in the reverse order of removal.

# FUEL INJECTOR AND FUEL TUBE

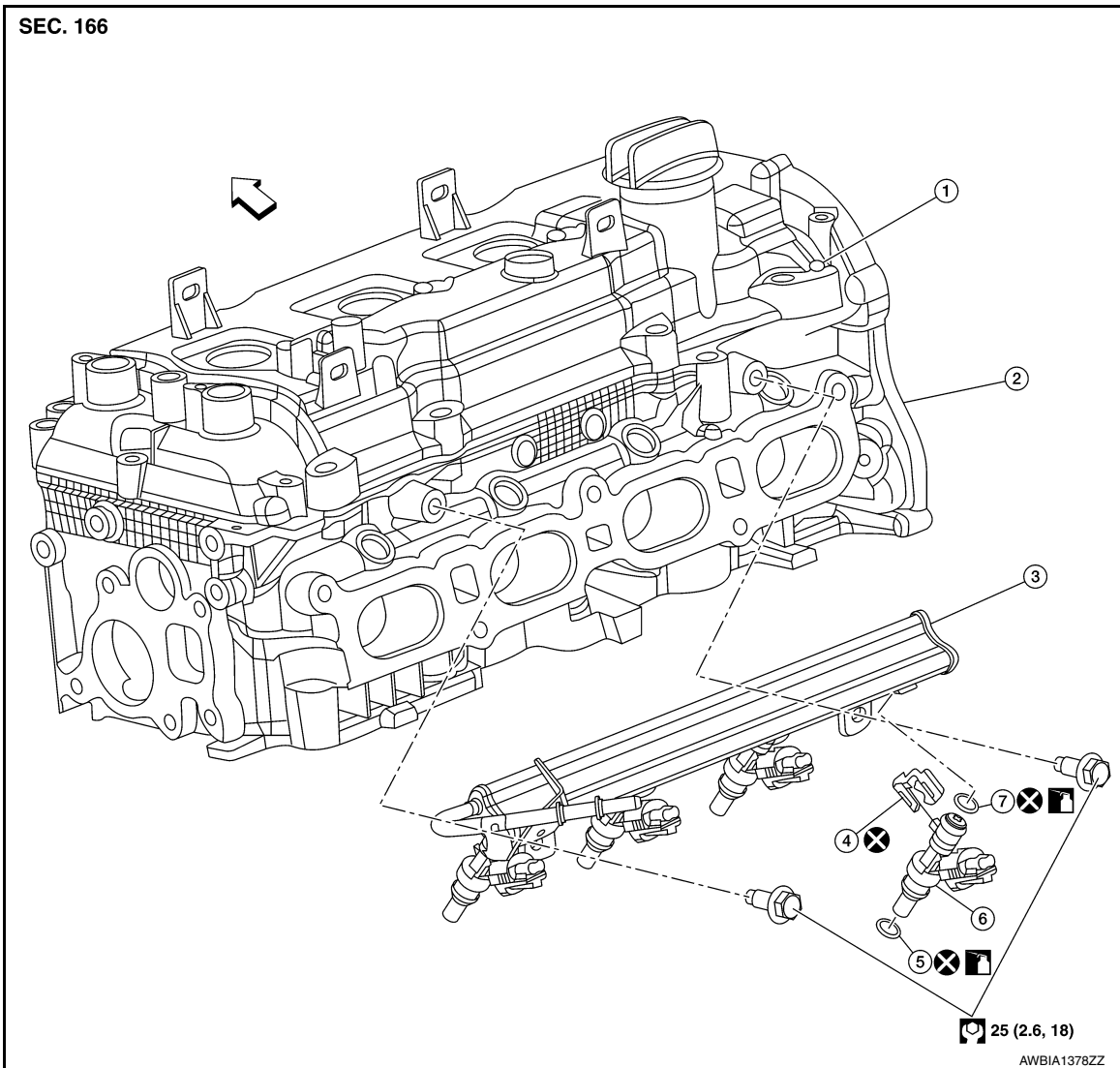
< REMOVAL AND INSTALLATION >

[QR25DE]

## FUEL INJECTOR AND FUEL TUBE

Exploded View

INFOID:000000009460488



- |                   |                   |                  |
|-------------------|-------------------|------------------|
| 1. Rocker cover   | 2. Cylinder head  | 3. Fuel tube     |
| 4. Clip           | 5. O-ring (green) | 6. Fuel injector |
| 7. O-ring (black) | ↶ Front           |                  |

### Removal and Installation

INFOID:000000009460489

#### CAUTION:

- Apply new engine oil before installing the parts, as shown above.
- Do not remove or disassemble parts unless instructed as shown.

#### REMOVAL

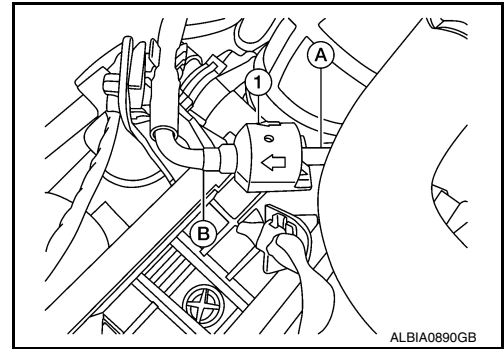
1. Remove engine room cover. Refer to [EM-28, "Removal and Installation"](#).
2. Release the fuel pressure. Refer to [EC-182, "Work Procedure"](#).
3. Disconnect the battery negative terminal. Refer to [PG-73, "Removal and Installation \(Battery\)"](#).
4. Remove the air duct hose and resonator. Refer to [EM-29, "Exploded View"](#).

# FUEL INJECTOR AND FUEL TUBE

[QR25DE]

## < REMOVAL AND INSTALLATION >

5. Remove quick connector cap (1) from the fuel feed side (B) and the fuel tube side (A).

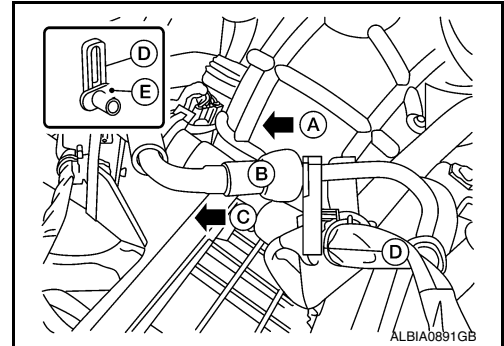


6. Disconnect the fuel hose quick connector at the fuel tube side using Tool (D).

**Tool number : 16441 6N210 (J-45488)**

### **CAUTION:**

- 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.
- Be sure to cover openings of disconnected pipes with plug or plastic bag to avoid fuel leaks and entry of foreign materials.
- Do not reuse O-ring.



- a. With the sleeve (E) side of Tool (D) facing quick connector, install Tool onto fuel tube.
- b. Insert Tool into quick connector until sleeve contacts and goes no further (A). Hold the Tool on that position.

### **CAUTION:**

**Inserting the Tool hard will not disconnect quick connector. Hold Tool where it contacts and goes no further.**

- c. Hold the fuel tube in the location (B) and pull the quick connector straight out in direction (C) from the fuel tube.

7. Disconnect the EVAP canister purge volume control solenoid.
8. Remove the PCV hose from the rocker cover.
9. Disconnect sub-harness for injectors at engine front side, and remove it from bracket.
10. Disconnect the fuel injector harness connectors.

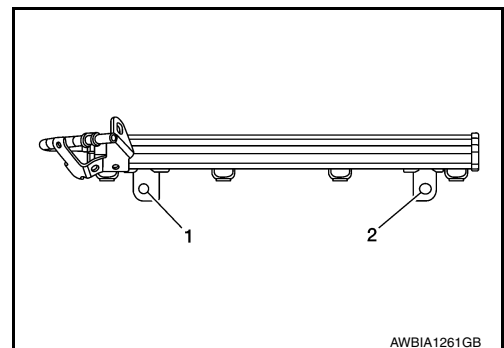
11. Loosen the bolts in the reverse order shown, then remove fuel tube and fuel injectors as an assembly.

12. Remove the fuel injectors from the fuel tube, (if necessary).

- a. Release the clip.
- b. Pull fuel injector straight out of the fuel tube.

### **CAUTION:**

- Be careful not to damage the nozzle.
- Avoid any impact, such as dropping the fuel injector.
- Do not disassemble or adjust the fuel injector.



## INSTALLATION

1. Install new O-rings on the fuel injector.

### **CAUTION:**

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

# FUEL INJECTOR AND FUEL TUBE

< REMOVAL AND INSTALLATION >

[QR25DE]

Fuel tube side : Black

Nozzle side : Green

- Handle O-rings with bare hands only. Do not wear gloves.
- Do not clean O-rings with solvent.
- Make sure that O-ring and its mating part are free of foreign material.
- Be careful not to scratch O-rings during installation.
- Do not twist or stretch the O-ring. If the O-ring was stretched while it is attached, do not insert it into the fuel tube immediately.

2. Install the fuel injector (5) into the fuel tube (1) with the following procedure:

(2): O-ring (black)

(4): O-ring (green)

a. Insert the new clip (3) into the clip mounting groove (F) on fuel injector (5).

- Insert the clip (3) so that protrusion (E) of fuel injector (5) matches cutout (C) of the clip (3).

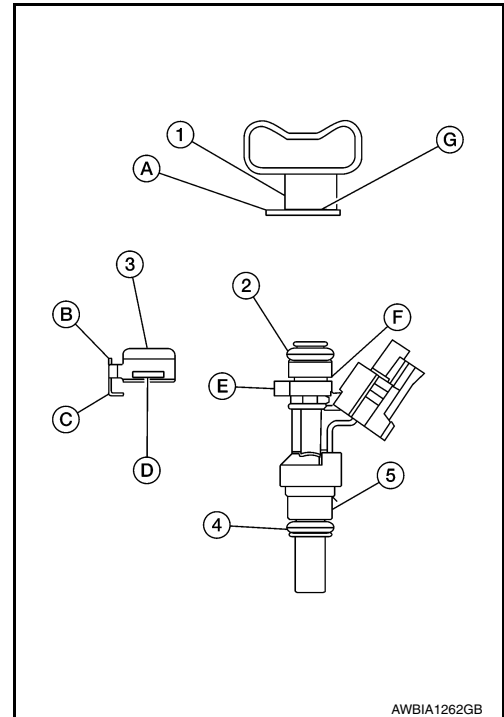
**CAUTION:**

- Do not reuse clip (3), replace it with a new one.
- Be careful to keep clip from interfering with O-ring. If interference occurs, replace O-ring.

b. Insert fuel injector (5) into fuel tube (1) with clip (3) attached.

- Insert fuel injector (5) so that protrusion (A) of fuel tube (1) matches cut-out (B) of the clip (3).
- Check that fuel tube flange (G) is securely fixed in flange groove (D) on the clip (3).

c. Check that installation is complete by checking that fuel injector (5) does not rotate or come off.



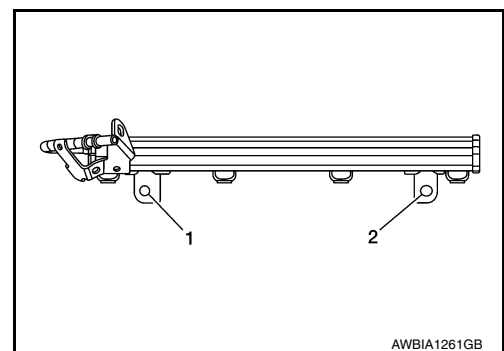
3. Install fuel tube and fuel injector assembly with the following procedure.

a. Insert the tip of each fuel injector into intake manifold.

b. Tighten the bolts to specification in the numerical order as shown.

**CAUTION:**

**After properly connecting fuel tube assembly to injector and fuel hose, check connection for fuel leaks.**



4. Connect the fuel hose quick connector.

- a. Make sure no foreign substances are deposited in and around the fuel tube and quick connector, and there is no damage to them.
- b. Thinly apply new engine oil around the fuel tube tip end.



## FUEL INJECTOR AND FUEL TUBE

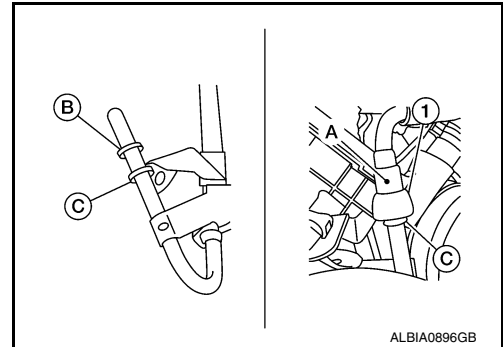
[QR25DE]

### < REMOVAL AND INSTALLATION >

- c. Align center to insert quick connector straight onto fuel tube.
- d. Insert fuel tube into quick connector (1) until the top spool (B) on fuel tubes is inserted completely and the second level spool (C) is positioned slightly below the quick connector bottom end.

**CAUTION:**

- Hold at position (A) as shown, when inserting the fuel tube into the quick connector.
- Carefully align to center to avoid inclined insertion to prevent damage to the O-ring inside the quick connector.
- Insert the fuel tube 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.
- Do not reuse O-ring.



- e. Before clamping the fuel hose with the hose clamp, pull the quick connector hard by hand, holding at the (A) position, as shown. Make sure it is completely engaged (connected) so that it does not come off of the fuel tube.

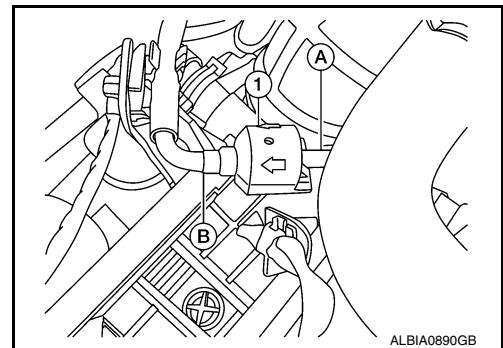
**NOTE:**

Recommended pulling force is 50 N (5.1 kg, 11.2 lb).

- f. Install quick connector cap (1) over fuel hose side (B) and fuel tube side (A).

**NOTE:**

Direct arrow mark on quick connector cap (1) to fuel hose side.



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

### INSPECTION AFTER INSTALLATION

Make sure there are no fuel leaks 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.
  - Perform procedures for “Throttle Valve Closed Position Learning” after finishing repairs. Refer to [EC-178, "Work Procedure"](#).
  - If electric throttle control actuator is replaced, perform procedures for “Idle Air Volume Learning” after finishing repairs. Refer to [EC-179, "Work Procedure"](#).

**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.



# ROCKER COVER

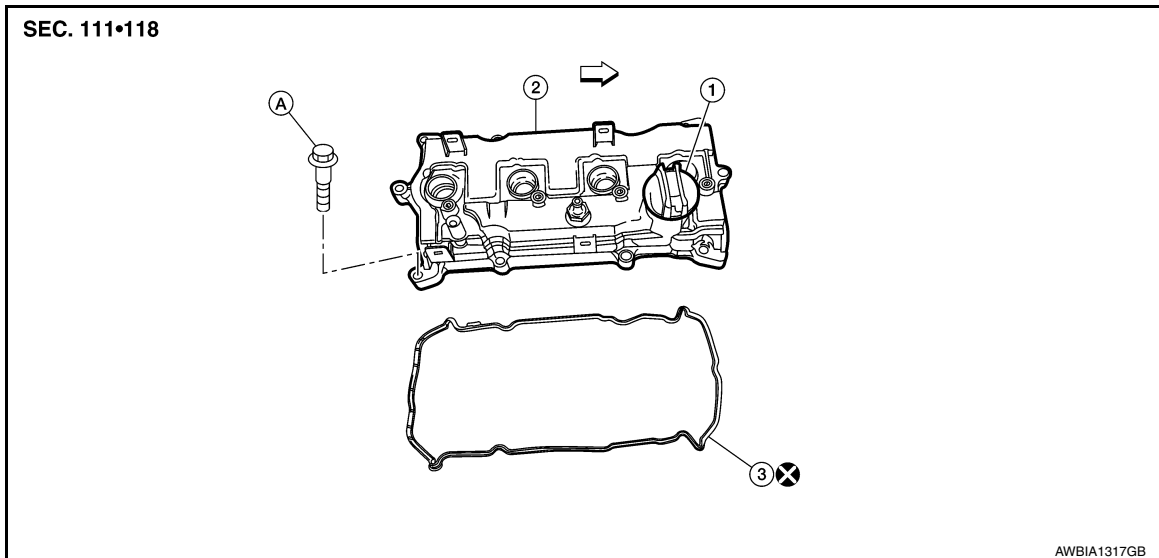
< REMOVAL AND INSTALLATION >

[QR25DE]

## ROCKER COVER

### Exploded View

INFOID:000000009460490



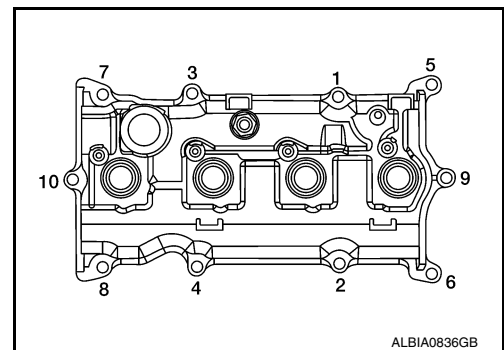
1. Oil filler cap                      2. Rocker cover                      3. Rocker cover gasket  
A. Refer to INSTALLATION          ⇐ Engine front

### Removal and Installation

INFOID:000000009460491

#### REMOVAL

1. Disconnect the battery negative terminal. Refer to [PG-73, "Removal and Installation \(Battery\)"](#).
2. Remove the engine room cover. Refer to [EM-28, "Removal and Installation"](#).
3. Remove the core support cover. Refer to [EXT-17, "Removal and Installation"](#).
4. Remove the front air duct. Refer to [EM-29, "Removal and Installation"](#).
5. Remove the RH engine mount torque rod. Refer to [EM-84, "Removal and Installation"](#).
6. Support the engine using a suitable jack.
7. Remove harness grounds from the top of the engine mount bracket.
8. Remove the RH engine support bracket. Refer to [EM-84, "Removal and Installation"](#).
9. Remove the RH engine mounting bracket. Refer to [EM-84, "Removal and Installation"](#).
10. Disconnect the PCV hose.
11. Remove the ignition coils. Refer to [EM-40, "Removal and Installation"](#).
12. Loosen the bolts in the numerical order as shown using power tool.
13. Remove the rocker cover and the rocker cover gasket. Discard the rocker cover gasket.  
**CAUTION:**  
**Do not reuse the rocker cover gasket.**
14. Remove the oil filler cap, (if necessary).



#### INSTALLATION

# ROCKER COVER

[QR25DE]

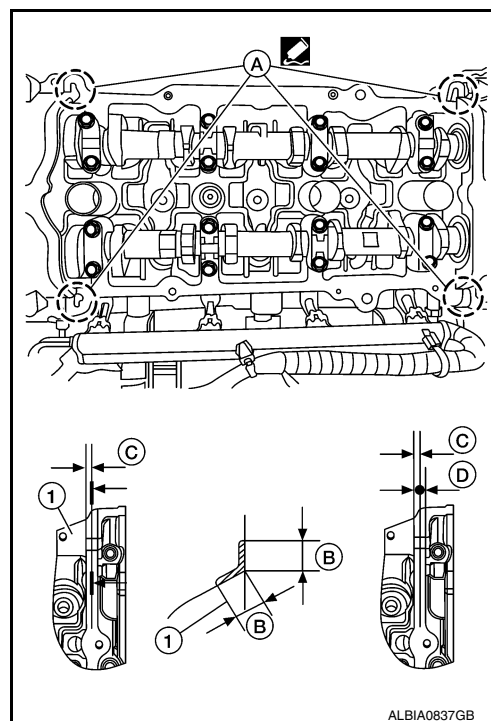
## < REMOVAL AND INSTALLATION >

1. Apply liquid gasket to the position shown (A) with the following procedure:
  - a. Apply liquid gasket to joint part of No.1 camshaft bracket (1) and cylinder head.
  - b. Apply liquid gasket in a 90° degree angle (B).
    - Use **Genuine Silicone RTV Sealant, or equivalent. Refer to [GI-21](#).**

(B) : 10 mm (0.39 in)

(C) : 4 mm (0.16 in)

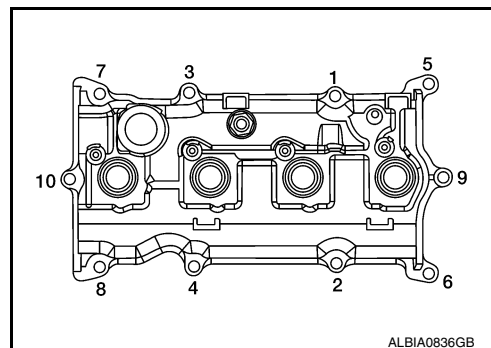
(D) : 5 mm (0.20 in)



2. Install rocker cover gasket to rocker cover.  
**NOTE:**  
The rocker cover gasket must be securely installed in the groove in the rocker cover.
3. Install the rocker cover and rocker cover gasket onto the cylinder head.
4. Tighten the rocker cover bolts to specification in two steps in the order shown.

**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)



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

# CAMSHAFT

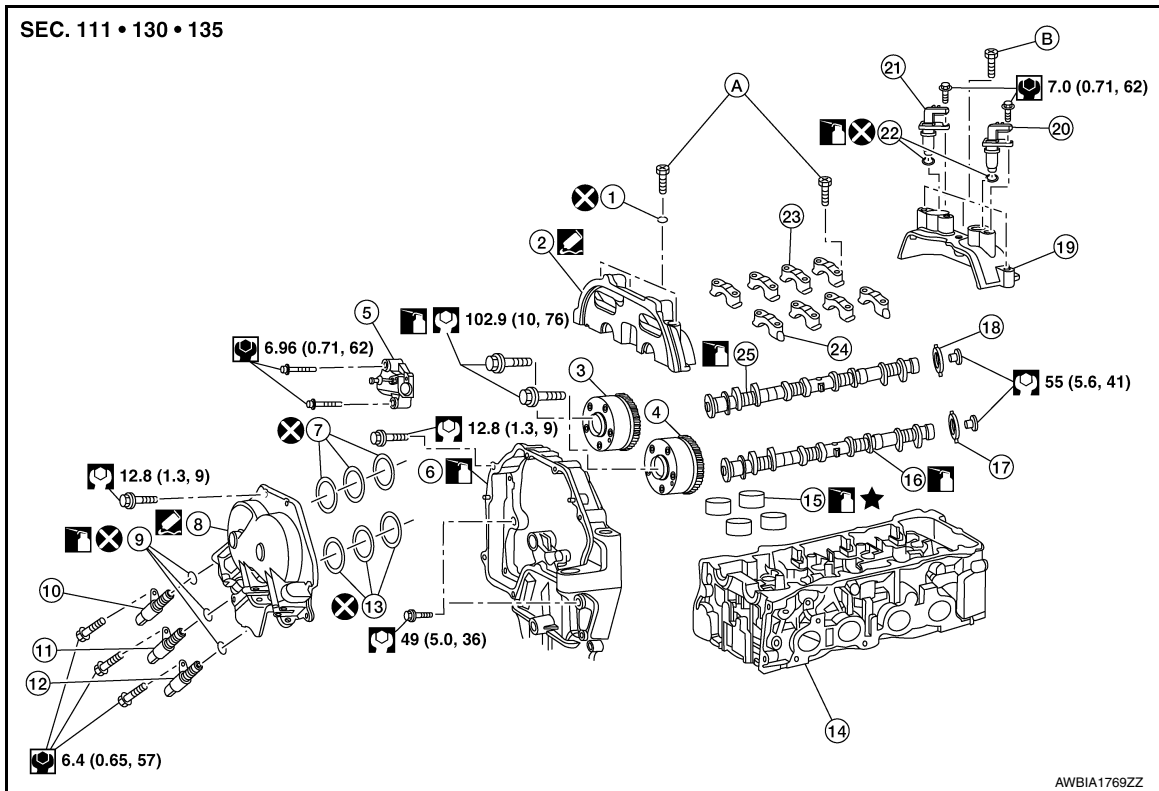
< REMOVAL AND INSTALLATION >

[QR25DE]

## CAMSHAFT

### Exploded View

INFOID:000000009460492



- |  |  |   |
|--|--|---|
| 1. Washer  | 2. Camshaft bracket (No.1)                     | 3. Camshaft sprocket (INT)                      |
| 4. Camshaft sprocket (EXH)                                       | 5. Chain tensioner                             | 6. Front cover (partial view)                   |
| 7. Valve timing control cover O-rings (INT)                      | 8. Valve timing control cover                  | 9. Valve timing control solenoid valve O-rings  |
| 10. Intake valve timing intermediate lock control solenoid valve | 11. Intake valve timing control solenoid valve | 12. Exhaust valve timing control solenoid valve |
| 13. Valve timing control cover O-rings (EXH)                     | 14. Cylinder head                              | 15. Valve lifters                               |
| 16. Camshaft (EXH)   | 17. Signal plate (EXH)                         | 18. Signal plate (INT)                          |
| 19. Camshaft position sensor bracket                             | 20. Camshaft position sensor (EXH)             | 21. Camshaft positions sensor (INT)             |
| 22. Camshaft position sensor O-rings                             | 23. Camshaft brackets (INT)                    | 24. Camshaft brackets (EXH)                     |
| 25. Camshaft (INT)   | A. Refer to INSTALLATION                       | B. Refer to INSTALLATION                        |

## Removal and Installation

INFOID:000000009460493

### REMOVAL

- Remove the rocker cover. Refer to [EM-45, "Removal and Installation"](#).
- Disconnect intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, exhaust valve timing control solenoid valve and camshaft sensor harness connectors.
- Remove camshaft position sensors.
- Remove camshaft position sensor bracket.
- Remove the intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve and exhaust valve timing control solenoid valve.

#### **CAUTION:**

**Do not reuse O-ring.**

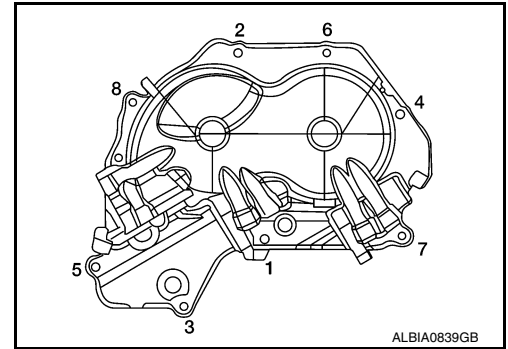
- Remove the spark plugs. Refer to [EM-16, "Removal and Installation"](#).

# CAMSHAFT

[QR25DE]

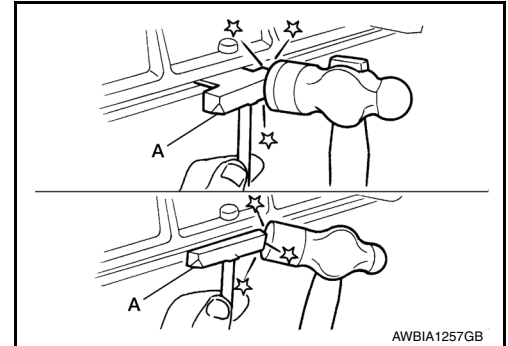
## < REMOVAL AND INSTALLATION >

7. Loosen the valve timing control cover bolts in the reverse order shown.
  - a. Remove the valve timing control cover bolts.



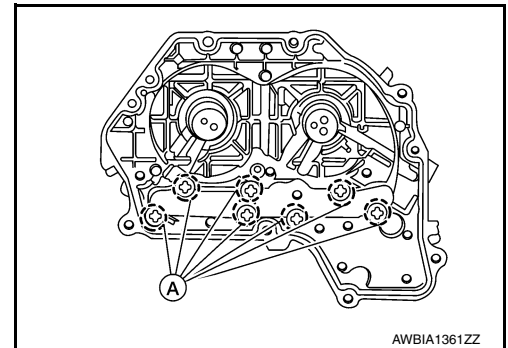
8. Remove the valve timing control cover by cutting the liquid gasket using Tool (A).

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



### NOTE:

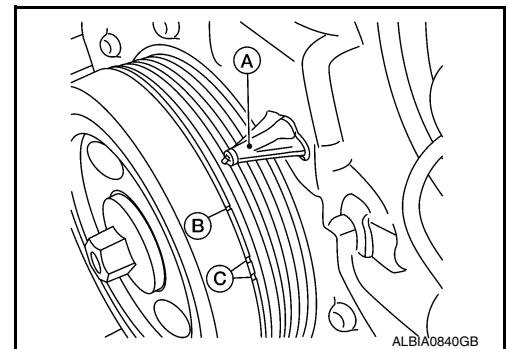
Do not loosen screws (A) on the back of the valve timing control cover.



9. Set the No.1 cylinder at TDC on its compression stroke using the following procedure:
  - a. Remove the fender protector side cover RH. Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).
  - b. Rotate crankshaft pulley clockwise, and align mating mark for TDC (B) with timing indicator (A) on front cover, as shown.

### NOTE:

Do not confuse TDC (B) with paint mark (C).

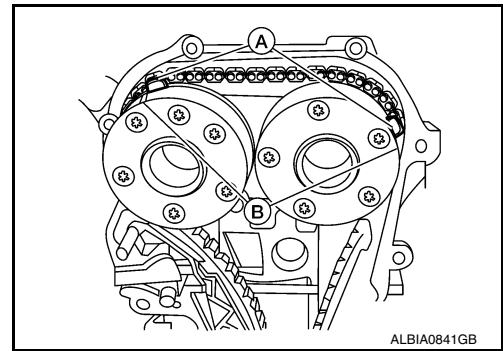


# CAMSHAFT

## < REMOVAL AND INSTALLATION >

[QR25DE]

- c. At the same time, make sure that the mating marks (outer groove) (B) on camshaft sprockets are lined up with the pink links (A) in the timing chain, as shown.
- If not, rotate crankshaft pulley one more turn to line up the mating marks (outer groove) (B) to the pink links (A), as shown.

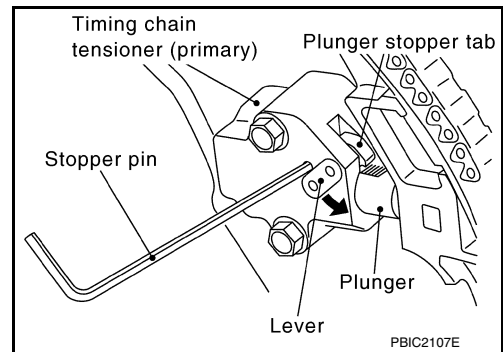


10. Remove the timing chain tensioner (primary) with the following procedure.

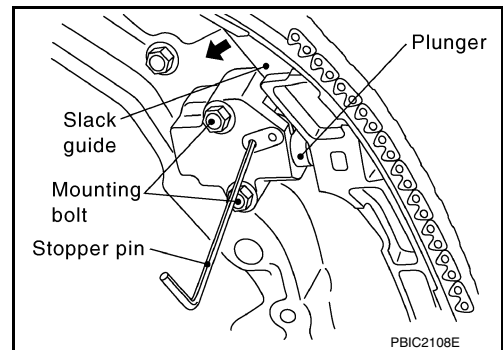
- a. Pull the lever down and release the plunger stopper tab.
- Plunger stopper tab can be pushed up to release (coaxial structure with lever).
- b. Insert the stopper pin into the tensioner body hole to hold the lever and keep tab released.

**NOTE:**

Allen wrench [2.5 mm (0.098)] is used for a stopper pin as an example.



- c. Insert plunger into tensioner body by pressing slack guide.
- d. Keep slack the guide pressed and hold it by pushing the stopper pin through the lever hole and body hole.
- e. Remove the bolts and remove the timing chain tensioner (primary).



11. Remove camshaft sprockets with the following procedure.

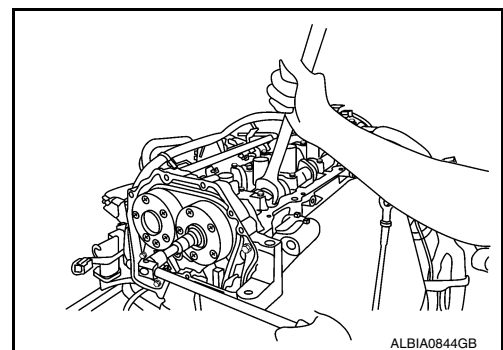
**CAUTION:**

• Do not rotate the crankshaft or camshaft while the timing chain is removed. It causes interference between valve and piston.

**NOTE:**

• Chain tension holding work is not necessary. Timing chain does not fall off the crankshaft sprocket while the front cover is attached.

- a. Line up the mating marks on camshaft sprockets with the pink links in the timing chain, and paint an indelible mating mark on the sprocket and timing chain link plate.
- b. Secure the hexagonal part of camshaft with a suitable tool. Loosen the camshaft sprocket bolts and remove the camshaft sprockets.



# CAMSHAFT

[QR25DE]

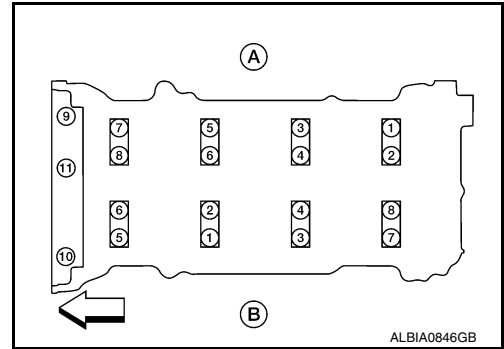
## < REMOVAL AND INSTALLATION >

12. Loosen the camshaft bracket bolts in the order as shown, and remove the camshaft brackets and camshafts.

**NOTE:**

Remove No.1 camshaft bracket by slightly tapping it with a rubber mallet.

- (A) : Intake side
- (B) : Exhaust side
- ⇐ : Engine front



13. Remove the valve lifters.

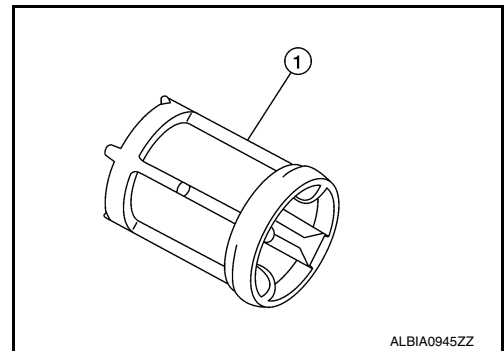
**NOTE:**

Check mounting positions, and set them aside in the order removed.

## INSPECTION AFTER REMOVAL

### Oil Filter

- Check that there is no foreign material on the oil filter (1) and check for clogging.
- Check the oil filter for damage.
- If there is damage, replace the oil filter.



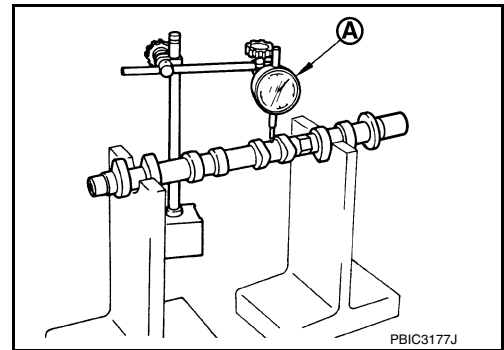
### Camshaft Runout

1. Put the camshaft on a V-block supporting the No.2 and No.5 journals.

**CAUTION:**

**Do not support the No. 1 journal (on the side of the camshaft sprocket) because it has different diameter from the other four locations.**

2. Set the dial gauge (A) vertically on the No.3 journal.  
 3. Turn camshaft in one direction by hand, and measure the camshaft runout on the dial gauge total indicator reading.



**Standard : Less than 0.02 mm (0.0008 in)**

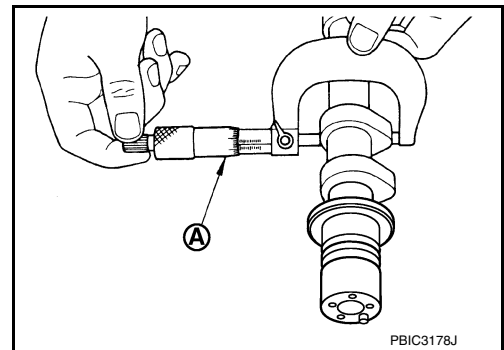
### Camshaft Cam Height

1. Measure the camshaft cam height using suitable tool (A).

**Standard intake cam height : 45.865 - 46.055 mm (1.8057 - 1.8132 in)**

**Standard exhaust cam height : 44.175 - 44.365 mm (1.7392 - 1.7467 in)**

2. If wear is beyond the limit, replace the camshaft.



### Camshaft Journal Clearance

#### Outer Diameter of Camshaft Journal

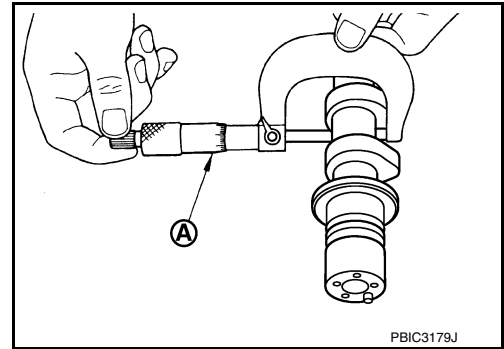
# CAMSHAFT

[QR25DE]

## < REMOVAL AND INSTALLATION >

- Measure the outer diameter of the camshaft journal using suitable tool (A).

<b>Standard No.1 outer diameter</b>	<b>: 27.935 - 27.955 mm</b> <b>(1.0998 - 1.1006 in)</b>
<b>Standard No.2, 3, 4, 5, outer diameter</b>	<b>: 23.435 - 23.455 mm</b> <b>(0.9226 - 0.9234 in)</b>

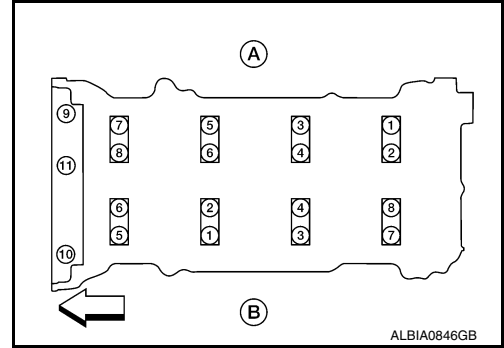


### Inner Diameter of Camshaft Bracket

- Tighten the camshaft bracket bolts to the specified torque following the tightening pattern as shown.

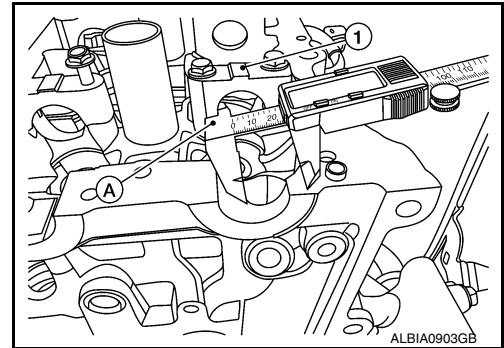
<b>Step 1 (bolts 9 - 11)</b>	<b>: 1.96 N·m (0.2 kg-m, 17 in-lb)</b>
<b>Step 2 (bolts 1 - 8)</b>	<b>: 1.96 N·m (0.2 kg-m, 17 in-lb)</b>
<b>Step 3 (bolts 1 - 11)</b>	<b>: 5.88 N·m (0.6 kg-m, 52 in-lb)</b>
<b>Step 4 (bolts 1 - 11)</b>	<b>: 10.4 N·m (1.02 kg-m, 92 in-lb)</b>

- (A) : Intake side
- (B) : Exhaust side
- ↶ : Engine front



- Using inside micrometer (A), measure inner diameter of camshaft bracket (1).

<b>Standard No.1</b>	<b>: 28.000 - 28.021 mm (1.1024 - 1.1032 in)</b>
<b>Standard No.2, 3, 4, 5</b>	<b>: 23.500 - 23.521 mm (0.9252 - 0.9260 in)</b>



### Calculation of Camshaft Journal Clearance

- (Journal clearance) = (inner diameter of camshaft bracket) – (outer diameter of camshaft journal)

<b>Standard</b>	<b>: 0.045 - 0.086 mm (0.0018 - 0.0034 in)</b>
-----------------	--

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

#### NOTE:

Inner diameter of the camshaft bracket is manufactured together with the cylinder head. If the camshaft bracket is out of specification, replace the whole cylinder head assembly.

### Camshaft End Play



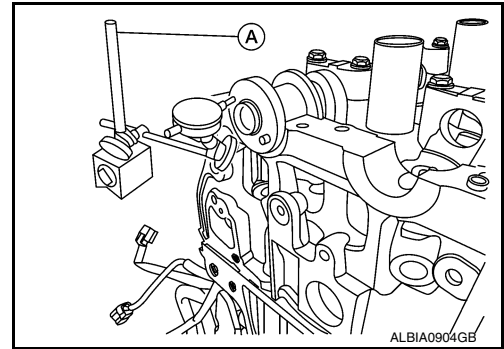
# CAMSHAFT

[QR25DE]

## < REMOVAL AND INSTALLATION >

1. Install a dial gauge (A) in the thrust direction on the front end of the camshaft. Measure the end play with the dial gauge while moving the camshaft forward and backward (in direction to axis).

**Standard end play** : 0.115 - 0.188 mm (0.0045 - 0.0074 in)



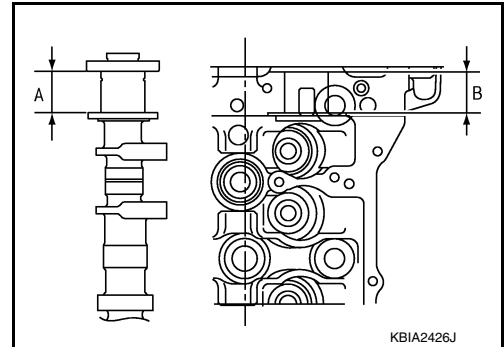
- Measure the following parts if out of the standard.
  - Dimension (A) for camshaft No. 1 journal

**Standard** : 25.800 - 25.848 mm (1.0157 - 1.0176 in)

- Dimension (B) for cylinder head No. 1 journal

**Standard** : 25.660 - 25.685 mm (1.0102 - 1.0112 in)

- Refer to the standards above, and then replace camshaft and/or cylinder head.

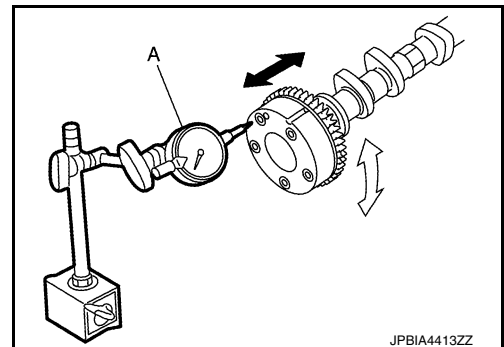


### Camshaft Sprocket Runout

1. Install the camshaft in the cylinder head.
2. Install the camshaft sprocket on the camshaft.
3. Measure camshaft sprocket runout while turning the camshaft by hand using suitable tool (A).

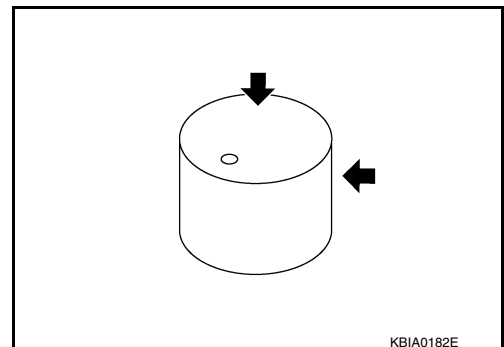
**Runout** : Less than 0.15 mm (0.0059 in)

4. If it exceeds the specification, 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



# CAMSHAFT

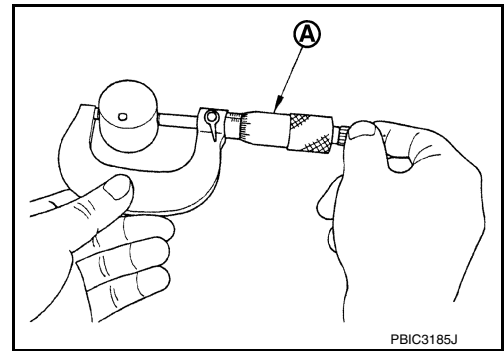
## < REMOVAL AND INSTALLATION >

[QR25DE]

- Measure the outer diameter of the valve lifter using suitable tool (A).

**Valve lifter outer diameter** : 33.977 - 33.987 mm (1.3377 - 1.3381 in)

- If out of the specified range, replace the valve lifter.

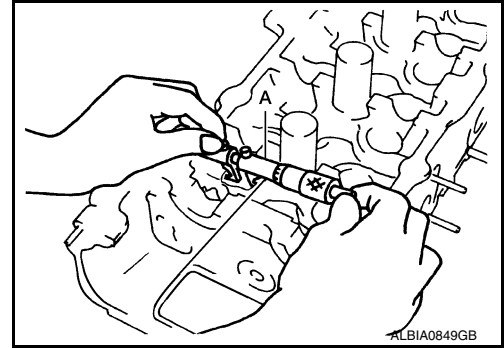


### Valve Lifter Bore Inner Diameter

- Measure diameter of valve lifter bore of cylinder head using suitable tool (A).

**Standard** : 34.000 - 34.021 mm (1.3386 - 1.3394 in)

- If out of the specified range, replace the cylinder head assembly.



### Calculation of Valve Lifter Clearance

- (Valve lifter clearance) = (hole diameter for valve lifter) – (outer diameter of valve lifter)

**Standard** : 0.013 - 0.044 mm (0.0005 - 0.0017 in)

- If out of specified range, replace either or both valve lifter and cylinder head assembly.

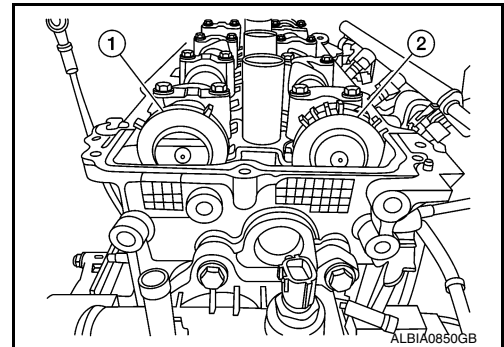
## INSTALLATION

1. Install the valve lifter.
  - Install them in the same position from which they were removed.
2. Install the camshafts.

- (1) : Exhaust camshaft
- (2) : Intake camshaft

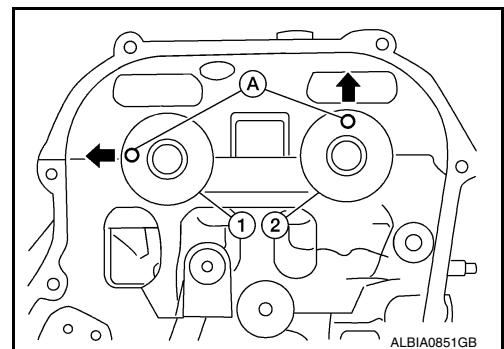
### NOTE:

The distinction between the intake and exhaust camshafts is the difference in the shape of the rear.



- Install camshafts so that the dowel pins (A) on the front side are positioned as shown.

- (1) : Intake camshaft
- (2) : Exhaust camshaft



# CAMSHAFT

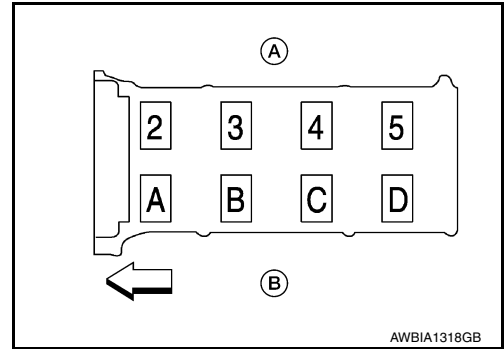
## < REMOVAL AND INSTALLATION >

[QR25DE]

### 3. Install camshaft brackets.

- Install by referring to identification mark on upper surface mark.
- Install so that identification mark can be correctly read when viewed from the exhaust side.

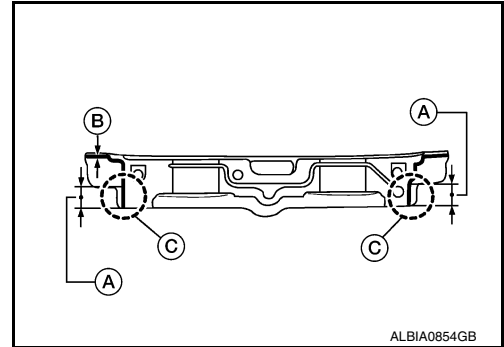
- (A) : Intake side  
 (B) : Exhaust side  
 ⇐ : Engine front



- Install No. 1 camshaft bracket as follows.
- Apply liquid gasket to No.1 camshaft bracket as shown (A), (B).
- Use **Genuine Silicone RTV Sealant, or equivalent. Refer to GI-21, "Recommended Chemical Products and Sealants".**

**CAUTION:**

- After installation, be sure to wipe off any excessive liquid gasket leaking from part (C).

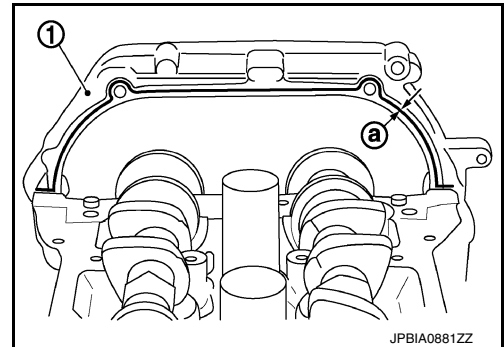


- Apply liquid gasket to camshaft bracket contact surface on the front cover backside.

**(a) : 3.4 - 4.4 mm (0.134-0.173 in)**

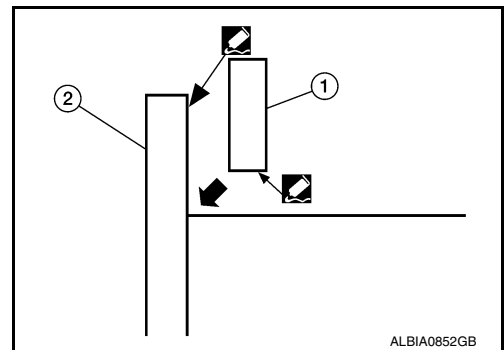
- (1) : Front cover

- Apply liquid gasket to the outside of bolt hole on front cover.



- Position the No.1 camshaft bracket near the mounting position, and install it without disturbing the liquid gasket applied to the surfaces.

- (1) : Number 1 camshaft bracket  
 (2) : Front cover




# CAMSHAFT

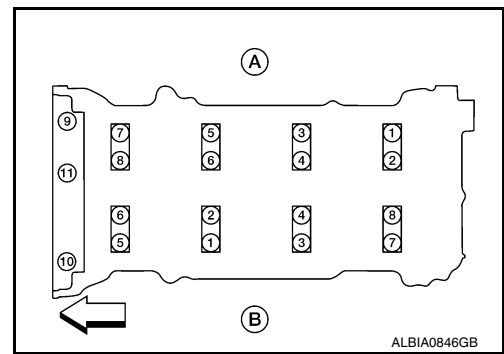
[QR25DE]

## < REMOVAL AND INSTALLATION >

4. Tighten camshaft bracket bolts in four steps in the order as shown.

- Step 1 (bolts 9 - 11) : 1.96 N·m (0.2 kg-m, 17 in-lb)**  
**Step 2 (bolts 1 - 8) : 1.96 N·m (0.2 kg-m, 17 in-lb)**  
**Step 3 (bolts 1 - 11) : 5.88 N·m (0.6 kg-m, 52 in-lb)**  
**Step 4 (bolts 1 - 11) : 10.41 N·m (1.1 kg-m, 8 ft-lb)**

- (A) : Intake side  
 (B) : Exhaust side  
 : Engine front



### CAUTION:

After tightening camshaft bracket bolts, be sure to wipe off excessive liquid gasket from the parts listed below.

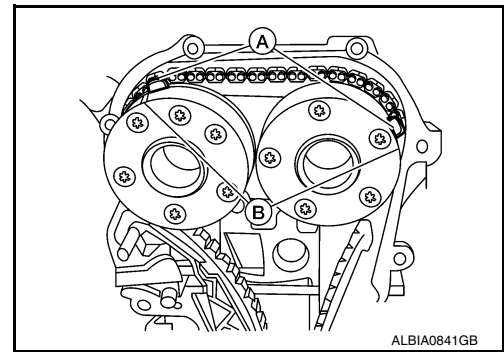
- Mating surface of rocker cover.
- Mating surface of front cover, when installed without the front cover.

5. Install camshaft sprockets.

- Install them by lining up the mating marks (outer groove) (B) on each camshaft sprocket with the painted marks (A) on the timing chain during removal.
- Before installation of chain tensioner, it is possible to re-match the painted marks (A) on timing chain with the mating marks (B) on each sprocket.

### CAUTION:

- Aligned mating marks could slip. Therefore, after matching them, hold the timing chain in place by hand.
- Before and after installing chain tensioner, check again to make sure that mating marks have not slipped.

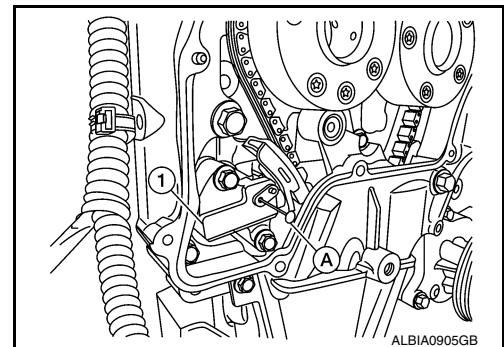


6. Install chain tensioner using the following procedure:

- Install stopper pin (A) into the chain tensioner (1).
- Install the chain tensioner and pull the stopper pin out.

### CAUTION:

After installation, pull the stopper pin out, and make sure that the tensioner is fully released.



7. Install chain guide.

8. Install intake valve timing control cover with the following procedure.

- Install intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, and exhaust valve timing control solenoid valve to valve timing control cover.

### CAUTION:

Do not reuse O-ring.

- Install O-ring to front cover side.

### CAUTION:

Do not reuse O-ring.

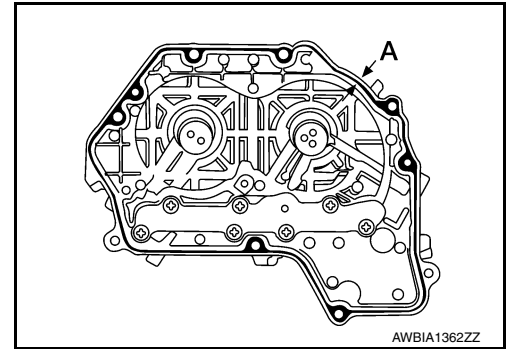
# CAMSHAFT

[QR25DE]

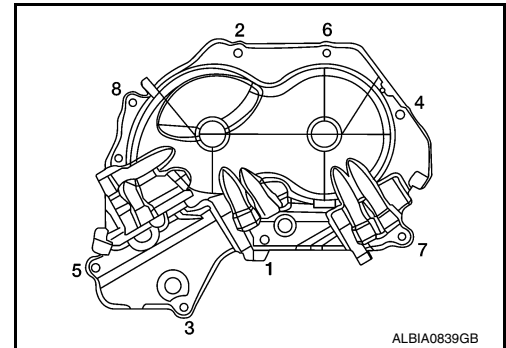
## < REMOVAL AND INSTALLATION >

- c. Apply liquid gasket to the positions shown. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).

**Diameter (A) : 3.4 - 4.4 mm (0.134 - 0.173 in)**



- d. Install valve timing control cover.
- Tighten the bolts to specification in the numerical order as shown.



9. Check and adjust valve clearances. Refer to [EM-23, "Camshaft valve clearance"](#).
10. Install camshaft position sensor bracket.

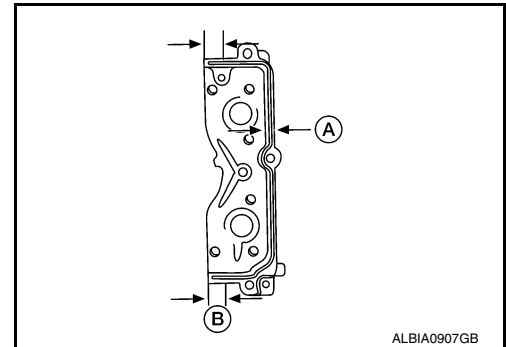
- a. Apply liquid gasket to camshaft position sensor bracket as shown.

**(A) : 2.0 - 3.0 mm (0.079-0.118)**

**(B) : 10.5 mm (0.413 in)**

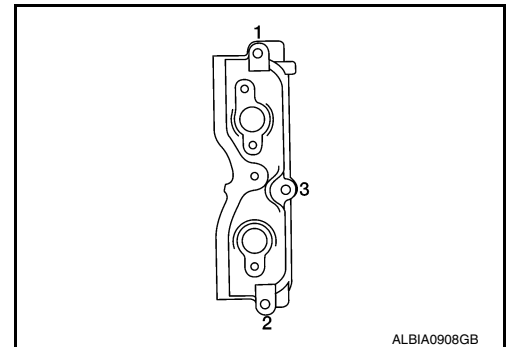
### CAUTION:

- Use Genuine Silicone RTV Sealant, or equivalent. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).
- After installation be sure to wipe off excessive liquid gasket leaking from part (B).
- 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.



- b. Tighten bolts to specification in numerical order shown.

**Camshaft position sensor bracket bolts : 10.41 N·m (1.1 kg-m, 8.0 ft-lb)**



11. Install the camshaft position sensors.
12. Installation of the remaining components is in the reverse order of removal.

## Inspection After Installation

INFOID:000000009460494

## Inspection of Camshaft Sprocket (INT) Oil Groove and Camshaft Sprocket (EXH) Oil Groove

# CAMSHAFT

< REMOVAL AND INSTALLATION >

[QR25DE]

**WARNING:**

Check when engine is cold so as to prevent burns from any splashing engine oil.

**CAUTION:**

Perform this inspection only when DTC P0011, P0014, P052A, P052B is detected in self-diagnostic results of CONSULT and it is directed according to inspection procedure of EC section. Refer to [EC-210, "Diagnosis Procedure"](#).

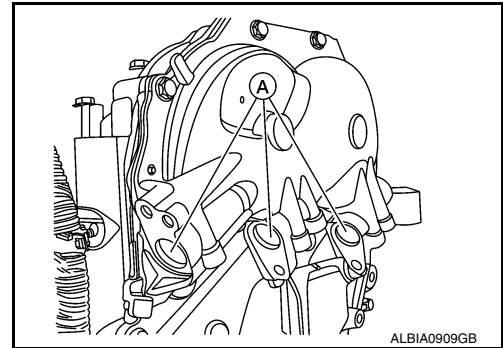
1. Check engine oil level and adjust oil level as necessary. Refer to [LU-9, "Inspection"](#).
2. Remove the intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, and exhaust valve timing control solenoid valve. Refer to [EM-58, "Intake Valve Timing Intermediate Lock Control Solenoid Valve, Intake Valve Timing Control Solenoid Valve, and Exhaust Valve Timing Control Solenoid Valve"](#).
3. Perform the following procedure to prevent the engine from being unintentionally started while checking.
  - a. Release fuel pressure. Refer to [EC-182, "Work Procedure"](#).
  - b. Disconnect injector harness connectors.
4. Crank engine, and then make sure that engine oil comes out of the valve timing control cover oil holes (A). End cranking after checking.

**WARNING:**

Be careful not to touch rotating parts (drive belt, crankshaft pulley, etc.).

**CAUTION:**

- Engine oil may squirt from intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, exhaust valve timing control solenoid valve installation holes 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. If engine oil does not come out from valve timing control cover oil holes (A), diagnose problem in lubrication circuit such as dirty oil groove between oil strainer and intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, or exhaust valve timing control solenoid valve. Refer to [LU-7, "Lubrication Circuit"](#).
  - a. Remove components between intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, exhaust valve timing control solenoid valve and camshaft sprocket (INT) or camshaft sprocket (EXH), (if necessary) and then check each oil groove for clogging.
  - b. Clean oil groove if necessary. Refer to [LU-7, "Lubrication Circuit"](#).
6. After inspection, install the remaining components in the reverse order of removal.

# VALVE TIMING CONTROL

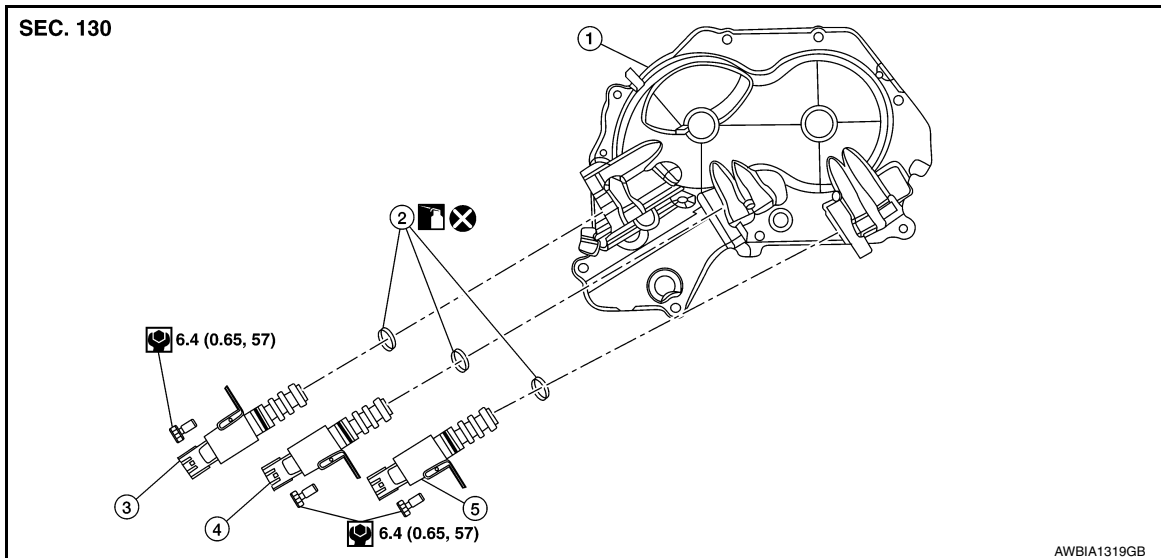
< REMOVAL AND INSTALLATION >

[QR25DE]

## VALVE TIMING CONTROL

### Exploded View

INFOID:000000009460495



- |   |  |   |
|---|--|---|
| 1. Valve timing cover                         | 2. O-rings                                     | 3. Intake valve timing intermediate lock control solenoid valve |
| 4. Intake valve timing control solenoid valve | 5. Exhaust valve timing control solenoid valve |   |

### Intake Valve Timing Intermediate Lock Control Solenoid Valve, Intake Valve Timing Control Solenoid Valve, and Exhaust Valve Timing Control Solenoid Valve

INFOID:000000009460496

#### REMOVAL

1. Disconnect the battery negative terminal. Refer to [PG-73. "Removal and Installation \(Battery\)"](#).
2. Remove the core support cover. Refer to [EXT-17. "Removal and Installation"](#).
3. Remove the front air duct. Refer to [EM-29. "Removal and Installation"](#).
4. Remove the engine room cover. Refer to [EM-28. "Removal and Installation"](#).
5. Support the engine using a suitable jack.
6. Remove the RH engine mounting support bracket. Refer to [EM-84. "Removal and Installation"](#).
7. Remove the RH engine mount torque rod. Refer to [EM-84. "Removal and Installation"](#).
8. Disconnect intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, and exhaust valve timing control solenoid valve connectors.
9. Remove intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, and exhaust valve timing control solenoid valve bolts.
10. Remove intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, exhaust valve timing control solenoid valve from valve timing control cover.
11. Remove O-rings from intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, and exhaust valve timing control solenoid valve.

#### **CAUTION:**

**Do not reuse O-rings.**

#### INSTALLATION

Installation is in the reverse order of removal.

#### **CAUTION:**

- Do not reuse O-rings.
- Lubricate O-rings with clean engine oil before installing.

# VALVE TIMING CONTROL

< REMOVAL AND INSTALLATION >

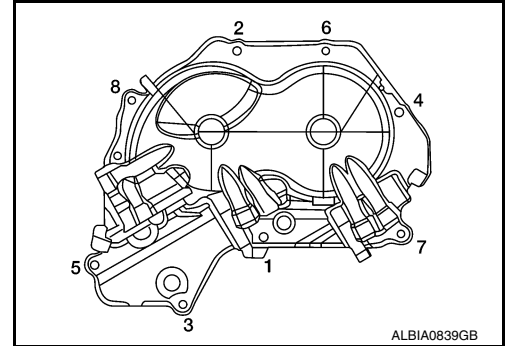
[QR25DE]

## Valve Timing Control Cover

INFOID:00000009460497

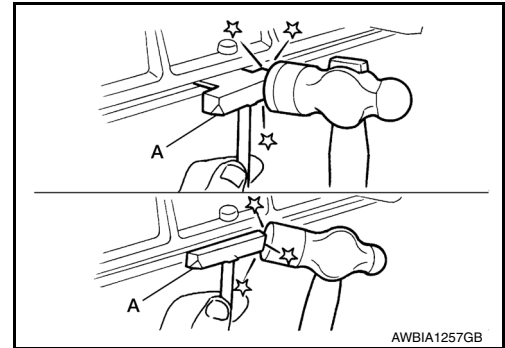
### REMOVAL

1. Remove the intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve, exhaust valve timing control solenoid valve. Refer to [EM-58, "Intake Valve Timing Intermediate Lock Control Solenoid Valve, Intake Valve Timing Control Solenoid Valve, and Exhaust Valve Timing Control Solenoid Valve"](#).
2. Remove harness grounds and retainers from the top of the engine mount bracket.
3. Loosen the valve timing control cover bolts in the reverse order shown.
- a. Remove the valve timing control cover bolts.



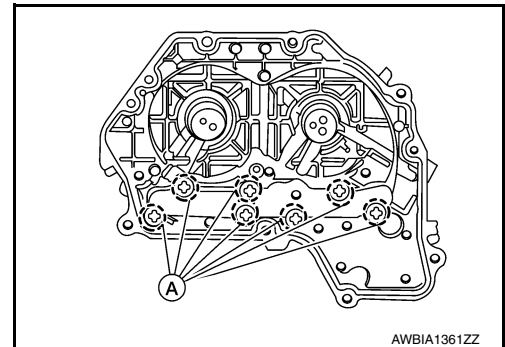
- b. Remove the valve timing control cover by cutting the liquid gasket using Tool (A).

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



### NOTE:

Do not loosen screws (A) on the back of the valve timing control cover.



### INSTALLATION

1. Install valve timing control cover with the following procedure.
  - a. Install intake valve timing intermediate lock control solenoid valve, intake valve timing control solenoid valve and exhaust valve timing control solenoid valve to valve timing control cover.
  - b. Install O-ring to front cover side.

### CAUTION:

**Do not reuse O-ring.**

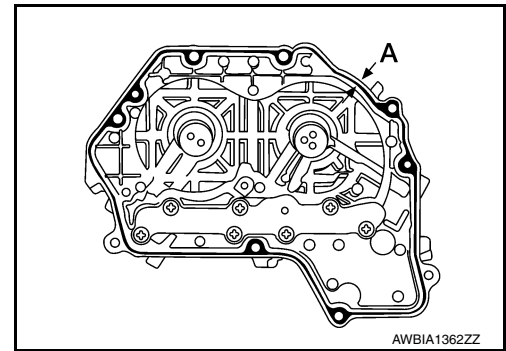
# VALVE TIMING CONTROL

[QR25DE]

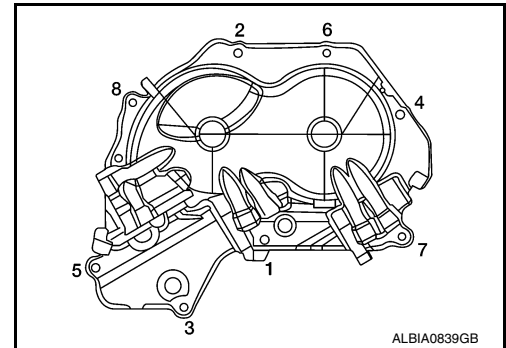
## < REMOVAL AND INSTALLATION >

- c. Apply liquid gasket to the positions shown. Refer to [GI-21. "Recommended Chemical Products and Sealants"](#).

**Diameter (A) : 3.4 - 4.4 mm (0.134 - 0.173 in)**



- d. Install valve timing control cover.  
• Tighten the bolts to specification in the numerical order shown.





# TIMING CHAIN

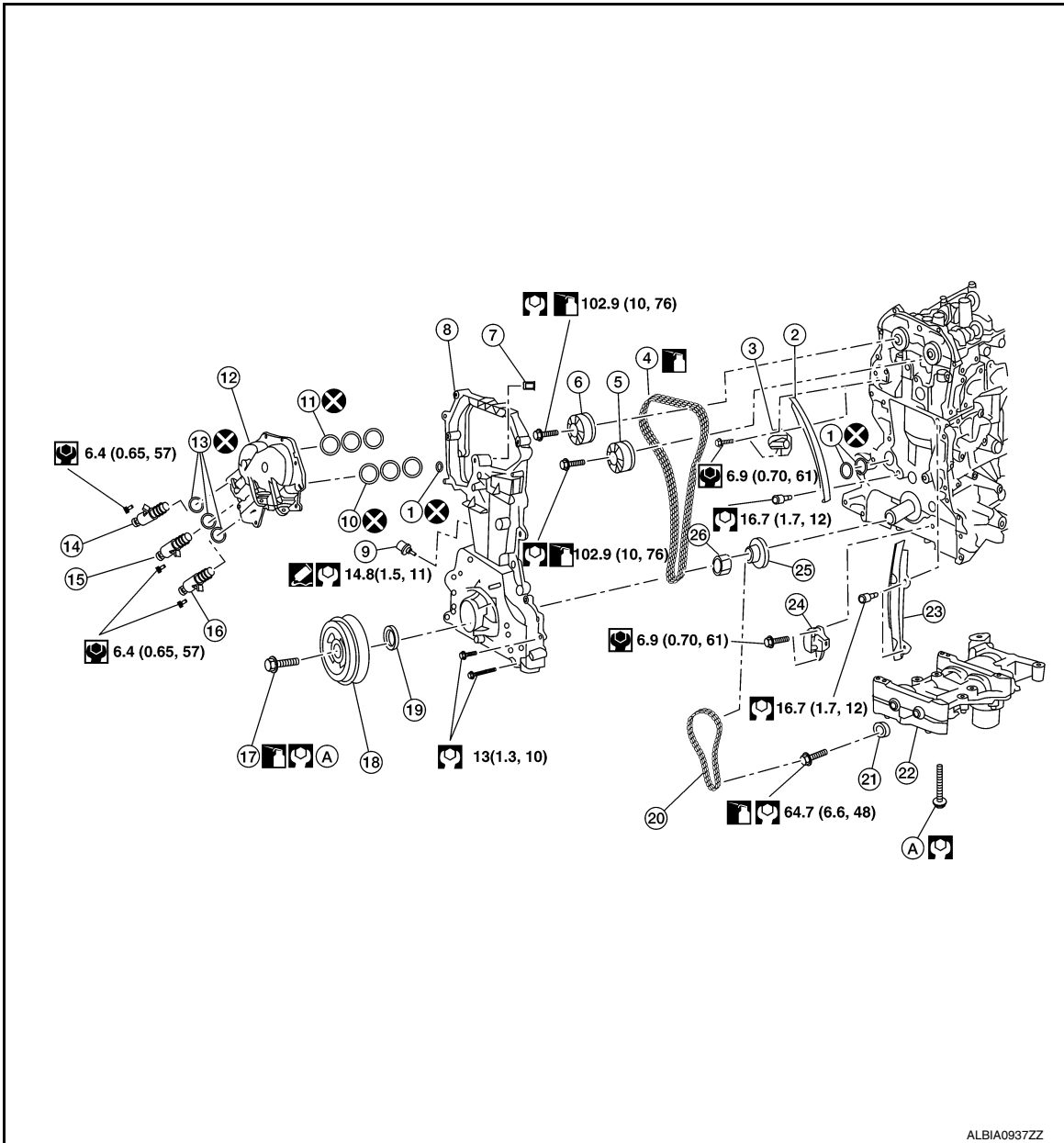
< REMOVAL AND INSTALLATION >

[QR25DE]

## TIMING CHAIN

### Exploded View

INFOID:00000009460498



- |   |  |  |
|---|--|--|
| 1. O-rings                                      | 2. Timing chain slack guide                                      | 3. Chain tensioner                             |
| 4. Timing chain                                 | 5. Camshaft sprocket (EXH)                                       | 6. Camshaft sprocket (INT)                     |
| 7. Oil filter                                   | 8. Front cover   | 9. Oil pressure sensor                         |
| 10. Valve timing control cover O-rings (EXH)    | 11. Valve timing control cover O-rings (INT)                     | 12. Valve timing control cover                 |
| 13. Valve timing control solenoid valve O-rings | 14. Intake valve timing intermediate lock-control solenoid valve | 15. Intake valve timing control solenoid valve |
| 16. Exhaust valve timing control solenoid valve | 17. Crankshaft pulley bolt                                       | 18. Crankshaft pulley                          |
| 19. Front oil seal                              | 20. Balancer unit timing chain                                   | 21. Balancer unit sprocket                     |
| 22. Balancer unit                               | 23. Timing chain tension guide                                   | 24. Balancer unit timing chain tensioner       |
| 25. Crankshaft sprocket                         | 26. Oil pump drive spacer  | A. Follow the installation procedure           |

A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

ALBIA0937ZZ

# TIMING CHAIN

< REMOVAL AND INSTALLATION >

[QR25DE]

## Removal and Installation

INFOID:000000009460499

### CAUTION:

Apply new engine oil to parts as indicated in the illustration before installation.

### REMOVAL

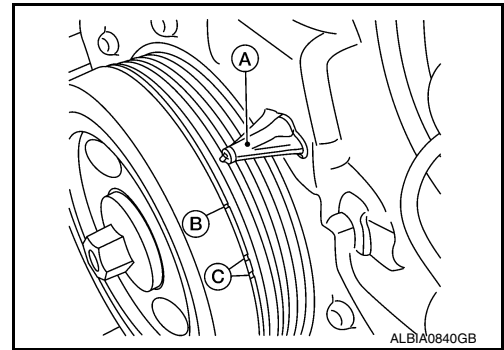
1. Remove the engine and transaxle assembly. Refer to [EM-84, "Removal and Installation"](#).
2. Separate the engine from the transaxle assembly. Refer to [EM-84, "Removal and Installation"](#).
3. Remove the drive plate assembly if using an engine stand that attaches to the rear of the engine block.
4. Install engine to a suitable engine stand.
5. Remove the upper and lower oil pan, oil strainer, and O-ring. Refer to [EM-36, "Removal and Installation"](#).
6. Remove generator and bracket. Refer to [CHG-32, "Removal and Installation"](#).
7. Remove the engine mount bracket. Refer to [EM-84, "Removal and Installation"](#).

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

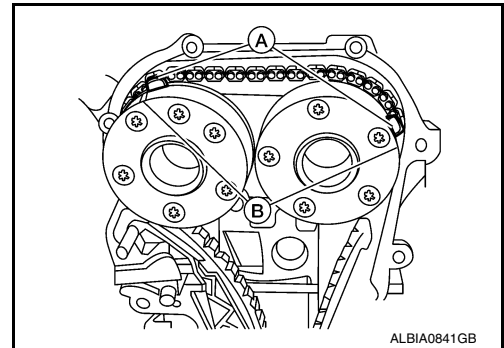
- a. Rotate the crankshaft pulley clockwise and align the mating mark (B) to the timing indicator (A) on the front cover.

### NOTE:

Do not use the white paint marks (C).

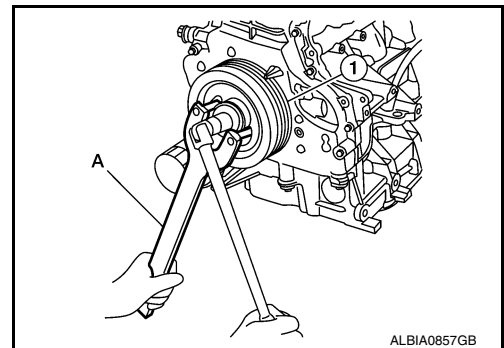


- b. At the same time, make sure that the camshaft sprocket mating marks (B) line up with the painted marks on the timing chain (A).
  - If not lined up, rotate the crankshaft pulley one more turn to line up the mating marks to the positions as shown.



9. Remove crankshaft pulley (1) using the following procedure:

- a. Hold the crankshaft pulley (1) using suitable tool (A), then loosen and remove the crankshaft pulley bolt.

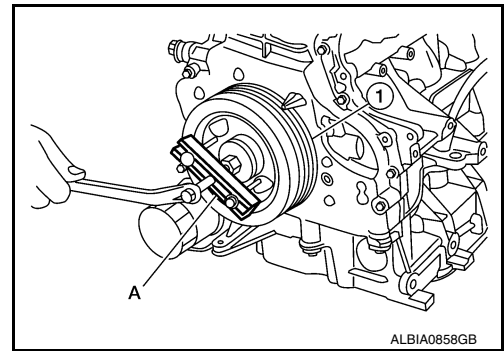


# TIMING CHAIN

[QR25DE]

## < REMOVAL AND INSTALLATION >

- b. Attach suitable tool (A) in the M 6 (0.24 in diameter) thread hole on crankshaft pulley (1), and remove crankshaft pulley.

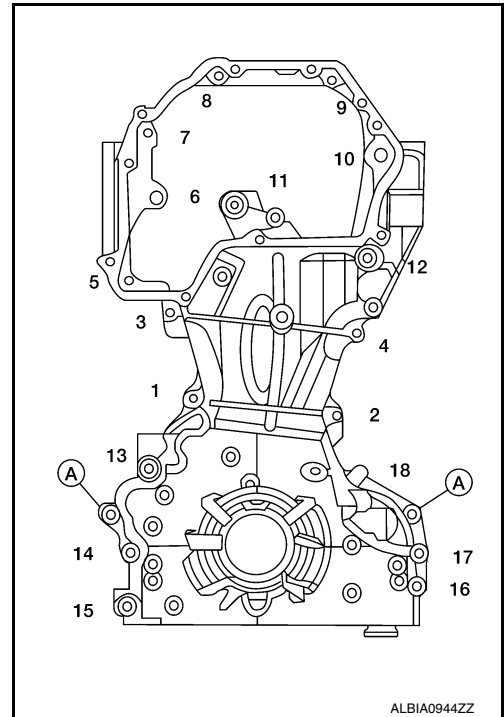


10. Remove the intake valve timing control cover. Refer to [EM-59. "Valve Timing Control Cover"](#).

11. Remove the front cover using the following procedure:

- a. Loosen the bolts in reverse order as shown, and remove them.

(A) : Dowel pin



- b. Cut liquid gasket using Tool (A).

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

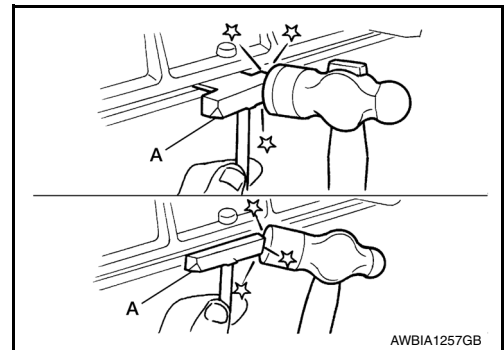
**CAUTION:**

**Be careful not to damage the front cover.**

- c. Remove the front cover.  
d. Remove front oil seal using suitable tool, (if necessary).

**CAUTION:**

**Be careful not to damage the front cover.**



12. Remove timing chain tensioner (primary) and timing chain using the following procedure:

- a. Pull the lever down and release the plunger stopper tab.

# TIMING CHAIN

[QR25DE]

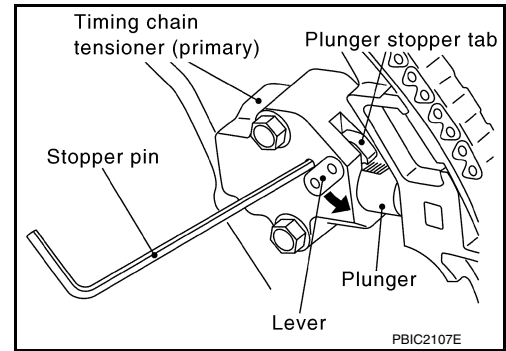
## < REMOVAL AND INSTALLATION >

- Plunger stopper tab can be pushed up to release (coaxial structure with lever).

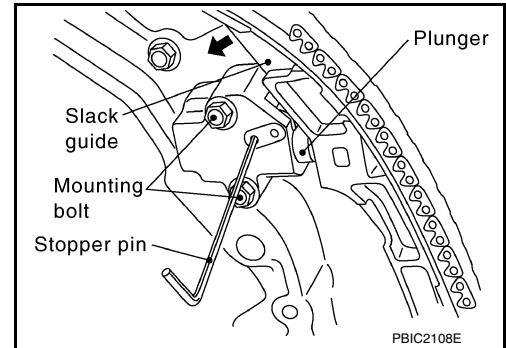
- b. Insert the stopper pin into the tensioner body hole to hold the lever and keep tab released.

**NOTE:**

Allen wrench [2.5 mm (0.098)] is used for a stopper pin as an example.



- c. Insert plunger into tensioner body by pressing slack guide.  
d. Keep slack the guide pressed and hold it by pushing the stopper pin through the lever hole and body hole.  
e. Remove the bolts and remove the timing chain tensioner (primary).



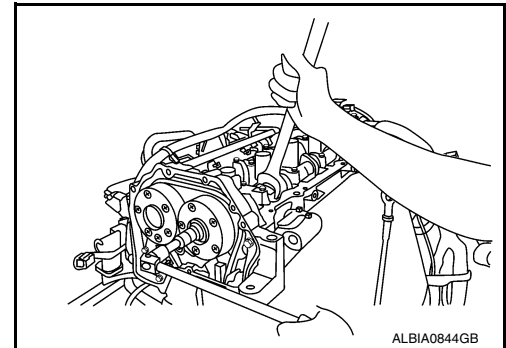
- f. Remove the timing chain.

**CAUTION:**

**Do not rotate the crankshaft or camshafts while the timing chain is removed. It can cause damage to the valve and piston.**

13. Remove the camshaft sprockets using the following procedure:

- a. Secure hexagonal part of the camshaft with a wrench and loosen the camshaft sprocket bolt.  
b. Remove the camshaft sprocket bolt and camshaft sprockets for both camshafts.



14. Remove the chain slack guide, tension guide, and oil pump drive spacer.

# TIMING CHAIN

[QR25DE]

## < REMOVAL AND INSTALLATION >

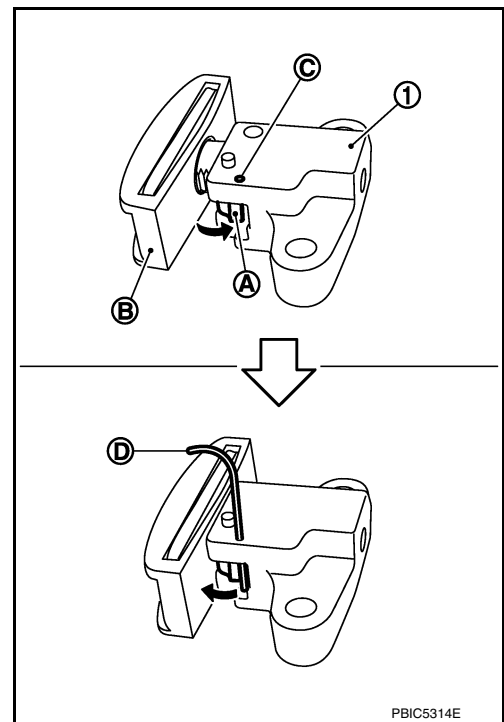
15. Press stopper tab (A) in the direction shown to push the timing chain slack guide (B) toward timing chain tensioner (1) for the balancer unit.
- The slack guide (B) is released by pressing the stopper tab (A). As a result, the slack guide (B) can be moved.

16. Insert stopper pin (D) into tensioner body hole (C) to secure timing chain slack guide (B).

**NOTE:**

Use a hard metal pin with a diameter of approximately 1.2 mm (0.047 in) as a stopper pin.

17. Remove timing chain tensioner (1) for balancer unit.
18. Secure width across flats of the balancer unit LH side shaft using a suitable tool. Loosen the balancer unit sprocket bolt.
19. Remove balancer unit timing chain, balancer unit sprocket and crankshaft sprocket.

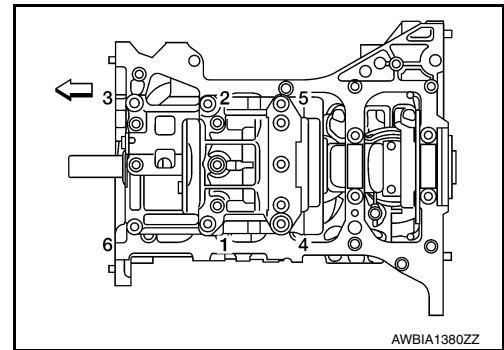


20. Loosen bolts in the reverse order shown, and remove balancer unit.

**CAUTION:**

- Do not disassemble balancer unit.

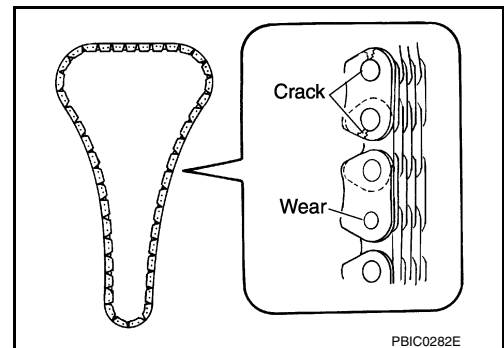
← : Engine front



## INSPECTION AFTER REMOVAL

### Timing Chain

Check the timing chain for cracks or excessive wear. If a defect is found, replace the timing chain.



Balancer Unit Bolt Outer Diameter

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

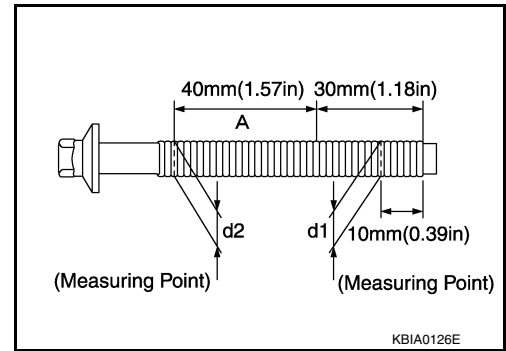
# TIMING CHAIN

[QR25DE]

## < REMOVAL AND INSTALLATION >

- Measure outer diameters (d1, d2) at the two positions as shown.
- Measure d2 within the range (A).
- If the value difference (d1 - d2) exceeds the limit, replace the balancer unit bolt with a new one.

**Limit : 0.15 mm (0.0059 in) or more**



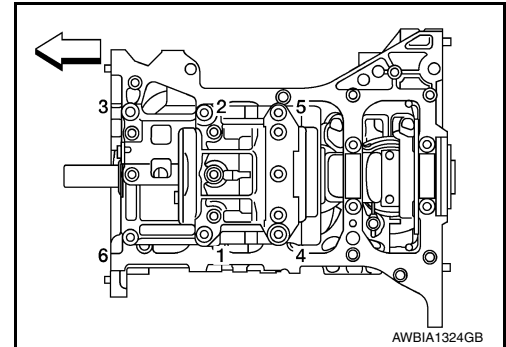
## INSTALLATION

1. Make sure the crankshaft key points straight up.
2. Install the balancer unit and tighten the bolts in the numerical order as shown:

← : Engine front

### CAUTION:

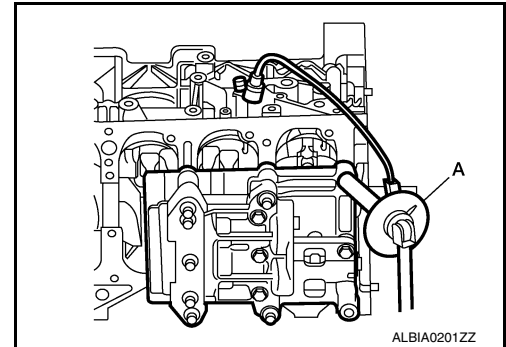
- When reusing a bolt, check its outer diameter before installation. Follow the Balancer Unit Bolt Outer Diameter procedure.
- Apply new engine oil to threads and seating surfaces of bolts.



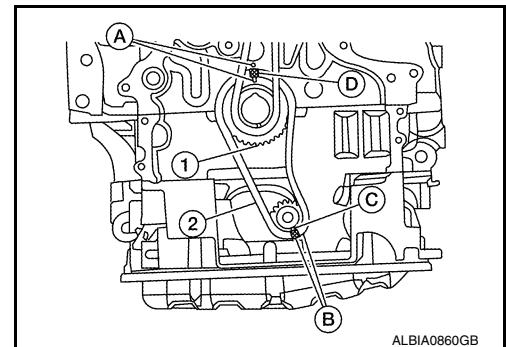
- Check tightening angle with an angle wrench (A) or a protractor. Do not make judgment by visual check alone.

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

<b>Step 1</b>	<b>Bolts 1-5</b>	<b>: 42 N·m (4.3 kg-m, 31 ft-lb)</b>
	<b>Bolt 6</b>	<b>: 36 N·m (3.7 kg-m, 27 ft-lb)</b>
<b>Step 2</b>	<b>Bolts 1-5</b>	<b>: 120° + 5°</b>
	<b>Bolt 6</b>	<b>: 90° + 5°</b>
<b>Step 3</b>	<b>Loosen in reverse order</b>	<b>: 0 N·m (0 kg-m, 0 ft-lb)</b>
<b>Step 4</b>	<b>Bolts 1-5</b>	<b>: 42 N·m (4.3 kg-m, 31 ft-lb)</b>
	<b>Bolt 6</b>	<b>: 36 N·m (3.7 kg-m, 27 ft-lb)</b>
<b>Step 5</b>	<b>Bolts 1-5</b>	<b>: 120° + 5°</b>
	<b>Bolt 6</b>	<b>: 90° + 5°</b>



3. Install the crankshaft sprocket (1) and timing chain (2) for the balancer unit.
  - Make sure that the crankshaft sprocket (1) is positioned with mating marks (A) on the block and sprocket meeting at the top.
  - Install it by lining up mating marks on each sprocket (A), (C) and timing chain (B), (D).
  - (B): Pink link
  - (D): Yellow link

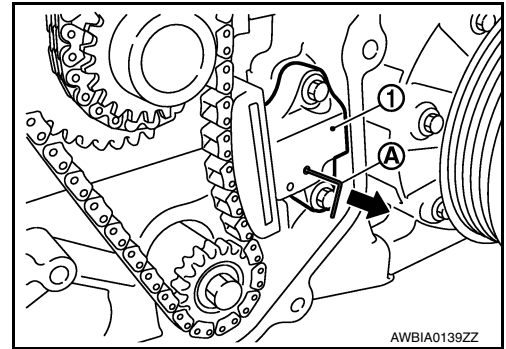


# TIMING CHAIN

## < REMOVAL AND INSTALLATION >

[QR25DE]

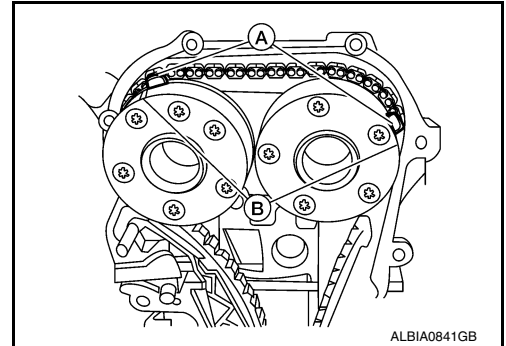
4. Install timing chain tensioner for balancer unit (1).
  - Compress the plunger, insert a stopper pin (A), and then install the tensioner for the balancer unit.
  - Do not pull out (←) the stopper pin until after installing the timing chain tensioner for balancer unit.
  - Check matching mark position of balancer unit drive chain and each sprocket again.



5. Install camshaft sprockets.
  - Install them by lining up the mating marks on each camshaft sprocket (B) with the ones painted on the timing chain (A) during removal.
  - Before installation of chain tensioner, it is possible to re-match the marks on timing chain with the ones on each sprocket.

**CAUTION:**

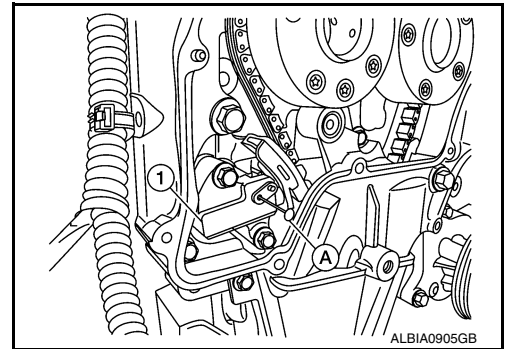
- **Aligned mating marks could slip. Therefore, after matching them, hold the timing chain in place by hand.**
- **Before and after installing chain tensioner, check again to make sure that mating marks have not slipped.**



6. Install chain tensioner using the following procedure:
  - a. Install stopper pin (A) into the chain tensioner (1).
  - b. Install the chain tensioner and pull the stopper pin out.

**CAUTION:**

**After installation, pull the stopper pin out, and make sure that the tensioner is fully released.**



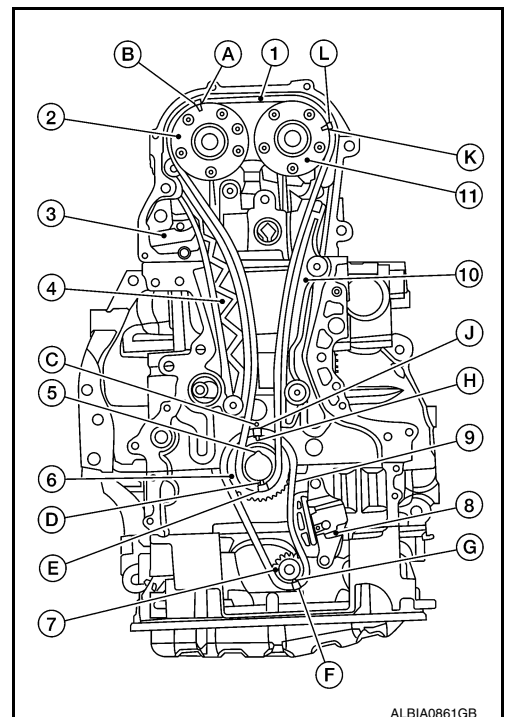
7. Install timing chain (1) and related parts.
  - Install by lining up mating marks on each sprocket and timing chain as shown.
  - Before and after installing chain tensioner (3), check to make sure the mating marks have not slipped.
  - After installing timing chain tensioner (3), remove the stopper pin, and make sure that the tensioner moves freely.

**CAUTION:**

- **For the following note, after the mating marks are aligned, keep them aligned by holding them by hand.**
- **To avoid skipped teeth, do not move crankshaft and camshaft until front cover is installed.**

**NOTE:**

- Before installing chain tensioner (3) it is possible to slip the chain on the sprocket to align the chain timing mark with the sprocket timing mark.
- There may be two color variations of the link marks (link colors) on the timing chain.
- There are 26 links between the pink mating marks on the timing chain; and 64 links between the camshaft sprocket pink link and the crankshaft sprocket yellow link, on the timing chain side without the tensioner.



A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P



# TIMING CHAIN

## < REMOVAL AND INSTALLATION >

[QR25DE]

- (2) : Camshaft sprocket (INT)
- (4) : Timing chain slack guide
- (5) : Crankshaft key
- (6) : Crankshaft sprocket
- (7) : Balancer unit sprocket
- (8) : Balancer unit chain tensioner
- (9) : Balancer unit timing chain
- (10) : Timing chain tension guide
- (11) : Camshaft sprocket (EXH)
- (A) : Mating mark (Outer groove)
- (B) : Pink link
- (C) : Mating mark (lug)
- (D) : Mating mark (stamp)
- (E) : Yellow link
- (F) : Pink link
- (G) : Mating mark (stamp)
- (H) : Mating mark (stamp)
- (J) : Yellow link
- (K) : Mating mark (Outer groove)
- (L) : Pink link

8. Install new front oil seal to front cover. Refer to [EM-71, "Removal and Installation of Front Oil Seal"](#).
9. Install front cover with the following procedure:
  - a. Install O-rings to cylinder head and cylinder block.

**CAUTION:**

**Do not reuse O-rings.**

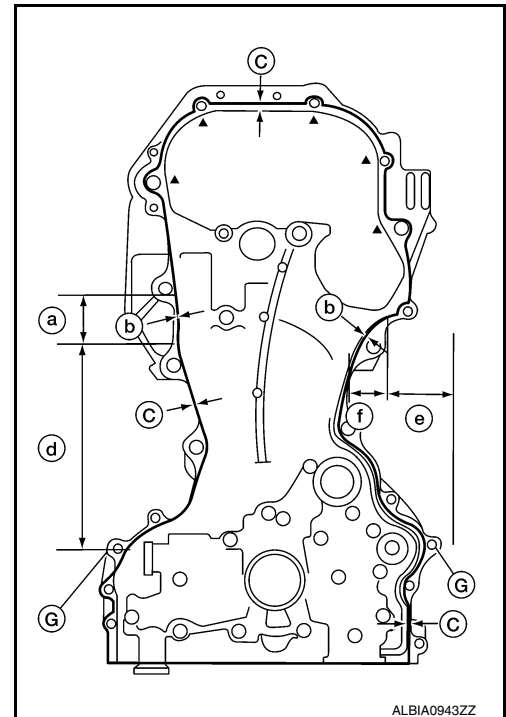
- a. Apply a continuous bead of liquid gasket to front cover as shown.

- (a) : 35.7 mm (1.406 in)
- (b) : 6.0 – 6.5 mm (0.236 – 0.256 in)
- (c) : 3.4 – 4.4 mm (0.134 – 0.173 in)
- (d) : 179.6 mm (7.07 in)
- (e) : 35.5 mm (1.398 in)
- (f) : 31.3 mm (1.232 in)
- (G) : Dowel pin hole

Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).

**CAUTION:**

- For bolt holes with ▲ marks (5 locations), apply liquid gasket outside the holes.
- Installation should be done within 5 minutes after application of 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.



ALBIA0943ZZ

- c. Make sure the mating marks on the timing chain and each sprocket are still aligned. Then install the front cover.

**CAUTION:**

**Do not damage the front oil seal during installation.**



# TIMING CHAIN

[QR25DE]

## < REMOVAL AND INSTALLATION >

- d. Tighten front cover bolts in the numerical order shown.
- e. After all bolts are tightened, retighten them to the specified torque.

### Front cover bolts

**Bolts 6, 10, 12** : 49 N·m (5.0 kg-m, 36 ft-lb)

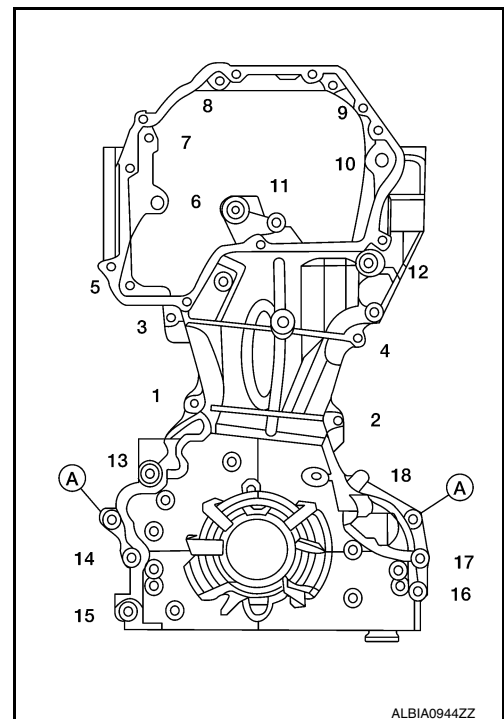
**Bolts (all remaining)** : 12.7 N·m (1.3 kg-m, 9 ft-lb)

**(A)** : Dowel pin

### CAUTION:

**Wipe off excess sealant leaking at the surface for installing the oil pan.**

10. Install the chain guide between the camshaft sprockets.



11. Install valve timing control cover. Refer to [EM-59, "Valve Timing Control Cover"](#).
12. Insert crankshaft pulley by aligning with crankshaft key.
  - Tap its center with a plastic hammer to insert.
  - Do not tap the crankshaft pulley outer diameter.
13. Tighten crankshaft pulley bolt.
  - Secure crankshaft pulley with tool to tighten the bolt.
  - Perform angle tightening with the following procedure:
    - a. Apply new engine oil to threads and seat surfaces of bolts.
    - b. Tighten to initial specifications:

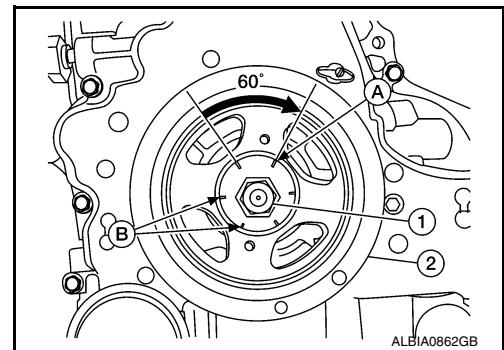
**Crankshaft bolt (1)** : 42.1 N·m (4.3 kg-m, 31 ft-lb)

- c. Apply a paint mark (A) on the front cover, mating with any one of six easy to recognize stamp marks on bolt flange (B).
- d. Turn crankshaft pulley bolt an additional 60 degrees +6/-0 degrees.

### NOTE:

Check that the assembled unit does not interfere with adjacent components by turning the crankshaft in the tightening direction.

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



## OIL SEAL

## Removal and Installation of Valve Oil Seal

INFOID:000000009460500

## REMOVAL

1. Remove camshaft. Refer to [EM-47, "Removal and Installation"](#).
2. Remove valve lifter. Refer to [EM-47, "Removal and Installation"](#).
3. Rotate crankshaft, and set piston whose oil seal is to be removed to top dead center. This prevents valve from dropping inside cylinder.

**CAUTION:**

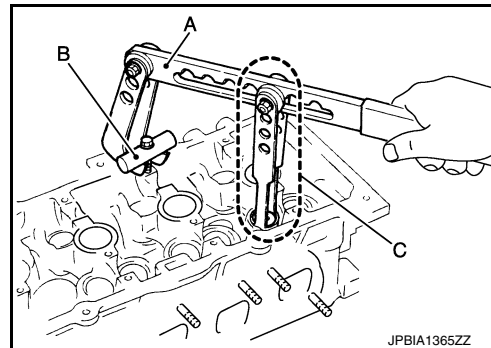
**When rotating crankshaft, be careful to avoid scarring the front cover with the timing chain.**

4. Remove valve collet.
  - Compress valve spring using Tools. Remove valve collet with magnet hand.

**Tool number (A) : KV10116200 (J-26336-A)**

**Tool number (B) : KV10109220 ( — )**

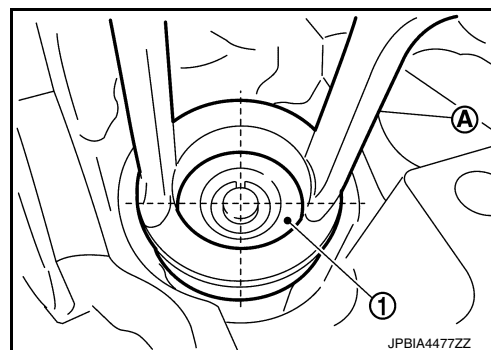
**Tool number (C) : KV10115900 (J-26336-20)**

**CAUTION:**

- Be careful not to damage valve lifter holes.
- Install Tool (A) in the center of valve spring retainer to press it.

**Tool number : KV10115900 (J-26336-20)**

1 : Valve spring retainer



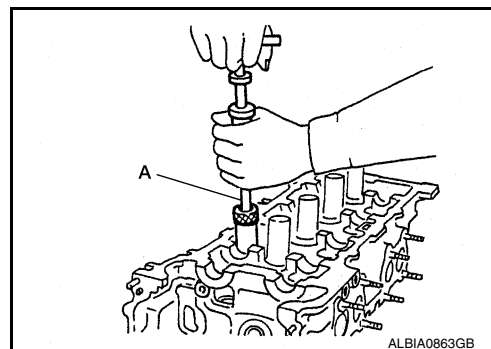
5. Remove valve spring retainer and valve spring (with valve spring seat).

**CAUTION:**

**Do not remove valve spring seat from valve spring.**

6. Remove valve oil seal using Tool (A).

**Tool number : KV10107902 (J-38959)**



## INSTALLATION

1. Apply new engine oil to new valve oil seal joint surface and seal lip.

# OIL SEAL

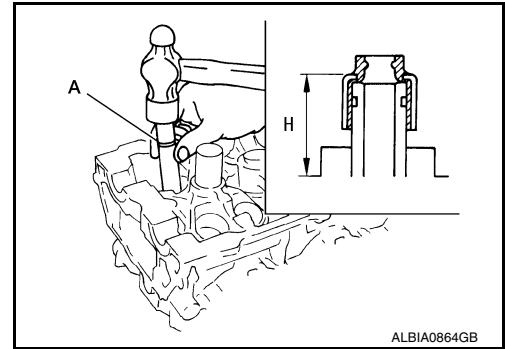
## < REMOVAL AND INSTALLATION >

[QR25DE]

- Press in valve oil seal to the position shown using Tool (A).

Oil seal installed height (H) : 12.1 mm (0.476 in)

Tool number : KV10115600 (J-38958)



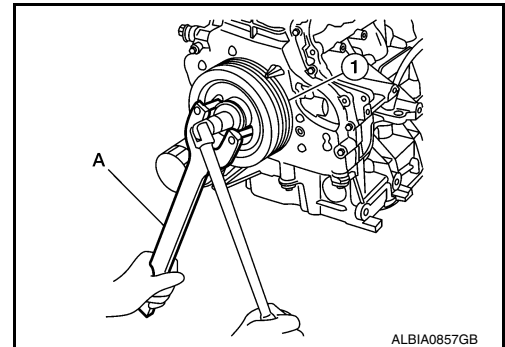
- Installation of the remaining components is in the reverse order of removal.

## Removal and Installation of Front Oil Seal

INFOID:00000009460501

### REMOVAL

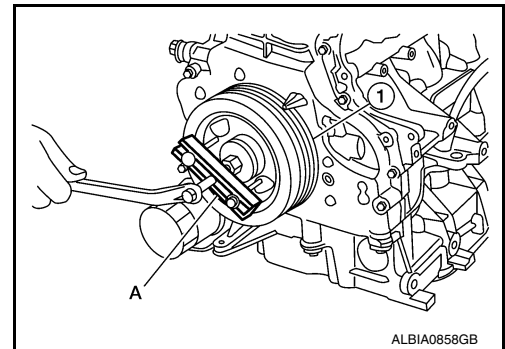
- Remove the RH front wheel. Refer to [WT-55. "Adjustment"](#).
- Remove the fender protector side cover (RH). Refer to [EXT-26. "FENDER PROTECTOR : Removal and Installation"](#).
- Remove the drive belt. Refer to [EM-19. "Removal and Installation"](#).
- Remove the rear cover plate.
- Remove crankshaft pulley (1) using the following procedure:
  - Hold the crankshaft pulley (1) using suitable tool (A), then loosen and remove the crankshaft pulley bolt.



- Attach suitable tool (A) in the M 6 (0.24 in diameter) thread hole on crankshaft pulley (1), and remove crankshaft pulley.
- Remove front oil seal from front cover.

### CAUTION:

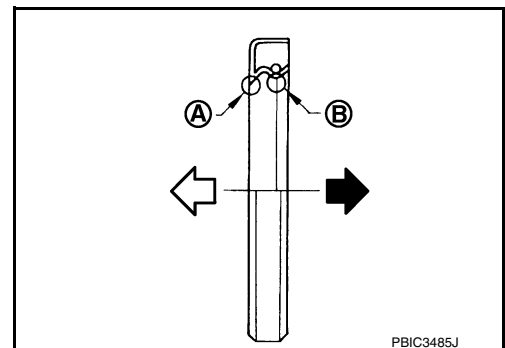
Be careful not to damage the front cover.



### INSTALLATION

- Apply new engine oil to new front oil seal lip and install it using a suitable tool.
  - Install new oil seal in the direction shown.

- (A) : Dust seal lip
- (B) : Oil seal lip
- ⇐ : Engine outside
- ⇨ : Engine inside



# OIL SEAL

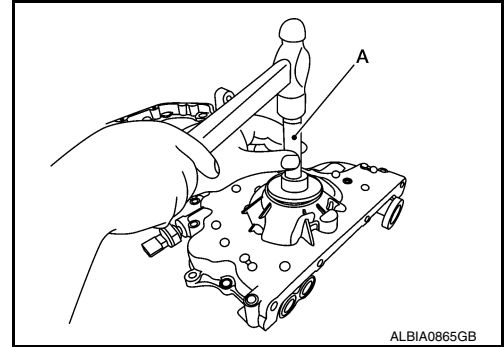
## < REMOVAL AND INSTALLATION >

[QR25DE]

- Press-fit front oil seal until it is flush with front end surface of front cover using a suitable drift (A) with outer diameter 56 mm (2.20 in) and inner diameter 48 mm (1.89 in).

**CAUTION:**

- Do not reuse oil seal.
- Be careful not to damage front cover or crankshaft.
- Press-fit oil seal straight to avoid causing burrs or tilting.
- Never touch the grease applied to the oil seal lip.



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

## Removal and Installation of Rear Oil Seal

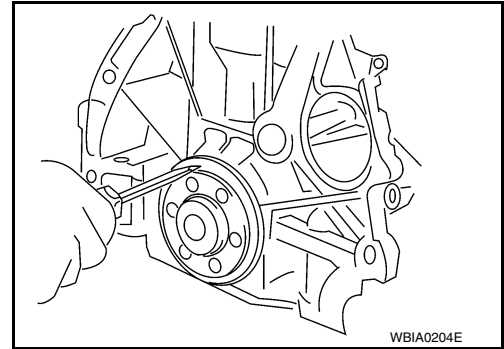
INFOID:000000009460502

### REMOVAL

1. Remove the engine and transaxle. Refer to [EM-84, "Removal and Installation"](#).
2. Separate engine from transaxle.
3. Remove drive plate.
4. Remove rear oil seal using suitable tool.

**CAUTION:**

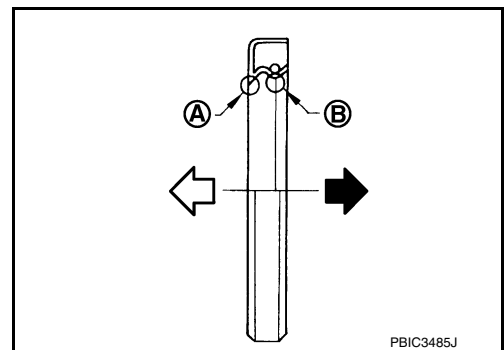
**Be careful not to scratch rear oil seal retainer.**



### INSTALLATION

1. Apply new engine oil to new rear oil seal and install it using a suitable tool.
  - Install new oil seal in the direction shown.

- (A) : Dust seal lip
- (B) : Oil seal lip
- ⇐ : Drive plate side
- ← : Engine front

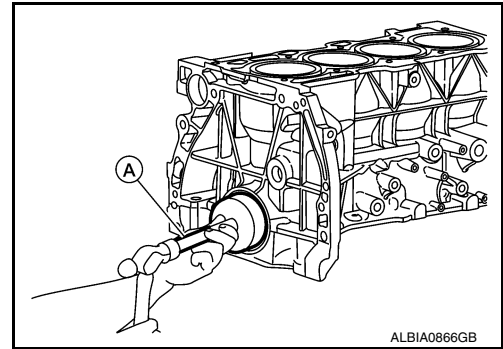


# OIL SEAL

## < REMOVAL AND INSTALLATION >

[QR25DE]

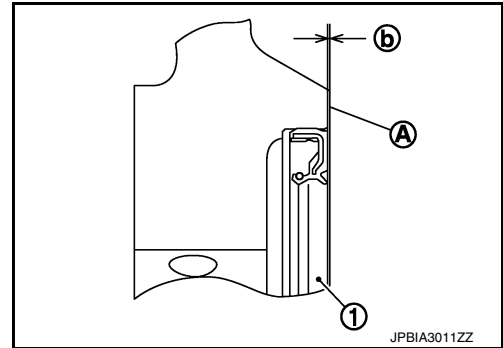
- Press fit new oil seal straight using a suitable tool (A) to avoid tilting the seal or causing burrs.



- Press in the new rear oil seal (1) to the position (b) shown.

**(b) : 0 - 0.5 mm (0 - 0.020 in)**

(A) : Rear surface of cylinder block



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

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# CYLINDER HEAD

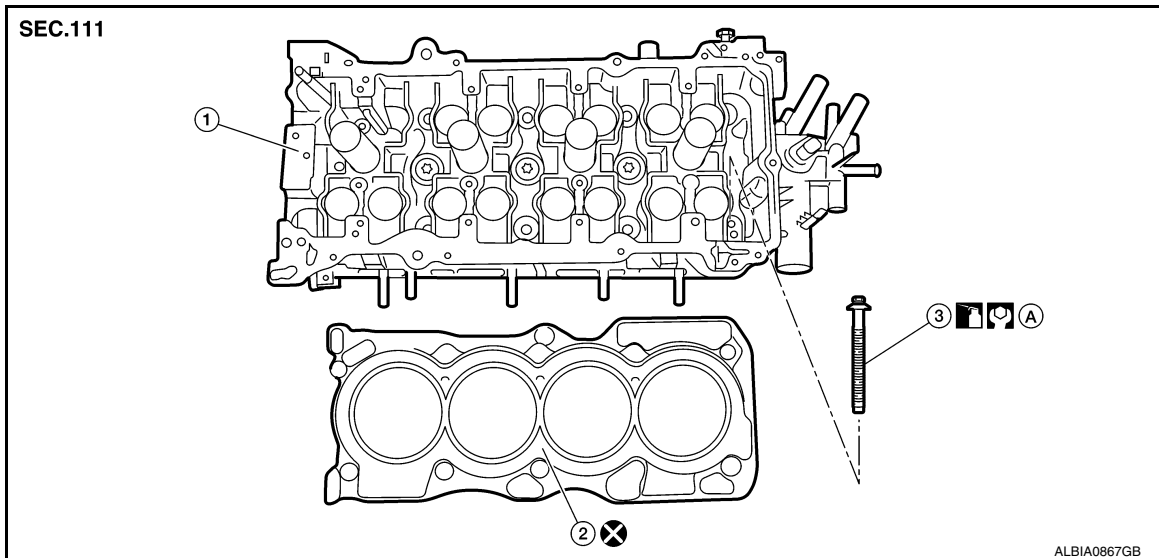
< REMOVAL AND INSTALLATION >

[QR25DE]

## CYLINDER HEAD

### Exploded View

INFOID:000000009460503



1. Cylinder head

2. Cylinder head gasket

3. Cylinder head bolt

A. Refer to INSTALLATION

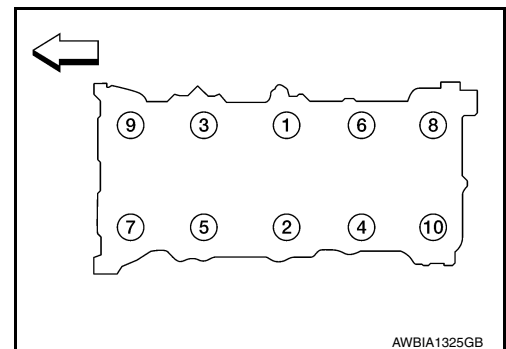
### Removal and Installation

INFOID:000000009460504

#### REMOVAL

1. Remove the timing chain. Refer to [EM-62, "Removal and Installation"](#).
2. Remove the camshafts. Refer to [EM-47](#).
3. Remove spark plugs. Refer to [EM-16, "Removal and Installation"](#).
4. Remove the intake manifold. Refer to [EM-30, "Removal and Installation"](#).
5. Remove the exhaust manifold and three way catalyst. Refer to [EM-33, "Removal and Installation"](#).
6. Loosen the cylinder head bolts in the reverse order shown, using power tool.

← : Engine front



7. Remove cylinder head.

8. Remove cylinder head gasket.

#### INSPECTION AFTER REMOVAL

Outer Diameter of Cylinder Head Bolts

# CYLINDER HEAD

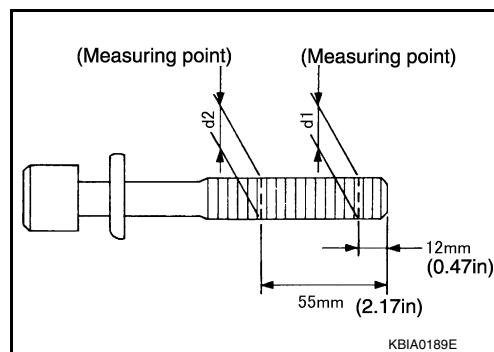
[QR25DE]

## < REMOVAL AND INSTALLATION >

- Replace the cylinder heads bolts with new ones if the size difference between d1 and d2 exceeds the limit.

**Limit (d1 - d2) : 0.23 mm (0.0091 in) or more**

- If reduction of outer diameter appears in a position other than d2, use it as d2 point.



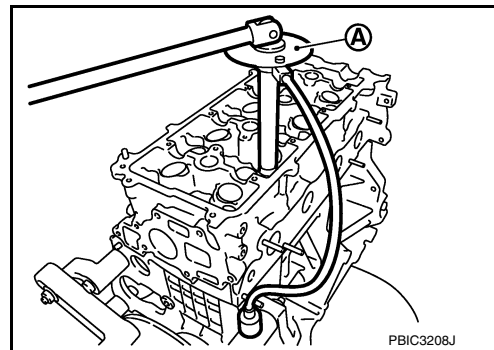
## INSTALLATION

1. Clean surfaces of cylinder head and cylinder block.
2. Install a new cylinder head gasket.
  - CAUTION:**  
**Do not reuse cylinder head gasket.**
3. Install the cylinder head.
4. Follow the steps below to tighten the cylinder head bolts in the numerical order as shown.
  - Clean threads and seating surfaces of bolts.
  - Apply new engine oil to the threads and the seating surfaces of bolts.

**CAUTION:**

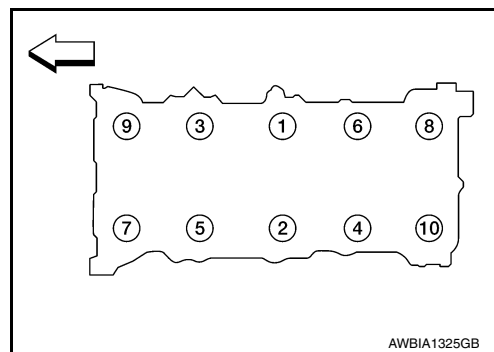
- If cylinder head bolts are re-used, check their outer diameters before installation. Follow the Outer Diameter of Cylinder Head Bolts measurement procedure.
- Check and confirm the tightening angle by using angle wrench or protractor. Do not judge angle by visual inspection.

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



- Step a : 50 N·m (5.1 kg-m, 37 ft-lb) in order**
- Step b : 60° clockwise in order**
- Step b : Loosen to 0 N·m in order**
- Step c : 39.2 N·m (4.0 kg-m, 29 ft-lb) in order**
- Step d : 75° clockwise in order**
- Step e : 75° clockwise in order**

← : Engine front



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

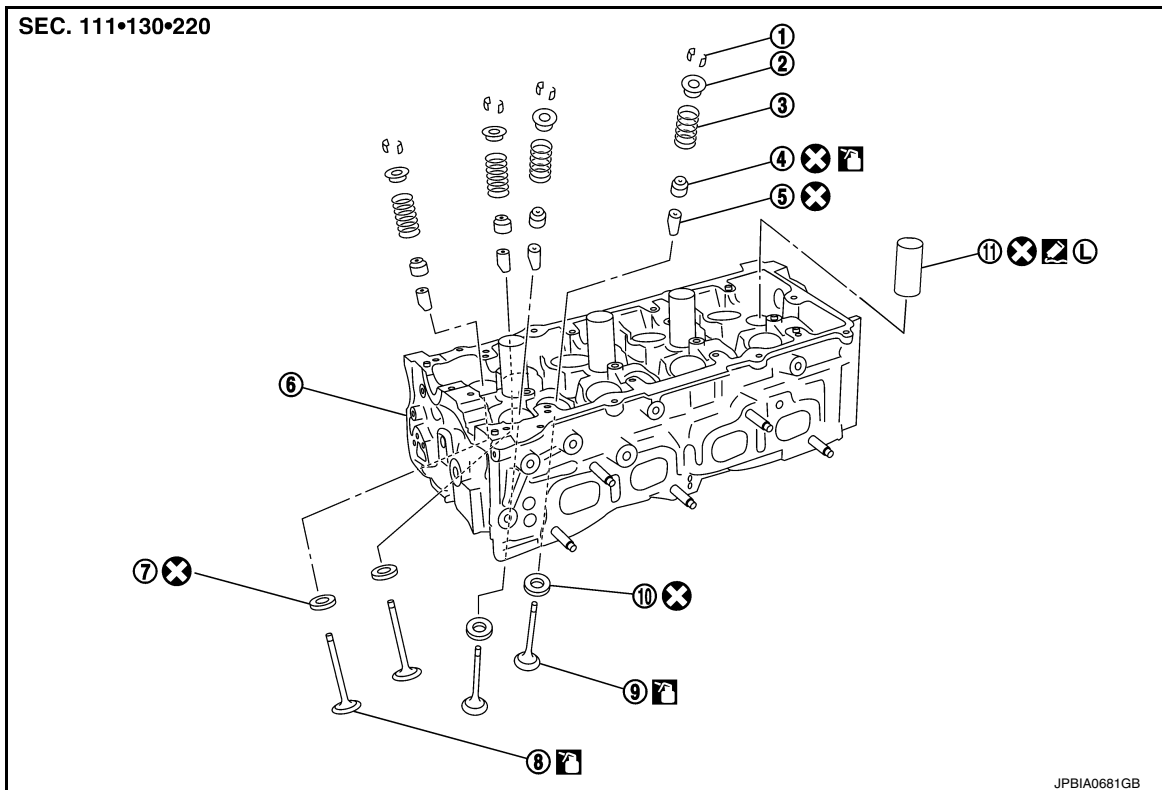
# CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[QR25DE]

## Disassembly and Assembly

INFOID:000000009460505



- |                      |                          |                                 |
|----------------------|--------------------------|---------------------------------|
| 1. Valve collet      | 2. Valve spring retainer | 3. Valve spring                 |
| 4. Valve oil seal    | 5. Valve guide           | 6. Cylinder head                |
| 7. Valve seat (INT)  | 8. Valve (INT)           | 9. Valve (EXH)                  |
| 10. Valve seat (EXH) | 11. Spark plug tube      | L. Apply thread locking sealant |

### 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 surfaces when installing the cylinder head, camshaft sprocket, crankshaft pulley and camshaft bracket.
- Attach tags to valve lifters so all parts are assembled in their original position.

### CAUTION:

Read PRECAUTION carefully.

The exhaust valve contains metallic sodium. Therefore, extreme caution must be taken when handling and disposing of the exhaust valve. Refer to [EM-5, "Special Cautions to Ensure the Safe Disposal of Sodium-filled Exhaust Valves"](#).

### DISASSEMBLY

1. Remove the valve lifter.

#### NOTE:

Confirm installation point to return valve lifter to original location during assembly.

2. Remove valve collet.



# CYLINDER HEAD

## < REMOVAL AND INSTALLATION >

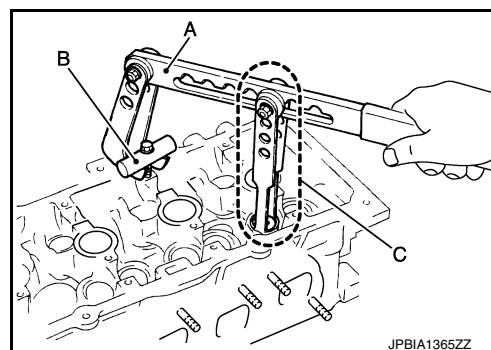
[QR25DE]

- Compress valve spring using Tools. Remove valve collet with a magnet hand.

Tool number (A) : KV10116200 (J-26336-A)

Tool number (B) : KV10109220 (—)

Tool number (C) : KV10115900 (J-26336-20)

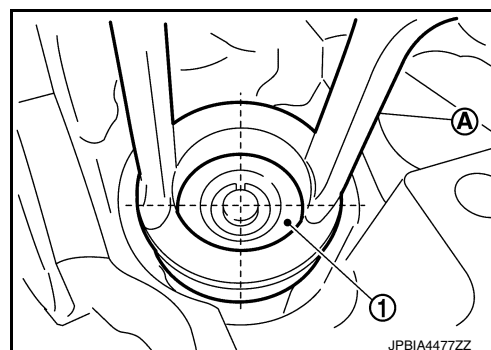


### CAUTION:

- Be careful not to damage valve lifter holes.
- Install tool (A) in the center of valve spring retainer to press it.

Tool number : KV10115900 (J-26336-20)

(1) : Valve spring retainer



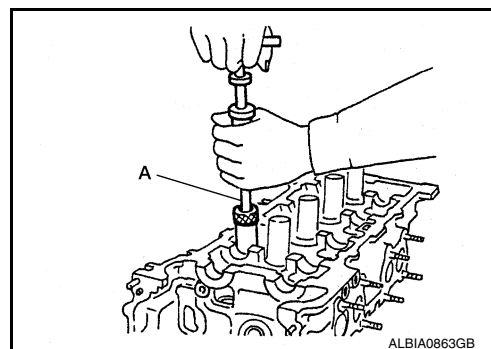
- Remove valve spring retainer and valve spring (with valve spring seat).

### CAUTION:

**Do not remove valve spring seat from valve spring.**

- Push valve stem to combustion chamber side, and remove valve.
  - Inspect valve guide clearance before removal. Refer to [EM-78, "Inspection After Disassembly"](#).
  - Confirm installation point to return valve to original location during assembly.
- Remove valve oil seal using Tool (A).

Tool number : KV10107902 (J-38959)



- When valve seat must be replaced, refer to [EM-78, "Inspection After Disassembly"](#).
- When valve guide must be replaced, refer to [EM-78, "Inspection After Disassembly"](#).
- Remove spark plug tubes, if necessary, using suitable tool.

### CAUTION:

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

## ASSEMBLY

- Install valve guide. Refer to [EM-78, "Inspection After Disassembly"](#).
- Install valve seat. Refer to [EM-78, "Inspection After Disassembly"](#).
- Apply new engine oil to new valve oil seal joint surface and seal lip.

# CYLINDER HEAD

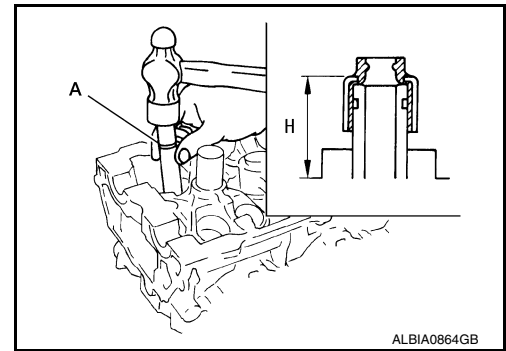
## < REMOVAL AND INSTALLATION >

[QR25DE]

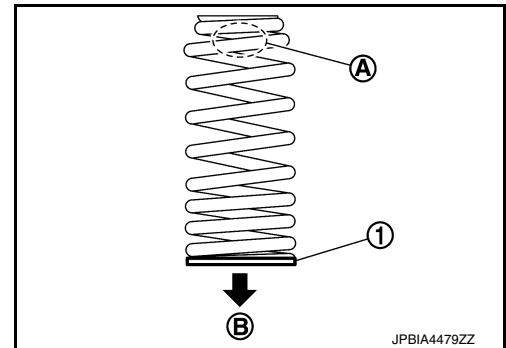
4. Install new valve oil seal using Tool (A) as shown.

**Oil seal installed height (H) : 12.1 mm (0.476 in)**

**Tool number : KV10115600 (J-38958)**



5. Install valve.
- Install larger diameter to intake side.
6. Install valve spring with valve spring seat (1).
- Install valve spring so that the identification color faces upward (A).
  - Install smaller pitch to cylinder head side (B).
  - Confirm the identification color of the valve spring.
  - Intake: white
  - Exhaust: light blue



7. Install valve spring retainer.
8. Install valve collet.
- Compress valve spring using Tools. Install valve collet with a magnet hand.

**Tool number (A) : KV10116200 (J-26336-A)**

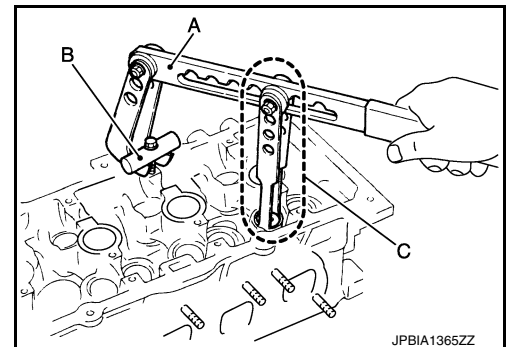
**Tool number (B) : KV10109220 ( — )**

**Tool number (C) : KV10115900 (J-26336-20)**

### CAUTION:

**When working take care not to damage valve lifter holes.**

- Tap valve stem edge lightly with a plastic hammer after installation to check its installed condition.

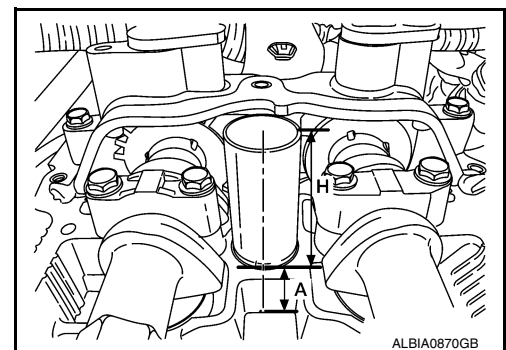


9. Install valve lifter.
10. Install spark plug tube.
- a. Remove old liquid gasket from cylinder head mounting hole.
- b. Apply liquid gasket all around on spark plug tube with a 12 mm (0.47 in) width from edge of spark plug tube on the press fit side.
- Use Three Bond or equivalent. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).
- c. Press fit spark plug tube so that height (H) is as shown.

**Press fit height (H) standard value : 41.7 mm (1.642 in)**

### CAUTION:

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



## Inspection After Disassembly

INFOID:000000009460506

## CYLINDER HEAD DISTORTION

# CYLINDER HEAD

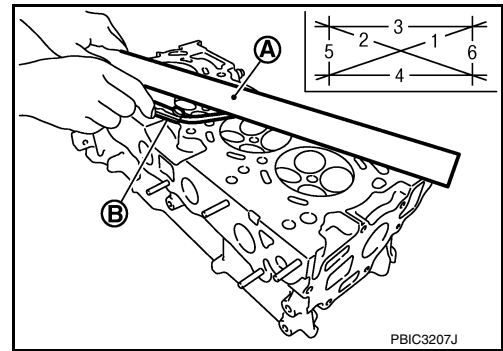
[QR25DE]

## < REMOVAL AND INSTALLATION >

1. Wipe off oil and remove water scale deposits, old gasket, old sealer, and carbon with a scraper.  
**CAUTION:**  
**Use care not to allow gasket debris to enter passages for oil or water.**
2. At each of several locations on bottom surface of cylinder head, measure distortion in six directions using suitable tools (A, B).

**Limit : 0.1 mm (0.004 in)**

- If measurements exceed the limit, replace cylinder head.



## VALVE DIMENSIONS

Check dimensions of each valve. Refer to [EM-111, "Standard and Limit"](#).

## VALVE GUIDE CLEARANCE

- Measure diameter of valve stem using suitable tool (A) as shown.

### Standard

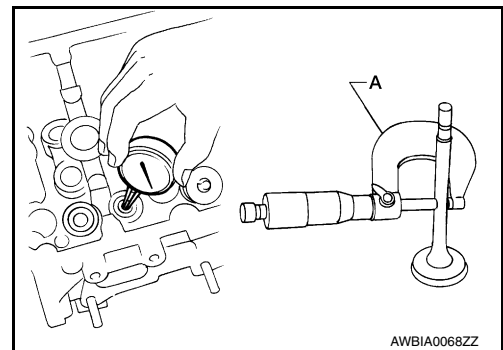
**Intake : 5.965 - 5.980 mm (0.2348 - 0.2354 in)**

**Exhaust : 5.955 - 5.970 mm (0.2344 - 0.2350 in)**

- Measure inner diameter of valve guide with a bore gauge as shown.

### Standard

**Intake and Exhaust : 6.000 - 6.018 mm (0.2362 - 0.2369 in)**



- Valve guide clearance = (Valve guide inner diameter) - (Valve stem diameter)

### Valve guide clearance

#### Standard

**Intake : 0.020 - 0.053 mm (0.0008 - 0.0021 in)**

**Exhaust : 0.030 - 0.063 mm (0.0012 - 0.0025 in)**

#### Limit

**Intake : 0.08 mm (0.003 in)**

**Exhaust : 0.09 mm (0.004 in)**

- If it exceeds the limit, replace valve guide and/or valve. When valve guide must be replaced, follow the "VALVE GUIDE REPLACEMENT" procedure.

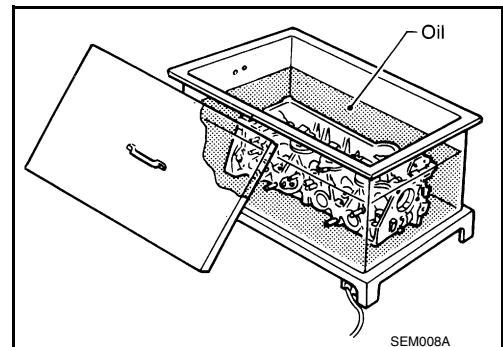
## VALVE GUIDE REPLACEMENT

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° to 130°C (230° to 266°F) by soaking in heated oil.

### WARNING:

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

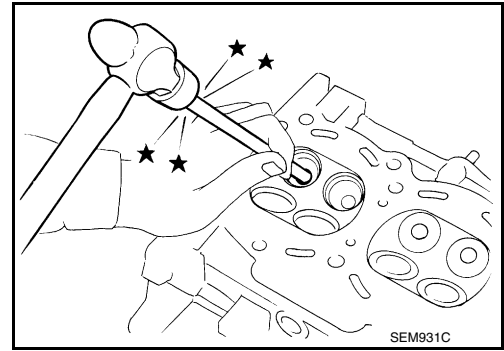


# CYLINDER HEAD

## < REMOVAL AND INSTALLATION >

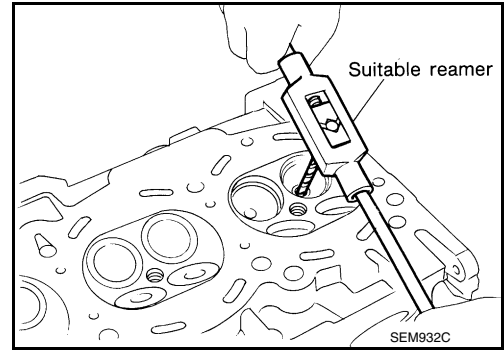
[QR25DE]

2. Drive out valve guide with a press [under 20 kN (2.2 ton-f) pressure] or suitable tool.



3. Ream cylinder head valve guide hole using suitable reamer.

**Intake and exhaust valve guide hole diameter (Service)** : Refer to [EM-111, "Standard and Limit"](#).

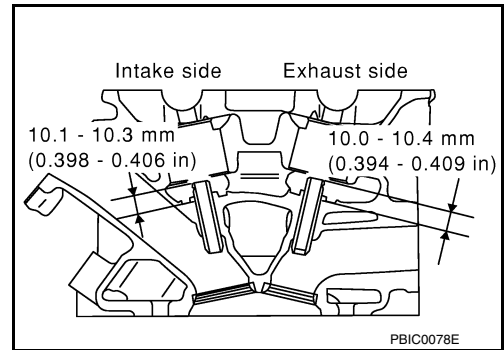


4. Heat cylinder head to 110° to 130°C (230° to 266°F) by soaking in heated oil.

**WARNING:**

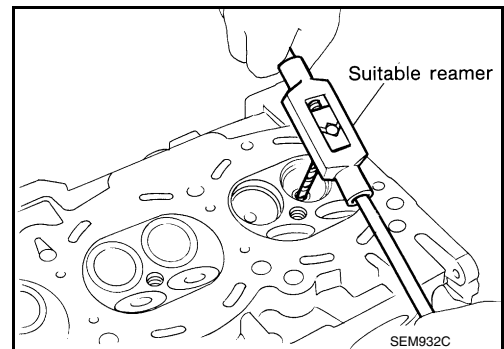
**Cylinder head contains heat. When working, wear protective equipment to avoid getting burned.**

5. Press valve guide from camshaft side to dimensions as shown.



6. Apply finish to valve guide using suitable reamer.

**Intake and exhaust** : Refer to [EM-111, "Standard and Limit"](#).



## VALVE SEAT CONTACT NOTE:

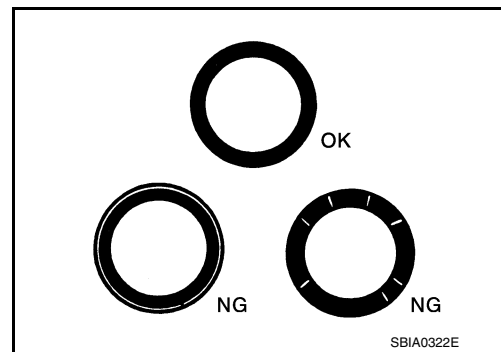
# CYLINDER HEAD

## < REMOVAL AND INSTALLATION >

[QR25DE]

After confirming that the dimensions of valve guides and valves are within specifications, perform this procedure:

- Apply prussian blue (or white lead) onto contacting surface of valve seat to check the condition of the valve contact on the seat 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 re-check, replace the valve seat.



## VALVE SEAT REPLACEMENT

### NOTE:

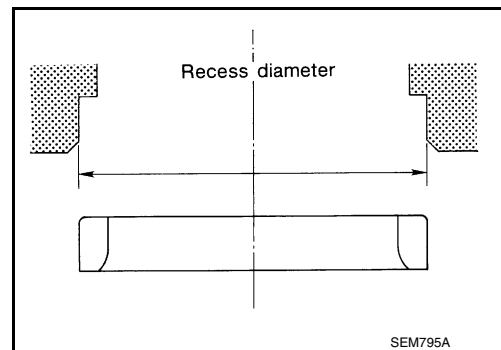
When valve seat is removed, replace with an oversized [0.5 mm (0.020 in)] valve seat.

1. Bore out old seat until it collapses. Boring should not continue beyond the bottom face of the seat recess in the cylinder head. Set the machine depth stop to ensure this.
2. Ream cylinder head recess diameter for service valve seat.

**Intake** : 37.000 - 37.016 mm (1.4567 - 1.4573 in)

**Exhaust** : 32.000 - 32.016 mm (1.2598 - 1.2605 in)

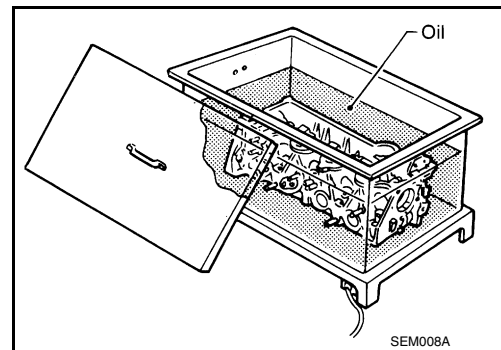
- Be sure to ream in circles concentric to the valve guide center. This will enable the valve seat to fit correctly.



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

### WARNING:

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



4. Use valve seats cooled well with dry ice. Force fit valve seat into cylinder head.

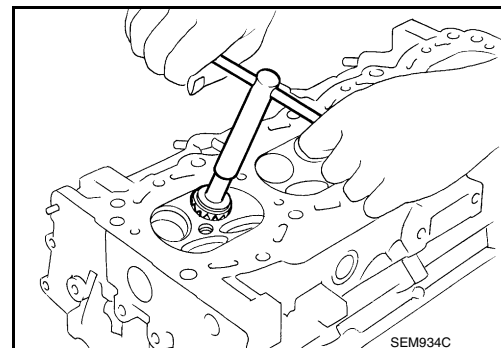
### CAUTION:

**Avoid directly touching the cold valve seats.**

5. Finish the seat to the specified dimensions using suitable tool. Refer to [EM-111, "Standard and Limit"](#).

### CAUTION:

**When using valve seat cutter, firmly grip the cutter handle with both hands. Then, press on the contacting surface all around the circumference to cut in a single drive. Improper pressure on the cutter or cutting many different times may result in a defective valve seat.**



6. Using compound, grind to adjust valve fitting.
7. Check again for normal contact.

# CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[QR25DE]

## VALVE SPRING SQUARENESS

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

(B) : Contact

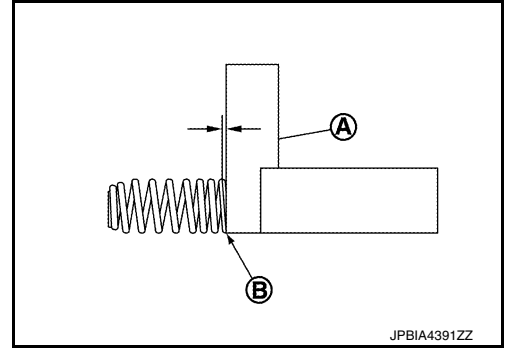
### CAUTION:

**Do not remove the valve spring seat from the valve spring**

### NOTE:

If the valve spring exceeds the limit, replace the valve spring with the valve spring seat.

**Limit** : Refer to [EM-111, "Standard and Limit"](#).



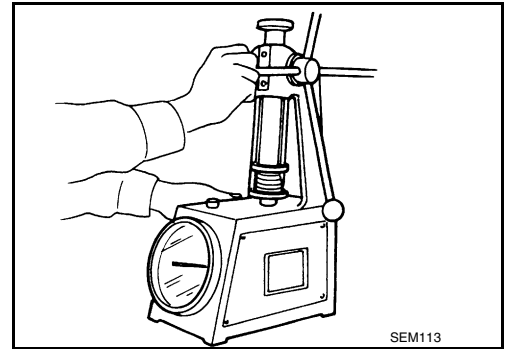
## VALVE SPRING DIMENSIONS AND VALVE SPRING PRESSURE LOAD

Check valve spring pressure with valve spring seat installed at specified spring height. Replace if not within specifications.

### CAUTION:

**Do not remove the valve spring seat.**

**Standard** : Refer to [EM-111, "Standard and Limit"](#).



# ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

[QR25DE]

## UNIT REMOVAL AND INSTALLATION

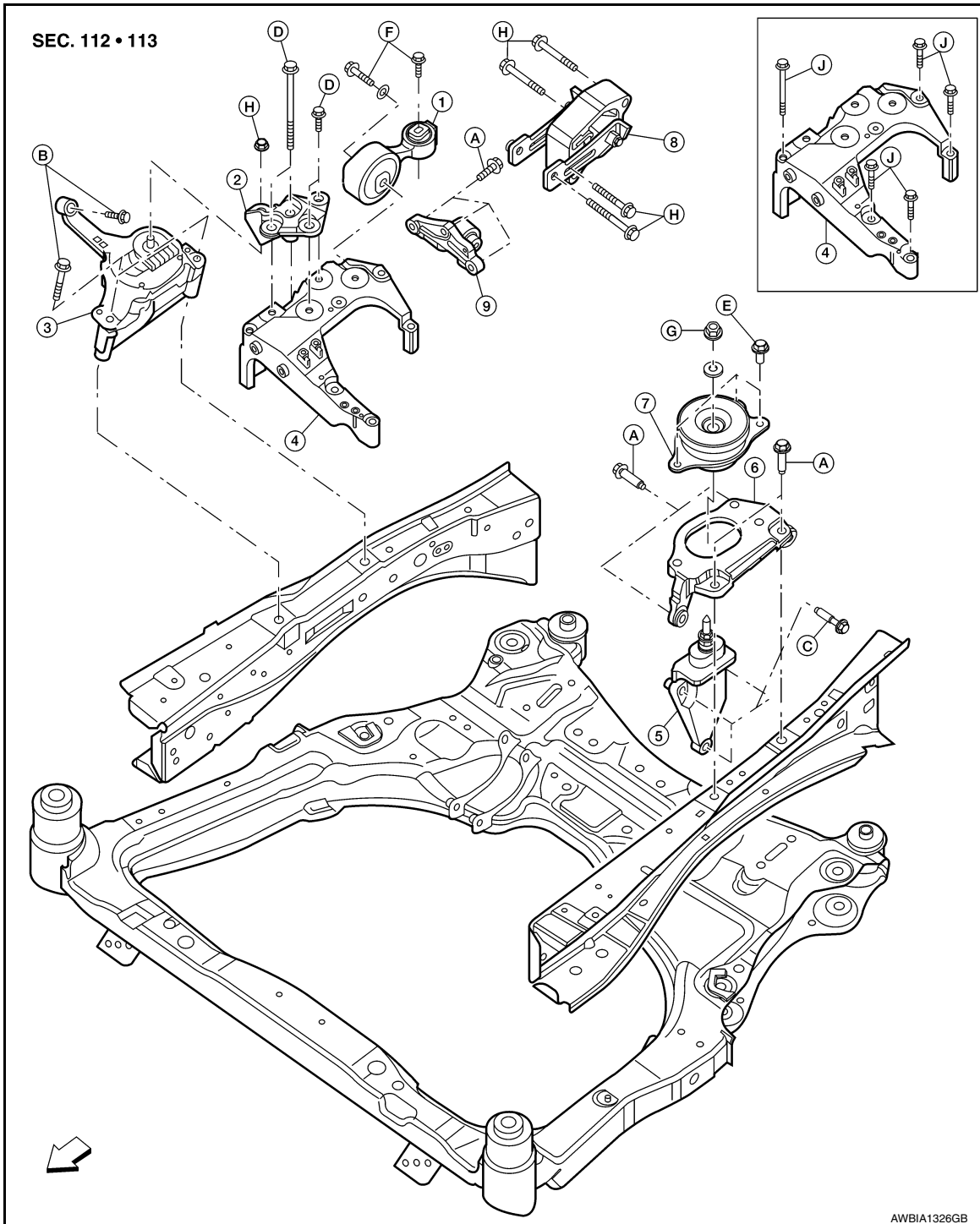
### ENGINE ASSEMBLY

Exploded View

INFOID:000000009460507

A

EM



C

D

E

F

G

H

I

J

K

L

M

N

O

P

- |                                 |                                  |   |
|---------------------------------|----------------------------------|---|
| 1. RH engine mount torque rod   | 2. RH engine support bracket     | 3. RH engine mounting insulator         |
| 4. RH engine mounting bracket   | 5. Transmission mounting bracket | 6. LH engine mounting bracket           |
| 7. LH engine mounting insulator | 8. Rear engine mount torque rod  | 9. Rear engine mount torque rod bracket |
| A. 40 N·m (4.1 kg·m, 30 ft·lb)  | B. 41 N·m (4.2 kg·m, 30 ft·lb)   | C. 45 N·m (4.6 kg·m, 33 ft·lb)          |
| D. 50 N·m (5.1 kg·m, 37 ft·lb)  | E. 60 N·m (6.1 kg·m, 44 ft·lb)   | F. 85 N·m (8.7 kg·m, 63 ft·lb)          |



G. 90 N·m (9.2 kg-m, 66 ft-lb)

H. 103 N·m (11 kg-m, 76 ft-lb)

J. Follow installation procedure

↩ Front

## Removal and Installation

INFOID:000000009460508

### WARNING:

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

### CAUTION:

- Do not start working until the 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-33, "Garage Jack and Safety Stand"](#).
- In removing the drive shaft, be careful not to damage the grease seals on the transaxle.

### NOTE:

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

### REMOVAL

1. Remove engine cover using power tool. Refer to [EM-28, "Removal and Installation"](#).
2. Release fuel pressure. Refer to [EC-182, "Work Procedure"](#).
3. Disconnect the negative and positive battery terminal. Refer to [PG-73, "Removal and Installation \(Battery\)"](#).
4. Disconnect the fuel rail at the fuel hose quick connector (engine side). Refer to [EM-41, "Removal and Installation"](#).
5. Drain the engine coolant. Refer to [CO-12, "Changing Engine Coolant"](#).
6. Remove the engine under cover. Refer to [EXT-28, "Removal and Installation"](#).
7. Remove hood assembly. Refer to [DLK-170, "HOOD ASSEMBLY : Removal and Installation"](#).
8. Remove core support cover.
9. Remove the front air duct and air cleaner case assembly. Refer to [EM-29, "Removal and Installation"](#).
10. Remove battery and battery tray. Refer to [PG-74, "Removal and Installation \(Battery Tray\)"](#).
11. Remove cowl top. Refer to [EXT-24, "Removal and Installation"](#).
12. Remove strut brace. Refer to [FSU-19, "Exploded View"](#).
13. Disconnect EVAP hose and vacuum hose from intake manifold.
14. Remove upper and lower radiator hoses (engine side).
15. Remove CVT cooler lines.
16. Disconnect engine room harness connector at the CVT and ECM connectors.

### CAUTION:

**Protect the harness connector with plastic bags or suitable covering to help prevent damage and intrusion of foreign materials into the connectors.**

17. Remove the brake booster vacuum hose.
18. Disconnect the heater hoses.
19. Remove the front wheels and tires using a power tool. Refer to [WT-55, "Adjustment"](#).
20. Remove the fender protector side covers (RH) and (LH). Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).
21. Remove tie rod ends from the steering knuckles. Refer to [ST-36, "Removal and Installation"](#).
22. Remove the power steering gear bolts and support the power steering gear. Refer to [ST-36, "Exploded View"](#).
23. Remove rear cover plate.
24. Remove the torque converter nuts.
25. Remove the rear engine mount torque rod.
26. Remove front exhaust tube and gaskets. Refer to [EX-5, "Exploded View"](#).



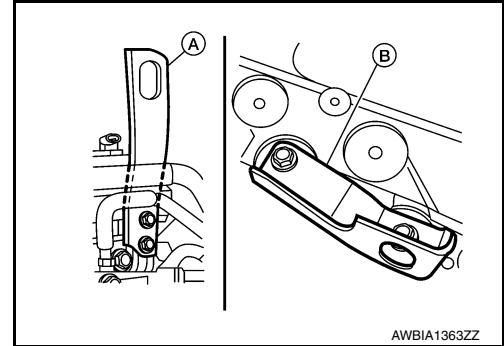
# ENGINE ASSEMBLY

[QR25DE]

## < UNIT REMOVAL AND INSTALLATION >

27. Remove the LH and RH drive shafts. Refer to [FAX-10. "Removal and Installation \(LH\)"](#), [FAX-12. "Removal and Installation \(RH\)"](#).
28. Remove the drive belt. Refer to [EM-19. "Removal and Installation"](#).
29. Remove the front suspension member. Refer to [FSU-20. "Removal and Installation"](#).
30. Remove the A/C compressor with piping connected and support using suitable wire.
31. Disconnect the transaxle shift controls. Refer to [TM-407. "Removal and Installation"](#).
32. Install engine slingers into the rear of the cylinder head (A) and front engine mounting bracket holes (B).
  - Use engine mounting bolt holes for front slinger.
  - Use the holes in the rear of the cylinder head for the rear slinger.

**Slinger bolts (A) : 28 N·m (2.8 kg-m, 21 ft-lb)**  
**Slinger bolts (B) : 48 N·m (4.9 kg-m, 35 ft-lb)**



33. Support engine and transaxle assembly with engine lifting equipment from the top with the vehicle raised on a hoist.
34. Remove the RH engine mount torque rod, RH engine support bracket and RH engine mounting insulator and bracket.
35. Remove LH transaxle mounting insulator through-bolts.
36. Lower the engine and transaxle assembly from the engine compartment using suitable tool.  
**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 mounting insulators.**
37. Remove the starter motor. Refer to [STR-22. "QR25DE : Removal and Installation"](#).
38. Remove engine and transaxle harness.
39. Separate engine and transaxle. Refer to [TM-206. "Exploded View"](#).

## INSTALLATION

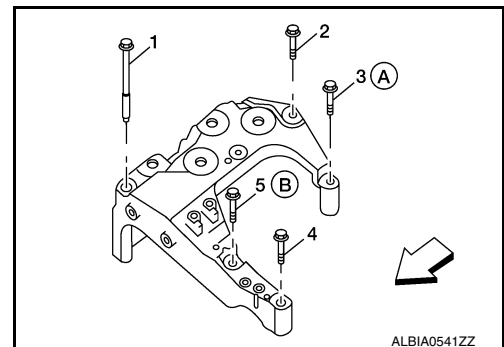
Installation is in the reverse order of removal.

### NOTE:

- Tighten the transmission bolts to specification. Refer to [TM-407. "Removal and Installation"](#).
- Do not allow oil to get on mounting insulators. Be careful not to damage mounting insulators.
  - If parts have a direction mark (arrow) this indicates front of the vehicle, and the parts must be installed according to the identification mark.
  - Install the RH engine mounting bracket bolts in the following steps:
    - First install bolts (A) and (B) loosely.
    - Install and tighten the five RH engine mounting bracket bolts to specification in the order as shown.

**RH engine mounting bracket bolt : 48.2 N·m (4.9 kg-m, 36 ft-lb)**

- ⇐: Front



## 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-11. "FOR USA AND CANADA : Fluids and Lubricants"](#).
- 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.

# ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

[QR25DE]

**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.
- Summary of the inspection items:

Item		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission/ transaxle fluid	CVT Models	Leakage	Level/Leakage	Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gas		—	Leakage	—

\*Power steering fluid, brake fluid, etc.

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

## UNIT DISASSEMBLY AND ASSEMBLY

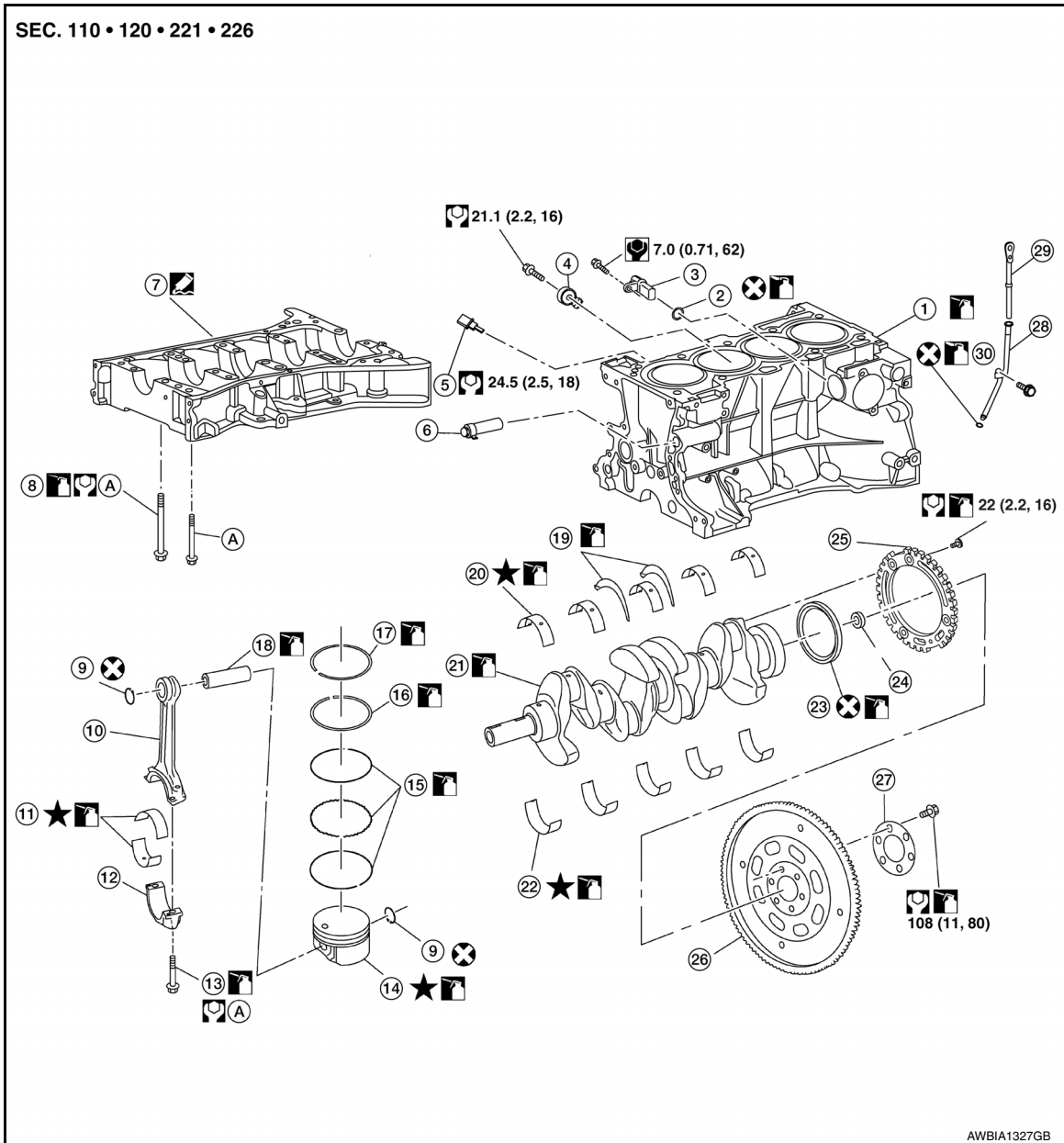
### CYLINDER BLOCK

Exploded View

INFOID:000000009460509

A

EM



C

D

E

F

G

H

I

J

K

L

M

N

- |                                     |                              |  |
|-------------------------------------|------------------------------|--|
| 1. Cylinder block                   | 2. O-ring                    | 3. Crankshaft position sensor (POS)    |
| 4. Knock sensor                     | 5. Water temperature sensor  | 6. Cylinder block heater (if equipped) |
| 7. Lower cylinder block             | 8. Lower cylinder block bolt | 9. Snap ring                           |
| 10. Connecting rod                  | 11. Connecting rod bearing   | 12. Connecting rod bearing cap         |
| 13. Connecting rod bearing cap bolt | 14. Piston                   | 15. Oil ring                           |
| 16. Second ring                     | 17. Top ring                 | 18. Piston pin                         |
| 19. Main thrust bearing             | 20. Main bearing upper       | 21. Crankshaft                         |
| 22. Main bearing lower              | 23. Crankshaft rear oil seal | 24. Pilot converter                    |
| 25. Crankshaft signal plate         | 26. Drive plate              | 27. Reinforcement plate                |

O

P

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

28. Oil level gauge guide

29. Oil level gauge

30. O-ring

A. Follow assembly procedure

## Disassembly and Assembly

INFOID:000000009460510

### CAUTION:

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

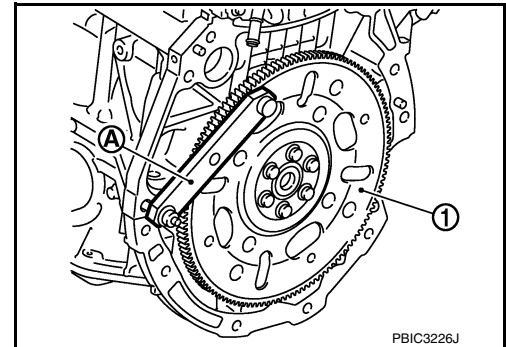
### NOTE:

The following procedures explain how to disassemble the engine with the engine stand fastened to the bell housing. Some steps may be different if using a different type of engine stand.

### DISASSEMBLY

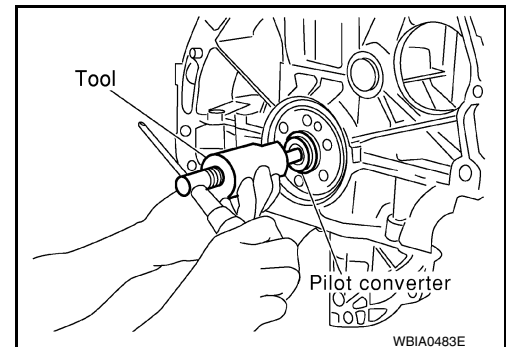
1. Remove the engine and transaxle as an assembly from the vehicle, and separate the transaxle from the engine. Refer to [EM-84. "Removal and Installation"](#).
2. Remove the drive plate. Hold the crankshaft using Tool (A) and use a suitable tool to remove the bolts.

**Tool Number** : KV11105210 (J-44716)



3. Remove pilot converter using Tool.

**Tool Number** : ST16610001 (J-23907)



4. Remove the rear oil seal. Refer to [EM-72. "Removal and Installation of Rear Oil Seal"](#).
5. Mount the engine on a suitable engine stand (A).

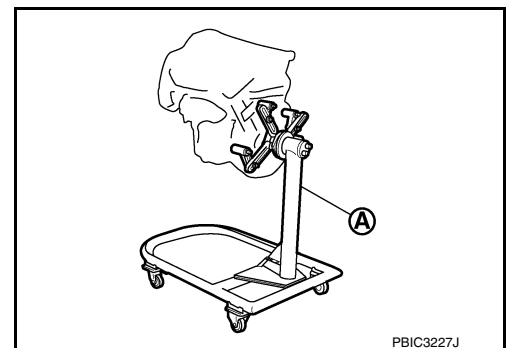
### CAUTION:

- Use an engine stand that has a load capacity large enough for supporting the engine weight [approximately 135 kg (298 lb) or more].
- Before removing the hanging chains, check the engine stand is stable and there is no risk of overturning.

### NOTE:

The figure shows an example of widely used engine stand (A) that can support mating surface of transaxle with drive plate removed.

- Remove the following parts if the engine stand load capacity is not adequate, to reduce the potential risk of overturning stand:
  - Intake manifold. Refer to [EM-30. "Removal and Installation"](#).
  - Exhaust manifold. Refer to [EM-33. "Removal and Installation"](#).
  - Rocker cover. Refer to [EM-45. "Removal and Installation"](#).



6. Drain any remaining engine oil and coolant from the engine.
7. Remove the exhaust manifold and three way catalyst assembly. Refer to [EM-33. "Removal and Installation"](#).
8. Remove the intake manifold and fuel tube assembly. Refer to [EM-30. "Removal and Installation"](#).

# CYLINDER BLOCK

[QR25DE]

## < UNIT DISASSEMBLY AND ASSEMBLY >

9. Remove the ignition coils. Refer to [EM-40. "Removal and Installation"](#).
10. Remove the rocker cover. Refer to [EM-45. "Removal and Installation"](#).
11. Remove the front cover, timing chain, and balancer unit. Refer to [EM-62. "Removal and Installation"](#).
12. Remove the cylinder head. Refer to [EM-74. "Removal and Installation"](#).
13. Remove oil cooler. Refer to [LU-16. "Exploded View"](#).
14. Remove the knock sensor.

**CAUTION:**

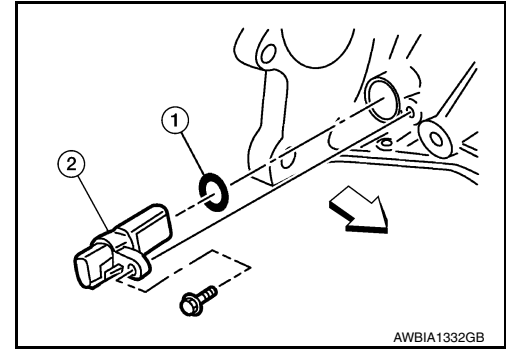
**Carefully handle the sensor and do not drop the sensor.**

15. Remove crankshaft position sensor (POS) (2) and O-ring (1).

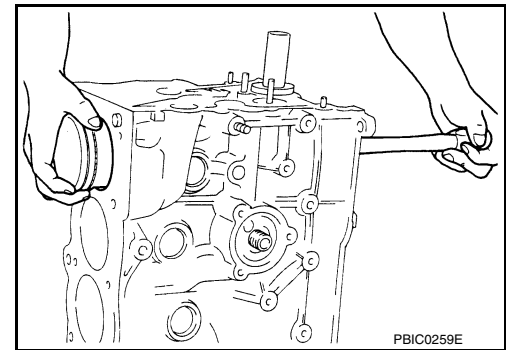
⇐ : Engine front

**CAUTION:**

- Avoid impacts such as a dropping.
- Do not disassemble.
- Keep it away from metal particles.
- Do not place sensor close to magnetic materials.
- Do not reuse O-ring.



16. Remove the piston and connecting rod assemblies.
  - a. Position the crankshaft and corresponding connecting rod, to be removed, to the bottom dead center stroke.
  - b. Remove the connecting rod cap. Number the cap so it can be assembled in the same position.
  - c. Using a hammer handle or similar tool, push the piston and connecting rod assembly out of the top of the cylinder block. Number the piston and rod so it can be assembled in the same position.
    - Before removing the piston and connecting rod assembly, check the connecting rod side clearance. Refer to [EM-96. "Inspection After Disassembly"](#).



17. Remove the connecting rod bearings. If reusing, number them so they can be assembled in the same position and direction.

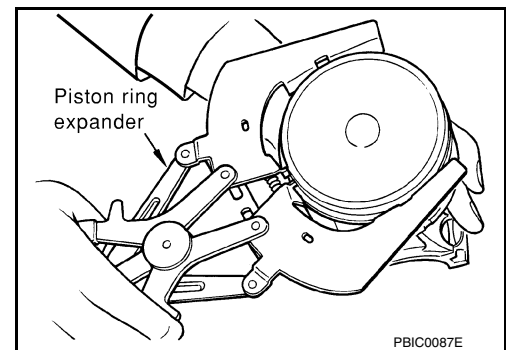
**CAUTION:**

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

18. Remove the piston rings from the piston.
  - Use a piston ring expander.
  - Before removing the piston rings, check the piston ring side clearance. Refer to [EM-96. "Inspection After Disassembly"](#).

**CAUTION:**

- When removing the piston rings, be careful not to damage the piston.
- Be careful not to damage piston rings by expanding them excessively, if reusing them.



A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

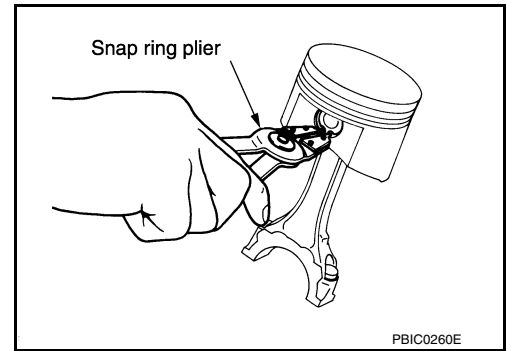
# CYLINDER BLOCK

[QR25DE]

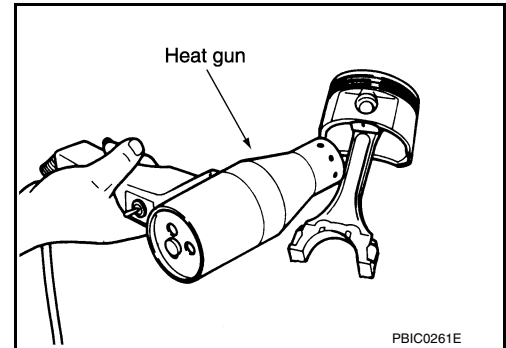
## < UNIT DISASSEMBLY AND ASSEMBLY >

19. Remove the piston from the connecting rod as follows.

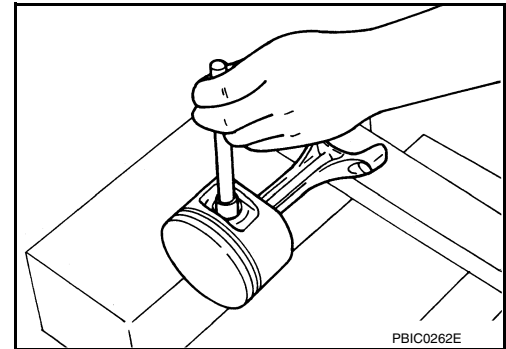
a. Using a snap ring pliers, remove the two snap rings.



b. Heat the piston to 60° - 70°C (140° - 158°F) with a heat gun, or equivalent.



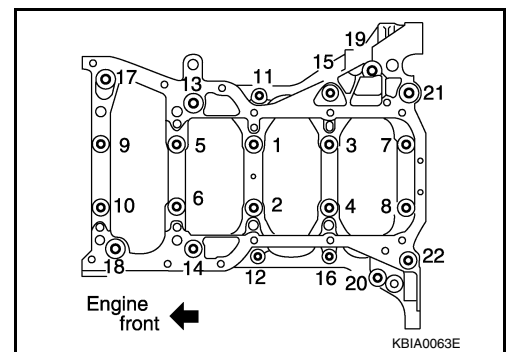
c. Push out piston pin with a punch of an outer diameter of approximately 19 mm (0.75 in).



20. Remove the lower cylinder block bolts.

- Before loosening the lower cylinder block bolts, measure the crankshaft side clearance. Refer to [EM-96. "Inspection After Disassembly"](#).

- Loosen the lower cylinder block bolts in the reverse order shown.



21. Remove the lower cylinder block.

- Cut the Silicone RTV Sealant and remove the lower cylinder block from the cylinder block, using Tool.

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

**CAUTION:**

**Be careful not to damage the mating surface.**

# CYLINDER BLOCK

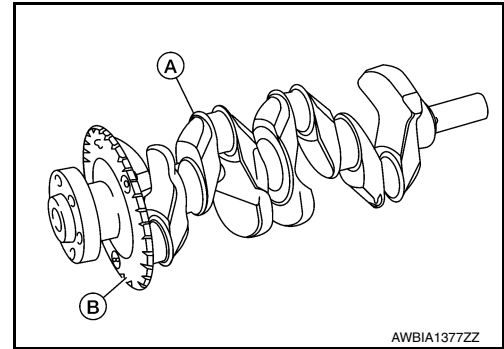
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

22. Remove the crankshaft (A).

**CAUTION:**

- Do not damage or deform the signal plate (B) while mounted on the crankshaft.
- When setting the crankshaft on a flat surface, use a block of wood to avoid interference between the signal plate and the surface.
- Do not remove signal plate unless it is necessary.



23. Pull the rear oil seal off of the rear end of the crankshaft.

**CAUTION:**

**Do not damage the crankshaft or cylinder block when removing the rear oil seal.**

**NOTE:**

When replacing the rear oil seal without removing the cylinder block, use a suitable tool to pull it out from between crankshaft and block.

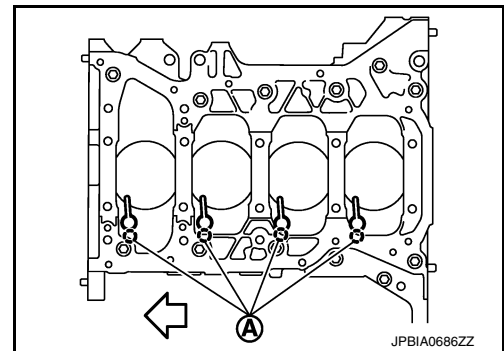
24. Remove the main bearings and thrust bearings from the cylinder block and lower cylinder block.

**CAUTION:**

**Identify and number the bearings, if reusing them, so that they are assembled in the same position and direction.**

25. Remove oil jets (A) if necessary.

⇐ : Engine front



## ASSEMBLY

1. Using compressed air, clean out the coolant and oil passages in the cylinder block, the cylinder bore and the crankcase to remove any foreign material.

**WARNING:**

**Use approved safety glasses to protect your eyes.**

2. Install the drain plugs on the cylinder block.

- Apply Silicone RTV Sealant.

**Use Genuine Silicone RTV Sealant, or equivalent. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).**

- ⇐: Engine front

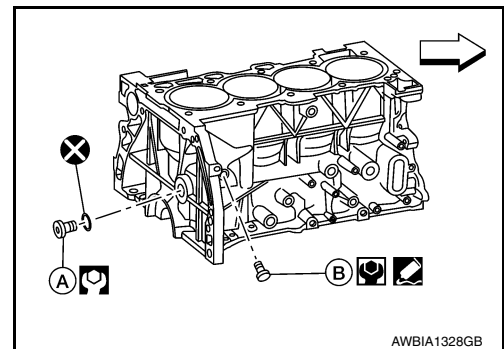
**CAUTION:**

**Do not reuse copper sealing washers.**

**Drain plug torque**

**Drain plug (A) : 54 Nm (5.5 kg-m, 40 ft-lb)**

**Drain plug (B) : 9.8 Nm (1.0 kg-m, 87 in-lb)**





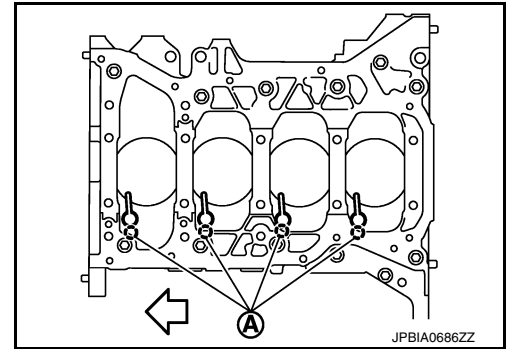
# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

## 3. Install oil jets (A).

⇐ : Engine front



## 4. Install the main bearings and the thrust bearings.

- a. Remove dust, dirt, and oil from the bearing mating surfaces of the cylinder block and lower cylinder block.
- b. Install the thrust bearings (1) to both sides of the No. 3 main bearing journal (F) on the cylinder block.
  - Install the thrust bearings with the oil groove (G) facing the crankshaft arm (outside).

(A) : No. 1

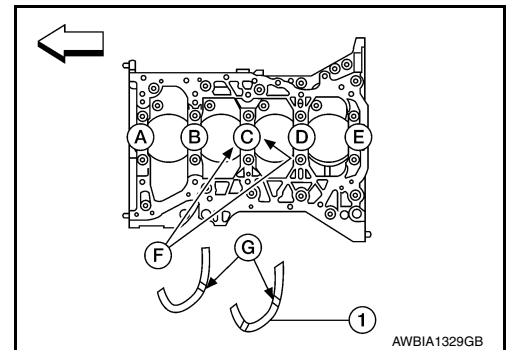
(B) : No. 2

(C) : No. 3

(D) : No. 4

(E) : No. 5

⇐ : Engine front

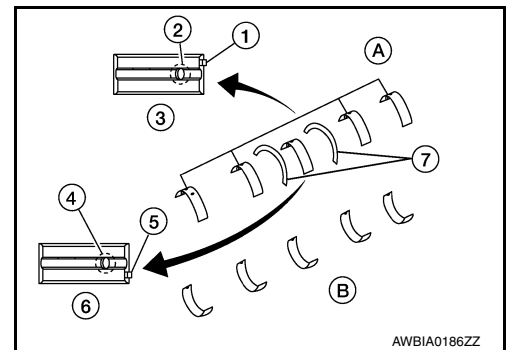


- c. Install the main bearings paying attention to their position and direction.

(3) : Bearing other than No. 3

(7) : Thrust bearings

- The main bearing with an oil hole and groove goes on the cylinder block side (A). The one without them goes on the lower cylinder block side (B).
- Only the main bearing (on the cylinder block side) for No. 3 journal (6) has different specifications.
- Before installing the bearings, apply engine oil to the bearing friction surface (inside). Do not apply oil to the back surface, but thoroughly clean it.
- When installing, align the bearing stopper (1), (5) to the notch.
- Make sure that the oil holes on the cylinder block and those on the corresponding bearing (2), (4) are aligned.



## 5. Install the signal plate to the crankshaft.

- a. Position the crankshaft and signal plate using a positioning dowel pin, and tighten the bolts to specification.
- b. Remove the dowel pin.

### CAUTION:

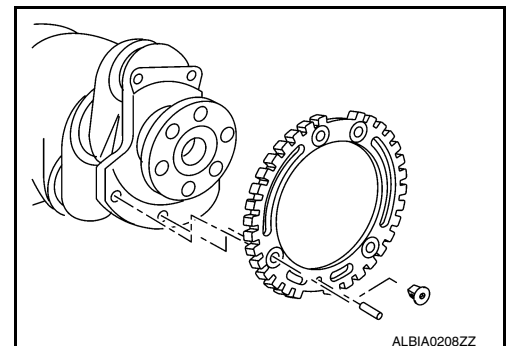
**Be sure to remove dowel pin before installing the crankshaft.**

### NOTE:

Dowel pins for the crankshaft and signal plate are supplied as a set for each.

## 6. Install the crankshaft onto the cylinder block.

- While turning the crankshaft by hand, check that it turns smoothly.





# CYLINDER BLOCK

[QR25DE]

## < UNIT DISASSEMBLY AND ASSEMBLY >

7. Install the lower cylinder block.
  - Apply Silicone RTV Sealant to positions as shown (A and B).
  - Use Genuine Silicone RTV Sealant, or equivalent. Refer to [GL-21, "Recommended Chemical Products and Sealants"](#).

**Dimension (A) : 4 - 5 mm (0.157 - 0.197 in)**  
**Dimension (B) : Apply to end**

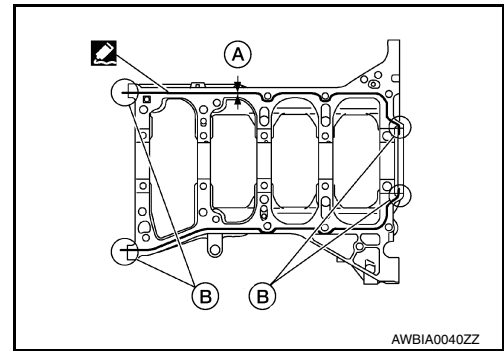
**CAUTION:**

**After the Silicone RTV Sealant is applied, the lower cylinder block installation must be finished within 5 minutes.**

**NOTE:**

Cylinder block and lower cylinder block are machined together. Replace only as a unit. Do not replace separately.

8. Tighten lower cylinder block bolts in the numerical order as shown and according to the following steps:
  - a. Apply new engine oil to threads and seat surfaces of the bolts.



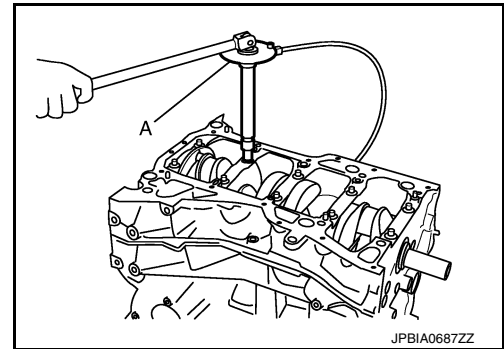
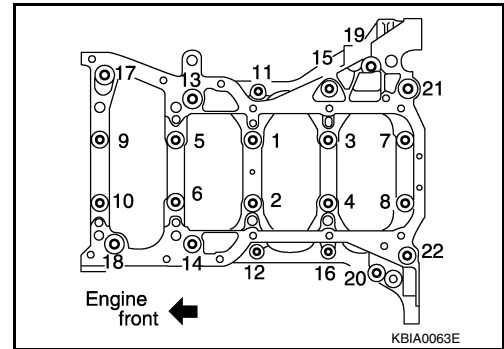
- b. Tighten bolts to specification using suitable tool and Tool (A).

**CAUTION:**

**Check tightening angle. Do not judge angle by visual inspection.**

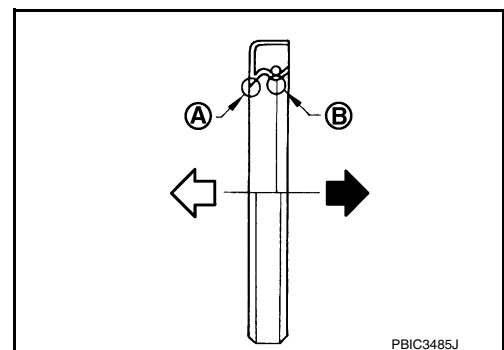
**Step 1, bolts 11 - 22 only : 25.1 N·m (2.6 kg-m, 19 ft-lb)**  
**Step 2, bolts 1 - 10 only : 39.2 N·m (4.0 kg-m, 29 ft-lb)**  
**Step 3, bolts 1 - 10 only : 60°degrees rotation**

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



- c. Wipe off completely any protruding Silicone RTV Sealant on rear oil seal installation surface and the exterior of engine.
  - d. Check crankshaft side clearance. Refer to [EM-96, "Inspection After Disassembly"](#).
  - e. After installing the bolts, make sure that the crankshaft can be rotated smoothly by hand.
9. Apply new engine oil to new rear oil seal and install it using a suitable tool.
  - Install new oil seal in the direction shown.

- (A) : Dust seal lip
- (B) : Oil seal lip
- ⇐ : Drive plate side
- ← : Engine front

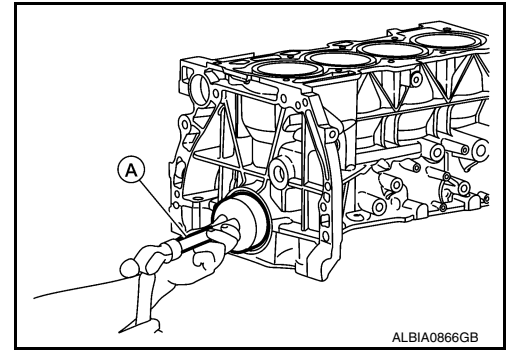


# CYLINDER BLOCK

## < UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

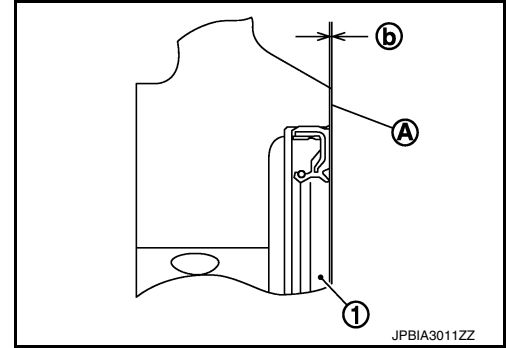
- Press fit new oil seal straight using a suitable tool (A) to avoid tilting the seal or causing burrs.



- Press in the new rear oil seal (1) to the position (b) shown.

(b) : 0 - 0.5 mm (0 - 0.020 in)

(A) : Rear surface of cylinder block



10. Install the piston to the connecting rod. Assemble the components in their original positions.

- a. Using a snap ring pliers, install the snap ring to the grooves of the piston's rear side.

- Insert the piston pin snap ring fully into groove.

**CAUTION:**

**Do not reuse snap rings.**

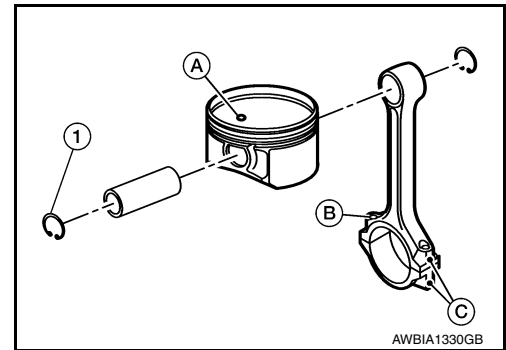
- b. Install the piston to the connecting rod.

- Using a heat gun, heat the piston [approximately 60° - 70 C° (140° - 158 °F)] until the piston pin can be pushed in by hand without excessive force. From the front to the rear, insert the piston pin into the piston and the connecting rod.

- Assemble so that the front mark on the piston crown (A) and the oil holes (B) and the cylinder No. (C) on the connecting rod are positioned as shown.

- c. Install the piston pin snap ring (1) into the front of the piston.

- Check that the connecting rod moves smoothly.



11. Using a piston ring expander, install the piston rings. Assemble the components in their original positions.

**CAUTION:**

**Be careful not to damage the piston.**

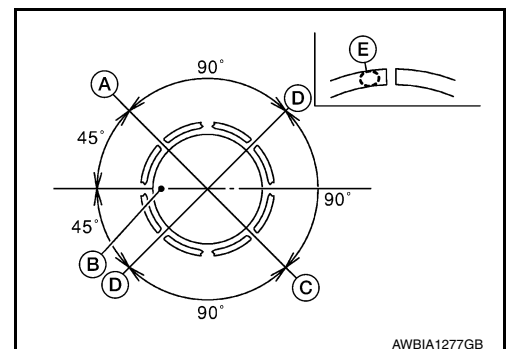
- Position each ring with the gap as shown, referencing the piston front mark as the starting point.

(A) : Top ring mating

(B) : Front mark

(C) : Second ring mating, oil ring, spacer mating

(D) : Oil ring upper or lower rail gap



**NOTE:**

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

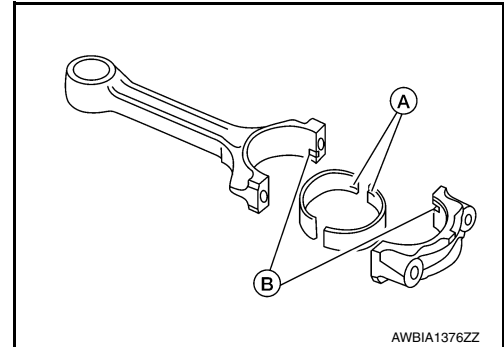
The gap of the upper rail on the oil ring shall face the direction opposite to that of the lower rail.

- Install the top ring and the second ring with the stamped surface (E) facing upward.

**Stamped mark : 2K (second ring)**

12. Install the connecting rod bearings to the connecting rod and the connecting rod cap. Assemble the components in their original positions.

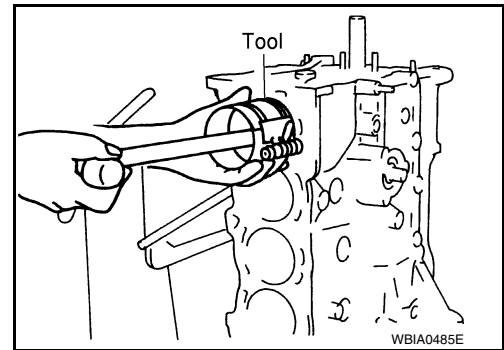
- When installing the connecting rod bearings, apply engine oil to the bearing friction surface (inside). Do not apply oil to the back surface, but thoroughly clean the back.
- When installing, align the connecting rod bearing stopper protrusion (A) with the notch (B) of the connecting rod to install.
- Check the oil holes on the connecting rod and those on the corresponding bearing are aligned.



13. Install the piston and connecting rod assembly using Tool. Assemble the components in their original positions.

**Tool number : EM03470000 (J-8037)**

- Rotate the crankshaft so the pin corresponding to the connecting rod to be installed is at the bottom dead center position.
- Apply engine oil sufficiently to the cylinder bore, piston, and crankshaft pin.
- Match the cylinder position number with the cylinder No. on the connecting rod for installation.
- Install the piston with the front mark on the piston crown facing the front of the engine using Tool.



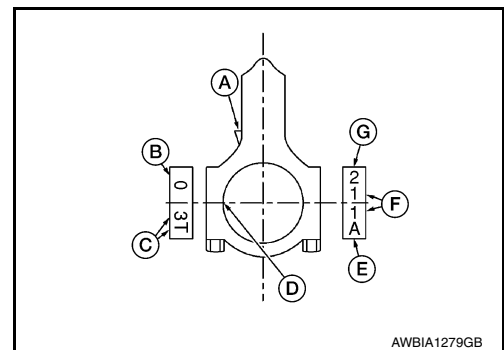
**CAUTION:**

**Be careful not to damage the crankshaft pin, resulting from an interference of the connecting rod big end.**

14. Install the connecting rod caps. Assemble the components in their original positions.

- Match the stamped cylinder number marks (F) on the connecting rod with those on the cap to install.

- (A) : Oil splash
- (B) : Small end diameter grade
- (C) : Reference code
- (D) : Bearing stopper groove
- (E) : Reference code
- (G) : Big end diameter grade

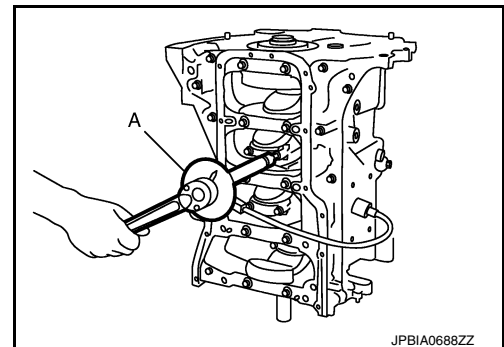


15. Tighten the connecting rod bolts using Tool (A) as follows:  
Apply engine oil to the threads and seats of the connecting rod bolts.

**CAUTION:**

**Check tightening angle. Do not judge angle by visual inspection.**

- Step 1 : 29.4 N·m (3.0 kg-m, 22 ft-lb)**
- Step 2 : 0 N·m**
- Step 3 : 19.6 N·m (2.0 kg-m, 14 lb-ft)**
- Step 4 : Rotate bolts 90° + 0.5°**



# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

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

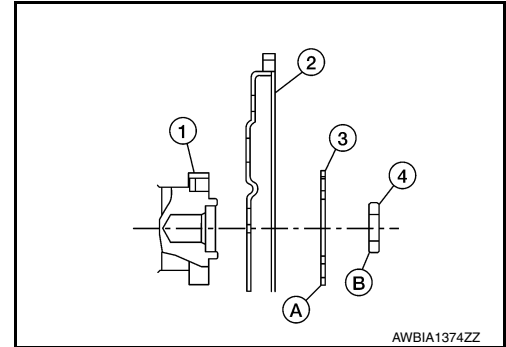
- Check the connecting rod side clearance. Refer to [EM-96. "Inspection After Disassembly"](#).
- After tightening the bolts, make sure that the crankshaft rotates smoothly.

## 16. Install drive plate (2).

- Install drive plate (2), reinforcement plate (3) and pilot converter (4) as shown.
- Using a drift with 33 mm (1.30 in) diameter, push pilot converter (4) into the end of the crankshaft (1).

(A) : Rounded

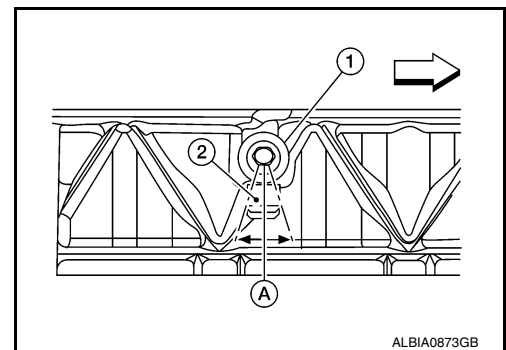
(B) : Chamfered



## 17. Install the knock sensor (1).

- Make sure that there is no foreign material on the cylinder block mating surface or the back surface of the knock sensor.
- Install the knock sensor with the connector (2) facing as shown (A).
- Be sure the knock sensor connector is within 15° of centerline (A).
- Do not tighten the bolts while holding the connector.
- Make sure that the knock sensor does not interfere with other parts.

⇐ : Front



### **CAUTION:**

**If the knock sensor is dropped, replace it with new one.**

## 18. Install the crankshaft position sensor (POS).

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

## Inspection After Disassembly

INFOID:000000009460511

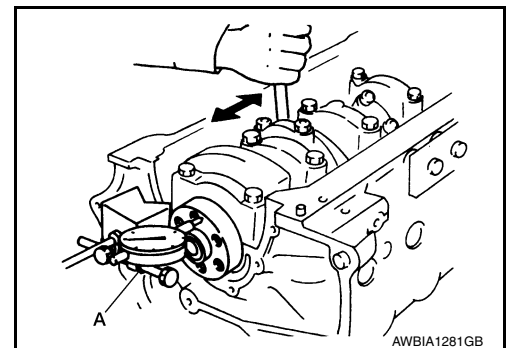
### CRANKSHAFT SIDE CLEARANCE

- Using a dial gauge (A), measure the clearance between the thrust bearings and the crankshaft arm when the crankshaft is moved fully forward or backward.

**Standard : 0.10 - 0.26 mm (0.0039 - 0.0102 in)**

**Limit : 0.30 mm (0.0118 in)**

- If the measured value exceeds the limit, replace the thrust bearings, and measure again. If it still exceeds the limit, replace the crankshaft.



### CONNECTING ROD SIDE CLEARANCE

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

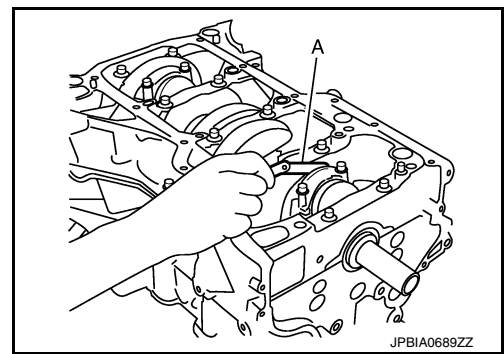
[QR25DE]

- Measure side clearance between connecting rod and crankshaft arm using a suitable tool (A).

**Standard : 0.20 - 0.35 mm (0.0079 - 0.0138 in)**

**Limit : 0.50 mm (0.0197 in)**

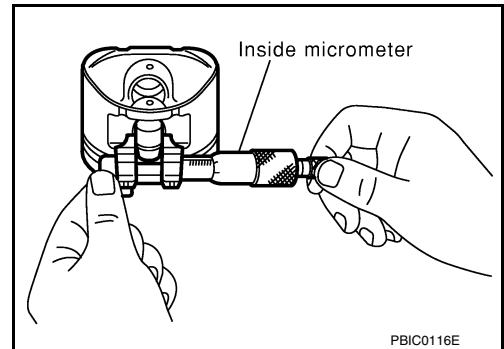
- If the measured value exceeds the limit, replace the connecting rod bearings, and measure again. If it still exceeds the limit, replace the crankshaft also.



## PISTON AND PISTON PIN CLEARANCE

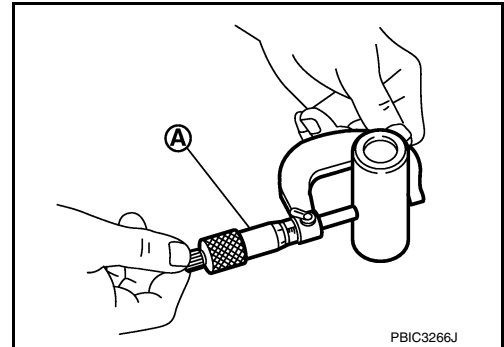
Diameter of Piston Pin Bore

- Measure the diameter of piston pin bore using an inside micrometer. Refer to [EM-111, "Standard and Limit"](#).



Outer Diameter of Piston Pin

- Measure outer diameter of piston pin using a suitable tool (A). Refer to [EM-111, "Standard and Limit"](#).



Piston to Piston Pin Clearance

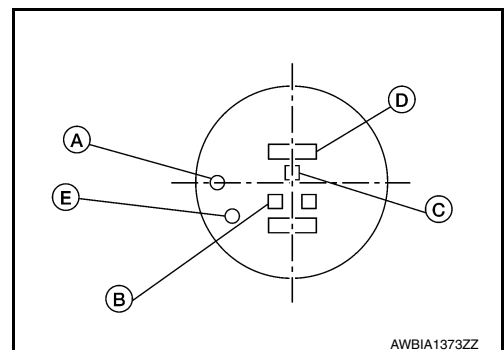
(Piston pin clearance) = (Piston pin bore diameter) – (Outer diameter of piston pin)

- (A) : Front mark
- (B) : Piston pin bore grade
- (C) : Piston grade I.D. stamp
- (D) : Piston crown I.D. code stamp
- (E) : ID mark

**Standard : 0.002 - 0.006 mm (0.0001 - 0.0002 in)**

- If clearance exceeds specification, replace either or both of piston/ piston pin assembly and connecting rod assembly with reference to specification of each parts.
- Use the piston selection table to replace piston/piston pin assembly. Refer to [EM-105, "How to Select Piston and Bearing"](#).
- Use the connecting rod bearing selection table to replace connecting rod. Refer to [EM-105, "How to Select Piston and Bearing"](#).

**NOTE:**



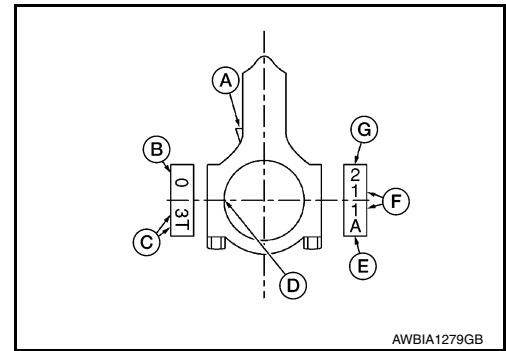
# CYLINDER BLOCK

## < UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- The connecting rod small end grade and piston pin hole (piston pin) grade are provided only for the parts installed at the plant. For service parts, no grades can be selected. Only 0 grade is available.

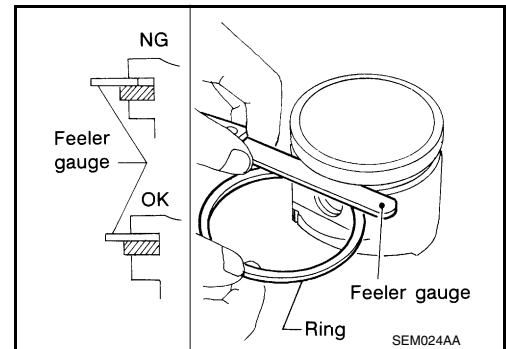
- (A) : Oil splash
- (B) : Small end diameter grade
- (C) : Reference code
- (D) : Bearing stopper groove
- (E) : Reference code
- (F) : Cylinder No.
- (G) : Big end diameter grade



- Follow the "CONNECTING ROD BUSHING OIL CLEARANCE (SMALL END)" procedure for the values for each grade at the plant.

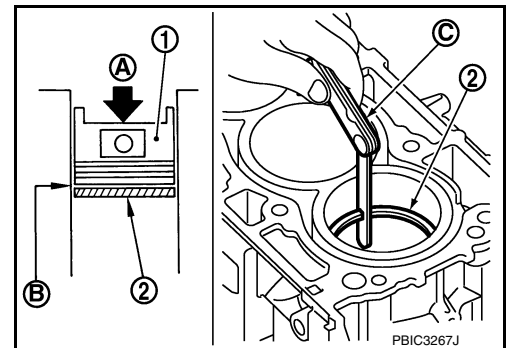
### PISTON RING SIDE CLEARANCE

- Measure side clearance of piston ring and piston ring groove using a feeler gauge. Refer to [EM-111, "Standard and Limit"](#).
- If out of specification, replace piston and/or piston ring assembly.



### PISTON RING END GAP

- Check if inner diameter of cylinder bore is within specification. Follow the "PISTON TO CYLINDER BORE CLEARANCE" procedure.
- Insert piston ring (2) to middle of cylinder (B) with piston (1), in the direction shown (A), and measure gap using feeler gauge (C). Refer to [EM-111, "Standard and Limit"](#).
- If out of specification, replace piston ring.



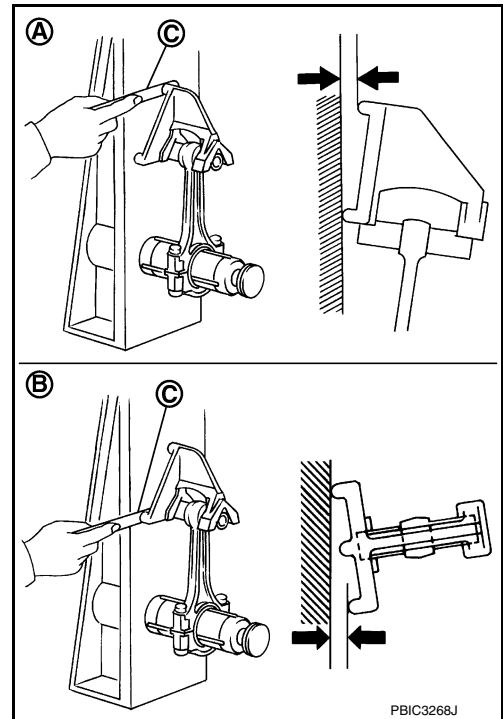
### CONNECTING ROD BEND AND TORSION

# CYLINDER BLOCK

## < UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

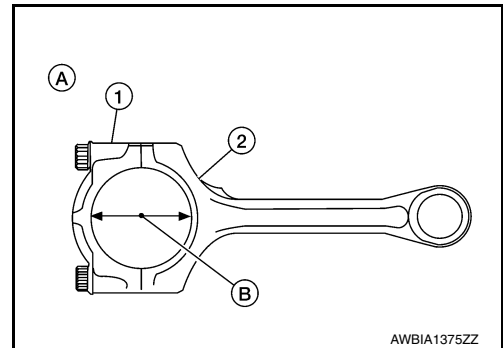
- Check with connecting rod aligner. Refer to [EM-111, "Standard and Limit"](#).
- If it exceeds the limit, replace connecting rod assembly.



### CONNECTING ROD BEARING (BIG END)

- Install the connecting rod cap (1) without the connecting rod bearing installed. After tightening the connecting rod bolt to the specified torque, measure the connecting rod big end inner diameter using an inside micrometer. Refer to [EM-111, "Standard and Limit"](#).

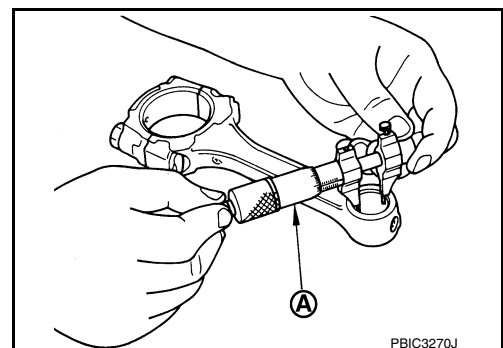
- (A) : Example
- (B) : Measuring direction of inner diameter
- (2) : Connecting rod



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

#### Inner Diameter of Connecting Rod (Small End)

- Measure inner diameter of bushing using suitable tool (A). Refer to [EM-111, "Standard and Limit"](#).



#### Outer Diameter of Piston Pin

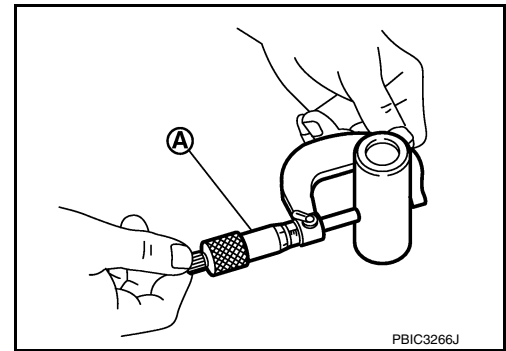


# CYLINDER BLOCK

## < UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Measure outer diameter of piston pin using suitable tool (A). Refer to [EM-111, "Standard and Limit"](#).

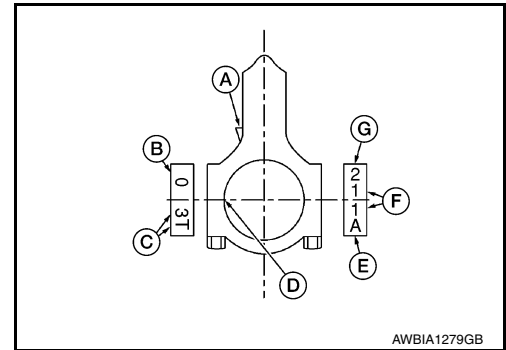


Piston Pin to Connecting Rod Bushing Clearance (Small End)  
 (Piston pin to connecting rod bushing clearance (small end)) = (Inner diameter of connecting rod small end) – (Outer diameter of piston pin)

**Standard : 0.005 - 0.017 mm (0.0002 - 0.0007 in)**

- If the measured value exceeds the standard, replace the connecting rod assembly and/or piston and piston pin assembly.

- (A) : Oil splash
- (B) : Small end diameter grade
- (C) : Reference code
- (D) : Bearing stopper groove
- (E) : Reference code
- (F) : Cylinder No.
- (G) : Big end diameter grade



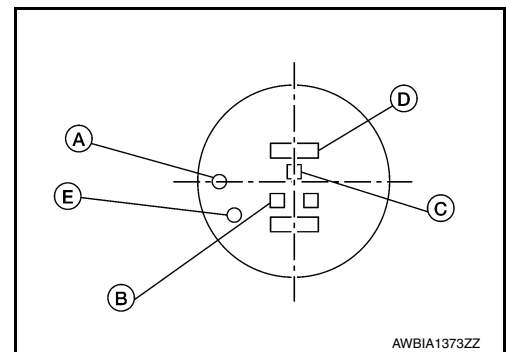
- If replacing the piston and piston pin assembly, use the "Piston Selection Table" to select the piston corresponding to the applicable bore grade of the cylinder block to be used. Refer to [EM-105, "How to Select Piston and Bearing"](#).

### Factory Installed Parts Grading:

- Service parts apply only to grade 0 (B).

Piston Pin Grade	Unit: mm (in)	
	0	1
Connecting rod small end inner bushing diameter	20.000 - 20.006 (0.7874 - 0.7876)	20.006 - 20.012 (0.7876 - 0.7879)
Piston pin outer diameter	19.989 - 19.995 (0.7870 - 0.7872)	19.995 - 20.001 (0.7872 - 0.7874)
Piston pin bore diameter	19.993 - 19.999 (0.7871 - 0.7874)	19.999 - 20.005 (0.7874 - 0.7876)

- (A) : Front mark
- (B) : Piston pin bore grade
- (C) : Piston grade I.D. stamp
- (D) : Piston crown I.D. code stamp
- (E) : ID mark



### CYLINDER BLOCK DISTORTION

- Using a scraper, remove gasket on the cylinder block surface, and also remove oil, scale, carbon, or other contamination.

**CAUTION:**

**Be careful not to allow gasket debris to enter the oil or coolant passages.**



# CYLINDER BLOCK

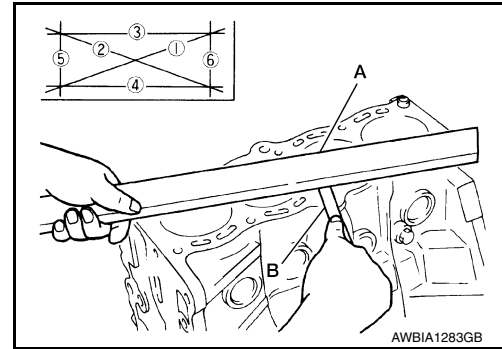
## < UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Measure the distortion on the block upper face at some different points in 6 directions using a suitable tool (A).

**Limit : 0.1 mm (0.004 in)**

- If out of the distortion limit, replace the cylinder block and lower block they are machined together as an assembly.



## INNER DIAMETER OF MAIN BEARING HOUSING

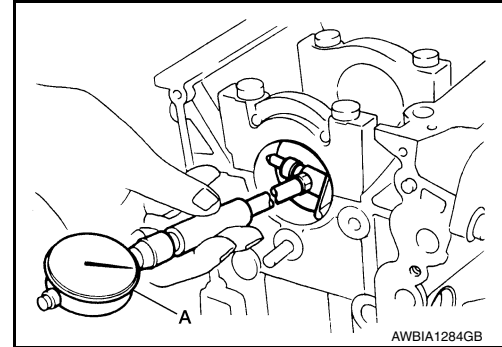
- Install the main bearing caps with the main bearings removed and tighten the bolts to the specified torque. Refer to [EM-88, "Disassembly and Assembly"](#).
- Using a bore gauge (A), measure the inner diameter of the main bearing housing.

**Standard : 58.944 - 58.968 mm (2.3206 - 2.3216 in)**

- If out of the standard, replace the cylinder block and lower cylinder block assembly.

### NOTE:

These components cannot be replaced as a single unit because they were processed together.



## PISTON TO CYLINDER BORE CLEARANCE

### Inner Diameter of Cylinder Bore

- Using a bore gauge, measure cylinder bore for wear, out-of-round and taper at 6 different points on each cylinder. (Y and X directions at C, D, and E). The Y axis is in the longitudinal direction of the engine.

### NOTE:

When determining cylinder bore grade, measure cylinder bore at (D) position. Refer to [EM-111, "Standard and Limit"](#).

**Standard : Refer to [EM-111, "Standard and Limit"](#).**

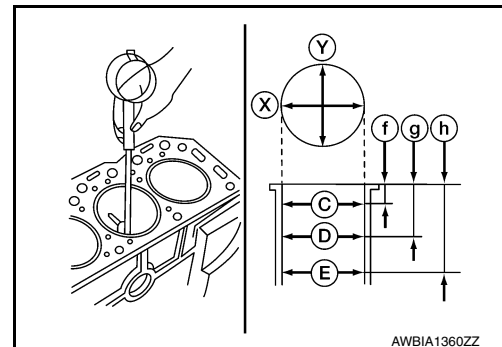
**Out-of-round : Difference between (Y) and (X).**

**Taper : Difference between (C) and (E).**

**Dimension (f) : 10 mm (0.39 in)**

**Dimension (g) : 60 mm (2.36 in)**

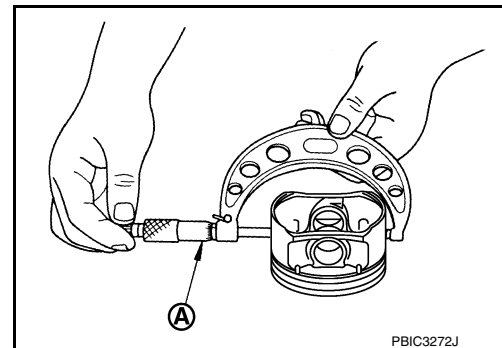
**Dimension (h) : 120 mm (4.72 in)**



- If there are scratches and/or seizure on the cylinder inner wall, hone the inner wall.

### Outer Diameter of Piston

- Measure piston skirt diameter using a suitable tool (A). Refer to [EM-111, "Standard and Limit"](#).
- Measure point (distance from the top): 37.5 mm (1.476 in).



### Piston to Cylinder Bore Clearance

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

- Calculate by outer diameter of piston skirt and inner diameter of cylinder (direction X, position B).  
(Clearance) = (Inner diameter of cylinder) – (Outer diameter of piston skirt).

**Standard : 0.010 - 0.030 mm (0.0004 - 0.0012 in)**

**Limit : 0.08 mm (0.0031 in)**

- If it exceeds the limit, replace piston/piston pin assembly.

Reboring Cylinder Bore

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

**Rebored size calculation:  $D = A + B - C$**

**(D): Bored diameter**

**(A): Piston diameter as measured**

**(B): Piston-to-bore clearance (standard value)**

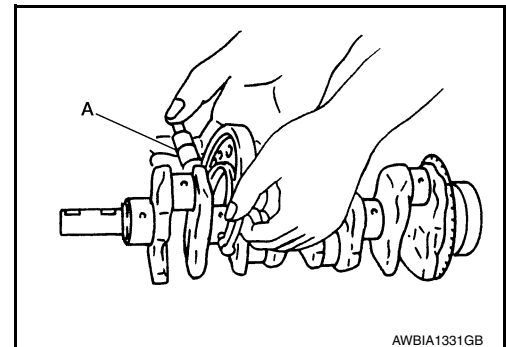
**(C): Honing allowance 0.02 mm (0.0008 in)**

2. Install lower cylinder block, and tighten to the specified torque. Otherwise, cylinder bores may be distorted in final assembly.
3. 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.**
4. Hone cylinders to obtain specified piston-to-bore clearance.
5. Measure finished cylinder bore for out-of-round and taper.
  - **Measurement should be done after cylinder bore cools down.**

OUTER DIAMETER OF CRANKSHAFT JOURNAL

- Measure outer diameter of crankshaft journals using suitable tool (A).

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



OUTER DIAMETER OF CRANKSHAFT PIN

- Measure outer diameter of crankshaft pin using a suitable tool.

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

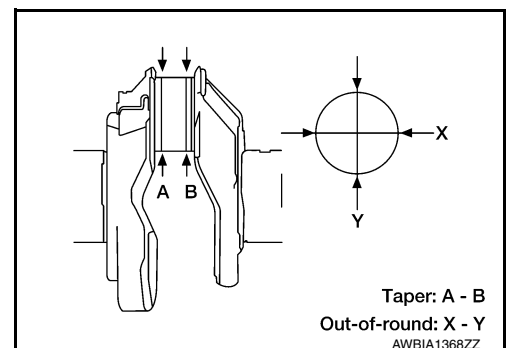
OUT-OF-ROUND AND TAPER OF CRANKSHAFT

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

**Standard**

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

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



# CYLINDER BLOCK

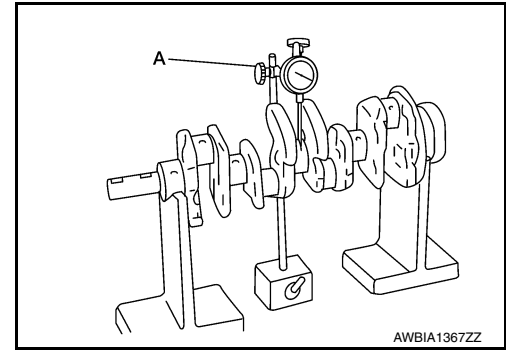
< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

## CRANKSHAFT RUNOUT

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

**Limit** : Less than 0.05 mm (0.002 in)



## OIL CLEARANCE OF CONNECTING ROD BEARING

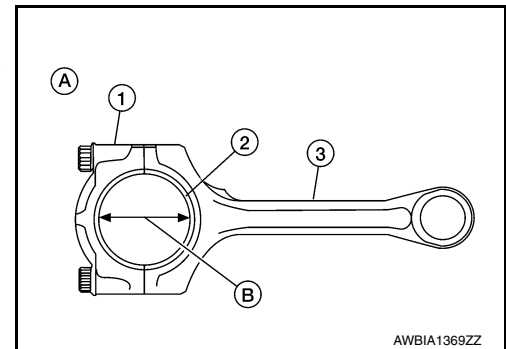
### Method of Measurement

- Install the connecting rod bearings (2) to the connecting rod (3) and the cap (1), and tighten the connecting rod bolts to the specified torque. Using an inside micrometer measure the inner diameter of connecting rod bearing (B).
- (Oil clearance) = (Inner diameter of connecting rod bearing) – (Outer diameter of crankshaft pin)

(A) Example

**Standard** : 0.035 - 0.045 mm (0.0014 - 0.0018 in)

**Limit** : 0.10 mm (0.0039 in)



- If clearance cannot be adjusted within the standard, grind crankshaft pin and use undersized bearing. Refer to [EM-105, "How to Select Piston and Bearing"](#).

### Method of Using Plastigage

- Remove oil and dust on the crankshaft pin and the surfaces of each bearing completely.
- Cut the 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 bolts to the specified torque.

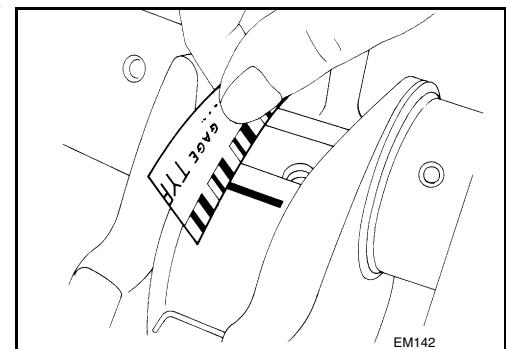
**CAUTION:**

**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 limit is same as that described in the method by calculation.



## OIL CLEARANCE OF MAIN BEARING

### Method of Measurement

- Install the main bearings to the cylinder block and bearing cap. Measure the main bearing inner diameter with the bearing cap bolt tightened to the specified torque.
- (Oil clearance) = (Inner diameter of main bearing) – (Outer diameter of crankshaft journal)

**Standard:**

**No. 1, 3, and 5 journals** : 0.012 - 0.022 mm (0.0005 - 0.0009 in)

**No. 2 and 4 journals** : 0.018 - 0.028 mm (0.0007 - 0.0011 in)

**Limit** : 0.1 mm (0.004 in)

- If the measured value exceeds the limit, select main bearings referring to the main bearing inner diameter and crankshaft journal outer diameter, so that the oil clearance satisfies the standard. Refer to [EM-105, "How to Select Piston and Bearing"](#).

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

## Method of Using Plastigage

- Remove oil and dust on the crankshaft journal and the surfaces of each bearing completely.
- Cut the Plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Tighten the main bearing bolts to the specified torque.

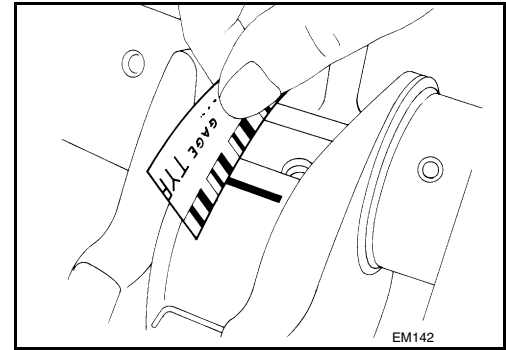
### CAUTION:

**Do not rotate the crankshaft.**

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

### NOTE:

The procedure when the measured value exceeds the limit is same as that described in the "Method by Calculation".

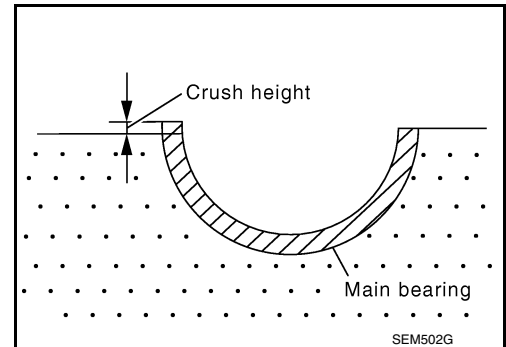


## CRUSH HEIGHT OF MAIN BEARING

- When the bearing cap is removed after being tightened to the specified torque with main bearings installed, the tip end of bearing must protrude.

**Standard** : There must be crush height.

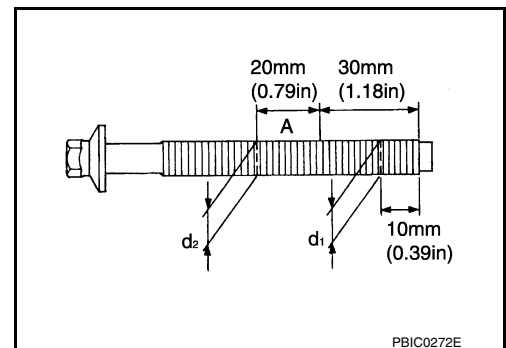
- If the standard is not met, replace main bearings.



## OUTER DIAMETER OF LOWER CYLINDER BLOCK BOLT

- Perform only with M10 (0.39 in) bolts.
- Measure outer diameters ( $d_1$ ,  $d_2$ ) at two positions as shown.
- Measure  $d_2$  at a point within area (A) as shown.
- When the value of  $d_1 - d_2$  exceeds the limit (a large difference in dimensions), replace the bolt with a new one.

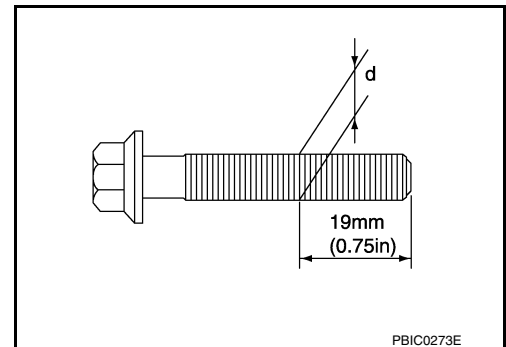
**Limit** : 0.13 mm (0.0051 in)



## OUTER DIAMETER OF CONNECTING ROD BOLT

- Measure outer diameter ( $d$ ) at position as shown.
- When ( $d$ ) exceeds the limit (when it becomes thinner), replace the bolt with a new one.

**Limit** : 7.75 mm (0.3051 in) or less



# HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

## HOW TO SELECT PISTON AND BEARING

### How to Select Piston and Bearing

INFOID:00000009460512

#### DESCRIPTION

Selection points	Selection parts	Selection items	Selection methods
Between cylinder block to crankshaft	Main bearing	Main bearing grade (bearing thickness)	Determined by match of cylinder block bearing housing grade (inner diameter of housing) and crankshaft journal grade (outer diameter of journal)
Between crankshaft to connecting rod	Connecting rod bearing	Connecting rod bearing grade (bearing thickness)	Combining service grades for connecting rod big end inner diameter and crankshaft pin outer diameter determine connecting rod bearing selection
Between cylinder block to piston	Piston and piston pin assembly (The piston is available together with piston pin as an assembly)	Piston grade (piston outer diameter)	Piston grade = cylinder bore grade (inner diameter of bore)
*Between piston to connecting rod	—	—	—

\*For the service parts, the grade for fitting cannot be selected between a piston pin and a connecting rod. (Only 0 grade is available.) The information at the shipment from the plant is described as a reference.

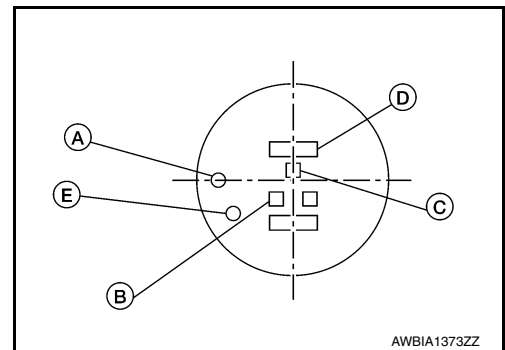
- The identification grade stamped on each part is the grade for the dimension measured in new condition. This grade cannot apply to reused parts.
- For reused or repaired parts, measure the dimension accurately. Determine the grade by comparing the measurement with the values of each selection table.
- For details of the measurement method of each part, the reuse standards, and the selection method of the selective fitting parts, follow the applicable procedures.

#### HOW TO SELECT A PISTON

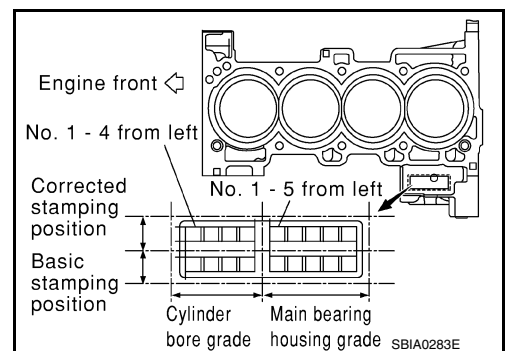
##### When New Cylinder Block is Used:

- Check the cylinder bore grade on rear left side of cylinder block, and select a piston of the same grade.

- (A) : Front mark
- (B) : Piston pin bore grade
- (C) : Piston grade I.D. stamp
- (D) : Piston crown I.D. code stamp
- (E) : ID marks



- If there is a corrected stamp mark on the cylinder block, use it as a correct reference.



# HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

## When a Cylinder Block is Reused:

1. Measure the cylinder block bore inner diameter.
2. Determine the bore grade by comparing the measurement with the values under the cylinder bore inner diameter of the "Piston Selection Table". Select the piston of the same grade.

## Piston Selection Table

- For the piston selection table, refer to [EM-111, "Standard and Limit"](#).

### NOTE:

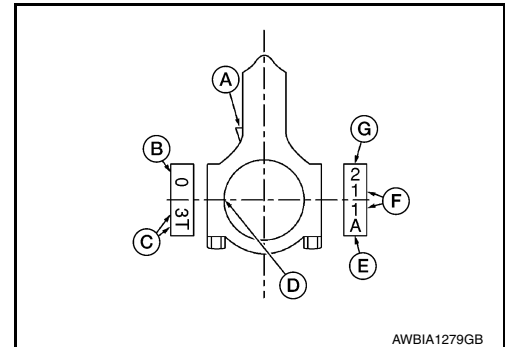
- The piston is available together with piston pin as an assembly.
- The piston pin (piston pin bore) grade is provided only for the parts installed at the plant. For service parts, no grades can be selected. Only 0 grade is available.

## HOW TO SELECT A CONNECTING ROD BEARING

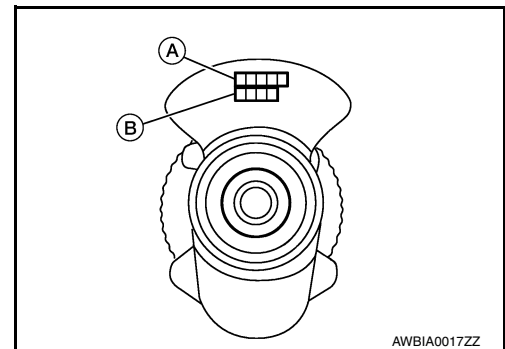
### When New Connecting Rod and Crankshaft are Used:

1. Apply big end inside diameter grade stamped on connecting rod side face to the row in the "Connecting Rod Bearing Selection Table".

- (A) : Oil splash
- (B) : Small end diameter grade
- (C) : Reference code
- (D) : Bearing stopper groove
- (E) : Reference code
- (F) : Cylinder No.
- (G) : Big end diameter grade



2. Apply pin diameter grade (B) stamped on crankshaft front side to the column in the "Connecting Rod Bearing Selection Table".
  - Journal diameter grade (A)
3. Read the symbol at the cross point of selected row and column in the "Connecting Rod Bearing Selection Table".
4. Apply the symbol obtained to connecting rod bearing grade table to select.



### When Crankshaft and Connecting Rod are Reused:

1. Measure dimensions of the big end inner diameter of connecting rod and outer diameter of crankshaft pin individually.
2. Apply the dimension measured to the "Connecting Rod Bearing Selection Table" below.

# HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

**Connecting Rod Bearing Selection Table**

Connecting rod big end. inner diameter		Crankshaft pin outer diameter		Mark												
				Inner diameter Unit: mm (in)												
Mark	Outer diameter Unit: mm (in)	0	1	2	3	4	5	6	7	8	9	A	B	C		
		48.000 - 48.001 (1.8898 - 1.8898)	48.001 - 48.002 (1.8898 - 1.8898)	48.002 - 48.003 (1.8898 - 1.8899)	48.003 - 48.004 (1.8899 - 1.8899)	48.004 - 48.005 (1.8899 - 1.8900)	48.005 - 48.006 (1.8890 - 1.8900)	48.006 - 48.007 (1.8890 - 1.8900)	48.007 - 48.008 (1.8890 - 1.8901)	48.008 - 48.009 (1.8901 - 1.8901)	48.009 - 48.010 (1.8901 - 1.8902)	48.010 - 48.011 (1.8902 - 1.8902)	48.011 - 48.012 (1.8902 - 1.8902)	48.012 - 48.013 (1.8902 - 1.8903)		
A	44.974 - 44.973 (1.7706 - 1.7706)	0	0	0	0	01	01	01	1	1	1	12	12	12		
B	44.973 - 44.972 (1.7706 - 1.7705)	0	0	0	01	01	01	1	1	1	1	12	12	12		
C	44.972 - 44.971 (1.7705 - 1.7705)	0	0	01	01	01	1	1	1	12	12	12	2	2		
D	44.971 - 44.970 (1.7705 - 1.7705)	0	01	01	01	1	1	1	1	12	12	12	2	2		
E	44.970 - 44.969 (1.7705 - 1.7704)	01	01	01	1	1	1	12	12	12	2	2	2	23		
F	44.969 - 44.968 (1.7704 - 1.7704)	01	01	1	1	1	12	12	12	2	2	2	2	23		
G	44.968 - 44.967 (1.7704 - 1.7704)	01	1	1	1	12	12	12	2	2	2	23	23	23		
H	44.967 - 44.966 (1.7704 - 1.7703)	1	1	1	12	12	12	2	2	2	23	23	23	3		
J	44.966 - 44.965 (1.7703 - 1.7703)	1	1	12	12	12	2	2	2	23	23	23	3	3		
K	44.965 - 44.964 (1.7703 - 1.7702)	1	12	12	12	2	2	2	23	23	23	3	3	3		
L	44.964 - 44.963 (1.7702 - 1.7702)	12	12	12	2	2	2	23	23	23	3	3	3	34		
M	44.963 - 44.962 (1.7702 - 1.7702)	12	12	2	2	2	23	23	23	3	3	3	3	34		
N	44.962 - 44.961 (1.7702 - 1.7701)	12	2	2	2	23	23	23	3	3	3	34	34	34		
P	44.961 - 44.960 (1.7701 - 1.7701)	2	2	2	23	23	23	3	3	3	34	34	34	4		
R	44.960 - 44.959 (1.7701 - 1.7700)	2	2	23	23	23	3	3	3	34	34	34	4	4		
S	44.959 - 44.958 (1.7700 - 1.7700)	2	23	23	23	3	3	3	34	34	34	4	4	4		
T	44.958 - 44.957 (1.7700 - 1.7700)	23	23	23	3	3	3	34	34	34	4	4	4	4		
U	44.957 - 44.956 (1.7700 - 1.7699)	23	23	3	3	3	34	34	34	4	4	4	4	4		

AWBIA0021GB

Connecting Rod Bearing Grade Table. Refer to [EM-111, "Standard and Limit"](#).

### Undersize Bearing Usage Guide

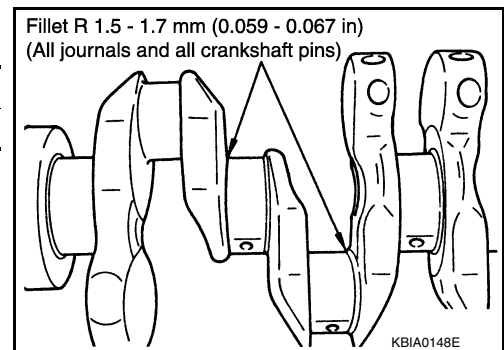
- When the specified oil clearance is not obtained with standard size connecting rod bearing, use undersize (US) bearing.
- When using undersize bearing, measure the bearing inner diameter with bearing installed, and grind the crankshaft pin so that the oil clearance satisfies the standard.

### Bearing Undersize Table

Unit: mm (in)	
Size U.S.	Thickness
0.25 (0.0098)	1.622 - 1.630 (0.0639 - 0.0642)

### CAUTION:

In grinding the crankshaft pin to use undersize bearings, do not damage the fillet R (All crankshaft pins).



### HOW TO SELECT A MAIN BEARING

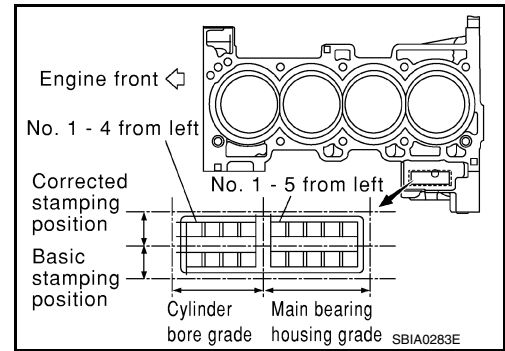
When New Cylinder Block and Crankshaft are Used:

# HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

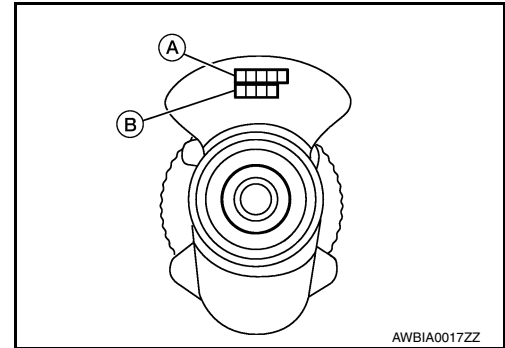
[QR25DE]

1. "Main Bearing Selection Table" rows correspond to bearing housing grade on rear left side of cylinder block.
  - If there is a corrected stamp mark on the cylinder block, use it as a correct reference.



2. Apply journal diameter grade (A) stamped on crankshaft front side to column in "Main Bearing Selection Table".

(B) : Pin diameter grade



3. Find value at crossing of row and column in "Main Bearing Selection Table".

**CAUTION:**

- There are two main bearing selection tables. One is for odd-numbered journals (1, 3, and 5) and the other is for even-numbered journals (2 and 4). Make certain to use the appropriate table. This is due to differences in the specified clearances.

4. Apply the symbol obtained to "Main Bearing Grade Table" to select.

**NOTE:**

- Service parts are available as a set of both upper and lower.

**When Cylinder Block and Crankshaft are Reused:**

1. Measure inner diameter of cylinder block main bearing housing and outer diameter of crankshaft journal.
2. Apply measurement in above step 1 to the "Main Bearing Selection Table".
3. Follow steps 3 and 4 in "When New Cylinder Block and Crankshaft are Used".



# HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

Main Bearing Selection Table (No.1, 3, and No.5 journals)

Cylinder block main bearing housing inner diameter	Crankshaft journal outer diameter	Mark	Mark		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7
			Outer diameter Unit: mm (in)	Inner diameter Unit: mm (in)	58.944 - 58.945 (2.3206 - 2.3207)	58.945 - 58.946 (2.3207 - 2.3207)	58.946 - 58.947 (2.3207 - 2.3207)	58.947 - 58.948 (2.3207 - 2.3208)	58.948 - 58.949 (2.3208 - 2.3208)	58.949 - 58.950 (2.3208 - 2.3209)	58.950 - 58.951 (2.3209 - 2.3209)	58.951 - 58.952 (2.3209 - 2.3209)	58.952 - 58.953 (2.3209 - 2.3210)	58.953 - 58.954 (2.3210 - 2.3210)	58.954 - 58.955 (2.3210 - 2.3211)	58.955 - 58.956 (2.3211 - 2.3211)	58.956 - 58.957 (2.3211 - 2.3211)	58.957 - 58.958 (2.3212 - 2.3212)	58.958 - 58.959 (2.3212 - 2.3212)	58.959 - 58.960 (2.3212 - 2.3213)	58.960 - 58.961 (2.3213 - 2.3213)	58.961 - 58.962 (2.3213 - 2.3213)	58.962 - 58.963 (2.3213 - 2.3214)	58.963 - 58.964 (2.3214 - 2.3214)	58.964 - 58.965 (2.3214 - 2.3215)	58.965 - 58.966 (2.3215 - 2.3215)	58.966 - 58.967 (2.3215 - 2.3215)	58.967 - 58.968 (2.3215 - 2.3216)
A	54.979 - 54.978 (2.1645 - 2.1645)	0	0	01	01	01	1	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4
B	54.978 - 54.977 (2.1645 - 2.1644)	0	01	01	01	1	1	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4
C	54.977 - 54.976 (2.1644 - 2.1644)	01	01	01	1	1	1	1	12	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	
D	54.976 - 54.975 (2.1644 - 2.1644)	01	01	1	1	1	12	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45
E	54.975 - 54.974 (2.1644 - 2.1643)	01	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	45	45
F	54.974 - 54.973 (2.1643 - 2.1643)	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	45	45	45
G	54.973 - 54.972 (2.1643 - 2.1642)	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	45	45	5
H	54.972 - 54.971 (2.1642 - 2.1642)	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5
J	54.971 - 54.970 (2.1642 - 2.1642)	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5
K	54.970 - 54.969 (2.1642 - 2.1641)	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56
L	54.969 - 54.968 (2.1641 - 2.1641)	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56
M	54.968 - 54.967 (2.1641 - 2.1641)	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56
N	54.967 - 54.966 (2.1641 - 2.1640)	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6
P	54.966 - 54.965 (2.1640 - 2.1640)	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6
R	54.965 - 54.964 (2.1640 - 2.1639)	23	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6
S	54.964 - 54.963 (2.1639 - 2.1639)	23	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67
T	54.963 - 54.962 (2.1639 - 2.1639)	23	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67
U	54.962 - 54.961 (2.1639 - 2.1638)	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	67
V	54.961 - 54.960 (2.1638 - 2.1638)	3	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	67	7
W	54.960 - 54.959 (2.1638 - 2.1637)	3	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	67	7	7
X	54.959 - 54.958 (2.1637 - 2.1637)	34	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	67	7	7	7
Y	54.958 - 54.957 (2.1637 - 2.1637)	34	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	67	7	7	7	7
4	54.957 - 54.956 (2.1637 - 2.1636)	34	4	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	67	7	7	7	7	7
7	54.956 - 54.955 (2.1636 - 2.1636)	4	4	4	45	45	45	5	5	5	5	56	56	56	6	6	6	6	67	67	67	7	7	7	7	7	7	7

KBIA0149E

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# HOW TO SELECT PISTON AND BEARING

< UNIT DISASSEMBLY AND ASSEMBLY >

[QR25DE]

Main Bearing Selection Table (No.2, and 4 journals)

Cylinder block main bearing housing inner diameter  Crankshaft journal outer diameter		Mark																													
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7						
Mark	Outer diameter Unit: mm (in)	Inner diameter Unit: mm (in)																													
		56.944 - 56.945 (2.3206 - 2.3207)	56.945 - 56.946 (2.3207 - 2.3207)	56.946 - 56.947 (2.3207 - 2.3207)	56.947 - 56.948 (2.3207 - 2.3208)	56.948 - 56.949 (2.3208 - 2.3208)	56.949 - 56.950 (2.3208 - 2.3209)	56.950 - 56.951 (2.3209 - 2.3209)	56.951 - 56.952 (2.3209 - 2.3209)	56.952 - 56.953 (2.3209 - 2.3210)	56.953 - 56.954 (2.3210 - 2.3210)	56.954 - 56.955 (2.3210 - 2.3211)	56.955 - 56.956 (2.3211 - 2.3211)	56.956 - 56.957 (2.3211 - 2.3211)	56.957 - 56.958 (2.3212 - 2.3212)	56.958 - 56.959 (2.3212 - 2.3212)	56.959 - 56.960 (2.3212 - 2.3213)	56.960 - 56.961 (2.3213 - 2.3213)	56.961 - 56.962 (2.3213 - 2.3213)	56.962 - 56.963 (2.3213 - 2.3214)	56.963 - 56.964 (2.3214 - 2.3214)	56.964 - 56.965 (2.3214 - 2.3215)	56.965 - 56.966 (2.3215 - 2.3215)	56.966 - 56.967 (2.3215 - 2.3215)	56.967 - 56.968 (2.3215 - 2.3216)						
A	54.979 - 54.978 (2.1645 - 2.1645)	0	0	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3			
B	54.978 - 54.977 (2.1645 - 2.1644)	0	0	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3			
C	54.977 - 54.976 (2.1644 - 2.1644)	0	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3				
D	54.976 - 54.975 (2.1644 - 2.1644)	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	2	2	23	23	23	3	3	3	34				
E	54.975 - 54.974 (2.1644 - 2.1643)	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	2	2	23	23	23	3	3	3	34	34				
F	54.974 - 54.973 (2.1643 - 2.1643)	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	2	2	2	23	23	23	3	3	3	34	34				
G	54.973 - 54.972 (2.1643 - 2.1642)	0	0	01	01	01	1	1	1	12	12	12	2	2	2	2	2	2	2	23	23	23	3	3	3	34	34				
H	54.972 - 54.971 (2.1642 - 2.1642)	0	01	01	01	1	1	1	12	12	12	2	2	2	2	2	2	2	2	23	23	23	3	3	3	34	34				
J	54.971 - 54.970 (2.1642 - 2.1642)	01	01	01	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4				
K	54.970 - 54.969 (2.1642 - 2.1641)	01	01	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	45				
L	54.969 - 54.968 (2.1641 - 2.1641)	01	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	3	3	34	34	34	4	4	4	45				
M	54.968 - 54.967 (2.1641 - 2.1641)	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	3	3	3	34	34	34	4	4	4	45				
N	54.967 - 54.966 (2.1641 - 2.1640)	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	3	3	3	3	34	34	34	4	4	4	45				
P	54.966 - 54.965 (2.1640 - 2.1640)	1	12	12	12	2	2	2	2	2	23	23	23	3	3	3	3	3	3	3	34	34	34	4	4	4	45				
R	54.965 - 54.964 (2.1640 - 2.1639)	12	12	12	2	2	2	2	2	23	23	23	3	3	3	3	3	3	3	3	34	34	34	4	4	4	45				
S	54.964 - 54.963 (2.1639 - 2.1639)	12	12	2	2	2	23	23	23	3	3	3	3	3	34	34	34	4	4	4	4	45	45	45	5	5	56				
T	54.963 - 54.962 (2.1639 - 2.1639)	12	2	2	2	23	23	23	3	3	3	3	3	34	34	34	4	4	4	4	4	45	45	45	5	5	56				
U	54.962 - 54.961 (2.1639 - 2.1638)	2	2	2	23	23	23	3	3	3	3	3	34	34	34	4	4	4	4	4	4	45	45	45	5	5	56				
V	54.961 - 54.960 (2.1638 - 2.1638)	2	2	23	23	23	3	3	3	3	3	34	34	34	4	4	4	4	4	4	4	45	45	45	5	5	56				
W	54.960 - 54.959 (2.1638 - 2.1637)	2	23	23	23	3	3	3	3	3	34	34	34	4	4	4	4	4	4	4	4	45	45	45	5	5	56				
X	54.959 - 54.958 (2.1637 - 2.1637)	23	23	23	3	3	3	3	3	3	34	34	34	4	4	4	4	4	4	4	4	45	45	45	5	5	56				
Y	54.958 - 54.957 (2.1637 - 2.1637)	23	23	3	3	3	3	3	3	3	34	34	34	4	4	4	4	4	4	4	4	45	45	45	5	5	56				
4	54.957 - 54.956 (2.1637 - 2.1636)	23	3	3	3	3	3	3	3	3	34	34	34	4	4	4	4	4	4	4	4	45	45	45	5	5	56				
7	54.956 - 54.955 (2.1636 - 2.1636)	3	3	3	3	3	3	3	3	3	34	34	34	4	4	4	4	4	4	4	4	45	45	45	5	5	56				

KBIA0150E

Main Bearing Grade Table (All Journals) Refer to [EM-111, "Standard and Limit"](#).

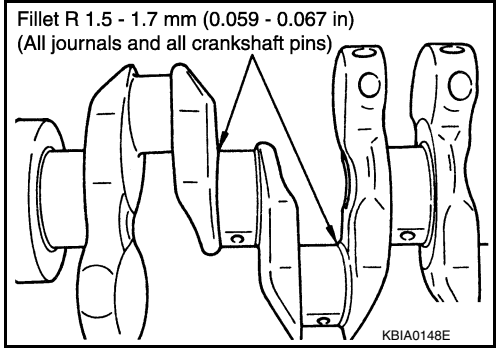
**Use Undersize Bearing Usage Guide**

- Use undersize (U.S.) bearing when oil clearance with standard size main bearing is not within specification.
- When using undersize (U.S.) bearing, measure the bearing inner diameter with the bearing installed and grind journal until oil clearance falls within specification.

**Bearing Undersize Table**

Unit: mm (in)	
Size U.S.	Thickness
0.25 (0.0098)	2.106 - 2.114 (0.0829 - 0.0832)

**CAUTION:**  
Do not damage fillet R when grinding crankshaft journal in order to use an undersize bearing (all journals).



# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

## SERVICE DATA AND SPECIFICATIONS (SDS)

### SERVICE DATA AND SPECIFICATIONS (SDS)

#### Standard and Limit

INFOID:000000009460513



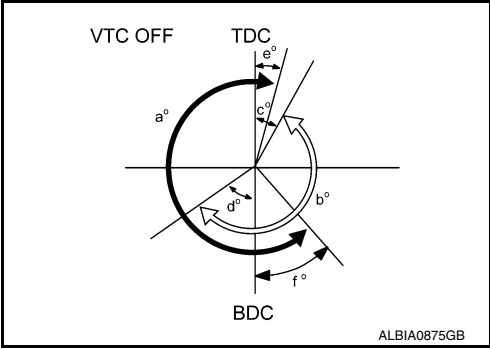
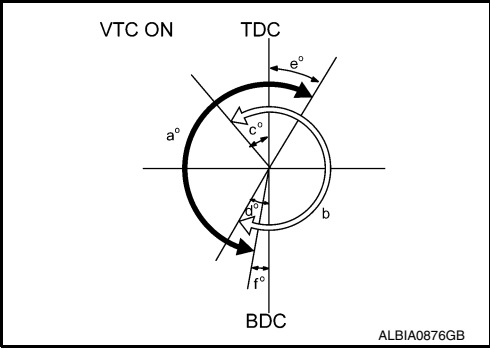
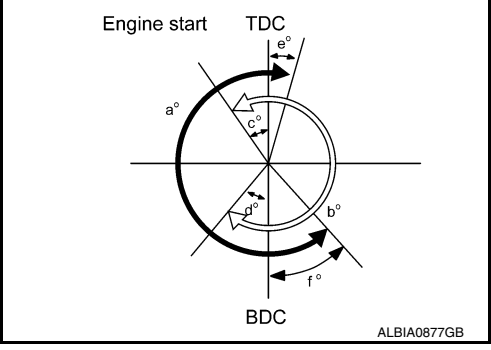
A  
EM

#### GENERAL SPECIFICATIONS

Cylinder arrangement		In-line 4
Displacement cm <sup>3</sup> (in <sup>3</sup> )		2,488 (151.82)
Bore and stroke mm (in)		89.0 x 100 (3.50 x 3.94)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Compression ratio		10.0:1
Compression pressure kPa (kg/cm <sup>2</sup> , psi) / 250 rpm	Standard	1410 (14.4, 204.5)
	Minimum	1220 (12.4, 176.9)
	Differential limit between cylinders	100 (1.0, 14)

#### VALVE TIMING

Unit: degree

Valve timing  Intake valve  Exhaust valve						
						
	a	b	c	d	e	f
VTC Minimum phasing (Mechanical) *1	224	244	5	69	3	41
VTC Maximum phasing (Mechanical) *2	224	244	35	29	48	4
Intermediate lock phasing (Mechanical) *3	224	244	5	59	3	41

\*1: When running at idle with engine coolant temperature more than 60°C (140°F).

C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

## < SERVICE DATA AND SPECIFICATIONS (SDS)

\*2: When the intake or exhaust valve opening angle is at the maximum.

\*3: When starting the engine with engine coolant temperature 60°C (140°F) or less.

### DRIVE BELTS

Tension of drive belts	Auto adjustment by drive belt auto-tensioner
------------------------	--

### EXHAUST MANIFOLD

Unit: mm (in)

Surface distortion	Description	Limit
	Exhaust manifold	0.3 (0.012)

### SPARK PLUG

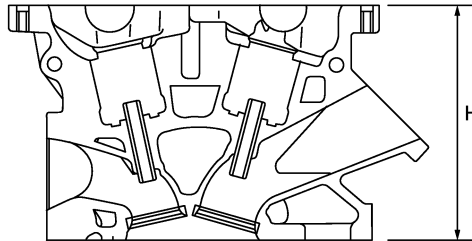
Unit: mm (in)

Make	DENSO	
Type*	Standard	FXE20HE11C
Gap (nominal)	1.1 (0.043)	

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

### CYLINDER HEAD

Unit: mm (in)



Nominal cylinder head height:  
H = 129.4 mm (5.09 in)

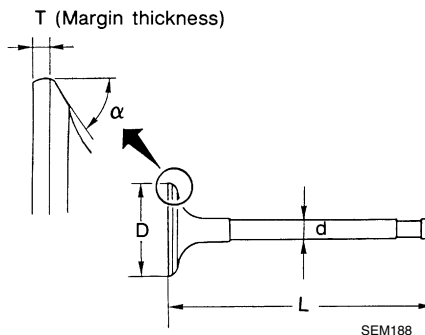
PBIC0283E

Description	Limit
Head surface distortion	0.1 (0.004)
Description	Standard
Spark plug tube installation height	41.7 (1.642)

### VALVE

#### Valve Dimensions

Unit: mm (in)



Valve head diameter (D)	Intake	35.5 - 35.8 (1.398 - 1.409)
	Exhaust	30.3 - 30.6 (1.193 - 1.205)

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Valve length (L)	Intake	101.72 (4.0074)
	Exhaust	102.78 (4.0464)
Valve stem diameter (d)	Intake	5.965 - 5.980 (0.2348 - 0.2354)
	Exhaust	5.955 - 5.970 (0.2344 - 0.2350)
Valve seat angle $\alpha$	Intake	45°15' - 45°45'
	Exhaust	
Valve margin (T)	Intake	1.08 (0.0425)
	Exhaust	1.38 (0.0543)

## Valve Clearance

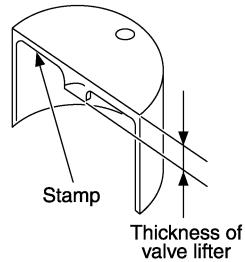
Unit: mm (in)

	Cold	Hot*
Intake	0.24 - 0.32 (0.009 - 0.013)	0.304 - 0.416 (0.012 - 0.016)
Exhaust	0.26 - 0.34 (0.010 - 0.013)	0.308 - 0.432 (0.012 - 0.017)

\* Approximately 80°C (176°F)

## Available Valve Lifter

Unit: mm (in)



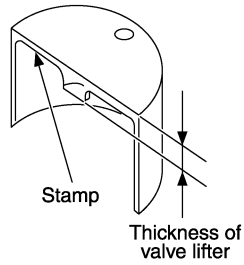
KBIA0119E

Thickness	Identification mark (Stamp)*
3.00 (0.1181)	300H
3.02 (0.1189)	302H
3.04 (0.1197)	304H
3.06 (0.1205)	306H
3.08 (0.1213)	308H
3.10 (0.1220)	310H
3.12 (0.1228)	312H
3.14 (0.1236)	314H
3.16 (0.1244)	316H
3.18 (0.1252)	318H
3.20 (0.1260)	320H
3.22 (0.1268)	322H
3.24 (0.1276)	324H
3.26 (0.1283)	326H
3.28 (0.1291)	328H
3.30 (0.1299)	330H
3.32 (0.1307)	332H
3.34 (0.1315)	334H
3.36 (0.1323)	336H

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]



KBIA0119E

Thickness	Identification mark (Stamp)*
3.38 (0.1331)	338H
3.40 (0.1339)	340H
3.42 (0.1346)	342H
3.44 (0.1354)	344H
3.46 (0.1362)	346H
3.48 (0.1370)	348H
3.50 (0.1378)	350H

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

## Valve Spring

Free height standard mm (in)	Intake	47.92 - 48.12 (1.8866 - 1.8945)
	Exhaust	48.65 - 48.85 (1.9154 - 1.9232)
Installation height mm (in)	Intake	36.96 (1.4551)
	Exhaust	36.96 (1.4551)
Installation load N (kg - f, lb-f)	Intake	151 - 175 (15.4 - 17.8, 34 - 39)
	Exhaust	151 - 175 (15.4 - 17.8, 34 - 39)
Height during valve open mm (in)	Intake	26.76 (1.0535)
	Exhaust	28.46 (1.1205)
Load with valve open N (kg-f, lb-f)	Intake	335 - 383 (34.2 - 39.1, 75.3 - 86.1)
	Exhaust	300 - 342 (30.6 - 34.9, 67.4 - 76.9)
Identification color	Intake	White
	Exhaust	Light blue
Out-of-square mm (in)	1.0 (0.0394)	1.0 (0.0394)

## Valve Lifter

Unit: mm (in)

Description	Standard
Valve lifter outer diameter	33.977 - 33.987 (1.3377 - 1.3381)
Valve lifter bore inner diameter	34.000 - 34.021 (1.3386 - 1.3394)
Clearance between lifter and lifter guide	0.013 - 0.044 (0.0005 - 0.0017)

## Valve Oil Seal

Unit: mm (in)

Description	Standard
Valve oil seal installation height (A)	12.1 (0.476)

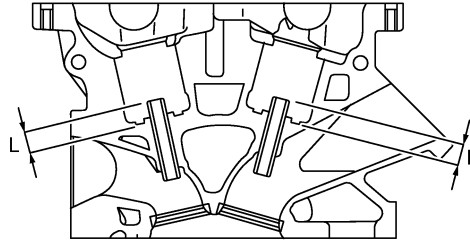
## Valve Guide

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Unit: mm (in)

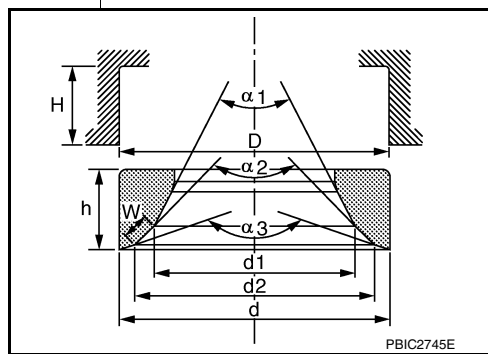


PBIC0184E

Description		Standard	Service
Valve guide	Outer diameter	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
	Inner diameter (Finished size)	6.000 - 6.018 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter		9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	
Standard			
Valve guide clearance (Standard)	Intake	0.020 - 0.053 (0.0008 - 0.0021)	
	Exhaust	0.030 - 0.063 (0.0012 - 0.0025)	
Valve guide clearance (Limit)	Intake	0.08 (0.003)	
	Exhaust	0.09 (0.004)	
Projection length (L)	Intake	10.1 - 10.3 (0.398 - 0.406)	
	Exhaust	10.0 - 10.4 (0.394 - 0.409)	

## Valve Seat

Unit: mm (in)



PBIC2745E

Description		Standard	Service
Cylinder head seat recess diameter (D)	Intake	36.500 - 36.516 (1.4370 - 1.4376)	37.000 - 37.016 (1.4567 - 1.4573)
	Exhaust	31.500 - 31.516 (1.2402 - 1.2408)	32.000 - 32.016 (1.2598 - 1.2605)
Valve seat interference fit	Intake	0.081 - 0.113 (0.0032 - 0.0044)	
	Exhaust	0.084 - 0.116 (0.0033 - 0.0046)	
Valve seat outer diameter (d)	Intake	36.597 - 36.613 (1.4408 - 1.4415)	37.097 - 37.113 (1.4605 - 1.4611)
	Exhaust	31.600 - 31.616 (1.2441 - 1.2447)	32.100 - 32.116 (1.2638 - 1.2644)
Diameter (d1)	Intake	33.5 (1.319)	
	Exhaust	28.0 (1.102)	
Diameter (d2)	Intake	34.8 - 35.3 (1.370 - 1.390)	
	Exhaust	29.6 - 30.1 (1.165 - 1.185)	

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

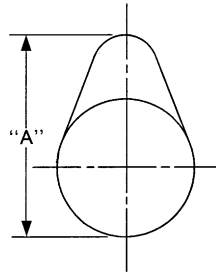
Angle ( $\alpha_1$ )	Intake	60°
	Exhaust	60°
Angle ( $\alpha_2$ )	Intake	88° 46' - 90° 14'
	Exhaust	88° 46' - 90° 14'
Angle ( $\alpha_3$ )	Intake	120°
	Exhaust	120°
Contacting width (W)*1	Intake	0.99 - 1.35 (0.0390 - 0.0531)
	Exhaust	1.19 - 1.55 (0.0469 - 0.0610)

\*1 Machining data

## CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard
Camshaft runout [TIR*]	Less than 0.02 (0.0008)



SEM671

Cam height (A)	Intake	45.865 - 46.055 (1.8057 - 1.8132)
	Exhaust	44.175 - 44.365 (1.7392 - 1.7467)
Outer diameter of camshaft journal	No. 1	27.935 - 27.955 (1.0998 - 1.1006)
	No. 2, 3, 4, 5	23.435 - 23.455 (0.9226 - 0.9234)
Inner diameter of camshaft bracket	No.1	28.000 - 28.021 (1.1024 - 1.1032)
	No.2, 3, 4, 5	23.500 - 23.521 (0.9252 - 0.9260)
Camshaft journal clearance		0.045 - 0.086 (0.0018 - 0.0034)
Camshaft end play		0.115 - 0.188 (0.0045 - 0.0074)
Camshaft sprocket runout [TIR*]		Less than 0.15 (0.0059)

\*: Total indicator reading

## CYLINDER BLOCK

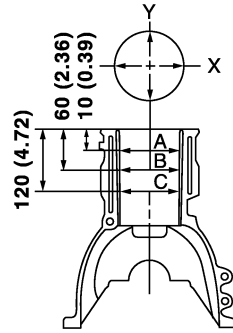


# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Unit: mm (in)



Surface distortion	Limit	0.1 (0.004)	
Cylinder bore	Inner diameter	Standard	Grade No. 2 89.010 - 89.020 (3.5043 - 3.5047)
			Grade No. 3 89.020 - 89.030 (3.5047 - 3.5051)
		Wear limit	0.2 (0.008)
Out-of-round (X - Y)		Less than 0.015 (0.0006)	
Taper (C - A)		Less than 0.01 (0.0004)	
Main journal inner diameter grade (Without bearing)	Grade No. A	58.944 - 58.945 (2.3206 - 2.3207)	
	Grade No. B	58.945 - 58.946 (2.3207 - 2.3207)	
	Grade No. C	58.946 - 58.947 (2.3207 - 2.3207)	
	Grade No. D	58.947 - 58.948 (2.3207 - 2.3208)	
	Grade No. E	58.948 - 58.949 (2.3208 - 2.3208)	
	Grade No. F	58.949 - 58.950 (2.3208 - 2.3209)	
	Grade No. G	58.950 - 58.951 (2.3209 - 2.3209)	
	Grade No. H	58.951 - 58.952 (2.3209 - 2.3209)	
	Grade No. J	58.952 - 58.953 (2.3209 - 2.3210)	
	Grade No. K	58.953 - 58.954 (2.3210 - 2.3210)	
	Grade No. L	58.954 - 58.955 (2.3210 - 2.3211)	
	Grade No. M	58.955 - 58.956 (2.3211 - 2.3211)	
	Grade No. N	58.956 - 58.957 (2.3211 - 2.3211)	
	Grade No. P	58.957 - 58.958 (2.3211 - 2.3212)	
	Grade No. R	58.958 - 58.959 (2.3212 - 2.3212)	
	Grade No. S	58.959 - 58.960 (2.3212 - 2.3213)	
	Grade No. T	58.960 - 58.961 (2.3213 - 2.3213)	
	Grade No. U	58.961 - 58.962 (2.3213 - 2.3213)	
	Grade No. V	58.962 - 58.963 (2.3213 - 2.3214)	
Grade No. W	58.963 - 58.964 (2.3214 - 2.3214)		
Grade No. X	58.964 - 58.965 (2.3214 - 2.3215)		
Grade No. Y	58.965 - 58.966 (2.3215 - 2.3215)		
Grade No. 4	58.966 - 58.967 (2.3215 - 2.3215)		
Grade No. 7	58.967 - 58.968 (2.3215 - 2.3216)		
Difference in inner diameter between cylinders	Standard	Less than 0.03 (0.0012)	

## PISTON, PISTON RING, AND PISTON PIN

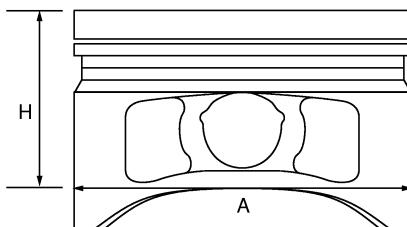
Available Piston

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Unit: mm (in)



PBIC0188E

Piston skirt diameter (A)	Standard	Grade*	Dimension
		Grade No. 2	88.990 - 89.000 (3.5035 - 3.5039)
		Grade No. 3	89.000 - 89.010 (3.5039 - 3.5043)
(H) dimension			37.5 (1.476)
Piston pin bore diameter	Grade No. 0		19.993 - 19.999 (0.7871 - 0.7874)
	Grade No. 1		19.999 - 20.005 (0.7874 - 0.7876)
Piston clearance to cylinder block	Standard		0.010 - 0.030 (0.0004 - 0.0012)
	Limit		0.08 (0.0031)

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

## Piston Ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.080 (0.0016 - 0.0031)	0.11 (0.0043)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)	0.10 (0.0039)
	Oil ring	0.045 - 0.125 (0.0018 - 0.0049)	—
End gap	Top	0.21 - 0.31 (0.0083 - 0.0122)	0.53 (0.0209)
	2nd	0.37 - 0.52 (0.0146 - 0.0205)	0.71 (0.0280)
	Oil (rail ring)	0.20 - 0.45 (0.0079 - 0.0177)	0.80 (0.0315)

## Piston Pin

Unit: mm (in)

Piston pin outer diameter	Grade No.0	19.989 - 19.995 (0.7870 - 0.7872)
	Grade No.1	19.995 - 20.001 (0.7872 - 0.7874)
Piston to piston pin clearance (Standard)		0.002 - 0.006 (0.0001 - 0.0002)
Piston pin to connecting rod bushing clearance	Standard	0.005 - 0.017 (0.0002 - 0.0007)

## CONNECTING ROD

Unit: mm (in)

Center distance		143.00 - 143.10 (5.63 - 5.63)
Bend [per 100 (3.94)]	Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	Limit	0.30 (0.0118)
Connecting rod small end inner diameter		22.000 - 22.012 (0.7874 - 0.7879)
Connecting rod small end inner bushing diameter <sup>1</sup>	Grade <sup>2</sup>	Dimension
	Grade No. 0	20.000 - 20.006 (0.7874 - 0.7876)
	Grade No. 1	20.006 - 20.012 (0.7876 - 0.7879)
Connecting rod big end inner diameter		48.000 - 48.013 (1.8898 - 1.8903)

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

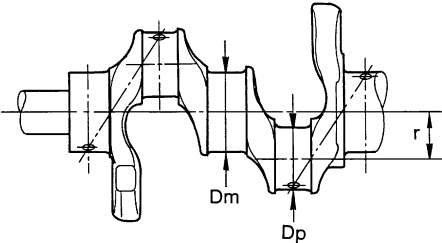
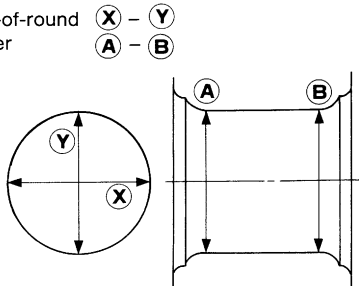
Side clearance	Standard	0.20 - 0.35 (0.0079 - 0.0138)
	Limit	0.50 (0.0197)
Connecting rod bearing housing	Grade <sup>2</sup>	Dimension
	Grade No. 0	48.000 - 48.001 (1.8898 - 1.8898)
	Grade No. 1	48.001 - 48.002 (1.8898 - 1.8898)
	Grade No. 2	48.002 - 48.003 (1.8898 - 1.8899)
	Grade No. 3	48.003 - 48.004 (1.8899 - 1.8899)
	Grade No. 4	48.004 - 48.005 (1.8899 - 1.8899)
	Grade No. 5	48.005 - 48.006 (1.8899 - 1.8900)
	Grade No. 6	48.006 - 48.007 (1.8900 - 1.8900)
	Grade No. 7	48.007 - 48.008 (1.8900 - 1.8901)
	Grade No. 8	48.008 - 48.009 (1.8901 - 1.8901)
	Grade No. 9	48.009 - 48.010 (1.8901 - 1.8902)
	Grade No. A	48.010 - 48.011 (1.8902 - 1.8902)
	Grade No. B	48.011 - 48.012 (1.8902 - 1.8902)
Grade No. C	48.012 - 48.013 (1.8902 - 1.8903)	

<sup>1</sup>: After installing in connecting rod.

<sup>2</sup>: Always check with the Parts Department for the latest parts information.

## CRANKSHAFT

Unit: mm (in)

 <p style="text-align: center;">SEM645</p>	<p>Out-of-round (X) - (Y) Taper (A) - (B)</p>  <p style="text-align: center;">SEM715</p>																																				
		<table border="1"> <tr> <td rowspan="17">Pin journal dia. (DP)</td> <td>Grade No. A</td> <td>44.974 - 44.973 (1.7706 - 1.7706)</td> </tr> <tr> <td>Grade No. B</td> <td>44.973 - 44.972 (1.7706 - 1.7705)</td> </tr> <tr> <td>Grade No. C</td> <td>44.972 - 44.971 (1.7705 - 1.7705)</td> </tr> <tr> <td>Grade No. D</td> <td>44.971 - 44.970 (1.7705 - 1.7705)</td> </tr> <tr> <td>Grade No. E</td> <td>44.970 - 44.969 (1.7705 - 1.7704)</td> </tr> <tr> <td>Grade No. F</td> <td>44.969 - 44.968 (1.7704 - 1.7704)</td> </tr> <tr> <td>Grade No. G</td> <td>44.968 - 44.967 (1.7704 - 1.7704)</td> </tr> <tr> <td>Grade No. H</td> <td>44.967 - 44.966 (1.7704 - 1.7703)</td> </tr> <tr> <td>Grade No. J</td> <td>44.966 - 44.965 (1.7703 - 1.7703)</td> </tr> <tr> <td>Grade No. K</td> <td>44.965 - 44.964 (1.7703 - 1.7702)</td> </tr> <tr> <td>Grade No. L</td> <td>44.964 - 44.963 (1.7702 - 1.7702)</td> </tr> <tr> <td>Grade No. M</td> <td>44.963 - 44.962 (1.7702 - 1.7702)</td> </tr> <tr> <td>Grade No. N</td> <td>44.962 - 44.961 (1.7702 - 1.7701)</td> </tr> <tr> <td>Grade No. P</td> <td>44.961 - 44.960 (1.7701 - 1.7701)</td> </tr> <tr> <td>Grade No. R</td> <td>44.960 - 44.959 (1.7701 - 1.7700)</td> </tr> <tr> <td>Grade No. S</td> <td>44.959 - 44.958 (1.7700 - 1.7700)</td> </tr> <tr> <td>Grade No. T</td> <td>44.958 - 44.957 (1.7700 - 1.7700)</td> </tr> <tr> <td>Grade No. U</td> <td>44.957 - 44.956 (1.7700 - 1.7699)</td> </tr> </table>	Pin journal dia. (DP)	Grade No. A	44.974 - 44.973 (1.7706 - 1.7706)	Grade No. B	44.973 - 44.972 (1.7706 - 1.7705)	Grade No. C	44.972 - 44.971 (1.7705 - 1.7705)	Grade No. D	44.971 - 44.970 (1.7705 - 1.7705)	Grade No. E	44.970 - 44.969 (1.7705 - 1.7704)	Grade No. F	44.969 - 44.968 (1.7704 - 1.7704)	Grade No. G	44.968 - 44.967 (1.7704 - 1.7704)	Grade No. H	44.967 - 44.966 (1.7704 - 1.7703)	Grade No. J	44.966 - 44.965 (1.7703 - 1.7703)	Grade No. K	44.965 - 44.964 (1.7703 - 1.7702)	Grade No. L	44.964 - 44.963 (1.7702 - 1.7702)	Grade No. M	44.963 - 44.962 (1.7702 - 1.7702)	Grade No. N	44.962 - 44.961 (1.7702 - 1.7701)	Grade No. P	44.961 - 44.960 (1.7701 - 1.7701)	Grade No. R	44.960 - 44.959 (1.7701 - 1.7700)	Grade No. S	44.959 - 44.958 (1.7700 - 1.7700)	Grade No. T	44.958 - 44.957 (1.7700 - 1.7700)
Pin journal dia. (DP)	Grade No. A	44.974 - 44.973 (1.7706 - 1.7706)																																			
	Grade No. B	44.973 - 44.972 (1.7706 - 1.7705)																																			
	Grade No. C	44.972 - 44.971 (1.7705 - 1.7705)																																			
	Grade No. D	44.971 - 44.970 (1.7705 - 1.7705)																																			
	Grade No. E	44.970 - 44.969 (1.7705 - 1.7704)																																			
	Grade No. F	44.969 - 44.968 (1.7704 - 1.7704)																																			
	Grade No. G	44.968 - 44.967 (1.7704 - 1.7704)																																			
	Grade No. H	44.967 - 44.966 (1.7704 - 1.7703)																																			
	Grade No. J	44.966 - 44.965 (1.7703 - 1.7703)																																			
	Grade No. K	44.965 - 44.964 (1.7703 - 1.7702)																																			
	Grade No. L	44.964 - 44.963 (1.7702 - 1.7702)																																			
	Grade No. M	44.963 - 44.962 (1.7702 - 1.7702)																																			
	Grade No. N	44.962 - 44.961 (1.7702 - 1.7701)																																			
	Grade No. P	44.961 - 44.960 (1.7701 - 1.7701)																																			
	Grade No. R	44.960 - 44.959 (1.7701 - 1.7700)																																			
	Grade No. S	44.959 - 44.958 (1.7700 - 1.7700)																																			
	Grade No. T	44.958 - 44.957 (1.7700 - 1.7700)																																			
Grade No. U	44.957 - 44.956 (1.7700 - 1.7699)																																				

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

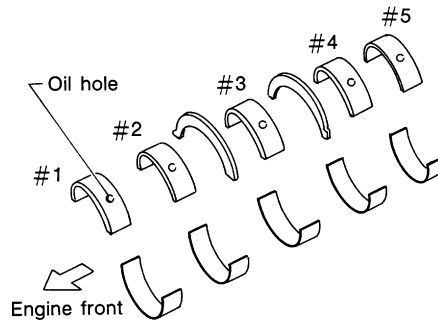
[QR25DE]

Main journal dia. (Dm) grade	Grade No. A	54.979 - 54.978 (2.1645 - 2.1645)
	Grade No. B	54.978 - 54.977 (2.1645 - 2.1644)
	Grade No. C	54.977 - 54.976 (2.1644 - 2.1644)
	Grade No. D	54.976 - 54.975 (2.1644 - 2.1644)
	Grade No. E	54.975 - 54.974 (2.1644 - 2.1643)
	Grade No. F	54.974 - 54.973 (2.1643 - 2.1643)
	Grade No. G	54.973 - 54.972 (2.1643 - 2.1642)
	Grade No. H	54.972 - 54.971 (2.1642 - 2.1642)
	Grade No. J	54.971 - 54.970 (2.1642 - 2.1642)
	Grade No. K	54.970 - 54.969 (2.1642 - 2.1641)
	Grade No. L	54.969 - 54.968 (2.1641 - 2.1641)
	Grade No. M	54.968 - 54.967 (2.1641 - 2.1641)
	Grade No. N	54.967 - 54.966 (2.1641 - 2.1640)
	Grade No. P	54.966 - 54.965 (2.1640 - 2.1640)
	Grade No. R	54.965 - 54.964 (2.1640 - 2.1639)
	Grade No. S	54.964 - 54.963 (2.1639 - 2.1639)
	Grade No. T	54.963 - 54.962 (2.1639 - 2.1639)
	Grade No. U	54.962 - 54.961 (2.1639 - 2.1638)
Grade No. V	54.961 - 54.960 (2.1638 - 2.1638)	
Grade No. W	54.960 - 54.959 (2.1638 - 2.1637)	
Grade No. X	54.959 - 54.958 (2.1637 - 2.1637)	
Grade No. Y	54.958 - 54.957 (2.1637 - 2.1637)	
Grade No. 4	54.957 - 54.956 (2.1637 - 2.1636)	
Grade No. 7	54.956 - 54.955 (2.1636 - 2.1636)	
Center distance (r)		49.60 - 50.04 (1.9528 - 1.9701)
Out-of-round (X - Y)	Standard	Less than 0.005 (0.0002)
Taper (A - B)	Standard	Less than 0.005 (0.0002)
Runout [TIR*]	Limit	Less than 0.05 (0.002)
Free end play	Standard	0.10 - 0.26 (0.0039 - 0.0102)
	Limit	0.30 (0.0118)

\*: Total indicator reading

## MAIN BEARING

Unit: mm (in)



SEM685D

Grade number*	Thickness	Identification color	Remarks
0	1.973 - 1.976 (0.0777 - 0.0778)	Black	Grade and color are the same for upper and lower bearings.
1	1.976 - 1.979 (0.0778 - 0.0779)	Brown	
2	1.979 - 1.982 (0.0779 - 0.0780)	Green	
3	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	
4	1.985 - 1.988 (0.0781 - 0.0783)	Blue	
5	1.988 - 1.991 (0.0783 - 0.0784)	Pink	
6	1.991 - 1.994 (0.0784 - 0.0785)	Purple	
7	1.994 - 1.997 (0.0785 - 0.0786)	White	

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

01	UPR	1.973 - 1.976 (0.0777 - 0.0778)	Black	Grade and color are different for upper and lower bearings.
	LWR	1.976 - 1.979 (0.0778 - 0.0779)	Brown	
12	UPR	1.976 - 1.979 (0.0778 - 0.0779)	Brown	
	LWR	1.979 - 1.982 (0.0779 - 0.0780)	Green	
23	UPR	1.979 - 1.982 (0.0779 - 0.0780)	Green	
	LWR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	
34	UPR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	
	LWR	1.985 - 1.988 (0.0781 - 0.0783)	Blue	
45	UPR	1.985 - 1.988 (0.0781 - 0.0783)	Blue	
	LWR	1.988 - 1.991 (0.0783 - 0.0784)	Pink	
56	UPR	1.988 - 1.991 (0.0783 - 0.0784)	Pink	
	LWR	1.991 - 1.994 (0.0784 - 0.0785)	Purple	
67	UPR	1.991 - 1.994 (0.0784 - 0.0785)	Purple	
	LWR	1.994 - 1.997 (0.0785 - 0.0786)	White	

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

## Undersize

Unit: mm (in)

Size U.S.	Thickness	Main journal diameter
0.25 (0.0098)	2.106 - 2.114 (0.0829 - 0.0832)	Grind so that bearing clearance is the specified value.

## Bearing Clearance

Unit: mm (in)

Main bearing oil clearance	Standard	No.1, 3, and 5	0.012 - 0.022 (0.0005 - 0.0009)
		No.2 and 4	0.018 - 0.028 (0.0007 - 0.0011)
	Limit		0.1 (0.004)

## CONNECTING ROD BEARING

Grade number*	Thickness mm (in)	Identification color (mark)
0 (upper)	1.496 - 1.493 (0.0589 - 0.0588)	Black-Black
0 (lower)	1.496 - 1.493 (0.0589 - 0.0588)	Black-Black
01 (upper)	1.496 - 1.493 (0.0589 - 0.0588)	Black-Black
01 (lower)	1.499 - 1.496 (0.0590 - 0.0589)	Brown-Brown
1 (upper)	1.499 - 1.496 (0.0590 - 0.0589)	Brown-Brown
1 (lower)	1.499 - 1.496 (0.0590 - 0.0589)	Brown-Brown
12 (upper)	1.499 - 1.496 (0.0590 - 0.0589)	Brown-Brown
12 (lower)	1.502 - 1.499 (0.0591 - 0.0590)	Green-Green
2 (upper)	1.502 - 1.499 (0.0591 - 0.0590)	Green-Green
2 (lower)	1.502 - 1.499 (0.0591 - 0.0590)	Green-Green
23 (upper)	1.502 - 1.499 (0.0591 - 0.0590)	Green-Green
23 (lower)	1.505 - 1.502 (0.0593 - 0.0591)	Yellow-Yellow
3 (upper)	1.505 - 1.502 (0.0593 - 0.0591)	Yellow-Yellow
3 (lower)	1.505 - 1.502 (0.0593 - 0.0591)	Yellow-Yellow
34 (upper)	1.505 - 1.502 (0.0593 - 0.0591)	Yellow-Yellow
34 (lower)	1.508 - 1.505 (0.0594 - 0.0593)	Blue-Blue
4 (upper)	1.508 - 1.505 (0.0594 - 0.0593)	Blue-Blue
4 (lower)	1.508 - 1.505 (0.0594 - 0.0593)	Blue-Blue

# SERVICE DATA AND SPECIFICATIONS (SDS)

## < SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

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

### Undersize

Unit: mm (in)

Size U.S.	Thickness	Crank pin journal diameter
0.25 (0.0098)	1.622 - 1.630 (0.0639 - 0.0642)	Grind so that bearing clearance is the specified value.

### Bearing Clearance

Unit: mm (in)

Connecting rod bearing clearance	Standard	0.035 - 0.045 (0.0014 - 0.0018)
	Limit	0.10 (0.0039)

PRECAUTION

PRECAUTIONS

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

INFOID:000000009951676

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 Draining Coolant

INFOID:000000009460515

- Drain coolant when engine is cooled.

Precaution for Disconnecting Fuel Piping

INFOID:000000009460516

- 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

INFOID:000000009460517

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

Precaution for Inspection, Repair and Replacement

INFOID:000000009460518

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

Precaution for Assembly and Installation

INFOID:000000009460519

- Use torque wrench to tighten bolts or nuts to specification.

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# PRECAUTIONS

[VQ35DE]

## < PRECAUTION >

- 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.

## Parts Requiring Angular Tightening

INFOID:000000009460520

- 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

INFOID:000000009460521

### REMOVAL OF LIQUID GASKET

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

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

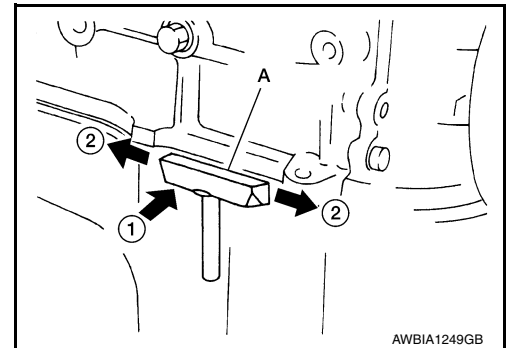
#### **CAUTION:**

**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.

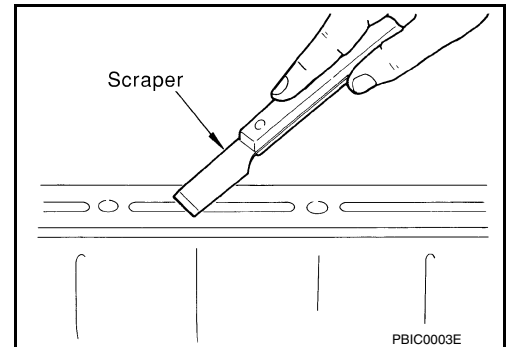
#### **CAUTION:**

**Do not damage the mating surfaces.**



### LIQUID GASKET APPLICATION PROCEDURE

1. Using a scraper, remove the old liquid gasket adhering to the gasket application surface and the mating surface.
  - Remove the liquid gasket completely from the groove of the gasket application surface, mounting bolts, and bolt holes.
2. Thoroughly clean the gasket application surface and the mating surface and remove adhering moisture, grease and foreign materials.
3. Attach the liquid gasket tube to the tube presser.  
**Use Genuine Silicone RTV Sealant or equivalent. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).**



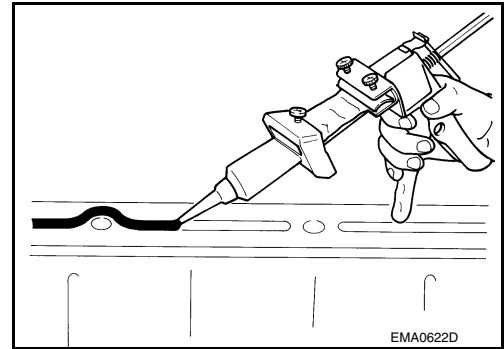


# PRECAUTIONS

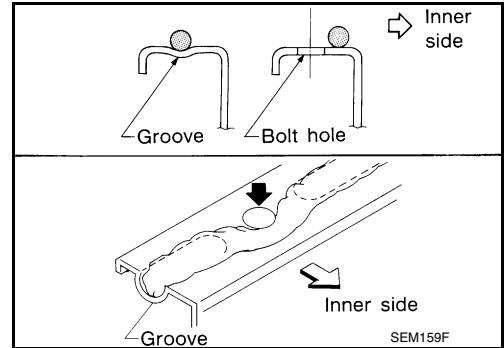
[VQ35DE]

## < PRECAUTION >

4. Apply the liquid gasket using suitable tool without breaks to the specified location.
  - If there is a groove for the liquid gasket application, apply the liquid gasket to the groove.



- As for the bolt holes, normally apply the liquid gasket inside the holes. If specified, it should be applied outside the holes. Make sure to read the text of this manual.
- Within five minutes of the liquid gasket application, install the mating component.
- If the liquid gasket protrudes, wipe it off immediately.
- Do not retighten after the installation.
- After 30 minutes or more have passed from the installation, fill the engine with the specified oil and coolant. Refer to [MA-11, "FOR USA AND CANADA : Fluids and Lubricants"](#).



### CAUTION:

If there are more specific instructions in the procedures contained in this manual concerning liquid gasket application, observe them.

# PREPARATION

< PREPARATION >

[VQ35DE]

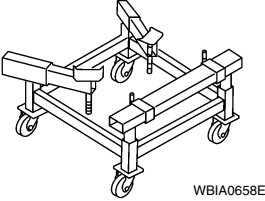
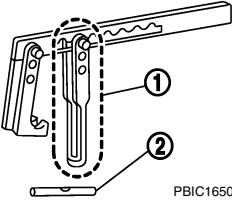
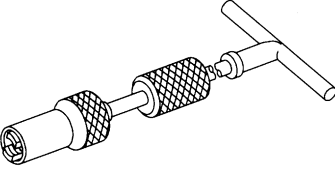
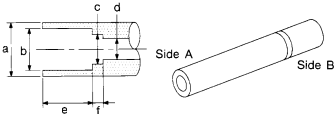
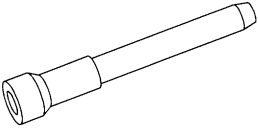
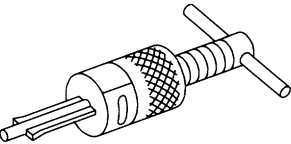
## PREPARATION

### PREPARATION

#### Special Service Tool

INFOID:000000009460522

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

Tool number (TechMate No.) Tool name	Description
KV101J0010 (J-47242) Engine support table	Engine and transmission assembly removal
 <p style="text-align: right; font-size: small;">WBIA0658E</p>	
KV10116200 (J-26336-A) Valve spring compressor 1. KV10115900 (J-26336-20) Attachment 2. KV10109220 ( — ) Adapter	Disassembling valve mechanism Part (1) is a component of KV10116200 (J-26336-A), but part (2) is not.
 <p style="text-align: right; font-size: small;">PBIC1650E</p>	
KV10107902 (J-38959) Valve oil seal puller	Removing valve oil seal
 <p style="text-align: right; font-size: small;">S-NT011</p>	
KV10115600 (J-38958) Valve oil seal drift	Installing valve oil seal <b>Use side A.</b> a: 20 (0.79) dia.                      d: 8 (0.31) dia. b: 13 (0.51) dia.                        e: 10.7 (0.421) dia. c: 10.3 (0.406) dia.                    f: 5 (0.20) dia. Unit: mm (in)
 <p style="text-align: right; font-size: small;">S-NT603</p>	
— (J-39386) Valve oil seal drift	Installing valve oil seal
 <p style="text-align: right; font-size: small;">NT024</p>	
ST16610001 (J-23907) Pilot bushing puller	Removing crankshaft pilot bushing
 <p style="text-align: right; font-size: small;">NT045</p>	

# PREPARATION

< PREPARATION >

[VQ35DE]

Tool number (TechMate No.) Tool name	Description	
KV10111100 (J-37228) Seal cutter	Removing steel oil pan and rear timing chain case	A EM C
KV10112100 (BT-8653-A) Angle wrench	Tightening bolts for bearing cap, cylinder head, etc.	D E F
KV991J0050 (J-44626) Air fuel sensor Socket	Loosening or tightening air fuel ratio A/F sensor <b>a: 22 mm (0.87 in)</b>	G H
KV10114400 (J-38365) Heated oxygen sensor wrench	Loosening or tightening rear heated oxygen sensor <b>a: 22 mm (0.87 in)</b>	I J K
— (J-50288) Ring gear stopper	Removing and installing crankshaft pulley	L M
— (J-47128) Seal installer	Installing rear main seal	N O P


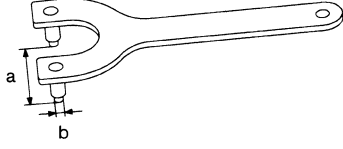
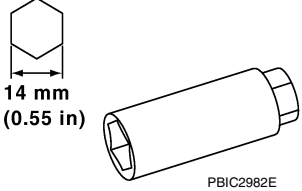
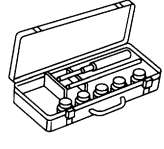
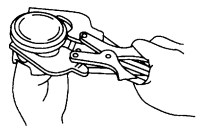
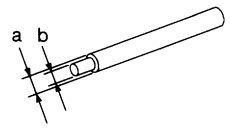
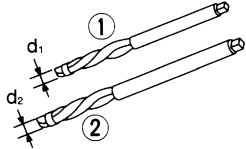
Commercial Service Tool

INFOID:000000009460523

# PREPARATION

< PREPARATION >

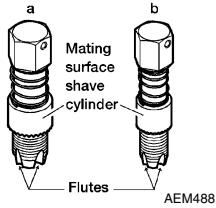
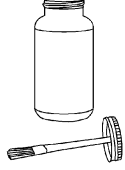
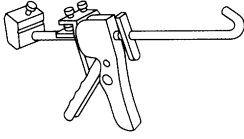
[VQ35DE]

Tool name	Description
<p>Power tool</p>  <p>PIIB1407E</p>	<p>Loosening nuts, screws and bolts</p>
<p>Pulley holder</p>  <p>NT628</p>	<p>Removing and installing crankshaft pulley (Holding crankshaft pulley) <b>a: 68 mm (2.68 in) dia.</b> <b>b: 8 mm (0.31 in) dia.</b></p>
<p>Spark plug wrench</p>  <p>14 mm (0.55 in)</p> <p>PBIC2982E</p>	<p>Removing and installing spark plug</p>
<p>Valve seat cutter set</p>  <p>NT048</p>	<p>Finishing valve seat dimensions</p>
<p>Piston ring expander</p>  <p>NT030</p>	<p>Removing and installing piston ring</p>
<p>Valve guide drift</p>  <p>NT015</p>	<p>Removing and installing valve guide <b>Intake &amp; Exhaust:</b> <b>a: 9.5 mm (0.374 in) dia.</b> <b>b: 5.5 mm (0.217 in) dia.</b></p>
<p>Valve guide reamer</p>  <p>NT016</p>	<p>Reaming valve guide 1 or hole for oversize valve guide 2 <b>Intake &amp; Exhaust:</b> <b>d1: 6.0 mm (0.236 in) dia.</b> <b>d2: 10.2 mm (0.402 in) dia.</b></p>

# PREPARATION

< PREPARATION >

[VQ35DE]

Tool name	Description
<p>(J-43897-18) (J-43897-12) Oxygen sensor thread cleaner</p> 	<p>Reconditioning the exhaust system threads before installing a new oxygen sensor (Use with anti-seize lubricant shown below.) <b>a: J-43897-18 (18 mm dia.) for zirconia oxygen sensor</b> <b>b: J-43897-12 (12 mm dia.) for titania oxygen sensor</b></p>
<p>Anti-seize lubricant (Permatex 133AR or equivalent meeting MIL specification MIL-A-907)</p> 	<p>Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads</p>
<p>Tube presser</p> 	<p>Pressing the tube of liquid gasket</p>

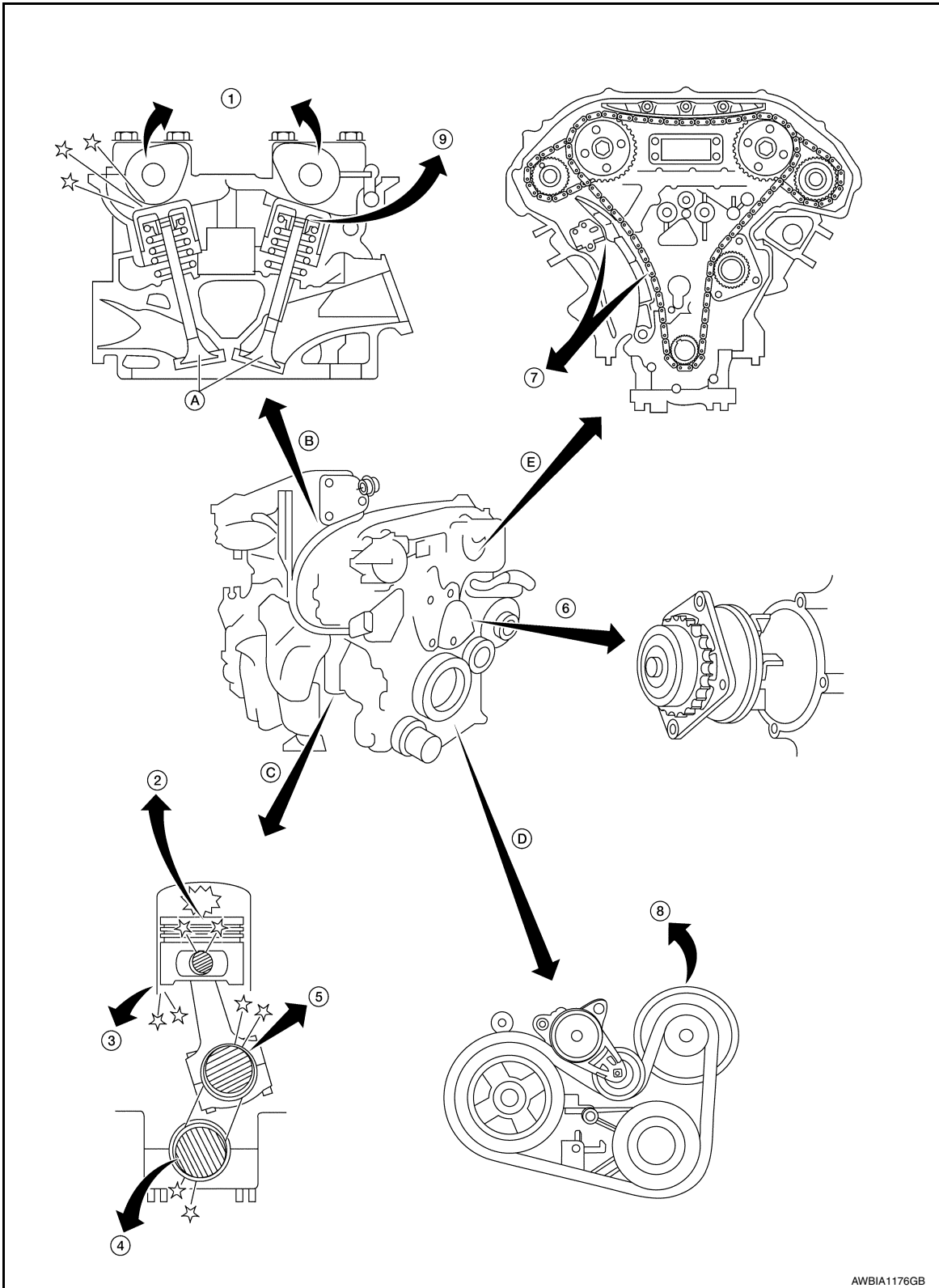
A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

**SYSTEM DESCRIPTION**

**NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING**

**NVH Troubleshooting - Engine Noise**

INFOID:000000009460524



AWBIA1176GB

- |                           |                                 |                      |
|---------------------------|---------------------------------|----------------------|
| 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  |

# NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

< SYSTEM DESCRIPTION >

[VQ35DE]

- |   |   |                       |
|---|---|-----------------------|
| 7. Timing chain and chain tensioner noise | 8. Drive belt noise (Sticking/Slipping) | 9. Tappet noise       |
| A. Valve                                  | B. Valve mechanism                      | C. Rotation mechanism |
| D. Drive belt                             | E. Timing chain                         |                       |

A

EM

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

INFOID:000000009460525

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.

C

D

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warm-up	After warm-up	When starting	When idling	When racing	While driving			
Top of engine Rocker cover Cylinder head	Ticking or clicking	C	A	—	A	B	—	Tappet noise	Valve clearance	<a href="#">EM-138</a>
	Rattle	C	A	—	A	B	C	Camshaft bearing noise	Camshaft journal clearance Camshaft runout	<a href="#">EM-194</a>
Crankshaft pulley Cylinder block (Side of engine) Oil pan	Slap or knock	—	A	—	B	B	—	Piston pin noise	Piston and piston pin clearance Connecting rod bushing clearance	<a href="#">EM-142</a>
	Slap or rap	A	—	—	B	B	A	Piston slap noise	Piston-to-bore clearance Piston ring side clearance Piston ring end gap Connecting rod bend and torsion	<a href="#">EM-224</a>
	Knock	A	B	C	B	B	B	Connecting rod bearing noise	Connecting rod bushing clearance (Small end) Connecting rod bearing clearance (Big end)	<a href="#">EM-224</a>
	Knock	A	B	—	A	B	C	Main bearing noise	Main bearing oil clearance Crankshaft runout	<a href="#">EM-224</a>
Front of engine Timing chain cover	Tapping or ticking	A	A	—	B	B	B	Timing chain and chain tensioner noise	Timing chain cracks and wear Timing chain tensioner operation	<a href="#">EM-182</a>
Front of engine	Squeaking or fizzing	A	B	—	B	—	C	Drive belts (Sticking or slipping)	Drive belts deflection	<a href="#">EM-134</a>
	Creaking	A	B	A	B	A	B	Drive belts (Slipping)	Idler pulley bearing operation	
	Squall Creak	A	B	—	B	A	B	Water pump noise	Water pump operation	<a href="#">CO-44</a>

E

F

G

H

I

J

K

L

M

N

O

P

A: Closely related B: Related C: Sometimes related —: Not related

# SPARK PLUG

< PERIODIC MAINTENANCE >

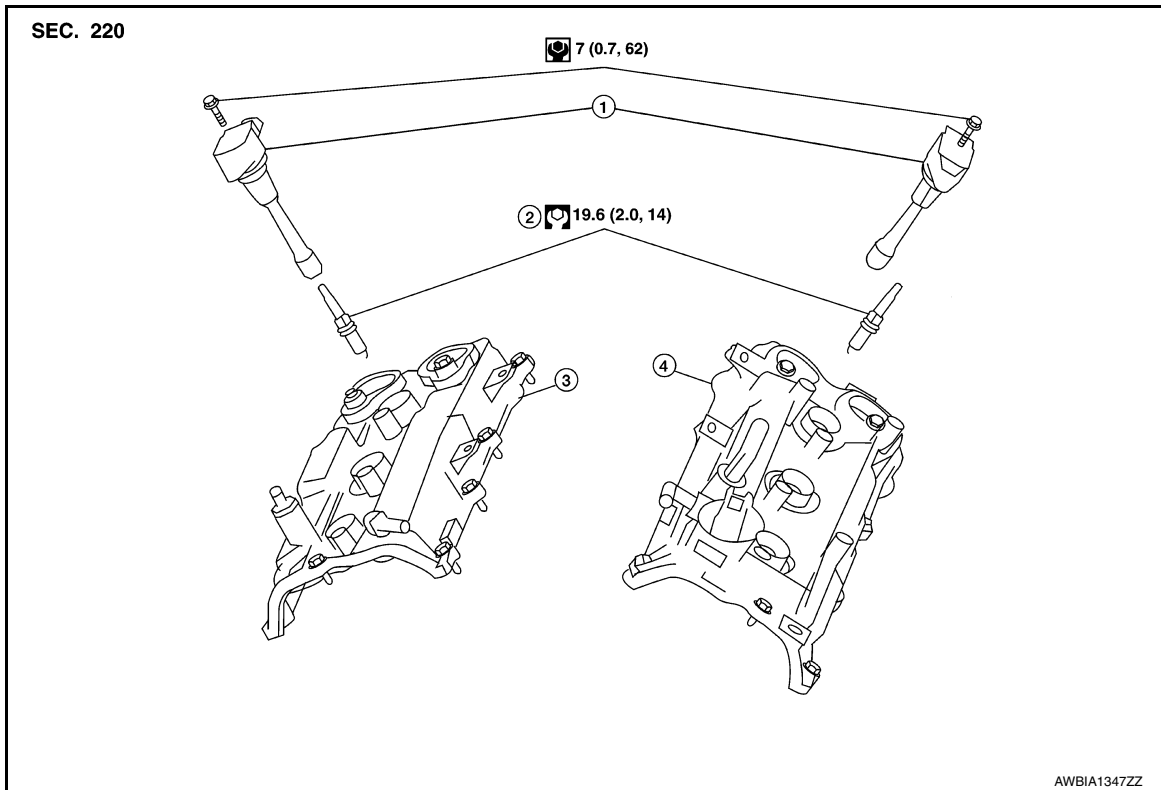
[VQ35DE]

## PERIODIC MAINTENANCE

### SPARK PLUG

#### Exploded View

INFOID:000000009460526



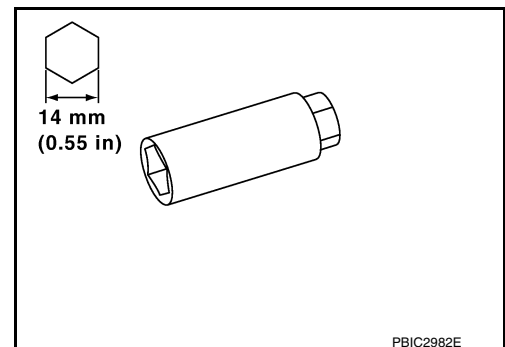
- 1. Ignition coil
- 2. Spark plug
- 3. Rocker cover (RH)
- 4. Rocker cover (LH)

### Removal and Installation

INFOID:000000009460527

#### REMOVAL

1. Remove the ignition coil. Refer to [EM-162, "Removal and Installation LH"](#) (LH side) and [EM-162, "Removal and Installation RH"](#) (RH side).
2. Remove the spark plug using suitable tool.



#### INSPECTION AFTER REMOVAL

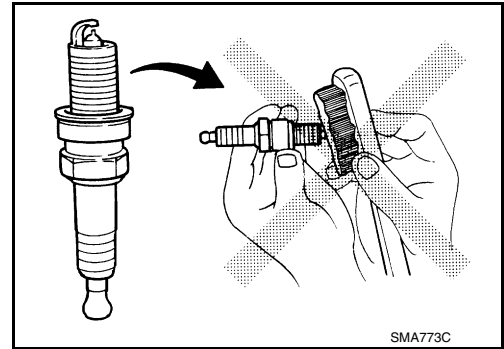


# SPARK PLUG

[VQ35DE]

## < PERIODIC MAINTENANCE >

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

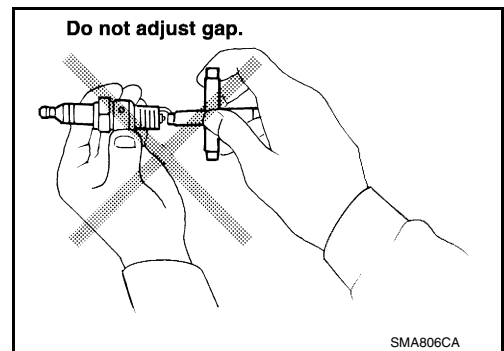


- If plug is covered with carbon, a spark plug cleaner may be used.

**Cleaner air pressure : less than 588 kPa (6 kg/cm<sup>2</sup>, 85 psi)**

**Cleaning time : less than 20 seconds**

- Checking and adjusting plug gap is not required between change intervals. If the gap is out of specification, replace the spark plug.



## INSTALLATION

Installation is in the reverse order of removal.

Standard type*	DENSO
	FXE22HR11
Gap (nominal)	1.1 mm (0.043 in)

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

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# DRIVE BELTS

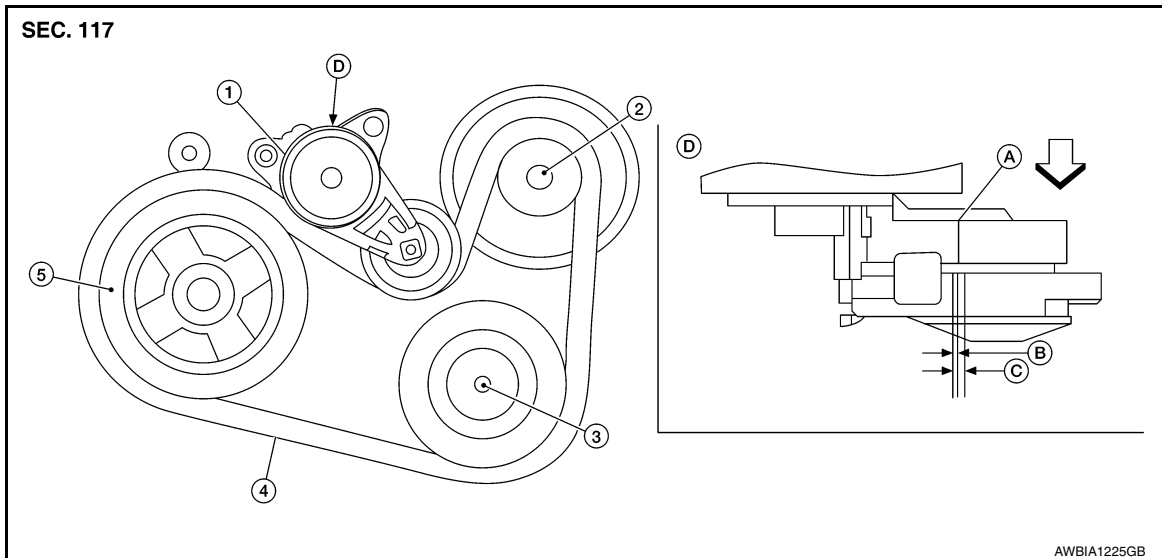
< PERIODIC MAINTENANCE >

[VQ35DE]

## DRIVE BELTS

### Exploded View

INFOID:000000009460528



- |   |                       |                   |
|---|-----------------------|-------------------|
| 1. Drive belt auto-tensioner              | 2. Generator          | 3. A/C compressor |
| 4. Drive belt                             | 5. Crankshaft pulley  | A. Indicator      |
| B. Range when new drive belt is installed | C. Possible use range | D. View D         |
- ⇐ Engine front

### Checking Drive Belts

INFOID:000000009460529

#### **WARNING:**

**Inspect and check the drive belts with the engine off.**

1. Inspect belt for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
2. Rotate the crankshaft pulley two times then ensure the drive belt auto-tensioner is within the possible use range.

#### **NOTE:**

Inspect drive belt tension when engine is cold.

### Tension Adjustment

INFOID:000000009460530

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

### Removal and Installation

INFOID:000000009460531

#### REMOVAL

1. Remove the front RH wheel and tire. Refer to [WT-55, "Adjustment"](#).
2. Remove the fender protector side cover RH. Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).

## DRIVE BELTS

[VQ35DE]

### < 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 belt is installed again.

5. Loosen drive belt and then remove it from the other pulleys.

### INSTALLATION

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

**CAUTION:**

**Confirm belts are completely set on the pulleys.**

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

**WARNING:**

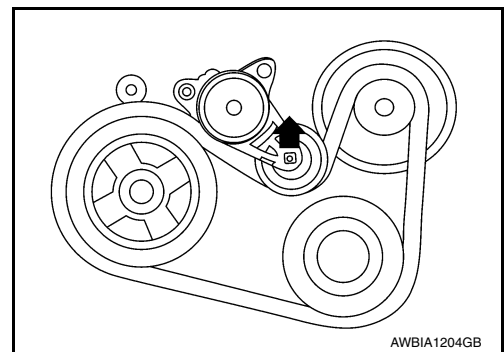
**Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes off.**

**CAUTION:**

**Do not loosen the auto-tensioner pulley bolt. (Don't turn it counterclockwise. If turned counterclockwise, the complete 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 tension of belt at indicator is within the possible use range. Refer to [EM-19, "Checking Drive Belts"](#).
5. Install the fender protector side cover RH. Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).
6. Install the front RH wheel and tire. Refer to [WT-55, "Adjustment"](#).

### Removal and Installation of Drive Belt Auto-tensioner



A

EM

C

D

E

F

G

H

I

J

K

L

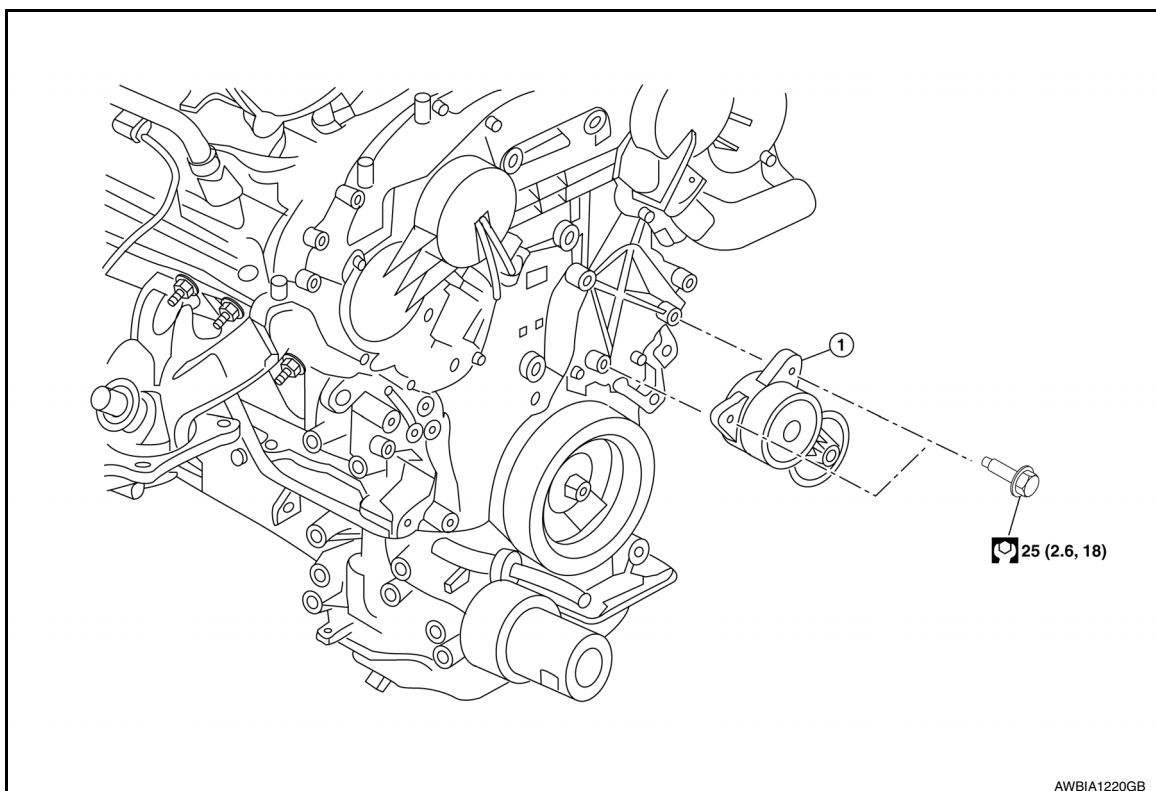
M

N

O

P

INFOID:00000009460532



1. Drive belt auto-tensioner

#### REMOVAL

##### CAUTION:

The complete auto-tensioner must be replaced as a unit, including the pulley.

1. Remove the drive belt [EM-134, "Removal and Installation"](#).
2. Remove the drive belt auto-tensioner using power tool.

##### 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.)

#### 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 unit.

# AIR CLEANER FILTER

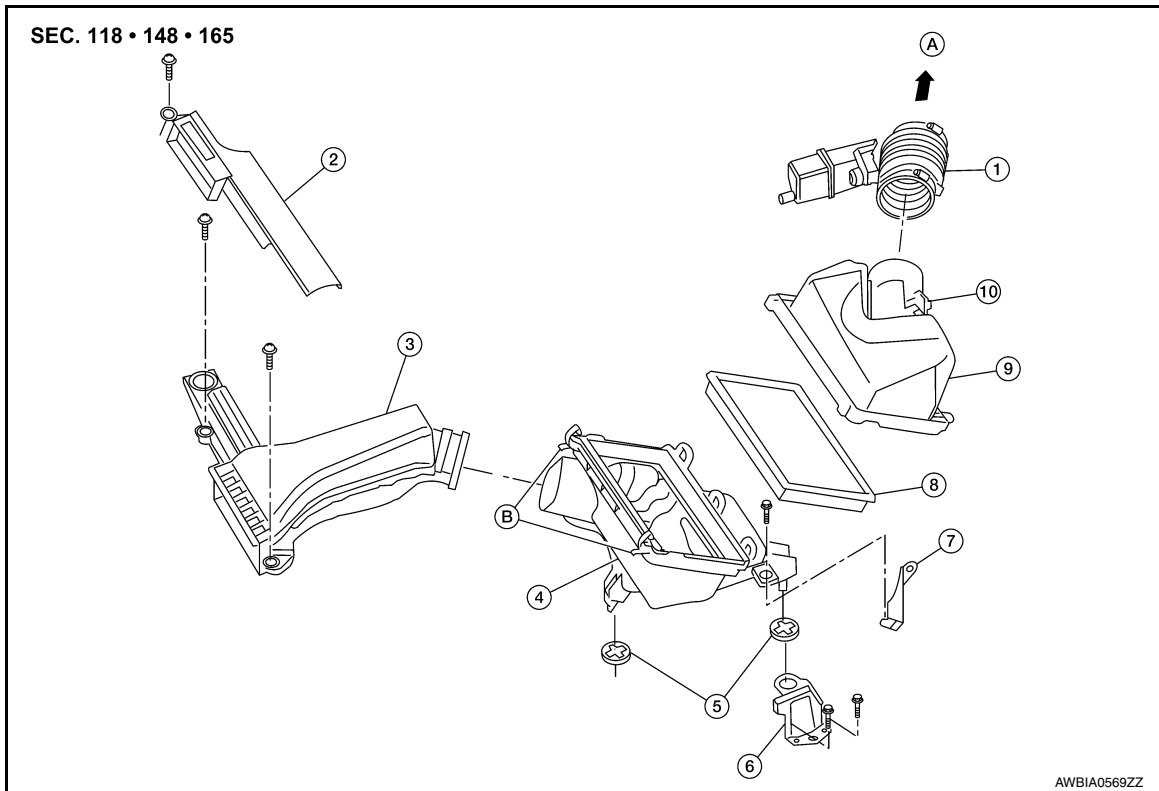
< PERIODIC MAINTENANCE >

[VQ35DE]

## AIR CLEANER FILTER

### Exploded View

INFOID:00000009460533



- |   |  |                                      |
|---|--|--------------------------------------|
| 1. Air duct hose and resonator assembly | 2. Duct sub-cover                        | 3. Front air duct                    |
| 4. Air cleaner case (lower)             | 5. Grommets                              | 6. Air cleaner case mounting bracket |
| 7. Bracket                              | 8. Air cleaner filter                    | 9. Air cleaner case (upper)          |
| 10. Mass air flow sensor                | A. To electric throttle control actuator | B. Air cleaner case side clips       |

### Removal and Installation

INFOID:00000009460534

#### REMOVAL

##### **CAUTION:**

**It is not necessary to remove the front air duct to replace the air cleaner filter.**

##### **NOTE:**

Replace the air cleaner filter per the periodic maintenance schedule or as necessary. Refer to [MA-7. "FOR USA AND CANADA : Introduction of Periodic Maintenance"](#).

1. Unhook air cleaner case side clips and lift air cleaner case (upper).
2. Remove the air cleaner filter.

#### INSTALLATION

Installation is in the reverse order of removal.

# CAMSHAFT VALVE CLEARANCE

< PERIODIC MAINTENANCE >

[VQ35DE]

## CAMSHAFT VALVE CLEARANCE

### Valve Clearance

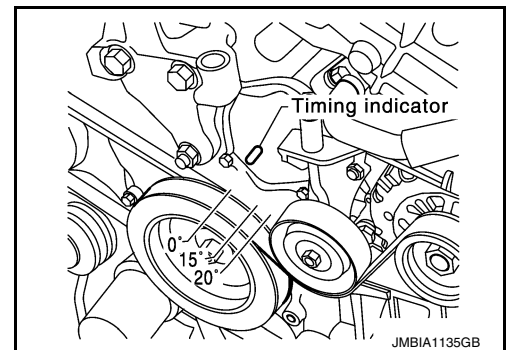
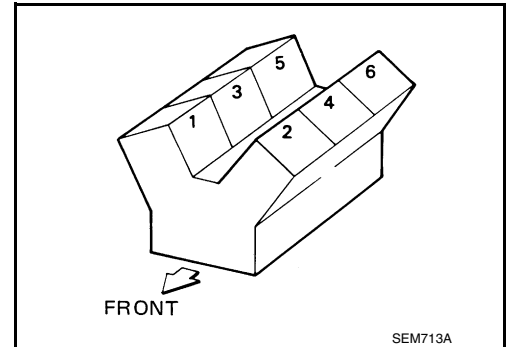
INFOID:000000009460535

#### CHECKING

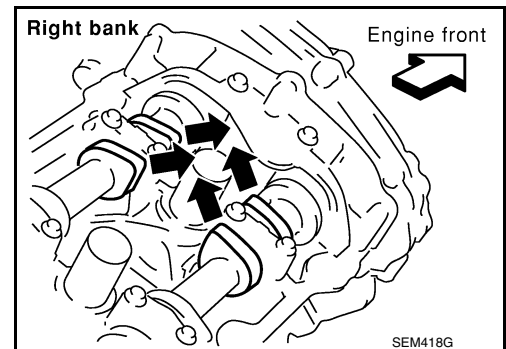
- Perform inspection as follows after removal, installation or replacement of camshaft or valve related parts, or if there is unusual engine conditions regarding valve clearance.

#### Check valve clearance while engine is cold and not running.

1. Remove the intake manifold collector. Refer to [EM-146. "Removal and Installation"](#).
2. Remove the ignition coils and spark plugs. Refer to [EM-132. "Removal and Installation"](#).
3. Remove the rocker covers. Refer to [EM-168. "Removal and Installation LH"](#) (LH), [EM-169. "Removal and Installation RH"](#) (RH).
4. Set No.1 cylinder at TDC on its compression stroke.
  - Align pointer with TDC mark on crankshaft pulley.



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



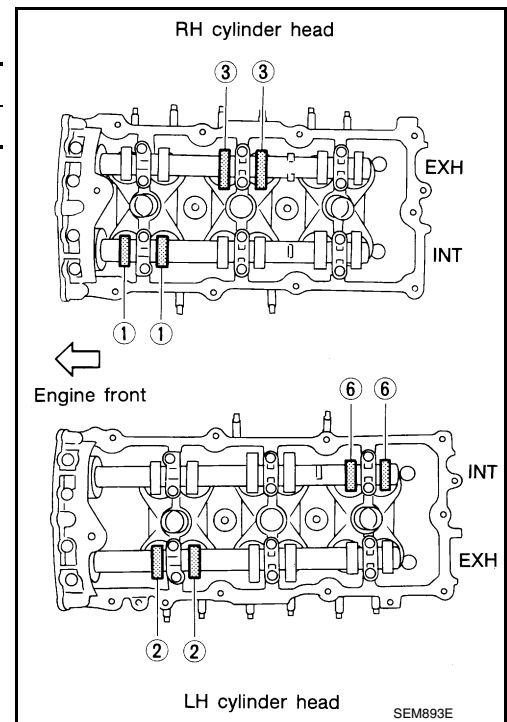
# CAMSHAFT VALVE CLEARANCE

[VQ35DE]

< PERIODIC MAINTENANCE >

5. Check only the valves as shown.

Crank Position	Valve No. 1	Valve No. 2	Valve No. 3	Valve No. 6
No. 1 TDC	Intake	Exhaust	Exhaust	Intake

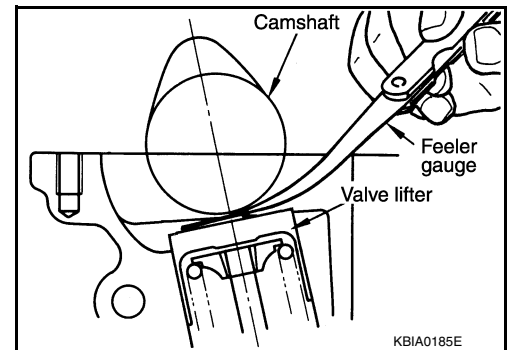
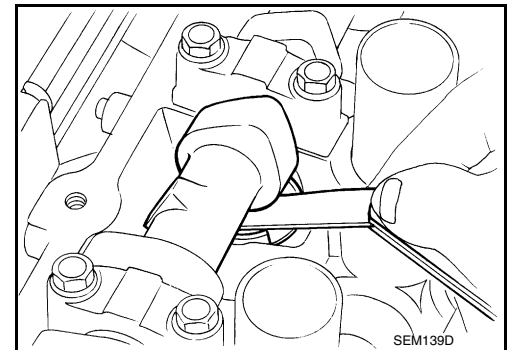


- Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
- Record any valve clearance measurements which are out of specification. They will be used later to determine the required replacement lifter size.

**Valve Clearance for Checking (cold)**

**Intake** : 0.26 - 0.34 mm (0.010 - 0.013 in)

**Exhaust** : 0.29 - 0.37 mm (0.011 - 0.015 in)



6. Turn crankshaft 240°.
7. Set No.3 cylinder at TDC on its compression stroke.

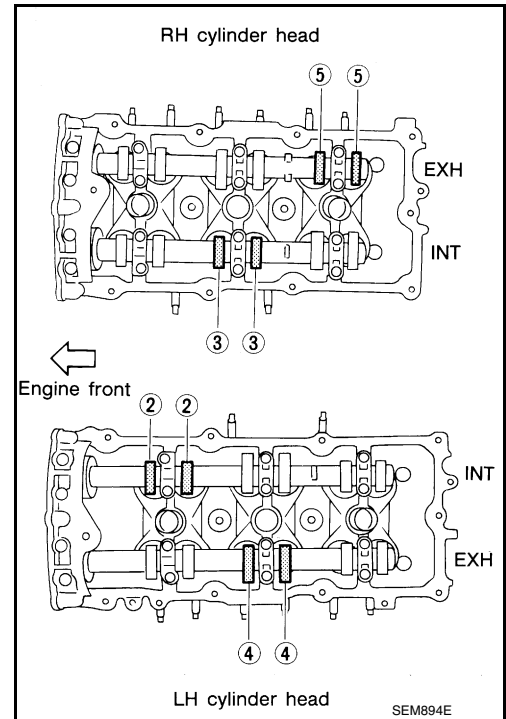
# CAMSHAFT VALVE CLEARANCE

[VQ35DE]

< PERIODIC MAINTENANCE >

8. Check only those valves as shown.

Crank Position	Valve No. 2	Valve No. 3	Valve No. 4	Valve No. 5
No. 3 TDC	Intake	Intake	Exhaust	Exhaust

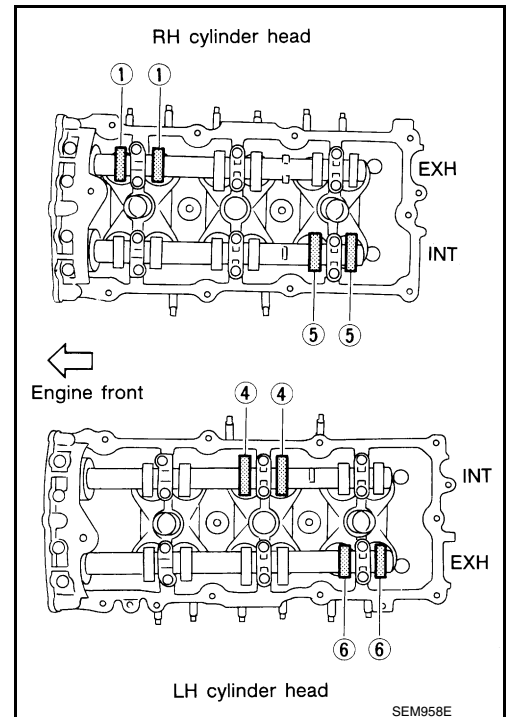


9. Turn the crankshaft 240° and align as above.

10. Set No.5 cylinder at TDC on its compression stroke.

11. Check only those valves as shown.

Crank Position	Valve No. 1	Valve No. 4	Valve No. 5	Valve No. 6
No. 5 TDC	Exhaust	Intake	Intake	Exhaust



12. If all valve clearances are within specification, install the following components. If the valve clearances are out of specification, adjust the valve clearances.

- Rocker covers. Refer to [EM-168, "Removal and Installation LH"](#) (LH), [EM-169, "Removal and Installation RH"](#) (RH).
- All spark plugs. Refer to [EM-132, "Removal and Installation"](#).
- All ignition coils. Refer to [EM-162, "Removal and Installation LH"](#) (LH), [EM-162, "Removal and Installation RH"](#) (RH).
- Intake manifold collector. Refer to [EM-146, "Removal and Installation"](#).



# CAMSHAFT VALVE CLEARANCE

< PERIODIC MAINTENANCE >

[VQ35DE]

## VALVE ADJUSTING

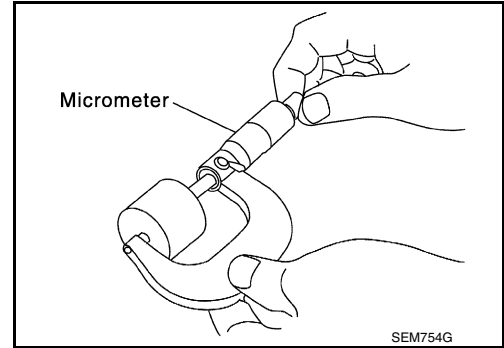
### CAUTION:

**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 is the dimension at normal temperatures. Ignore dimensional differences caused by temperature. Use specifications for hot engine condition to confirm valve clearances.

1. Remove the camshaft. Refer to [EM-194. "Removal and Installation"](#).
2. Remove the valve lifter that was measured as being outside the standard specifications.
3. Measure the center thickness of the removed lifter with a micrometer, as shown.



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

Valve lifter thickness calculation equation:  $t = t1 + (C1 - C2)$

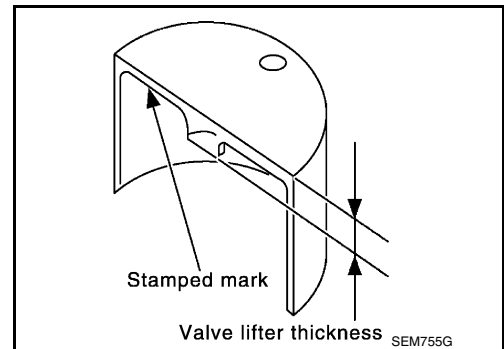
t = thickness of the replacement lifter

t1 = thickness of the removed lifter

C1 = measured valve clearance

C2 = standard valve clearance

- The thickness of the new valve lifter can be identified by the stamp mark on the reverse side (inside the lifter).
- Available thickness of the valve lifter (factory setting):  
7.88 - 8.40 mm (0.3102 - 0.3307 in), in 0.02 mm (0.0008 in) increments, in 27 sizes (intake / exhaust). Refer to [EM-249. "Cylinder Head"](#).



5. Install the selected replacement valve lifter.
6. Install the camshaft. Refer to [EM-194. "Removal and Installation"](#).
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.

Standard Valve Clearance	Cold	Hot* (reference data)
Intake	0.26 - 0.34 mm (0.010 - 0.013 in)	0.304 - 0.416 mm (0.012 - 0.016 in)
Exhaust	0.29 - 0.37 mm (0.011 - 0.015 in)	0.308 - 0.432 mm (0.012 - 0.017 in)

\* Approximately 80°C (176°F)

# COMPRESSION PRESSURE

< PERIODIC MAINTENANCE >

[VQ35DE]

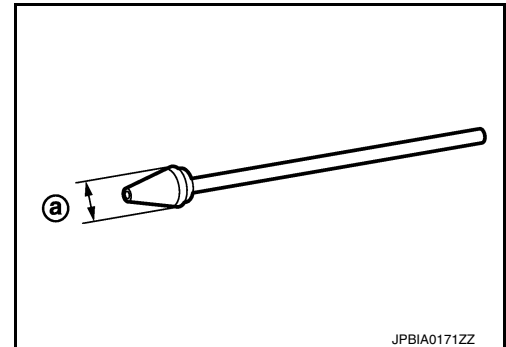
## COMPRESSION PRESSURE

### On-Vehicle Service

INFOID:000000009460536

#### CHECKING COMPRESSION PRESSURE

1. Run the engine until it reaches normal operating temperature.
2. Turn the ignition switch to OFF.
3. Release fuel pressure and leave the fuel pump electrically disconnected.  
Refer to [EC-687, "Work Procedure"](#).
4. Remove all six spark plugs.  
Refer to [EM-132, "Removal and Installation"](#).
5. Install the compression tester with the adapter into the spark plug hole.
  - Use compression tester whose end (a) (rubber portion) is smaller than 20 mm (0.79 in) in diameter. Otherwise, it may be caught by cylinder head during removal.



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.
8. Repeat the measurement on each cylinder (steps 5 - 7).

**NOTE:**

Always use a fully charged battery to obtain specified engine speed.

Unit: kPa (kg/cm<sup>2</sup>, psi)/rpm

Standard	Minimum	Difference limit between cylinders
1,275 (13.0, 185)/300	981 (10.0, 142)/300	98 (1.0, 14)/300

9. If compression in one or more cylinders is low:
  - a. Pour a small amount of engine oil into cylinders through the spark plug holes.
  - b. Retest compression (steps 5 - 8).
    - If adding oil helps raise compression pressure, then the piston rings may be worn or damaged. If so, replace piston rings after checking piston.
    - If the pressure stays low, a valve may be sticking or is seating improperly. Inspect and repair the valve and/or valve seat. Refer to [EM-212, "Inspection After Disassembly"](#). If the valve and/or valve seat is damaged replace as necessary.
    - If compression stays low in two or more cylinders that are next to each other:
      - The cylinder head gasket may be leaking.
      - Both cylinders may have valve component damage. Inspect and repair as necessary.

# ENGINE ROOM COVER

< REMOVAL AND INSTALLATION >

[VQ35DE]

## REMOVAL AND INSTALLATION

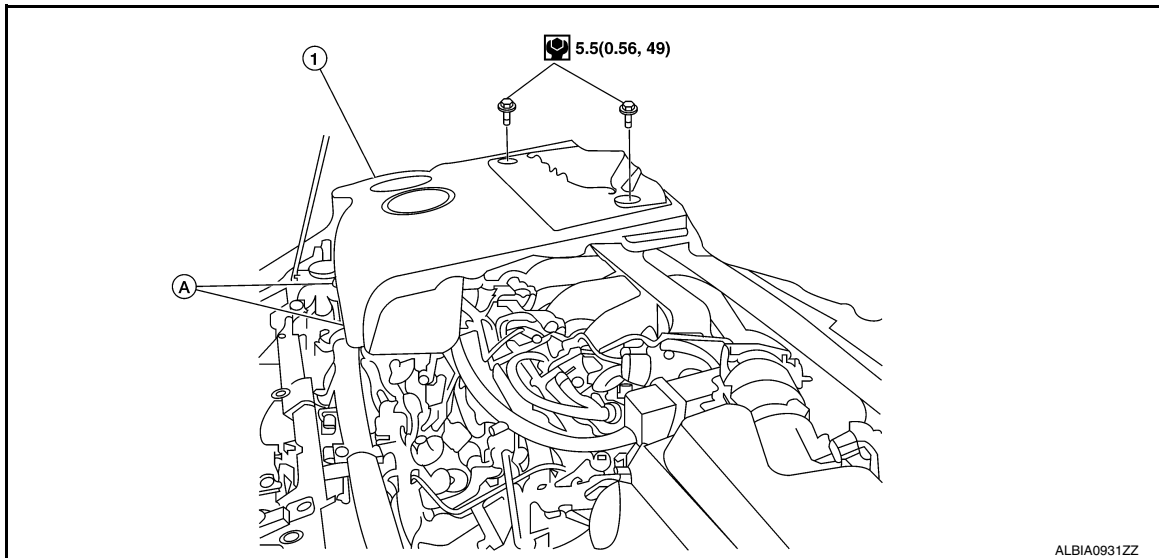
### ENGINE ROOM COVER

Exploded View

INFOID:000000009460537

A

EM



1. Engine room cover

A. Engine room cover locking tabs

C

D

E

F

G

H

### Removal and Installation

INFOID:000000009460538

#### **CAUTION:**

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

#### REMOVAL

1. Remove front air duct. Refer to [EM-144. "Removal and Installation"](#).
2. Remove engine room cover bolts.
3. Remove engine room cover by lifting straight up releasing engine room cover locking tabs.

#### INSTALLATION

Installation is in the reverse order of removal.

J

K

L

M

N

O

P

# AIR CLEANER AND AIR DUCT

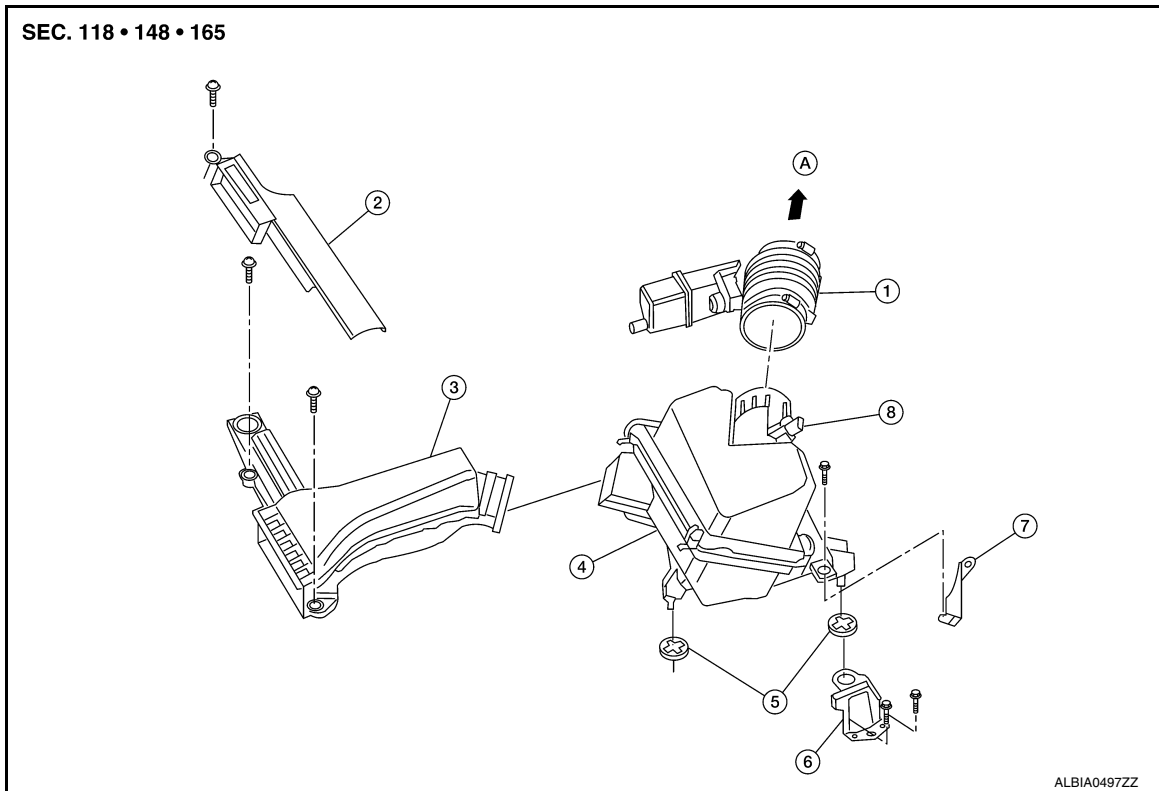
< REMOVAL AND INSTALLATION >

[VQ35DE]

## AIR CLEANER AND AIR DUCT

### Exploded View

INFOID:000000009460539



- |   |                         |  |
|---|-------------------------|--|
| 1. Air duct hose and resonator assembly | 2. Duct sub-cover       | 3. Front air duct                        |
| 4. Air cleaner assembly                 | 5. Grommets             | 6. Air cleaner mounting bracket          |
| 7. Bracket                              | 8. Mass air flow sensor | A. To electric throttle control actuator |

### Removal and Installation

INFOID:000000009460540

#### REMOVAL

1. Remove engine room cover. Refer to [EM-143, "Removal and Installation"](#).
2. Remove duct sub-cover and front air duct.
3. Disconnect the blow-by hose.
4. Disconnect the tube clamp at the electric throttle control actuator and at the air duct hose and resonator assembly.
5. Remove air duct hose and resonator assembly.
6. Disconnect mass air flow sensor.
7. Remove mass air flow sensor from air cleaner assembly, as necessary.

#### **CAUTION:**

**Handle mass air flow sensor with care.**

- Do not shock it.
- Do not disassemble it.
- Do not touch its sensor.

8. Disconnect transaxle breather hose.
9. Remove air cleaner assembly.

#### INSPECTION AFTER REMOVAL

Inspect air cleaner case assembly, front air duct, air duct hose and resonator assembly for cracks or tears. Replace as necessary.

# AIR CLEANER AND AIR DUCT

< REMOVAL AND INSTALLATION >

[VQ35DE]

## INSTALLATION

Installation is in the reverse order of removal.

A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

# INTAKE MANIFOLD COLLECTOR

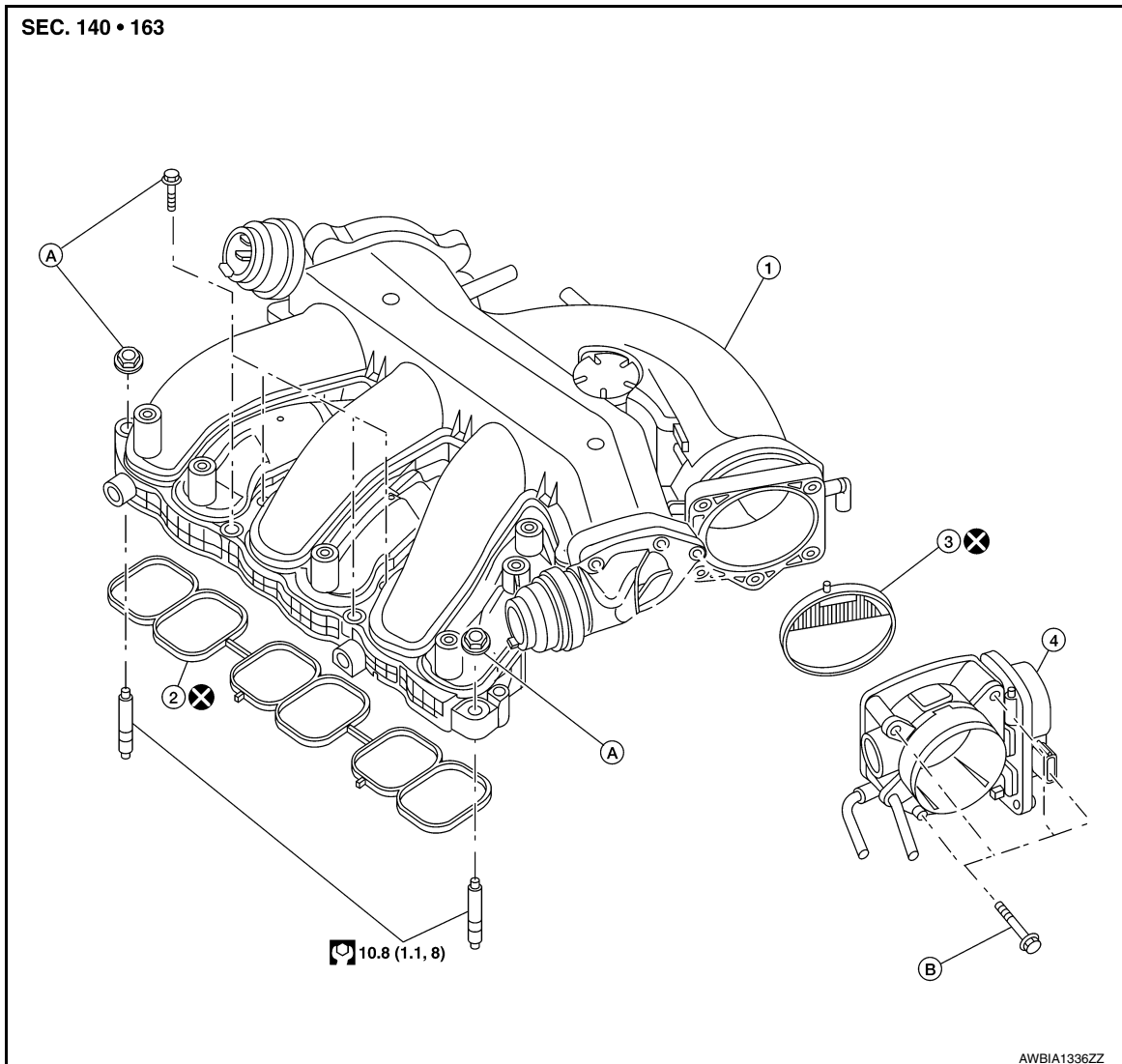
< REMOVAL AND INSTALLATION >

[VQ35DE]

## INTAKE MANIFOLD COLLECTOR

Exploded View

INFOID:000000009460541



- |                                       |                                     |  |
|---------------------------------------|-------------------------------------|--|
| 1. Intake manifold collector          | 2. Intake manifold collector gasket | 3. Electric throttle control actuator gasket |
| 4. Electric throttle control actuator | A. Refer to INSTALLATION            | B. Refer to INSTALLATION                     |

### CAUTION:

Do not remove power valves.

### Removal and Installation

INFOID:000000009460542

#### REMOVAL

#### WARNING:

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

1. Remove the cowl top. Refer to [EXT-24, "Removal and Installation"](#).
2. Remove the strut tower bar. Refer to [FSU-19, "Exploded View"](#).
3. Remove the engine room cover. Refer to [EM-143, "Removal and Installation"](#).
4. Remove front air duct and air duct hose and resonator assembly. Refer to [EM-144, "Removal and Installation"](#).
5. Partially drain the engine coolant. Refer to [CO-36, "Changing Engine Coolant"](#).

#### NOTE:

Revision: November 2013

EM-146

2014 Altima NAM

# INTAKE MANIFOLD COLLECTOR

## < REMOVAL AND INSTALLATION >

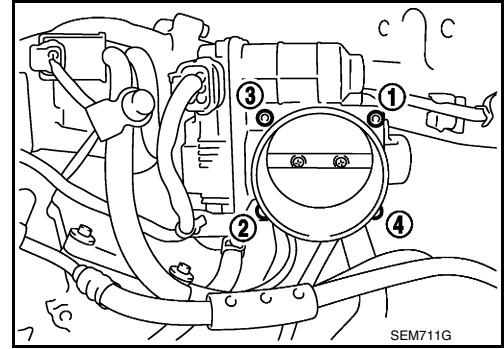
[VQ35DE]

This step is only required when removing electric throttle control actuator from the vehicle.

- Remove the electric throttle control actuator bolts in the reverse order as shown and 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.

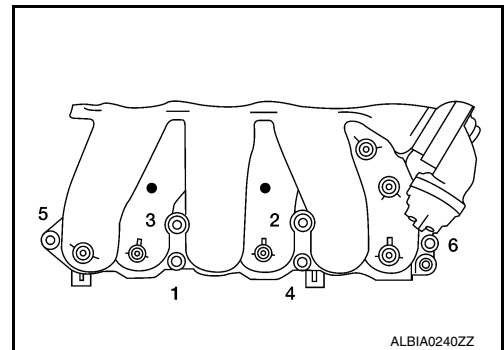


- Disconnect the following:
  - Power brake booster vacuum hose
  - Fuel injector harness connectors
  - PCV hose
  - Electric throttle control actuator harness connector
  - EVAP canister purge hose

**CAUTION:**

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

- Remove the EVAP canister purge volume solenoid valve bracket bolt. Position the valve aside.
- Loosen the intake manifold collector nuts and bolts in the reverse order as shown using power tool, and remove the intake manifold collector and gasket.



- If necessary remove the following components:
  - VIAS control solenoid valve
  - EVAP canister purge volume control solenoid valve

## INSTALLATION

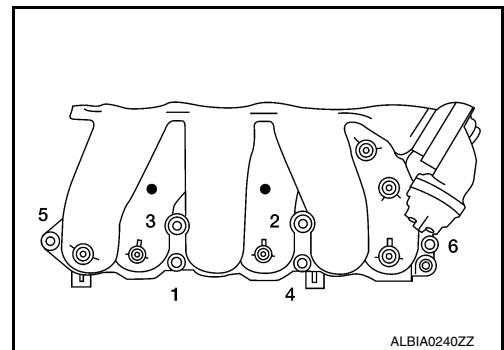
**CAUTION:**

**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 nuts and bolts in the order as shown.

**Nuts and bolts :11.0 N·m (1.1 kg-m, 8 ft-lb)**



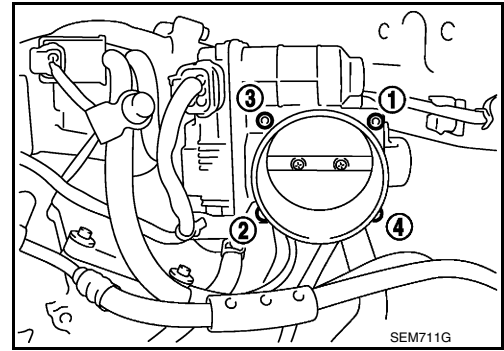
## INTAKE MANIFOLD COLLECTOR

< REMOVAL AND INSTALLATION >

[VQ35DE]

- Tighten electric throttle control actuator bolts in the order shown.

**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-682, "Work Procedure"](#).
2. Perform the "Idle Air Volume Learning" when the electric throttle control actuator is replaced. Refer to [EC-683, "Work Procedure"](#).



# INTAKE MANIFOLD

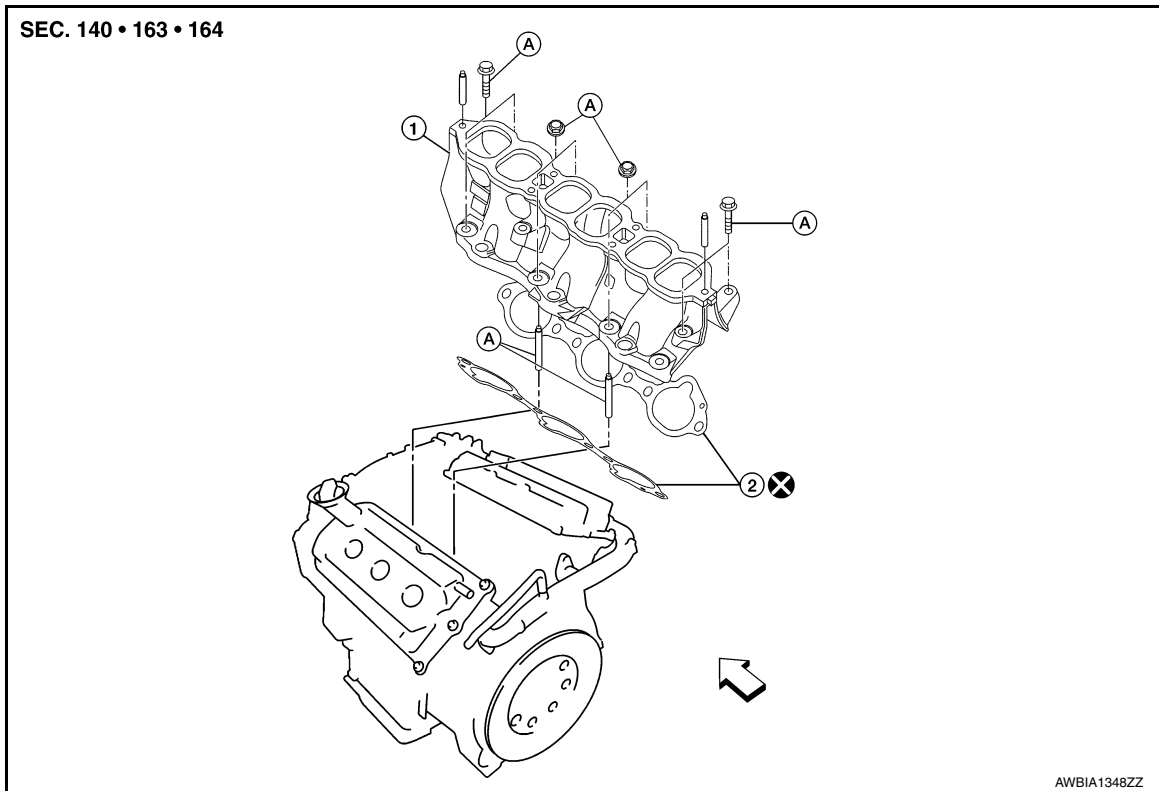
< REMOVAL AND INSTALLATION >

[VQ35DE]

## INTAKE MANIFOLD

### Exploded View

INFOID:000000009460543



1. Intake manifold

2. Intake manifold gaskets

A. Refer to INSTALLATION

⇐ Engine front

### Removal and Installation

INFOID:000000009460544

#### REMOVAL

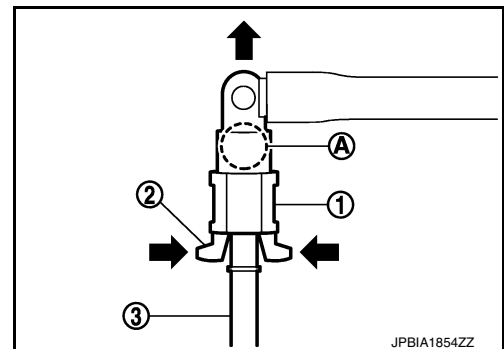
##### **WARNING:**

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

1. Release the fuel pressure. Refer to [EC-687, "Work Procedure"](#).
2. Disconnect the battery negative terminal. Refer to [PG-73, "Removal and Installation \(Battery\)"](#).
3. Remove intake manifold collector. Refer to [EM-146, "Removal and Installation"](#).
4. Disconnect fuel tube quick connector (1) at fuel tube (3) side. Refer to [EM-163, "Removal and Installation"](#).

(2) : Quick connector release

(A) : Holding position



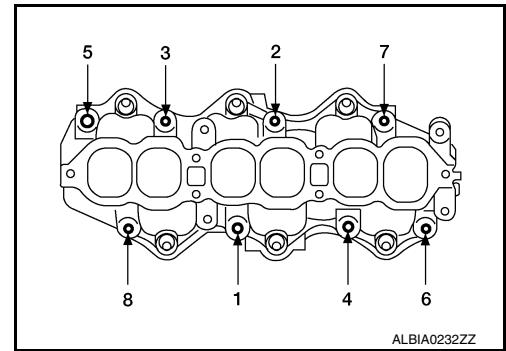
5. Remove fuel injector and fuel tube. Refer to [EM-163, "Removal and Installation"](#).

# INTAKE MANIFOLD

[VQ35DE]

## < REMOVAL AND INSTALLATION >

- Loosen the bolts in the order as shown, and remove the intake manifold.

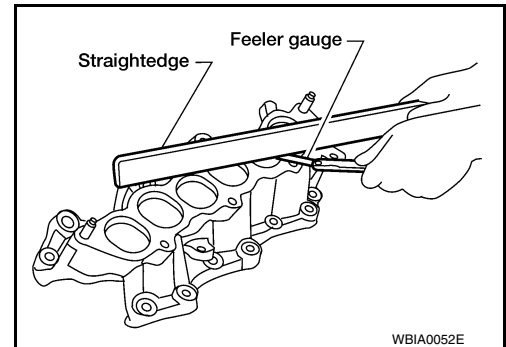


## INSPECTION AFTER REMOVAL

### Surface Distortion

- Using straightedge and feeler gauge, inspect the surface distortion of the intake manifold. Refer to [EM-146, "Removal and Installation"](#).

**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.

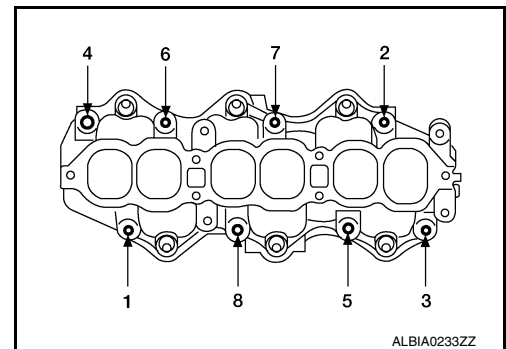
### CAUTION:

**Do not reuse intake manifold gaskets.**

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

**Step 1 : 7.3 N·m (0.74 kg-m, 65 in-lb)**

**Step 2 : 25.5 N·m (2.6 kg-m, 19 ft-lb)**



### 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-682, "Work Procedure"](#).
- Perform the "Idle Air Volume Learning" when the electric throttle control actuator is replaced. Refer to [EC-683, "Work Procedure"](#).
- Install the quick connector. Refer to [EM-163, "Removal and Installation"](#).

## INSPECTION AFTER INSTALLATION

Make sure there are no fuel leaks at the connections as follows:

- Apply fuel pressure to fuel lines by turning ignition switch ON (with engine stopped). Then check for fuel leaks at connections.
- 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.

# EXHAUST MANIFOLD AND THREE WAY CATALYST

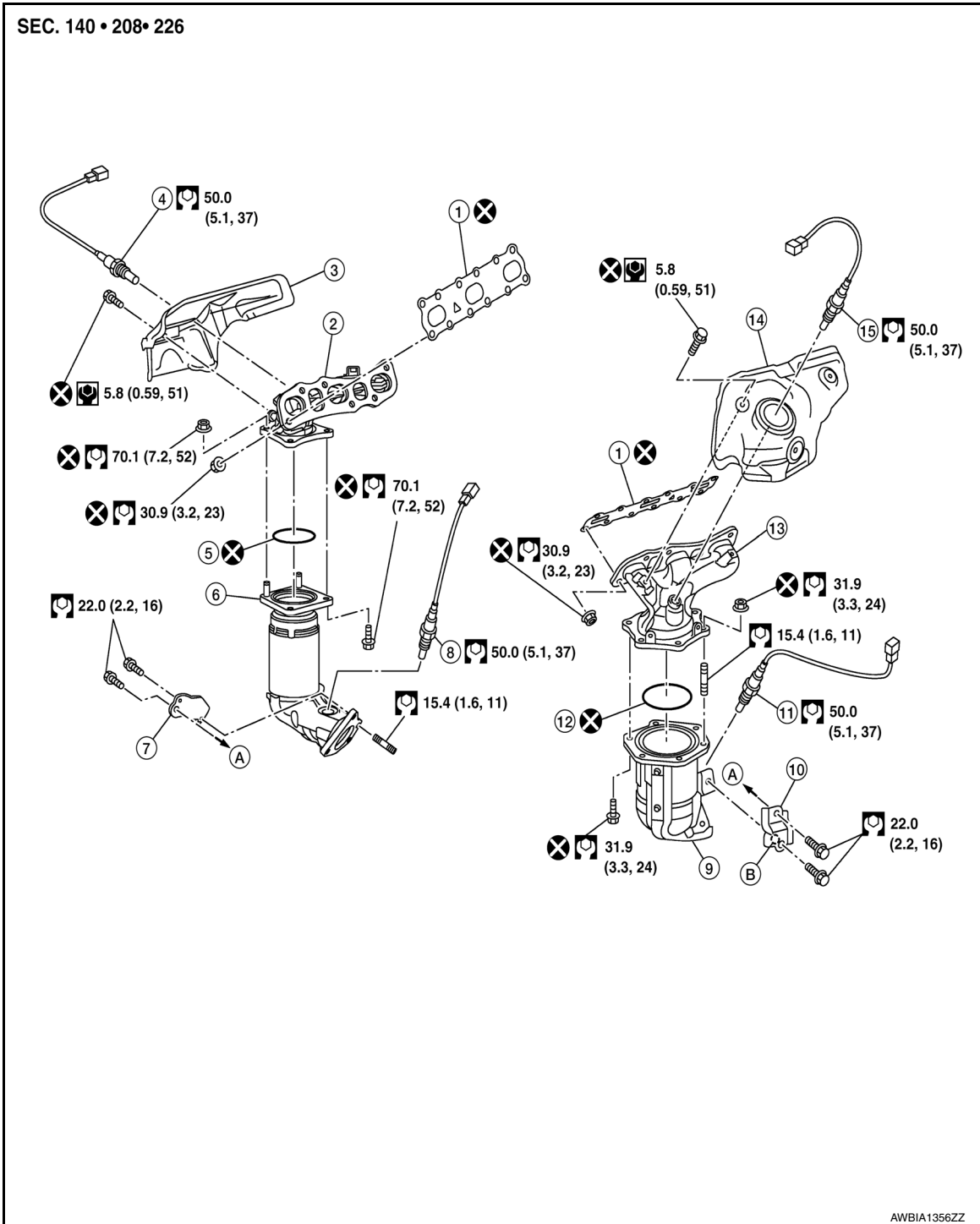
< REMOVAL AND INSTALLATION >

[VQ35DE]

## EXHAUST MANIFOLD AND THREE WAY CATALYST

Exploded View

INFOID:00000009460545



- |   |                                       |                                      |
|---|---------------------------------------|--------------------------------------|
| 1. Gasket                               | 2. Exhaust manifold (RH)              | 3. Exhaust manifold heat shield (RH) |
| 4. Air fuel ratio sensor 1 (bank 1)     | 5. Ring gasket                        | 6. Three way catalyst (bank 1)       |
| 7. Three way catalyst support (bank 1)  | 8. Heated oxygen sensor 2 (bank 1)    | 9. Three way catalyst (bank 2)       |
| 10. Three way catalyst support (bank 2) | 11. Heated oxygen sensor 2 (bank 2)   | 12. Ring gasket                      |
| 13. Exhaust manifold (LH)               | 14. Exhaust manifold heat shield (LH) | 15. Air fuel ratio sensor 1 (bank 2) |
| A. To oil pan (upper)                   | B. Upper mark                         |                                      |

# EXHAUST MANIFOLD AND THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

[VQ35DE]

## Removal and Installation (LH)

INFOID:000000009460546

### 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 air cleaner assembly, and air duct hose and resonator assembly. Refer to [EM-144, "Removal and Installation"](#).
2. Remove the battery and battery tray assembly. Refer to [PG-74, "Removal and Installation \(Battery Tray\)"](#).
3. Remove the engine under cover. Refer to [EXT-28, "Removal and Installation"](#).
4. Remove the radiator assembly. Refer to [CO-41, "Removal and Installation"](#).
5. Remove the engine cooling fan shroud and motor assembly. Refer to [CO-42, "Removal and Installation"](#).
6. Remove the front exhaust tube. Refer to [EX-10, "Exploded View"](#).
7. Remove the LH three way catalyst support brackets.
8. Remove heated oxygen sensor 2 (bank 2), air fuel ratio (A/F) sensor 1 (bank 2).
  - a. Remove harness connector of each sensor, and disconnect the harness from the bracket and middle clamp.
  - b. Remove both heated oxygen sensor 2 and air fuel ratio (A/F) sensor 1 using Tool.

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

#### CAUTION:

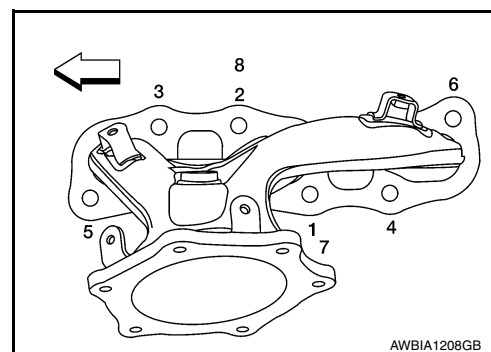
- Be careful not to damage heated oxygen sensors 2 or air fuel ratio (A/F) sensors 1.
  - Discard any heated oxygen sensor 2 which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; replace with a new sensor.
9. Remove exhaust manifold heat shield (LH) and three way catalyst heat shields (LH) using power tool.
  10. Remove the three way catalyst (bank 2) by loosening the bolts first and then removing the nuts and through bolts.
  11. Loosen and remove the exhaust manifold nuts in the reverse order as shown.

⇐ : Engine front

#### NOTE:

Number 7 and 8 are not applicable to removal.

12. Remove the exhaust manifold (LH) and gasket.



### INSPECTION AFTER REMOVAL

#### Surface Distortion

# EXHAUST MANIFOLD AND THREE WAY CATALYST

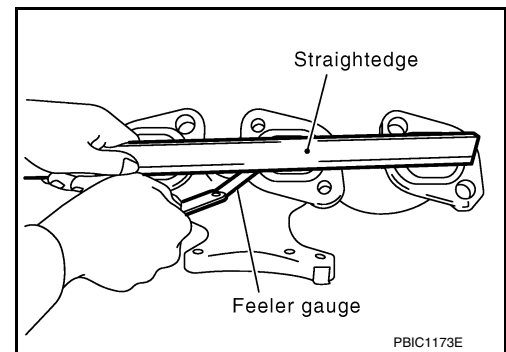
[VQ35DE]

## < REMOVAL AND INSTALLATION >

- Use a reliable straightedge and feeler gauge 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.

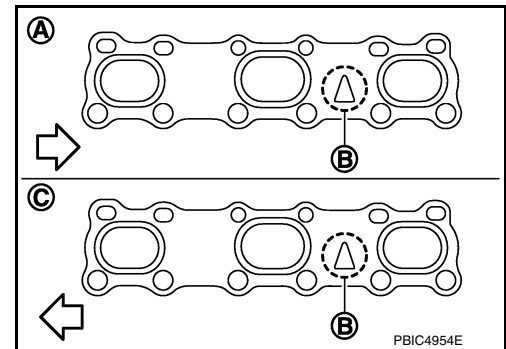
**Exhaust manifold studs : 15.4 N·m (1.6 kg-m, 11 ft-lb)**

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

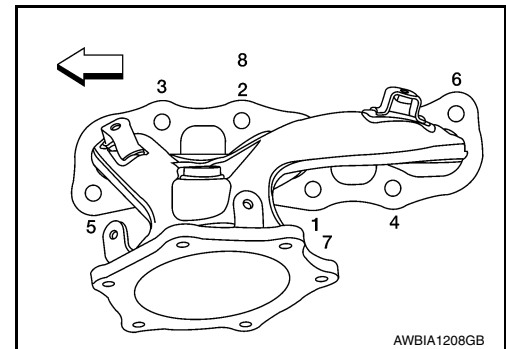


3. Install the exhaust manifold (LH) nuts and tighten to specification in the order shown.

⇐ : **Engine front**

### 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.

**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 (RH)

INFOID:000000009460547

## REMOVAL

### WARNING:

# EXHAUST MANIFOLD AND THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

[VQ35DE]

- 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. For engine slingers, refer to [EM-220, "Removal and Installation"](#).
1. Remove the engine and transaxle assembly. Refer to [EM-220, "Removal and Installation"](#).
  2. Remove the RH three way catalyst supports.
  3. Remove rear engine mount bracket. Refer to [EM-220, "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 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 and air fuel ratio (A/F) sensors 1 using Tool.

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

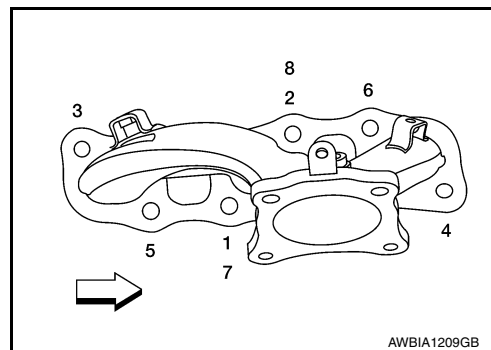
## CAUTION:

- 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 (RH) and three way catalyst heat shields (RH) 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 (RH).

← : Engine front

## NOTE:

Number 7 and 8 are not applicable to removal.

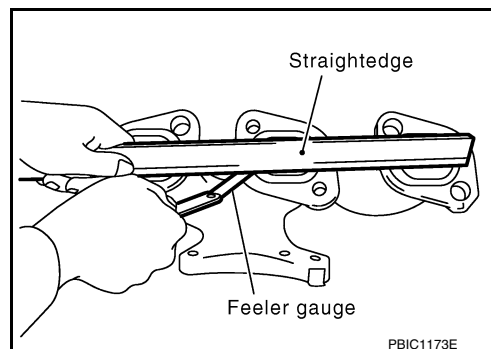


## INSPECTION AFTER REMOVAL

### Surface Distortion

- Use a reliable straightedge and feeler gauge to check the flatness of the exhaust manifold mating surfaces.

**Limit** : 0.3mm (0.012 in)



## INSTALLATION

Installation is in the reverse order of removal.

## CAUTION:

**Do not reuse exhaust manifold gaskets.**

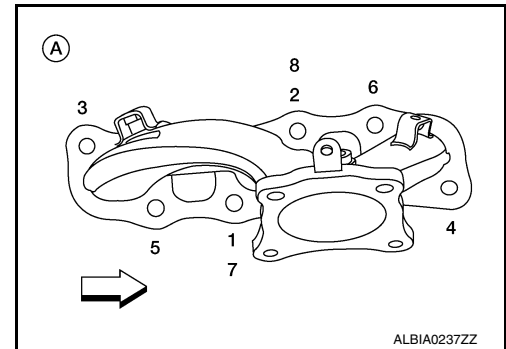
# EXHAUST MANIFOLD AND THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

[VQ35DE]

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

← :Engine front



A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

## 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)

# OIL PAN AND OIL STRAINER

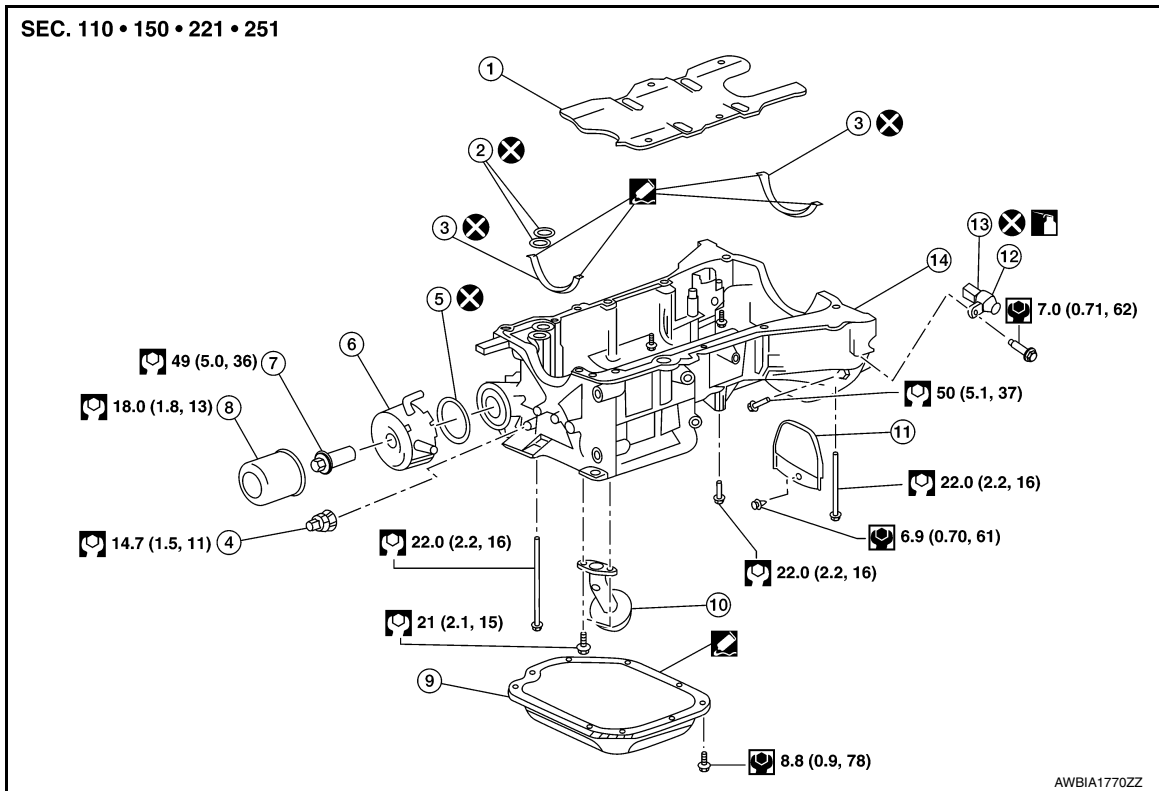
< REMOVAL AND INSTALLATION >

[VQ35DE]

## OIL PAN AND OIL STRAINER

Exploded View

INFOID:000000009460548



- |                          |                      |                                      |
|--------------------------|----------------------|--------------------------------------|
| 1. Oil pan baffle        | 2. O-ring            | 3. Gasket                            |
| 4. Oil pressure switch   | 5. Oil cooler O-ring | 6. Oil cooler                        |
| 7. Oil cooler connection | 8. Oil filter        | 9. Lower oil pan                     |
| 10. Oil strainer         | 11. Rear plate cover | 12. Crankshaft position sensor (POS) |
| 13. O-ring               | 14. Upper oil pan    |                                      |

### Removal and Installation (Lower Oil Pan)

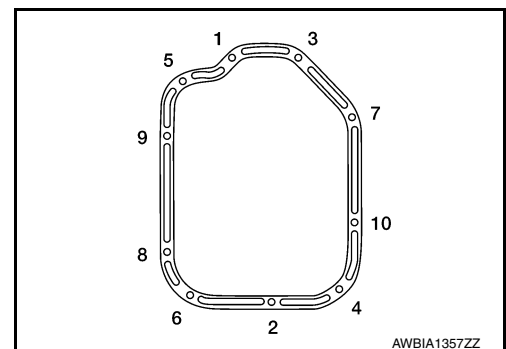
INFOID:000000009460549

#### REMOVAL

#### **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-26. "Changing Engine Oil"](#).
2. Loosen the lower oil pan bolts in the reverse order as shown using power tool.



3. Remove the lower oil pan.



# OIL PAN AND OIL STRAINER

## < REMOVAL AND INSTALLATION >

[VQ35DE]

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

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

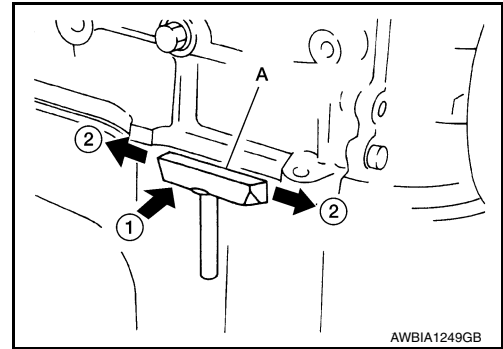
### CAUTION:

- 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.**

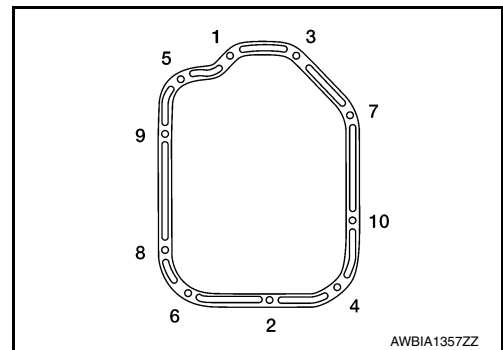
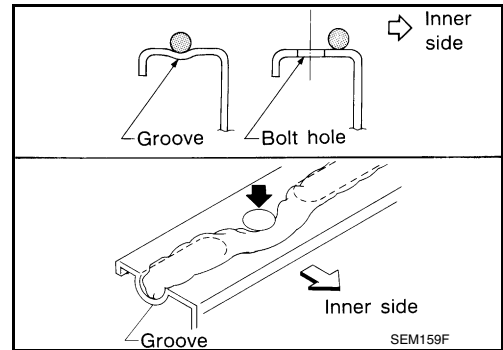


## INSPECTION AFTER REMOVAL

Clean oil strainer if any object is attached.

## INSTALLATION

1. Apply a continuous bead of liquid gasket to the lower oil pan.
- Use Genuine Silicone RTV Sealant, or equivalent. Refer to [GL-21, "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. Refer to [LU-25, "Inspection"](#).
- Inspect the engine oil level. Refer to [LU-25, "Inspection"](#).

## Removal and Installation (Upper Oil Pan)

INFOID:000000009460550

## 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-220, "Removal and Installation"](#).

### CAUTION:

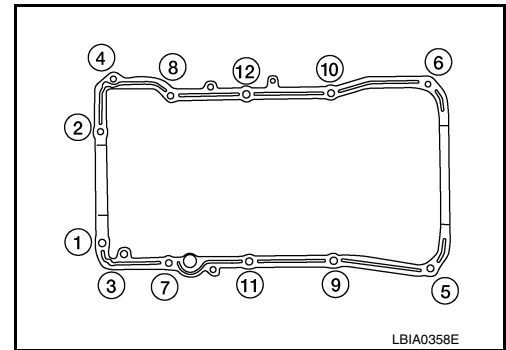
**When removing the upper oil pan from the engine, first remove the crankshaft position sensor (POS). Be careful not to damage sensor edges or signal plate teeth.**

# OIL PAN AND OIL STRAINER

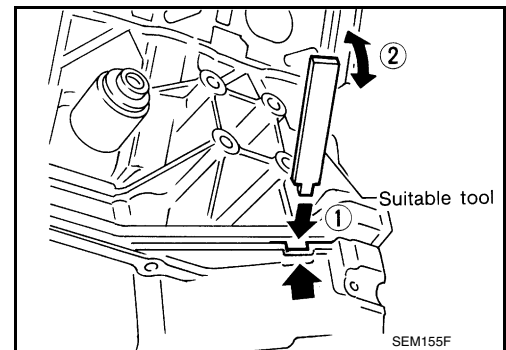
[VQ35DE]

## < REMOVAL AND INSTALLATION >

1. Remove the engine from the vehicle. Refer to [EM-220, "Removal and Installation"](#).
2. Drain the engine oil. Refer to [LU-26, "Changing Engine Oil"](#).
3. Remove the oil level gauge guide.
4. Remove the drive belt. Refer to [EM-134, "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-30, "COMPRESSOR : Removal and Installation"](#).
7. Remove coolant pipe bolts. Refer to [CO-51, "Removal and Installation"](#).
8. Disconnect the coolant lines from the engine oil cooler.
9. Remove the oil filter and engine oil cooler from the upper oil pan.
10. Remove the oil pressure switch, and the crankshaft position sensor (POS) from the upper oil pan.
11. Remove the lower oil pan. Refer to [EM-156, "Removal and Installation \(Lower Oil Pan\)"](#).
12. Remove the upper oil pan.
  - a. Loosen the bolts in the order as shown, using power tool.

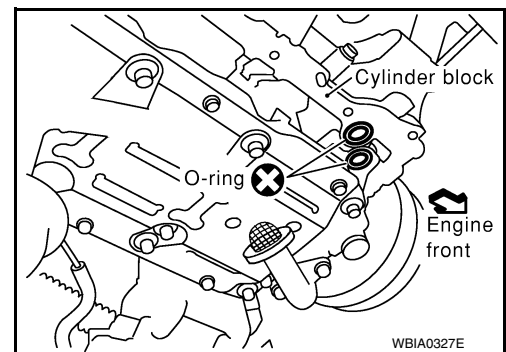


- b. Insert an appropriate size tool into the notch (1) of the upper oil pan as shown.
- c. Pry off the upper oil pan by moving the tool up and down (2) as shown.



13. Remove the O-ring seals from the bottom of the cylinder block and oil pump housing. Use new O-rings for installation.

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



# OIL PAN AND OIL STRAINER

## < REMOVAL AND INSTALLATION >

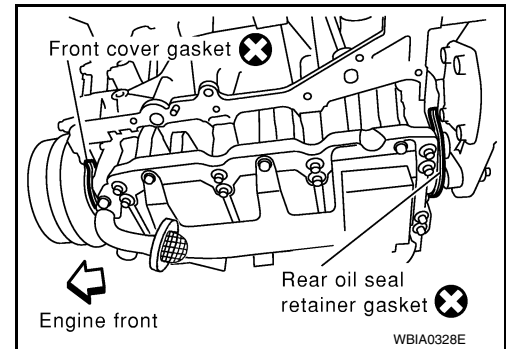
[VQ35DE]

14. Remove front cover gasket and rear oil seal retainer gasket.

**CAUTION:**

**Do not reuse gaskets.**

15. Remove the oil strainer.



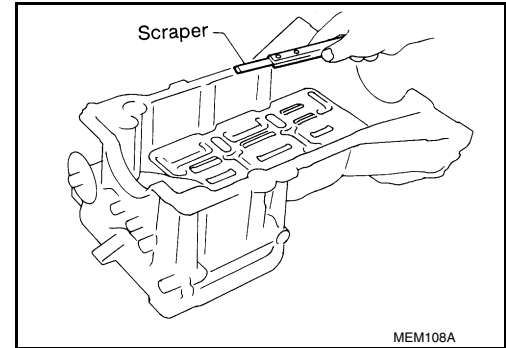
16. If re-installing the original oil pan, remove the old sealant from the mating surfaces using a scraper.

- 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.

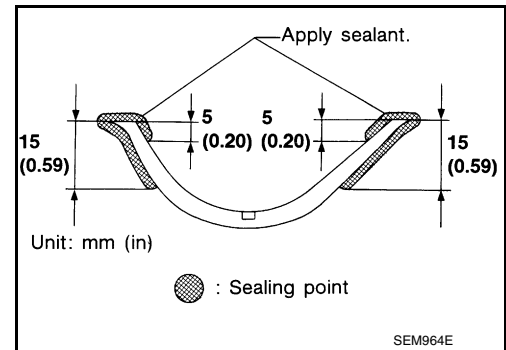
## INSTALLATION

1. Install oil strainer and tighten bolts to specified torque. Refer to [EM-156, "Exploded View"](#).

2. Apply Genuine Silicone RTV Sealant or equivalent, to the front cover gasket and the rear oil seal retainer gasket as shown. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).

**CAUTION:**

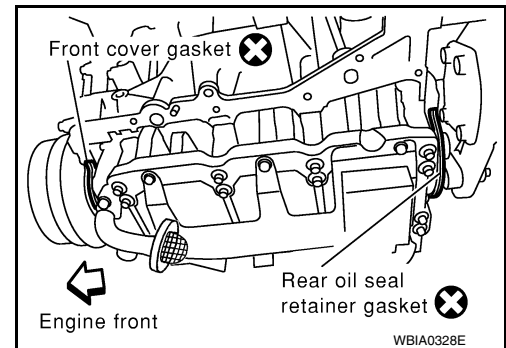
**The components must be installed within 5 minutes of the liquid gasket application. Then allow 30 minutes for the liquid gasket to set before operating the engine.**



3. Install the front cover gasket and rear oil seal retainer gasket as shown.

**CAUTION:**

**Do not reuse gaskets.**



A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# OIL PAN AND OIL STRAINER

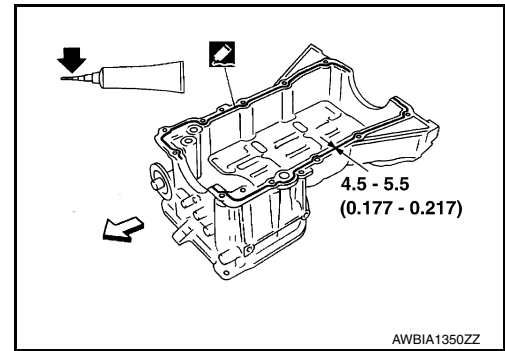
[VQ35DE]

## < REMOVAL AND INSTALLATION >

4. Apply a bead of sealant to the cylinder block mating surface of the upper oil pan to a limited portion as shown.
  - Use Genuine Silicone RTV Sealant, or equivalent. Refer to [GI-21. "Recommended Chemical Products and Sealants"](#).
  - Be sure the sealant is applied to a limited portion as shown, and the sealant is 4.5 - 5.5 mm (0.177 - 0.217 in) wide.
  - Attaching should be done within 5 minutes after coating.

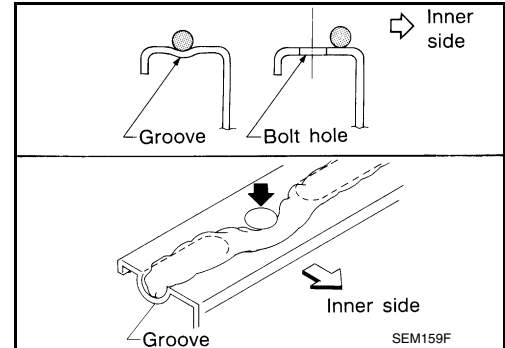
⇐ :Engine front

➡ :Cut here



### CAUTION:

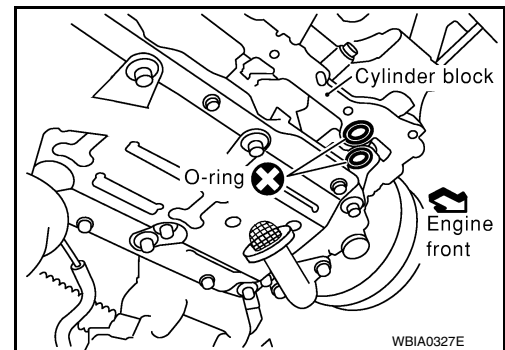
The components must be installed within 5 minutes of the liquid gasket application. Then allow 30 minutes for the liquid gasket to set before operating the engine.



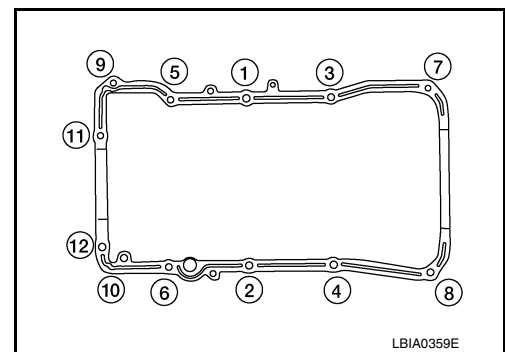
5. Install new O-rings on the cylinder block and oil pump body.

### CAUTION:

Do not reuse O-rings.



6. Install the upper oil pan.
  - Tighten upper oil pan bolts in the order as shown.
  - Wait at least 30 minutes before refilling the engine with oil.



7. Install the lower oil pan. Refer to [EM-156. "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 less than required quantity, fill to the specified level. Refer to [MA-11. "FOR USA AND CANADA : Fluids and Lubricants"](#).
- 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.

# OIL PAN AND OIL STRAINER

## < REMOVAL AND INSTALLATION >

[VQ35DE]

- 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.
- Summary of the inspection items:

Item		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission/ transaxle fluid	A/T and CVT Models	Leakage	Level/Leakage	Leakage
	M/T Models	Level/Leakage	Leakage	Level/Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gas		—	Leakage	—

\*Power steering fluid, brake fluid, etc.

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# IGNITION COIL

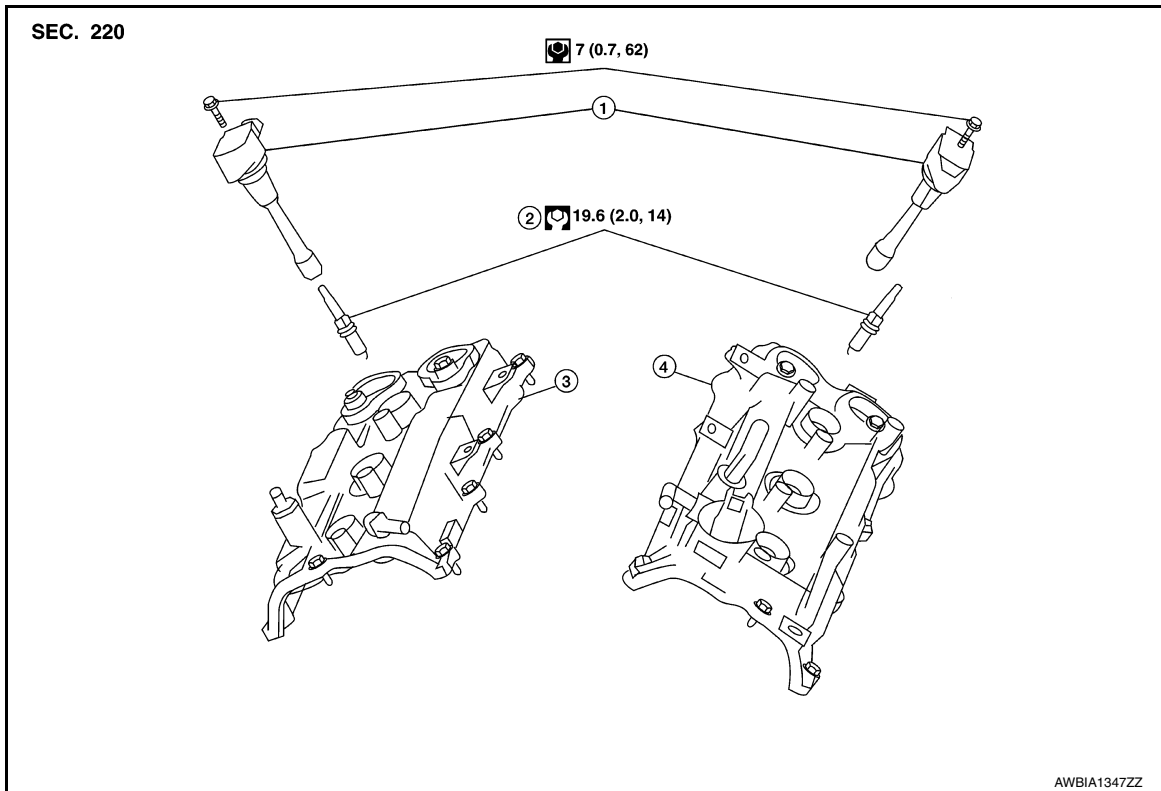
< REMOVAL AND INSTALLATION >

[VQ35DE]

## IGNITION COIL

Exploded View

INFOID:000000009460551



- 1. Ignition coil
- 2. Spark plug
- 3. Rocker cover (RH)
- 4. Rocker cover (LH)

## Removal and Installation LH

INFOID:000000009460552

### REMOVAL

1. Remove engine room cover. Refer to [EM-143, "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

INFOID:000000009460553

### REMOVAL

1. Disconnect the battery negative terminal. Refer to [PG-73, "Removal and Installation \(Battery\)"](#).
2. Remove the intake manifold collector. Refer to [EM-146, "Removal and Installation"](#).
3. Disconnect ignition coil harness connector.
4. Remove the ignition coil.

**CAUTION:**  
**Do not shock ignition coil.**

### INSTALLATION

Installation is in the reverse order of removal.

# FUEL INJECTOR AND FUEL TUBE

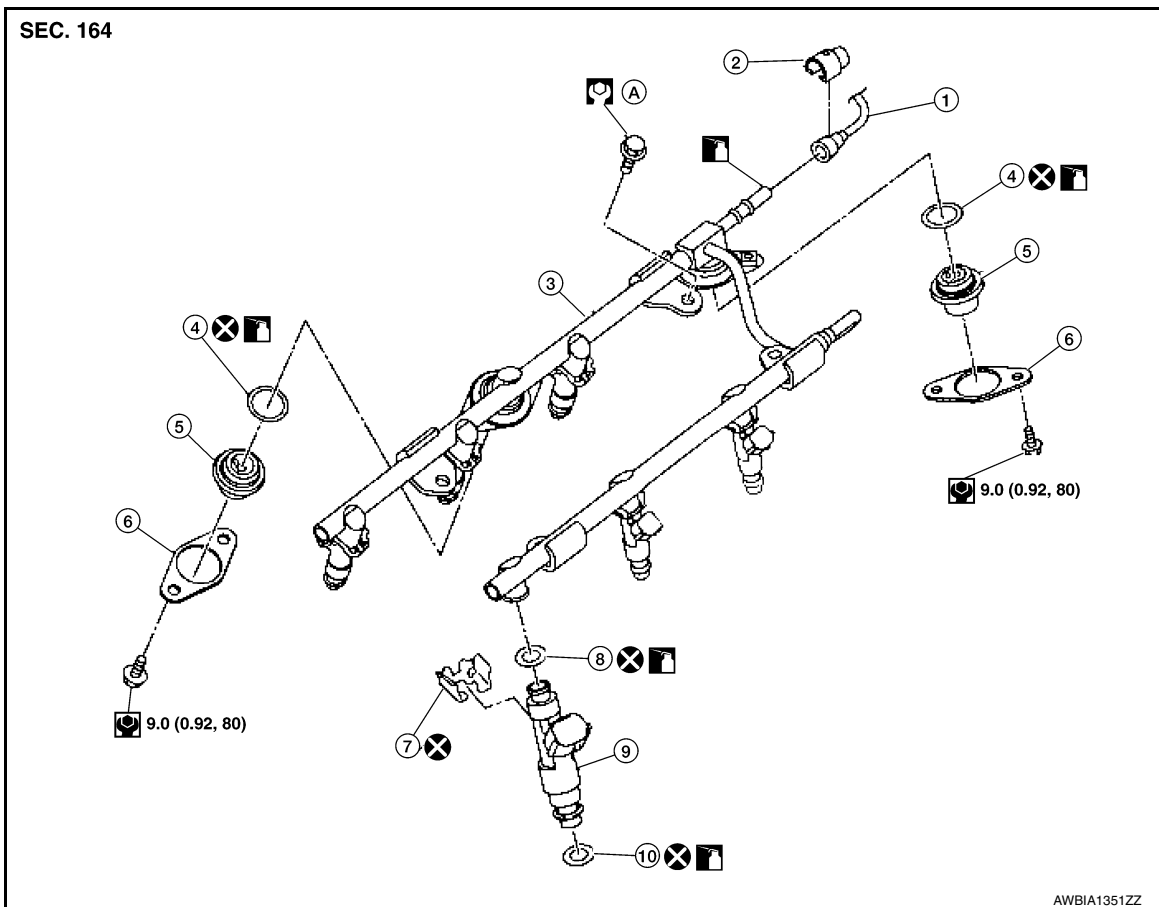
< REMOVAL AND INSTALLATION >

[VQ35DE]

## FUEL INJECTOR AND FUEL TUBE

Exploded View

INFOID:000000009460554



- |                    |                          |                    |
|--------------------|--------------------------|--------------------|
| 1. Fuel feed hose  | 2. Quick connector cap   | 3. Fuel tube       |
| 4. O-ring          | 5. Fuel damper           | 6. Fuel damper cap |
| 7. Clip            | 8. O-ring (black)        | 9. Fuel injector   |
| 10. O-ring (green) | A. Refer to INSTALLATION |                    |

### CAUTION:

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

## Removal and Installation

INFOID:000000009460555

### REMOVAL

#### 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.

1. Remove engine room cover. Refer to [EM-143. "Removal and Installation"](#).
2. Release the fuel pressure. Refer to [EC-687. "Work Procedure"](#).
3. Disconnect the battery negative terminal. Refer to [PG-73. "Removal and Installation \(Battery\)"](#).
4. Remove front wiper arm and cowl top extension. Refer to [EXT-24. "Removal and Installation"](#).
5. Remove strut tower bar. Refer to [FSU-19. "Exploded View"](#).

# FUEL INJECTOR AND FUEL TUBE

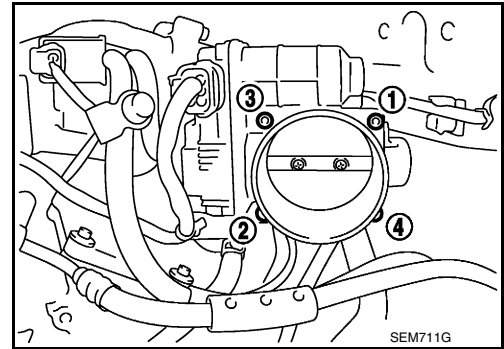
[VQ35DE]

## < REMOVAL AND INSTALLATION >

6. Remove the electric throttle control actuator bolts in the reverse order as shown and 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. Remove intake manifold collector. Refer to [EM-146. "Removal and Installation"](#).
8. When separating fuel feed hose and fuel tube connection, disconnect quick connector as follows:
- a. Remove quick connector cap from quick connector.
- b. Disconnect quick connector from fuel tube as follows:

**CAUTION:**

**Disconnect quick connector by using the quick connector release (commercial service tool: J-45488), not by picking out retainer tabs.**

- i. With the sleeve side of quick connector release facing to quick connector, install the quick connector release onto fuel tube.
- ii. Insert the quick connector release (A) into quick connector (2) until sleeve (B) contacts and goes no further. Hold quick connector release on that position.

(C) : Insert and retain

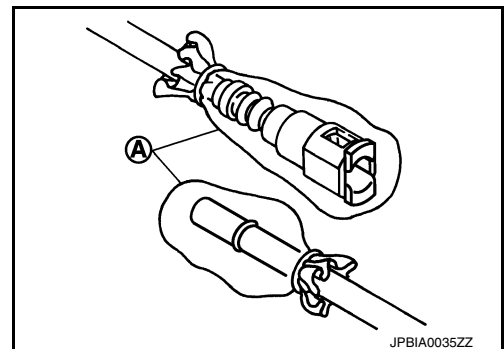
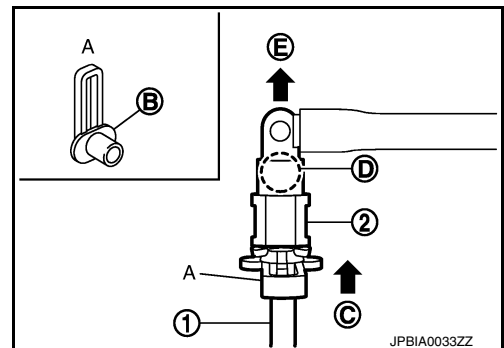
**CAUTION:**

**Inserting quick connector release 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.



9. Disconnect harness connector from fuel injector.



# FUEL INJECTOR AND FUEL TUBE

[VQ35DE]

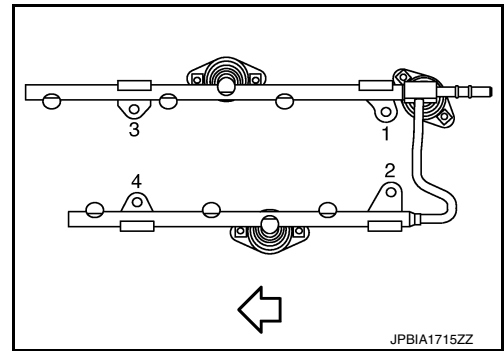
## < REMOVAL AND INSTALLATION >

10. 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.



11. Remove fuel injector from fuel tube as follows:

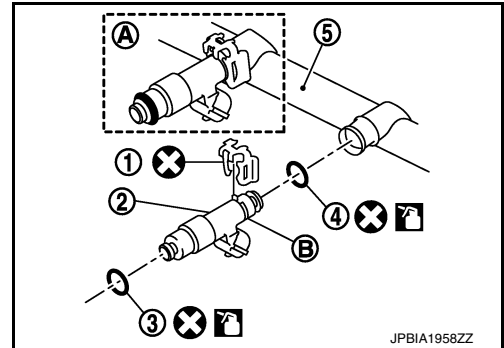
- a. Open and remove clip (1).

- (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.



12. 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)

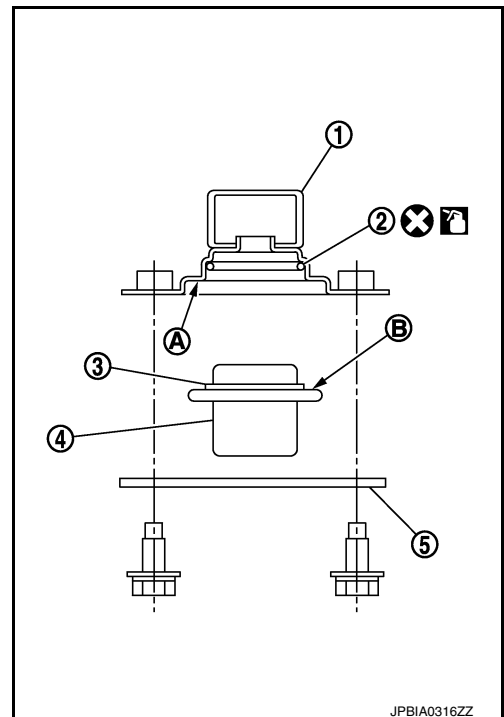
- Insert fuel damper until (B) is touching (A) of fuel tube.

- d. Tighten bolts evenly in turn.

- After tightening bolts, check that there is no gap between fuel damper cap (5) and fuel tube.

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

**CAUTION:**



# FUEL INJECTOR AND FUEL TUBE

[VQ35DE]

## < REMOVAL AND INSTALLATION >

- 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).

(2) : O-ring (black)

(4) : O-ring (green)

- Insert clip so that protrusion (E) of fuel injector matches cutout (C) of clip.

### CAUTION:

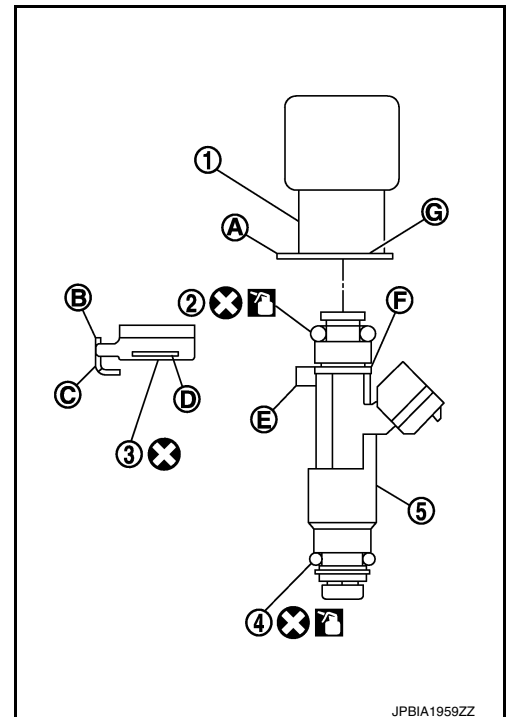
- Do not reuse O-rings.
- Do not reuse clip. Replace it with new one.
- Be careful to keep clip from interfering with O-ring. If interference occurs, replace O-ring.

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.



JPBIA1959ZZ

4. Install fuel tube and fuel injector assembly to intake manifold.

### CAUTION:

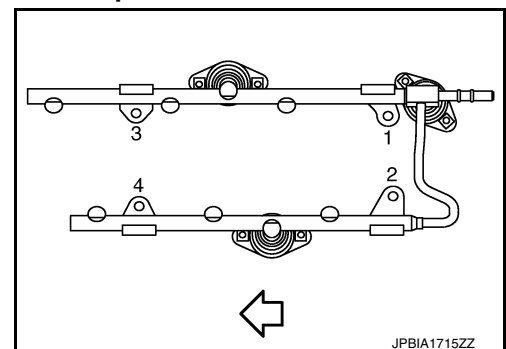
Be careful not to let tip of injector nozzle come in contact with other parts.

- 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)



JPBIA1715ZZ

5. Connect fuel injector harness.

6. Install intake manifold collector. Refer to [EM-146, "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 no damage on them.

# FUEL INJECTOR AND FUEL TUBE

[VQ35DE]

## < REMOVAL AND INSTALLATION >

- b. Thinly apply new engine oil around fuel tube from tip end to spool end.
- c. Align center to insert quick connector straightly 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.

(B) : Installed condition

⇐ : Upright insertion

### CAUTION:

- Do not reuse O-ring.
- Hold (A) position as shown when inserting fuel tube into quick connector.
- 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.

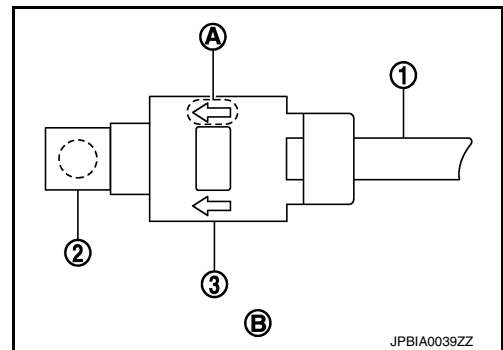
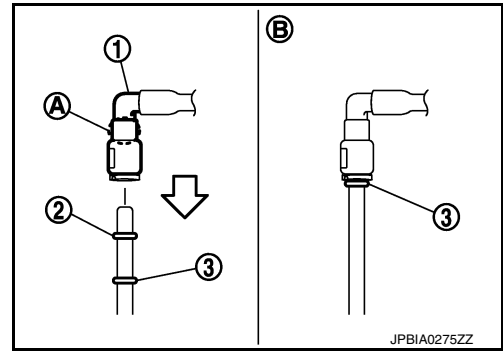
### WARNING:

**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.

- Perform procedures for “Throttle Valve Closed Position Learning” after finishing repairs. Refer to [EC-682. "Work Procedure"](#).
- If electric throttle control actuator is replaced, perform procedures for “Idle Air Volume Learning” after finishing repairs. Refer to [EC-683. "Work Procedure"](#).



# ROCKER COVER

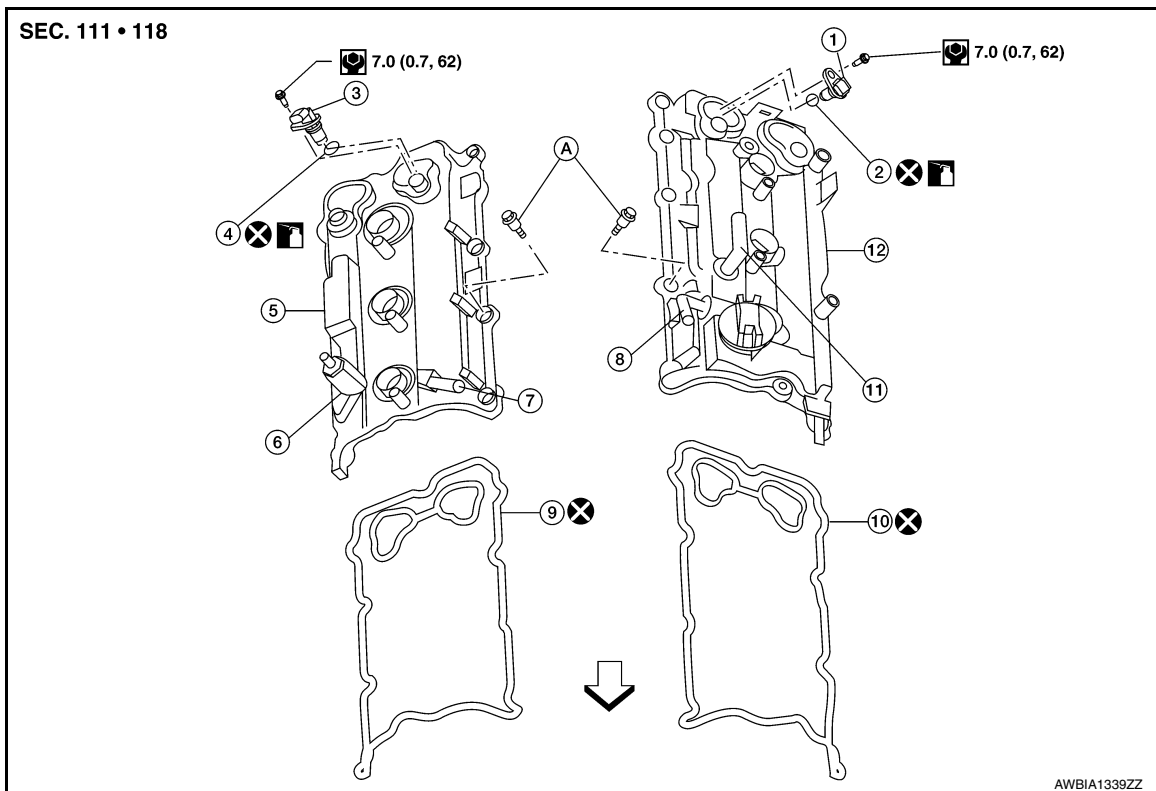
< REMOVAL AND INSTALLATION >

[VQ35DE]

## ROCKER COVER

Exploded View

INFOID:000000009460556



- |                                  |                      |                                  |
|----------------------------------|----------------------|----------------------------------|
| 1. Camshaft position sensor (LH) | 2. O-ring            | 3. Camshaft position sensor (RH) |
| 4. O-ring                        | 5. Rocker cover (RH) | 6. Breather (RH)                 |
| 7. Blow by vent (RH)             | 8. Blow by vent (LH) | 9. Rocker cover gasket (RH)      |
| 10. Rocker cover gasket (LH)     | 11. Breather (LH)    | 12. Rocker cover (LH)            |
- ↶ Engine front      A. Refer to INSTALLATION

## Removal and Installation LH

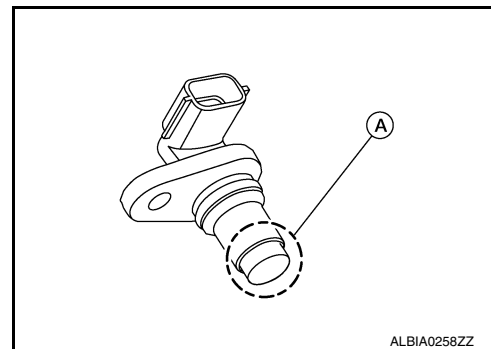
INFOID:000000009460557

### REMOVAL

1. Remove front air duct. Refer to [EM-144, "Removal and Installation"](#).
2. Remove blow by hose and breather hose from rocker cover.
3. Remove camshaft position sensor (LH).

#### 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.



4. Disconnect the ignition coil harness connectors.
5. Remove the ignition coils. Refer to [EM-162, "Removal and Installation LH"](#).

#### CAUTION:

**Do not shock ignition coils.**

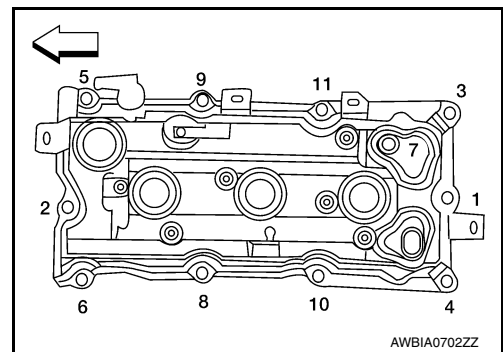
# ROCKER COVER

[VQ35DE]

## < REMOVAL AND INSTALLATION >

- Remove LH rocker cover bolts from cylinder head in order as shown.

← :Engine front



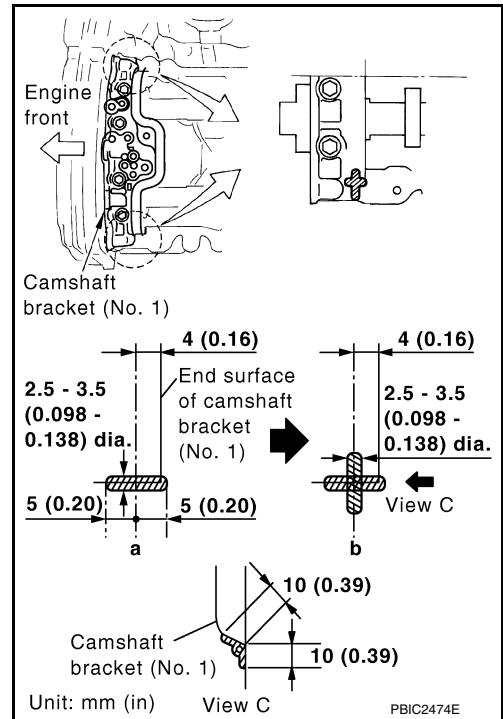
## INSTALLATION

Installation is in the reverse order of removal.

- Apply sealant to the areas on the front corners using suitable tool.
- Use Genuine Silicone RTV Sealant or equivalent. Refer to [EM-124, "Precaution for Liquid Gasket"](#).

### CAUTION:

The components must be installed within 5 minutes of the liquid gasket application. Then allow 30 minutes for the liquid gasket to set before operating the engine.



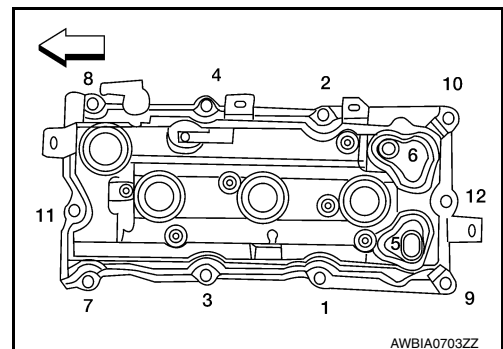
- Tighten the rocker cover bolts in two steps in the order as shown.

← : 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)



## Removal and Installation RH

INFOID:000000009460558

### REMOVAL

- Remove the engine room cover. Refer to [EM-143, "Removal and Installation"](#).
- Remove the intake manifold collector. Refer to [EM-146, "Removal and Installation"](#).
- Disconnect the ignition coil harness connectors.
- Remove ignition coils. Refer to [EM-162, "Removal and Installation RH"](#).

### CAUTION:

# ROCKER COVER

[VQ35DE]

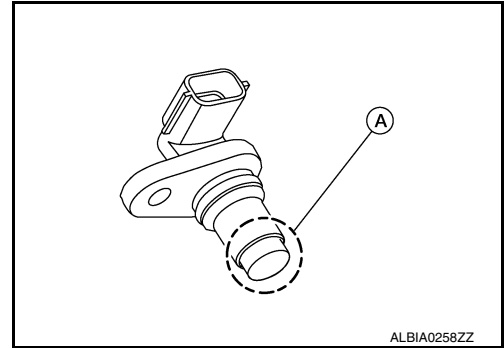
## < REMOVAL AND INSTALLATION >

**Do not shock ignition coils.**

5. Remove blow by hose and breather hose from rocker cover.
6. Remove camshaft position sensor.

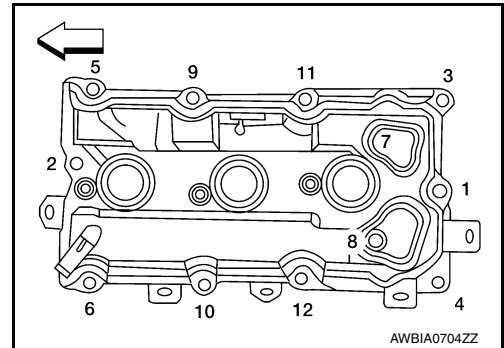
**CAUTION:**

- 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.



7. Remove RH rocker cover bolts from cylinder head in order as shown.

← : Engine front



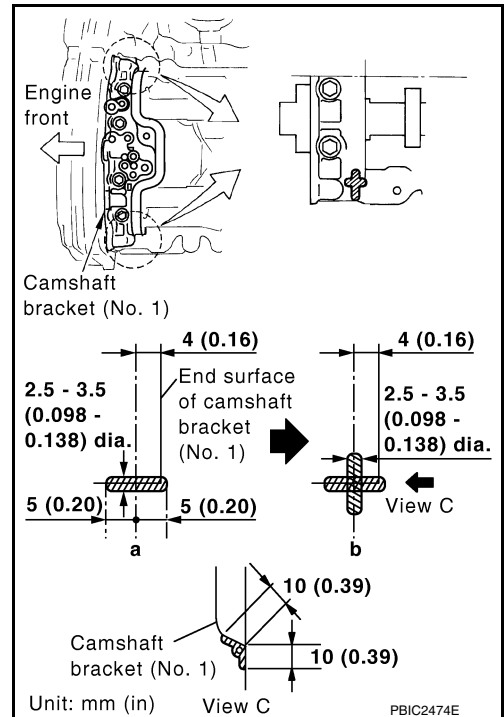
## INSTALLATION

Installation is in the reverse order of removal.

- Apply sealant to the areas on the front corners using suitable tool.
- Use Genuine Silicone RTV Sealant or equivalent. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).

**CAUTION:**

The components must be installed within 5 minutes of the liquid gasket application. Then allow 30 minutes for the liquid gasket to set before operating the engine.



# ROCKER COVER

< REMOVAL AND INSTALLATION >

[VQ35DE]

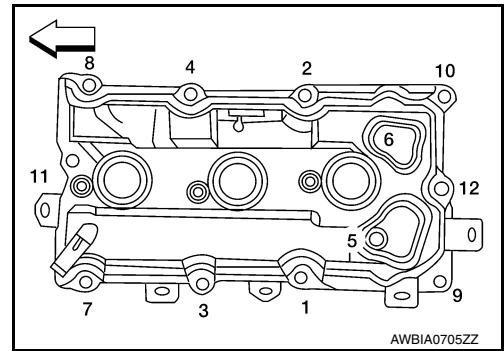
- Tighten the rocker cover bolts in two steps in the order as shown.

← : 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)



A

EM

C

D

E

F

G

H

I

J

K

L

M

N

O

P

# INTAKE VALVE TIMING CONTROL

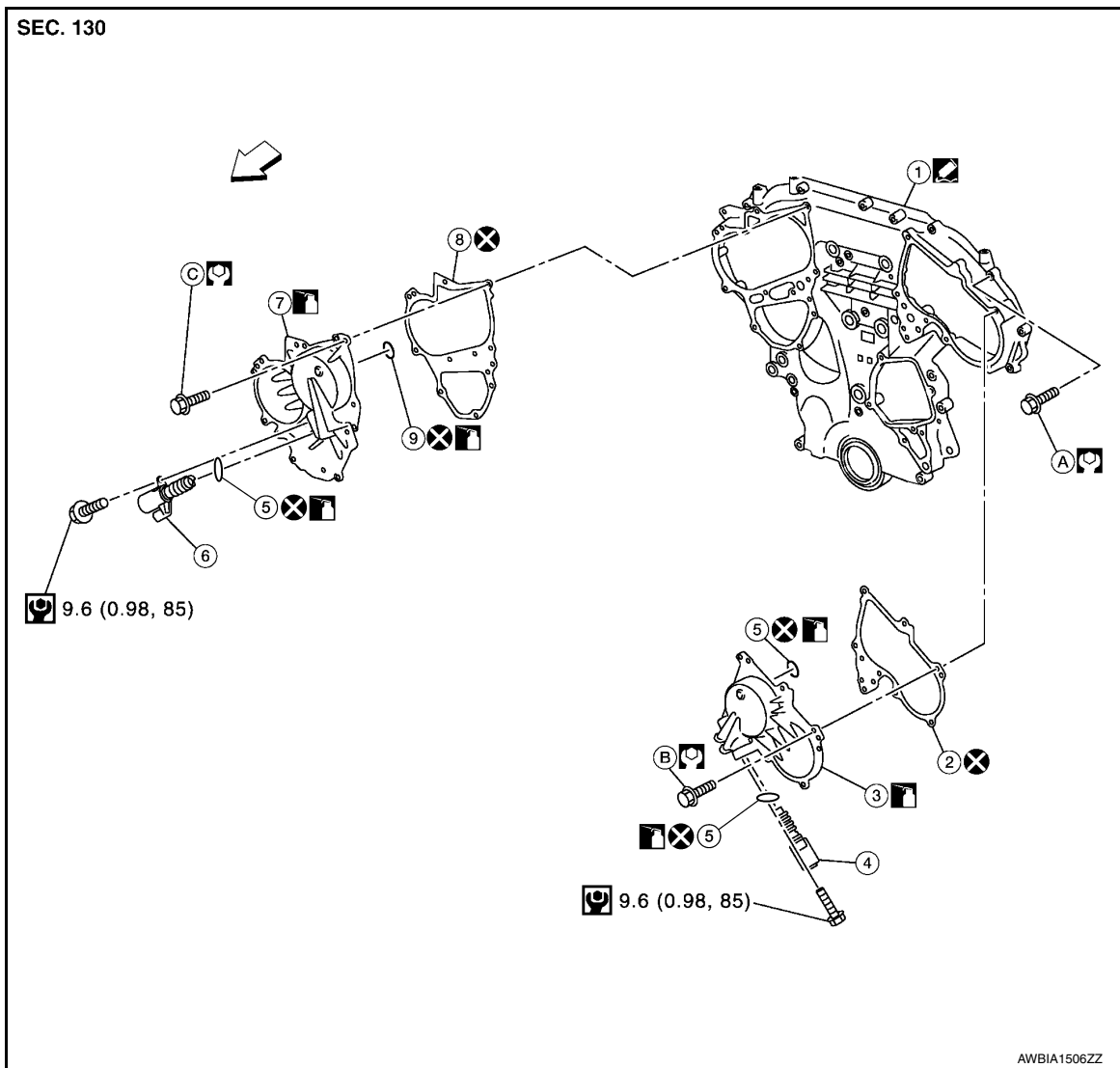
< REMOVAL AND INSTALLATION >

[VQ35DE]

## INTAKE VALVE TIMING CONTROL

Exploded View

INFOID:000000009460559



- |  |                                  |   |
|--|----------------------------------|---|
| 1. Front timing chain case                         | 2. Gasket (LH)                   | 3. Intake valve timing control cover (LH)   |
| 4. Intake valve timing control solenoid valve (LH) | 5. O-ring                        | 6. Intake valve timing control solenoid valve (RH)  |
| 7. Intake valve timing control cover (RH)          | 8. Gasket (RH)                   | A. Follow installation procedure. Refer to <a href="#">EM-173. "Intake Valve Timing Control Solenoid Valve (RH) (bank 1)"</a> |
| B. Follow installation procedure                   | C. Follow installation procedure | ↶ Engine front  |

### Intake Valve Timing Control Solenoid Valve (LH) (bank 2)

INFOID:000000009460560

#### REMOVAL

1. Remove hood ledge cover.
2. Remove coolant reservoir and set aside.
3. Disconnect intake valve timing control solenoid valve (LH) (bank 2) harness connector.
4. Remove intake valve timing control solenoid valve cover (LH) (bank 2). Refer to [EM-174. "Removal and Installation"](#).



# INTAKE VALVE TIMING CONTROL

[VQ35DE]

## < REMOVAL AND INSTALLATION >

5. Remove intake valve timing control solenoid valve (LH) (bank 2) and O-ring from intake valve timing control solenoid valve cover (LH) (bank 2).

**CAUTION:**

**Do not reuse O-ring.**

### INSTALLATION

Installation is in the reverse order of removal.

**CAUTION:**

- **Do not reuse O-ring.**
- **Replace the O-ring for the intake valve timing control solenoid valve LH (bank 2) with a new one, then lubricate O-ring with engine oil before installing.**

## Intake Valve Timing Control Solenoid Valve (RH) (bank 1)

INFOID:000000009460561

### REMOVAL

1. Remove hood ledge cover.
2. Remove coolant reservoir and set aside.
3. Support engine using suitable tool.
4. Remove upper torque rod, engine mounting insulator (RH), and engine mounting bracket (RH). Refer to [EM-220, "Removal and Installation"](#).
5. Disconnect intake valve timing control solenoid valve (RH) (bank 1) harness connector.
6. Remove intake valve timing control solenoid valve (RH) (bank 1) and O-ring from intake valve timing control solenoid valve cover (RH) (bank 1).

**CAUTION:**

**Do not reuse O-ring.**

### INSTALLATION

Installation is in the reverse order of removal.

**CAUTION:**

- **Do not reuse O-ring.**
- **Replace the O-ring for the intake valve timing control solenoid valve (RH) (bank 1) with a new one, then lubricate O-ring with engine oil before installing.**

# FRONT TIMING CHAIN CASE

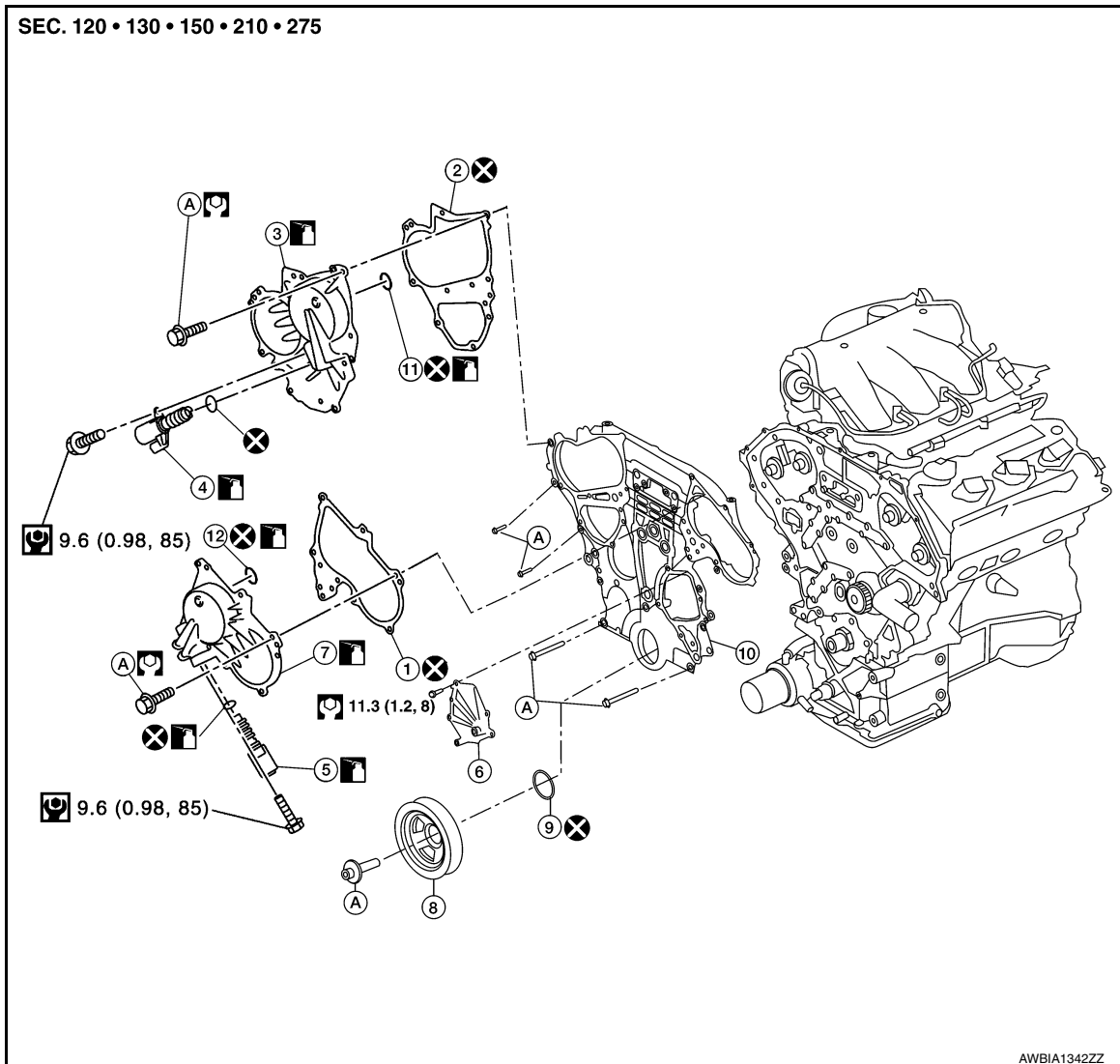
< REMOVAL AND INSTALLATION >

[VQ35DE]

## FRONT TIMING CHAIN CASE

Exploded View

INFOID:000000009460562



- |   |   |  |
|---|---|--|
| 1. Intake valve timing control solenoid valve cover gasket (LH) | 2. Intake valve timing control solenoid valve cover gasket (RH) | 3. Intake valve timing control solenoid valve cover (RH) |
| 4. Intake valve timing control solenoid valve (RH) with O-ring  | 5. Intake valve timing control solenoid valve (LH) with O-ring  | 6. Water pump cover                                      |
| 7. Intake valve timing control solenoid valve cover (LH)        | 8. Crankshaft pulley  | 9. Front oil seal  |
| 10. Front timing chain case                                     | A. Refer to INSTALLATION  |  |

## Removal and Installation

INFOID:000000009460563

### 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. 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. Refer to [EM-189, "Removal and Installation"](#).
- Refer to [EM-182, "Exploded View"](#) for component parts location.
- When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

# FRONT TIMING CHAIN CASE

< REMOVAL AND INSTALLATION >

[VQ35DE]

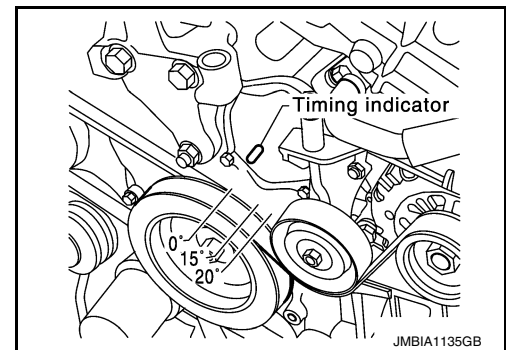
## REMOVAL

1. Remove engine under cover. Refer to [EXT-28, "Removal and Installation"](#).
2. Drain the engine coolant from the radiator. Refer to [MA-23, "ENGINE COOLANT : Changing Engine Coolant"](#).
3. Drain the engine oil. Refer to [MA-27, "ENGINE OIL : Changing Engine Oil"](#).
4. Drain the power steering fluid. Refer to [ST-30, "Draining and Refilling"](#).
5. Remove engine room cover. Refer to [EM-143, "Removal and Installation"](#).
6. Remove front air duct. Refer to [EM-144, "Removal and Installation"](#).
7. Remove battery tray. Refer to [PG-74, "Removal and Installation \(Battery Tray\)"](#).
8. Remove the hood ledge covers (LH/RH).
9. Remove cowl top and cowl top extension. Refer to [EXT-24, "Removal and Installation"](#).
10. Remove upper radiator hose.
11. Disconnect engine coolant reservoir hose from the radiator and remove engine coolant reservoir.
12. Remove cooling fan assembly. Refer to [CO-42, "Removal and Installation"](#).
13. Disconnect lower radiator hose from engine.
14. Remove the radiator. Refer to [CO-41, "Removal and Installation"](#).
15. Disconnect the power steering fluid reservoir tank hose from the power steering pump and fluid cooler and remove the power steering fluid reservoir tank. Refer to [ST-38, "Exploded View"](#).
16. Remove the front RH wheel and tire. Refer to [MA-39, "WHEELS : Adjustment"](#).
17. Remove the fender protector side cover (RH). Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).
18. Remove the drive belt. Refer to [EM-134, "Removal and Installation"](#).
19. Remove the rocker covers, if necessary. Refer to [EM-168, "Removal and Installation LH"](#) and [EM-169, "Removal and Installation RH"](#).

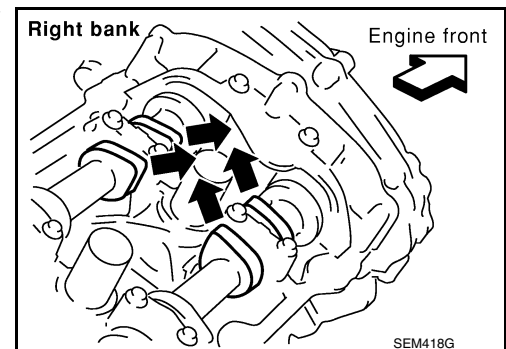
### NOTE:

Necessary only when removing timing chains.

20. 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.



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

**Tool number** : — (J-50288)

### CAUTION:

# FRONT TIMING CHAIN CASE

< REMOVAL AND INSTALLATION >

[VQ35DE]

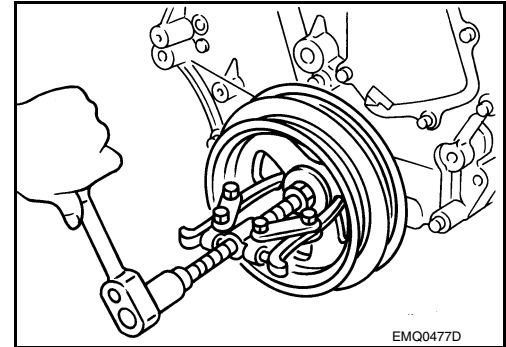
**Do not damage the ring gear teeth, or the signal plate teeth behind the ring gear, when installing Tool.**

22. Remove the crankshaft pulley as follows:

- Loosen crankshaft pulley and locate bolt seating surface at 10 mm (0.39 in) from its original position.
- Position a pulley puller at recess hole of crankshaft pulley to remove crankshaft pulley.

**CAUTION:**

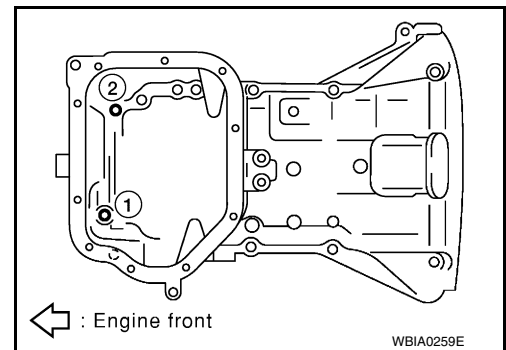
**Do not use a puller claw on crankshaft pulley periphery.**



23. Remove the power steering pump. Refer to [ST-38, "Removal and Installation"](#).

24. Remove the lower oil pan. Refer to [EM-156, "Removal and Installation \(Lower Oil Pan\)"](#).

25. Remove upper oil pan bolts (1) and (2) as shown. Refer to [EM-157, "Removal and Installation \(Upper Oil Pan\)"](#).



26. Remove the generator. Refer to [CHG-32, "Removal and Installation"](#).

27. Disconnect the A/C tubes from the A/C compressor and position aside. Refer to [HA-23, "Recycle Refrigerant"](#).

28. Remove the A/C compressor bolts and the A/C compressor. Refer to [HA-30, "COMPRESSOR : Removal and Installation"](#).

29. Remove the generator bracket. Refer to [CHG-32, "Removal and Installation"](#).

30. Support the engine with suitable jack and remove the RH engine insulator, mount and torque rod. Refer to [EM-220, "Removal and Installation"](#).

31. Disconnect the oil pressure switch harness connector.

32. Disconnect the intake valve timing control solenoid valve harness connector.

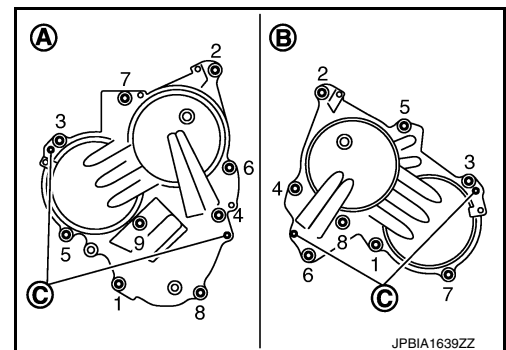
33. Remove the intake valve timing control solenoid valve cover bank 1 (RH) (A) and intake timing control solenoid valve cover bank 2 (LH) (B).

(C) : Dowel pin hole

- Loosen the intake valve timing control solenoid valve cover bolts in the reverse order as shown.

**CAUTION:**

**The shaft in the intake valve timing control solenoid valve cover is inserted into the center hole of the intake camshaft sprocket. Remove the intake valve timing control solenoid valve cover by pulling straight out until the intake valve timing control solenoid valve cover disengages from the camshaft sprocket.**



34. Remove the drive belt auto-tensioner. Refer to [EM-134, "Removal and Installation"](#).

35. If necessary, remove the water pump cover.

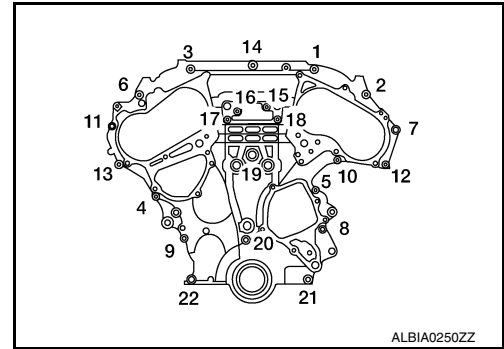
# FRONT TIMING CHAIN CASE

[VQ35DE]

## < REMOVAL AND INSTALLATION >

36. Remove the front timing chain case.

a. Loosen the front timing chain case bolts in the order as shown.



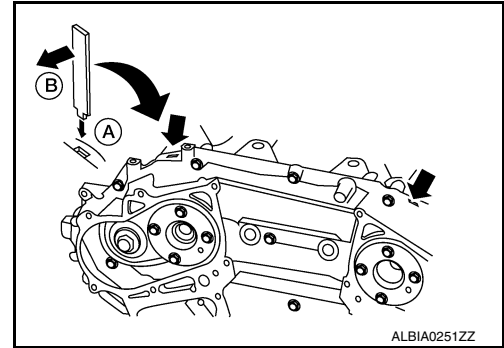
b. Insert the appropriate size suitable tool into the notch (A) at the top of the front timing chain case as shown.

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.



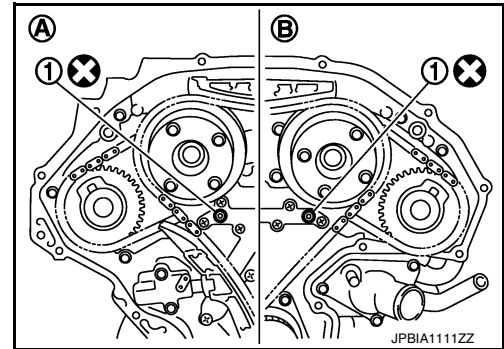
37. Remove O-rings (1) from rear timing chain case.

(A) : Bank 1 (RH)

(B) : Bank 2 (LH)

**CAUTION:**

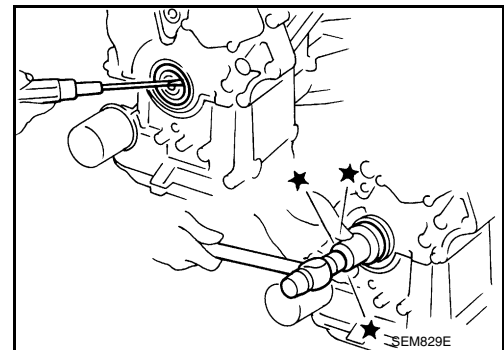
**Do not reuse O-rings.**



38. Remove the front oil seal from the front timing chain case using suitable tool.

**CAUTION:**

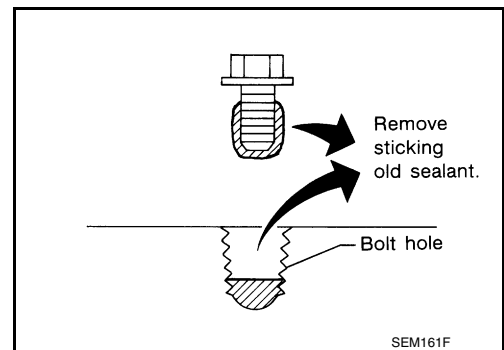
**Do not damage the front cover.**



39. Remove all old Silicone RTV Sealant from all the bolt holes and bolts.

**CAUTION:**

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



# FRONT TIMING CHAIN CASE

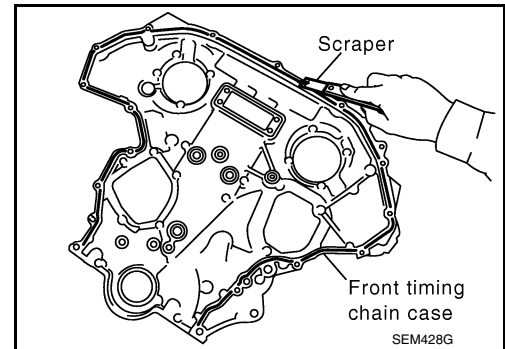
## < REMOVAL AND INSTALLATION >

[VQ35DE]

40. 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.

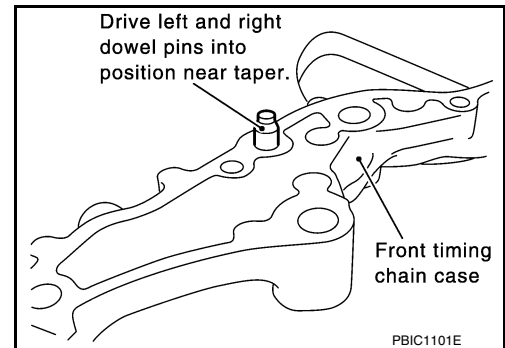


## INSTALLATION

1. 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:**

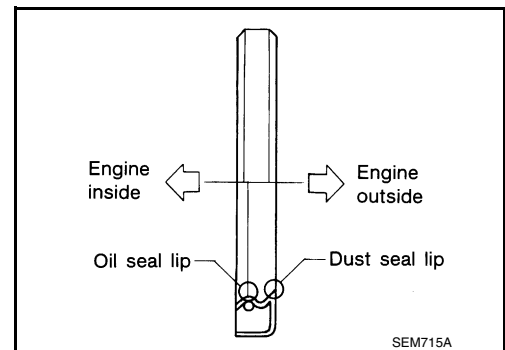
Be sure to place the dowel pins in original hole locations in the front timing chain case.



2. 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.



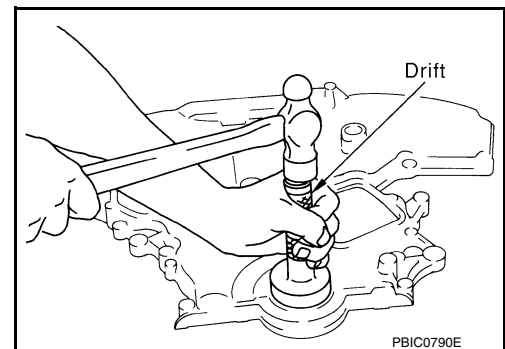
- a. Install the new front oil seal so that it becomes flush with the face with front timing chain case using suitable tool.

**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.



# FRONT TIMING CHAIN CASE

[VQ35DE]

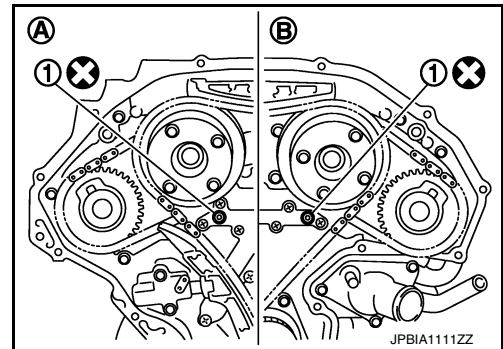
## < REMOVAL AND INSTALLATION >

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

(A) : Bank 1 (RH)

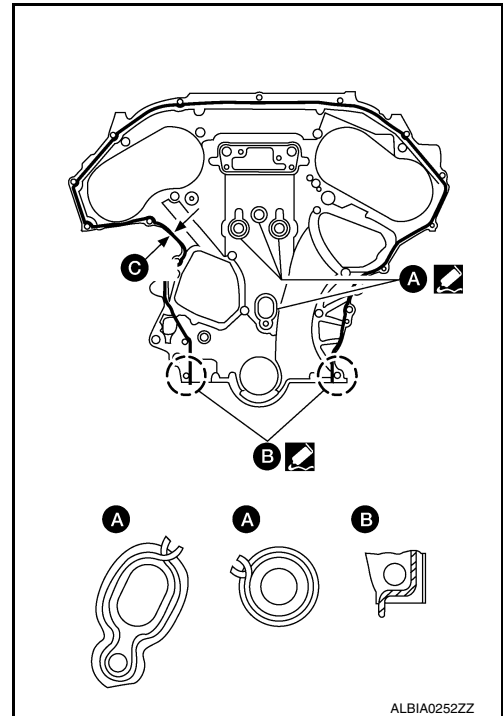
(B) : Bank 2 (LH)

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



4. Apply Silicone RTV Sealant to front timing chain case as shown.

- Use Genuine Silicone RTV Sealant, or equivalent. Refer to [GI-21. "Recommended Chemical Products and Sealants"](#).
- Before installation, wipe off the protruding sealant.
- (C): 2.6 - 3.6 mm (0.102 - 0.142 in) dia.

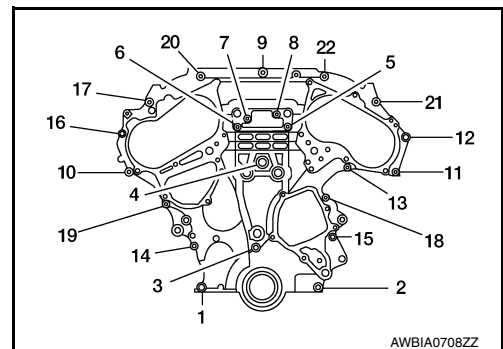


5. Install dowel pin on the front timing chain case into dowel pin hole in the rear timing chain case.  
6. Loosely install the front timing chain case bolts.

Bolt position	Bolt diameter
1, 2	: 8 mm (0.31 in)
3 - 22	: 6 mm (0.24 in)

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

Bolt position	Tightening specification
1, 2	: 28.5 N·m (2.9 kg-m, 21 ft-lb)
3 - 22	: 12.8 N·m (1.3 kg-m, 9 ft-lb)



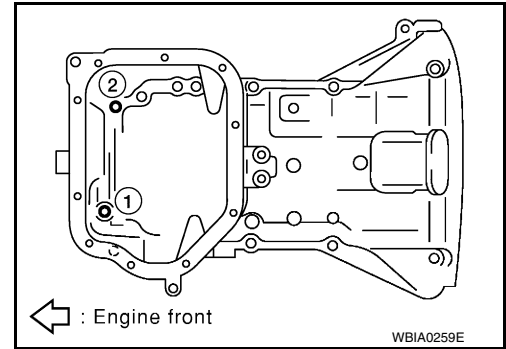


# FRONT TIMING CHAIN CASE

[VQ35DE]

## < REMOVAL AND INSTALLATION >

8. Install upper oil pan bolts (1) and (2) as shown. Refer to [EM-157. "Removal and Installation \(Upper Oil Pan\)"](#).



9. Install lower oil pan. Refer to [EM-156. "Removal and Installation \(Lower Oil Pan\)"](#).

10. Install intake valve timing control solenoid valve covers as follows:

- a. Install new O-rings in shaft grooves.

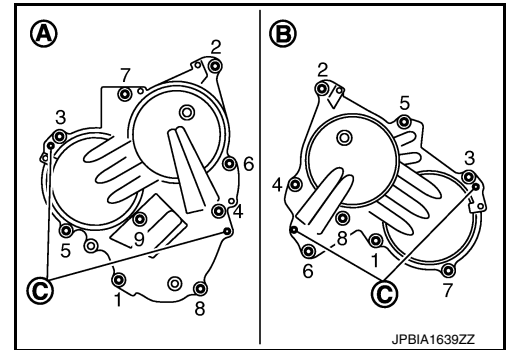
**CAUTION:**

**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.
- 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)**



11. Apply liquid gasket and install the water pump cover, if removed.

- Use Genuine Silicone RTV Sealant or equivalent. Refer to [GI-21. "Recommended Chemical Products and Sealants"](#).

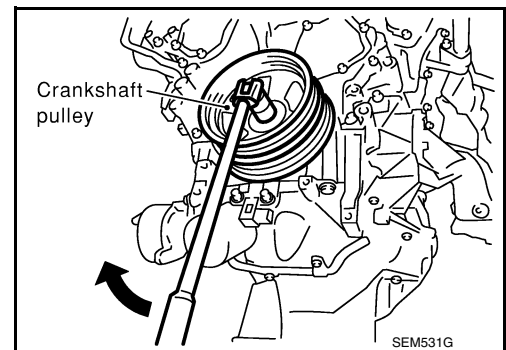
12. Install crankshaft pulley and tighten the bolt in two steps.

- 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)**



13. 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.**

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

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

## INSPECTION AFTER INSTALLATION



# FRONT TIMING CHAIN CASE

< REMOVAL AND INSTALLATION >

[VQ35DE]

- 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-11, "FOR USA AND CANADA : Fluids and Lubricants"](#).
- 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.

A

EM

**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.

C

- 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.
- Summary of the inspection items:

D

E

Item		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission/ transaxle fluid	CVT Models	Leakage	Level/Leakage	Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gas		—	Leakage	—

F

G

H

\*Power steering fluid, brake fluid, etc.

I

J

K

L

M

N

O

P

# TIMING CHAIN

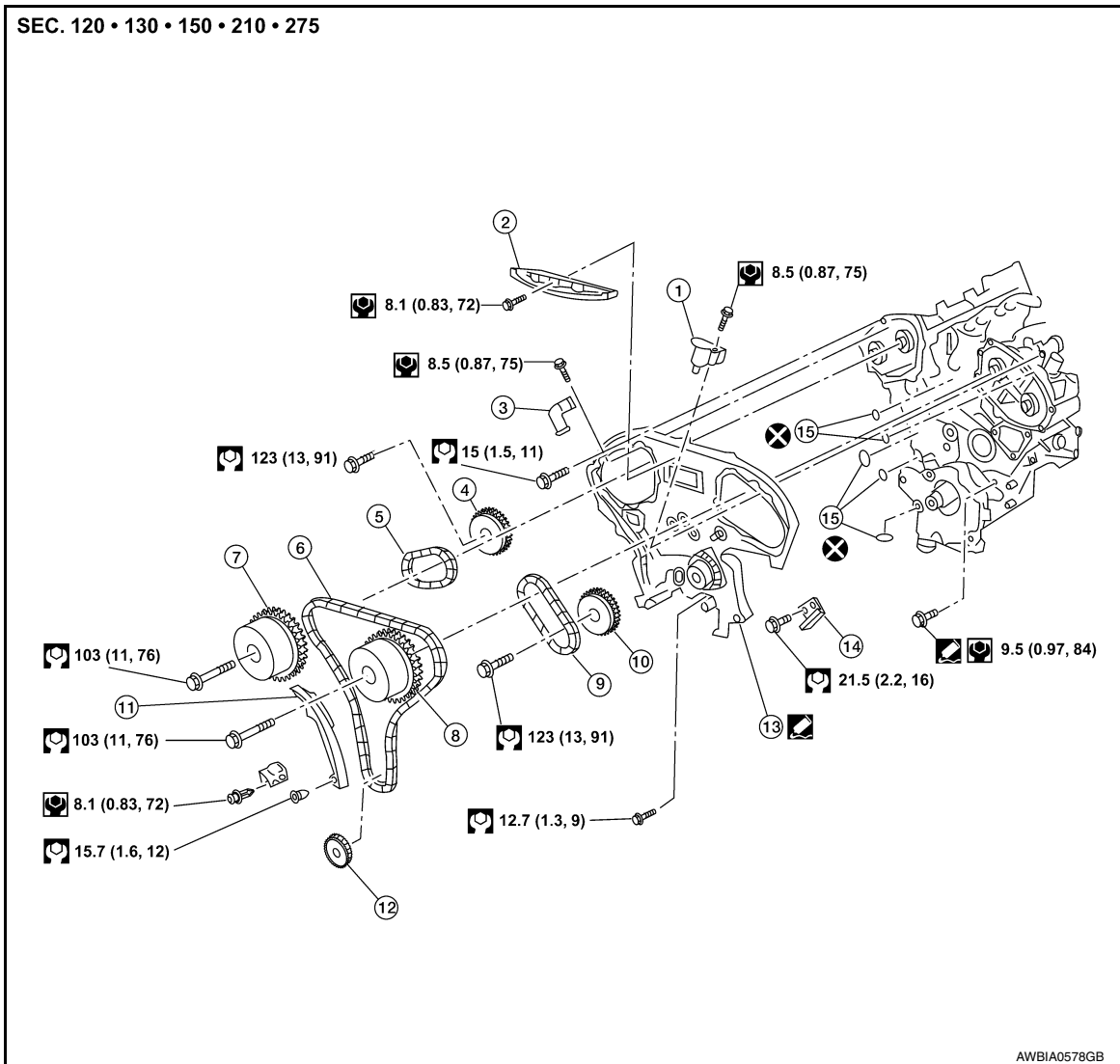
< REMOVAL AND INSTALLATION >

[VQ35DE]

## TIMING CHAIN

Exploded View

INFOID:000000009460564



- |                             |                             |                             |
|-----------------------------|-----------------------------|-----------------------------|
| 1. Timing chain tensioner   | 2. Internal chain guide     | 3. Timing chain tensioner   |
| 4. Camshaft sprocket (EXH)  | 5. Timing chain (secondary) | 6. Timing chain (primary)   |
| 7. Camshaft sprocket (INT)  | 8. Camshaft sprocket (INT)  | 9. Timing chain (secondary) |
| 10. Camshaft sprocket (EXH) | 11. Slack guide             | 12. Crankshaft sprocket     |
| 13. Rear timing chain case  | 14. Tension guide           | 15. O-ring                  |

## Removal and Installation

INFOID:000000009460565

### CAUTION:

- After removing timing chain, 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

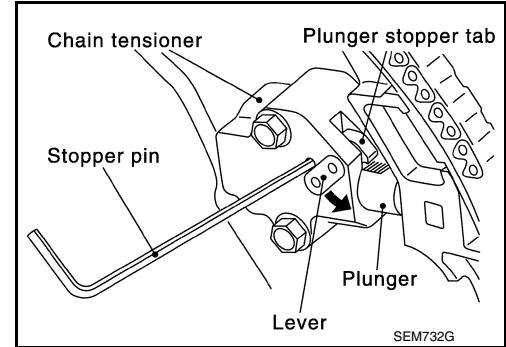
1. Remove front timing chain case. Refer to [EM-174, "Removal and Installation"](#).

# TIMING CHAIN

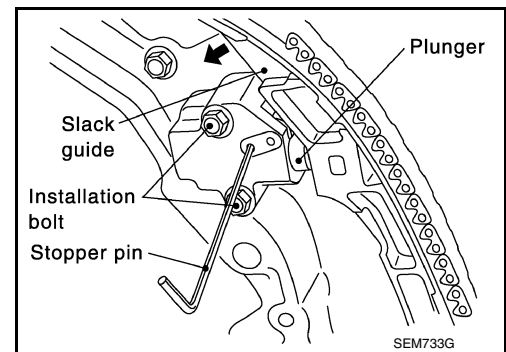
[VQ35DE]

## < REMOVAL AND INSTALLATION >

2. Remove the intake manifold collector. Refer to [EM-146. "Removal and Installation"](#).
3. Place paint marks on the timing chain and sprockets to indicate the correct position of the components for installation.
4. Remove the timing chain tensioner (primary).
- a. Pull lever down and release plunger stopper tab. Plunger stopper tab can be pushed up to release (coaxial structure with lever).



- b. Insert stopper pin into tensioner body hole to hold lever, and keep the tab released. An Allen wrench [1.2 mm (0.047 in)] is used for a stopper pin as an example.
- c. Insert plunger into tensioner body by pressing the slack side chain guide.
- d. Keep the slack side chain guide pressed and hold it by pushing the stopper pin through the lever hole and body hole.
- e. Remove the bolts and remove the timing chain tensioner.

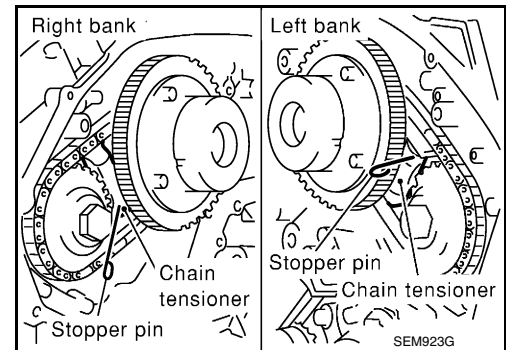


5. Remove the internal chain guide, and slack guide.
6. Remove primary timing chain and crankshaft sprocket.

**CAUTION:**

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

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



8. Remove timing chain (secondary) and camshaft sprockets as follows:

# TIMING CHAIN

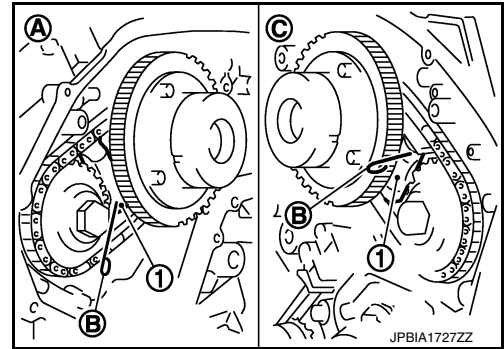
[VQ35DE]

## < REMOVAL AND INSTALLATION >

- a. Attach a suitable stopper pin (B) to the bank 1 (A) and bank 2 (C) timing chain tensioners (secondary) (1).

**NOTE:**

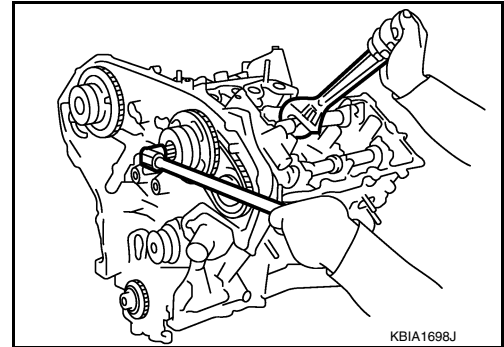
- Use approximately 0.5 mm (0.02 in) diameter hard metal pin as a stopper pin.
- Removal of camshaft bracket (No. 1) is required prior to removing the timing chain tensioner (secondary).



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

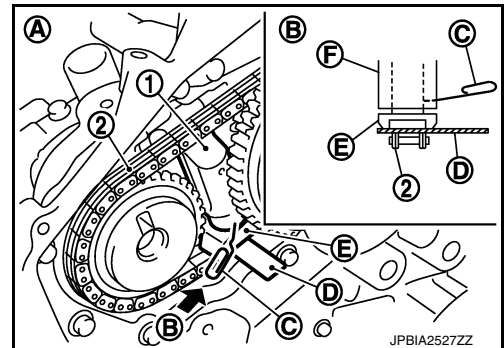
**CAUTION:**

**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.

- (1) : Timing chain tensioner (secondary)
- (A) : Bank 1
- (B) : View B
- (C) : Stopper pin
- (D) : Plate
- (F) : Timing chain tensioner (body)



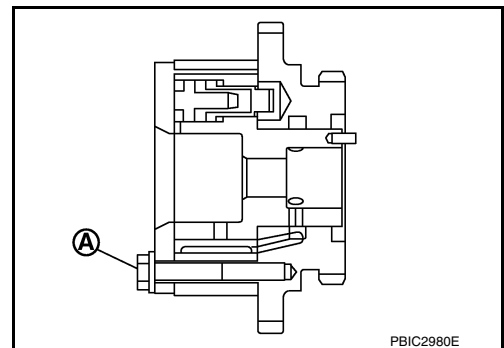
**CAUTION:**

**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].



# TIMING CHAIN

< REMOVAL AND INSTALLATION >

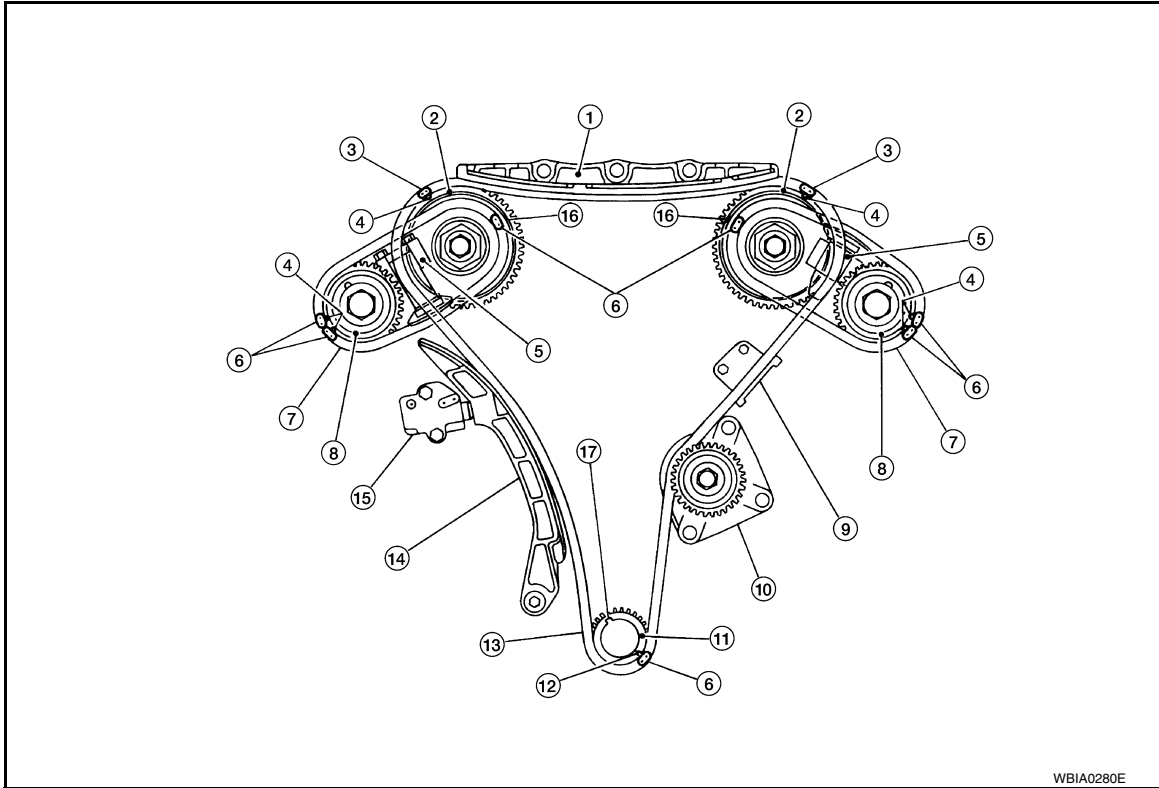
[VQ35DE]

9. Remove the chain tension guide.

## INSPECTION

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 (intake)       | 3. Mating mark (pink link)         |
| 4. Mating mark (punched)    | 5. Secondary timing chain tensioner | 6. Mating mark (orange link)       |
| 7. Secondary timing chain   | 8. Camshaft sprocket (exhaust)      | 9. Tension guide                   |
| 10. Water pump              | 11. Crankshaft sprocket             | 12. Mating mark (notched)          |
| 13. Primary timing chain    | 14. Slack guide                     | 15. Primary timing chain tensioner |
| 16. Mating mark (back side) | 17. Crankshaft key                  |                                    |

### NOTE:

The illustration shows the relationship between the mating mark on each timing chain and that on the corresponding sprocket, the components installed.

1. Install the timing chain tension guide.
2. Check that dowel pin (A) and crankshaft key (1) are located as shown. (No. 1 cylinder at compression TDC)

### NOTE:

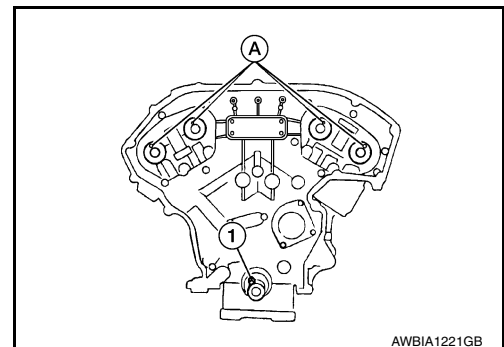
Though camshaft does not stop at the position as shown, for the placement of cam nose, it is generally accepted camshaft is placed in the same direction.

#### Camshaft dowel pin

: At cylinder head upper face side in each bank

#### Crankshaft key

: At cylinder head side of bank 1



# TIMING CHAIN

[VQ35DE]

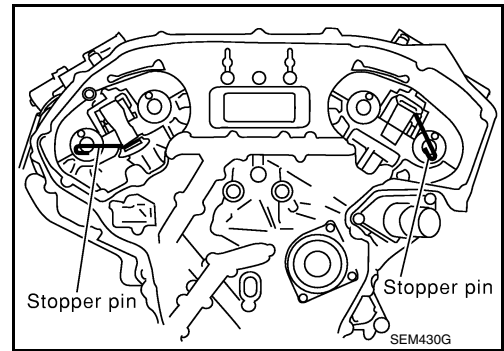
## < REMOVAL AND INSTALLATION >

3. Install the secondary timing chains and camshaft sprockets.

**CAUTION:**

**Matching marks between the timing chain and sprockets slip easily. Confirm all matching mark positions repeatedly during the installation process.**

- Push the sleeve of the secondary chain tensioner and keep it pressed in with a stopper pin.



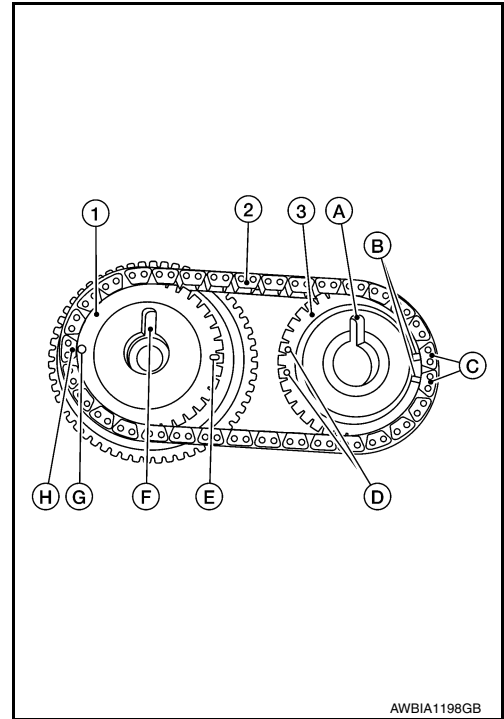
- a. Install timing chain (secondary) (2) and camshaft sprockets [INT (1) and EXH (3)].

- (A) : Dowel pin groove
- (B) : Mating mark (2 oblong on rear face)
- (C) : Orange link
- (D) : Mating mark (2 circles on rear face)
- (E) : Mating mark (Oblong on rear face)
- (F) : Dowel pin groove
- (G) : Mating mark (Circle on rear face)
- (H) : Orange link

**NOTE:**

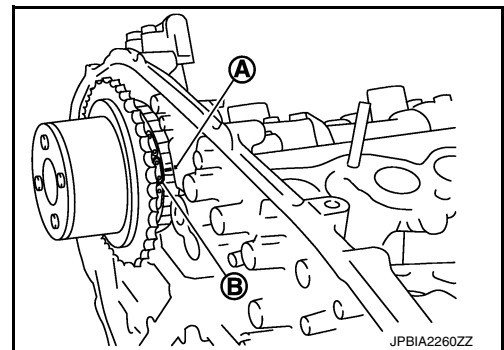
Bank 1 shown (rear view).

- 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.

- (B) : Mating mark (orange link)

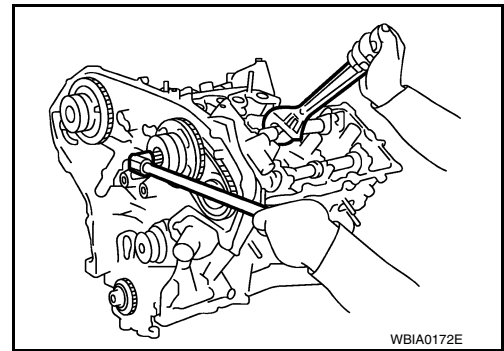


# TIMING CHAIN

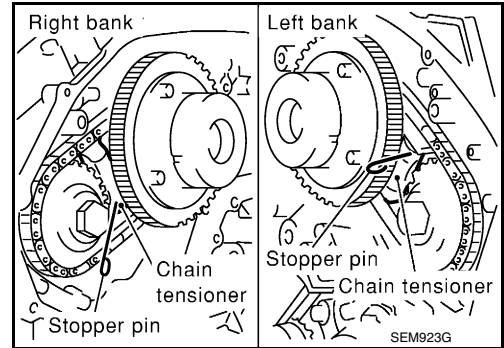
[VQ35DE]

## < REMOVAL AND INSTALLATION >

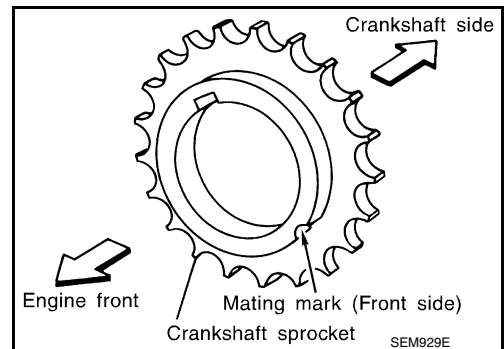
- After confirming the mating marks are aligned, tighten the camshaft sprocket bolts.
  - Secure the camshaft using a wrench at the hexagonal portion to tighten the bolts.



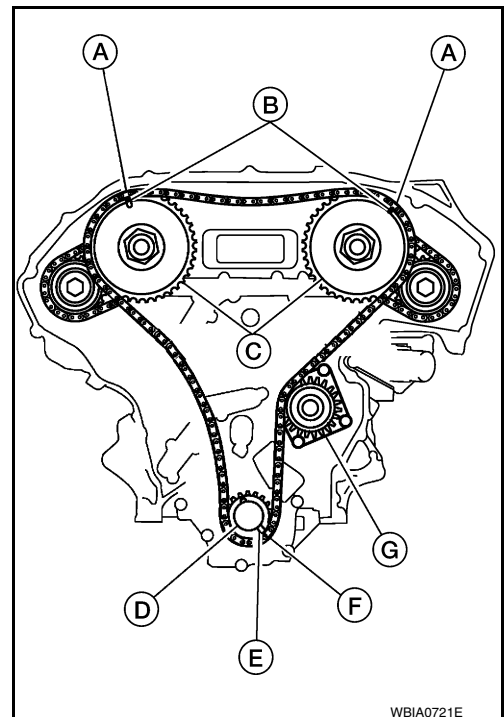
- Pull the stopper pins out from the secondary timing chain tensioners.



- Install the crankshaft sprocket on the crankshaft.
  - Make sure the mating marks on the crankshaft sprocket face the front of the engine.



- Install the primary timing chain.
  - Install primary timing chain 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 primary timing chain 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

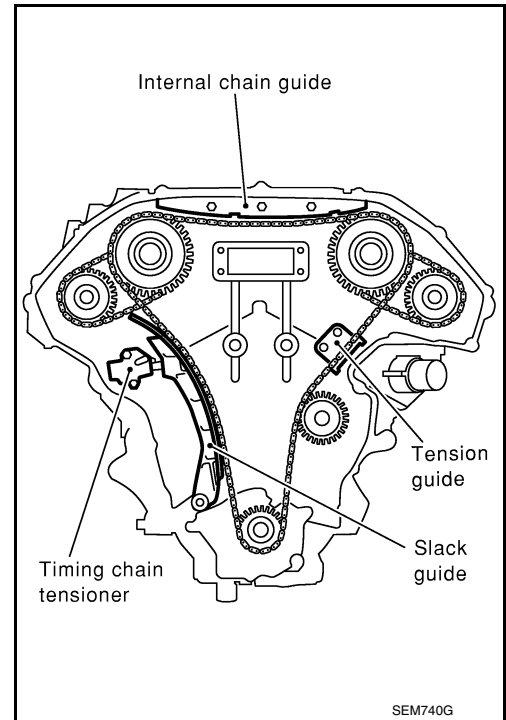


# TIMING CHAIN

< REMOVAL AND INSTALLATION >

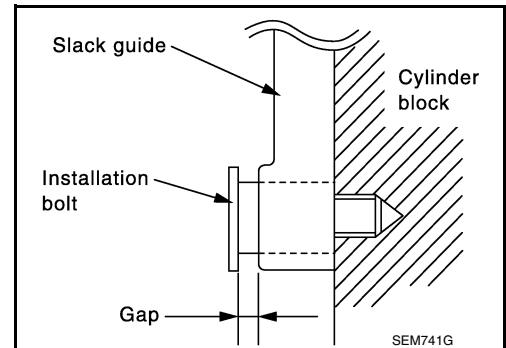
[VQ35DE]

8. Install the internal chain guide and slack guide.

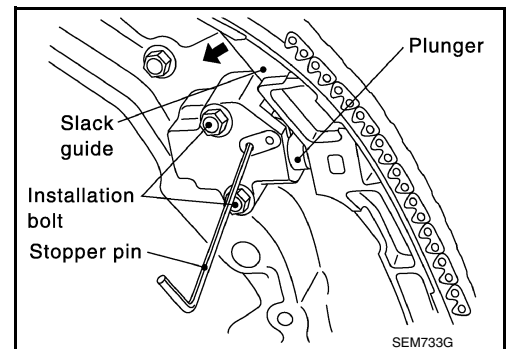


**CAUTION:**

- Do not overtighten the slack guide bolts. It is normal for a gap to exist under the bolt seats when the bolts are tightened to specification.



9. Install the timing chain tensioner for the slack guide.
- When installing the chain tensioner, push in the sleeve and keep it pressed in with the stopper pin.
  - Remove any dirt and foreign materials completely from the back and the mounting surfaces of the chain tensioner.
  - After installation, pull out the stopper pin while pressing the slack guide.
10. Reconfirm that the matching marks on the sprockets and the timing chain have not slipped out of alignment.



11. Install the front timing chain case. Refer to [EM-174, "Removal and Installation"](#).



# REAR TIMING CHAIN CASE

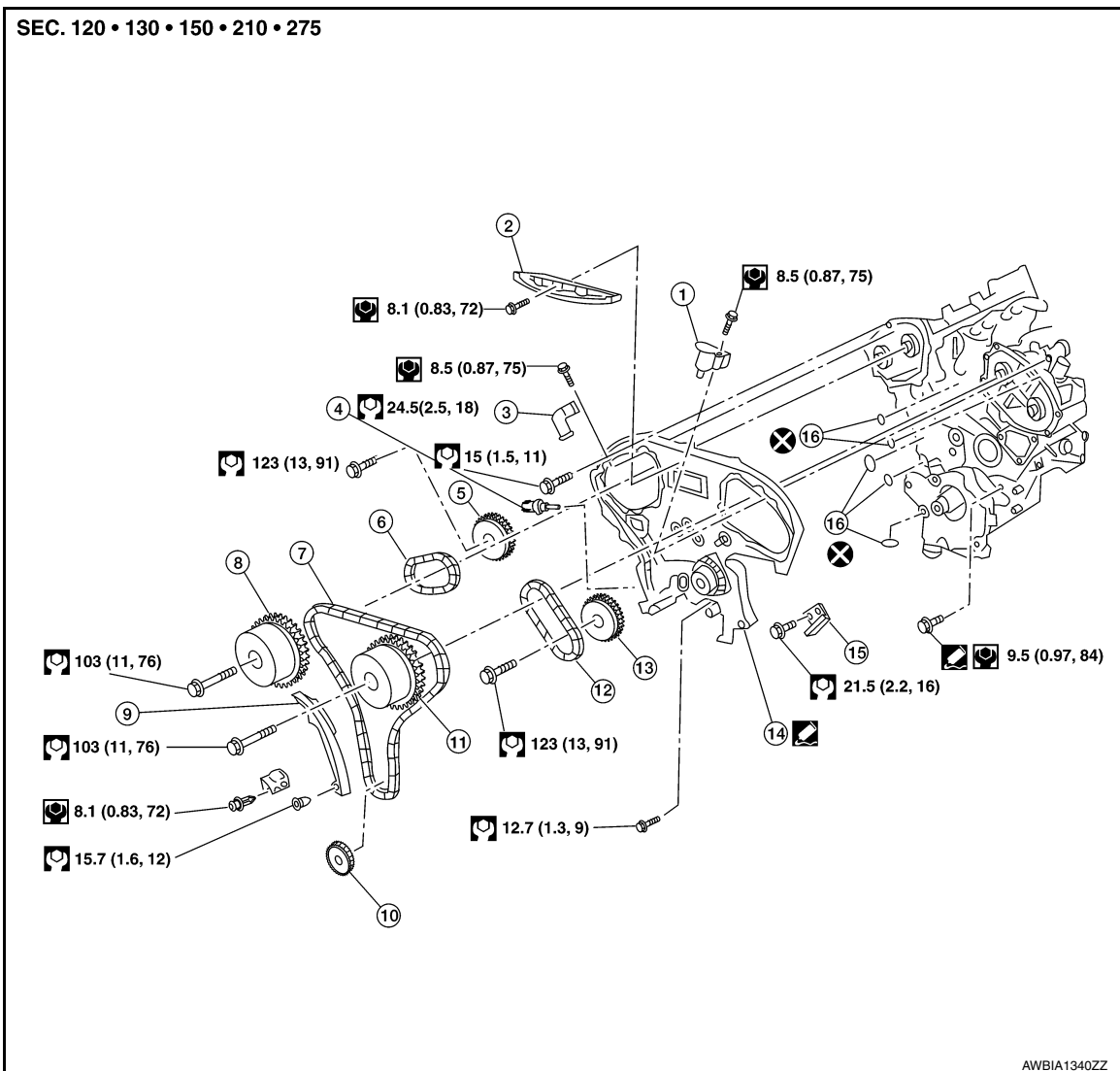
< REMOVAL AND INSTALLATION >

[VQ35DE]

## REAR TIMING CHAIN CASE

Exploded View

INFOID:000000009460566



- |                              |                             |                             |
|------------------------------|-----------------------------|-----------------------------|
| 1. Timing chain tensioner    | 2. Internal chain guide     | 3. Timing chain tensioner   |
| 4. Oil pressure sensor       | 5. Camshaft sprocket (EXH)  | 6. Timing chain (secondary) |
| 7. Timing chain (primary)    | 8. Camshaft sprocket (INT)  | 9. Camshaft sprocket (INT)  |
| 10. Timing chain (secondary) | 11. Camshaft sprocket (EXH) | 12. Slack guide             |
| 13. Crankshaft sprocket      | 14. Rear timing chain case  | 15. Tension guide           |
| 16. O-ring                   |                             |                             |

## Removal and Installation

INFOID:000000009460567

### REMOVAL

#### CAUTION:

- After removing timing chain, 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.
- Before disconnecting fuel hose, release fuel pressure. Refer to [FL-5, "Inspection"](#).

# REAR TIMING CHAIN CASE

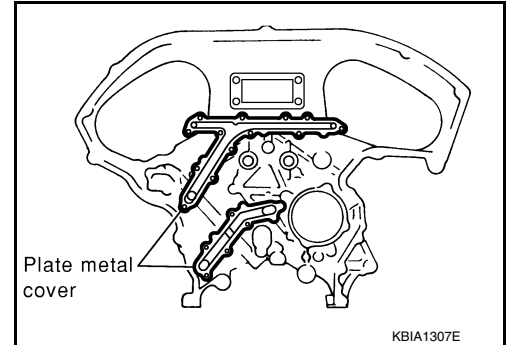
[VQ35DE]

## < REMOVAL AND INSTALLATION >

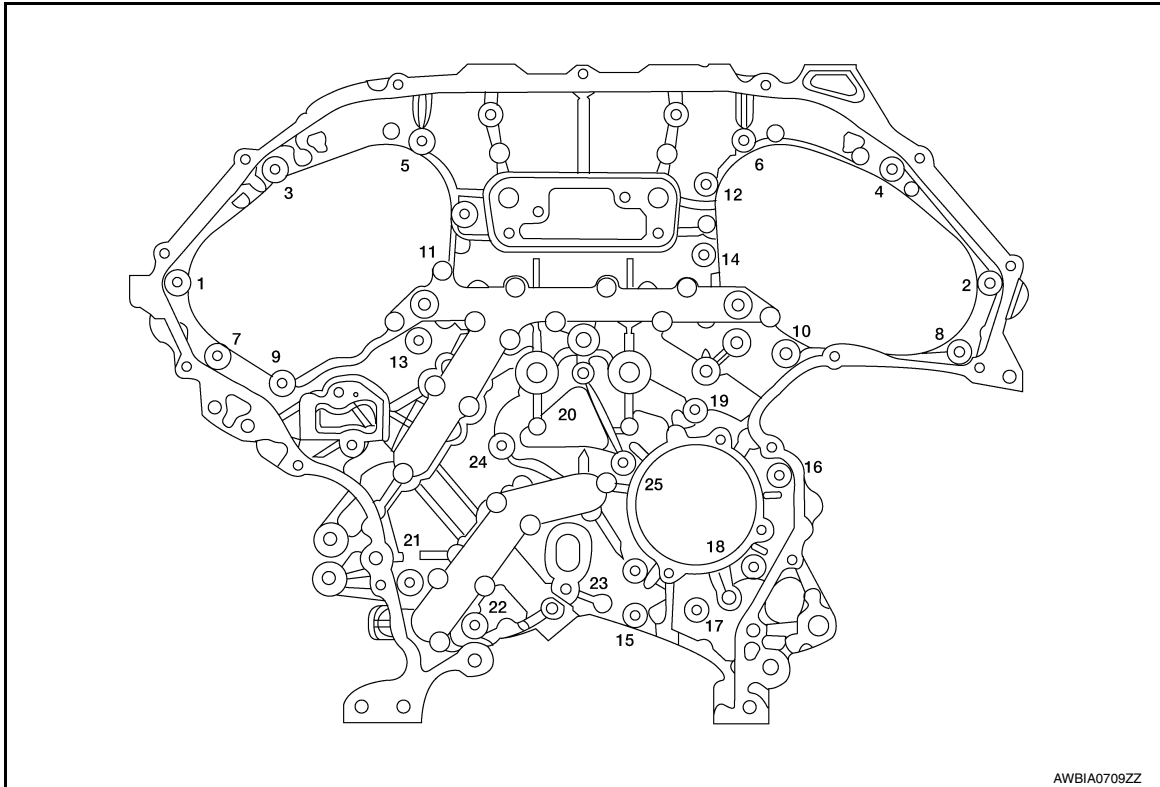
- Before removing the upper oil pan, remove the crankshaft position sensor (POS).
  - Be careful not to damage sensor edges.
  - Do not spill engine oil or coolant on drive belt.
1. Remove the engine assembly. Refer to [EM-220, "Removal and Installation"](#).
  2. Remove the oil pan lower and upper. Refer to [EM-157, "Removal and Installation \(Upper Oil Pan\)"](#).
  3. Remove the front timing chain case. Refer to [EM-174, "Removal and Installation"](#).
  4. Remove the primary and secondary timing chains. Refer to [EM-182, "Removal and Installation"](#).
  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 order as shown.



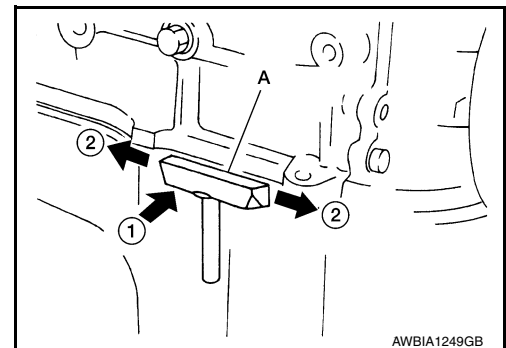
- b. Cut the sealant using Tool (A) and remove the rear timing chain case.

**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.

- c. 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.



# REAR TIMING CHAIN CASE

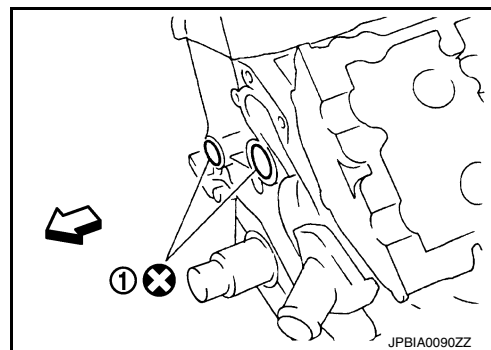
## < REMOVAL AND INSTALLATION >

[VQ35DE]

6. Remove O-rings (1) to timing chain case and cylinder block.

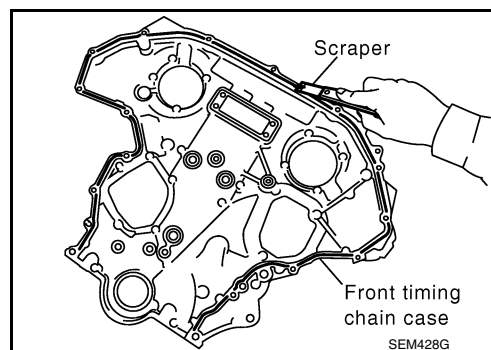
↔ : Engine front

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



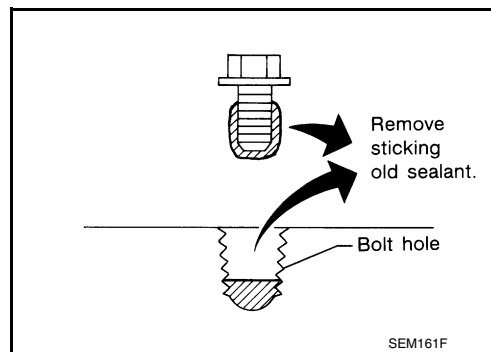
7. Use a scraper to remove all of the old Silicone RTV Sealant from the front and rear timing chain case and opposite mating surfaces.

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



8. Remove all old Silicone RTV Sealant from all the bolt holes and bolts.

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

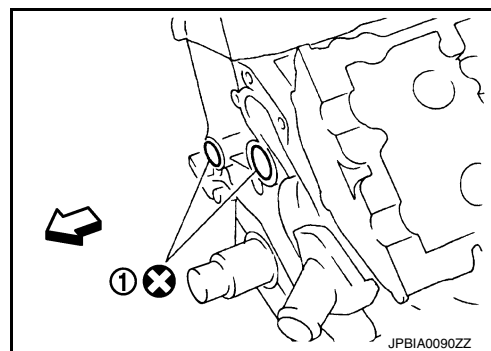


## INSTALLATION

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

↔ : Engine front

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



2. Apply Genuine Silicone RTV Sealant or equivalent, to the rear timing chain case using Tool as shown. Refer to [GI-21, "Recommended Chemical Products and Sealants"](#).

Tool number : WS39930000 ( — )

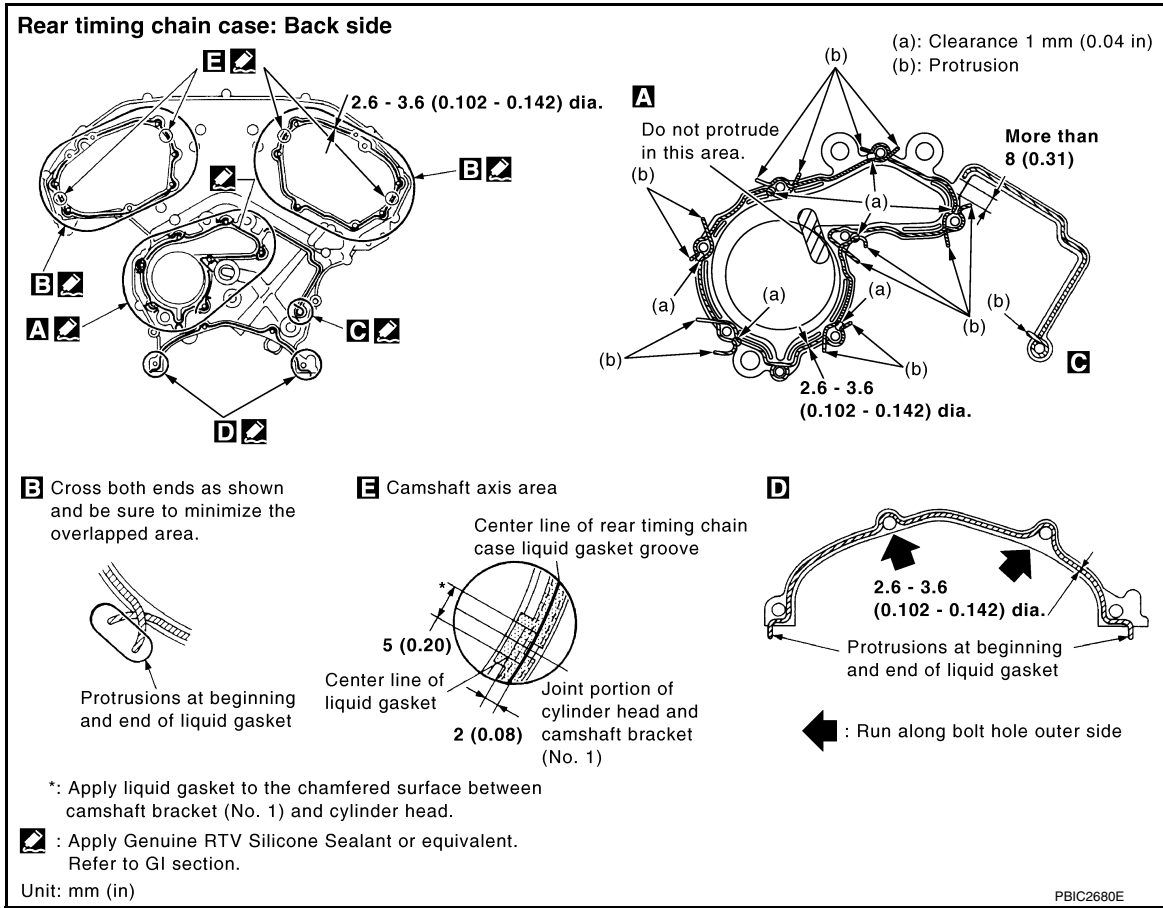
**CAUTION:**

- For (a), completely wipe out liquid gasket extended on a portion touching at engine coolant.
- Apply liquid gasket on installation position of water pump and cylinder completely.

# REAR TIMING CHAIN CASE

< REMOVAL AND INSTALLATION >

[VQ35DE]



- Align the rear timing chain case and water pump assembly with the dowel pins (RH and LH) on the cylinder block and install the case. Make sure the O-rings stay in place during installation.

**CAUTION:**

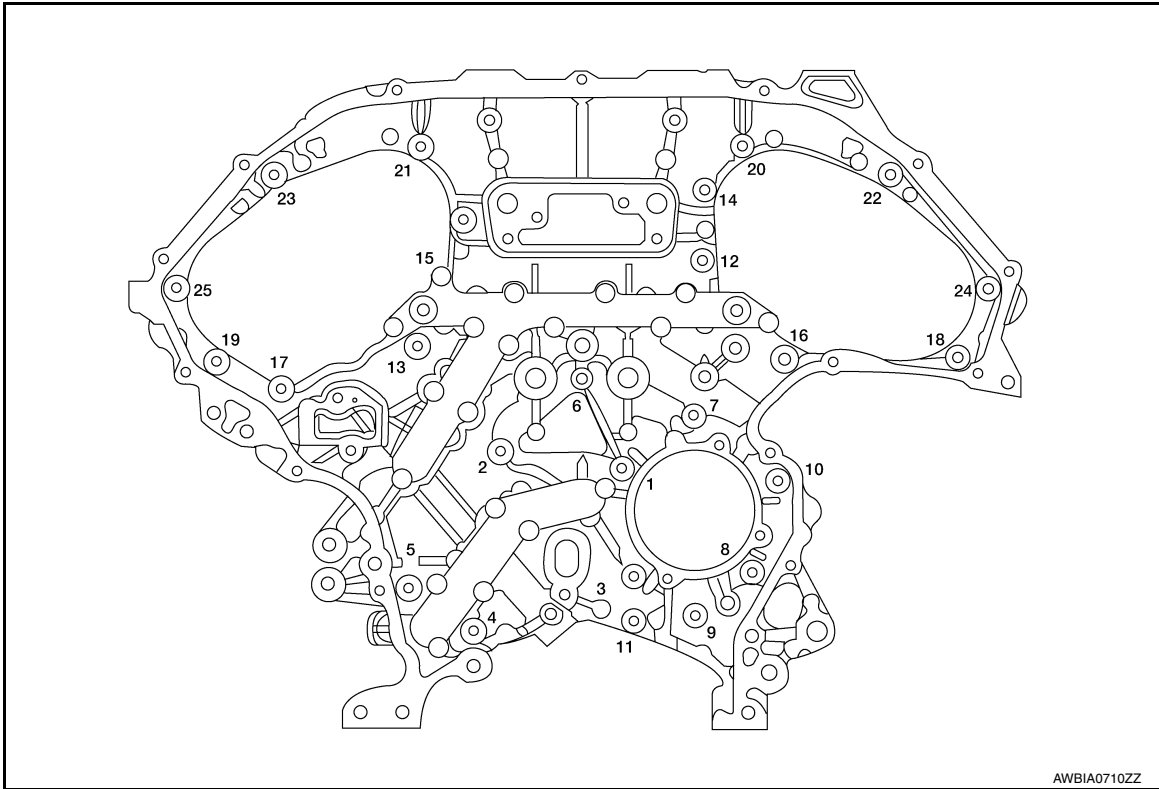
**Do not reuse O-rings**

## REAR TIMING CHAIN CASE

### < REMOVAL AND INSTALLATION >

[VQ35DE]

- 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.



Bolt length	Bolt position	Torque specification
20 mm (0.79 in)	1, 2, 3, 6, 7, 8, 9, 10	12.7 N·m (1.3 kg-m, 9 ft-lb)
16 mm (0.63 in)	4, 5, 11, 12-25	12.7 N·m (1.3 kg-m, 9 ft-lb)

- b. After all bolts are initially tightened, retighten them to the specification in the numerical order as shown.
4. Install the primary and secondary timing chains. Refer to [EM-182, "Removal and Installation"](#).
  5. Install the front timing chain case. Refer to [EM-174, "Removal and Installation"](#).
  6. Install the oil pan upper and lower. Refer to [EM-157, "Removal and Installation \(Upper Oil Pan\)"](#).
  7. Install the engine assembly. Refer to [EM-220, "Removal and Installation"](#).

# CAMSHAFT

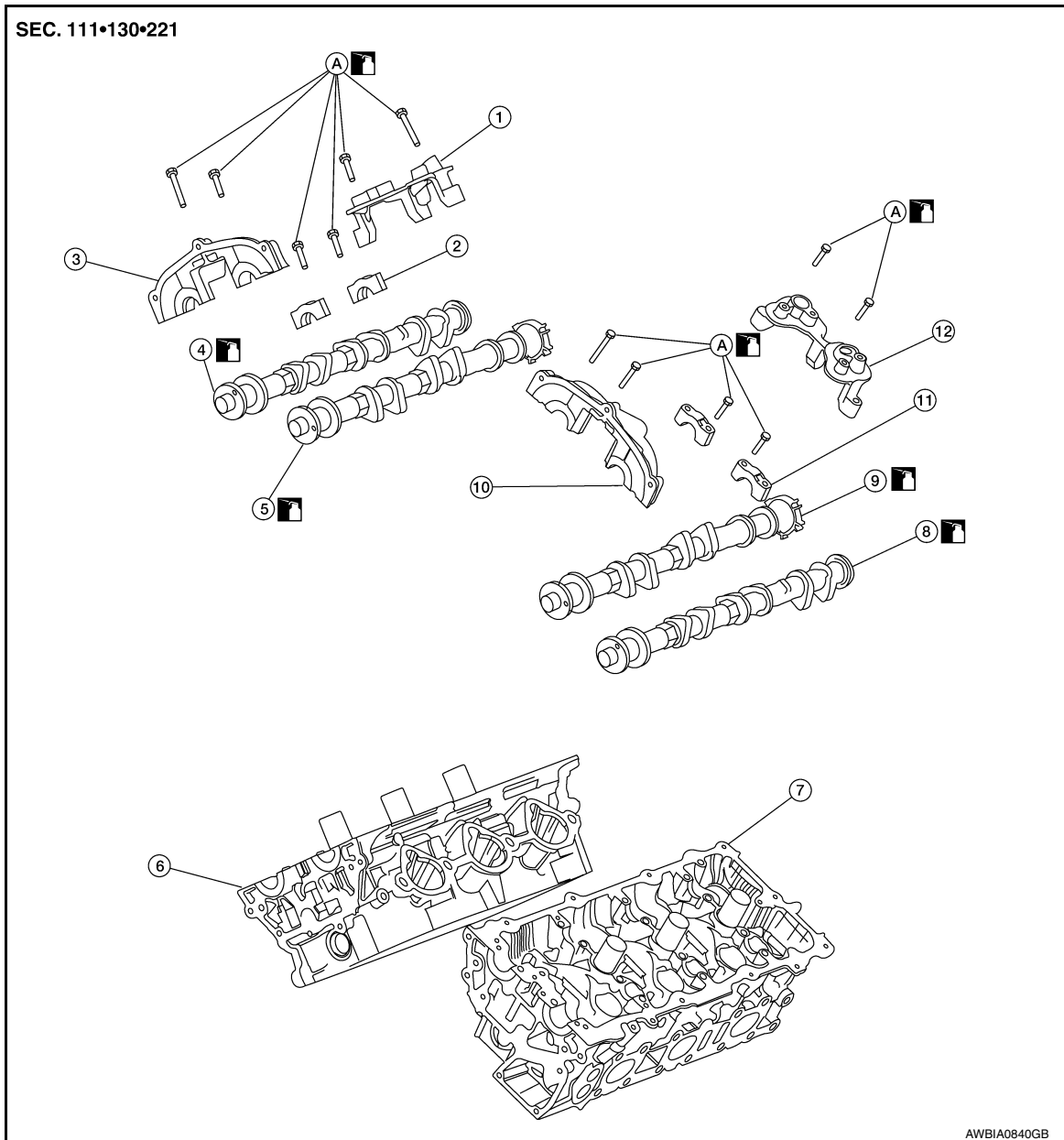
< REMOVAL AND INSTALLATION >

[VQ35DE]

## CAMSHAFT

Exploded View

INFOID:000000009460568



- |  |                       |   |
|--|-----------------------|---|
| 1. Camshaft position sensor bracket (RH) | 2. Camshaft brackets  | 3. No. 1 camshaft bracket (RH)            |
| 4. Camshaft (EXH) RH                     | 5. Camshaft (INT) RH  | 6. Cylinder head (RH)                     |
| 7. Cylinder head (LH)                    | 8. Camshaft (EXH) LH  | 9. Camshaft (INT) LH                      |
| 10. No. 1 camshaft bracket (LH)          | 11. Camshaft brackets | 12. Camshaft position sensor bracket (LH) |
- A. Follow INSTALLATION procedure

### Removal and Installation

INFOID:000000009460569

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

#### REMOVAL

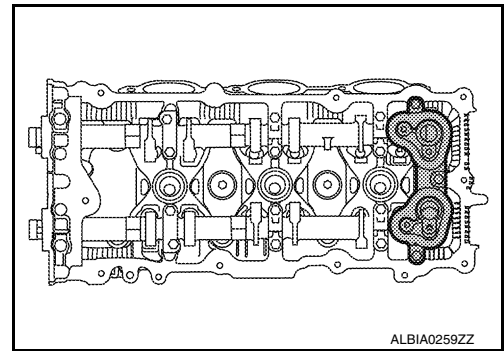
1. Remove the timing chains. Refer to [EM-182, "Removal and Installation"](#).

# CAMSHAFT

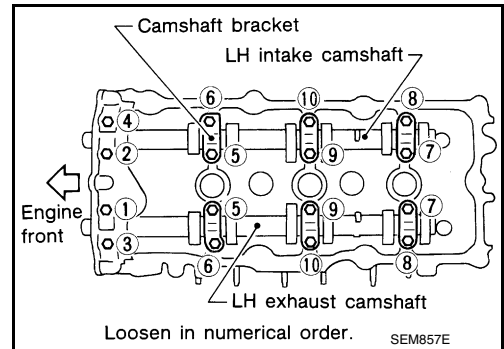
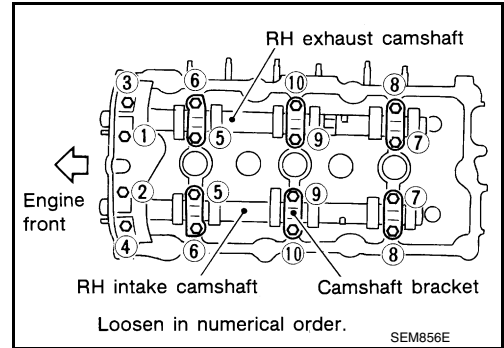
## < REMOVAL AND INSTALLATION >

[VQ35DE]

- Remove camshaft position sensor brackets (RH shown LH similar).



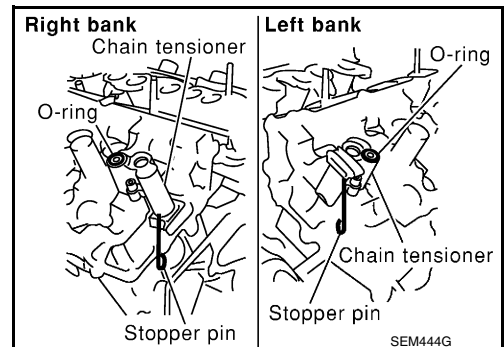
- Remove the intake and exhaust camshaft brackets and the camshafts.
  - Mark the camshafts, camshaft brackets, and bolts so they are placed in the same position and direction for installation.
  - Equally loosen the camshaft bracket bolts in several steps in the numerical order as shown.



- Remove valve lifters, if necessary.

**NOTE:**  
Identify installation positions to ensure proper installation.
- Remove secondary timing chain tensioner from cylinder head
  - Remove secondary tensioner with its stopper pin attached.

**NOTE:**  
Stopper pin was attached when secondary timing chain was removed.



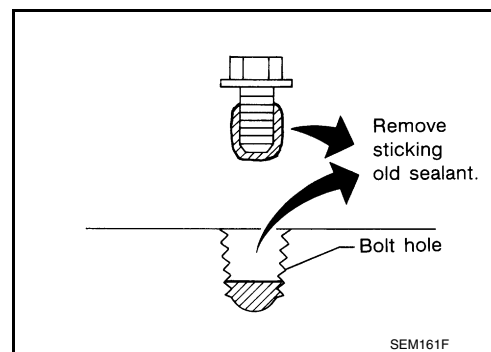
## INSTALLATION

# CAMSHAFT

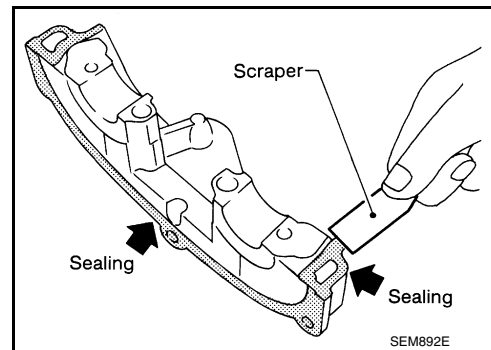
[VQ35DE]

## < REMOVAL AND INSTALLATION >

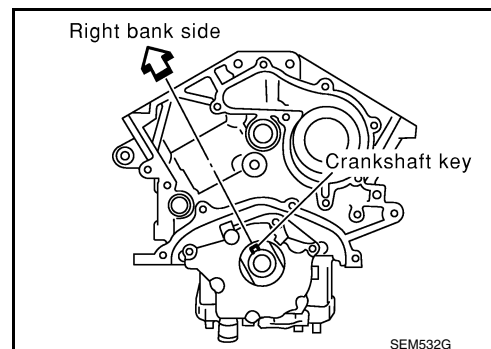
1. Before installation, remove any old Silicone RTV Sealant from component mating surfaces using a scraper.
  - Remove the old Silicone RTV Sealant from the bolt holes and threads.
  - Do not scratch or damage the mating surfaces.



2. Before installing the front cam bracket, remove the old Silicone RTV Sealant from the mating surface using a scraper.
  - Do not scratch or damage the mating surface.

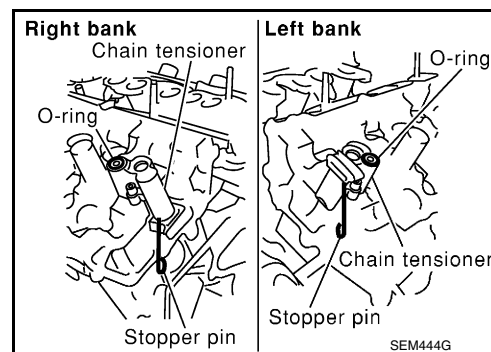


3. Turn the crankshaft until No. 1 piston is set at TDC on the compression stroke.
  - The crankshaft key should line up with the right bank cylinder center line as shown.



4. Install camshaft chain tensioners on both sides of cylinder head. Refer to [EM-182. "Removal and Installation"](#).

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



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

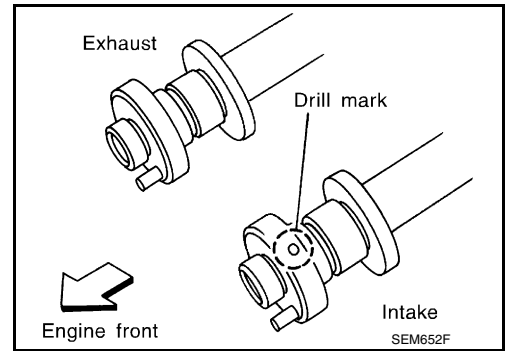


# CAMSHAFT

## < REMOVAL AND INSTALLATION >

[VQ35DE]

6. Install exhaust and intake camshafts and camshaft brackets.
  - Intake camshaft has a drill mark on camshaft sprocket mounting flange.



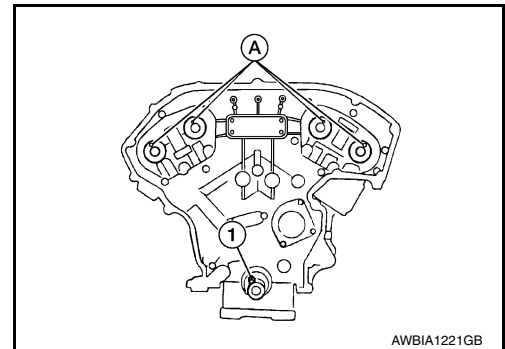
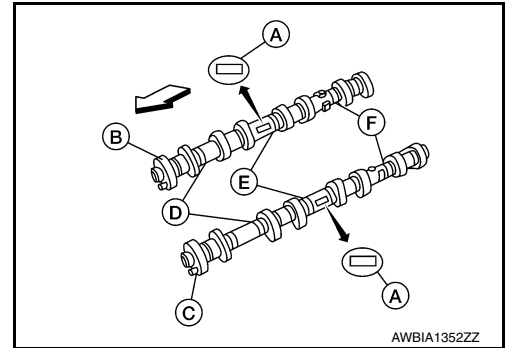
- Follow your identification marks made during removal, or follow the identification marks that are present on the new camshafts components for proper placement and direction of the components.

↶ :Engine front

Bank	INT/EXH	ID mark (A)	Drill mark	Paint marks		
				M1 (E)	M2 (F)	M3 (D)
RH (B)	INT	1A	Yes	Pink	No	Light blue
	EXH	1C	No	No	Light blue	Light blue
LH (C)	INT	1B	Yes	Pink	No	Light blue
	EXH	1D	No	No	Light blue	Light blue

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

(1) :Crankshaft key



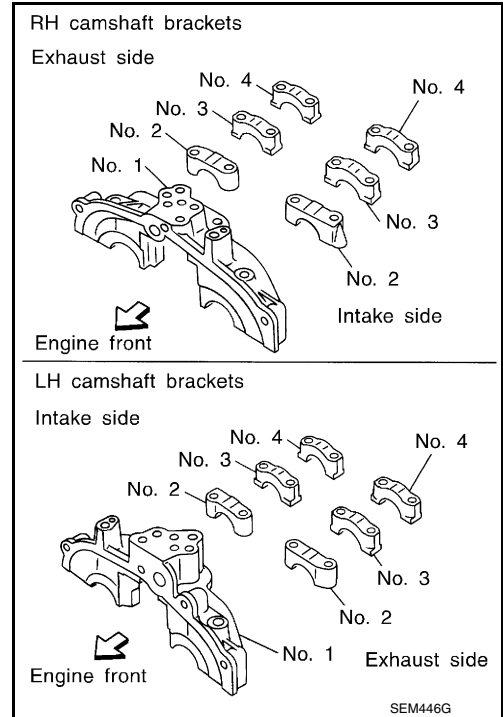
A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# CAMSHAFT

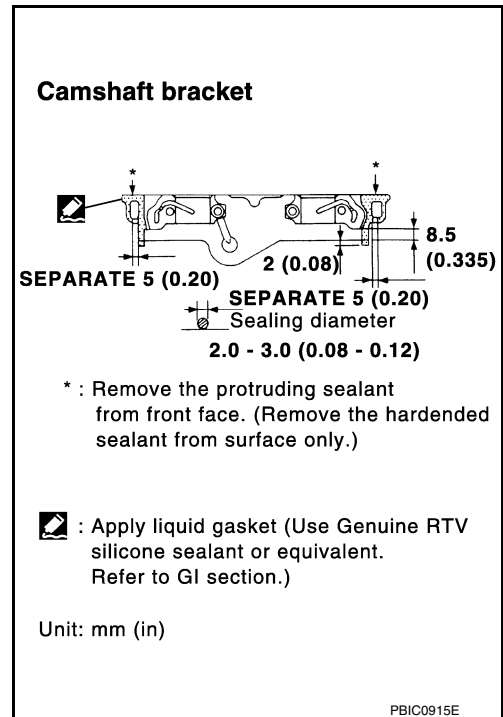
[VQ35DE]

## < REMOVAL AND INSTALLATION >

- Before installing camshaft brackets, apply sealant to mating surface of No. 1 camshaft bracket.
  - Use **Genuine Silicone RTV Sealant, or equivalent. Refer to [EM-124, "Precaution for Liquid Gasket"](#).**



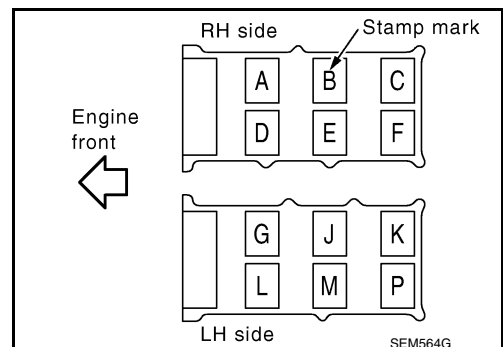
- Before installation, wipe off any protruding sealant.
- Refer to [EM-124, "Precaution for Liquid Gasket"](#).



- Install camshaft brackets in their original positions and direction. Align the stamp marks as shown.
- If checking and adjusting any part of valve assembly or camshaft, check valve clearance according to the reference data. Refer to [EM-138, "Valve Clearance"](#).

**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)**



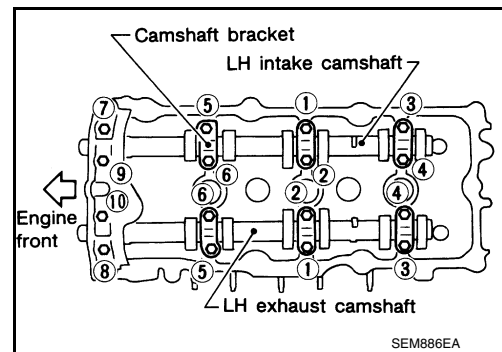
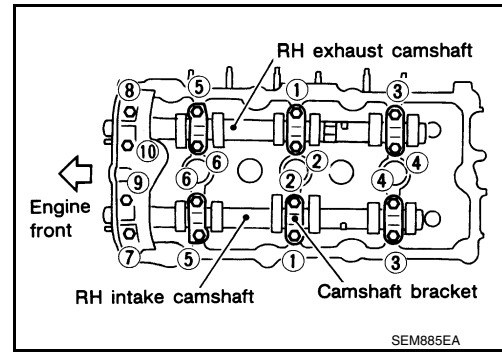
# CAMSHAFT

## < REMOVAL AND INSTALLATION >

[VQ35DE]

- Tighten the camshaft brackets in the three steps, in numerical order as shown.

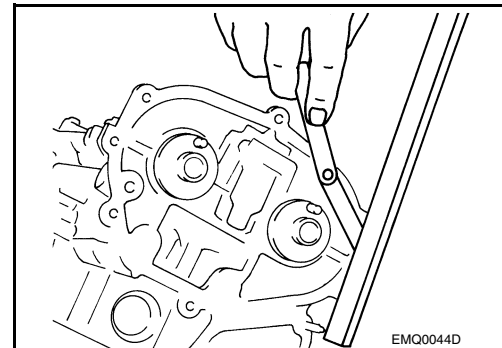
1	1.96 N·m (0.2 kg-m, 17 in-lb)	Tighten No. 7 - 10, then tighten 1 - 6 in numerical order as shown.
2	5.88 N·m (0.6 kg-m, 52 in-lb)	Tighten all in numerical order as shown.
3	10.41 N·m (1.10 kg-m, 8 ft-lb)	Tighten No. 1 - 10 in numerical order as shown.



- 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, re-install camshaft and camshaft bracket.



- Install camshaft position sensor bracket (PHASE) (RH and LH bank.)
- Install the timing chains. Refer to [EM-182. "Removal and Installation"](#).

## INSPECTION AFTER REMOVAL

### Camshaft Visual Check

Check camshaft for scratches, seizure and wear. Replace if necessary.

### Camshaft Runout

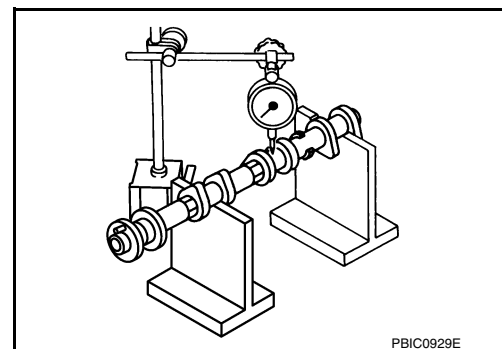
- Put V-block on precise flat bed and support No. 2 and No. 4 journal of camshaft as shown.
- Set dial gauges vertically to No. 3 journal as shown.
- Turn camshaft in one direction slowly by hand, measure the camshaft runout on the dial gauges.
  - Runout is the largest indicator reading after one full revolution.

### Camshaft Runout

**Standard** : Less than 0.02 mm (0.0008 in)

**Limit** : 0.05 mm (0.0020 in)

- If actual runout exceeds the limit, replace the camshaft.



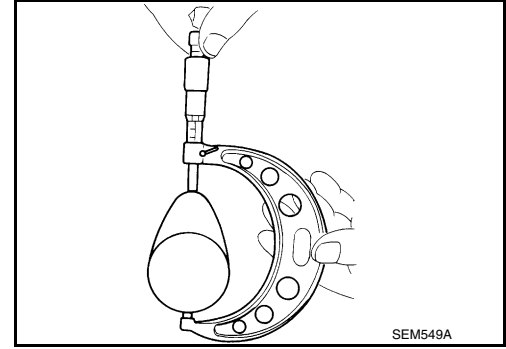
# CAMSHAFT

## < REMOVAL AND INSTALLATION >

[VQ35DE]

### Camshaft Cam Lobe Height

1. Measure camshaft cam lobe height as shown. Refer to [EM-247](#), "[Camshaft](#)".
2. If wear has reduced the lobe height below specifications, replace the camshaft.



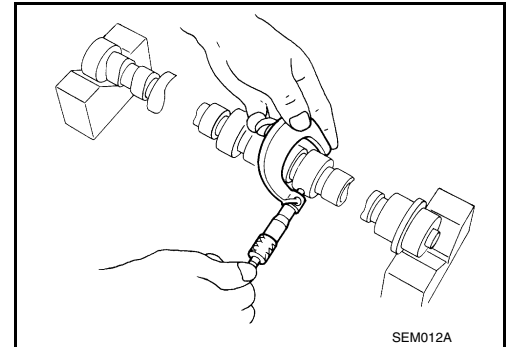
### Camshaft Journal Clearance

#### Outer Diameter of Camshaft Journal

- Measure outer diameter of camshaft journal as shown.

**Standard outer diameter** : 25.935 - 25.955 mm  
**No.1** (1.0211 - 1.0218 in)

**Standard outer diameter** : 23.445 - 23.465 mm  
**No.2, 3, 4** (0.9230 - 0.9238 in)

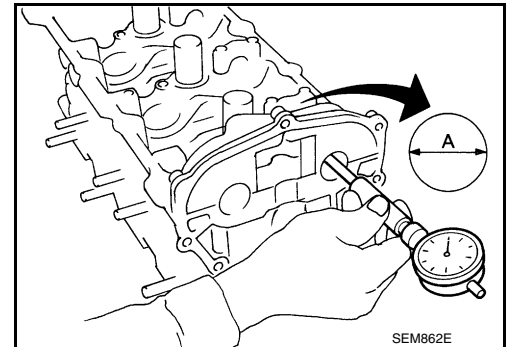


#### Inner Diameter of Camshaft Bracket

1. Tighten camshaft bracket bolt with specified torque.
2. Using inside micrometer, measure inner diameter (A) of camshaft bearing.

**Standard inner diameter** : 26.000 - 26.021 mm  
**No.1** (1.0236 - 1.0244 in)

**Standard inner diameter** : 23.500 - 23.521 mm  
**No.2, 3, 4** (0.9252 - 0.9260 in)



#### Calculation of Camshaft Journal Clearance

(Journal clearance) = (inner diameter of camshaft bracket) – (outer diameter of camshaft journal)

**Standard** : 0.045 - 0.086 mm (0.0018 - 0.0034 in)  
**No.1**

**Standard** : 0.035 - 0.076 mm (0.0014 - 0.0030 in)  
**No.2, 3, 4**

**Limit** : 0.15 mm (0.0059 in)

- 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.

# CAMSHAFT

[VQ35DE]

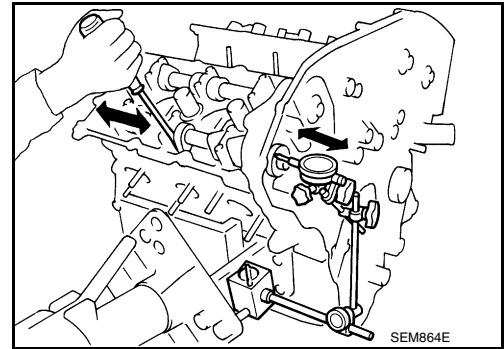
## < REMOVAL AND INSTALLATION >

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.

**Standard : 0.115 - 0.188 mm (0.0045 - 0.0074 in)**

**Limit : 0.24 mm (0.0094 in)**

- 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.

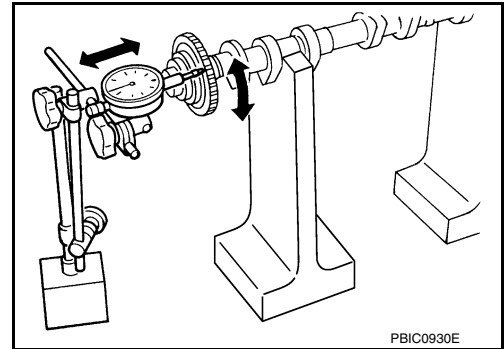


### Camshaft Sprocket Runout

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.

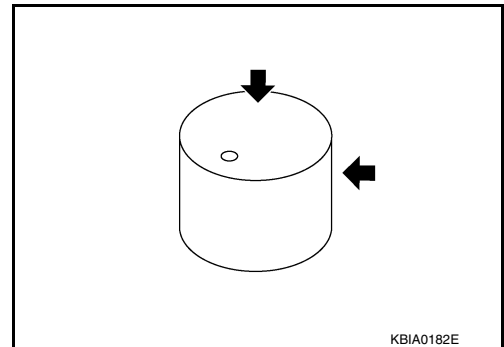
**Runout : Less than 0.15 mm (0.0059 in)**

4. If sprocket runout exceeds the limit, replace camshaft sprocket.



### Valve Lifter

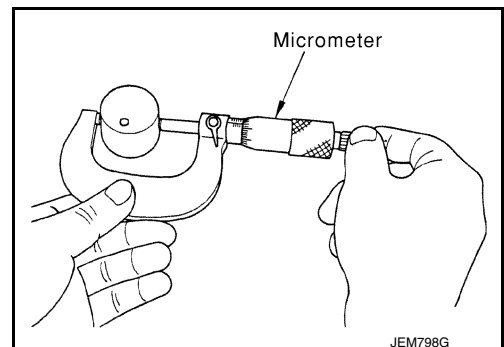
- Check if the surface of the valve lifter has any excessive wear or cracks, replace as necessary.



### Valve Lifter Clearance

#### Outer Diameter of Valve Lifter

- Measure the outer diameter of the valve lifter. Refer to [EM-247](#), "[Camshaft](#)".
- If out of the specified range, replace the valve lifter.



### Valve Lifter Bore Diameter

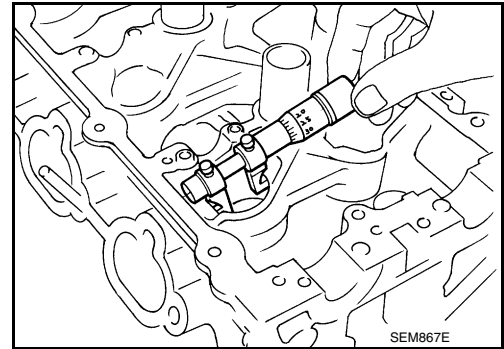
A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# CAMSHAFT

[VQ35DE]

## < REMOVAL AND INSTALLATION >

- Using inside micrometer, measure diameter of valve lifter bore of cylinder head. Refer to [EM-247, "Camshaft"](#).
- If out of the specified range, replace the cylinder head assembly.



### Calculation of Valve Lifter Clearance

- (Valve lifter clearance) = (hole diameter for valve lifter) – (outer diameter of valve lifter) Refer to [EM-247, "Camshaft"](#).
- If out of specified range, replace either or both valve lifter and cylinder head assembly.

## Inspection after Installation

INFOID:000000009460570

### INSPECTION OF CAMSHAFT SPROCKET (INT) OIL GROOVE

#### **WARNING:**

- Check when engine is cold so as to prevent burns from any splashing engine oil.

#### **CAUTION:**

- Perform this inspection only when DTC P0011 is detected in self-diagnostic results of CONSULT and it is directed according to inspection procedure of EC section. Refer to [EC-716, "Diagnosis Procedure"](#).

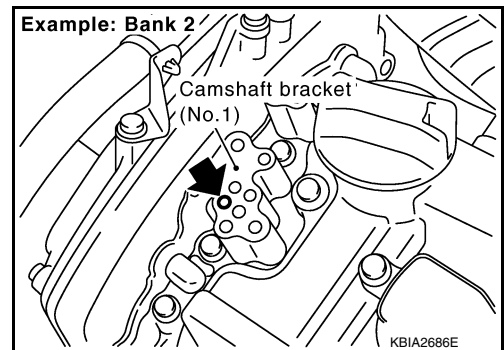
1. Check engine oil level. Refer to [MA-26, "ENGINE OIL : Inspection"](#).
2. Perform the following procedure so as to prevent the engine from being unintentionally started while checking.
  - a. Release fuel pressure. Refer to [FL-5, "Inspection"](#).
  - b. Disconnect ignition coil and injector harness 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.

## OIL SEAL

### Removal and Installation of Valve Oil Seal

INFOID:00000009460571

#### 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.**

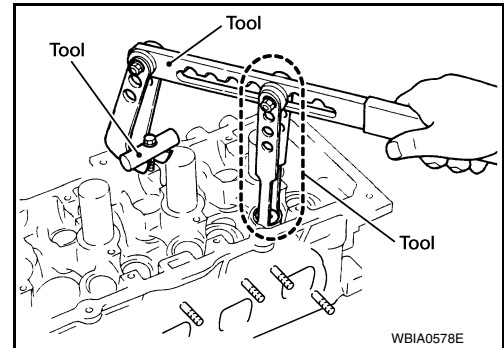
2. Remove camshaft relating to valve oil seal to be removed. Refer to [EM-194, "Removal and Installation"](#).
3. Remove valve lifters. Refer to [EM-210, "Disassembly and Assembly"](#).
4. Remove valve collet, valve spring retainer and valve spring using Tool.

**CAUTION:**

**When working, take care not to damage valve lifter holes.**

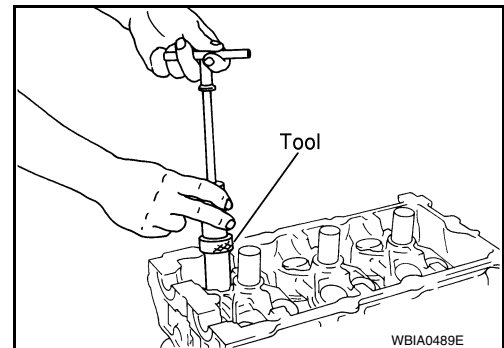
- Tool numbers** : KV10116200 (J-26336-A)  
 : KV10115900 (J-26336-20)  
 : KV10109230 ( — )

- Compress valve spring using Tool attachment, adapter. Remove valve collet with magnet hand.



5. Remove valve oil seal using Tool.

- Tool number** : KV10107902 (J-38959)



#### INSTALLATION

1. Apply new engine oil to new valve oil seal joint surface and seal lip.
2. Press in valve oil seal using Tool to specified height (H).

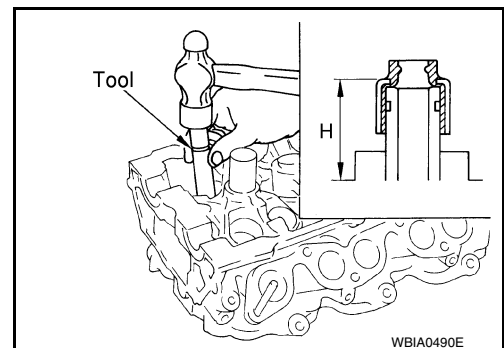
- Tool number** : — (J-39386)

**NOTE:**

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

- Intake and exhaust** : 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

INFOID:00000009460572

#### REMOVAL

1. Remove the following parts:
  - Engine under cover. Refer to [EXT-17, "Removal and Installation"](#).
  - Drive belts. Refer to [EM-134, "Removal and Installation"](#).
  - Cooling fan. Refer to [CO-42, "Removal and Installation"](#).

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# OIL SEAL

## < REMOVAL AND INSTALLATION >

[VQ35DE]

2. Remove the crankshaft pulley as follows:
  - a. Remove the access plate and lock the ring gear using Tool.

**Tool number** : — (J-50288)

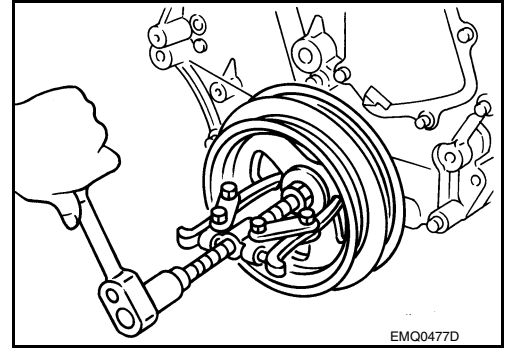
**CAUTION:**

**Do not damage the ring gear teeth, or the signal plate teeth behind the ring gear when setting the stopper.**

- b. Loosen crankshaft pulley bolt and locate bolt seating surface at 10 mm (0.39 in) from its original position.
    - c. Position a pulley puller at recess hole of crankshaft pulley to remove crankshaft pulley.

**CAUTION:**

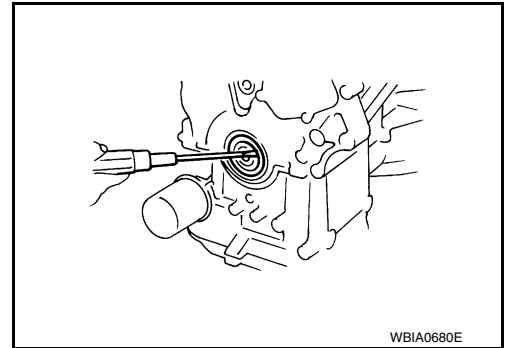
**Do not use a puller claw on crankshaft pulley periphery.**



3. Remove front oil seal from front cover using suitable tool.

**CAUTION:**

**Be careful not to damage front cover or crankshaft.**

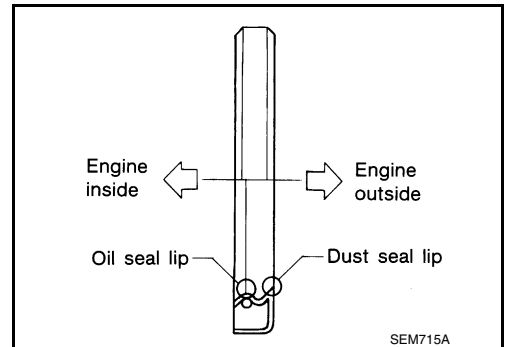


## INSTALLATION

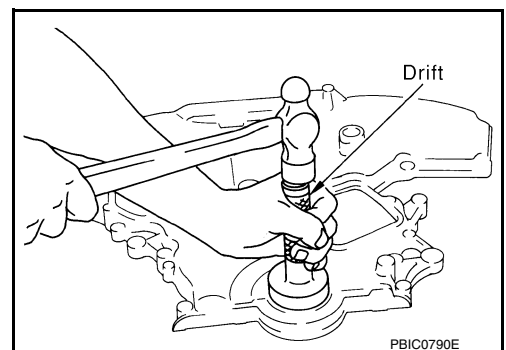
1. Apply new engine oil to new front oil seal and install.
  - Install new front oil seal in the direction as shown.

**CAUTION:**

- **Press fit straight and avoid causing burrs or tilting the front oil seal.**
- **Do not reuse front oil seal.**



- Press-fit front oil seal until it becomes flush with the timing chain case end face, using suitable tool.
- Make sure the garter spring in the front oil seal is in position and seal lip is not inverted.





# OIL SEAL

## < REMOVAL AND INSTALLATION >

[VQ35DE]

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.

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

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

3. 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.

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

## Removal and Installation of Rear Oil Seal

INFOID:000000009460573

### REMOVAL

1. Remove the engine assembly. Refer to [EM-220, "Removal and Installation"](#).
2. Remove drive plate. Refer to [EM-224, "Disassembly and Assembly"](#).
3. Drain engine oil. Refer to [MA-27, "ENGINE OIL : Changing Engine Oil"](#).
4. Remove the upper oil pan and oil strainer. Refer to [EM-157, "Removal and Installation \(Upper Oil Pan\)"](#).
5. Remove rear oil seal retainer using Tool.

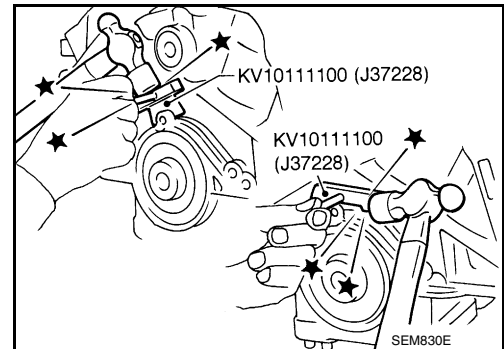
**Tool Number** : KV10111100 (J-37228)

### CAUTION:

- Be careful not to damage mating surface.
- If rear oil seal 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.

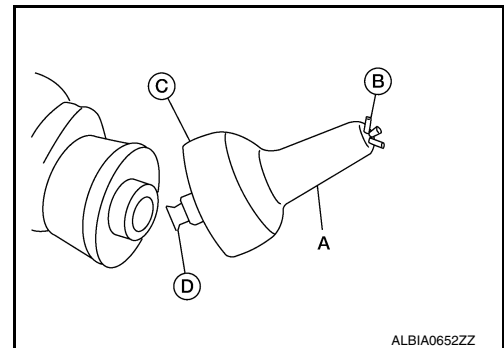


### INSTALLATION

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.

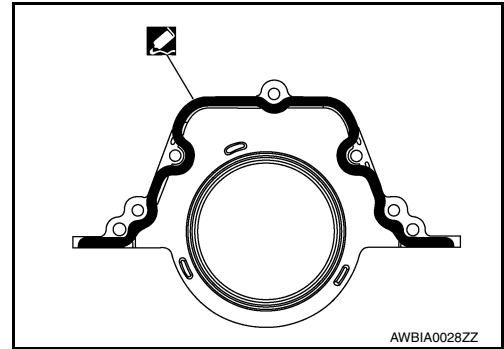


## OIL SEAL

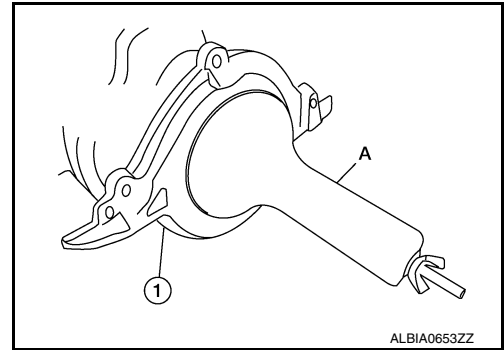
[VQ35DE]

### < REMOVAL AND INSTALLATION >

- d. Apply sealant to rear oil seal retainer as shown.  
**Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-21, "Recommended Chemical Products and Sealants".**
- Assembly should be completed within 5 minutes after coating.



- 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.



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.

# CYLINDER HEAD

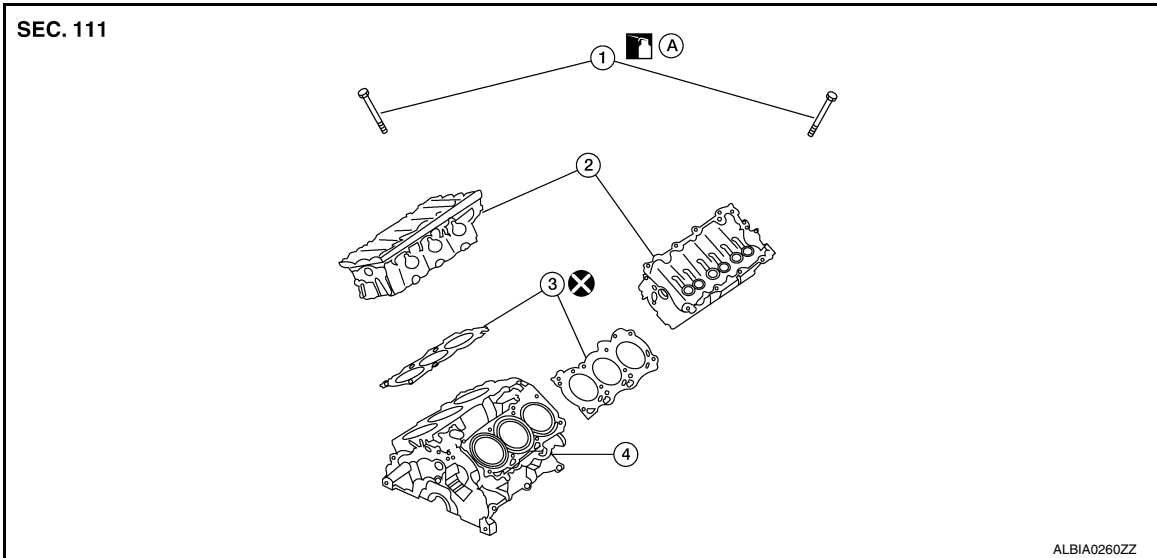
< REMOVAL AND INSTALLATION >

[VQ35DE]

## CYLINDER HEAD

### Exploded View

INFOID:000000009460574



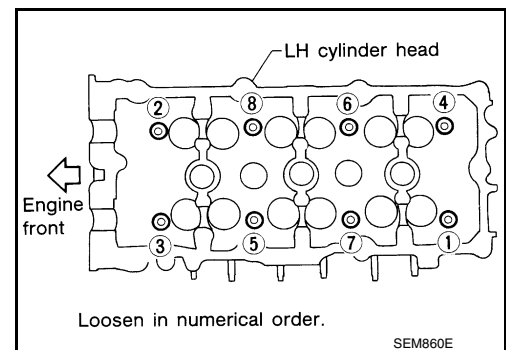
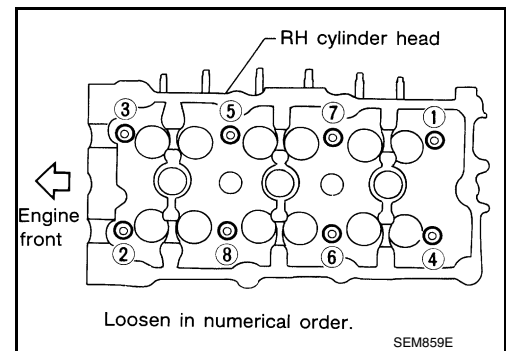
- |                       |                                  |                         |
|-----------------------|----------------------------------|-------------------------|
| 1. Cylinder head bolt | 2. Cylinder head                 | 3. Cylinder head gasket |
| 4. Engine block       | A. Follow INSTALLATION procedure |                         |

### Removal and Installation

INFOID:000000009460575

#### REMOVAL

1. Remove the rear timing chain case. Refer to [EM-189, "Removal and Installation"](#).
2. Remove the intake manifold. Refer to [EM-149, "Removal and Installation"](#).
3. Remove the intake and exhaust camshafts. Refer to [EM-194, "Removal and Installation"](#).
4. Remove exhaust manifolds. Refer to [EM-153, "Removal and Installation \(RH\)"](#).
5. Remove the coolant outlet housing. Refer to [CO-51, "Removal and Installation"](#).
6. Remove the RH and LH cylinder head bolts, with power tool.
  - The bolts should be loosened gradually in three stages.
  - Loosen the bolts in the numerical order as shown.

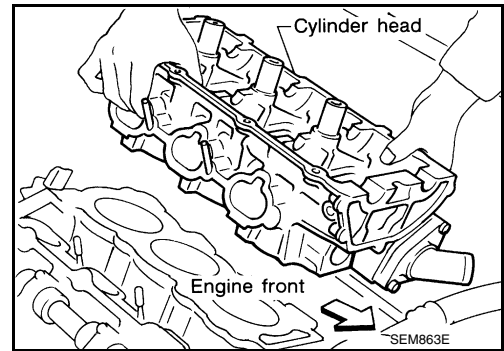


# CYLINDER HEAD

## < REMOVAL AND INSTALLATION >

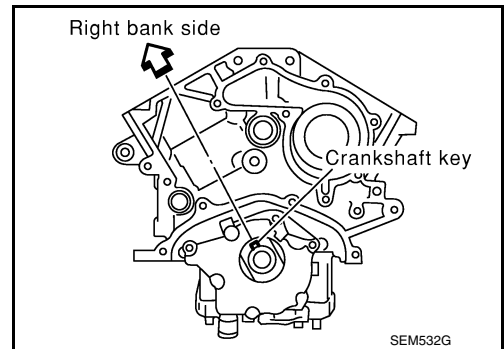
[VQ35DE]

- Remove cylinder heads and gaskets.
  - Discard the cylinder head gaskets and use new gaskets for installation.

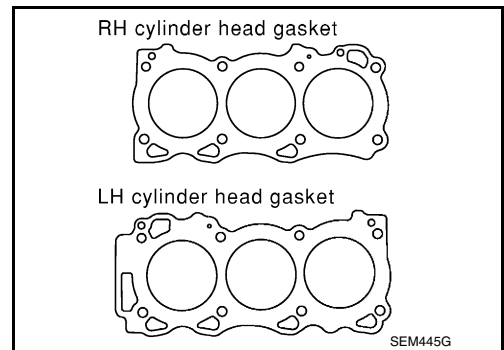


## INSTALLATION

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



- Install new gaskets on the cylinder heads.



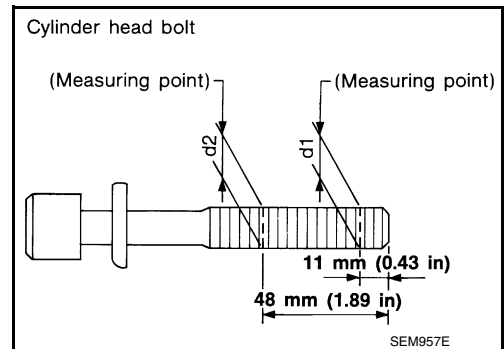
- Inspect the cylinder head bolts before installing the cylinder heads.

**CAUTION:**

Cylinder head bolts are tightened by degree rotation tightening method. 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.



# CYLINDER HEAD

## < REMOVAL AND INSTALLATION >

[VQ35DE]

4. Install the cylinder heads on the cylinder block. Tighten the cylinder head bolts in five steps in the numerical order as shown using Tool.

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

- **Tightening procedure:**

### Cylinder head bolts

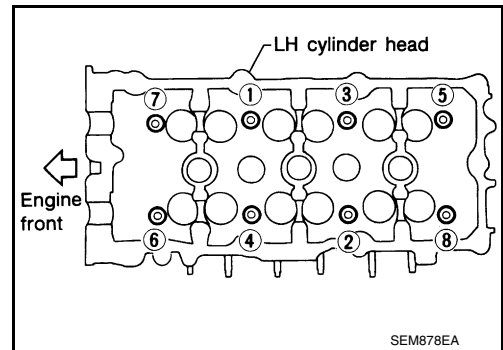
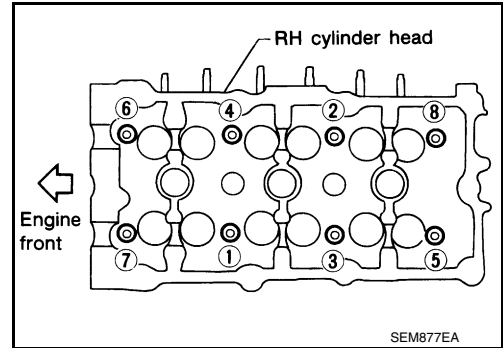
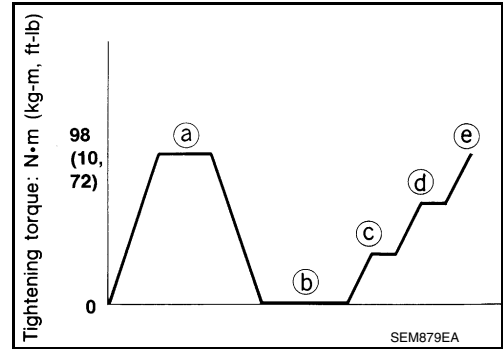
**Step a : 98.1 N·m (10 kg-m, 72 ft-lb)**

**Step b : Loosen in the reverse order of tightening**

**Step c : 39.2 N·m (4.0 kg-m, 29 ft-lb)**

**Step d : 103° degrees rotation clockwise**

**Step e : 103° degrees rotation clockwise**



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

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

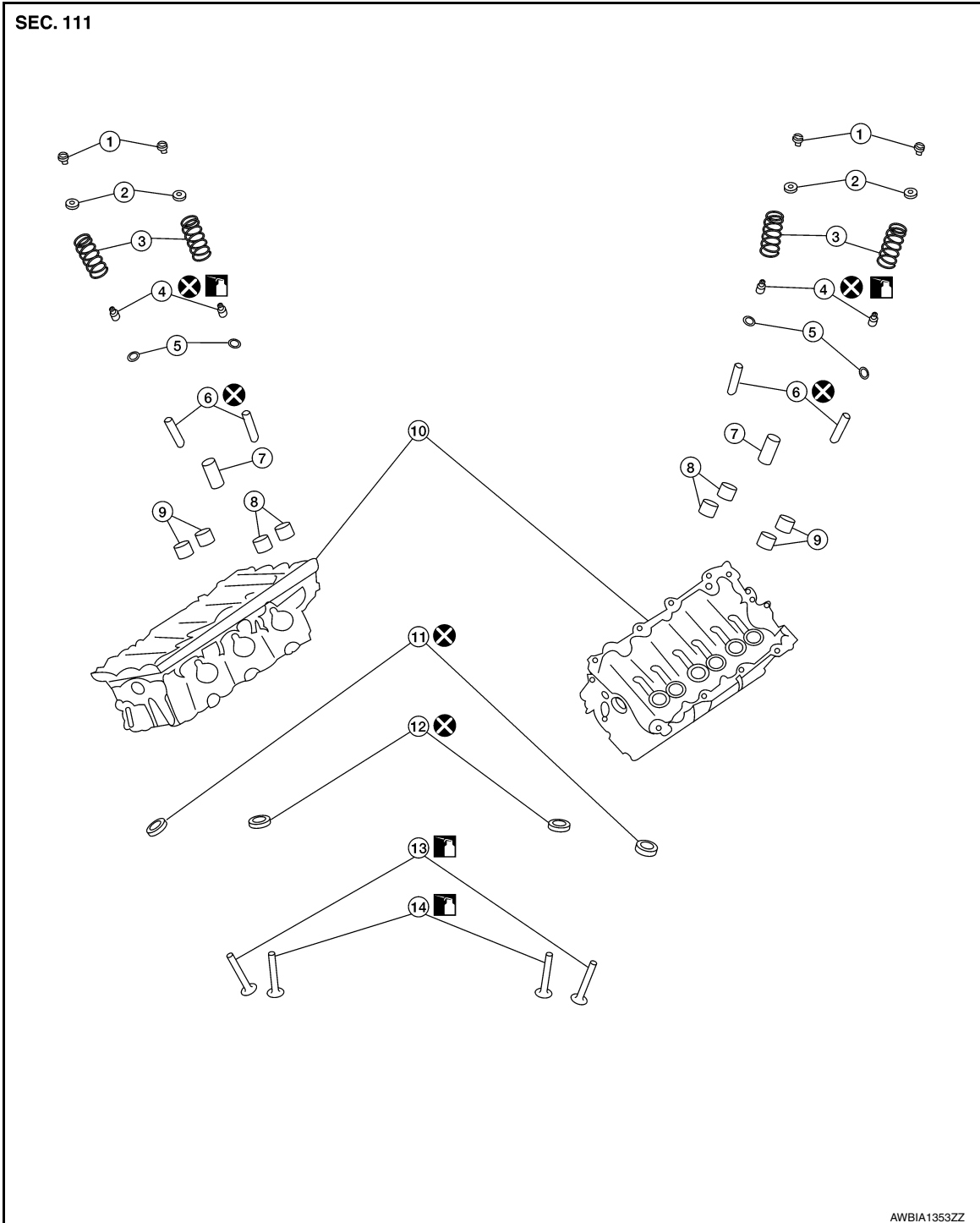
# CYLINDER HEAD

< REMOVAL AND INSTALLATION >

[VQ35DE]

## Disassembly and Assembly

INFOID:000000009460576



- |                    |                          |                      |
|--------------------|--------------------------|----------------------|
| 1. Valve collet    | 2. Valve spring retainer | 3. Valve spring      |
| 4. Valve oil seal  | 5. Valve spring seat     | 6. Valve guide       |
| 7. Spark plug tube | 8. Lifter (INT)          | 9. Lifter (EXH)      |
| 10. Cylinder head  | 11. Valve seat (EXH)     | 12. Valve seat (INT) |
| 13. Valve (EXH)    | 14. Valve (INT)          |                      |

### 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 >

[VQ35DE]

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

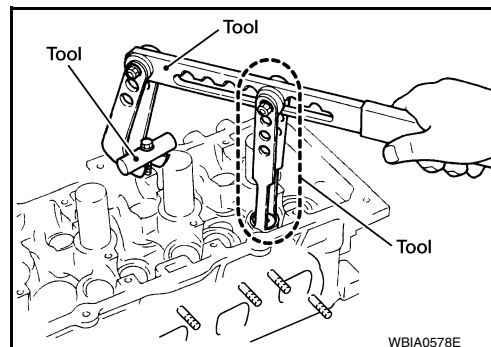
## DISASSEMBLY

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 Tool.

### CAUTION:

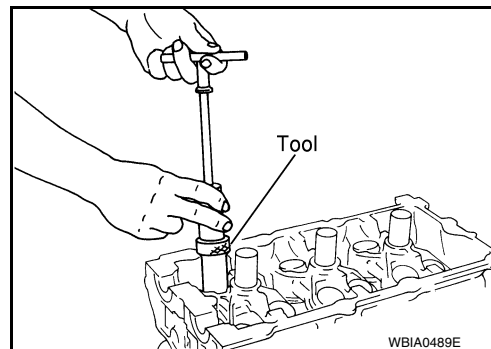
When working, take care not to damage valve lifter holes.

**Tool numbers** : KV10109230 ( — )  
: KV10116200 (J-26336-A)  
: KV10115900 (J-26336-20)



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 Tool.

**Tool number** : KV10107902 (J-38959)



7. If valve seat must be replaced, refer to [EM-212. "Inspection After Disassembly"](#).
8. If valve guide must be replaced, refer to [EM-212. "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-212. "Inspection After Disassembly"](#).
2. When valve seat is removed, install it. Refer to [EM-212. "Inspection After Disassembly"](#).
3. Install valve oil seals using Tool.

**Tool number** : — (J-39386)

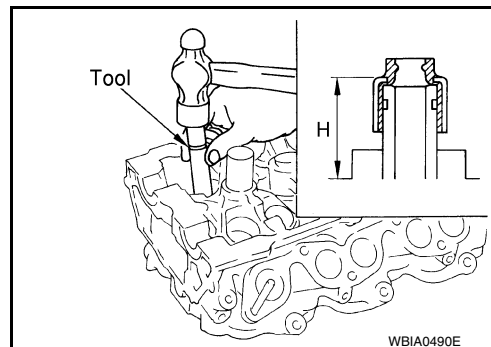
**Height (H) (Without valve spring seat installed)**

**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.

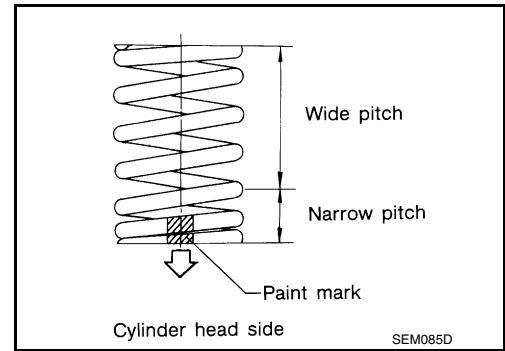


# CYLINDER HEAD

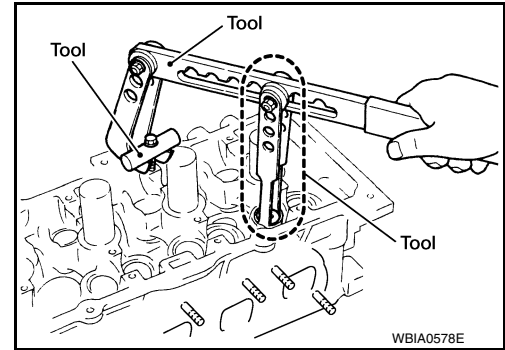
## < REMOVAL AND INSTALLATION >

[VQ35DE]

6. Install valve spring (uneven pitch type) with narrow pitch end (paint mark) to cylinder head side (valve spring seat side).



7. Install valve spring retainer.  
8. Install valve collet.  
• Compress valve spring with valve spring compressor, attachment and adapter using Tool. Install valve collet with magnet hand.  
**CAUTION:**  
**When working, take care not to damage valve lifter holes.**  
• Tap valve stem edge lightly with plastic hammer after installation to check its installed condition.



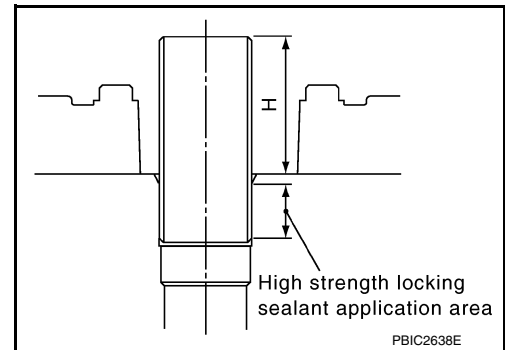
**Tool numbers** : KV10109230 ( — )  
: KV10116200 (J-26336-A)  
: KV10115900 (J-26336-20)

9. Install valve lifter.  
• Install it in the original position.  
10. Install spark plug tube, if removed.  
• Press-fit spark plug tube as follows:  
a. Remove old liquid gasket adhering to cylinder head mounting hole.  
b. Apply sealant to area 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 [EM-124, "Precaution for Liquid Gasket"](#).**  
c. Press-fit spark plug tube so that its height (H) is as specified in using suitable tool.

**Press-fit height (H)** : 37.7 - 39.1 mm (1.484 - 1.529 in)

**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-132, "Removal and Installation"](#).



## Inspection After Disassembly

INFOID:000000009460577

### 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.



# CYLINDER HEAD

## < REMOVAL AND INSTALLATION >

[VQ35DE]

Check along six positions as shown.

### Head surface distortion

Limit	: 0.1 mm (0.004 in)
Standard	: Less than 0.03 mm (0.0012 in)

If beyond the specified limit, resurface or replace it.

**The limit for cylinder head resurfacing is determined by the cylinder block resurfacing.**

### Resurfacing Limit

Amount of cylinder head resurfacing is (A).	
Amount of cylinder block resurfacing is (B).	
The maximum limit	: $A + B = 0.2 \text{ mm (0.008 in)}$

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

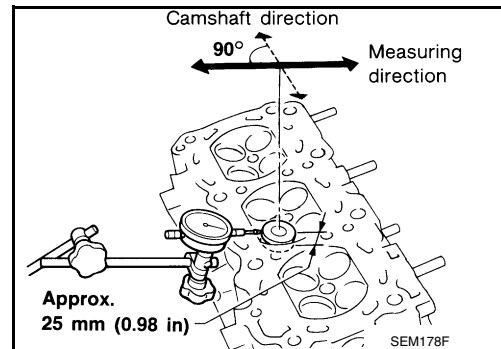
Nominal cylinder head height	: 126.3 - 126.5 mm (4.972 - 4.980 in)
------------------------------	---------------------------------------

## VALVE GUIDE CLEARANCE

1. Measure valve deflection as shown. (Valve and valve guide mostly wear in this direction.)

### Valve deflection limit (dial gauge reading)

Intake	: 0.24 mm (0.0094 in)
Exhaust	: 0.28 mm (0.0110 in)



2. If it exceeds the limit, check valve to valve guide clearance.
  - a. Measure valve stem diameter and valve guide inner diameter. Refer to [EM-249, "Cylinder Head"](#).
  - b. Check that clearance is within specification.  
(Valve guide clearance) = (Valve guide inner diameter) - (Valve stem diameter)

### Valve to valve guide clearance standard

Intake	: 0.020 - 0.053 mm (0.0008 - 0.0021 in)
Exhaust	: 0.040 - 0.073 mm (0.0016 - 0.0029 in)

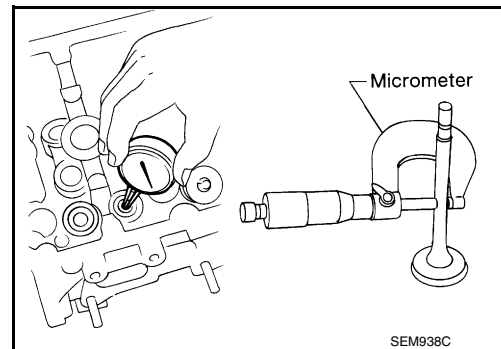
### Valve to valve guide clearance limit

Intake	: 0.08 mm (0.0031 in)
Exhaust	: 0.1 mm (0.004 in)

- c. If it exceeds the limit, replace valve or valve guide.

## VALVE GUIDE REPLACEMENT

When valve guide is removed, replace with oversized [0.2 mm (0.008 in)] valve guide.



# CYLINDER HEAD

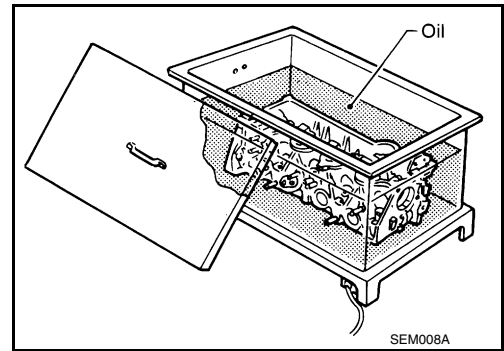
[VQ35DE]

## < REMOVAL AND INSTALLATION >

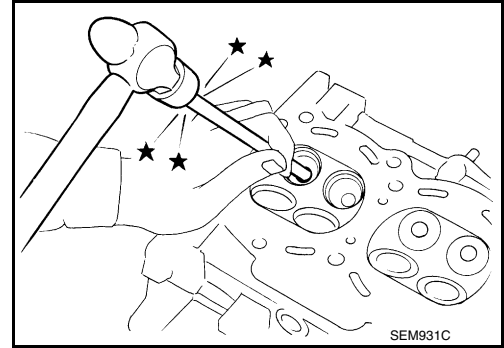
1. To remove valve guide, heat cylinder head to 110° to 130°C (230° to 266°F) by soaking in heated oil.

**WARNING:**

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

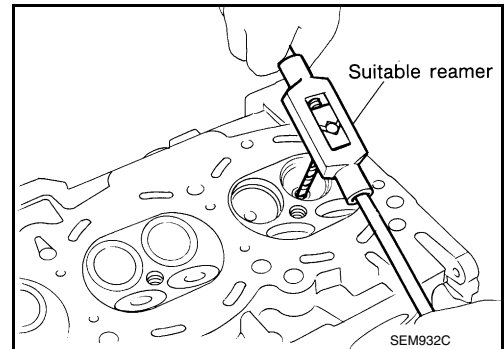


2. Drive out the valve guide with a press [under a 20 kN (2.2 US ton) pressure] or hammer and suitable tool.



3. Ream cylinder head valve guide hole.

**Valve guide hole diameter : 10.175 - 10.196 mm  
(for service parts), intake (0.4006 - 0.4014 in)  
and exhaust**

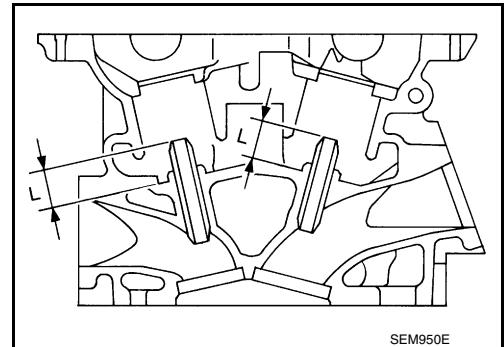


4. Heat cylinder head to 110° to 130°C (230° to 266°F) by soaking in heated oil and press new valve guide from camshaft side into the cylinder head to the dimensions as shown.

**WARNING:**

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

**Projection (L) : 12.6 - 12.8 mm (0.496 - 0.504 in)**



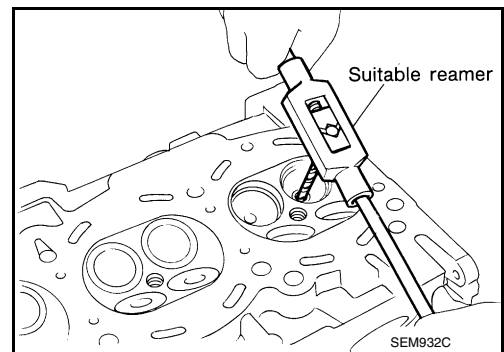
# CYLINDER HEAD

## < REMOVAL AND INSTALLATION >

[VQ35DE]

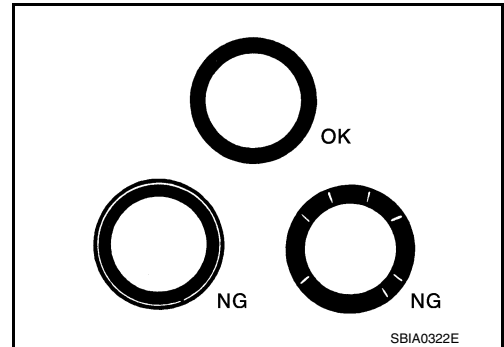
- Using a valve guide reamer, apply a reamer finish to the valve guide.

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



### VALVE SEAT CONTACT

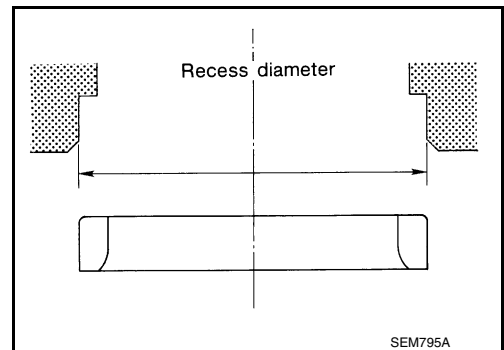
- After confirming that the dimensions of valve guides and valves are within specifications, perform this procedure.
- Apply prussian blue onto contacting surface of valve seat to check the condition of the valve contact on the surface.
- Check if the contact area band is continuous all around the circumference.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



### VALVE SEAT REPLACEMENT

- Bore out old seat 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.
- Ream cylinder head recess for service valve seat.

**Oversize : 0.5 mm (0.020 in)**  
**Intake : 38.500 - 38.516 mm (1.5157 - 1.5164 in)**  
**Exhaust : 32.100 - 32.116 mm (1.2638 - 1.2644 in)**



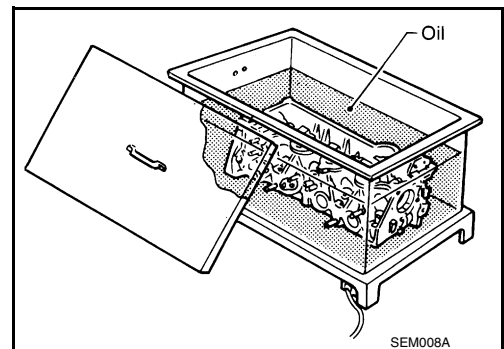
**Be sure to ream in circles concentric to the valve guide center.**

**This will enable valve seat to fit correctly.**

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

#### **WARNING:**

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



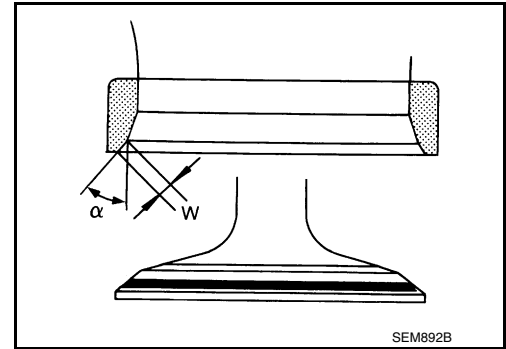
- Press fit valve seat until it seats on the bottom.
- Cut or grind valve seat using suitable tool to the specified dimensions. Refer to [EM-249, "Cylinder Head"](#).
- After cutting, lap valve seat with abrasive compound.
- Check valve seating condition.

# CYLINDER HEAD

< REMOVAL AND INSTALLATION >

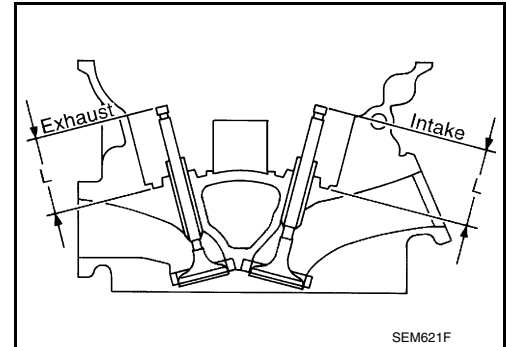
[VQ35DE]

<b>Seat face angle <math>\alpha</math></b>	<b>: 45° 15' - 45° 45' degrees/minutes</b>
<b>Contacting width (W) for intake</b>	<b>: 1.18 - 1.22 mm (0.0465 - 0.0480 in)</b>
<b>Contacting width (W) for exhaust</b>	<b>: 1.38 - 1.42 mm (0.0543 - 0.0559 in)</b>



8. Use a depth gauge to measure the distance between the mounting surface of the cylinder head spring seat and the valve stem end. 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.

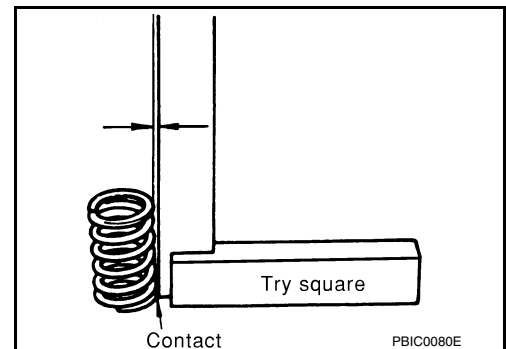
<b>Valve seat resurface limit (L) intake</b>	<b>: 41.16 - 41.76 mm (1.6205 - 1.6441 in)</b>
<b>Valve seat resurface limit (L) exhaust</b>	<b>: 41.09 - 41.69 mm (1.6177 - 1.6413 in)</b>



## VALVE SPRING SQUARENESS

Set try square along the side of valve spring and rotate the spring. Measure the maximum clearance between the top face of spring and try square.

<b>Out-of-square limit</b>	<b>: Less than 2.0 mm (0.079 in)</b>
----------------------------	--------------------------------------

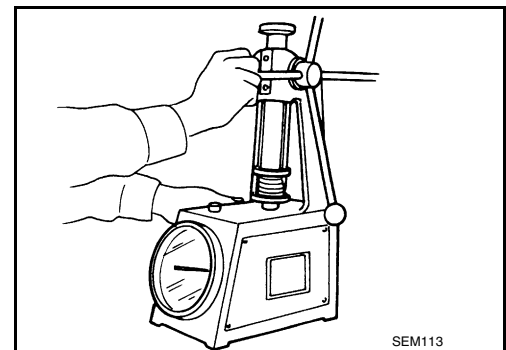


## VALVE SPRING DIMENSIONS AND VALVE SPRING PRESSURE LOAD

Check valve spring pressure at specified spring height.

<b>Standard</b>	<b>: 166 - 188 N (16.9 - 19.2 kg, 37.3 - 42.3 lb) at height 37.0 mm (1.457 in)</b>
<b>Limit</b>	<b>: 373 - 421 N (38.0 - 42.9 kg, 84 - 95 lb) at height 27.2 mm (1.071 in)</b>

If it is not within specifications, replace the spring.



## ENGINE MOUNT

### ENGINE MOUNT (FRONT)

#### ENGINE MOUNT (FRONT) : Removal and Installation

INFOID:000000009460578

A

EM

#### WARNING:

- Situate the vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.
- Always work safely.
- 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 (front).

#### NOTE:

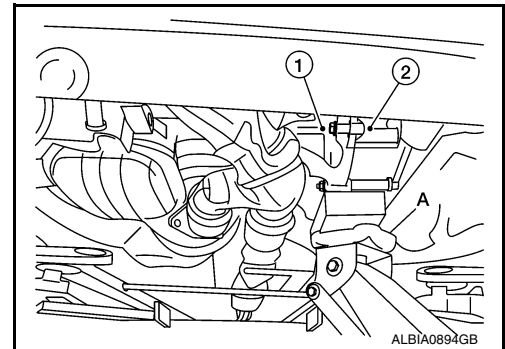
When removing components such as hoses, tubes/lines, etc., cap or plug openings to prevent fluid from spilling.

#### REMOVAL

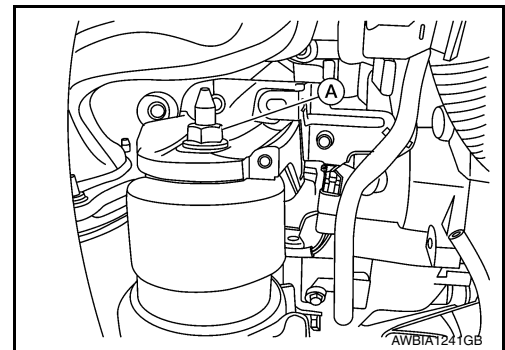
1. Remove the air cleaner assembly, front air duct, and air duct hose and resonator assembly. Refer to [EM-144, "Removal and Installation"](#).
2. Remove the battery and battery tray assembly. Refer to [PG-74, "Removal and Installation \(Battery Tray\)"](#).
3. Remove the engine under cover. Refer to [EXT-28, "Removal and Installation"](#).
4. Remove the fender protector side covers (RH/LH). Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).
5. Partially remove the fender protectors (RH/LH). Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).
6. Remove the radiator. Refer to [CO-41, "Removal and Installation"](#).
7. Remove the cooling fan shroud and motor assembly. Refer to [CO-42, "Removal and Installation"](#).
8. Remove the exhaust manifold heat shield (LH). Refer to [EM-153, "Removal and Installation \(RH\)"](#).
9. 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.



10. Disconnect the engine mounting insulator (front) vacuum hose.
11. Remove the engine mounting insulator (front) nut (A).



C

D

E

F

G

H

I

J

K

L

M

N

O

P

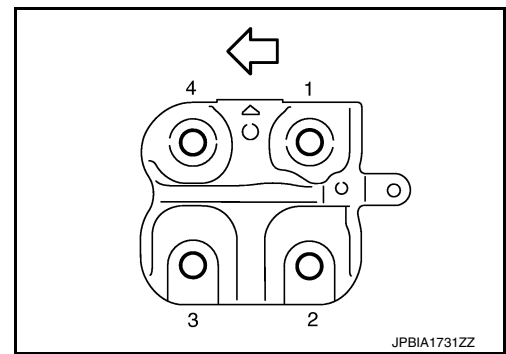
# ENGINE MOUNT

[VQ35DE]

## < REMOVAL AND INSTALLATION >

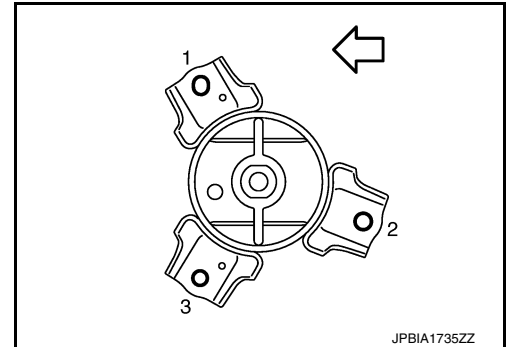
12. Loosen the engine mounting bracket (front) bolts in the reverse order shown.

⇐ : Engine front

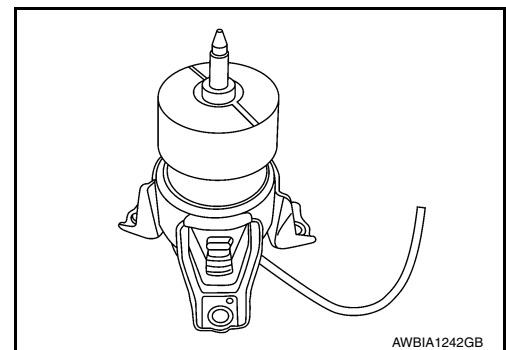


13. Remove the engine mounting bracket (front).  
14. Remove the engine mounting insulator (front) bolts in the reverse order as shown.

⇐ :Front

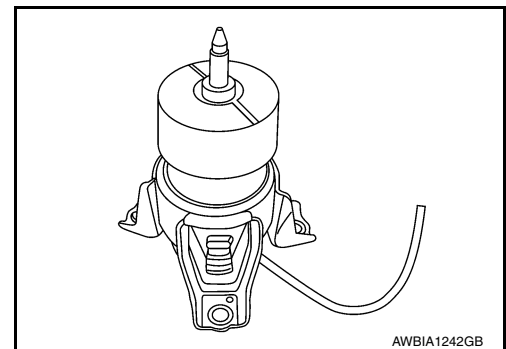


15. Remove the engine mounting insulator (front).



## INSTALLATION

1. Install the engine mounting insulator (front).



# ENGINE MOUNT

[VQ35DE]

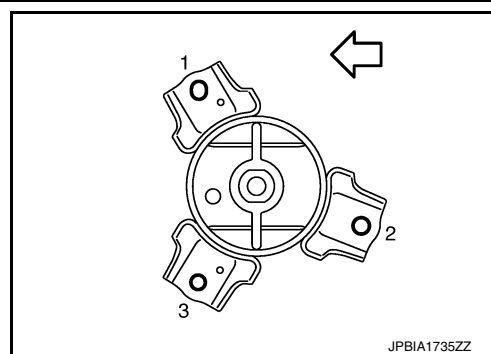
## < REMOVAL AND INSTALLATION >

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

⇐ :Front

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

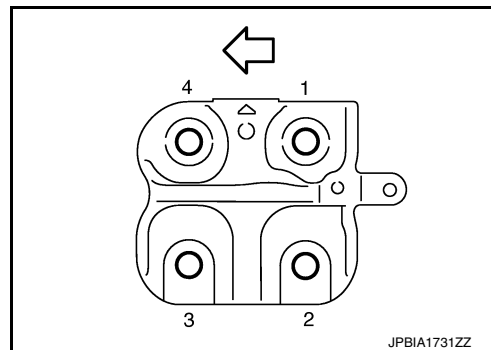
**CAUTION:**  
Check engine mounting insulator (front) is seated properly before tightening.



3. Install the engine mounting bracket (front) to the engine block.
4. Tighten the engine mounting bracket (front) bolts to specification in the order shown.

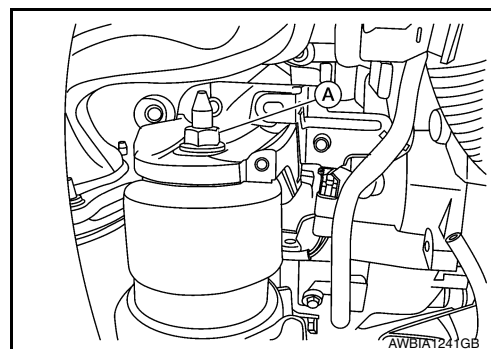
⇐ :Engine front

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



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

**Engine mounting 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.

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

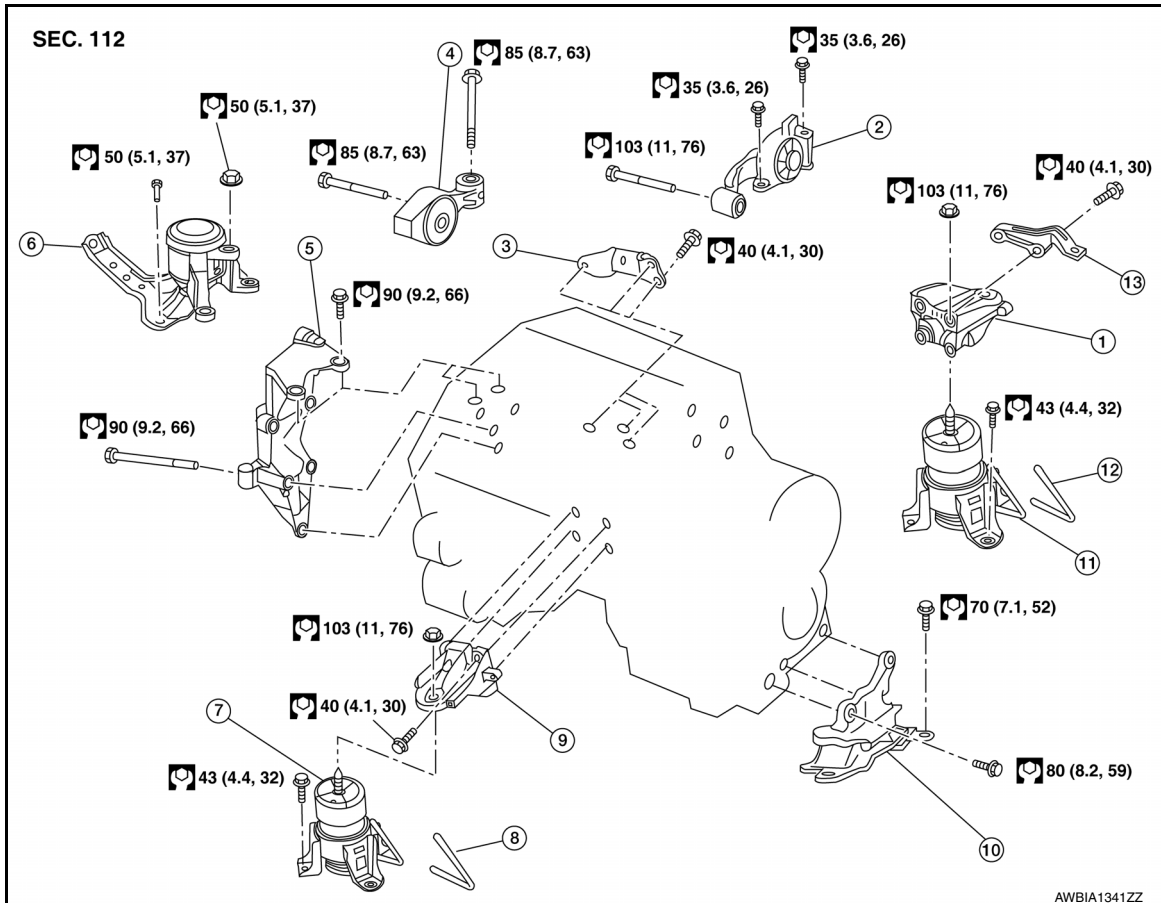
[VQ35DE]

## UNIT REMOVAL AND INSTALLATION

### ENGINE ASSEMBLY

Exploded View

INFOID:000000009460579



- |                                      |  |  |
|--------------------------------------|--|--|
| 1. Engine mounting bracket (rear)    | 2. Rear torque rod                             | 3. Rear torque rod bracket                     |
| 4. Upper torque rod                  | 5. Engine mounting bracket (RH)                | 6. Engine mounting insulator (RH)              |
| 7. Engine mounting insulator (front) | 8. Front engine mounting insulator vacuum hose | 9. Engine mounting bracket (front)             |
| 10. Engine mounting insulator (LH)   | 11. Engine mounting insulator (rear)           | 12. Rear engine mounting insulator vacuum hose |
| 13. Gusset                           | ← Front  |  |

### Removal and Installation

INFOID:000000009460580

#### **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.
- Do not start working until exhaust system and coolant are cool.

#### **CAUTION:**

- 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-33, "Garage Jack and Safety Stand"](#).
- 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).



# ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

[VQ35DE]

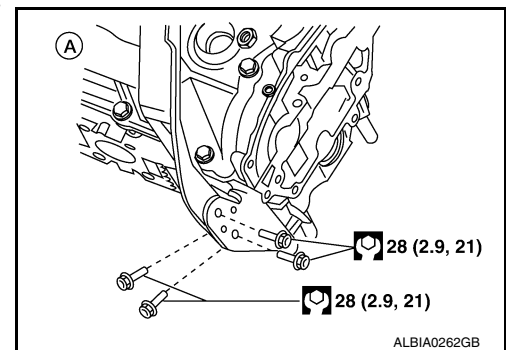
- Do not damage the edge of the crankshaft position sensor (POS) or the ring gear teeth.

## REMOVAL

### NOTE:

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

1. Remove hood assembly. Refer to [DLK-170, "HOOD ASSEMBLY : Removal and Installation"](#).
2. Release fuel pressure. Refer to [FL-5, "Inspection"](#).
3. Drain engine coolant. Refer to [CO-36, "Changing Engine Coolant"](#).
4. Drain power steering fluid. Refer to [ST-30, "Draining and Refilling"](#).
5. Remove front wheels and tires (RH/LH). Refer to [WT-55, "Adjustment"](#).
6. Remove fender protector side covers (RH/LH). Refer to [EXT-26, "FENDER PROTECTOR : Removal and Installation"](#).
7. Remove the engine under cover. Refer to [EXT-17, "Removal and Installation"](#).
8. Remove the engine room cover. Refer to [EM-143, "Removal and Installation"](#).
9. Remove air duct hose and resonator assembly and air cleaner case assembly with mass air flow sensor. Refer to [EM-144, "Removal and Installation"](#).
10. Remove battery and battery tray. Refer to [PG-74, "Removal and Installation \(Battery Tray\)"](#).
11. Remove transmission control module. Refer to [TM-183, "Removal and Installation"](#).
12. Remove cowl top. Refer to [EXT-24, "Removal and Installation"](#).
13. Remove strut brace using power tools. Refer to [FSU-19, "Exploded View"](#).
14. Remove IPDM E/R. Refer to [PCS-32, "Removal and Installation"](#).
15. Remove the following parts:
  - EVAP vacuum hose
  - Brake booster vacuum hose
  - Heater hoses (engine side)
16. Disconnect transaxle shift control cables. Refer to [TM-380, "Removal and Installation"](#).
17. Remove upper and lower radiator hoses.
18. Disconnect CVT fluid cooler hoses.
19. Remove power steering reservoir, suction hose and high pressure hose.
20. Disconnect fuel hose quick connection at vehicle piping side. Refer to [EM-163, "Removal and Installation"](#).
21. Remove the front exhaust tube using power tools. Refer to [EX-10, "Exploded View"](#).
22. Discharge and recover the R134a refrigerant. Refer to [HA-23, "Recycle Refrigerant"](#).
23. Remove the A/C compressor using power tools. Refer to [HA-30, "COMPRESSOR : Removal and Installation"](#).
24. Install engine slingers into front of LH cylinder head and rear of RH cylinder head.
  - (A): RH cylinder head

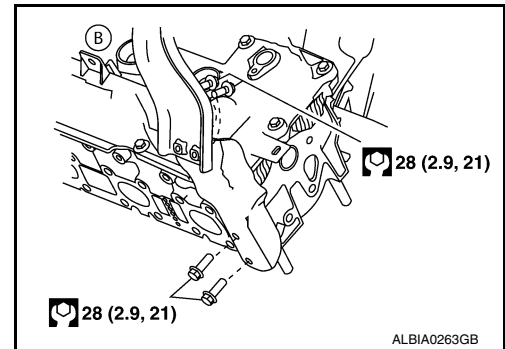


# ENGINE ASSEMBLY

## < UNIT REMOVAL AND INSTALLATION >

[VQ35DE]

- (B): LH cylinder head



25. Remove rear cover plate.
26. Remove the torque converter nuts.
27. Remove nuts of stabilizer connecting rods from struts. Refer to [FSU-19, "Exploded View"](#).
28. Remove front wheel speed sensors and position aside. Refer to [BRC-124, "Removal and Installation - Front Wheel Sensor"](#).
29. Remove front brake rotors. Refer to [BR-36, "BRAKE CALIPER ASSEMBLY : Removal and Installation"](#).
30. Remove piston rod nut. Refer to [FSU-19, "Exploded View"](#).
31. Remove front drive shaft (LH/RH). Refer to [FAX-10, "Removal and Installation \(LH\)"](#) and [FAX-12, "Removal and Installation \(RH\)"](#).
32. Remove RH drive shaft center bearing bracket.
33. Remove lower steering column pinch bolt. Refer to [ST-33, "Exploded View"](#).
34. Remove three way catalyst (manifold) (bank 1) heat shield.
35. Disconnect front and rear engine mounting insulator vacuum hoses.
36. Remove front and rear engine mounting insulator nut.
37. Position a suitable support table under suspension member and engine assembly. [TM-206, "Removal and Installation"](#)
38. Disconnect the engine mounting insulator (LH), upper torque rod, and engine mounting insulator (RH).
39. For additional safety, secure the engine in position with suitable tool.
40. Remove suspension member bolts. Refer to [FSU-19, "Exploded View"](#).
41. Carefully lower the engine, transaxle assembly and suspension member using 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 spilling onto the engine mounting insulators.

**Tool number** : KV101J0010 (J-47242)

42. Remove the starter motor. Refer to [STR-23, "VQ35DE : Removal and Installation"](#).
43. Remove the crankshaft position sensor (POS).
44. Remove engine and transaxle harness.
45. Separate the engine and transaxle and mount the engine on a suitable engine stand.

## INSTALLATION

Installation is in the reverse order of removal.

### NOTE:

Tighten transmission bolts to specification. Refer to [TM-206, "Removal and Installation"](#).

## 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-11, "FOR USA AND CANADA : Fluids and Lubricants"](#).
- 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.

# ENGINE ASSEMBLY

## < UNIT REMOVAL AND INSTALLATION >

[VQ35DE]

- Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

A

**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.

EM

- 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.
- Summary of the inspection items:

C

D

Item		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission/ transaxle fluid	CVT Models	Leakage	Level/Leakage	Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gas		—	Leakage	—

E

F

G

\*Power steering fluid, brake fluid, etc.

H

I

J

K

L

M

N

O

P

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

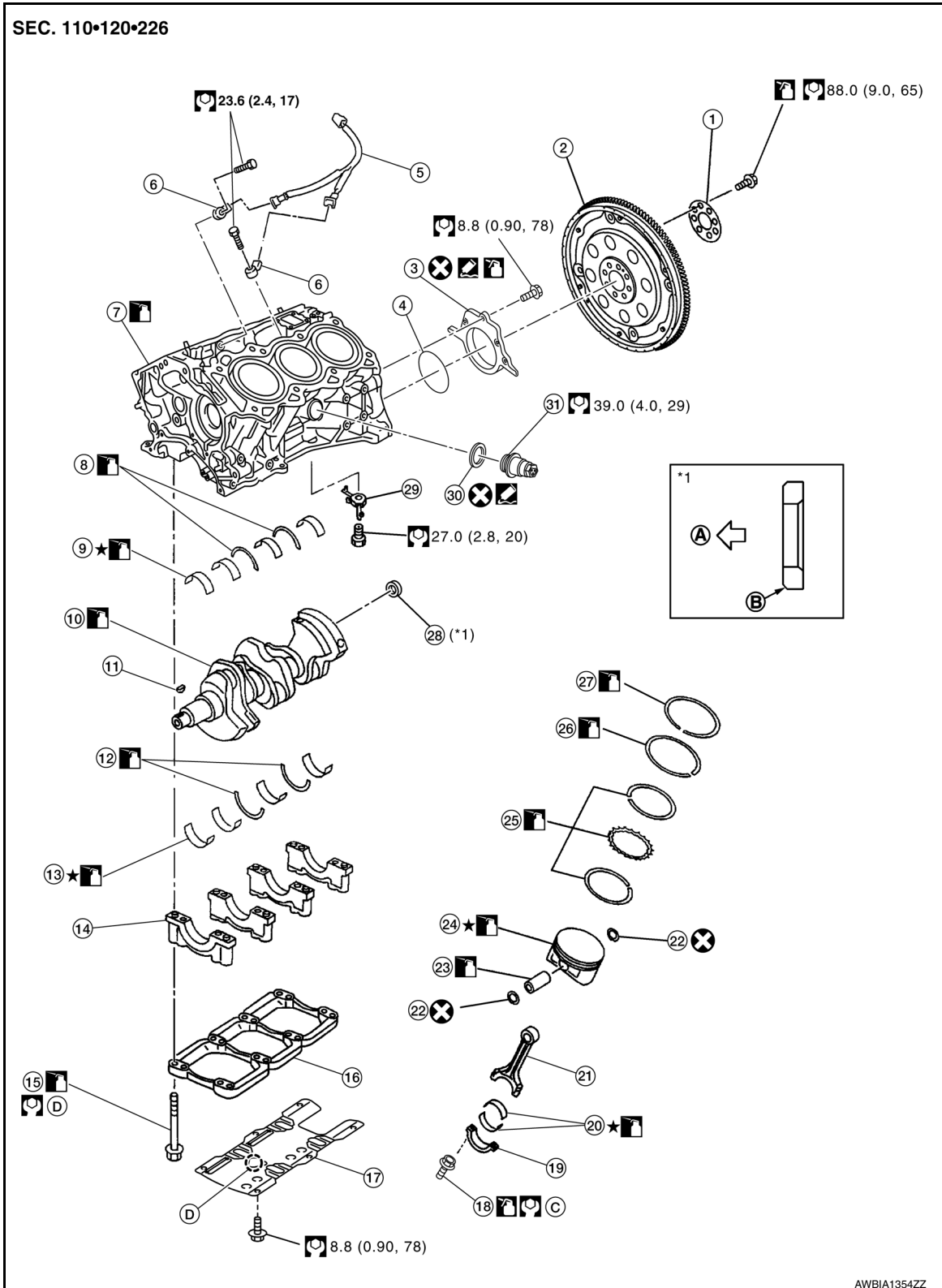
[VQ35DE]

## UNIT DISASSEMBLY AND ASSEMBLY

### CYLINDER BLOCK

Disassembly and Assembly

INFOID:000000009460581



# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

- |  |                            |                            |
|--|----------------------------|----------------------------|
| 1. Reinforcement plate                 | 2. Drive plate             | 3. Rear oil seal retainer  |
| 4. Rear oil seal                       | 5. Sub harness             | 6. Knock sensor            |
| 7. Cylinder block                      | 8. Thrust bearing (upper)  | 9. Main bearing (upper)    |
| 10. Crankshaft                         | 11. Crankshaft key         | 12. Thrust bearing (lower) |
| 13. Main bearing (lower)               | 14. Main bearing cap       | 15. Main bearing cap bolt  |
| 16. Main bearing beam                  | 17. Baffle plate           | 18. Connecting rod bolt    |
| 19. Connecting rod bearing cap         | 20. Connecting rod bearing | 21. Connecting rod         |
| 22. Snap ring                          | 23. Piston pin             | 24. Piston                 |
| 25. Oil ring                           | 26. Second ring            | 27. Top ring               |
| 28. Pilot converter                    | 29. Oil jet                | 30. Gasket (for Canada)    |
| 31. Cylinder block heater (for Canada) | A. Crankshaft side         | B. Chamfered               |
| C. Follow the assembly procedure       | D. Front mark              |                            |

## CAUTION:

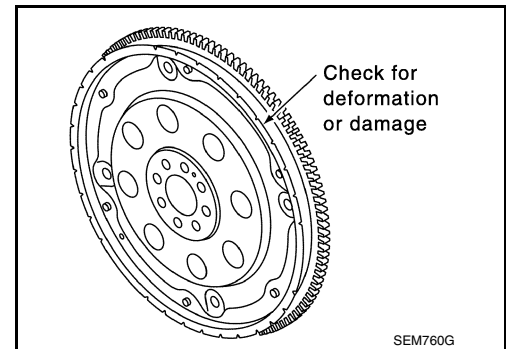
- Apply new engine oil to parts as marked in illustrations before installation.
- Place removed parts such as bearings and bearing caps in their proper order and direction.
- When installing the connecting rod nuts, and main bearing cap bolts, apply new engine oil to the threads and mating surfaces
- 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-220, "Removal and Installation"](#).
2. Remove drive plate.
  - Loosen bolts in diagonal order.

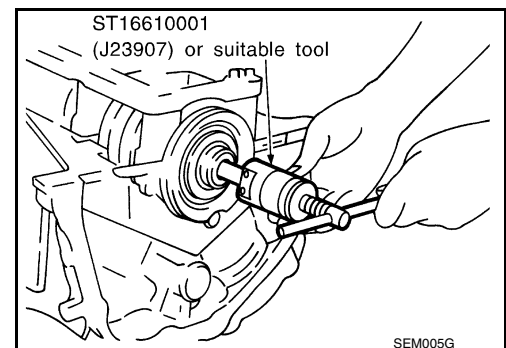
### CAUTION:

- Do not disassemble drive plate.
- Place the drive plate with signal plate surface facing upward.
- Be careful not to damage or scratch drive plate. Especially avoiding deforming and damaging of signal plate teeth.
- Keep magnetic materials away from signal plate.



3. Remove pilot converter using Tool.

**Tool number** : ST16610001 (J-23907)



4. Install the engine on the engine stand.

### CAUTION:

- Use an engine stand that has a load capacity [approximately 240kg (529) 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.

5. Remove the knock sensors.

### CAUTION:

Carefully handle sensors avoiding shocking it.

# CYLINDER BLOCK

[VQ35DE]

## < UNIT DISASSEMBLY AND ASSEMBLY >

6. Drain the engine of all coolant and oil.
7. Remove the oil pan. Refer to [EM-157, "Removal and Installation \(Upper Oil Pan\)"](#).
8. Remove the timing chain primary and secondary. Refer to [EM-182, "Removal and Installation"](#).
9. Remove the cylinder head. Refer to [EM-207, "Removal and Installation"](#).
10. Cut away liquid gasket and remove rear oil seal retainer using Tool. Refer to [EM-124, "Precaution for Liquid Gasket"](#).

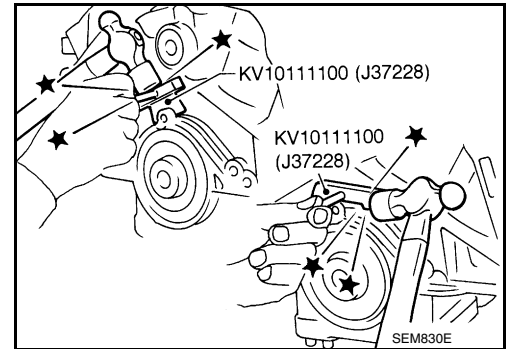
**Tool number** : KV10111100 (J-37228)

**CAUTION:**

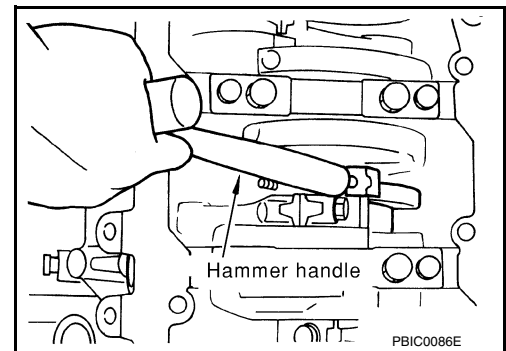
- Be careful not to damage mounting surface.
- If rear oil seal retainer is removed, replace it with a new one.

**NOTE:**

Rear oil seal and retainer form a single part and are handled as an assembly.



11. 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 hammer handle or similar 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-234, "Inspection"](#).



12. Remove the connecting rod bearings.

**CAUTION:**

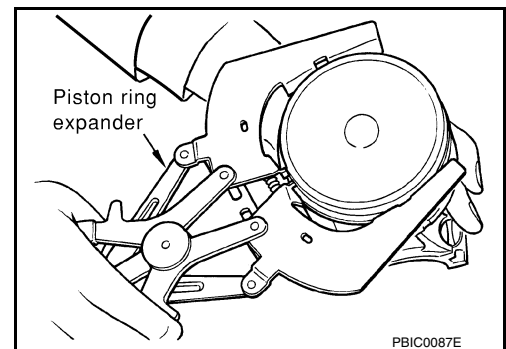
- When removing the connecting rod side bearings, note the installation position. Keep them in the correct order.

13. Remove the piston rings from the piston.

- Use a piston ring expander.

**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-234, "Inspection"](#).

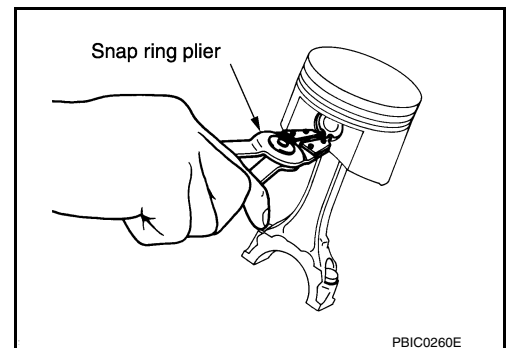


14. Remove the piston from the connecting rod as follows.

- a. Using a snap ring pliers, remove the snap ring.

**CAUTION:**

**Do not reuse snap rings.**



# CYLINDER BLOCK

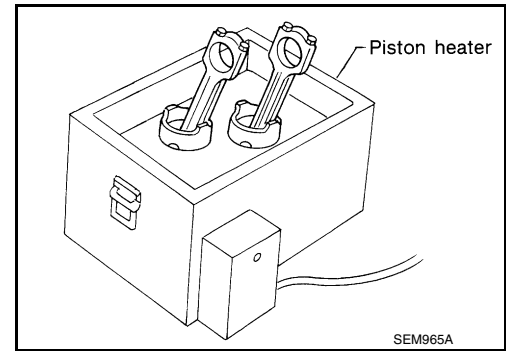
## < UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

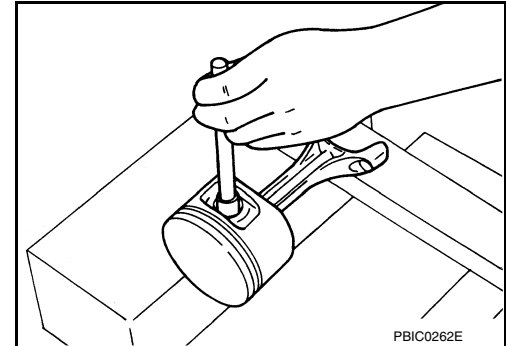
- b. Heat the pistons to 60° - 70°C (140° - 158°F).

**WARNING:**

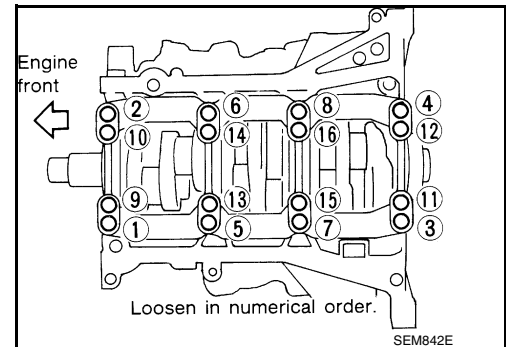
**Pistons contain heat. when working, wear protective equipment to avoid getting burned.**



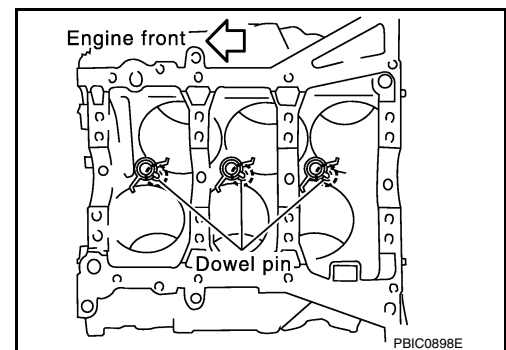
- c. Push out the piston pin with a suitable tool, with an outer diameter approximately 20 mm (0.8 in).



15. Remove the baffle plate from the main bearing beam.  
16. Loosen the bolts in the numerical order as 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-234, "Inspection"](#).



17. Remove the oil jets and dowel pins.  
18. 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.



## ASSEMBLY

1. Blow out the coolant and oil passages and cylinder bore to remove any foreign materials.

**WARNING:**

**Use goggles to protect your eyes.**

2. Install each plug to cylinder block as shown.

**CAUTION:**

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P



# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

**Do not reuse washer.**

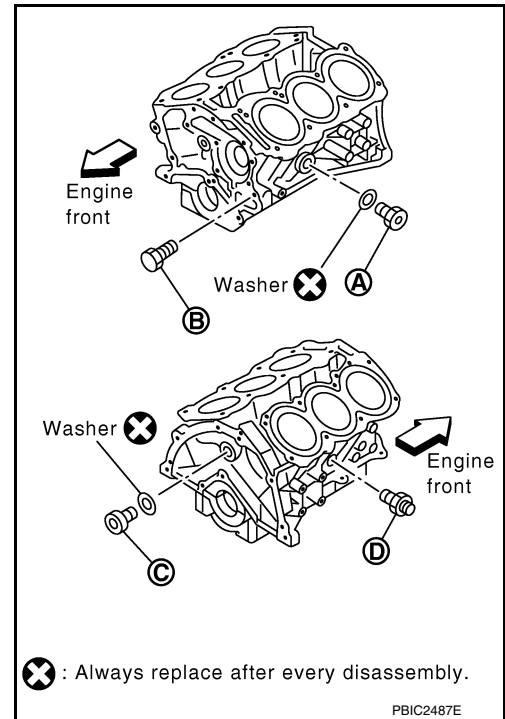
(B) : Water drain plug

- Apply sealant to the thread of water drain plug (A).  
**Use Anaerobic Liquid Gasket or equivalent. Refer to EM-124, "Precaution for Liquid Gasket".**

**NOTE:**

For Canada, water drain plug (A) shown is not water drain plug but block heater. Refer to EM-252, "Cylinder Block".

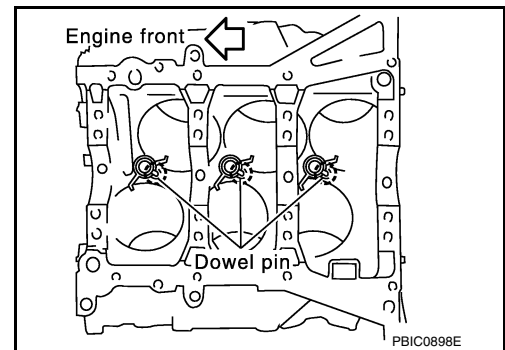
- Apply sealant to the thread of connector bolt (D).  
**Use Genuine RTV Silicone Sealant or equivalent. Refer to EM-124, "Precaution for Liquid Gasket".**
- Apply sealant to the thread of plug (C).  
**Use genuine high strength thread locking sealant or equivalent. Refer to EM-124, "Precaution for Liquid Gasket".**



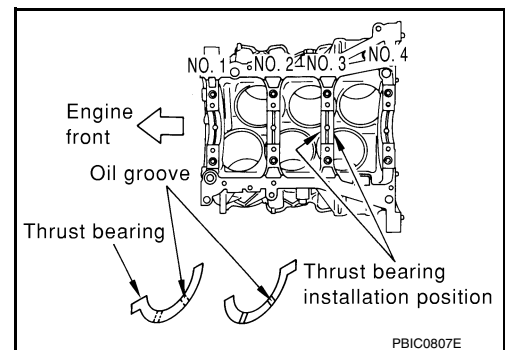
- Tighten each plug and connector bolt as specified below.

Part	Washer	Tightening torque
A (except Canada)	Yes	62.0 N·m (6.3 kg-m, 46 ft-lb)
A (Canada)	Yes	39.0 N·m (4.0 kg-m, 29 ft-lb)
B	No	6 N·m (0.6 kg-m, 53)
C	Yes	78 N·m (8.0 kg-m, 58 ft-lb)
D	Yes	39.2 N·m (4.0 kg-m, 29 ft-lb)

3. Install the oil jets.
  - 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.
  - 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 to both sides of the No. 3 journal housing on the cylinder block and the main bearing cap.
    - Install the thrust bearings 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.



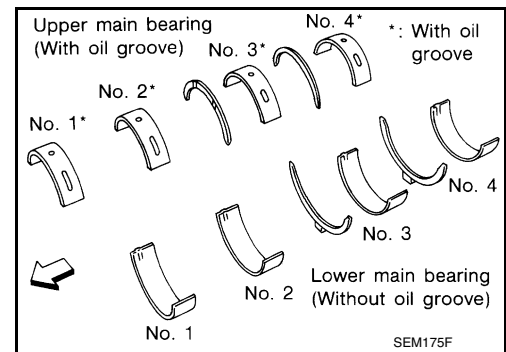


# CYLINDER BLOCK

[VQ35DE]

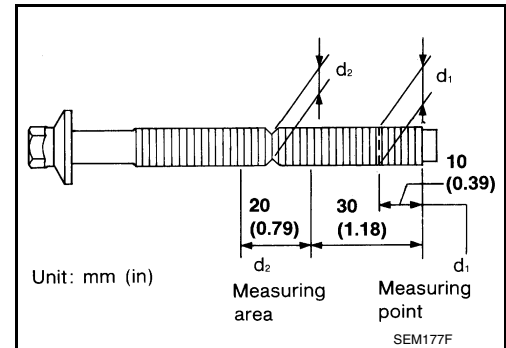
## < UNIT DISASSEMBLY AND ASSEMBLY >

5. Set the upper main bearings in their proper positions on the cylinder block.
  - Confirm the correct main bearings are used. Refer to [EM-234](#), "Inspection".

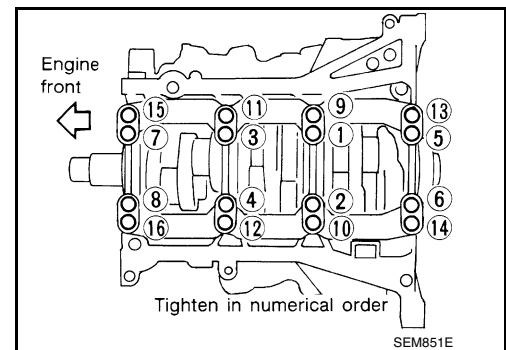


6. Instructions for the re-use of the main bearing cap bolts.
  - A plastic zone tightening method is used for tightening the main bearing cap bolts. Measure  $d_1$  and  $d_2$  as shown.
  - For  $d_2$ , select the minimum diameter in the measuring area.
  - If the difference between  $d_1$  and  $d_2$  exceeds the limit, replace the bolts for assembly.

**Limit ( $d_1 - d_2$ ) : 0.11 mm (0.0043 in)**

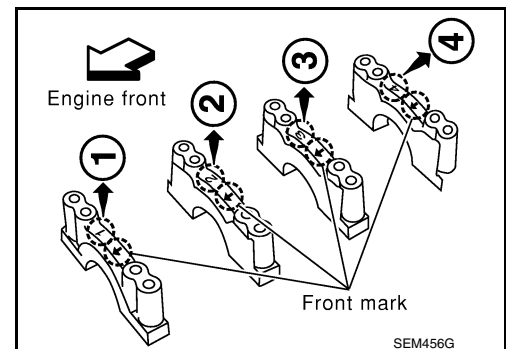


7. After installing the crankshaft, lower main bearings, main bearing caps, main bearing beam, and bearing cap bolts. Tighten the bearing cap bolts in the numerical order as shown.



- 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:**



# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

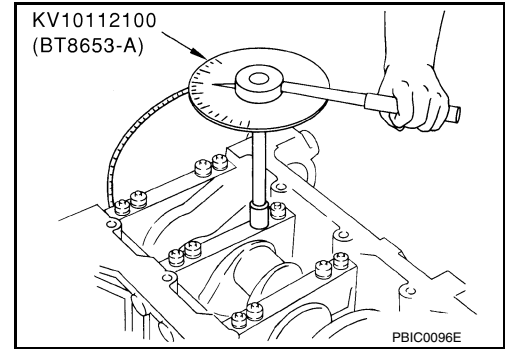
[VQ35DE]

Measure the tightening angle in stage 2 using Tool. Do not measure visually.

Stage 1 : 35.3 N·m (3.6kg-m, 26ft-lb)

Stage 2 : 90° degrees clockwise

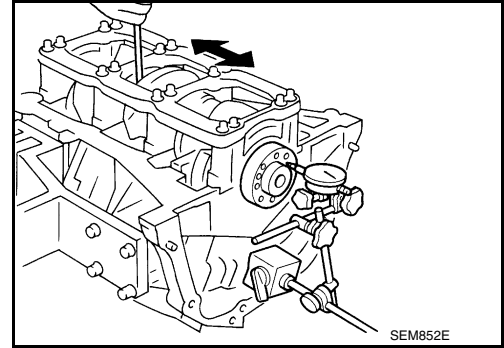
Tool number : KV10112100 (BT-8653-A)



8. Measure crankshaft end play.
- If beyond the limit, replace the bearing with a new one.

Standard : 0.10 - 0.25 mm (0.0039 - 0.0098 in)

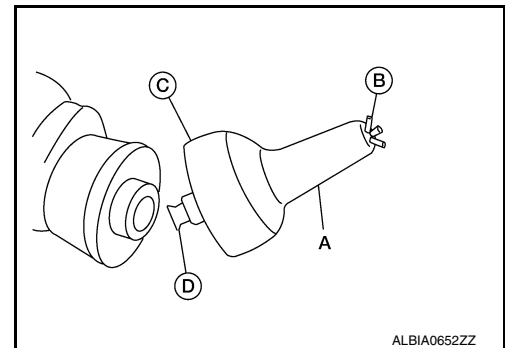
Limit : 0.30 mm (0.0118 in)



9. Install the rear oil seal retainer using Tool (A).

Tool number : — (J-47128)

- Loosen the wing nut (B) on the end of the Tool (A).
- 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.
- Tighten the wing nut (B) to secure the Tool (A) to the crankshaft.

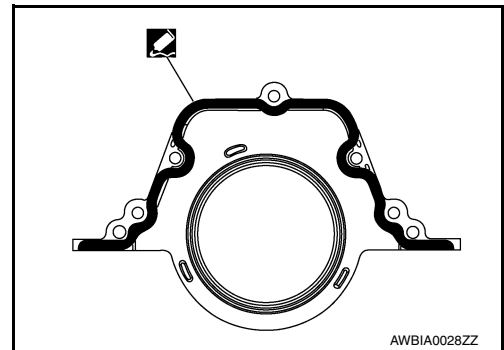


- Apply sealant to rear oil seal retainer as shown. Use **Genuine Silicone RTV Sealant**, or equivalent. Refer to [EM-124, "Precaution for Liquid Gasket"](#).

- Assembly should be completed within 5 minutes after coating.

**CAUTION:**

The components must be installed within 5 minutes of the liquid gasket application. Then allow 30 minutes for the liquid gasket to set before operating the engine.



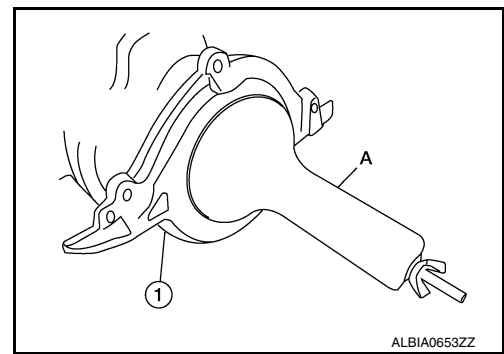
- Lubricate the sealing surface of the new rear main seal with new engine oil.

# CYLINDER BLOCK

## < UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

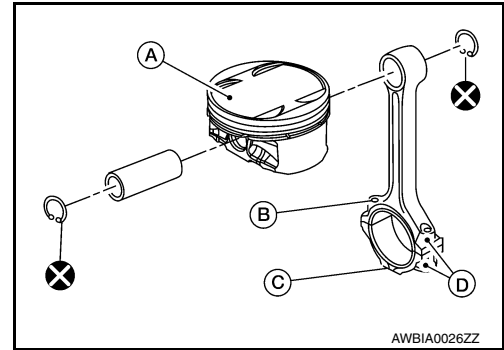
- f. Slide the new rear main seal (1) over the Tool (A) and onto the crankshaft.
- g. Loosen the wing nut and push the threaded rod into the handle to remove the Tool (A).
- h. Tighten the rear oil seal retainer bolts to specification.



- 10. 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.
    - Piston front mark (A)
    - Oil hole (B)
    - Connecting rod front mark (C)
    - Cylinder No. (D)

**CAUTION:**

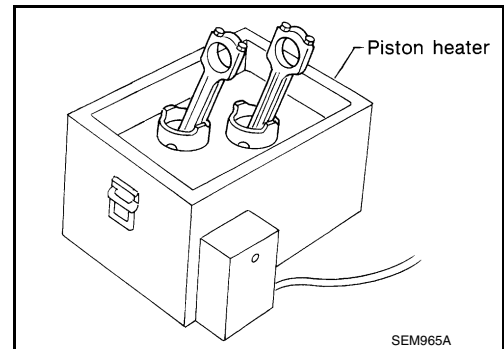
**Do not reuse snap rings.**



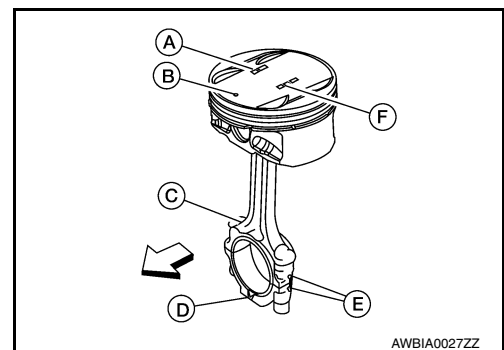
- b. Install the piston to the connecting rod.
  - Heat the piston until the piston pin can be pushed in by hand without excess force [approx. 60° - 70°C (140° to 158°F)]. From the front to the rear, insert the piston pin into the piston and through the connecting rod.

**WARNING:**

**Pistons contain heat. When working, wear protective equipment to avoid getting burned.**



- Assemble so that the piston front mark (B) on the crown and the oil hole (C), connecting rod front mark (D) and Cylinder No. (E) on the are positioned as shown.
  - ←: Engine front
  - Piston grade number (A)
  - Pin grade number (F)

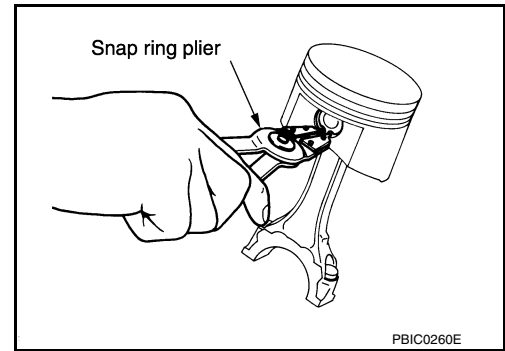


# CYLINDER BLOCK

## < UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

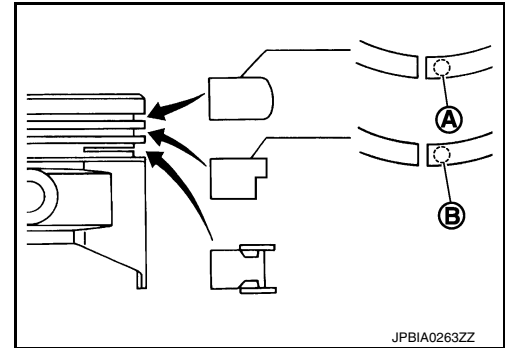
- c. Install the snap ring into the front of the piston pin-groove.
- After installing, check that the connecting rod pivots smoothly on the pin.
- CAUTION:**  
Do not reuse snap rings.



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

**CAUTION:**

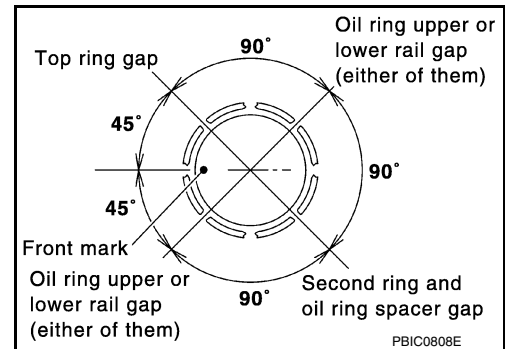
- Be careful not to damage the piston.
- When the piston rings are not replaced, remount the rings in their original positions.
- When replacing the piston rings, those without stamped surface (A) can be mounted either side up.
- Install the second ring with the stamped surface (B) facing upward. If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



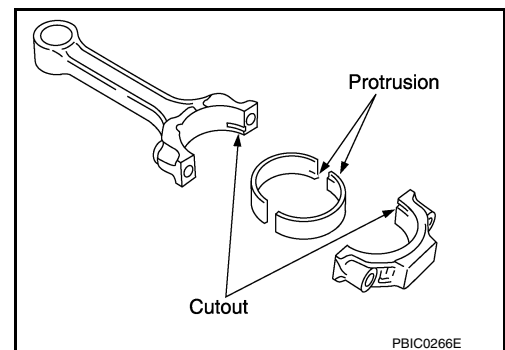
Top ring (A) : —

Second ring (B) : 2A

- Position each ring with the gap as shown, referring to the piston front mark.



12. Install the connecting rod bearings to the connecting rod and the connecting rod cap.
- When installing the connecting rod bearings, 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 protrusion with the notch of the connecting rod to install.
  - Check that the oil holes on the connecting rod and on the corresponding bearing are aligned.

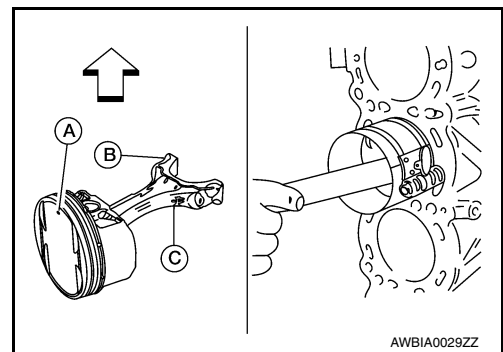


# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

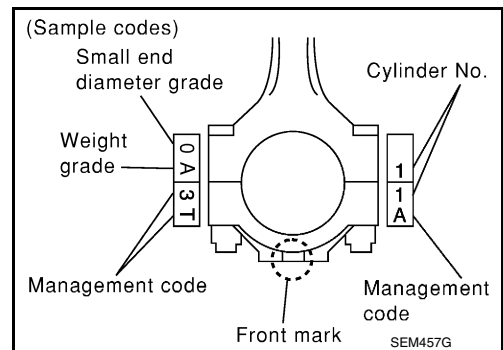
13. Install the piston and connecting rod assembly into the corresponding cylinder.
- Position the crankshaft pin corresponding to the connecting rod to be installed onto the bottom dead center.
  - Apply engine oil sufficiently to the cylinder bore, piston, and crankshaft pin.
  - Match the cylinder 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.
  - Oil hole (C)



**CAUTION:**

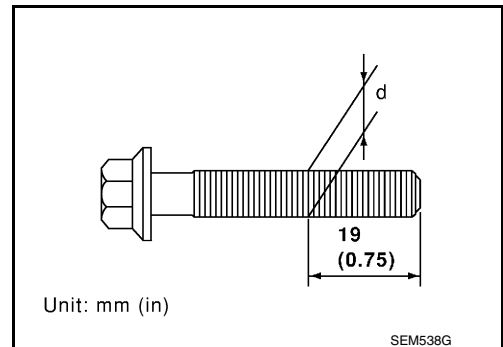
**Be careful not to damage the crankshaft pin and cylinder wall, resulting from an interference of the connecting rod big end.**

14. Install the connecting rod cap.
- Match the stamped cylinder number marks 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.**



15. 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 bolts as shown.

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



16. Tighten the connecting rod cap bolts in two stages using Tool:

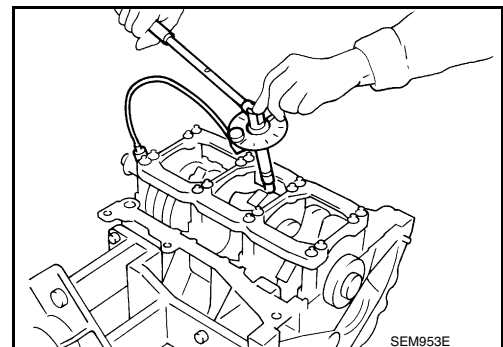
**Stage 1 : 19.6 N·m (2.0 kg-m, 14 ft-lb)**  
**Stage 2 : 90° - 95° degrees clockwise**

**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 cap bolts.
- After tightening the connecting rod cap bolts, make sure that the crankshaft rotates smoothly.
- Check the connecting rod side clearance. If beyond the limit, replace the connecting rod and/or crankshaft.



**Connecting rod side clearance:**

**Standard : 0.20 - 0.35 mm (0.0079 - 0.0138 in)**  
**Limit : 0.40 mm (0.0157 in)**

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# CYLINDER BLOCK

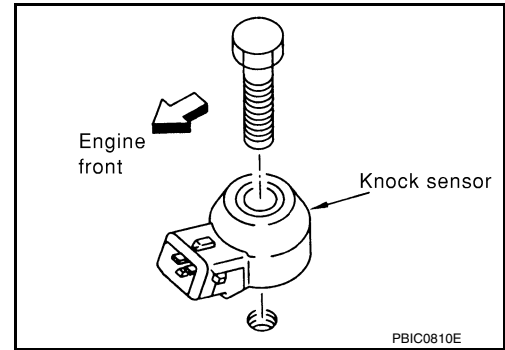
< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

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

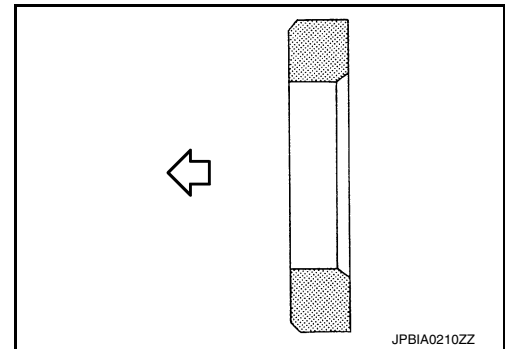
**CAUTION:**

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

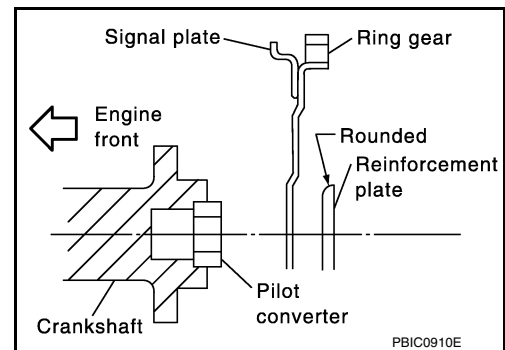


19. Install the cylinder head. Refer to [EM-207, "Removal and Installation"](#).
20. Install the timing chain. Refer to [EM-182, "Removal and Installation"](#).
21. Install the oil pan. Refer to [EM-157, "Removal and Installation \(Upper Oil Pan\)"](#).
22. Remove the engine from the stand and install the engine assembly into the vehicle. Refer to [EM-220, "Removal and Installation"](#).
23. Install the pilot converter with its chamfer facing crankshaft as shown.

⇐ : Crankshaft side



24. Install the drive plate.
  - Install the drive plate and reinforce plate in the direction as shown.
  - Align dowel pins of crankshaft rear and drive plate with pin holes of each part.
  - Secure the crankshaft using a suitable tool.
  - Tighten the drive plate bolts in one or two steps.
25. Assembly of the remaining parts is in the reverse order of disassembly.
26. Fill the engine with the specified oil and coolant. Refer to [MA-11, "FOR USA AND CANADA : Engine Oil Recommendation"](#) and [MA-11, "FOR USA AND CANADA : Fluids and Lubricants"](#).



**CAUTION:**

**Wait at least 30 minutes for the sealant to set-up before filling the engine with fluids and running it.**

## Inspection

INFOID:000000009460582

## PISTON AND PISTON PIN CLEARANCE

Inner Diameter of Piston Pin Hole

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

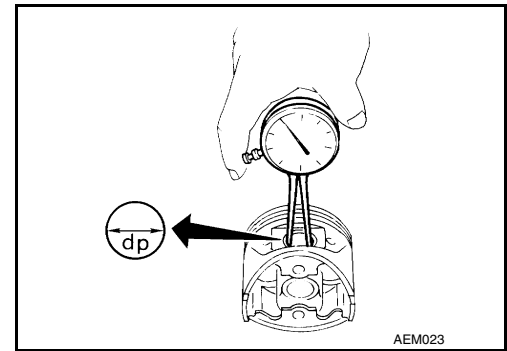
[VQ35DE]

- Measure the inner diameter of piston pin hole (dp).

**Standard diameter (dp)**

**Grade No. 0 : 21.993 – 21.999 mm (0.8659 – 0.8661 in)**

**Grade No. 1 : 21.999 – 22.005 mm (0.8661 – 0.8663 in)**



AEM023

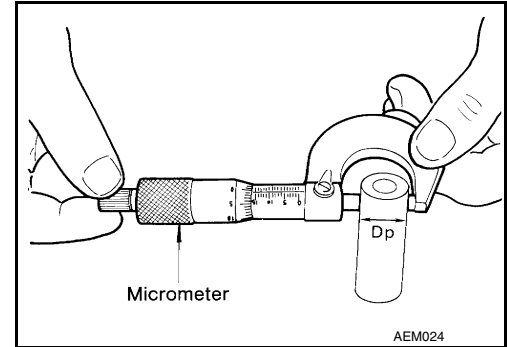
**Outer Diameter of Piston Pin**

- Measure outer diameter of piston pin (Dp).

**Standard diameter (Dp)**

**Grade No. 0 : 21.989 – 21.995 mm (0.8657 – 0.8659 in)**

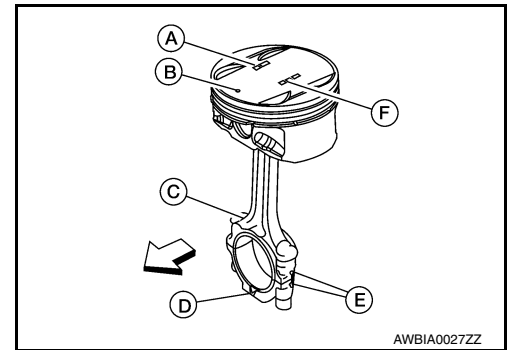
**Grade No. 1 : 21.995 – 22.001 mm (0.8659 – 0.8662 in)**



Micrometer

AEM024

- ⇐: Engine front
- Piston Grade No. (A)
- Piston front mark (B)
- Oil hole (C)
- Connecting rod front mark (D)
- Cylinder No. (E)
- Pin Grade No. (F)



AWBIA0027ZZ

**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**

- Measure side clearance of piston ring and piston ring groove with feeler gauge.

**Standard Side Clearance**

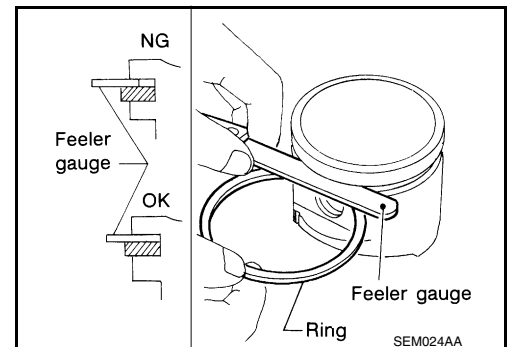
**Top ring : 0.045 - 0.080 mm (0.0018 - 0.0031 in)**

**2nd ring : 0.030 - 0.070 mm (0.0012 - 0.0028 in)**

**Oil ring : 0.045 - 0.125 mm (0.0018 - 0.0049 in)**

**Maximum Limit**

**Top ring : 0.11 mm (0.0043 in)**



SEM024AA

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

**2nd ring** : 0.1 mm (0.004 in)  
**Oil ring** : —

- If out of specification, replace piston ring assembly. If clearance exceeds maximum limit with new rings, replace piston

## PISTON RING END GAP

- Insert piston ring until it is in the middle of the cylinder bore and measure the end gap.

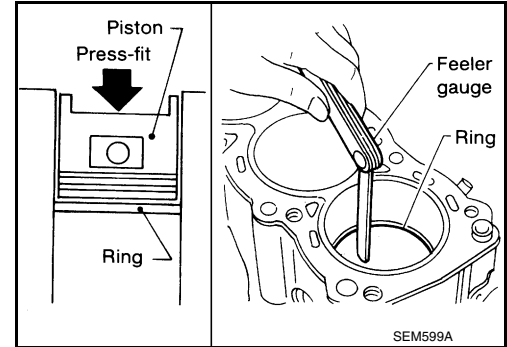
### Standard

**Top ring** : 0.23 - 0.28 mm (0.0091 - 0.0130 in)  
**2nd ring** : 0.33 - 0.43 mm (0.0091 - 0.0130 in)  
**Oil ring** : 0.20 - 0.45 mm (0.0079 - 0.0177 in)

### Limit:

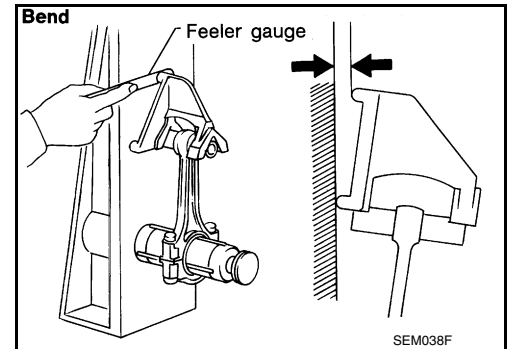
**Top ring** : 0.54 mm (0.0213 in)  
**2nd ring** : 0.80 mm (0.0315 in)  
**Oil ring** : 0.95 mm (0.0374 in)

- If out of specification, replace piston ring.

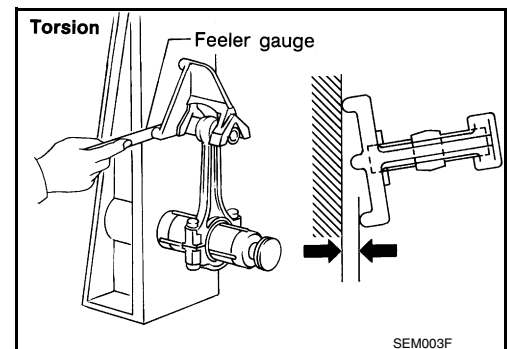


## CONNECTING ROD BEND AND TORSION

**Bend** : Limit 0.15 mm (0.0059 in) per 100 mm (3.94 in) length  
**Torsion** : Limit 0.30 mm (0.0118 in) per 100 mm (3.94 in) length



- If it exceeds the limit, replace connecting rod assembly.



## CONNECTING ROD BEARING HOUSING DIAMETER (BIG END)



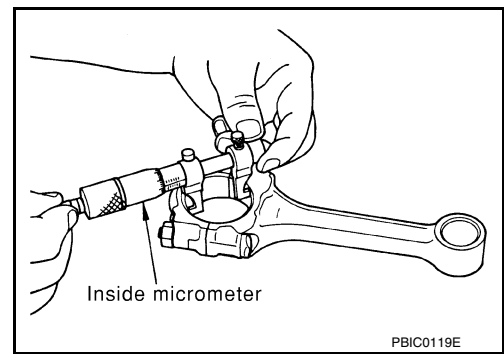
# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

- 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.

**Standard : 55.000 - 55.013 mm (2.1654 - 2.1659 in)**

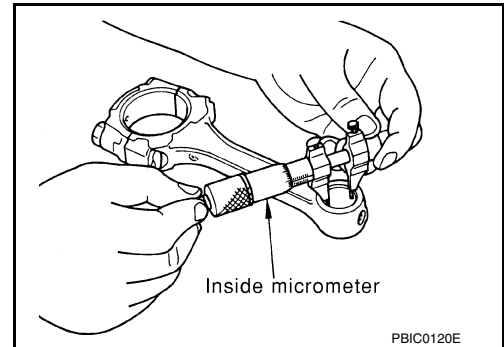


## CONNECTING ROD BUSHING OIL CLEARANCE (SMALL END)

Inner Diameter of Connecting Rod (Small End)

- Measure inner diameter of piston pin bushing.

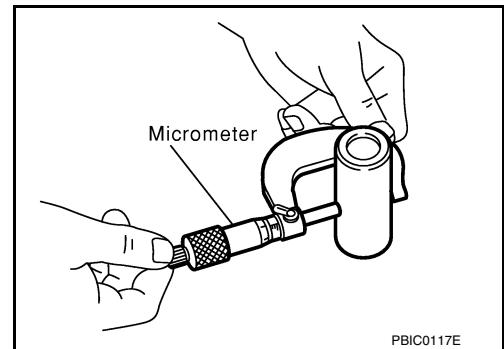
**Standard Grade No. 0 : 22.000 - 22.006 mm (0.8661 - 0.8664 in)**  
**Grade No. 1 : 22.006 - 22.012 mm (0.8664 - 0.8666 in)**



Outer Diameter of Piston Pin

- Measure outer diameter of piston pin.

**Standard Grade No. 0 : 21.989 - 21.995 mm (0.8657 - 0.8659 in)**  
**Grade No. 1 : 21.995 - 22.001 mm (0.8659 - 0.8662 in)**

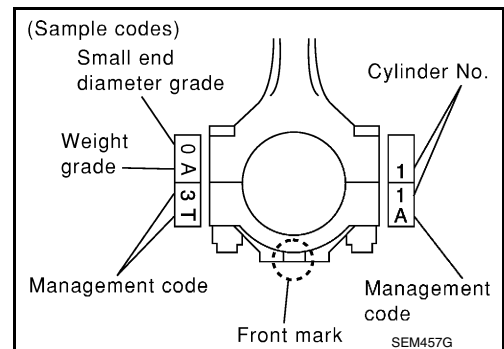


Connecting Rod Bushing Oil Clearance (Small End)

(Connecting rod small end oil clearance) = (Inner diameter of connecting rod small end) – (Outer diameter of piston pin)

**Standard : 0.005 - 0.017 mm (0.0002 - 0.0007 in)**  
**Limit : 0.030 mm (0.0012 in)**

- 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:**

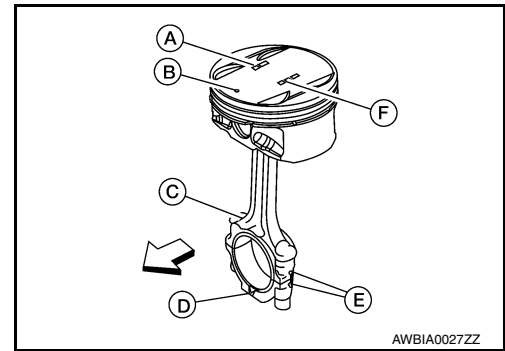
A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

- ⇐: Engine front
- Piston Grade No. (A)
- Piston front mark (B)
- Oil hole (C)
- Connecting rod front mark (D)
- Cylinder No. (E)
- Pin Grade No. (F)



Service parts apply only to grade 0.

Unit: mm (in)

Grade	0	1
Connecting rod bushing inner diameter <sup>2</sup>	22.000 - 22.006 (0.8661 - 0.8664)	22.006 - 22.012 (0.8664 - 0.8666)
Piston pin outer diameter	21.989 - 21.995 (0.8657 - 0.8659)	21.995 - 22.001 (0.8659 - 0.8662)
Piston pin hole diameter	21.993 - 21.999 (0.8659 - 0.8661)	21.999 - 22.005 (0.8661 - 0.8663)

## 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:

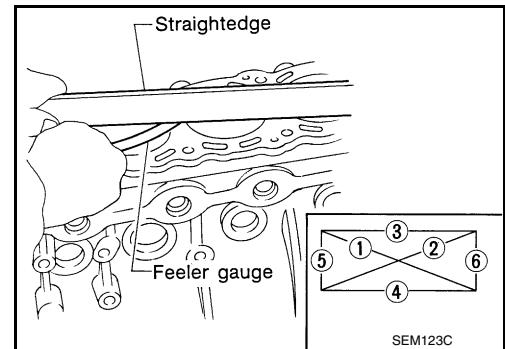
**Be careful not to allow gasket flakes to enter the oil or coolant passages.**

- Measure the distortion on the block upper face at different points in six directions.

**Distortion limit : 0.10 mm (0.0039 in)**

- 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

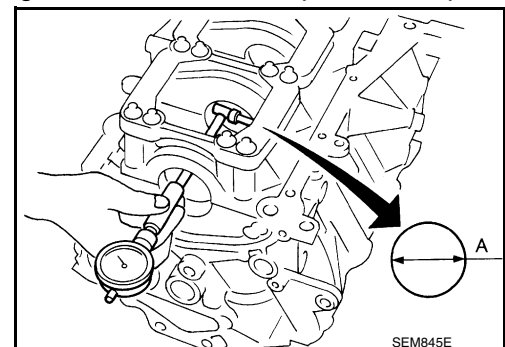
- Install the main bearing caps with the main bearings removed, and tighten the bolts to the specified torque.
- Using a bore gauge, measure the inner diameter of the main bearing housing (A).

**Standard : 63.993 - 64.017 mm (2.5194 - 2.5203 in)**

- 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.

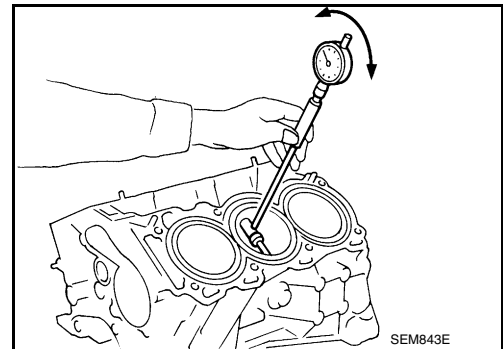
# CYLINDER BLOCK

## < UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

Cylinder bore inner diameter

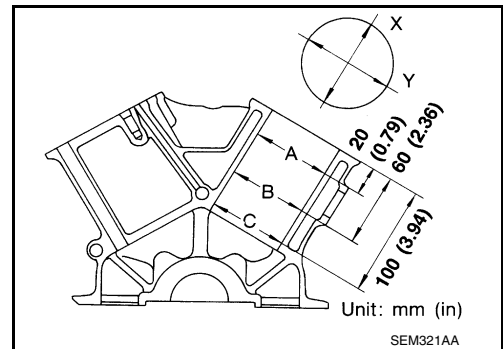
Grade No.	Standard inner diameter	Wear limit
No. 1	95.500 - 95.510 mm (3.7598 - 3.7602 in)	0.20 mm (0.0079 in)
No. 2	95.510 - 95.520 mm (3.7602 - 3.7606 in)	
No. 3	95.520 - 95.530 mm (3.7606 - 3.7610 in)	



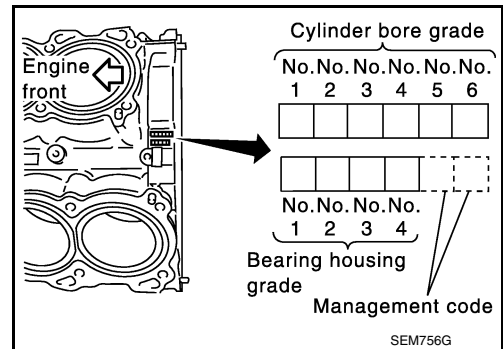
If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

**Out-of-round (Difference between X and Y)** : limit 0.015 mm (0.0006 in)

**Taper (Difference between A and C)** : limit 0.015 mm (0.0006 in)



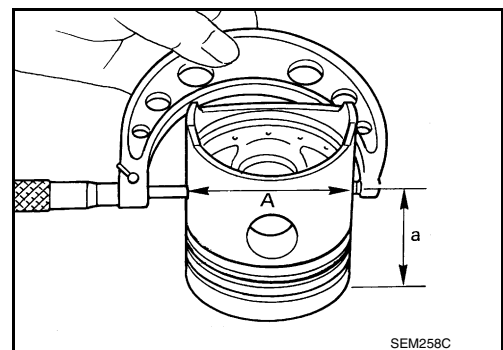
- Check for scratches and seizure. If seizure is found, hone it.
  - If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block rear position. These numbers are punched in either Arabic or Roman numerals.



- Measure piston skirt diameter.

**Piston diameter (A)** : Refer to [EM-252](#), "[Cylinder Block](#)"

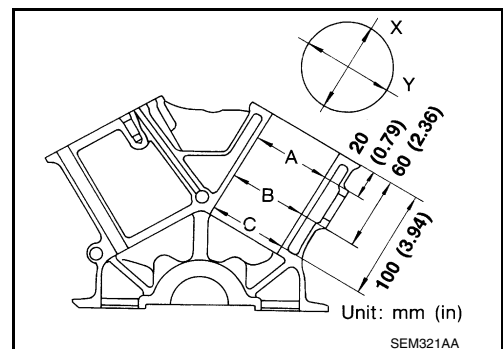
**Measuring point (a)** : 38.0 mm (1.496 in)  
(Distance from the top)



- Check that piston-to-bore clearance is within specification.

**Piston-to-bore clearance at (B)** : 0.010 - 0.030 mm (0.0004 - 0.0012 in)

- The piston-to-bore clearance is measured at the (B) level in the cylinder as shown.



A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

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.
9. Measure finished cylinder bore for out-of-round and taper.
- **Measurement should be done after cylinder bore cools down.**

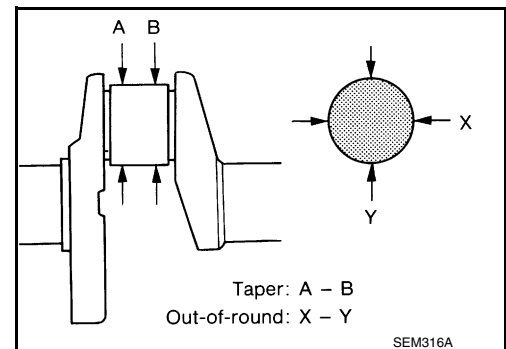
## CRANKSHAFT

1. Check the crankshaft main and pin journals for scoring, wear, or cracks.
2. Measure the journals for taper and out-of-round.

**Standard**

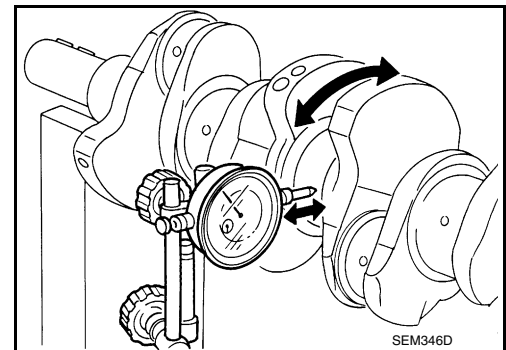
**Out-of-round (X - Y) : 0.002 mm (0.0001 in)**

**Taper (A - B) : 0.002 mm (0.0001 in)**



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.

**Runout limit (total indicator reading) : 0.10 mm (0.0039 in)**



## 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)

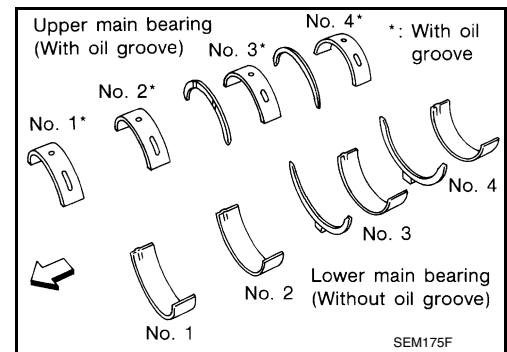
#### Main Bearing

# CYLINDER BLOCK

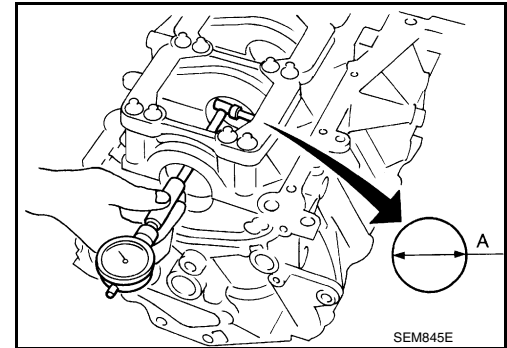
[VQ35DE]

## < UNIT DISASSEMBLY AND ASSEMBLY >

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-224, "Disassembly and Assembly"](#).



3. Measure the inner diameters (A) of each main bearing as shown.

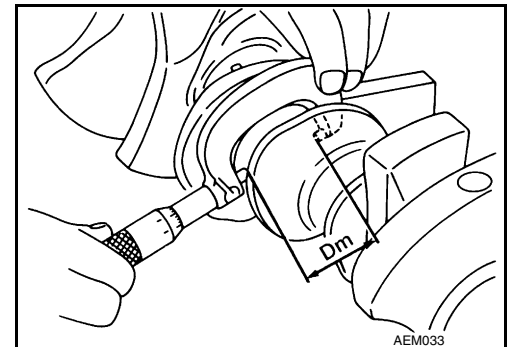


4. Measure the outer diameters (Dm) of each crankshaft main journal as shown.
5. Calculate the main bearing clearance.  
**Main bearing clearance = (A) - (Dm)**

**Standard : 0.035 - 0.045 mm (0.0014 - 0.0018 in)**

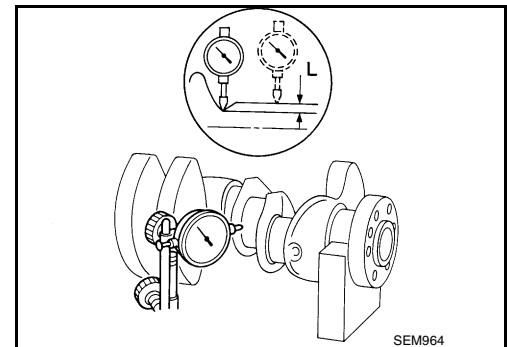
**Limit : 0.065 mm (0.0026 in)**

- 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.

**(L) : 0.10 mm (0.0039 in)**



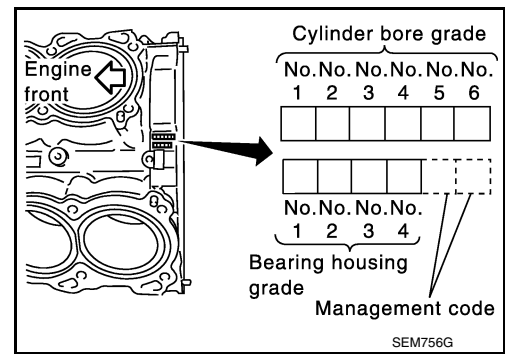
6. If the crankshaft or the cylinder block is replaced with a new one, select thickness of the main bearings as follows:

# CYLINDER BLOCK

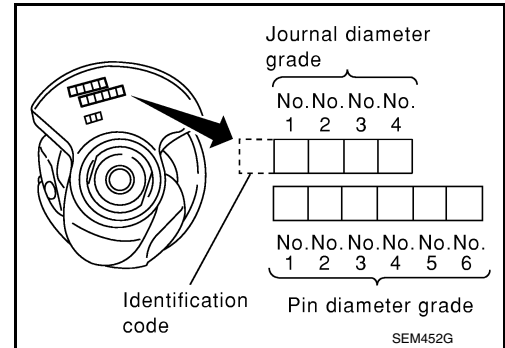
[VQ35DE]

## < UNIT DISASSEMBLY AND ASSEMBLY >

- 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:

Cylinder block bearing housing inner diameter Unit: mm (in)  Crankshaft main journal diameter Unit: mm (in)		Mark		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7	
		Hole diameter	Mark	63.993 - 63.994 (2.5194 - 2.5194)	63.994 - 63.995 (2.5194 - 2.5195)	63.995 - 63.996 (2.5195 - 2.5195)	63.996 - 63.997 (2.5195 - 2.5196)	63.997 - 63.998 (2.5196 - 2.5196)	63.998 - 63.999 (2.5196 - 2.5196)	63.999 - 64.000 (2.5196 - 2.5197)	64.000 - 64.001 (2.5197 - 2.5197)	64.001 - 64.002 (2.5197 - 2.5198)	64.002 - 64.003 (2.5198 - 2.5198)	64.003 - 64.004 (2.5198 - 2.5198)	64.004 - 64.005 (2.5198 - 2.5199)	64.005 - 64.006 (2.5199 - 2.5199)	64.006 - 64.007 (2.5199 - 2.5200)	64.007 - 64.008 (2.5200 - 2.5200)	64.008 - 64.009 (2.5200 - 2.5200)	64.009 - 64.010 (2.5200 - 2.5201)	64.010 - 64.011 (2.5201 - 2.5201)	64.011 - 64.012 (2.5201 - 2.5202)	64.012 - 64.013 (2.5202 - 2.5202)	64.013 - 64.014 (2.5202 - 2.5202)	64.014 - 64.015 (2.5202 - 2.5203)	64.015 - 64.016 (2.5203 - 2.5203)	64.016 - 64.017 (2.5203 - 2.5203)	
Mark	Axle diameter																											
A	59.975 - 59.974 (2.3612 - 2.3612)	0	0	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
B	59.974 - 59.973 (2.3612 - 2.3611)	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
C	59.973 - 59.972 (2.3611 - 2.3611)	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
D	59.972 - 59.971 (2.3611 - 2.3611)	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
E	59.971 - 59.970 (2.3611 - 2.3610)	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
F	59.970 - 59.969 (2.3610 - 2.3610)	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
G	59.969 - 59.968 (2.3610 - 2.3609)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
H	59.968 - 59.967 (2.3609 - 2.3609)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
J	59.967 - 59.966 (2.3609 - 2.3609)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
K	59.966 - 59.965 (2.3909 - 2.3608)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
L	59.965 - 59.964 (2.3608 - 2.3608)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
M	59.964 - 59.963 (2.3608 - 2.3607)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
N	59.963 - 59.962 (2.3607 - 2.3607)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
P	59.962 - 59.961 (2.3607 - 2.3607)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
R	59.961 - 59.960 (2.3607 - 2.3606)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
S	59.960 - 59.959 (2.3606 - 2.3606)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
T	59.959 - 59.958 (2.3606 - 2.3605)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
U	59.958 - 59.957 (2.3605 - 2.3605)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
V	59.957 - 59.956 (2.3605 - 2.3605)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
W	59.956 - 59.955 (2.3605 - 2.3604)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
X	59.955 - 59.954 (2.3604 - 2.3604)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
Y	59.954 - 59.953 (2.3604 - 2.3603)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
4	59.953 - 59.952 (2.3603 - 2.3603)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
7	59.952 - 59.951 (2.3603 - 2.3603)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4

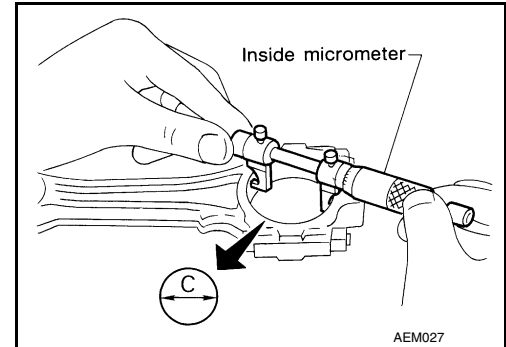
# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

## 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-224, "Disassembly and Assembly"](#).
3. Measure the inner diameter (C) of each connecting rod (big end) as shown.

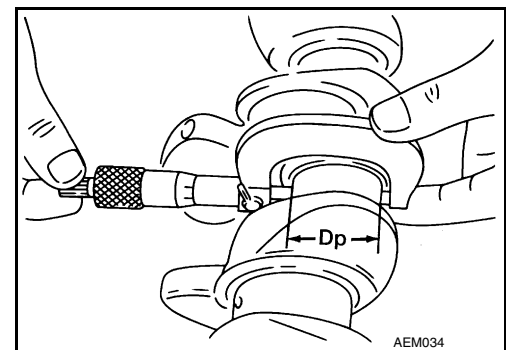


4. Measure the outer diameter (Dp) of each crankshaft pin journal.
5. Calculate the connecting rod bearing clearance.  
**Connecting rod bearing clearance = (C) - (Dp)**

**Standard : 0.020 - 0.045 mm (0.0008 - 0.0018 in)**

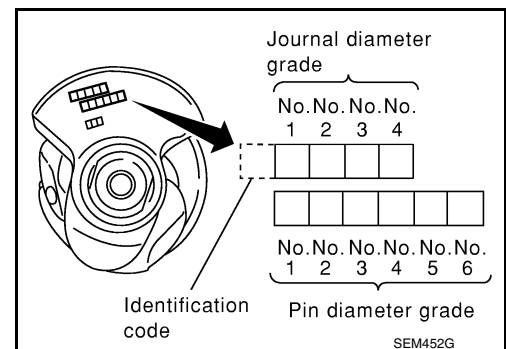
**Limit : 0.070 mm (0.0028 in)**

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)**

Crankshaft pin journal grade number	Connecting rod bearing grade number
0	0 (black)
1	1 (brown)
2	2 (green)



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.

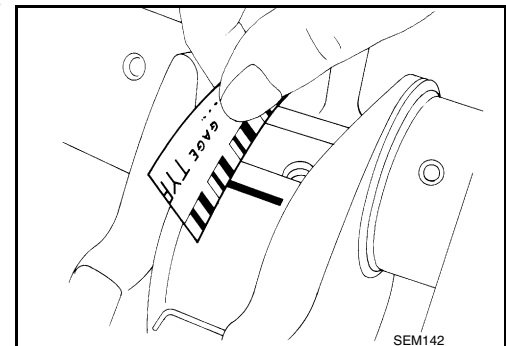
#### CAUTION:

**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

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P



# CYLINDER BLOCK

< UNIT DISASSEMBLY AND ASSEMBLY >

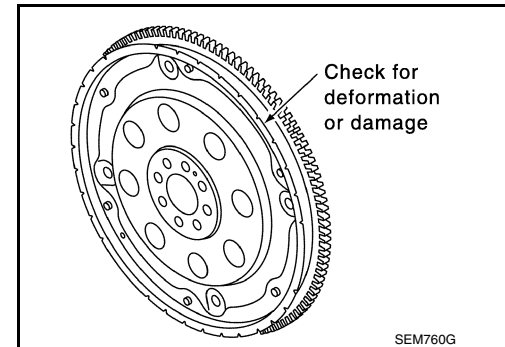
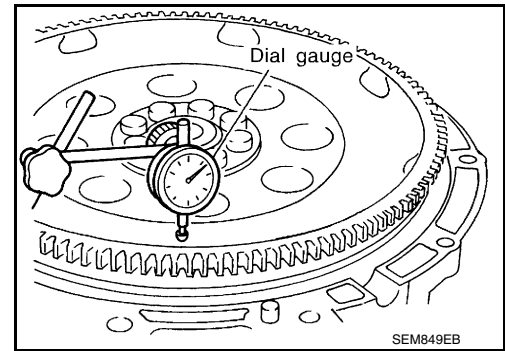
[VQ35DE]

## Runout (Total Indicator Reading):

- Drive plate torque converter surface : less than 0.35 mm (.0138 in)
- Ring gear : less than 0.5 mm (.0197 in)

### 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 any magnetized objects away from the signal plate, particularly the teeth.

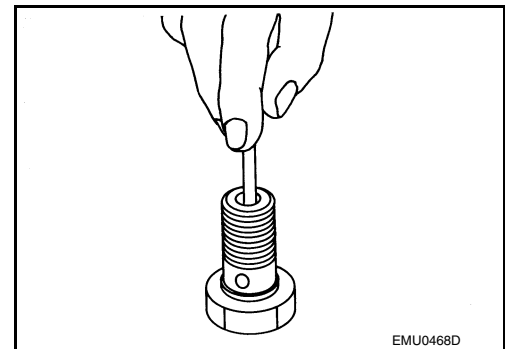


## OIL JET

- 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

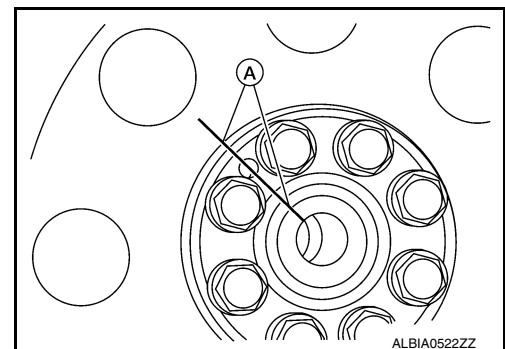
INFOID:000000009460583

## REMOVAL

- Use suitable tool to lock the drive plate and match mark (A) before removing the bolts.

### CAUTION:

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





# CYLINDER BLOCK

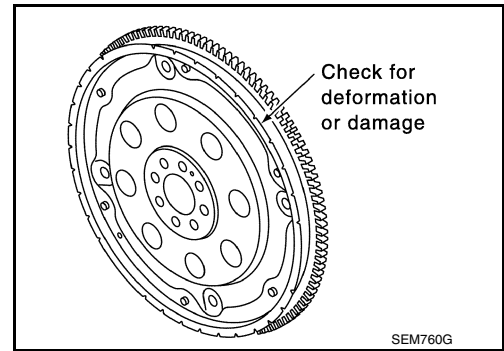
< UNIT DISASSEMBLY AND ASSEMBLY >

[VQ35DE]

2. Remove the drive plate.
- Loosen the drive plate bolts in a diagonal order.

**CAUTION:**

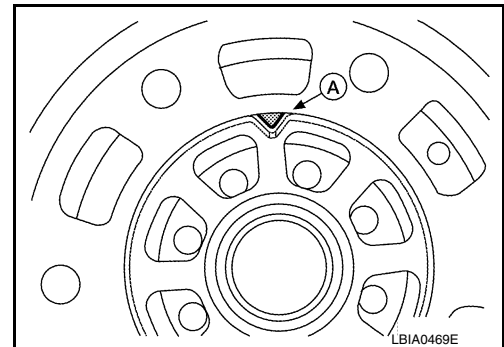
- Do not disassemble drive plate.**
- Do not place drive plate with signal plate facing down.**
- When handling the signal plate, take care not to damage or scratch it.**
- Handle the signal plate in a manner that prevents it from becoming magnetized.**



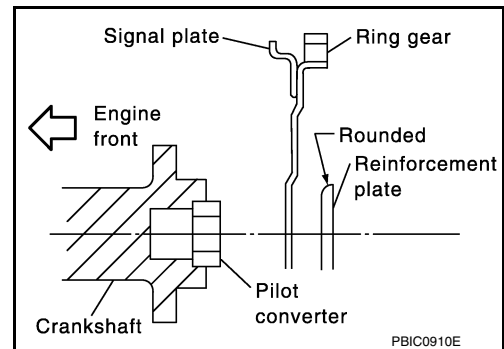
## INSTALLATION

Installation is in the reverse order of removal.

- When installing the drive plate to the crankshaft, use the triangle shaped 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 drive plate reinforcement plate in the direction as shown.
- Tighten the drive plate bolts in a diagonal pattern in two steps. Refer to [EM-224, "Disassembly and Assembly"](#).



# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

## SERVICE DATA AND SPECIFICATIONS (SDS)

### SERVICE DATA AND SPECIFICATIONS (SDS)

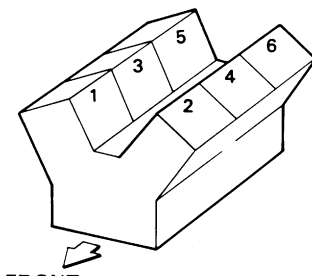
#### General Specification

INFOID:000000009460584

#### GENERAL SPECIFICATIONS

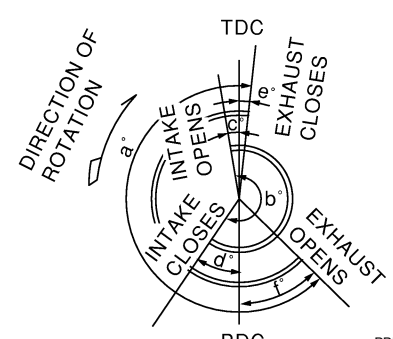
Cylinder arrangement		V-6
Displacement cm <sup>3</sup> (cu in)		3,498 (213.45)
Bore and stroke mm (in)		95.5 x 81.4 (3.760 x 3.205)
Valve arrangement		DOHC
Firing order		1-2-3-4-5-6
Number of piston rings	Compression	2
	Oil	1
Number of main bearings		4
Compression ratio		10.3:1
Compression pressure kPa (kg/cm <sup>2</sup> , psi)/300 rpm	Standard	1,275 (13.0, 185)
	Minimum	981 (10.0, 142)
	Differential limit between cylinders	98 (1.0, 14)

Cylinder number



SEM713A

Valve timing  
(Valve timing control - "OFF")



PBIC0187E

Unit: degree

a	b	c	d	e	f
240	240	-10 (-35) ATDC	70(25) ABDC	10	50

#### Drive Belt

INFOID:000000009460585

#### DRIVE BELT

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

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

## Spark Plug

INFOID:000000009460586

### SPARK PLUG

Unit: mm (in)

Make	DENSU	
Standard type*	FXE22HR11	
Gap	Standard	1.1 (0.043)

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

## Intake Manifold

INFOID:000000009460587

### INTAKE MANIFOLD

Unit: mm (in)

Items		Limit
Surface distortion	Intake manifold	0.1 (0.004)

## Exhaust Manifold

INFOID:000000009460588

### EXHAUST MANIFOLD

Unit: mm (in)

Items		Limit
Surface distortion	Exhaust manifold	0.3 (0.012)

## Camshaft

INFOID:000000009460589

### CAMSHAFT

Unit: mm (in)

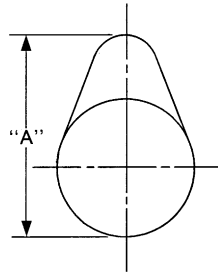
Items		Standard	Limit
Camshaft journal oil clearance	No. 1	0.045 - 0.086 (0.0018 - 0.0034)	0.15 (0.0059)
	No. 2, 3, 4	0.035 - 0.076 (0.0014 - 0.0030)	
Camshaft bracket inner diameter	No. 1	26.000 - 26.021 (1.0236 - 1.0244)	—
	No. 2, 3, 4	23.500 - 23.521 (0.9252 - 0.9260)	—
Camshaft journal diameter	No. 1	25.935 - 25.955 (1.0211 - 1.0218)	—
	No. 2, 3, 4	23.445 - 23.465 (0.9230 - 0.9238)	—
Camshaft end play		0.115 - 0.188 (0.0045 - 0.0074)	0.24 (0.0094)
Camshaft cam height (A)	Intake	45.475 - 45.665 (1.7904 - 1.7978)	0.2 (0.008)* <sup>1</sup>
	Exhaust	45.485 - 45.675 (1.7907 - 1.7982)	0.2 (0.008)* <sup>1</sup>
Camshaft runout [TIR* <sup>2</sup> ]		Less than 0.02 (0.0008)	0.05 (0.0020)
Camshaft sprocket runout [TIR* <sup>2</sup> ]		Less than 0.15 (0.0059)	—

# SERVICE DATA AND SPECIFICATIONS (SDS)

## < SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

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



SEM671

\*1: Cam wear limit

\*2: Total indicator reading

### VALVE LIFTER

Unit: mm (in)

Items	Standard
Valve lifter outer diameter	33.977 - 33.987 (1.3377 - 1.3381)
Valve lifter hole diameter	34.000 - 34.016 (1.3386 - 1.3392)
Valve lifter clearance	0.013 - 0.039 (0.0005 - 0.0015)

### VALVE CLEARANCE

Unit: mm (in)

Items	Cold	Hot* (reference data)
Intake	0.26 - 0.34 (0.010 - 0.013)	0.304 - 0.416 (0.012 - 0.016)
Exhaust	0.29 - 0.37 (0.011 - 0.015)	0.308 - 0.432 (0.012 - 0.017)

\*: Approximately 80°C (176°F)

### AVAILABLE VALVE LIFTER

Unit: mm (in)

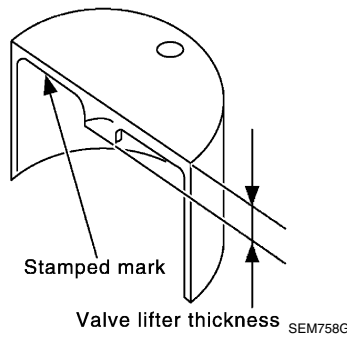
Identification (stamped) mark*	Thickness
788C	7.88 (0.3102)
790C	7.90 (0.3110)
792C	7.92 (0.3118)
794C	7.94 (0.3126)
796C	7.96 (0.3134)
798C	7.98 (0.3142)
800C	8.00 (0.3150)
802C	8.02 (0.3157)
804C	8.04 (0.3165)
806C	8.06 (0.3173)
808C	8.08 (0.3181)
810C	8.10 (0.3189)
812C	8.12 (0.3197)
814C	8.14 (0.3205)
816C	8.16 (0.3213)
818C	8.18 (0.3220)

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

Identification (stamped) mark*	Thickness
820C	8.20 (0.3228)
822C	8.22 (0.3236)
824C	8.24 (0.3244)
826C	8.26 (0.3252)
828C	8.28 (0.3260)
830C	8.30 (0.3268)
832C	8.32 (0.3276)
834C	8.34 (0.3283)
836C	8.36 (0.3291)
838C	8.38 (0.3299)
840C	8.40 (0.3307)



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

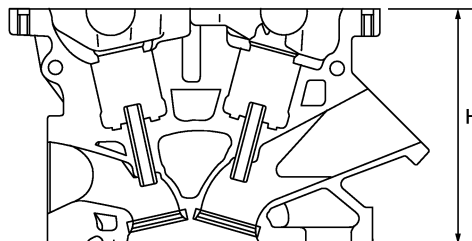
## Cylinder Head

INFOID:000000009460590

### CYLINDER HEAD

Unit: mm (in)

Items	Standard	Limit
Head surface distortion	Less than 0.03 (0.0012)	0.1 (0.004)
Normal cylinder head height (H)	126.3 - 126.5 (4.972 - 4.980)	—
Spark plug tube installation height	37.7 - 39.1 (1.484 - 1.539)	—



PBIC0924E

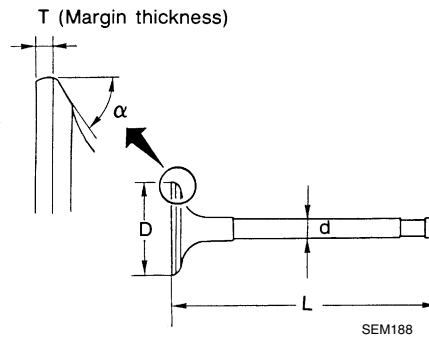
### VALVE DIMENSIONS

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

Unit: mm (in)



Valve head diameter (D)	Intake	36.6 - 36.9 (1.441 - 1.453)
	Exhaust	30.2 - 30.5 (1.189 - 1.201)
Valve length (L)	Intake	97.13 (3.8240)
	Exhaust	94.67 (3.7272)
Valve stem diameter (d)	Intake	5.970 - 5.980 (0.2350 - 0.2354)
	Exhaust	5.962 - 5.970 (0.2347 - 0.2350)
Valve seat angle $\alpha$	Intake	45°15' - 45°45'
	Exhaust	
Valve margin (T)	Intake	1.15 - 1.45 (0.0453 - 0.0571)
	Exhaust	1.45 - 1.75 (0.0571 - 0.0689)
Valve margin (T) limit		More than 0.5 (0.020)
Valve stem end surface grinding limit		Less than 0.2 (0.008)

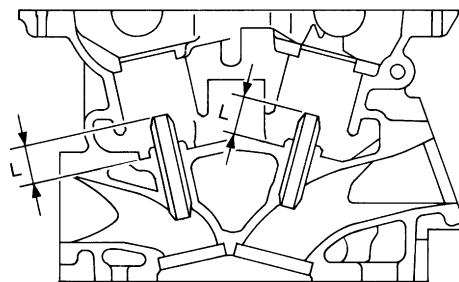
## VALVE OIL SEAL

Unit: mm (in)

Description	Standard
Valve oil seal installation height	14.3 - 14.9 (0.563 - 0.587)

## VALVE GUIDE

Unit: mm (in)



Items		Standard	Oversize (Service) [0.2 (0.008)]
Valve guide	Outer diameter	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
	Inner diameter (Finished size)	6.000 - 6.018 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter		9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	
Items		Standard	Limit

# SERVICE DATA AND SPECIFICATIONS (SDS)

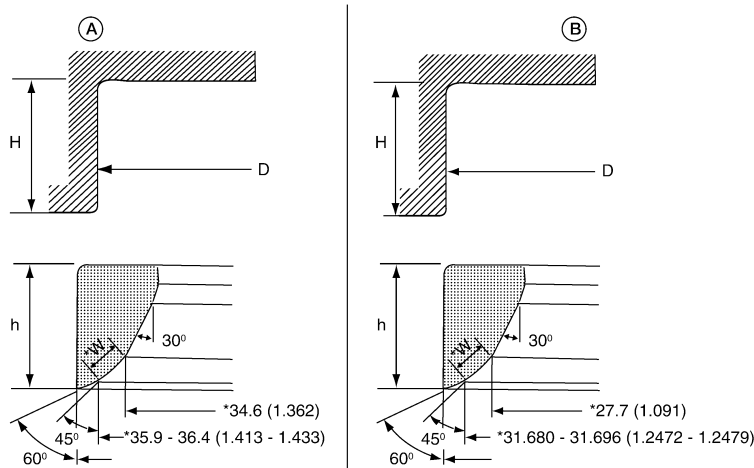
< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

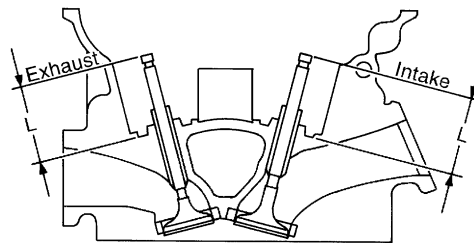
Valve guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.08 (0.0031)
	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.01 (0.004)
Valve deflection	Intake	—	0.24 (0.0094)
	Exhaust	—	0.28 (0.0110)
Projection length (L)		12.6 - 12.8 (0.496 - 0.504)	

## VALVE SEAT

Unit: mm (in)



AWBIA0033GB



SEM621F

Items	Standard	Oversize (Service) [0.5 (0.02)]
Cylinder head seat recess diameter (D)	Intake (A)	38.000 - 38.016 (1.4961 - 1.4967)
	Exhaust (B)	31.600 - 31.616 (1.2441 - 1.2447)
Valve seat outer diameter	Intake	38.097 - 38.113 (1.4999 - 1.5005)
	Exhaust	31.680 - 31.696 (1.2472 - 1.2479)
Valve seat interference fit	Intake	0.081 - 0.113 (0.0032 - 0.0044)
	Exhaust	0.064 - 0.096 (0.0025 - 0.0038)
Height (h)	Intake (A)	5.9 - 6.0 (0.232 - 0.236)
	Exhaust (B)	5.9 - 6.0 (0.232 - 0.236)
Contacting width (W)*	Intake (A)	1.0 - 1.4 (0.0394 - 0.0551)
	Exhaust (B)	1.2 - 1.6 (0.0472 - 0.0630)
Cylinder head seat recess depth (H)		6.0 (0.236)
Depth (L)	Intake (A)	41.16 - 41.76 (1.6205 - 1.6441)
	Exhaust (B)	41.09 - 41.69 (1.6177 - 1.6413)

\*:Machining data

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

## VALVE SPRING

Items	Standard
Free height	47.07 mm (1.8531 in)
Installation height	37.0 mm (1.457 in)
Installation load	166 - 188 N (16.9 - 19.2 kg, 37 - 42 lb)
Height during valve open	27.2 mm (1.071 in)
Load with valve open	373 - 421 N (38.0 - 42.9 kg, 84 - 95 lb)

Unit: mm (in)

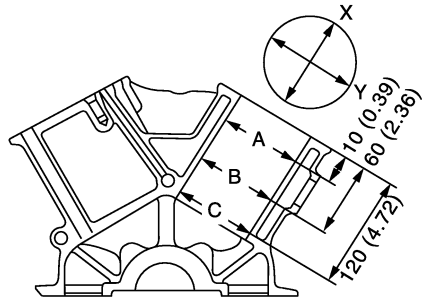
Items	Limit
Squareness	Less than 2.0 (0.079)

## Cylinder Block

INFOID:000000009460591

## CYLINDER BLOCK

Unit: mm (in)



JPBIA2238GB

Surface distortion		Standard		Less than 0.03 (0.0012)
		Limit		0.10 (0.0039)
Main bearing housing inner diameter		Standard		63.993 - 64.017 (2.5194 - 2.5203)
Cylinder bore	Inner diameter	Standard	Grade No. 1	95.500 - 95.510 (3.7598 - 3.7602)
			Grade No. 2	95.510 - 95.520 (3.7602 - 3.7606)
			Grade No. 3	95.520 - 95.530 (3.7606 - 3.7610)
		Wear limit		0.20 (0.0079)
Out-of-round		Limit		0.015 (0.0006)
Taper (Difference between A and C)				0.015 (0.0006)



# SERVICE DATA AND SPECIFICATIONS (SDS)

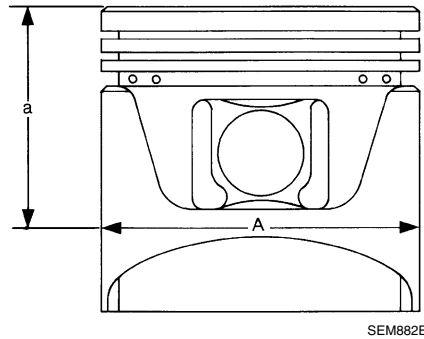
< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

Main bearing housing inner diameter grade (Without bearing)	Grade No. A	63.993 - 63.994 (2.5194 - 2.5194)	A  EM  C  D  E  F  G  H  I  J  K  L  M  N  O  P
	Grade No. B	63.994 - 63.995 (2.5194 - 2.5195)	
	Grade No. C	63.995 - 63.996 (2.5195 - 2.5195)	
	Grade No. D	63.996 - 63.997 (2.5195 - 2.5196)	
	Grade No. E	63.997 - 63.998 (2.5196 - 2.5196)	
	Grade No. F	63.998 - 63.999 (2.5196 - 2.5196)	
	Grade No. G	63.999 - 64.000 (2.5196 - 2.5197)	
	Grade No. H	64.000 - 64.001 (2.5197 - 2.5197)	
	Grade No. J	64.001 - 64.002 (2.5197 - 2.5198)	
	Grade No. K	64.002 - 64.003 (2.5198 - 2.5198)	
	Grade No. L	64.003 - 64.004 (2.5198 - 2.5198)	
	Grade No. M	64.004 - 64.005 (2.5198 - 2.5199)	
	Grade No. N	64.005 - 64.006 (2.5199 - 2.5199)	
	Grade No. P	64.006 - 64.007 (2.5199 - 2.5200)	
	Grade No. R	64.007 - 64.008 (2.5200 - 2.5200)	
	Grade No. S	64.008 - 64.009 (2.5200 - 2.5200)	
	Grade No. T	64.009 - 64.010 (2.5200 - 2.5201)	
	Grade No. U	64.010 - 64.011 (2.5201 - 2.5201)	
	Grade No. V	64.011 - 64.012 (2.5201 - 2.5202)	
Grade No. W	64.012 - 64.013 (2.5202 - 2.5202)		
Grade No. X	64.013 - 64.014 (2.5202 - 2.5202)		
Grade No. Y	64.014 - 64.015 (2.5202 - 2.5203)		
Grade No. 4	64.015 - 64.016 (2.5203 - 2.5203)		
Grade No. 7	64.016 - 64.017 (2.5203 - 2.5203)		
Difference in inner diameter between cylinders	Standard	Less than 0.03 (0.0012)	

## AVAILABLE PISTON

Unit: mm (in)



Items	Grade*	Standard
Piston skirt diameter (A)	Grade No. 1	95.480 - 95.490 (3.7590 - 3.7594)
	Grade No. 2	95.490 - 95.500 (3.7594 - 3.7598)
	Grade No. 3	95.500 - 95.510 (3.7598 - 3.7602)
(a) dimension		38.0 (1.496)
Piston pin hole diameter	Grade No. 0	21.993 - 21.999 (0.8659 - 0.8661)
	Grade No. 1	21.999 - 22.005 (0.8661 - 0.8663)
Piston to cylinder bore clearance		0.010 - 0.030 (0.0004 - 0.0012)

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

## PISTON RING

Unit: mm (in)

Items	Standard	Limit
Side clearance	Top	0.045 - 0.080 (0.0018 - 0.0031)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)
	Oil ring	0.045 - 0.125 (0.0018 - 0.0049)
		—

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

End gap	Top	0.23 - 0.28 (0.0091 - 0.0110)	0.54 (0.0213)
	2nd	0.33 - 0.43 (0.0130 - 0.0169)	0.80 (0.0315)
	Oil (rail ring)	0.20 - 0.45 (0.0079 - 0.0177)	0.95 (0.0374)

## PISTON PIN

Unit: mm (in)

Items	Grade*	Standard	Limit
Piston pin outer diameter	Grade No. 0	21.989 - 21.995 (0.8657 - 0.8659)	—
	Grade No. 1	21.995 - 22.001 (0.8659 - 0.8662)	—
Piston to piston pin oil clearance		0.002 - 0.006 (0.0001 - 0.0002)	—
Connecting rod bushing oil clearance		0.005 - 0.017 (0.0002 - 0.0007)	0.030 (0.0012)

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

## CONNECTING ROD

Unit: mm (in)

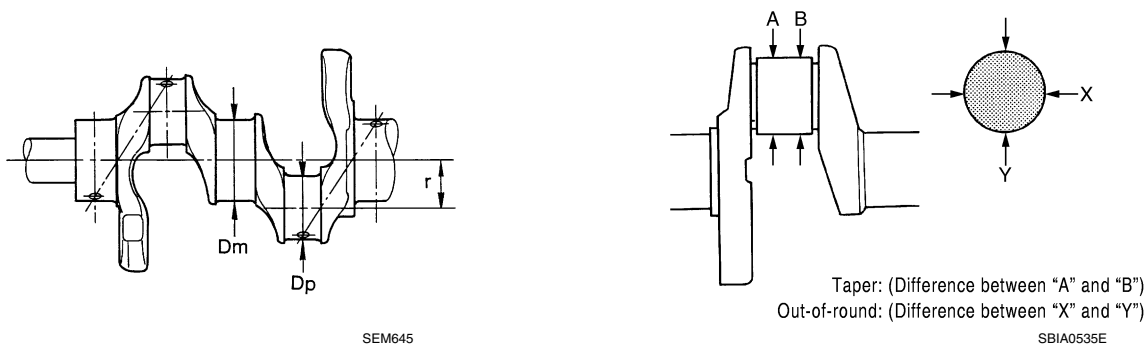
Items	Grade <sup>1</sup>	Standard	Limit
Center distance		144.13 - 144.27 (5.6744 - 5.6799)	—
Bend [per 100 (3.94)]		—	0.15 (0.0059)
Torsion [per 100 (3.94)]		—	0.30 (0.0118)
Connecting rod small end inner diameter		23.980 - 24.000 (0.9441 - 0.9449)	—
Connecting rod bushing inner diameter <sup>2</sup>	Grade No. 0	22.000 - 22.006 (0.8661 - 0.8664)	—
	Grade No. 1	22.006 - 22.012 (0.8664 - 0.8666)	—
Connecting rod big end diameter (Without bearing)		55.000 - 55.013 (2.1654 - 2.1659)	—
Side clearance		0.20 - 0.30 (0.0079 - 0.0118)	0.40 (0.0157)

<sup>1</sup>: Always check with the Parts Department for the latest parts information.

<sup>2</sup>: After installing in connecting rod

## CRANKSHAFT

Unit: mm (in)



# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

		Grade <sup>1</sup>	Dimension
		Main journal diameter. (Dm) grade	Standard
Grade No. B	59.974 - 59.973 (2.3612 - 2.3611)		
Grade No. C	59.973 - 59.972 (2.3611 - 2.3611)		
Grade No. D	59.972 - 59.971 (2.3611 - 2.3611)		
Grade No. E	59.971 - 59.970 (2.3611 - 2.3610)		
Grade No. F	59.970 - 59.969 (2.3610 - 2.3610)		
Grade No. G	59.969 - 59.968 (2.3610 - 2.3609)		
Grade No. H	59.968 - 59.967 (2.3609 - 2.3609)		
Grade No. J	59.967 - 59.966 (2.3609 - 2.3609)		
Grade No. K	59.966 - 59.965 (2.3609 - 2.3608)		
Grade No. L	59.965 - 59.964 (2.3608 - 2.3608)		
Grade No. M	59.964 - 59.963 (2.3608 - 2.3607)		
Grade No. N	59.963 - 59.962 (2.3607 - 2.3607)		
Grade No. P	59.962 - 59.961 (2.3607 - 2.3607)		
Grade No. R	59.961 - 59.960 (2.3607 - 2.3606)		
Grade No. S	59.960 - 59.959 (2.3606 - 2.3606)		
Grade No. T	59.959 - 59.958 (2.3606 - 2.3605)		
Grade No. U	59.958 - 59.957 (2.3605 - 2.3605)		
Grade No. V	59.957 - 59.956 (2.3605 - 2.3605)		
Grade No. W	59.956 - 59.955 (2.3605 - 2.3604)		
Grade No. X	59.955 - 59.954 (2.3604 - 2.3604)		
Grade No. Y	59.954 - 59.953 (2.3604 - 2.3603)		
Grade No. 4	59.953 - 59.952 (2.3603 - 2.3603)		
Grade No. 7	59.952 - 59.951 (2.3603 - 2.3603)		
Pin journal diameter. (Dp) grade	Standard	Grade No. 0	51.968 - 51.974 (2.0460 - 2.0462)
		Grade No. 1	51.962 - 51.968 (2.0457 - 2.0460)
		Grade No. 2	51.956 - 51.962 (2.0445 - 2.0457)
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)]			Less than 0.002 (0.0001)
Crankshaft runout [TIR <sup>2</sup> ]	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)

<sup>1</sup>: Always check with the Parts Department for the latest parts information.

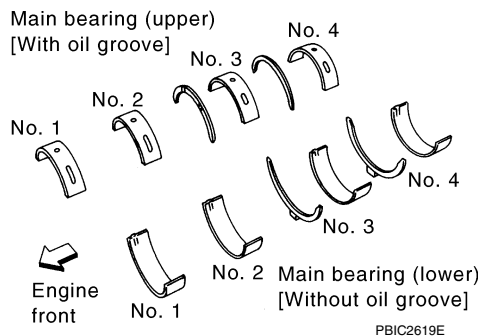
<sup>2</sup>: Total indicator reading

## Main Bearing

INFOID:000000009460592

### MAIN BEARING

Unit: mm (in)



Grade number*	Thickness	Width	Identification color	Remarks
---------------	-----------	-------	----------------------	---------

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

0		2.000 - 2.003 (0.0787 - 0.0789)	19.9 - 20.1 (0.783 - 0.791)	Black	Grade is the same for upper and lower bearings.
1		2.003 - 2.006 (0.0789 - 0.0790)		Brown	
2		2.006 - 2.009 (0.0790 - 0.0791)		Green	
3		2.009 - 2.012 (0.0791 - 0.0792)		Yellow	
4		2.012 - 2.015 (0.0792 - 0.0793)		Blue	
5		2.015 - 2.018 (0.0793 - 0.0794)		Pink	
6		2.018 - 2.021 (0.0794 - 0.0796)		Purple	
7		2.021 - 2.024 (0.0796 - 0.0797)		White	
01	UPR	2.003 - 2.006 (0.0789 - 0.0790)		Brown	Grade and color are different for upper and lower bearings.
	LWR	2.000 - 2.003 (0.0787 - 0.0789)		Black	
12	UPR	2.006 - 2.009 (0.0790 - 0.0791)		Green	
	LWR	2.003 - 2.006 (0.0789 - 0.0790)		Brown	
23	UPR	2.009 - 2.012 (0.0791 - 0.0792)		Yellow	
	LWR	2.006 - 2.009 (0.0790 - 0.0791)		Green	
34	UPR	2.012 - 2.015 (0.0792 - 0.0793)	Blue		
	LWR	2.009 - 2.012 (0.0791 - 0.0792)	Yellow		
45	UPR	2.015 - 2.018 (0.0793 - 0.0794)	Pink		
	LWR	2.012 - 2.015 (0.0792 - 0.0793)	Blue		
56	UPR	2.018 - 2.021 (0.0794 - 0.0796)	Purple		
	LWR	2.015 - 2.018 (0.0793 - 0.0794)	Pink		
67	UPR	2.021 - 2.024 (0.0796 - 0.0797)	White		
	LWR	2.018 - 2.021 (0.0794 - 0.0796)	Purple		

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

## UNDERSIZE

Unit: mm (in)

Items	Thickness	Main journal diameter
0.25 (0.0098)	2.132 - 2.140 (0.0839 - 0.0843)	Grind so that bearing clearance is the specified value.

## MAIN BEARING OIL CLEARANCE

Unit: mm (in)

Items	Standard	Limit
Main bearing oil clearance	0.012 - 0.022 (0.0005 - 0.0009)*	0.065 (0.0026)

\*: Actual clearance

## Connecting Rod Bearing

INFOID:000000009460593

## CONNECTING ROD BEARING

Unit: mm (in)

Grade number*	Thickness	Identification color (mark)
0	1.500 - 1.503 (0.0591 - 0.0592)	Black
1	1.503 - 1.506 (0.0592 - 0.0593)	Brown
2	1.506 - 1.509 (0.0593 - 0.0594)	Green

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

## UNDERSIZE

Unit: mm (in)

Items	Thickness	Crank pin journal diameter (Dp)
0.25 (0.0098)	1.626 - 1.634 (0.0640 - 0.0643)	Grind so that bearing clearance is the specified value.

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ35DE]

## CONNECTING ROD BEARING OIL CLEARANCE

Unit: mm (in)

Items	Standard	Limit
Connecting rod bearing oil clearance	0.020 - 0.045 (0.0010 - 0.0018)*	0.070 (0.0028)

\*: Actual clearance

## Drive Plate

INFOID:000000009460594

Unit: mm (in)

Drive plate runout [TIR]* - on torque converter mounting surface	Less than 0.35 (0.0138)
Drive plate runout [TIR]* - on ring gear	0.5 (0.0197)

\*: Total indicator reading

A  
EM  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P