2012 ENGINE

Engine Mechanical (VQ25HR) - G Sedan

PRECAUTION

PRECAUTIONS

Precaution for Procedure without Cowl Top Cover

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.

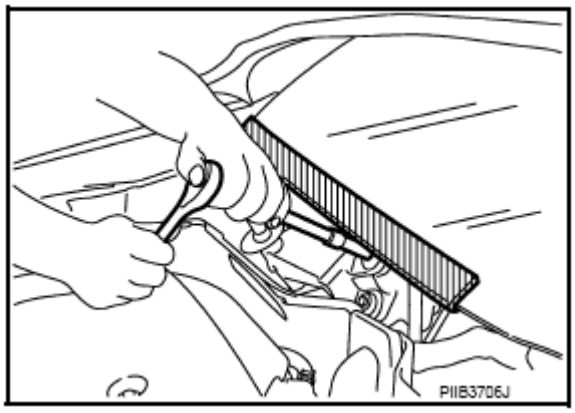

Fig. 1: Removing Cowl Top Cover
Courtesy of NISSAN NORTH AMERICA, INC.

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

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

Information necessary to service the system safely is included in the **SRS AIRBAG (SEDAN)** and **SEAT BELT (SEDAN)** article of this Service Information.

WARNING: Always observe the following items for preventing accidental activation.

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation**

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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 SRS AIRBAG (SEDAN) article.

- **Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Information. 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: Always observe the following items for preventing accidental activation.

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.**

Precautions For Engine Service

DISCONNECTING FUEL PIPING

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

DRAINING ENGINE COOLANT

Drain engine coolant and engine oil when the engine is cooled.

INSPECTION, REPAIR AND REPLACEMENT

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

REMOVAL AND DISASSEMBLY

- When instructed to use SST, use specified tools. Always be careful to work safely, avoid forceful or uninstructed operations.
- Exercise maximum care to avoid damage to mating or sliding surfaces.
- Dowel pins are used for several parts alignment. When replacing and reassembling parts with dowel pins, check that dowel pins are installed in the original position.
- Must cover openings of engine system with a tape or equivalent, to seal out foreign materials.

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- Mark and arrange disassembly parts in an organized way for easy troubleshooting and reassembly.
- 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 in the step.

ASSEMBLY AND INSTALLATION

- Use torque wrench to tighten bolts or nuts to specification.
- When tightening nuts and bolts, as a basic rule, equally tighten in several different steps starting with the ones in center, then ones on inside and outside diagonally in this order. If the order of tightening is specified, do exactly as specified.
- Replace with new gasket, packing, oil seal or O-ring.
- Thoroughly wash, clean, and air-blow each part. Carefully check engine oil or engine coolant passages for any restriction and blockage.
- Avoid damaging sliding or mating surfaces. Completely remove foreign materials such as cloth lint or dust. Before assembly, oil sliding surfaces well.
- After disassembling, or exposing any internal engine parts, change engine oil and replace oil filter with a new one.
- Release air within route when refilling after draining engine coolant.
- After repairing, start the engine and increase engine speed to check engine coolant, fuel, engine oil, and exhaust gases for leakage.

Parts Requiring Angle Tightening

- Use the angle wrench [SST: KV10112100] for the final tightening of the following engine parts:
  - Cylinder head bolts
  - Lower cylinder block bolts
  - Connecting rod cap bolts
- 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.

Liquid Gasket

REMOVAL OF LIQUID GASKET SEALING

- After removing mounting bolts and nuts, separate the mating surface using the seal cutter [SST: KV10111100 (J-37228)] (A) and remove old liquid gasket sealing.

CAUTION: Never damage the mating surfaces.

- Tap the seal cutter [SST: KV10111100 (J-37228)] to insert it (B), and then slide it (C) by tapping on the

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side as shown in the figure.

- In areas where the seal cutter [SST: KV10111100 (J-37228)] is difficult to use, use a plastic hammer to lightly tap the parts, to remove it.

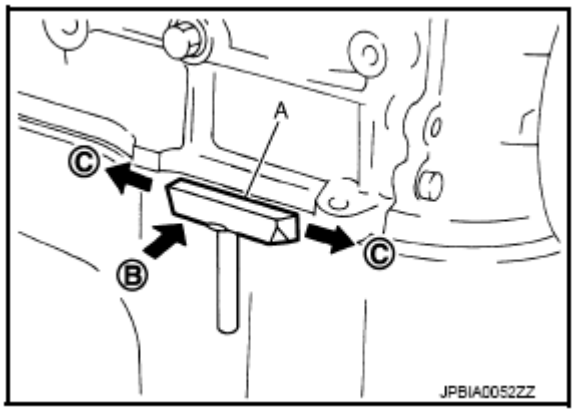

Fig. 2: Cutting Liquid Gasket Sealing Using Seal Cutter
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: If for some unavoidable reason tool such as a screwdriver is used, be careful not to damage the mating surfaces.

LIQUID GASKET APPLICATION PROCEDURE

1. Using a scraper (A), remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
   - Remove liquid gasket completely from the groove of the liquid gasket application surface, mounting bolts, and bolt holes.
2. Wipe the liquid gasket application surface and the mating surface with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.

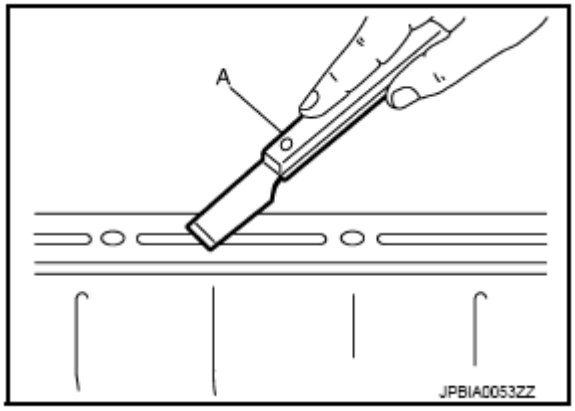

Fig. 3: Removing Liquid Gasket Adhering Using Scraper
Courtesy of NISSAN NORTH AMERICA, INC.

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3. Attach liquid gasket tube to the tube presser (commercial service tool).

   Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS ".

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

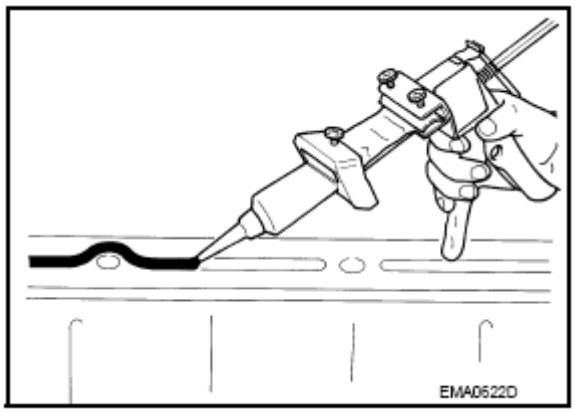

Fig. 4: Applying Liquid Gasket Without Breaks To Specified Location
Courtesy of NISSAN NORTH AMERICA, INC.

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

A : Groove
⇦ : Inside

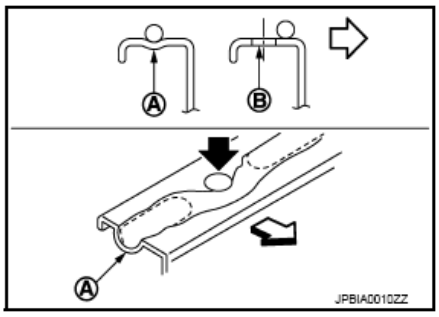

Fig. 5: Locating Bolt Holes And Groove
Courtesy of NISSAN NORTH AMERICA, INC.

   - Within five minutes of liquid gasket application, install the mating component.
   - If liquid gasket protrudes, wipe it off immediately.
   - Do not retighten mounting bolts or nuts after the installation.
   - After 30 minutes or more have passed from the installation, fill engine oil and engine coolant.

CAUTION: If there are specific instructions in this article, observe them.

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Definitions of Bank Names

- In this article, each bank name is defined as follows:

A : Bank 1 (The conventional right bank)
B : Bank 2 (The conventional left bank)
⇦ : Engine front

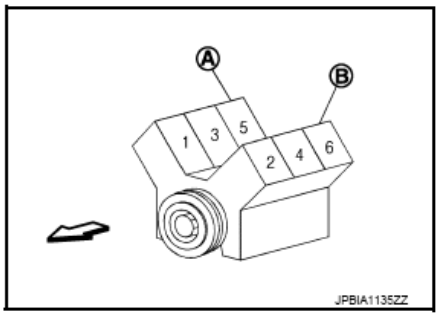


Fig. 6: Identifying Conventional Right And Left Bank
Courtesy of NISSAN NORTH AMERICA, INC.

- For cylinder numbers and bank layout, refer to the illustration.

  Bank 1: The bank side including cylinder No. 1 (odd-numbered cylinder side)

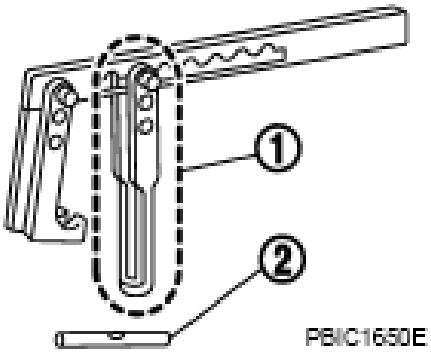
  Bank 2: The other bank side of the above (even-numbered cylinder side)

PREPARATION

PREPARATION

Special Service Tools

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

Tool number (Kent-Moore No.) Tool name	Description
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 so.

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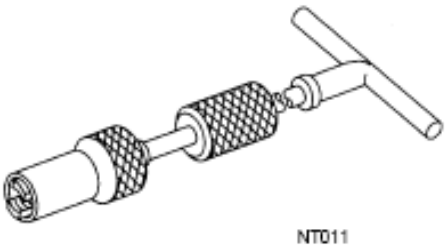
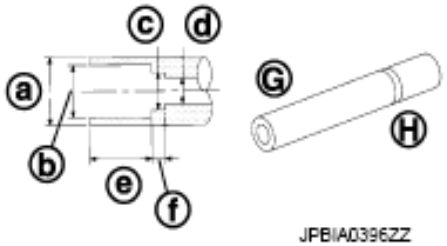
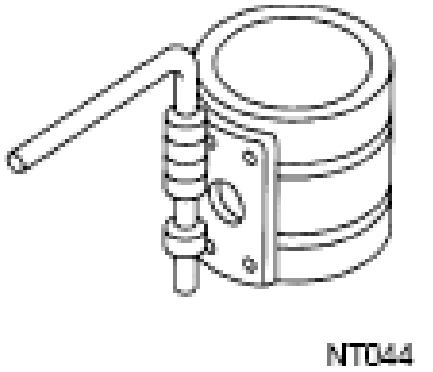
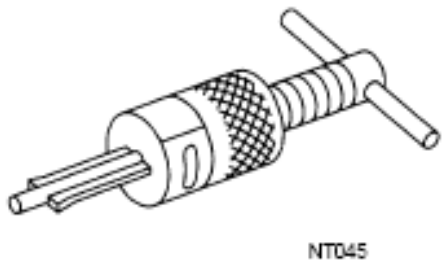
KV10107902 (J-38959) Valve oil seal puller		Replacing valve oil seal
KV10115600 (J-38958) Valve oil seal drift		Installing valve oil seal **Use side A (G).** a. **20 (0.79) dia.** b. **13 (0.51) dia.** c. **10.3 (0.406) dia.** d. **8 (0.31) dia.** e. **10.7 (0.421)** f. **5 (0.20)** **H: side B** Unit: mm (in)
EM03470000 (J-8037) Piston ring compressor		Installing piston assembly into cylinder bore
ST16610001 (J-23907) Pilot bushing puller		Removing pilot converter

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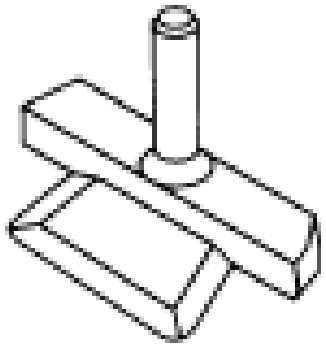
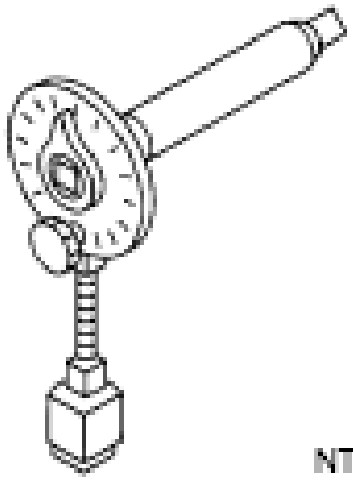
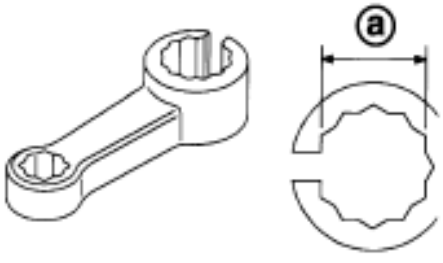
KV10111100 (J-37228) Seal cutter	 NT046	Removing oil pan (lower and upper), front and rear timing chain case, etc.
KV10112100 (BT8653-A) Angle wrench	 NT014	Tightening bolts for connecting rod bearing cap, cylinder head, etc. at an angle
KV10114400 (J-38365) Heated oxygen sensor wrench	 JPBIA0397ZZ	Loosening or tightening air fuel ratio sensor 1 a. **22 mm (0.87 in)**
KV99105600 (-) Tension gauge set		Auxiliary machine belt tension check

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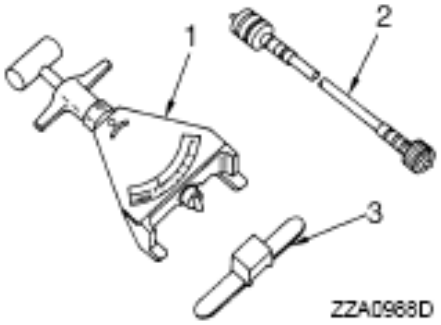
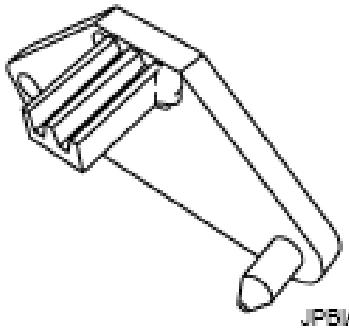
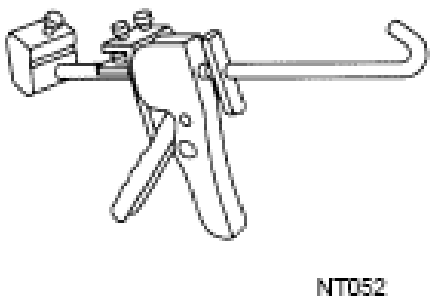
		
KV10105620 (-) Ring gear stopper		The fixing of crankshaft
KV10118700 (-) Ring gear stopper		The fixing of crankshaft

Commercial Service Tools

(Kent-Moore No.) Tool name		Description
(-) Tube presser		Pressing the tube of liquid gasket

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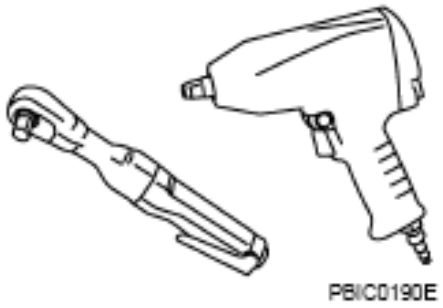
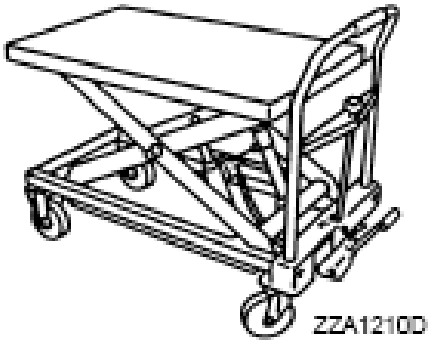
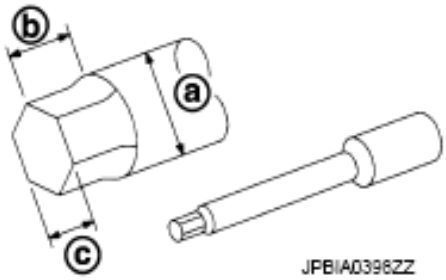
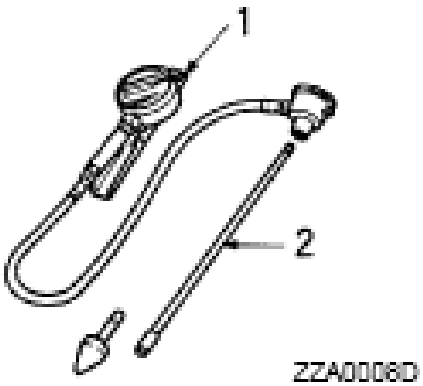
(-) Power tool	 PBIC0190E	Loosening nuts and bolts
(-) Manual lift table caddy	 ZZA1210D	Removing and installing engine
(J-24239-01) Cylinder head bolt wrench	 JPBIA0396ZZ	Loosening and tightening cylinder head bolt, and used with the angle wrench [SST: KV10112100 (BT8653-A)] a. **13 (0.51) dia.** b. **12 (0.47)** c. **10 (0.39)** Unit: mm (in)
(-) 1. Compression gauge 2. Adapter	 ZZA0006D	Checking compression pressure

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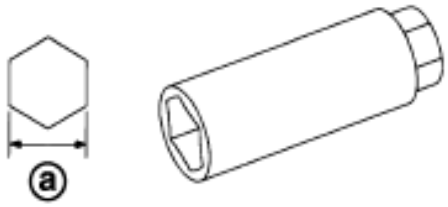
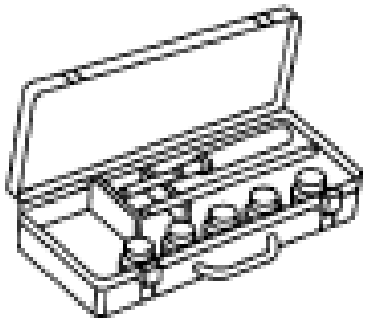
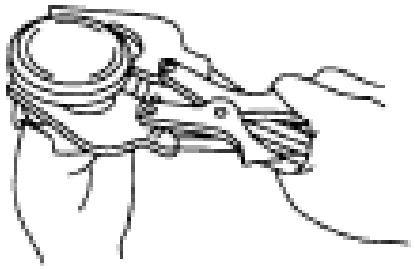
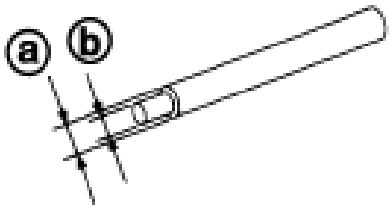
(-) Spark plug wrench	 JPBIA0399ZZ	Removing and installing spark plug a. **14 mm (0.55 in)**
(-) Valve seat cutter set	 NT048	Finishing valve seat (EXH) dimensions
(-) Piston ring expander	 NT030	Removing and installing piston ring
(-) Valve guide drift	 JPBIA0400ZZ	Removing and installing valve guide (EXH) **Exhaust:** a. **9.5 mm (0.374 in) dia.** b. **5.5 mm (0.217 in) dia.**
(-)		A. Reaming valve guide (EXH) inner hole B. Reaming hole for oversize valve guide (EXH)

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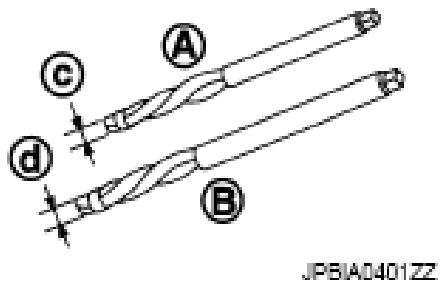
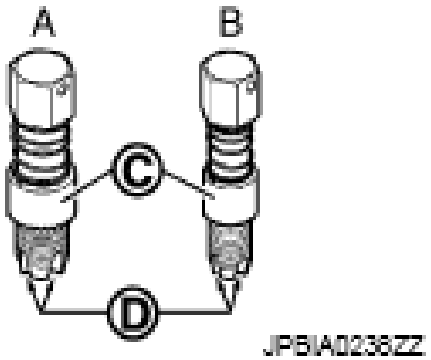
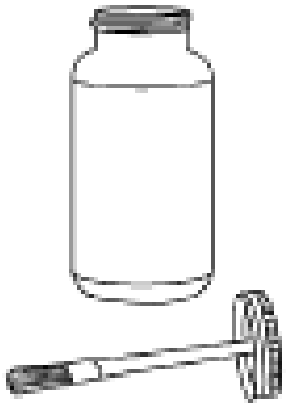
Valve guide reamer	 JPBIA0401ZZ	**Exhaust:** **c: 6.0 mm (0.236 in) dia.** **d: 10.2 mm (0.402 in) dia.**
(J-43897-18) (J-43897-12) Oxygen sensor thread cleaner	 JPBIA0238ZZ	Reconditioning the exhaust system threads before installing a new air fuel ratio sensor and heated oxygen sensor (Use with anti-seize lubricant shown below.) A. **J-43897-18 [18 mm (0.71 in) dia.] for zirconia heated oxygen sensor and air fuel ratio sensor** B. **J-43897-12 [12 mm (0.47 in) dia.] for titania heated oxygen sensor** C. Mating surface shave cylinder D. Flutes
(-) Anti-seize lubricant (Permatex 133AR or equivalent meeting MIL specification MIL-A-907)	 AEM489	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads

BASIC INSPECTION

CAMSHAFT VALVE CLEARANCE

Inspection and Adjustment

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INSPECTION

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.

In cases of removing/installing or replacing camshaft and valve-related parts, or of unusual engine conditions due to changes in valve clearance (found malfunctions during stating, idling or causing noise), perform inspection as follows:

⇦ : Engine front

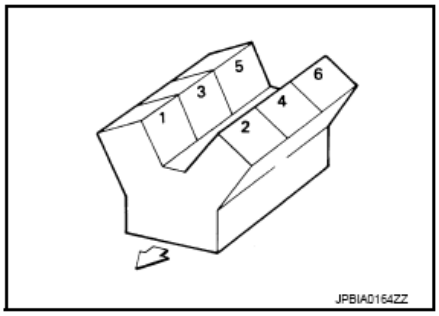

Fig. 7: Conventional Bank Layout
Courtesy of NISSAN NORTH AMERICA, INC.

1. Remove rocker covers (bank 1 and bank 2). Refer to "**REMOVAL AND INSTALLATION**".
2. Measure the valve clearance as follows:
   a. Set No. 1 cylinder at TDC of its compression stroke.
      - Rotate crankshaft pulley clockwise to align timing mark (grooved line without color) with timing indicator.

⬅ : Timing mark (grooved line without color)

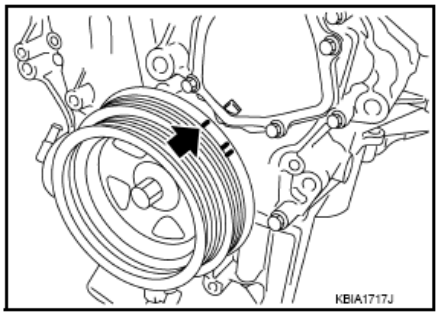

Fig. 8: Aligning Timing Mark (Grooved Line Without Color) With Timing Indicator
Courtesy of NISSAN NORTH AMERICA, INC.

- Check that intake and exhaust cam nose on No. 1 cylinder (engine front side of bank 1) are located as shown in the figure.

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⇦ : Engine front

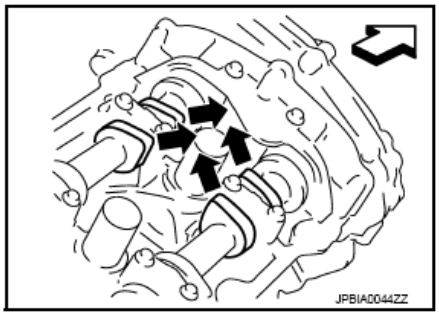

Fig. 9: Locating Intake And Exhaust Cam Nose Position On No. 1 Cylinder
Courtesy of NISSAN NORTH AMERICA, INC.

- If not, turn crankshaft one revolution (360 degrees) and align as shown in the figure.

b. Use a feeler gauge, measure the clearance between valve lifter and camshaft.

Valve clearance: Refer to "CAMSHAFT".

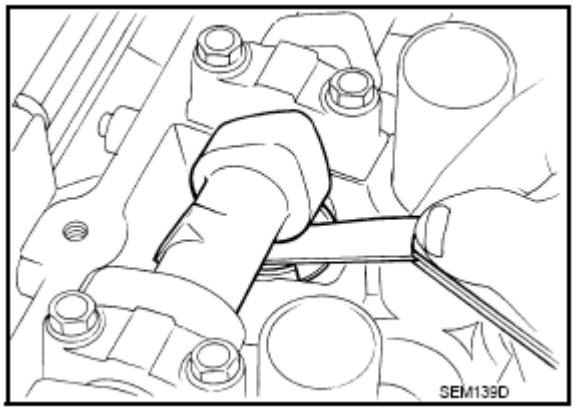

Fig. 10: Measuring Clearance Between Valve Lifter And Camshaft Using Feeler Gauge
Courtesy of NISSAN NORTH AMERICA, INC.

- By referring to the figure, measure the valve clearances at locations marked "x" as shown in the table below (locations indicated in the figure).

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⇦ : Engine front

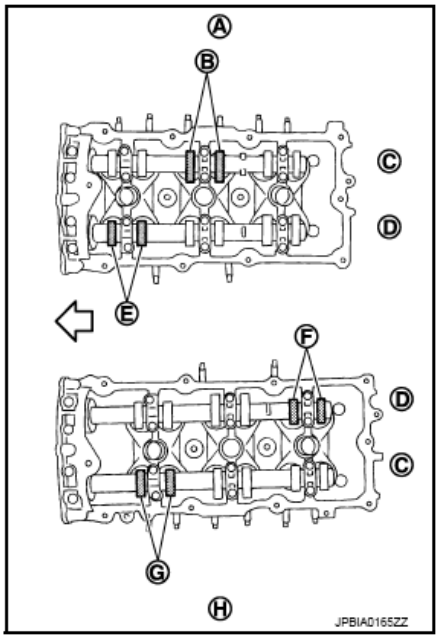

Fig. 11: Identifying Valve Clearances Measuring Locations
Courtesy of NISSAN NORTH AMERICA, INC.

- No. 1 cylinder at compression TDC

Measuring position [bank 1 (A)]		No. 1 CYL.	No. 3 CYL.	No. 5 CYL.
No. 1 cylinder at compression TDC	EXH (C)		x (B)	
	INT (D)	x (E)		
Measuring position [bank 2 (H)]		No. 2 CYL.	No. 4 CYL.	No. 6 CYL.
No. 1 cylinder at compression TDC	INT (D)			x (F)
	EXH (C)	x (G)		

1 : Crankshaft pulley
A : Paint mark

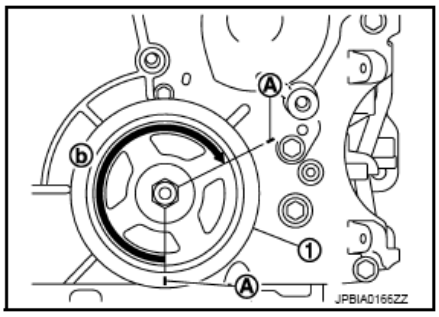

Fig. 12: Rotating Crankshaft 240 Degrees To Clockwise
Courtesy of NISSAN NORTH AMERICA, INC.

c. Rotate crankshaft 240 degrees clockwise (when viewed from engine front) to align No. 3 cylinder at TDC its compression stroke.

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NOTE: **Mark a position 240 degrees (b) from a corner of the hexagonal part of crankshaft pulley mounting bolt as shown in the figure. Use the hexagonal part as a guide.**

- By referring to the figure, measure the valve clearances at locations marked "x" as shown in the table below (locations indicated in the figure).

⇦ : Engine front

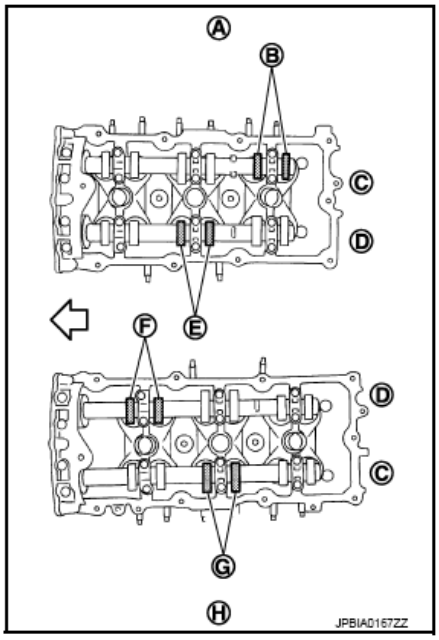

Fig. 13: Identifying Valve Clearances Measuring Locations
Courtesy of NISSAN NORTH AMERICA, INC.

- No. 3 cylinder at compression TDC

Measuring position [bank 1 (A)]		No. 1 CYL.	No. 3 CYL.	No. 5 CYL.
No. 3 cylinder at compression TDC	EXH (C)			x (B)
	INT (D)		x (E)	
Measuring position [bank 2 (H)]		No. 2 CYL.	No. 4 CYL.	No. 6 CYL.
No. 3 cylinder at compression TDC	INT (D)	x (F)		
	EXH (C)		x (G)	

d. Rotate crankshaft 240 degrees clockwise (when viewed from engine front) to align No. 5 cylinder at TDC of compression stroke.

NOTE: **Mark a position 240 degrees (b) from a corner of the hexagonal part of crankshaft pulley mounting bolt as shown in the figure. Use the hexagonal part as a guide.**

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1 : Crankshaft pulley
A : Paint mark

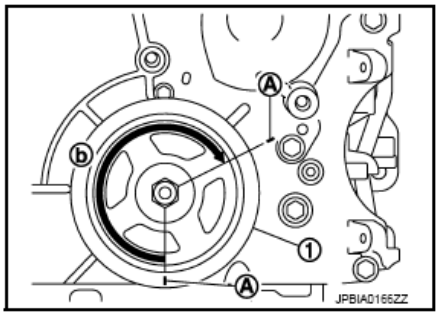

Fig. 14: Rotating Crankshaft 240 Degrees To Clockwise
Courtesy of NISSAN NORTH AMERICA, INC.

- By referring to the figure, measure the valve clearances at locations marked "x" as shown in the table below (locations indicated in the figure).

⇦ : Engine front

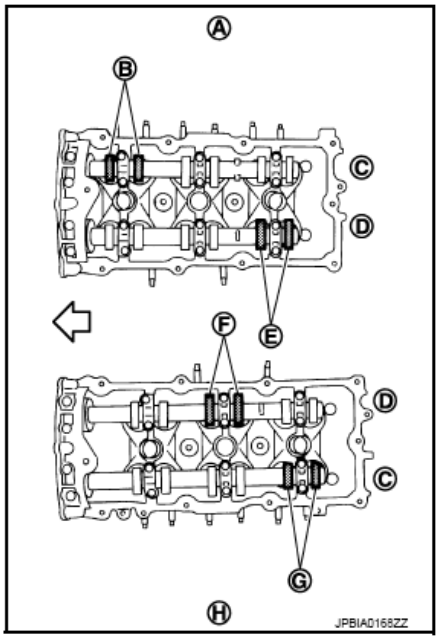

Fig. 15: Identifying Valve Clearances Measuring Locations
Courtesy of NISSAN NORTH AMERICA, INC.

- No. 5 cylinder at compression TDC

Measuring position [bank 1 (A)]		No. 1 CYL.	No. 3 CYL.	No. 5 CYL.
No. 5 cylinder at compression TDC	EXH (C)	x (B)		
	INT (D)			x (E)
Measuring position [bank 2 (H)]		No. 2 CYL.	No. 4 CYL.	No. 6 CYL.
No. 5 cylinder at compression TDC	INT (D)		x (F)	
	EXH (C)			x (G)

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3. Perform adjustment if the measured value is out of the standard. Refer to "**ADJUSTMENT**".

ADJUSTMENT

- Perform adjustment depending on selected head thickness of valve lifter.

1. Measure the valve clearance. Refer to "**INSPECTION**".
2. Remove camshaft. Refer to "**EXPLODED VIEW**".
3. Remove valve lifters at the locations that are out of the standard.
4. Measure the center thickness of the removed valve lifters with a micrometer (A).

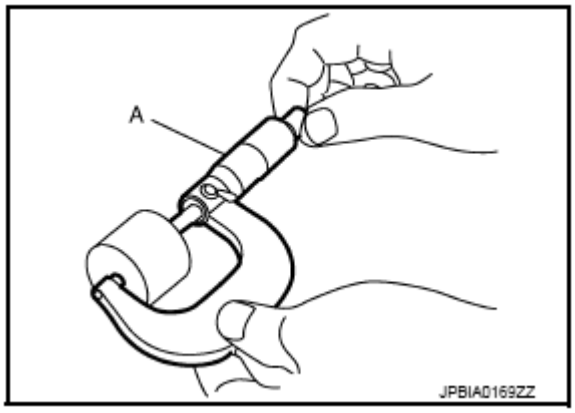

Fig. 16: Measuring Center Thickness Of Valve Lifters Using Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

5. Use the equation below to calculate valve lifter thickness for replacement.

   Valve lifter thickness calculation: t = t1+ (C1 - C2)

   t = Valve lifter thickness to be replaced

   t1 = Removed valve lifter thickness

   C1 = Measured valve clearance

   C2 = Standard valve clearance:

   Intake: 0.30 mm (0.012 in)

   Exhaust: 0.33 mm (0.013 in)

   - Thickness of new valve lifter can be identified by stamp marks on the reverse side (inside the cylinder).

     Stamp mark 788 indicates 7.88 mm (0.3102 in) in thickness.

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A : Stamp
B : Thickness of valve lifter

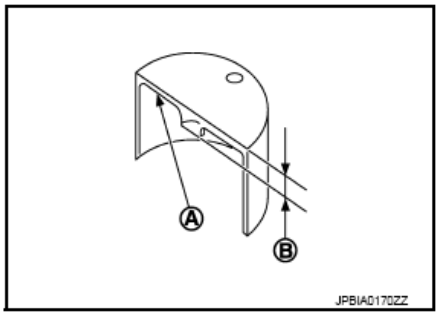

Fig. 17: Identifying Valve Lifter Thickness And Stamp
Courtesy of NISSAN NORTH AMERICA, INC.

Available thickness of valve lifter: 27 sizes with range 7.88 to 8.40 mm (0.3102 to 0.3307 in) in steps of 0.02 mm (0.0008 in) (when manufactured at factory). Refer to "**CAMSHAFT**".

6. Install selected valve lifter.
7. Install camshaft. Refer to "**EXPLODED VIEW**".
8. Manually turn crankshaft pulley a few turns.
9. Check that the valve clearances for cold engine are within the specifications by referring to the specified values.
10. Install all removal parts in the reverse order of removal.
11. Warm up the engine, and check for unusual noise and vibration.

COMPRESSION PRESSURE

Inspection

1. Warm up engine thoroughly. Then, stop it.
2. Release fuel pressure. Refer to "**INSPECTION** " (FOR USA AND CANADA) or "**INSPECTION** " (FOR MEXICO).
3. Disconnect fuel pump fuse (1) from IPDM E/R (2) to avoid fuel injection during measurement.

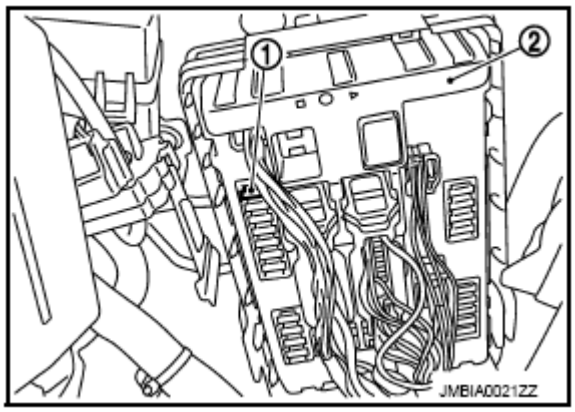

Fig. 18: Identifying Fuel Pump Fuse And IPDM E/R

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Courtesy of NISSAN NORTH AMERICA, INC.

4. Remove engine cover, using a power tool. Refer to "**EXPLODED VIEW**".
5. Remove ignition coil and spark plug from each cylinder. Refer to "**EXPLODED VIEW**".
6. Connect engine tachometer (not required in use of CONSULT).
7. Install compression gauge with an adapter (commercial service tool) onto spark plug hole.

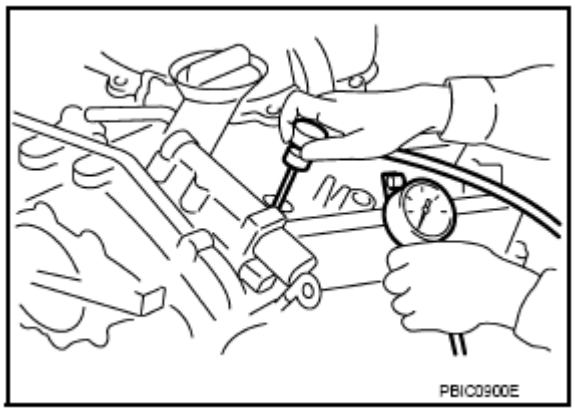

Fig. 19: Installing Compression Gauge With Adapter Onto Spark Plug Hole
Courtesy of NISSAN NORTH AMERICA, INC.

- Use the adapter whose picking up end inserted to spark plug hole is smaller than 20 mm (0.79 in) in diameter. Otherwise, it may be caught by cylinder head during removal.

a : 20 mm (0.79 in)

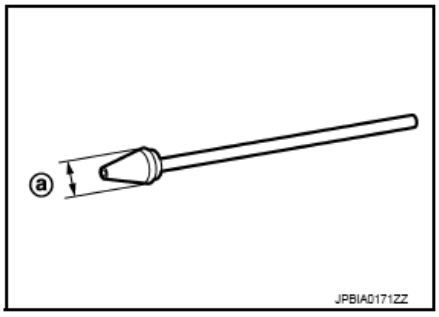

Fig. 20: Identifying Adapter Picking Up End Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

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

Compression pressure: Refer to "GENERAL SPECIFICATION".

CAUTION:

- **Measure a six-cylinder under the same conditions since a measurement depends on measurement conditions (engine**

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water temperature, etc.).

- **Always use a fully charged battery to obtain the specified engine speed.**
- **If the engine speed is out of the specified range, check battery liquid for proper gravity. Check the engine speed again with normal battery gravity.**
- **If compression pressure is below the 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 checking, measure compression pressure again.**
- **If a cylinder has low compression pressure, pour a small amount of engine oil into the spark plug hole of the cylinder to recheck it for compression.**
  - **If the added engine oil improves the compression, piston rings may be worn out or damaged. Check piston rings and replace if necessary.**
  - **If the compression pressure remains at low level despite the addition of engine oil, valves may be malfunctioning. Check valves for damage. Replace valve or valve seat accordingly.**
- **If two adjacent cylinders have respectively low compression pressure and their compression remains low even after the addition of engine oil, cylinder head gaskets are leaking. In such a case, replace cylinder head gaskets.**

9. After inspection is completed, install removed parts.
10. Start the engine, and check that the engine runs smoothly.
11. Perform trouble diagnosis. If DTC appears, erase it. Refer to "**DESCRIPTION** ".

SYMPTOM DIAGNOSIS

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting - Engine Noise

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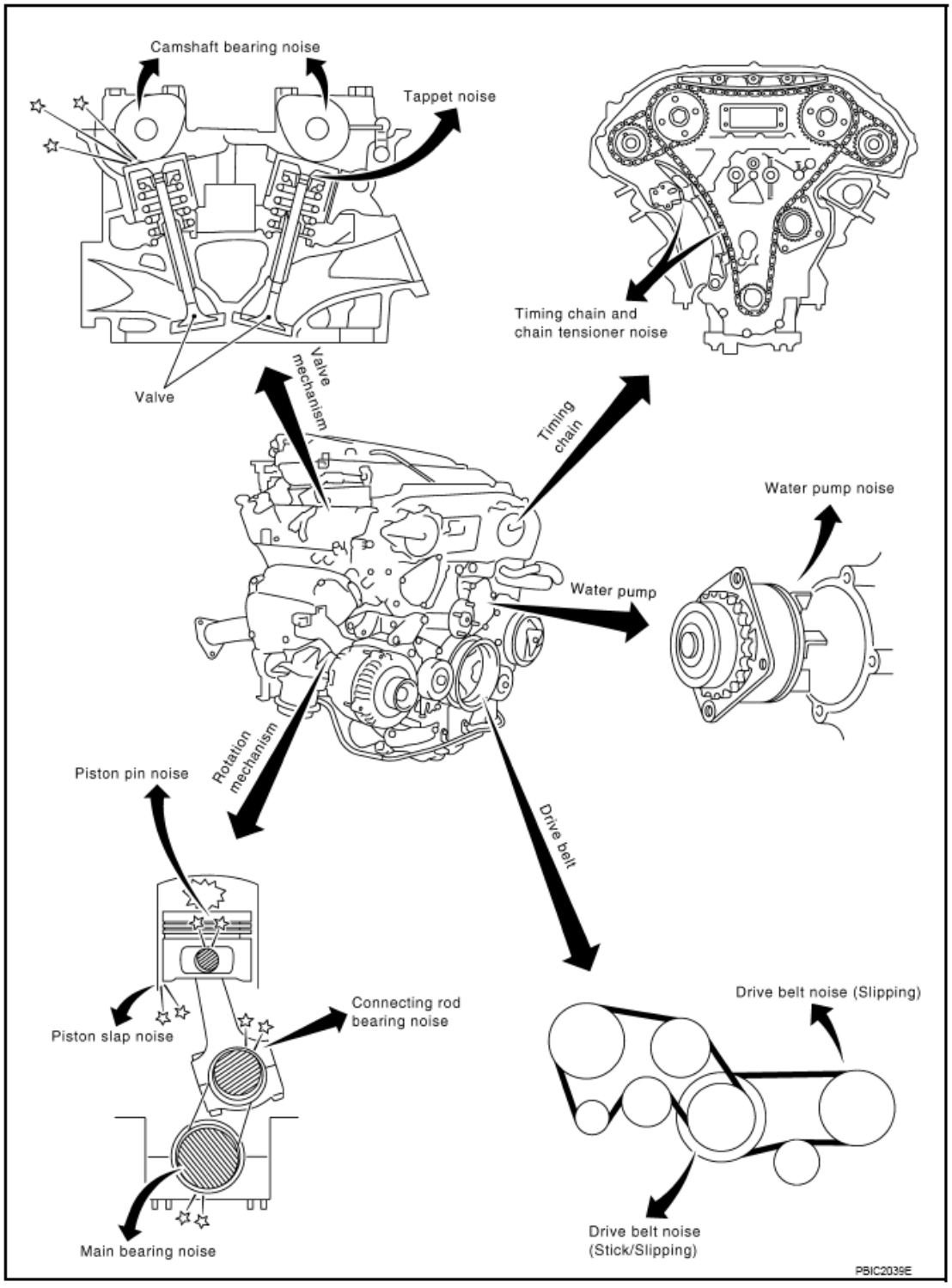

Fig. 21: Noise, Vibration And Harshness (NVH) Troubleshooting Components
Courtesy of NISSAN NORTH AMERICA, INC.

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

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1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of the 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	Refer to
		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	CAMSHA VALVE CLEARAN
	Rattle	C	A	-	A	B	C	Camshaft bearing noise	Camshaft runout Camshaft journal oil clearance	CAMSHA
Crankshaft pulley Cylinder block (Side of engine) Oil pan	Slap or knock	-	A	-	B	B	-	Piston pin noise	Piston to piston pin oil clearance Connecting rod bushing oil clearance	PISTON T PISTON P OIL CLEARAN
	Slap or rap	A	-	-	B	B	A	Piston slap noise	Piston to cylinder bore clearance Piston ring side clearance Piston ring end gap Connecting rod bend and torsion	PISTON T CYLINDE BORE CLEARAN
	Knock	A	B	C	B	B	B	Connecting rod bearing noise	Connecting rod bushing oil clearance Connecting rod bearing oil	CONNECT ROD BUSHING CLEARAN CONNECT ROD BEARING

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									clearance	CLEARAN
	Knock	A	B	-	A	B	C	Main bearing noise	Main bearing oil clearance Crankshaft runout	MAIN BEARIN CRANKSH RUNOU
Front of engine Timing chain case	Tapping or ticking	A	A	-	B	B	B	Timing chain and timing chain tensioner noise	Timing chain cracks and wear Timing chain tensioner operation	TIMING CHAIN TIMING CHAIN
Front of engine	Squeaking or fizzing	A	B	-	B	-	C	Drive belt (Sticking or slipping)	Drive belt deflection	DRIVE BE
	Creaking	A	B	A	B	A	B	Drive belt (Slipping)	Idler pulley bearing operation	
	Squall Creak	A	B	-	B	A	B	Water pump noise	Water pump operation	WATER PU
A: Closely related B: Related C: Sometimes related -: Not related										

PERIODIC MAINTENANCE

DRIVE BELT

Inspection

- Check the belt with the engine cold or after a lapse of 30 minutes or more after the engine is stopped.

1 : Power steering oil pump
2 : Alternator
3 : Idler pulley
4 : Crankshaft pulley
5 : A/C compressor

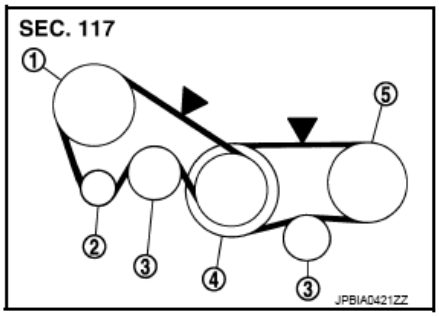

Fig. 22: Drive Belt Layout
Courtesy of NISSAN NORTH AMERICA, INC.

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- Measure belt tension at the position ? as shown in the figure with the tension gauge [SST: KV99105600 (-)] (A). If it is difficult to measure the tension at the position ? then a nearby position can be measured.
- Apply the force of 98.1 N (10kg) at the ? position shown in the figure also when measuring by deflection amount.

CAUTION:

- **To check belt tension right after belt installation, adjust belt tension to the reference value and rotate the crankshaft twice or more to prevent variations in the tension between pulleys. Measure belt tension again and adjust to the reference value.**
- **Tighten Idler pulley lock nut by hand and measure tension in backlash-free condition.**

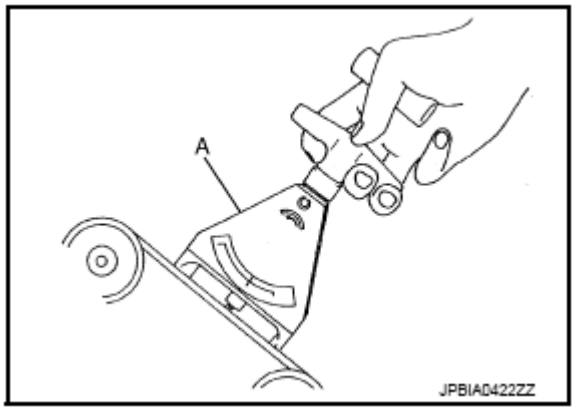

Fig. 23: Measuring Belt Tension Using Tension Gauge
Courtesy of NISSAN NORTH AMERICA, INC.

Auxiliary machine belt tension

Deflection amount of auxiliary machine belt: Refer to "DRIVE BELT"

Adjustment

Portion	Belt tightening method for adjustment
Alternator Power steering oil pump belt	Adjusting bolt of idler pulley
A/C compressor belt	Adjusting bolt of idler pulley

CAUTION:

- **After replacing belt with a new one, adjust it to the value of "NEW" since new ones do not sufficiently fit in with pulley grooves.**
- **If the belt in use exceeds the value of "Limit of Retightening," adjust the belt to the value of "For Adjustment."**
- **To check belt tension right after belt installation, adjust belt tension to the reference value and rotate the crankshaft twice or more to prevent variations in the tension between pulleys. Measure belt**

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tension again and adjust to the reference value.

- **After installing belt, check that it is completely fit into the pulley groove.**
- **Never allow oil and coolant to adhere to the belt.**
- **Never twist or bend the belt.**

Alternator.power steering oil pump belt

1. Remove engine under cover with power tool.
2. Loosening idler pulley rock nut (A).

1 : Alternator ·power steering oil pump belt
2 : A/C compressor belt
3 : Power steering oil pump
4 : Idler pulley
5 : Alternator
6 : Crankshaft pulley
7 : A/C compressor
C : Idler pulley rock nut
D : Adjustment bolt

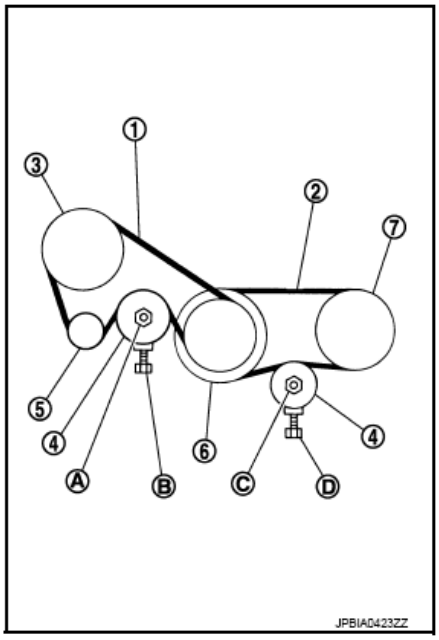

Fig. 24: Power Steering Oil Pump Belt Layout
Courtesy of NISSAN NORTH AMERICA, INC.

3. Adjust tension by turning adjusting bolt (B).

CAUTION: Adjusting bolts are applied with grease. Never allow the grease to adhere to the belt.

- For adjustment value, refer to "**INSPECTION**".

4. Tightening idler pulley rock nut (A).

Tightening torque 34.8 N.m (3.5 kg-m)

A/C compressor belt

1. Remove engine under cover with power tool.

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2. Loosening idler pulley rock nut (C).

1 : Alternator ·power steering oil pump belt
2 : A/C compressor belt
3 : Power steering oil pump
4 : Idler pulley
5 : Alternator
6 : Crankshaft pulley
7 : A/C compressor
A : Idler pulley rock nut
B : Adjustment bolt

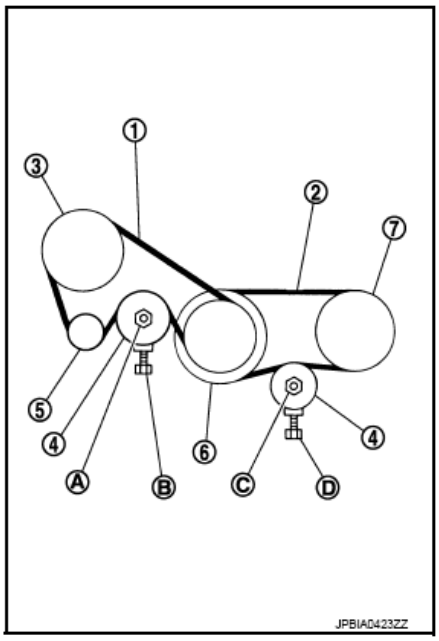

Fig. 25: A/C Compressor Belt Layout
Courtesy of NISSAN NORTH AMERICA, INC.

3. Adjust tension by turning adjusting bolt (D).

CAUTION: Adjusting bolts are applied with grease. Never allow the grease to adhere to the belt.

- For adjustment value, refer to "**INSPECTION**".

4. Tightening idler pulley rock nut (C).

Tightening torque 34.8 N.m (3.5 kg-m)

AIR CLEANER FILTER

Removal and Installation

REMOVAL

1. Unhook clips (A).

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1 : Holder
2 : Air cleaner case

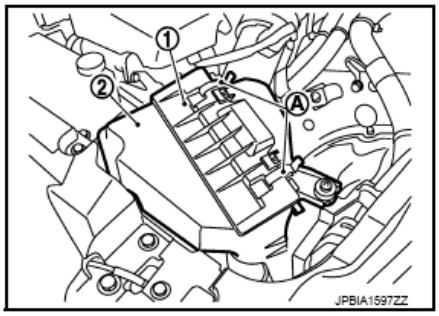

Fig. 26: Identifying Air Cleaner Case, Holder And Clips
Courtesy of NISSAN NORTH AMERICA, INC.

2. Remove air cleaner filter (1) from air cleaner case (2).

3 : Holder

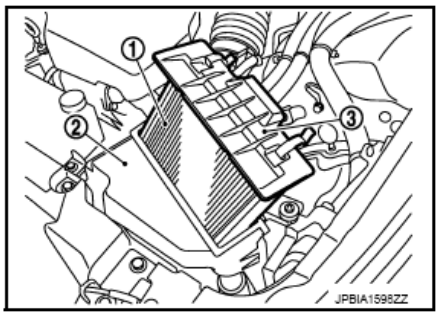

Fig. 27: Identifying Air Cleaner Filter, Case And Holder
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

Note the following, and install in the reverse order of removal.

- Install the air cleaner filter by aligning the seal with the notch of air cleaner case.

SPARK PLUG

Exploded View

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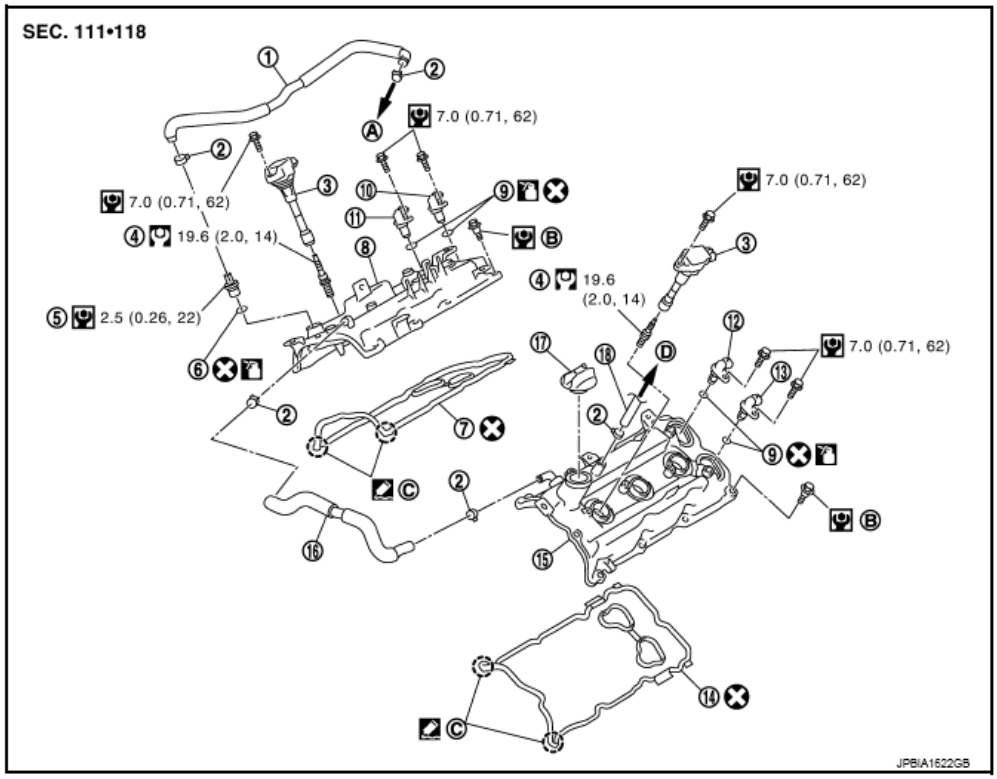
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1.	PCV hose	2.	Clamp	3.	Ignition coil
4.	Spark plug	5.	PCV valve	6.	O-ring
7.	Rocker cover gasket (bank 1)	8.	Rocker cover (bank 1)	9.	O-ring
10.	Camshaft position sensor (PHASE) (bank 1)	11.	Exhaust valve timing control position sensor (bank 1)	12.	Camshaft position sensor (PHASE) (bank 2)
13.	Exhaust valve timing control position sensor (bank 2)	14.	Rocker cover gasket (bank 2)	15.	Rocker cover (bank 2)
16.	PCV hose	17.	Oil filler cap	18.	PCV hose
A.	To intake manifold collector	B.	Comply with the installation procedure when tightening.	C.	Camshaft bracket side
D.	To air duct				

Fig. 28: Exploded View Of Spark Plug With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

Removal and Installation

REMOVAL

1. Remove air cleaner case and air duct (RH and LH). Refer to "**EXPLODED VIEW**".
2. Remove ignition coil. Refer to "**REMOVAL AND INSTALLATION**".
3. Remove spark plug with a spark plug wrench (commercial service tool).

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a : 14 mm (0.55 in)

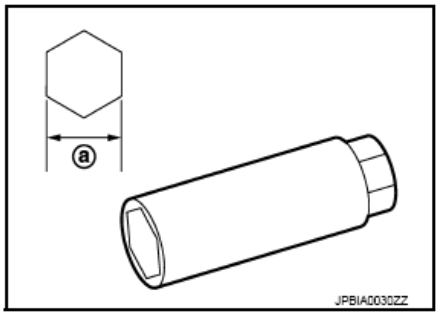

Fig. 29: Identifying Spark Plug Wrench Inner Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

Installation is the reverse order of removal.

Inspection

INSPECTION AFTER REMOVAL

Use the standard type spark plug for normal condition.

Spark plug (Standard type): Refer to "SPARK PLUG".

CAUTION:

- **Never drop or shock spark plug.**
- **Never use a wire brush for cleaning.**
- **If plug tip is covered with carbon, use spark plug cleaner to clean.**

Cleaner air pressure

: Less than 588 kPa (6 kg/cm^2 , 85 psi)

Cleaning time

: Less than 20 seconds

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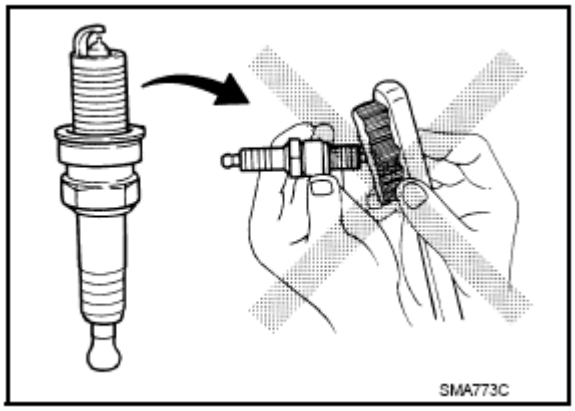

Fig. 30: Caution For Cleaning Shock Spark Plug Using Wire Brush
Courtesy of NISSAN NORTH AMERICA, INC.

- **Check and adjustment of plug gap is not required between change intervals.**

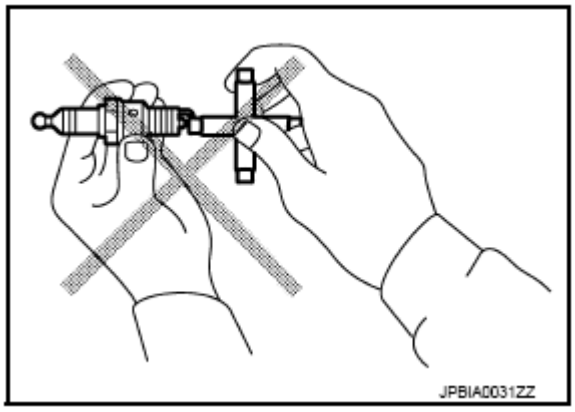

Fig. 31: Caution For Adjusting Spark Plug Gap
Courtesy of NISSAN NORTH AMERICA, INC.

REMOVAL AND INSTALLATION

ENGINE COVER

Exploded View

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1 : Engine cover

Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

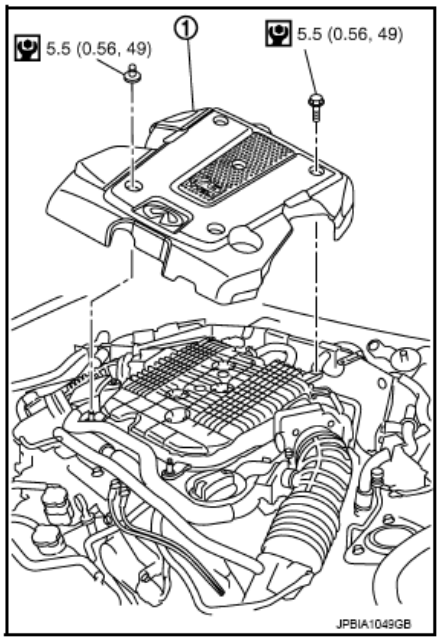

Fig. 32: Exploded View Of Engine Cover With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

Removal and Installation

REMOVAL

Loosen mounting bolts and nuts in the reverse order as shown in the figure, and then remove engine cover.

CAUTION: Never damage or scratch engine cover when installing or removing.

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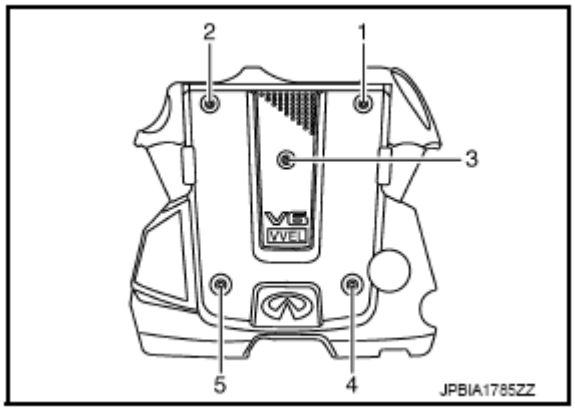

Fig. 33: Identifying Tightening Sequence Of Engine Cover Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

Install engine cover, and then tighten mounting bolts and nuts in numerical order as shown in the figure.

CAUTION: Never damage or scratch engine cover when installing or removing.

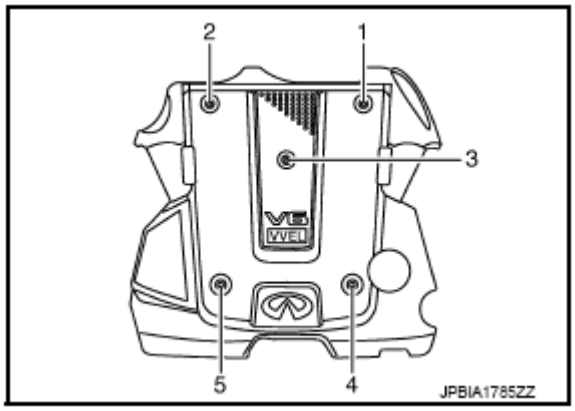

Fig. 34: Identifying Tightening Sequence Of Engine Cover Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

DRIVE BELT IDLER PULLEY

Removal and Installation

Removal

1. Remove alternator.power steering oil pump belt (1).

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2 : A/C compressor belt
3 : Power steering pump
4 : Idler pulley
5 : Alternator
6 : Crankshaft pulley
7 : A/C compressor

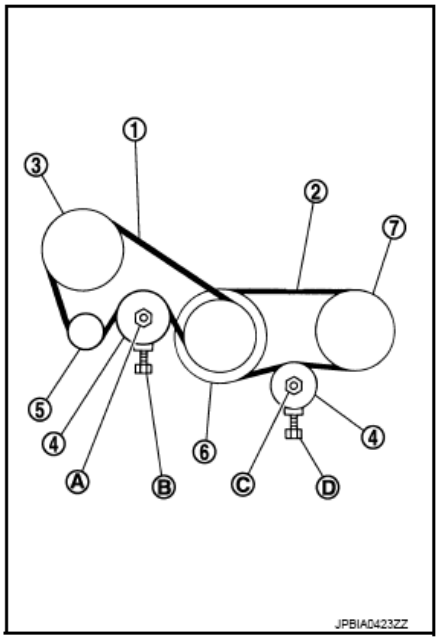

Fig. 35: Drive Belt Idler Pulley Layout
Courtesy of NISSAN NORTH AMERICA, INC.

2. Remove A/C compressor belt (2).

CAUTION: Idler adjusting bolts (B),(D) are applied with grease. Never allow the grease to adhere to the belt.

3. Remove idler pulley (4).

Installation

1. Install the belt to the pulley in the reverse order of removal.

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1 : Alternator · power steering pump belt
2 : A/C compressor belt
3 : Power steering pump
4 : Idler pulley
5 : Alternator
6 : Crankshaft pulley
7 : A/C compressor

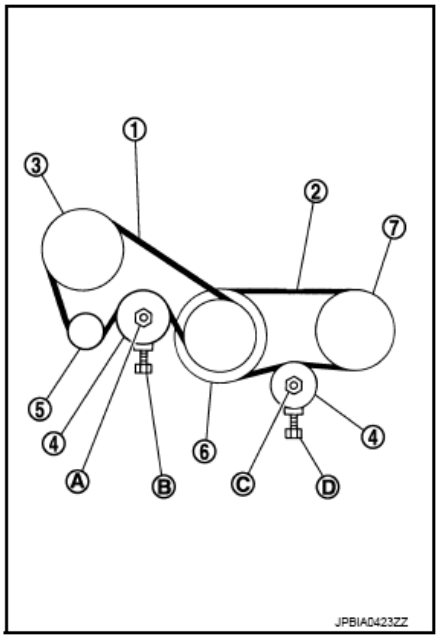

Fig. 36: Drive Belt Idler Pulley Layout
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION:
- **Check that the belt is completely fit in with each pulley.**
- **Check that belt and each pulley groove are free from the adhesion of oil and coolant.**

2. Adjust belt tension. Refer to "**INSPECTION**".
3. Tighten each idler pulley lock nut to the specified torque. Refer to "**ADJUSTMENT**".
4. Recheck that the tension of each belt is within the reference value. Refer to "**ADJUSTMENT**".

AIR CLEANER AND AIR DUCT

Exploded View

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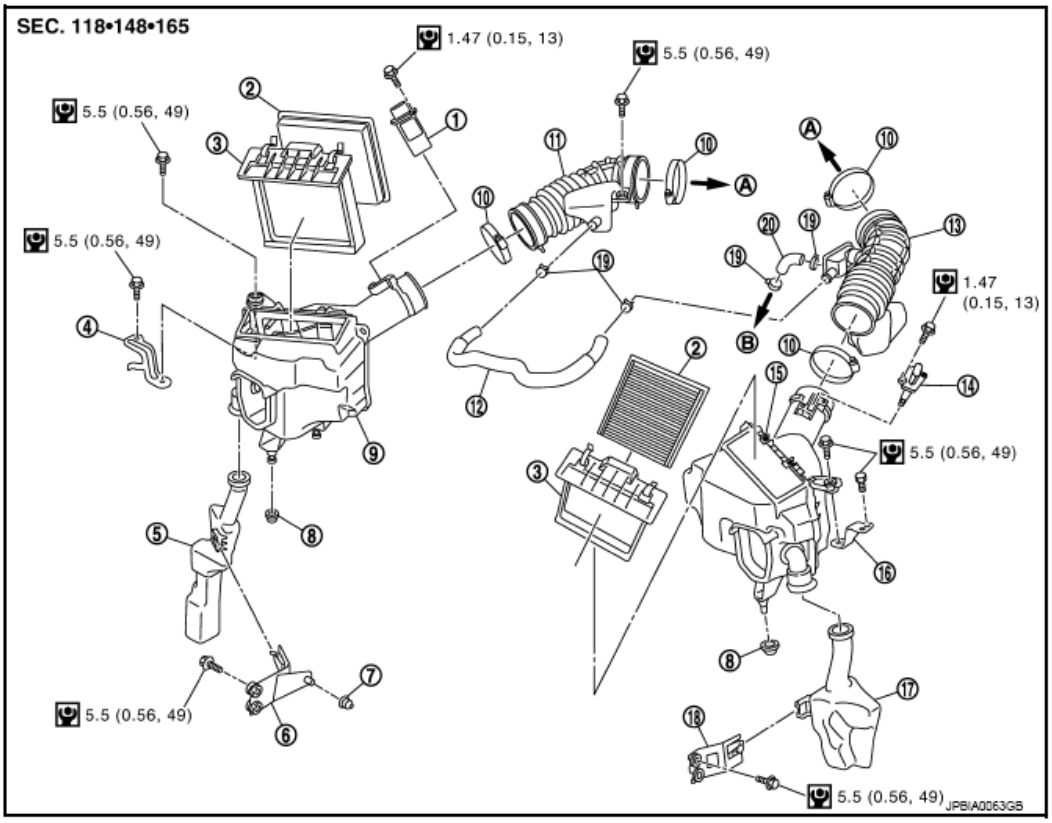
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Mass air flow sensor (bank 1)
2. Air cleaner filter
3. Holder
4. Bracket
5. Resonator (RH)
6. Bracket
7. Grommet
8. Grommet
9. Air cleaner case (RH)
10. Clamp
11. Air duct (RH)
12. PCV hose
13. Air duct (LH)
14. Mass air flow sensor (bank 2)
15. Air cleaner case (LH)
16. Bracket
17. Resonator (LH)
18. Bracket
19. Clamp
20. PCV hose
21. Resonator (LH)
22. Bracket
23. Mass air flow sensor (bank 2)

A. To electric throttle control actuator
B. To rocker cover (bank 2)

Fig. 37: Exploded View Of Air Cleaner And Air Duct With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

Removal and Installation

REMOVAL

1. Disconnect mass air flow sensor harness connector.
2. Disconnect PCV hose.

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3. Remove air cleaner case with mass air flow sensor and air duct, disconnecting each joints.
    - Add marks if necessary for easier installation.
4. Remove mass air flow sensor from air cleaner case if necessary.

CAUTION: Handle mass air flow sensor according to the following instructions.

- **Never shock mass air flow sensor.**
- **Never disassemble mass air flow sensor.**
- **Never touch mass air flow sensor.**

INSTALLATION

Note the following, and install in the reverse order of removal.

Inspection

INSPECTION AFTER REMOVAL

Inspect air duct and resonator assembly for crack or tear.

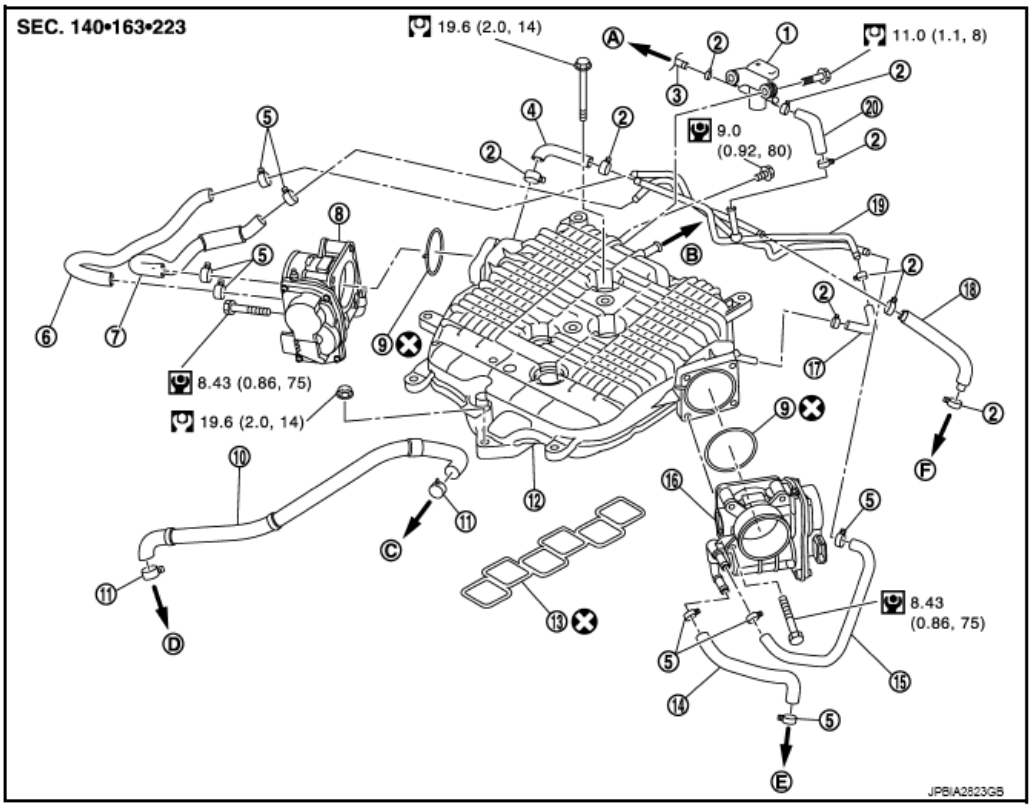
- If anything is found, replace air duct and resonator assembly.

INTAKE MANIFOLD COLLECTOR

Exploded View

 © 2011 Mitchell Repair Information Company, LLC.

Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1.	EVAP canister purge control solenoid valve	2.	Clamp	3.	EVAP hose
4.	EVAP hose	5.	Clamp	6.	Water hose
7.	Water hose	8.	Electric throttle control actuator (bank 1)	9.	Gasket
10.	PCV hose	11.	Clamp	12.	Intake manifold collector
13.	Gasket	14.	Water hose	15.	Water hose
16.	Electric throttle control actuator (bank 2)	17.	EVAP hose	18.	Water hose
19.	EVAP tube assembly	20.	EVAP hose		
A.	To vacuum pipe	B.	To brake booster	C.	Intake manifold collector
D.	To PCV valve	E.	To heater pipe	F.	To water outlet (rear)

Fig. 38: Exploded View Of Intake Manifold Collector With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

Removal and Installation

REMOVAL

WARNING: Never drain engine coolant when the engine is hot to avoid the danger of being scalded.

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1. Remove engine cover, using a power tool. Refer to "**EXPLODED VIEW**".
2. Remove air cleaner case and air duct (RH and LH). Refer to "**EXPLODED VIEW**".
3. Remove electric throttle control actuator as follows:
   a. Drain engine coolant. When water hoses are disconnected, attach plug to prevent engine coolant leakage.

CAUTION:
- **Perform this step when engine is cold.**
- **Never spill engine coolant on drive belt.**

   b. Disconnect water hoses from electric throttle control actuator. When engine coolant is not drained from radiator, attach plug to water hoses to prevent engine coolant leakage.
   c. Disconnect harness connector.
   d. Loosen mounting bolts in reverse order as shown in the figure.

NOTE:
- **When removing only intake manifold collector, move electric throttle control actuator without disconnecting the water hose.**
- **The figure shows the electric throttle control actuator (bank 1) viewed from the air duct side.**
- **Viewed from the air duct side, the order of loosening mounting bolts of electric throttle control actuator (bank 2) is the same as that of the electric throttle control actuator (bank 1).**

CAUTION: Handle carefully to avoid any shock to electric throttle control actuator.

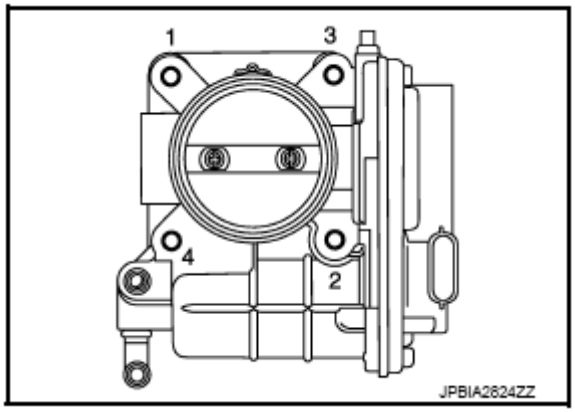

Fig. 39: Identifying Tightening Sequence Of Electric Throttle Control Actuator Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

4. Disconnect vacuum hose, PCV hose and EVAP hose from intake manifold collector.

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5. Remove EVAP canister purge volume control solenoid valve and EVAP tube assembly from intake manifold collector.
6. Loosen mounting bolts and nuts with power tool in the reverse order as shown in the figure to remove intake manifold collector.

⇦ : Engine front

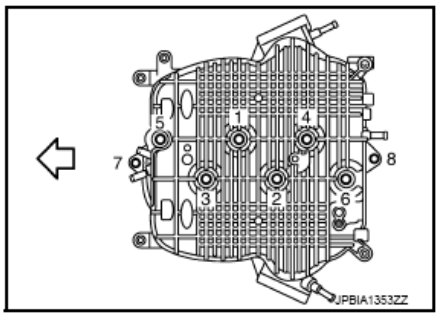

Fig. 40: Identifying Tightening Sequence Of Intake Manifold Collector Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

Note the following, and install in the reverse order of removal.

INTAKE MANIFOLD COLLECTOR

- If stud bolts were removed, install them and tighten to the torque specified below.

  : 10.8 N.m (1.1 kg-m, 8 ft-lb)

- Tighten mounting bolts and nuts in numerical order as shown in the figure.

⇦ : Engine front

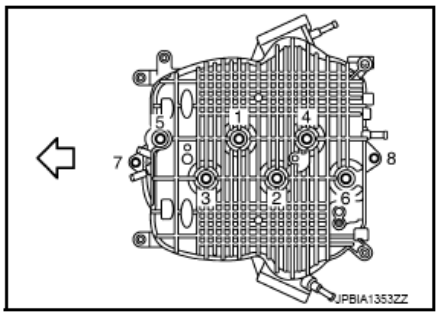

Fig. 41: Identifying Tightening Sequence Of Intake Manifold Collector Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

WATER HOSE

- Insert hose by 27 to 32 mm (1.06 to 1.26 in) from connector end.
- Clamp hose at location of 3 to 7 mm (0.12 to 0.28 in) from hose end.

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ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 1 AND BANK 2)

- Tighten in numerical order as shown in the figure.

NOTE:

- **The figure shows the electric throttle control actuator (bank 1) viewed from the air duct side.**
- **Viewed from the air duct side, the order of tightening mounting bolts of electric throttle control actuator (bank 2) is the same as that of the electric throttle control actuator (bank 1).**

- Perform the "Throttle Valve Closed Position Learning" when harness connector of electric throttle control actuator is disconnected. Refer to "**THROTTLE VALVE CLOSED POSITION LEARNING: DESCRIPTION** " (FOR USA AND CANADA) or "**THROTTLE VALVE CLOSED POSITION LEARNING: DESCRIPTION** " (FOR MEXICO).
- Perform the "Idle Air Volume Learning" and "Throttle Valve Closed Position Learning" when electric throttle control actuator is replaced. Refer to "**THROTTLE VALVE CLOSED POSITION LEARNING: DESCRIPTION** " and "**IDLE AIR VOLUME LEARNING: DESCRIPTION** " (FOR USA AND CANADA) or "**THROTTLE VALVE CLOSED POSITION LEARNING: DESCRIPTION** " and "**IDLE AIR VOLUME LEARNING: DESCRIPTION** " (FOR MEXICO).

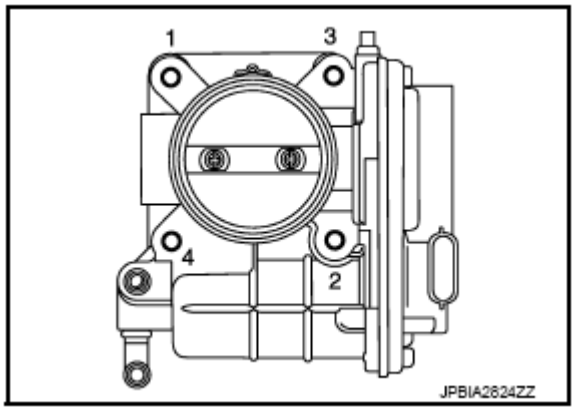

Fig. 42: Identifying Tightening Sequence Of Electric Throttle Control Actuator Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

INTAKE MANIFOLD

Exploded View

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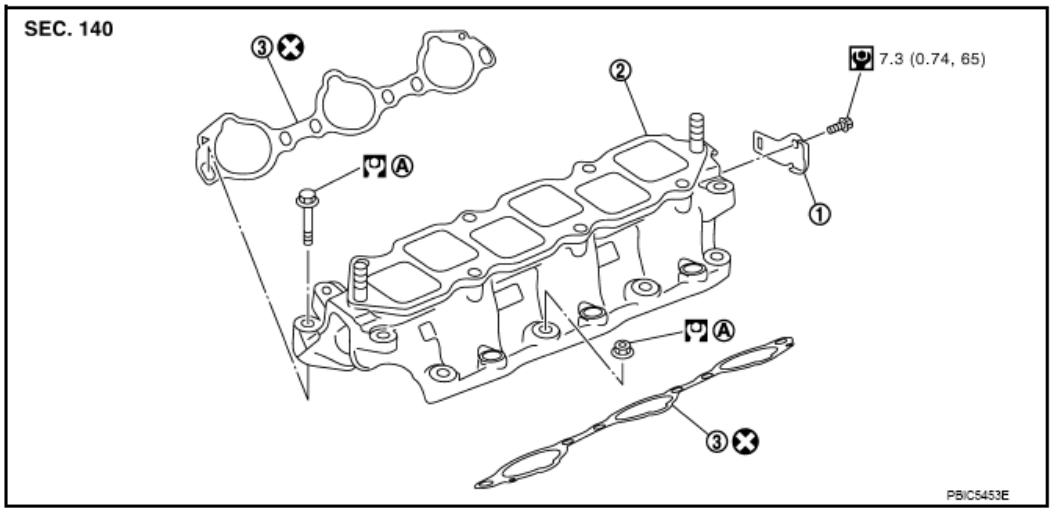
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Harness bracket
2. Intake manifold
3. Gasket

A. Comply with the installation procedure when tightening.

Fig. 43: Exploded View Of Intake Manifold With Torque Specification
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

Removal and Installation

REMOVAL

1. Release fuel pressure. Refer to "**INSPECTION** " (FOR USA AND CANADA) or "**INSPECTION** " (FOR MEXICO).
2. Remove intake manifold collector. Refer to "**EXPLODED VIEW**".
3. Remove fuel tube and fuel injector assembly. Refer to "**EXPLODED VIEW**".
4. Loosen mounting bolts in reverse order as shown in the figure to remove intake manifold, using a power tool.

⇦ : Engine front

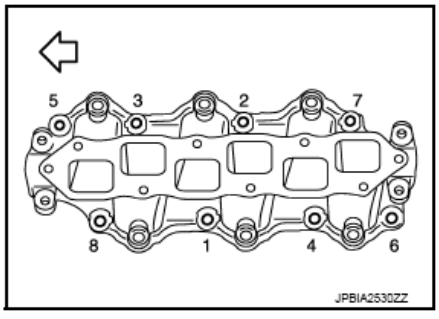


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Fig. 44: Identifying Tightening Sequence Of Intake Manifold Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION:
- **Cover engine openings to avoid entry of foreign materials.**
- **Put a mark on the intake manifold and the cylinder head with paint before removal because they need to be installed in the specified direction.**

5. Remove gaskets.

INSTALLATION

Note the following, and install in the reverse order of removal.

INTAKE MANIFOLD

- If stud bolts were removed, install them and tighten to the torque specified below.

  : 10.8 N.m (1.1 kg-m, 8 ft-lb)

- Tighten all mounting bolts to the specified torque in two or more steps in numerical order as shown in the figure.

⇦ : Engine front

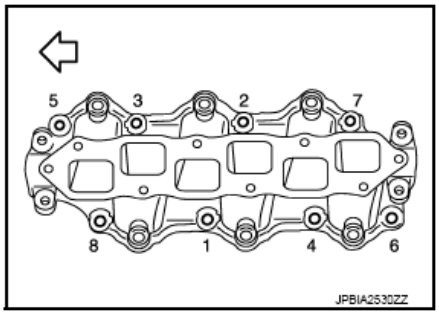

Fig. 45: Identifying Tightening Sequence Of Intake Manifold Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION:
- **Install intake manifold with the marks (put on the intake manifold and the cylinder head before removal) aligned.**

1st step:

: 7.4 N.m (0.75 kg-m, 5 ft-lb)

2nd step and after:

: 29.0 N.m (3.0 kg-m, 21 ft-lb)

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Inspection

INSPECTION AFTER REMOVAL

Surface Distortion

- Check the surface distortion of the intake manifold mating surface with a straightedge (A) and a feeler gauge (B).

  Limit: Refer to "INTAKE MANIFOLD".

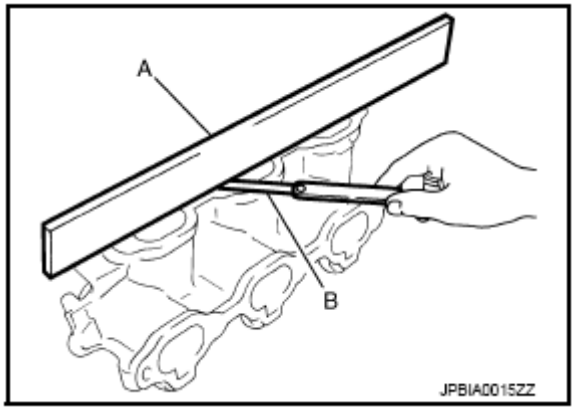

Fig. 46: Checking Surface Distortion Of Intake Manifold Mating Surface Using Straightedge And Feeler Gauge
Courtesy of NISSAN NORTH AMERICA, INC.

- If it exceeds the limit, replace intake manifold.

EXHAUST MANIFOLD

Exploded View

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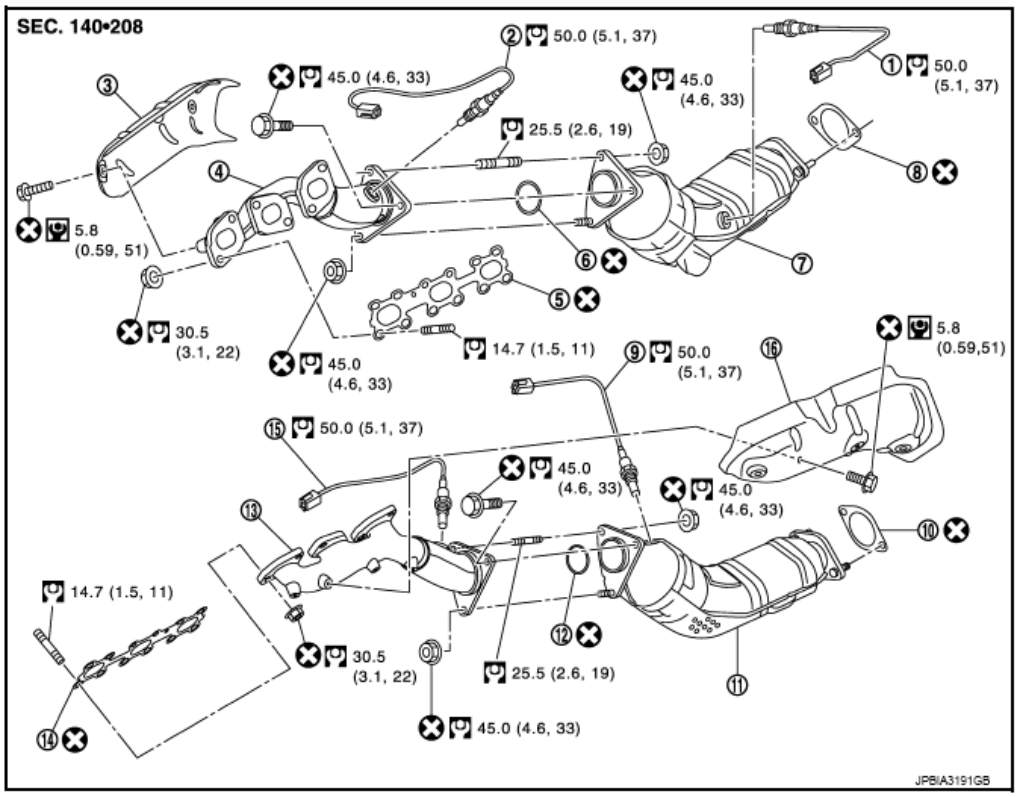
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Heated oxygen sensor 2 (bank 1)
2. Air fuel ratio sensor 1 (bank 1)
3. Exhaust manifold cover
4. Exhaust manifold (bank 1)
5. Gasket
6. Ring gasket
7. Three way catalyst (bank 1)
8. Gasket
9. Heated oxygen sensor 2 (bank 2)
10. Gasket
11. Three way catalyst (bank 2)
12. Ring gasket
13. Exhaust manifold (bank 2)
14. Gasket
15. Air fuel ratio sensor 1 (bank 2)
16. Exhaust manifold cover

Fig. 47: Exploded View Of Exhaust Manifold With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

Removal and Installation

REMOVAL

WARNING: Perform the work when the exhaust and cooling system have completely cooled down.

NOTE: When removing bank 1 side parts only, steps 1 and 4 are unnecessary.

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1. Drain engine coolant. Refer to "**DRAINING** ".
2. Remove engine cover, using a power tool. Refer to "**EXPLODED VIEW**".
3. Remove air cleaner case and air duct (RH and LH). Refer to "**EXPLODED VIEW**".
4. Remove water pipe and water hose. Refer to "**VQ25HR: EXPLODED VIEW** ".
5. Remove engine undercover, using a power tool.
6. Remove exhaust front tube and three way catalysts (bank 1 and bank 2). Refer to "**EXPLODED VIEW** ".
7. Disconnect steering lower joint at power steering gear assembly side, and release steering lower shaft. Refer to "**EXPLODED VIEW** ".
8. Disconnect air fuel ratio sensor 1 (bank 1 and bank 2) harness connectors and remove harness clip.
9. Using the heated oxygen sensor wrench [SST: KV10114400] (C), remove air fuel ratio sensor 1 (bank 1 and bank 2).

A : Bank 2
B : Bank 1

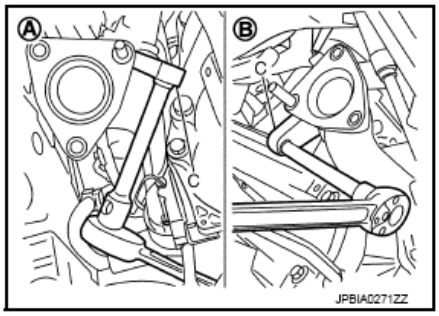

Fig. 48: Removing Air Fuel Ratio Sensor 1 (Bank 1 And Bank 2) Using Heated Oxygen Sensor Wrench
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION:
- **Never damage air fuel ratio sensor 1.**
- **Discard any 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; use a new one.**

10. Remove exhaust manifold cover (upper) (bank 1 and bank 2).
11. Loosen mounting nuts in the reverse order as shown in the figure to remove exhaust manifold.

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A : Bank 1
B : Bank 2
⇦ : Engine front

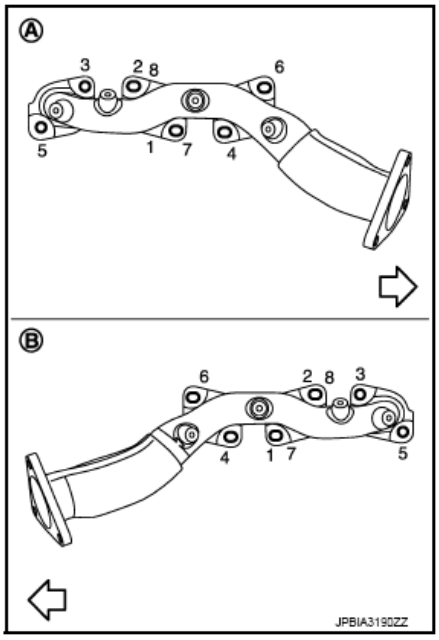

Fig. 49: Identifying Tightening Sequence Of Exhaust Manifold Cover Mounting Nuts
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: Disregard the numerical order No. 7 and 8 in removal.

12. Remove gaskets.

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

INSTALLATION

Note the following, and install in the reverse order of removal.

EXHAUST MANIFOLD GASKET

- Install exhaust manifold gasket in direction shown in the figure. (Follow the same procedure for both banks.)

A : Bank 1
B : Circle press
C : Bank 2
⇦ : Engine front

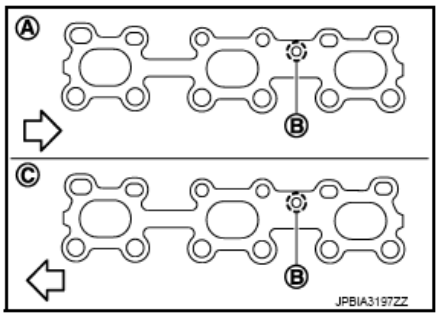

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Fig. 50: Identifying Exhaust Manifold Gasket Circle Press
Courtesy of NISSAN NORTH AMERICA, INC.

EXHAUST MANIFOLD

- If stud bolts were removed, install them and tighten to the torque specified below.

  Tightening torque: Refer to "EXPLODED VIEW".

- Install exhaust manifold and tighten mounting bolts in numerical order as shown in the figure.

A : Bank 1
B : Bank 2
⇦ : Engine front

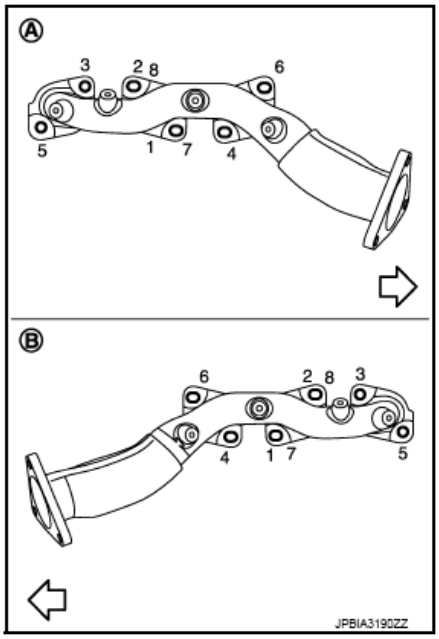

Fig. 51: Identifying Tightening Sequence Of Exhaust Manifold Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: Tighten nuts the No. 1 and 2 in two steps. The numerical order No. 7 and 8 shows the second step.

AIR FUEL RATIO SENSOR 1

CAUTION:

- **Before installing a new air fuel ratio sensor 1, clean exhaust system threads using heated oxygen sensor thread cleaner tool (commercial service tool) and apply anti-seize lubricant.**
- **Never over torque air fuel ratio sensor 1. Doing so may cause damage to air fuel ratio sensor 1, resulting in the "MI" coming on.**
- **Prevent rust preventives from adhering to the sensor body.**

Inspection

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INSPECTION AFTER REMOVAL

Surface Distortion

- Check the surface distortion of the exhaust manifold mating surface with a straightedge (A) and a feeler gauge (B).

  Limit: Refer to "EXHAUST MANIFOLD".

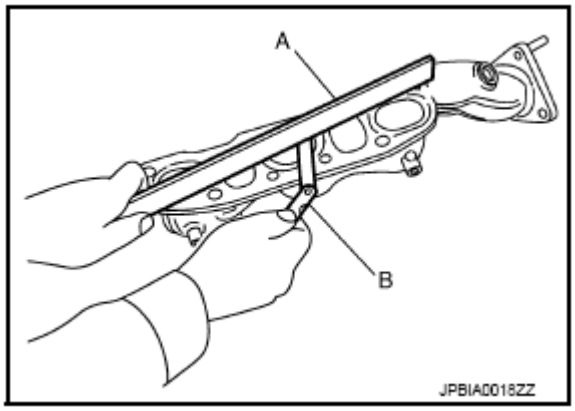

Fig. 52: Checking Surface Distortion Of Exhaust Manifold Mating Surface Using Straightedge And Feeler Gauge
Courtesy of NISSAN NORTH AMERICA, INC.

- If it exceeds the limit, replace exhaust manifold.

FUEL INJECTOR AND FUEL TUBE

Exploded View

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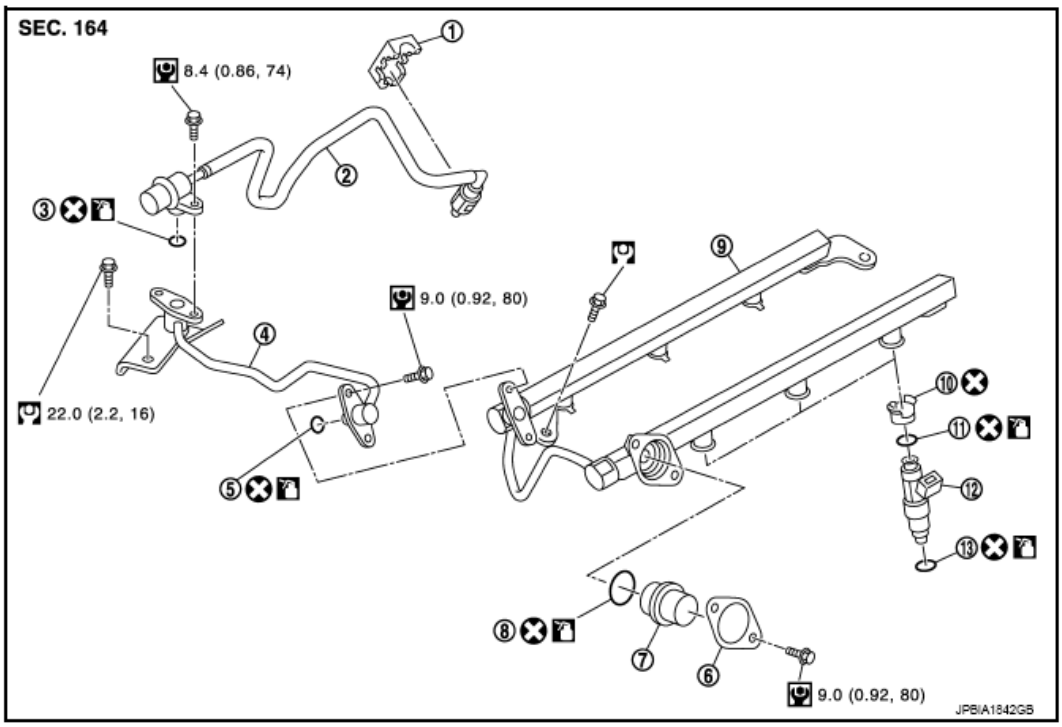
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Quick connector cap
2. Fuel feed hose (with damper)
3. O-ring
4. Fuel sub tube
5. O-ring
6. Fuel damper cap
7. Fuel damper
8. O-ring
9. Fuel tube
10. Clip
11. O-ring (black)
12. Fuel injector
13. O-ring (green)

Fig. 53: Exploded View Of Fuel Injector And Fuel Tube With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

CAUTION: Never remove or disassemble parts unless instructed as shown in the figure.

Removal and Installation

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.**

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- **Never smoke while servicing fuel system. Keep open flames and sparks away from the work area.**
- **Never drain engine coolant when the engine is hot to avoid the danger of being scalded.**

1. Release fuel pressure. Refer to "**INSPECTION** " (FOR USA AND CANADA) or "**INSPECTION** " (FOR MEXICO).
2. Disconnect battery cable from the negative terminal. Refer to "**EXPLODED VIEW** ".
3. Remove engine cover, using a power tool. Refer to "**EXPLODED VIEW**".
4. Remove air cleaner case and air duct (RH and LH). Refer to "**EXPLODED VIEW**".
5. Remove fuel feed hose (with damper) (1) from fuel sub-tube (2) and remove harness bracket (3).

⇦ : Engine front

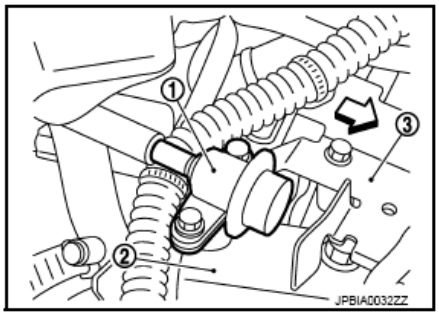

Fig. 54: Identifying Fuel Feed Hose (With Damper), Fuel Sub-Tube And Harness Bracket
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: **There is no fuel return route.**

CAUTION:
- **While hoses are disconnected, plug them to prevent fuel from draining.**
- **Never separate damper and hose.**

6. When separating fuel feed hose (with damper) and centralized under-floor piping connection, disconnect quick connector as follows:
   a. Remove quick connector cap (2) from quick connector connection on right member side.
   b. Disconnect fuel feed hose (with damper) (1) from bracket hose clamp.

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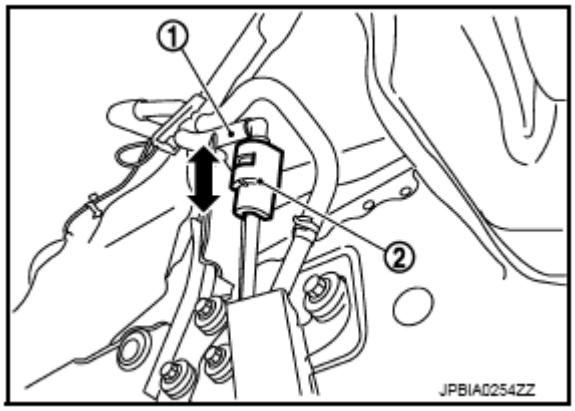

Fig. 55: Removing Right Member Side Quick Connector Cap From Quick Connector Connection
Courtesy of NISSAN NORTH AMERICA, INC.

c. Push in retainer tabs (2).
d. Draw and pull out quick connector (1) straight from centralized under-floor piping (3).

CAUTION:

- **Pull quick connector holding (A) position as shown in the figure.**
- **Never pull with lateral force applied. O-ring inside quick connector may be damaged.**
- **Prepare container and cloth beforehand because fuel will leak out.**
- **Avoid fire and sparks.**

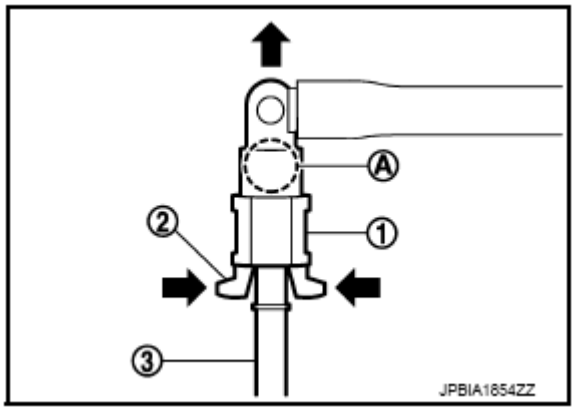

Fig. 56: Pulling Out Quick Connector
Courtesy of NISSAN NORTH AMERICA, INC.

- **Keep parts away from heat source. Especially, be careful when welding is performed around them.**
- **Never expose parts to battery electrolyte or other acids.**

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- **Never bend or twist connection between quick connector and fuel feed hose (with damper) during installation/removal.**
- **To keep the connecting portion clean and to avoid damage and foreign materials, cover them completely with plastic bags, etc. (A) or a similar item.**

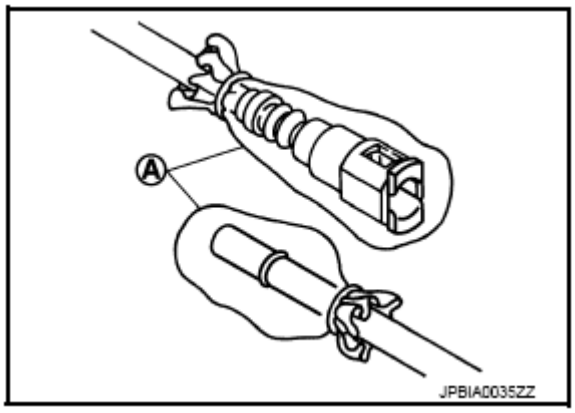

Fig. 57: Securing Quick Connector Using Plastic Bag
Courtesy of NISSAN NORTH AMERICA, INC.

7. Remove fuel sub tube mounting bolt.
8. Disconnect harness connector from fuel injector.
9. Loosen mounting bolts in reverse order as shown in the figure, and remove fuel tube and fuel injector assembly.

⇦ : Engine front

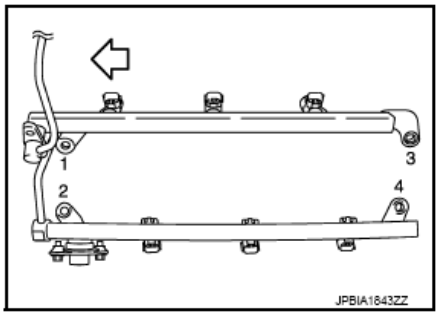

Fig. 58: Identifying Tightening Sequence Of Fuel Injector Assembly Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Never tilt fuel tube, or remaining fuel in pipes may flow out from pipes.

10. Remove fuel injector (2) from fuel tube (4) as follows:

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Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

3 : O-ring
A : Installed condition
B : Clip mounting groove

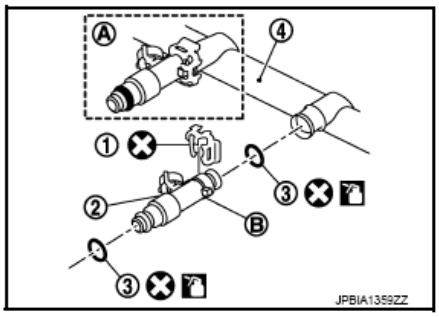

Fig. 59: Identifying Fuel Injector, Fuel Tube And O-Ring
Courtesy of NISSAN NORTH AMERICA, INC.

a. Open and remove clip (1).
b. Remove fuel injector from fuel tube by pulling straight.

CAUTION:
- **Be careful with remaining fuel that may go out from fuel tube.**
- **Never damage injector nozzles during removal.**
- **Never bump or drop fuel injector.**
- **Never disassemble fuel injector.**

11. Remove fuel sub-tube and fuel damper, if necessary.

INSTALLATION

CAUTION: Do not reuse O-rings.

1. Install fuel damper (4) as follows:

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Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

1 : Fuel tube
3 : Spacer
5 : Fuel damper cap

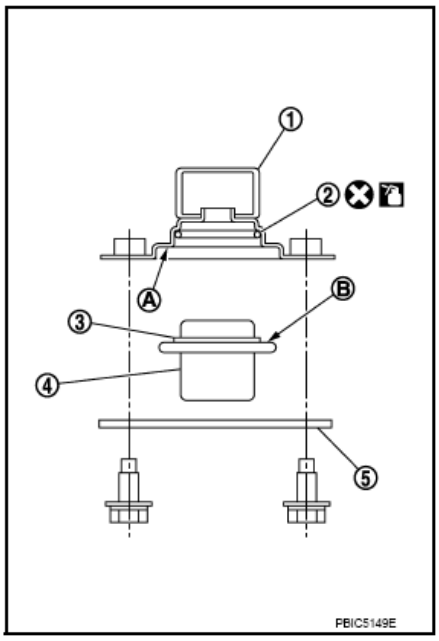

Fig. 60: Identifying Fuel Tube, Spacer, O-Ring, Fuel Damper And Cap
Courtesy of NISSAN NORTH AMERICA, INC.

a. Install new O-ring (2) to fuel tube as shown. When handling new O-ring, pay attention to the following caution items:

CAUTION:
- **Do not reuse O-rings.**
- **Handle O-ring with bare hands. Never wear gloves.**
- **Lubricate O-ring with new engine oil.**
- **Never 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. Never twist it.**

b. Install spacer to fuel damper.
c. Insert fuel damper straight into fuel tube.

CAUTION:
- **Insert straight, checking that the axis is lined up.**

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- **Never pressure-fit with excessive force.**

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

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

2. Install fuel sub-tube.
   - When handling new O-rings, be careful of the following caution items:

CAUTION:

- **Handle O-ring with bare hands. Never wear gloves.**
- **Lubricate O-ring with new engine oil.**
- **Never 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, never insert it quickly into fuel tube.**
- **Insert new O-ring straight into fuel tube. Never decenter or twist it.**

   - Insert fuel sub-tube straight into fuel tube.
   - Tighten mounting bolts evenly in turn.
   - After tightening mounting bolts, check that there is no gap between flange and fuel tube.
3. Install new O-rings to fuel injector, paying attention to the following items.

CAUTION:

- **Upper and lower O-ring are different. Be careful not to confuse them.**

  Fuel tube side: Black

  Nozzle side: Green

- **Handle O-ring with bare hands. Never wear gloves.**
- **Lubricate O-ring with new engine oil.**
- **Never 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, never insert it quickly into fuel tube.**

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- **Insert O-ring straight into fuel injector. Never decenter or twist it.**

4. Install fuel injector to fuel tube as follows:

Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

2 : O-ring (Black)
4 : O-ring (Green)

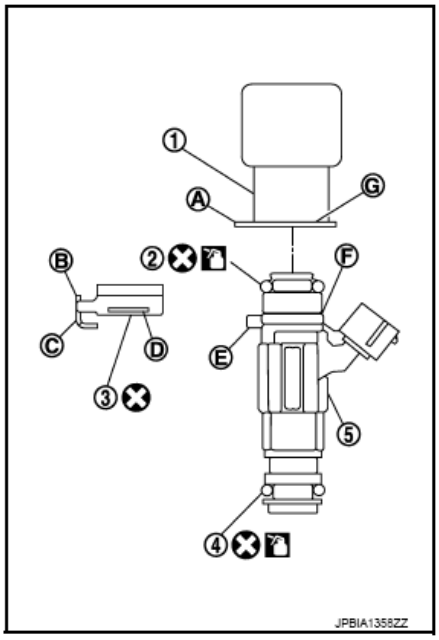

Fig. 61: Identifying Fuel Injector, Clip, Mounting Groove And O-Ring
Courtesy of NISSAN NORTH AMERICA, INC.

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

CAUTION:
- **Never reuse clip. Replace it with a new one.**
- **Be careful to keep clip from interfering with O-ring. If interference occurs, replace O-ring.**
- **Insert clip so that protrusion (E) of fuel injector matches cut-out (C) of clip.**

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 tube are aligned with cutouts of clips after

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installation.

5. Install fuel tube and fuel injector assembly to intake manifold.

CAUTION: Never let tip of injector nozzle come in contact with other parts.

- Tighten mounting bolts in two steps in numerical order as shown in the figure.

⇦ : Engine front

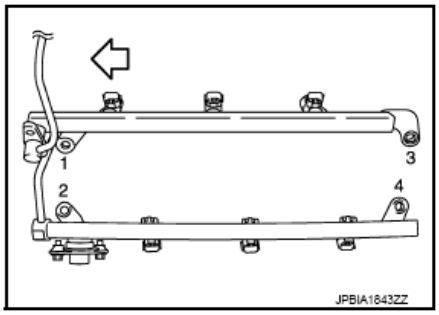

Fig. 62: Identifying Tightening Sequence Of Fuel Tube And Fuel Injector Assembly
Courtesy of NISSAN NORTH AMERICA, INC.

1st step: 10.1 N.m (1.0 kg-m, 7 ft-lb)

2nd step: 23.6 N.m (2.4 kg-m, 17 ft-lb)

6. Connect injector sub-harness.
7. Install fuel sub tube mounting bolt.
8. Connect fuel feed hose (with damper).
   - Handling procedure of O-ring is the same as that of fuel damper and fuel sub-tube.
   - Insert fuel damper straight into fuel sub-tube.
   - Tighten mounting bolts evenly in turn.
   - After tightening mounting bolts, check that there is no gap between flange and fuel sub-tube.
9. Connect quick connector between fuel feed hose (with damper) and centralized under-floor piping connection as follows:
   a. Check that no foreign substances are deposited in and around centralized under-floor piping and quick connector, and that there is no damage to them.
   b. Thinly apply new engine oil around centralized under-floor piping from tip end to spool end.
   c. Align center to insert quick connector straightly into centralized under-floor piping.
      - Insert quick connector to centralized under-floor piping until top spool is completely inside quick connector and 2nd level spool exposes right below quick connector.

CAUTION:
- **Hold align center to avoid inclined insertion to prevent damage to O-ring inside quick connector.**

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- **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 (A). Check it is completely engaged (connected) so that it does not come out from centralized under-floor piping (1).

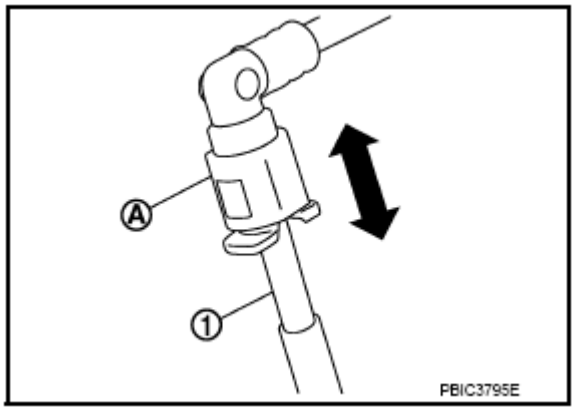

Fig. 63: Pulling Quick Connector From Centralized Under-Floor Piping
Courtesy of NISSAN NORTH AMERICA, INC.

e. Install quick connector cap (3) to quick connector connection.
   - 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 the connection again.

10. Install in the reverse order of removal after this step.

1 : Centralized under-floor piping
2 : Fuel feed hose
B : Under view

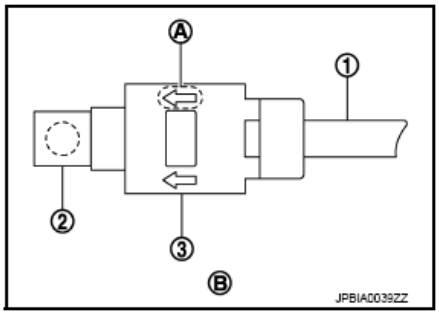

Fig. 64: Identifying Quick Connector Cap, Centralized Under-Floor Piping And Fuel Feed Hose
Courtesy of NISSAN NORTH AMERICA, INC.

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Inspection

INSPECTION AFTER INSTALLATION

Check for Fuel Leakage

1. Turn ignition switch "ON" (with the engine stopped). With fuel pressure applied to fuel piping, check that there is no fuel leakage at connection points.

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

2. Start the engine. With engine speed increased, check that again that there is no fuel leakage at connection points.

CAUTION: Never touch the engine immediately after it is stopped because the engine is extremely hot.

OIL PAN (LOWER)

Exploded View

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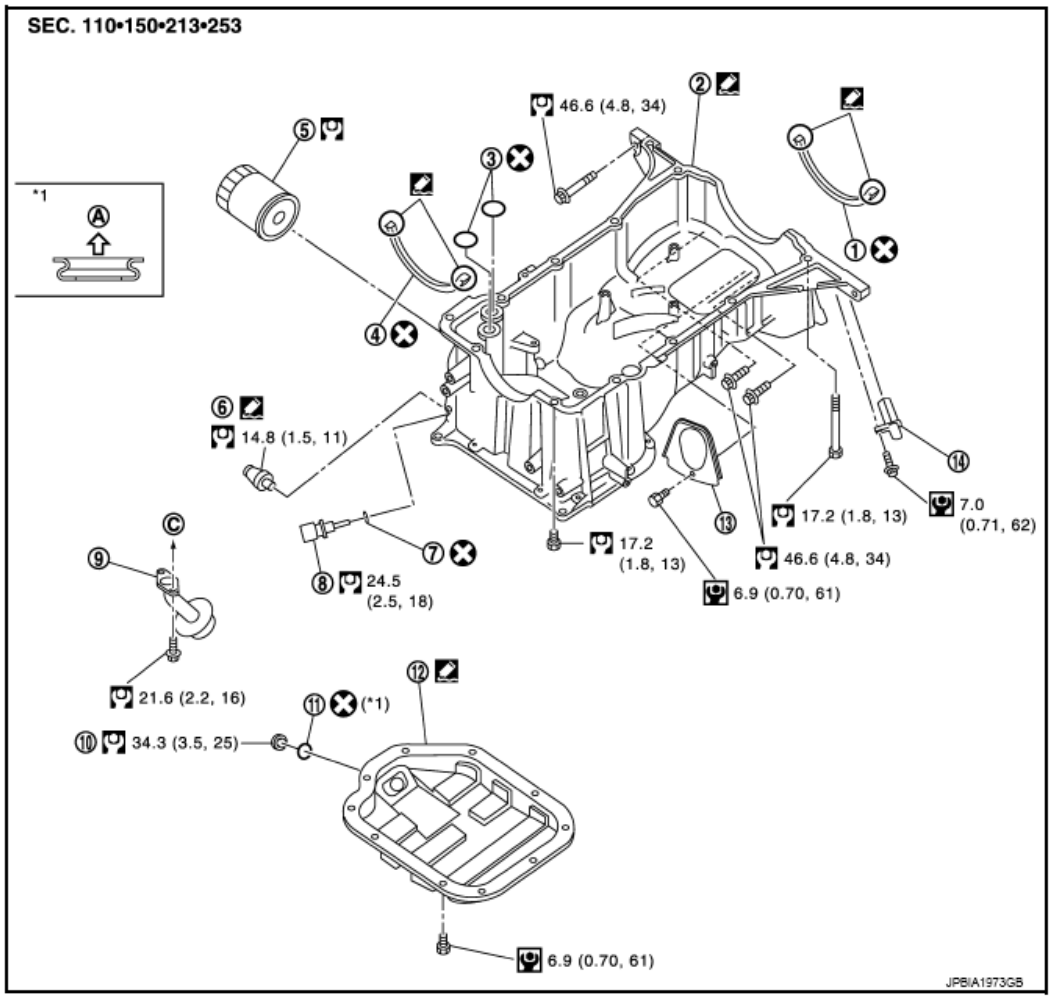
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Oil pan gasket (rear)
2. Oil pan (upper)
3. O-ring
4. Oil pan gasket (front)
5. Oil filter
6. Oil pressure switch
7. Washer
8. Oil temperature sensor
9. Oil strainer
10. Drain plug
11. Drain plug washer
12. Oil pan (lower)
13. Rear plate cover
14. Crank shaft position sensor
A. Oil pan lower side

Fig. 65: Exploded View Of Lower Oil Pan With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

NOTE: The above figure shows 2WD models.

Removal and Installation

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REMOVAL

CAUTION: Never drain engine oil when the engine is hot to avoid the danger of being scalded.

1. Remove engine undercover, using a power tool.
2. Drain engine oil.
3. Remove oil pan (lower) as follows:
   a. Loosen mounting bolts in reverse order as shown in the figure to remove.

⇦ : Engine front

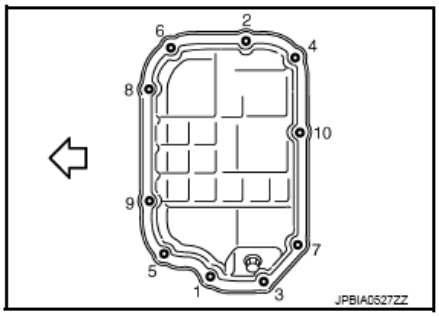

Fig. 66: Identifying Tightening Sequence Of Lower Oil Pan Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

   b. Insert the seal cutter [SST: KV10111100] (A) between oil pan (upper) and oil pan (lower).

CAUTION:
- **Never damage the mating surfaces.**
- **Never insert a screwdriver. This damages the mating surfaces.**

   c. Slide the seal cutter by tapping on the side of tool with a hammer. Remove oil pan (lower).

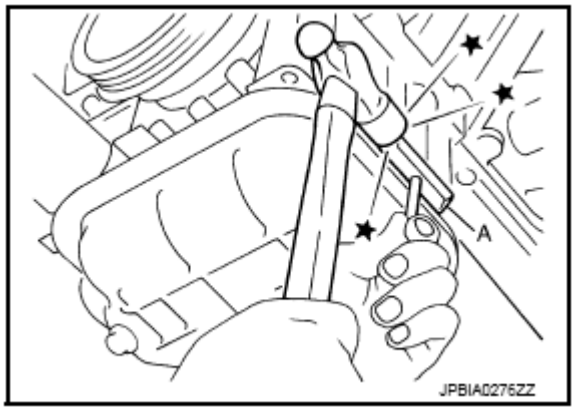

Fig. 67: Sliding Seal Cutter Using Hammer
Courtesy of NISSAN NORTH AMERICA, INC.

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INSTALLATION

CAUTION: Do not reuse drain plug washer.

1. Install oil pan (lower) as follows:
   a. Use scraper (A) to remove old liquid gasket from mating surfaces.
      - Remove old liquid gasket from the bolt holes and thread.

CAUTION: Never scratch or damage the mating surfaces when cleaning off old liquid gasket.

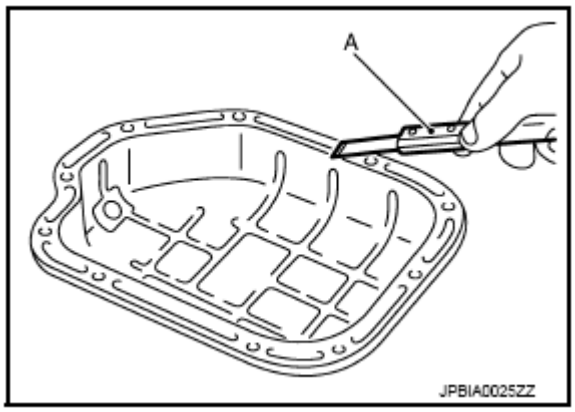

Fig. 68: Removing Old Liquid Gasket From Mating Surfaces Using Scraper
Courtesy of NISSAN NORTH AMERICA, INC.

   b. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) (A) to the oil pan (lower) as shown in the figure.

b: -4.0 - 5.0 mm (0.157 - 0.197 in)

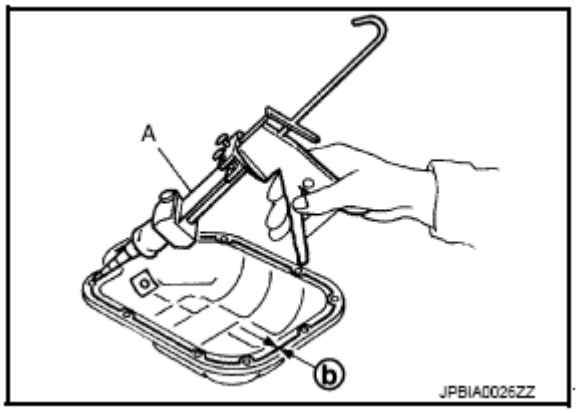

Fig. 69: Applying Continuous Bead Of Liquid Gasket Using Tube Presser

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Courtesy of NISSAN NORTH AMERICA, INC.

Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS ".

CAUTION: Attaching should be done within 5 minutes after coating.

c. Install oil pan (lower).
   - Tighten mounting bolts in numerical order as shown in the figure.

⇦ : Engine front

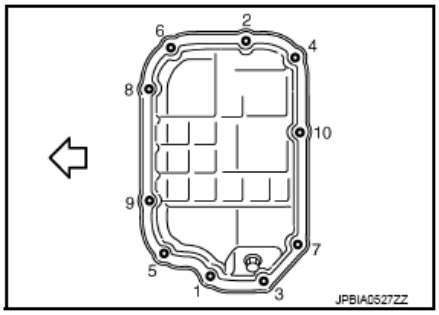

Fig. 70: Identifying Tightening Sequence Of Lower Oil Pan Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

2. Install oil pan drain plug.

CAUTION: Do not reuse drain plug washer.

   - Refer to **EXPLODED VIEW** of the components for installation direction of drain plug washer.
3. Install in the reverse order of removal after this step.

NOTE: Wait at least 30 minutes after oil pan is installed before pouring engine oil.

Inspection

INSPECTION AFTER REMOVAL

Clean oil strainer if any object is attached.

INSPECTION AFTER INSTALLATION

1. Check the engine oil level and adjust engine oil. Refer to "**INSPECTION** ".
2. Start engine, and check there is no leakage of engine oil.
3. Stop engine and wait for 10 minutes.

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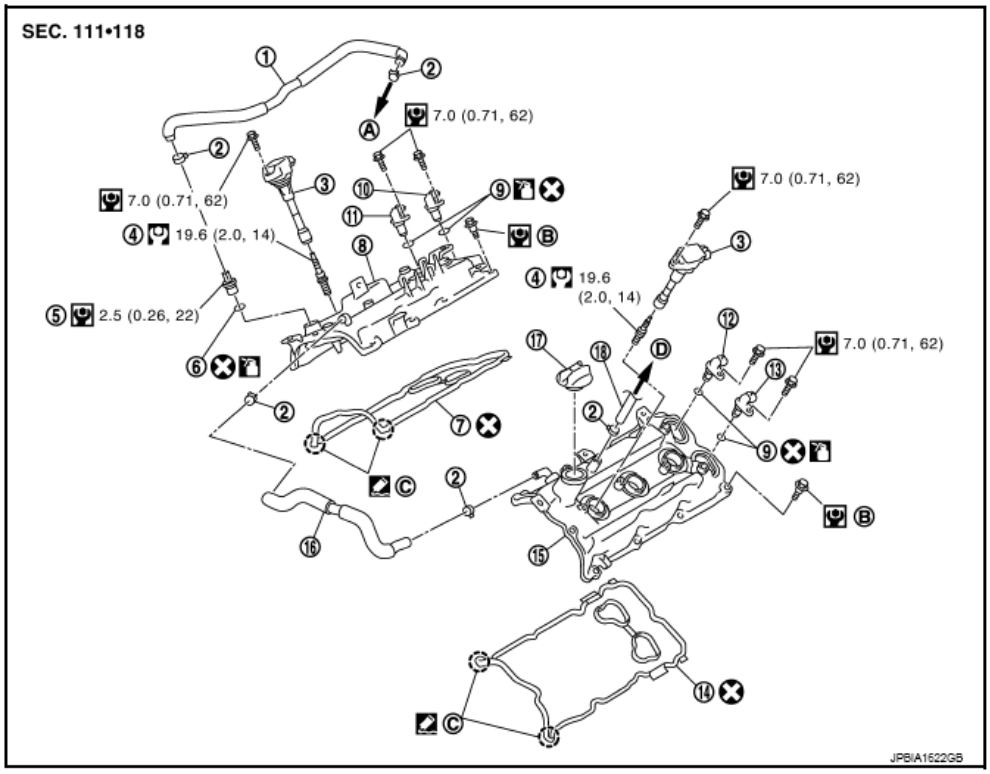
4. Check the engine oil level again. Refer to "**INSPECTION** ".

IGNITION COIL, SPARK PLUG AND ROCKER COVER

Exploded View

Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1.	PCV hose	2.	Clamp	3.	Ignition coil
4.	Spark plug	5.	PCV valve	6.	O-ring
7.	Rocker cover gasket (bank 1)	8.	Rocker cover (bank 1)	9.	O-ring
10.	Camshaft position sensor (PHAGE) (bank 1)	11.	Exhaust valve timing control position sensor (bank 1)	12.	Camshaft position sensor (PHAGE) (bank 1)
13.	Exhaust valve timing control position sensor (bank 2)	14.	Rocker cover gasket (bank 2)	15.	Rocker cover (bank 2)
16.	PCV hose	17.	Oil filler cap	18.	PCV hose
A.	To intake manifold collector	B.	Comply with the installation procedure when tightening.	C.	Camshaft bracket side
D.	To air duct				

Fig. 71: Exploded View Of Ignition Coil, Spark Plug And Rocker Cover With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

Removal and Installation

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REMOVAL

1. Remove engine cover. Refer to "**EXPLODED VIEW**".
2. Remove air cleaner case and air duct (RH and LH). Refer to "**EXPLODED VIEW**".
3. Remove intake manifold collector. Refer to "**EXPLODED VIEW**".
4. Disconnect PCV hose from rocker cover.
5. Remove PCV valve and O-ring from rocker cover, if necessary.
6. Remove camshaft position sensor and exhaust valve timing control position sensor.
7. Remove oil filler cap from rocker cover, if necessary.
8. Remove ignition coil.

CAUTION: Never shock ignition coil.

9. Loosen bolts in reverse order shown in the figure.

⇦ : Engine front

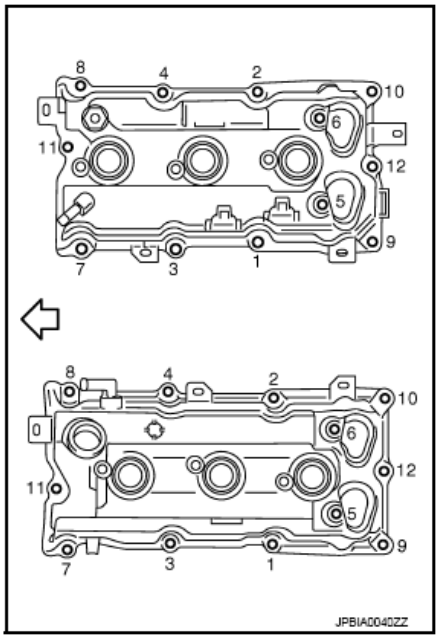

Fig. 72: Identifying Tightening Sequence Of Engine Cover Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

10. Remove rocker cover gasket from rocker cover.

INSTALLATION

1. Apply liquid gasket to the position shown in the figure with the following procedure:

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A : Liquid gasket application point
F : View F
I : End surface of VVEL ladder assembly
b : 4 mm (0.16 in)
c : ϕ2.5 - 3.5 mm (0.098 - 0.138 in)
d : 5 mm (0.20 in)
g : 10 mm (0.39 in)
⇦ : Engine front

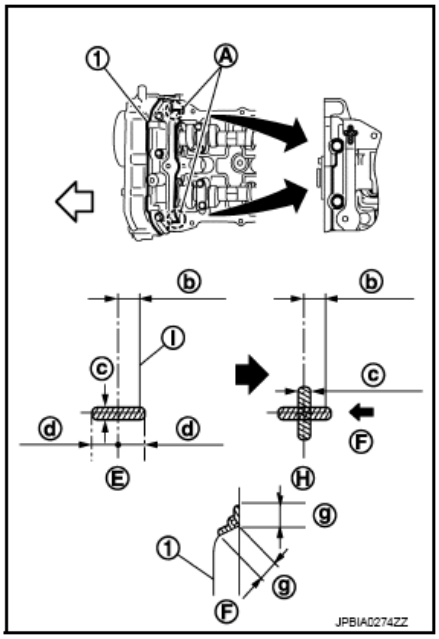

Fig. 73: Identifying Liquid Gasket Applying Areas
Courtesy of NISSAN NORTH AMERICA, INC.

Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS ".

a. Refer to figure (E) to apply liquid gasket to joint part of camshaft bracket (No. 1) (1) and cylinder head.
b. Refer to figure (H) to apply liquid gasket in 90 degrees to figure.

2. Install rocker cover gasket to rocker cover.
3. Install rocker cover.
   - Check that rocker cover gasket does not drop from the installation groove of rocker cover.
4. Tighten bolts in two steps separately in numerical order as shown in the figure.

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⇦ : Engine front

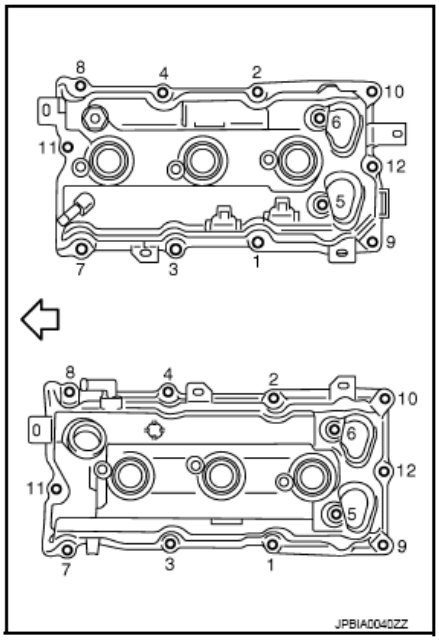

Fig. 74: Identifying Tightening Sequence Of Rocker Cover Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

1st step: 2.0 N.m (0.2 kg-m, 18 in-lb)

2nd step: 8.3 N.m (0.85 kg-m, 73 in-lb)

5. Install in the reverse order of removal after this step.

TIMING CHAIN

Exploded View

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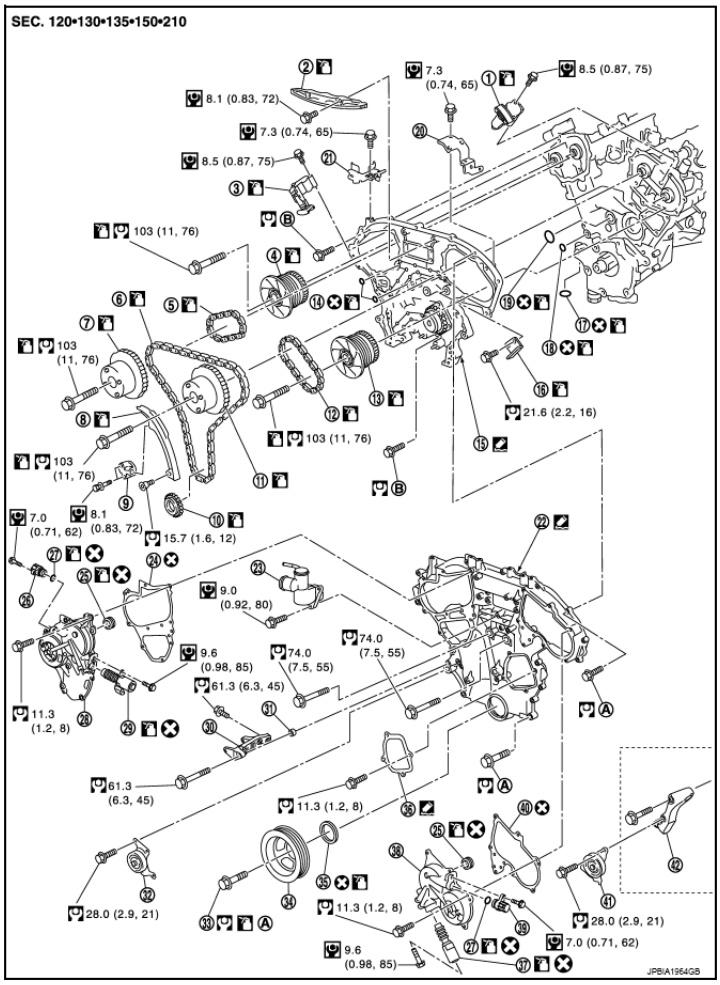
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Timing chain tensioner (secondary)	2. Internal chain guide	3. Timing chain tensioner (secondary)
4. Camshaft sprocket (EXH)	5. Timing chain (secondary)	6. Timing chain (primary)
7. Camshaft sprocket (INT)	8. Slack guide	9. Timing chain tensioner (primary)
10. Crankshaft sprocket	11. Camshaft sprocket (INT)	12. Timing chain (secondary)
13. Camshaft sprocket (EXH)	14. O-ring	15. Rear timing chain case
16. Tension guide	17. O-ring	18. O-ring
19. O-ring	20. Bracket	21. Bracket
22. Front timing chain case	23. Water outlet (front)	24. Valve timing control cover gasket (bank 1)
25. Seal ring	26. Exhaust valve timing control magnet retarder (bank 1)	27. O-ring
28. Valve timing control cover (bank 1)	29. Intake valve timing control solenoid valve (bank 1)	30. Power steering oil pump bracket
31. Collar	32. Idler pulley	33. Crankshaft pulley bolt
34. Crankshaft pulley	35. Front oil seal	36. Water pump cover
37. Intake valve timing control solenoid valve (bank 2)	38. Valve timing control cover (bank 2)	39. Exhaust valve timing control magnet retarder (bank 2)
40. Valve timing control cover gasket (bank 2)	41. Idler pulley assembly	42. A/C compressor bracket
A. Comply with the installation procedure when tightening.	B. Comply with the assembly procedure when tightening.	

Fig. 75: Exploded View Of Timing Chain With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

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Removal and Installation

REMOVAL

1. Release the fuel pressure. Refer to "**INSPECTION** " (FOR USA AND CANADA) or "**INSPECTION** " (FOR MEXICO).
2. Disconnect the battery cable from the negative terminal.
3. Remove engine cover, using a power tool. Refer to "**EXPLODED VIEW**".
4. Remove radiator reservoir tank. Refer to "**EXPLODED VIEW** ".
5. Remove air duct and air cleaner case assembly (RH and LH). Refer to "**EXPLODED VIEW**".
6. Remove engine undercover, using a power tool.
7. Drain engine coolant from radiator. Refer to "**DRAINING** ".

CAUTION:
- **Perform this step when the engine is cold.**
- **Never spill engine coolant on drive belt.**

8. Remove radiator hose (upper and lower). Refer to "**EXPLODED VIEW** ".
9. Drain engine oil. Refer to "**DRAINING** ".

CAUTION:
- **Perform this step when the engine is cold.**
- **Never spill engine oil on drive belt.**

10. Remove drive belt. Refer to "**REMOVAL AND INSTALLATION**".
11. Remove radiator cooling fan assembly. Refer to "**EXPLODED VIEW** ".
12. Separate engine harnesses removing their brackets from front timing chain case.
13. Remove intake manifold collector. Refer to "**EXPLODED VIEW**".
14. Remove intake manifold. Refer to "**EXPLODED VIEW**".
15. Remove fuel sub tube mounting bolt. Refer to "**EXPLODED VIEW**".
16. Remove oil level gauge and oil level gauge guide.
17. Remove A/C compressor from bracket with piping connected, and temporarily secure it aside. Refer to "**EXPLODED VIEW** ".
18. Remove power steering oil pump from bracket with piping connected, and temporarily secure it aside. Refer to "**EXCEPT FOR SPORT MODELS (VQ37VHR): EXPLODED VIEW** " (Except for SPORT models).
19. Remove power steering oil pump bracket. Refer to "**EXPLODED VIEW**".
20. Remove idler pulley and bracket.
21. Remove alternator and alternator bracket. Refer to "**VQ25HR: EXPLODED VIEW** ".
22. Remove water outlet (front) and water piping. Refer to "**VQ25HR: EXPLODED VIEW** ".
23. Remove valve timing control covers (bank 1 and bank 2) and gasket as follows:
    a. Disconnect valve timing control harness connector.

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b. Loosen mounting bolts in reverse order as shown in the figure.

A : Bank 1
B : Bank 2
C : Dowel pin hole

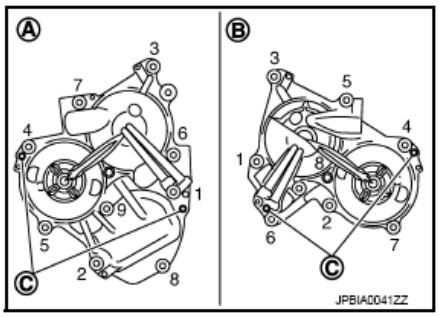

Fig. 76: Identifying Tightening Sequence Of Valve Timing Control Cover Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Shaft is internally jointed with camshaft sprocket (INT) center hole. When removing, keep it horizontal until it is completely disconnected.

c. Shaft is engaged with intake side camshaft sprocket center hole on inside. pull straight out so as not to tilt until the joint is disengaged.
   - The mating surface of magnet retarder (2) may be fitted with the exhaust side camshaft sprocket via the engine oil. Open valve timing control cover (1) carefully
   - If the mating surface of magnet retarder is fitted with the camshaft sprocket, open the cover within the range that the load is not applied to the harness. And then, remove it so as to prevent magnet retarder from dropping.

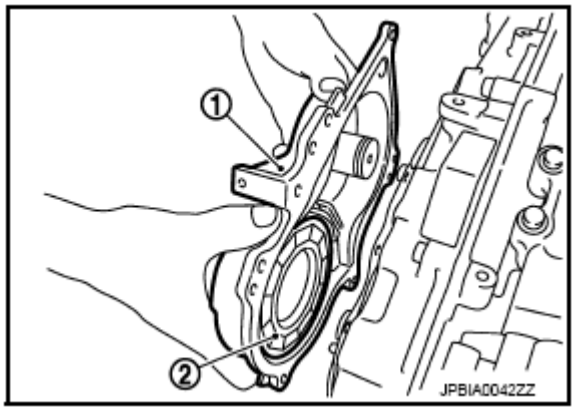

Fig. 77: Identifying Valve Timing Control Cover And Magnet Retarder
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION:
- **Never damage magnet retarder.**
- **When carrying valve timing control cover, face the magnet retarder side up to prevent the cover from falling from magnet retarder.**

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- **Never remove magnet retarder from valve timing control cover. (Disassembly prohibited parts)**

24. Remove rocker covers (bank 1 and bank 2). Refer to "**EXPLODED VIEW**".
25. Obtain No. 1 cylinder at TDC of its compression stroke as follows:
    a. Rotate crankshaft pulley clockwise to align timing mark (grooved line without color) with timing indicator.

⬅ : Timing mark (grooved line without color)

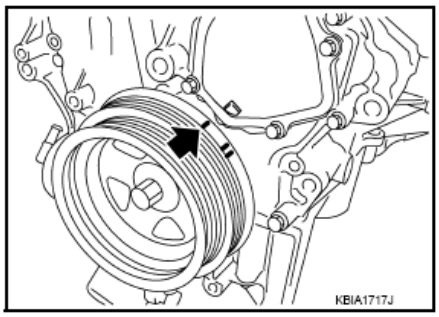

Fig. 78: Aligning Timing Mark (Grooved Line Without Color) With Timing Indicator
Courtesy of NISSAN NORTH AMERICA, INC.

    b. Check that intake and exhaust cam noses on No. 1 cylinder (engine front side of bank 1) are located as shown in the+ figure.

⇦ : Engine front

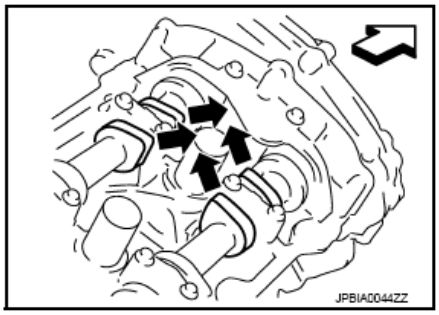

Fig. 79: Locating Intake And Exhaust Cam Nose Position On No. 1 Cylinder
Courtesy of NISSAN NORTH AMERICA, INC.

- If not, turn crankshaft one revolution (360 degrees) and align as shown in the figure.

26. Remove crankshaft pulley as follows:
    a. Remove rear cover plate and set the ring gear stopper [SST: KV10118700] (A) as shown in the figure.

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1 : Oil pan (upper)
2 : Steering gear linkage
⇦ : Vehicle front

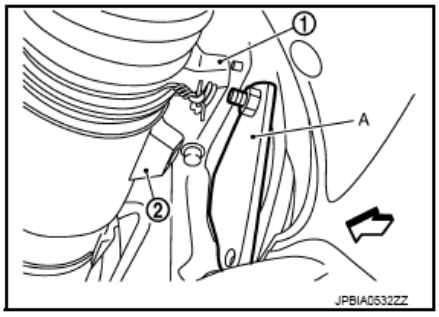

Fig. 80: Removing Rear Cover Plate Using Tool
Courtesy of NISSAN NORTH AMERICA, INC.

b. Loosen crankshaft pulley bolt and rotate bolt seating surface at 10 mm (0.39 in) from its original position.

1 : Crankshaft pulley

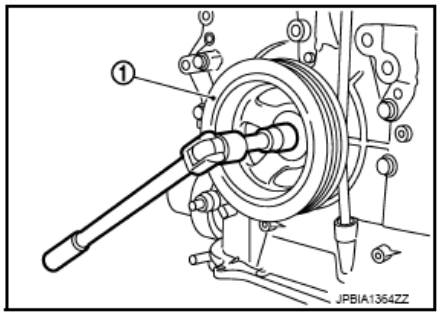

Fig. 81: Loosening Crankshaft Pulley Bolt
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Never remove crankshaft pulley bolt as it will be used as a supporting point for suitable puller.

c. Place suitable puller tab on holes of crankshaft pulley, and pull crankshaft pulley through.

CAUTION: Never put suitable puller tab on crankshaft pulley periphery, as this will damage internal damper.

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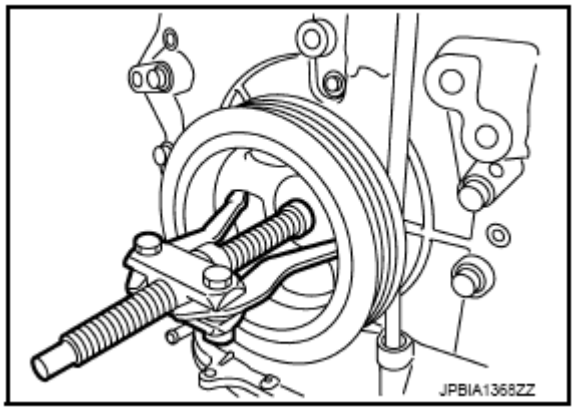

Fig. 82: Pulling Crankshaft Pulley Using Puller
Courtesy of NISSAN NORTH AMERICA, INC.

27. Remove oil pan (lower). Refer to "**EXPLODED VIEW**".
28. Loosen two mounting bolts in front of oil pan (upper) with power tool in reverse order as shown in the figure.

⇦ : Engine front

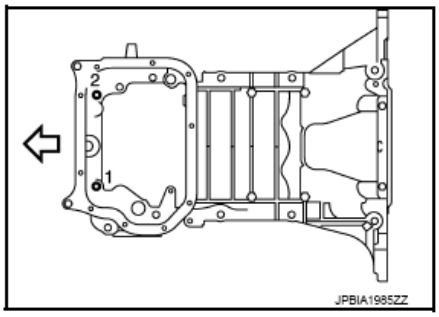

Fig. 83: Identifying Tightening Sequence Of Lower Oil Pan Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

29. Remove front timing chain case as follows:
    a. Loosen mounting bolts in reverse order as shown in the figure.

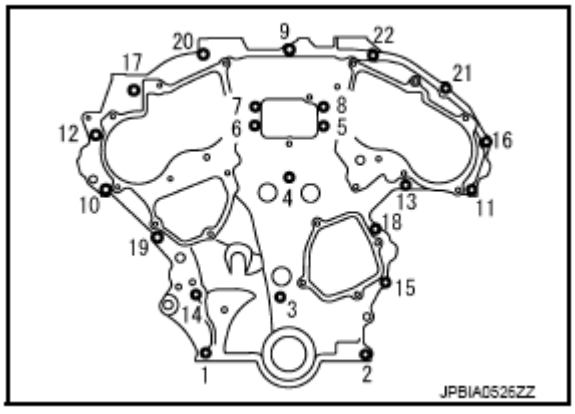

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Fig. 84: Identifying Tightening Sequence Of Front Timing Chain Case Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

b. Insert a suitable tool (A) into the notch at the top of front timing chain case as shown.
c. Pry off case by moving the suitable tool as shown.
   - Use the seal cutter [SST: KV10111100] to cut liquid gasket for removal.

CAUTION:
- **Never use a screwdriver or something similar.**
- **After removal, handle front timing chain case carefully so it does not tilt, cant, or warp under a load.**

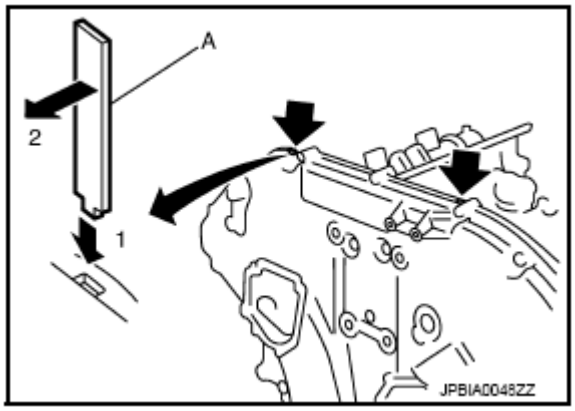

Fig. 85: Prying Off Front Timing Chain Case Using Tool
Courtesy of NISSAN NORTH AMERICA, INC.

30. Remove water pump cover (1) from front timing chain case.

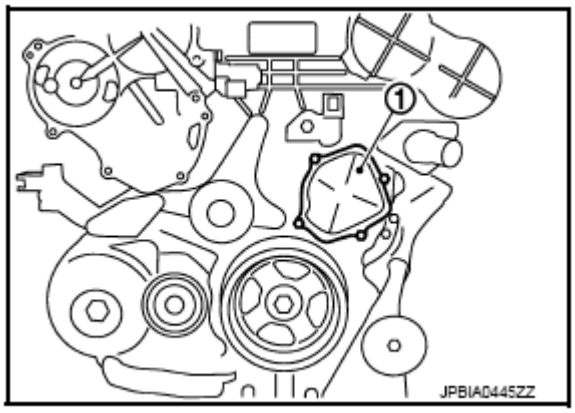

Fig. 86: Identifying Water Pump Cover
Courtesy of NISSAN NORTH AMERICA, INC.

31. Remove front oil seal from front timing chain case using a suitable tool.
   - Use a screwdriver for removal.

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CAUTION: Never damage front timing chain case.

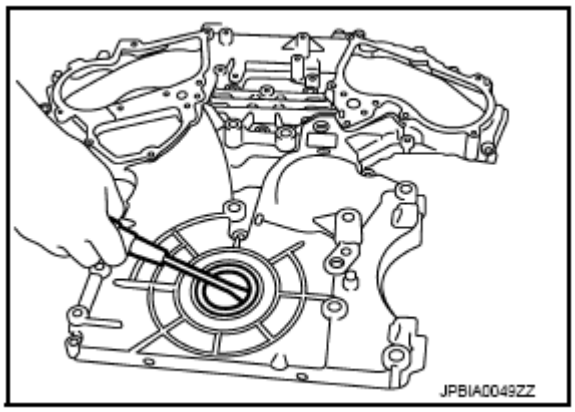

Fig. 87: Removing Front Oil Seal From Front Timing Chain Case Using Tool
Courtesy of NISSAN NORTH AMERICA, INC.

32. Remove timing chain tensioner (primary) as follows:
    a. Remove lower mounting bolt (A).
    b. Loosen upper mounting bolt (B) slowly, and then turn timing chain tensioner (primary) (1) on the upper mounting bolt so that plunger (C) is fully expanded.

    NOTE: Even if plunger is fully expanded, it is not dropped from the body of timing chain tensioner (primary).

    c. Remove upper mounting bolt, and then remove timing chain tensioner (primary).

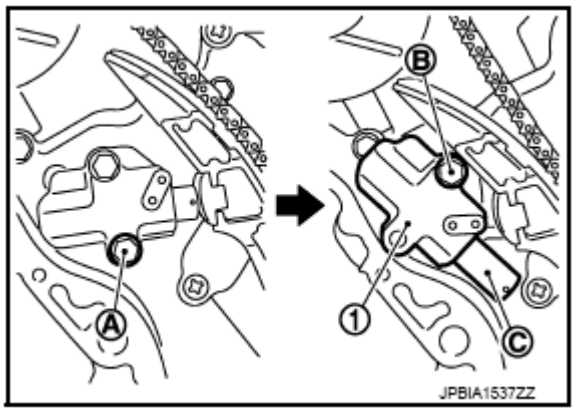

Fig. 88: Identifying Timing Chain Tensioner, Plunger, Lower And Upper Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

33. Remove internal guide, tension guide and slack guide.

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1 : Internal chain guide
2 : slack guide
3 Tension guide

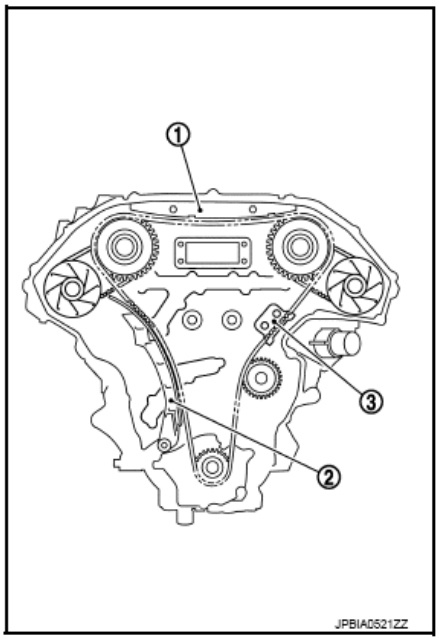

Fig. 89: Identifying Internal Chain Guide, Tension Guide And Slack Guide
Courtesy of NISSAN NORTH AMERICA, INC.

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

CAUTION: After removing timing chain tensioner (primary), never turn crankshaft and camshaft separately, or valves will strike the piston heads.

35. Remove timing chain (secondary) and camshaft sprockets as follows:
    a. Attach suitable stopper pin (2) to the timing chain tensioners (secondary) (1).

A : Bank 1
B : Bank 2

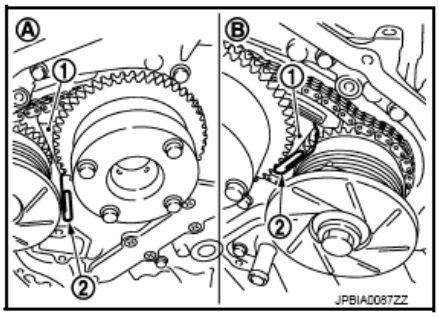

Fig. 90: Removing Timing Chain (Secondary) And Camshaft Sprockets
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE:

- **Use approximately 0.5 mm (0.02 in) dia. hard metal pin as a stopper pin.**
- **For removal of timing chain tensioners (secondary), refer to**

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"EXPLODED VIEW". [Removing camshaft bracket (No. 1) is required.]

b. Remove camshaft sprocket mounting bolts (INT and EXH).
   - Secure the hexagonal portion of camshaft using a wrench to loosen mounting bolts.

c. Remove timing chain (secondary) together with camshaft sprockets.

CAUTION:

- **Never loosen the mounting bolts with securing anything other than the camshaft hexagonal portion or with tensioning the timing chain.**

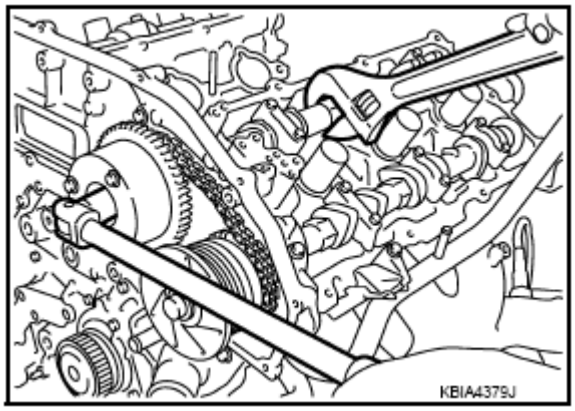

Fig. 91: Removing Timing Chain (Secondary) Using Camshaft Sprockets
Courtesy of NISSAN NORTH AMERICA, INC.

- **Never disassemble. [Never loosen bolts (A) and (B) as shown in the figure.]**

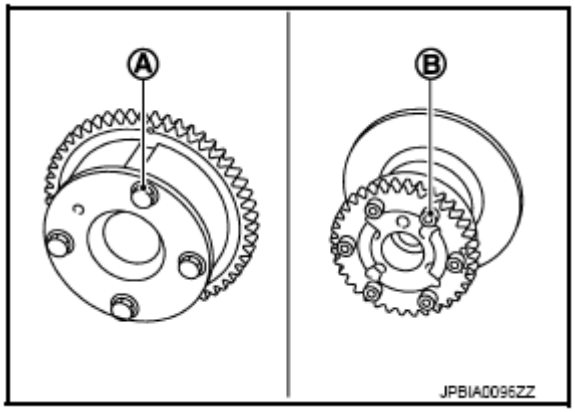

Fig. 92: Identifying Secondary Timing Chain Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

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36. Remove timing chain tensioners (secondary) from cylinder head as follows, if necessary.
    a. Remove camshaft brackets (No. 1). Refer to "**EXPLODED VIEW**".
    b. Remove timing chain tensioners (secondary) with a stopper pin attached.
37. Use a scraper to remove all traces of old liquid gasket from front and rear timing chain cases and oil pan (upper), and liquid gasket mating surfaces.

CAUTION: Never allow gasket fragments to enter oil pan.

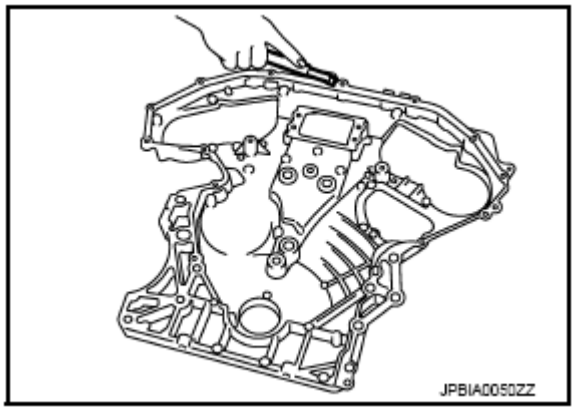

Fig. 93: Removing Traces Of Liquid Gasket Using Scraper
Courtesy of NISSAN NORTH AMERICA, INC.

38. Remove old liquid gasket from bolt hole and thread.

A : Remove sticking old liquid gasket
B : Bolt hole

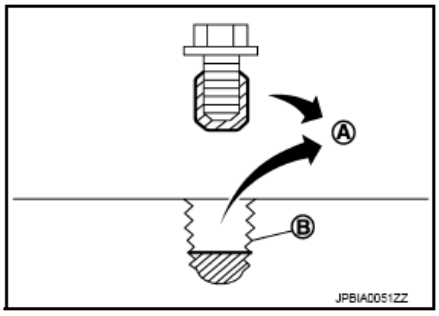

Fig. 94: Removing Liquid Gasket From Bolt Hole And Thread
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

NOTE: The below figure shows the relationship between the matching mark on each timing chain and that on the corresponding sprocket, with the components installed.

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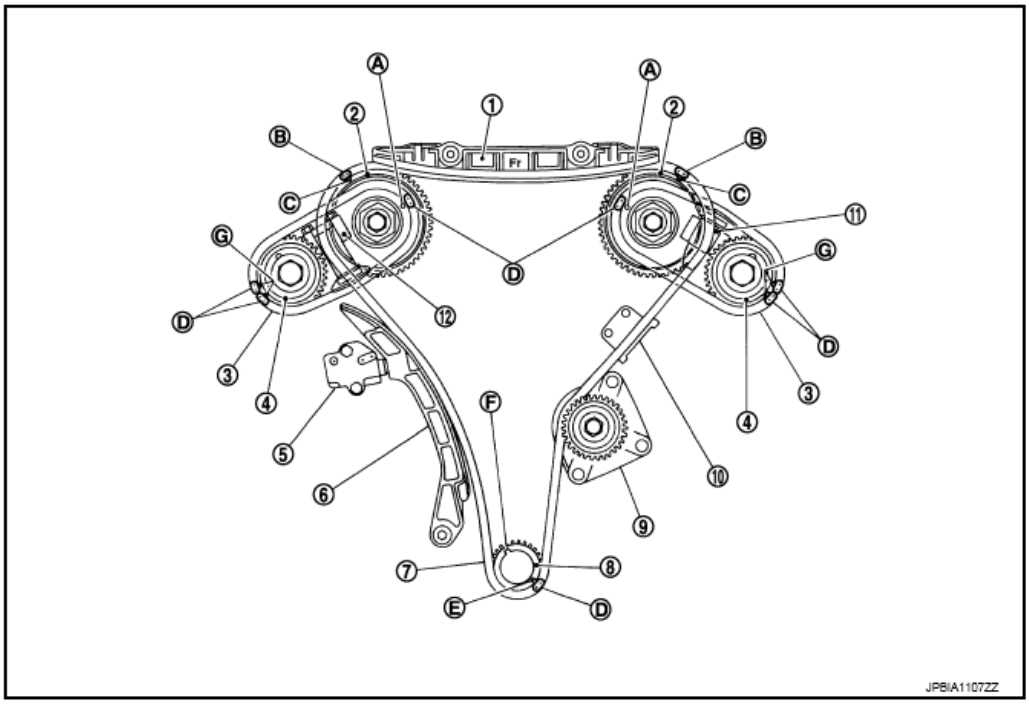

1.	Internal chain guide	2.	Camshaft sprocket (INT)	3.	Timing chain (secondary)
4.	Camshaft sprocket (EXH)	5.	Timing chain tensioner (primary)	6.	Slack guide
7.	Timing chain (primary)	8.	Crankshaft sprocket	9.	Water pump
10.	Tension guide	11.	Timing chain tensioner (secondary) (bank 2)	12.	Timing chain tensioner (secondary) (bank 1)
A.	Matching mark [punched (back side)]	B.	Matching mark (pink link)	C.	Matching mark (punched)
D.	Matching mark (orange link)	E.	Matching mark (notched)	F.	Crankshaft key
G.	Matching mark [punched (back side)]				

Fig. 95: Identifying Timing Chain And Related Components
Courtesy of NISSAN NORTH AMERICA, INC.

1. Install timing chain tensioners (secondary) to cylinder head as follows if removed. Refer to "**EXPLODED VIEW**".
2. Install tension duide(3).

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1 : Internal chain guide
2 : Slack guide

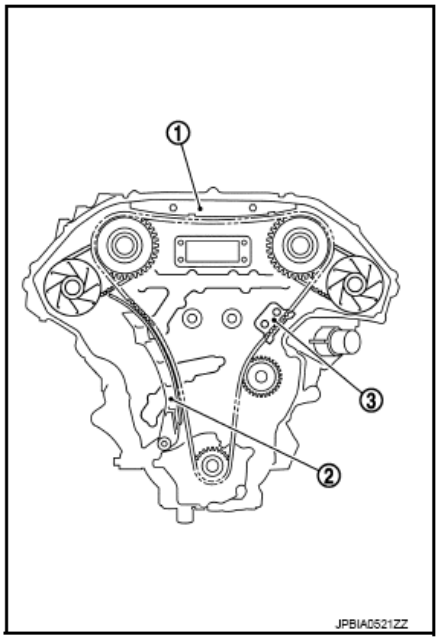

Fig. 96: Identifying Tension Duide, Internal Chain Guide And Slack Guide
Courtesy of NISSAN NORTH AMERICA, INC.

3. Check that dowel pin (A) and crankshaft key (1) are located as shown in the figure. (No. 1 cylinder at compression TDC)

NOTE: Though camshaft does not stop at the position as shown in the figure, for the placement of cam noses, it is generally accepted camshaft is placed for the same direction of the figure.

Camshaft dowel pin

: At cylinder head upper face side in each bank.

Crankshaft key

: At cylinder head side of bank 1.

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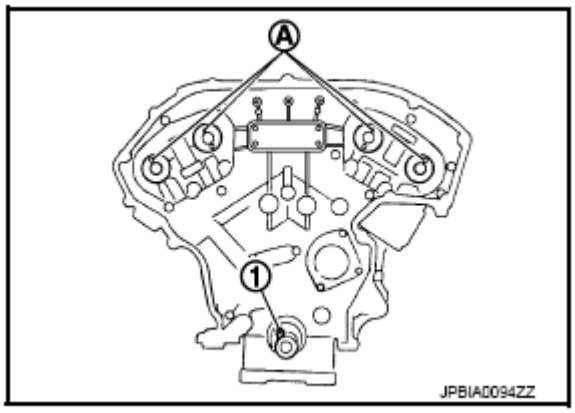

Fig. 97: Identifying Dowel Pin And Crankshaft Key
Courtesy of NISSAN NORTH AMERICA, INC.

4. Install timing chains (secondary) and camshaft sprockets as follows:

CAUTION: Matching marks between timing chain and sprockets slip easily. Confirm all matching mark positions repeatedly during the installation process.

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

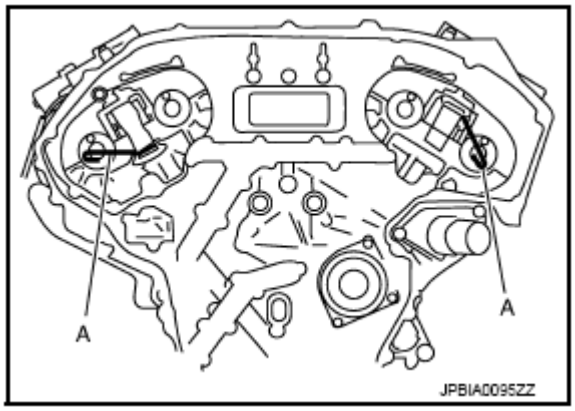

Fig. 98: Pushing Plunger Of Timing Chain Tensioner (Secondary) Using Stopper Pin
Courtesy of NISSAN NORTH AMERICA, INC.

b. Install timing chains (secondary) and camshaft sprockets.
   - Align the matching marks on timing chain (secondary) (orange link) with the ones on intake and exhaust camshaft sprockets (punched), and install them.

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A : Camshaft sprocket (INT) back face
B : Orange link
C : Matching mark (Circle)
D : Matching mark (Oval)
E : Dowel groove
F : Matching mark (2 oval)
G : Camshaft sprocket (EXH) back face
H : Matching mark (2 circle)
I : Dowel hole
J : Timing chain (secondary)

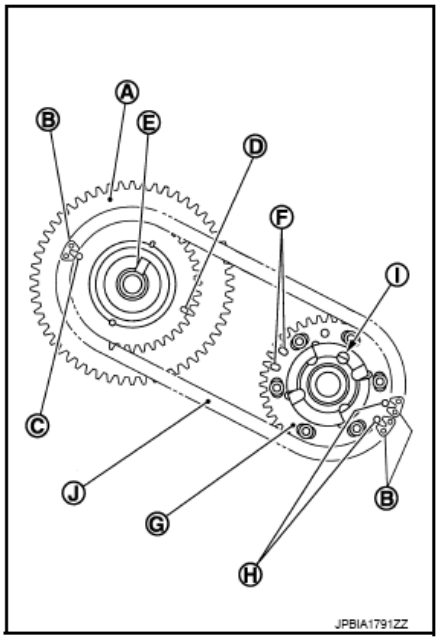

Fig. 99: Identifying Timing Chain (Secondary) And Camshaft Sprocket With Related Components
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE:

- **Figure shows bank 1 (rear view).**
- **Matching marks for camshaft sprockets are on the back side of camshaft sprockets (secondary).**
- **There are two types of matching marks, circle and oval types. They should be used for the bank 1 and bank 2, respectively.**

  Bank 1: Use circle type.

  Bank 2: Use oval type.

- **Align dowel pin camshafts with the groove or dowel hole on sprockets, and install them.**
- **On the intake side, align dowel pin on camshaft front end with pin groove on the back side of camshaft sprocket, and install them.**
- **On the exhaust side, align dowel pin on camshaft front end with pin hole on camshaft sprocket, and install them.**
- **In case that positions of each matching mark and each dowel pin are not fit on matching parts, make fine adjustment to the position holding the hexagonal portion on camshaft with wrench or equivalent.**
- **Mounting bolts for camshaft sprockets must be tightened in the next step. Tightening them by hand is enough to prevent the**

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dislocation of dowel pins.

- **Check the matching marks (punched) (D) on each camshaft sprocket are positioned on the matching marks (orange link) (C) on timing chain (secondary).**

A : Intake side
B : Exhaust side

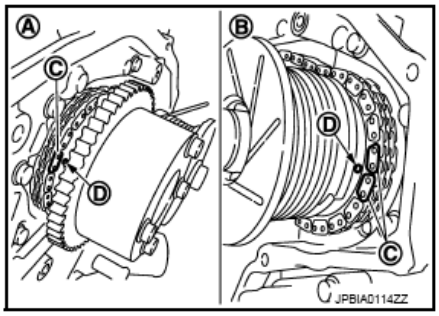

Fig. 100: Identifying Camshaft Sprocket Matching Marks
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: **Matching mark (punched) in the figure is for checking loose at this step.**

c. After confirming the matching marks are aligned, tighten camshaft sprocket mounting bolts.
   - Secure camshaft using a wrench at the hexagonal portion to tighten mounting bolts.

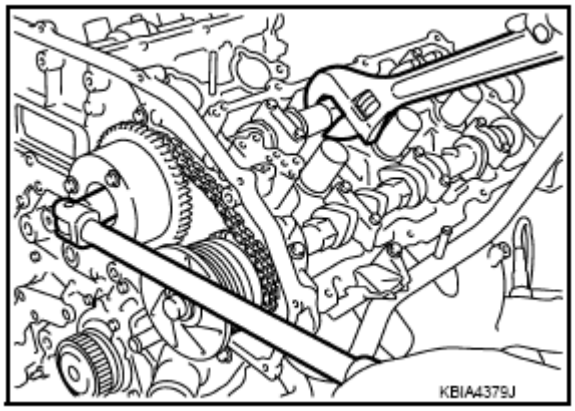

Fig. 101: Tightening Camshaft Sprocket Mounting Bolts Using Wrench
Courtesy of NISSAN NORTH AMERICA, INC.

d. Pull stopper pins (2) out from timing chain tensioners (secondary) (1).

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A : Bank 1
B : Bank 2

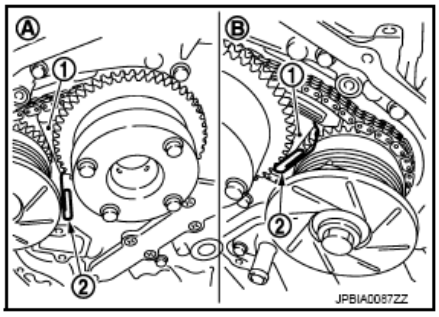

Fig. 102: Identifying Timing Chain Tensioners (Secondary) And Stopper Pins
Courtesy of NISSAN NORTH AMERICA, INC.

5. Install timing chain (primary) as follows:
   a. Install crankshaft sprocket (1).

A : Matching mark (Front side)
⇦ : Engine front

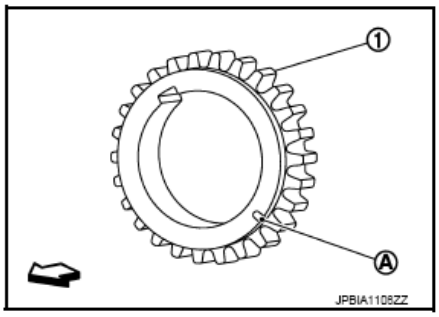

Fig. 103: Identifying Crankshaft Sprocket And Front Side Matching Mark
Courtesy of NISSAN NORTH AMERICA, INC.

- Check the matching marks on crankshaft sprocket face the front of the engine.

   b. Install timing chain (primary).
- Install timing chain (primary) so the matching mark (punched) (B) on camshaft sprocket (INT) (1) is aligned with the Pink link (A) on timing chain, while the matching mark (notched) (C) on crankshaft sprocket (2) is aligned with the orange link (D) one on timing chain, as shown in the figure.

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3 : Water pump

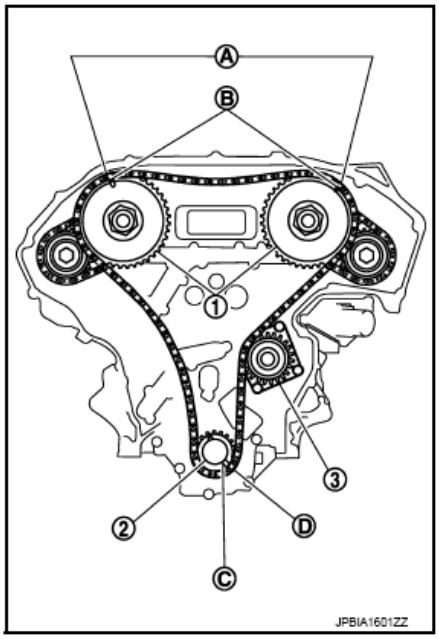

Fig. 104: Identifying Timing Chain Matching Marks And Camshaft Sprocket Related Components
Courtesy of NISSAN NORTH AMERICA, INC.

- When it is difficult to align matching marks of timing chain (primary) with each sprocket, gradually turn camshaft using wrench on the hexagonal portion to align it with the matching marks.
- During alignment, be careful to prevent dislocation of matching mark alignments of timing chains (secondary).

6. Install internal chain guide (1), slack guide (2).

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3 : Tension guide

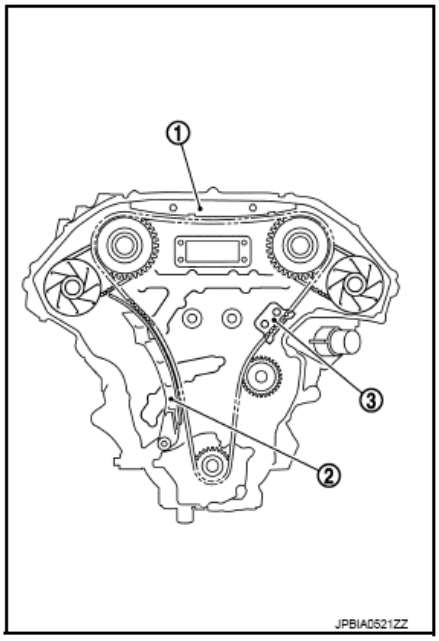

Fig. 105: Identifying Internal Chain Guide, Slack Guide And Tension Guide
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Never overtighten slack guide mounting bolts (2). It is normal for a gap (A) to exist under the bolt seats when mounting bolts are tightened to the specification.

1 : Slack guide
3 : Cylinder block

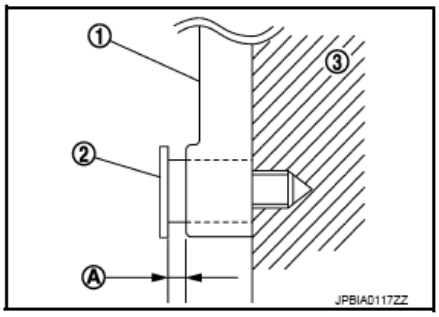

Fig. 106: Identifying Cylinder Guide, Slack Guide And Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

7. Install the timing chain tensioner (primary) with the following procedure:
   a. Pull plunger stopper tab (A) up (or turn lever downward) so as to remove plunger stopper tab from the ratchet of plunger (D).

      NOTE: Plunger stopper tab and lever (C) are synchronized.

   b. Push plunger into the inside of tensioner body.
   c. Hold plunger in the fully compressed position by engaging plunger stopper tab with the tip of

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ratchet.

d. To secure lever, insert stopper pin (E) through hole of lever into tensioner body hole (B).
   - The lever parts and the plunger stopper tab are synchronized. Therefore, the plunger will be secured under this condition.

NOTE: Figure shows the example of 1.2 mm (0.047 in) diameter thin screwdriver being used as the stopper pin.

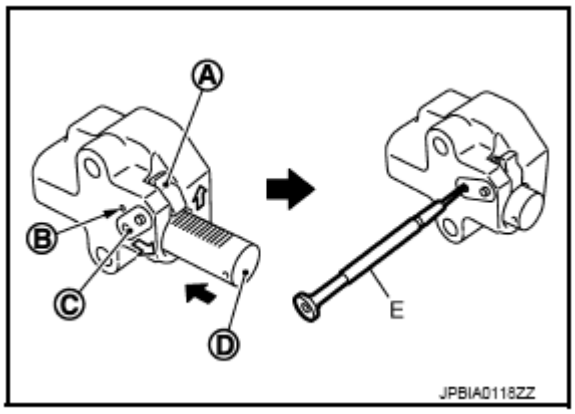

Fig. 107: Removing Plunger Stopper Tab From Ratchet Of Plunger
Courtesy of NISSAN NORTH AMERICA, INC.

e. Install timing chain tensioner (primary) (1).
   - Remove any dirt and foreign materials completely from the back and the mounting surfaces of timing chain tensioner (primary).

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

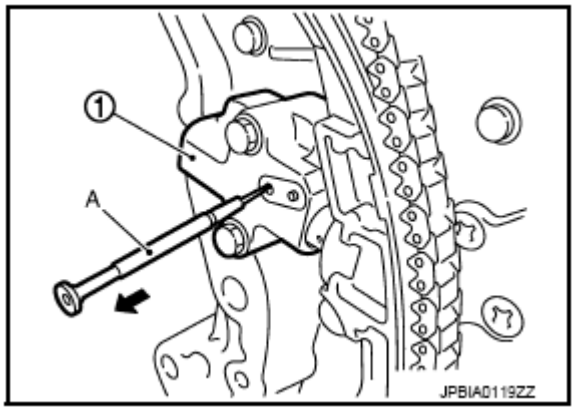

Fig. 108: Pulling Out Stopper Pin Using Tool
Courtesy of NISSAN NORTH AMERICA, INC.

8. Check again that the matching marks on sprockets and timing chain have not slipped out of alignment.
9. Install new O-rings (1) on rear timing chain case.

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Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

A : Bank 1
B : Bank 2

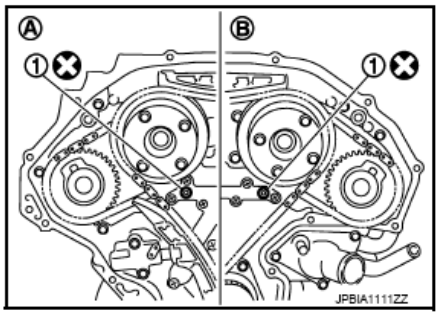

Fig. 109: Identifying O-Rings On Rear Timing Chain Case
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Do not reuse O-rings.

10. Install new front oil seal on front timing chain case.
    - Apply new engine oil to both oil seal lip (A) and dust seal lip (B).

⇦ : Engine inside
⬅ : Engine outside

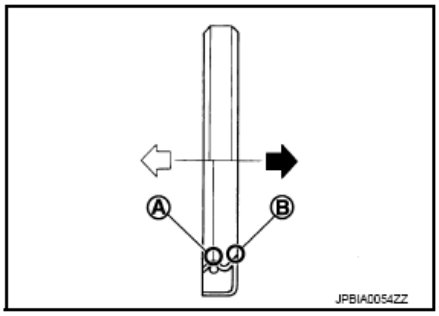

Fig. 110: Identifying Oil And Dust Seal Lip
Courtesy of NISSAN NORTH AMERICA, INC.

- Install it so that each seal lip is oriented as shown in the figure.
- Using a suitable drift [outer diameter: 60 mm (2.36 in)] (A), press-fit oil seal until it becomes flush with front timing chain case end face.
- Check the garter spring is in position and seal lip is not inverted.

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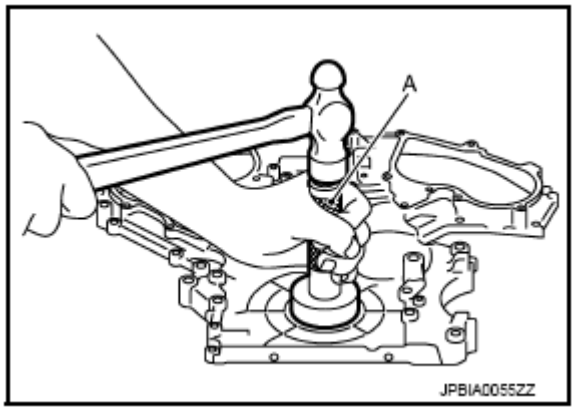

Fig. 111: Pressing To Fit Oil Seal Using Drift
Courtesy of NISSAN NORTH AMERICA, INC.

11. Install water pump cover (1) to front timing chain case.

a : ϕ2.3 - 3.3 mm (0.091 - 0.130 in)

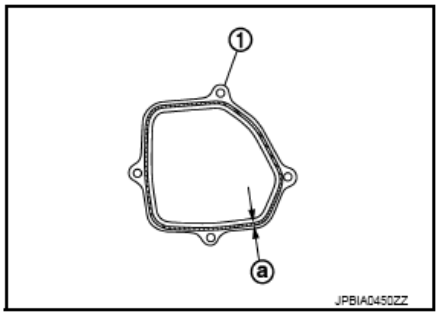

Fig. 112: Identifying Liquid Gasket Applying Area On Water Pump Cover
Courtesy of NISSAN NORTH AMERICA, INC.

- Apply liquid gasket (an equivalent of Three Bond 1218B) to the area shown in the figure in a seamless single layer.

12. Install front timing chain case as follows:
    - Check O-rings stay in place during installation to rear timing chain case.
    a. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) to front timing chain case back side as shown in the figure.

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C : Bolt hole
D : ϕ Protrusion
e : ϕ3.4 - 4.4 mm (0.134 - 0.173 in)
f : ϕ2.6 - 3.6 mm (0.102 - 0.142 in)
g : ϕ4.0 - 5.6 mm (0.157 - 0.220 in)

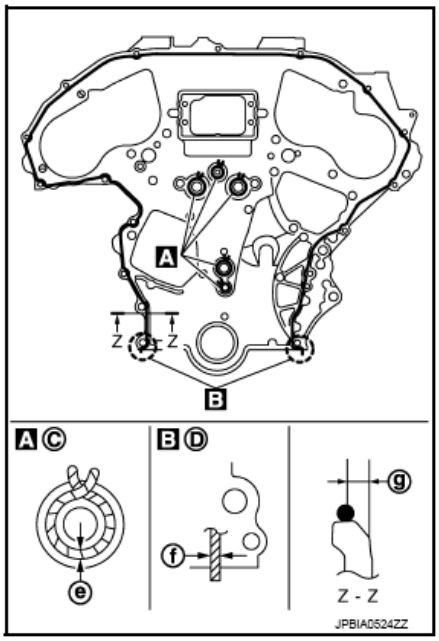

Fig. 113: Identifying Liquid Gasket Applying Area On Front Timing Chain Case
Courtesy of NISSAN NORTH AMERICA, INC.

b. Apply liquid gasket to top surface of oil pan (upper) as shown in the figure.

A : ϕ4.0 - 5.0 mm (0.157 - 0.197 in)

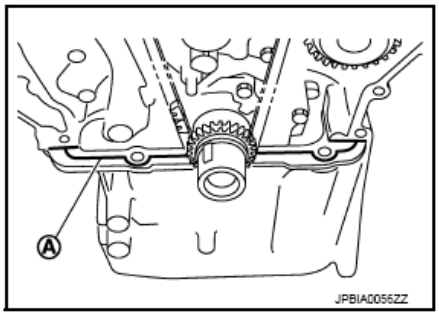

Fig. 114: Identifying Liquid Gasket Applying Area On Top Surface Of Oil Pan
Courtesy of NISSAN NORTH AMERICA, INC.

Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS ".

c. Assemble front timing chain case.

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1 : Front timing chain case
2 : Oil pan (upper)
3 : Cylinder block
⇦ : Engine front

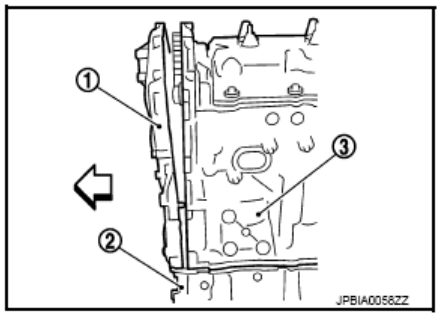

Fig. 115: Identifying Front Timing Chain Case, Upper Oil Pan And Cylinder Block
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION:
- **Never damage front oil seal by interference with front end of crankshaft.**
- **Attaching should be done within 5 minutes after liquid gasket application.**

d. Install front timing chain case as to fit its dowel pin hole together dowel pin on rear timing chain case.
e. Tighten mounting bolts to the specified torque in numerical order as shown in the figure.
   - There are two types of mounting bolts. Refer to the following for locating bolts.

   M8 bolts: 1, 2

   : 28.4 N.m (2.8 kg-m, 20 ft-lb)

   M6 bolts: Except the above

   : 12.7 N.m (1.3 kg-m, 9 ft-lb)

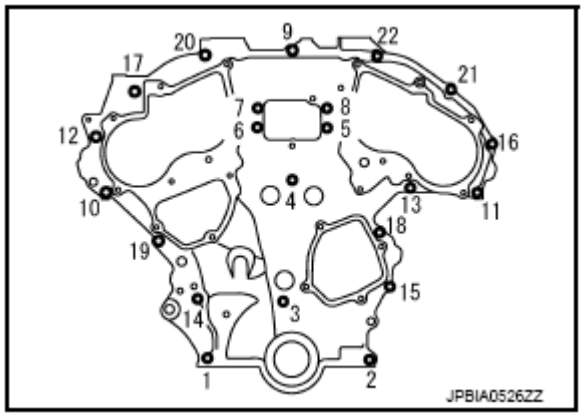

Fig. 116: Identifying Tightening Sequence Of Front Timing Chain Case Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

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f. After all bolts are tightened, retighten them to the specified torque in numerical order shown in the figure.

CAUTION: Be sure to wipe off any excessive liquid gasket leaking on surface mating with oil pan (upper).

g. Install two mounting bolts in front of oil pan (upper) in numerical order shown in the figure.

⇦ : Engine front

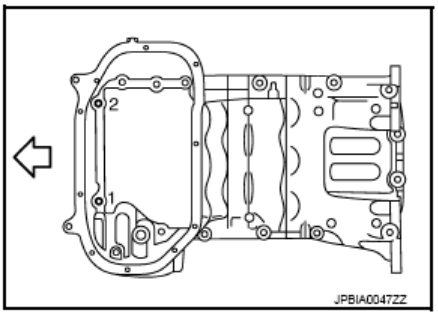

Fig. 117: Identifying Tightening Sequence Of Upper Oil Pan Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

Tightening torque: Refer to "2WD: EXPLODED VIEW".

13. Install valve timing control covers (bank 1 and bank 2) as follows:
    a. Install new seal rings (1) in shaft grooves.

A : Bank 2

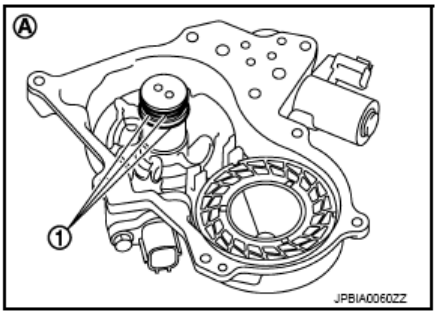

Fig. 118: Identifying Seal Rings
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: When replacing seal ring, replace all rings with new one.

b. To check the joint between dowel pins and dowel pin holes, check the looseness in the axle direction by pushing the circumferential looseness (between dowel pins and dowel pin holes) by twisting in the circumferential direction.

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A : Mating surface of magnet retarder
B : Moves slightly
C : Not shaken

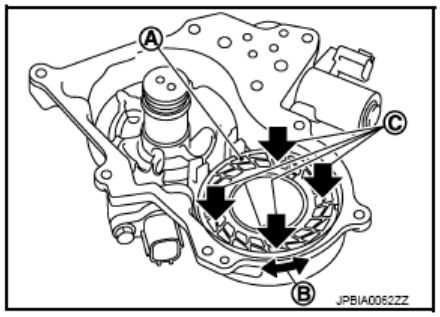

Fig. 119: Checking Looseness Of Dowel Pins And Dowel Pin Holes
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Always perform this procedure when removing because the gap between dowel pins and dowel pin holes may not be caused on purpose.

c. Install valve timing control cover with new gasket to front timing chain case.

1 : Valve timing control cover
2 : Magnet retarder

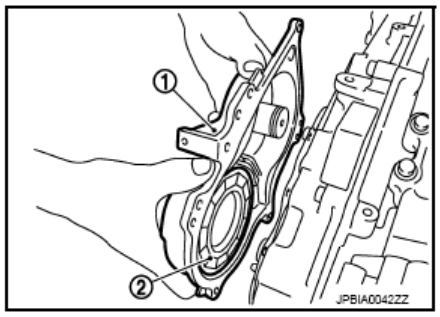

Fig. 120: Installing Valve Timing Control Cover To Front Timing Chain Case
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION:

- **Never face the magnet retarder side down to prevent magnet retarder from dropping.**
- **Check the mating surface of magnet retarder and the drum of exhaust side camshaft sprocket for foreign materials.**
- **Align the center of both shaft holes of the shaft and the intake side camshaft sprocket, and then insert them.**
- **Never drop the seal ring from the shaft groove.**
- **When setting the valve timing control cover in position by hand, if valve timing control cover is not contacting with the front timing chain case, the dowel pin of magnet retarder may not be aligned with the dowel pin holes of cover. In this case, return to step "b".**

d. Being careful not to move seal ring from the installation groove, align dowel pins on front timing chain case with holes to install valve timing control covers.

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e. Tighten mounting bolts in numerical order as shown in the figure.

A : Bank 1
B : Bank 2
C : Dowel pin hole

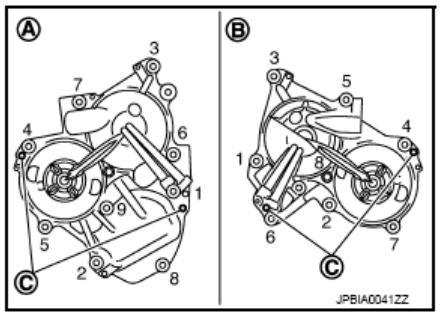

Fig. 121: Identifying Tightening Sequence Of Valve Timing Control Cover Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

Tightening torque: Refer to "EXPLODED VIEW".

- After all bolts are tightened, tighten No. 1 bolt to the specified torque again.

14. Install oil pan (lower). Refer to "**EXPLODED VIEW**".
15. Install rocker covers (bank 1 and bank 2). Refer to "**EXPLODED VIEW**".
16. Install crankshaft pulley as follows:
    a. Fix crankshaft using the ring gear stopper [SST: KV10118700].
    b. Install crankshaft pulley, taking care not to damage front oil seal.
        - When press-fitting crankshaft pulley with plastic hammer, tap on its center portion (not circumference).
    c. Tighten crankshaft pulley bolt.

    : 44.1 N.m (4.5 kg-m, 33 ft-lb)

    d. Place a matching mark (A) on crankshaft pulley (2) aligning with the matching mark (C) of crankshaft pulley bolt (1). Tighten the bolt 90 degrees (one marks) (b).

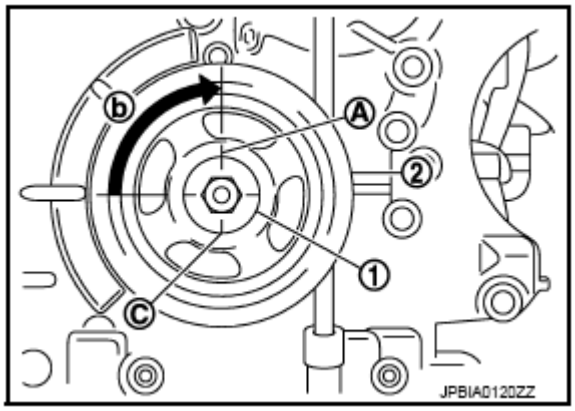

Fig. 122: Tightening Crankshaft Pulley Bolt 90 Degrees
Courtesy of NISSAN NORTH AMERICA, INC.

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

17. Install power steering oil pump bracket as per the following procedure.
    1. Temporarily tighten the power steering oil pump bracket mounting bolts on the cylinder block side.

1 : Color
⇦ : Engine front

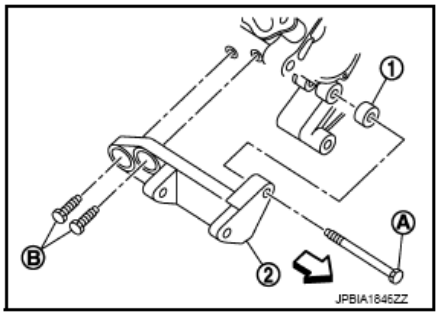

Fig. 123: Exploded View Of Power Steering Oil Pump Bracket
Courtesy of NISSAN NORTH AMERICA, INC.

    2. Temporarily tighten the power steering oil pump bracket mounting bolt (A) on the timing chain case side.
    3. Temporarily tighten each mounting bolt, according to the order of A to B as shown in the figure.
18. For the following operations, perform steps in the reverse order of removal.

Inspection

INSPECTION AFTER REMOVAL

Timing Chain

Check for cracks and any excessive wear at link plates and roller links of timing chain. Replace timing chain if necessary.

A : Crack
B : Wear

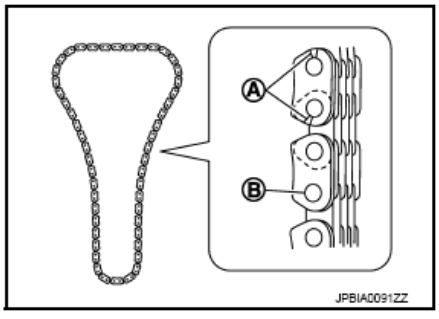

Fig. 124: Identifying Crack And Wear On Timing Chain
Courtesy of NISSAN NORTH AMERICA, INC.

INSPECTION AFTER INSTALLATION

Inspection for Leakage

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The following are procedures for checking fluids leakage, lubricates leakage.

- 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 "**FOR NORTH AMERICA: 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.

NOTE: If hydraulic pressure inside chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after the engine start. However, this does not indicate an unusualness. Noise will stop after hydraulic pressure rises.

- Warm up engine thoroughly to check there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

SUMMARY INSPECTION ITEMS

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids(1)		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		-	Leakage	-
(1) Power steering fluid, brake fluid, etc.				

CAMSHAFT

Exploded View

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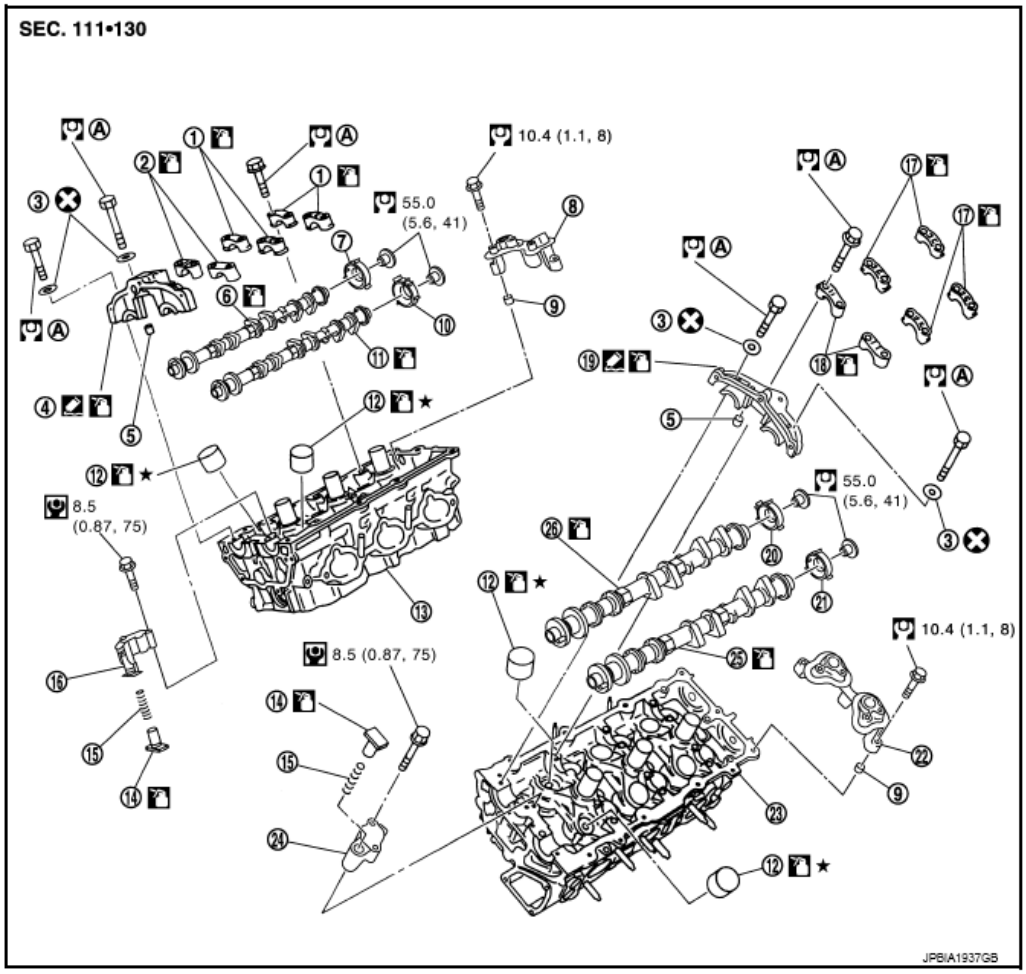
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Camshaft bracket (No. 3, 4)	2. Camshaft bracket (No. 2)	3. Seal washer
4. Camshaft bracket (No. 1) (bank 1)	5. Dowel pin	6. Camshaft (EXH) (bank 1)
7. Camshaft signal plate (EXH)	8. Camshaft sensor bracket (bank 1)	9. Dowel pin
10. Camshaft signal plate (INT)	11. Camshaft (INT) (bank 1)	12. Valve lifter
13. Cylinder head (bank 1)	14. Plunger	15. Spring
16. Timing chain tensioner (secondary) (bank 1)	17. Camshaft bracket (No. 3, 4)	18. Camshaft bracket (No. 2)
19. Camshaft bracket (No. 1) (bank 2)	20. Camshaft signal plate (INT)	21. Camshaft signal plate (EXH)
22. Camshaft sensor bracket (bank 2)	23. Cylinder head (bank 2)	24. Timing chain tensioner (primary) (bank 2)
25. Camshaft (EXH) (bank 2)	26. Camshaft (INT) (bank 2)	
A. Comply with the installation procedure when tightening.		

Fig. 125: Exploded View Of Camshaft With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

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Removal and Installation

REMOVAL

1. Remove front timing chain case, camshaft sprocket and timing chain. Refer to "**EXPLODED VIEW**".
2. Remove fuel sub tube. Refer to "**EXPLODED VIEW**".
3. Loosen camshaft sensor bracket bolts in reverse order as shown in the figure.

⇦ : Engine front

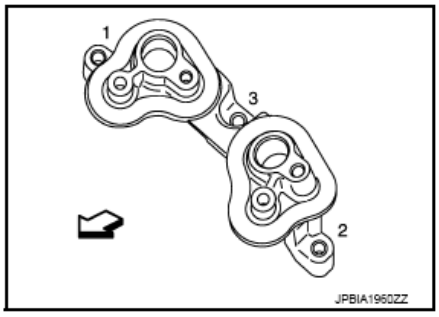

Fig. 126: Identifying Tightening Sequence Of Camshaft Sensor Bracket Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: The order of loosening bolts is the same for bank 1 and bank 2.

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

⇦ : Engine front

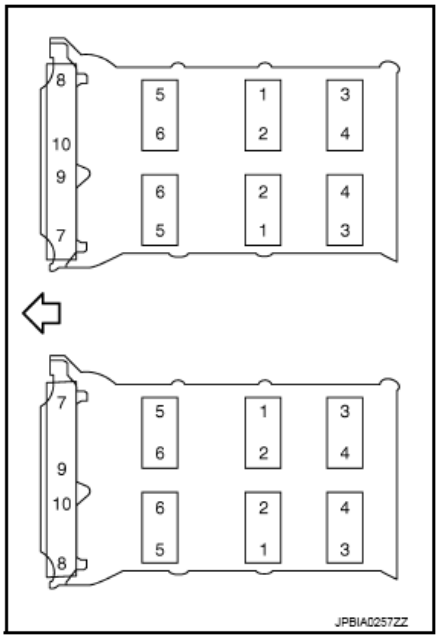

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Fig. 127: Identifying Tightening Sequence Of Camshaft Bracket Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

5. Remove camshaft.
6. Remove valve lifter.
   - Identify installation positions, and store them without mixing them up.
7. Remove timing chain tensioners (secondary) (1) from cylinder head.

A : Bank 1
B : Bank 2

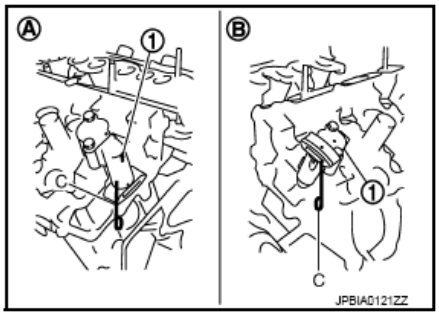

Fig. 128: Identifying Timing Chain Tensioners (Secondary)
Courtesy of NISSAN NORTH AMERICA, INC.

- Remove timing chain tensioners (secondary) with its stopper pin (C) attached.

NOTE: Stopper pin should be attached when timing chain (secondary) is removed.

INSTALLATION

1. Install timing chain tensioners (secondary) on both sides of cylinder head.
   - Install timing chain tensioners (1) with its stopper pin (C) attached.

Bank 1 side (A) : Sliding part facing downward
Bank 2 side (B) : Sliding part facing upward

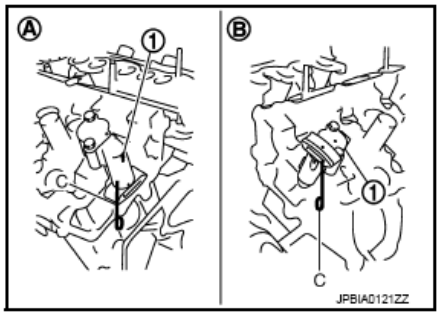

Fig. 129: Identifying Timing Chain Tensioners (Secondary)
Courtesy of NISSAN NORTH AMERICA, INC.

2. Install valve lifter.
   - Install it in the original position.
3. Install camshafts.

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

⇦ : Engine front

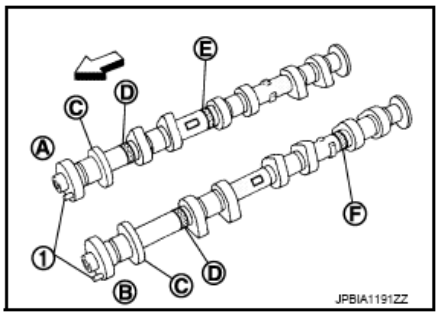

Fig. 130: Identifying Camshaft Proper Placement And Directions With Identification Marks
Courtesy of NISSAN NORTH AMERICA, INC.

Bank	INT/EXH	Dowel pin (1)	Paint marks			Identification mark (C)
			M1 (E)	M2 (F)	M3 (D)	
1	EXH (B)	Yes	No	Yellow	Light blue	1K
	INT (A)	Yes	Yellow	No	Light blue	1J
2	INT (A)	Yes	Yellow	No	Light blue	1L
	EXH (B)	Yes	No	Yellow	Light blue	1M

- Install camshaft so that dowel pin (A) on front end face are positioned as shown in the figure. (No. 1 cylinder TDC on its compression stroke)

1 : Crankshaft key

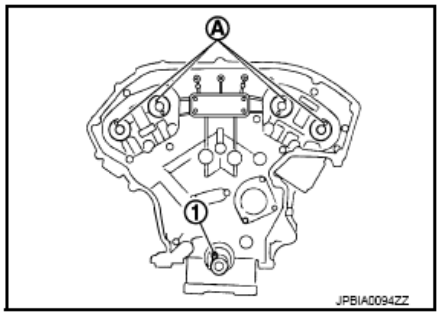

Fig. 131: Identifying Crankshaft Key And Dowel Pin
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: Though camshaft does not stop at the portion as shown in the figure, for the placement of cam nose, it is generally accepted camshaft is placed for the same direction of the figure.

4. Install camshaft brackets.

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A : No. 1
B : No. 2
C : No. 3
D : No. 4
E : Bank 1
F : Exhaust side
G : Intake side
H : Bank 2
I : Intake side
J : Exhaust side
⇦ : Engine front

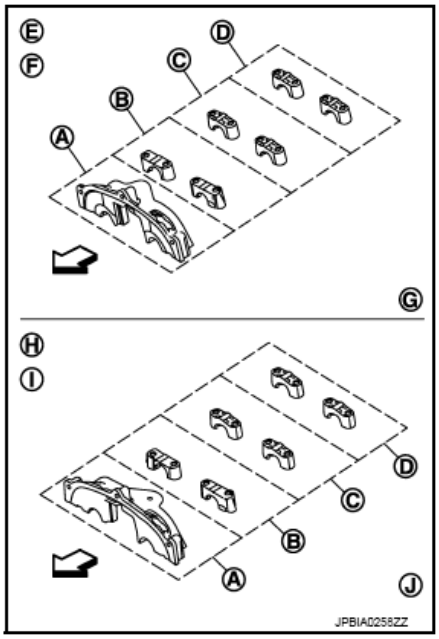

Fig. 132: Identifying Camshaft Brackets
Courtesy of NISSAN NORTH AMERICA, INC.

- Remove foreign material completely from camshaft bracket backside and from cylinder head installation face.
- Install camshaft bracket in original position and direction as shown in figure.
- Install camshaft brackets (No. 2 to 4) aligning the stamp marks (A) as shown in the figure.

B : Bank 1
C : Bank 2
⇦ : Engine front

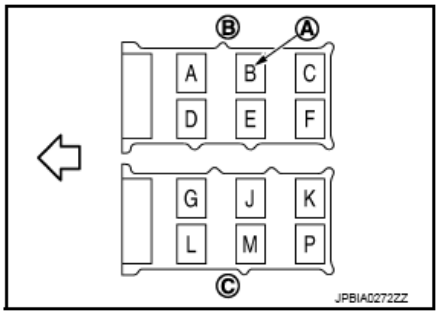

Fig. 133: Identifying Camshaft Bracket With Stamp Marks
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: There are no identification marks indicating bank 1 and bank 2 for camshaft bracket (No. 1).

- Apply liquid gasket to mating surface of camshaft bracket (No. 1) as shown on both bank 1 and bank 2.

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a : 8.5 mm (0.335 in)
b : 2 mm (0.08 in)
c : Clearance 5 mm (0.20 in)
d : ϕ2.5 mm (0.098 in)
* : Apply liquid gasket to rear timing chain side

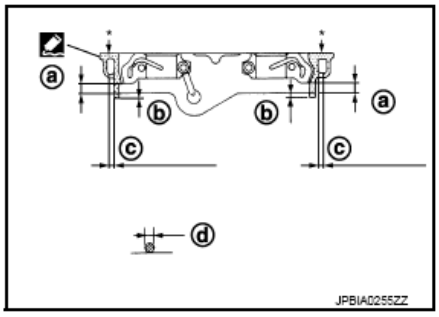

Fig. 134: Identifying Liquid Gasket Applying Areas And Clearance Of Camshaft Bracket
Courtesy of NISSAN NORTH AMERICA, INC.

Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS ".

- Apply liquid gasket to camshaft bracket (No. 1) contact surface on the rear timing chain case backside as shown on both bank 1 and bank 2.

1 : Rear timing chain case
a : ϕ3.9 mm (0.154 in)

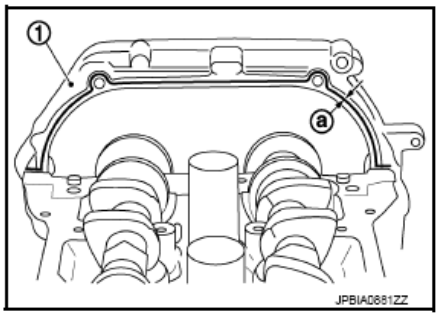

Fig. 135: Identifying Liquid Gasket Applying Areas Of Camshaft Bracket
Courtesy of NISSAN NORTH AMERICA, INC.

Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS ".

CAUTION: For camshaft bracket (No. 1) near installation position, and install it without disturbing the liquid gasket applied to the surfaces.

5. Tighten camshaft bracket bolts in the following steps, in numerical order as shown in the figure.

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⇦ : Engine front

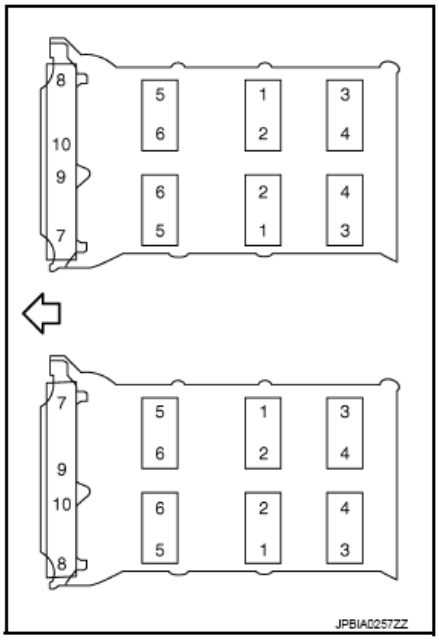

Fig. 136: Identifying Tightening Sequence Of Camshaft Bracket Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

a. Tighten No. 7 to 10 in numerical order as shown.

   : 1.96 N.m (0.20 kg-m, 1 ft-lb)

b. Tighten No. 1 to 6 in numerical order as shown.

   : 1.96 N.m (0.20 kg-m, 1 ft-lb)

c. Tighten No. 1 to 10 in numerical order as shown.

   : 5.88 N.m (0.60 kg-m, 4 ft-lb)

d. Tighten No. 1 to 10 in numerical order as shown.

   : 10.4 N.m (1.1 kg-m, 8 ft-lb)

6. Tighten camshaft sensor bracket bolts in numerical order as shown in the figure.

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⇦ : Engine front

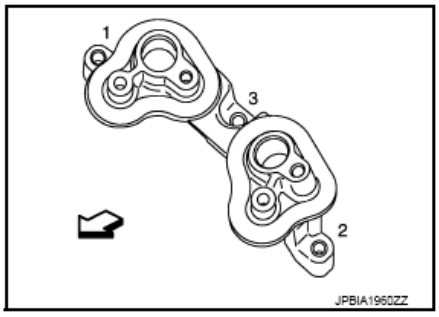

Fig. 137: Identifying Tightening Sequence Of Camshaft Sensor Bracket Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: The order of tightening bolts is the same for bank 1 and bank 2.

7. Inspect and adjust the valve clearance. Refer to "**INSPECTION AND ADJUSTMENT**".
8. Install in the reverse order of removal after this step.

Inspection

INSPECTION AFTER REMOVAL

Camshaft Runout

1. Put V-block on precise flat table, and support No. 2 and 4 journals of camshaft.

CAUTION: Never support No. 1 journal (on the side of camshaft sprocket) because it has a different diameter from the other three locations.

2. Set a dial indicator vertically to No. 3 journal.
3. Turn camshaft to one direction with hands, and measure the camshaft runout on a dial indicator. (Total indicator reading)

Standard and limit: Refer to "CAMSHAFT".

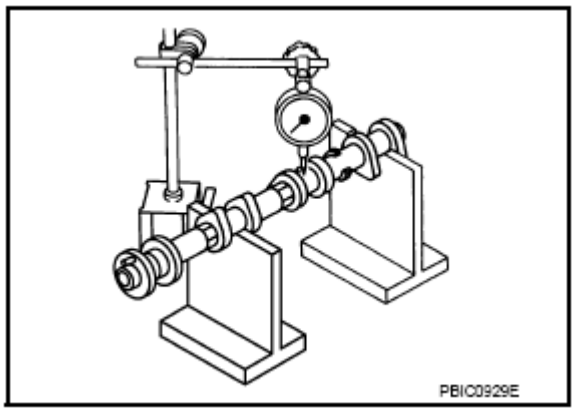

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Fig. 138: Measuring Camshaft Runout Using Dial Indicator
Courtesy of NISSAN NORTH AMERICA, INC.

4. If it exceeds the limit, replace camshaft.

Camshaft Cam Height

1. Measure the camshaft cam height with a micrometer.

   Standard cam height

   (Intake and exhaust) Cam wear limit: Refer to "CAMSHAFT".

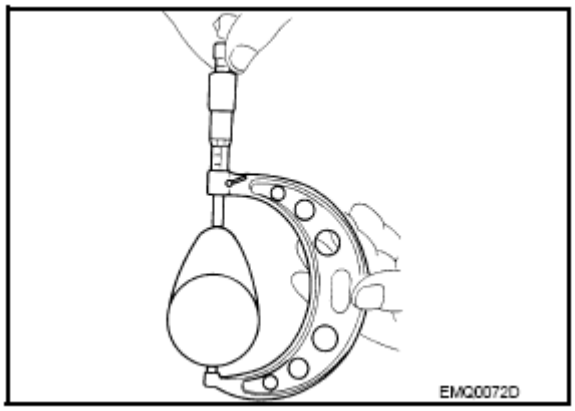

Fig. 139: Measuring Camshaft Cam Height Using Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

2. If wear exceeds the limit, replace camshaft.

Camshaft Journal Oil Clearance

CAMSHAFT JOURNAL DIAMETER

- Measure the outer diameter of camshaft journal with a micrometer (A).

  Standard: Refer to "CAMSHAFT".

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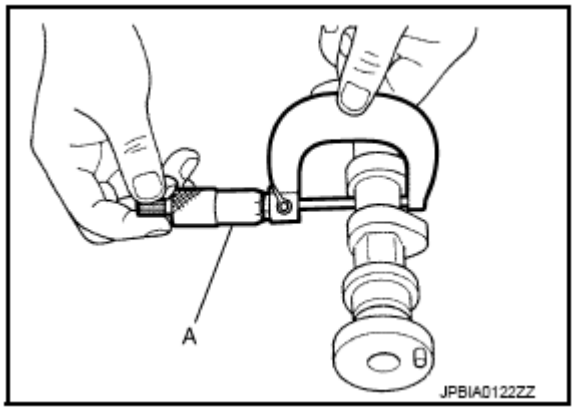

Fig. 140: Measuring Outer Diameter Of Camshaft Journal Using Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

CAMSHAFT BRACKET INNER DIAMETER

- Tighten camshaft bracket bolt with the specified torque. Refer to "**INSTALLATION**" for the tightening procedure.
- Measure inner diameter (A) of camshaft bracket with a bore gauge.

  Standard: Refer to "CAMSHAFT".

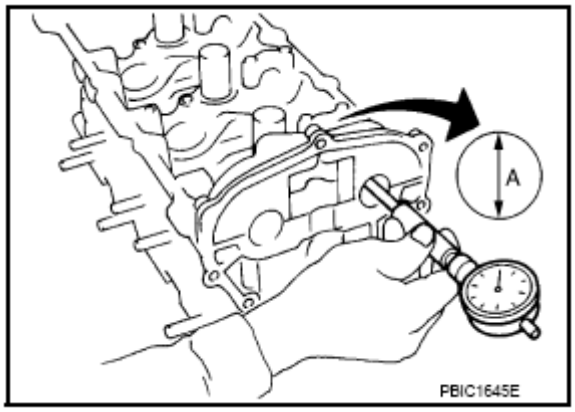

Fig. 141: Measuring Inner Diameter Of Camshaft Bracket Using Bore Gauge
Courtesy of NISSAN NORTH AMERICA, INC.

CAMSHAFT JOURNAL OIL CLEARANCE

- (Oil clearance) = (Camshaft bracket inner diameter) - (Camshaft journal diameter).

  Standard and limit: Refer to "CAMSHAFT".

- If the calculated value exceeds the limit, replace either or both camshaft and cylinder head.

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NOTE: **Camshaft brackets cannot be replaced as single parts, because there are machined together with cylinder head. Replace whole cylinder head assembly.**

Camshaft End Play

- Install a dial indicator in thrust direction on front end of camshaft. Measure the end play of a dial indicator when camshaft is moved forward/backward (in direction to axis).

  Standard and limit: Refer to "CAMSHAFT".

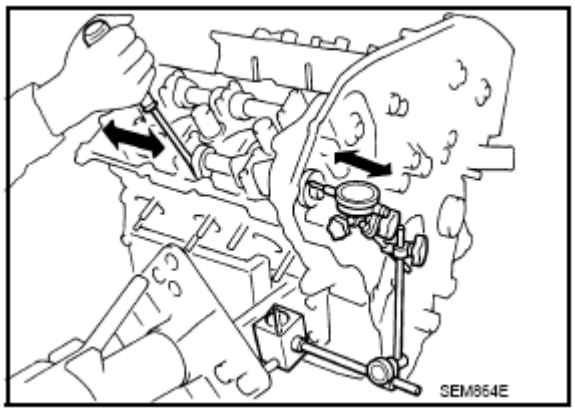

Fig. 142: Measuring Camshaft End Play Using Dial Indicator
Courtesy of NISSAN NORTH AMERICA, INC.

- Measure the following parts if out of the limit.
  - Dimension "A" for camshaft No. 1 journal

    Standard: 27.500 - 27.548 mm (1.0827 - 1.0846 in)

  - Dimension "B" for cylinder head No. 1 journal bearing

    Standard: 27.360 - 27.385 mm (1.0772 - 1.0781 in)

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

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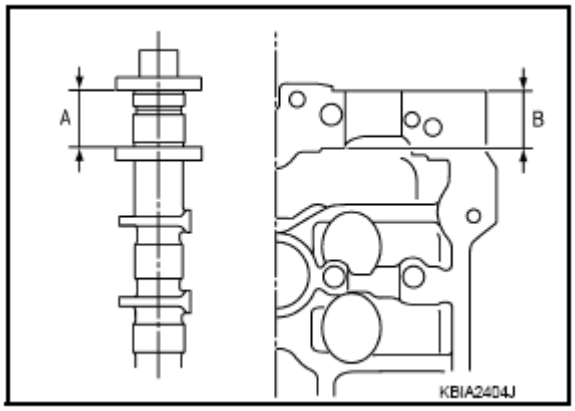

Fig. 143: Identifying Camshaft No. 1 Journal And Cylinder Head No. 1 Journal Bearing
Courtesy of NISSAN NORTH AMERICA, INC.

Camshaft Sprocket Runout

1. Put V-block on precise flat table, and support No. 2 and 4 journals of camshaft.

   CAUTION: Never support No. 1 journal (on the side of camshaft sprocket) because it has a different diameter from the other three locations.

2. Measure the camshaft sprocket runout with a dial indicator. (Total indicator reading)

   Limit: Refer to "CAMSHAFT".

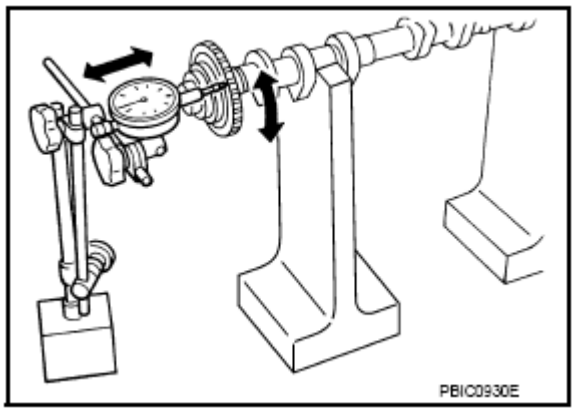

Fig. 144: Measuring Camshaft Sprocket Runout Using Dial Indicator
Courtesy of NISSAN NORTH AMERICA, INC.

- If it exceeds the limit, replace camshaft sprocket.

Valve Lifter

Check if surface of valve lifter has any wear or cracks.

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- If anything above is found, replace valve lifter. Refer to "**CAMSHAFT**".

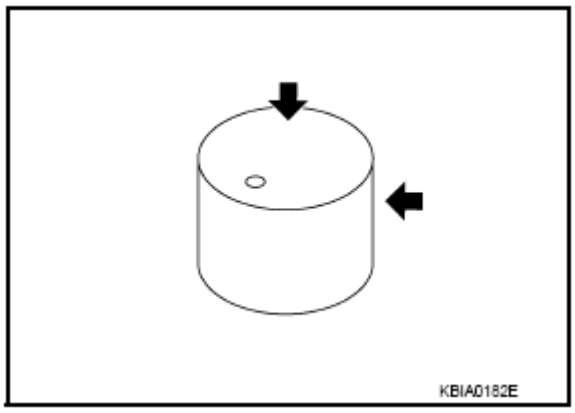

Fig. 145: Locating Surface Of Valve Lifter
Courtesy of NISSAN NORTH AMERICA, INC.

Valve Lifter Clearance

VALVE LIFTER OUTER DIAMETER

- Measure the outer diameter at 1/2 height of valve lifter with a micrometer (A) since valve lifter is in barrel shape.

  Standard (Intake and exhaust): Refer to "CAMSHAFT".

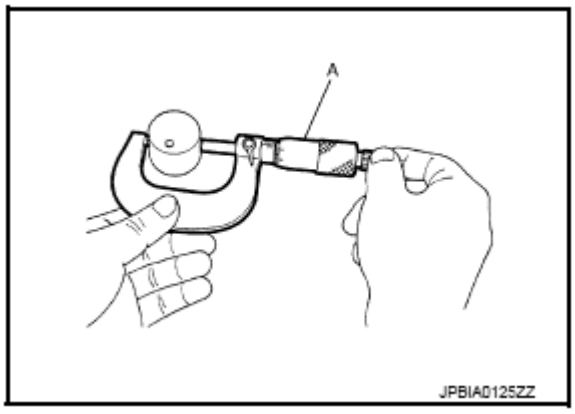

Fig. 146: Measuring Outer Diameter Of Valve Lifter Using Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

- Measure the inner diameter of valve lifter hole of cylinder head with an inside micrometer.

  Standard (Intake and exhaust): Refer to "CAMSHAFT".

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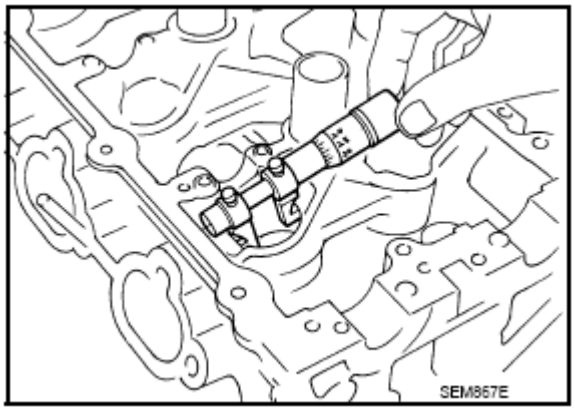

Fig. 147: Measuring Inner Diameter Of Valve Lifter Hole Of Cylinder Head Using Inside Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

VALVE LIFTER CLEARANCE

- (Valve lifter clearance) = (Valve lifter hole diameter) - (Valve lifter outer diameter)

  Standard (Intake and exhaust): Refer to "CAMSHAFT".

- If the calculated value is out of the standard, referring to each standard of valve lifter outer diameter and valve lifter hole diameter, replace either or both valve lifter and cylinder head.

INSPECTION AFTER INSTALLATION

Inspection of Camshaft Sprocket (INT) Oil Groove

CAUTION:

- **Perform this inspection only when DTC P0011, P0021 is detected in self-diagnostic results of CONSULT and it is directed according to inspection procedure of the Engine Control article. Refer to "DTC LOGIC " (FOR USA AND CANADA) or "DTC LOGIC " (FOR MEXICO).**
- **Check when engine is cold so as to prevent burns from the splashing engine oil.**

1. Check engine oil level. Refer to "**INSPECTION** ".
2. Perform the following procedure so as to prevent the engine from being unintentionally started while checking.
   a. Release the fuel pressure. Refer to "**INSPECTION** " (FOR USA AND CANADA) or "**INSPECTION** " (FOR MEXICO).
   b. Disconnect ignition coil and injector harness connectors. Refer to "**EXPLODED VIEW**" and "**EXPLODED VIEW**".
3. Remove intake valve timing control solenoid valve. Refer to "**EXPLODED VIEW**".
4. Crank engine, and then check that engine oil comes out from intake valve timing control solenoid valve

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hole (A). End crank after checking.

1 : Valve timing control cover (bank 1)
⇦ : Engine front

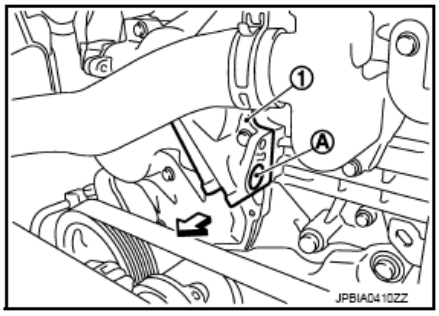

Fig. 148: Identifying Intake Valve Timing Control Solenoid Valve Hole And Valve Timing Control Cover (Bank 1)
Courtesy of NISSAN NORTH AMERICA, INC.

WARNING: Never touch rotating parts. (drive belt, idler pulley, and crankshaft pulley, etc.)

CAUTION:
- **Prevent splashing by using a shop cloth so as to prevent the worker from injury from engine oil and so as to prevent engine oil contamination.**
- **Prevent splashing by using a shop cloth so as to prevent engine oil from being splashed to engine and vehicle. Especially, be careful no to apply engine oil to rubber parts of drive belt, engine mounting insulator, etc. Wipe engine oil off immediately if it is splashed.**

5. Perform the following inspection if engine oil does not come out from intake valve timing control solenoid valve oil hole of the cylinder head.
   - Remove oil filter, and then clean it. Refer to "**REMOVAL AND INSTALLATION** ".
   - Clean oil groove between oil strainer and intake valve timing control solenoid valve. Refer to "**ENGINE LUBRICATION SYSTEM** ".
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. Refer to "**ENGINE LUBRICATION SYSTEM** ".
7. After inspection, install removed parts in the reverse order.

Inspection for Leakage

The following are procedures for checking fluids leakage, lubricates leakage.

- 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 "**FOR NORTH AMERICA: FLUIDS AND LUBRICANTS** " (FOR NORTH AMERICA) or "**FOR MEXICO: FLUIDS AND LUBRICANTS**

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" (FOR MEXICO).

- Use procedure below to check for fuel leakage.
  - Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
  - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

NOTE: If hydraulic pressure inside timing chain tensioner drops after removal/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 check there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

SUMMARY INSPECTION ITEMS

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids(1)		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		-	Leakage	-
(1) Power steering fluid, brake fluid, etc.				

OIL SEAL

VALVE OIL SEAL

VALVE OIL SEAL: Removal and Installation

REMOVAL

1. Remove camshaft relating to valve oil seal to be removed. Refer to "**EXPLODED VIEW**".
2. Remove valve lifters. Refer to "**EXPLODED VIEW**".
3. Turn crankshaft until the cylinder requiring new oil seals is at TDC. This will prevent valve from dropping into cylinder.

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4. Remove valve collet.
   - Compress valve spring with the valve spring compressor [SST: KV10116200] (A), the attachment [SST: KV10115900] (C), the adapter [SST: KV10109220-] (B). Remove valve collet with a magnet hand.

CAUTION: When working, take care not to damage valve lifter holes.

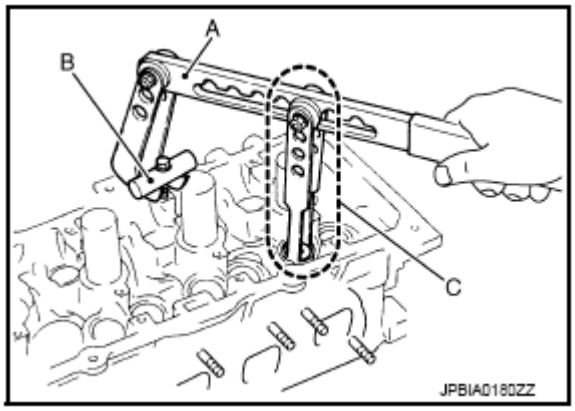

Fig. 149: Compressing Valve Spring Using Valve Spring Compressor
Courtesy of NISSAN NORTH AMERICA, INC.

5. Remove valve spring retainer, and valve spring.
6. Remove valve oil seal using the valve oil seal puller [SST: KV10107902] (A).

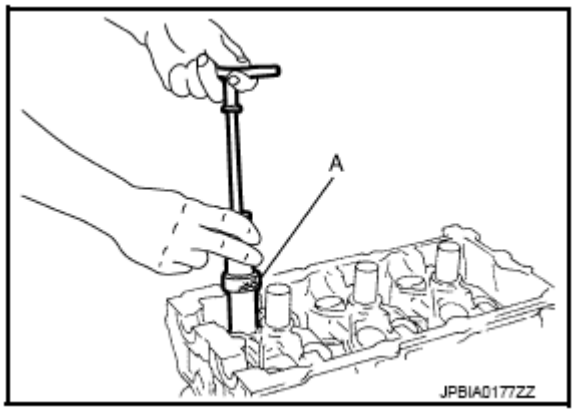

Fig. 150: Removing Valve Oil Seal Using Valve Oil Seal Puller
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

1. Apply new engine oil on new valve oil seal joint and seal lip.
2. Using the valve oil seal drift [SST: KV10115600] (A), press fit valve seal to height (b) shown in the

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figure.

NOTE: Dimension: Height measured before valve spring seat installation

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

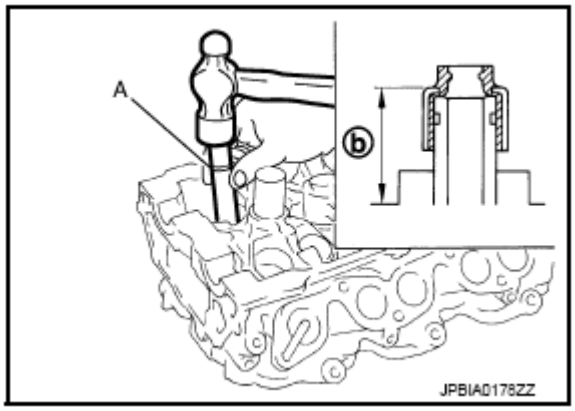

Fig. 151: Pressing To Fit Valve Seal Using Valve Oil Seal Drift
Courtesy of NISSAN NORTH AMERICA, INC.

3. Install in the reverse order of removal after this step.

FRONT OIL SEAL

FRONT OIL SEAL: Removal and Installation

REMOVAL

1. Remove the following parts:
   - Engine undercover with power tool.
   - Drive belt: Refer to "**REMOVAL AND INSTALLATION**".
   - Crankshaft pulley: Refer to "**EXPLODED VIEW**".
2. Remove front oil seal using a suitable tool.

CAUTION: Never damage front timing chain case and crankshaft.

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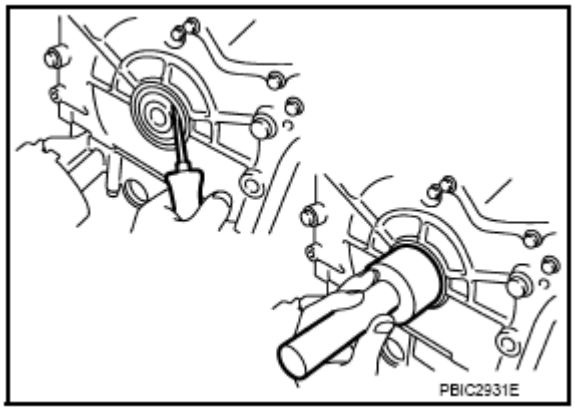

Fig. 152: Removing Front Oil Seal Using Tool
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

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

A : Oil seal lip
B : Dust seal lip
⇦ : Engine inside
⬅ : Engine outside

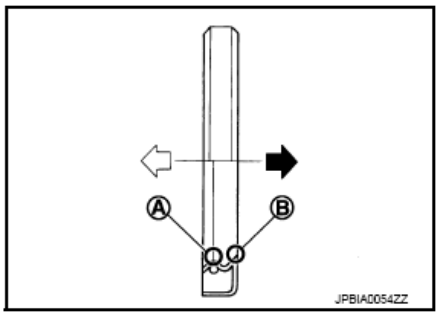

Fig. 153: Identifying Oil And Dust Seal Lip
Courtesy of NISSAN NORTH AMERICA, INC.

- Using a suitable drift, press-fit until the height of front oil seal is level with the mounting surface.
  - Suitable drift: outer diameter 60 mm (2.36 in), inner diameter 50 mm (1.97 in).
- Check the garter spring is in position and seal lips not inverted

CAUTION:
- **Never damage front timing chain case and crankshaft.**
- **Press-fit straight and avoid causing burrs or tilting oil seal.**

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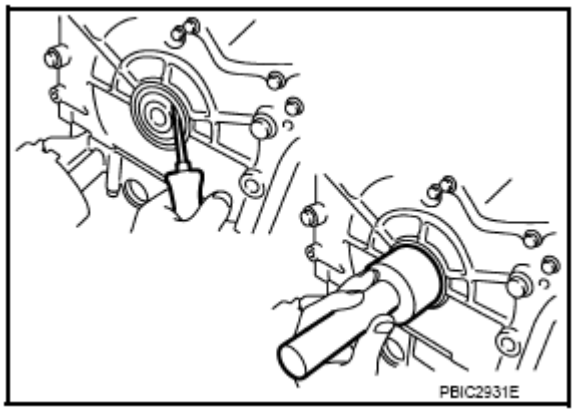

Fig. 154: Removing Front Oil Seal Using Tool
Courtesy of NISSAN NORTH AMERICA, INC.

3. Install in the reverse order of removal after this step.

REAR OIL SEAL

REAR OIL SEAL: Removal and Installation

REMOVAL

1. Remove transmission assembly. Refer to "**2WD: EXPLODED VIEW** " (2WD models) or "**AWD: EXPLODED VIEW** " (AWD models).
2. Remove drive plate. Refer to "**EXPLODED VIEW**".
3. Remove rear oil seal with a suitable tool.

CAUTION: Never damage crankshaft and cylinder block.

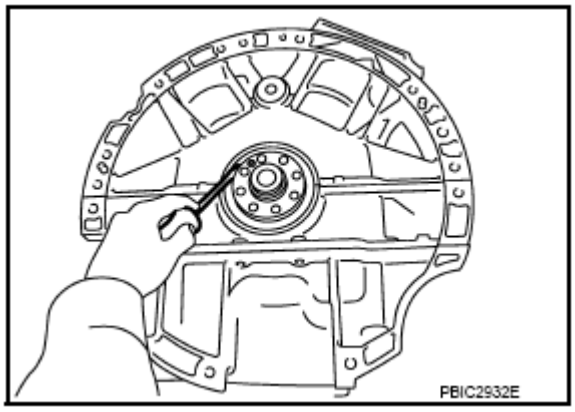

Fig. 155: Removing Rear Oil Seal Using Tool
Courtesy of NISSAN NORTH AMERICA, INC.

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4. Remove liquid gasket with the seal cutter [SST: KV10111100] (A) to remove rear oil seal retainer.

CAUTION: Never damage the mounting surface.

NOTE: Rear oil seal retainer and rear oil seal are assembled parts.

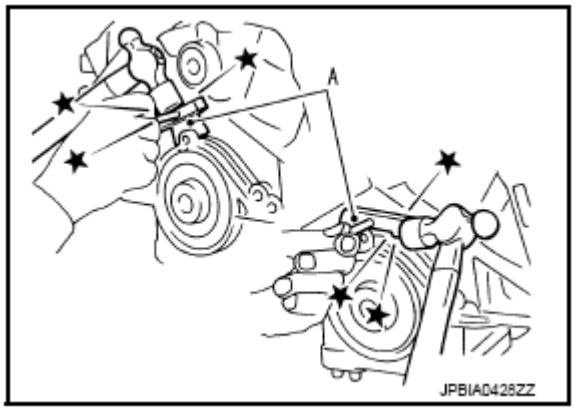

Fig. 156: Removing Rear Oil Seal Retainer Using Seal Cutter
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

1. Install rear oil seal.
   - Install rear oil seal so that each seal lip is oriented as shown in the figure.

A : Oil seal lip
B : Dust seal lip
⇦ : Engine inside
⬅ : Engine outside

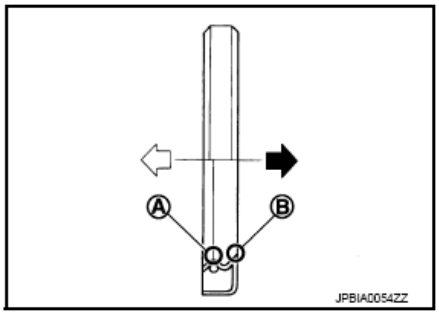

Fig. 157: Identifying Rear Oil And Dust Seal Lip
Courtesy of NISSAN NORTH AMERICA, INC.

   - Press in rear oil seal (1) to the position as shown in the figure.

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B : Cylinder block rear end face
a : 0 - 0.5 mm (0 - 0.020 in)

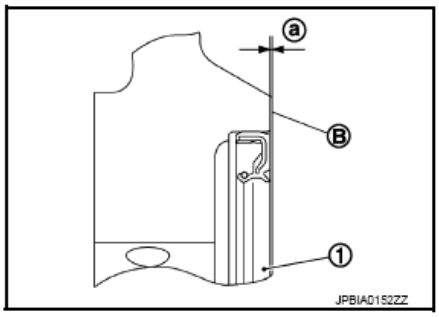

Fig. 158: Identifying Oil Seal Applying Area On Cylinder Block Rear End Face
Courtesy of NISSAN NORTH AMERICA, INC.

- Using a suitable drift (A), press-fit until the height of rear oil seal is level with the mounting surface.
  - Suitable drift: outer diameter 100 mm (3.94 in), inner diameter 85 mm (3.35 in).

CAUTION:
- **Never damage crankshaft and cylinder block.**
- **Press-fit straight and avoid causing burrs or tilting oil seal.**

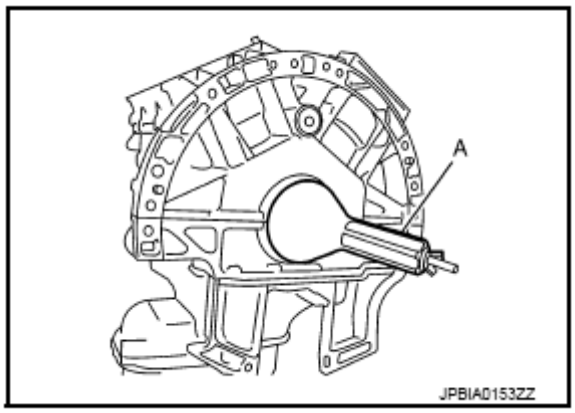

Fig. 159: Pressing To Fit Height Of Rear Oil Seal Using Drift
Courtesy of NISSAN NORTH AMERICA, INC.

2. Apply liquid gasket (an equivalent of Three Bond 1218B) to the area shown in the figure in a seamless single layer. Refer to "**LIQUID GASKET**".

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a : ϕ2.3-3.3mm (0.091 - 0.130 in)

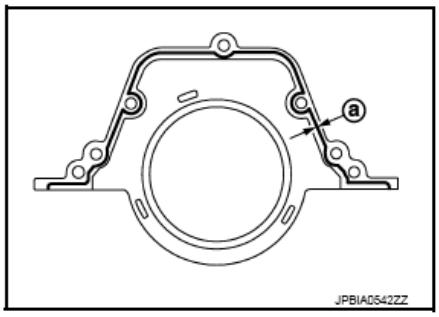

Fig. 160: Identifying Liquid Gasket Applying Areas
Courtesy of NISSAN NORTH AMERICA, INC.

3. Install rear oil seal retainer to cylinder block.

   Tightening torque. 8.8 N.m (0.90 kg-m)

4. Install in the reverse order of removal after this step.

UNIT REMOVAL AND INSTALLATION

ENGINE ASSEMBLY

2WD

2WD: Exploded View

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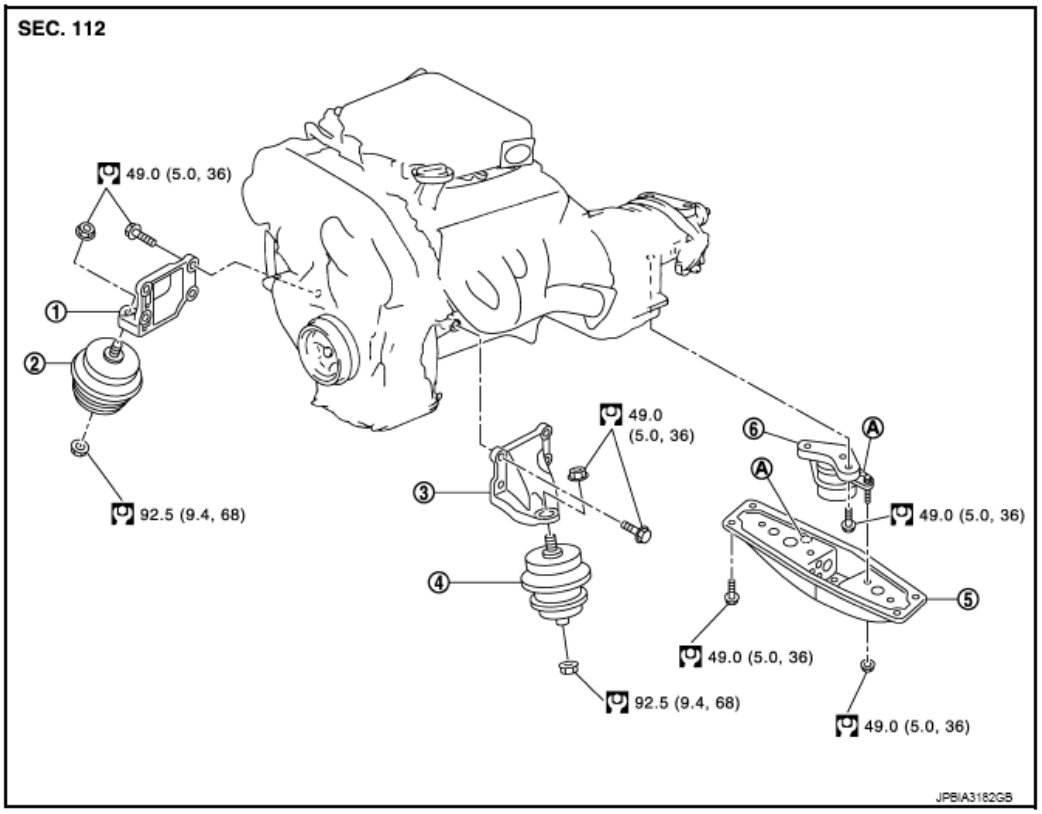
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Engine mounting bracket (RH)
2. Engine mounting insulator (RH)
3. Engine mounting bracket (LH)
4. Engine mounting insulator (LH)
5. Rear engine mounting member
6. Engine mounting insulator (rear)

A. Front mark

Fig. 161: Exploded View Of Engine Assembly With Torque Specifications (2WD)
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

2WD: Removal and Installation

WARNING:

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

CAUTION:

- **Always be careful to work safely, avoid forceful or uninstructed operations.**
- **Never start working until exhaust system and engine coolant are cool**

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enough.

- **If items or work required are not covered by the engine article, refer to the applicable articles.**
- **Always use the support point specified for lifting.**
- **Use either 2-pole lift type or separate type lift as best you can. If board-on type is used for unavoidable reasons, support at rear axle jacking point with transmission jack or similar tool before starting work, in preparation for the backward shift of center of gravity.**
- **For supporting points for lifting and jacking point at rear axle, refer to "GARAGE JACK AND SAFETY STAND AND 2-POLE LIFT ".**

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

REMOVAL

Outline

At first, remove the engine, the transmission assembly, the transfer assembly and the front final drive assembly with front suspension member downward. Then separate the engine, the transmission assembly, the transfer and the front final drive assembly.

Preparation

1. Release fuel pressure. Refer to "**INSPECTION** " (FOR USA AND CANADA) or "**INSPECTION** " (FOR MEXICO).
2. Disconnect both battery terminals. Refer to "**EXPLODED VIEW** ".
3. Drain engine coolant from radiator. Refer to "**DRAINING** ".

CAUTION:
- **Perform this step when engine is cold.**
- **Never spill engine coolant on drive belt.**

4. Remove the following parts:
   - Radiator reservoir tank: Refer to "**EXPLODED VIEW** ".
   - Engine cover: Refer to "**EXPLODED VIEW**".
   - Front road wheel and tires (power tool)
   - Engine undercover (power tool)
   - Cowl top cover: Refer to "**EXPLODED VIEW** ".
   - Air duct and air cleaner case assembly (RH and LH): Refer to "**EXPLODED VIEW**".
   - Cooling fan assembly: Refer to "**EXPLODED VIEW** ".
5. Discharge refrigerant from A/C circuit. Refer to "**COLLECTION AND CHARGE** ".
6. Remove radiator hose (upper and lower). Refer to "**EXPLODED VIEW** ".

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Engine Room LH

1. Disconnect heater hose from vehicle-side, and fit a plug onto hose end to prevent engine coolant leakage.
2. Disconnect A/C piping from A/C compressor, and temporarily fasten it on vehicle with a rope. Refer to "**EXPLODED VIEW** ".
3. Disconnect brake booster vacuum hose.
4. Disconnect ground cables.

Engine Room RH

1. Disconnect battery positive cable vehicle side and temporarily fasten it on engine.
2. Disconnect all clips and connectors of the engine room harness from engine back side.
3. Disconnect fuel feed hose (with damper) and EVAP hose. Refer to "**EXPLODED VIEW**".

CAUTION: Fit plugs onto disconnected hoses to prevent fuel leakage.

4. Remove reservoir tank of power steering oil pump and piping from vehicle, and temporarily secure them on engine. Refer to "**2WD: EXPLODED VIEW** ".

CAUTION: When temporarily securing, keep the reservoir tank upright to avoid a fluid leakage.

Vehicle Inside

Follow procedure below to disconnect engine room harness connectors at passenger room side, and temporarily secure them on engine.

1. Remove passenger-side kicking plate and dash side finisher. Refer to "**EXPLODED VIEW** ".
2. Disconnect engine room harness connectors at unit sides TCM, ECM and other.
3. Disengage intermediate fixing point. Pull out engine room harnesses to engine room side, and temporarily secure them on engine.

CAUTION:

- **When pulling out harnesses, take care not to damage harnesses and connectors.**
- **After temporarily securing, cover connectors with vinyl or similar material to protect against foreign material adhesion.**

Vehicle Underbody

1. Remove A/T fluid cooler hoses and power steering oil pump oil cooler hoses.
2. Disconnect heated oxygen sensor 2 harness.
3. Remove three way catalyst and exhaust front tube. Refer to "**EXPLODED VIEW** ".

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4. Disconnect steering lower joint at power steering gear assembly side, and release steering lower shaft. Refer to "**EXPLODED VIEW** ".
5. Remove rear propeller shaft. Refer to "**EXPLODED VIEW** ".
6. Disconnect harness connector from transmission assembly and transfer assembly.
7. Disengage A/T control rod at control device assembly side. Then, temporarily secure it on the transmission assembly, so that it does not sag. Refer to "**EXPLODED VIEW** ".
8. Remove rear plate cover from oil pan (upper). Then remove bolts fixing drive plate to torque converter. Refer to "**2WD: EXPLODED VIEW**".
9. Remove bolts fixing the transmission assembly to lower rear side of oil pan (upper). Refer to "**2WD: EXPLODED VIEW**".
10. Remove front stabilizer connecting rod from transverse link. Refer to "**EXPLODED VIEW** ".
11. Remove lower ends of left and right steering knuckle from transverse link. Refer to "**EXPLODED VIEW** ".
12. Separate steering outer sockets from steering knuckle. Refer to "**2WD: EXPLODED VIEW** ".
13. Remove transverse links mounting bolts at suspension member side. Refer to "**EXPLODED VIEW** ".

Removal Work

1. Use a manual lift table caddy (commercial service tool) or equivalently rigid tool such as a transmission jack. Securely support bottom of suspension member and transmission.

CAUTION: Put a piece of wood or something similar as the supporting surface, secure a completely stable condition.

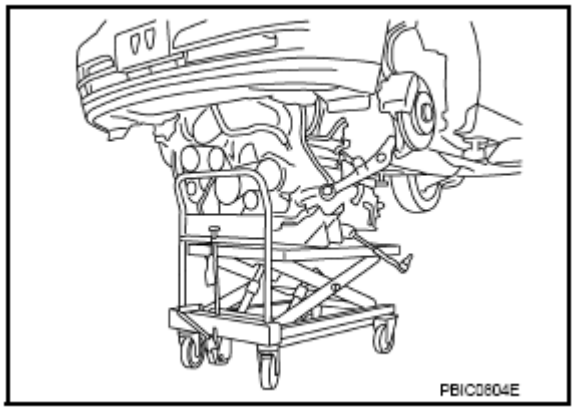

Fig. 162: Supporting Bottom Of Suspension Member And Transmission Using Jack
Courtesy of NISSAN NORTH AMERICA, INC.

2. Remove rear engine mounting member bolts.
3. Remove front suspension member mounting bolts and nuts. Refer to "**EXPLODED VIEW** ".
4. Carefully lower jack, or raise lift to remove the engine, transmission assembly, transfer, front final drive assembly and front suspension member. When performing work, observe the following caution:

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CAUTION:

- **Confirm there is no interference with the vehicle.**
- **Check that all connection points have been disconnected.**
- **Keep in mind the center of the vehicle gravity changes. If necessary, use jack(s) to support the vehicle at rear jacking point(s) to prevent it from falling it off the lift.**

Separation Work

1. Install engine slingers into front of cylinder head (bank 1) and rear of cylinder head (bank 2).

1 : Engine front slinger
2 : Engine rear upper slinger
3 : Spacer
4 : Engine rear lower slinger
A : Bank 1
B : Bank 2
⇦ : Engine front

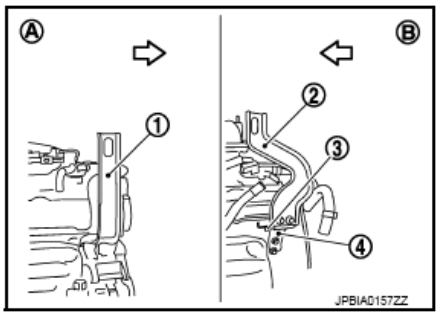

Fig. 163: Identifying Spacer, Engine Front And Rear Slingers
Courtesy of NISSAN NORTH AMERICA, INC.

Slinger bolts:

: 28.0 N.m (2.9 kg-m, 21 ft-lb)

- To protect rocker cover against damage caused by tilting of engine slinger, insert spacer between cylinder head and engine rear lower slinger (3), in direction shown in the figure.

1 : Engine rear upper slinger
⇦ : Engine front

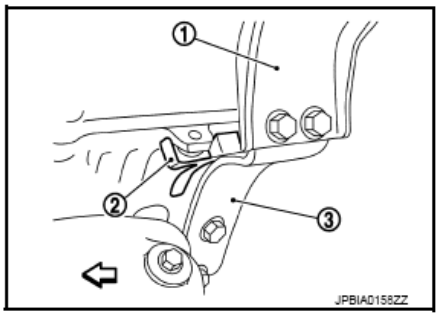

Fig. 164: Identifying Spacer, Engine Rear Upper And Lower Slingers
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: **Spacer (2) is a component part of engine rear upper slinger assembly.**

2. Remove power steering oil pump from engine side. Refer to "**EXCEPT FOR SPORT MODELS**

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(VQ37VHR): EXPLODED VIEW ".

3. Remove engine mounting insulators (RH and LH) under side nuts with power tool.
4. Lift with hoist and separate the engine, the transmission assembly, the transfer assembly and the front final drive assembly from front suspension member.

CAUTION:

- **Before and during this lifting, always check if any harnesses are left connected.**
- **Never damage to and oil/grease smearing or spills onto engine mounting insulator.**

5. Remove alternator. Refer to "**VQ25HR: EXPLODED VIEW** ".
6. Remove starter motor. Refer to "**EXPLODED VIEW** ".
7. Remove crankshaft position sensor.

CAUTION:

- **Handle it carefully and avoid impacts.**
- **Never disassemble.**
- **Never place sensor in a location where it is exposed to magnetism.**

8. Separate the engine from the transmission assembly. Refer to "**2WD: EXPLODED VIEW** ".
9. Remove each engine mounting insulator and each engine mounting bracket from the engine with power tool.

INSTALLATION

Note the following, and install in the reverse order of removal.

- Do not allow engine mounting insulator to be damage and careful no engine oil gets on it.
- For a location with a positioning pin, insert it securely into hole of mating part.
- For a part with a specified installation orientation, refer to component figure in "**2WD: EXPLODED VIEW**".
- When installing engine mounting bracket (RH and LH) on cylinder block, tighten two upper bolts [shown as (B) in the figure] first. Then tighten two lower bolts [shown as (C) in the figure].

A : Example left side

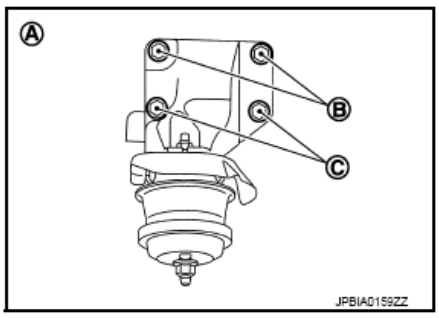

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Fig. 165: Identifying Engine Mounting Bracket Lower And Upper Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

- Check all engine mounting insulators are seated properly, then tighten mounting nuts.
- Tighten rear engine mounting member bolts in numerical order as shown in the figure.

⇦ : Vehicle front

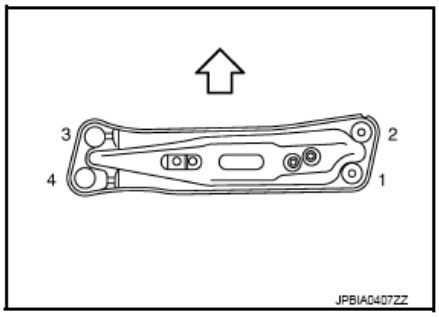

Fig. 166: Identifying Tightening Sequence Of Rear Engine Mounting Member Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

2WD: Inspection

INSPECTION AFTER INSTALLATION

Inspection for Leakage

The following are procedures for checking fluids leakage, lubricates leakage and exhaust gases leakage.

- 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 "**FOR NORTH AMERICA: FLUIDS AND LUBRICANTS** " (FOR NORTH AMERICA) or "**FOR MEXICO: FLUIDS AND LUBRICANTS** " (FOR MEXICO).
- Use procedure below to check for fuel leakage.
  - Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
  - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

SUMMARY INSPECTION ITEMS

Items	Before starting engine	Engine running	After engine stopped
Engine coolant	Level	Leakage	Level

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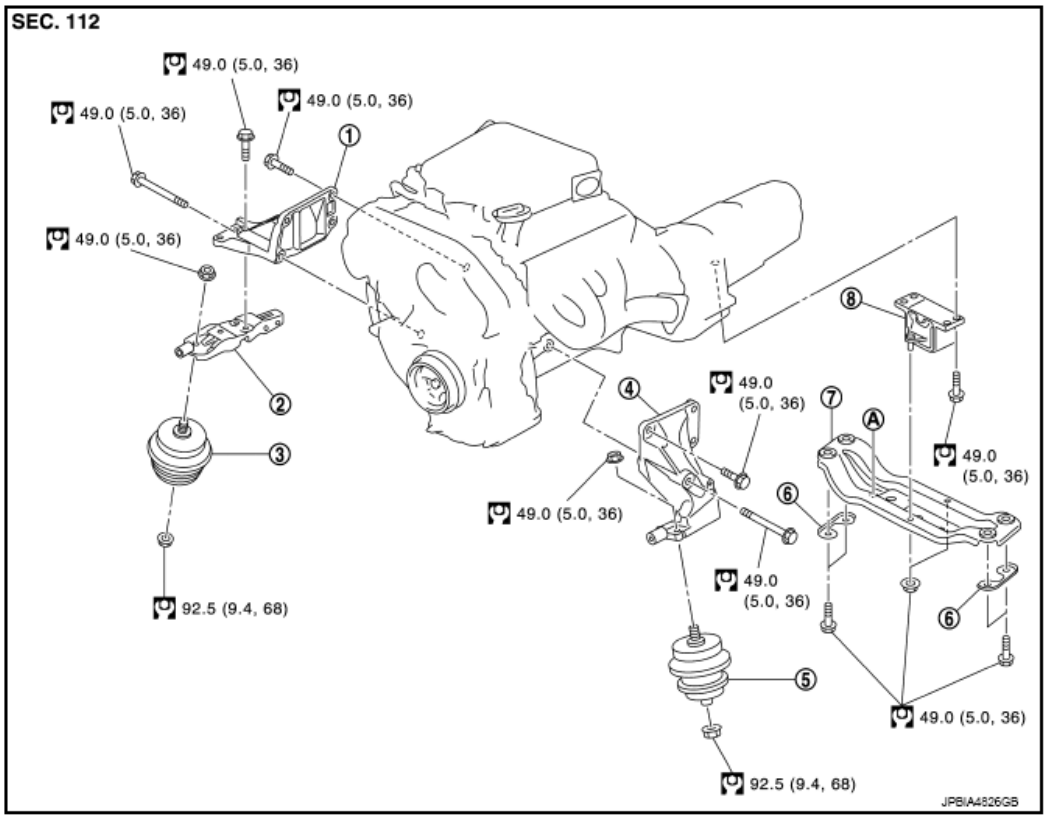
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids(1)		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		-	Leakage	-
(1) Power steering fluid, brake fluid, etc.				

AWD

AWD: Exploded View

Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Engine mounting bracket (RH)
2. Engine mounting bracket (RH) (lower)
3. Engine mounting insulator (RH)
4. Engine mounting bracket (LH)
5. Engine mounting insulator (LH)
6. Heat insulator
7. Rear engine mounting member
8. Engine mounting insulator (rear)
A. Front mark

Fig. 167: Exploded View Of Engine Assembly With Torque Specifications (AWD)

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Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

AWD: Removal and Installation

WARNING:

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

CAUTION:

- **Always be careful to work safely, avoid forceful or uninstructed operations.**
- **Never start working until exhaust system and engine coolant are cool enough.**
- **If items or work required are not covered by the engine article, refer to the applicable articles.**
- **Always use the support point specified for lifting.**
- **Use either 2-pole lift type or separate type lift as best you can. If board-on type is used for unavoidable reasons, support at rear axle jacking point with transmission jack or similar tool before starting work, in preparation for the backward shift of center of gravity.**
- **For supporting points for lifting and jacking point at rear axle, refer to "GARAGE JACK AND SAFETY STAND AND 2-POLE LIFT ".**

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

REMOVAL

Outline

At first, remove the engine, the transmission assembly, the transfer assembly and the front final drive assembly with front suspension member downward. Then separate the engine, the transmission assembly, the transfer and the front final drive assembly.

Preparation

1. Release fuel pressure. Refer to "**INSPECTION** " (FOR USA AND CANADA) or "**INSPECTION** " (FOR MEXICO).
2. Disconnect both battery terminals. Refer to "**EXPLODED VIEW** ".
3. Drain engine coolant from radiator. Refer to "**DRAINING** ".

CAUTION:

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- **Perform this step when engine is cold.**
- **Never spill engine coolant on drive belt.**

4. Remove the following parts:
   - Radiator reservoir tank: Refer to "**EXPLODED VIEW** ".
   - Engine cover: Refer to "**EXPLODED VIEW**".
   - Front road wheel and tires (power tool)
   - Engine undercover (power tool)
   - Cowl top cover: Refer to "**EXPLODED VIEW** ".
   - Air duct and air cleaner case assembly (RH and LH): Refer to "**EXPLODED VIEW**".
   - Cooling fan assembly: Refer to "**EXPLODED VIEW** ".
5. Discharge refrigerant from A/C circuit. Refer to "**COLLECTION AND CHARGE** ".
6. Remove radiator hose (upper and lower). Refer to "**EXPLODED VIEW** ".

Engine Room LH

1. Disconnect heater hose from vehicle-side, and fit a plug onto hose end to prevent engine coolant leakage.
2. Disconnect A/C piping from A/C compressor, and temporarily fasten it on vehicle with a rope. Refer to "**EXPLODED VIEW** ".
3. Disconnect brake booster vacuum hose.
4. Disconnect ground cables.

Engine Room RH

1. Disconnect battery positive cable vehicle side and temporarily fasten it on engine.
2. Disconnect all clips and connectors of the engine room harness from engine back side.
3. Disconnect fuel feed hose (with damper) and EVAP hose. Refer to "**EXPLODED VIEW**".

CAUTION: Fit plugs onto disconnected hoses to prevent fuel leakage.

4. Remove reservoir tank of power steering oil pump and piping from vehicle, and temporarily secure them on engine. Refer to "**AWD: EXPLODED VIEW** ".

CAUTION: When temporarily securing, keep the reservoir tank upright to avoid a fluid leakage.

Vehicle Inside

Follow procedure below to disconnect engine room harness connectors at passenger room side, and temporarily secure them on engine.

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1. Remove passenger-side kicking plate and dash side finisher. Refer to "**EXPLODED VIEW** ".
2. Disconnect engine room harness connectors at unit sides TCM, ECM and other.
3. Disengage intermediate fixing point. Pull out engine room harnesses to engine room side, and temporarily secure them on engine.

CAUTION:
- **When pulling out harnesses, take care not to damage harnesses and connectors.**
- **After temporarily securing, cover connectors with vinyl or similar material to protect against foreign material adhesion.**

Vehicle Underbody

1. Remove A/T fluid cooler hoses and power steering oil pump oil cooler hoses.
2. Disconnect heated oxygen sensor 2 harness.
3. Remove three way catalyst and exhaust front tube. Refer to "**EXPLODED VIEW** ".
4. Disconnect steering lower joint at power steering gear assembly side, and release steering lower shaft. Refer to "**EXPLODED VIEW** ".
5. Remove rear propeller shaft. Refer to "**EXPLODED VIEW** ".
6. Remove front drive shaft (both side). Refer to "**REMOVAL AND INSTALLATION** ".
7. Disconnect harness connector from transmission assembly and transfer assembly.
8. Disengage A/T control rod at control device assembly side. Then, temporarily secure it on the transmission assembly, so that it does not sag. Refer to "**EXPLODED VIEW** ".
9. Remove rear plate cover from oil pan (upper). Then remove bolts fixing drive plate to torque converter. Refer to "**AWD: EXPLODED VIEW**".
10. Remove bolts fixing the transmission assembly to lower rear side of oil pan (upper). Refer to "**AWD: EXPLODED VIEW**".
11. Remove front stabilizer connecting rod from transverse link. Refer to "**EXPLODED VIEW** ".
12. Remove lower ends of left and right steering knuckle from transverse link. Refer to "**EXPLODED VIEW** ".
13. Separate steering outer sockets from steering knuckle. Refer to "**AWD: EXPLODED VIEW** ".
14. Remove transverse links mounting bolts at suspension member side. Refer to "**EXPLODED VIEW** ".

Removal Work

1. Use a manual lift table caddy (commercial service tool) or equivalently rigid tool such as a transmission jack. Securely support bottom of suspension member and transmission.

CAUTION: Put a piece of wood or something similar as the supporting surface, secure a completely stable condition.

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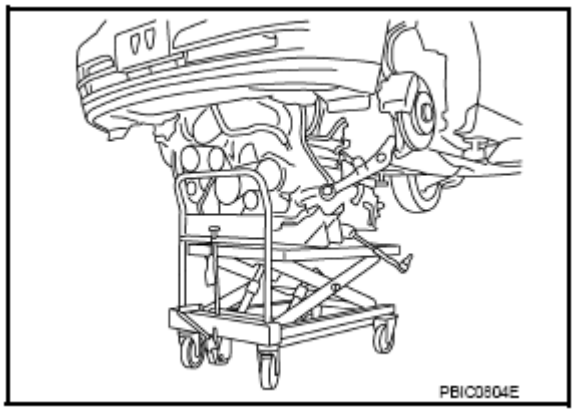

Fig. 168: Supporting Bottom Of Suspension Member And Transmission Using Jack
Courtesy of NISSAN NORTH AMERICA, INC.

2. Remove rear engine mounting member bolts.
3. Remove front suspension member mounting bolts and nuts. Refer to "**EXPLODED VIEW** ".
4. Carefully lower jack, or raise lift to remove the engine, transmission assembly, transfer, front final drive assembly and front suspension member. When performing work, observe the following caution:

CAUTION:

- **Confirm there is no interference with the vehicle.**
- **Check that all connection points have been disconnected.**
- **Keep in mind the center of the vehicle gravity changes. If necessary, use jack(s) to support the vehicle at rear jacking point(s) to prevent it from falling it off the lift.**

Separation Work

1. Install engine slingers into front of cylinder head (bank 1) and rear of cylinder head (bank 2).

1 : Engine front slinger
2 : Engine rear upper slinger
3 : Spacer
4 : Engine rear lower slinger
A : Bank 1
B : Bank 2
⇦ : Engine front

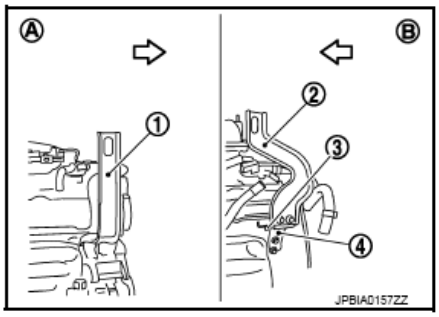

Fig. 169: Identifying Spacer, Engine Front And Rear Slingers
Courtesy of NISSAN NORTH AMERICA, INC.

Slinger bolts:

: 28.0 N.m (2.9 kg-m, 21 ft-lb)

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- To protect rocker cover against damage caused by tilting of engine slinger, insert spacer between cylinder head and engine rear lower slinger (3), in direction shown in the figure.

1 : Engine rear upper slinger
⇦: Engine front

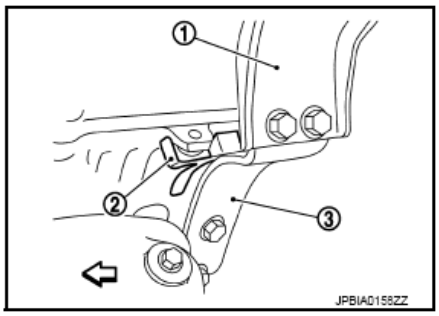

Fig. 170: Identifying Spacer, Engine Rear Upper And Lower Slingers
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: **Spacer (2) is a component part of engine rear upper slinger assembly.**

2. Remove power steering oil pump from engine side. Refer to "**EXCEPT FOR SPORT MODELS (VQ37VHR): EXPLODED VIEW** " (Except for SPORT models).
3. Remove engine mounting insulators (RH and LH) under side nuts with power tool.
4. Lift with hoist and separate the engine, the transmission assembly, the transfer assembly and the front final drive assembly from front suspension member.

CAUTION:
- **Before and during this lifting, always check if any harnesses are left connected.**
- **Never damage to and oil/grease smearing or spills onto engine mounting insulator.**

5. Remove alternator. Refer to "**VQ25HR: EXPLODED VIEW** ".
6. Remove starter motor. Refer to "**EXPLODED VIEW** ".
7. Remove front propeller shaft. Refer to "**REMOVAL AND INSTALLATION** ".
8. Remove crankshaft position sensor.

CAUTION:
- **Handle it carefully and avoid impacts.**
- **Never disassemble.**
- **Never place sensor in a location where it is exposed to magnetism.**

9. Separate the engine from the transmission assembly. Refer to "**AWD: EXPLODED VIEW** ".
10. Remove each engine mounting insulator and each engine mounting bracket from the engine with power tool.
11. Remove front final drive. Refer to "**VQ25HR: REMOVAL AND INSTALLATION** ".

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INSTALLATION

Note the following, and install in the reverse order of removal.

- Do not allow engine mounting insulator to be damage and careful no engine oil gets on it.
- For a location with a positioning pin, insert it securely into hole of mating part.
- For a part with a specified installation orientation, refer to component figure in "**AWD: EXPLODED VIEW**".
- When installing engine mounting bracket (RH and LH) on cylinder block, tighten two upper bolts [shown as (B) in the figure] first. Then tighten two lower bolts [shown as (C) in the figure].

3 : Engine mounting bracket (LH)
A : Right side
G : Left side

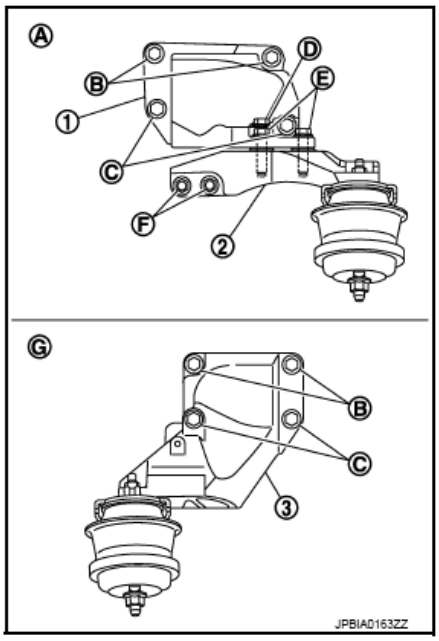

Fig. 171: Identifying Engine Mounting Bracket And Related Components
Courtesy of NISSAN NORTH AMERICA, INC.

- Install engine mounting bracket (RH) (lower) (2) as follows:
  - Temporarily tighten mounting bolts [shown as (D), (E) and (F) in the figure].
  - Tighten mounting bolts to the specified torque with following mounting surfaces touched.
- Engine mounting bracket (RH) (1) to engine mounting bracket (RH) (lower) [shown as and in figure].
- Front final drive to engine mounting bracket (RH) (lower) [shown as in figure].
- Check all engine mounting insulators are seated properly, then tighten mounting nuts.
- Tighten rear engine mounting member bolts in numerical order as shown in the figure.

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⇦ : Vehicle front

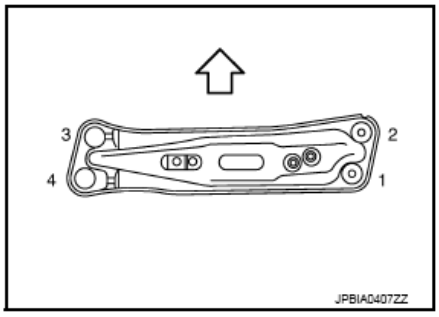

Fig. 172: Identifying Tightening Sequence Of Rear Engine Mounting Member Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

AWD: Inspection

INSPECTION AFTER INSTALLATION

Inspection for Leakage

The following are procedures for checking fluids leakage, lubricates leakage and exhaust gases leakage.

- 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 "**FOR NORTH AMERICA: FLUIDS AND LUBRICANTS** " (FOR NORTH AMERICA) or "**FOR MEXICO: FLUIDS AND LUBRICANTS** " (FOR MEXICO).
- Use procedure below to check for fuel leakage.
  - Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
  - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

SUMMARY INSPECTION ITEMS

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids(1)		Level	Leakage	Level

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Fuel	Leakage	Leakage	Leakage
Exhaust gases	-	Leakage	-
(1) Power steering fluid, brake fluid, etc.			

UNIT DISASSEMBLY AND ASSEMBLY

ENGINE STAND SETTING

Setting

NOTE: Explained here is how to disassemble with engine stand supporting transmission surface. When using a different type of engine stand, note the difference in the steps, etc.

1. Remove the engine assembly from the vehicle. Refer to "**2WD: EXPLODED VIEW**" (2WD models) or "**AWD: EXPLODED VIEW**" (AWD models).
2. Remove the parts that may restrict installation of engine to a widely use engine stand.

NOTE: The procedure is described assuming that you use a widely use engine stand holding the surface, to which transmission is installed.

- Remove drive plate with power tool. Fix crankshaft with a ring gear stopper [SST: KV10105620], and remove mounting bolts.
- Loosen mounting bolts in diagonal order.
- Check for deformation or damage of drive plate.

CAUTION:
- **Never disassemble drive plate.**
- **Never place drive plate with signal plate facing down.**
- **When handling signal plate, take care not to damage or scratch it.**
- **Handle signal plate in a manner that prevents it from becoming magnetized.**

3. Remove or pilot converter using the pilot bushing puller [SST: ST16610001] (A) if necessary.

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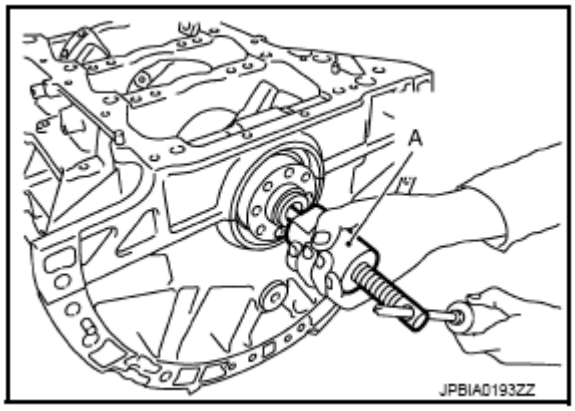

Fig. 173: Removing Pilot Converter Using Pilot Bushing Puller
Courtesy of NISSAN NORTH AMERICA, INC.

4. Lift the engine with hoist to install it onto the widely use engine stand.

CAUTION: Use an engine stand that has a load capacity [220 kg (441 lb) or more] large enough for supporting the engine weight.

- If the load capacity of the stand is not adequate, remove the following parts beforehand to reduce the potential risk of overturning the stand.
  - Remove intake manifold collector. Refer to "**EXPLODED VIEW**".
  - Remove fuel injector and fuel tube assembly. Refer to "**EXPLODED VIEW**".
  - Remove intake manifold. Refer to "**EXPLODED VIEW**".
  - Remove ignition coil. Refer to "**EXPLODED VIEW**".
  - Remove rocker cover. Refer to "**EXPLODED VIEW**".
  - Remove exhaust manifold. Refer to "**EXPLODED VIEW**".
  - Other removable brackets.

NOTE: The figure shows an example of widely use engine stand (A) that can hold mating surface of transmission with drive plate removed.

CAUTION: Before removing the hanging chains, check the engine stand is stable and there is no risk of overturning.

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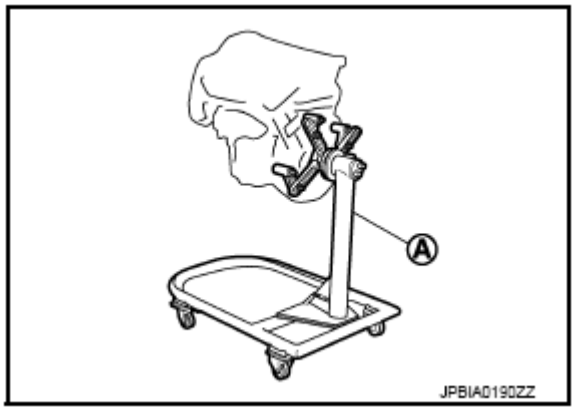

Fig. 174: Holding Mating Surface Of Transmission Using Engine Stand
Courtesy of NISSAN NORTH AMERICA, INC.

5. Drain engine oil. Refer to "**DRAINING** ".
6. Drain engine coolant by removing water drain plug (1) from both sides of the cylinder block as shown in the figure.

1 : Drain plug
2 : Drain plug
3 : Plug
4 : Plug
A : Front
B : Right side
C : Left side and back side
⇦ : Engine front

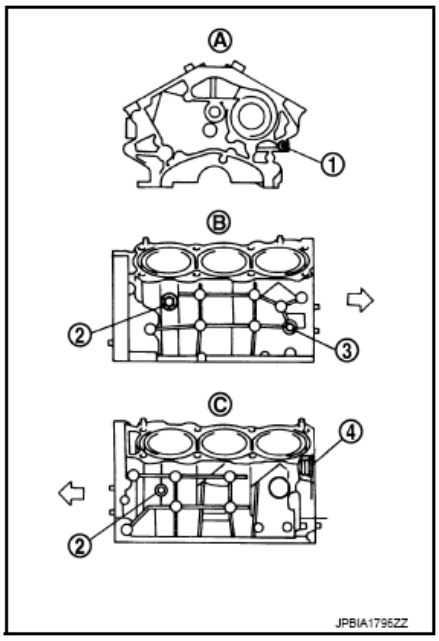

Fig. 175: Identifying Water Drain Plug And Plug
Courtesy of NISSAN NORTH AMERICA, INC.

ENGINE UNIT

Disassembly

1. Remove intake manifold collector. Refer to "**EXPLODED VIEW**".
2. Remove fuel injector and fuel tube. Refer to "**EXPLODED VIEW**".

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3. Remove intake manifold. Refer to "**EXPLODED VIEW**".
4. Remove exhaust manifold. Refer to "**EXPLODED VIEW**".
5. Remove oil pan (lower). Refer to "**EXPLODED VIEW**".
6. Remove ignition coil, spark plug and rocker cover. Refer to "**EXPLODED VIEW**".
7. Remove timing chain. Refer to "**EXPLODED VIEW**".
8. Remove rear timing chain case. Refer to "**EXPLODED VIEW**".
9. Remove camshaft (EXH). Refer to "**EXPLODED VIEW**".
10. Remove cylinder head. Refer to "**EXPLODED VIEW**".

Assembly

Assemble in the reverse order of disassembly.

OIL PAN (UPPER) AND OIL STRAINER

2WD

2WD: Exploded View

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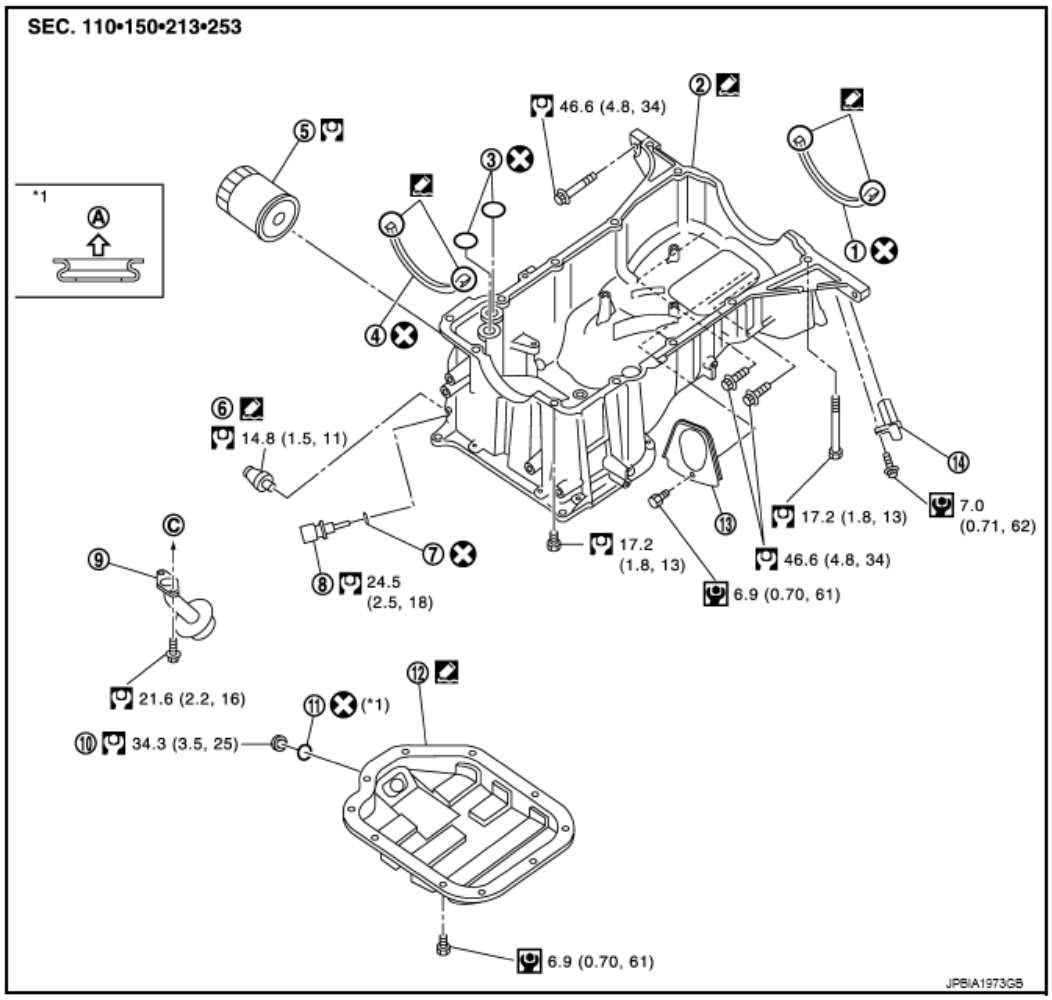
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Oil pan Gasket (rear)
2. Oil pan (upper)
3. O-ring
4. Oil pan Gasket (front)
5. Oil filter
6. Oil pressure switch
7. Washer
8. Oil temperature switch
9. Oil strainer
10. Drain plug
11. Washer
12. Oil pan (lower)
13. Rear plate cover
14. Crankshaft position sensor
- A. Oil pan (lower) side
- C. To oil pump

Fig. 176: Exploded View Of Upper Oil Pan And Oil Strainer With Torque Specifications (2WD)
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

2WD: Disassembly and Assembly

REMOVAL

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CAUTION: Never drain engine oil when the engine is hot to avoid the danger of being scalded.

1. Remove oil pan (lower). Refer to "**EXPLODED VIEW**".
2. Remove oil strainer.
3. Loosen mounting bolts in the reverse order as shown in the figure with power tool to remove.

⇦ : Engine front

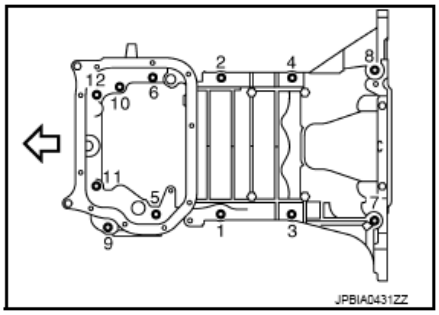

Fig. 177: Identifying Tightening Sequence Of Oil Strainer Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

- Insert the seal cutter [SST: KV10111100] between oil pan (upper) and lower cylinder block. Slide seal cutter by tapping on the side of tool with a hammer. Remove oil pan (upper).

CAUTION:
- **Never damage the mating surfaces.**
- **Never insert a screwdriver, because this damages the mating surfaces.**

4. Remove O-rings (2) from bottom of lower cylinder block (1) and oil pump (3).

⇦ : Engine front

Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

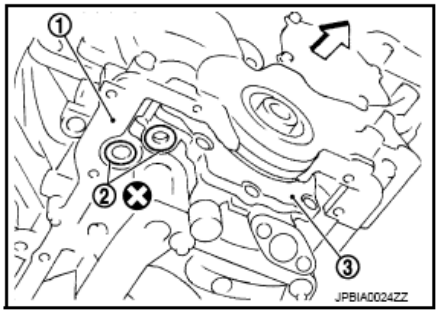

Fig. 178: Identifying Lower Cylinder Block, O-Ring And Oil Pump
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

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CAUTION: Do not reuse O-rings.

1. Install oil pan (upper) as follows:
   a. Install O-ring (2) on the bottom of lower cylinder block (1) and oil pump (3).

Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

⇦ : Engine front

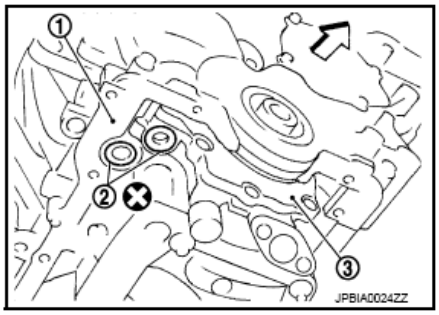

Fig. 179: Identifying Lower Cylinder Block, O-Ring And Oil Pump
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Do not reuse O-rings.

   b. Install oil pan gaskets (both front and rear).

C : Liquid gasket application position
a :15 mm (0.59 in)
b :5 mm (0.20 in)

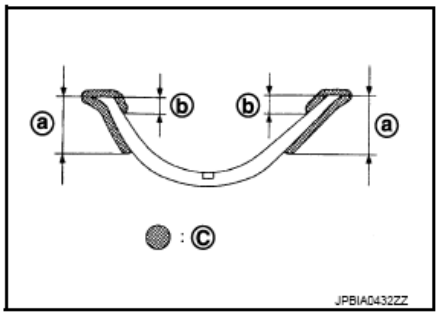

Fig. 180: Identifying Liquid Gasket Application Positions
Courtesy of NISSAN NORTH AMERICA, INC.

- Apply liquid gasket (an equivalent of Three Bond 1218B) to the area of oil pan gasket shown in the figure in a seamless single layer. Refer to "**LIQUID GASKET**"
- To install oil pan gasket (1), align the protrusion (B) with the notches (A) of the front timing chain case and the rear oil seal retainer..

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Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

⇦ : Engine front

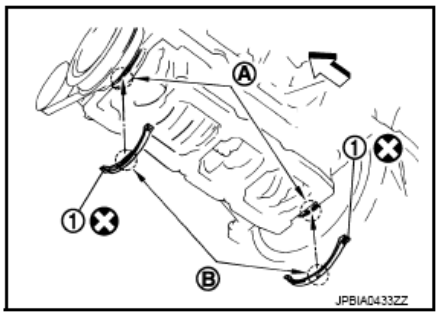

Fig. 181: Identifying Oil Pan Gasket, Protrusion And Notches Of Front Timing Chain Case
Courtesy of NISSAN NORTH AMERICA, INC.

- Install the oil pan gasket with smaller arc to the front timing chain case side.

c. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) to the cylinder block mating surface of oil pan (upper) to a limited portion as shown in the figure.

a : ϕ4.5 - 5.5 mm (0.177 - 0.217 in)
b :35 mm (1.38 in)
c :ϕ4.0 - 5.0 mm (0.157 - 0.197 in)
⇦ :Engine front

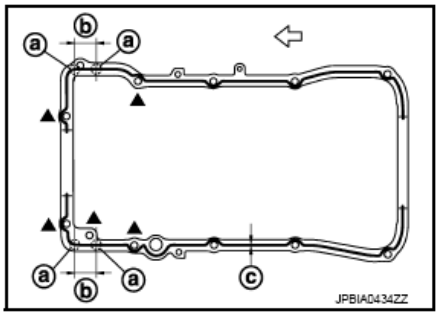

Fig. 182: Identifying Liquid Gasket Applying Areas On Cylinder Block Mating Surface
Courtesy of NISSAN NORTH AMERICA, INC.

Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS ".

CAUTION:
- **For bolt holes with marks (5 locations), apply liquid gasket outside the holes.**
- **Attaching should be done within 5 minutes after coating.**

d. Install oil pan (upper).

CAUTION: Install avoiding misalignment of O-rings.

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- Tighten mounting bolts in numerical order as shown in the figure.

⇦ : Engine front

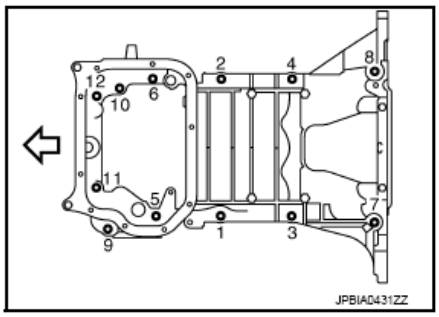

Fig. 183: Identifying Tightening Sequence Of Upper Oil Pan Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

- There are three types of mounting bolts. Refer to the following for locating bolts.

  M8 x 100 mm (3.94 in): 5, 7, 11

  M8 x 25 mm (0.98 in): Except the adove

2. Install oil strainer to oil pump.
3. Install oil pan (lower). Refer to "**EXPLODED VIEW**".
4. Install oil pan drain plug.
   - Refer to **EXPLODED VIEW** of components for installation direction of drain plug washer.
5. Install in the reverse order of removal after this step.

NOTE: At least 30 minutes after oil pan is installed, pour engine oil.

2WD: Inspection

INSPECTION AFTER REMOVAL

Clean oil strainer if any object is attached.

INSPECTION AFTER INSTALLATION

1. Check the engine oil level and adjust engine oil. Refer to "**INSPECTION** ".
2. Start engine, and check there is no leakage of engine oil.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level again. Refer to "**INSPECTION** ".

AWD

AWD: Exploded View

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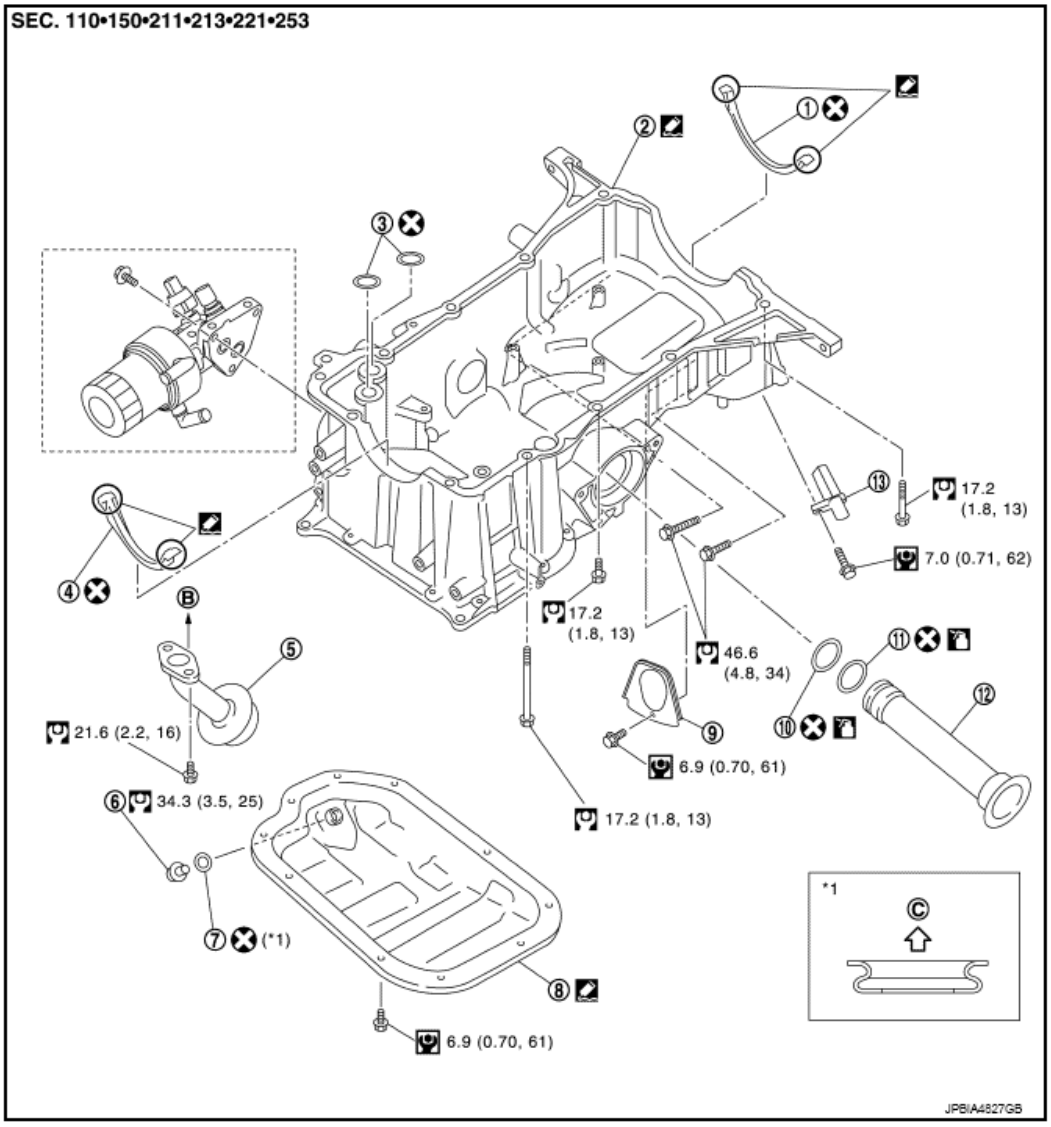
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Oil pan Gasket (rear)
2. Oil pan (upper)
3. O-ring
4. Oil pan Gasket (front)
5. Oil strainer
6. Drain plug
7. Washer
8. Oil pan (lower)
9. Rear plate cover
10. O-ring (small)
11. O-ring (large)
12. Axle pipe
13. Crankshaft position sensor

B. To oil pump

C. Oil pan (lower) side

Fig. 184: Upper Oil Pan And Oil Strainer With Torque Specifications (AWD)
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

AWD: Disassembly and Assembly

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REMOVAL

CAUTION: Never drain engine oil when the engine is hot to avoid the danger of being scalded.

1. Remove oil pan (lower). Refer to "**EXPLODED VIEW**".
2. Remove oil cooler. Refer to "**REMOVAL AND INSTALLATION** ".
3. Remove oil filter bracket. Refer to "**REMOVAL AND INSTALLATION** ".
4. Remove oil strainer.
5. Loosen mounting bolts in the reverse order as shown in the figure with power tool to remove.

⇦ : Engine front

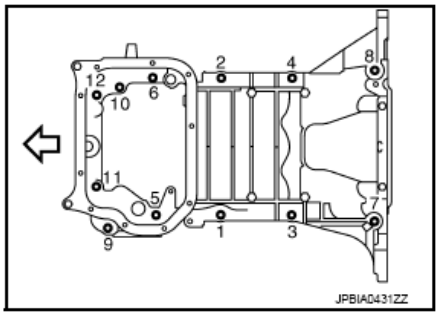

Fig. 185: Identifying Tightening Sequence Of Oil Strainer Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

- Insert the seal cutter [SST: KV10111100] between oil pan (upper) and lower cylinder block. Slide seal cutter by tapping on the side of tool with a hammer. Remove oil pan (upper).

CAUTION:
- **Never damage the mating surfaces.**
- **Never insert a screwdriver, because this damages the mating surfaces.**

6. Remove O-rings (2) from bottom of lower cylinder block (1) and oil pump (3).

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Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

⇦ : Engine front

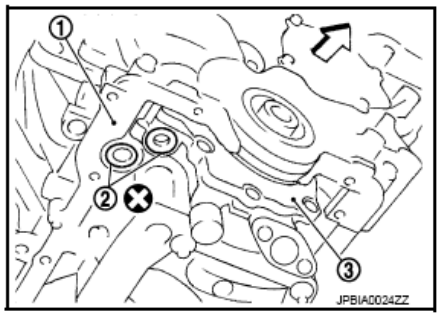

Fig. 186: Identifying Lower Cylinder Block, O-Ring And Oil Pump
Courtesy of NISSAN NORTH AMERICA, INC.

7. Remove axle pipe, if necessary.
   - Remove axle pipe from oil pan (upper) using a suitable drift (A) [outer diameter: 37 mm (1.46 in)].

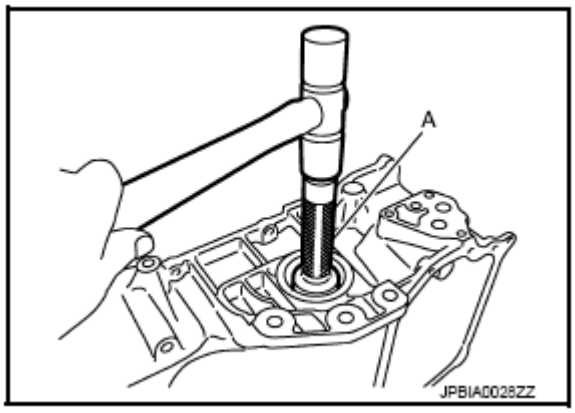

Fig. 187: Removing Axle Pipe From Upper Oil Pan Using Drift
Courtesy of NISSAN NORTH AMERICA, INC.

INSTALLATION

CAUTION: Do not reuse O-rings.

1. Install axle pipe (3) to oil pan (upper), if removed.
   - Lubricate O-ring groove of axle pipe, O-rings (1), (2), and O-ring joint of oil pan with new engine oil.

	Unit: mm (in)
Items	**O-ring inner diameter**

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Final drive side (right side)	31.4 (1.236)
Axle pipe flange side (left side)	33.6 (1.323)

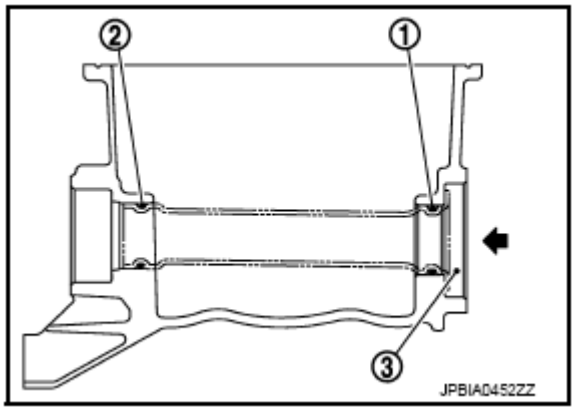

Fig. 188: Identifying Axle Pipe And O-Rings
Courtesy of NISSAN NORTH AMERICA, INC.

- Install axle pipe (1) to oil pan (upper) from axle pipe flange side (left side) using a suitable drift (A) [outer diameter: 43 to 57 mm (1.69 to 2.24 in)].

CAUTION: Insert it with care to prevent O-ring from sliding.

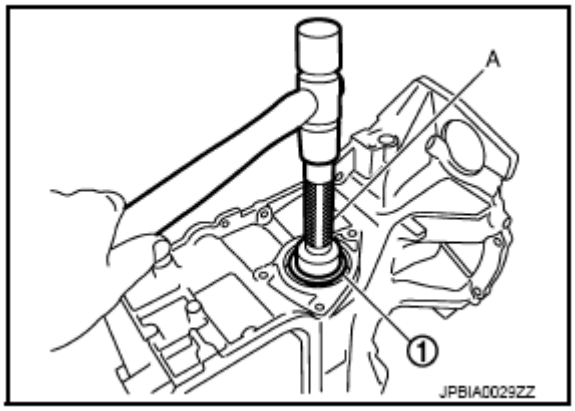

Fig. 189: Installing Axle Pipe To Upper Oil Pan Using Drift
Courtesy of NISSAN NORTH AMERICA, INC.

2. Install oil pan (upper) as follows:
   a. Install O-ring (2) on the bottom of lower cylinder block (1) and oil pump (3).

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Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

⇦ : Engine front

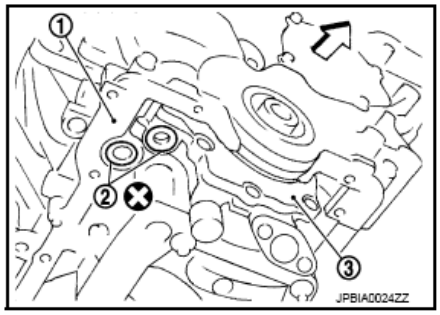

Fig. 190: Identifying O-Ring, Lower Cylinder Block And Oil Pump
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Do not reuse O-rings.

b. Install oil pan gaskets (both front and rear).

C : Liquid gasket application position
a :15 mm (0.59 in)
b :5 mm (0.20 in)

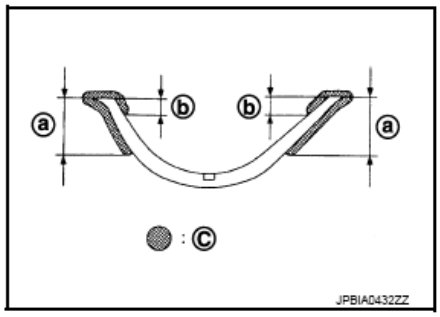

Fig. 191: Identifying Liquid Gasket Application Position
Courtesy of NISSAN NORTH AMERICA, INC.

- Apply liquid gasket (an equivalent of Three Bond 1218B) to the area of oil pan gasket shown in the figure in a seamless single layer. Refer to "**LIQUID GASKET**"
- To install oil pan gasket (1), align the protrusion (B) with the notches (A) of the front timing chain case and the rear oil seal retainer..

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Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

⇦ : Engine front

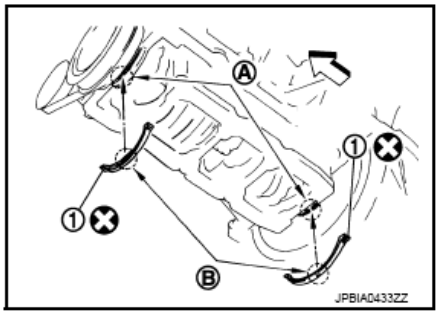

Fig. 192: Identifying Oil Pan Gasket, Protrusion And Notches Of Front Timing Chain Case
Courtesy of NISSAN NORTH AMERICA, INC.

- Install the oil pan gasket with smaller arc to the front timing chain case side.

c. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) to the cylinder block mating surface of oil pan (upper) to a limited portion as shown in the figure.

a : ϕ4.5 - 5.5 mm (0.177 - 0.217 in)
b :35 mm (1.38 in)
c :ϕ4.0 - 5.0 mm (0.157 - 0.197 in)
⇦ :Engine front

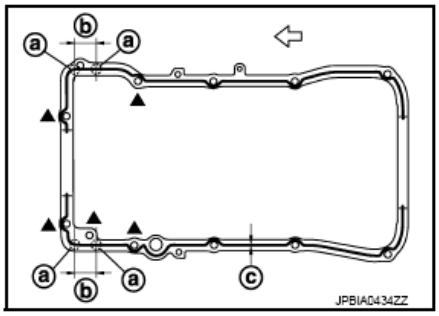

Fig. 193: Identifying Liquid Gasket Applying Areas On Cylinder Block Mating Surface
Courtesy of NISSAN NORTH AMERICA, INC.

Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS ".

CAUTION:
- **For bolt holes with marks (5 locations), apply liquid gasket outside the holes.**
- **Attaching should be done within 5 minutes after coating.**

d. Install oil pan (upper).

CAUTION: Install avoiding misalignment of O-rings.

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- Tighten mounting bolts in numerical order as shown in the figure.

⇦ : Engine front

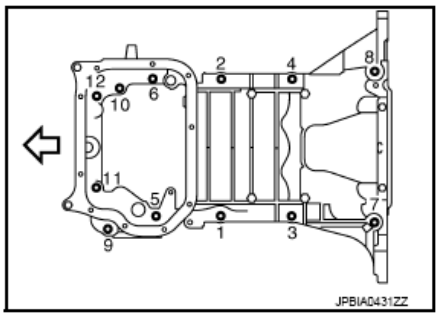

Fig. 194: Identifying Tightening Sequence Of Upper Oil Pan Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

- There are three types of mounting bolts. Refer to the following for locating bolts.

  M8 x 100 mm (3.94 in): 5, 7, 11

  M8 x 25 mm (0.98 in): Except the adove

3. Install oil strainer to oil pump.
4. Install oil pan (lower). Refer to "**EXPLODED VIEW**".
5. Install oil pan drain plug.
   - Refer to **EXPLODED VIEW** of the components for installation direction of drain plug washer.
6. Install in the reverse order of removal after this step.

NOTE: At least 30 minutes after oil pan is installed, pour engine oil.

AWD: Inspection

INSPECTION AFTER REMOVAL

Clean oil strainer if any object is attached.

INSPECTION AFTER INSTALLATION

1. Check the engine oil level and adjust engine oil. Refer to "**INSPECTION** ".
2. Start engine, and check there is no leakage of engine oil.
3. Stop engine and wait for 10 minutes.
4. Check the engine oil level again. Refer to "**INSPECTION** ".

REAR TIMING CHAIN CASE

Exploded View

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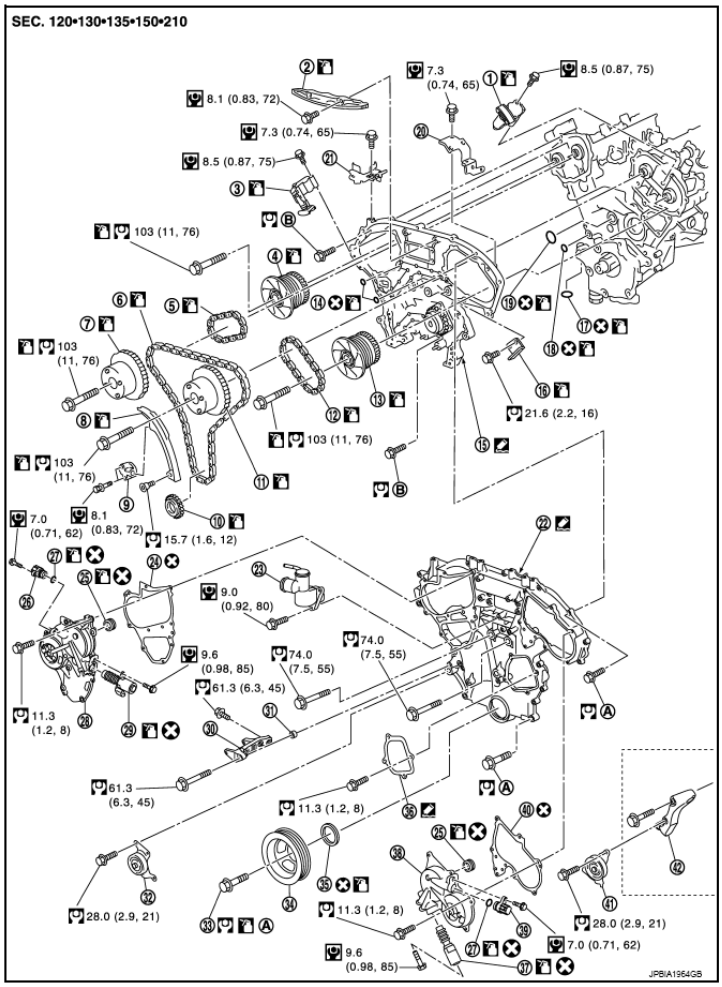
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Timing chain tensioner (secondary)	2. Internal chain guide	3. Timing chain tensioner (secondary)
4. Camshaft sprocket (EXH)	5. Timing chain (secondary)	6. Timing chain (primary)
7. Camshaft sprocket (INT)	8. Slack guide	9. Timing chain tensioner (primary)
10. Crankshaft sprocket	11. Camshaft sprocket (INT)	12. Timing chain (secondary)
13. Camshaft sprocket (EXH)	14. O-ring	15. Rear timing chain case
16. Tension guide	17. O-ring	18. O-ring
19. O-ring	20. Bracket	21. Bracket
22. Front timing chain case	23. Water outlet (front)	24. Valve timing control cover gasket (bank 1)
25. Seal ring	26. Exhaust valve timing control magnet retarder (bank 1)	27. O-ring
28. Valve timing control cover (bank 1)	29. Intake valve timing control solenoid valve (bank 1)	30. Power steering oil pump bracket
31. Collar	32. Idler pulley	33. Crankshaft pulley bolt
34. Crankshaft pulley	35. Front oil seal	36. Water pump cover
37. Intake valve timing control solenoid valve (bank 2)	38. Valve timing control cover (bank 2)	39. Exhaust valve timing control magnet retarder (bank 2)
40. Valve timing control cover gasket (bank 2)	41. Idler pulley assembly	42. A/C compressor bracket
A. Comply with the installation procedure when tightening.	B. Comply with the assembly procedure when tightening.	

Fig. 195: Exploded View Of Rear Timing Chain Case With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

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Disassembly and Assembly

DISASSEMBLY

1. Remove front timing chain case and timing chain. Refer to "**REMOVAL AND INSTALLATION**".
2. Remove water pump. Refer to "**VQ25HR: EXPLODED VIEW** ".
3. Remove oil pan (upper). Refer to "**2WD: EXPLODED VIEW**" (2WD models) or "**AWD: EXPLODED VIEW**" (AWD models).
4. Remove rear timing chain case as follows:
   a. Loosen mounting bolts in reverse order as shown in the figure.

A : Dowel hole

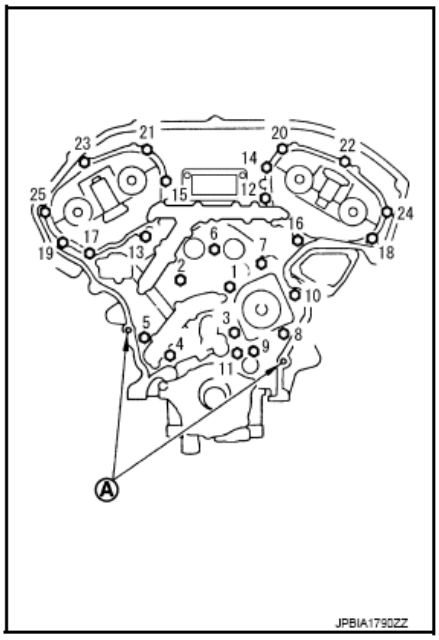

Fig. 196: Identifying Tightening Sequence Of Front Timing Chain Case Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

   b. Cut liquid gasket using the seal cutter [SST: KV10111100] and remove rear timing chain case.

CAUTION:
- **Never remove plate metal cover (1) of oil passage.**
- **After removal, handle rear timing chain case carefully so it does not tilt, cant, or warp under a load.**

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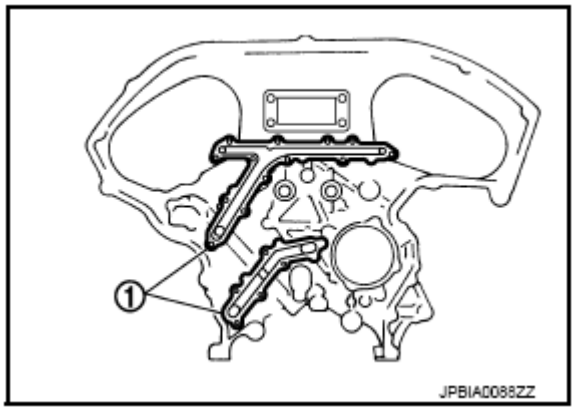

Fig. 197: Identifying Plate Metal Cover Of Oil Passage
Courtesy of NISSAN NORTH AMERICA, INC.

5. Remove O-rings (1) from cylinder block.

Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

⇦ : Engine front

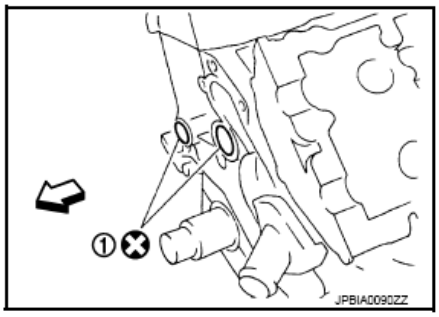

Fig. 198: Identifying Cylinder Block O-Ring
Courtesy of NISSAN NORTH AMERICA, INC.

6. Remove timing chain tensioners (secondary) from cylinder head as follows, if necessary.
   a. Remove camshaft brackets (No. 1). Refer to "**EXPLODED VIEW**".
   b. Remove timing chain tensioners (secondary) with a stopper pin (A) attached.

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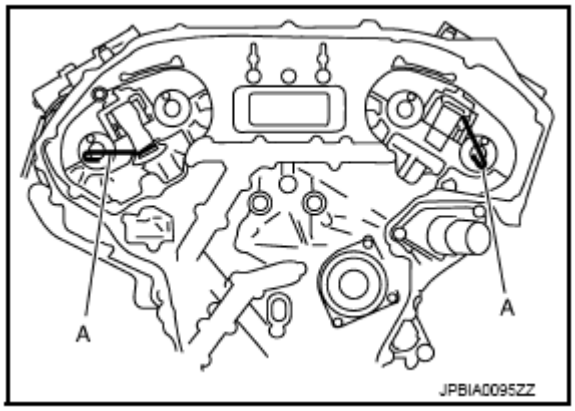

Fig. 199: Pushing Plunger Of Timing Chain Tensioner (Secondary) Using Stopper Pin
Courtesy of NISSAN NORTH AMERICA, INC.

ASSEMBLY

CAUTION: Do not reuse O-rings.

1. Install timing chain tensioners (secondary) to cylinder head as follows if removed. Refer to "**EXPLODED VIEW**".
   a. Install timing chain tensioners (secondary) with a stopper pin attached and new O-rings.
   b. Install camshaft brackets (No. 1). Refer to "**EXPLODED VIEW**".
   c. Measure difference in levels between front end faces of camshaft bracket (No. 1) and cylinder head.

   Standard: -0.14 to 0.14 mm (-0.0055 to 0.0055 in)

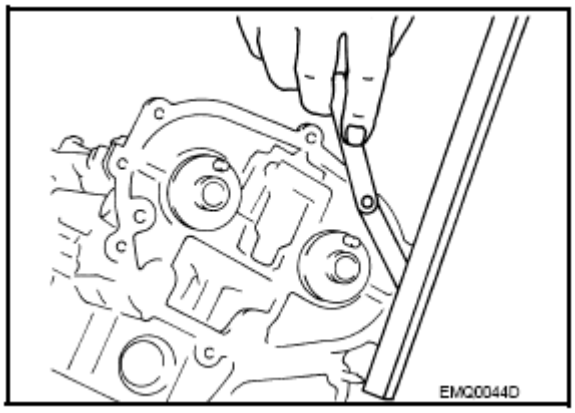

Fig. 200: Measuring Difference In Levels Between Front End Faces Of Camshaft Bracket And Cylinder Head
Courtesy of NISSAN NORTH AMERICA, INC.

- Measure two positions (both intake and exhaust side) for a single bank.

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- If the measured value is out of the standard, reinstall camshaft bracket (No. 1).

2. Install rear timing chain case as follows:
   a. Install new O-rings (1) onto cylinder block.

⇦ : Engine front

Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.

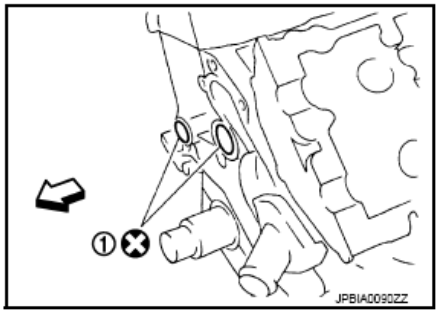

Fig. 201: Identifying Cylinder Block O-Rings
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Do not reuse O-rings.

   b. Apply liquid gasket with the tube presser (commercial service tool) to rear timing chain case back side as shown in the figure.

Use Genuine RTV Silicone Sealant or equivalent. Refer to "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS ".

CAUTION:
- **For (A) in the figure, completely wipe out liquid gasket extended on a portion touching at engine coolant.**
- **Apply liquid gasket on installation position of water pump and cylinder head very completely.**

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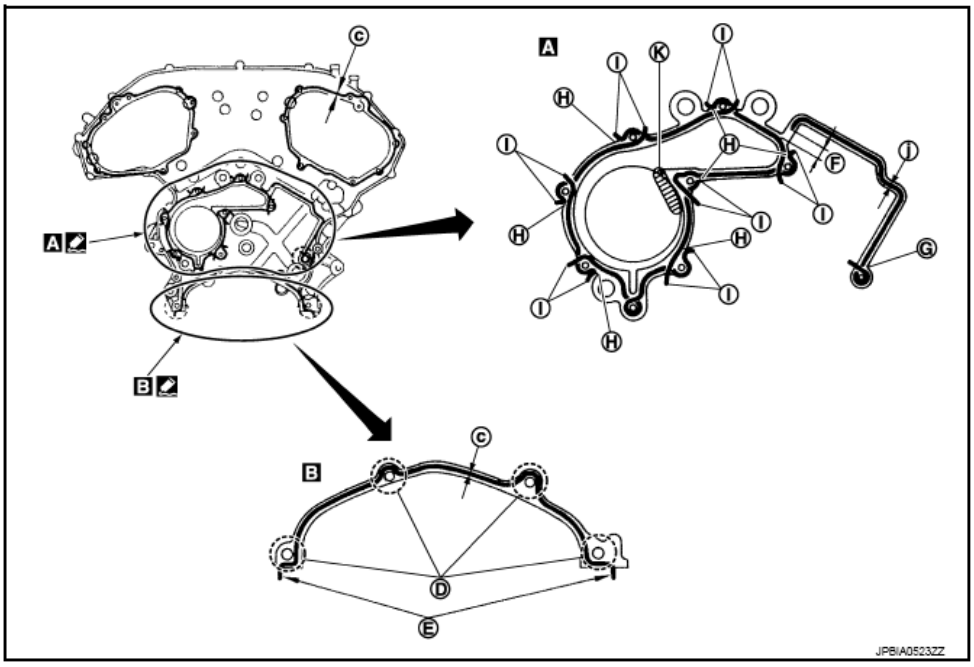
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



D. Run along bolt hole inner side
E. Protrusion
F. Clearance 8mm (0.31)
G. Stop when liquid gasket is squeezed out
H. Clearance 1mm (0.04 in)
I. Apply extra liquid gasket outside of the case rim
K. Don not protrude in this area
c. ϕ3.9mm (0.154 in)
j. ϕ3.1mm (0.122 in)

Fig. 202: Identifying Liquid Gasket Applying Areas On Water Pump And Cylinder Head
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

c. Align rear timing chain case with dowel pins (bank 1 and bank 2) on cylinder block and install rear timing chain case.
   - Check O-rings stay in place during installation to cylinder block and cylinder head.

d. Tighten mounting bolts in numerical order as shown in the figure.
   - There are two types of mounting bolts. Refer to the following for locating bolts.

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A : Dowel pin hole

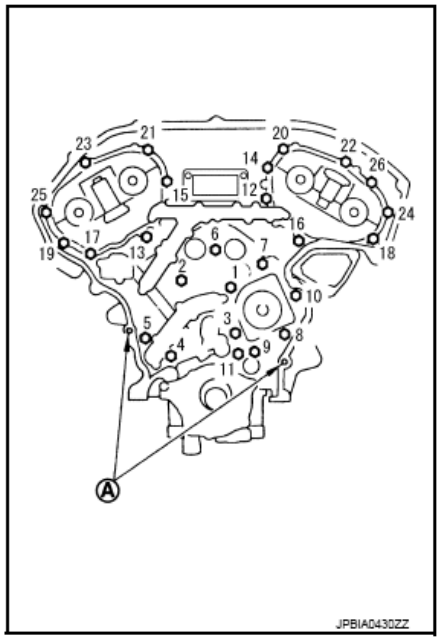

Fig. 203: Identifying Tightening Sequence Of Rear Timing Chain Case Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

Bolt length: Bolt position

20 mm (0.79 in): 1, 2, 3, 6, 7, 8, 9, 10

16 mm (0.63 in): 4, 5, 11

:: 12.7 N.m (1.3 kg-m, 9 ft-lb)

16 mm (0.63 in): Except the above

:: 15.0 N.m (1.5 kg-m, 11 ft-lb)

e. After all bolts are tightened, retighten them to the specified torque in numerical order shown in the figure.
   - If liquid gasket protrudes, wipe it off immediately.

f. After installing rear timing chain case, check the surface height difference between the following parts on the oil pan (upper) mounting surface.

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1 : Rear timing chain case
2 : Lower cylinder block

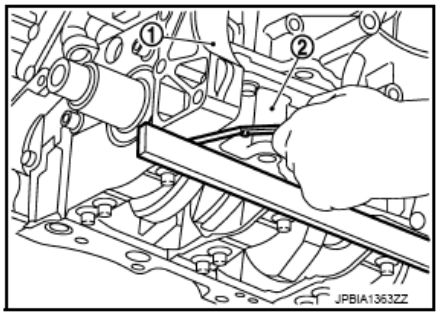

Fig. 204: Checking Surface Height Difference Between Upper Oil Pan Mounting Surface
Courtesy of NISSAN NORTH AMERICA, INC.

Standard

Rear timing chain case to lower cylinder block:

-0.24 to 0.14 mm (-0.0094 to 0.0055 in)

- If not within the standard, repeat the installation procedure.

3. Install water pump with new O-rings. Refer to "**VQ25HR: EXPLODED VIEW** ".
4. Check that dowel pin (A) and crankshaft key (1) are located as shown in the figure. (No. 1 cylinder at compression TDC)

NOTE: **Though camshaft does not stop at the position as shown in the figure, for the placement of cam nose, it is generally accepted camshaft is placed for the same direction of the figure.**

Camshaft dowel pin

: At cylinder head upper face side in each bank.

Crankshaft key

: At cylinder head side of bank 1.

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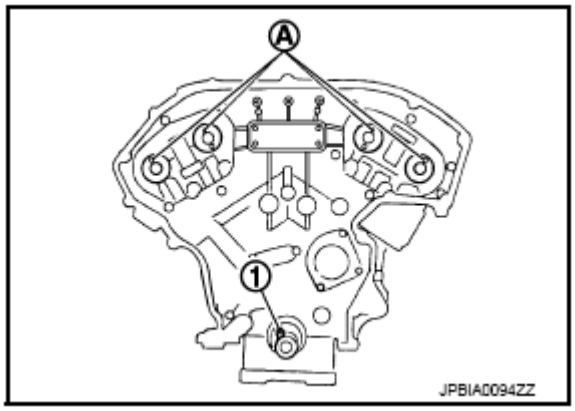

Fig. 205: Identifying Crankshaft Key And Dowel Pin
Courtesy of NISSAN NORTH AMERICA, INC.

5. Install timing chains (secondary) and camshaft sprockets as follows:

CAUTION: Matching marks between timing chain and sprockets slip easily. Confirm all matching mark positions repeatedly during the installation process.

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

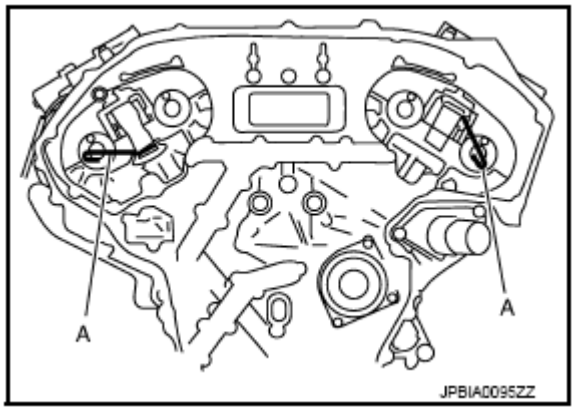

Fig. 206: Pushing Plunger Of Timing Chain Tensioner (Secondary) Using Stopper Pin
Courtesy of NISSAN NORTH AMERICA, INC.

6. For the following operations, perform steps in the reverse order of removal.

CYLINDER HEAD

Exploded View

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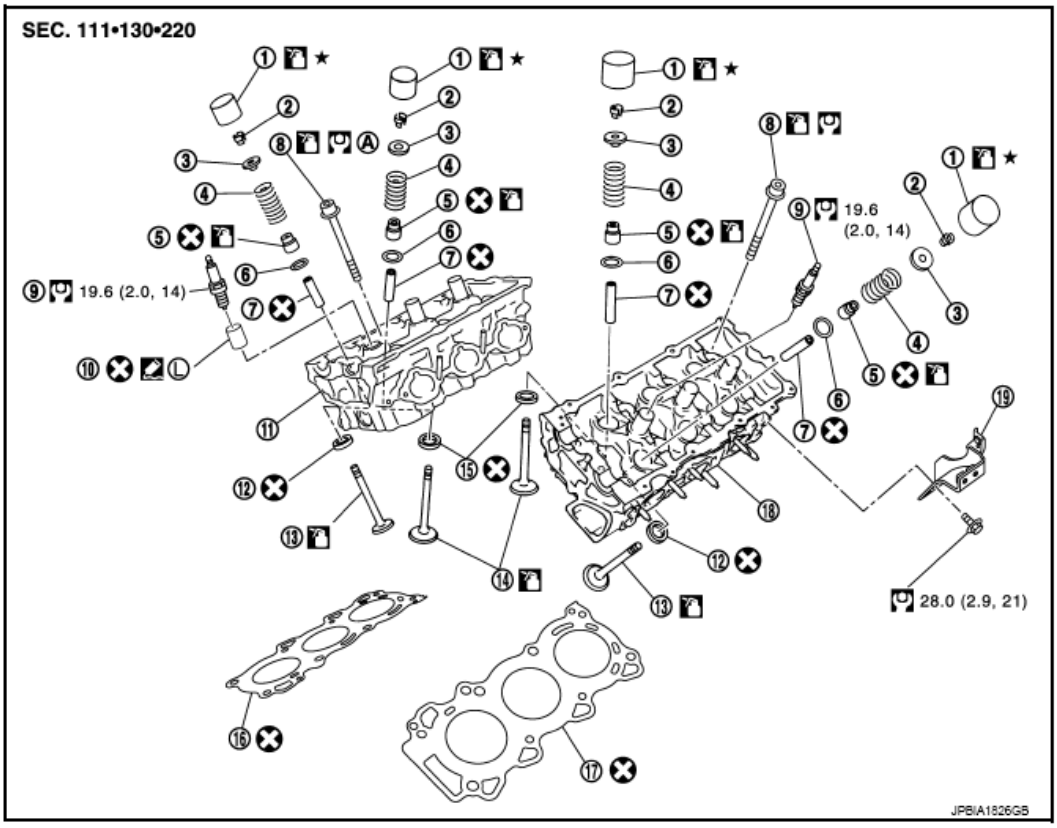
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Valve lifter
2. Valve collet
3. Valve spring retainer
4. Valve spring
5. Valve oil seal
6. Valve spring seat
7. Valve guide
8. Cylinder head bolt
9. Spark plug
10. Spark plug tube
11. Cylinder head (bank 1)
12. Valve seat (EXH)
13. Valve (INT)
14. Valve (EXH)
15. Valve seat (EXH)
16. Cylinder head gasket (bank 1)
17. Cylinder head gasket (bank 2)
18. Cylinder head (bank 2)
19. Engine rear lower slinger

Ⓛ: Apply high strength thread locking sealant or equivalent.

Fig. 207: Exploded View Of Cylinder Head With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols not described on the above.

Disassembly and Assembly

DISASSEMBLY

1. Remove the following parts:
   - Intake manifold collector: Refer to "**EXPLODED VIEW**".

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- Rocker cover and spark plug: Refer to "**EXPLODED VIEW**".
- Fuel tube and fuel injector assembly: Refer to "**EXPLODED VIEW**".
- Intake manifold: Refer to "**EXPLODED VIEW**".
- Exhaust manifold: Refer to "**EXPLODED VIEW**".
- Water inlet and thermostat assembly: Refer to "**EXPLODED VIEW** ".
- Water outlets (front and rear), water pipe and heater pipe: Refer to "**VQ25HR: EXPLODED VIEW** ".
- Timing chain: Refer to "**EXPLODED VIEW**".
- Rear timing chain case: Refer to "**EXPLODED VIEW**".
- Camshaft: Refer to "**EXPLODED VIEW**".

2. Remove cylinder head.
   - Loosen cylinder head bolts in reverse order as shown in the figure with cylinder head bolt wrench (commercial service tool) and power tool.

A : Bank 1
B : Bank 2
⇦ : Engine front

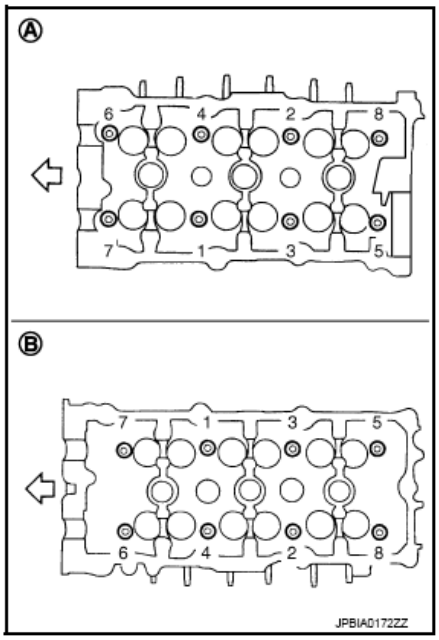

Fig. 208: Identifying Tightening Sequence Of Cylinder Head Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

3. Remove cylinder head gaskets.
4. Remove valve lifter.
   - Identify installation positions, and store them without mixing them up.
5. Remove valve collet.
   - Compress valve spring with the valve spring compressor [SST: KV10116200] (A), the attachment [SST: KV10115900] (C) and the adapter [SST: KV10109220] (B). Remove valve collet with a magnet hand.

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CAUTION: When working, take care not to damage valve lifter holes.

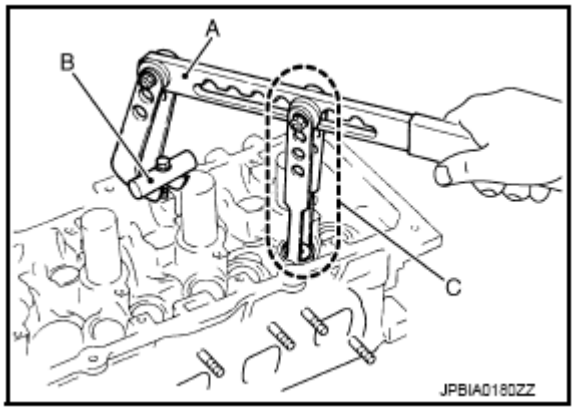

Fig. 209: Compressing Valve Spring Using Valve Spring Compressor
Courtesy of NISSAN NORTH AMERICA, INC.

6. Remove valve spring retainer, valve spring and valve spring seat.
7. Push valve stem to combustion chamber side, and remove valve.
   - Identify installation positions, and store them without mixing them up.
8. Remove valve oil seal using the valve oil seal puller [SST: KV10107902] (A).

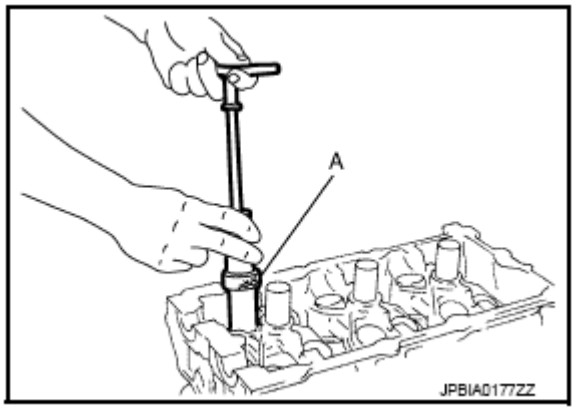

Fig. 210: Removing Valve Oil Seal Using Valve Oil Seal Puller
Courtesy of NISSAN NORTH AMERICA, INC.

9. Remove valve seat, if valve seat must be replaced.
   - 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. Refer to "**CYLINDER HEAD**".

CAUTION: Prevent to scratch cylinder head by excessive boring.

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10. Remove valve guide, if valve guide must be replaced.
    a. To remove valve guide, heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil (A).

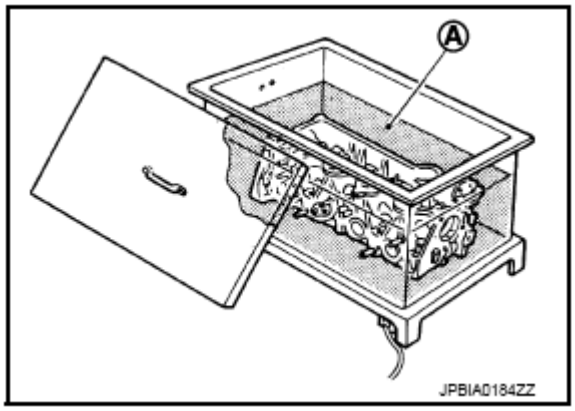

Fig. 211: Heating Cylinder Head To 110 To 130°C Using Heated Oil
Courtesy of NISSAN NORTH AMERICA, INC.

    b. Drive out valve guide with a press [under a 20 kN (2 ton, 2.0 lmp ton) pressure] or a hammer and the valve guide drift (commercial service tool).

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

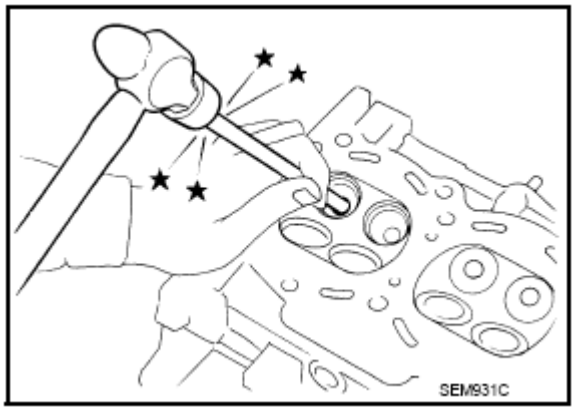

Fig. 212: Driving Out Valve Guide Using Press Or Hammer
Courtesy of NISSAN NORTH AMERICA, INC.

11. Remove spark plug tube, if necessary.
    - Using a pliers, pull spark plug tube out of cylinder head.

CAUTION:
- **Take care not to damage cylinder head.**

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- **Once removed, spark plug tube will be deformed and cannot be reused. Never remove it unless absolutely necessary.**

ASSEMBLY

1. If valve guide is removed in step 10 (DISASSEMBLY), install it.

   Replace with oversized [0.2 mm (0.008 in)] valve guide.

   a. Using the valve guide reamer (commercial service tool) (A), ream cylinder head valve guide hole.

      Valve guide hole diameter (for service parts):

      Intake and exhaust

      : Refer to "CYLINDER HEAD".

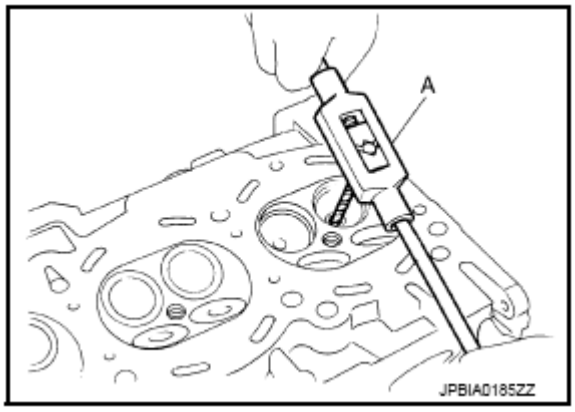

Fig. 213: Reaming Cylinder Head Valve Guide Hole Using Reamer
Courtesy of NISSAN NORTH AMERICA, INC.

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

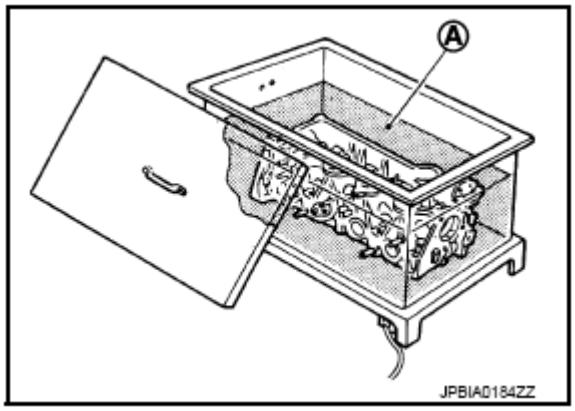

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Fig. 214: Heating Cylinder Head To 110 To 130°C Using Heated Oil
Courtesy of NISSAN NORTH AMERICA, INC.

c. Using the valve guide drift (commercial service tool), press valve guide from camshaft side to the dimensions as shown in the figure.

Projection (A)

Intake and exhaust

: Refer to "CYLINDER HEAD".

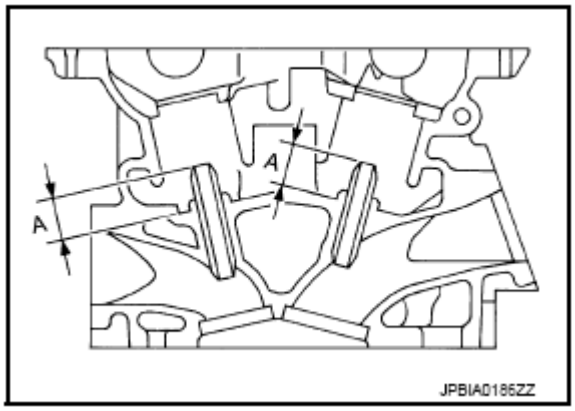

Fig. 215: Identifying Dimension Between Valve Guide To Camshaft Side
Courtesy of NISSAN NORTH AMERICA, INC.

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

d. Using the valve guide reamer (commercial service tool) (A), apply reamer finish to valve guide.

Standard: Refer to CYLINDER HEAD.

(Intake and exhaust) "Cylinder Head" .

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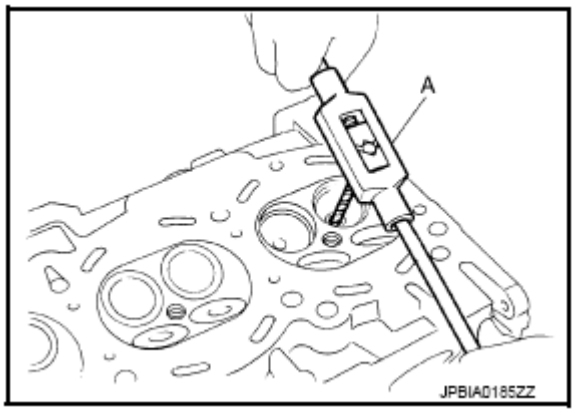

Fig. 216: Reaming Cylinder Head Valve Guide Hole Using Reamer
Courtesy of NISSAN NORTH AMERICA, INC.

2. If valve seat is removed in step 9 (DISASSEMBLY), install it.

   Replace with oversize [0.5 mm (0.020 in)] valve seat.

   a. Ream cylinder head recess diameter (a) for service valve seat.

      Oversize: Refer to CYLINDER HEAD.

      (Intake and exhaust) "Cylinder Head" .

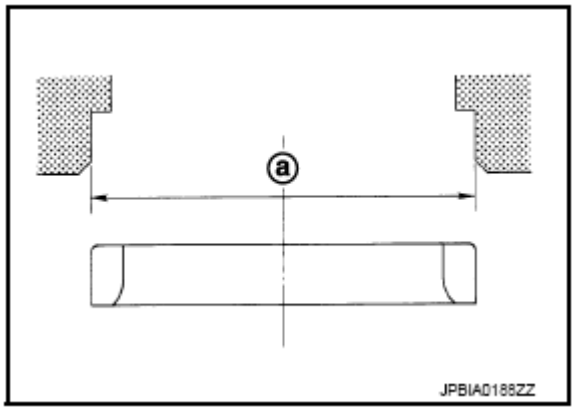

Fig. 217: Identifying Cylinder Head Recess Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

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

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

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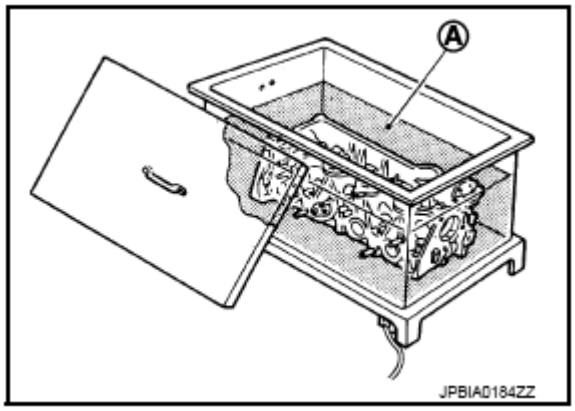

Fig. 218: Heating Cylinder Head To 110 To 130°C Using Heated Oil
Courtesy of NISSAN NORTH AMERICA, INC.

c. Provide valve seats cooled well with dry ice. Force fit valve seat into cylinder head.

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

CAUTION: Avoid directly touching cold valve seats.

d. Using the valve seat cutter set (commercial service tool) or valve seat grinder, finish seat to the specified dimensions. Refer to "**CYLINDER HEAD**".

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

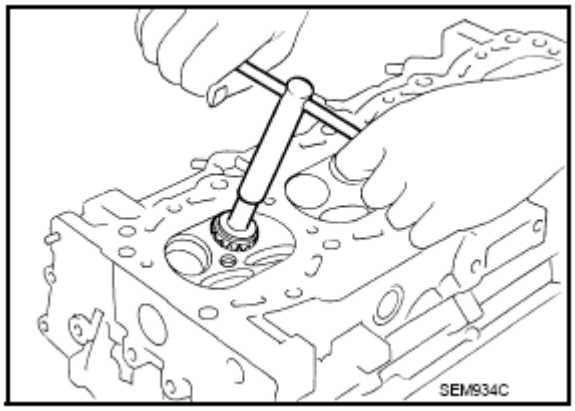

Fig. 219: Finishing Seat Using Valve Seat Cutter

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Courtesy of NISSAN NORTH AMERICA, INC.

e. Using compound, grind to adjust valve fitting.
f. Check again for normal contact. Refer to "VALVE SEAT CONTACT".

3. Install new valve oil seals as follows:
   a. Apply new engine oil on valve oil seal joint and seal lip.
   b. Install with the valve oil seal drift [SST: KV10115600] (A) to match dimension in the figure.

Height (b) (Without valve spring seat installed)

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

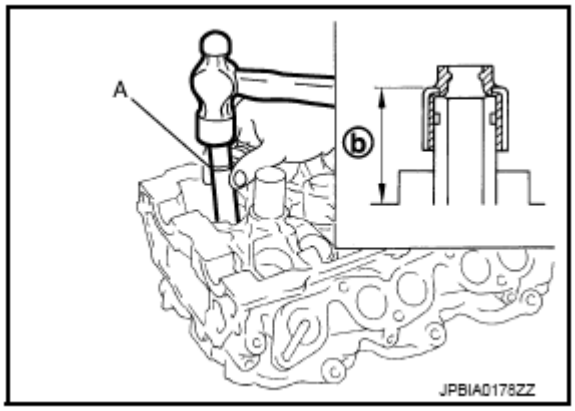

Fig. 220: Installing Valve Oil Seals Using Drift
Courtesy of NISSAN NORTH AMERICA, INC.

4. Install valve spring seat.
5. Install valve.

NOTE: Larger diameter valves are for intake side.

6. Install valve spring (uneven pitch type).
   - Install narrow pitch end to cylinder head side (valve spring seat side).

A : Wide pitch
B : Narrow pitch
C : Paint mark
⇦ : Cylinder head side

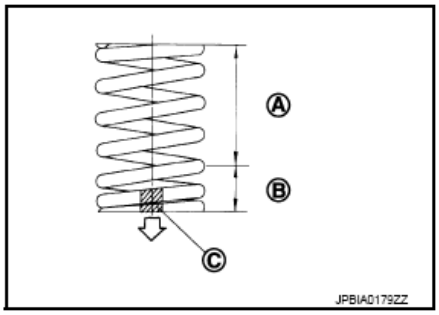

Fig. 221: Identifying Cylinder Head Side Wide Pitch And Narrow Pitch

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Courtesy of NISSAN NORTH AMERICA, INC.

Paint mark color: Yellowish green

7. Install valve spring retainer.
8. Install valve collet.
   - Compress valve spring with the valve spring compressor [SST: KV10116200] (A), the attachment [SST: KV10115900] (C) and the adapter [SST: KV10109220] (B). Install valve collet with a 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.

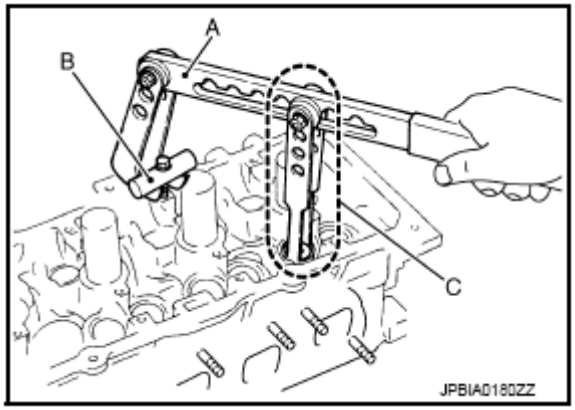

Fig. 222: Compressing Valve Spring Using Valve Spring Compressor
Courtesy of NISSAN NORTH AMERICA, INC.

9. Install new cylinder head gaskets.
10. Turn crankshaft until No. 1 piston is set at TDC.

1 : Crankshaft key
⇦ : Bank 1 side

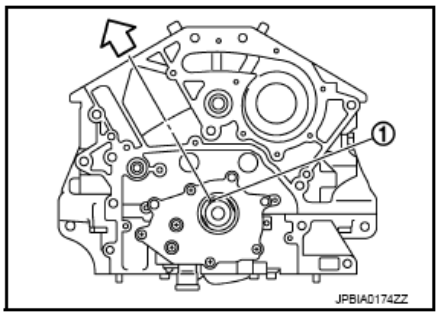

Fig. 223: Identifying Crankshaft Key
Courtesy of NISSAN NORTH AMERICA, INC.

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- Crankshaft key should line up with the bank 1 cylinder center line as shown in the figure.

11. Install cylinder head follow the steps below to tighten cylinder head bolts in numerical order as shown in the figure with cylinder head bolts wrench (commercial service tool).

A : Bank 1
B : Bank 2
⇦ : Engine front

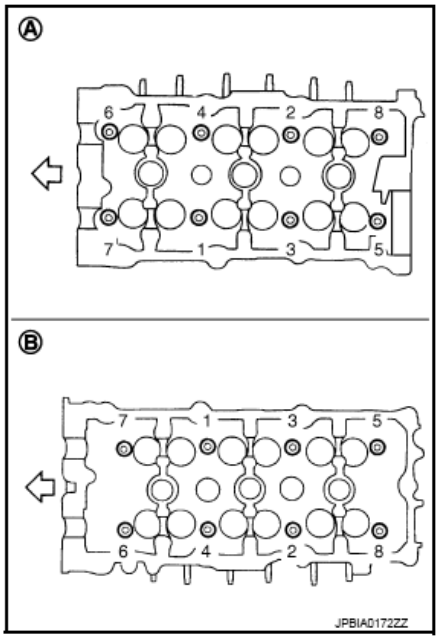

Fig. 224: Identifying Tightening Sequence Of Cylinder Head Mounting Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION:
- **If cylinder head bolts reused, check their outer diameters before installation. Refer to "INSPECTION".**
- **Before installing cylinder head, inspect cylinder head distortion. Refer to "INSPECTION".**

a. Apply new engine oil to threads and seat surfaces of cylinder head bolts.
b. Tighten all cylinder head bolts.

: 98.1 N.m (10 kg-m, 72 ft-lb)

c. Completely loosen all cylinder head bolts.

: 0.0 N.m (0 kg-m, 0 ft-lb)

CAUTION: In step "c", loosen bolts in reverse order of that indicated in the figure.

d. Tighten all cylinder head bolts.

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: 39.2 N.m (4.0 kg-m, 28 ft-lb)

e. Turn all cylinder head bolts 90 degrees clockwise (angle tightening).

CAUTION: Check the tightening angle by using the angle wrench [SST: KV10112100] (A). Never make judgment by visual inspection.

- Check tightening angle indicated on the angle wrench indicator plate.

f. Turn all cylinder head bolts 90 degrees clockwise again (angle tightening).

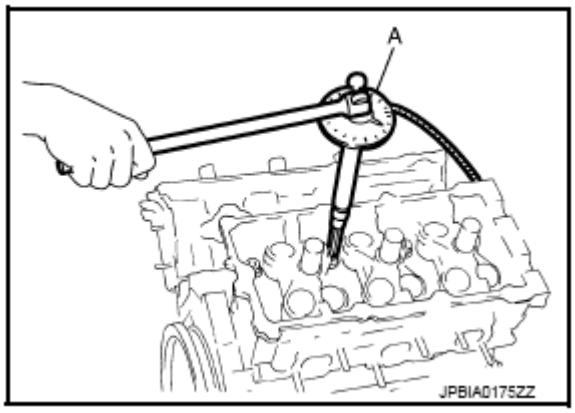

Fig. 225: Checking Tightening Angle Using Angle Wrench Indicator Plate
Courtesy of NISSAN NORTH AMERICA, INC.

12. After installing cylinder head, measure distance between front end faces of cylinder block and cylinder head (bank 1 and bank 2).

Standard: 14.1 - 14.9 mm (0.555 - 0.587 in)

- If measured value is out of the standard, re-install cylinder head.

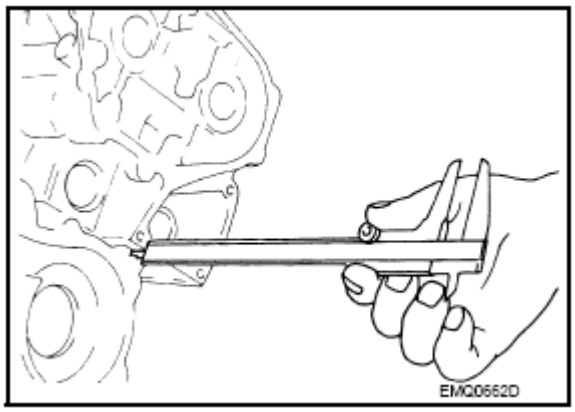

Fig. 226: Measuring Distance Between Front End Faces Of Cylinder Block And Cylinder Head (Bank 1 And Bank 2)

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Courtesy of NISSAN NORTH AMERICA, INC.

13. Install valve lifter.
    - Install it in the original position.
14. Install spark plug tube.
    - Press-fit spark plug tube as follows:
    a. Remove old locking sealant 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 high strength thread locking sealant or equivalent.

    c. Using drift, press-fit spark plug tube so that its height (A) is as specified in the figure.

B : High strength thread locking sealant application area

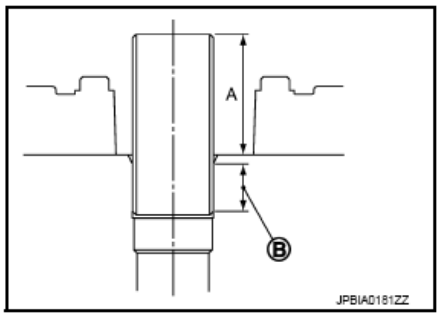

Fig. 227: Identifying High Strength Thread Locking Sealant Application Area
Courtesy of NISSAN NORTH AMERICA, INC.

Standard press-fit height:

: 37.7 - 38.7 mm (1.484 - 1.524 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.**

15. Install spark plug with spark plug wrench (commercial service tool).
16. Install in the reverse order of removal after this step.

Inspection

INSPECTION AFTER REMOVAL

Cylinder Head Bolts Outer Diameter

- Cylinder head bolts are tightened by plastic zone tightening method. Whenever the size difference

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between (C) and (B) exceeds the limit, replace them with new one.

A : Measuring point
d : 11 mm (0.43 in)
e : 48 mm (1.89 in)

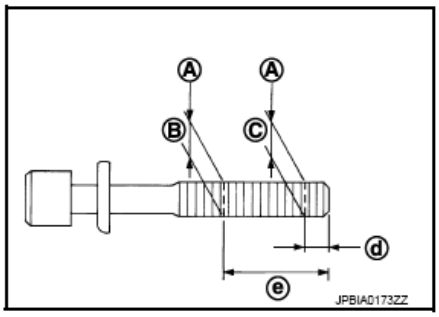

Fig. 228: Identifying Cylinder Head Bolts Outer Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

Limit [(C) - (B)]: 0.18 mm (0.0071 in)

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

Cylinder Head Distortion

NOTE: When performing this inspection, cylinder block distortion should be also checking. Refer to "CYLINDER BLOCK".

1. Using a scraper, wipe off oil, scale, gasket, sealant and carbon deposits from surface of cylinder head.

   CAUTION: Never allow gasket fragments to enter engine oil or engine coolant passages.

2. At each of several locations on bottom surface of cylinder head, measure the distortion in six directions (A), (B), (C), (D), (E), and (F).

   Limit: Refer to "CYLINDER HEAD".

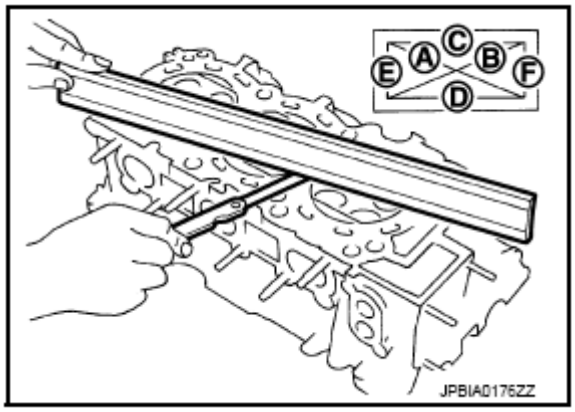

Fig. 229: Measuring Cylinder Head Distortion

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- If it exceeds the limit, replace cylinder head.

INSPECTION AFTER DISASSEMBLY

Valve Dimensions

- Check the dimensions of each valve. For the dimensions, refer to "**CYLINDER HEAD**".
- If dimensions are out of the standard, replace valve and check valve seat contact. Refer to "VALVE SEAT CONTACT".

Valve Guide Clearance

Valve Stem Diameter

- Measure the diameter of valve stem with micrometer (A).

  Standard (Intake and exhaust): Refer to "CYLINDER HEAD".

  Valve Guide Inner Diameter

- Measure the inner diameter of valve guide with bore gauge.

  Standard (Intake and exhaust): Refer to "CYLINDER HEAD".

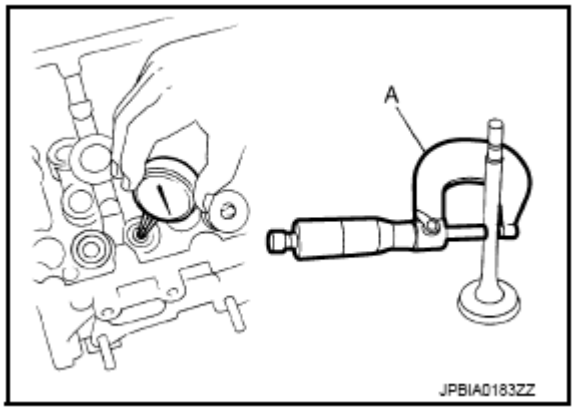

Fig. 230: Measuring Valve Guide Clearance Using Tool
Courtesy of NISSAN NORTH AMERICA, INC.

Valve Guide Clearance

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

  Valve guide clearance Standard and limit (Intake and exhaust): Refer to "CYLINDER HEAD".

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- If the calculated value exceeds the limit, replace valve and/or valve guide. When valve guide must be replaced, refer to "**DISASSEMBLY AND ASSEMBLY**".

Valve Seat Contact

- After confirming that the dimensions of valve guides and valves are within the 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 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" (B) conditions even after the recheck, replace valve seat. Refer to "**DISASSEMBLY AND ASSEMBLY**".

A : OK

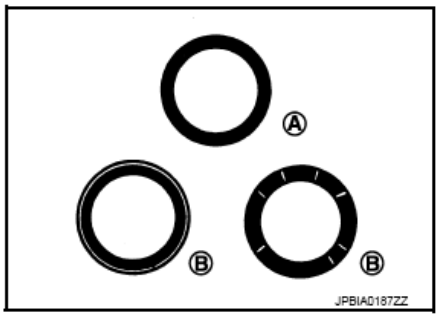

Fig. 231: Identifying Good And Not Good Contacting Surface Of Valve Seat
Courtesy of NISSAN NORTH AMERICA, INC.

Valve Spring Squareness

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

B : Contact

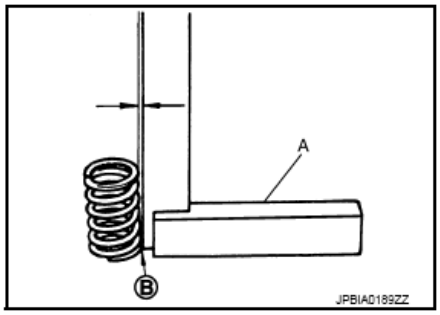

Fig. 232: Measuring Valve Spring Squareness
Courtesy of NISSAN NORTH AMERICA, INC.

Limit: Refer to "CYLINDER HEAD".

- If it exceeds the limit, replace valve spring.

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Valve Spring Dimensions and Valve Spring Pressure Load

- Check the valve spring pressure at specified spring height.

  Standard (Intake and exhaust)

  Free height

  Installation height: Refer to "CYLINDER HEAD".

  Installation load

  Height during valve open

  Load with valve open

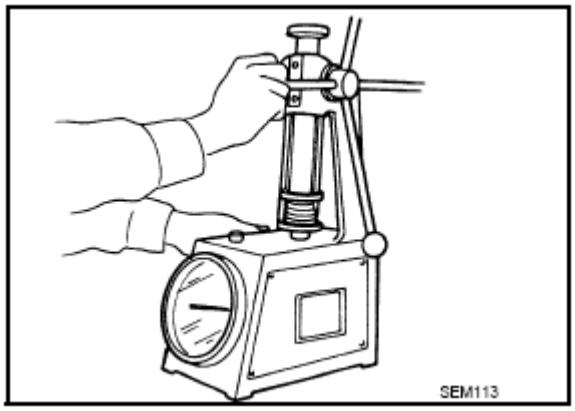

Fig. 233: Checking Valve Spring Dimensions And Valve Spring Pressure Load Using Tool
Courtesy of NISSAN NORTH AMERICA, INC.

- If the installation load or load with valve open is out of the standard, replace valve spring.

INSPECTION AFTER INSTALLATION

Inspection for Leakage

The following are procedures for checking fluids leakage, lubricates leakage and exhaust gases leakage.

- 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 "**FOR NORTH AMERICA: FLUIDS AND LUBRICANTS** " (FOR NORTH AMERICA) or "**FOR MEXICO: FLUIDS AND LUBRICANTS** " (FOR MEXICO).
- Use procedure below to check for fuel leakage.
  - Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
  - Start engine. With engine speed increased, check again for fuel leakage at connection points.

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- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

SUMMARY INSPECTION ITEMS

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids(1)		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		-	Leakage	-
(1) Power steering fluid, brake fluid, etc.				

CYLINDER BLOCK

Exploded View

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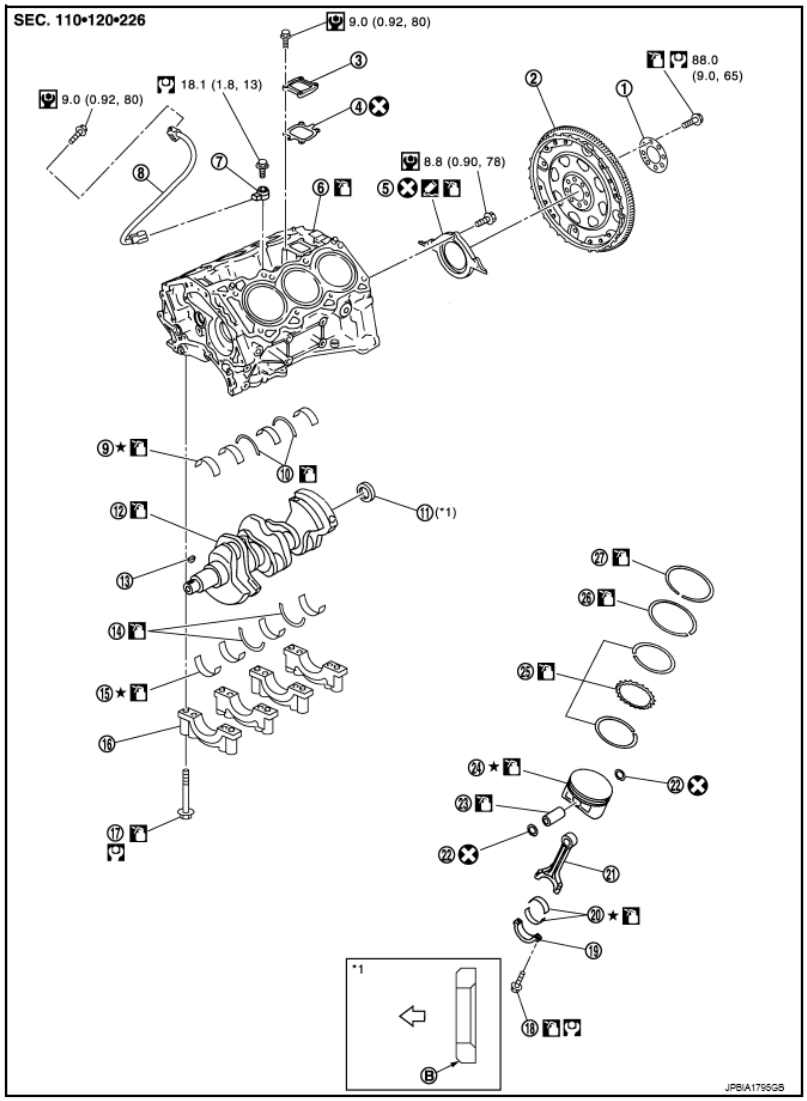
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Reinforcement plate
2. Drive plate
3. Cover
4. Gasket
5. Rear oil seal retainer (oil seal with oil seal)
6. Cylinder block
7. Knock sensor
8. Sub harness
9. Main bearing (upper)
10. Thrust bearing (upper)
11. Pilot converter
12. Crankshaft
13. Crankshaft key
14. Thrust bearing (lower)
15. Main bearing (lower)
16. Main bearing cap
17. Main bearing cap bolt
18. Connecting rod cap bolt
19. Connecting rod 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
B. Chamfered

⇦ : Crankshaft side

Fig. 234: Exploded View Of Cylinder Block With Torque Specifications
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

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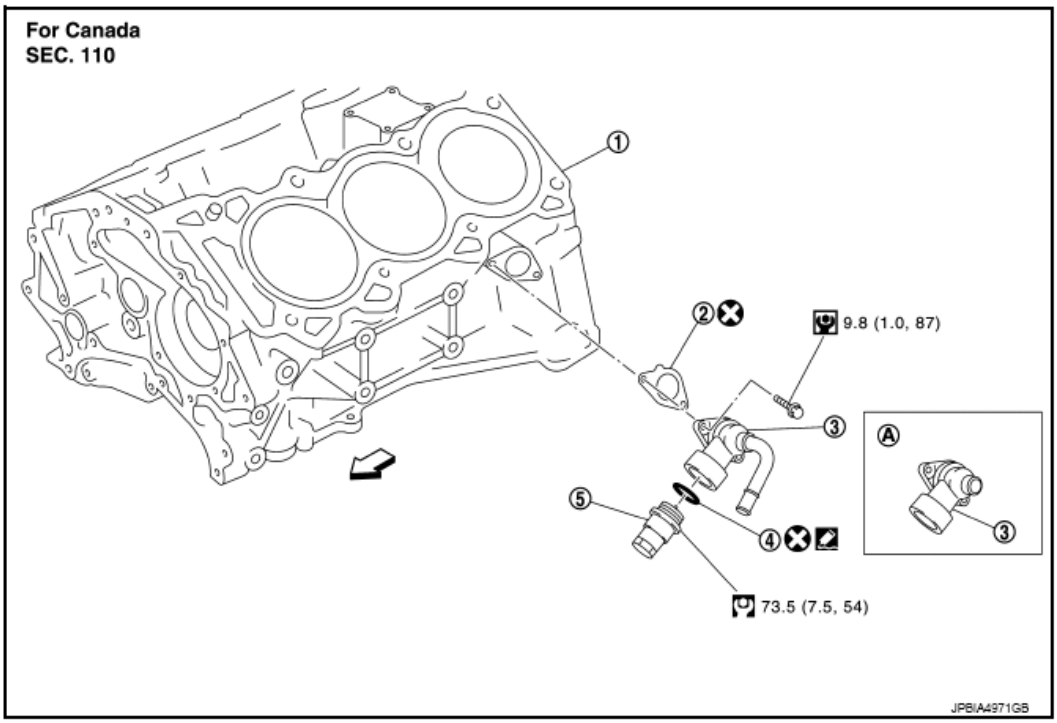
Symbol	Description
	N·m (kg-m, ft-lb)
	N·m (kg-m, in-lb)
	Always replace after disassembly.



1. Cylinder block
2. Gasket
3. Water connector
4. Gasket
5. Cylinder block heater

A. 2WD models

⇦ : Engine front

Fig. 235: Exploded View Of Cylinder Block With Torque Specifications (For Canada)
Courtesy of NISSAN NORTH AMERICA, INC.

Refer to "**COMPONENTS** " for symbols in the figure.

Disassembly and Assembly

DISASSEMBLY

1. Remove the following parts:
   - Oil pans (lower and upper): Refer to "**2WD: EXPLODED VIEW**" (2WD models) or "**AWD: EXPLODED VIEW**" (AWD models).
   - Timing chain: Refer to "**EXPLODED VIEW**".
   - Rear timing chain case. Refer to "**EXPLODED VIEW**".
   - Cylinder head: Refer to "**EXPLODED VIEW**".
2. Remove knock sensor.

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CAUTION: Carefully handle sensor avoiding shocks.

3. Remove baffle plate from lower cylinder block.
4. Remove piston and connecting rod assembly with the following procedure:
   - Before removing piston and connecting rod assembly, check the connecting rod side clearance.

CAUTION: Never drop connecting rod bearing, and to scratch the surface.

   a. Position crankshaft pin corresponding to connecting rod to be removed onto the bottom dead center.
   b. Remove connecting rod bearing cap.
   c. Using a hammer handle or similar tool, push piston and connecting rod assembly out to the cylinder head side.

CAUTION: Never damage the cylinder wall and crankshaft pin, resulting from an interference of the connecting rod big end.

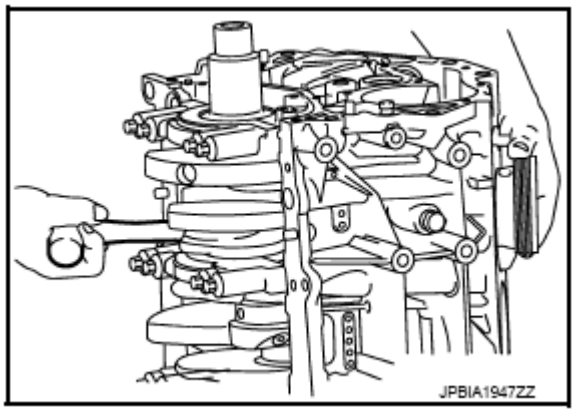

Fig. 236: Pushing Piston And Connecting Rod Assembly Using Hammer Handle
Courtesy of NISSAN NORTH AMERICA, INC.

5. Remove connecting rod bearings from connecting rod and connecting rod bearing cap.

CAUTION:
- **Never drop connecting rod bearing, and to scratch the surface.**
- **Identify installation positions, and store them without mixing them up.**

6. Remove piston rings from piston.
   - Before removing piston rings, check the piston ring side clearance. Refer to "**CYLINDER BLOCK**".

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- Use a piston ring expander (commercial service tool) (A).

CAUTION:
- **When removing piston rings, be careful not to damage piston.**
- **Never damage piston rings by expanding them excessively.**

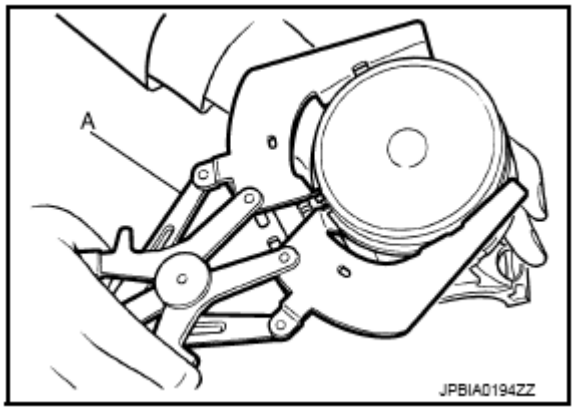

Fig. 237: Removing Piston Rings From Piston Using Piston Ring Expander
Courtesy of NISSAN NORTH AMERICA, INC.

7. Remove piston from connecting rod as follows:
   a. Using a snap ring pliers (A), remove snap rings.

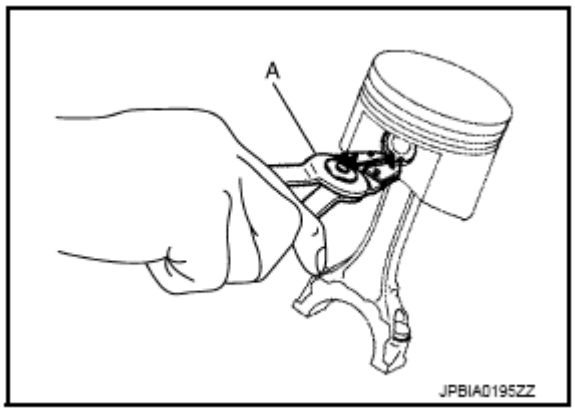

Fig. 238: Removing Piston From Connecting Rod Using Snap Ring Pliers
Courtesy of NISSAN NORTH AMERICA, INC.

   b. Heat piston to 60 to 70°C (140 to 158°F) with an industrial use drier (A) or equivalent.

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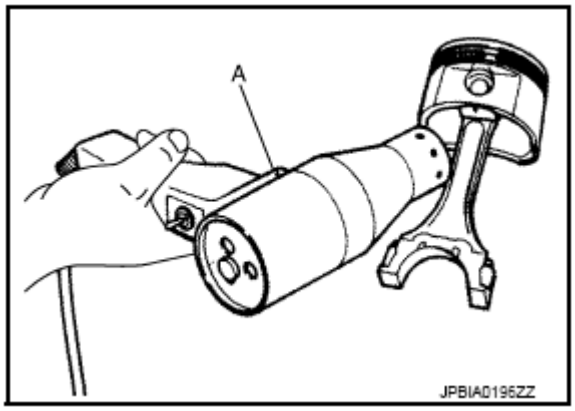

Fig. 239: Heating Piston Using Drier
Courtesy of NISSAN NORTH AMERICA, INC.

c. Push out piston pin with stick of outer diameter approximately 20 mm (0.79 in).

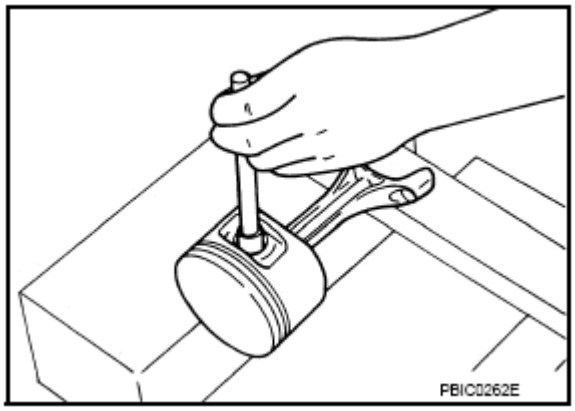

Fig. 240: Pushing Out Piston Pin Using Stick
Courtesy of NISSAN NORTH AMERICA, INC.

8. Remove main bearing cap bolts.

NOTE: Use TORX socket (size E14).

- Before loosening main bearing cap bolts, measure the crankshaft end play. Refer to "**INSPECTION**".
- Loosen main bearing cap bolts in the reverse order shown in the figure in several different steps.

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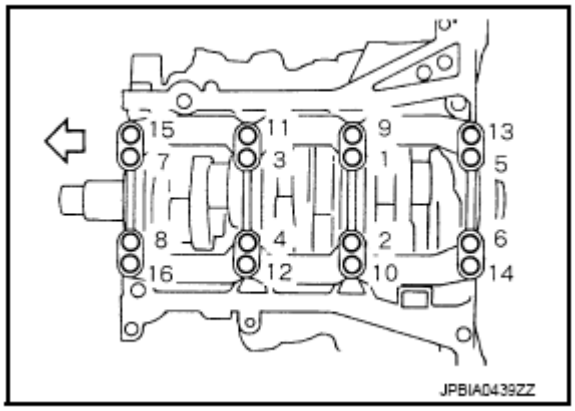

Fig. 241: Identifying Tightening Sequence Of Main Bearing Cap Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

9. Remove main bearing beam.
10. Remove main bearing caps.

CAUTION: Never drop main bearing, and to scratch the surface.

- Using main bearing cap bolts, remove main bearing cap while shaking it back-and-forth.

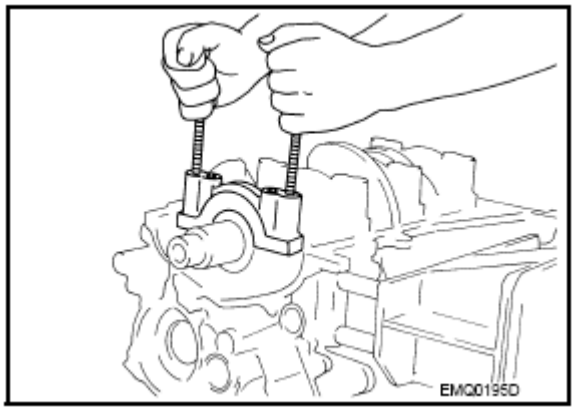

Fig. 242: Removing Main Bearing Cap Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

11. Remove crankshaft.
12. Pull rear oil seal out from rear end of crankshaft.
13. Remove main bearings and thrust bearings from cylinder block and lower cylinder block.

CAUTION:
- **Never drop main bearing, and to scratch the surface.**
- **Identify installation positions, and store them without mixing**

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them up.

ASSEMBLY

CAUTION: Do not reuse washer.

1. Fully air-blow engine coolant and engine oil passages in cylinder block, cylinder bore and crankcase to remove any foreign material.

CAUTION: Use a goggles to protect your eye.

2. Install each plug to cylinder block as shown in the figure.

1 :Drain plug
2 :Drain plug
3 : Plug
4 : Plug
A :Front
B :Right side
C :Left side and back side
⇦ : Engine front

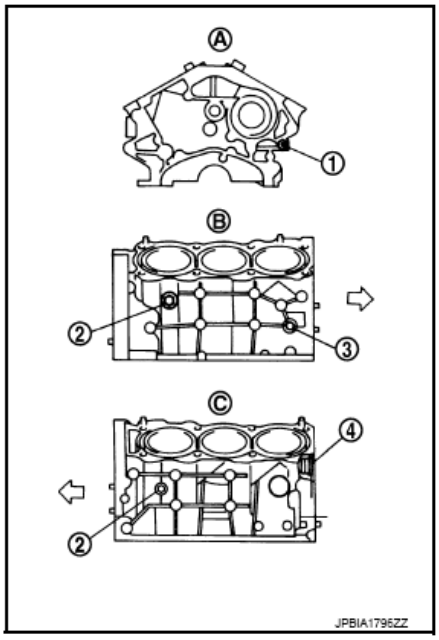

Fig. 243: Identifying Drain Plug And Plug
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Do not reuse washer.

- Apply liquid gasket to the screw of each plug before tightening.
- Replace washers.
- For gasket name, the presence/absence of washer, and tightening torque, refer to the following list.
- Tighten each plug as specified below.

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Part		Washer	Tightening torque
1	New	No	6.0 N.m (0.6 kg-m, 53 in-lb)
	Reuse	No	9.8 N.m (1.0 kg-m, 87 in-lb)
2		No	19.6 N.m (2.0 kg-m, 14 ft-lb)
3		Yes	12.3 N.m (1.3 kg-m, 9 ft-lb)
4		Yes	62.0 N.m (6.3 kg-m, 45 ft-lb)

3. Install main bearings and thrust bearings as follows:

CAUTION: Never drop main bearing, and to scratch the surface.

a. Remove dust, dirt, and engine oil on bearing mating surfaces of cylinder block and lower cylinder block.
b. Install thrust bearings (1) to the both sides of the No. 3 journal housing on cylinder block.

A : No. 1
B : No. 2
C : No. 3
D : No. 4
F : Thrust bearing installation position
⇦ : Engine front

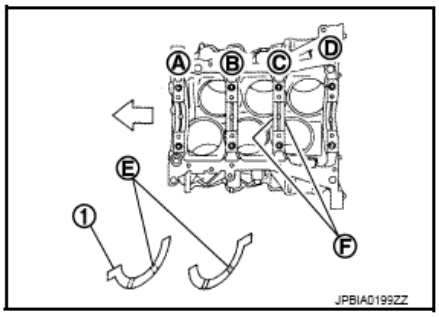

Fig. 244: Identifying Thrust Bearing Installation Position
Courtesy of NISSAN NORTH AMERICA, INC.

- Install thrust bearings with the oil groove (E) facing crankshaft arm (outside).

c. Install main bearings paying attention to the direction.

A : Cylinder block side
D : Lower cylinder block side
⇦ : Engine front

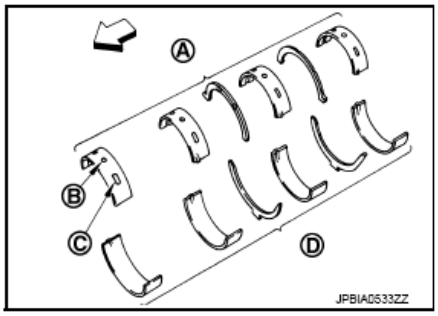

Fig. 245: Identifying Main Bearings
Courtesy of NISSAN NORTH AMERICA, INC.

- Main bearing with oil hole (B) and groove (C) goes on cylinder block. The one without them

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goes on lower cylinder block.

- Before installing main bearings, apply engine oil to the bearing surface (inside). Do not apply engine oil to the back surface, but thoroughly clean it.
- When installing, align main bearing stopper protrusion to cutout of cylinder block and lower cylinder block.
- Ensure the oil holes on cylinder block and those on the corresponding bearing are aligned.

4. Install crankshaft to cylinder block.
   - While turning crankshaft by hand, check that it turns smoothly.
5. Install main bearing cap.
   - Use a cast-embossed mark to identify main bearing cap. To install main bearing cap, face front mark (E) to the front side.

A : No1
B : No2
C : No3
D : No4
⇦ : Engine front

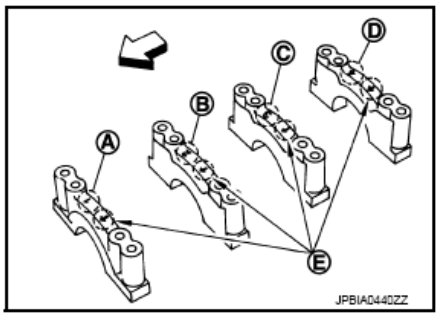

Fig. 246: Identifying Main Bearing Cap And Front Mark
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: Since the main bearing cap is assembled with a cylinder block, always replace as an assembly part.

6. Check outside diameter of the main bearing cap bolt. Refer to "**INSPECTION**"
7. Tighten main bearing cap bolt, according to the following procedure.
   1. Apply engine oil to the screw and the bearing surface of each bolt.
   2. Tighten main bearing cap bolts, according to the numerical order shown in the figure.

⇦ : Engine front

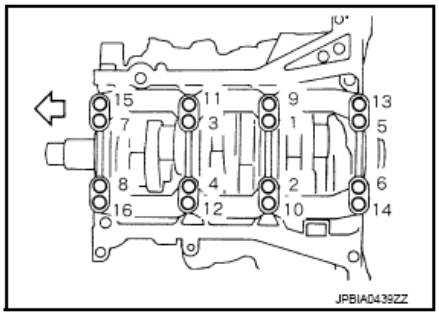

Fig. 247: Identifying Tightening Sequence Of Main Bearing Cap Bolts
Courtesy of NISSAN NORTH AMERICA, INC.

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Tightening torque 35.3N.m (3.6 Kg-m 26ft-lb)

3. Tighten the connecting rod bolt by 90 degrees. (Angular tightening)

CAUTION: Use angle wrench [SST: KV10112100] (A) for angular tightening. Never judge by visual check.

- After tightening bolts, check that the crankshaft rotates smoothly.
- Check crankshaft side clearance. Refer to "**INSPECTION**"

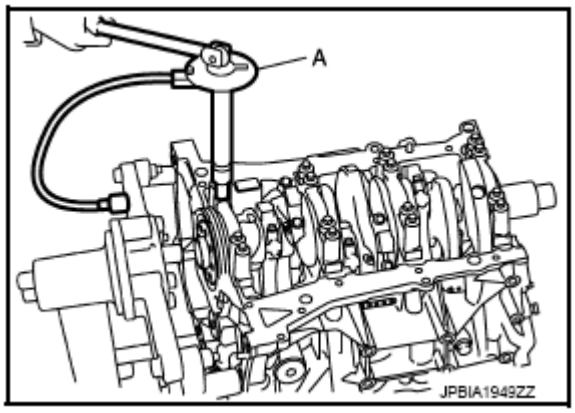

Fig. 248: Checking Tightening Angle Using Angle Wrench
Courtesy of NISSAN NORTH AMERICA, INC.

8. Check the outside diameter of connecting rod bolt. Refer to "**INSPECTION**"
9. Install piston to connecting rod as follows:
   a. Using a snap ring pliers, install new snap ring to the groove of piston rear side.
      - Insert it fully into groove to install.
   b. Install piston to connecting rod.
      - Using an industrial use drier or similar tool, heat piston until piston pin can be pushed in by hand without excess force [approximately 60 to 70°C (140 to 158°F)]. From the front to the rear, insert piston pin into piston and connecting rod.
      - Assemble so that the front mark on the piston head and the cylinder number on connecting rod are positioned as shown in the figure.

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A : Piston grade number
B : Front mark
C : Pin grade number
D : Cylinder number
E : Front mark
⇦ : Engine front

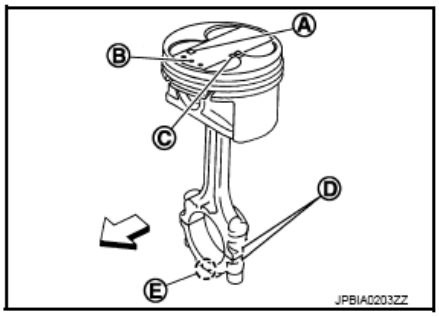

Fig. 249: Identifying Piston Grade Number, Front Mark, Pin Grade Number And Cylinder Number
Courtesy of NISSAN NORTH AMERICA, INC.

c. Install new snap ring to the groove of the piston front side.
   - Insert it fully into groove to install.
   - After installing, check that connecting rod moves smoothly.

10. Using a piston ring expander (commercial service tool) (A), install piston rings.

CAUTION:
- **When installing piston rings, be careful not to damage piston.**
- **Never damage piston rings by expending them excessively.**

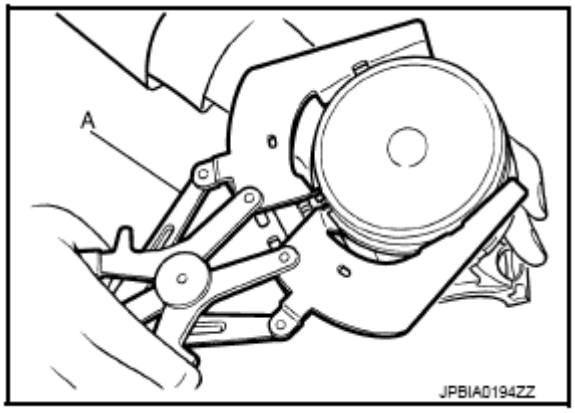

Fig. 250: Removing Piston Rings From Piston Using Piston Ring Expander
Courtesy of NISSAN NORTH AMERICA, INC.

- If there is stamped mark on ring, mount it with marked side up.

  Stamped mark:

  Top ring (A): R

  Second ring (B): R 2

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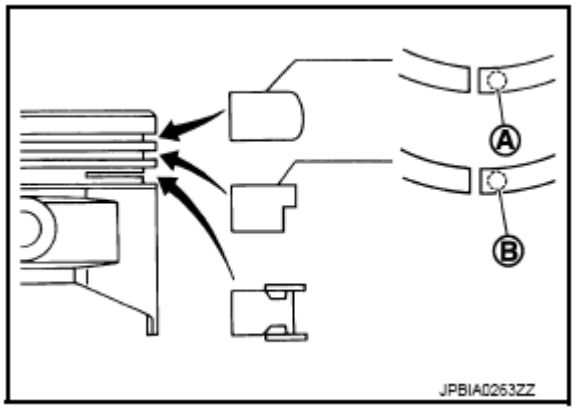

Fig. 251: Identifying Stamped Mark On Top And Second Ring
Courtesy of NISSAN NORTH AMERICA, INC.

- Position each ring with the gap as shown in the figure referring to the piston front mark (D).

C : Top ring gap
E : Oil ring upper or lower rail gap (either of them)
F : Second ring and oil ring spacer gap
a : 90 degrees
b : 45 degrees

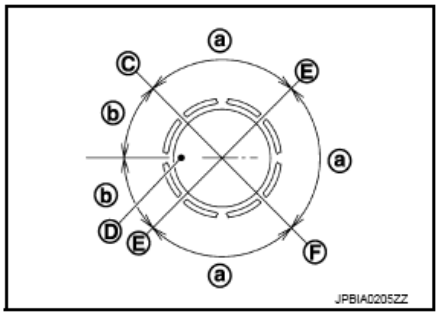

Fig. 252: Identifying Piston Rings With Gap
Courtesy of NISSAN NORTH AMERICA, INC.

- Check the piston ring side clearance. Refer to "**CYLINDER BLOCK**".

11. Install connecting rod bearings to connecting rod and connecting rod bearing cap.

CAUTION: Never drop connecting rod bearing, and to scratch the surface.

- Before installing connecting rod bearings, apply engine oil to the bearing surface (inside). Do not apply engine oil to the back surface, but thoroughly clean it.
- When installing, align connecting rod bearing stopper protrusion (B) with cutout (C) of connecting rods and connecting rod bearing caps to install.
- Ensure the oil hole (A) on connecting rod and that on the corresponding bearing are aligned.

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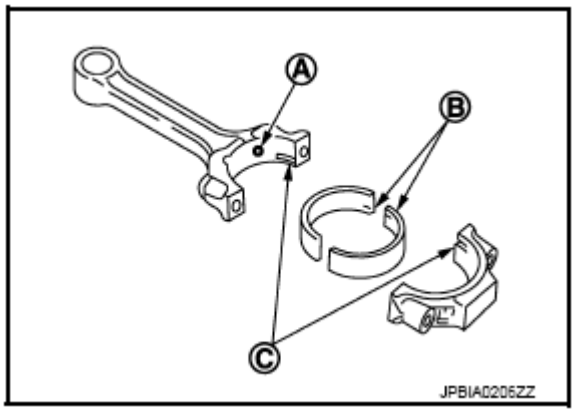

Fig. 253: Identifying Oil Hole, Connecting Rod Bearing Stopper Protrusion And Cutout
Courtesy of NISSAN NORTH AMERICA, INC.

12. Install piston and connecting rod assembly to crankshaft.
    - Position crankshaft pin corresponding to connecting rod to be installed onto the bottom dead center.
    - Apply engine oil sufficiently to the cylinder bore, piston and crankshaft pin journal.
    - Match the cylinder position with the cylinder number on connecting rod to install.
    - Be sure that front mark on piston crown is facing front of engine.
    - Using a piston ring compressor [SST: EM03470000] (A) or suitable tool, install piston with the front mark on the piston crown facing the front of the engine.

CAUTION: Never damage the cylinder wall and crankshaft pin, resulting from an interference of the connecting rod big end.

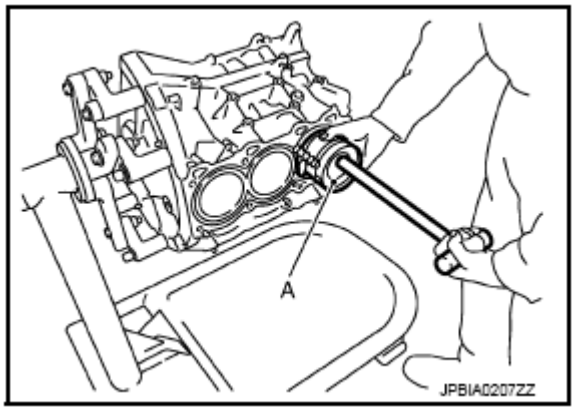

Fig. 254: Installing Piston And Connecting Rod Assembly To Crankshaft
Courtesy of NISSAN NORTH AMERICA, INC.

13. Install connecting rod bearing cap.
    - Match the stamped cylinder number marks on connecting rod with those on connecting rod bearing cap to install.

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A : Sample codes
B : Bearing stopper groove
C : Small-end diameter grade
D : Big-end diameter grade
E : Weight grade
F : Cylinder No.
G : Management code
I : Management code

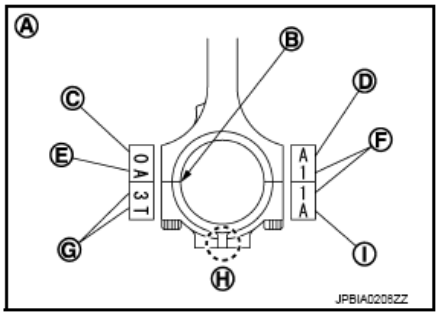

Fig. 255: Identifying Identification Codes On Connecting Rod Bearing Cap
Courtesy of NISSAN NORTH AMERICA, INC.

- Be sure that front mark (H) on connecting rod bearing cap is facing front of the engine.

14. Tighten connecting rod bolt as follows:
    a. Apply engine oil to the screw and the bearing surface of connecting rod.
    b. Tighten the connecting rod bolt to the specified torque.

    Tightening torque 19.6 N.m (1.9 Kg-m 14 ft-lb)

    c. Tighten the connecting rod bolt by 90 degrees. (Angular tightening)

    CAUTION: Use angle wrench [SST: KV10112100] (A) for angular tightening. Never judge by visual check.

    - After tightening bolts, check that the crankshaft rotates smoothly.
    - Check the piston ring side clearance. Refer to "**INSPECTION**".

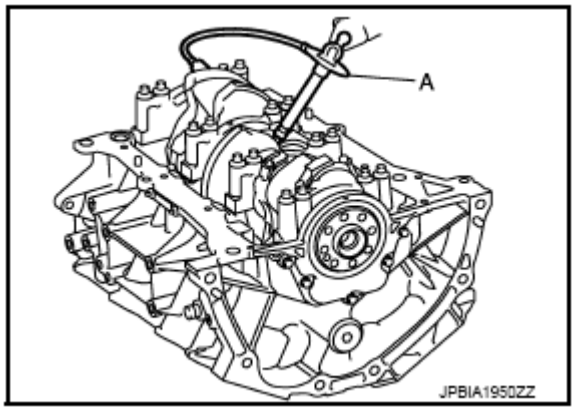

Fig. 256: Measuring Connecting Rod Bolt Tightening Angle Using Angle Wrench
Courtesy of NISSAN NORTH AMERICA, INC.

15. Install rear oil seal retainer.
    - Apply liquid gasket (an equivalent of Three Bond 1218B) to the edge shown in the figure in a

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seamless single layer. Refer to "**LIQUID GASKET**"

a : ϕ2.3-3.3mm (0.091 - 0.130 in)

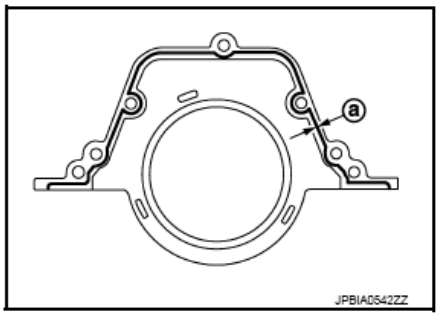

Fig. 257: Identifying Liquid Gasket Applying Area On Rear Oil Seal Retainer
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Replace rear oil seal retainer with a new one.

NOTE: Rear oil seal retainer and rear oil seal are assembled parts.

16. Install pilot converter.
    - Press pilot converter into the cylinder block all the way to the end with a drift (general purpose tool) measuring approximately 33mm in outside diameter.

NOTE: The figure shows pilot converter installation as an example.

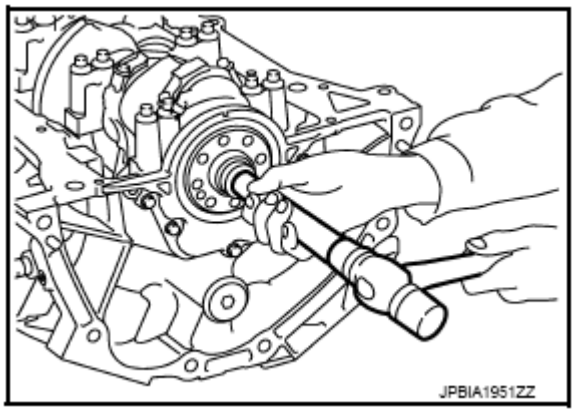

Fig. 258: Pressing Pilot Converter Into Cylinder Block Using Drift
Courtesy of NISSAN NORTH AMERICA, INC.

- Press-fit pilot converter with its chamfer facing crankshaft as shown in the figure.

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⇦ : Crankshaft side

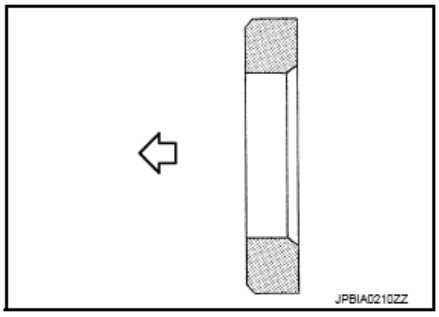

Fig. 259: Identifying Pilot Converter With Chamfer Facing Crankshaft
Courtesy of NISSAN NORTH AMERICA, INC.

17. Install drive plate as follows:
    - Install drive plate and reinforce plate (3) in the direction shown in the figure.

1 : Ring gear
2 : Drive plate
4 : Pilot converter
A : R
⇦ : Engine front

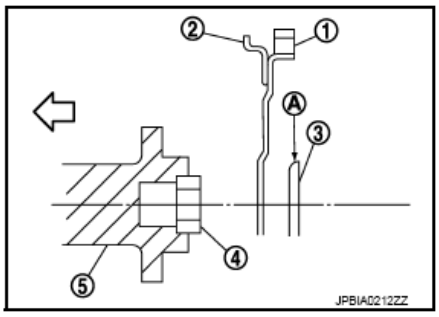

Fig. 260: Identifying Ring Gear, Drive Plate And Pilot Converter
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION: Ensure the correct side (front or back) to install.

- To install drive plate and reinforce plate, align the dowel holes with the dowel pins on the rear end of crankshaft (5).
- Fix crankshaft with the ring gear stopper [SST: KV10105620] to tighten the mounting bolt.
- Tighten mounting bolts diagonally in several steps.

18. Install knock sensors.

1 : Knock sensor
⇦ : Engine front

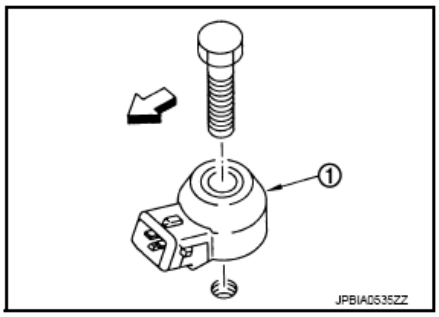

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Fig. 261: Identifying Knock Sensor
Courtesy of NISSAN NORTH AMERICA, INC.

CAUTION:
- **Always use genuine mounting bolts.**
- **Never hold the connector when tightening the mounting bolts.**
- **Check that the knock sensor does not interfere with other parts.**
- **If the knock sensor is physically-impacted, replace it with a new one.**

- Check that the cylinder block mounting surface and the knock sensor rear face are free from foreign matter.
- To install the connector, turn it toward the front of the vehicle.
- After installing the knock sensor, connect the sub-harness and set aside its harness cable on the engine rear side.

19. Install in the reverse order of disassembly after this step.

Inspection

CRANKSHAFT END PLAY

- Measure the clearance between thrust bearings and crankshaft arm when crankshaft is moved fully forward or backward with a dial indicator.

  Standard and limit: Refer to "CYLINDER BLOCK".

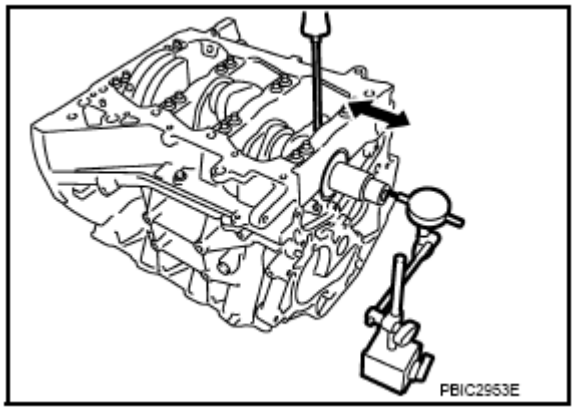

Fig. 262: Measuring Crankshaft End Play Using Dial Indicator
Courtesy of NISSAN NORTH AMERICA, INC.

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

CONNECTING ROD SIDE CLEARANCE

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- Measure the side clearance between connecting rod and crankshaft arm with a feeler gauge.

  Standard and limit: Refer to "CYLINDER BLOCK".

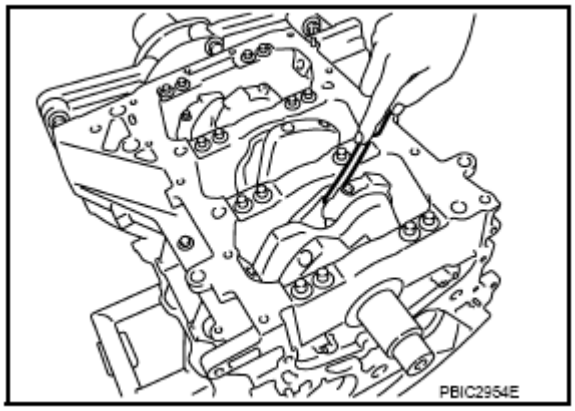

Fig. 263: Measuring Side Clearance Between Connecting Rod And Crankshaft Arm Using Feeler Gauge
Courtesy of NISSAN NORTH AMERICA, INC.

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

PISTON TO PISTON PIN OIL CLEARANCE

Piston Pin Hole Diameter

Measure the inner diameter of piston pin hole with an inside micrometer (A).

Standard: Refer to "CYLINDER BLOCK".

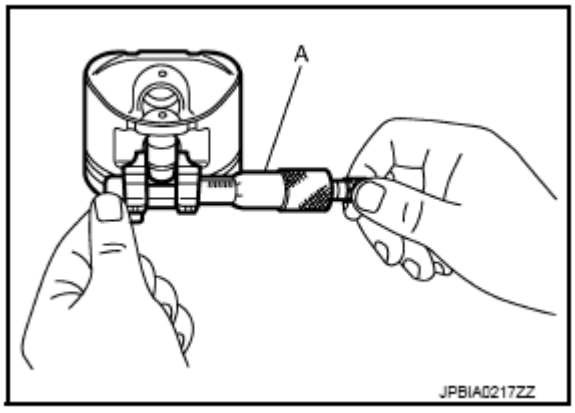

Fig. 264: Measuring Inner Diameter Of Piston Pin Hole Using Inside Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

Piston Pin Outer Diameter

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Measure the outer diameter of piston pin with a micrometer (A).

Standard: Refer to "CYLINDER BLOCK".

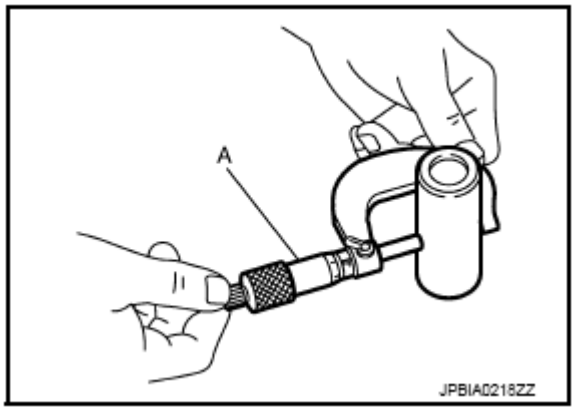

Fig. 265: Measuring Outer Diameter Of Piston Pin Using Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

Piston to Piston Pin Oil Clearance

(Piston to piston pin oil clearance) = (Piston pin hole diameter) - (Piston pin outer diameter)

Standard: Refer to "CYLINDER BLOCK".

- If the calculated value is out of the standard, replace piston and piston pin assembly.
- When replacing piston and piston pin assembly, refer to "**DESCRIPTION**".

NOTE:

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

PISTON RING SIDE CLEARANCE

- Measure the side clearance of piston ring (1) and piston ring groove with a feeler gauge (C).

A : NG
B : OK

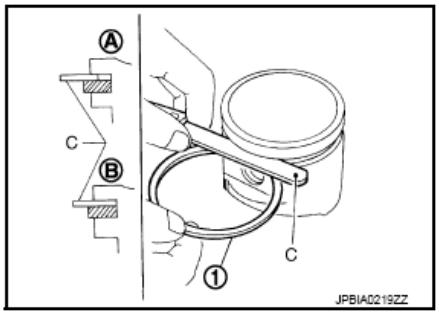

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Fig. 266: Measuring Side Clearance Of Piston Ring And Piston Ring Groove Using Feeler Gauge
Courtesy of NISSAN NORTH AMERICA, INC.

Standard and limit: Refer to "CYLINDER BLOCK".

- If the measured value exceeds the limit, replace piston ring, and measure again. If it still exceeds the limit, replace piston also.

PISTON RING END GAP

- Check that the cylinder bore inner diameter is within the specification. Refer to "**DISASSEMBLY AND ASSEMBLY**".
- Lubricate with new engine oil to piston (1) and piston ring (2), and then insert piston ring until middle of cylinder with piston, and measure the piston ring end gap with a feeler gauge (B).

A : Press-fit
C : Measuring point

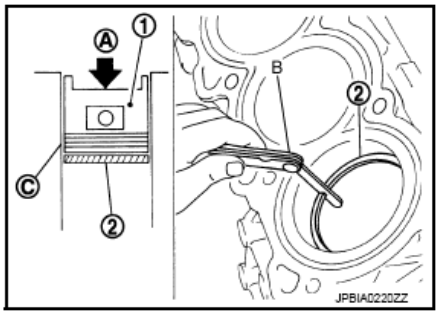

Fig. 267: Measuring Piston Ring End Gap Using Feeler Gauge
Courtesy of NISSAN NORTH AMERICA, INC.

Standard and limit: Refer to "CYLINDER BLOCK".

- If the measured value exceeds the limit, replace piston ring, and measure again. If it still exceeds the limit, rebore cylinder and use oversize piston and piston rings.

CONNECTING ROD BEND AND TORSION

- Check with a connecting rod aligner.

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A : Bend
B : Torsion
C : Feeler gauge

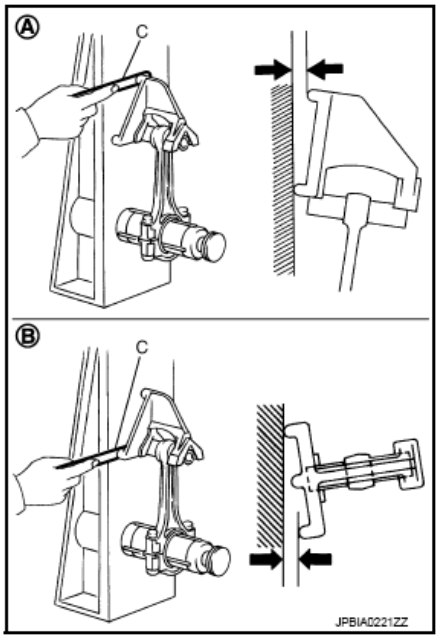

Fig. 268: Checking Connecting Rod Bend And Torsion Using Connecting Rod Aligner
Courtesy of NISSAN NORTH AMERICA, INC.

Bend limit

: Refer to "CYLINDER BLOCK".

Torsion limit

- If it exceeds the limit, replace connecting rod assembly.

CONNECTING ROD BIG END DIAMETER

- Install connecting rod bearing cap without installing connecting rod bearing, and tightening connecting rod bolts to the specified torque. Refer to "**DISASSEMBLY AND ASSEMBLY**" for the tightening procedure.

1 : Connecting rod

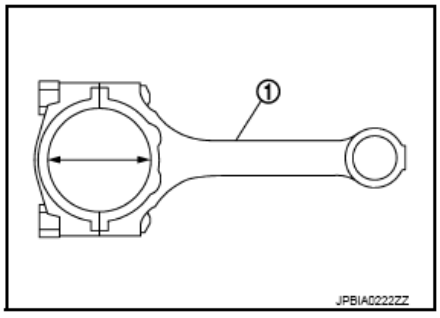

Fig. 269: Identifying Connecting Rod Big End Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

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- Measure the inner diameter of connecting rod big end with an inside micrometer.

  Standard: Refer to "CYLINDER BLOCK".

- If out of the standard, replace connecting rod assembly.

CONNECTING ROD BUSHING OIL CLEARANCE

Connecting Rod Bushing Inner Diameter

Measure the inner diameter of connecting rod bushing with an inside micrometer (A).

Standard: Refer to "CYLINDER BLOCK".

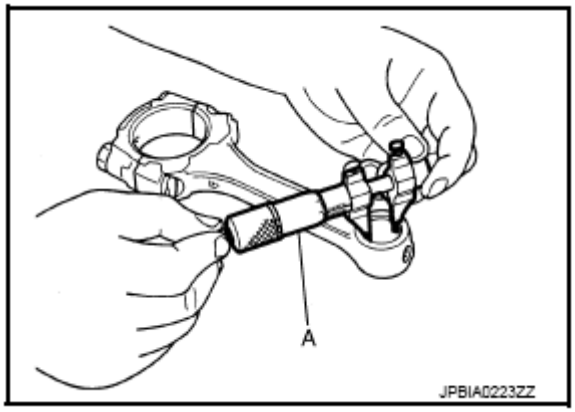

Fig. 270: Measuring Inner Diameter Of Connecting Rod Bushing Using Inside Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

Piston Pin Outer Diameter

Measure the outer diameter of piston pin with a micrometer (A).

Standard: Refer to "CYLINDER BLOCK".

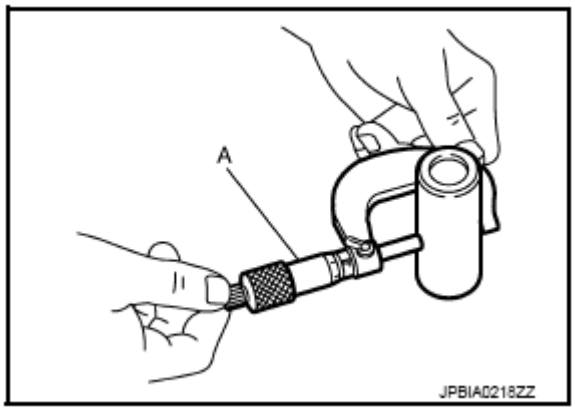

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Fig. 271: Measuring Outer Diameter Of Piston Pin Using Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

Connecting Rod Bushing Oil Clearance

(Connecting rod bushing oil clearance) = (Connecting rod bushing inner diameter) - (Piston pin outer diameter)

Standard and limit: Refer to "CYLINDER BLOCK".

- If the calculated value exceeds the limit, replace connecting rod assembly and/or piston and piston pin assembly.
- If replacing piston and piston pin assembly, refer to "**DESCRIPTION**".
- If replacing connecting rod assembly, refer to "**CONNECTING ROD BEARING**" to select the connecting rod bearing.

A : Sample codes
B : Bearing stopper groove
C : Small-end diameter grade
D : Big-end diameter grade
E : Weight grade
F : Cylinder No.
G : Management code
H : Front mark
I : Management code

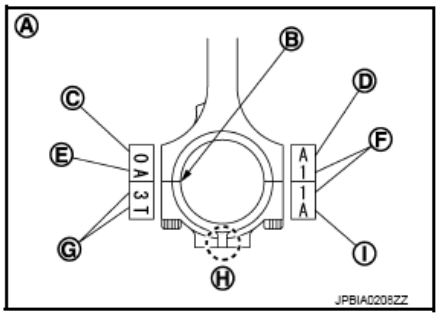

Fig. 272: Identifying Identifications On Connecting Rod Bearing
Courtesy of NISSAN NORTH AMERICA, INC.

Factory installed parts grading:

- Service parts apply only to grade "0".

A : Piston grade number
B : Front mark
C : Piston pin grade number

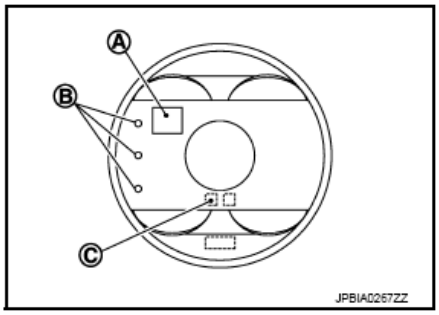

Fig. 273: Identifying Piston Grade Number, Front Mark And Piston Pin Grade Number
Courtesy of NISSAN NORTH AMERICA, INC.

		Unit: mm (in)

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Grade	0	1
Connecting rod bushing inner diameter ()	Refer to "CYLINDER BLOCK"	
Piston pin hole diameter		
Piston pin outer diameter		

CYLINDER BLOCK DISTORTION

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

CAUTION: Never allow gasket flakes to enter engine oil or engine coolant passages.

- Measure the distortion on the cylinder block upper face at some different points in six directions (C), (D), (E), (F), (G), and (H) with a straightedge (A) and a feeler gauge (B).

  Limit: Refer to "CYLINDER BLOCK".

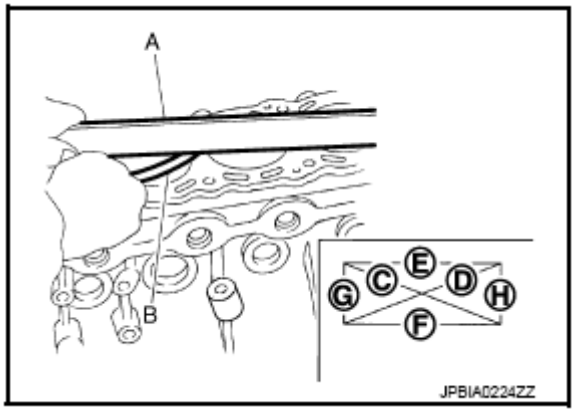

Fig. 274: Measuring Cylinder Block Distortion Using Straightedge And Feeler Gauge
Courtesy of NISSAN NORTH AMERICA, INC.

- If it exceeds the limit, replace cylinder block.

MAIN BEARING HOUSING INNER DIAMETER

- Install lower cylinder block (2) without installing main bearings, and tighten lower cylinder block bolts to the specified torque. Refer to "**DISASSEMBLY AND ASSEMBLY**" for the tightening procedure.
- Measure the inner diameter of main bearing housing with a bore gauge.

  Standard: Refer to "CYLINDER BLOCK".

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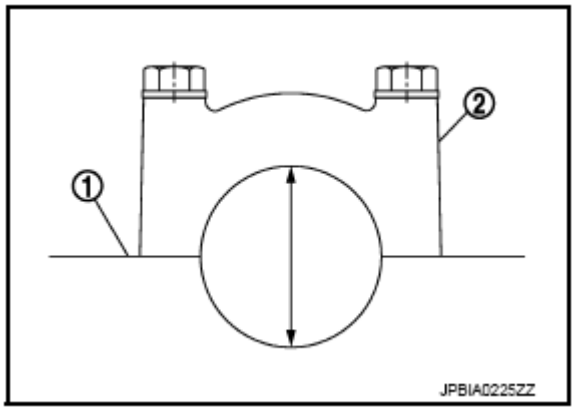

Fig. 275: Identifying Main Bearing Housing Inner Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

- If out of the standard, replace cylinder block (1) and lower cylinder block as assembly.

NOTE: Cylinder block cannot be replaced as a single part, because it is machined together with lower cylinder block.

PISTON TO CYLINDER BORE CLEARANCE

Cylinder Bore inner Diameter

- Using a bore gauge, measure cylinder bore for wear, out-of-round and taper at six different points on each cylinder. [(A) and (B) directions at (C), (D) and (E)] is in longitudinal direction of engine.

  f: 10 mm (0.39 in)

  g: 60 mm (2.36 in)

  h: 120 mm (4.72 in)

  Standard and limit: Refer to "CYLINDER BLOCK".

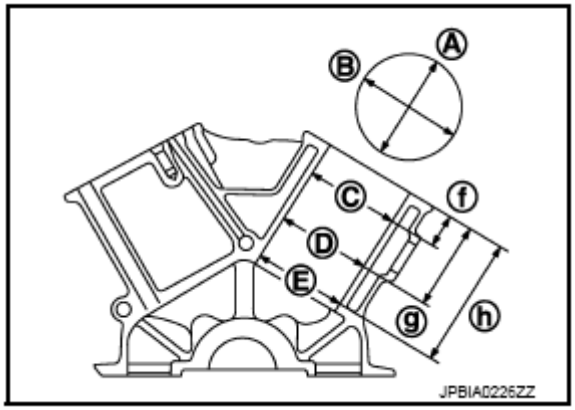

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Fig. 276: Identifying Cylinder Bore Inner Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

- If the measured value exceeds the limit, or if there are scratches and/or seizure on the cylinder inner wall, hone or rebore the inner wall.
- Oversize piston is provided. When using oversize piston, rebore cylinder so that the clearance of the piston to cylinder bore satisfies the standard.

CAUTION: When using oversize piston, use oversize pistons for all cylinders with oversize piston rings.

Oversize (O/S): 0.2 mm (0.008 in)

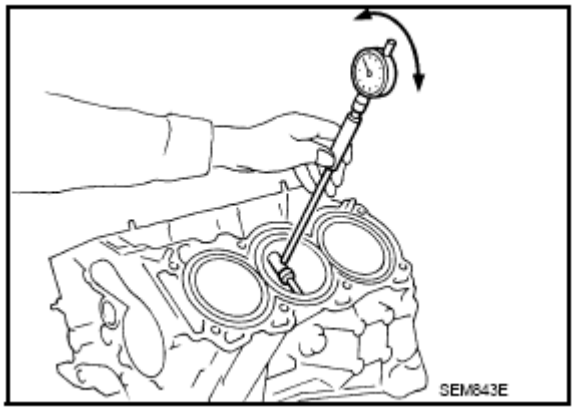

Fig. 277: Measuring Cylinder Bore Inner Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

Piston Skirt Diameter

Measure the outer diameter of piston skirt with a micrometer (A).

Measure point

: Refer to "CYLINDER BLOCK".

Standard

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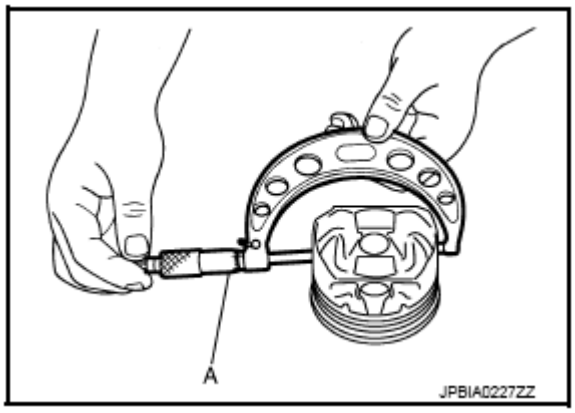

Fig. 278: Measuring Outer Diameter Of Piston Skirt Using Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

Piston-to-Cylinder Bore Clearance

Calculate by piston skirt diameter and cylinder bore inner diameter [direction (B), position (D)].

A : Direction A
C : Position C
E : Position E
f : 10 mm (0.39 in)
g : 60 mm (2.36 in)
h : 120 mm (4.72 in)

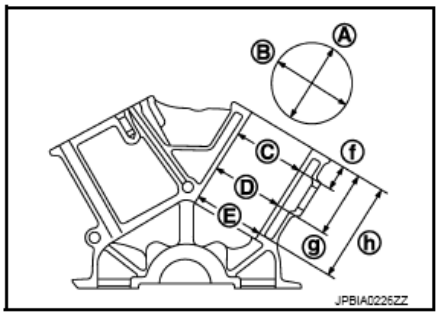

Fig. 279: Identifying Piston-To-Cylinder Bore Clearance
Courtesy of NISSAN NORTH AMERICA, INC.

(Clearance) = (Cylinder bore inner diameter) - (Piston skirt diameter).

Standard and limit: Refer to "CYLINDER BLOCK".

- If the calculated value exceeds the limit, replace piston and piston pin assembly. Refer to "**CYLINDER BLOCK**".

Re-boring Cylinder Bore

1. Cylinder bore size is determined by adding piston to cylinder bore clearance to piston skirt diameter.

   Re-bored size calculation: D = A + B - C

   where,

   A: Piston skirt diameter as measured

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B: Piston to cylinder bore clearance (standard value)

C: Honing allowance 0.02 mm (0.0008 in)

D: Bored diameter

2. Install lower cylinder block, and tighten to the specified torque. Otherwise, cylinder bores may be distorted in final assembly.
3. Cut cylinder bores.

NOTE:

- **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 the specified piston to cylinder bore clearance.
5. Measure finished cylinder bore for the out-of-round and taper.

NOTE: Measurement should be done after cylinder bore cools down.

CRANKSHAFT MAIN JOURNAL DIAMETER

- Measure the outer diameter of crankshaft main journals with a micrometer.

  Standard: Refer to "CYLINDER BLOCK".

- If out of the standard, measure the main bearing oil clearance. Then use undersize bearing. Refer to "**CONNECTING ROD BEARING**".

CRANKSHAFT PIN JOURNAL DIAMETER

- Measure the outer diameter of crankshaft pin journal with a micrometer (A).

  Standard: Refer to "CYLINDER BLOCK".

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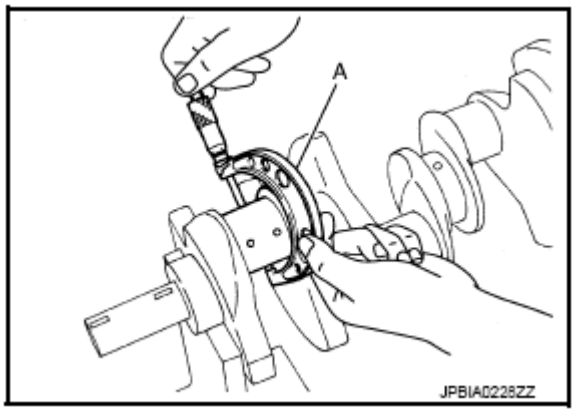

Fig. 280: Measuring Outer Diameter Of Crankshaft Pin Journal Using Micrometer
Courtesy of NISSAN NORTH AMERICA, INC.

- If out of the standard, measure the connecting rod bearing oil clearance. Then use undersize bearing. Refer to "**CONNECTING ROD BEARING**".

CRANKSHAFT OUT-OF-ROUND AND TAPER

- Measure the dimensions at four different points as shown in the figure on each main journal and pin journal with a micrometer.
- Out-of-round is indicated by the difference in the dimensions between (d) and (c) at (a) and (b).
- Taper is indicated by the difference in the dimensions between.

Limit: Refer to "CYLINDER BLOCK".

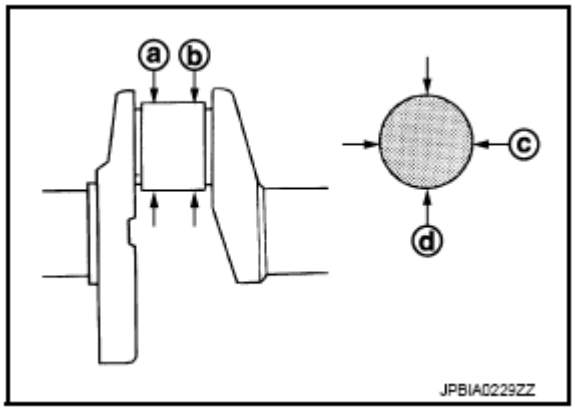

Fig. 281: Identifying Main Journal And Pin Journal Dimensions
Courtesy of NISSAN NORTH AMERICA, INC.

- If the measured value exceeds the limit, correct or replace crankshaft.
- If corrected, measure the bearing oil clearance of the corrected main journal and/or pin journal. Then select the main bearing and/or connecting rod bearing. Refer to "**MAIN BEARING**" and/or "**CONNECTING ROD BEARING**".

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CRANKSHAFT RUNOUT

- Place V-block on precise flat table, and support the journals on the both end of crankshaft.
- Place a dial indicator straight up on the No. 3 journal.
- While rotating crankshaft, read the movement of the pointer on a dial indicator. (Total indicator reading)

  Standard and limit: Refer to "CYLINDER BLOCK".

- If it exceeds the limit, replace crankshaft.

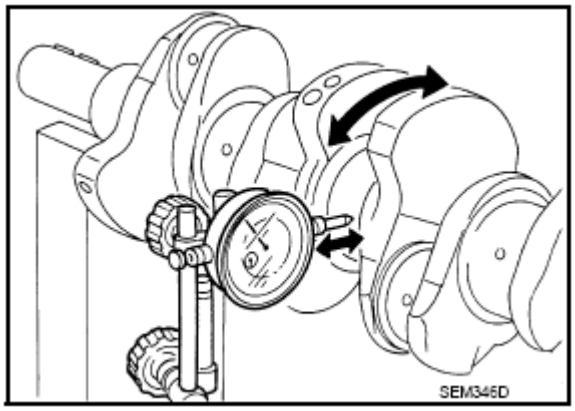

Fig. 282: Measuring Crankshaft Runout Using Dial Indicator
Courtesy of NISSAN NORTH AMERICA, INC.

CONNECTING ROD BEARING OIL CLEARANCE

Method by Calculation

- Install connecting rod bearings (1) to connecting rod (2) and connecting rod cap, and tighten connecting rod bolts to the specified torque. Refer to "**DISASSEMBLY AND ASSEMBLY**" for the tightening procedure.
- Measure the inner diameter of connecting rod bearing with an inside micrometer.

(Oil clearance) = (Connecting rod bearing inner diameter) - (Crankshaft pin journal diameter)

Standard and limit: Refer to "CONNECTING ROD BEARING".

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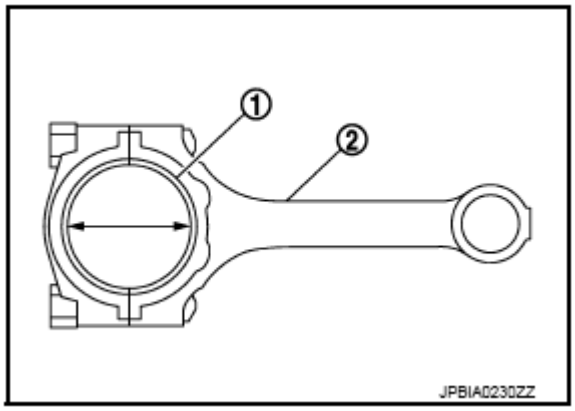

Fig. 283: Identifying Connecting Rod Bearing Oil Clearance
Courtesy of NISSAN NORTH AMERICA, INC.

- If the calculated value exceeds the limit, select proper connecting rod bearing according to connecting rod big end diameter and crankshaft pin journal diameter to obtain the specified bearing oil clearance. Refer to "**DESCRIPTION**".

Method of Using Plastigage

- Remove oil and dust on crankshaft pin journal 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 connecting rod bearings to connecting rod and connecting rod bearing cap, and tighten connecting rod bolts to the specified torque. Refer to "**DISASSEMBLY AND ASSEMBLY**" for the tightening procedure.

CAUTION: Never rotate crankshaft.

- Remove connecting rod 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".

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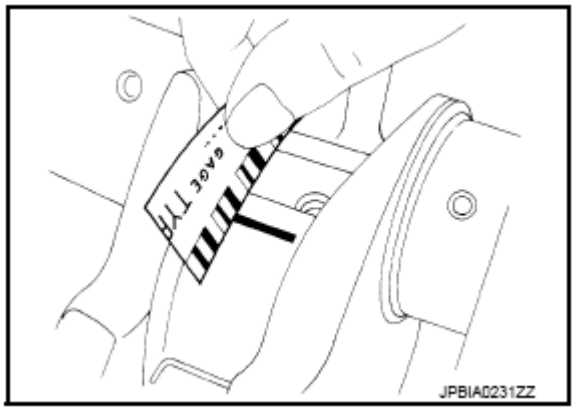

Fig. 284: Measuring Plastigage Width
Courtesy of NISSAN NORTH AMERICA, INC.

MAIN BEARING OIL CLEARANCE

Method by Calculation

- Install main bearings (3) to cylinder block (1) and lower cylinder block (2), and tighten lower cylinder block bolts to the specified torque. Refer to "**DISASSEMBLY AND ASSEMBLY**" for the tightening procedure.
- Measure the inner diameter of main bearing with a bore gauge.

  (Oil clearance) = (Main bearing inner diameter) - (Crankshaft main journal diameter)

  Standard and limit: Refer to "MAIN BEARING".

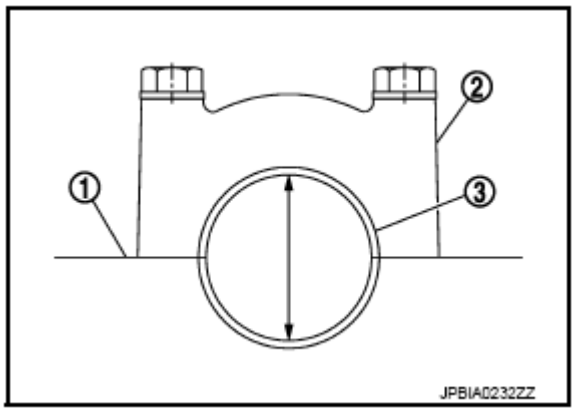

Fig. 285: Identifying Main Bearing Oil Clearance
Courtesy of NISSAN NORTH AMERICA, INC.

- If the calculated value exceeds the limit, select proper main bearing according to main bearing inner diameter and crankshaft main journal diameter to obtain the specified bearing oil clearance. Refer to "**DESCRIPTION**".

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Method of Using Plastigage

- Remove engine oil and dust on crankshaft journal 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 main bearing to cylinder block and lower cylinder block, and tighten lower cylinder block bolts with lower cylinder block to the specified torque. Refer to "**DISASSEMBLY AND ASSEMBLY**" for the tightening procedure.

CAUTION: Never rotate crankshaft.

- Remove lower cylinder block 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".

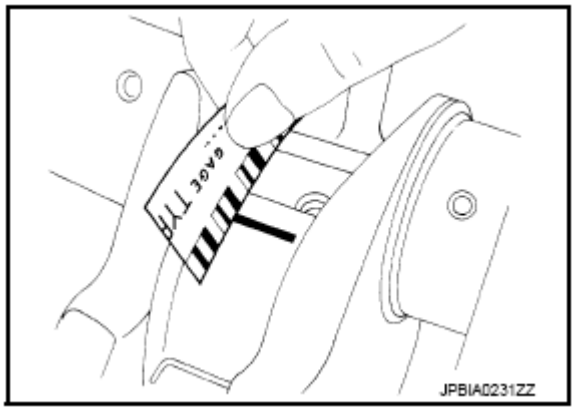

Fig. 286: Measuring Plastigage Width
Courtesy of NISSAN NORTH AMERICA, INC.

MAIN BEARING CRUSH HEIGHT

- When lower cylinder block is removed after being tightened to the specified torque with main bearings (1) installed, the tip end of bearing must protrude. Refer to "**DISASSEMBLY AND ASSEMBLY**" for the tightening procedure.

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A : Crush height

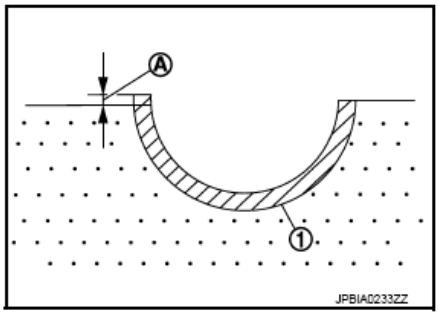

Fig. 287: Identifying Main Bearing Crush Height
Courtesy of NISSAN NORTH AMERICA, INC.

Standard: There must be crush height.

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

CONNECTING ROD BEARING CRUSH HEIGHT

- When connecting rod bearing cap is removed after being tightened to the specified torque with connecting rod bearings (1) installed, the tip end of bearing must protrude. Refer to "**DISASSEMBLY AND ASSEMBLY**" for the tightening procedure.

A : Crush height

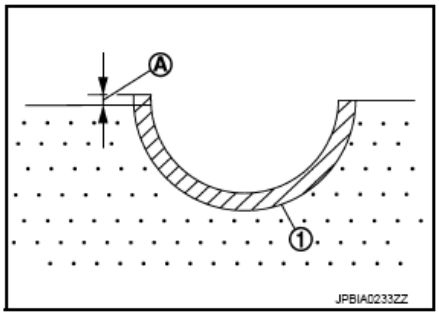

Fig. 288: Identifying Main Bearing Crush Height
Courtesy of NISSAN NORTH AMERICA, INC.

Standard: There must be crush height.

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

LOWER CYLINDER BLOCK BOLT OUTER DIAMETER

- Measure the outer diameters (c), (d) at two positions as shown in the figure.

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a : 20 mm (0.79 in)
b : 30 mm (1.18 in)
e : 10 mm (0.39 in)

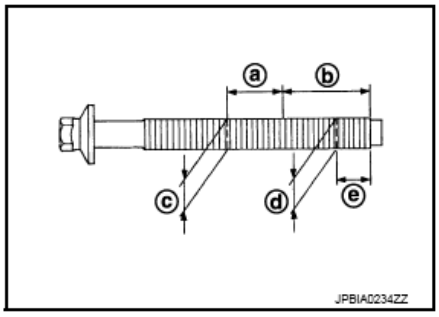

Fig. 289: Identifying Lower Cylinder Block Bolt Outer Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

- If reduction appears in (a) range, regard it (c).

  Limit [(d) - (c)]: 0.11 mm (0.0043 in)

- If it exceeds the limit (large difference in dimensions), replace lower cylinder block bolt with new one.

CONNECTING ROD BOLT OUTER DIAMETER

1. Measure the outer diameters [(a), (b) and (c)] at the position shown in the figure.

a : Value at the end of the smaller diameter of the bolt
b : Value at the end of the smaller diameter of the bolt [opposite side of (a)]
c : Value of the smallest diameter of the smaller of the bolt

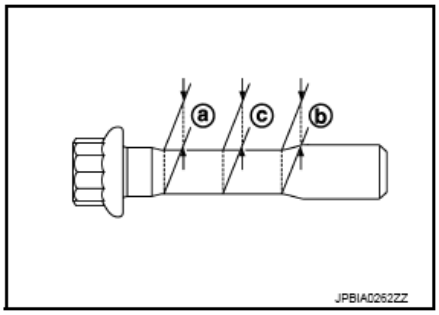

Fig. 290: Identifying Connecting Rod Bolt Outer Diameter
Courtesy of NISSAN NORTH AMERICA, INC.

2. Obtain a mean value (d) of (a) and (b).
3. Subtract (c) from (d).

   Limit [(d) - (c)]: 0.09 mm (0.0035 in)

4. If it exceeds the limit (large difference in dimensions), replace the bolt with new one.

DRIVE PLATE

- Check drive plate and signal plate for deformation or damage.

CAUTION:
- **Never disassemble drive plate.**

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- **Never place drive plate with signal plate facing down.**
- **When handling signal plate, take care not to damage or scratch it.**
- **Handle signal plate in a manner that prevents it from becoming magnetized.**

- If anything is found, replace drive plate.

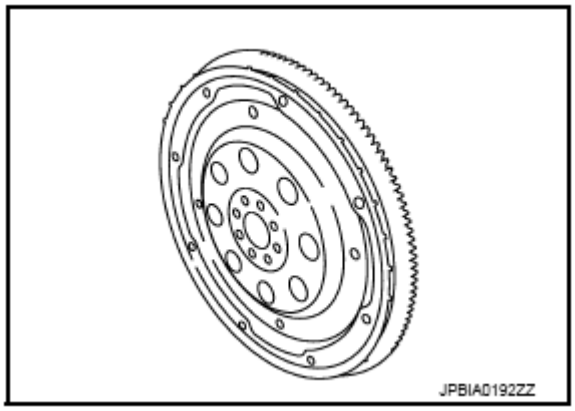

Fig. 291: Identifying Drive Plate
Courtesy of NISSAN NORTH AMERICA, INC.

HOW TO SELECT PISTON AND BEARING

Description

Selection points	Selection parts	Selection items	Selection methods
Between cylinder block and 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 and connecting rod	Connecting rod bearing	Connecting rod bearing grade (bearing thickness)	Combining service grades for connecting rod big end diameter and crankshaft pin outer diameter determine connecting rod bearing selection.
Between cylinder block and piston	Piston and piston pin assembly (Piston is available together with piston pin as assembly.)	Piston grade (piston skirt diameter)	Piston grade = cylinder bore grade (inner diameter of bore)
Between piston and connecting rod(1)	-	-	-

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

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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, refer to the text.

Piston

WHEN NEW CYLINDER BLOCK IS USED

Check the cylinder bore grade ("1", "2" or "3") on rear side of cylinder block, and select piston of the same grade.

A : Bearing housing grade No. 1
B : Bearing housing grade No. 2
C : Bearing housing grade No. 3
D : Bearing housing grade No. 4
E : Cylinder bore grade No. 1
F : Cylinder bore grade No. 2
G : Cylinder bore grade No. 3
H : Cylinder bore grade No. 4
I : Cylinder bore grade No. 5
J : Cylinder bore grade No. 6
K : Identification
⇦ : Engine front

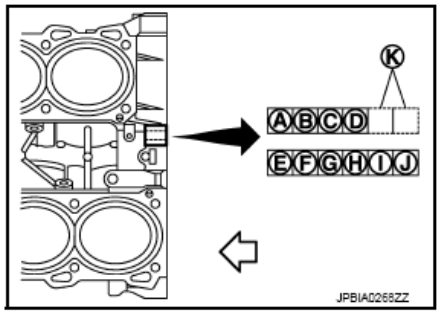

Fig. 292: Identifying Cylinder Bore Grade On Cylinder Block Rear Side
Courtesy of NISSAN NORTH AMERICA, INC.

NOTE: Piston is available with piston pin as a set for the service part. (Only "0" grade piston pin is available.)

WHEN CYLINDER BLOCK IS REUSED

1. Measure the cylinder bore inner diameter. Refer to "**CYLINDER BLOCK**".
2. Determine the bore grade by comparing the measurement with the values under the cylinder bore inner diameter of the "PISTON SELECTION TABLE".

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A : Piston grade number
B : Front mark
C : Piston pin grade number

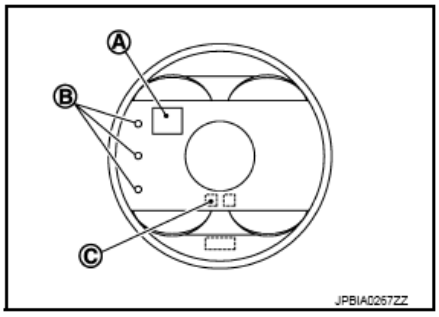

Fig. 293: Identifying Piston Grade Number, Front Mark And Piston Pin Grade Number
Courtesy of NISSAN NORTH AMERICA, INC.

3. Select piston of the same grade.

PISTON SELECTION TABLE

Unit: mm (in)			
Grade	**1**	**2**	**3**
Cylinder bore inner diameter	Refer to "**CYLINDER BLOCK**"		
Piston skirt diameter			

NOTE:

- **Piston is available together with piston pin as assembly.**
- **Piston pin (piston pin hole) grade is provided only for the parts installed at the plant. For service parts, no piston pin grades can be selected. (Only "0" grade is available.)**
- **No second grade mark is available on piston.**

Connecting Rod Bearing

WHEN NEW CONNECTING ROD AND CRANKSHAFT ARE USED

1. Apply crankshaft pin journal diameter grade stamped on crankshaft front side to the column in the "CONNECTING ROD BEARING SELECTION TABLE"

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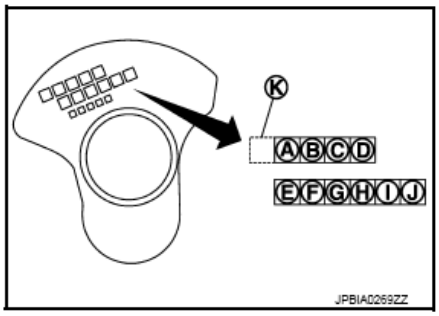

A : Journal diameter grade No. 1
B : Journal diameter grade No. 2
C : Journal diameter grade No. 3
D : Journal diameter grade No. 4
E : Pin diameter grade No. 1
F : Pin diameter grade No. 2
G : Pin diameter grade No. 3
H : Pin diameter grade No. 4
I : Pin diameter grade No. 5
J : Pin diameter grade No. 6
K : Identification

Fig. 294: Identifying Crankshaft Pin Journal Diameter Grade Stamped On Crankshaft Front Side
Courtesy of NISSAN NORTH AMERICA, INC.

2. Read the symbol at the cross point of selected row and column in the "CONNECTING ROD BEARING SELECTION TABLE".
3. Apply the symbol obtained to the "CONNECTING ROD BEARING GRADE TABLE" to select connecting rod bearing.

WHEN CONNECTING ROD AND CRANKSHAFT ARE REUSED

1. Measure the connecting rod big end diameter. Refer to "**CYLINDER BLOCK**".
2. Check that the connecting rod big end diameter is within the standard value.
3. Measure the crankshaft pin journal diameter. Refer to "**CYLINDER BLOCK**".
4. Determine the grade of crankshaft pin diameter grade by corresponding to the measured dimension in "Crankshaft pin journal diameter" column of "CONNECTING ROD BEARING SELECTION TABLE".
5. Select connecting rod bearing of the same grade.

CONNECTING ROD BEARING SELECTION TABLE

Connecting rod big end inner diameter (mm)		53.013/53.000	
Crankshaft pin diameter (mm)	Grade (press)	0 (No press)	
49.974/49.968	0	• Bearing grade No. • Bearing thickness (mm) • Identification color	STD 0 1.503/1.500 Black
49.968/49.962	1	• Bearing grade No. • Bearing thickness (mm) • Identification color	STD 1 1.506/1.503 Blown
49.962/49.956	2	• Bearing grade No. • Bearing thickness (mm) • Bearing thickness (mm)	STD 2 1.509/1.506 Green

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CONNECTING ROD BEARING GRADE TABLE

Connecting rod bearing grade table: Refer to "CONNECTING ROD BEARING".

UNDERSIZE BEARING USAGE GUIDE

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

CAUTION: In grinding crankshaft pin to use undersize bearings, keep the fillet R (A) [1.5 - 1.7 mm (0.059 - 0.067 in)].

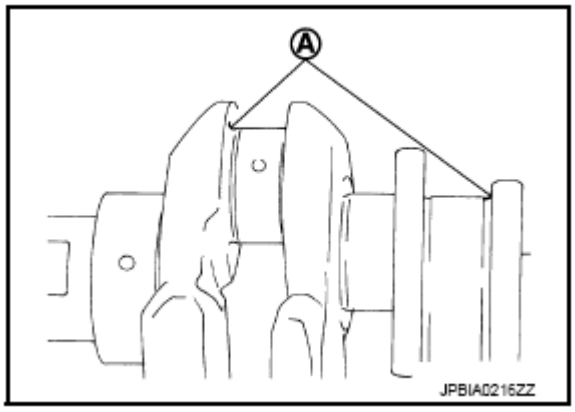

Fig. 295: Identifying Crankshaft Pin Fillet R
Courtesy of NISSAN NORTH AMERICA, INC.

Bearing undersize table: Refer to "CONNECTING ROD BEARING".

Main Bearing

WHEN NEW CYLINDER BLOCK AND CRANKSHAFT ARE USED

1. "MAIN BEARING SELECTION TABLE" rows correspond to bearing housing grade on rear left side of cylinder block.

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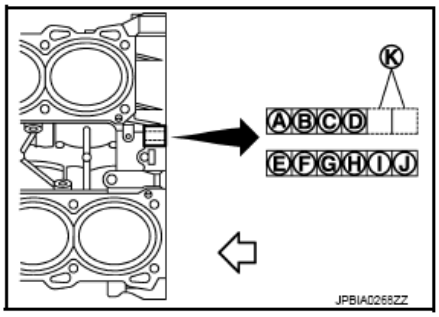
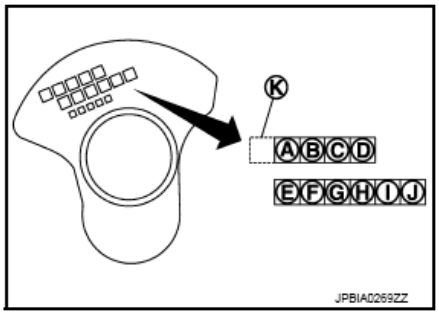


A : Bearing housing grade No. 1
B : Bearing housing grade No. 2
C : Bearing housing grade No. 3
D : Bearing housing grade No. 4
E : Cylinder bore grade No. 1
F : Cylinder bore grade No. 2
G : Cylinder bore grade No. 3
H : Cylinder bore grade No. 4
I : Cylinder bore grade No. 5
J : Cylinder bore grade No. 6
K : Identification code
⇦ : Engine front

Fig. 296: Identifying Main Bearing Housing Grade On Rear Left Side
Courtesy of NISSAN NORTH AMERICA, INC.

2. "MAIN BEARING SELECTION TABLE" columns correspond to journal diameter grade on front side of crankshaft.



A : Journal diameter grade No. 1
B : Journal diameter grade No. 2
C : Journal diameter grade No. 3
D : Journal diameter grade No. 4
E : Pin diameter grade No. 1
F : Pin diameter grade No. 2
G : Pin diameter grade No. 3
H : Pin diameter grade No. 4
I : Pin diameter grade No. 5
J : Pin diameter grade No. 6
K : Identification code

Fig. 297: Identifying Journal Diameter Grade On Front Side Of Crankshaft
Courtesy of NISSAN NORTH AMERICA, INC.

3. Select main bearing grade at the point where selected row and column meet in "MAIN BEARING SELECTION TABLE".
4. Apply sign at crossing in above step 3 to "MAIN BEARING GRADE TABLE".

NOTE:

- **"MAIN BEARING GRADE TABLE" applies to all journals.**
- **Service parts is available as a set of both upper and lower.**

WHEN CYLINDER BLOCK AND CRANKSHAFT ARE REUSED

1. Measure cylinder block main bearing housing inner diameter and crankshaft main journal diameter. Refer to "**MAIN BEARING**" and "**CYLINDER BLOCK**".

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2. Correspond the measured dimension in "Cylinder block main bearing housing inner diameter" row of "MAIN BEARING SELECTION TABLE".
3. Correspond the measured dimension in "Crankshaft main journal diameter" column of "MAIN BEARING SELECTION TABLE".
4. Follow step 3 and later in "When New Cylinder Block and Crankshaft are Used".

MAIN BEARING SELECTION TABLE

Cylinder block main bearing housing inner diameter
Unit: mm (in)

Crankshaft main journal diameter
Unit: mm (in)

Mark	Axle diameter	Hole diameter	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7
			63.993 - 63.994 (2.5194 - 2.5194)	63.994 - 63.995 (2.5194 - 2.5194)	63.995 - 63.996 (2.5194 - 2.5195)	63.996 - 63.997 (2.5195 - 2.5195)	63.997 - 63.998 (2.5195 - 2.5196)	63.998 - 63.999 (2.5196 - 2.5196)	63.999 - 64.000 (2.5196 - 2.5196)	64.000 - 64.001 (2.5196 - 2.5197)	64.001 - 64.002 (2.5197 - 2.5197)	64.002 - 64.003 (2.5197 - 2.5197)	64.003 - 64.004 (2.5197 - 2.5198)	64.004 - 64.005 (2.5198 - 2.5198)	64.005 - 64.006 (2.5198 - 2.5199)	64.006 - 64.007 (2.5199 - 2.5199)	64.007 - 64.008 (2.5199 - 2.5199)	64.008 - 64.009 (2.5199 - 2.5200)	64.009 - 64.010 (2.5200 - 2.5200)	64.010 - 64.011 (2.5200 - 2.5201)	64.011 - 64.012 (2.5201 - 2.5201)	64.012 - 64.013 (2.5201 - 2.5201)	64.013 - 64.014 (2.5201 - 2.5202)	64.014 - 64.015 (2.5202 - 2.5202)	64.015 - 64.016 (2.5202 - 2.5203)	64.016 - 64.017 (2.5203 - 2.5203)
A	59.975 - 59.974 (2.3612 - 2.3611)		0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34
B	59.974 - 59.973 (2.3611 - 2.3611)		0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4
C	59.973 - 59.972 (2.3611 - 2.3610)		0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4
D	59.972 - 59.971 (2.3610 - 2.3610)		01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4
E	59.971 - 59.970 (2.3610 - 2.3610)		01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45
F	59.970 - 59.969 (2.3610 - 2.3609)		01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45
G	59.969 - 59.968 (2.3609 - 2.3609)		1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45
H	59.968 - 59.967 (2.3609 - 2.3609)		1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5
J	59.967 - 59.966 (2.3609 - 2.3608)		1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5
K	59.966 - 59.965 (2.3608 - 2.3608)		12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5
L	59.965 - 59.964 (2.3608 - 2.3607)		12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56
M	59.964 - 59.963 (2.3607 - 2.3607)		12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56
N	59.963 - 59.962 (2.3607 - 2.3607)		2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56
P	59.962 - 59.961 (2.3607 - 2.3606)		2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6
R	59.961 - 59.960 (2.3606 - 2.3606)		2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6
S	59.960 - 59.959 (2.3606 - 2.3605)		23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6
T	59.959 - 59.958 (2.3605 - 2.3605)		23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67
U	59.958 - 59.957 (2.3605 - 2.3605)		23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67
V	59.957 - 59.956 (2.3605 - 2.3604)		3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67
W	59.956 - 59.955 (2.3604 - 2.3604)		3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7
X	59.955 - 59.954 (2.3604 - 2.3603)		3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7
Y	59.954 - 59.953 (2.3603 - 2.3603)		34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7
4	59.953 - 59.952 (2.3603 - 2.3603)		34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7	X
7	59.952 - 59.951 (2.3603 - 2.3602)		34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7	X	X

JPBIA3212GB

Fig. 298: Main Bearing Selection Chart
Courtesy of NISSAN NORTH AMERICA, INC.

- If the intersection of a column and a row is "X" (as shown in the bottom right of the figure), use Grade 7.
- **NOTE: Bearing: A set of top and bottom.**

MAIN BEARING GRADE TABLE (ALL JOURNALS)

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Main bearing grade table (All journals): Refer to "MAIN BEARING".

UNDERSIZE BEARING USAGE GUIDE

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

CAUTION: In grinding crankshaft main journal to use undersize bearings, keep the fillet R (A) [1.5 - 1.7 mm (0.059 - 0.067 in)].

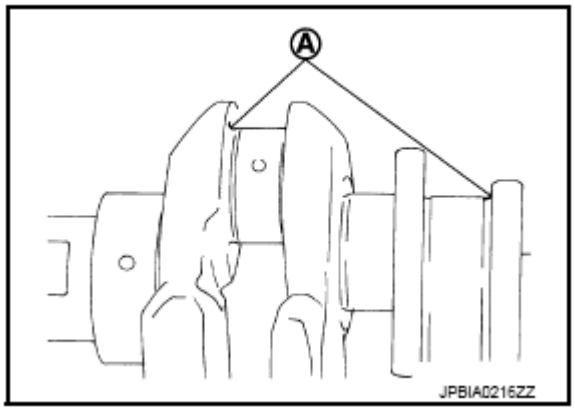

Fig. 299: Identifying Crankshaft Main Journal Fillet R
Courtesy of NISSAN NORTH AMERICA, INC.

Bearing undersize table: Refer to "MAIN BEARING".

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specification

GENERAL SPECIFICATIONS

Cylinder arrangement		V-6
Displacement cm^3 (cu in)		2.496 (152.26)
Bore and stroke mm (in)		85.0 x 73.3 (3.35 x 2.89)
Valve arrangement		DOHC
Firing order		1-2-3-4-5-6
Number of piston rings	Compression	2
	Oil	1
Number of main bearings		4

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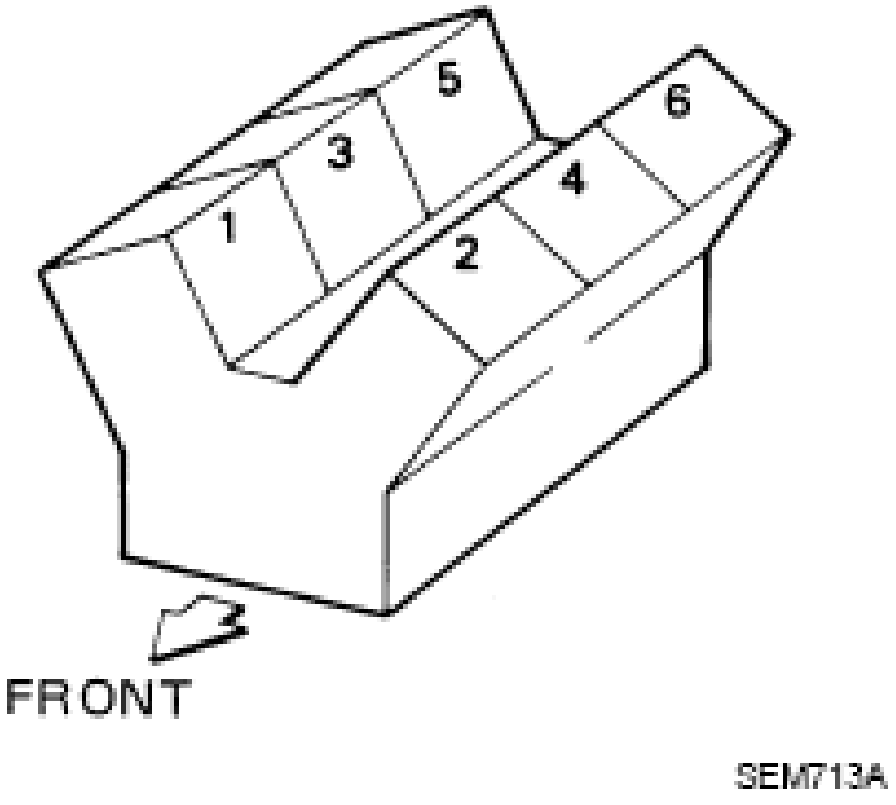
Compression ratio		10.3
Compression pressure kPa (kg/cm^2 , psi)/300 rpm	Standard	1320 (13.5, 191)
	Minimum	1030 (10.5, 149)
	Differential limit between cylinders	100 (1.0, 14.5)
Cylinder number		
Valve timing (Valve timing control - "OFF")		

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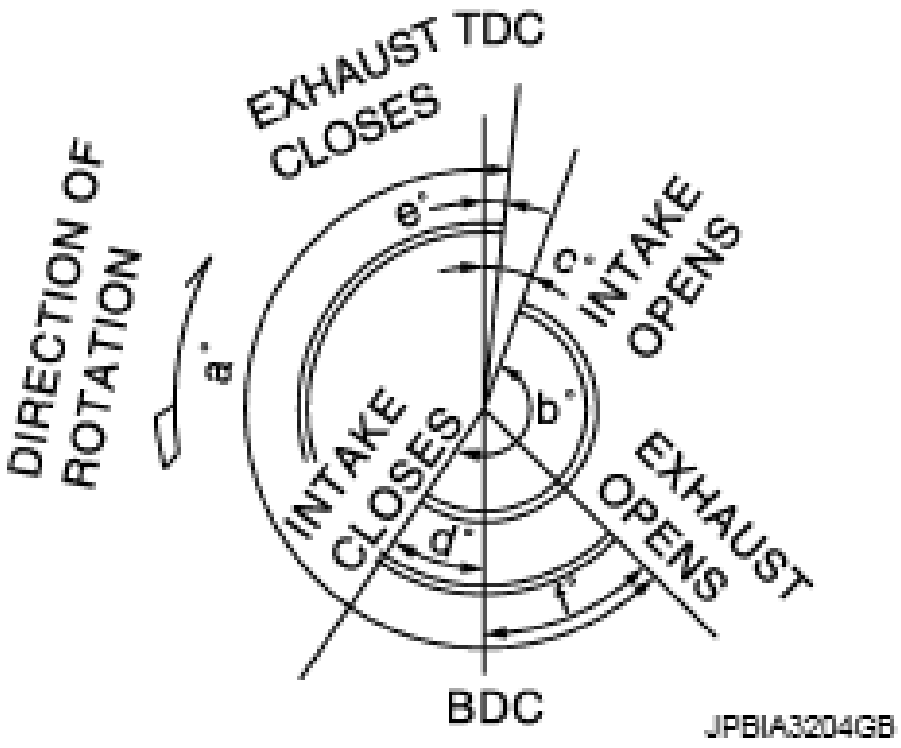

a	b	c	d	e	f
232	232	6	58	0	56

Unit: degree

Drive Belt

DRIVE BELT

PART	Belt spec	Tension [N (kg)]			Belt tension (mm) [When pushed at 98.1N (10 Kg)]		
		New	Adjustment	Rimit of retghtening	New	Adjustment	Rimit of retghtening
Alternator.power steering oil pump belt	V-ribbed belt (6 ribbs)	838 - 926 (85.5 - 94.5)	730 - 818 (74.5 - 83.5)	294 (30)	6 - 7	7 - 8	12
A/C compressor belt	V-ribbed belt (4 ribbs)	470 - 559 (48 - 57)	348 - 436 (35.5 - 4.5)	196 (20)	8 - 9	9 - 10	12

Spark Plug

SPARK PLUG

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Unit: mm (in)

Make		DENSO
Standard type		FXE22HR11
Gap	Standard	1.1 (0.043)
	Limit	1.4 (0.055)

Intake Manifold

INTAKE MANIFOLD

Unit: mm (in)

Items		Limit
Surface distortion	Intake manifold	0.1 (0.004)

Exhaust Manifold

EXHAUST MANIFOLD

Unit: mm (in)

Items		Limit
Surface distortion	Exhaust manifold	0.7 (0.028)

Camshaft

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	44.665 - 44.855 (1.7585 - 1.7659)	0.2 (0.008)(1)
	Exhaust	44.775 - 44.965 (1.7628 - 1.7703)	0.2 (0.008)(1)
Camshaft runout [TIR(2)]		Less than 0.02 (0.0008)	0.05 (0.0020)
Camshaft sprocket runout [TIR(2)]		-	0.15 (0.0059)

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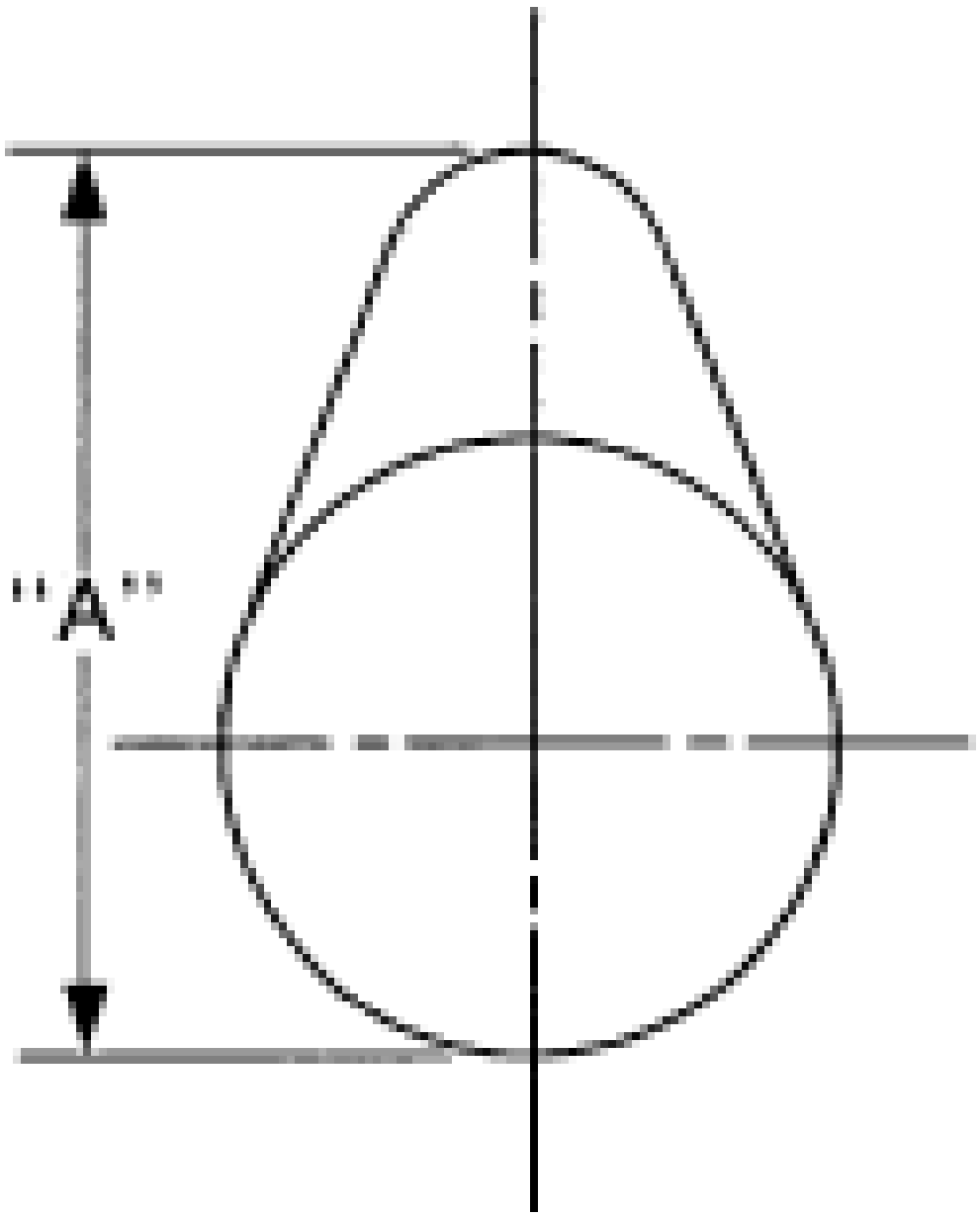

(1) Cam wear limit

(2) Total indicator reading

VALVE LIFTER

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Unit: mm (in)		
Items		**Standard**
Valve lifter outer diameter	Intake	33.980 - 33.990 (1.3378 - 1.3382)
	Exhaust	29.977 - 29.987 (1.1802 - 1.1806)
Valve lifter hole diameter	Intake	34.000 - 34.016 (0.0004 - 0.0014)
	Exhaust	29.997 - 30.013 (1.1810 - 1.1816)
Valve lifter clearance	Intake	0.010 - 0.036 (0.0004 - 0.0014)
	Exhaust	

VALVE CLEARANCE

Unit: mm (in)		
Items	**Cold**	**Hot(1) (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)
(1) Approximately 80°C (176°F)		

AVAILABLE VALVE LIFTER

Unit: mm (in)			
Intake		**Exhaust**	
Identification (stamped) mark (A)	**Thickness (B)**	**Identification (stamped) mark (A)**	**Thickness (B)**
788P	7.88 (0.31)	666U	6.66 (0.26)
790P	7.90 (0.31)	668U	6.68 (0.26)
792P	7.92 (0.31)	670U	6.70 (0.26)
794P	7.94 (0.31)	672U	6.72 (0.26)
796P	7.96 (0.31)	674U	6.74 (0.27)
798P	7.98 (0.31)	676U	6.76 (0.27)
800P	8.00 (0.31)	678U	6.78 (0.27)
802P	8.02 (0.32)	680U	6.80 (0.27)
804P	8.04 (0.32)	682U	6.82 (0.27)
806P	8.06 (0.32)	684U	6.84 (0.27)
808P	8.08 (0.32)	686U	6.86 (0.27)
810P	8.10 (0.32)	688U	6.88 (0.27)
812P	8.12 (0.32)	690U	6.90 (0.27)
814P	8.14 (0.32)	692U	6.92 (0.27)
816P	8.16 (0.32)	694U	6.94 (0.27)
818P	8.18 (0.32)	696U	6.96 (0.27)
820P	8.20 (0.32)	698U	6.98 (0.27)
822P	8.22 (0.32)	700U	7.00 (0.28)

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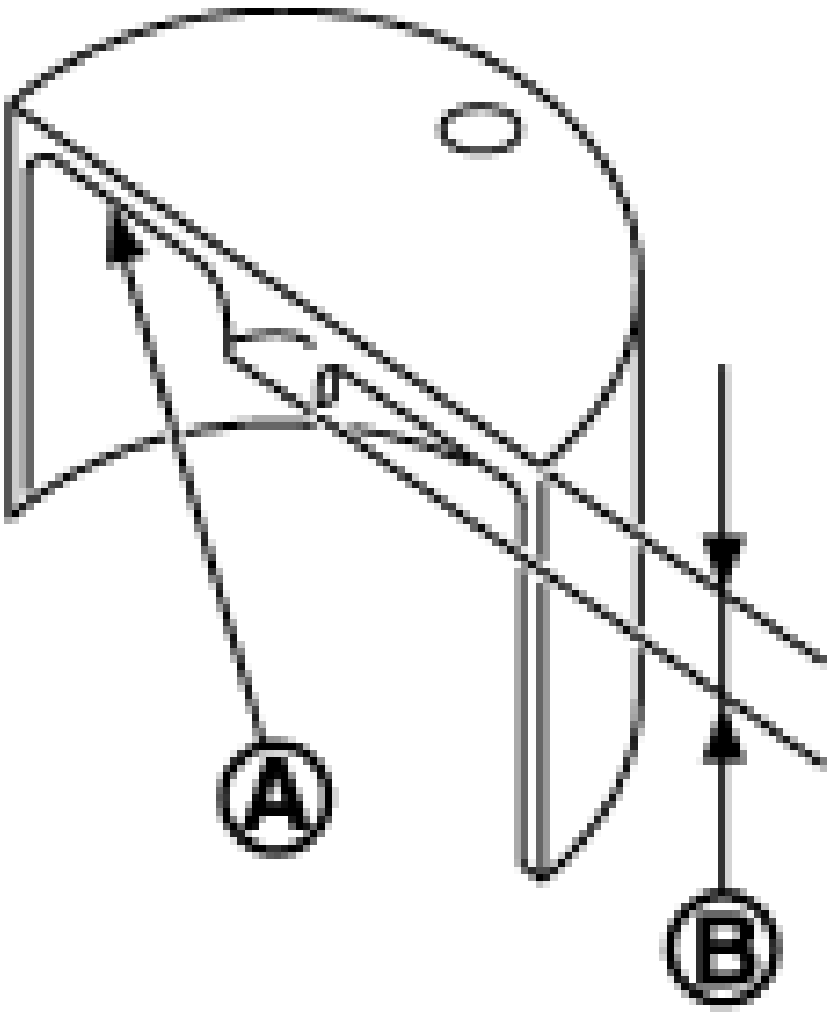
824P	8.24 (0.32)	702U	7.02 (0.28)
826P	8.26 (0.33)	704U	7.04 (0.28)
828P	8.28 (0.33)	706U	7.06 (0.28)
830P	8.30 (0.33)	708U	7.08 (0.28)
832P	8.32 (0.33)	710U	7.10 (0.28)
834P	8.34 (0.33)	712U	7.12 (0.28)
836P	8.36 (0.33)	714U	7.14 (0.28)
838P	8.38 (0.33)	716U	7.16 (0.28)
840P	8.40 (0.33)	718U	7.18 (0.28)



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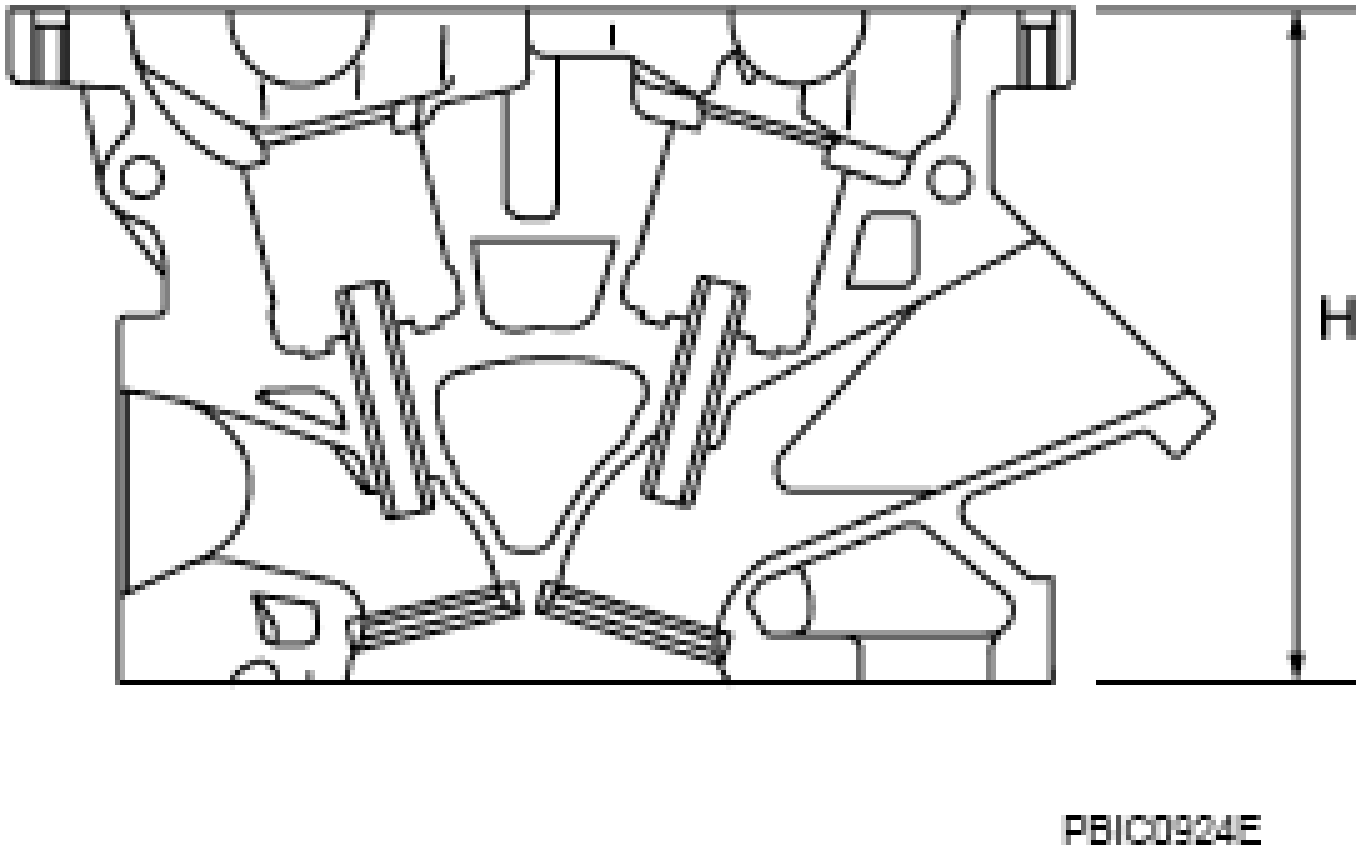
Cylinder Head

CYLINDER HEAD

Unit: mm (in)

Items	Standard	Limit
Head surface distortion	-	0.1 (0.004)
Normal cylinder head height "H"	126.3 - 126.5 (4.97 - 4.98)	-



VALVE DIMENSIONS

Unit: mm (in)

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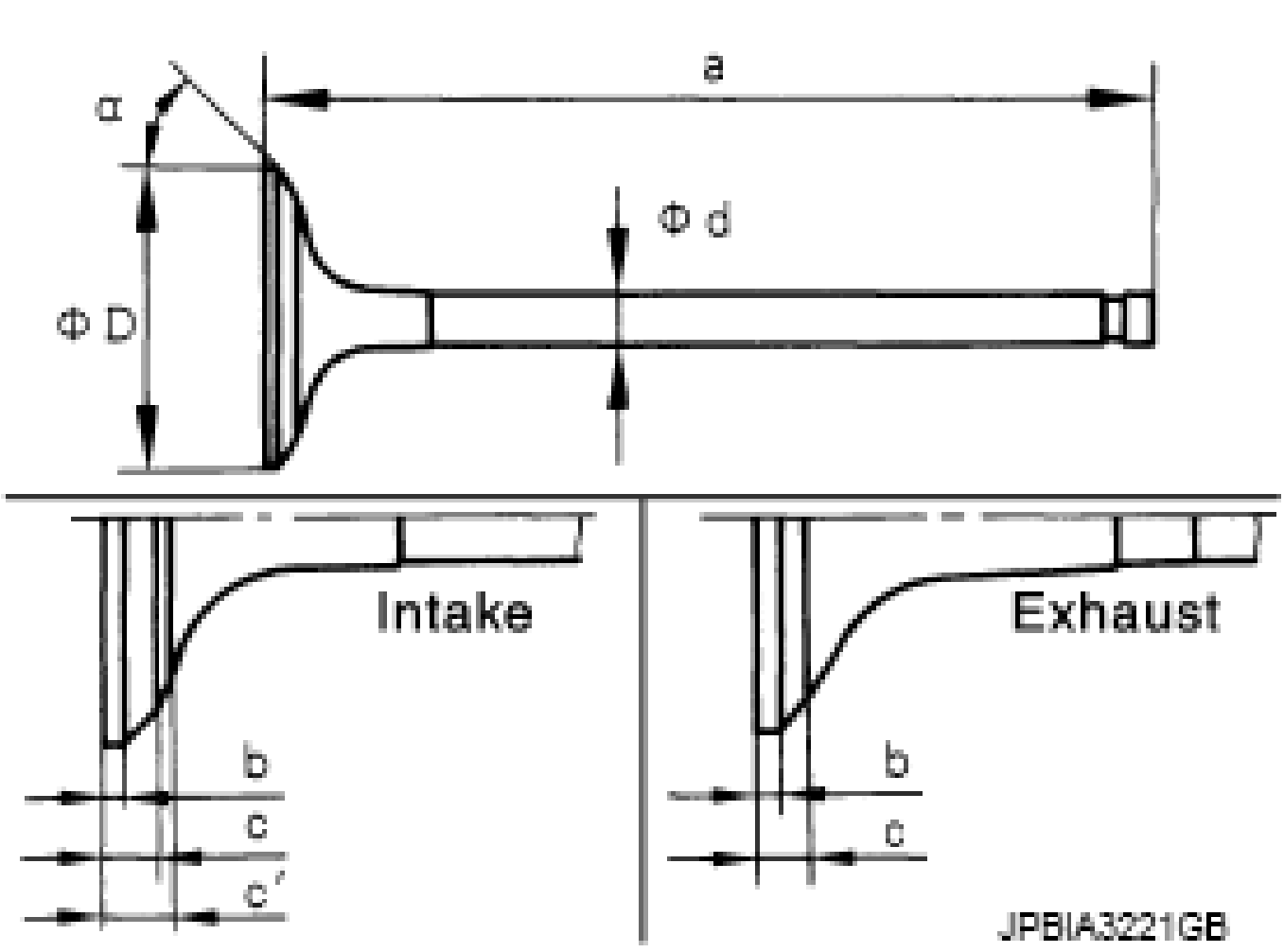

(a)	Intake	98.06 (3.8606)
	Exhaust	96.81 (3.8114)
(b)	Intake	1.1 (0.0433)
	Exhaust	1.3 (0.0511)
(c)	Intake	2.4 - 2.7 (0.0944 - 0.1062)
	Exhaust	3.0 - 3.4 (0.1181 - 0.1260)
(c')	Intake	3.2 (0.1260)
	Exhaust	-
(ød)	Intake	5.965 - 5.980 (0.2348 - 0.2354)
	Exhaust	5.955 - 5.970 (0.2344 - 0.2350)
(øD)	Intake	34.0 - 34.3 (1.3386 - 1.3503)
	Exhaust	29.0 - 29.3 (1.1417 - 1.1535)
(a)	Intake	45°15' - 45°45'
	Exhaust	

VALVE GUIDE

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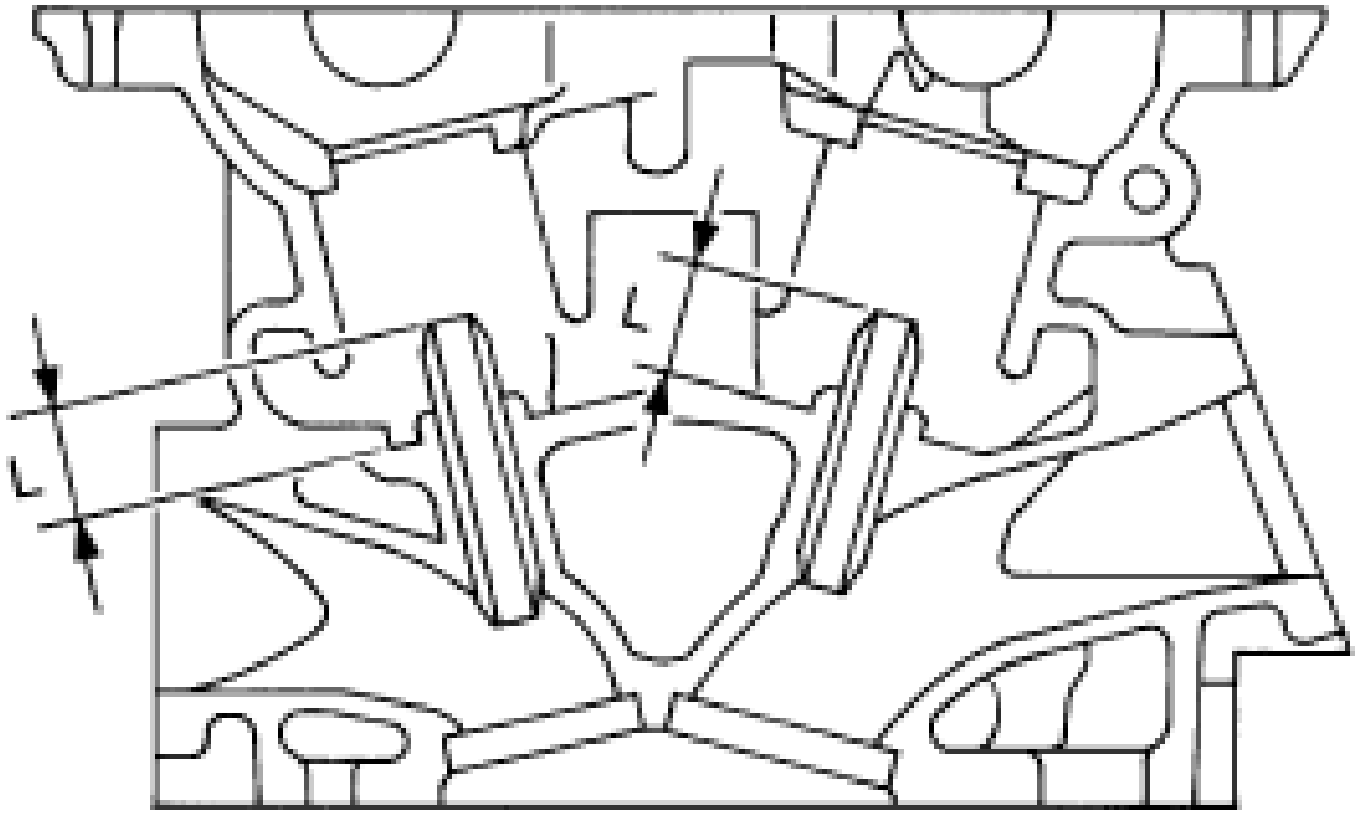
Unit: mm (in)



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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
Valve guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.08 (0.0031)
	Exhaust	0.030 - 0.056 (0.0012 - 0.0022)	0.09 (0.0035)
Projection length "L"		12.6 - 12.8 (0.496 - 0.504)	

VALVE SEAT

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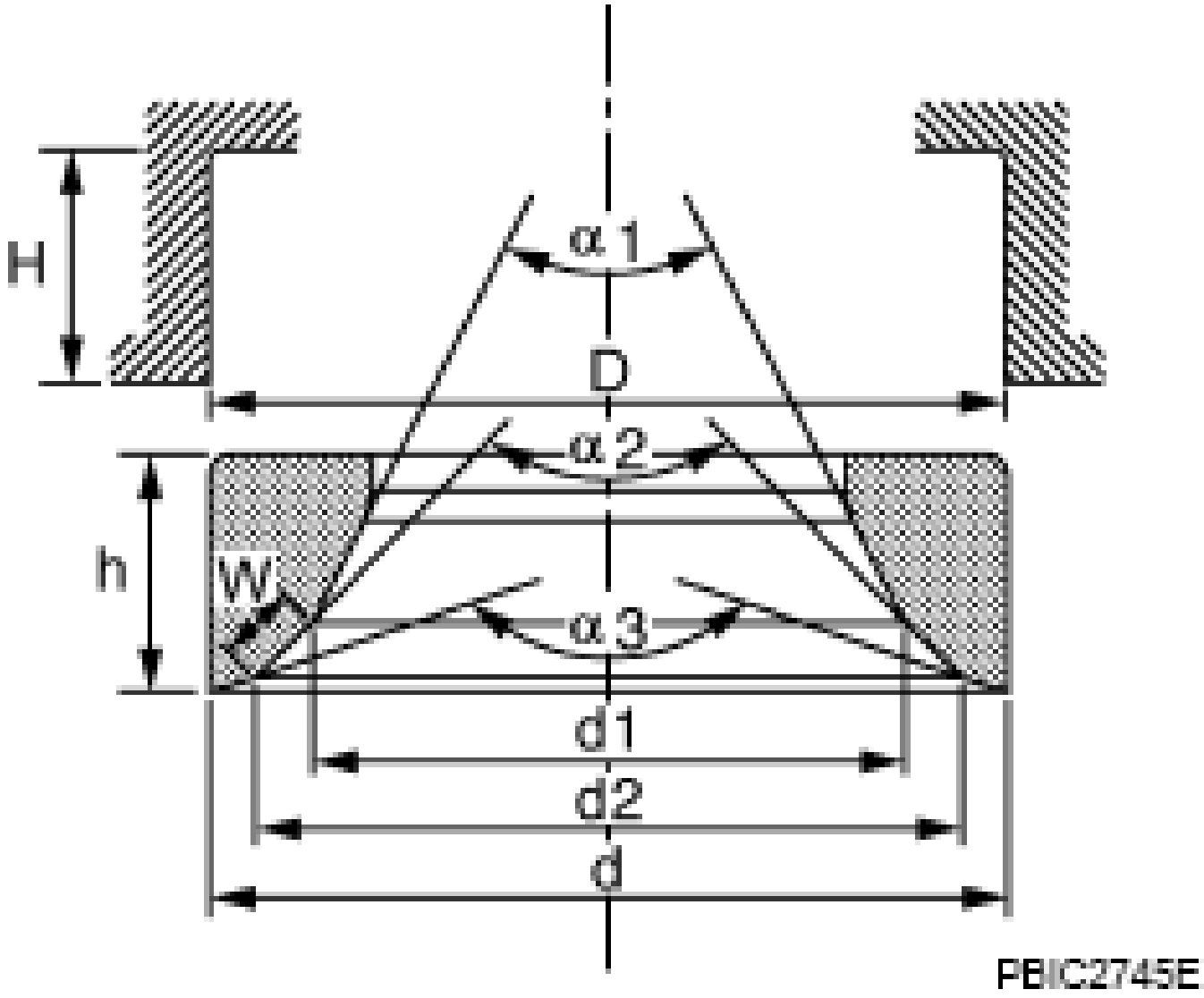
Unit: mm (in)



Items		Standard	Oversize (Service) [0.5 (0.02)]
Cylinder head seat recess diameter "D"	Intake	35.000 - 35.016 (1.3780 - 1.3786)	35.500 - 35.516 (1.3976 - 1.3983)
	Exhaust	30.000 - 30.016 (1.1811 - 1.1817)	30.500 - 30.516 (1.2008 - 1.2014)
Valve seat outer diameter "d"	Intake	35.080 - 35.096 (1.3811 - 1.3817)	35.580 - 35.596 (1.1842 - 1.1849)
	Exhaust	30.080 - 30.096 (1.1842 - 1.1849)	30.580 - 30.596 (1.2039 - 1.2046)
Valve seat interference fit	Intake	0.064 - 0.096 (0.0025 - 0.0038)	
	Exhaust	0.064 - 0.096 (0.0025 - 0.0038)	

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Diameter "d1"(1)	Intake	32.0 (1.260)	
	Exhaust	26.5 (1.043)	
Diameter "d2"(2)	Intake	33.3 - 33.8 (1.311 - 1.331)	
	Exhaust	28.1 - 28.6 (1.106 - 1.126)	
Angle "a1"	Intake	60°	
	Exhaust	60°	
Angle "a2"	Intake	88°45' - 90°15'	
	Exhaust	88°45' - 90°15'	
Angle "a3"	Intake	120°	
	Exhaust	120°	
Contacting width "W"(3)	Intake	1.0 - 1.4 (0.039 - 0.055)	
	Exhaust	1.2 - 1.6 (0.047 - 0.063)	
Height "h"	Intake	6.20 - 6.30 (0.2441 - 0.2480)	5.40 - 5.50 (0.2126 - 0.2165)
	Exhaust	5.9 - 6.0 (0.232 - 0.236)	4.95 - 5.05 (0.1949 - 0.1988)
Depth "H"		6.0 (0.236)	

(1) Diameter made by intersection point of conic angles "a1" and "a2"

(2) Diameter made by intersection point of conic angles "a2" and "a3"

(3) Machining data

VALVE SPRING

Items	Standard
Free height	43.85 mm (1.7264 in)
Installation height	37.00 mm (1.4567 in)
Installation load	166 - 188 N (16.9 - 19.2 kg, 37 - 42 lb)
Height during valve open	26.8 mm (1.055 in)
Load with valve open	502 - 566 N (51.2 - 57.7 kg, 113 - 127 lb)
Squareness	1.9 mm (0.075 in)

Cylinder Block

CYLINDER BLOCK

Unit: mm (in)

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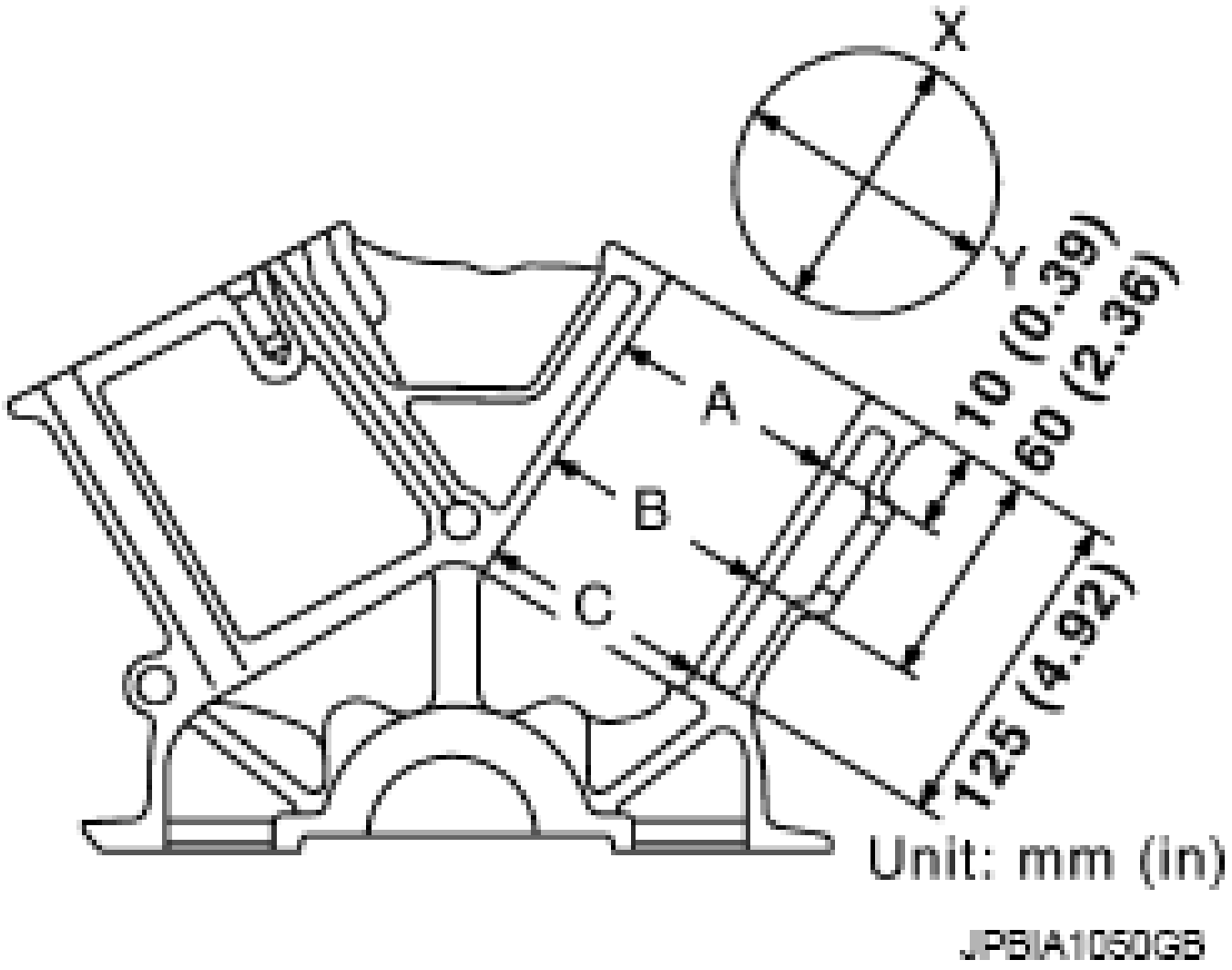

Surface flatness		Limit		0.1 (0.004)
Main bearing housing inner diameter		Standard		63.993 - 64.017 (2.5194 - 2.5203)
Cylinder bore	Inner diameter	Standard	Grade No. 1	85.000 - 85.010 (3.3465 - 3.3468)
			Grade No. 2	85.010 - 85.020 (3.3468 - 3.3472)
			Grade No. 3	85.020 - 85.030 (3.3472 - 3.3476)
		Wear limit		0.2 (0.008)
Out-of-round		Limit		0.015 (0.0006)
Taper				0.010 (0.0004)
			Grade No. A	63.993 - 63.994 (2.5194 - 2.5194)
			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)

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Main bearing housing inner diameter grade (Without bearing)	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)

AVAILABLE PISTON

	Unit: mm (in)

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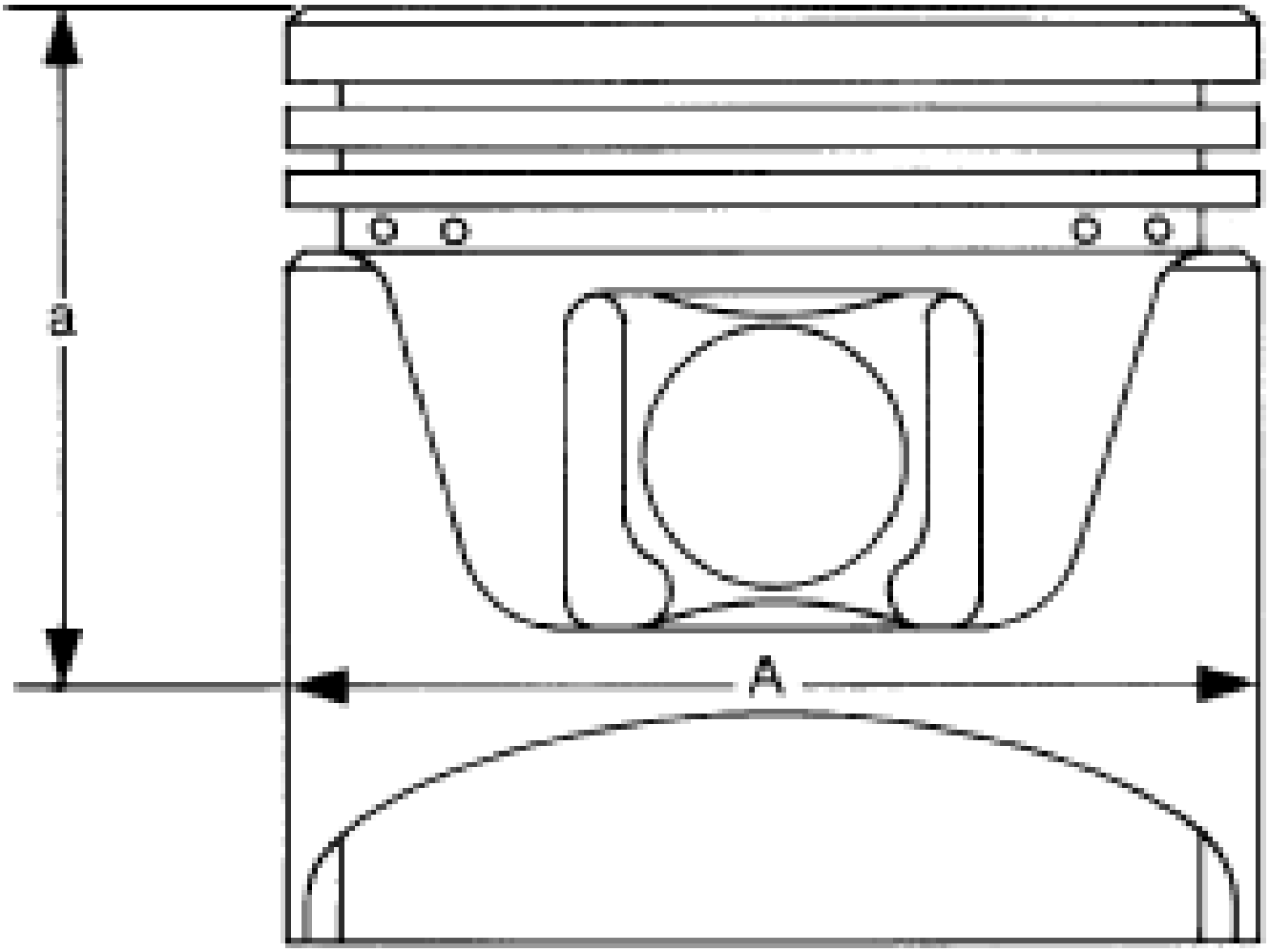

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Items		Standard	Oversize (Service) [0.2 (0.008)]
Piston skirt diameter "A"	Grade No. 1	84.980 - 84.990 (3.3457 - 3.3461)	-
	Grade No. 2	84.990 - 85.000 (3.3461 - 3.3465)	-
	Grade No. 3	85.000 - 85.010 (3.3465 - 3.3468)	-
	Service	-	-
"a" dimension		38.8 (1.528)	-
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)	0.08 (0.0031)

PISTON RING

		Unit: mm (in)

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Items		Standard	Limit
Side clearance	Top	0.045 - 0.080 (0.0018 - 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	0.20 - 0.30 (0.0079 - 0.0118)	0.54 (0.0213)
	2nd	0.31 - 0.46 (0.0122 - 0.0181)	0.67 (0.0264)
	Oil (rail ring)	0.20 - 0.50 (0.0079 - 0.0197)	0.87 (0.034)

PISTON PIN

Unit: mm (in)

Items		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)

CONNECTING ROD

Unit: mm (in)

Items		Standard	Limit
Center distance		147.65 (5.81)	-
Bend [per 100 (3.94)]		-	0.15 (0.0059)
Torsion [per 100 (3.94)]		-	0.30 (0.0118)
Connecting rod big end diameter (Without bearing)		53.000 - 53.013 (2.0866 - 2.0871)	-
Connecting rod bushing inner diameter(1)	Grade No.	0 22.000 - 22.006 (0.8661 - 0.8664)	-
	Grade No. 1	22.006 - 22.012 (0.8664 - 0.8666)	-
	Grade No. A		-
	Grade No. B		-
	Grade No. C		-
	Grade No. D		-
	Grade No. E		-
	Grade No.		-

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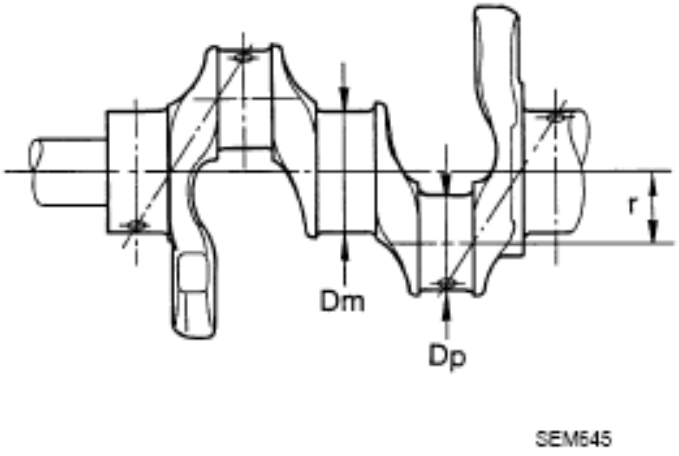
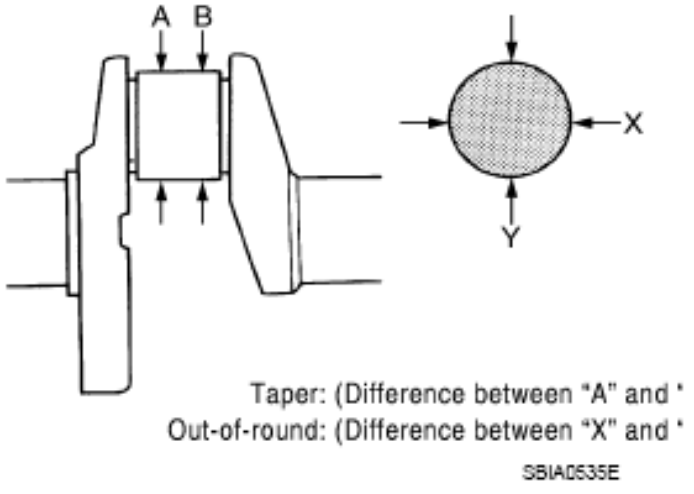
Connecting rod big end diameter (Without bearing)	F	53.000 - 53.013 (2.0866 - 2.0871)	
	Grade No. G		-
	Grade No. H		-
	Grade No. J		-
	Grade No. K		-
	Grade No. L		-
	Grade No. M		-
	Grade No. N		-
Side clearance		0.20 - 0.35 (0.0079 - 0.0138)	0.40 (0.0157)
(1) After installing in connecting rod			

CRANKSHAFT

Unit: mm (in





Grade No. A	59.975 - 59.974 (2.3612 - 2.3612)
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)

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Main journal diameter. "Dm" grade	Standard	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. A	-
		Grade No. B	-
		Grade No. C	-
		Grade No. D	-
		Grade No. E	-
		Grade No. F	-
		Grade No. G	-
		Grade No. H	-
		Grade No. J	-
		Grade No. K	-
		Grade No. L	-
		Grade No. M	-
		Grade No. N	-
		Grade No. P	-
		Grade No. R	-
		Grade No. S	-
		Grade No. T	-
		Grade No. U	-
		Grade No. 0	49.968 - 49.974 (1.9672 - 1.9675)
		Grade No. 1	49.962 - 49.968 (1.9670 - 1.9672)
		Grade No. 2	49.956 - 49.962 (1.9668 - 1.9670)
Center distance "r"			36.61 - 36.69 (1.4413 - 1.4445)
Taper (Difference between "A" and "B")	Limit		0.0025 (0.0001)
Out-of-round (Difference between "X" and "Y")			0.0025 (0.0001)

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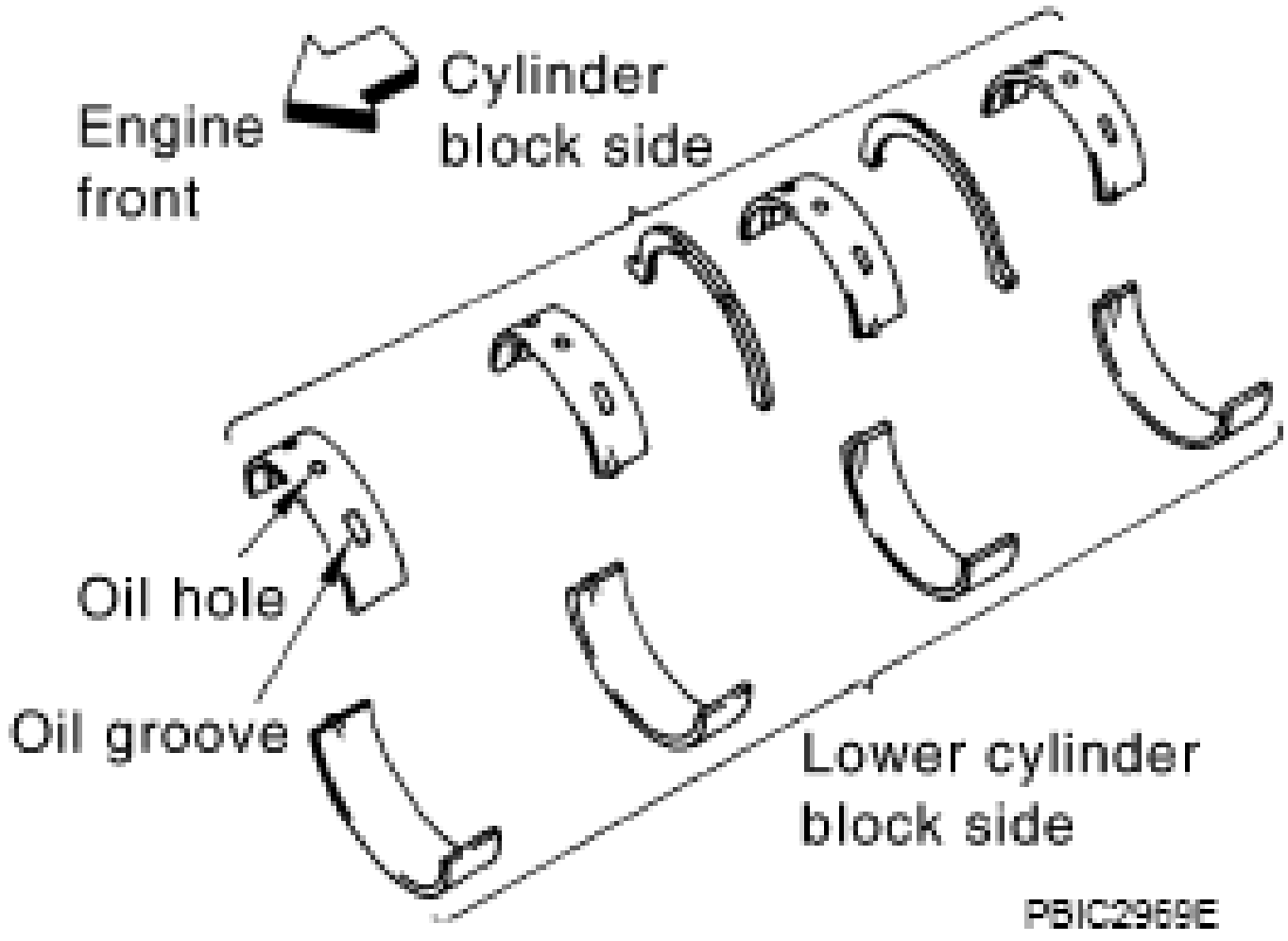
Crankshaft runout [TIR(1)]	Standard	Less than 0.05 (0.0020)
	Limit	0.10 (0.0039)
Crankshaft end play	Standard	0.10 - 0.25 (0.0039 - 0.0098)
	Limit	0.30 (0.0118)

(1) Total indicator reading

Main Bearing

MAIN BEARING

Unit: mm (in)



Grade number	Thickness	Identification color	Width	Remarks
0	2.000 - 2.003 (0.0787 - 0.0789)	Black		
	2.003 - 2.006 (0.0789 -			

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1		0.0790)	Brown	19.9 - 20.1 (0.783 - 0.791)	Grade is the same for upper and lower bearings.
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 - 0.0796)	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		

UNDERSIZE

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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	0.035 - 0.045 (0.0014 - 0.0018)(1)	0.065 (0.0026)
(1) Actual clearance		

Connecting Rod Bearing

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
3	-	-
4	-	-

UNDERSIZE

Unit: mm (in)

Items	Thickness	Crank pin journal diameter
0.25 (0.0098)	1.626 - 1.634 (0.0640 - 0.0643)	Grind so that bearing clearance is the specified value.

CONNECTING ROD BEARING OIL CLEARANCE

Unit: mm (in)

Items	Standard	Limit
Connecting rod bearing oil clearance	0.040 - 0.053 (0.0016 - 0.0021)(1)	0.070 (0.0028)
(1) Actual clearance		

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