

2003 ENGINE**Engine Mechanical - QX4****PRECAUTIONS****PARTS REQUIRING ANGULAR TIGHTENING**

- Use an angle wrench for the final tightening of the following engine parts:
 - a. Cylinder head bolts
 - b. Main bearing cap bolts
 - c. Connecting rod cap bolts
 - d. Crankshaft pulley bolt
- 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 APPLICATION PROCEDURE

1. **Use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves. Also, completely clean and oil from these areas.**
2. **Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine RTV silicone sealant or equivalent. Refer to RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS .)**
 - Be sure liquid gasket diameter is as specified.

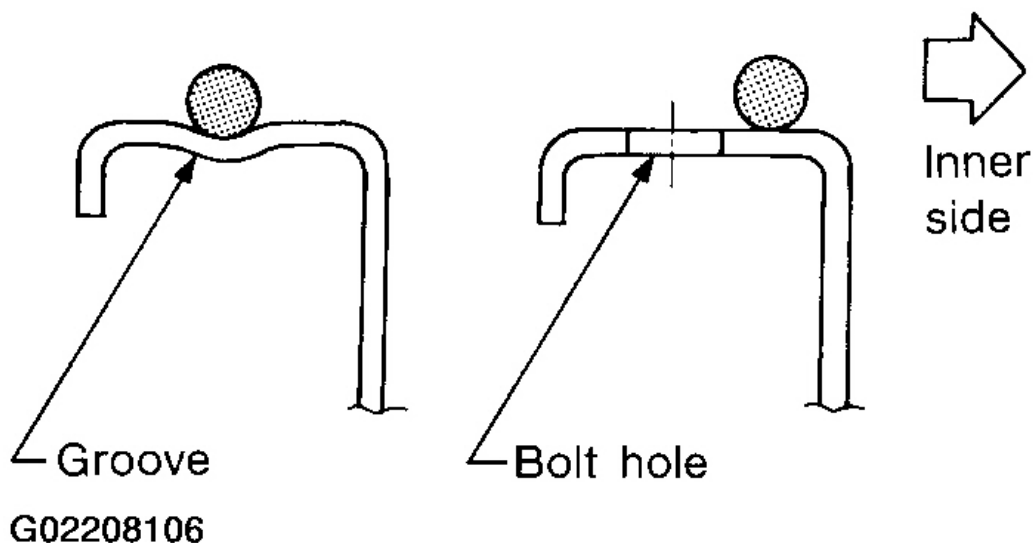


Fig. 1: Applying Continuous Bead Of Liquid Gasket To Mating Surfaces
Courtesy of NISSAN MOTOR CO., U.S.A.

3. Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
4. Assembly should be done within 5 minutes after coating.
5. Wait at least 30 minutes before refilling engine oil and engine coolant.

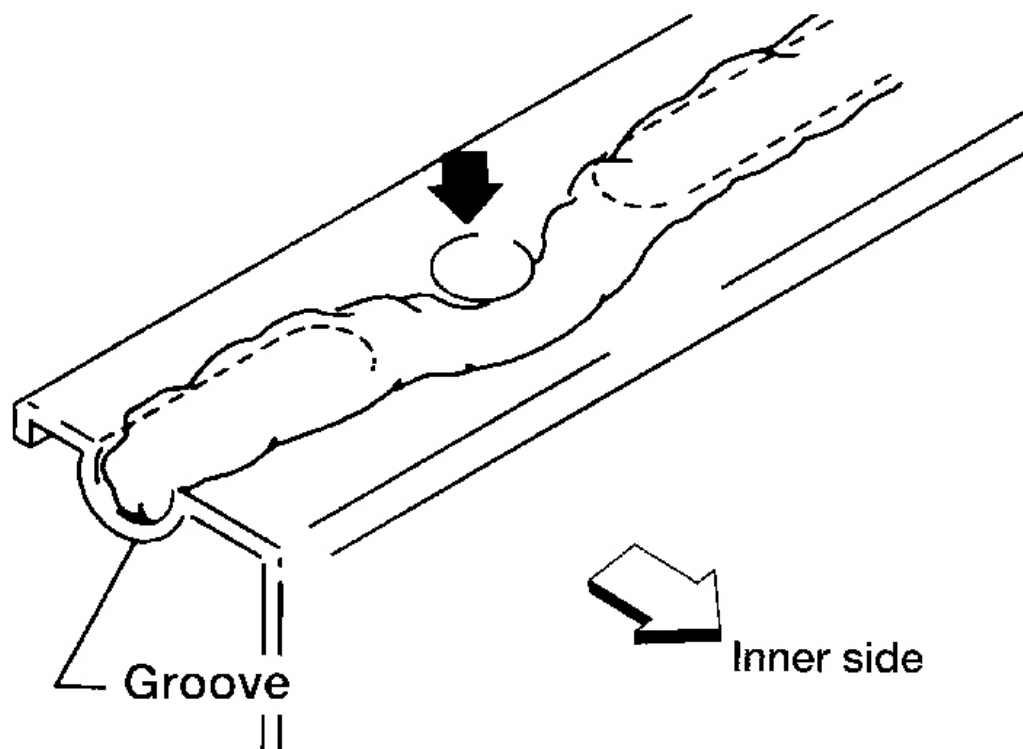
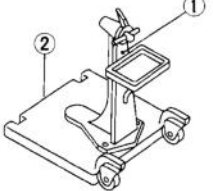
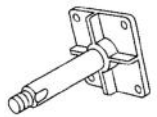
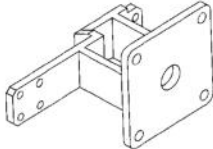
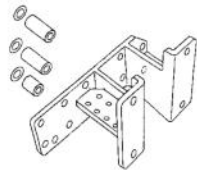
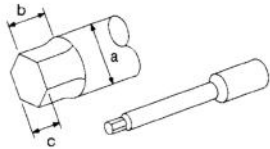
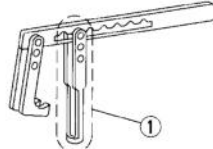


Fig. 2: Applying Liquid Gasket Around Inner Side Of Bolt Holes
Courtesy of NISSAN MOTOR CO., U.S.A.

PREPARATION

SPECIAL SERVICE TOOLS

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

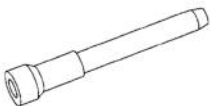
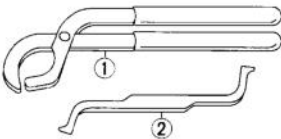
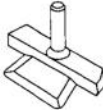
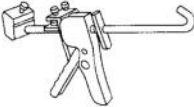
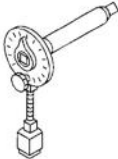
Tool number (Kent-Moore No.) Tool name	Description
ST0501S000 (—) Engine stand assembly 1 ST05011000 (—) Engine stand 2 ST05012000 (—) Base	 Disassembling and assembling
KV10106500 (—) Engine stand shaft	
KV10117000 (J41262) Engine sub-attachment	 KV10117000 has been replaced with KV10117001 (KV10117000 is no longer in production, but it is usable).
KV10117001 (—) Engine sub-attachment	 Installing on the cylinder block
ST10120000 (J24239-01) Cylinder head bolt wrench	 Loosening and tightening cylinder head bolt a: 13 (0.51) dia. b: 12 (0.47) c: 10 (0.39) Unit: mm (in)
KV10116200 (J26336-A) Valve spring compressor 1 KV10115900 (J26336-20) Attachment	 Disassembling valve mechanism

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Fig. 3: Identifying Special Service Tools (1 Of 3)
Courtesy of NISSAN MOTOR CO., U.S.A.

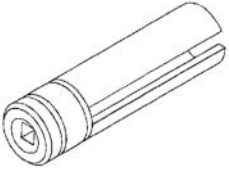
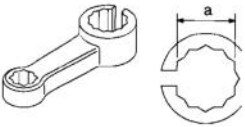
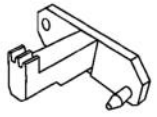
2003 Infiniti QX4

2003 ENGINE Engine Mechanical - QX4

Tool number (Kent-Moore No.) Tool name	Description
(J39386) Valve oil seal drift	Installing valve oil seal 
KV101151S0 (J38972) Lifter stopper set 1 KV10115110 (J38972-1) Camshaft pliers 2 KV10115120 (J38972-2) Lifter stopper	Changing shims 
EM03470000 (J8037) Piston ring compressor	Installing piston assembly into cylinder bore 
ST16610001 (J23907) Pilot bushing puller	Removing crankshaft pilot bushing 
KV10111100 (J37228) Seal cutter	Removing steel oil pan and rear timing chain case 
WS39930000 (—) Tube presser	Pressing the tube of liquid gasket 
KV10112100 (BT8653-A) Angle wrench	Tightening bolts for bearing cap, cylinder head, etc. 

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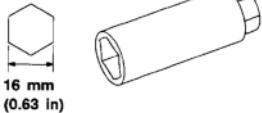
Fig. 4: Identifying Special Service Tools (2 Of 3)
Courtesy of NISSAN MOTOR CO., U.S.A.

Tool number (Kent-Moore No.) Tool name	Description
KV10117100 (J3647-A) Heated oxygen sensor wrench	 Loosening or tightening heated oxygen sensor For 22 mm (0.87 in) hexagon nut
KV10114400 (J38365) Heated oxygen sensor wrench	 Loosening or tightening rear heated oxygen sensor a: 22 mm (0.87 in)
KV10117700 (J44716) Ring gear stopper	 Removing and installing crankshaft pulley

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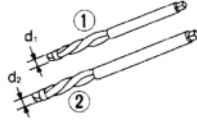
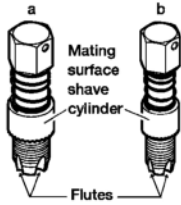
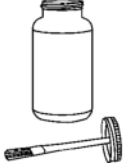
Fig. 5: Identifying Special Service Tools (3 Of 3)
Courtesy of NISSAN MOTOR CO., U.S.A.

COMMERCIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description
Spark plug wrench	 16 mm (0.63 in) Removing and installing spark plug
Valve seat cutter set	 Finishing valve seat dimensions
Piston ring expander	 Removing and installing piston ring
Valve guide drift	 Removing and installing valve guide Intake & Exhaust: a = 9.5 mm (0.374 in) dia. b = 5.5 mm (0.217 in) dia.

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Fig. 6: Identifying Commercial Service Tools (1 Of 2)
Courtesy of NISSAN MOTOR CO., U.S.A.

Tool number (Kent-Moore No.) Tool name	Description
Valve guide reamer	 Reaming valve guide 1 or hole for oversize valve guide 2 Intake & Exhaust: d₁ = 6.0 mm (0.236 in) dia. d₂ = 10.2 mm (0.402 in) dia.
(J-43897-18) (J-43897-12) Oxygen sensor thread cleaner	 Reconditioning the exhaust system threads before installing a new heated oxygen sensor (Use with anti-seize lubricant shown heated below.) a = J-43897-18 (18 mm dia.) for zirconia heated oxygen sensor b = J-43897-12 (12 mm dia.) for titania heated oxygen sensor
Anti-seize lubricant (Permatex 133AR or equivalent meeting MIL specification MIL-A-907)	 Lubricating heated oxygen sensor thread cleaning tool when reconditioning exhaust system threads

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Fig. 7: Identifying Commercial Service Tools (2 Of 2)
 Courtesy of NISSAN MOTOR CO., U.S.A.

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

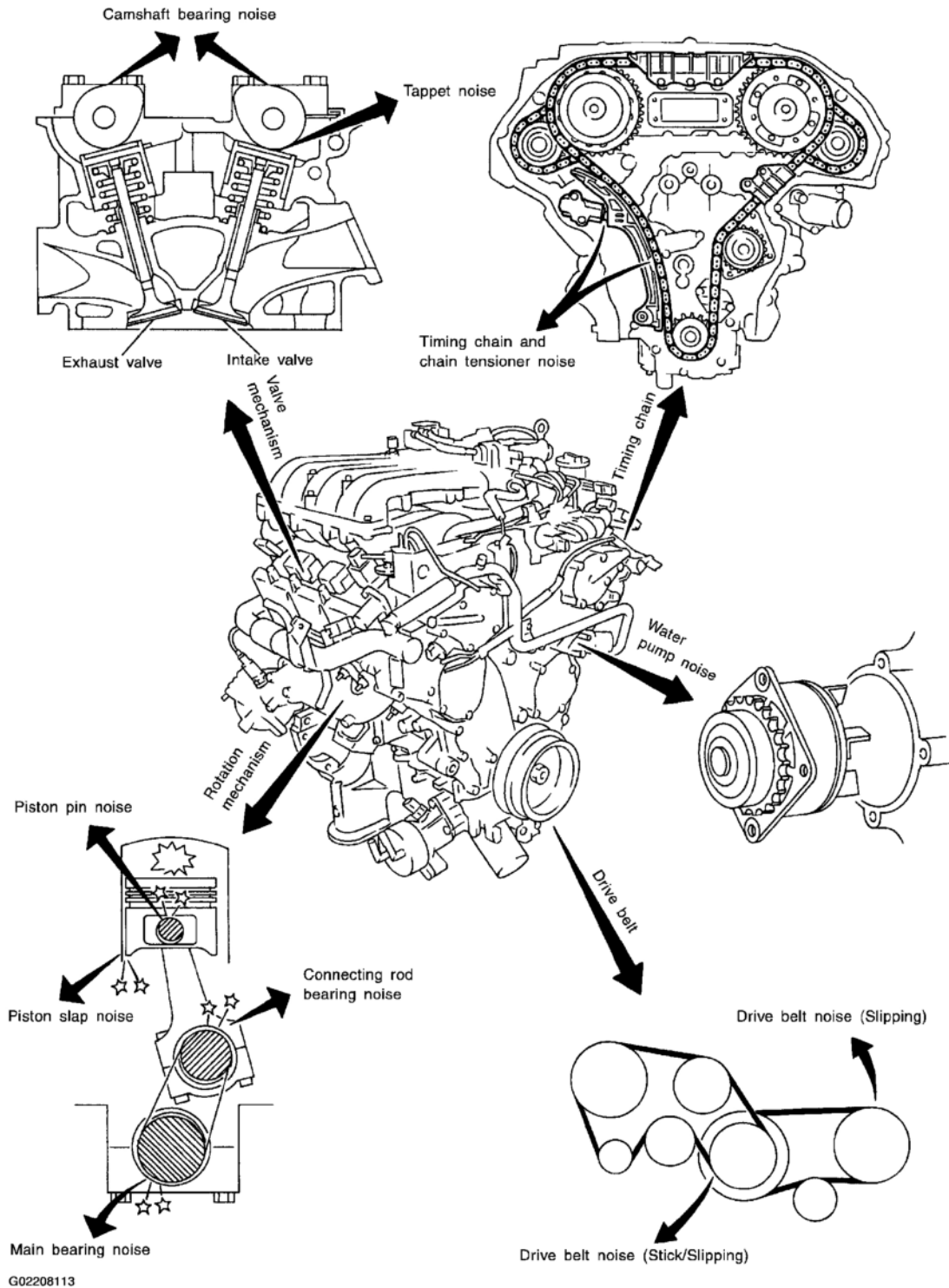


Fig. 8: Identifying Noise, Vibration And Harshness Troubleshooting
 Courtesy of NISSAN MOTOR CO., U.S.A.

NVH TROUBLESHOOTING - ENGINE NOISE

Use the chart below to help you find the cause of the symptom.

1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of engine.
4. Check specified noise source.

If necessary, repair or replace these parts.

Operating Condition Of Engine Specifications

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item
		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
	Rattle	C	A	-	A	B	C	Camshaft bearing noise	Camshaft journal clearance Camshaft runout
Crankshaft pulley Cylinder block (Side of engine) Oil pan	Slap or knock	-	A	-	B	B	-	Piston pin noise	Piston and piston pin clearance Connecting rod bushing clearance
	Slap or rap	A	-	-	B	B	A	Piston slap noise	Piston-to-bore clearance Piston ring side clearance Piston ring end gap Connecting rod bend and torsion
	Knock	A	B	C	B	B	B	Connecting rod bearing noise	Connecting rod bushing clearance (Small end) Connecting rod bearing clearance (Big end)
								Main bearing	Main bearing oil clearance

2003 Infiniti QX4

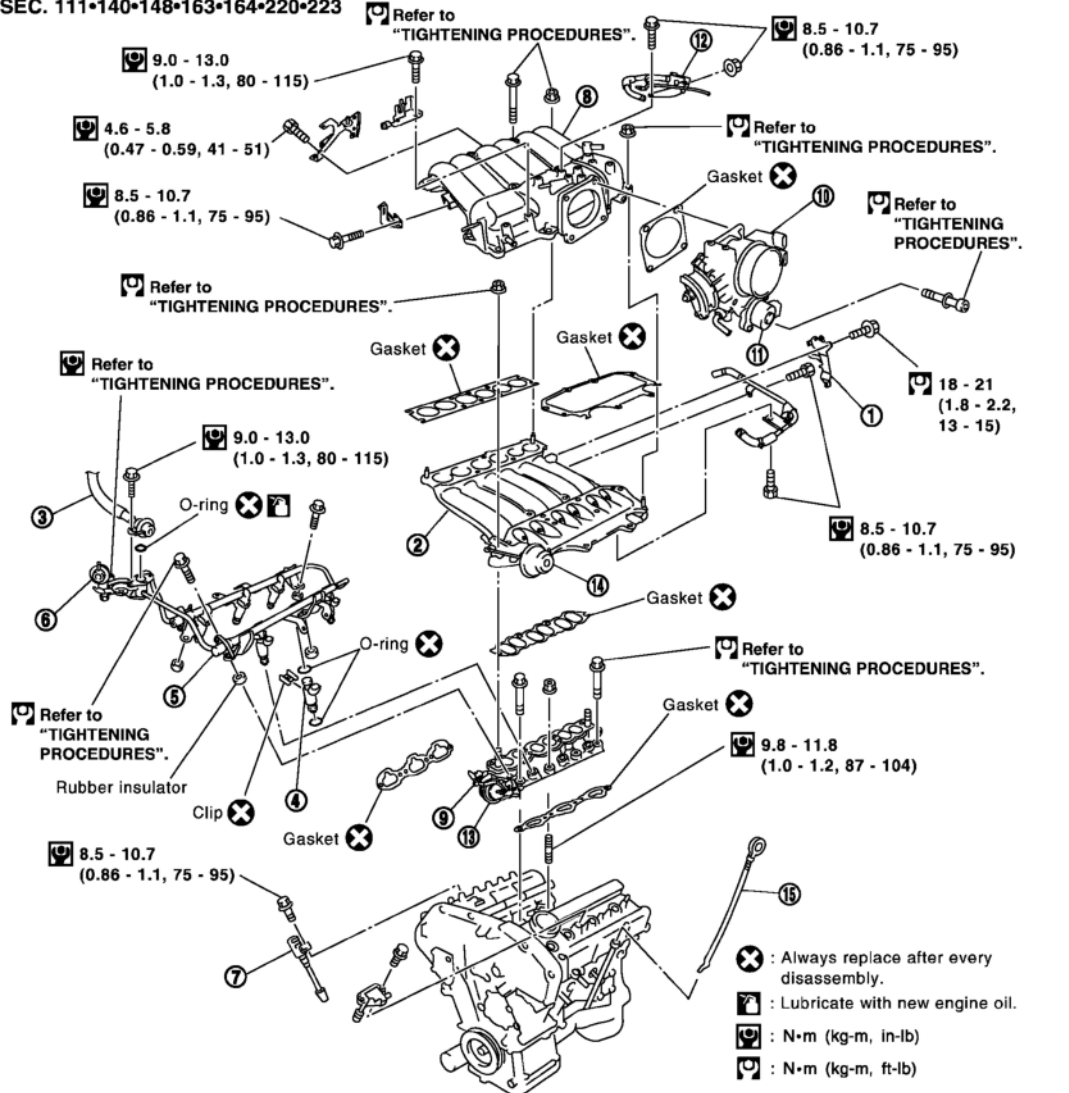
2003 ENGINE Engine Mechanical - QX4

	Knock	A	B	-	A	B	C	noise	Crankshaft runout
Front of engine Timing chain cover	Tapping or ticking	A	A	-	B	B	B	Timing chain and chain tensioner noise	Timing chain cracks and wear Timing chain tensioner operation
Front of engine	Squeaking or fizzing	A	B	-	B	-	C	Drive belts (Sticking or slipping)	Drive belts deflection
	Creaking	A	B	A	B	A	B	Drive belts (Slipping)	Idler pulley bearing operation
	Squall Creak	A	B	-	B	A	B	Water pump noise	Water pump operation

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

OUTER COMPONENT PARTS**REMOVAL AND INSTALLATION**

SEC. 111•140•148•163•164•220•223



- | | | |
|--|--|---|
| 1. Intake manifold collector support | 6. Fuel pressure regulator | 11. IACV-AAC valve |
| 2. Lower intake manifold collector | 7. Ignition coil with power transistor | 12. EVAP canister purge volume control solenoid valve |
| 3. Fuel damper and fuel feed hose assembly | 8. Upper intake manifold collector | 13. Swirl control valve actuator |
| 4. Fuel injector | 9. Intake manifold | 14. Power valve actuator |
| 5. Fuel tube assembly | 10. Throttle body | 15. Oil level gauge |

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Fig. 9: Removal And Installation Of Outer Component Parts (1 Of 2)
 Courtesy of NISSAN MOTOR CO., U.S.A.

SEC. 140•147•210•211•221

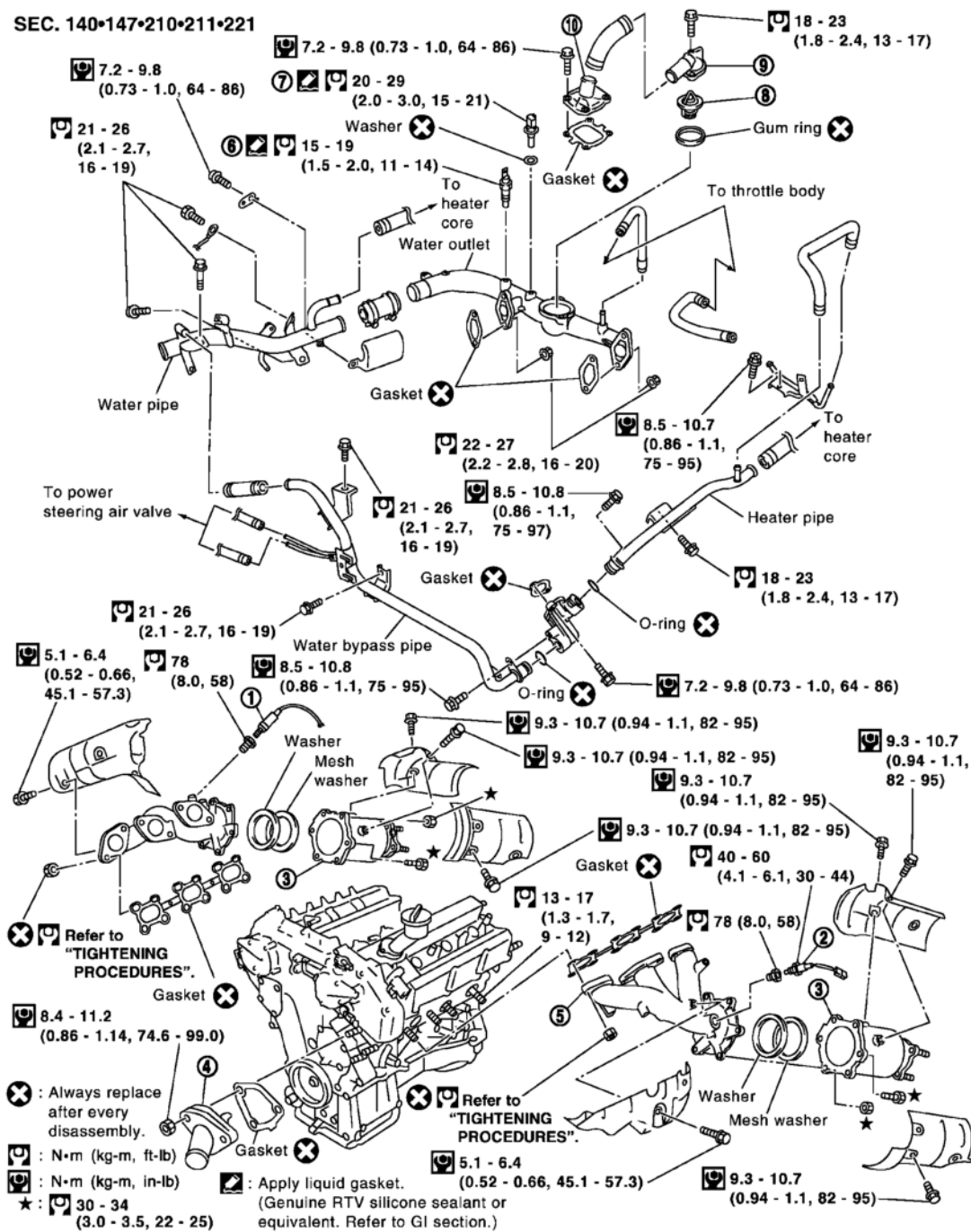
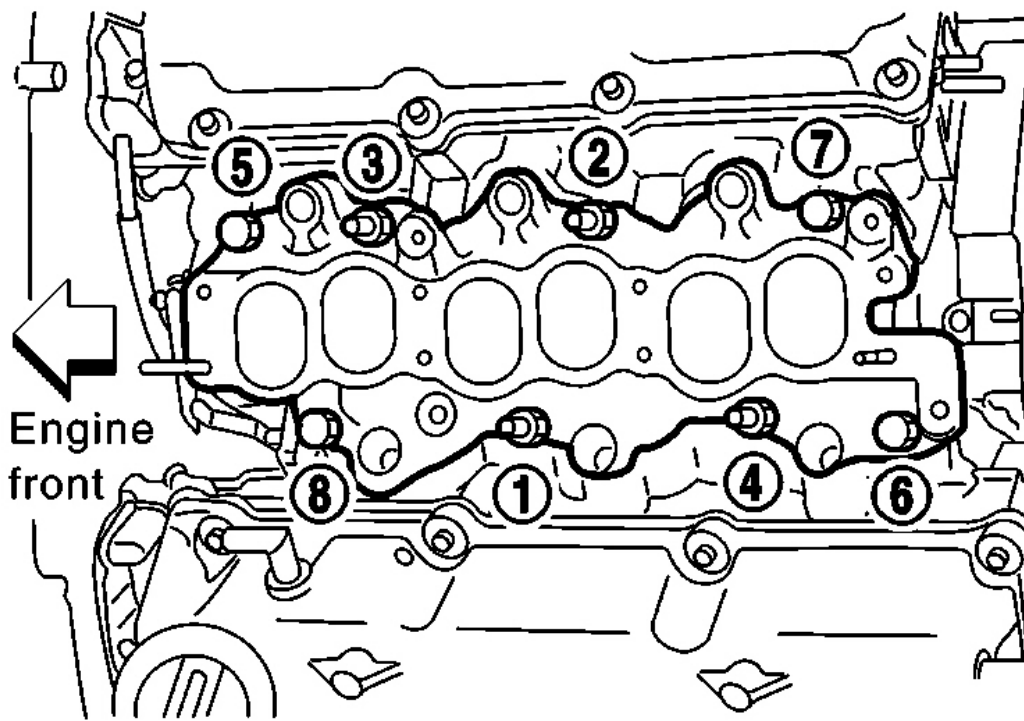


Fig. 10: Removal And Installation Of Outer Component Parts (2 Of 2)

Courtesy of NISSAN MOTOR CO., U.S.A.

TIGHTENING PROCEDURES**Intake Manifold**

- **Loosen in reverse order and tighten in numerical order shown in the figure.**
 1. Tighten all bolts and nuts to 5 to 10 N.m (0.5 to 1.0 kg-m, 44 to 86 in-lb).
 2. Finally tighten all bolts and nuts to 26 to 31 N.m (2.7 to 3.2 kg-m, 20 to 23 ft-lb).
- Tighten all bolts and nuts to the final torque, evenly dividing the tightening into at least three steps.

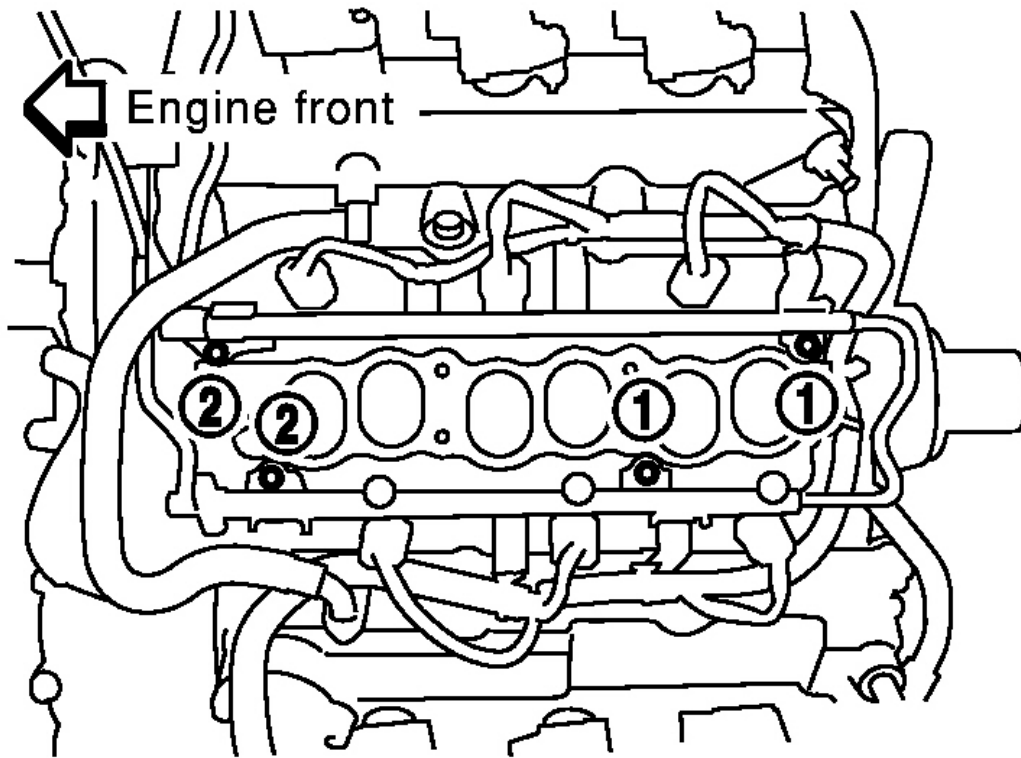


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Fig. 11: Tightening Sequence Of Intake Manifold Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

Fuel Tube

- **Tighten in numerical order shown in the figure.**
 1. Tighten all bolts to 9.3 to 10.8 N.m (0.95 to 1.1 kg-m, 83 to 95 in-lb).
 2. Then tighten all bolts to 20.6 to 26.5 N.m (2.1 to 2.7 kg-m, 16 to 19 ft-lb).



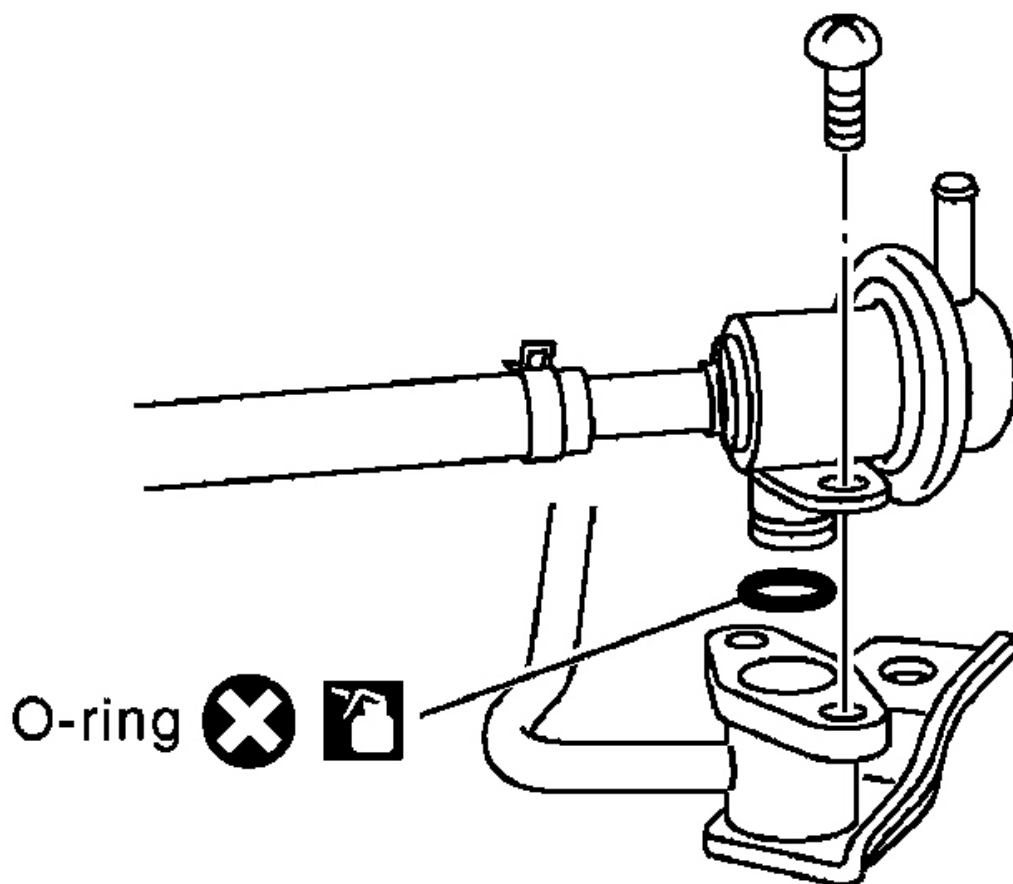
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Fig. 12: Tightening Sequence Of Fuel Tube
Courtesy of NISSAN MOTOR CO., U.S.A.

Fuel Pressure Regulator

Tighten fuel pressure regulator to 2.9 to 3.8 N.m (0.3 to 0.39 kg-m, 26.0 to 33.9 in-lb).

- Tighten screws evenly several times to have the fuel pressure regulator tightened at the specified torque.
- Always replace O-ring with new ones.
- Lubricate O-ring with new engine oil.

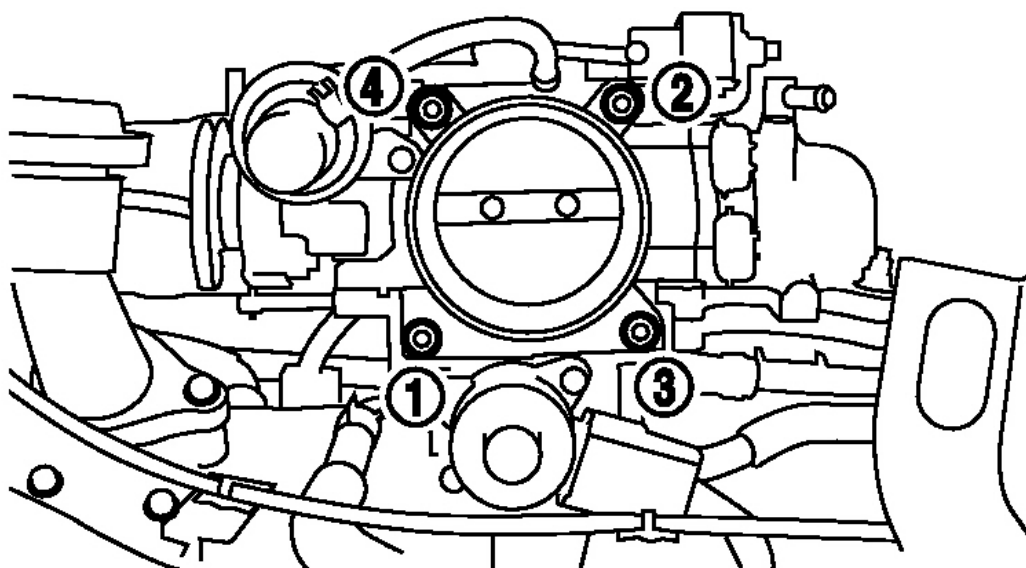


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Fig. 13: Tightening Procedures Of Fuel Pressure Regulator
Courtesy of NISSAN MOTOR CO., U.S.A.

Throttle Body

- **Tighten in numerical order shown in the figure.**
 1. Tighten all bolts to 8.8 to 10.8 N.m (0.9 to 1.1 kg-m, 79 to 95 in-lb).
 2. Then tighten all bolts to 18 to 21 N.m (1.8 to 2.2 kg-m, 13 to 15 ft-lb).

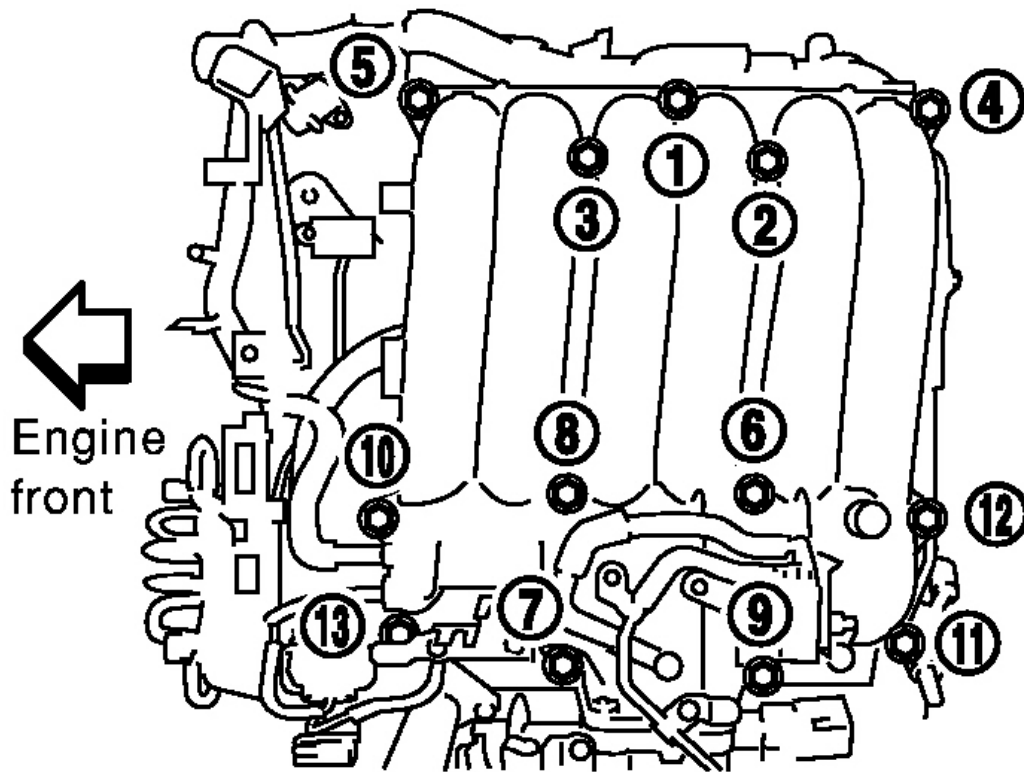


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Fig. 14: Tightening Procedures Of Throttle Body
Courtesy of NISSAN MOTOR CO., U.S.A.

Upper Intake Manifold Collector

Loosen bolts and nuts in reverse order and tighten to 18 to 21 N.m (1.8 to 2.2 kg-m, 13 to 15 ft-lb) in numerical order shown in the figure.

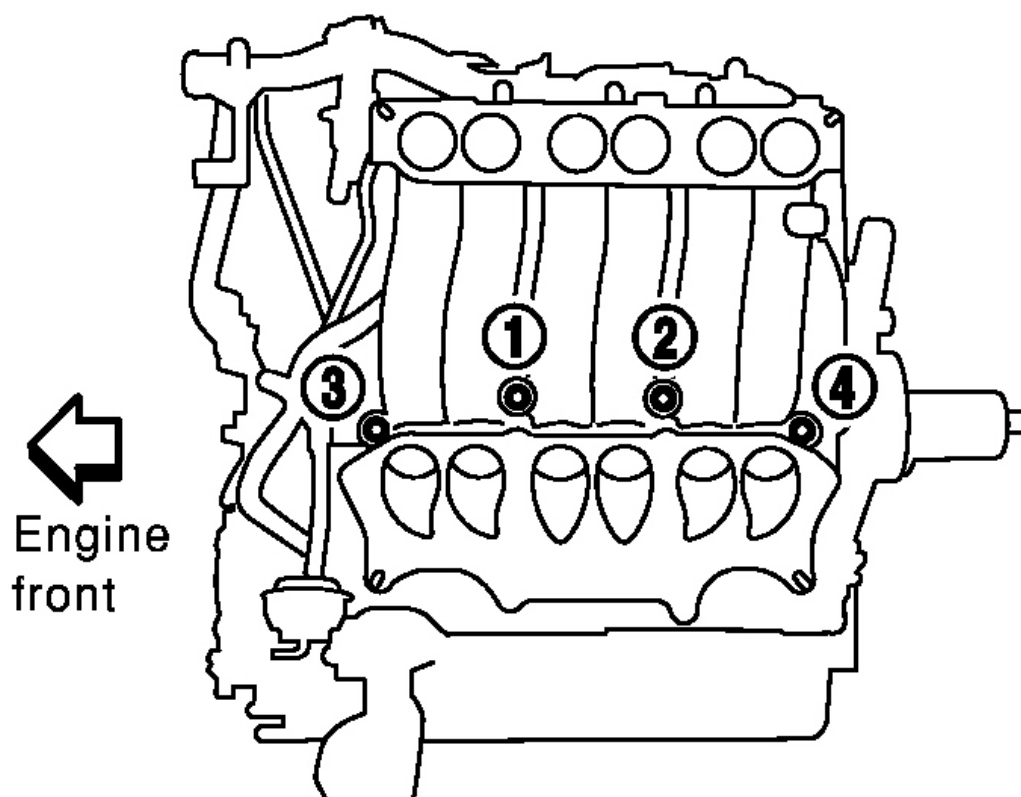


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Fig. 15: Tightening Procedures Of Upper Intake Manifold Collector
Courtesy of NISSAN MOTOR CO., U.S.A.

Lower Intake Manifold Collector

Loosen bolts and nuts in reverse order and tighten to 18 to 21 N.m (1.8 to 2.2 kg-m, 13 to 15 ft-lb) in numerical order shown in the figure.



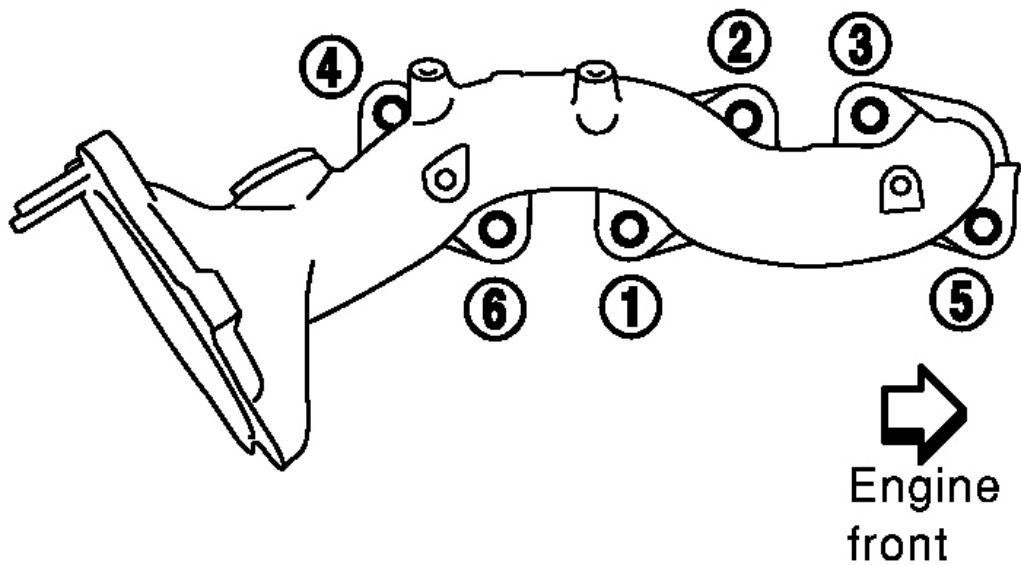
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Fig. 16: Loosening And Tightening Procedures Of Lower Intake Manifold Collector
Courtesy of NISSAN MOTOR CO., U.S.A.

Exhaust Manifold

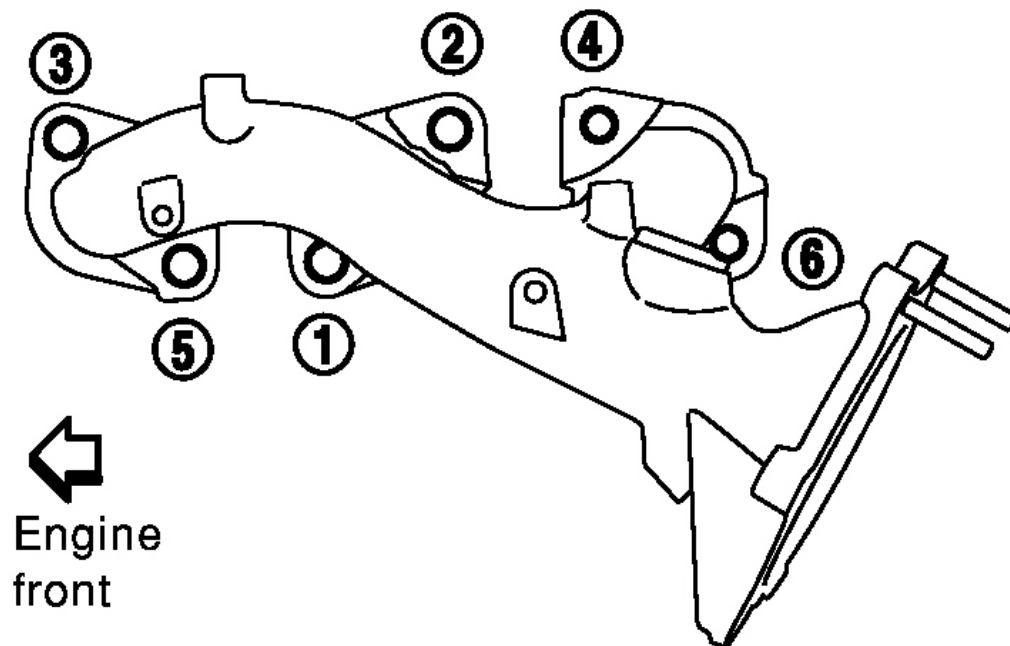
Loosen nuts in reverse order and tighten to 28 to 32 N.m (2.9 to 3.3 kg-m, 21 to 24 ft-lb) in numerical order shown in the figure.

Right bank



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Fig. 17: Loosening And Tightening Procedures Of Exhaust Manifold - Right Bank
Courtesy of NISSAN MOTOR CO., U.S.A.

Left bank

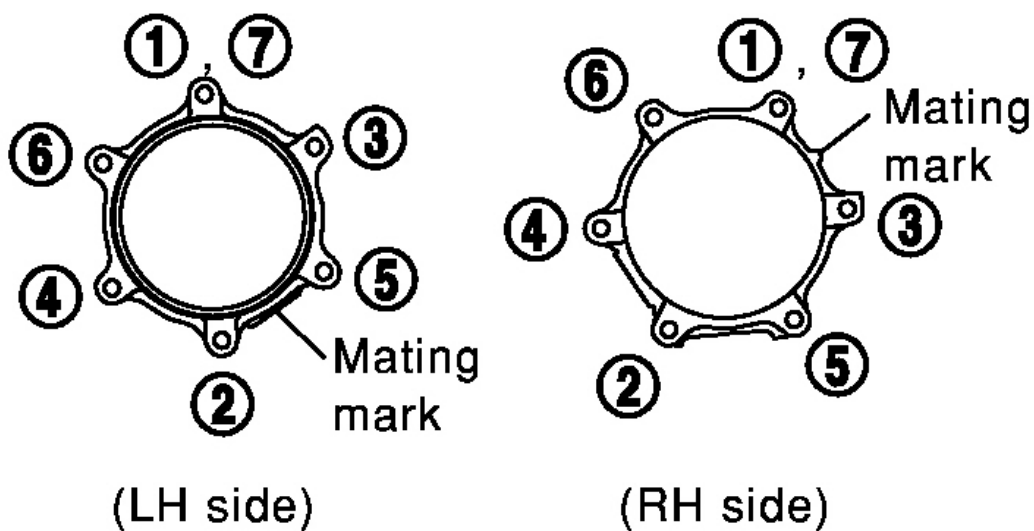
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Fig. 18: Loosening And Tightening Procedures Of Exhaust Manifold - Left Bank
Courtesy of NISSAN MOTOR CO., U.S.A.

TWC (Manifold)

- Align the mating mark as shown for locating exhaust flange.

Tighten in numerical order
(view from outlet of TWC).



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Fig. 19: Aligning Mating Mark On Exhaust Flange
Courtesy of NISSAN MOTOR CO., U.S.A.

- Install washer and mesh washer as shown.

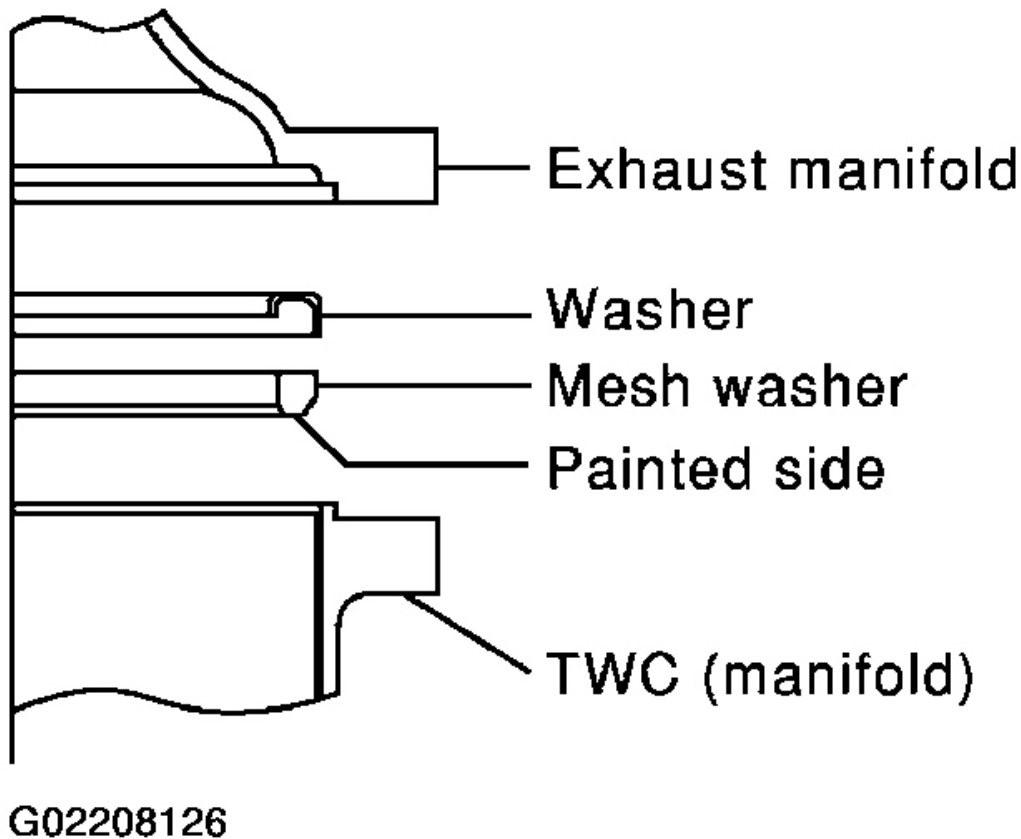


Fig. 20: Installing Washer And Mesh Washer
Courtesy of NISSAN MOTOR CO., U.S.A.

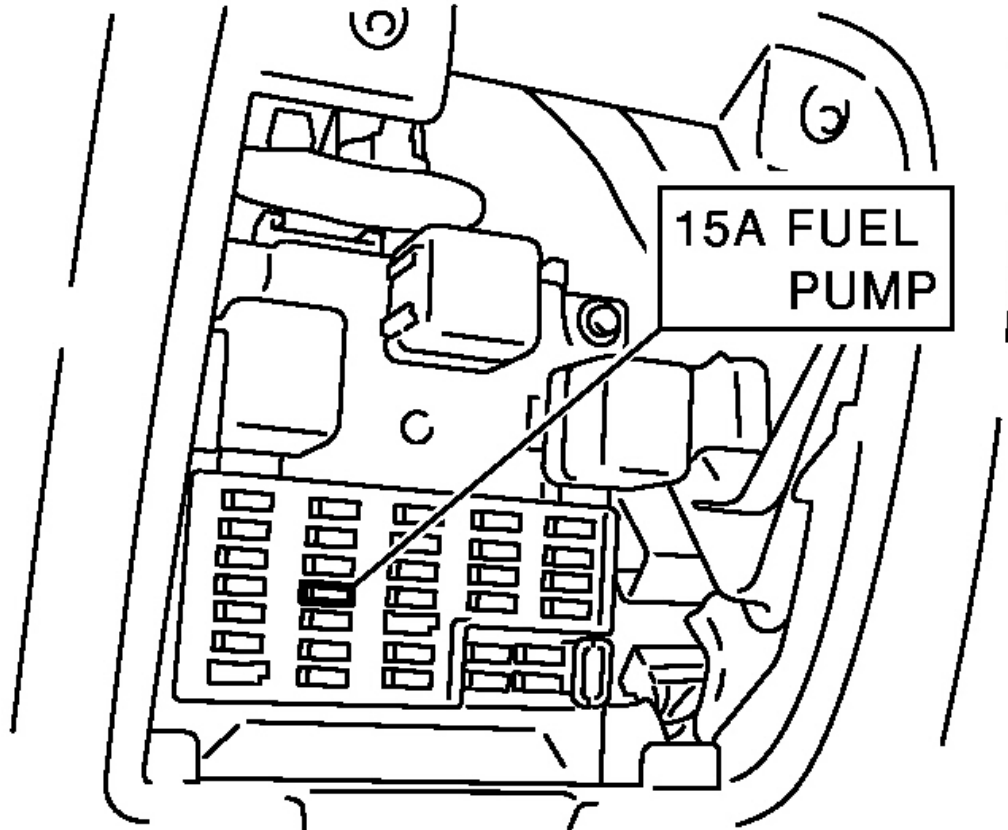
MEASUREMENT OF COMPRESSION PRESSURE

1. Warm up engine.
2. Turn ignition switch OFF.
3. Release fuel pressure.

Refer to **FUEL SYSTEM PRESSURE RELEASE** .

4. Disconnect fuel pump fuse to avoid injection during measurement.
5. Remove engine cover and throttle wire.
6. Remove air duct with air cleaner case.
7. Remove harness connectors and harness brackets around ignition coils.

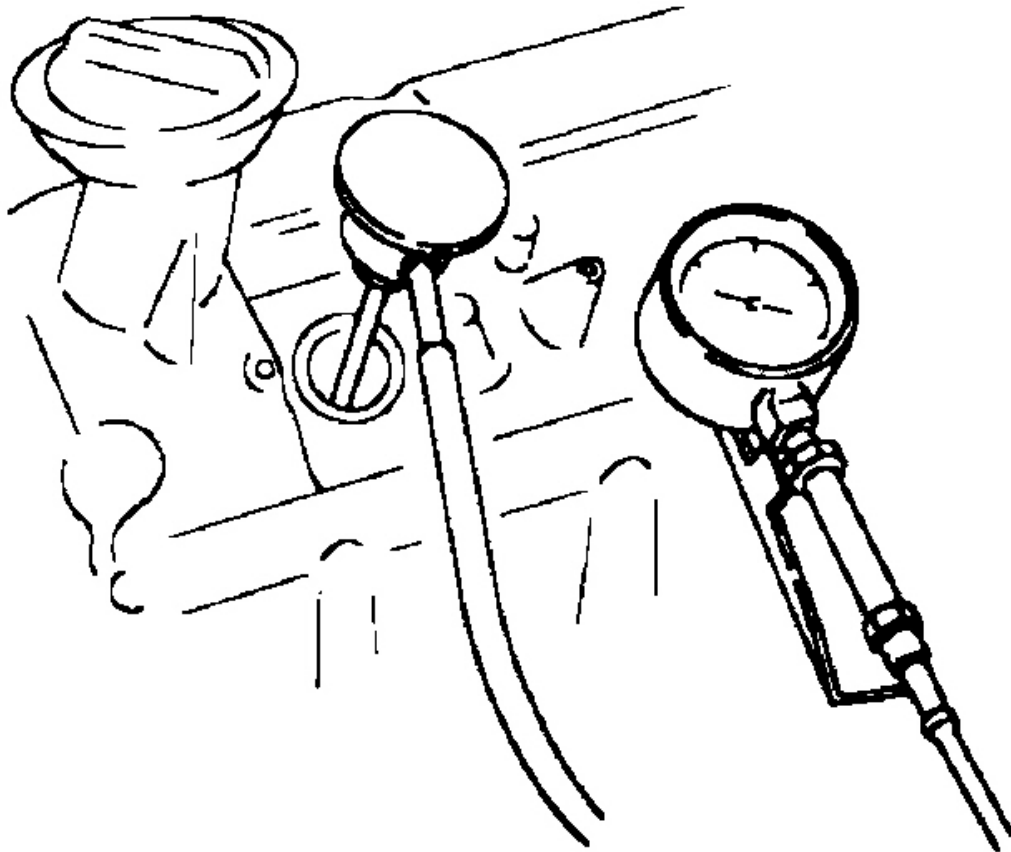
8. Remove Electric throttle control actuator.
9. Disconnect ignition coil with power transistor harness connectors, then remove ignition coils.
10. Remove all spark plugs.
 - Clean area around plug with compressed air before removing the spark plug.



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Fig. 21: Identifying Fuel Pump Fuse Location
Courtesy of NISSAN MOTOR CO., U.S.A.

11. Attach a compression tester to No. 1 cylinder.
12. Crank engine and record highest gauge indication.
13. Repeat the measurement on each cylinder as shown above.
 - **Always use a fully-charged battery to obtain specified engine speed.**



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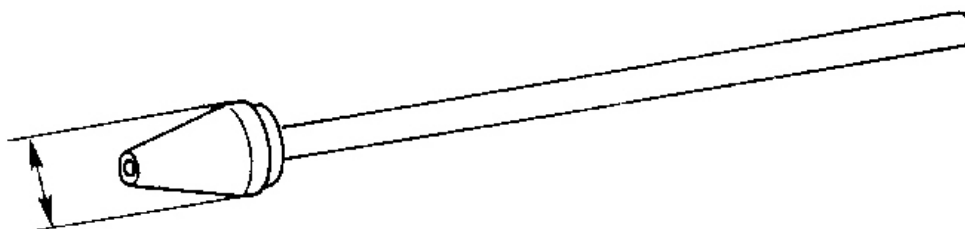
Fig. 22: Measurement Of Cylinder Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

Unit: kPa (kg/cm ² , psi)/rpm		
Standard	Minimum	Difference limit between cylinders
1,275 (13.0, 185)/300	981 (10.0, 142)/300	98 (1.0, 14)/300

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Fig. 23: Cylinder Compression Chart
 Courtesy of NISSAN MOTOR CO., U.S.A.

14. If compression in one or more cylinders is low:
 - a. Pour a small amount of engine oil into cylinders through spark plug holes.
 - b. Retest compression.
 - If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.
 - If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to SDS, and .) If valve or valve seat is damaged excessively, replace them.



20 mm (0.79 in) dia.

Use compressor tester whose end (rubber portion) is less than 20 mm (0.79 in) dia. Otherwise, it may be caught by cylinder head during removal.

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Fig. 24: Identifying Compression Tester Rubber Dimensions
 Courtesy of NISSAN MOTOR CO., U.S.A.

- If compression stays low in two cylinders that are next to each other:
 - a. The cylinder head gasket may be leaking, or
 - b. Both cylinders may have valve component damage. Inspect and repair as necessary.
15. Install removed parts in reverse order of removal.
 16. Perform "Self-diagnosis Procedure" referring to EC-85 "How to Erase DTC" if any DTC appears.

OIL PAN

COMPONENTS

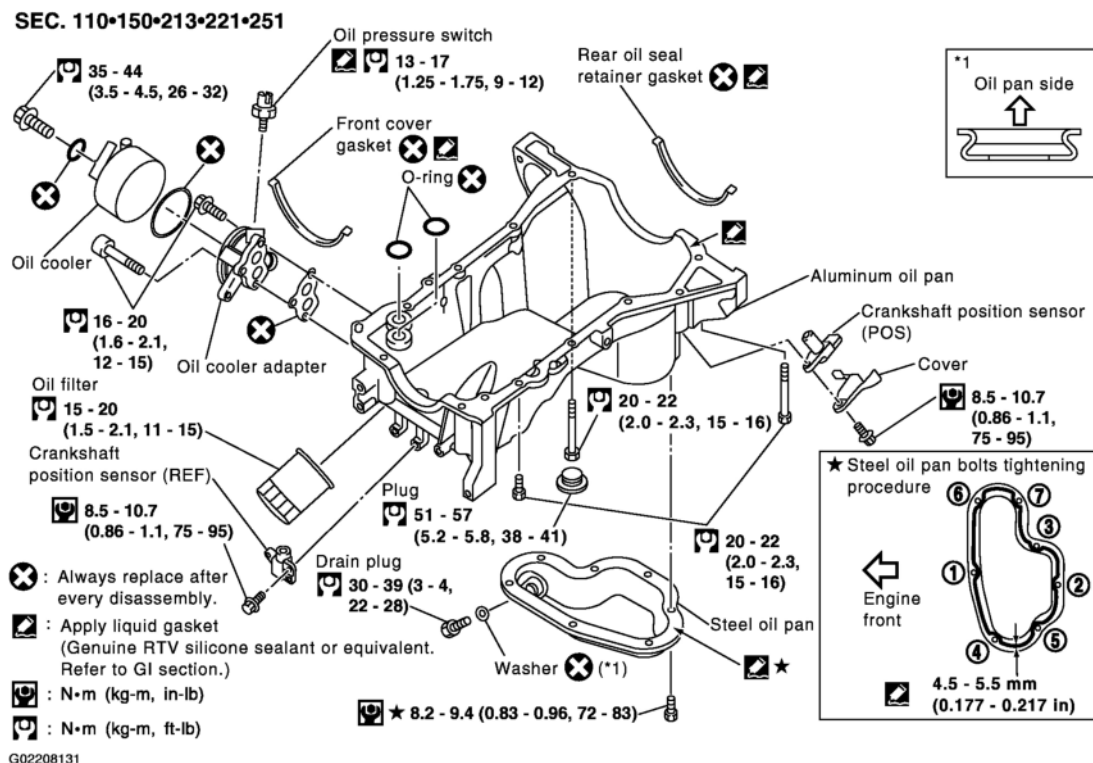


Fig. 25: Identifying Oil Pan Components
Courtesy of NISSAN MOTOR CO., U.S.A.

REMOVAL

WARNING:

- Place vehicle on a flat and solid surface.
- You should not remove oil pan until exhaust system and cooling system have completely cooled off.

Otherwise, you may burn yourself and/or fire may break out in the fuel line.

- When removing front engine mounting nuts, lift up slightly engine for safety work.

CAUTION: When removing the aluminum oil pan from engine, first remove the crankshaft position sensors (POS and REF) from the assembly.

Be careful not to damage sensor edges and signal plate teeth.

1. Remove front RH and LH wheels.
2. Remove battery.
3. Remove oil level gauge.
4. Remove engine undercover.
5. Remove suspension member stay.
6. Drain engine coolant from radiator drain plug.
7. Disconnect A/T oil cooler hoses.
8. Drain engine oil.
9. Remove the crankshaft position sensors (REF and POS).
10. Remove drive belts and idler pulley with bracket.
11. Remove power steering oil pump, then put it aside holding with a suitable wire.
12. Remove alternator.
13. Install engine slingers.
14. Remove front propeller shaft. (4WD)

Refer to **REMOVAL AND INSTALLATION** .

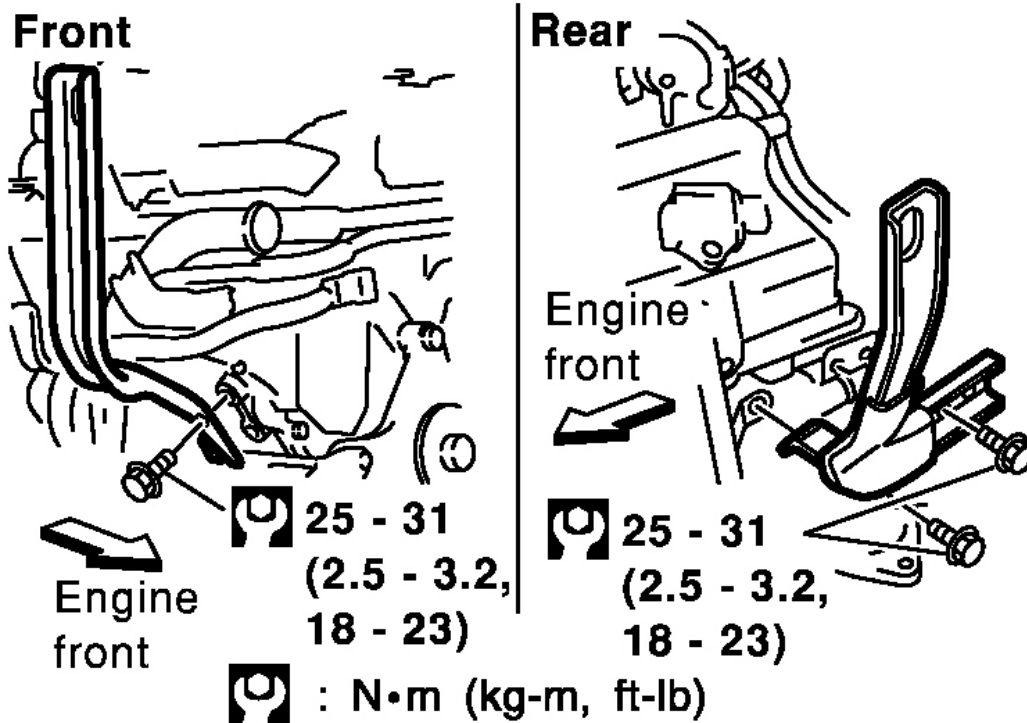
15. Remove exhaust front tube heat insulators, then remove rear heated oxygen sensors.
16. Remove exhaust front tube from both sides.

Refer to **REMOVAL AND INSTALLATION** .

17. Remove front final drive. (4WD)

Refer to **REMOVAL AND INSTALLATION** .

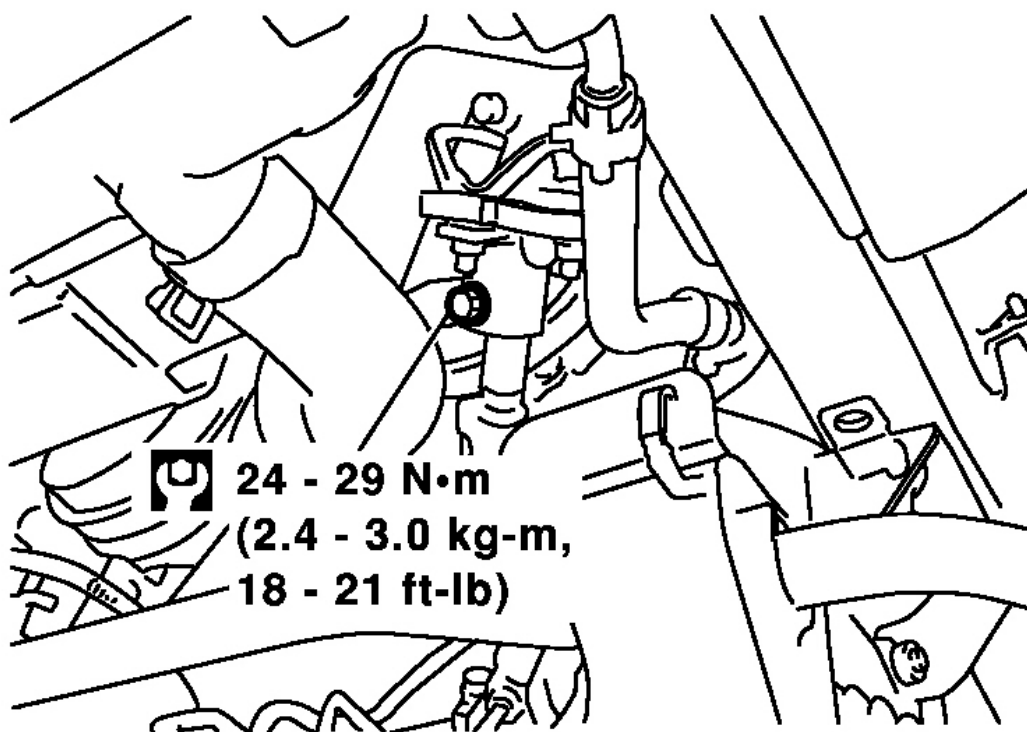
18. Remove starter motor.
19. Disconnect oil pressure switch harness connector.



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Fig. 26: Installing Engine Slingers
 Courtesy of NISSAN MOTOR CO., U.S.A.

20. Loosen and disconnect the bolts fixing the steering column assembly lower joint and the power steering gear.

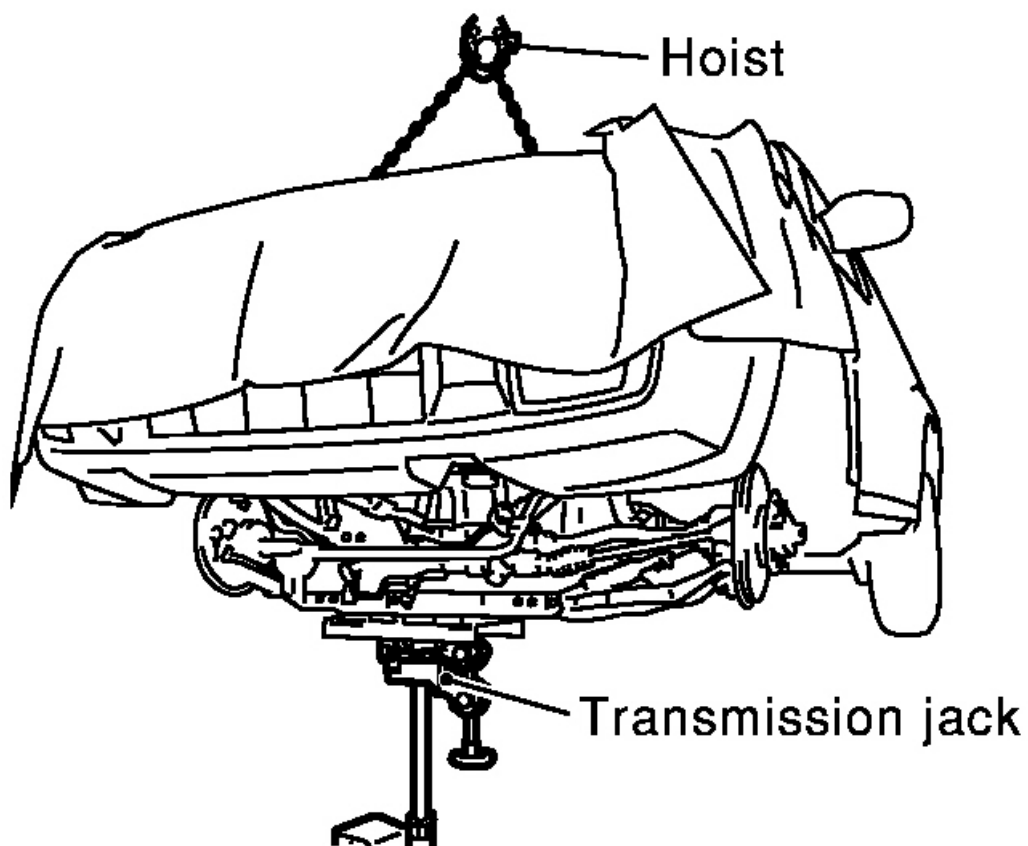


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Fig. 27: Disconnecting Bolts Fixing Steering Column Assembly Lower Joint And Power Steering Gear

Courtesy of NISSAN MOTOR CO., U.S.A.

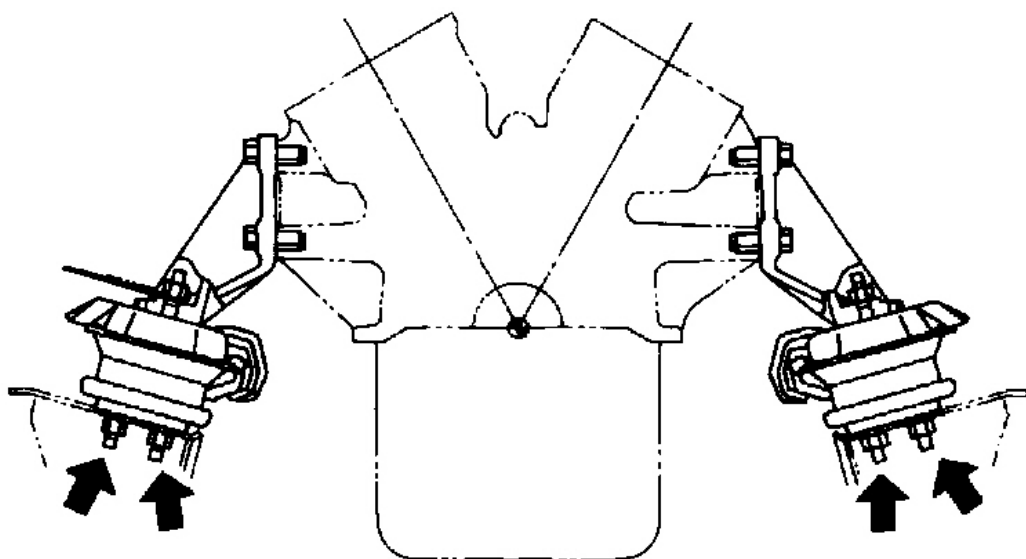
21. Set a suitable transmission jack under the front suspension member and hoist engine with engine slingers.



G02208134

Fig. 28: Setting Transmission Jack Under Front Suspension Member
Courtesy of NISSAN MOTOR CO., U.S.A.

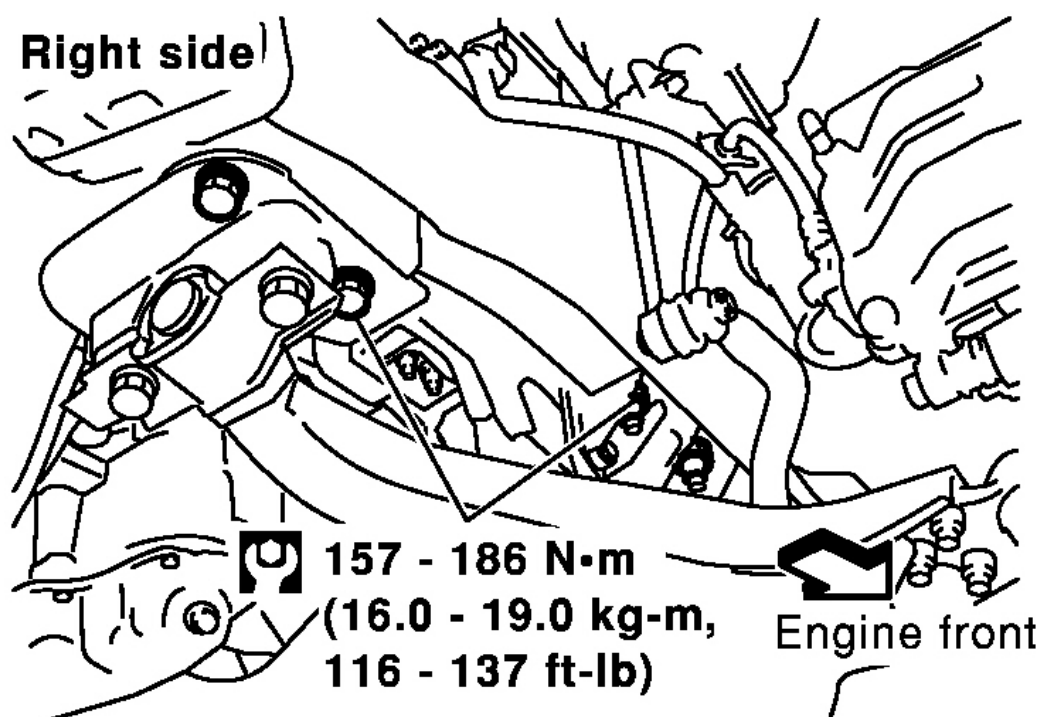
22. Remove front engine mounting nuts from both sides.



G02208135

Fig. 29: Removing Front Engine Mounting Nuts From Both Sides
Courtesy of NISSAN MOTOR CO., U.S.A.

23. Remove front suspension member bolts and nuts.
24. Lower the transmission jack carefully to secure clearance between the oil pan and suspension member.
25. Remove A/T oil cooler tube.
26. Remove water hose and tube.



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Fig. 30: Removing Front Suspension Member Bolts And Nuts - Right Side
Courtesy of NISSAN MOTOR CO., U.S.A.

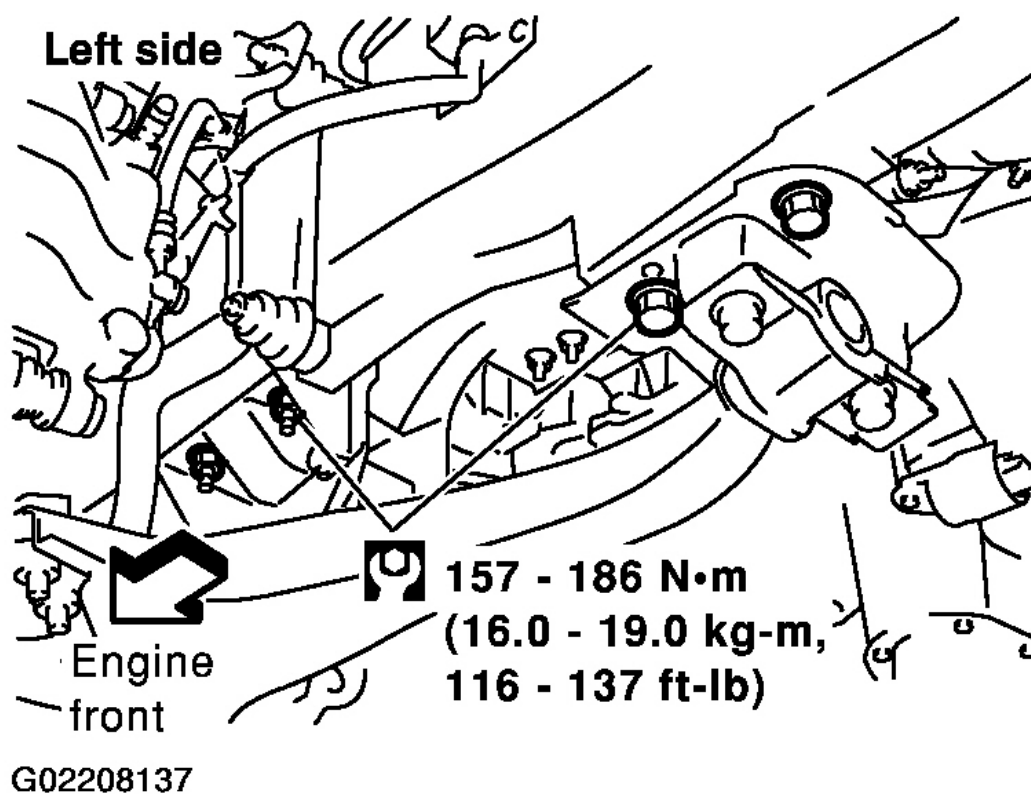
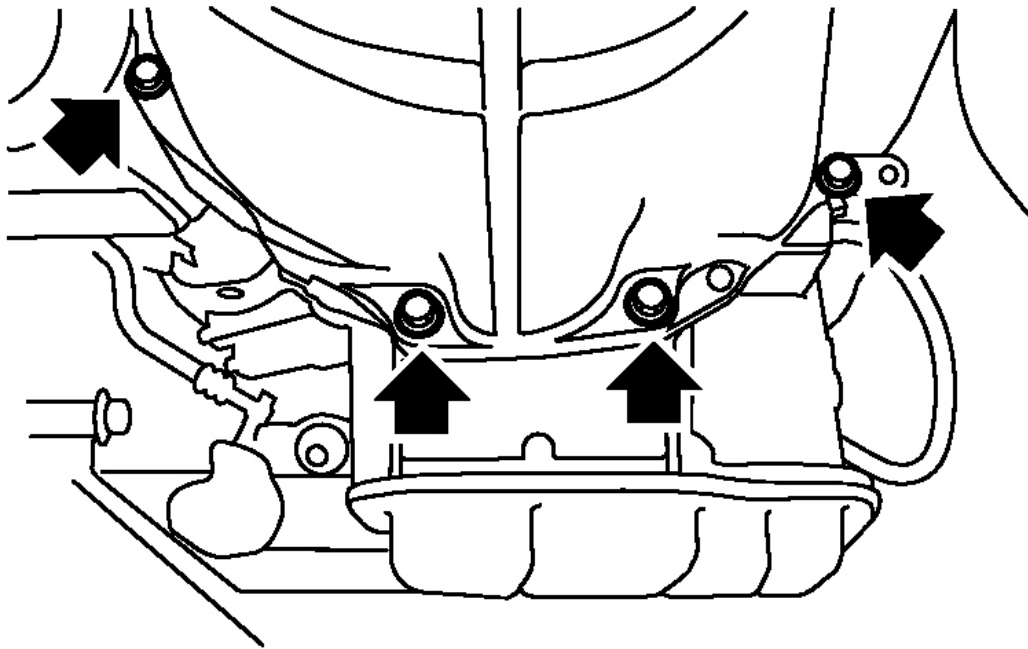


Fig. 31: Removing Front Suspension Member Bolts And Nuts - Left Side
Courtesy of NISSAN MOTOR CO., U.S.A.

27. Remove the four engine-to-transmission bolts.

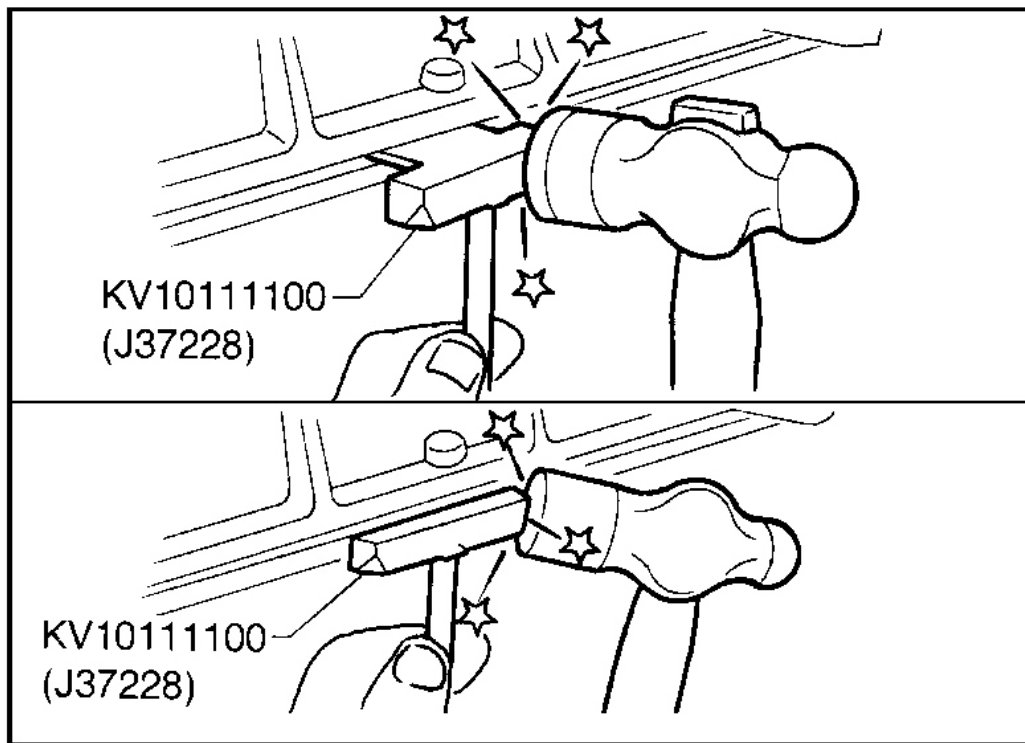


G02208138

Fig. 32: Removing Engine-To-Transmission Bolts

Courtesy of NISSAN MOTOR CO., U.S.A.

28. Loosen steel oil pan bolts in reverse order of tightening. Refer to "**COMPONENTS**", .
29. Remove steel oil pan.
 - a. Insert seal cutter (special service tool) between aluminum oil pan and steel oil pan.
 - **Be careful not to damage aluminum mating surface.**
 - **Do not insert screwdriver, or oil pan flange will be deformed.**
 - b. Slide seal cutter by tapping on the side of the tool with a hammer.



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Fig. 33: Inserting Seal Cutter Between Aluminum Oil Pan And Steel Oil Pan
Courtesy of NISSAN MOTOR CO., U.S.A.

30. Remove plug from rear right of aluminum oil pan.
 - Plug position is under No. 4 bolt in the figure.
31. Remove aluminum oil pan bolts in numerical order.
32. Remove aluminum oil pan.
 - a. Insert seal cutter between aluminum oil pan and cylinder block.
 - **Be careful not to damage aluminum mating surface.**
 - **Do not insert screwdriver, or oil pan flange will be deformed.**
 - b. Slide seal cutter by tapping its side with a hammer.

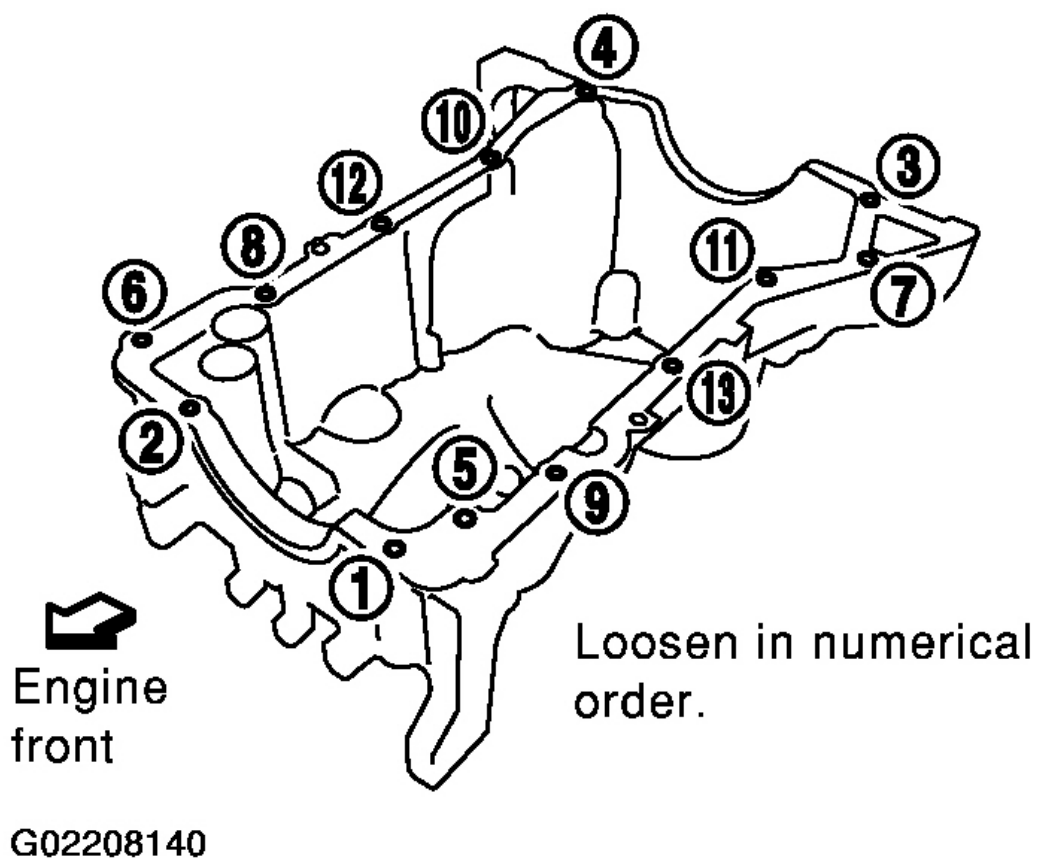
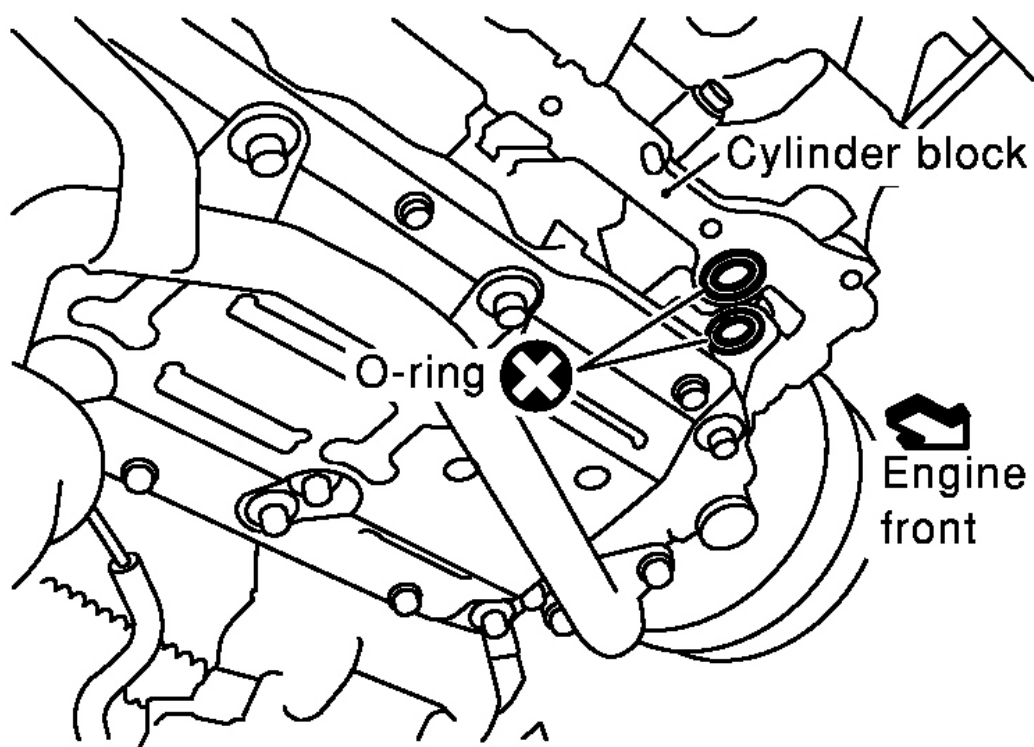


Fig. 34: Removing Aluminum Oil Pan Bolts In Numerical Order
Courtesy of NISSAN MOTOR CO., U.S.A.

33. Remove O-rings from cylinder block and oil pump body.



G02208141

Fig. 35: Removing O-Rings From Cylinder Block And Oil Pump Body
Courtesy of NISSAN MOTOR CO., U.S.A.

34. Remove front cover gasket and rear oil seal retainer gasket.

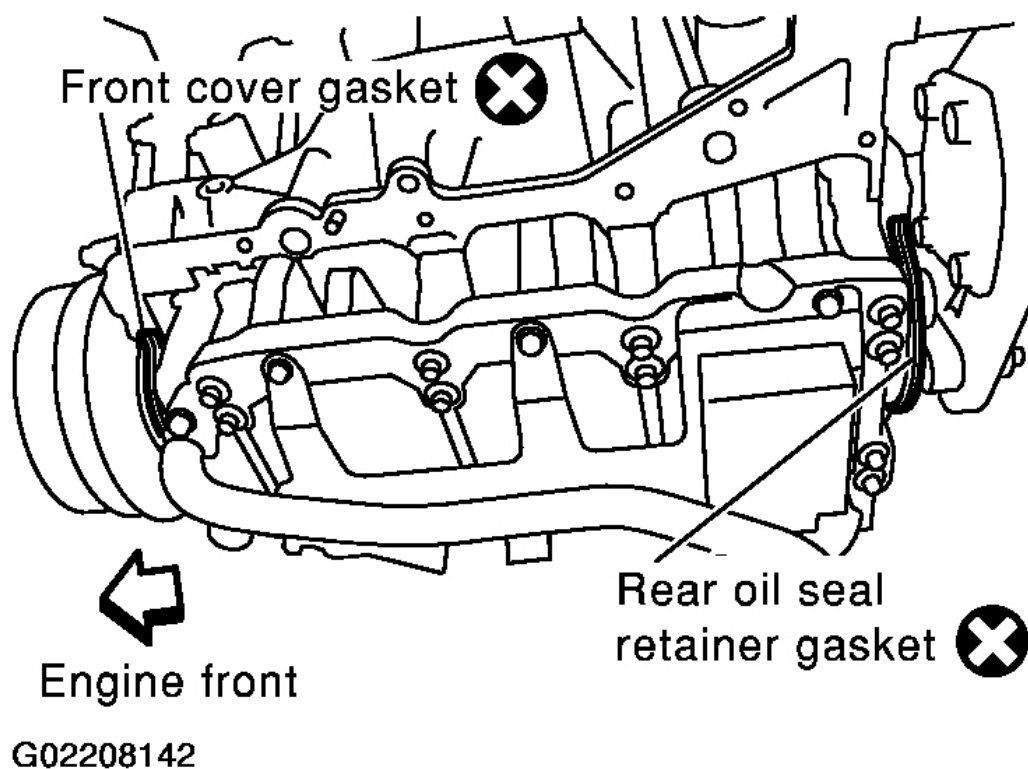
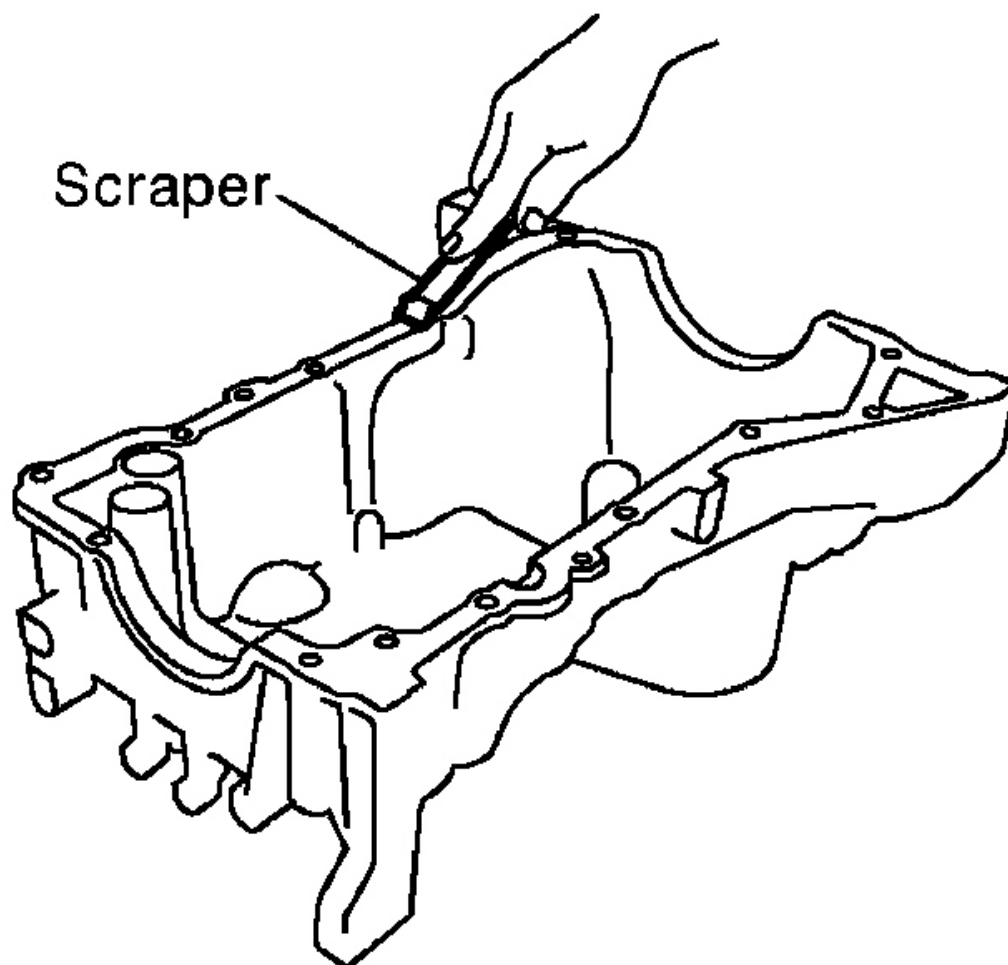


Fig. 36: Removing Front Cover Gasket And Rear Oil Seal Retainer Gasket
Courtesy of NISSAN MOTOR CO., U.S.A.

INSTALLATION

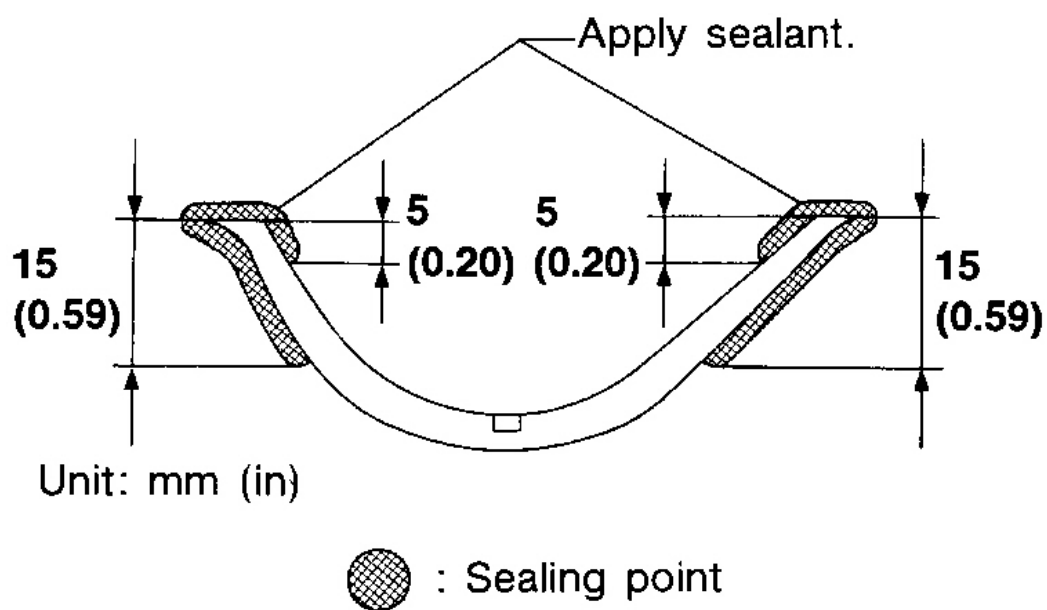
1. Before installing oil pan, remove old liquid gasket from mating surface using a scraper.
 - Also remove old liquid gasket from mating surface of cylinder block.
 - Remove old liquid gasket from the bolt hole and thread.



G02208143

Fig. 37: Removing Old Liquid Gasket From Mating Surface Using Scraper
Courtesy of NISSAN MOTOR CO., U.S.A.

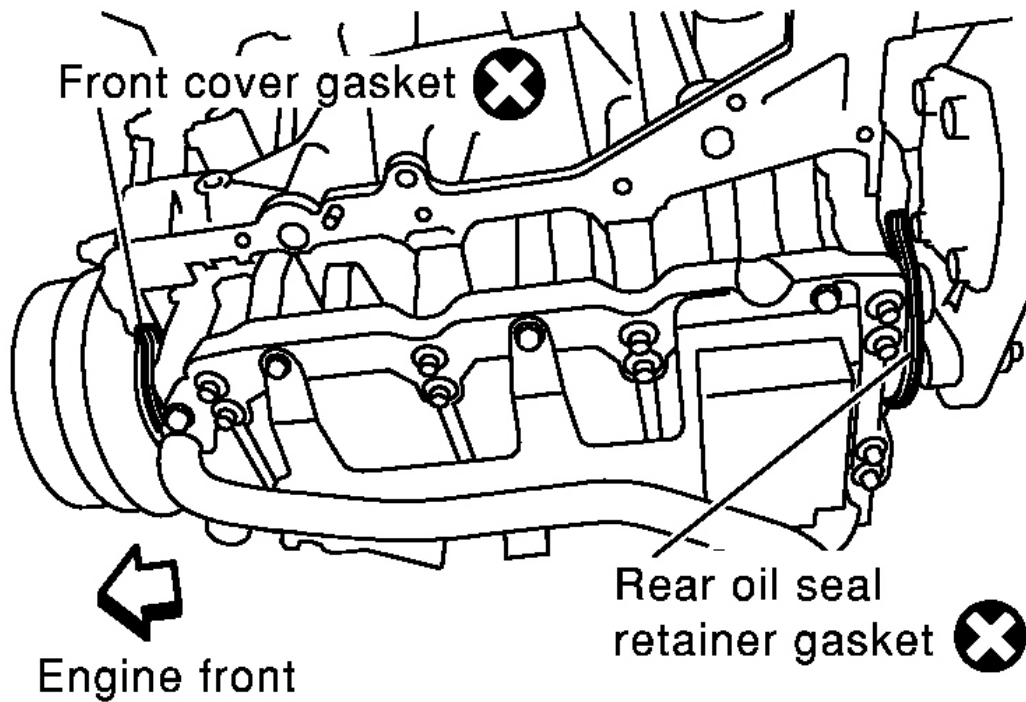
2. Apply sealant to front cover gasket and rear oil seal retainer gasket.



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Fig. 38: Applying Sealant To Front Cover Gasket And Rear Oil Seal Retainer Gasket
Courtesy of NISSAN MOTOR CO., U.S.A.

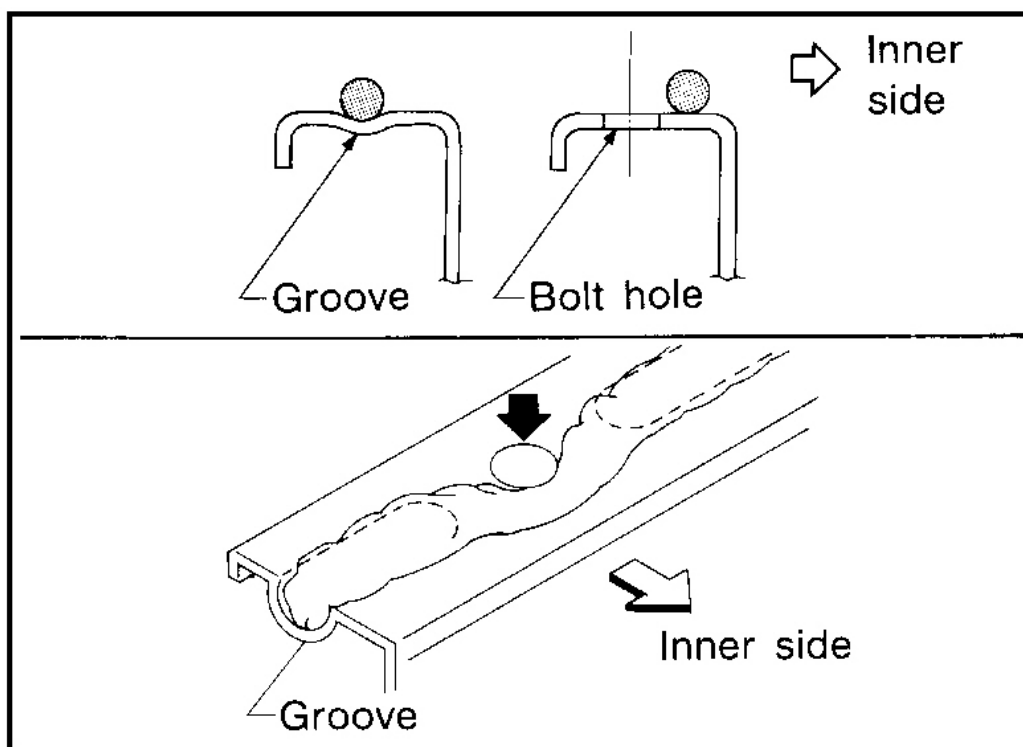
3. Install front cover gasket and rear oil seal retainer gasket.



G02208145

Fig. 39: Installing Front Cover Gasket And Rear Oil Seal Retainer Gasket
Courtesy of NISSAN MOTOR CO., U.S.A.

4. Apply a continuous bead of liquid gasket to mating surface of aluminum oil pan.
 - **Use Genuine RTV silicone sealant or equivalent. Refer to RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS .**

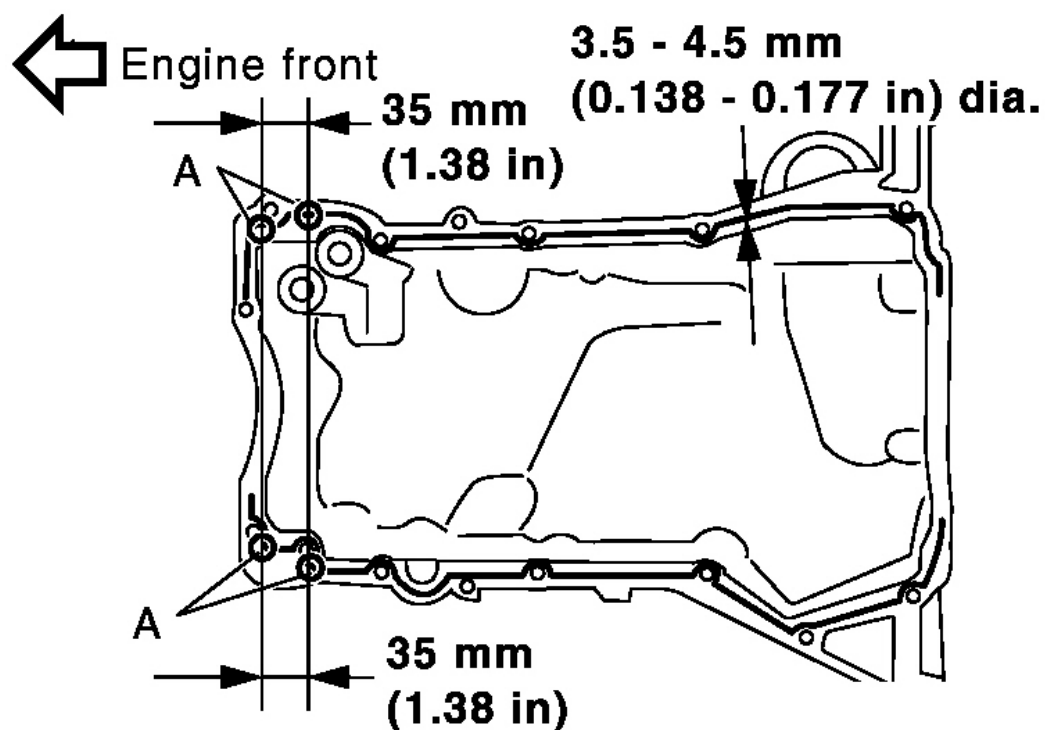


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Fig. 40: Applying Continuous Bead Of Liquid Gasket To Mating Surface Of Aluminum Oil Pan

Courtesy of NISSAN MOTOR CO., U.S.A.

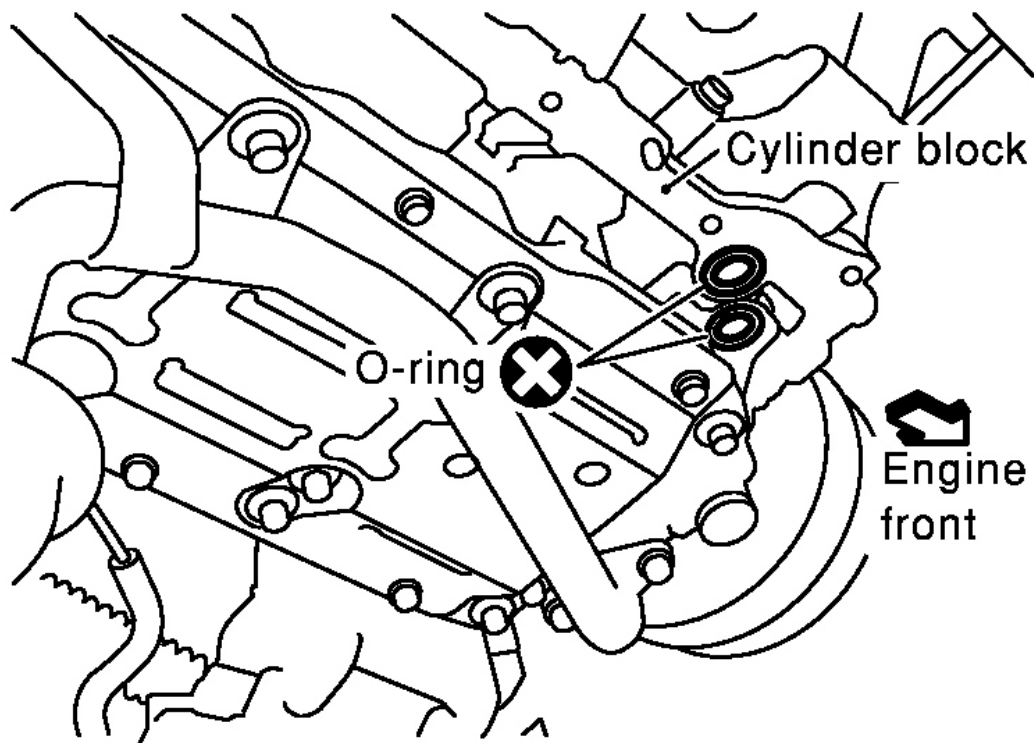
5. Apply liquid gasket to inner sealing surface as shown in figure.
 - Be sure to apply it inside to all bolt holes.
 - Be sure to apply it to part A at [4.5 to 5.5 mm (0.177 to 0.217 in)].
 - Attaching should be done within 5 minutes after coating.



G02208147

Fig. 41: Applying Liquid Gasket To Inner Sealing Surface
Courtesy of NISSAN MOTOR CO., U.S.A.

6. Install O-rings, cylinder block and oil pump body.



G02208148

Fig. 42: Installing O-Rings, Cylinder Block And Oil Pump Body
Courtesy of NISSAN MOTOR CO., U.S.A.

7. Install aluminum oil pan.
 - Tighten bolts in numerical order.
 - **Wait at least 30 minutes before refilling engine oil.**
8. Install plug to rear right of aluminum oil pan.
 - Plug position is under No. 10 bolt in the figure.

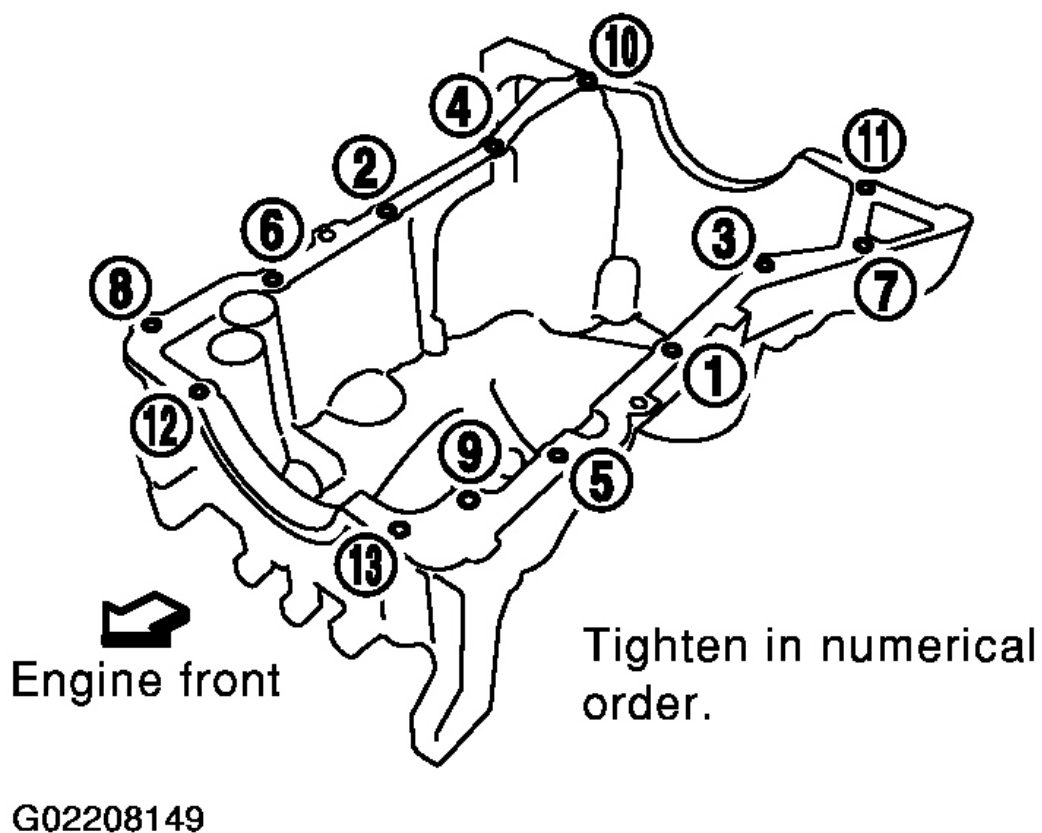
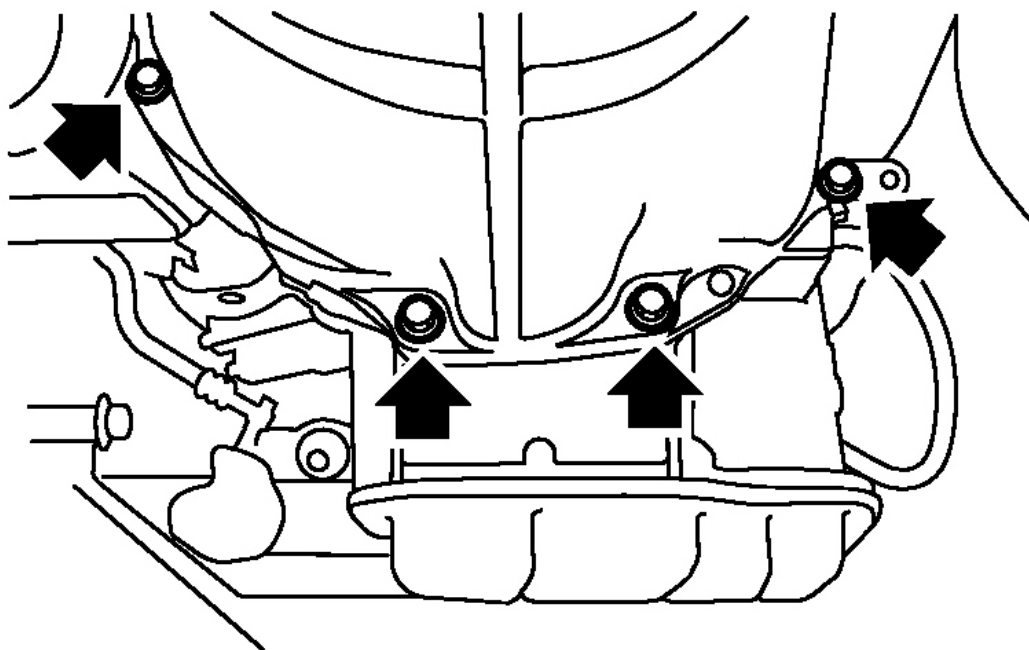


Fig. 43: Tightening Aluminum Oil Pan Bolts In Numerical Order
Courtesy of NISSAN MOTOR CO., U.S.A.

9. Install the four engine-to-transmission bolts. For tightening torque, refer to **INSTALLATION**.
10. Reinstall in the reverse order of removal.



G02208150

Fig. 44: Installing Engine-To-Transmission Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

TIMING CHAIN

COMPONENTS

SEC. 120•130•135•150•210

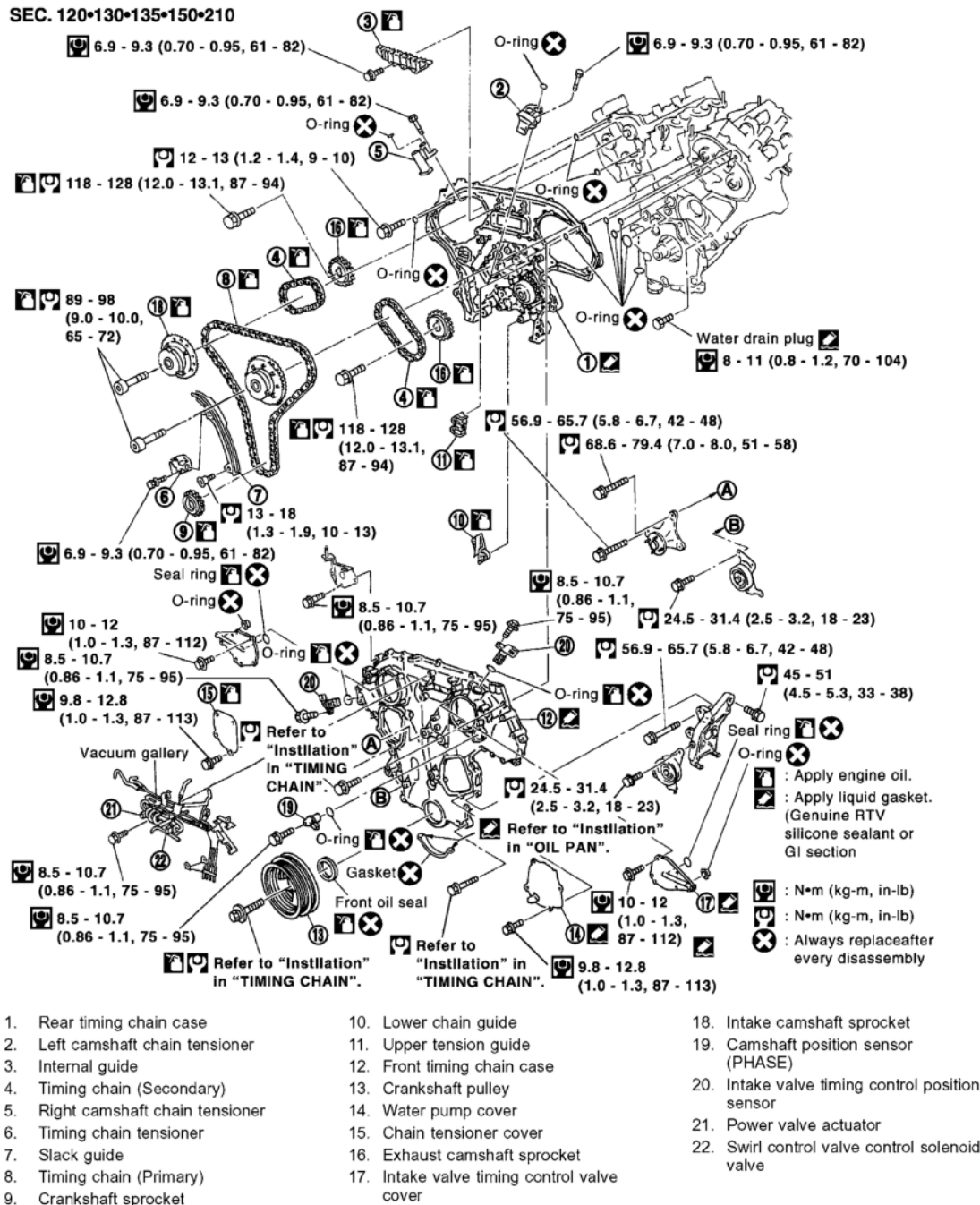
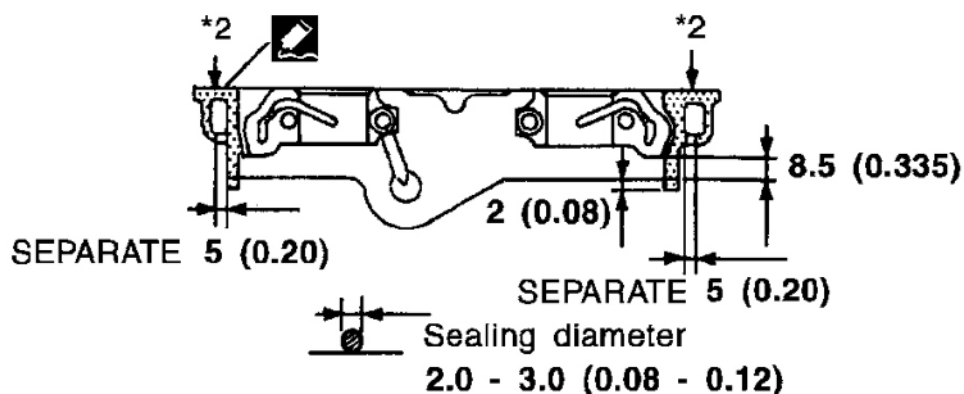


Fig. 45: Identifying Timing Chain Components And Torque Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

POSITION FOR APPLYING LIQUID GASKET

Refer to "**LIQUID GASKET APPLICATION PROCEDURE**" in "PRECAUTION", .



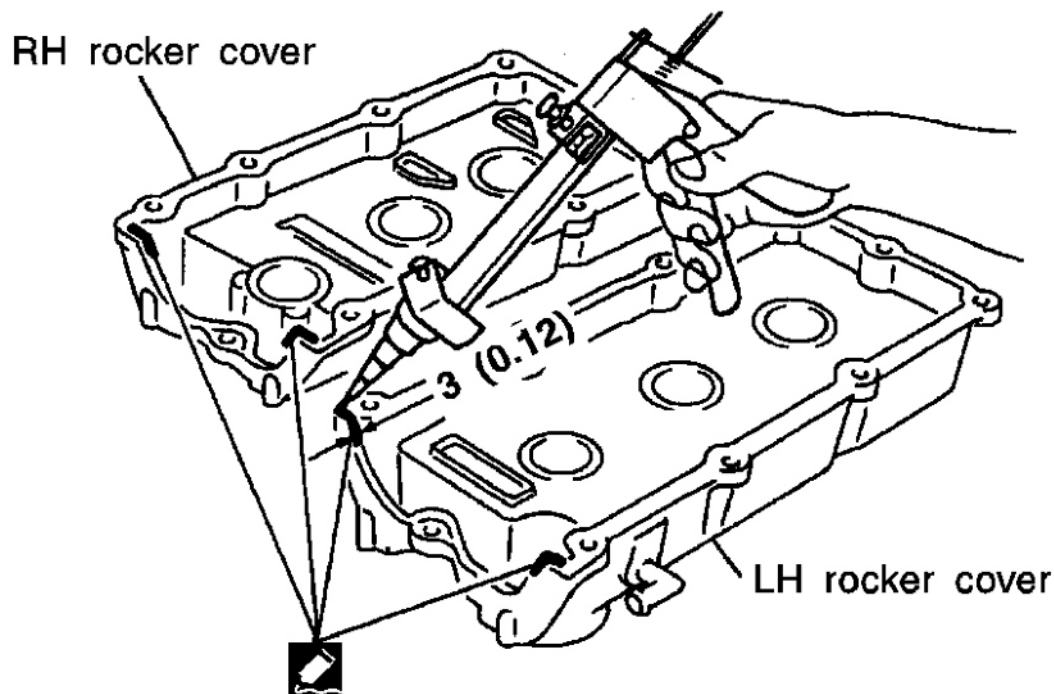
*2: Remove the protruding sealant from front face.
(Remove the hardened sealant from surface only.)

Unit: mm (in)

G02208154

Fig. 48: Identifying Camshaft Bracket Components And Torque Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

Rocker cover



G02208155

Fig. 49: Applying Engine Oil To Rocker Cover Seat Surfaces

Courtesy of NISSAN MOTOR CO., U.S.A.

CAUTION:

- After removing timing chain, do not turn crankshaft and camshaft and camshaft separately, or valves will strike piston heads.
- When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.
- Apply new engine oil to bolt threads and seat surfaces when installing camshaft sprockets and crankshaft pulley.
- Before disconnecting fuel hose, release fuel pressure. Refer to **FUEL SYSTEM PRESSURE RELEASE**.
- Be careful not to damage sensor edges.
- Do not spill engine coolant on drive belts.

REMOVAL

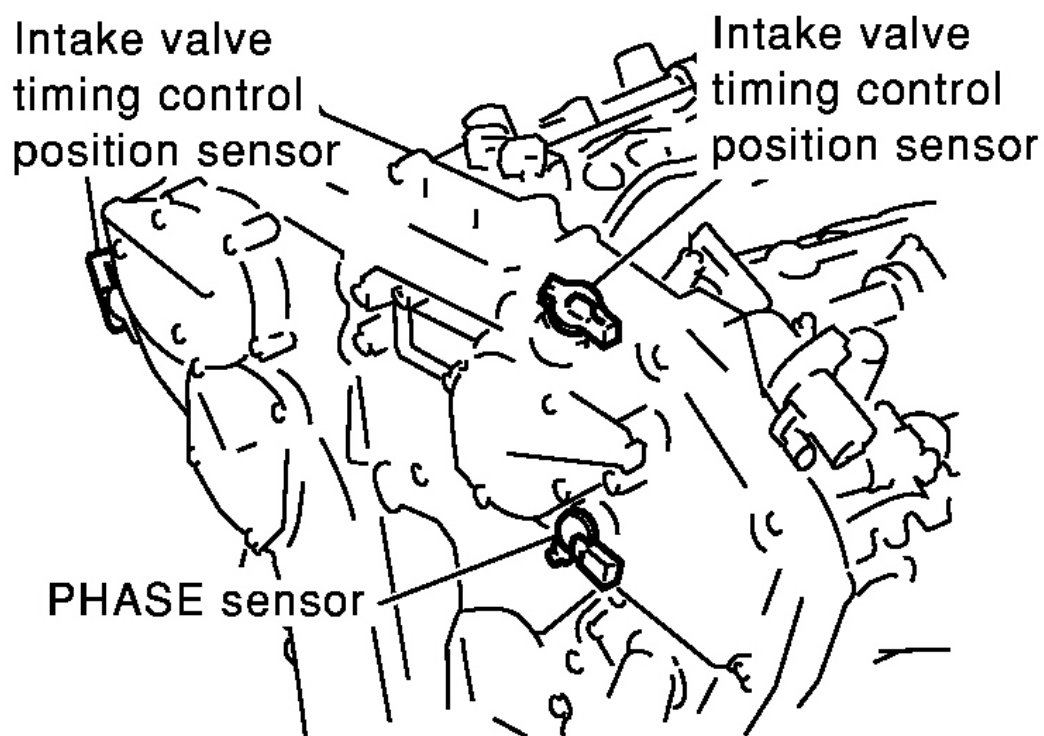
1. Release fuel pressure.

Refer to **FUEL SYSTEM PRESSURE RELEASE**.

2. Remove battery.
3. Remove radiator.

Refer to **REMOVAL AND INSTALLATION** .

4. Drain engine oil.
5. Remove drive belts and idler pulley with brackets.
6. Remove cooling fan with bracket.
7. Remove engine cover.
8. Remove air duct with air cleaner case, collector, PCV hose, vacuum hoses, fuel hoses, water hoses, wires, harnesses, connectors and so on.
9. Remove the air conditioner compressor, and tie it down using rope or the like to keep it from interfering.
10. Remove the power steering oil pump and reservoir tank. Tie them down using rope or the like to keep them from interfering.
11. Remove alternator.
12. Remove the following.
 - Vacuum tank
 - Water bypass pipe
 - Brackets
13. Remove camshaft position sensors (PHASE), intake valve timing control position sensors and crankshaft position sensor (REF).
 - Avoid impact such as dropping.
 - Do not disassemble the components.
 - Do not place them on areas where iron powder may adhere.
 - Keep away from the objects susceptible to magnetism.



G02208156

Fig. 50: Removing Camshaft Position Sensors, Intake Valve Timing Control Position Sensors
Courtesy of NISSAN MOTOR CO., U.S.A.

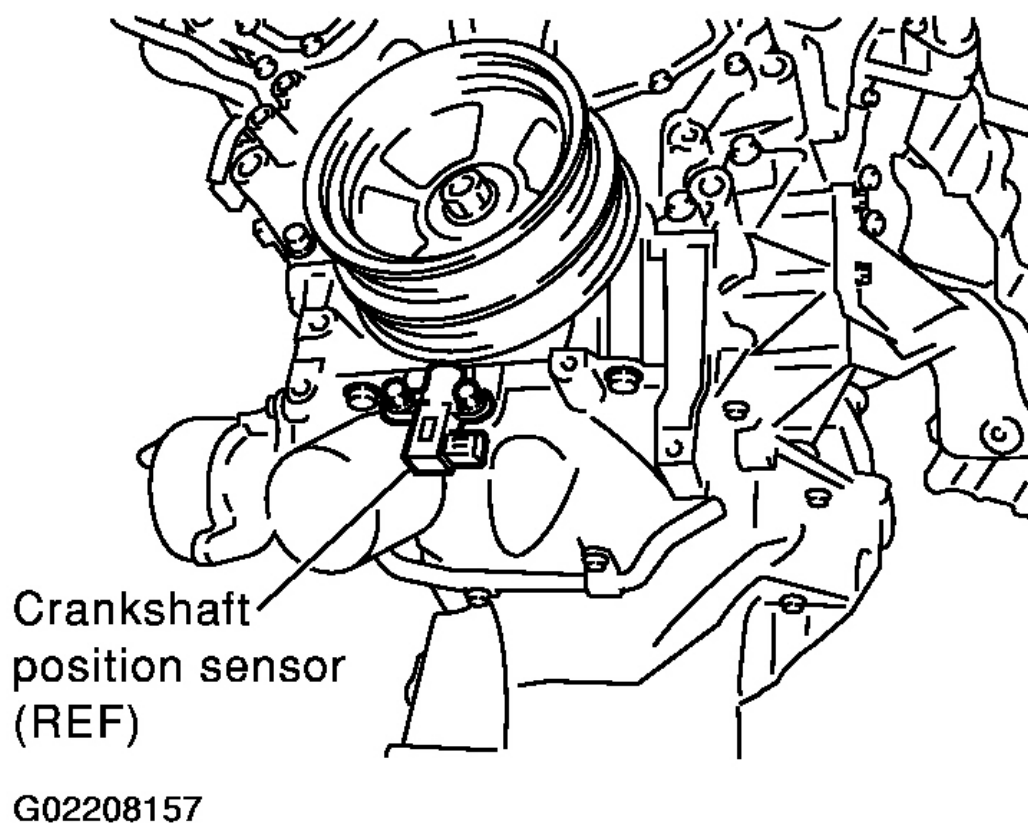
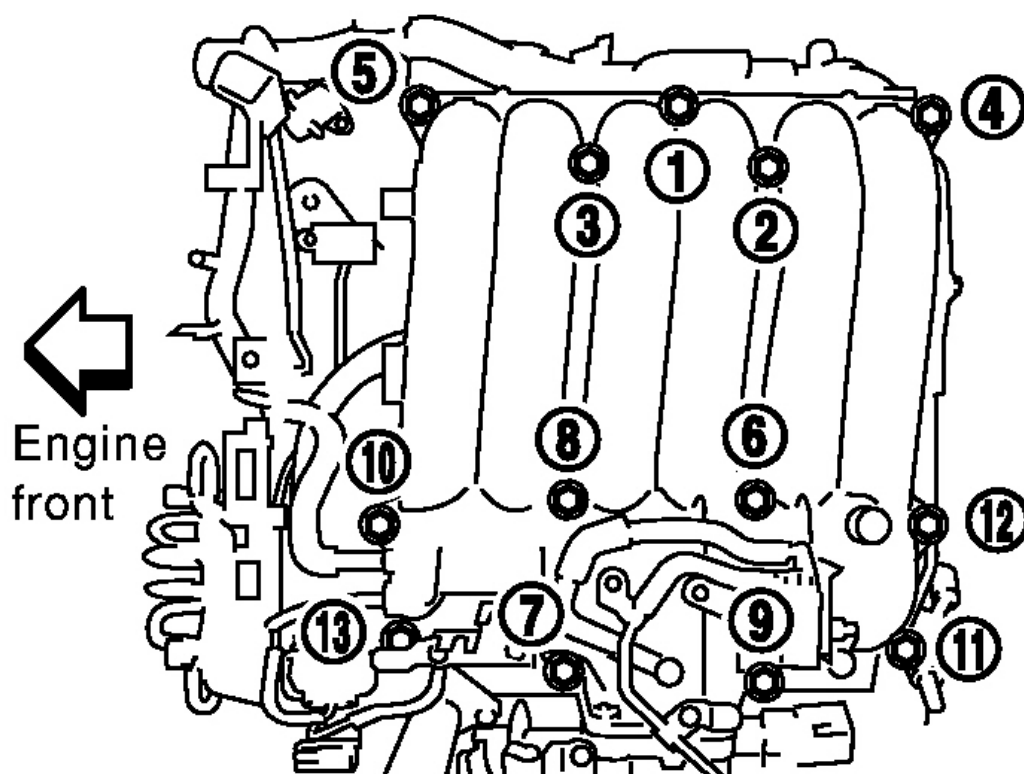


Fig. 51: Removing Crankshaft Position Sensor
Courtesy of NISSAN MOTOR CO., U.S.A.

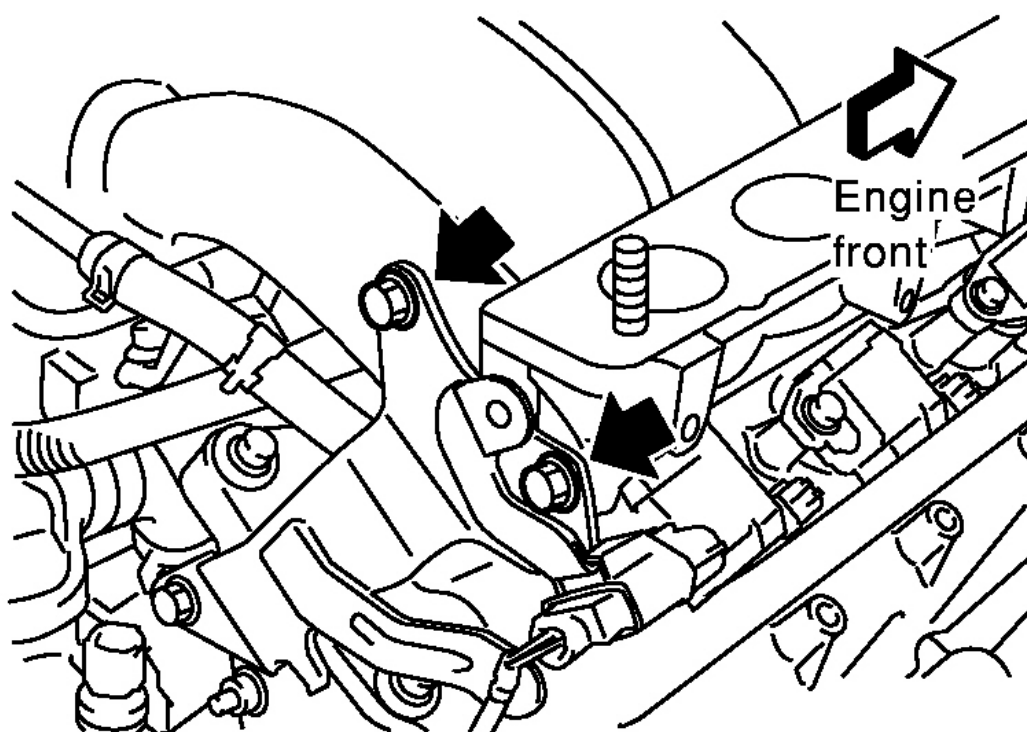
14. Remove upper intake manifold collector in reverse order of illustration.



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Fig. 52: Removing Upper Intake Manifold Collector
Courtesy of NISSAN MOTOR CO., U.S.A.

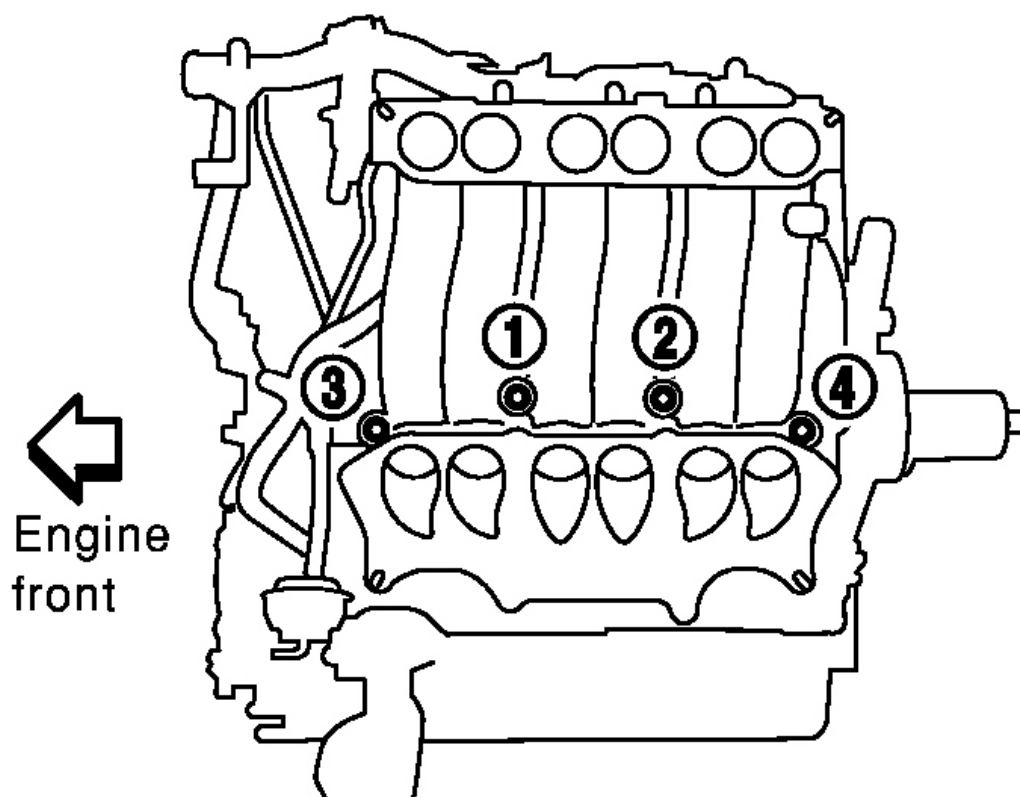
15. Remove intake manifold collector support bolts.



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Fig. 53: Removing Intake Manifold Collector Support Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

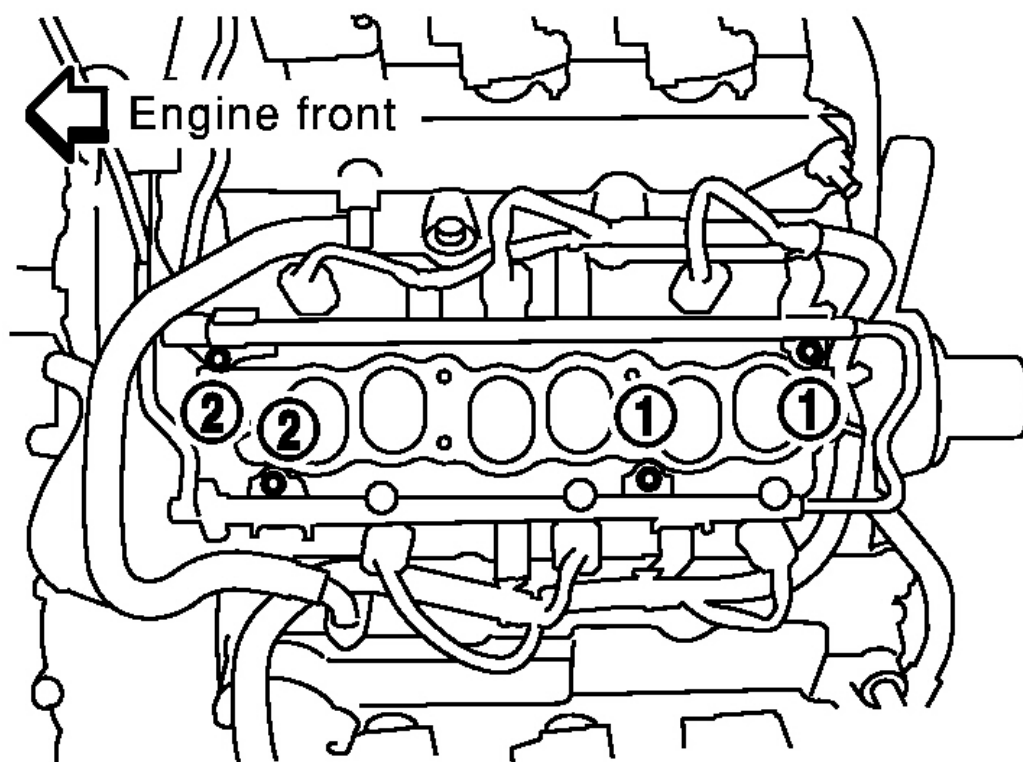
16. Remove lower intake manifold collector in reverse order of illustration.



G02208160

Fig. 54: Removing Lower Intake Manifold Collector
Courtesy of NISSAN MOTOR CO., U.S.A.

17. Disconnect injector harness connectors.
18. Remove fuel tube assembly in reverse order of illustration.



G02208161

Fig. 55: Removing Fuel Tube Assembly
Courtesy of NISSAN MOTOR CO., U.S.A.

19. Remove ignition coils.
20. Remove RH and LH rocker covers from cylinder head.
 - Loosen bolts in numerical order shown in the figure.

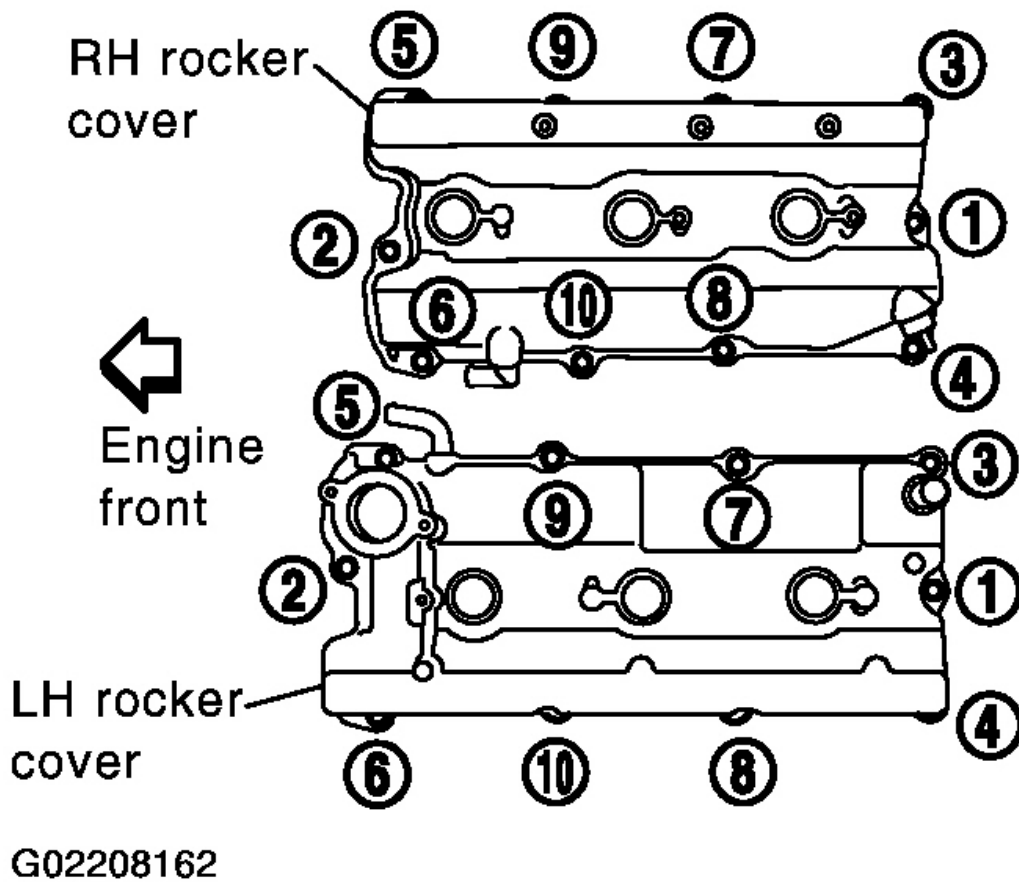
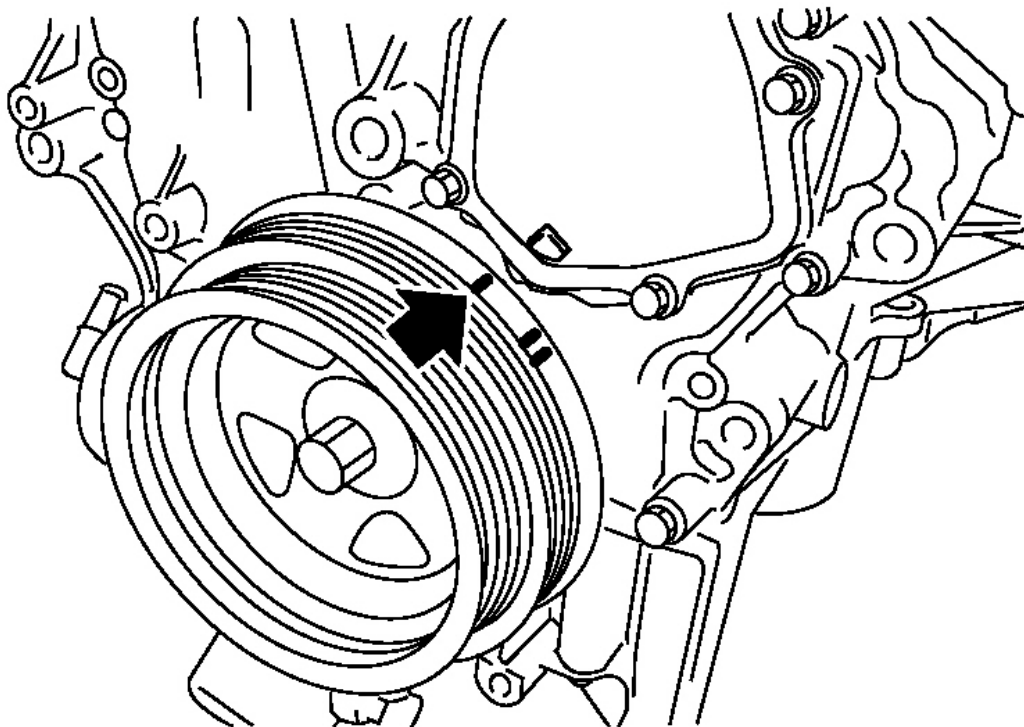


Fig. 56: Removing RH And LH Rocker Covers From Cylinder Head
Courtesy of NISSAN MOTOR CO., U.S.A.

21. Set No. 1 piston at TDC on the compression stroke by rotating crankshaft.
 - Align pointer with TDC mark on crankshaft pulley.



G02208163

Fig. 57: Aligning Pointer With TDC Mark On Crankshaft Pulley
Courtesy of NISSAN MOTOR CO., U.S.A.

- Check that intake and exhaust cam nose on No. 1 cylinder are located as shown left.

If not, turn the crankshaft one revolution (360°) and align as above.

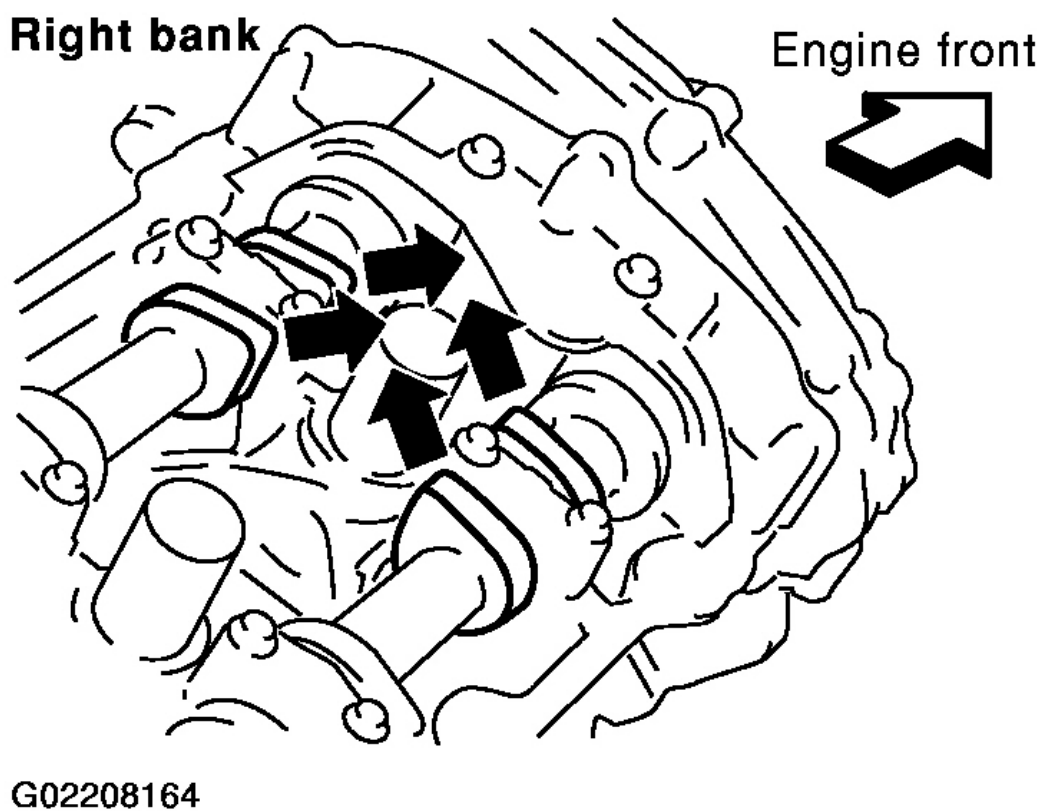


Fig. 58: Checking Intake And Exhaust Cam Nose On No. 1 Cylinder
Courtesy of NISSAN MOTOR CO., U.S.A.

22. Remove starter motor, and set ring gear stopper using the mounting bolt hole.
 - Be careful not to damage the signal plate teeth.

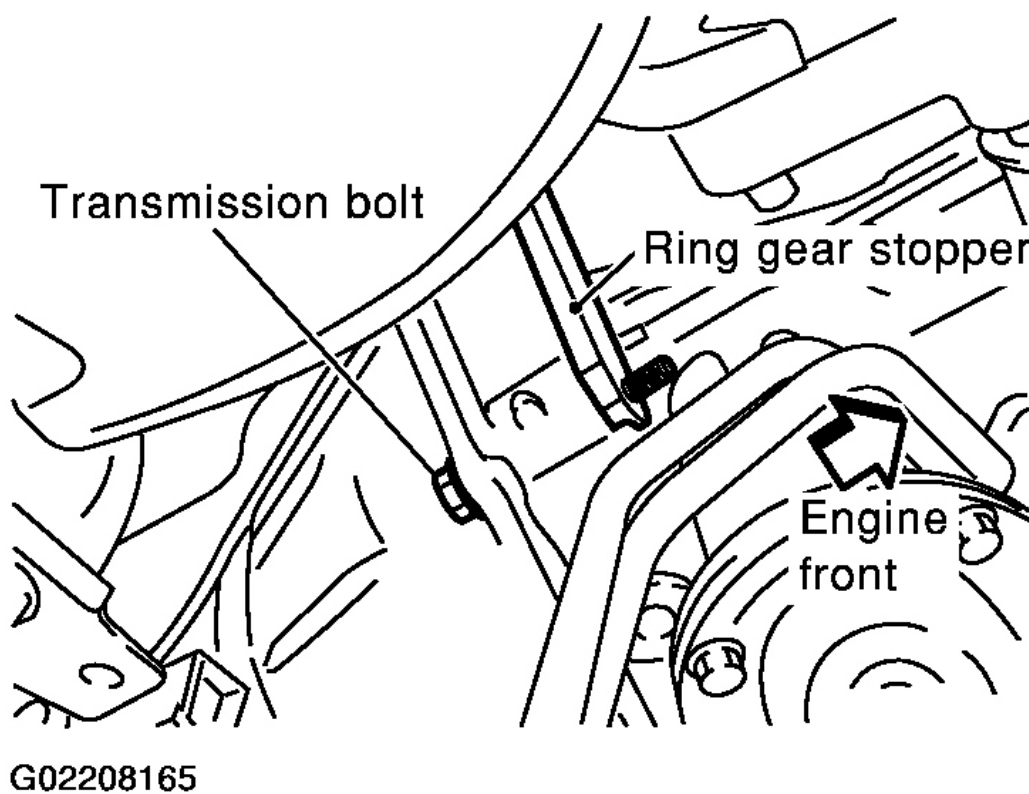
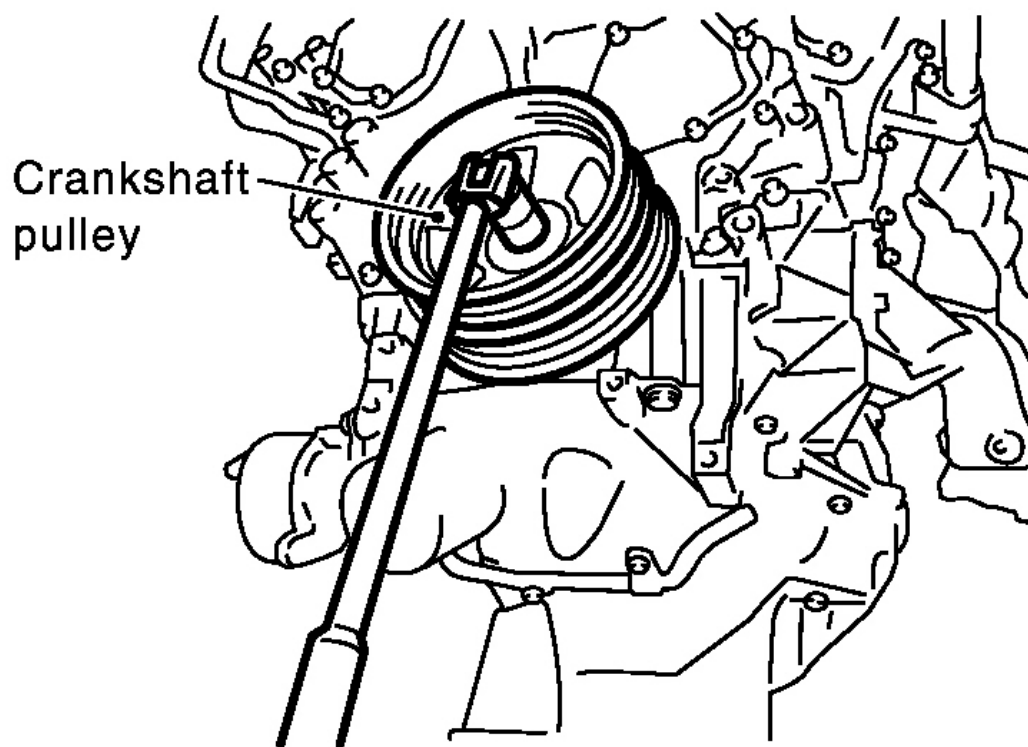


Fig. 59: Setting Ring Gear Stopper Using Mounting Bolt Hole
Courtesy of NISSAN MOTOR CO., U.S.A.

23. Loosen the crankshaft pulley bolt.



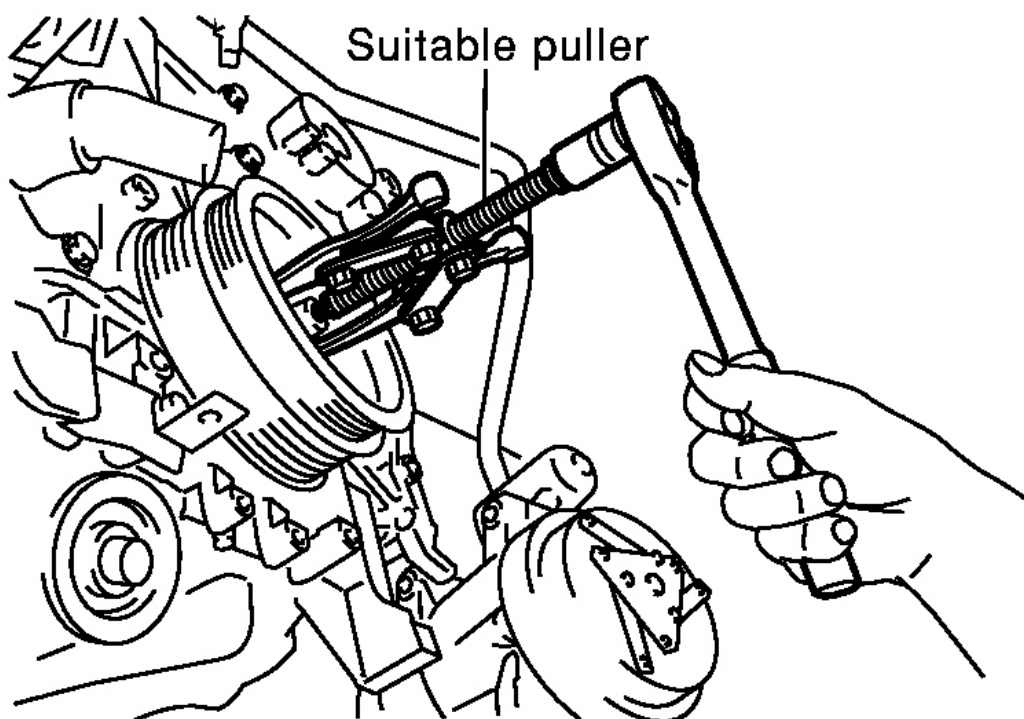
G02208166

Fig. 60: Loosening Crankshaft Pulley Bolt
Courtesy of NISSAN MOTOR CO., U.S.A.

24. Remove crankshaft pulley with a suitable puller.
25. Remove aluminum oil pan.

Refer to "**REMOVAL**".

26. Temporarily install the suspension member bolts and engine mounting nuts.

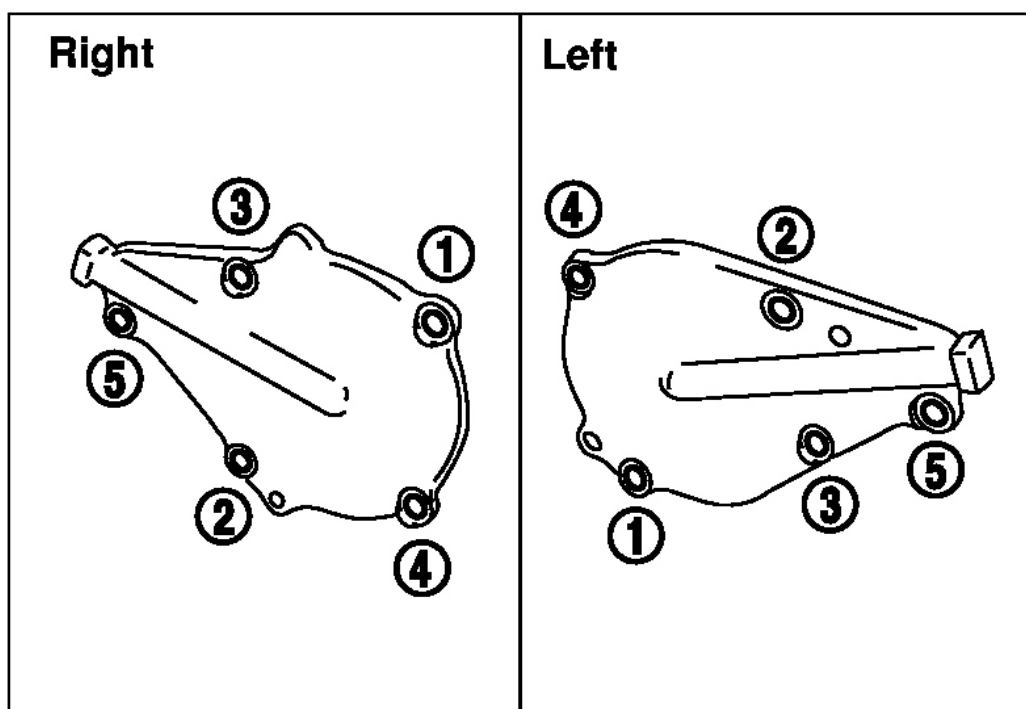


G02208167

Fig. 61: Removing Crankshaft Pulley With Puller
Courtesy of NISSAN MOTOR CO., U.S.A.

27. Remove intake valve timing control covers.

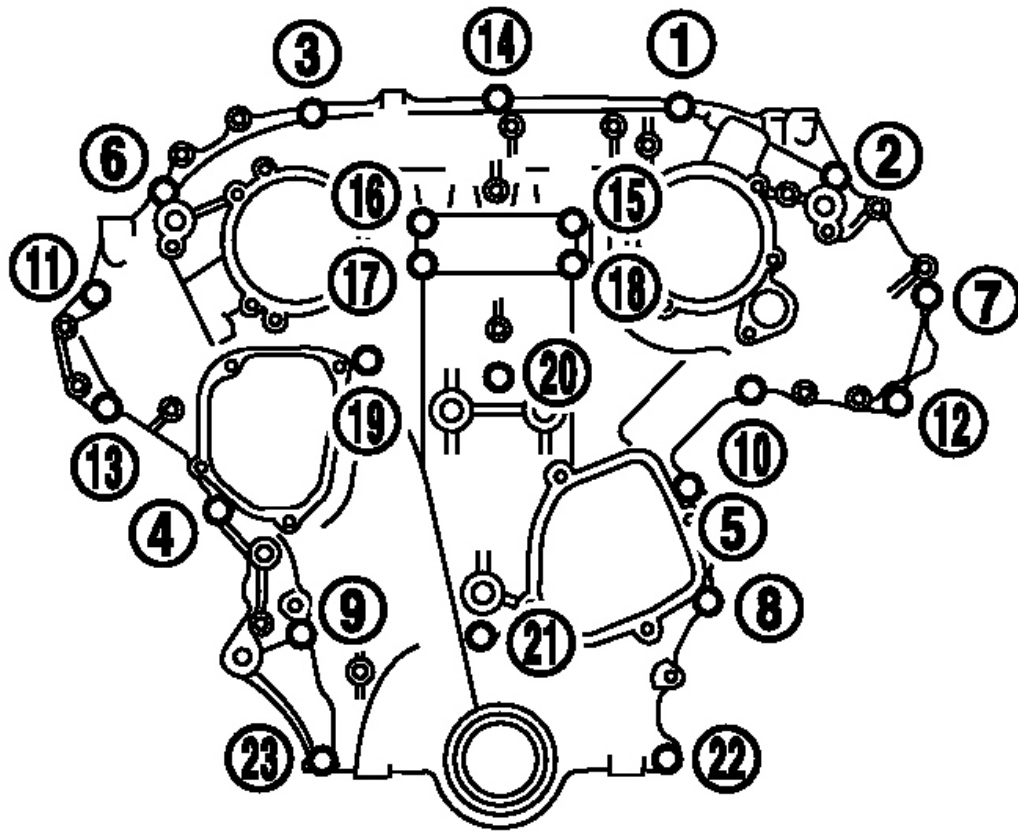
- **Loosen bolts in numerical order as shown in the figure.**
- In the cover, the shaft is engaged with the center hole of the intake cam sprocket. Remove it straight out until the engagement comes off.



G02208168

Fig. 62: Removing Intake Valve Timing Control Covers
Courtesy of NISSAN MOTOR CO., U.S.A.

28. Remove front timing chain case bolts.
- Loosen bolts in numerical order as shown in the figure.



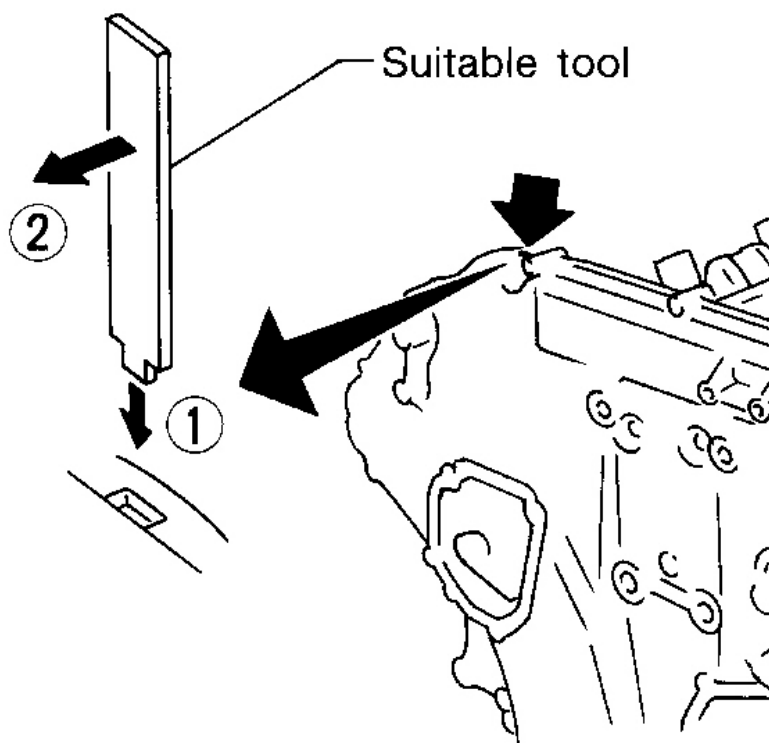
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Fig. 63: Removing Front Timing Chain Case Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

29. Remove front timing chain case.
- Insert the appropriate size tool into the notch at the top of the front timing chain case as shown (1).
 - Pry off the case by moving the tool as shown (2).
 - Use seal cutter (special service tool) or an equivalent tool to cut liquid gasket for removal.

CAUTION:

- Do not use screwdrivers or something similar.
- After removal, handle it carefully so it does not tilt, car load.



G02208170

Fig. 64: Inserting Tool Into Notch At Top Of Front Timing Chain Guide
Courtesy of NISSAN MOTOR CO., U.S.A.

30. Remove internal guide.
31. Remove upper tension guide.
32. Remove timing chain tensioner and slack guide.

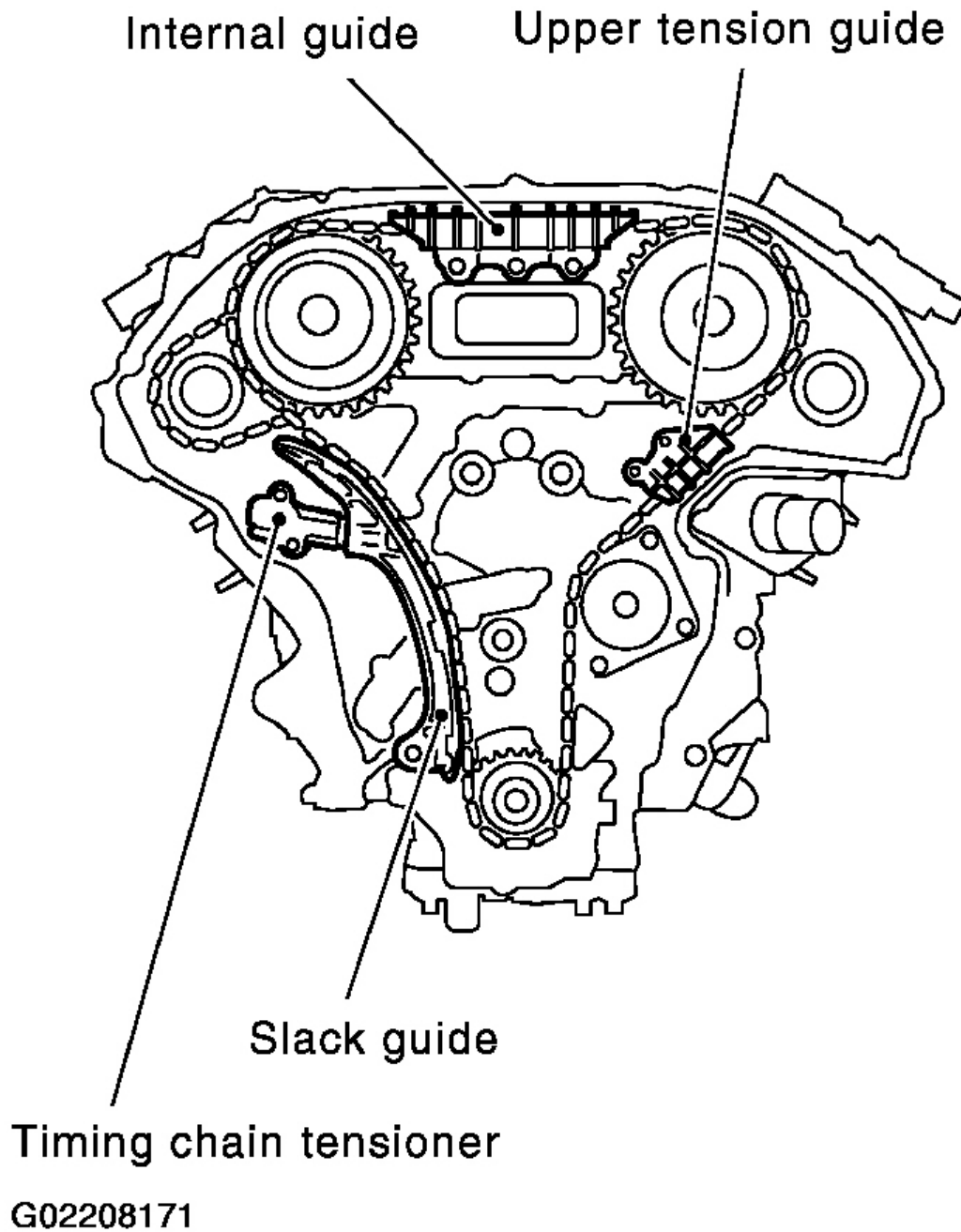
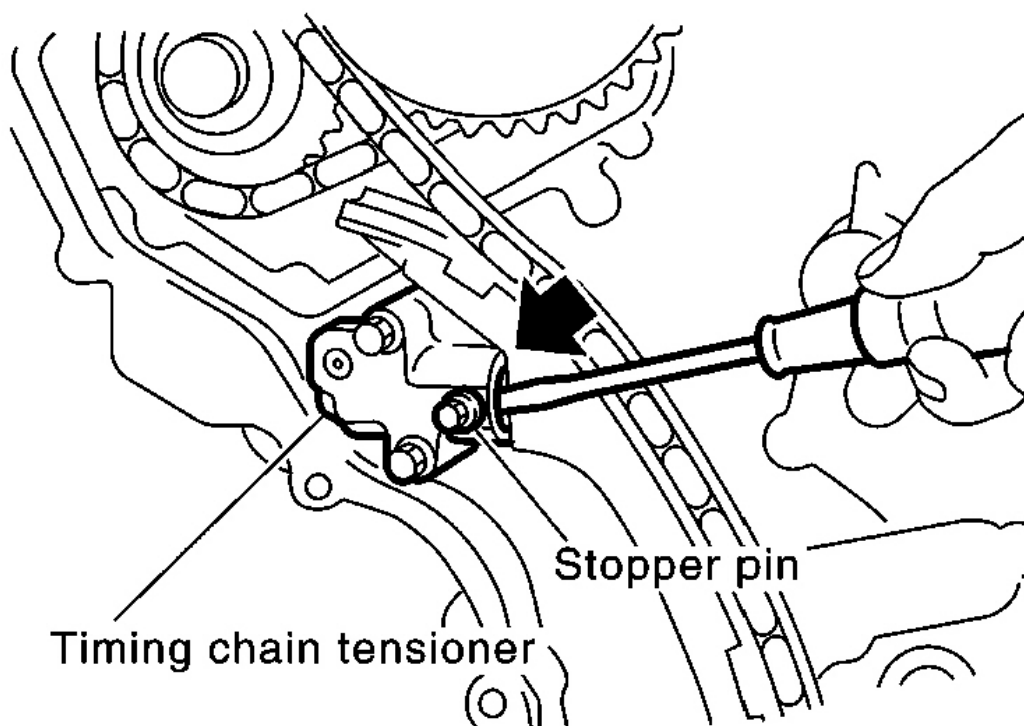


Fig. 65: Removing Timing Chain Tensioner And Slack Guide
 Courtesy of NISSAN MOTOR CO., U.S.A.

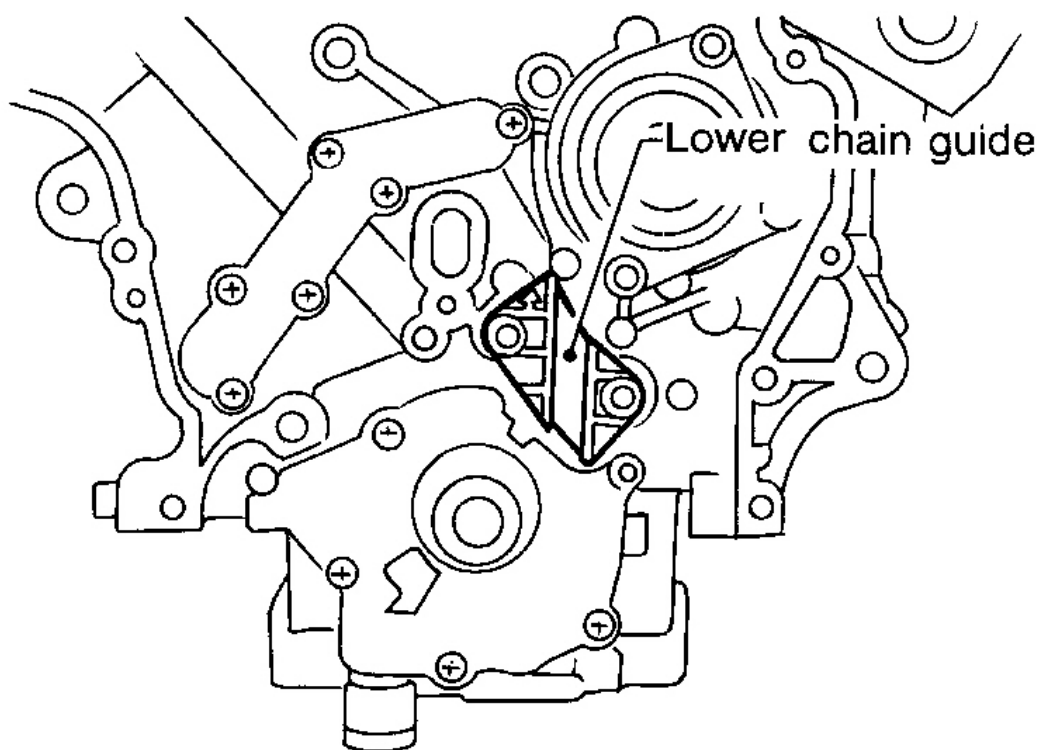
- Remove timing chain tensioner. (Push piston and insert a suitable pin into pinhole.)
33. Remove primary timing chain and crankshaft sprocket.



G02208172

Fig. 66: Removing Primary Timing Chain And Crankshaft Sprocket
Courtesy of NISSAN MOTOR CO., U.S.A.

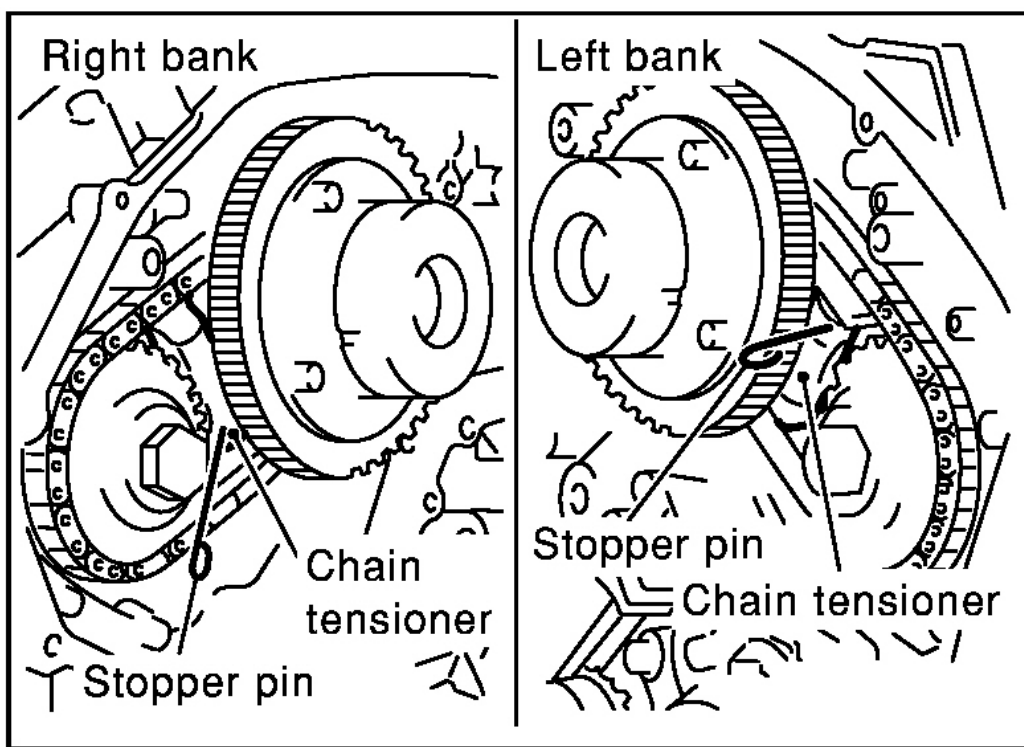
34. Remove lower chain guide.



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Fig. 67: Removing Lower Chain Guide
Courtesy of NISSAN MOTOR CO., U.S.A.

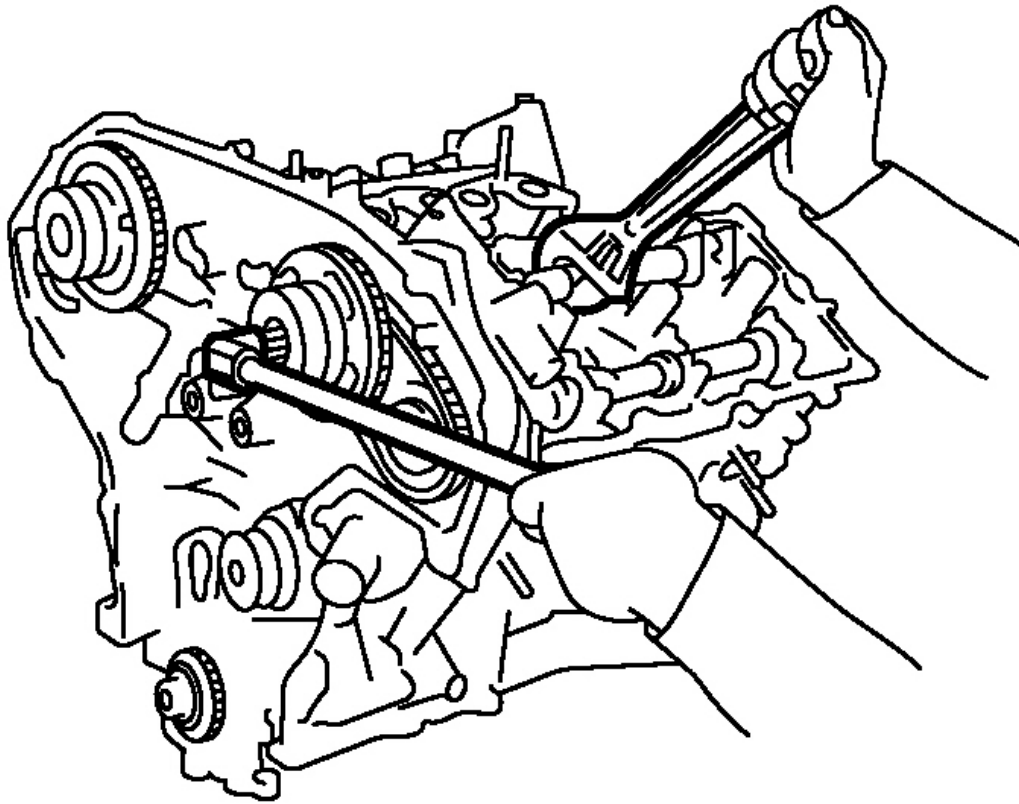
35. Attach a suitable stopper pin to RH and LH camshaft chain tensioners.



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Fig. 68: Attaching Stopper Pin To RH And LH Camshaft Chain Tensioners
Courtesy of NISSAN MOTOR CO., U.S.A.

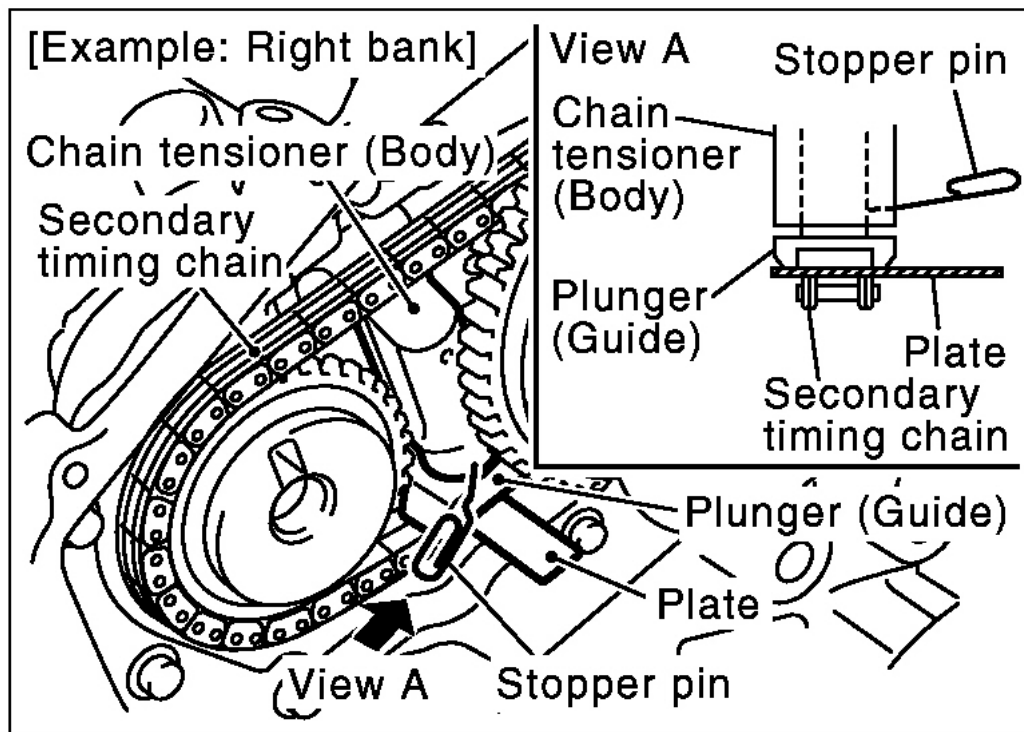
36. Remove intake and exhaust camshaft sprocket bolts.
- Secure the hexagonal head of the camshaft using a spanner to loosen mounting bolts.



G02208175

Fig. 69: Removing Intake And Exhaust Camshaft Sprocket Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

37. Remove secondary timing chains with camshaft sprockets.
 - a. Rotate camshaft lightly, and slacken timing chain of timing chain tensioner-side.
 - b. Insert metal or resin plate [thickness: 0.5 mm (0.020 in)] into guide between timing chain and chain tensioner plunger. Remove cam sprocket and secondary timing chain with timing chain floated from guide groove.

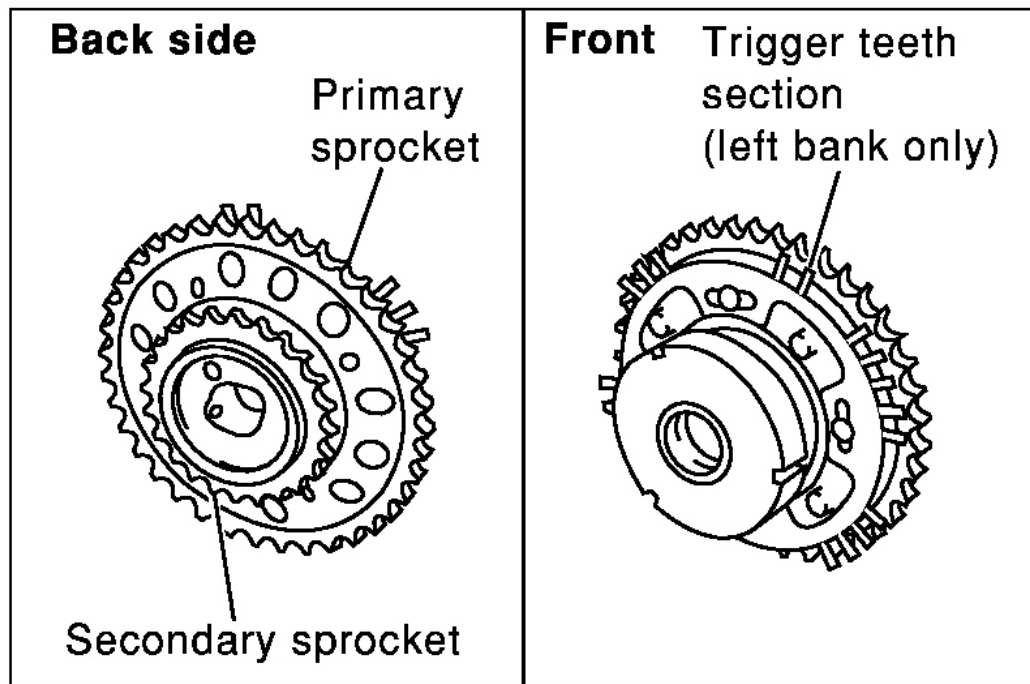


G02208176

Fig. 70: Removing Secondary Timing Chains With Camshaft Sprockets
 Courtesy of NISSAN MOTOR CO., U.S.A.

CAUTION: Chain tensioner plunger may move, while fixed stopper pin and plunger both come off when timing chain is removed. Use caution during removal.

- Avoid impact on the intake camshaft sprocket.
- Do not disassemble the intake camshaft sprocket.

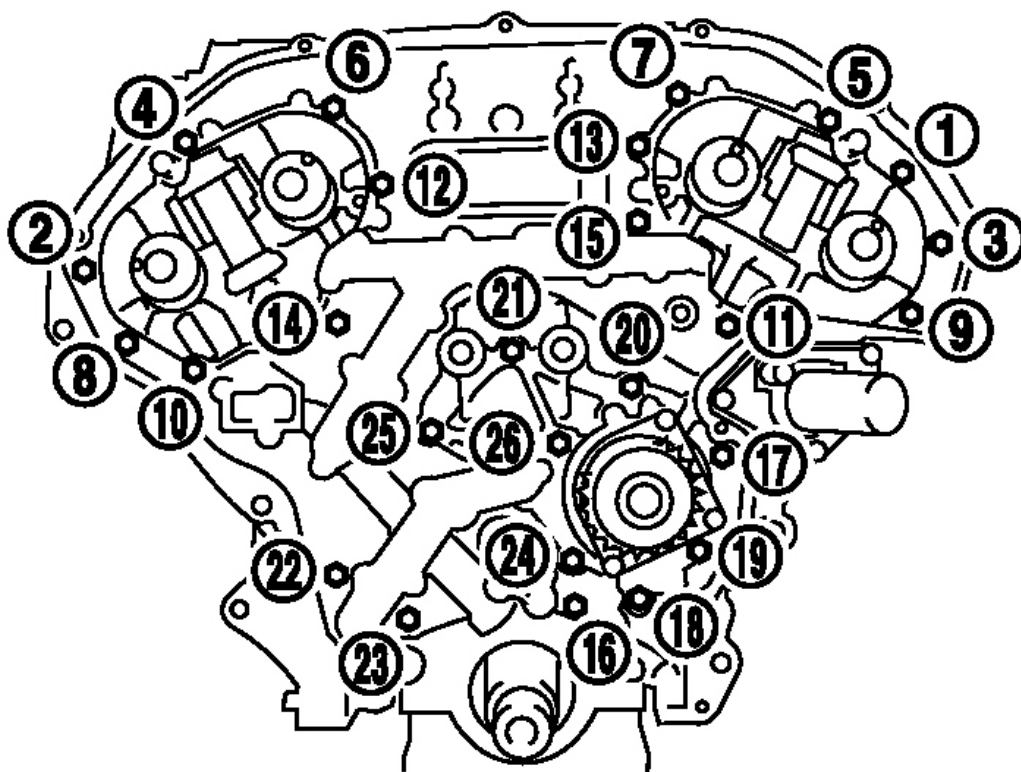


G02208177

Fig. 71: Removing Cam Sprocket And Secondary Timing Chain With Timing Chain Floated From Guide Groove

Courtesy of NISSAN MOTOR CO., U.S.A.

38. Remove rear timing chain case as follows, if necessary.
 - a. Loosen mounting bolts in numerical order shown in figure, and remove them.
 - b. Disconnect liquid gasket applied portion using seal cutter (special service tool: KV10111100) or an equivalent tool. Then remove rear timing chain case.



G02208178

Fig. 72: Loosening Mounting Bolts In Numerical Order
Courtesy of NISSAN MOTOR CO., U.S.A.

CAUTION:

- Do not remove plate metal cover of oil passage.
- After removing chain case, do not apply any load which affects fl

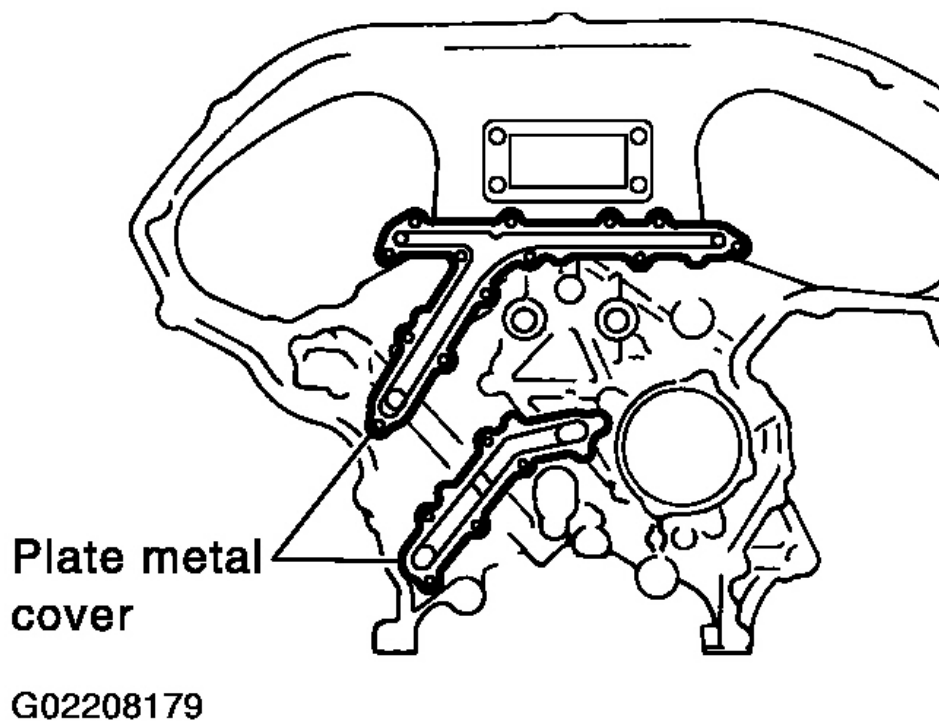
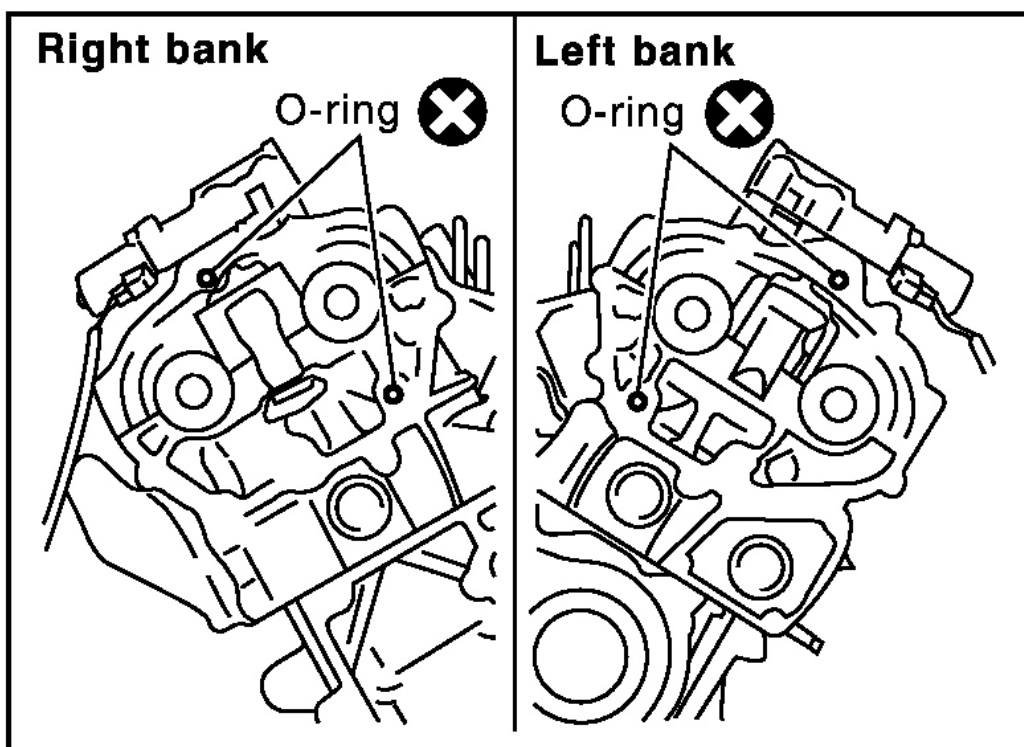


Fig. 73: Precaution For Removing Plate Metal Cover Of Oil Passage
Courtesy of NISSAN MOTOR CO., U.S.A.

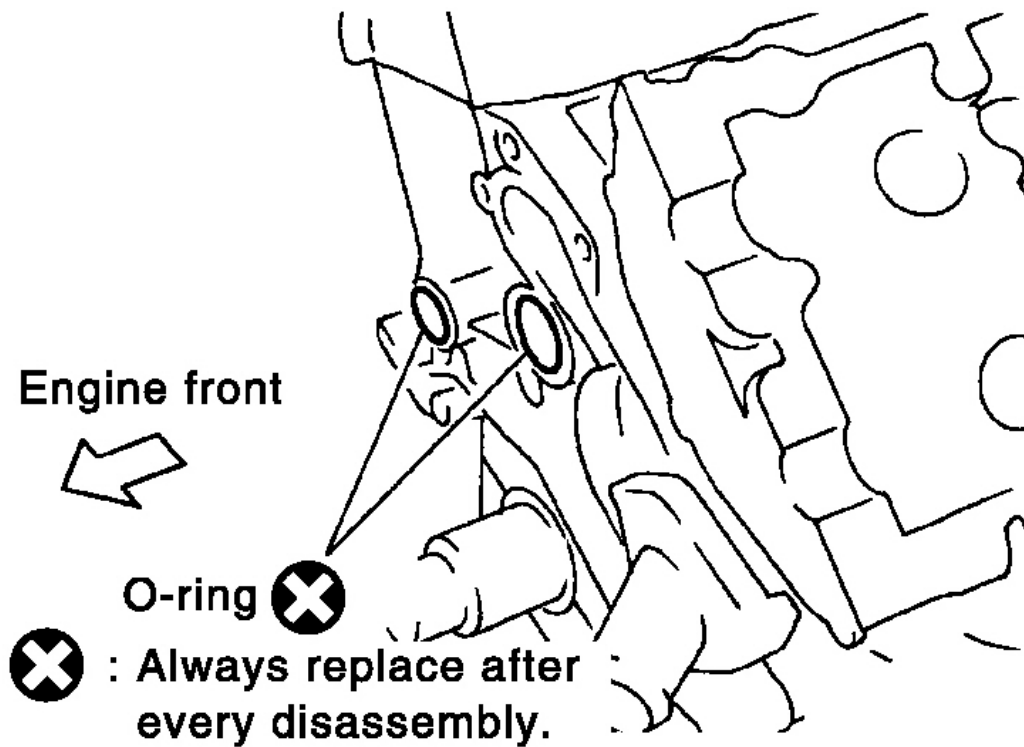
39. Remove O-rings from cylinder head.



G02208180

Fig. 74: Removing O-Rings From Cylinder Head
Courtesy of NISSAN MOTOR CO., U.S.A.

40. Remove O-rings from cylinder block.



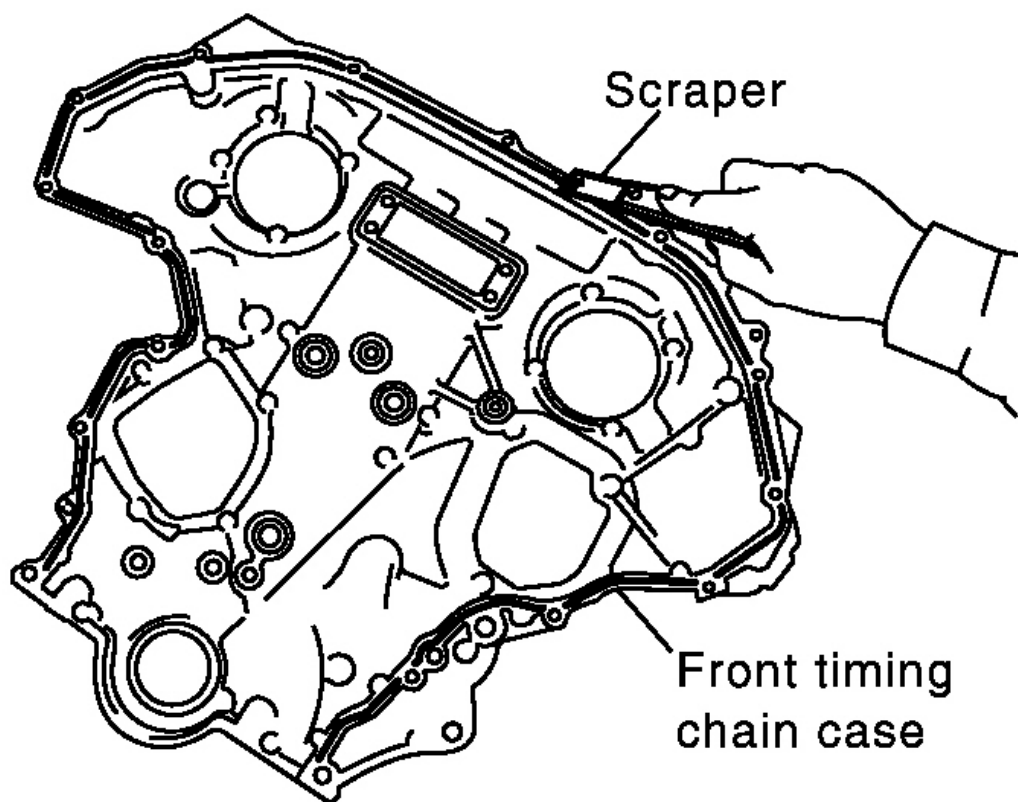
G02208181

Fig. 75: Removing O-Rings From Cylinder Block

Courtesy of NISSAN MOTOR CO., U.S.A.

41. Remove RH and LH camshaft chain tensioners from cylinder head as follows if necessary.
 - a. Remove No. 1 camshaft brackets.

Refer to "**REMOVAL**".
 - b. Remove chain tensioners with stopper pin attached.
42. Use a scraper to remove all traces of liquid gasket from front and rear timing chain case, and opposite mating surfaces.

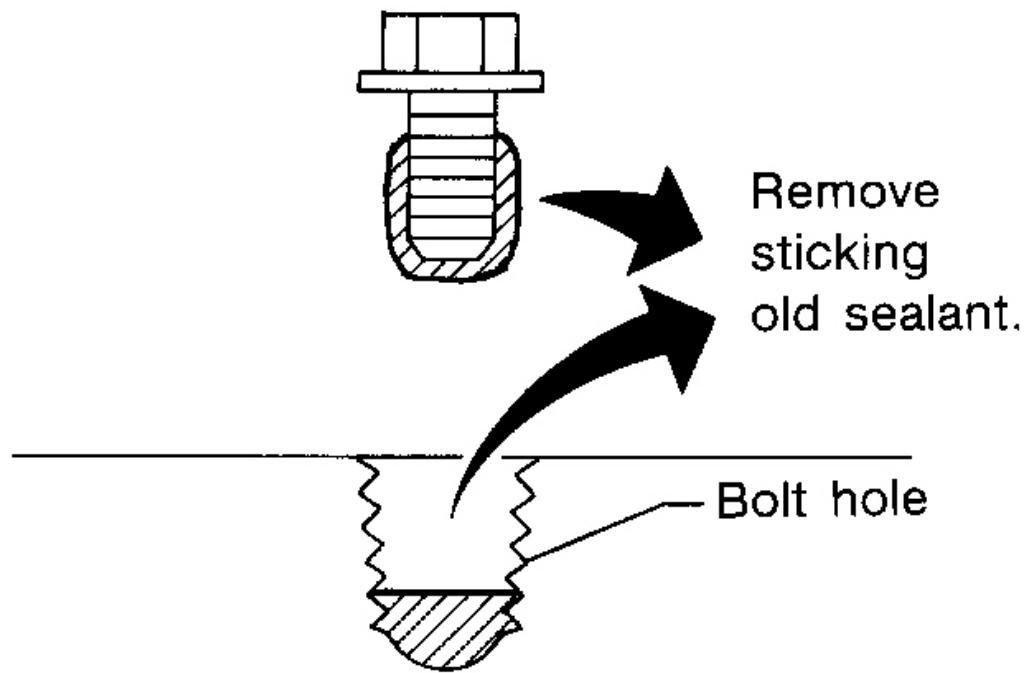


G02208182

Fig. 76: Removing Traces Of Liquid Gasket From Front And Rear Timing Chain Case, And Opposite Mating Surfaces

Courtesy of NISSAN MOTOR CO., U.S.A.

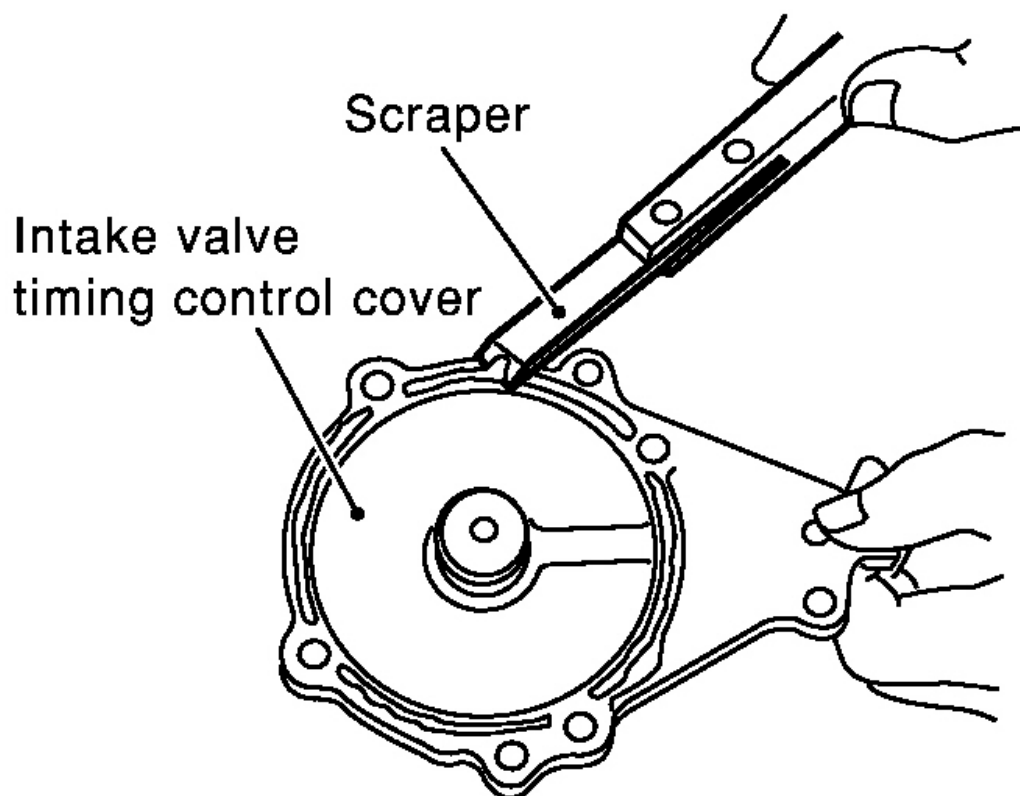
- Remove old liquid gasket from the bolt hole and thread.



G02208183

Fig. 77: Removing Old Liquid Gasket From Bolt Hole And Thread
Courtesy of NISSAN MOTOR CO., U.S.A.

43. Use a scraper to remove all traces of liquid gasket from intake valve timing control cover, water pump cover and chain tensioner covers.
44. Remove front oil seal from front timing chain case. Refer to "**FRONT OIL SEAL**".
45. Remove water pump cover and chain tensioner cover from front timing chain case if necessary.



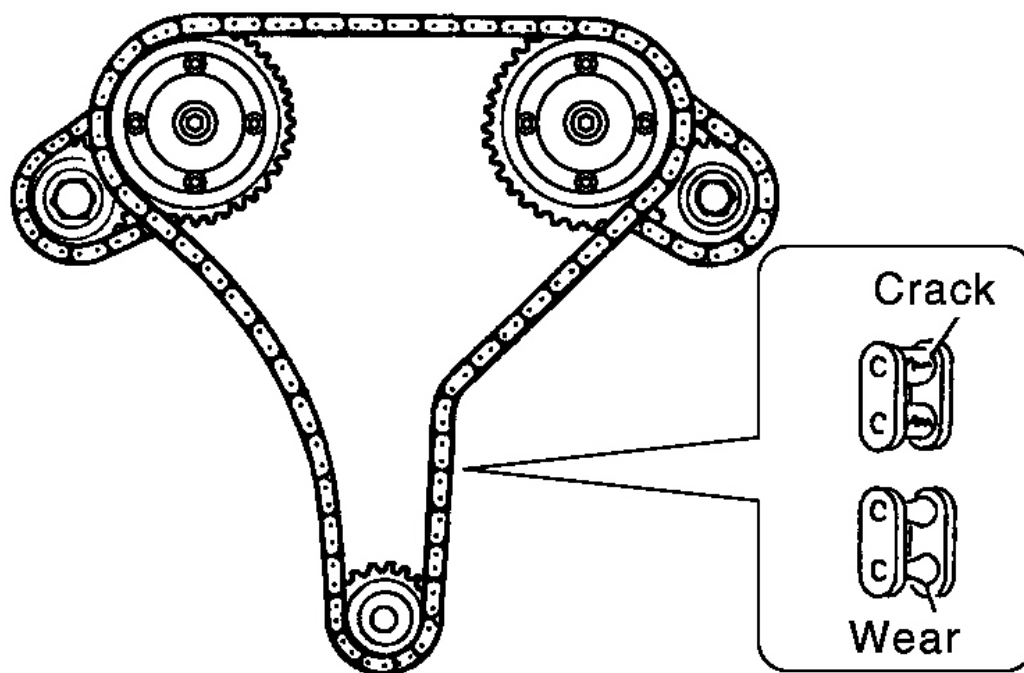
G02208184

Fig. 78: Removing Water Pump Cover And Chain Tensioner Cover From Front Timing Chain Case

Courtesy of NISSAN MOTOR CO., U.S.A.

INSPECTION

Check for cracks and excessive wear at roller links. Replace chain if necessary.

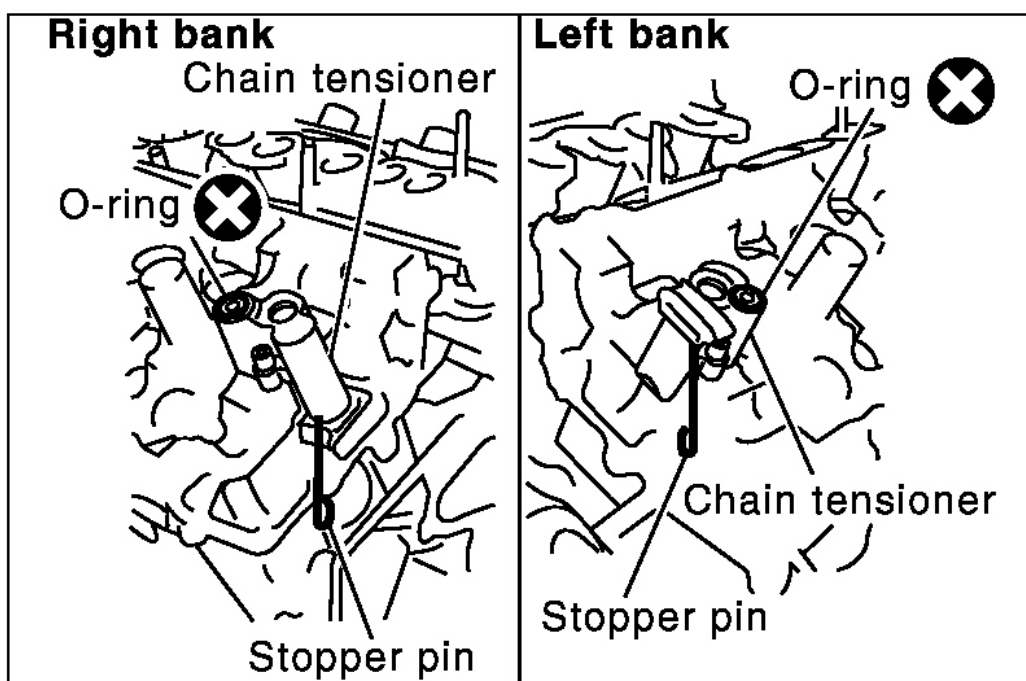


G02208185

Fig. 79: Forcing Cracks And Excessive Wear At Roller Links
Courtesy of NISSAN MOTOR CO., U.S.A.

INSTALLATION

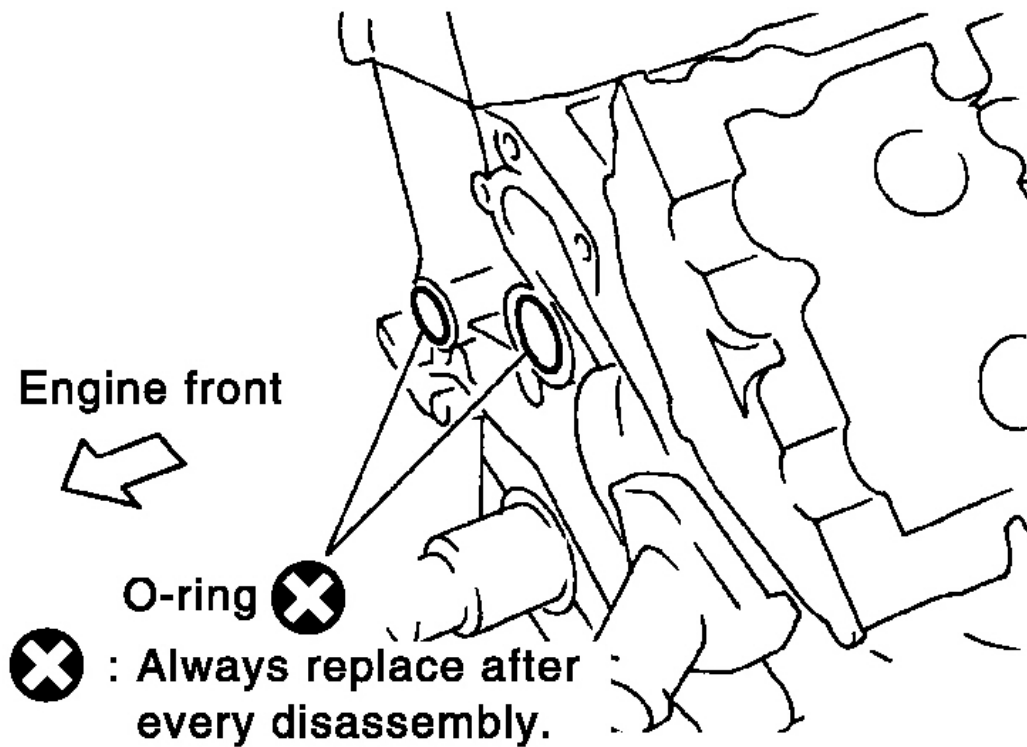
1. Install RH and LH camshaft chain tensioners to cylinder head as follows if removed.
 - a. Install chain tensioners with stopper pin attached and new O-ring.
 - b. Install No. 1 camshaft brackets.



G02208186

Fig. 80: Installing RH And LH Camshaft Chain Tensioners To Cylinder Head
Courtesy of NISSAN MOTOR CO., U.S.A.

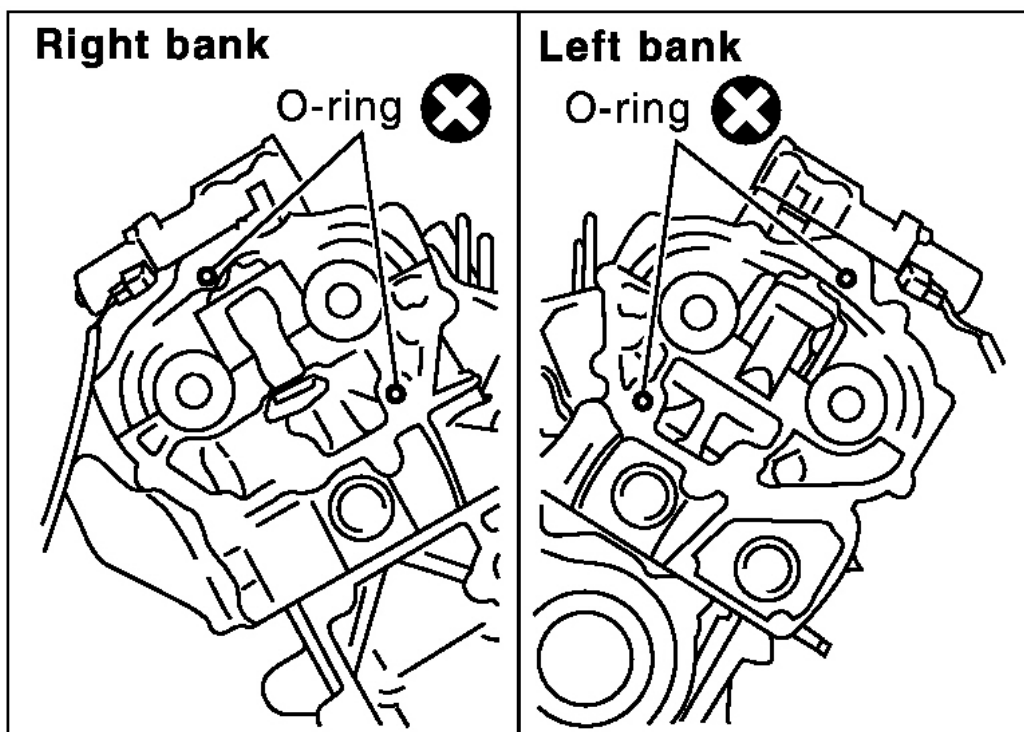
2. Install new O-rings to cylinder block if rear timing chain case is removed.



G02208187

Fig. 81: Installing O-Rings To Cylinder Block
Courtesy of NISSAN MOTOR CO., U.S.A.

3. Install new O-rings to cylinder head if rear timing chain case is removed.
4. Apply liquid gasket to rear timing chain case. Refer to "**POSITION FOR APPLYING LIQUID GASKET**".



G02208188

Fig. 82: Installing O-Rings To Cylinder Head
 Courtesy of NISSAN MOTOR CO., U.S.A.

5. Align rear timing chain case, if removed, with dowel pins (RH and LH) on cylinder block. Then install it.
 - Do not allow O-ring to drop.

- a. Tighten mounting bolts in order as shown in the figure.
 - Install two types of mounting bolts, referring to the following instructions and figure.

Bolt length:

20 mm (0.79 in) (1, 2, 3, 6, 7, 8, 9, and 10 in the figure)

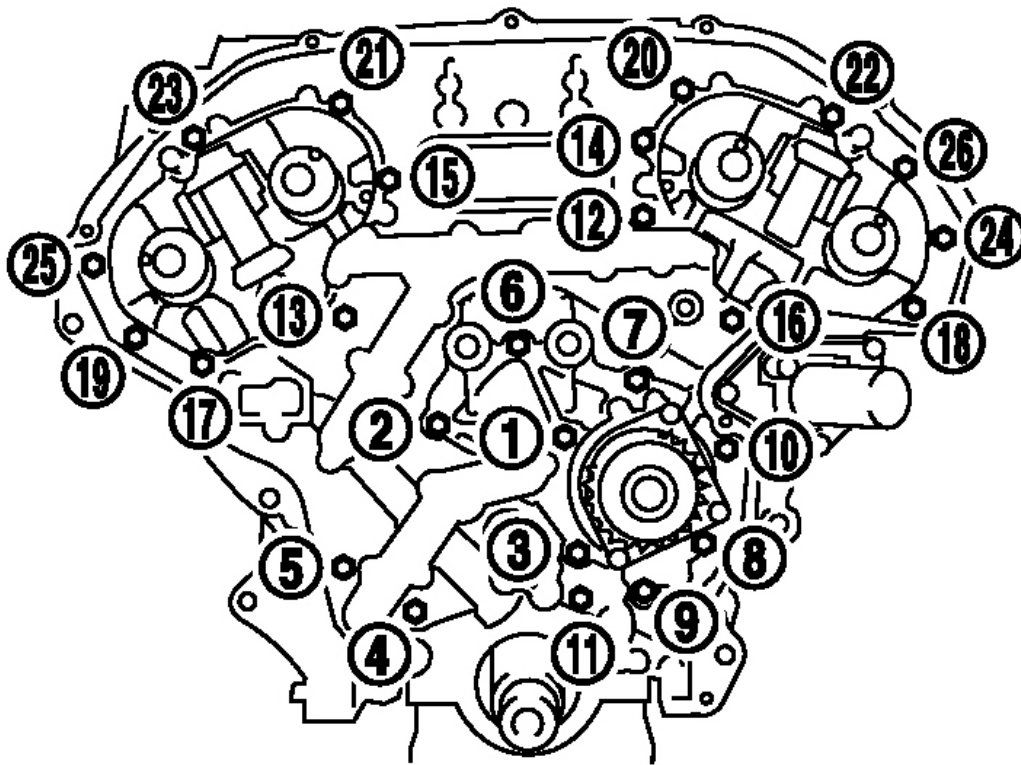
16 mm (0.63 in) (other than the above)

- b. After all bolts are temporarily tightened, retighten them to specified torque in order shown in the figure.
6. After installing rear timing chain case, check surface height difference between following parts on oil pan mounting surface.

Standard**Rear timing chain case to cylinder block:**

-0.24 to 0.14 mm (-0.0094 to 0.0055 in)

- If not within standard, repeat above installation procedure.



12 - 13 N•m

(1.2 - 1.4 kg-m, 9 - 10 ft-lb)

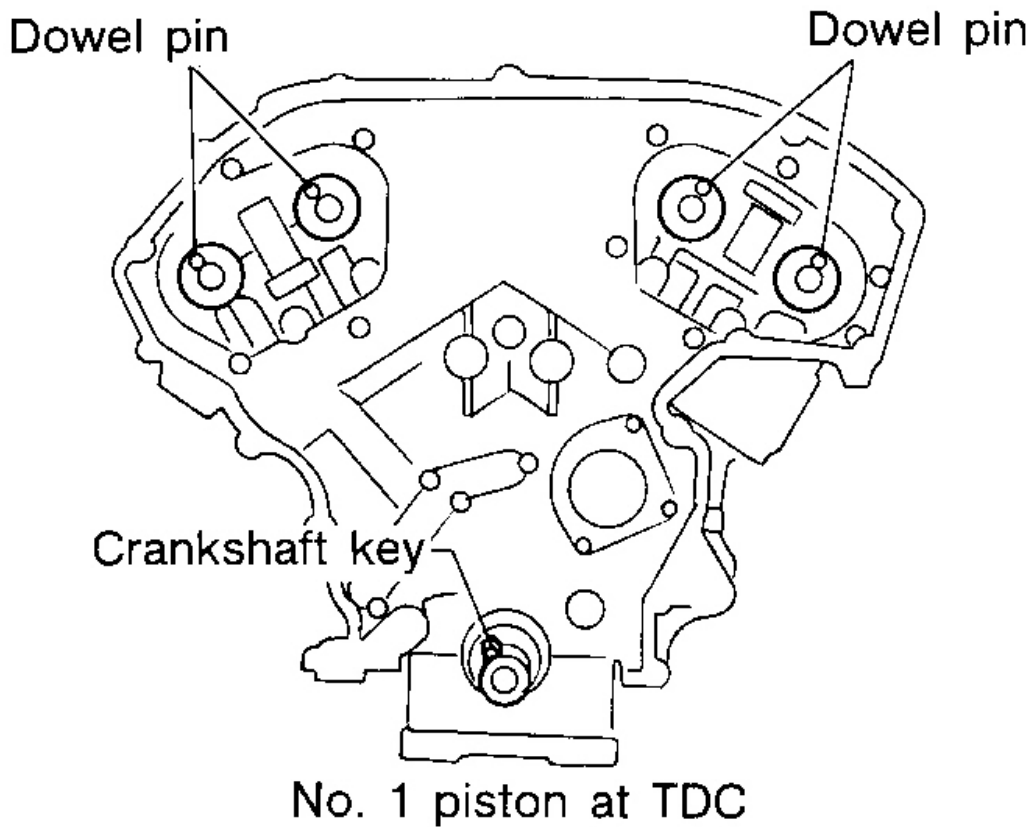
G02208189

Fig. 83: Tightening Rear Timing Chain Case Mounting Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

7. Make sure that camshaft and crankshaft are at TDC position of No. 1 cylinder.
 - Make sure that dowel pin and crankshaft key are located as shown in the figure.

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

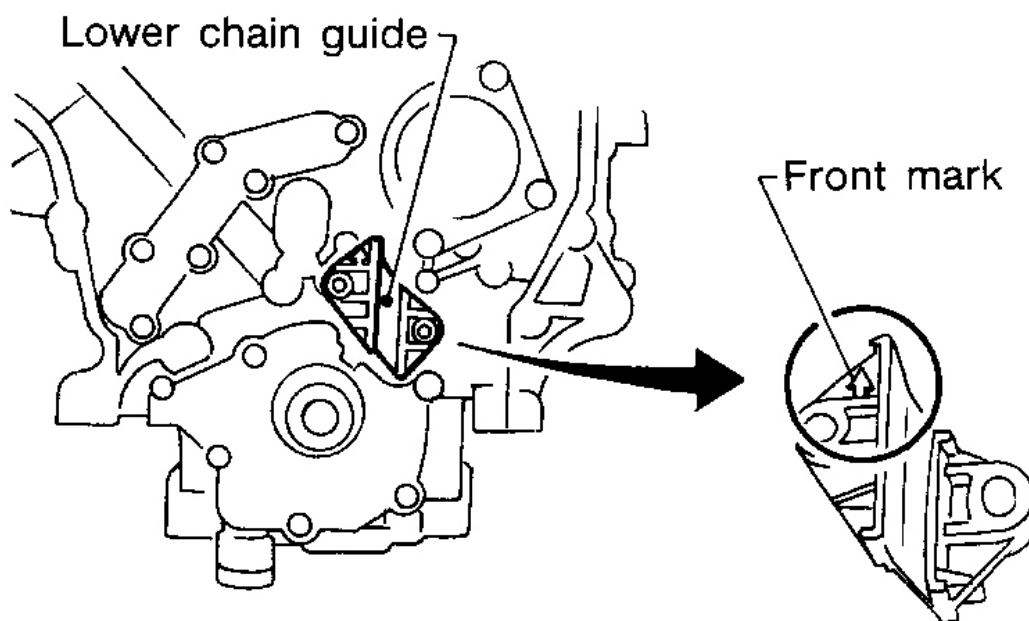
Crankshaft key: At cylinder head side of RH bank



G02208190

Fig. 84: Identifying Dowel Pin Location
Courtesy of NISSAN MOTOR CO., U.S.A.

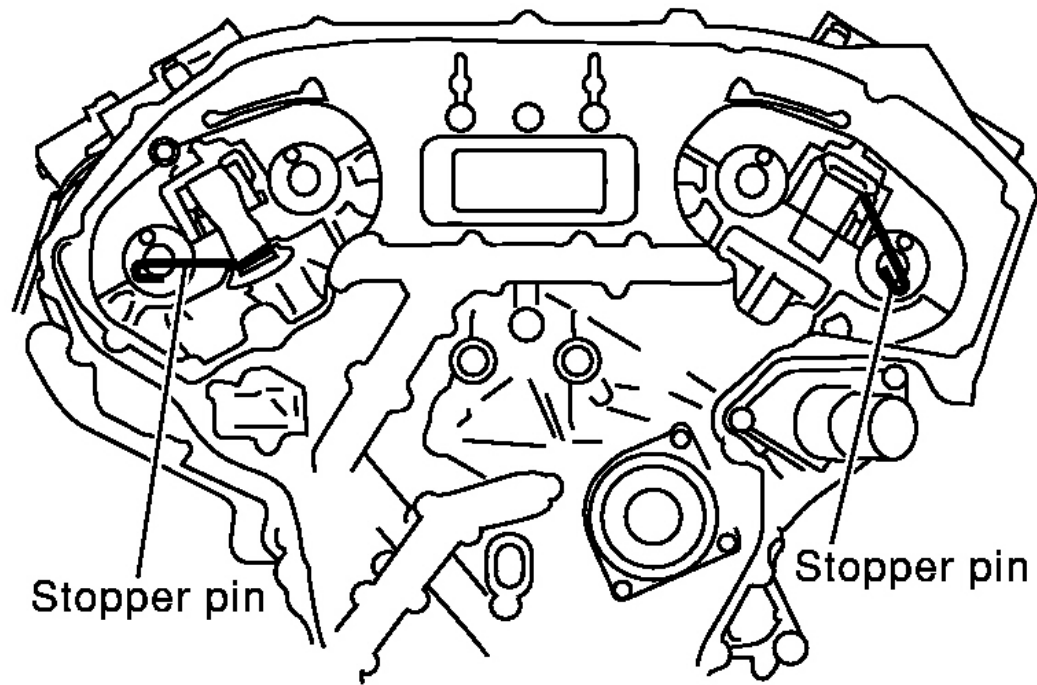
8. Install lower chain guide on dowel pin, with front mark on the guide facing upside.



G02208191

Fig. 85: Installing Lower Chain Guide On Dowel Pin
Courtesy of NISSAN MOTOR CO., U.S.A.

9. Install secondary timing chain and camshaft sprockets.
 - a. Press and shrink the secondary chain tensioner sleeve, and fix it using stopper pins.
 - Lubricate threads and seat surfaces of camshaft sprocket bolts with new engine oil.



G02208192

Fig. 86: Identifying Stopper Pins Location
Courtesy of NISSAN MOTOR CO., U.S.A.

- b. Install secondary timing chain and sprocket.
- Align mating marks (golden links) on secondary timing chain with those (punched marks) on the intake and exhaust sprockets.
 - Align camshaft dowel pins with the sprocket groove and hole.
 - Because camshaft sprocket mounting bolts are tightened in step 10, perform manual tightening to the extent necessary to keep camshaft dowel pin from dislocating.

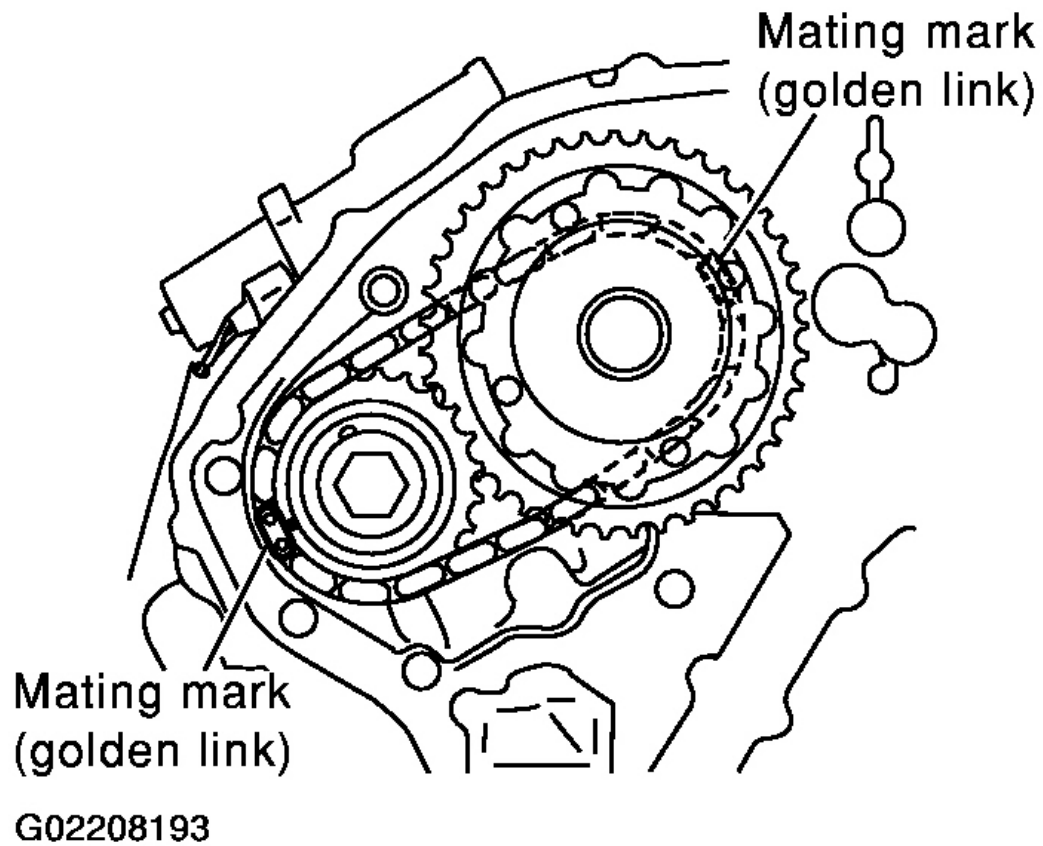
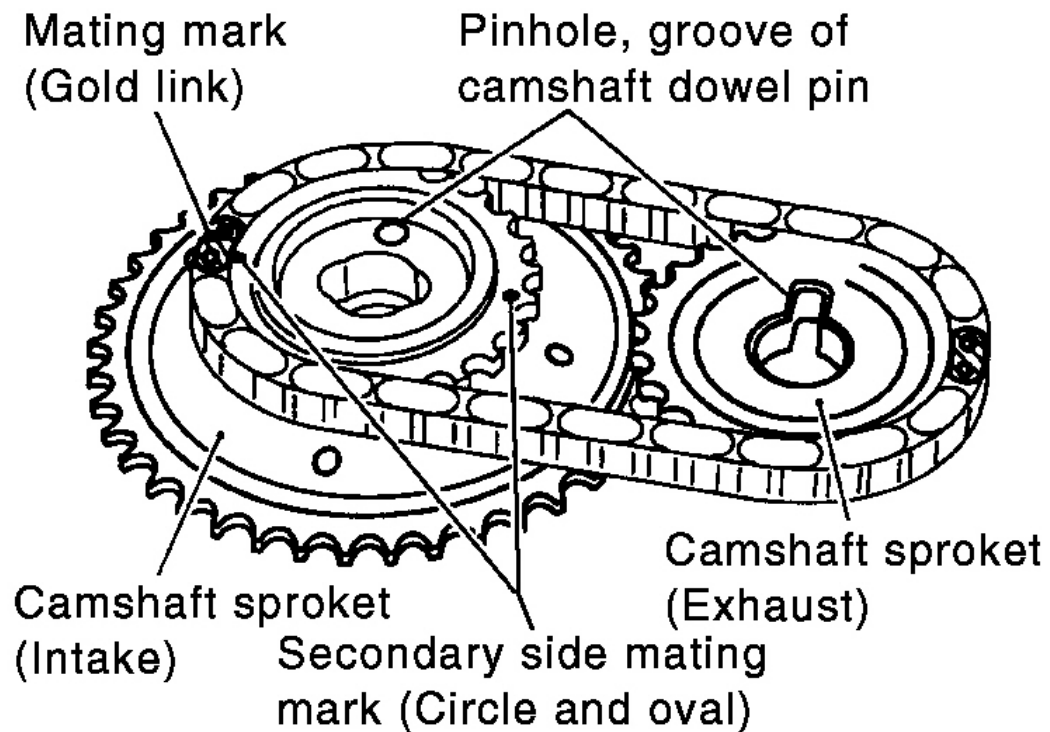


Fig. 87: Aligning Camshaft Dowel Pins With Sprocket Groove And Hole
Courtesy of NISSAN MOTOR CO., U.S.A.

- Matching marks of the intake sprocket are on the back side of the secondary sprockets. There are two types of the marks; round and oval types, which should be used for right and left banks respectively.

Right bank: Circle

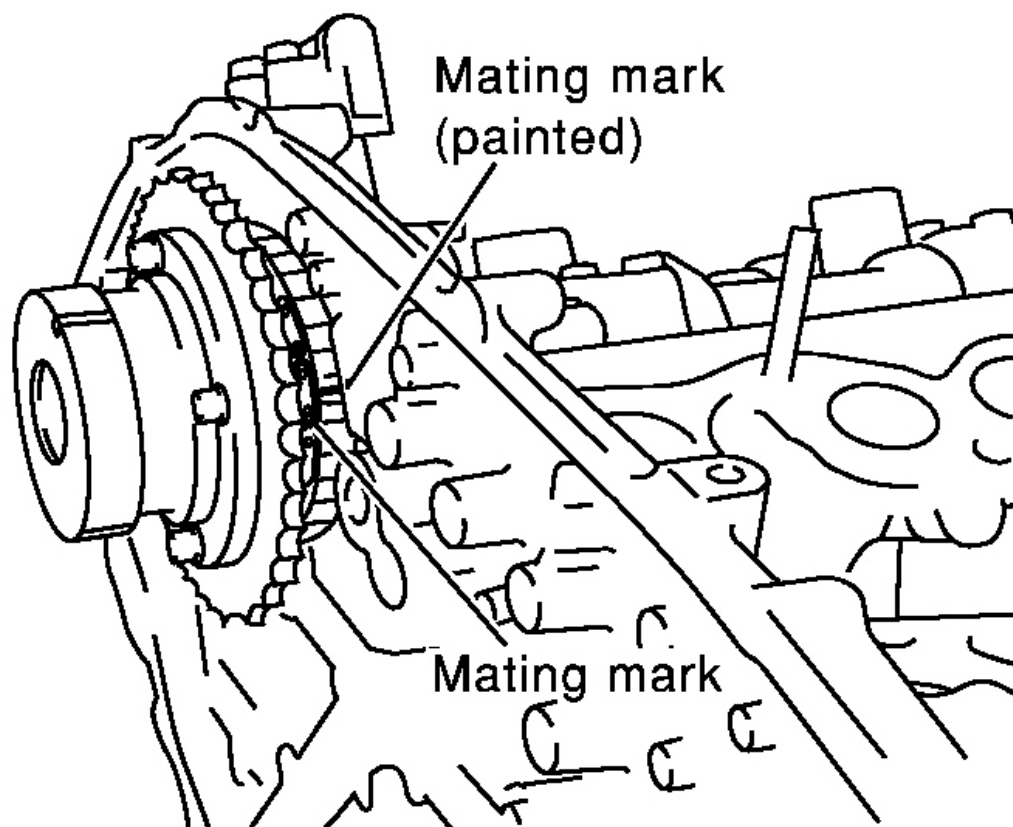
Left bank: Oval



G02208194

Fig. 88: Identifying Matching Marks Position
Courtesy of NISSAN MOTOR CO., U.S.A.

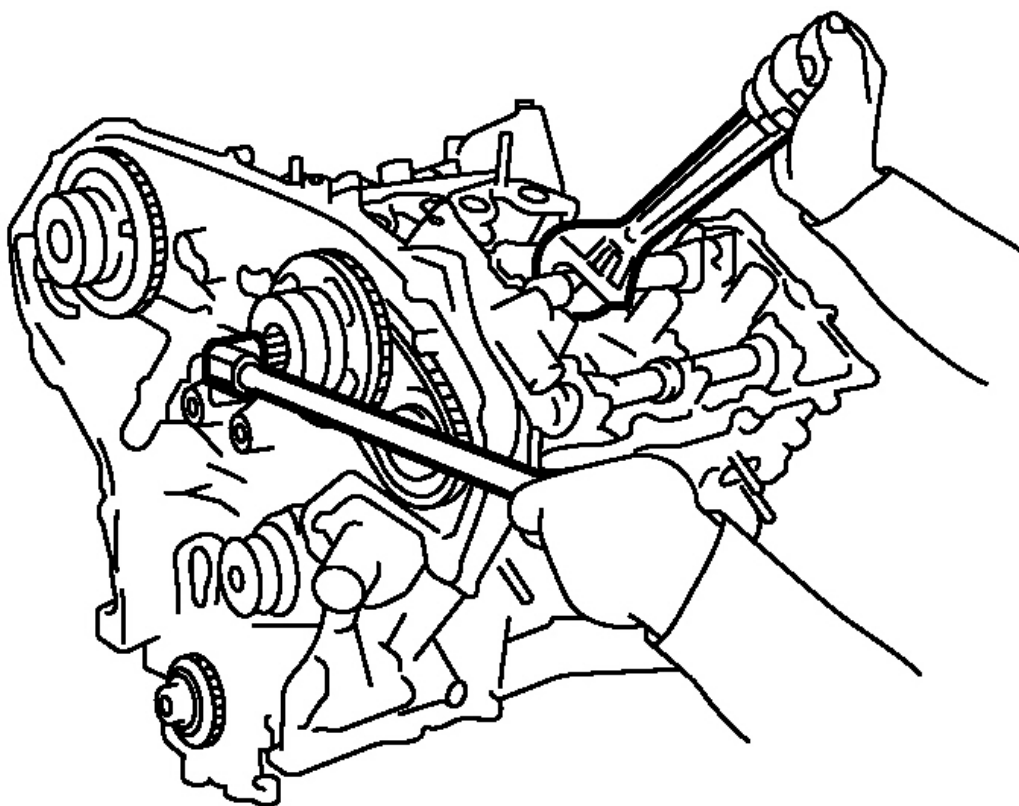
- It may be difficult to visually check the dislocation of mating marks during and after installation. To make the matching easier, make a mating mark on top of the sprocket teeth and its extended line in advance with paint.



G02208195

Fig. 89: Identifying Mating Marks Location
Courtesy of NISSAN MOTOR CO., U.S.A.

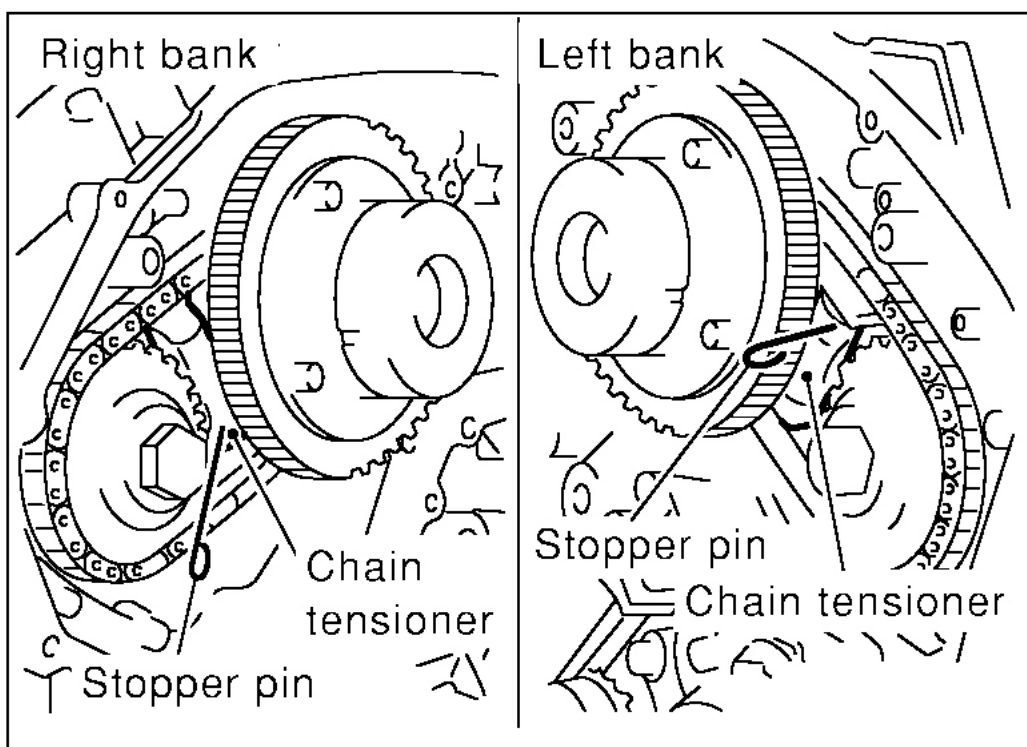
10. After confirming the mating marks are aligned, tighten the camshaft sprocket mounting bolts.
 - Secure the camshaft hexagonal head using a spanner to tighten mounting bolts.



G02208196

Fig. 90: Tightening Mounting Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

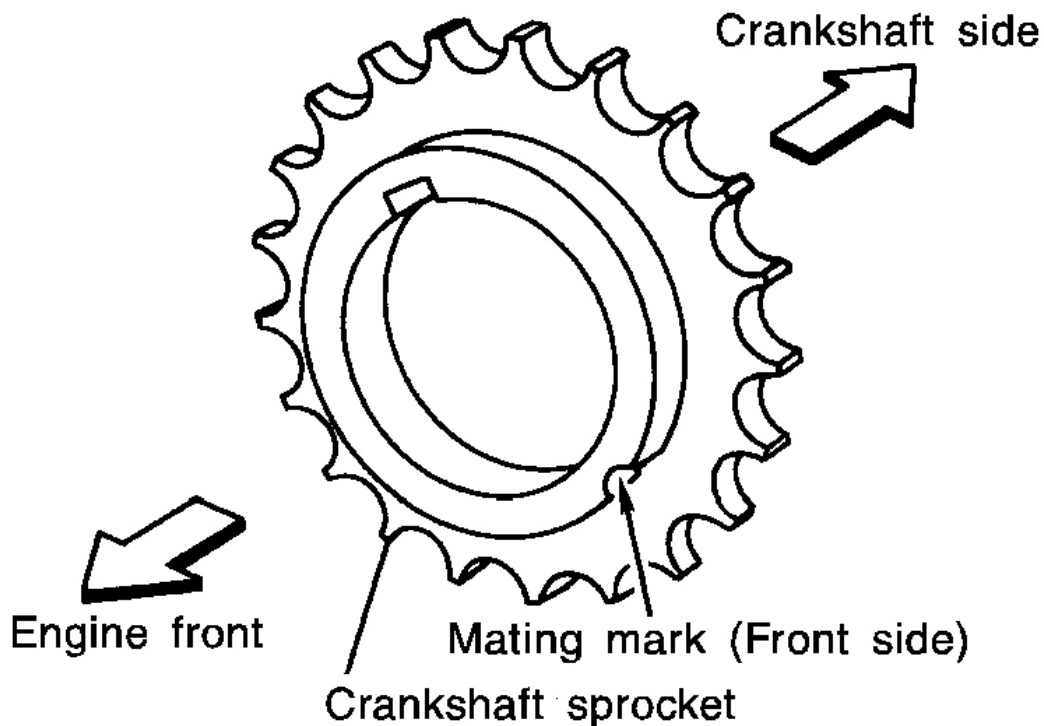
11. Pull out the stopper pin from the secondary timing chain tensioner.
12. Install primary timing chain.



G02208197

Fig. 91: Installing Primary Timing Chain
Courtesy of NISSAN MOTOR CO., U.S.A.

- Install crankshaft sprocket, with mating mark to timing chain facing front of engine.

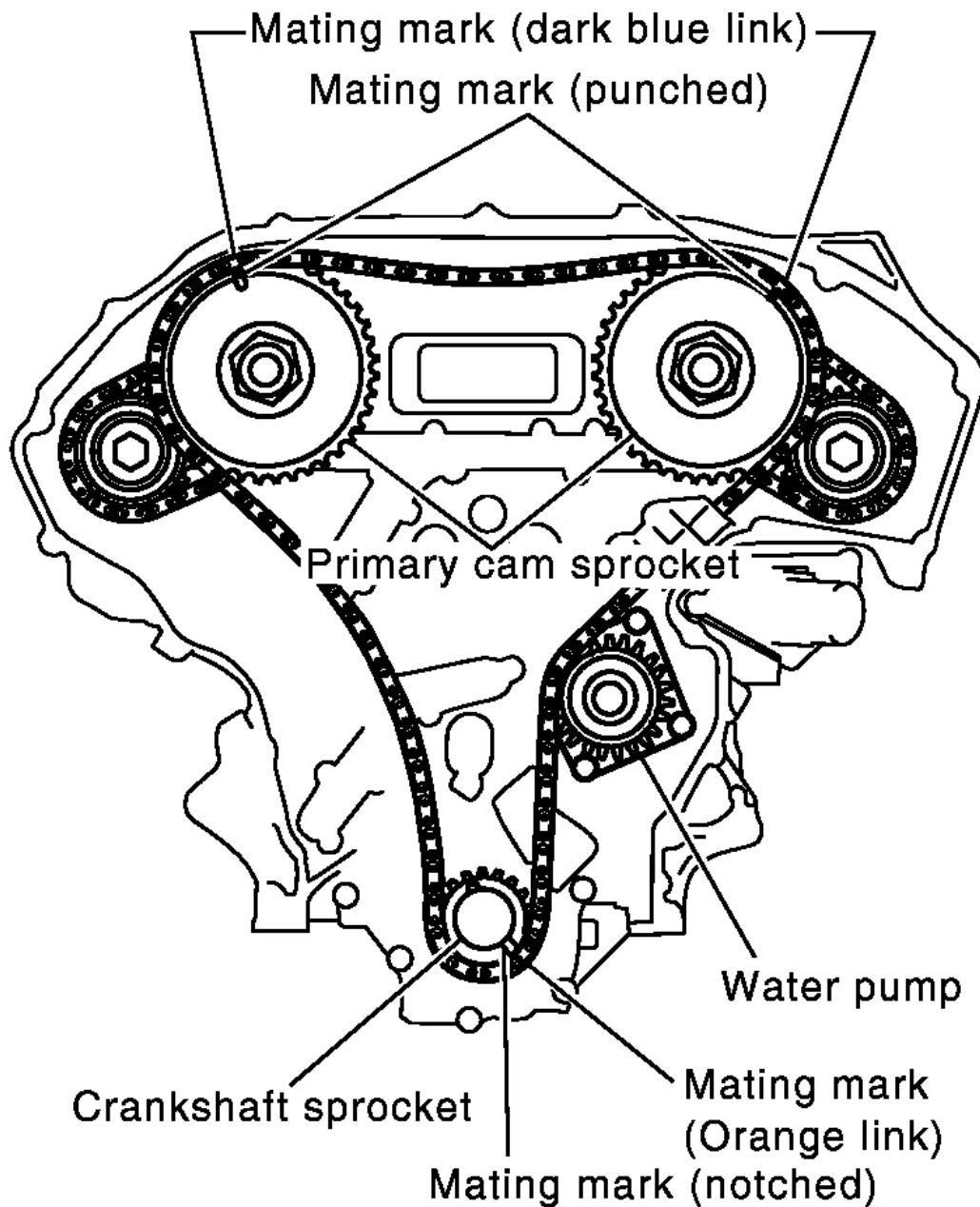


G02208198

Fig. 92: Installing Crankshaft Sprocket, With Mating Mark To Timing Chain Facing Front Of Engine

Courtesy of NISSAN MOTOR CO., U.S.A.

- Install primary timing chain so that mating mark (punched) on camshaft sprocket is aligned with that (dark blue link) on the timing chain, and mating mark (notched) on crankshaft sprocket is aligned with that (orange link) on the timing chain, respectively.
- When it is difficult to align mating marks of the primary timing chain with each sprocket, gradually turn the camshaft hexagonal head using a spanner so it is aligned with the mating mark.
- During alignment, be careful to prevent dislocation of mating marks on the secondary timing chain.



G02208199

Fig. 93: Aligning Mating Mark On Camshaft Sprocket And Crankshaft Sprocket
Courtesy of NISSAN MOTOR CO., U.S.A.

13. Install internal guide.
14. Install upper tension guide and slack guide.

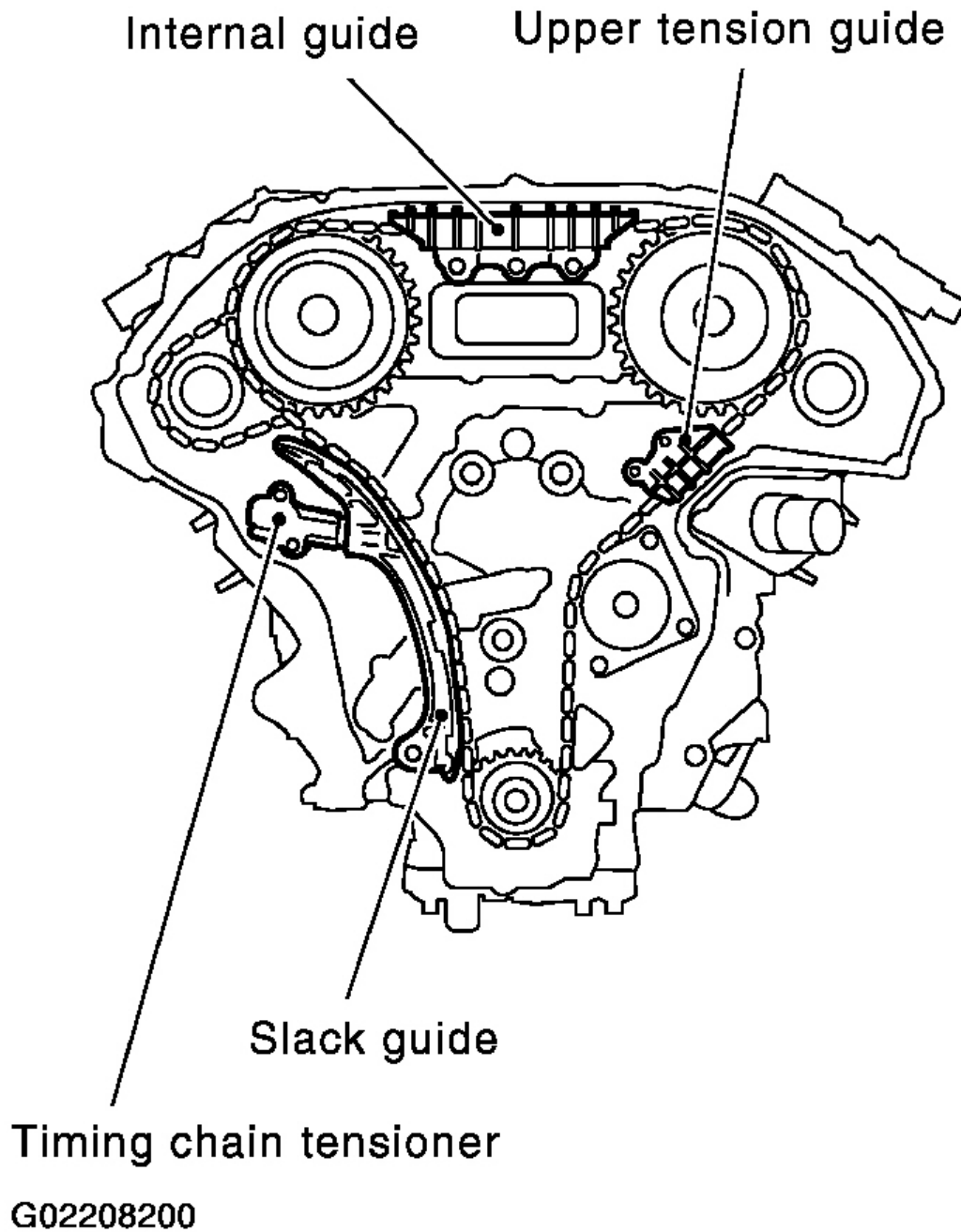
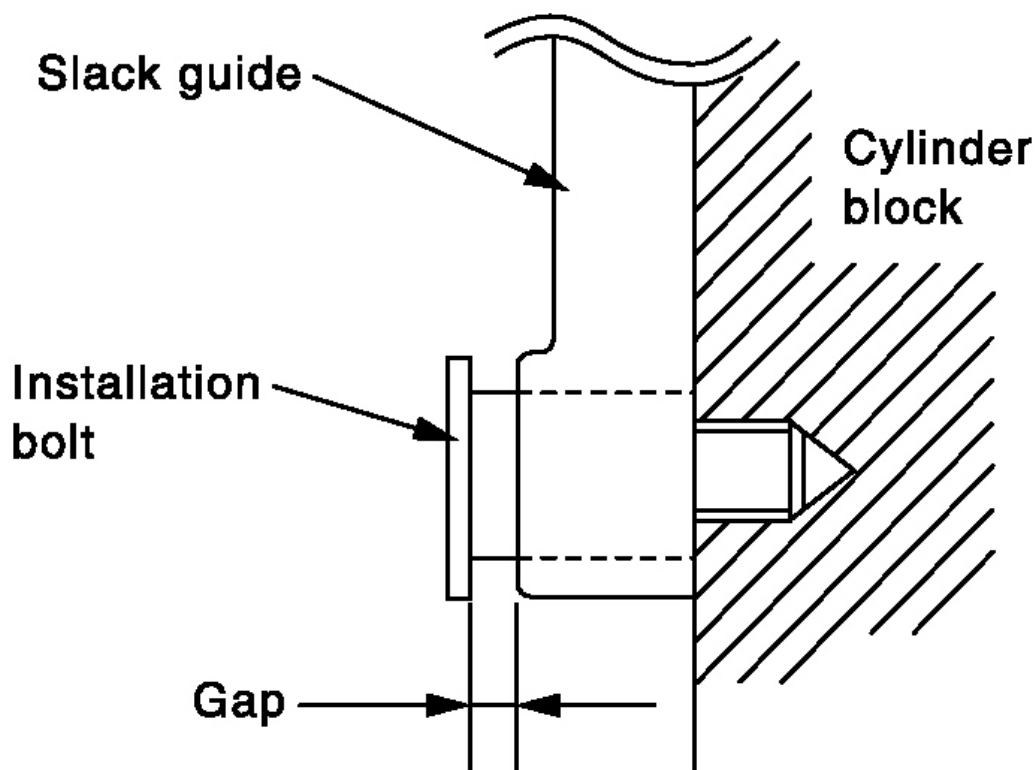


Fig. 94: Installing Upper Tension Guide And Slack Guide
 Courtesy of NISSAN MOTOR CO., U.S.A.

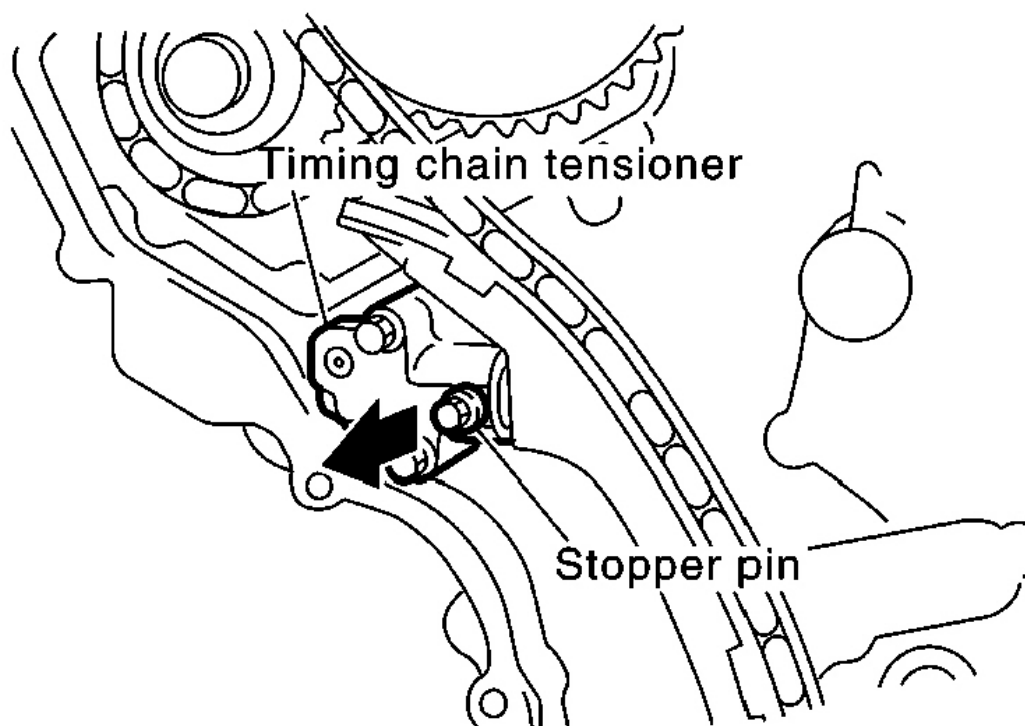
- Do not overtighten the slack guide mounting bolts. It is normal for a gap to exist under the bolt seats when the mounting bolts are tightened to specification.



G02208201

Fig. 95: Identifying Slack Guide Mounting Bolts Positions
Courtesy of NISSAN MOTOR CO., U.S.A.

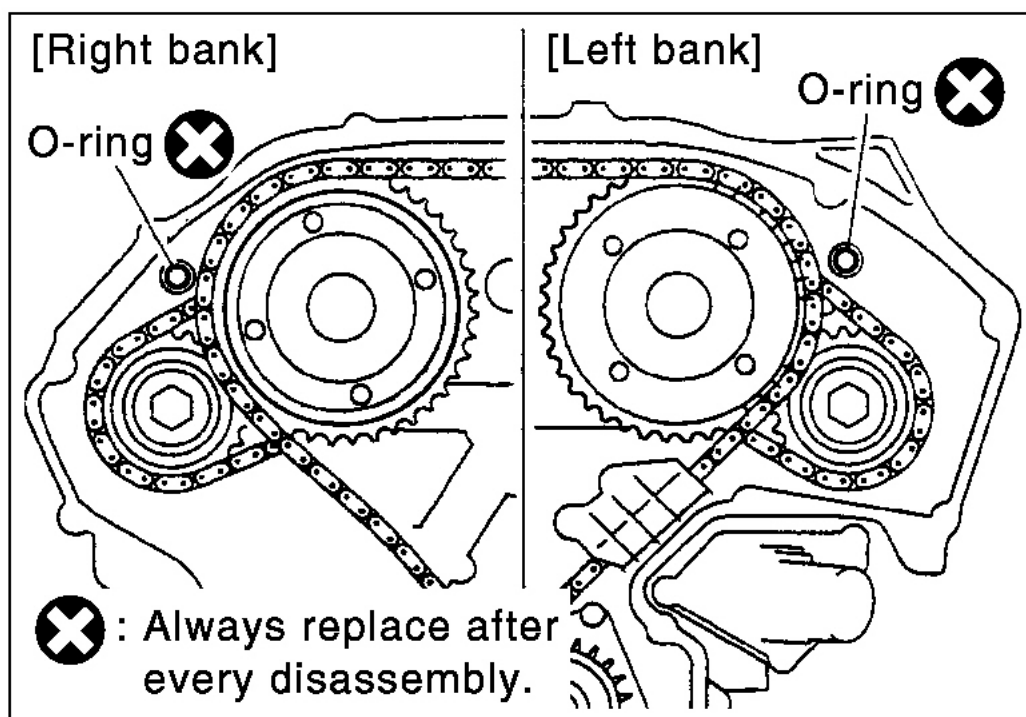
15. Install timing chain tensioner, then remove the stopper pin.
 - **When installing the timing chain tensioner, engine oil should be applied to the oil hole and tensioner.**



G02208202

Fig. 96: Installing Timing Chain Tensioner
Courtesy of NISSAN MOTOR CO., U.S.A.

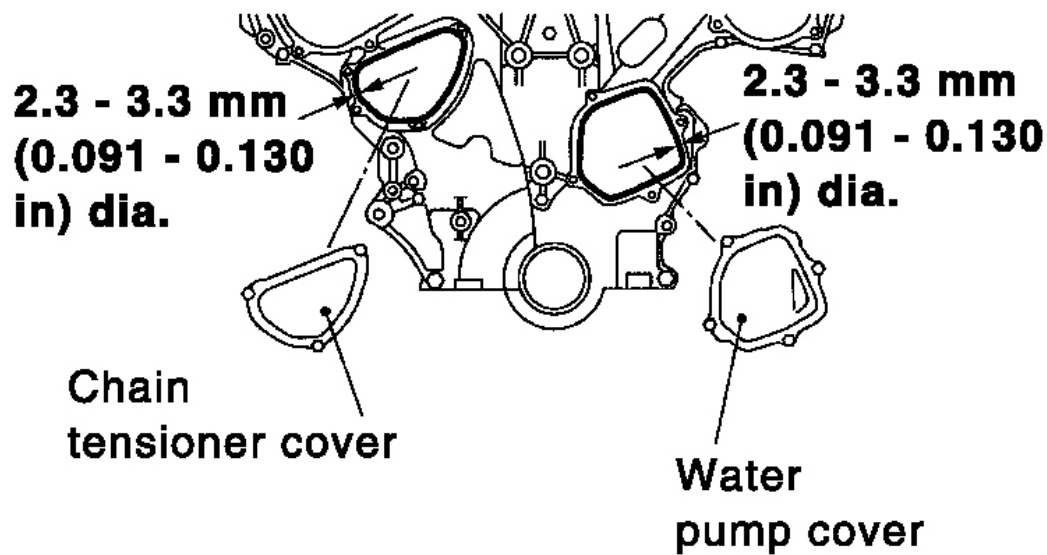
16. Install O-rings on rear timing chain case.



G02208203

Fig. 97: Installing O-Rings On Rear Timing Chain Case
Courtesy of NISSAN MOTOR CO., U.S.A.

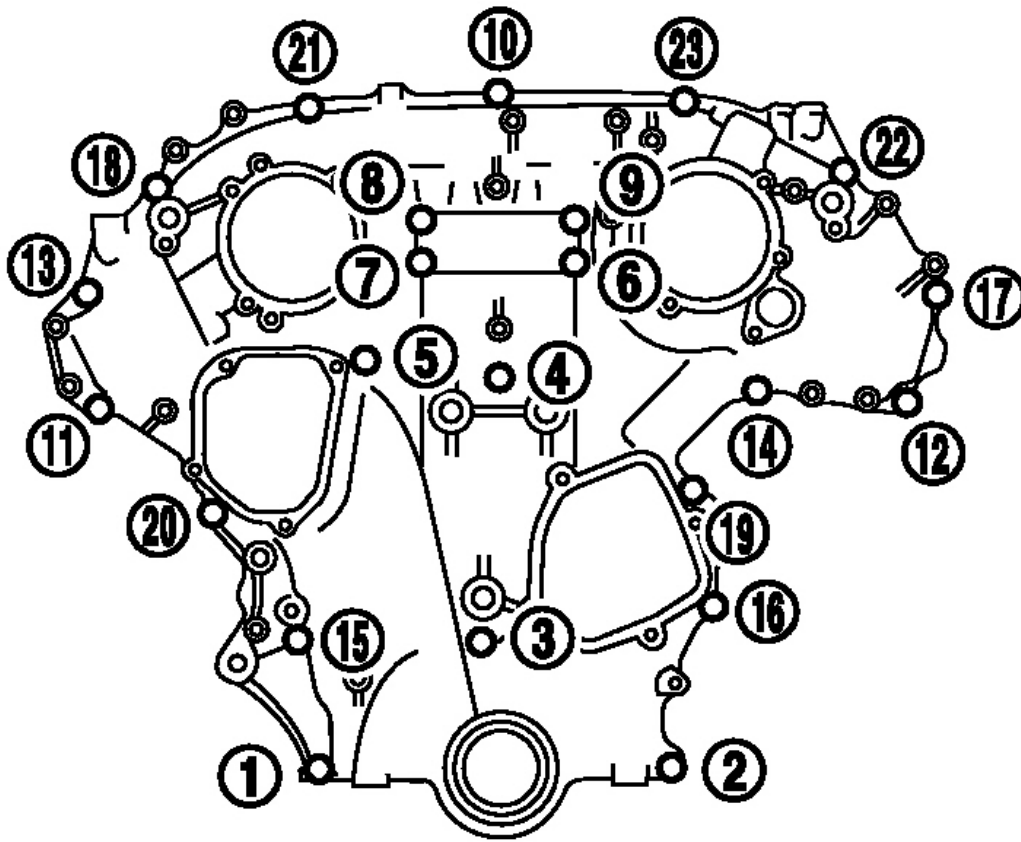
17. Install the water pump cover and the chain tensioner cover to front timing chain case if removed.
 - Apply RTV silicone sealant or equivalent. Refer to **RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS**.
18. Install new front oil seal, then apply liquid gasket to front timing chain case.
 - Refer to "**OIL SEAL INSTALLATION DIRECTION**", .
 - Refer to "**POSITION FOR APPLYING LIQUID GASKET**", .
 - **Before installation, wipe off the protruding sealant.**



G02208204

Fig. 98: Installing The Water Pump Cover And The Chain Tensioner Cover
Courtesy of NISSAN MOTOR CO., U.S.A.

19. Install rear timing chain case pin into dowel pin hole on front timing chain case.
20. Tighten bolts to the specified torque in order shown in the figure.
 - **Leave the bolts unattended for 30 minutes or more after tightening.**



- ① - ②** 8 mm dia. bolts
 25.5 - 31.4 N•m
 (2.6 - 3.2 kg-m, 18.8 - 23.1 ft-lb)
- ③ - ②③** 6 mm dia. bolts
 11.8 - 13.7 N•m
 (1.2 - 1.4 kg-m, 8.7 - 10.1 ft-lb)

G02208205

Fig. 99: Tightening Rear Timing Chain Case Bolts To Specified Torque
 Courtesy of NISSAN MOTOR CO., U.S.A.

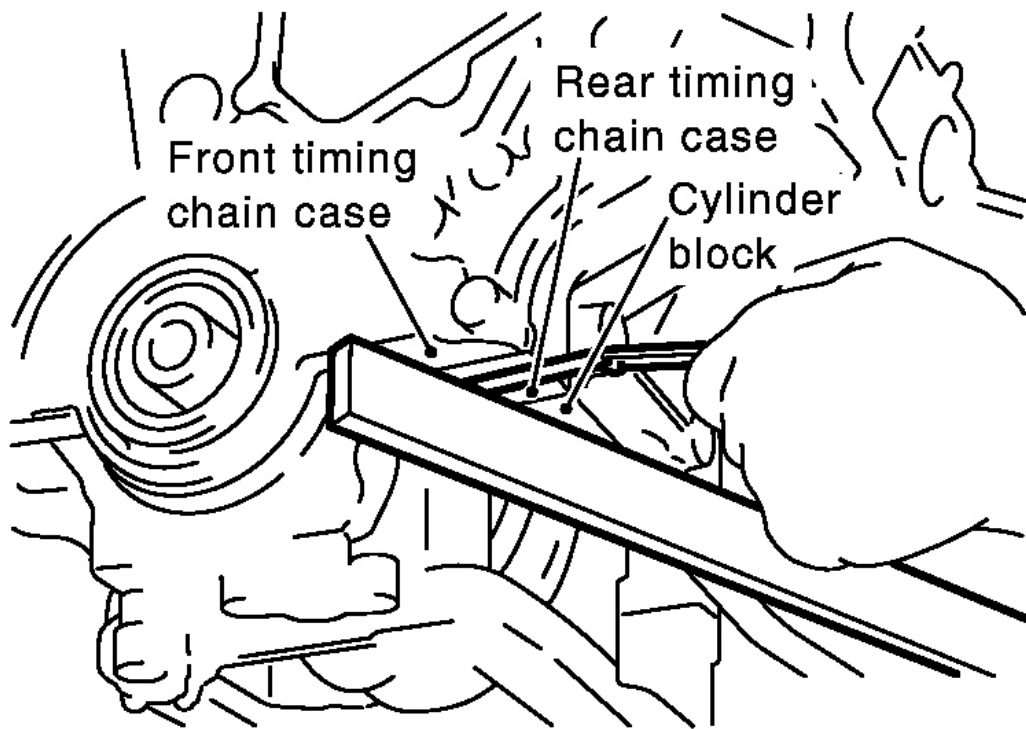
21. After installing front timing chain case, check surface height difference between following parts on oil pan mounting surface.

Standard

Front timing chain case to rear timing chain case:

-0.14 to 0.14 mm (-0.0055 to 0.0055 in)

- If not within standard, repeat above installation procedure.

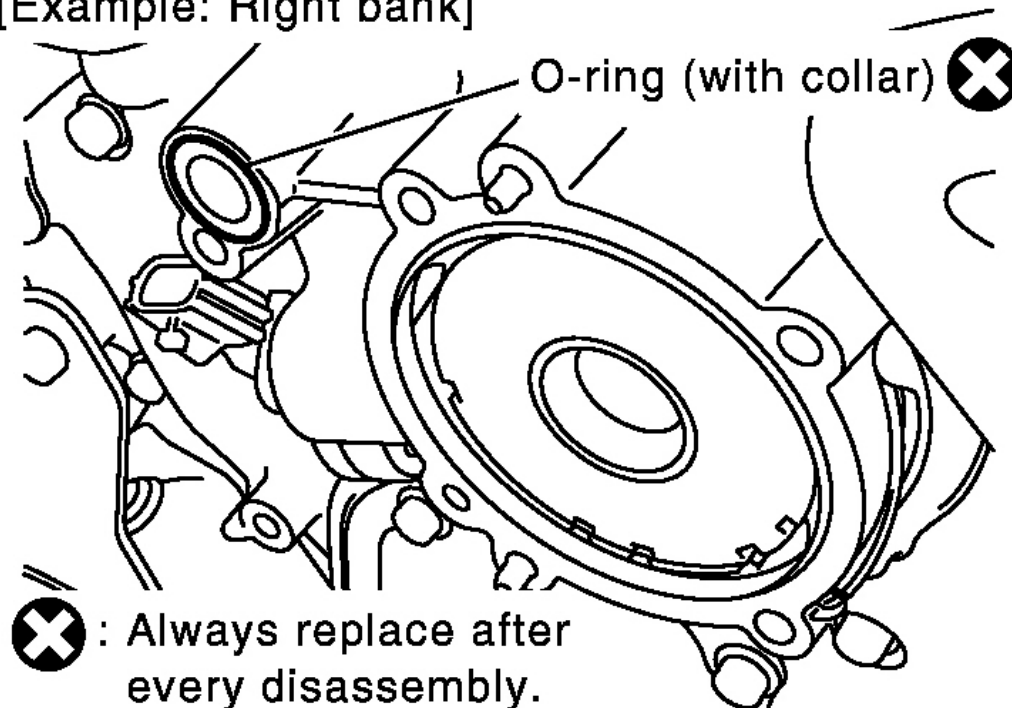


G02208206

Fig. 100: Checking Surface Height Difference Between Oil Pan Mounting Surface
Courtesy of NISSAN MOTOR CO., U.S.A.

22. Install intake valve timing control cover.
- a. Install collared O-rings in front timing chain case oil hole (RH and LH sides).

[Example: Right bank]



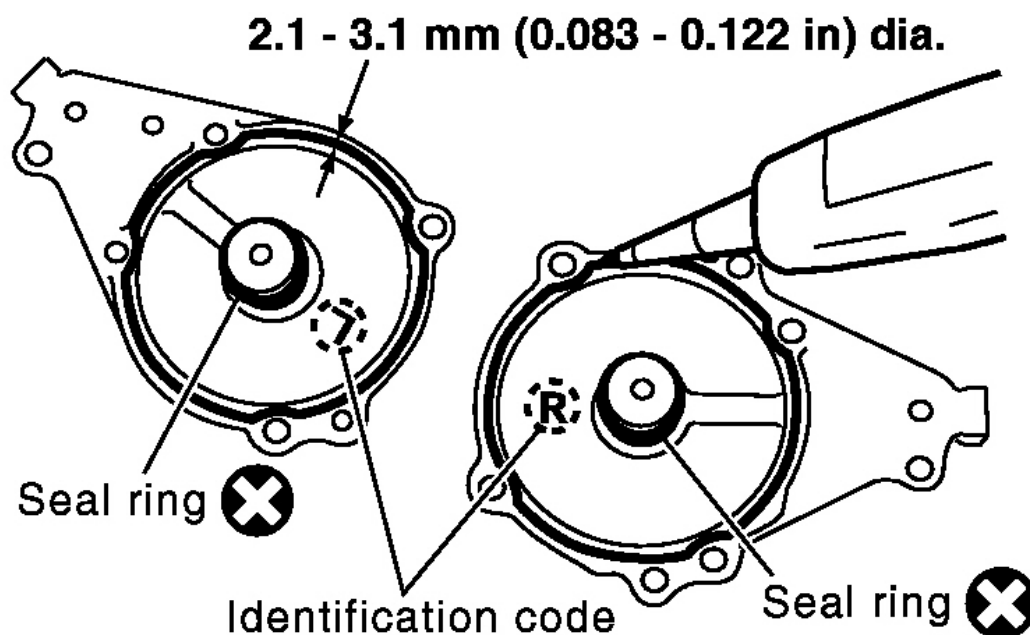
G02208207

Fig. 101: Installing Intake Valve Timing Control Cover
Courtesy of NISSAN MOTOR CO., U.S.A.

- b. Install seal ring at intake valve timing control covers.
- c. Apply liquid gasket to intake valve timing control covers.

Use genuine RTV silicone sealant or equivalent. Refer to **RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS** .

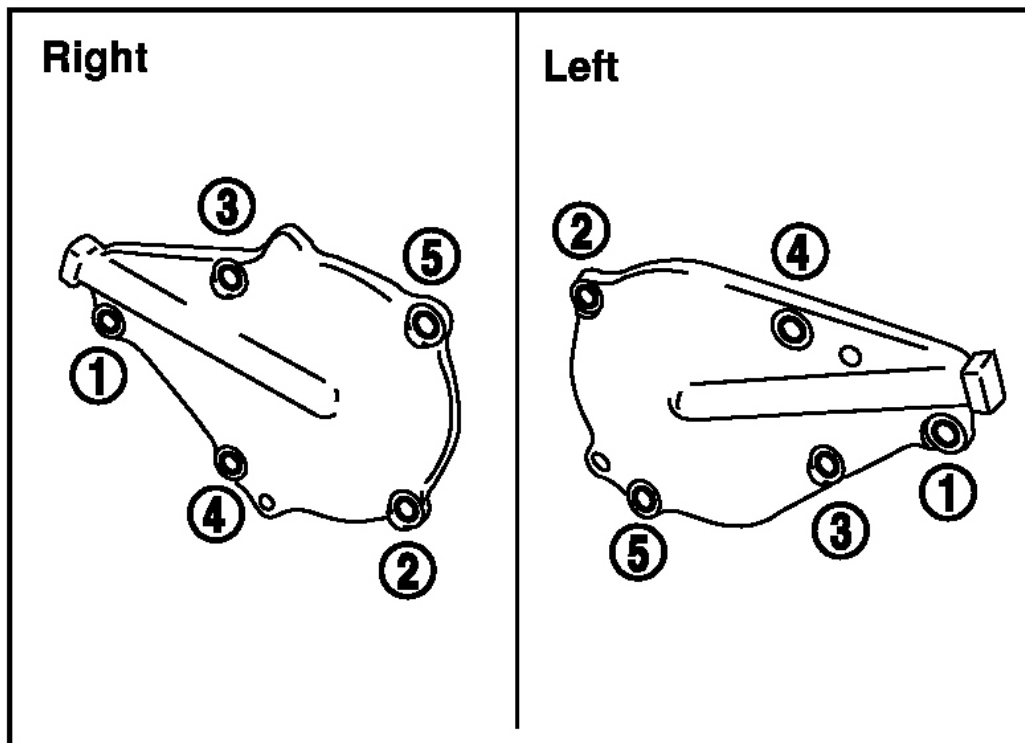
- d. Being careful not to move the seal ring from the installation groove, align the dowel pins on the chain case with the holes to install the intake valve timing control cover.



G02208208

Fig. 102: Installing Seal Ring At Intake Valve Timing Control Covers
Courtesy of NISSAN MOTOR CO., U.S.A.

- e. Tighten in numerical order as shown in the figure.



G02208209

Fig. 103: Tightening In Numerical Order
 Courtesy of NISSAN MOTOR CO., U.S.A.

23. Install RH and LH rocker covers.

Rocker cover tightening procedure:

- **Tighten in numerical order as shown in the figure.**
 - a. Tighten bolts 1 to 10 in that order to 6.9 to 8.8 N.m (0.7 to 0.9 kg-m, 61 to 78 in-lb).
 - b. Then tighten bolts 1 to 10 as indicated in figure to 6.9 to 8.8 N.m (0.7 to 0.9 kg-m, 61 to 78 in-lb).

24. Hang engine using the right and left side engine slingers with a suitable hoist.
25. Set a suitable transmission jack under the suspension member.

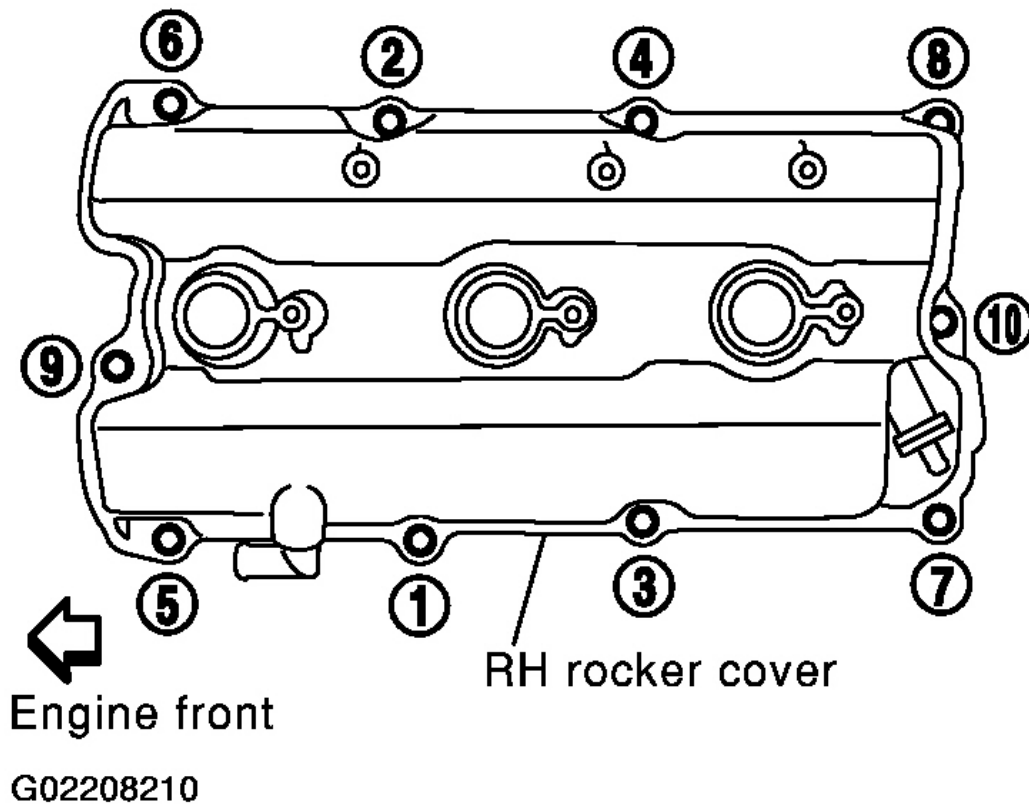


Fig. 104: Installing RH And LH Rocker Covers
Courtesy of NISSAN MOTOR CO., U.S.A.

26. Remove right and left side engine mounting nuts.
27. Remove right and left side suspension member bolts.
28. Install oil pan. Refer to "INSTALLATION".
29. Set ring gear stopper using the mounting bolt hole.
 - Be careful not to damage the signal plate teeth.

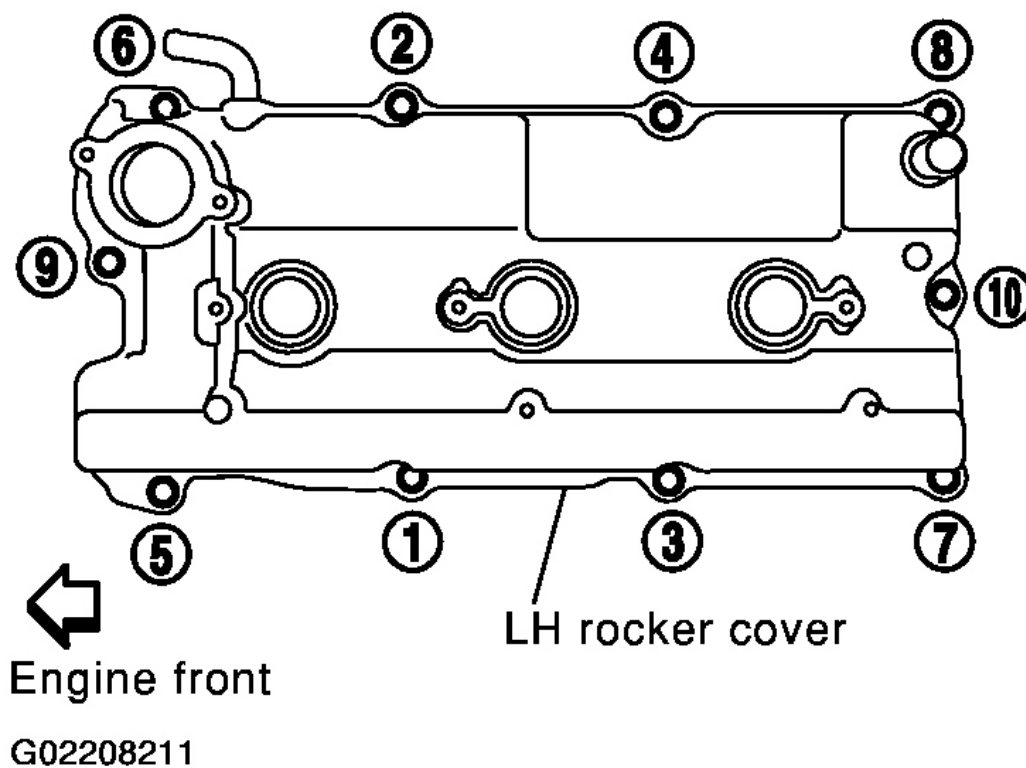
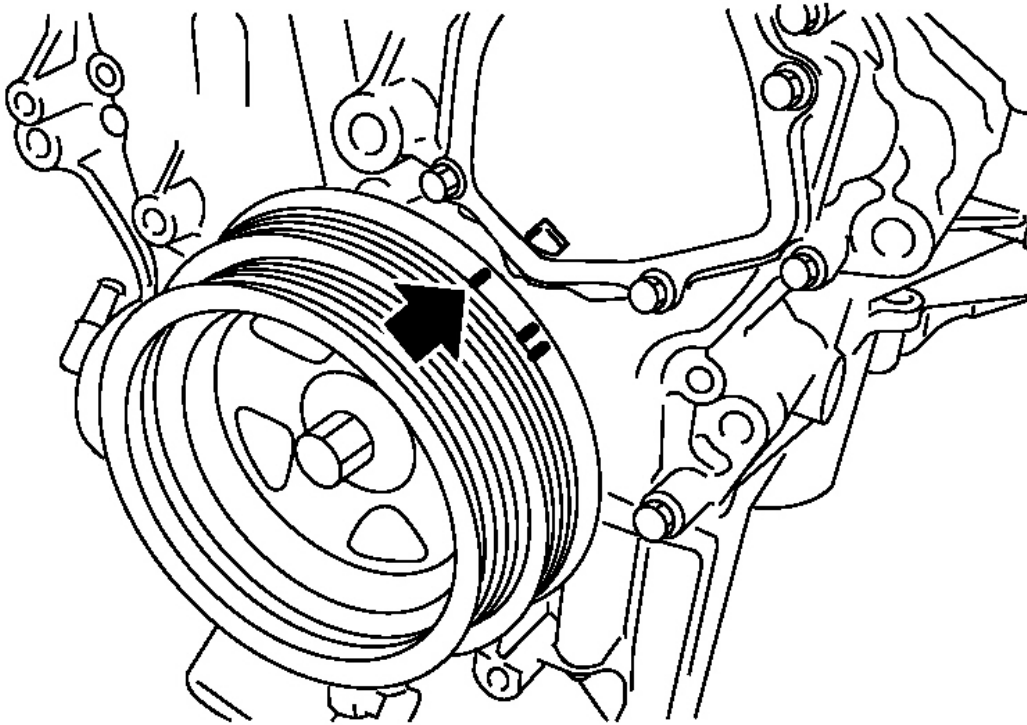


Fig. 105: Removing Right And Left Side Engine Mounting Nuts
Courtesy of NISSAN MOTOR CO., U.S.A.

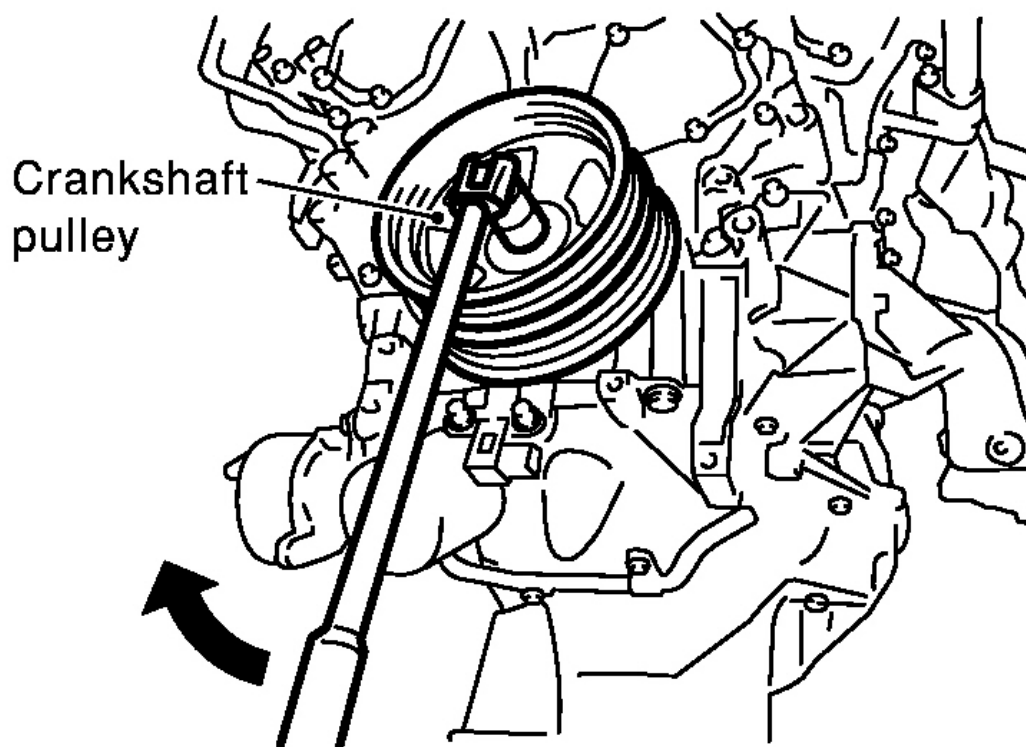
30. Install crankshaft pulley to crankshaft.
 - Align pointer with TDC mark on crankshaft pulley.



G02208212

Fig. 106: Aligning Pointer With TDC Mark On Crankshaft Pulley
Courtesy of NISSAN MOTOR CO., U.S.A.

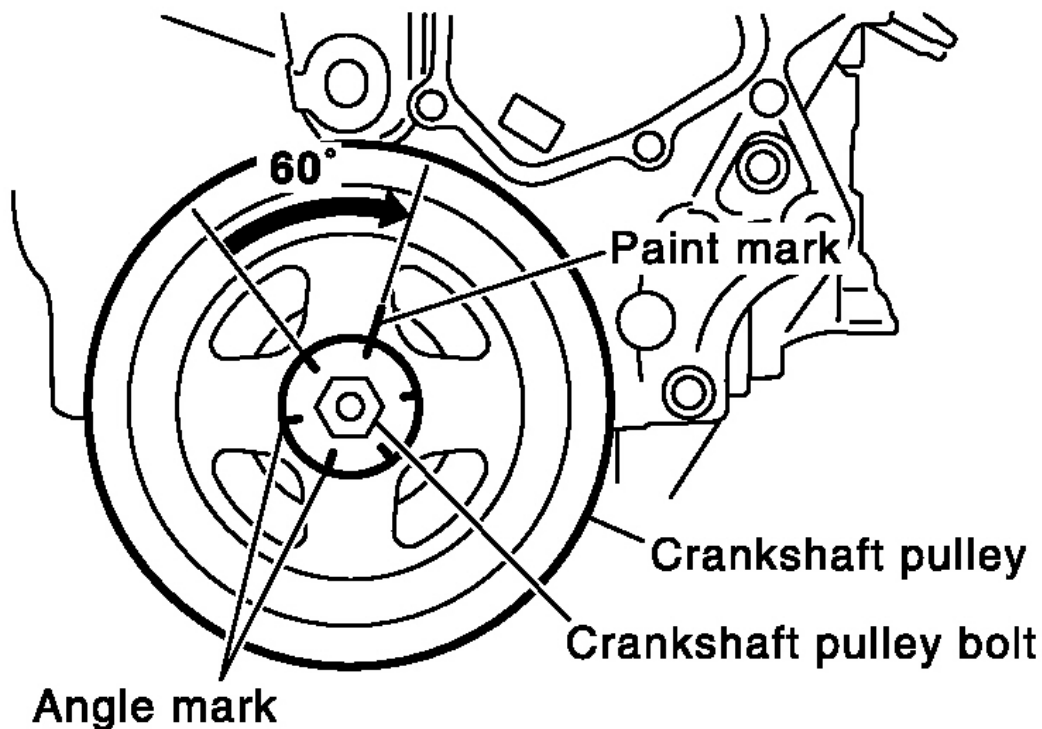
31. Install crankshaft pulley bolt.
 - **Lubricate thread and seat surface of the bolt with new engine oil.**
 - a. Tighten to 39 to 49 N.m (4.0 to 5.0 kg-m, 29 to 36 ft-lb).
 - b. Put a paint mark on the crankshaft pulley.



G02208213

Fig. 107: Installing Crankshaft Pulley Bolt
Courtesy of NISSAN MOTOR CO., U.S.A.

- c. Again tighten by turning 60° to 66° , about the angle from one hexagon bolt head corner to another.
32. Install camshaft position sensor (PHASE), crankshaft position sensor (POS).
33. Reinstall removed parts in the reverse order of removal.
 - When installing fuel tube and intake manifold collectors, Refer to "**TIGHTENING PROCEDURES**".
 - Check engine oil level.
 - After starting engine, keep idling for three minutes. Then rev engine up to 3,000 RPM under no load to purge air from the high-pressure chamber of the chain tensioners. The engine may produce a rattling noise. This indicates that air still remains in the chamber and is not a matter of concern.



G02208214

Fig. 108: Identifying Hexagon Bolt Angle
Courtesy of NISSAN MOTOR CO., U.S.A.

OIL SEAL

REPLACEMENT

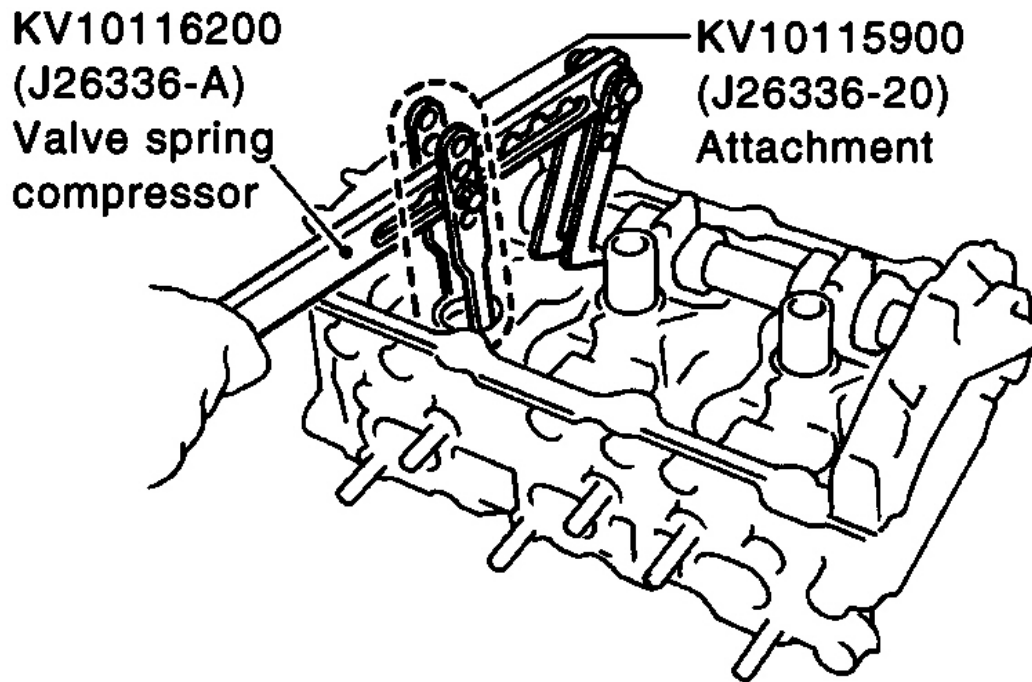
CAUTION: When removing the oil pans, oil pump assembly and timing chain from engine, first remove the camshaft position sensor (PHASE), intake valve timing control position sensor and the crankshaft position sensors (REF)/ (POS) from the assembly. Be careful not to damage sensor edges.

VALVE OIL SEAL

1. Remove timing chain. Refer to "REMOVAL".
2. Remove camshaft brackets and camshaft. Refer to "REMOVAL".
3. Remove valve lifters.
4. Remove valve spring with Tool.

Before removing valve spring, fix valve as follows.

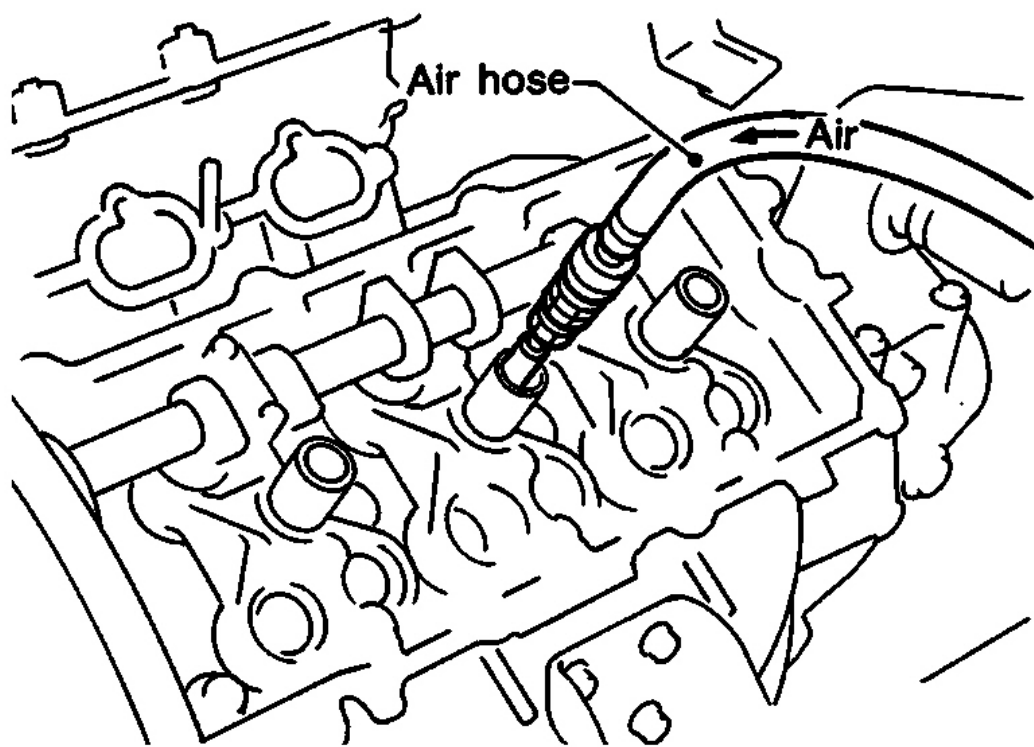
Piston concerned should be set at TDC to prevent valve from falling.



G02208215

Fig. 109: Removing Valve Spring With Tool
Courtesy of NISSAN MOTOR CO., U.S.A.

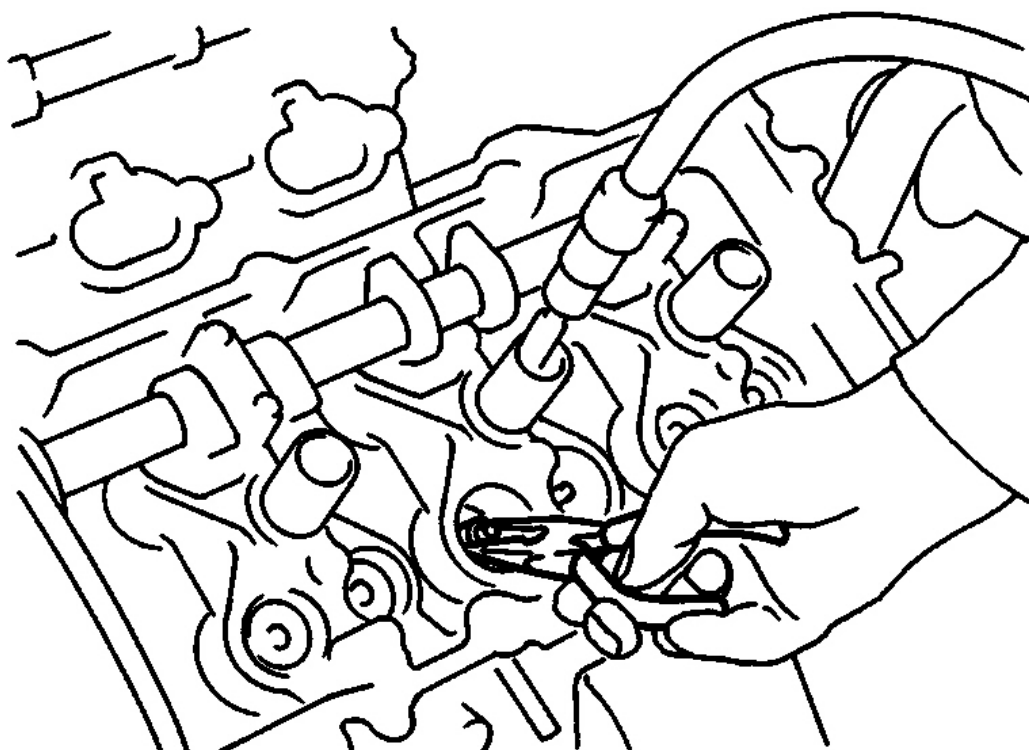
Remove spark plug, then install air hose adapter into spark plug hole and apply air pressure to hold valves in place. Apply a pressure of 490 kPa (5 kg/cm², 71 psi).



G02208216

Fig. 110: Installing Air Hose Adapter Into Spark Plug Hole
Courtesy of NISSAN MOTOR CO., U.S.A.

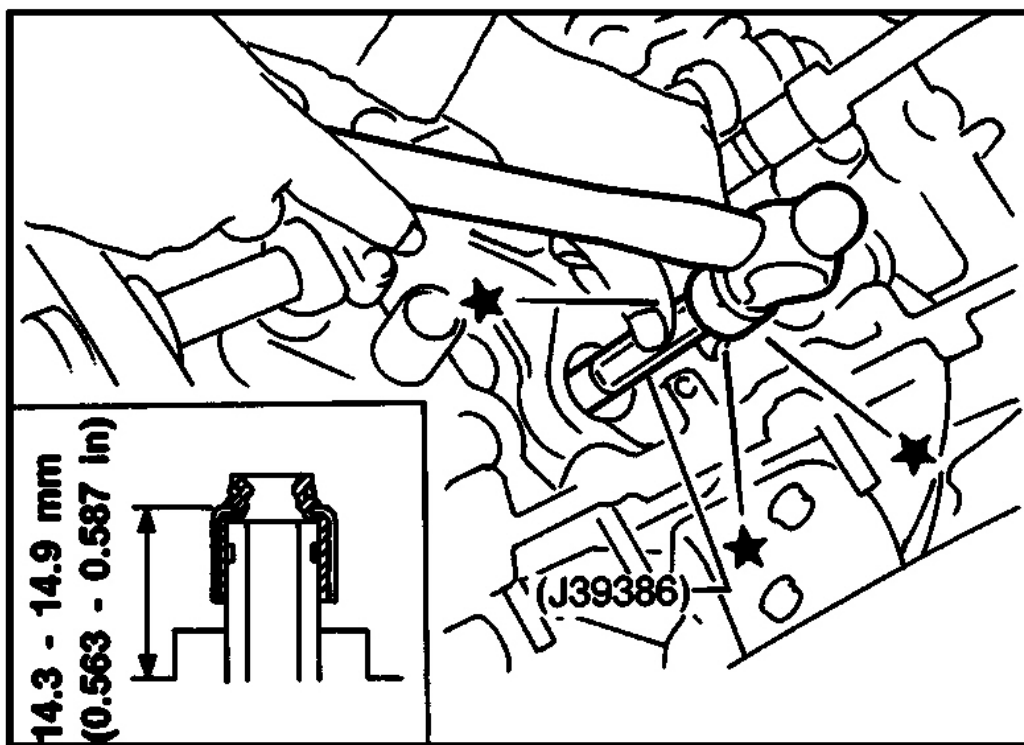
5. Remove valve oil seal.



G02208217

Fig. 111: Removing Valve Oil Seal
Courtesy of NISSAN MOTOR CO., U.S.A.

6. Apply engine oil to new valve oil seal and install it with Tool.
7. Reinstall any parts removed in reverse order of removal.



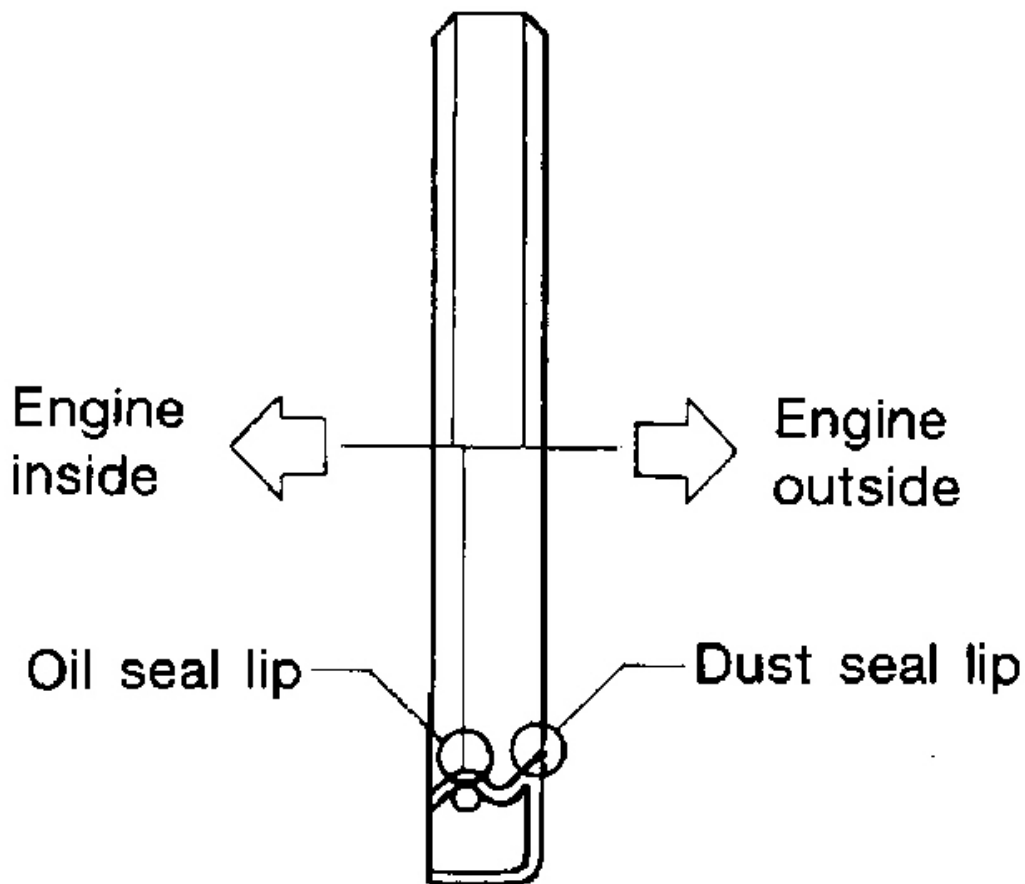
G02208218

Fig. 112: Installing Valve Oil Seal With Tool

Courtesy of NISSAN MOTOR CO., U.S.A.

OIL SEAL INSTALLATION DIRECTION

- Install new oil seal in the direction shown in the figure.



G02208219

Fig. 113: Identifying Oil Seal Position
Courtesy of NISSAN MOTOR CO., U.S.A.

FRONT OIL SEAL

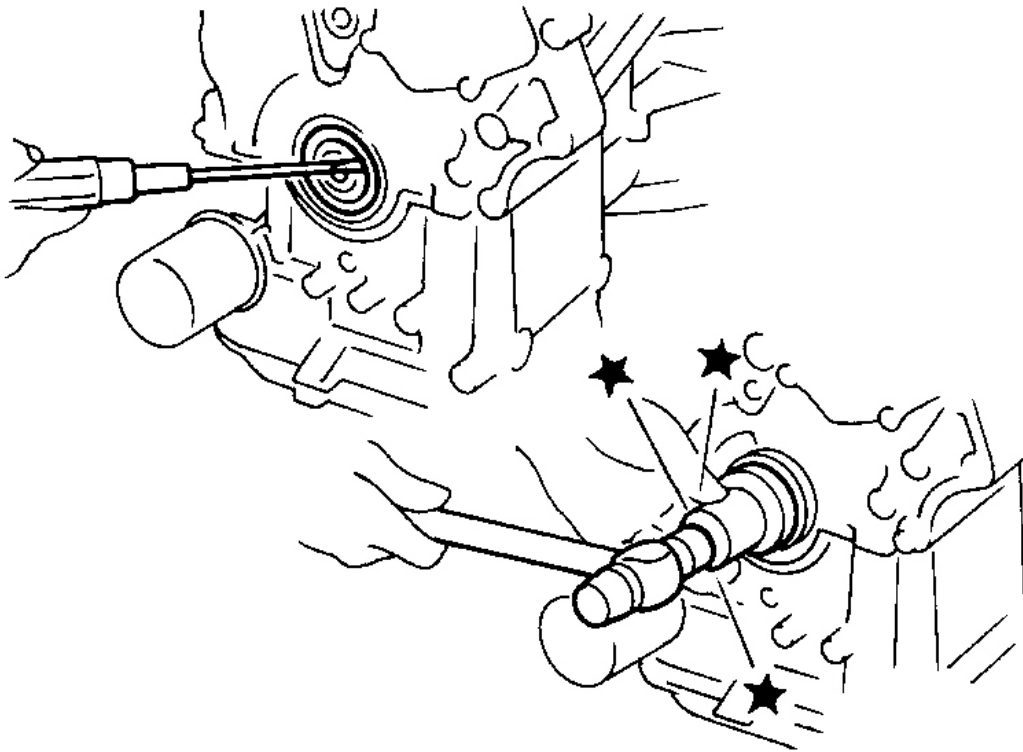
1. Remove the following parts:
 - Engine undercover
 - Suspension member stay
 - Drive belts
 - Crankshaft position sensor (REF)

Be careful not to damage sensor edge.

- Crankshaft pulley: Refer to "**REMOVAL**".
 - Radiator: Refer to **REMOVAL AND INSTALLATION** .
 - Cooling fan
2. Remove front oil seal using a suitable tool.

Be careful not to scratch front cover

3. Apply engine oil to new oil seal and install it using a suitable tool until its front end is level with front end of front cover.



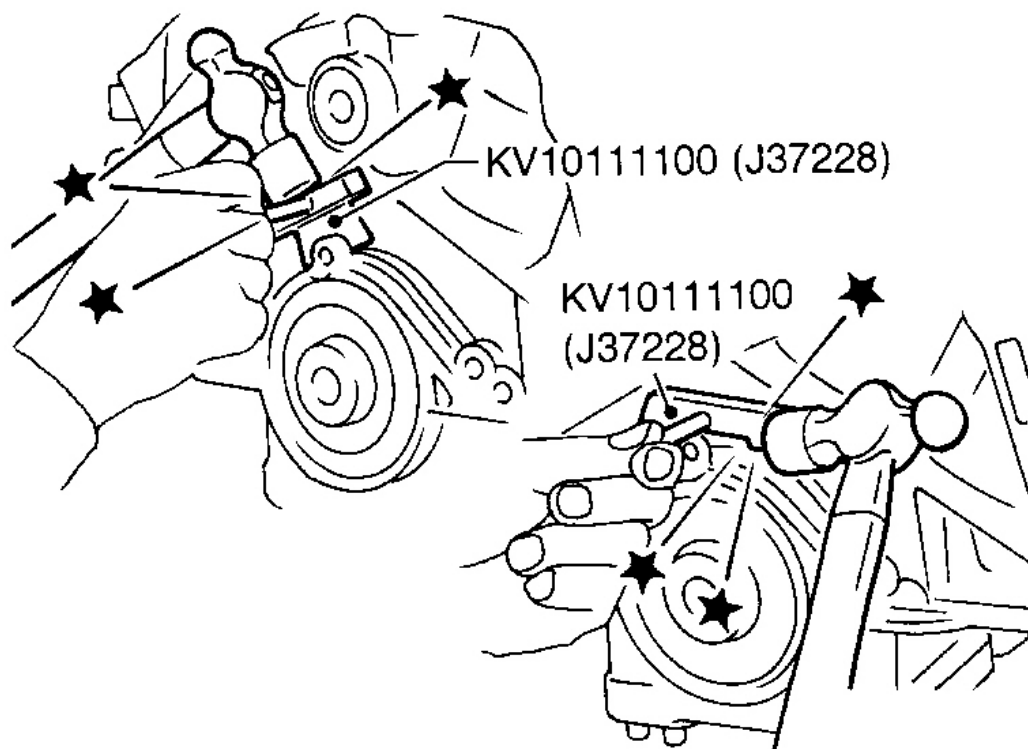
G02208220

Fig. 114: Removing Front Oil Seal Using Tool
Courtesy of NISSAN MOTOR CO., U.S.A.

REAR OIL SEAL

1. Remove transmission. Refer to **REMOVAL** .
2. Remove flywheel or drive plate.
3. Remove **OIL PAN**.

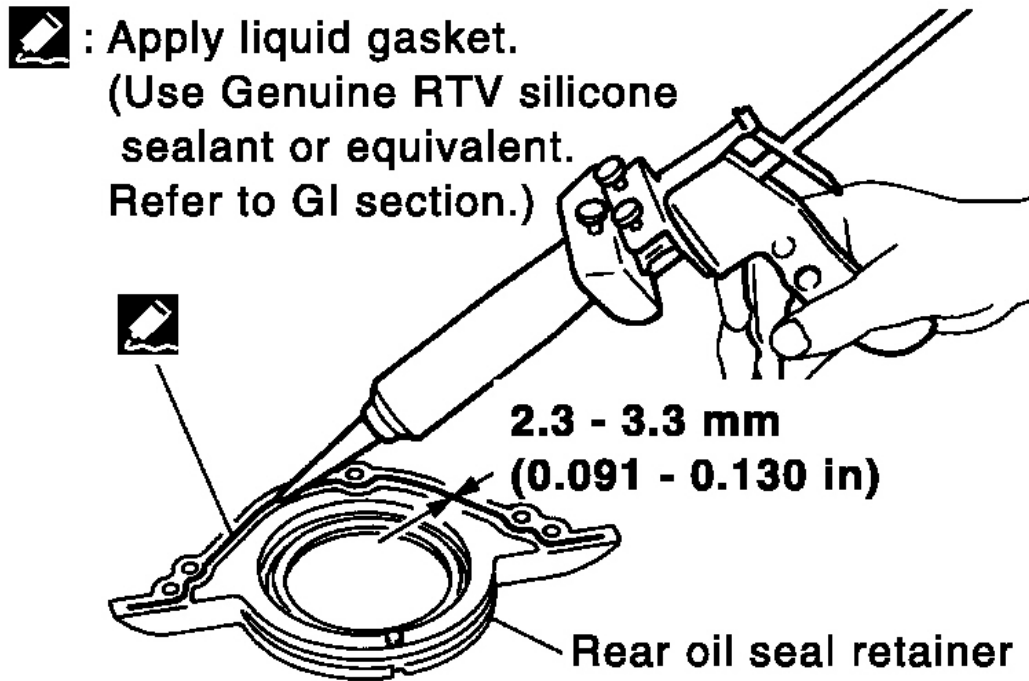
4. Remove rear oil seal retainer.



G02208221

Fig. 115: Removing Rear Oil Seal Retainer
Courtesy of NISSAN MOTOR CO., U.S.A.

5. Apply liquid gasket to rear oil seal retainer.
 - Assembly should be done within 5 minutes after coating.



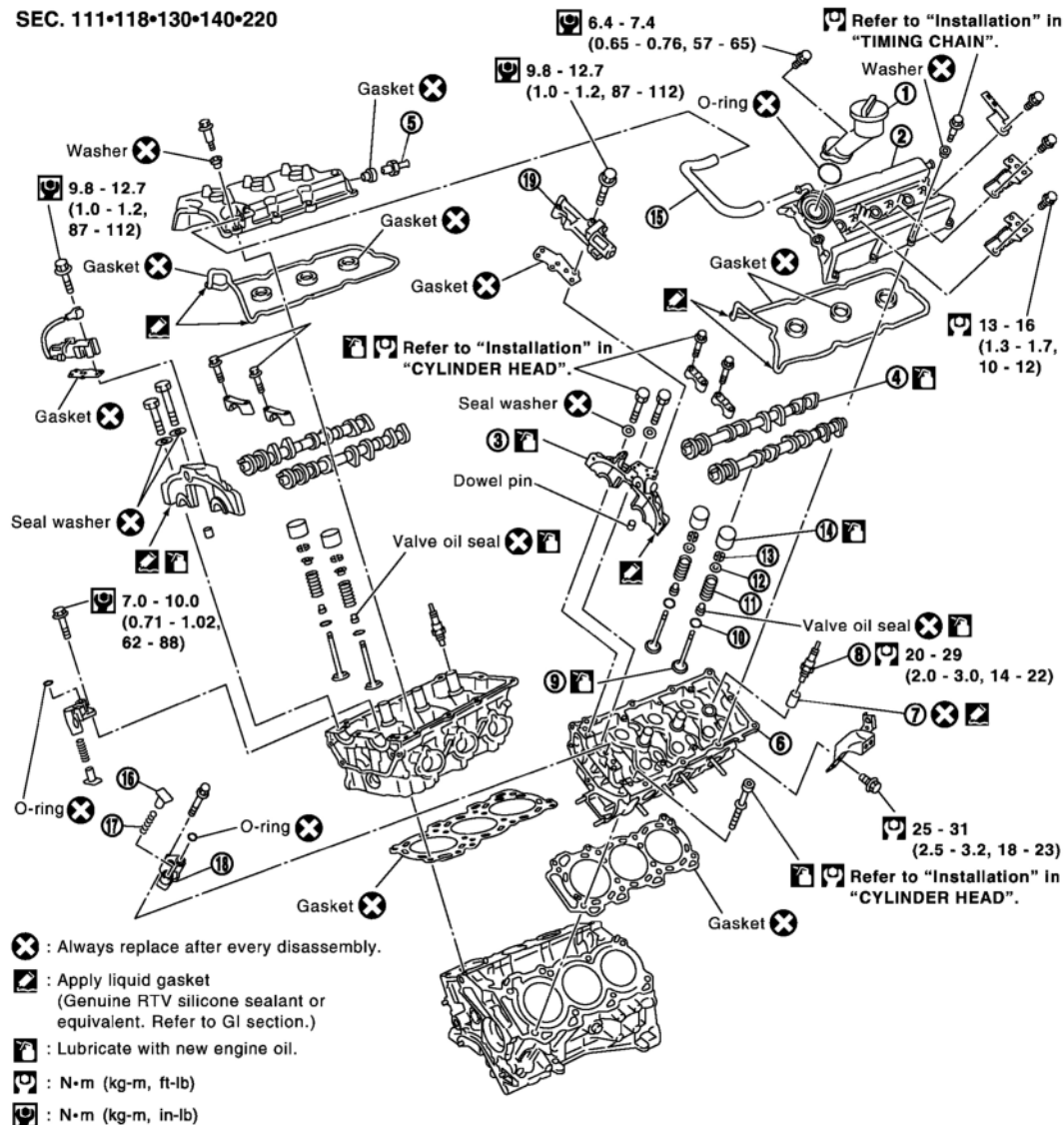
G02208222

Fig. 116: Applying Liquid Gasket To Rear Oil Seal Retainer
Courtesy of NISSAN MOTOR CO., U.S.A.

CYLINDER HEAD

COMPONENTS

SEC. 111•118•130•140•220



- | | | |
|---------------------|---------------------------|--|
| 1. Oil filler cap | 8. Spark plug | 15. PCV hose |
| 2. Rocker cover | 9. Valve | 16. Tensioner sleeve |
| 3. Camshaft bracket | 10. Valve spring seat | 17. Spring |
| 4. Camshaft | 11. Valve spring | 18. Chain tensioner |
| 5. PCV valve | 12. Valve spring retainer | 19. Intake valve timing control solenoid valve |
| 6. Cylinder head | 13. Valve collet | |
| 7. Spark plug tube | 14. Valve lifter | |

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Fig. 117: Identifying Cylinder Head Components And Torque Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

CAUTION:

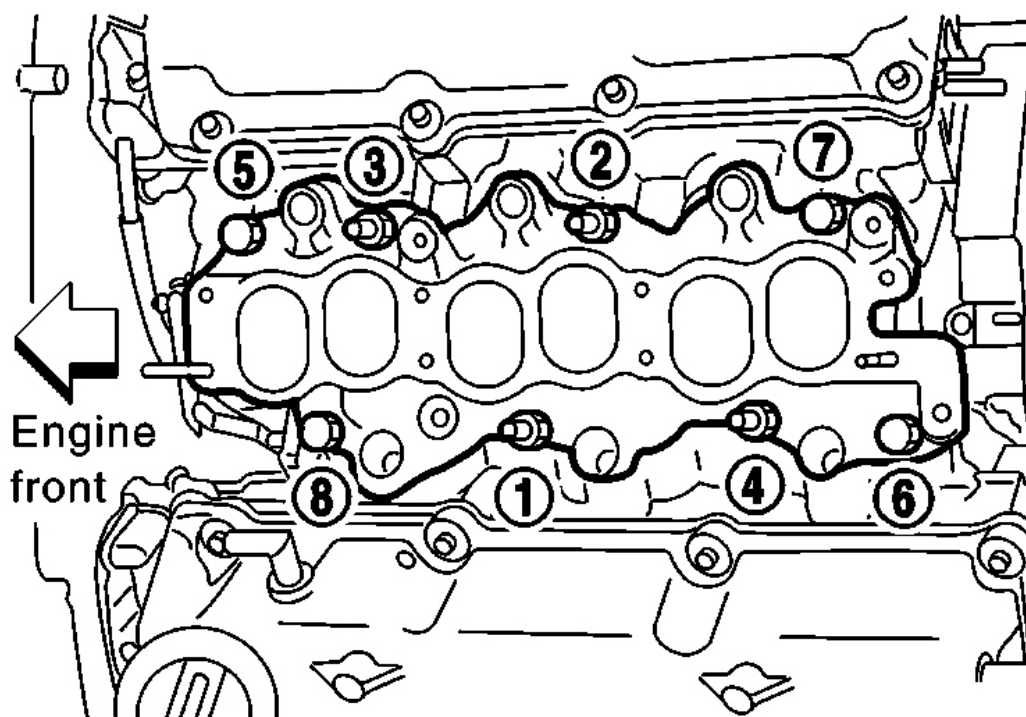
- When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.
- Apply new engine oil to threads and seat surfaces when installing cylinder head, camshaft sprocket, crankshaft pulley, and camshaft

bracket.

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

REMOVAL

1. Release fuel pressure. Refer to **FUEL SYSTEM PRESSURE RELEASE** .
2. Drain engine coolant and engine oil.
3. Remove the following parts.
 - Battery
 - Engine undercover
 - Radiator shroud
 - Radiator: Refer to **REMOVAL AND INSTALLATION** .
 - Cooling fan
 - Drive belts
4. Remove exhaust front tubes. Refer to **REMOVAL AND INSTALLATION** .
5. Remove exhaust manifolds in reverse order of installation. Refer to "**EXHAUST MANIFOLD**".
6. Remove aluminum oil pan. Refer to "**REMOVAL**".
7. Remove front timing chain case, timing chain and rear timing chain case. Refer to "**REMOVAL**".
8. Remove intake manifold in reverse order of illustration.
9. Remove water outlet.



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Fig. 118: Removing Intake Manifold
Courtesy of NISSAN MOTOR CO., U.S.A.

10. Remove intake valve timing control solenoid valves.

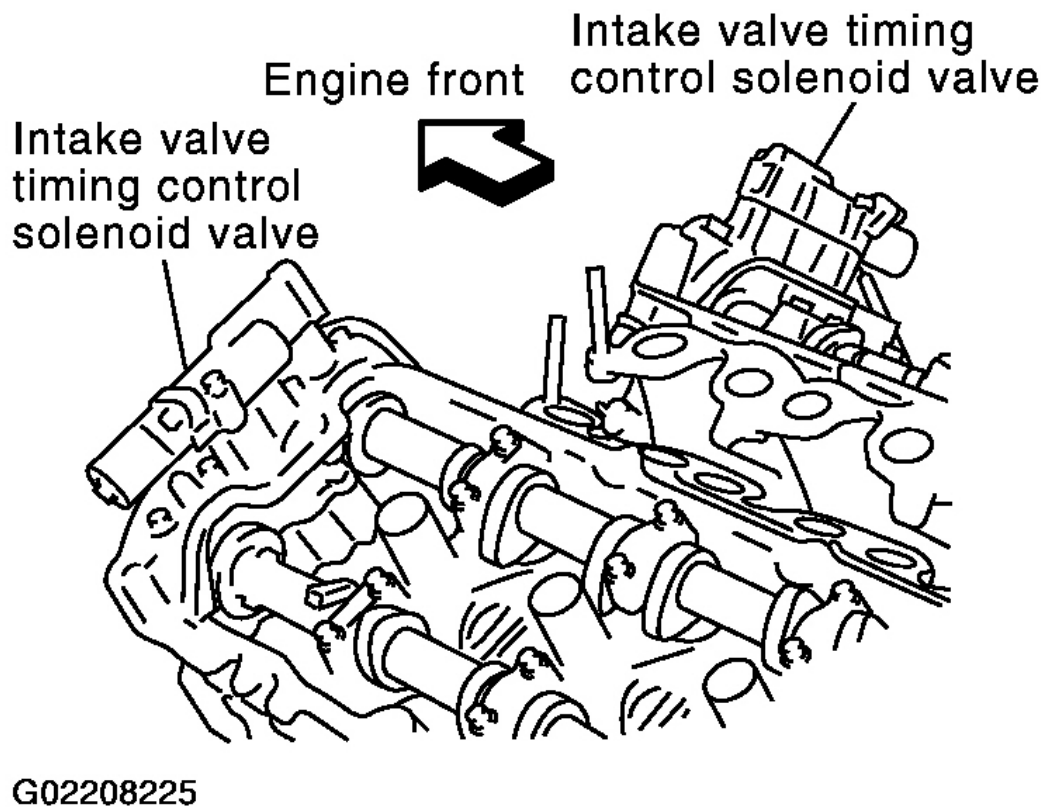
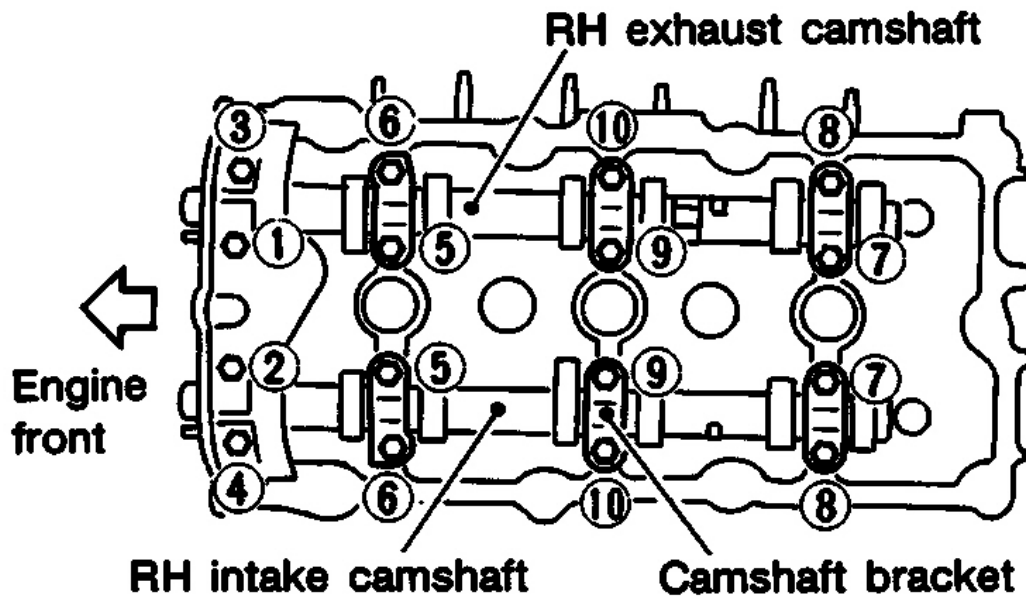


Fig. 119: Removing Intake Valve Timing Control Solenoid Valves
Courtesy of NISSAN MOTOR CO., U.S.A.

11. Remove intake and exhaust camshafts and camshaft brackets.
 - Equally loosen camshaft bracket bolts in several steps in the numerical order shown in the figure.

For reinstallation, be sure to put marks on camshaft bracket before removal.

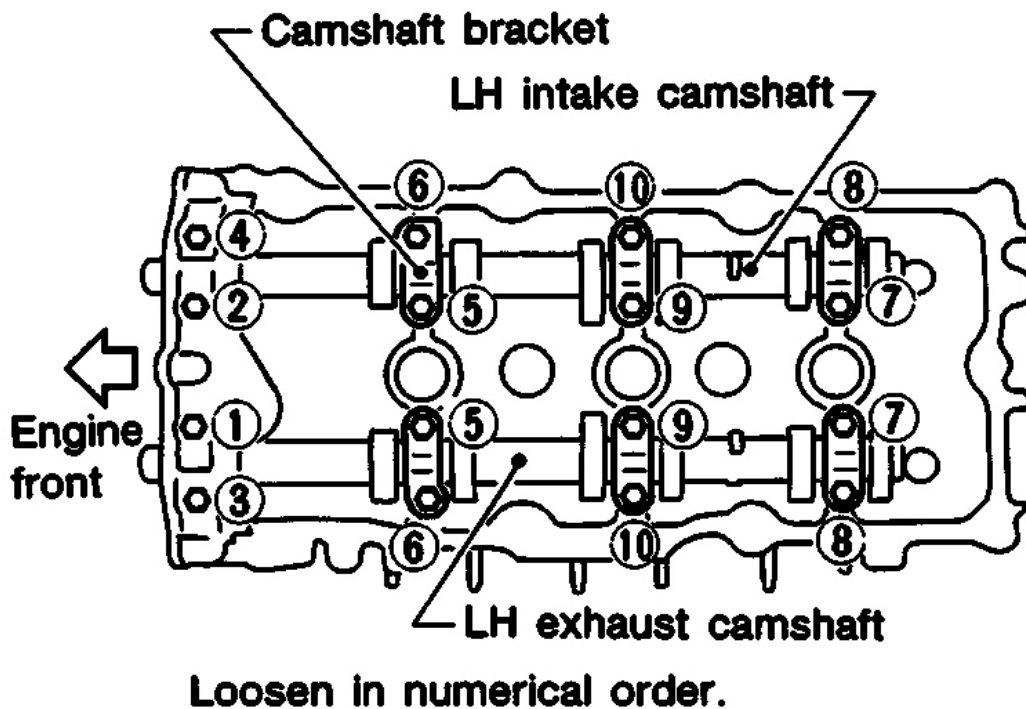
12. Remove valve lifters.
 - Identify installation positions, and store them without mixing them up.



Loosen in numerical order.

G02208226

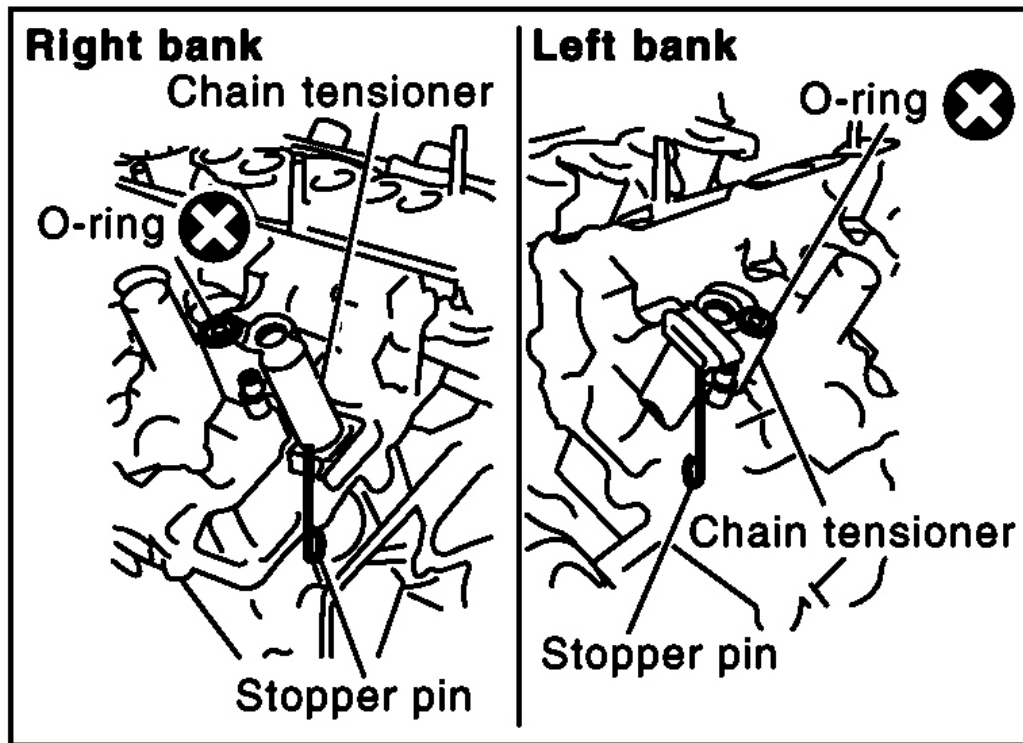
Fig. 120: Loosening Camshaft Bracket Bolts In Several Steps In Numerical Order (RH)
Courtesy of NISSAN MOTOR CO., U.S.A.



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Fig. 121: Loosening Camshaft Bracket Bolts In Several Steps In Numerical Order (LH)
Courtesy of NISSAN MOTOR CO., U.S.A.

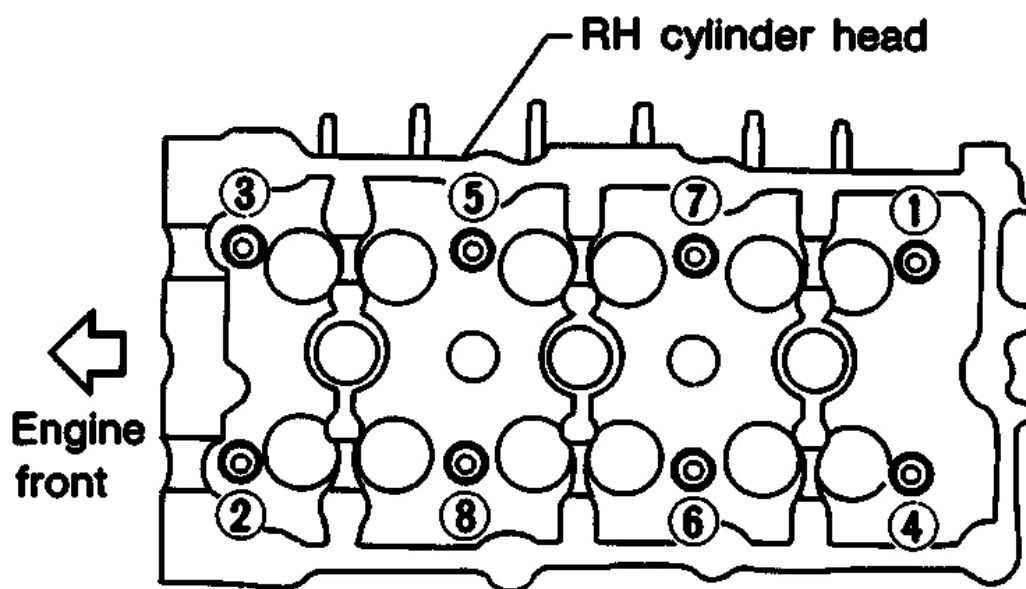
13. Remove RH and LH camshaft chain tensioners from cylinder head.
 - Remove chain tensioner with its stopper pin attached.
 - Stopper pin was attached when secondary timing chain was removed.



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Fig. 122: Removing RH And LH Camshaft Chain Tensioners From Cylinder Head
Courtesy of NISSAN MOTOR CO., U.S.A.

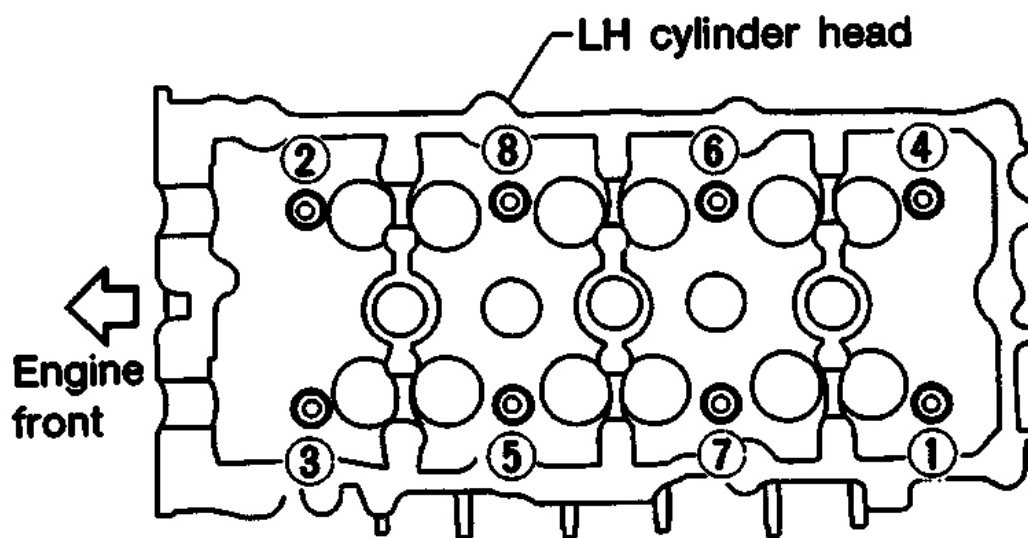
14. Remove cylinder head bolts.
 - Cylinder head bolts should be loosened in two or three steps.
 - A warped or cracked cylinder head could result from removing in incorrect order.



Loosen in numerical order.

G02208229

Fig. 123: Removing RH Cylinder Head Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

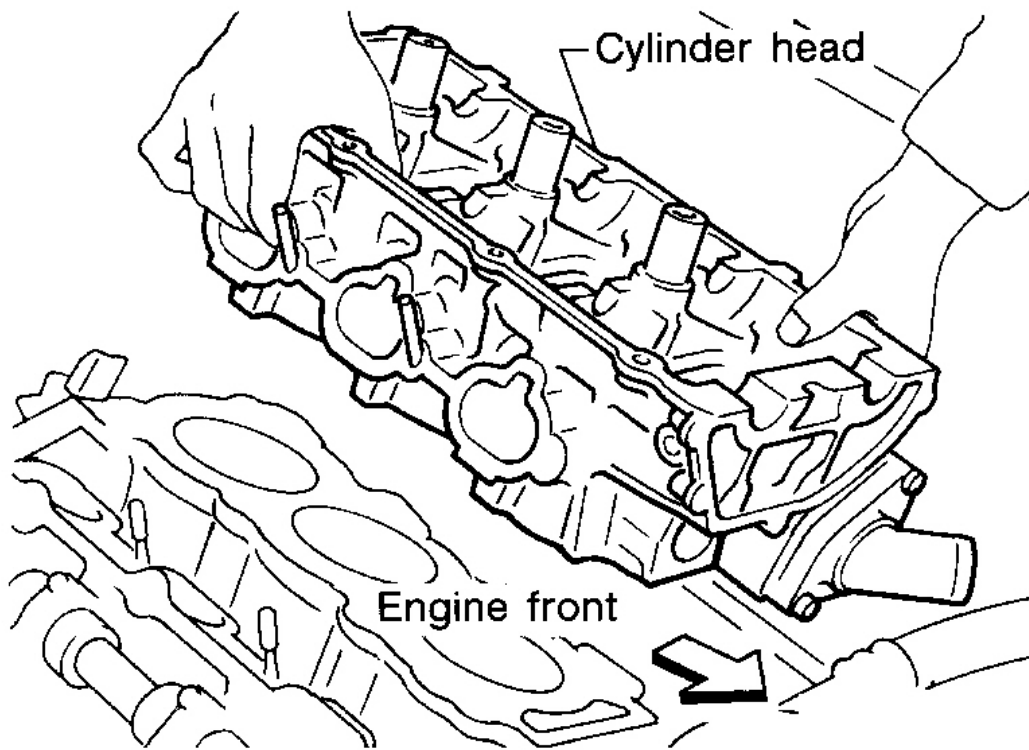


Loosen in numerical order.

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Fig. 124: Removing LH Cylinder Head Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

15. Remove cylinder head.



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Fig. 125: Removing Cylinder Head
Courtesy of NISSAN MOTOR CO., U.S.A.

DISASSEMBLY

1. Remove spark plug with spark plug wrench (commercial service tool).
2. Remove valve component parts.

Refer to "VALVE OIL SEAL".

- Check the clearance before removing the valve guide. Refer to "VALVE GUIDE CLEARANCE".
3. Remove spark plug tube, as necessary.
 - Using a pair of pliers, pull spark plug tube out of cylinder head.

CAUTION:

- Take care not to damage cylinder head.
- Once removed, a spark plug tube will be deformed and cannot be reused. Do not remove it unless absolutely necessary.

INSPECTION**CYLINDER HEAD DISTORTION**

Clean surface of cylinder head.

Use a reliable straightedge and feeler gauge to check the flatness of cylinder head surface.

Check along six positions shown in the figure.

Head surface flatness: Limit 0.1 mm (0.004 in)

If beyond the specified limit, resurface or replace it.

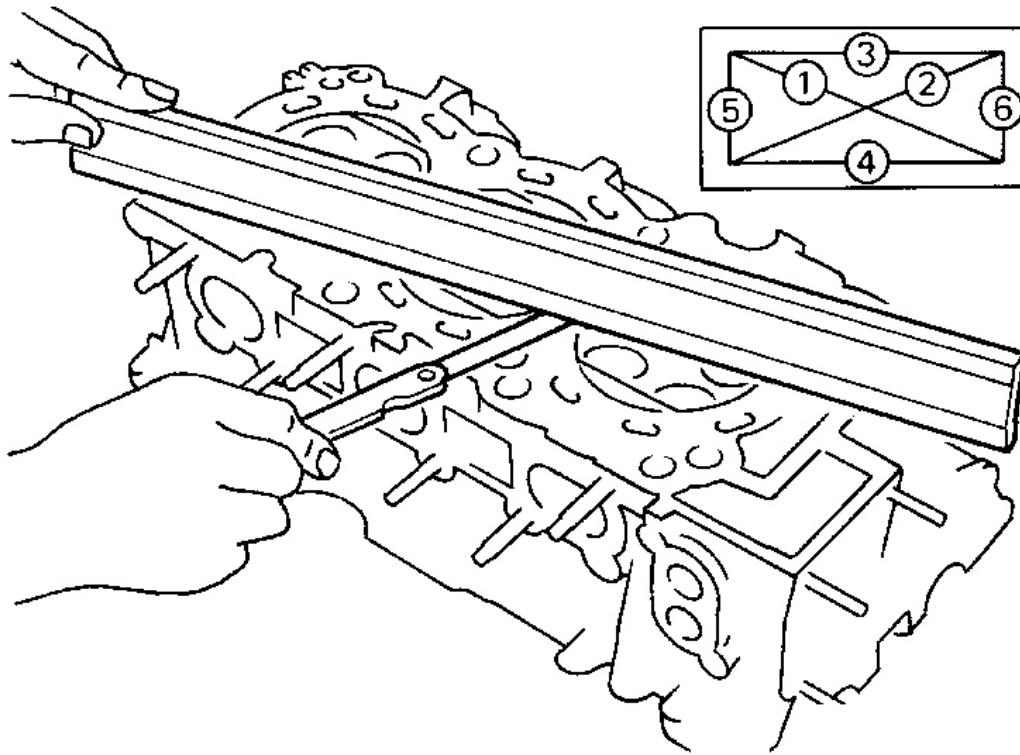
The limit for cylinder head resurfacing is determined by the cylinder block resurfacing.

Resurfacing limit:

Amount of cylinder head resurfacing is "A"

Amount of cylinder block resurfacing is "B".

The maximum limit: $A + B = 0.2 \text{ mm (0.008 in)}$



G02208232

Fig. 126: Checking Flatness Of Cylinder Head Surface Using Reliable Straightedge
 Courtesy of NISSAN MOTOR CO., U.S.A.

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

Nominal cylinder head height:

126.3 - 126.5 mm (4.972 - 4.980 in)

CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

CAMSHAFT RUNOUT

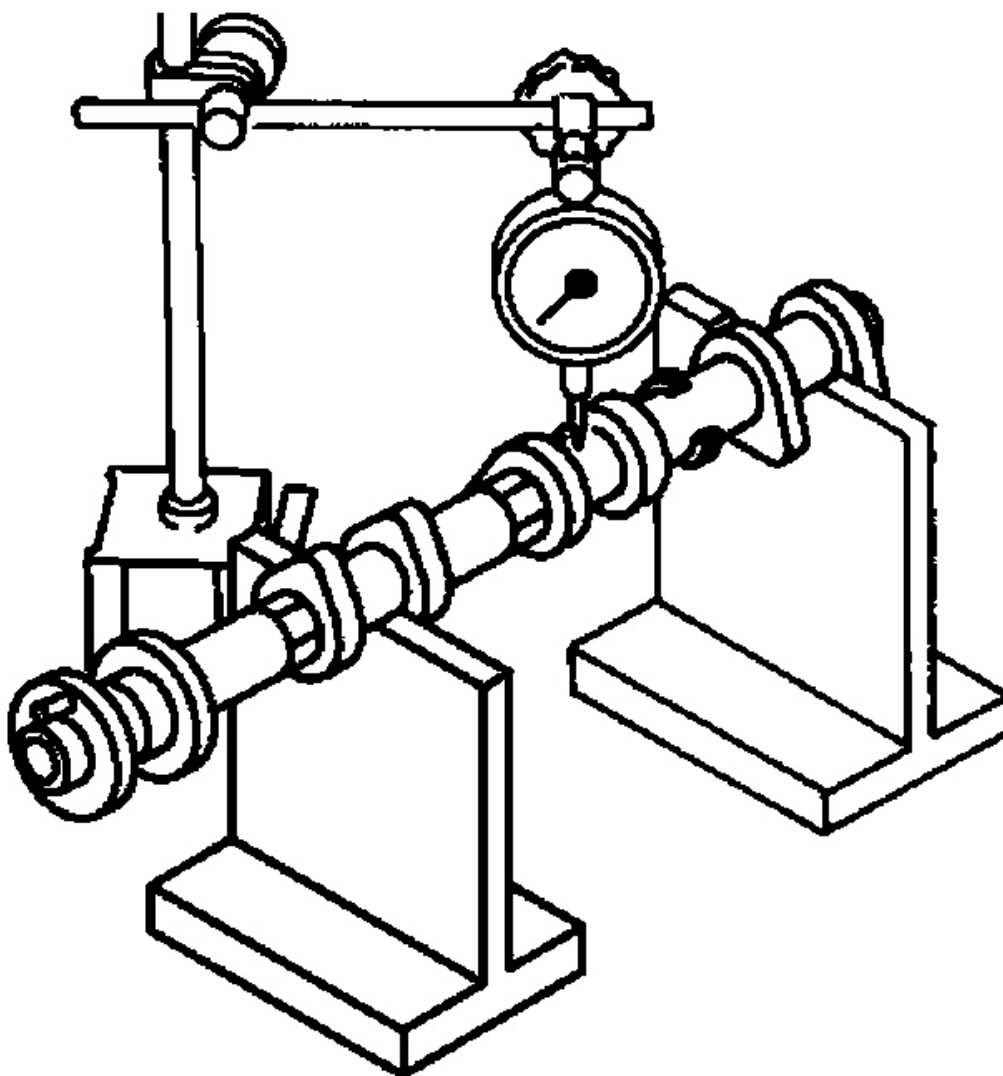
1. Put V block on precise flat bed, and support No. 2 and No. 4 journal of camshaft.
2. Set dial gauge vertically to No. 3 journal.
3. Turn camshaft to one direction with hands, and measure camshaft runout on dial gauge. (Total indicator

reading)

Runout (Total indicator reading):

Limit 0.05 mm (0.0020 in)

4. If it exceeds the limit, replace camshaft.



G02208233

Fig. 127: Setting Dial Gauge Vertically To Camshaft Journal

Courtesy of NISSAN MOTOR CO., U.S.A.

CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.

Standard cam height:

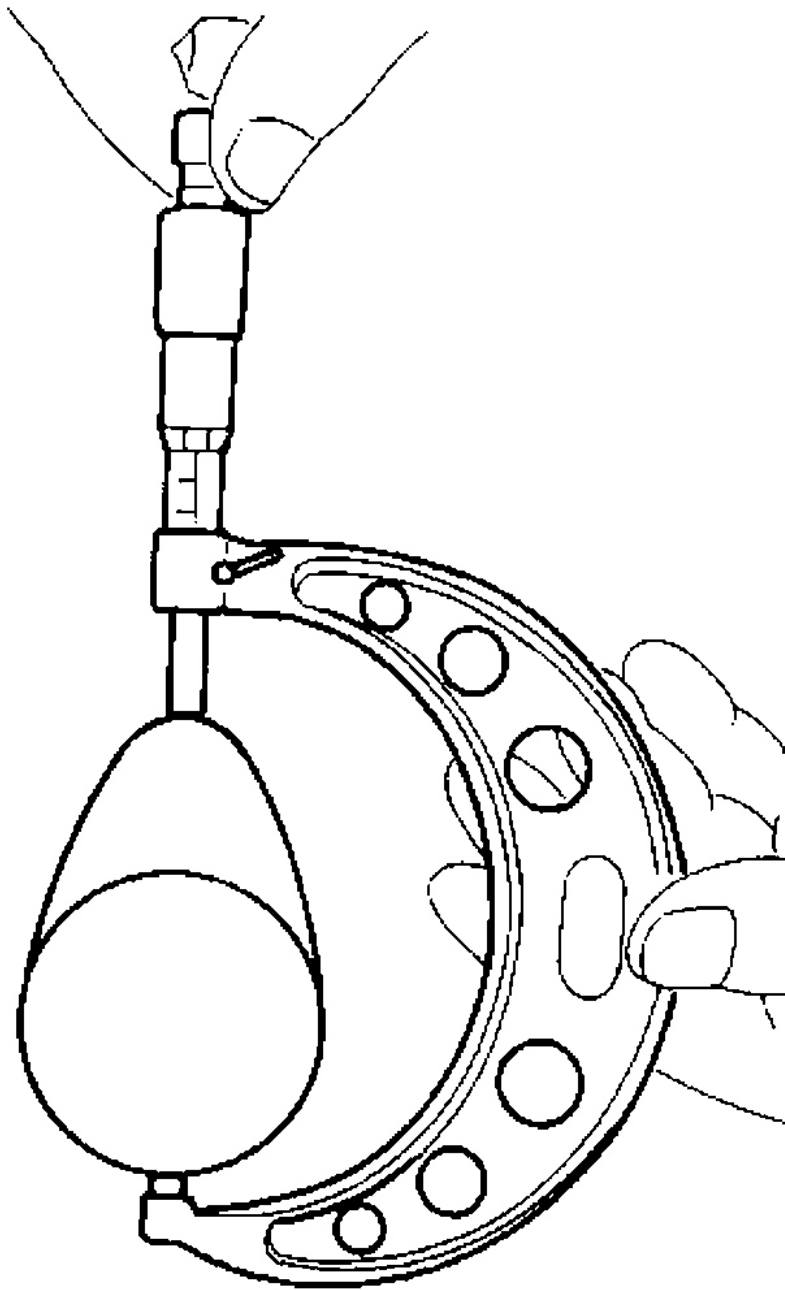
Intake and exhaust

44.465 - 44.655 mm (1.7506 - 1.7581 in)

Cam wear limit:

0.2 mm (0.008 in)

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



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Fig. 128: Measuring Camshaft Cam Height
Courtesy of NISSAN MOTOR CO., U.S.A.

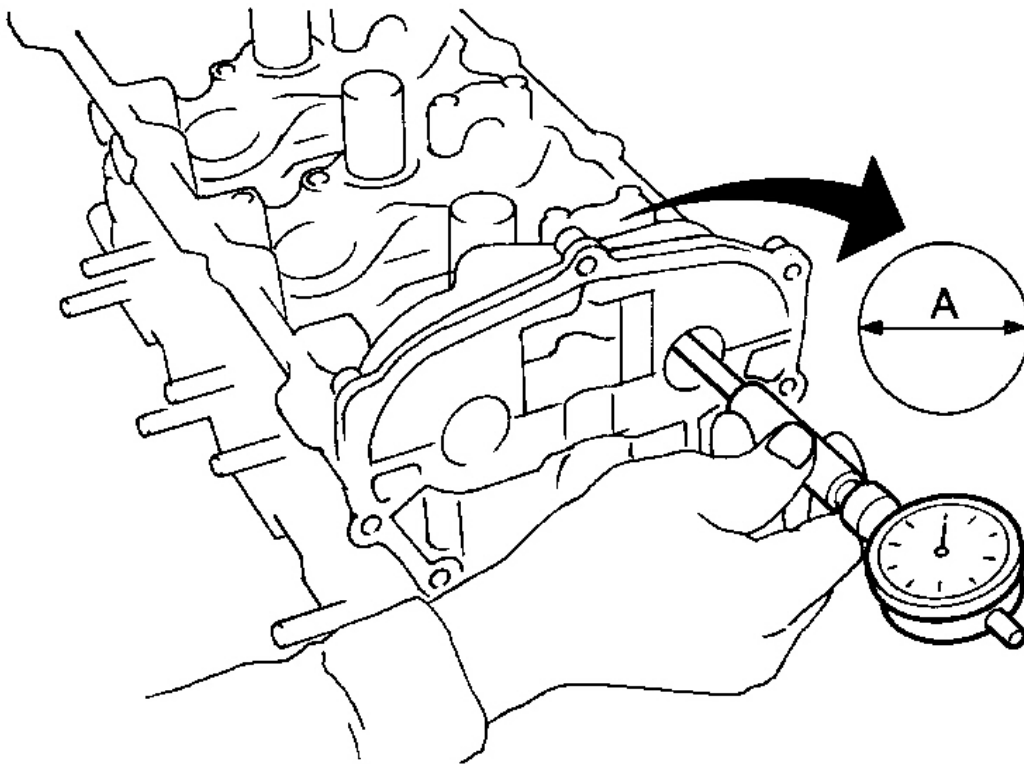
CAMSHAFT JOURNAL CLEARANCE

1. Install camshaft bracket and tighten bolts to the specified torque.
2. Measure inner diameter "A" of camshaft bearing.

Standard inner diameter:

No. 1: 26.000 - 26.021 mm (1.0236 - 1.0244 in)

No. 2, 3, 4: 23.500 - 23.521 mm (0.9252 - 0.9260 in)



G02208235

Fig. 129: Measuring Inner Diameter Of Camshaft Bearing
Courtesy of NISSAN MOTOR CO., U.S.A.

3. Measure outer diameter of camshaft journal.

Standard outer diameter:

No. 1: 25.935 - 25.955 mm (1.0211 - 1.0218 in)

No. 2, 3, 4: 23.445 - 23.465 mm (0.9230 - 0.9238 in)

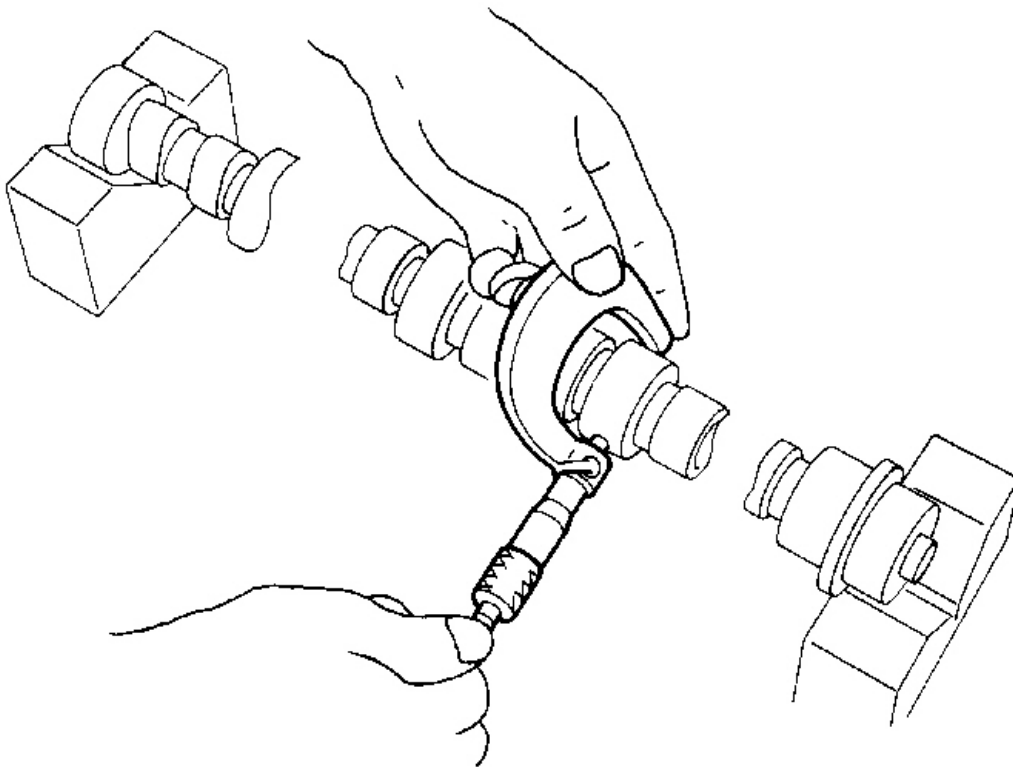
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.

Camshaft journal clearance:

Standard

No. 1: 0.045 - 0.086 mm (0.0018 - 0.0034 in)

No. 2, 3, 4: 0.035 - 0.076 mm (0.0014 - 0.0030 in)



G02208236

Fig. 130: Measuring Outer Diameter Of Camshaft Journal
Courtesy of NISSAN MOTOR CO., U.S.A.

Limit

0.15 mm (0.0059 in)

CAMSHAFT END PLAY

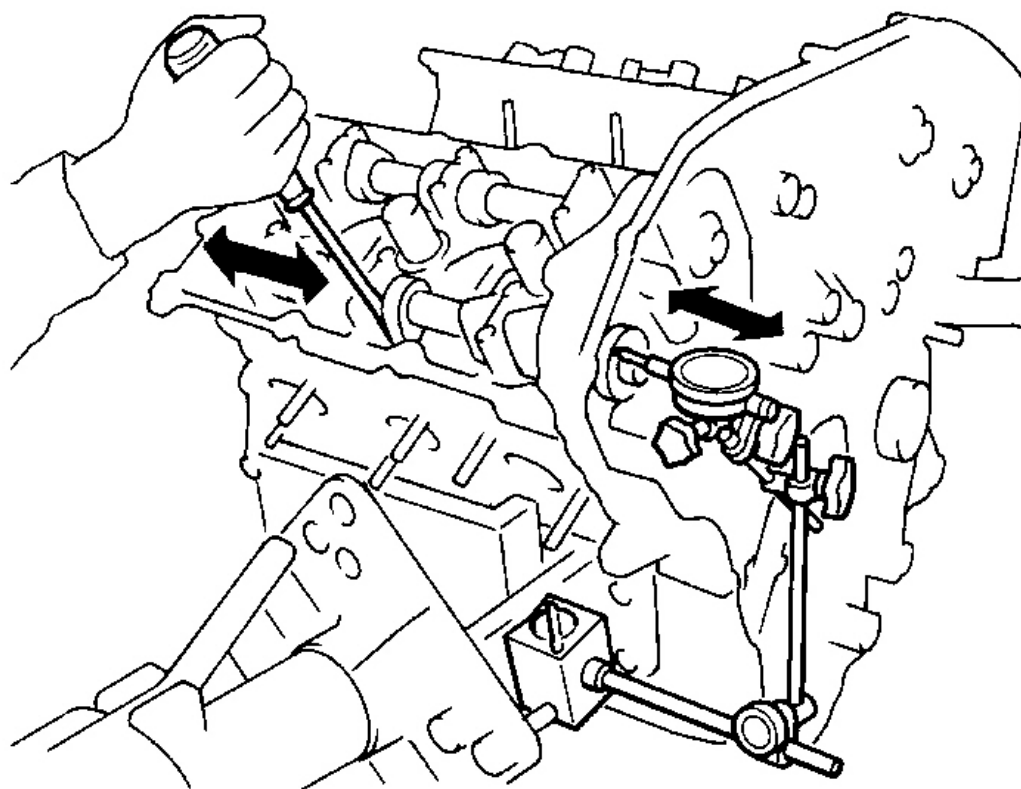
1. Install camshaft in cylinder head.
2. Measure camshaft end play.

Camshaft end play:**Standard**

0.115 - 0.188 mm (0.0045 - 0.0074 in)

Limit

0.24 mm (0.0094 in)



G02208237

Fig. 131: Measuring Camshaft End Play
Courtesy of NISSAN MOTOR CO., U.S.A.

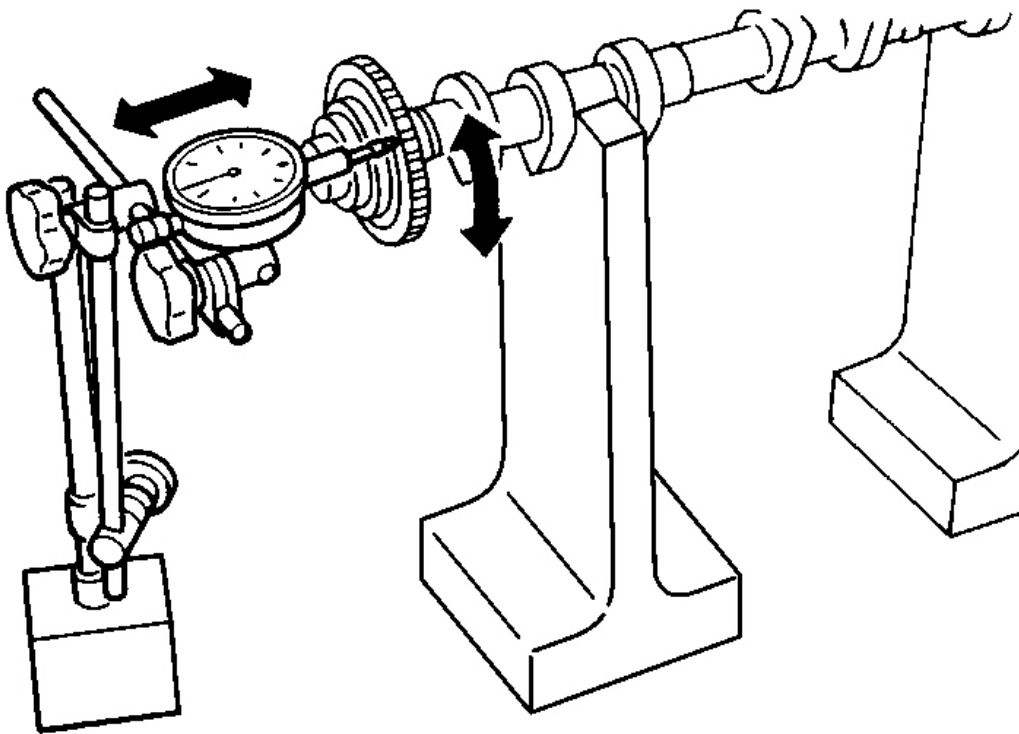
CAMSHAFT SPROCKET RUNOUT

1. Install sprocket on camshaft.
2. Put V block on precise flat bed, and support No. 2 and No. 4 journal of camshaft.
3. Measure camshaft sprocket runout.

Runout (Total indicator reading):

Less than 0.15 mm (0.0059 in)

4. If it exceeds the limit, replace camshaft sprocket.



G02208238

Fig. 132: Measuring Camshaft Sprocket Runout
Courtesy of NISSAN MOTOR CO., U.S.A.

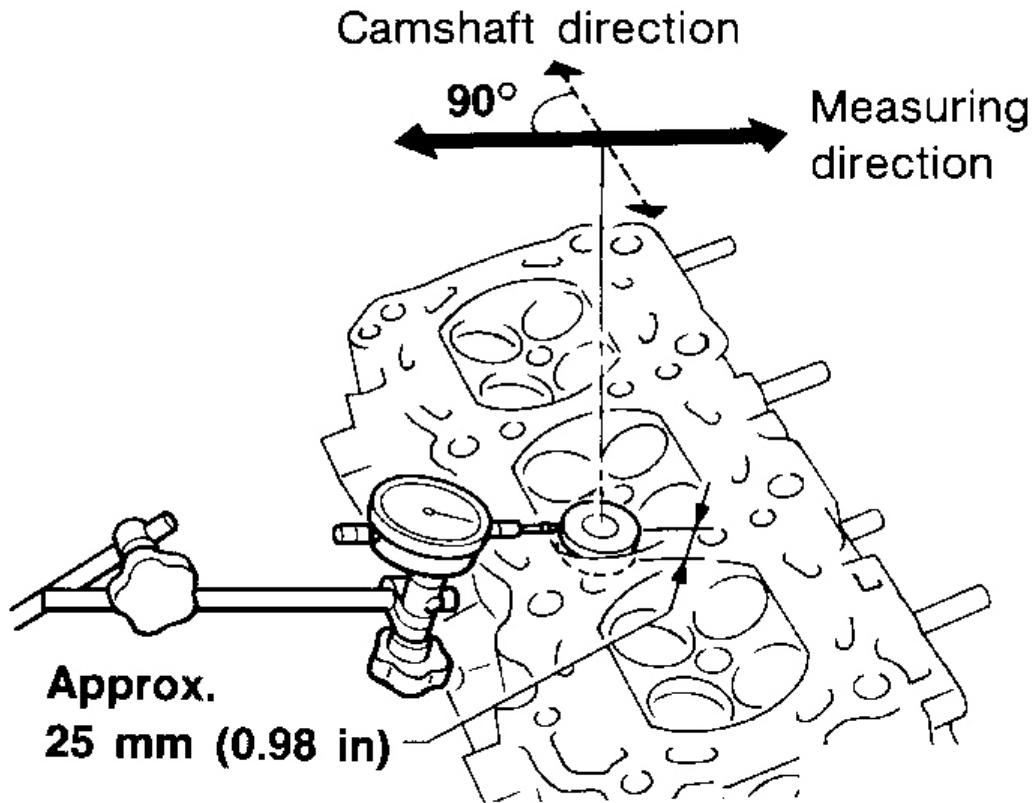
VALVE GUIDE CLEARANCE

1. Measure valve deflection as shown in the figure. (Valve and valve guide mostly wear in this direction.)

Valve deflection limit (Dial gauge reading):

Intake 0.24 mm (0.0094 in)

Exhaust 0.28 mm (0.0110 in)



G02208239

Fig. 133: Measuring Valve Guide Clearance
Courtesy of NISSAN MOTOR CO., U.S.A.

2. If it exceeds the limit, check valve to valve guide clearance.
 - a. Measure valve stem diameter and valve guide inner diameter.
 - b. Check that clearance is within specification.

Valve to valve guide clearance limit:

Intake 0.08 mm (0.0031 in)

Exhaust 0.1 mm (0.004 in)

- c. If it exceeds the limit, replace valve or valve guide.

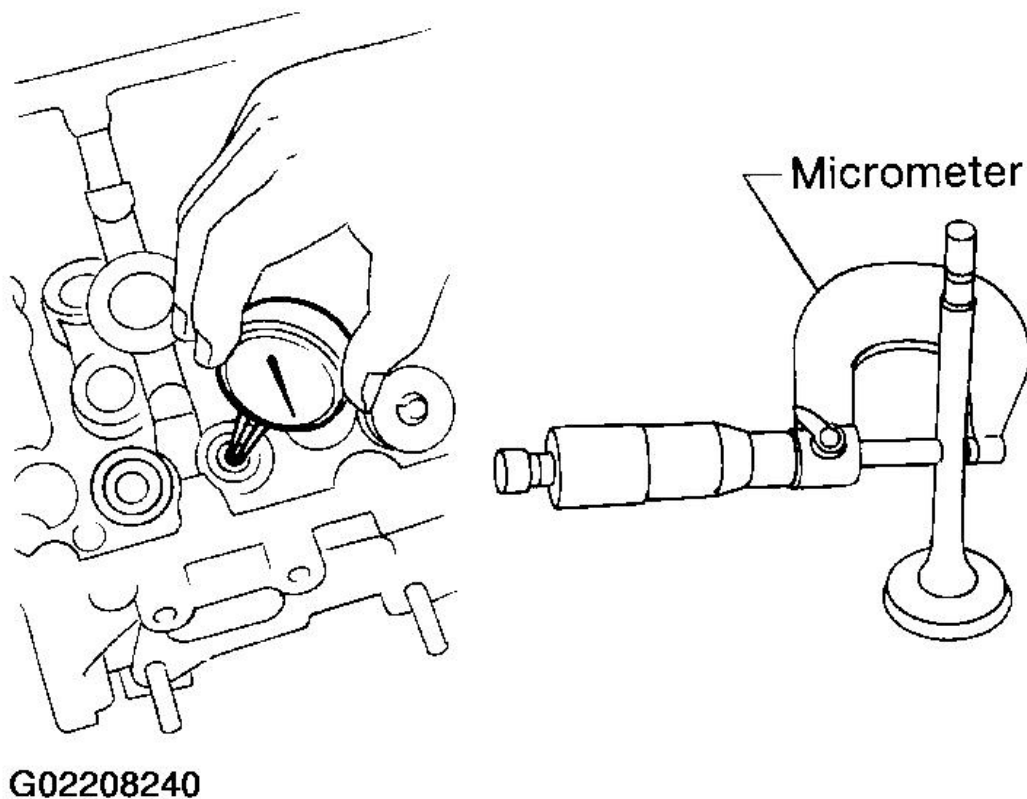
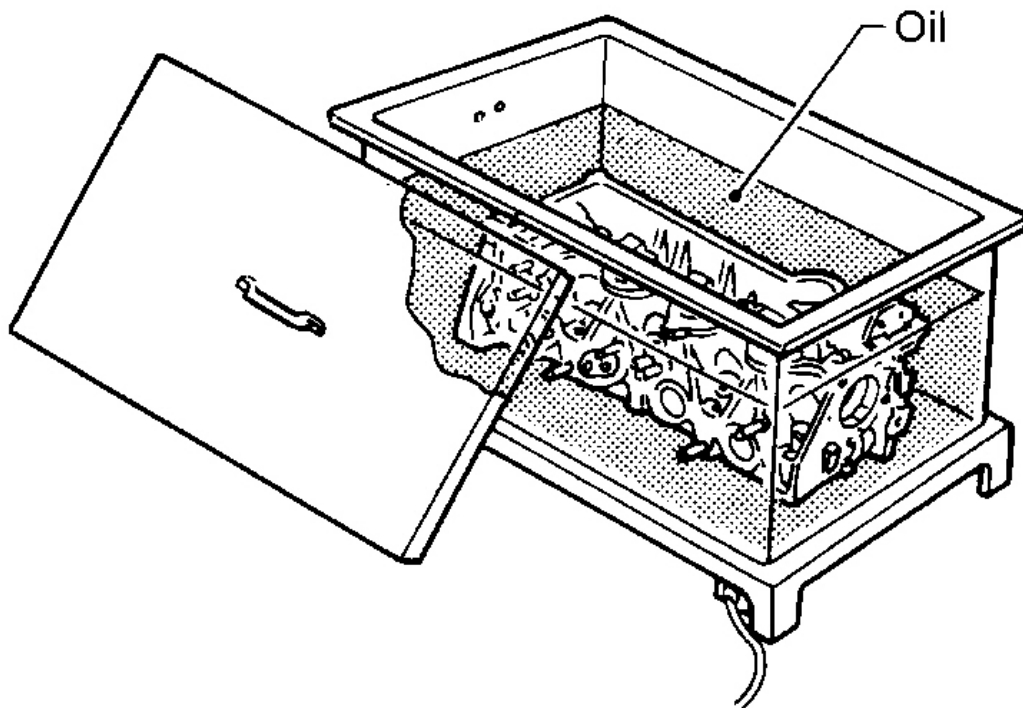


Fig. 134: Measuring Valve Stem Diameter And Valve Guide Inner Diameter
Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE GUIDE REPLACEMENT

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

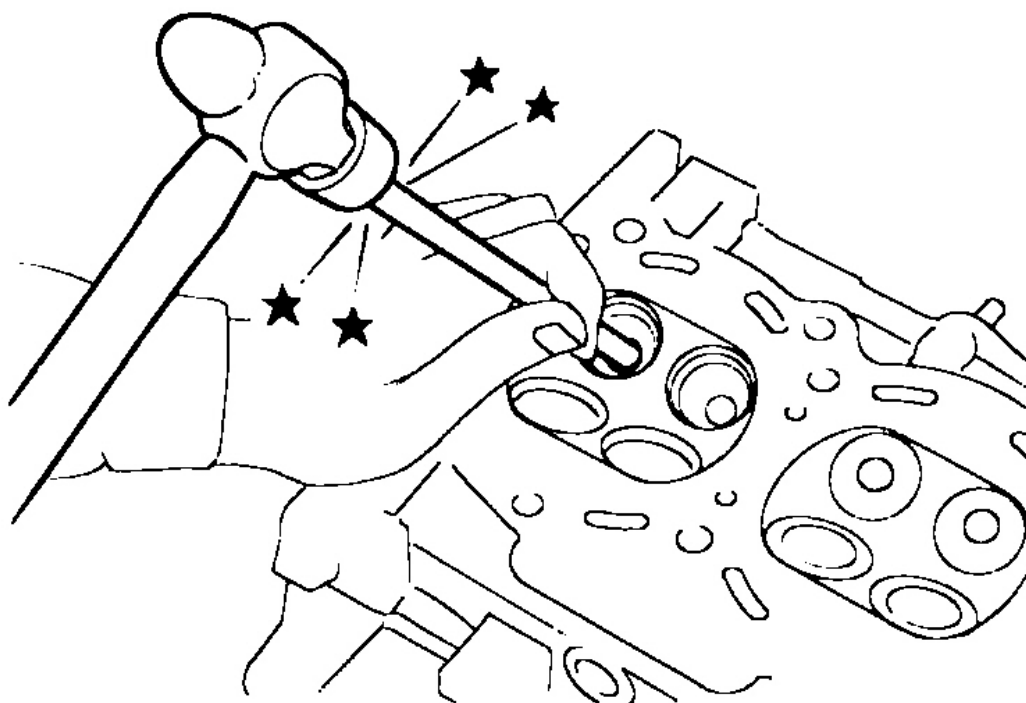


G02208241

Fig. 135: Heating Cylinder Head
Courtesy of NISSAN MOTOR CO., U.S.A.

2. Drive out valve guide with a press [under a 20 kN (2 ton, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.

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



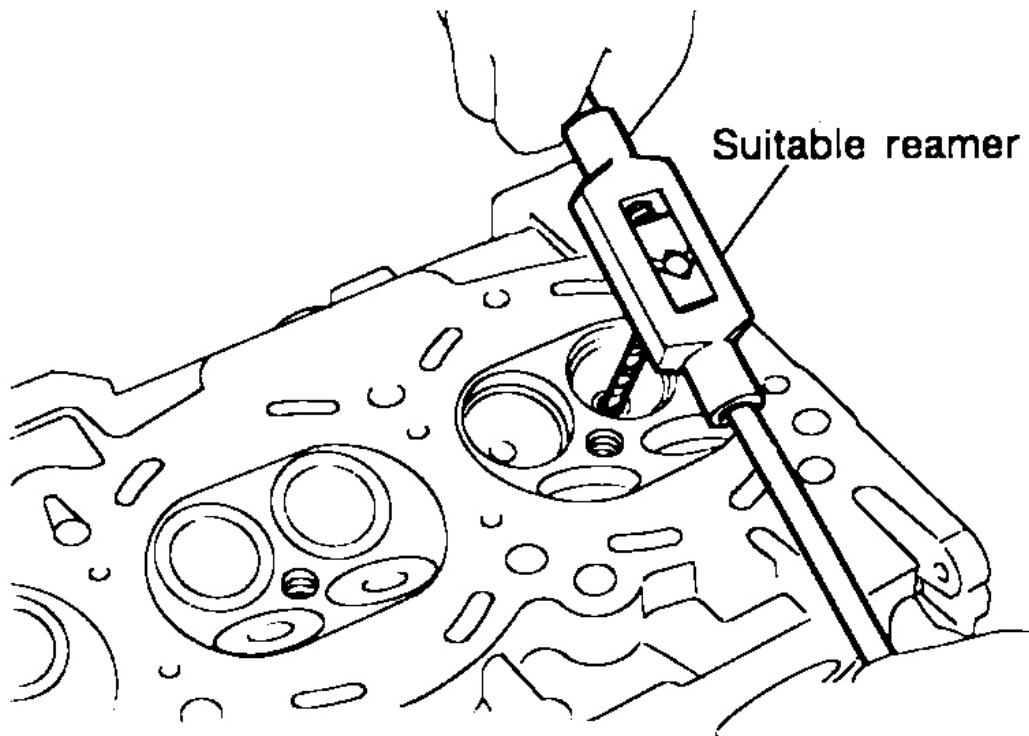
G02208242

Fig. 136: Driving Out Valve Guide With Press
Courtesy of NISSAN MOTOR CO., U.S.A.

3. Ream cylinder head valve guide hole.

Valve guide hole diameter (for service parts):

10.175 - 10.196 mm (0.4006 - 0.4014 in)



G02208243

Fig. 137: Reaming Cylinder Head Valve Guide Hole
Courtesy of NISSAN MOTOR CO., U.S.A.

4. Heat cylinder head to 110 to 130°C (230 to 266°F) and press service valve guide onto cylinder head.

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

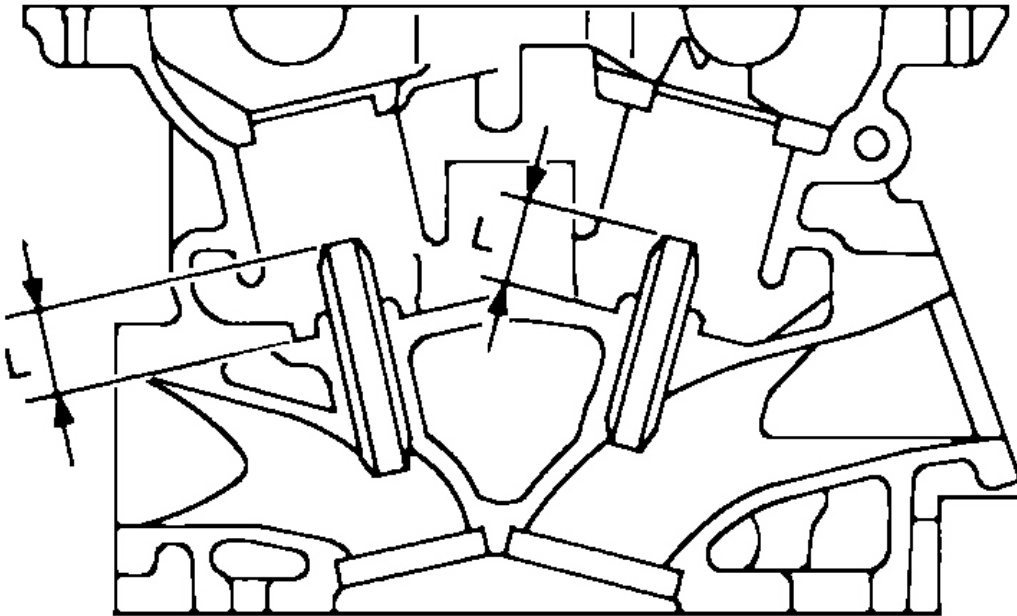
Projection "L":

12.6 - 12.8 mm (0.496 - 0.504 in)

5. Ream valve guide.

Finished size:

6.000 - 6.018 mm (0.2362 - 0.2369 in)



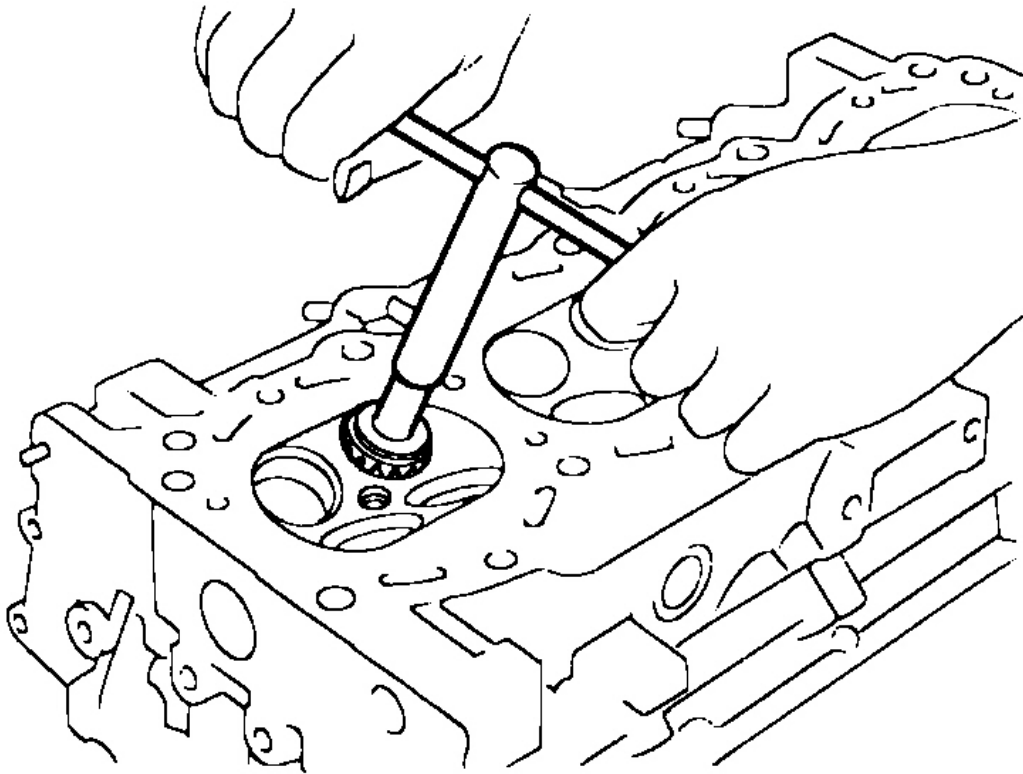
G02208244

Fig. 138: Pressing Service Valve Guide Onto Cylinder Head
Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE SEATS

Check valve seats for any evidence of pitting at valve contact surface, and reseal or replace if it has worn out excessively.

- **Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.**
- **Use both hands to cut uniformly.**



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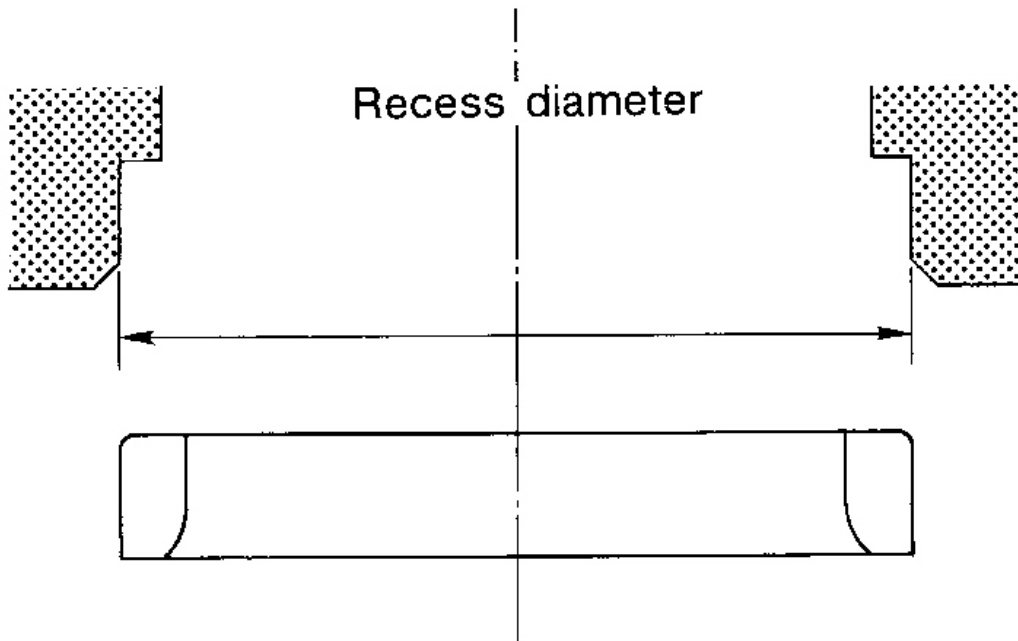
Fig. 139: Checking Valve Seats

Courtesy of NISSAN MOTOR CO., U.S.A.

REPLACING VALVE SEAT FOR SERVICE PARTS

1. 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.
2. Ream cylinder head recess for service valve seat.

Oversize [0.5 mm (0.020 in)]:**Intake 38.500 - 38.516 mm (1.5157 - 1.5164 in)****Exhaust 32.700 - 32.716 mm (1.2874 - 1.2880 in)****Be sure to ream in circles concentric to the valve guide center.****This will enable valve seat to fit correctly.**



G02208246

Fig. 140: Identifying Recess Diameter

Courtesy of NISSAN MOTOR CO., U.S.A.

3. Heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil.
4. Press fit valve seat until it seats on the bottom.

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

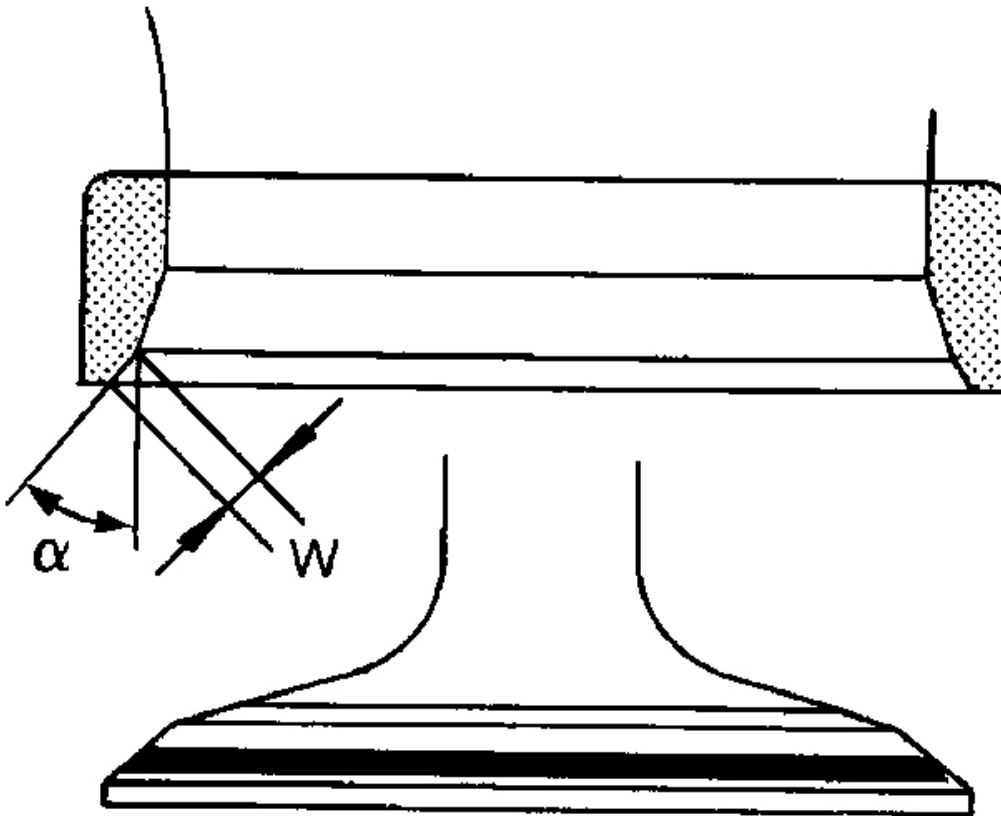
5. Cut or grind valve seat using suitable tool to the specified dimensions as shown in SDS (EM-81).
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seating condition.

Seat face angle "alpha;": 45°

Contacting width "W":

Intake 1.09 - 1.31 mm (0.0429 - 0.0516 in)

Exhaust 1.29 - 1.51 mm (0.0508 - 0.0594 in)



G02208247

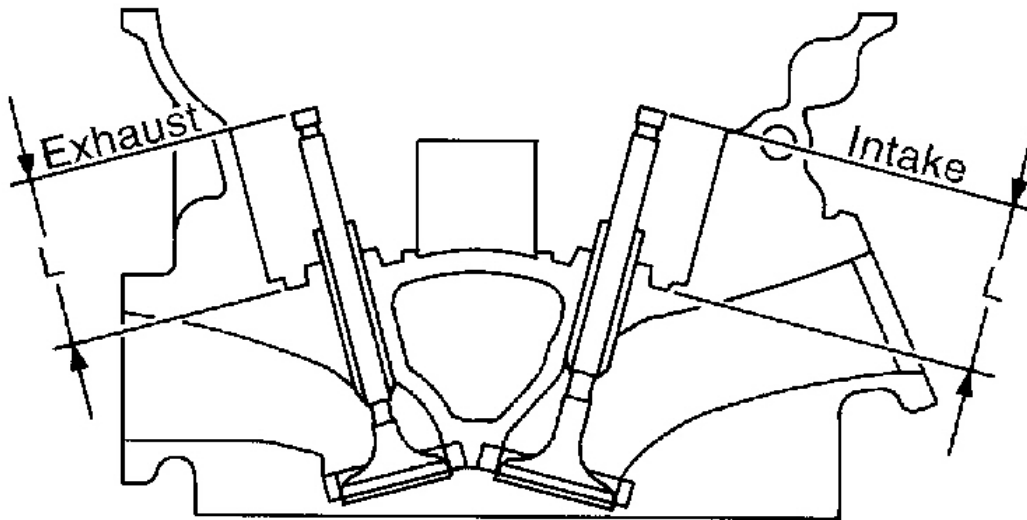
Fig. 141: Cutting Or Grinding Valve Seat Using Suitable Tool To Specified Dimensions
Courtesy of NISSAN MOTOR CO., U.S.A.

8. Use a depth gauge to measure the distance between the mounting surface of the cylinder head spring seat and the valve stem end. If the distance is shorter than specified, repeat step 5 above to adjust it. If it is longer, replace the valve seat with a new one.

Valve seat resurface limit "L":

Intake 41.07 - 41.67 mm (1.6169 - 1.6405 in)

Exhaust 41.00 - 41.60 mm (1.6142 - 1.6378 in)



G02208248

Fig. 142: Measuring Distance Between Mounting Surface Of Cylinder Head Spring Seat And Valve Stem End

Courtesy of NISSAN MOTOR CO., U.S.A.

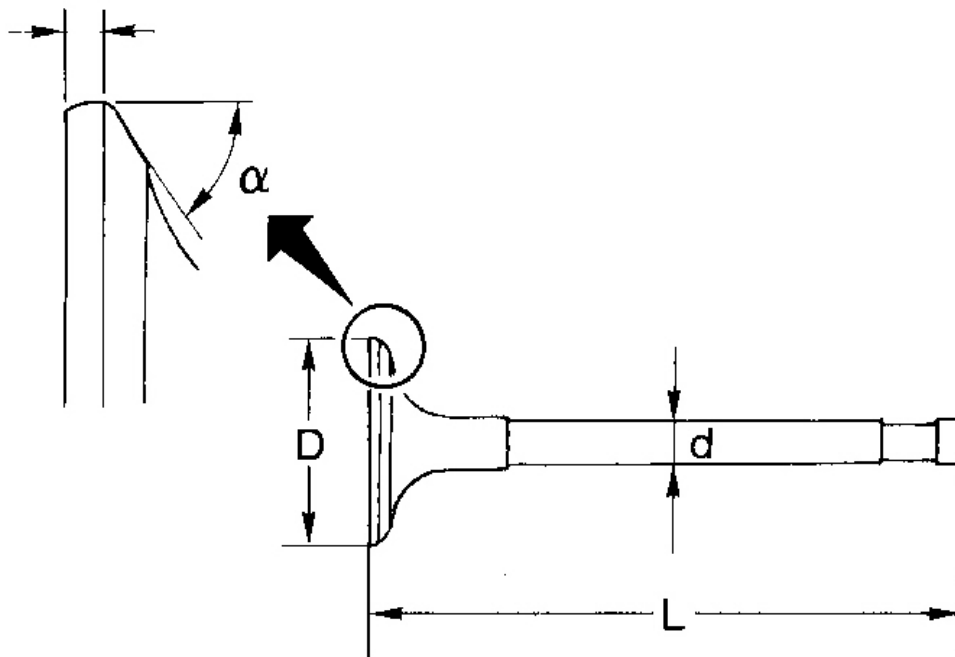
VALVE DIMENSIONS

Check dimensions of each valve. For dimensions, refer to **SDS** .

When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.

Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.

T (Margin thickness)



G02208249

Fig. 143: Checking Dimensions Of Valve
 Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE SPRING

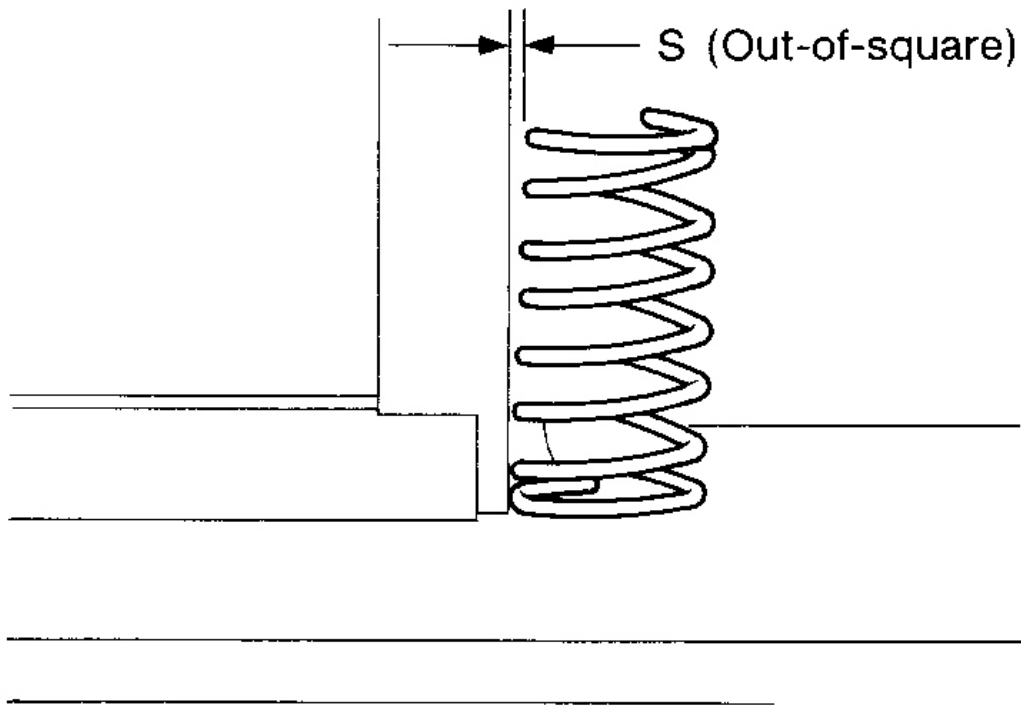
Squareness

1. Measure dimension "S".

Out-of-square "S":

Less than 2.0 mm (0.079 in)

2. If it exceeds the limit, replace spring.



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Fig. 144: Identifying Valve Spring Dimension
Courtesy of NISSAN MOTOR CO., U.S.A.

Pressure

Check valve spring pressure at specified spring height.

Pressure:

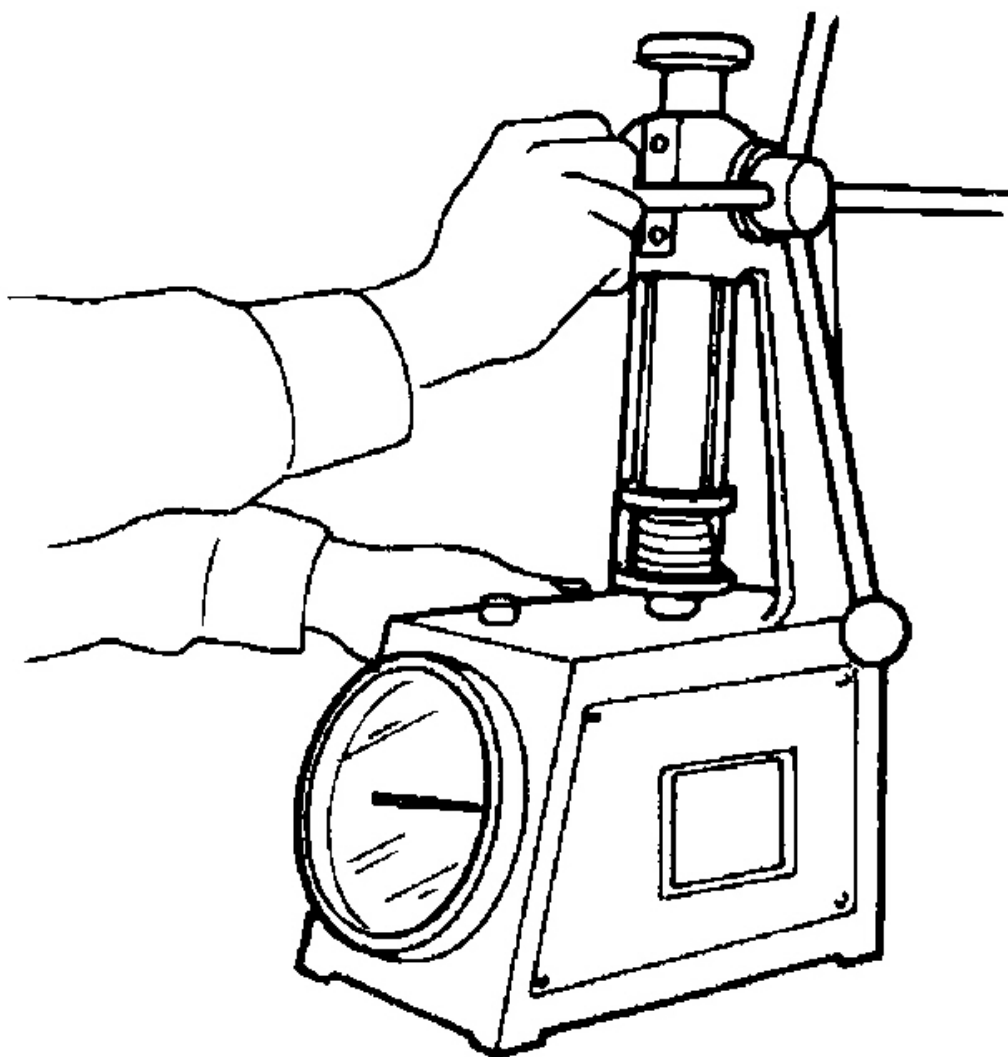
Installation

196 N (20.0 kg, 44.1 lb) at height 37.0 mm (1.457 in)

Valve open

More than 433 N (44.2 kg, 97.3 lb) at height 27.8 mm (1.094 in)

If it exceeds the limit, replace spring.

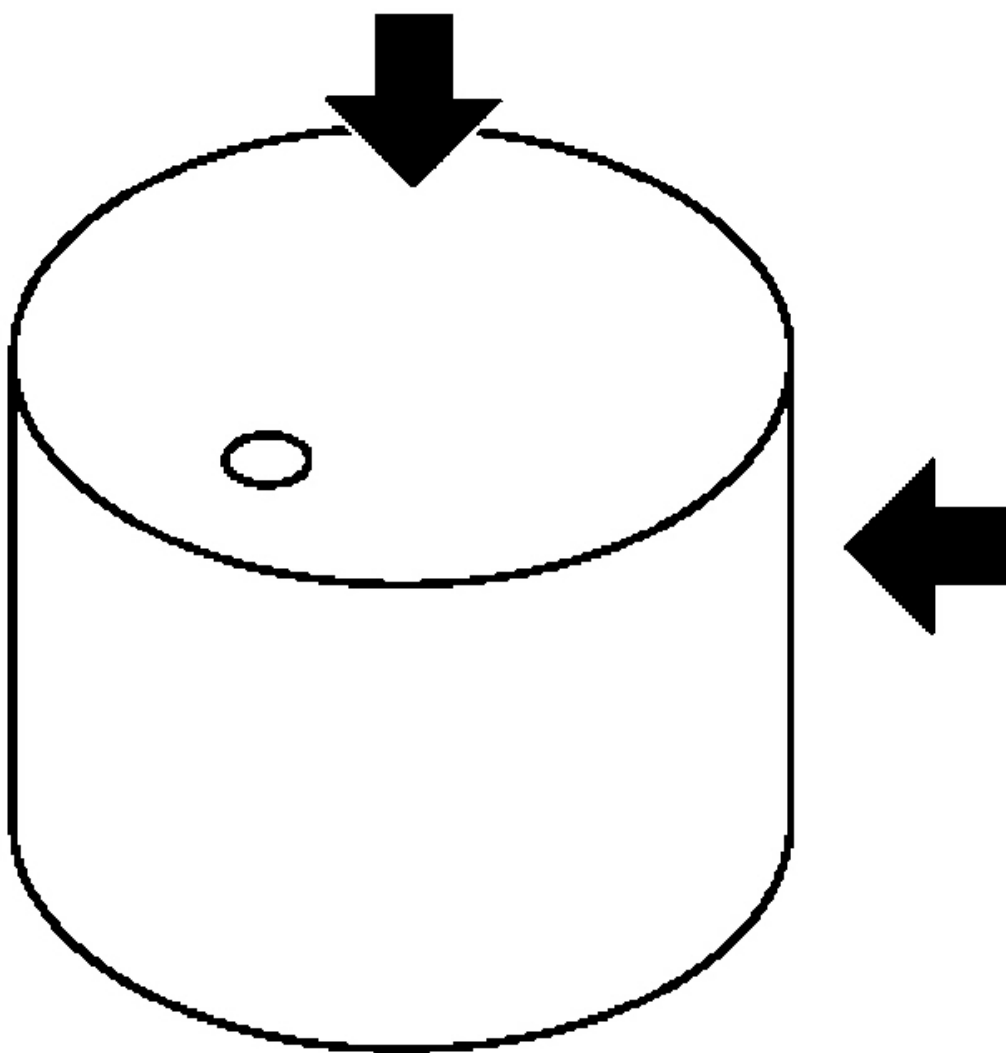


G02208251

Fig. 145: Checking Valve Spring Pressure At Specified Spring Height
Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE LIFTER

1. Check contact and sliding surfaces for wear or scratches.



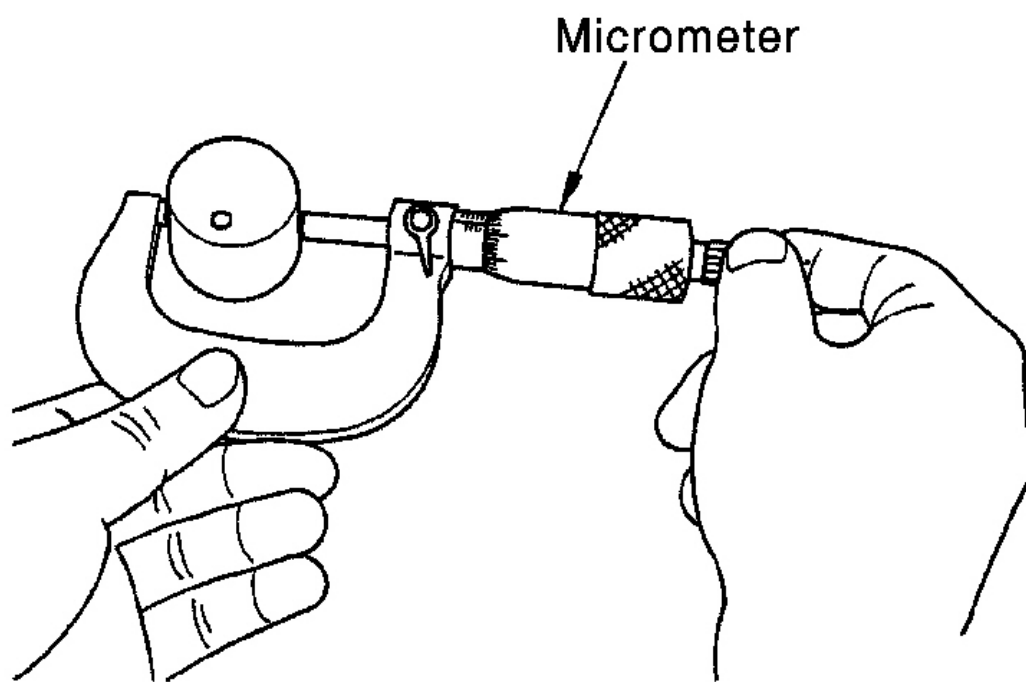
G02208252

Fig. 146: Checking Contact And Sliding Surfaces Of Valve Lifter
Courtesy of NISSAN MOTOR CO., U.S.A.

2. Check diameter of valve lifter and lifter guide bore.

Valve lifter outer diameter:

33.977 - 33.987 mm (1.3377 - 1.3381 in)

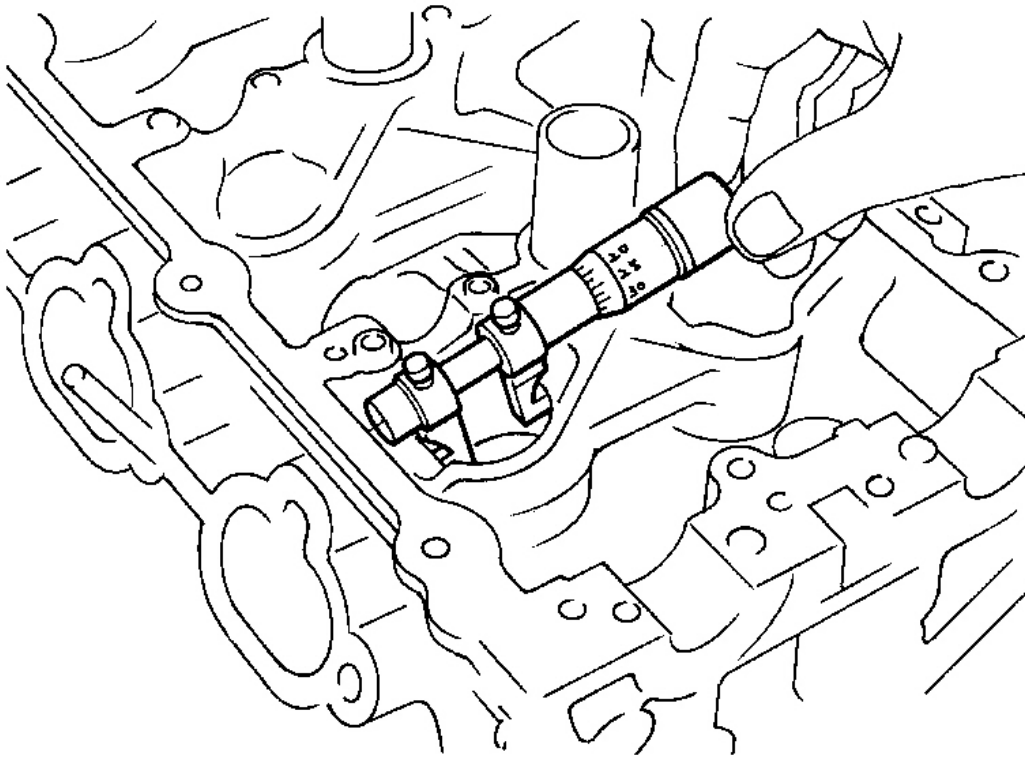


G02208253

Fig. 147: Checking Diameter Of Valve Lifter And Lifter Guide Bore
Courtesy of NISSAN MOTOR CO., U.S.A.

Lifter guide bore diameter:

34.000 - 34.016 mm (1.3386 - 1.3392 in)

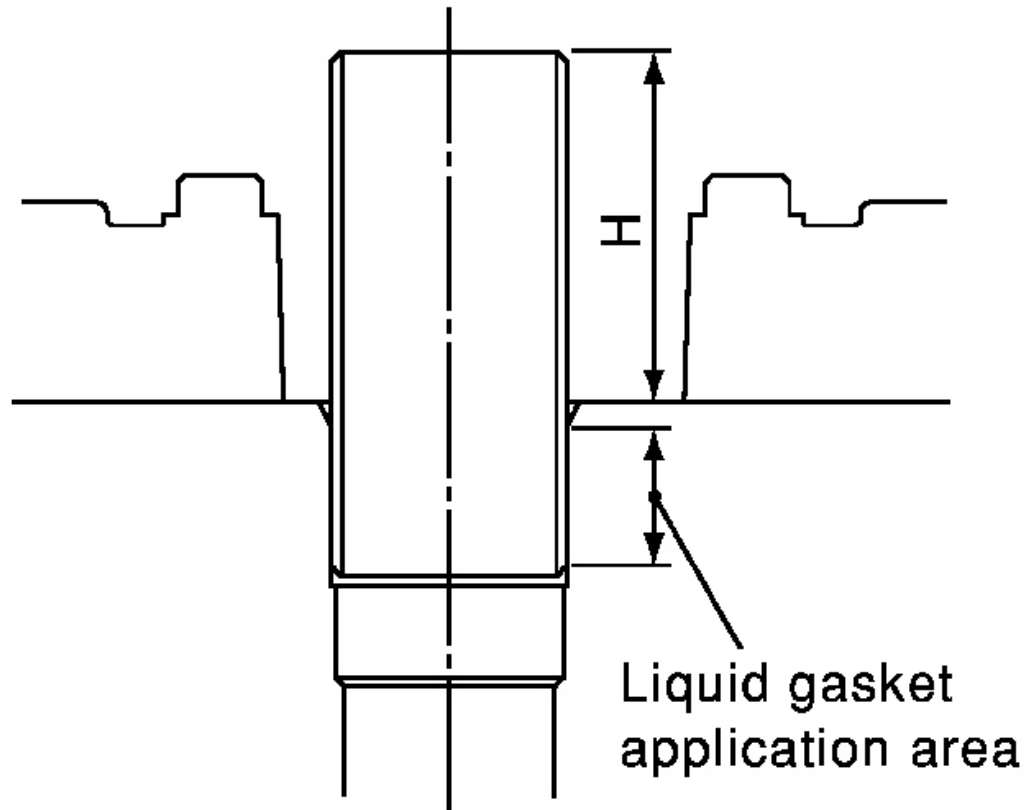


G02208254

Fig. 148: Measuring Lifter Guide Bore Diameter
Courtesy of NISSAN MOTOR CO., U.S.A.

ASSEMBLY

1. Install spark plug tube.
 - Press-fit spark plug tube following procedure below.
 - a. Remove old liquid gasket adhering to cylinder-head mounting hole.
 - b. Apply liquid gasket to area within approximately 12 mm (0.47 in) from edge of spark plug tube press-fit side.
 - Use Genuine RTV Silicone Sealant or equivalent. Refer to **RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS**.



G02208255

Fig. 149: Identifying Apply Liquid Gasket Area Dimension
Courtesy of NISSAN MOTOR CO., U.S.A.

- c. Using a drift, press-fit spark plug tube so that its height "H" is as specified in the figure.

Standard press-fit height "H":

38.55 - 38.65 mm (1.5177 - 1.5217 in)

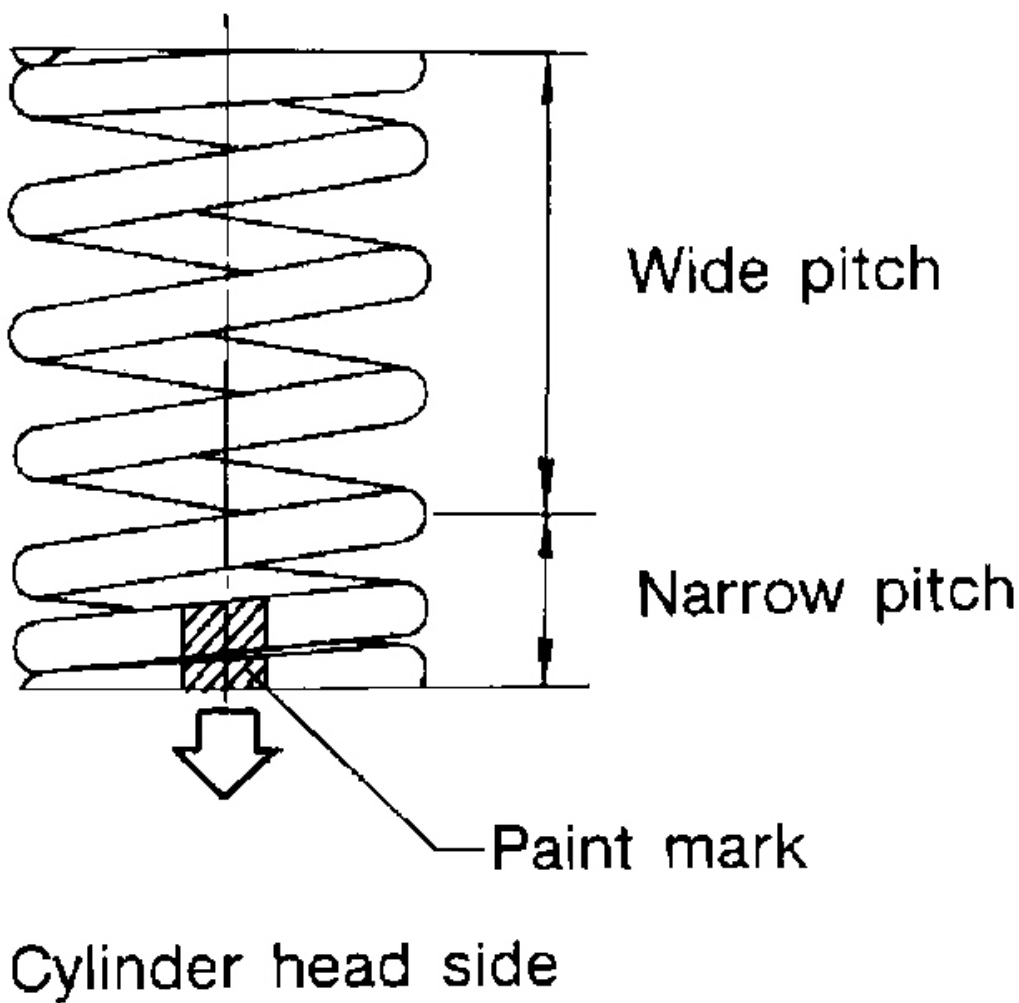
CAUTION:

- When press-fitting, take care not to deform spark plug tube.
- After press-fitting, wipe off liquid gasket protruding onto cylinder-head upper face.

2. Install valve component parts.

- Always use new valve oil seal. Refer to "VALVE OIL SEAL".
- Before installing valve oil seal, install valve spring seat.
- Install valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side (paint mark).
- After installing valve component parts, tap valve stem tip with plastic hammer to assure a proper fit.

3. Install spark plug.

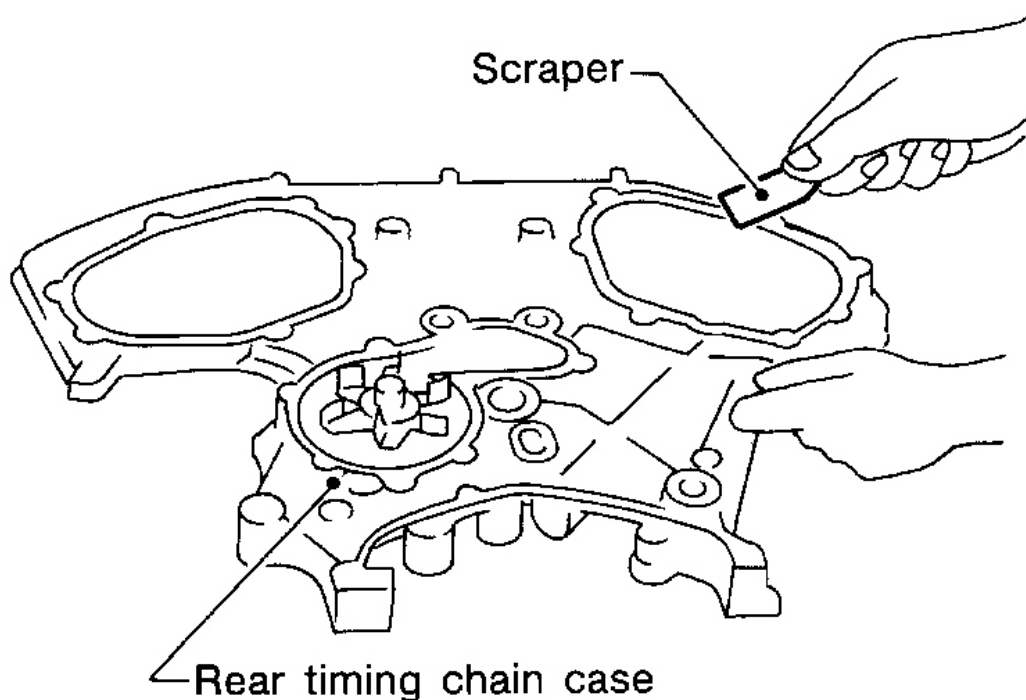


G02208256

Fig. 150: Identifying Valve Spring Dimension
Courtesy of NISSAN MOTOR CO., U.S.A.

INSTALLATION

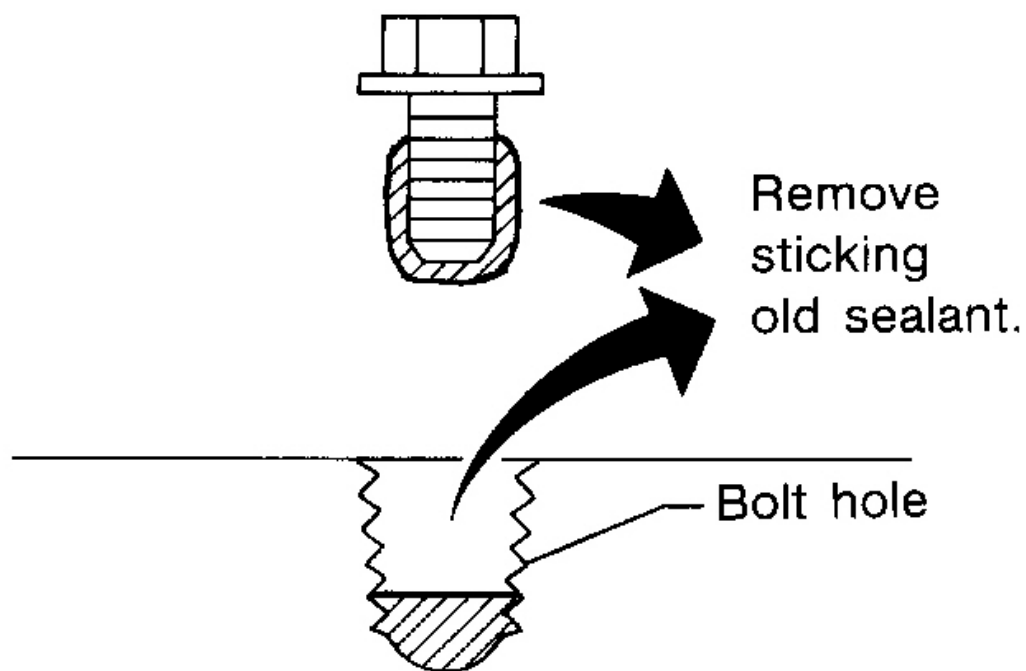
1. Before installing rear timing chain case, remove old liquid gasket from mating surface using a scraper.
 - Also remove old liquid gasket from mating surface of cylinder block.



G02208257

Fig. 151: Removing Old Liquid Gasket From Mating Surface Of Cylinder Block
Courtesy of NISSAN MOTOR CO., U.S.A.

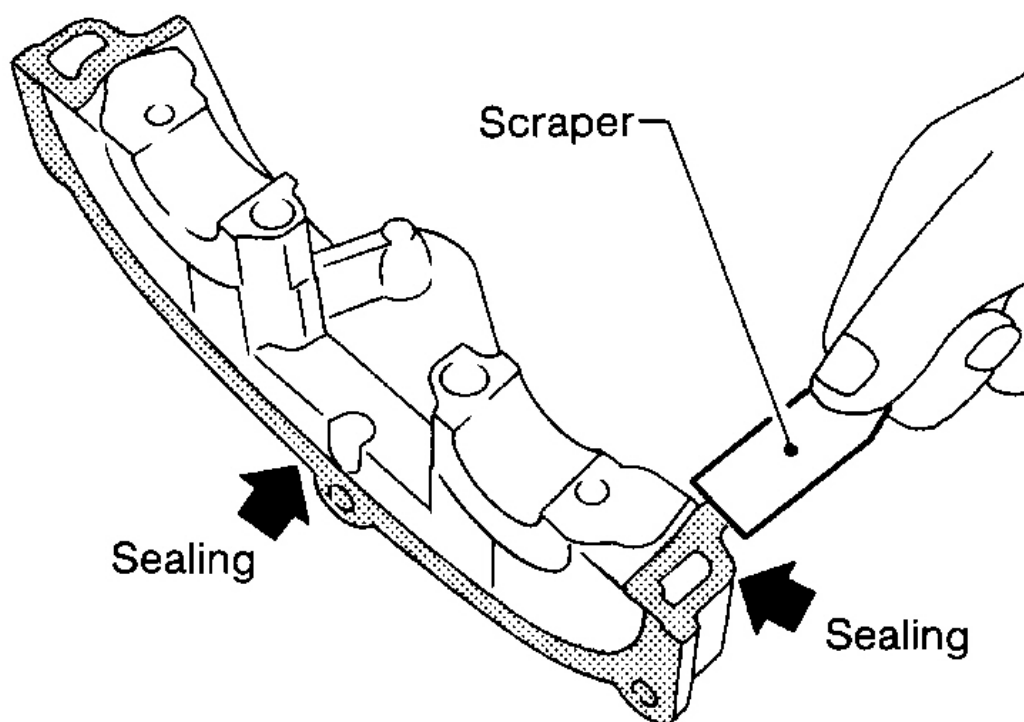
- Remove old liquid gasket from the bolt hole and thread.



G02208258

Fig. 152: Removing Old Liquid Gasket From Bolt Hole And Thread
Courtesy of NISSAN MOTOR CO., U.S.A.

2. Before installing cam bracket, remove old liquid gasket from mating surface using a scraper.

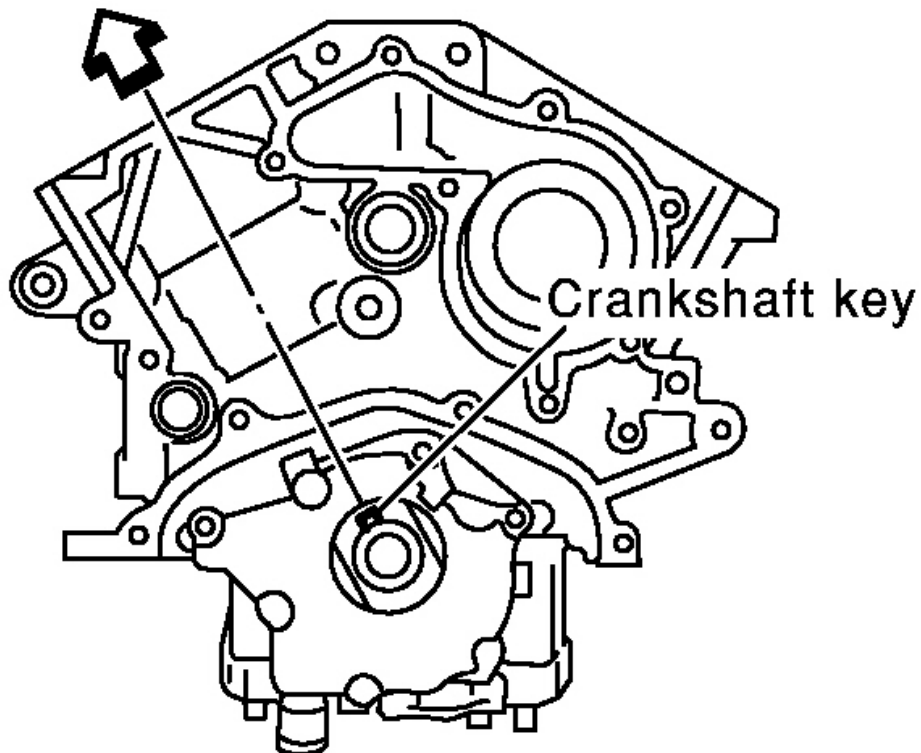


G02208259

Fig. 153: Removing Old Liquid Gasket From Mating Surface Using Scraper
Courtesy of NISSAN MOTOR CO., U.S.A.

3. Before installing the cylinder head gasket, be sure that No. 1 cylinder is at TDC.
 - At this time, the crankshaft key should face toward the right bank.

Right bank side

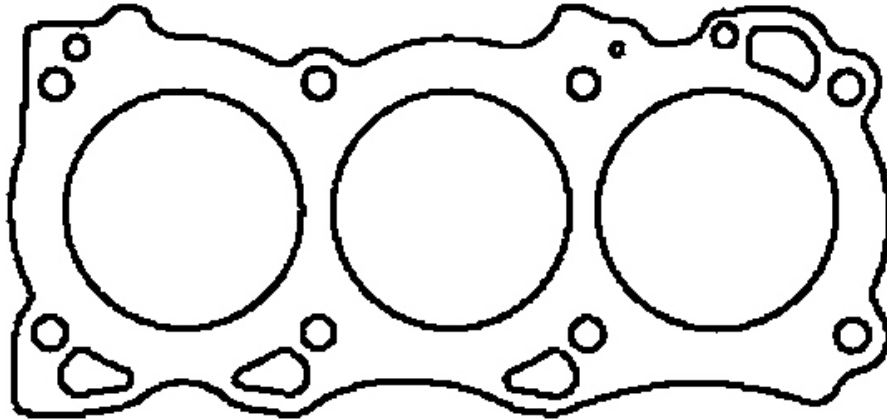


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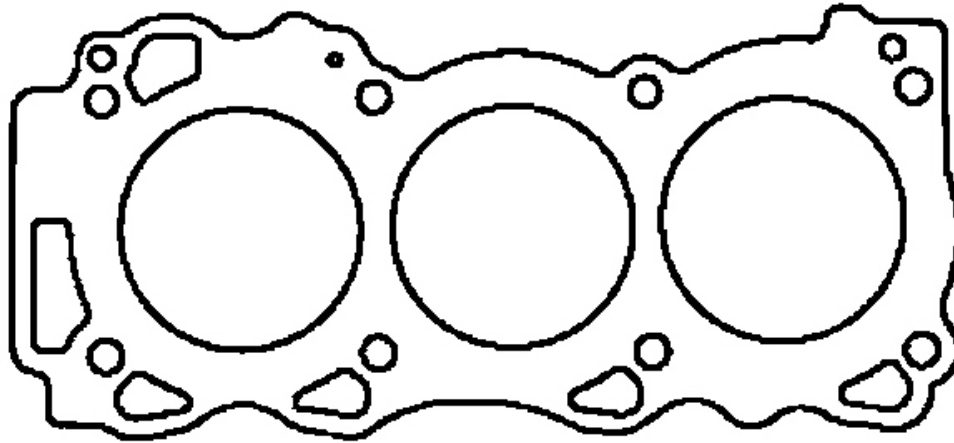
Fig. 154: Identifying Crankshaft Key Location
Courtesy of NISSAN MOTOR CO., U.S.A.

4. Install cylinder heads with new gaskets.
 - **Do not rotate crankshaft and camshaft separately, or valves will strike piston heads.**

RH cylinder head gasket



LH cylinder head gasket



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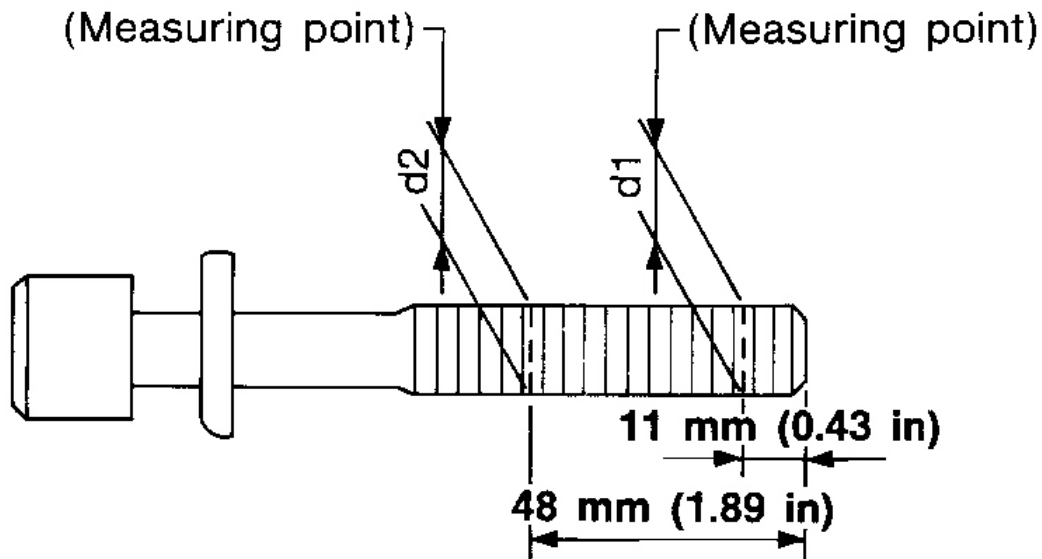
Fig. 155: Identifying Cylinder Head Gaskets
Courtesy of NISSAN MOTOR CO., U.S.A.

CAUTION: Cylinder head bolts are tightened by plastic zone tightening method. Whenever the size difference between d1 and d2 exceeds the limit, replace them with new ones.

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

- If reduction of outer diameter appears in a position other than d2, use it as d2 point.
- Lubricate threads and seat surfaces of the bolts with new engine oil.

Cylinder head bolt

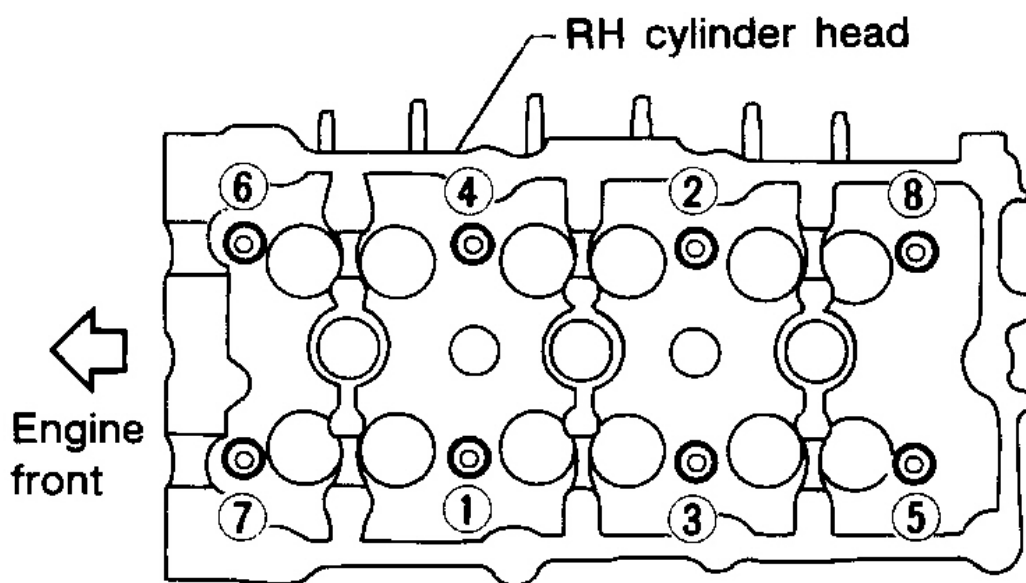


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Fig. 156: Identifying Cylinder Head Bolts Tightening Method
 Courtesy of NISSAN MOTOR CO., U.S.A.

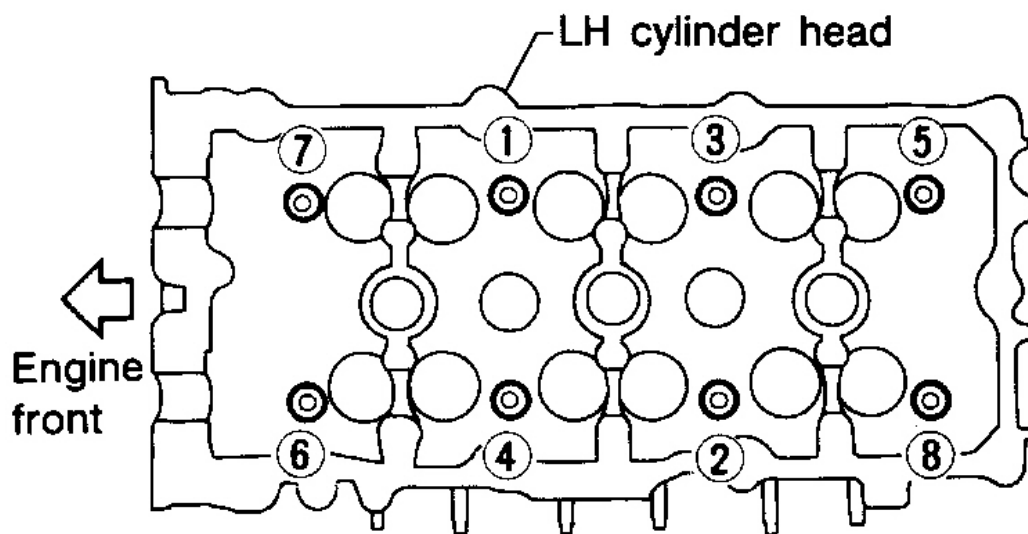
5. Install cylinder head outside bolts.

- **Tightening procedure:**
 - Tighten all bolts to 98.1 N.m (10 kg-m, 72 ft-lb).
 - Completely loosen all bolts in reverse order shown.
 - Tighten all bolts to 34.3 to 44.1 N.m (3.5 to 4.4 kg-m, 25 to 33 ft-lb).
 - Turn all bolts 90 to 95 degrees clockwise. [target: 90 degrees (angle tightening)]
 - Turn all bolts 90 to 95 degrees clockwise again. [target: 90 degrees (angle tightening)]
- Tighten in numerical order shown in the figure.



G02208263

Fig. 157: Tightening RH Cylinder Head Outside Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.



G02208264

Fig. 158: Tightening LH Cylinder Head Outside Bolts
Courtesy of NISSAN MOTOR CO., U.S.A.

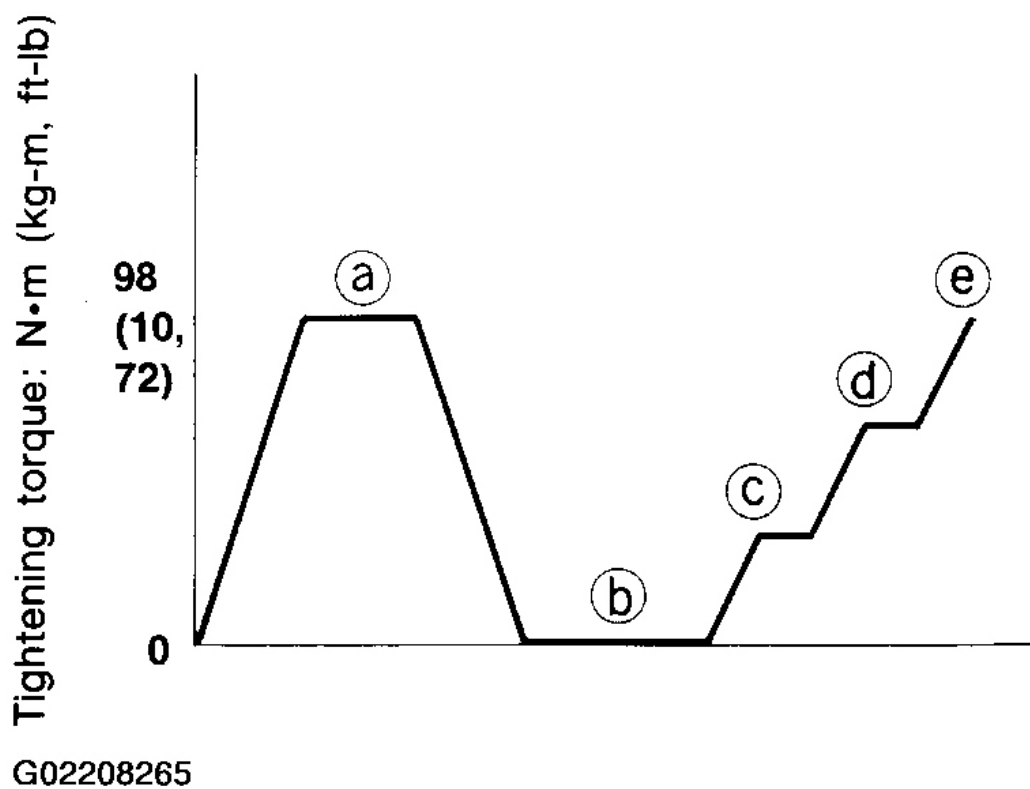
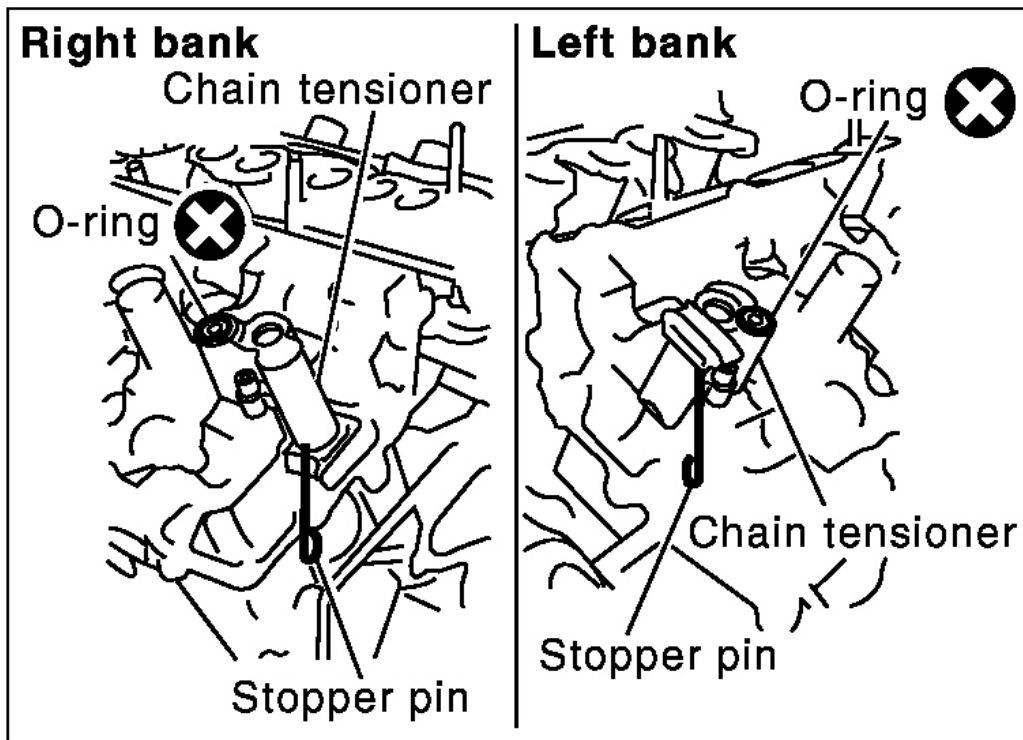


Fig. 159: Torque Specifications Graph
Courtesy of NISSAN MOTOR CO., U.S.A.

6. Install camshaft chain tensioners on both sides of cylinder head.



G02208266

Fig. 160: Installing Camshaft Chain Tensioners On Both Sides Of Cylinder Head
Courtesy of NISSAN MOTOR CO., U.S.A.

7. Install exhaust and intake camshafts and camshaft brackets.
 - Intake camshaft has a drill mark on camshaft sprocket mounting flange. Install it on the intake side.

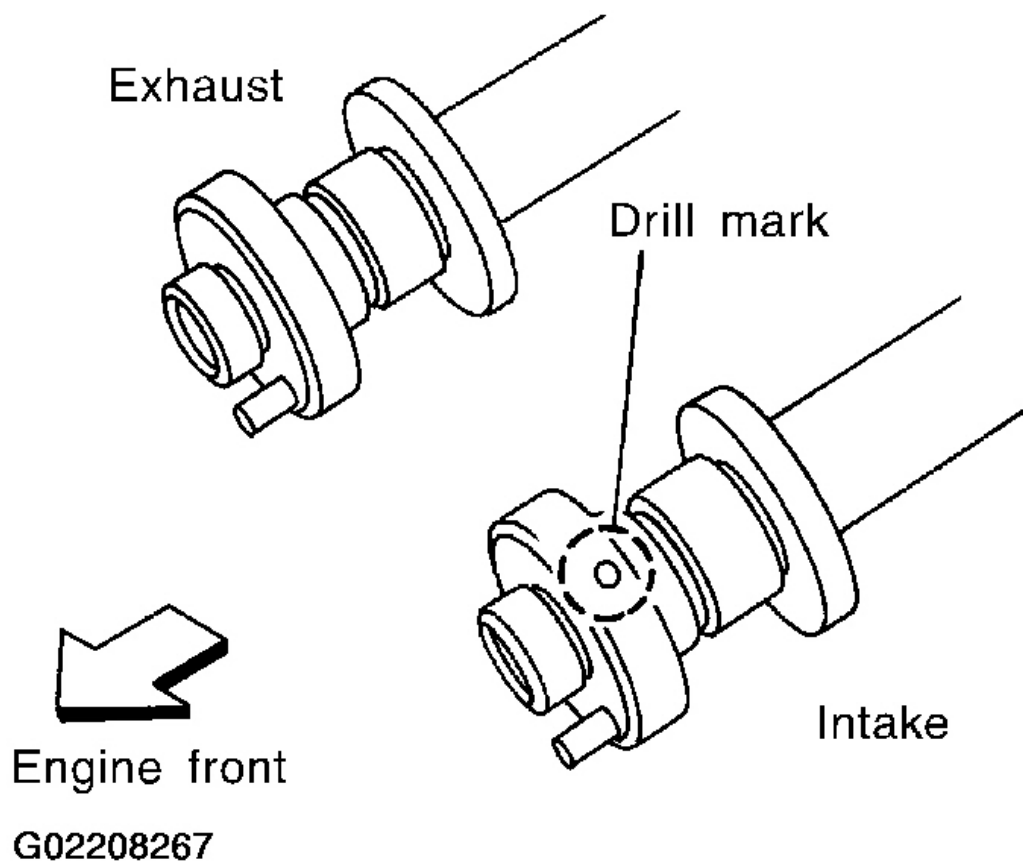


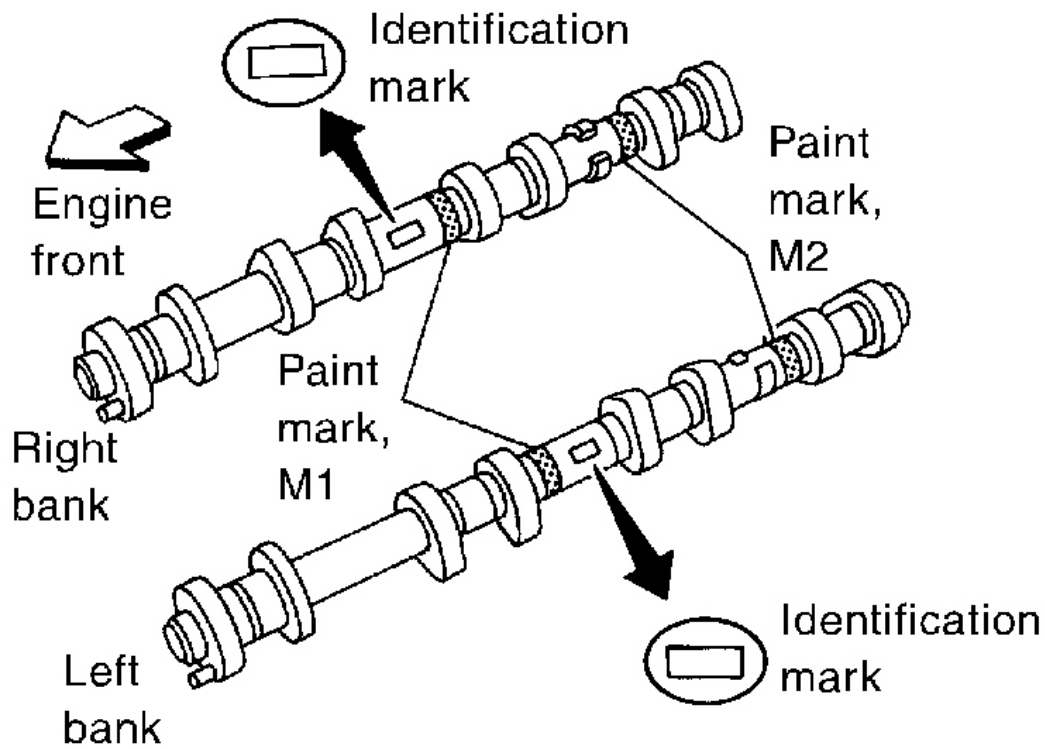
Fig. 161: Installing Exhaust And Intake Camshafts And Camshaft Brackets
Courtesy of NISSAN MOTOR CO., U.S.A.

8. Identification marks are present on camshafts.

Bank	INT/EXH	ID mark	Drill mark	Paint mark	
				M1	M2
RH	INT	R3	Yes	Yes	No
	EXH	R3	No	No	Yes
LH	INT	L3	Yes	Yes	No
	EXH	L3	No	No	Yes

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Fig. 162: Identification Marks Description Chart
Courtesy of NISSAN MOTOR CO., U.S.A.



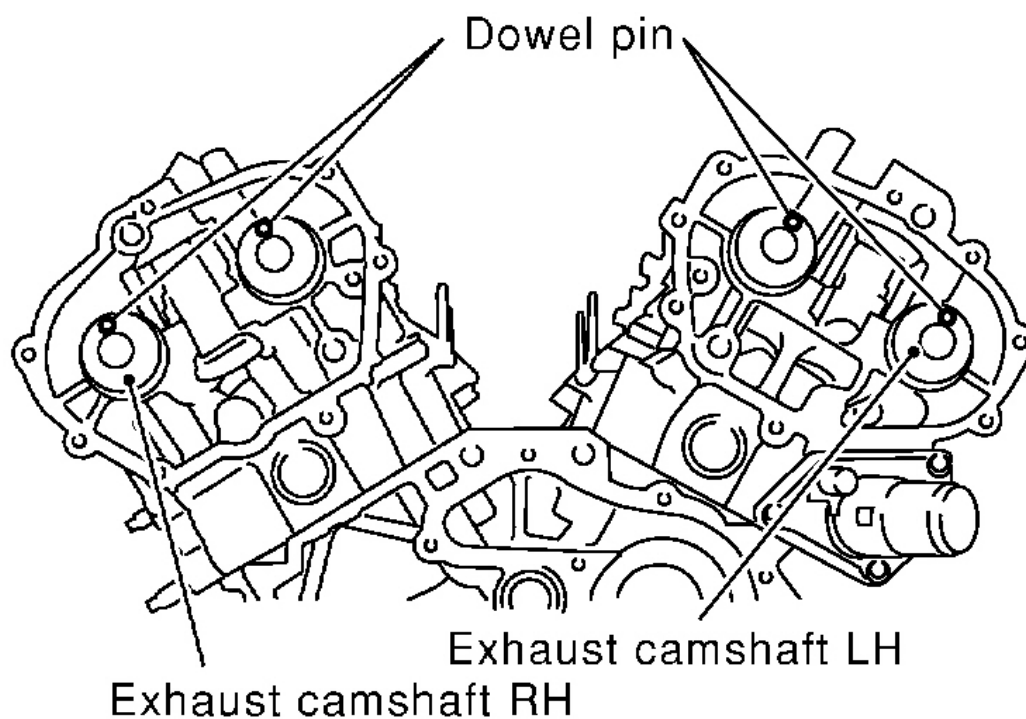
G02208269

Fig. 163: Identifying Identification Marks Location
Courtesy of NISSAN MOTOR CO., U.S.A.

9. Position camshaft

RH exhaust camshaft dowel pin at about 10 o'clock

LH exhaust camshaft dowel pin at about 2 o'clock



G02208270

Fig. 164: Identifying Dowel Pin Position
Courtesy of NISSAN MOTOR CO., U.S.A.

10. Before installing camshaft brackets, apply sealant to mating surface of No. 1 journal head.
- Use Genuine RTV silicone sealant or equivalent. Refer to **RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS**.
 - Refer to **"POSITION FOR APPLYING LIQUID GASKET"**, .
 - Install camshaft brackets in their original positions. Align stamp mark as shown in the figure.
 - If any part of valve assembly or camshaft is replaced, check valve clearance according to reference data. After completing assembly check valve clearance. Refer to **"CHECKING"**

and "ADJUSTING" in "VALVE CLEARANCE", .

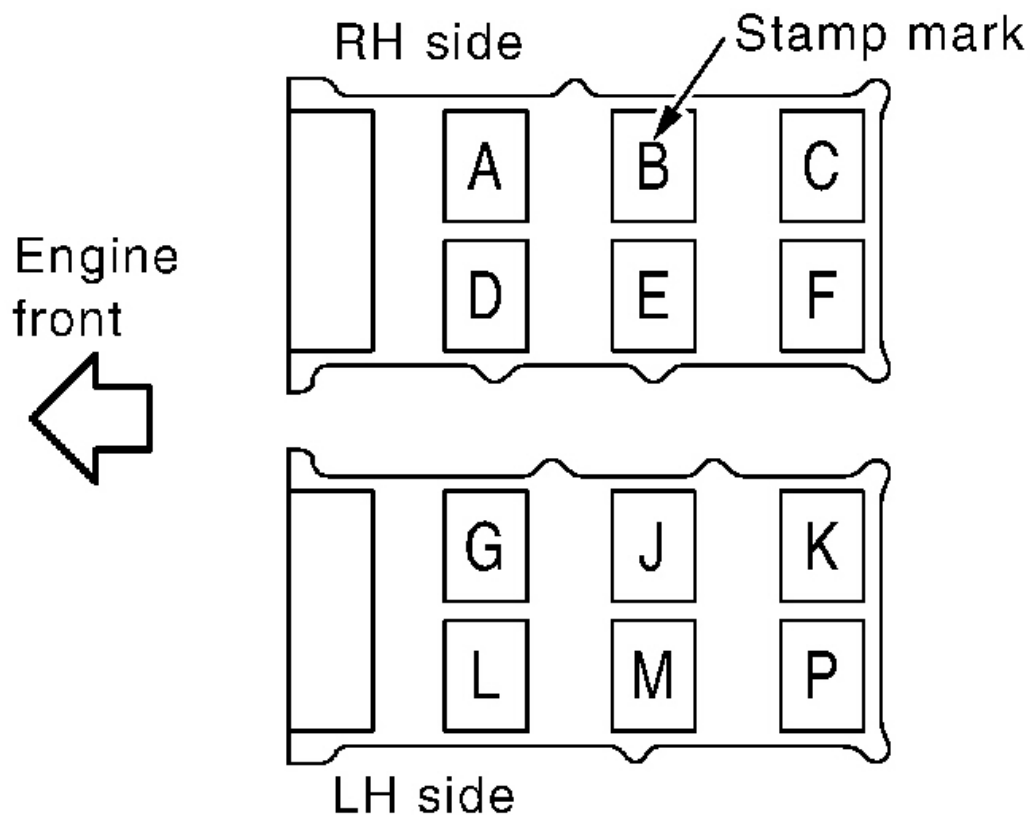
Reference data valve clearance (Cold):

Intake

0.26 - 0.34 mm (0.010 - 0.013 in)

Exhaust

0.29 - 0.37 mm (0.011 - 0.015 in)



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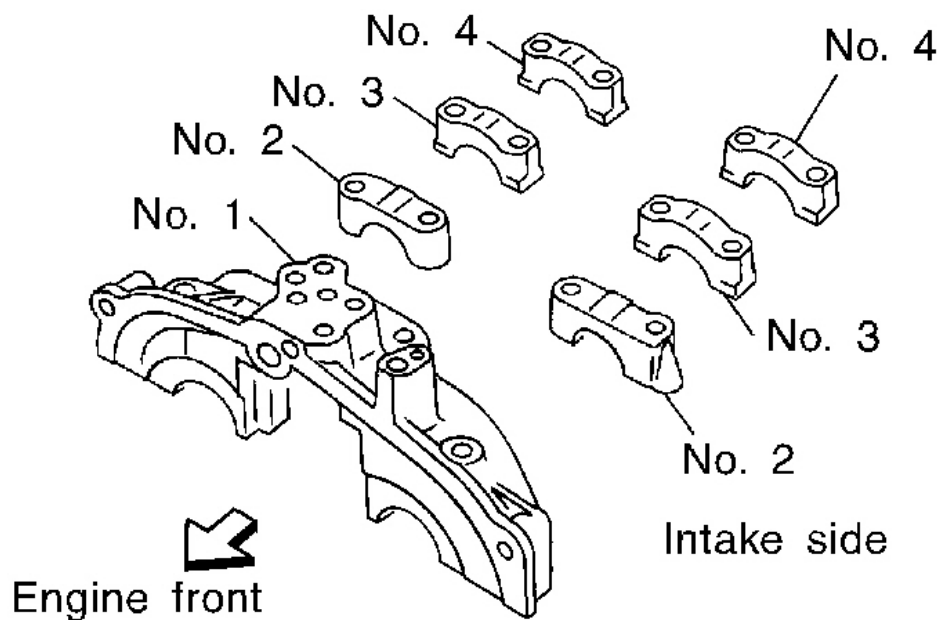
Fig. 165: Aligning Stamp Mark
Courtesy of NISSAN MOTOR CO., U.S.A.

- Lubricate threads and seat surfaces of camshaft bracket bolts with new engine oil before

installing them.

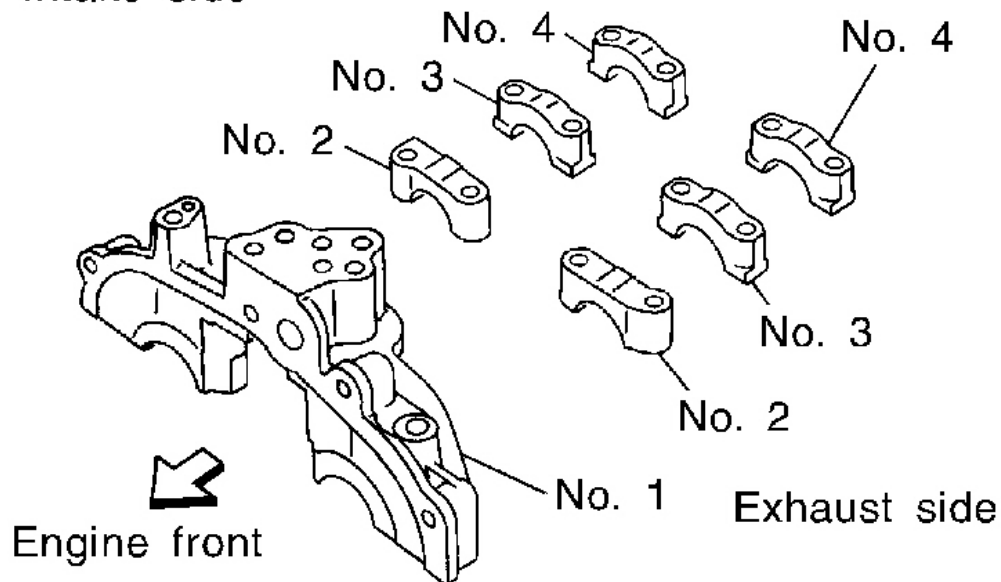
RH camshaft brackets

Exhaust side



LH camshaft brackets

Intake side



G02208272

Fig. 166: Identifying Camshaft Bracket
 Courtesy of NISSAN MOTOR CO., U.S.A.

- Tighten the camshaft brackets in the following steps.

Torque Specifications

Step	Tightening torque	Tightening order
1	1.96 N.m (0.2 kg-m, 17 in-lb)	Tighten in the order of 7 to 10, then tighten 1 to 6.
2	5.88 N.m (0.6 kg-m, 52 in-lb)	Tighten in the numerical order.
3	9.02 -- 11.8 N.m (0.92 -- 1.20 kg-m, 79.9 -- 104.2 in-lb)	Tighten in the order of 1 to 6.
	8.3 -- 10.3 N.m (0.9 -- 1.0 kg-m, 74 -- 91 in-lb)	Tighten in the order of 7 to 10.

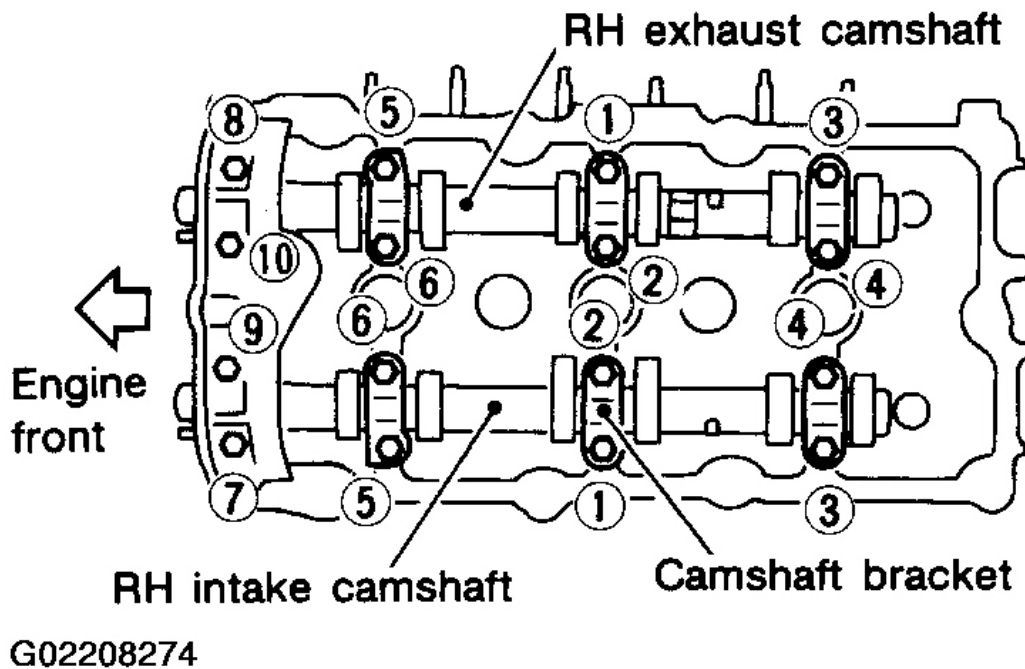
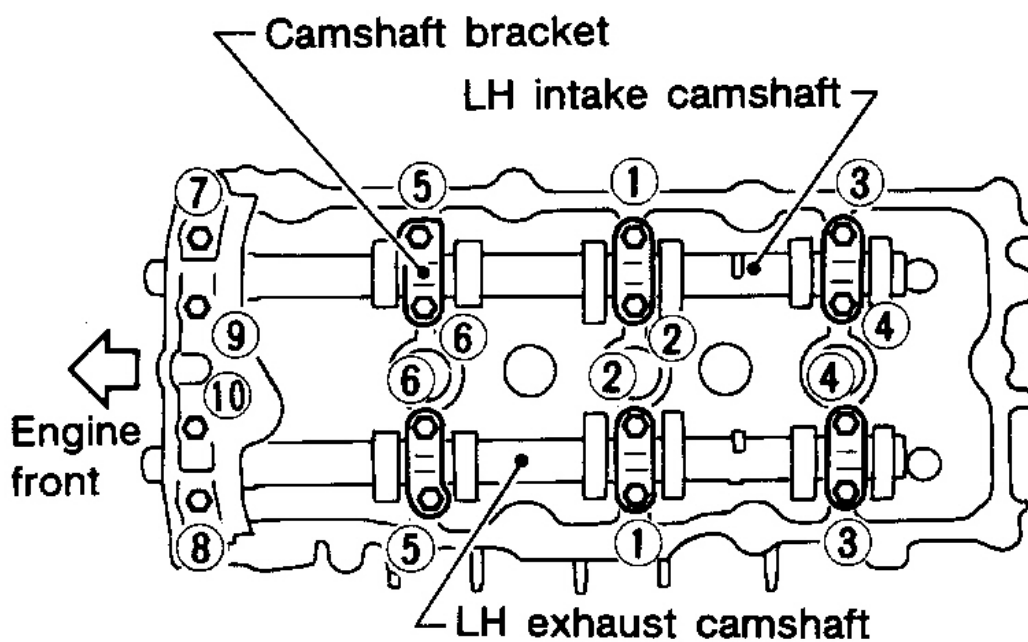


Fig. 167: Tightening Camshaft Brackets - RH
 Courtesy of NISSAN MOTOR CO., U.S.A.



G02208275

Fig. 168: Tightening Camshaft Brackets - LH
Courtesy of NISSAN MOTOR CO., U.S.A.

11. Install intake valve timing control solenoid valves.

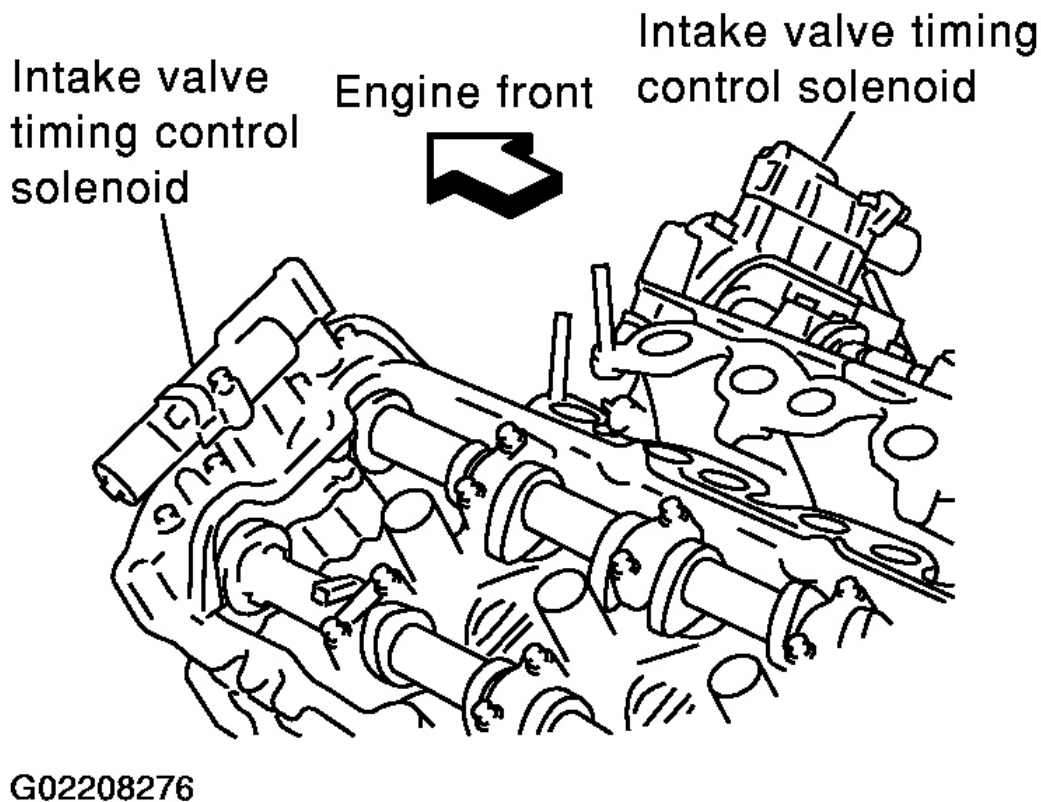


Fig. 169: Installing Intake Valve Timing Control Solenoid Valves
 Courtesy of NISSAN MOTOR CO., U.S.A.

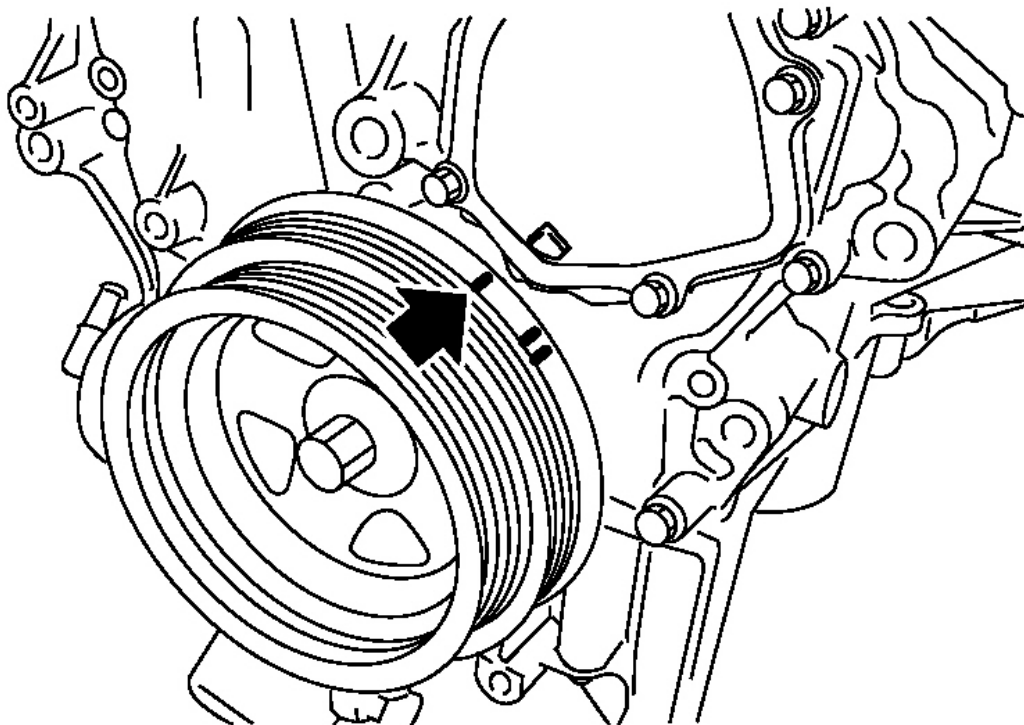
12. Reinstall all removed parts in reverse order of removal.

VALVE CLEARANCE

CHECKING

Check valve clearance while engine is cold and not running.

1. Remove engine cover.
2. Remove air duct with air cleaner case, collectors, hoses, wires, harnesses, connectors and so on.
3. Remove intake manifold collectors. Refer to "**TIGHTENING PROCEDURES**".
4. Remove ignition coils and spark plugs.
5. Remove RH and LH rocker covers.
6. Set No. 1 cylinder at TDC on its compression stroke.
 - Align pointer with TDC mark on crankshaft pulley.



G02208277

Fig. 170: Aligning Pointer With TDC Mark On Crankshaft Pulley
Courtesy of NISSAN MOTOR CO., U.S.A.

- Check that valve lifters on No. 1 cylinder are loose and valve lifters on No. 4 are tight.

If not, turn crankshaft one revolution (360°) and align as above.

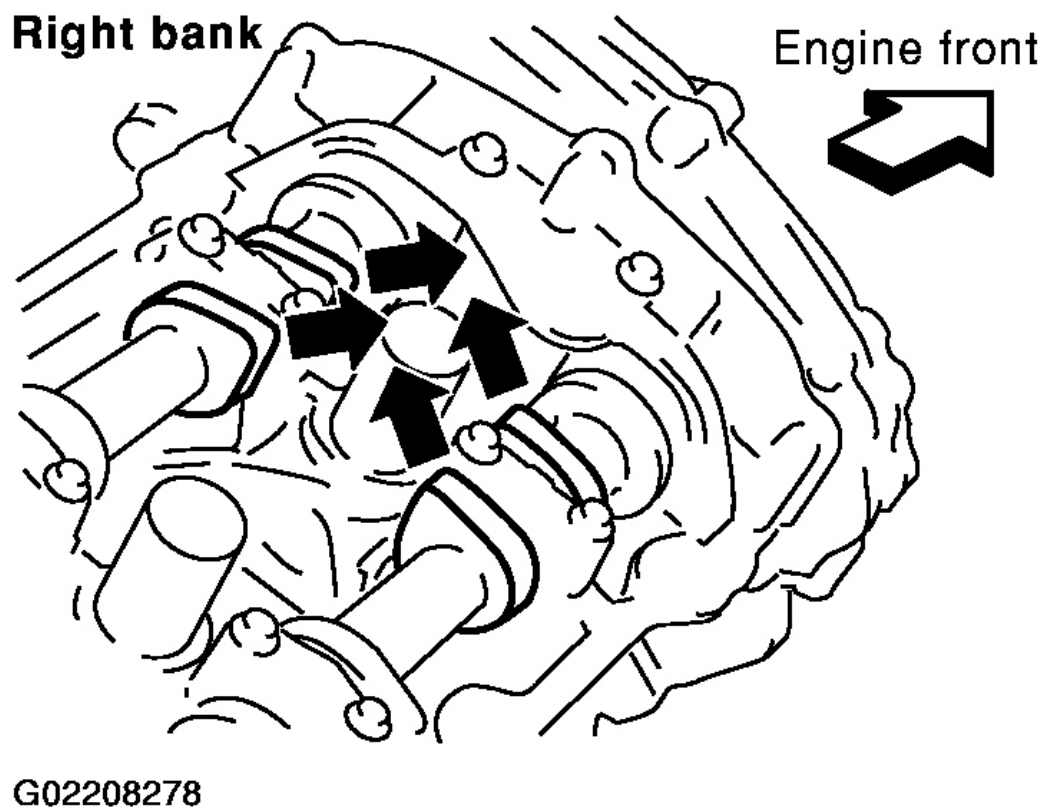


Fig. 171: Checking Valve Lifters
Courtesy of NISSAN MOTOR CO., U.S.A.

7. Check only those valves shown in the figure.

2003 Infiniti QX4

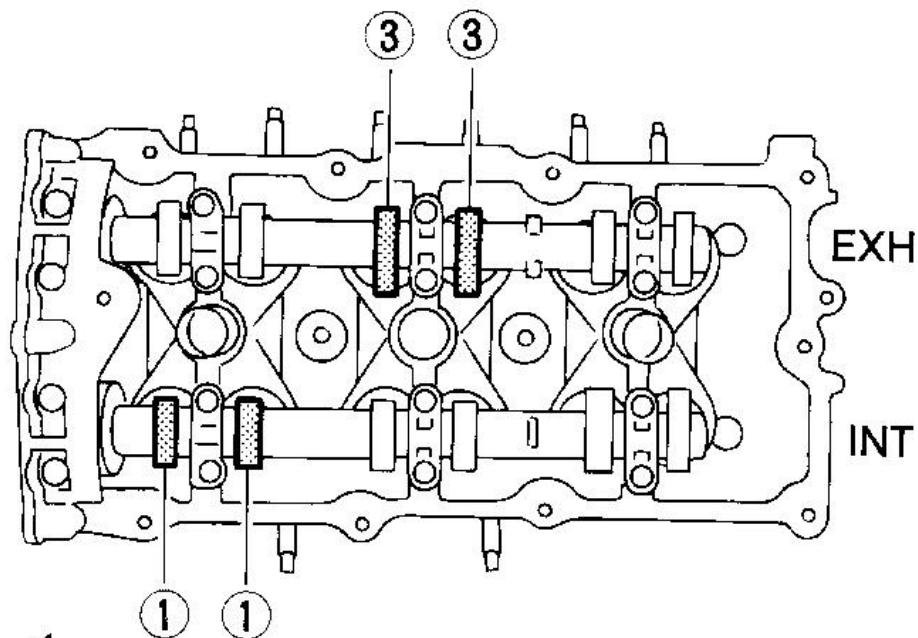
2003 ENGINE Engine Mechanical - QX4

Measuring position (RH bank)		No. 1 CYL.	No. 3 CYL.	No. 5 CYL.
No. 1 CYL. at TDC	EXH		X	
	INT	X		
Measuring position (LH bank)		No. 2 CYL.	No. 4 CYL.	No. 6 CYL.
No. 1 CYL. at TDC	INT			X
	EXH	X		

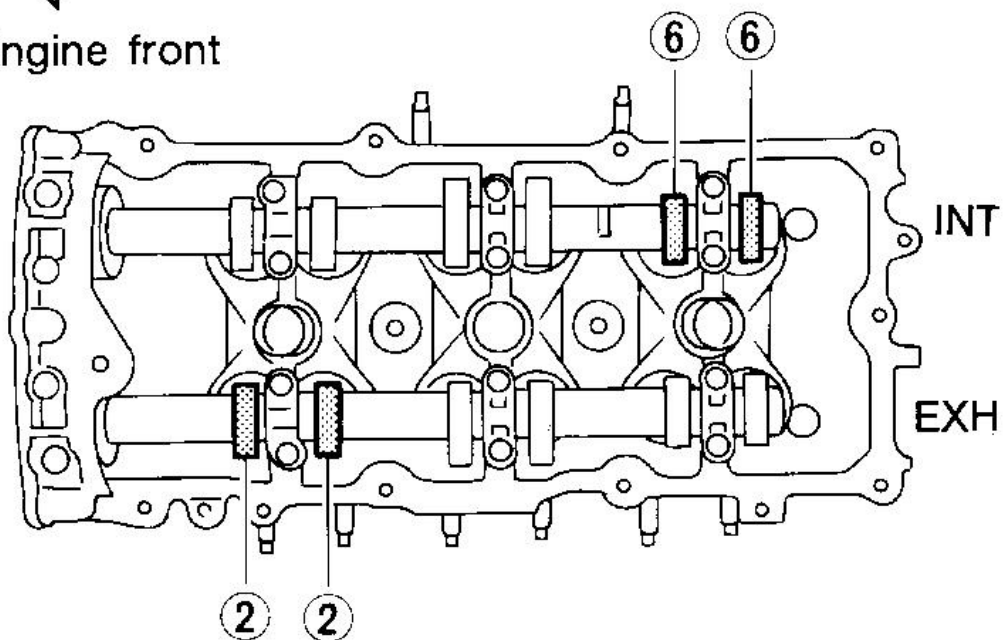
G02208279

Fig. 172: Valves Specifications**Courtesy of NISSAN MOTOR CO., U.S.A.**

RH cylinder head



Engine front



LH cylinder head

G02208280

Fig. 173: Identifying Valves**Courtesy of NISSAN MOTOR CO., U.S.A.**

- Using a feeler gauge, measure clearance between valve lifter and camshaft.
- Record any valve clearance measurements which are out of specification. They will be used later to determine the required replacement valve lifter.

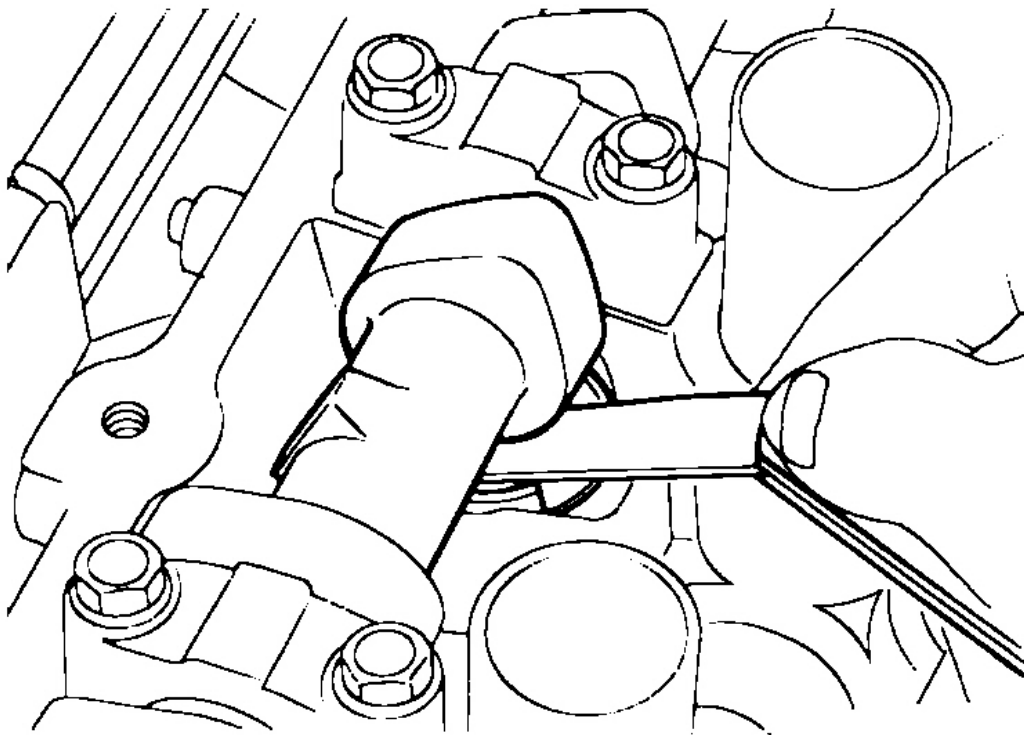
Valve clearance for checking:**Cold****Intake****0.26 - 0.34 mm (0.010 - 0.013 in)****Exhaust****0.29 - 0.37 mm (0.011 - 0.015 in)****G02208281**

Fig. 174: Measuring Clearance Between Valve Lifter And Camshaft Using Feeler Gauge (1 Of 2)

Courtesy of NISSAN MOTOR CO., U.S.A.

Hot*

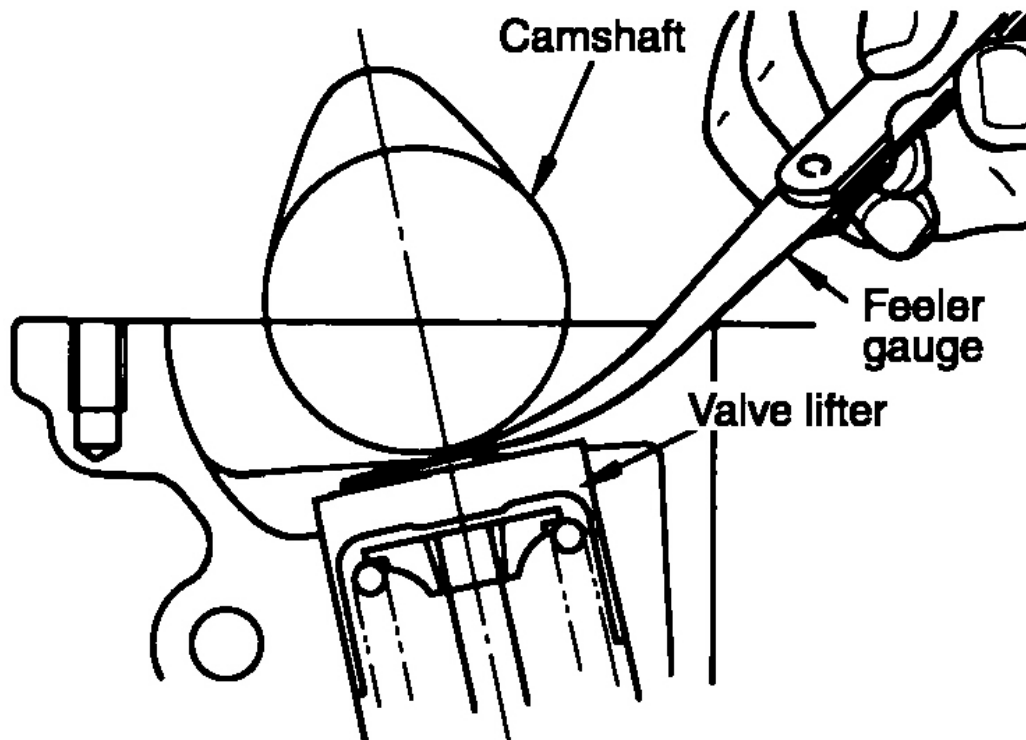
Intake

0.304 - 0.416 mm (0.012 - 0.016 in)

Exhaust

0.308 - 0.432 mm (0.012 - 0.017 in)

*: Approximately 80°C (176°F) (Reference date)



G02208282

Fig. 175: Measuring Clearance Between Valve Lifter And Camshaft Using Feeler Gauge (2 Of 2)

Courtesy of NISSAN MOTOR CO., U.S.A.

8. Turn crankshaft 240° and align as above.
9. Set No. 3 cylinder at TDC on its compression stroke.
10. Check only those valves shown in the figure.

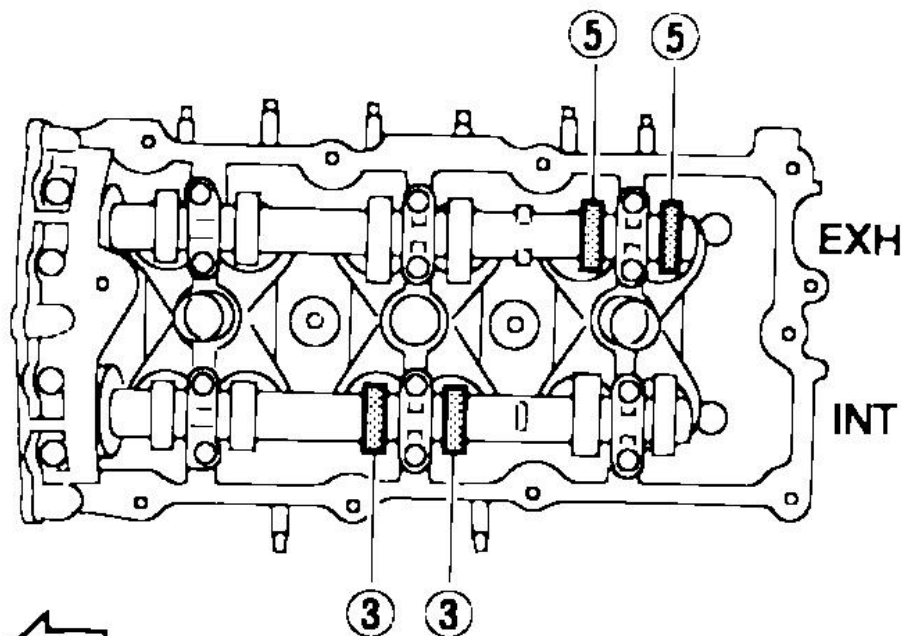
Measuring position (RH bank)		No. 1 CYL.	No. 3 CYL.	No. 5 CYL.
No. 3 CYL. at TDC	EXH			X
	INT		X	
Measuring position (LH bank)		No. 2 CYL.	No. 4 CYL.	No. 6 CYL.
No. 3 CYL. at TDC	INT	X		
	EXH		X	

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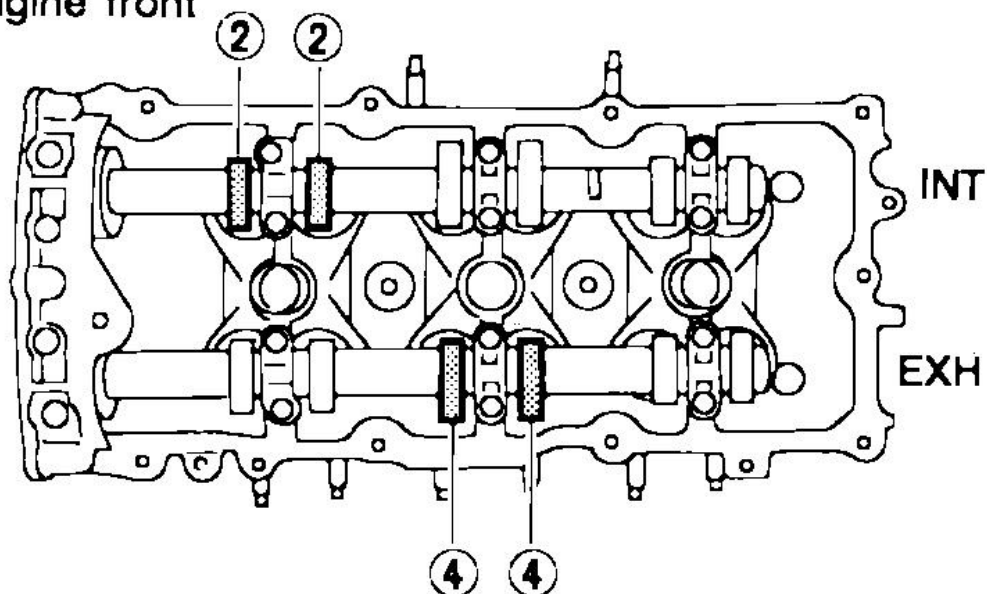
Fig. 176: Valves Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

RH cylinder head



Engine front



LH cylinder head

G02208284

Fig. 177: Identifying Valves

Courtesy of NISSAN MOTOR CO., U.S.A.

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

Measuring position (RH bank)		No. 1 CYL.	No. 3 CYL.	No. 5 CYL.
No. 5 CYL. at TDC	EXH	X		
	INT			X
Measuring position (LH bank)		No. 2 CYL.	No. 4 CYL.	No. 6 CYL.
No. 5 CYL. at TDC	INT		X	
	EXH			X

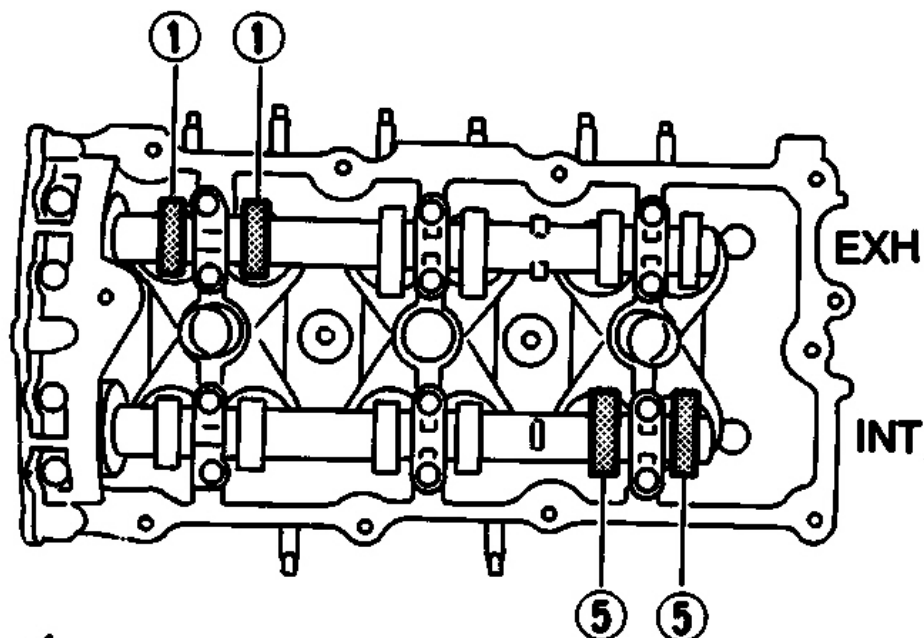
G02208285

Fig. 178: Valves Specifications

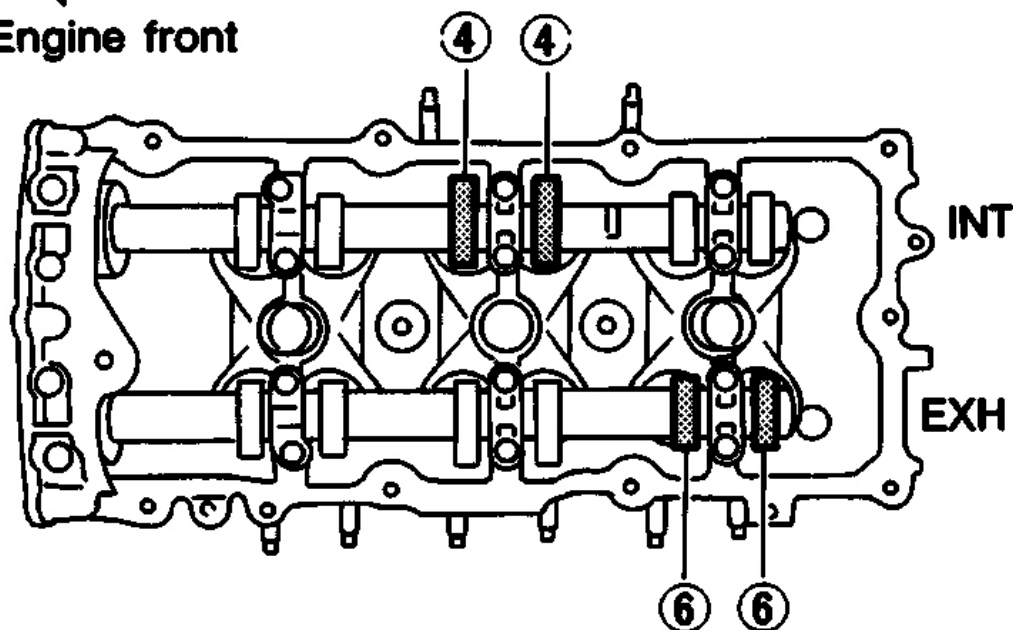
Courtesy of NISSAN MOTOR CO., U.S.A.

14. If all valve clearances are within specification, install the following parts. If they are out of specification, adjust the valve clearances.
 - Intake manifold collectors
 - RH and LH rocker covers
 - All spark plugs
 - All ignition coils

RH cylinder head



Engine front



LH cylinder head

G02208286

Fig. 179: Identifying Valves**Courtesy of NISSAN MOTOR CO., U.S.A.****ADJUSTING****Adjust valve clearance while engine is cold.**

Perform adjustment by selecting head thickness of valve lifter (Adjusting shims are not used).

1. Remove camshaft.
2. Remove valve lifter at location where measured value is outside standard.
3. Measure center thickness of removed valve lifter with micrometer.
4. Use equation below to calculate valve lifter thickness for replacement.

Valve lifter thickness calculation:

Thickness of replacement valve lifter = $t1 + (C1 - C2)$

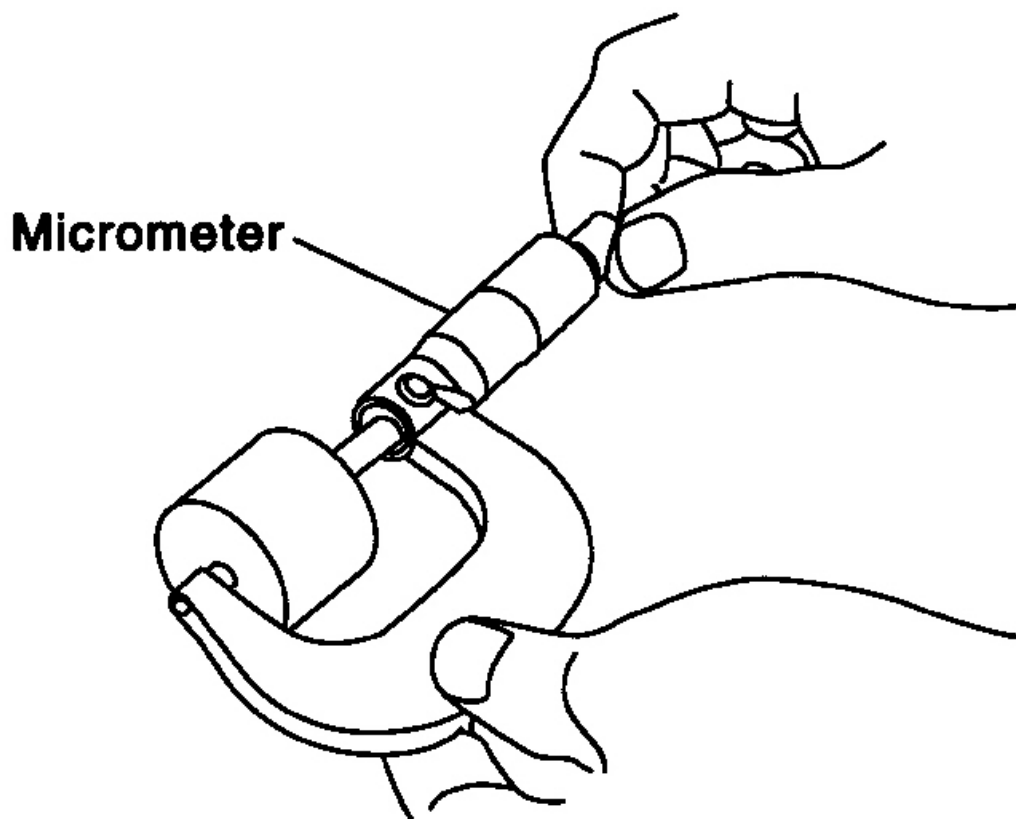
$t1$ = Thickness of removed valve lifter

$C1$ = Measured valve clearance

$C2$ = Standard valve clearance:

Intake: 0.30 mm (0.012 in)

Exhaust: 0.33 mm (0.013 in)



G02208287

Fig. 180: Measuring Center Thickness Of Valve Lifter With Micrometer
Courtesy of NISSAN MOTOR CO., U.S.A.

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

Unit: mm (in)

Stamp mark	Thickness of valve lifter
Starting: 788U or 788R	7.88 (0.3102)
Ending: 840U or 840R	8.40 (0.3307)

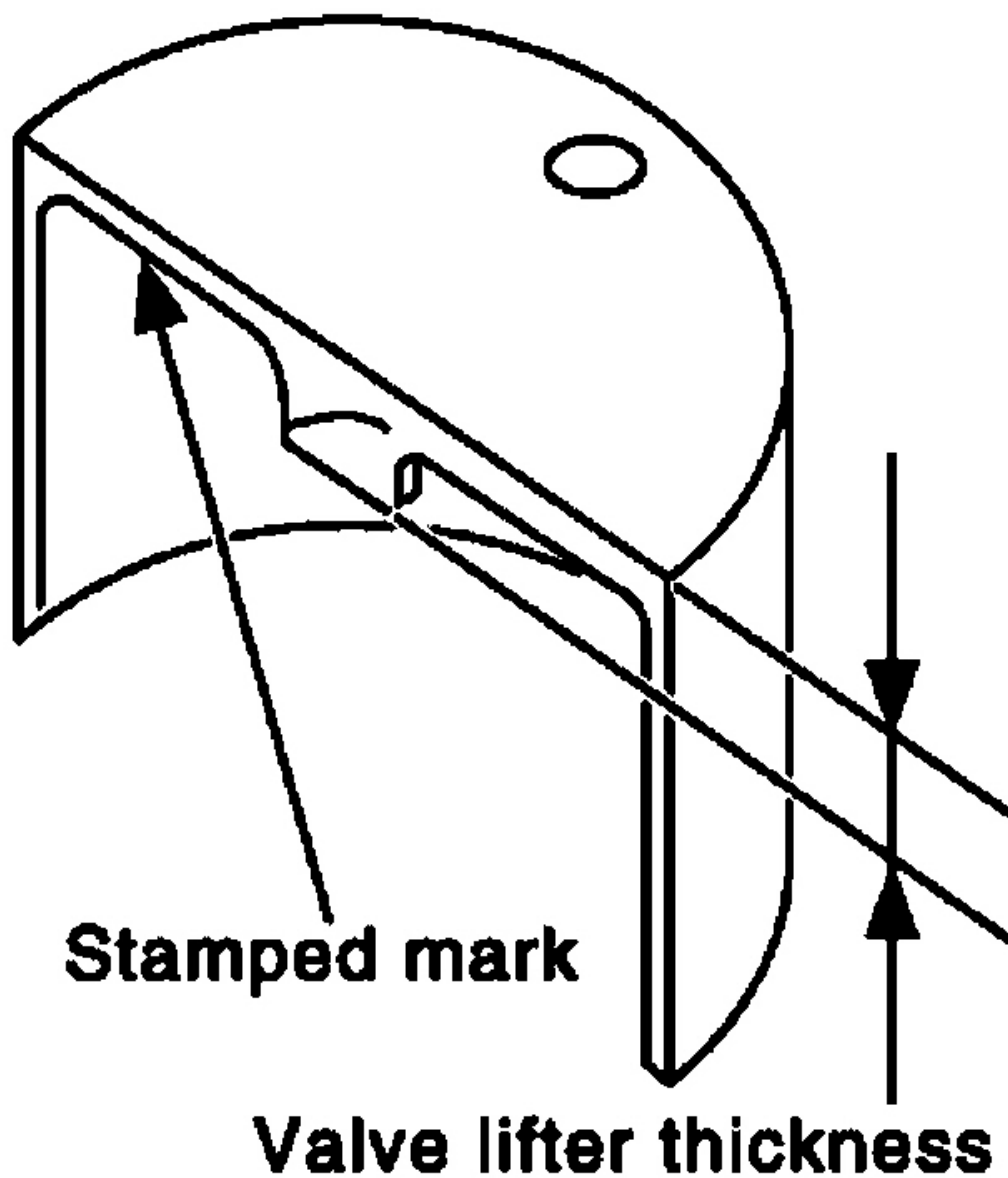
G02208288

Fig. 181: Valve Lifter Thickness Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

- Available thickness of valve lifter (Factory setting): 7.88 - 8.40 mm (0.3102 - 0.3307 in) [in 0.02 mm (0.0008 in) step] in 27 sizes (Intake/Exhaust)

Refer to **AVAILABLE LIFTERS**.



G02208289

Fig. 182: Identifying Valve Lifter Thickness
Courtesy of NISSAN MOTOR CO., U.S.A.

5. Install selected valve lifter.
6. Install camshaft.
7. Rotate crankshaft a few turns by hand.

8. Confirm that valve clearance is within standard.
9. After repair, confirm that valve clearance is within standard with engine warmed-up.

Valve clearance:

Unit: mm (in)

	Cold	Hot* (reference data)
Intake	0.26 - 0.34 (0.010 - 0.013)	0.304 - 0.416 (0.012 - 0.016)
Exhaust	0.29 - 0.37 (0.011 - 0.015)	0.308 - 0.432 (0.012 - 0.017)

*: Approximately 80°C (176°F)

G02208290

Fig. 183: Valve Clearance Specifications
 Courtesy of NISSAN MOTOR CO., U.S.A.

ENGINE ASSEMBLY**REMOVAL AND INSTALLATION****WARNING:**

- Situate vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.
- Do not remove engine until exhaust system has completely cooled off. Otherwise, you may burn yourself and/or fire may break out in fuel line.
- For safety during subsequent steps, the tension of wires should be slackened against the engine.
- Before disconnecting fuel hose, release fuel pressure from fuel line.

Refer to FUEL SYSTEM PRESSURE RELEASE .

- Before removing front axle from transmission, place safety stands under designated front supporting points.

Refer to LIFTING POINTS AND TOW TRUCK TOWING for lifting points and towing.

- Be sure to hoist engine and transmission in a safe manner.
- For engines not equipped with engine slingers, attach proper

slingers and bolts described in PARTS CATALOG.

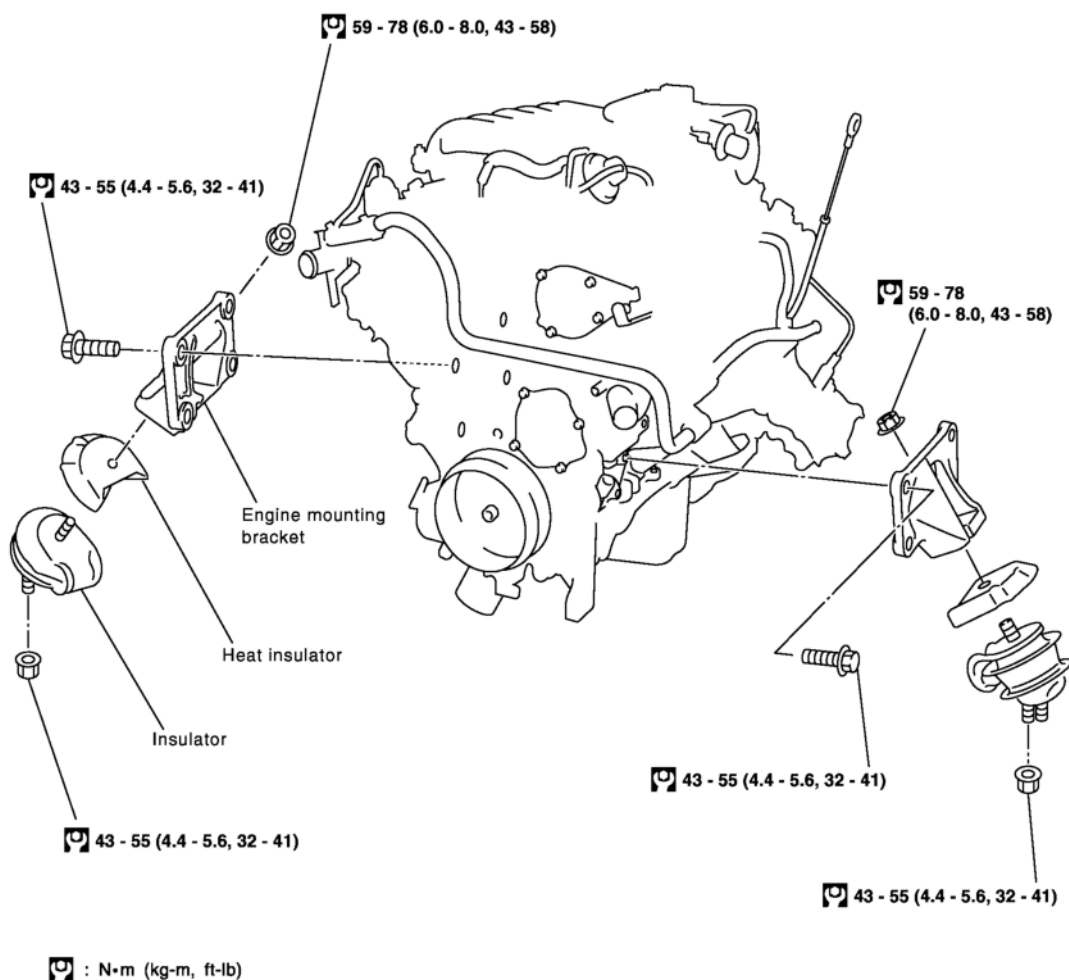
CAUTION:

- When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.
- Before separating engine and transmission, remove crankshaft position sensor (POS) from the assembly.
- Always take extra care not to damage edge of crankshaft position sensor (POS), or ring gear teeth.

REMOVAL

Front Engine Mounting

SEC. 112



G02208291

Fig. 184: Identifying Front Engine Mounting Components And Torque Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

Rear Engine Mounting

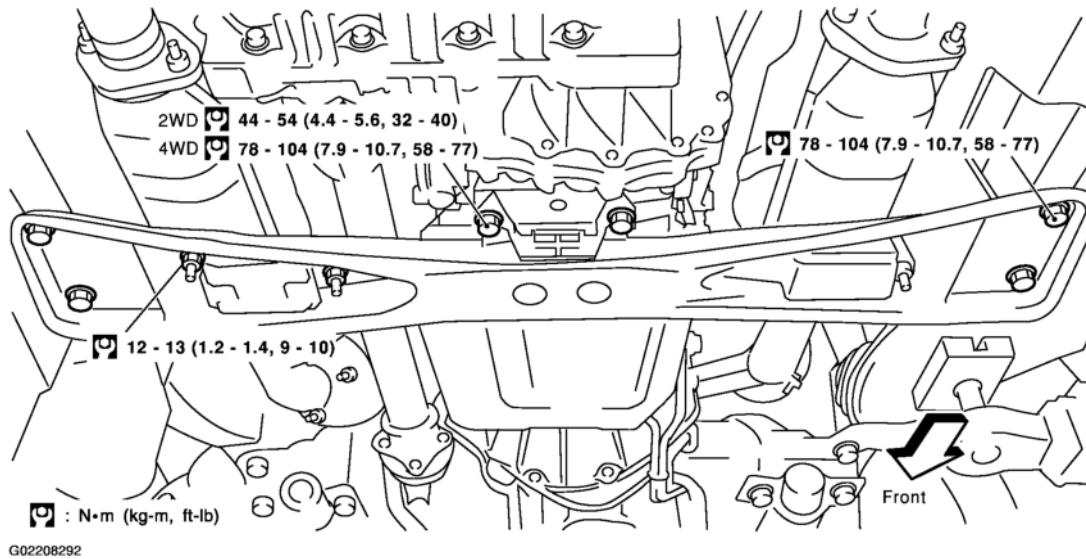
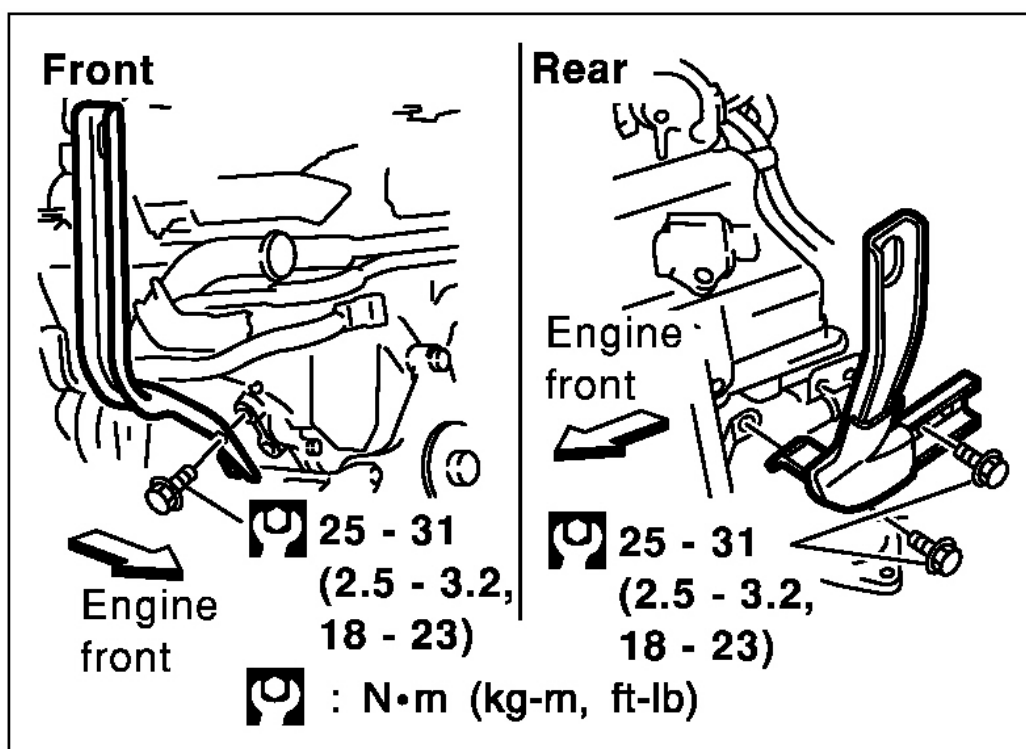


Fig. 185: Identifying Rear Engine Mounting Components And Torque Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

1. Release fuel pressure.

Refer to **FUEL SYSTEM PRESSURE RELEASE** .

2. Remove engine hood and front RH and LH wheels.
3. Remove engine undercover and suspension member stay.
4. Drain coolant from radiator.
5. Remove the following parts.
 - Battery
 - Engine undercover
 - Radiator shroud
 - Radiator: Refer to **REMOVAL AND INSTALLATION** .

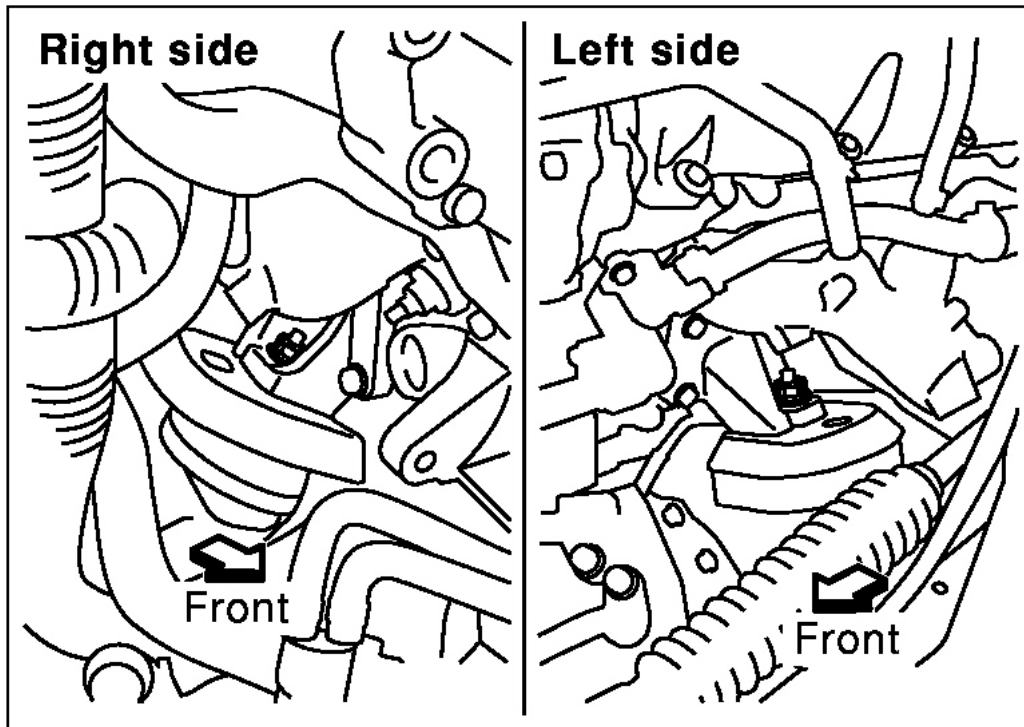


G02208293

Fig. 186: Installing Engine Slingers

Courtesy of NISSAN MOTOR CO., U.S.A.

- Cooling fan
 - Drive belts
 - Throttle wires
 - Air duct with air cleaner case
6. Disconnect vacuum hoses, fuel hoses, heater hoses, EVAP canister hoses, harnesses, connectors and so on.
 7. Remove air conditioner compressor from bracket, then put it aside holding with a suitable wire.
 8. Remove power steering oil pump and reservoir tank with bracket, then put it aside holding with a suitable wire.
 9. Remove alternator.



G02208294

Fig. 187: Disconnecting Vacuum Hoses, Fuel Hoses, Heater Hoses, EVAP Canister Hoses
Courtesy of NISSAN MOTOR CO., U.S.A.

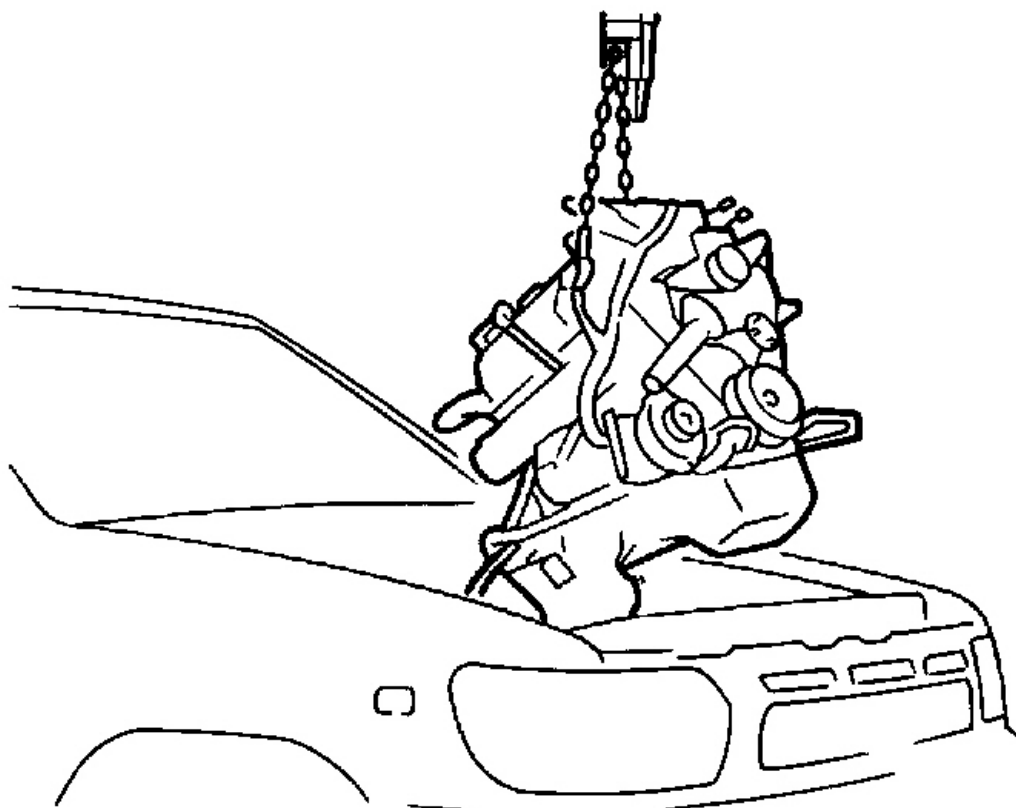
10. Remove exhaust front tube heat insulators, then remove rear heated oxygen sensors.
11. Remove exhaust front and rear tubes.

Refer to **REMOVAL AND INSTALLATION** .

12. Remove transmission.

Refer to **REMOVAL** .

13. Remove TWC (manifold) heat insulators, then remove TWC (manifold).
14. Install engine slingers.
15. Hoist engine with engine slingers and remove front engine mounting nuts.



G02208295

Fig. 188: Hoisting Engine With Engine Slingers
Courtesy of NISSAN MOTOR CO., U.S.A.

16. Remove engine from vehicle.

INSTALLATION

Installation is in the reverse order of removal.

CYLINDER BLOCK

COMPONENTS

21 - 26
(2.1 - 2.7, 16 - 19)

8.2 - 9.3
(0.83 - 0.95, 72 - 82)

83 - 93
(8.5 - 9.5, 61 - 69)

17.6 - 21.6
(1.80 - 2.20, 12.98 - 15.93)

8 - 12
(0.8 - 1.2, 69 - 104)

60 - 66
(6.1 - 6.7, 44 - 48)

24 - 30
(2.4 - 3.1, 18 - 22)

Refer to "Assembly".

Refer to "Assembly".

2.5 - 3.1
(0.25 - 0.32, 22 - 27)

Refer to "Assembly".

Refer to "Assembly".

1. Rear oil seal retainer

2. Cylinder block

3. Knock sensor

4. Upper main bearing

5. Lower main bearing

6. Oil jet

7. Water drain plug (RH side)

8. Water drain plug (Water pump side)

9. Main bearing cap

10. Main bearing beam

11. Crankshaft

12. Pilot converter

13. Drive plate with signal plate

14. Drive plate reinforce plate

15. Oil ring

16. Piston ring

17. Connecting rod bearing

18. Connecting rod

19. Piston

20. Top ring

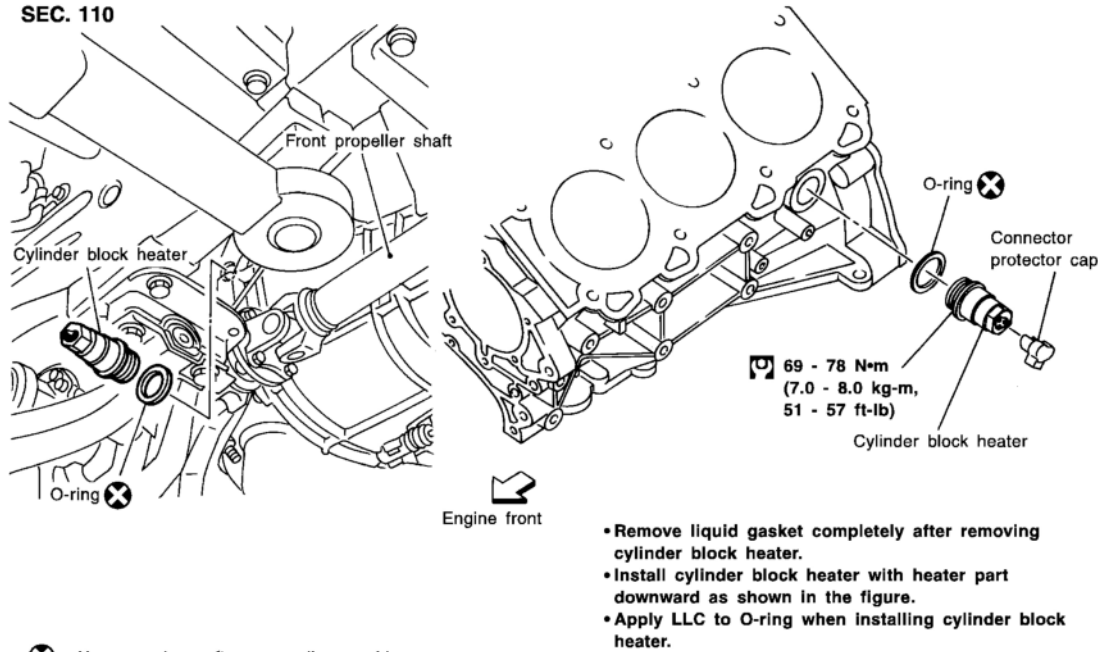
21. 2nd ring

22. Baffle plate

23. Water drain plug (LH side)

CYLINDER BLOCK HEATER

For Canada
SEC. 110



G02208297

Fig. 190: Identifying Cylinder Block Heater Components And Torque Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

REMOVAL AND INSTALLATION

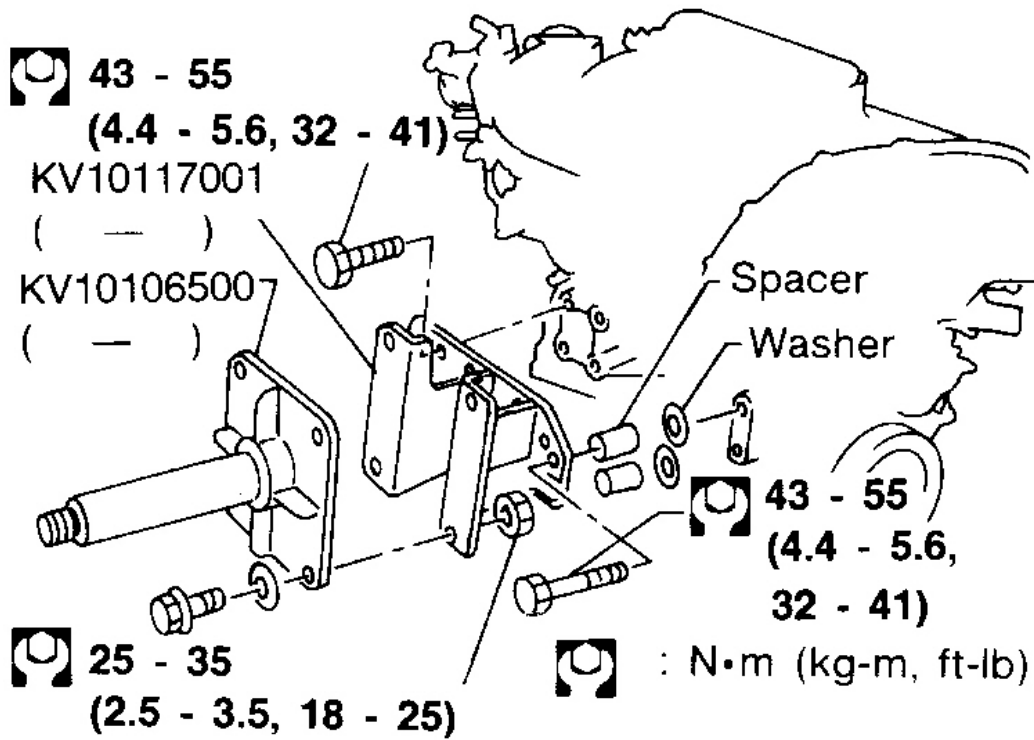
CAUTION:

- When installing bearings, pistons, or other sliding parts, lubricate contacting surfaces with new engine oil.
- Place removed parts such as bearings and bearing caps in their proper order and direction.
- When installing connecting rod nuts, and main bearing cap bolts, apply new engine oil to threads and seating surfaces.
- Do not allow any magnetic materials to contact the signal plate teeth of flywheel or drive plate.

DISASSEMBLY

PISTON, CRANKSHAFT AND OIL JET

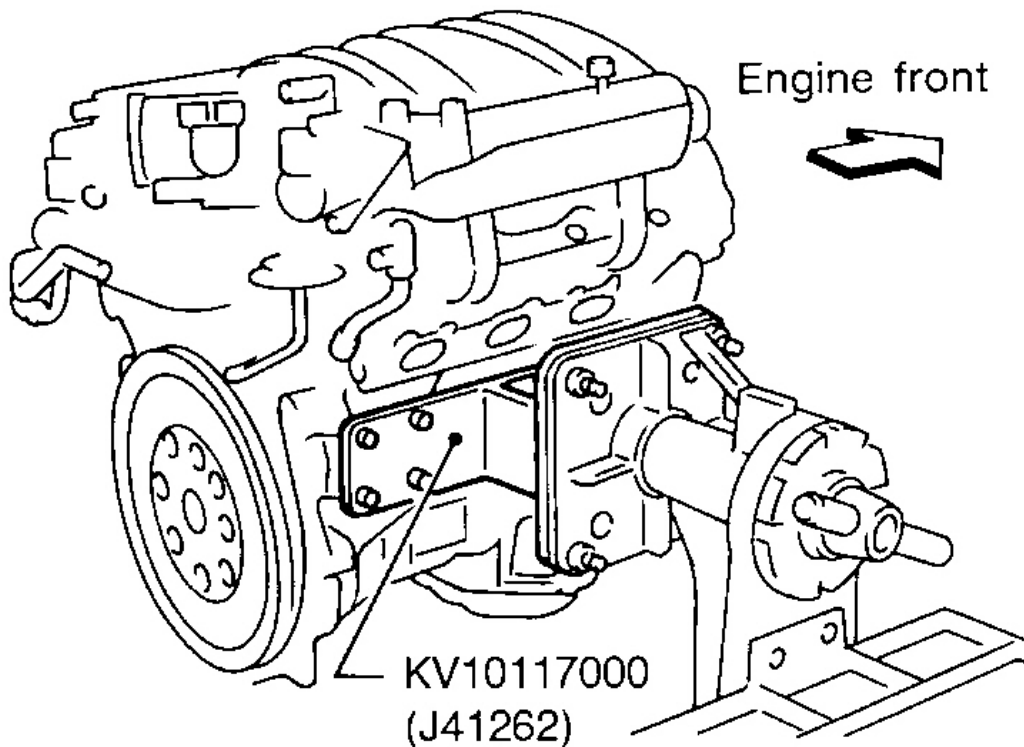
1. Remove engine. Refer to "**REMOVAL AND INSTALLATION**", .



G02208298

Fig. 191: Identifying Engine Work Stand
Courtesy of NISSAN MOTOR CO., U.S.A.

2. Place engine on a work stand.
3. Drain coolant and oil.
4. Remove oil pan. Refer to "**REMOVAL**", .
5. Remove timing chain. Refer to "**REMOVAL**", .
6. Remove cylinder head. Refer to "**REMOVAL**", .



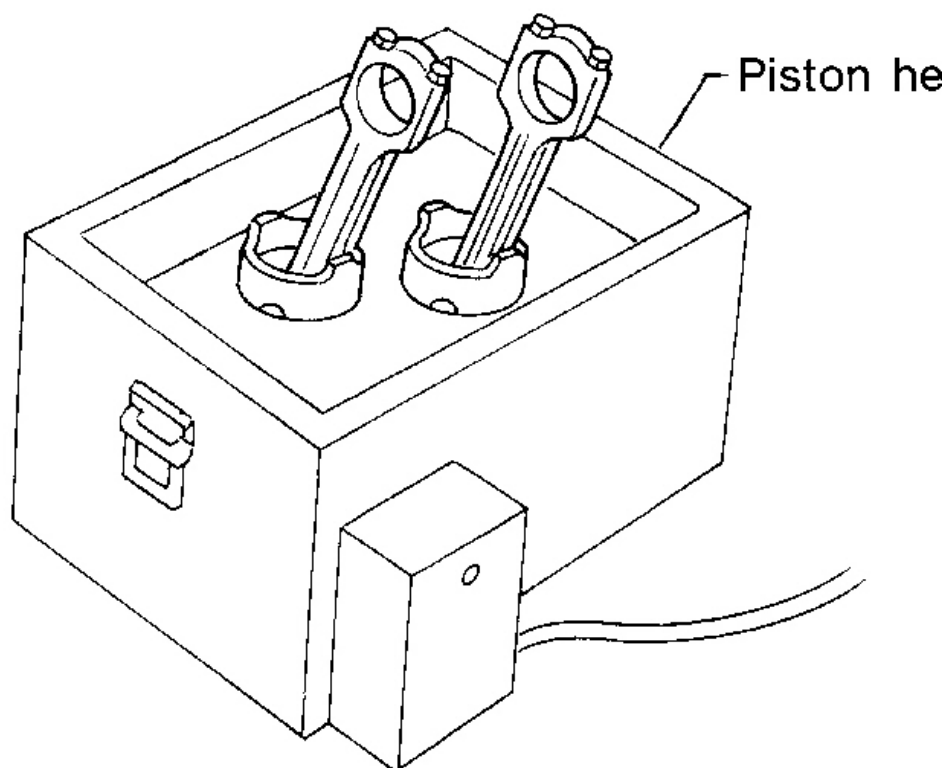
G02208299

Fig. 192: Placing Engine On Work Stand
Courtesy of NISSAN MOTOR CO., U.S.A.

7. Remove baffle plate from main bearing beam.
8. Remove pistons with connecting rods.
 - When disassembling piston and connecting rod, remove snap ring first, then heat piston to 60 to 70° C (140 to 158°F).
9. Remove rear oil seal retainer.

CAUTION:

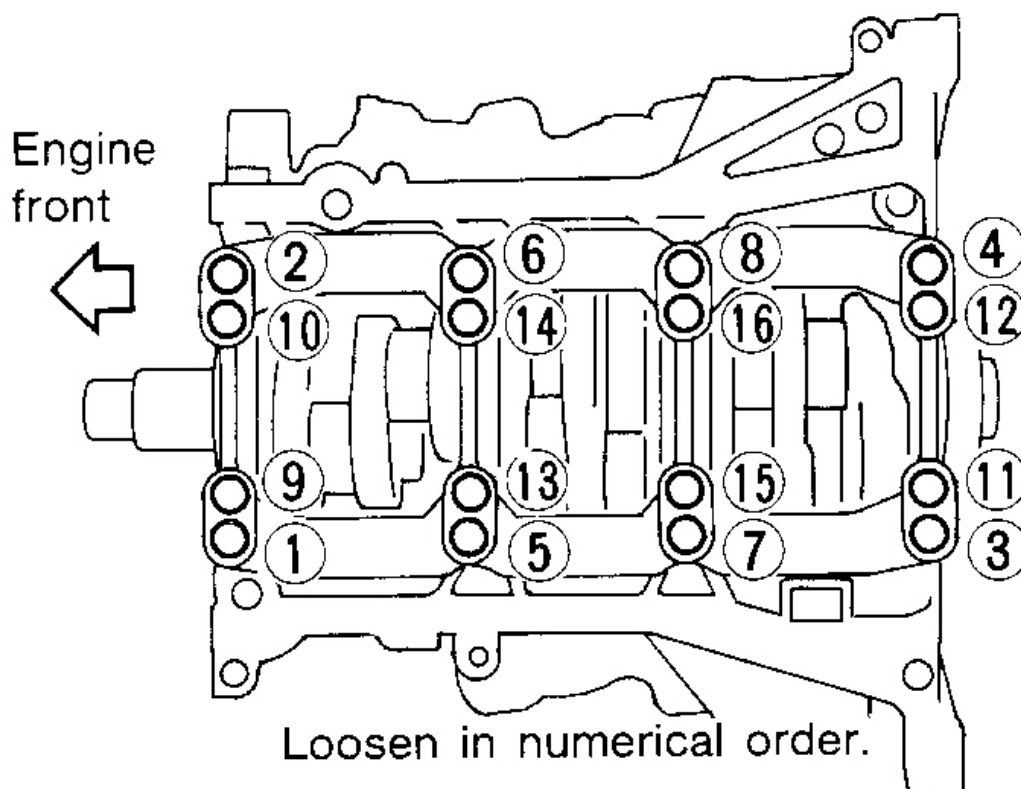
- When piston rings are not replaced, make sure that piston rings are mounted in their original positions.
- When replacing piston rings, if there is no punch mark, install with side up.



G02208300

Fig. 193: Heating Pistons With Connecting Rods
Courtesy of NISSAN MOTOR CO., U.S.A.

10. Loosen bolts in numerical order as shown and remove main bearing beam, bearing cap and crankshaft.
 - **Before removing bearing beam and bearing cap, measure crankshaft end play. Refer to CRANKSHAFT.**
 - **Bolts should be loosened in two or three steps.**

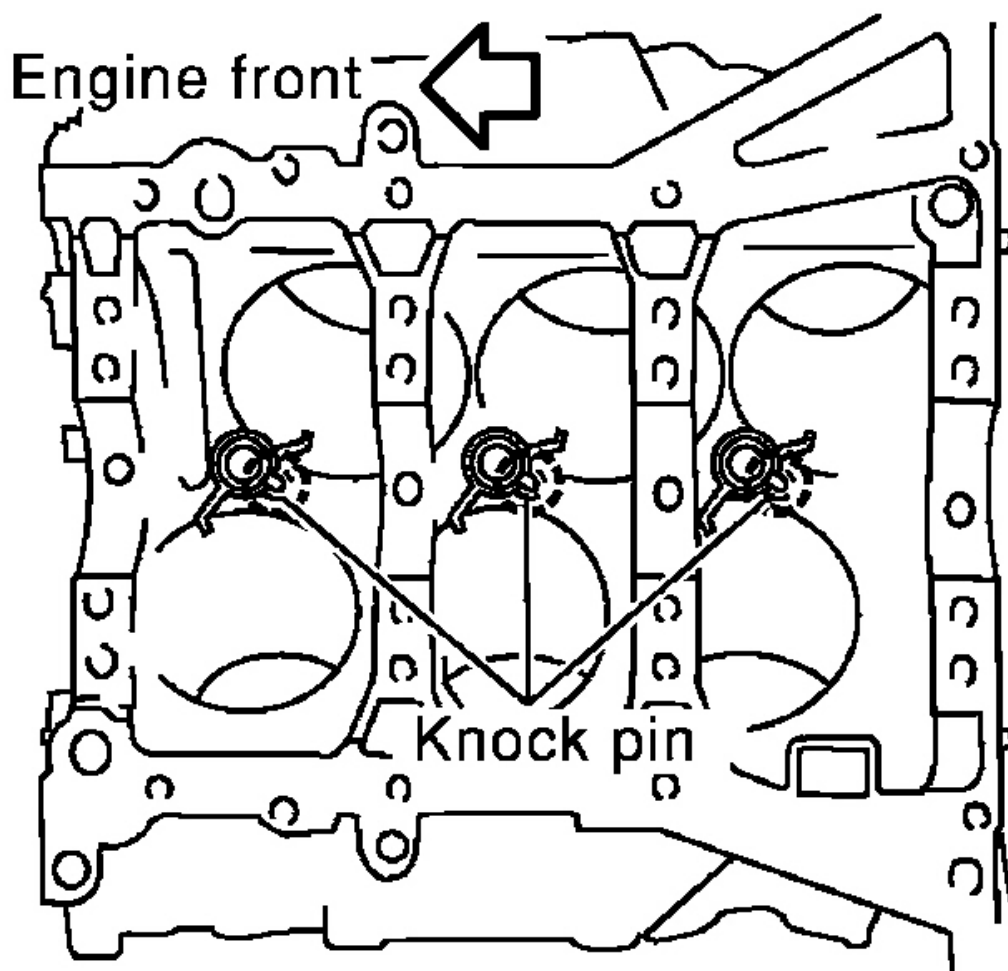


G02208301

Fig. 194: Loosening Bolts In Numerical Order
Courtesy of NISSAN MOTOR CO., U.S.A.

11. Remove oil jets.
12. Remove knock sensor.

CAUTION: Carefully handle the sensor and avoid impacts.



G02208302

Fig. 195: Removing Oil Jets

Courtesy of NISSAN MOTOR CO., U.S.A.

INSPECTION**PISTON AND PISTON PIN CLEARANCE**

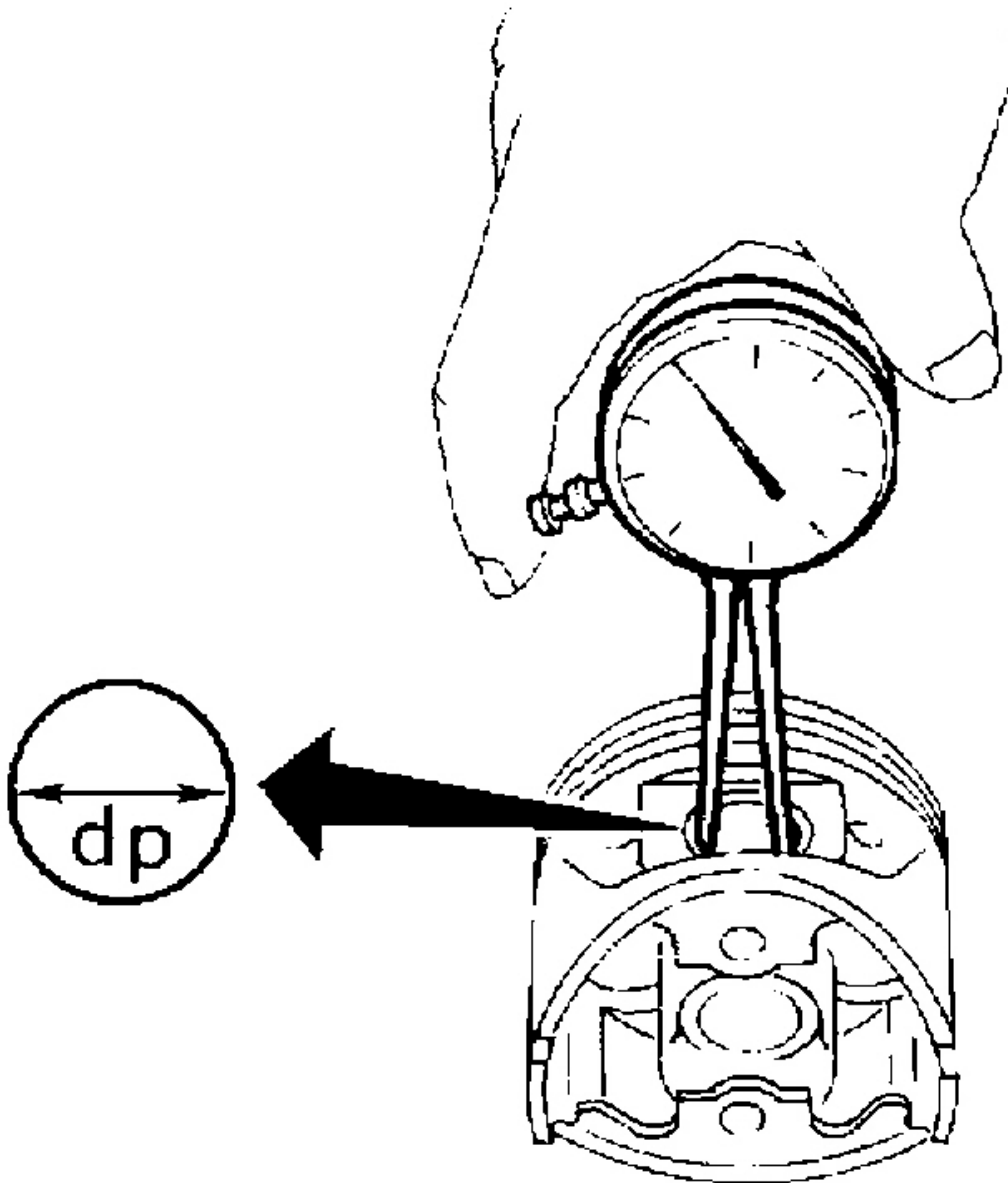
1. Measure inner diameter of piston pin hole "dp".

Standard diameter "dp":**Grade No. 0**

21.993 - 21.999 mm (0.8659 - 0.8661 in)

Grade No. 1

21.999 - 22.005 mm (0.8661 - 0.8663 in)



G02208303

Fig. 196: Measuring Inner Diameter Of Piston Pin Hole
Courtesy of NISSAN MOTOR CO., U.S.A.

2. Measure outer diameter of piston pin "Dp".

Standard diameter "Dp":

Grade No. 0

21.989 - 21.995 mm (0.8657 - 0.8659 in)

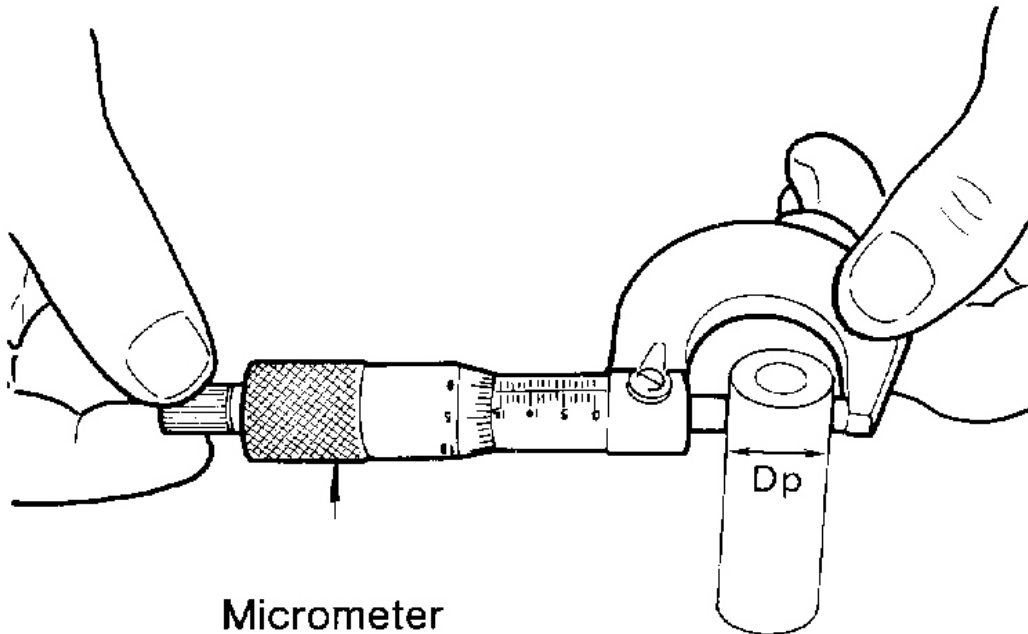
Grade No. 1

21.995 - 22.001 mm (0.8659 - 0.8662 in)

3. Calculate interference fit of piston pin to piston.

$D_p - dp = 0.002 - 0.006 \text{ mm (0.0001 - 0.0002 in)}$

If it exceeds the above value, replace piston assembly with pin.



Micrometer

G02208304

Fig. 197: Measuring Outer Diameter Of Piston Pin

Courtesy of NISSAN MOTOR CO., U.S.A.

PISTON RING SIDE CLEARANCE**Side clearance:****Top ring**

0.040 - 0.080 mm (0.0016 - 0.0031 in)

2nd ring

0.030 - 0.070 mm (0.0012 - 0.0028 in)

Oil ring

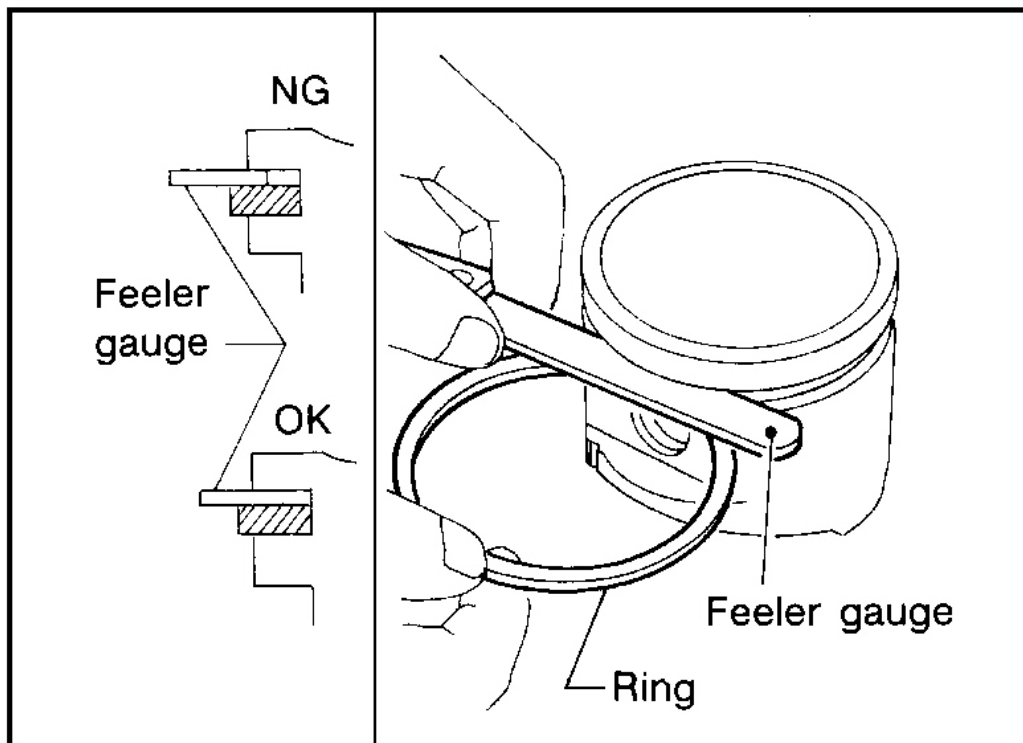
0.015 - 0.050 mm (0.0006 - 0.0020 in)

Max. limit of side clearance:

Top ring 0.11 mm (0.0043 in)

2nd ring 0.1 mm (0.004 in)

If out of specification, replace piston ring. If clearance exceeds maximum limit with new ring, replace piston.



G02208305

Fig. 198: Measuring Piston Ring Side Clearance
Courtesy of NISSAN MOTOR CO., U.S.A.

PISTON RING END GAP

End gap:

Top ring 0.23 - 0.33 mm (0.0091 - 0.0130 in)

2nd ring 0.33 - 0.48 mm (0.0130 - 0.0189 in)

Oil ring 0.20 - 0.60 mm (0.0079 - 0.0236 in)

Max. limit of ring gap:

Top ring 0.54 mm (0.0213 in)

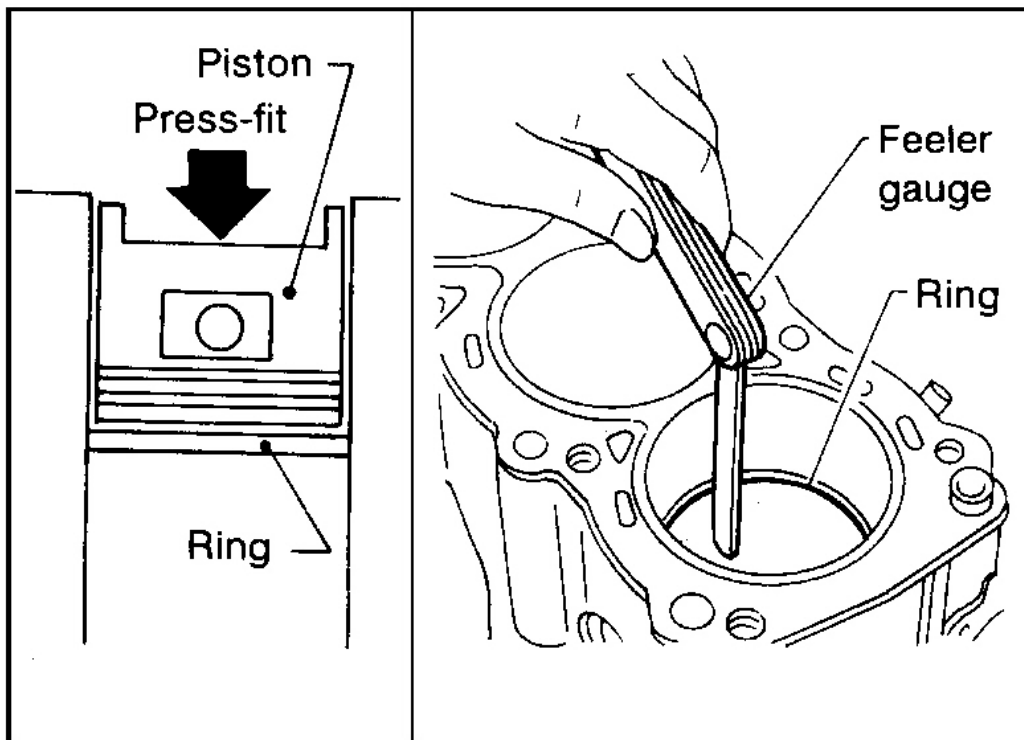
2nd ring 0.80 mm (0.0315 in)

Oil ring 0.95 mm (0.0374 in)

If out of specification, replace piston ring. If gap still exceeds the limit even with a new ring, do the following. Rebore cylinder and use oversized piston and piston rings.

Refer to .

- When replacing the piston, check the cylinder block surface for scratches or seizure. If scratches or seizure is found, hone or replace the cylinder block.



G02208306

Fig. 199: Measuring Piston Ring End Gap
Courtesy of NISSAN MOTOR CO., U.S.A.

CONNECTING ROD BEND AND TORSION

Bend:

Limit 0.15 mm (0.0059 in)

per 100 mm (3.94 in) length

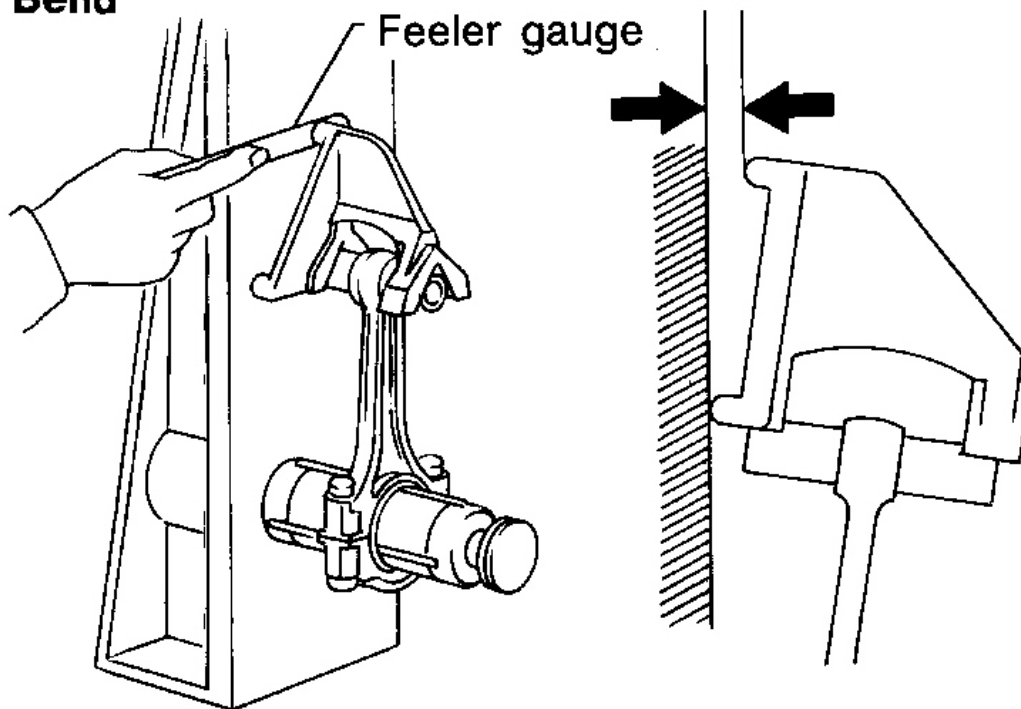
Torsion:

Limit 0.30 mm (0.0118 in)

per 100 mm (3.94 in) length

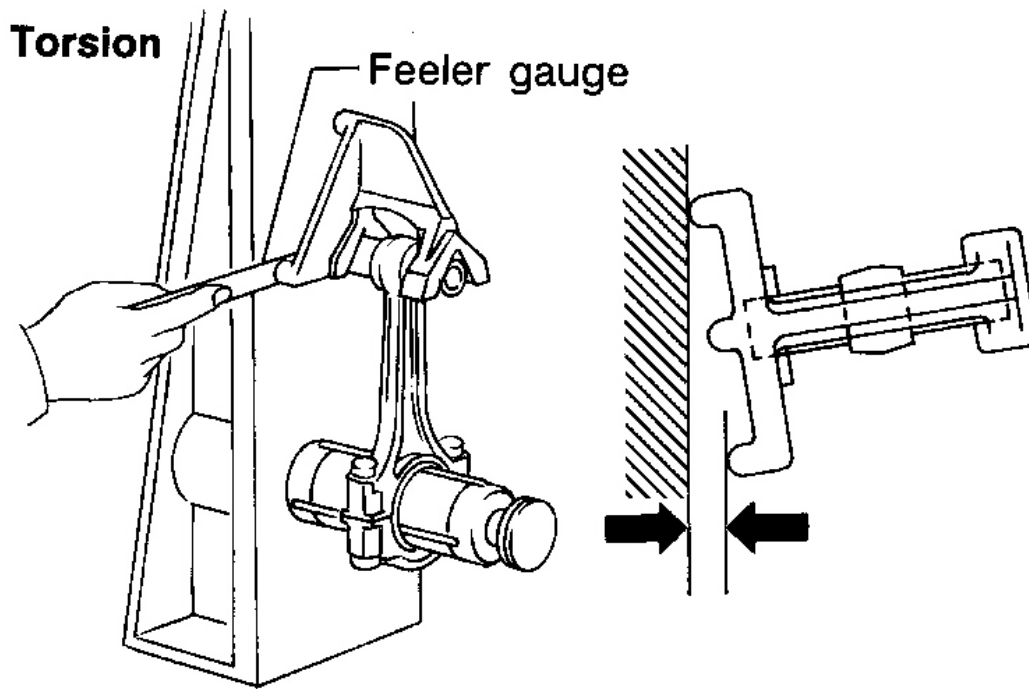
If it exceeds the limit, replace connecting rod assembly.

Bend



G02208307

Fig. 200: Measuring Connecting Rod Bend
Courtesy of NISSAN MOTOR CO., U.S.A.



G02208308

Fig. 201: Measuring Connecting Rod Torsion
 Courtesy of NISSAN MOTOR CO., U.S.A.

CYLINDER BLOCK DISTORTION AND WEAR

- Clean upper surface of cylinder block.

Use a reliable straightedge and feeler gauge to check the flatness of cylinder block surface.

Check along six positions shown in the figure.

Distortion limit: 0.10 mm (0.0039 in)

- If out of specification, resurface it. The limit for cylinder block resurfacing is determined by cylinder head resurfacing in engine.

Resurfacing limit:

Amount of cylinder head resurfacing is "A".

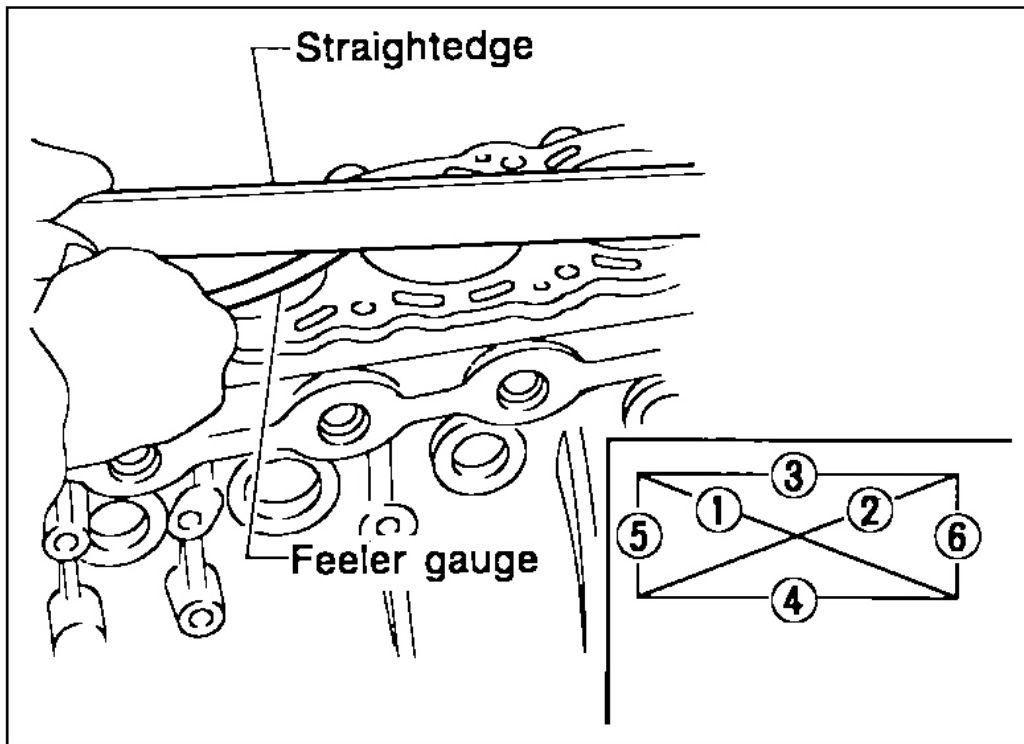
Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

$$A + B = 0.2 \text{ mm (0.008 in)}$$

Nominal cylinder block height from crankshaft center:

$$214.95 - 215.05 \text{ mm (8.4626 - 8.4665 in)}$$



G02208309

Fig. 202: Checking Flatness Of Cylinder Block Surface
Courtesy of NISSAN MOTOR CO., U.S.A.

- If necessary, replace cylinder block.

PISTON-TO-BORE CLEARANCE

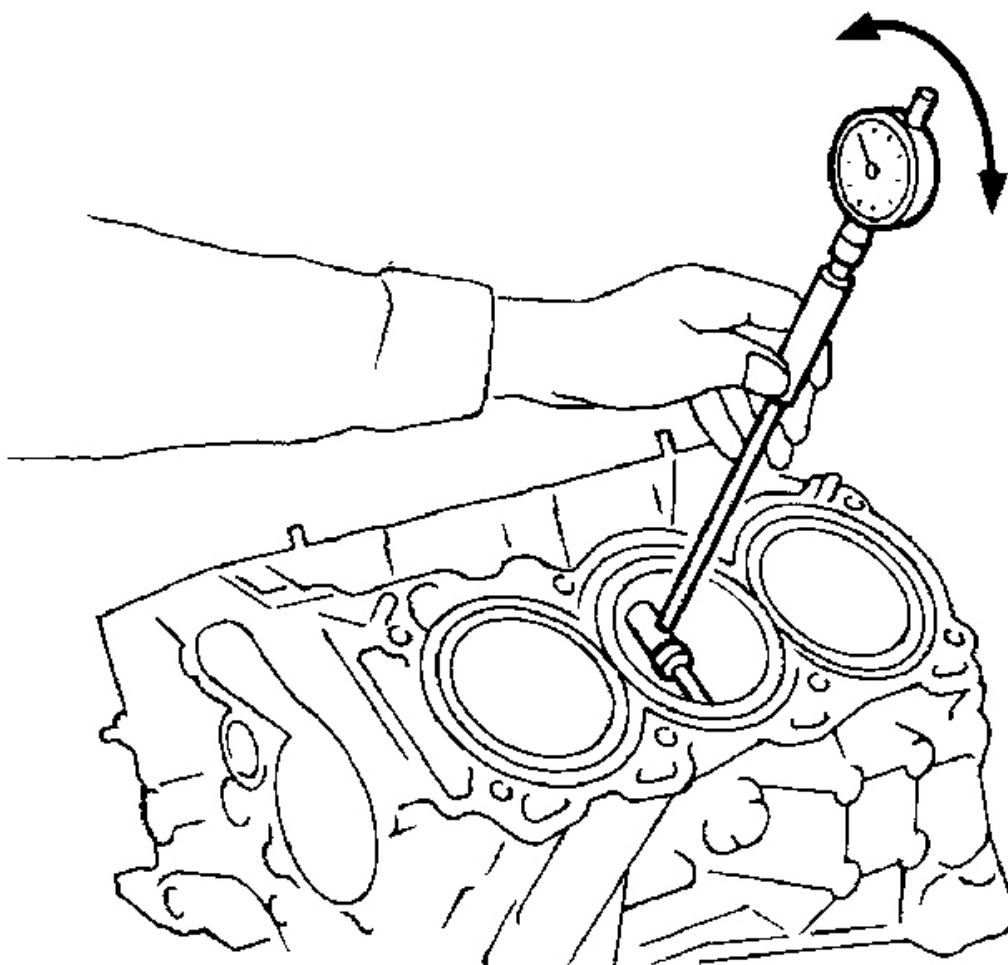
1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.

Cylinder bore inner diameter

Grade No.	Standard inner diameter	Wear limit
No. 1	95.500 - 95.510 mm (3.7598 - 3.7602 in)	0.20 mm (0.0079 in)
No. 2	95.510 - 95.520 mm (3.7602 - 3.7606 in)	
No. 3	95.520 - 95.530 mm (3.7606 - 3.7610 in)	

G02208310

Fig. 203: Cylinder Bore Inner Diameter Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.



G02208311

Fig. 204: Measuring Cylinder Bore For Out-Of-Round
Courtesy of NISSAN MOTOR CO., U.S.A.

If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

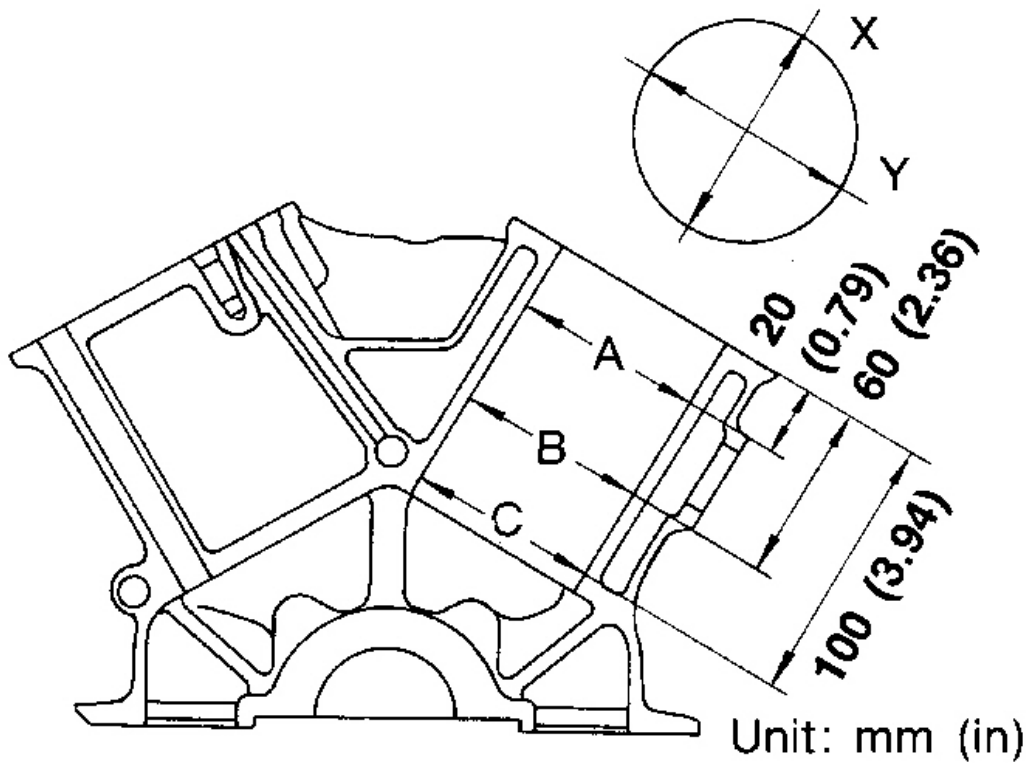
Out-of-round (Difference between X and Y):

Limit 0.015 mm (0.0006 in)

Taper (Difference between A and C):

Limit 0.015 mm (0.0006 in)

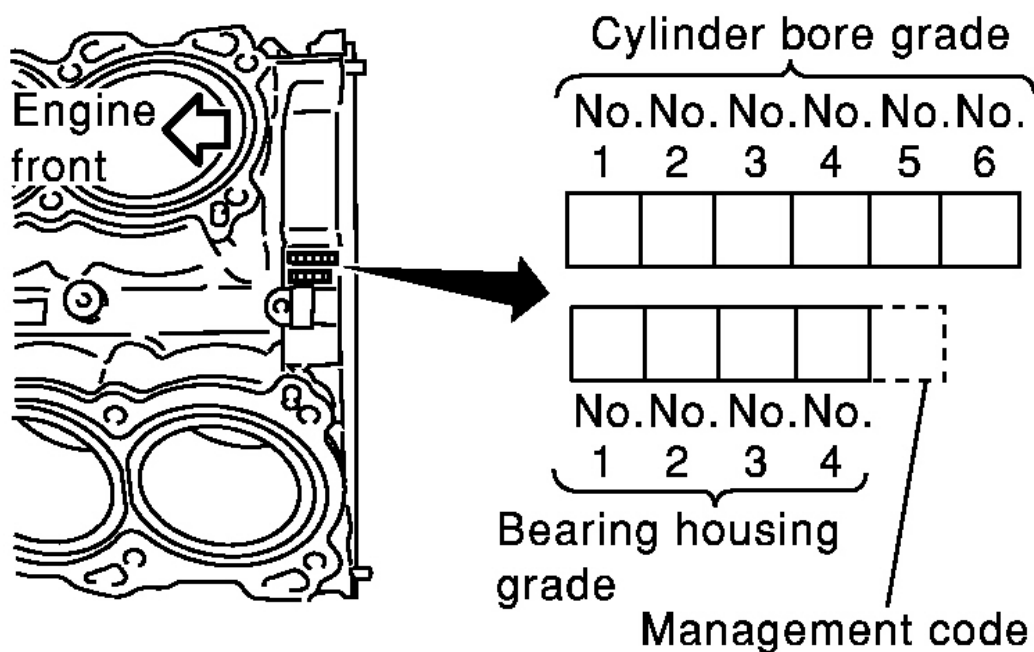
2. Check for scratches and seizure. If seizure is found, hone it.



G02208312

Fig. 205: Measuring Cylinder Bore For Taper
Courtesy of NISSAN MOTOR CO., U.S.A.

- If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block rear position. These numbers are punched in either Arabic or Roman numerals.



G02208313

Fig. 206: Identifying Grade Number Punching Position

Courtesy of NISSAN MOTOR CO., U.S.A.

3. Measure piston skirt diameter.

Piston diameter "A": Refer to Cylinder Block .

Measuring point "a" (Distance from the top): 41.0 mm (1.61 in)

4. Check that piston-to-bore clearance is within specification.

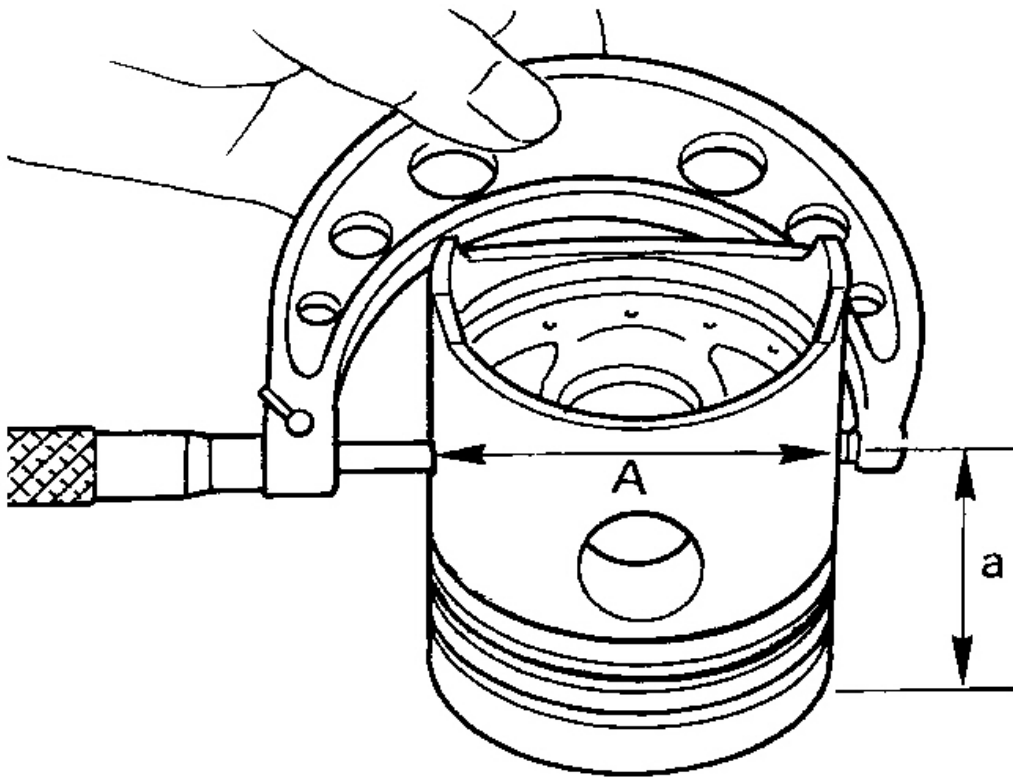
Piston-to-bore clearance "B":

0.010 - 0.030 mm (0.0004 - 0.0012 in)

5. Determine piston oversize according to amount of cylinder wear.

Oversize pistons are available for service.

Refer to Cylinder Block .



G02208314

Fig. 207: Measuring Piston Skirt Diameter
Courtesy of NISSAN MOTOR CO., U.S.A.

6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".

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

where,

D: Bored diameter

A: Piston diameter as measured

B: Piston-to-bore clearance

C: Honing allowance 0.02 mm (0.0008 in)

7. Install main bearing caps, and tighten to the specified torque. Otherwise, cylinder bores may be distorted in final assembly.
8. Cut cylinder bores.
 - **When any cylinder needs boring, all other cylinders must also be bored.**
 - **Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**
9. Hone cylinders to obtain specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.
 - **Measurement should be done after cylinder bore cools down.**

CRANKSHAFT

1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out-of-round.

Out-of-round (X - Y):**Standard****0.002 mm (0.0001 in)****Taper (A - B):****Standard****0.002 mm (0.0001 in)**

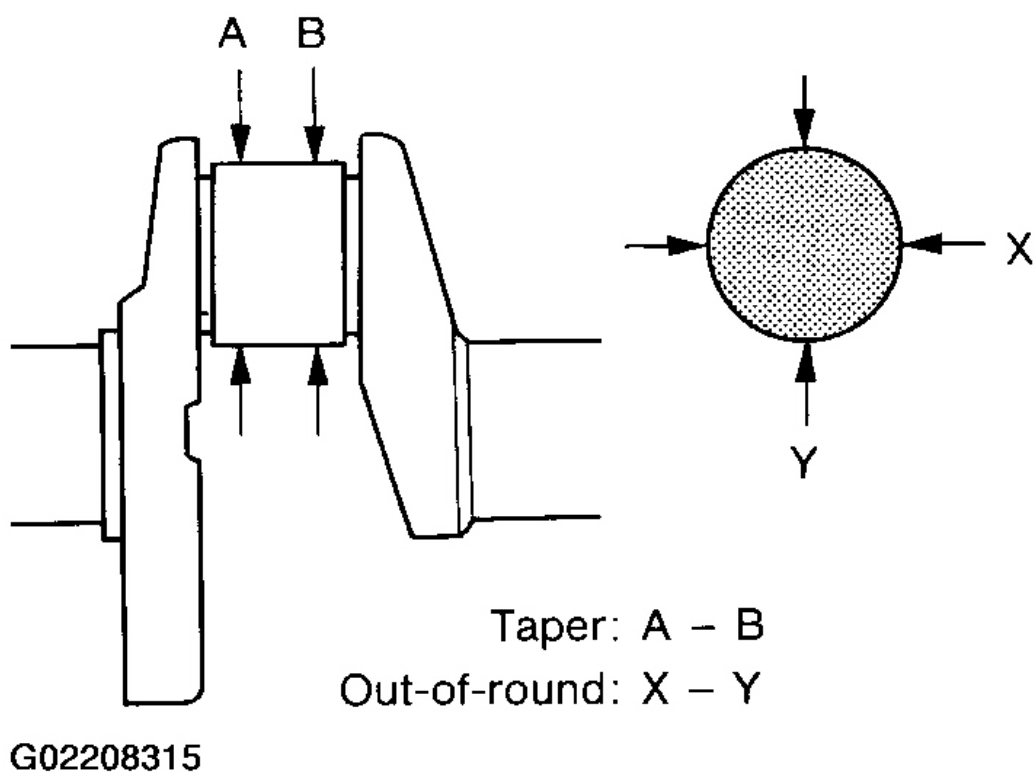
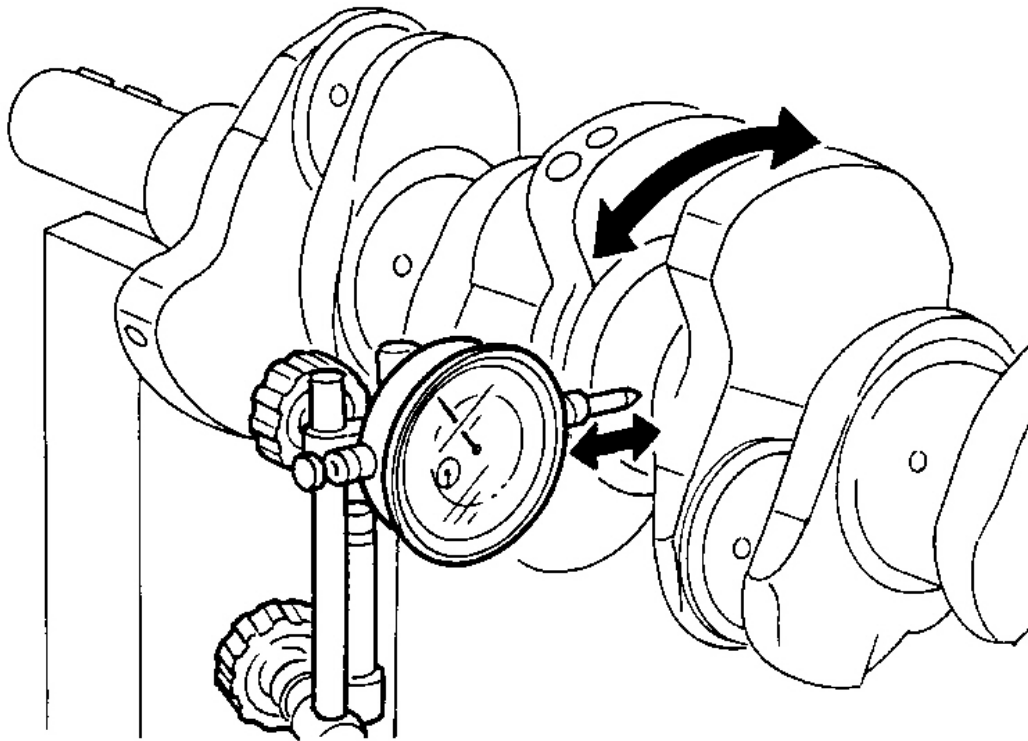


Fig. 208: Checking Crankshaft Main And Pin Journals
Courtesy of NISSAN MOTOR CO., U.S.A.

3. Measure crankshaft runout.

Runout (Total indicator reading):

Limit 0.10 mm (0.0039 in)



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Fig. 209: Measuring Crankshaft Runout
Courtesy of NISSAN MOTOR CO., U.S.A.

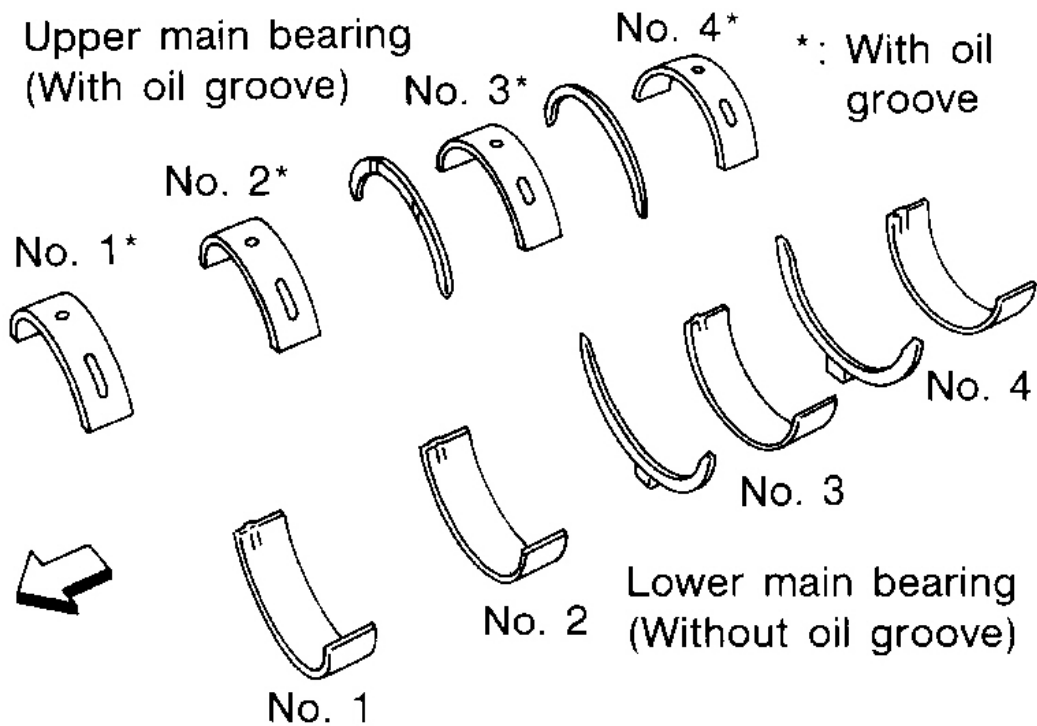
BEARING CLEARANCE

- Use either of the following two methods, however, method "A" gives more reliable results and is preferable.

Method A (Using bore gauge & micrometer)

Main bearing

1. Set main bearings in their proper positions on cylinder block and main bearing cap.



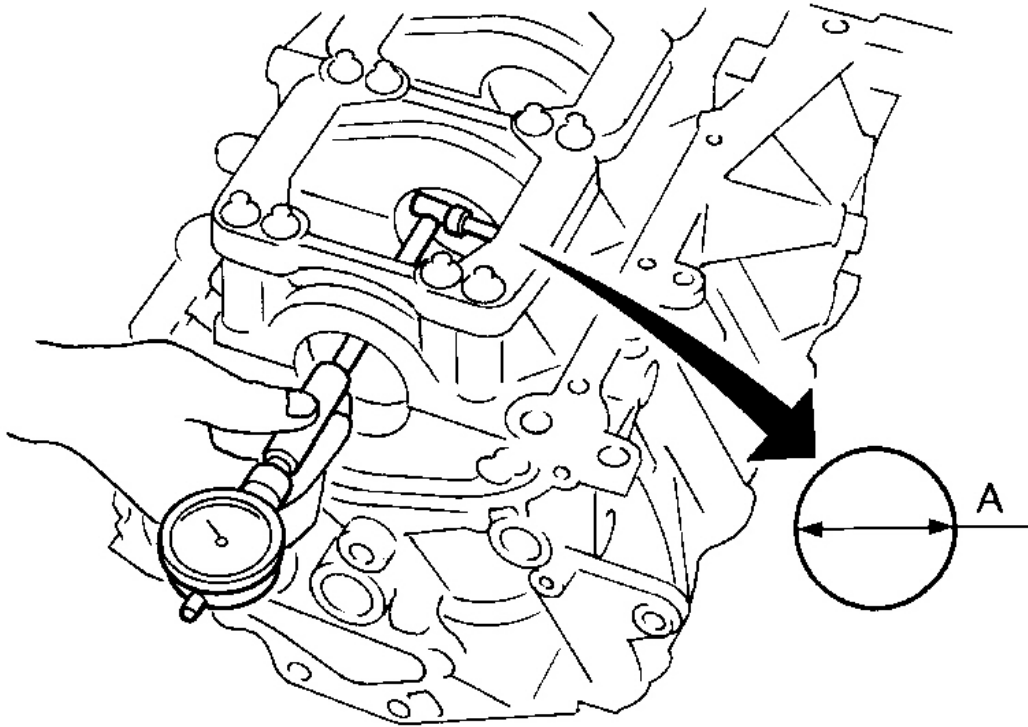
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Fig. 210: Inspecting Bearing Clearance
 Courtesy of NISSAN MOTOR CO., U.S.A.

2. Install main bearing cap and bearing beam to cylinder block.

Tighten all bolts in correct order.

3. Measure inner diameters "A" of each main bearing.



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Fig. 211: Installing Main Bearing Cap And Bearing Beam To Cylinder Block
Courtesy of NISSAN MOTOR CO., U.S.A.

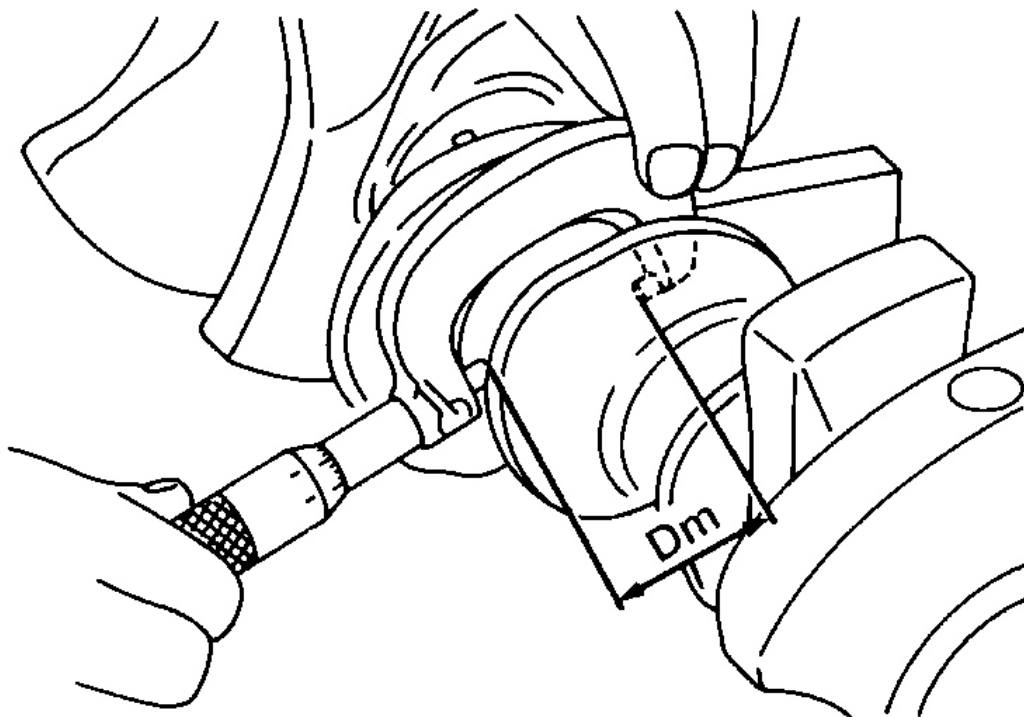
4. Measure outer diameters "Dm" of each crankshaft main journal.
5. Calculate main bearing clearance.

Main bearing clearance = A - Dm

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

Limit: 0.065 mm (0.0026 in)

- If it exceeds the limit, replace bearing.
- If clearance cannot be adjusted using any standard bearing grade, grind crankshaft journal and use undersized bearing.



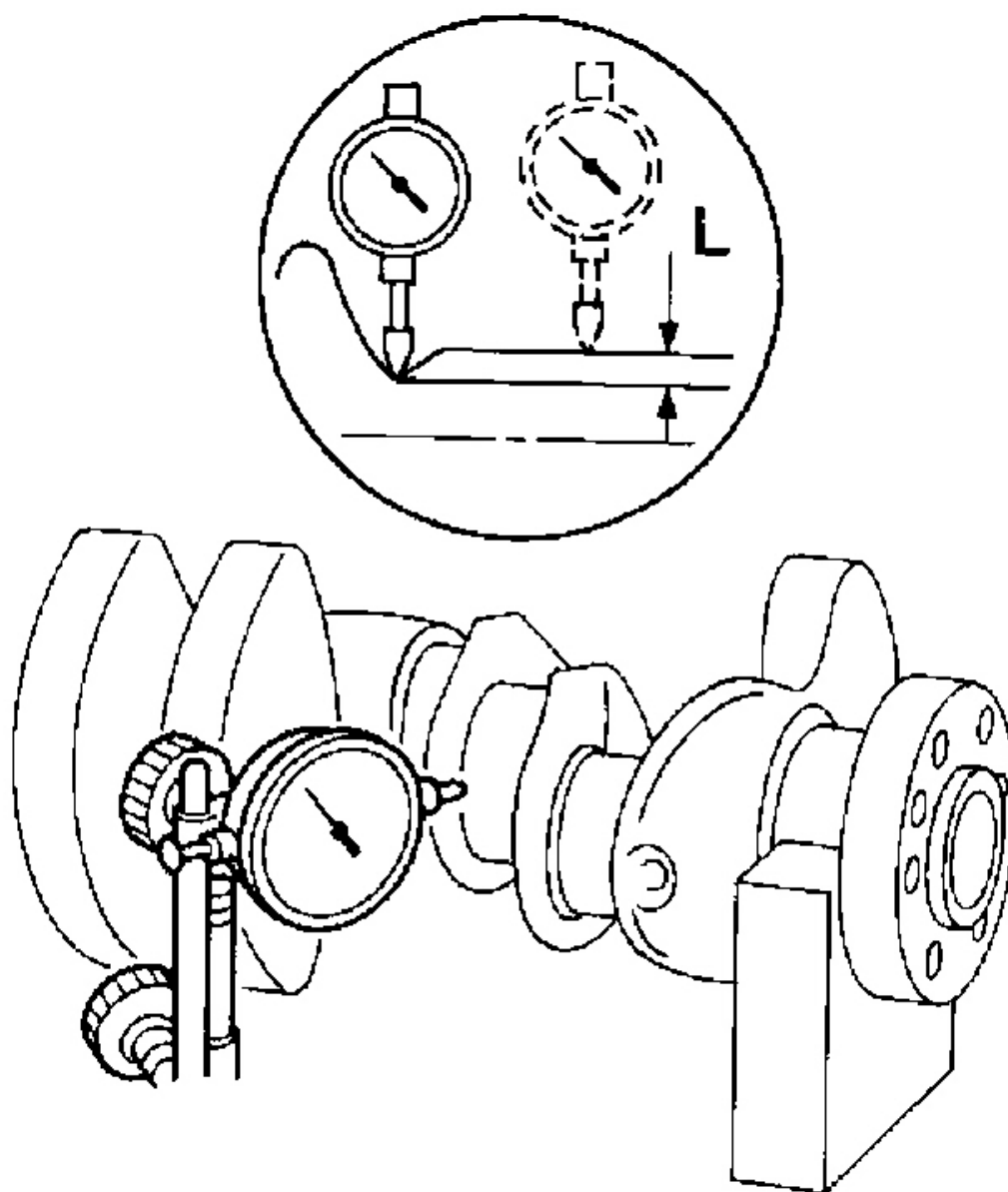
G02208319

Fig. 212: Measuring Outer Diameters Of Crankshaft Main Journal
Courtesy of NISSAN MOTOR CO., U.S.A.

- a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.

"L": 0.1 mm (0.004 in)

- b. Refer to **Crankshaft** for grinding crankshaft and available service parts.



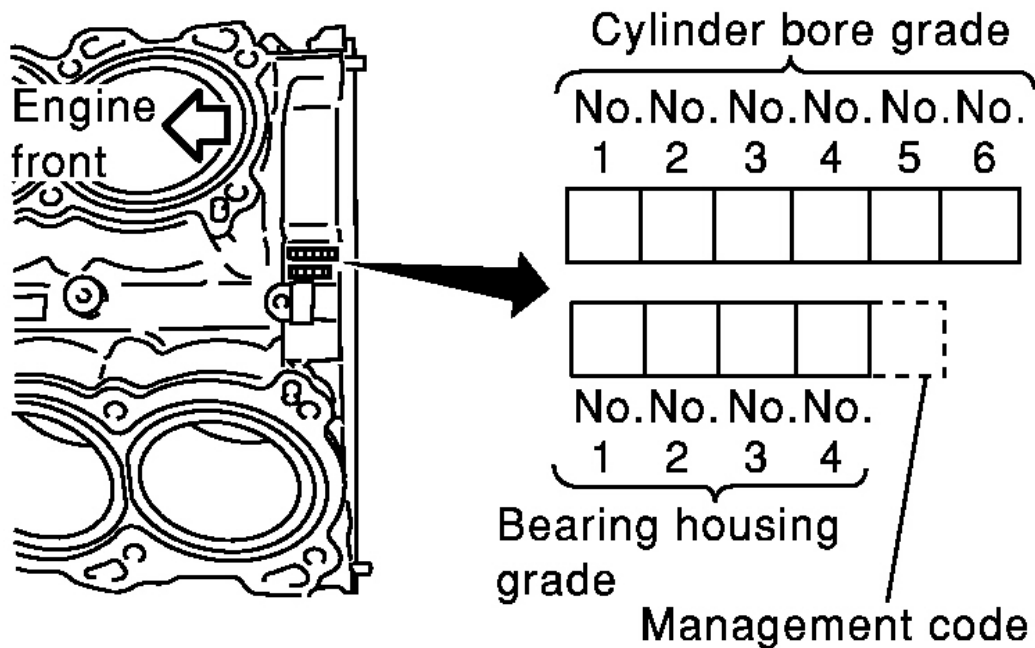
G02208320

Fig. 213: Measuring Grinding Crankshaft Journal
Courtesy of NISSAN MOTOR CO., U.S.A.

6. If crankshaft or cylinder block is replaced with a new one, select thickness of main bearings as follows:
 - a. Grade number of each cylinder block main journal is punched on the respective cylinder block.

These numbers are punched in either Arabic or Alphabet. Refer to **Cylinder Block** .

If measured diameter is out of grade punched, decide suitable grade using table in SDS.



G02208321

Fig. 214: Identifying Cylinder Block Main Journal Punching Position
 Courtesy of NISSAN MOTOR CO., U.S.A.

- b. Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Alphabet. Refer to **Crankshaft** .

If measured diameter is out of grade punched, decide suitable grade using table in SDS.

- c. Select main bearing with suitable thickness according to the following table.

Refer to **Available Main Bearing** , for available main bearings.

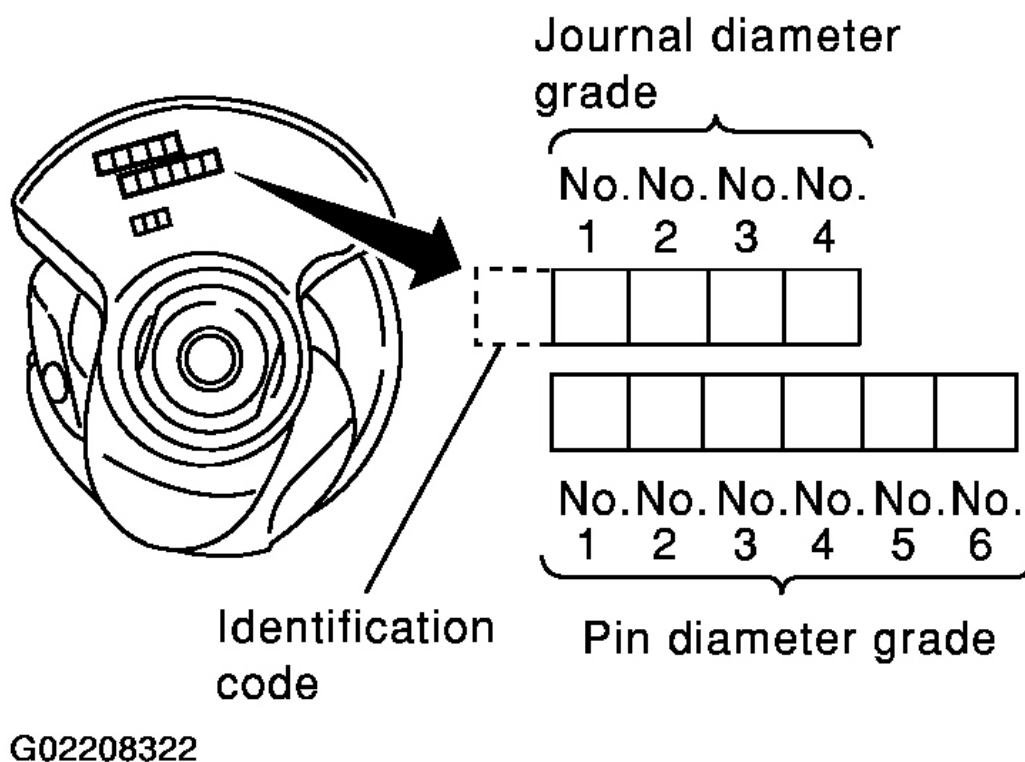


Fig. 215: Identifying Grade Number Of Crankshaft Main Journal Punching Position
Courtesy of NISSAN MOTOR CO., U.S.A.

Cylinder block bearing housing inner diameter Unit: mm (in) Crankshaft main journal diameter Unit: mm (in)		Mark		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
		Axle diameter		Hole diameter		63.993 - 63.994 (2.5194 - 2.5194)	63.994 - 63.995 (2.5194 - 2.5195)	63.995 - 63.996 (2.5195 - 2.5195)	63.996 - 63.997 (2.5195 - 2.5196)	63.997 - 63.998 (2.5196 - 2.5196)	63.998 - 63.999 (2.5196 - 2.5196)	63.999 - 64.000 (2.5196 - 2.5197)	64.000 - 64.001 (2.5197 - 2.5197)	64.001 - 64.002 (2.5197 - 2.5198)	64.002 - 64.003 (2.5198 - 2.5198)	64.003 - 64.004 (2.5198 - 2.5198)	64.004 - 64.005 (2.5198 - 2.5199)	64.005 - 64.006 (2.5199 - 2.5199)	64.006 - 64.007 (2.5199 - 2.5200)	64.007 - 64.008 (2.5200 - 2.5200)	64.008 - 64.009 (2.5200 - 2.5200)	64.009 - 64.010 (2.5200 - 2.5201)	64.010 - 64.011 (2.5201 - 2.5201)	64.011 - 64.012 (2.5201 - 2.5202)	64.012 - 64.013 (2.5202 - 2.5202)	64.013 - 64.014 (2.5202 - 2.5202)	64.014 - 64.015 (2.5202 - 2.5203)	64.015 - 64.016 (2.5203 - 2.5203)	64.016 - 64.017 (2.5203 - 2.5203)
Mark		Axle diameter		Hole diameter																									
A	59.975 - 59.974 (2.3612 - 2.3612)	0	0	0	0	01	01	01	01	01	1	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34
B	59.974 - 59.973 (2.3612 - 2.3611)	0	0	01	01	01	01	1	1	1	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 - 2.3611)	0	01	01	01	1	1	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	3	3	34	34	34	4	4
D	59.972 - 59.971 (2.3611 - 2.3611)	01	01	01	1	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4
E	59.971 - 59.970 (2.3611 - 2.3610)	01	01	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	45
F	59.970 - 59.969 (2.3610 - 2.3610)	01	1	1	1	12	12	12	2	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	4	45
G	59.969 - 59.968 (2.3610 - 2.3609)	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	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	4	4	4	4	4	4	4	45
J	59.967 - 59.966 (2.3609 - 2.3609)	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	45
K	59.966 - 59.965 (2.3609 - 2.3608)	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	45
L	59.965 - 59.964 (2.3608 - 2.3608)	12	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	45
M	59.964 - 59.963 (2.3608 - 2.3607)	12	2	2	2	23	23	23	3	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	45
N	59.963 - 59.962 (2.3607 - 2.3607)	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
P	59.962 - 59.961 (2.3607 - 2.3607)	2	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
R	59.961 - 59.960 (2.3607 - 2.3606)	2	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
S	59.960 - 59.959 (2.3606 - 2.3606)	23	23	23	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
T	59.959 - 59.958 (2.3606 - 2.3605)	23	23	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
U	59.958 - 59.957 (2.3605 - 2.3605)	23	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
V	59.957 - 59.956 (2.3605 - 2.3605)	3	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
W	59.956 - 59.955 (2.3605 - 2.3604)	3	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
X	59.955 - 59.954 (2.3604 - 2.3604)	3	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
Y	59.954 - 59.953 (2.3604 - 2.3603)	34	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
4	59.953 - 59.952 (2.3603 - 2.3603)	34	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45
7	59.952 - 59.951 (2.3603 - 2.3603)	34	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	45

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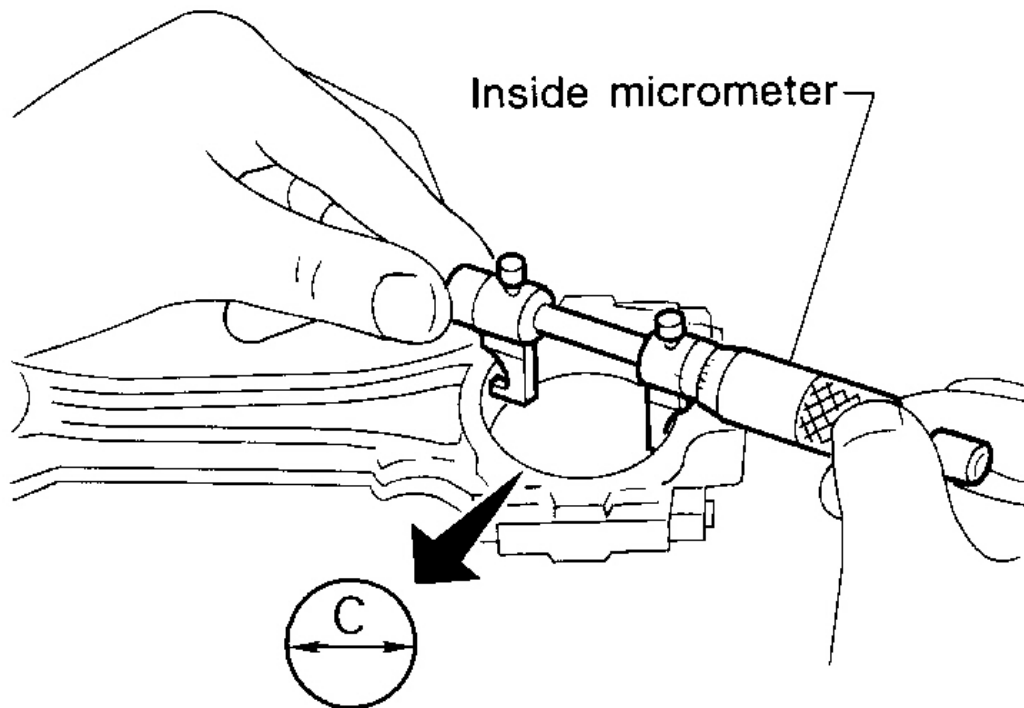
Fig. 216: Crankshaft Main Journal And Bearing Housing Inner Diameter Chart
 Courtesy of NISSAN MOTOR CO., U.S.A.

Connecting Rod Bearing (Big end)

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

Tighten bolts to the specified torque.

3. Measure inner diameter "C" of connecting rod.



G02208324

Fig. 217: Measuring Inner Diameter Of Connecting Rod
Courtesy of NISSAN MOTOR CO., U.S.A.

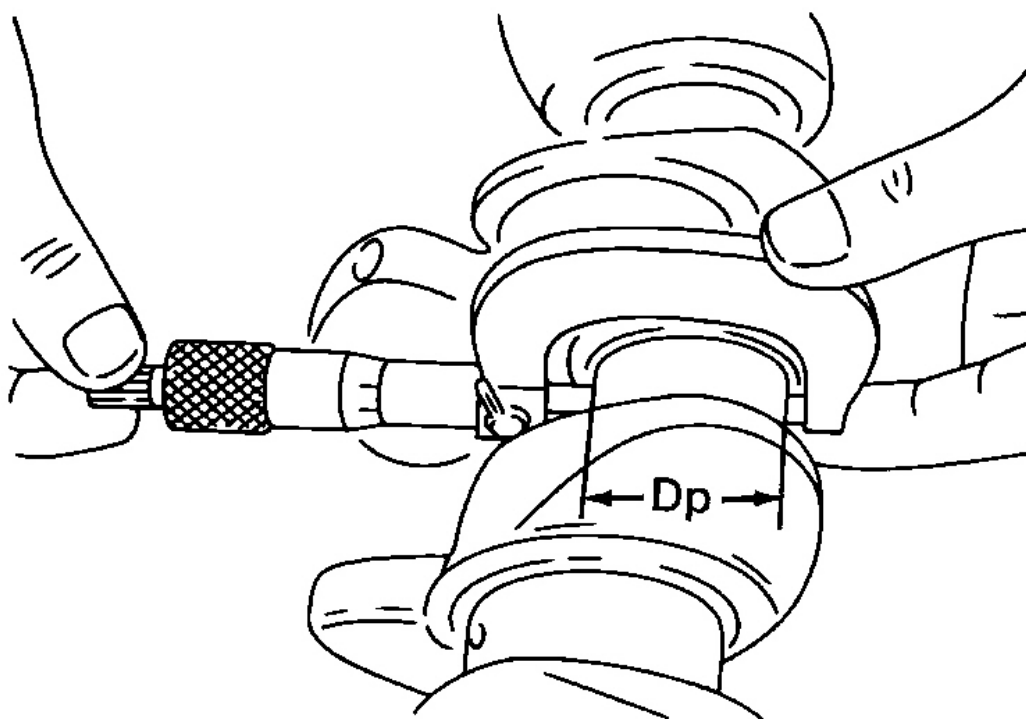
4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.

Connecting rod bearing clearance = C - Dp

Standard: 0.034 - 0.059 mm (0.0013 - 0.0023 in)

Limit: 0.070 mm (0.0028 in)

6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing. Refer to "**BEARING CLEARANCE - MAIN BEARING**", .



G02208325

Fig. 218: Measuring Outer Diameter Of Crankshaft Pin Journal
Courtesy of NISSAN MOTOR CO., U.S.A.

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

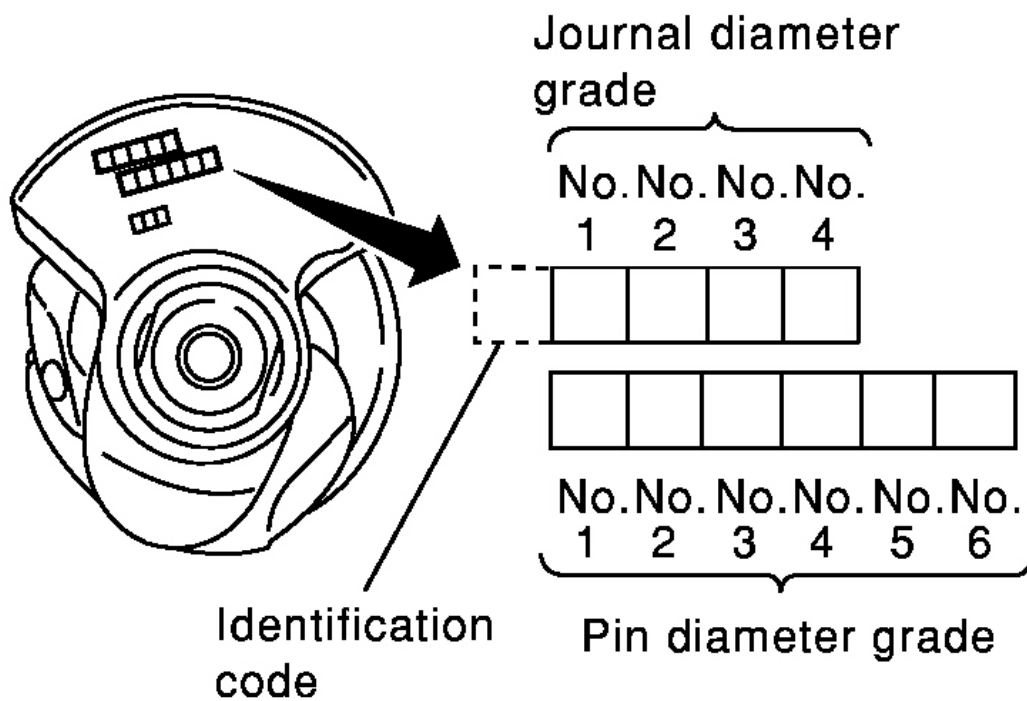
Connecting rod bearing grade number (Identification color):

These numbers are punched in either Arabic or Roman numerals.

Crankshaft pin journal grade number	Connecting rod bearing grade number
0	0 (Black)
1	1 (Brown)
2	2 (Green)

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Fig. 219: Connecting Rod Bearing Grade Number Specifications
 Courtesy of NISSAN MOTOR CO., U.S.A.



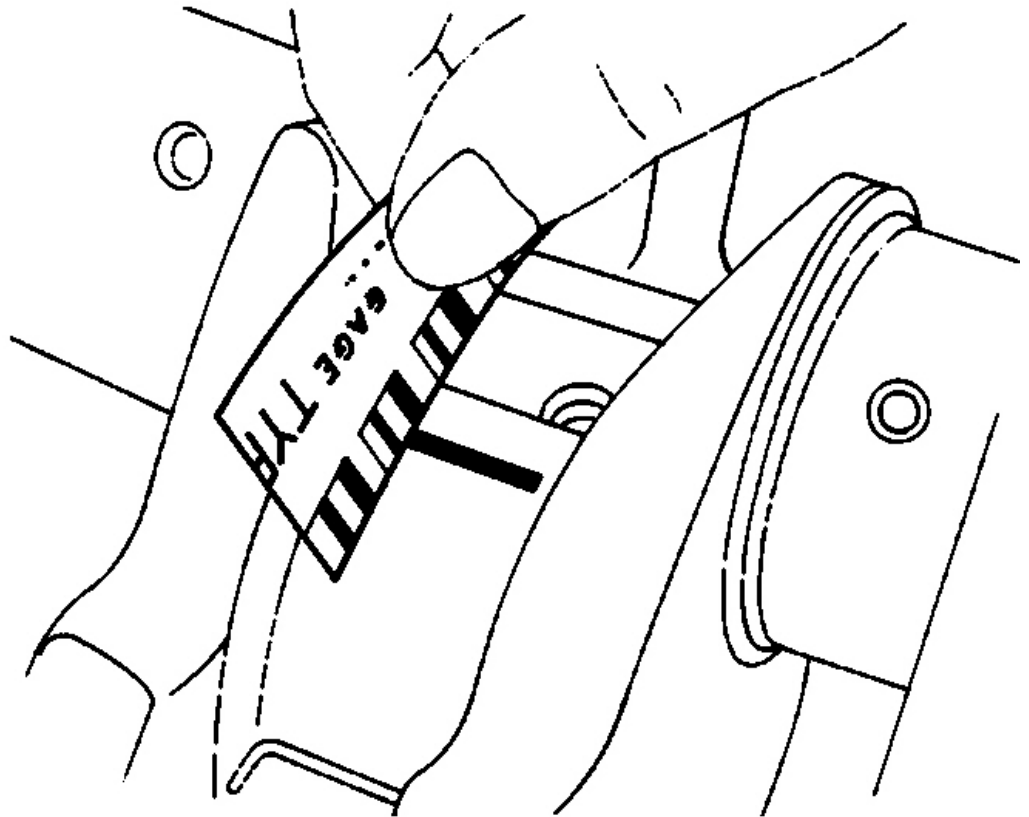
G02208327

Fig. 220: Identifying Connecting Rod Bearing Grade Number
 Courtesy of NISSAN MOTOR CO., U.S.A.

Method B (Using plastigage)

CAUTION:

- Do not turn crankshaft or connecting rod while plastigage is being inserted.
- When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. If incorrect bearing clearance exists use a thicker or undersized main bearing to ensure specified clearance.



G02208328

Fig. 221: Precaution For Handling Plastigage
Courtesy of NISSAN MOTOR CO., U.S.A.

CONNECTING ROD BUSHING CLEARANCE (SMALL END)

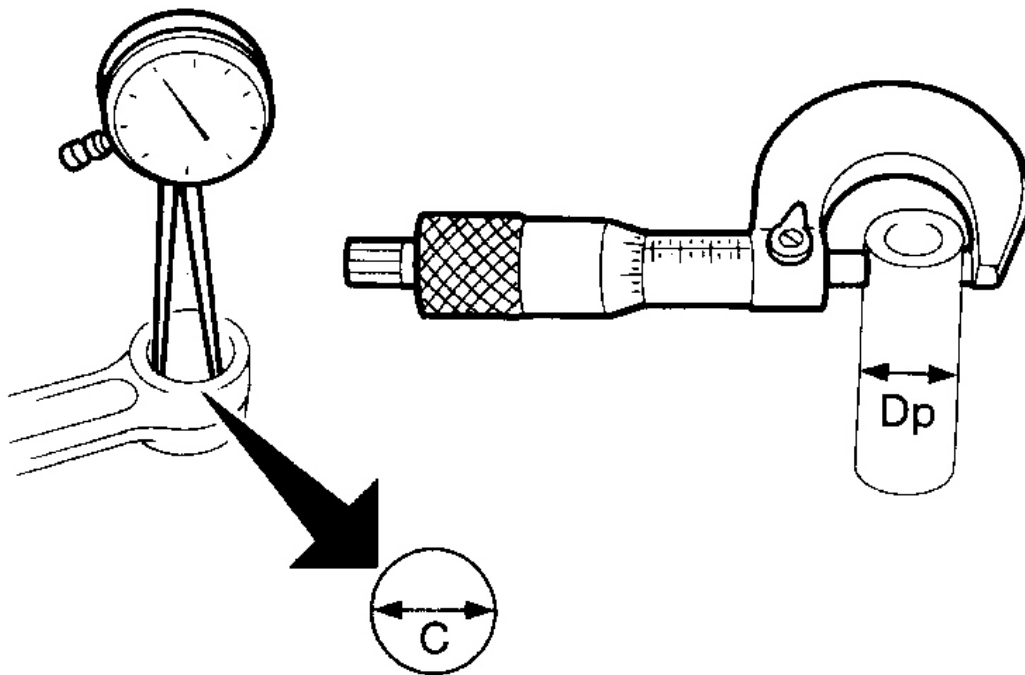
1. Measure inner diameter "C" of bushing.
2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bushing clearance.

Connecting rod bushing clearance = $C - D_p$

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

Limit: 0.030 mm (0.0012 in)

If it exceeds the limit, replace connecting rod assembly or connecting rod bushing and/or piston set with pin.



G02208329

Fig. 222: Measuring Connecting Rod Bushing Clearance - Small End
 Courtesy of NISSAN MOTOR CO., U.S.A.

DRIVE PLATE RUNOUT

Runout (Total indicator reading):

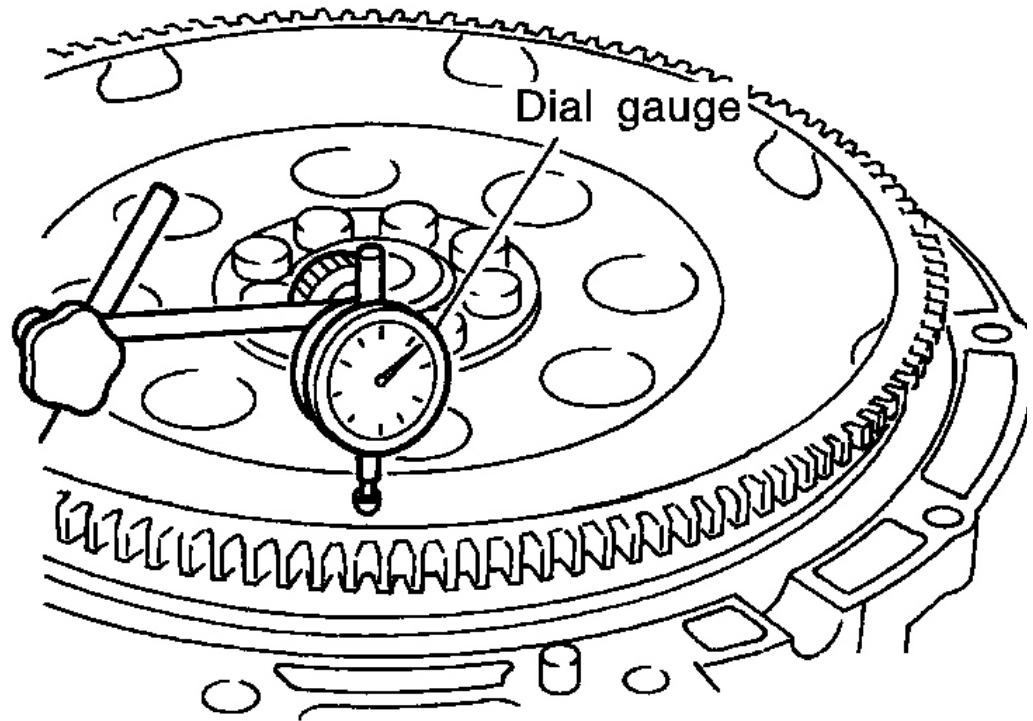
Drive plate

Less than 0.15 mm (0.0059 in)

CAUTION: • The signal plate is built into the drive plate assembly. Be careful not to

damage the signal plate, especially the teeth.

- Check the drive plate and signal plate for deformation or cracks.
- Keep any magnetized objects away from the signal plate.
- Do not allow any magnetic materials to contact the signal plate teeth.



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Fig. 223: Measuring Drive Plate Runout
Courtesy of NISSAN MOTOR CO., U.S.A.

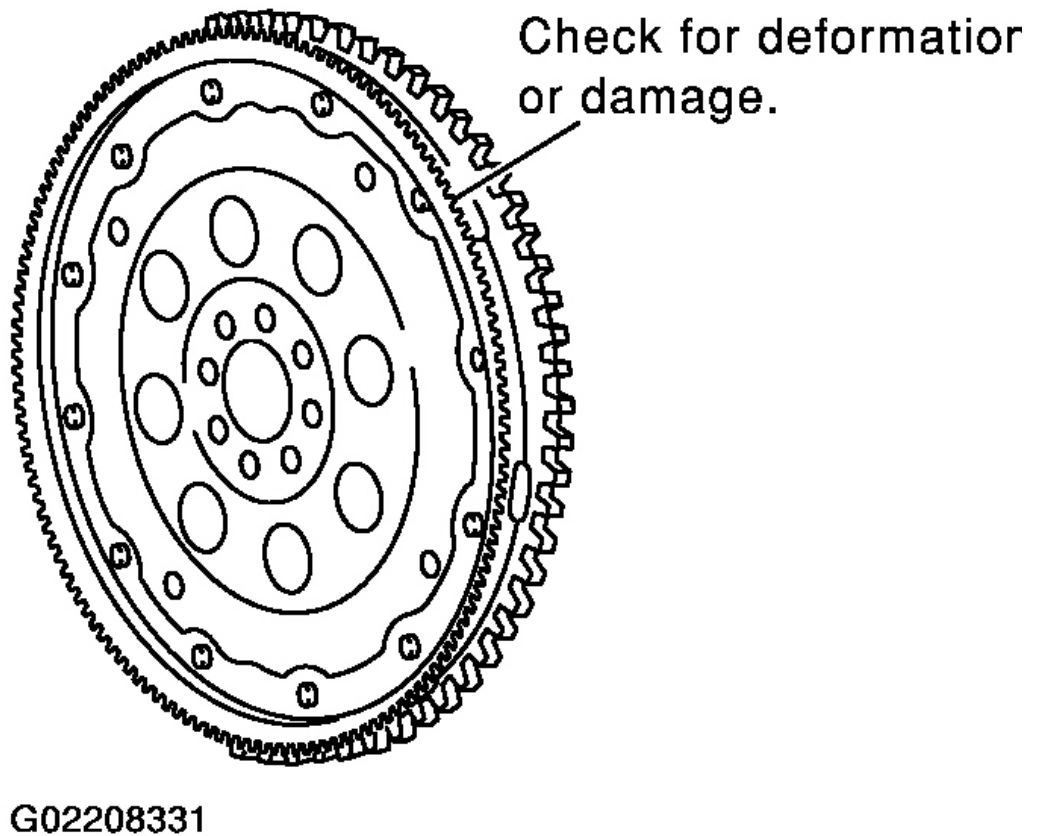


Fig. 224: Inspecting Drive Plate
Courtesy of NISSAN MOTOR CO., U.S.A.

ASSEMBLY

PISTON

1. Install new snap ring on one side of piston pin hole.
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.
 - **Align the direction of piston and connecting rod.**
 - **Numbers stamped on connecting rod and cap correspond to each cylinder.**
 - **After assembly, make sure connecting rod swings smoothly.**

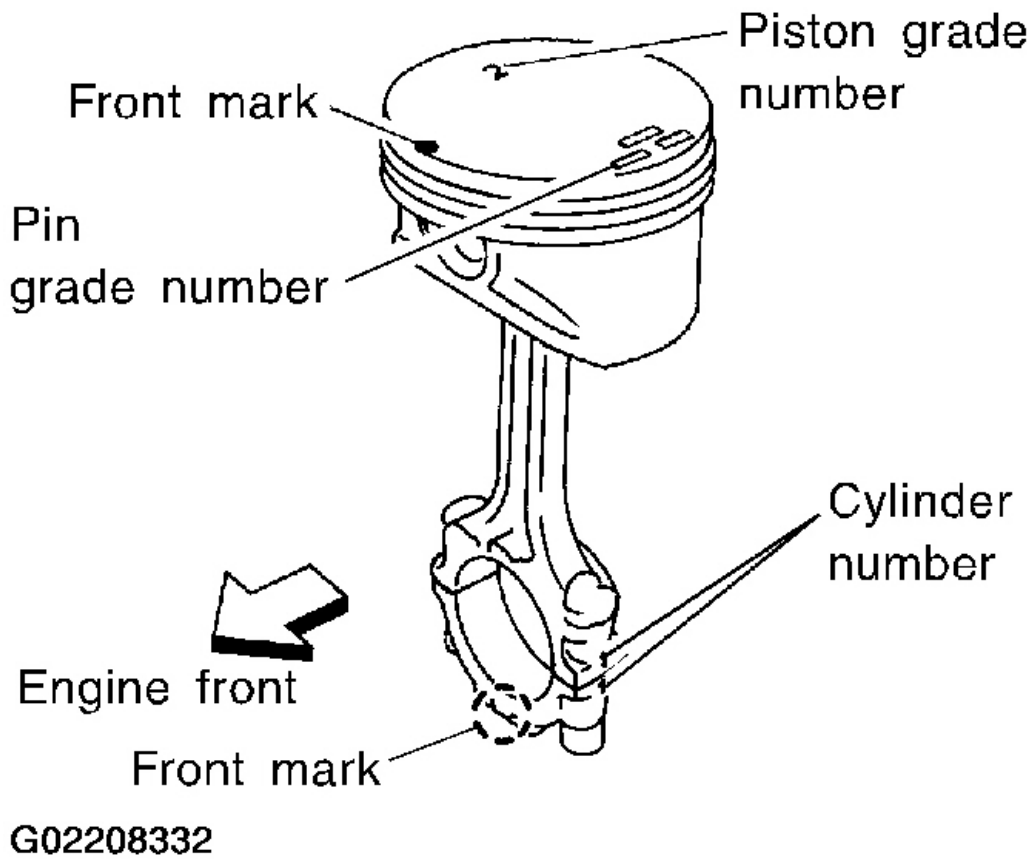
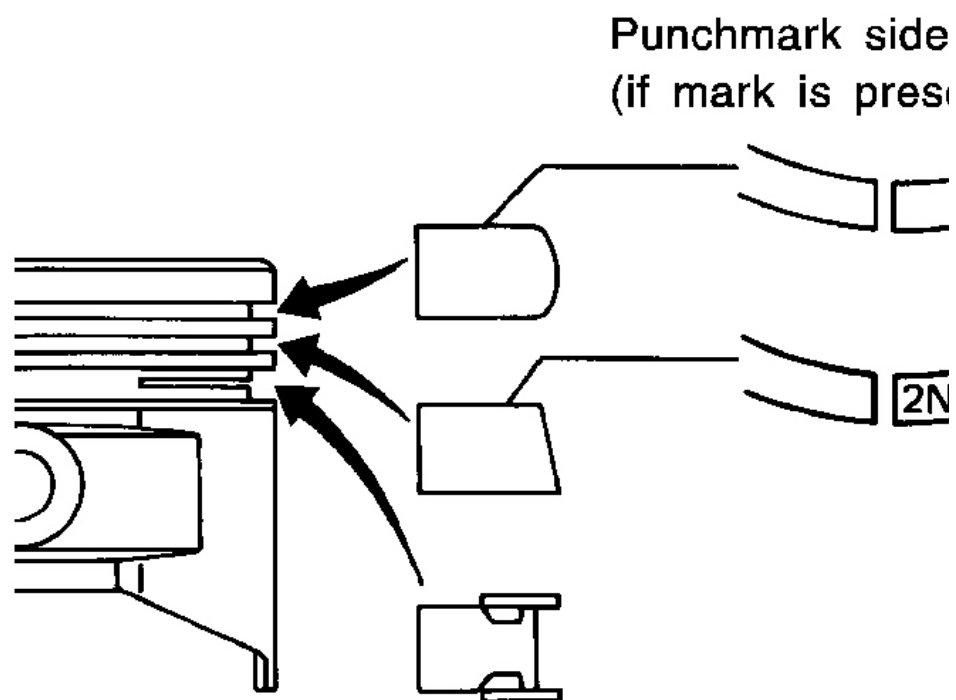


Fig. 225: Installing Snap Ring On Piston Pin Hole
Courtesy of NISSAN MOTOR CO., U.S.A.

3. Set piston rings as shown.

CAUTION:

- When piston rings are not replaced, make sure that piston rings are mounted in their original positions.
- When replacing piston rings, these without punch mark present, rings can be mounted with either side up.



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Fig. 226: Identifying Piston Rings Position

Courtesy of NISSAN MOTOR CO., U.S.A.

- Align piston rings so that end gaps are positioned as shown in the diagram.

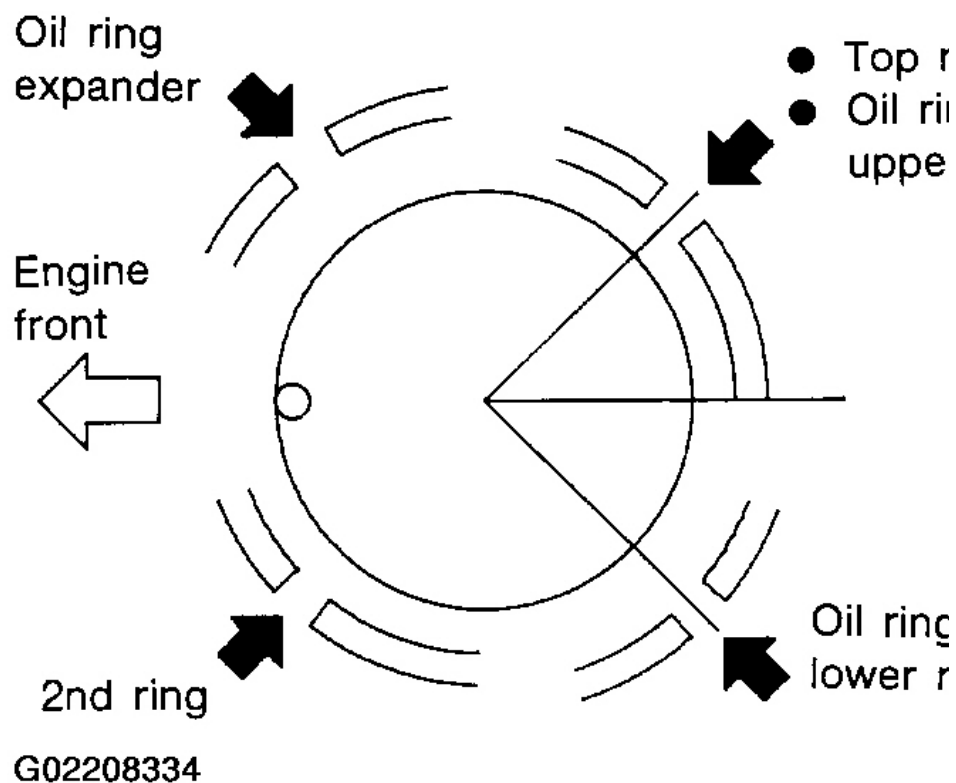
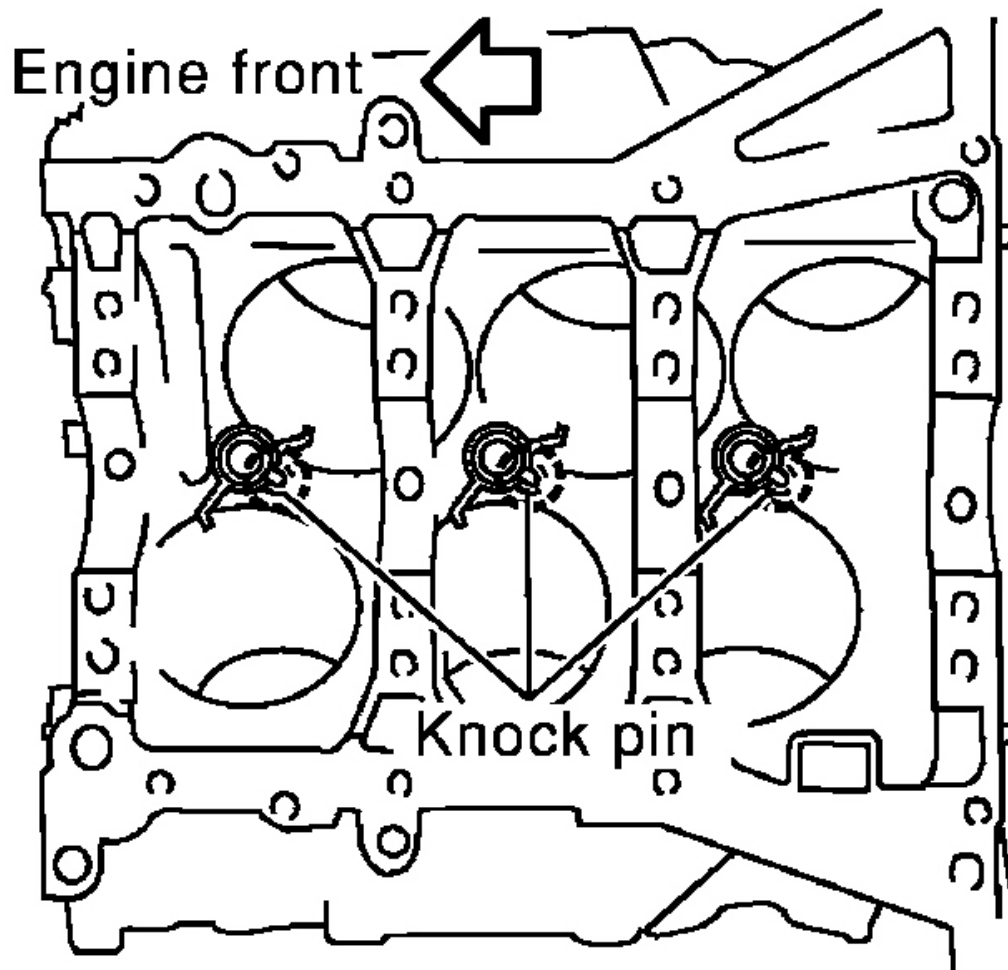


Fig. 227: Aligning Piston Rings Position
Courtesy of NISSAN MOTOR CO., U.S.A.

OIL JET

1. Install oil jets.
 - Insert oil jet knock pin into the cylinder block knock pin hole, and tighten the mounting bolts.

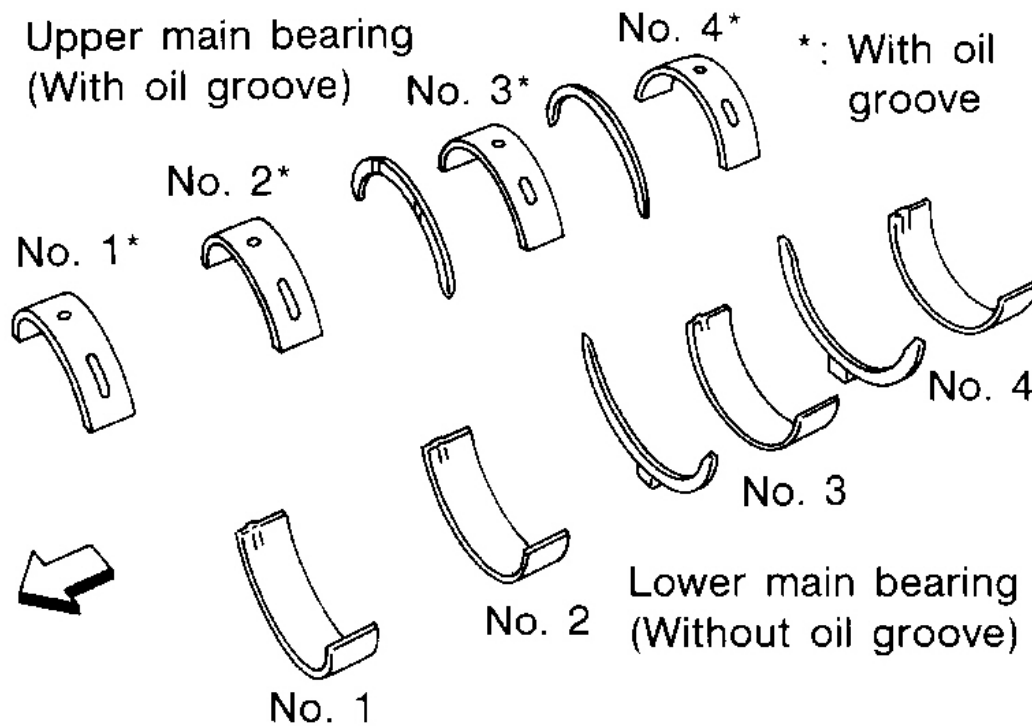


G02208335

Fig. 228: Inserting Oil Jet Knock Pin Into Cylinder Block Knock Pin Hole
Courtesy of NISSAN MOTOR CO., U.S.A.

CRANKSHAFT

1. Set main bearing in their proper positions on cylinder block and main bearing beam.
 - **Confirm that correct main bearings are used. Refer to "INSPECTION" of this section.**



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Fig. 229: Identifying Main Bearings

Courtesy of NISSAN MOTOR CO., U.S.A.

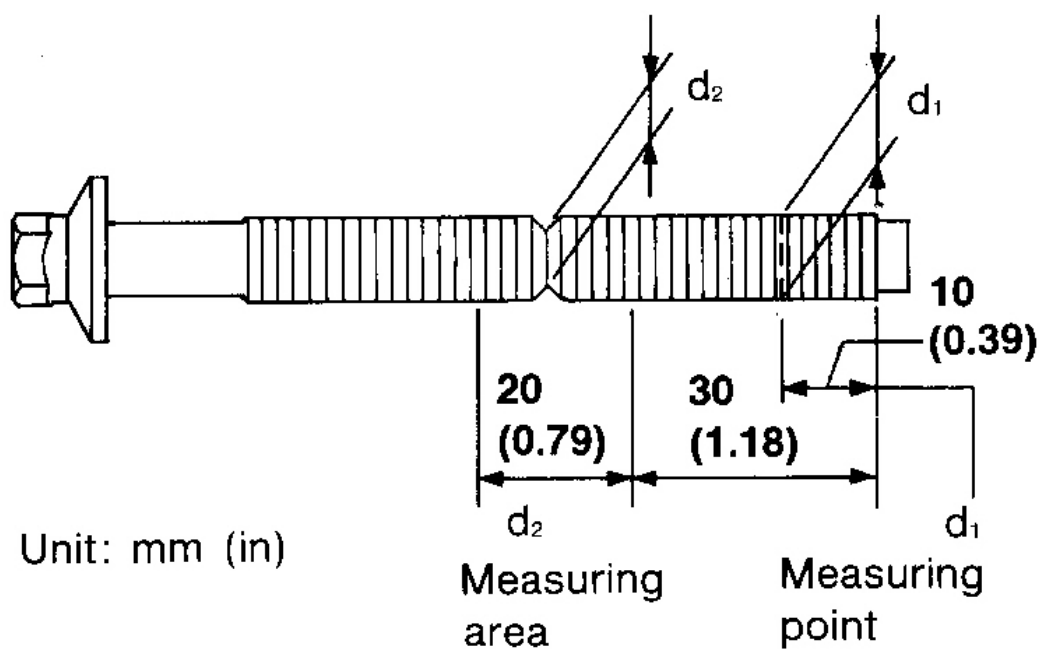
2. Instruction for re-use of main bearing cap bolts.

- A plastic zone tightening method is used for tightening main bearing cap bolts. Measure d1 and d2 as shown in the figure.

d2: Select minimum diameter in the measuring area.

If the difference between d1 and d2 exceeds the limit, replace the bolts with new ones.

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



G02208337

Fig. 230: Identifying Main Bearing Cap Bolt Dimension
Courtesy of NISSAN MOTOR CO., U.S.A.

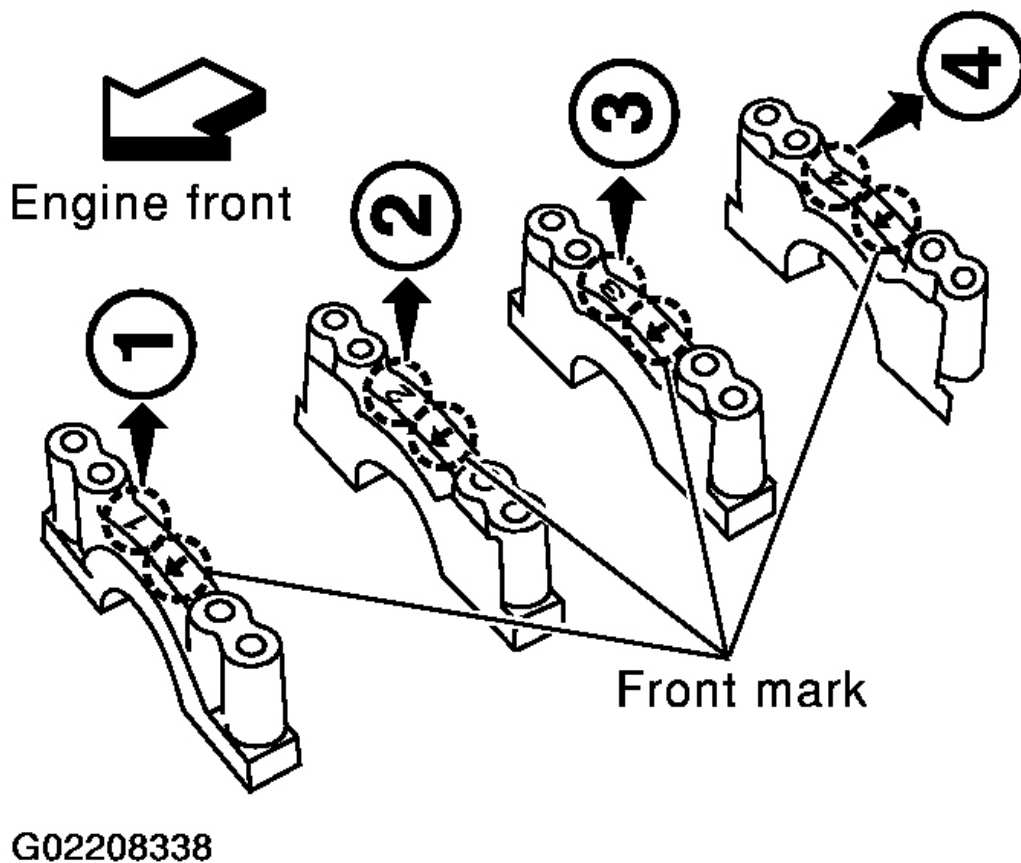
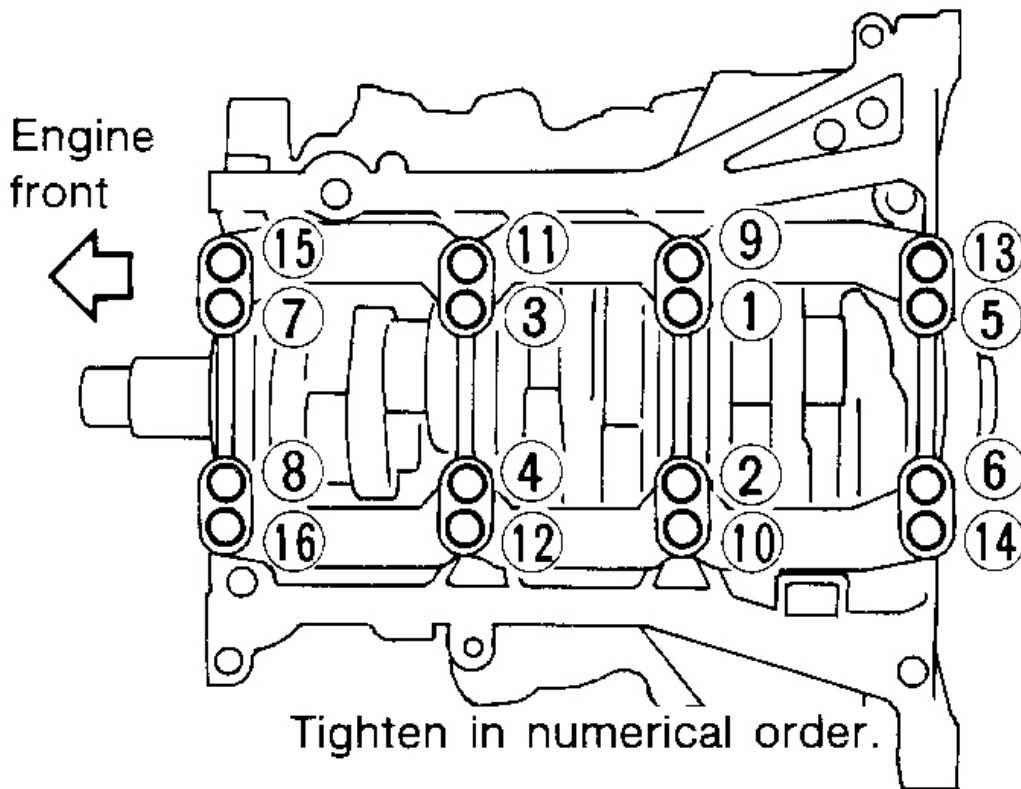


Fig. 231: Identifying Main Bearing Cap Bolts Marks
Courtesy of NISSAN MOTOR CO., U.S.A.

3. After installing crankshaft, main bearing cap, main bearing beam and bearing cap bolts, tighten bearing cap bolts in numerical order as shown.
 - **Make sure that the front mark on the main bearing beam faces the front of the engine.**
 - **Tightening procedure**
 - a. Tighten all bolts to 32 to 38 N.m (3.3 to 3.9 kg-m, 24 to 28 ft-lb) in several different steps.
 - b. Turn all bolts 90 to 95 degrees clockwise with angle wrench.
 - **Prior to tightening bearing cap bolts, place bearing beam**



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Fig. 232: Tightening Main Bearing Cap Bolts

Courtesy of NISSAN MOTOR CO., U.S.A.

in its proper position by shifting crankshaft in the axial direction.

- After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.
- Lubricate threads and seat surfaces of the bolts with new engine oil.

4. Measure crankshaft end play.

Crankshaft end play:

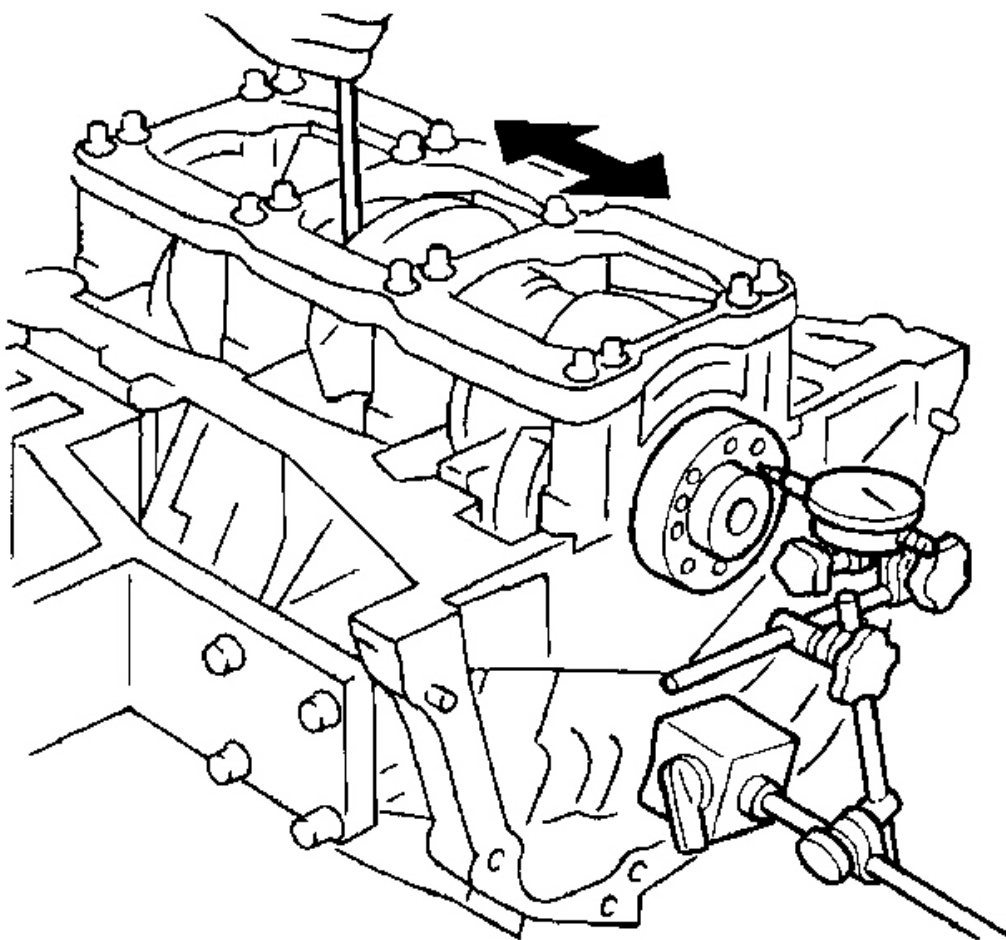
Standard

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Limit

0.30 mm (0.0118 in)

If beyond the limit, replace bearing with a new one.



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Fig. 233: Measuring Crankshaft End Play
Courtesy of NISSAN MOTOR CO., U.S.A.

5. Install connecting rod bearings in connecting rods and connecting rod caps.
 - **Confirm that correct bearings are used.**

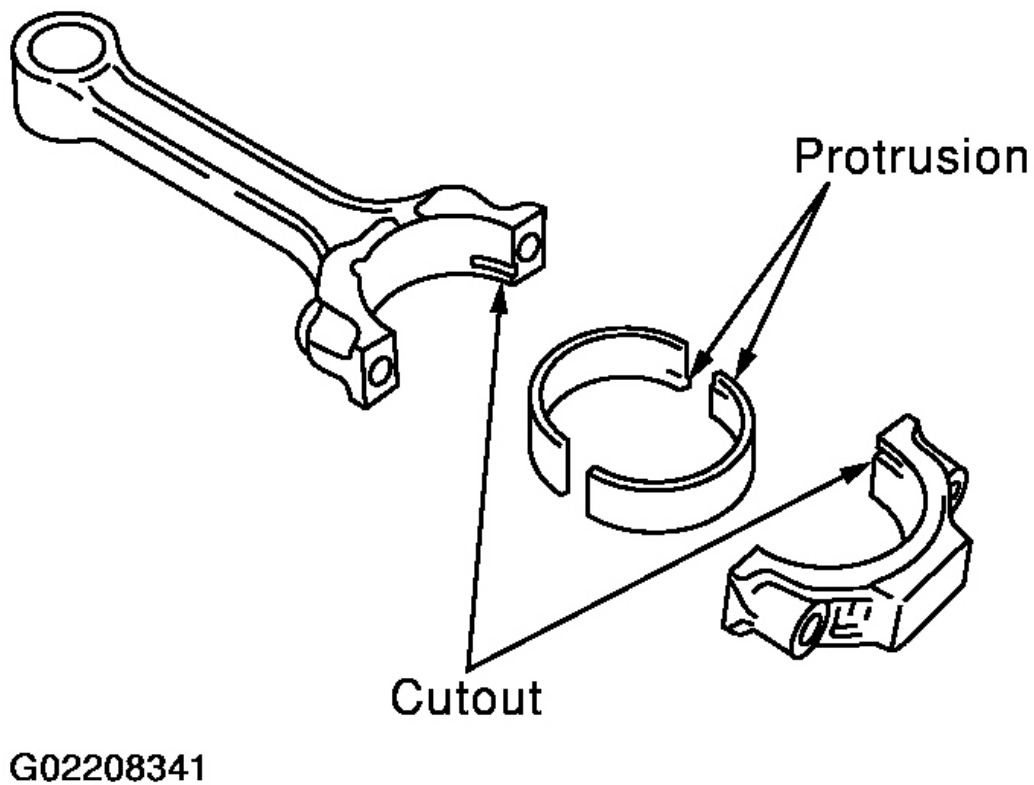
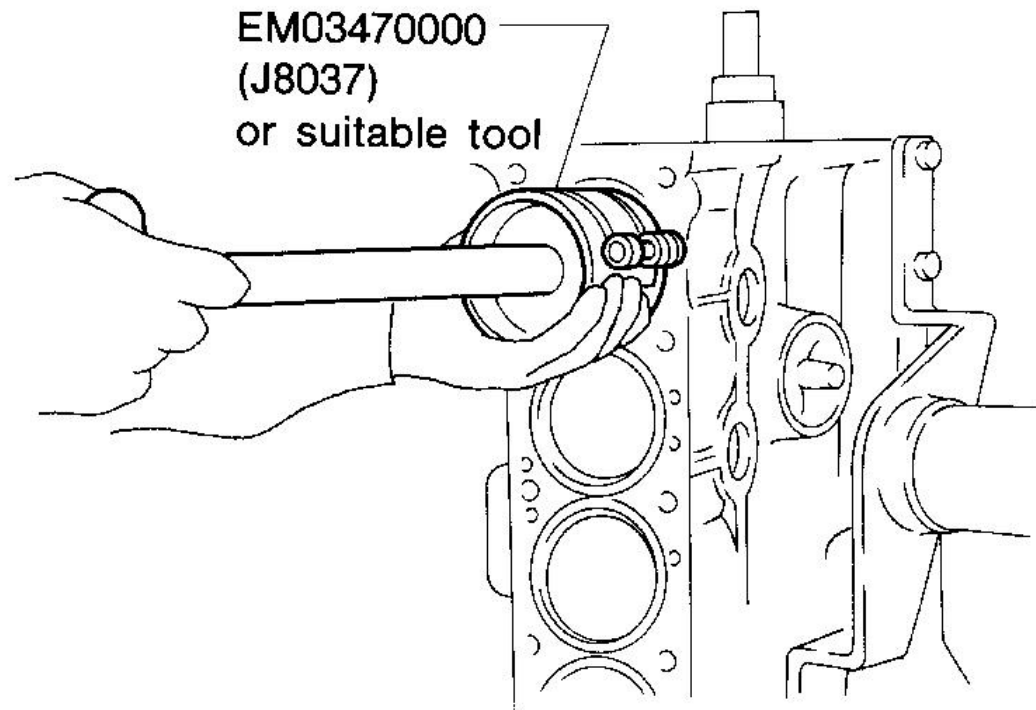


Fig. 234: Installing Connecting Rod Bearings In Connecting Rods And Connecting Rod Caps
Courtesy of NISSAN MOTOR CO., U.S.A.

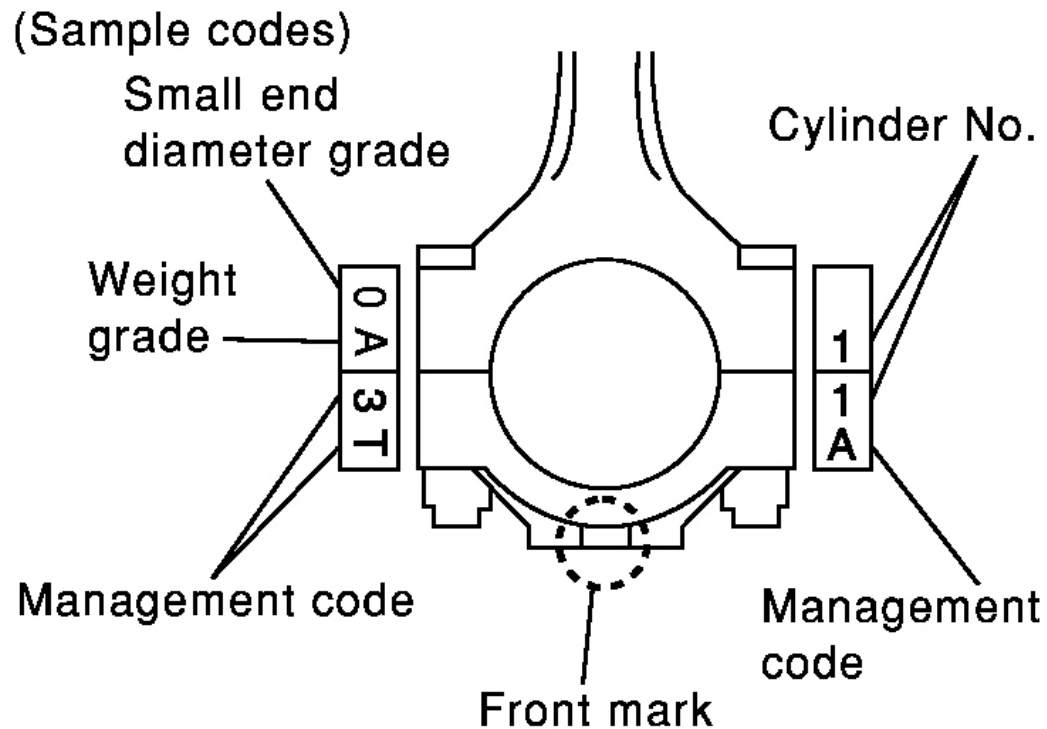
6. Install pistons with connecting rods.
 - a. Install them into corresponding cylinders with Tool.
 - Be careful not to scratch cylinder wall with the connecting rod.
 - Arrange so that front mark on piston head faces toward engine front.



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Fig. 235: Installing Piston Into Corresponding Cylinders With Tool
Courtesy of NISSAN MOTOR CO., U.S.A.

- b. Install connecting rod caps.
- **Lubricate threads and seat surfaces with new engine oil.**
 - Install so that the cylinder number stamped on the connecting rod agrees with that stamped on cap side.
 - Make sure that front mark on the connecting rod cap faces the front of the engine.



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Fig. 236: Lubricating Threads And Seat Surfaces With Engine Oil
 Courtesy of NISSAN MOTOR CO., U.S.A.

- c. Re-use connecting rod cap bolts as follows.
- Make sure that the bolts can be smoothly screwed-in to the end manually.
 - If not, measure the outer diameter "d" shown in the figure.

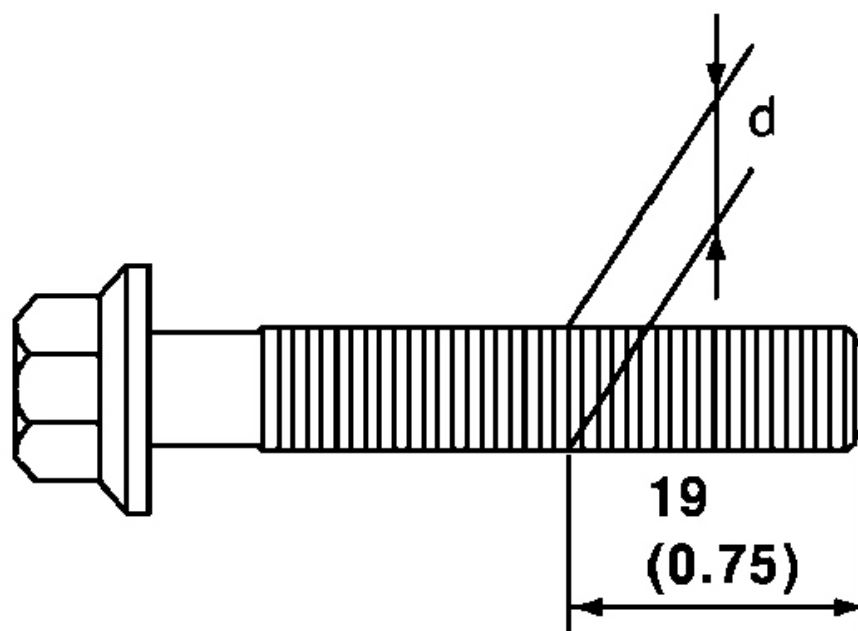
Outer diameter "d" of connecting rod cap bolt:

Standard

7.90 - 8.00 mm (0.3110 - 0.3150 in)

Limit

7.75 mm (0.3051 in)



Unit: mm (in)

G02208344

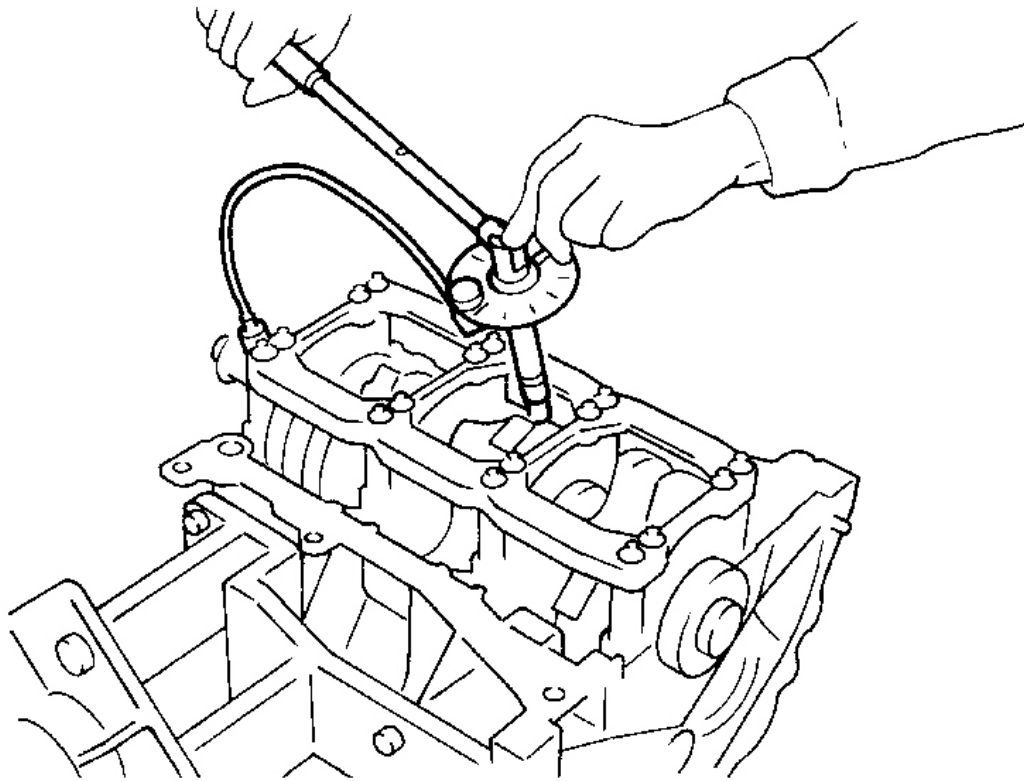
Fig. 237: Identifying Connecting Rod Cap Bolt Dimension
Courtesy of NISSAN MOTOR CO., U.S.A.

- d. Tighten connecting rod cap bolts to the specified torque.

Connecting rod cap bolt:

Tighten nuts to 19 to 21 N.m (1.9 to 2.1 kg-m, 14 to 15 ft-lb).

Turn nuts 90 to 95 degrees clockwise with angle wrench.



G02208345

Fig. 238: Tightening Connecting Rod Cap Bolts To Specified Torque
Courtesy of NISSAN MOTOR CO., U.S.A.

7. Measure connecting rod side clearance.

Connecting rod side clearance:

Standard

0.20 - 0.35 mm (0.0079 - 0.0138 in)

Limit

0.40 mm (0.0157 in)

If beyond the limit, replace connecting rod and/or crankshaft.

8. Install rear oil seal retainer.

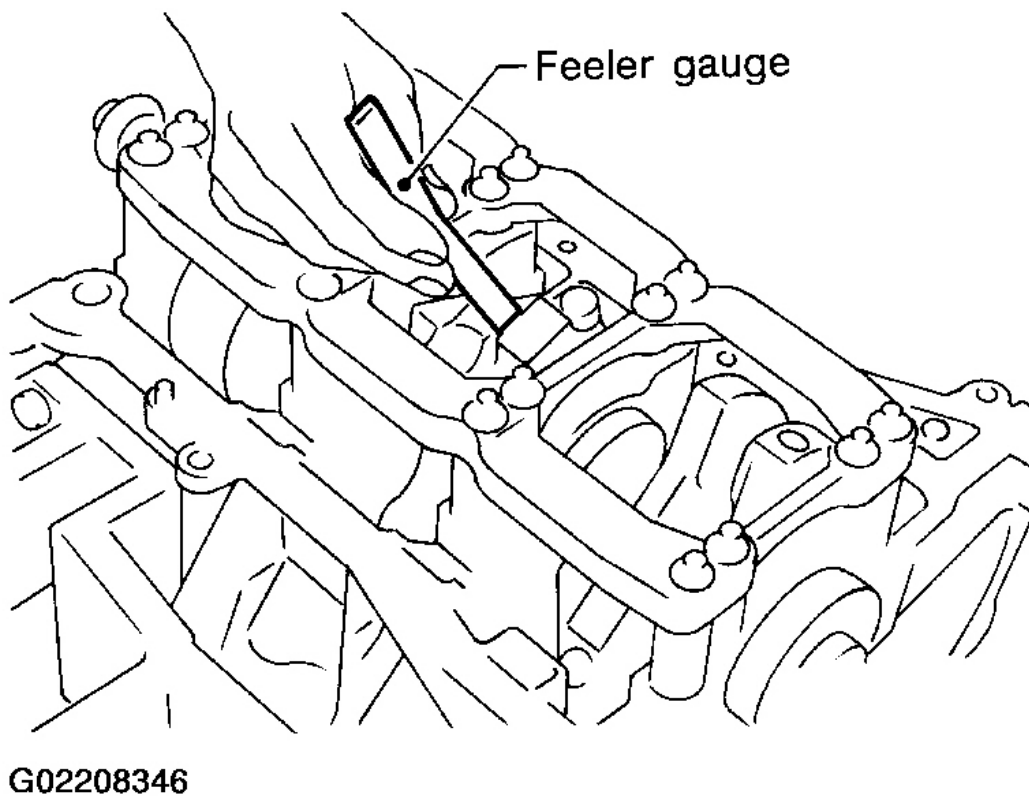
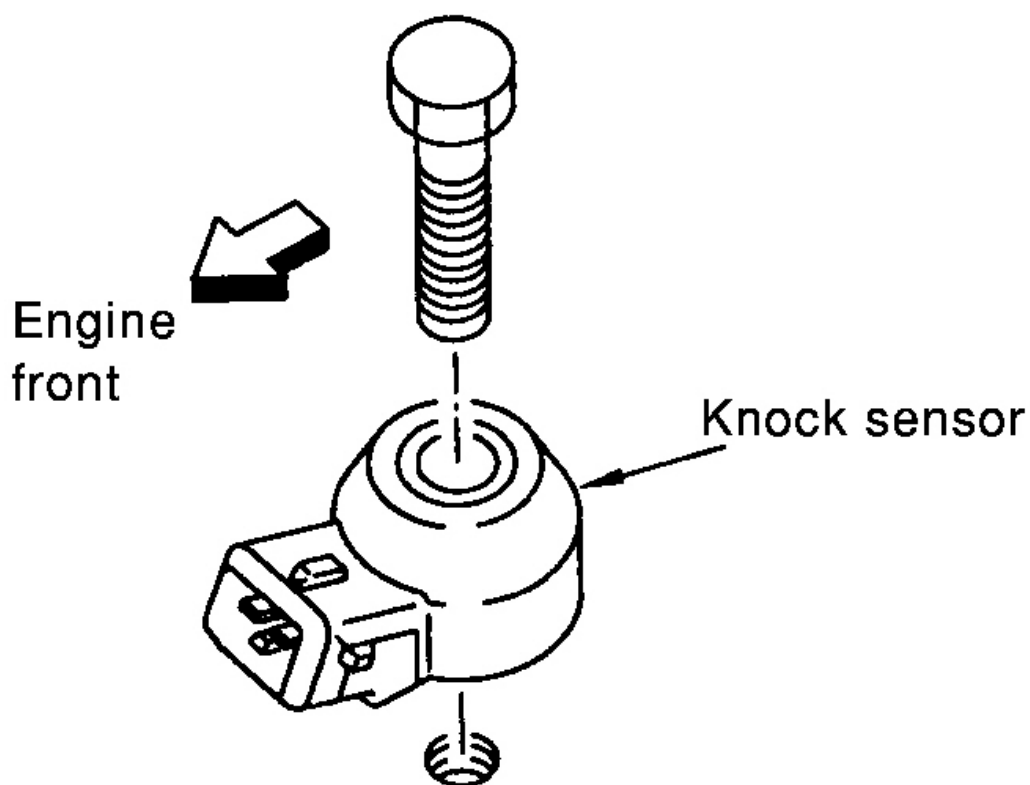


Fig. 239: Measuring Connecting Rod Side Clearance
Courtesy of NISSAN MOTOR CO., U.S.A.

KNOCK SENSOR

1. Install knock sensor.
 - Make sure that there is no foreign material on the cylinder block mating surface and the back surface of the knock sensor.
 - Install knock sensor so that connector faces front of engine.
 - Do not tighten the mounting bolts while holding the connector.
 - Make sure that the knock sensor does not interfere with other parts.

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



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Fig. 240: Installing Knock Sensor
Courtesy of NISSAN MOTOR CO., U.S.A.

- After installing knock sensor, connect sub-harness, and lay it out to rear of engine.

REPLACEMENT OF PILOT CONVERTER

1. Remove pilot converter using tool or suitable tool.

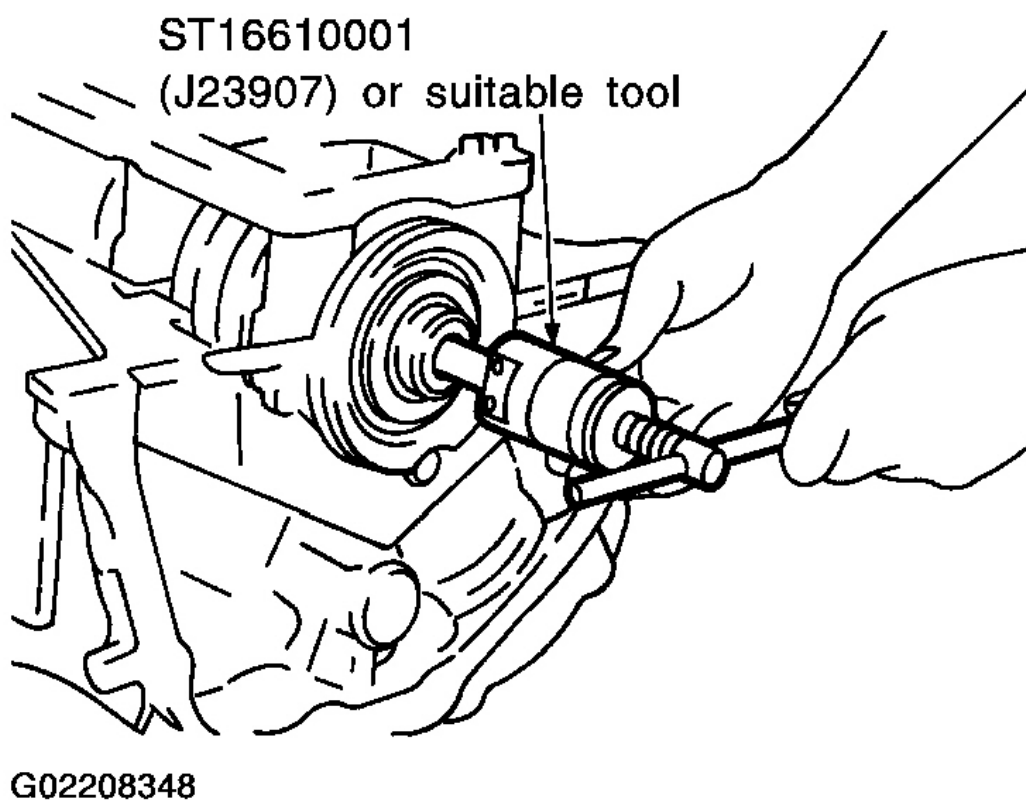
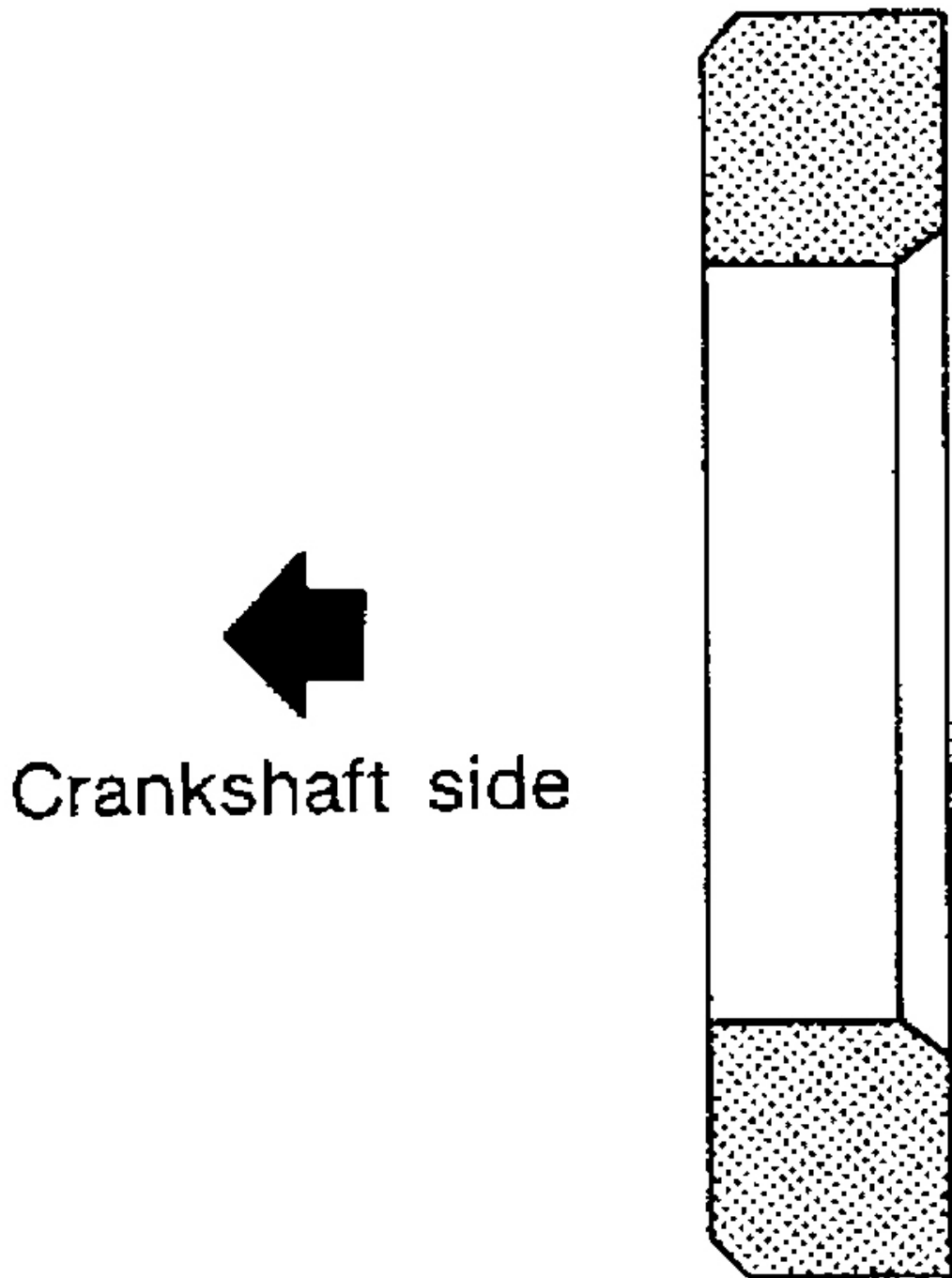


Fig. 241: Removing Pilot Converter Using Tool
Courtesy of NISSAN MOTOR CO., U.S.A.

2. Install pilot converter as shown.



G02208349

Fig. 242: Installing Pilot Converter

Courtesy of NISSAN MOTOR CO., U.S.A.

DRIVE PLATE

- Install the drive plate and reinforce plate in the direction shown in the figure.
- Align dowel pin of crankshaft rear end with pin holes of each part.
- Secure the crankshaft using a ring gear stopper.
- Tighten the installation bolts crosswise over several times.

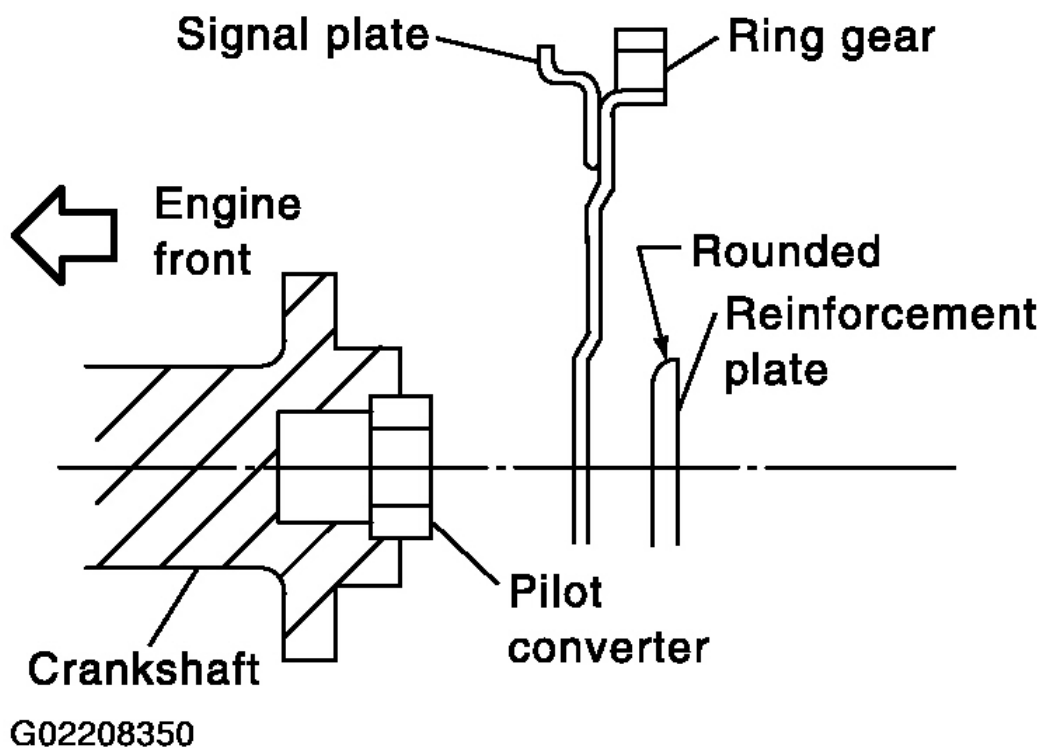


Fig. 243: Identifying Drive Plate Dimension
 Courtesy of NISSAN MOTOR CO., U.S.A.

SERVICE DATA AND SPECIFICATIONS (SDS)

GENERAL SPECIFICATIONS

General Specifications

Cylinder arrangement	V-6
Displacement cm ³ (cu in)	3,498 (213.45)

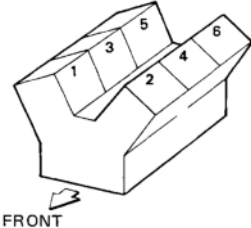
2003 Infiniti QX4

2003 ENGINE Engine Mechanical - QX4

Bore and stroke mm (in)		95.5 x 81.4 (3.760 x 3.205)
Valve arrangement		DOHC
Firing order		1-2-3-4-5-6
Number of piston rings	Compression	2
	Oil	1
Number of main bearings		4
Compression ratio		10.0

COMPRESSION PRESSURE

Unit: kPa (kg/cm², psi)/300 rpm

Compression pressure	Standard	1,275 (13.0, 185)
	Minimum	981 (10.0, 142)
	Differential limit between cylinders	98 (1.0, 14)
Cylinder number	 FRONT	

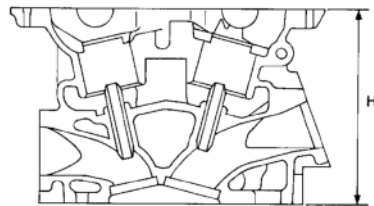
G02208352

Fig. 244: Compression Pressure Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface distortion	Less than 0.03 (0.0012)	0.1 (0.004)



Nominal cylinder head height:
H = 126.3 - 126.5 mm (4.972 - 4.980 in)

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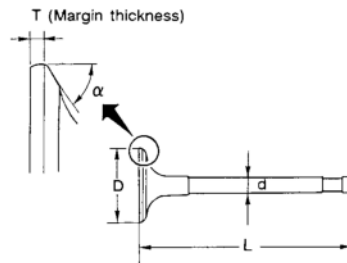
Fig. 245: Cylinder Head Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE

VALVE

Unit: mm (in)



Valve head diameter "D"	Intake	37.0 - 37.3 (1.4567 - 1.4685)
	Exhaust	31.2 - 31.5 (1.228 - 1.240)
Valve length "L"	Intake	96.12 - 96.62 (3.7842 - 3.8039)
	Exhaust	93.65 - 94.15 (3.6870 - 3.7067)
Valve stem diameter "d"	Intake	5.965 - 5.980 (0.2348 - 0.2354)
	Exhaust	5.945 - 5.960 (0.2341 - 0.2346)
Valve seat angle "α"	Intake	45°15' - 45°45'
	Exhaust	
Valve margin "T"	Intake	1.15 - 1.45 (0.0453 - 0.0571)
	Exhaust	1.45 - 1.75 (0.0571 - 0.0689)
Valve margin "T" limit		More than 0.5 (0.020)
Valve stem end surface grinding limit		Less than 0.2 (0.008)

G02208354

Fig. 246: Valve Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE CLEARANCE

Unit: mm (in)

	Cold	Hot* (reference data)
Intake	0.26 - 0.34 (0.010 - 0.013)	0.304 - 0.416 (0.012 - 0.016)
Exhaust	0.29 - 0.37 (0.011 - 0.015)	0.308 - 0.432 (0.012 - 0.017)

*: Approximately 80°C (176°F)

G02208355

Fig. 247: Valve Clearance Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE SPRING

2003 Infiniti QX4

2003 ENGINE Engine Mechanical - QX4

Free height	mm (in)	46.52 (1.831)
Pressure	N (kg, lb) at height mm (in)	196 (20.0, 44.1) at 37.0 (1.457)
	Valve open	433 (44.2, 97.3) at 27.8 (1.094)
Out-of-square	mm (in)	Less than 2.0 (0.079)

G02208356

Fig. 248: Valve Spring Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE LIFTER

Unit: mm (in)

Valve lifter outer diameter	33.977 - 33.987 (1.3377 - 1.3381)
Lifter guide inner diameter	34.000 - 34.016 (1.3386 - 1.3392)
Clearance between lifter and lifter guide	0.013 - 0.039 (0.0005 - 0.0015)

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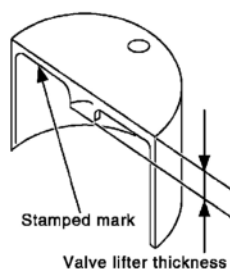
Fig. 249: Valve Lifter Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

AVAILABLE LIFTERS

2003 Infiniti QX4

2003 ENGINE Engine Mechanical - QX4

Identification mark	Thickness mm (in)
788U or 788R	7.88 (0.3102)
790U or 790R	7.90 (0.3110)
792U or 792R	7.92 (0.3118)
794U or 794R	7.94 (0.3126)
796U or 796R	7.96 (0.3134)
798U or 798R	7.98 (0.3142)
800U or 800R	8.00 (0.3150)
802U or 802R	8.02 (0.3157)
804U or 804R	8.04 (0.3165)
806U or 806R	8.06 (0.3173)
808U or 808R	8.08 (0.3181)
810U or 810R	8.10 (0.3189)
812U or 812R	8.12 (0.3197)
814U or 814R	8.14 (0.3205)
816U or 816R	8.16 (0.3213)
818U or 818R	8.18 (0.3220)
820U or 820R	8.20 (0.3228)
822U or 822R	8.22 (0.3236)
824U or 824R	8.24 (0.3244)
826U or 826R	8.26 (0.3252)
828U or 828R	8.28 (0.3260)
830U or 830R	8.30 (0.3268)
832U or 832R	8.32 (0.3276)
834U or 834R	8.34 (0.3283)
836U or 836R	8.36 (0.3291)
838U or 838R	8.38 (0.3299)
840U or 840R	8.40 (0.3307)

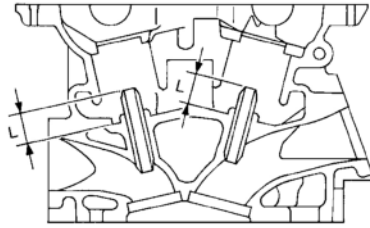


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Fig. 250: Lifters Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE GUIDE

Unit: mm (in)



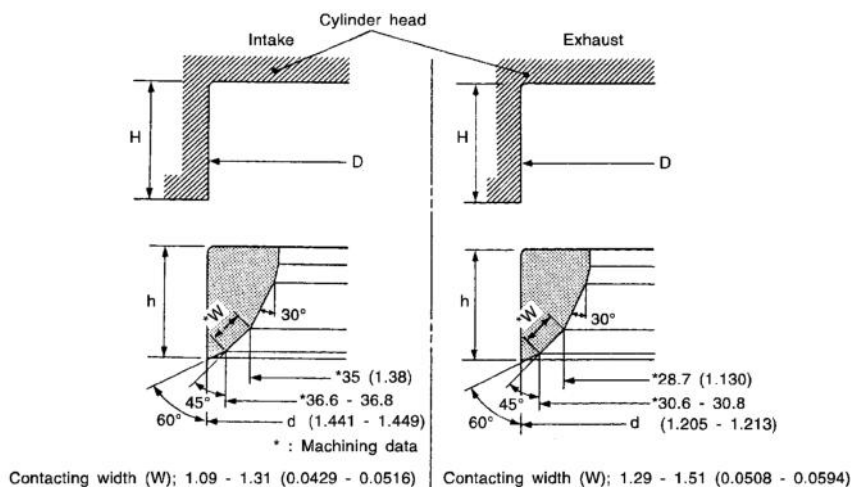
		Standard	Service
Valve guide	Outer diameter	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
Valve guide	Inner diameter (Finished size)	6.000 - 6.018 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter		9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	
		Standard	Max. tolerance
Stem to guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.08 (0.0031)
	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
Valve deflection limit	Intake	—	0.24 (0.0094)
	Exhaust	—	0.28 (0.0110)
Projection length "L"		12.6 - 12.8 (0.496 - 0.504)	

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Fig. 251: Valve Guide Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

VALVE SEAT

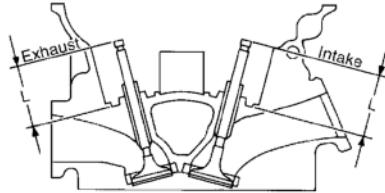
Unit: mm (in)



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Fig. 252: Valve Seat Specifications (1 Of 2)

Courtesy of NISSAN MOTOR CO., U.S.A.



		Standard	Service
Cylinder head seat recess diameter (D)	Intake	38.000 - 38.016 (1.4961 - 1.4967)	38.500 - 38.516 (1.5157 - 1.5164)
	Exhaust	32.200 - 32.216 (1.2677 - 1.2683)	32.700 - 32.716 (1.2874 - 1.2880)
Valve seat interference fit	Intake	0.081 - 0.113 (0.0032 - 0.0044)	
	Exhaust	0.064 - 0.096 (0.0025 - 0.0038)	
Valve seat outer diameter (d)	Intake	38.097 - 38.113 (1.4999 - 1.5005)	38.597 - 38.613 (1.5196 - 1.5202)
	Exhaust	32.280 - 32.296 (1.2709 - 1.2715)	32.780 - 32.796 (1.2905 - 1.2912)
Height (h)	Intake	5.9 - 6.0 (0.232 - 0.236)	5.05 - 5.15 (0.1988 - 0.2028)
	Exhaust	5.9 - 6.0 (0.232 - 0.236)	4.95 - 5.05 (0.1949 - 0.1988)
Depth (H)		5.9 - 6.1 (0.232 - 0.240)	
Depth (L)	Intake	41.07 - 41.67 (1.6169 - 1.6405)	
	Exhaust	41.00 - 41.60 (1.6142 - 1.6378)	

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Fig. 253: Valve Seat Specifications (2 Of 2)

Courtesy of NISSAN MOTOR CO., U.S.A.

CAMSHAFT AND CAMSHAFT BEARING

2003 Infiniti QX4

2003 ENGINE Engine Mechanical - QX4

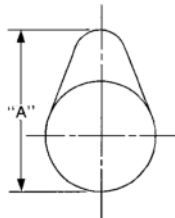
Unit: mm (in)

	Standard	Limit
Camshaft journal to bearing clearance	No. 1 0.045 - 0.086 (0.0018 - 0.0034) No. 2, 3, 4 0.035 - 0.076 (0.0014 - 0.0030)	0.15 (0.0059)
Inner diameter of camshaft bearing	No. 1 26.000 - 26.021 (1.0236 - 1.0244) No. 2, 3, 4 23.500 - 23.521 (0.9252 - 0.9260)	—
Outer diameter of camshaft journal	No. 1 25.935 - 25.955 (1.0211 - 1.0218) No. 2, 3, 4 23.445 - 23.465 (0.9230 - 0.9238)	—
Camshaft runout [TIR*]	Less than 0.02 (0.0008)	0.05 (0.0020)
Camshaft sprocket runout [TIR*]	Less than 0.15 (0.0059)	—
Camshaft end play	0.115 - 0.188 (0.0045 - 0.0074)	0.24 (0.0094)

*: Total indicator reading

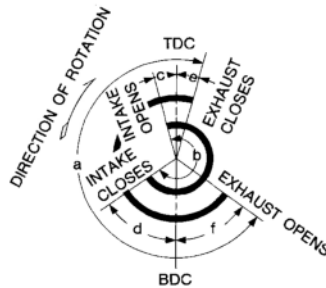
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Fig. 254: Camshaft And Camshaft Bearing Specifications (1 Of 2)
Courtesy of NISSAN MOTOR CO., U.S.A.



Cam height "A"	Intake and exhaust	44.465 - 44.655 (1.7506 - 1.7581)
Wear limit of cam height		0.2 (0.008)

Valve timing



Unit: degree

a	b	c	d	e	f
232	230	-3	53	6	46

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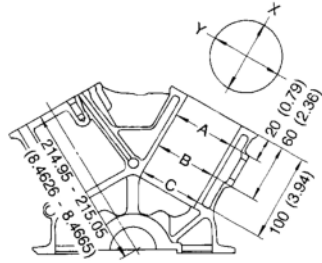
Fig. 255: Camshaft And Camshaft Bearing Specifications (2 Of 2)
Courtesy of NISSAN MOTOR CO., U.S.A.

CYLINDER BLOCK

2003 Infiniti QX4

2003 ENGINE Engine Mechanical - QX4

Unit: mm (in)



Surface flatness	Standard			Less than 0.03 (0.0012)
	Limit			0.10 (0.0039)
Cylinder bore	Inner diameter	Standard	Grade No. 1	95.500 - 95.510 (3.7598 - 3.7602)
			Grade No. 2	95.510 - 95.520 (3.7602 - 3.7606)
			Grade No. 3	95.520 - 95.530 (3.7606 - 3.7610)
		Wear limit		0.20 (0.0079)
Out-of-round (Difference between X and Y)				Less than 0.015 (0.0006)
Taper (Difference between A and C)				Less than 0.015 (0.0006)

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Fig. 256: Cylinder Block Specifications (1 Of 2)
Courtesy of NISSAN MOTOR CO., U.S.A.

Main journal inner diameter grade (Without bearing)	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)
	Grade No. F	63.998 - 63.999 (2.5196 - 2.5196)
	Grade No. G	63.999 - 64.000 (2.5196 - 2.5197)
	Grade No. H	64.000 - 64.001 (2.5197 - 2.5197)
	Grade No. J	64.001 - 64.002 (2.5197 - 2.5198)
	Grade No. K	64.002 - 64.003 (2.5198 - 2.5198)
	Grade No. L	64.003 - 64.004 (2.5198 - 2.5198)
	Grade No. M	64.004 - 64.005 (2.5198 - 2.5199)
	Grade No. N	64.005 - 64.006 (2.5199 - 2.5199)
	Grade No. P	64.006 - 64.007 (2.5199 - 2.5200)
	Grade No. R	64.007 - 64.008 (2.5200 - 2.5200)
	Grade No. S	64.008 - 64.009 (2.5200 - 2.5200)
	Grade No. T	64.009 - 64.010 (2.5200 - 2.5201)
	Grade No. U	64.010 - 64.011 (2.5201 - 2.5201)
	Grade No. V	64.011 - 64.012 (2.5201 - 2.5202)
	Grade No. W	64.012 - 64.013 (2.5202 - 2.5202)
	Grade No. X	64.013 - 64.014 (2.5202 - 2.5202)
	Grade No. Y	64.014 - 64.015 (2.5202 - 2.5203)
	Grade No. 4	64.015 - 64.016 (2.5203 - 2.5203)
	Grade No. 7	64.016 - 64.017 (2.5203 - 2.5203)
Difference in inner diameter between cylinders	Standard	Less than 0.03 (0.0012)

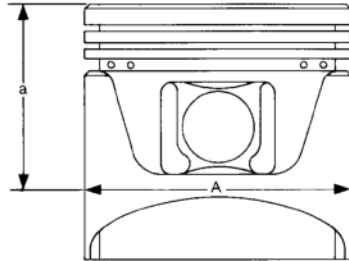
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Fig. 257: Cylinder Block Specifications (2 Of 2)
Courtesy of NISSAN MOTOR CO., U.S.A.

PISTON, PISTON RING AND PISTON PIN

AVAILABLE PISTON

Unit: mm (in)



Piston skirt diameter "A"	Standard	Grade No. 1	95.480 - 95.490 (3.7590 - 3.7594)
		Grade No. 2*	95.490 - 95.500 (3.7594 - 3.7598)
		Grade No. 3	95.500 - 95.510 (3.7598 - 3.7602)
		0.20 (0.0079) oversize (Service)	95.680 - 95.710 (3.7669 - 3.7681)
"a" dimension			41.0 (1.614)
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 clearance to cylinder block			0.010 - 0.030 (0.0004 - 0.0012)

*: No grade No. is punched on piston.

G02208366

Fig. 258: Piston, Piston Ring And Piston Pin Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

PISTON RING

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.080 (0.0016 - 0.0031)	0.11 (0.0043)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)	0.1 (0.004)
	Oil ring	0.015 - 0.050 (0.0006 - 0.0020)	—
End gap	Top	0.23 - 0.33 (0.0091 - 0.0130)	0.54 (0.0213)
	2nd	0.33 - 0.48 (0.0130 - 0.0189)	0.80 (0.0315)
	Oil (rail ring)	0.20 - 0.60 (0.0079 - 0.0236)	0.95 (0.0374)

G02208367

Fig. 259: Piston Ring Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

PISTON PIN

2003 Infiniti QX4

2003 ENGINE Engine Mechanical - QX4

Unit: mm (in)

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)
Interference fit of piston pin to piston		0.002 - 0.006 (0.0001 - 0.0002)
Piston pin to connecting rod bushing clearance	Standard	0.005 - 0.017 (0.0002 - 0.0007)
	Limit	0.030 (0.0012)

*: Values measured at ambient temperature of 20°C (68°F)

G02208368

Fig. 260: Piston Pin Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

CONNECTING ROD

Unit: mm (in)

Center distance		144.15 - 144.25 (5.6752 - 5.6791)
Bend [per 100 (3.94)]	Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	Limit	0.30 (0.0118)
Connecting rod small end inner diameter		23.980 - 24.000 (0.9441 - 0.9449)
Piston pin bushing inner diameter*	Grade No. 0	22.000 - 22.006 (0.8661 - 0.8664)
	Grade No. 1	22.006 - 22.012 (0.8664 - 0.8666)
Connecting rod big end inner diameter		55.000 - 55.013 (2.1654 - 2.1659)
Side clearance	Standard	0.20 - 0.35 (0.0079 - 0.0138)
	Limit	0.40 (0.0157)

*: After installing in connecting rod

G02208369

Fig. 261: Connecting Rod Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

CRANKSHAFT

Unit: mm (in)

Main journal dia. "Dm" grade	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)
	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 dia. "Dp"	Grade No. 0	51.968 - 51.974 (2.0460 - 2.0462)
	Grade No. 1	51.962 - 51.968 (2.0457 - 2.0460)
	Grade No. 2	51.956 - 51.962 (2.0445 - 2.0457)
Center distance "r"		40.36 - 40.44 (1.5890 - 1.5921)
Out-of-round (X - Y)	Standard	Less than 0.002 (0.0001)
Taper (A - B)	Standard	Less than 0.002 (0.0001)
Runout [TIR*]	Limit	Less than 0.10 (0.0039)
Free end play	Standard	0.10 - 0.25 (0.0039 - 0.0098)
	Limit	0.30 (0.0118)
		Out-of-round (X - Y) Taper (A - B)

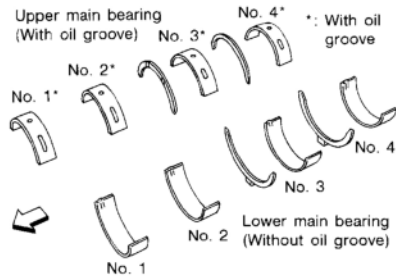
*: Total indicator reading
G02208370

Fig. 262: Crankshaft Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

AVAILABLE MAIN BEARING

2003 Infiniti QX4

2003 ENGINE Engine Mechanical - QX4



Grade number		Thickness "T" mm (in)	Width "W" mm (in)	Identification color (UPR/LWR)	Remarks
0		2.000 - 2.003 (0.0787 - 0.0789)	19.9 - 20.1 (0.783 - 0.791)	Black	Grade is the same for upper and lower bearings.
1		2.003 - 2.006 (0.0789 - 0.0790)		Brown	
2		2.006 - 2.009 (0.0790 - 0.0791)		Green	
3		2.009 - 2.012 (0.0791 - 0.0792)		Yellow	
4		2.012 - 2.015 (0.0792 - 0.0793)		Blue	
5		2.015 - 2.018 (0.0793 - 0.0794)		Pink	
6		2.018 - 2.021 (0.0794 - 0.0796)		Purple	
7		2.021 - 2.024 (0.0796 - 0.0797)		White	
01	UPP	2.003 - 2.006 (0.0789 - 0.0790)		Brown/Black	Grade is different for upper and lower bearings.
	LWR	2.000 - 2.003 (0.0787 - 0.0789)			
12	UPR	2.006 - 2.009 (0.0790 - 0.0791)		Green/Brown	
	LWR	2.003 - 2.006 (0.0789 - 0.0790)			
23	UPR	2.009 - 2.012 (0.0791 - 0.0792)		Yellow/Green	
	LWR	2.006 - 2.009 (0.0790 - 0.0791)			
34	UPR	2.012 - 2.015 (0.0792 - 0.0793)		Blue/Yellow	
	LWR	2.009 - 2.012 (0.0791 - 0.0792)			
45	UPR	2.015 - 2.018 (0.0793 - 0.0794)		Pink/Blue	
	LWR	2.012 - 2.015 (0.0792 - 0.0793)			
56	UPR	2.018 - 2.021 (0.0794 - 0.0796)		Purple/Pink	
	LWR	2.015 - 2.018 (0.0793 - 0.0794)			
67	UPR	2.021 - 2.024 (0.0796 - 0.0797)		White/Purple	
	LWR	2.018 - 2.021 (0.0794 - 0.0796)			

G02208371

Fig. 263: Main Bearing Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.

UNDERSIZE

Unit: mm (in)

	Thickness	Main journal diameter "Dm"
0.25 (0.0098)	2.132 - 2.140 (0.0839 - 0.0843)	Grind so that bearing clearance is the specified value.

G02208372

Fig. 264: Undersize Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

AVAILABLE CONNECTING ROD BEARING**CONNECTING ROD BEARING**

Grade number	Thickness "T" mm (in)	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

G02208373

Fig. 265: Connecting Rod Bearing Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

UNDERSIZE

Unit: mm (in)

	Thickness	Crank pin journal diameter "Dp"
0.25 (0.0098)	1.626 - 1.634 (0.0640 - 0.0643)	Grind so that bearing clearance is the specified value.

G02208374

Fig. 266: Undersize Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Drive plate runout [TIR]*	Less than 0.15 (0.0059)
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*: Total indicator reading

G02208375

Fig. 267: Miscellaneous Components Specifications

Courtesy of NISSAN MOTOR CO., U.S.A.

BEARING CLEARANCE

2003 Infiniti QX4

2003 ENGINE Engine Mechanical - QX4

Unit: mm (in)

Main bearing clearance	Standard	0.035 - 0.045 (0.0014 - 0.0018)
	Limit	0.065 (0.0026)
Connecting rod bearing clearance	Standard	0.034 - 0.059 (0.0013 - 0.0023)
	Limit	0.070 (0.0028)

G02208376

Fig. 268: Bearing Clearance Specifications
Courtesy of NISSAN MOTOR CO., U.S.A.