

SECTION **EM**

CONTENTS

PRECAUTIONS	2	Valve Dimensions	36
Parts Requiring Angular Tightening.....	2	Valve Spring.....	36
Liquid Gasket Application Procedure.....	2	Valve Lifter.....	36
PREPARATION	3	Assembly.....	37
Special Service Tools.....	3	Installation.....	37
Commercial Service Tools	6	VALVE CLEARANCE	38
NOISE, VIBRATION AND HARSHNESS (NVH)		Checking	38
TROUBLESHOOTING	8	Adjusting	38
NVH Troubleshooting Chart.....	8	ENGINE REMOVAL	41
OUTER COMPONENT PARTS	10	Removal.....	42
COMPRESSION PRESSURE	14	Installation	44
Measurement of Compression Pressure	14	CYLINDER BLOCK	45
OIL PAN	15	Disassembly.....	46
Removal.....	15	Piston And Crankshaft.....	46
Installation	16	Inspection.....	46
TIMING CHAIN	17	Piston And Piston Pin Clearance	46
Removal.....	18	Piston Ring Side Clearance	47
Inspection.....	21	Piston Ring End Gap.....	47
Installation	21	Connecting Rod Bend And Torsion	47
OIL SEAL REPLACEMENT	28	Cylinder Block Distortion And Wear	48
Valve Oil Seal	28	Piston-To-Bore Clearance	48
Front Oil Seal.....	28	Crankshaft	49
Rear Oil Seal	29	Bearing Clearance.....	50
CYLINDER HEAD	30	Method A (Using bore gauge and	
Removal	31	micrometer)	50
Disassembly.....	31	Method B (Using Plastigage)	52
Inspection.....	31	Connecting Rod Bushing Clearance (Small	
Cylinder Head Distortion	31	end).....	52
Camshaft Visual Check	31	Replacement of Connecting Rod Bushing	
Camshaft Runout.....	32	(Small end)	52
Camshaft Cam Height.....	32	Flywheel/Driveplate Runout.....	52
Camshaft Journal Clearance.....	32	Assembly.....	53
Camshaft End Play.....	32	Piston.....	53
Camshaft Sprocket Runout	33	Crankshaft	54
Valve Guide Clearance.....	33	SERVICE DATA AND SPECIFICATIONS (SDS)	56
Valve Guide Replacement.....	34	General Specifications	56
Valve Seats.....	35	Inspection and Adjustment.....	56
Replacing Valve Seat For Service Parts	35	Compression Pressure	56

CONTENTS (Cont'd.)

Cylinder Head.....	56
Valve.....	56
Camshaft And Camshaft Bearing.....	60
Cylinder Block.....	60
Piston, Piston Ring And Piston Pin.....	61
Connecting Rod.....	61

Crankshaft.....	61
Main Bearing.....	62
Connecting Rod Bearing.....	62
Bearing Clearance.....	62
Miscellaneous Components.....	62

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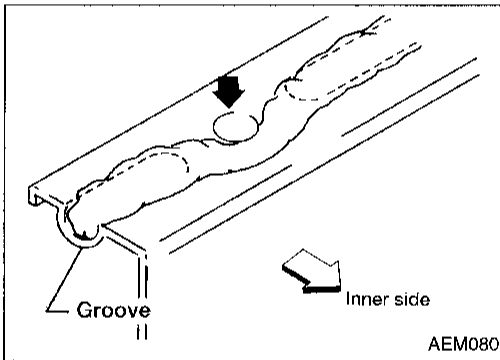
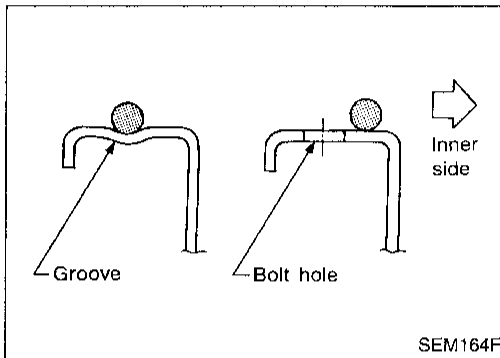
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PRECAUTIONS

Parts Requiring Angular Tightening

- Use an angle wrench for the final tightening of the following engine parts:
 - (1) Cylinder head bolts
 - (2) Main bearing cap bolts
 - (3) Connecting rod cap nuts
- 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.



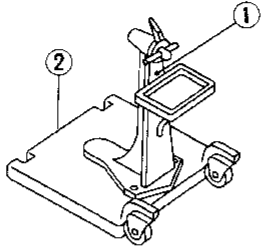
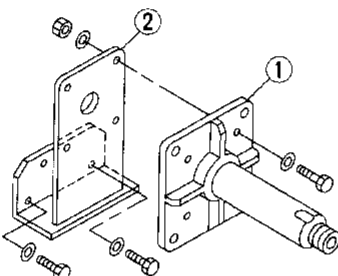
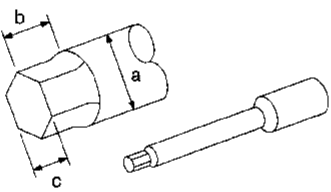
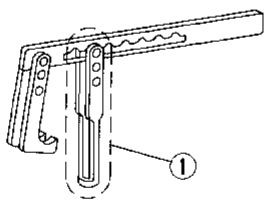
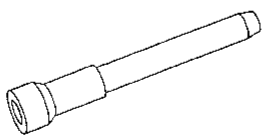
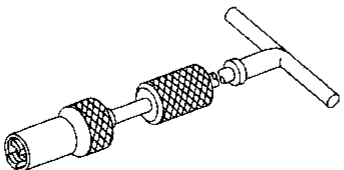
Liquid Gasket Application Procedure

- a. Use a scraper to remove old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.
- b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Nissan Genuine RTV silicone sealant Part No. 999MP-A7007 Three Bond TB1207D or equivalent.)
 - For oil pan, be sure liquid gasket diameter is 4.0 to 5.0 mm (0.157 to 0.197 in) for GA engine.
 - For areas except oil pan, be sure liquid gasket diameter is 2.0 to 3.0 mm (0.079 to 0.118 in).
- c. Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
- d. Assembly should be done within 5 minutes after coating.
- e. Wait at least 30 minutes before refilling engine oil and engine coolant.

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		GI
ST0501S000 (—) Engine stand assembly ① ST05011000 (—) Engine stand ② ST05012000 (—) Base	 NT042	Disassembling and assembling	MA
Engine attachment assembly ① KV10106500 (—) Engine attachment ② KV10113300 (—) Sub-attachment	 NT029	Overhauling engine	EM
ST10120000 (J24239-01) Cylinder head bolt wrench	 NT583	Loosening and tightening cylinder head bolt a: 13 (0.51) dia. b: 12 (0.47) c: 10 (0.39) Unit: mm (in)	LC
KV10116200 (J26336-B) Valve spring compressor ① KV10115900 (J26336-20) Attachment	 NT022	Disassembling valve mechanism	EC
KV10115600 (J38958) Valve oil seal drift	 NT024	Installing valve oil seal	FE
KV10107902 (J38959) Valve oil seal puller	 NT011	Displacing valve lip seal	CL

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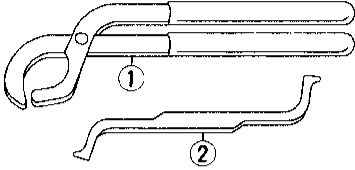
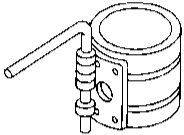
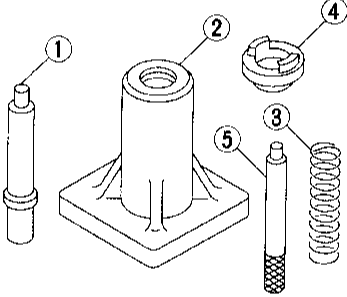
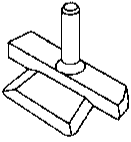
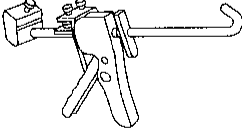
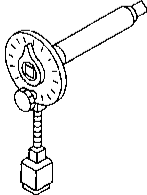
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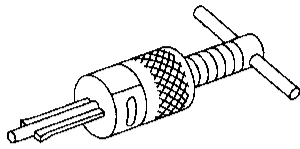
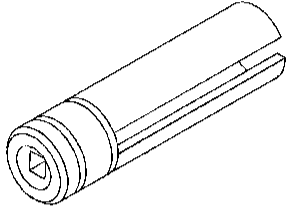
PREPARATION

Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description
KV101151S0 (J38972) Lifter stopper set ① KV10115110 (J38972-1) Camshaft pliers ② KV10115120 (J38972-2) Lifter stopper	<div style="text-align: right;">Changing shims</div> <div style="text-align: center;">  </div> <div style="text-align: center;">NT041</div>
EM03470000 (J8037) Piston ring compressor	<div style="text-align: right;">Installing piston assembly into cylinder bore</div> <div style="text-align: center;">  </div> <div style="text-align: center;">NT044</div>
KV10107400 (J26365-12, J26365) Piston pin press stand ① KV10107310 (—) Center shaft ② ST13040020 (—) Stand ③ ST13040030 (—) Spring ④ KV10107320 (—) Cap ⑤ ST13040050 (—) Drift	<div style="text-align: right;">Disassembling and assembling piston pin</div> <div style="text-align: center;">  </div> <div style="text-align: center;">NT013</div>
KV10111100 (J37228) Seal cutter	<div style="text-align: right;">Removing oil pan</div> <div style="text-align: center;">  </div> <div style="text-align: center;">NT046</div>
WS39930000 (—) Tube presser	<div style="text-align: right;">Pressing the tube of liquid gasket</div> <div style="text-align: center;">  </div> <div style="text-align: center;">NT052</div>
KV10112100 (BT-8653-A) Angle wrench	<div style="text-align: right;">Tightening bolts for bearing cap, cylinder head, etc.</div> <div style="text-align: center;">  </div> <div style="text-align: center;">NT014</div>

PREPARATION

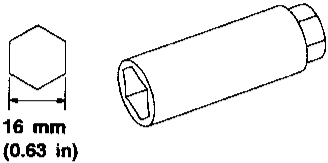
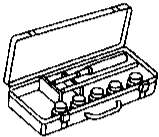
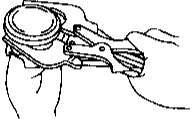
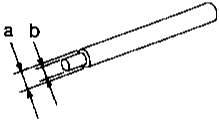
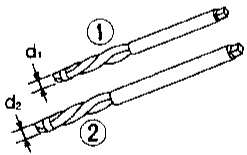
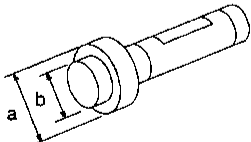
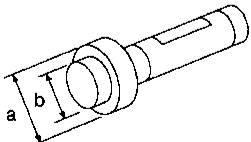
Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
ST16610001 (J23907) Pilot bushing puller	 <p style="text-align: center;">NT045</p>	GI MA EM
(J36471-A) Front (heated) oxygen sensor wrench	 <p style="text-align: center;">NT379</p>	LC EC FE

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PREPARATION

Commercial Service Tools

Tool name	Description									
Spark plug wrench	 <p style="text-align: center;">16 mm (0.63 in)</p> <p>NT047</p>	Removing and installing spark plug								
Valve seat cutter set	 <p>NT048</p>	Finishing valve seat dimensions								
Piston ring expander	 <p>NT030</p>	Removing and installing piston ring								
Valve guide drift	 <p>NT015</p>	Removing and installing valve guide <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2" style="text-align: center;">Diameter: mm (in)</td> </tr> <tr> <td colspan="2" style="text-align: center;">Intake & Exhaust</td> </tr> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">9.5 (0.374)</td> </tr> <tr> <td style="text-align: center;">b</td> <td style="text-align: center;">5.5 (0.217)</td> </tr> </table>	Diameter: mm (in)		Intake & Exhaust		a	9.5 (0.374)	b	5.5 (0.217)
Diameter: mm (in)										
Intake & Exhaust										
a	9.5 (0.374)									
b	5.5 (0.217)									
Valve guide reamer	 <p>NT016</p>	Reaming valve guide ① or hole for oversize valve guide ② <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2" style="text-align: center;">Diameter: mm (in)</td> </tr> <tr> <td colspan="2" style="text-align: center;">Intake & Exhaust</td> </tr> <tr> <td style="text-align: center;">d₁</td> <td style="text-align: center;">5.5 (0.217)</td> </tr> <tr> <td style="text-align: center;">d₂</td> <td style="text-align: center;">9.685 (0.3813)</td> </tr> </table>	Diameter: mm (in)		Intake & Exhaust		d ₁	5.5 (0.217)	d ₂	9.685 (0.3813)
Diameter: mm (in)										
Intake & Exhaust										
d ₁	5.5 (0.217)									
d ₂	9.685 (0.3813)									
Front oil seal drift	 <p>NT049</p>	Installing front oil seal a: 75 mm (2.95 in) dia. b: 45 mm (1.77 in) dia.								
Rear oil seal drift	 <p>NT049</p>	Installing rear oil seal a: 110 mm (4.33 in) dia. b: 80 mm (3.15 in) dia.								

PREPARATION

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NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting Chart

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

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.

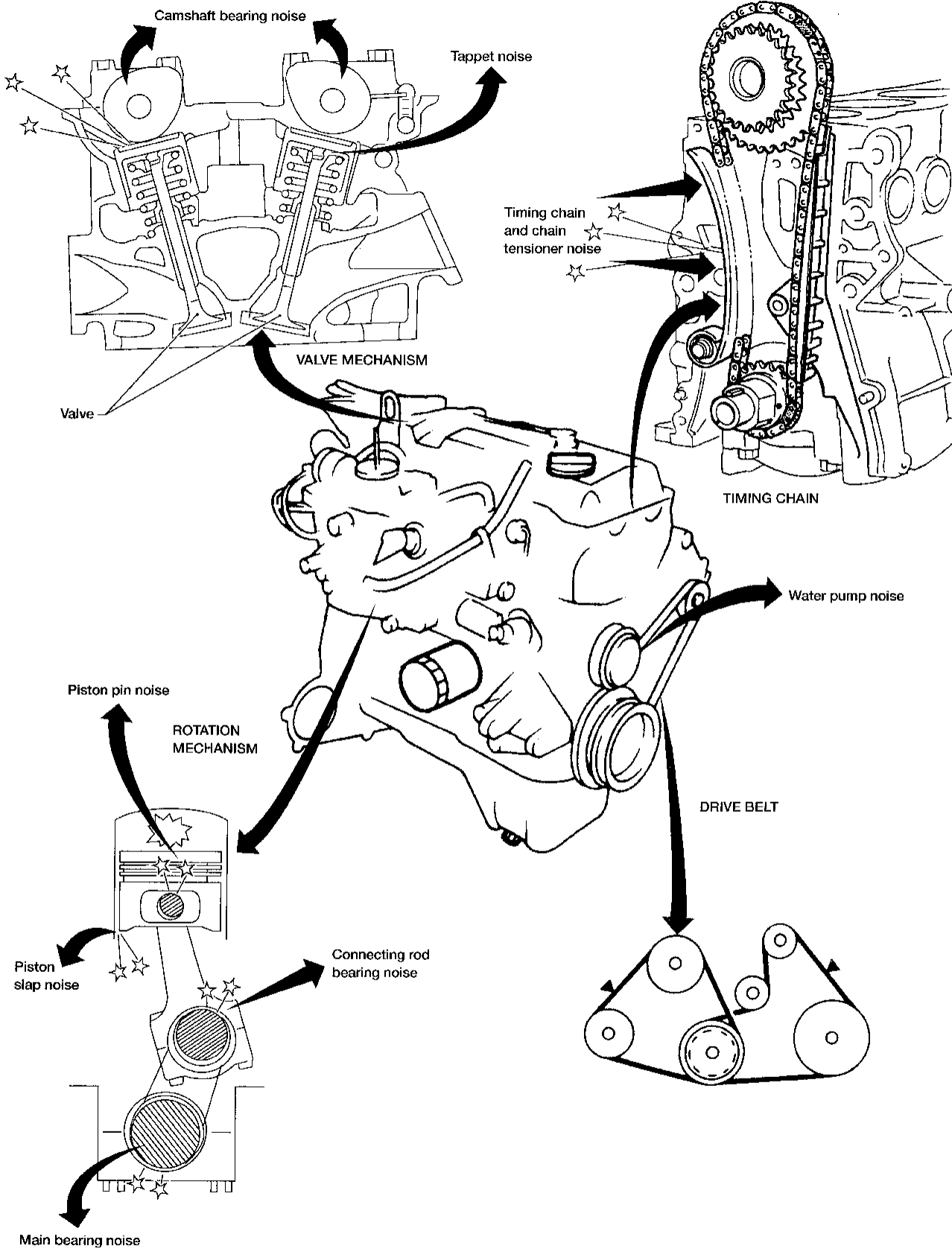
If necessary, repair or replace these parts.

ENGINE NOISE

Location of Noise	Type of Noise	Operating Condition of Engine.						Source of Noise	Check Item	Reference page
		Before warm-up	After warm-up	When starting	When idling	When revving	While driving			
Top of Engine Rocket Cover Cylinder Head	Ticking or click	C	A	—	A	B	—	Tappet noise	Valve clearance	EM-38
	Rattle	C	A	—	A	B	C	Camshaft bearing noise	Camshaft journal clearance Camshaft runout	EM-33
Crankshaft Pulley Cylinder block (Side of Engine)	Slap or knock	—	A	—	B	B	—	Piston pin noise	Piston and piston pin clearance Connecting rod bushing clearance	EM-46, 52
	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	EM-47, 48
Oil pan	Knock	A	B	C	B	B	B	Connecting rod-bearing noise	Connecting rod bearing clearance (Big end) Connecting rod bushing clearance (Small end)	EM-50, 51, 52
	Knock	A	B	—	A	B	C	Main bearing noise	Main bearing oil clearance Crankshaft runout	EM-49, 50
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	EM-21, 26
Front of Engine	Squeak or fizzing	A	B	—	B	—	C	Other drive belts (sticking or slipping)	Drive belts deflection	MA Section ("Checking Drive Belts", "Engine Maintenance")
	Creaking	A	B	A	B	A	B	Other drive belts (slipping)	Idler pulley bearing operation	
	Squall or creak	A	B	—	B	A	B	Water pump noise	Water pump operation	LC Section ("Water Pump Inspection", "Engine Cooling System")

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

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING



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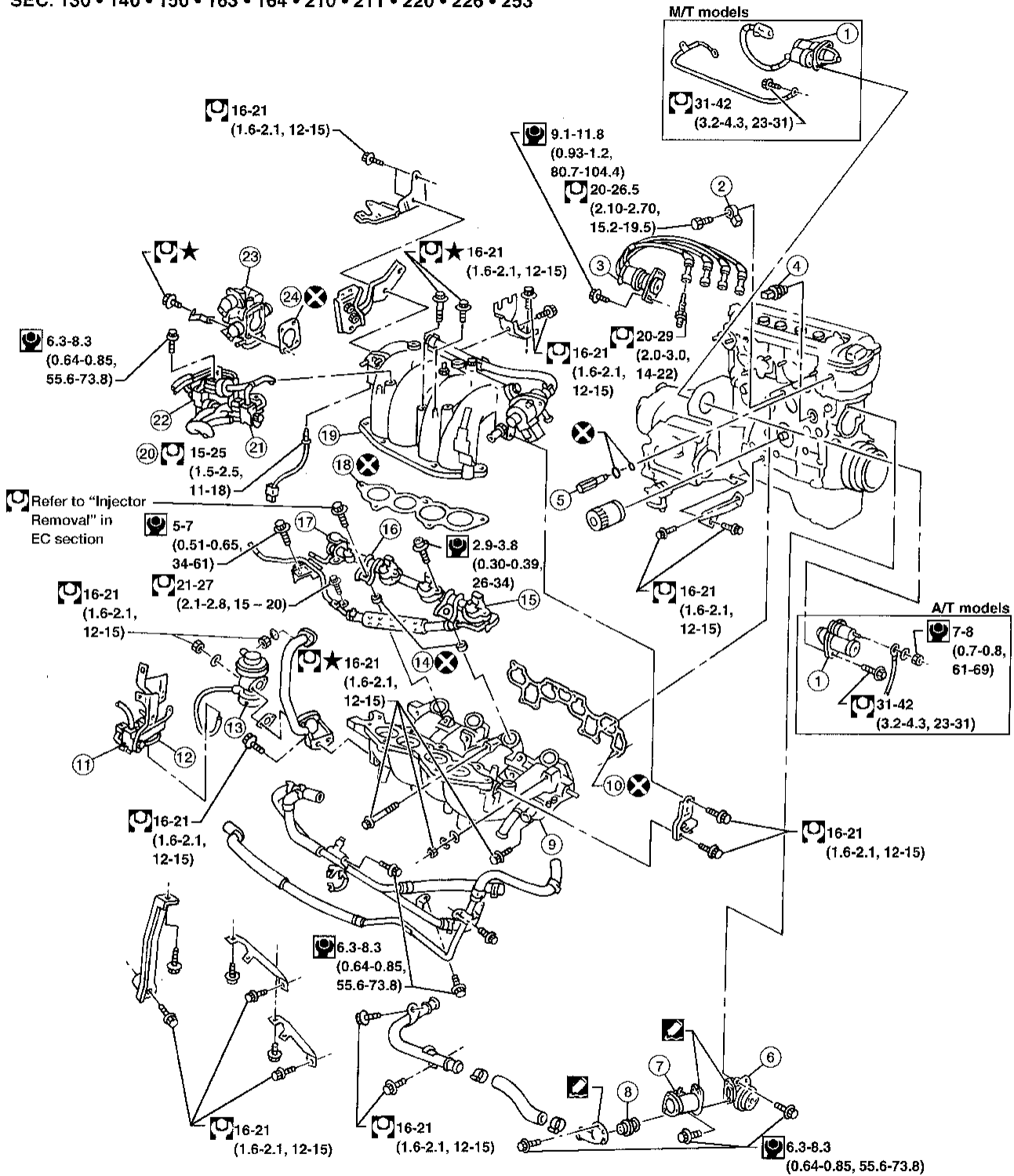
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OUTER COMPONENT PARTS

SEC. 130 • 140 • 150 • 163 • 164 • 210 • 211 • 220 • 226 • 253



- ★ : Refer to "TIGHTENING ORDER"
- : N·m (kg-m, in-lb)
- : N·m (kg-m, ft-lb)
- : Use Nissan Genuine RTV Silicone Part No. 999 MP-A 7007, Three Bond TB1207D or equivalent

OUTER COMPONENT PARTS

- ① Starter motor
- ② Knock sensor
- ③ Distributor
- ④ Oil pressure switch
- ⑤ Intake valve control solenoid valve
- ⑥ Water pump
- ⑦ Thermostat housing
- ⑧ Thermostat

- ⑨ Intake manifold
- ⑩ Intake manifold gasket
- ⑪ EGRC-solenoid valve
- ⑫ EGRC-BPT valve
- ⑬ EGR valve
- ⑭ Insulator
- ⑮ Fuel injector
- ⑯ Fuel tube assembly
- ⑰ Fuel pressure regulator

- ⑱ Collector gasket
- ⑲ Intake manifold collector
- ⑳ EGR temperature sensor
- ㉑ MAP/BARO switch solenoid valve
- ㉒ EVAP canister purge control solenoid valve
- ㉓ Throttle body
- ㉔ Throttle body gasket

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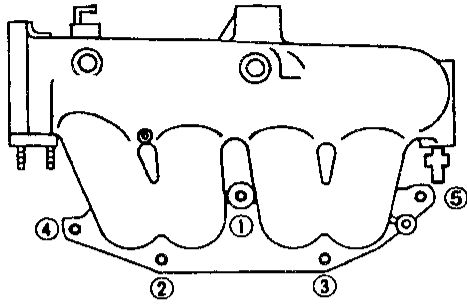
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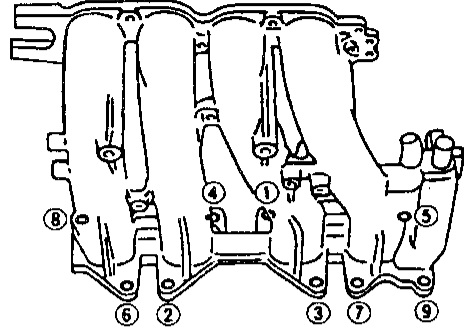
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OUTER COMPONENT PARTS

★ Intake manifold collector nuts and bolts tightening order



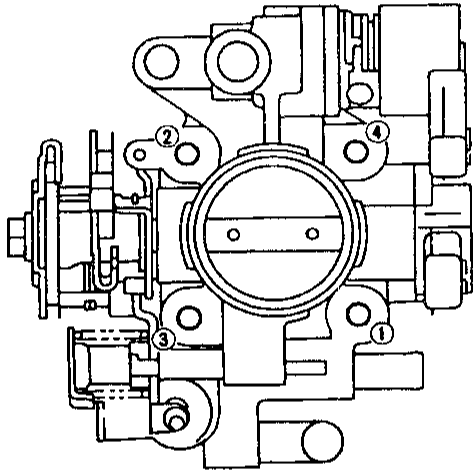
★ Intake manifold bolts and nuts tightening order



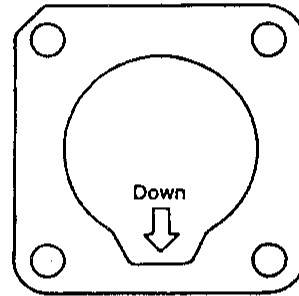
Tighten in numerical order

★ Throttle body parts tightening procedure

- 1) Tighten all bolts to 9 - 11 N·m (0.9 - 1.1 kg-m, 6.5 - 8.0 ft-lb)
 - 2) Tighten all bolts to 18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)
- Make sure the direction of the gasket is as shown in figure.



Tighten in numerical order



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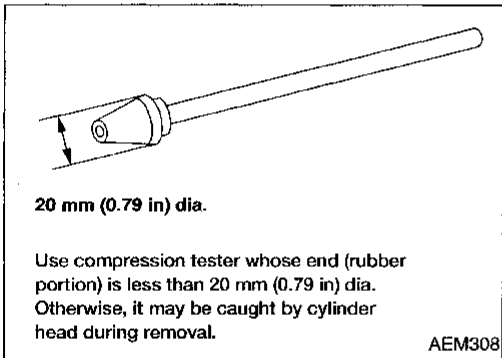
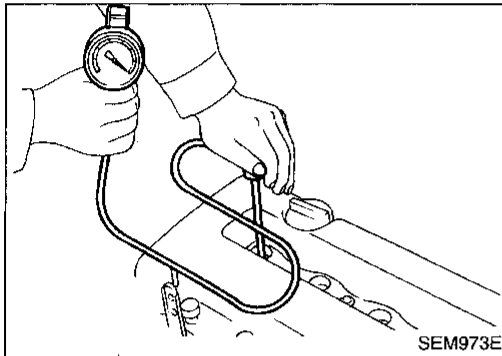
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Measurement of Compression Pressure

1. Warm up engine.
2. Turn ignition switch OFF.
3. Release fuel pressure.
Refer to EC section ("Fuel Pressure Release", "BASIC SERVICE PROCEDURE").
4. Remove all spark plugs.
5. Disconnect distributor coil connector.



6. Attach a compression tester to No. 1 cylinder.
 7. Depress accelerator pedal fully to keep throttle valve wide open.
 8. Crank engine and record highest gauge indication.
 9. Repeat the measurement on each cylinder.
- **Always use a fully-charged battery to obtain specified engine speed.**

Compression pressure:

kPa (kg/cm², psi)/rpm

Standard

1,373 (14.0, 199)/350

Minimum

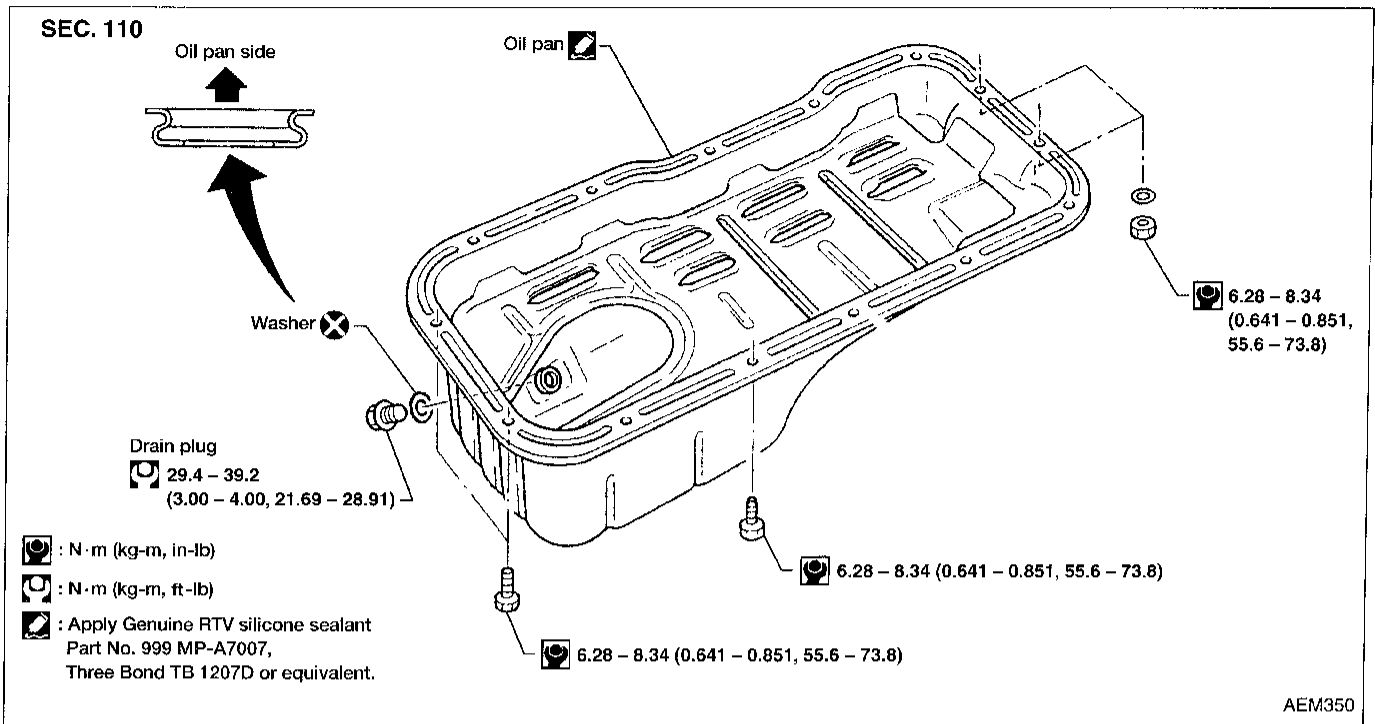
1,177 (12.0, 171)/350

Maximum Difference limit between cylinders

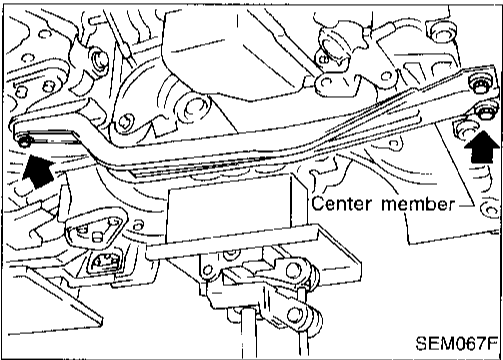
98 (1.0, 14)/350

10. 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 raises 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, EM-58. If valve or valve seat is damaged excessively, replace them.**
 - **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.

OIL PAN

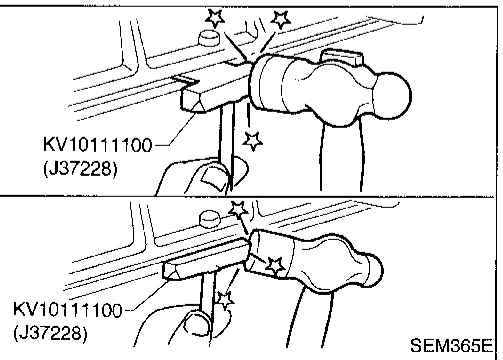
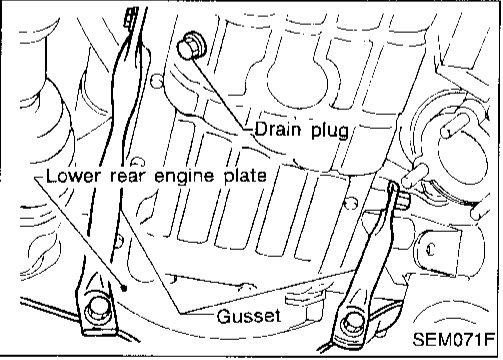


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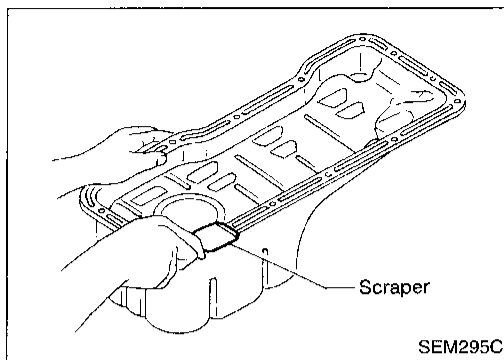
Removal

1. Remove engine RH side cover and under covers.
2. Drain engine oil.
3. Remove front exhaust tube. Refer to FE section ("EXHAUST SYSTEM").
4. Set a suitable transmission jack under transaxle and lift engine with engine slinger.
5. Remove center member.
6. Remove front and rear engine gussets.
7. Remove rear plate cover (A/T models).



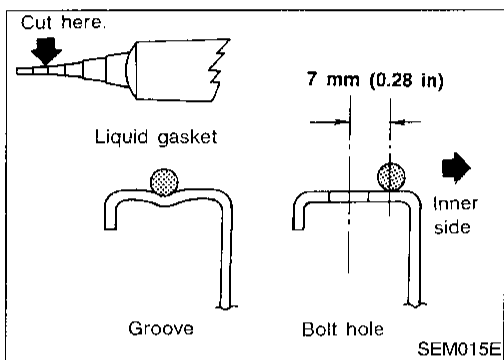
8. Remove oil pan.
 - a. Insert Tool between cylinder block and oil pan.
 - Be careful not to damage aluminum mating face.
 - Do not insert screwdriver, or oil pan flange will be damaged.
 - b. Slide Tool by tapping on the side of the Tool with a hammer.

OIL PAN

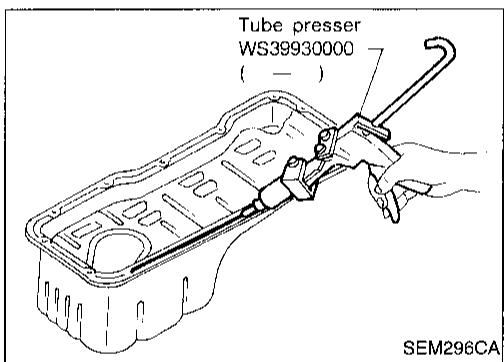


Installation

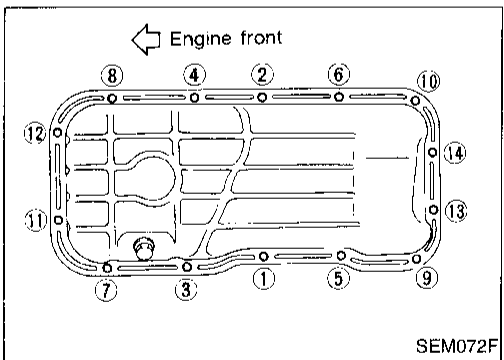
1. Use a scraper to remove old liquid gasket from mating surface of oil pan.
 - Also remove old liquid gasket from mating surface of cylinder block.



2. Apply a continuous bead of liquid gasket to mating surface of oil pan.
 - Use Nissan Genuine RTV silicone sealant part no. 999MP-A7007, Three Bond TB1207-D or equivalent.
 - Apply to groove on mating surface.
 - Allow 7 mm (0.28 in) clearance around bolt holes.



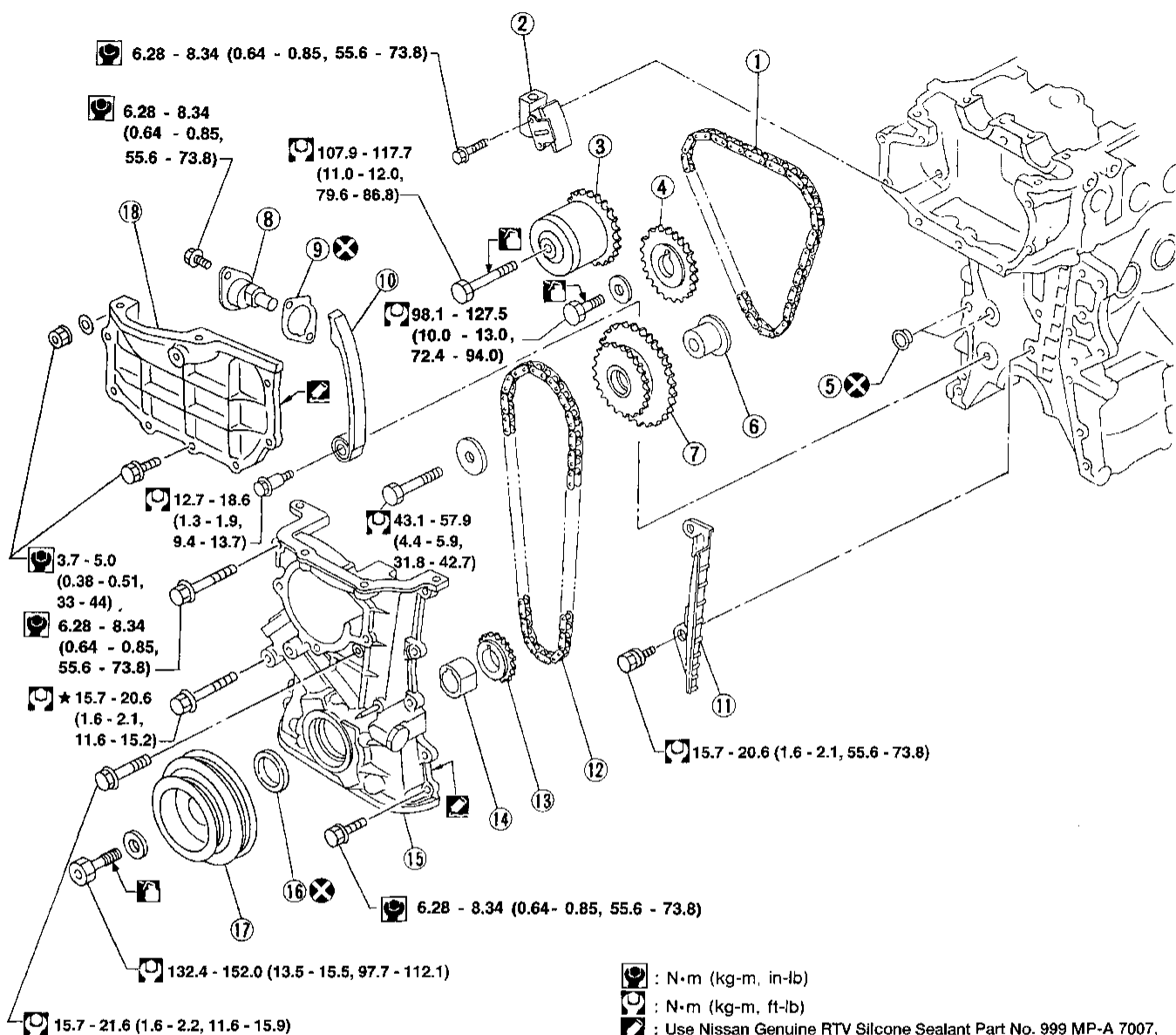
- Be sure liquid gasket diameter is 4.0 to 5.0 mm (0.157 to 0.197 in).
- Attaching should be done within 5 minutes after coating.



3. Install oil pan.
 - Tighten oil pan nuts and bolts in the numerical order.
 - Wait at least 30 minutes before refilling engine oil.
4. Install parts in reverse order of removal.

TIMING CHAIN

SEC. 111 • 120 • 130 • 135



- : N·m (kg-m, in-lb)
- : N·m (kg-m, ft-lb)
- : Use Nissan Genuine RTV Silicone Sealant Part No. 999 MP-A 7007, Three Bond TB1207D or equivalent
- : Lubricate with new engine oil.
- ★ : Located on power steering pump adjusting bar

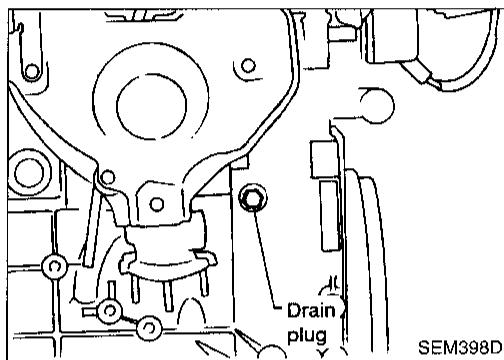
- | | | |
|--------------------------------|-------------------------|-----------------------------|
| ① Upper timing chain | ⑦ Idler sprocket | ⑬ Crankshaft sprocket |
| ② Upper timing chain tensioner | ⑧ Lower chain tensioner | ⑭ Oil pump drive spacer |
| ③ Camshaft sprocket (Intake) | ⑨ Gasket | ⑮ Front cover |
| ④ Camshaft sprocket (Exhaust) | ⑩ Timing chain guide | ⑯ Oil seal |
| ⑤ O-ring | ⑪ Timing chain guide | ⑰ Crankshaft pulley |
| ⑥ Idler shaft | ⑫ Lower timing chain | ⑱ Cylinder head front cover |

AEM338

TIMING CHAIN

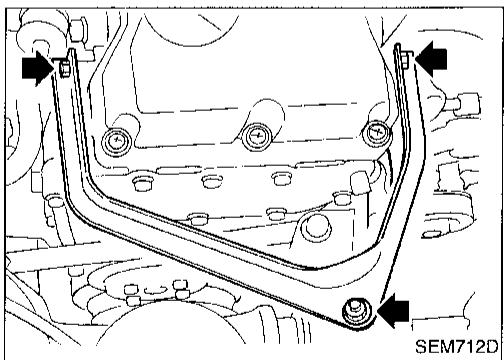
CAUTION:

- After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.
- When installing camshafts, chain tensioner, 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 cylinder head, camshaft sprocket, crankshaft pulley, and camshaft brackets.

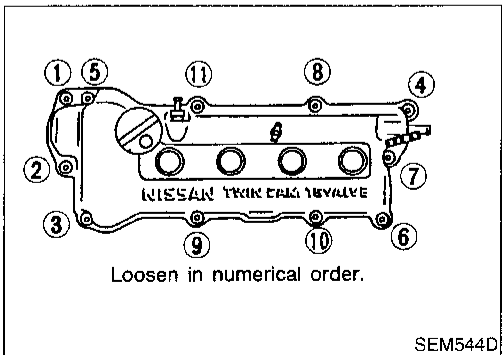


Removal

1. Drain engine coolant from radiator and cylinder block. Refer to MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE").
 - Be careful not to spill coolant on drive belts.
2. Release fuel pressure. Refer to EC section ("Fuel Pressure Release", "BASIC SERVICE PROCEDURE").
3. Remove drive belts.
4. Remove power steering pulley and oil pump with bracket.
5. Remove air duct to intake manifold collector.
6. Remove front RH wheel.
7. Remove engine side cover.
8. Remove front under covers.
9. Remove front exhaust tube. Refer to FE section ("EXHAUST SYSTEM").



10. Remove cylinder head front mounting bracket.

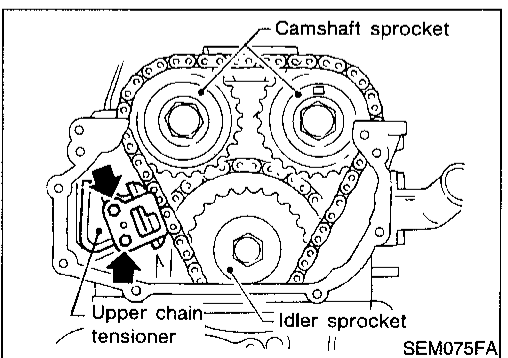
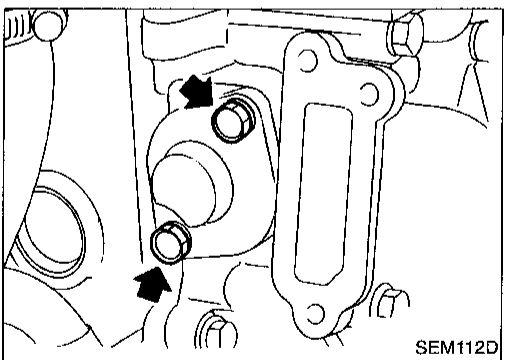
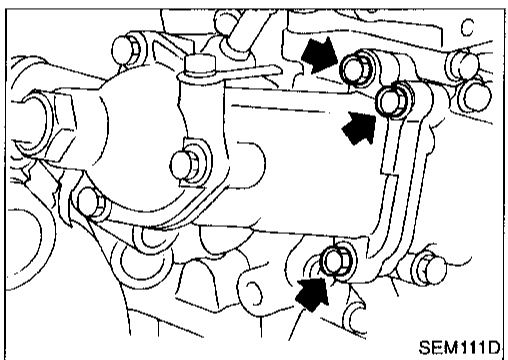
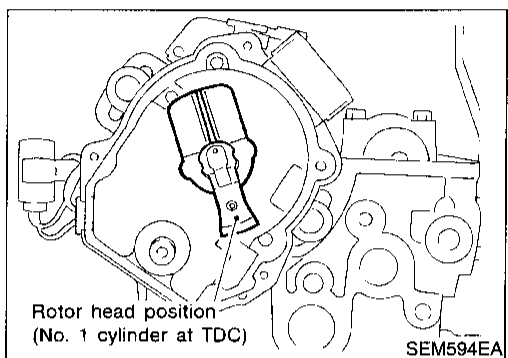
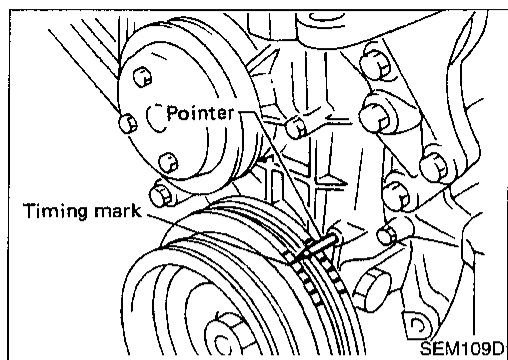


11. Remove rocker cover.
 - Loosen bolts in numerical order.
12. Remove distributor cap.
13. Remove all spark plugs.
14. Remove intake manifold support.

TIMING CHAIN

Removal (Cont'd)

15. Set No. 1 piston at TDC of compression stroke.



• **Make sure No. 1 cylinder is at TDC by looking at distributor rotor position.**

16. Remove distributor.

17. Remove cylinder head front cover.

18. Remove water pump pulley.

19. Remove thermostat housing.

20. Remove lower chain tensioner.

21. Remove upper chain tensioner and slack side timing chain guide.

22. Loosen idler sprocket bolt.

23. Remove camshaft sprocket bolts.

24. Remove camshaft sprockets.

• **For retiming in cylinder head removal, apply paint marks to timing chain matched with mating marks of camshaft sprockets.**

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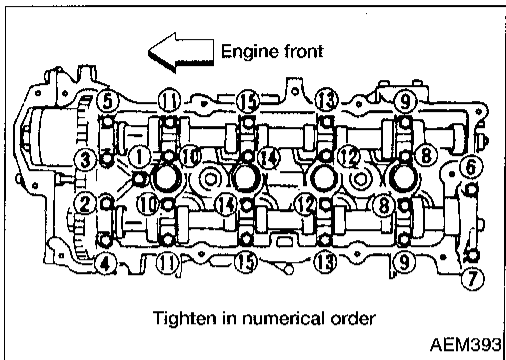
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TIMING CHAIN

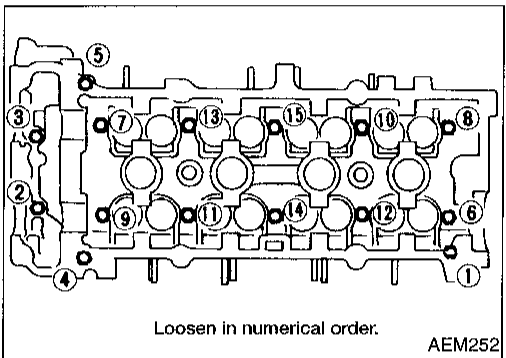
Removal (Cont'd)



25. Remove camshaft brackets and camshafts.

- **Mark these parts' original positions for reassembly.**

26. Remove idler sprocket bolt.



27. Remove cylinder head bolts in numerical order.

- **Removing in incorrect order could result in a warped or cracked cylinder head.**
- **Loosen cylinder head bolts in two or three steps.**

28. Remove cylinder head with intake and exhaust manifolds.

29. Remove idler sprocket shaft from rear side.

30. Remove upper timing chain.

31. Remove center member.

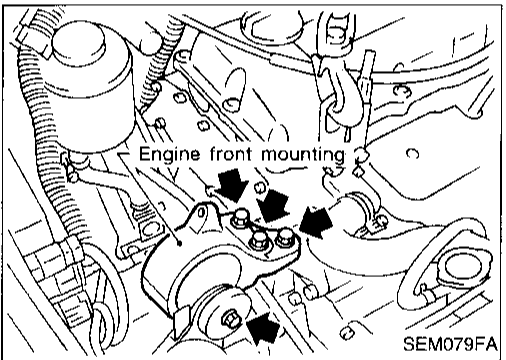
32. Remove oil pan. Refer to EM-15.

33. Remove oil strainer.

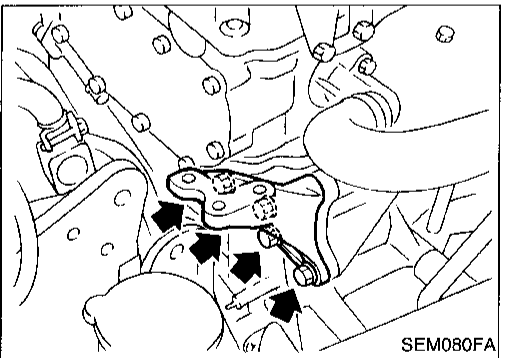
34. Remove crankshaft pulley.

35. Support engine with a suitable jack.

36. Remove engine front mounting.



37. Remove engine front mounting bracket.



38. Remove front cover bolts and front cover as shown.

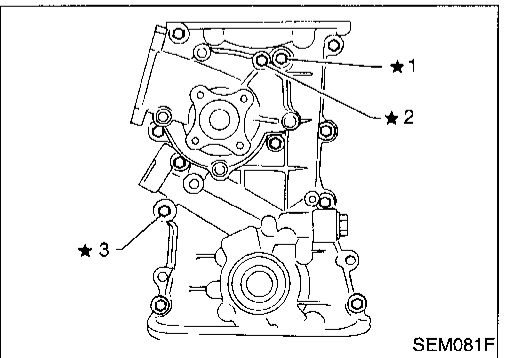
CAUTION:

One bolt is located on water pump.

***1: Located on engine front mounting bracket**

***2: Located on water pump**

***3: Located on power steering oil pump adjusting bar**



TIMING CHAIN

Removal (Cont'd)

39. Remove idler sprocket.

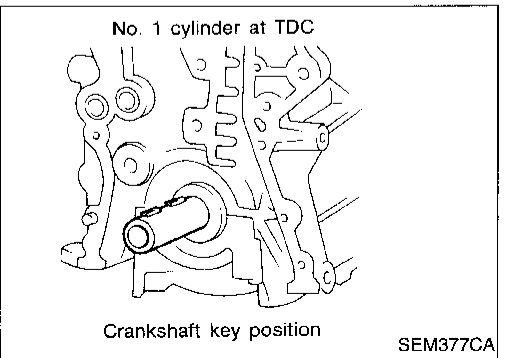
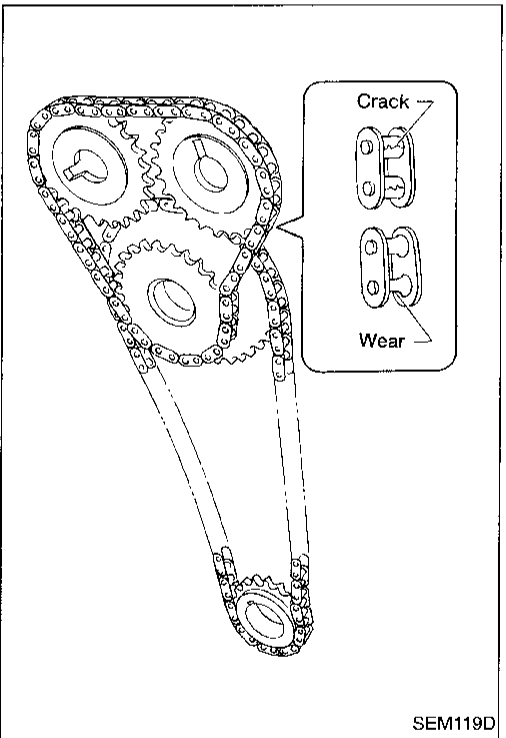
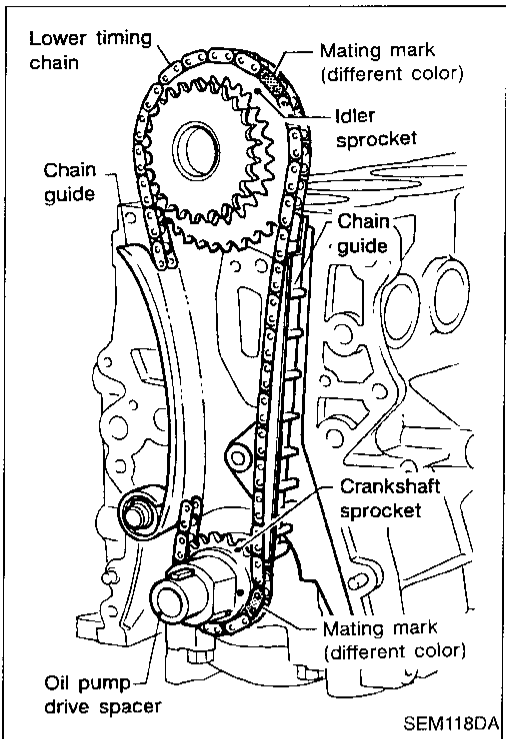
- For retiming in cylinder head removal, apply paint marks to timing chain matched with mating mark of idler sprocket.

40. Remove lower timing chain.

41. Remove oil pump drive spacer.

42. Remove chain guides.

43. Remove crankshaft sprocket.



Inspection

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

Installation

1. Position crankshaft so that No. 1 piston is at TDC and key way is at 12 o'clock.

a. Install crankshaft sprocket.

- Make sure mating marks on crankshaft sprocket face front of engine.

b. Install oil pump drive spacer.

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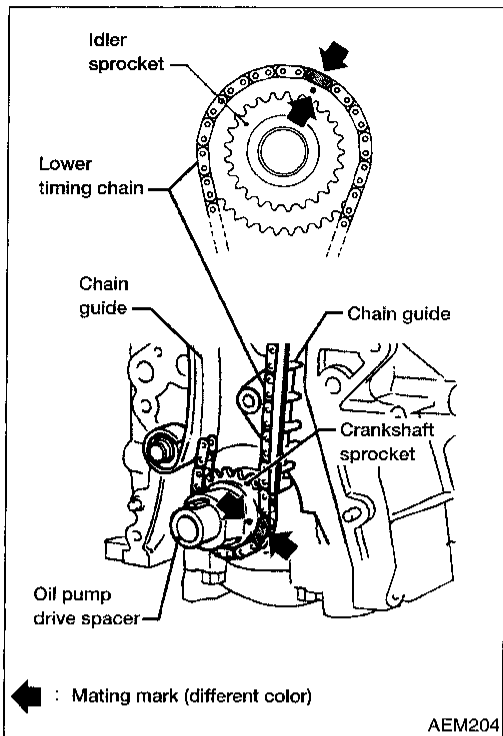
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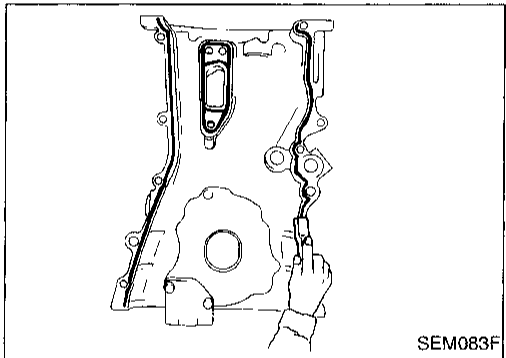
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TIMING CHAIN

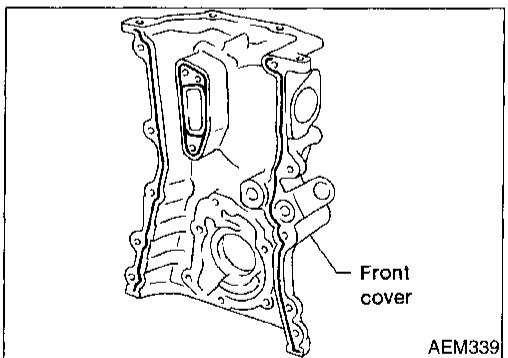
Installation (Cont'd)



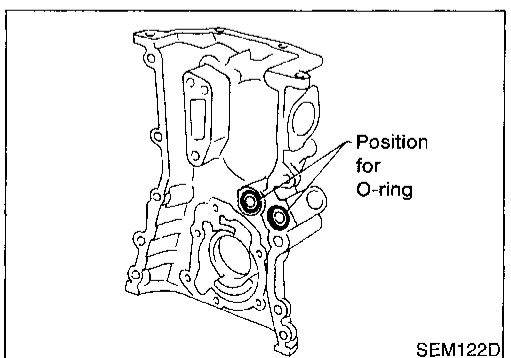
2. Install chain guides.
3. Install crankshaft sprocket and lower timing chain.
 - Set timing chain by aligning its mating mark with the one on crankshaft sprocket.
 - Make sure sprocket's mating mark faces engine front.
 - The number of links between the alignment marks are the same for the left and right sides, so either side can be used during alignment with the sprocket.



4. Install front cover.
 - a. Use a scraper to remove old liquid gasket from mating surface of front cover.
 - Also remove old liquid gasket from mating surface of cylinder block.



- c. Apply a continuous bead of liquid gasket to front cover.
 - Use Nissan Genuine RTV silicone sealant Part No. 999MP-A7007, Three Bond TB1207D or equivalent.
 - Check alignment of mating marks on chain and crankshaft sprocket.
 - Align oil drive spacer with oil pump.
 - Put chain to the side of chain guide so that chain does not make contact with water seal area of front cover.
 - Make sure two O-rings are present.
 - Be careful not to damage oil seal when installing front cover.



TIMING CHAIN

Installation (Cont'd)

5. Install engine front mounting bracket and mounting.
6. Install oil strainer.
7. Install oil pan. Refer to EM-16.
8. Install crankshaft pulley.
9. Install center member.

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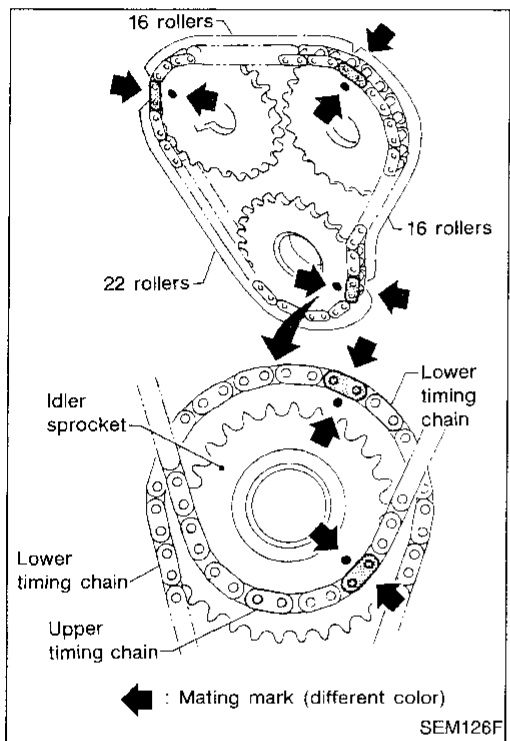
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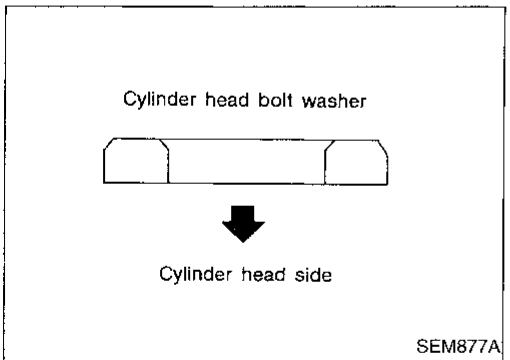
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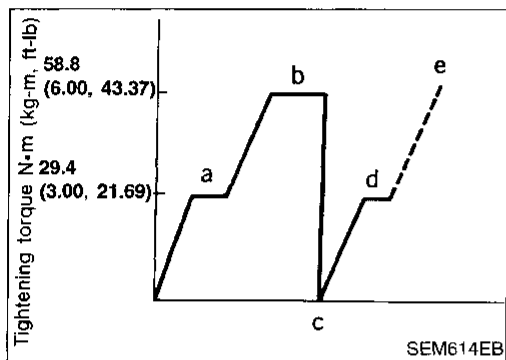
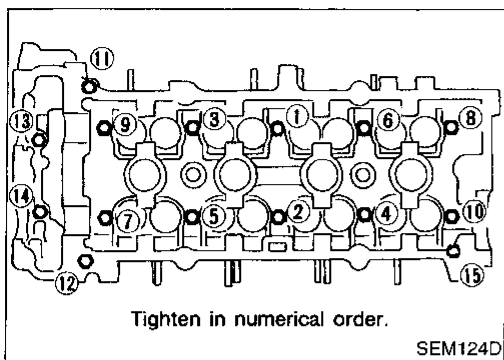
10. Set idler sprocket by aligning mating mark on larger sprocket with mating mark on lower timing chain.
 11. Install upper timing chain and set it by aligning mating mark on the smaller sprocket with mating marks on upper timing chain.
- **Make sure sprocket's mating mark faces engine front.**
12. Install idler sprocket shaft from the rear side.



13. Install cylinder head with new gasket.
- **Be sure to install washers between bolts and cylinder head.**
 - **Do not rotate crankshaft and camshaft separately, or valves will strike piston heads.**
 - **Apply new engine oil to cylinder head bolt threads and seat surfaces.**

TIMING CHAIN

Installation (Cont'd)

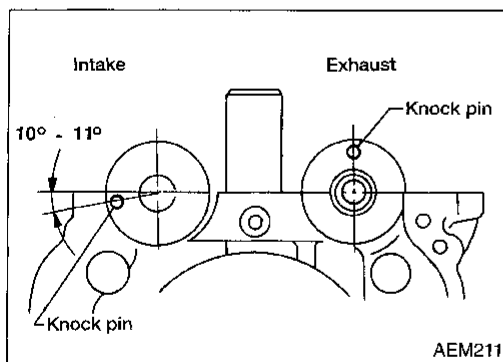


- Tighten bolts ① - ⑩ in numerical order using the following procedure:
 - a. Tighten bolts to 29.4 N·m (3.00 kg-m, 21.69 ft-lb).
 - b. Tighten bolts to 58.8 N·m (6.00 kg-m, 43.37 ft-lb).
 - c. Loosen bolts completely.
 - d. Tighten bolts to 29.4 N·m (3.00 kg-m, 21.69 ft-lb).
 - e. Turn bolts 50 to 55 degrees clockwise. If angle wrench is not available, tighten bolts to 53.9 to 63.7 N·m (5.50 to 6.50 kg-m, 39.76 to 46.99 ft-lb).
 - f. Tighten bolts (⑪ - ⑮) to 6.3 to 8.3 N·m (0.64 to 0.85 kg-m, 55.8 to 73.5 in-lb).

	Tightening torque N·m (kg-m, ft-lb)				
	a	b	c	d	e, f
Bolts ① - ⑩	29.4 (3.00, 21.69)	58.8 (6.00, 43.37)	0 (0, 0)	29.4 (3.00, 21.69)	50 - 55 degrees or 53.9 - 63.7 (5.50 - 6.50, 39.76 - 46.99)
Bolts ⑪ - ⑮	—	—	—	—	6.3 - 8.3 (0.64 - 0.85, 55.8 - 73.5 [in-lb])

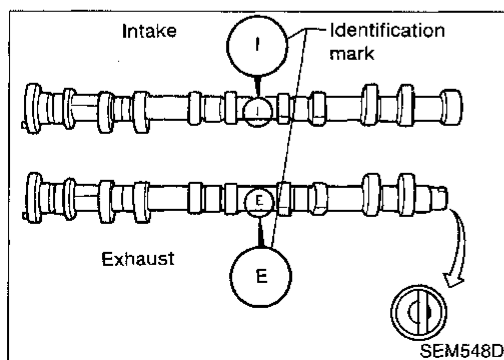
14. Install idler sprocket bolt.

- **Apply new engine oil to bolt thread and seat surface.**



15. Install camshaft.

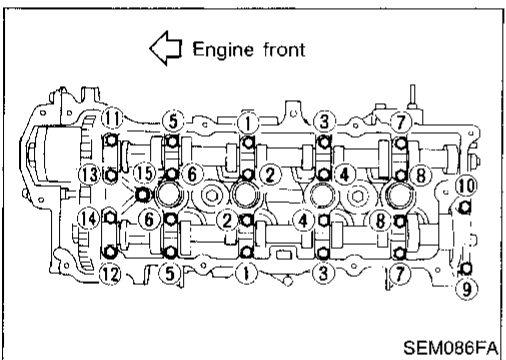
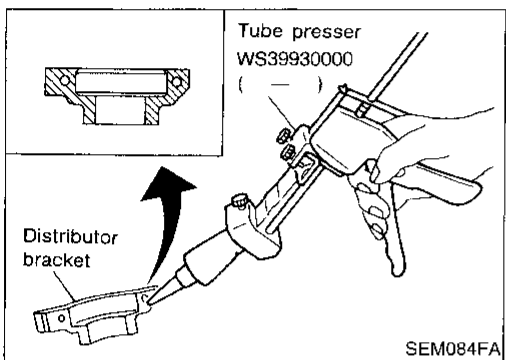
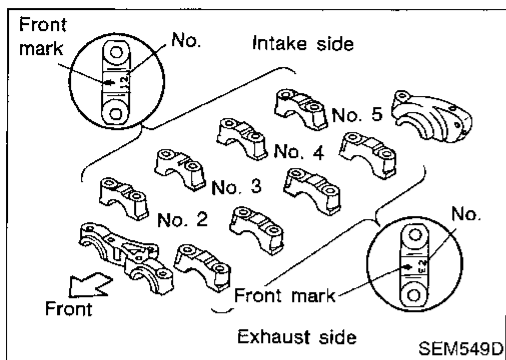
- **Make sure camshafts are aligned as shown in figure.**



- **Identification marks are present on camshafts.**

TIMING CHAIN

Installation (Cont'd)



16. Install camshaft brackets and distributor bracket.

- Make sure camshaft brackets are aligned as shown in figure.
- Refer to marks made at disassembly to ensure camshaft brackets are installed in their original positions.

- Apply liquid gasket to distributor bracket as shown in the figure.

- Apply new engine oil to bolt threads and seat surfaces
- Tighten camshaft bracket bolts using the following procedure:

- Set camshafts and camshaft brackets.
- Tighten bolts ⑪ - ⑮, then ① - ⑩.
Ⓜ: 2.0 N·m (0.204 kg-m, 17.7 in-lb)
- Tighten bolts ① - ⑮.
Ⓜ: 5.9 N·m (0.60 kg-m, 52.2 in-lb)
- Tighten bolts ① - ⑭.
Ⓜ: 9.0 - 11.8 N·m (0.92 - 1.20 kg-m, 6.7 - 8.7 ft-lb)
- Tighten bolt ⑮.
Ⓜ: 6.3 - 8.3 N·m (0.64 - 0.85 kg-m, 55.8 - 73.5 in-lb)

- 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 EM-38.

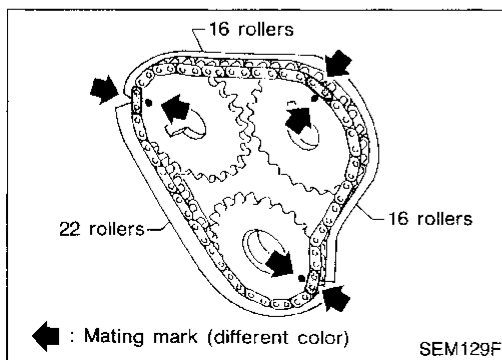
Reference data valve clearance (Cold):

Intake

0.25 - 0.33 mm (0.010 - 0.013 in)

Exhaust

0.32 - 0.40 mm (0.013 - 0.016 in)



17. Assemble camshaft sprocket with chain.

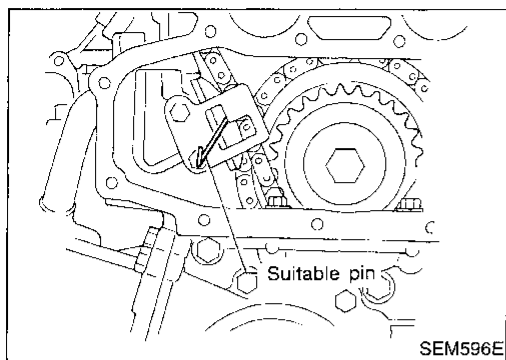
- Set timing chain by aligning mating marks with those of camshaft sprockets.
- Make sure sprocket's mating marks face engine front.

18. Install camshaft sprocket bolts.

- Apply new engine oil to bolt threads and seat surfaces.

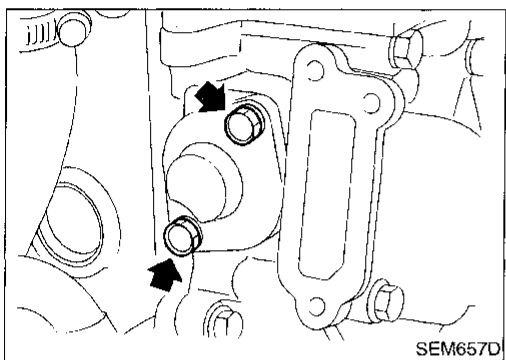
TIMING CHAIN

Installation (Cont'd)



19. Install upper chain tensioner.

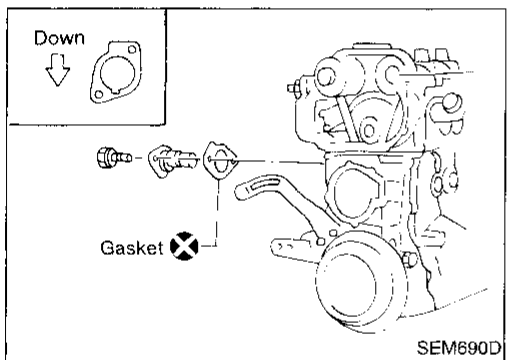
- Before installing chain tensioner, insert a suitable pin into pin hole of chain tensioner.
- After installing chain tensioner, remove the pin.



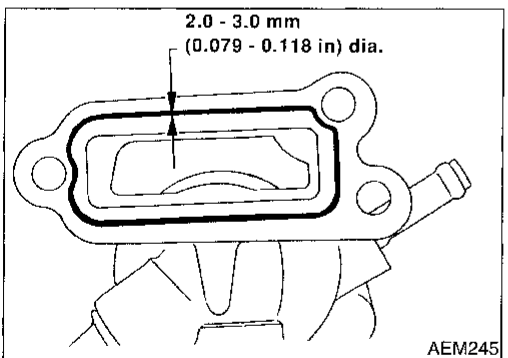
20. Install lower chain tensioner.

CAUTION:

- Check no problems occur when engine is rotated.
- Make sure that No. 1 piston is set at TDC on its compression stroke.



- Make sure gasket is facing proper direction before installing lower chain tensioner.

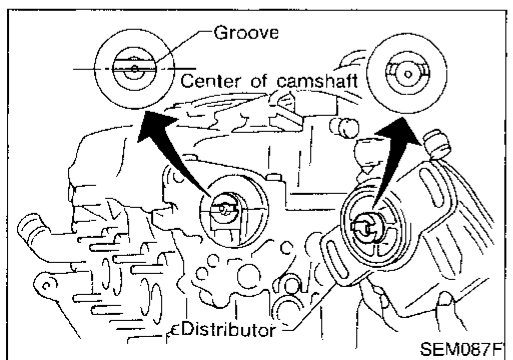


21. Apply liquid gasket to thermostat housing.

- Use Nissan Genuine RTV silicone sealant Part No. 999MP-A7007, Three Bond TB1207D or equivalent.

22. Install thermostat housing.

23. Install water pump pulley.

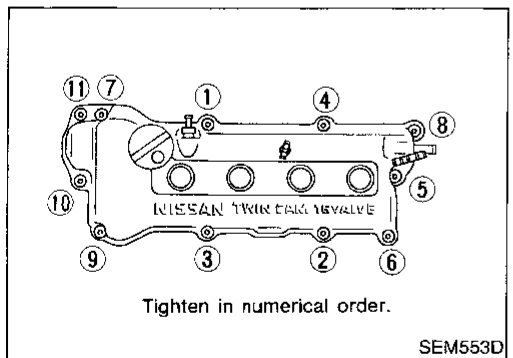
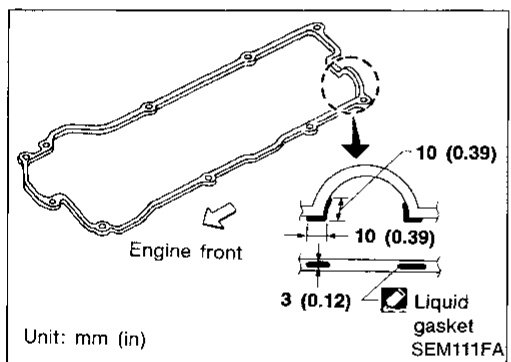
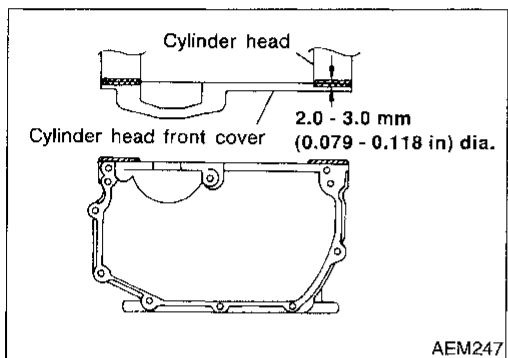
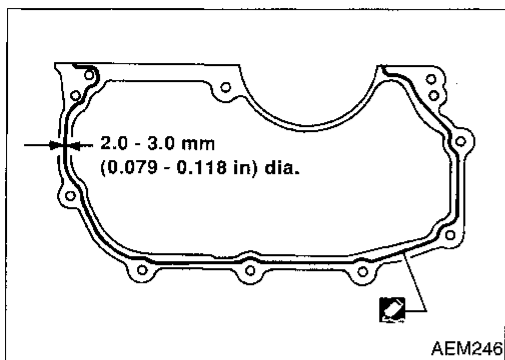


24. Install distributor.

- Make sure that position of camshaft is as shown in figure.

TIMING CHAIN

Installation (Cont'd)



25. Install cylinder head front cover.

- Apply liquid gasket to cam sprocket cover gusset.
- Use Nissan Genuine RTV silicone sealant Part No. 999MP-A7007, Three Bond TD1207D or equivalent.

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26. Apply liquid gasket to mating surfaces of cylinder head and cylinder head front covers shown in figure.

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27. Apply liquid gasket to rocker cover gasket.

- Use Nissan Genuine RTV silicone sealant Part No. 999MP-A7007, Three Bond TD1207D or equivalent.

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28. Install rocker cover and tighten in numerical order as shown.

29. Install the following parts:

- Spark plugs and leads
 - Cylinder head front mounting bracket
 - Front exhaust tube
 - Engine under cover
 - Engine side cover and RH wheel
 - Power steering oil pump and pulley with bracket
- To check power steering fluid, refer to MA section ("Checking Power Steering Fluid and Lines", "CHASSIS AND BODY MAINTENANCE").

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- Drive belts
- For adjusting drive belt deflection, refer to MA section ("Checking Drive Belts", "ENGINE MAINTENANCE").

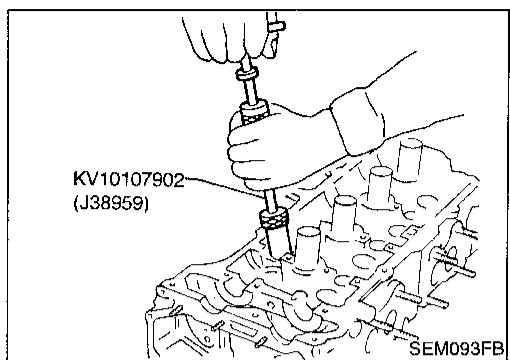
EL

30. Connect the following:

- Vacuum hoses
- Fuel hoses
- Wire, harnesses and connectors
- Air duct to intake manifold
- Upper radiator hose and refill with coolant. Refer to MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE").

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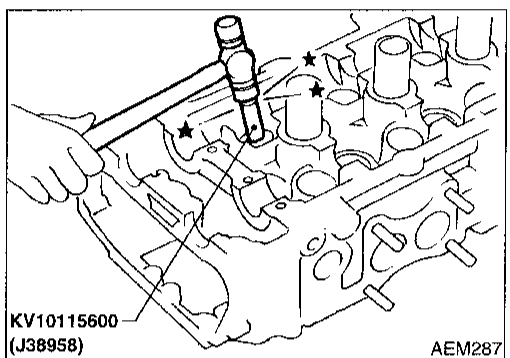
OIL SEAL REPLACEMENT



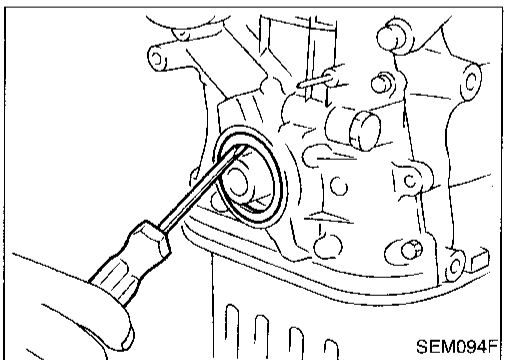
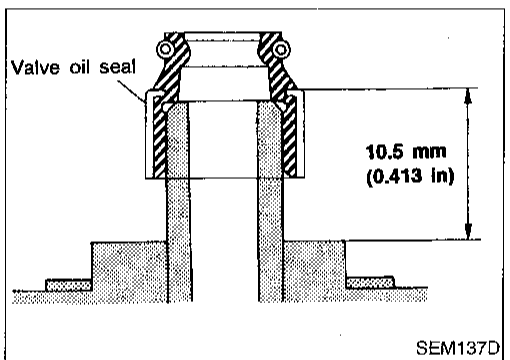
Valve Oil Seal

1. Remove rocker cover.
2. Remove camshaft.
3. Remove valve spring. Refer to EM-30.
4. Remove valve oil seal with Tool.

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



5. Apply new engine oil to new valve oil seal and install it with Tool.

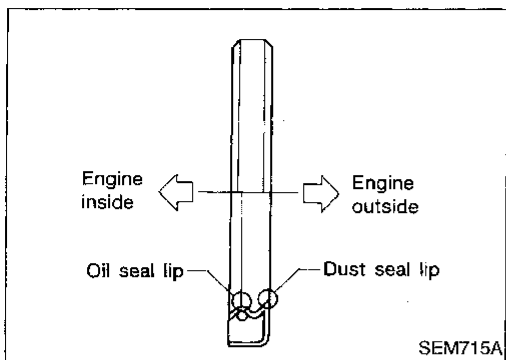


Front Oil Seal

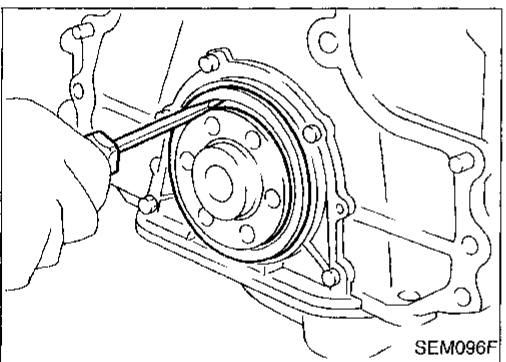
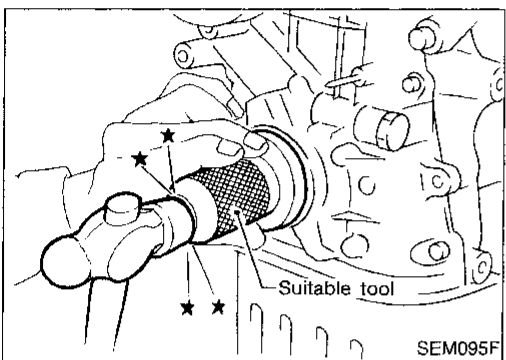
1. Remove the following parts:
 - Engine under cover
 - RH engine side cover
 - Generator and power steering drive belts
 - Crankshaft pulley
2. Remove front oil seal from front cover.
 - **Be careful not to scratch front cover.**

OIL SEAL REPLACEMENT

Front Oil Seal (Cont'd)

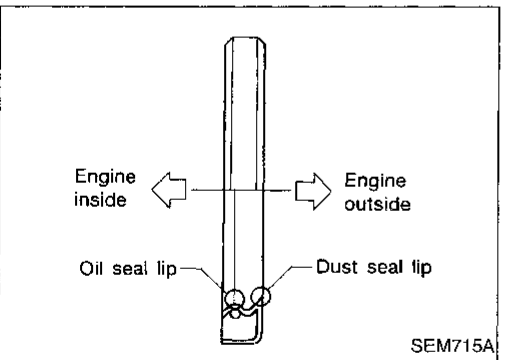


3. Apply new engine oil to new oil seal and install it using a suitable tool.
- Install new oil seal in the direction shown.

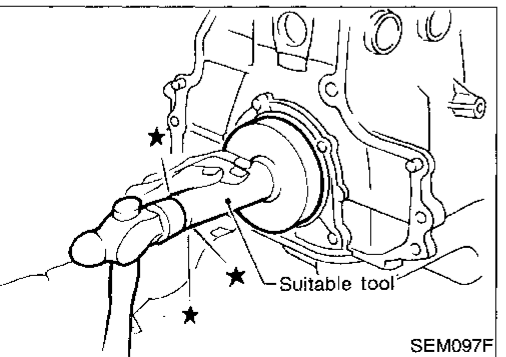


Rear Oil Seal

1. Remove flywheel or drive plate.
 2. Remove rear oil seal retainer.
 3. Remove traces of liquid gasket using scraper.
 4. Remove seal from rear oil seal retainer.
- **Be careful not to scratch rear oil seal retainer.**



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



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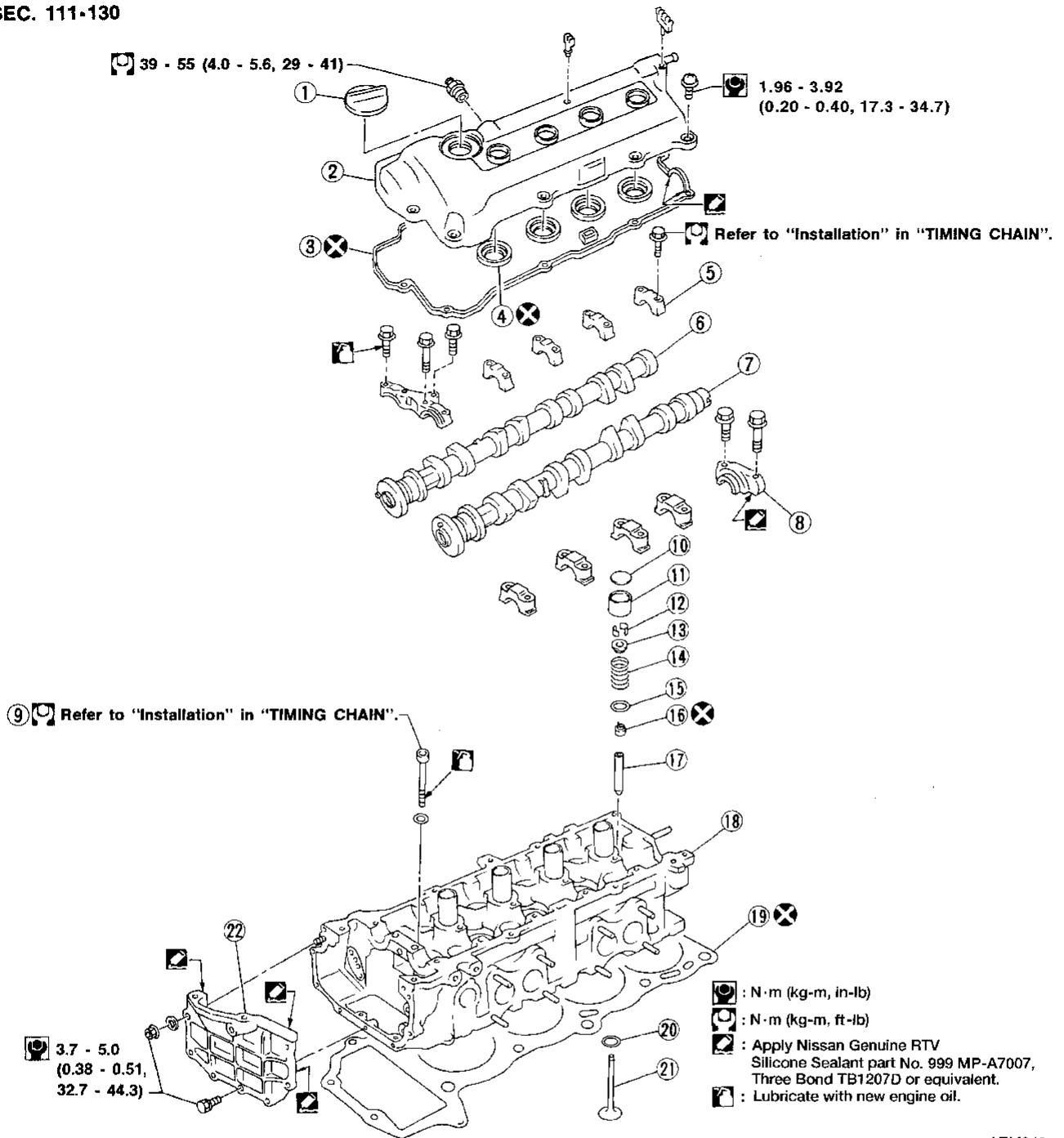
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CYLINDER HEAD

SEC. 111-130



AEM340

- | | | |
|-----------------------|-------------------------|-----------------------------|
| ① Oil filler cap | ⑨ Cylinder head bolt | ⑰ Valve guide |
| ② Rocker cover | ⑩ Shim | ⑱ Cylinder head |
| ③ Rocker cover gasket | ⑪ Valve lifter | ⑲ Cylinder head gasket |
| ④ Oil seal | ⑫ Valve cotter | ⑳ Valve seat |
| ⑤ Camshaft bracket | ⑬ Valve spring retainer | ㉑ Valve |
| ⑥ Intake camshaft | ⑭ Valve spring | ㉒ Cylinder head front cover |
| ⑦ Exhaust camshaft | ⑮ Valve spring seat | |
| ⑧ Distributor bracket | ⑯ Valve oil seal | |

CYLINDER HEAD

CAUTION:

- When installing camshaft and oil seal, lubricate contacting surfaces with new engine oil.
- When tightening cylinder head bolts, camshaft sprocket bolts and camshaft bracket bolts, lubricate bolt threads and seat surfaces with new engine oil.
- Attach tags to valve lifters so as not to mix them up.

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Removal

- The removal procedure is the same as for timing chain. Refer to EM-18.
- Before removing camshaft and idler sprockets, apply paint marks to them for retiming.

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Disassembly

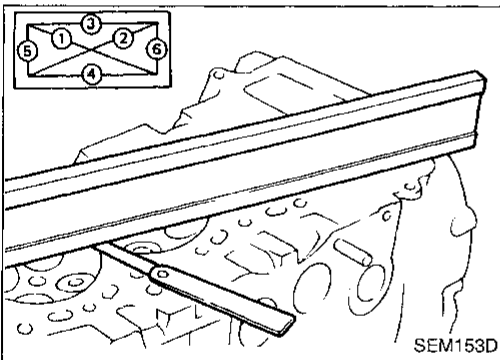
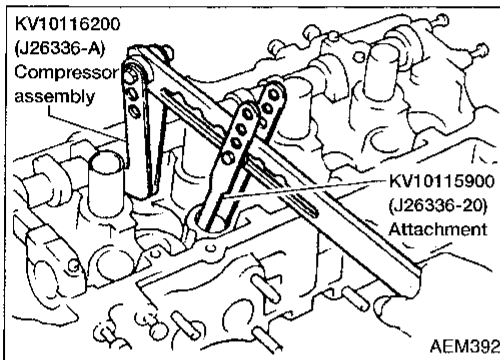
1. Remove valve components with Tool.
2. Remove valve oil seal with a suitable tool.

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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 figure.

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Head surface flatness:

Standard: Less than 0.03 mm (0.0012 in)

Limit: 0.1 mm (0.004 in)

BR

If beyond the specified limit, replace it or resurface it.

Resurfacing limit:

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

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

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

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

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Nominal cylinder head height:

117.8 - 118.0 mm (4.638 - 4.646 in)

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CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

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CYLINDER HEAD

Inspection (Cont'd)

CAMSHAFT RUNOUT

1. Measure camshaft runout at the center journal.

Runout (Total indicator reading):

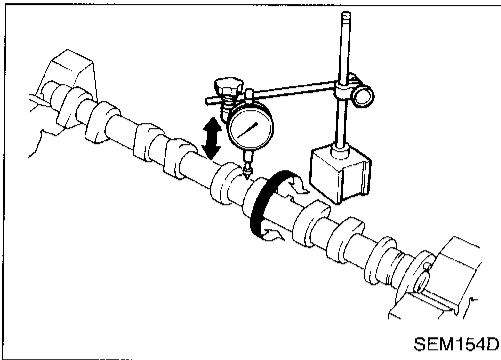
Standard:

Less than 0.02 mm (0.0008 in)

Limit:

0.1 mm (0.004 in)

2. If it exceeds the limit, replace camshaft.



CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.

Standard cam height:

Intake

40.610 - 40.800 mm (1.5988 - 1.6063 in)

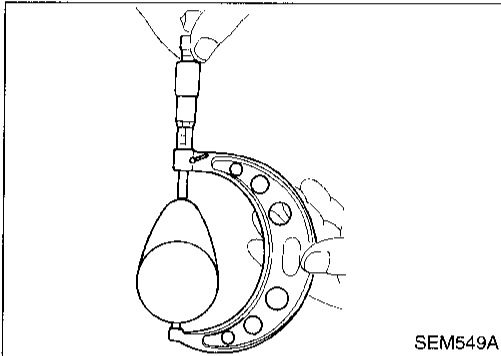
Exhaust

39.910 - 40.100 mm (1.5713 - 1.5787 in)

Cam wear limit:

0.20 mm (0.0079 in)

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



CAMSHAFT JOURNAL CLEARANCE

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

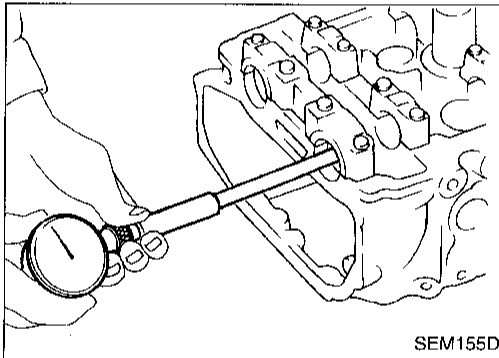
Standard inner diameter:

No. 1 bearing

28.000 - 28.021 mm (1.1024 - 1.1032 in)

No. 2 to No. 5 bearings

24.000 - 24.021 mm (0.9449 - 0.9457 in)



3. Measure outer diameter of camshaft journal.

Standard outer diameter:

No. 1 journal

27.935 - 27.955 mm (1.0998 - 1.1006 in)

No. 2 to No. 5 journals

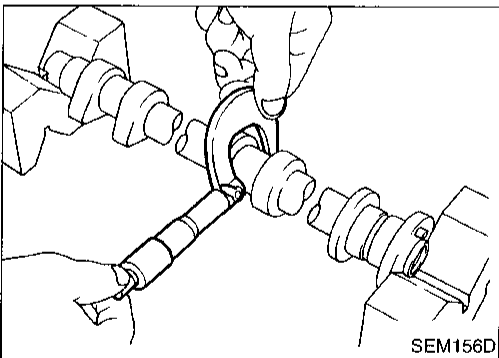
23.935 - 23.955 mm (0.9423 - 0.9431 in)

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

Camshaft journal clearance:

Standard 0.045 - 0.086 mm (0.0018 - 0.0034 in)

Limit 0.15 mm (0.0059 in)



CAMSHAFT END PLAY

1. Install camshaft in cylinder head. Refer to EM-23.
2. Measure camshaft end play.

Camshaft end play:

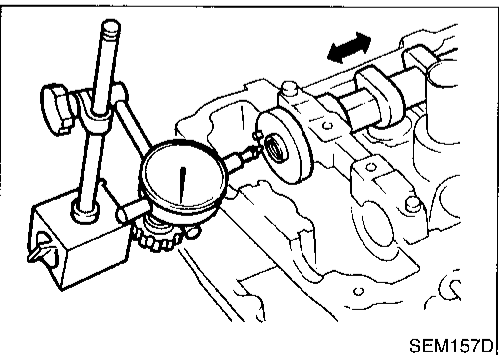
Standard

0.115 - 0.188 mm (0.0045 - 0.0074 in)

Limit

0.20 mm (0.0079 in)

3. If limit is exceeded, replace camshaft and remeasure end play.



CYLINDER HEAD

Inspection (Cont'd)

- If limit is still exceeded after replacing camshaft, replace cylinder head.

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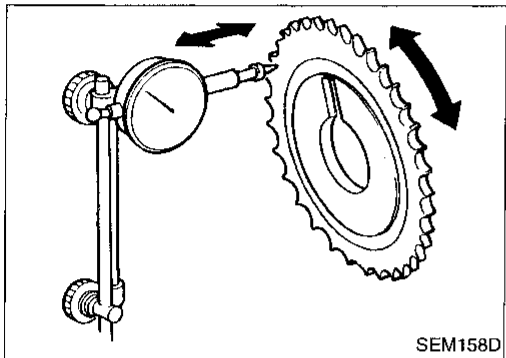
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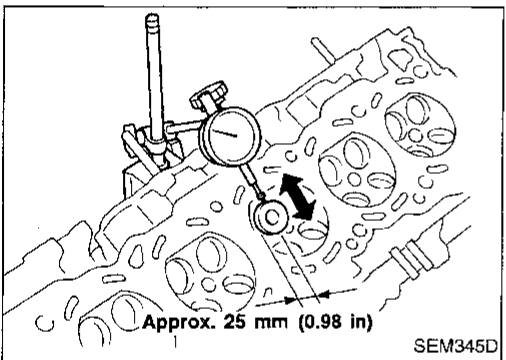
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SEM158D

CAMSHAFT SPROCKET RUNOUT

1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
Runout (Total indicator reading):
Limit 0.15 mm (0.0059 in)
3. If it exceeds the limit, replace camshaft sprocket.

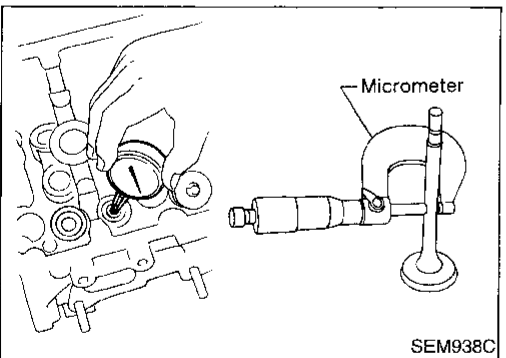


SEM345D

VALVE GUIDE CLEARANCE

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

Valve deflection limit (Dial gauge reading):
Intake & Exhaust
0.2 mm (0.008 in)



SEM938C

2. If it exceeds the limit, check valve to valve guide clearance.
 - a. Measure valve stem diameter and valve guide inner diameter.
 - b. Calculate valve to valve guide clearance.

Valve to valve guide clearance = valve guide inner diameter - valve stem diameter.

- c. Check that clearance is within specification.

Unit: mm (in)

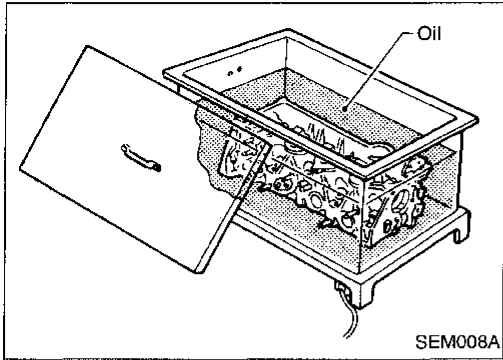
	Standard	Limit
Intake	0.020 - 0.050 (0.0008 - 0.0020)	0.1 (0.004)
Exhaust	0.040 - 0.070 (0.0016 - 0.0028)	0.1 (0.004)

- If it exceeds the limit, replace valve and remeasure clearance.
- **If limit is still exceeded after replacing valve, replace valve guide.**

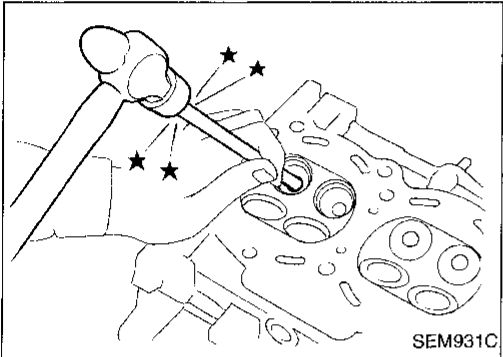
CYLINDER HEAD

Inspection (Cont'd)

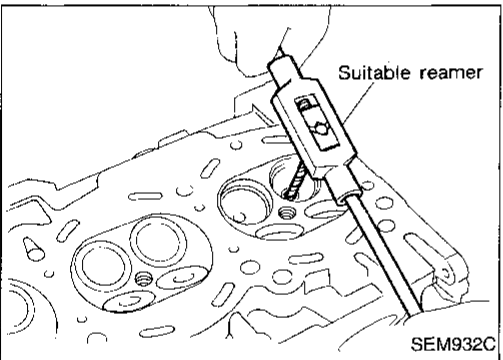
VALVE GUIDE REPLACEMENT



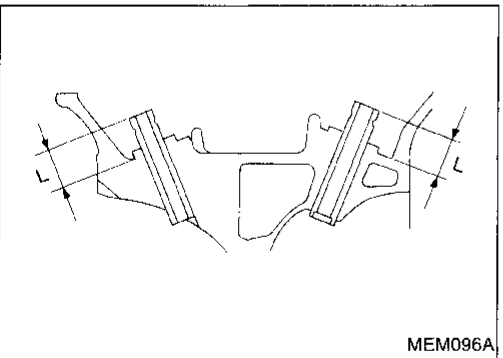
1. To remove valve guide, heat cylinder head to 110 to 130°C (230 to 266°F).



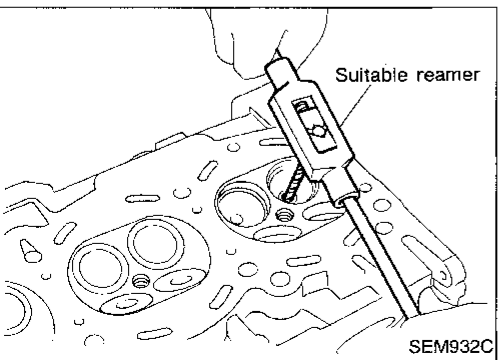
2. Drive out valve guide with a press (under a 20 kN [2 ton, 2.2 US ton, 2.0 Imp ton] pressure) or hammer and suitable tool.



3. Ream cylinder head valve guide hole.
**Valve guide hole diameter
(for service parts):**
Intake & Exhaust
9.685 - 9.696 mm (0.3813 - 0.3817 in)



4. Heat cylinder head to 110 to 130°C (230 to 266°F) and press service valve guide into cylinder head.
Projection "L":
11.5 - 11.7 mm (0.453 - 0.461 in)



5. Ream valve guide.
Finished size:
Intake & Exhaust
5.500 - 5.515 mm (0.2165 - 0.2171 in)

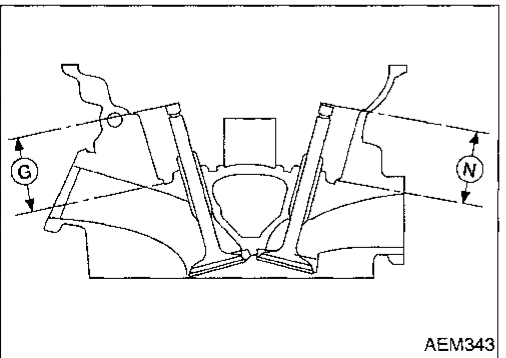
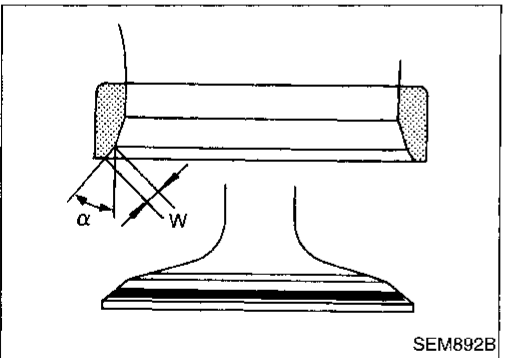
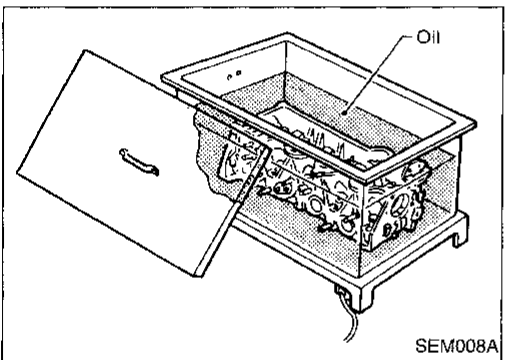
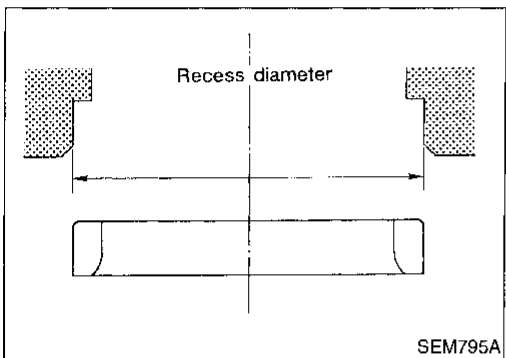
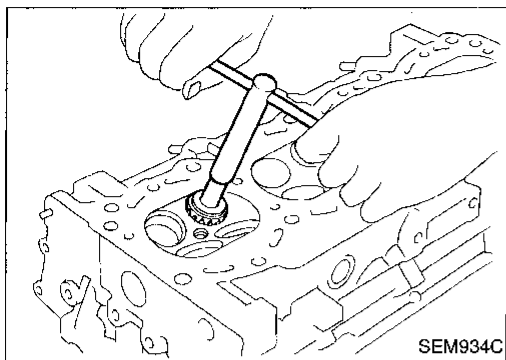
CYLINDER HEAD

Inspection (Cont'd)

VALVE SEATS

Check valve seats for pitting at contact surface. Resurface or replace if excessively worn.

- 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.



REPLACING VALVE SEAT FOR SERVICE PARTS

1. Bore out old seat until it collapses. Set machine depth stop so that boring cannot contact the bottom face of seat recess in cylinder head.
2. Ream cylinder head recess.

Reaming bore for service valve seat

Oversize [0.5 mm (0.020 in)]:

Intake 31.500 - 31.516 mm (1.2402 - 1.2408 in)

Exhaust 26.500 - 26.516 mm (1.0433 - 1.0439 in)

Use the valve guide center for reaming to ensure valve seat will have the correct fit.

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

5. Cut or grind valve seat using suitable tool to the specified dimensions as shown in SDS, EM-58.
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seating condition.

Seat face angle " α ":

44°53' - 45°07' deg.

Contacting width "W":

Intake

1.06 - 1.34 mm (0.0417 - 0.0528 in)

Exhaust

1.20 - 1.68 mm (0.0472 - 0.0661 in)

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 correct it. If the distance is longer, replace the valve seat.

Valve seat resurface limit:

Intake

35.95 - 36.55 mm (1.4154 - 1.4390 in)

Exhaust

35.92 - 36.52 mm (1.4142 - 1.4378 in)

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CYLINDER HEAD

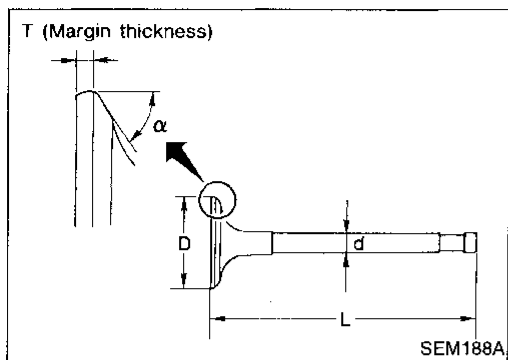
Inspection (Cont'd)

VALVE DIMENSIONS

Check dimensions of each valve. Refer to SDS, EM-56 for dimensions.

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.



VALVE SPRING

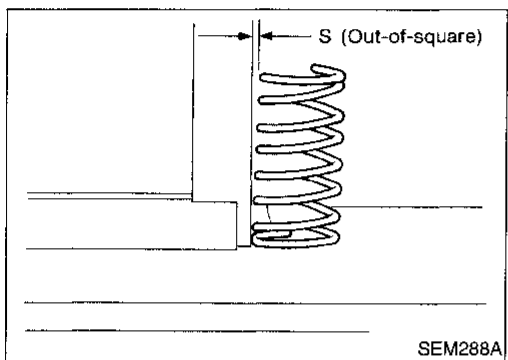
Squareness

1. Measure dimension "S".

Out-of-square "S":

Less than 1.80 mm (0.0709 in)

2. If it exceeds the limit, replace spring.



Pressure

Check valve spring pressure at specified spring height.

Pressure:

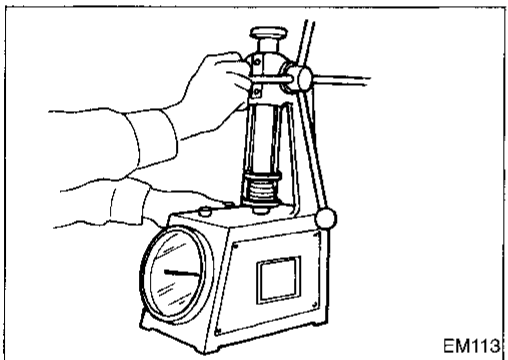
Standard

344.42 N (35.12 kg, 77.44 lb) at 25.26 mm (0.9945 in)

Limit

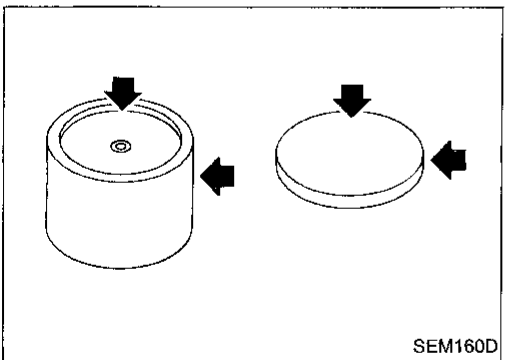
More than 330.41 N (33.69 kg, 74.31 lb) at 23.64 mm (0.9307 in)

If it exceeds the limit, replace spring.



VALVE LIFTER

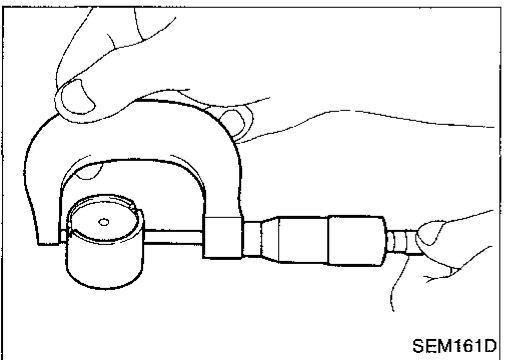
1. Check contact and sliding surfaces for wear or scratches.



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

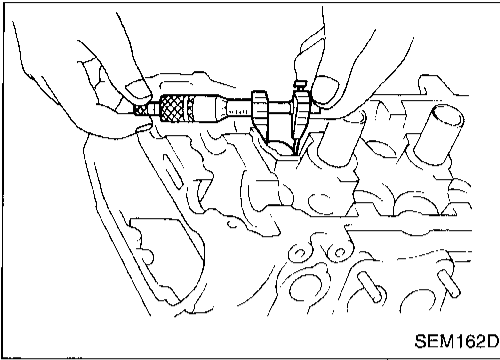
Valve lifter diameter:

29.960 - 29.975 mm (1.1795 - 1.1801 in)



CYLINDER HEAD

Inspection (Cont'd)



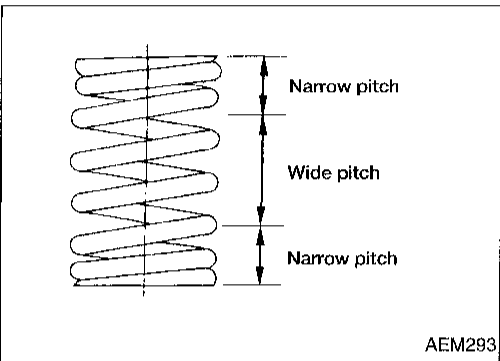
Lifter guide bore diameter:

30.000 - 30.021 mm (1.1811 - 1.1819 in)

Clearance between valve lifter and valve lifter guide:

0.025 - 0.061 mm (0.0010 - 0.0024 in)

If it exceeds the limit, replace valve lifter or cylinder head which exceeds the standard diameter tolerance.



Assembly

1. Install valve component parts.

- Always use new valve oil seal. Refer to EM-28.
- Before installing valve oil seal, install valve spring seat.
- After installing valve components, tap valve stem tip with a plastic hammer to assure a proper fit.
- Install valve spring (narrow pitch at both ends of spring) with either end toward cylinder head.

Installation

- The installation procedure is the same as for timing chain. Refer to EM-21.

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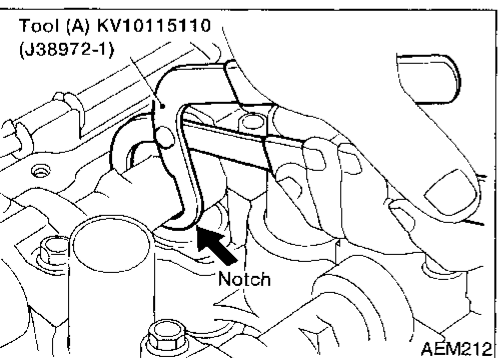
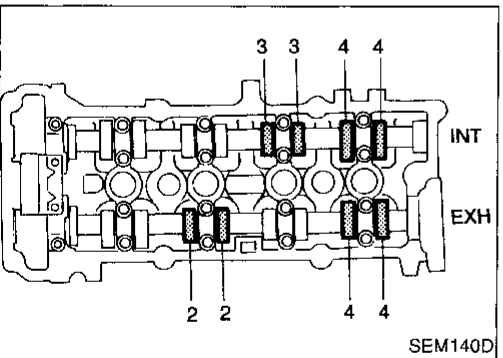
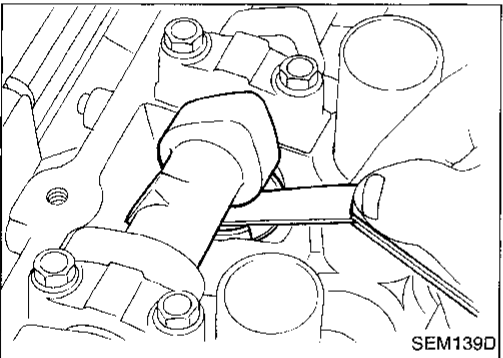
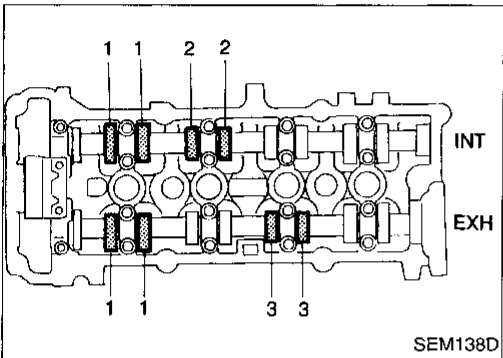
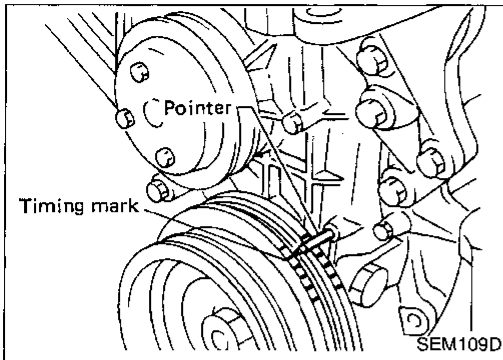
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VALVE CLEARANCE



Checking

Check valve clearance while engine is warm and not running.

1. Remove rocker cover.
2. Remove all spark plugs.
3. Set No. 1 cylinder at TDC on its compression stroke.
 - Align pointer with TDC mark on crankshaft pulley.
 - 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 described above.
4. Check only those valves shown in the figure.

- 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 adjusting shim.

Valve clearance for checking (Hot):

Intake

0.21 - 0.49 mm (0.008 - 0.019 in)

Exhaust

0.30 - 0.58 mm (0.012 - 0.023 in)

5. Turn crankshaft one revolution (360°) and align mark on crankshaft pulley with pointer.
6. Check only those valves shown in the figure.
 - Use the same procedure as mentioned in step 4.
7. If all valve clearances are within specification, install the following parts:
 - Rocker cover
 - All spark plugs

Adjusting

Adjust valve clearance while engine is cold.

1. Turn crankshaft. Position cam lobe upward on camshaft for valve that must be adjusted.
2. Place Tool (A) around camshaft as shown in figure.

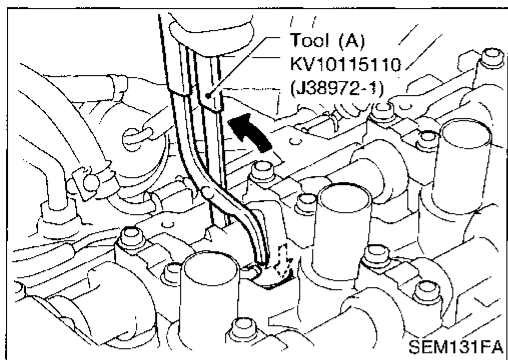
Before placing Tool (A), rotate notch toward center of cylinder head. (See figure.) This will simplify shim removal later.

CAUTION:

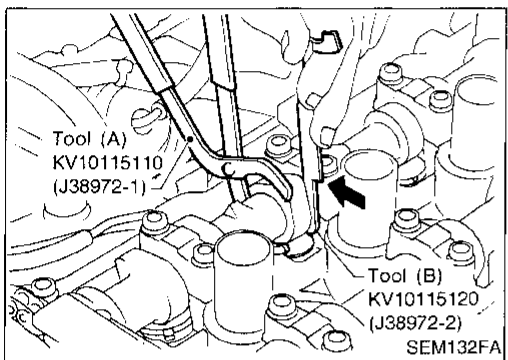
Be careful not to damage cam surface with Tool (A).

VALVE CLEARANCE

Adjusting (Cont'd)



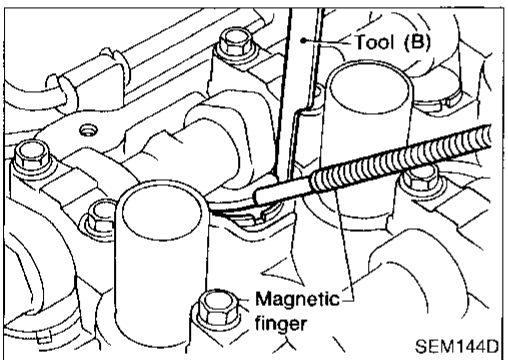
3. Rotate Tool (A) so that valve lifter is pushed down.



4. Place Tool (B) between camshaft and valve lifter to retain valve lifter.

CAUTION:

- Tool (B) must be placed as close to camshaft bracket as possible.
 - Be careful not to damage cam surface with Tool (B).
5. Remove Tool (A).



6. Remove adjusting shim using a small screwdriver and a magnetic finger.

7. Determine replacement adjusting shim size using the following formula.

- Use a micrometer to determine thickness of removed shim.
- Calculate thickness of new adjusting shim so valve clearance comes within specified values.

R = Thickness of removed shim

N = Thickness of new shim

M = Measured valve clearance

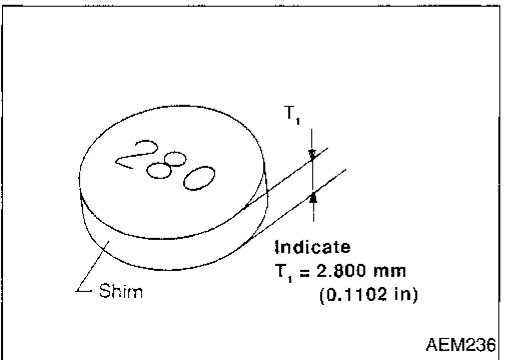
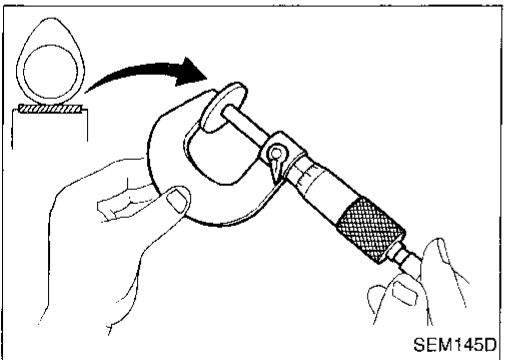
Intake:

$$N = R + [M - 0.37 \text{ mm (0.0146 in)}]$$

Exhaust:

$$N = R + [M - 0.40 \text{ mm (0.0157 in)}]$$

Shims are available in 50 sizes from 2.00 mm (0.0787 in) to 2.98 mm (0.1173 in), in steps of 0.02 mm (0.0008 in).



- Select the closest size shim to the calculated thickness. Refer to chart in SDS, EM-57.

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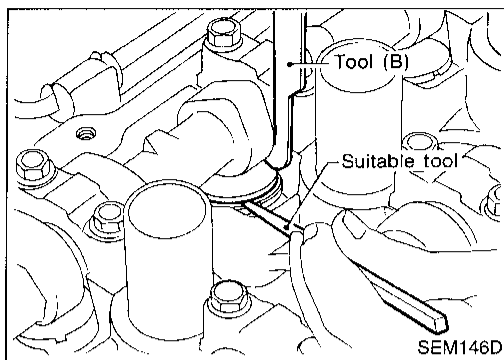
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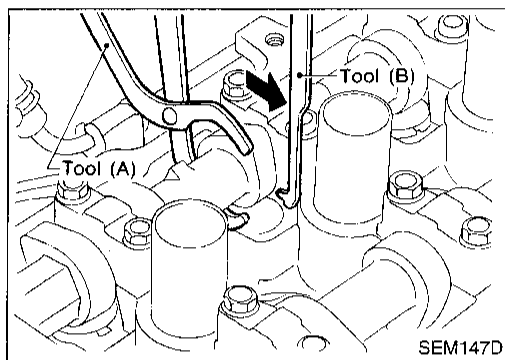
VALVE CLEARANCE

Adjusting (Cont'd)



8. Install new shim using a suitable tool.

- Install with the surface on which the thickness is stamped facing down.



9. Place Tool (A) as explained in steps 2 and 3.

10. Remove Tool (B).

11. Remove Tool (A).

12. Recheck valve clearance.

Valve clearance:

Unit: mm (in)

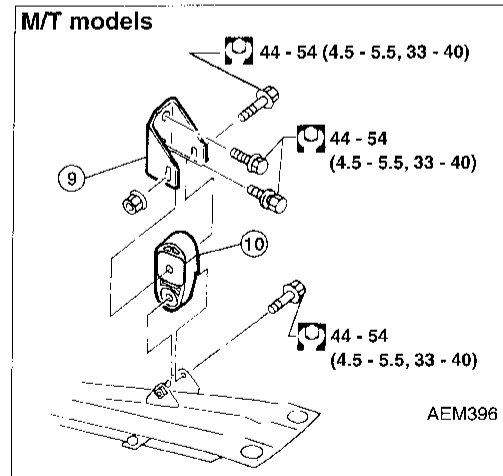
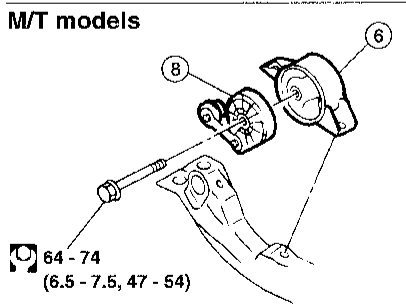
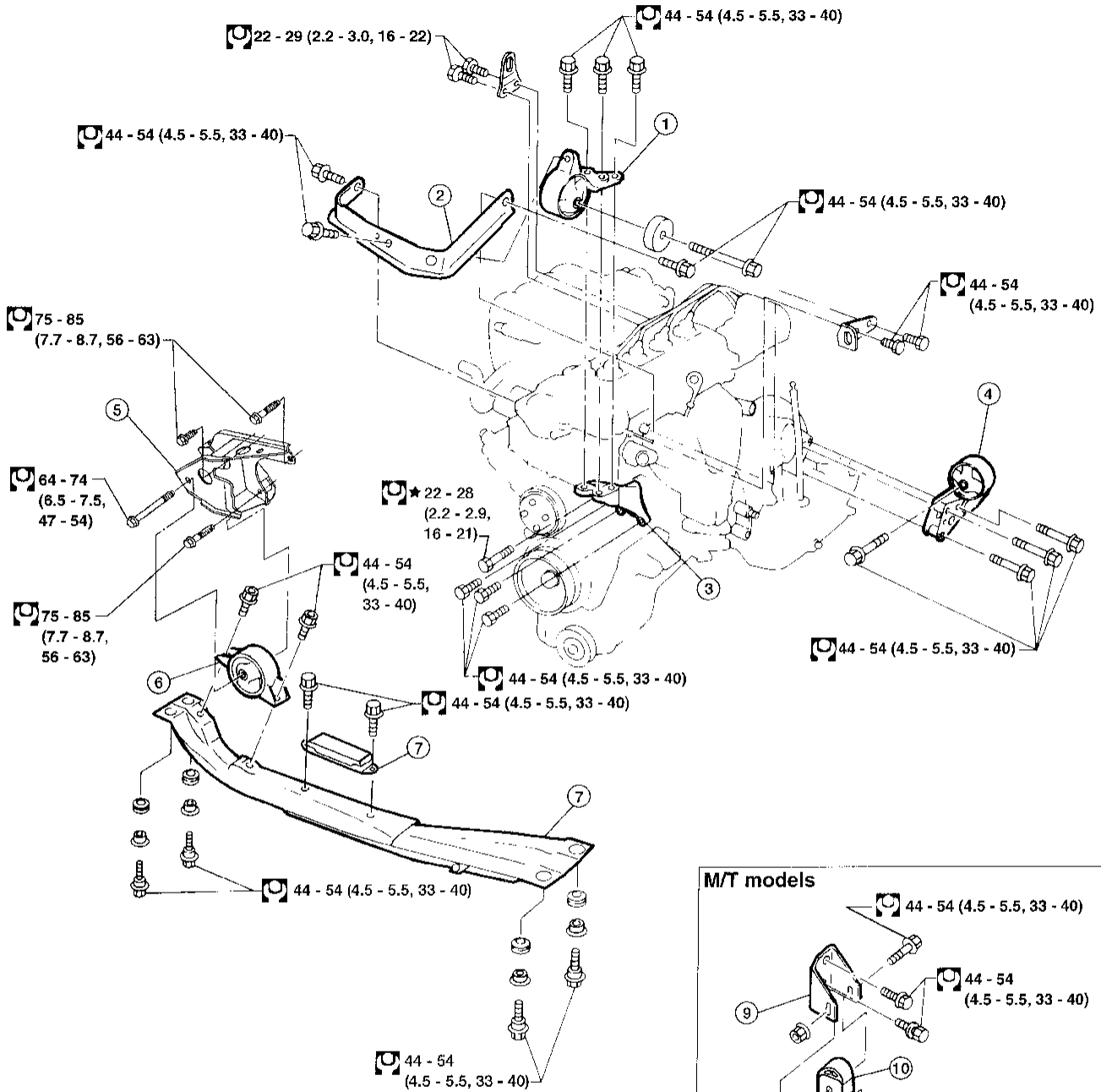
	For adjusting		For checking
	Hot	Cold* (reference data)	Hot
Intake	0.32 - 0.40 (0.013 - 0.016)	0.25 - 0.33 (0.010 - 0.013)	0.21 - 0.49 (0.008 - 0.019)
Exhaust	0.37 - 0.45 (0.015 - 0.018)	0.32 - 0.40 (0.013 - 0.016)	0.30 - 0.58 (0.012 - 0.023)

*: At a temperature of approximately 20°C (68°F)

Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

ENGINE REMOVAL

SEC. 112



: N·m (kg-m, ft-lb)
 ★ : Located at front cover.

- ① Engine front mounting
- ② Cylinder head front mounting bracket
- ③ Engine front mounting bracket
- ④ LH engine mounting
- ⑤ Transaxle mounting
- ⑥ Engine rear mounting
- ⑦ Center member

- ⑧ Roll damper
- ⑨ Buffer rod bracket
- ⑩ Buffer rod

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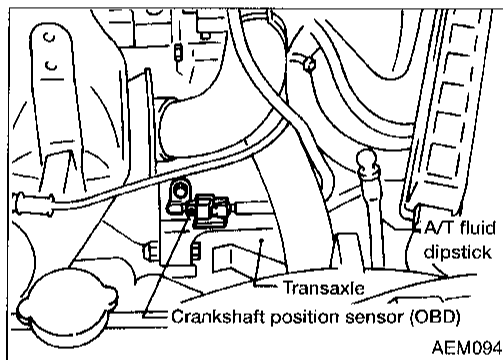
ENGINE REMOVAL

WARNING:

- Position 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.
- Before disconnecting fuel hose, release pressure. Refer to EC section (“Fuel Pressure Release”, “BASIC SERVICE PROCEDURE”).
- Be sure to lift engine and transaxle 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 sure to clear surrounding parts. Use special care near accelerator wire casing, brake lines and brake master cylinder.
- When lifting the engine, always use engine slingers in a safe manner.
- When removing drive shaft, be careful not to damage grease seal of transaxle.



- Before separating engine and transaxle, remove crankshaft position sensor (OBD) from the assembly.
- Always be extra careful not to damage edge of crankshaft position sensor (OBD), or ring gear teeth.

Engine cannot be removed separately from transaxle. Remove engine with transaxle as an assembly.

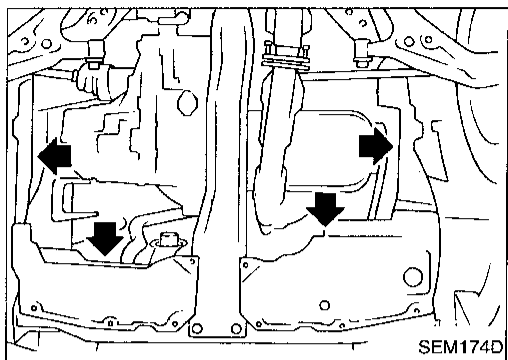
Removal

1. Drain coolant from radiator and cylinder block. Refer to (LC) section (“Changing Engine Coolant”, “ENGINE MAINTENANCE”).
2. Drain engine oil.
3. Remove battery.
4. Remove coolant reservoir tank and bracket.
5. Remove drive belts.
6. Remove generator and air conditioner compressor from engine.
7. Remove power steering oil pump from engine and position aside.

Power steering oil pump does not need to be disconnected from power steering tubes.

ENGINE REMOVAL

Removal (Cont'd)



8. Remove the following parts:

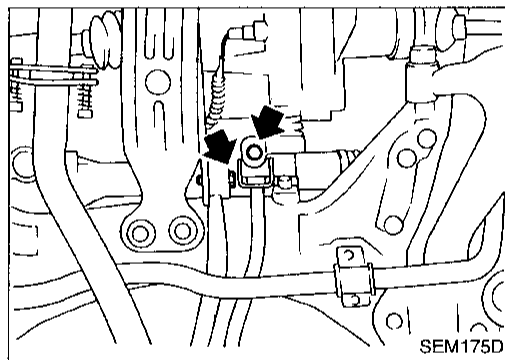
- RH and LH front tires
- Under covers
- Splash covers
- RH and LH brake caliper assemblies

: 54 - 64 N·m (5.5 - 6.5 kg-m, 40 - 47 ft-lb)

Brake hose does not need to be disconnected from brake caliper assembly. Never depress brake pedal.

- RH & LH drive shaft. Refer to FA section ("Drive Shaft", "FRONT AXLE").

When removing drive shaft, be careful not to damage trans-axle side grease seal.



- Disconnect control rod and support rod from transaxle. (M/T models.)

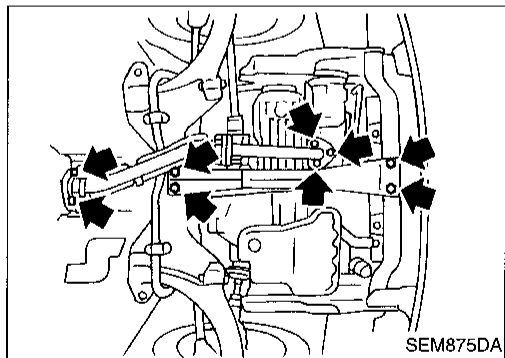
Control rod:

: 14 - 18 N·m (1.4 - 1.8 kg-m, 10 - 13 ft-lb)

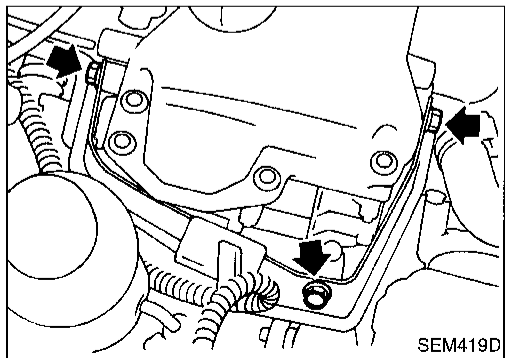
Support rod:

: 35 - 47 N·m (3.6 - 4.8 kg-m, 26 - 35 ft-lb)

- Disconnect control cable from transaxle. (A/T models.)



- Center member
- Front exhaust tube
- Stabilizer bar
- Cooling fan
- Radiator



- Cylinder head front mounting bracket
- Remove air duct and disconnect wires, harness, pipes, hoses and so on.

9. Lift up engine slightly and disconnect or remove all engine mountings.

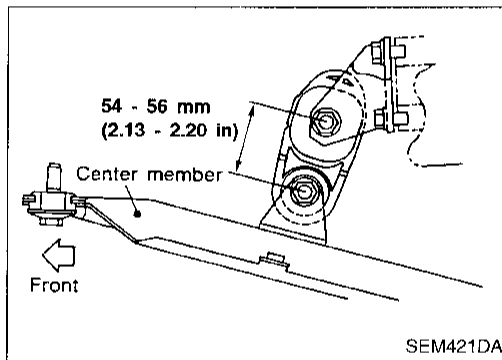
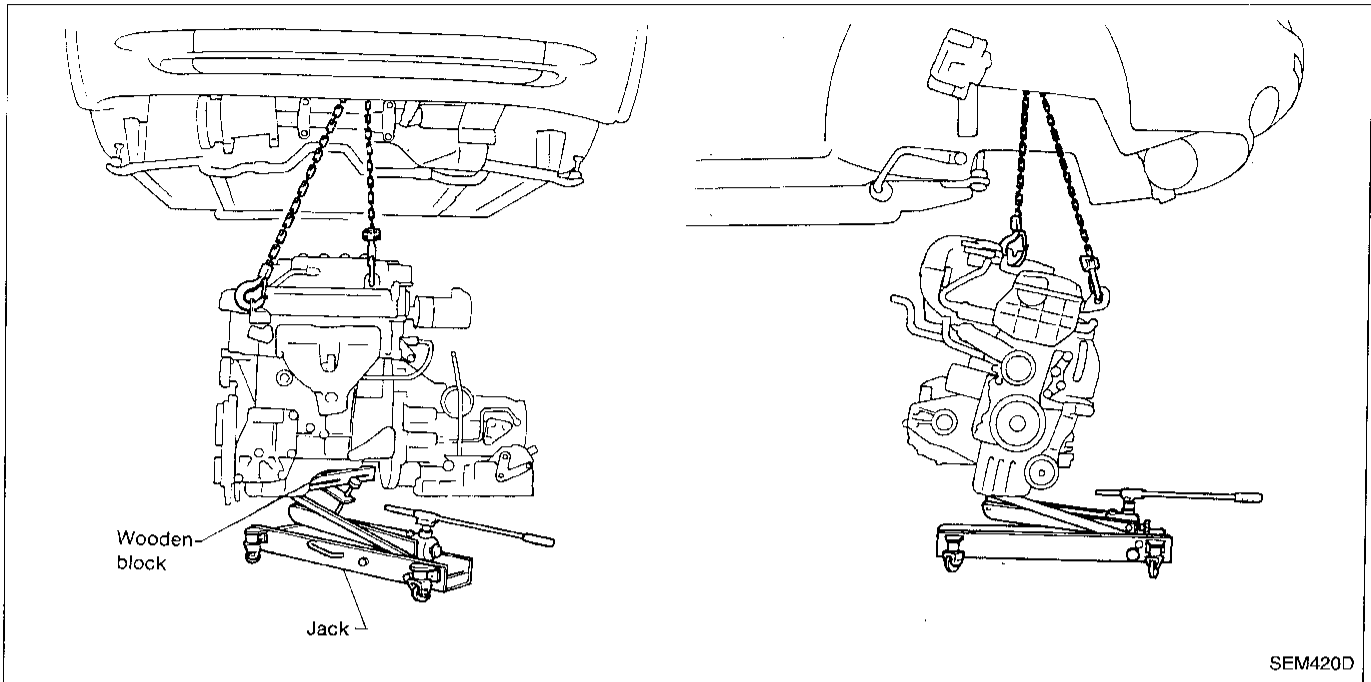
When lifting engine, be sure to clear surrounding parts. Use special care near brake tubes and brake master cylinder.

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ENGINE REMOVAL

Removal (Cont'd)

10. Remove engine with transaxle as shown.



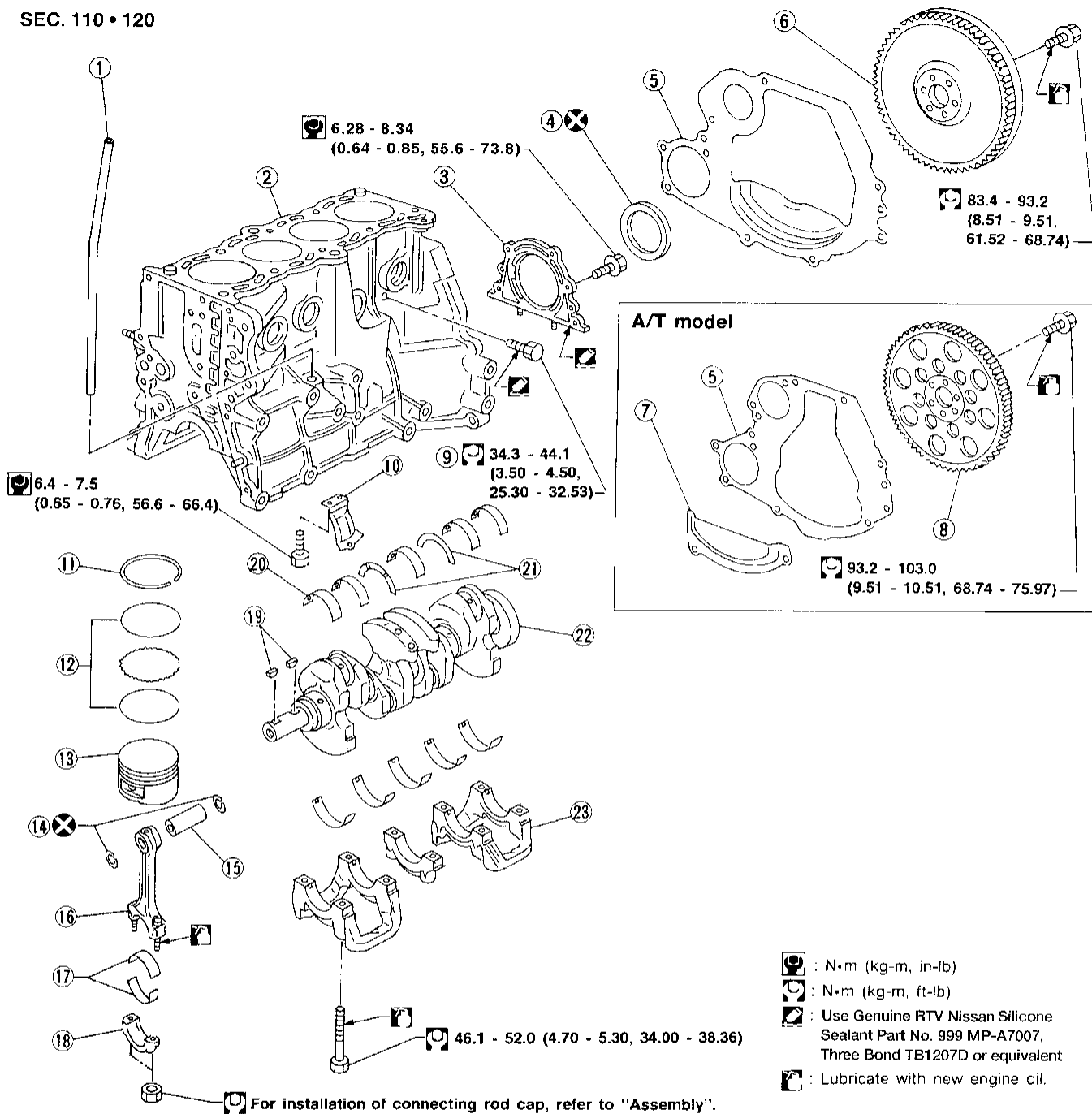
Installation

When installing the engine, adjust the height of buffer rod as shown. (For M/T models.)

- Install in reverse order of removal.

CYLINDER BLOCK

SEC. 110 • 120



- ① Oil level gauge guide
- ② Cylinder block
- ③ Rear oil seal retainer
- ④ Rear oil seal
- ⑤ Rear plate
- ⑥ Flywheel
- ⑦ Rear plate cover
- ⑧ Drive plate

- ⑨ Drain plug
- ⑩ Buffer plate
- ⑪ Top ring
- ⑫ Oil ring
- ⑬ Piston
- ⑭ Snap ring
- ⑮ Piston pin
- ⑯ Connecting rod

- ⑰ Connecting rod bearing
- ⑱ Connecting rod cap
- ⑲ Key
- ⑳ Main bearing
- ㉑ Thrust bearing
- ㉒ Crankshaft
- ㉓ Main bearing cap

- : N·m (kg-m, in-lb)
- : N·m (kg-m, ft-lb)
- : Use Genuine RTV Nissan Silicone Sealant Part No. 999 MP-A7007, Three Bond TB1207D or equivalent
- : Lubricate with new engine oil.

AEM341

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CYLINDER BLOCK

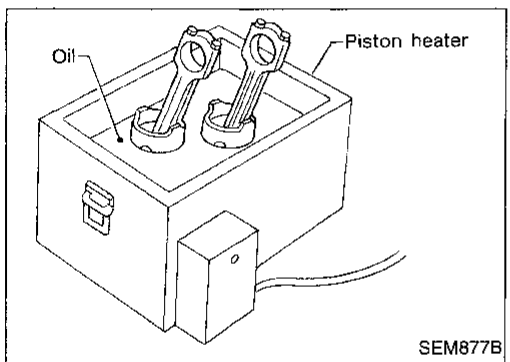
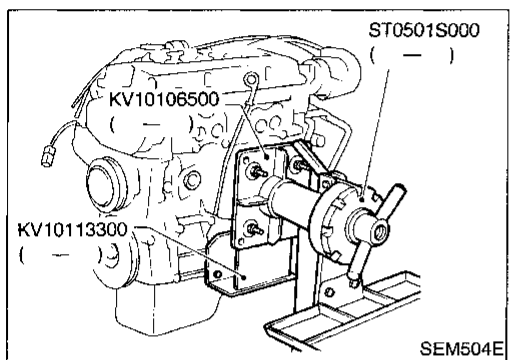
CAUTION:

- When installing sliding parts such as bearings and pistons, apply engine oil on the sliding surfaces.
- 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 ring gear teeth of flywheel or drive plate, and rear plate.

Disassembly

PISTON AND CRANKSHAFT

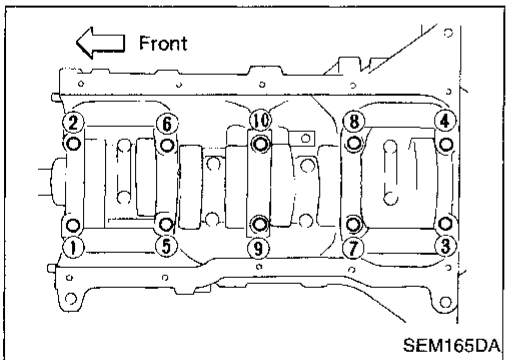
1. Place engine on a work stand.
2. Drain coolant and oil.
3. Remove timing chain.
Refer to EM-18.



4. Remove pistons with connecting rod.
 - When disassembling piston and connecting rod, remove snap ring first. Then heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.

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 either side up.

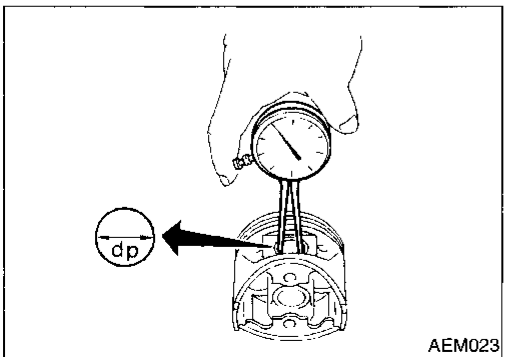


5. Loosen main bearing caps in numerical order as shown in figure.
6. Remove bearing caps, main bearings and crankshaft.
 - Before removing bearing caps, measure crankshaft end play. Refer to EM-54.
 - Bolts should be loosened in two or three steps.

Inspection

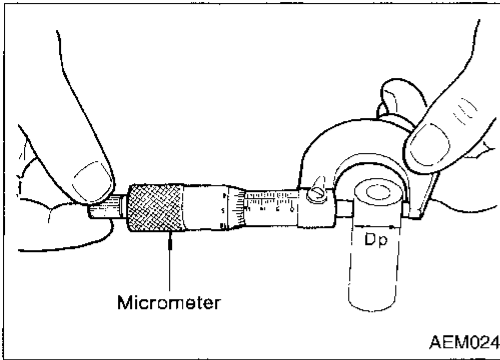
PISTON AND PISTON PIN CLEARANCE

1. Measure inner diameter of piston pin hole "dp".
Standard diameter "dp":
18.987 - 18.999 mm (0.7475 - 0.7480 in)



CYLINDER BLOCK

Inspection (Cont'd)



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

Standard diameter "Dp":

18.989 - 19.001 mm (0.7476 - 0.7481 in)

3. Calculate piston pin clearance.

Dp - dp = -0.004 to 0 mm (-0.0002 to 0 in)

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

GI

MA

EM

PISTON RING SIDE CLEARANCE

Side clearance:

Top ring

0.040 - 0.080 mm (0.0016 - 0.0031 in)

Max. limit of side clearance:

0.1 mm (0.004 in)

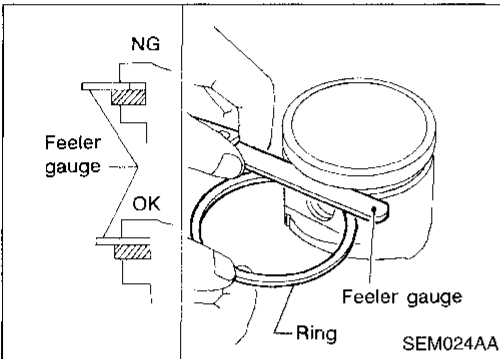
If out of specification, replace piston and/or piston ring assembly.

LC

EC

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PISTON RING END GAP

End gap:

Top ring 0.20 - 0.44 mm (0.0079 - 0.0173 in)

Oil ring 0.20 - 0.69 mm (0.0079 - 0.0272 in)

Max. limit of ring gap:

Top ring 0.49 mm (0.0193 in)

Oil ring 0.69 mm (0.0272 in)

If out of specification, replace piston ring. If gap exceeds maximum limit with a new ring, rebore cylinder and use oversized piston and piston rings.

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Refer to SDS, EM-61.

- 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.

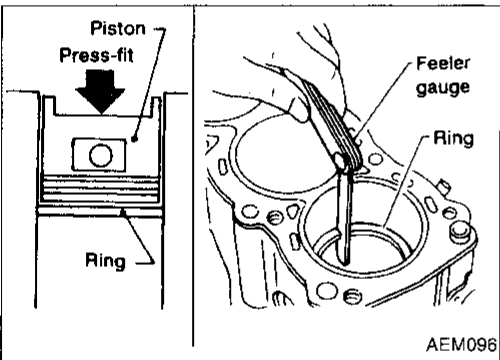
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CONNECTING ROD BEND AND TORSION

Bend:

Limit 0.15 mm (0.0059 in) per 100 mm (3.94 in) length

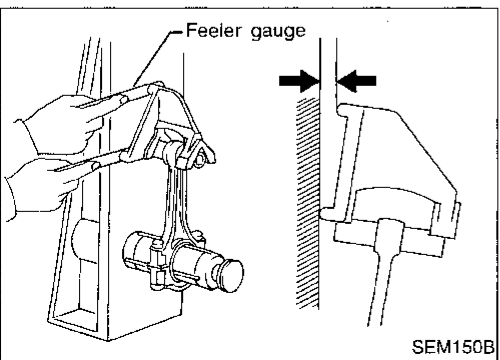
Torsion:

Limit 0.3 mm (0.012 in) per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.

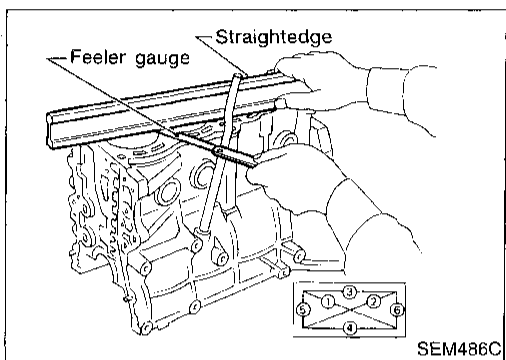
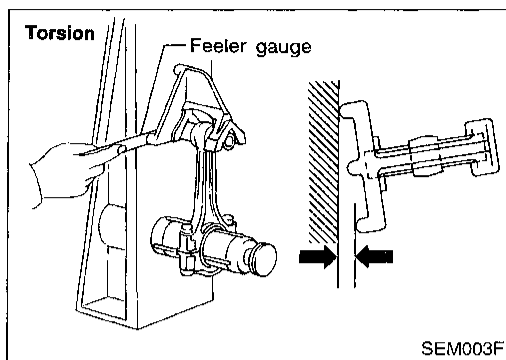
EL

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CYLINDER BLOCK

Inspection (Cont'd)



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 figure.

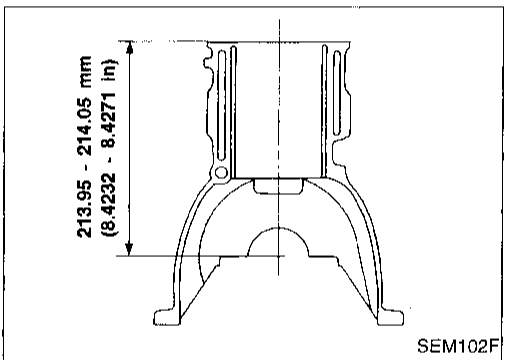
Block surface flatness:

Standard: Less than 0.03 mm (0.0012 in)

Limit: 0.10 mm (0.004 in)

If out of specification, resurface it.

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



Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

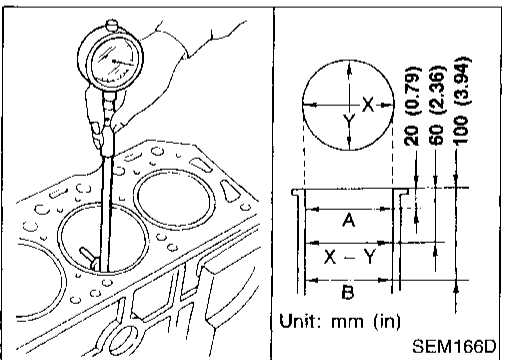
The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

Nominal cylinder block height from crankshaft center:

213.95 - 214.05 mm (8.4232 - 8.4271 in)

If necessary, replace cylinder block.



PISTON-TO-BORE CLEARANCE

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

Standard inner diameter:

76.000 - 76.010 mm (2.9921 - 2.9925 in)

Wear limit:

0.2 mm (0.008 in)

Out-of-round (X - Y) standard:

Less than 0.015 mm (0.0006 in)

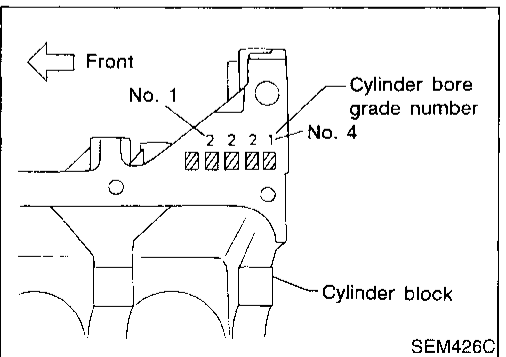
Taper (A - B) standard:

Less than 0.01 mm (0.0004 in)

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

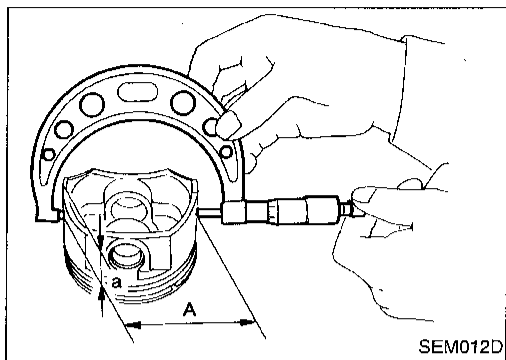
- Check for score and seizure. If seizure is found, hone it.

- If cylinder block or piston is replaced, match piston grade with grade number on cylinder block lower surface.**



CYLINDER BLOCK

Inspection (Cont'd)



3. Measure piston skirt diameter.
Piston diameter "A":
Refer to SDS, EM-61.
Measuring point "a" (Distance from the bottom):
9.9 mm (0.390 in)
4. Check that piston-to-bore clearance is within specification.
Piston-to-bore clearance = cylinder bore measurement "B" – Piston diameter "A":
0.015 - 0.035 mm (0.0006 - 0.0014 in)
5. Determine piston oversize according to amount of cylinder wear.

Oversize pistons are available for service. Refer to SDS EM-61.

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

Rebored size calculation:

$$D = A + B - C$$

where,

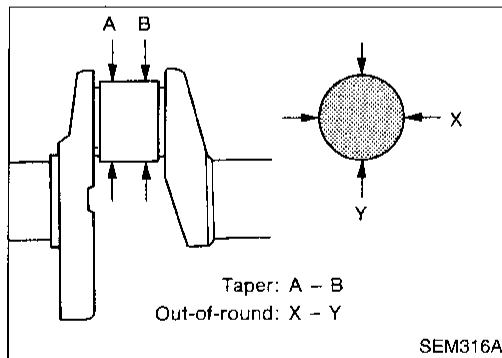
D: Bored diameter

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 bolts to the specified torque. This will prevent distortion of cylinder bores.
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 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

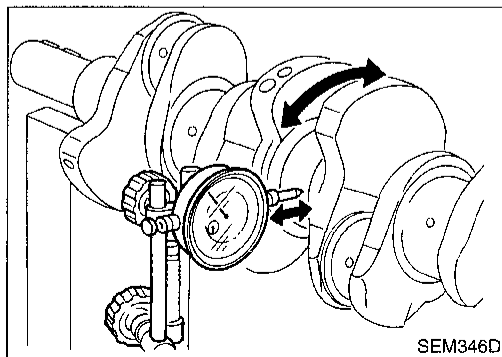
1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out-of-round.

Out-of-round (X - Y):

Less than 0.002 mm (0.0001 in)

Taper (A - B):

Less than 0.003 mm (0.0001 in)



3. Measure crankshaft runout.
Runout (Total indicator reading):
Less than 0.04 mm (0.0016 in)

CYLINDER BLOCK

Inspection (Cont'd)

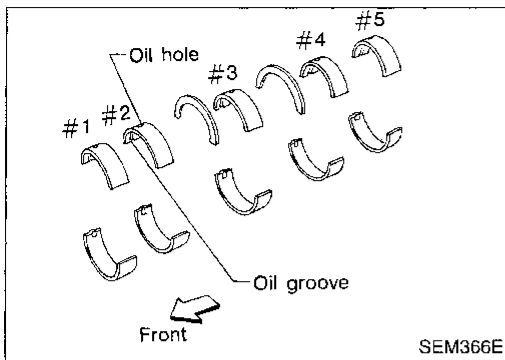
BEARING CLEARANCE

- Use Method A or Method B. Method A is preferred because it is more accurate.

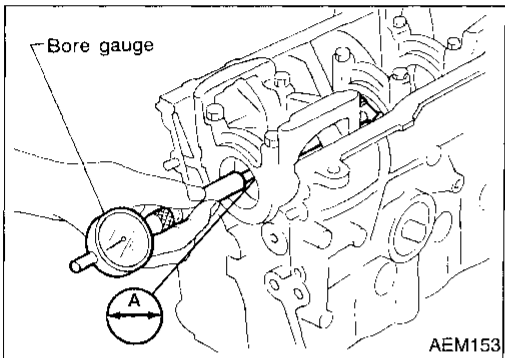
Method A (Using bore gauge and micrometer)

Main bearing

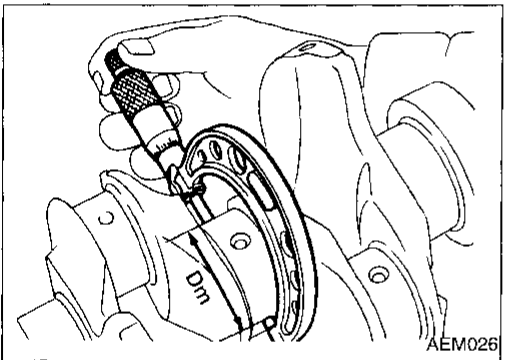
1. Set main bearings in their proper positions on cylinder block and main bearing cap.



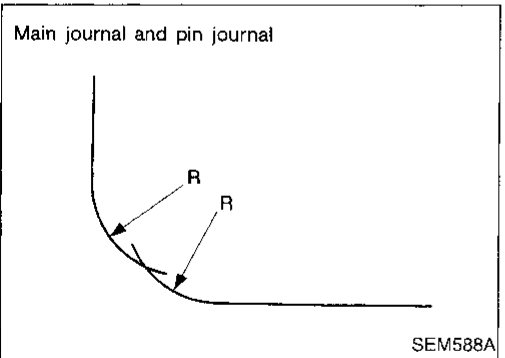
SEM366E



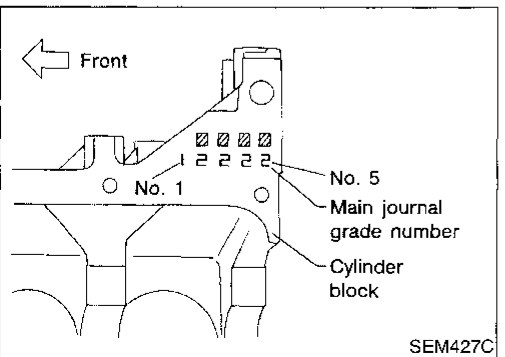
AEM153



AEM026



SEM588A



SEM427C

2. Install main bearing cap to cylinder block.

Tighten all bolts in correct order in two or three stages. Refer to EM-54.

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

4. Measure outer diameter "Dm" of each main journal in crankshaft.

5. Calculate main bearing clearance.

$$\text{Main bearing clearance} = A - Dm$$

Standard: 0.018 - 0.042 mm (0.0007 - 0.0017 in)

Limit: 0.1 mm (0.004 in)

If it exceeds the limit, replace bearing.

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

When grinding crank pin and crank journal:

- Grind until clearance is within specified standard bearing clearance.
- Fillets should be finished as shown in the figure.
R: 2.3 - 2.5 mm (0.091 - 0.098 in)

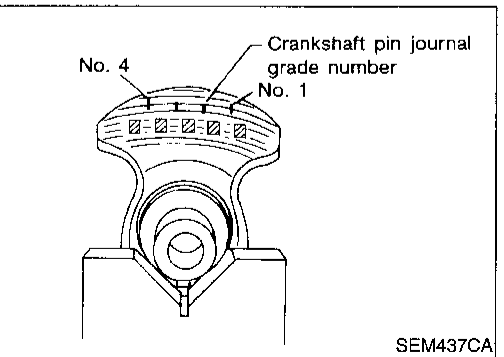
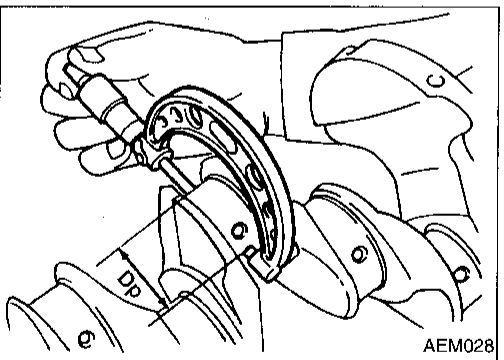
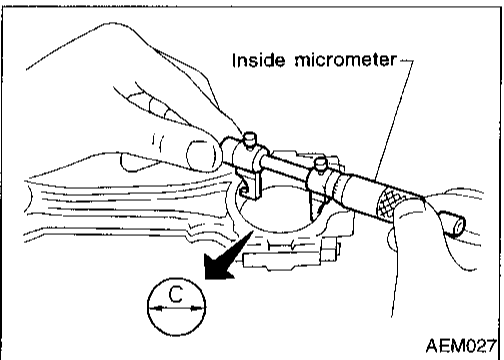
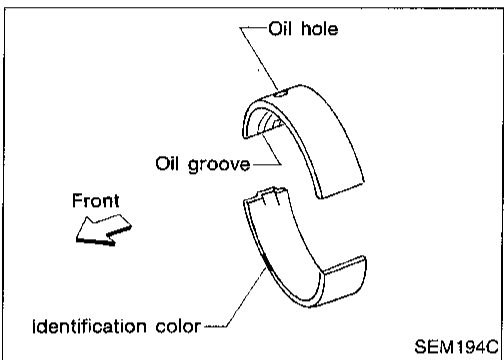
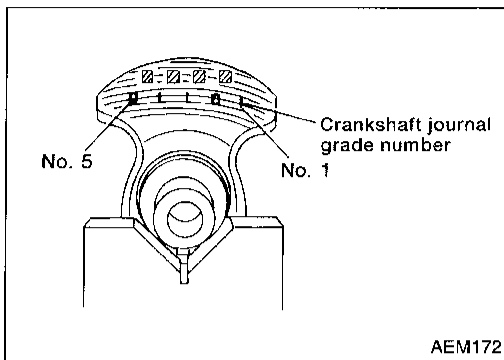
Refer to SDS, EM-62 for standard bearing clearance and available spare parts.

6. If the crankshaft is replaced, 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 Roman numerals.

CYLINDER BLOCK

Inspection (Cont'd)



- b. Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Roman numerals.
- c. Select main bearing with suitable thickness according to the following table.

Main bearing grade color:

Crankshaft main journal grade number	Cylinder block main journal grade number		
	0	1	2
0	Black	Brown	Green
1	Brown	Green	Yellow
2	Green	Yellow	Blue

For example:

Cylinder block main journal grade number: 1
 Crankshaft main journal grade number: 2
 Main bearing grade number = 1 + 2 = Yellow

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 each bearing.

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

$$\text{Connecting rod bearing clearance} = C - Dp$$

Standard: 0.014 - 0.039 mm (0.0006 - 0.0015 in)

Limit: 0.1 mm (0.004 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. Refer to step 5, EM-50.

- If a new bearing, crankshaft or connecting rod is replaced, select connecting rod bearing according to the following table.

Connecting rod bearing grade number:

These numbers are punched in either Arabic or Roman numerals.

Crankshaft pin journal grade number	Connecting rod bearing grade color
0	—
1	Brown
2	Green

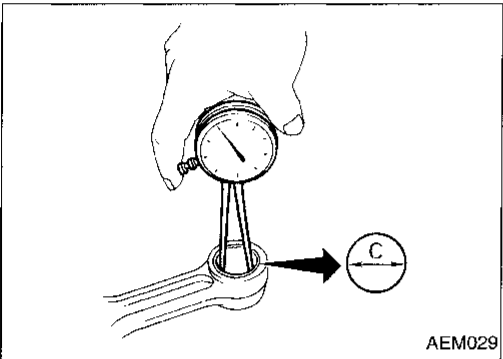
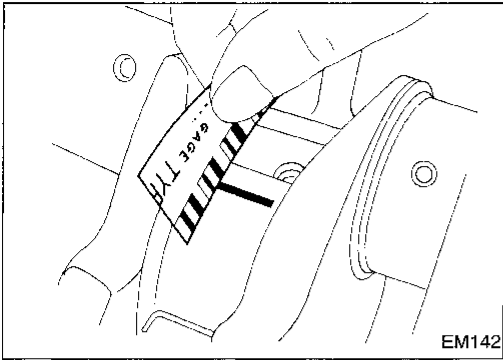
CYLINDER BLOCK

Inspection (Cont'd)

Method B (Using Plastigage)

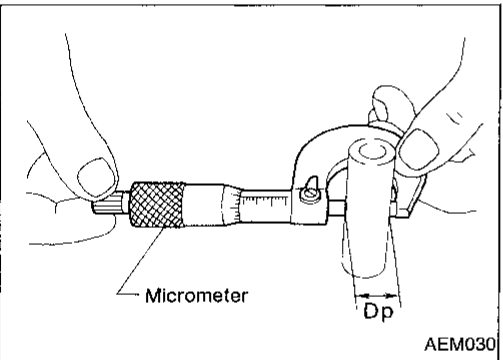
CAUTION:

- Do not turn crankshaft or connecting rod while Plastigage is being inserted.
- If incorrect bearing clearance exists, use a thicker or undersized main bearing to ensure specified clearance.



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.

$$\text{Connecting rod bushing clearance} = C - Dp$$

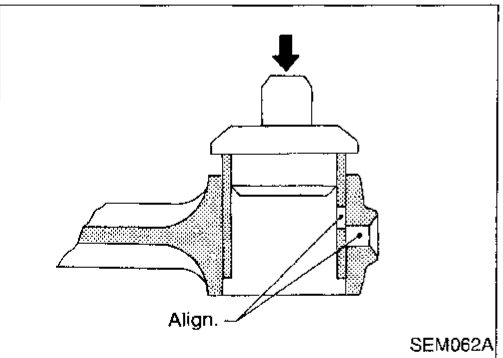
Standard:

0.005 - 0.017 mm (0.0002 - 0.0007 in)

Limit:

0.023 mm (0.0009 in)

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



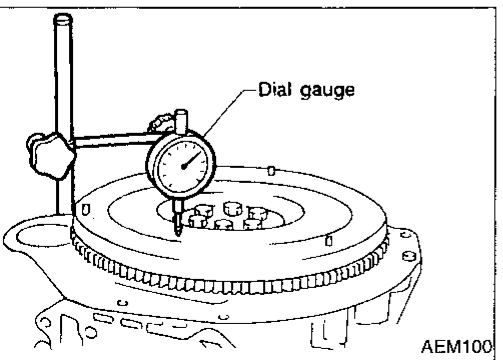
REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

1. Drive in small end bushing until it is flush with end surface of rod.

Be sure to align the oil holes.

2. Ream the bushing so that clearance with piston pin is within specification.

Clearance between connecting rod bushing and piston pin: 0.005 - 0.017 mm (0.0002 - 0.0007 in)



FLYWHEEL/DRIVEPLATE RUNOUT

Runout (Total indicator reading):

Flywheel (M/T models)

Less than 0.15 mm (0.0059 in)

Drive plate (A/T models)*

Less than 0.2 mm (0.008 in)

*Measuring points: Approximately 115 mm (4.53 in) from crankshaft center

CYLINDER BLOCK

Inspection (Cont'd)

CAUTION:

- Do not allow any magnetic materials to contact the ring gear teeth and rear plate.
- Do not resurface flywheel. Replace as necessary.

GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

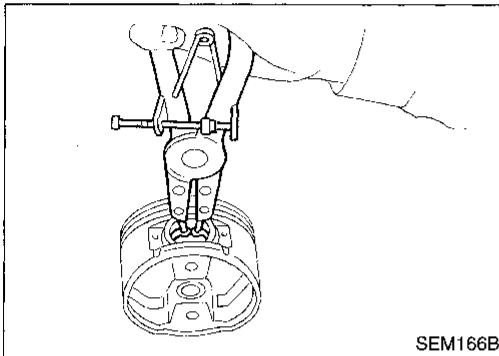
RS

BT

HA

EL

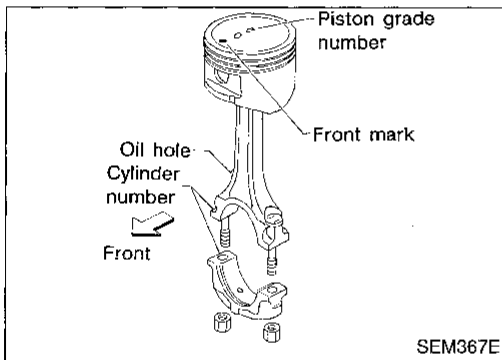
IDX



Assembly

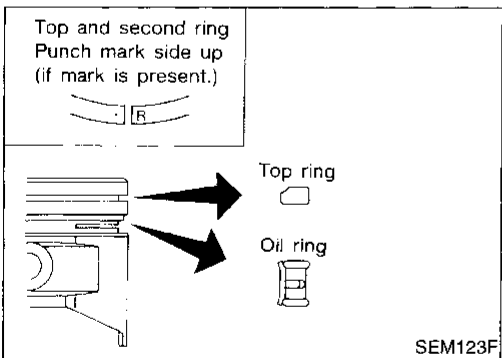
PISTON

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.

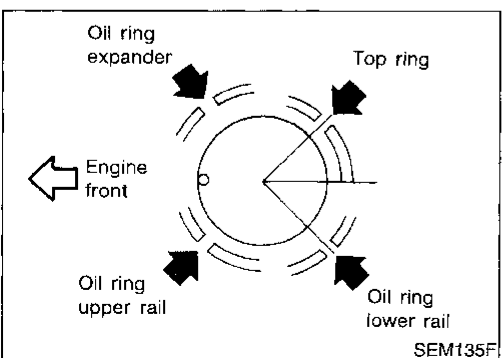
- Align the direction of piston and connecting rod.
- Numbers stamped on connecting rod and cap correspond to each cylinder.
- After assembly, make sure connecting rod swings smoothly.



3. Set piston rings as shown.

CAUTION:

- When piston rings are not replaced, make sure that piston rings are mounted in their original position.
- Install new piston rings either side up if there is no punch mark.

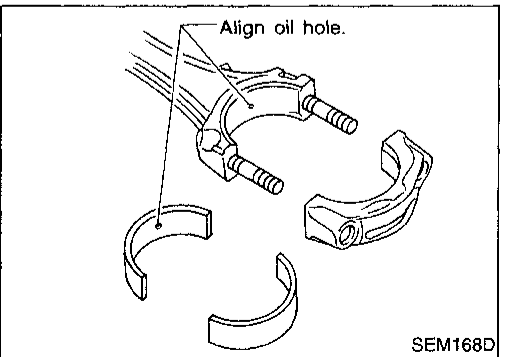
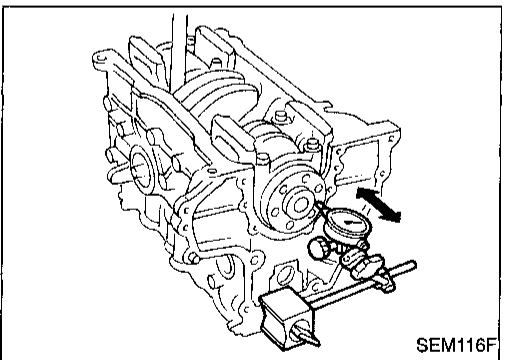
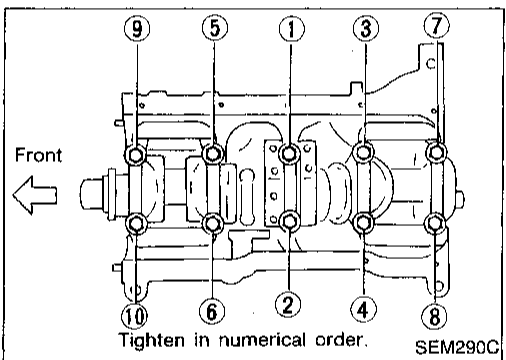
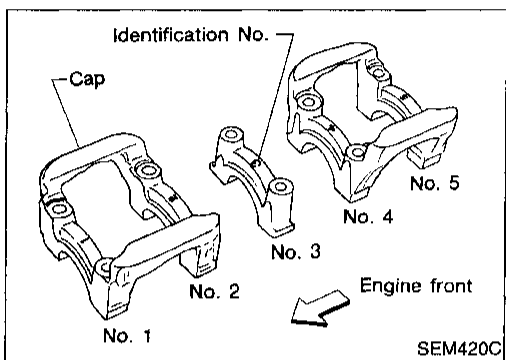
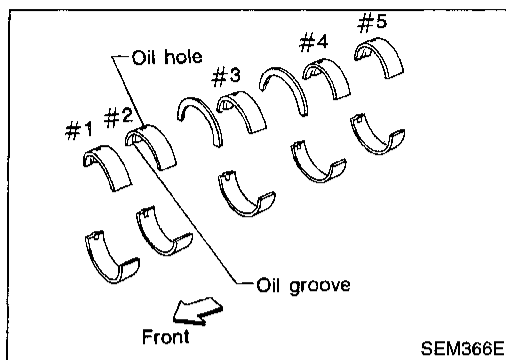


- Align piston rings so that end gaps are positioned as shown.

CYLINDER BLOCK

Assembly (Cont'd)

CRANKSHAFT



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

- Confirm that correct main bearings are selected by using Method A or Method B. Refer to EM-50.
- Apply new engine oil to bearing surfaces.

2. Install crankshaft and main bearing caps and tighten bolts to the specified torque.

- Apply new engine oil to the bolt thread and seat surface.
- Prior to tightening bearing cap bolts, shift crankshaft back and forth to properly seat the bearing caps.
- Tighten bearing cap bolts gradually in two or three stages. Start with center bearing and move outward as shown in figure.
- After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.

3. Measure crankshaft end play.

Crankshaft end play:

Standard

0.060 - 0.180 mm (0.0024 - 0.0071 in)

Limit

0.3 mm (0.012 in)

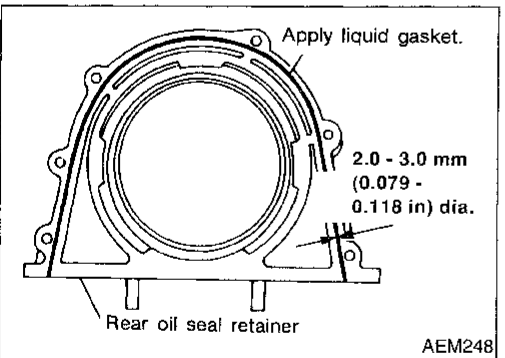
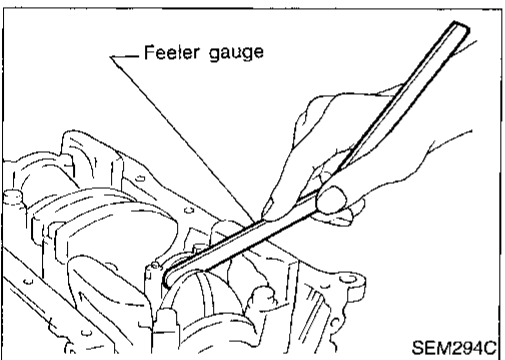
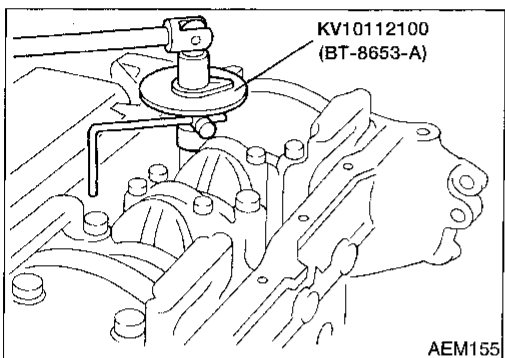
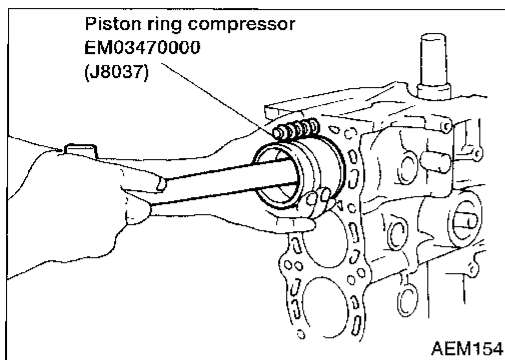
If beyond the limit, replace thrust bearings with new ones.

4. Install connecting rod bearings in connecting rods and connecting rod caps.

- Confirm that correct bearings are used. Refer to EM-51.
- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.
- Apply new engine oil to bolt threads and bearing surfaces.

CYLINDER BLOCK

Assembly (Cont'd)



5. Install pistons with connecting rods.
 - a. Install them into corresponding cylinders with Tool.
 - **Make sure connecting rod does not scratch cylinder wall.**
 - **Make sure connecting rod bolts do not scratch crankshaft pin journals.**
 - **Arrange so that front mark on piston head faces engine.**
 - **Apply new engine oil to piston rings and sliding surface of piston.**

- b. Install connecting rod caps.

Apply new engine oil to bolt threads and nut seating surfaces.

Tighten connecting rod cap nuts in the following procedure:

 - 1) **Tighten to 13.72 to 15.68 N·m (1.399 to 1.599 kg-m, 10.120 - 11.566 ft-lb).**
 - 2) **Turn nuts to 35° to 40° degrees clockwise with an angle wrench. If an angle wrench is not available, tighten nuts to 23 to 28 N·m (2.3 to 2.9 kg-m, 17 to 21 ft-lb).**

6. Measure connecting rod side clearance.

Connecting rod side clearance:

Standard
0.200 - 0.470 mm (0.0079 - 0.0185 in)

Limit
0.50 mm (0.0197 in)

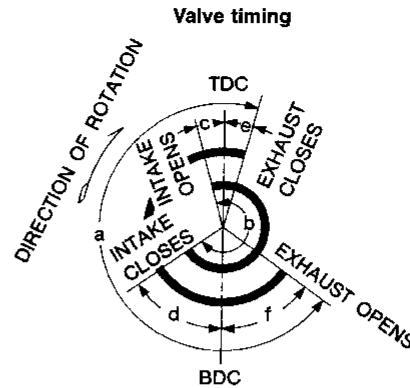
If beyond the limit, replace connecting rod and/or crankshaft.

7. Install rear oil seal retainer.
 - a. Before installing rear oil seal retainer, remove old liquid gasket from cylinder block and retainer.
 - b. Apply a continuous bead of liquid gasket to rear oil seal retainer.
 - **Use Nissan Genuine RTV silicone sealant Part No. 999MP-A7007, Three Bond TB1207D or equivalent.**
 - **Apply around inner side of bolt holes.**

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

Engine	GA16DE	
Classification	Gasoline	
Cylinder arrangement	4, in-line	
Displacement	cm ³ (cu in)	1,596 (97.39)
Bore × stroke	mm (in)	76.0 × 88.0 (2.992 × 3.465)
Valve arrangement	DOHC	
Firing order	1-3-4-2	
Number of piston rings		
Compression	1	
Oil	1	
Number of main bearings	5	
Compression ratio	9.9	



EM120
Unit: degree

a	b	c	d	e	f
222	236	-12	68	0	42

Inspection and Adjustment

COMPRESSION PRESSURE

Unit: kPa (kg/cm², psi)/350 rpm

Standard	1,373 (14.0, 199)
Minimum	1,177 (12.0, 171)
Difference limit between cylinders	98 (1.0, 14)

CYLINDER HEAD

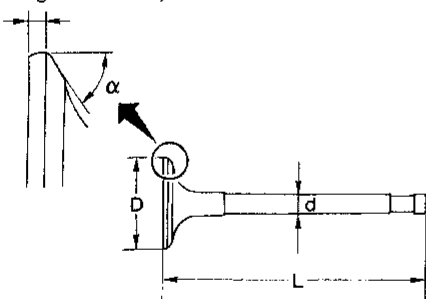
Unit: mm (in)

	Standard	Limit
Head surface flatness	Less than 0.03 (0.0012)	0.1 (0.004)
Height	117.8 - 118.0 (4.638 - 4.646)	—

VALVE

Unit: mm (in)

T (Margin thickness)



SEM188A

Valve head diameter "D"	Intake	29.9 - 30.2 (1.177 - 1.189)
	Exhaust	24.9 - 25.2 (0.980 - 0.992)
Valve length "L"	Intake	92.00 - 92.5 (3.6220 - 3.6417)
	Exhaust	92.37 - 92.87 (3.6366 - 3.6563)
Valve stem diameter "d"	Intake	5.465 - 5.480 (0.2152 - 0.2157)
	Exhaust	5.445 - 5.460 (0.2144 - 0.2150)
Valve face angle "α"	45°15' - 45°45'	
Valve margin "T" limit	1.05 - 1.35 (0.0413 - 0.0531)	
Valve stem end surface grinding limit	0.2 (0.008)	

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

Valve clearance

Unit: mm (in)

	For adjusting		For checking
	Hot	Cold* (reference data)	Hot
Intake	0.32 - 0.40 (0.013 - 0.016)	0.25 - 0.33 (0.010 - 0.013)	0.21 - 0.49 (0.008 - 0.019)
Exhaust	0.37 - 0.45 (0.015 - 0.018)	0.32 - 0.40 (0.013 - 0.016)	0.30 - 0.58 (0.012 - 0.023)

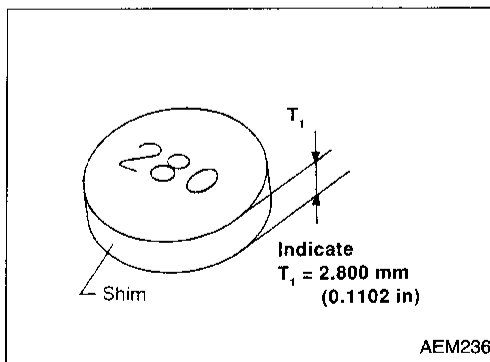
*: At a temperature of approximately 20°C (68°F)

Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary

Available shims

Thickness mm (in)	Identification mark
2.00 (0.0787)	200
2.02 (0.0795)	202
2.04 (0.0803)	204
2.06 (0.0811)	206
2.08 (0.0819)	208
2.10 (0.0827)	210
2.12 (0.0835)	212
2.14 (0.0843)	214
2.16 (0.0850)	216
2.18 (0.0858)	218
2.20 (0.0866)	220
2.22 (0.0874)	222
2.24 (0.0882)	224
2.26 (0.0890)	226
2.28 (0.0898)	228
2.30 (0.0906)	230
2.32 (0.0913)	232
2.34 (0.0921)	234
2.36 (0.0929)	236
2.38 (0.0937)	238
2.40 (0.0945)	240
2.42 (0.0953)	242
2.44 (0.0961)	244
2.46 (0.0969)	246
2.48 (0.0976)	248
2.50 (0.0984)	250
2.52 (0.0992)	252
2.54 (0.1000)	254
2.56 (0.1008)	256
2.58 (0.1016)	258

Thickness mm (in)	Identification mark
2.60 (0.1024)	260
2.62 (0.1031)	262
2.64 (0.1039)	264
2.66 (0.1047)	266
2.68 (0.1055)	268
2.70 (0.1063)	270
2.72 (0.1071)	272
2.74 (0.1079)	274
2.76 (0.1087)	276
2.78 (0.1094)	278
2.80 (0.1102)	280
2.82 (0.1110)	282
2.84 (0.1118)	284
2.86 (0.1126)	286
2.88 (0.1134)	288
2.90 (0.1142)	290
2.92 (0.1150)	292
2.94 (0.1157)	294
2.96 (0.1165)	296
2.98 (0.1173)	298



GI

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IDX

SERVICE DATA AND SPECIFICATIONS (SDS)

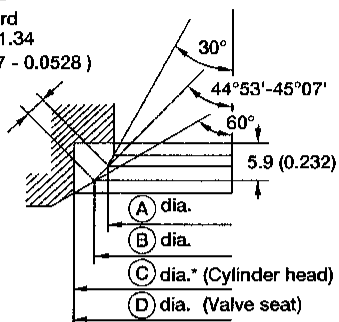
Inspection and Adjustment (Cont'd)

Valve seat

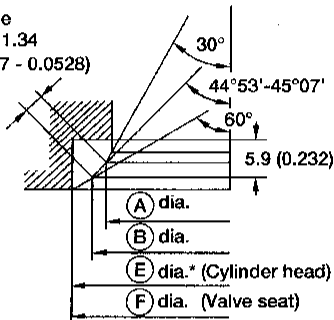
Unit: mm (in)

INTAKE

Standard
1.06 - 1.34
(0.0417 - 0.0528)



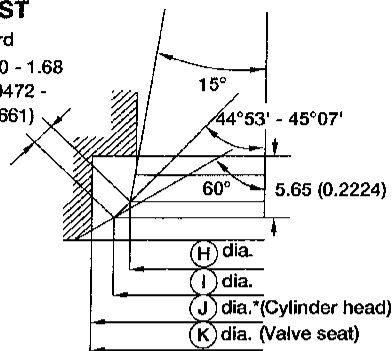
Oversize
1.06 - 1.34
(0.0417 - 0.0528)



*Cylinder head machining data

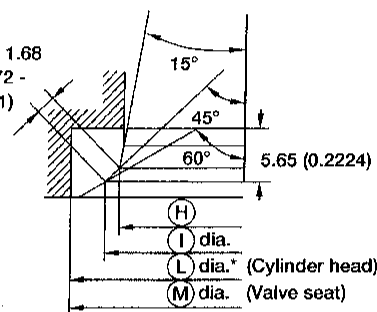
EXHAUST

Standard
1.20 - 1.68
(0.0472 - 0.0661)



Oversize

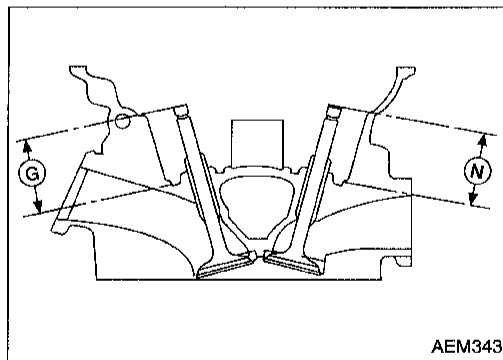
1.20 - 1.68
(0.0472 - 0.0661)



* Cylinder head machining data

AEM291

AEM342



AEM343

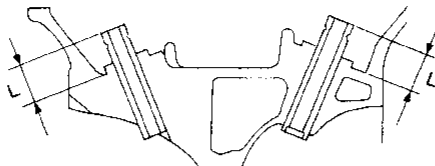
Dia.	INTAKE	Dia.	EXHAUST
(A)	27.8 - 28.0 (1.094 - 1.102) dia.	(H)	21.1 - 23.0 (0.831 - 0.906) dia.
(B)	29.5 - 29.7 (1.161 - 1.169) dia.	(I)	24.5 - 24.7 (0.965 - 0.972) dia.
(C)	31.0 - 31.016 (1.220 - 1.221) dia.*	(J)	26.0 - 26.016 (1.024 - 1.024) dia.
(D)	31.080 - 31.096 (1.224 - 1.224) dia.	(K)	26.080 - 26.096 (1.027 - 1.027) dia.
(E)	31.500 - 31.516 (1.240 - 1.241) dia.	(L)	26.500 - 26.516 (1.043 - 1.044) dia.
(F)	31.580 - 31.596 (1.243 - 1.244) dia.	(M)	26.580 - 26.596 (1.046 - 1.047) dia.
(G)	35.95 - 36.55 (1.4154 - 1.4390)	(N)	35.92 - 36.52 (1.4142 - 1.4378)

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

Valve guide

Unit: mm (in)



MEM096A

	Intake		Exhaust	
	Standard	Service	Standard	Service
Valve guide				
Outer diameter	9.523 - 9.534 (0.3749 - 0.3754)	9.723 - 9.734 (0.3828 - 0.3832)	9.523 - 9.534 (0.3749 - 0.3754)	9.723 - 9.734 (0.3828 - 0.3832)
Valve guide				
Inner diameter [Finished size]	5.500 - 5.515 (0.2165 - 0.2171)		5.500 - 5.515 (0.2165 - 0.2171)	
Cylinder head valve guide hole diameter	9.475 - 9.496 (0.3730 - 0.3739)	9.685 - 9.696 (0.3813 - 0.3817)	9.475 - 9.496 (0.3730 - 0.3739)	9.685 - 9.696 (0.3813 - 0.3817)
Interference fit of valve guide	0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)	0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)
Stem to guide clearance	0.020 - 0.050 (0.0008 - 0.0020)		0.040 - 0.070 (0.0016 - 0.0028)	
Valve deflection limit (Dial gauge reading)	0.2 (0.008)			
Projection length "L"	11.5 - 11.7 (0.453 - 0.461)			

GI

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SERVICE DATA AND SPECIFICATIONS (SDS)

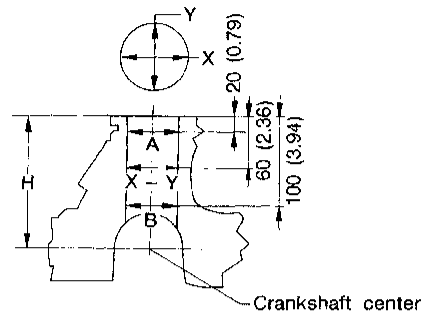
Inspection and Adjustment (Cont'd)

CYLINDER BLOCK

Unit: mm (in)

Valve spring

Free height	mm (in)	41.19 (1.6217)
Pressure N (kg, lb) at height mm (in)	Standard	344.42 (35.12, 77.44) at 25.26 (0.9945)
	Limit	330.41 (33.69, 74.31) at 23.64 (0.9307)
Out-of-square	mm (in)	Less than 1.80 (0.0709)



Valve lifter

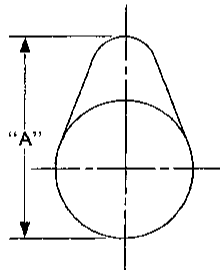
Unit: mm (in)

Valve lifter outside diameter	29.960 - 29.975 (1.1795 - 1.1801)
Lifter guide inside diameter	30.000 - 30.021 (1.1811 - 1.1819)
Clearance between lifter and lifter guide	0.025 - 0.061 (0.0010 - 0.0024)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

Cam height "A"	Intake	40.610 - 40.800 (1.5988 - 1.6063)
	Exhaust	39.910 - 40.100 (1.5713 - 1.5787)
Cam wear limit		0.20 (0.0079)



EM671

		Standard	Limit
Camshaft journal to bearing clearance		0.045 - 0.086 (0.0018 - 0.0034)	0.15 (0.0059)
Inner diameter of camshaft bearing	No. 1	28.000 - 28.021 (1.1024 - 1.1032)	---
	No. 2 to No. 5	24.000 - 24.021 (0.9449 - 0.9457)	
Outer diameter of camshaft journal	No. 1	27.935 - 27.955 (1.0998 - 1.1006)	---
	No. 2 to No. 5	23.935 - 23.955 (0.9423 - 0.9431)	
Camshaft runout [TIR*]		Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft end play		0.115 - 0.188 (0.0045 - 0.0074)	0.20 (0.0079)

*: Total indicator reading

SEM171D

	Standard	Limit
Surface flatness	Less than 0.03 (0.0012)	0.1 (0.004)
Height "H" (nominal)	213.95 - 214.05 (8.4232 - 8.4271)	---
Standard		
Inner diameter		0.2 (0.008)
Grade No. 1	76.000 - 76.010 (2.9921 - 2.9925)	
Grade No. 2	76.010 - 76.020 (2.9925 - 2.9929)	
Grade No. 3	76.020 - 76.030 (2.9929 - 2.9933)	
Out-of-round (X - Y)	Less than 0.015 (0.0006)	---
Taper (A - B)	Less than 0.010 (0.0004)	---

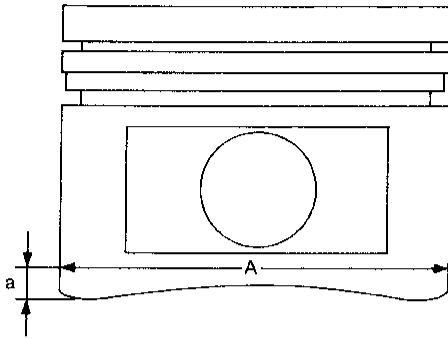
SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)



SEM125F

Piston skirt diameter "A"		
Standard		
Grade No. 1		75.975 - 75.985 (2.9911 - 2.9915)
Grade No. 2		75.985 - 75.995 (2.9915 - 2.9919)
Grade No. 3		75.995 - 76.005 (2.9919 - 2.9923)
0.5 (0.020) oversize (service)		76.475 - 76.505 (3.0108 - 3.0120)
1.0 (0.039) oversize (service)		76.975 - 77.005 (3.0305 - 3.0317)
"a" dimension		9.9 (0.390)
Piston pin hole inner diameter		18.987 - 18.999 (0.7475 - 0.7480)
Piston to bore clearance		0.015 - 0.035 (0.0006 - 0.0014)

Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.080 (0.0016 - 0.0031)	0.1 (0.004)
	Oil	0.20 - 0.69 (0.0079 - 0.0272)	0.69 (0.0272)
End gap	Top	0.20 - 0.44 (0.0079 - 0.0173)	0.49 (0.0193)
	Oil	0.20 - 0.69 (0.0079 - 0.0272)	0.69 (0.0272)

Piston pin

Unit: mm (in)

Piston pin outer diameter	18.989 - 19.001 (0.7476 - 0.7481)
Piston pin to piston clearance	- 0.004 to 0 (- 0.0002 to 0)
Piston pin to connecting rod, bushing clearance	0.005 - 0.017 (0.0002 - 0.0007)
	0.023 (0.0009)

CONNECTING ROD

Unit: mm (in)

Center distance	140.45 - 140.55 (5.5295 - 5.5335)	GI	
Bend limit [per 100 (3.94)]	0.15 (0.0059)		
Torsion limit [per 100 (3.94)]	0.3 (0.012)	MA	
Connecting rod bushing inner diameter* (small end)	19.000 - 19.012 (0.7480 - 0.7485)	EM	
Connecting rod big end inner diameter	43.000 - 43.013 (1.6929 - 1.6934)		
Side clearance	Standard	0.20 - 0.47 (0.0079 - 0.0185)	LC
	Limit	0.50 (0.0197)	

*: After installing in connecting rod

CRANKSHAFT

Unit: mm (in)

Main journal dia. "Dm"			FE
Grade No. 0		49.956 - 49.964 (1.9668 - 1.9671)	
Grade No. 1		49.948 - 49.958 (1.9665 - 1.9668)	CL
Grade No. 2		49.940 - 49.948 (1.9661 - 1.9665)	MT
Pin journal dia. "Dp"			
Grade No. 0		39.968 - 39.974 (1.5735 - 1.5738)	AT
Grade No. 1		39.962 - 39.968 (1.5733 - 1.5735)	FA
Grade No. 2		39.956 - 39.962 (1.5731 - 1.5733)	
Center distance "r"		43.95 - 44.05 (1.7303 - 1.7342)	RA
Out-of-round (X - Y)			
Standard		Less than 0.002 (0.0001)	BR
Taper (A - B)			
Standard		Less than 0.003 (0.0001)	
Runout [TIR*]			ST
Standard		Less than 0.04 (0.0016)	
Free end play			
Standard		0.060 - 0.180 (0.0024 - 0.0071)	RS
Limit		0.3 (0.012)	BT

*: Total indicator reading

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

MAIN BEARING

Standard

Grade No.	Thickness "T" mm (in)	Identification color
0	1.827 - 1.831 (0.0719 - 0.0721)	Black
1	1.831 - 1.835 (0.0721 - 0.0722)	Brown
2	1.835 - 1.839 (0.0722 - 0.0724)	Green
3	1.839 - 1.843 (0.0724 - 0.0726)	Yellow
4	1.843 - 1.847 (0.0726 - 0.0727)	Blue

Undersize

Unit: mm (in)

Thickness "T"	
0.25 (0.0098)	1.960 - 1.964 (0.0772 - 0.0773)
0.50 (0.0197)	2.085 - 2.089 (0.0821 - 0.0822)

CONNECTING ROD BEARING

Connecting rod bearing

Unit: mm (in)

	Grade No.	Thickness	Identification color or number
Standard	0	1.505 - 1.508 (0.0593 - 0.0594)	—
	1	1.508 - 1.511 (0.0594 - 0.0595)	Brown
	2	1.511 - 1.514 (0.0595 - 0.0596)	Green
Undersize	0.08 (0.0031)	1.542 - 1.546 (0.0607 - 0.0609)	8
	0.12 (0.0047)	1.562 - 1.566 (0.0615 - 0.0617)	12
	0.25 (0.0098)	1.627 - 1.631 (0.0641 - 0.0642)	25

BEARING CLEARANCE

Unit: mm (in)

Main bearing clearance	
Standard	0.018 - 0.042 (0.0007 - 0.0017)
Limit	0.1 (0.004)
Connecting rod bearing clearance	
Standard	0.014 - 0.039 (0.0006 - 0.0015)
Limit	0.1 (0.004)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Flywheel Runout [TIR*]	Less than 0.15 (0.0059)
Drive plate Runout [TIR*]	Less than 0.2 (0.008)
Camshaft sprocket Runout [TIR*]	Less than 0.15 (0.0059)

*: Total indicator reading