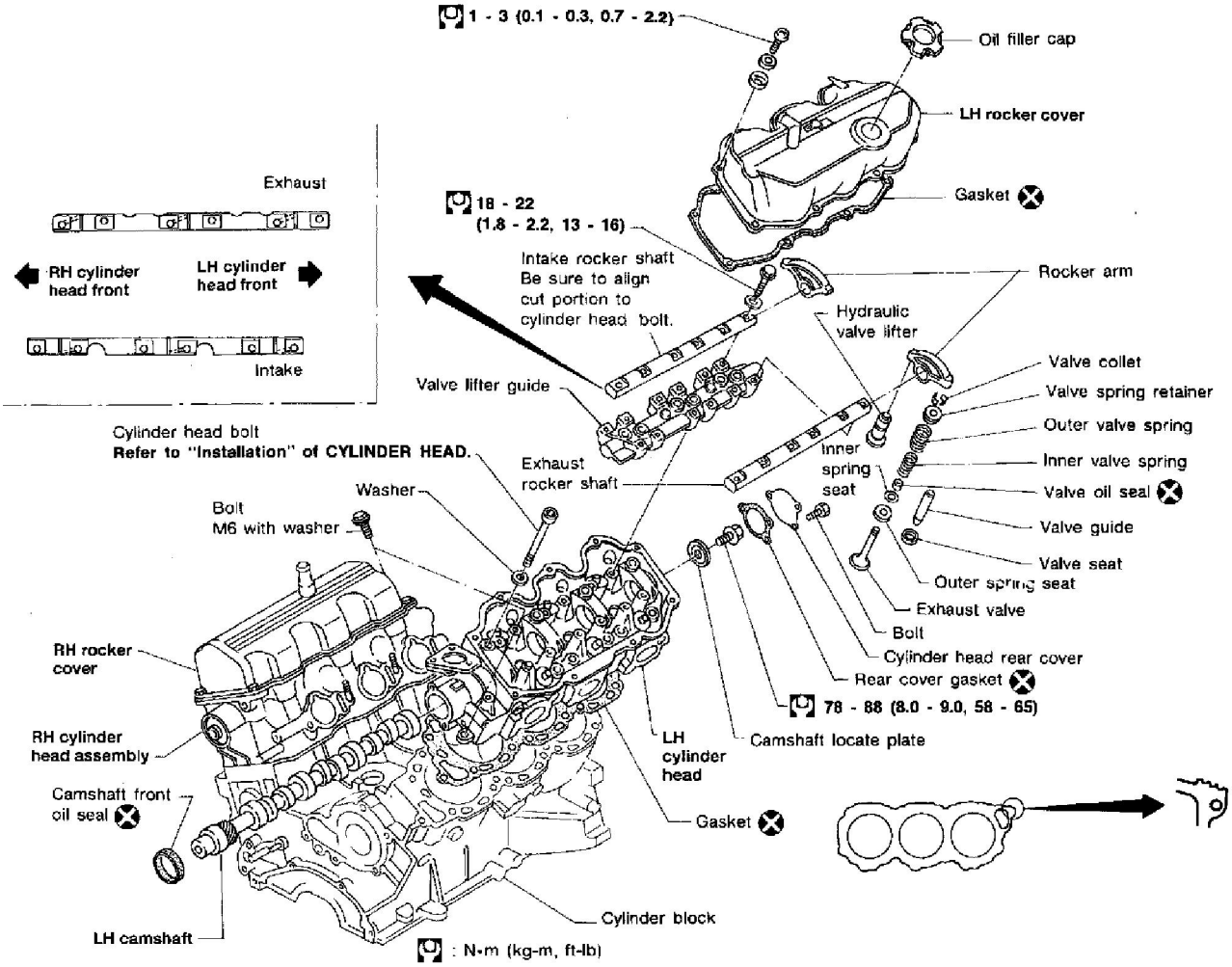
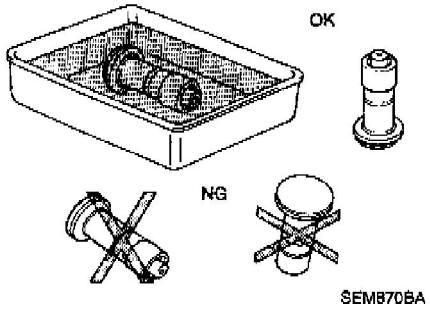
1996 Nissan-Datsun Truck Quest Minivan V6-2960cc 3.0L SOHC MFI (VG30E)

Cylinder Head Assembly: Service and Repair



CAUTION: When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces. When tightening cylinder head bolts and rocker shaft bolts, apply new engine oil to thread portions and seat surfaces of bolts.



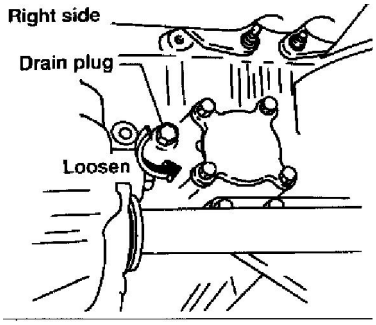
If hydraulic valve lifter is kept on its side, there is a risk of air entering it. After removal, always set hydraulic valve lifter straight up, or when laying it on its side, have it soak in new engine oil. Do not disassemble hydraulic valve lifter. Attach tags to valve lifters so as not to mix them up.

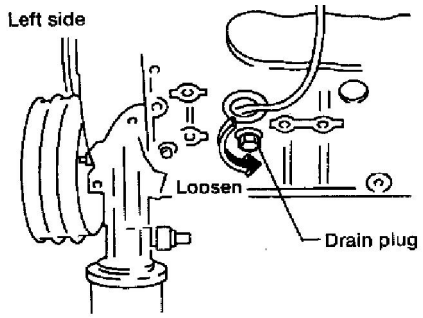
Removal

1. Release fuel pressure.

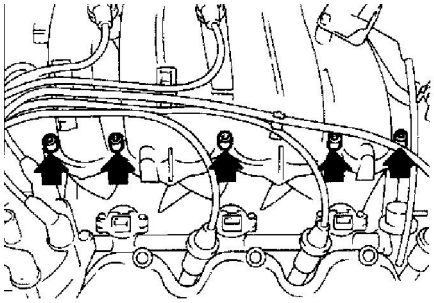
Refer to (Powertrain Management) Fuel Pressure".

2. Remove timing belt. Refer to Timing Belt See: Timing Components/Timing Belt/Service and Repair

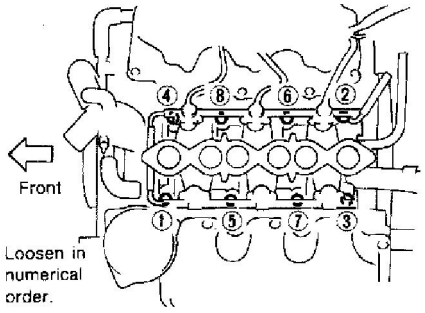




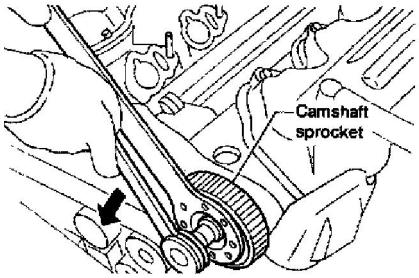
3. Drain coolant by removing drain plugs from both sides of cylinder block.
4. Separate ASCD and accelerator control wire from intake manifold collector.



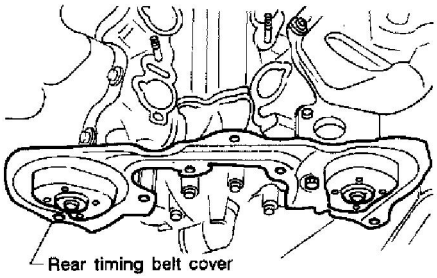
5. Remove intake manifold collector from engine. The following parts should be disconnected or removed:
   (a) Harness connectors for:
      - IAC valve-AAC valve
      - IAC valve-FICD solenoid valve
      - Closed throttle position switch
      - Throttle position sensor
      - AC valve-air regulator
      - EGR control-solenoid valve
      - EGR temperature sensor
      - Main harness connectors and brackets
   (b) Spark plug wires
   (c) Distributor dust cover
   (d) Distributor cap
   (e) PCV hoses
   (f) Vacuum hoses for
      - Master brake cylinder
      - Fuel pressure regulator
      - Carbon canister
      - Rear heater valve (if equipped)
   (g) Air hoses from
      - Air duct
   (h) Water hoses for
      - Throttle body
      - Water tube
   (I) Carbon canister purge hose
   (j) BPT tube (to EGR valve)
   (k) EGR tube



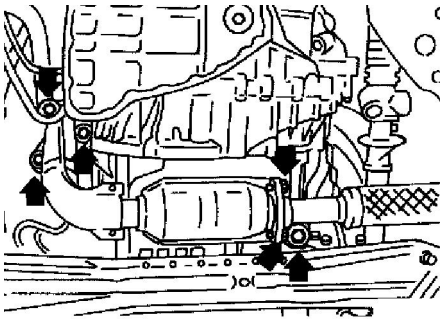
6. Remove intake manifold. The following parts should be disconnected or removed:
   - Fuel feed and return hoses
   - All fuel injector harness connectors
   - Fuel tube assembly
   - Upper radiator hose and bracket
   - Bypass hose
   - Engine coolant temperature sensor harness connector
   - Thermal transmitter



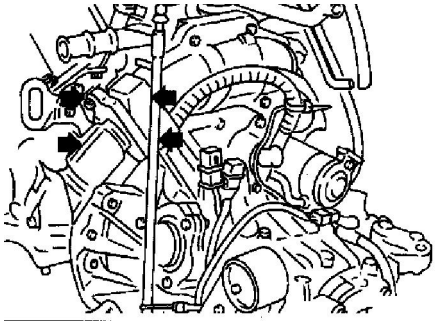
7. Remove both camshaft sprockets.



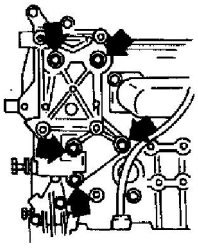
8. Remove rear timing belt cover.
9. GRemove distributor and ignition wires. **After pulling out distributor from cylinder head, do not rotate distributor rotor.**



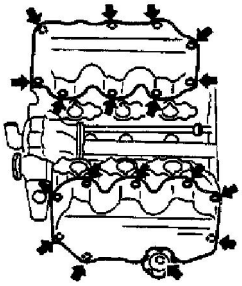
10. Remove exhaust tube from LH exhaust manifold.



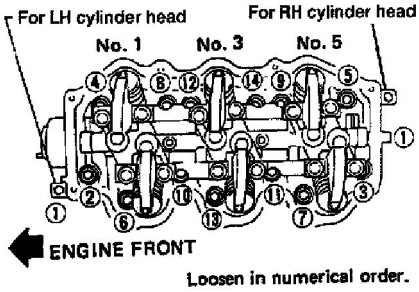
11. Remove the nuts and bolt and separate the LH exhaust manifold from the RH exhaust manifold.
12. Remove the LH exhaust manifold-to-support bracket bolt.



13. Remove compressor from bracket.
14. Remove compressor bracket.
15. Disconnect high pressure switch and magnetic clutch connectors.

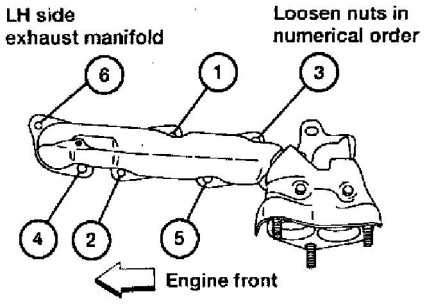


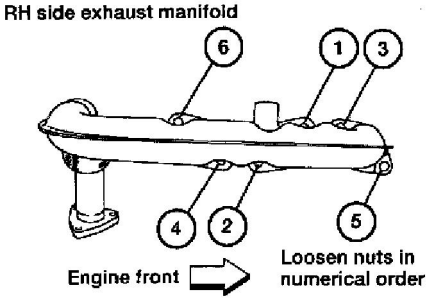
16. Remove both rocker covers.



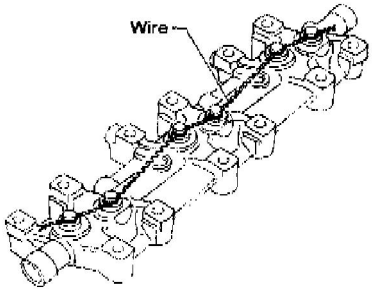
17. Remove cylinder head with exhaust manifold. **Warped or cracked cylinder head could result from removing in incorrect order. Cylinder head bolts should be loosened in two or three steps.**

Disassembly

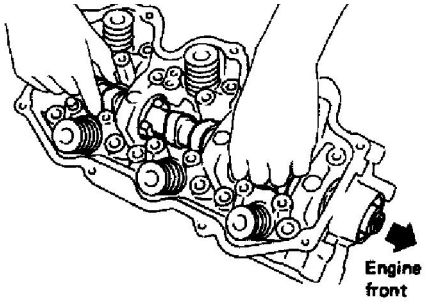




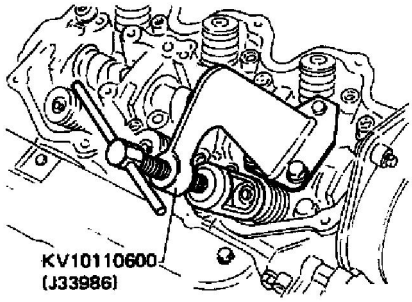
1. Remove exhaust manifolds from cylinder head.
2. Remove rocker shafts with rocker arms. **Bolts should be loosened in two or three steps.**
3. Remove hydraulic valve lifters and lifter guide.



- **Hold hydraulic valve lifters with wire so that they will not drop from lifter guide.**



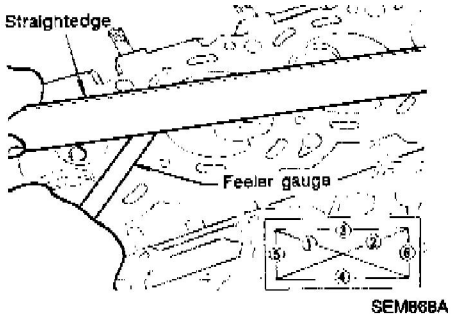
4. Remove oil seal and camshaft.
   - Before removing camshaft, measure camshaft end play.



5. Remove valve components with Tool.

6. Remove valve oil seals with Tool or suitable tool.

Inspection



CYLINDER HEAD DISTORTION

Head surface flatness: Less than **0.1 mm (0.004 in).** If beyond the specified limit, replace it or resurface it.

Resurfacing limit: The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.

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.

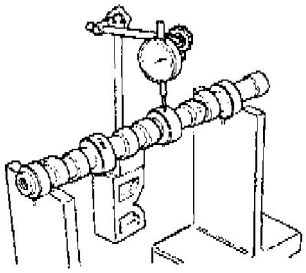
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height: **106.8 - 107.2 mm (4.205 - 4.220 in).**

CAMSHAFT VISUAL CHECK

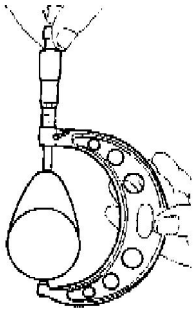
Check camshaft for scratches, seizure and wear.

CAMSHAFT RUNOUT

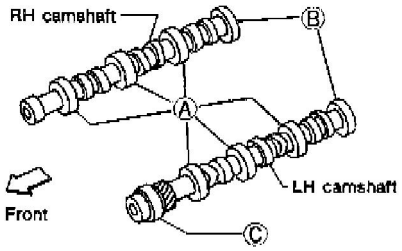


1. Measure camshaft runout at the center journal.
   Runout (Total indicator reading):
   Limit: **0.1 mm (0.004 in).**
2. If it exceeds the limit, replace camshaft.

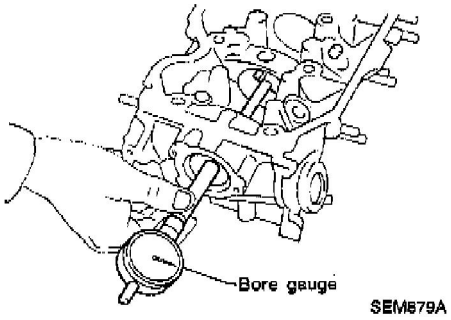
CAMSHAFT CAM HEIGHT



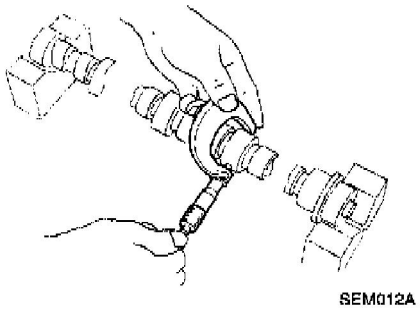
1. Measure camshaft cam height.
   Standard cam height:
   38.942 - 39.132 mm (1.5331 - 1.5406 in).
   Cam wear limit:
   0.15mm (0.0059 in).
2. If wear is beyond the limit, replace camshaft.



CAMSHAFT JOURNAL CLEARANCE



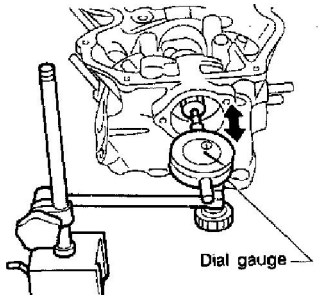
1. Measure inner diameter of camshaft bearing.
   Standard inner diameter:
   - A **47.000 - 47.025 mm (1.8504 - 1.8514 in).**
   - B **42.500 - 42.525 mm (1.6732 - 1.6742 in).**
   - C **48.000 - 48.025 mm (1.8898 - 1.8907 in).**



2. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   - A **46.920 - 46.940 mm (1.8472 - 1.8480 in).**
   - B **42.420 - 42.440 mm (1.6701 - 1.6709 in).**
   - C **47.920 - 47.940 mm (1.8866 - 1.8874 in).**
3. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance limit: **0.15 mm (0.0059 in).**

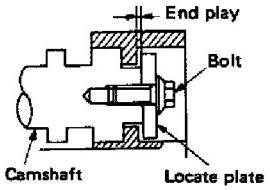
CAMSHAFT END PLAY

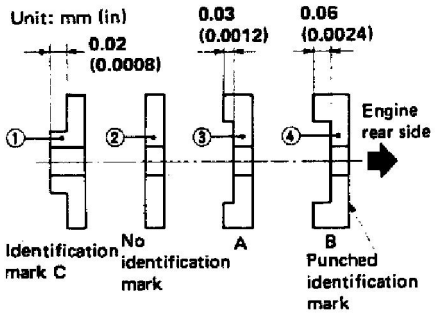
1. Install camshaft and locate plate in cylinder head.



2. Measure camshaft end play.
   Camshaft end play:
   Standard: **0.03-0.06 mm (0.0012 - 0.0024 in).**

3. If it is out of the specified range, select thickness of cam- shaft locate plate to obtain standard specified end play

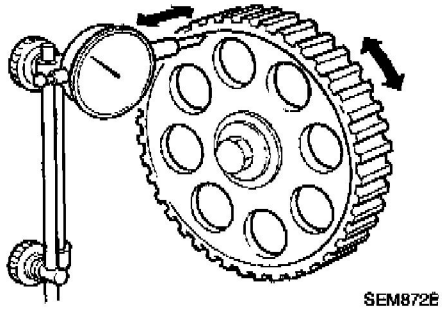




Example: When camshaft end play is **0.08 mm (0.0031 in)** with camshaft locating plate (2), replace camshaft locating plate (2) with camshaft locating plate (3) to set the end play at **0.05 mm (0.0020 in).**

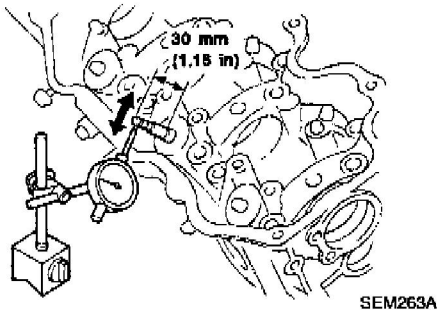
CAMSHAFT SPROCKET RUNOUT

1. Install sprocket on camshaft.

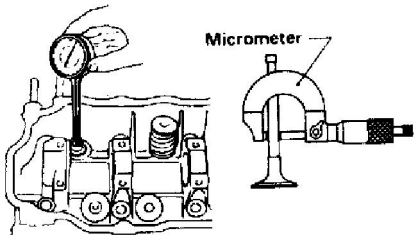


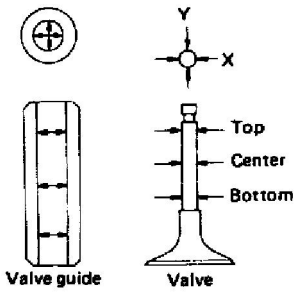
2. Measure camshaft sprocket runout.
   Runout (Total indicator reading):
   Limit: **0.1 mm (0.004 in).**
3. If it exceeds the limit, replace camshaft sprocket.

VALVE GUIDE CLEARANCE



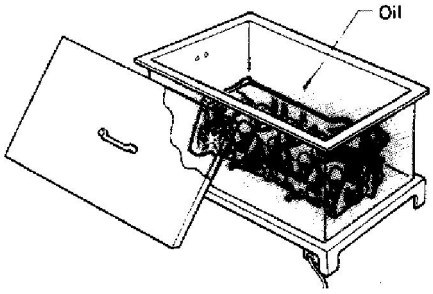
1. Measure valve deflection in a right-angled direction with camshaft. (Valve and valve guide mostly wear in this direction.) Valve deflection limit(Dial gauge reading): **0.20 mm (0.0079 in).**
2. If it exceeds the limit, check valve to valve guide clearance.



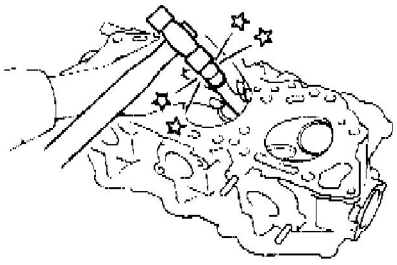


a. Measure valve stem diameter and valve guide inner diameter.
b. Check that clearance is within specification.
   Valve to valve guide clearance:
   Intake
   0.020 - 0.053 mm (0.0008 - 0.0021 in).
   Exhaust
   0.040 - 0.073 mm (0.0016 - 0.0029 in).
   Limit
   0.10 mm (0.00.39 in).
c. If it exceeds the limit, replace valve or valve guide.

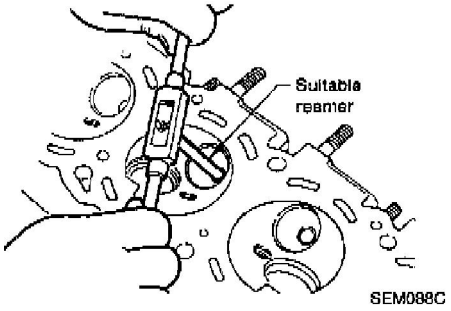
VALVE GUIDE REPLACEMENT



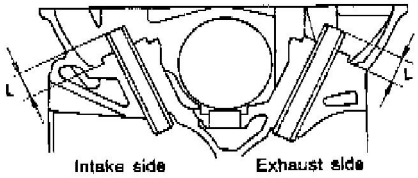
1. To remove valve guide, heat cylinder head to **150 to 1 60°C (302 to 320°F).**



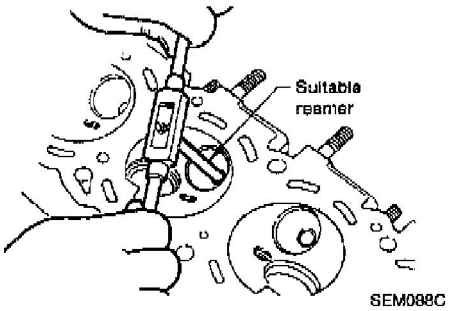
2. Drive out valve guide with a press [under a **20 kN (2 ton, 2.2 US ton, 2.0 Imp ton)** pressure] or hammer and suitable tool.



3. Ream cylinder head valve guide hole.
   Valve guide hole diameter (for service parts):
   Intake
   11.175 - 11.196 mm (0.4400-0.4408 in).
   Exhaust
   12.175 - 12.196 mm (0.4793 - 0.4802 in).
4. Heat cylinder head to **150 to 160°C (302 to 320°F)** and press service valve guide onto cylinder head.



Projection "L": **13.2 - 13.4 mm (0.520 - 0.528 in).**

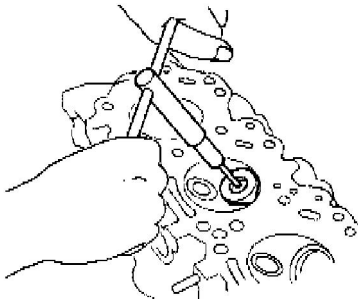


5. Ream valve guide.
   Finished size:
   Intake
   7.000 - 7.018 mm (0.2756 - 0.2763 in).
   Exhaust
   8.000 - 8.018 mm (0.3150 - 0.3157 in).

VALVE SEATS

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

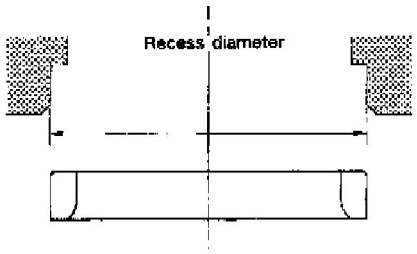
- Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them and recondition valve seat.



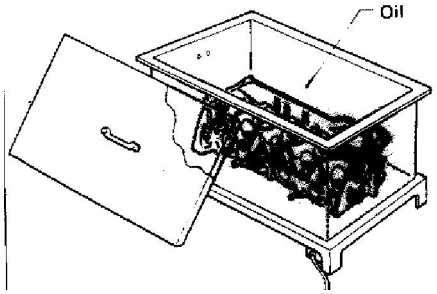
- Cut with both hands to maintain a uniform cutting surface.

REPLACING VALVE SEAT FOR SERVICE PARTS

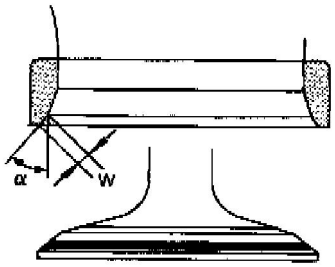
1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.



2. Ream cylinder head recess.
   Reaming bore for service valve seat Oversize **[0.5 mm (0.020 in)]**:
   Intake **44.500 - 44.516 mm (1.7520 - 1.7526 in).**
   Exhaust **37.500 - 37.516 mm (1.4764 - 1.4770 in)** Reaming should be done in circles concentric to the valve guide center so that valve seat will have the correct fit.

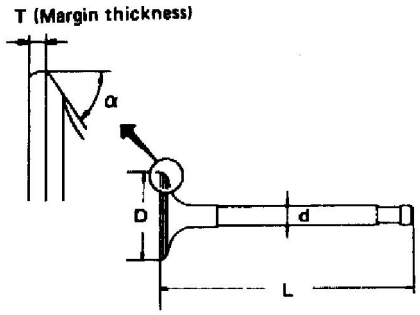


3. Heat cylinder head to **150 to 160°C (302 to 320°F)**.
4. Press fit valve seat until it seats on the bottom.
5. Cut or grind valve seat using suitable tool at the specified dimensions as shown at Valve Seat Specifications. See: Valve Seat/Specifications
6. After cutting, lap valve seat with abrasive compound.



		Intake	Exhaust
Seat face angle "α"	degree	45	45
Contacting width "W"	mm (in)	1.75 (0.0689)	1.7 (0.067)

7. Check valve seating condition.



VALVE DIMENSIONS

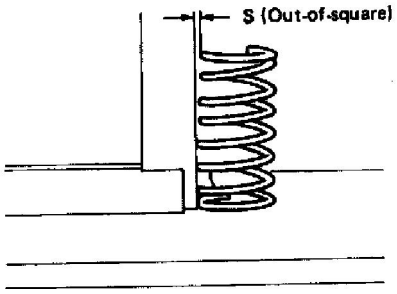
Check dimensions in each valve. For dimensions, refer to Valves, Intake and Exhaust See: Valve/Specifications When valve head has been worn

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.

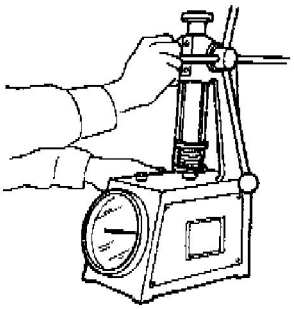
VALVE SPRING

Squareness



1. Measure "S" dimension.
   Out-of-square:
   Outer
   Less than **2.2 mm (0.087 in).**
   Inner
   Less than **1.9 mm (0.075 in).**
2. If it exceeds the limit, replace spring.

Pressure



Check valve spring pressure.

Pressure: N (kg, lb) at height mm (in).

Standard

Outer **523.7 (53.4, 117.7) at 30.0 (1.181).**

Inner **255.0 (26.0, 57.3) at 25.0 (0.984).**

Limit

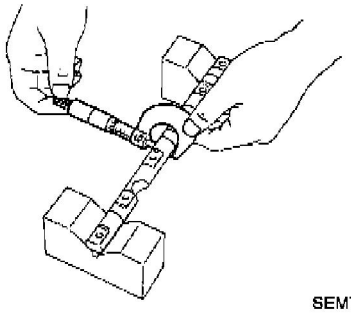
Outer More than **228.5 (23.3, 51.4) at 25.0 (0.9M).**

Inner More than **225.6 (23.0, 50.7) at 25.0 (0.984).**

If it exceeds the limit, replace spring.

ROCKER SHAFT AND ROCKER ARM

1. Check rocker shafts for scratches, seizure and wear.



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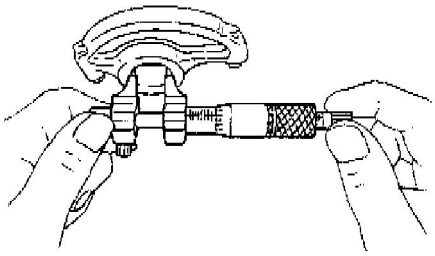
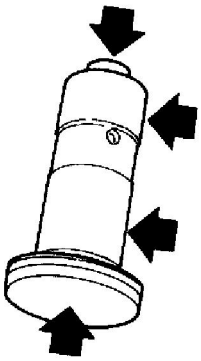
2. Check outer diameter of rocker shaft.
   Diameter:
   17.979 - 18.000 mm (0.7078 - 0.7087 in).

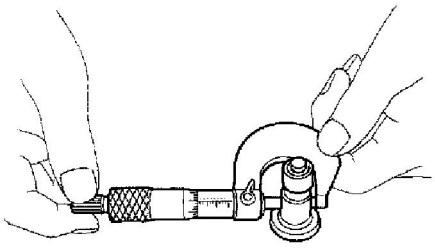


3. Check inner diameter of rocker arm.
   Diameter:
   18.007 - 18.028 mm (0.7089 - 0.7098 in).
   Rocker arm to shaft clearance:
   0.007 - 0.049 mm (0.0003 - 0.0019 in).
   Keep rocker arm with hydraulic valve lifter standing to prevent air from entering hydraulic valve lifter when checking.

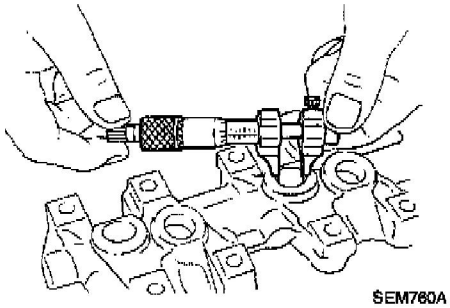
HYDRAULIC VALVE LIFTER



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



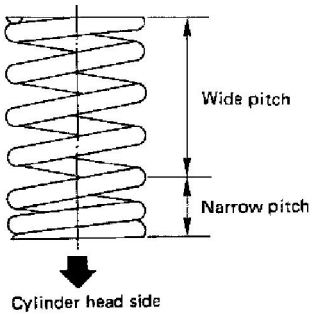
2. Check diameter of valve lifter.
   Outer diameter:
   15.947 - 15.957 mm (0.6278 - 0.6282 in).



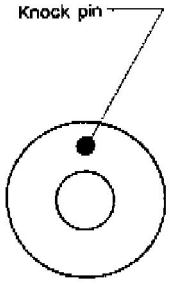
3. Check valve lifter guide inner diameter.
   Inner diameter:
   16.000 - 16.013 mm (0.6299 - 0.6304 in).
   Standard clearance between valve lifter and lifter guide:
   0.043 - 0.066 mm (0.0017 - 0.0026 in).

Assembly

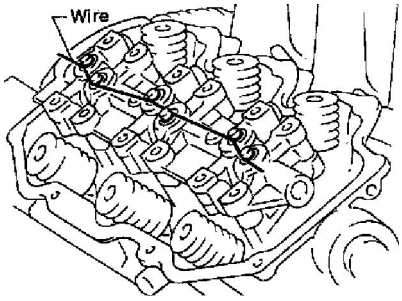
1. Install valve component parts.
   - Always use new valve oil seal. Refer to Valve Guide Seal. See: Seals and Gaskets/Valve Guide Seal/Service and Repair
   - Before installing valve oil seal, install inner valve spring seat.



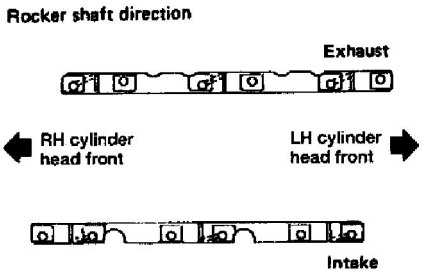
   - Install outer valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.
   - After installing valve component parts, use plastic hammer to lightly tap valve stem tip to assure a proper fit.
2. Install camshafts, locate plates and cylinder head rear covers.



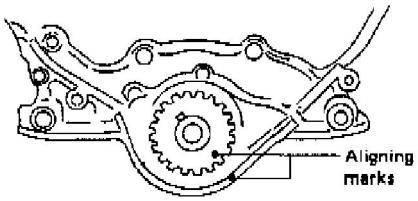
   - Set knock pin of camshaft at the top.
3. Install valve lifters into valve lifter guide.



   - Assemble valve lifters to their original position and hold all valve lifters with wire to prevent lifters from falling off.
   - After installing, remove the wire.



4. Install rocker shafts with rocker arms.
   - Tighten bolts gradually in two or three stages.
   - Before tightening, be sure to set camshaft the lobe at the position where lobe is not lifted.

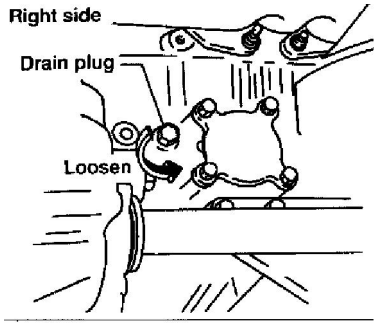


a. Set No.1 piston at TDC on its compression stroke and tighten rocker shaft bolts for No.2, No.4 and No.6 cylinders.
b. Set No.4 piston at TDC on its compression stroke and tighten rocker shaft bolts for No.1, No.3, and No.5 cylinders.

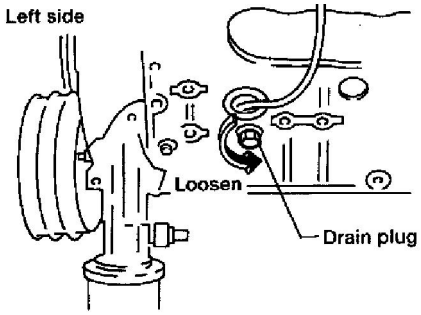
5. Install exhaust manifold to cylinder head in reverse order of removal.

Installation

1. Set No.1 piston at TDC on its compression stroke as follows:
   a. Align crankshaft sprocket aligning mark with mark on oil pump body.
   b. Confirm that knock pin on camshaft is set at the top.

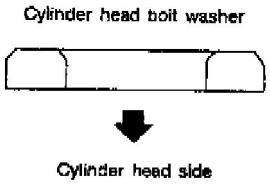


2. Install both drain plugs.

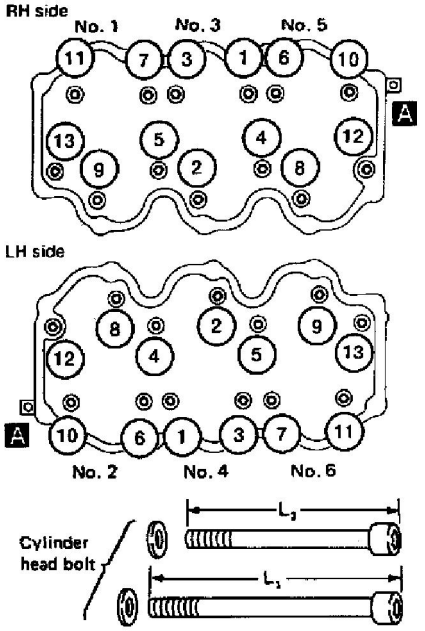


- Apply sealant to drain plug threads.

3. Install exhaust manifolds to cylinder head in reverse order of removal.
4. Install cylinder head with new gasket.

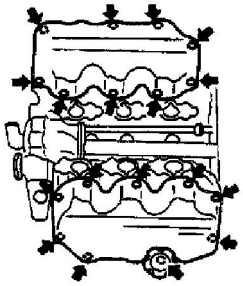


- Be sure to install washers between bolts and cylinder head.

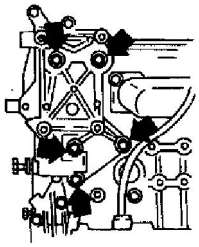


5. Tighten cylinder head bolts in numerical order using ST 10120000 (J24239-01).
   - Tightening procedure:
     (a) Tighten all bolts to **29 N.m (3.0 kg-m, 22 ft-lb)**.
     (b) Tighten all bolts to **59 N.m (6.0 kg-m, 43 ft-lb)**.
     (c) Loosen all bolts completely.
     (d) Tighten all bolts to **29 N.m (3.0 kg-m, 22 ft-lb)**.
     (e) Turn all bolts 60 to 65 degrees clockwise.
     If an angle wrench is not available, tighten all bolts to **54 to 64 N,m (5.5 to 6.5 kg-m, 40 to 47 ft-lb)**.
     - Bolts for (4), (5), (120 and (13) are longer than the others.
     L1: **127 mm (5.00 in)** for (4), (5), (12) and (13)
     L2: **106 mm (4.17 in)** for others
6. Tighten cylinder head bolt "A" to **8 N.m (0.8 kg-m, 5.9 ft-lb)**. using ST1O12OOOO (J24239-01).

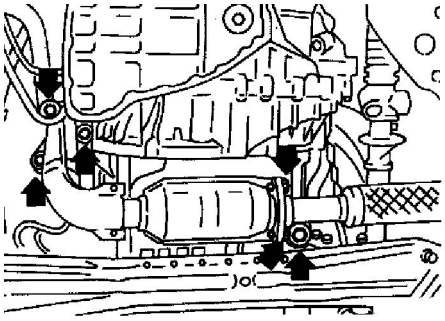
	Identification mark	θ
RH camshaft sprocket	R3	0°53′
LH camshaft sprocket	L3	-3°27′



7. Install both rocker covers.



8. Install compressor bracket and compressor.



9. Install front exhaust tube to exhaust manifold.
10. Install rear belt cover and camshaft sprocket.

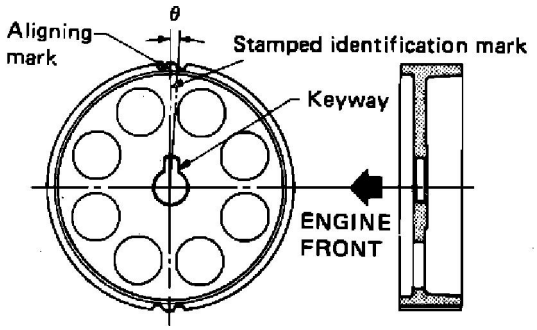
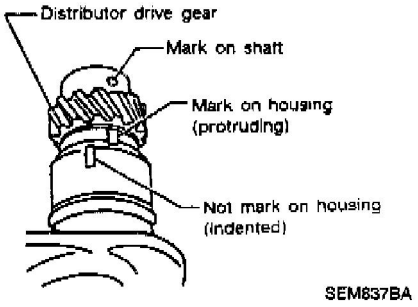


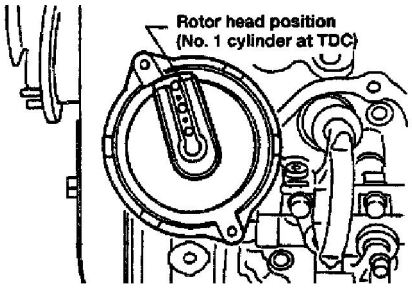
Fig. 9 Camshaft Pulley Identification

RH camshaft sprocket and LH camshaft sprocket are different parts. Be sure to install them in the correct location.

12. Install distributor.

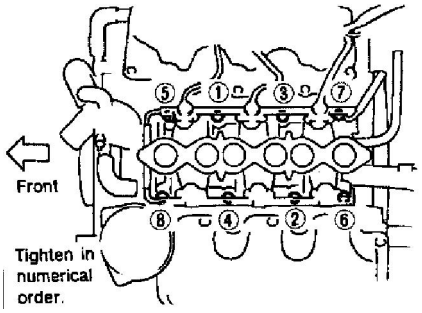


(a) Align mark on shaft with protruding mark on housing.



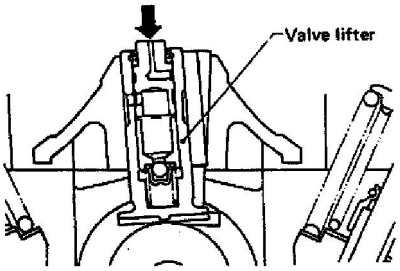
(b) After installing, confirm that distributor rotor head is set as shown in figure.

13. Install intake manifold.
    - Tightening procedure



STEP 1: Tighten bolts and nuts 1 thru 8 in that order: **3 - 5 N.m (0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb).**
STEP 2: Tighten bolts and nuts in the specified order:
bolts **16 - 20 N.m (1.6 - 2.0 kg-m, 12 - 14 ft-lb).**
nuts **24 - 27 N.m (2.4 - 2.8 kg-m, 17 - 20 ft-lb).**
STEP 3: Retighten bolts and nuts in the specified order: Same as those of step 2.
Install all parts which were removed in step 6 at removal, above.

14. Install intake manifold collector.
    Install all parts which were removed in step 5 at removal, above.
15. Install ASCD and accelerator control wire.



16. Check hydraulic valve lifter.
    a. Push plunger forcefully with your finger.
       - Be sure to check it with rocker arm in its free position (not on the lobe).
    b. If valve lifter moves more than **1 mm (0.04 in)**, air may be inside it.
    c. Bleed air off by running engine at 1,000 rpm under no load for about 10 minutes.
    d. If hydraulic valve lifters are still noisy, replace them and bleed air off again in the same manner as in step 16 (c).