

2.4L 4-CYL - VINS [F,H,S]

1990 Nissan 240SX

1990 ENGINES
Nissan 2.4L 4-Cylinder

Axxess, Pickup, Stanza, 240SX

* PLEASE READ THIS FIRST *

NOTE: For engine repair procedures not covered in this article, see ENGINE OVERHAUL PROCEDURES - GENERAL INFORMATION article in the GENERAL INFORMATION section.

ENGINE IDENTIFICATION

Engine identification number is stamped on left side of cylinder block between exhaust manifold runners.

ENGINE IDENTIFICATION CODES TABLE

Application	Engine Code	VIN Code
2.4L 4-Cylinder		
Axxess & 240SX	KA24E	H
Pickup	KA24E	S
Stanza	KA24E	F

NOTE: If liquid gasket is used on component parts, DO NOT expose gasket to oil or water for at least 30 minutes.

VALVE ARRANGEMENT

Right Side - All Intake.
Left Side - All Exhaust.

VALVE CLEARANCE ADJUSTMENT

Hydraulic valve lifters are used and no valve adjustment is required.

FUEL PRESSURE RELEASE

Remove fuel pump fuse. Start engine. After engine stalls, crank engine 2 or 3 times to ensure fuel pressure is released. Turn ignition switch to OFF position and replace fuse.

ENGINE R & I

AXXESS, STANZA

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also place mating marks on engine hood and other major assemblies.

Removal

1) Release fuel pressure. See FUEL PRESSURE RELEASE in this

article. Disconnect negative battery cable. Drain oil and coolant. Disconnect all related pipes, electrical harnesses, vacuum lines and fuel lines. Remove A/C compressor and power steering pump without disconnecting hoses and set aside.

2) Remove alternator and adjusting bracket. Raise and support vehicle. Remove drive shaft on 4WD models. On all models, remove axle shafts. Disconnect exhaust manifold from exhaust front pipe. Remove front exhaust pipe.

3) Raise engine slightly and disconnect and/or remove all engine mounts. Support engine and transaxle assembly with jacks under oil pan and transaxle. Lower engine and transaxle assembly. Separate engine from transaxle.

Installation

On Axxess 4WD models, adjust length between buffer rod bolts. See Fig. 1. On all models, replace worn or separated rubber engine mounts. Ensure proper placement of all electrical harnesses and vacuum lines. To complete installation, reverse removal procedure. See TORQUE SPECIFICATIONS at end of article.

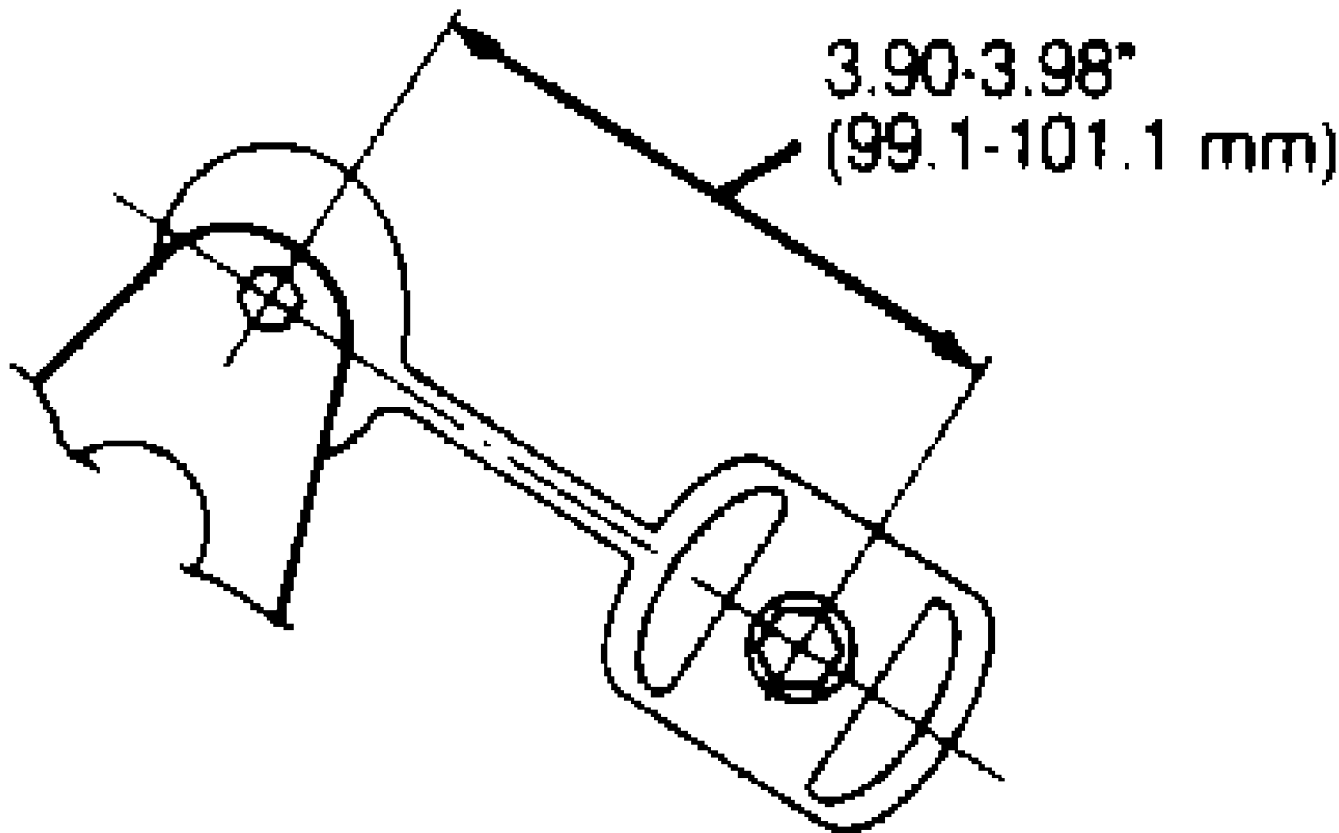


Fig. 1: Adjusting Buffer Rod Length (Axxess 4WD)
Courtesy of Nissan Motor Co., U.S.A.

PICKUP

Removal

1) Release fuel pressure. See FUEL PRESSURE RELEASE in this

article. Disconnect negative battery cable. Drain oil and coolant. Remove radiator with shroud. Remove cooling fan.

2) Remove engine undercover. Remove A/C compressor and power steering pump (if equipped) without disconnecting hoses and set aside. Wire compressor and pump out of working area.

3) On 2WD models, disconnect starter motor harness. On 4WD models, remove starter motor. On all models, disconnect exhaust manifold from exhaust pipe. Remove front exhaust pipe.

4) On 2WD models, disconnect drive shaft from transmission. Remove transmission-to-rear engine mount bracket bolts. Remove transmission crossmember. Remove front engine mount bolts. Lift and remove engine.

5) On 4WD models, disconnect front drive shaft from front differential carrier. Remove front drive shaft bolts. Remove front differential carrier bolts and remove front differential carrier member.

6) Remove differential front mount bolts. Remove transmission-to-rear engine mount bracket nuts. Remove front engine mount bolts. Lift engine. Remove engine-to-transmission bolts. Lift and remove engine.

Installation

Replace worn or separated rubber engine mounts. Ensure proper placement of all electrical harnesses and/or vacuum lines. To complete installation, reverse removal procedure. See TORQUE SPECIFICATIONS at end of article.

240SX

Removal & Installation

Information not available from manufacturer.

INTAKE MANIFOLD R & I

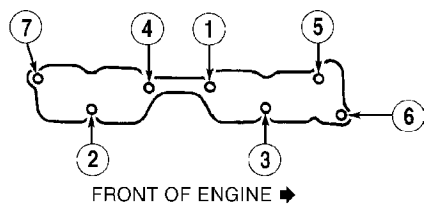
Removal (All Models)

1) Release fuel pressure. See FUEL PRESSURE RELEASE in this article. Disconnect negative battery cable. Drain coolant. Disconnect throttle cable(s) at throttle body. Disconnect all related pipes, electrical harnesses, vacuum lines and fuel lines.

2) Remove accessories and brackets as required for clearance. Remove intake manifold support bracket. Remove fuel rail and injectors. Remove intake manifold bolts and intake manifold.

Installation

Install intake manifold on cylinder head. Tighten bolts in sequence to specification. See Fig. 2. See TORQUE SPECIFICATIONS table at end of article. To complete installation, reverse removal procedure.



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Fig. 2: Intake Manifold Tightening Sequence
Courtesy of Nissan Motor Co., U.S.A.

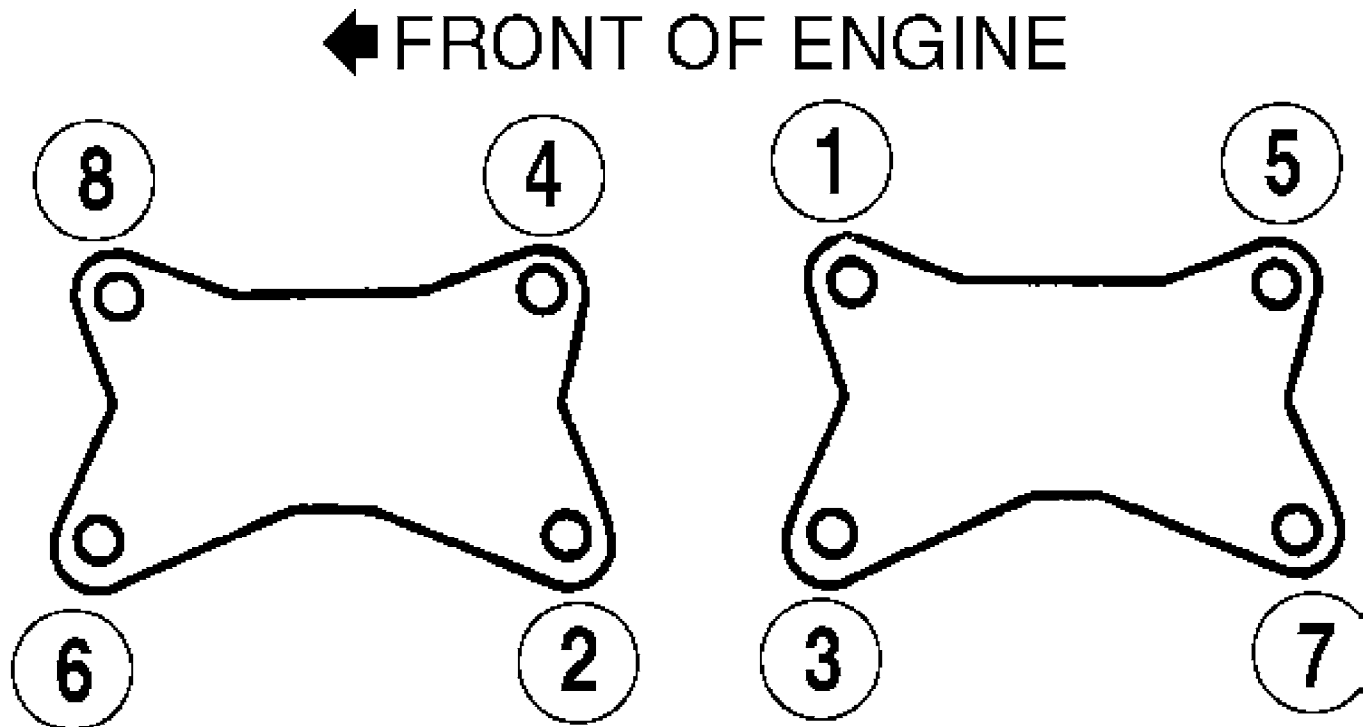
EXHAUST MANIFOLD R & I

Removal (All Models)

Disconnect negative battery cable. Remove accessories and brackets as required for clearance. Disconnect exhaust pipe from manifold. Remove exhaust manifold heat shield and exhaust manifold.

Installation

Install exhaust manifold on cylinder head. Tighten nuts and bolts in sequence and to specification. See Fig. 3. See TORQUE SPECIFICATIONS table at end of article. To complete installation, reverse removal procedure.



91D00136

Fig. 3: Exhaust Manifold Tightening Sequence
Courtesy of Nissan Motor Co., U.S.A.

CYLINDER HEAD R & I

ACCESS, STANZA

Removal

1) Release fuel pressure. See FUEL PRESSURE RELEASE in this article. Disconnect negative battery cable. Drain coolant. Remove intake air duct. Disconnect throttle cable(s) at throttle body.

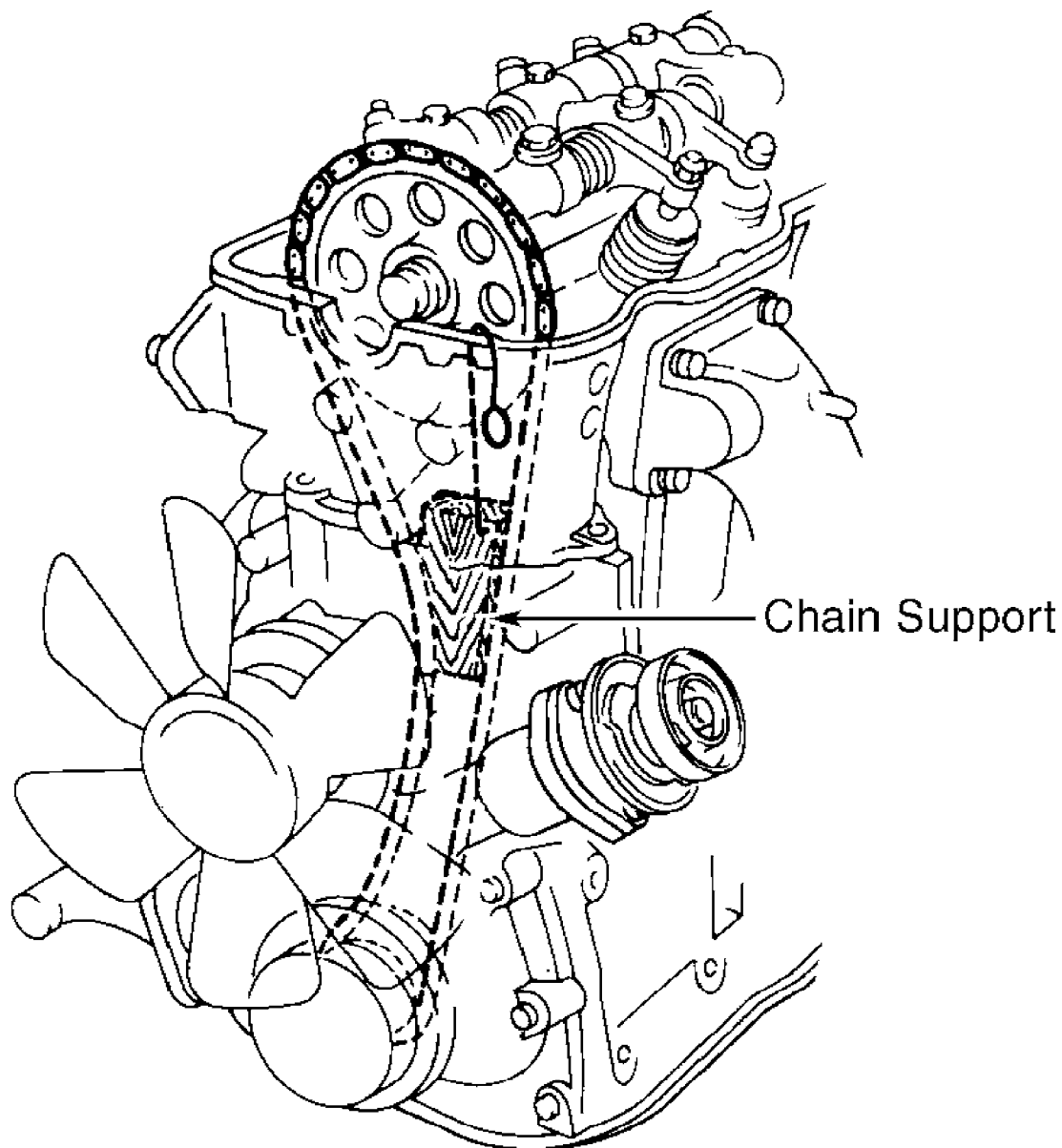
2) Remove throttle body and intake plenum as a unit. Disconnect all related pipes, hoses, fuel lines and vacuum lines. Remove intake manifold support bracket and intake manifold. Remove rocker arm cover. Carefully remove rocker arm cover without striking rocker arms.

3) Set No. 1 piston at TDC on compression stroke. Loosen camshaft sprocket bolt. Using Chain Support (KV10105800), support timing chain. See Fig. 4. Remove camshaft sprocket.

4) Remove cylinder head-to-front cover bolts. Remove cylinder head bolts in REVERSE order of tightening sequence in 2 or 3 steps. See Fig. 5. Remove cylinder head.

Disassembly

Loosen rocker arm shaft bolts evenly in 2 or 3 steps, rotating from outside to inside in sequence. Remove camshaft. Remove valves, valve springs and related parts using Valve Spring Compressor (KV10109210). Mark bottom side of springs with Red paint if necessary for reassembly reference.



90102239

Fig. 4: Holding Timing Chain With Chain Support
Courtesy of Nissan Motor Co., U.S.A.

Inspection

1) Check cylinder head for cracks, flaws or damage. Repair or

replace as necessary. Inspect head and block mating surfaces for warpage. Warpage limit is .004" (.10 mm) or less. If beyond limit, refinish surface.

2) Maximum surface grinding limit of cylinder head plus block is .008" (.20 mm). Replace head and/or block if machined or warped beyond specification.

3) Using calipers, measure cylinder head height. See CYLINDER HEAD SPECS TABLE at end of article. If cylinder head height is not within specifications, replace cylinder head.

4) After resurfacing cylinder head, ensure camshaft rotates freely by hand. Replace cylinder head if resistance is felt.

Installation

1) Ensure mating surfaces of cylinder head and block are clean. Install cylinder head and new gasket.

2) Tighten head bolts to 22 ft. lbs. (30 N.m). See Fig. 5. Tighten head bolts to 58 ft. lbs. (79 N.m). Loosen all bolts completely. Tighten head bolts to 22 ft. lbs. (30 N.m). Tighten head bolts to 54-61 ft. lbs. (73-83 N.m).

3) Ensure knockpin is positioned at 12 o'clock in camshaft. Set chain on camshaft by aligning Silver chain mating link to punch mark on cam sprocket. Install camshaft sprocket to camshaft. Install camshaft sprocket bolt and tighten to specification. Remove chain stopper installed during removal.

4) Apply sealant to cylinder head and rubber plug. Install rubber plug. Wipe off excess sealant. To complete installation, reverse removal procedure. Run engine for several minutes, allow engine to cool down and recheck head bolt torque.

PICKUP, 240SX

Removal

1) Release fuel pressure. See FUEL PRESSURE RELEASE in this article. Disconnect negative battery cable. Drain cooling system. Remove power steering pump drive belt. Remove power steering pump, brackets and idler pulley.

2) Label and disconnect necessary electrical wiring and vacuum hoses. Disconnect accelerator cable bracket. Disconnect EGR tube from exhaust manifold. Remove intake plenum-to-intake manifold bolts.

3) Remove intake manifold-to-cylinder head bolts while raising plenum upward. Remove rocker arm cover. Bring No. 1 piston to TDC on compression stroke. Loosen camshaft sprocket bolt. Using Chain Support (KV10105800), support timing chain. See Fig. 4. Remove camshaft sprocket.

4) Remove cylinder head-to-engine front cover bolts. Loosen cylinder head bolts in 2 or 3 steps in reverse order of tightening sequence to prevent warping or cracking cylinder head. See Fig. 5. Remove cylinder head.

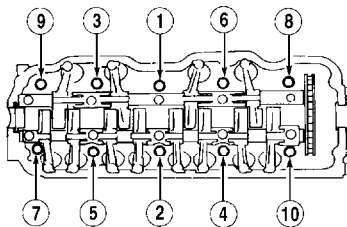
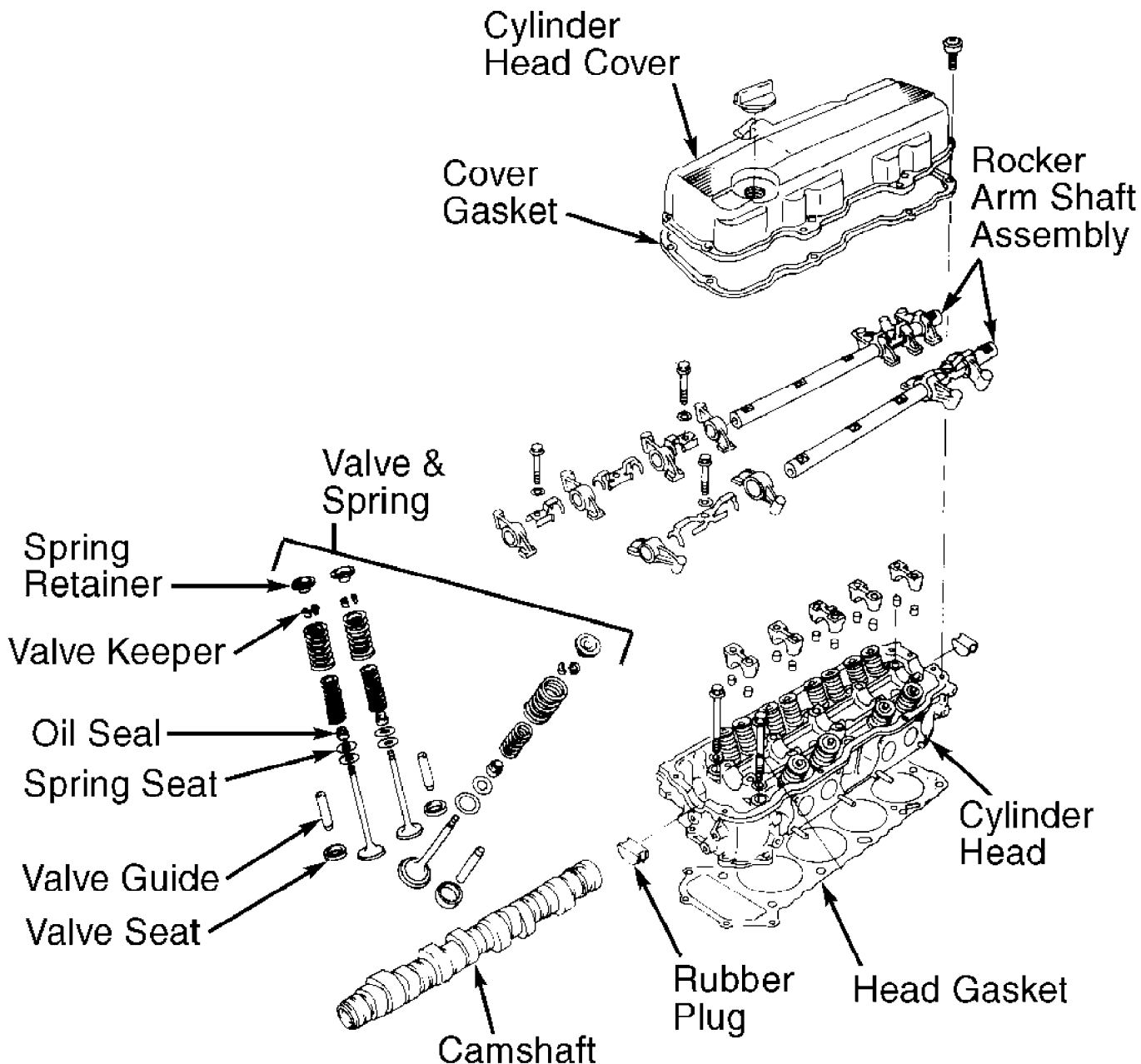


Fig. 5: Cylinder Head Tightening Sequence
Courtesy of Nissan Motor Co., U.S.A.

Disassembly

Loosen rocker arm shaft bolts evenly in 2 or 3 steps, rotating from outside to inside in sequence. Remove camshaft. Remove valves, valve springs and related parts using Valve Spring Compressor (KV10109210). Mark bottom side of springs with Red paint if necessary for reassembly reference.



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Fig. 6: Exploded View of Cylinder Head
 Courtesy of Nissan Motor Co., U.S.A.

Inspection

1) Check cylinder head for cracks, flaws or damage. Repair or replace as necessary. Inspect head and block mating surfaces for warpage. Warpage limit is .004" (.10 mm) or less. If beyond limit,

refinish surface.

2) Maximum surface grinding limit of cylinder head plus block is .008" (.20 mm). Replace head and/or block if machined or warped beyond specification.

3) Using calipers, measure cylinder head height. See CYLINDER HEAD SPECS TABLE at end of article. If cylinder head height is not within specifications, replace cylinder head.

4) After resurfacing cylinder head, ensure camshaft rotates freely by hand. Replace cylinder head if resistance is felt.

Installation

1) Ensure mating surfaces of cylinder head and block are clean. Install cylinder head and new gasket.

2) Tighten head bolts to 22 ft. lbs. (30 N.m). See Fig. 5. Tighten head bolts to 58 ft. lbs. (79 N.m). Loosen all bolts completely. Tighten head bolts to 22 ft. lbs. (30 N.m). Tighten head bolts to 54-61 ft. lbs. (73-83 N.m).

3) Ensure knockpin is positioned at 12 o'clock in camshaft. Set chain on camshaft by aligning Silver chain mating link to punch mark on cam sprocket. Install camshaft sprocket to camshaft. Install camshaft sprocket bolt and tighten to specification. Remove chain stopper installed during removal.

4) Apply sealant to cylinder head and rubber plug. Install rubber plug. Wipe off excess sealant. To complete installation, reverse removal procedure. Run engine for several minutes, allow engine to cool down and recheck head bolt torque.

FRONT COVER & OIL SEAL R & I

NOTE: The following procedure includes removal of engine front cover. If only oil seal is being replaced, it is not necessary to remove front cover.

Removal

1) Drain coolant and crankcase oil. Remove radiator and cooling fan. Remove air cleaner. Label all wiring and vacuum lines for reassembly reference.

2) Remove power steering, air conditioner and alternator belts. On Pickup and 240SX, remove distributor cap and wiring from distributor. Set No. 1 piston to TDC of compression stroke. Ensure distributor rotor is pointing to No. 1 spark plug wire on distributor cap.

3) On all models, remove power steering pump, power steering idler pulley and power steering brackets (if equipped). Remove alternator and adjusting bracket. Remove compressor idler pulley and crankshaft pulley. On Pickup and 240SX, remove oil pump together with pump drive spindle.

4) On all models, remove rocker arm cover. Remove oil pan. See OIL PAN R & I in this article. On Axxess and Stanza, remove engine mount at front of engine near alternator.

5) On all models, remove front cover bolts. Note bolt locations for reassembly reference. Remove front cover together with distributor (Pickup and 240SX) and water pump. DO NOT damage head gasket. Disassemble as necessary.

Inspection

Check oil seal surface of crankshaft for nicks or damage. Repair as necessary.

Installation

1) Before installation, apply sealant at mating corners of oil pan gasket, cylinder head gasket and front cover gaskets. Press

new oil seal in front cover with dust seal lip facing outside.

2) Apply lithium grease to oil seal sealing lip before cover is installed. Use new gaskets and sealant. Front cover mount bolts are different lengths. Ensure bolts are in proper locations during installation. Install front cover. To complete installation, reverse removal procedure.

TIMING CHAIN R & I

Removal

1) Remove front cover. See FRONT COVER & OIL SEAL R & I in this article. Carefully remove chain tensioner. DO NOT lose spring. Remove chain guides. Remove camshaft sprocket bolt, ensuring camshaft does not rotate.

CAUTION: Ensure neither crankshaft nor camshaft is rotated with timing chain off or damage to valves may result.

2) Remove timing chain and camshaft sprocket. Remove oil slinger (if equipped). On Pickup and 240SX, remove oil pump drive gear (note installation direction). On Axxess and Stanza remove oil pump drive boss. On all models, remove crankshaft sprocket. Remove chain guide and tensioner.

Inspection

1) Check camshaft sprocket tooth surface for flaws and wear. Replace if damaged. Install sprocket on camshaft and check for runout. See CAMSHAFT SPECS TABLE at end of article. Sprocket runout limit using total indicator reading is .004" (.10 mm). Replace sprocket, if runout exceeds specification.

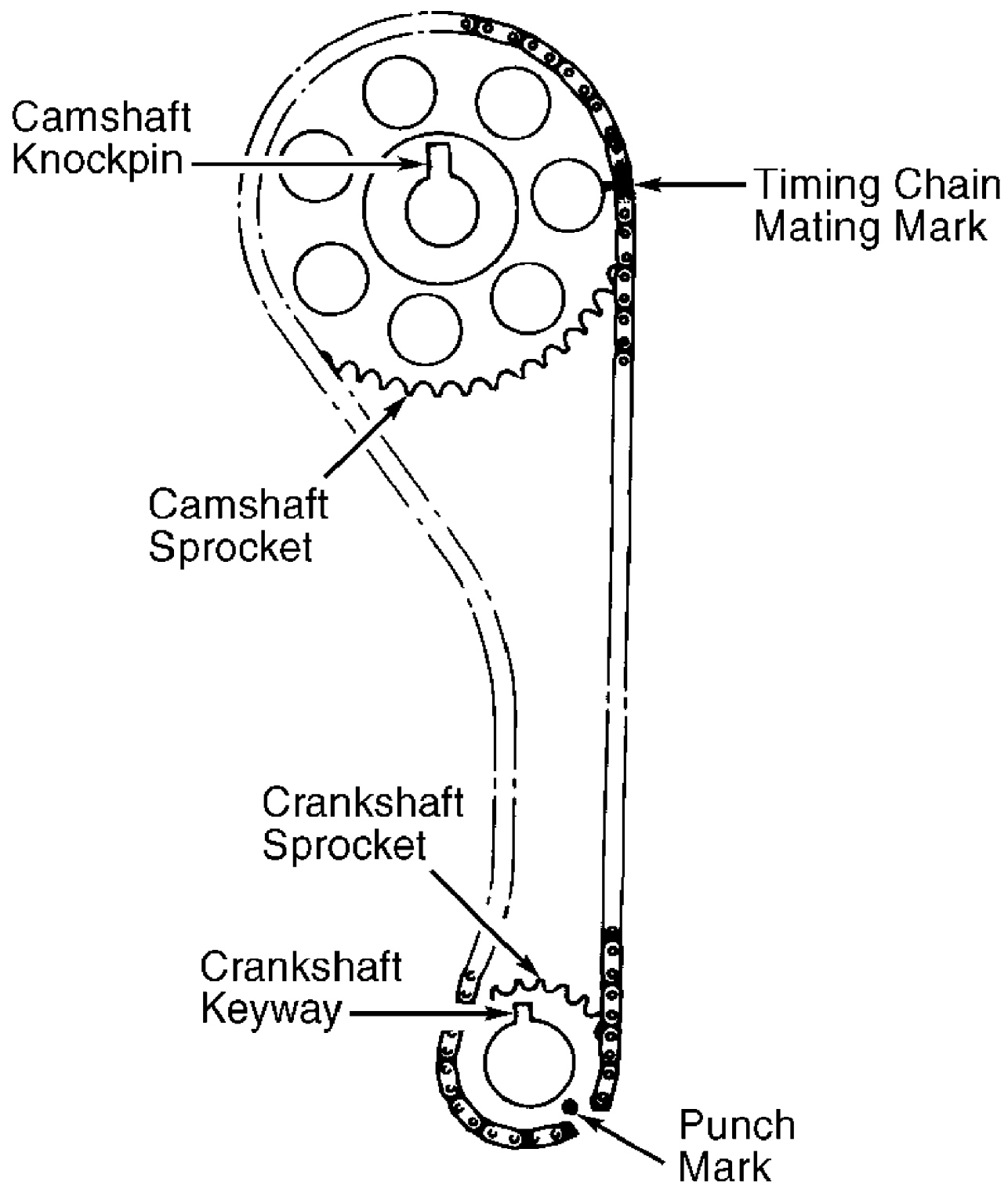
2) Check timing chain for damage and excessive wear at roller links. Replace timing chain if faulty or stretched. Check chain tensioner and guide for excessive wear or defect. Replace as necessary.

Installation

1) Ensure No. 1 piston is at TDC of compression stroke. Camshaft knockpin should be at 12 o'clock position. Align Silver timing chain link with punch mark on sprocket.

2) Install timing chain onto crankshaft sprocket. Align marks on timing chain with marks on crankshaft sprocket. See Fig. 7. Both sprocket timing marks will be toward left side of engine. Install chain guide and tensioner. Adjust chain guide tensioner.

3) Install oil pump drive gear onto crankshaft with large chamfered inner face toward rear. Install oil slinger (if equipped). To complete installation, reverse removal procedure.



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Fig. 7: Aligning Timing Chain on Crankshaft & Camshaft
 Courtesy of Nissan Motor Co., U.S.A.

NOTE: The following procedure is for in-vehicle removal.
Otherwise, refer to CYLINDER HEAD R & I in this article.
Valve adjustment is not required.

Removal & Disassembly

1) Disconnect negative battery cable. Remove valve cover and gasket. Place No. 1 piston at TDC on compression stroke. Loosen rocker arm bolts. When loosening bolts, evenly loosen in 2 or 3 steps from outside in sequence.

2) Remove rocker arm shaft assembly and bolts. Disassemble rocker arms and shaft. Note component locations for reassembly reference. See Fig. 8.

NOTE: Rocker arm contains integral hydraulic lifter. DO NOT allow rocker arms to lay on side as oil will bleed out. Place rocker arms in shallow pan of engine oil.

Inspection

Inspect rocker arms, retaining bolts and shafts for wear or damage. If excessive wear or damage is found, replace rocker arm and/or shaft.

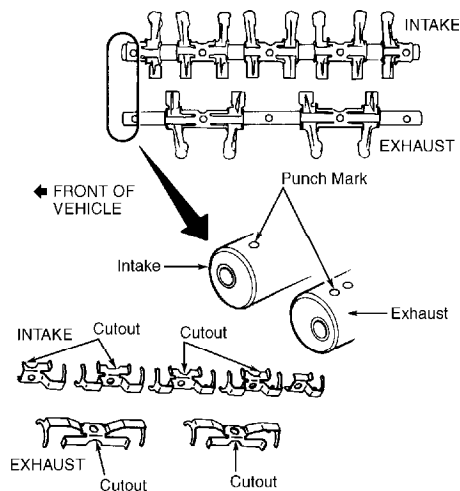
Reassembly & Installation

1) Ensure camshaft knockpin is positioned at 12 o'clock (No. 1 piston at TDC compression). Assemble rocker arm shaft. Install rocker arm shaft brackets and rocker arms on shaft. See Fig. 8.

2) Intake rocker arm shaft has a single punch mark. Exhaust rocker arm shaft has 2 punch marks. Both shafts should be installed so punch marks on front surface face up. Marks are used to identify oil hole direction and must be installed correctly for lubrication purposes. See Fig. 8.

3) DO NOT move rocker arms from original locations. Mount rocker arm shaft assembly on alignment dowel pin in head. Gradually tighten bolts to specification, in 2 or 3 steps from center outward. See TORQUE SPECIFICATIONS at end of article.

4) Apply sealant to cylinder head and rubber plug. Install rubber plug. Wipe off excess sealant. Install rocker arm cover. Reconnect negative battery cable.



90B02245
Fig. 8: Installing Rocker Arm & Shaft Assembly
Courtesy of Nissan Motor Co., U.S.A.

CAMSHAFT R & I

NOTE: The following procedure is for in-vehicle removal.
Otherwise, refer to CYLINDER HEAD R & I in this article.

Removal

1) Disconnect negative battery cable. Drain cooling system. Remove rocker arm cover. Set No. 1 cylinder at TDC of compression stroke. Loosen camshaft sprocket bolt. DO NOT allow camshaft or crankshaft to rotate. Using Chain Support (KV10105800) wedged in space between timing chain rails, support timing chain. See Fig. 1.

2) Remove camshaft sprocket. Loosen rocker arm shaft bolts evenly in 2 or 3 steps, moving from outside to inside in sequence. Remove rocker arm assembly with bolts. Remove camshaft.

CAUTION: DO NOT allow crankshaft to rotate with timing chain removed or damage to valves may result.

Inspection

Measure camshaft bearing journals and camshaft bearing inside diameter to determine oil clearance. Check camshaft lobe height. Place camshaft in "V" blocks and check camshaft runout. See CAMSHAFT specifications table at end of article.

Installation

1) Install camshaft on cylinder head with camshaft knockpin at 12 o'clock position. Install rocker arm assembly by aligning rocker arm shaft on dowel pin of cylinder head.

2) Tighten rocker arm bolts evenly, in 2 or 3 steps, in an outward sequence from center. See TORQUE SPECIFICATIONS at end of article.

3) Set chain on camshaft sprocket by aligning mating marks. See Fig. 7. Install camshaft sprocket on camshaft. Install camshaft sprocket bolt and tighten to specification. See TORQUE SPECIFICATIONS at end of article. Remove chain stopper.

4) Apply sealant to cylinder head and rubber plug. Install rubber plug. Wipe off excess sealant. Install rocker arm cover. Fill cooling system and reconnect negative battery cable.

REAR CRANKSHAFT OIL SEAL R & I

Removal

Remove transmission/transaxle. Remove flywheel or flexplate. Remove rear oil seal retainer. Scrape old liquid gasket material off mating surfaces. Drive old seal out of retainer.

Installation

Install new seal into oil seal retainer using seal installer tool. Apply oil to outside and sealing lip of oil seal. Apply liquid gasket to rear of oil seal retainer. Wipe oil or foreign material from oil seal retainer surface at rear of block. Install oil seal retainer to rear of engine block. Tighten screws to specification. See TORQUE SPECIFICATIONS at end of article.

WATER PUMP R & I

AXXESS, STANZA

Removal

1) Slowly open radiator cap to release system pressure. Drain coolant from drain plugs on left rear of cylinder block and radiator.

2) Loosen alternator bracket and remove fan belt. Remove power steering belt (if equipped). Remove water pump mount bolts. Remove water pump with pulley.

Inspection

Inspect water pump body and impeller vanes for corrosion. Check pump bearing for excessive play or rough operation. Inspect fan coupling for oil leakage or bent bimetallic spring.

Installation

1) Using new gasket, install water pump by reversing removal procedure. Adjust belt tension and fill cooling system. Check hoses for proper attachments and damage.

2) Start engine and check for leaks. Check thermostat for proper operation. Pressure leak test cooling system using pressure tester and a maximum of 14 psi (1.0 kg/cm²) pressure. Replace components as necessary.

NOTE: For information on electric cooling fans, see ENGINE COOLING article.

PICKUP, 240SX

Removal

1) Slowly open radiator cap to release system pressure. Drain coolant from drain plugs on left rear of cylinder block and radiator. Remove upper radiator shroud. Loosen alternator bracket and remove fan belt.

2) Remove power steering belt (if equipped). Remove fan. Remove pump mount bolts. Remove water pump with fan pulley, fan coupling and gasket. Remove fan bolts and fan coupling nuts.

Inspection

Inspect water pump body and impeller vanes for corrosion. Check pump bearing for excessive play or rough operation. Inspect fan coupling for oil leakage or bent bimetallic spring.

Installation

1) Using new gasket, install water pump by reversing removal procedure. Adjust belt tension and fill cooling system. Check hoses for proper attachments and damage.

2) Start engine and check for leaks. Check thermostat for proper operation. Pressure leak test cooling system using pressure tester and a maximum of 14 psi (1.0 kg/cm²) pressure. Replace components as necessary.

NOTE: For information on electric cooling fans, see ENGINE COOLING article.

OIL PAN R & I

NOTE: Oil pan installation is similar for all models.

AXXESS & STANZA

Removal

Raise vehicle and support with safety stands. Drain engine oil. Remove front exhaust pipe. Remove front side engine support. On 2WD models remove center crossmember. Remove oil pan bolts and oil pan.

Installation

Remove old gasket from mating surfaces. Apply a continuous bead of liquid gasket to mating surfaces. To complete installation, reverse removal procedure. Tighten bolts to specification. See TORQUE SPECIFICATIONS at end of article.

PICKUP

Removal

1) Raise vehicle and support with safety stands. Remove undercover. Drain engine oil. On 2WD models, remove front suspension crossmember. On 4WD models, remove front differential carrier member bolts. Remove front differential carrier bolts and support differential carrier.

2) On 4WD models, remove transmission to rear engine mount bracket nuts. Remove engine mount bolts or nuts. Lift up engine. If necessary, disconnect exhaust pipes. On all models, remove oil pan.

Installation

Remove old gasket from mating surfaces. Apply a continuous bead of liquid gasket to mating surfaces. To complete installation, reverse removal procedure. Tighten bolts to specification. See TORQUE SPECIFICATIONS at end of article.

240SX

Removal

Raise vehicle and support with safety stands. Drain engine oil. Remove front stabilizer bar bolts and nuts from side member. Loosen engine mounts and raise engine. Remove oil pan bolts and remove oil pan through front side.

Installation

Remove old gasket from mating surfaces. Apply a continuous bead of liquid gasket to mating surfaces. To complete installation, reverse removal procedure. Tighten bolts to specification. See TORQUE SPECIFICATIONS at end of article.

CYLINDER HEAD SERVICE

NOTE: Before grinding valves or valve seats, measure installed valve height and record measurements for reassembly reference.

Remove cylinder head and disassemble. See CYLINDER HEAD R & I. Remove valves using Valve Spring Compressor (KV10109210). Keep disassembled parts in order for reassembly. Mark bottom side of springs with Red paint for reassembly reference (if necessary).

VALVE SPRINGS SERVICE

Check valve springs for squareness using steel square and surface plate. Measure free length and check tension of valve springs at installed height. Tension specifications must be taken with a calibrated valve spring pressure tester. See ENGINE SPECIFICATIONS at end of article. If not within specification, replace springs.

VALVE STEM OIL SEALS SERVICE

Install spring seat. Using valve stem oil seal installer, seat new oil seal onto valve guides. Install lubricated valve,

springs, retainer and keepers.

VALVE GUIDES SERVICE

1) Remove and disassemble cylinder head. See CYLINDER HEAD R & I in this article. Heat head to 302-320°F (150-160°C). Remove guide from combustion chamber side using driver. With head at room temperature, ream guide hole in cylinder head to specification. See CYLINDER HEAD SPECS TABLE at end of article.

2) Measure oil clearance between valve stem and valve guide. See CYLINDER HEAD SPECS TABLE at end this article. If not to specification, replace or repair. If clearance exceeds specification and valve stem is not worn, replace guide.

NOTE: Valve guides of .008" (.20 mm) oversize are available.

3) To install guide, reheat head. Press guide into head until guide projects .587-.594" (14.9-15.1 mm) above cylinder head surface.

4) Use reamer to finish inside guide bore. Finished intake guide bore is .2756-.2763" (7.000-7.018 mm), while finished exhaust guide bore is .3150-.3157" (8.000-8.002 mm). Reface valve seat surface, after valve guide repair or replacement is completed.

VALVE SEAT SERVICE

1) Check valves and valve seat inserts for pitting or excessive wear at valve face contact surface.

NOTE: Replacement valve seat inserts of .020" (.50 mm) oversize are available. Before replacing valve seat, check valve guide wear. Replace valve guide before replacing valve seat.

2) Standard intake valve seat contact width is .063-.067" (1.6-1.7 mm), while exhaust valve seat contact width is .067-.083" (1.7-2.1 mm). Correct valve seat surface or replace if excessively worn.

3) To remove old inserts, set machine depth to prevent boring beyond bottom face of valve seat insert in cylinder head. Use a drilling guide (such as a mandrel in valve guide) to cut old valve seat insert out of cylinder head. Ensure valve seat recess is centered on valve guide for correct seat replacement.

4) Heat cylinder head to 302-320°F (150-160°C). Apply Loctite to valve seat insert and install seat insert. Ensure insert seats firmly against bottom face of recess. Cut valve seats to correct depth, face angle and seat width of valve being installed. Reface valve.

VALVES SERVICE

1) After disassembly, inspect valve head diameter, stem diameter and seat angle. Inspect valves for worn, damaged or deformed valve head or stem. Inspect valve keeper grooves for excessive wear.

2) If valve head is worn to .020" (.50 mm) margin thickness, replace valve. Valve stem end surface grinding limit is .008" (.20 mm).

3) Install valve spring seat and oil seal over top of valve guide. Place springs in position with close-coiled (painted Red) end toward cylinder head. Lubricate valve, valve retainers and keepers. Use valve spring compressor to install valve spring.

VALVE SEAT CORRECTION ANGLES

Use 30-degree stone or cutter to raise valve seat position on valve. Use 60-degree stone or cutter to lower valve seat position on valve.

ROCKER ARM SHAFT ASSEMBLY SERVICE

Inspect rocker arms, shafts and retaining bolts for wear or damage. If excessive wear or damage is found, replace rocker arm and/or shaft. See ROCKER ARM & SHAFT SPECIFICATIONS table.

ROCKER ARM & SHAFT SPECIFICATIONS

Application	In. (mm)
Outer Shaft Diameter .....	.8653-.8661 (21.979-22.000)
Inner Arm Diameter .....	.8666-.8673 (22.012-22.029)
Arm-to-Shaft Clearance .....	.0005-.0020 (.012-.050)

PISTON & ROD ASSEMBLY R & I

Removal

1) Remove cylinder head and front cover. See CYLINDER HEAD R & I and FRONT COVER & OIL SEAL R & I in this article. Remove oil pan and oil strainer. See OIL PAN R & I in this article.

2) Ensure rod cap and connecting rod is stamped with a matching identification number. Remove connecting rod nuts. Remove connecting rod cap with bearing half. Remove piston and rod assembly. See OVERHAUL PROCEDURES article.

Inspection

1) Measure cylinders for out-of-round and taper. See CYLINDER BLOCK SPECS TABLE at end of article. If specification is exceeded, cylinders must be bored. If boring cylinders to oversize, proceed to FITTING PISTONS in this article.

2) Install connecting rod with bearings, on crank journal and tighten to specification in 2 stages. See TORQUE SPECIFICATIONS at end of article. Measure rod side thrust clearance. Standard thrust clearance at connecting rod big end is .008-.016" (.20-.40 mm). Maximum limit is .024" (.60 mm). Replace rod and/or crankshaft if specification is exceeded.

Installation

1) Apply oil to rings, piston and cylinder wall. Ensure ring gaps are approximately 180 degrees apart and not located on thrust side of piston or in line with piston pin.

2) Ensure grade mark stamped on top of piston is toward front of engine. Install cylinder head, front cover and related components. Install oil pan with new gasket. Tighten bolts evenly in a crisscross pattern. DO NOT overtighten. To complete installation, reverse removal procedure. Tighten bolts to specification. See TORQUE SPECIFICATIONS at end of article.

FITTING PISTONS

1) Inspect cylinder block for cracks or flaws. Using dial bore gauge, measure cylinder bore for out-of-round or taper. See CYLINDER BLOCK SPECS TABLE at end of article. If out-of-round or taper exceeds specification, cylinder will need to be bored. When any one cylinder is bored, all cylinders must be bored.

2) Determine piston oversize according to amount of wear in cylinder. See CYLINDER BLOCK SPECS TABLE at end of article. Cylinder bore wear limit is .008" (.20 mm).

3) Measure piston diameter at thrust face. Add piston-to-cylinder clearance. Piston-to-cylinder clearance should be .0008-.0016 (.020-.040 mm). Finish hone cylinder to size.

NOTE: If only piston rings are replaced, measure ring gap at bottom of bore. Oversize pistons and rings are available in .20 mm, .50 mm and 1.0 mm sizes.

PISTON PIN REPLACEMENT

1) Piston pin is press fit into piston and has sliding fit in connecting rod. To remove piston pin, remove snap rings. Set piston and rod assembly with correct adapters in hydraulic press and press pin out of connecting rod or piston. Note correlation between piston and rod for reassembly reference. DO NOT damage piston during removal.

2) Check pin and pin hole for signs of galling or excessive wear. Using micrometer and telescopic hole gauge, measure diameter of piston pin, piston pin hole and rod small end. Determine pin-to-piston and pin-to-rod clearance. See PISTONS, PINS & RINGS SPECS TABLE at end of article. If maximum limit is exceeded, replace connecting rod or piston and pin set.

3) To assemble piston and rod, install new snap ring on one side of piston pin hole. Heat piston to 140-158°F (60-70°C). Using proper adapters, press in piston pin. Install remaining snap ring.

PISTON RINGS SERVICE

When installing piston rings, ensure stamped mark on ring faces up. Ensure oil ring spacers are properly positioned and all oil ring segments are butted together correctly. See Fig. 9.

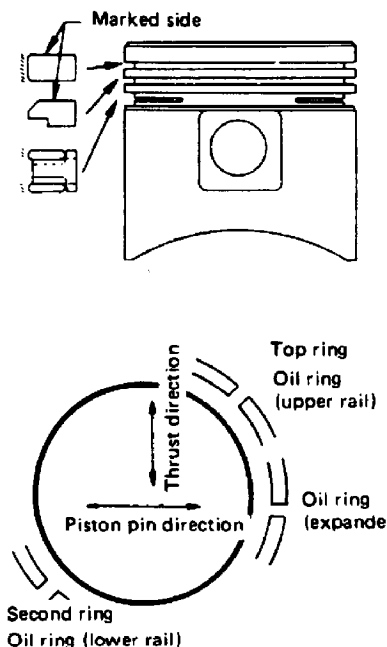


Fig. 9: Installing Piston Rings
Courtesy of Nissan Motor Co., U.S.A.

ROD BEARINGS SERVICE

- 1) Ensure rod caps and connecting rods are stamped with a matching identification number. Remove connecting rod nuts. Remove connecting rod cap with bearing half. Remove piston and rod assembly.
- 2) Check connecting rods for bend or twist using rod aligner. See CONNECTING RODS SPECS TABLE at end of article. Install piston and connecting rod with bearings, on crank journal and tighten to 28-33 ft. lbs. (38-44 N.m).
- 3) Measure rod side thrust clearance. Standard thrust clearance at connecting rod big end is .008-.016" (.20-.40 mm). Maximum limit is .024" (.60 mm). Replace or recondition rod if specifications are exceeded.

CRANKSHAFT & MAIN BEARINGS SERVICE

- 1) With engine removed from vehicle, remove manifolds, cylinder head and oil pan as previously described. Remove flywheel and rear plate. Remove oil strainer, oil pump and drive spindle.
- 2) Remove front cover, chain tensioner, guide and timing chain. Remove oil slinger (if equipped), oil pump drive gear and crankshaft sprocket. Remove piston and rod assemblies.
- 3) Loosen main bearing bolts in 2 or 3 steps, starting from outside and working toward center in sequence. Remove rear oil seal and crankshaft.
- 4) Check crankshaft journals for scoring, wear, cracks, taper and out-of-round. See CRANKSHAFT, MAIN & ROD BEARINGS SPECS TABLE at end of article. Check crankshaft runout by placing on "V" blocks. Check crankshaft pilot bushing for wear or damage.
- 5) If bushing is excessively worn, pull bushing from crankshaft using Pilot Bushing Puller (ST16610001). Clean bushing hole. DO NOT damage bushing edge or insert bushing excessively.
- 6) Check flywheel friction surface for cracks, hot spots, damage or wear. Measure friction surface runout using a dial indicator. Runout limit is .004" (.10 mm). Resurface or replace flywheel if not within specification. Check tooth surfaces of ring gear for flaws or wear. Replace ring gear if necessary.

NOTE: Upper and lower bearings are not interchangeable. Upper bearings have an oil groove or hole and must be installed to block. Ensure main bearing oil feed holes in block are clear.

- 7) Apply lubricant to upper main bearing surfaces. Install crankshaft. Install main bearing beam. Shift crankshaft forward. Tighten main bearing caps, in 2 or 3 steps, starting at center bearing and working outward. Ensure crankshaft rotates smoothly.

NOTE: Apply sealer to rear main bearing cap at point where cap contacts cylinder block.

- 8) Check crankshaft end play. See THRUST BEARING SERVICE in this article. Apply sealant to side seals and install in rear main bearing cap. Install new seal into oil seal retainer using seal installer. Apply oil to outside and sealing lip of oil seal.
- 9) Apply liquid gasket to rear of oil seal retainer. Wipe oil or foreign material from oil seal retainer surface at rear of block. Install oil seal retainer to rear of engine block.
- 10) Install flexplate or flywheel. Install piston and rod assemblies. To complete installation, reverse removal procedure.

THRUST BEARING SERVICE

Thrust bearing is installed on No. 3 main bearing journal. Check crankshaft end play by inserting a feeler gauge between flange of thrust bearing and crankshaft. Standard crankshaft end play is .002-.007" (.05-.18 mm) and service limit is .012" (.30 mm).

CYLINDER BLOCK SERVICE

1) Measure cylinders for out-of-round in excess of .0006" (.015 mm), or taper greater than .0004 (.010 mm). If specification is exceeded, cylinders must be bored. See FITTING PISTONS in this article.

2) Maximum surface grinding limit of cylinder head plus block is .008" (.20 mm). Replace head and/or block if machined or warped beyond specification.

ENGINE LUBRICATION SYSTEM

Oil drawn from pan passes through screen to oil pump and is delivered to oil filter and main oil gallery. Main oil gallery supplies oil to crankshaft main bearings and drilled passages in crankshaft. Oil sprayed from connecting rods lubricates cylinder walls and piston pins. Oil from main gallery lubricates chain tensioner and timing chain. Hole in crankshaft center bearing feeds oil to camshaft bearings in cylinder head. Valve rocker arm mechanism is lubricated through oil gallery in camshaft and through holes in rocker arm shaft.

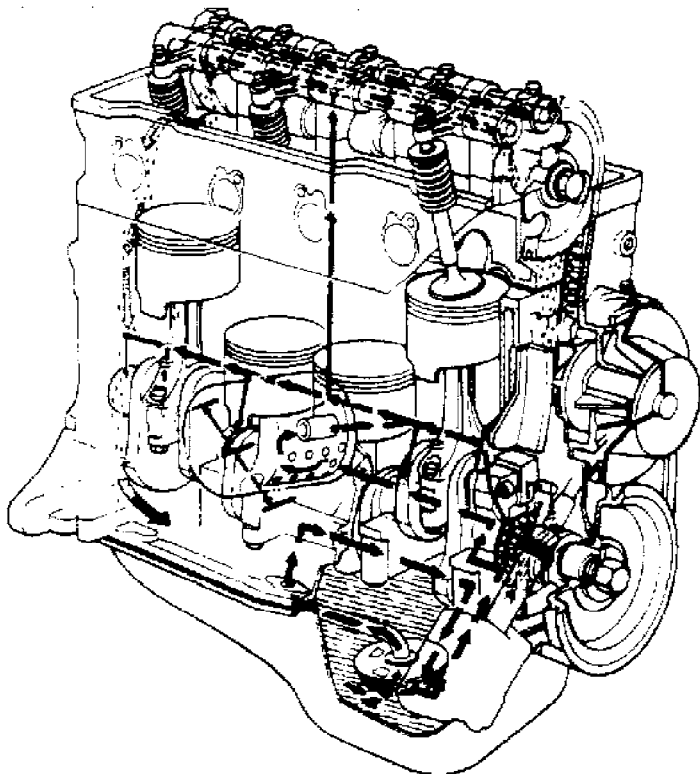


Fig. 10: Cutaway View of Engine Oiling System
Courtesy of Nissan Motor Co., U.S.A.

CRANKCASE CAPACITY

CRANKCASE CAPACITY (WITH OIL FILTER)

Application	Qts. (L)
Axxess, Stanza (1) & 240SX	3.8 (3.5)
Pickup	
2WD	4.1 (3.9)
4WD	3.5 (3.3)

(1) - Stanza has oil reservoir tank. Total capacity is 7.8 qts. (7.4L)

OIL PRESSURE

Oil pressure should be more than 11 psi (.8 kg/cm²) at idle and 60-70 psi (4.2-4.9 kg/cm²) at 3000 RPM.

OIL PUMP R & I

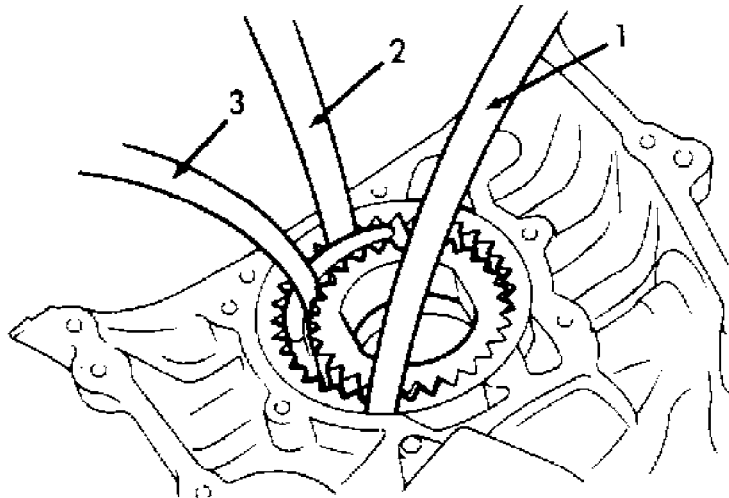
AXXESS, STANZA

Removal

Oil pump housing is part of front cover. Oil pump gears are accessible from inside of front cover. Remove front cover. See FRONT COVER & OIL SEAL R & I in this article.

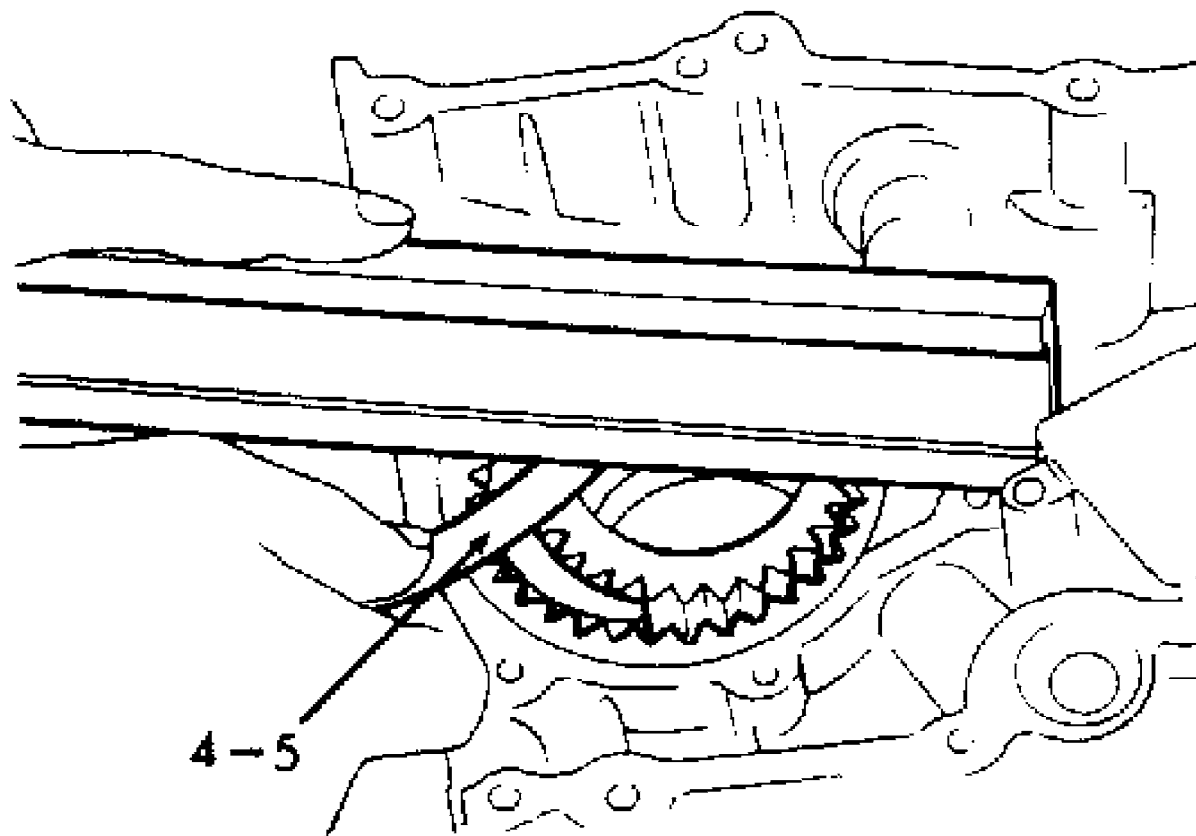
Inspection & Installation

Check clearances of oil pump gears and housing. See Figs. 11 and 12. If not within specifications, replace gear set and/or engine front cover. To install, reverse removal procedure.



1. Body-to-Outer Gear .0043-.0079" (.109-.201 mm)
2. Inner Gear-to-Crescent .0087-.0130" (.221-.330 mm)
3. Outer Gear-to-Crescent .0083-.0126" (.211-.320 mm)

Fig. 11: Checking Oil Pump Clearances (Axxess & Stanza)
Courtesy of Nissan Motor Co., U.S.A.



- 4. Housing-to-Inner Gear** .0020-.0035" (.050-.089 mm)
5. Housing-to-Outer Gear .0020-.0043" (.050-.109 mm)

Fig. 12: Checking Oil Pump Clearances (Axxess & Stanza)
 Courtesy of Nissan Motor Co., U.S.A.

PICKUP, 240SX

Removal & Disassembly

1) Set No. 1 piston at TDC of compression stroke. Check distributor rotor position for reassembly reference. Remove mount bolts. Remove oil pump and drive spindle assembly.

2) Remove cover, gasket and gears from oil pump body. See Fig. 13. Wash parts with solvent. Inspect for wear or damage.

Inspection

Using a feeler gauge, check clearances. See Fig. 14. With rotor in pump body and gasket installed, place straightedge over rotor. Check clearance between rotor and straightedge. Clearance should not exceed .0031" (.08 mm).

NOTE: Oil pump rotors and body are not serviced separately. If excessively worn or damaged, replace pump rotor set or complete pump assembly.

Reassembly & Installation

1) Install outer pump rotor with large chamfered portion facing pump body side. Ensure distributor rotor is in same position as before removal. Fill pump housing with oil. Align punch mark on drive

spindle with hole in pump.

2) Using new gasket, install oil pump and drive spindle assembly. Ensure drive spindle tip securely fits in distributor hole. Tighten all bolts to specification. See TORQUE SPECIFICATIONS at end of article. To complete installation, reverse removal procedure.

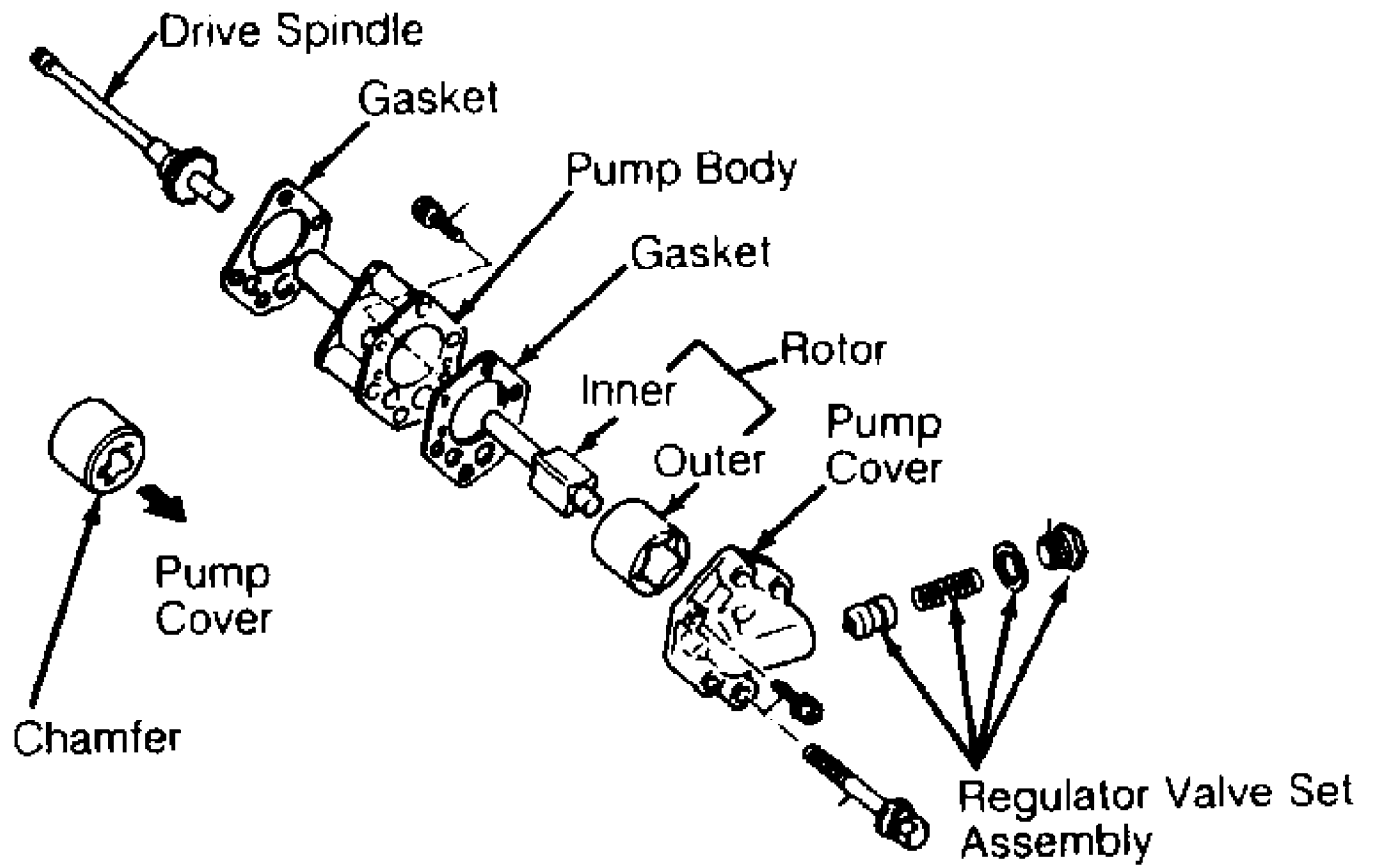
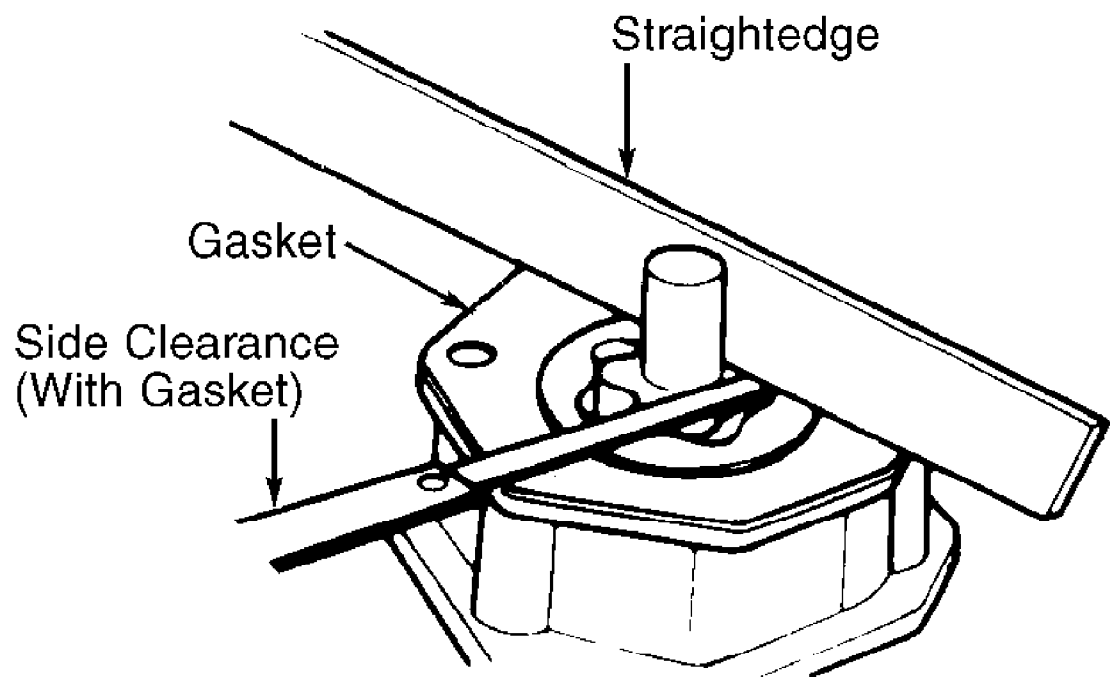
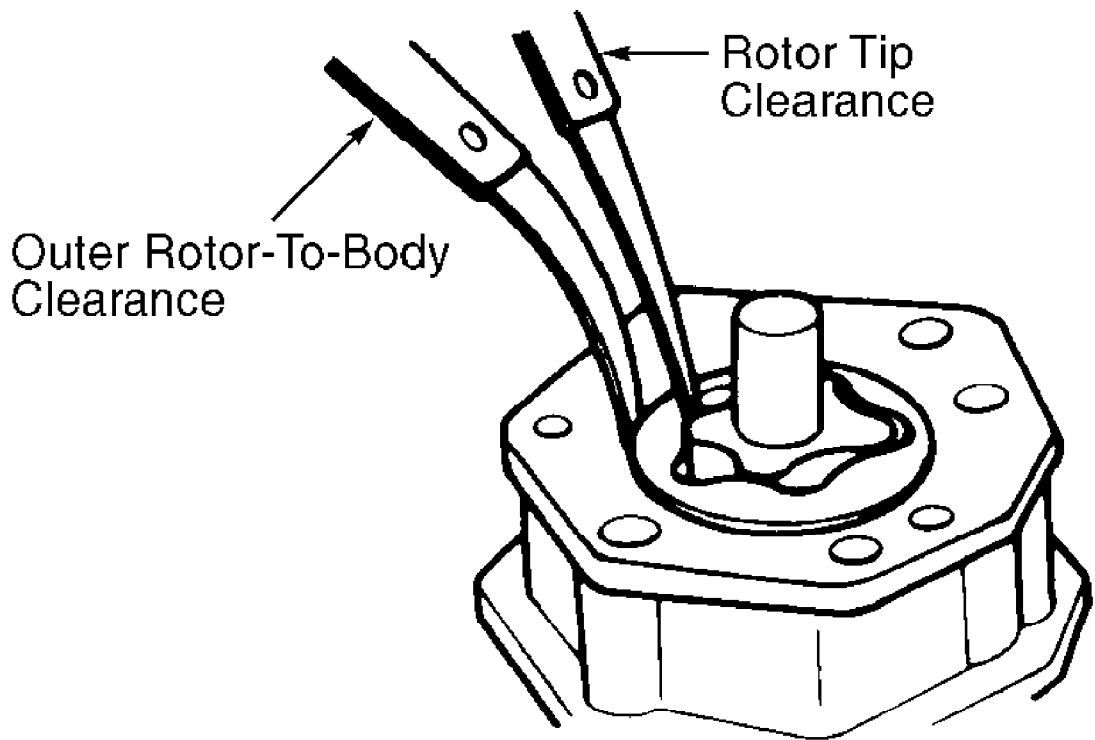


Fig. 13: Exploded View of Oil Pump Assembly (Pickup & 240SX)
Courtesy of Nissan Motor Co., U.S.A.



91G00139
Fig. 14: Checking Oil Pump Clearances (Pickup & 240SX)
Courtesy of Nissan Motor Co., U.S.A.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Alternator Bracket Bolt	12-15 (16-20)
Alternator Pivot Bolt	33-44 (45-60)
Camshaft Sprocket Bolt	87-116 (118-157)
Connecting Rod Nut	
Step 1	10-12 (14-16)
Step 2	28-33 (38-44)
Crankshaft Pulley	
Axxess & Stanza	87-116 (118-157)
Pickup & 240SX	105-112 (142-152)
Cylinder Block Drain Plug	25-33 (34-45)
Cylinder Head Bolt (1)	
Step 1	22 (30)
Step 2	58 (79)
Step 3	Loosen All Bolts
Step 4	22 (30)
Step 5	54-61 (73-83)
EGR Tube Nut	29-36 (40-49)
Exhaust Manifold Bolt/Nut	12-15 (16-20)
Flexplate Mount Bolt (A/T)	69-76 (94-103)
Flywheel Mount Bolt (M/T)	105-112 (142-152)
Intake Manifold Bolt/Nut	12-15 (16-20)
Intake Plenum Bolt/Nut	12-15 (16-20)
Main Bearing Cap Bolt	34-38 (46-52)
Oil Drain Plug	22-29 (30-39)
Oil Pump Bolt (Axxess & Stanza)	12-15 (16-20)
Oil Strainer Bolt	12-15 (16-20)
Rocker Arm Shaft Bolt	27-30 (37-41)
Starter Motor Bolt	22-30 (30-41)
Transmission/Transaxle-to-Cylinder Block Bolt	30 (41)
Oil Filter Adapter-to-Block Bolt	
Axxess & Stanza	22-29 (30-39)
Pickup & 240SX	12-15 (16-20)
Water Pump Bolt	12-15 (16-20)

INCH Lbs. (N.m)

Cam Chain Guide Bolt	108-126 (12-19)
Cam Chain Tensioner Bolt	61-70 (7-8)
Cylinder Head-to-Front Cover Bolt	35-86 (4-10)
Front Cover Bolt	61-70 (7-8)
Oil Pan Bolt	61-70 (7-8)
Oil Pump Bolt (Pickup & 240SX)	96-132 (11-15)
Oil Pump Cover Screw (Axxess & Stanza)	35-43 (4-5)
Rear Oil Seal Retainer Bolt	61-70 (7-8)
Rocker Arm Cover Bolt	61-86 (7-10)
Water Pump Pulley Bolt (Axxess & Stanza)	61-70 (7-8)
Water Pump Pulley Nut (Pickup & 240SX)	51-86 (6-10)

(1) - See torque procedure in CYLINDER HEAD R & I.

ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS TABLE

Application	Specification
Displacement	146 Cu. In. (2.4L)
Bore	3.50" (89 mm)
Stroke	3.78" (96 mm)
Compression Ratio	
Axxess, Stanza & Pickup	8.6:1
240SX	9.0:1
Fuel System	PFI
HP @ RPM	
Axxess & Stanza	138 @ 5600
Pickup	134 @ 5200
240SX	140 @ 5600
Torque Ft. Lbs. @ RPM	
Axxess & Stanza	148 @ 4400
Pickup	154 @ 3600
240SX	152 @ 4400

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECS TABLE

Application	In. (mm)
Crankshaft	
End Play	.002-.007 (.05-.18)
Runout	.004 (.10)
Main Bearings	
Journal Diameter	
Axxess, Stanza & 240SX	
Grade 0	2.3609-2.3612 (59.967-59.975)
Grade 1	2.3606-2.3609 (59.959-59.967)
Grade 2	2.3603-2.3606 (59.951-59.959)
Pickup	
Grade 0	2.5057-2.5060 (63.645-63.652)
Grade 1	2.5060-2.5064 (63.652-63.663)
Grade 2	2.5064-2.5068 (63.663-63.672)
Journal Out-of-Round & Taper	.0004 (.010)
Oil Clearance	.0008-.0019 (.020-.047)
Connecting Rod Bearings	
Journal Diameter	
Axxess, Stanza & 240SX	
Grade 0	1.9672-1.9675 (49.968-49.974)
Grade 1	1.9670-1.9672 (49.962-49.968)
Grade 2	1.9668-1.9670 (49.956-49.962)
Pickup	2.3603-2.3612 (59.951-59.975)
Journal Out-of-Round & Taper	.0002 (.005)
Oil Clearance	.0004-.0014 (.010-.035)

CONNECTING RODS SPECIFICATIONS

CONNECTING RODS SPECIFICATIONS TABLE

Application	In. (mm)
Bore Diameter	
Pin Bore	
Axxess, Stanza & 240SX	.8268-.8272 (21.000-21.012)
Pickup	.8247-.8259 (20.948-20.978)

Crankpin Bore	2.0866-2.0871	(53.000-53.013)
Center-to-Center Length	6.494-6.498	(164.950-165.050)
Maximum Bend .....	.0059	(.150)
Maximum Twist .....	.012	(.30)
Side Play .....	.008-.016	(.20-.40)

PISTONS, PINS & RINGS SPECIFICATIONS

PISTONS, PINS & RINGS SPECIFICATIONS TABLE

Application	In. (mm)	
Pistons		
Clearance .....	.0008-.0016	(.020-.040)
Diameter		
Grade 1	3.5027-3.5031	(88.970-88.980)
Grade 2	3.5031-3.5035	(88.980-88.990)
Grade 3	3.5035-3.5039	(88.990-89.000)
Pins		
Diameter		
Axxess, Stanza & 240SX .....	.8263-.8268	(20.989-21.000)
Pickup .....	.8265-.8266	(20.994-20.996)
Piston Fit		
Axxess, Stanza & 240SX (1)	0-.0002	(0-.005)
Pickup .....	.0003-.0005	(.008-.012)
Rod Fit		
Axxess, Stanza & 240SX .....	.0002-.0007	(.005-.017)
Pickup (1) .....	.0006-.0013	(.015-.033)
Rings		
No. 1		
End Gap .....	.0110-.0169	(.280-.430)
Side Clearance .....	.0016-.0031	(.040-.080)
No. 2		
End Gap		
Ring Marked		
"R" or "T" (Axxess, Stanza & 240SX) .....	.0177-.0236	(.450-.600)
"N" (Axxess, Stanza & 240SX) .....	.0217-.0276	(.550-.700)
Pickup .....	.0177-.0272	(.450-.690)
Side Clearance .....	.0012-.0028	(.030-.070)
No. 3 (Oil)		
End Gap .....	.0079-.0236	(.200-.600)
Side Clearance		
Rinken Rings .....	.0026-.0053	(.065-.135)

(1) - Interference fit or negative clearance.

CYLINDER BLOCK SPECIFICATIONS

CYLINDER BLOCK SPECIFICATIONS TABLE

Application	In. (mm)	
Cylinder Bore		
Standard Diameter		
Grade 1	3.5039-3.5043	(89.000-89.010)
Grade 2	3.5043-3.5047	(89.010-89.020)
Grade 3	3.5047-3.5051	(89.020-89.030)
Maximum Taper .....	.0004	(.010)

Maximum Out-of-Round .....	.0006 (.015)
Minimum Deck Height	9.722-9.726 (246.95-247.05)
Maximum Deck Warpage (1) .....	.004 (.10)

(1) - Maximum resurfacing limit of cylinder block and cylinder head combined is .008" (.20).

VALVES & VALVE SPRINGS SPECIFICATIONS

VALVES & VALVE SPRINGS SPECIFICATIONS TABLE

Application	Specification
Intake Valves	
Face Angle	45°
Head Diameter	1.339-1.346" (34.00-34.20 mm)
Minimum Margin .....	.02" (.5 mm)
Minimum Refinish Length	4.72" (119.9 mm)
Stem Diameter .....	.2742-.2748" (6.965-6.980 mm)
Valve Tip Maximum Refinish .....	.008" (.20 mm)
Exhaust Valves	
Face Angle	45°
Head Diameter	1.575-1.583" (40.00-40.20 mm)
Minimum Margin .....	.02" (.5 mm)
Minimum Refinish Length	4.7508" (120.67 mm)
Stem Diameter .....	.3129-.3134" (7.948-7.960 mm)
Valve Tip Maximum Refinish .....	.008" (.20 mm)
Valve Springs	
Intake	
Free Length	
Inner Spring	2.100" (53.34 mm)
Outer Spring	2.2614" (57.440 mm)
Out-of-Square	
Inner Spring .....	.091" (2.30 mm)
Outer Spring .....	.098" (2.50 mm)
Pressure	
	Lbs. @ In. (Kg @ mm)
Inner Spring	63.9 @ 1.283 (29 @ 32.60)
Outer Spring	135.80 @ 1.48 (61.6 @ 37.6)
Exhaust	
Free Length	
Inner Spring	1.888" (47.95 mm)
Outer Spring	2.095" (53.21 mm)
Out-of-Square	
Inner Spring .....	.083" (2.10 mm)
Outer Spring .....	.091" (2.30 mm)
Pressure	
	Lbs. @ In. (Kg @ mm)
Inner Spring	73.90 @ 1.146 (33.5 @ 29.10)
Outer Spring	144.0 @ 1.343 (65.3 @ 34.10)

CYLINDER HEAD SPECIFICATIONS

CYLINDER HEAD SPECIFICATIONS TABLE

Application	Specification
Cylinder Head Height	3.890-3.898" (98.80-99.00 mm)
Maximum Warpage .....	.004" (.10 mm)

Valve Seats	
Intake Valve	
Seat Angle	45 °
Seat Width	
Exhaust .....	.067-.083" (1.70-2.10 mm)
Intake .....	.063-.067" (1.60-1.70 mm)
Seat Bore	
Diameter	1.4350-1.4356" (36.00-36.016 mm)
Exhaust Valve	
Seat Angle	45 °
Seat Width .....	.067-.083" (1.7-2.1 mm)
Seat Bore Diameter ...	1.4350-1.4356" (36.00-36.016 mm)
Valve Guides	
Intake Valve	
Valve Guide Cylinder	
Head Bore I.D. ....	.4321-.4329" (10.975-10.996 mm)
Oversize Guide	
Hole Diameter .....	.4400-.4408" (11.175-11.196 mm)
Valve Guide I.D. ....	.2756-.2763" (7.000-7.018 mm)
Valve Guide Installed Height .	.587-.594" (14.9-15.1 mm)
Valve Stem-to-Guide	
Oil Clearance .....	.0008-.0021" (.020-.053 mm)
Exhaust Valve	
Valve Guide Cylinder	
Head Bore I.D. ....	.4715-.4723" (11.975-11.996 mm)
Oversize Guide	
Hole Diameter .....	.4793-.4802" (12.175-12.196 mm)
Valve Guide I.D. ....	.3150-.3157" (8.000-8.018 mm)
Valve Guide Installed	
Height .....	.587-.594" (14.9-15.1 mm)
Valve Stem-to-Guide	
Oil Clearance .....	.0016-.0028" (.040-.070 mm)

CAMSHAFT SPECIFICATIONS

CAMSHAFT SPECIFICATIONS TABLE

Application	In. (mm)
Bore Diameter	1.2992-1.3002 (33.000-33.025)
End Play .....	.0028-.0059 (.07-.15)
Journal Diameter	1.2967-1.2974 (32.935-32.9555)
Journal Runout .....	.0008 (.02)
Lobe Height	1.7653-1.7728 (44.839-45.029)
Lobe Lift .....	.409 (10.4)
Oil Clearance .....	.0018-.0035 (.045-.090)