

1.6L 4-CYL VIN [0]

Article Text

1995 Suzuki Esteem

For Xeon

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Tuesday, December 02, 2003 06:52PM

ARTICLE BEGINNING

1995-96 ENGINES
Suzuki - 1.6L 4-Cylinder

Esteem

* PLEASE READ THIS FIRST *

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

ENGINE IDENTIFICATION

Engine code is stamped on rear portion of cylinder block at bellhousing, exhaust side. Vehicle Identification Number (VIN) is stamped on a metal tag attached to left side of instrument panel near pillar. The sixth character of VIN identifies engine model.

ENGINE IDENTIFICATION CODE TABLE

Application	VIN
Esteem	0

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

1) Disconnect negative battery cable. Remove rocker cover. Remove right side inner fender apron extension to make timing marks visible. Align crankshaft pulley timing mark with TDC mark on timing belt cover.

2) Remove distributor cap. Ensure rotor is pointing upward toward distributor hold-down bolt and to No. 1 terminal of distributor cap. If not correctly oriented, rotate crankshaft 360 degrees.

3) Measure clearance between adjustment screw and valve stem using thickness gauge. Check intake valve clearance of cylinders No. 1 and 2 and exhaust valve clearance of cylinders No. 1 and 3. Turn crankshaft one complete revolution (360 degrees). Check intake valve clearance of cylinders No. 3 and 4 and exhaust valve clearance of cylinders No. 2 and 4.

4) Ensure clearance is within specification. See VALVE CLEARANCE SPECIFICATIONS table. If clearance adjustment is necessary, loosen lock nut and turn adjusting screw. Hold adjusting screw while tightening lock nut to 106 INCH lbs. (12 N.m). Recheck clearance.

VALVE CLEARANCE SPECIFICATIONS TABLE

Application	In. (mm)
Engine Cold	
Intake & Exhaust .....	.005-.007 (.13-.18)
Engine Hot	
Intake & Exhaust .....	.007-.008 (.18-.20)

REMOVAL & INSTALLATION

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 before removal.

WARNING: ALWAYS relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components.

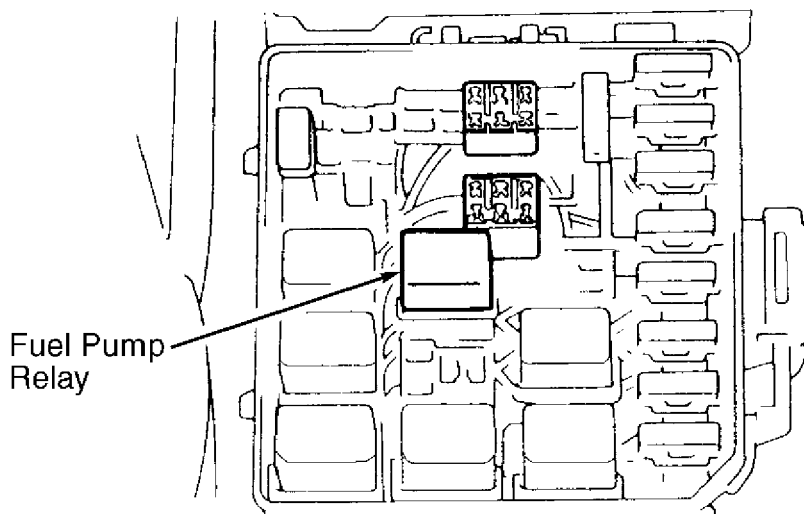
FUEL PRESSURE RELEASE

1) Place transmission in Neutral (M/T) or Park (A/T). Set parking brake and block drive wheels.

2) Disconnect fuel pump relay connector. Fuel pump relay is located in relay box, near battery. See Fig. 1.

3) Remove fuel filler cap to release pressure. Reinstall fuel filler cap. Start engine, and idle until engine dies. Crank engine 2

or 3 times to ensure lines are empty. Reconnect fuel pump relay connector.



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Fig. 1: Locating Fuel Pump Relay
Courtesy of Suzuki of America Corp.

ENGINE

CAUTION: When raising or supporting engine or automatic transmission for any reason, DO NOT use a jack under oil pan. Damage to oil pump and pick-up strainer could result.

NOTE: Remove engine and transmission as an assembly. Engine and transmission assembly must be lowered from vehicle.

Removal

1) Release fuel pressure. See FUEL PRESSURE RELEASE.

Disconnect battery cables. Mark and remove hood. Drain coolant and remove radiator hoses.

2) Disconnect cooling fan wires. Remove air cleaner assembly. Remove radiator and cooling fan as an assembly. Disconnect fuel lines and heater hoses. Identify, mark and remove vacuum lines and hoses at engine.

3) Disconnect accelerator cable at throttle body. On M/T models, disconnect clutch cable at transmission. On A/T models, disconnect gear select cable from transmission. On all models, label and disconnect all engine and transmission wiring.

4) Raise vehicle. Remove right and left engine undercovers. Disconnect exhaust pipe at manifold. Loosen A/C compressor pivot bolt. Remove A/C drive belt and compressor mounting bracket (if equipped).

5) On A/T models, disconnect gearshift control shaft and gearshift extension rod at transaxle. On all models, drain transmission and engine oil. Disconnect ball joints, and remove drive axles. See AXLE SHAFTS - FWD article in DRIVE AXLES section.

6) Attach hoist to engine. Disconnect crossmember from frame rails. Disconnect left and right side engine mounts. Lower engine and transmission as an assembly.

Installation

Raise engine/transmission unit into vehicle. Install engine/transmission mountings to brackets. Install bolts into frame brackets. Tighten bolts to specification. See TORQUE SPECIFICATIONS. To complete installation, reverse removal procedure.

INTAKE MANIFOLD

Removal

1) Release fuel pressure. See FUEL PRESSURE RELEASE.

Disconnect negative battery cable. Drain cooling system. Remove air intake hoses and air breather hoses.

WARNING: To avoid severe burns, DO NOT remove radiator drain plug or cap while engine and radiator are still hot.

2) Remove air cleaner assembly. Label and disconnect all electrical connections from intake manifold, injectors and throttle body. Label and disconnect vacuum hoses from intake manifold.

3) Disconnect coolant hoses from manifold and throttle body and remove upper radiator hose. Remove fuel supply and return lines from delivery pipe. Disconnect all control cables.

4) Remove intake manifold-to-cylinder head bolts. Remove intake manifold and throttle body and gasket. Remove remaining components from intake manifold as required.

Installation

To install, reverse removal procedure. Use NEW gaskets. Tighten bolts to specification. See TORQUE SPECIFICATIONS. Adjust all control cables and fill cooling system.

EXHAUST MANIFOLD

Removal

- 1) Disconnect negative battery cable. Remove air cleaner assembly (if necessary). Disconnect oxygen sensor wire connector.
- 2) Disconnect exhaust pipe from exhaust manifold. Remove exhaust manifold cover. Remove exhaust manifold stiffener. Remove exhaust manifold-to-cylinder head bolts. Remove exhaust manifold and gasket.

Installation

To install, reverse removal procedure. Use NEW exhaust manifold gasket. Tighten bolts to specification. See TORQUE SPECIFICATIONS.

CYLINDER HEAD

Removal

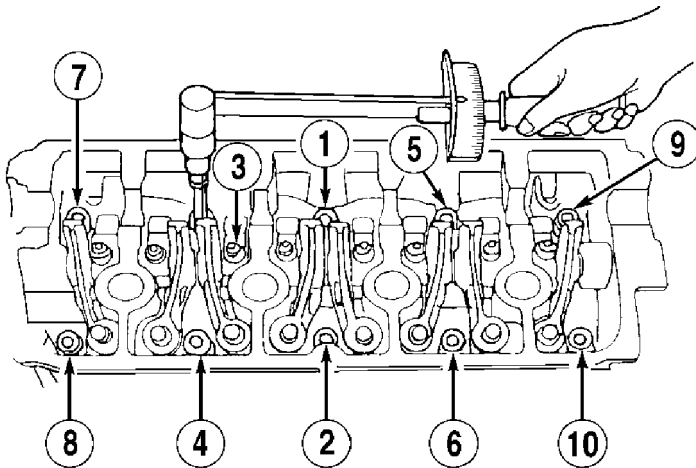
- 1) Release fuel pressure. See FUEL PRESSURE RELEASE. Disconnect negative battery cable. Drain cooling system and remove necessary coolant hoses from cylinder head. Remove intake manifold brace. Label and remove hoses, lines and electrical connectors from cylinder head, intake manifold and exhaust manifold. Disconnect exhaust pipe from exhaust manifold and remove brace.
- 2) Removing exhaust and intake manifolds is not necessary. Remove rocker arm cover. Fully loosen all rocker arm adjustment screws. Remove timing belt. See TIMING BELT. Remove air conditioner compressor and/or generator adjusting arm from cylinder head (if equipped).
- 3) Loosen cylinder head bolts in reverse order of tightening sequence. See Fig. 2. Loosen head bolts in 2 or 3 steps to prevent cylinder head warpage. Remove head bolts. Using a lifting device, remove cylinder head with intake and exhaust manifolds attached.

Inspection

- 1) Check cylinder head for evidence of water leakage or damage. Remove carbon from combustion chambers. Check cylinder head for cracks in intake and exhaust ports, combustion chambers and head surface.
- 2) Check head warpage at 6 locations. If warpage exceeds specification, cylinder head should be machined or replaced. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.
- 3) Check intake and exhaust manifold seating faces on cylinder head for warpage. Warpage limit for manifold seating faces is .004" (.10 mm). If warpage exceeds specification, machine or replace cylinder head.

Installation

To install cylinder head, reverse removal procedure. Use NEW head and manifold gaskets. Tighten cylinder head bolts to specification in 3 steps using proper sequence. See Fig. 2 or 8. See TORQUE SPECIFICATIONS. Adjust valve clearance. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS.



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Fig. 2: Cylinder Head Bolt Tightening Sequence
Courtesy of Suzuki of America Corp.

FRONT COVER OIL SEAL

Removal

1) Remove water pump, crankshaft pulley and generator. Remove timing belt cover and timing belt. See TIMING BELT.

2) Drain engine oil. Remove oil dipstick and oil pan. Remove oil pump pick-up screen. Remove oil pump assembly. Remove oil pump rotor plate.

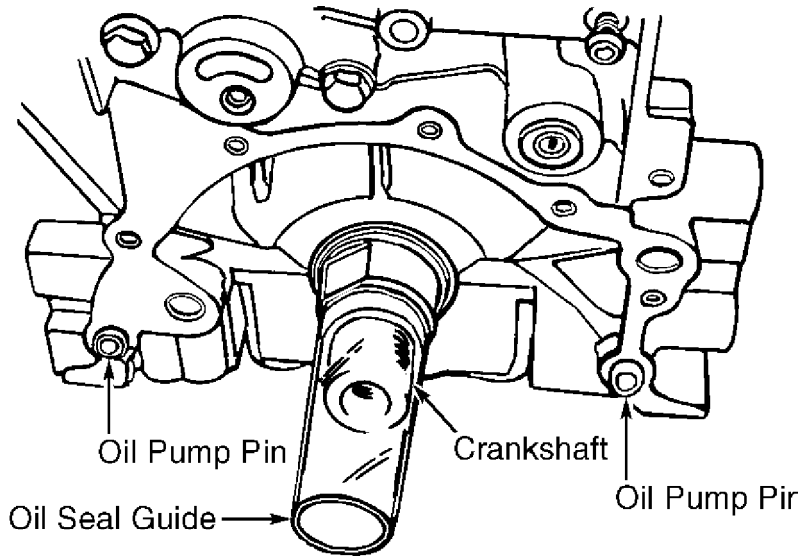
3) Using felt pen, mark outer gear for reassembly reference. Remove inner and outer oil pump gears. Remove plug, relief spring and relief valve. Drive out oil seal.

Installation

1) Drive in NEW oil seal. Ensure gears are assembled in same direction as originally installed. Apply thin coat of engine oil to lip portion of oil seal and inside surfaces of oil pump case and plate. Install inner and outer rotors.

2) Install rotor plate. Tighten 5 screws. Install 2 oil pump pins, NEW dipstick "O" ring, NEW seal for oil pick-up tube and NEW oil pump gasket. Use Oil Seal Guide (09926-18210) to prevent damage to oil seal during installation of oil pump. See Fig. 3.

3) Apply engine oil to guide and install oil pump. Install dipstick guide with NEW seal. Install oil pan using silicone-type sealant. To complete installation, reverse removal procedure. Tighten bolts to specification. See TORQUE SPECIFICATIONS.



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Fig. 3: Installing Oil Seal Guide
Courtesy of Suzuki of America Corp.

TIMING BELT

Removal

1) Disconnect negative battery cable.

2) Raise vehicle and remove fender apron extension by pushing center pin into clip. DO NOT push in too far as pin may fall into fender. Loosen generator, and remove water pump pulley and belt.

3) Remove crankshaft pulley. Remove timing belt cover. Align all sprocket timing marks with timing marks on engine. See Fig. 4. Move up and secure timing belt tensioner.

4) If timing belt is to be reused, mark belt with an arrow indicating direction of rotation. Remove timing belt from camshaft and crankshaft sprockets.

CAUTION: DO NOT turn crankshaft more than 90 degrees in either direction from aligned position. Doing so could damage piston(s) and/or valve(s) by interference. Also, DO NOT bend timing belt.

Installation

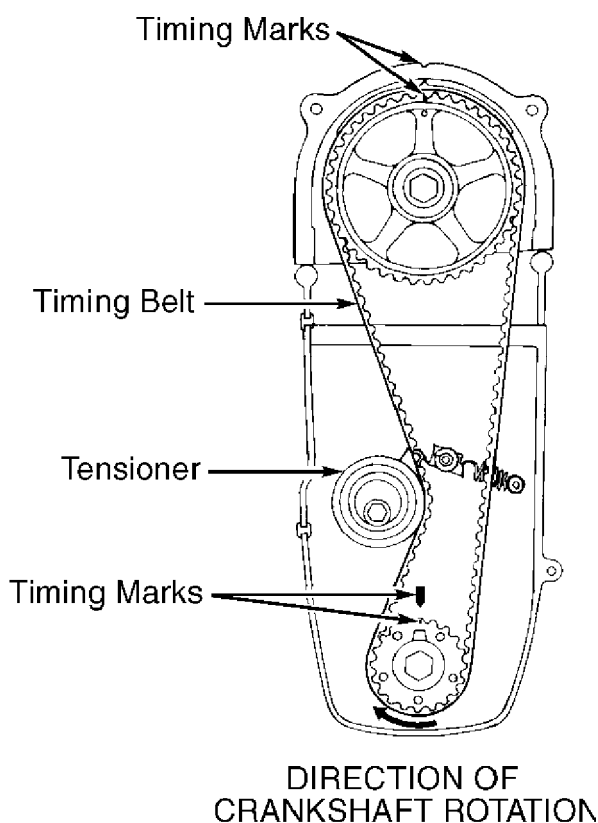
1) Loosen all valve adjusting screws fully before installing timing belt. Allow camshaft to rotate freely during belt tension adjustment. Align timing mark on camshaft sprocket with "V" mark on timing belt inner cover. See Fig. 4.

2) Turn crankshaft clockwise until punch mark on crankshaft sprocket is aligned with arrow mark on oil pump. With timing marks aligned, install timing belt. Ensure direction arrow mark on timing belt is pointed in direction of crankshaft rotation. Ensure drive side of belt is free of slack.

3) Move tensioner plate up with finger pressure, and loosely secure tensioner bolt. Turn crankshaft 2 revolutions clockwise to remove all slack from belt. Tighten tensioner nut and then tensioner bolt. See TORQUE SPECIFICATIONS.

4) Ensure timing marks are aligned. Install timing belt outer cover and tighten bolts to specification. See TORQUE SPECIFICATIONS. Reverse

removal procedure to complete installation. Adjust valve clearance. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS.



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Fig. 4: Aligning Timing Belt & Tensioner (Typical SOHC)
Courtesy of Suzuki of America Corp.

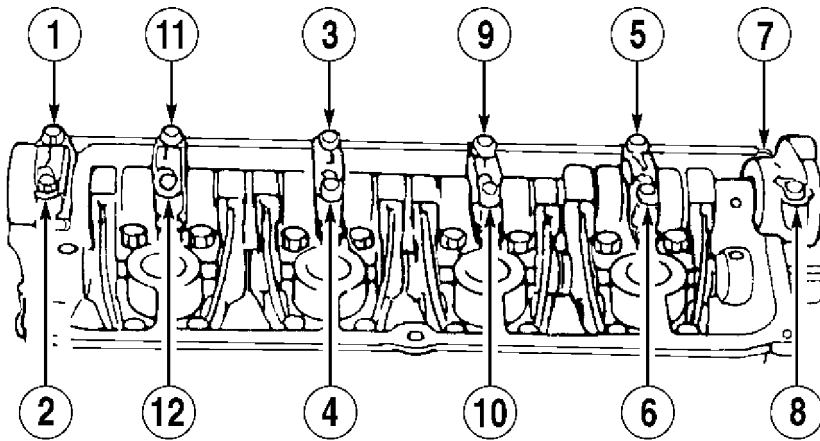
ROCKER ARM & VALVE LASH ADJUSTER

Removal

- 1) Disconnect negative battery cable. Remove front grille. Remove hood lock and hood lock support member and disconnect lead wire from horn. Push center pin of clips to release grille clips.
- 2) Drain cooling system. Remove radiator, cooling fan and shroud. Remove A/C condenser and compressor (if equipped), leaving hoses connected. Remove air cleaner assembly and rocker arm cover.
- 3) Remove water pump belt and pulley. Remove timing belt. See TIMING BELT. Use Camshaft Pulley Holder (09917-68220) to secure camshaft pulley. Remove camshaft sprocket bolt and sprocket.
- 4) Loosen all valve adjustment lock nuts and valve adjusting screws to allow rocker arms to move freely.
- 5) Loosen camshaft bearing caps in reverse order of tightening sequence. See Fig. 5. Loosen bolts in 2 or 3 steps. Remove camshaft bearing caps and camshaft. Remove rocker arm shaft plug and timing belt inside cover.
- 6) Remove intake rocker arms, with clip, from rocker arm shaft. Remove rocker arm shaft bolts. Push rocker arm shaft slightly to rear and remove "O" ring from shaft. Remove exhaust rocker arms and springs while pushing rocker arm shaft toward front of engine.

Installation

- 1) To install, reverse removal procedure. Install NEW "O" ring on rear of rocker arm shaft. Ensure flat surface of rocker arm shaft is facing down and is parallel with cylinder head gasket mating surface. Tighten camshaft bearing caps in 3 or 4 steps in sequence, finishing with final torque specification. See Fig. 5. See TORQUE SPECIFICATIONS.
- 2) Intake rocker shaft has a .55" (14 mm) stepped end. Exhaust rocker shaft has a .59" (15 mm) stepped end. Ensure intake rocker shaft stepped end faces front of engine and exhaust rocker shaft stepped end faces rear of engine. Adjust valve clearance. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS.



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Fig. 5: Camshaft Bearing Cap Bolt Tightening Sequence
 Courtesy of Suzuki of America Corp.

CAMSHAFT

Removal

For camshaft removal, see **ROCKER ARM & VALVE LASH ADJUSTER**.

CAUTION: Hydraulic valve lash adjusters cannot be disassembled or repaired. DO NOT apply force to adjuster body. If removed, keep immersed in container of clean engine oil.

Inspection

1) Check cam lobes and journals for wear and damage. Use Plastigage to check bearing clearance. If wear exceeds specification, repair or replace as necessary. See **CAMSHAFT** table under **ENGINE SPECIFICATIONS**.

2) Use dial indicator and "V" blocks to measure camshaft runout at center of shaft. If wear exceeds specification, repair or replace as necessary. See **CAMSHAFT** table.

Installation

Lubricate camshaft lobes and camshaft bearing journals. Install camshaft and NEW oil seal in cylinder head. Install camshaft sprocket. Ensure camshaft sprocket timing marks align with timing marks on cylinder head. See Fig. 4. To complete installation, reverse removal procedure.

REAR CRANKSHAFT OIL SEAL

Removal

Remove engine or engine and transmission. See **ENGINE**. Separate transmission from engine. Remove flywheel. Remove oil seal housing. Remove seal. Inspect oil seal housing for wear or damage. Repair or replace as necessary.

Installation

Install oil seal in housing. Apply oil to seal lip. Install oil seal housing with NEW gasket. Tighten housing bolts to specification. See **TORQUE SPECIFICATIONS** table. Oil seal housing gasket will bulge after mounting bolts have been tightened. Trim excess gasket material even with oil pan gasket surface.

WATER PUMP

Removal

1) Drain cooling system. Disconnect negative battery cable. Remove drive belts. Remove A/C compressor (if equipped), leaving hoses connected.

2) Remove pump pulley. Ensure No. 1 piston is at TDC of compression stroke. Remove crankshaft pulley bolts and crankshaft pulley. Remove timing belt cover, tensioner and timing belt. See **TIMING BELT**. Remove dipstick and tube. Remove generator mounting bracket. Remove water pump.

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Installation

To install, reverse removal procedure. Ensure all mating surfaces are clean. Use NEW water pump gasket and NEW dipstick tube "O" ring.

NOTE: For further information on cooling systems, see **COOLING SYSTEM SPECIFICATIONS & ENGINE COOLING FANS** article in **ENGINE COOLING** section.

OIL PAN

Removal

Raise and support vehicle. Drain engine oil. Remove engine undercovers. Remove exhaust pipe No. 1. Remove transmission stiffener. Support engine/transmission assembly. Remove crossmember. Remove crankshaft position sensor from oil pan. Remove oil pan nuts and bolts. Remove oil pan then oil pump strainer.

Installation

To install, reverse removal procedure. Install oil pan using silicone-type sealant. Tighten bolts to specification. See TORQUE SPECIFICATIONS.

OVERHAUL

CYLINDER HEAD

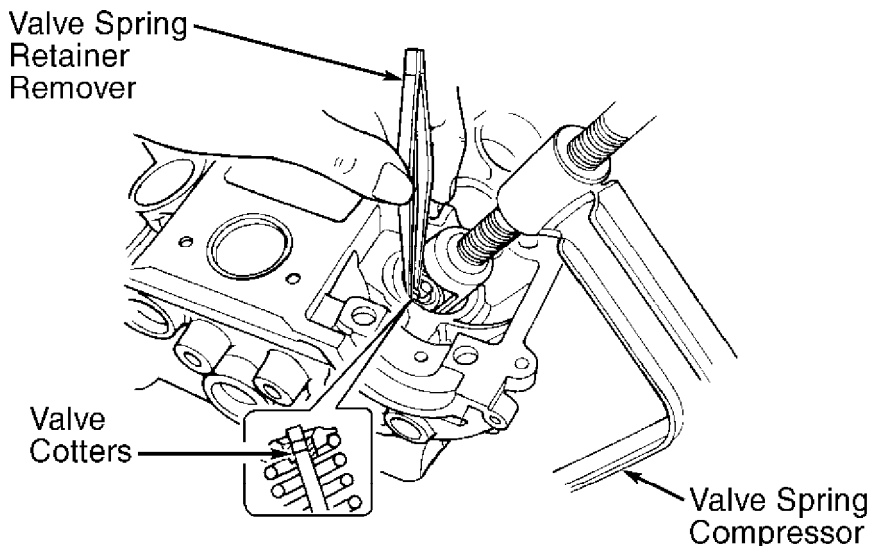
Cylinder Head Disassembly

1) Remove cylinder head. See CYLINDER HEAD under REMOVAL & INSTALLATION. Remove intake and exhaust manifolds. Remove camshaft. See CAMSHAFT. Remove rocker arms and shaft. See

ROCKER ARM & VALVE LASH ADJUSTER under REMOVAL & INSTALLATION.
2) Use Valve Spring Compressor (09916-14510) and Valve Lifter Attachment (09916-14910) to compress valve spring. Use Forceps (09916-84510) to remove retainer locks. See Fig. 6. Remove retainers, springs, valve stem oil seals, spring seats and valves. Keep all components in order for reassembly reference.

Cylinder Head Reassembly

To assemble, reverse disassembly procedure. Ensure valve springs are installed with close coiled (small pitch) end down, toward cylinder head.



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Fig. 6: Removing Valve Lock
Courtesy of Suzuki of America Corp.

Valve Springs

Check valve springs for damage. Use a square and flat surface plate to check spring squareness. Maximum out-of-square is .079" (2.00 mm). Using valve spring tester, check valve spring preload pressure. See VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS. Replace any weak or out of square springs.

NOTE: DO NOT reuse old valve stem oil seals

Valve Stem Oil Seals

Place NEW lubricated stem seal on valve guide. Use Valve Stem Seal Installer (09916-58210). Press seal on valve guide using hand pressure only. When installer bottoms on head, seal is properly positioned. Avoid twisting seals during installation.

Valve Guides

1) Check valve stem-to-guide clearance. If clearance exceeds specification, replace with oversize valve guide. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

2) Use Valve Guide Remover (09916-44910). Drive out old guide.

3) Ream guide bore in cylinder head with 11-mm Reamer (09916-38210). Heat cylinder head to 176-212°F (80-100°C).

4) Using Valve Guide Installer Attachment (09916-58210 for SOHC), drive new valve guide into valve guide, until it contacts cylinder head.

5) Valve guide protrusion is .45" (11.5mm). Ream valve guide with 5.5-mm Reamer (09916-34550).

6) Clean valve guide bore after reaming. Install valve and ensure valve stem oil clearance is correct. See CYLINDER HEAD table.

Valve Seat

Inspect valve seats for damage or wear. If valve seat rework is necessary, use 2 cutters to obtain required angles. On intake and exhaust valves, first cut should be 15 degrees. Second cut should be 45 degrees to obtain correct seat angle. After cutting valve seats to correct angles, lap valve seat.

Valves

1) Remove carbon deposits. Inspect for wear, burns or distortion at face and stem. Replace as necessary. Measure valve head margin. Check valve stem end for pitting or wear.

2) Measure valve length. Valve stem end may be resurfaced if no more than .19" (4.8 mm) is removed from valve length. See VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS.

Seat Correction Angles

On intake and exhaust valves, use 15-degree stone to narrow seat and 45-degree stone to widen seat.

VALVE TRAIN

Rocker Arm Shaft Assembly

Check rocker arm-to-shaft oil clearance. Maximum clearance is .0035 (.09). Check rocker arm shaft runout. Rocker arm shaft runout limit is .008" (.20 mm) on 16-valve or .004" (.10 mm) on all others.

Lash Adjusters

If tip of rocker arm adjusting screw is worn, replace screw. If cam riding face of rocker arm is badly worn, replace rocker arm.

CYLINDER BLOCK ASSEMBLY

Piston & Rod Assembly

1) Remove cylinder head. See CYLINDER HEAD under REMOVAL & INSTALLATION. Remove oil dipstick guide, oil pan and screen. See OIL PAN under REMOVAL & INSTALLATION.

2) Ensure pistons, connecting rods and rod caps are marked for reassembly reference. Remove carbon from top of cylinder bores. Remove connecting rod caps. Install protective hose over connecting rod bolts.

3) Remove connecting rod and piston assembly through top of cylinder block. Mark cylinder number on piston crown. Remove piston rings.

4) Remove circlips, and push piston pin out by hand.

5) Check piston pin-to-bore fit. Pin should press in piston smoothly by hand at room temperature. When assembling, apply engine oil to outside of pin and to piston pin bore.

6) Position piston upward. Install circlips and piston pin. Install circlips with opening facing either up or down.

Fitting Pistons

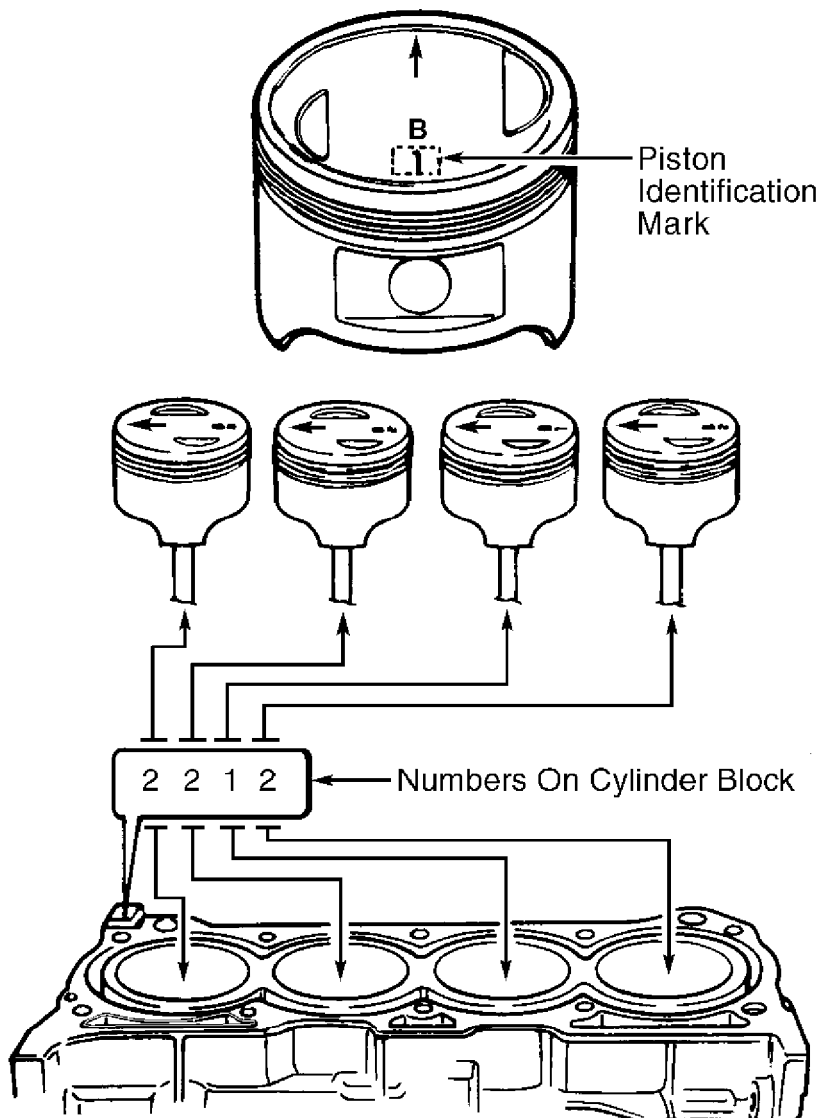
1) Check cylinder bore for damage, wear and taper. See CYLINDER BLOCK under CYLINDER BLOCK ASSEMBLY under OVERHAUL. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS to determine if block must be rebored.

2) Pistons are available in .0098" (.25 mm) and .0197" (.50 mm) oversizes. Check outside diameter of piston. Measure at a point .63" (16.0 mm) from bottom of skirt and at 90 degrees to pin bore.

3) Standard pistons are available in 2 sizes. Piston diameter is determined by numerical mark ("1" or "2") stamped on piston crown. See Fig. 7.

4) Cylinder bore diameter is determined by numerical mark ("1" or "2") stamped on cylinder block. Numerical marks on cylinder block, read left to right, indicate bore sizes of cylinders No. 1, 2, 3 and 4, respectively. See Fig. 7.

5) When installing piston into cylinder, ensure piston numerical mark matches cylinder bore numerical mark to provide correct piston-to-cylinder clearance.



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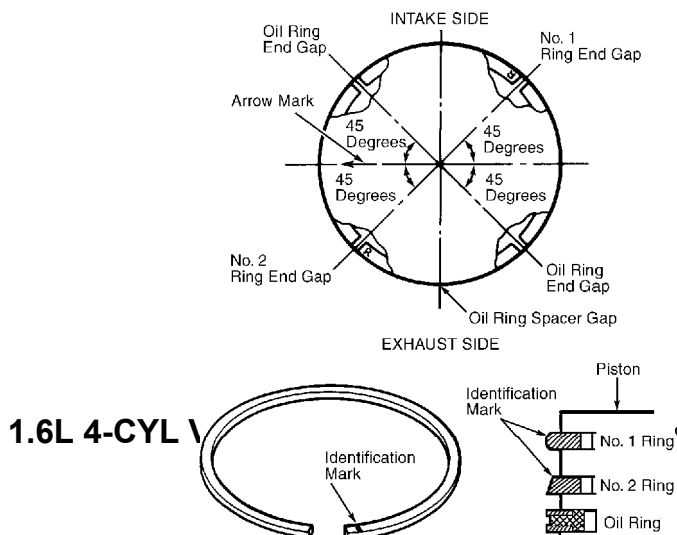
Fig. 7: Matching Pistons To Cylinders
 Courtesy of Suzuki of America Corp.

Piston Rings

1) Install rings with "R", "RN" or "T" mark facing upward. Install oil ring spacer first, then rails. Position piston ring gaps. See Fig. 8. Lubricate all internal surfaces with engine oil before installation.

2) Ensure arrow on piston head faces front of engine. Ensure oil hole in connecting rod faces intake side of engine. Install cylinder head, oil pick-up screen and oil pan. To complete installation, reverse removal procedure.

CAUTION: Install spacer gap more than 45 degrees from side rail gaps. Rails should turn smoothly when installed.



1.6L 4-CYL

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Fig. 8: Positioning Piston Ring Gaps
 Courtesy of Suzuki of America Corp.

Rod Bearings

1) Inspect journals for wear, taper and out-of-round. If

specifications are exceeded, grind journals to undersize or replace crankshaft. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

2) Inspect bearing shells for signs of fusion, pitting, burning or flaking. Observe contact pattern. Standard bearings are unmarked. Undersized bearings are stamped US025 on back of bearing to indicate .010" (.25 mm) undersize.

3) Check bearing clearance using Plastigage. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table. Standard connecting rod side play is .0039-.0078" (.10-.20mm), with a service limit of .0138" (.35 mm).

4) To install, reverse removal procedure. Tighten rod nuts to specification. See TORQUE SPECIFICATIONS.

Crankshaft & Main Bearings

1) Remove engine, or engine and transmission. See ENGINE under REMOVAL & INSTALLATION. Separate transmission from engine. Remove timing belt, sprockets, pulley and tensioner. See TIMING BELT under REMOVAL & INSTALLATION.

2) Remove flywheel and oil pan. Remove rear main oil seal housing. Remove connecting rod caps. Remove main bearing caps. Remove crankshaft.

3) Inspect journals for wear, taper and out-of-round condition. If specifications are exceeded, grind journals to undersize or replace crankshaft. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

4) Standard main bearings are color-coded. See Fig. 11. Upper half of bearing has an oil groove. An arrow mark and number are embossed on each main bearing cap.

5) Ensure arrow mark on main bearing cap faces toward crankshaft pulley. Bearing No. 1 is at crankshaft pulley end of engine. Bearing No. 5 is at flywheel end of engine.

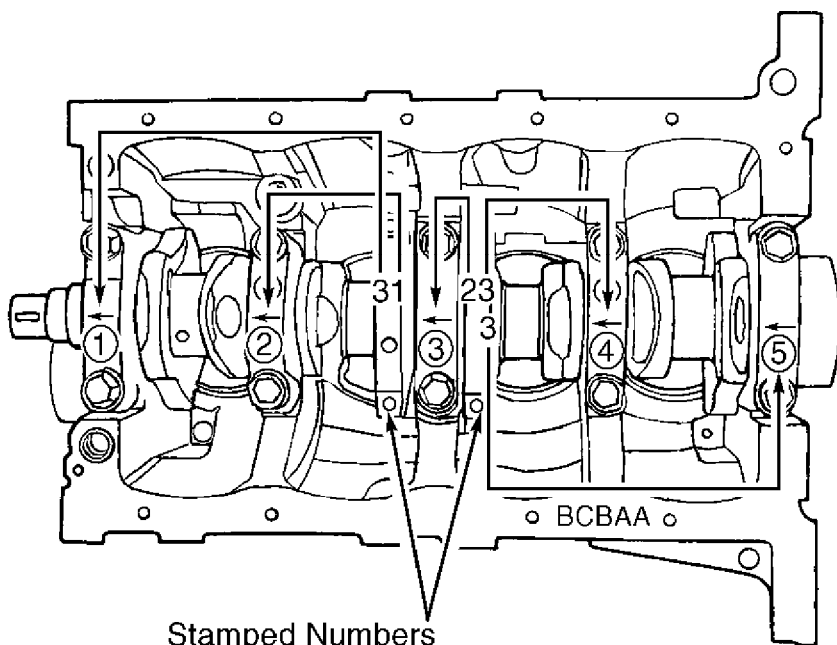
6) Main bearing journal diameter is determined by numerical mark ("1", "2" or "3") stamped on crankshaft webs of cylinders No. 2 and 3. See Fig. 9.

7) The numerical marks on crankshaft web, read left to right, indicate journal diameters of bearings No. 1, 2, 3, 4 and 5, respectively.

8) Determine bearing cap bore diameter with bearing removed. Bearing cap bore diameter is determined by letter ("A", "B" or "C") stamped on cylinder block mating surface. See Fig. 10. See appropriate BEARING CAP BORE DIAMETERS table.

9) The letters stamped on cylinder block mating surface, read left to right, indicate cap bore diameters of bearing caps No. 1, 2, 3, 4 and 5, respectively. Five standard main bearing sizes are available. Bearing thickness is determined by color code. See Fig. 11. See COLOR CODE FOR STANDARD BEARINGS table.

10) Use numerical marks on crankshaft webs and letters stamped on cylinder block mating surface to determine correct replacement bearing. See STANDARD BEARING APPLICATION table.



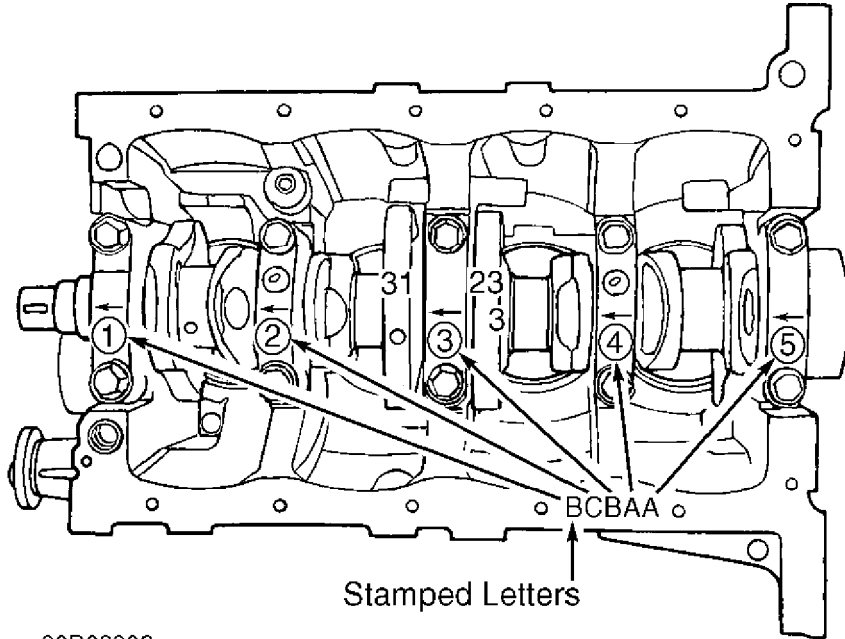
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Fig. 9: Locating Numerical Marks On Crankshaft Webs (SOHC)
Courtesy of Suzuki of America Corp.

CRANKSHAFT JOURNAL DIAMETERS TABLE

Numbers Stamped On Webs	In. (mm)
"1"	2.0470-2.0472 (51.994-52.000)

"2"	2.0468-2.0470	(51.988-51.994)
"3"	2.0465-2.0468	(51.982-51.988)

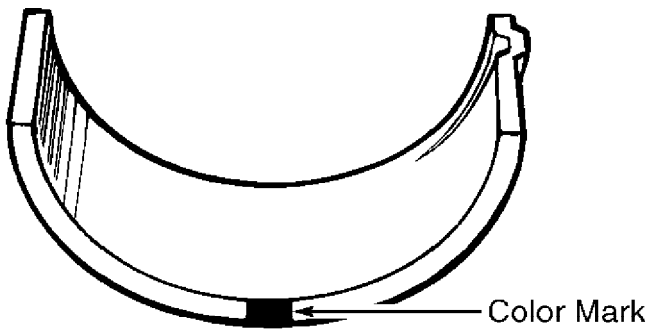


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Fig. 10: Locating Letters Stamped On Cylinder Block
Courtesy of Suzuki of America Corp.

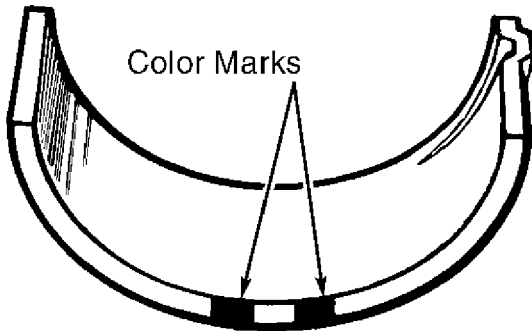
BEARING CAP BORE DIAMETERS TABLE

Letters Stamped On Block	In. (mm)
"A"	2.2047-2.2050 (56.000-56.006)
"B"	2.2050-2.2052 (56.006-56.012)
"C"	2.2052-2.2054 (56.012-56.018)



96I18562

Fig. 11: Identifying Main Bearing Color Codes Standard Bearing
Courtesy of Suzuki of America Corp.



96J18563

Fig. 12: Identifying Main Bearing Color Codes Undersize Bearing
Courtesy of Suzuki of America Corp.

COLOR CODE FOR STANDARD BEARINGS TABLE

Color Painted	Thickness - In. (mm)
Green	.0786-.0787 (1.996-2.000)
Black	.0787-.0788 (1.999-2.003)
No Paint	.0788-.0789 (2.002-2.006)
Yellow	.0789-.0790 (2.005-2.009)
Blue	.0790-.0791 (2.008-2.012)

STANDARD BEARING APPLICATION TABLE

Letter Stamped On Block	Numbers Stamped On Crankshaft Webs	Color
"A"	"1"	Green
"A"	"2"	Black
"A"	"3"	No Paint
"B"	1	Black
"B"	"2"	No Paint
"B"	"3"	Yellow
"C"	1	No Paint
"C"	"2"	Yellow
"C"	"3"	Blue

Undersize Bearings

1) Bearings are available in .010" (.25 mm) undersize. Undersize bearing thickness is determined by 2 color marks. See Fig. 11. See COLOR CODE FOR UNDERSIZE BEARINGS table.

2) Use journal finished diameters, 2.0367-2.0373" (51.732-51.747 mm), and letters stamped on cylinder block mating surface to determine correct undersize bearing for replacement. See UNDERSIZE BEARING APPLICATION table.

3) Use Plastigage to ensure correct clearance of installed undersize bearing. Lubricate bearings before installing. Tighten bolts to specification in 3 steps. Tighten main bearing caps in following order: center cap, No. 2 cap, No. 4 cap, front cap and rear cap. See TORQUE SPECIFICATIONS.

COLOR CODE FOR UNDERSIZE BEARINGS TABLE

Color Painted	Thickness - In. (mm)
Green & Red .....	.0835-.0836 (2.121-2.125)
Black & Red .....	.0836-.0837 (2.124-2.128)
Red Only .....	.0837-.0838 (2.127-2.131)
Yellow & Red .....	.0838-.0839 (2.130-2.134)
Blue & Red .....	.0839-.0840 (2.133-2.137)

UNDERSIZE BEARING APPLICATION TABLE

Measured Journal Diameter - In. (mm)	Letter Stamped On Block	Color
2.0371-2.0373 (51.744-51.750)	"A"	Green & Red
	"B"	Black & Red
	"C"	Red Only
2.0369-2.0371 (51.738-51.744)	"A"	Black & Red
	"B"	Red Only
	"C"	Yellow & Red
2.0367-2.0369 (51.732-51.78)	"A"	Red Only
	"B"	Yellow & Red
	"C"	Blue & Red

Thrust Bearing

1) With crankshaft bearing caps installed, check thrust clearance (end play) using dial gauge to read displacement in axial thrust direction of crankshaft.

2) Standard thickness of thrust bearing is .0984" (2.50 mm). Oversize thrust bearings are available in increments of .0049" (.125 mm). If clearance exceeds specification, replace thrust bearing. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

Cylinder Block

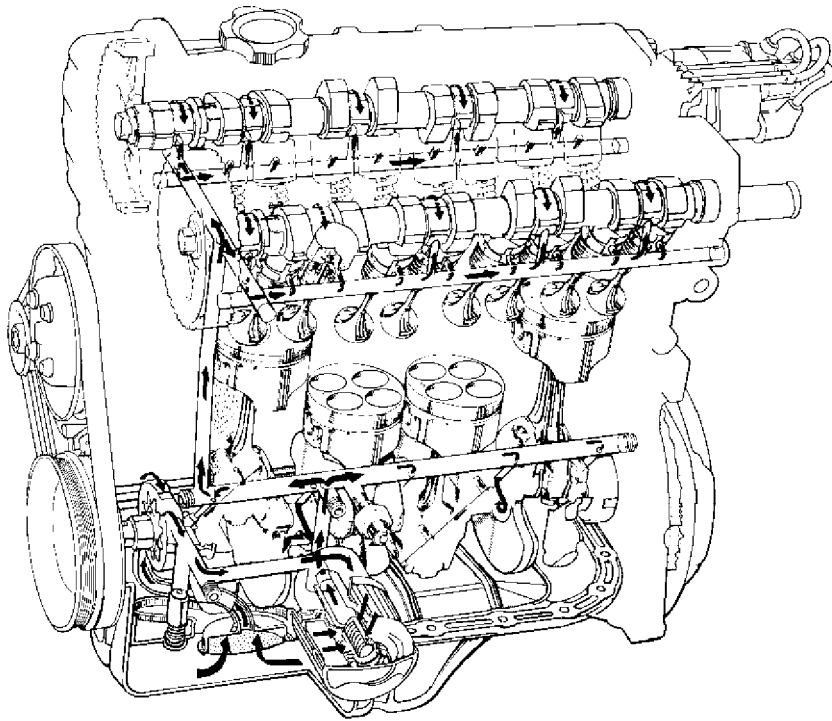
1) Inspect block for distortion of deck surface. Warp page limit is .0012-.0024" (.03-.06 mm). Inspect block for cracks, scratches and other defects. Measure bores at 3 levels for wear, taper and out-of-round condition.

2) If bore wear, taper or out-of-round exceed specification, rebore cylinders. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS.

ENGINE OILING

ENGINE LUBRICATION SYSTEM

A force-feed type lubrication system is used. The oil pump is a trochoid-type pump mounted on the forward portion of the crankshaft.



90A00349

Fig. 13: Cross-Sectional View Of Engine Oil Circuit (Typical)
 Courtesy of Suzuki of America Corp.

Crankcase Capacity

Crankcase capacity, including filter, is 3.5 qts. (3.3L).
 Check dipstick to verify oil level is correct.

Oil Pressure

Normal oil pressure is 46.9-61.2 psi (3.3-4.3 kg/cm²) at 4000 RPM.

OIL PUMP

Removal & Disassembly

1) Disconnect negative battery cable. Remove radiator cooling fan, shroud, water pump pulley and drive belt. Remove timing belt cover, timing belt and tensioner. See TIMING BELT under REMOVAL & INSTALLATION. Remove generator and bracket and air conditioner compressor bracket bolts (if equipped).

2) Raise vehicle and drain engine oil. Remove oil dipstick and oil pan. Remove oil pump pick-up screen. Lock crankshaft with Gear Stopper (09927-56010) installed at flywheel ring gear. With crankshaft locked, remove timing belt pulley. Remove oil pan and oil pump strainer/pickup. Remove oil pump assembly. Remove dip stick guide. Remove oil pump rotor plate.

3) Mark outer gear with felt pen for reassembly reference. Remove inner and outer oil pump gears. Remove plug, relief spring and relief valve.

Inspection

1) Inspect oil pump housing for cracks or damage. Inspect oil screen for clogging or damage. Inspect oil screen "O" ring. Ensure relief valve slides smoothly in bore. Inspect pressure relief spring for damaged coils.

2) Inspect oil pump gears for wear or damage. Using a feeler gauge, measure radial and side clearance. See Figs. 14 and 22. If clearance exceeds specification, replace outer rotor or case. See OIL PUMP SPECIFICATIONS table.

OIL PUMP SPECIFICATIONS TABLE

Application	Radial Clearance	Side Clearance
	In. (mm)	In. (mm)
All Models	.0122 (.310)	.0059 (.150)

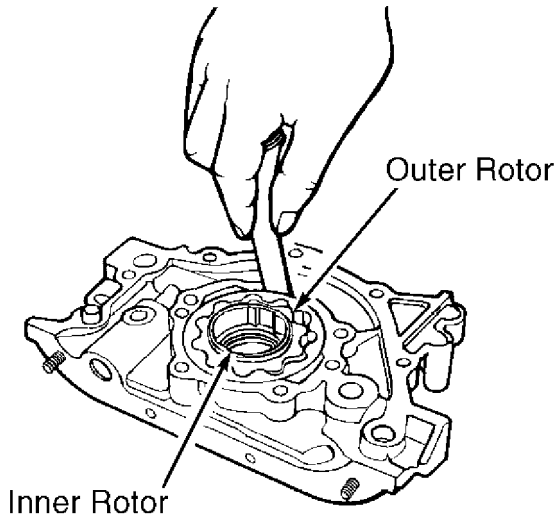
Reassembly & Installation

1) Ensure gears are assembled in same direction as originally installed. Apply thin coat of engine oil to inner and outer rotors, lip portion of oil seal and inside surfaces of oil pump case and plate. Install inner and outer rotors.

2) Install gear plate. Ensure gears turn freely by hand after gear plate is installed. Install oil pump pins, NEW dipstick "O" ring, NEW seal for oil pick-up tube and NEW oil pump gasket. Use Oil Seal

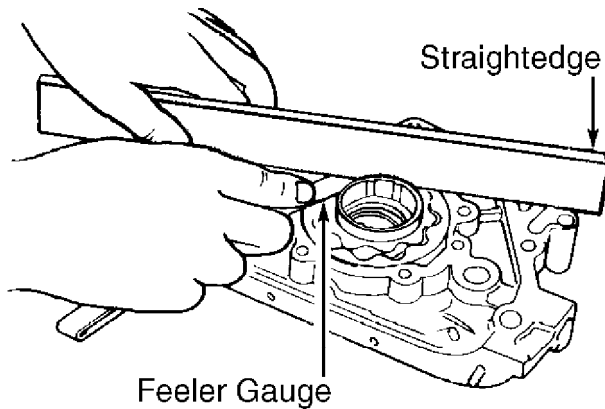
Guide (09926-18210) to prevent damage to oil seal during installation of oil pump.

3) Apply engine oil to guide, and install pump. Install dipstick guide with NEW seal. Install oil pan using silicone-type sealant. Tighten bolts to specification. See TORQUE SPECIFICATIONS.



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Fig. 14: Checking Oil Pump Radial Clearance
Courtesy of Suzuki of America Corp.



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Fig. 15: Checking Oil Pump Side Clearance
Courtesy of Suzuki of America Corp.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Generator Mount & Adjusting Bolts	13-21 (18-28)
Generator Pulley Bolt	82 (111)
Camshaft Sprocket Bolt	41-47 (56-64)
Connecting Rod Cap Nut	24-27 (33-37)
Crankshaft Main Bearing Cap Bolt	37-42 (50-57)
Crankshaft Pulley Bolt	11-13 (15-18)
Crankshaft Sprocket Bolt	
1995-96	77-85 (105-115)
1997	77-85 (105-115)
Cylinder Head Bolt (1)	48-52 (65-70)
Drive Plate-To-Torque Converter Bolt	70 (95)
Engine Mounts-To-Block	33 (45)
Engine Mounts-To-Frame	37 (50)
Exhaust Manifold Bolt	13-21 (18-28)
Exhaust Pipe	33 (45)
Flywheel Bolt (Drive Plate For A/T)	55-59 (75-80)
Intake Manifold Bolt	13-21 (18-28)
Fuel Feed Flare Nut	33 (45)
Oil Pan Drain Plug	22-30 (30-40)
Oil Filter Mount	15-18 (20-25)
Spark Plug	15-22 (20-30)
Timing Belt Tensioner Bolt	18-22 (24-30)
Torque Converter Bolts	47 (64)
	INCH Lbs. (N.m)
Camshaft Bearing Cap Bolt	80-106 (9-12)
Cooling Fan Nut	71-106 (8-12)

Distributor Case Bolt	71-106	(8-12)
Oil Pan Bolt	80-106	(9-12)
Oil Pressure Switch	106-133	(12-15)
Oil Pump Mounting Bolt	80-106	(9-12)
Oil Pump Rotor Plate Screw	80-106	(9-12)
Oil Pump Strainer Bolt	80-106	(9-12)
Oil Seal Housing Bolt	80-106	(9-12)
Rear Main Seal Bolt	89-115	(10-13)
Rocker Arm Shaft Screw	80-106	(9-12)
Rocker Cover Bolt	35-44	(4-5)
Timing Belt Outer Cover Bolt	80-106	(9-12)
Timing Belt Tensioner Stud Nut	80-106	(9-12)
Water Pump Mounting Bolt	80-106	(9-12)
Water Pump Pulley Bolt	89-115	(10-13)

(1) - Tighten in sequence. See Fig. 2 or 8.

ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS TABLE

Application	Specification
Displacement	97.0 Cu. In. (1.6L)
Bore	2.95" (75.0 mm)
Stroke	3.54" (90.0 mm)
Compression Ratio	9.5:1
Compression Pressure (1)	
Standard	199 psi (14 kg/cm ²)
Limit	156 psi (11 kg/cm ²)
Maximum Variation	14.2 psi (1 kg/cm ²)
Fuel System	SFI
Horsepower HP @ RPM	98 @ 6000
Torque Ft. Lbs. @ RPM	96 @ 30 00

(1) - Checked at 250 RPM or higher.

CONNECTING RODS SPECIFICATIONS

CONNECTING RODS TABLE

Application	In. (mm)
Pin Bore	.7481-.7485 (19.003-19.011)
Maximum Bend	.0020 (.05)
Maximum Twist	.0039 (.10)
Side Play	
Standard	.0039-.0078 (.10-.20)
Service Limit	.0138 (.35)

(1) - Information is not available at time of publication.

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS TABLE

Application	In. (mm)
Crankshaft	
End Play	
Standard	.004-.012 (.11-.31)
Service Limit	.015 (.38)
Runout	.002 (.06)
Main Bearings	
Journal Diameter (1)	
"1"	2.0470-2.0472 (51.994-52.000)
"2"	2.0468-2.0470 (51.988-51.994)
"3"	2.0465-2.0468 (51.982-51.988)
Journal Out-Of-Round	.0004 (.010)
Journal Taper	.0004 (.010)
Oil Clearance	
Standard	.0008-.0016 (.020-.040)
Service Limit	.0024 (.060)
Main Bearing Cap Bore Diameter (2)	
"A"	2.2047-2.2050 (56.000-56.006)
"B"	2.2050-2.2052 (56.006-56.012)
"C"	2.2052-2.2054 (56.012-56.018)

Connecting Rod Bearings

Journal Diameter	.....	1.7316-1.7323	(43.982-44.000)
Journal Out-Of-Round	.....	.0004	(.010)
Journal Taper	.....	.0004	(.010)
Oil Clearance			
Standard	.....	.0008-.0020	(.020-.050)
Service Limit	.....	.0031	(.080)

- (1) - Main bearing journal diameter is determined by numerical mark ("1", "2" or "3") stamped on crankshaft web.
- (2) - Main bearing cap bore diameter is determined by letter ("A", "B" or "C") stamped on cylinder block mating surface. See Fig. 11.

PISTONS, PINS & RINGS SPECIFICATIONS

PISTONS, PINS & RINGS TABLE

Application	In.	(mm)
Pistons		
Clearance0008-.0016 (.02-.04)
Diameter (1)		
"1"	2.9520-2.9524 (74.980-74.990)
"2"	2.9516-2.9520 (74.970-74.980)
Pins		
Diameter7478-.7480 (18.995-19.000)
Piston Fit	Slip
Rod Fit	Slip
Rings		
No. 1		
End Gap		
Standard0079-.0138 (.20-.35)
Service Limit0276 (.70)
Side Clearance0012-.0028 (.030-.070)
No. 2		
End Gap		
Standard0079-.0138 (.20-.35)
Service Limit0276 (.70)
Side Clearance0008-.0024 (.02-.06)
No. 3 (Oil)		
End Gap		
Standard0079-.0276 (.20-.70)
Service Limit0669 (1.7)

- (1) - Piston diameter is determined by numerical mark ("1" or "2") stamped on piston. See Fig. 8.

VALVES & VALVE SPRINGS SPECIFICATIONS

VALVES & VALVE SPRINGS TABLE

Application	Specification
Intake Valves	
Seat Angle	..... 45°
Valve Head Thickness	
Standard	..... .03-.047" (.8-1.2 mm)
Service Limit	..... .024" (.6 mm)
Stem Diameter	..... .2152-.2157" (5.465-5.480 mm)
Exhaust Valves	
Seat Angle	..... 45°
Valve Head Thickness	
Standard	..... .03-.047" (.8-1.2 mm)
Service Limit	..... .028" (.70 mm)
Stem Diameter	..... .2142-.2148" (5.440-5.455 mm)
Valve Springs	
Free Length	
Standard	..... 1.4500" (36.83 mm)
Service Limit	..... 1.4043" (35.67 mm)
Out-Of-Square	..... .079" (2.00 mm)
	Lbs. @ In. (kg @ mm)
Valve Spring Preload	
Standard	..... 23.6-27.5 @ 1.24 (10.7-12.5 @ 31.5)
Service Limit	..... 20.5 @ 1.24 (9.3 @ 31.5)

CYLINDER BLOCK TABLE

Application	In. (mm)
Cylinder Bore	
Standard Diameter (1)	
"1"	2.9531-2.9535 (75.010-75.020)
"2"	2.9528-2.9531 (75.000-75.010)
Maximum Taper .....	.0039 (.10)
Maximum Out-Of-Round .....	.0039 (.10)
Maximum Deck Warpage .....	.002 (.05)

(1) - Cylinder bore diameter is determined by numerical mark ("1" or "2") stamped on cylinder block. See Fig. 8.

CYLINDER HEAD SPECIFICATIONS

CYLINDER HEAD TABLE

Application	Specification
Maximum Warpage	
Head-To-Block .....	.002" (.05 mm)
Manifold-To-Head .....	.004" (.10 mm)
Valve Seats	
Intake & Exhaust Valves	
Seat Angle	45°
Seat Width .....	.0433-.0512" (1.1-1.3 mm)
Valve Guides	
Valve Stem End Deflection Limit	
Intake .....	.006" (.14 mm)
Exhaust .....	.007" (.18 mm)
Intake Valve	
Valve Guide I.D. ....	.2165-.2170" (5.500-5.512 mm)
Valve Guide Installed Height .....	.45" (11.5 mm)
Valve Stem-To-Guide Oil	
Clearance .....	.0008-.0020" (.020-.047 mm)
Service Limit .....	.0027" (.07 mm)
Exhaust Valve	
Valve Guide I.D. ....	.2165-.2170" (5.500-5.512 mm)
Valve Guide Installed Height .....	.45" (11.5 mm)
Valve Stem-To-Guide Oil	
Clearance .....	.0018-.0028" (.045-.072 mm)
Service Limit .....	.0035" (.09 mm)

CAMSHAFT SPECIFICATIONS

CAMSHAFT TABLE

Application	In. (mm)
Bore Diameter	1.1024-1.1032 (28.000-28.021)
Journal Diameter	1.1000-1.1008 (27.939-27.960)
Journal Runout .....	.0039 (.10)
Lobe Height	
Exhaust Standard	1.4313-1.4376 (36.356-36.516)
Exhaust Service Limit	1.4273 (36.256)
Intake Standard	1.4240-1.4303 (36.171-36.331)
Intake Service Limit	1.4201 (36.071)
Oil Clearance	
16-Valve Standard .....	.0016-.0032 (.040-.082)
16-Valve Service Limit .....	.0047 (.12)

ROCKER ARM & ROCKER ARM SHAFT SPECIFICATIONS

ROCKER ARM & ROCKER ARM SHAFT TABLE

Application	In. (mm)
Rocker Arm Inside Diameter ...	.6293-.6301 (15.985-16.005)
Rocker Arm Shaft Outside	
Diameter .....	.6287-.6293 (15.969-15.984)
Rocker Arm-To-Shaft Oil Clearance	
Standard0005-.0018 (.012-.045)
Service Limit0035 (.09)
Rocker Arm Shaft Runout008 (.20)

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