

1999-2000 ENGINES

1.3L & 1.6L 4-Cylinder

ENGINE IDENTIFICATION

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

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

Application	VIN
Esteem, Vitara (1.6L 16-Valve)	0
Swift (1.3L 16-Valve)	3

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

1. Remove rocker cover. Remove right side undercover (if necessary). Remove necessary items to view "V" mark on crankshaft. Rotate crankshaft until "V" mark of crankshaft pulley align line with "0" (zero) mark on timing belt cover. Cylinder No. 1 should be on compression stroke.
2. Using thickness gauge, measure clearance between cam-riding rocker arm face and camshaft lobe. Check valve clearance at positions No. 1, 2, 5 and 7. See **Fig. 1**. Indicated rocker arms should be off of camshaft lobes.
3. Turn crankshaft clockwise one complete revolution (360 degrees). Check valve clearance at positions No. 3, 4, 6 and 8. See **Fig. 1**. Ensure clearance is within specification. See **VALVE CLEARANCE SPECIFICATIONS** table.
4. Using Tappet Adjuster Wrench (09917-18210), adjust valve clearance as necessary. After adjusting clearance, tighten adjusting screw lock nut to 106 INCH lbs. (12 N.m). Recheck clearance.

VALVE CLEARANCE SPECIFICATIONS

Application	In. (mm)
Esteem & Vitara	
Engine Cold	
Intake	.005-.007 (.13-.18)
Exhaust	.009-.010 (.23-.25)
Engine Hot	
Intake	.007-.008 (.18-.20)
Exhaust	.010-.012 (.25-.30)
Swift (1.3L)	

Engine Cold	
Intake	.005-.007 (.13-.18)
Exhaust	.009-.011 (.23-.28)
Engine Hot	
Intake	.007-.009 (.18-.23)
Exhaust	.011-.013 (.28-.33)

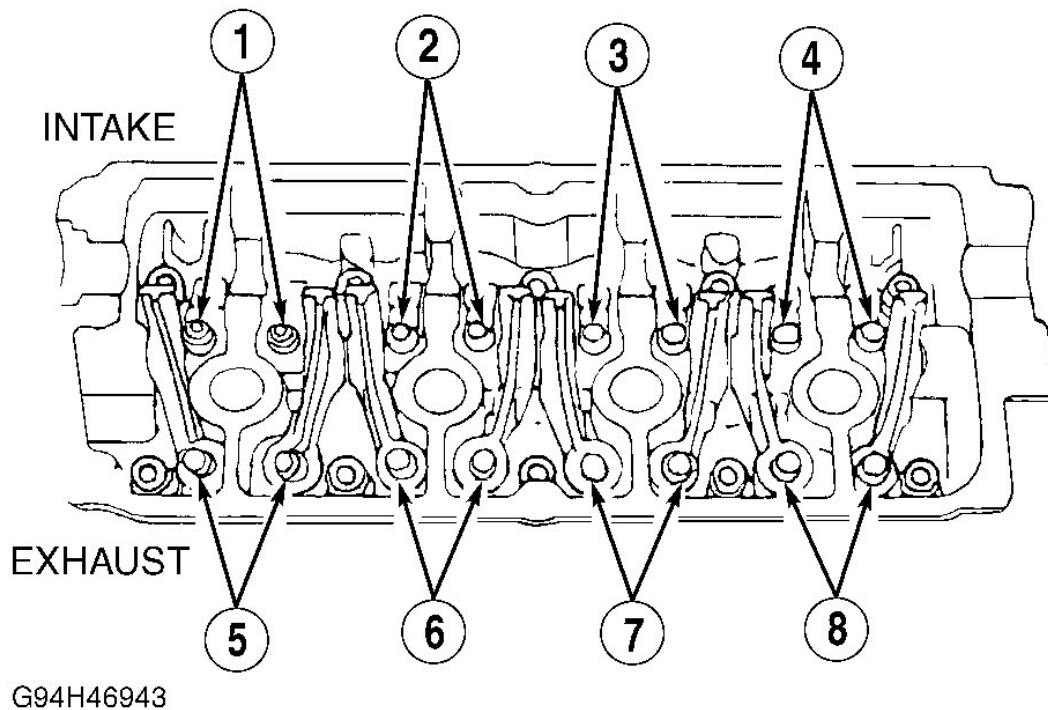


Fig. 1: Checking Valve Clearance
Courtesy of SUZUKI OF AMERICA CORP.

TROUBLE SHOOTING

To trouble shoot mechanical engine components, see appropriate table in TROUBLE SHOOTING article in GENERAL INFORMATION.

REMOVAL & INSTALLATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle.

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. 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. On Esteem, disconnect fuel pump relay connector. Fuel pump relay is located in relay box near battery. See **Fig. 2**.
3. On Swift, remove relay box cover near battery. Disconnect fuel pump relay connector. See **Fig. 3**.
4. On Vitara, remove fuel pump relay connector (relay with Pink wire). Fuel pump relay is located under driver's side of dash, near main relay. See **Fig. 4**.
5. On all models, 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.

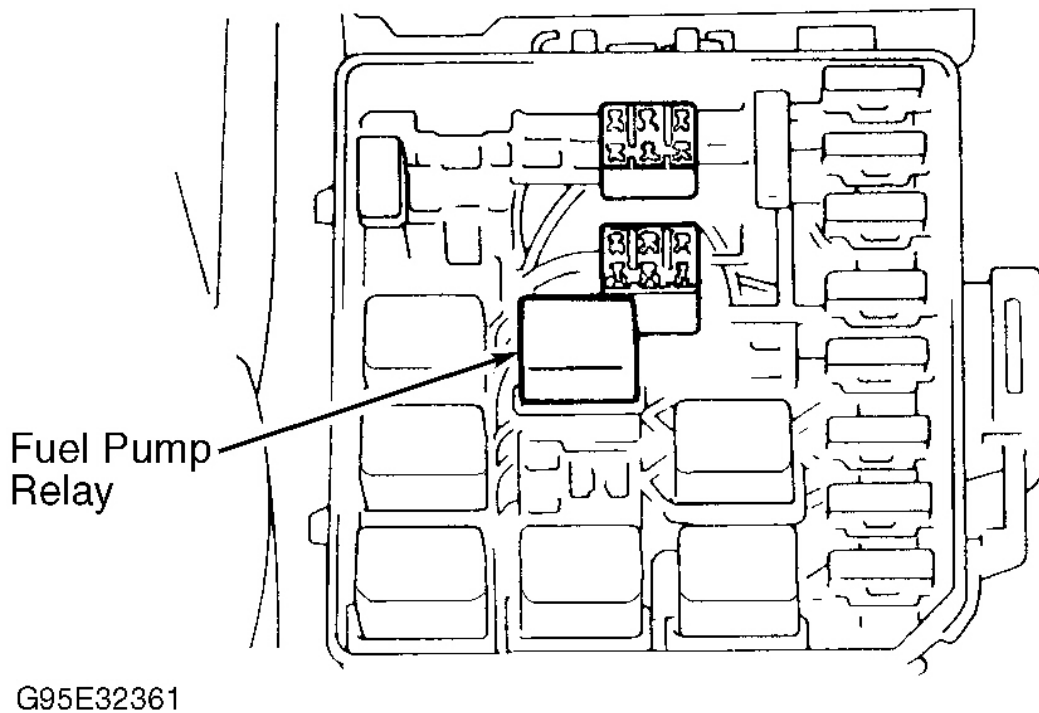
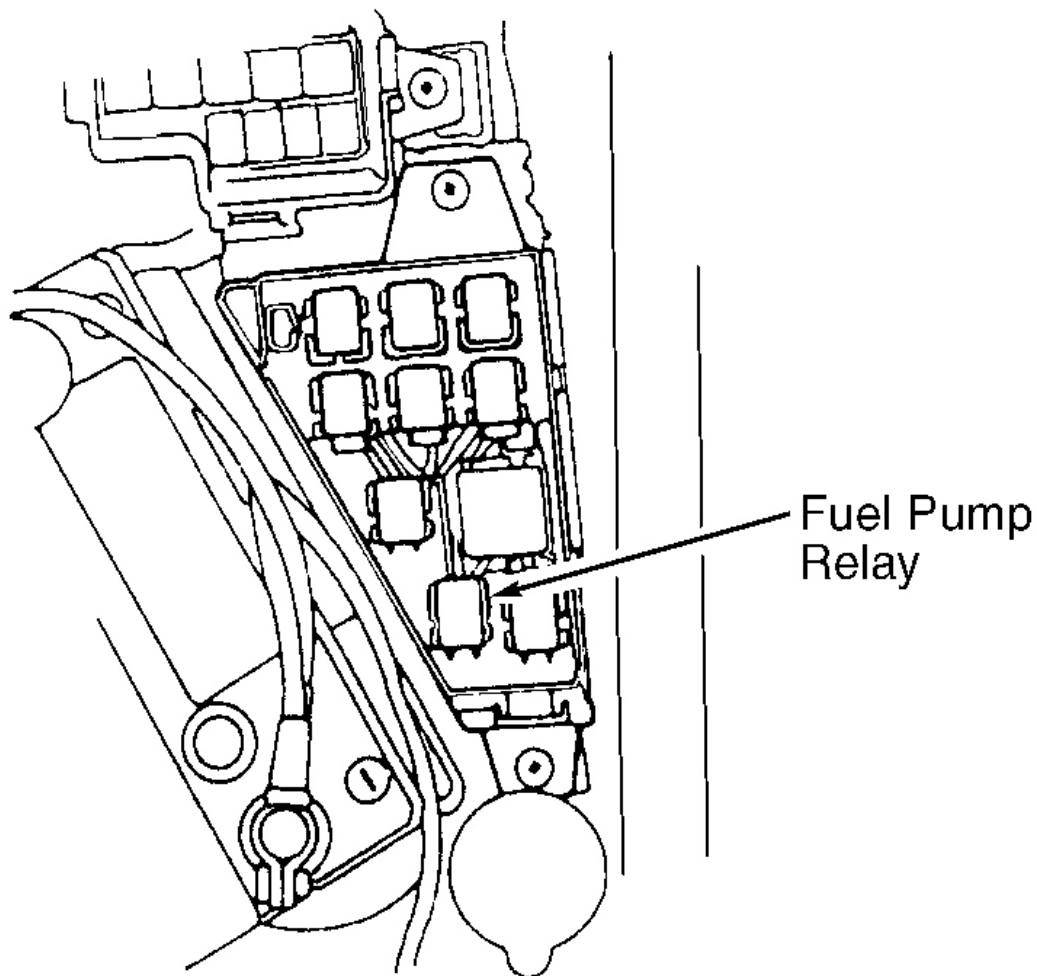


Fig. 2: Locating Fuel Pump Relay (Esteem)

Courtesy of SUZUKI OF AMERICA CORP.



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Fig. 3: Locating Fuel Pump Relay (Swift)
Courtesy of SUZUKI OF AMERICA CORP.

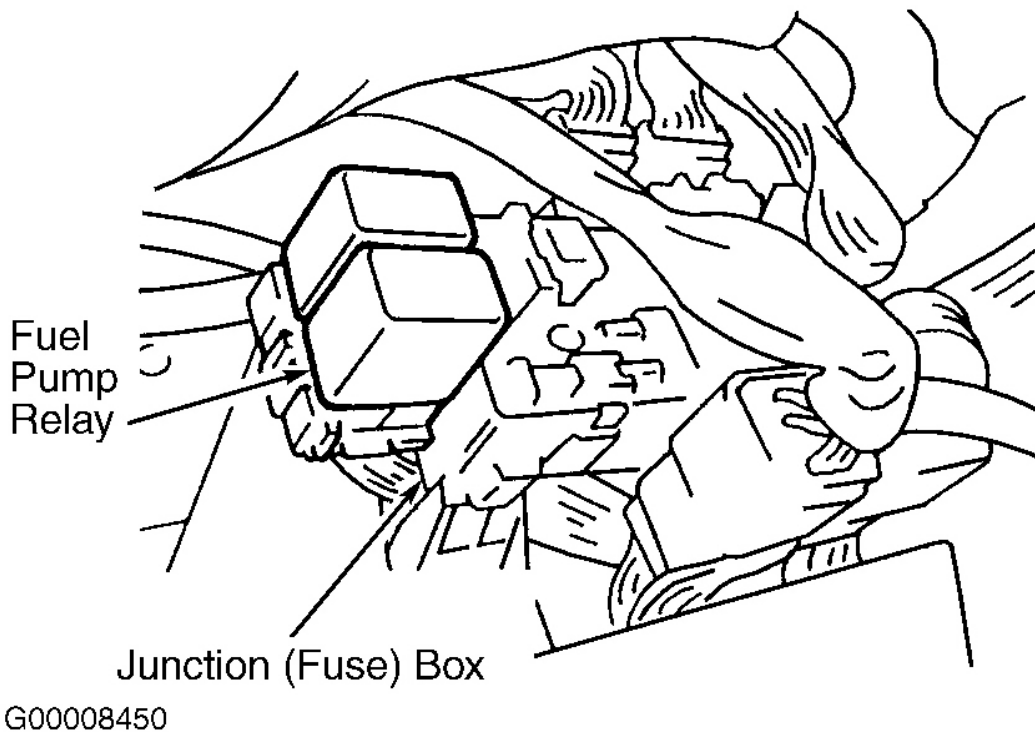


Fig. 4: Locating Fuel Pump Relay (Vitara)
 Courtesy of SUZUKI OF AMERICA CORP.

ENGINE

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

NOTE: On Esteem, remove engine and transmission as an assembly. Lower engine and transmission assembly from vehicle.

Removal (Esteem)

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 and support 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 FWD AXLE SHAFTS article in DRIVE AXLES.
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 (Esteem)

Lift engine and transmission (if removed with engine) into vehicle. Install engine mountings to brackets. Install bolts into frame brackets. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**. Replace cooling system, engine and transmission fluids. To complete installation, reverse removal procedure.

Removal (Swift)

1. Release fuel pressure. See **FUEL PRESSURE RELEASE**. Disconnect battery cables. Remove battery, battery tray and hood (disconnect windshield washer hose from hood). Drain coolant and remove radiator hoses. DO NOT remove drain plug and radiator cap while engine and radiator are still hot. Remove air cleaner and air cleaner outlet hose.
2. Disconnect the following cables:
 - Accelerator cable from throttle body.
 - A/T throttle pressure control cable from A/T.
 - Clutch cable from transmission (M/T).
 - Gear select cable from transmission (A/T).
3. Disconnect following electric wires:
 - Ignition coil assembly
 - Ground wires from surge tank
 - Engine oil pressure switch
 - EVAP canister purge valve (if equipped)
 - Engine coolant temp. sensor
 - Fuel injectors
 - Power steering pressure switch (if equipped)
 - Oxygen sensor-1
 - Back-up light switch (M/T)
 - Transmission range switch (A/T)
 - A/T vehicle speed sensor (A/T)
 - Generator
 - Starter
 - Battery negative cable from transmission

- TP sensor
 - IAC valve
 - CMP sensor
 - MAP sensor and then release wire harnesses from clamps.
4. Disconnect the following hoses:
 - Canister purge hose from EVAP canister purge valve
 - Brake booster hose from intake manifold
 - Radiator outlet hose from inlet pipe
 - Heater inlet and outlet hose from heater unit
 5. Disconnect fuel feed and return hoses from fuel delivery pipe. Remove exhaust No. 1 pipe (if equipped) and exhaust pipe. Remove right and left engine under covers. Remove gear shift control shaft from transmission and remove extension rod (M/T).
 6. For A/T vehicle, disconnect A/T select cable from A/T. Drain engine and transmission oil. Disconnect drive shaft joints from differential gears of transmission or center bearing support. In this case, it is not necessary to disconnect drive shafts from steering knuckle.
 7. With hoses connected, detach A/C compressor and/or P/S pump with bracket from cylinder block, if equipped. Suspend removed compressor and/or pump at a place where no damage will be caused during removal and installation of engine with transmission. Disconnect P/S hose from P/S oil pump. (if equipped). Plug pipe, hose and pump port.
 8. Install lifting device. Remove rear mounting from body. (For M/T model). Remove rear torque rod (For A/T model). Remove engine left mounting from body. Remove engine right mounting from right mounting bracket and stiffener.
 9. Before removing engine with transmission from body, recheck to make sure all hoses, electric wires and cables are disconnected from engine and transmission. Lower engine with transmission from body.

Installation (Swift)

1. Lift engine with transmission into engine compartment, but do not remove lifting device. Install engine right mounting to right mounting bracket and stiffener. Install engine left mounting to body. Install rear mounting to body (For M/T model). Install torque rod (For A/T model). Tighten bolts and nuts of all parts installed in previous steps to 50 ft. lbs. (55 N.m).
2. Remove lifting device. Reverse removal procedures for installation of remainder. Push in each axle shaft joint fully so that snap ring engages with differential gear or center bearing support. DO NOT damage oil seal lip when inserting axle shafts. Reclamp electric wire securely.
3. Adjust clutch pedal free travel. (M/T). Adjust gear select cable and A/T throttle pressure control cable. (A/T). Adjust gear shift control lever. (M/T). Adjust accelerator cable play. Refill transmission with gear oil. (A/T fluid for A/T model). Refill engine with engine oil. Refill cooling system.
4. Upon completion of installation, verify that there is no fuel leakage, coolant leakage, transmission oil leakage or exhaust gas leakage at each connection.

Removal (Vitara)

1. Relieve fuel pressure. See **FUEL PRESSURE RELEASE**. Disconnect battery cables and remove battery. Mark and remove hood. Drain radiator. Remove radiator fan and fan shroud. Remove air intake

hose.

2. Disconnect following electric wires:
 - Ground wires from intake manifold
 - Manifold differential pressure sensor
 - Camshaft position sensor
 - EGR valve
 - EVAP canister purge valve
 - Engine coolant temp. sensor
 - Throttle position sensor
 - Idle air control valve
 - Fuel injector wire at the connector
 - Intake air temp. sensor
 - Mass airflow sensor
 - Tank pressure control solenoid valve
 - EVAP canister air valve
 - Crankshaft position sensor
 - Generator
 - Ground cable from cylinder block (if equipped)
 - Heated oxygen sensor-1 and -2
 - Engine oil pressure switch
 - Power steering pressure switch (if equipped) and then release wire harnesses from clamps.
3. Remove starter motor. Disconnect following hoses:
 - Canister purge hose from EVAP canister purge valve
 - Radiator outlet hose from inlet pipe
 - Brake booster hose from intake manifold
 - Vacuum hose from intake manifold
 - Heater inlet and outlet hose from pipe
 - Fuel feed hose and return hose from each pipe
 - A/T fluid hose clamp from bracket
4. Disconnect accelerator cable and A/T throttle cable (if equipped) from throttle body and each clamp. With hose connected, detach A/C compressor and/or power steering pump with bracket from cylinder block if equipped.
5. Loosen bolts fastening cylinder block and transmission. Hoist vehicle. Drain engine oil if necessary. Remove exhaust pipe bolts or exhaust pipe. Remove right side transmission stiffener from transmission and cylinder block (A/T).
6. Remove clutch housing (torque converter housing) lower plate. Remove torque converter bolts (A/T) using special Tool (09927-56010). Remove nuts fastening cylinder block and transmission. Lower vehicle.
7. Support transmission with jack. Install lifting device. Remove engine mounting bracket nuts (R & L).

Before lifting engine, check to ensure all hoses, electric wires and cables are disconnected from engine.

8. Remove engine assembly from chassis and transmission by lifting a little, sliding toward the front side, and then carefully hoisting engine assembly.

Installation (Vitara)

1. Lower engine assembly into engine compartment and connect engine to transmission. Hand-tighten bolts and nuts fastening cylinder block and transmission. Tighten engine mounting bracket nuts (R & L) to 36.5 ft. lbs. (50 N.m). Tighten bolts fastening cylinder block and transmission to 61.5 ft. lbs. (85 N.m). Remove lifting device. Reverse removal procedure for installation, noting the following:
 - Tighten torque converter bolts to 47 ft. lbs. (65 N.m).
 - Tighten nuts fastening cylinder block and transmission to 61.5 ft. lbs. (85 N.m)
 - Tighten bolts of exhaust pipes to 36.5 ft. lbs. (50 N.m)
 - Tighten transmission stiffener bolts (right side) to 36.5 ft. lbs. (50 N.m)
2. Adjust water pump drive belt tension. Adjust power steering pump belt tension or A/C compressor belt tension, if equipped.
3. Adjust accelerator cable play and A/T throttle cable (for A/T) play. Check to ensure that all removed parts are back in place.
4. Refill engine with engine oil. Refill cooling system. Verify that there is no fuel leakage, coolant leakage and exhaust gas leakage at each connection.

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. On all models, 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 (Esteem & Vitara)**

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.

NOTE: Removing exhaust and intake manifolds is not necessary.

2. 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. 5**. 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.

Removal (Swift)

1. Release fuel pressure. See **FUEL PRESSURE RELEASE**. Disconnect negative battery cable. Label and remove hoses, lines and electrical connectors for intake and exhaust manifold removal. Disconnect exhaust pipe from manifold.

NOTE: Removing exhaust and intake manifolds is not necessary.

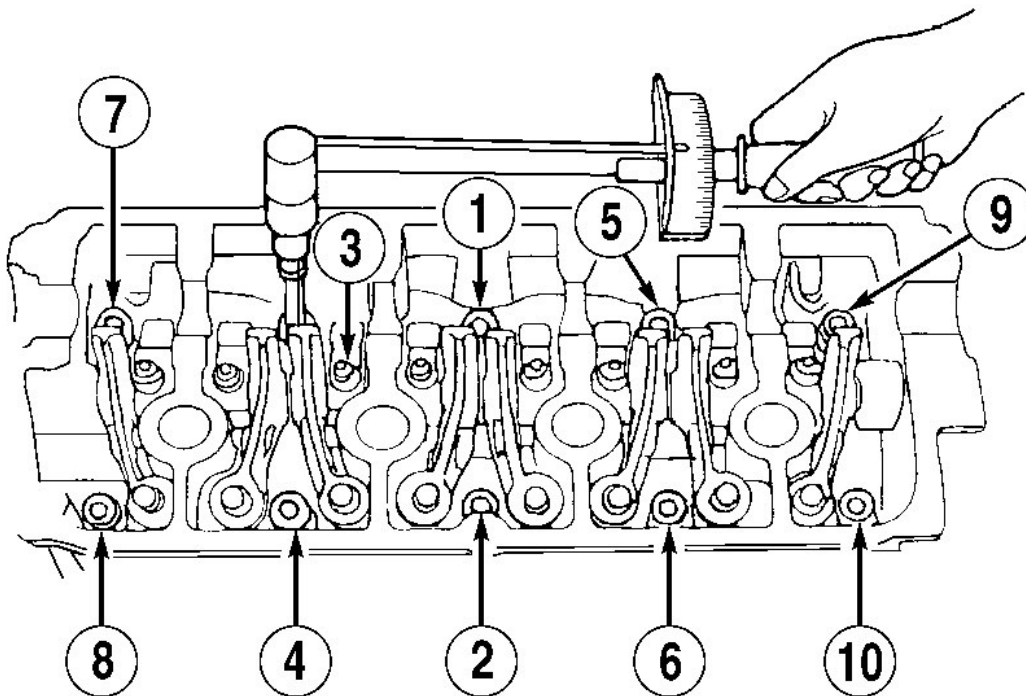
2. Remove timing belt. See **TIMING BELT**. Remove air conditioner compressor and/or generator adjusting arm from cylinder head (if equipped).
3. Loosen all valve adjusting screws fully. Loosen cylinder head bolts in reverse order of tightening sequence. See **Fig. 5**. Loosen head bolts in 2 or 3 steps to prevent cylinder head warpage. Remove bolts and cylinder head with intake and exhaust manifolds.

Inspection (All Models)

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 (All Models)

To install cylinder head, reverse removal procedure. Use NEW cylinder head and manifold gaskets. Tighten cylinder head bolts to specification in 3 steps using proper sequence. See **Fig. 5** Adjust valve clearance. See **VALVE CLEARANCE ADJUSTMENT** under ADJUSTMENTS.



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Fig. 5: Cylinder Head Bolt Tightening Sequence
Courtesy of SUZUKI OF AMERICA CORP.

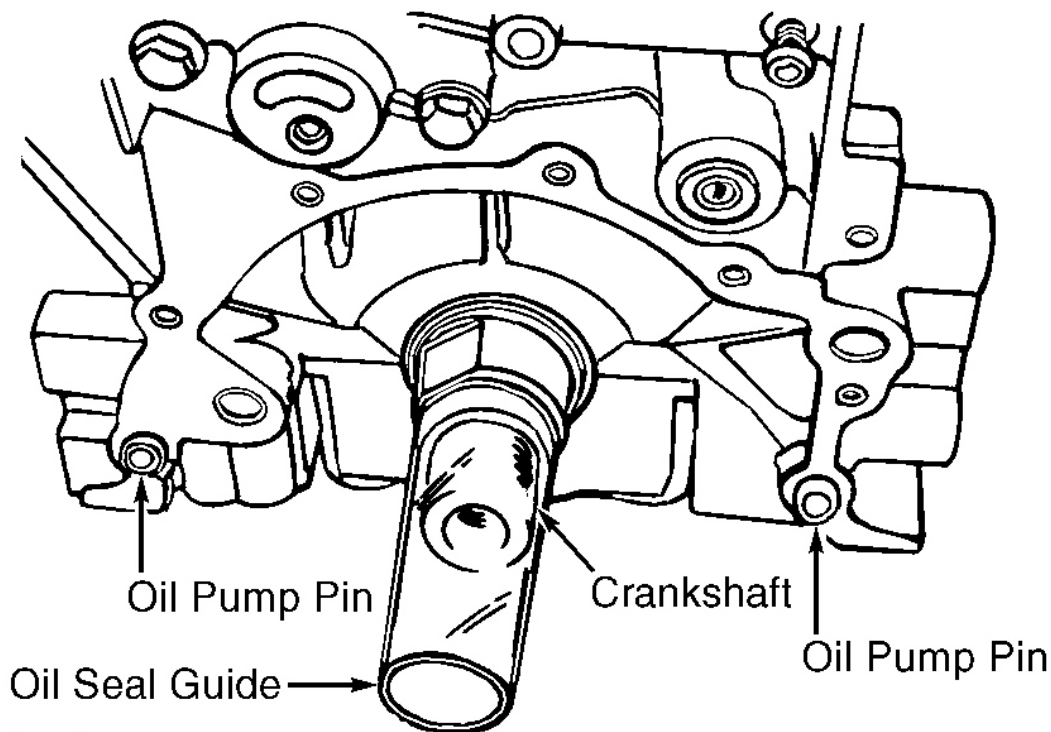
FRONT COVER OIL SEAL

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. Using suitable driver, 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. 6**.
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. 6: Installing Oil Seal Guide

Courtesy of SUZUKI OF AMERICA CORP.

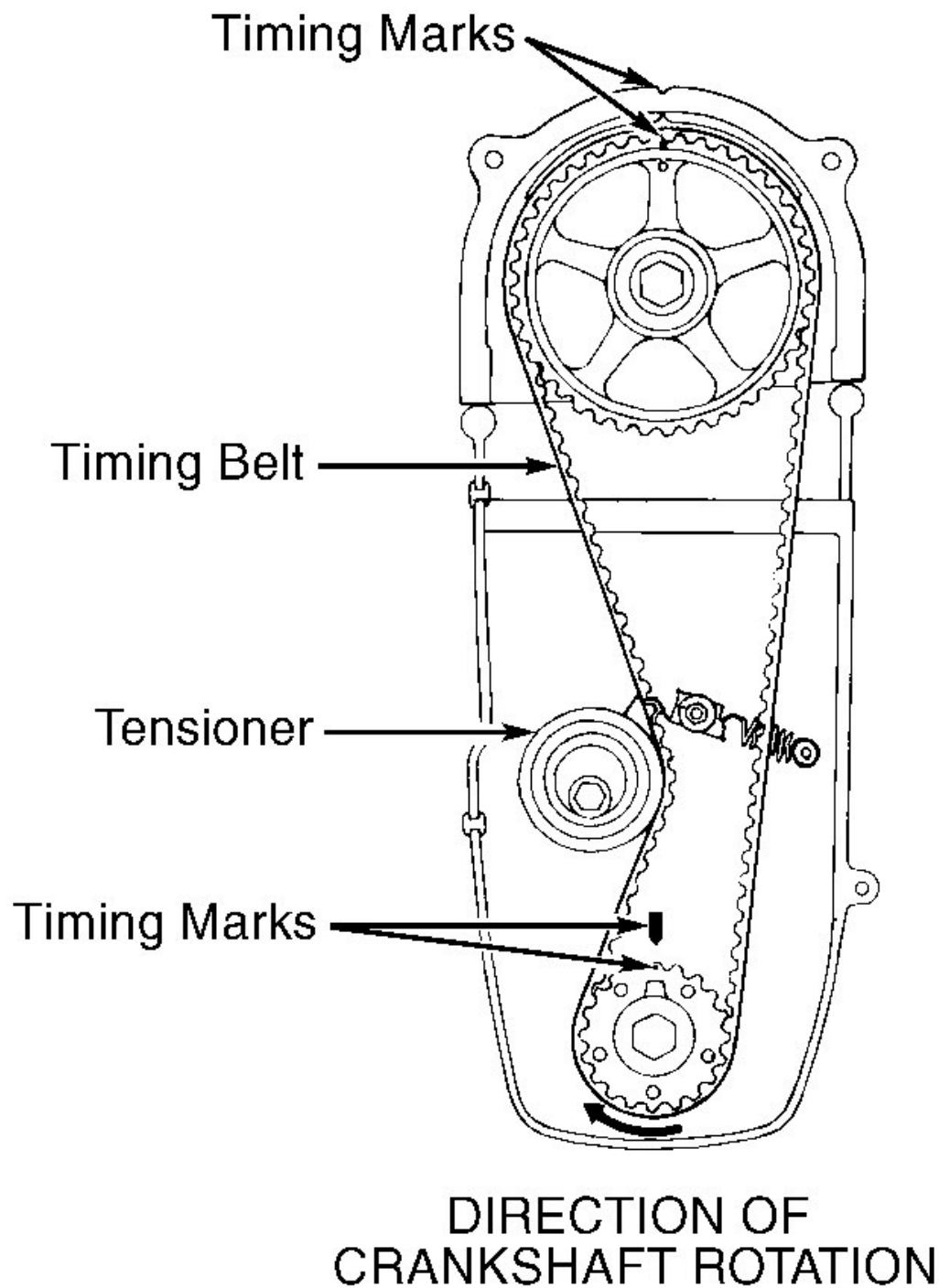
TIMING BELT**Removal**

1. Disconnect negative battery cable. Remove power steering and A/C compressor belt (if equipped).
2. On Esteem and Swift, 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. On all models, loosen generator, and remove water pump pulley and belt.
3. On Esteem and Vitara, support engine, remove right engine mount and bracket.
4. On all models, remove crankshaft pulley. On Swift, remove center bolt to remove crankshaft pulley if engine is in vehicle. On all models, remove timing belt cover. Align all sprocket timing marks with timing marks on engine. See **Fig. 7**. Rotate belt tensioner upward, and secure in place.
5. 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 to piston(s) and/or valve(s). 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.
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. See **Fig. 7**. Ensure 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 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 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. 7: Aligning Timing Belt & Tensioner (Typical)
Courtesy of SUZUKI OF AMERICA CORP.

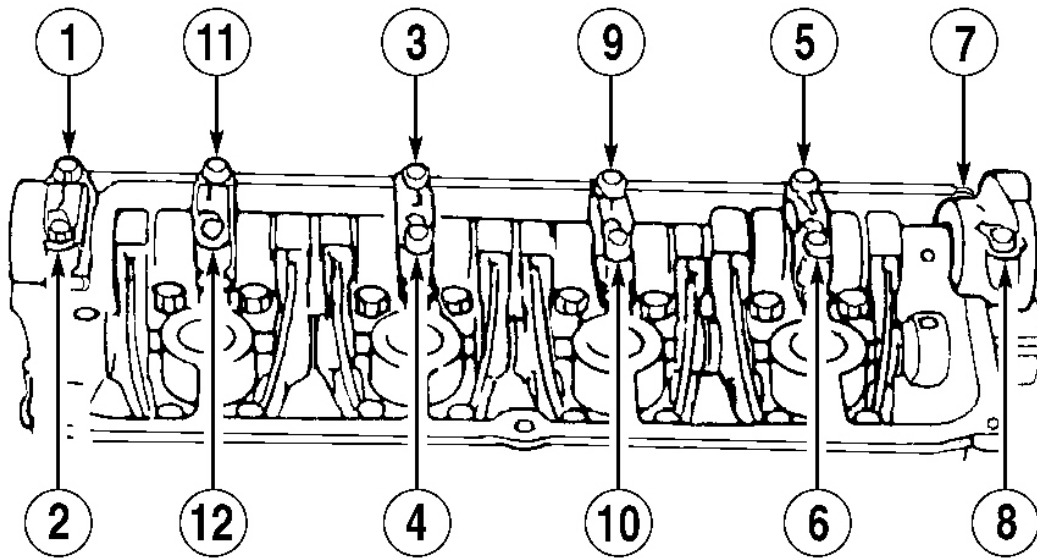
ROCKER ARM & VALVE LASH ADJUSTER

Removal

1. Disconnect negative battery cable. Remove front grille. Remove hood lock and hood lock support member. 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. Remove CMP sensor (if equipped). 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. 8**. 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 parallel with cylinder head gasket mating surface. Tighten camshaft bearing caps in 3 or 4 steps in sequence. See **Fig. 8**. Install CMP sensor (if equipped).
2. Adjust valve clearance. See **VALVE CLEARANCE ADJUSTMENT** under ADJUSTMENTS. To complete installation, reverse removal procedure.



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Fig. 8: Camshaft Bearing Cap Bolt Tightening Sequence
Courtesy of SUZUKI OF AMERICA CORP.

CAMSHAFT

Removal

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

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. 7. To complete installation, reverse removal procedure.

REAR CRANKSHAFT OIL SEAL

Removal

Remove engine. See **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. On Vitaras, remove cooling fan, fan shroud and fan clutch.
2. On all models, remove water 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** under REMOVAL & INSTALLATION. Remove dipstick and tube. Remove generator mounting bracket. Remove water pump.

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 **SPECIFICATIONS and ELECTRIC COOLING FANS** articles in **ENGINE COOLING**.

OIL PAN

Removal (Except Esteem)

1. Raise and support vehicle. On Vitaras 4WD, remove front differential assembly. See appropriate article in **DRIVE AXLES**. On all models, drain engine oil.
2. Remove clutch housing lower cover or torque converter housing lower cover. Remove crankshaft position sensor from oil pan. Remove oil pan nuts and bolts. Remove oil pan and oil pump strainer.

Removal (Esteem)

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 and 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

Disassembly

1. Remove cylinder head. See **CYLINDER HEAD** under REMOVAL & INSTALLATION. Remove intake and exhaust manifolds. Remove camshaft. See **CAMSHAFT** under REMOVAL & INSTALLATION. Remove rocker arms and shaft. See **ROCKER ARM & VALVE LASH ADJUSTER** under REMOVAL & INSTALLATION.
2. Using Valve Spring Compressor (09916-14510) and Valve Lifter Attachment (09916-14910), compress valve spring. Using Valve Spring Retainer Remover (09916-84510), remove retainer locks. See **Fig. 9**. Remove retainers, springs, valve stem oil seals, spring seats and valves. Keep all components in order for reassembly reference.

Reassembly

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

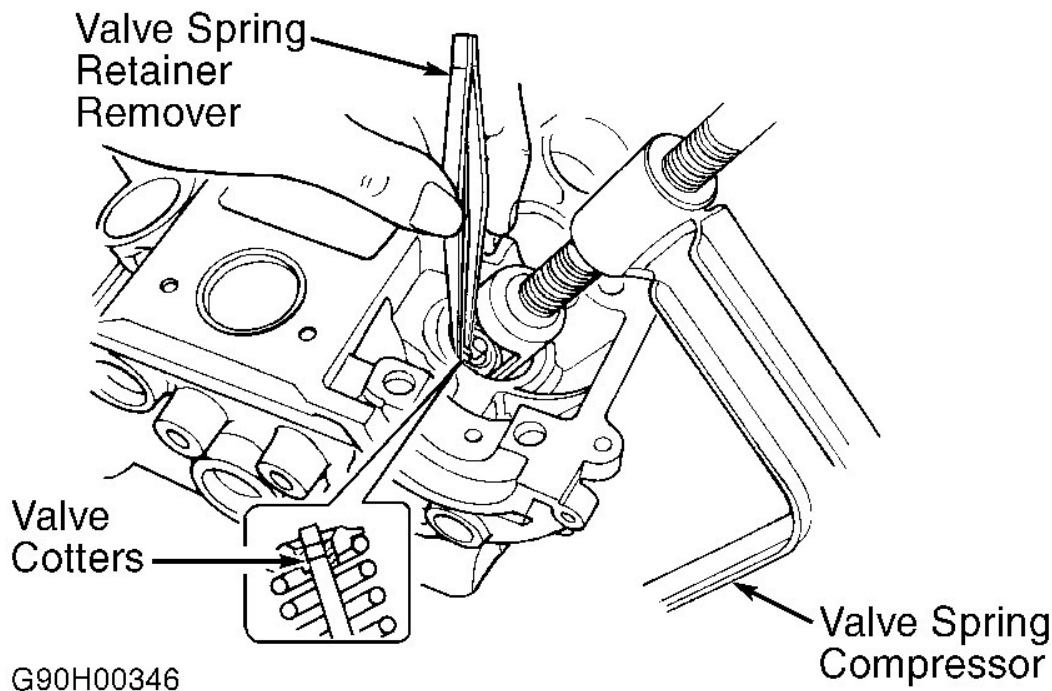


Fig. 9: Removing Valve Lock
Courtesy of SUZUKI OF AMERICA CORP.

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 Set (09917-98221 and 09916-58210). Press seal onto 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. Using Valve Guide Remover (09916-44910), drive out old guide. Ream guide bore in cylinder head with 11-mm Reamer (09916-38210). Heat cylinder head to 176-212°F (80-100°C).
3. Using Valve Guide Installer Attachment Set (09916-56011 and 09916-58210), drive in new oversize valve guide until valve guide installer contacts cylinder head.
4. Valve guide installed height is .45" (11.4 mm). Ream valve guide with 5.5-mm Reamer (09916-34550).
5. Clean valve guide bore after reaming. Install valve and ensure valve stem oil clearance is correct. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS. Install new valve stem oil seals. See **VALVE STEM OIL SEALS** under OVERHAUL.

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" (.089 mm). Check rocker arm shaft runout. Rocker arm shaft runout limit is .008" (.20 mm).

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.

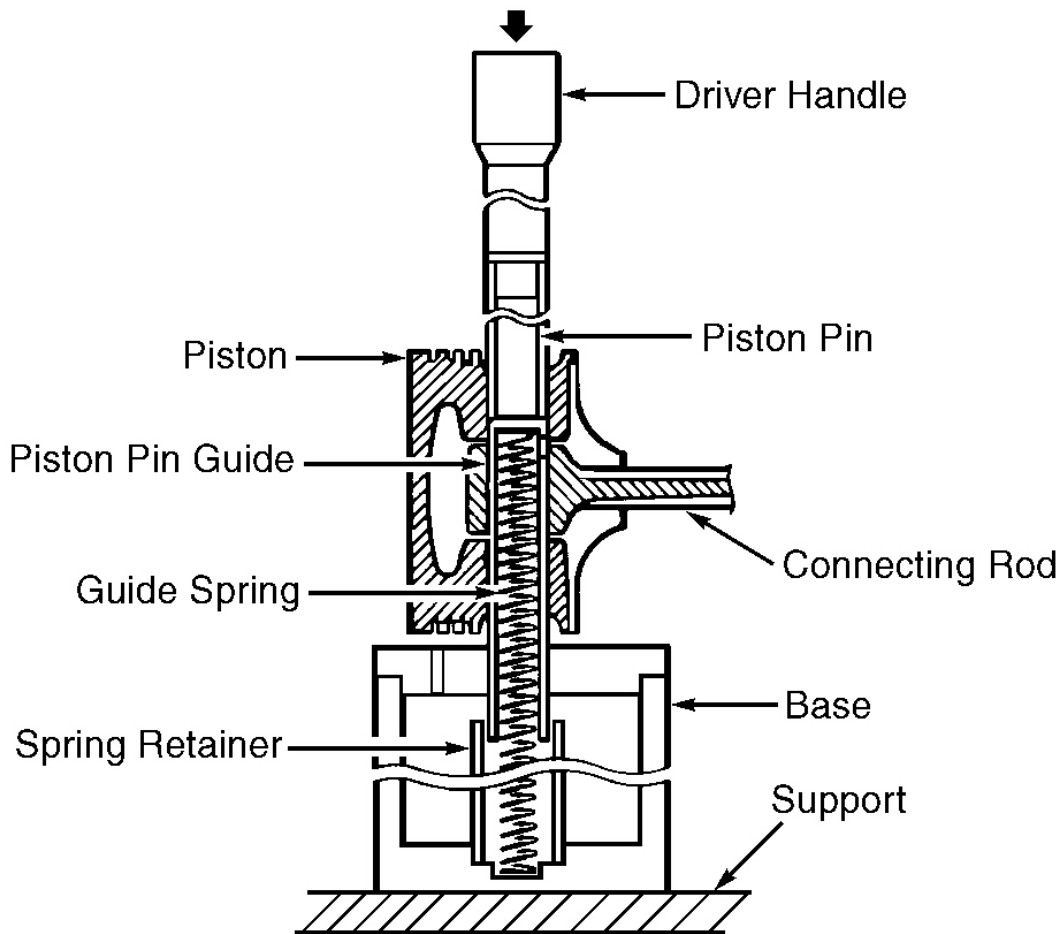
CYLINDER BLOCK ASSEMBLY

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.

NOTE: **On some 1.3L engines, pistons may be retained by circlips; others may be press fit.**

4. Use Piston Pin Remover/Installer (09910-38211) on 1.3L engine with press fit piston pins. On 1.6L engines (and some 1.3L engines), 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. Align piston, pin and rod with Piston Pin Remover/Installer (09910-38211) for press fit 1.3L pistons. Press pin into piston and rod using a hydraulic press. See **Fig. 10**. On 1.6L engines (and some 1.3L engines), install circlips and piston pin. Install circlips with opening facing either up or down.



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Fig. 10: Installing Piston Pin (1.3L - Press Fit)
 Courtesy of SUZUKI OF AMERICA CORP.

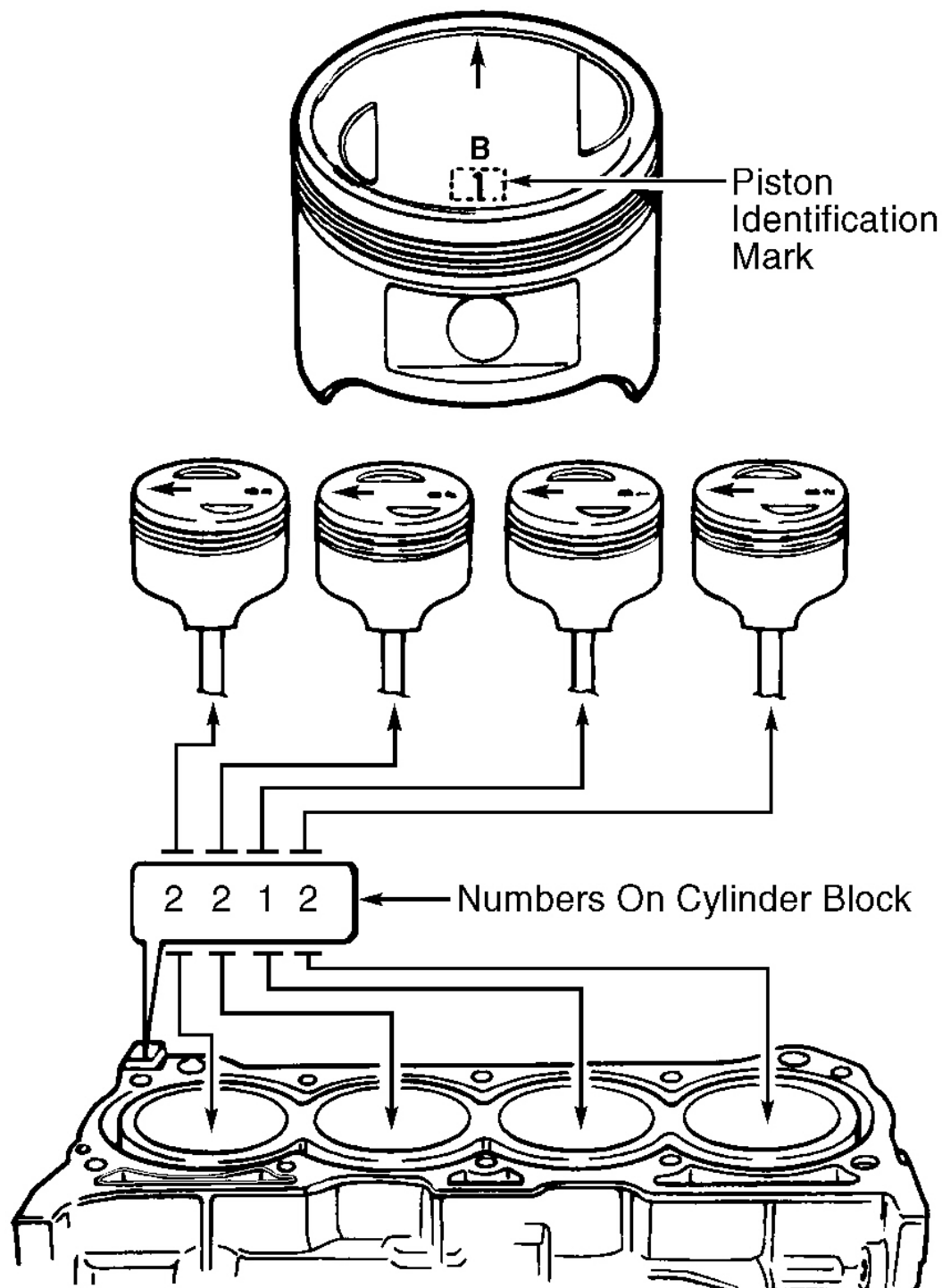
Fitting Pistons

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) oversize. Check outside diameter of piston. On 1.6L engine, measure at a point .63" (16.0 mm) from bottom of skirt and at 90 degrees to pin bore. On 1.3L engine, measure at a point .91" (23.0 mm) from bottom of skirt and at 90 degrees to pin bore.
3. On all models, standard pistons are available in 2 sizes. Piston diameter is determined by numerical mark ("1" or "2") stamped on piston crown. See **Fig. 11**.
4. Cylinder bore diameter is determined by numerical mark ("1" or "2") stamped on cylinder block. Numerical marks on cylinder block, reading left to right, indicate bore sizes of cylinders No. 1, 2, 3 and 4. See **Fig. 11**.

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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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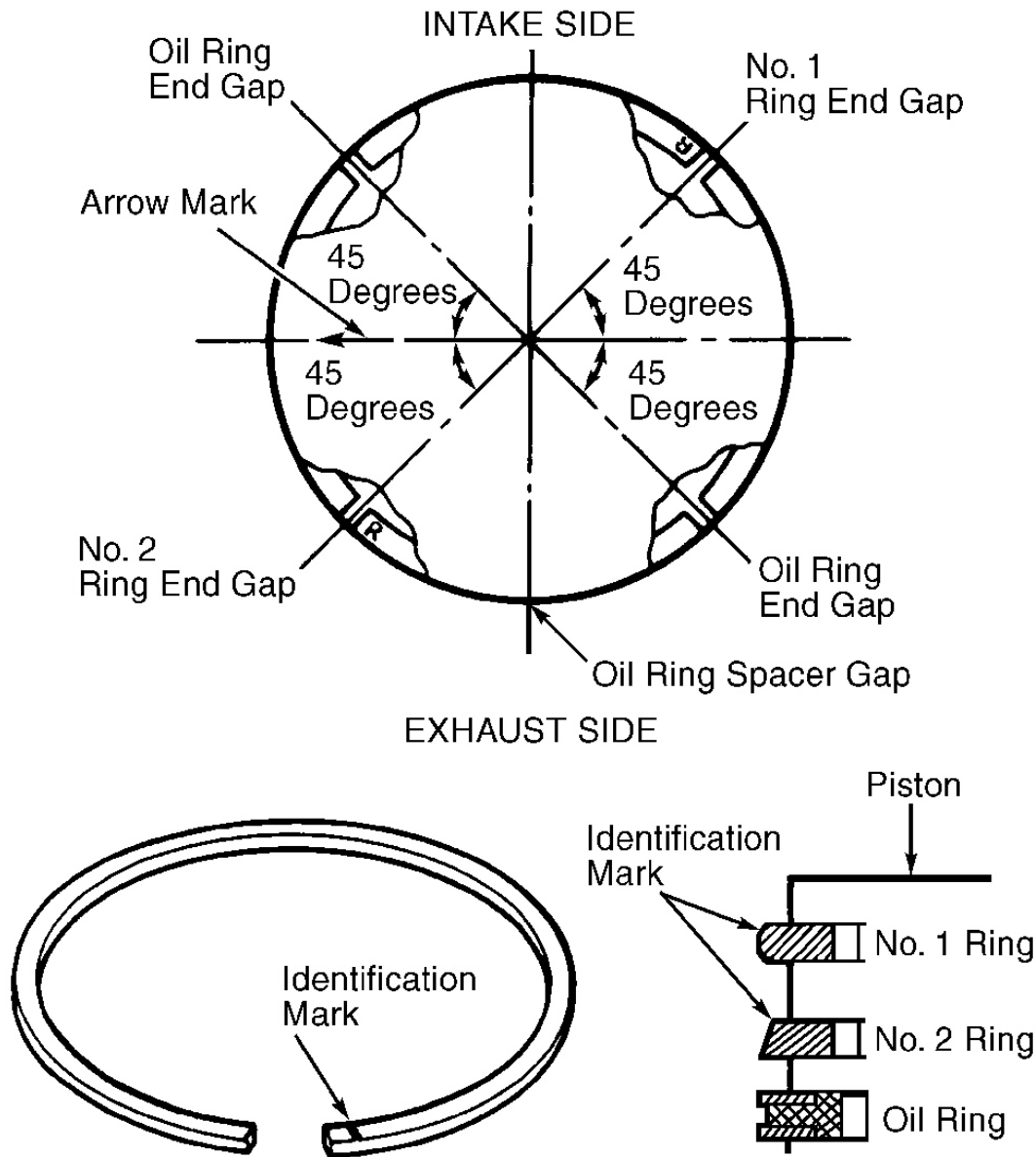
Fig. 11: Matching Pistons To Cylinders

Courtesy of SUZUKI OF AMERICA CORP.

Piston Rings

1. Install rings with "R", "RN" or "T" mark facing upward. On all models, install oil ring spacer first, then rails. Position piston ring gaps. See **Fig. 12**. 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.



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Fig. 12: 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. Undersize 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" (.099-.198 mm), with a service limit of .0138" (.351 mm).
4. To install, reverse removal procedure. Tighten rod nuts to specification. See **TORQUE SPECIFICATIONS**.

Crankshaft & Main Bearings

1. Remove engine. See **ENGINE** under REMOVAL & INSTALLATION. 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. 15** and **Fig. 16** . 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. 13**.
7. The numerical marks on crankshaft web, reading 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. 14**. See appropriate BEARING CAP BORE DIAMETERS table.
9. The letters stamped on cylinder block mating surface, reading 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. 15** and **Fig. 16** . 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.

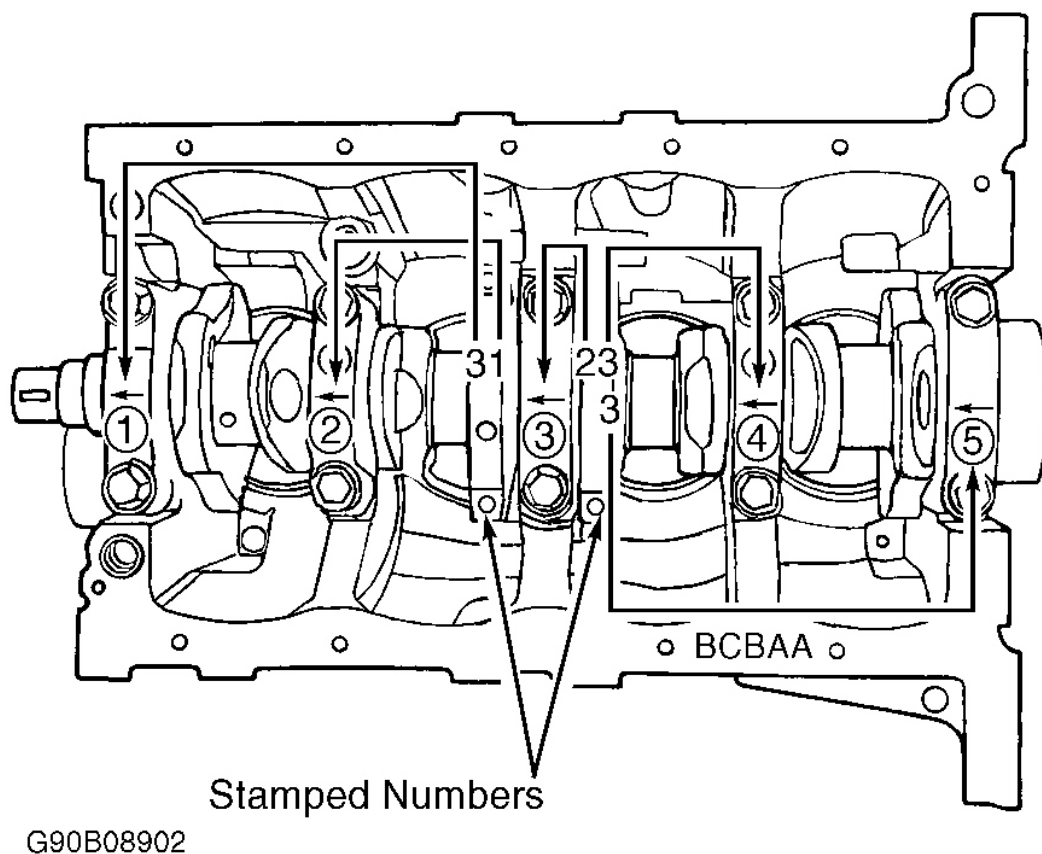


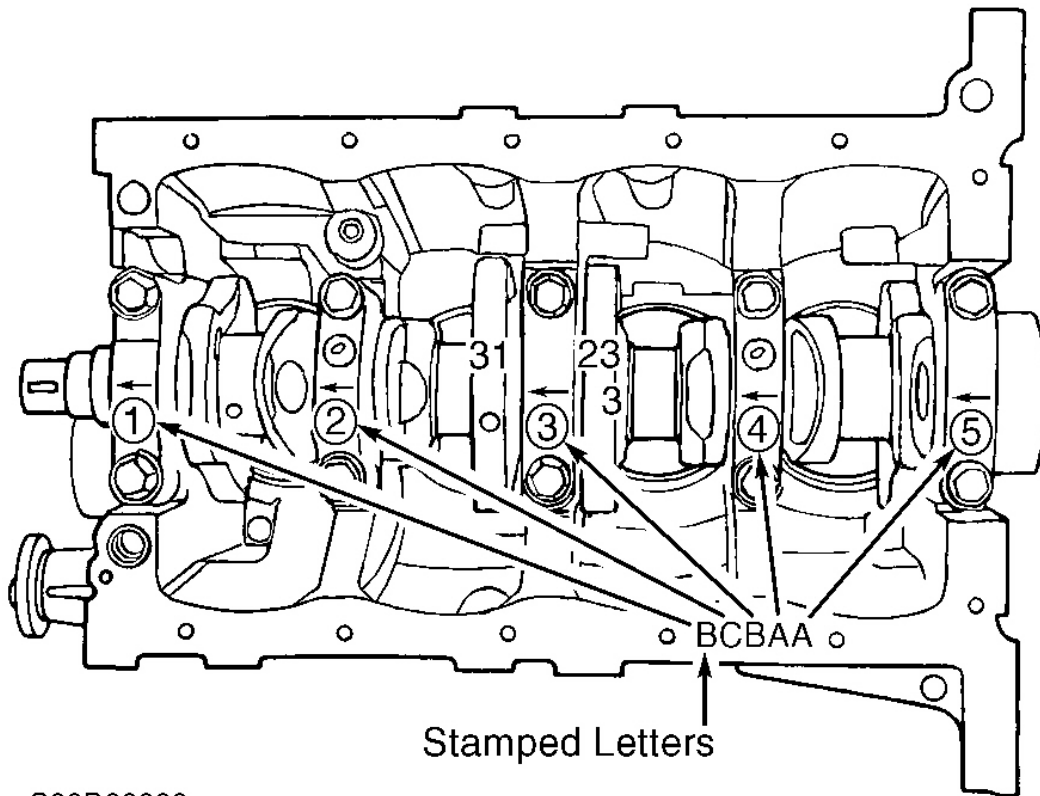
Fig. 13: Locating Numerical Marks On Crankshaft Webs (SOHC)
 Courtesy of SUZUKI OF AMERICA CORP.

CRANKSHAFT JOURNAL DIAMETERS (1.3L)

Numbers Stamped On Webs	In. (mm)
"1"	1.7714-1.7716 (44.994-45.000)
"2"	1.7712-1.7714 (44.988-44.994)
"3"	1.7710-1.7712 (44.983-44.988)

CRANKSHAFT JOURNAL DIAMETERS (1.6L)

Numbers Stamped On Webs	In. (mm)
"1"	2.0470-2.0472 (51.994-52.000)
"2"	2.0468-2.0470 (51.989-51.994)
"3"	2.0465-2.0468 (51.981-51.989)



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Fig. 14: Locating Letters Stamped On Cylinder Block
 Courtesy of SUZUKI OF AMERICA CORP.

BEARING CAP BORE DIAMETERS (1.3L)

Letters Stamped On Block	In. (mm)
"A"	1.9292-1.9294 (49.002-49.007)
"B"	1.9294-1.9296 (49.007-49.012)
"C"	1.9296-1.9298 (49.012-49.017)

BEARING CAP BORE DIAMETERS (1.6L)

Letters Stamped On Block	In. (mm)
"A"	2.2047-2.2050 (56.000-56.007)
"B"	2.2050-2.2052 (56.007-56.012)
"C"	2.2052-2.2054 (56.012-56.017)

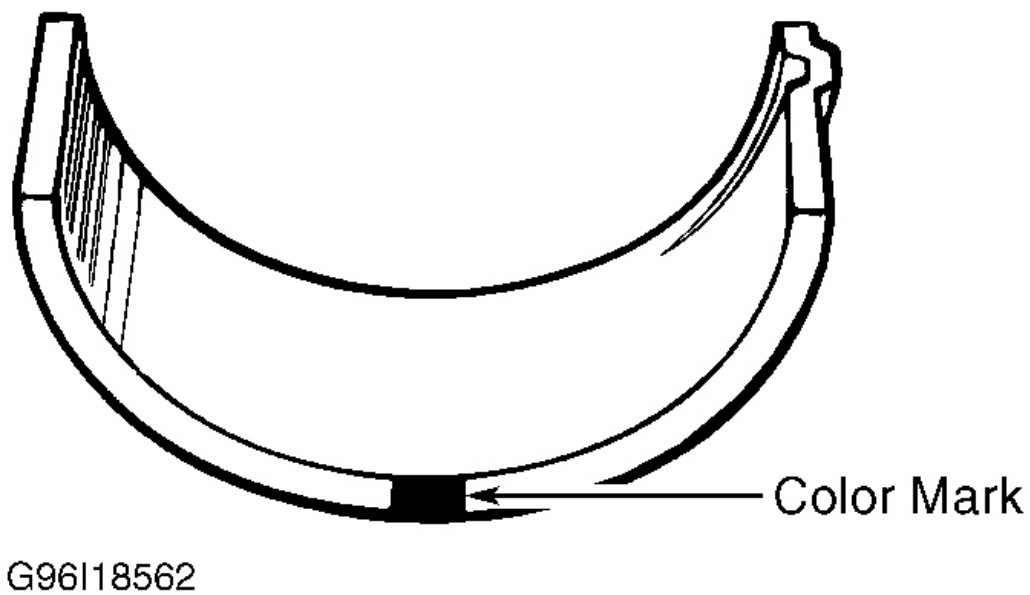


Fig. 15: Identifying Main Bearing Color Codes (Standard Bearing)
Courtesy of SUZUKI OF AMERICA CORP.

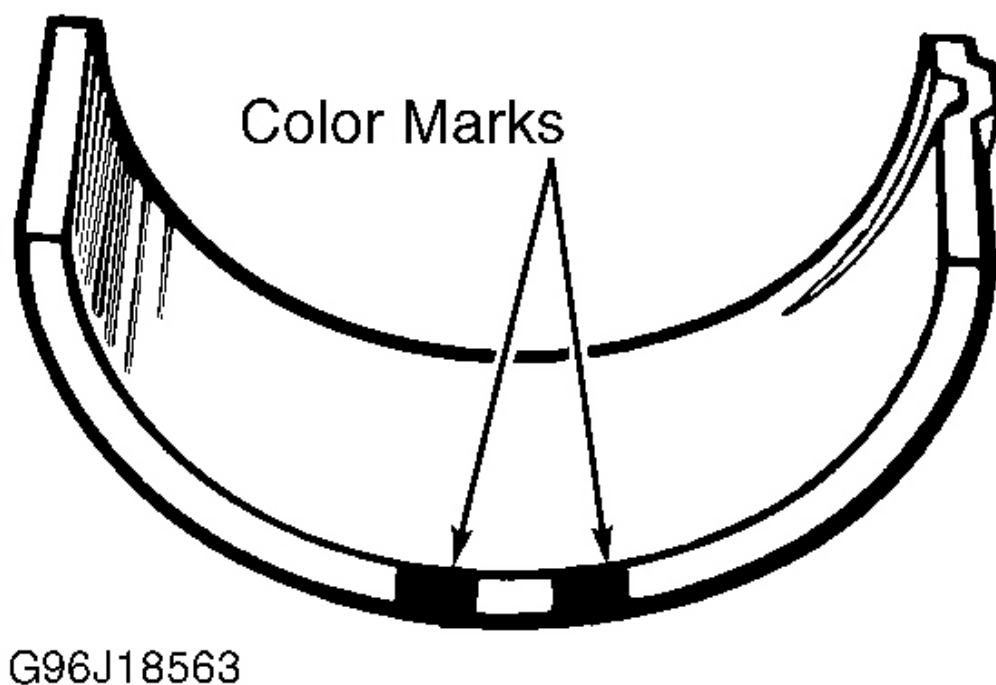


Fig. 16: Identifying Main Bearing Color Codes (Undersize Bearing)
 Courtesy of SUZUKI OF AMERICA CORP.

COLOR CODE FOR STANDARD BEARINGS

Paint Color	Thickness - In. (mm)
Green	.0786-.0787 (1.996-2.000)
Black	.0787-.0788 (2.000-2.002)
No Paint	.0788-.0789 (2.002-2.004)
Yellow	.0789-.0790 (2.004-2.007)
Blue	.0790-.0791 (2.007-2.009)

STANDARD BEARING APPLICATION

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

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	"3"	Yellow
"C"	"1"	No Paint
	"2"	Yellow
	"3"	Blue

Undersize Bearings

1. Bearings are available in .010" (.25 mm) undersize. Undersize bearing thickness is determined by 2 color marks. See **Fig. 15** and **Fig. 16** . See **COLOR CODE FOR UNDERSIZE BEARINGS** table.
2. On 1.3L, use journal finished diameters, 1.7611-1.7618" (44.732-44.750 mm), and letters stamped on cylinder block mating surface to determine correct undersize bearing for replacement. See appropriate **UNDERSIZE BEARING APPLICATION** table.
3. On 1.6L, 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 appropriate **UNDERSIZE BEARING APPLICATION** table.
4. 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

Paint Color	Thickness - In. (mm)
Green & Red	.0835-.0836 (2.121-2.124)
Black & Red	.0836-.0837 (2.124-2.126)
Red Only	.0837-.0838 (2.126-2.129)
Yellow & Red	.0838-.0839 (2.129-2.131)
Blue & Red	.0839-.0840 (2.131-2.134)

UNDERSIZE BEARING APPLICATION (1.3L)

Measured Journal Diameter - In. (mm)	Letter Stamped On Block	Color
1.7616-1.7618	"A"	Green & Red
(44.745-44.750)	"B"	Black & Red
"C"		Red Only
1.7614-1.7616	"A"	Black & Red
(44.740-44.745)	"B"	Red Only
"C"		Yellow & Red
1.7612-1.7614	"A"	Red Only
(44.735-44.740)	"B"	Yellow & Red
"C"		Blue & Red

UNDERSIZE BEARING APPLICATION (1.6L)

Measured Journal Diameter - In. (mm)	Letter Stamped On Block	Color

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2.0371-2.0373 (51.742-51.747)	"A"	Green & Red
	"B"	Black & Red
	"C"	Red Only
2.0369-2.0371 (51.737-51.742)	"A"	Black & Red
	"B"	Red Only
	"C"	Yellow & Red
2.0367-2.0369 (51.732-51.737)	"A"	Red Only
	"B"	Yellow & Red
	"C"	Blue & Red

Thrust Bearing

1. With crankshaft bearing caps installed, check axial thrust clearance using dial gauge.
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.

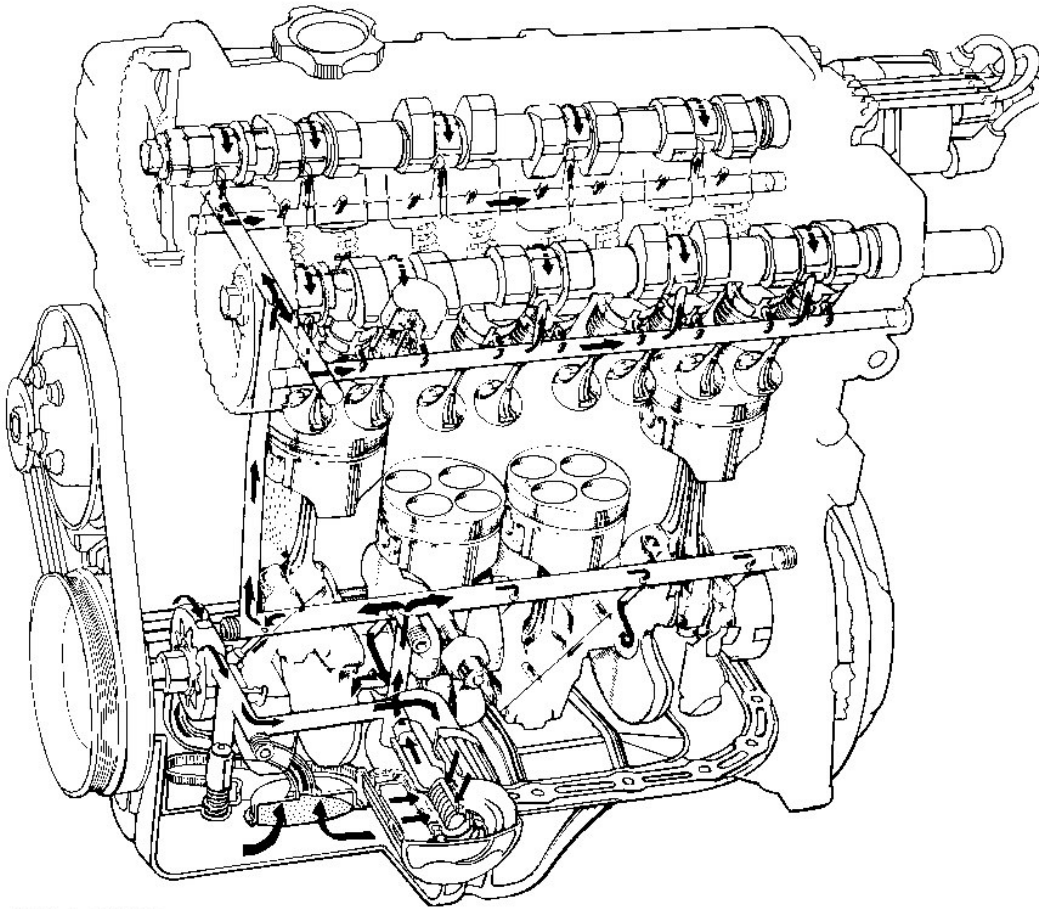
Cylinder Block

1. Inspect block for distortion of deck surface. Warpage limit is .001-.002" (.03-.05 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 forward portion of crankshaft. See **Fig. 17**.



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Fig. 17: Cross-Sectional View Of Engine Oil Circuit (Typical)
Courtesy of SUZUKI OF AMERICA CORP.

Crankcase Capacity

Vitara crankcase capacity, including filter, is 4.8 qts. (4.5L). Esteem and Swift 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

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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 dipstick 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 **Fig. 18** and **Fig. 19** . If clearance exceeds specification, replace outer rotor or case. See **OIL PUMP SPECIFICATIONS** table.

OIL PUMP SPECIFICATIONS

Application	Radial Clearance - In. (mm)	Side Clearance - 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**.

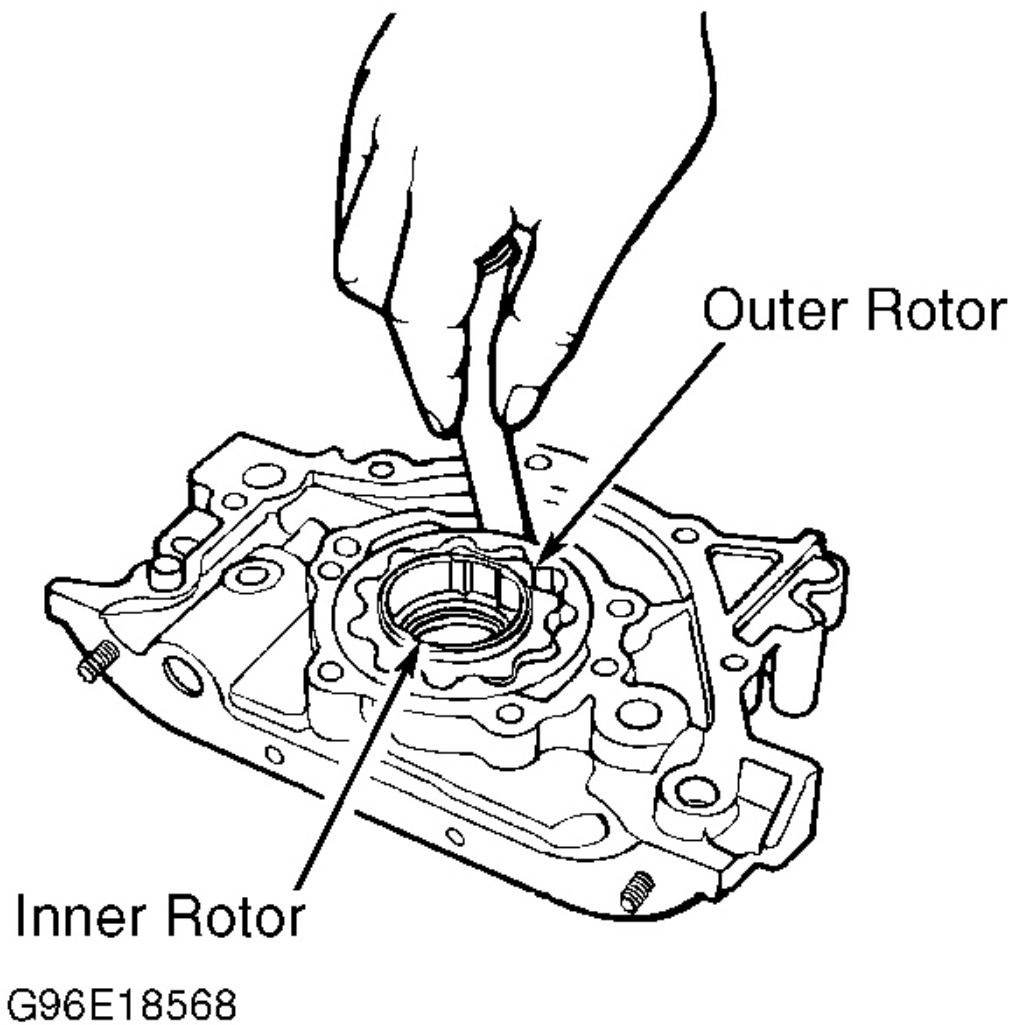


Fig. 18: Checking Oil Pump Radial Clearance
Courtesy of SUZUKI OF AMERICA CORP.

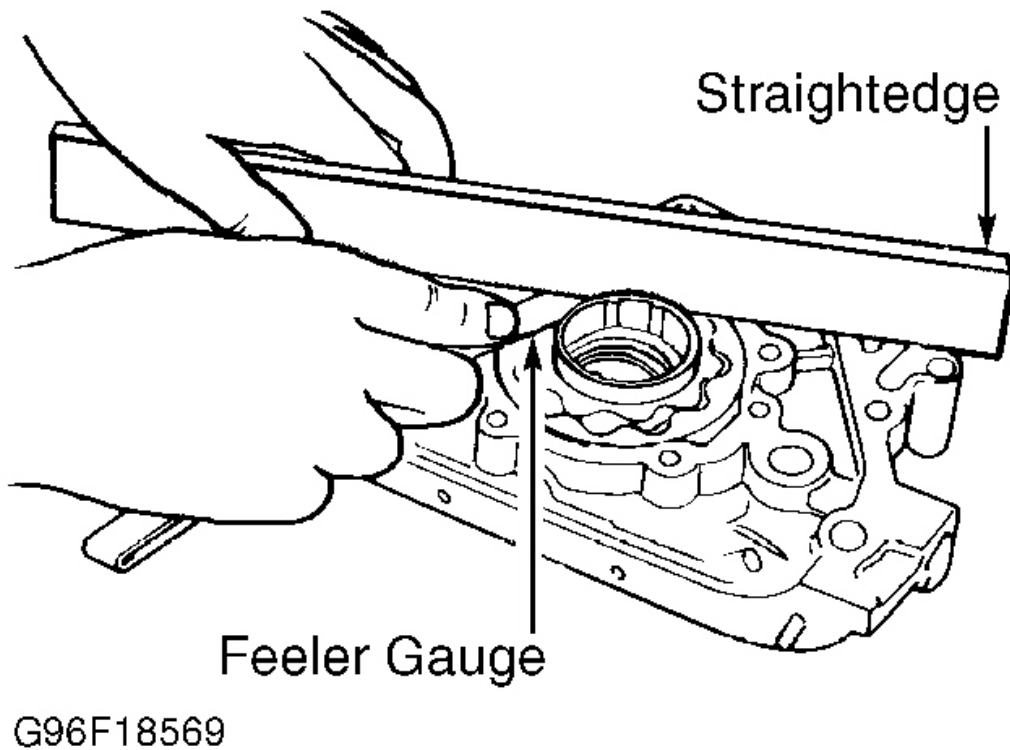


Fig. 19: Checking Oil Pump Side Clearance
 Courtesy of SUZUKI OF AMERICA CORP.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Camshaft Sprocket Bolt	41-47 (56-64)
Connecting Rod Cap Nut	26 (35)
Crankshaft Main Bearing Cap Bolt	39 (53)
Crankshaft Pulley Bolt	11-13 (15-18)
Crankshaft Sprocket Bolt	93 (126)
Cylinder Head Bolt ⁽¹⁾	48-52 (65-71)
Drive Plate-To-Torque Converter Bolt	14 (19)
Engine Mounts-To-Block	33 (45)
Engine Mounts-To-Frame	37 (50)
Engine-To-Transmission Bolt	
Swift	37 (50)

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Vitara & Esteem	65 (88)
Exhaust Manifold Bolt	13-21 (18-28)
Exhaust Pipe Bolt	37 (50)
Flywheel Bolt (Drive Plate For A/T)	55-59 (75-80)
Fuel Feed Flare Nut	33 (45)
Generator Mount & Adjusting Bolts	13-21 (18-28)
Generator Pulley Bolt	
Esteem	82 (111)
Swift	40-55 (54-75)
Vitara	50 (68)
Intake Manifold Bolt	13-21 (18-28)
Intake Manifold Support (Stiffener)	29-43 (39-58)
Oil Filter Mount	15-18 (20-24)
Oil Pan Drain Plug	22-30 (30-41)
Spark Plug	15-22 (20-30)
Timing Belt Tensioner Bolt	18-22 (24-30)
Torque Converter Bolts	14 (19)
INCH Lbs. (N.m)	
Adjusting Screw Lock Nut	106 (12)
Camshaft Bearing Cap Bolt	80-106 (9-12)
Camshaft Position Sensor	97 (11)
Cooling Fan Nut	71-106 (8-12)
Cylinder Head Venturi Plug	35-53 (4-6)
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 Adjustment Lock Nut	80 (12)
Rocker Arm Shaft Plug	97 (11)
Rocker Arm Shaft Screw	97 (11)
Rocker Cover Bolt	80-106 (9-12)
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. 5 .	

ENGINE SPECIFICATIONS

2000 Suzuki Esteem GL

1999-2000 ENGINES 1.3L & 1.6L 4-Cylinder

GENERAL SPECIFICATIONS**GENERAL SPECIFICATIONS**

Application	Specification
1.3L	
Displacement	79.2 Cu. In. (1.3L)
Bore	2.91" (74.0 mm)
Stroke	2.97" (75.4 mm)
Compression Ratio	9.5:1
Compression Pressure ⁽¹⁾	
Standard	199 psi (14 kg/cm ²)
Service Limit	156 psi (11 kg/cm ²)
Maximum Variation	14.2 psi (1 kg/cm ²)
Fuel System	TBI
1.6L	
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
(1) Checked at 250 RPM or greater.	

CONNECTING RODS SPECIFICATIONS**CONNECTING RODS**

Application	In. (mm)
Pin Bore	.7481-.7485 (19.002-19.012)
Maximum Bend	.0020 (.05)
Maximum Twist	.0039 (.10)
Side Play	
Standard	.0039-.0078 (.10-.20)
Service Limit	.0138 (.351)

CRANKSHAFT, MAIN BEARINGS & CONNECTING ROD BEARINGS SPECIFICATIONS**CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS**

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1999-2000 ENGINES 1.3L & 1.6L 4-Cylinder

Application	In. (mm)
1.3L	
Crankshaft	
End Play	
Standard	.004-.012 (.10-.30)
Service Limit	.015 (.38)
Runout Limit	.002 (.05)
Main Bearings	
Journal Diameter ⁽¹⁾	
"1"	1.7714-1.7716 (44.994-45.000)
"2"	1.7712-1.7714 (44.988-44.994)
"3"	1.7710-1.7712 (44.983-44.988)
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 Diameters ⁽²⁾	
"A"	1.9292-1.9294 (49.002-49.007)
"B"	1.9294-1.9296 (49.007-49.012)
"C"	1.9296-1.9298 (49.012-49.017)
Connecting Rod Bearings	
Journal Diameter	1.6529-1.6535 (41.984-42.000)
Journal Out-Of-Round	.0004 (.010)
Journal Taper	.0004 (.010)
Oil Clearance	
Standard	.0008-.0020 (.020-.051)
Service Limit	.0031 (.079)
1.6L	
Crankshaft	
End Play	
Standard	.004-.012 (.10-.30)
Service Limit	.015 (.38)
Runout	.002 (.05)
Main Bearings	
Journal Diameter ⁽¹⁾	
"1"	2.0470-2.0472 (51.994-52.000)
"2"	2.0468-2.0470 (51.989-51.994)
"3"	2.0465-2.0468 (51.981-51.989)
Journal Out-Of-Round	.0004 (.010)
Journal Taper	.0004 (.010)

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1999-2000 ENGINES 1.3L & 1.6L 4-Cylinder

Standard	.0008-.0016 (.020-.040)
Service Limit	.0024 (.060)
Main Bearing Cap Bore Diameter ⁽²⁾	
"A"	2.2047-2.2050 (56.000-56.007)
"B"	2.2050-2.2052 (56.007-56.012)
"C"	2.2052-2.2054 (56.012-56.017)
Connecting Rod Bearings	
Journal Diameter	1.7316-1.7323 (43.983-44.000)
Journal Out-Of-Round	.0004 (.010)
Journal Taper	.0004 (.010)
Oil Clearance	
Standard	.0008-.0020 (.020-.051)
Service Limit	.0031 (.079)
(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. 14 .	

PISTONS, PISTON PINS & PISTON RINGS SPECIFICATIONS**PISTONS, PINS & RINGS**

Application	In. (mm)
1.3L	
Pistons	
Clearance	.0008-.0016 (.020-.041)
Diameter ⁽¹⁾	
"1"	2.9126-2.9130 (73.980-73.990)
"2"	2.9122-2.9126 (73.970-73.980)
Pins	
Diameter	.7482-.7486 (19.004-19.014)
Piston Fit	Slip
Rod Fit	Interference
Rings	
No. 1	
End Gap	
Standard	.0059-.0118 (.150-.300)
Service Limit	.0276 (.701)
Side Clearance	.0012-.0027 (.030-.069)
No. 2	
End Gap	

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1999-2000 ENGINES 1.3L & 1.6L 4-Cylinder

Standard	.0079-.0137 (.201-.348)
Service Limit	.0276 (.701)
Side Clearance	.0008-.0024 (.02-.06)
No. 3 (Oil)	
End Gap	
Standard	.0079-.0236 (.20-.60)
Service Limit	.0669 (1.699)
1.6L	
Pistons	
Clearance	.0008-.0016 (.02-.04)
Diameter ⁽¹⁾	
"1"	2.9520-2.9524 (74.981-74.991)
"2"	2.9516-2.9520 (74.971-74.981)
Pins	
Diameter	.7478-.7480 (18.994-19.000)
Piston Fit	Slip
Rod Fit	Slip
Rings	
No. 1	
End Gap	
Standard	.0079-.0138 (.201-.351)
Service Limit	.0276 (.701)
Side Clearance	.0012-.0028 (.030-.071)
No. 2	
End Gap	
Standard	.0079-.0138 (.201-.351)
Service Limit	.0276 (.701)
Side Clearance	.0008-.0024 (.02-.06)
No. 3 (Oil)	
End Gap	
Standard	.0079-.0276 (.201-.701)
Service Limit	.0669 (1.699)
(1) Piston diameter is determined by numerical mark ("1" or "2") stamped on piston. See Fig. 11 .	

ENGINE VALVES & VALVE SPRINGS SPECIFICATIONS**VALVES & VALVE SPRINGS**

Application	In. (mm)
1.3L	
Intake Valves	
Seat Angle	45°

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Valve Head Thickness	
Standard	.039 (1.0)
Service Limit	.024 (.61)
Stem Diameter	.2152-.2157 (5.466-5.479)
Exhaust Valves	
Seat Angle	45°
Valve Head Thickness	
Standard	.039 (1.0)
Service Limit	.028 (.701)
Stem Diameter	.2142-.2148 (5.440-5.456)
Valve Springs	
Free Length	
Standard	1.4500 (36.830)
Limit	1.4043 (35.669)
Out-Of-Square	.079 (2.01)
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)
1.6L	
Intake Valves	
Seat Angle	45°
Valve Head Thickness	
Standard	.03-.047 (.8-1.2)
Service Limit	.024 (.61)
Stem Diameter	.2152-.2157 (5.466-5.479)
Exhaust Valves	
Seat Angle	45°
Valve Head Thickness	
Standard	.03-.047 (.7-1.19)
Service Limit	.028 (.71)
Stem Diameter	.2142-.2148 (5.441-5.456)
Valve Springs	
Free Length	
Standard	1.4500 (36.83)
Service Limit	1.4043 (35.669)
Out-Of-Square	.079 (2.01)
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)

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CYLINDER BLOCK SPECIFICATIONS**CYLINDER BLOCK**

Application	In. (mm)
1.3L	
Cylinder Bore	
Standard Diameter ⁽¹⁾	
"1"	2.9138-2.9142 (74.011-74.021)
"2"	2.9134-2.9138 (74.000-74.011)
Maximum Taper	.0039 (.10)
MOut-Of-Round	.0039 (.10)
Maximum Deck Warpage	.002 (.051)
1.6L	
Cylinder Bore	
Standard Diameter ⁽¹⁾	
"1"	2.9531-2.9535 (75.009-75.019)
"2"	2.9528-2.9531 (75.001-75.009)
Maximum Taper	.0039 (.10)
Maximum Out-Of-Round	.0039 (.10)
Maximum Deck Warpage	.002 (.051)
(1) Cylinder bore diameter is determined by numerical mark ("1" or "2") stamped on cylinder block. See Fig. 11 .	

CYLINDER HEAD SPECIFICATIONS**CYLINDER HEAD**

Application	In. (mm)
Maximum Warpage	
Head-To-Block	.002 (.051)
Manifold-To-Head	.004 (.102)
Valve Seats	
Intake & Exhaust Valves	
Seat Angle	45°
Seat Width	.0433-.0512 (1.10-1.30)
Valve Guides	
Valve Stem End Deflection Limit	
Intake	.006 (.15)
Exhaust	.007 (.18)
Intake Valve	
Valve Guide I.D.	
1.3L	.2159-.2169 (5.484-5.509)

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1.6L	.2165-.2170 (5.499-5.512)
Valve Guide Installed Height	.45 (11.4)
Valve Stem-To-Guide Oil Clearance	
1.6L	.0008-.0020 (.020-.051)
1.3L	.0002-.0018 (.005-.046)
Service Limit	.0027 (.069)
Exhaust Valve	
Valve Guide I.D.	
1.3L	.2159-.2169 (5.484-5.509)
1.6L	.2165-.2170 (5.500-5.512)
Valve Guide Installed Height	.45 (11.4)
Valve Stem-To-Guide Oil Clearance	
1.3L	.0012-.0027 (.030-.069)
1.6L	.0018-.0028 (.046-.071)
Service Limit	.0035 (.089)

CAMSHAFT SPECIFICATIONS**CAMSHAFT**

Application	In. (mm)
Bore Diameter	1.1024-1.1032 (28.001-28.021)
Journal Diameter	1.1000-1.1008 (27.94-27.960)
Journal Runout ⁽¹⁾	.0039 (.10)
Lobe Height	
Esteem & Vitara	
Exhaust Standard	1.4134-1.4196 (35.900-36.058)
Exhaust Service Limit	1.4095 (35.801)
Intake Standard	1.4246-1.4308 (36.185-36.342)
Intake Service Limit	1.4207 (36.086)
Swift	
Intake Standard	1.4241-1.4303 (36.172-36.330)
Service Limit	1.4202 (36.073)
Exhaust Standard	1.4314-1.4376 (36.358-36.515)
Service Limit	1.4275 (36.259)
Oil Clearance	
Standard	.0016-.0032 (.041-.081)
Service Limit	.0047 (.12)
(1) Journals are numbered from front of engine.	

ROCKER ARM & ROCKER ARM SHAFT SPECIFICATIONS

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1999-2000 ENGINES 1.3L & 1.6L 4-Cylinder

ROCKER ARM & ROCKER ARM SHAFT

Application	In. (mm)
Rocker Arm Inside Diameter	
1.3L	.6299-.6306 (16.000-16.017)
1.6L	.6293-.6301 (15.984-16.005)
Rocker Arm Shaft Outside Diameter	.6287-.6293 (15.969-15.984)
Rocker Arm-To-Shaft Oil Clearance	
Standard	.0001-.0014 (.030-.036)
Service Limit	.0035 (.089)
Rocker Arm Shaft Runout	.008 (.20)