1.8L 4-CYL VIN [2]

1997-98 ENGINES Suzuki 1.8L 4-Cylinder

ENGINE IDENTIFICATION

Engine code is stamped on rear portion of cylinder block at exhaust side of bellhousing. 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
Sidekick Sport	2

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

NOTE: Engine uses hydraulic lifters. Adjustment is not required.

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. Remove fuel pump relay connector (relay with Pink wire). Fuel pump relay is located on right side of heater unit. See **Fig. 1** .
2. 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. Turn ignition off. Reconnect fuel pump relay connector.

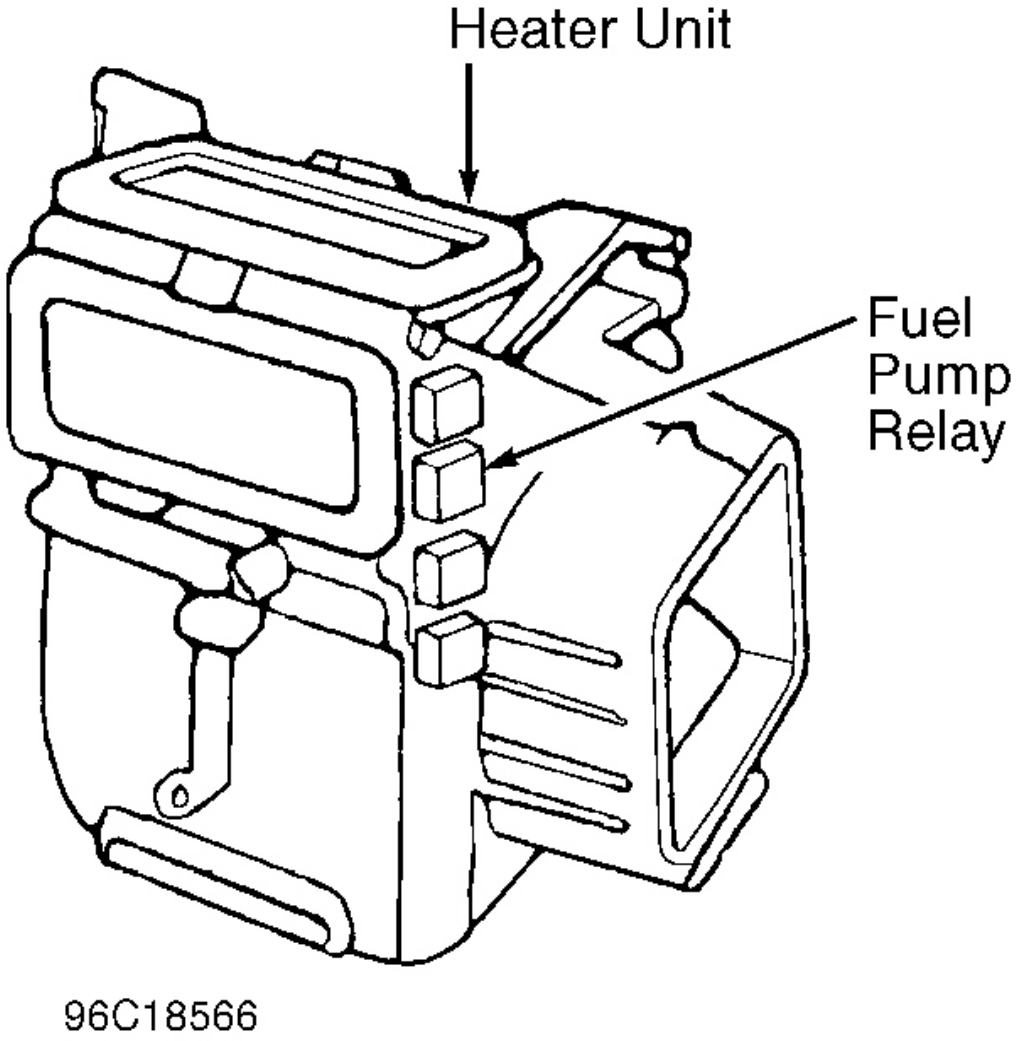

Fig. 1: Locating Fuel Pump Relay
Courtesy of SUZUKI OF AMERICA CORP.

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.

Removal

1. Relieve fuel pressure. See **FUEL PRESSURE RELEASE** . Disconnect battery cables and remove

battery. Mark and remove hood. Remove air cleaner and duct. Drain radiator. Remove cooling fan and clutch.

2. Remove fan shroud and radiator. Remove A/C condenser (if equipped). Disconnect accelerator cable and kickdown cable (if equipped). Remove strut tower bar. Remove engine oil level gauge (dipstick) and A/T fluid level gauge guide.
3. Mark and disconnect all wiring harness connectors from exhaust manifold, intake manifold, and throttle body. Mark and remove fuel and vacuum hoses from engine. Remove coolant and heater hoses.
4. Disconnect coolant temperature switch and oil pressure sensor. Without disconnecting hoses, detach power steering pump and A/C compressor. Disconnect wires from starter motor and generator terminals. Raise vehicle. Disconnect exhaust pipe from exhaust manifold.
5. On manual transmission models, remove clutch cable. On automatic transmission models, remove automatic transmission cooling hoses from clamps. Remove right side transmission stiffener, and torque converter housing lower cover. Remove torque converter bolts.
6. On all models, lower vehicle. Remove nuts and bolts fastening engine to transmission. Support transmission. Attach hoist to engine. Remove engine mounting bolts, and remove engine from body and transmission. Remove engine mountings from brackets.

Installation

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

INTAKE MANIFOLD

Removal

1. Release fuel pressure. See **FUEL PRESSURE RELEASE** . Disconnect negative battery cable. Drain cooling system. Remove strut tower bar. Remove air intake hoses and air breather hoses.
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. Remove fuel supply and return lines from delivery pipe. Disconnect all control cables. Disconnect intake manifold front and rear stiffeners. See **Fig. 2** .
4. Disconnect coolant pipe from intake manifold. 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.

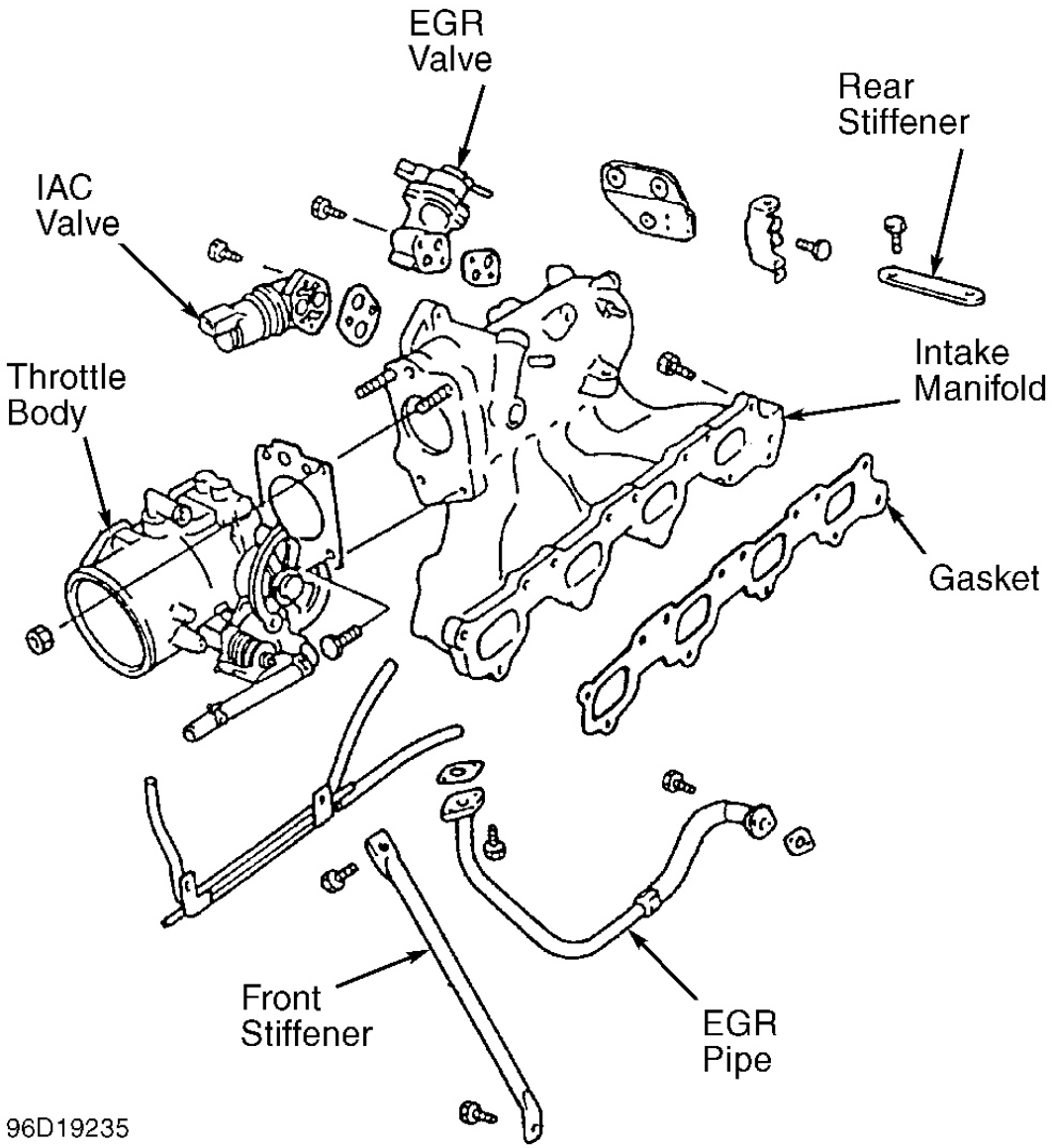

Fig. 2: Exploded View Of Intake Manifold
Courtesy of SUZUKI OF AMERICA CORP.

EXHAUST MANIFOLD

Removal

1. Disconnect negative battery cable. Remove strut tower bar. Disconnect oxygen sensor wire connector. Remove exhaust manifold upper cover.
2. Remove exhaust manifold stiffener. Disconnect exhaust pipe from exhaust manifold. 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 COVER

Removal & Installation

Disconnect negative battery cable. Remove ignition coil cover. Disconnect and remove ignition coils. Detach accelerator cable from clamp. Remove oil level dipstick. Disconnect breather hose and PCV hose from cylinder head cover. Remove cylinder head cover. To install, reverse removal procedure. Apply sealant to cylinder head and cover. See **Fig. 3** .

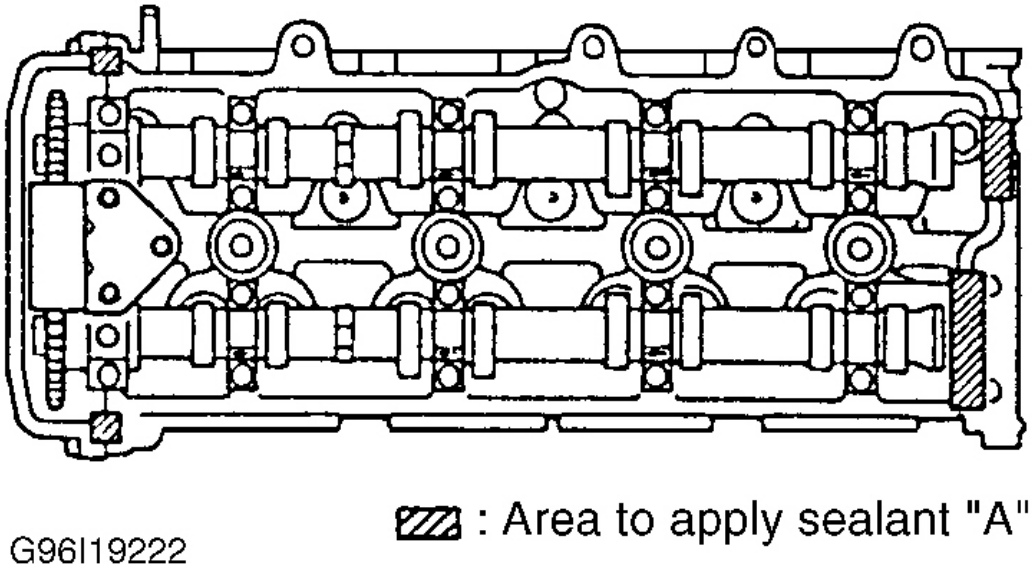

Fig. 3: Installing Cylinder Head Cover
Courtesy of SUZUKI OF AMERICA CORP.

CYLINDER HEAD

Removal

1. Release fuel pressure. See **FUEL PRESSURE RELEASE** . Disconnect negative battery cable. Drain cooling system and engine oil. Remove strut tower bar. Remove air cleaner outlet hose. Disconnect accelerator cable and A/T throttle cable at throttle body.
2. Remove 1st timing chain. See **1ST TIMING CHAIN & CHAIN TENSIONER** . Remove camshafts and valve lash adjusters. See **CAMSHAFT & VALVE LASH ADJUSTERS** . Label and remove hoses, lines

and electrical connectors from cylinder head, intake manifold and exhaust manifold.

3. Remove intake manifold stiffener. Disconnect coolant pipe from intake manifold. Disconnect exhaust pipe from exhaust manifold and remove stiffener. Loosen cylinder head bolts in order shown in illustration. See **Fig. 4** . Remove cylinder head.

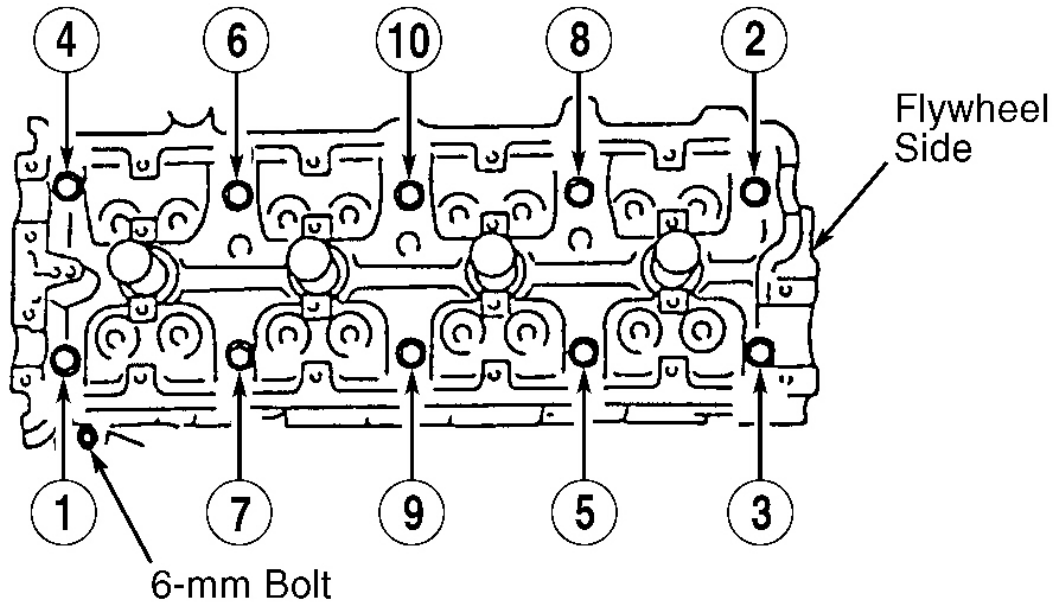

Fig. 4: Cylinder Head Bolt Removal Sequence
Courtesy of SUZUKI OF AMERICA CORP.

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** 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

1. To install, reverse removal procedure. Use NEW head and manifold gaskets. Tighten cylinder head bolts to 39 ft. lbs (53 N.m) using proper sequence. See **Fig. 5** .
2. Increase cylinder head bolt torque to 62 ft. lbs (84 N.m) using proper sequence. Now LOOSEN all bolts

until torque is reduced to zero (0). See **Fig. 4**

3. Now tighten cylinder head bolts to 27 ft. lbs (37 N.m) using proper sequence. See **Fig. 5** . Finish tightening cylinder head bolts to 77 ft. lbs. (105 N.m). Tighten the 6-mm bolt on side of cylinder head to 97 INCH lbs. (11 N.m).

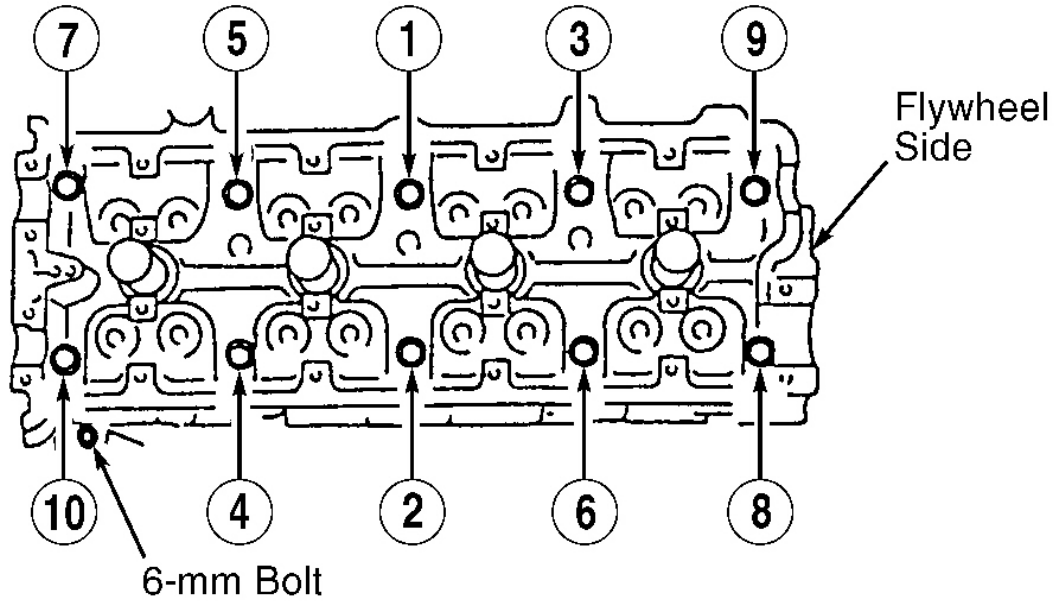

Fig. 5: Cylinder Head Bolt Tightening Sequence
Courtesy of SUZUKI OF AMERICA CORP.

TIMING CHAIN COVER

Removal

1. Disconnect negative battery cable. Drain engine oil and coolant. Remove oil pan and oil pump strainer. See OIL PAN. Remove cylinder head cover. See **CYLINDER HEAD COVER** .
2. Remove coolant by-pass pipe and hose. Detach cooling fan from pulley. Remove fan belt, pulley, and cooling fan. Remove generator belt by turning tensioner center bolt clockwise to loosen tension on belt.
3. Remove water pump and generator belt tensioner. Remove generator belt idler pulley. Disconnect radiator outlet hose from thermostat cap. Without disconnecting refrigerant lines, remove A/C compressor and bracket.
4. Remove crankshaft pulley bolt and crankshaft pulley. Remove timing chain cover. Remove crankshaft oil seal.

Installation

To install, reverse removal procedure. Drive in NEW oil seal until it is flush with cover. Apply sealant along edge of engine block, where timing cover comes into contact with block, and at cylinder block-to-cylinder head parting surfaces.

2ND TIMING CHAIN & CHAIN TENSIONER

Removal

1. Disconnect negative battery cable. Drain engine oil and coolant. Remove oil pan and oil pump strainer. See OIL PAN. Remove cylinder head cover. See **CYLINDER HEAD COVER** .
2. Remove timing chain cover. See **TIMING CHAIN COVER** . Align all sprocket timing marks with timing marks on block. See **Fig. 6** . Ensure key on crankshaft sprocket is pointing up.
3. Remove timing chain tensioner adjuster by turning intake camshaft slightly counterclockwise while pushing back pad. Remove intake and exhaust camshaft sprocket bolts. Remove camshaft sprockets and 2nd timing chain.

CAUTION: DO NOT turn camshafts more than 15 degrees or crankshaft more than 90 degrees in either direction from aligned position. Doing so could damage pistons and/or valves.

Installation

1. Align all sprocket timing marks with timing marks on block. See **Fig. 6** . Ensure key on crankshaft sprocket is pointing up. Check that arrow on idler sprocket faces up.
2. Install 2nd timing chain by aligning Yellow plate of timing chain with arrow on idler sprocket. Install sprockets on intake and exhaust camshafts by aligning Dark Blue plate of 2nd timing chain.
3. Insert a push pin into timing chain tensioner and press plunger back into tensioner body. Ensure plunger does not come out. Install timing chain tensioner with gasket and tighten to specification.
4. Remove push pin from timing chain tensioner. Turn crankshaft clockwise 2 rotations then align timing marks. Ensure all timing marks align. Apply oil to timing chains, tensioner, sprockets, and guide. To complete installation, reverse removal procedure.

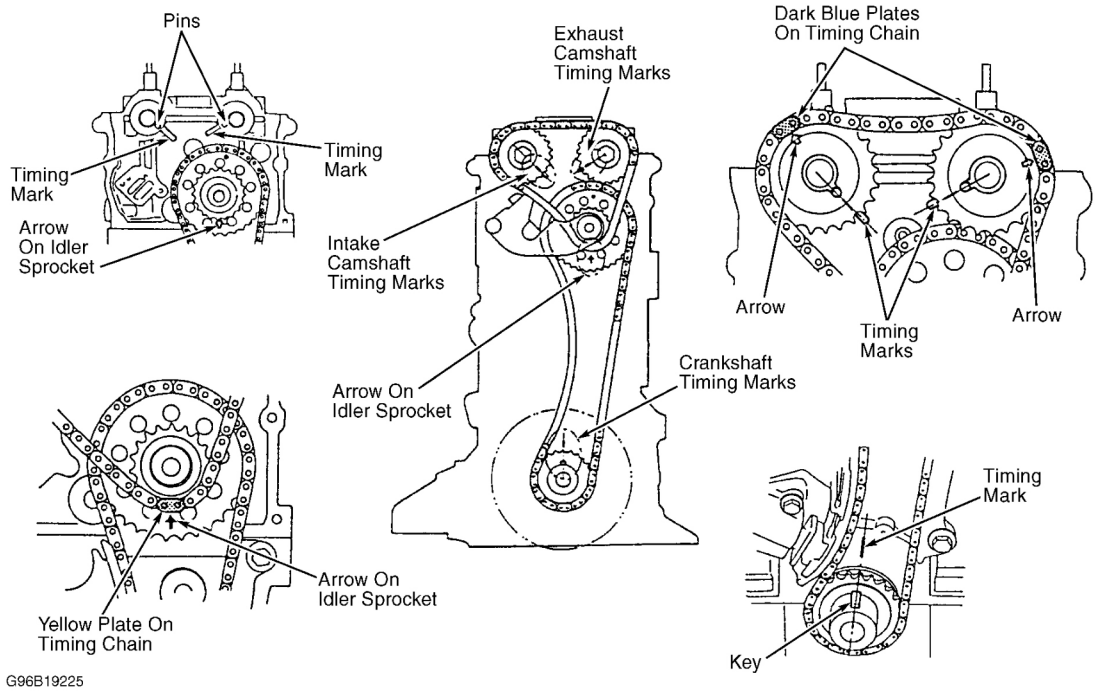

Fig. 6: Aligning 2nd Timing Chain & Sprockets
Courtesy of SUZUKI OF AMERICA CORP.

1ST TIMING CHAIN & CHAIN TENSIONER

Removal

1. Disconnect negative battery cable. Drain engine oil and coolant. Remove oil pan and oil pump strainer. See **OIL PAN** . Remove cylinder head cover. See **CYLINDER HEAD COVER** .
2. Remove timing chain cover. See **TIMING CHAIN COVER** . Align all sprocket timing marks with timing marks on block. See **Fig. 7** . Ensure key on crankshaft sprocket is pointing up.
3. Remove 2nd timing chain and chain tensioner. See **2ND TIMING CHAIN & CHAIN TENSIONER** . Remove 1st timing chain guide, chain tensioner adjuster, and timing chain tensioner. Remove idler sprocket and 1st timing chain. Remove crankshaft timing chain sprocket.

Installation

1. Ensure key on crankshaft sprocket is pointing up. See **Fig. 7** . Apply oil to bushing of idler sprocket. Install 1st timing chain by aligning Dark Blue plate of timing chain with mark on idler sprocket.
2. Align Yellow plate of timing chain with mark on crankshaft sprocket. Install timing chain tensioner. Release latch on tensioner adjuster, insert a pin to hold latch in place, and press plunger back into tensioner adjuster body.
3. Ensure plunger does not come out. Install timing chain adjuster and tighten to specification. Remove pin from timing chain adjuster. Install timing chain guide. Ensure Dark Blue plate and Yellow plate of timing chain are aligned with timing marks. To complete installation, reverse removal procedure.

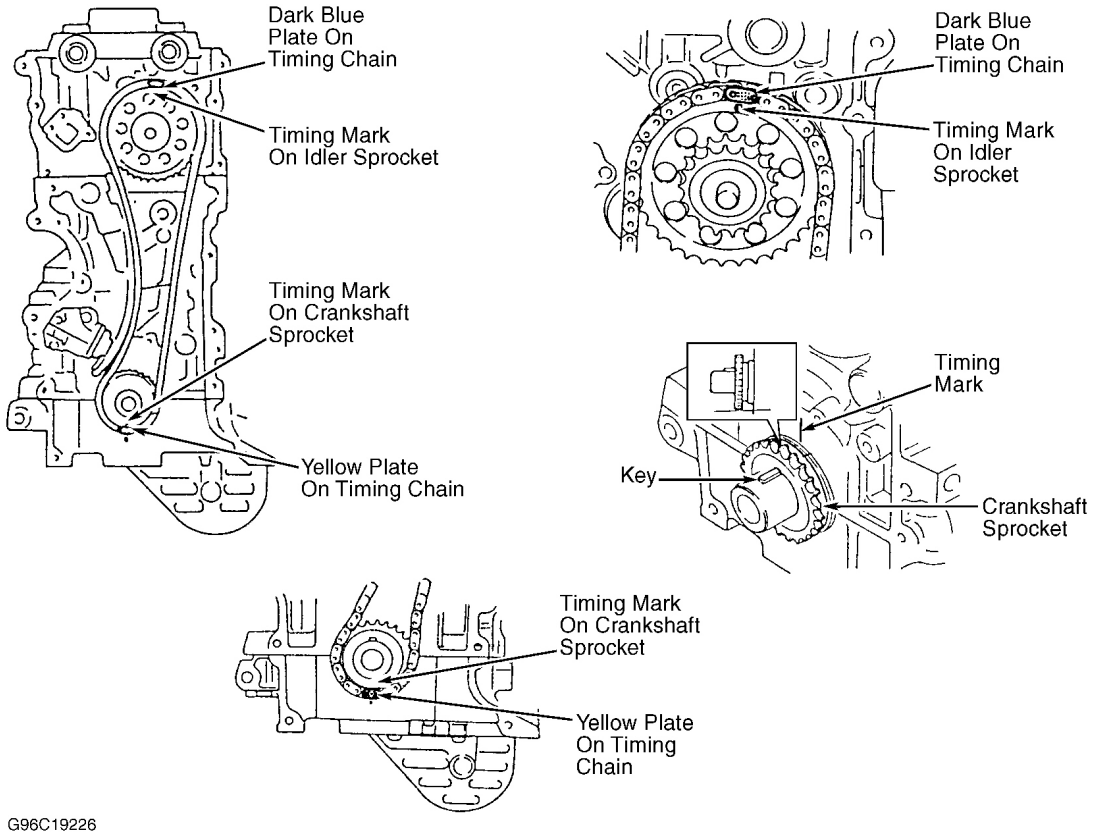

Fig. 7: Aligning 1st Timing Chain & Sprockets
Courtesy of SUZUKI OF AMERICA CORP.

CAMSHAFT & VALVE LASH ADJUSTERS

Removal

1. Disconnect negative battery cable. Drain engine oil and coolant. Remove oil pan and oil pump strainer. See OIL PAN. Remove cylinder head cover. See **CYLINDER HEAD COVER** .
2. Remove timing chain cover. See **TIMING CHAIN COVER** . Remove 2nd timing chain and chain tensioner. See **2ND TIMING CHAIN & CHAIN TENSIONER** . Remove camshaft position sensor from end of camshaft.
3. After removing 2nd timing chain, turn crankshaft clockwise 90 degrees to prevent valves from hitting pistons. Remove camshaft bearing cap bolts in reverse order of tightening sequence. See **Fig. 9** . Remove camshaft bearing caps and camshafts.
4. Remove valve lash adjusters. Completely immerse valve lash adjusters in clean engine oil to keep them from collapsing. DO NOT apply force to body of adjuster nor place adjuster on its side or with bucket body facing up.

Installation

1. Fill valve lash adjuster pockets on cylinder head with clean engine oil. Ensure oil comes out of oil passages. Lubricate valve lash adjusters and install on cylinder head.
2. Ensure key on crankshaft sprocket is pointing up and aligned with timing mark. See **Fig. 6** . Lubricate camshafts and install on cylinder head, ensuring pins align with timing marks. See **Fig. 6** .
3. Apply sealant to exhaust camshaft sealing surface. See **Fig. 8** . Ensure camshaft bearing caps are marked with an "I" for intake camshaft and "E" for exhaust. Ensure arrow on caps point toward timing chain.
4. Lubricate camshaft bearing cap bolts and tighten them in sequence, in 2-3 steps, to specified torque. See **Fig. 9** . To complete installation, reverse removal procedure.

CAUTION: DO NOT turn camshafts or start engine for 30 minutes after installing valve lash adjusters and camshafts. Operating engine within 30 minutes and hour may cause valve and/or piston damage.

NOTE: If air is trapped in valve lash adjuster, valve may make a tapping sound when engine is operated. To correct this condition, run engine for 30 minutes at 2000 RPM to purge air from valve lash adjuster. If condition is not corrected, replace defective valve lash adjuster(s).

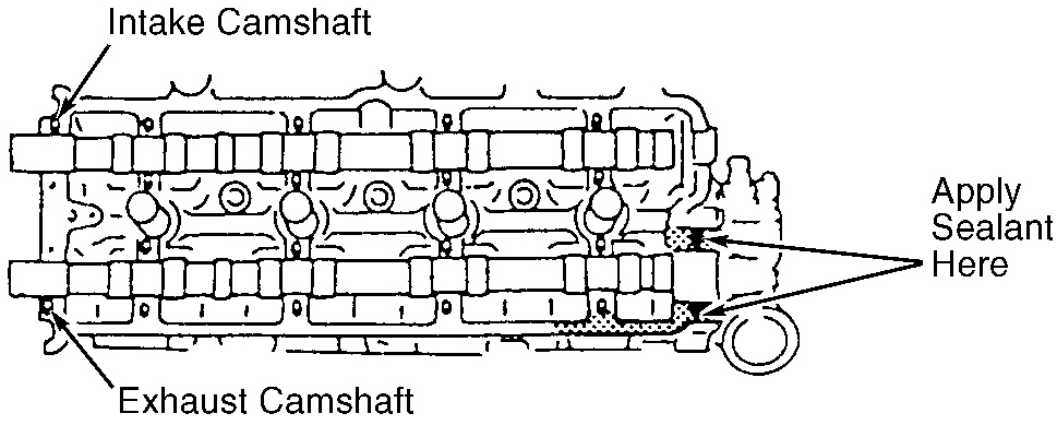

Fig. 8: Exhaust Camshaft Bearing Cap Sealing Surface
Courtesy of SUZUKI OF AMERICA CORP.

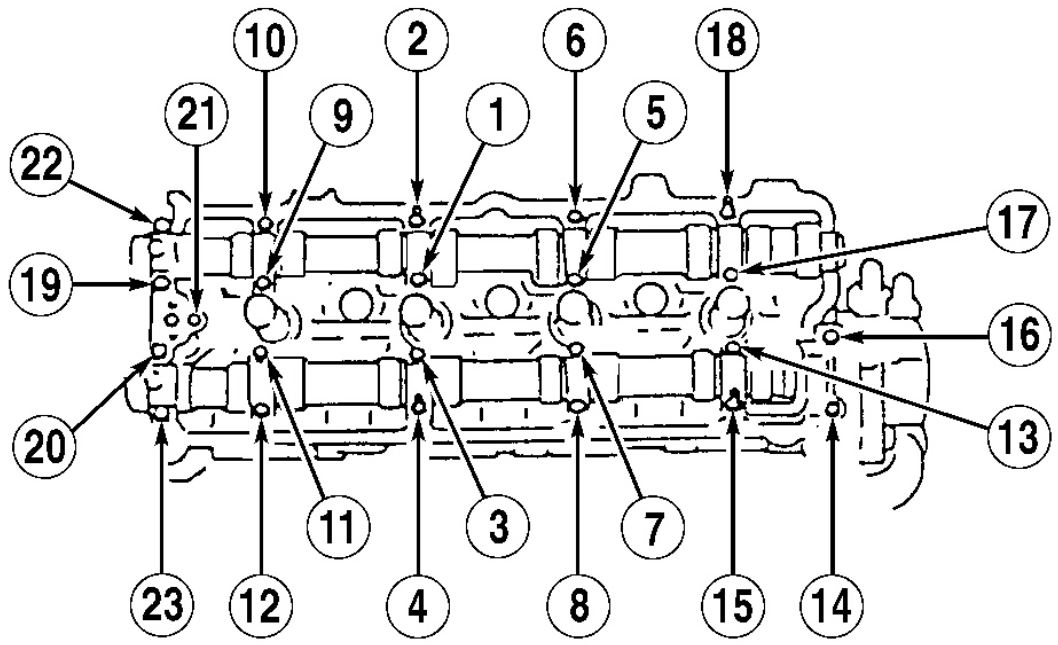

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Fig. 9: Camshaft Bearing Cap Bolt Tightening Sequence
Courtesy of SUZUKI OF AMERICA CORP.

WATER PUMP

Removal

1. Disconnect negative battery cable. Drain cooling system. Remove radiator hose from thermostat housing. Remove heater outlet pipe bolt. Remove drive belts.
2. Remove cooling fan, fan shroud, and fan clutch. Remove water pump pulley. Remove water pump, being careful not to lose dowel when removing pump.

Installation

To install, reverse removal procedure. Ensure all mating surfaces are clean. Use NEW water pump gasket.

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

OIL PAN

Removal

1. Remove oil level gauge (dipstick). Raise and support vehicle. Remove front differential assembly. See **DIFFERENTIALS & REAR AXLE SHAFTS** article in DRIVE AXLES. Remove tie rod, center link, and idler arm.
2. Drain engine oil. Remove oil pan bolts and lower oil pan until it comes in contact with crossmember and oil pump strainer. Using wrench, remove oil pump strainer. Remove oil pan from vehicle.

Installation

Apply sealant to oil pan. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** . To complete installation, reverse removal procedure.

OVERHAUL

CYLINDER HEAD

Disassembly

1. Remove cylinder head. See **CYLINDER HEAD** under REMOVAL & INSTALLATION. Remove manifolds and fuel injectors. Remove water outlet pipe and thermostat housing. Remove camshafts. See **CAMSHAFT & VALVE LASH ADJUSTERS** under REMOVAL & INSTALLATION.
2. Use Valve Spring Compressor (09916-14510) and Valve Lifter Attachment (09916-14910) to compress valve spring. Use tweezers to remove retainer locks. See **Fig. 10** . Remove retainers, springs, 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.

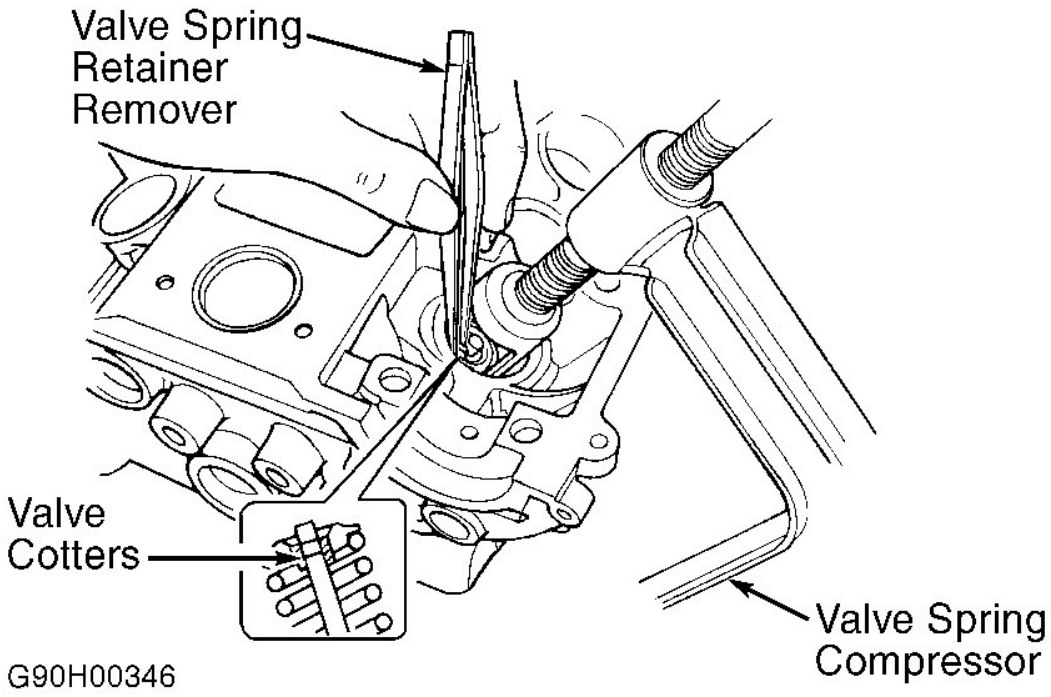


Fig. 10: Removing Valve Retainer Locks
Courtesy of SUZUKI OF AMERICA CORP.

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** under ENGINE SPECIFICATIONS. Replace any weak or out-of-square springs.

Valve Stem Oil Seals

Use Handle (09917-98221) and Valve Stem Seal Installer (09916-58210) to install seal. Place NEW lubricated stem seal on valve stem seal installer. 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** under ENGINE SPECIFICATIONS.
2. Use Valve Guide Remover (09916-44910) to drive out old guide. Ream guide bore in cylinder head with 11-mm Reamer (09916-38210) and Handle (09916-34542). Heat cylinder head to 176-212°F (80-100°C).
3. Using Valve Guide Installer (09917-87810) and Handle (09916-58210), drive in NEW oversized valve guide until valve guide installer contacts cylinder head.

4. Ensure valve guide protrusion is .53" (13.5 mm). Ream guide bore in cylinder head with 6-mm Reamer (09916-37810) and Handle (09916-34542). Clean valve guide bore after reaming.

Valve Seats

1. Inspect valve seats for damage or wear. If valve seat rework is necessary, use cutters to obtain required angles. On exhaust valve seats, first cut should be 15 degrees. Second cut should be 45 degrees to obtain correct seat angle.
2. On intake valve seats, first cut should be 15 degrees. Second cut should be 60 degrees, and third cut should be 45 degrees to obtain correct seat angle. After cutting valve seats to correct angles, lap valve seats.

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. Valve stem end may be resurfaced if not too much material is removed from valve length. Measure valve length. See **VALVES & VALVE SPRINGS** under ENGINE SPECIFICATIONS.

CYLINDER BLOCK ASSEMBLY

Piston & Rod Assembly

1. Remove cylinder head. See **CYLINDER HEAD** under REMOVAL & INSTALLATION. Remove oil pump. See **OIL PUMP** under ENGINE OILING.
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. Remove circlips and push piston pin out by hand.
4. 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. Install circlips and piston pin. Install circlips with opening facing down.

Fitting Pistons

1. Check cylinder bore for damage, wear and taper. See CYLINDER BLOCK under OVERHAUL. See **CYLINDER BLOCK** 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 1.04" (26.5 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. Cylinder bore diameter is determined by mark (Red or Blue) on cylinder block.
4. When installing piston into cylinder, ensure piston numerical mark matches cylinder bore numerical mark to provide correct piston-to-cylinder clearance. See **Fig. 11** .

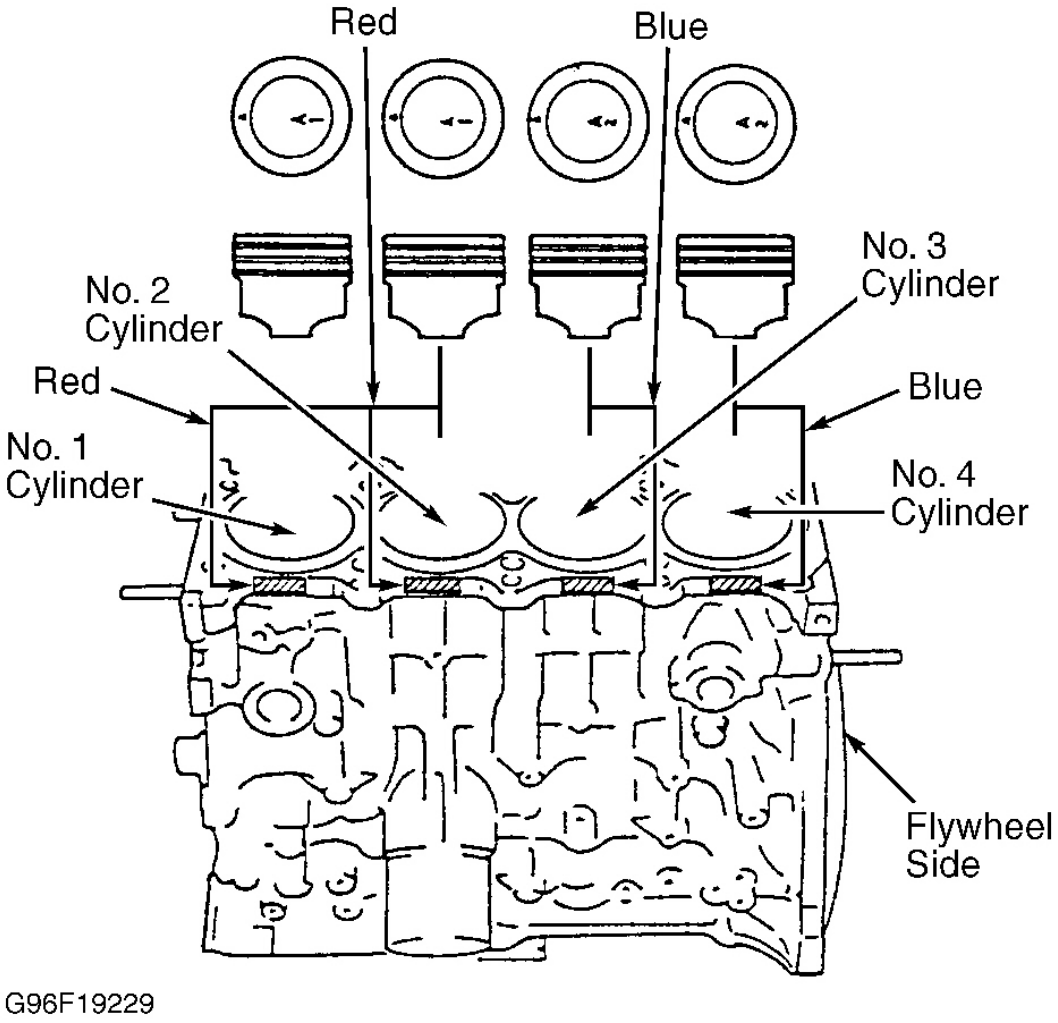


Fig. 11: Matching Pistons To Cylinders
Courtesy of SUZUKI OF AMERICA CORP.

Piston Rings

1. Install rings with "R" or "RN" mark facing upward. Install oil ring spacer first, then rails. Position piston ring gaps 45 degrees apart. Lubricate all internal surfaces with engine oil before installation.
2. Ensure arrow on piston head faces front of engine (crankshaft pulley side). Ensure "77E" mark on connecting rod faces front of engine. See **Fig. 12** . Install cylinder head and oil pump. To complete installation, reverse removal procedure.

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**

under ENGINE SPECIFICATIONS.

2. Inspect bearing shells for signs of fusion, pitting, burning or flaking. Standard bearings are unmarked or colored Green, Black, Yellow or Blue on edge of bearing. Undersized bearing is painted Red on edge of bearing. Undersize bearing thickness is .0632-.0636" (1.605-1.615 mm) at center of bearing.
3. Check bearing clearance using Plastigage. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS** . Standard connecting rod side play is .010-.015" (.25-.40 mm), with a service limit of .0157" (.40 mm).
4. Connecting rod crank pin diameter is determined by letter ("A", "B" or "C") stamped on crank web No. 3. See **Fig. 12** . Connecting rod large end bore diameter is stamped ("1", "2" or "3") on side of connecting rod. See the appropriate connecting rod tables for specific information.

CONNECTING ROD CRANK PIN DIAMETERS

Letters Stamped On Web	In. (mm)
"A"	1.9683-1.9685 (49.994-50.000)
"B"	1.9680-1.9683 (49.988-49.994)
"C"	1.9678-1.9680 (49.982-49.988)

CONNECTING ROD MAIN BEARING CAP BORE DIAMETERS

Number Stamped On Rod	In. (mm)
"1"	2.0866-2.0868 (53.000-53.006)
"2"	2.0868-2.0870 (53.006-53.012)
"3"	2.0870-2.0873 (53.012-53.018)

COLOR CODE FOR STANDARD CONNECTING ROD BEARINGS

Color Painted	Thickness - In. (mm)
Green	.0583-.0585 (1.482-1.485)
Black	.0585-.0586 (1.485-1.488)
No Paint	.0586-.0587 (1.488-1.491)
Yellow	.0587-.0588 (1.491-1.494)
Blue	.0588-.0589 (1.494-1.497)

STANDARD CONNECTING ROD BEARING APPLICATIONS

Letter Stamped On Crank Web No. 3	Numbers Stamped On Connecting Rod	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

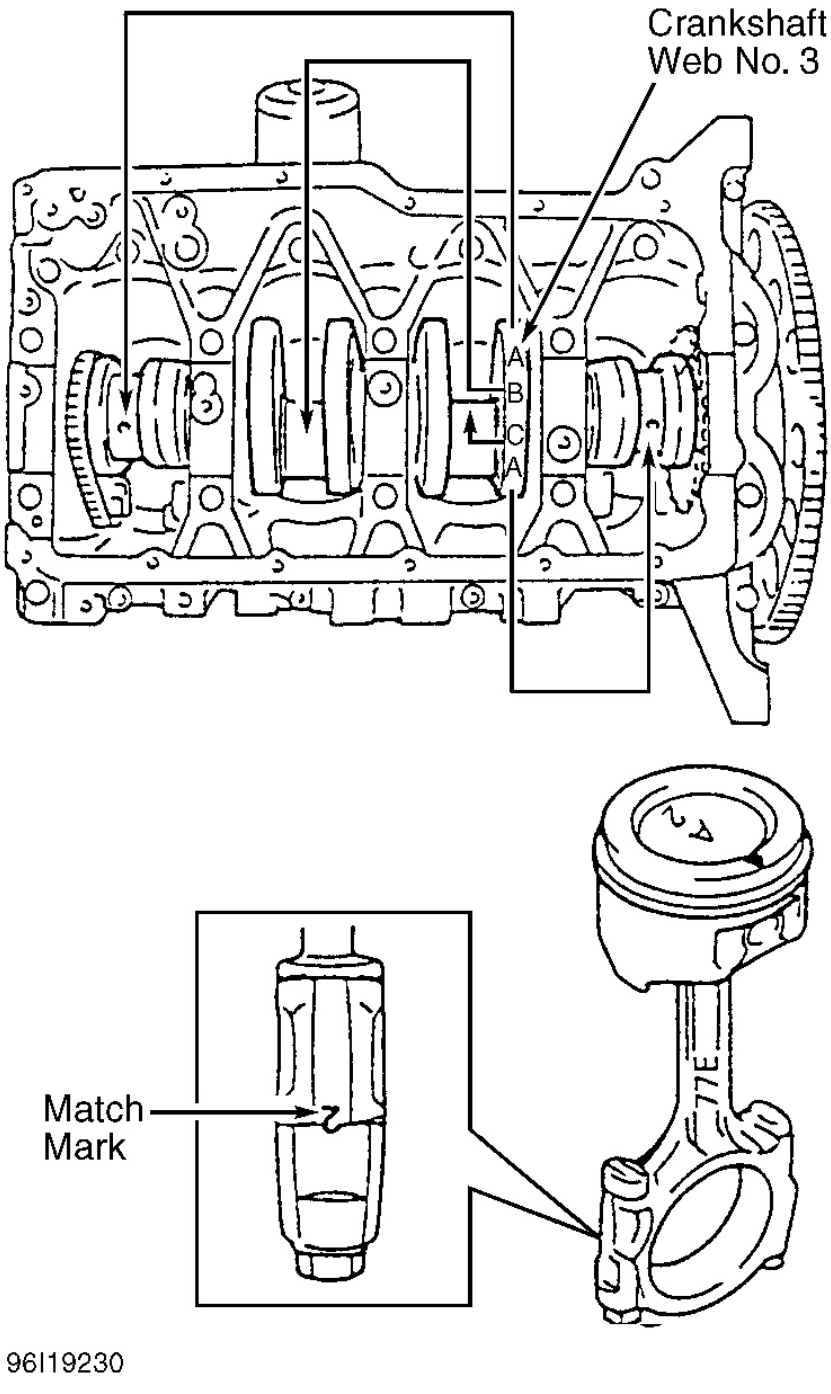


Fig. 12: Locating Connecting Rod Crank Pin Diameter On Crankshaft Web No. 3
Courtesy of SUZUKI OF AMERICA CORP.

Crankshaft & Main Bearings

1. Loosen crankshaft bearing caps in sequence shown. See **Fig. 15** . Inspect journals for wear, taper and out-of-round condition. I f specifications are exceeded, grind journals to undersize or replace crankshaft. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS** under ENGINE SPECIFICATIONS.
2. Standard main bearings are available in 5 different sizes and are color-coded. Upper bearing half has an oil groove. Bearing No. 1 is at crankshaft pulley end of engine. Bearing No. 5 is at flywheel end of engine.
3. Main bearing journal diameter is determined by numerical mark ("1", "2" or "3") stamped on crankshaft web No. 2. See **Fig. 13** . The numerical marks on crankshaft web No. 2, read left to right, indicate journal diameters of bearings No. 1, 2, 3, 4 and 5, respectively. See **CRANKSHAFT MAIN BEARING JOURNAL DIAMETERS** .
4. Determine bearing cap bore diameter with bearing removed. Bearing cap bore diameter is determined by letter ("A", "B" or "C"). See **Fig. 14** . See appropriate **MAIN BEARING CAP BORE DIAMETER** .
5. The letters stamped on cylinder block, 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 **COLOR CODE FOR STANDARD MAIN BEARINGS** .
6. Use numerical marks on crankshaft webs and letters stamped on cylinder block mating surface to determine correct replacement bearing. See **STANDARD MAIN BEARING APPLICATIONS** . Tighten crankshaft bearing caps to specification and in sequence shown. See **Fig. 16** .

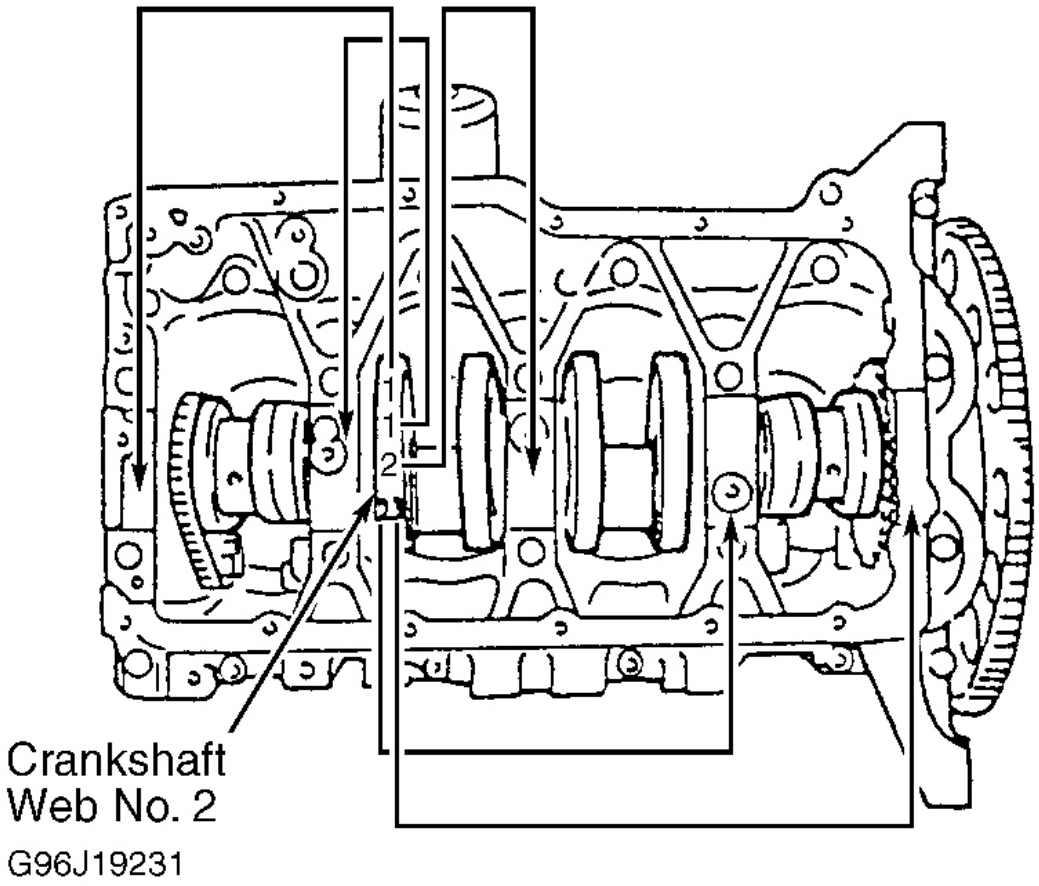


Fig. 13: Locating Main Bearing Journal Diameter On Crankshaft Web No. 2
Courtesy of SUZUKI OF AMERICA CORP.

CRANKSHAFT MAIN BEARING JOURNAL DIAMETERS

Numbers Stamped On Web No. 2	In. (mm)
"1"	2.2832-2.2835 (57.994-58.000)
"2"	2.2830-2.2832 (57.988-57.994)
"3"	2.2828-2.2830 (57.982-57.988)

MAIN BEARING CAP BORE DIAMETERS

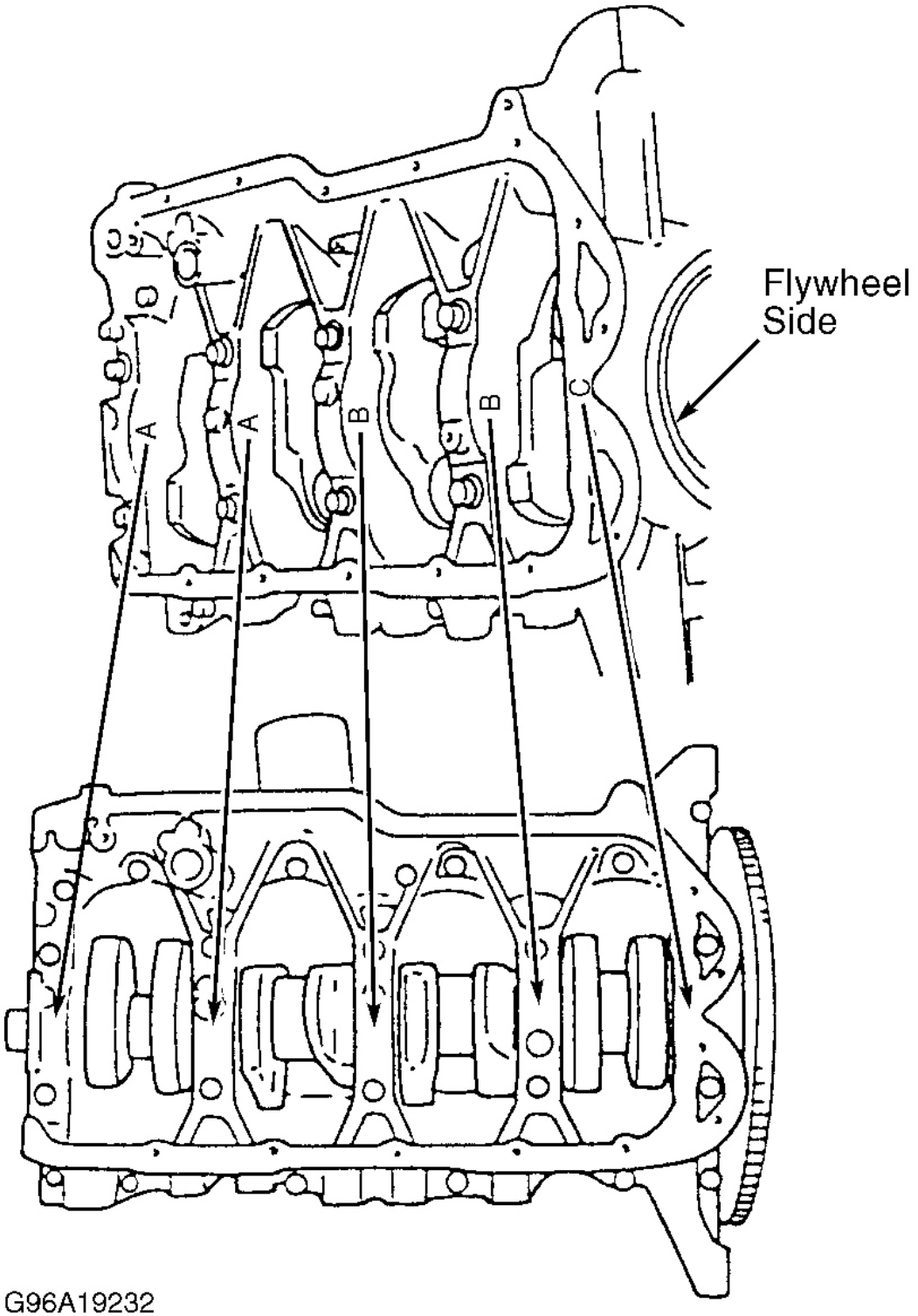
Letters Stamped On Block	In. (mm)
"A"	2.4409-2.4412 (62.000-62.006)
"B"	2.4412-2.4414 (62.006-62.012)
"C"	2.4414-2.4416 (62.012-62.018)

COLOR CODE FOR STANDARD MAIN BEARINGS

Color Painted	Thickness - In. (mm)
Green	.0785-.0786 (1.993-1.997)
Black	.0786-.0787 (1.997-2.000)
No Paint	.0787-.0788 (2.000-2.003)
Yellow	.0788-.0789 (2.003-2.006)
Blue	.0789-.0791 (2.006-2.009)

STANDARD MAIN BEARING APPLICATIONS

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



G96A19232

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

Undersize Bearings

1. Bearings are available in .010" (.25 mm) undersize. Undersize bearing thickness is .0836-.0838" (2.124-2.128 mm) at center of bearing.
2. On .010" (.25 mm) undersize crankshaft, ensure journal finished diameter is 2.2716-2.2734" (57.698-57.744 mm). Use Plastigage to ensure correct clearance of installed undersize bearing.

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** under ENGINE SPECIFICATIONS.

Cylinder Block

Inspect block for distortion of deck surface. Inspect block for cracks, scratches and other defects. Measure bores at 2 levels for wear, taper and out-of-round condition. If bore wear, taper or out-of-round exceed specification, rebore cylinders. See **CYLINDER BLOCK** under ENGINE SPECIFICATIONS.

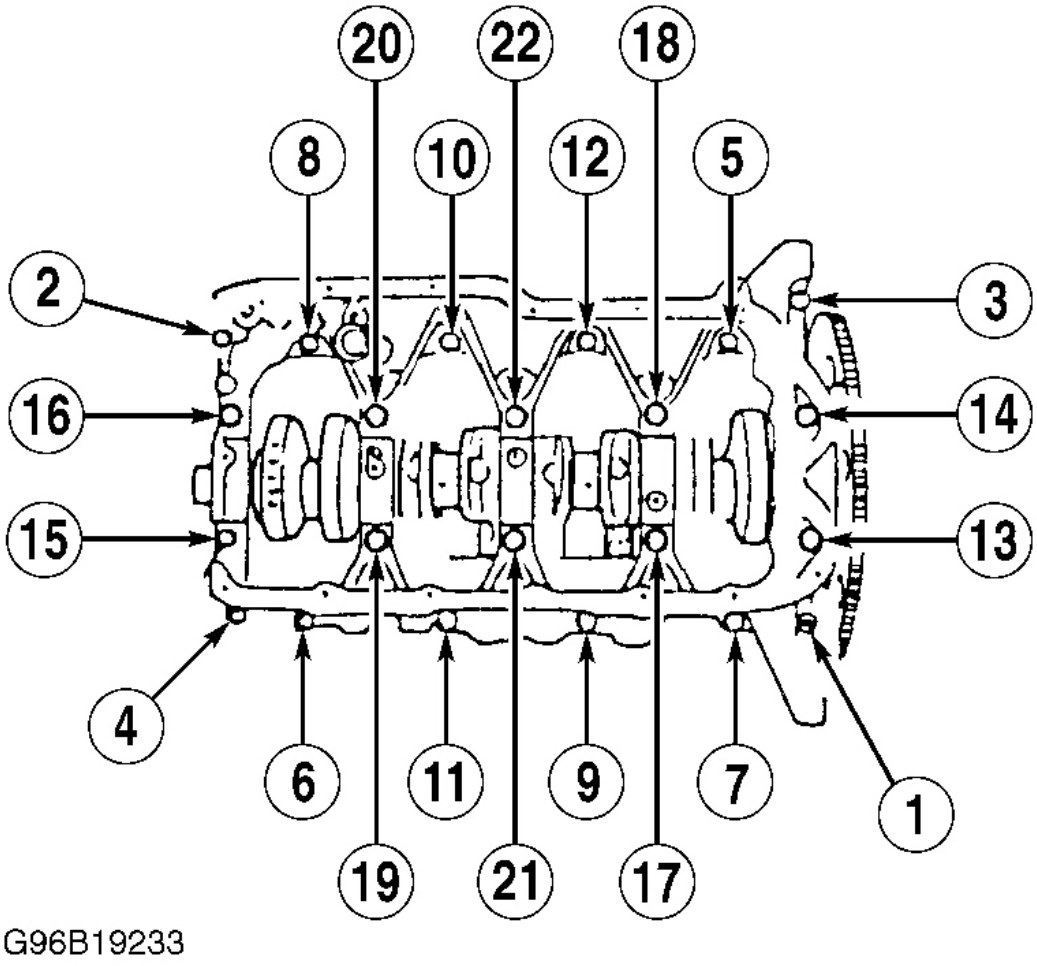


Fig. 15: Loosening Crankshaft Bearing Bolts
Courtesy of SUZUKI OF AMERICA CORP.

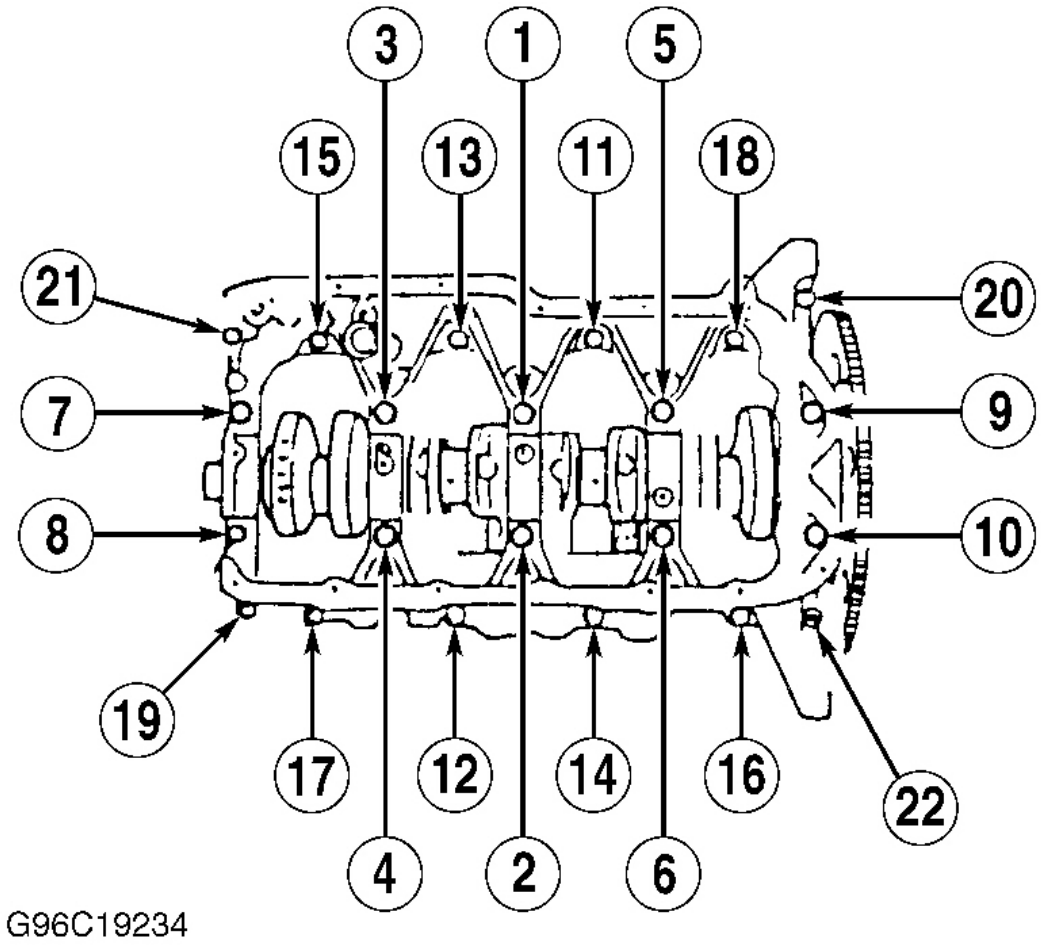


Fig. 16: Tightening Crankshaft Bearing Bolts
Courtesy of SUZUKI OF AMERICA CORP.

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. Oil is drawn up through the oil strainer, passed through pump, and then the oil filter. The filtered oil flows through 2 passages in cylinder block.

Crankcase Capacity

Total oil capacity, including filter, is 5.4 qts. (5.2L). Check dipstick to verify oil level is correct.

Oil Pressure

Normal oil pressure is 55.5-66.8 psi (3.9-4.7 kg/cm^2) at 4000 RPM.

OIL PUMP

Removal & Disassembly

1. Disconnect negative battery cable. Remove oil pan and oil strainer. See **OIL PAN** under REMOVAL & INSTALLATION. Remove oil pump sprocket cover. DO NOT remove oil pump sprocket as oil pump may be damaged.
2. Remove oil pump assembly. Mark oil pump for reassembly reference. Remove bolts, inner and outer oil pump gears. Remove plug, relief spring and relief valve.

Inspection

1. Inspect oil pump housing for cracks or damage. 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. If clearance exceeds specification, replace outer gear rotor or case. See **OIL PUMP SPECIFICATIONS** .

OIL PUMP SPECIFICATIONS

Clearance	In. (mm)
Radial	.006 (.15)
Side	.004 (.11)

Reassembly & Installation

1. Ensure gears are assembled in same direction as originally installed. Apply thin coat of engine oil to inner and outer gear rotors, and inside surfaces of oil pump case. Install inner and outer gear rotors.
2. Ensure gears turn freely by hand after pump is assembled. Install oil pump and tighten bolts to specification. See **TORQUE SPECIFICATIONS** . To complete installation, reverse removal procedure.

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

Application	(1) Specification
Displacement	109.8 Cu. In. (1.8L)
Compression Pressure (2)	
Standard	199 psi (14 kg/cm^2)
Minimum Limit	171 psi (12 kg/cm^2)
Maximum Variation	14.2 psi (1.0 kg/cm^2)
Fuel System	SFI

(1) Additional information is not available.

(2) Checked at 250 RPM or higher.

CONNECTING RODS

CONNECTING RODS

Application	In. (mm)
Pin Bore	.8269-.8272 (21.003-21.011)
Maximum Bend	.002 (.05)
Maximum Twist	.004 (.10)
Side Play	
Standard	.010-.016 (.25-.40)
Service Limit	.016 (.40)

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS

Application	In. (mm)
Crankshaft	
End Play	
Standard	.004-.014 (.10-.35)
Service Limit	.017 (.42)
Runout	.002 (.06)
Main Bearings	
Journal Diameter (1)	
"1"	2.2832-2.2834 (57.994-58.000)
"2"	2.2830-2.2832 (57.988-57.994)
"3"	2.2828-2.2830 (57.982-57.988)
Journal Out-Of-Round	.0004 (.010)
Journal Taper	.0004 (.010)
Oil Clearance	
Standard	.0010-.0018 (.026-.046)
Service Limit	.0024 (.060)
Main Bearing Cap Bore Diameter (2)	
"A"	2.4409-2.4412 (62.000-62.006)
"B"	2.4412-2.4414 (62.006-62.012)

"C"	2.4414-2.4416 (62.012-62.018)
Connecting Rod Bearings	
Standard Journal Diameter (3)	
"A"	1.9683-1.9685 (49.994-50.000)
"B"	1.9680-1.9683 (49.988-49.994)
"C"	1.9678-1.9680 (49.982-49.988)
Undersize Journal Diameter	
.25 mm	1.9580-1.9586 (49.732-49.750)
Journal Out-Of-Round	.0004 (.010)
Journal Taper	.0004 (.010)
Oil Clearance	
Standard	.0018-.0025 (.045-.063)
Service Limit	.0031 (.080)

(1) Main bearing journal diameter is determined by numerical mark ("1", "2" or "3") stamped on crankshaft web No. 2. See **Fig. 13** .

(2) Main bearing cap bore diameter is determined by letter ("A", "B" or "C") stamped on cylinder block. See **Fig. 14** .

(3) Connecting rod bearing journal diameter is determined by letter stamped on crankshaft web No. 3. See **Fig. 12** .

PISTONS, PINS & RINGS

PISTONS, PINS & RINGS

Application	**In. (mm)**
Pistons	
Clearance	.0008-.0016 (.020-.040)
Standard Diameter (1)	
"1"	3.3063-3.3067 (83.980-83.990)
"2"	3.3059-3.3063 (83.970-83.980)
Oversize Diameter	
.010" (.25 mm)	3.3157-3.3165 (84.220-84.240)
.020" (.50 mm)	3.3256-3.3264 (84.470-84.490)
Pins	
Diameter	.8267-.8268 (20.997-21.000)
Piston Fit	Slip
Rod Fit	.0001-.0005 (.003-.014)
Rings	

No. 1	
End Gap	
Standard	.0079-.0138 (.20-.35)
Service Limit	.0276 (.70)
Side Clearance	.0012-.0028 (.030-.070)
No. 2	
End Gap	
Standard	.0138-.0196 (.35-.50)
Service Limit	.0276 (.70)
Side Clearance	.0008-.0024 (.02-.06)
No. 3 (Oil)	
End Gap	
Standard	.0079-.0276 (.20-.70)
Service Limit	.0709 (1.8)
Side Clearance	.0024-.0059 (.06-.15)
(1) Piston diameter is determined by numerical mark ("1" or "2") stamped on top of piston.	

VALVES & VALVE SPRINGS

VALVES & VALVE SPRINGS

Application	Specification
Intake Valves	
Seat Angle	45°
Valve Head Thickness	
Standard	.040" (1.0 mm)
Service Limit	.024" (.6 mm)
Stem Diameter	.2348-.2354" (5.965-5.980 mm)
Exhaust Valves	
Seat Angle	45°
Valve Head Thickness	
Standard	.047" (1.2 mm)
Service Limit	.028" (.7 mm)
Stem Diameter	.2339-.2344" (5.940-5.955 mm)
Valve Springs	
Free Length	
Standard	1.6791" (42.65 mm)
Service Limit	1.6339" (41.50 mm)
Out-Of-Square	.079" (2.0 mm)
Valve Spring Preload: Lbs. @ In. (kg @ mm)	
Standard	49.2-56.7 @ 1.28 (22.3-25.7 @ 32.6)

Service Limit	46.7 @ 1.28 (21.2 @ 32.6)

CYLINDER BLOCK

CYLINDER BLOCK

Application	In. (mm)
Cylinder Bore	
Standard Diameter (1)	
Red	3.3075-3.3079 (84.010-84.020)
Blue	3.3071-3.3075 (84.000-84.010)
Maximum Taper	.004 (.10)
Maximum Out-Of-Round	.004 (.10)
Maximum Deck Warpage	.002 (.05)
(1) Cylinder bore diameter is determined by color mark (Red or Blue) on cylinder block. See **Fig. 11** .	

CYLINDER HEAD

CYLINDER HEAD

Application	Specification
Maximum Warpage	
Head-To-Block	.002" (.05 mm)
Manifold-To-Head	.004" (.10 mm)
Valve Seats	
Seat Angle	45°
Seat Width	.0433-.0512" (1.1-1.3 mm)
Valve Guides	
Intake Valve	
Valve Guide I.D.	.2362-.2367" (6.000-6.012 mm)
Valve Guide Installed Height	.53" (13.5 mm)
Valve Stem-To-Guide Oil Clearance	
Standard	.0008-.0019" (.020-.047 mm)
Service Limit	.0028" (.07 mm)
Exhaust Valve	
Valve Guide I.D.	.2362-.2367" (6.000-6.012 mm)
Valve Guide Installed Height	.53" (13.5 mm)
Valve Stem-To-Guide Oil Clearance	
Standard	.0018-.0028" (.045-.072 mm)
Service Limit	.0035" (.09 mm)

CAMSHAFT

CAMSHAFT

Application	In. (mm)
Bore Diameter	1.0236-1.0249 (26.000-26.033)
Journal Diameter	1.0220-1.0228 (25.959-25.980)
Journal Runout	.004 (.10)
Lobe Height	
Intake	
Standard	1.5917-1.5979 (40.428-40.588)
Service Limit	1.5838 (40.228)
Exhaust	
Standard	1.5717-1.5780 (39.922-40.082)
Service Limit	1.5639 (39.722)
Oil Clearance	
Standard	.0008-.0029 (.020-.074)
Service Limit	.0047 (.12)

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
A/C Compressor Bracket Bolts	41 (55)
Camshaft Sprocket Bolts	44 (60)
Connecting Rod Cap Nut	32 (44)
Crankshaft Main Bearing Cap Bolts	
8-mm Bolt	18 (25)
10-mm Bolt	44 (60)
Crankshaft Pulley Bolt	111 (150)
Cylinder Head Bolt	(1) 77 (105)
Engine Side Mounting Bracket Bolts	37 (50)
Engine-To-Transmission Bolts	59 (80)
Exhaust Manifold Bolt	17 (23)
Exhaust Manifold Stiffener	(2) 37 (50)
Exhaust Pipe	37 (50)
Flex Plate/Flywheel Bolts	52 (70)
Generator Belt Idler Pulley Bolt	33 (45)
Generator Belt Tensioner Bolts	18 (25)
Intake Manifold Bolt	17 (23)
Intake Manifold Stiffener	(2) 37 (50)
Lower Crankcase-To-Cylinder Block Bolt	

8-mm Bolt	20 (27)
10-mm Bolt	42 (58)
Oil Pan Drain Plug	26 (35)
Oil Pump Mounting Bolts	15 (21)
Oil Pump Relief Valve Plug	21 (29)
Strut Tower Bar	66 (90)
Timing Chain (1st) Tensioner	18 (25)
Timing Chain Tensioner Adjuster Bolt	(3) 32 (44)
Torque Converter Bolts	47 (64)
Transmission Stiffener Bolts	37 (50)
	INCH Lbs. (N.m)
Camshaft Bearing Cap Bolts	97 (11)
Oil Pan Bolts	97 (11)
Oil Pump Bolts	106 (12)
Oil Pump Sprocket Cover Bolts	97 (11)
Oil Strainer Bolts	97 (11)
Timing Chain Cover Bolts	97 (11)
Timing Chain Guide	97 (11)
Throttle Body Bolts	115 (13)
Valve Cover Nuts	97 (11)

(1) Follow tightening procedure listed under CYLINDER HEAD installation. See **Fig. 4** and **Fig. 5** . Tighten 6-mm bolt to 97 INCH lbs. (11 N.m).

(2) Tighten smaller bolts to 18 ft. lbs. (25 N.m).

(3) Tighten smaller bolts to 97 INCH lbs. (11 N.m).

