

3.2L V6

Article Text

1996 Isuzu Rodeo

For 1 1 1 1

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Wednesday, May 18, 2005 12:05AM

ARTICLE BEGINNING

1995-96 ENGINES

Isuzu - 3.2L V6

Honda; Passport

Isuzu; Rodeo

*** PLEASE READ THIS FIRST ***

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

ENGINE IDENTIFICATION

Engine may be identified by using Vehicle Identification
Number (VIN) stamped on a metal pad located near lower left corner of
windshield. The eighth character identifies engine model.

Engine identification number, located on left side of
cylinder block above starter, may be required when ordering
replacement parts (if needed).

ENGINE IDENTIFICATION CODES TABLE

Engine	Code
3.2L SOHC (1995-96)	V
3.2L DOHC (1995)	W

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

Valve adjustment is not required. Both engines use hydraulic
valve lifters. On SOHC, lifter is installed into rocker arm. On DOHC,
lifter is installed in cylinder head.

ACCELERATOR CABLE

Loosen adjusting nut, and screw cap (1995) or lock nut
(1996). Pull outer cable while holding throttle valve closed.
Temporarily tighten adjusting nut, and screw cap or lock nut. Loosen
adjusting nut 3 turns and tighten screw cap or lock nut. Ensure valve

lever returns to stopper screw.

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.

FUEL PRESSURE RELEASE

Turn ignition off. Remove fuel filler cap. Remove fuel pump relay (15-amp) on Trooper and SLX, or (20-amp) on Rodeo and Passport, from underhood relay center. Start engine and allow it to stall. After engine stalls, crank engine for an additional 5 seconds. Disconnect negative battery cable. Remove fuel filler cap. Reinstall fuel pump relay.

ENGINE

Removal

1) Release fuel pressure. See FUEL PRESSURE RELEASE. Disconnect battery cables. Mark hood and hood hinge for reassembly reference. Remove hood from vehicle.

2) Drain engine coolant. Disconnect throttle cable from throttle valve and upper intake manifold. Disconnect air intake duct from throttle valve. Remove air cleaner assembly. Disconnect canister vacuum hose. Disconnect brake booster vacuum hose.

3) Disconnect engine and starter harness connectors. Disconnect 2 battery ground cables. Disconnect bonding cable connector from left side of dash panel. Disconnect bonding cable terminal from back of left bank cylinder head.

4) Remove engine coolant hoses. Remove lower fan shroud and radiator. Remove power steering belt. Remove 2 bolts from power steering pump bracket. Without disconnecting power steering pump hoses, position pump and bracket aside.

5) Remove A/C compressor belt, if equipped. Remove 2 bolts attaching A/C compressor to engine. Without disconnecting A/C compressor lines, position A/C compressor aside. Remove heater hoses from engine.

6) Remove transmission cooler lines from right-side engine mount. Remove transmission assembly. See procedures in the TRANSMISSION REMOVAL & INSTALLATION - A/T article or procedures in TRANSMISSION REMOVAL & INSTALLATION - M/T article. Support engine and remove mount-to-chassis bolts for both engine mounts. Remove engine assembly.

Installation

To install, reverse removal procedure. Tighten all bolts and nuts to specification. See TORQUE SPECIFICATIONS. Adjust all control cables. Replenish fluid levels.

UPPER INTAKE MANIFOLD

Removal

1) Disconnect negative battery cable. Remove air cleaner assembly. Disconnect throttle cable from throttle valve and upper intake manifold. Disconnect necessary vacuum hoses and lines from upper intake manifold.

2) Disconnect necessary electrical connectors from sensors and valves. Remove Direct Ignition System (DIS) assembly with bracket and spark plug wires. Remove throttle body assembly. On DOHC, remove common chamber duct. See Fig. 1.

3) On both engines, remove EGR valve assembly. Remove 6 upper intake manifold retaining bolts and 2 nuts. Remove upper intake manifold.

Installation

To install, reverse removal procedure. Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS. Adjust accelerator cable. See Fig. 2. Loosen adjusting nut, and screw cap (1995) or lock nut (1996). Pull outer cable while holding throttle valve closed. Temporarily tighten adjusting nut, and screw cap or lock nut. Loosen adjusting nut 3 turns and tighten screw cap or lock nut. Ensure valve lever returns to stopper screw.

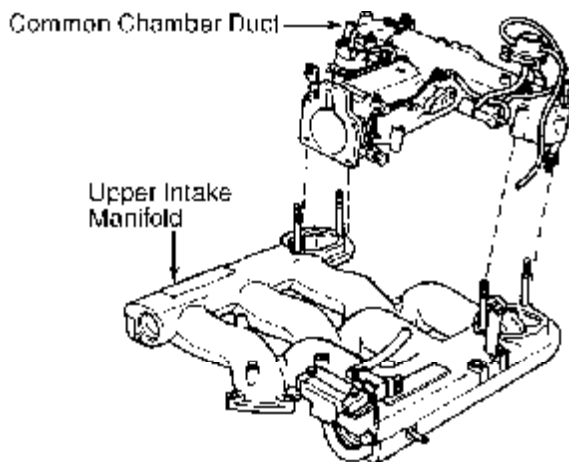
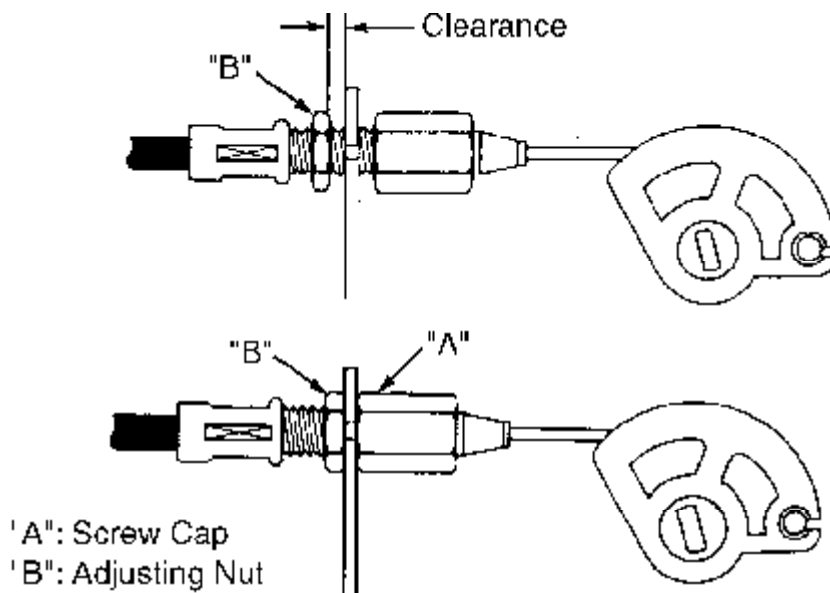


Fig. 1: Removing Common Chamber Duct (DOHC)

Courtesy of Isuzu Motor Co.



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Fig. 2: Adjusting Accelerator Cable (1995; 1996 Similar)
Courtesy of Isuzu Motor Co.

LOWER INTAKE MANIFOLD

Removal

- 1) Release fuel pressure. See FUEL PRESSURE RELEASE. Disconnect negative battery cable. Remove air cleaner assembly. Remove upper intake manifold. See UPPER INTAKE MANIFOLD.
- 2) Remove fuel line bracket from valve cover. Disconnect fuel inlet and return hoses from fuel pipes. Disconnect electrical connectors at thermo sensor and fuel injectors. Remove lower intake manifold nuts and bolts. Remove lower intake manifold.

Installation

- 1) To install, reverse removal procedure. Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS. Adjust accelerator cable. See Fig. 2.
- 2) Loosen adjusting nut, and screw cap (1995) or lock nut (1996). Pull outer cable while holding throttle valve closed. Temporarily tighten adjusting nut, and screw cap or lock nut. Loosen adjusting nut 3 turns and tighten screw cap or lock nut. Ensure valve lever returns to stopper screw.

EXHAUST MANIFOLD

Removal & Installation

Disconnect negative battery cable. On left side manifold, remove V-belt pulley and gasket from exhaust manifold. On both

manifolds, remove front exhaust pipe. Remove exhaust manifold heat shield. Remove exhaust manifolds from engine. To install, reverse removal procedure. Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS.

CYLINDER HEAD COVERS

Removal & Installation (DOHC)

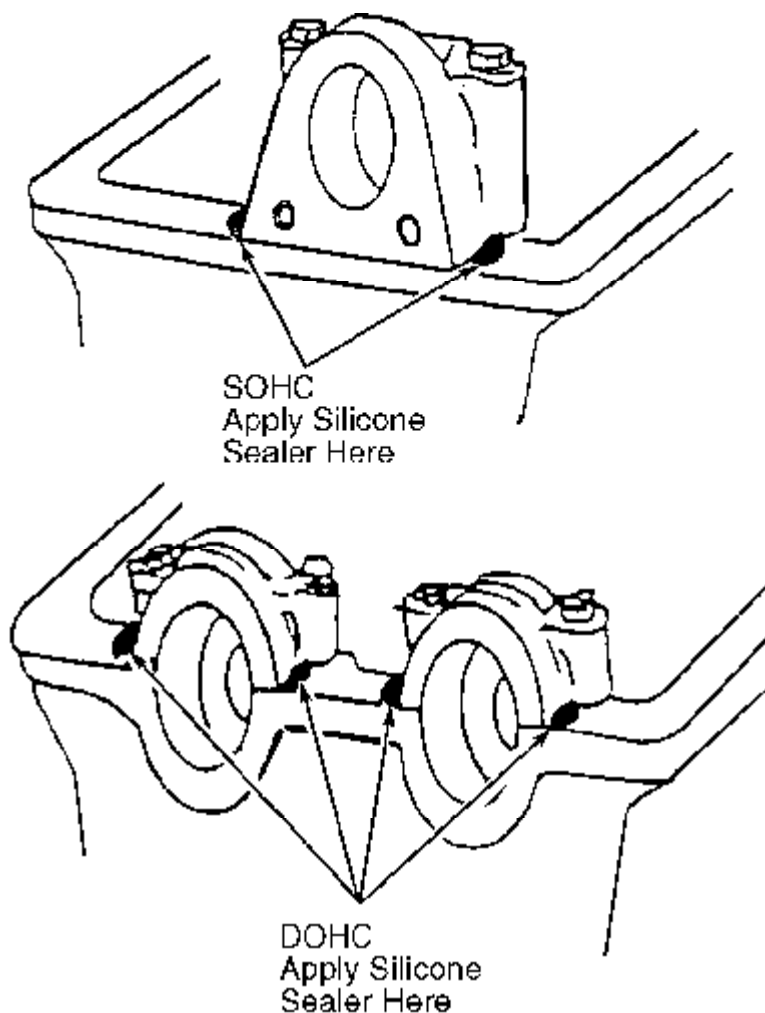
Release fuel pressure. See FUEL PRESSURE RELEASE. Disconnect negative battery cable. Remove plug wires at spark plugs. Remove upper intake manifold. See UPPER INTAKE MANIFOLD. Disconnect fuel supply and return hoses from fuel rail. Remove bolts and cylinder head cover(s). To install, apply RTV sealant to corners of end camshaft bearing towers. See Fig. 3. To complete installation, reverse removal procedure.

Removal & Installation (SOHC Right Side)

- 1) Release fuel pressure. See FUEL PRESSURE RELEASE. Disconnect negative battery cable. Remove plug wires at spark plugs.
- 2) Remove upper intake manifold. See UPPER INTAKE MANIFOLD. Remove vent hose from cylinder head cover. Remove fuel hose assembly retaining bolts. Disconnect fuel supply and return hoses.
- 3) Remove right-side exhaust manifold heat shield. Remove engine hanger from cylinder head and exhaust manifold. Remove heater pipe from bracket. Remove bolts and cylinder head cover.
- 4) To install, clean sealing surfaces. Apply RTV sealant to corners of end camshaft towers and install NEW gasket. See Fig. 3. To complete installation, reverse removal procedure. Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS.

Removal & Installation (SOHC Left Side)

- 1) Remove plug wires at spark plugs. Disconnect PCV hose from intake manifold and vacuum hose from throttle body. Detach wiring harness from cylinder head cover. Remove EGR pipe and valve. Remove bolts and cylinder head cover.
- 2) To install, clean sealing surfaces. Apply RTV sealant to corners of end camshaft towers and install NEW gasket. See Fig. 3. To complete installation, reverse removal procedure. Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS.



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Fig. 3: Applying Sealant To Camshaft Towers
Courtesy of Isuzu Motor Co.

CYLINDER HEAD

Removal

1) Release fuel pressure. See FUEL PRESSURE RELEASE.
Disconnect battery cables. Mark hood and hood hinge for reassembly reference. Remove hood from vehicle.

2) Drain engine coolant. Remove air cleaner assembly. Remove upper fan shroud and upper radiator hose. Remove radiator cooling fan and fan motor. Remove upper and lower intake manifolds. See UPPER INTAKE MANIFOLD and LOWER INTAKE MANIFOLD.

3) Disconnect coolant manifold from rear of cylinder heads. Remove thermostat housing. Remove all accessory drive belts. Remove power steering pump and cooling fan pulley assembly.

4) Using Puller (J-8614-01), remove crankshaft pulley bolt and pulley. Remove oil cooler hose from timing cover. Remove timing

belt. See TIMING BELT. Remove cylinder head covers. See procedures under CYLINDER HEAD COVERS. Remove power steering bracket. Disconnect front exhaust pipes from both exhaust manifolds. Remove cylinder head bolts. Remove cylinder heads and gasket.

Inspection

1) Inspect cylinder head for warpage at cylinder block and manifold areas. Resurface cylinder head if warpage exists on head or manifold surfaces. Replace cylinder head if warpage exceeds specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS. Inspect cylinder head for cracks, especially in area between valve seats and inside exhaust ports. Check head surface for corrosion and porosity.

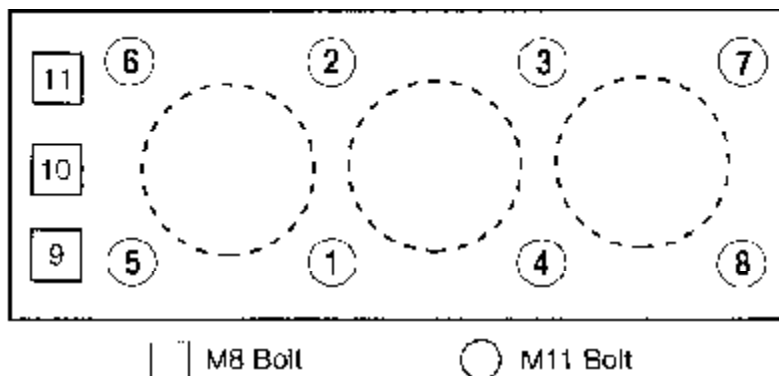
CAUTION: DO NOT weld cylinder head to repair. Replace cylinder head.

2) Ensure cylinder head height is within specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS. Inspect cylinder block deck surface warpage. Resurface cylinder block if warpage exists. Replace cylinder block if warpage exceeds specification. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS.

Installation

1) To install, reverse removal procedure. Clean all gasket surfaces. DO NOT clean head using motorized wire brush. Tighten NEW cylinder head bolts in sequence. See Fig. 4. Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS.

2) Before installing cylinder head cover, apply silicone sealant to corners of end camshaft towers and install NEW gasket. See Fig. 3. Adjust accelerator cable. See Fig. 2. See ACCELERATOR CABLE under ADJUSTMENTS.



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Fig. 4: Cylinder Head Bolt Tightening Sequence
Courtesy Of Isuzu Motor Co.

CRANKSHAFT FRONT SEAL

Removal

Disconnect negative battery cable. Remove timing belt. See TIMING BELT. Remove crankshaft timing sprocket. Using inside puller, remove crankshaft front seal.

CAUTION: DO NOT damage oil pump and crankshaft sealing surfaces when removing seal.

Installation

To install, reverse removal procedure. Lubricate oil seal lip with engine oil. Install seal using seal driver.

TIMING BELT

Removal

1) Disconnect negative battery cable. Remove air cleaner assembly. Remove upper fan shroud. Remove cooling fan assembly. Remove all accessory drive belts.

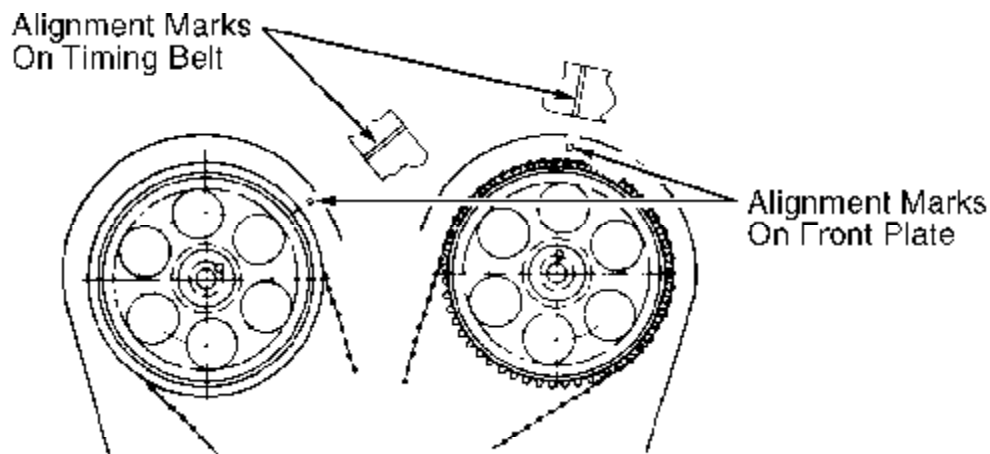
2) Remove fan pulley assembly. Using Puller (J-8614-01), remove crankshaft pulley bolt and pulley. Remove oil cooler hose from timing cover. Remove timing belt cover. Align all timing marks prior to belt removal. See Figs. 5, 6 and 7. Mark timing belt direction of rotation if reusing belt. Remove belt tensioner pusher and timing belt.

Installation

1) Ensuring all timing marks are aligned. Install belt over one pulley at a time, starting at crankshaft sprocket and working counterclockwise. Belt should go over tensioner last. Secure belt at each pulley during installation with pinch clips. See Fig. 8.

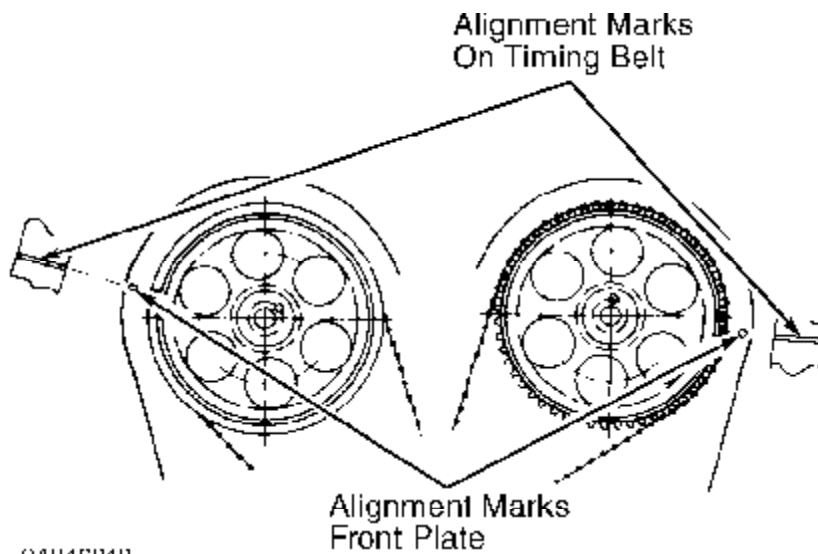
CAUTION: If reusing original belt, ensure direction of rotation marks are pointing in proper direction.

2) Compress timing belt tensioner pusher and insert pin to retain pusher. Apply pressure to tensioner against belt and install tensioner pusher. Tighten bolts to specification. See TORQUE SPECIFICATIONS.



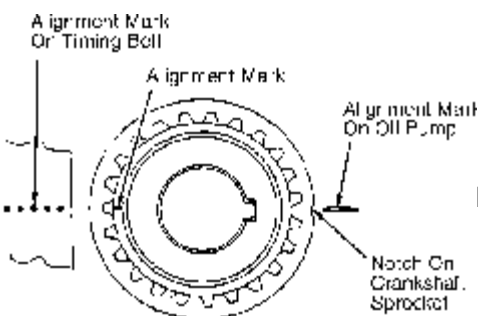
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Fig. 5: Aligning Camshaft Timing Marks (DOHC)
Courtesy of Isuzu Motor Co.



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Fig. 6: Aligning Camshaft Timing Marks (SOHC)
Courtesy of Isuzu Motor Co.



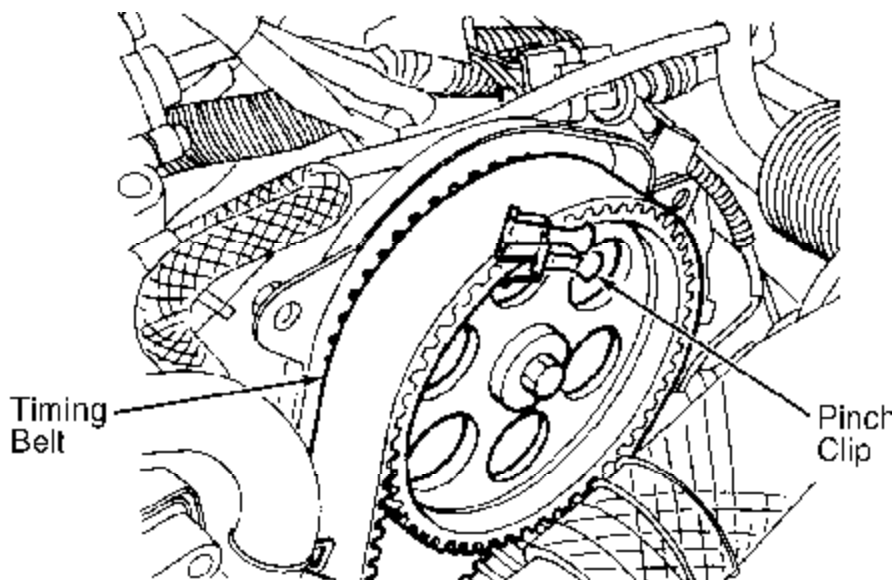
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Fig. 7: Aligning Crankshaft Timing Marks (All Models)
Courtesy of Isuzu Motor Co.

3) Loosen tensioner pulley bolt. Apply pressure on belt by rotating tensioner. Tighten tensioner pulley bolt to specification. Remove pin from timing belt tensioner pusher.

4) Remove pinch clips from timing belt, (if used). Install crankshaft pulley, tightening center bolt finger tight. Rotate crankshaft 2 turns clockwise to remove belt slack. Tighten tensioner pulley bolt to specification. See TORQUE SPECIFICATIONS.

5) Remove crankshaft pulley and install timing belt cover. To complete installation, reverse removal procedure. Tighten nuts and bolts to specification. See TORQUE SPECIFICATIONS.



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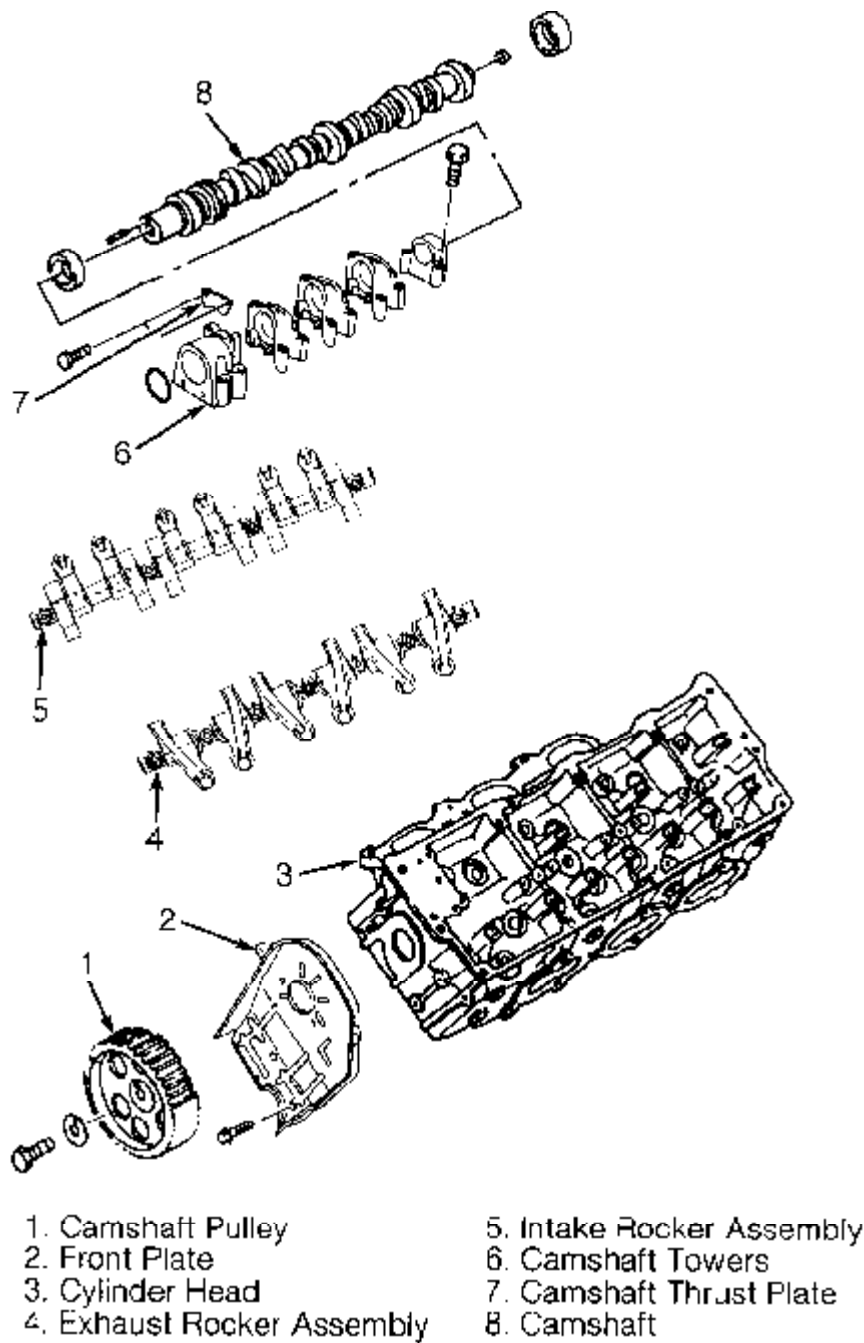
Fig. 8: Installing Pinch Clip On Timing Belt
Courtesy of Isuzu Motor Co.

CAMSHAFT

Removal

1) Release fuel pressure. See FUEL PRESSURE RELEASE. Disconnect negative battery cable. Remove fan shrouds and cooling fan assembly. Remove upper intake manifold. See UPPER INTAKE MANIFOLD.

2) Remove cylinder head covers. See CYLINDER HEAD COVERS. Remove timing belt. See TIMING BELT. Remove camshaft pulley bolt and pulley. Remove front plate bolts and front plate. On DOHC, remove camshaft timing chain sprockets and tensioners. On all engines, mark valve train components for reassembly reference. Remove camshaft towers and camshaft. See Fig. 9.



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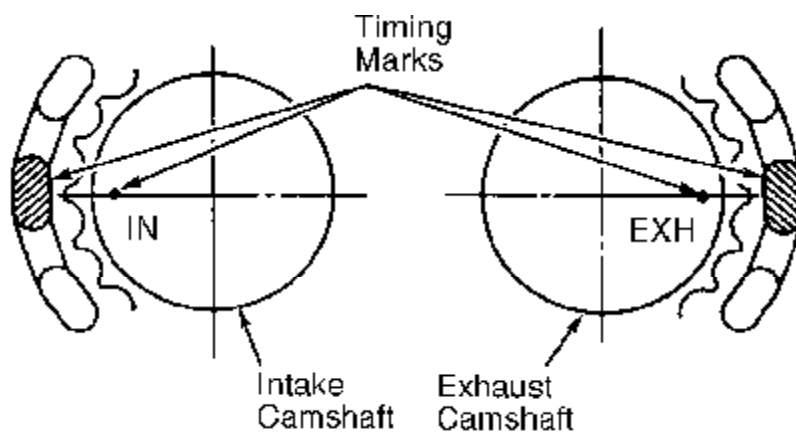
Fig. 9: Exploded View Of Cylinder Head Components (SOHC; DOHC Is Similar)

Courtesy of Isuzu Motor Co.

Installation

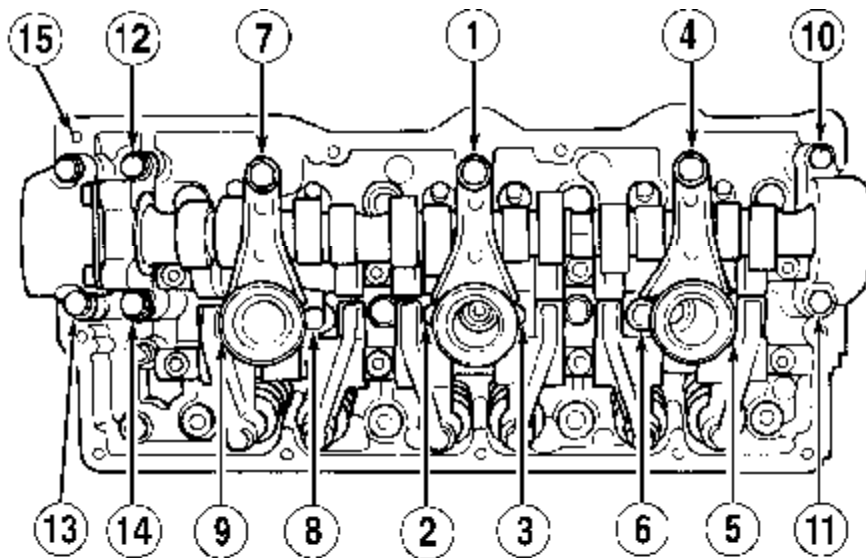
3.2L V6 Article Text (p. 11) **Installation** To install, reverse removal procedure. Install camshaft with mark facing up. See Fig. 5. Align mating mark on camshaft with mark on timing chain. See Fig. 10. Ensure tensioners are installed in correct

locations. Tensioners are marked "L" and "R". On all engines, tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS. See Fig. 11. Ensure timing belt installation procedures are followed closely. See TIMING BELT.



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Fig. 10: Aligning Timing Chain Sprockets (DOHC)
Courtesy of Isuzu Motor Co.



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Fig. 11: Tightening Camshaft Bracket Housing Fixing Bolts (SOHC)
Courtesy of Isuzu Motor Co.

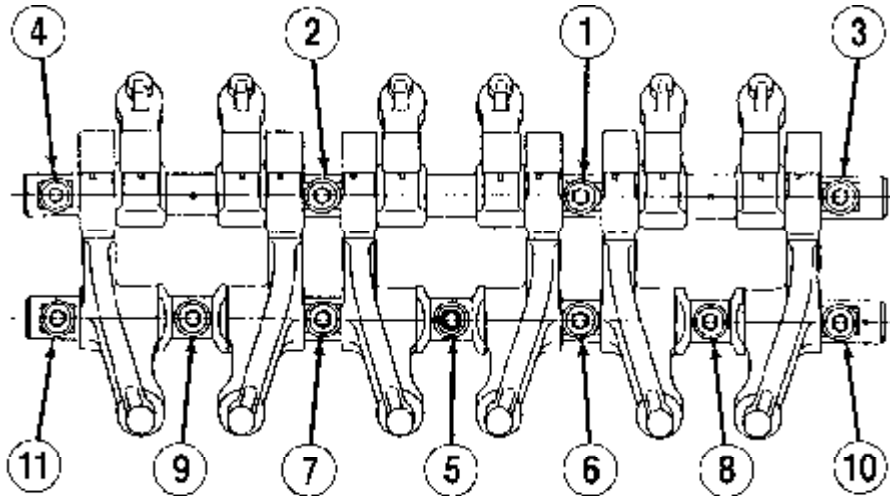
ROCKER ARM ASSEMBLY (SOHC)

Removal

Release fuel pressure. See FUEL PRESSURE RELEASE. Disconnect negative battery cable. Remove camshaft. See CAMSHAFT. Remove rocker arm assembly retaining bolts and rocker arm assembly.

Installation

To install, reverse removal procedure. Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS. Tighten rocker assembly bolts in sequence to specification. See Fig. 12. Ensure timing belt installation procedures are followed closely. See TIMING BELT.



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Fig. 12: Rocker Arm Assembly Tightening Sequence (SOHC)
Courtesy of Isuzu Motor Co.

REAR MAIN SEAL

Removal

Remove transmission. For automatic transmission, see TRANSMISSION REMOVAL & INSTALLATION - A/T article or manual transmission, see TRANSMISSION REMOVAL & INSTALLATION - M/T article. On M/T, remove clutch assembly and flywheel. On A/T, remove torque converter and flexplate. On all models, carefully remove seal from seal housing using a seal puller. DO NOT damage sealing surfaces on crankshaft.

Installation

1) Ensure all sealing surfaces are clean. Apply engine oil to lip of oil seal. Using Seal Installer (J-39201), install seal in seal housing. DO NOT reuse flywheel or flexplate bolts. Ensure no oil is present in threads of crankshaft.

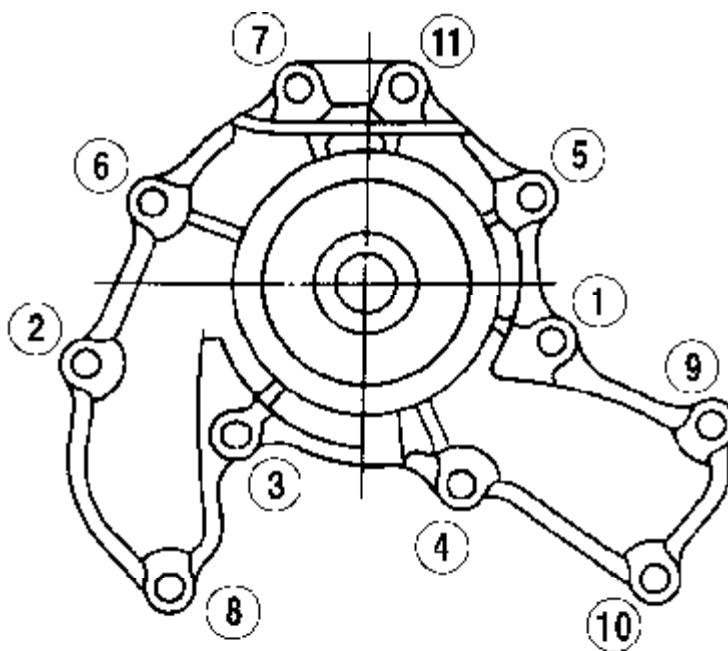
2) Install flywheel. Tighten all bolts to specification. Tighten flywheel bolts in a diagonal pattern. See TORQUE SPECIFICATIONS. To install remaining components, reverse removal procedure.

WATER PUMP

Removal & Installation

1) Disconnect negative battery cable. Drain cooling system. Remove timing belt. See TIMING BELT. Remove water pump bolts, water pump and gasket.

2) To install, reverse removal procedure. Ensure gasket surfaces are clean. Tighten water pump bolts in sequence to specification. See TORQUE SPECIFICATIONS. See Fig. 13. Fill cooling system and check system for leaks.



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Fig. 13: Water Pump Bolt Tightening Sequence
Courtesy of Isuzu Motor Co.

OIL PAN

Removal

1) Disconnect negative battery cable. Remove dipstick. Raise and support vehicle by frame. Remove front skid plate and crossmember. On 4WD, disconnect front drive shaft bolts at front axle. On all models, remove flywheel/flexplate inspection cover.

2) Place reference marks on pitman arm and steering gear shaft. Remove nut, washer and pitman arm from steering gear. Remove 4 bolts and idler arm. On 4WD, support front axle. Remove front axle-to-mount bolts. Lower front axle. On all models, drain engine oil. Remove oil pan bolts, oil pan and gasket.

Installation **3.2L V6Article Text (p. 14)**1996 Isuzu RodeoFor 1 1 1 1 1Copyright © 1998 Mitchell Repair Informati
Ensure gasket surfaces are clean. Before installing oil pan

and gasket, apply continuous bead of silicone sealant around oil pan sealing area. To complete installation, reverse removal procedure. Tighten all bolts and nuts to specification. See TORQUE SPECIFICATIONS

OVERHAUL

CYLINDER HEAD

Cylinder Head

1) Inspect cylinder head for warpage at cylinder block and manifold areas. Resurface cylinder head if warpage exists on head or manifold surfaces. Replace cylinder head if warpage exceeds specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

2) Inspect cylinder head for cracks, especially in area between valve seats and inside exhaust ports. Check head surface for corrosion and porosity.

CAUTION: DO NOT weld cylinder head to repair. Replace cylinder head.

3) Ensure cylinder head height is within specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

Valve Springs

Ensure valve spring free length, out-of-square and pressure are within specification. See VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS. Install valve springs with painted area of valve spring facing downward.

CAUTION: Ensure valve spring is installed with painted area toward cylinder head surface.

Valve Stem Oil Seals

Carefully install valve stem oil seal using Seal Installer (J-37986).

Valve Guides

1) Check valve stem-to-guide oil clearance. Ensure valve stem diameter is within specification. Replace valve guide if clearance exceeds specification. Manufacturer recommends replacing valve and valve guide as a set. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

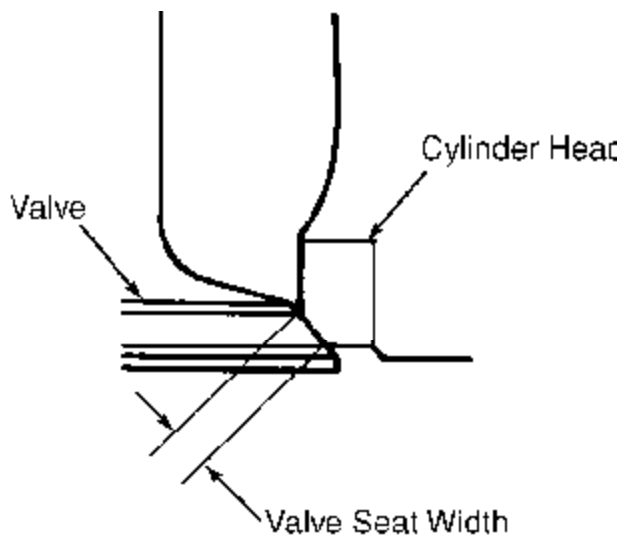
2) To replace valve guide, use hammer and Valve Guide Remover/Installer (J-37985). Working from combustion side of cylinder head, drive valve guide out of top of head. Apply engine oil to outside of NEW valve guide.

3) Using hammer and valve guide remover/installer, drive valve guide into cylinder head from camshaft side. Measure valve guide installed height from top of valve guide to cylinder head surface. Ensure valve guide installed height is within specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS. Using reamer, ream valve guide to obtain specified valve stem-to-guide oil clearance. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

Valve Seat

1) To measure valve seat margin, install a NEW valve in cylinder head. Measure valve installed height from spring seat to tip of valve stem. Replace valve seats if not within specification. See VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS.

2) Measure valve seat width. See Fig. 14. Cut or replace valve seats to reach required width specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.



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Fig. 14: Measuring Valve Seat Width
Courtesy of Isuzu Motor Co.

3) Replace valve seat if damaged. To remove valve seat, arc weld a welding rod to valve seat in several areas to shrink valve seat. Allow valve seat to cool. Gently tap on welding rod to remove valve seat. Ensure valve seat area in cylinder head is clean.

4) To install valve seat, heat valve seat area of cylinder head with steam. Cool valve seat with dry ice or refrigerate. Install valve seat in cylinder head. Valve seat-to-cylinder head interference fit should be .004-.006" (.11-.15 mm). Grind valve seat to specified seat width. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

Ensure valve stem diameter is within specification. Replace valves if not within specifications. Manufacturer recommends replacing valve and valve guide as a set. See VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS.

Valve Seat Correction Angles

After grinding seat, to lower seat, use a 30-degree stone to remove stock from top of valve seat on all valves. To raise seat, use a 75-degree stone to remove stock from bottom of seat on all valves.

VALVE TRAIN

Rocker Arm Assembly (SOHC)

1) Mark component location for reassembly reference. Ensure components are installed in original location. Disassemble rocker arm assembly. Inspect components for damage.

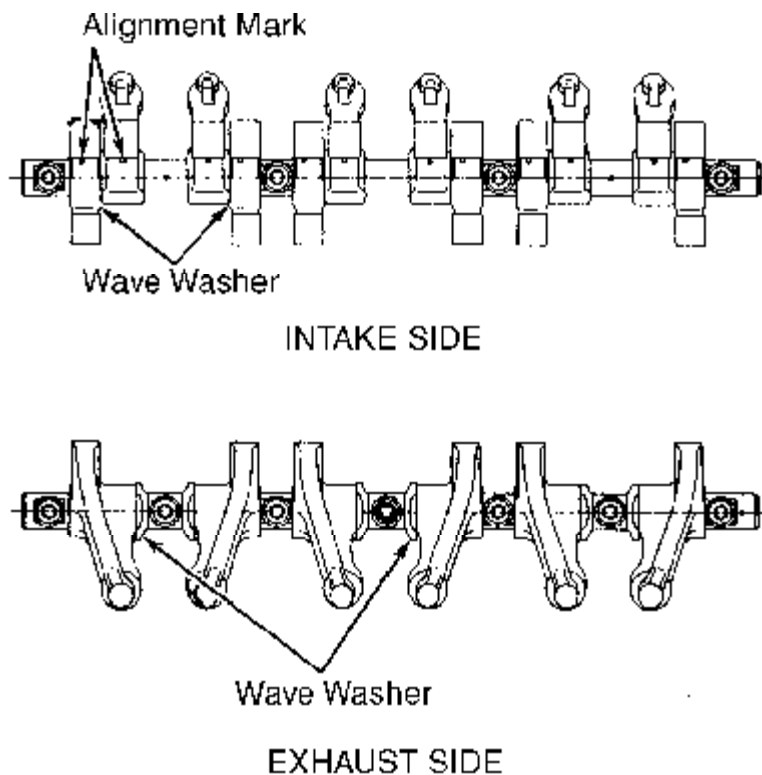
2) Using "V" block and dial indicator, check runout of rocker arm shafts. Measure rocker arm shaft O.D. in rocker arm operating area. Replace components if measurements are not within specifications. See ROCKER ARM SPECIFICATIONS table.

3) Measure rocker arm I.D. and rocker arm shaft O.D. to determine oil clearance. Replace components if oil clearance is not within specification. See ROCKER ARM SPECIFICATIONS table.

ROCKER ARM SPECIFICATIONS TABLE

Application	In. (mm)
Maximum Oil Clearance .....	.008 (.20)
Maximum Rocker Arm Shaft Runout .....	.008 (.20)
Minimum Rocker Arm Shaft O.D. ....	.623 (15.83)

4) To reassemble, coat components with engine oil. Rocker arm shafts and rocker arms are different. Ensure shafts and arms are installed in proper position. Ensure a wave washer is installed between intake and exhaust rocker arms and all reused rocker arms are returned to original position. See Fig. 15.



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Fig. 15: Assembling Rocker Arm Components
Courtesy of Isuzu Motor Co.

Valve Lifters

1) Visually inspect hydraulic valve lifters. Replace parts if damage or abnormal wear is present. If outside diameter is not within specification, replace lifter. See VALVE LIFTERS table under ENGINE SPECIFICATIONS.

CAUTION: DO NOT disassemble hydraulic valve lifter. Keep lifter upright and submersed in oil when not being measured.

2) Subtract outside diameter of lifter from inside diameter of lifter mounting in rocker arm (SOHC), or inside diameter of cylinder head (DOHC). On SOHC, replace rocker arm and/or lifter if oil clearance exceeds specification. On DOHC, replace cylinder head and/or lifter if oil clearance exceeds specification. See VALVE LIFTERS table under ENGINE SPECIFICATIONS.

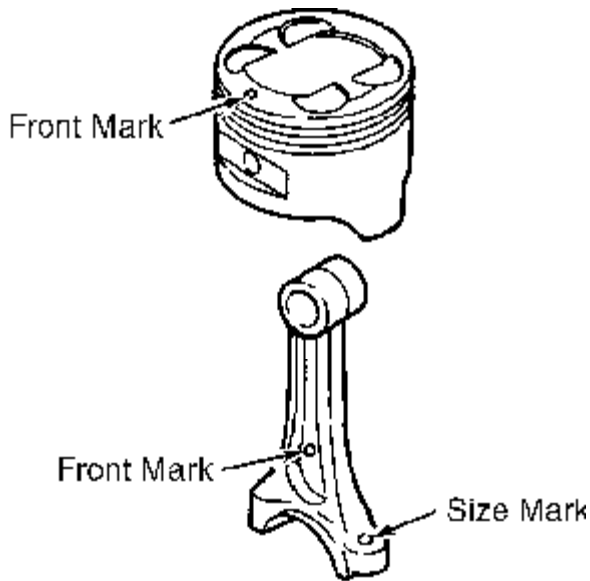
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CYLINDER BLOCK ASSEMBLY

Piston & Rod Assembly

Ensure piston is installed in cylinder block with front mark area on top of piston toward front of engine. See Fig. 16. Install

piston on connecting rod so front mark at center of connecting rod aligns with front mark on top of piston.



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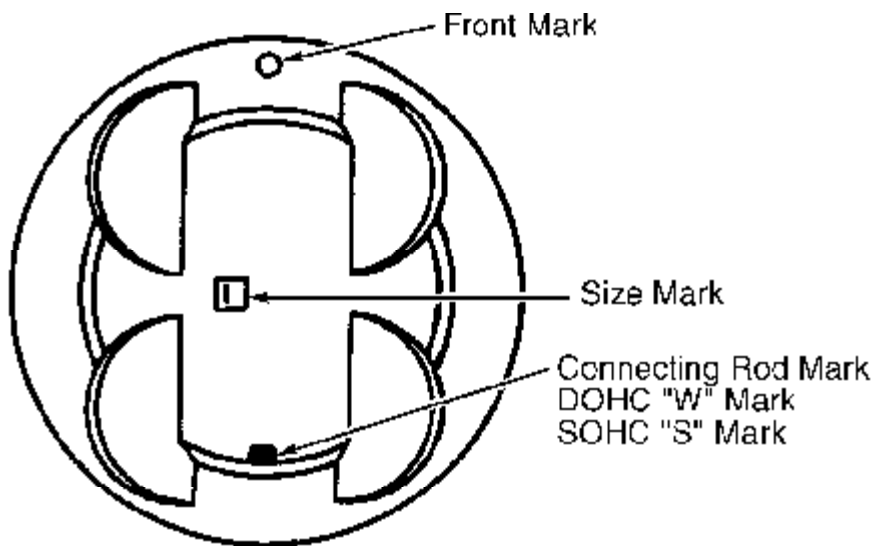
Fig. 16: Aligning Piston & Connecting Rod
Courtesy of Isuzu Motor Co.

Fitting Pistons

1) Determine if piston-to-cylinder clearance is within specification. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS. Measure piston skirt diameter at 1.22" (31.0 mm) from top of piston, at a 90-degree angle to piston pin. Different piston sizes are used. Piston size can be identified by letter (size mark) stamped on top of piston. See Fig. 17.

2) Size mark on piston is a letter corresponding to piston diameter. Ensure piston diameter is within specification. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS.

3) Check cylinder bore to determine piston-to-cylinder clearance. Clearance should be within specification. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS.



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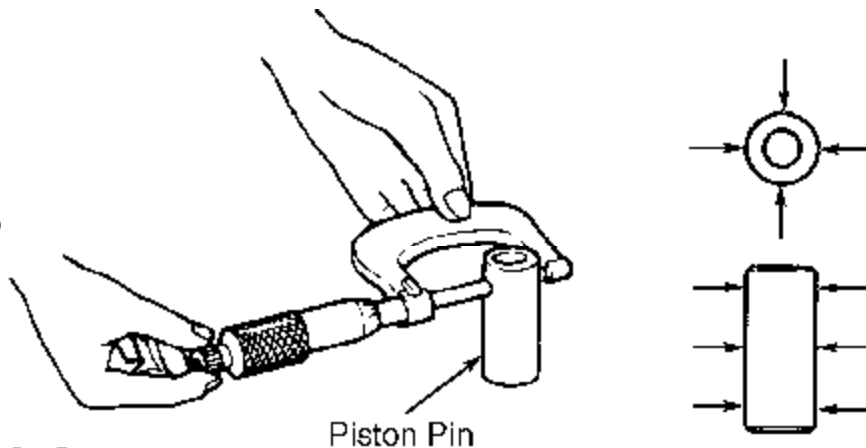
Fig. 17: Identifying Piston & Connecting Rod Size
Courtesy of Isuzu Motor Co.

Piston Pins

1) Measure piston pin outside diameter in 2 directions and 3 places. See Fig. 18. If outside diameter is not within specification at any one place, replace piston pin. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS.

2) Ensure piston pin to connecting rod interference fit is within specification. Measure inside diameter of connecting rod small end. If interference fit is not within specification, replace connecting rod and piston pin. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS.

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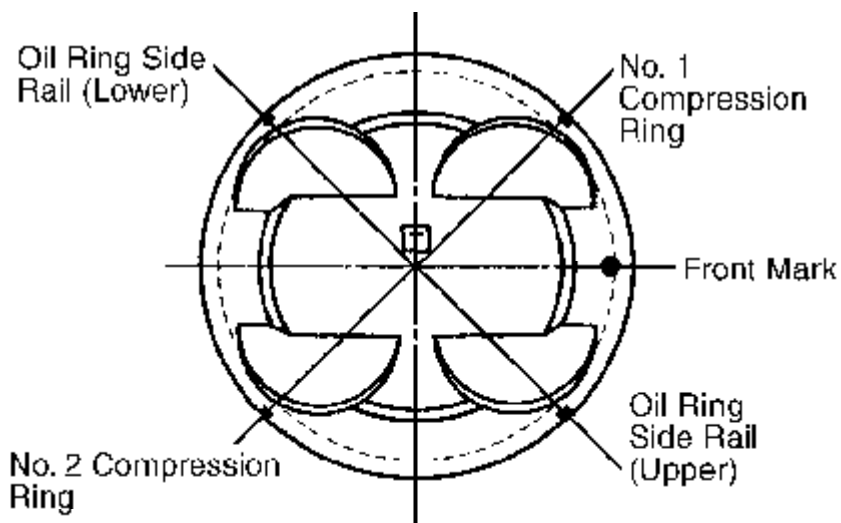
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Fig. 18: Measuring Piston Pins
Courtesy of Isuzu Motor Co.

Piston Rings

1) Place NEW piston ring into cylinder bore. Using a piston, push ring into smallest part of cylinder bore. Measure ring end gap. If ring end gap is too large, use an oversize ring. If ring end gap is too small, file material from end of ring. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS.

2) Measure clearance between piston ring groove and piston ring. If clearance is not within specification, replace piston. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS. Position piston ring gaps in proper areas. See Fig. 19.



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Fig. 19: Positioning Piston Rings
Courtesy of Isuzu Motor Co.

Rod Bearings

1) Note direction of connecting rod and cap installation. Ensure connecting rod is installed so front mark at center of connecting rod is toward front of engine. See Fig. 16.

2) Connecting rod big end bore diameter is indicated by an "A", "B" or "C" size mark stamped on one side of connecting rod. See Fig. 16. Ensure big end bore diameter is within specification. See CONNECTING RODS table under ENGINE SPECIFICATIONS.

3) Check rod bearing oil clearance using Plastigage. Ensure bearing oil clearance and side play are within specification. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS and CONNECTING RODS tables under ENGINE SPECIFICATIONS.

4) If rod bearing oil clearance is incorrect, it may be possible to obtain correct clearance using selective service rod bearings. Rod bearings are available in 3 standard service sizes, indicated by a color code on bearing. See ROD BEARING SPECIFICATIONS table. Coat nut and threads with engine oil before installing. Tighten

nuts to specification. See TORQUE SPECIFICATIONS.

ROD BEARING SPECIFICATIONS TABLE

Color Code	Bearing Thickness In. (mm)
Yellow .....	.0595-.0597 (1.512-1.516)
Green .....	.0594-.0595 (1.508-1.512)
Pink .....	.0592-.0594 (1.504-1.508)

Crankshaft & Main Bearings

1) Ensure main bearing caps are numbered for location. Mark bearing cap for reassembly reference. Remove main bearing cap bolts in proper sequence. See Fig. 20.

2) Cylinder block main bearing bore size is indicated by numerical size mark stamped on cylinder block. See Fig. 21. Main bearing journal size is determined by size marks, given in dashes (-), located on crankshaft front counterweight. See Fig. 22.

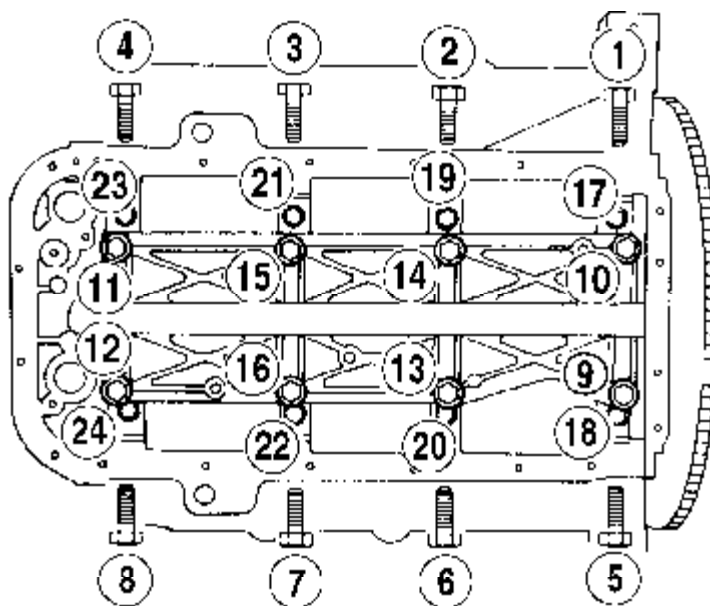
3) If color code on original bearing cannot be obtained, use size marks on cylinder block and crankshaft to determine proper color-coded main bearing. See MAIN BEARING SELECTION table.

MAIN BEARING SELECTION TABLE

Cylinder Block Size Mark	Crankshaft Size Mark	Bearing Color Code
1	1 Or -	Green
1	2 Or -	Brown
2	1 Or -	Yellow
2	2 Or -	Green
3	1 Or -	Pink
3	2 Or -	Yellow

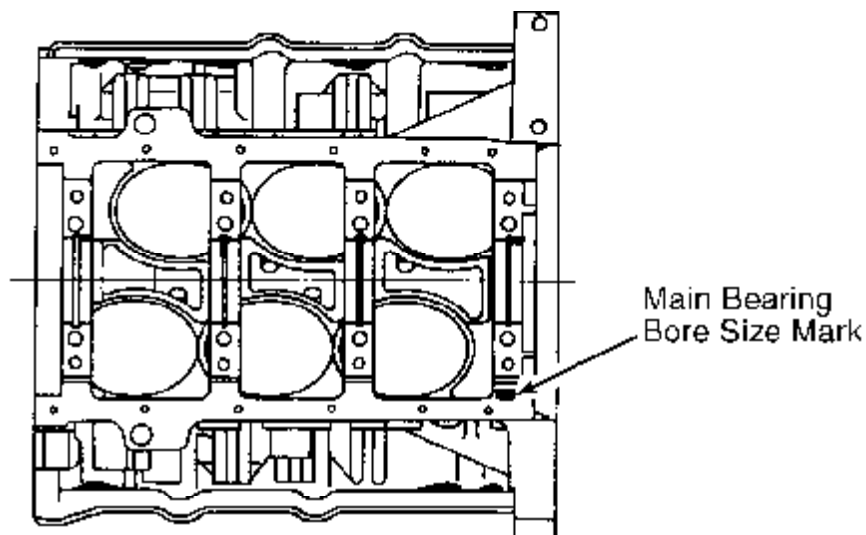
4) When installing main bearing caps, ensure reassembly reference mark on cap points toward front of engine. Coat bolt threads with engine oil before installing.

5) Tighten bolts in sequence to specification. See Fig. 23. See TORQUE SPECIFICATIONS. Ensure crankshaft end play is within specification. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.



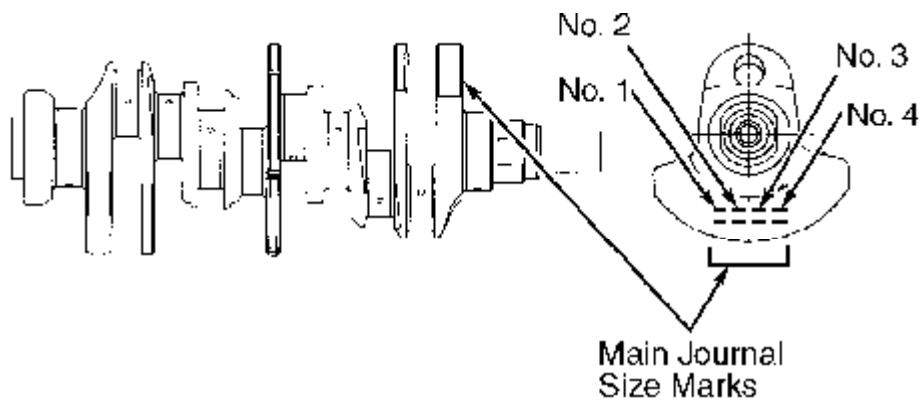
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Fig. 20: Main Bearing Bolt Removal Sequence
Courtesy of Isuzu Motor Co.



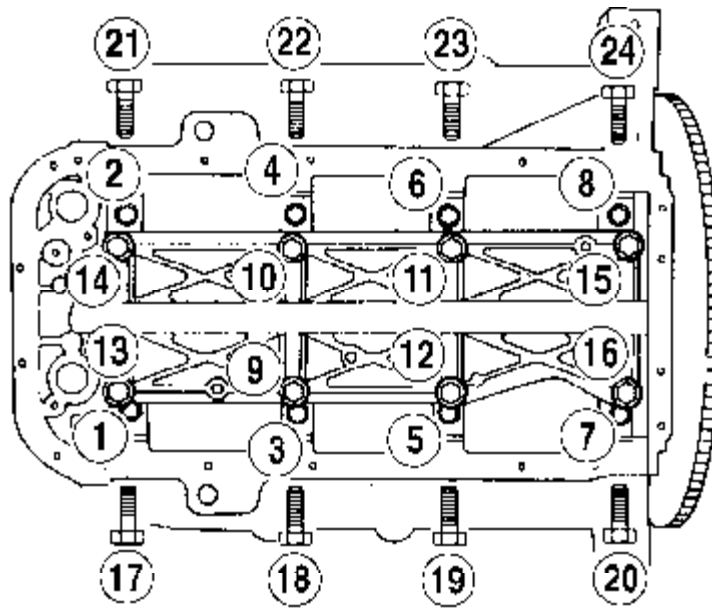
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Fig. 21: Identifying Main Bearing Bore Size
Courtesy of Isuzu Motor Co.



G94D46907

Fig. 22: Identifying Main Bearing Journal Size
Courtesy of Isuzu Motor Co.



G93D01609

Fig. 23: Main Bearing Bolt Installation Sequence
Courtesy of Isuzu Motor Co.

Thrust Bearing

Install thrust bearing on No. 3 main bearing so grooves are toward crankshaft, away from cylinder block. Replace thrust bearing if

crankshaft end play is not within specification. See 3.2L V6 Article Text (p. 24) for size and torque. See 1 Copyright © 1998 Mitchell Repair Information Company, LLC Wednesday, November 11, 2009 10:00 AM
CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

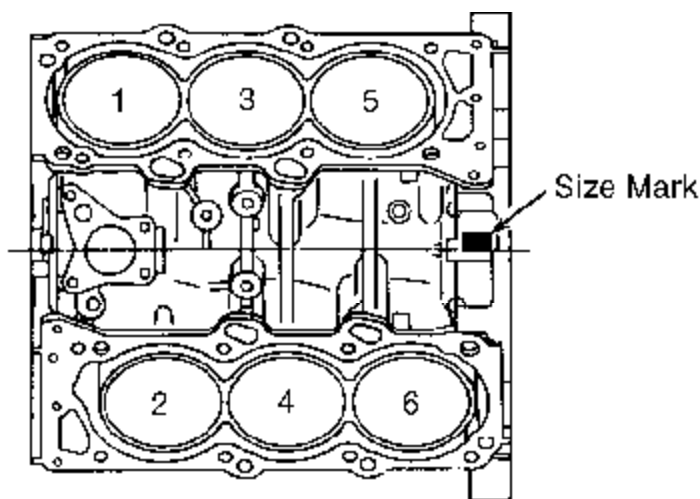
Cylinder Block

1) Using feeler gauge and straightedge, check cylinder block deck surface warpage. If warpage exceeds specification, resurface or replace cylinder block. See CYLINDER BLOCK table under ENGINE

SPECIFICATIONS.

2) Check diameter of cylinder bore. Measure cylinder in axial and thrust directions. Different cylinder bore sizes are used and can be identified by size marks on deck surface of cylinder block. See Fig. 24. Cylinder size marks are stamped in relation to cylinder layout.

3) Ensure diameter of cylinder bore is within specification. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS. If diameter of cylinder bore exceeds maximum limit, replace cylinder block.



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Fig. 24: Identifying Cylinder Bore Diameter
Courtesy of Isuzu Motor Co.

ENGINE OILING

ENGINE LUBRICATION SYSTEM

A trochoid-type oil pump is used. Oil pump is driven by crankshaft. Oil pump delivers filtered oil through full-flow oil filter and water-cooled oil cooler to main oil gallery, feeding crankshaft journals and cylinder head. Oil passages in crankshaft supply oil to connecting rod journals. Engine cylinder bore and piston pins are lubricated by oil sprayed from connecting rods.

Crankcase Capacity

Crankcase capacity is 5.7 qts. (5.4L) with oil filter change.

Oil Pressure

With engine at normal operating temperature, ensure oil pressure is 57-80 psi (3.9-5.6 kg/cm²) at 3000 RPM.

OIL PUMP

Removal & Disassembly

1) Remove timing belt. See TIMING BELT under REMOVAL & INSTALLATION. Remove crankshaft sprocket from oil pump. Remove oil pan. See OIL PAN under REMOVAL & INSTALLATION. Remove oil strainer and oil pipe.

2) Remove oil cooler assembly. Remove oil pump bolts and oil pump. See Fig. 25. Remove pressure relief valve. Remove oil pump cover. Mark oil pump gears for reassembly reference. Remove oil pump gears. Remove oil seal from oil pump housing.

NOTE: In colder climates, pressure relief valve may stick, creating excessive oil pressure and causing oil filter to deform and leak. If this condition exists, install NEW pressure relief valve and spring.

Inspection

1) Inspect components for damage. Install gears in oil pump housing. Place straightedge across oil pump housing surface.

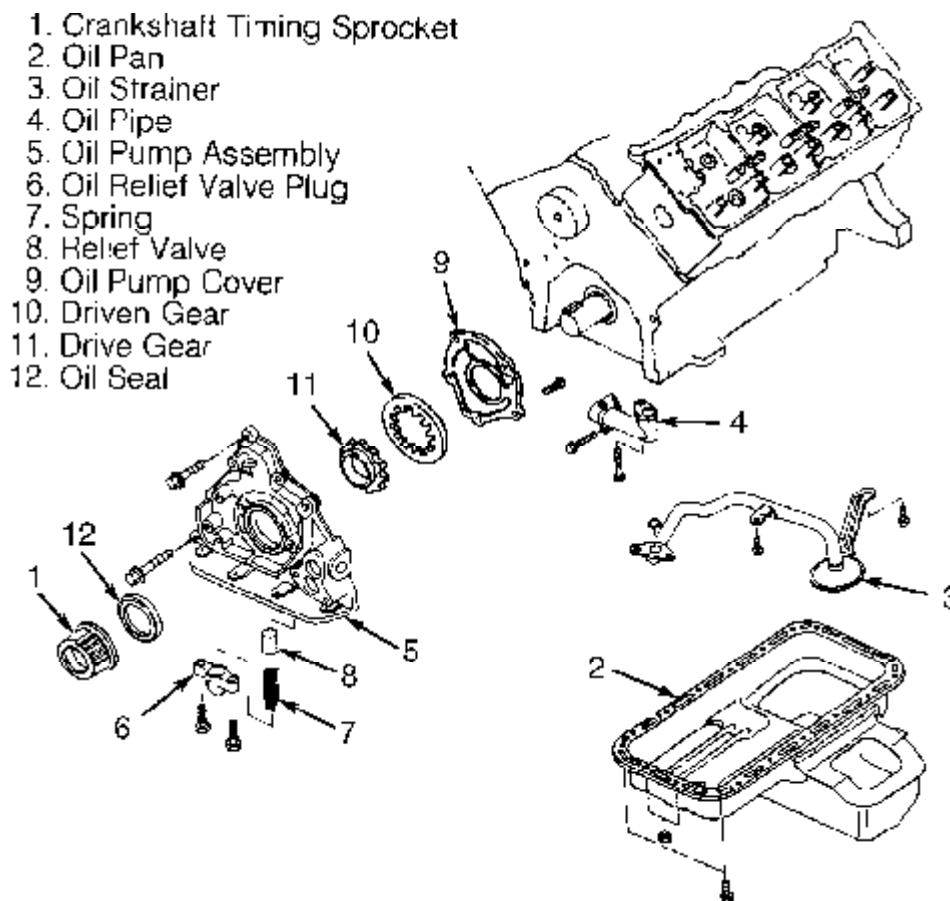
2) Using feeler gauge, measure gear side clearance. Replace components if clearance exceeds specification. See OIL PUMP SPECIFICATIONS table.

3) Using feeler gauge, measure side clearance between outside edge of outer gear and oil pump housing. Replace components if clearance exceeds specification. See OIL PUMP SPECIFICATIONS table.

4) Assemble gears in oil pump housing. Using feeler gauge, measure clearance between tip of inner gear and tip of outer gear. Replace components if clearance exceeds specification. See OIL PUMP SPECIFICATIONS table.

OIL PUMP SPECIFICATIONS TABLE

Application	In. (mm)
Gear Side Clearance	
Standard .....	.001-.004 (.03-.10)
Wear Limit .....	.006 (.15)
Outer Gear-To-Oil Pump Housing Clearance	
Standard .....	.004-.007 (.10-.18)
Wear Limit .....	.008 (.20)
Gear Tip Clearance	
Standard .....	.004-.009 (.10-.23)
Wear Limit .....	.014 (.35)



G93H01611

Fig. 25: Exploded View Of Engine Oiling System
Courtesy of Isuzu Motor Co.

Reassembly & Installation

1) To reassemble, reverse disassembly procedure. Lubricate all components with engine oil. Install oil seal using Seal Installer (J-39202). Tighten oil pump assembly bolts to specification. See **TORQUE SPECIFICATIONS**.

NOTE: Ensure oil pump gears rotate smoothly after oil pump cover bolts are tightened to specification.

2) To install, reverse removal procedure. Apply Sealant (TB-1207B) to oil pump gasket surface before installing oil pump. Tighten all bolts to specification. See **TORQUE SPECIFICATIONS**.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATION TABLE

Application	Ft. Lbs. (N.m)
Axle Housing Mounting Bolt	
Step 1	61 (83)
Step 2	112 (152)
Camshaft Idler Pulley Bolt	31 (42)
Camshaft Sprocket Bolt	41 (55)
Camshaft Timing Chain Tensioner Bolt	14 (19)
Common Chamber Duct Bolt	17 (23)
Connecting Rod Nut	40 (54)
Coolant Manifold Bolt	14 (19)
Crankshaft Pulley Bolt	123 (167)
Cylinder Head Bolt (1)	
M8	15 (20)
M11	47 (64)
DIS Module Assembly Bolt	14 (19)
Engine Hanger	
Bolt	15 (20)
Nut	42 (57)
Engine-To-Transmission Bolt	56 (76)
EGR Valve Bolt (Manifold Side - DOHC)	21 (29)
Exhaust Manifold	
Bolt	21 (29)
Nut	42 (57)
Exhaust Pipe	
Bolt & Nut	32 (43)
Stud Nut	49 (67)
Fan Pulley Bolt	16 (22)
Flywheel Bolt	40 (54)
Front Plate Bolt (Timing Belt)	14 (19)
Heater Pipe Bolt	15 (20)
Idler Arm Retaining Bolt	33 (44)
Lock Plate Bolt	58-65 (79-88)
Lower Intake Manifold Bolt	18 (24)
Main Bearing Cap Bolt (2)	29 (39)
Main Bearing Cap Side Bolt (2)	29 (39)
Mount-To-Chassis Bolt	30 (41)
Oil Cooler Bolt	19 (26)
Oil Gallery Retaining Bolt	
Step 1	22 (30)
Step 2	Additional 55-65 Degrees
Oil Pump Assembly-To-Cylinder	
Block Bolt	13 (18)
Oil Pump Strainer Bolt	16 (22)
Pitman Arm Nut	159 (216)
Power Steering Pump Bolt	34 (46)

Rear Crankshaft Seal Retainer Bolt	13 (18)
Rocker Arm Assembly Bolt (3)	13 (18)
Spark Plug	13 (18)
Suspension Crossmember Bolt	58 (79)
Throttle Body Bolt	14 (19)
Timing Belt Cover Bolt	13 (18)
Timing Belt Tensioner Pulley Bolt	32 (43)
Timing Belt Tensioner Pusher Bolt	14 (19)
Upper Intake Manifold Bolt	18 (24)
Water Pump Bolt (4)	13 (18)

INCH Lbs. (N.m)

Cylinder Head Cover Bolt	69 (8)
Camshaft Thrust Plate Bolt	87 (10)
Camshaft Tower Bolt	
DOHC	87 (10)
SOHC M6 Bolt	69 (8)
SOHC M8 Bolt	(5)
Cooling Fan Assembly Nut	69 (8)
EGR Valve Bolt (Valve Side)	69 (8)
Oil Pan Bolt	87 (10)
Oil Pump Cover Bolt	87 (10)
Oil Pump Relief Valve Plug	69 (8)

- (1) - Tighten bolts in sequence. See Fig. 4.
(2) - Tighten bolts in sequence. See Fig. 22.
(3) - Tighten bolts in sequence. See Fig. 11.
(4) - Tighten bolts in sequence. See Fig. 12.
(5) - Tighten bolts to 13 ft. lbs. (18 N.m).

ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS TABLE

Application	Specification
Displacement	193 Cu. In. (3.2L)
Bore	3.68" (93.4 mm)
Stroke	3.03" (77 mm)
Compression Ratio	
DOHC	9.8:1
SOHC	

1995	9.3:1
1996	9.0:1
Fuel System	SFI
Horsepower @ RPM	
DOHC	190 @ 5600
SOHC	
1995	175 @ 5200
1996	190 @ 5600
Torque Ft. Lbs. @ RPM	
DOHC	195 @ 3800
SOHC	188 @ 4000

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS TABLE

Application	In. (mm)
Crankshaft	
End Play .....	.012 (.30)
Runout .....	.002 (.04)
Main Bearings	
Journal Diameter	2.5165-2.5170 (63.918-63.933)
Journal Out-Of-Round .....	.0016 (.040)
Journal Taper .....	.0002 (.005)
Oil Clearance .....	.0010-.0019 (.025-.048)
Connecting Rod Bearings	
Journal Diameter	2.1229-2.1235 (53.922-53.937)
Journal Out-Of-Round .....	.0002 (.005)
Journal Taper .....	.0002 (.005)
Oil Clearance .....	.0010-.0023 (.025-.058)
Trust Clearance	
Standard .....	.0024-.0094 (.061-.239)
Limit .....	.0118 (.300)

CONNECTING RODS SPECIFICATIONS

CONNECTING RODS TABLE

Application	In. (mm)
Big End Bore Diameter (1)	
Size Mark "A"	2.2439-2.2441 (56.994-57.000)
Size Mark "B"	2.2436-2.2439 (56.988-56.994)

Size Mark "C"	2.2434-2.2436 (56.982-56.988)
Maximum Bend (2) .....	.0059 (.15)
Maximum Twist (2) .....	.0078 (.20)
Side Play .....	.006-.014 (.16-.35)

(1) - Diameter is determined by size mark stamped on connecting rod. See Fig. 15.

(2) - Specification is per 3.937" (100 mm) of rod length.

PISTONS, PINS & RINGS SPECIFICATIONS

PISTONS, PINS & RINGS TABLE

Application	In. (mm)
Pistons	
Clearance .....	.0008-.0031 (.020-.080)
Diameter	
Size Mark "A"	3.6752-3.6756 (93.350-93.360)
Size Mark "B"	3.6756-3.6760 (93.361-93.370)
Size Mark "C"	3.6760-3.6764 (93.371-93.380)
Pins	
Diameter .....	.8660-.8663 (21.997-22.005)
Pin/Rod Interference Fit .....	.0008-.0016 (.020-.041)
Pin/Piston Clearance .....	.0003-.0008 (.007-.020)
Rings	
No. 1	
End Gap .....	.0138-.0185 (.350-.470)
Side Clearance .....	.0006-.0015 (.015-.038)
No. 2	
End Gap .....	.0177-.0236 (.450-.600)
Side Clearance .....	.0006-.0015 (.015-.038)
No. 3 (Oil)	
End Gap .....	.0059-.0177 (.150-.450)

CYLINDER BLOCK SPECIFICATIONS

CYLINDER BLOCK TABLE

Application	In. (mm)
Cylinder Bore	
Standard Diameter	3.6772-3.6783 (93.400-93.430)
Maximum Diameter	3.6823 (93.530) 3.2L V6Article Text (p. 31) 1996 Isuzu RodeoFor

Maximum Deck Warpage006 (.15)

VALVES & VALVE SPRINGS SPECIFICATIONS

VALVES & VALVE SPRINGS TABLE

Application	Specification
Face Angle	45°
Minimum Margin	
Intake & Exhaust	(1)
Stem Diameter	
Intake	
Standard .....	.2346-.2353" (5.959-5.977 mm)
Service Limit .....	.2323" (5.90 mm)
Exhaust	
Standard .....	.2343-.2350" (5.952-5.970 mm)
Service Limit .....	.2323" (5.90 mm)
Valve Installed Height (Maximum) (2)	
DOHC	
Intake	1.756" (44.62 mm)
Exhaust	1.757" (44.65 mm)
SOHC	
Standard	1.673" (42.50mm)
Limit	1.687" (42.85 mm)
Valve Springs	
Free Length	
Standard	1.971" (50.06 mm)
Service Limit	1.913 (48.59 mm)
Installed Height	1.54" (39.0 mm)
Out-Of-Square .....	.087" (2.2 mm)

Lbs. @ In. (kg @ mm)

Pressure (Valve Closed) 245 @ 1.54 (55 @ 39.0)

- (1) - Information not available at time of publication.
(2) - With NEW valve installed. Replace valve seat if greater than specification.
-

CYLINDER HEAD SPECIFICATIONS

CYLINDER HEAD TABLE

Application	In. (mm)
Cylinder Head Height	
DOHC	5.413 (137.5)
SOHC	
Standard	4.126 (104.8)
Minimum	4.118 (104.6)
Maximum Allowable Warpage .....	.002 (.05)
Resurface Limit .....	.008 (.20)
Valve Seats	
Seat Angle	45°
Minimum Seat Width .....	.025 (.64)
Seat Margin	
Intake Valve	(1)
Exhaust Valve	(1)
Valve Guides	
Intake Valve	
Valve Guide Installed Height .....	.69 (17.5)
Valve Stem-To-Guide	
Oil Clearance .....	.0009-.0022 (.023-.056)
Exhaust Valve	
Valve Guide Installed Height .....	.69 (17.5)
Valve Stem-To-Guide	
Oil Clearance .....	.0012-.0025 (.030-.063)

(1) - See VALVE INSTALLED HEIGHT specification in the VALVES & VALVE SPRINGS table.

CAMSHAFT SPECIFICATIONS

CAMSHAFT TABLE

Application	In. (mm)
Camshaft Runout .....	.004 (.10)
End Play (Maximum)	
DOHC .....	.008 (.20)
SOHC .....	.010 (.25)
Journal Diameter	
DOHC	
Standard	1.0610-1.0618 (26.950-26.970)
Service Limit	1.0555 (26.810)
SOHC	
Standard	1.7692-1.7701 (44.939-44.960)
Service Limit	1.7634 (44.790)

Journal Out-Of-Round (Maximum)004 (.10)
Oil Clearance0016-.0043 (.040-.108)
Lobe Height
DOHC
Intake 1.3437 (34.130)
Exhaust 1.3437 (34.130)
SOHC
Intake 1.3480 (34.240)
Exhaust 1.4638 (37.180)
Thrust Clearance
Standard003-.008 (.07-.20)
Limit01 (.25)

VALVE LIFTERS SPECIFICATIONS

VALVE LIFTERS TABLE

Application	In. (mm)
DOHC	
Lifter Diameter .....	.6685-.6690 (16.980-16.993)
Oil Clearance .....	.0003-.0016 (.007-.040)
SOHC	
Lifter Diameter .....	.4716-.4720 (11.978-11.989)
Oil Clearance .....	.0004-.0016 (.010-.040)

END OF ARTICLE