

ISUZU & LUV 4-CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Engine may be identified by the Vehicle Identification Number (VIN) stamped on a metal tab located on top of instrument panel at lower left of windshield. The Engine Code is the 8th digit of the Vehicle Identification Number. The Engine Serial Number is stamped on the top right front corner of engine block.

Engine Identification		Code
Application		
Isuzu		
I-Mark & Pickup (1816 cc)		B
LUV		
Pickup (1816 cc)		N

ENGINE, CYLINDER HEAD & MANIFOLDS

ENGINE

Removal — 1) Disconnect battery cables, drain crankcase and cooling system. Disconnect carburetor linkage, all necessary water and fuel hoses. Disconnect all necessary vacuum lines and electrical leads. Disconnect exhaust pipe at manifold flange. Remove radiator and cooling fan.

2) Disconnect drive shaft, slave cylinder and speedometer-cable. Remove starter. Remove flywheel inspection cover and bell housing bolts. Support transmission. Attach hoist and take up vehicle weight. Remove front and rear engine mount nuts. Pull engine forward and lift out of vehicle.

Installation — To install engine, reverse removal procedure.

INTAKE MANIFOLD

Removal & Installation — 1) Disconnect battery ground cable and drain cooling system. Remove air cleaner assembly. Remove EGR pipe clamp bolt at rear of cylinder head. From underneath vehicle, remove EGR pipe from manifolds, and remove EGR valve and bracket assembly from bottom of intake manifold.

2) Disconnect upper radiator hose at water outlet and heater hose at top of manifold. Disconnect fuel line, accelerator linkage, vacuum lines and electrical connections at carburetor. Remove manifold mounting nuts and pull assembly off studs. To install, reverse removal procedure and tighten nuts in several steps, beginning with inner nuts and working outward.

NOTE — PCV hose must be on upper left side, hot idle compensator hose on upper right, and air vacuum hose on lower side. Incorrect installation could cause poor engine operation.

EXHAUST MANIFOLD

Removal & Installation — 1) Disconnect battery ground cable and remove EGR pipe clamp bolt at rear of cylinder head. Working under vehicle, remove EGR pipe from manifolds and attachments from exhaust pipe to bell housing and manifold. Separate exhaust pipe from manifold.

2) Remove manifold shield bolts and shield. Disconnect heat stove hose at air cleaner and remove heat stove. Remove mounting nuts and take off manifold. To install, reverse removal procedure, ensuring that mounting nuts are tightened in steps from center outward.

CYLINDER HEAD

Removal & Installation — 1) Drain cooling system and remove EGR pipe clamp bolt at rear of cylinder head. Disconnect exhaust pipe from manifold. Disconnect all necessary water hoses, vacuum lines, carburetor linkage and electrical leads. Remove air cleaner assembly and valve cover. Rotate crankshaft so number 4 cylinder is in firing position.

2) Mark rotor-to-housing relationship. Lock timing chain adjuster by depressing and turning automatic adjuster slide 90° clockwise. Remove timing chain sprocket from camshaft. Disconnect A.I.R. hose and check valve at exhaust manifold. Remove cylinder head-to-timing cover bolts and remove front cover.

3) Using special tool (J-24239), remove cylinder head bolts in sequence starting with outer bolts. Remove cylinder head, intake and exhaust manifold as an assembly. To install, reverse removal procedure.

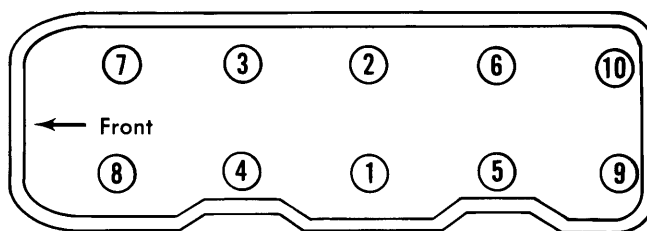


Fig. 1 Cylinder Head Tightening Sequence

CAMSHAFT

CAMSHAFT

Removal & Installation — 1) Remove valve cover and position No. 4 cylinder in firing position. Remove distributor cap and mark rotor position. Lock timing chain adjuster by depressing and turning automatic adjuster slide pin 90° in a clockwise direction. Ensure that chain is slack after locking adjuster.

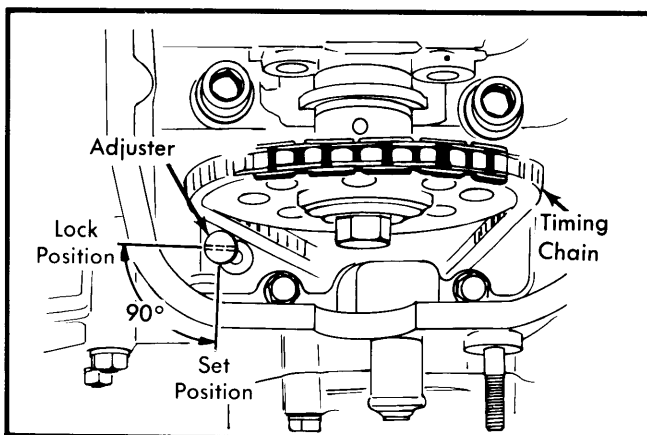


Fig. 2 Locking Timing Chain Adjuster

2) Remove timing sprocket from camshaft, keeping sprocket on chain damper and tensioner without removing sprocket from chain. Remove rocker arm shaft and bracket assembly. Remove camshaft.

3) Check camshaft journals and cams for wear or damage. Measure height of cams with a micrometer and replace

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camshaft if height is less than 1.4311" (36.3 mm). If working faces of cams have slight scores or steps, eliminate them by honing.

4) Measure outside diameter of camshaft journals, replace camshaft if diameter is less than 1.3307" (33.8 mm). Check camshaft runout by placing camshaft in v-blocks and using a suitable dial indicator, measure runout. If runout exceeds .0038" (.096 mm) replace camshaft.

CAMSHAFT END PLAY

Measure camshaft end play with thrust plate installed in thrust groove. Replace thrust plate if end play is found to exceed .0078" (.198 mm). Standard end play is .002-.006" (.05-.15 mm).

CAMSHAFT BEARING REPLACEMENT

Camshaft bearings are not replaceable. Camshaft rides in a carrier. If clearance is beyond limits, replace camshaft carrier.

OIL SEAL

Removal & Installation — 1) Disconnect negative battery terminal and drain cooling system. Disconnect radiator hoses and remove radiator. Remove fan and air conditioning belts and remove fan assembly. Remove crankshaft pulley bolt. Using a suitable puller, remove pulley and assembly.

2) Using a large screwdriver, pry seal out of cover. Using special tool (J-26587), install new seal in cover. Reverse removal procedure to complete installation. Replenish fluid levels previously drained.

FRONT COVER

Removal — Remove cylinder head and oil pan as previously outlined. Remove oil pump pickup tube. Remove harmonic balancer and AIR belt. If equipped with air conditioning, remove compressor and mounting brackets. Remove distributor cap (wires attached), then remove distributor. Remove front cover.

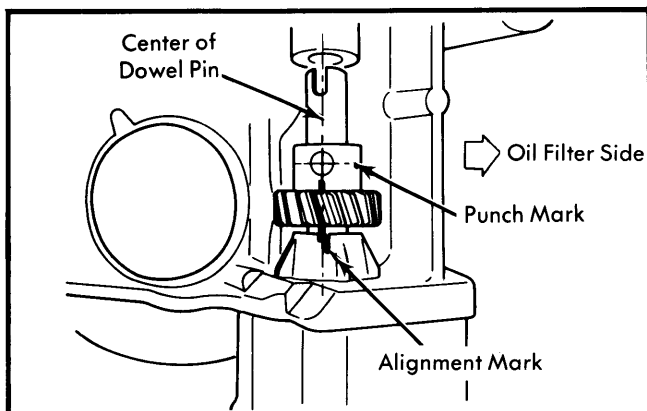


Fig. 3 Oil Pump Alignment

Installation — Align oil pump drive gear punch mark with oil filter side of cover. Align center of dowel pin with alignment mark on oil pump case. Rotate No. 1 and 4 cylinders to top dead center. Install front cover by engaging pinion gear with oil pump drive gear on crankshaft. Ensure that punch mark on oil pump drive gear is turned to rear side as viewed between front cover and cylinder block. Slit at end of oil pump shaft must be offset forward and parallel with front face of cylinder block. Install front cover and reverse removal procedure.

TIMING CHAIN

Removal — Remove front cover as outlined previously. Remove camshaft gear attaching bolt and remove timing chain from camshaft and crankshaft sprockets.

Inspection — 1) Check camshaft and crankshaft sprockets for wear or damage. Check timing chain for wear by pulling chain straight with proper tension measuring gauge. Pull chain at 22 lbs. (10 kg) and measure distance of 40 links from front of link as shown in Fig. 4.

2) If distance exceeds 15.16" (385 mm), replace chain. Check automatic adjuster, chain tensioner, and tensioner pins for wear or damage. Make sure that tensioner and adjuster have free rotation movement on pins. Ensure that oil jet in chain guide mounting is not plugged.

Installation — 1) Install timing sprocket and pinion gear with groove side toward front cover. Align keyway on crankshaft sprocket with key on crankshaft and drive sprocket onto crankshaft using suitable installing tool. Turn crankshaft so that key is facing straight upward, thus ensuring that No. 1 or No.4 piston is at TDC.

2) Align mark plate on chain with mark on crankshaft sprocket, install camshaft sprocket in upper portion of chain with marked side of sprocket facing forward and triangular marks align with chain mark plate. Reverse removal procedure to complete installation.

NOTE — The side of chain with mark plate is on front side and side of chain with most links between mark plates is on chain guide side. See Fig. 5.

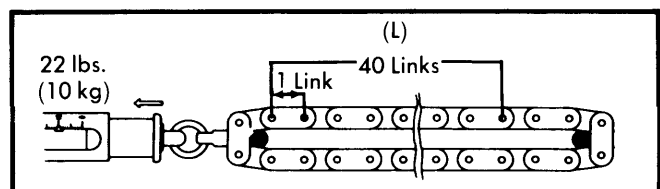


Fig. 4 Timing Chain Stretch Test

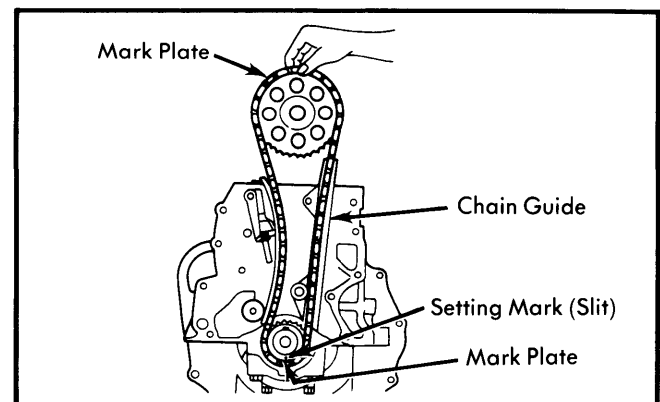


Fig. 5 Timing Chain Alignment

VALVES

VALVE ARRANGEMENT

Right Side — Intake.

Left Side — Exhaust.

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VALVE GUIDES

Removal & Installation — 1) Inspect inside diameter of valve guide for grooves or uneven wear. Measure inside diameter of valve guides with caliper gauge. Measure diameter of valve stem and compare measured values to determine clearance. If clearance is excessive, replace both valve and valve guide.

2) Use valve guide removal tool (J-26512) and drive old guide out from combustion chamber side. Remove lower spring seat. To install, oil outside of new guide and place in position in cylinder head. Use installer (J-26512-1&2) and drive guide in until tool bottoms on cylinder head.

VALVE SPRINGS & VALVE STEM OIL SEALS

Removal — With rocker arm shaft assembly removed, use compressed air method to hold valve in closed position. Use suitable spring compressor (J-26513) and remove valve spring retainers (keepers). Remove spring and cap. Remove valve stem oil seal and spring lower seat.

Installation — Lubricate valve stem and spring lower seat. Place seat in position, then slide new seal over valve stem and onto guide, ensuring that ridge in oil seal fits in groove in valve guide. Install springs and retainers.

VALVE SPRING INSTALLED HEIGHT

Visually check valve springs for damage and replace as necessary. Measure free length of valve springs using suitable calipers and replace if measured value is beyond limit. With a valve spring tester check valve spring tension and compare it with values in chart, replace as necessary.

ROCKER ARM ASSEMBLY

Removal & Installation — 1) Loosen rocker shaft brackets in sequence, working from ends toward center. Remove spring from shaft, then remove brackets and rocker arms, keeping parts in order for reassembly.

2) Inspect rocker arm shaft for wear damage or excessive runout. If runout is greater than .0156" (.396 mm), replace shaft. Diameter of shaft is .8071" (20.5 mm). Replace shaft if diameter is less than .8012" (20.35 mm). Measure inside diameter of rocker arms and compare with diameter of rocker shaft. If clearance is greater than .0078" (.198 mm) replace rocker arms and/or rocker shaft.

3) To install, apply engine oil to rocker arm shaft, rocker arms, and valve stems. Install longer shaft on exhaust side and shorter shaft on intake side. Aligning marks on shafts are turned to front side.

4) Assemble brackets and arms to shafts, so cylinder number (on upper face of bracket) is pointed to front of engine. Align No. 1 shaft bracket with mark on the intake and exhaust valve side rocker arm shafts. Place springs between shaft bracket and rocker arm. Punch mark on rocker arm shafts must be turned upward. Tighten shaft bracket nuts.

NOTE — Hold rocker arm springs with a wrench while tightening nuts to prevent damaging springs.

VALVE CLEARANCE

With No. 1 or No. 4 cylinder piston at top dead center, loosen lock nut and adjust intake valves to .006" (.15 mm), and ex-

haust valves to .010" (.25 mm). When valves are correctly adjusted reset lock nut.

Valve Adjustment Sequence

Application	Intake/Cylinder	Exhaust/Cylinder
No. 1 @ TDC	1,2	1,3
No. 4 @ TDC	3,4	2,4

PISTONS, PINS & RINGS

OIL PAN

Removal & Installation — Disconnect battery ground cable and drain engine oil. Remove front splash shield and front crossmember. Disconnect and lower relay rod at idler arm. Remove left hand bell-housing brace and disconnect vacuum line at oil pan. Remove oil pan bolts and lower pan from engine. To install, reverse removal procedure.

NOTE — To remove pan on 4-wheel drive models, engine must be removed from vehicle.

PISTON & ROD ASSEMBLY

Removal & Installation — 1) With cylinder head and pan removed, mark piston, connecting rods and bearing caps on starter side for assembly order. Scrape carbon deposits from upper part of cylinder wall.

2) Remove connecting rod bearing cap nuts and bearing cap. Using a wood rod, push piston, together with connecting rod, upward. Removal sequence is 1, 4, 2, & 3.

NOTE — Ensure piston and connecting rod are pulled parallel to cylinder wall.

3) To install piston and rod assembly, position piston so notch mark on crown of piston is facing front of engine. Align cylinder number marks on connecting rods so they will be on right-hand side of front mark on piston.

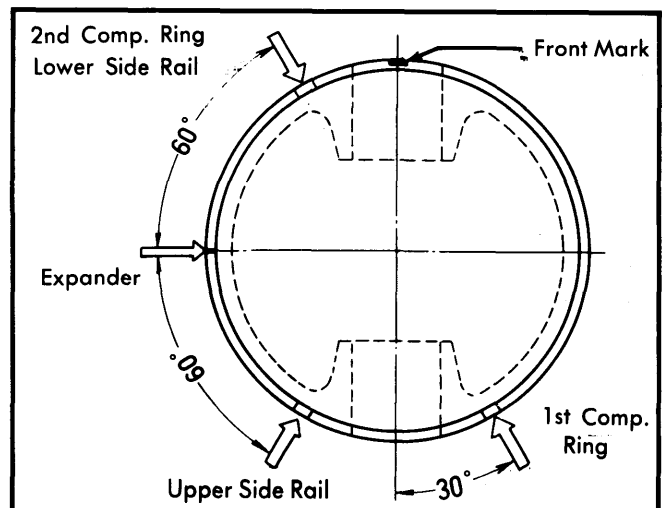


Fig. 6 Piston Ring Gap Arrangement

PISTON PIN

Removal — Using a press and piston pin removal tool set (J-25270), press piston pin out of piston and connecting rod assembly.

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Installation — Install new pin by placing pilot through piston and connecting rod. Lightly oil piston pin and place piston, rod, pin, and ram on press base. Press in pin until its centered in connecting rod.

PISTON RINGS

1) Assemble piston rings to piston with a piston ring expander. When replacing piston rings, position compression rings so that "NPR" or "TOP" mark is turned up. The expander ring and side rail is not marked.

2) Install oil control ring in this order; expander ring, lower side rail, and upper side rail. After installing all rings, apply clean engine oil to the entire rings. Check that rings turn smoothly in their ring grooves.

FITTING PISTONS

1) Measure piston at right angles to piston pin, 1.575" (40 mm) below piston head. Measure bore diameter at lower section, where least wear occurs. If clearance exceeds specifications, pistons must be replaced.

2) Measure weight of assembled piston-rod assembly. Variance between assemblies must not exceed .42 oz. (.01 kg). If correction is necessary, arched portions of connecting rod bearing caps may be ground to reduce weight.

Piston Class		
Piston Size	Piston Grade	Piston Diameter
Standard	A	3.3049-3.3053 (83.944-83.955)
Standard	B	3.3053-3.3057 (83.955-83.965)
Standard	C	3.3057-3.3061 (83.965-83.975)
Standard	D	3.3061-3.3065 (83.975-83.985)

NOTE — Pistons are available in .020" (0.5 mm) and .040" (1.0 mm) oversize.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

MAIN & CONNECTING ROD BEARING SERVICE

NOTE — The following procedure is with engine, cylinder head, timing cover, oil pan, and timing chain removed.

Connecting Rod Bearings — After ensuring rod caps are marked for cylinder identification, remove rod caps. Use Plastigage method to check for proper clearance. If not within specifications, new bearings must be installed. New bearings are available in standard, .010", and .020".

NOTE — Always replace bearings in pairs. Never use a new bearing in combination with a used bearing.

Main Bearings — 1) With all bearing caps (except one being checked) tight, check clearances using Plastigage method. If clearances are excessive, undersized bearings will have to be installed. Remove upper bearings by inserting tool into oil hole of crankshaft and rotating crankshaft clockwise to roll bearing from engine.

2) To check crankshaft out of round place crankshaft on two "V" shaped blocks at No. 1 and No. 5 journals. Hold dial indicator in contact with No. 3 journal and slowly turn crankshaft, recording highest point on journal. Replace crankshaft if bend exceeds .0038" (.097 mm). Standard assembly value is .0012" (.030 mm) or less.

3) To check crankshaft end play, place bearings and crankshaft in crankcase. Install thrust bearing on both sides of No. 3 crankshaft journal. Shift crankshaft endwise and measure clearance between thrust bearing and journal side face. If clearance is greater than .0117" (.297 mm), install oversize thrust bearings. Standard value is .0024-.0094" (.061-.239 mm).

4) Install bearing caps so that arrow mark on rear face of each bearing cap is turned to front of engine. Bearings should be well lubricated prior to installation. Tighten in 2 steps in sequence of 3, 4, 2, 5 and 1.

REAR MAIN OIL SEAL

Removal — Remove oil pan and transmission. Remove clutch (if equipped). Remove starter and flywheel assembly. Remove seal retainer bolts and pry seal out of retainer.

Installation — To install, reverse removal procedure noting the following: Fill clearance between lips of seal with grease, and coat lips of seal with engine oil. Place retainer on flat surface and drive seal into place using suitable seal installer tool (J-22354).

ENGINE OILING

ENGINE OILING SYSTEM

Trochoid type oil pump is designed to deliver 3.7 gallons of oil per minute through the engine at a pump speed of 1400 RPM. Lubricating system is designed to deliver oil at a rate of 57 psi.

Crankcase Capacity — 4.2 qts. with filter.

Oil Filter — Full-flow disposable canister type.

Normal Oil Pressure — 57-71 psi (4-5 kg/cm²) at 2800 RPM.

Relief Valve — Located on side of cylinder block near oil filter. Opening pressure is 57-71 psi (4-5 kg/cm²).

OIL PUMP

NOTE — Oil pump can be serviced with engine in or out of vehicle. Procedure given is with engine in vehicle.

Removal — Remove front cover, distributor, and oil pan as outlined previously. Remove oil pickup tube. Remove oil pump mounting bolts and remove pump assembly.

Inspection — 1) Measure tip clearance with a feeler gauge, between drive rotor and driven rotor. Replace entire pump assembly if clearance is greater than .0079" (.2 mm).

2) Measure clearance between driven rotor and inner wall of pump body. Replace entire pump assembly if clearance is greater than .0098" (.249 mm).

3) Using a square and a feeler gauge, measure clearance between drive rotor, driven rotor, and oil pump cover. Replace entire pump assembly if clearance is greater than .0079" (.2 mm). Inspect all parts wear or damage.

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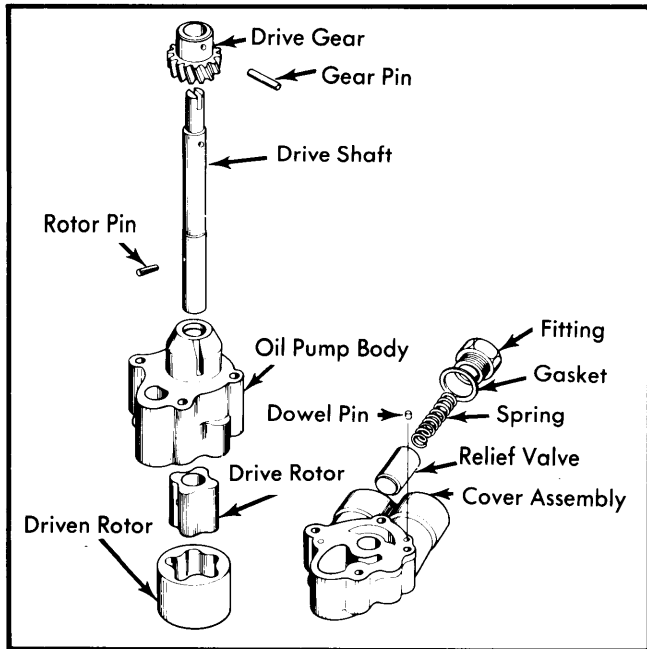


Fig. 7 Exploded View of Oil Pump Assembly

Installation – 1) Align mark on camshaft with mark on No. 1 rocker arm shaft bracket. Align notch on crankshaft pulley with "O" mark on front cover. When the two sets of marks are aligned, No. 4 cylinder is at top dead center on compression stroke.

2) Install driven rotor so that alignment mark aligns with mark on the drive rotor. Engage drive gear with pinion gear on crankshaft so alignment mark is turned rearward and is away from crankshaft by approximately 20° in clockwise rotation.

3) When oil pump is installed, make sure mark on drive gear is turned to rear side as viewed from the clearance between front cover and cylinder block. Slit at end of shaft must be parallel with front face of cylinder block, and is offset as viewed through distributor fitting hole.

4) Install pump cover by fitting it to the dowel pins, then install mounting bolts. Install relief valve assembly and rubber hose on cover. Reverse removal procedure.

ENGINE COOLING

WATER PUMP

Disconnect negative battery cable. Remove lower cover. Drain cooling system. If equipped with air conditioning, remove fan and air pump drive belt. Remove fan, fan pulley, and air pump drive pulley. Remove set plate and pulley. On all other models remove fan nuts and fan. On all models, remove attaching bolts and water pump from vehicle.

Thermostat – Opens at about 180°F (82°C).

Cooling Capacity – 6.4 quarts with automatic transmission; 6.8 quarts with manual transmission.

Pressure Cap – 15 psi (1.1 kg/cm²).

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS										
Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1981	110.8	1816	1x2-Bbl.	80 @4800	95 @3000	8.5:1	3.31	84	3.23	82

VALVES							
Engine & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Min. Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
1816 cc Int.	1.59 (40.3)	45°	45°	.047-.063 (1.19-1.60)	.3102 (7.88)	.0009-.0022 (.023-.056)
Exh.	1.34 (34.0)	45°	45°	.047-.063 (1.19-1.60)	.3091 (7.85)	.0015-.0031 (.038-.079)

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ENGINE SPECIFICATIONS (Cont.)

PISTONS, PINS, RINGS						
Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Rings	End Gap In. (mm)	Side Clearance In. (mm)
1816 cc	.0018-.0026 (.046-.066)	Press Fit	.0024 (.061)	1	.008-.016 (.20-.41)
				2	.008-.016 (.20-.41)
				Oil	.008-.035 (.20-.89)

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
1816 cc	2.205 (56.01)	.0008-.0025 (.020-.063)	No. 3	.012 (.30)	1.929 (48.99)	.0007-.0030 (.017-.076)	.011 (.28)

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1816 cc	1.3362-1.3368 (33.94-33.95)	.0024 ① (.061)

① — End Play .002-.006" (.05-.15 mm)

VALVE TIMING				
Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
1816 cc	21°	65°	55°	20°

VALVE SPRINGS				
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)		
		Valve Closed	Valve Open	
1816 cc	Inner	1.78 (45.2)	21.5 @ 1.52 (9.7 @ 38.6)
	Outer	1.85 (47.0)	37.0 @ 1.61 (16.8 @ 40.9)

TIGHTENING SPECIFICATIONS	
Application	Ft. Lbs. (N·m)
Camshaft Sprocket	58 (79)
Connecting Rod Bearings	43 (58)
Cylinder Head	
Step 1	61 (83)
Step 2	72 (98)
Flywheel	69 (94)
Main Bearings	72 (98)
Rocker Arm Shaft Bracket Nuts	16 (22)