1.9L 4-CYL - VIN [A], 2.0L TURBO [F], 2.3L 4-CYL [L]

1986 Isuzu Trooper II

1986 ISUZU ENGINES
1.9L, 2.0L Turbo & 2.3L 4-Cylinder

Impulse, P'UP, Trooper II

*** PLEASE READ THIS FIRST ***

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

ENGINE CODING

ENGINE IDENTIFICATION

Engine may be identified by the eighth character of the Vehicle Identification Number (VIN). The VIN is stamped on a metal tab, located on top of instrument panel at lower left of windshield. Engine serial number is stamped on a machined pad on engine block.

ENGINE IDENTIFICATION CODES TABLE

Application	VIN Code
1.9L 4-Cylinder	
P'UP & Impulse	A
2.0L 4-Cylinder Turbo	
Impulse	F
2.3L 4-Cylinder	
P'UP & Trooper II	L

ENGINE, MANIFOLDS & CYLINDER HEAD

ENGINE

Removal (P'UP & Trooper II)

1) Disconnect battery cables. Scribe hinge positions on hood. Remove hood. Remove lower engine cover. Drain crankcase oil and cooling system.

2) Disconnect PCV hose from air cleaner. Disconnect hose from air injection pump. Remove air cleaner duct. Remove air cleaner bolts and wing nut. Lift air cleaner to disconnect TCA hose at air cleaner. Remove air cleaner.

3) Remove intake manifold cover. Disconnect alternator wiring. Disconnect exhaust pipe from exhaust manifold. Loosen clutch control cable adjustment nut.

4) Disconnect heater hose to temperature control valve (if equipped). Disconnect oxygen sensor wiring (if equipped). Disconnect hose at air switching valve and vacuum switching valve (if equipped). Disconnect heater hoses at heater core tubes.

5) Disconnect control cable from heater temperature control valve. Remove control valve (if equipped). Remove left engine mount nut. Install Engine Hanger (J-26555). Use exhaust manifold studs to mount hanger.

6) Disconnect engine ground cable. Disconnect fuel hoses at carburetor. Remove coil high tension wire. Disconnect vacuum hose from rear of intake manifold. Disconnect canister vacuum hoses (if

equipped). Disconnect accelerator control cable from carburetor.

7) Disconnect starter motor wiring. Disconnect temperature sensor, oil pressure switch and distributor wiring. Disconnect hose at vacuum switch (if equipped). Disconnect temperature switch and ground wire from rear of intake manifold (if equipped).

8) Disconnect hose from solenoid valve (if equipped). Disconnect EFE heater wiring, carburetor solenoid and choke wiring. Disconnect back-up light switch and transmission switch wiring at rear of engine.

9) Disconnect ECS hose from engine oil pan (if equipped). Remove right engine mount nut. Raise engine slightly and remove left engine stop plate. On 4WD models, separate engine from transmission.

10) Discharge A/C system and disconnect A/C compressor lines (if equipped). Disconnect radiator hoses, fan shroud, radiator and fan blade assembly. Remove gearshift lever assembly from passenger compartment. Remove parking brake cable return spring. Disconnect parking brake cable.

11) Remove drive shaft. Remove clutch cable return spring. Disconnect clutch cable and remove cable from engine holder. Remove front exhaust pipe bracket from transmission. Disconnect side exhaust pipes. Remove front pipe.

12) Disconnect speedometer cable. Raise engine slightly. Remove rear engine mount bolts. On 4WD models, remove engine from vehicle. On all other models, remove engine and transmission from vehicle.

Installation

To install, reverse removal procedure.

Removal (Impulse)

1) Disconnect battery cables. Disconnect relay box cables (if equipped). Disconnect headlight drive motor wiring. Remove hood strut. Scribe hinge positions on hood and remove hood. Remove lower engine cover. Drain crankcase oil and cooling system. Remove lower and upper radiator hoses. Disconnect transmission oil cooler line (if equipped).

2) Discharge A/C system. Disconnect receiver-drier line. Disconnect A/C compressor line at condenser. Remove A/C compressor and set aside. Remove air duct-to-cylinder head cover/turbocharger (if equipped). Remove throttle body/intercooler air duct hose (if equipped). Disconnect accelerator cable at throttle body. On turbo models, disconnect air duct-to-intercooler hose.

3) Disconnect injection pipe-to-pressure regulator hose. Disconnect fuel hose from fuel injection line at rear of engine. Disconnect canister purge hoses from vacuum chamber and at 3-way connector. Disconnect vacuum switching valve hoses from vacuum chamber and at 3-way connector.

4) Disconnect wiring from fender skirt to cylinder head. Remove coil high tension wire. On models with digital instrument panel, disconnect boost sensor wiring and vacuum hose.

5) Disconnect oil pressure sending unit, oil pressure switch and coolant temperature sensor wiring. Disconnect knock sensor and I-TEC wiring. Disconnect crankshaft position sensor wiring at distributor. Disconnect starter wiring and engine-to-rear crossmember ground cable.

6) Remove right engine mount nut. Remove air intake duct at front of engine. Remove radiator reservoir hose. Disconnect alternator and oxygen sensor wiring. Disconnect cruise control-to-vacuum chamber hose. Disconnect automatic transmission control wiring (if equipped).

7) Disconnect power brake unit vacuum hose from intake manifold. Disconnect heater hoses. Remove heat shield from left engine mount and remove mount bolt. Disconnect power steering lines.

Remove drive shaft. Disconnect speedometer cable. Disconnect shift lever from automatic transmission (if equipped).

8) Remove clutch slave cylinder from manual transmission (if equipped). Remove exhaust pipe bracket and catalytic converter. Disconnect exhaust pipe from exhaust manifold. Support engine and remove rear engine mount. Remove engine and transmission from vehicle.

Installation

To install, reverse removal procedure.

INTAKE MANIFOLD

Removal (P'UP & Trooper II)

1) Drain cooling system. Remove air cleaner assembly. Disconnect radiator, fuel and vacuum hose from intake manifold. Disconnect heater hoses at firewall and from rear of intake manifold. Disconnect accelerator cable from carburetor.

2) Disconnect distributor vacuum hose, temperature sending unit and temperature switch wiring. Disconnect choke and solenoid wiring from carburetor. Disconnect ground wire and canister purge hose.

3) Disconnect EFE heater wiring and PCV hose from valve cover. Disconnect EGR pipe from EGR valve. Disconnect air injection vacuum hose from 3-way connector. Remove intake manifold and carburetor assembly.

Installation

To install, reverse removal procedure.

Removal & Installation (Impulse)

Drain cooling system. Disconnect top radiator hose. Remove A/C compressor and bracket (if equipped). Disconnect EGR pipe from rear of intake manifold. Disconnect throttle body cable, wiring, fuel and vacuum hoses. Remove intake manifold and throttle body/intercooler as an assembly. To install, reverse removal procedure.

EXHAUST MANIFOLD

Removal & Installation (P'UP & Trooper II)

Remove air cleaner bolts and loosen clamp bolt. Lift air cleaner to remove hot air hose. Remove heat shield. Remove EGR pipe clamp from top of transmission and disconnect EGR pipe. Disconnect exhaust pipe and oxygen sensor wiring (if equipped). Remove exhaust manifold. To install, reverse removal procedure.

Removal & Installation (Impulse)

Disconnect EGR pipe. Remove heat shield. Disconnect exhaust pipe. Disconnect oxygen sensor wiring. On turbo models, disconnect oil supply, water supply and return lines at turbocharger. Separate turbocharger from exhaust manifold. Remove exhaust manifold. To install, reverse removal procedure.

CYLINDER HEAD

NOTE: A timing belt is used on 2.0L turbo and 2.3L models. A timing chain is used on 1.9L models.

Removal (1.9L Models)

1) Remove valve cover, gasket and front plug. Remove camshaft sprocket bolt. Position timing chain and sprocket between guide and tensioner. Insert a screwdriver along right side of chain and depress tensioner lock lever rearward. Push in on tensioner

adjustment shoe and lock tensioner in retracted position by releasing lever.

2) Start with outer nuts and work inward to loosen camshaft brackets. Remove camshaft brackets and nuts. Remove cylinder head-to-front cover bolts. Starting with outer bolts and working inward, loosen cylinder head bolts using Head Bolt Wrench (J-24239-01). Remove cylinder head and gasket.

Removal (2.0L & 2.3L Models)

1) Remove tension spring and loosen tensioner adjusting bolt. Move tension sprocket toward water pump. Remove timing belt, sprocket, tensioner and spring. Hold camshaft sprocket stationary and remove camshaft sprocket nut. Remove sprocket and guide plate. Repeat procedure for oil pump sprocket.

2) Start with outer nuts and work inward to loosen camshaft brackets. Remove camshaft brackets and nuts. Remove cylinder head-to-front cover bolts. Starting with outer bolts and working inward, loosen cylinder head bolts using Head Bolt Wrench (J-24239-01). Remove cylinder head and gasket.

Installation (All Models)

1) Clean gasket surfaces. Clean head bolts and threads in cylinder block. Install new head gasket with side marked "TOP" up. Apply a thin coat of engine oil to head bolt threads. Install cylinder head, but do not tighten bolts.

2) Apply a thin coat of oil to front cover bolts and install. Tighten cylinder head bolts and front cover bolts to specifications. Tighten cylinder head bolts in sequence. See Fig. 2. Reverse removal procedure to complete installation.

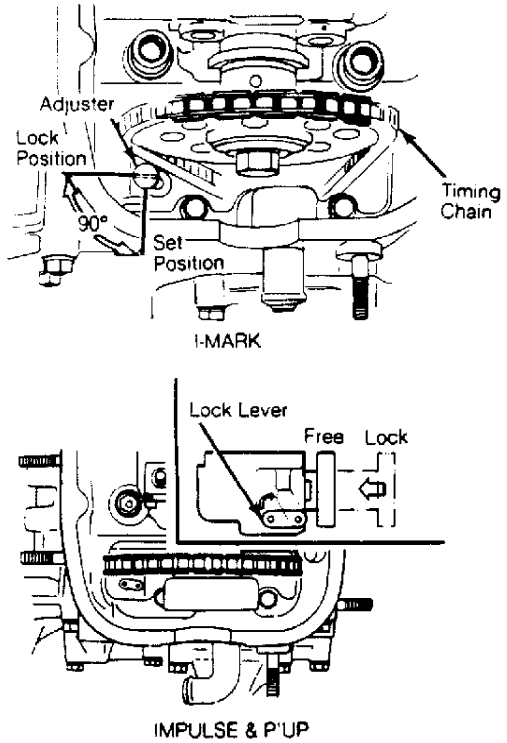
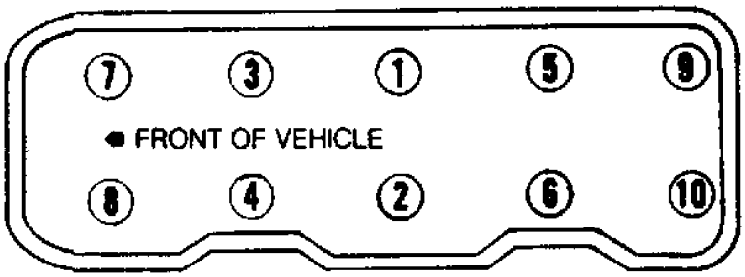
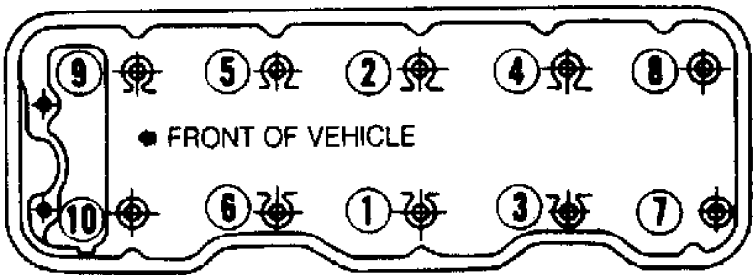


Fig. 1: Locking Timing Chain Tensioner on 1.9L models
Courtesy of Isuzu Motor Co.



2.0L & 2.3L ENGINE



1.9L ENGINE

Fig. 2: Cylinder Head Tightening Sequence 2.3L & 2.0 Turbo
Courtesy of Isuzu Motor Co.

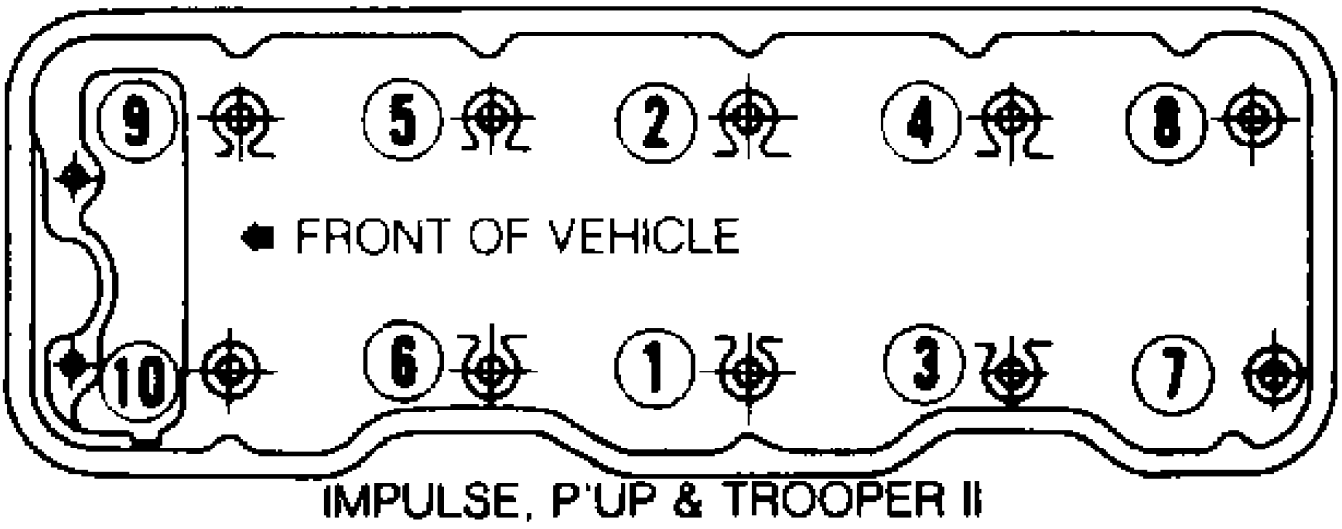


Fig. 3: Cylinder Head Tightening Sequence 1.9L
Courtesy of Isuzu Motor Co.

CAMSHAFT

ENGINE FRONT COVER

Removal (1.9L Models)

Remove cylinder head as previously outlined. Remove oil pan. Remove oil pump pick-up tube. Remove drive belts. Remove vibration damper assembly. Remove A/C compressor and mounting brackets (if equipped). Remove distributor.

Installation

1) Clean gasket surfaces. Install new front cover gasket. Align center of dowel pin with alignment mark on oil pump case. See Fig. 4.

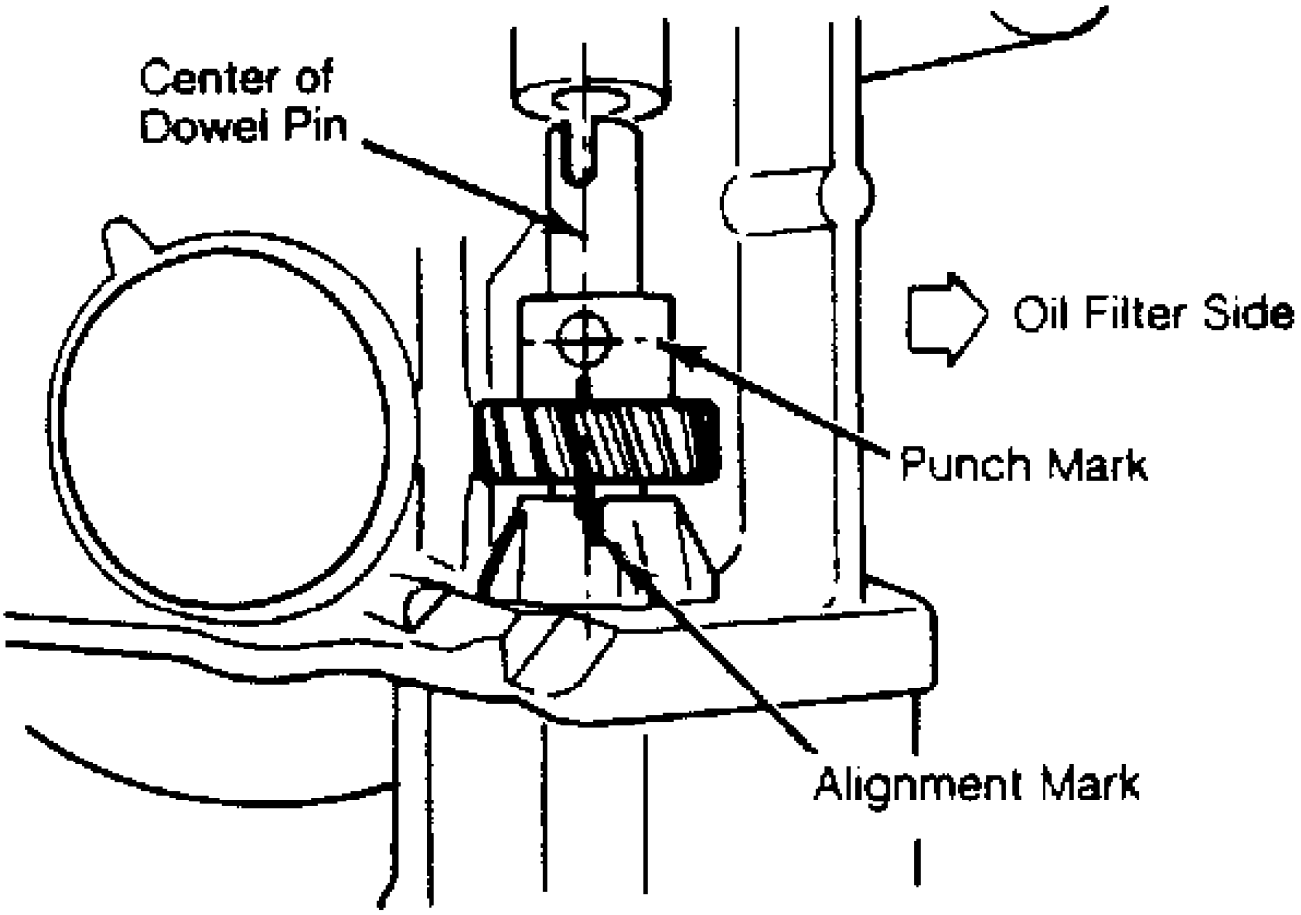


Fig. 4: Aligning Oil Pump for Front Cover Installation on 1.9L Models
Courtesy of Isuzu Motor Co.

2) Position No. 1 and 4 pistons on TDC. Install front cover by engaging pinion gear with oil pump drive gear on crankshaft. Ensure that punch mark on oil pump drive gear is toward engine. Mark may be seen through clearance between front cover and block with oil pan removed.

3) Ensure that slot at end of oil pump shaft (as viewed from top of front cover) is parallel with front face of cylinder block. Offset must be forward. Reverse removal procedure to complete installation.

FRONT COVER/TIMING BELT COVER OIL SEAL

Removal

Disconnect negative battery cable. Drain cooling system. Disconnect radiator hoses. Remove radiator. Remove all drive belts. Remove fan. Remove vibration damper assembly. Pry seal out of front cover/timing belt cover.

Installation

Using Seal Installer (J-26587), install new seal in cover. Coat oil seal lip with oil. Reverse removal procedure to complete installation.

TIMING CHAIN & SPROCKETS (1.9L MODELS)

Removal

Remove front cover. Lock chain tensioner in retracted position. Remove timing chain from sprockets.

Inspection

1) Check camshaft and crankshaft sprockets for wear or damage. If crankshaft sprocket replacement is required, remove sprocket using Puller (J-25031).

2) Using spring scale, check timing chain for stretch. Apply 22 lbs. (10 kg) of tension to chain and measure length of 40 chain links. See Fig. 5.

3) Length of chain should be 15" (381 mm). If length exceeds 15 5/32" (385 mm), replace chain. Check chain tensioner, tensioner guide pins, guide rail, and chain guide for wear. Replace as necessary.

4) Ensure that tensioner guide rail and chain tensioner move freely on guide pins. Ensure that oil jet in chain guide is not plugged. If oil jet is removed, install oil jet with hole pointing toward crankshaft.

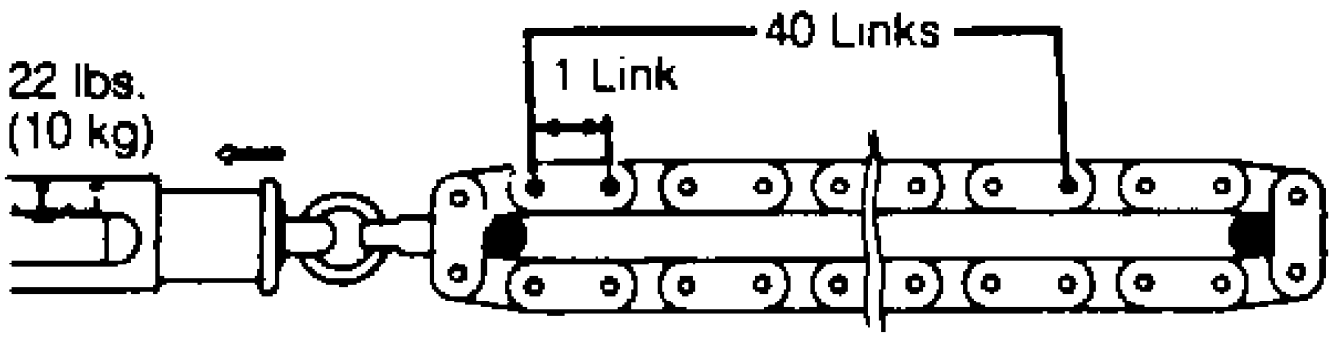


Fig. 5: Timing Chain Stretch Test On 1.9L Models
Courtesy of Isuzu Motor Co.

Installation

1) Install timing sprocket and pinion gear with grooved side toward front cover. Turn crankshaft so that key groove is facing upward (No. 1 piston on TDC).

2) Install timing chain by aligning chain marked plate with mark on crankshaft sprocket. Ensure that side of chain with most links between marked plates is on chain guide side of engine. See Fig. 6.

3) Install chain on camshaft sprocket. Ensure that marked plate aligns with triangular mark on sprocket. Install sprocket on

camshaft. Ensure that marks on sprockets are still aligned with marked plates. Reverse removal procedure to complete installation.

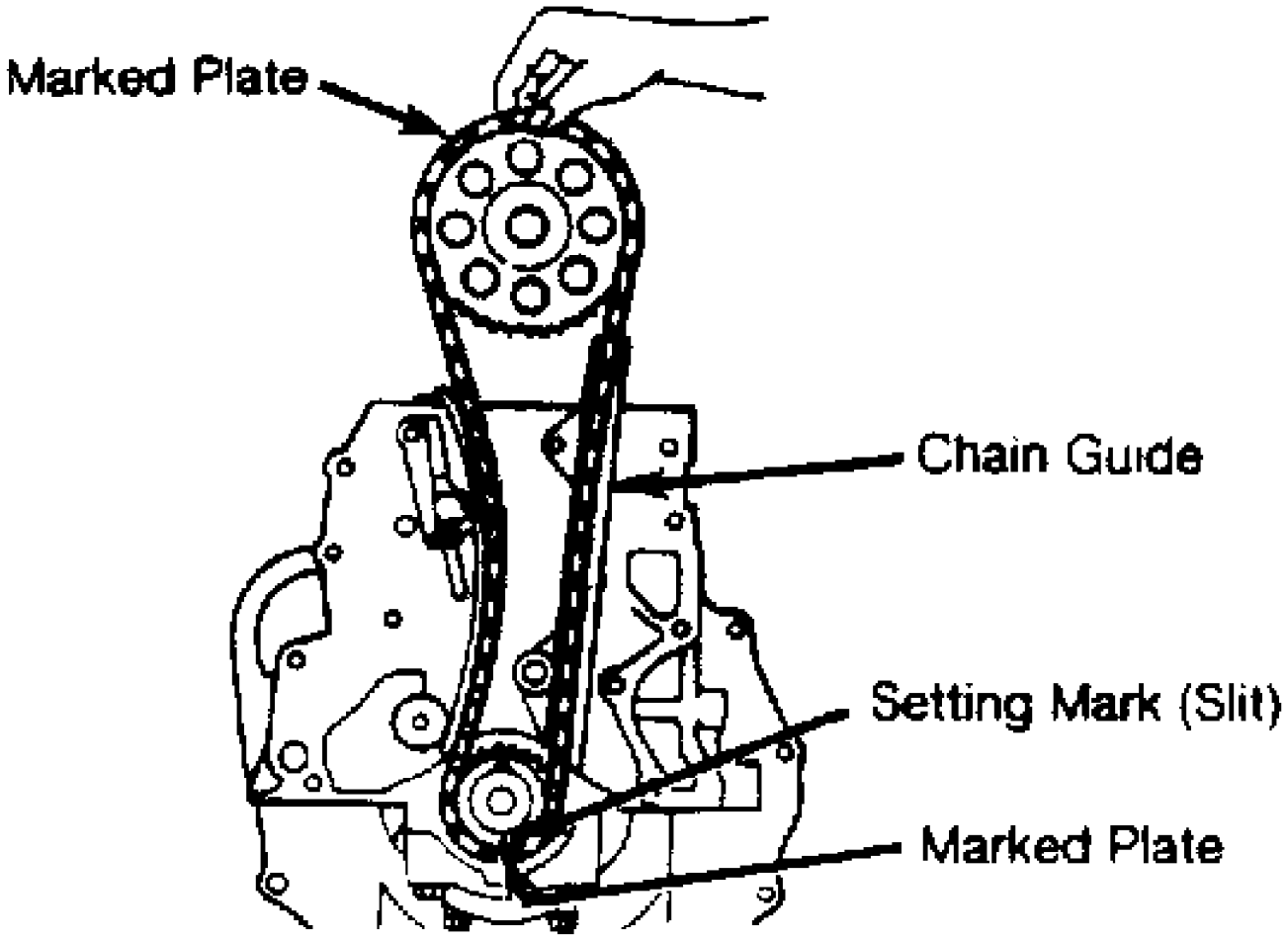


Fig. 6: Aligning Timing Chain & Sprockets on 1.9L Models
Courtesy of Isuzu Motor Co.

NOTE: Install timing chain with most links between marked plates on chain guide side of engine.

TIMING BELT & SPROCKETS (2.0L TURBO & 2.3L MODELS)

Removal

1) Remove timing belt cover as previously outlined. Remove spring from tension pulley. Loosen adjusting bolt and move pulley toward water pump. Remove timing belt. Remove tension pulley and spring. Remove crankshaft timing pulley and guide plate.

2) Secure camshaft sprocket and remove camshaft sprocket nut. Remove sprocket and guide plate. Repeat procedure for oil pump sprocket. Remove oil pump and water pump. Remove engine front cover.

Inspection

1) Timing belt must be handled carefully. Do not bend belt in an arc less than .79" (20 mm) in radius. Avoid twisting or kinking belt. Do not allow belt to become contaminated by water, oil, dust or other contaminates.

2) Inspect belt for cracks or cuts on front and rear surfaces, abnormal wear on sides, cracked or frayed areas on front of

belt (ribbed side) and abnormal wear on ribs. Replace belt if any of these conditions are present.

3) Using a rubber hardness tester, measure hardness of belt at 3-5 places around circumference of belt. If any single measurement exceeds reading of "90" on tester, replace belt.

4) Measure outside diameter of crankshaft, camshaft, oil pump sprockets and tensioner. If specifications are exceeded, replace sprocket. See TIMING SPROCKET SPECIFICATIONS table.

5) Measure tension pulley spring length and force. If length exceeds 3.105" (78.87 mm) or force is less than 53-57 lbs. (24-26 kg), replace spring.

TIMING SPROCKET SPECIFICATIONS TABLE

Application	Standard In. (mm)	Limit In. (mm)
Camshaft	5.202 (132.03	5.198 (131.93)
Crankshaft	2.574 (65.33)	2.570 (65.23
Oil Pump	4.485 (113.84)	4.481 (113.74)
Tensioner	2.364 (60.00)	2.356 (59.80)

Installation

1) Install engine front cover and water pump. Coat oil pump rotor with engine oil and install rotor with chamfered side facing cylinder body. Coat "O" ring with engine oil and insert in housing groove. Mount housing and tighten bolts to specification. Rotate pump. If oil pump does not rotate smoothly, replace pump.

2) Install oil pump sprocket. Install camshaft guide plate and camshaft sprocket. Hold sprocket stationary and tighten mounting bolt. Install crankshaft timing sprocket with keyway at 12 o'clock position. Install tension sprocket and spring. Push sprocket assembly toward water pump and temporarily tighten mounting bolt.

3) Rotate crankshaft until mark on timing sprocket aligns with mark on front oil seal retainer. Rotate camshaft sprocket until timing mark aligns with mark on front plate. Ensure No. 4 cylinder is at TDC on compression stroke. See Fig. 7.

4) Position timing belt over crankshaft sprocket, oil pump sprocket, camshaft sprocket and tensioner. Ensure that belt is positioned in sequence given and without slack between sprockets. Loosen tension sprocket adjusting bolt to allow spring tension to tighten belt. Tighten adjusting bolt.

5) Install crankshaft damper and rotate crankshaft 2 complete revolutions in opposite direction of engine rotation until marks on crankshaft timing pulley and front oil seal retainer are aligned. Loosen tension adjusting bolt. Tighten timing belt to specification. Tighten adjusting bolt.

6) Install timing belt cover. Install crankshaft damper assembly. To complete installation, reverse removal procedure. Install all drive belts. Set valves to cold clearance.

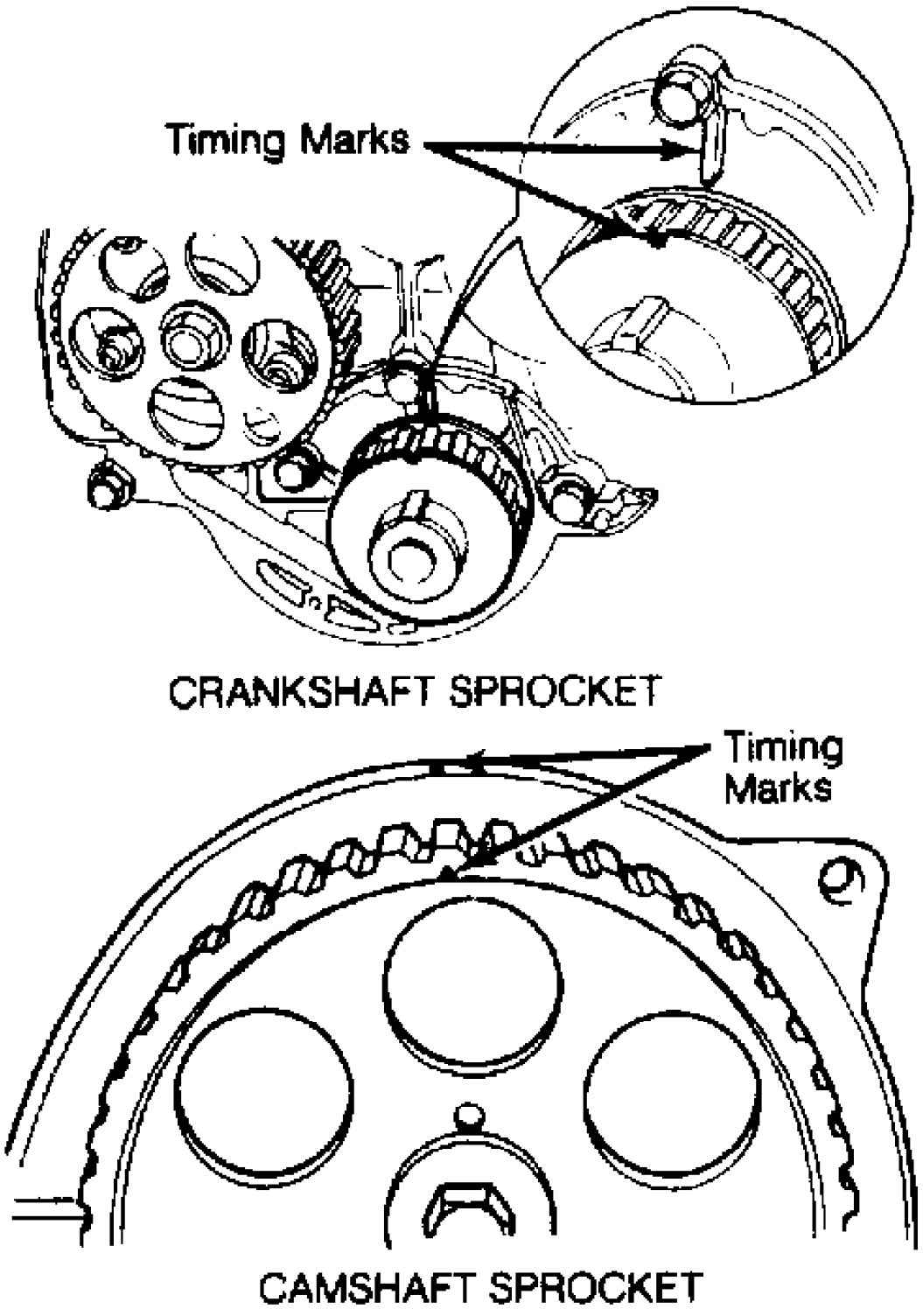


Fig. 7: Aligning Timing Belt Sprockets on 2.0L & 2.3L Models
Courtesy of Isuzu Motor Co.

CAMSHAFT

Removal

1) On 1.9L models, remove valve cover. Remove mechanical fuel pump (if equipped). Rotate camshaft until No. 4 cylinder is on TDC of compression stroke. Remove distributor cap and mark rotor position on housing. Lock timing chain tensioner by depressing and turning slide pin 90 degrees clockwise. See Fig. 1.

2) Check chain for slack after locking tensioner. Remove fuel pump drive cam (if equipped) and camshaft sprocket with timing chain attached. DO NOT separate chain and sprocket.

3) On 2.0L turbo and 2.3L models, remove valve cover and cylinder head as previously outlined. Rotate crankshaft until No. 4 piston is at TDC of compression stroke. Remove timing belt cover and timing belt. Remove camshaft timing sprocket and guide plate.

4) On all models, remove rocker arm shaft and bracket assembly. Remove camshaft.

Inspection

1) Inspect camshaft lobes and journals for wear or damage. Measure height of camshaft lobes. Replace camshaft if measurement is less than 1.432" (36.37 mm).

2) Measure camshaft journals. If journal diameter is less than 1.331" (33.83 mm) or if difference between largest and smallest journal is more than .002" (.05 mm), replace camshaft.

3) Place camshaft on "V" blocks and check runout at center journal. If runout exceeds .004" (.10 mm), replace camshaft. A slight amount of runout can be corrected with a press. DO NOT apply heat.

Installation

1) Apply heavy coat of engine oil to camshaft journals and bearing surfaces. Install camshaft and rocker arm shaft brackets so that mark on camshaft thrust flange is aligned with mark on No. 1 rocker arm shaft bracket. Ensure that crankshaft sprocket mark is aligned with TDC mark on front cover.

2) Reverse removal procedure to complete installation. Ensure that rotor and mark on distributor housing are aligned when No. 4 cylinder is in firing position. Check that crankshaft sprocket mark is aligned with TDC mark on front cover.

CAMSHAFT BEARINGS

Measure camshaft journal diameters. Measure camshaft bearing inside diameter. Install rocker arm shaft brackets. Tighten nuts to 16 ft. lbs (22 N.m). If bearing clearance is greater than .006" (.15 mm), replace worn components.

CAMSHAFT END PLAY

Remove rocker arm shaft assembly to relieve load on camshaft. Install camshaft. Measure camshaft end play using a dial indicator. If end play exceeds .008" (.20 mm), check camshaft thrust flange or thrust groove in head for wear. Replace worn components.

VALVES

VALVE ARRANGEMENT

Right Side - Intake valves.
Left Side - Exhaust valves.

ROCKER ARM SHAFT ASSEMBLY

Removal

Remove valve cover. Starting with outer nuts and working inward, loosen rocker arm shaft brackets. Disassemble rocker arm shaft assembly by removing springs from shafts. Remove rocker arm brackets and rocker arms. Keep parts in order for reassembly.

Inspection

1) Place rocker arm shaft on "V" blocks and check runout at center of shaft. Maximum runout should not exceed .008" (.20 mm). A slight amount of runout can be corrected with a press. DO NOT apply heat. Replace shaft if runout is greater than .016" (.41 mm).

2) Measure rocker arm shaft diameter at 4 rocker arm locations. Replace shaft if diameter is less than .801" (20.35 mm). Measure inside diameter of rocker arms. If clearance is greater than .008" (.20 mm), replace either rocker arms or shaft. Replace rocker arms if valve stem contact area is scored or worn.

Installation

1) Reassemble rocker arm shaft components in original positions. Cylinder number on upper face of brackets must point toward front of engine. Longer rocker shaft must be installed on exhaust side. Punch marks on rocker arm shafts must face front and point up.

2) Coat rocker arm shaft, rocker arms, and valve stems with engine oil. Install rocker arm shaft assembly on cylinder head. Align camshaft mark with mark on No. 1 rocker arm shaft bracket. On turbo models, apply silicon gasket material to No. 1 rocker arm bracket mounting surface on cylinder head.

3) Starting with inner nuts and working outward, tighten brackets in steps. Adjust valve clearance and install valve cover.

VALVE SEAT INSERTS

Inspection

With valves installed in cylinder head, check depth of valve head below cylinder head surface. If depth is more than .067" (1.70 mm), replace valve seat insert.

Removal

Weld a bead at several points on inner face of valve seat insert, away from aluminum alloy parts. Allow cylinder head to cool for 2-5 minutes. Loosen valve seat insert by striking beads. Pull out inserts.

Installation

Clean valve seat insert recess. Heat cylinder head with steam to expand insert area. Chill valve seat with dry ice and press insert into head. Interference fit is .0031-.0047" (.079-.119 mm).

VALVE GUIDES

Inspection

Measure valve guide and corresponding valve for wear. If stem-to-guide clearance is greater than .008" (.20 mm) on intake valves or .0097" (.246 mm) on exhaust valves, replace valve guides and valves as necessary.

Removal

Working from combustion chamber side of head, use Valve Guide Driver (J-26512-1) to drive guide out of head. Remove lower spring seat.

Installation

Lubricate outside of new guide with engine oil. Working from

camshaft side of head, drive valve guide into place until driver bottoms on cylinder head. Valve guide installed height should be .634-.642" (16.10-16.30 mm) above cylinder head surface.

VALVE SPRINGS

Removal

1) Remove rocker arm shaft assembly. Remove spark plug of cylinder to be serviced. Install air hose and adapter into spark plug hole and apply air pressure.

2) Use Valve Spring Compressor (J-26513-A) to remove keepers, retainers and springs. Remove valve stem oil seals and lower spring seats.

Inspection

1) Measure valve spring free length. Test valve spring tension with a valve spring tester. If valve spring exceeds specifications, replace spring.

2) Using a flat surface and steel square, check valve spring for squareness. Slowly rotate spring and take measurement between top of spring and square. If spring is more than .0827" (2.100 mm) out-of-square, replace spring.

Installation

Lubricate valve stem and lower spring seat. Install lower spring seat. Slide new seal over valve stem and onto guide. Ensure that oil seal lip fits into groove in valve guide. To complete installation, reverse removal procedure.

VALVE CLEARANCE ADJUSTMENT

Ensure that rocker arm shaft brackets are tightened to specifications. Set No. 1 piston at TDC of compression stroke. Adjust clearance of No. 1 and No. 2 intake, and No. 1 and No. 3 exhaust valves. Turn crankshaft 360 degrees to place No. 4 piston on TDC of compression stroke. Adjust remaining valves.

VALVE CLEARANCE ADJUSTMENTS TABLE

Application	In. (mm)
Cold	
Intake	.006 (.15)
Exhaust	.010 (.25)
Hot	
Intake	.008 (.20)
Exhaust	.012 (.30)

PISTONS, PINS & RINGS

OIL PAN

Removal & Installation

Remove engine from vehicle. Remove oil pan. When installing oil pan, apply a thin coat of non-hardening sealer to engine block. See Fig. 8. Install engine.

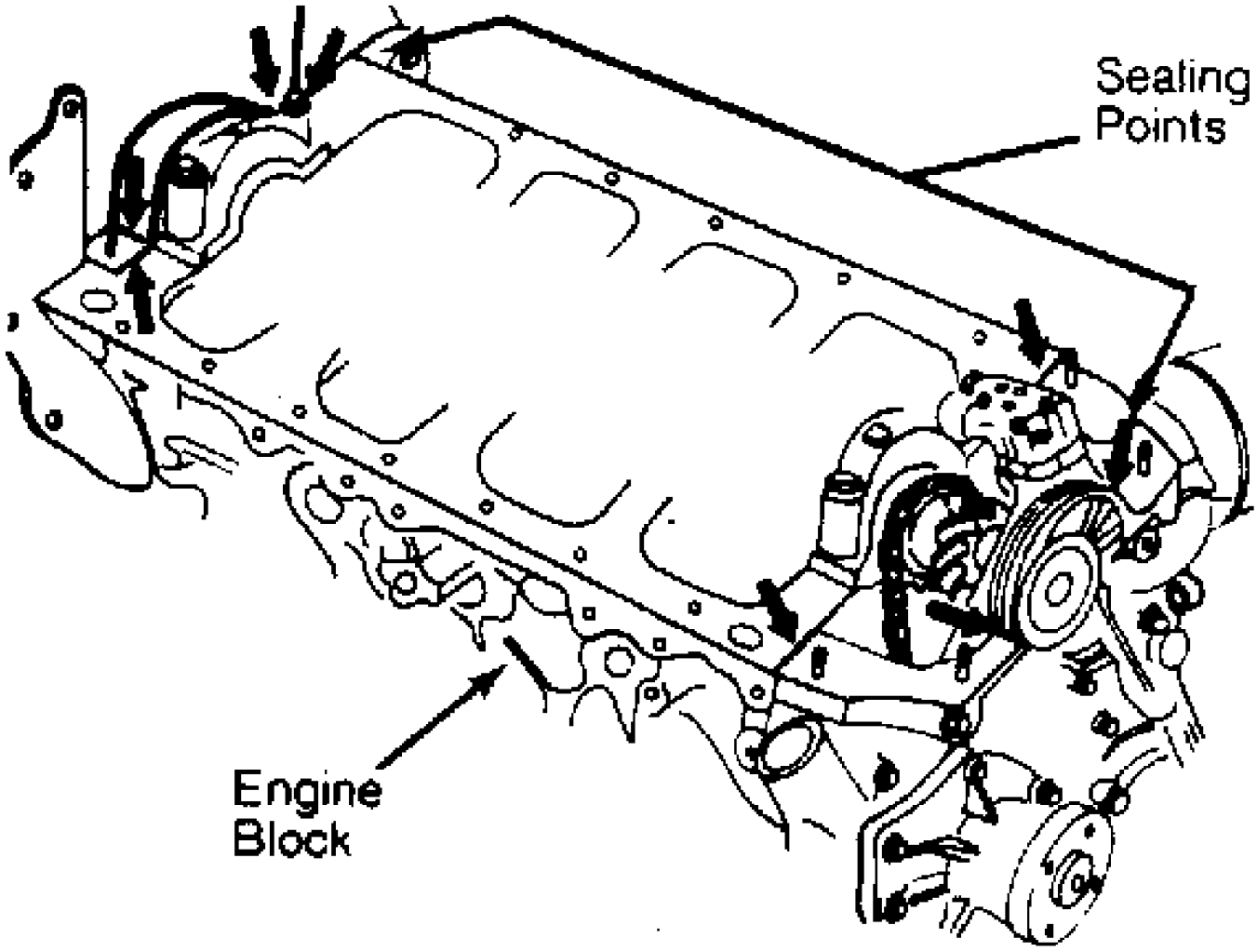


Fig. 8: Sealer Application Points for Oil Pan Installation
Courtesy of Isuzu Motor Co.

PISTON & ROD ASSEMBLY

Removal

1) Remove cylinder head and oil pan. Mark connecting rods and caps for cylinder identification. Place rod and cap identification marks on starter side of engine. Remove carbon deposits or ridge from upper part of cylinder wall.

2) Remove connecting rod caps. Install a piece of hose over rod bolts. Using a wooden hammer handle, push piston and connecting rod out top of engine block.

Installation

Apply clean engine oil to bearings and piston rings. On 1.9L models, install piston and rod assembly so that mark on piston is facing front of engine and cylinder identification number on connecting rod is on starter side of engine. On 2.0L turbo and 2.3L models, install piston and rod assembly so that mark on piston is facing front of engine and "ISUZU" on connecting rod is on same side as mark on piston.

FITTING PISTONS

Engine Block Inspection

1) Inspect engine block upper surface for distortion using a straightedge and feeler gauge. Replace block if distortion exceeds .016" (.41 mm).

2) If distortion is more than .008" (.20 mm) but less than .016" (.41 mm), block may be resurfaced. Measure cylinder bore diameter. Replace block if bore measurement is greater than 3.5197" (89.400 mm) on 2.0L and 2.3L models, or greater than 3.466" (88.036 mm) on 1.9L models.

3) Engine block must be rebored if measurement is more than .008" (.20 mm) over standard size. See CYLINDER BORE SIZES table. Variation between bore diameters after honing should be .0008" (.020 mm) or less.

CYLINDER BORE SIZES TABLE

Application	Standard Size In. (mm)
2.0L & 2.3L Models	3.465-3.480 (88.01-88.39)
1.9L Models	3.425 (87.00)

Piston Inspection

1) Measure diameter of piston skirt 1.58" (40 mm) below piston head, at 90 degrees to piston pin bore. Measure cylinder bore diameter near bottom of bore at minimum wear area. Clearance between cylinder bore diameter and piston diameter must be within .0018-.0026" (.046-.066 mm). If clearance exceeds specifications, replace pistons.

2) Measure weight of piston and rod assemblies. Variation in weight between assemblies must not exceed .42 oz. (12 grams). If correction is necessary, adjust by changing parts between assemblies, other than piston and piston pin. Oversize (O.S.) pistons are available in .020" (.50 mm) and .040" (1.0 mm) for all models.

PISTON CODE CHART TABLE

Size	Diameter In. (mm)
1.9L	
Standard	3.425-3.426 (87.00-87.04)
0.5 mm O.S.	3.444-3.445 (87.50-87.52)
1.0 mm O.S.	3.464-3.465 (88.00-88.02)
2.0L	
Standard	3.463-3.464 (87.95-87.99)
0.5 mm O.S.	3.482-3.484 (88.45-88.49)
1.0 mm O.S.	3.502-3.504 (88.95-88.99)
2.3L	
Standard	3.514-3.515 (89.255-89.295)
0.5 mm O.S.	3.534-3.535 (89.755-89.795)
1.0 mm O.S.	3.553-3.555 (90.255-90.295)

FITTING RINGS

1) Position rings squarely in cylinder bore at a point where bore diameter is smallest. Measure ring end gap with a feeler gauge. Replace rings if end gap is greater than .059" (1.5 mm). Using a feeler gauge, measure ring side clearance. Replace pistons and rings if side clearance is greater than .006" (.15 mm).

2) Install expander ring, lower side rail, then upper side rail. See Fig. 9. Position compression rings so that "N", "NPR", "T"

or "TOP" mark is upward. Ensure rings turn freely in ring grooves. Piston ring size may be identified using mark on rings.

PISTON RING IDENTIFICATION TABLE

Application	Mark
Standard	
1st Compression Ring	None
2nd Compression Ring	None
Oil Control Ring	Red
0.5 mm Oversize	
1st Compression Ring	50
2nd Compression Ring	50
Oil Control Ring	Blue
1.0 mm Oversize	
1st Compression Ring	100
2nd Compression Ring	100
Oil Control Ring	Yellow

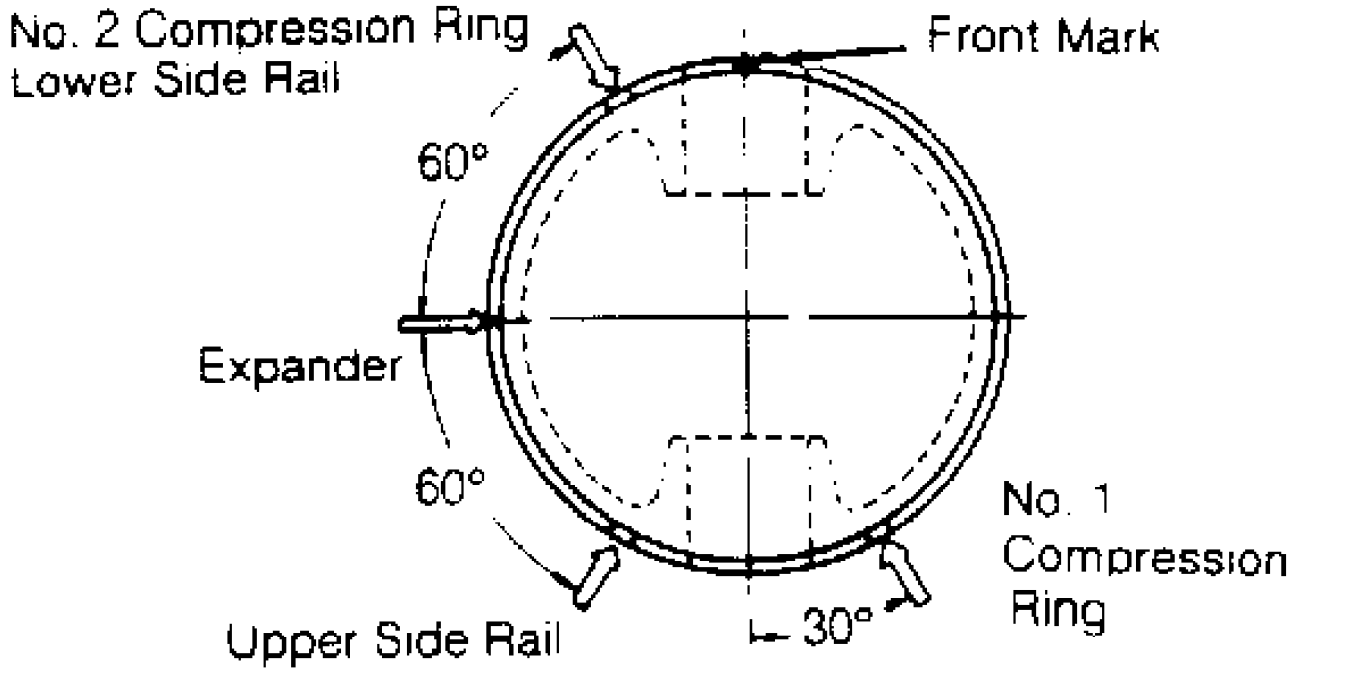


Fig. 9: Piston Ring Gap Spacing
Courtesy of Isuzu Motor Co.

NOTE: Lower side rail and second compression ring share same gap position on piston.

PISTON PIN REPLACEMENT

Removal

Use an arbor press and Piston Pin Remover (J-24086) to press piston pin out of piston and connecting rod assembly.

Inspection

1) Check connecting rod for distortion and parallelism. If distortion exceeds .008" (.20 mm) or parallelism exceeds .006" (.15 mm) per 3.94" (100 mm) of length, replace connecting rod. Standard

distortion and parallelism is .002" (.05 mm) or less.

2) Check piston pin diameter at several points. Check interference fit between pin and small end of connecting rod. Check fit between piston pin and piston by applying a thin coat of oil to pin and checking that pin fits into piston with finger pressure. If pin cannot be fitted, select a pin of smaller diameter.

Installation

Inspect oil jet on connecting rod for obstructions and clean as necessary. Assemble connecting rod so that front mark on piston and "ISUZU" stamp on connecting rod are on same side. Lightly oil pin bores in piston and rod. Press pin into piston and rod.

CRANKSHAFT & ROD BEARINGS

CRANKSHAFT MAIN BEARINGS

1) Use Plastigage method to check main bearing clearances. If clearances are exceeded, install undersize bearings. Replacement bearings are available in standard, .010" (.25 mm) undersize and .020" (.50 mm) undersize.

2) Remove crankshaft from engine. Measure crankshaft journals and crankpins to check for wear and taper. If taper exceeds .002" (.05 mm), replace or correct crankshaft.

3) Check crankshaft runout by placing "V" blocks under crankshaft at No. 1 and No. 5 journals. Position dial indicator point on No. 3 journal. Slowly turn crankshaft, while noting runout. If runout exceeds .004" (.10 mm), replace or correct crankshaft. Standard runout is .001" (.03 mm) or less.

4) Lubricate engine bearings. Install main bearing caps with arrow pointing toward front of engine. Tighten caps gradually and in sequence of caps No. 3, No. 4, No. 2, No. 5 and No. 1. Tighten caps to specification. Ensure that crankshaft turns freely.

CONNECTING ROD BEARINGS

Mark connecting rod and cap on starter side of engine for cylinder identification. Remove rod cap. Check bearing clearance using Plastigage. If clearance exceeds specifications, install new bearing. Replacement bearings are available in standard, .010" (.25 mm) undersize and .020" (.50 mm) undersize.

THRUST BEARING ALIGNMENT

Install bearings in engine block. Position crankshaft in place. Install thrust bearing on both sides of No. 3 crankshaft journal. Move crankshaft fully forward and measure clearance between crankshaft and thrust bearing. If clearance is greater than .012" (.30 mm), replace thrust bearing.

REAR MAIN BEARING OIL SEAL

Removal

Remove starter. Remove transmission. Remove clutch assembly (if equipped). Remove flex plate or flywheel. Pry oil seal from seal retainer.

Installation

Position seal in retainer. Fill clearance between lips of seal with grease. Coat seal lips with engine oil. Using Seal Installer (J-22928-A), install seal into retainer. Reverse removal procedure to complete installation.

ENGINE OILING

ENGINE OILING SYSTEM

A full-flow oil filter and trochoid-type oil pump are used. The oil pump delivers filtered oil to main oil gallery and crankshaft journals. Oil passages in crankshaft feed oil to connecting rod journals. Engine cylinder bore and piston pins are lubricated by oil spray from oil jet located on connecting rods.

An oil passage from No. 3 crankshaft journal delivers oil to cylinder head. Oil is fed to rocker arms by oil ports in rocker arm shaft assemblies. An oil well on top of cylinder head provides lubrication for camshaft. Timing chain and sprockets are lubricated by oil spray from oil jet located on chain guide.

CRANKCASE CAPACITY

Impulse

Oil capacity is 5.28 quarts (5.0L) on 1.9L models. Oil capacity is 3.8 quarts (3.6L) with filter and 3.4 quarts (3.2L) without filter on 2.0L models.

P'UP & Trooper II

Oil capacity is 5.28 quarts (5.0L) on 1.9L models. Capacity is 4.0 quarts (3.8L) without filter and 4.4 quarts (4.2L) with filter on 2.3L models.

OIL PRESSURE

Oil pressure should be approximately 57 psi (4 kg/cm^2) at 2800 RPM.

OIL PRESSURE RELIEF VALVE

Oil pressure relief valve opens at approximately 57-71 psi (4-5 kg/cm^2).

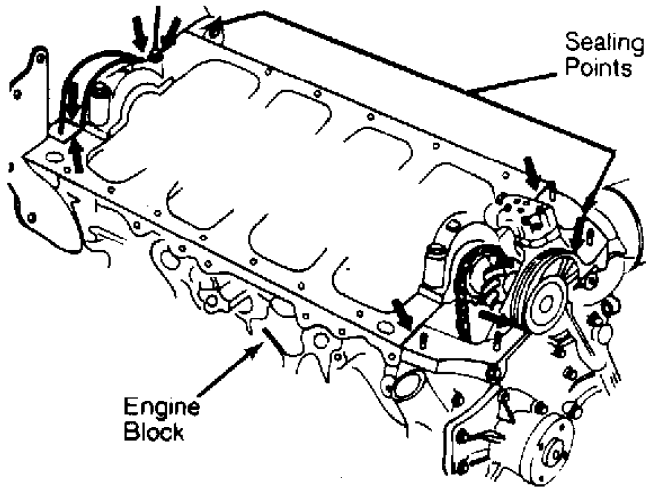


Fig. 10: Exploded View of Oil Pump Assembly on 1.9L Models
Courtesy of Isuzu Motor Co.

OIL PUMP

Removal

On 2.0L turbo and 2.3L models, remove front cover, timing belt and oil pump as outlined in TIMING BELT & SPROCKETS. On 1.9L models, remove valve cover and distributor. Remove oil pan. Remove oil pick-up tube from block, then remove tube from oil pump. Remove oil pump.

Inspection

1) Measure tip clearance between inner and outer rotors. Replace oil pump if clearance is greater than .008" (.20 mm). Measure clearance between outer rotor and inner wall of pump housing. Replace oil pump if clearance is greater than .016" (.41 mm) on 2.0L and 2.3L models or .010" (.25 mm) on 1.9L models.

2) Install both gears in pump housing. Place a straightedge over pump housing. Use a feeler gauge to measure rotor-to-pump cover clearance. Replace oil pump if clearance is greater than .006" (.15 mm) on 2.0L and 2.3L models or .008" (.20 mm) on 1.9L models.

3) Inspect relief valve spring for wear, weakness or damage. Check oil pump body, cover and drive gear for wear, cracking or damage. If oil pump components exceed specifications, replace pump.

4) On 1.9L models, measure outside diameter of drive shaft and inside diameter of shaft hole in pump cover. Compare measurements to determine drive shaft clearance. Replace oil pump if clearance is greater than .010" (.25 mm).

OIL PUMP SPECIFICATIONS TABLE

Application	In. (mm)
Drive Shaft Clearance	.0028-.0043 (.071-.109)
Rotor Tip Clearance	
2.0L & 2.3L	.016 (.41)
1.9L	.0005-.0059 (.013-.150)
Rotor-to-Pump Housing	
2.0L &2.3L	.006 (.15)
1.9L	.0063-.0087 (.160-.221)
Rotor-to-Pump Cover	
2.0L & 2.3L	.006 (.15)
1.9L	.0012-.0035 (.030-.089)

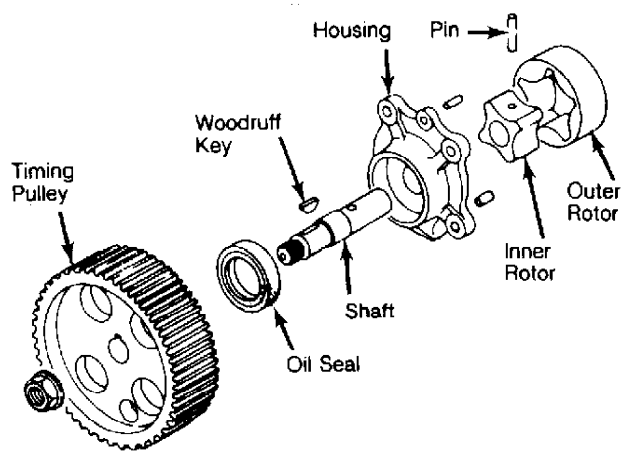


Fig. 11: Exploded View of Oil Pump Assembly on 2.0L & 2.3L Models Courtesy of Isuzu Motor Co.

Installation

1) On 2.0L and 2.3L models, follow installation procedures

under TIMING BELT & SPROCKETS. On 1.9L models, 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 2 sets of marks are aligned, No. 4 piston is at TDC of compression stroke.

2) Ensure that marks on oil pump inner and outer rotors are aligned. Engage oil pump drive gear with pinion gear on crankshaft. Ensure that alignment mark is facing to the rear and approximately 20 degrees in a clockwise direction away from crankshaft. See Fig. 12.

3) Ensure that mark on drive gear is facing rear of engine with oil pump installed. Slot at end of drive shaft must be parallel with front face of cylinder block, and offset forward. See Fig. 12.

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

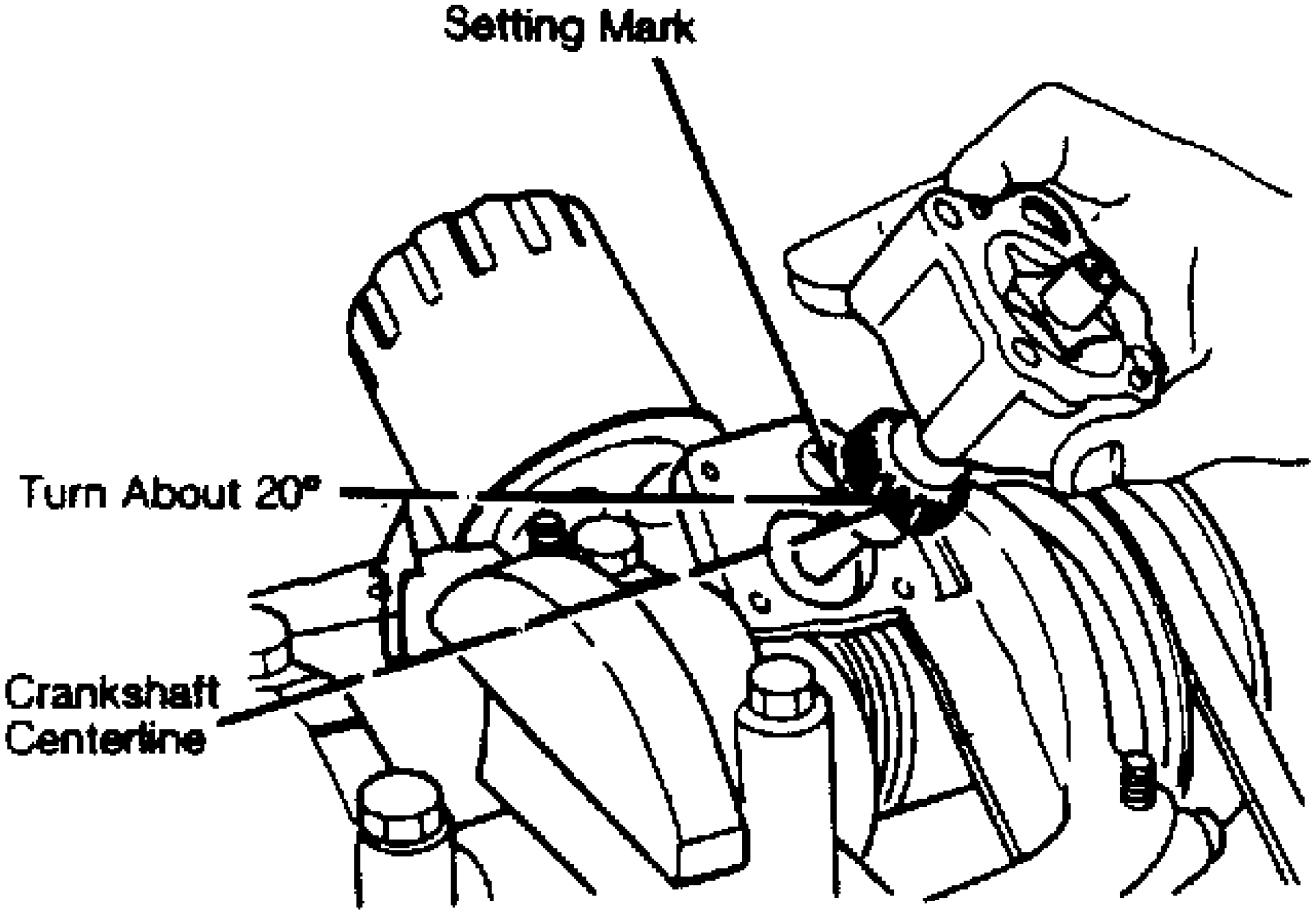


Fig. 12: Installing Oil Pump on 1.9L Models
Courtesy of Isuzu Motor Co.

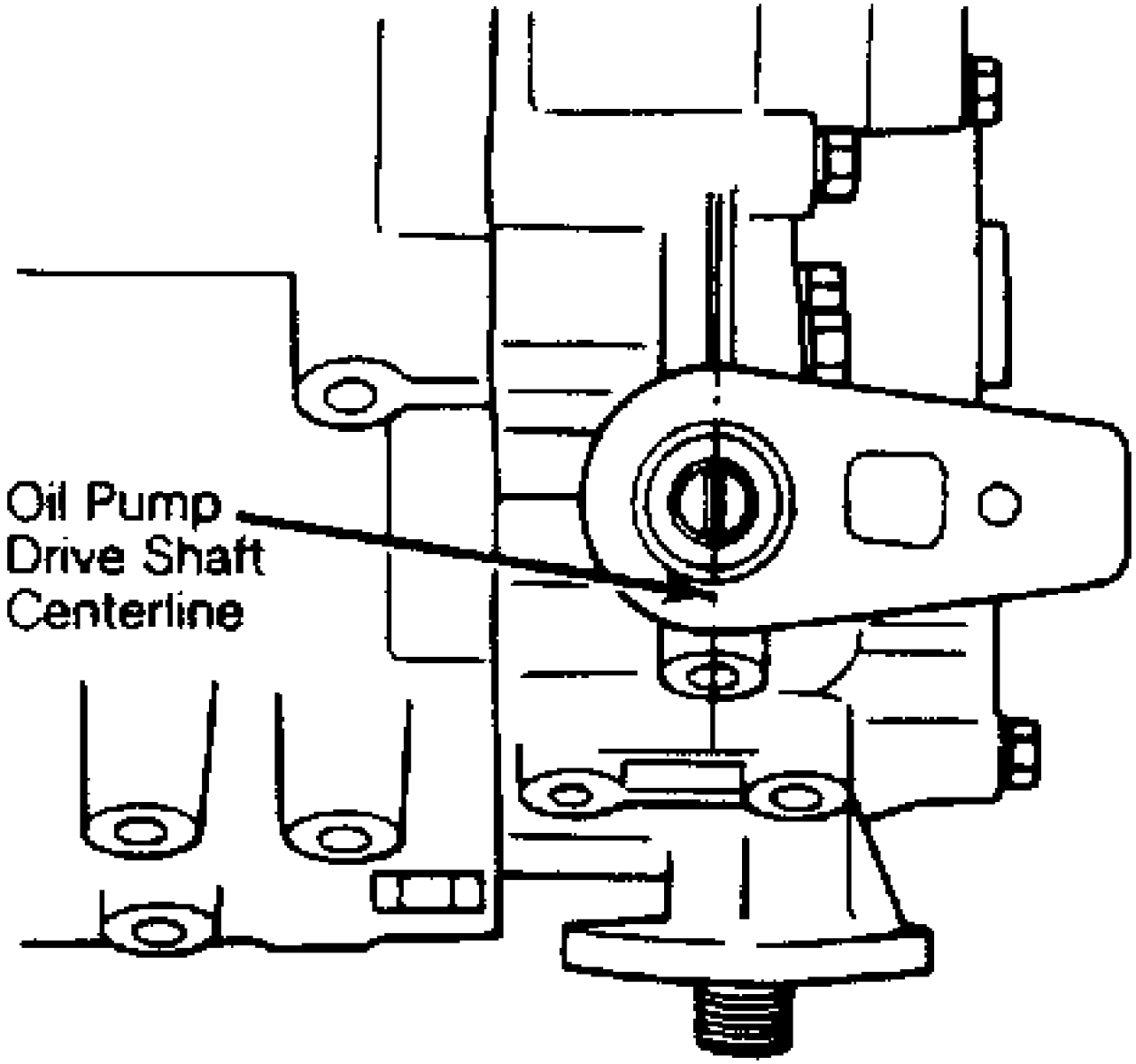


Fig. 13: Checking Oil Pump Drive Shaft Alignment on 1.9L Models
Courtesy of Isuzu Motor Co.

ENGINE COOLING

WATER PUMP

Removal

Disconnect negative battery cable. Remove lower cover and drain cooling system. Remove fan belts. Remove fan and fan pulley. Remove air pump drive pulley. Remove water pump.

Installation

To install, reverse removal procedure.

NOTE: For further information on cooling systems, see ENGINE

COOLING section.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Camshaft Pulley Bolts	58 (79)
Connecting Rod Caps	33 (45)
Connecting Rod Caps 2.3L	43 (58)
Cylinder Head Bolts 1.9L	
Step 1	61 (83)
Step 2	72 (98)
Cylinder Head Bolts 2.0L & 2.3L	
Step 1	58 (79)
Step 2	79 (107)
Exhaust Manifold	16 (22)
Flex Plate (Auto. Trans.)	76 (103)
Flywheel (Man. Trans.)	
2.0L & 2.3L	(1) 45 (33)
1.9L	76 (103)
Front Cover	18 (24)
Front Pulley Bolts	18 (24)
Front Pulley Boss Bolt	87 (118)
Intake Manifold	16 (22)
Main Bearing Caps	72 (98)
Oil Pump Sprocket	58 (79)
Oxygen Sensor	
2.0L & 2.3L	33 (45)
1.9L	18 (24)
Rocker Arm Shaft Brackets	(2) 16 (22)
Rear Oil Seal Retainer	18 (24)
Water Pump	
2.0L &2.3L	14 (19)
1.9L	18 (24)

(1) - With Loctite applied to first thread.
(2) - Tighten No. 9 and 10 bolts to 72 INCH lbs. (8 N.m) on 2.0L & 2.3L models.

ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS TABLE

Application	Specifications
Impulse	
Displacement	
Cu. In.	121.7
Liters	2.0
Fuel System	Fuel Inj.
HP @ RPM	140 @ 5400
Torque Ft. @ RPM	166 @ 3000
Compr. Ratio	7.2
Bore	
In. (mm)	3.46 (88)
Stroke	

In. (mm)	3.29 (82)
Displacement	
Cu. In.	119
Liters	1.9
Fuel System	Fuel Inj.
HP @ RPM	90 @ 5000
Torque Ft. @ RPM	108 @ 3000
Compr. Ratio	9.2
Bore	
In. (mm)	3.43 (87)
Stroke	
In. (mm)	3.29 (82)
P'UP	
Displacement	
Cu. In.	119
Liters	1.9
Fuel System	1 x 2 Bbl.
HP @ RPM	82 @ 4600
Torque Ft. @ RPM	101 @ 3000
Compr. Ratio	8.4
Bore	
In. (mm)	3.43 (87)
Stroke	
In. (mm)	3.29 (82)
Displacement	
Cu. In.	138
Liters	2.3
Fuel System	1 x 2 Bbl.
HP @ RPM	96 @ 4600
Torque Ft. @ RPM	128 @ 2200
Compr. Ratio	8.3
Bore	
In. (mm)	3.52 (83.9)
Stroke	
In. (mm)	3.54 (90)
Trooper II	
Displacement	
Cu. In.	138
Liters	2.3
Fuel System	1 x 2 Bbl.
HP @ RPM	96 @ 4600
Torque Ft. @ RPM	128 @ 2200
Compr. Ratio	8.3
Bore	
In. (mm)	3.52 (83.4)
Stroke	
In. (mm)	3.54 (90)

VALVE SPECIFICATIONS

VALVE SPECIFICATIONS TABLE

Application	In.(mm)
1.9L	
Intake	
Head Diam.	1.59 (40.4)
Face Angle	45°
Seat Angle	45°
Seat Width	.048-.063 (1.21-1.60)
Stem Diameter	.315 (8.00)
Stem Clearance	.0009-.0022 (.023-.056)

Valve Lift	...
Exhaust	
Head Diam.	1.34 (34)
Face Angle	45°
Seat Angle	45°
Seat Width	.048-.063 (1.21-1.60)
Stem Diameter	.315 (8.00)
Stem Clearance	.0015-.0031 (.038-.079)
Valve Lift	...
2.0L & 2.3L	
Intake	
Head Diam.	1.67 (42.4)
Face Angle	45°
Seat Angle	45°
Seat Width	.048-.063 (1.21-1.60)
Stem Diameter	.315 (8.00)
Stem Clearance	.0009-.0022 (.023-.056)
Valve Lift	...
Exhaust	
Head Diam.	1.42 (36.1)
Face Angle	45°
Seat Angle	45°
Seat Width	.048-.063 (1.21-1.60)
Stem Diameter	.315 (8.0)
Stem Clearance	.0015-.0031 (.038-.079)
Valve Lift	...

PISTONS, PINS & RINGS SPECIFICATIONS

PISTONS, PINS & RINGS SPECIFICATIONS TABLE

Application	In.(mm).
1.9L	
Pistons	
Clearance	.0018-.0026 (.045-.065)
Pins	
Piston Fit	.0002-.0004 (.006-.011)
Rod Fit	.0012-.0016 (.030-.041)
Rings	
Ring No. 1 & 2	
End Gap	.014-.020 (.35-.50)
Side Clearance	.0010-.0024 (.025-.060)
Oil Ring	
End Gap	.008-.035 (.20-.90)
Side Clearance	.0008 (.020)
2.0L & 2.3	
Pistons	
Clearance	.0018-.0026 (.045-.065)
Pins	
Piston Fit	.0002-.0004 (.006-.011)
Rod Fit	.0012-.0016 (.003-.020)
Rings	
Ring No. 1	
End Gap	.012-.018 (.30-.46)
Side Clearance	.0010-.0024 (.025-.061)
Ring No. 2	
End Gap	.001-.016 (.25-.41)
Side Clearance	.001-.0024 (.025-.061)
Oil Ring	
End Gap	.008-.028 (.20-.71)
Side Clearance	.0008 (.020)

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS

CRANKSHAFT MAIN & CONNECTING
ROD BEARINGS SPECIFICATIONS TABLE

Application	In.(mm).
1.9L, 2.0L & 2.3L	
Main Bearings	
Journal Diam.	2.2032-2.2038 (55.920-55.935)
Clearance	.0008-.0025 (.021-.064)
Thrust Bearing	No. 3
Crankshaft End Play	.0024-.0099 (.06-.25)
Connecting Rod Bearings	
Journal Diam.	1.9276-1.9282 (48.925-48.940)
Clearance	.0007-.0029 (.019-.075)
Side Play	.008-.013 (.02-.33)

VALVE SPRING SPECIFICATIONS

VALVE SPRING SPECIFICATIONS TABLE

Application	In.(mm).
1.9L, 2.0L & 2.3L	
Free Length	1.8951 (48.1)
Pressure Lbs. @ In. (Kg @ mm)	
Valve Closed	56 @ 1.61 (25.4 @ 41)
Valve Open	...

CAMSHAFT SPECIFICATIONS

CAMSHAFT SPECIFICATIONS TABLE

Application	In.(mm).
1.9L, 2.0L & 2.3L	
Journal Diam.	1.339 (34.0)
Clearance	.003-.0043 (.065-.110)
Lobe Lift	1.451 (36.85)

VALVE TIMING SPECIFICATIONS

VALVE TIMING TABLE

Application	Specifications
Intake	
Open (BTDC)	21°
Close (ABDC)	65°
Exhaust	
Open (BBDC)	55°
Close (ATDC)	20°