Fiat Engines

X1/9 4-CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Engine identification and serial numbers are stamped on crankcase on flywheel side of engine, next to the union for radiator hoses. Engine code is stamped above serial number.

ENGINE IDENTIFICATION

Application	Code
X1/9	138 BS.031

ENGINE, MANIFOLDS & CYLINDER HEAD

ENGINE

Removal

1) Disconnect battery cables. Drain cooling system. Remove radiator and heater hoses. Remove cooling system expansion tank, and disconnect hoses from thermostat. Remove air cleaner assembly.

CAUTION: On fuel injected engines, relieve fuel system pressure before disconnecting lines. Remove vacuum line from fuel pressure regulator. Connect vacuum pump to regulator, and pump vacuum up to 20 inches.

2) Remove hose from air flow sensor to intake manifold. Disconnect all fuel lines, throttle control cables, vacuum hoses, wiring harness and electrical connector.

3) On fuel injected engines, mark all lines, hoses and wires prior to removal.

4) Remove access from inside trunk. Raise and support vehicle with safety stands. Remove rear grill assembly. Remove alternator heat shield, engine panels and wheel panels.

5) Drain transmission and differential assembly. Disconnect back-up light and seat belt interlock connectors. Remove clamps to allow wires to come with engine. Disconnect speedometer cable and gearshift linkage from transmission.

6) Disconnect ground strap at engine. Remove muffler and muffler upper bracket. Remove 6 Allen head bolts from transmission end of right and left half-shafts.

NOTE: For installation, use new Allen head bolts. Torque to 31 ft. lbs. (42.14 N.m).

7) Remove nuts securing hand brake cable brackets to control arms. Remove bolts attaching control arms to body, and swing arms down out of brackets. Move control arms away from differential until axles are free of differential.

8) Remove lower crossmember attaching bolts and remove crossmember. Remove through bolt holding reaction rod to bracket on engine. Remove front engine mount bolt. Separate transmission and differential from engine.

NOTE: Record number and size of shims at control arm mounting points for installation purposes. If shims are worn or damaged, rear end alignment should be checked and adjusted after engine and transmission are reinstalled.

Installation

To install, reverse removal procedure. Upon completion of installation, refill cooling system and inspect all lines and hoses for tightness.

INTAKE & EXHAUST MANIFOLDS

Removal

1) Drain cooling system. Remove spare tire from engine compartment. Remove air cleaner assembly. Remove carburetor preheating water hoses. Disconnect exhaust pipe from exhaust manifold.

2) On fuel injected engines, mark all lines, hoses and wires prior to removal. Disconnect cooling air hose duct. Remove air intake and manifold as an assembly.

3) Remove carburetor with guard and gaskets. Remove shroud from intake and exhaust manifold. Remove intake and exhaust manifold from engine.

Installation

To install, reverse removal procedure and use new gaskets.

CYLINDER HEAD

Removal

1) Disconnect positive battery cable. Drain engine cooling system. Remove spare tire from engine compartment. Remove air cleaner housing and cartridge. Disconnect spark plug wires at spark plugs.

2) On fuel injected engines, relieve fuel system pressure. Procedure is described in Engine Removal section. After marking for identification, disconnect all wires from manifold assembly.

3) Disconnect accelerator linkage and choke cable at carburetor. Disconnect fuel line at carburetor. Disconnect wire from temperature sending unit.

4) Disconnect heater hose at cylinder head. Disconnect all water hoses at union on left side of engine. Disconnect exhaust pipe from exhaust manifold.

5) Disconnect reaction rod from engine bracket and hose from exhaust shroud. Remove timing cover, alternator, and the water pump drive belt.

6) Remove air pump drive belt. Loosen nut on tensioner pulley and remove timing belt. Remove cylinder head nuts and bolts. Remove head and manifolds as an assembly.

Installation

1) Thoroughly clean all gasket surfaces on cylinder head and block. When installing cylinder head, use new head gasket with word "ALTO" facing up.

2) For vehicles with .75" (19 mm) head bolts, torque bolts in 2 stages in the sequence shown in *Fig. 1*.

3) Nuts on manifold side of engine will require special wrench, A.50131 (Kent-Moore J28032). Tighten bolts to 29 ft. lbs. (39 N.m), then to 69 ft. lbs. (94 N.m).

4) For vehicles with .67" (17 mm) head bolts, lubricate all bolts and washers with SAE engine oil, and let excess oil drip for 30 minutes.

5) Tighten bolts in 4 stages using special tool (A.50172) in sequence shown. *See Fig. 1.* First tighten bolts to 15 ft. lbs. (20 N.m), then retighten to 29 ft. lbs. (39 N.m).

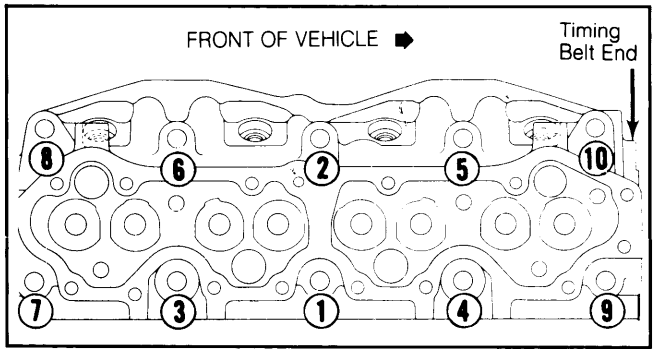
6) Apply paint marks to 1 corner of all the head bolts and a corresponding mark to the cylinder head.

X1/9 4-CYLINDER (Cont.)

Tighten all bolts to a 90° angle. Retighten bolts another 90°. Bolts must now have been tightened a total of 180° in 2 stages.

7) For all vehicles, complete installation in reverse order of removal. See Timing Belt Replacement in this article.

Fig. 1: Cylinder Head Tightening Sequence



Special wrench is required for cylinder head bolts.

CAMSHAFT

TIMING BELT REPLACEMENT

Removal

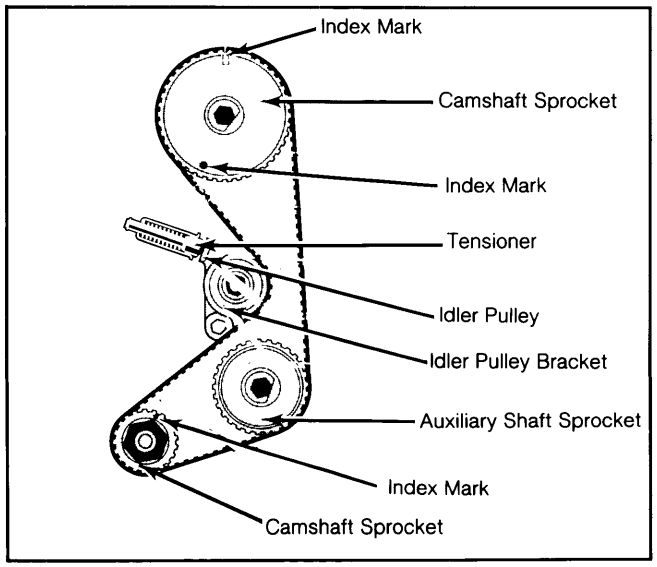
1) Disconnect battery cable. Remove timing belt covers. Lower cover bolt must be removed from under vehicle.

2) Turn engine until crankshaft pulley mark is aligned with TDC indicator and camshaft sprocket index mark is aligned with mark on belt guard.

NOTE: If timing belt is loosened or removed to perform repair work, install new belt.

3) Loosen mounting bolts for alternator and A/C compressor (if equipped). Remove pulley drive belt. Loosen idler pulley nut, and move pulley to the left as far as possible. Secure with nut and remove belt.

Fig. 2: Timing Belt Correctly Installed



Ensure that timing belt teeth are perfectly coupled with sprockets.

Installation

1) Install new timing belt with slack on tensioner side. Ensure timing belt teeth are perfectly coupled with sprockets.

CAUTION: DO NOT turn camshaft independently of crankshaft. This could cause valve to come in contact with pistons and damage engine.

2) Loosen idler pulley nut to allow tensioner to tighten belt. Tighten idler pulley nut. Check that timing marks are correctly aligned. To complete installation, reverse removal procedure.

CAMSHAFT

Removal

1) Remove timing belt protective cover. Turn engine until pulley mark is aligned with TDC indicator and sprocket mark is aligned with mark on belt guard. Loosen belt tensioner.

2) Remove timing belt from camshaft sprocket, and remove sprocket from camshaft. Remove camshaft cover, camshaft and housing. Remove camshaft from housing, and thoroughly clean and inspect both camshaft and housing.

3) If camshaft housing bores show signs of wear or scoring and are out-of-round, replace housing.

4) Check camshaft for signs of seizure or scoring. If scoring or seizure marks cannot be removed with a fine abrasive stone, replace camshaft.

5) Check camshaft for out-of-round conditions. Center camshaft journal should not vary more than .008" (.2 mm) out-of-round.

Installation

1) After installing new end seal with driver (A.86018), install camshaft in housing. Install sprocket, and place housing and camshaft on cylinder head.

2) Tighten nuts to specifications, and install timing belt. See Timing Belt Replacement. Check valve clearance. See Valve Clearance Adjustment. Install camshaft cover.

AUXILIARY SHAFT

Removal

1) The auxiliary shaft drives distributor and oil pump. Shaft is driven by timing belt. Remove oil pump as described in Oil Pump Removal.

2) Remove distributor, and inspect drive gears of distributor and oil pump. If gears are chipped or worn, auxiliary shaft must be replaced.

3) Remove timing belt. See Timing Belt Replacement. Remove auxiliary shaft sprocket. Remove lock plate and auxiliary shaft. Thoroughly clean and inspect shaft.

AUXILIARY SHAFT SPECIFICATIONS

Application	In. (mm)
Auxiliary Shaft	
Outer Journal	1.4013-1.4023 (35.59-35.62)
Inner Journal	1.2575-1.2583 (31.94-31.96)
Bushings (Reamed)	
Outer Journal	1.4041-1.4049 (35.66-35.68)
Inner Journal	1.2598-1.2606 (32.00-32.02)
Clearance	
Outer Journal	.0017-.0036 (.044-.091)
Inner Journal	.0016-.0031 (.04-.08)

Fiat Engines

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4) Check inner and outer journals of shaft. If journal size is less than specified, replace shaft. Check inside diameter of inner and outer bushings. If more than specified, replace bushings.

5) To replace bushings, use a driver (A.60372/1/2 for outer journal; A.660372/1 for inner journal) to drive out of crankcase.

6) Install new bushings, using same drivers as used for removal. Oil holes in bushings must align with oil holes in crankcase. Ream bushings to specified clearance.

Installation

1) Install auxiliary shaft and lock plate. Install sprocket and secure with lock plate and screw. Install remaining components in reverse of removal order.

VALVE TIMING

1) With timing belt removed, rotate camshaft sprocket until marks on sprocket are in alignment with index marks on belt guard. *See Fig. 2.*

2) Rotate crankshaft sprocket until mark on sprocket aligns with index on end plate. Install timing belt as outlined in Timing Belt Replacement. Do not rotate crankshaft or camshaft while installing belt.

VALVES

VALVE ARRANGEMENT

E-I-I-E-E-I-I-E (Front-to-rear)

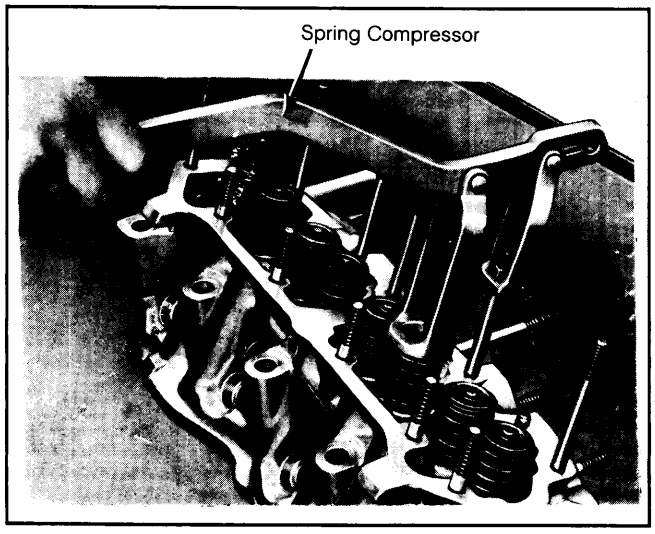
VALVE SPRINGS

Removal

1) With cylinder head removed, remove camshaft housing cover, intake and exhaust manifolds and camshaft with camshaft housing.

2) Using a valve spring compressor (A.60311) compress valve spring. Remove valve keepers, and release compressor. Remove spring retainer, inner spring, outer spring, lower spring seat and washer.

Fig. 3: Special Valve Spring Compressor



Check springs for tension and wear.

3) Inspect valve springs for wear or cracking. Using a spring tester (AP.5049), check inner and outer springs against specifications with specified load applied.

VALVE SPRING TENSION

Height in In. (mm)	Load in Lbs. (kg)
Inner Spring	
1.220 (31)	31.9-34.1 (14.4-15.4)
.846 (21.5)	62.4-66.6 (26.9-29.3)
Outer Spring	
1.417 (36)	81.7-88.3 (37.4-40.4)
1.043 (26.5)	8.5-19.5 (57-62)

VALVE STEM OIL SEALS

Removal

1) Remove spark plug from cylinder No. 1. Piston should be approximately 2/3 of the way up the cylinder.

2) Screw compressor gauge hose/adapter into spark plug hole, and connect an air hose. Pressurize cylinder to approximately 120-150 psi (8.4-10.5 kg/cm²).

3) Using valve spring compressor (A.60311 or Kent-Moore J28067), compress valve springs. Remove valve keepers. Slowly release tension from spring.

4) Remove tool, spring retainer, inner and outer springs and lower spring seat from valve stem. Remove valve stem seal. Ensure that all portions of seal have been removed from valve guide.

Installation

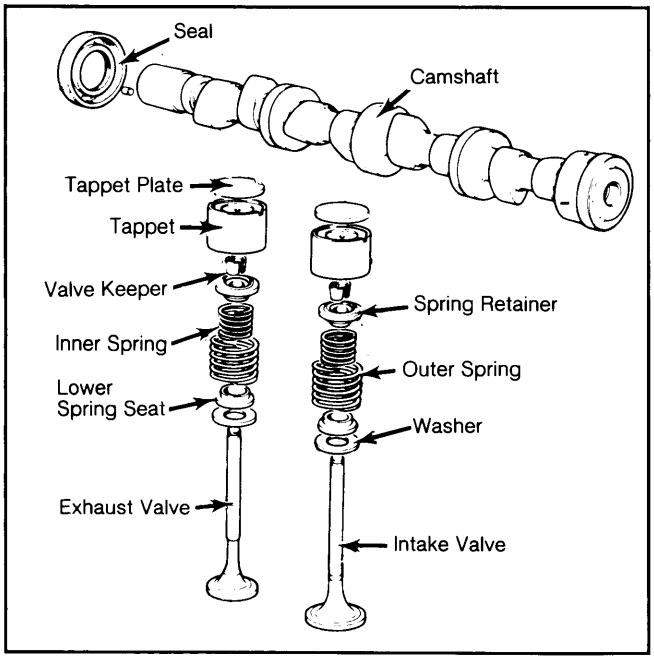
1) Using a light grease, lubricate the seal protector pin (60313/1) of valve guide seal installer and protector (Kent-Moore J28069).

2) Place protector pin on end of valve stem. Slide new oil seal down pin and valve stem onto guide. Remove protector pin.

3) Place installer (60313/2) over valve stem seal. Lightly tap end of installer until oil seal is properly seated on valve guide.

4) Remove installer. Reinstall lower spring seat, inner and outer springs and spring retainer. Using valve spring compressor (J28067), compress valve springs and install valve keepers.

Fig. 4: Exploded View of Valve Train Components



X1/9 4-CYLINDER (Cont.)

5) Repeat procedure for other valve of cylinder No. 1. After seal replacement, remove air hose, reinstall spark plug and repeat procedure on remaining cylinders.

6) Reinstall camshaft housing and related parts onto cylinder head. See Camshaft Removal and Installation. Use a new timing belt.

VALVE GUIDE SERVICING

1) With cylinder head removed and disassembled, check clearance between valve stem and valve guide. If clearance is more than .006" (.15 mm), and valve stem is not worn, valve guide must be replaced.

2) Use driver (A.60395) to remove guides. Use driver (A.60462) to install guides. Factory replacement guides are pre-reamed. If guides are damaged during installation, finish ream with reamer (A.90310).

VALVE CLEARANCE ADJUSTMENT

1) Adjust clearance with engine cold. Remove camshaft cover. Rotate engine until lobe on camshaft of valve being checked is pointing straight up.

2) Using a feeler gauge, check clearance between camshaft lobe and valve tappet plate.

3) If clearance is not as specified, insert a spring compressor (A.60421) under camshaft to release spring tension against camshaft lobe.

4) Remove tappet plate with a removing tool (A.87001). With plate removed, measure thickness to determine size of plate to be installed.

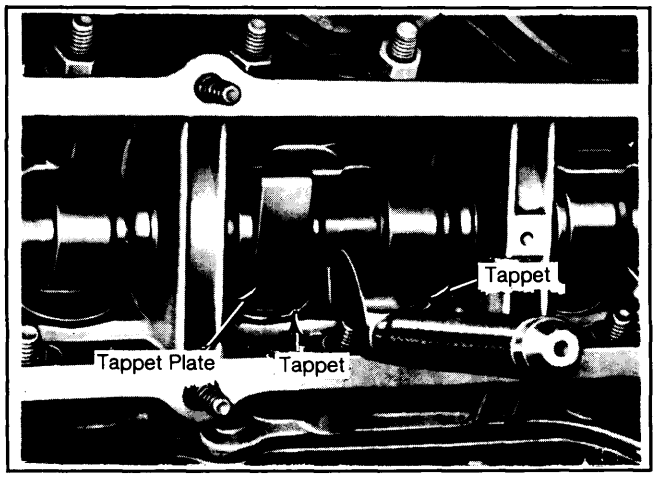
VALVE CLEARANCE SPECIFICATIONS

Application	In. (mm)
Intake Valve	.011-.014 (.24-.32)
Exhaust Valve	.015-.018 (.34-.42)

5) Valve tappet plates are available in various thicknesses, .1457-.1850" (3.70-4.70 mm) in increments of .002" (.05 mm). Plate size is shown on face.

6) Install side with plate size toward tappet. Use same procedure on both intake and exhaust valves. Recheck clearance, and install camshaft cover.

Fig. 5: Using Special Tool to Remove Valve Tappet Plate



Plates are available in various thicknesses.

PISTONS, RINGS & PINS

OIL PAN

1) Attach a suitable engine support to top of engine. Remove protective shields and engine crossmember.

2) Drain oil. Remove oil pan retaining bolts and oil pan. To install, clean all gasket surfaces, use new gaskets, and reverse removal procedure.

PISTON & ROD ASSEMBLY

Removal

Remove oil pan and cylinder head. Remove oil pump. See Oil Pump. Remove nuts from connecting rods and remove rod caps. Push piston and rod assembly up and out through top of cylinder.

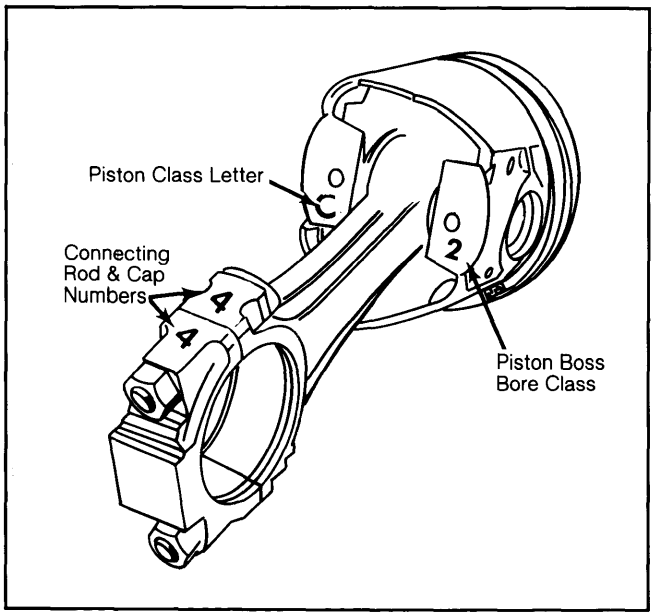
Installation

To install, compress piston rings with a ring compressor. Pistons must be installed with number stamped on connecting rod and rod cap facing away from auxiliary shaft. Torque rod nuts. Install remaining components in reverse of removal procedure.

FITTING PISTONS

1) Remove piston and rod assembly and disassemble. Thoroughly clean piston. Check ring side clearance. Side clearance should be no greater than .006" (.15 mm). Check ring end gap in cylinder.

Fig. 6: Piston & Rod Identification



Piston & bore class must match.

2) Check fit of piston in cylinders with rings removed. There should be no more than .006" (.15 mm) clearance. Pistons are available in .0079" (.2 mm), .0157" (.4 mm) and .0236" (.6 mm) oversizes.

3) There are 3 classes of standard size pistons. If piston is replaced, one of the same class must be installed. Class of piston is stamped on bottom of piston.

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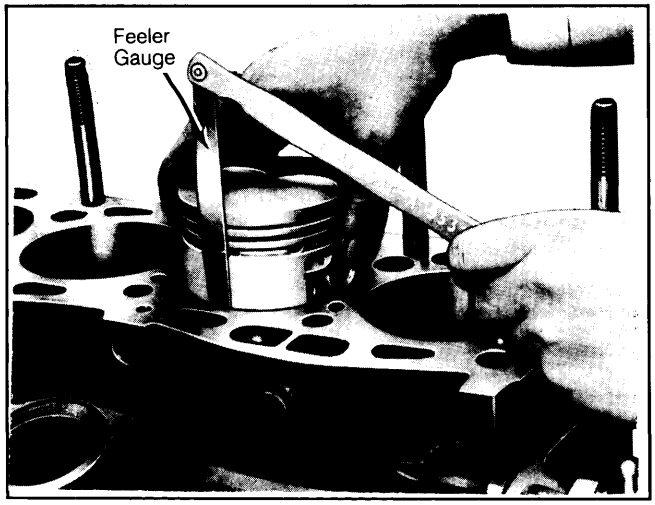
Fig. 7: Checking Piston-to-Cylinder Wall Clearance



Clearance should not exceed .006" (.15 mm).

FITTING RINGS

When installing rings, make sure gaps are spaced approzimately 120° apart. Assemble piston and connecting rod. Install in vehicle as previously outlined.

PISTON PIN REPLACEMENT

1) Remove piston and rod assembly. Remove circlips and drive out piston pin.

2) Check fit of pin in piston. Pin should be push fit in piston. It should not fall through under its own weight. There are 2 classes of piston pin and piston pin bore sizes.

3) If piston pin is to be replaced, it must be replaced with a pin of the same class. Class of piston is stamped on bottom of piston. Class of pin is stamped on face of pin. *See Fig. 6.*

4) Check piston pin clearance in connecting rod. If clearance is more than specified, drive bushing from connecting rod using driver A.60054. Install a new bushing with same driver and ream to size.

5) Piston pin bore in piston is offset .08" (2 mm). Position rod to piston so that number, stamped on rod, faces towards side of piston bore offset and away from auxiliary shaft.

6) Lubricate piston, and secure connecting rod big end in a vise. Place piston in proper position on connecting rod. Install piston pin. Install circlips using special tool (A.60303).

7) After installation, ensure that circlip's end gap is not in line with slot provided in piston. Install piston and connecting rod assembly as previously outlined.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

Crankshaft Main Bearings

1) Remove engine from vehicle. Remove cylinder head, oil pan, clutch and flywheel. Remove oil pump. See Oil Pump. Remove all sprockets and timing belt. See Timing Belt Replacement.

2) Remove cover plates and seals from both ends of engine. Remove all piston rod assemblies. Remove main bearing caps with lower bearing halves.

3) Remove crankshaft and upper bearing halves. Remove thrust bearings from flywheel end main bearing saddle. Thoroughly clean and inspect crankshaft and crankcase.

4) Check crankshaft journals for out-of-round. If more than .0002" (.005 mm) out-of-round, crankshaft must be ground to next undersize.

5) Bearings for undersize crankshafts are available in .010" (.25 mm), .020" (.50 mm), .030" (.76 mm) and .040" (1 mm) undersize.

6) Use Plastigage method to check main bearing clearances. Install upper bearing halves in crankcase, and install crankshaft.

7) Place a piece of Plastigage on journal, and install main bearing cap with bearing. Torque bolts to specifications, and then remove main bearing cap.

8) With cap removed, check flattened Plastigage against scale on back of package to determine if clearance is as specified. If clearance is incorrect, crankshaft must be ground to next undersize.

9) When correct clearance is obtained, install upper bearing halves in crankcase. Lubricate bearings and install crankshaft. Install main bearing caps with bearings and torque bolts to specifications. Rotate crankshaft to check for freedom of movement.

Connecting Rod Bearings

1) Check connecting rod bearings, using Plastigage method. Clean parts, and place rods on relative crankpins. Place a length of Plastigage along crankpin. Install caps and torque nuts to specifications.

2) Remove caps and compare Plastigage to scale on back of package. Clearance should be between .0014-.0034" (.036-.086 mm). If clearance exceeds limit, grind crankshaft and install undersize bearings.

3) Bearings for undersize crankpin journals are available in .010" (.254 mm), .020" (.508 mm), .030" (.762 mm) and .040" (1.016 mm) undersizes.

THRUST BEARING ALIGNMENT

1) Check end play with crankshaft installed and main bearing caps torqued. Attach a dial indicator to crankcase with arm against flywheel end of crankshaft. Pry crankshaft back and forth to measure end play.

2) If end play is more than .0137" (.35 mm), remove flywheel end main bearing cap and install oversize thrust rings. Thrust rings are available in .005" (.13 mm) oversize. Install thrust rings with grooves facing crankshaft shoulder.

FRONT & REAR MAIN BEARING OIL SEAL SERVICE

1) Front and rear main bearing oil seals are secured in end plates mounted to both ends of crankcase. Both seals should be replaced when crankshaft has been removed.

2) Drive seals from end plates and install new seals. Lubricate sealing lip of seal, and use new gaskets when installing end plates.

X1/9 4-CYLINDER (Cont.)

ENGINE OILING

CRANKCASE CAPACITY

The crankcase capacity is 5 qts. (4.75L), including filter.

OIL FILTER

The oil filter is a full-flow type, mounted on front side of engine.

NORMAL OIL PRESSURE

The normal oil pressure is 50-71 psi (3.5-5.0 kg/cm²) with engine at 212°F (100°C).

OIL PRESSURE REGULATOR VALVE

The oil pressure regulator valve is mounted in the oil pump.

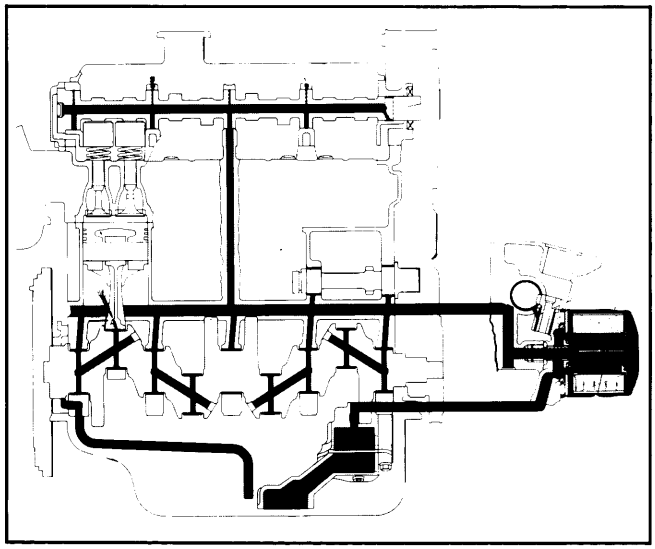
ENGINE OILING SYSTEM

Oil is circulated through engine by pressure, provided by a gear-type pump. Pump is mounted on bottom of crankcase, and is driven by the auxiliary shaft. Oil is drawn from the oil pan by the oil pump and circulated through a full-flow oil filter.

Oil is then pumped into main oil gallery of crankcase, where it is distributed to crankshaft and camshaft. Oil flows through crankshaft to lubricate main and connecting rod bearings. Cylinders, pistons and piston pins are lubricated by oil squirted from hole in connecting rod.

Oil flows through camshaft to journals. Oil is squirted from number 2 and 4 journal to lubricate valve lifters and valves. Auxiliary shaft is lubricated by oil from main oil gallery. Excess oil flows back into the oil pan.

Fig. 8: Engine Lubrication Flow



OIL PUMP

Removal

Drain engine and remove oil pan. Remove 3 bolts holding pump to engine. Remove oil pump and gasket.

Disassembly

Clamp pump housing in a vise, and remove suction pipe with filter screen and relief valve. Remove the pick-up housing, relief valve and relief spring.

Inspection

1) Check both gears for excessive wear, and replace as necessary. Check backlash between gears.

2) If more than .010" (.25 mm), replace both gears. Check gear-to-pump housing clearance. If more than .010" (.25 mm), replace gears or housing as necessary.

3) Check gear end play by placing a straight-edge on mating surface of pump, and inserting a feeler gauge between straightedge and gears. If clearance is more than .006" (.15 mm), replace gears or housing as necessary.

4) Check clearance between drive gear shaft and housing. If more than .004" (.10 mm), replace gear or housing as necessary.

OIL PUMP SPECIFICATIONS

Application	Clearance
Gear-to-Gear	.006" (.15 mm)
Gear-to-Housing	.004-.007" (.11-.18 mm)
Gear End Play	.0008-.0041" (.02-.11 mm)

5) Inspect pressure relief spring for cracking or wear. Relief spring free length is 1.583" (40.2 mm). Spring pressure should be 11.023 lbs. (5.0 kg) @ .827" (21 mm).

Reassembly & Installation

Assemble oil pump in reverse order of disassembly. To install, reverse removal procedure.

ENGINE COOLING

COOLANT CAPACITY

The coolant capacity is 12 qts. (11.5L). Use a 50-50 mixture of antifreeze and water.

THERMOSTAT

Thermostat starts to open at 172°-183°F (78°-84°C). Thermostat is fully open at 194°-201°F (90°-94°C).

THERMOSWITCH

The radiator thermoswitch cut-in temperature is 198°F (92°C). The cut-out temperature is 189°F (87°C).

WATER PUMP

Removal

1) Remove protective panels from bottom of engine and drain cooling system. Remove alternator and drive belt. If equipped with air pump, remove top half of timing belt cover, air pump and drive belt.

2) On models with air conditioning, it is not necessary to discharge system. Remove compressor, compressor mount and set to one side.

3) Disconnect hoses from water pump. Remove nuts attaching water pipe to pump, and disconnect water pipe from pump. Remove bolts holding water pump to engine and remove pump.

Installation

Clean all gasket surfaces and install new gasket. Reverse removal procedure and refill cooling system. Run engine and check for leaks.

Fiat Engines

X1/9 4-CYLINDER (Cont.)

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displacement		Fuel System	HP@RPM	Torque Ft. Lbs.@RPM	Compr. Ratio	Bore		Stroke	
	Cu. In.	cc					In.	mm	In.	mm
1982	91.4	1498	Fuel Inj.	75@5500	80@3000	8.5:1	3.40	86.4	2.52	63.9

VALVES

Engine Size & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
1498 cc							
Intake	1.4173 (36)	45.5°	45°	.0787 (2)	.3139-.3146 (7.974-7.992)	.0012-.0026 (.030-.066)	.3622 (9.20)
Exhaust	1.3031 (33.1)	45.5°	45°	.0787 (2)	.3139-.3146 (7.974-7.992)	.0012-.0026 (.030-.066)	.3641 (9.25)

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Ring No.	End Gap In. (mm)	Side Clearance In. (mm)
1498 cc	.0011-.0019 (.03-.05)	.0001-.0003 (.002-.008)	.0004-.0006 (.010-.016)	No. 1	.0118-.0177 (.30-.45)	.0018-.0030 (.045-.077)
				No. 2	.00118-.0177 (.30-.45)	.0016-.0028 (.040-.072)
				No. 3	.0098-.0157 (.25-.40)	.0012-.0024 (.030-.062)

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)
1498 cc	1.9990-1.9997 (50.775-50.795)	.0019-.0037 (.050-.095)	[1]	.0021-.0104 (.055-.265)	1.7913-1.7920 (45.498-45.518)	.0014-.0034 (.036-.086)	

[1] - Thrust ring is installed at flywheel end of main bearing cap.

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (Kg @ mm)	
		Valve Closed	Valve Open
1498 cc			
Inner	1.646 (41.8)	62@.846 (28@21.5)	32.8@1.220 (14.9@31)
Outer	2.122 (53.9)	131@1.043 (59.4@26.5)	85.7@1.417 (38.8@36)

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1498 cc			
No. 1	1.1789-1.1795 (29.944-29.960)	.0011-.0028 (.029-.070)	[1]
No. 2	1.8872-1.8878 (47.935-47.950)	.0012-.0028 (.030-.070)	
No. 3	1.8951-1.8957 (48.135-48.150)	.0012-.0028 (.030-.070)	
No. 4	1.9030-1.9035 (48.335-48.350)	.0012-.0028 (.030-.070)	
No. 5	1.9108-1.9114 (48.535-48.550)	.0012-.0028 (.030-.070)	

[1] - Intake .362" (9.2 mm), Exhaust .364" (9.25 mm)

Fiat Engines

X1/9 4-CYLINDER (Cont.)

ENGINE SPECIFICATIONS (Cont.)

VALVE TIMING

Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
1498 cc	10°	54°	54°	12°

PISTON SKIRT SPECIFICATIONS

Application	[1] Size
X1/9	
Class A	3.3999-3.4003" (86.360-86.370 mm)
Class B	3.4007-3.4011" (86.380-86.390 mm)
Class C	3.4015-3.4019" (86.400-86.410 mm)

[1] - Measured at 1.08" (27.5 mm) from piston skirt edge.

PISTON PIN & BORE SPECIFICATIONS

Applications	In. (mm)
Piston Pin	
Class 1	.8658-.8659" (21.991-21.994 mm)
Class 2	.8659-.8660" (21.994-21.996 mm)
Piston Pin Bore	
Class 1	.8660-.8661" (21.996-21.999 mm)
Class 2	.8661-.8662" (21.999-22.002 mm)

TIGHENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Cylinder Head Bolt	See Text
Main Bearing Cap Bolts	59 (80)
Connecting Rod Cap Bolts	38 (51)
Intake & Exhaust Manifold	20 (27)
Camshaft Sprocket Bolt	61 (83)
Timing Belt Tensioner Pulley Nut	33 (44)
Crankshaft Pulley & Sprocket Nut	101 (137)
Flywheel-to-Crankshaft Bolts	61 (83)