

## 128, STRADA & X1/9 4-CYLINDER

### ENGINE CODING

#### ENGINE IDENTIFICATION

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

Application	Engine Code	
	Federal	California
128		
1290 cc .....	128A1.040.6 .....	128A1.031.6
Strada & X1/9		
1498 cc .....	138AS.040 .....	138AS.031

### ENGINE, CYLINDER HEAD & MANIFOLDS

#### ENGINE

**NOTE** — Engine and transmission are removed as one unit.

**Removal (128 & Strada) — 1)** Raise and support vehicle on safety stands. Raise hood, mark hood hinge position, remove hinge retaining bolts and hood. Remove spare tire and tools. Disconnect both battery cables. Remove lower protective shield.

**2)** Remove air cleaner cover, cartridge, air inlet snorkel and housing. Disconnect and remove from engine all fuel lines, throttle control cables, vacuum hoses, wiring harness and electrical connectors.

**3)** Drain cooling system. Remove radiator cap and supply tank cap, then open drain on bottom of radiator and on inner side of crankcase. Remove radiator and heater hoses. From transmission, remove speedometer cable and clutch cable.

**4)** From underneath vehicle, remove stabilizer bar from body and lower suspension control arms. Remove front section of exhaust system (header pipe from exhaust manifold) and bracket. Disconnect gear selector rod from shift linkage.

**5)** Remove strut connecting engine to body. Attach a suitable lifting fixture (A.60559 for 128 or A.60592/10 for Strada) to engine. Connect lifting fixture to engine hoist and lift engine slightly to remove weight from engine mounting points. Remove engine-to-body mounting bolts and engine support crossmember.

**6)** On Strada models, remove axle shaft-to-differential stub shaft bolts and secure axle shafts, with wire, back away from engine to allow removal clearance. Remove engine and transmission from beneath vehicle. Separate transmission from engine once unit is removed.

**7)** On 128 models, remove left wheel and tire. Remove left tie-rod nut and separate tie-rod from steering arm using suitable puller (A.47044). Remove outer axle nuts from both sides. Remove lower strut bolts from left side.

**8)** Pull left axle shaft from hub assembly and secure to differential with wire. Move engine assembly toward left side of vehicle while pulling right axle shaft from hub assembly. Secure to engine with wire. Lower engine and transmission down and out of vehicle. Separate transmission from engine once unit is removed.

**Removal (X/19) — 1)** Disconnect battery cables and loosen fuel cap to vent fuel tank. Drain cooling system completely. Disconnect hoses from air injection system and air cleaner, then disconnect fresh air duct from carburetor cooling fan. Remove air cleaner assembly with fresh air duct.

**2)** Disconnect hoses from air pump, then separate heater return hose at coupling joint and heater hose at pump. Disconnect wires from alternators. Remove bolts holding louvered protection panel below carbon trap in rear firewall.

**3)** Disconnect choke linkage, hoses and wires from carburetor. Disconnect electrical leads from distributor, oil pressure switch, water temperature sending unit and starter.

**4)** Remove clamp holding fuel lines to firewall and disconnect fuel lines from firewall. Disconnect accelerator cable from support. Remove cooling system expansion tank and disconnect hoses from thermostat. Disconnect clutch master cylinder from transmission and swing out of way.

**5)** Raise and support vehicle with safety stands. Remove remaining bolt attaching louvered panel in rear firewall, then remove panel. Remove alternator heat shield, engine panels and wheel panels. Drain transmission and differential assembly. Disconnect back-up light and seat belt interlock connectors, then remove clamps to allow wires to come out with engine. Disconnect speedometer cable and gearshift linkage from transmission.

**6)** Disconnect ground strap at engine, then remove muffler and muffler upper bracket. Remove axle boot retaining bolts and slide boots away from differential.

**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. From above engine, disconnect reaction arm from bracket on engine, then remove front engine mount through bolt. Remove engine and transmission assembly from bottom of vehicle. Separate transmission and differential from engine.

**NOTE** — Record number of shims at control arm mounting points for installation purposes. Also note sizes of shims. If shims are worn or damaged, rear end alignment should be checked and adjusted, if necessary, after engine and transmission are reinstalled.

#### INTAKE & EXHAUST MANIFOLD

**1)** Drain cooling system. Remove spare tire from engine compartment. Remove air cleaner and cartridge. Disconnect accelerator linkage and choke cable from carburetor. Remove carburetor pre-heating water hoses.

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

**3)** To install, use new gaskets and reverse removal procedure.

## 128, STRADA &amp; X1/9 4-CYLINDER (Cont.)

## CYLINDER HEAD

**NOTE** — This procedure is with engine in vehicle.

- 1) Drain engine cooling system and remove spare tire from engine compartment. Remove air cleaner housing and cartridge. Disconnect spark plug wires at spark plugs.
- 2) Disconnect accelerator linkage and choke cable at carburetor. Disconnect fuel line at carburetor. Disconnect wire from temperature sending unit.
- 3) Disconnect heater hose at cylinder head. Disconnect all water hoses at union on left side of engine. Disconnect exhaust pipe from exhaust manifold.
- 4) Disconnect reaction rod from engine bracket and hose from exhaust shroud. Remove timing cover, then remove alternator and water pump drive belt. Remove air pump drive belt, then loosen nut on tensioner pulley and remove timing belt. Remove cylinder head nuts and bolts, then remove head and manifolds as an assembly.
- 5) Thoroughly clean all gasket surfaces on cylinder head and block. Use new gasket with word "ALTO" facing up when installing head. Tighten bolts and nuts in sequence shown in Fig. 1 in two steps: first to about 29 ft.lbs. (4.0 mkg), and then to final torque of 69 ft.lbs. (9.5 mkg). Complete assembly in reverse order of removal. See *Timing Belt Replacement*.

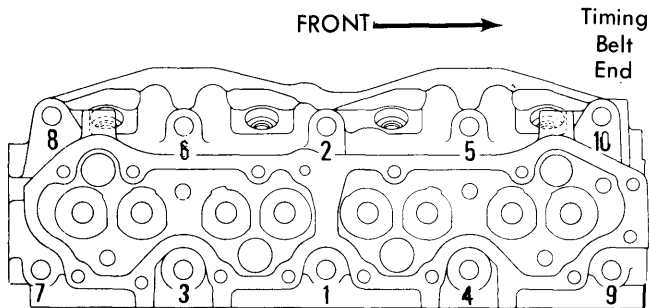


Fig. 1 Cylinder Head Tightening Sequence

## CAMSHAFT

## TIMING BELT REPLACEMENT

**NOTE** — This procedure is with engine in vehicle. If a timing belt is loosened or removed to perform repair work, it should always be replaced.

**Removal (128 & Strada)** — 1) Remove right guard and loosen timing belt cover retaining screws, from under vehicle. Remove timing belt cover. Check timing by aligning index marks on top and bottom of camshaft sprocket with index marks on engine mounting and upper case. Index on crankshaft sprocket should be in alignment with index on crankshaft seal case.

2) Put vehicle in low gear and apply hand brake to prevent crankshaft from turning. Remove fan belt, loosen tensioner pulley retaining nut and relieve tension. Remove timing belt.

**Installation** — Install new belt, making sure belt and sprocket teeth engage correctly. Tighten pulley support nut. Recheck timing. Install remaining components.

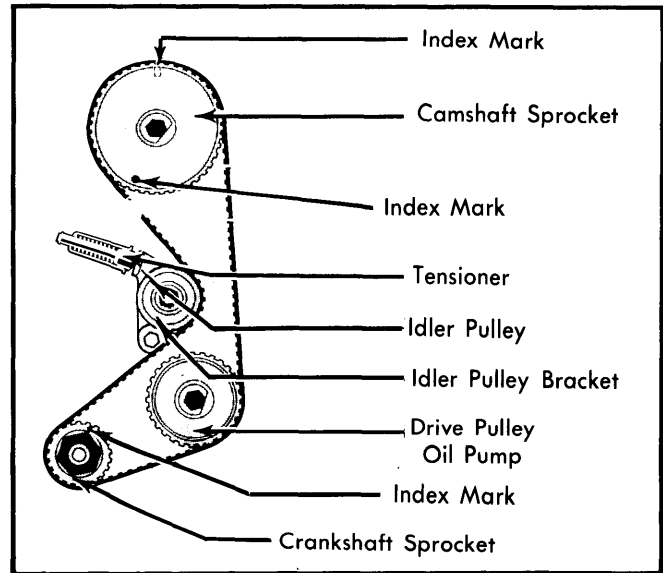


Fig. 2 Front View of Engine Showing Timing Belt Installed

**Removal (X1/9)** — 1) Rotate crankshaft to position No. 4 piston at TDC of compression stroke. Place gear selector in 4th gear position and set parking brake.

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

2) Remove right guard from under engine. Remove timing bolts and cover. Loosen alternator and remove alternator/water pump drive belt. Loosen air pump and remove drive belt.

3) Remove valve cover and check that camshaft lobes of No. 4 cylinder are pointing up. Remove distributor. Loosen idler pulley lock nut. Remove timing belt starting at idler pulley.

**Installation** — 1) Install timing belt making sure that teeth are properly engaged in sprockets. Start installation of timing belt at crankshaft pulley. Release idler pulley lock nut and retighten after tension is on belt.

**CAUTION** — Never allow crankshaft to rotate counter-clockwise. This could slacken belt, causing it to jump timing.

2) Rotate engine one-half turn. Loosen idler pulley lock nut to ensure all slack is removed. Retighten lock nut. Rotate engine until No. 4 cylinder is in firing position (cam lobe up). Install remaining components in reverse of removal order.

## CAMSHAFT

**Removal & Installation** — 1) Remove timing belt protective cover and loosen belt tensioner. 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.

2) If camshaft housing bores show signs of wear or scoring and are out of round, replace housing. Check camshaft for signs of seizure or scoring. If scoring or seizure marks cannot be removed with a fine abrasive stone, replace camshaft.

## 128, STRADA & X1/9 4-CYLINDER (Cont.)

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

4) Install camshaft in housing using new drive end seal. Install sprocket and place housing and camshaft on cylinder head. Tighten nuts to specifications. Install timing belt correctly. See *Valve Timing*. Check valve clearance. See *Valve Clearance Adjustment*. Install camshaft cover.

### AUXILIARY SHAFT

1) Auxiliary shaft drives distributor, oil pump and fuel pump. Shaft is driven by timing belt. Remove oil pump. See *Oil Pump Removal*. Remove fuel pump and distributor. Inspect drive gears of distributor and oil pump, if gears are chipped or worn, auxiliary shaft must be replaced.

2) Remove timing belt as previously outlined. With fuel pump, oil pump and distributor removed, remove auxiliary shaft sprocket. Remove lock plate and auxiliary shaft. Thoroughly clean and inspect shaft.

3) 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.

4) To replace bushings, drive out of crankcase using a suitable driver (A.60372/1/2 outer journal and A.660372/1 inner journal). Install new bushings using same drivers as used for removal. Make sure oil holes in bushings align with oil holes in crankcase. Ream bushings to specified clearance with shaft using a suitable reamer (A.90365).

5) Install auxiliary shaft and lock plate. Install sprocket and secure with lock plate and screw. Install remaining components as previously outlined or in reverse of removal order.

### Auxiliary Shaft Specifications

Application	Size
Auxiliary Shaft	
Outer Journal.....	1.4013-1.4023" (35.59-35.62mm)
Inner Journal.....	1.2575-1.2583" (31.94-31.96mm)
Bushings (Reamed)	
Outer Journal.....	1.4041-1.4049" (35.66-35.68mm)
Inner Journal.....	1.2598-1.2606" (32.00-32.02mm)
Clearance	
Outer Journal.....	.0018-.0036" (.046-.091mm)
Inner Journal.....	.0016-.0031" (.04-.08mm)

### VALVE TIMING

1) With timing belt removed, rotate camshaft sprocket until marks on sprocket are in alignment with index marks on engine.

2) Rotate crankshaft sprocket until mark on sprocket aligns with index on end plate. Install timing belt as previously outlined, making sure camshaft or crankshaft are not rotated.

## VALVES

### VALVE ARRANGEMENT

E-I-I-E-E-I-I-E

### 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) Drive guide from cylinder head using a suitable driver (A.60153). Use same driver to install guides with a suitable spacer (6A intake and 6S exhaust) installed on driver.

### VALVE STEM OIL SEALS

Use new seals when assembling cylinder head. Use a suitable guide (A.60313) to install seals on valve guides.

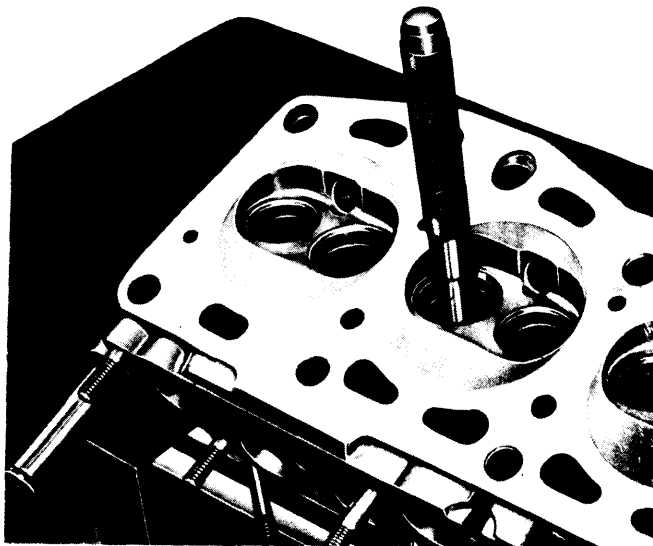


Fig. 3 Using Special Driver to Remove Valve Guide

### VALVE SPRING REMOVAL

1) Remove cylinder head as previously outlined. Remove camshaft housing cover, carburetor, intake and exhaust manifolds. Remove camshaft housing with camshaft.

2) Using a suitable 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.

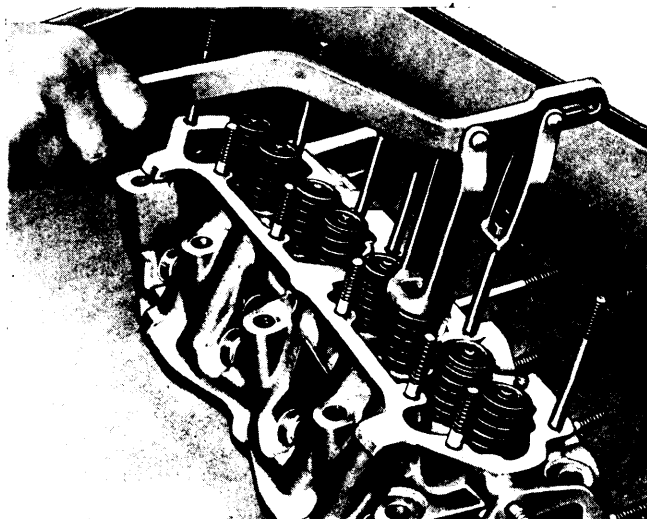


Fig. 4 Using Special Valve Spring Compressor to Remove Valve Springs

## 128, STRADA & X1/9 4-CYLINDER (Cont.)

- 3) Inspect valve springs for wear or cracking. Using a suitable spring tester (AP.5049) check inner and outer springs against specifications with specified load applied.
- 4) To install valve spring, reverse removal procedure. Install cylinder head as previously outlined.

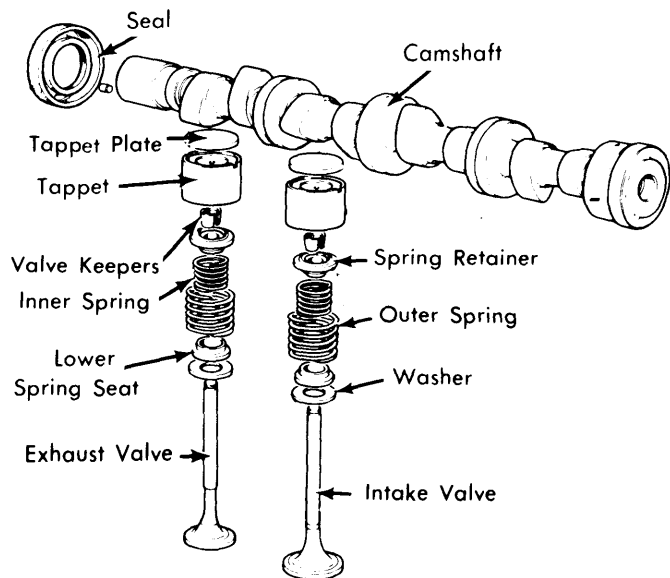


Fig. 5 Expanded View of Valve Train Components

### VALVE CLEARANCE ADJUSTMENT

**NOTE** — Check and adjust valve clearance with engine cold.

- 1) Remove camshaft cover. Rotate engine until lobe on camshaft of valve being checked is pointing straight up. Using a feeler gauge, check clearance between camshaft lobe and valve tappet plate.

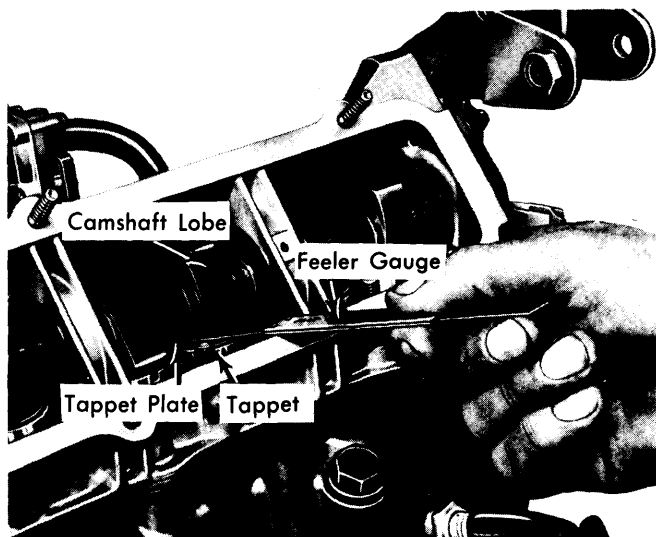


Fig. 6 Showing Where to Make Valve Clearance Check

- 2) If clearance is not as specified, insert a suitable spring compressor (A.60421) under camshaft to release spring tension against camshaft lobe. Remove tappet plate with a suitable removing tool (A.8700I). With plate removed, measure thickness to determine size of plate to be installed.

### Valve Clearance Specifications

Application	Intake Valve	Exhaust Valve
All .....	.012" (.3 mm)	.016" (.4 mm)

- 3) Valve tappet plates are available in various thicknesses: .1280-.1850" (3.251-4.699 mm) in increments of .0019" (.048 mm). Plate size is shown on face, install this side toward tappet. Use same procedure on both intake and exhaust valves. Recheck clearance and install camshaft cover.

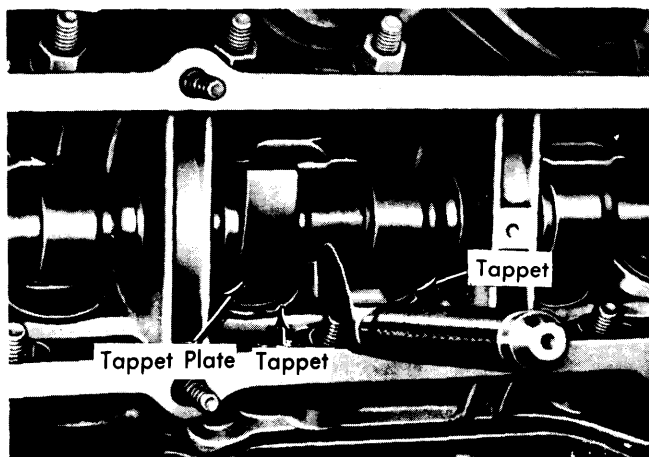


Fig. 7 Using Special Tool to Remove Valve Tappet Plate

### PISTONS, PINS & RINGS

#### OIL PAN

**NOTE** — This procedure is with engine in vehicle.

- 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 gasket and reverse removal procedure.

#### PISTON & ROD ASSEMBLY

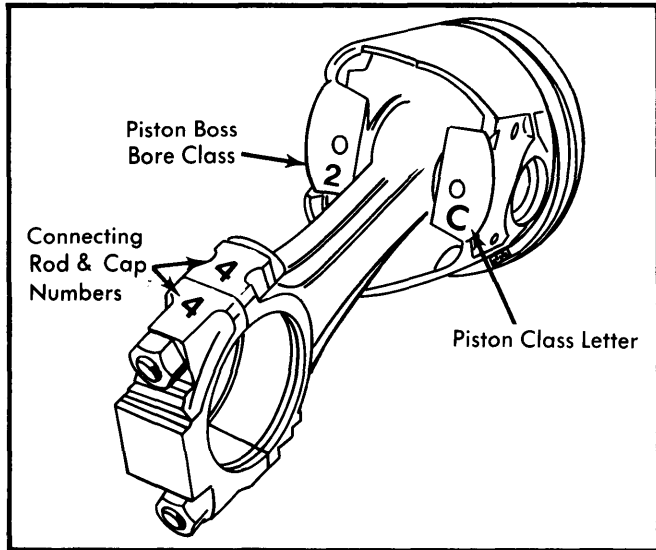
- 1) Remove oil pan and cylinder head as previously outlined. Remove oil pump. See *Oil Pump*. Remove nuts from connecting rods and remove rod caps. Push piston and rod assembly up and out through top.

**NOTE** — On Strada and X1/9 engines, note installed position of pistons and connecting rods for installation reference. Determine if numbers stamped on connecting rod and rod cap are facing away from or toward auxiliary shaft. Specific information not available from manufacturer.

## 128, STRADA & X1/9 4-CYLINDER (Cont.)

2) To install, compress piston rings with a suitable ring compressor. Pistons must be installed with number stamped on connecting rod and rod cap facing away from auxiliary shaft on 128 engines. On Strada and X1/9 engines, install pistons in position noted during removal.

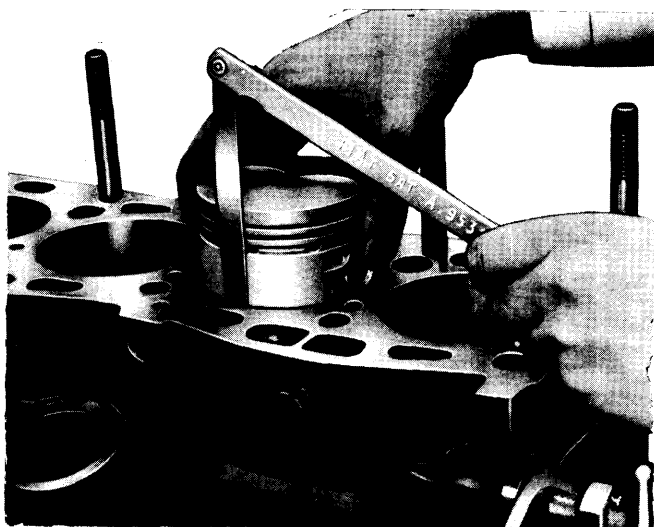
3) Tighten rod nuts to specifications. Install remaining components as previously outlined.



**Fig. 8 Piston & Connecting Rod Assembly Showing Identification Class Numbers**

### FITTING PISTONS

1) With piston and rod assembly removed and disassembled as previously outlined, thoroughly clean piston. Check ring side clearance, side clearance should be no more than .006" (.15mm). Check ring end gap in cylinder against specifications.



**Fig. 9 Using a Feeler Gauge to Check Piston-to-Cylinder Wall Clearance**

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

oversizes. There are three 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.

### Piston Class Specification

Application	(128)	⓪Size
128		
Class A	3.3827-3.3831"	(85.92-85.93 mm)
Class C	3.3835-3.3839"	(85.94-85.95 mm)
Class E	3.3842-3.3846"	(85.96-85.97 mm)

⓪ — Measured at 1.35" (34.3 mm) from piston skirt edge.

### Piston Class Specification (Strada & X1/9)

Application	(Strada & X1/9)	⓪Size
Strada & 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)

⓪ — Measured at 1.08" (27.5 mm) from piston skirt edge.

3) When installing rings, make sure gaps are spaced approximately 120° apart. Assemble piston and connecting rod and install in vehicle as previously outlined.

### PISTON PIN REPLACEMENT

1) Remove piston and rod assembly as previously outlined. Remove circlips and drive out piston pin using a suitable driver (A.60251).

**NOTE** — On Strada and X1/9 engines, note assembled position of piston on rod for reassembly reference. Determine if numbers stamped on connecting rod and rod cap are on same side as pin offset or opposite side of pin offset. Specific information not available from manufacturer.

2) Check fit of pin in piston. Pin should be push fit in piston and should not fall through under its own weight. There are two classes of piston pin and piston bore sizes. If piston pin is replaced it must be replaced with a pin of the same class. Class of piston is stamped on bottom and class of pin is stamped on face of pin.

### Piston Pin & Bore Class Specifications

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

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

4) Piston pin bore in piston is offset .08" (2 mm). On 128 engines, install connecting rod with numbered side on same side as pin offset. On Strada and X1/9 engines, install pistons on rods in position noted during disassembly.

## 128, STRADA &amp; X1/9 4-CYLINDER (Cont.)

5) Lubricate piston and secure connecting rod big end in a vise. Place piston in proper position on connecting rod and push in piston pin using a suitable driver (A.60251). Install circlips.

6) Install piston and connecting rod assembly as previously outlined.

### CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

#### MAIN & CONNECTING ROD BEARING SERVICE

1) Remove engine as previously outlined. Remove cylinder head, oil pan, clutch and flywheel as previously outlined. 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 and connecting 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. Bearings for undersize crankshafts are available in .010" (.25 mm), .020" (.50 mm), .030" (.76 mm) and .040" (1 mm) undersizes.

5) Use the Plastigage method to check main bearing clearances. Install upper bearing halves in crankcase and install crankshaft. Place a piece of Plastigage on journal and install main bearing cap with bearing. Tighten bolts to specifications and then remove main bearing cap.

6) With cap removed, check flattened Plastigage against scale on back of package to determine if clearance is as specified. Check connecting rod bearing clearance using same procedure. If clearance is incorrect, crankshaft must be ground to next undersize and bearings of corresponding undersize installed.

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

8) Check crankshaft endplay. See *Thrust Bearing Alignment*. Install remaining components in reverse of removal order or as previously outlined. Install engine as previously outlined.



Fig. 10 Fitting Crankshaft Thrust Washer to Block

#### THRUST BEARING ALIGNMENT

1) With crankshaft installed and main bearing caps tightened, 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 .0104" (.264 mm), remove flywheel end main bearing cap and install oversize thrust rings. Thrust rings are available in .005" (.13 mm) oversize.

#### 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 ones. Lubricate sealing lip of seal and use new gaskets when installing end plates.

### ENGINE OILING

**Crankcase Capacity** – Total capacity of entire system is 5.3 quarts. Normal drain and refill capacity (with filter) is 4.5 quarts.

**Oil Filter** – Full flow, mounted on front side of engine.

**Normal Oil Pressure** – 64-85 psi. with engine @212°F.

**Pressure Relief Valve** – Mounted in oil pump. See *Oil Pump*.

#### ENGINE OILING SYSTEM

Oil is circulated through engine by pressure provided by a gear type oil pump. Pump is mounted on bottom of crankcase and driven by the auxiliary shaft. Oil is drawn from oil pan by 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 two and four journal to lubricate valve tappets and valves. Auxiliary shaft is lubricated by oil from main oil gallery. Excess oil flows back into oil pan.

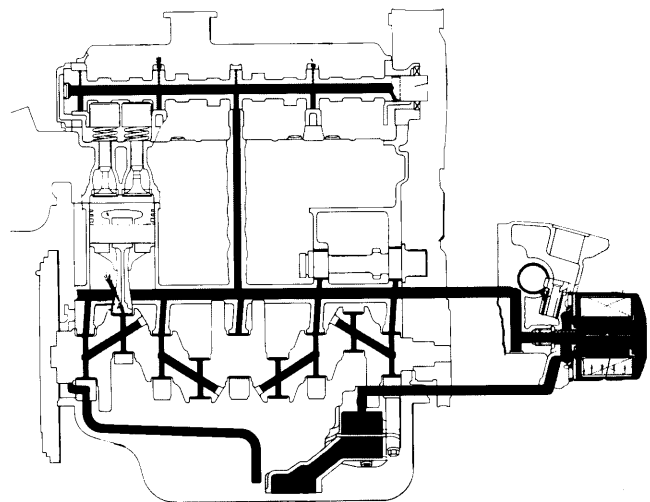


Fig. 11 Diagram Showing Engine Lubrication Flow

## 128, STRADA & X1/9 4-CYLINDER (Cont.)

### OIL PUMP

- 1) Remove oil pan as previously outlined. Remove retaining screws and slide out oil pump with suction tube.
- 2) Clamp pump housing in a vise and remove suction pipe with filter screen and relief valve. Remove pump cover and gears. Thoroughly clean all components.
- 3) Check both gears for excessive wear and replace as necessary. Check clearance between gears. 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.
- 4) Check gear end play by placing a straightedge 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. Check clearance between drive gear shaft and housing. If more than .004" (.10 mm), replace gear or housing as necessary.
- 5) Inspect pressure relief spring for cracking or wear. Inspect valve for wear or scoring.
- 6) Assemble oil pump in reverse order of disassembly. To install, reverse removal procedure.

### Oil Pump Specifications

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

### ENGINE COOLING

Thermostat — Fully open @ 176-183° F.

#### Cooling System Capacity

128 —	6.8 quarts.
128 3P —	7.4 quarts.
Strada —	7.5 quarts.
X1/9 —	11.4 quarts.

### WATER PUMP

- 1) Remove protective panels from bottom of engine and drain cooling system. Remove alternator and drive belt. Disconnect hoses from water pump, then remove nuts attaching water pipe to pump and disconnect pipe. Remove bolts holding water pump to engine and remove pump.
- 2) Clean all gasket surfaces and install new gasket. To install, reverse removal procedure and refill cooling system. Run engine and check for leaks.

### 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
1979										
128	78.7	1290	2-Bbl.	62@6000	67@4000	8.5:1	3.39	86.0	2.19	55.5
Strada	91.4	1498	2-Bbl.	67@5250	76@3000	8.5:1	3.40	86.4	2.52	63.9
X1/9	91.4	1498	2-Bbl.	67@5250	76@3000	8.5:1	3.40	86.4	2.52	63.9

VALVES							
Engine & 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)
1290cc Intake	1.4173 (36)	45°	45°	.0787 (2)	.3139-.3146 (7.974-7.992)	.0012-.0026 (.030-.066)	.3839 (9.75)
Exhaust	1.2205 (31)	45°	45°	.0787 (2)	.3139-.3146 (7.974-7.992)	.0012-.0026 (.030-.066)	.3839 (9.75)
1498cc 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)

# Fiat Engines

## 128, STRADA & X1/9 4-CYLINDER (Cont.)

### ENGINE SPECIFICATIONS (Cont.)

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1290cc Inner	1.646 (41.81)	33@1.220 (15@31.00)	62@.846 (28@21.49)
		Outer	2.122 (53.90)
1498cc Inner	.....	29.8@1.220 (13.5@31.00)	.....
		Outer	.....

VALVE TIMING				
Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
1290cc①	10°	54°	54°	10°
1498cc①	10°	54°	54°	10°

① — Valve timing checked with all valves adjusted to .020".

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)
1290cc	.0028-.0035 (.05-.07)	.0001-.0003 (.002-.008)	.0004-.0006 (.010-.016)	No. 1	.0118-.0177 (.30-.45)	.0018-.0030 (.045-.077)
				No. 2	.0118-.0177 (.30-.45)	.0016-.0028 (.040-.072)
				No. 3	.0098-.0157 (.25-.40)	.0012-.0024 (.030-.062)
1498cc	.0011-.0019 (.03-.05)	.0001-.0003 (.002-.008)	.0004-.0006 (.010-.016)	No. 1	.0118-.0177 (.30-.45)	.0018-.0030 (.045-.077)
				No. 2	.0118-.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)
1290cc	1.9994-2.0002 (50.785-50.805)	.0016-.0033 (.040-.085)	①	.0021-.0104 (.055-.265)	1.7913-1.7920 (45.498-45.518)	.0014-.0034 (.036-.086)	.....
1498cc	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 main bearing cap.

## 128, STRADA & X1/9 4-CYLINDER (Cont.)

### ENGINE SPECIFICATIONS (Cont.)

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1290 cc & 1498 cc	1.1789-1.1795 (29.944-29.960)	.0011-.0028 (.029-.070)	....
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)	....

TIGHTENING SPECIFICATIONS	
Application	Ft. Lbs. (mkg)
Cylinder Head Bolts .....	69 (9.5)
Cylinder Head Nuts .....	69 (9.5)
Main Bearing Cap Bolts .....	58 (8.0)
Connecting Rod Cap Bolts .....	36 (5.0)
Intake and Exhaust Manifold Nuts .....	22 (3.0)
Camshaft Sprocket Bolt .....	61 (8.5)
Timing Belt Tensioner Pulley Nut.....	33 (4.5)
Crankshaft Pulley and Sprocket Nut .....	101 (14.0)
Flywheel-to-Crankshaft Bolts.....	61 (8.5)