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.

Engine Identification

Application	Code
Strada	138 B2.031
X1/9	138 BS.031

ENGINE, CYLINDER HEAD & MANIFOLDS

ENGINE

NOTE – *Engine and transmission are removed as an assembly.*

Removal (Strada) – 1) Raise hood, mark hood hinge position, and remove hinge retaining bolts and hood. Remove spare tire and tools. Disconnect both battery cables. Drain cooling system. Remove radiator and heater hoses. On air conditioned models, slowly drain freon and remove compressor hoses.

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

3) Raise vehicle on lift. Remove front wheels and lower protective shields. Remove left side reaction rod bracket, reaction rod and hub support brackets. Remove left and right strut assemblies. Using suitable tool (A.47038), disconnect tie rod ball joints from hub carriers.

4) Remove axle shafts and control arms. Remove front section of exhaust system. Disconnect speedometer cable from transmission. On manual transmission models, mark gear control rod in relation to bracket and remove. On automatic transmission models, move gear selector to position "1". Disconnect shift cable from transmission lever and lay aside.

5) Attach a lifting fixture (A.60592) to engine and engine hoist. Lift engine slightly to remove weight from engine mounting points. Place a jack under center engine mount. Remove engine-to-body mounting bolts and engine support crossmember.

6) Remove mounting brackets and on automatic transmission models, the stabilizer bar. Remove engine and transmission from beneath vehicle. Separate transmission from engine once assembly is removed.

Removal (X1/9) – 1) Disconnect battery cables. Drain cooling system. Remove radiator and heater hoses. Remove cooling system expansion tank and disconnect hoses from thermostat.

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

3) Remove bolts holding louvered protection panel below carbon trap in rear firewall. 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.

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

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

6) 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.

7) Remove lower crossmember attaching bolts and remove crossmember. From above engine, disconnect reaction arm beneath 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.*

Installation (All Models) – To install, reverse removal procedure. Upon completion of installation, refill coolling system and inspect all lines and hoses for tightness.

INTAKE & EXHAUST MANIFOLDS

NOTE – *The following procedure refers to carbureted models only. Information is not available from manufacturer on fuel injected models.*

Removal – 1) Drain cooling system. Remove spare tire from engine compartment. Remove air cleaner and cartridge 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.

Installation – To install, reverse removal procedure and use new gaskets.

CYLINDER HEAD

NOTE – *The following procedure refers to carbureted models only. Information is not available from manufacturer on fuel injected models.*

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

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

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.

Installation — 1) Thoroughly clean all gasket surfaces on cylinder head and block. Use new head gasket with word "ALTO" facing up wen installing cylinder head.

2) For vehicles with .75" (19 mm) head bolts, tighten bolts in sequence shown in *Fig. 1* in 3 stages. If necessary, modify tool J28032 (Fiat A50131/1) by removing ¼" (6 mm) of material from bottom of tool. Tighten bolts first to 29 ft. lbs. (93 N.m), then to 69 ft. lbs. (94 N.m) following sequence in *Fig. 1*. Loosen bolts ½ turn and retighten in sequence.

3) 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. Tighten bolts in 4 stages using special tool (Fiat A50172) 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).

4) Apply paint marks to 1 corner of all the head bolts and a corresponding mark to the cylinder head. Tighten all bolts to a 90° angle. Retighten bolts another 90°. Bolts must now have been tightened a total of 180° in 2 stages.

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

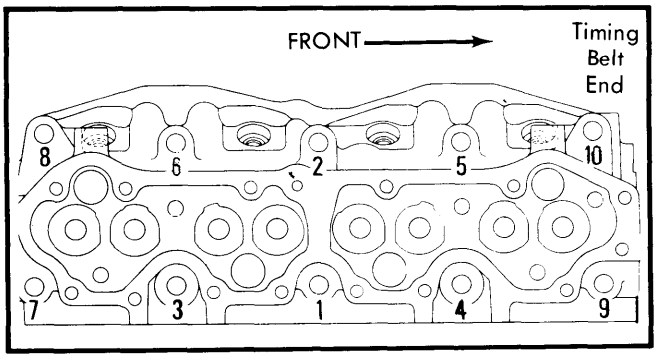

Fig. 1 Cylinder Head Tightening Sequence

CAMSHAFT

TIMING BELT REPLACEMENT

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

Removal (Strada) — 1) Disconnect battery cable. Remove timing belt covers (lower cover bolt must be removed from under vehicle). Turn engine with tool (A.60459) until crankshaft pulley mark is aligned with TDC indicator and camshaft sprocket index mark is aligned with mark on belt guard.

2) Loosen alternator and A/C compressor (if equipped) mounting bolts and remove pulley drive belt. Loosen idler pulley nut and move pulley left as far as possible. Secure with nut and remove belt.

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

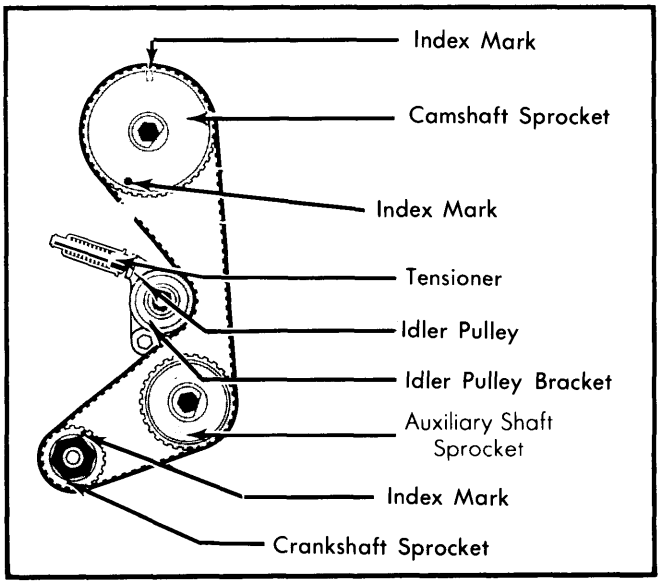

Fig. 2 Timing Belt Correctly Installed on Camshaft, Auxiliary Shaft and Crankshaft Sprockets

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 counterclockwise. 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.

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

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.

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, after installing new end seal with driver (A.86018 or equivalent). Install sprocket and place housing and camshaft on cylinder head. 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 and Installation — 1) Auxiliary shaft drives distributor and oil pump. Shaft is driven by timing belt. Remove oil pump as described in Oil Pump Removal. Remove distributor, and inspect drive gears of distributor and oil pump. If gears are chipped or worn, auxilary shaft must be replaced.

2) Remove timing belt. See Timing Belt Replacement. 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 belt guard.

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

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. Use driver A 60395 to remove guides, and A 60462 to install guides. If guides are damaged during installation, finish ream with reamer (A.90310).

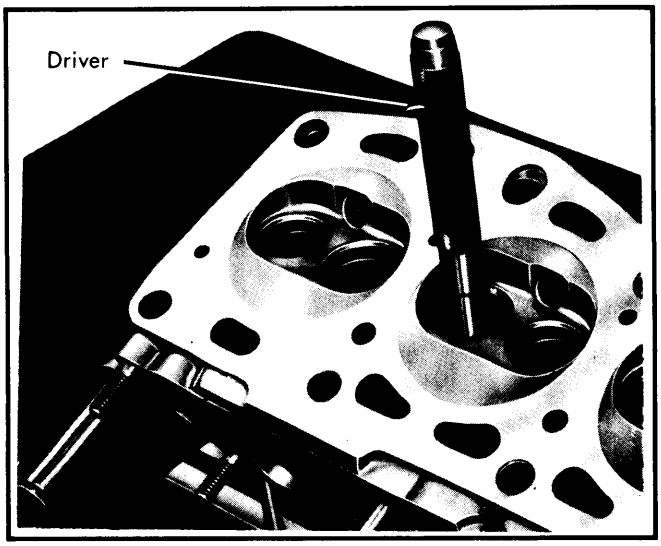

Fig. 3 Using Special Driver to Remove Valve Guide

VALVE STEM OIL SEALS

Removal — 1) Remove spark plug from cylinder No. 1. Piston should be approximately ⅔ of the way up the cylinder. Screw in compressor gauge hose/adapter into spark plug hole and connect an air hose, pressurizing cylinder to approximately 120-150 psi (8.4-10.5 kg/cm²).

2) Using valve spring compressor (Kent-Moore J28067), compress valve springs. Remove valve keepers. Slowly release tension from spring. 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). Place protector pin on end

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

of valve stem. Slide new oil seal down pin and valve stem onto guide. Remove protector pin.

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

3) Repeat procedure for other valve of cylinder No. 1. After seal replacement, remove air hose, reinstall spark plug and repeat procedure on remaining cylinders. Reinstall camshaft housing and related parts onto cylinder head. See Camshaft Removal and Installation. Use a new timing belt.

VALVE SPRINGS

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

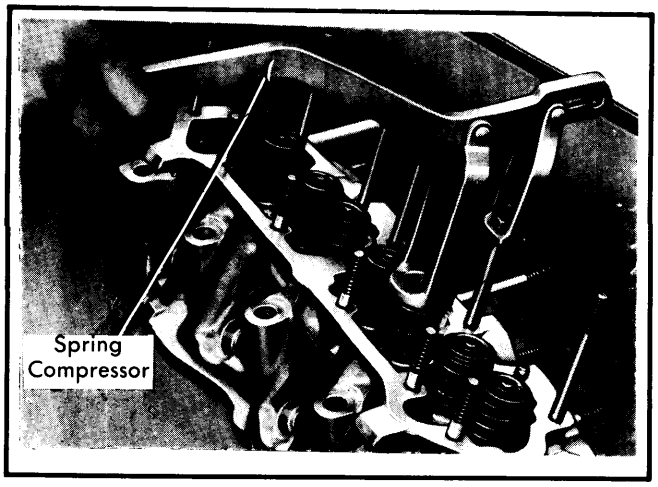

Fig. 4 Using Special Valve Spring Compressor to Remove Valve Springs

Valve Spring Tension

Height in Inches (mm)	Load in Lbs. (kg)
Inner Spring	
1.220 (31)	33 ± 1.1 (14.9 ± 0.5)
.846 (21.5)	64 ± 2.6 (28.1 ± 1.2)
Outer Spring	
1.417 (36)	85 ± 3.3 (38.9 ± 1.5)
1.043 (26.5)	14 ± 5.5 (59.5 ± 2.5)

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.

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.

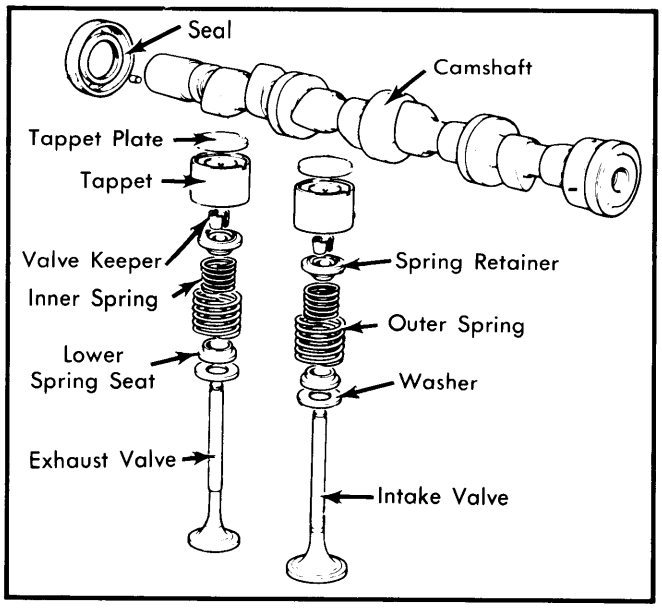

Fig. 5 Exploded View of Valve Train Components

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.

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.87001). With plate removed, measure thickness to determine size of plate to be installed.

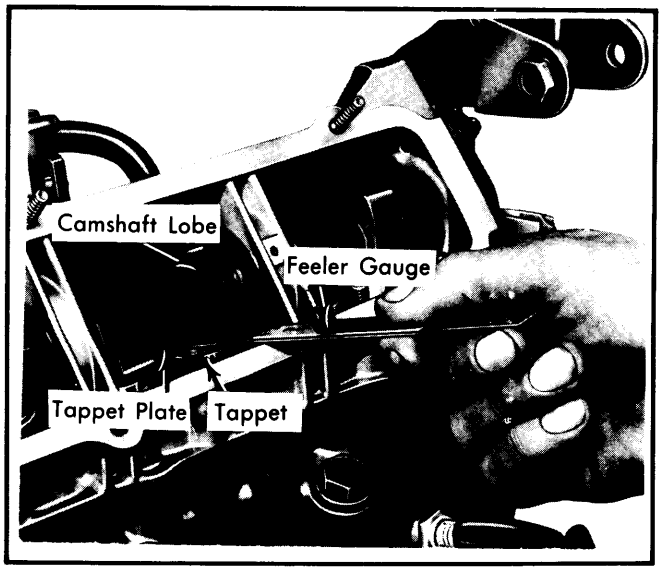

Fig. 6 Checking Valve Clearance

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

Valve Clearance Specifications

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

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

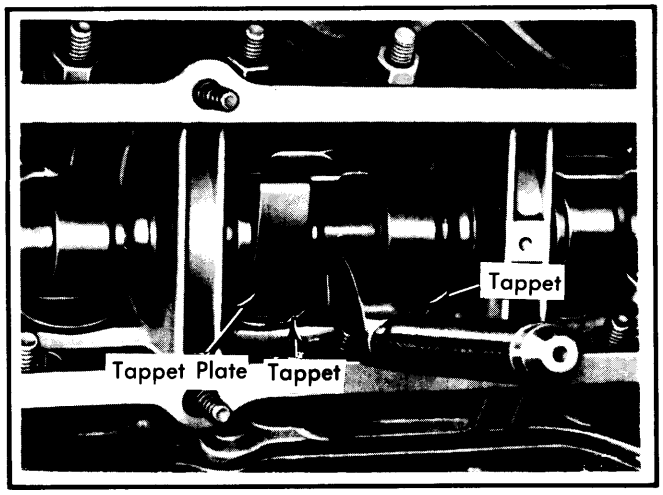

Fig. 7 Using Special Tool to Remove Valve Tappet Plate

PISTONS, PINS & RINGS

OIL PAN

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

Removal – 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.

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. Tighten rod nuts. Install remaining components in reverse of removal procedure.

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.

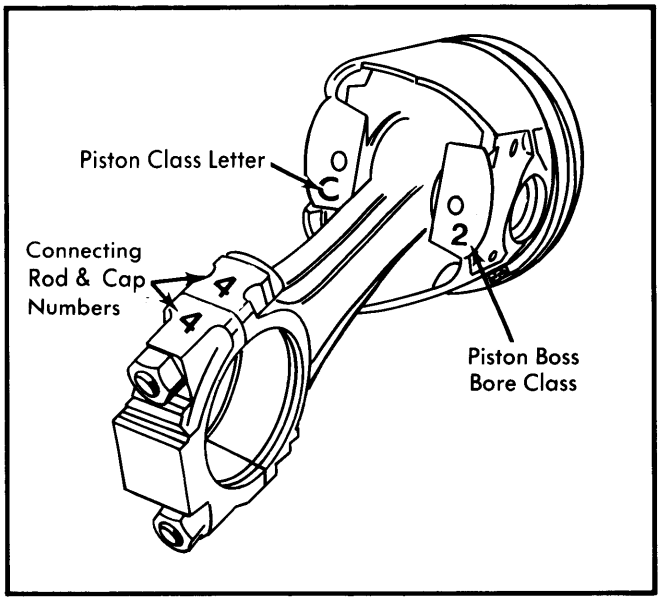

Fig. 8 Piston & Connecting Rod Assembly Showing Identification Class Numbers

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.

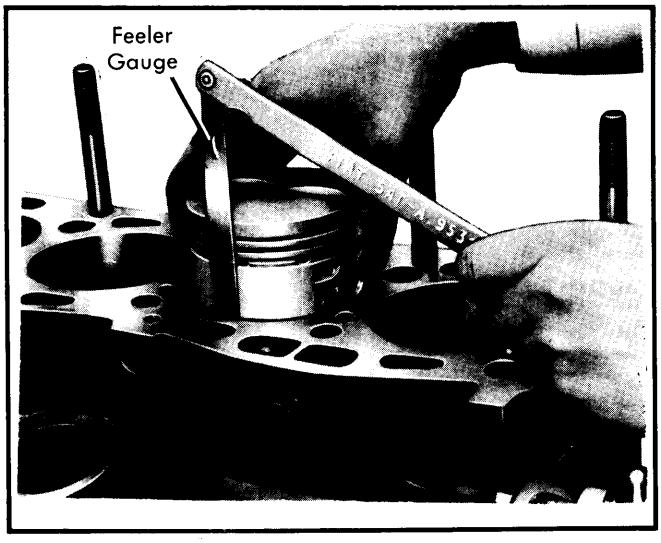

Fig. 9 Using a Feeler Gauge to Check Piston-to-Cylinder Wall Clearance

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

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

Piston Class Specification

Application	①Size
Strada & 1/9	
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 REPLACEMENT

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

2) Check fit of pin in piston. Pin should be push fit in piston and not fall through under its own weight. There are 2 classes of piston pin and piston bore sizes. 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 and class of pin is stamped on face of pin and bottom of piston. *See Fig. 8.*

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). Install connecting rod with numbered side on same side as pin offset.

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 with driver (A.60251). Install circlips using special tool (A.60301).

6) After installation, ensure circlips 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 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.

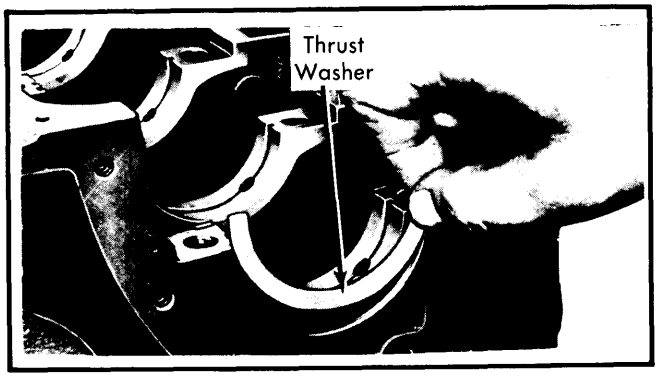

Fig. 10 Fitting Crankshaft Thrust Washer to Block

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 .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.

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

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 — Normal drain and refill capacity for both models is 4½ quarts.

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

Normal Oil Pressure — 50-71 psi (3.5-5.0 kg/cm²) with engine at 212°F (100°C).

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.

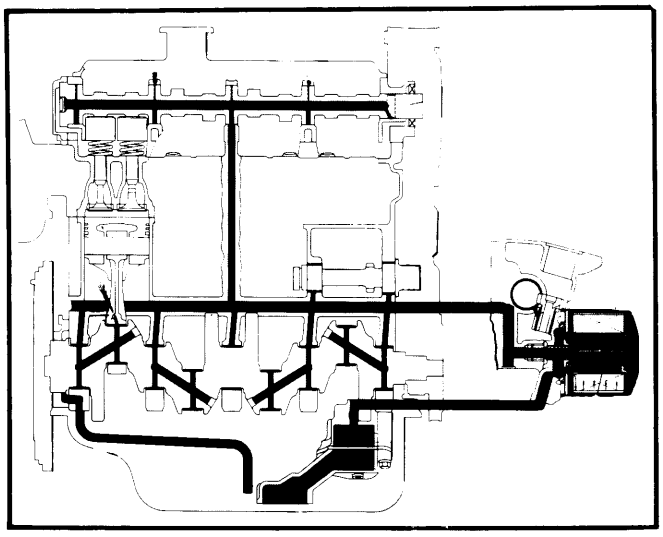

Fig. 11 Diagram Showing Engine Lubrication Flow

OIL PUMP

Removal & Installation – 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

Radiator Cap — Opens at 11 psi (0.8 kg/cm²).

Thermostat — Temperature range was not available from manufacturer.

Thermoswitch — Operates at 185° F (85° C).

Cooling System Capacity

Application	Capacity
Strada	7.5 quarts
X1/9	12.2 quarts

WATER PUMP

Removal – 1) Remove protective panels from bottom of engine and drain cooling system. Remove alternator and drive belt. On models with air conditioning, remove compressor and mount. On models with air pump, remove top half of timing belt cover, air pump and drive belt.

2) 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.

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

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

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displ. cu. ins.	Displ. cc	Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore in.	Bore mm	Stroke in.	Stroke mm
1981	91.4	1498	Fuel Inj.	75@5500	.....	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)
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)

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm) Valve Closed	PRESSURE Lbs. @ In. (kg @ mm) 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)

VALVE TIMING

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

PISTONS, PINS, RINGS

Engine	PISTONS Clearance In. (mm)	PINS Piston Fit In. (mm)	PINS Rod Fit In. (mm)	RINGS Rings	RINGS End Gap In. (mm)	RINGS Side Clearance In. (mm)
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 Journal Diam. In. (mm)	MAIN BEARINGS Clearance In. (mm)	MAIN BEARINGS Thrust Bearing	MAIN BEARINGS Crankshaft End Play In. (mm)	CONNECTING ROD BEARINGS Journal Diam. In. (mm)	CONNECTING ROD BEARINGS Clearance In. (mm)	CONNECTING ROD BEARINGS Side Play In. (mm)
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.

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

ENGINE SPECIFICATIONS (Cont.)

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)	....
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 SPECIFICATION

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