

OVERHAUL MANUAL

R800-46

R839-46

WHEN ORDERING PARTS, BE SURE TO SPECIFY THE FOLLOWING INFORMATION WHICH CAN BE FOUND ON THE ENGINE NAME-PLATE.

ENGINE MODEL

ENGINE SERIAL NUMBER

SPECIFICATION NUMBER

Your cooperation in giving the above data will be of material assistance in filling your orders promptly and correctly.

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ENGINE REPAIR AND OVERHAUL

This section includes instructions for repairs and overhaul of the component units of Teledyne Continental "R" Series, four-cylinder, overhead valve engines.

Provide a clean place to work and clean the engine exterior before you start disassembling. **DIRT CAUSES ENGINE FAILURES.**

Many shop tools have been developed to save time and assure good workmanship. These should be included in your equipment.

Use only genuine Teledyne Continental parts in these engines. Years of development and testing have gone into these specifications to assure maximum life and performance.

CYLINDER HEAD

The cylinder head is an important part of the engine assembly since it contains the combustion chamber, valves, and cored passages for air, exhaust and water flow and oil passages to the rocker arm assembly.

REMOVING THE CYLINDER HEAD

1. Drain coolant from engine and disconnect radiator hoses.
2. Remove rocker arm cover by removing the two thumb nuts with their gaskets. Check cover gasket for damage and replace if necessary. Replace the thumb nut gaskets with new ones.

CAUTION

When reinstalling rocker arm cover, finger-tighten thumb nuts. Over tightening may cause gaskets to leak.

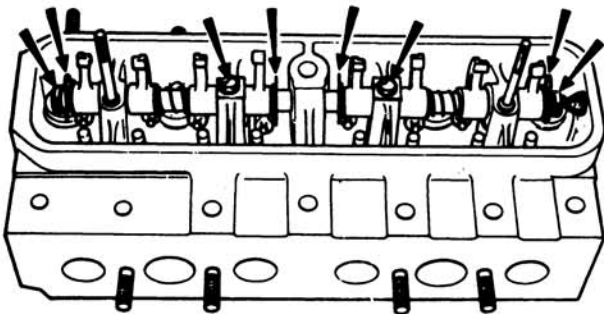


FIGURE 1. PRELIMINARY DISASSEMBLY OF ROCKER SHAFTS

3. Remove the rubber grommet from the rocker shaft aperture. Unscrew the rocker shaft end bolts. Remove the four clips, the two end springs and the two rocker shaft lock bolts (Figure 1).

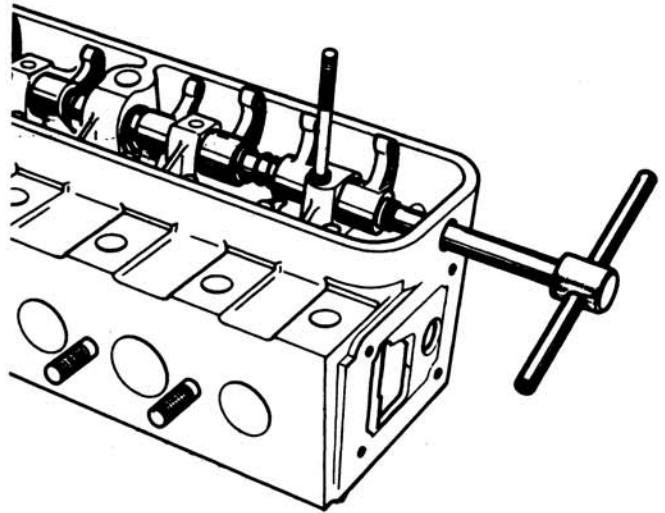


FIGURE 2. WITHDRAWING ROCKER ARM SHAFTS

4. Using a puller, draw out the rocker shafts (Figure 2).
5. Remove rocker arm shaft assemblies and pushrods. They should be put aside in the order in which they were removed (Figure 3).

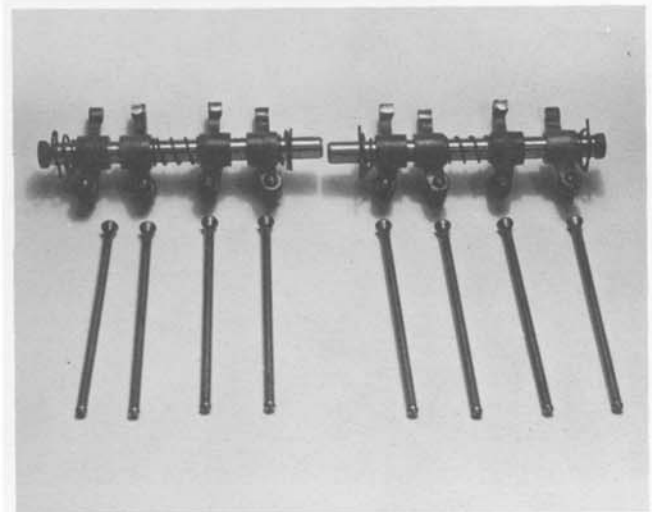


FIGURE 3. ROCKER ARM AND PUSHROD ASSEMBLIES

6. Loosen and remove the cap screws holding the cylinder head to the block.

- Lift the cylinder head off the engine and carry to a clean bench for further disassembly.
- Lock sleeves in place, so you will not disturb the seals (Figure 4).

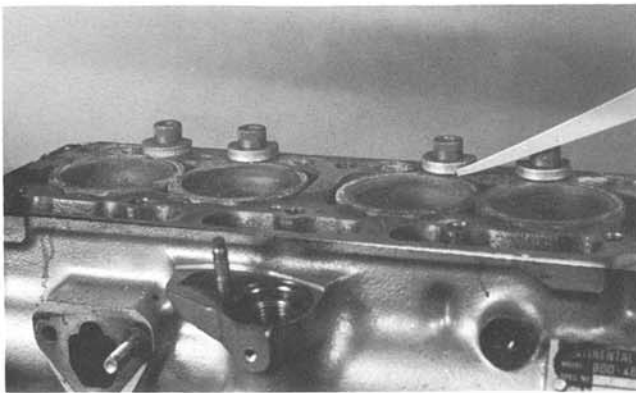


FIGURE 4. CYLINDER SLEEVE LOCKS

IMPORTANT

Do not rotate crankshaft until sleeve locks are in place.

DISASSEMBLY OF CYLINDER HEAD

- Remove all carbon from combustion chamber areas using scraper and wire brush.
- Using a "C" type valve spring compressor, remove the valve springs, retainer locks, and retainers placing all parts in a container of solvent (Figure 5).

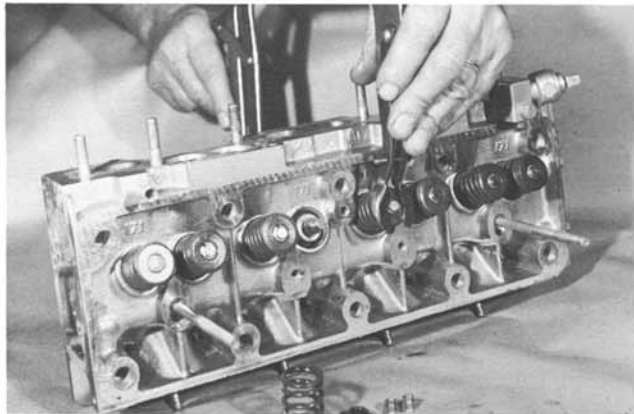


FIGURE 5. REMOVING VALVE SPRINGS AND VALVES

- Remove the valves and place them in order in a rack with holes numbered for both intake and exhaust so they will not be mixed in handling. Intake and exhaust valve stem keepers are not interchangeable. Keep separated (Figure 6).

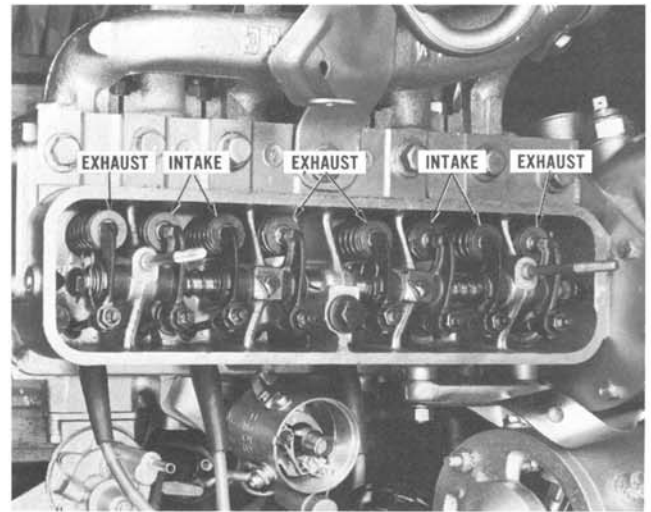


FIGURE 6. EXHAUST AND INTAKE VALVE LOCATION

- Clean the cylinder head thoroughly with a solvent or degreasing solution and blow it off with compressed air. Inspect carefully for cracks.

VALVES

- Inspect valves for condition and replace any that are "necked", cracked or burned, also any on which valve stems are bent or worn more than .002 inch (0.05 mm). Reface or replace all valves.
- All valves having less than 50% margin thickness (outer edge of valve head) after refacing has been completed must be replaced. To check this dimension, compare the refaced valve with a new valve (Figure 7).

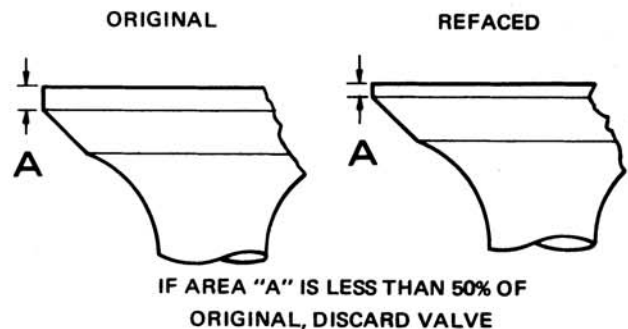


FIGURE 7. ALLOWABLE THICKNESS OF REFACED VALVE

- Check all refaced or new valves in V-blocks with indicator to determine if the contact face is true with the stem within .002 inch (0.05 mm). If not, repeat the refacing operation. Before removing the arbor, indicate the seat. Total indicator must not be more than .002 inch (0.05 mm).

Use a pilot preferably having a solid stem with a long taper, as all valve seats must be ground concentric and square with either new or worn valve stem guide holes.

4. After the valves and seats have been refaced and reground, coat the seat lightly with Prussian blue and drop the valve into position, oscillating it slightly to transfer the blue pattern to the valve face. This should show a contact width of .0468 inch (1.19 mm) for intake and .0625 inch (1.58 mm) for exhaust and should fall well within the width of the valve face, leaving at least .0156 inch (0.39 mm) on either side where the blue does not show.

If the contact is too wide, the seat in the head may be narrowed by using a 15° stone to reduce the outside diameter or using a 60° or 75° stone to increase the inside diameter (Figure 8).

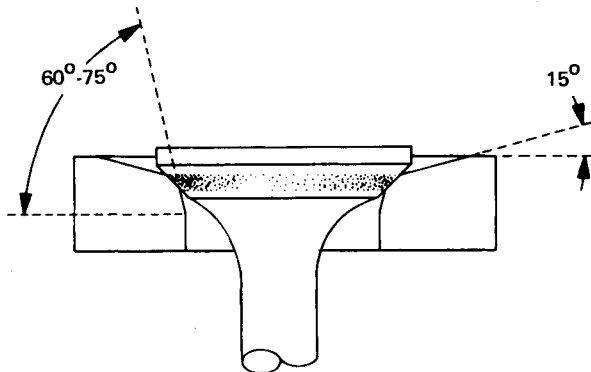


FIGURE 8. METHOD OF NARROWING VALVE SEATS

After the narrowed-down seat is brought within specifications, it should be retouched lightly with the original stone to remove burrs or feathered edge.

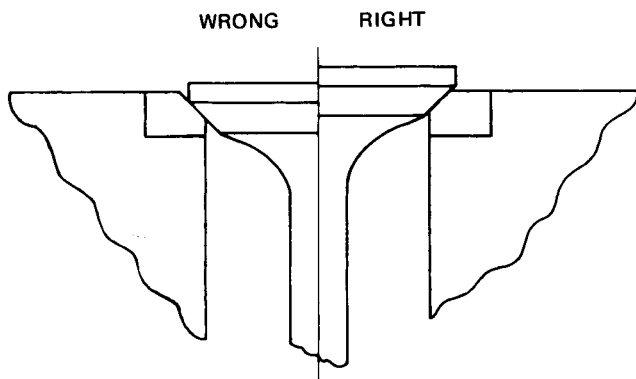


FIGURE 9. VALVE POSITION IN HEAD

NOTE

Never allow valves to set down inside the seat (Figure 9).

5. Coat the valve with a light film of engine oil.

VALVE SPRINGS

The intake and exhaust valve springs are identical within each model. Check all valve springs on a spring tester to make sure they meet specifications.

VALVE PUSHRODS

1. Inspect pushrods for bends or twists and examine the ball and cup ends for excessive wear. Replace rods that are faulty or excessively worn.

2. To prevent damage to pushrods, replace after the cylinder head is installed.

VALVE GUIDES

1. Clean the valve stem guides, removing lacquer or other deposits. Do not use tools that remove metal.

2. Check guides for wear by using a telescopic gauge and 1-inch micrometer. Replace all guides that are worn bell-mouthed and have increased .0015 inch in diameter (.038 mm).

3. To remove valve guides, press out from top of cylinder head. Original outside diameter of guide is .433 inch (11 mm). Oversizes are available (Figure 10).

.005 inch oversize - .437 inch (11.10 mm) diameter identified by one groove.

.010 inch oversize - .443 inch (11.25 mm) diameter identified by two grooves.

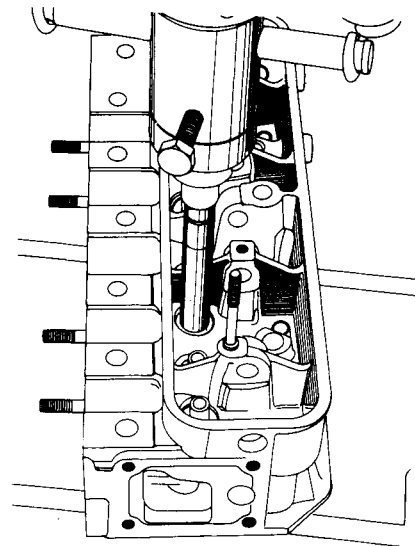


FIGURE 10. PRESSING OUT VALVE GUIDE

To replace guides, ream out bore with a reamer corresponding to the diameter of the new guide (Figure 11).

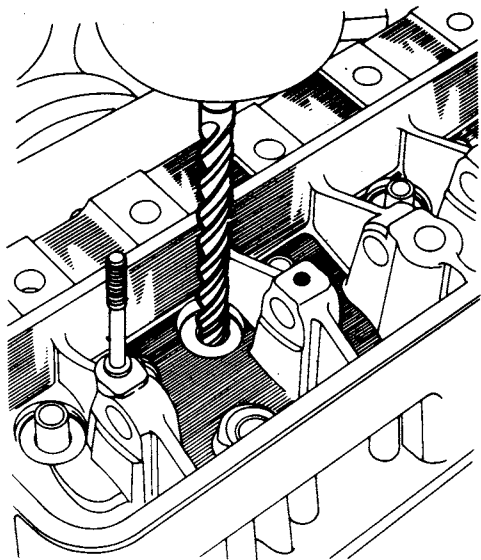


FIGURE 11. REAMING VALVE GUIDE BORE

Insert mandrel into stop guide, position correctly for either intake or exhaust. Lubricate the guide and press in place with an arbor press until mandrel makes contact with cylinder head.

Ream out inside of the guides, using reamer with .276 inch (7 mm) diameter (Figure 12).

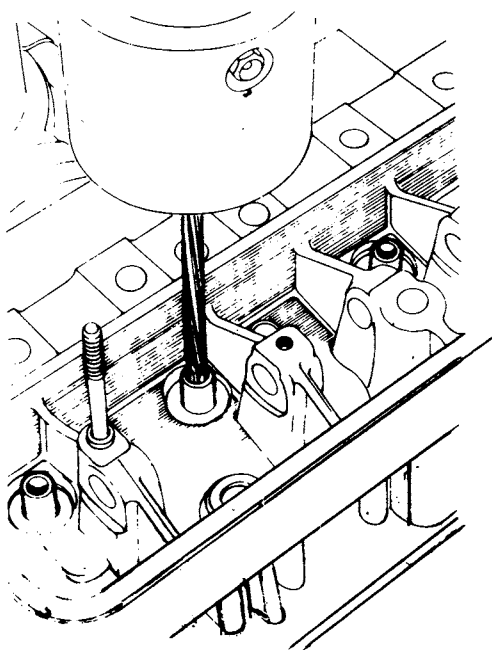


FIGURE 12. REAMING VALVE GUIDE

INSTALLING CYLINDER HEAD

1. Make sure that gasket contact surfaces on the head and block are clean, smooth and flat.

Check flatness with straight edge and feeler gauge in three positions lengthwise and five crosswise. The maximum permissible is .002 inch (0.05 mm) low in the center lengthwise, gradually decreasing towards the ends, or .002 inch (0.05 mm) crosswise or in localized low spots. Cylinder head or block must be replaced or resurfaced if these limits are exceeded (Figure 13).

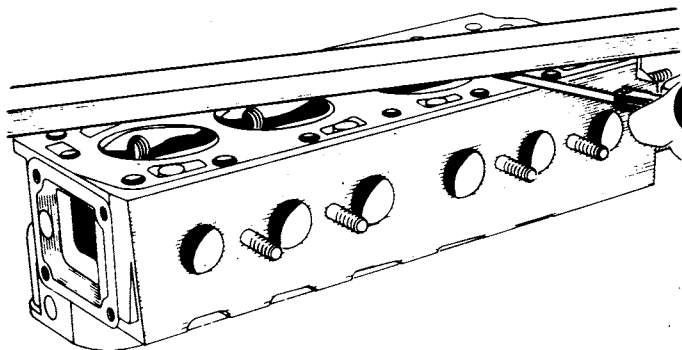


FIGURE 13. CHECKING CYLINDER HEAD FLATNESS

2. Use new cylinder head gasket, which is pre-coated, thus no cement is required. Install gasket with side marked "Top" towards the cylinder head.
3. Compress valve springs. Install the keepers (Figure 14).

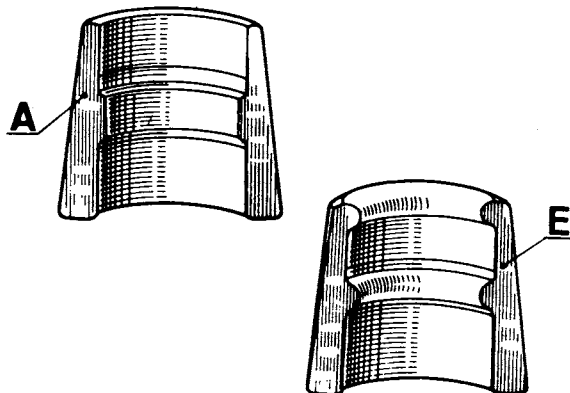


FIGURE 14. VALVE KEEPERS

CAUTION

The intake keepers (A) and exhaust keepers (E) are different. Keep separated.

4. Insert the rocker arm shafts (with the set bolt holes in line with the set holes in the bracket), fitting the rocker arms and springs one after the other as the shaft is assembled to the head. Screw in the two shaft set bolts and lock them. Place the rubber plugs at the cylinder head ends (Figure 15).

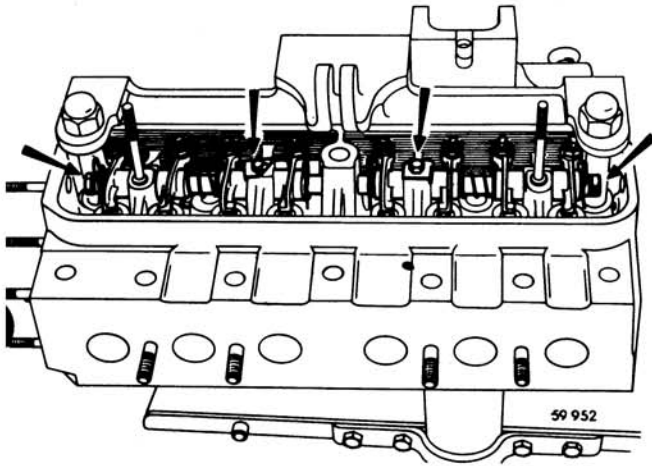


FIGURE 15. INSTALLING ROCKER ARM ASSEMBLIES

5. Lower the cylinder head assembly evenly, then pull all cylinder head cap screws up snug.

6. Tighten the capscrews with a torque wrench in the recommended sequence to the correct torque (chart on page 22) by going over them twice before pulling them down to the final torque on the third round (Figure 16).

After 10 hours of operation, readjust valve tappets (refer to page 17) and retorque cylinder head capscrews. When retorquing, back off number one (1) capscrew 1/4 turn and retorque. Follow this procedure until all capscrews have been retorqued individually.

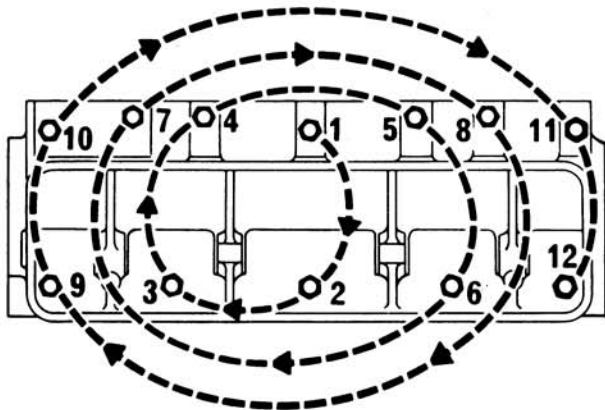


FIGURE 16. RECOMMENDED CYLINDER HEAD TORQUE SEQUENCE

CYLINDER BLOCK

The "R" engines have cylinder barrels with replaceable sleeves, commonly termed the "wet-type", meaning that they complete the water jacket of the cylinder block when they are assembled in place.

When cylinder bores of wet-sleeve engines are worn more than .008 inch (0.20 mm) it is more economical to replace the sleeve and use a standard piston and ring assembly instead of reboring the cylinder and assembling an oversize piston. When worn less than .008 inch (0.20 mm), a set of service rings may be used to restore the engine to satisfactory condition.

CHECKING BORE WEAR

1. Clean the ring of carbon from around the top of the cylinder bore formed above the travel of the top ring.
2. Determine the original diameter of the cylinder barrel by checking this unworn area with an inside micrometer at intervals of approximately 45° (Figure 17).



FIGURE 17. CHECKING I. D. OF SLEEVE BORE

3. Check in same manner, the top of the ring travel area approximately 1/4 inch below the shoulder.
4. The maximum difference in the above checks indicates the amount of cylinder bore wear. If less than .008 inch (0.20 mm), re-ringing will be suitable; and if over .008 inch (0.20 mm), re-sleeving is required.

CYLINDER HONING (For cylinder wear less than .008 inch (0.20 mm).

1. Ridge ream the cylinders to remove the unworn area at the top so that the new rings, when assembled, will not bump and distort both themselves and the piston lands.

Several good makes of ridge reamers are available which will ream the top of the bore in direct relation to the worn area so that if the worn area should be off center slightly, there will be no partial ridge remaining.

With the head removed, there is no compression on the sleeves to hold them in place. It will be necessary to make some form of holding clamp to hold cylinder sleeves in position during the ridge reaming and honing operations (Figure 18).

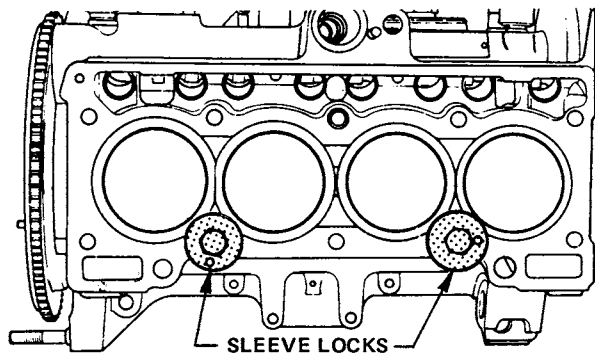


FIGURE 18. CYLINDER SLEEVE LOCKS

2. Drain the crankcase and remove the oil pan. Replace old drain plug gasket with a new one.
3. Remove the connecting rod caps. Keep the caps and bolts in numerical order so that when the pistons and rods are removed from the engine, the cap can be reassembled and kept with its mating part. If not already numbered, do so at this time (Figure 19).

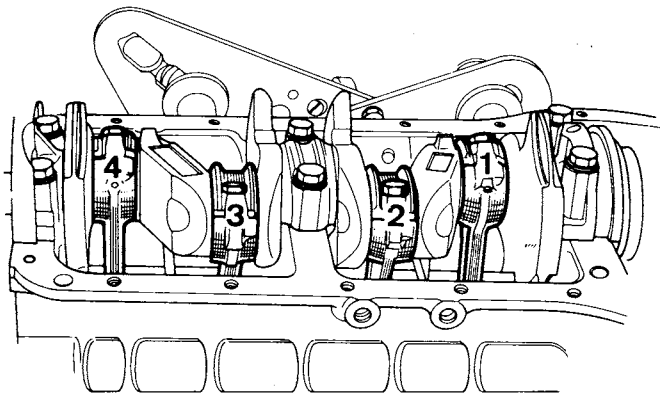


FIGURE 19. IDENTIFYING CONNECTING ROD CAPS

Before removing, check position of bearings in the rod and cap. When replacing, make sure tang of the bearing fits into the notch at the rod and cap for proper reassembly.

4. Push the pistons and connecting rods and sleeves up through the top of the cylinder, carrying with them all the carbon and metal chips left from the cleaning and ridge reaming operation. When doing this, every precaution must be taken to prevent damage to cylinder bores by the sharp corners and rough edges of the connecting rods and bolts.

CAUTION

If cylinder sleeves are to be reused, cylinders should be honed as shown in Teledyne Continental Motors Service Bulletin No. 70-147.

REMOVING PISTON PIN

Remove the piston pin on an arbor press using the short guide on the support base (A) and the extracting mandrel (3) (Figure 20).

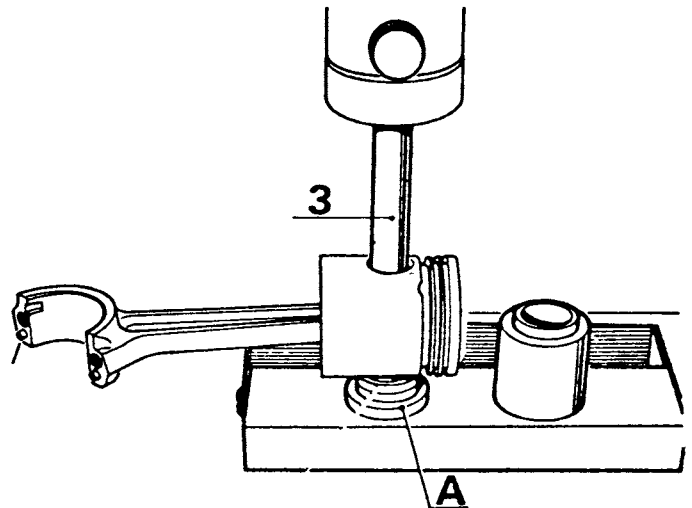


FIGURE 20. REMOVING PISTON PIN

CONNECTING ROD

Inspect the connecting rod for any evidence of twist or out-of-squareness. If these conditions exist, replacement of connecting rod is recommended.

INSTALLING PISTON PIN

Place the connecting rod in a container full of water. Heat to boiling point.

An alternate method is to use an electric oven capable of a temperature of 480° F (Figure 21).

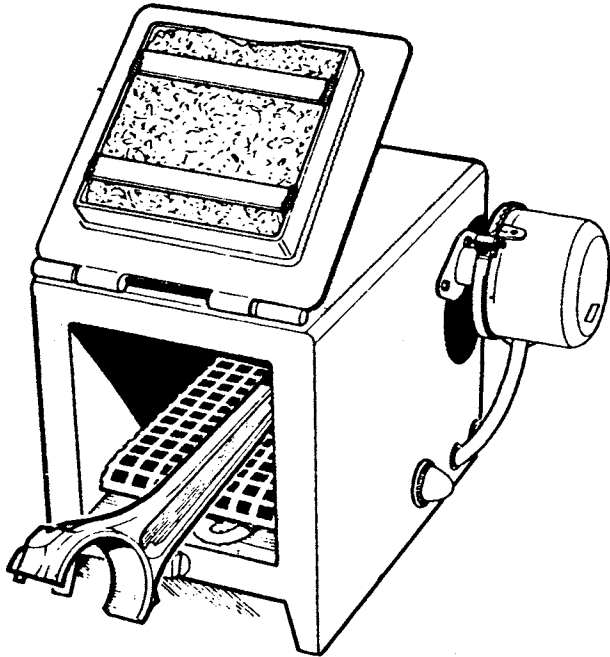


FIGURE 21. METHOD OF HEATING CONNECTING ROD

The piston has a flat surface on one side of the piston skirt at the piston pin hole. When installing new piston, it is necessary to form a slight chamfer of .020 inch (0.50 mm) using chamfering tool, as described below, on the inside of the skirt opposite the flat spot before the piston pin can be fitted to the piston (Figure 22).

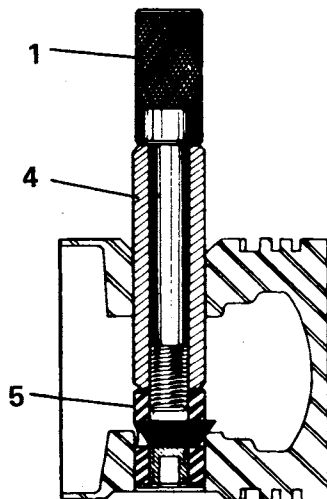


FIGURE 22. PREPARING THE PISTON

a. Slide the tool carrier (5) between the two piston bores with the cutting edge of the tool towards the bore to be chamfered.

b. Screw inserting mandrel (1), fitted with dummy pin (4), into the tool carrier.

c. Make a regular chamfer by turning the tool and applying a moderate pressure to the knurled mandrel.

d. Check piston pin so it turns freely in the new piston.

e. Slide the new piston pin over the fitting mandrel (1) (Figure 23).

f. Screw locating plug (2) into place (without tightening it).

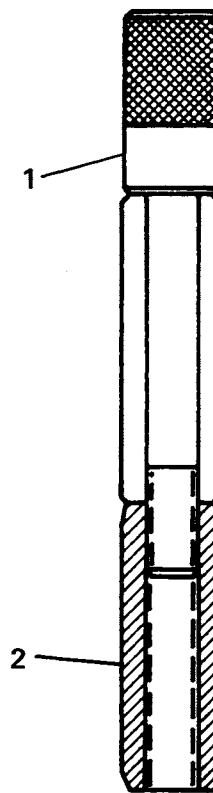


FIGURE 23. PISTON PIN MANDREL

g. Coat the piston pin with oil.

The preceding operations are to be carried out quickly so that the heat losses are reduced to a minimum (especially when the connecting rod has been heated in boiling water).

On Model R800 and R839, the piston is to be fitted to the connecting rod with the flat spot on the piston skirt, facing towards the flywheel. Position the short end of the connecting rod toward the camshaft.

Fit the assembly guide sleeve (2) onto the assembly guide (B) on the mounting base. Place the "piston-connecting rod" assembly on the mounting base making sure that the spotface on the piston is resting on the assembly guide sleeve (2). Push the "mandrel-piston pin-sleeve" assembly by hand into the piston and connecting rod small end until the assembly guide sleeve just touches the bottom of the assembly guide (Figure 24).

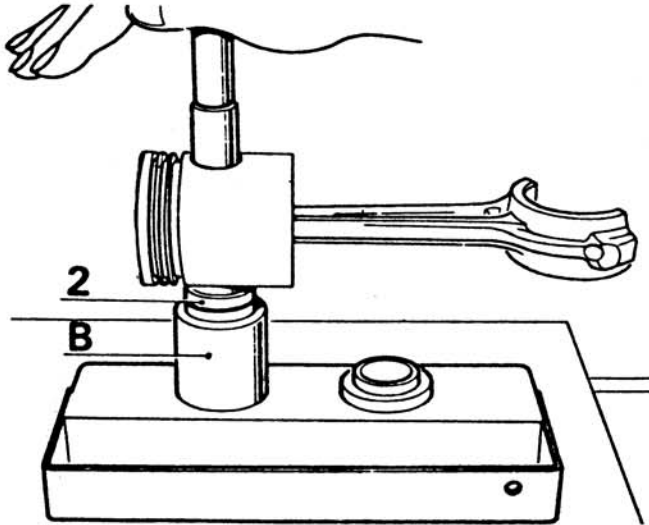


FIGURE 24. INSERTING PISTON PIN

After fitting, check for any tight spots. In an instance where hand fitting of the piston pin assembly is found difficult, a press may be used.

NOTE

The depth of the counterbore in the guide has been calculated to correctly position the connecting rod with respect to the piston pin after insertion.

RECOMMENDED METHOD OF INSTALLING PISTON RINGS



FIGURE 25. CHECKING RING CLEARANCE IN GROOVE

1. Grip the connecting rod in a vise with lead-lined jaws to hold the piston firmly, and roll each ring in its groove to be sure there are no burrs or other interference with the free action of the ring in the groove (Figure 25).

2. Hold the ring tool with recess side up and place the ring in with the bottom side up. Start with the lowest ring first (Figure 26).

Fit the following to the pistons:

- a. The U-Flex oil control ring.
- b. The compression ring.
- c. The "firing" ring.

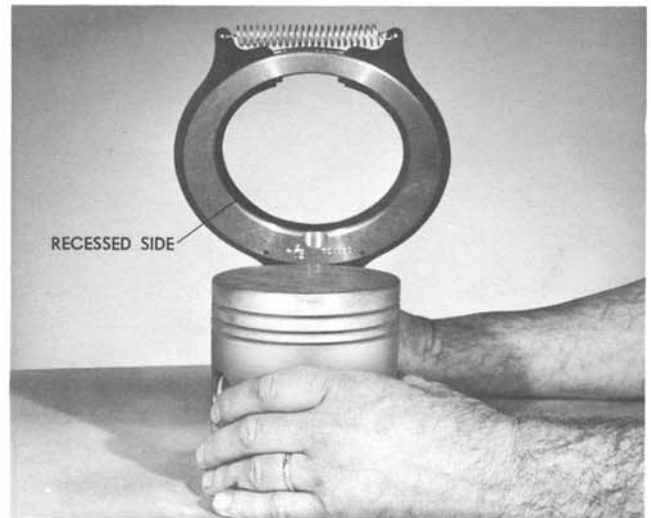


FIGURE 26. INSTALLING RINGS WITH RING EXPANDER

CAUTION

The gap on all these piston rings is pre-adjusted and it is never to be altered.

Oil the rings and stagger the gaps at an angle of 180° to each other. The gap on the U-Flex oil control ring is to be in line with the unpierced part of the piston groove.

REPLACING CYLINDER SLEEVES

When the bore wear measures over .008 inch (0.20 mm) or bores are badly scored or damaged, re-sleeving is recommended using standard piston and ring assemblies which are available in complete kits including sleeves, pistons, piston pins, and rings.

1. Pull the sleeve, piston, and connecting rod as one unit.
2. Clean out the counterbore thoroughly, removing all rust and scale to prevent metal to metal contact of the new sleeve with the block.
3. Clean the lower seal contact surface so that the new seals, when assembled, will not be torn or damaged by particles of rust or corrosion protruding from the machined surfaces (Figure 27).

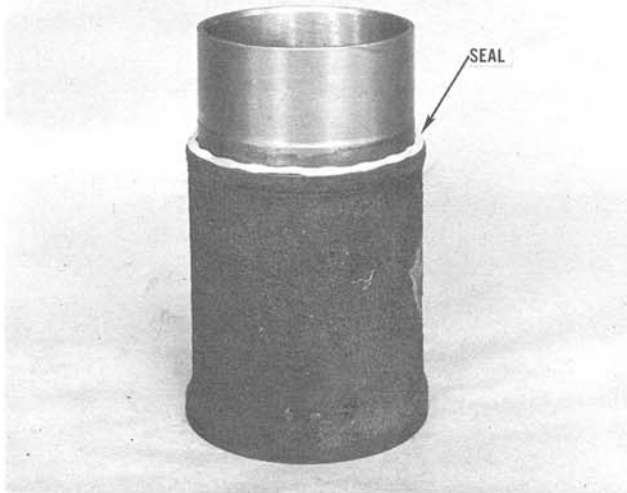


FIGURE 27. CYLINDER SLEEVE SEAL INSTALLATION

Install the lower seals to the sleeves using a thin tool with well rounded edges.

Fit the sleeves into the cylinder block. Press in by hand so they rest correctly on the seals.

When installing sleeves, make sure that the flat areas butt together. Check the sleeve projection above the cylinder block. Refer to chart below for proper projection (Figure 28).

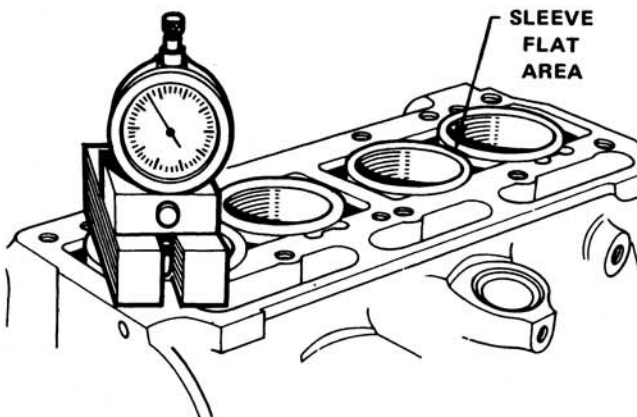


FIGURE 28. CHECKING SLEEVE PROJECTION

SLEEVE PROJECTION ABOVE BLOCK

Models	INCHES	MM
R800-46 R839-46	.003"-.006"	0.08-0.15

If the projection is not correct, replace the sleeve seals with one of suitable thickness as shown in the chart below:

SLEEVE SEALS

Models	MM	INCHES	Color Code
R800-46 & R839-46	0.08	.003"	Blue
	0.10	.004"	Red
	0.145	.006"	Green

Lower the liners into the cylinder block. Press down by hand on top of the liners to insure a good seal. Check the liner projection with reference to the face of the cylinder block. When the correct projection has been obtained, remove the sleeves.

Oil the pistons. Fit the connecting rod and piston assemblies into the sleeves by means of a sleeve tool (Figure 29).



FIGURE 29. INSTALLING PISTON ASSEMBLY IN SLEEVE

CAUTION

When installing sleeve and piston assembly, care should be taken so that the connecting rods do not strike the machine surfaces of the crankshaft rod journals.

Place bearings on the connecting rods. Place the connecting rod piston sleeve assemblies in the cylinder block in their correct positions (Figure 30).

1. With No. 1 at the clutch end.
2. Position the long end of the connecting rod away from the camshaft.

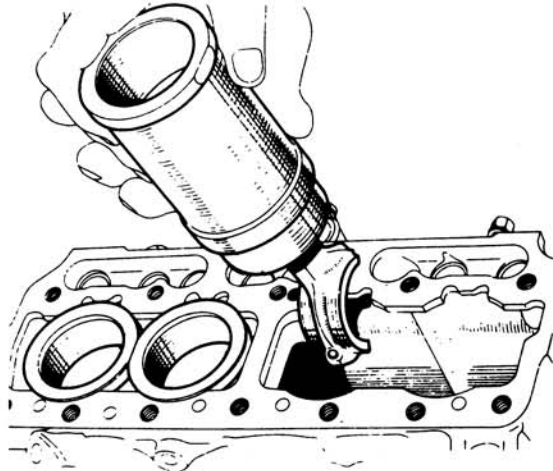


FIGURE 30. FITTING CYLINDER SLEEVE ASSEMBLIES IN BLOCK

REMOVING AND CHECKING THE CRANKSHAFT AND MAIN BEARINGS

1. Remove the crankshaft sprocket by means of a gear puller. Position an end fitting under the screw in order not to damage the end of the crankshaft. Remove the key (Figure 31).

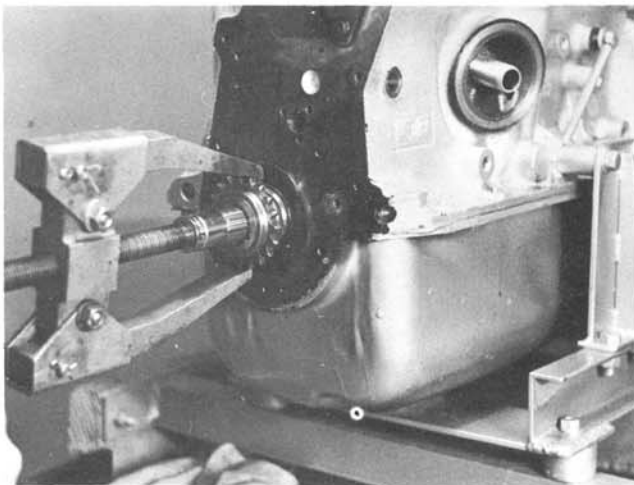


FIGURE 31. REMOVING CRANKSHAFT SPROCKET

2. Remove the oil pan and flywheel.
3. Remove the screws holding gear cover to the front of the block.

4. Remove the oil pump assembly preparatory to checking the crankshaft journal and main bearing clearances.

5. Identify each main bearing cap before removing from engine. Inspect the main bearings for any indication of flaking out, scoring or actual wear. If any of these conditions exist, the bearings must be replaced (Figure 32).

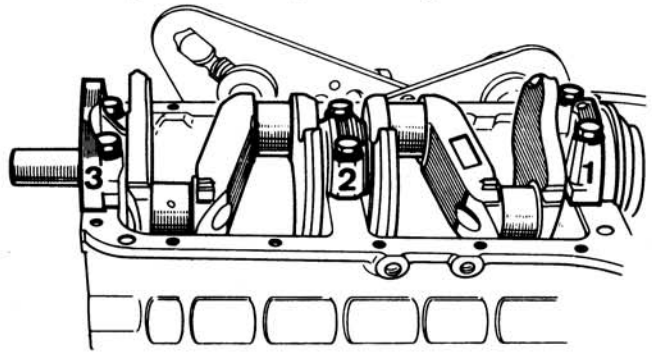


FIGURE 32. IDENTIFYING MAIN BEARING CAPS

6. If the visual inspection appears satisfactory, bearings should be removed and checked for thickness using a ball micrometer (Figure 33).

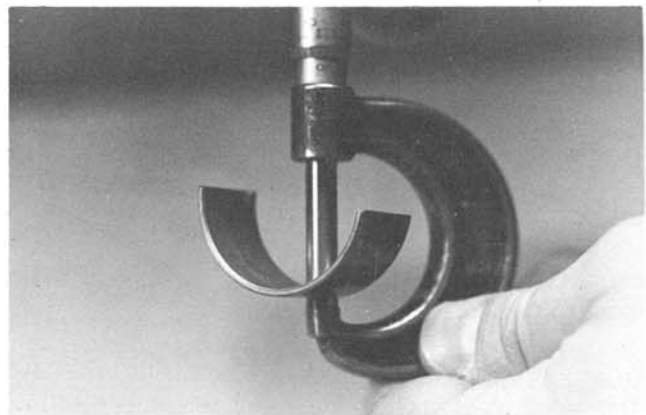


FIGURE 33. CHECKING BEARING THICKNESS

MODELS R800 & R839 Thickness of Main Bearings

	MM	INCHES
Std.	1.9940-1.9880	.0785-.0783
.010	2.1190-2.1130	.0834-.0832

Thickness of Rod Bearings

	MM	INCHES
Std.	1.5660-1.5600	.0617-.0614
.010	1.6910-1.6850	.0666-.0663

7. The crankshaft is scientifically heat-treated, so that the journals are subject to very little wear; it is normally safe to use old crank unless it is scored or cut from lack of lubrication (Figure 34).

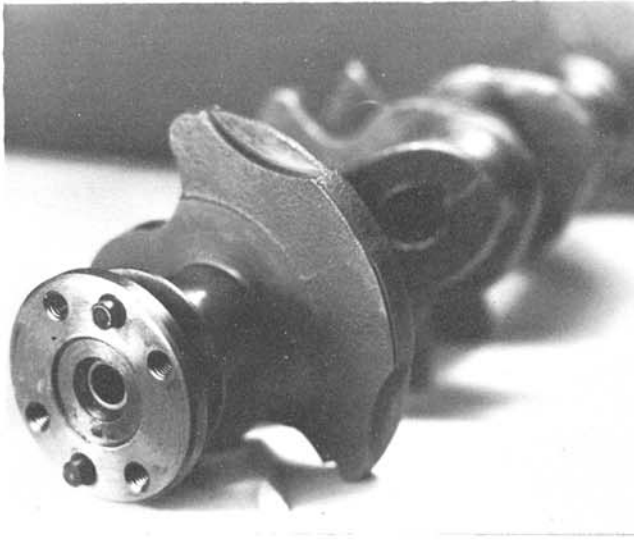


FIGURE 34. CRANKSHAFT

If visual inspection of the crankshaft shows no indication of excessive wear or scoring, the clearance of the bearing should be checked using a piece of Plastigage.

By placing this Plastigage in the bearing and tightening it in place, the width of the Plastigage, after crushing, determines the bearing clearance.

When using this method, DO NOT TURN the crankshaft as that would destroy the Plastigage. If crankshaft is scored or worn enough so that new bearings will not fit with the required clearance, it should be removed and reground.

Clean the crankshaft and pass a steel wire down the lubrication holes. Replace the clutch shaft pilot bushing (tap a screw thread in it to remove it). Check the journals and crankpin diameters with a micrometer referring to limits below.

**MODELS R800 & R839
CRANKSHAFT JOURNALS**

	UPPER LIMIT		LOWER LIMIT	
	MM	INCHES	MM	INCHES
Std.	39.991	1.57445	39.975	1.57382
.010	39.741	1.56461	39.725	1.56398
.020	39.491	1.55476	39.475	1.55413

CRANKSHAFT CRANKPINS

	UPPER LIMIT		LOWER LIMIT	
	MM	INCHES	MM	INCHES
Std.	37.975	1.49508	37.959	1.49405
.010	37.725	1.48524	37.699	1.48421
.020	37.475	1.47539	37.449	1.47437

The crankshaft is of the roll-hardened type identified by undercut "A". It can be re-ground if the undercut remains complete over an angle of 140° on the side facing the crankshaft rotational center line (Figure 35).

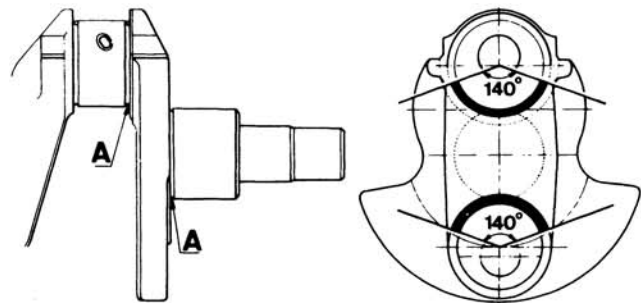


FIGURE 35. CRANKSHAFT UNDERCUT "A"

REASSEMBLE MAIN BEARINGS

Install the upper main bearing shells (those with the lubrication holes). Oil bearing shells. Oil crankshaft journals and install crankshaft (Figure 36).

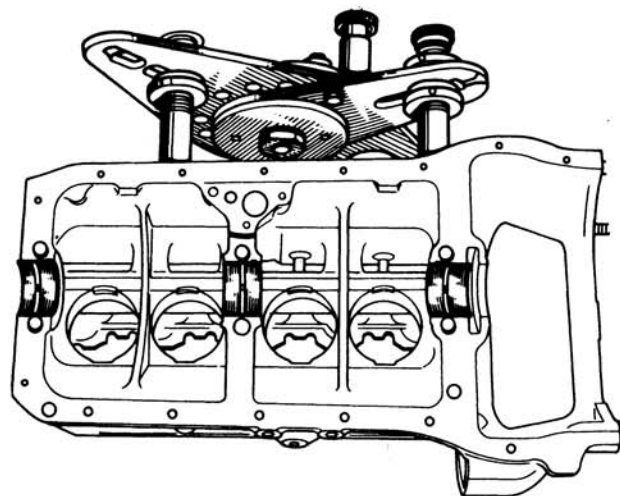


FIGURE 36. UPPER MAIN BEARING SHELLS

Install the end play thrust washers with the machined face towards the crankshaft. Install the lower bearing shells in the main bearing caps (those in which there are no lubrication holes) (Figure 37).

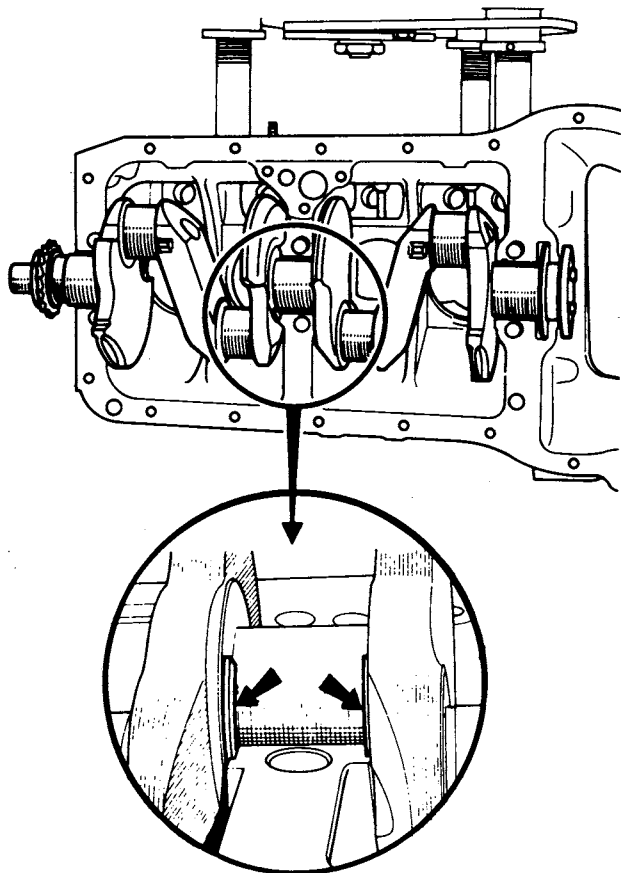


FIGURE 37. INSTALLING THRUST WASHERS ON CENTER MAIN BEARING

Oil the bearing shells. Install the main bearing caps following the reference marks made during dismantling. Tighten the bearing cap bolts to a torque of (45 lb./ft.) using torque wrench. Make sure that the crankshaft turns freely after torquing is completed (Figure 38).

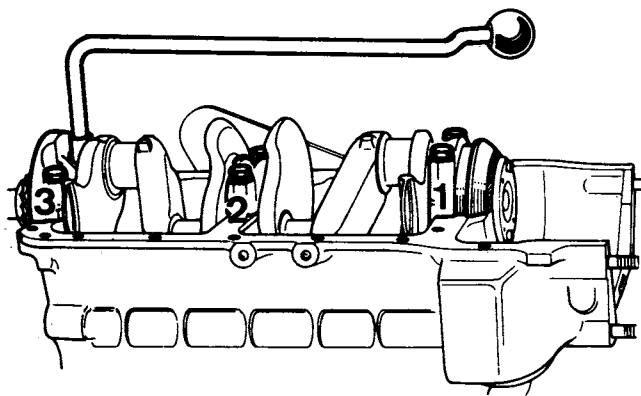


FIGURE 38. TORQUING MAIN BEARING CAPS

END PLAY

Place a dial indicator against the end of the crankshaft. Check the crankshaft end play. If the end play does not fall within the limits shown below, replace the thrust washers (Figure 39).

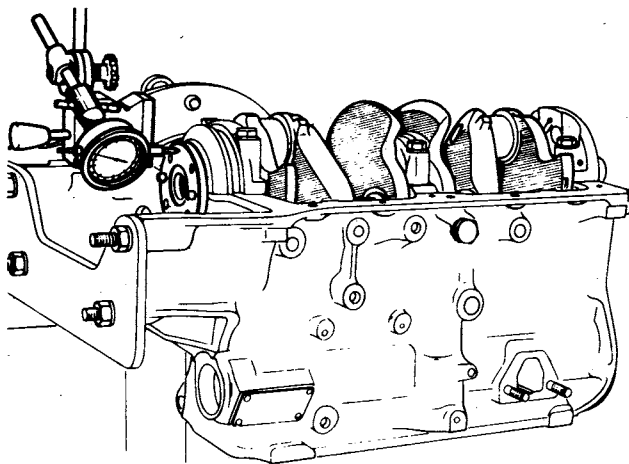


FIGURE 39. CHECKING CRANKSHAFT END PLAY

END PLAY

Model	MM	INCHES
R800-46 R839-46	0.05-0.25	.002-.010

THRUST WASHER THICKNESS

MM	INCHES
*2.00	.079
**2.05	.081
**2.10	.083
**2.15	.085

- * Standard
- ** Service or Repair Thickness

FLYWHEEL ASSEMBLY

Check the flywheel runout by means of a dial indicator. Maximum permissible is .003 inch (0.08 mm) (Figure 40).

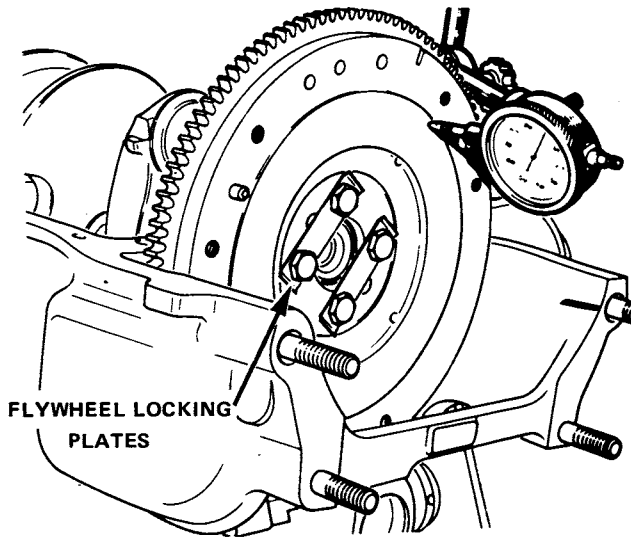


FIGURE 40. CHECKING FLYWHEEL RUNOUT

CAUTION

On Models R800 and R839, the bolts are secured by means of locking tabs. Install the lock plates over the two shear pins and tighten the bolts to the specified torque as shown in chart.

FLYWHEEL BOLT TIGHTENING CHART

Model	Lb./Ft.
R800-46	30-35
R839-46	30-35

PISTON INSTALLATION

On Models R800 and R839, the flat spot in the piston skirt at the piston pin should face the flywheel.

ASSEMBLING CONNECTING ROD CAP

Place the connecting rod over the crank pin, which should have been previously oiled, and assemble caps. Tighten the nuts to torque of 25 lb./ft. (Figure 41).

Fold up locking tabs.

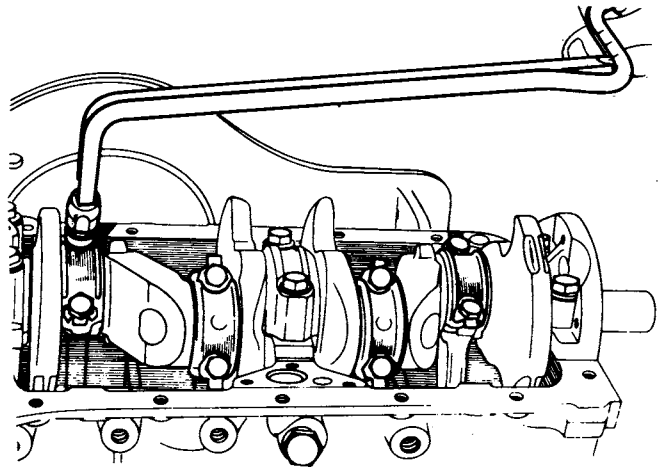


FIGURE 41. TORQUING CONNECTING ROD CAPS

IMPORTANT

Check to make sure the moving parts rotate freely.

REMOVING THE TIMING CHAIN COVER AND TENSIONER

Remove the timing chain cover and bolts. Remove chain tensioner. To do this, unlock and unscrew the retaining cylinder cap screw (Figure 42).

Insert a 3 mm (.118 inch) Allen wrench into the retaining cylinder. Turn the wrench in a counter-clockwise direction until the pad carrier assembly is no longer under tension. Remove the tensioner and thrust pad.

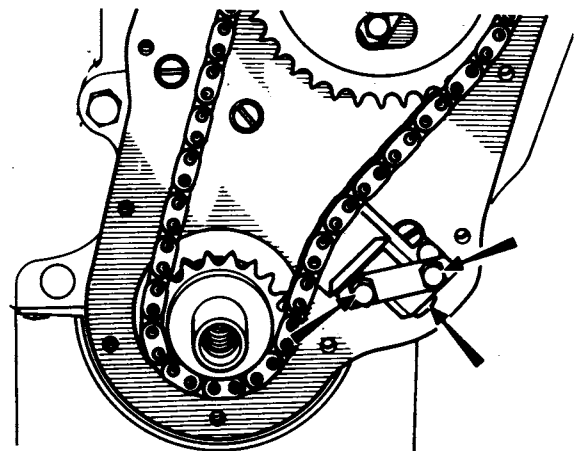


FIGURE 42. REMOVING TIMING CHAIN TENSIONER

REMOVING CAMSHAFT

Remove the camshaft sprocket by means of a gear puller (Figure 43). Remove the camshaft bolts and thrust plate.

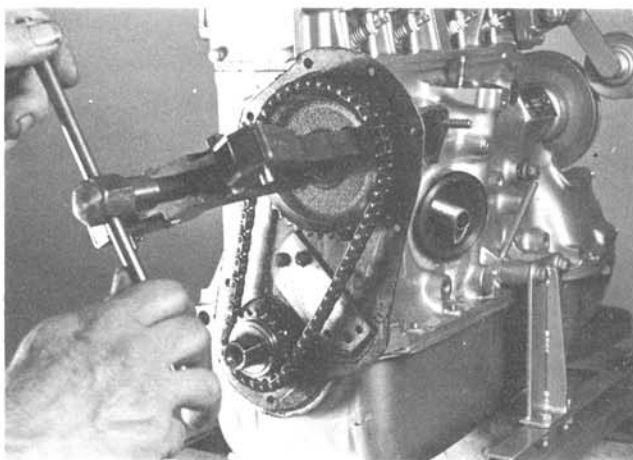


FIGURE 43. REMOVING CAMSHAFT SPROCKET

CAUTION

Before pulling camshaft, you must first remove the distributor and the oil pump pinion drive gear.

REMOVING DISTRIBUTOR DRIVE PINION

When removing the distributor drive pinion, use proper tool (Figure 44).

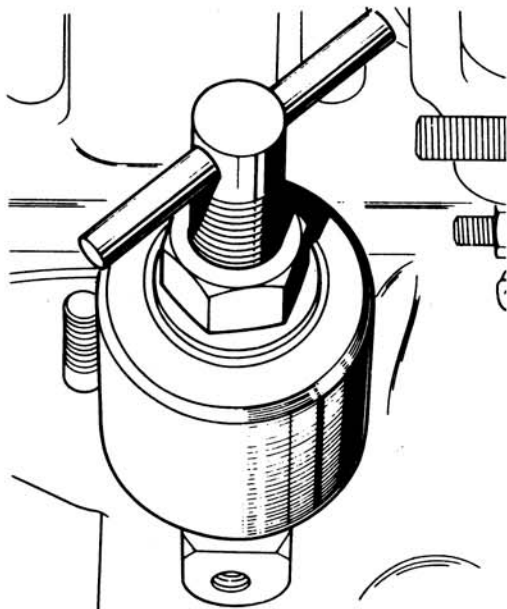


FIGURE 44. EXTRACTOR TOOL

Lift out distributor. Screw the extractor sleeve into the distributor sleeve (1) (Figure 45).

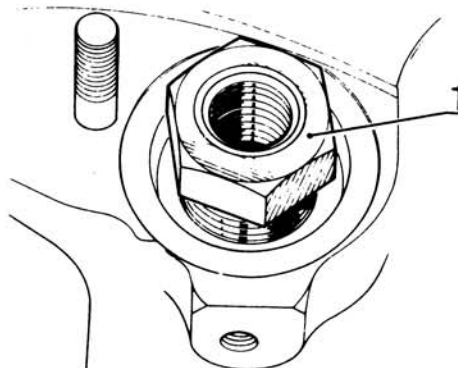


FIGURE 45. DISTRIBUTOR SLEEVE

Screw the threaded spindle down into the extractor sleeve. Pull out distributor sleeve. Lift out the distributor drive end fitting and the distributor drive gear. Now remove camshaft.

CHECKING CAMSHAFT

Clean and check diameter of the camshaft journals to determine if there is any excessive wear which would require replacement of the shaft.

Before installing the camshaft, check the end play at the thrust plate by pressing on the thrust plate sprocket. The clearance should be .002 inch to .005 inch (0.06 to .14 mm) (Figure 46).

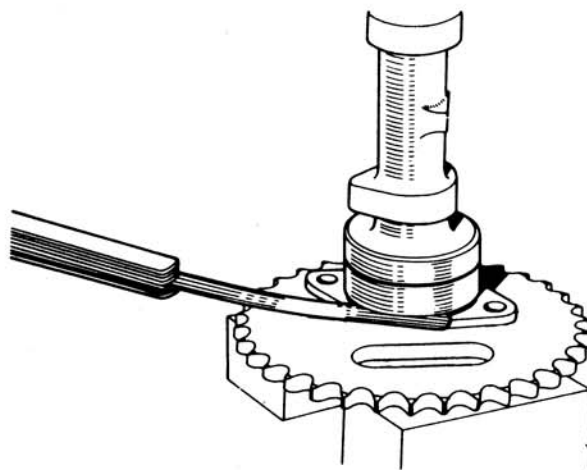


FIGURE 46. CHECKING CAMSHAFT END PLAY

Since this end play cannot be altered, replace the thrust plate if clearance exceeds these limits. To do this:

1. Remove the thrust plate and sprocket.

2. Install a new thrust plate.
3. Using an arbor press, install sprocket on camshaft.
4. Recheck the end play.

Lubricate the camshaft bearing surfaces and lobes. Install camshaft with thrust plate and sprocket already assembled. Install key into the camshaft. Line up the crankshaft sprocket timing mark with the center of the camshaft and the center of the crankshaft (Figure 47).

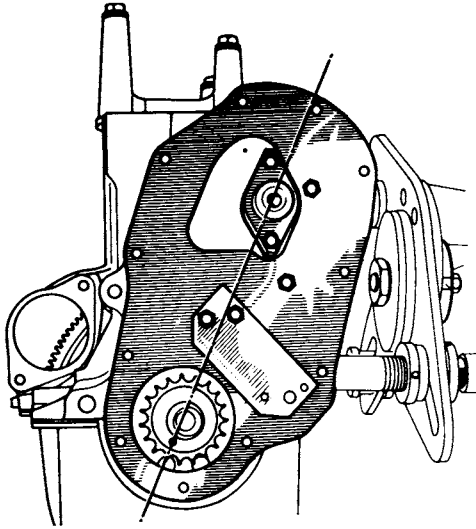


FIGURE 47. CAMSHAFT ALIGNMENT

REFITTING DISTRIBUTOR DRIVE PINION

Refit the distributor drive gear into place. Locate the guide shaft (2) in the gear. Place the sleeve on the cylinder block (chamfer toward the cylinder block). Fit the assembly mandrel (3) over sleeve (Figure 48).

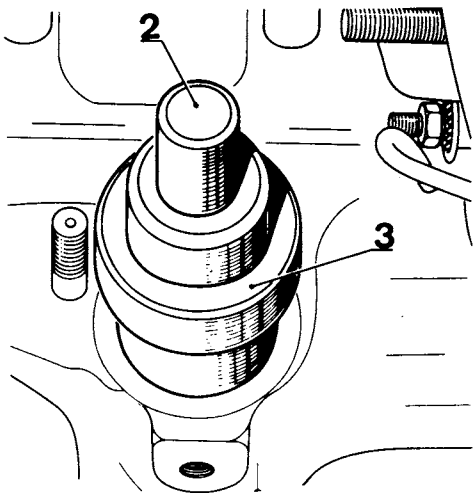


FIGURE 48. SLEEVE ASSEMBLY MANDREL

Using a tube, drive in the sleeve until the shoulder of the mandrel (3) touches the cylinder block (Figure 49).

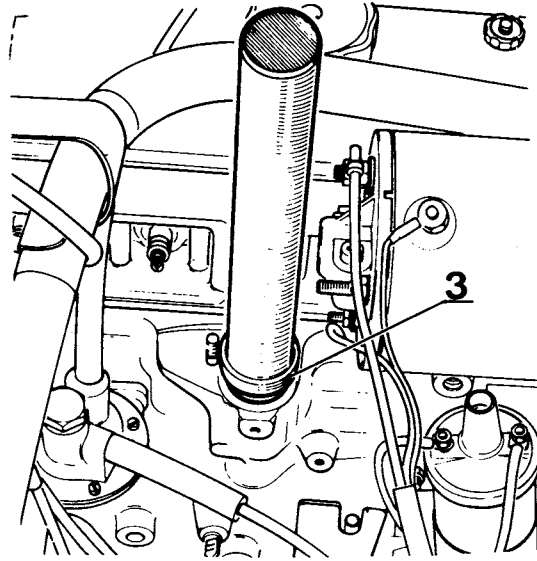


FIGURE 49. SLEEVE DRIVER

Lift out the assembly mandrel and the guide shaft. Screw the spindle into the drive gear and check clearance (A) between the drive gear and the sleeve (Figure 50).

$$A = 0.15 \text{ to } 0.55 \text{ mm } (.006'' \text{ to } .022'')$$

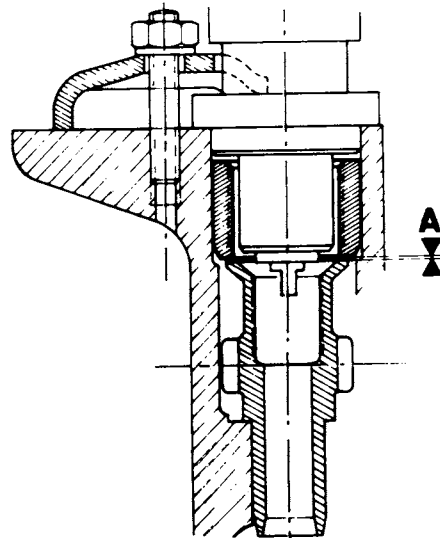


FIGURE 50. DRIVE GEAR AND SLEEVE CLEARANCE

Unscrew the spindle. Fit the distributor drive end in place, making sure that it is correctly positioned. The position of the distributor drive shaft slot must be square with the longitudinal center line of the engine with the largest offset facing the flywheel end.

TENSIONER OIL FILTER SCREEN

Remove tensioner oil filter screen, rinse with solvent and reinstall (Figure 51).

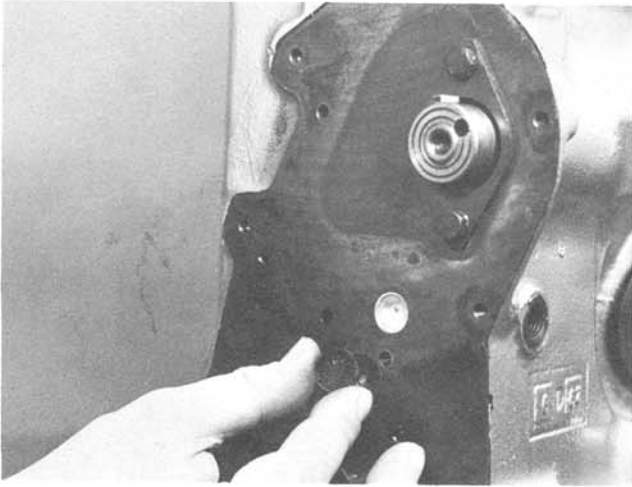


FIGURE 51. CHAIN TENSIONER OIL SCREEN

Reassemble the chain tensioner, the timing cover plate gasket (coated with jointing compound), and the oil input plate with its gasket (Figure 52).

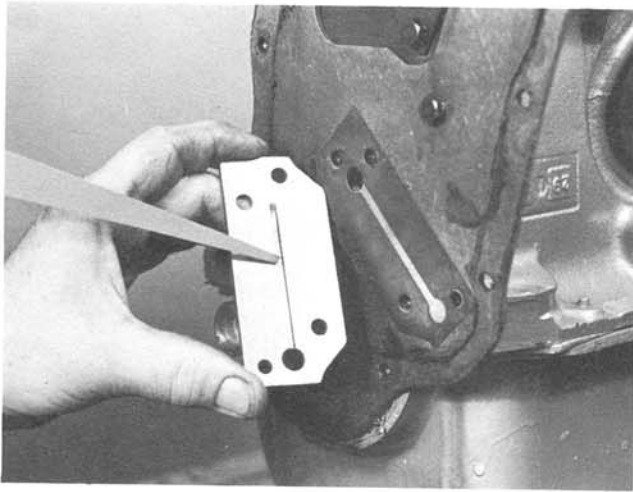


FIGURE 52. CHAIN TENSIONER OIL INPUT PLATE

CHAIN DRIVEN TIMING SPROCKET FOR MODELS R800-46 AND R839-46

In order to assist timing gear adjustment, the timing chain has two marks (Figure 53).

1. A yellow link (a).
2. A scribed line (b).

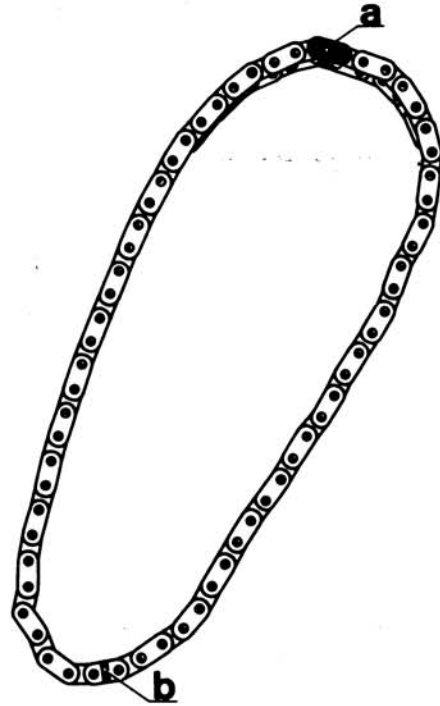


FIGURE 53. TIMING CHAIN ALIGNMENT MARKS

TIMING MARK ALIGNMENT

Install the timing chain, making sure that the marks on both sprockets are in line with marks (A) and (B) on the chain (Figure 54).

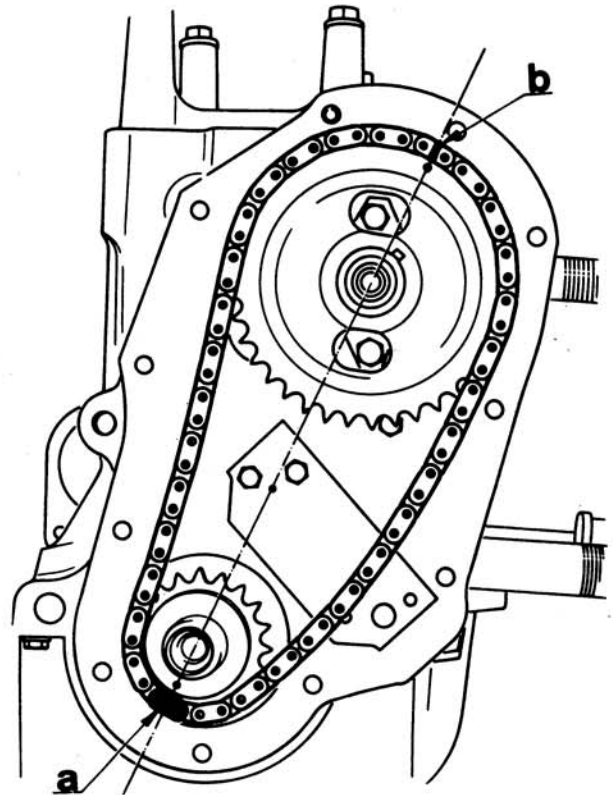


FIGURE 54. CAM SPROCKET AND CHAIN ALIGNMENT

TIMING CHAIN ADJUSTMENT

Install the chain tensioner and plate. Tighten the two bolts. Insert 3 mm (.118 inch) Allen wrench into the retaining cylinder (Figure 55).

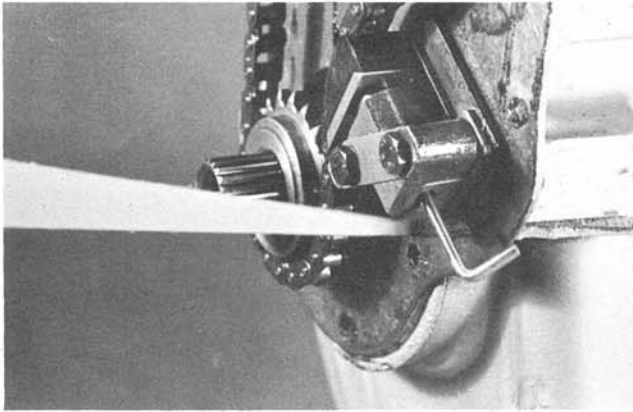


FIGURE 55. CHAIN TENSIONER ADJUSTMENT

Turn the wrench in a clockwise direction until the pad carrier assembly moves against the chain. Tighten and lock the retaining bolt.

INSTALLING OIL PAN GASKETS ON R800 AND R839 ENGINES

Install oil pan gaskets with ends overlapping. Smear "Perma Seal" compound at the points which overlap. When installing oil pan, make certain gaskets do not move (Figure 56).

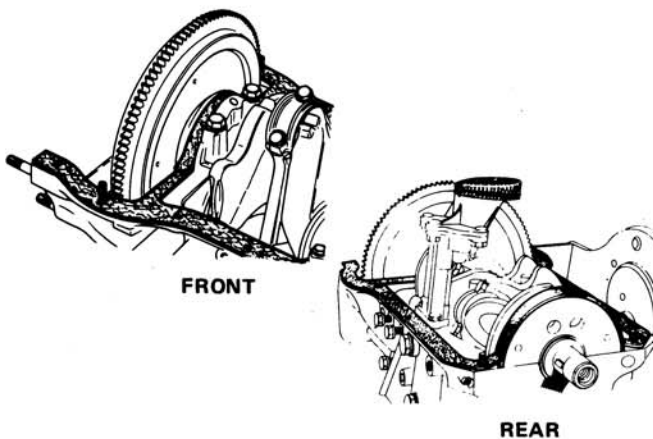


FIGURE 56. INSTALLING OIL PAN GASKETS FRONT AND REAR

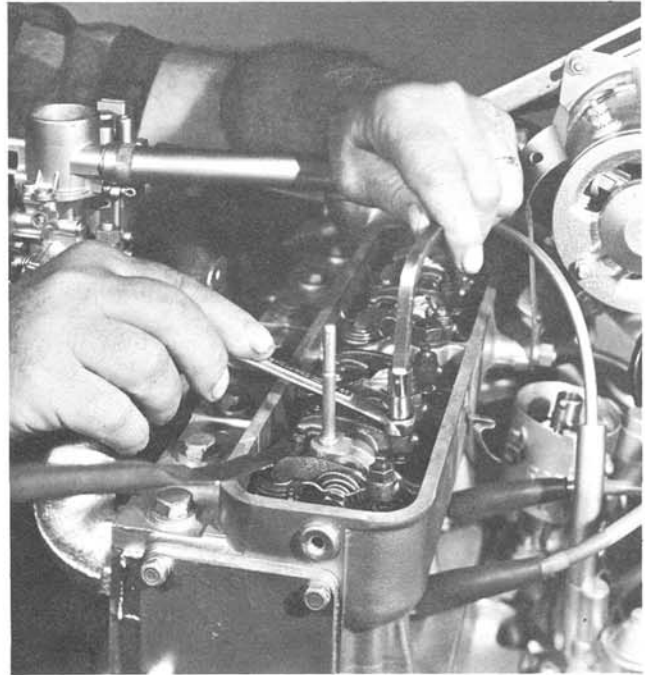


FIGURE 57. ROCKER ARM TAPPET ADJUSTMENT

TAPPET ADJUSTMENT

Adjust the tappet clearances referring to chart below (Figure 57).

Clearances on a cold engine:

Intake .005 inch (0.13 mm)

Exhaust .008 inch (0.20 mm)

NOTE

After the first 10 hours of operation, the cylinder head capscrews should be retorqued (refer to page 5) and the tappets adjusted.

INSTALLING THE DISTRIBUTOR DRIVE

1. Place the No. 1 cylinder at TDC compression stroke (flywheel end).

2. The position of the distributor drive shaft slot must be square with the longitudinal center line of the engine. With the largest offset facing the fly-wheel end (Figure 58).

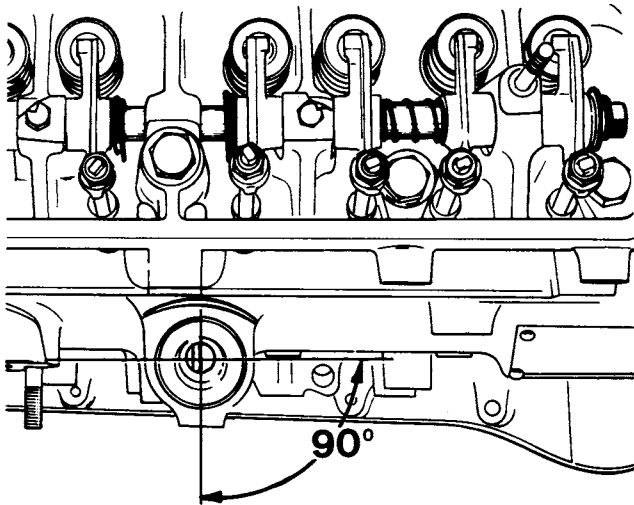


FIGURE 58. DISTRIBUTOR DRIVE SHAFT ALIGNMENT

ADJUSTING THE POINT GAP

Loosen screw (1). Adjust the points gap by moving the fixed contacts with a screwdriver, as shown in the illustration. After adjusting, tighten screw (1) (Figure 59).

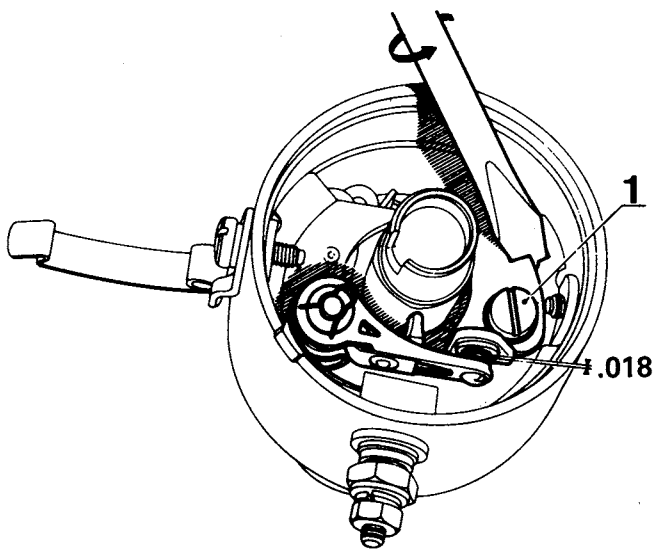


FIGURE 59. ADJUSTING DISTRIBUTOR

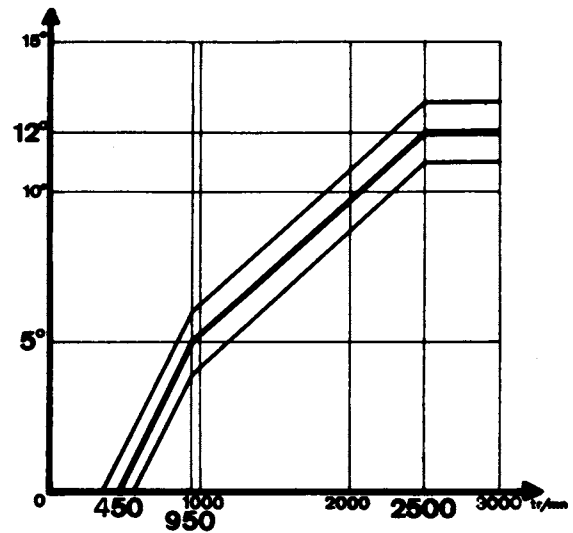


FIGURE 60. CENTRIFUGAL ADVANCE CURVE FOR R800 SERIES ENGINES

REMOVING THE OIL PUMP

Remove oil pan and the three pump securing bolts; remove the pump (Figure 61).

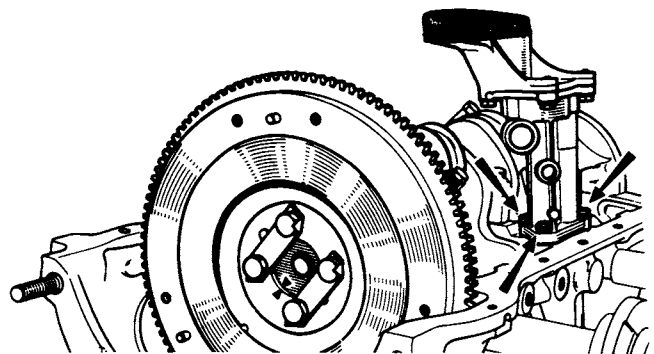


FIGURE 61. REMOVING OIL PUMP

OVERHAULING THE OIL PUMP

Dismantling:

Remove the cover bolts and take out the idler gear, the drive gear and its shaft (Figure 62).

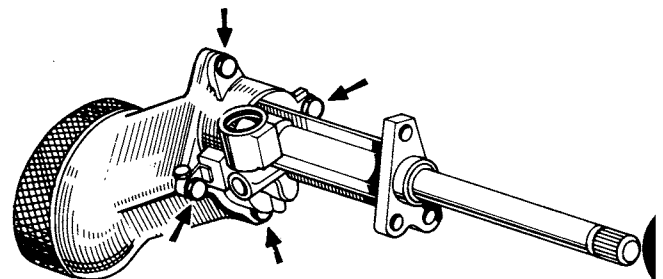


FIGURE 62. DISASSEMBLY OF OIL PUMP

Checking:

Clean all the parts and check the condition of the drive shaft splines. Check the clearance between the gears and the pump body; if above 0.2 mm (.008 inch), replace the gears in sets. Check the cover face. Replace, if it is scored (Figure 63).

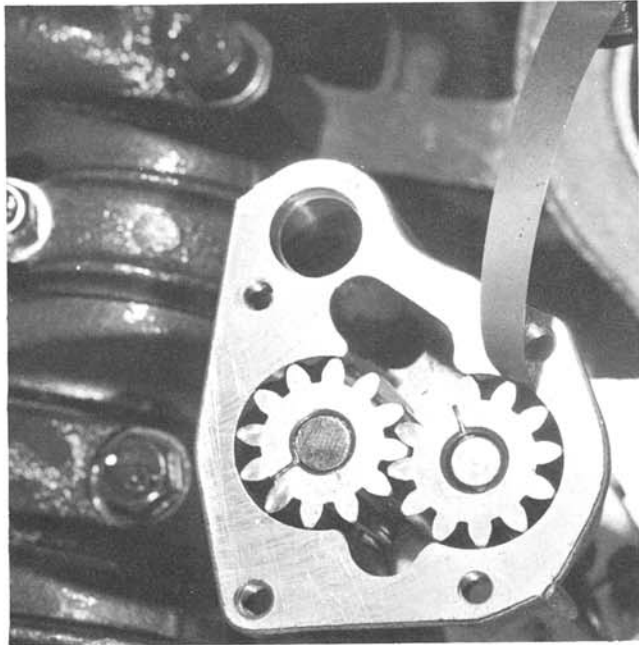


FIGURE 63. CHECKING OIL PUMP GEAR CLEARANCE

Reassembling: (Figure 64).

Carry out the dismantling operations in reverse.

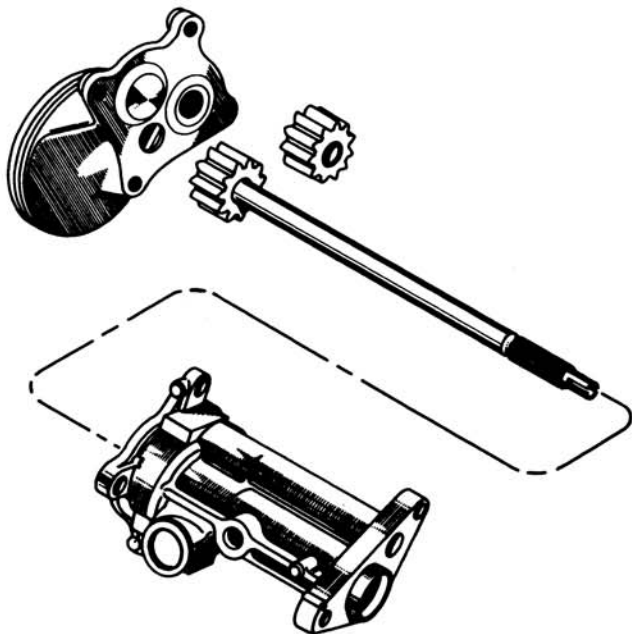


FIGURE 64. OIL PUMP EXPLODED VIEW

CARBURETOR-SOLEX TYPE

The downdraft carburetor has a manually operated choke (Figure 65).

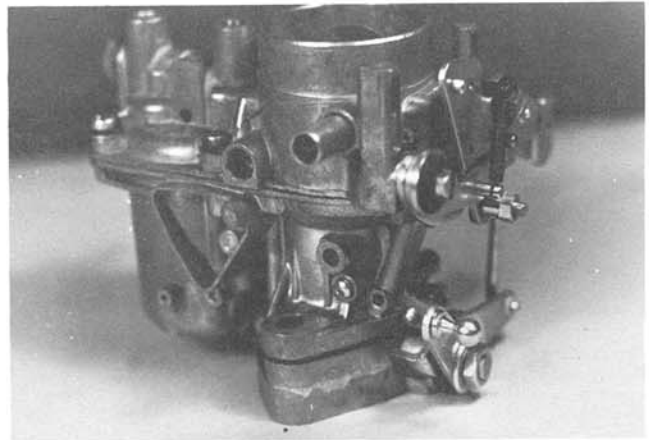


FIGURE 65. SOLEX CARBURETOR

NOTE

The carburetor type and its reference are marked on a metal tag which is secured by one of the float chamber cover screws.

REMOVING AND REPLACING THE CARBURETOR

1. Remove the air cleaner.
2. Disconnect fuel line and governor control linkage (Figure 66).
3. Remove two nuts and washers and remove carburetor.

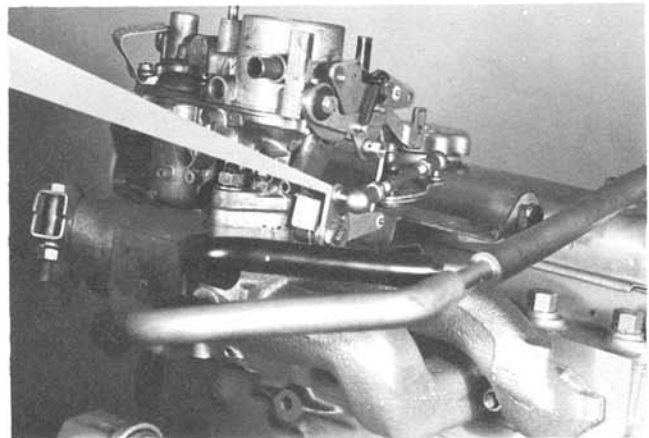


FIGURE 66. CARBURETOR CONTROL LINKAGE

CARBURETOR ADJUSTMENTS BEFORE INSTALLATION

1. Initial Throttle Opening.

a. Initial throttle opening adjustment is made by closing the choke plate to its full extent. Measure the initial throttle opening. This should be between 0.80 mm to 0.90 mm (.032" to .035"). To adjust, bend the connecting link (1) (Figure 67).

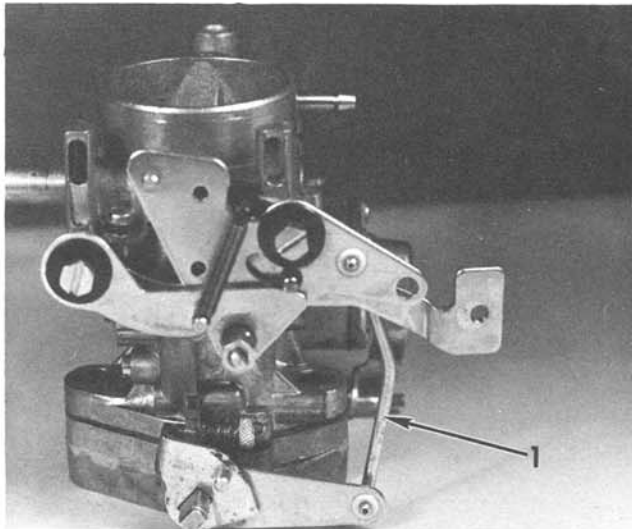


FIGURE 67. CHOKE PLATE CONNECTING LINK

b. When checking throttle opening at end of pump travel, place a suitable diameter gauge rod 3.5 mm (.138") between the butterfly and the carburetor main bore. The pump should be at the end of the stroke.

IMPORTANT

The initial throttle opening is factory set. It is our recommendation that if it becomes necessary to readjust, that it be done by a qualified mechanic.

To adjust, push the pump lever (2) up to the stop, then turn nut (3) until it just touches the lever. (Figure 68).

To replace, carry out the removing operations in reverse.

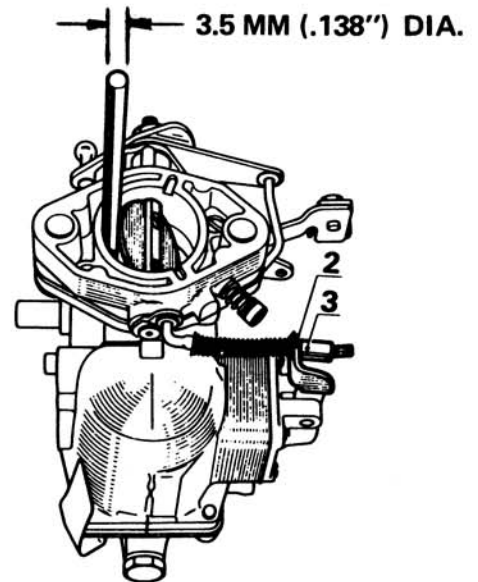


FIGURE 68. ADJUSTING PUMP LEVER

CARBURETOR ADJUSTMENTS AFTER INSTALLATION

1. Idle Fuel Adjustment.

To set the idle fuel adjustment, turn the adjustment screw clockwise, shutting off the fuel until the engine speed decreases or begins to miss due to lean mixture. Now open the adjustment until the engine runs smoothly without missing.

2. Adjusting the Idling Speed.

The idle screw controls the idling speed, which should be 600 to 650 RPM minimum. This should be set by using a tachometer. *Do not adjust idle when engine is cold.* (Figure 69).

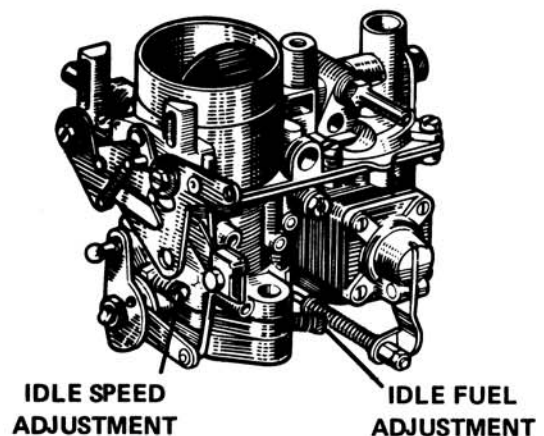


FIGURE 69. IDLE FUEL AND IDLE SPEED ADJUSTMENT

REMOVING WATER PUMP ASSEMBLY

1. Drain the cooling system.
2. Disconnect radiator hoses.
3. Release the tension from the fan belt by loosening the generator strap bolt and pushing the generator inboard.
4. Remove fan, pulley and belt.
5. Before removing the water pump, release the tension on the idler pulley tensioner. Now remove water pump.

IMPORTANT

The idler pulley tensioner nut has a left-hand thread.

WATER PUMP

The water pump body cannot be repaired if any of the parts are damaged. (Figure 70).

1. If damaged, remove fan hub pulley (1) from the shaft.
2. Remove water sending unit (2).
3. Replace water pump body (3).

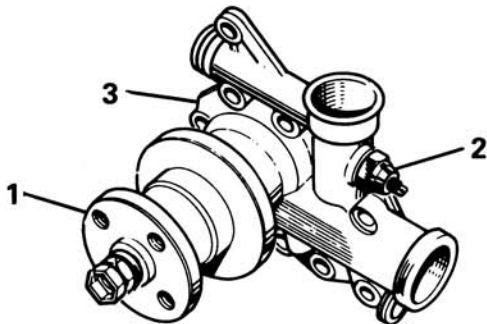


FIGURE 70. WATER PUMP

To reassemble, carry out the above operations in reverse using new gaskets where necessary.

DISTRIBUTOR IGNITION TIMING (With Timing Light)

The "R" engines, with distributor ignition, are timed to have the distributor points start to open when No. 1 cylinder (flywheel end) is on compression stroke and the "top-dead-center" mark on the flywheel lines up with the pointer on the housing.

Follow this sequence:

1. Paint a line on the flywheel so the timing mark will be more legible under the timing light.
2. Clip blue secondary lead of light to the No. 1 or No. 4 spark plug. Leave spark plug wire on plug.
3. Connect primary positive lead (red) to positive terminal of battery.
4. Connect primary negative lead (black) to negative battery terminal.
5. Start engine and run at idle speed 450 RPM or lower, so the automatic advance of the distributor is completely retarded. **THIS IS VERY IMPORTANT TO OBTAIN CORRECT TIMING.**
6. Direct timing light on the flywheel and note timing marks as light flashes.
7. Timing is at TDC (Figure 71).

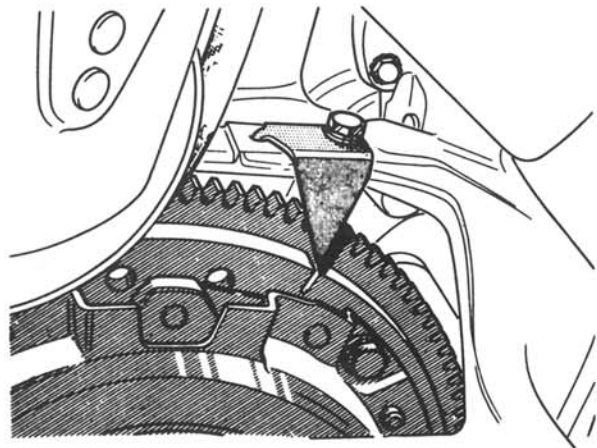


FIGURE 71. FLYWHEEL TIMING MARK (TDC)

8. To advance timing, turn distributor body counterclockwise. To retard timing, turn distributor body clockwise.
9. When timing is correct (timing mark opposite pointer), tighten distributor clamp screw securely, then recheck timing again with light.
10. This operation is best performed in shaded area, so timing light is visible.

TORQUE SPECIFICATIONS

Teledyne Continental "R" Series gasoline engines have many stud, bolts and cap screws of special materials and sizes, and it is very important that special care be exercised to replace all studs and bolts in their respective locations during assembly of engine.

The torque specifications in foot pounds as listed below, **MUST** be followed in order to have the assembled engine conform to the original specifications.

TORQUE SPECIFICATIONS (FOOT POUNDS)

R800-46 & R839-46

Bearing Caps	40-50	Belt Tensioner on Support	35-50
Flywheel	30-35	Fan on Pulley	15-20
Clutch	10-15	Generator on Support	35-40
Connecting Rod Caps	25-30	Generator Support on Cylinder Head	10-15
Gear Cover	10-13	Generator Adjusting Strap on Water Pump	10-13
Cylinder Head	45	Generator Adjusting Strap on Generator	10-13
Pulley on Camshaft	10-15	Starter	15-20
Camshaft Thrust Bearing Flange	10-12	Spark Plugs (Aluminum Head)	25-30
Manifold Nuts (Ends & Center)	10-13	Fuel Pump	10-15
Manifold Stud on Cylinder Head	6	Water Temperature Switch on Water Pump	10-15
Intake & Exhaust Manifold Assembly	10-15	Oil Pressure Switch	15
Oil Pump, Pump on Housing	10-12	Chain Tensioner	10-13
Oil Pump, Strainer Support on Pump	10-12	Exhaust Half-Clamps	20
Oil Pan	7	Distributor Plate	15-20
Oil Drain Plug	15-20	Carburetor Control	10-13
Water Pump			
Pump Body, Cylinder Head	10		
Pump Cover on Body	10		
Water Pump Pulley, Nut & Locknut	25		

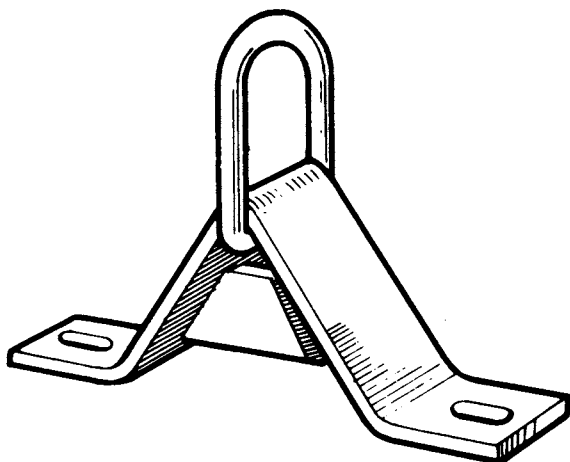
"R" SERIES SPECIFICATIONS

ENGINE MODEL	R800	R839
Number of Cylinders	4	4
Bore/Stroke	2.28/3.14	2.19/3.14
Displacement (Cubic Inch)	51.6	47.8
Compression Ratio	8:1	8.5:1
H.P./R.P.M. (Maximum)	37.6/5000	36/5500
Horsepower Range	12-38	10-36
Torque (Lbs./Ft.)/R.P.M. (Max.)	43/3000	39/3000
Number of Main Bearings	3	3
Main Bearing Diameter	1.575	1.575
Main Bearing Length - Front	1.279	1.279
Main Bearing Length - Center	1.299	1.299
Main Bearing Length - Rear	1.417	1.417
Main Bearing Length - Intermediate	—	—
Connecting Rod Length (Center-to-Center)	5.709	5.709
Connecting Rod Bearing Diameter	1.496	1.496
Connecting Rod Bearing Length	1.024	1.024
Intake Valve Head Diameter	1.109	1.109
Intake Valve Seat Angle	45°	45°
Exhaust Valve Head Diameter	0.984	0.984
Exhaust Valve Seat Angle	45°	45°
Weight of Basic Engine With Accessories (Approx.) Lbs.	184	189
Water Pump and Fan Speed Ratio to Crank R.P.M.	0.80	0.80
Heat Rejection to Coolant (BTU/HP/MIN)	44	44
Water Capacity - Engine (Quarts)	2.25	2.25
Water Pump Flow - Gal./Min. @ 200° F. @ Pump R.P.M.	14/4000	14/4000
Thermostat Opening Temperature ° F.	183°	183°
Oil Capacity - Crankcase (Quarts)	2.75	2.75
Oil Capacity - Filter (Quarts)	0.25	0.25
Oil Pressure - Maximum (psi)	50	50
Oil Pressure - Minimum (psi)	10	10
Angle Operation Permissible (Oil Pressure)		
Flywheel Down	30°	30°
Flywheel Up	29°	29°
Distributor Down	54°	54°
Distributor Up	34°	34°
Generator	12V-22A	12V-22A
Point Gap	.018	.018
Cam Angle Degrees ± 3°	61°	61°
Spark Plug Gap	.025	.025
Spark Occurs ° TC	TDC	TDC
Firing Order	1-3-4-2	1-3-4-2
Valve Clearance (Cold) Intake/Exhaust	.005/.008	.005/.008
Advance ° Crankshaft	12°	12°
Type Carburetor (Solex)	32PDIS3	32PDIS3
Fuel Pressure at Carburetor (psi)	1.5-3.5	1.5-3.5
Exhaust Back Pressure Maximum In. H ₂ O	20	20

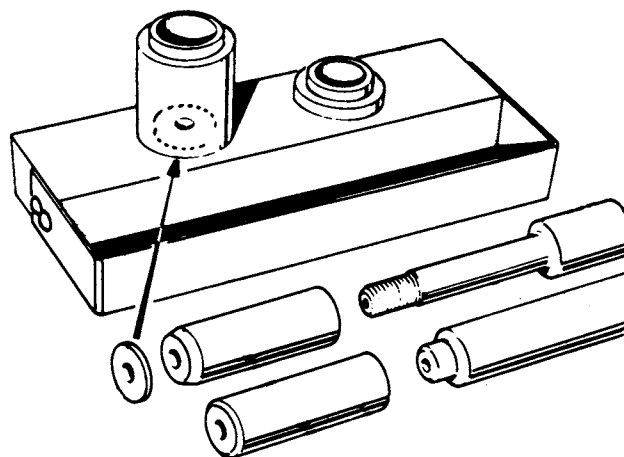
DECIMAL & METRIC EQUIVALENTS OF PARTS OF AN INCH

Fractional Inches	Decimal Inches	Millimeters	Fractional Inches	Decimal Inches	Millimeters
1/64 =	.015625 =	0.39687	33/64 =	.515625 =	13.09671
1/32 =	.03125 =	0.79374	17/32 =	.53125 =	13.49362
3/64 =	.046875 =	1.19061	35/64 =	.546875 =	13.89045
1/16 =	.0625 =	1.58748	9/16 =	.5625 =	14.28737
5/64 =	.078125 =	1.98435	37/64 =	.578125 =	14.68419
3/32 =	.09375 =	2.38123	19/32 =	.59375 =	15.08111
7/64 =	.109375 =	2.77809	39/64 =	.609375 =	15.47793
1/8 =	.125 =	3.17497	5/8 =	.625 =	15.87485
9/64 =	.140625 =	3.57183	41/64 =	.640625 =	16.27167
5/32 =	.15625 =	3.96871	21/32 =	.65625 =	16.66859
11/64 =	.171875 =	4.36557	43/64 =	.671875 =	17.06541
3/16 =	.1875 =	4.76245	11/16 =	.6875 =	17.46234
13/64 =	.203125 =	5.15931	45/64 =	.703125 =	17.85915
7/32 =	.21875 =	5.55620	23/32 =	.71875 =	18.25608
15/64 =	.234375 =	5.95305	47/64 =	.734375 =	18.65289
1/4 =	.25 =	6.34994	3/4 =	.75 =	19.04982
17/64 =	.265625 =	6.74679	49/64 =	.765625 =	19.44663
9/32 =	.28125 =	7.14368	25/32 =	.78125 =	19.84356
19/64 =	.296875 =	7.54053	51/64 =	.796875 =	20.24037
5/16 =	.3125 =	7.93743	13/16 =	.8125 =	20.63731
21/64 =	.328125 =	8.33427	53/64 =	.828125 =	21.03411
11/32 =	.34375 =	8.73117	27/32 =	.84375 =	21.43105
23/64 =	.359375 =	9.12801	55/64 =	.859375 =	21.82785
3/8 =	.375 =	9.52491	7/8 =	.875 =	22.22479
25/64 =	.390625 =	9.92175	57/64 =	.890625 =	22.62159
13/32 =	.40625 =	10.31865	29/32 =	.90625 =	23.01853
27/64 =	.421875 =	10.71549	59/64 =	.921875 =	23.41533
7/16 =	.4375 =	11.11240	15/16 =	.9375 =	23.81228
29/64 =	.453125 =	11.50923	61/64 =	.953125 =	24.20907
15/32 =	.46875 =	11.90614	31/32 =	.96875 =	24.60602
31/64 =	.484375 =	12.30297	63/64 =	.984375 =	25.00281
1/2 =	.5 =	12.69988	1		25.39977

SPECIAL TOOLS



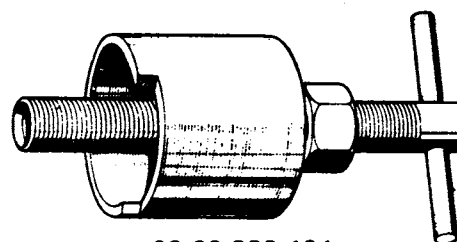
00 01 222 600
ENGINE LIFTING EYE



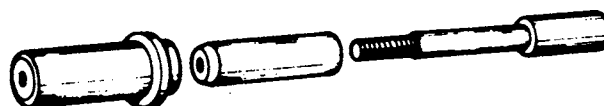
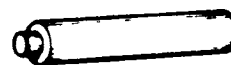
00 00 025 500
TOOLING FOR EXTRACTING AND INSERTING
20MM DIAMETER PISTON PINS



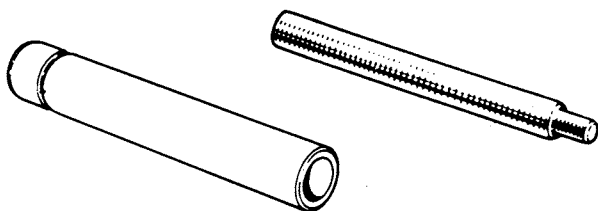
00 01 326 600
SET OF THREE REAMERS FOR FITTING
7MM DIAMETER VALVE GUIDES



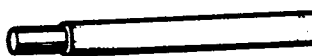
00 00 889 101
OIL PUMP PINION EXTRACTOR



00 00 025 501
USE WITH 00 00 025 500 FOR R800 AND R839
TYPE ENGINES WITH PRESS-FITTED PISTON
PINS (16 MM)



00 01 327 901
MANDREL FOR INSERTING AND EX-
TRACTING 7MM DIAMETER VALVE GUIDE



00 00 046 800
TOOLING FOR FITTING DISTRIBUTOR STOP
COLLAR (USE WITH 00 00 889 101)