

# Section 11

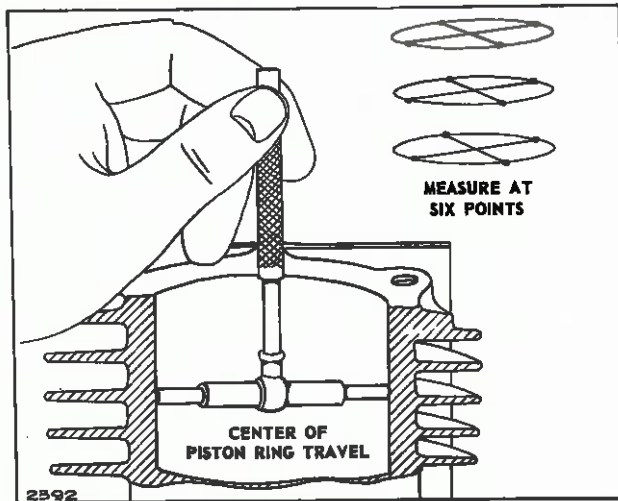
## CYLINDERS & BEARINGS

### INSPECTION

#### All Models

Always inspect the cylinder after the engine has been disassembled. Visual inspection will show if there are any cracks, stripped bolt holes, broken fins or if the cylinder wall is damaged. Use a telescoping gauge and dial indicator or inside micrometer to determine the size of the cylinder bore. Measure at right angles. See Fig. 1. Table No. 1 lists the standard cylinder bore sizes.

If the cylinder bore is more than .003" (.08 mm) oversize, or .0015" (.04 mm) out of round on cast iron cylinders, or .0025" (.06 mm) out of round on lightweight cylinders, it must be resized.



**Fig. 1 — Check Cylinder Bore**

**NOTE:** Do not deglaze cylinder walls when installing piston rings in aluminum cylinder engines.

**NOTE:** Chrome ring sets are available for most models. See Bulletin #479 or Illustrated Parts List. They are used to control oil consumption in bores worn to .005" (.13 mm) over standard and do not require honing or glaze breaking the bore to seat.

### RESIZING

#### Resize Cylinder Bore to Next Oversize

#### All Models

**ALWAYS RESIZE TO EXACTLY .010" (.25 mm) or .020" (.51 mm), or .030" (.76 mm) OVER STANDARD SIZE AS SHOWN IN TABLE NO. 1. IF THIS IS DONE ACCURATELY, THE STOCK OVERSIZE RINGS AND PISTONS WILL FIT PERFECTLY AND PROPER CLEARANCES WILL BE MAINTAINED.** Cylinders, either cast iron or aluminum, can be quickly resized with a good hone such as Briggs & Stratton part #19205 for aluminum cylinders or part #19211 for cast iron cylinders. Contact your Briggs & Stratton source of supply. Use the stones and lubrication recommended by the hone manufacturers for the various engine models, to produce the correct cylinder wall finish.

**TABLE NO. 1**

BASIC ENGINE MODEL OR SERIES	STANDARD BORE SIZE DIAMETER			
	MAX.		MIN.	
	Inches	Milli-meters	Inches	Milli-meters
ALUMINUM CYLINDER				
6B, 60000 before Ser. #5810060	2.3125	58.74	2.3115	58.71
60000 after Ser. #5810030	2.3750	60.33	2.3740	60.30
8B, 80000, 82000	2.3750	60.33	2.3740	60.30
92000, 93000, 94000	2.5625	65.09	2.5615	65.06
100000	2.5000	63.50	2.4990	63.47
110000	2.7812	70.64	2.7802	70.62
130000	2.5625	65.09	2.5615	65.06
140000	2.7500	69.85	2.7490	69.82
170000, 190000	3.0000	76.20	2.9990	76.17
220000, 250000	3.4375	87.31	3.4365	87.29

(Table No. 1 — Cast Iron Cylinders continued on page 2.)

# CYLINDERS Resizing Bore

TABLE NO. 1 (Cont'd.)

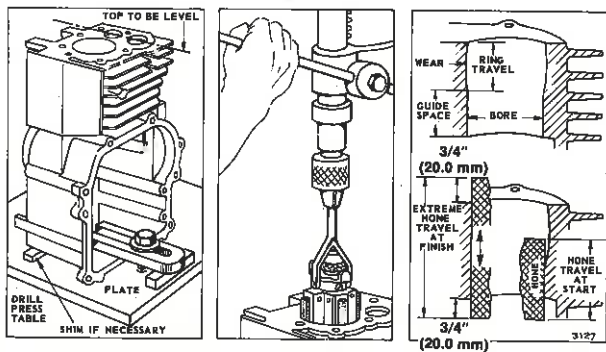
BASIC ENGINE MODEL OR SERIES	STANDARD BORE SIZE DIAMETER			
	MAX.		MIN.	
CAST IRON CYLINDER	Inches	Milli-meters	Inches	Milli-meters
	5, 5S, 6, N	2.0000	50.80	1.9990
8	2.2500	57.15	2.2490	57.12
9	2.2500	57.15	2.2490	57.12
14	2.6250	66.68	2.6240	66.65
19, 23, 190000, 200000	3.0000	76.20	2.9990	76.17
230000	3.0000	76.20	2.9990	76.17
240000	3.0625	77.79	3.0615	77.76
300000	3.4375	87.31	3.4365	87.29
320000	3.5625	90.49	3.5615	90.46

If a boring bar is used, a hone must be used after the boring operation to produce the proper cylinder wall finish.

Honing can be done with a portable electric drill, but it is easier to use a drill press.

## To Set Up For Honing

Clean cylinder at top and bottom to remove burrs and pieces of base and head gaskets.



HONING PLATE

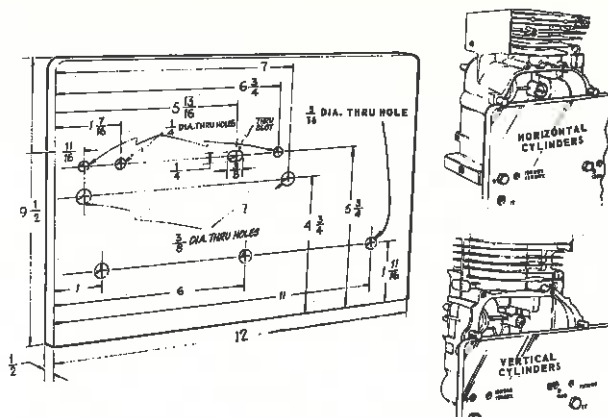
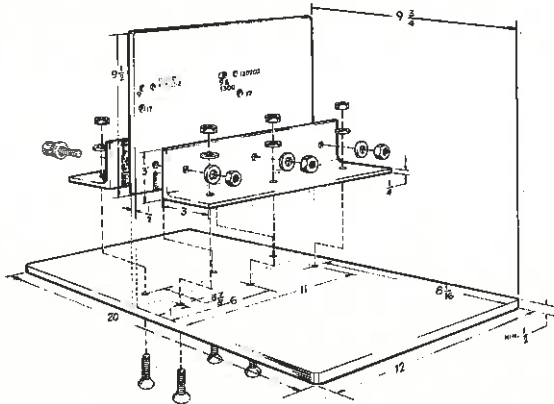


Fig. 2 — Honing Cylinder  
(See page 8 for enlarged drawing.)

Fasten cylinder to a heavy iron bracket or use honing plate. Fig. 2. Some cylinders require shims. Use a level to align drill press spindle with bore.

Oil surface of drill press table liberally. Set plate and cylinder on drill press table. (Do not anchor to drill press table.) If using portable drill, set plate and cylinder on floor. Place hone drive shaft in chuck of drill or portable drill.

Slip hone into cylinder; Fig. 2, Illus. 2. Connect drive shaft to hone and set stop on drill press so hone can only extend 3/4" (20.0 mm) to 1" (25.0 mm) from top or bottom of cylinder. If using a portable drill, cut a wood block to place inside of cylinder as a stop for hone.

## To Hone Cylinder

Place hone in middle of cylinder bore. Tighten adjusting knob with finger or small screwdriver until stones fit snugly against cylinder wall. **DO NOT FORCE.** Hone should operate at 300 to 700 RPM. Lubricate hone as recommended by manufacturer.

Connect drive shaft to hone. Be sure that cylinder and hone are centered and aligned with drive shaft and drill spindle. Start drill and, as hone spins, move it up and down at lower end of cylinder. Fig. 2, Illus. 3. The cylinder is not worn at the bottom but is round so it will guide the hone to straighten cylinder bore. As the bottom of the cylinder increases diameter, gradually increase strokes until hole travels full length of bore. Do not extend hone more than 3/4" (20.0 mm) to 1" (25.0 mm) at either end of cylinder bore.

As cutting tension decreases, stop hone and tighten adjusting knob. Check cylinder bore frequently with an accurate micrometer. Hone about .0005" (.01 mm) large to allow for shrinkage when cylinder cools.

On cast iron cylinders, change from rough stone to finishing stone when within .0015" (.04 mm) of desired size, then use finishing stones. ALWAYS HONE .010" (.25 mm) or .020" (.51 mm), or .030" (.76 mm) ABOVE THE STANDARD DIMENSIONS GIVEN IN TABLE NO. 1.

### CYLINDER FINISH AND CLEANING

The finish resized cylinder should have a cross-hatch appearance, Fig. 3. Proper stones, lubrication and spindle speed along with rapid movement of hone within the cylinder during the last few strokes, will produce this finish. Cross-hatching will allow proper lubrication and ring break-in.

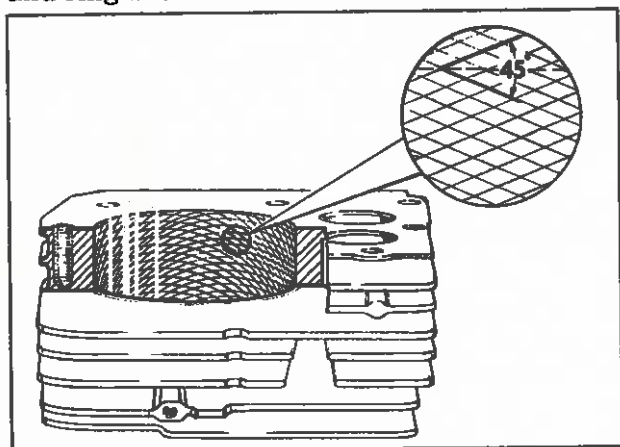


Fig. 3 — Cross Hatch

IT IS MOST IMPORTANT THAT THE ENTIRE CYLINDER BE THOROUGHLY CLEANED AFTER HONING. WASH THE CYLINDER CAREFULLY IN A SOLVENT SUCH AS KEROSENE OR COMMERCIAL SOLVENT. THE CYLINDER BORE SHOULD THEN BE CLEANED WITH A BRUSH, SOAP AND HOT WATER.

### BEARINGS

#### BALL BEARING

To check a ball bearing, rotate the bearing slowly by hand; if any roughness is noted, bearing should be replaced.

Wash bearing in a clean solvent. Re-oil with engine oil during assembly.

Ball bearings are a press fit on the crankshaft. If bearing is to be replaced, it should be removed in an arbor press. Fig. 4. (bearing should not be reused if removed from crankshaft.)

NOTE: Bearing shield faces crankshaft crankpin.

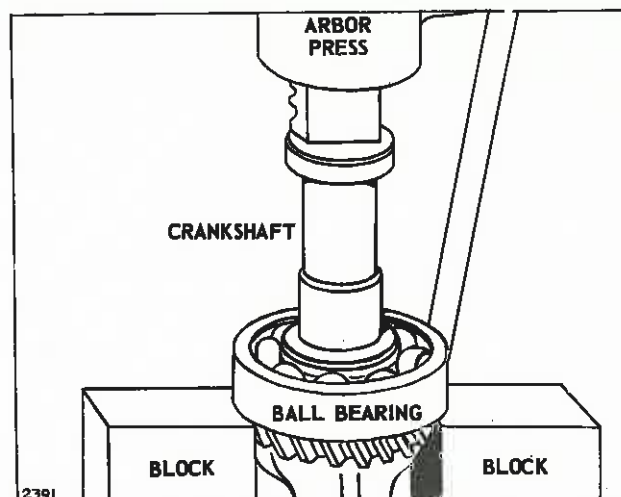


Fig. 4 — Removing Ball Bearings

To install, heat bearing in hot (250° F Max.) (120° C Max.) oil. Place crankshaft in a vise with bearing side up. When bearing is hot it will be a slip fit on crankshaft journal. Grasp bearing with the shield down and slide it on the crankshaft. Fig. 5. The bearing will tighten while cooling. Do not quench.

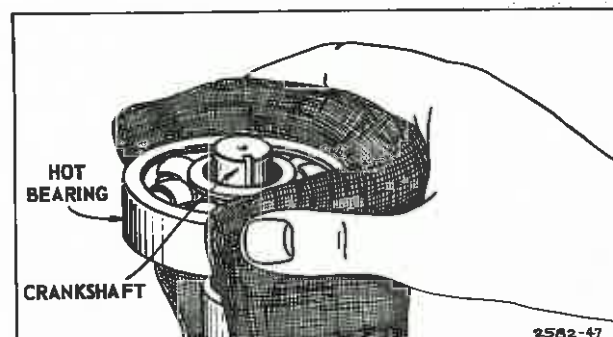


Fig. 5 — Install Ball Bearings

### PLAIN BEARINGS

#### Checking

Bearings should be replaced if scored or if plug gauge will enter. Try gauge at several locations in bearing. Fig. 6. See gauge listing in Table No. 3.

# CYLINDERS

## Plain Bearing

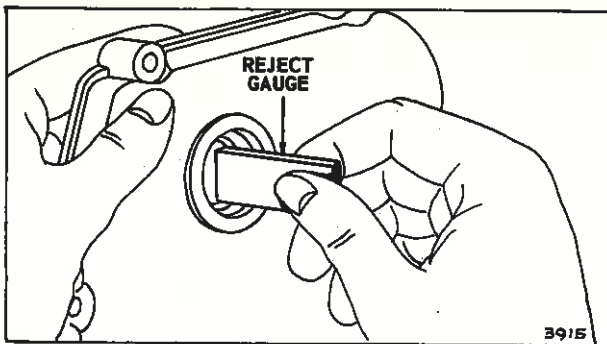


Fig. 6 — Checking Bearing

## REPLACING PLAIN BEARINGS

### Models 9, 14, 19, 20 and 23 Series

The crankcase cover or bearing support should be replaced if the bearing is worn or scored. Select the correct assembly part number by referring to the Parts List covering the engine. Refer to Table No. 3 for main bearing gauges.

TABLE NO. 2  
CYLINDER BEARING REJECT SIZE CHART

BASIC ENGINE MODEL OR SERIES	PTO BEARING		BEARING MAGNETO	
	Inches	Milli-meter	Inches	Milli-meter
<b>ALUMINUM CYLINDER</b>				
6B, 8B*	.878	22.30	.878	22.30
60000, 80000*	.878	22.30	.878	22.30
82000, 92000*, 94000*	.878	22.30	.878	22.30
110900*, 111900*	.878	22.30	.878	22.30
100000, 130000	1.003	25.48	.878	22.30
140000, 170000	1.185	30.10	1.004#	25.50#
190000	1.185	30.10	1.004#	25.50#
220000 Horiz.	Ball	Ball	Ball	Ball
220000 Vert., 250000	1.383	35.13	1.383	35.13
<b>CAST IRON CYLINDER</b>				
5, 6, 8, N	.878	22.30	.878	22.30
9	.988	25.09	.988	25.09
14	1.185	30.10	1.185	30.10
19, 190000, 200000	1.185	30.10	1.185	30.10
23; 230000†	1.382	35.10	1.382	35.10
240000, 300000	Ball	Ball	Ball	Ball
320000	Ball	Ball	Ball	Ball

†Gear Reduction PTO — 1.185" (30.10 mm)

\*Auxiliary drive models PTO Bearing Reject size 1.003" (25.48 mm)

#Synchro-Balanced Magneto Bearing Reject size 1.185" (30.10 mm)

## REPLACING MAGNETO BEARING

### Aluminum Cylinder Engines Except 171700, 191700

There is no removable bearing in these models; the cylinder must be reamed out so a replacement bushing can be installed.

Place pilot guide bushing in the sump bearing, with flange of pilot guide bushing toward inside of sump.

Assemble sump on cylinder. Be careful that pilot guide bushing does not fall out of place. Place reamer guide bushing into the oil seal recess in the cylinder. The reamer guide bushing, along with the pilot guide bushing, will center the counterbore reamer with the opposite bearing even though old bearing might be badly worn.

Place counterbore reamer on pilot and insert into cylinder until the tip of the pilot enters the pilot guide bushing in the sump. Fig. 7.

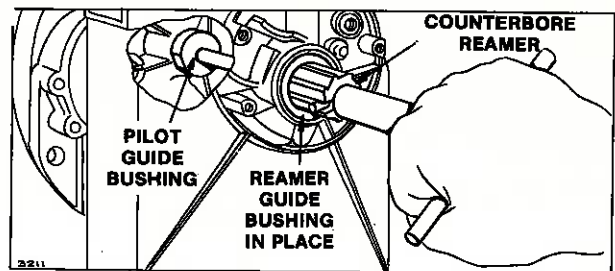


Fig. 7 — Counterbore Reaming

Turn reamer clockwise with a steady even pressure until it is completely through the bearing. Lubricate reamer with kerosene or Stoddard Solvent.

NOTE: Counterbore reaming may be undertaken without any lubricant. However, as aluminum material builds up on reamer flutes, eventual damage to the reamer and oversize counterbores will be experienced.

Remove sump and pull reamer out without backing it through the bearing. Clean out reaming chips. Remove reamer guide bushing from oil seal recess.

Hold new bushing, with notch toward cylinder and in line with notch on inside of cylinder, (Fig. 8, insert), against reamed out bearing. Note position of split in bushing. At a point opposite to the split in the bushing, using a chisel or screwdriver and hammer, make a notch in the reamed out cylinder bearing at a 45° angle. Fig. 8.



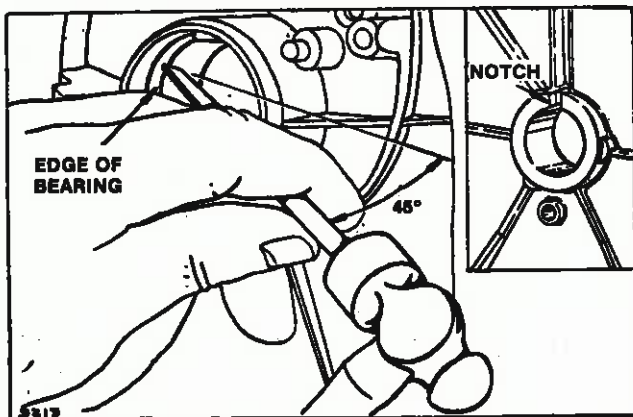
# CYLINDERS Plain Bearing

**TABLE NO. 3  
MAIN BEARING TOOL CHART**

BASIC ENGINE MODEL SERIES	CYLINDER SUPPORT	PILOT	COUNTER-BORE REAMER	REAMER GUIDE BUSHING MAG.	REAMER GUIDE BUSHING PTO	BUSHING DRIVER	PILOT GUIDE BUSHING MAG.	PILOT GUIDE BUSHING PTO	FINISH REAMER	PLUG GAUGE
5, N, 6, 8	19123	19096	—	—	—	19124	19094	19094	19095	19166
6B, 60000, 8B, 80000, 82000, 92000, 94000, 110900, 111200, 111900	19123	19096	19099	19101	19100	19124	19094	19094	19095	19166
8BHA* 80590* 81590* 92590* 80790* 81790* 92990* 110990* 111990*	19123	19096	19099	19101	†	19124	19094	†	19095	19166
100000 130000	19123	19096	19099 MAG 19172 PTO	19101	19186V 19170H	19124	19094	19168	19095 MAG 19173 PTO	19166 19178
140000 170000, 190000	19123	19096	19172 MAG 19174 PTO	19170	19171	19179	19168	19169	19173 MAG 19175 PTO	19178
171700 191700	19123	19096	19174 MAG 19174 PTO	19201	19171	19179	19169	19169	19175 PTO 19175 MAG	19178
9, 14, 19, 20, 23, 191400, 193400, 200400, 230000	Replace support and cover.									19117

† Use sump or cover with 7/8" diameter bearing and 19094 guide.

\* Replace sump if PTO bearing is worn.



**Fig. 8 — Notching Cylinder Hub**

Press in the new bushing, being careful to align the oil notches, with driver and support until the outer end of the bushing is flush with the end of the reamed out cylinder hub. Fig. 9. If oil notches do not line up, bushing can be pressed through into recess in cylinder support and then reinstalled.

With a blunt chisel or screwdriver, drive a portion of the bushing into the notch previously made in the cylinder. See Fig. 8. This is called staking and is done to prevent the bushing from turning.

Reassemble sump to cylinder with pilot guide bushing in the sump bearing.

Place finish reamer on pilot and insert the pilot into the cylinder bearing until the tip of the pilot enters the pilot guide bushings in the sump bearing. Fig. 10.

Lubricate the reamer with kerosene, fuel oil or Stoddard Solvent, then ream the bushing turning the reamer clockwise with a steady even pressure until reamer is completely through the bearing. Improper lubricants will produce a rough bearing surface. Remove sump and pull reamer out without backing it through the bearing. Remove pilot guide bushing; clean out all reaming chips.

On most cylinders, the breaker point plunger hole enters the reamed out main bearing and a burr is formed by the counterbore reaming operation. Burr can be removed using 19058 finish reamer. Clean out dirt and reaming chips.

# CYLINDERS

## Plain Bearing

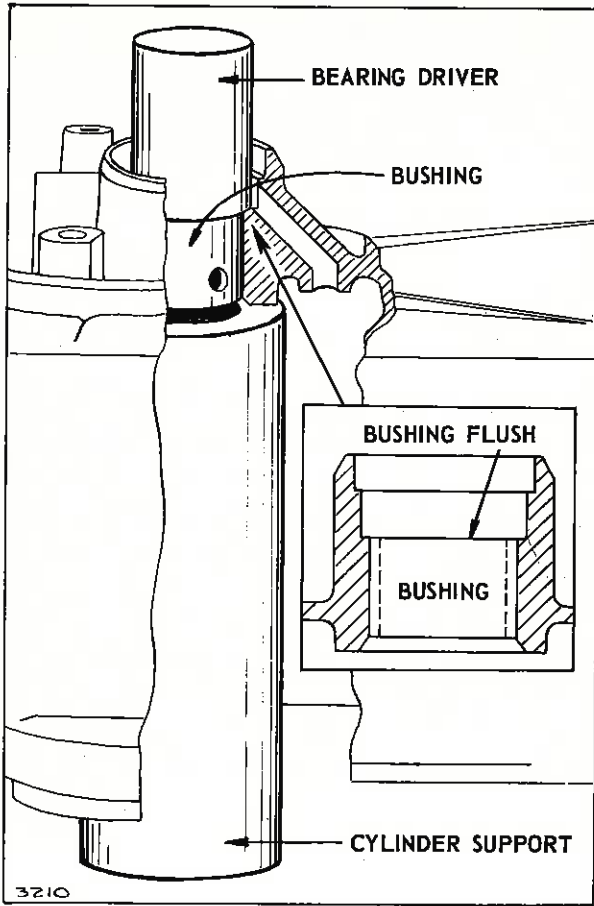


Fig. 9 — Pressing in New Bushing

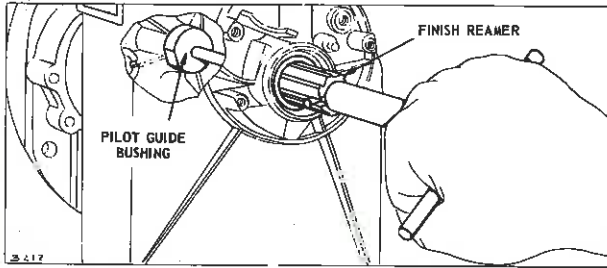


Fig. 10 — Shell Reaming

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## MAGNETO BEARING

Model Series 171700, 191700

Counterbore ream worn bearing using tools per Table No. 3 and procedure for standard magneto bushing. Then place new bushing against reamed out bearing on inside of cylinder, with bushing notch against cylinder and in line with oil hole, Fig. 11. Note position of split in bearing. At a point opposite the split in bushing, use a chisel or screwdriver and hammer to make a notch in the reamed out bearing at a 45° angle.

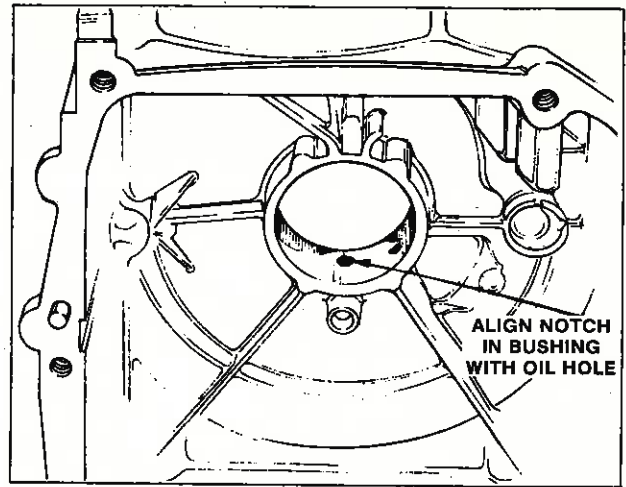


Fig. 11 — Location of Oil Hole

Press in new bushing from outside cylinder, Fig. 12, using care to keep notch in line with oil hole, Fig. 11, with bushing driver and cylinder support until bushing is flush with inside edge of cylinder, Fig. 12. If bushing notch and bushing oil hole are not aligned, press bushing through and reinstall.

With a chisel or screwdriver, drive a portion of the bushing into the notch previously made in cylinder. See Fig. 11. This is called staking and is done to prevent the bushing from turning.

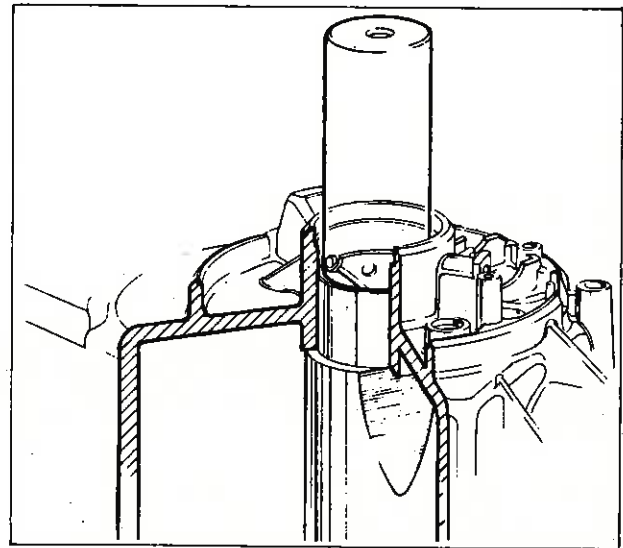


Fig. 12 — Pressing in New Bushing

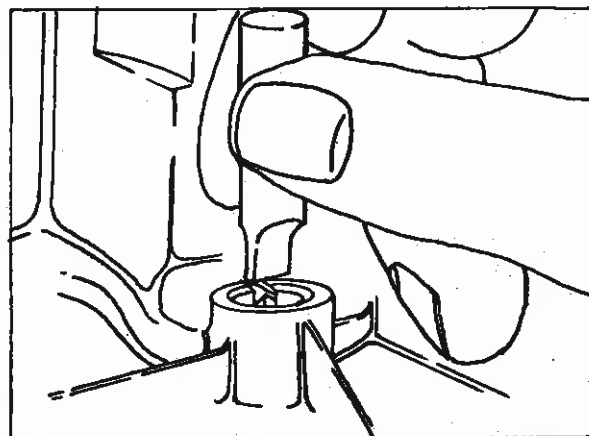
Finish ream bushing using same procedure for standard magneto bushing. Clean out breaker point plunger hole with 19058 finish reamer. Clean out dirt and chips.

**Checking Cam Gear Bearing**

**CHECKING CAM GEAR BEARINGS**

Check cam gear bushing using 19164 plug gauge as shown, Fig. 14. If 1/4" or more of gauge enters bearing bore, bearing is worn beyond reject and the cylinder, sump or crankcase cover must be replaced.

NOTE: On Model Series 111200, 111900, plug gauge 19164 is used on the sump or crankcase cover cam gear bearing bore. Reject size of the cylinder cam bearing is .443 or larger.



**Fig. 14 — Checking Cam Gear Bearing**

**REPLACING PTO BEARING**

**Aluminum Cylinder Engines**

The sump or crankcase cover bearing can be repaired in the same manner as the magneto bearing. However, one bearing should be completely repaired before starting the other bearing. After the bearings are finished, press in the new oil seals.

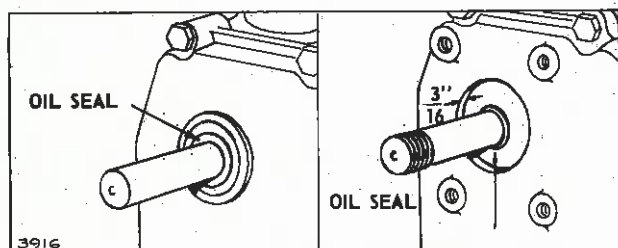
**NOTE: Model 8B-HA, 80590, 81590, 82590, 80790, 81790, 82990, 92590, 92990, 110990, 111990.**

The magneto bearing can be replaced as above; if the sump bearing is worn, the sump must be replaced. No tools are available for replacing the sump bearing.

**REPLACING OIL SEAL**

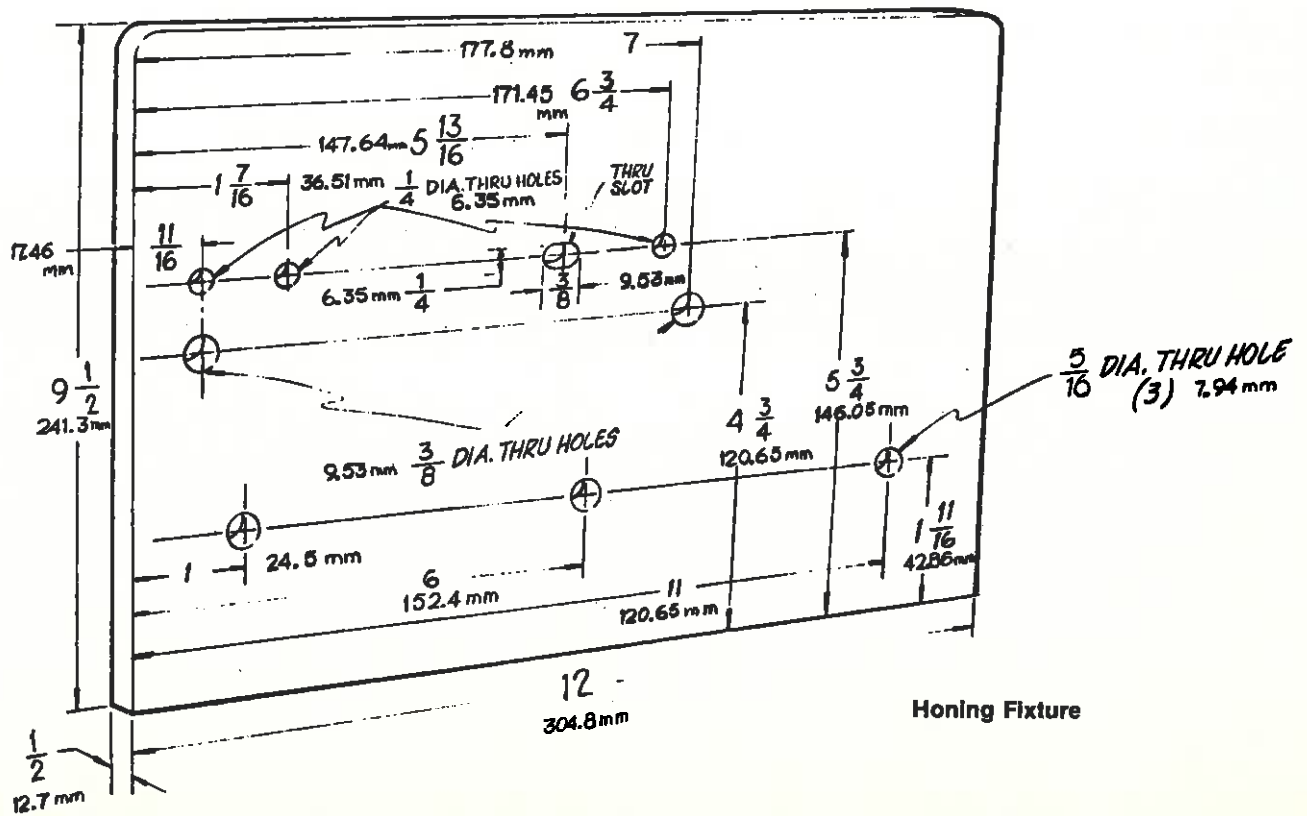
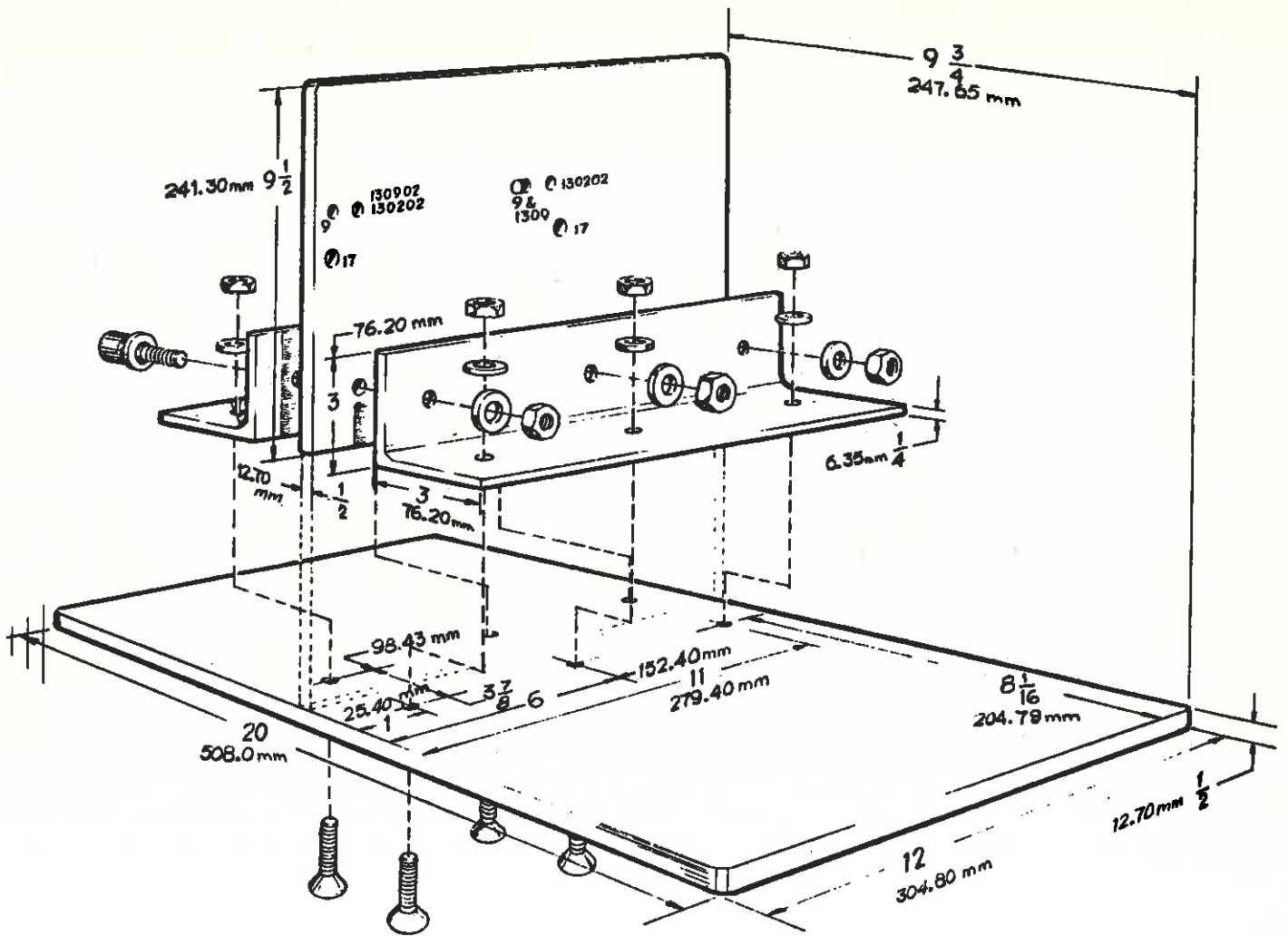
The oil seal is assembled with the sharp edge of the leather or rubber toward the inside of the engine. Lubricate inside diameter of oil seals with "Lubriplate," or equivalent, before assembling engines.

Most oil seals are pressed in, flush with the hub. However, models 60000, 80000, 100000 and 130000 using a ball bearing with mounting flange have the seal pressed 3/16" below crankcase mounting flange. Fig. 13.



**Fig. 13 — Replacing Oil Seal**

# CYLINDERS



Honing Fixture

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