

# LYCOMING

## OVERHAUL SUPPLEMENT

**Models Affected: IO-540-B1A5**

### SECTION I

#### INTRODUCTION

The purpose of this Overhaul Supplement is to enable personnel to overhaul the IO-540-B1A5 series Lycoming Aircraft engines. This Supplement must be used in conjunction with the O-540 Overhaul Manual.

All procedures outlined in the O-540 overhaul manual also apply to the IO-540-B1A5 engines except where specific differences are outlined in this supplement. Modification and salvage procedures outlined in the basic manual do not apply to the IO-540-B1A5 engines. The paragraph numbers in this supplement correspond to the paragraph numbers in the basic manual. Figure numbers, however, have no relationship to the basic manual. Section numbers in this supplement, correspond to the sections in the basic manual.

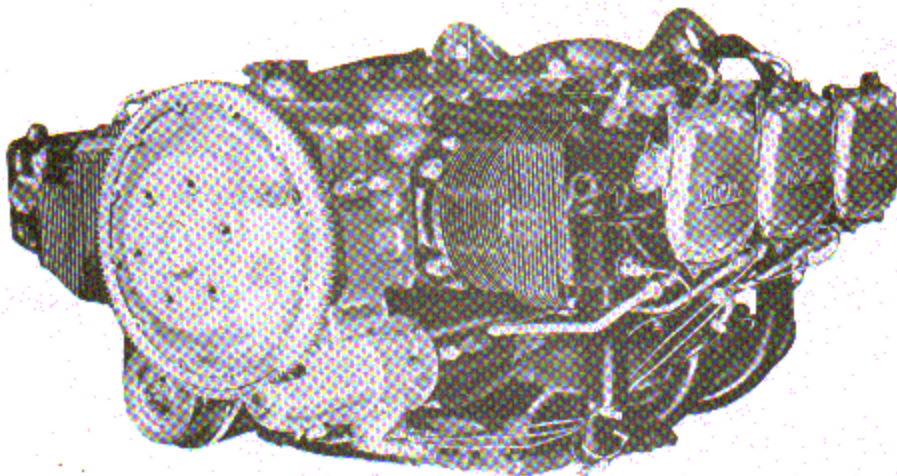


Figure 1-1. Left Front View IO-540-B1A5

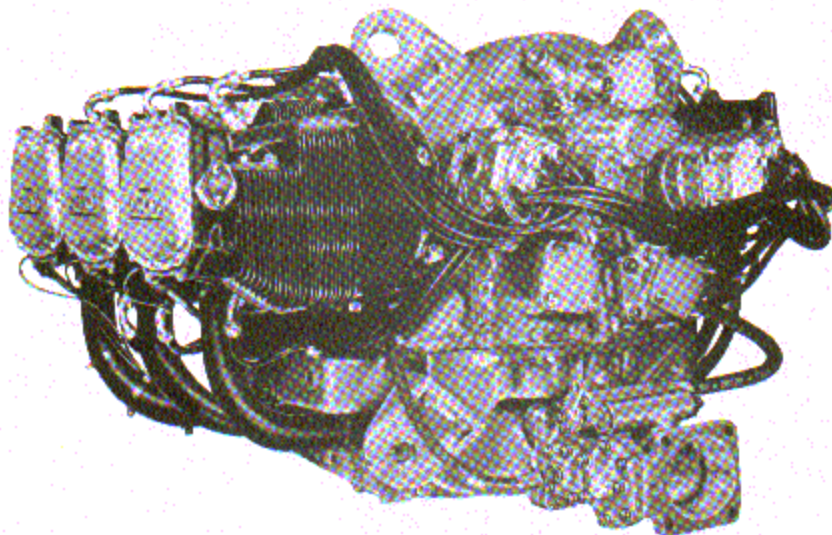


Figure 1-2. Left Rear View IO-540-B1A5

## SECTION II

### DESCRIPTION

#### TYPE OF ENGINE

2-1. Lycoming Aircraft Engine Models IO-540-B1A5 Series, are direct drive, six cylinder, wet sump, fuel injection, tuned induction, horizontally opposed, air cooled engines with top side exhaust port. This engine is supplied at the factory with automotive type generator and starter. Also available are drives for AN type vacuum pump, hydraulic pump, propeller governor and fuel supply pump.

2-2. CYLINDER. Instead of being directly opposite each other, the cylinders are staggered, which permits a separate throw on the crankshaft for each connecting rod. These cylinders employ top side exhaust ports and provide for updraft cooling. Baffles are provided to build up pressure between the cowling and the cylinders, and are located on top side of cylinder. Effective from engine number 187-48 and up, nitride hardened steel barrels are used. Prior to this serial effectivity, chrome barrels were used. Angle valves are employed on this engine. A sodium cooled rotator type exhaust valve is used, and bronze valve guides with austenitic chrome nickel steel valve seats are shrunk into machined recesses in the head. Rocker bosses have been relocated to allow for angle exhaust push rods. Chrome cylinders are identified by either an orange band at the base of the cylinder or orange paint on the cylinder fins between the push rods. Nitride hardened steel cylinders are identified in the same manner, but color is blue.

2-4. Paragraphs 2-4 through 2-5 in basic O-540 overhaul manual, also apply to IO-540-B1A5 engines.

2-6. CRANKSHAFT. The crankshaft is made from a chrome molybdenum steel forging. All bearing journal surfaces are nitrided and centrifugal sludge removers are provided in the form of oil tubes at each crankpin journal. These tubes are removed during overhaul and replaced with new ones; this enables thorough cleaning of the internal oil passages in the crankshaft.

NOTE: The suffix "5" listed in model designation refers to order of counterweights used in crankshaft. For example IO-540-B1A5 denotes one fifth and one sixth order crankshaft counterweight. The counterweights are employed to reduce reciprocal vibrations caused by piston motion when crankshaft is traveling at its critical speed.

2-7. Description of crankcase in basic O-540 overhaul manual applies to crankcase for IO-540-B1A5 engines. However it should be noted, that if it is found necessary to replace either half of the crankcase, both halves must be replaced. This is due to line boring requirements necessary for correct running clearance for the crankshaft.

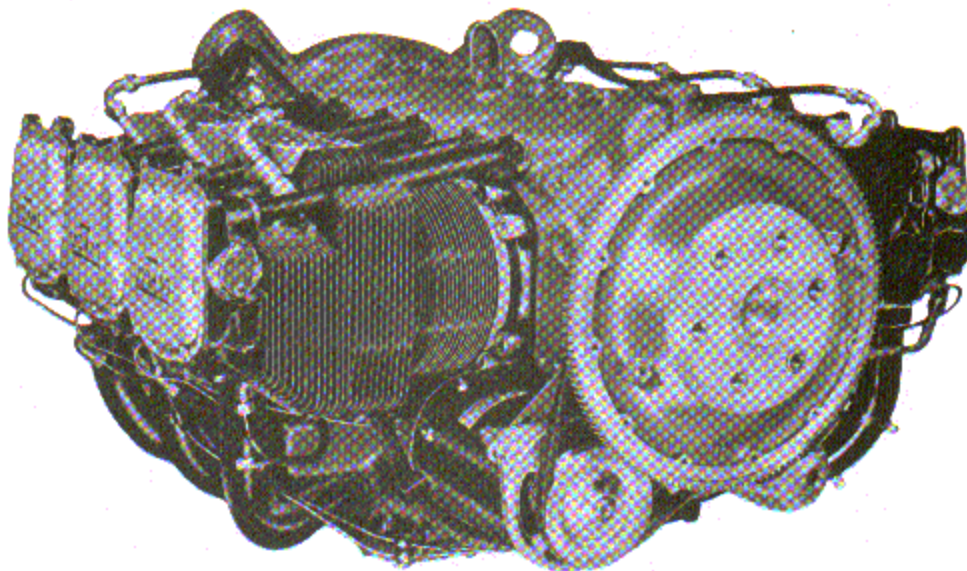


Figure 1-3. Right Front View IO-540-B1A5



## LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

- 2-8. OIL SUMP. The oil sump incorporates an oil screen filter, plenum chamber for tuned intake system, and attached air throttle body and mounting bracket for fuel distributor. The air, as it passes through the plenum chamber is warmed by the heated oil in the sump forming the top half of the chamber.
- 2-9. CONNECTING RODS. Paragraph 2-9 in basic O-540 manual also applies to IO-540-B1A5 engines.
- 2-10. PISTONS. The full skirt type piston is machined from an aluminum alloy forging and is provided with grooves for four rings, three compression rings, and one oil regulating ring, of the expander type. The piston pin is of the full floating type with a plug located at each end to prevent the pin from touching the cylinder wall. Aluminum plugs are used with nitride hardened steel barrels, and aluminum bronze with chrome steel barrels.
- 2-11. ACCESSORY HOUSING. Paragraph 2-11 in basic O-540 overhaul manual applies to IO-540-B1A5 engines, with the following exception: The IO-540-B1A5 engines employ a Bendix RS10B1 fuel injection system and are equipped with an AN type fuel pump drive.
- 2-12. COOLING SYSTEM. Paragraph 2-12 of the basic O-540 overhaul manual applies to IO-540-B1A5 engines with the following exceptions: The cylinder provides updraft cooling, the baffles are located on top of cylinders.
- 2-13. LUBRICATING SYSTEM. Paragraphs 2-13 through 2-16 as described in basic O-540 overhaul manual also apply to IO-540-B1A5 model engines.
- 2-17. INDUCTION SYSTEM. The IO-540-B1A5 engines incorporate a Bendix RS10B1 continuous flow type fuel injection system. This fuel injection system is fully described in Section VIII of this supplement. The engine is equipped with matched intake pipes, tuned in length and diameter to put a larger volume of air into the cylinder than is possible with a normal untuned induction system. The increased air flow to the cylinder results in increased power output for a tuned induction engine.
- 2-18. IGNITION SYSTEM. Engine models IO-540-B1A5 are equipped with one each of Scintilla type S6LN-200 and type S6LN-204 magnetos. The S6LN-200 Series are retard breaker magnetos replacing the impulse type, and provide fixed retard and a long duration "hot shower of sparks" to the proper spark plug for starting. A source of DC power and a starting vibrator are required to complete the installation and it is recommended that the magneto manufacturer be contacted for information on the various vibrator and switching arrangements available. Both of these -200 series magnetos incorporate an integral feed through capacitor and require no external noise filter in the ground lead. The direction of rotation of the magneto shafts, viewed from anti-propeller end of the engine is clockwise. The engine firing order is 1-4-5-2-3-6. Timing procedure for -200 series magnetos is fully discussed in Section IV, this supplement.
- CAUTION: The -200 magneto can be used only on the left side of the engine, as viewed from the rear.
- 2-19. ACCESSORY DRIVES. In addition to the magneto, starter, and generator drives, the basic IO-540-B1A5 engine is furnished with an SAE type tachometer drive. Optional drives available include a hydraulic pump drive, vacuum pump drive, and AN fuel pump drive and a propeller governor drive.

### SECTION III

#### GENERAL OVERHAUL PROCEDURES

##### CLEANING

- 3-4. The IO-540-B1A5 Series Aircraft engines are disassembled and cleaned as per instructions described in the O-540 Series aircraft engine overhaul manual.

##### INSPECTION

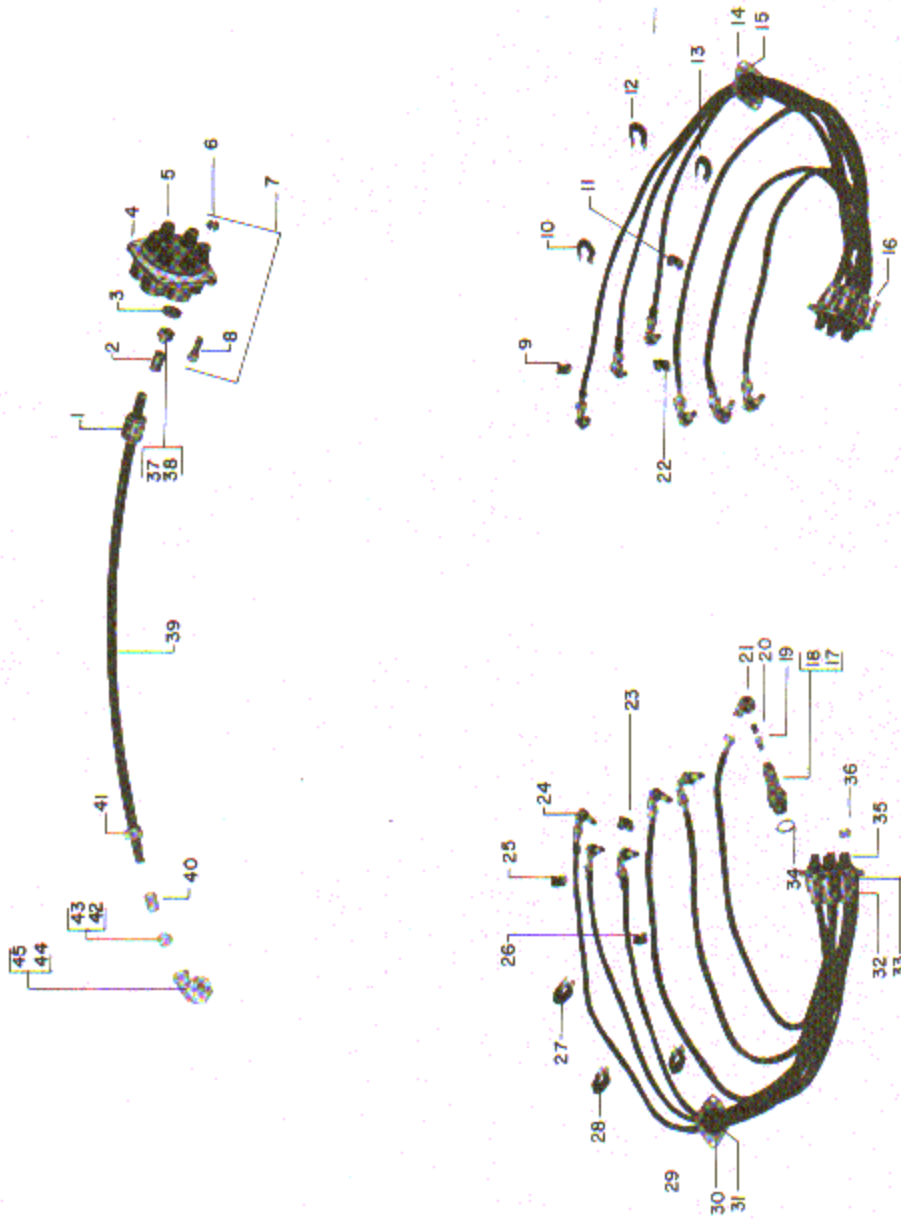
- 3-11. The IO-540-B1A5 Series aircraft engines are inspected in accordance with instructions listed in O-540 Series aircraft engine overhaul manual.

##### REPAIR AND REPLACEMENT

- 3-21. Damaged parts, parts which do not meet requirements listed in applicable Table of Limits, and painted parts are repaired or replaced as per instructions in O-540 Aircraft engine overhaul manual.

##### REASSEMBLY

- 3-32. Under "Arbitrary Replacement of Parts, add cylinder fin stabilizers.

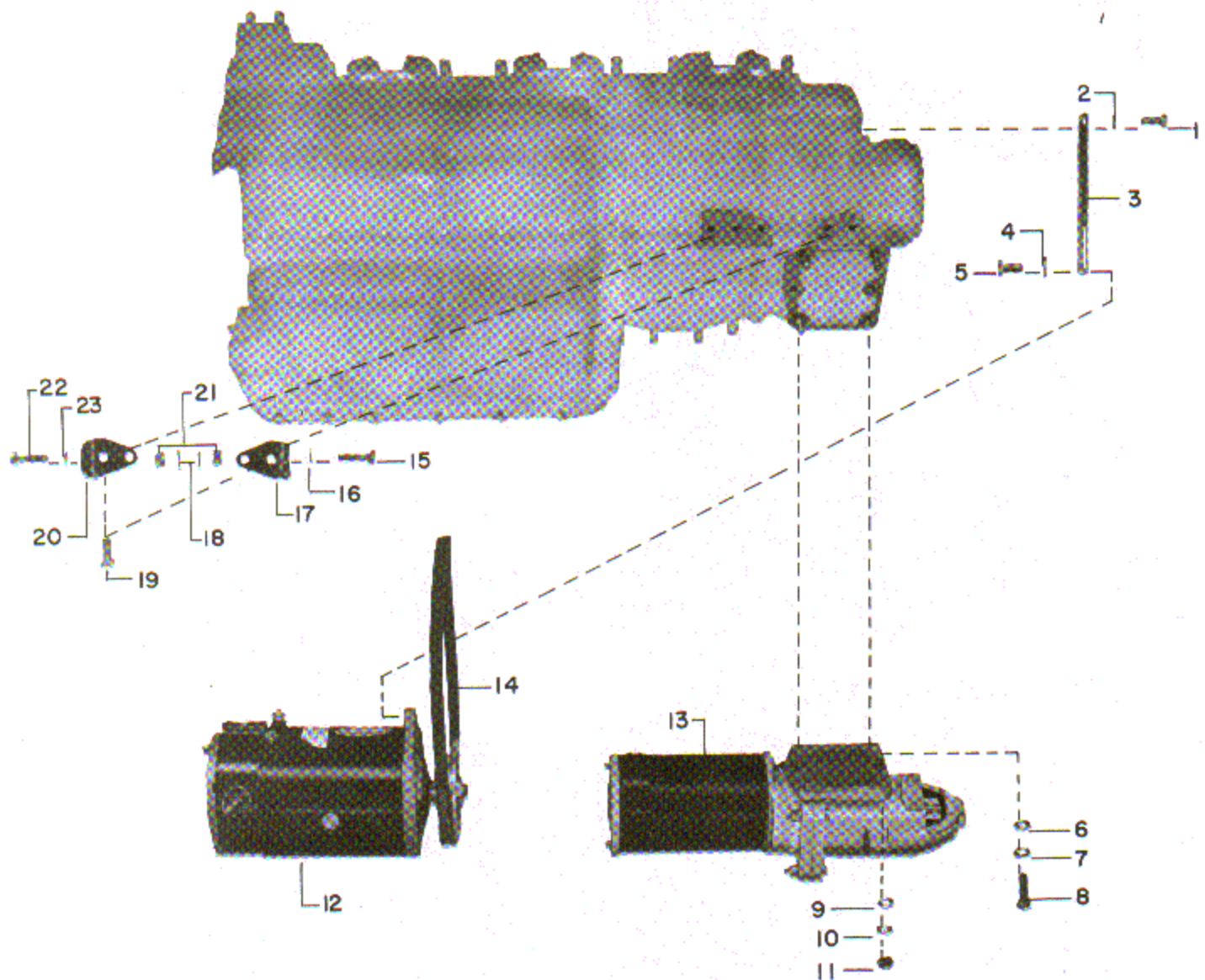


1. Nut, Coupling
2. Sleeve, Shielded
3. Washer
4. Plate, Ignition cable
5. Grommet, Ignition Cable
6. Washer, Cable contact
7. Kit Assy., Ignition cable, shielded
8. Screw, No. 10-32
9. Clip, Ignition cable, 6 wire
10. Clip, Ignition cable, 3 wire
11. Clip, Ignition cable, 3 wire
12. Clip, Ignition cable, 2 wire
13. Clip, Ignition cable, 2 wire
14. Plate, Spark plug cable
15. Grommet Ignition cable

16. Screw, No. 10-32 self locking
17. Spark plug, (AC-SR-87)
18. Spark plug, (AC-SR-87)
19. Sleeve, Spark plug terminal
20. Collar, Spark plug terminal
21. Elbow Assy., Spark plug, 110°
22. Clip, Ignition cable 6 wire
23. Clip, Ignition cable 6 wire
24. Elbow Assy., Spark plug
25. Clip, Ignition cable, 6 wire
26. Clip, Ignition cable, 3 wire
27. Clip, Ignition cable, 3 wire
28. Clip, Ignition cable, 2 wire
29. Clip, Ignition cable, 2 wire
30. Plate, Spark plug cable

31. Grommet, Ignition cable
32. Nut, Coupling, 11/16-24 round
33. Plate, Ignition cable outlet, shielded
34. Gasket, Spark plug (Furnished with plug)
35. Grommet, Ignition cable, 6 wire
36. Washer, High tension cable contact
37. Ferrule, Terminator confining
38. Ferrule, Terminator confining
39. Cable, High tension, shielded
40. Sleeve, Insulation support
41. Nut, Spark plug union
42. Ferrule, Terminator confining
43. Ferrule, Terminator confining
44. Elbow Assy., Spark plug 110°
45. Elbow Assy., Spark plug

Figure 4-1. Ignition Shielded Cable Assembly.



- |  |  |
|--|--|
| 1. Bolt, Hex hd. drilled 5/16-18 x 3/4 in. long    | 12. Generator, 24 v. - 50 AMP                      |
| 2. Washer, Plain 5/16 in.                          | 13. Starter, 24 volt                               |
| 3. Link, Generator adjusting                       | 14. Belt, Generator                                |
| 4. Washer, Plain 3/4 OD x 11/32 ID x 1/8 in. thick | 15. Bolt, Drilled end 5/16-18 x 1-5/32 in. long    |
| 5. Bolt, Hex hd. drilled 5/16-18 x 3/4 in. long    | 16. Washer, Plain 5/16 in.                         |
| 6. Washer, Plain 5/16 in.                          | 17. Bracket, Generator                             |
| 7. Washer, 5/16 in. lock. int. teeth               | 18. Pin, Cotter                                    |
| 8. Bolt, Hex hd. 5/16-18 x 1-3/32 in. long         | 19. Bolt, Hex hd. drilled 5/16-18 x 29/32 in. long |
| 9. Washer, Plain 5/16 in.                          | 20. Bracket, Generator                             |
| 10. Washer, 5/16 in. lock. int. teeth              | 21. Nut, Slotted, 5/16-18                          |
| 11. Nut, Plain 5/16-18                             | 22. Bolt, Drilled end, 5/16-18 x 1-5/32 in. long.  |
|  | 23. Washer, Plain 5/16 in.                         |

Figure 4-2. Starter, Generator and Related Parts



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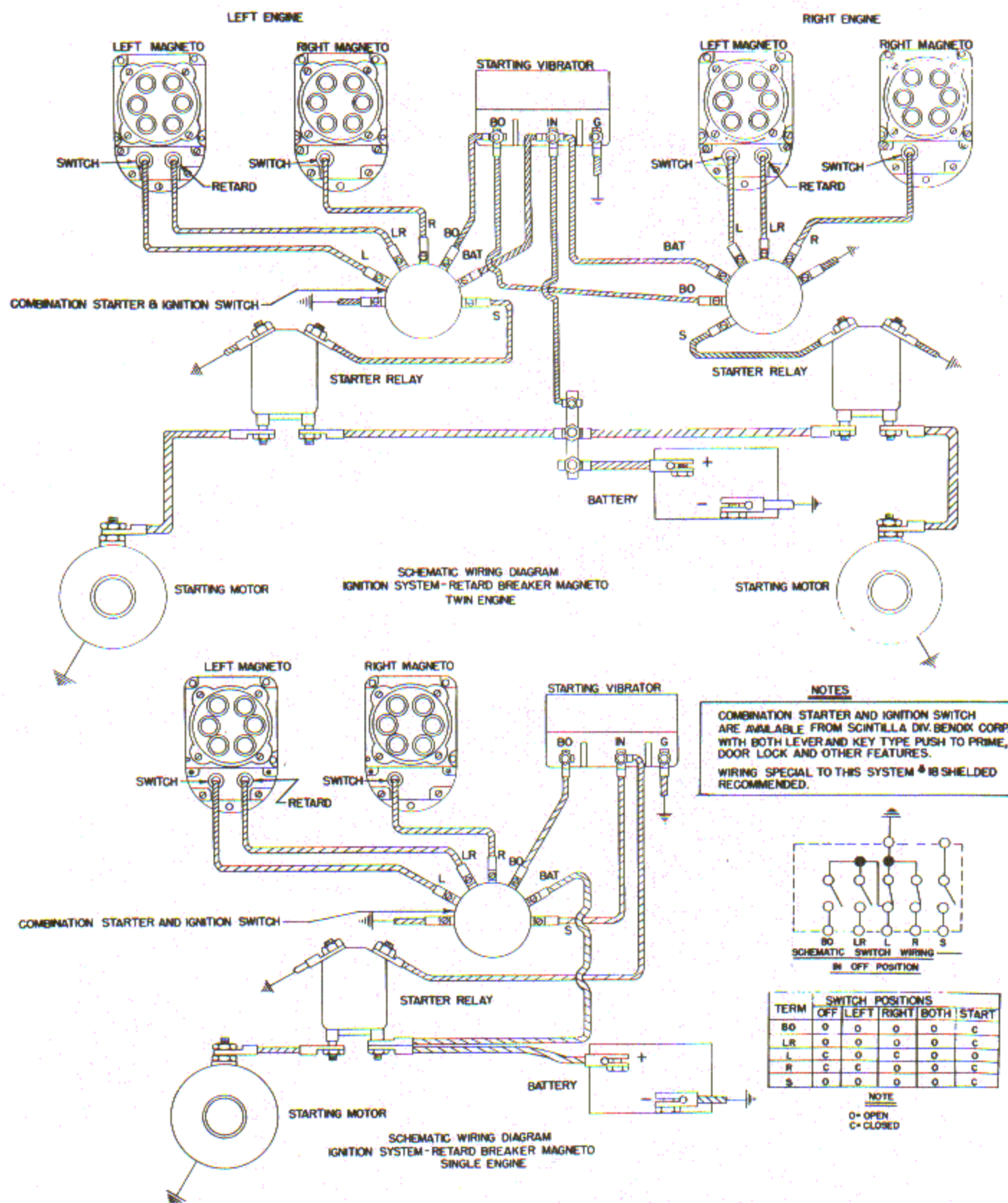


Figure 4-3. Schematic for Retard Breaker Magnetos

1. Gasket, Magneto adapter
2. Adapter, Magneto
3. Adapter, Magneto
4. Gasket, Magneto adapter
5. Gasket, Magneto adapter
6. Bearing, Ball
7. Gasket, Magneto adapter
8. Bearing, Ball
9. Cushion, Magneto drive
10. Gear and Retainer Assy., Magneto drive
11. Gear and Retainer Assy., Magneto drive

12. Cushion, Magneto drive
13. Coupling, Magneto drive (retard breaker)
14. Coupling, Magneto drive
15. Magneto, Retard breaker
16. Magneto
17. Kit, Magneto ground terminal
18. Kit, Magneto retard terminal
19. Washer, Plain 3/4 OD x 11/32 ID x 1/8 in. thick
20. Nut, Plain 5/16-18
21. Washer, 5/16 in. lock, internal teeth
22. Kit, Magneto ground terminal

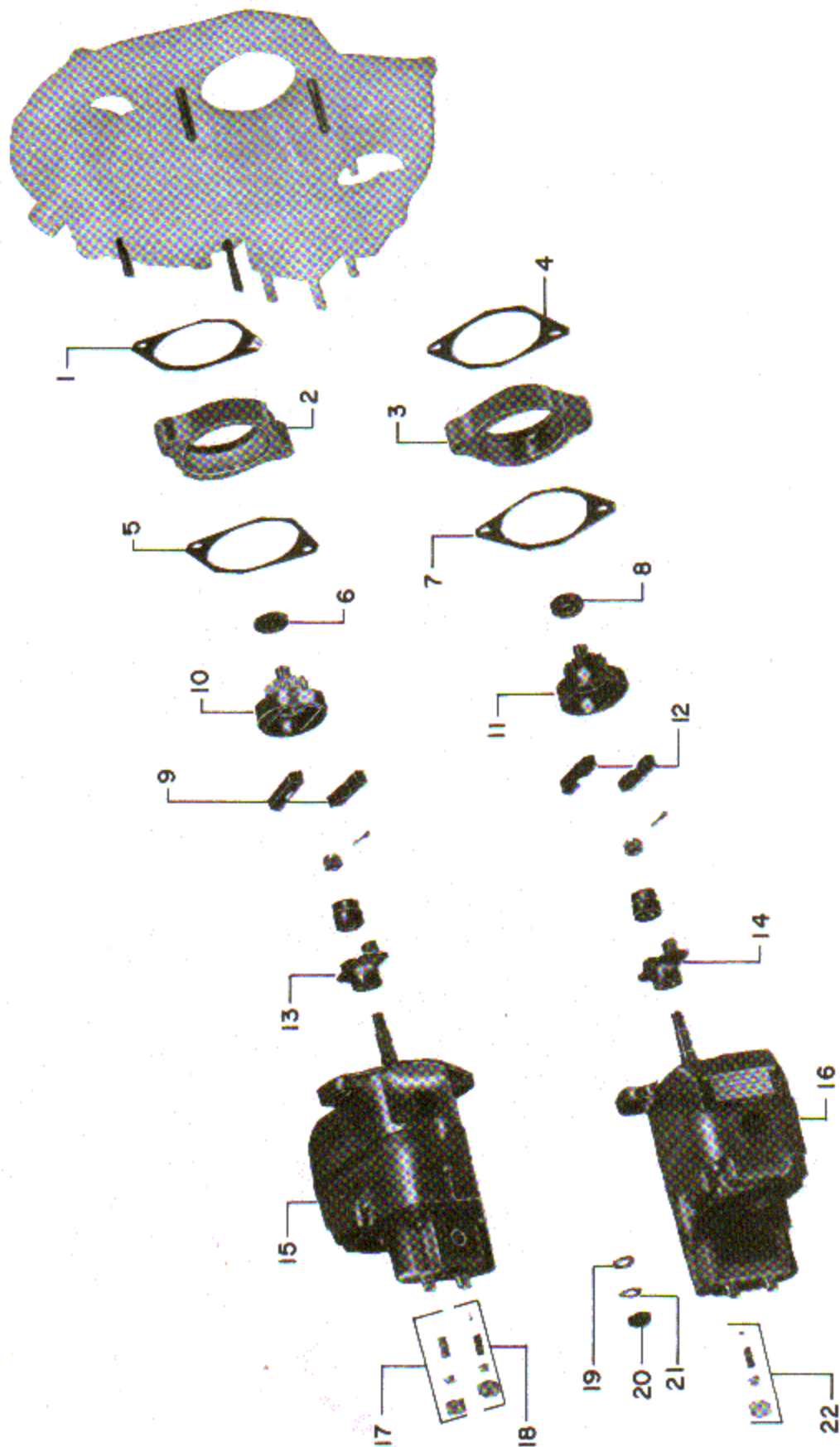


Figure 4-4. Magnetos and Magneto Drives.

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### SECTION IV

#### IGNITION SYSTEM

4-1. All procedures for disassembly, repair and replacement, and reassembly of the ignition system, as described in paragraphs 4-1 to 4-20 inclusive in the O-540 series engine overhaul manual will apply to the IO-540-B1A5 series engines. All references on magneto timing procedures which do not apply to Scintilla type -200 series magnetos should be disregarded.

NOTE: In timing the new Scintilla -200 magnetos to the engine, it is well to remember that only the main breaker points are timed to the engine. Retard breaker points are timed to open a predetermined number of degrees after main breaker points, thus they must not be considered in timing the magneto to the engine. Spark advance on subject magnetos is 20° BTC.

4-22. Paragraphs 4-22 through 4-33 of the basic O-540 overhaul manual may be used for harness assembly. All information other than that pertaining to six cylinder harness installation should be disregarded.

### SECTION V

#### ACCESSORY HOUSING

5-1. It is assumed that all accessories, with which the engine is equipped, will have been removed from the accessory housing before disassembly. For overhaul procedures covering the various accessories not manufactured by Lycoming, consult the applicable manufacturer's handbook.

#### DISASSEMBLY

5-2. The original O-540 overhaul manual may be used for the description of disassembly of the IO-540-B1A5 series aircraft engine accessory housing with the exception of the AN type fuel pump.

#### CLEANING

5-8. Cleaning procedures outlined in basic O-540 overhaul manual also apply to the IO-540-B1A5 engines. Paragraph 5-9 in basic manual also applies to IO-540-B1A5 engines.

#### INSPECTION

5-10. Inspect all accessory housing parts in accordance with the general instructions in paragraphs 5-10 through 5-11 in basic overhaul manual. Make sure they compare in fit with the applicable Table of Limits listed in this supplement.

#### REPAIR AND REPLACEMENT

5-12. Repair and replace all accessory housing parts not conforming to the applicable Table of Limits listed in this IO-540-B1A5 overhaul supplement.

#### REASSEMBLY

5-13. Paragraphs 5-13 through 5-30 in basic O-540 overhaul manual, describe in detail reassembly methods for accessory housing. These details also apply to IO-540-B1A5 engines.

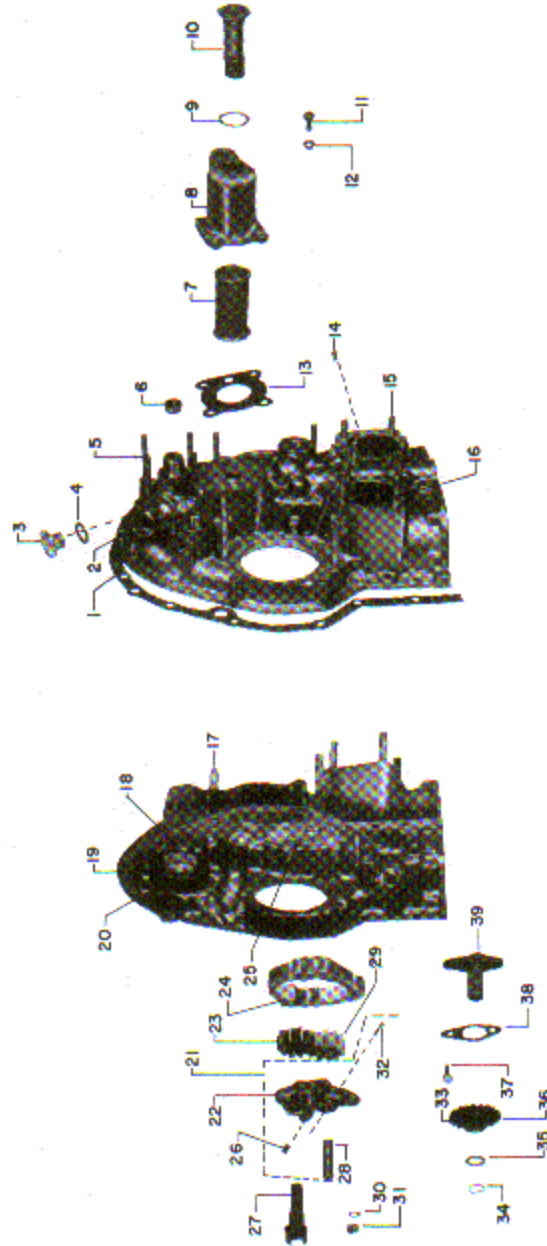


1. Gasket, Accessory Housing
2. Fitting, Breather Short
3. Plug, Oil Cooler By-Pass
4. Gasket, Annular, 7/8 OD x 3/32 in.
5. Stud, 1/4-20 x 2 5/8 in. long
6. Seal, Tachometer Drive, Oil
7. Screen Assy., Oil Pressure
8. Housing, Thermostatic Valve and Oil Pressure Screen
9. Gasket, Annular 7/8 OD x 3/32 in.

ATTACHING PARTS

40	43	46	49
41	44	47	50
42	45	48	51

10. Valve Assy., Oil Cooler By-Pass Temp. Control Valve
11. Screw, Hex. Hd. Self Locking 1/4-20 x 1.00 in. long
12. Washer Plain 1/4 in.
13. Gasket, Oil Pressure Housing
14. Plug, Allen Head, 3/8-18 NPT
15. Stud, 5/16-18 x 1 1/2 in. long
16. Stud, 5/16-18 x 2 3/16 in. long
17. Stud, 5/16-18 x 2 9/16 in. long
18. Rivet, Brazier Hd.



19. Shield, Oil Accessory Breather
20. Rivet, Brazier Hd.
21. Cover Assy., Oil Pump
22. Cover, Oil Pump
23. Impeller, Oil Pump, Driving
24. Body, Oil Pump
25. Stud, Drilled 5/16-18 x 2 3/16 in. long
26. Plug, Allen Head, 1/16-27 NPT
27. Shaft, Oil Pump Drive
28. Shaft, Oil Pump Idler
29. Impeller, Oil Pump, Driven

30. Washer, Plain, 5/16 in.
31. Nut, Slotted 5/16-18
32. Pin, Cotter 1/8 dia. x 1.00 in. long
33. Bushing, Crankshaft Idler Gear
34. Ring, External Ret. 9/16 dia. x 11/32 in. thk.
35. Washer, Fuel Pump Gear Thrust
36. Gear Assy. Fuel Pump Idler
37. Screw, Hex. Hd. 1/4-20 x 11/16 in. long
38. Lockplate, 1/4 Bolt x 1 3/4 Spacing
39. Shaft, Fuel Pump Idler Gear
40. Bolt, Hex. Hd. 1/4-20 x 15/16 in. long

41. Washer, Plain 1/4 in.
42. Washer, Shakeproof Lock, 1/4 in.
43. Bolt, Hex. Hd., 1/4-20 x 1 3/4 in. long
44. Washer, Plain 1/4 in.
45. Washer, Shakeproof Lock, 1/4 in.
46. Bolt, Hex. Hd. 1/4-20 x 1 1/8 in. long
47. Washer, Plain 1/4 in.
48. Washer, Shakeproof Lock, 1/4 in.
49. Bolt, Hex. Hd., 1/4-20 x 1.00 in. long
50. Washer, Plain 1/4 in.
51. Washer, Shakeproof Lock, 1/4 in.

Figure 5-1. Exploded View of Accessory Housing

1. Gear Assy., Vacuum pump driven
2. Washer, Accessory driven gear
3. Shaft, Gear Assy., Fuel pump dr.
4. Gear Assy., Hydraulic pump driven
5. Gasket Accessory Adapter
6. Dowel, 1/8 dia. x 1/4 in. long
7. Gasket, Fuel pump adapter
8. Washer, Accessory driven gear
9. Gasket, Accessory drive adapter
10. Adapter Assy., Vacuum pump

11. Adapter Assy., Fuel pump drive
12. Dowel, 1/8 dia. x 1/4 in. long
13. Oil seal, 7/8 in. dia. x 1-1/2 OD x 5/16 wide
14. Seal, Oil 3/4 ID x 1-3/8 OD
15. Seal, Oil 7/8 ID x 1-1/2 OD x 5/16 in. wide
16. Stud, 1/4-20 x 1-17/32 in. long
17. Adapter Assy., Hydraulic pump
18. Washer, Plain 5/16 in.
19. Washer, 5/16 in. lock. internal teeth
20. Gasket, Vacuum pump

(A) VACUUM PUMP DRIVE

(B) FUEL PUMP DRIVE

(C) HYDRAULIC PUMP DRIVE

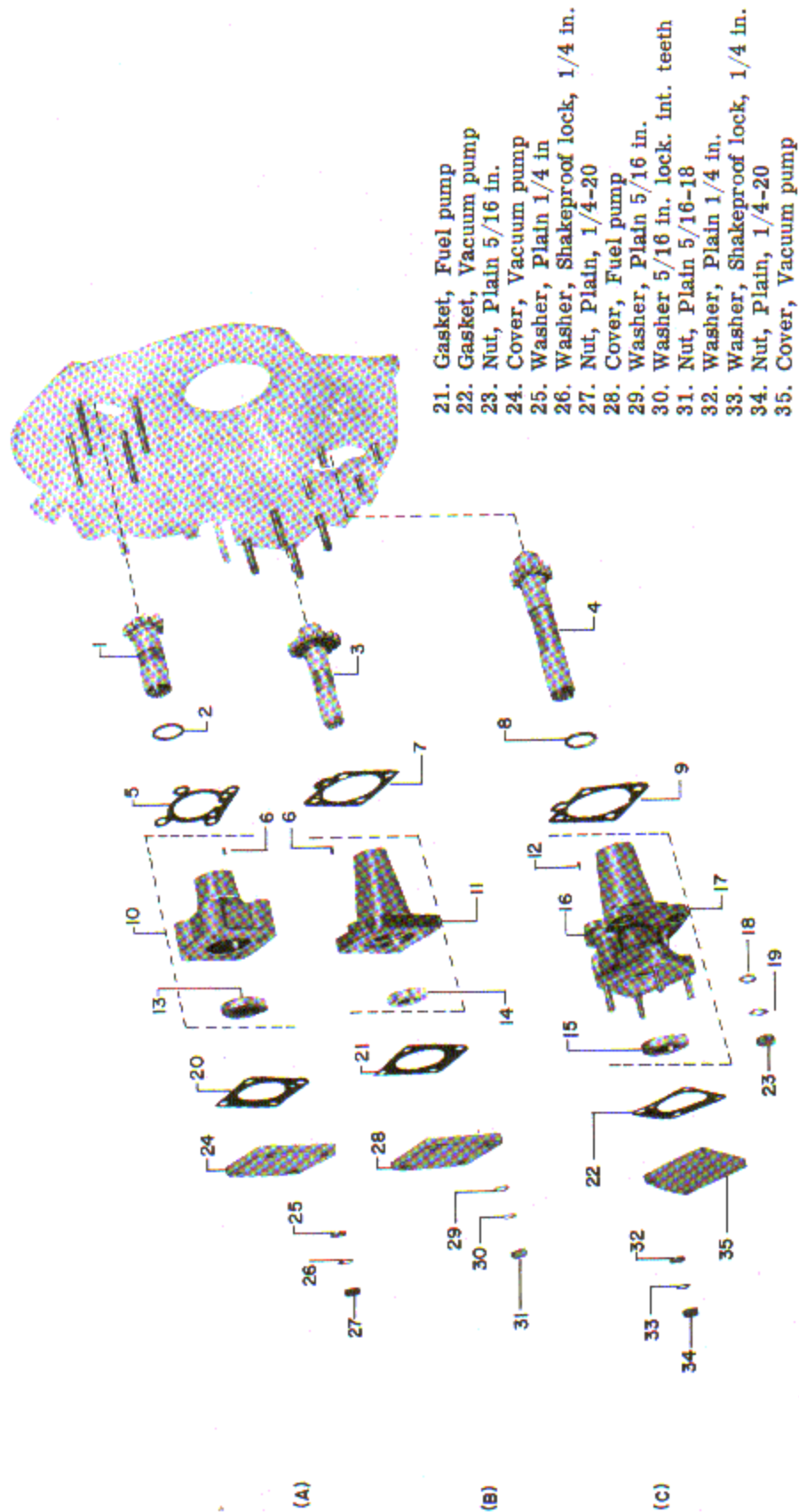


Figure 5-2. Accessory Drives.

SECTION VI

CYLINDERS, PISTONS, AND VALVE TRAIN

6-1. The cylinder assemblies for IO-540-B1A5 engines differ from the O-540 series engines in the following manner.

1. Angle valves are employed.
2. From engine number 187-48 and up, nitride hardened steel barrels are used. Prior to this effectivity, chrome barrels were used. From engine serial number 187-48 and up, chrome cylinders will be furnished only as optional equipment and will be identified by a streak of orange paint on the cooling fins located between the push rods or an orange band around the base of the cylinder barrel.
3. The rocker bosses have been re-located to allow for top exhaust cylinders.
4. Cylinder employs updraft cooling. Exhaust port is on top of cylinder, and cooling air is taken in below engine and forced up thru the cooling fins.
5. Cylinder fin stabilizers are installed in the following manner:
  - a. Three stabilizers are used for each cylinder on IO-540-B1A5 engines. Clean stabilizers and affected fins of all grease, dirt, or foreign matter.
  - b. Apply Dow Corning A-4094 primer to the affected fins and allow to dry. Do not apply primer to the stabilizer itself.
  - c. Apply Dow Corning Silastic 140 adhesive cement to the stabilizers.
  - d. One stabilizer (Lyc. P/N 72943) is installed on the intake side of cylinder, between No. 9 and No. 10 fins, 2.06/1.94 inches from the centerline of the head and ends between No. 14 and No. 15 fins. (Figure 6-1)

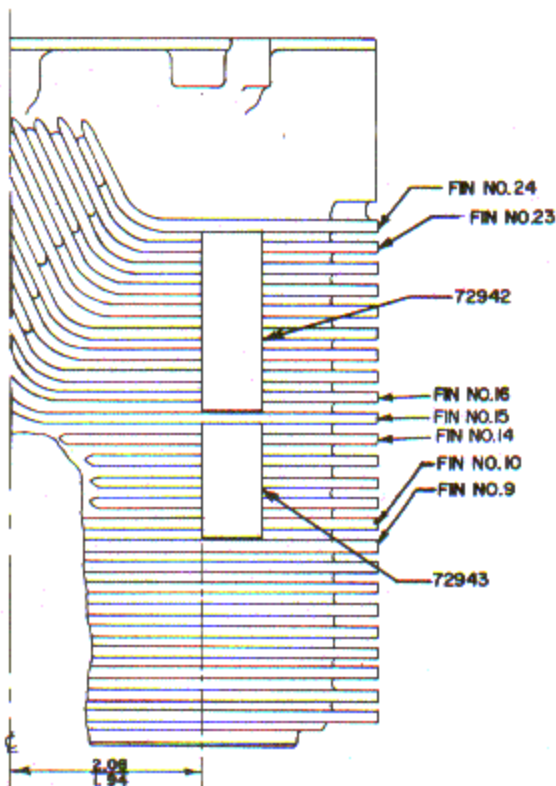


Figure 6-1. Stabilizers IO-540-B1A5  
Cylinder Head Fins

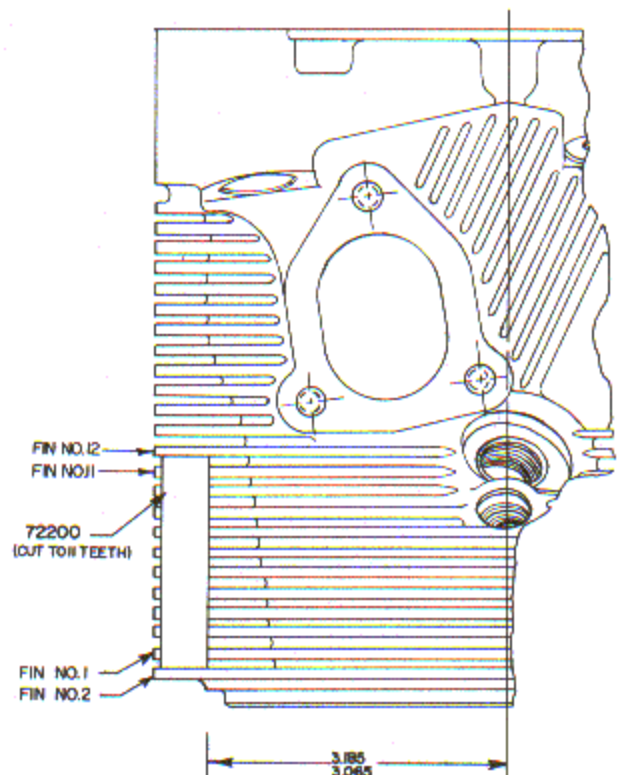


Figure 6-2. Stabilizers IO-540-B1A5  
Cylinder Head Fins



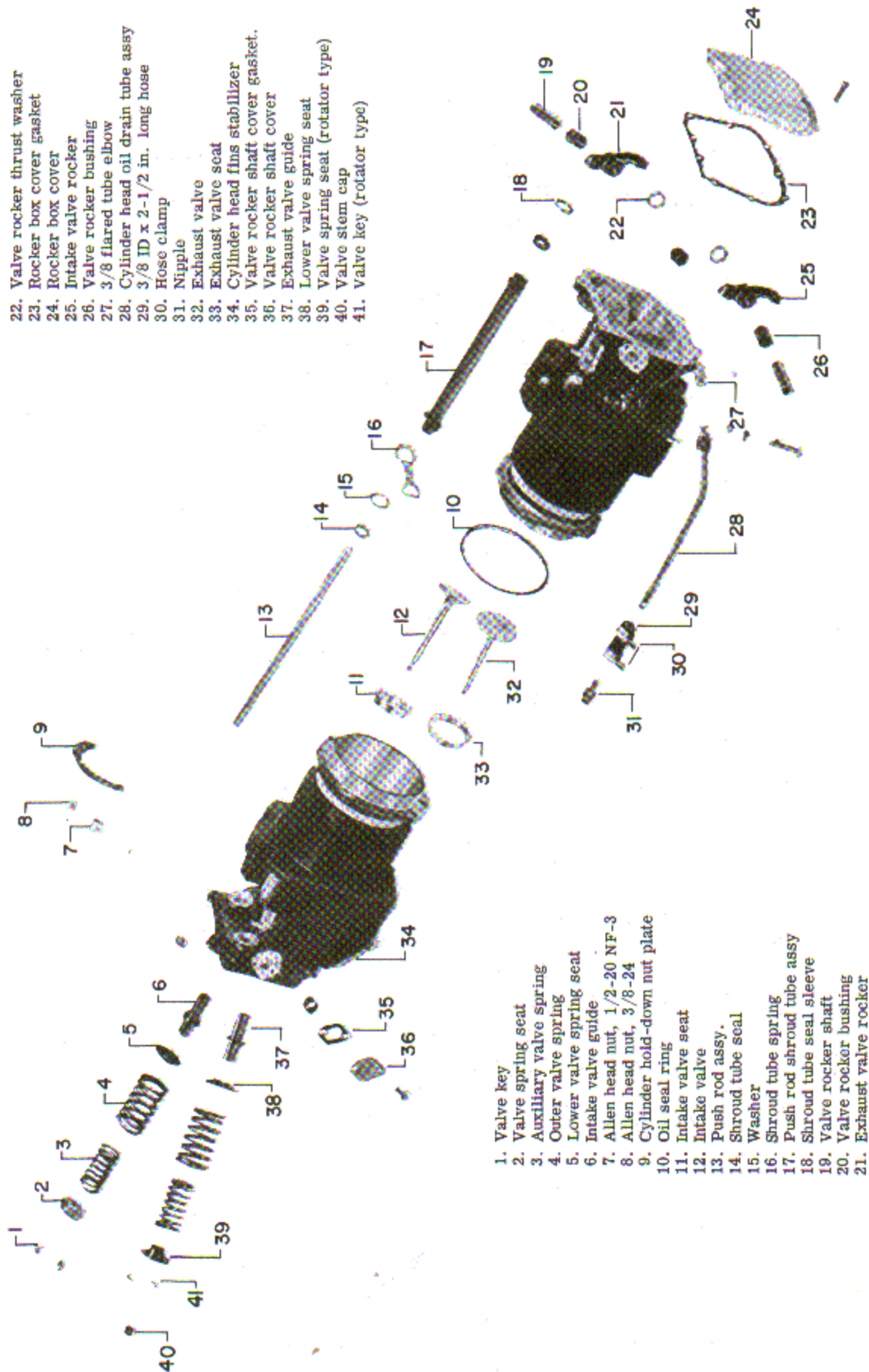


Figure 6-3. Cylinder and Head Assembly

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- e. The second stabilizer (Lyc. P/N 72942) begins above Lyc. P/N 72943 between fin No. 15 and No. 16, and ends between No. 23 and No. 24 fins.
- f. The third stabilizer (Lyc. P/N 72200) is cut to size (11 teeth in length) and installed on the opposite side 3.185/3.065 inches from the centerline of the head, and begins between No. 1 and No. 2 fins and ends between No. 11 and No. 12 fins. (Figure 6-2)

6-2. Paragraphs 6-2 and 6-3 in basic O-540 overhaul manual also apply to IO-540-B1A5 engines.

### DISASSEMBLY

6-4. There are no primer lines on IO-540-B1A5 engines. However, at this point the fuel injection lines must be disconnected and the fuel nozzles removed from the cylinder ports. Mark fuel lines 1-2-3-4-5-6 so that at re-assembly the lines may be installed in the same cylinder from which they were removed. The lower spark plugs may now be removed.

6-5. Remove oil drain tubes, intake pipes, and baffles as described in paragraphs 6-5 through 6-7 in basic IO-540 overhaul manual. The intake pipes will be fully discussed in Section VIII of this supplement.

6-8. Balance of cylinder disassembly may now be accomplished in accord with instructions given in paragraphs 6-8 through 6-18.

### CLEANING

6-19. All cleaning instructions for cylinder, piston, and valve train for IO-540-B1A5 engines, are contained in Section III of the basic O-540 overhaul manual.

6-20. Disregard this paragraph in the basic O-540 overhaul manual. See paragraphs 6-32 through 6-33 of the basic O-540 overhaul manual and paragraphs 6-32 and 6-33 of this supplement for proper inspection and cleaning methods for hydraulic tappet bodies and plunger assemblies.

6-21. Follow paragraphs 6-21 through 6-24 in basic O-540 overhaul manual for the proper methods of inspection for IO-540-B1A5 cylinder assemblies, with the following exceptions.

6-22. The following information under subdivision "c" of this paragraph lists the approved acceptance standards of angle valve type cylinder heads with cracked fins.

#### I. Fin adjacent to exhaust port flange.

- a. Stop drilling, 3/16 dia. hole, is permissible providing end of crack is at least 1/4" from base metal.
- b. Fin removal, to reduce size of vibrating mass, is preferred providing
  - 1. Maximum removal is no more than one half the length of the fin.
  - 2. Maximum removal is to within 1/2 inch of base metal.
  - 3. No sharp edges or burrs are permitted.
  - 4. Minimum fillet at root of removed portion of fin is 1/4 inch radius. Minimum corner radius at tip of fin adjacent to removed portion is 1/2 inch radius.

#### II. Cracks in other fins are acceptable providing end of crack is at least 1/4 inch from base metal and providing fin stabilizers are used.

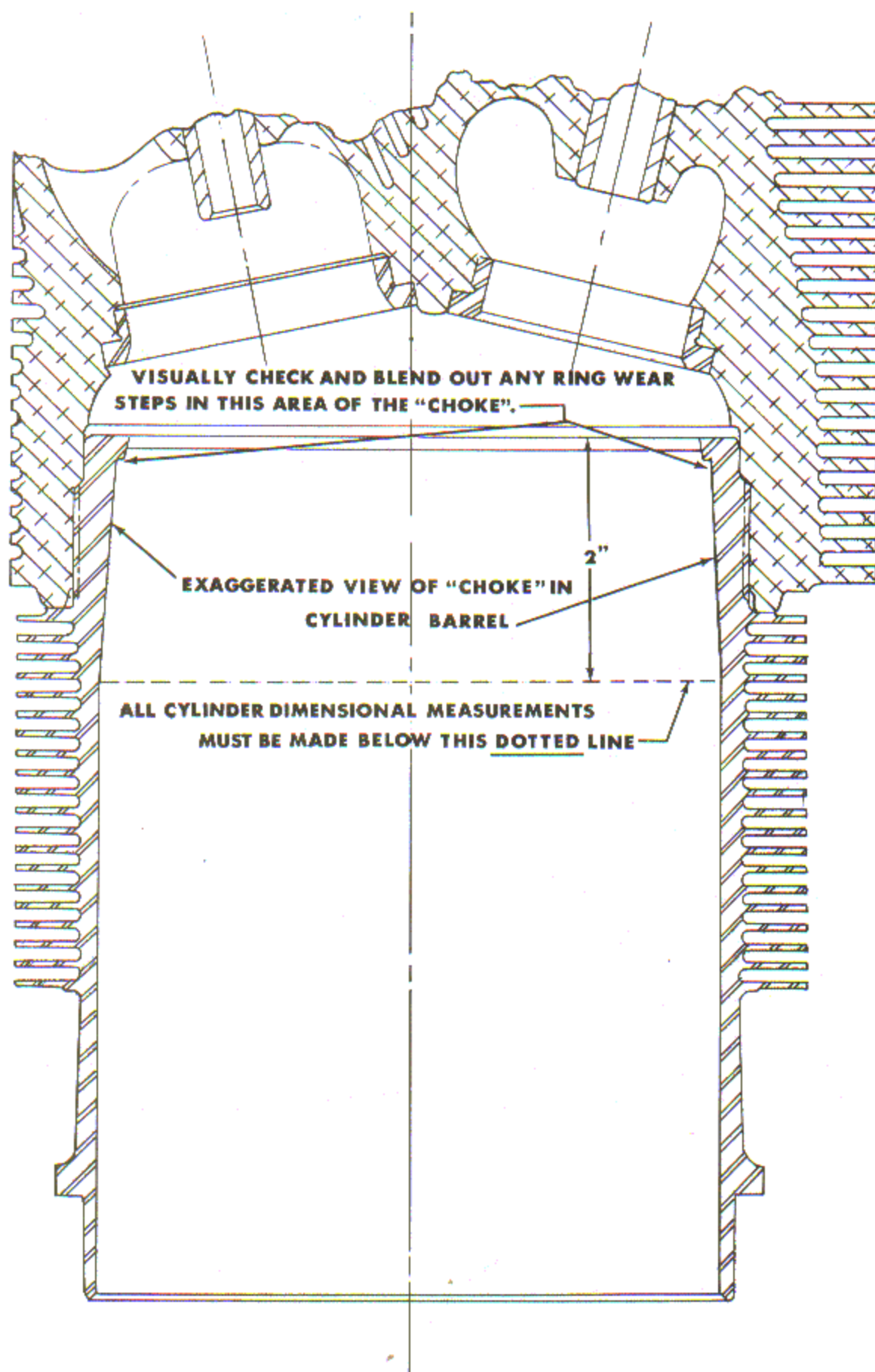


Figure 6-4. Dimensional Inspection, Nitride Hardened Steel Barrels



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6-25. CHROME CYLINDERS. Chrome cylinders on IO-540-B1A5 engines are inspected in the same manner and to the same limits as that described for chrome cylinders in the basic manual.

6-25a. NITRIDE HARDENED STEEL CYLINDERS. Nitrided cylinders are inspected in the same manner and to the same limits as chrome cylinders. Nitrided cylinders, however, are manufactured with a "choke" in the top two inches of the cylinder and head assembly. (Figure 6-4) All dimensional measurements of the cylinder must be made below the start of the choke, or in other words, more than two inches below the top of the assembly. (Figure 6-4) For cylinders that do not meet the maximum service allowable limits, refer to paragraph 6-76a of this supplement. Visually inspect the top two inches of the assembly (the choked area) for signs of barrel wear. This will appear as a "groove" or "step" at that point where the top ring stops on the up stroke of the piston and starts on the down stroke. (Figure 6-4) For service rework information to eliminate this condition, refer to paragraph 6-76a of this supplement.

NOTE: It is not practical to make dimensional inspection readings in the top two inches of the cylinder assembly (choke area). All dimensional inspections must be made two or more inches from the top of the cylinder.

6-26. The visual and dimensional inspection of the piston may now be carried out in the manner described in paragraphs 6-26 thru 6-28 in the O-540 overhaul manual.

6-27. Earlier model IO-540-B1A5 engines did not employ heli-coil inserts in the cylinder head for the fuel nozzle. If at inspection thread damage is found in this hole, ream out and install heli-coil insert Lyc. P/N STD 1872.

6-29. Flat plug rejection gage No. 64542 used for dimensional inspection of ID of rocker bushings is listed in Section XI this supplement. Remainder of inspection of valve rockers and push rods may be carried out as described in O-540 overhaul manual.

6-31. All exhaust valves **MUST BE REPLACED**. It is permissible to grind minor pitting on face of intake valves only.

6-32. The tappet body used on IO-540-B1A5 engines, has been redesigned to prevent chipping of the seating shoulder. There has been no change at all in material or functional design. The tappet body used in this engine is Lyc. P/N 72887, and the plunger assembly is Lyc. P/N 72876 (fast leak down) or 73062 (slow leak down).

### CAUTION

Only plunger assemblies 72876 and 73062 may be used with 72877 tappet body.

Fast leak down plunger assembly 72876 and slow leak down plunger assembly 73062 are not interchangeable in the same engine. It will be necessary to employ either 72876 or 73062 plunger assemblies in complete sets of twelve.

Subparagraphs a., b., c. of paragraph 6-32 in basic O-540 overhaul manual may now be accomplished.

Subparagraph d. In testing tappet bodies for structural failure by means of the magnetic particle or magnaflux method, it will be necessary to pass a current of 500 amps through the tappet body for 1/2 to 3/4 of a second while magnaflux solution is running over the tappet body.

Disregard the NOTE in paragraph 6-33 of the basic manual.

6-33. Subparagraph e of this paragraph must be accomplished as follows: Check each hydraulic tappet body and plunger assembly to see that the ball check valve is not leaking. Plunger assembly 72876 may be checked after first dipping the assembly in light machine oil and then following inspection method as described in basic O-540 overhaul manual. However, plunger assembly 73062 must be checked dry. Do not dip this plunger in light machine oil prior to inspection.

6-34. Check valve springs as described in O-540 basic overhaul manual.

DESIRED (1° MAX. ANGLE)

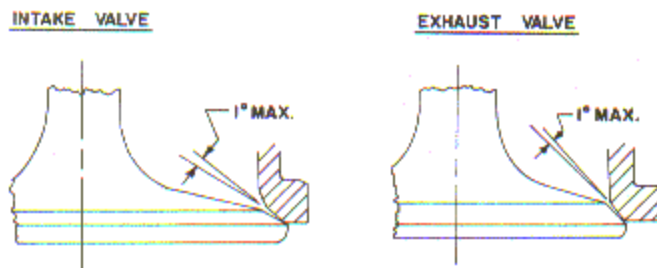


Figure 6-5. Desirable Valve Contact with Seat Face

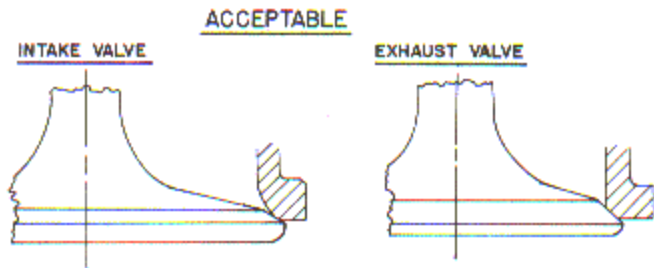


Figure 6-6. Acceptable Valve Contact with Seal Face

REPAIR AND REPLACEMENT

6-35. Follow paragraphs 6-35 through 6-41 in basic O-540 overhaul manual all of which apply to IO-540-B1A5 engines.

6-42. VALVE GUIDE REMOVAL AND REPLACEMENT. The IO-540-B1A5 series engines, employ different exhaust valve guides, depending on the date of manufacture. The difference is in the outside diameter of the exhaust valve guide. Earlier models of the IO-540-B1A5 series engines employ exhaust valve guide Lyc. P/N 69693 with an OD of .5933 - .5938. Later model engines of the same series, employ exhaust valve guide Lyc. P/N 73030 with an OD of .6633 - .6638. It is important to remember that the inside diameter of both type exhaust valve guides, is the same (.427 - .429). To make absolutely certain which exhaust valve guide is being employed, examine the guide in the cylinder head. If the visible portion of the guide contains three identification grooves around the OD, then exhaust valve guide Lyc. P/N 69693 is employed. All tools, therefore, for replacement of this guide, applicable to the O-540 engines, shall also be applicable to the IO-540-B1A5 engines, and will be listed in the tool section (XI) of the basic O-540 overhaul manual. However, if no identification grooves are visible, then exhaust valve guide Lyc. P/N 73030 is employed. It then becomes necessary to use a different set of valve guide replacement tools, and these tools are listed in Section XI of this IO-540-B1A5 overhaul supplement.

NOTE: Unless valve guide is in obviously new condition it is better to replace it. Should the guide be bell mouthed, it will be impossible to get a concentric grind of the valve seat.

NOT ACCEPTABLE

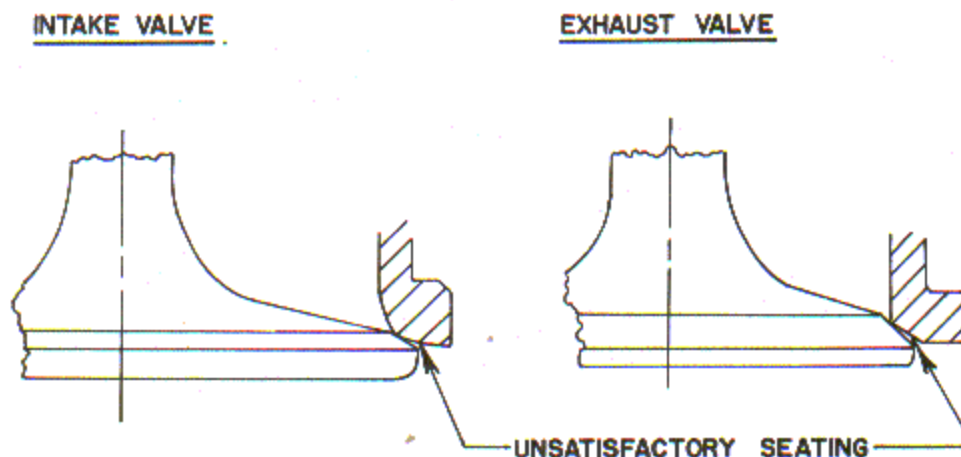


Figure 6-7. Unacceptable Valve Contact with Seat Face

## LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

- 6-48. 1. In figure 6-20 of basic O-540 overhaul manual substitute dimensions 2.344/2.334 for dimensions 2.155/2.145 for intake valve seat. Figure 6-5.
2. In figure 6-20 of basic O-540 overhaul manual substitute dimensions 1.826/1.816 for dimensions 1.750/1.740 for exhaust valve seat. Figure 6-5.
3. In figure 6-20 of basic O-540 overhaul manual substitute dimensions .093/.074 for dimensions .117/.076 for intake valve seat. Figure 6-6.
4. In figure 6-20 of basic O-540 overhaul manual substitute dimensions .106/.091 for dimensions .077/.058 for exhaust valve seat. Figure 6-7.
- 6-49. Paragraphs 6-49 through 6-58 of basic O-540 overhaul manual also apply to IO-540-B1A5 engines with the following exceptions.
1. Use valve seat removal counterbore 64881 for intake valves and seat removal counterbore 64880 for exhaust valves. These tools will be listed in Section XI this supplement.
  2. When oversize seats are to be installed, cutters 64922-1, -2 and -3 will be used for the oversize intake valve seats. Use 64883-1, -2 and -3 cutters to install oversize exhaust valve seats.
- 6-59. NOTE: When refacing valves, it is permissible to reface intake valves only, exhaust valves must be replaced.
- 6-60. The remainder of repair and replacement of the cylinder assemblies, may be accomplished in accord with paragraphs 6-60 through 6-69 described in basic O-540 overhaul manual.
- 6-70 thru 6-75. Disregard these paragraphs in the basic manual.
- 6-76. Chrome cylinders are serviced in the same manner as described for the O-540 engine.
- 6-76a. RECONDITIONING NITRIDE CYLINDERS BY CHROME PLATING. When inspection procedures as outlined in paragraph 6-25a of this supplement show a cylinder beyond service limits, the following procedure must be followed:
- a. Remove the nitride case by grinding to not more than .015" over the maximum standard cylinder bore diameter of 5.125 - 5.1265.
  - b. The cylinder is then plated with porous channel type chromium plating which will bring it within the limits set forth for a standard chrome plated cylinder.
- WARNING: The above overhaul procedure must be done by Lycoming or repair facilities which specialize in aircraft cylinder plating.
- c. Cylinder can be rebarreled by returning to the factory.

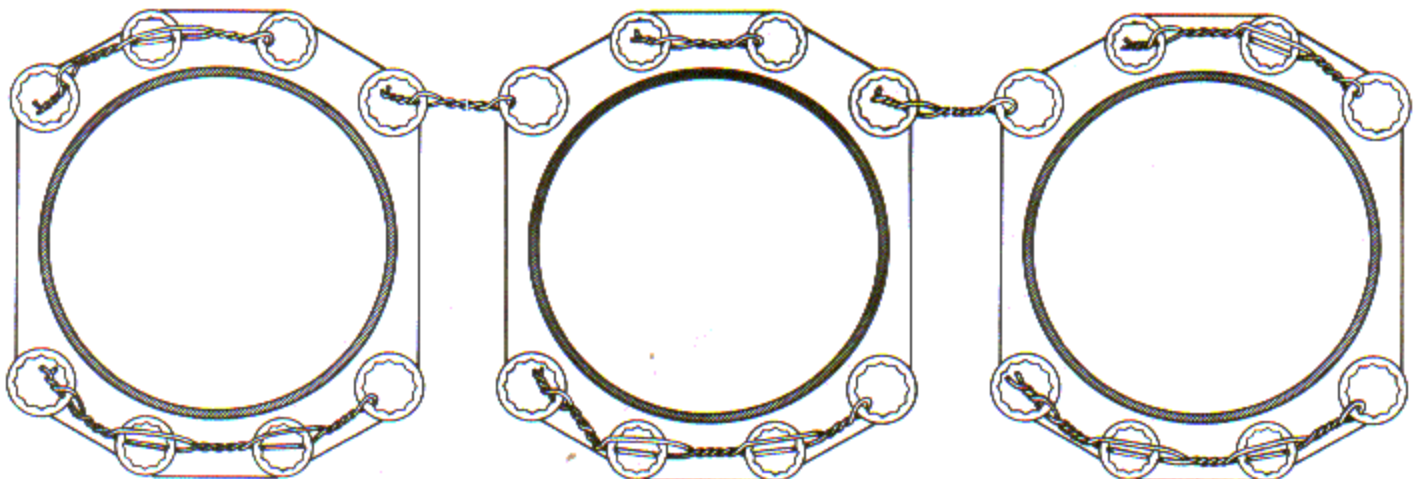


Figure 6-8. Proper Method of Lockwiring Cylinder Base Nuts



## LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

- d. Assemble applicable standard size parts for chrome cylinders.

**WARNING:** Although chrome plated piston rings are used in nitrided cylinders, after stripping and chrome plating, plain piston rings must be used. Never assemble chrome plated rings, in a chrome plated cylinder. Cylinders after chrome plating must be reidentified by painting an orange band around the base of the cylinder or a streak of orange paint on the cylinder fins between the push rods.

**6-76b. SERVICE REWORK OF BARREL WEAR IN CHOKE AREA.** When visual inspection reveals wear in the choke area of the barrel at the end of top ring travel as described in paragraph 6-25a of this supplement, the factory recommends the following procedure be followed:

- a. Lay the cylinder on a suitable holding fixture and blend any steps or ridges that are present until all sharp edges have been eliminated. Perform this operation prior to cylinder barrel deglazing. If the condition of the barrel bore is satisfactory after ring steps have been blended, it may not be necessary to deglaze.
- b. For blending ring steps, employ an abrasive charged felt wheel turned by a 1400 RPM Thor Bantam rotary air grinder, Model No. 000 or equivalent. Fabricate the wheels by rolling three inch diameter by one-half inch wide hard piano discs, or equivalent felt wheels, in Le Pages glue, or its equivalent, and then in aluminum oxide, grain size No. 180, or comparable abrasive grit. Dry the discs in an oven and store in a dry place. Worn wheels may be dressed down in a lathe and recoated with abrasive for future use.
- c. **DEGLAZING.** This operation can be performed by using an abrasive cloth (Grade #400). Wet abrasive cloth in Varsol, or equivalent, and employing a figure eight motion of the hand, remove glaze from the barrel.

**6-77.** See paragraph 6-22 this overhaul supplement for proper procedure on broken cylinder fins.

### REASSEMBLY

**6-79. ASSEMBLY OF CYLINDER.** The cylinder may now be assembled as described in paragraph 6-79 to 6-80 inclusive, in the basic O-540 overhaul manual.

**6-81. ASSEMBLY OF PISTONS.** The piston assembly is completed as per instructions in basic O-540 overhaul manual, with the following exceptions:

1. Piston for IO-540-B1A5 engines employs four rings. Three compression rings and one oil regulating ring of the expander type. The compression rings are of the 1/2 wedge type, and are etched with the word "top" on one side and this side must face toward head of piston. The oil regulating ring is installed as described in the basic manual, with the exception that it is installed in the fourth groove from the top of the piston. The compression rings are installed in the top three grooves.

**NOTE:** It is not permissible to install oversize piston rings in either nitride hardened steel or chrome cylinder barrels.

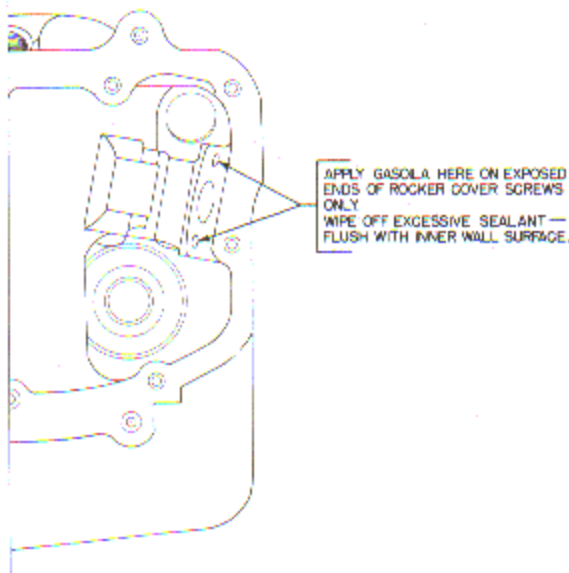


Figure 6-9. Rocker Box Area

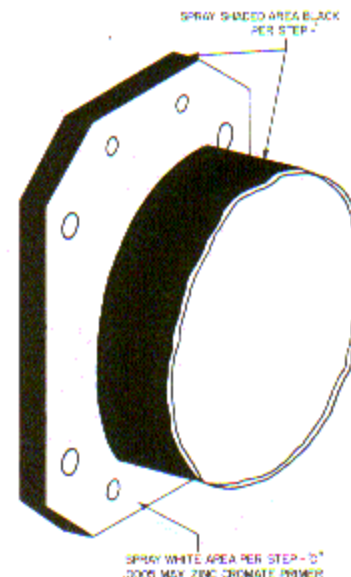


Figure 6-10. Proper Method of Painting Cyl. Flange

## LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

6-84. Follow paragraphs 6-84 through 6-104 in basic O-540 overhaul manual, for final assembly of the pistons and cylinders. There will be the following exceptions:

1. Use only information in basic O-540 overhaul manual applying to six cylinder engines.

### 6-88. INSTALLATION OF PISTONS AND CYLINDERS

1. When assembling piston on engines which employ nitride hardened steel cylinder barrels, use aluminum piston pin plug. If the cylinder employs a chrome steel barrel, an aluminum bronze piston pin plug is used.
2. See Figure 6-8 for proper method of lockwiring cylinder base nuts on IO-540-B1A5 engines.

### 6-100. VALVE ROCKER SHAFT COVER INSTALLATION

1. When performing the assembly of the Valve Rocker Shaft Covers proceed as follows:

Before assembly of the exhaust valve rocker shaft cover on earlier models of IO-540-B1A5 engines, it will be necessary to apply a sealant in the area shown in Figure 6-9. Lycoming recommends the use of Gasoila which is a hardenable and adhering type sealant manufactured by the Federal Process Co. The material is fast drying and there is no danger of flaking or loosening which would be detrimental to the lubricating system.

NOTE: At assembly of engines, after tear down, the sealant may be applied directly to the bolt threads before attaching the valve rocker shaft cover.

6-101. Intercylinder cooling baffles are installed at top of cylinder assemblies rather than at the bottom.

6-104. Disregard this paragraph in the basic manual.

6-105. The installation of fuel nozzles is accomplished as follows: The identification number 12 stamped on the nozzle is used to locate the air bleed hole in the nozzle body. The number is located 180° from air bleed hole and must be on the bottom after the nozzle is tightened into the cylinder port. This assures that the air bleed hole is on top which eliminates fuel bleeding from the air bleed hole just after engine shut down. Using a one half inch, deep socket, install air bleed nozzles in cylinder ports.

6-106. Fuel injection lines may now be installed. Be sure that correct line is installed in exact order of removal.

6-107. See Lycoming Service Bulletin No. 280 attached to this supplement concerning modification of fuel injection lines.

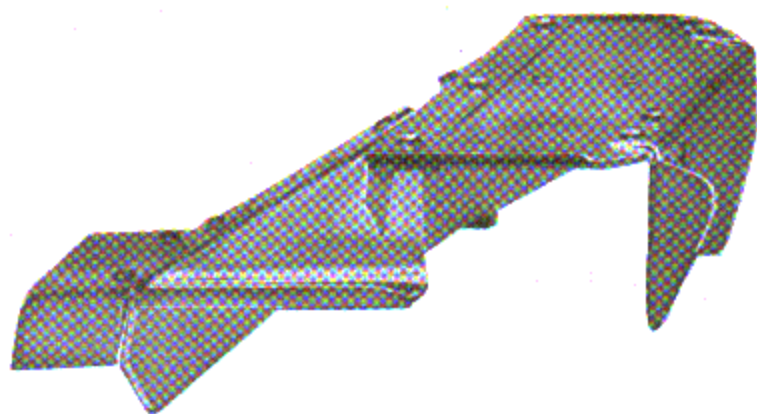
6-108. CYLINDER PAINT PROCEDURE. It is necessary to use extreme caution when painting the cylinder base flange of IO-540-B1A5 engine cylinder assemblies. Any excessive amount of paint between the cylinder hold down plate and the cylinder flange will lead to loss of torque on the cylinder nuts, and eventual stud and/or cylinder failure.

The following procedure should be used when painting a cylinder.

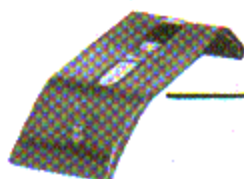
- a. Remove all old paint from the cylinder. A vapor degreaser is best suited for this purpose.
- b. Mask off following parts of the cylinder:
  1. Rocker box section including the rocker box flange.
  2. Both valve ports and flanges.
  3. Thermocouple hole.
  4. Spark Plug Holes.
  5. Rocker box drain tube hole.
  6. Push rod shroud tube holes.
  7. Valve rocker shaft cover flange.
  8. All other exposed threaded surfaces in which paint might accumulate.

NOTE: Masking tape, corks, plugs, metal covers, etc. are acceptable for masking purposes.

c. Spray a very light coat of zinc chromate primer (.0005 max. thickness) on the cylinder flange (Figure 6-10). If the correct amount of paint has been applied the color of the paint will be green with a yellowish tint and the metal will show through. If the paint is too thick the color will be a zinc chromate yellow.



2



3

Figure 6-11. Inter-cylinder Cooling Baffle



## LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

NOTE: It is imperative that the paint thickness on the flange be held to .0005 maximum. To measure the thickness of the paint layer one of two methods must be used. A Tinsley thickness gage which incorporates a magnetic needle and is scaled in tenths of thousandths is the most satisfactory method. If this type equipment is not available, use a micrometer to measure the thickness of the flange before and after painting. If the paint is too thick, it must be removed and the flange repainted.

- d. Mask off the flange area shown in figure 6-10 and proceed to paint the cylinder with a black phthalate resin type paint, properly thinned with Toluol or equivalent. Avoid paint "pockets" and "runs".
- e. Use a cloth dipped in thinner to clean paint from all surfaces where paint may have accidentally accumulated.
- f. The best finish will result if the cylinder is air dried for fifteen minutes and then baked in an oven until completely dry.

## SECTION VII

### CRANKCASE, CRANKSHAFT, AND RECIPROCATING PARTS

7-2. REMOVAL OF ACCESSORIES. Remove the generator and starter as described in paragraphs 7-3 to 7-6 inclusive in O-540 overhaul manual.

7-7. Using paragraphs 7-7 through 7-20 that pertain to the O-540 series aircraft engines, proceed with the disassembly of the crankcase and crankshaft as described in the O-540 overhaul manual.

NOTE: On engines with controlled pitch propeller, no expansion plug is used. There is, instead, a plug located at the rear of the front bore of the crankshaft. This plug is not removed during overhaul.

7-20. CRANKPIN OIL TUBES. Remove six crankpin oil tubes as described in paragraph 7-20 in the O-540 overhaul manual.

NOTE: All crankpin journal sludge tubes must be removed from the crankshaft and discarded; otherwise accumulated sludge loosened during cleaning, will clog the crankshaft oil passages and cause subsequent bearing failures. The oil transfer tubes, however, which conduct oil from the main bearings to the crankpin journals must not be removed under any circumstances.

### CLEANING

7-21. Clean all crankcase, crankshaft, and their reciprocating parts as described in the O-540 overhaul manual.

CAUTION: Do not attempt under any circumstances to clean the crankshaft without first removing the crankshaft oil tubes, as solvent will loosen but not remove sludge. This loose sludge is certain either to form a stoppage in the nearest oil passage, or wash through and cause a bearing failure.

### INSPECTION

7-22. Inspect all crankcase, crankshaft, and reciprocating parts, in accordance with description in O-540 overhaul manual. It must be recognized that if it is necessary to replace either half of crankcase that both halves will have to be replaced. This is due to line boring requirements necessary for correct running clearance for the crankshaft.

NOTE: Use only information for inspection pertaining to O-540 series aircraft engines.

7-23. All visual and dimensional inspections are performed as per instructions listed in basic O-540 series overhaul manual. Paragraphs 7-23 to 7-34 inclusive, in basic manual, supply this information.

### REPAIR AND REPLACEMENT

7-35. Repair and replace all crankcase, crankshaft, and reciprocating parts, not conforming with applicable Table of Limits, as set forth in this IO-540-B1A5 overhaul supplement. Paragraphs 7-35 to 7-60 inclusive in basic O-540 overhaul manual, supply this information.

### REASSEMBLY

7-62. Disregard this paragraph.

7-63. Disregard this paragraph.

7-64. Paragraphs 7-64 and 7-65 are applicable to IO-540-B1A5 series aircraft engines.

7-66. The crankshaft oil seal assembly is installed in the following manner.

1. Inspect crankshaft sealing surface for nicks or scratches.

CAUTION: Use extreme caution not to scratch the crankshaft journal sealing surface. Any nicks or scratches in this area will allow oil seal to leak. To remove any nicks and scratches from the crankshaft journal, the crankshaft must be removed from the engine, and polished on a lathe. The crankshaft must be kept turning during this operation as no longitudinal lines are permitted.

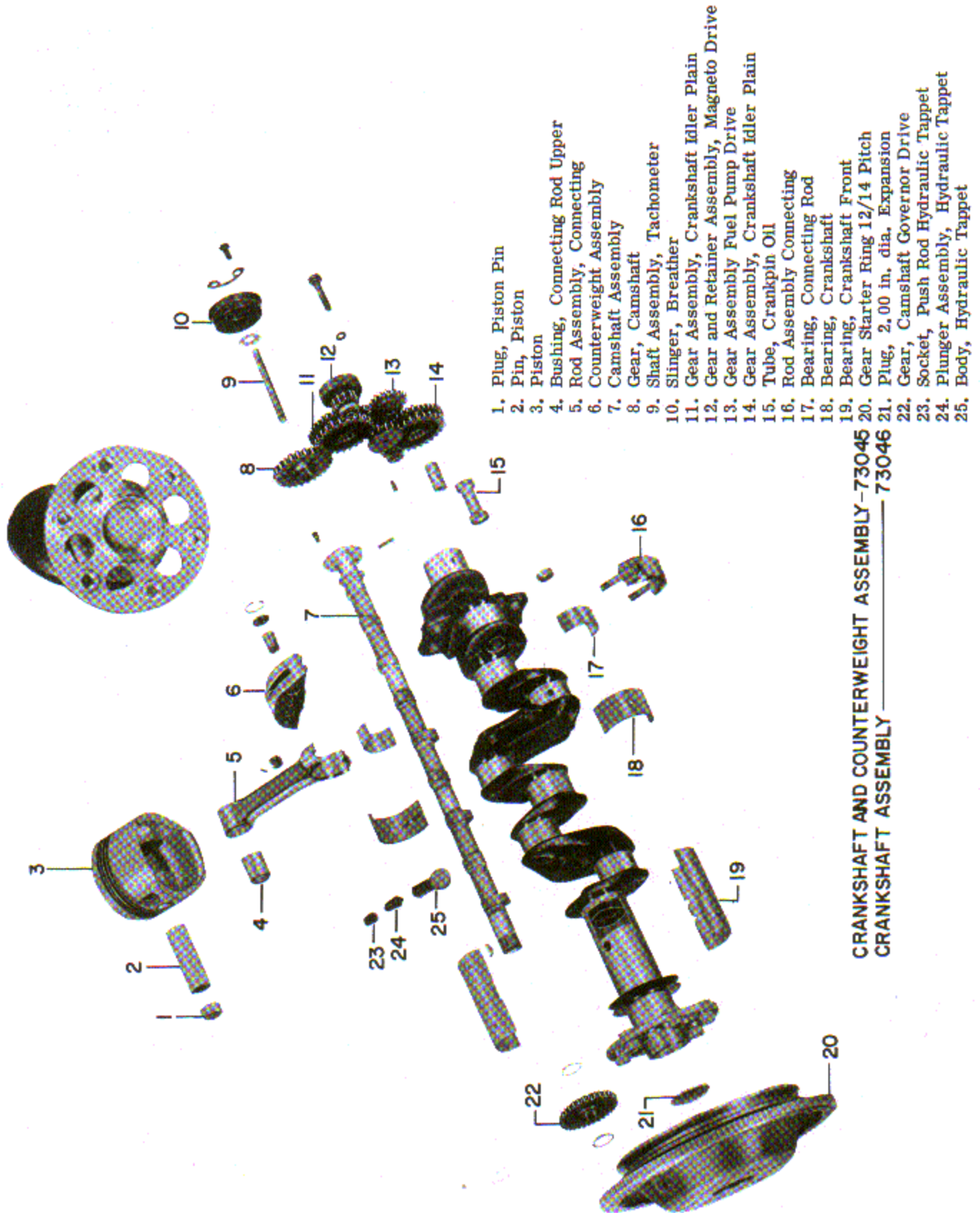


Figure 7-1. Crankshaft and Related Parts



## LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

2. Clean oil seal recess in crankcase, and the crankshaft sealing surfaces of all foreign matter.

NOTE: Should deposits of cement remain in the crankcase seal recess, or on the crankshaft sealing surface, following degreasing, methyl ethyl ketone or equivalent applied with a swab will remove these deposits.

3. On type seal requiring a garter spring, place the spring around the crankshaft, bringing the two ends together and turning in a clockwise direction to tighten. (Figure 7-3) Make sure that the pointed end is firmly inside the coils of the open end. The spring should now be a continuous circle around the crankshaft and no kinks or twists are permitted. (Figure 7-4) (On seals not equipped with a garter spring, this step is not required.)
4. Apply a thin film of Lubriko M-6 grease (or equivalent) on the sealing surface of the seal and around the crankshaft on the sealing surface. This step is applicable to both types of seals.
5. Apply a fairly liberal film of Lubriko M-6 grease (or equivalent) between split in seal. This step is applicable to both types of seals.
6. Slip the seal around the front of crankshaft ahead of the spring. Place the sealing lip of the seal toward the crankcase recess. If the seal employs a garter spring, work the spring into position in the groove provided in the rear of the seal.
7. Place Goodyear Pliobond Cement #20 (or equivalent) in the seal recess in left hand crankcase half (as viewed from propeller end of the engine). Place Lubriko M-6 grease (or equivalent) in the right hand seal recess in crankcase half (as viewed from propeller end of engine).
8. Assemble two halves of crankcase and torque all crankcase through bolts to 42 ft. lbs. torque. Snug down the through bolt and stud located in nose section, but do not torque.
9. Locate split in seal at the one o'clock position as viewed from propeller end of engine. This step is applicable to both types of seals.
10. Install seal in recess in crankcase, (Figure 7-5) When seating seal in crankcase, apply pressure with fingers and thumbs of both hands, first at approximately 180° from split in seal. Move from this location around both sides of the seal toward the split. This is to force seal together at area of the split and to reduce possibility that any gap will occur there. This step is applicable to both types of seals.
11. Torque through bolt and stud in nose section, to 25 ft. lbs.

7-67. Disregard this paragraph in basic manual.

7-68. This paragraph in basic manual also applies to IO-540-B1A5 series engines.

7-69. Paragraphs 7-69 to paragraph 7-115 in the basic overhaul manual, which apply to O-540 series aircraft engines, shall be used in conjunction with the IO-540-B1A5 series aircraft engines.

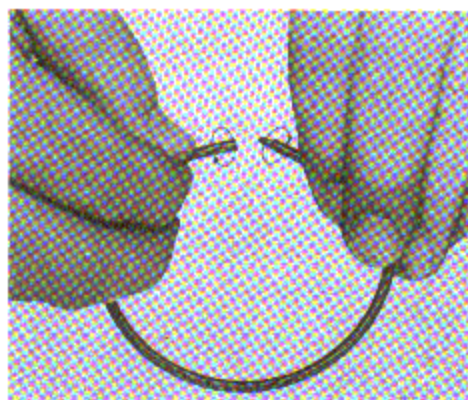


Figure 7-3.

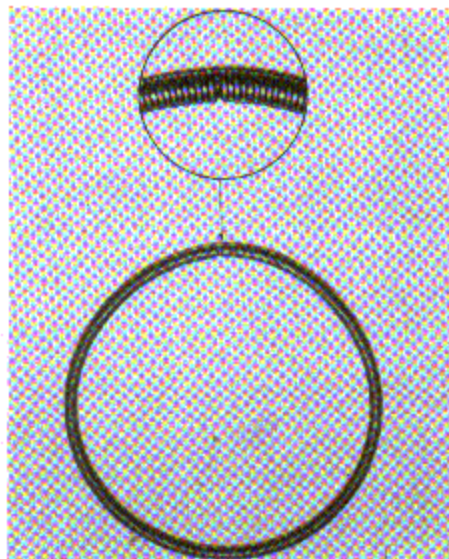


Figure 7-4.

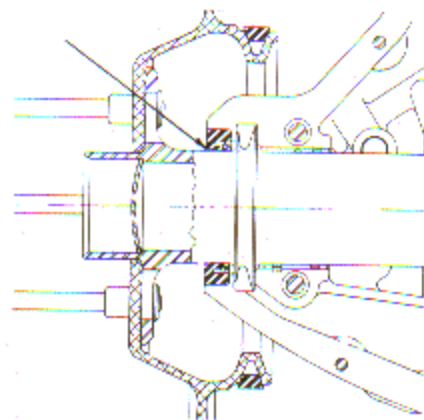
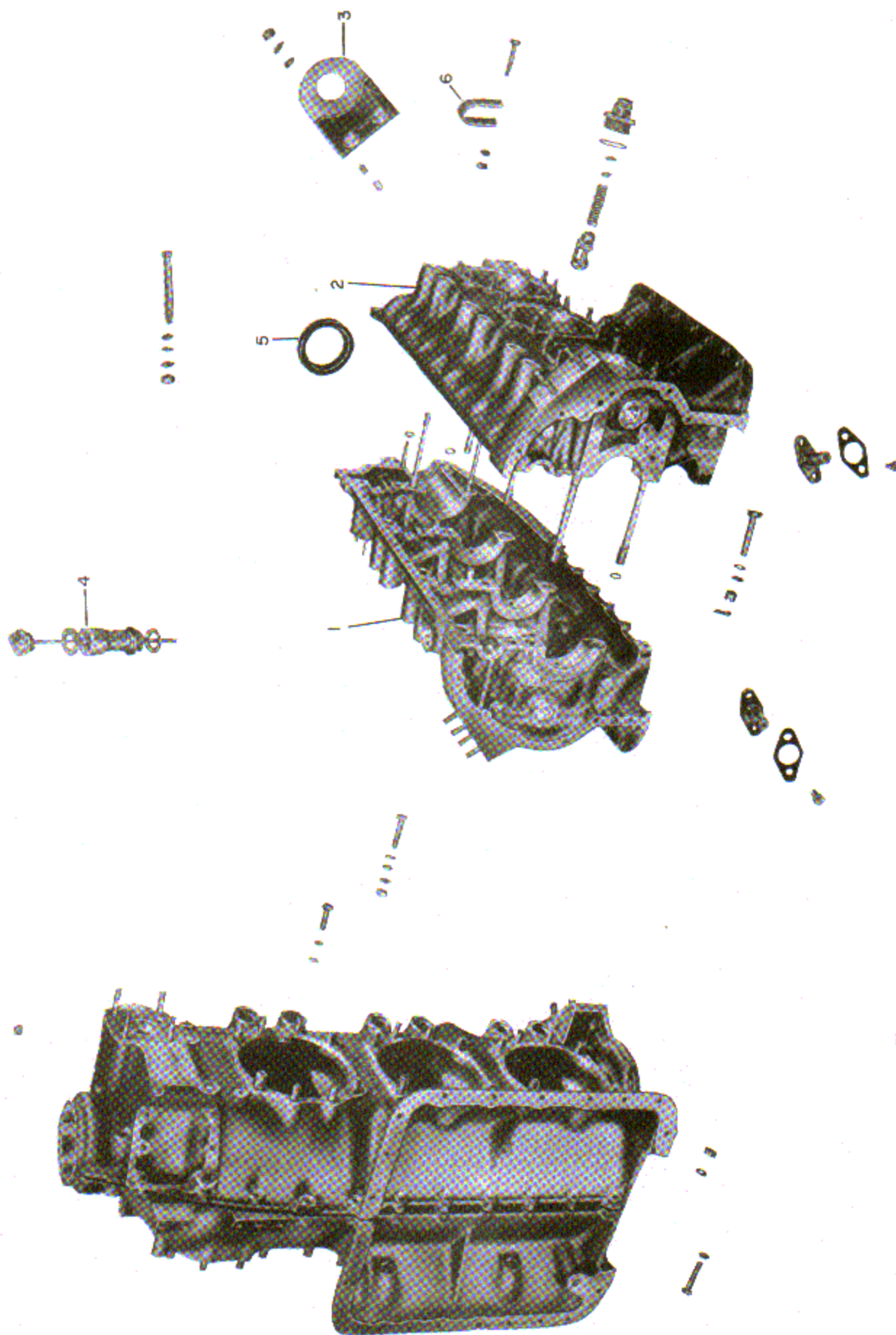


Figure 7-5.



5. Seal crankshaft oil  
6. Strap, Lifting

3. Bracket Assy., Engine mtg. dynafocal  
4. Gage Assy., Oil level

Figure 7-2. Crankcase, Exploded View.

1. Crankcase left half  
2. Crankcase right half

## SECTION VIII

### OIL SUMP AND INDUCTION SYSTEM

#### DISASSEMBLY

8-2. When dismantling intake pipes, it will be well to mark the pipes so that they may be remounted in the exact place of removal. These pipes are matched for tuned induction, and therefore should be replaced in the same spot from which they were removed.

8-3. This paragraph in Basic O-540 overhaul manual, also applies to the IO-540-B1A5 series aircraft engines.

#### CLEANING

8-4. This paragraph in basic O-540 overhaul manual, also applies to IO-540-B1A5 series engines.

#### INSPECTION

8-5. This paragraph in Basic O-540 overhaul manual, also applies to IO-540-B1A5 series engines.

#### REPAIR AND REPLACEMENT

8-6. To increase engine power during hot weather conditions by reducing heat absorption thru pipes, change the specification on intake pipes, reading "Paint all outside surfaces in accordance with Lycoming Spec. 140" to "Aluminum paint all outside surfaces in accordance with AMS 3130 using AMS 3128 pigment" or equivalent.

#### DESCRIPTION

8-7. Following paragraphs describe, and provide maintenance procedures for Bendix RS10B1 fuel injection system.

8-8. **SERVO REGULATOR.** The servo regulator occupies the position ordinarily used by the carburetor at the engine intake manifold inlet. The servo regulator consists of the airflow sensing system, servo valve and fuel control system. Operation of the fuel injection system is based on the principle of measuring air flow and using the airflow signals to operate a servo valve. The accurately regulated fuel pressures established by the servo valve, when applied across the fuel control system, makes fuel flow proportional to airflow.

8-9. **AIR FLOW SENSING SYSTEM.** The airflow sensing system consists of a throttle body which houses the air throttle valve, the venturi, servo valve, and fuel control unit. The differential pressure between impact air and venturi throat pressure is a measurement of the velocity of the air entering the engine. These pressures are vented through drilled channels in the throttle body to both sides of an air diaphragm and create a force across the diaphragm. A change in air throttle position or a change in engine speed will change the air velocity which in turn changes the force across the air diaphragm.

8-10. **SERVO REGULATOR UNIT.** The servo regulator is mounted on the side of the throttle body casting and consists of the air diaphragm discussed in airflow sensing system. Fuel inlet pressure is applied to one side of the fuel diaphragm and metered fuel pressure is applied to the other side of the diaphragm which is referred to as a fuel metering force. The ball on the fuel diaphragm also acts as a servo valve and controls fuel pressure applied to the top side of the fuel distributor valve diaphragm. The pressure on the other side of the distributor valve diaphragm is metered fuel pressure from the fuel control unit. Build up in the servo valve pressure to the top side of the distributor valve will cause an increase in metered fuel pressure. A balanced regulator is obtained by servo pressure reacting on the distributor valve to build up metered fuel pressure until the fuel metering force is equal to the air metering force. The richer mixture for engine idle is obtained by use of a constant head spring beneath the air diaphragm in the regulator. Adjustment to the idle mixture is contained in the paragraph entitled, Servo Regulator Adjustment which follows the paragraph containing inspection and cleaning procedures for servo regulator.

8-11. **FUEL CONTROL SYSTEM.** The fuel control system is contained within the throttle body casting and consists of an inlet fuel screen, a rotary idle valve and a rotary mixture valve. The idle valve controls the fuel flow through the low speed range of operation and is adjustable to obtain good characteristics without affecting fuel metering in high power range. The mixture control valve gives full rich mixture as it is moved toward the idle cutoff. The full rich stops define sea level requirements and the mixture control provides for manual altitude leaning.



## CLEANING

**8-12. SERVO REGULATOR CLEANING.** The servo regulator should be inspected and the fuel inlet screen should be cleaned at every fifty hour inspection period. To accomplish this most readily remove and clean the fuel injector inlet screen in unleaded gas or Varsol cleaning fluid. Replace fuel injector screen and safety with .032 inch lockwire.

## INSPECTION

**SERVO REGULATOR.** The servo regulator should now be checked, in conjunction with all injector fuel lines for fuel leakage.

**NOTE:** The fuel screen O-rings, if damaged, must be replaced.

Check the tightness and lockwire all nuts and screws which fasten the injector to the engine. Check throttle and mixture and alternate air control rods and levers for evidence of wear and loose lockwiring. Clean the induction air filter in the following manner. Remove air filter and wash in clean solution of Varsol. Drain, after washing, thoroughly. A jet of dry compressed air, to blow all remaining fluid off the surface of the filter, is recommended if available.

**NOTE:** Slight stains around the air bleed nozzles should not be cause for concern. Should metallic wires show on the surface of the air filter after cleaning, the filter is ineffective and should be replaced.

Immerse the filter in SAE 10 weight oil, and allow to drain for several hours before reinstallation. After reinstallation of air filter, add a drop of engine grade oil to the ends of the throttle shaft, so that oil can work into shaft bushings. Lightly lubricate the rod ends of the throttle, mixture and alternate air control rods. Check the controls for evidence of binding or other interference. Adjustments to the servo regulator will be confined to idle speed and mixture only.

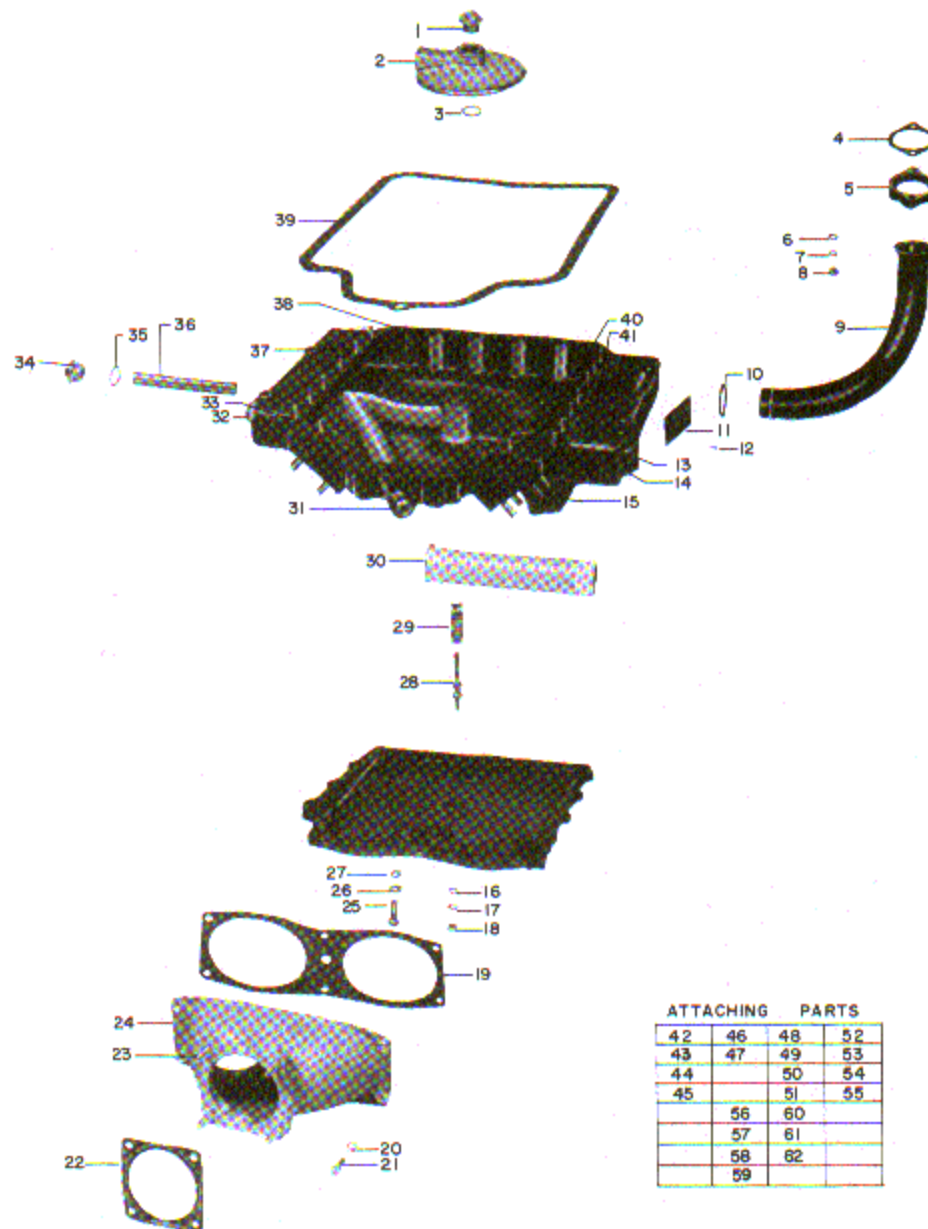
**8-13. SERVO REGULATOR ADJUSTMENT** Start and warm engine until the oil and cylinder head temperatures are in normal operating range. Check magnetos for proper operation. If magneto operation is normal, proceed with idle adjustment. Check ignition system should magneto drop be excessive. Now close throttle to (650-700 RPM). If the RPM increases appreciably after changing the idle mixture adjustment during the succeeding steps, readjust idle speed to the desired RPM. (600-750)

**NOTE:** The idle mixture should be set with the propeller in full low pitch (high RPM) and fuel boost pumps on.

Now that idling speed has been stabilized, move cockpit mixture control slowly toward the "idle cutoff" position. Observe the tachometer for any change during manual mixture leaning process. Quickly return the mixture control to normal before engine stops. An increase of more than 10 RPM while manually leaning the mixture indicates a rich idle mixture. An immediate decrease in RPM (if not preceded by a momentary increase) indicates idle mixture is too lean. Should the idle mixture be too rich, turn the idle mixture adjustment screw one or two notches in the clockwise direction as viewed looking forward from aft end of the engine. If the idle mixture is too lean, turn the idle adjustment screw one or two notches in the counter-clockwise direction as viewed looking forward from aft end of engine. After each adjustment has been completed close the throttle to idle position (650-700 RPM) and move the cockpit mixture control slowly toward the "idle cutoff" position. Make additional adjustments as previously outlined until a momentary pickup of approximately 5 RPM (never more than 10 RPM) is reached. The engine must be cleared by increasing RPM to 2000 before making idle mixture check. Make final adjustment to idle speed to obtain the desired idling RPM (650-700 RPM). It should be noted that each time an adjustment is made, the engine is cleared by increasing RPM to 2000 before making any further adjustments. This method of setting the idle mixture will give the desired idle RPM and the lowest manifold pressure reading. Should the setting fail to remain steady, check the throttle and mixture linkage for wear or improper rigging. Any looseness in this area, will cause erratic idling. In all cases, however, an allowance should be made for the effect of weather condition upon idling adjustment. The relation of the airplane to direction of prevailing wind will have an effect on the propeller load and on its RPM. It is advisable to make idle adjustment with the airplane crosswind.

**8-14. FUEL DISTRIBUTOR VALVE.** The fuel distributor valve is located on the lower forward part of the engine and consists of a spring loaded diaphragm actuated poppet valve. The diaphragm action is controlled by servo pressure from the regulator. The spring is employed only to seat the needle when the engine is stopped. This keeps the distributor valve loaded with fuel at all times. The sensitivity obtained with this hydraulically controlled valve eliminates the necessity for an acceleration pump. Servo pressure is bled from the top side of the fuel distributor valve diaphragm through a fixed bleed installed in the fuel return line to the tank. The fuel distributor valve is mounted with the discharge ports in a horizontal plane. Filter screens have been installed between the outlets of the fuel distributor, and fuel lines. Overhaul maintenance of these screens is discussed fully in Paragraph 8-17 of this overhaul supplement.

# LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT



ATTACHING		PARTS	
42	46	48	52
43	47	49	53
44		50	54
45		51	55
	56	60	
	57	61	
	58	62	
	59		

1. Plug, Hex head 7/8-14 x 5/8
2. Baffle, Oil sump
3. Gasket annular, 1-1/8 OD x 29/32 ID x 1/16
4. Gasket, 2 bolt, flange, 1-7/8 ID
5. Flange, Intake pipe upper
6. Washer, Plain 1/4 in.
7. Washer, Shakeproof lock, 1/4 in.
8. Nut, Plain 1/4-20
9. Pipe, Intake, cylinder No. 1
10. Ring, Oil seal, intake pipes
11. Name plate
12. Screw, Drive No. 4 x 3/16 in. long rd. hd.
13. Plug, Allen head, 3/4-14 NPT
14. Plug, Sq. hd. drilled, 1/2-14 NPT
15. Stud, 3/8-16 x 1-7/8 in. long
16. Washer, Plain 1/4 in.
17. Washer, Shakeproof lock, 1/4 in.
18. Nut, Plain 1/4 x 20
19. Gasket, Air throttle housing
20. Washer Plain 1/4 in.
21. Bolt, Hex head, 1/4-20 x 13/16 in. long
22. Gasket, Air inlet housing
23. Stud, 5/16-18 x 1-11/16 in. long
24. Housing Assy., Air intake
25. Bolt, Hex hd. 1/4-20 x 2.00 long
26. Washer, Shakeproof lock, 1/4 in.
27. Washer, Plain 1/4 in.
28. Stud, Intake pipe extension
29. Clamp, Intake pipe extension
30. Pipe, Extension, intake
31. Plug, Allen head, 1/2-14 (NPT)
32. Plug, Allen hd. 3/4-14 NPT
33. Stud, 1/4-20 x 1-3/16 in. long
34. Plug, 1.00 ID x 1-1/4 OD x 3/32 in. thick
35. Gasket, 1.00 ID x 1-1/4 OD x 3/32 in. thick
36. Screen, Oil suction
37. Stud, 1/4-20 x 1-3/8 in. long
38. Housing Assembly, Oil sump and induction
39. Gasket, Oil sump
40. Stud, 1/4-20 x 1-3/8 in. long

Figure 8-1. Oil Sump

## LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

8-15. **AIR BLEED NOZZLES.** From the fuel distributor valve, individual fuel lines convey the metered fuel to the air bleed nozzles, one of which is located in each cylinder. Each nozzle outlet is directed into the cylinder intake port. An air bleed, incorporated into each nozzle, aids in vaporizing the fuel by breaking the high vacuum in the intake manifold at idle RPM and keeps the fuel lines filled and ready for engine acceleration. The calibrated air bleed nozzles installed have an identification number 12 stamped on one of the hexagonal flats of the nozzle body and this number must always be pointed down.

8-16. **AIR BLEED NOZZLE REMOVAL.** The air bleed nozzle must be removed from the engine, before it can be cleaned. To remove the nozzles from the engine proceed as follows:

- a. Disconnect fuel injection lines from air bleed nozzles.

NOTE: Plug or cap all disconnected lines and fittings.

- b. Using a one half inch, deep socket, remove the air bleed nozzle from the cylinder.

8-17. **AIR BLEED NOZZLE CLEANING AND INSPECTION.** To clean the air bleed nozzles, immerse in clean solvent. Using compressed air, not to exceed 100 psi, blow through nozzle in opposite direction to fuel flow.

CAUTION: Do not use wire to clean orifices.

8-18. **AIR BLEED NOZZLE INSTALLATION.** The identification number 12 stamped on the nozzle is used to locate the air bleed hole in the nozzle body. The number is located 180 degrees from the air bleed hole and must be on the lower side of the nozzle, after the nozzle is tightened into the cylinder port. This assures that the air bleed hole is on top which eliminates fuel bleeding from the air bleed hole just after engine shut down. To install the air bleed nozzle in the cylinder proceed as follows:

- a. Using a one half inch, deep socket, install air bleed nozzles in cylinders, so that identification number 12 is located on the lower side of the nozzles, after they are tightened into the cylinders. Air bleed nozzles should be pulled up snug and then tightened until identification number is on bottom.

CAUTION: When replacing fuel lines and fittings use only a fuel soluble lubricant such as engine oil on the thread fitting. Do not use any other form of thread compound.

- b. Connect fuel injection lines to air bleed nozzles.
- c. Inspect installation for evidence of crimped lines.
- d. Open fuel shut-off valve, turn fuel boost pump ON and check fittings and air bleed nozzles for evidence of fuel leaks.
- e. Turn fuel boost pump OFF, close fuel shut-off valve and turn MASTER (battery) switch OFF.



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61581-15A - 19  
61581-17A - 18  
61581-20A - 17

- Figure 8-2. Fuel Injection System**

## LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

### SECTION IX

#### TEST PROCEDURE

9-1. This paragraph in basic O-540 overhaul manual, also applies to IO-540-B1A5 engines.

#### 9-2. INSTALLATION.

9-3. This paragraph in basic O-540 overhaul manual also applies to IO-540-B1A5 engines with the following exception:

1. The cooling shroud for O-540 engines is not applicable to the IO-540-B1A5 engines.

9-4. Lubricating oil for test run-in, shall be Lycoming's Specification 138 (Sohio, or equivalent) for the IO-540-B1A5 series engines. Should preparation for storage be indicated, at this time, then preservative oil (Esso's "Rust-ban 622" or Socony Vacuum's "Avrex 901" or equivalent) should be used.

9-5. This paragraph in basic O-540 overhaul manual, also applies to IO-540-B1A5 series engines.

9-6. This paragraph in basic O-540 overhaul manual will apply to IO-540-B1A5 engines, except that Bendix RS10B1 fuel injectors require no pre service maintenance except to see that all preservative oil is purged from injection system. To accomplish this, turn on fuel boost pump, filling the system with fuel. This operation will also purge lines of air. When hissing stops at the air bleed nozzle, set mixture control at idle cut-off. To make sure preservative oil has also been purged, disconnect fuel nozzle on throttle body located immediately above throttle lever linkage, and examine fuel for oil, continue to purge until all fuel flowing from this hole is free of oil.

9-7. Minimum operating fuel pressure is 20 psi. Maximum operating fuel pressure is 26 psi, for IO-540-B1A5 engines.

#### 9-8. TEST RUN.

9-9. Paragraphs 9-9 through 9-13 described in basic O-540 overhaul manual may be used to complete test run of IO-540-B1A5 engines with the following exceptions.

The oil consumption for one hour on an overhauled engine with new rings installed, should not exceed .012 lb/bph/hr., at 75% to rated power.

Check the magneto drop off at engine speed of 1800 RPM. The drop off should not exceed 125 RPM and the magnetos must be within 50 RPM of each other.

**LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT**

**TABLE IX-I**

**GENERAL SPECIFICATIONS**

**IO-540-B1A5 SERIES AIRCRAFT ENGINES**

FAA Type Certificate . . . . .	1E4
Rated Horsepower and Speed, RPM . . . . .	290 @ 2575
Performance Cruise (75% Rated) . . . . .	220 @ 2350
Economy Cruise (60% Rated) . . . . .	175 @ 2200
Fuel Consumption, Cruise, GPH @ 75% Rated Power . . . . .	16.5
65% Rated Power . . . . .	13.5
60% Rated Power . . . . .	12.0
Propeller Drive Ratio . . . . .	1:1
Propeller Shaft Rotation . . . . .	Clockwise
Bore, Inches . . . . .	5.125
Stroke, Inches . . . . .	4.375
Displacement, Cubic Inches . . . . .	541.5
Compression Ratio . . . . .	8.7:1
Weight Without Installation Parts . . . . .	437
Dimensions: Height, Inches . . . . .	19.60
Width, Inches . . . . .	34.25
Length, Inches . . . . .	38.62
Oil Sump Capacity, Quarts. . . . .	12
Fuel, Aviation Grade, Minimum Octane . . . . .	100/130
Fuel Injector . . . . .	Bendix RS10B1
Magneto Drive, Ratio to Crankshaft and Rotation . . . . .	1.500-1 Clockwise
Magnetos (2) Scintilla . . . . .	S6LN-200 Left S6LN-204 Right
Head Temperature, Max. °F. at Bayonet Location . . . . .	500°
Barrel Temperature, Max. °F. . . . .	325
Oil Sump - Safe Min. Quantity - Qts. . . . .	2 3/4
Oil Pressure Min. Idling (lbs. per sq. in.) . . . . .	25
Normal Oper. (lbs. per sq. in.) . . . . .	60-85
Valve Rocker Clearance (Hyd. Tappets Collapsed) . . . . .	.028"-.080"
Spark Occurs - Degrees BTC . . . . .	20
Spark Plug Gap - Shielded . . . . . Thin Wire .015"-.018" . . . . . Massive Wire .018"-.022"	
Firing Order . . . . .	1-4-5-2-3-6

**OIL INLET TEMPERATURE**

AVIATION GRADE OIL	AVERAGE AMBIENT AIR	DESIRED	MAXIMUM
SAE 50	Above 60° F.	180° F. (82° C.)	245° F. (118° C.)
SAE 40	30° to 90° F.	180° F. (82° C.)	245° F. (118° C.)
SAE 30	0° to 70° F.	170° F. (77° C.)	220° F. (104° C.)
SAE 20	Below 10° F.	160° F. (71° C.)	200° F. (93° C.)

Fuel Pressure psi . . . . . 20 to 26

**SPARK PLUGS**

A. C. SR87	(Radio Shielded)	Thin Wire .015"-.018"	Massive Wire Spark Gap .018" to .022"
Champion RHM-38	(Radio Shielded)	Thin Wire .015"-.018"	Massive Wire Spark Gap .018" to .022"

**ACCESSORY DRIVES**

	GEAR RATIO	DIRECTION OF ROTATION
Starter	16.556:1	Counter-Clockwise
Generator	1.91 :1	Clockwise
Vacuum Pump	1.300:1	Counter-Clockwise
Hydraulic Pump	1.385:1	Clockwise
Tachometer	.500:1	Clockwise
Propeller Governor	.895:1	Clockwise
Fuel Pump	1.000:1	Counter-Clockwise

# LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

TABLE IX-II  
RUN IN TEST SCHEDULE

RPM	TIME - MIN.	REMARKS
1200	5	
1500	5	
1800	10	Check Mag. Drop Off
2200	10	
2400	10	
Normal Rated	15	Change Prop as Required to Get Rated Speed $\pm$ 50 RPM
As Required to Satisfy Fuel Flow Limits Requirements	20 Total Max.	See Applicable Performance Specs. for Fuel Flow Limits
2400 $\pm$ 20	15	Stabilization Run For Oil Consumption Run
2400 $\pm$ 20	30 - 60	Oil Consumption Run

9-15. Paragraphs 9-15 through 9-21 in basic O-540 overhaul manual also apply to IO-540-B1A5 engines.

9-22. Disregard all references to carburetors in the basic O-540 overhaul manual.

The fuel injector must have preservation oil placed in the fuel side of the injector. Preservative oil (Esso Turbo Oil 1010 or equivalent) is placed in a small bottle and poured into the fuel side of the injector. This is accomplished by disconnecting the fuel line from the injector and pouring into hole occupied by the fuel line.

## SECTION X

TABLE OF LIMITS

10-1. The table of limits for IO-540-B1A5 engines will correspond with the table of limits as set forth in the basic O-540 engine overhaul manual, with the following exceptions:

1. Disregard all limits in basic O-540 overhaul manual not applicable to IO-540-B1A5 engines.
2. All limits listed in basic O-540 overhaul manual applicable to chrome cylinders, will also apply to the nitride hardened steel barrels employed in the IO-540-B1A5 engine.
3. The IO-540-B1A5 engine employs a four ring piston which incorporates three one half wedge type compression rings, and one oil regulator ring. The limits for the additional compression ring are as follows:

	Min.	Max.	Max. Ser. Allow.
515 - Piston Ring, and Piston Side Clearance 3rd Ring Compression	.000(B)	.004L(B)	.005L(B)

NOTE: For further information on Table of Limits, consult the latest edition of Lycoming Service Bulletin No. 268, which is included in the service literature attached to this Overhaul Supplement.



# LYCOMING MODEL IO-540-B1A5 OVERHAUL SUPPLEMENT

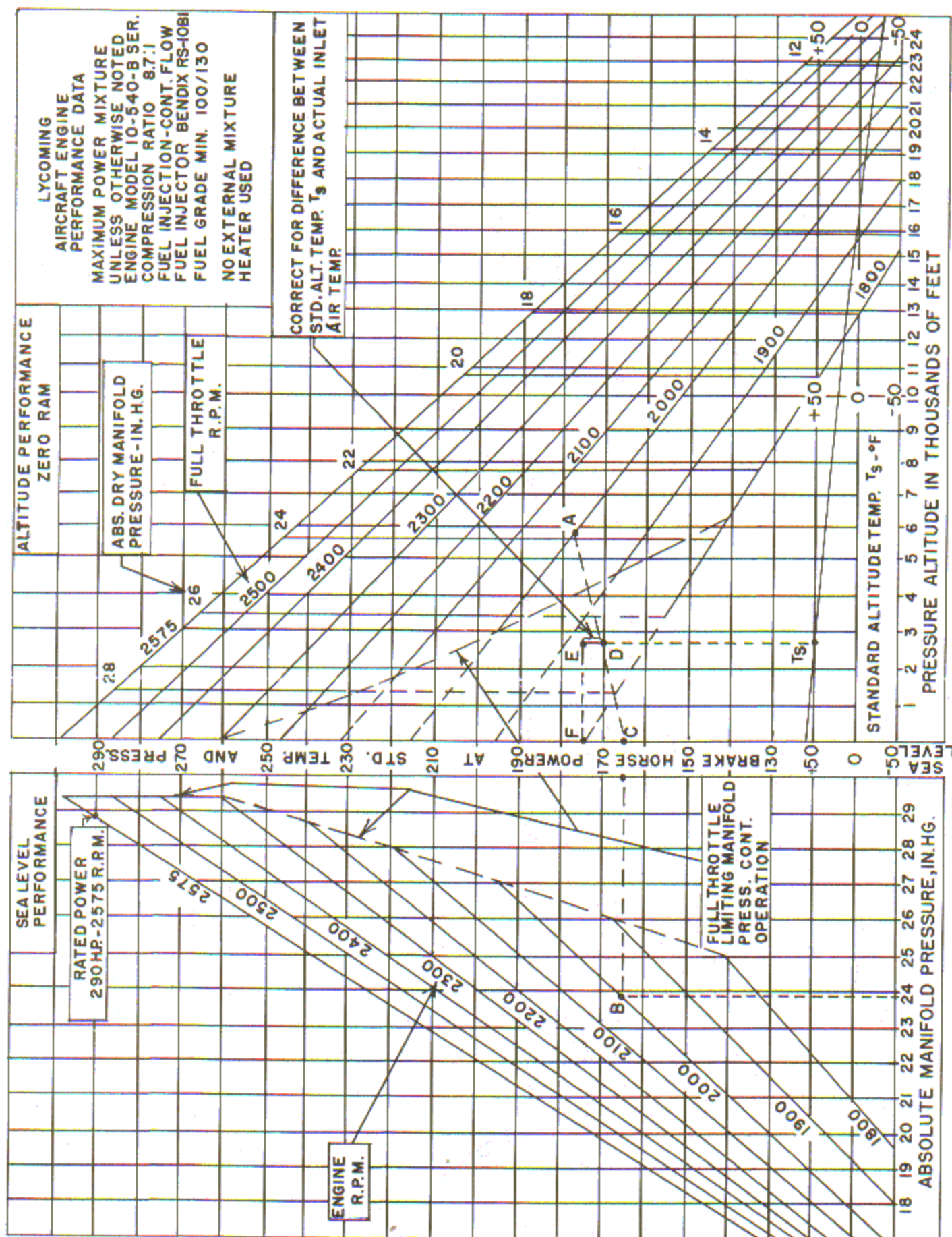
## SECTION XI

### OVERHAUL TOOLS

The following tools are used to overhaul IO-540-B1A5 engines. They are used with, or in place of, those tools which are listed in basic O-540 overhaul manual.

Those tools used for measuring large exhaust valve guide, on later model IO-540-B1A5 engines, which has a high OD of .6638 and a low OD of .6633 will be marked in the following tool section with the mean figure .6635. All other valve guide installation and removal tools, will remain the same for all O-540 and IO-540-B1A5 engines. Paragraph 6-42 of this IO-540-B1A5 overhaul supplement, describes fully the combinations of these tools.

64597-1	Block, Replace Connecting Rod Bushing
64635	Compressor - Valve Spring
64644	Fixture - Valve Guide Replacement
64696	Fixture - Cylinder Holding for Valve Seat Replacing
64678-5	Reamer - Valve Guide OD .030 o/s (Intake)
64781	Tool - Swaging Intake Pipe Extension
64803	Club - Test 56"
64880	Counterbore - Exhaust Valve Seat Removal
64881	Counterbore - Intake Valve Seat Removal
64883-1	Cutter - Exhaust Valve Seat .010 o/s
64883-2	Cutter - Exhaust Valve Seat .020 o/s
64883-3	Cutter - Exhaust Valve Seat .030 o/s
64920	Gage, Flat Plug Rejection, Valve Guide, Intake and Exhaust
64921	Drift, Valve Seat Replacement, Intake
64922-1	Cutter, Intake Valve Seat .010 o/s
64922-2	Cutter, Intake Valve Seat .020 o/s
64922-3	Cutter, Intake Valve Seat .030 o/s
64923	Drift, Exhaust Valve Guide Installation (.6635 OD)
64924-1	Reamer, Valve Guide OD .005 o/s Exhaust (.6635 OD)
64924-2	Reamer, Valve Guide OD .010 o/s Exhaust (.6635 OD)
64924-3	Reamer, Valve Guide OD .020 o/s Exhaust (.6635 OD)
64924-4	Reamer, Valve Guide OD .030 o/s Exhaust (.6635 OD)
64928	Gage, Plug - Valve Guide Hole in Cyl. Hd. .005 o/s Exhaust (.6635 OD)
64929	Gage, Plug - Valve Guide Hole in Cyl. Hd. .010 o/s Exhaust (.6635 OD)
64930	Gage, Plug - Valve Guide Hole in Cyl. Hd. .020 o/s Exhaust (.6635 OD)
64931	Gage, Plug - Valve Guide Hole in Cyl. Hd. .030 o/s Exhaust (.6635 OD)
64933	Wrench 1/2" - Top Exhaust Head Manifold Removal
64940	Gage, Plug - Valve Guide Hole in Cyl. Hd. STD. Exhaust (.6635 OD)
64941	Tool - Tappet Assembly Removal



CURVE NO.12742-A

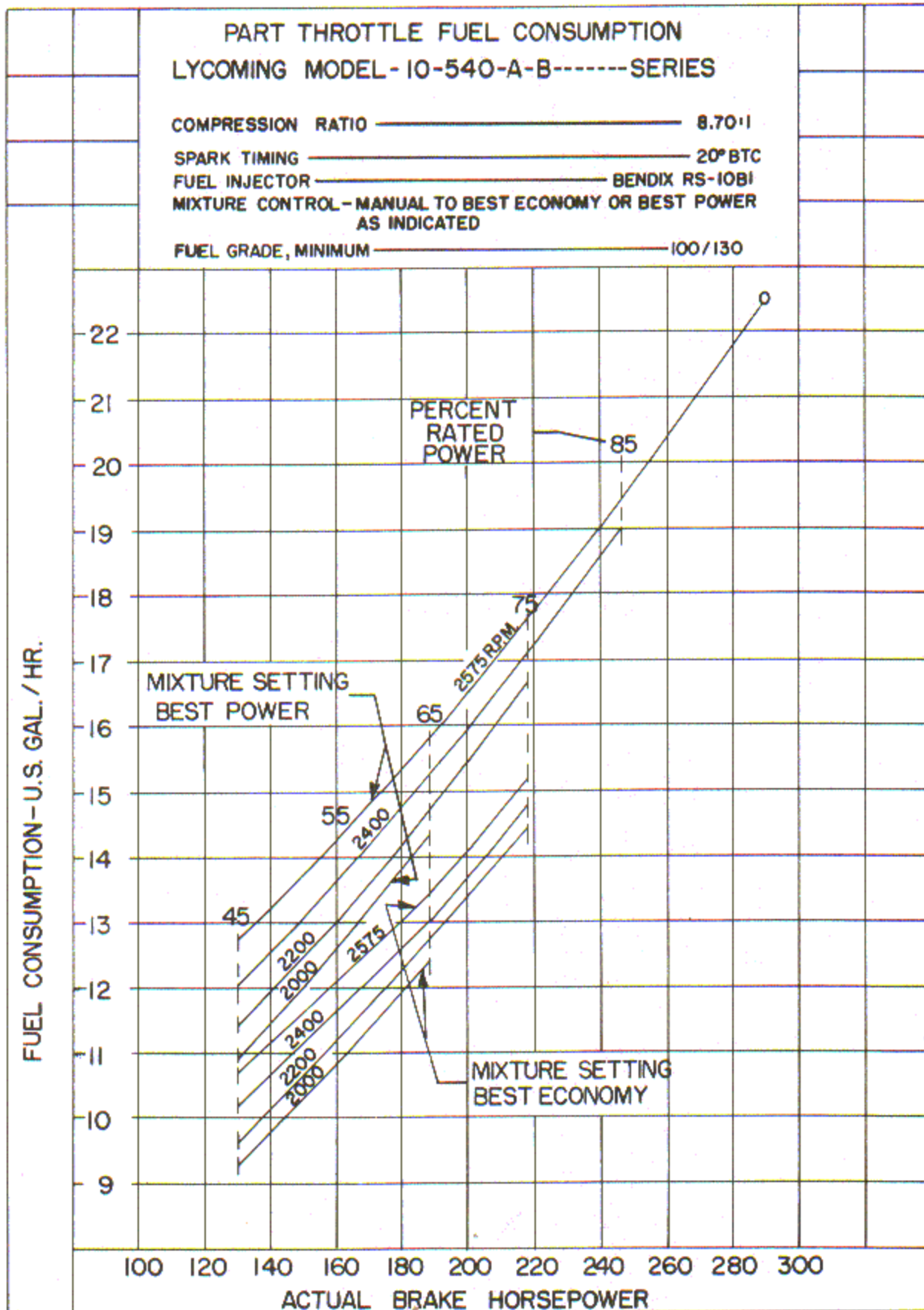


Figure 10-2. Fuel Consumption Curve



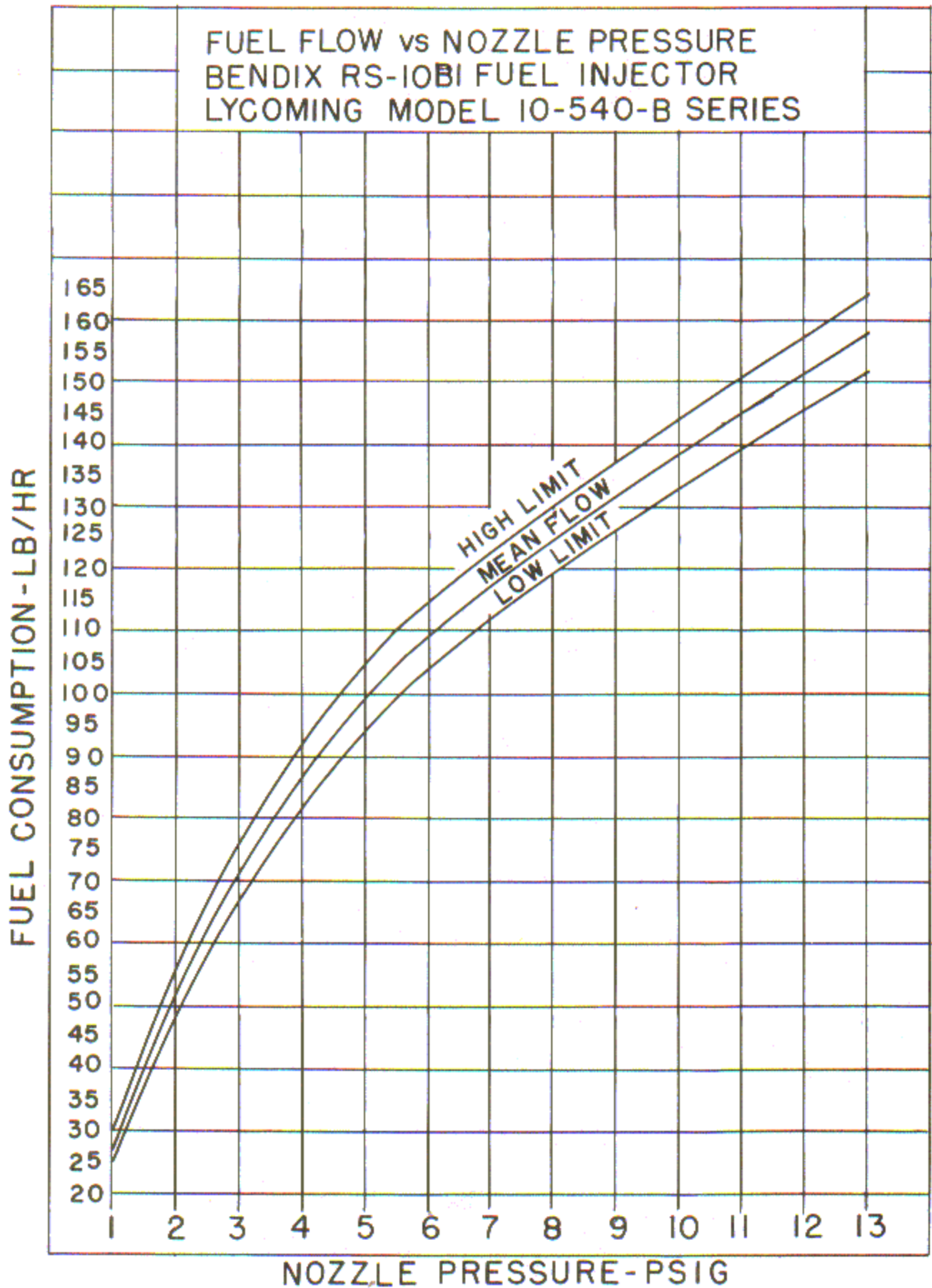


Figure 10-3. Fuel Pressure vs. Nozzle Pressure



# LYCOMING



## SERVICE BULLETIN

LYCOMING DIVISION



WILLIAMSPORT, PA., U.S.A.

DATE: November 18, 1960

Service Bulletin No. 268  
Approved by FAA

SUBJECT: Table of Limits

MODELS AFFECTED: All Lycoming Opposed Series Aircraft Engines

The Table of Limits in this Service Bulletin lists all the tolerances and dimensions that must be maintained in Lycoming Aircraft Engines. As revisions are made at various times to this Table of Limits, this bulletin will be revised to reflect the latest available data. The tolerances and dimensions set forth in this bulletin take precedence over any contradictory data listed in Lycoming Manuals.

The figures in the first column entitled "Reference Number" correspond to the figures shown on the Limits Chart of the applicable Overhaul Manual, and list the various parts or fits. The second column entitled "Nomenclature" gives a brief description of the part or fit. When overhauling the engine, the dimensions in the third and fourth columns, marked minimum and maximum, are considered ideal. The last column entitled "Maximum Service Allowable" indicates the limits that must not be exceeded in rebuilding the engine.

Throughout this bulletin various symbols appear. The following chart lists these symbols and what they represent.

### TABLE OF LIMITS SYMBOLS

- (A) These fits are either shrink fits controlled by machining, fits that may be readily adjusted, or fits where wear does not normally occur. In each case the fit must be held to the manufacturing tolerance.
- (B) Side clearance on wedge type rings must be measured with face of ring flush with piston.
- (C) Replacements to correct these items must be made to give uniform backlash within .001 between the stationary gear and the pinions, and within .001 between the pinions and the ring gear.
- (D) The dimensions shown are measured at the bottom of the piston skirt at right angles to the piston pin.
- (E) Permissible wear on the crankshaft (rod & main bearing journals) to be minus .0015 on the diameter.

The following is a list of alphabetical letters and the engine models they represent throughout the Table of Limits.

CHART	MODEL	CHART	MODEL
A -----	O-235-C1	M -----	GO-480-C2, -G2
B -----	O-290-D	N -----	GO-435-C2A
C -----	O-290-D2	P -----	GSO-480-A, -B
D -----	O-435-A	Q -----	GO-480-D
E -----	GO-435-C2	R -----	GO-480-C1B6, -G1B6
F -----	GO-435-C2B	S -----	O-360-A
G -----	O-320-A	T -----	O-540-A
H -----	GO-480-B	U -----	O-320-B
J -----	O-340-A	V -----	VO-540
K -----	GO-480-F6	W -----	IGSO-480-A
L -----	VO-435-A, -A1D	Y -----	VO-360-A

REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW.
501	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y G-J-S-Y  T  A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-U-V-W-Y T	Main Bearing & Crankshaft  Main Bearing-Front & Crank- shaft Main Bearing-Front & Crank- shaft Dia. of Main Bearing Journal on Crankshaft Dia. of Front Main Bearing Journal on Crankshaft	.0015L .0025L .0025L 2.375 2.3755	.0036L .0055L .0050L 2.376 2.376	.0055L .007L .007L (E) (E)
502	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Connecting Rod Bearings & Crankshaft Dia. of Connecting Rod Journal on Crankshaft	.0008L 2.124	.0033L 2.125	.0050L (E)
503	D E-F-H-K-M-N-P-Q-R-W	Thrust Bearing & Crankshaft Thrust Bearing & Propeller Shaft	.0000 .0000	.0012L .0012L	.002L .002L
504	A-B-C-G-J-S-T-U-Y  E-F-H-K-M-N  D-L-P-Q-R-V-W	Crankshaft Timing Gear & Crankshaft Crankshaft Timing Gear & Crankshaft Crankshaft Timing Gear & Crankshaft	.001L .0015L .000	.001T .0005T .0015T	(A) (A) (A)
505	D E-F-H-N-P-Q-R-W	Crankshaft Run-Out-Rear Cone Location Propeller Shaft Run-Out Rear Cone Location			.003 .003
506	D E-F-H-N-P-Q-R-W	Crankshaft Run-Out-Front Cone Location Propeller Shaft Run-Out-Front Cone Location (Prop. Shaft Inst.)			.007 .007
507	E-F-H-K-M-N	Starter Jaw & Crankshaft	.0005L	.0040L	(A)
508	D E-F-H-K-M-N-P-Q-R-W	Thrust Bearing & Thrust Bearing Cage Thrust Bearing & Reduction Gear Housing	.0016L .0006L	.0034L .0024L	.0045L .0035L
509	D-E-F-H-K-M-N-P-Q-R-W	Thrust Bearing & Thrust Brg. Cap Clamp Fit (Shim to this Fit)	.003T	.005T	(A)
510	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Conn. Rod & Conn. Rod Bushing  Finished ID of Conn. Rod Bushing	Bushing Must Be Burnished in Place 1.1254	1.1259	
511	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Connecting Rod Bushing & Piston Pin	.0008L	.0016L	.003L
512	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Piston Pin & Piston  Dia. of Piston Pin Hole in Piston  Dia. of Piston Pin	.0003L 1.1249 1.1243	.0009L 1.1252 1.1246	.003L
513	A-G-H-J-K-Q-S-T-U  G-H-J-K-M-P-Q-R-S-T-U-V W-Y B-C-D-E-F-L-N A-G-H-J-K-Q-S-T-U  B-C-D-E-F-L-N G-H-J-K-M-P-Q-R-S-T-U-V W-Y	Piston & Piston Pin Plug (Plain Cylinders) Piston & Piston Pin Plug (Chrome Cylinders) Piston Pin & Piston Pin Plug OD of Piston Pin Plug (Plain Cylinders) OD of Piston Pin Plug OD of Piston Pin Plug (Chrome Cylinders)	.0009L .0002L .0005L 1.123 .8405 1.1242	.0022L .0010L .0025L 1.124 .8415 1.1247	.004L .002L .005L
514	A-E-F	Piston Ring & Piston-Side Clearance-Top Ring-Comp.	.000(B)	.004L(B)	.008L(B)



REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW.
514	B-C-D-H-K-N-Q (Cont'd)	Piston Ring & Piston-Side Clearance-Top Ring-Comp.	.0024L(B)	.0064(B)	.008L(B)
	S-G-J-T-U-Y	Piston Ring & Piston Side Clearance-Top Ring-Comp.	.000(B)	.004L(B)	.006L(B)
	L-M-P-R-V-W	Piston Ring & Piston-Side Clearance Top Ring-Comp.	.000(B)	.004L(B)	.005L(B)
515	A-B-C-D	Piston Ring & Piston-Side Clearance-Second Ring-Comp.	.000(B)	.004L(B)	.008L(B)
	E-F-H-K-N-Q	Piston Ring & Piston-Side Clearance-Second Ring-Comp.	.0024L(B)	.0064L(B)	.008L(B)
	S-G-J-T-U-Y	Piston Ring & Piston-Side Clearance-Second Ring-Comp.	.000(B)	.004L(B)	.006L(B)
	L-M-P-R-V-W	Piston Ring & Piston-Side Clearance-Second Ring-Comp.	.000(B)	.004L(B)	.005L(B)
	V	Piston Ring & Piston-Side Clearance-Third Ring Comp.	.000(B)	.004L(B)	.005L(B)
516	A-D	Piston Ring & Piston-Side Clearance-Oil Ring	.0040L	.0055L	.0075L
	B-C-E-F-G-H-J-K-L-M-N-P Q-R-S-T-U-V-W-Y	Piston Ring & Piston Side Clearance Oil Ring	.0035L	.0055L	.0075L
517	A-E-F-H-K-L-M-N-P-Q-R-V W	Piston Ring & Piston-Side Clearance-Bottom Ring	.003L	.0053L	.007L
519	A	Piston Skirt & Cylinder - Cast Type Piston	.0110L	.0135L	.025L
	A	Piston Skirt & Cylinder - Forged Type Piston	.0135L	.0160L	.025L
	E-F-H-K-L-M-N-P-Q-R-V-W	Piston Skirt & Cylinder - 5 Ring - Forged Type Piston	.0155L	.0195L	.025L
	D-B-C	Piston Skirt & Cylinder - Cast Type Piston	.0045L(D)	.0060L(D)	.017L(D)
	G	Piston Skirt & Cylinder - Cast Type Piston	.005L(D)	.0065L(D)	.017L(D)
	J-S-T-U-Y	Piston Skirt & Cylinder - Cast Type Piston	.006L(D)	.0075L(D)	.017L(D)
	M-R-P-W	Piston Skirt & Cylinder - 4 Ring - Forged Type Piston	.017L	.021L	.025L
	A	Piston Dia. at Bottom - Cast Type Piston	4.362	4.363	
	A	Piston Dia. at Bottom - Forged Type Piston	4.3595	4.3605	
	E-F-L-N	Piston Dia. at Bottom - Forged Type Piston	4.858	4.859	
	D-B-C	Piston Dia. at Bottom - Cast Type Piston	4.869(D)	4.870(D)	
	G	Piston Dia. at Bottom - Cast Type Piston	5.119(D)	5.120(D)	
	H-K-M-P-Q-R-V-W	Piston Dia. at Bottom - 5 Ring - Forged Type Piston	5.108	5.109	
	J-S-T-U-Y	Piston Dia. at Bottom - Cast Type Piston	5.118(D)	5.119(D)	
	M-R-P-W	Piston Dia. at Bottom - 4 Ring - Forged Type Piston	5.1065	5.1075	
	A	Piston-Dia. at Top - Cast Type Piston	4.3506	4.3536	
	A	Piston Dia. at Top - Forged Type Piston	4.3445	4.3475	
	B-D-C	Piston Dia. at Top - Cast Type Piston	4.8326	4.8356	
	E-F-L-N	Piston Dia. at Top - Forged Type Piston	4.8375	4.8405	
	G	Piston Dia. at Top - Cast Type Piston	5.0848	5.0876	
	H-K-M-P-Q-R-V-W	Piston Dia. at Top - Forged Type Piston	5.0875	5.0905	
	J-S-T-U-Y	Piston Dia. at Top - Cast Type Piston	5.0826	5.0856	

REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE
520	A-B-C-D-E-F-G-H-J-K-N Q-S-T-U	Cylinder Maximum Taper	.0000	.0005	.004
	E-F-H-L-M-P-K-Q-R-V-W	Cylinder Maximum Taper- Chrome Plated	.000	.002	.004
	B-C-G-J-S-T-U-Y	Cylinder Maximum Taper- Chrome Plated	.000	.0015	.004
521	A-B-C-D-E-F-G-H-J-K-N-Q S-T-U	Cylinder Maximum Out-of-Round	.0000	.0005	.004
	E-F-H-L-M-P-K-Q-R-V-W	Cylinder Maximum Out-of-Round- Chrome Plated	.0000	.002	.004
	B-C-G-J-S-T-U-Y	Cylinder Maximum Out-of-Round- Chrome Plated	.000	.0015	.004
522	A	Cylinder Bore Diameter	4.3740	4.3755	4.3795
	B-C-D-E-F-N	Cylinder Bore Diameter	4.8745	4.8755	4.8795
	G-H-J-K-Q-S-T-U	Cylinder Bore Diameter	5.1245	5.1255	5.1295
	E-F-L	Cylinder Bore Diameter-Chrome Plated	4.8745	4.8775	4.8795
	H-M-P-K-Q-R-V-W	Cylinder Bore Diameter-Chrome Plated	5.1245	5.1275	5.1295
	B-C	Cylinder Bore Diameter-Chrome Plated	4.874	4.876	4.8795
	G-J-S-T-U-Y	Cylinder Bore Diameter-Chrome Plated	5.1245	5.1265	5.1295
523	A-E-F-H-K-L-N-Q	Exhaust Valve Seat & Cylinder Hd.	.007T	.010T	(A)
	B-C-D-G-J-S-T-U-Y	Exhaust Valve Seat & Cylinder Hd.	.005T	.008T	(A)
	M-P-R-W-V	Exhaust Valve Seat & Cylinder Hd.	.008T	.011T	(A)
	A	OD Exhaust Seat	2.003	2.004	
	E-F-H-K-L-N-Q	OD Exhaust Seat	2.097	2.098	
	B-C-D-G-J-S-T-U-Y	OD Exhaust Seat	1.740	1.741	
	V-M-P-R-W	OD Exhaust Seat	1.936	1.937	
	A	ID Exhaust Seat Hole in Cylinder Head	1.994	1.996	
	E-F-H-K-L-N-Q	ID Exhaust Seat Hole in Cylinder Head	2.088	2.090	
	B-C-D-G-J-S-T-U-Y	ID Exhaust Seat Hole in Cylinder Head	1.733	1.735	
	V-M-P-R-W	ID Exhaust Seat Hole in Cylinder Head	1.926	1.928	
	A	Intake Valve Seat & Cylinder Head	.0075T	.0105T	(A)
	E-F-H-K-L-M-N-P-Q-R-W	Intake Valve Seat & Cylinder Head	.007T	.010T	(A)
524	B-C-D-G-J-S-T-U-V-Y	Intake Valve Seat & Cylinder Head	.005T	.008T	(A)
	A	OD Intake Seat	2.0965	2.0975	
	E-F-H-K-L-N-Q	OD Intake Seat	2.315	2.316	
	C-G-J-S-T-U-Y	OD Intake Seat	2.082	2.083	
	B-D	OD Intake Seat	1.927	1.928	
	V	OD Intake Seat	2.289	2.290	
	M-P-R-W	OD Intake Seat	2.168	2.169	
	A	ID Intake Seat Hole in Cylinder Head	2.087	2.089	
	E-F-H-K-L-N-Q	ID Intake Seat Hole in Cylinder Head	2.306	2.308	
	C-G-J-S-T-U-Y	ID Intake Seat Hole in Cylinder Head	2.075	2.077	
	B-D	ID Intake Seat Hole in Cylinder Head	1.920	1.922	
	V	ID Intake Seat Hole in Cylinder Head	2.282	2.284	
	M-P-R-W	ID Intake Seat Hole in Cylinder Head	2.159	2.161	
526	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Exhaust Valve Guide & Cylinder Head	.001T	.0025T	(A)

REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW
527	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y A-B-C-D E-F-H-K-L-N-Q G-J-S-T-U-Y M-P-R-W A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y Y M-P-R-W A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y Y M-P-R-W	Intake Valve Guide & Cylinder Head Finished ID of Intake Valve Guides Finished ID of Exhaust Valve Guides Finished ID of Exhaust Valve Guides-Rotator Type Finished ID of Exhaust Valve Guides-Rotator Type Finished ID of Exhaust Valve Guides-Rotator Type OD Valve Guides (Intake Only on Chart-M-P-R-W-Y) OD Exhaust Valve Guide OD Exhaust Valve Guide ID Valve Guide Holes in Cylinder Head ID Exhaust Valve Guide Hole in Cylinder Head ID Exhaust Valve Guide Hole in Cylinder Head	.001T .4040 .4040 .4360 .4375 .4985 .5933 .6267 .6633 .5913 .6247 .6613	.0025T .4050 .4050 .4370 .4385 .4995 .5938 .6272 .6638 .5923 .6257 .6623	(A)
528	A-B-C-D-E-F-G-H-K-L-N-Q-V G-J-S-T-U-Y A-B-C-D E-F-G-H-J-K-L-N-Q-S-T-U-V-W-Y M-P-R-W	Exhaust Valve Stem & Valve Guide Exhaust Valve Stem & Valve Guide OD of Valve Stem-Exhaust OD of Valve Stem-Exhaust-Rotator Type OD of Valve Stem-Exhaust-Rotator Type	.0020L .0035L .4015 .4335 .4960	.0035L .0050L .4020 .4340 .4965	.006L .006L
529	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Intake Valve Stem & Valve Guide OD of Valve Stem-Intake	.0010L .4025	.0025L .4030	.006L
530	A A	Valve Rocker Shaft & Cylinder Hd. Finished ID of Valve Rocker Shaft Bores in Cylinder Head	.0001L .6246	.0010L .6253	.0025L
531	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Valve Rocker Shaft & Valve Rocker Bushings OD of Valve Rocker Shaft	.0010L .6243	.0017L .6245	.004L
532	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Valve Rocker Bushing & Valve Rocker	Bushing must be Burnished in Place		
533	A-B-C-D-G-J-S-T-U-Y E-F-H-K-L-M-N-P-Q-R-V-W	Valve Rocker & Cylinder Head-Side Clearance Valve Rocker & Cylinder Head-Side Clearance	.003L .002L	.009L .014L	.012L .017L
535	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Push Rod & Push Rod Ball End	.0005T	.0025T	(A)
536	A-B C-D-E-F-G-H-J-K-L-M-N-P Q-R-S-T-U-V-W-Y A-B C-D-E-F-G-H-J-K-L-M-N-P Q-R-S-T-U-V-W-Y A-B C-D-E-F-G-H-J-K-L-M-N-P Q-R-S-T-U-V-W-Y	Tappet Body & Crankcase Tappet Body & Crankcase OD of Tappet Body OD of Tappet Body ID of Tappet Bore in Crankcase ID of Tappet Bore in Crankcase	.0010L .0010L .6230 .7172 .6250 .7187	.003L .0025L .6240 .7177 .6260 .7197	.004L .004L
537	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y T	Camshaft & Crankcase Camshaft & Crankcase-Front Bearing	.002L .002L	.004L .0035L	.006L .006L
538	A-B-C-E-F-G-H-J-K-L-M-N P-Q-R-S-T-U-V-W-Y D	Camshaft-End Clearance Camshaft-End Clearance	.002L .002L	.009L .006L	.015L .015L
539	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Camshaft-Run-Out at Center	.000	.001	.006



REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW.
540	D-G-J-S-T-U E-F-H-K-M-N	Tachometer Drive Shaft & Accessory Housing Tachometer Drive Gear & Accessory Housing	.0015L .0010L	.0035L .0025L	.006L .006L
541	E-F-H-K-M-N	Tachometer Drive Gear-End Clearance	.000	.030L	.040L
542	A-B-C-D-E-F-G-H-J-K-M-N S-T-U-Y L-P-Q-R-V-W	Oil Pump Impeller Dia. Clearance Oil Pump & Scavenge Pump Impellers-Dia. Clearance	.002L .007L	.005L .011L	.008L .014L
543	A-B-C-D-E-F-G-H-J-K-M-N S-T-U-Y L-P-Q-R-V-W  A-B-C-D-E-F-G-H-J-K-M-N S-T-U-Y L-P-Q-R-V-W L-P-Q-R-V-W	Oil Pump Impellers-Side Clearance Oil Pump & Scavenge Pump Impellers-side Clearance Width of Oil Pump Impellers  Width of Oil Pump Impellers Width of Oil Scavenge Pump Impellers	.002L .003L .748 .996 1.497	.004L .005L .749 .997 1.498	.005L .006L   
544	A-B-C-D-E-F-G-H-J-K-M-N S-T-U-Y L-P-Q-R-V-W	Oil Pump Driven Impellers & Idler Shaft Oil Pump & Oil Scavenge Pump Driven Impellers & Idler Shaft	.0010L .0010L	.0025L .0025L	.004L .004L
545	A-B-C-D-G-J-S-T-U-Y  E-F-H-K-M-N	Oil Pump Drive Shaft & Oil Pump Cover Oil Pump Drive Gear & Oil Pump Body	.0015L .0010L	.0030L .0025L	.004L .004L
546	E-F-H-K-M-N	Oil Pump Drive Gear-End Clearance	.008L	.042L	.060L
547	E-F-H-K-M-N	Oil Pump Drive Gear & Crank- shaft Timing Gear-Backlash	.004	.015	.020
548	E-F-H-K-M-N	Tachometer Drive Gear & Crank- shaft Timing Gear-Backlash	.004	.015	.020
549	D-E-F-K-M-N	Magneto Drive Bearing & Magneto Gear	.0008T	.0001L	.0005L
550	D-E-F-H-K-L-M-N-P-Q-R- V-W	Crankshaft Timing Gear & Cam- shaft Gear-Backlash	.004	.015	.020
551	D-E-F-H-K-M-N	Camshaft Gear & Magneto Gears- Backlash	.004	.015	.020
552	D	Crankshaft Gear & Generator Gear-Backlash	.004	.015	.020
553	A-B-C-D-E-F-G-H-J-K-M-N S-T-U-Y L-P-Q-R-V-W	Oil Pump Impellers-Backlash Oil Pump & Scavenge Pump Impellers-Backlash	.008 .008	.015 .015	.020 .020
554	E-F-H-N	Tachometer Driven Gear & Tachometer Drive Gear-Backlash	.004	.015	.020
555	D-E-F-H-K-M-N-P-Q-R-W	Thrust Bearing Tilt			.027 Tilt
556	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Crankshaft Run-Out at Center Main Bearings			.005
557	D-E-F-H-K-M	Oil Relief & Oil By-Pass Valve Plungers & Plugs	.0015L	.0035L	.005L
558	A-B-C-D-E-F-G-H-J-K-M-N S-T-U-Y	Oil Pump Idler Shaft & Oil Pump Cover or Body	.0000	.0015T	(A)
559	C-D-E-F-G-H-J-K-L-M-N-P Q-R-S-T-U-V-W-Y	Hydraulic Tappet Plunger Assy. & Tappet Body	.0010L	.0067L	(A)
560	C-D-E-F-G-H-J-K-L-M-N-P Q-R-S-T-U-V-W-Y	Hydraulic Tappet Socket & Tappet Body	.0020L	.007L	(A)
561	D-E-F-K-M-N	Magneto Drive Bearing & Adapter	.0006T	.0008L	(A)
562	D-E-F-K-M-N	Magneto Coupling Spline-Backlash	.001	.005	.0075
563	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Crankcase Main Brg. Bore Align- ment with Front & Rear Bearings			.003
564	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Connecting Rod-Side Clearance	.004L	.010L	.016L

REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW.
565	E-F-H-N	Tachometer Driven Gear & Adapter	.0015L	.0035L	.005L
566	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Connecting Rod Alignment			.010 in. 10 inches
567	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y	Connecting Rod Twist			.012 in. 10 inches
568	A-B-C-G-J-S-T-U-Y	Crankshaft & Crankcase Front End Clearance	.0075L	.016L	.026L
	E-F-H-K-L-M-N-P-Q-R-V-W	Crankshaft & Crankcase Front End Clearance	.006L	.015L	.025L
569	E-F-H-K-M-N-P-Q-R-W	Crankshaft & Crankshaft Front Bushing	.0010T	.0025T	(A)
570	E-F-H-K-M-N-P-Q-R-W	Pinion-End Clearance	.011	.016	.030
571	E-F-H-K-M-N-P-Q-R-W	Pinion Shaft & Cage	Select For Hand Push Fit		.002(C)
572	E	Propeller Shaft & Pinion Cage-Spline Backlash	.0000	.0025L	.0040L
573	E-F-H-K-M-N-P-Q-R-W	Propeller Shaft & Crankshaft Bushing	.0020L	.0035L	.005L
574	E-F-H-K-M-N-P-Q-R-W	Stationary Gear & Plate-Backlash	.002	.005	.010
575	E-F-H-K-M-N-P-Q-R-W	Stationary Gear & Plate-End Clearance	.000	.004	.007
576	E-F-H-K-M-N-P-Q-R-W	Ring Gear & Drive Plate-Backlash	.001	.004	.010
577	E-F-H-K-M-N-P-Q-R-W	Ring Gear & Drive Plate-End Clearance	.000	.004	.007
578	E-F-H-K-M-N-P-Q-R-T-W	Counterweight Bushings & Crankshaft	.0013T	.0026T	(A)
579	E-F-H-K-M-N-P-Q-R-T-W	Counterweight Roller-End Clearance	.004	.034	.038
580	E-F-H-K-M-N-P-Q-R-T-W	Counterweight & Crankshaft-Side Clearance	.003	.013	.017
581	E-F-H-K-M-N	Generator Driven Gear Bushing & Acc. Housing	.001T	.003T	(A)
583	E-F-H-K-M-N	Generator Driven Gear & Bushing	.002L	.004L	.006L
584	E-F-H-K-M-N	Generator Driven Gear-End Clearance	.005L	.049L	.060L
585	E-F-K-M-N	Generator Drive Gear & Generator Driven Gear-Backlash	.004	.015	.020
586	E-F-H-K-M-N	Accessory (Fuel Pump) Drive Gear & Acc. Housing	.0010L	.0030L	.005L
587	E-F-H-K-M-N	Accessory (Fuel Pump) Drive Gear-End Clearance	.016L	.045L	.065L
588	E-F-H-K-M-N	Oil Pump Drive Gear & Acc. (Fuel Pump) Drive Gear-Backlash	.004	.015	.020
589	D-E-F-H-K-M-N	Vacuum Pump Gear & Acc. Housing	.0010L	.0025L	.006L
590	A-B-C-G-J-S-T-U	Vacuum Pump Gear-End Clearance	.000	.067L	.075L
	Y	Fuel Pump Or Vacuum Pump Gear-End Clearance	.000	.067L	.075L
	D	Vacuum Pump Gear-End Clearance	.003L	.020L	.030L
	E-F-H-K-M-N	Vacuum Pump Gear-End Clearance	.016L	.045L	.065L
591	E-F-H-K-M-N	Oil Pump Drive Gear & Vacuum Pump Drive Gear-Backlash	.004	.015	.020
601	A-B-C-D-E-F-G-H-J-K-M-N S-T-U	Oil Pump Drive Shaft & Acc. Housing	.0015L	.0030L	.006L
	Y	Oil Pump Drive Shaft & Acc. Case	.0015L	.0030L	.006L
602	A-B-C-D-E-F-G-H-J-K-M-N S-T-U	Oil Pump Idler Shaft & Acc. Housing	.0005L	.0020L	.003L
	Y	Oil Pump Idler Shaft & Acc. Case	.0005L	.0020L	.003L
603	E-F-H-N	Tachometer Cover & Adapter	.001T	.003T	(A)



REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW.
606	E-F-H-N	Tachometer Drive Gear-End Clearance	.001L	.040L	.060L
607	A-B-C-G-J-K-L-M-S-T-U-V Y	Crankshaft Propeller Flange Run-Out			.005
608	E-F-H-K-M-N-P-Q-R-W	Propeller Shaft-Reduction Gear Total Backlash at 4 Ft. Radius			.50
611	B-C-D-E-F-G-H-J-K-L-M-N P-Q-R-S-T-U-V-W-Y B-C-D-E-F-G-H-J-K-L-M-N P-Q-R-S-T-U-V-W-Y	Valve Rocker Shaft & Rocker Shaft Bushing Finished ID of Valve Rocker Shaft Bushing in Cylinder Head	.0001L .6246	.0010L .6253	.0025L
612	B-C-D-E-F-G-H-J-K-L-M-N P-Q-R-S-T-U-V-W-Y	Rocker Shaft Bushing & Cylinder Head	.0022T	.0035T	(A)
615	A-B-C-D-E-F-G-H-J-K-L-M N-P-Q-R-S-T-U-V-W-Y A-B-C-D-E-F-L-N G-H-J-K-M-P-Q-R-S-T-U V-W-Y	Piston Ring Gap-All Rings Except Oil Control Ring Piston Ring Gap-Oil Control Ring Piston Ring Gap-Oil Control Ring	.020 .015 .020	.030 .025 .030	.045 .045 .045
616	A-B-C-G-J-S-T-U-Y	Crankshaft Idler Gear & Camshaft Gear-Backlash	.004	.015	.020
617	A-B-C-G-J-S-T-U-Y	Crankshaft Idler Gear & Crankshaft Gear-Backlash	.004	.015	.020
618	A-B-C-G-J-S-T-U	Crankshaft Idler Gear & Magneto Gear-Backlash	.004	.015	.020
619	A-B-C-G-J-S-T-U-Y	Crankshaft Idler Gear & Crankshaft Idler Gear Shaft	.001L	.003L	.005L
620	A-B-C-G-J-S-T-U-Y	Crankshaft Idler Gear-End Clearance	.010L	.045L	.055L
621	D	Vacuum Pump Gear & Vacuum Pump Drive Gear-Backlash	.004	.015	.020
622	A-B-C-G-J-S-T-U-Y	Accessory Drive Gear & Vacuum Pump Adapter	.0013L	.0033L	.005L
623	A-B-C-G-J-S-T-U Y	Accessory Drive & Camshaft Gear Backlash Fuel Pump or Vacuum Pump Driven Gear & Camshaft Gear-Backlash	.004 .004	.015 .015	.020 .020
624	A-B-C Y	Tachometer Adapter & Acc. Housing Tachometer Adapter & Acc. Case	.001T .001T	.003T .003T	(A) (A)
625	A-B-C-Y	Tachometer Drive Shaft & Tachometer Adapter	.0015L	.0035L	.005L
627	D	Generator Gear Bushing & Generator Gear	.0020T	.0035T	(A)
628	D	Generator Gear Bushing & Generator Drive Coupling Adapter	.001L	.0028L	.005L
629	A-B-C-D-G-J-S-T-U	Fuel Pump Plunger & Acc. Housing	.0015L	.003L	.005L
632	D	Bendix Drive Gear Bushing & Crankcase	.0005T	.0025T	(A)
633	D	Bendix Drive Gear & Bendix Drive Gear Bushing	.0010L	.0025L	.005L
634	D	Bendix Drive Shaft & Bendix Drive Housing	.003L	.005L	.010L
635	D	Starter Drive & Bendix Drive Gear-Backlash	.004	.015	.020
636	D	Bendix Drive Shaft Spline & Bendix Drive Gear Spline-Backlash	.001	.006	.015
637	D	Bendix Drive Shaft-End Clearance	.000	.059L	.080L
650	E	Vacuum Pump Driven Gear & Idler Gear-Backlash	.004	.015	.020
651	E	Propeller Governor Driven Gear & Idler Gear-Backlash	.004	.015	.020
652	E	Idler Gear & Vacuum Pump Drive Gear-Spline Backlash	.0018L	.0048L	.008L

REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW.
653	E	Vacuum Pump Driven Gear & Adapter	.001L	.0025L	.004L
654	E	Propeller Governor Driven Gear & Adapter	.001L	.0025L	.004L
655	E	Vacuum Pump & Prop. Gov Idler Gear & Adapter	.001L	.0025L	.004L
656	E	Propeller Gov. Driven Gear & Adapter Cover	.001L	.0025L	.004L
658	B-C-G-J-S-T-U	Oil Cooler By-Pass Plunger & Accessory Housing	.0015L	.0035L	.005L
659	E	Pinion Cage & Prop. Shaft Spline OD (Select)	.0005T	.0010T	(A)
660	E-F-H-K-M-N-P-Q-R-W	Pinion Gear & Stationary Gear-Backlash	.0047	.0077	.012(C)
661	E-F-H-K-M-N-P-Q-R-W	Pinion Gear & Ring Gear-Backlash	.0035	.0065	.012(C)
666	A-B-C	Hydraulic Valve & Crankcase	.0005L	.0025L	.003L
667	F-H-K-M-N-P-Q-R-T-W	Gov. Drive Gear & Gov. Drive Idler Gear-Backlash	.004	.015	.025
668	F-H-K-M-N-P-Q-R-W	Gov. Dr. Idler Bushings & Gov. Drive Idler Shaft	.001L	.003L	.004L
	T	Gov. Dr. Idler Shaft (Both Ends) & Crankcase	.0010L	.0025L	.004L
669	F-H-K-M-N-P-Q-R-T-W	Gov. Dr. Idler Gear (Bevel Gear End) & Gov. Driven Gear-Backlash	.004	.008	.015
670	F-H-K-M-N-P-Q-R-W	Gov. Driven Gear & Gov. Drive Adapter Bushing	.001L	.003L	.004L
	T	Gov. Driven Gear & Crankcase	.0010L	.0025L	.004L
671	F-H-K-M-N-P-Q-R-W	Prop. Shaft Seal Rings & Groove-Side Clearance	.0010L	.0035L	.005L
672	F-H-K-M-N-P-Q-R-W	Prop. Shaft Seal Rings-Gap	.010	.025	.030
673	F-H-K-M-N-P-Q-R-W	Prop. Shaft & Pinion Cage-Spline Fit	From Light Press Fit To 2000 Lb. Max. Press Fit		
674	G-J-S-U	Prop. Gov. Drive Shaftgear - End Clearance	.002L	.024L	.034L
675	G-J-S-U	Prop. Gov. Drive Shaftgear & Adapter	.0010L	.0025L	.005L
676	G-J-S-U	Crankshaft Idler Gear & Prop. Gov. Drive Shaftgear-Backlash	.004L	.015L	.020L
677	H-F-K-M	Magneto Drive Bearing & Magneto Gear	.001T	.0005L	.001L
	T	Magneto Drive Bearing & Magneto Gear	.0005T	.0001L	.0005L
	H-F-K-M	Magneto Drive Bearing & Support	.0001T	.0007L	(A)
	T	Magneto Drive Bearing & Crankcase	.0002T	.0007L	(A)
678	H	Gen. Drive Idler Gear & Bushing	Bushings Must Be Burnished In Place		
	H	Finished ID of Idler Gear Bushing	1.000	1.001	
679	H	Gen. Drive Countershaft & Bushing	.0015L	.0035L	.005L
680	H	Gen. Drive Idler Gear-End Clearance	.004L	.010L	.020L
681	H	Gen. Drive Idler Gear & Camshaft Gear-Backlash	.004	.015	.020
682	H	Gen. Drive Idler Gear & Gen. Drive Gear-Backlash	.004	.015	.020
683	H-K-M	Elec. Tach. -Idler Gear-End Clearance	.005L	.052L	.065L
684	H-K-M	Elec. Tach. -Driven Gear-End Clearance	.005L	.027L	.047L
	L-P-Q-R-V-W	Elec. Tach. -Driven Gear-End Clearance	.000	.028L	.047L
685	H-K-M	Elec. Tach. -Idler Gear Shaft & Idler Gear Bushing	.001L	.0025L	.004L



REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW.
686	H-K-M	Elec. Tach. -Driven Gear & Adapter	.0015L	.0035L	.006L
687	H-K-M	Elec. Tach. -Idler Gear & Driven Gear-Backlash	.004	.015	.020
688	H-K-M	Elec. Tach. -Idler Gear & Tach. Drive Gear-Backlash	.004	.015	.020
689	H-F	Angle Gen. Dr. -Gen. Driven Gear Bushing & Gen. Housing	.001T	.003T	(A)
690	H-F	Angle Gen. Dr. -Gen. Driven Gear & Bushing	.002L	.004L	.006L
691	H-F	Angle Gen. Dr. -Gen. Dr. Gear & Gen. Driven Gear-Backlash	.002	.004	.010
692	H-F	Angle Gen. Dr. -Gen. Housing & Gen. Drive Gear	.001L	.003L	.004L
693	H-F	Angle Gen. Dr. -Gen. Driven Gear & Gen. Dr. Gear-Spline Backlash	.003	.007	.009
694	K	Oil Transfer Tube & Prop. Shaft-Transfer End Select	.0000	.0015T	(A)
	M	Oil Transfer Tube & Prop. Shaft-Transfer End	.0010T	.0025T	(A)
695	K	Oil Transfer Tube & Prop. Shaft-Prop. Flange End Select	.000	.001T	(A)
696	E-F-H-K-M-N-P-Q-R-T-W	Dynamic C'weight Bore & Washer OD	.0002L	.0015L	(A)
697	L-P-Q-R-V-W	Oil Pump Drive Shaft Bushing & Oil Scavenge Pump Body	.001T	.003T	(A)
698	L-P-Q-R-V-W	Oil Pump Drive Shaft Bushing & Oil Pressure Pump Body	.001T	.003T	(A)
699	L-P-Q-R-V-W	Oil Pump Dr. Shaft Bushing & Oil Pressure Scavenge Pump Gear	.0015L	.0035L	.005L
700	L-P-Q-R-V-W	Oil Pump Dr. Shaft Bush & Oil Pump or Hydraulic Pump Shaft	.0015L	.0035L	.005L
701	L-P-Q-R-V-W	Fuel Pump Drive Gear Bushing & Acc. Housing	.001T	.004T	(A)
702	L-P-Q-R-V-W	Fuel Pump Drive Shaft Gear-End Clearance	.006L	.064L	.074L
703	L-P-Q-R-V-W	Gen. Drive Gear & Magneto Drive Idler Gear-Backlash	.004	.015	.020
704	L-P-Q-R-V-W	Mag. Dr. Idler Gear Hub Bush & Mag. Dr. Idler Gear Hub	Bushings Must Be Burnished In Place		
705	L-P-Q-R-V-W	Mag. Drive Idler Gear Hub Bush. & Magneto Dr. Idler Shaft	.001L	.003L	.004L
706	L-P-Q-R-V-W	Magneto Drive Idler Gear Hub-End Clearance	.005L	.014L	.024L
707	L-P-Q-R-V-W	Elec. Tach. Driven Gear & Access-Housing Cover	.001L	.003L	.004L
708	L-P-Q-R-V-W	Elec. Tach. Dr. Gear (Mag. Idler Hub) & Tach. Driven Gear-Backlash	.004	.015	.020
709	L-P-Q-R-V-W	Mag. Dr. Idler Gear & Mag. Dr. Shaftgear-Backlash	.004	.015	.020
710	L-P-Q-R-V-W	Mag. Dr. Shaft Gear & Accessory Housing Cover	.0036L	.0048L	.006L
711	L-P-Q-R-V-W	Magneto Drive Shaft & Accessory Housing	.002L	.004L	.006L
712	L-P-Q-R-V-W	Magneto Drive Shaft Sleeve & Magneto Drive Shaft	.001T	.003T	(A)
713	L-P-Q-R-V-W	Magneto Drive Shaft Sleeve & Magneto Drive Coupling	.001T	.003T	(A)
714	L-P-Q-R-V-W	Magneto Drive Shaft Gear-End Clearance	.002L	.020L	.030L
715	L-P-Q-R-V-W	Mag. Drive Shaft & Magneto Drive Shaft Gear-Spline Backlash	.001L	.005L	.008L

REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW
716	L-P-Q-R-V-W	Mag. Dr. Shaft Gear Mag. Dr. Coupling Spline Backlash	.001L	.005L	.008L
717	L-P-Q-R-V-W	Oil Relief Valve Plunger & Sleeve	.002L	.005L	.007L
718	L-P-Q-R-V-W	Rear Crankshaft Spline Bushing & Crankshaft	.0002T	.0015T	(A)
719	L-Q-R-V	Rear Crankshaft Spline Bush. & Acc. Gear Spline-Backlash	.002L	.005L	.018L
	P-W	Rear Crankshaft Spline Bush. & Acc. Dr. Shaft Spline-Backlash	.002L	.005L	.018L
720	L-Q-R-V	Acc. Idler Gear & Starter Drive Gear-Backlash	.004	.008	.015
	P-W	Super. & Acc. Drive Gear & Starter Drive Gear-Backlash	.004	.008	.015
721	L-Q-R-V	Accessory Idler Gear Bearing & Accessory Idler Gear	.0001T	.0007L	(A)
	P-W	Accessory Idler Gear Bearing & Accessory Drive Shaft	.0001T	.0007L	(A)
722	L-P-Q-R-V-W	Starter Drive Gear Bushings & Adapter	.002T	.004T	(A)
723	L-P-Q-R-V-W	Starter Drive Gear Bushings & Starter Drive Gear	.002L	.004L	.006L
724	L-P-Q-R-V-W	Accessory Drive Gear & Gen. Drive Gear-Backlash	.004	.015	.020
725	L-P-Q-R-V-W	Accessory Drive Gear & Vacuum Pump Shaft Gear Backlash	.004	.015	.020
726	L-P-Q-R-V-W	Gen. Drive Gear Bushing & Accessory Housing Cover	.0015T	.0035T	(A)
727	L-P-Q-R-V-W	Gen. Drive Gear Bushing (At Cover) & Gen. Drive Gear	.002L	.004L	.006L
728	L-P-Q-R-V-W	Gen. Drive Gear Bushing & Accessory Housing	.002T	.004T	(A)
729	L-P-Q-R-V-W	Gen. Drive Gear Bushing (At Acc. Hsg.) & Gen. Drive Gear	.0025L	.0045L	.006L
730	L-P-Q-R-V-W	Gen. Drive Gear-End Clearance	.010	.038	.050
731	L-P-Q-R-V-W	Vac. Pump Shaftgear Bushing & Acc. Housing Cover	.0015T	.0035T	(A)
732	L-P-Q-R-V-W	Vac. Pump Shaftgear Bushing (At Cover) & Vac. Pump Shaft Gear	.002L	.004L	.006L
733	L-P-Q-R-V-W	Vac. Pump Shaft Gear Bushing & Accessory Housing	.0015T	.0035T	(A)
734	L-P-Q-R-V-W	Vac. Pump Shaftgear Bush. (At Acc. Hsg.) & Vac. Pump Shaft Gear	.002L	.004L	.006L
735	L-P-Q-R-V-W	Vacuum Pump Shaftgear-End Clearance	.017	.031	.050
736	L-P-Q-R-V-W	Vac. Pump Shaftgear & Oil Pressure-Scavenge Pump Gear-Backlash	.004	.015	.020
737	N	Scavenge Pump Driven Gear & Acc. Drive Gear-Backlash	.004	.015	.020
738	N	Scavenge Pump Base & Scavenge Pump Drive Shaft Sleeve	.001L	.003L	.005L
739	N	Scavenge Pump Base & Oil Pump Idler Shaft	.000	.0015T	(A)
740	N	Scavenge Pump Cover & Scavenge Pump Drive Shaft	.0016L	.0025L	.004L
741	N	Scavenge Pump Impellers-Dia. Clearance	.007L	.011L	.014L
742	N	Scavenge Pump Impellers-Side Clearance	.001L	.003L	.004L
743	N	Scavenge Pump Driven Impellers & Oil Pump Idler Shaft	.001L	.0025L	.004L
744	N	Width of Scavenge Pump Impellers	.997	.998	
745	N	Scavenge Pump Impellers-Backlash	.008	.015	.020



REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW.
746	P-W	Supercharger & Accessory Drive Gear & Bushing	.001T	.003T	(A)
747	L-P-Q-R-V-W	Accessory Idler Gear Brg. & Accessory Drive Shaft Adapter	.0005T	.0005L	(A)
748	P-W	Super. & Acc. Drive Gear Bushing & Accessory Drive Shaft	.0005L	.0017L	.004L
749	P-W	Super & Acc. Dr. Gear & Intermediate Super. Dr. Shaft Gear-Backlash	.006	.015	.020
750	P-W	Supercharger & Accessory Drive Gear-End Clearance	.004L	.012L	.017L
751	P-W	Accessory Drive Shaft & Bushing	.001T	.003T	(A)
752	P-W	Super. Drive Shaft Gear & Accessory Drive Shaft Bushing	.002L	.004L	.006L
753	P-W	Super Drive Shaft Gear & Intermediate Super. Dr. Gear-Backlash	.006	.015	.020
754	P-W	Supercharger Drive Shaft Gear & Supercharger Shaft Bearing	.0038L	.0050L	.008L
755	P-W	Supercharger Drive Shaftgear-End Clearance	.012L	.015L	.020L
756	P-W	Impeller & Supercharger Air Inlet Adapter-Clearance	.050L	.070L	
757	P-W	Intermediate Supercharger Drive Shaft Gear & Bushing	.004L	.0055L	.0075L
758	P-W	Acc. Hsg. & Intermediate Super. Drive Shaft Gear Bushing	.001T	.003T	(A)
759	P-W	Intermediate Supercharger Drive Gear & Bushing	.002L	.004L	.006L
760	P-W	Intermediate Super. Drive Gear Bushing & Accessory Housing	.001T	.003T	(A)
761	P-W	Intermediate Super. Dr. Shaftgear & Drive Gear-Spline Backlash	.000	.002L	.005L
762	P-W	Intermediate Supercharger Drive Gear-End Clearance	.011L	.024L	.030L
763	L-P-Q-R-V-W	Fuel Pump Drive Shaft Gear & Bushing	.001L	.004L	.006L
764	G	Dual Accessory Drive Gear & Dual Accessory Drive Adapter	.0013L	.0028L	.005L
765	S-T	AN Fuel Pump Idler Gear & Crankshaft Idler Gear-Backlash	.004	.015	.020
766	S-T	AN Fuel Pump Idler Gear & Fuel Pump Dr. Shaft Gear-Backlash	.004	.015	.020
767	S-T	AN Fuel Pump Idler Gear & Fuel Pump Idler Gear Shaft	.001L	.003L	.005L
768	T	AN Fuel Pump Idler Gear-End Clearance	.002L	.018L	.024L
	S	AN Fuel Pump Idler Gear-End Clearance	.010L	.045L	.055L
769	S-T	AN Fuel Pump Drive Shaftgear & Adapter	.001L	.0025L	.004L
770	T	AN Fuel Pump Drive Shaftgear-End Clearance	.009L	.063L	.073L
	S	AN Fuel Pump Drive Shaft Gear-End Clearance	.000	.054L	.064L
771	T	Hydraulic Pump Driven Gear & Crankshaft Idler Gear-Backlash	.004	.015	.020
772	T	Hydraulic Pump Driven Gear & Adapter	.001L	.0025L	.004L
773	T	Hydraulic Pump Driven Gear-End Clearance	.010L	.066L	.076L
774	E-F-H-K-M-N-P-Q-R-W F-H-K-M-P-T-W T	OD of Counterweight Roller OD of Counterweight Roller OD of Counterweight Roller	.5045 .6945 .6650	.5050 .6950 .6655	

REF.	CHART NUMBER	NOMENCLATURE	MIN.	MAX.	MAX. SERVICE ALLOW.
775	E-F-H-K-M-N-P-Q-R-T-W	ID of Counterweight Assy. Bushings Out of Round of Bushing ID	.7485	.7505	
776	W	Fuel Injector Idler Gear & Injector Drive Gear-Backlash	.004	.015	.020
777	W	Fuel Injector Dr. Idler Gear & Fuel Injector Idler Gear-Backlash	.004	.015	.020
778	W	Injector Drive Gear & Accessory Hsg. Cover	.0036L	.0048L	.006L
779	W	Injector Drive Gear-End Clear- ance	.002L	.020L	.030L
780	W	Injector Drive Gear & Fuel Injector Pump- Spline Backlash	.0005L	.0056L	.008L
781	W	Fuel Injector Idler Gear & Magnetos Idler Ball Bearing	.0005T	.0004L	(A)
782	W	Fuel Injector Idler Shaft & Magnetos Idler Ball Bearing	.0001T	.0005L	(A)
783	Y	Magnetos Gears & Magnetos Driven Shaftgear (Spur Gear End) Backlash	.004	.015	.020
784	Y	Magnetos Driven Shaftgear & Magnetos Case	.001L	.003L	.005L
785	Y	Acc. Dr. Shaftgear & Mag. Driven Shaftgear (Bevel Gear Ends) Backlash	.003	.005	.012
786	Y	Acc. Drive Shaftgear & Magnetos & Oil Pump Drive Support Assy.	.001L	.003L	.005L
787	Y	Mag. Driven Shaftgear & Mag. & Oil Pump Drive Support Assy.	.001L	.003L	.005L
788	Y	Crankshaft Gear & Acc. Drive Shaftgear-Spline Backlash	.002L	.005L	.015L
789	G	(Dual Drive) Accessory Driven Gear End Clearance	.000	.017L	.027L
790	G	(Dual Drive) Accessory Driven Gear & Acc. Idler Gear Backlash	.004	.015	.020
791	G	(Dual Drive) Accessory Idler Gear & Acc. Idler Gear Shaft	.001	.0036	.0056
792	G	(Dual Drive) Accessory Idler Gear & Dual Acc. Dr. Gear Backlash	.004	.015	.020
793	G	(Dual Drive) Accessory Dr. Gear & Dual Acc. Dr. Gear-Spline Backlash	.0013L	.0073L	.010L
794	G	(Dual Drive) Accessory Drive Gear End Clearance	.000	.054L	.074L
800	A-B-C-D-G-J-S-T-U-Y	Outer Valve Spring-Comp. Load at 1.30" (Wire Dia. .162)	82#	89#	79# Min.
	E-F-H-K-L-M-N-P-Q-R-V-W	Outer Valve Spring-Comp. Load at 1.46" (Wire Dia. .177)	103#	111#	100# Min.
801	A-B-C-D-G-J-S-T-U-Y	Auxiliary Valve Spring-Comp. Load at 1.17" (Wire Dia. .135)	61#	67#	58# Min.
	E-F-H-K-L-M-N-P-Q-R-V-W	Auxiliary Valve Spring-Comp. Load at 1.33" (Wire Dia. .142)	75#	83#	72# Min.
802	D	Main Oil Relief Valve Spring- Comp. Load at 1.47" (Wire Dia. .063)	17.8#	19.4#	17.5# Min.
	E-F-H-K-M	Main Oil Relief Valve Spring- Comp. Load at 1.44" (Wire Dia. .047)	8.35#	8.85#	8.20# Min.
	D	Auxiliary Oil Relief Valve Spring- Comp. Load at 1.47" (Wire Dia. .063)	17.8#	19.4#	17.5# Min.
	E-F-H-K-M	Oil By-Pass Valve Spring-Comp. Load at 1.44" (Wire Dia. .047)	7.15#	7.65#	7.00# Min.



REF.	CHART NUMBER	NOMENCLATURE	MIN. <sup>c</sup>	MAX.	MAX. SERVICE ALLOW.
806	D-E-F-K-M-N	Magneto Coupling Spring-Comp. Load at .603" (Wire Dia. .091)	20#	22#	19# Min.
807	A-B-C	Oil Relief Valve Spring-Comp. Load at 1.30" (Wire Dia. .054)	8.5#	9.5#	
	G-J-S-T-U-Y	Oil Relief Valve Spring-Comp. Load at 1.30" (Wire Dia. .054)	7.25#	7.75#	
810	L-N-P-Q-R-V-W	Check Valve Spring-Comp. Load at 1.03" (Wire Dia. .031)	.74#	.94#	69# Min.
811	B-C-G-J-S-T-U	Oil Cooler By-Pass Spring-Comp. Load at 1.93" (Wire Dia. .0465)	6.54#	6.92#	6.41# Min.
812	L-P-Q-R-V-W	Oil Pressure Relief Spring-Comp. Load at 1.66" (Wire Dia. .067)	15#	17#	14# Min.
813	N	Oil Relief Valve Spring-Comp. Load at 1.50" (Wire Dia. .071)	4.5#	5.5#	
814	P-W	Spring-Supercharger Drive Coupling-Comp. Load at 1.10" (Wire Dia. .148)	168#	184#	



# LYCOMING



## SERVICE BULLETIN

LYCOMING DIVISION



WILLIAMSPORT, PA., U.S.A.

DATE: December 23, 1960 Service Bulletin No. 278  
Approved by FAA

SUBJECT: Scintilla Service Bulletin No. 466 - Replacement of Magneto Capacitor.

MODELS AFFECTED: S-200 Series and S-600 Series Scintilla Magnets

TIME OF COMPLIANCE: Immediately - But Not Later Than February 1, 1961.

Scintilla Service Bulletin No. 466, reprinted as part of this Lycoming Service Bulletin, replaces the capacitors in the -200 Series and -600 Series magnets.

This new capacitor has a "spun-over" type connection on the center electrode. This new improved capacitor will be supplied at no charge, if requested BEFORE FEBRUARY 1, 1961. (Contact nearest Scintilla distributor.)

We recommend immediate compliance with this Scintilla Bulletin.

## AIRCRAFT

**Subject:** Replacement of Capacitors 10-163131 and 10-163369.

**Reason for Bulletin:** To advise of the availability of a new improved capacitor and to recommend immediate replacement of the older type.

**Equipment Affected:** All magnetos of the S-200 and S-600 Series with a serial number below 646612 and not having a yellow dot painted on the raised portion of the breaker cover.

### MAINTENANCE (SPARE) PARTS AFFECTED:

Replace present inventory of capacitors 10-163131 (S-200 magnetos) and 10-163369 (S-600 magnetos) with capacitors having the "spun-over" type connection on the center electrode, as shown in Figure 1. The part number of the new capacitor has not been changed.

### COMPLIANCE:

Immediately.

### DETAILED INSTRUCTIONS:

As shown in Figure 1, the capacitor terminal post is spun over the bronze spring thus increasing the mechanical strength. It is then soldered for better electrical conductivity. These new improved capacitors should be obtained and installed in your magnetos in accordance with the following arrangement:

- a) To obtain your new improved capacitor, contact Scintilla Division, The Bendix Corporation, Service Department, Sidney, New York. The following information must accompany your request for capacitors:

1. Airplane Make & Type & Serial Number

2. Engine Make & Type & Serial Number

3. Magneto Type & Serial Number

- b) New improved capacitors will be supplied at no charge if requested prior to February 1, 1961.
- c) The procedure for installing the new improved capacitors is as follows:
1. If magneto is installed in an aircraft, remove the switch and retard connections from the breaker cover.

### WARNING

The magneto is in a "switch on" condition when the switch wire is disconnected; therefore the usual precautions used when working around a "live" engine must be strictly observed.

2. Remove the four screws and washers securing the breaker cover to the magneto.
3. Disengage the "FAST-ON" terminals of the capacitor and retard leads from the spade terminal at the main and retard

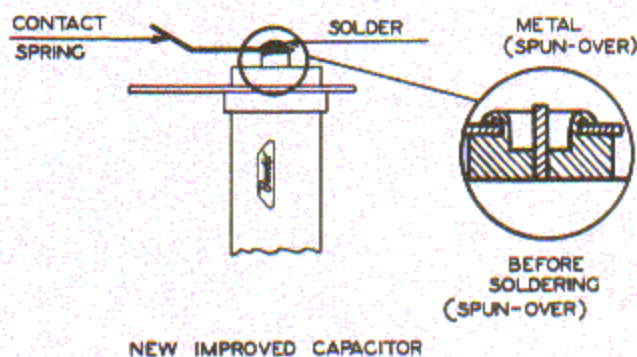
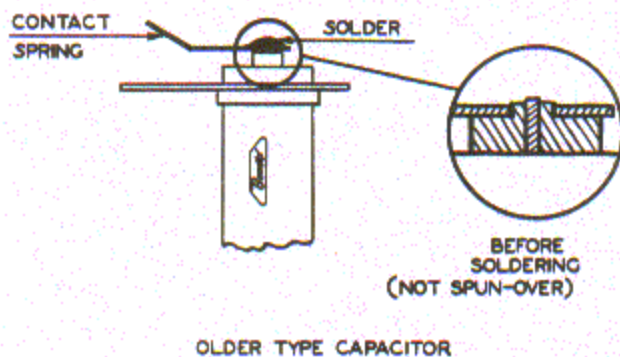


Figure 1



breaker positions. (Retard breaker may or may not be present depending upon magneto specification.) Pull the terminal straight off its lug. Do not exert pressure which will bend or turn the breaker spade terminal.

4. With the breaker cover removed from the magneto, remove the two screws and lockwashers holding the capacitor to the cover.
5. Install the replacement capacitor in the cover and tighten the securing screws.
6. For magnetos with clockwise rotation, form the leads in the breaker compartment as follows: (See A Figure 2.)
  - a. Form primary lead along the side of housing, between main breaker terminals and connect it to main breaker.
  - b. Capacitor lead should be placed along edge of housing and connected to other terminal of main breaker.
  - c. Retard lead should be placed between capacitor and housing, looped over and connected to retard terminal.

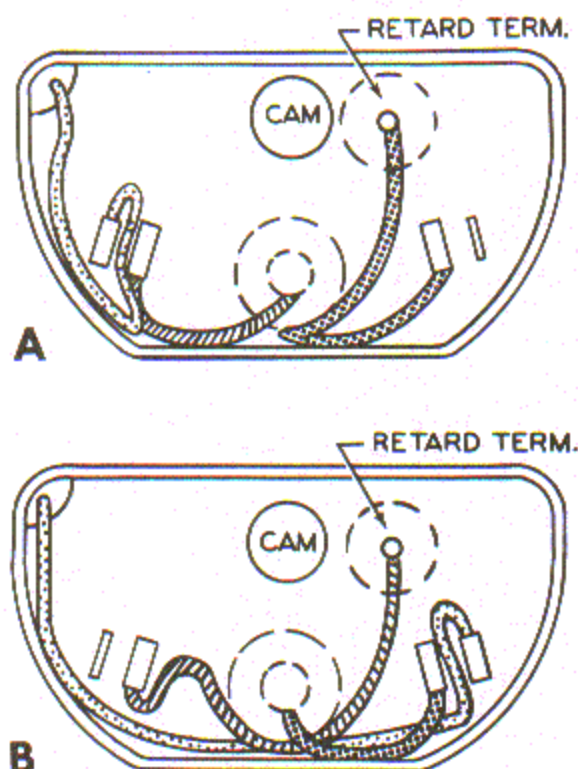


Figure 2

7. For magneto with counter-clockwise rotation, form the leads in the breaker compartment as follows: (See B Figure 2.)

- a. Place primary lead along edge of housing, between housing and capacitor, between main breaker terminals and connect it to main breaker.
- b. Capacitor lead should be placed along edge of housing and connected to other main breaker terminal.
- c. Retard lead should be placed between capacitor and housing and connected to retard terminal.

#### NOTE

When connecting terminals, observe the same precautions as to bending as in step 3.

8. When leads have been positioned as in steps 6 and 7, carefully mate the breaker cover with the main housing. As the cover is brought into mating position, the primary lead and capacitor leads should fold into the housing and cover recesses without danger of pinching between the mating surfaces.
9. Secure the cover to the housing with the four screws and washers. Install the switch and retard connectors in their proper positions.
10. Identify magnetos with new capacitors by painting a  $\frac{1}{4}$ " yellow dot on the round raised portion in the center of the breaker cover, see figure 3.

An engine log book entry is also recommended to indicate compliance with this bulletin.

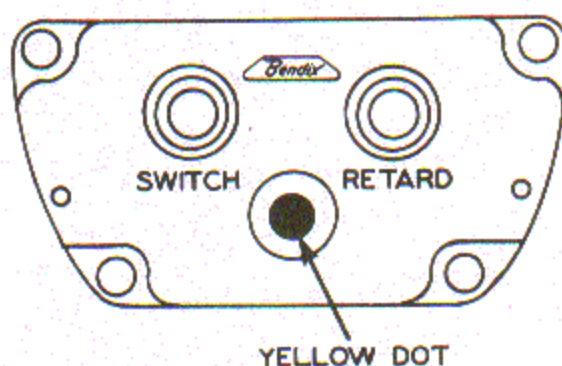


Figure 3

#### SPECIAL TOOLS REQUIRED:

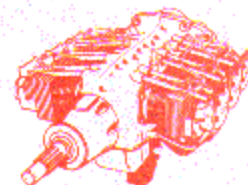
None

#### WEIGHT CHANGE:

None



# LYCOMING



## SERVICE BULLETIN

LYCOMING DIVISION



WILLIAMSPORT, PA., U.S.A.

DATE: January 6, 1961 Service Bulletin No. 279  
Approved by FAA

SUBJECT: Procedure for Cleaning Fuel Injection Nozzles

MODELS AFFECTED: IO-540 Series and IGO-540 Series Lycoming Aircraft Engines

TIME OF COMPLIANCE: As Required

Reports from the field have shown that foreign matter can become lodged in the fuel nozzles installed in the cylinders of subject engines. This condition is indicated by a "rough engine", cold cylinder or unusually high fuel flow reading on the cockpit gage.

When any of these symptoms are encountered, remove the fuel nozzles from the cylinders and blow out with compressed air in the direction opposite that of fuel flow.

### NOTE

When replacing nozzles, make certain the number "12" stamped on the hex of the nozzle is at the bottom. This will put the air bleed hole at the top.



# LYCOMING



## SERVICE BULLETIN

LYCOMING DIVISION



WILLIAMSPORT, PA., U.S.A.

DATE: January 27, 1961  
SUBJECT: Modification of Fuel Injection Lines  
MODELS AFFECTED: IO-540-B Series Lycoming Aircraft Engines  
TIME OF COMPLIANCE: Immediately

Service Bulletin No. 280  
Approved by FAA

Reports from the field have shown there is a possibility of damage to the fuel injection lines on subject engines, if the clamps which secure the lines to the intake pipes are not properly secured.

It is recommended the following inspection and modification be made immediately:

- Loosen and discard all present clamps, Lyc. P/N 73020.
- Inspect the plastic sleeve (Lyc. P/N 71811) for signs of wear. This part may be reused if in good condition. If the sleeve is damaged or worn but the fuel line is in good condition, replace the sleeve. To remove and replace worn sleeves cut the plastic lengthwise. (Figure 2.)
- Inspect all fuel injection lines for signs of damage. Slide the sleeve up or down the line and carefully inspect the area that was covered by the sleeve. Replace all lines that show signs of damage or wear.
- Assemble one AN735-26 clamp around the intake pipe in the same position the replaced 73020 clamp occupied.
- Place the 62254 clamp over the 71811 plastic sleeve on the fuel line. The fuel line must run straight through the clamp, and where possible there should be 1/2" of straight tubing on each side of the retaining clamp AN735-26.
- Assemble the bolt, washers and nuts as shown in figure 1.

This completes the modification and no further inspection of the fuel lines is required.

### PARTS REQUIRED FOR MODIFICATION (For Each Fuel Injection Line)

Lyc. P/N	Nomenclature	No. Required
62254	Clip, Cushion Type	1 Per line
71811	Sleeve, Injection Line	1 Per line
STD-28	Washer, Plain	2 Per line
STD-670	Nut, Self Locking	1 Per line
STD-969	Screw, Fillister Head	1 Per line
AN735-26	Clamp	1 Per line

### CAUTION

Do not put back in service any fuel injection lines that show wear. If allowed to continue in service wear, indentations can progress to the point where fuel leakage will occur.

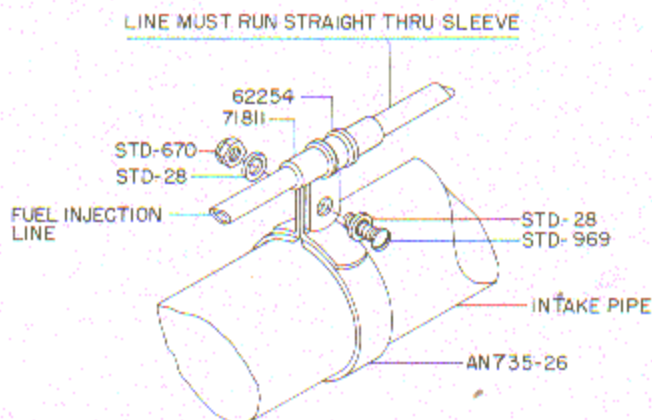


Figure 1. Method of Assembling New Parts.

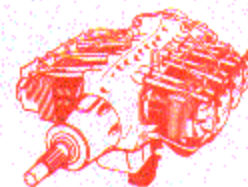


Figure 2. If split sleeve is used, locate split approximately 180° from gap in clamp, as shown.





# LYCOMING



## SERVICE BULLETIN

LYCOMING DIVISION



WILLIAMSPORT, PA., U.S.A.

DATE: May 5, 1961 Service Bulletin No. 281  
Approved by FAA

SUBJECT: Modification or Replacement of Oil Dip Stick

MODELS AFFECTED: The Following Lycoming Aircraft Engines: O-540-A Series (Aero Commander), O-540-A Series (Piper), O-540-F Series (Omega) and IO-540-B Series (Aero Commander)

TIME OF COMPLIANCE: Within the Next 50 Hours

Service experience has shown that on earlier model listed engines, there is a possibility of incorrectly inserting the oil dip stick in the crankcase. When incorrectly inserted, the crankshaft will break off the dip stick and cause severe engine damage.

To correct this condition, the factory recommends modifying the dip stick to incorporate an aluminum collar. This modification can be performed in the field by using 3/4 inch diameter AMS4118 aluminum bar stock or equivalent. Machine collar as shown in figure 1. Assemble collar on dip stick to dimension "A". Using 1/16 inch drill, drill through dip stick, and remaining half of the collar. Dimension "A" is defined for the below identified aircraft as follows:

Engine Model	Dimension - A	Aircraft	Part to be Serviced	Service Part No.
O-540-A	5.00 inch	Aero Commander	72984, 73120	72984-1, 73120-1
O-540-A	3.25 inch	Piper	72043	72043-1
O-540-F	3.25 inch	Omega	72043	72043-1
IO-540-B	5.00 inch	Aero Commander	72892, 72859	72892-1, 72859-1

To finish modification, cut a pin from .063 #52 drill rod .72 inch long. Press pin in 1/16 inch drilled hole in collar and dip stick, and peen the pin on both ends. Lycoming part numbers to be serviced in this manner are listed in above table opposite their respective engine model numbers. Service part numbers which incorporate the modification are listed opposite the original part numbers for easy identification.

The serial effectivity of Lycoming engine models which require this oil dip stick modification is listed in the following table.

Engine Model	Serial Effectivity
O-540	Engines with Serial Numbers Lower Than: 3683-40
IO-540	Engines with Serial Numbers Lower Than: 176-48

O-540 engines with serial numbers of 3683-40 and up and IO-540 engines with serial numbers of 176-48 and up incorporate a revised crankcase and will not require this modification.

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Lycoming will maintain a limited stock of the modified dip sticks for those customers who prefer to purchase the assembly rather than modify their present dip stick. Price of modified dip stick assembly is the same as for standard part listed in current Lycoming Parts Price listing.

NOTE

All Aero Commander owners with O-540-A2B engines must comply with Lycoming Service Bulletin No. 275A prior to incorporating above modification.

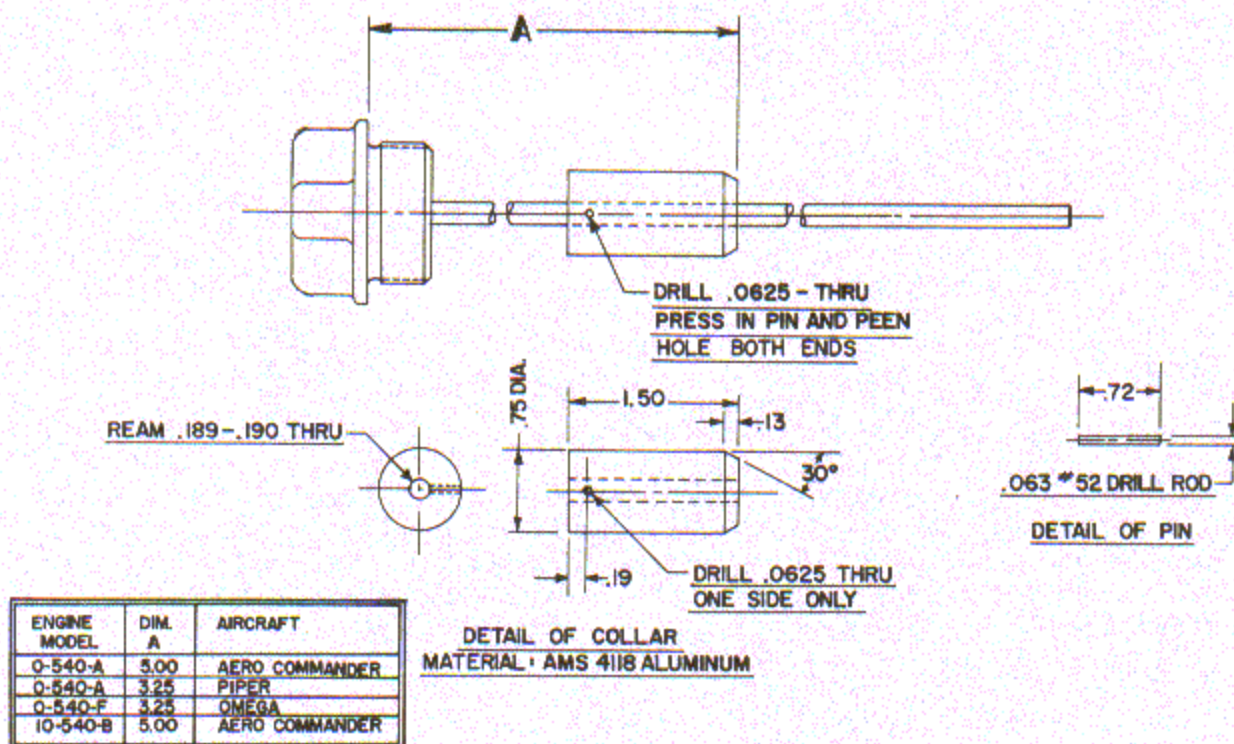
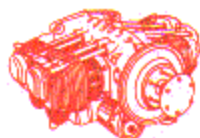


Figure 1. Oil Dip Stick Modification Dimensions



# LYCOMING



## SERVICE BULLETIN

LYCOMING DIVISION



WILLIAMSPORT, PA., U.S.A.

DATE: February 9, 1962 Service Bulletin No. 285  
Approved by FAA

SUBJECT: Replacement of AC-SR87 Spark Plugs

MODELS AFFECTED: All Lycoming IO-540-B1A5 Aircraft Engines

TIME OF COMPLIANCE: Recommended Immediately - Required Within Next 25 Hours of Engine Operation

Service experience with the AC-SR87 spark plug has not proven entirely satisfactory in the IO-540-B1A5 engine. Although this plug has given long and satisfactory service life in other model engines, when installed in the IO-540-B1A5, the insulator tips have a tendency to crack causing pre-ignition.

It is recommended that all owners of Aero Commander 500-B aircraft remove the subject plugs as soon as possible, but not later than the next 25 hours of operation. Listed below are the current approved plugs for the IO-540-B1A5.

5/8-24 Terminal Shielded

All Weather 3/4-20 Terminal Shielded

AC  
Auto Lite  
BG  
Champion

SR83P or S86R  
PH26 or SH26  
RB485S  
REM38P or REM38E

HSR83P or HSR86  
PH260 or SH260  
RB955S  
RHM38P or RHM38E

### NOTE

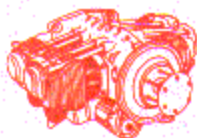
When installing spark plugs, the factory recommends a tightening torque of 360 to 420 inch pounds as specified in Service Instruction No. 1042.

PARTS REQUIRED: See Above Listing of Plugs

SPECIAL TOOLS REQUIRED: Standard Aircraft Spark Plug Tools

WEIGHT CHANGE: Not Affected





# LYCOMING



## SERVICE BULLETIN

LYCOMING DIVISION



WILLIAMSPORT, PA., U.S.A.

DATE: June 15, 1962 Service Bulletin No. 288  
Approved by FAA

SUBJECT: Maintenance Recommendations for Servo Bleed Screen Incorporated in Bendix RS10 Series Fuel Injection Systems

MODELS AFFECTED: Lycoming IO-540-B1A5, IGO-540-B1A and IGO-540-B1B Aircraft Engines

TIME OF COMPLIANCE: Every 25 Hours until all Foreign Material is Cleansed from the Fuel System, and Every 100 Hour Inspection Thereafter.

Service experience has shown that the screen protecting the servo bleed may become plugged if lint and foreign material are present in the aircraft fuel system.

All RS10 Series Bendix injection systems on the above listed engine models incorporate a screen in the "T" fitting to the distributor to protect the servo vent line orifice (Figure 1). If this screen becomes restricted due to accumulation of foreign matter, the injection system will "go rich". If the orifice in the vent line side of the "T" should become restricted, the system will "go lean". The factory recommends this screen be inspected and cleaned immediately and every twenty-five hours thereafter, until inspection reveals the fuel system has been cleansed of all fuel tank lint and foreign material. If the injection system "goes rich", however, the screen must be cleaned before the next flight.

**CLEANING PROCEDURE** - To clean this screen, do not remove the "T" fitting from the distributor. Disconnect the fuel lines and blow compressed air (20 psi maximum) in the direction opposite fuel flow (from the orifice or fuel return vent side, toward the fuel inlet side). Hold one hand over the fuel inlet side opening in case the screen should become dislodged. Constant removal and replacement of the "T" fitting will destroy the pipe threads.

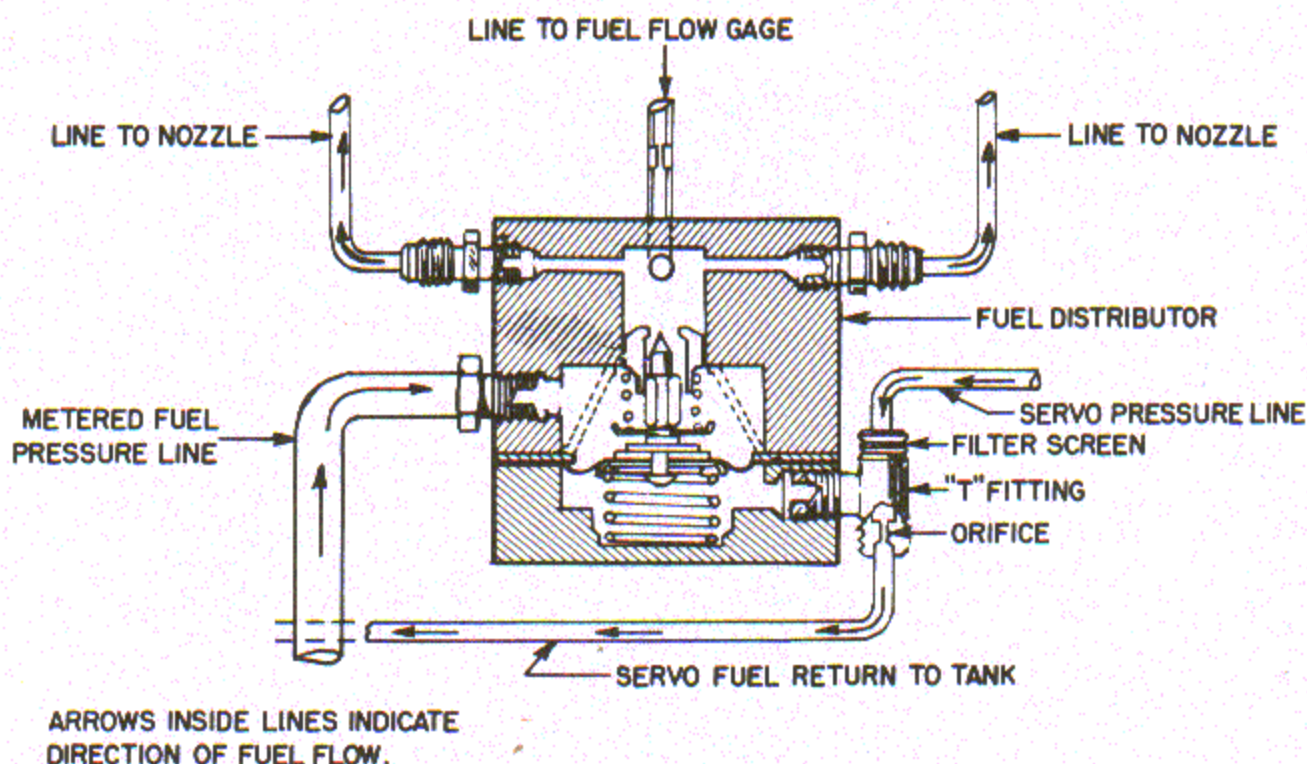


Figure 1. Schematic of Fuel Distributor Section