

**WEST BEND
"L" SERIES
INDUSTRIAL ENGINE
SERVICE MANUAL**

INTRODUCTION

This service manual covers the repair and disassembly of West Bend Power Bee Engines of the loop scavenge design.

The following publications should be used to supplement the information contained in this manual:

Eng. #	Description	Model
168	Parts Book	61001, 61002, 82001, 82002
178	" "	61006
179	" "	61010, 82010
184	" "	82004, 82012
186	" "	61012
185	" "	82005
182	" "	82006
177	" "	82008

Extra copies of the above booklets are available from the factory. Specify the book number when ordering additional copies.

If problems are encountered which are not specifically covered in this manual, further information can be obtained by writing to the West Bend Company, Field Service Department, Hartford, Wisconsin.

In section 5, a trouble check list has been provided to assist in diagnosing engine failures and to aid in locating the section of the manual which pertains specifically to the problem. To use the check list, read down the left hand column and locate the problem which most closely resembles that which has been found in the engine—then proceed according to the instructions given in the right hand column.

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GENERAL SPECIFICATIONS

<u>Model</u>	<u>Hd. Gasket</u>	<u>H.P.</u>	<u>R.P.M.*</u>	<u>*Rotation</u>	<u>Application</u>	<u>Equipment</u>
61001	.032	7.5	8000	CCW	Chain Saw	
61002	.032	7.5	8000	CW	Karts	
61006	.062	7.0	8000	CW	Chain Saw	Lancaster Pump and Mfg. Co., Lancaster, Pa.
61010	.062	7.0	8000	CW	Chain Saw	Montgomery Ward & Co.
61012	.020	7.5	8000	CW	Karts	
82001	.032	10.0	8000	CCW		
82002	.032	10.0	8000	CW	Karts, cycles, earth drills	
82004	.062	8.0	7000	CW	Snowmobile	
82005	.062	8.0	7000	CCW	Jet Boats	Berkeley Pump, Berkeley, California
82006	.062	8.0	7000	CW	Chain Saw	Whitehead Chain Saw Co., Atlanta, Ga.
82008	.125	7.5	6000	CW	Chain Saw	Whitehead Chain Saw Co., Atlanta, Ga.
					Chain Saw	Lancaster Pump and Mfg. Co., Lancaster, Pa.
82010	.125	7.0	6000	CW	Chain Saw	Montgomery Ward & Co.
**82012	.062	8.0	7000	CW	Snowmobile	

* Rotation as viewed from drive end.

** Governed engine.

ENGINE SPECIFICATIONS

<u>Model</u>	<u>Bore & Stroke</u>	<u>Cu. In. Disp.</u>	<u>Crankshaft Thread Size</u>	<u>Compression Hot (approx.)</u>	<u>Cold</u>	<u>Compression Ratio (approx.)</u>	<u>Spark Plug</u>
61001	2.187 x 1.62	6.1	7/16-20 R.H.	170- 185	190- 210	10.5:1	L4J, AC42FF
61002	"	"	L.H.	175	195	10.5:1	"
61006	"	"	L.H.	150	170	8.3:1	"
61010	"	"	L.H.	150	170	8.3:1	"
61012	"	"	L.H.	175	195	10.5:1	"
82001	2.531 x 1.62	8.2	R.H.	175	195	10:1	"
82002	"	"	L.H.	175	195	10:1	"
82004	"	"	L.H.	145	165	8.1:1	"
82005	"	"	R.H.	145	165	8.1:1	"
82006	"	"	L.H.	145	165	8.1:1	"
82008	"	"	L.H.	110	130	6.5:1	"
82010	"	"	L.H.	110	130	"	"
82012	"	"	L.H.	145	165	8.1:1	L85, AC44F

STARTER

The starter used on West Bend Industrial Engines is a Fairbanks-Morse, reversible left or right hand operation automatic rewind starter. Figure 1 shows an exploded view of this starter.

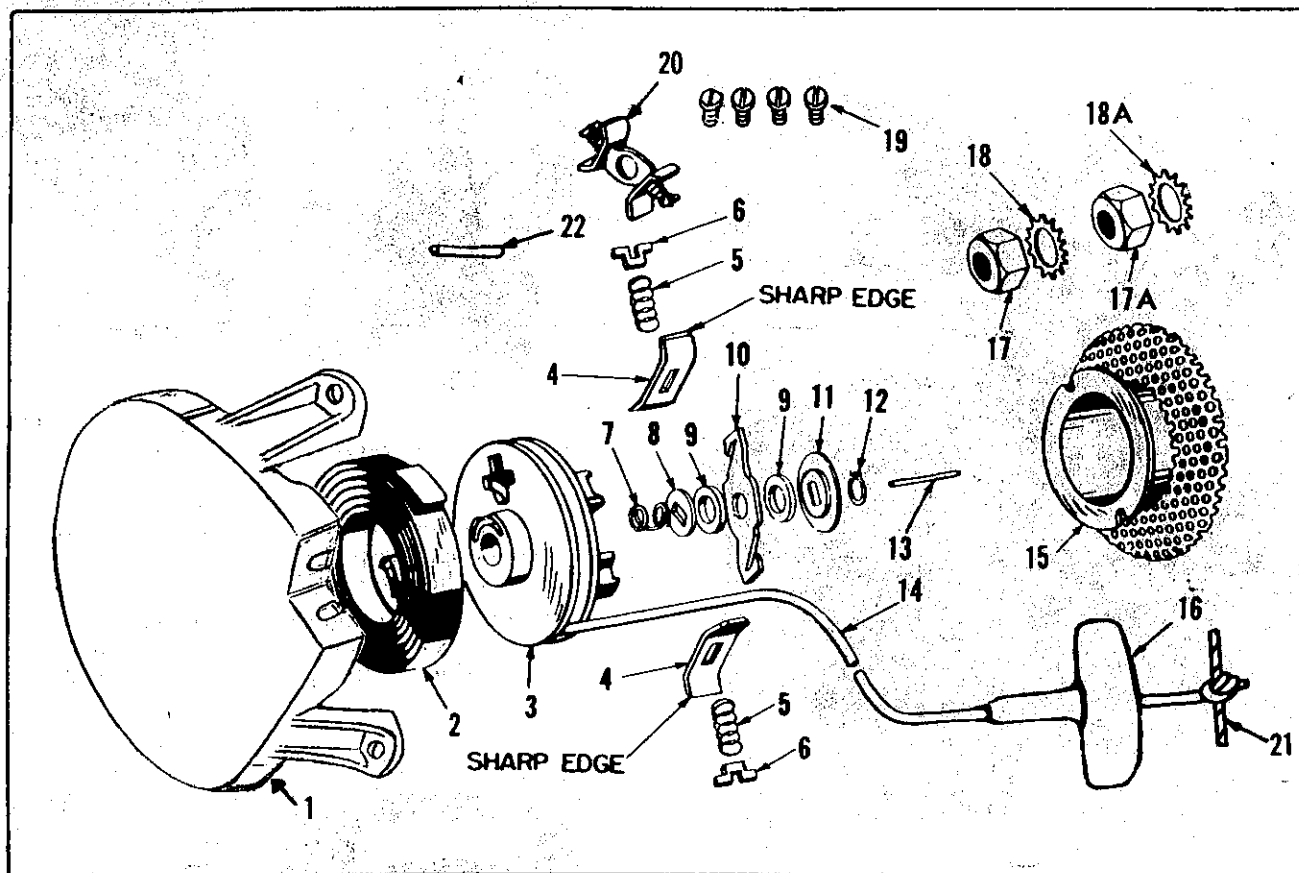


FIGURE 1. EXPLODED VIEW OF REWIND STARTER

PARTS LIST FOR REWIND STARTER

ILLUS. NO.	QTY.	DESCRIPTION
1	1	Cover
2	1	Rewind spring
3	1	Rotor
4	2	Friction shoe plate
5	2	Friction shoe spring
6	2	Spring retainer plate
7	1	Brake spring
8	1	Brake washer
9	2	Fiber washer
10	1	Brake lever
11	1	Brake retainer washer
12	1	Retainer ring
13	1	Centering pin
14	1	Cord
15	1	Cup and screen
16	1	T-handle
17	1	L.H. thick hex nut
17A	1	R.H. thick hex nut
18	1	Ext. tooth lockwasher (left hand)
18A	1	Ext. tooth lockwasher (right hand)
19	4	Pan hd. screw w/int.-ext. tooth lockwasher
20	1	Friction shoe assembly, includes: Items 4, 5, 6 and 10
21	1	Spiral pin
22	1	Roll pin

REWIND SPRING, ROPE OR FRICTION SHOE PLATE REPLACEMENT

1. Remove screws holding starter to fan housing.
2. Remove starter from engine as shown in Fig. 2.

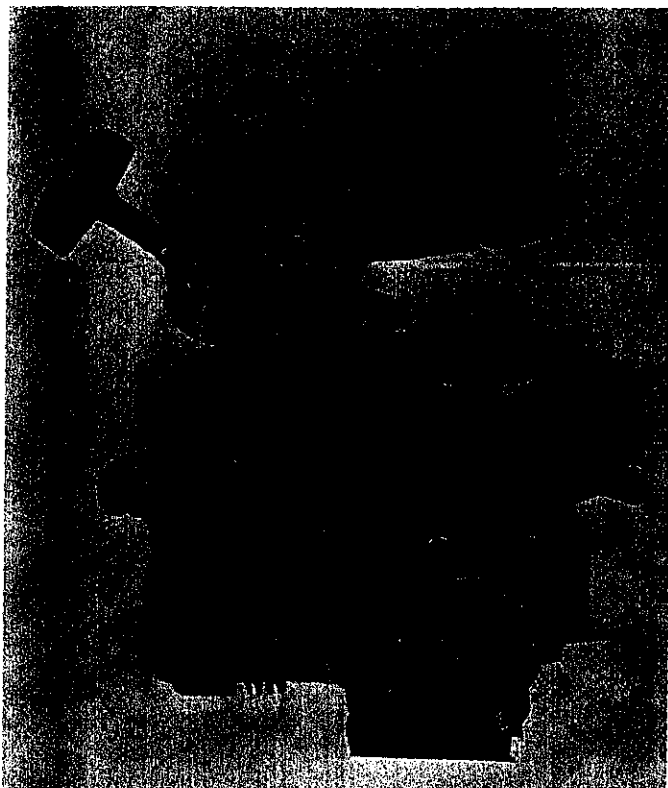


FIGURE 2. REMOVING STARTER

3. Remove snap ring from starter hub using T1081 pliers as shown in Fig. 3, being careful not to damage snap ring. Hold the retaining washer in place when removing snap ring to avoid losing the friction shoe and spring components.

4. Remove friction shoes as an assembly. If ends of shoes are worn and dull, they should be replaced. **IMPORTANT:** When reassembling friction shoes, the sharp edges of the shoes must contact the starter cup when the starter rope is pulled.

5. If starter rope or spring is to be replaced, continue with disassembly. Remove starter handle by untying knot in rope and allow rope to rewind on pulley. See Fig. 4.

6. Remove pulley from starter cover as shown in Fig. 5. Unwind rope from pulley.

7. Remove damaged rope from pulley. Tie a knot in end of new rope and install to pulley. Pull the knot firmly into the recess to prevent interference. See Fig. 5.

8. Wind rope around pulley until about 6 to 8 inches remain unwound.

NOTE: Wind rope in direction desired for left or right hand starter operation. Engage this end of the rope with the notch in the pulley shown in Fig. 6. This will allow the pulley to clear the edge of the starter cover and still permit the rope to be held while establishing initial tension.

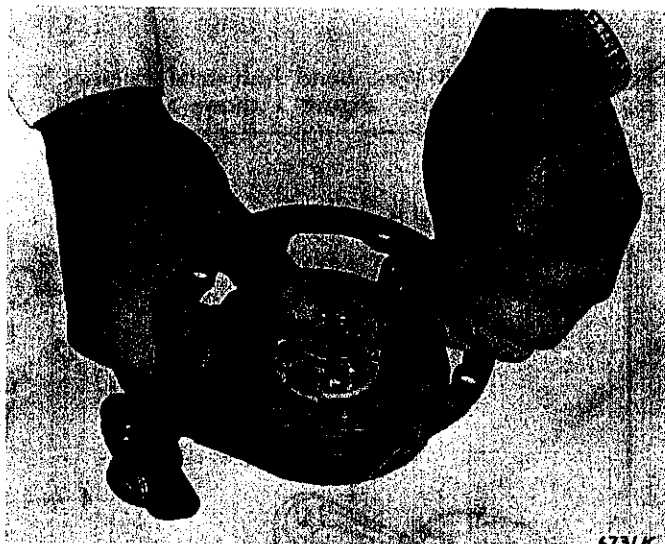


FIGURE 3. REMOVING RETAINING RING

9. Holding the end of the rope tightly to prevent it from unwinding, grasp the bosses on the pulley and insert it over the centering pin and hub in the cover.

10. Rotate the pulley slightly while pressing down until the end of the rewind spring is engaged with the notch in the underside of the pulley. See notch shown in Fig. 6.



FIGURE 4. REMOVING STARTER ROPE

11. Holding rope and pulley in position, assemble the brake spring, washers and brake lever assembly to the starter hub.

12. Install the snap ring, making sure that the ring is securely engaged in its groove.

13. Hold rope in notch in pulley and turn pulley approximately 4 turns in a counter-clockwise direction for right hand starters. For left hand starters turn pulley in a clockwise direction. This will establish the correct initial tension. For reference purposes, Fig. 3 shows a right hand starter assembly.

14. Hold the pulley to prevent rope from rewinding and pull the end of the rope out through the slot in the cover.

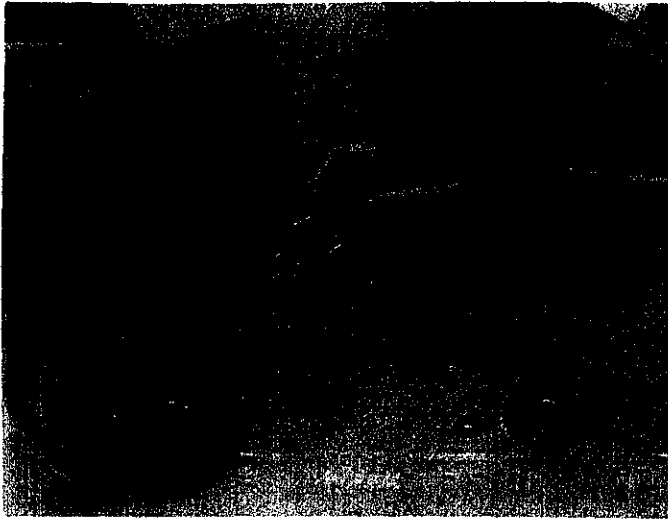


FIGURE 5. INSTALLING NEW STARTER ROPE



FIGURE 6. INSTALLING PULLEY IN COVER

INSTALLING STARTER SPRING

To install a new starter spring, follow steps 1 through 7 outlined above, then:

15. Remove damaged spring from cover.
16. Engage anchor loop of spring over pin in cover. For right hand starters, install spring so that the outside coil of the spring passes to the left in a counter-clockwise direction from the anchor pin. For left hand starters, install spring so that outside coil passes to right from anchor pin.

NOTE: Replacement springs have a heavy wire clip to hold the spring in a coiled position. Place spring and clip in position in cover and push spring down through clip and into recess in cover.

17. After installing new spring, continue with reassembly by observing steps 9 through 14.

18. Install starter to engine. **NOTE:** Before assembling starter to engine, pull the centering pin, 13, Fig. 1, part way out of the starter hub with a pair of pliers. Use

care to avoid bending the pin. The purpose of this pin is to center the starter over the starter cup so that the friction shoe plates 4, Fig. 1, will contact the starter cup evenly and firmly. If the starter is not centered, slippage and wear will occur.

19. Install and tighten mounting screws.

CARBURETOR

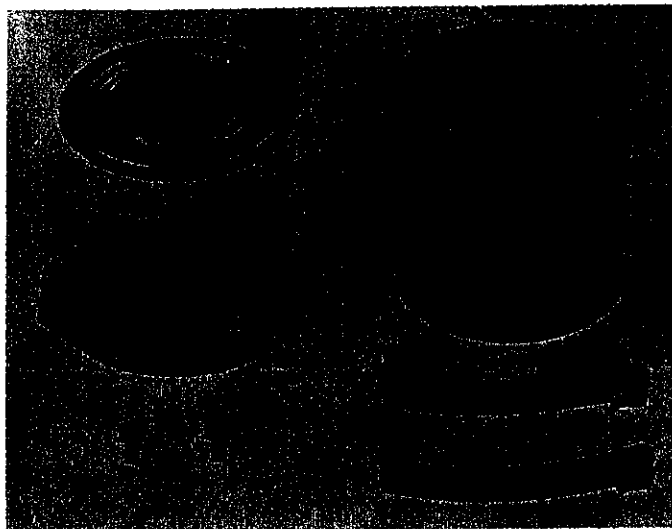


FIGURE 1. AIR CLEANER KIT

AIR CLEANER

Several types of air cleaner kits are available for engines not previously equipped with an air cleaner. Kit number 3181-1 shown in Fig. 1 uses a paper element filter, often referred to as a "Skinner" element.

NOTE: It is extremely important that all types of cleaners be serviced regularly to prevent their becoming clogged with dirt and damaging the engine. To clean the above element, remove and rinse in clean gasoline. Allow to dry before reinstalling.

CARBURETOR

The carburetor used on "L" Series West Bend Engines is the "HL" type which incorporates the use of an integral fuel pump. See Fig. 2.

Figure 2 shows an exploded view of the "HL" type carburetor. The "HL" carburetor has a drilled passage which transmits crankcase pressure directly to the fuel pump, eliminating the need for an external fuel line or pump. The diaphragm, 31, Fig. 2, controls the amount of fuel permitted to enter past the inlet needle.

DISASSEMBLY

1. Remove carburetor from engine.
2. Remove the six body screws, 34, Fig. 2, strainer cover screw, 35, Fig. 2, and separate the diaphragms, gaskets and body from the top half of the carburetor.
3. Inspect the diaphragms and gaskets. If the flapper valves on the fuel pump diaphragm, 40, Fig. 2, are worn or the body diaphragm, 31, Fig. 2, is distended or excessively flexible, install new diaphragms.
4. Remove and inspect the inlet control lever, 14, Fig. 2, for signs of wear from contact with the inlet needle and the diaphragm. Replace if necessary. Wear of the inlet control lever will permit an excessive amount of fuel to enter the engine, causing poor operation at low speeds,

rough idle and high fuel consumption at high speeds. Spark plug fouling and carbon formation will also result.

NOTE: Care must be taken to avoid bending the inlet control lever when installing as this will also change the rate of fuel flow.

5. Remove and inspect inlet needle and seat. If further cleaning of carburetor is indicated, remove idle and high speed needles. Blow out all air passages with compressed air. Do not use a drill or wire. Clean strainer screen, 38, Fig. 2.

REASSEMBLY

1. Install idle and high speed needles, inlet needle and seat. Refer to Fig. 2 for correct assembly.
2. Assemble inlet control lever and pinion screw.
3. Assemble fuel pump diaphragms and gaskets in the order shown. Use care when assembling to avoid wrinkling diaphragms. Tighten body screws evenly.
4. Install strainer screw, cover and attaching screw.
5. Install carburetor to engine and connect throttle linkage. The average idle needle and high speed needle adjustment is approximately one turn open. These adjustments may vary slightly. Refer to Section 5 for detailed information on correct carburetor adjustment.

ILLUS. NO.	QTY.	DESCRIPTION
1	1	Carburetor gasket
2	1	Throttle shutter
3		Order complete carburetor
4	1	Throttle shaft slip
5	1	Clip lockwasher
6	1	Clip retaining screw
7	1	Choke shaft and lever
8	1	Choke shutter
9	4	Shutter screw
10	1	Choke friction pin
11	1	Choke friction spring
12	1	Inlet seat gasket
13	1	Inlet needle, seat and gasket
14	1	Inlet control lever
15	1	Inlet tension spring
16	1	Nozzle check valve
17	1	Welch plug
18	1	Drain screw
19	1	Throttle shaft return spring
20	2	Adjustment screw packing
21	2	Adjustment screw washer
22	2	Adjustment screw spring
23	1	Control lever pinion screw
24	1	Throttle shaft and lever
25	1	Idle adjustment screw
26	1	Main adjustment screw
27	1	Gasket set
28	1	Idle speed regulating screw
29	1	Idle speed regulating screw spring
30	1	Diaphragm gasket
31	1	Diaphragm
32	1	Diaphragm cover
33	1	Repair parts kit
34	6	Body screw and lockwasher
35	1	Strainer cover screw
36	1	Strainer cover
37	1	Strainer cover gasket
38	1	Strainer screen
39	1	Fuel pump body
40	1	Fuel pump diaphragm
41	1	Fuel pump gasket
	1	Throttle shaft arm (not shown)

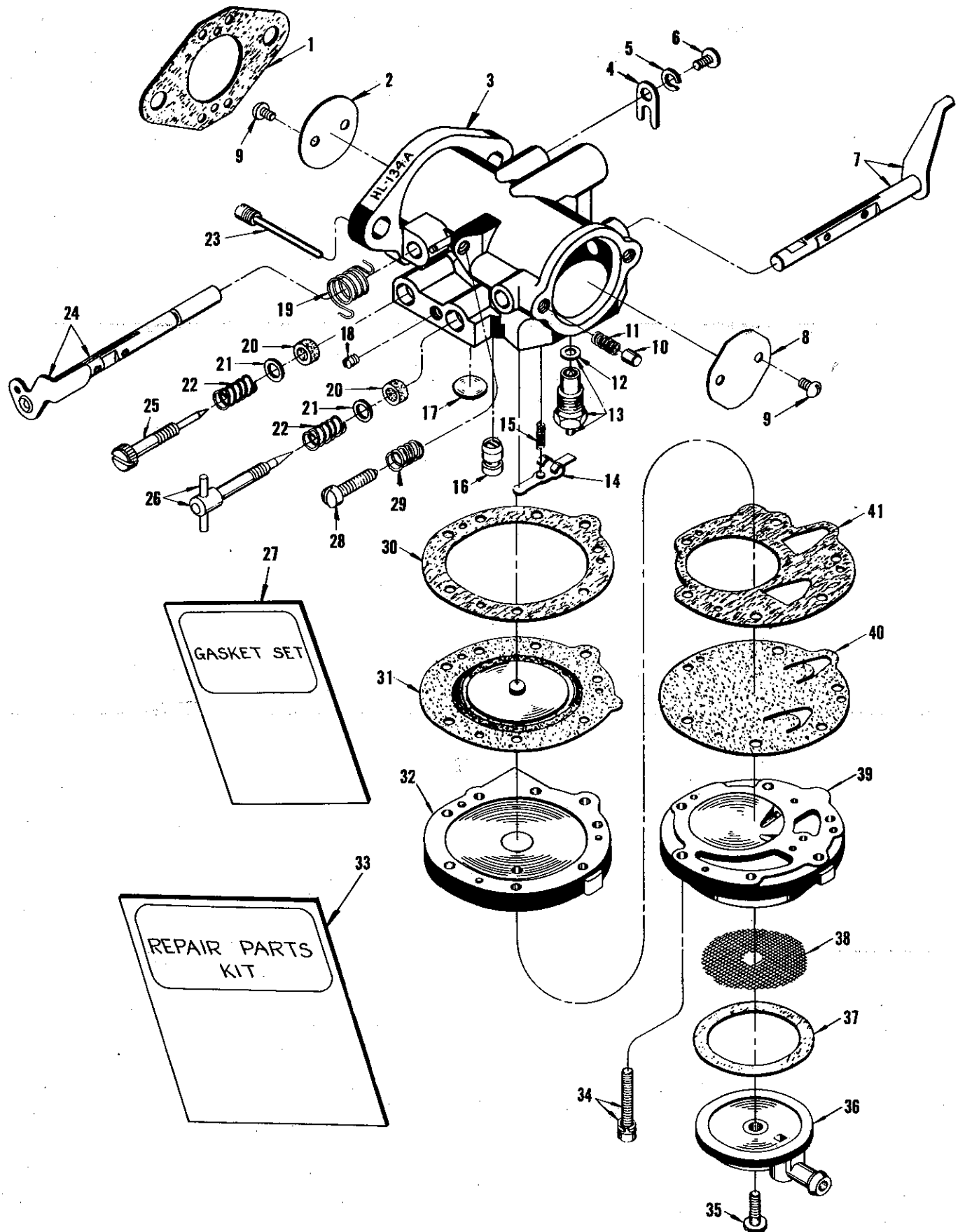


FIGURE 2. EXPLODED VIEW OF HL CARBURETOR

PARTS LIST AND INSTALLATION INSTRUCTIONS MODEL 3281-1 L - SERIES SIDE MANIFOLD KIT

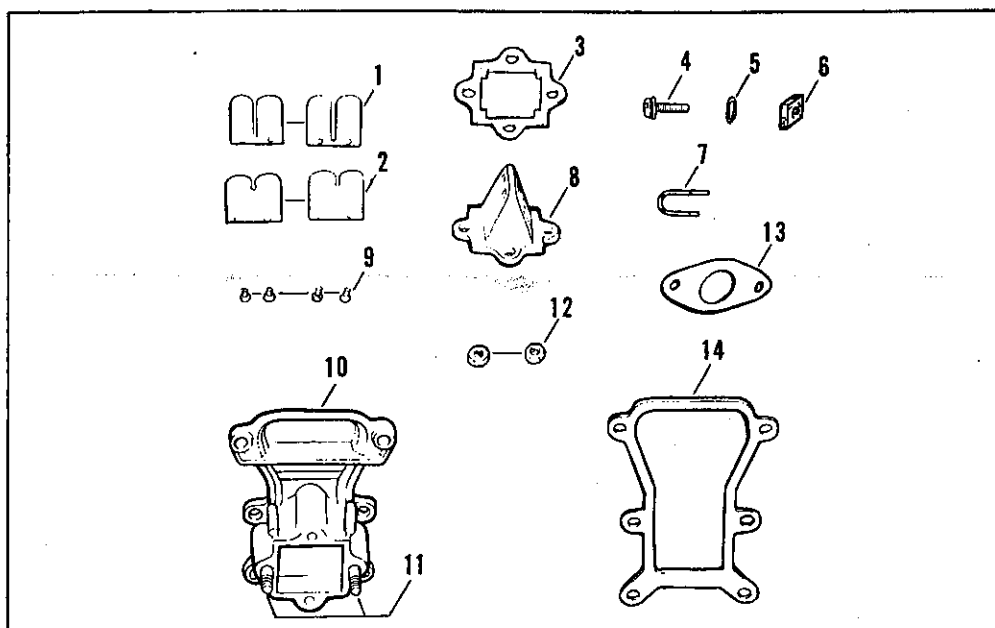


FIGURE 1

PARTS LIST

ILLUS. NO.	PART NO.	QTY.	DESCRIPTION
1	31160	2	Reed
2	31161	2	Reed stop
3	31168	1	Manifold gasket
4	10-24 x 5/8	1	Fill. hd. screw w/lockwasher
5	8018	1	Plain washer
6	10-24	1	Square nut
7	A2770589	1	Throttle shaft arm includes: Items 4, 5, 6, 7
8	A31158-1	1	Reed plate
9	6-32 x 1/4	4	Rnd. hd. screw w/lockwasher
10	A175157	1	Manifold
11	27209	2	Stud
12	1/4-20	2	Hex nut
13	2775906-3	1	Carburetor gasket
14	175223	1	Transfer port cover gasket

INSTALLATION INSTRUCTIONS

1. Remove transfer port cover and gasket from engine and install new gasket and manifold. Tighten screws securely.
2. Install the carburetor manifold gasket and reed plate assembly to manifold.
3. Install the carburetor gasket, making sure that the impulse hole in the gasket lines up with the hole in the reed plate.
4. Install the carburetor (not furnished with kit) to the manifold. Make sure the impulse holes are lined up. If necessary, reverse the position of the reed plate and carburetor gasket.
5. Install carburetor hex nuts and tighten securely.
6. Install the throttle shaft arm to the throttle shaft in the position desired and tighten screw. Connect the arm to the throttle linkage as desired, either for progressive or simultaneous throttle opening.

MAGNETO

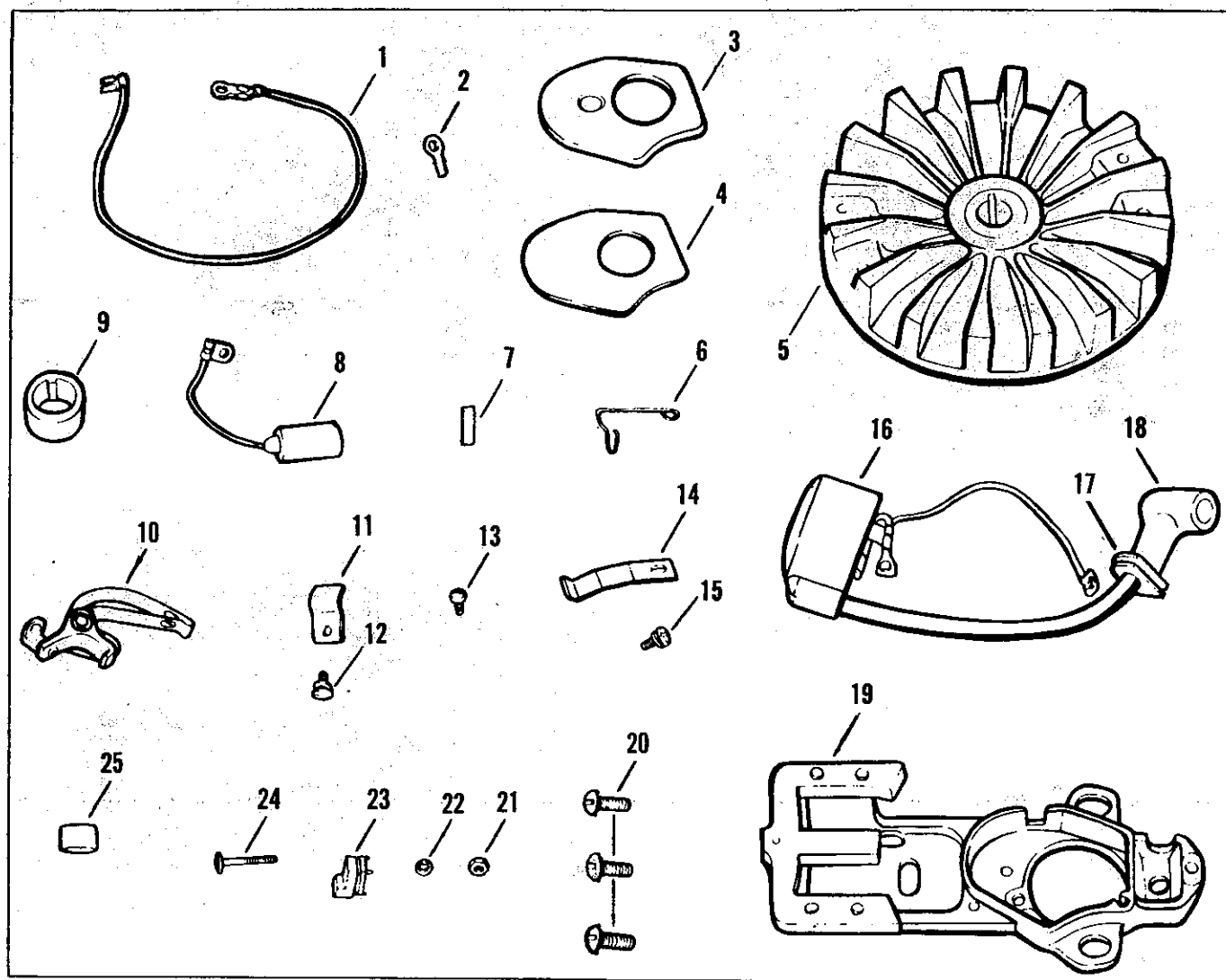


FIGURE 1. EXPLODED VIEW OF MAGNETO

ILLUS. NO.	QTY.	DESCRIPTION	ILLUS. NO.	QTY.	DESCRIPTION
1	1	Ground lead	14	1	Coil wedge spring
2	1	Terminal	15	1	Screw
3	1	Cover	16	1	Coil (Includes item 18)
4	1	Cover gasket	17	1	Grommet
5	1	Flywheel	18	1	Sparky
6	1	Cover spring	19	1	Stator plate, includes: All items except 1, 3, 4, 5, 7, 9, 17 and 20
7	1	Flywheel key	20	3	Rd. hd. screw w/ext. tooth L/W
8	1	Condenser	21	1	Nut
9	1	Cam	22	1	Lockwasher
10	1	Breaker point set	23	1	Insulator
11	1	Condenser clamp	24	1	Stud
12	1	Clamp screw	25	1	Cam felt
13	1	Clamp screw			



FIGURE 2. REMOVING FAN HOUSING

DISASSEMBLY

Fig. 1 shows a typical exploded view of the Wico magneto used on the "L" Series West Bend Engines. Some models do not incorporate the use of the grommet 17, Fig. 1, because of variations in the application on which they are used.

Unless the fan housing is also to be replaced, it is not necessary to remove the starter assembly when removing the fan housing from the support plate. These can be removed as one unit.

1. Remove the six 1/4-20 screws which attach the fan housing to support plate. Lift fan housing off and lay to one side. See Fig. 2.

2. Remove flywheel nut and lockwasher. NOTE: On all engines with model numbers ending in a zero or an even number, such as 82002, it is necessary to turn the nut in a clockwise direction to remove. All model numbers ending in an even number use left hand threads on both ends of the shaft—all odd model numbers such as 82005, have standard right hand threads.

Engines using left hand threads on the crankshaft will be referred to hereinafter as reverse rotation engines and engines using right hand threaded shafts will be referred to as standard rotation engines. Rotation is determined by viewing from the power take-off, or clutch, end of the crankshaft.

3. Remove flywheel as shown in Fig. 3 by installing the knock-off nut to within a few turns of the flywheel. For standard rotation engines, use 18091 knock-off nut. For reverse rotation engines use T-2923.

4. Strike nut sharply with a medium weight hammer while lifting up on flywheel at the same time. Do not use a heavy hammer or strike too hard, as this may damage the crankshaft. Remove nut and lift flywheel up and off. Remove crankshaft key.

5. Remove breaker box cover gasket and spring. See Fig. 4. The purpose of this cover is to prevent dust and dirt from affecting life and performance of the

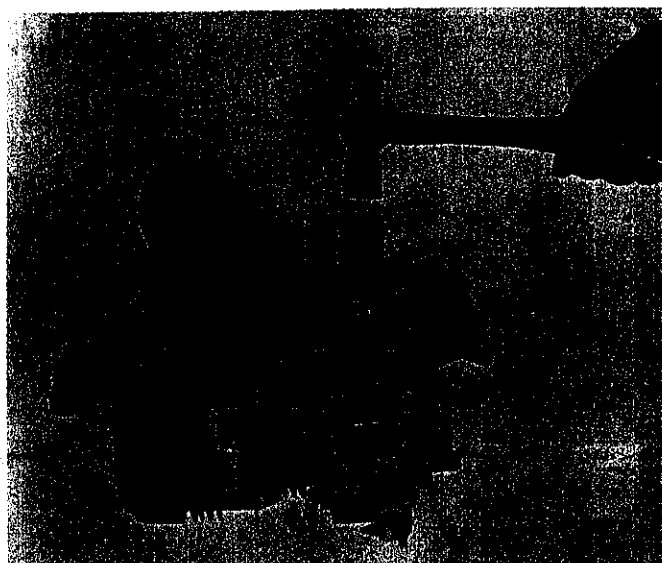


FIGURE 3. REMOVING FLYWHEEL

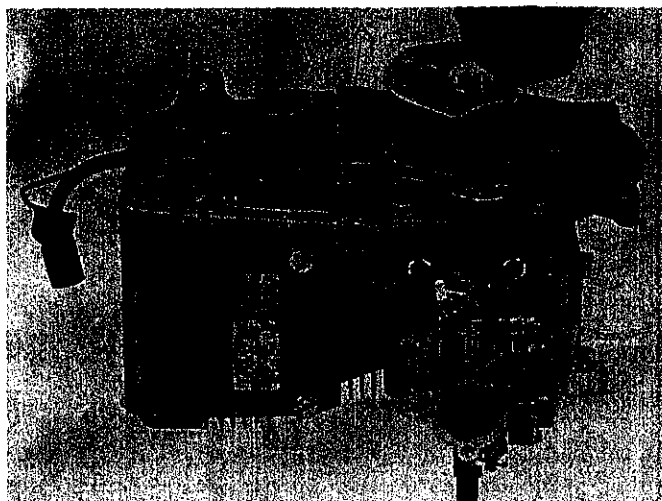


FIGURE 4. REMOVING DUST COVER

breaker points. Use care when removing spring to avoid bending. Pivot spring to one side before lifting.

6. Note the position of the magneto stator plate attaching screws. One of these screws is indicated by the arrow and "A" in Fig. 4. Timing of the engine is determined by the position of these screws in their slots. If the stator plate is to be removed from the support plate, it must be replaced in the same position. Refer to the Ignition Specifications at the end of this section to determine the correct amount of magneto advance for the model being worked on. Also see chapter on "Coil Replacement" in this section for further detail.

7. Remove breaker point assembly as shown in Fig. 5. Check the breaker points. The points should have a white, frosty appearance. If burned or pitted, replace. DO NOT FILE BREAKER POINTS. Use new parts.

8. Check condenser, as burned or pitted breaker points indicate the condenser is weak or leaks. Refer to the condenser capacity chart at the end of this section for various condenser capacities.

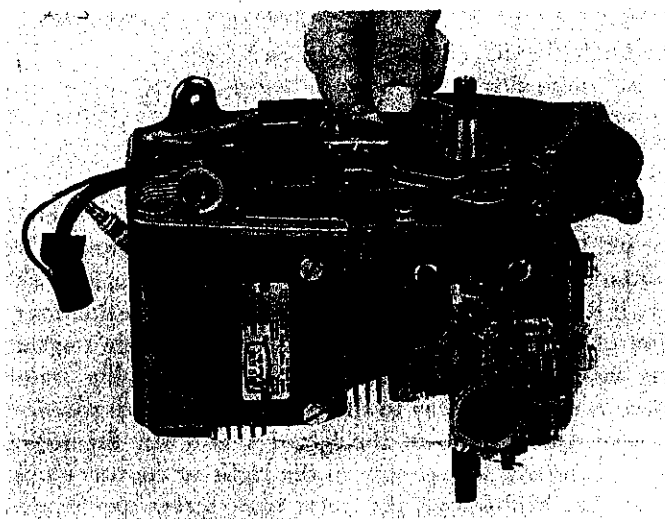


FIGURE 5. REMOVING BREAKER POINTS

COIL REPLACEMENT

If coil or high tension lead replacement is indicated, proceed as follows:

NOTE: If the stator plate is to be removed from the engine, steps 9 and 10 can be performed after step 11.

9. Remove the coil primary leads from the condenser and breaker point terminal post and core shoe before attempting to remove coil. See Fig. 6.

10. Pry up on the coil retaining clip with a small screwdriver and slide coil and clip off of the core shoe. Remove coil and lead wire assembly.

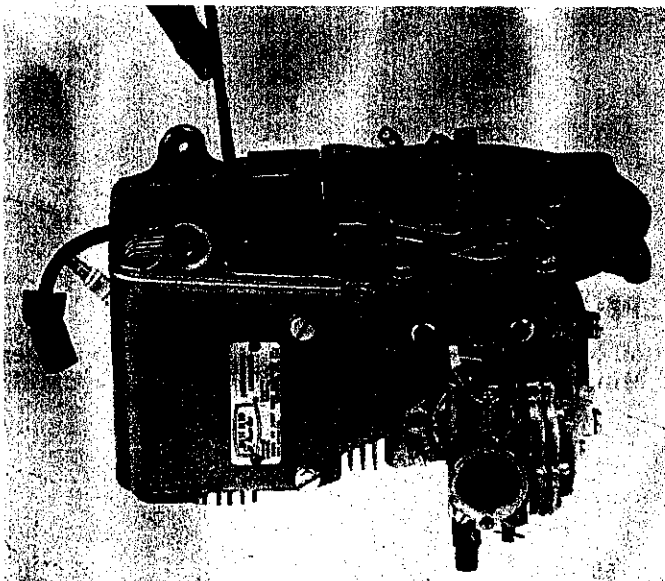


FIGURE 6. REMOVING COIL

11. Note the position of the stator plate with reference to the location of the three mounting screws, as described in step 6. Remove the three screws and remove the stator plate from the engine as shown in Fig. 7.

12. Remove spark plug lead by grasping the lead close to the coil and twisting in a counter-clockwise direction. Install new lead by twisting in a clockwise direction while pushing lead firmly into coil.

13. Install new coil by reversing above steps. Be sure that primary leads are correctly positioned. The primary lead to the breaker point terminal should be routed through the slot in the stator plate and tucked under the edge of the plate.

14. Install stator plate, making sure that the attaching screws are correctly positioned. Refer to the Ignition Specifications at the end of this section for correct magneto advance for the model being worked on.

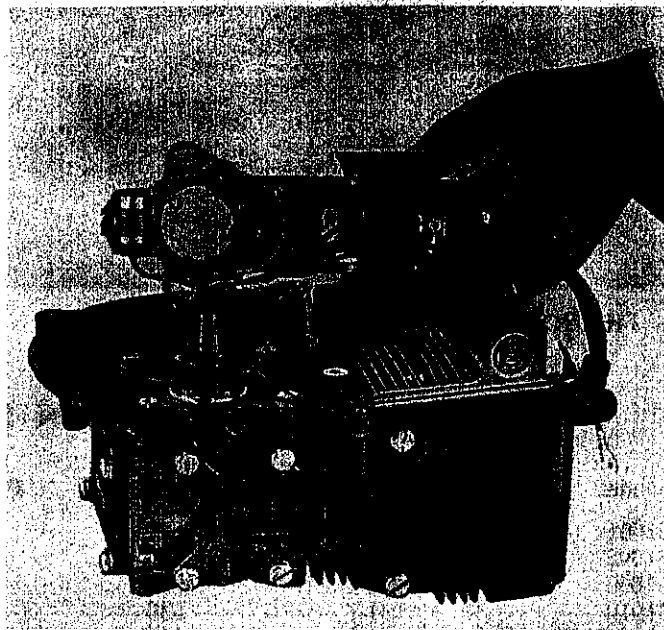


FIGURE 7. REMOVING STATOR PLATE

15. Install new condenser and breaker points. Adjust points with cam follower at keyway in cam. This is the high point of the cam. Correct breaker point spacing is .015". Adjust points as shown in Fig. 8. Replace breaker point cover gasket and cover.

16. Install flywheel, lockwasher, and nut. Tighten securely.

17. Remove and inspect spark plug. If electrodes are burned or pitted, replace plug. Spark plugs that are operating properly will show deposits ranging from rusty brown to grayish tan on the firing end. Gasoline fouling can usually be identified by dry, black, fluffy deposits caused by incomplete combustion. A leaner high speed adjustment may correct this condition. Oil fouled spark plugs usually have wet, sludgy deposits caused by too much oil in the combustion chamber.

Check to make sure that the proper mixture of oil has been used. Burned or overheated plugs usually have a white, burned appearance and badly eroded electrodes. Replace with new plugs. See ignition specifications on following page for correct spark plug number.



FIGURE 8. ADJUSTING BREAKER POINTS

EXPLANATION OF COLUMN HEADINGS**ANGLE BTDC (Before Top Dead Center)**

This is the degree of spark advance BTDC when the stator plate is set at the position given under STATOR POSITION.

STATOR POSITION

This column gives the position the stator plate should be set at for proper performance of the engine. The symbols are: FA (Full Advance), MR (Mid-Range), FR (Full Retard). This adjustment depends upon the direction of engine rotation. On a standard rotation engine, the flywheel turns to the right and for FA the stator plate is set all the way to the left. For a reverse rotation engine which turns to the left, FA is when the stator plate is turned all the way to the right or counter-clockwise. For Mid-Range, the stator plate screws are located in the middle of the slots.

DISTANCE BTDC (Before Top Dead Center)

This is a measurement in inches between the top of the piston and the top of the cylinder at the time ignition occurs, with the stator plate set at the position given under STATOR POSITION.

IGNITION SPECIFICATIONS

Model	Spark Plug	Spark Plug Gap	Breaker Point Gap	Angle BTDC	Stator Position	Distance BTDC
61001	L-4-J	.030	.015	26°	MR	7/64"
61002	L-4-J	.030	.015	26°	MR	7/64"
61006	L-4-J	.030	.015	22°	FR	3/32"
61010	L-4-J	.030	.015	22°	FR	3/32"
61012	L-4-J	.030	.015	22°	MR	7/64"
82001	L-4-J	.030	.015	26°	MR	7/64"
82002	L-4-J	.030	.015	26°	MR	7/64"
82004	L-4-J	.030	.015	22°	FR	3/32"
82005	L-4-J	.030	.015	22°	FR	3/32"
82006	L-4-J	.030	.015	22°	FR	3/32"
82008	L-4-J	.030	.015	24°	FR-MR	3/32"
82010	L-4-J	.030	.015	22°	FR	3/32"
82012	L85	.030	.015	22°	FR	3/32"

COIL & CONDENSER SPECIFICATIONS

Model	Wico Coil No.	Operating Amp	Coil continuity Min. - Max.	Wico Condenser No.	Condenser Cap. MFD
61001	X13313	1.7	50 - 60	X13299	.16 - .20
61002					
61006					
61010					
61012					
82001					
82002					
82004					
82005					
82006					
82008					
82010					
82012					

MOTOR MODEL NO.	WICO COIL NO.	OPER- ATING AMP.	COIL CONTINUITY MIN. - MAX.		WICO COND. NO.	COND. CAP. MFD.	MAGNETO NO.
2700	X7467	1.60	30	50	X7461	.10-- .15	FW2260
2704	X7467	1.60	30	50	X7461	.10-- .15	FW2260
2706	X9055	1.80			X8959	.16-- .20	FW2320
2722	X9055	1.80			X8959	.16-- .20	FW2320
2723	X9055	1.80			X8959	.16-- .20	FW2320
2725	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2726	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2727	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2728	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2729	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2730	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2731	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2732	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2733	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2734	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2735	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2736	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2738	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2740	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2742	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2744	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2752	X7536	1.70	38	58	X7529	.16-- .20	FW2242
2756	X9055	1.80			X9100	.26-- .30	FW2317
27562	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
27563	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
27564	X11260	1.55	30	50	X11000	.16-- .20	FW2605
2760	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2761	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
27612	X11260	1.50	30	50	X11000	.16-- .20	FW2605
2762	X11260	1.85	30	50	X11000	.16-- .20	FW2471B
2763	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2764	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2770	X7536	1.70	38	58	X9100	.26-- .30	FW2317
	X9055	1.80			X9100	.26-- .30	
2771	X9055	1.80			X9100	.26-- .30	FW2317
27712	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2772	X7536	1.70	38	58	X9100	.26-- .30	FW2317
2772	X9055	1.80			X9100	.26-- .30	FW2471B
2772	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
27722	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2774	X7536	1.70	38	58	X9100	.26-- .30	FW2317
2774	X9055	1.80			X9100	.26-- .30	FW2471B
2774	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
27742	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2775	X9055	1.80			X9100	.26-- .30	FW2317
2777	X7467	1.60	30	50	X7461	.10-- .15	FW2260
2778	X9055	1.80			X9100	.26-- .30	FW2378
2779	X9055	1.80			X9100	.26-- .30	FW2317
27792	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2780	X9055	1.80			X9100	.26-- .30	FW2317
2781	X9055	1.80			X9100	.26-- .30	FW2317
27812	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
2782	X9055	1.80			X9100	.26-- .30	FW2378
27822	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
27823	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
27824	X11260	1.55	30	50	X11000	.16-- .20	FW2605
27825	X11260	1.55	30	50	X11000	.16-- .20	FW2605
2783	X9055	1.80			X9100	.26-- .30	FW2378
2784	X9055	1.80			X9100	.26-- .30	FW2378
2785	X9055	1.80			X9100	.26-- .30	FW2378
27852	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
27853	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
27854	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
2786	X9055	1.80			X9100	.26-- .30	FW2378
2787	X9055	1.80			X9100	.26-- .30	FW2466B
2788	X9055	1.80			X9100	.26-- .30	FW2466B
2788	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
27882	X11260	1.55	30	50	X11000	.16-- .20	FW2466B
27883	X11260	1.55	30	50	X11000	.16-- .20	FW2605
2790	X11260	1.55	30	50	X11000	.16-- .20	FW2471B
58001	X11260	1.55	30	50	X11000	.16-- .20	FW2605
58002	X11260	1.55	30	50	X11000	.16-- .20	FW2639
58003	X11260	1.55	30	50	X11000	.16-- .20	FW2605
58004	X11260	1.55	30	50	X11000	.16-- .20	FW2639
58006	X11260	1.55	30	50	X11000	.16-- .20	FW2639
58007	X11260	1.55	30	50	X11000	.16-- .20	FW2605
58008	X11260	1.55	30	50	X11000	.16-- .20	FW2639
70001	X11260	1.55	30	50	X11000	.16-- .20	FW2605
70002	X11260	1.55	30	50	X11000	.16-- .20	FW2639
70006	X11260	1.55	30	50	X11000	.16-- .20	FW2639
70007	X11260	1.55	30	50	X11000	.16-- .20	FW2605
70008	X11260	1.55	30	50	X11000	.16-- .20	FW2639

SECTION FOUR POWER HEAD

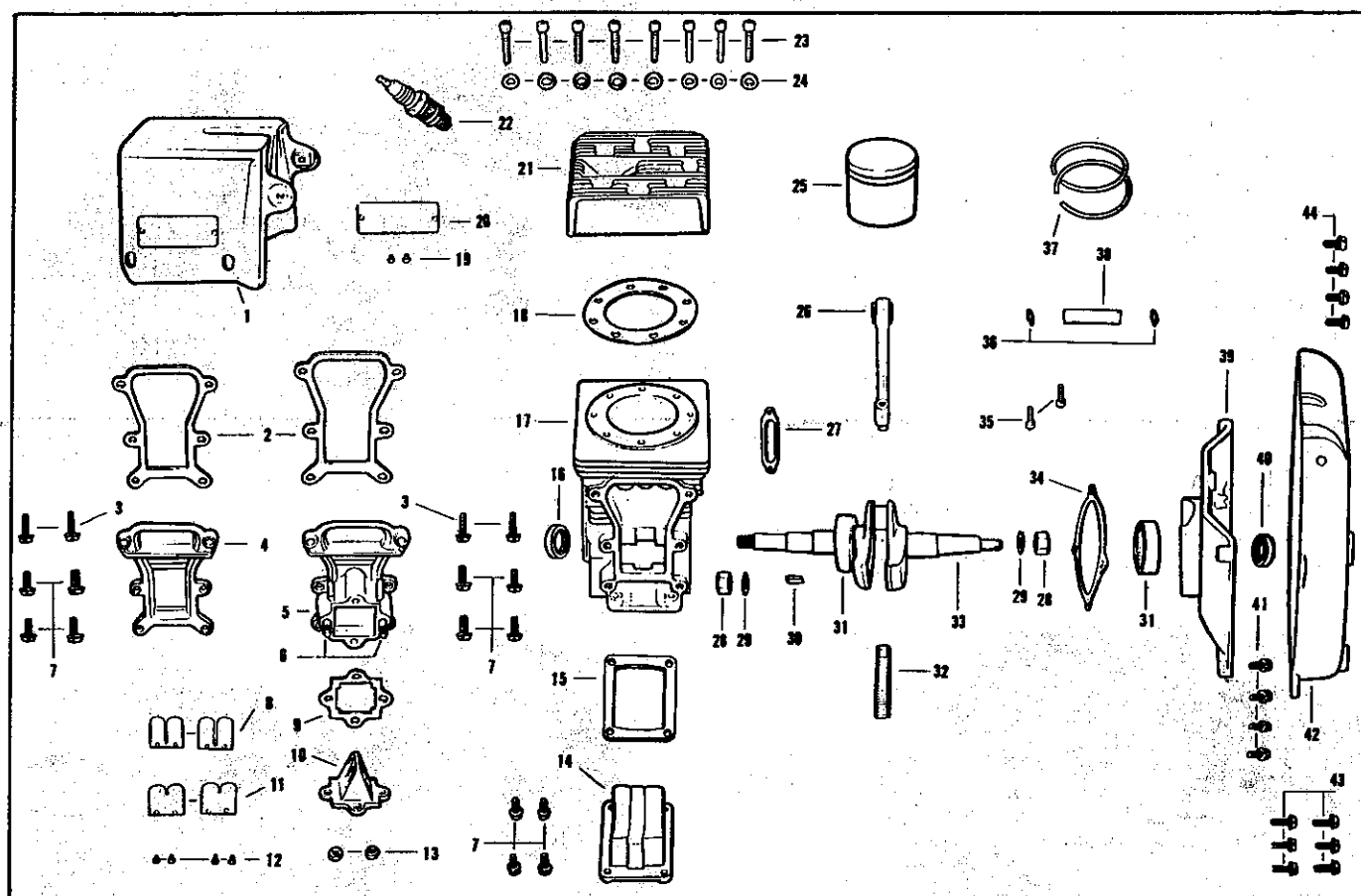


FIGURE 1. EXPLODED VIEW OF POWER HEAD

PARTS LIST FOR FIGURE 1

ILLUS. NO.	QTY.	DESCRIPTION	ILLUS. NO.	QTY.	DESCRIPTION
1	1	Cylinder cover	23	8	Socket hd. cap screw
2	2	Transfer port cover gasket	24	8	Plain washer
3	4	Pan head screw w/lockwasher	25	1	Piston
4	1	Transfer port cover	26	1	Connecting rod, includes: Cap, cap screws and bearing
5	1	Carburetor manifold w/studs	27	1	Cylinder exhaust gasket
6	2	Carburetor stud	28	2	Hex nut
7	12	Pan hd. screw w/lockwasher	29	2	Ext. tooth lockwasher
8	2	Reed	30	1	Crankshaft key
9	1	Carburetor manifold gasket	31	2	Ball bearing
10	1	Reed plate, includes: Reeds, reed stops and screws	32	1	Crankpin roller set
11	2	Reed stop	33	1	Crankshaft w/o ball bearing
12	4	Round hd. screw w/lockwasher	34	1	Bearing cage gasket
13	2	Hex nut	35	2	Connecting rod cap screw
14	1	Crankcase cover	36	2	Retaining ring
15	1	Crankcase cover gasket	37	1	Piston ring set
16	1	Seal, drive end	38	1	Piston pin
17	1	Cylinder w/seal	39	1	Support plate, includes: Seal and ball bearings
18	1	Head gasket	40	1	Seal, magneto end
19	2	Round hd. sheet metal screw	41	4	Hex slotted head screw w/lockwasher
20	1	Identification plate w/screws	42	1	Fan housing
21	1	Cylinder head	43	6	Pan hd. screw w/lockwasher
22	1	Spark plug	44	4	Pan hd. screw w/lockwasher

DISASSEMBLY

To disassemble the power head, remove the carburetor and magneto as outlined in previous sections, then:

1. Remove magneto cam and spark plug.
2. Remove the four screws attaching the support plate to the cylinder. See Fig. 2. Lift the support plate up and off the crankshaft as shown in Fig. 2. On governor equipped models, remove governor vane, pivot screw and linkage, before removing stator plate.

NOTE: The upper bearing is installed on the crankshaft with a light press fit which will cause a slight interference. It may be necessary to hold the cylinder and rotate the support plate slightly while pulling upward.

If interference is greater than mentioned above, install a flywheel nut flush with the end of the shaft and tap lightly with a lead hammer while lifting up on the support plate. Do not use a steel hammer or strike too hard, as this may damage the shaft. Remove the flywheel nut before attempting to remove support plate.

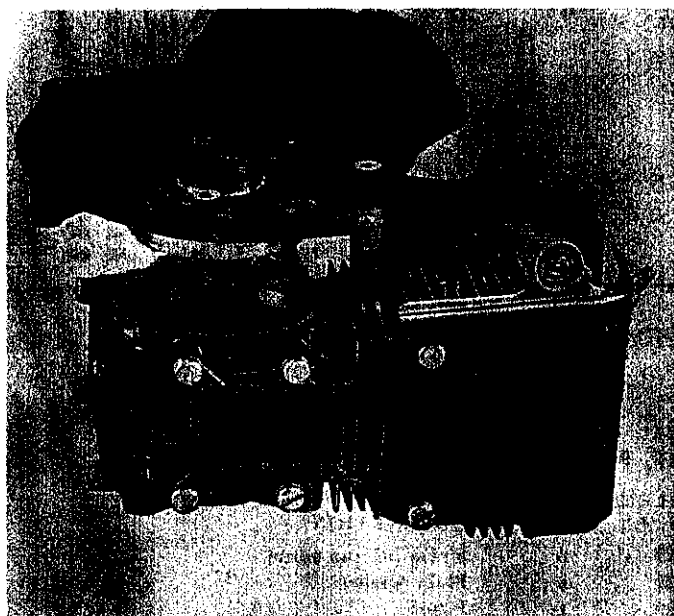


FIGURE 2. REMOVING SUPPORT PLATE

3. Remove bearing cage gasket from cylinder. If gasket adheres to support plate or cylinder, clean carefully with solvent. Do not scrape these surfaces as a leak between the crankcase and support plate will cause poor engine performance due to loss of crankcase pressure.
4. Remove the four screws which attach the cylinder cover to the cylinder and remove cover.
5. Remove the four remaining screws from each of the transfer port covers. See Fig. 3. Remove covers and gaskets. Two of the six mounting screws used on each cover were already removed in step 4.
6. Remove the four screws attaching the crankcase cover and remove cover as shown in Fig. 4. If the gasket adheres to either the cover or cylinder, clean surfaces carefully as outlined in step 3.



FIGURE 3. REMOVING TRANSFER PORT COVER

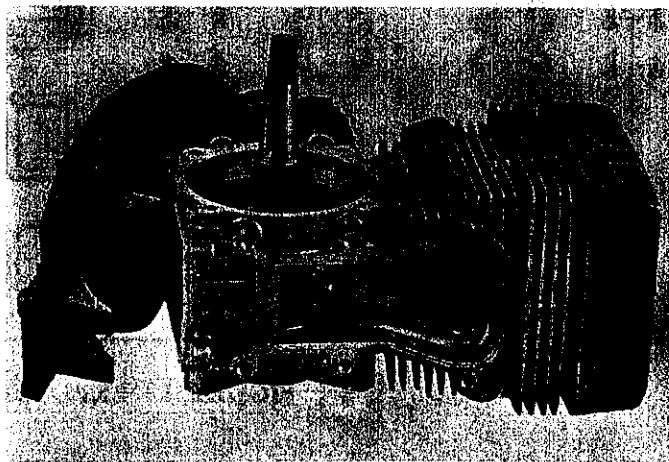


FIGURE 4. REMOVING CRANKCASE COVER

7. Remove the eight cylinder head screws, using a torque wrench or a T-1909, 3/16" allen wrench as shown in Fig. 5. When reinstalling, use a torque wrench and tighten to the specifications outlined in the torque chart, Section 4, for the model being worked on.
8. Remove cylinder head and gasket as shown in Fig. 6. When reinstalling, refer to the table in the General Specifications section at the beginning of this manual, for the correct thickness of head gasket for the model being worked on.
9. Turn cylinder upside down as shown in Fig. 7 and remove connecting rod screws. Use T-1582 hex bit and T-1907 adapter with a torque wrench, or T-2911, 5/32" allen wrench, as shown to remove the rod cap screws.
10. Hold rod cap in position when removing screws. Turn cylinder over and remove rod cap. This will allow the loose needles to fall out. Turn crankshaft slightly to make sure that all needles have been removed. "L" Series engines incorporate the use of full complement rollers rather than a bearing cage and needle assembly. Inspect the loose needles carefully. Replace the entire set if any are burned, pitted, or have damaged tips.

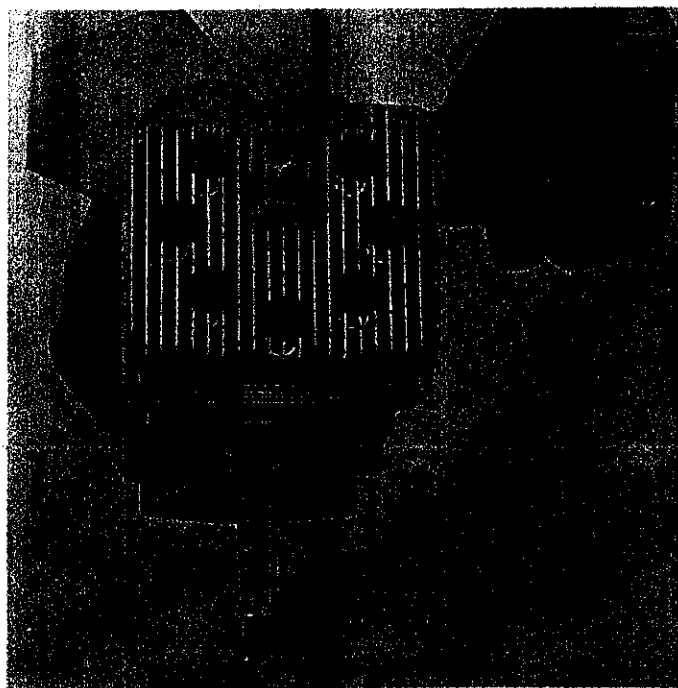


FIGURE 5. REMOVING CYLINDER
HEAD SCREWS

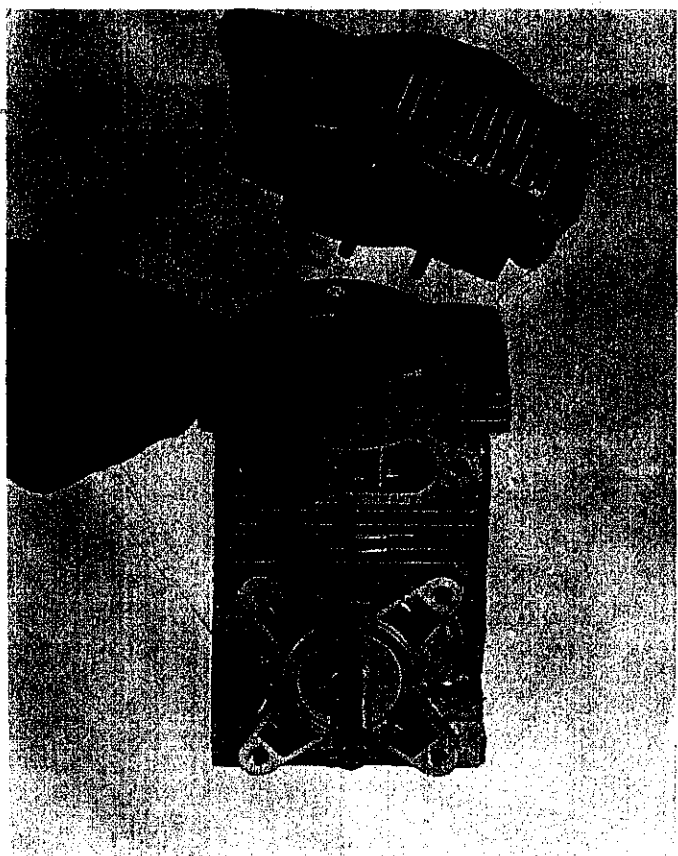


FIGURE 6. REMOVING CYLINDER
HEAD AND GASKET

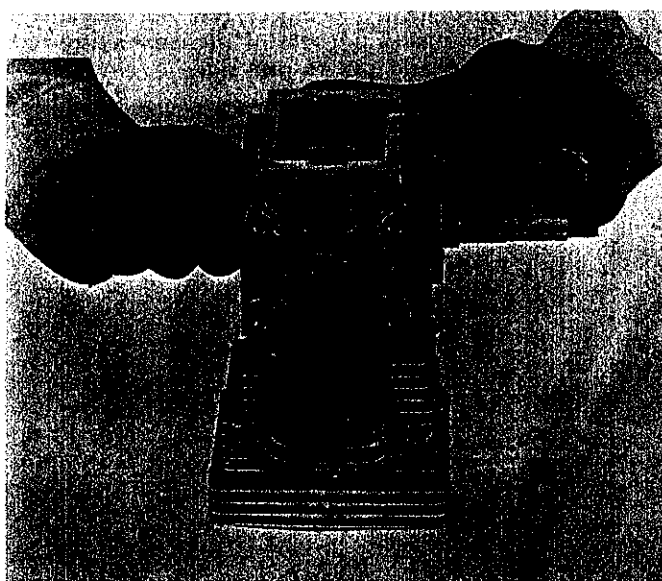


FIGURE 7. REMOVING CONNECTING
ROD CAP

11. Push the piston and connecting rod assembly out of the cylinder as shown in Fig. 8.

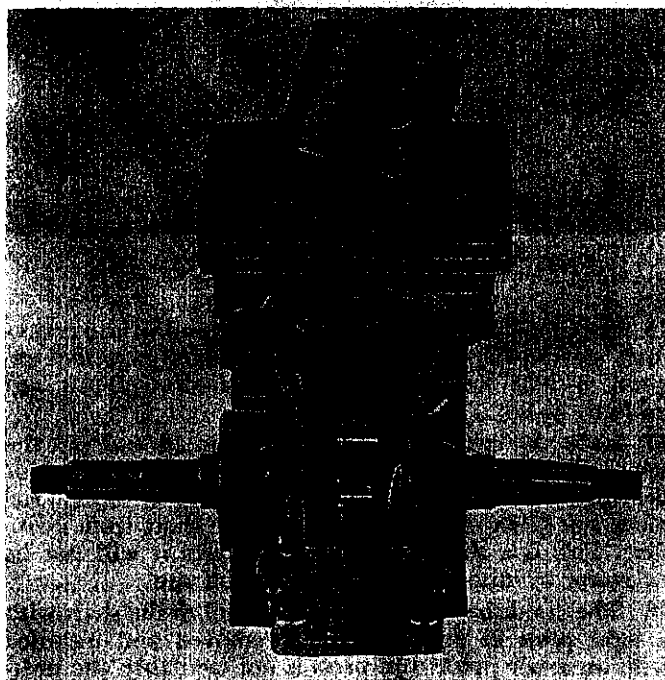


FIGURE 8. REMOVING PISTON

12. Remove piston rings from piston.
13. Remove piston pin lock rings from piston using T-1749 snap ring pliers.
14. The piston pin is assembled to the piston with a light press fit. In order to remove the pin without damaging the pin bosses in the piston, heat the bosses slightly, such as by placing on a hot light bulb. This temperature increase will enlarge the bosses sufficiently to enable the pin to be driven out with a small punch as shown in Fig. 9.

15. Tap the punch lightly, being careful not to damage the bearing in the piston pin end of the connecting rod. Lay the piston, rod and pin to one side.

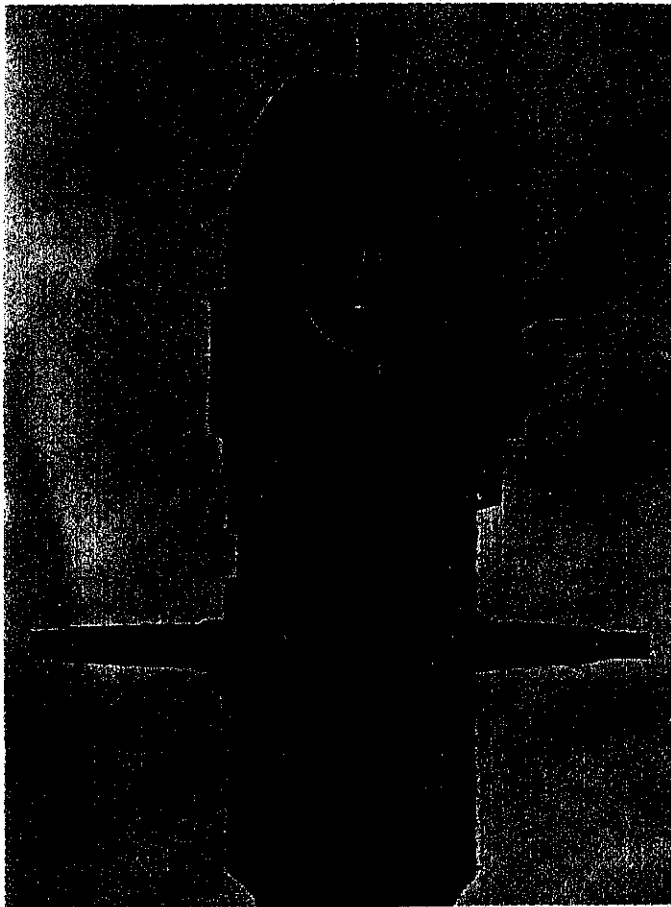


FIGURE 9. REMOVING PISTON PIN

16. Install a knock-off nut to the drive end of the crankshaft as shown. Use 18091 for standard rotation engines, T-2923 for reverse rotation models. Turn nut on shaft as far as possible.

17. Hold the cylinder as shown in Fig. 10 and tap the knock-off nut lightly. This will cause the crankshaft bearing to drop out of the recess in the cylinder. Remove nut from crankshaft and remove shaft from cylinder. This is a slip fit and in most cases it will not be necessary to install or tap the knock-off nut.

18. The crankshaft bearing is assembled to the shaft with a light press fit and should be removed and installed with an arbor press. If a press is not available, the bearing can be removed by tapping lightly with a small brass hammer. See Fig. 11.

19. Inspect the cylinder carefully for damage to determine whether it is satisfactory for future use. If the cylinder walls are scored lightly, this can be removed by honing. If the damage is severe, the cylinder must be replaced.

REASSEMBLY

20. Install new bearing on crankshaft, using an arbor press or a light hammer. Install until bearing seats firmly on crankshaft shoulder. If an arbor press is used,

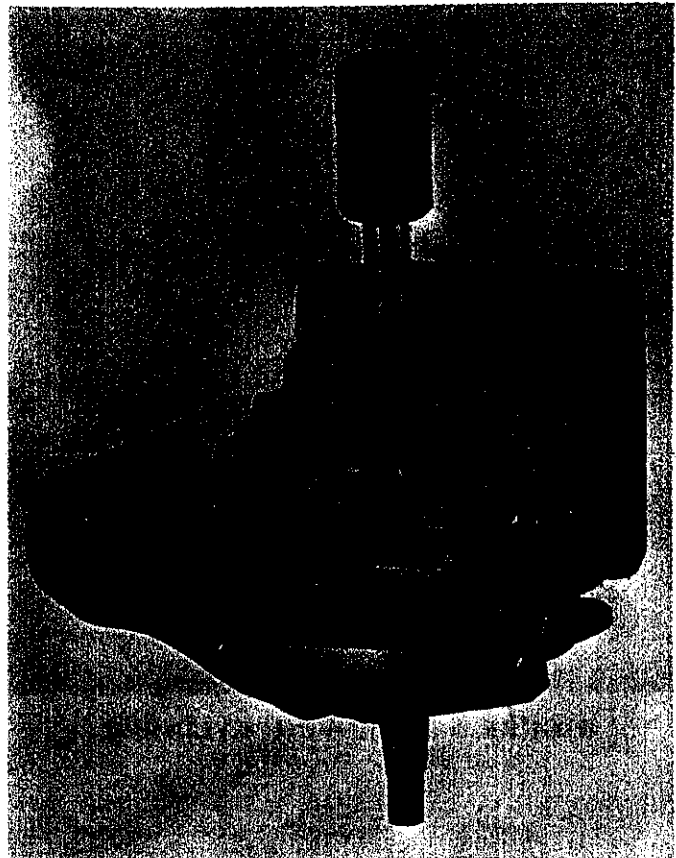


FIGURE 10. REMOVING CRANKSHAFT



FIGURE 11. REMOVING CRANKSHAFT BEARING

the shaft must be supported on the flat portion inside the crankshaft throw to prevent damage to the shaft.

21. If the old cylinder is to be reused, inspect the crankshaft seal, lower. Replace if necessary. Drive out the old seal with a wooden block and install a new seal. Tap the seal into position carefully, making sure that the outer edge of the seal is parallel to the face of the cylinder boss.

22. Insert the tapered shoulder of T-2916 seal sleeve into the crankshaft as shown in Fig. 12. Install a knock-off nut to the magneto end of the shaft as shown in Fig. 12 and insert shaft in cylinder.

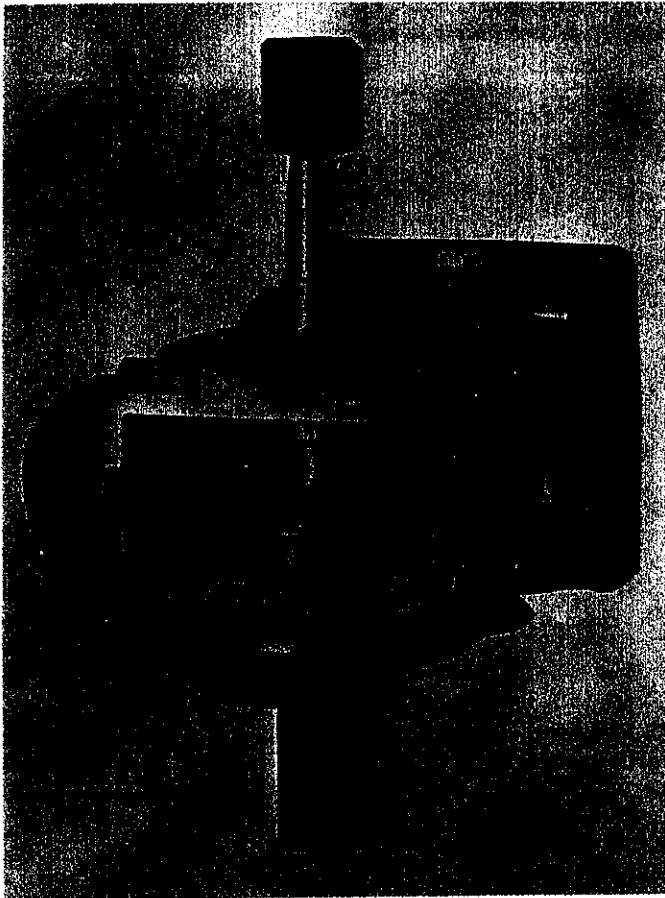


FIGURE 12. INSTALLING CRANKSHAFT

23. Tap the nut lightly until the bearing is seated in the recess in the cylinder. A slip fit is permissible and in some cases the bearing will rotate in the cylinder recess. This is satisfactory provided there is no side movement of the bearing.

24. Inspect the needle bearings in the piston pin end of the connecting rod. This bearing cannot be replaced independently of the connecting rod. If burned or pitted, replace complete rod.

25. Heat the piston pin bosses by placing on a light bulb as described in step 14. Hold piston with piston ring anchor pin up and insert the closed end of piston pin into this upper boss. The anchor pin is indicated by the pencil in Fig. 13.

26. Press the pin into the boss and assemble the connecting rod to the piston. The match mark on the con-

necting rod should also be facing up. See arrow "A", Fig. 13.

27. Align piston pin with rod and press pin through rod and into pin boss on other side so that the lock rings can be installed on both sides of the pin.

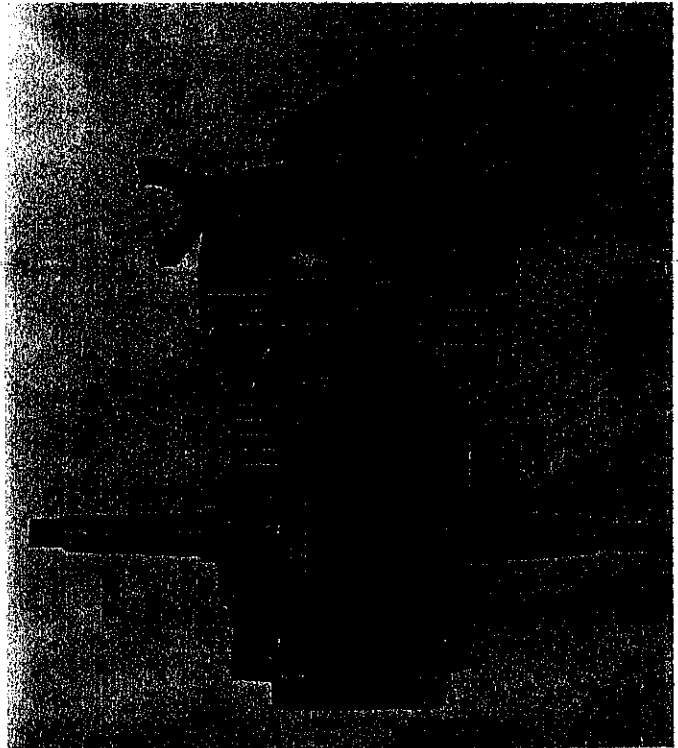


FIGURE 13. ASSEMBLING ROD AND PISTON

28. Install piston pin lock rings using T-1749 snap ring pliers.

29. Assemble piston rings to piston. Install with beveled edge of ring toward top of piston. Align open ends of rings with anchor pin in piston as shown in Fig. 13.

30. Coat piston, rings and cylinder wall with a light coat of oil. Insert rod and piston skirt into top of cylinder. Extreme care must be taken to make sure that the open ends of the rings are on each side of the anchor pin. If the rings are not aligned properly and an attempt is made to force the piston into the cylinder, the rings will break.

31. Guide the piston into the cylinder using a ring compressor, or compress the rings with the fingers as shown in Fig. 14.

32. Push rod and piston into cylinder, making sure that the match mark "A", Fig. 13, is toward the sloping shoulder of the crankshaft. Turn the rod at the same time so that the rod journal is in line with the crankshaft journal.

33. Push the piston into the cylinder, making sure that the rod journal extends over the crankshaft journal.

34. Turn cylinder upside down and coat the crankshaft journal with oil or light grease. This will facilitate installation of the bearing needles. See Fig. 15.

35. Assemble the loose needles to the rod and shaft as shown in Fig. 15.



FIGURE 14. INSTALLING ROD AND PISTON



FIGURE 15. INSTALLING CONNECTING ROD NEEDLES

NOTE: It is extremely important that the needles, bearing surfaces and tweezers be kept absolutely clean, as any particles of dirt can cause damage to the engine.

IMPORTANT: When installing new needles, be sure that the protective wax coating is removed before running the engine. A coating of warm oil will aid in removing the wax and will provide lubrication when starting the engine. Run engine for 20 minutes at not over half throttle.

36. Examine the connecting rod cap. These caps are separated from the connecting rod by the fracture method. The joint is broken rather than cut, resulting in rough, uneven edges.

These rough edges will align perfectly only with the piece from which they were broken as illustrated in the left connecting rod in Fig. 17. Notice that the joint is invisible. The right rod is improperly assembled, and the joint is very noticeable. Always recheck a joint which looks like this.

37. Assemble rod cap to rod over the loose needles, being careful not to dislodge any of the needles. Install connecting rod screws.

The match marks "A" Fig. 16, must be together when the cap is assembled to the rod.



FIGURE 16. MATCH MARKS ON ROD AND CAP

38. Tighten screws gradually and move cap back and forth gently until it is properly aligned with the connecting rod. Inspect joint; if joint is visible, the cap is improperly aligned. See Fig. 17. Loosen cap and realign, then retighten cap.

39. Using T-1907 adapter and T-1582 hex bit with a torque wrench, tighten both rod cap screws as specified in the torque chart at the end of this section. See Fig. 18. Do not over-tighten.

40. Assemble the carburetor manifold to the cylinder as shown in Fig. 20. Tighten the four attaching screws.

41. Inspect the reed plate assembly. Replace any reeds that are cracked, broken or warped. The reeds must seat lightly against the reed plate along the entire reed length and must completely cover the holes in the reed plate.

42. Inspect and measure reed stop spacing. Improper reed stop setting is a major contributing cause of reed breakage. The dimension should be measured from the reed plate surface to the underside of the reed stop as shown in Fig. 19. Correct spacing is 1/4".

43. The reed plate gasket and reed plate assembly may be assembled to the engine at this time, as shown in Fig. 20, or they may be laid to one side for assembly after the rest of the engine is assembled.

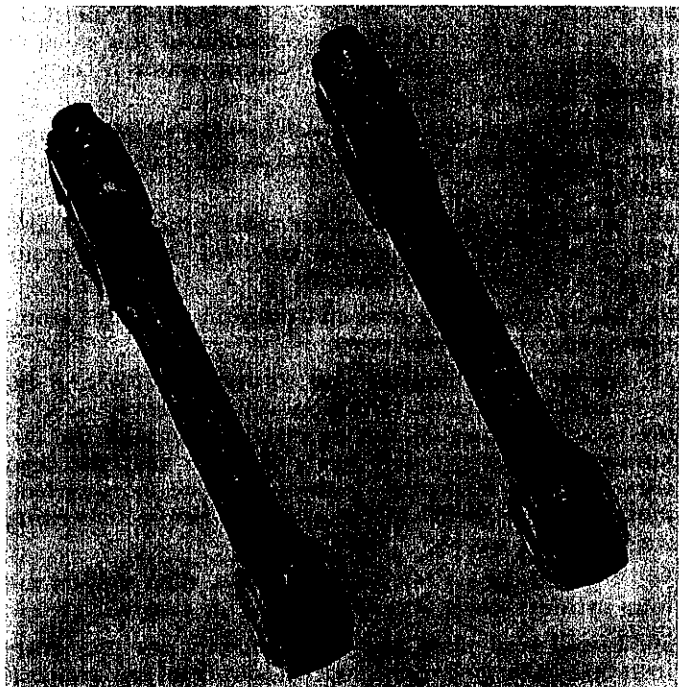


FIGURE 17. CONNECTING ROD JOINTS—
RIGHT AND WRONG

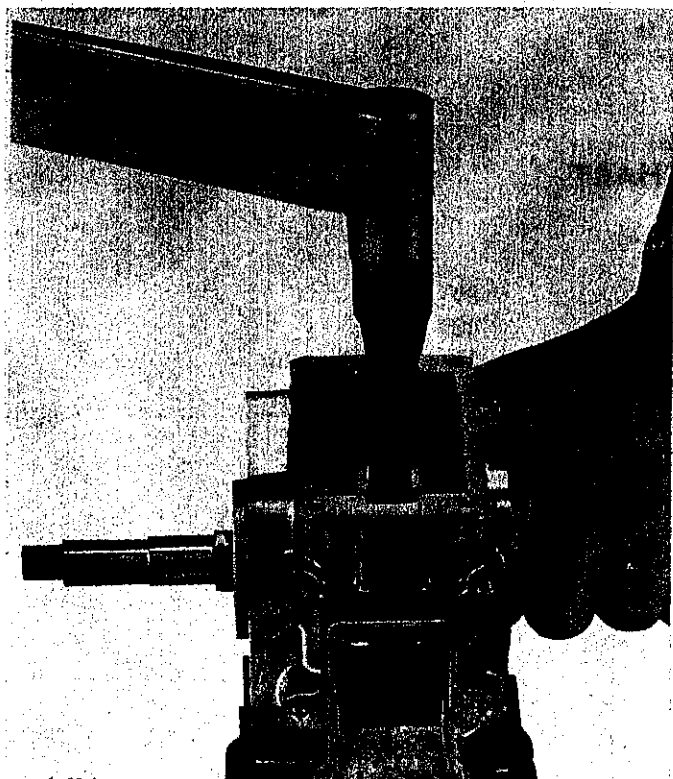


FIGURE 18. INSTALLING CONNECTING
ROD CAP SCREWS



FIGURE 19. MEASURING REED STOP
SPACING



FIGURE 20. INSTALLING REED PLATE

44. Assemble transfer port cover to the opposite side of the cylinder. This is the cover indicated in Fig. 3. Install and tighten the four 1/4-20 x 3/4 pan head screws.
45. Assemble cylinder cover to cylinder as shown in Fig. 21. Install, but do not tighten, the four 1/4-20 x 7/8 pan head screws.
46. Install a new bearing cage gasket to cylinder. A small amount of gasoil or other gasket cement may be used to coat both sides of gasket very lightly. Lay gasket in place on cylinder.

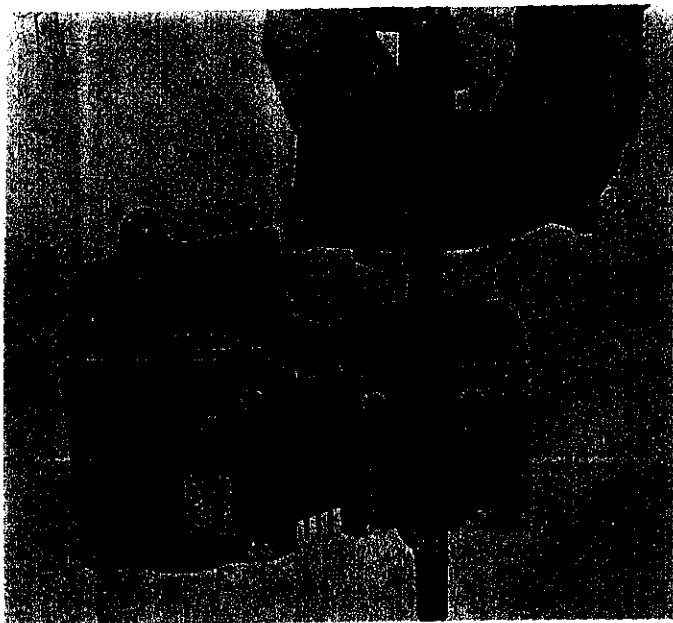


FIGURE 21. INSTALLING SUPPORT PLATE

47. Install T-2916 seal sleeve in support plate as shown in Fig. 21. Insert the sleeve just far enough so that it extends just past the bottom edge of the seal.

48. Install support plate to cylinder. It will be necessary to tap the support plate slightly when installing, so that the boss will pass into the cylinder.

NOTE: Care must be taken to avoid damaging the bearing cage gasket. Make sure that the gasket lines up with the support plate and cylinder.

49. Install and tighten the four hex head screws. Tighten evenly to avoid distorting the support plate. Torque to specifications outlined in the torque chart. On governor equipped models, install governor linkage.

50. Install stator plate. Refer to the Ignition Specifications at the end of the Magneto section of this manual for correct magneto advance. Position stator plate and tighten screws securely.

51. Install breaker cam. Adjust breaker points as outlined in the Magneto section and install dust cover and gasket.

52. Install key, flywheel, starter collar, lockwasher and nut. Torque flywheel nut as specified in the Torque Chart at the end of this section.

53. Install spark plug lead and position lead wire grommet at edge of cylinder cover.

54. Assemble fan housing and starter assembly and install attaching screws. Position cylinder cover so that the two shorter screws can be installed through the fan housing to the cylinder cover. Be sure that the lead wire grommet is correctly positioned. The shorting lead must also be inserted in the grommet before tightening the attaching screws.

55. Tighten the six fan housing screws, then tighten the four cylinder cover screws installed in step 45.

56. Install reed plate and carburetor, if not previously installed. On governor models, complete the connecting of the linkage. Check governor linkage to make sure that it is not binding or inoperative.

57. Check engine to make sure that all screws and nuts have been correctly tightened and that no parts have been overlooked. Test-run engine and adjust carburetor.

TORQUE CHART

(Inch Pounds)

CONNECTING RODS:

80 - 90

FLYWHEEL:

420

SPARK PLUG:

Finger Tight, plus
1/2 - 5/8 turn

STANDARD SCREWS:

10-24

30

10-32

35

12-24

45

1/4-20

70

5/16-18

160

3/8-16

270

CYLINDER HEAD:

610 Series

90 - 100

820 Series except model 82012

85 - 90

Model 82012

120 - 130

DO NOT OVER-TIGHTEN

OPERATING INSTRUCTIONS

FUEL MIXTURE

In a separate, clean, container, thoroughly mix three-fourths (3/4) pint of SAE No. 30 or 40 oil with each gallon of gasoline.

Use a regular grade of gasoline. High test ethyl gasoline is not recommended. Use any good quality outboard, 2-cycle, or equivalent motor oil.

Strain the fuel mixture through a fine mesh screen when filling the fuel tank to remove any dirt or water that may be present.

STARTING PROCEDURE

1. Fill fuel tank with fuel prepared as outlined above. Wipe up all spilled gasoline.
2. Open up fuel shut-off valve.
3. Move choke to closed position.
4. Turn ignition switch "ON". When starting engine for the first time, perform steps 1 and 2 under "Carburetor Adjustment."
5. To facilitate starting, crank engine part way through compression to bleed off some compression, then crank with quick, short pulls. When engine starts, move choke to open position.
6. Perform the steps outlined under "Carburetor Adjustment." if necessary.

TO STOP ENGINE

Move the ignition toggle switch to the "OFF" position to stop engine by shorting the magneto to ground. Engines not equipped with a toggle switch will have a shorting contact or button, which, when depressed, will short the spark plug or magneto to ground.

CARBURETOR ADJUSTMENT

1. Turn both adjustment needles clockwise until completely closed. CAUTION: Do not force needles tightly closed as the seats will be damaged.
2. Open both needles by turning counter-clockwise 1-3/4 turns. This will be a rich setting and operation under load will determine the best setting.
3. Start engine as described under "Starting Procedure" and allow it to warm up. Adjust the idle needle first and accelerate to approximately 6000 R.P.M.
If the engine bogged down and accelerated slowly, turn the idle needle clockwise until performance is acceptable. If the engine stalled on acceleration, turn the idle needle counter-clockwise until performance is satisfactory. The average idle needle adjustment is one turn open.
4. Adjust the high speed needle next. Turn the high speed needle clockwise until four-cycling stops WHILE ENGINE IS UNDER LOAD. DO NOT go any finer on the high speed adjustment as piston seizure can occur

at high speed. The average high speed needle adjustment is one turn open.

5. If the engine runs too fast at idle speed, turn the idle stop screw counter-clockwise until the desired idling speed is obtained. To increase idling speed, turn the idle stop screw clockwise.

MAGNETO

1. Breaker point gap must be maintained at .015. Set points with cam follower at index mark on breaker cam.
2. If the magneto stator plate is loosened or removed for any reason, the timing and breaker point adjustment must be re-checked.
 - (a) Place stator plate in position and install hold-down screws. Do not tighten screws.
 - (b) Refer to the Ignition specifications at the end of the Magneto section of this manual for correct magneto advance for each particular model. Correct breaker point adjustment is important as the timing will automatically be advanced if the breaker point setting is greater than .015, or retarded if less than .015. Tighten stator hold-down screws securely.

SPARK PLUG

Check and clean spark plugs regularly. Set spark plug gap at .030. Spark plugs that can be used in this engine are Champion L4J and L4, and AC, AC42FF.

AIR CLEANER

Under ordinary operating conditions, the air cleaner should be cleaned daily. Under extremely dirty conditions, more frequent cleaning is absolutely necessary. The repair of an engine damaged by dirt is not covered by warranty. The metal-maze type of air cleaner element should be oiled and allowed to drain before re-installing.

STORING ENGINE

The following steps should be taken to prepare your engine for storage:

1. Close fuel shut-off valve.
2. Do not run engine to remove the fuel left in the carburetor. Drain the carburetor by removing the fuel strainer cover.
3. Remove the spark plug and pour 1/4 cup of oil into the cylinder. Replace spark plug.
4. Crank engine over once or twice to circulate the oil.
5. If the engine is to be stored in an extremely damp area, remove the crankcase cover and lubricate the upper and lower main bearings in both ends of the connecting rod.

PROBLEM

PROBABLE CAUSE

SOLUTION

1. Engine will not start.

- (a) No fuel in tank or shut-off valve closed.
- (b) Spark plug not firing.

Remove spark plug, attach lead wire and ground plug against cylinder. Crank engine to determine if there is sufficient spark to jump gap on plug. If there is no spark or if spark is weak, remove flywheel and check following items: breaker points, coil, condenser, wiring, connections, hi-tension lead wire and lead wire spark plug connector.

- (c) Fuel not being delivered to combustion chamber.

Check carburetor hi-speed and idle adjustments. Both needles should be approximately 1 to 1-1/8 turns open. Remove spark plug and inspect. If plug is dry, pour a small amount of fuel into cylinder through spark plug hole, exhaust ports or carburetor. Replace plug and crank engine. If engine fires or starts but will not continue to run, check for the following: clogged fuel line, faulty fuel pump, sticking inlet needle, or dirty carburetor.

- (d) Engine flooded. Too much fuel in combustion chamber.

Close high speed needle. Remove and dry excess fuel from spark plug. Install spark plug and crank until engine starts, then open high speed needle 1-1/2 turns. Readjust after warm-up.

2. Engine hard to start.

- (a) Water or dirt in fuel, stale fuel mixture, or too much oil in fuel.
- (b) Weak ignition spark.
- (c) Engine over or under choked.
- (d) Carburetor out of adjustment.
- (e) Gasket or seal leaks.
- (f) Open or broken reed.

Drain fuel tank and carburetor. Fill with fresh fuel mixture. Be sure to strain through fine screen.

Refer to problem one, part (b).

Refer to problem one, parts (c) and (d).

- (g) Spark plug fouled.

Set both hi-speed and idle needles approximately 1-1/2 turns open. Readjust after warm-up.

Inspect gaskets and seals closely once engine is running. Characteristic of open or broken reed: Engine will "spit back" through carburetor while idling or starting. Remove reed plate and inspect. Refer to Section four, paragraphs 41 and 42, for correct setting or replacement. Remove and inspect.

3. Engine starts but will not continue to run.

- (a) Insufficient fuel supply.
- (b) Fuel line clogged.
- (c) Carburetor out of adjustment.
- (d) Vent screw on filler cap closed.
- (e) Faulty fuel pump or dirty carburetor.
- (f) Air leak in fuel system.
- (g) Defective or fouled spark plug.

Disconnect fuel line from carburetor to see if fuel flows freely.

Refer to Section five, paragraphs one through five under "Carburetor Adjustment."

Remove fuel pump and carburetor from engine, disassemble and inspect.

Inspect fuel system for leaks.

Remove and inspect.

4. Engine misses.

- (a) Dirt in fuel system.
- (b) Carburetor out of adjustment.
- (c) Spark plug fouled or defective.
- (d) Faulty magneto.

Refer to Section five, paragraphs one through five under "Carburetor Adjustment."

Remove and inspect.

Remove flywheel and inspect breaker points, all wires and connections. Test coil and condenser (Values given under "Ignition Specifications," Section three.) Check hi-tension lead wire for leaks.

PROBLEM	PROBABLE CAUSE	SOLUTION
5. Engine lacks power.	<ul style="list-style-type: none"> (a) Air cleaner clogged. (b) Carburetor not adjusted properly. (c) Incorrect spark plug. (d) Incorrect ignition timing. (e) Worn or stuck piston rings or leaky head gasket. (f) Scored piston or cylinder wall. 	<p>Rinse in clean gasoline.</p> <p>Refer to Section five, paragraphs one through five under "Carburetor Adjustments."</p> <p>Refer to Section three under "Ignition Specifications."</p> <p>Test compression with gauge. Reading should compare with one given under "Engine Specifications" in the front of this manual. If compression is low, replace rings or head gasket.</p> <p>Check compression. Disassemble engine and inspect piston, rings and cylinder wall.</p>
6. Engine overheats.	<ul style="list-style-type: none"> (a) Engine overloaded. (b) Carburetor adjustment too lean. (c) Insufficient oil in fuel. (d) Incorrect spark plug. (e) Ignition timing over-advanced. (f) Scored piston or cylinder wall. 	<p>Allow engine to cool. Reduce load.</p> <p>Refer to Section five, paragraphs one through five under "Carburetor Adjustments."</p> <p>Refer to Section three under "Ignition Specifications."</p> <p>Disassemble engine and inspect.</p>
7. Engine noisy or knocking.	<ul style="list-style-type: none"> (a) Loose flywheel. (b) Worn bearings. (c) Broken or loose parts inside engine. 	<p>Torque to specifications given in the Torque Chart at the end of Section four.</p> <p>Disassemble engine and inspect bearings.</p> <p>Disassemble and inspect.</p>
8. Engine stalls under load.	<ul style="list-style-type: none"> (a) Carburetor adjustment too lean. (b) Fuel line restricted or tank vent closed. (c) Faulty fuel pump. (d) Engine overloaded. 	<p>Refer to Section five, paragraphs one through five under "Carburetor Adjustment."</p> <p>Remove pump, disassemble and inspect diaphragm and valves.</p>
9. Poor acceleration.	<ul style="list-style-type: none"> (a) Carburetor out of adjustment (b) Air cleaner clogged. (c) Chipped or broken reeds. (d) Ignition timing over-advanced. (e) Leaking gaskets. (f) Exhaust restriction. (g) Poor compression. 	<p>Refer to Section five, paragraphs one through five under "Carburetor Adjustment."</p> <p>Rinse in clean gasoline.</p> <p>Remove reed plate and inspect.</p> <p>Refer to Section three under "Ignition Specifications."</p> <p>Inspect engine closely while running.</p> <p>Disassemble engine and inspect piston, rings, cylinder wall and head gasket.</p>
10. Poor high speed performance	<ul style="list-style-type: none"> (a) Carburetor out of adjustment. (b) Low compression. (c) Pre-ignition. 	<p>Refer to Section five, paragraphs one through five under "Carburetor Adjustment."</p> <p>Check for broken or worn rings, scored piston or cylinder wall or leaky head gasket.</p> <p>To check for pre-ignition: Allow engine to heat up thoroughly, turn ignition switch to "Off" position. If engine continues to run, check for the following: dirty or incorrect spark plug, excessive carbon or foreign matter in combustion chamber, carburetor adjustment too lean, excessive back pressure from muffler, ignition timing over-advanced.</p>

SPECIAL TOOLS

WEST BEND "L" SERIES POWER BEE ENGINE
SPECIAL TOOL LIST

TOOL NO.	NAME	APPLICATION
T-1582	Hex bit	Connecting rod screws
T-1749	Snap ring pliers	Piston pin lock rings
T-1907	Torque wrench adapter	Adapt T-1582 to 1/2" drive
T-1909	3/16" Allen wrench	Cylinder head screws
T-2904	Wrench	Spark plug
T-2911	5/32" Allen wrench	Connecting rod screws
T-2916	Seal sleeve	Crankshaft seals
T-2923	Knock-off nut L.H.	Flywheel (Rev. rot. models)
T-2935	Spanner wrench	Flywheel nut (starter cup)
18091	Knock-off nut R.H.	Flywheel (Std. rot. models)



18091



T-2923



T-1582



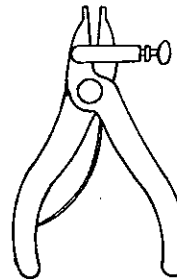
T-1907



T-1909



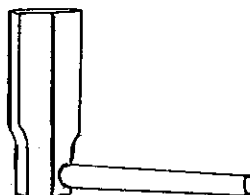
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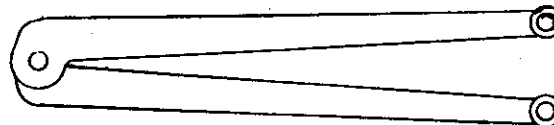
T-1749



T-2935



T-2916



T-2916