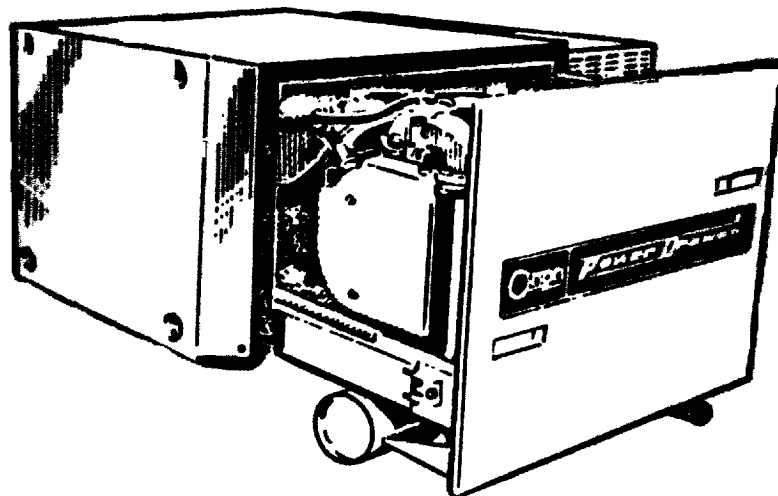




# OPERATORS MANUAL AND PARTS CATALOG



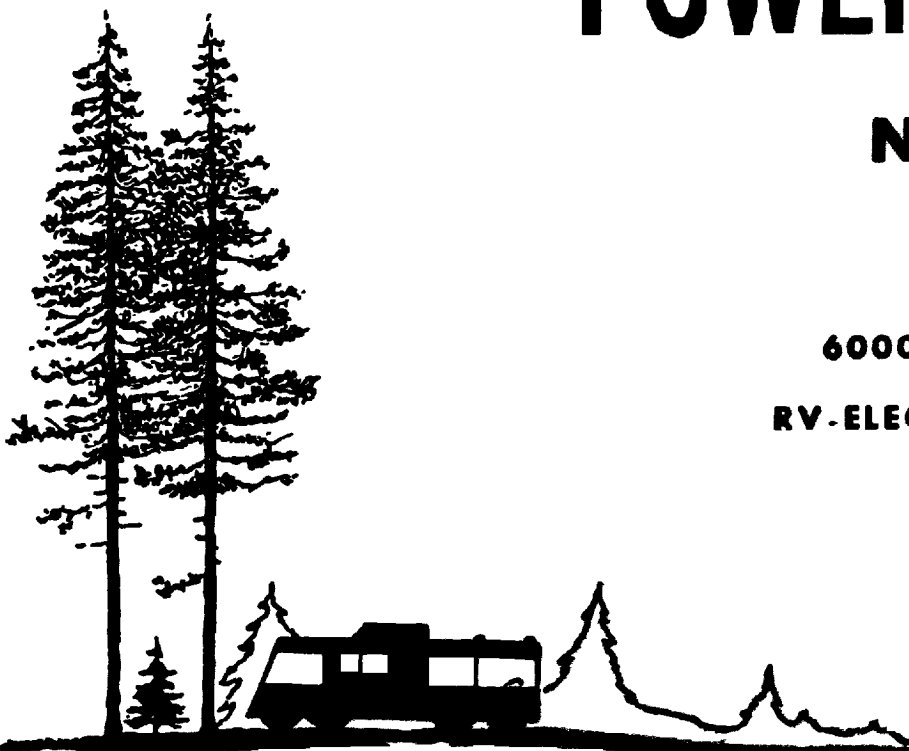
## “POWER DRAWER

### NH SERIES



6000 WATT CAPACITY

RV-ELECTRIC POWER PLANT

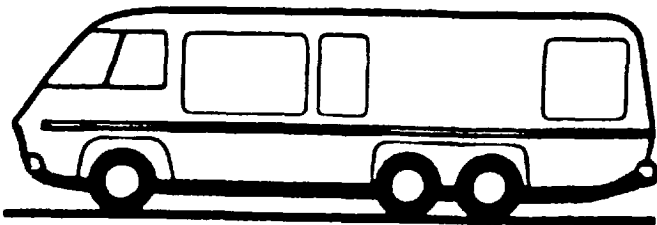


940-0315

6A73

GMC MOTORHOMES





# GMC

# MOTORHOMES INTERNATIONAL

This Manual was prepared for use of Members of  
GMC MOTORHOMES INTERNATIONAL.

Parts for ONAN Generators should be purchased  
from your local ONAN DISTRIBUTOR.

Some parts are available from GMC Truck and  
Coach Inc.

Manual is not for SALE

Onan recommends using non-leaded or low-lead regular grade gasoline. Ignition timing is 25° BTDC when point gap is set at .0120. Timing can be checked with timing light through 1/2 inch diameter hole in upper rear portion of Blower Cover. 25° timing is indicated when line on blower wheel is centered in 1/2 inch diameter hole.

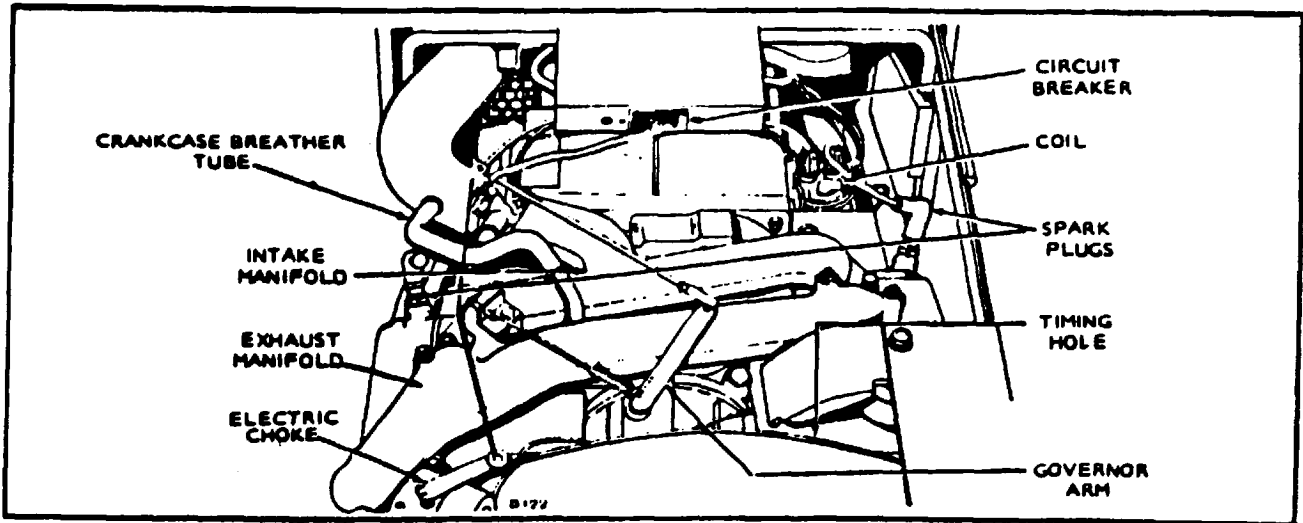
## MOTOR GENERATOR CAUTION

**CAUTION:** Do not interfere with or bypass electrical circuit breaker or attempt in other ways to defeat its purpose. Don't fill fuel tank while engine is running and don't smoke when filling fuel tank. Wipe up any oil and gasoline spills immediately and make sure oily rags aren't left on the power plant or in its compartment. Replace any compartment insulation that may become fuel or oil soaked. Do not use flammable materials directly above or around the power plant compartment. Make sure the ventilation system provides a constant flow of air to expel any fuel vapor from motor generator compartment while vehicle is in transit. Also, be sure any openings made in the motor generator compartment for conduit, wiring, etc. are sealed to prevent toxic gases from entering vehicle interior. Do not remove oil-fill cap while engine is running.

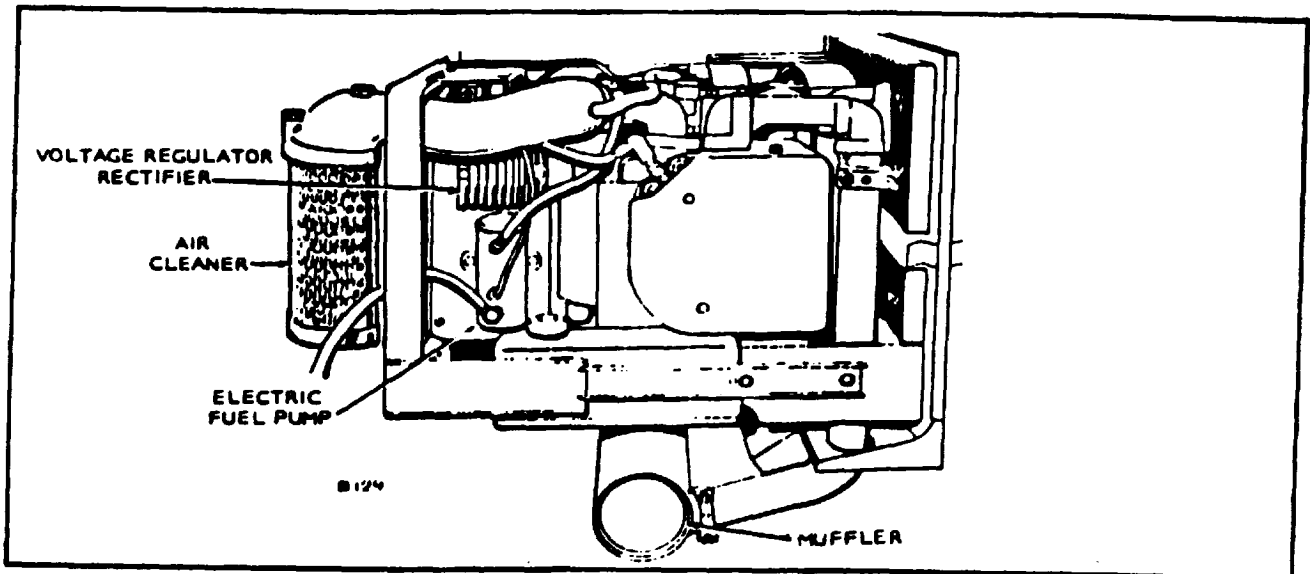
**NOTE**

**CAUTION** If lead deposits are not removed from the engine before switching from leaded to nonleaded gasoline, preignition could occur causing severe damage to the engine.

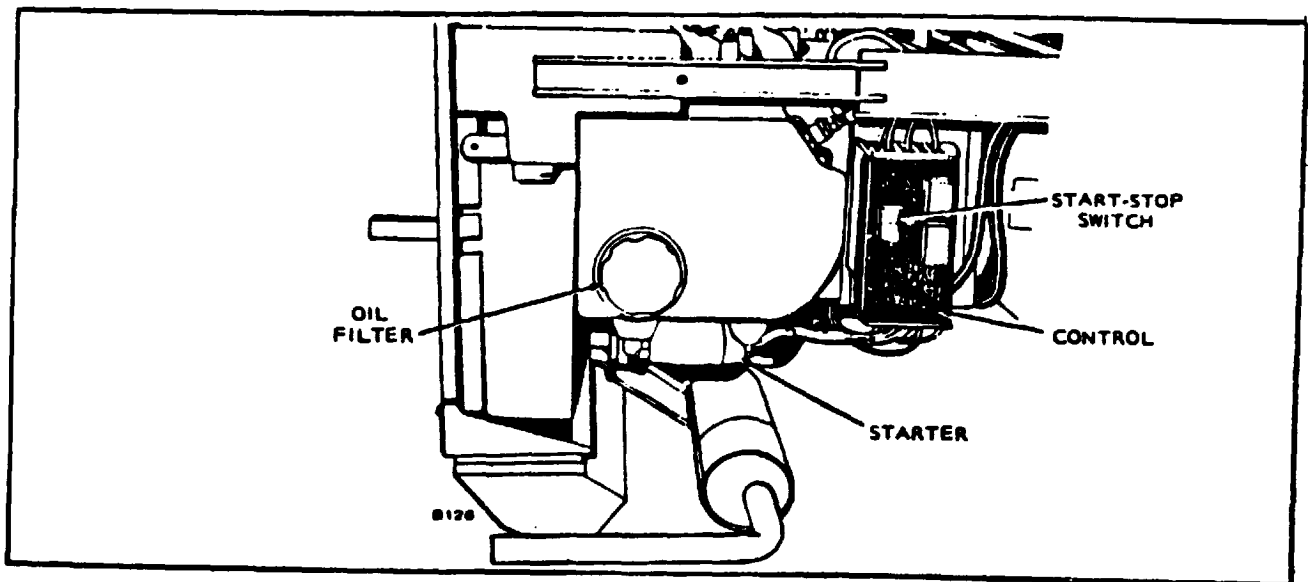
**NOTE:** The information in this bulletin on the use of lead free or low lead gasoline pertains to Onan-built engines ONLY.



TOP VIEW



LEFT SIDE



RIGHT SIDE

# SPECIFICATIONS

## ENGINE

6000 Watt NH series

Manufacturer ..... Onan  
Design ..... Four Cycle, Air Cooled, L Head  
Fuel ..... Gasoline \*  
Fuel Pump ..... 12 Volt, Electric  
Cylinders ..... Two  
Bore ..... 3-9/16 inch  
Stroke ..... 3 inch  
Oil Capacity ..... 4 quarts  
(With Filter Change) ..... 4-1/2 quarts  
Battery Voltage ..... 12 Volt  
Battery Size (Above 0° F. Operation) ..... 45 Amp/Hr. Min.  
Battery Charging System ..... 10 Amperes, Flywheel Alternator  
Starting System ..... Solenoid Shift

## GENERATOR

6000 Watt NH 9000

Manufacturer ..... Onan  
Design ..... Revolving Armature, Four Pole, 1800 rpm  
60 Hertz Recreational Vehicle Rating ..... 6000 Watts (6KW)  
Voltage ..... 120 Volts  
Current Rating ..... 50 Amperes  
Phase ..... Single  
Wire ..... Two

## PROTECTION

Generator ..... 50 Ampere Circuit Breaker  
Control (Remote Wiring) ..... 5 Ampere Fuse

## ENGINE

4000 Watt BF Series

Manufacturer ..... Onan  
Design ..... Four Cycle, Air Cooled, L Head  
Fuel ..... Gasoline  
Fuel Pump ..... 12V, Electric  
Cylinders ..... Two  
Bore ..... 3-1/8 Inch  
Stroke ..... 2-5/8 Inch  
Oil Capacity ..... 3 Quarts  
(With Filter Change) ..... 3-1/2 Quarts  
Battery Voltage ..... 12 Volt Battery Size (Above 0°F Operation) 45 Amp/hr Min.  
Battery Charging System ..... 10 Ampere, Flywheel Alternator  
Starting System ..... Solenoid Shift

## GENERATOR

4000 Watt BF series

Manufacturer ..... Onan  
Design ..... Revolving Armature, Four Pole, 1800rpm  
60 Hertz Recreational Vehicle Rating ..... 4000 Watts (4KW)  
Voltage ..... 120 Volts  
Current Rating ..... 33 Amperes  
Phase ..... Single  
Wire ..... Two

## PROTECTION

Generator ..... 35 or 40 Ampere Circuit Breaker  
Control (Remote Wiring) ..... 5 Ampere Fuse

## TUNE-UP SPECIFICATIONS

NH 6000 & BF 4000 series

Spark Plug Gap ..... .020 inch  
Breaker Point Gap (Full Separation) ..... .020 inch  
Ignition Timing (Engine Running or Static) \*\* ..... 25° BTC  
Tappet Adjustment (Engine Cold)  
Intake ..... .003 inch  
Exhaust ..... .012 inch

# MAINTENANCE

Regularly scheduled maintenance is the key to lower operating costs and longer service life for the unit. The following schedule can be used as a guide. However, actual operating conditions under which a unit is run should be the determining factor in establishing a maintenance schedule. When operating in very dusty or dirty conditions, some of the service periods may have to be reduced. Check the condition of the crankcase oil, the filters, etc. frequently until the proper service time periods can be established.

For any abnormalities in operation, unusual noises from engine or accessories, loss of power, overheating, etc., contact your nearest dealer.

## PERIODIC MAINTENANCE SCHEDULE

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS					
	8	50	100	200	400	1000
General Inspection	x					
Check Oil Level	x					
Check Battery		x				
Change Crankcase Oil			x1			
Check Air Cleaner			x1			
Check Breaker Points			x3			
Check Spark Plugs			x4			
Change Oil Filter				x1		
Clean Cooling Fins				x1		
Clean Crankcase Breather				x2		
Replace Breaker Points				x2		
Fuel Filter					x3	
Adjust Tappets					x2	
Replace Air Cleaner					x1	
Remove Carbon From Heads					x2	
Check Generator Brushes (For Sticking)		x5				
Complete Reconditioning (If Required)						x2
Check Generator Brushes (For Wear)						x2

- x1 - Perform more often in extremely dusty conditions.
- x2 - For detailed maintenance, contact your dealer.
- x3 - Replace if necessary.
- x4 - Replace at beginning of season.
- x5 - Check at this time (or sooner) if operating vehicle in extremely dusty conditions.

# ENGINE TROUBLE DIAGNOSIS

TROUBLE															CAUSE							
Backfire at Carburetor	Bearing Wear	Black Exhaust	Blue Exhaust	Burned Valves	Connecting Rod Wear	Cylinder Slowly	Engine Wear	Failure to Start	Governor Hunting	High Oil Pressure	Low Oil Pressure	Loss of Coolant (Water Cooled)	Mechanical Knock	Misfiring	Overheating (Water Cooled)	Overheating (Air Cooled)	Piston Wear	Poor Compression	Ring Wear	Sticking Valves		
<b>STARTING SYSTEM</b>																						
																					Loose or Corroded Battery Connection	
																						Low or Discharged Battery
																						Faulty Starter
																						Faulty Start Solenoid
<b>IGNITION SYSTEM</b>																						
																						Ignition Timing Wrong
																						Wrong Spark Plug Gap
																						Worn Points or Improper Gap Setting
																						Bad Ignition Coil or Condenser
																						Faulty Spark Plug Wires
<b>FUEL SYSTEM</b>																						
																						Out of Fuel - Check
																						Lean Fuel Mixture - Readjust
																						Rich Fuel Mixture or Choke Stuck
																						Engine Flooded
																						Poor Quality Fuel
																						Dirty Carburetor
																						Dirty Air Cleaner
																						Dirty Fuel Filter
																						Defective Fuel Pump
<b>INTERNAL ENGINE</b>																						
																						Wrong Valve Clearance
																						Broken Valve Spring
																						Valve or Valve Seal Leaking
																						Piston Rings Worn or Broken
																						Wrong Bearing Clearance
<b>COOLING SYSTEM (AIR COOLED)</b>																						
																						Poor Air Circulation
																						Dirty or Oily Cooling Fins
																						Blown Head Gasket
<b>LUBRICATION SYSTEM</b>																						
																						Relief Valve Stuck
																						Faulty Oil Pump
																						Dirty Oil or Filter
																						Oil Too Light or Diluted
																						Oil Level Low
																						Oil Too Heavy
																						Dirty Crankcase Breather Valve
<b>THROTTLE AND GOVERNOR</b>																						
																						Linkage Out of Adjustment
																						Linkage Worn or Disconnected
																						Governor Spring Sensitivity Too Great
																						Linkage Binding

## OIL LEVEL

Check the oil level daily or at least every eight hours of operating time. Check more often on a new unit as oil consumption is higher until piston rings seat properly.

## OIL CHANGE

Initial oil change should be made after the first 25 hours of operation; change every 100 hours after that. If operating in extremely dusty or cold weather conditions, change oil more frequently.

The engine's oil capacity is 4 quarts, 4-1/2 quarts if replacing oil filter. Do not mix brands nor grades of motor oil. Use a good quality oil with the designation SE/CC (former designation was MS, MS/DG). If necessary to add oil between changes, use the same brand and grade of oil already used.

The oil drain plug is located on the bottom side of engine oil base. Plant must be pulled out on its slide rails to gain access.

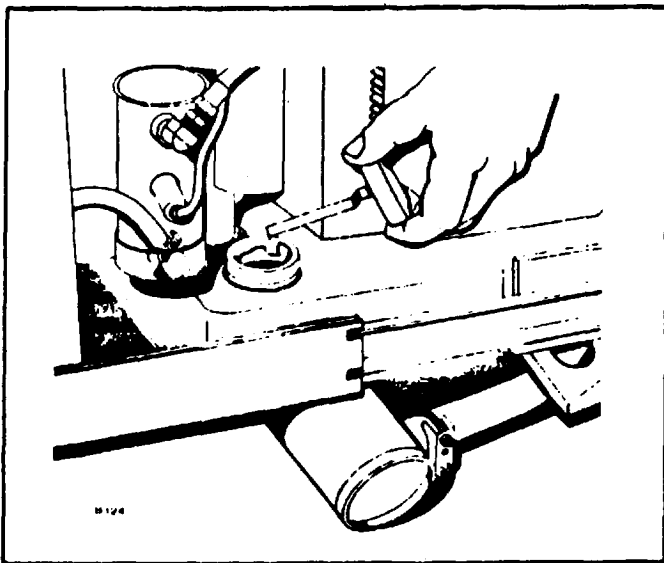


FIGURE 15. DIPSTICK AND OIL FILL

## OIL FILTER

Change the crankcase oil filter every 200 hours; change more often in extremely dusty conditions. The filter is located on the right side of engine (facing compartment). Remove by turning counterclockwise with a filter wrench. Before installing new filter, coat the gasket on the filter's base with a light film of new oil. Install by turning clockwise until a light friction is noted, then turn an additional 1/2 turn.

**CAUTION** Do not overtighten filter as damage may occur to rubber gasket which will cause filter to leak. Be sure to install sealing ring around filter; this ring is an air seal to prevent cooling air loss.

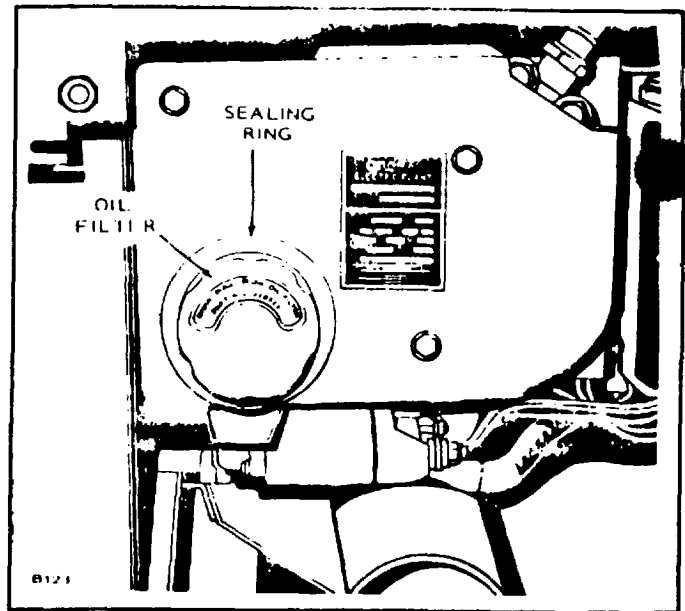


FIGURE 16. OIL FILTER LOCATION

## AIR CLEANER ELEMENT

Check element every 100 hours. Loosen wing nut to remove. Clean by tapping base lightly on a flat surface. Replace element at least every 400 operating hours; clean or replace more often in dusty conditions.

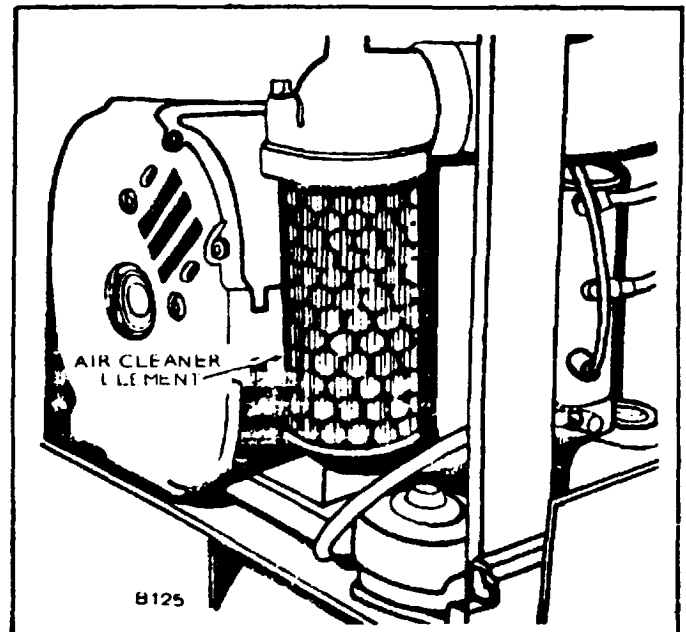


FIGURE 17. AIR CLEANER LOCATION

## SPARK PLUGS

Check, clean and reset spark plugs every 100 operating hours. Replace spark plugs that show signs of fouling or electrode erosion. It is recommended that spark plugs be replaced at the beginning of each new season (once a year).

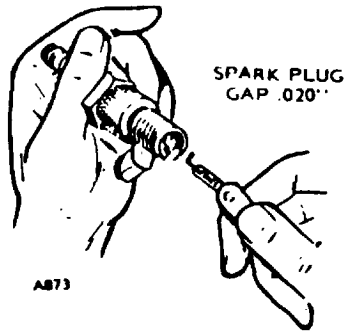


FIGURE 18. SPARK PLUG GAP

## COOLING SYSTEM

The power plant is cooled by a flywheel blower fan which pulls air through the generator and over the cylinders and cooling fins. The air path is directed by sheet metal shrouds and plates. These shrouds and plates must always be installed properly so unit does not overheat.

Check and clean (if necessary) the cooling fins at least every 200 hours of operation. Remove any dust, dirt or oil which may have accumulated. Check compartment air inlet and power plant air outlet for buildup of dirt, etc.

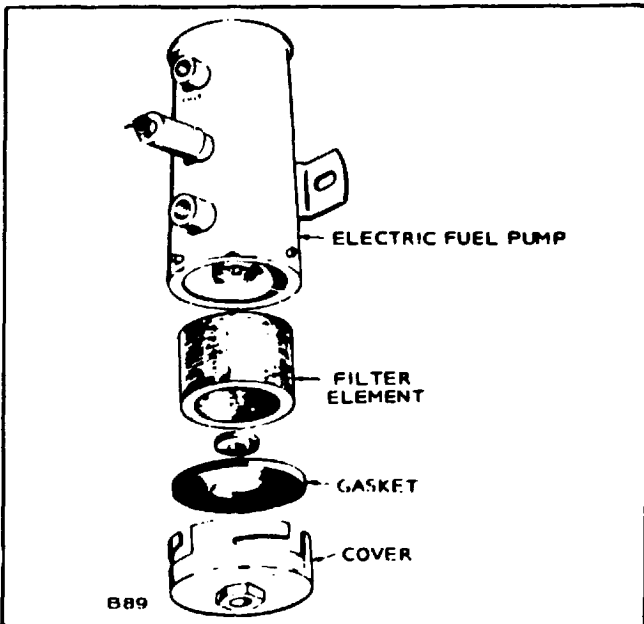


FIGURE 19. FUEL PUMP FILTER ELEMENT

## FUEL PUMP FILTER ELEMENT

Every 400 hours or sooner, drain fuel pump and check filter element. Remove fuel pump mounting screws and turn off hex nut on base of pump. If element appears dirty, replace with a new one. Be sure to replace gaskets when reassembling.

Some models may not use a filter element.

## CARBURETOR BOWL

Remove carburetor bowl from carburetor every 400 hours and clean screen in solvent. Blow out with low pressure, compressed air and reassemble, making sure gaskets are in place. Replace with new gaskets if necessary, a leaky or broken gasket can cause starting problems.

## GOVERNOR

The governor controls the engine speed by opening or closing the throttle according to the load taken off the plant. Every 50 hours check governor linkage for freedom of movement through its entire travel. Clean and lubricate ball joint with lubricating graphite.

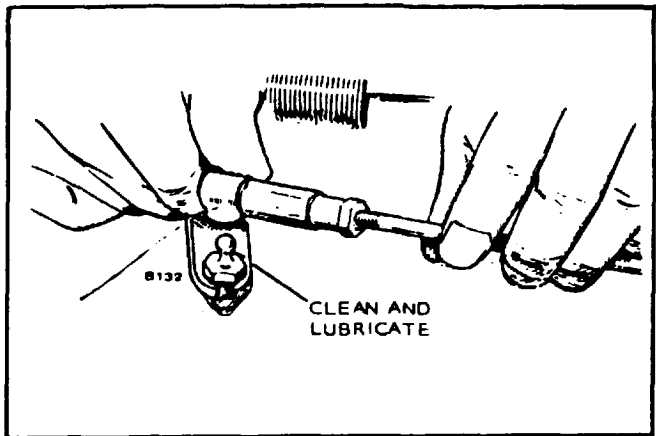


FIGURE 20. GOVERNOR LINKAGE

## BATTERY INSPECTION

Check battery cells with a hydrometer. The specific gravity reading should be approximately 1.280 at 80° F.

If one or more cells are low on water, add distilled water and recharge.

Keep the battery case clean and dry. An accumulation of moisture will lead to a more rapid discharge and battery failure.

Keep the battery terminals clean and tight. After making connections, coat the terminals with a light application of petroleum jelly or grease to retard corrosion.



# ADJUSTMENTS

## BREAKER POINTS

To maintain maximum efficiency from the unit, inspect the breaker points every 100 hours of operation. Change if points are pitted. Proceed as follows:

1. Remove the two screws and the cover on the breaker box.
2. Remove the two spark plugs so engine can be easily rotated by hand. Check condition of spark plugs at this time.
3. Remove mounting screw (A) and pull the points out of the box just far enough so screw (B) can be removed and leads disconnected.
4. Remove screw (C) and replace condenser with a new one.
5. Replace points with a new set but do not completely tighten mounting screw (A).
6. Rotate the engine clockwise (facing flywheel) until the 25° BTC mark on flywheel aligns with 1/2 inch hole in rear of blower scroll. Turn another 1/4 turn (90°) to ensure points are fully open.
7. Using a screwdriver inserted in notch (D) on the right side of points, turn points until gap measures .020 inch with a flat thickness gauge. (Be sure feeler is clean.) Tighten mounting screw and recheck gap.
8. Timing can be checked with a timing light, however, this is not usually necessary. 25° BTC timing is indicated when notch on flywheel is centered in inspection hole on rear of scroll. Timing light can be connected to either spark plug.

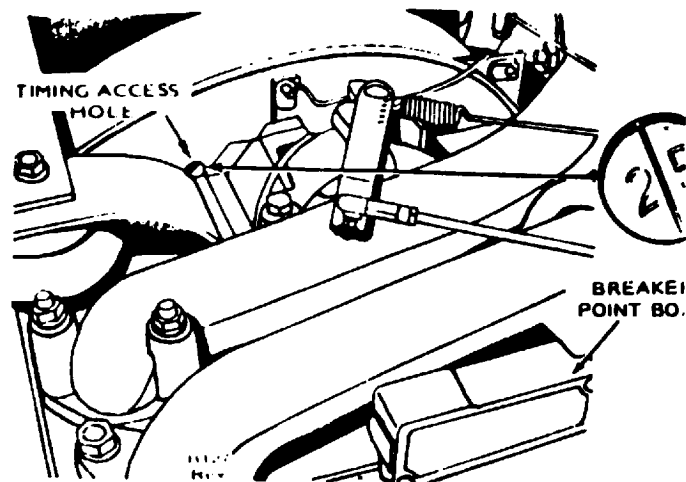
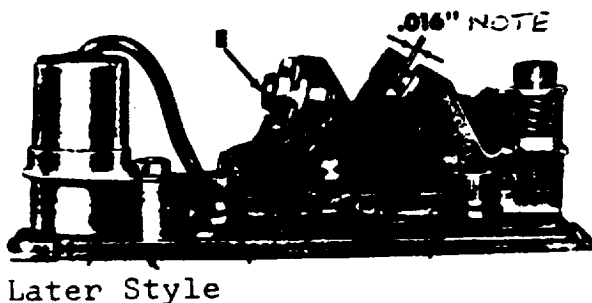
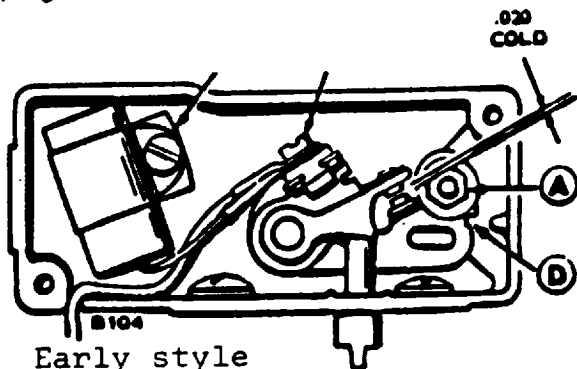


FIGURE 12. TIMING HOLE

## CARBURETOR

The carburetor has a main fuel (power) adjustment and an idle fuel adjustment. The main adjustment affects operation under heavy load conditions. Idle adjustment affects operation under light or no load conditions. Under normal circumstances, carburetor adjustments should not be disturbed. Normal settings are 1-1/4 turn open for main fuel jet and one turn open for idle fuel jet.

**CAUTION** Forcing the needle against its seat will damage it. The needle does not completely shut off fuel when turned fully in.

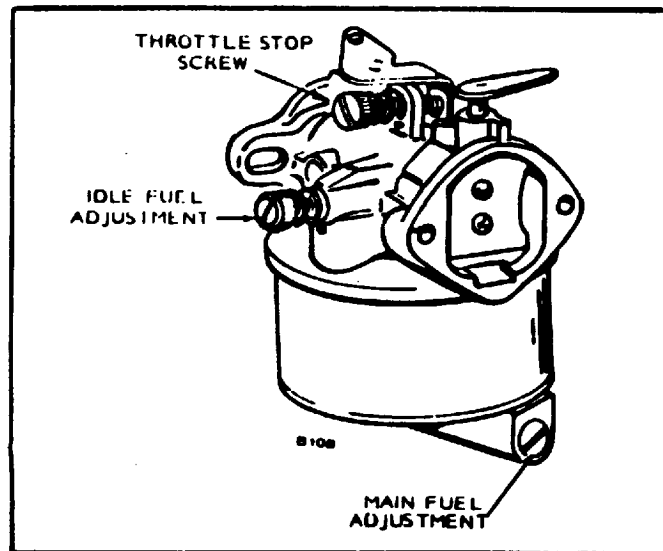


FIGURE 13. CARBURETOR ADJUSTMENTS

Before final adjustment, allow the engine to warm up. Make the idle adjustment under no load. Open the main jet until the engine runs smooth under acceleration with no load. Slightly more fuel may be needed (open about 1/4 turn further) when sudden load is applied or if operating in very cold weather.

Set the throttle stop screw (located on carburetor throttle lever) with no load connected and while running at a low speed setting. Turn the screw to give approximately 1/32 inch clearance between the screw and pin.

If the engine develops a "hunting" condition (alternate increase and decrease of engine speed), try correcting by opening the main adjustment needle a little more. Do not open more than 1/2 turn beyond the maximum power point.

### GOVERNOR ADJUSTMENTS (Figure 14)

Before making governor adjustments, run the unit about 15 minutes under light load to reach normal operating temperature. (If governor is completely out of adjustment, make a preliminary adjustment at no load to first attain a safe voltage operating range).

Engine speed determines the output voltage and current frequency of the generator. By increasing the engine speed, generator voltage and frequency are increased, and by decreasing the engine speed, generator voltage and frequency are decreased. An accurate voltmeter or frequency meter (preferably both) should be connected to the generator output in order to correctly adjust the governor. A small speed drop not noticeable without instruments will result in an objectionable voltage drop. The engine speed can be checked with a tachometer.

A binding in the bearings of the governor shaft, in the ball joint, or in the carburetor throttle assembly will cause erratic governor action, or alternate increase and decrease in speed (hunting). A lean carburetor adjustment may also cause hunting. Springs of all kinds have a tendency to lose their calibrated tension through fatigue after long usage. If all governor and carburetor adjustments are properly made, and the governor action is still erratic, replacing the spring with a new one and resetting the adjustments will usually correct the trouble.

1. Adjust the carburetor idle needle with no load connected.
2. Adjust the carburetor main jet for the best fuel mixture while operating the set with a full rated load connected.
3. Adjust the length of the governor linkage and check linkage and throttle shaft for binding or excessive looseness.
4. Adjust the governor spring tension for rated speed at no load operation.
5. Adjust the governor sensitivity.
6. Recheck the speed adjustment.
7. Set the carburetor throttle stop screw.

**Linkage:** The engine starts at wide open throttle. The length of the linkage connecting the governor arm to the throttle shaft and lever is adjusted by rotating the ball joint. Adjust this length so that with the engine stopped and tension on the governor spring, the stop on the carburetor throttle lever just contacts the underside of the carburetor bowl. This setting allows immediate control by the governor after starting. It also synchronizes travel of the governor arm and the throttle shaft.

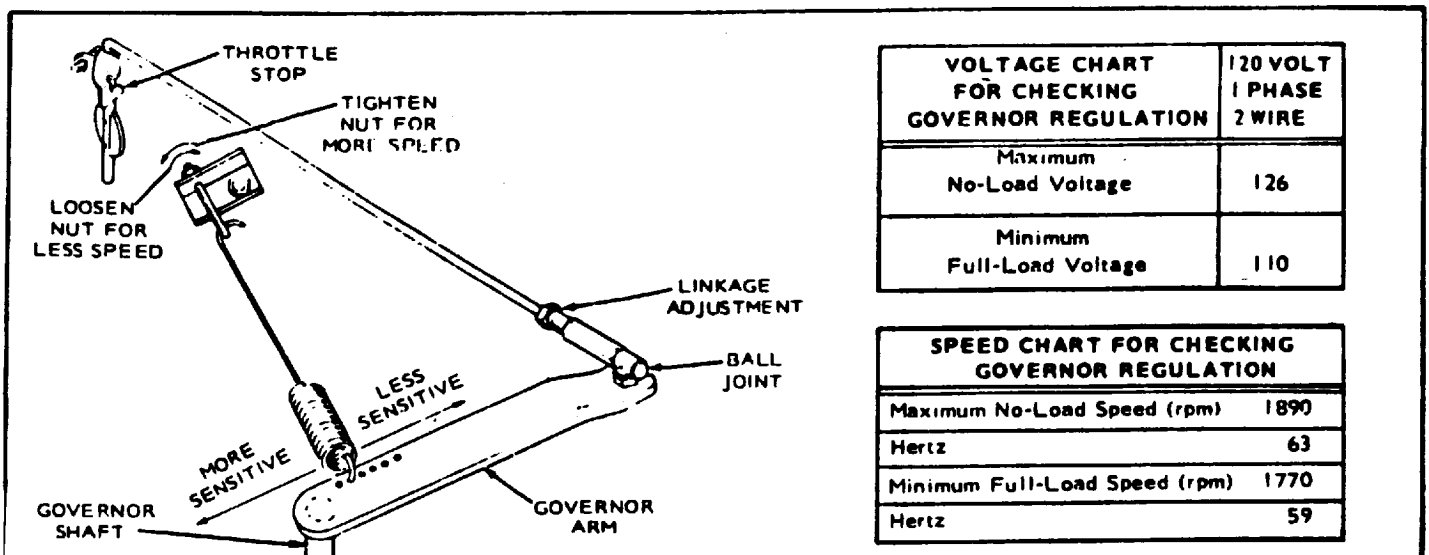


FIGURE 14. GOVERNOR ADJUSTMENTS

**Speed Adjustment:** With the warmed-up unit operating at no load, adjust the tension of the governor spring. Refer to *Voltage Chart* and the *Speed Chart*. Turn the speed adjusting nut to obtain a voltage and speed reading within the limits shown.

**Sensitivity Adjustment:** Refer to the *Governor Adjustment* illustration, and to the *Voltage* and *Speed Charts*. Check the voltage and speed, first with no load connected and again with a full load. Adjust the sensitivity to give the closest regulation (least speed and voltage difference between no load and full load) without causing a hunting condition.

To increase sensitivity (closer regulation), shift the spring toward the governor shaft.

An adjustment for too much sensitivity will cause alternate increase and decrease of engine speed (hunting).

To decrease sensitivity, shift the spring toward the outer end of the governor arm. Too little sensitivity will result in too much difference in speed between no load and full load conditions.

Any change in the sensitivity adjustment usually requires a compensating speed (spring tension)

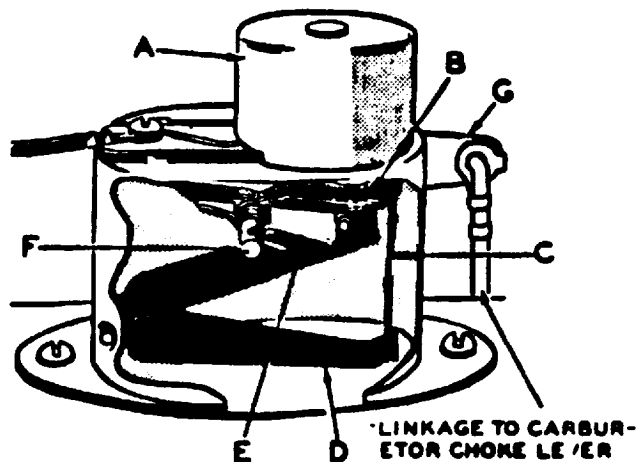
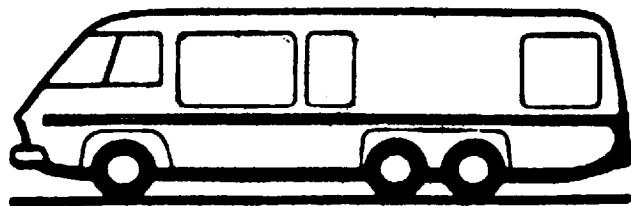
#### ELECTRIC SOLENOID

The electric solenoid choke is of Sisson manufacture. Sisson chokes are used on some Onan engines and electric plants and are a combination of magnet and bimetal.

The electric solenoid type of choke is shown in Figure 8. The magnetic coil and core assembly A is mounted at the top of the assembly. The hinged magnet arm B is connected by link C to a U-shaped bimetal strip D. The bimetal strip bears against the shaft plate E which operates the shaft F. Choke lever G is mounted on shaft F and is connected by suitable linkage to the carburetor choke lever.

When the start button on the plant is pressed, the magnet arm B is pulled upward. If the plant is being started "cold", the bimetal strip D is spread enough so that the lever G will move far enough to completely close the carburetor choke plate. This gives a rich choking mixture for starting. As soon as the plant starts and the start button is released, the magnet arm B drops down to a position determined by the bimetal strip D opening the carburetor choke slightly. As heat from the manifold affects the bimetal strip D, its ends come closer together permitting the carburetor choke to open still wider. When the plant is started at operating temperature, the bimetal strip ends are close together preventing the magnet arm from pulling the shaft plate upward.

This choke should require no seasonal readjustment. If the adjustment has been disturbed, adjust in the following manner. The engine should be "cold". Disconnect the linkage to the carburetor choke shaft. Rotate the choke lever G in the closed choke direction until the hole in shaft F is aligned with the notch in the shaft bearing. Insert a 1/16" diameter rod through the shaft hole engaging the rod in the notch of the mounting flange. This will lock the shaft in place.



Loosen the choke lever clamp screw enough to permit moving the lever on the shaft. The linkage to the carburetor choke lever must be properly in place. Remove the air cleaner connection from the carburetor air intake so that the carburetor choke plate can be seen. Adjust the choke assembly lever so that the carburetor choke plate is just completely closed or not more than 1/16" open. Tighten the choke lever clamp screw and remove the locking rod from the shaft.

Test the adjustment to see that when the choke lever is pulled upward to its limit, the carburetor choke plate is closed or nearly so. Press downward on the choke lever against the tension of the bimetal strip to the limit of its travel. The carburetor choke plate should open completely. If the carburetor choke plate will not completely open, adjust the position of the carburetor choke shaft lever as necessary. Recheck the adjustment. If trial proves further adjustment is necessary, reinsert the locking rod and loosen the lever clamp screw. For a richer choke mixture pull the lever upward slightly. For a leaner choke mixture, push the lever downward slightly.

Tighten the clamp screw and remove the rod from the shaft hole. When the plant is at operating temperature, the carburetor choke plate must be wide open.

The choke cannot operate properly if there is any binding in the connecting linkage, the choke assembly shaft or the carburetor shaft. To test the magnet of the choke assembly, hold a screwdriver blade 1/4" from the top center riveted post. When the start button is pressed the magnet coil should be energized pulling the screwdriver to the center post. If no magnetic pull is felt, check the choke electrical circuit. Replace the choke if the magnet coil is defective.

## BREAKER POINT ADJUSTMENT AND TIMING PROCEDURE

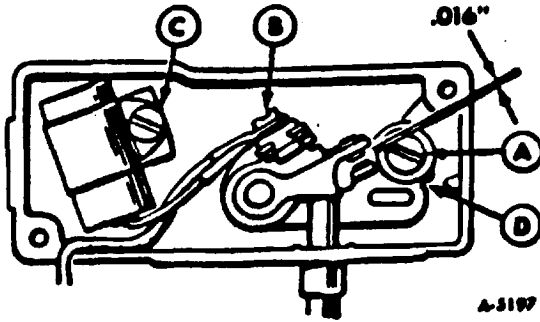


Figure 1—Breaker Point Adjustment—Type 1

### TYPE 1 BREAKER POINTS

1. Remove the two screws and the cover on the breaker box.
2. Remove the two spark plugs so the engine can easily be rotated by hand. Check condition of spark plugs at this time.
3. Remove mounting screw (A) and pull the points out of the box just far enough so screw (B) can be removed and leads disconnected.
4. Remove screw (C) and replace condenser with a new one. Tighten screw (C).
5. Replace points with a new set. Tighten screw (B) but do not completely tighten mounting screw (A).
6. Remove push-on terminal from ignition coil negative terminal. Connect test lamp, one lead to battery positive (+) terminal at starter, the other lead to push-on terminal (-).
7. Rotate engine clockwise (facing flywheel) by hand until  $20^{\circ}$  BTDC mark on flywheel aligns with center of timing access hole. (Note, early units marked at  $25^{\circ}$  BTDC should be set at  $25^{\circ}$  BTDC.) Then, using a screwdriver inserted in notch (D) on the left side of the points (reverse view of figure 1), adjust points until test lamp just goes out (or Ohmmeter reads Infinity). Tighten screw (A).
8. To check, turn crankshaft against rotation (counterclockwise) until points just close. At this time test lamp should light (or Ohmmeter should read "Zero"). Now slowly rotate the engine clockwise. Lamp should go out (or Ohmmeter read Infinity) just as the points break, which is the time at which ignition occurs. (6KW —  $20^{\circ}$  BTDC or  $25^{\circ}$  BTDC, whichever is marked on flywheel.) Breaker points are now adjusted properly and timing is set.

**NOTE:** Type 1 breaker box assembly may be converted to Type 2 breaker box assembly to provide easier access to ignition contacts.

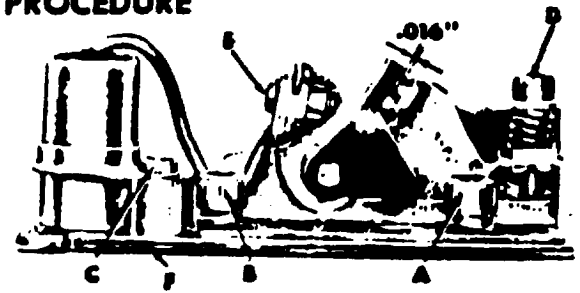
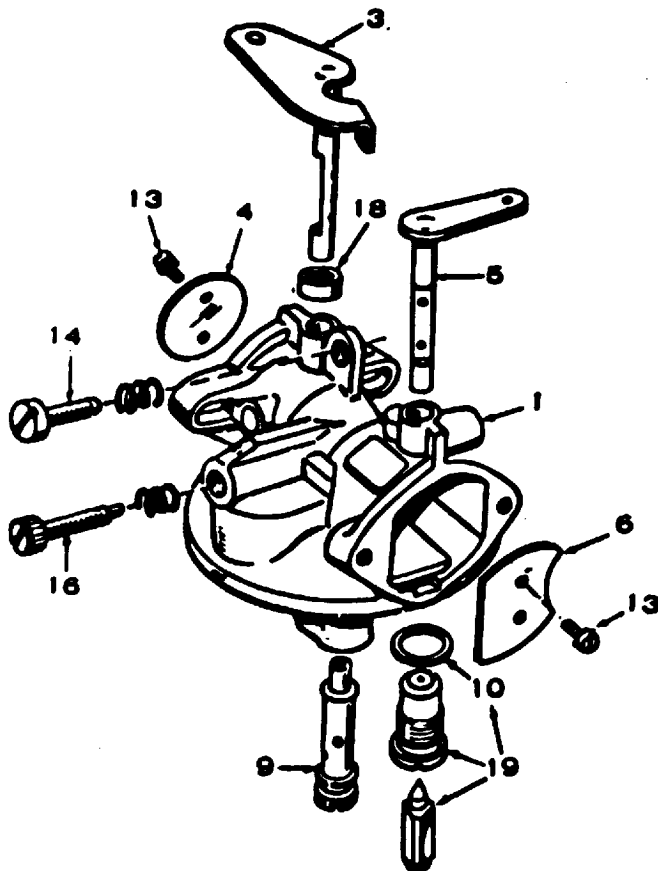


Figure 2—Breaker Point Adjustment—Type 2

### TYPE 2 BREAKER POINTS

1. Remove single screw and the breaker point cover box.
2. Remove the two spark plugs so the engine can easily be rotated by hand. Check condition of spark plugs at this time.
3. Using a screwdriver, remove mounting screw (C). Use an Allen wrench to remove mounting screws (A) and (B). Loosen screw (E) to remove leads. Remove points and condenser from base (F).
4. Replace points and condenser with a new set. Tighten screws (A), (B) and (C). Connect leads and tighten screw (E).
5. Remove push-on terminal from ignition coil negative terminal. Connect test lamp, one lead to battery positive (+) terminal at starter, the other lead to push-on terminal (-) removed from ignition coil terminal. (To use Ohmmeter or self-powered test lamp, remove push-on terminal from ignition coil negative terminal. Connect one of meter leads to removed terminal, the other to suitable engine ground. Do not connect Ohmmeter to battery positive (+) lead at starter or damage to instrument could result.)
6. Rotate engine clockwise (facing flywheel) by hand until  $20^{\circ}$  BTDC mark on flywheel aligns with center of timing access hole. (Note, early units marked at  $25^{\circ}$  BTDC should be set at  $25^{\circ}$  BTDC.) Then, using an Allen wrench inserted in screw (D), adjust points until test lamp just goes out (or Ohmmeter reads Infinity).
7. To check, turn crankshaft against rotation (counterclockwise) until points just close. At this time test lamp should light (or Ohmmeter should read "Zero" resistance). Now slowly rotate engine clockwise. The lamp should go out (or Ohmmeter read Infinity) just as the points break, which is the time at which ignition occurs. (6KW— $20^{\circ}$  BTDC or  $25^{\circ}$  BTDC, whichever is marked on flywheel.) Breaker points are now adjusted properly and timing is set.

# CARBURETOR PARTS GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	146-0188	1	Carburetor Assembly (Complete)
1	146-0189	1	Body, Carburetor
2	146-0171	1	Bowl Assembly (Includes Power Needle and Screen)
3	146-0172	1	Shaft, Throttle
4	146-0173	1	Valve, Throttle
5	146-0174	1	Shaft, Choke
6	146-0175	1	Valve, Choke
7	146-0176	1	Float Assembly
8	146-0111	1	*Shaft, Float
9	146-0190	1	Nozzle
10	146-0182	1	*Gasket, Valve Seat
11	146-0183	2	*Gasket, Bowl Nut
12	146-0184	1	*Gasket, Body to Bowl
13	146-0142	4	Screw and Washer Assembly
14	146-0186	1	Spring and Screw, Adjusting
15	146-0187	1	*Needle Assembly - Power
16	146-0116	1	*Needle Assembly - Idle
17	146-0177	1	Retainer, Bowl
18	146-0178	1	Seal, Throttle Shaft
19	146-0179	1	*Float, Valve Seat and Gasket Assembly
	141-0078	1	*Gasket, Mounting Flange
	146-0185	1	*Kit, Gasket (Includes Parts Marked *)
	146-0180	1	*Kit, Repair (Includes Parts Marked *)

\* - Parts contained in the 146-0185 Gasket Kit.  
 \* - Parts contained in the 146-0180 Repair Kit.

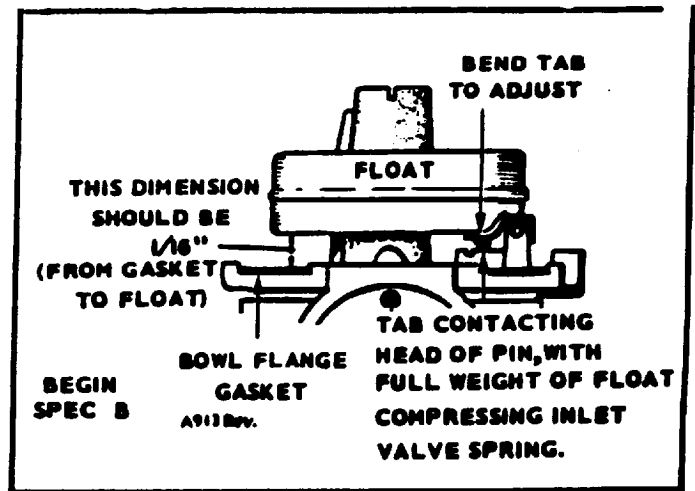
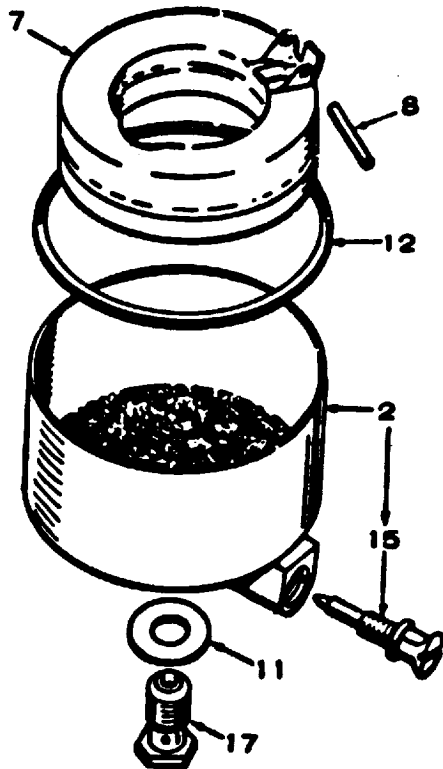


FIGURE 14. SETTING FLOAT LEVEL

## FUEL SYSTEM TROUBLE DIAGNOSIS

Problem	Possible Cause	Correction
Fuel leaks from carburetor when fuel shut-off is open.	1. Float level set too high.	1. With fuel bowl removed and carburetor inverted, set float parallel to bowl flange. (3/32" clearance)
	2. Dirt under inlet valve.	2. Remove inlet valve, clean seat by rinsing in clean fuel and blow off with compressed air.
	3. Bowl vent plugged.	3. Remove bowl and blow clean with compressed air.
	4. Collapsed float caused by blowing assembled carburetor with compressed air.	4. Replace float.
	5. Carburetor gummed from storage. Float stuck to screen.	5. Remove fuel bowl and clean.
Engine smokes and runs rich.	1. Dirty air filter.	1. Clean or replace.
	2. Improper adjustment.	2. Set idle & power needles at 1 turn open. After engine starts and runs, set for optimum performance.
	3. Nozzle boss gasket leaks. Engine runs with power needle seated.	3. Remove fuel bowl and replace gasket. Tighten bowl retainer securely.
	4. Air bleeds in carburetor plugged.	4. Remove fuel bowl, idle & power needles. Clean thoroughly with compressed air.
Engine runs lean.	1. Improper adjustment.	1. Set idle & power needles at 1 turn open. After engine starts and runs, set for optimum performance.
	2. Idle holes plugged. Dirt in fuel delivery channels.	2. Remove fuel bowl, idle & power needles. Clean thoroughly with compressed air.
	3. Float level set too low. Low level in fuel bowl.	3. With fuel bowl removed and carburetor inverted, set float parallel to bowl flange. (3/32" clearance)
	4. Fuel filter in electric fuel pump dirty.	4. Remove filter and replace.
	5. Fuel filter in fuel bowl plugged.	5. Remove fuel bowl. Invert bowl and tap on flat surface. Clean thoroughly and replace.

# VALVE SERVICE

Properly-seated valves are essential to good engine performance. The cylinder head is removable for valve servicing. Do not use a pry to loosen the cylinder head. Rap sharply on the edge with a soft-faced hammer. A conventional-type valve spring lifter may be used when removing the valve spring locks, which are of the split type. Clean all carbon deposits from the cylinder head, piston top, valves, guides, etc. If a valve face is burned or warped, or the stem worn, install a new valve.

Worn valve stem guides may be replaced from inside the valve chamber. Valve locks are the split, tapered-type, the smaller diameter facing toward the valve head. Tappets are replaceable from the valve chamber after the valve assemblies are removed. See Figure 18 for valve details.

The valve face angle is  $44^\circ$ . The valve seat angle is  $45^\circ$ . This  $1^\circ$  interference angle results in a sharp seating surface between the valve and the seat. This interference angle minimizes face deposits and lengthens valve life. Valve seat face should be  $1/32$  to  $3/64$  of an inch wide. Grind only enough to assure proper seating.

The valves should not be hand lapped, if at all avoidable, since the sharp contact may be destroyed. This is especially important where stellite-faced valves and seats are used. Remove all grinding dust from engine parts and install each valve in its proper location. Check each valve for a tight seat using an air pressure testing tool. If such a tool is not available, make pencil marks at intervals across the valve face and observe if the marks

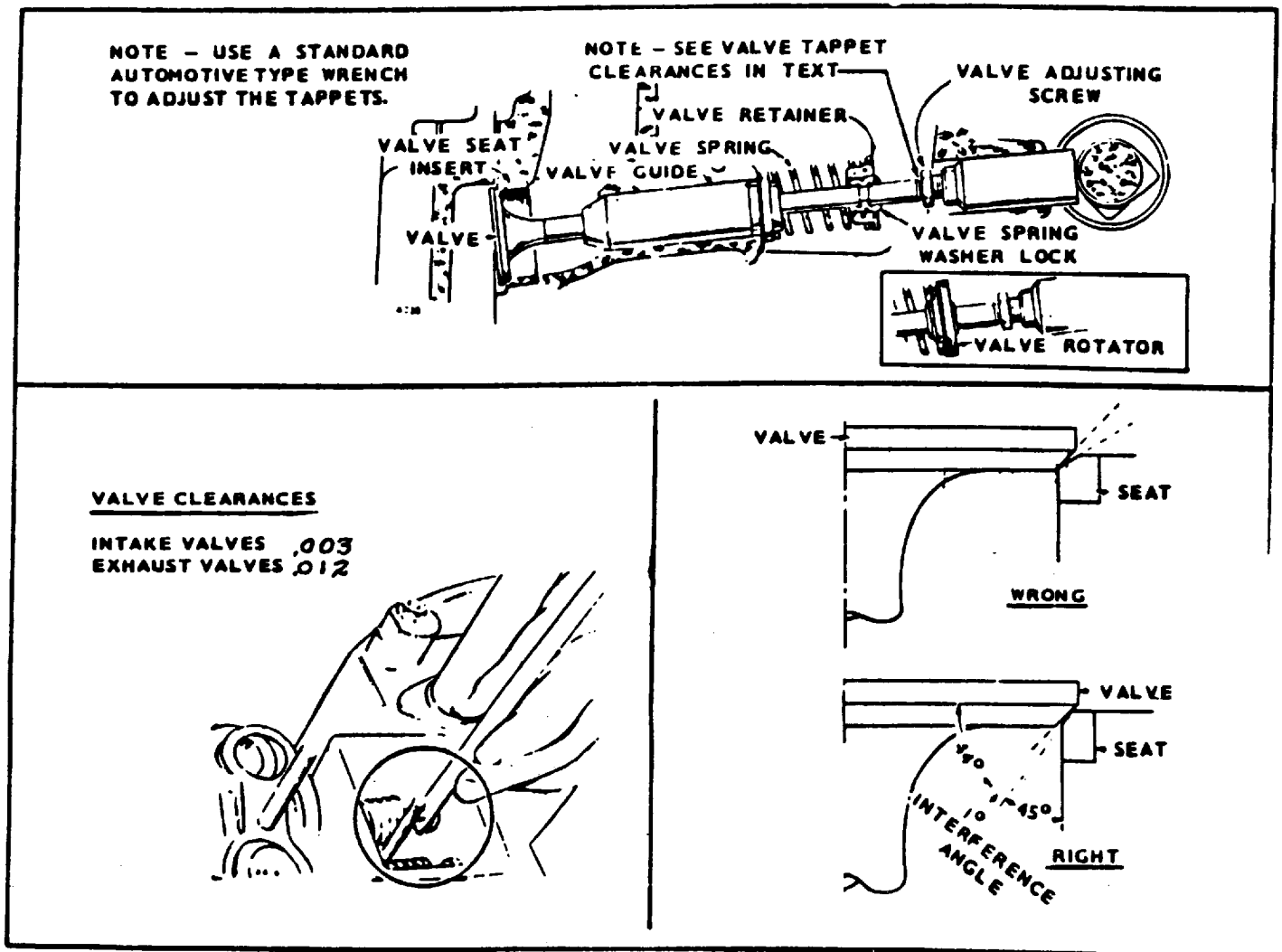


FIGURE 18. VALVE DETAILS AND CLEARANCES

rub off uniformly when the valve is rotated part of a turn against the seat.

Lightly oil the valve stems and assemble. Adjust the valve clearance.

The positive-type valve rotators serve to prolong valve life and lessen the need for valve service. When functioning properly, the valve is rotated a fraction of a turn each time it opens. While at open position, the valve can be rotated freely, but in only one direction. If rotators are faulty, replace.

#### TAPPET ADJUSTMENT

These plants are equipped with adjustable tappets. To make a valve adjustment, remove the valve covers. Facing the flywheel, crank the engine over slowly by hand until the left intake valve opens and closes. Continue about

1/4 turn until the mark on the flywheel and the TC mark on the gear cover are in line. This should place the left piston at the top of its compression stroke, the position it must be in to get proper valve adjustment for the left cylinder. Clearances are shown in Figure 18. For each valve, the thinner gauge (minimum) should pass freely between the valve stem and valve tappet but the thicker gauge (maximum) should not.

To adjust valve clearance, turn adjusting screw as needed to obtain the right clearance. The screw is self-locking.

To adjust the valves on the right cylinder, crank the engine over one complete revolution and again line up the mark on the flywheel and the TC mark on the gear cover. Then follow the adjustment given for the valves of the left cylinder.

#### ENGINE MISFIRES AT LIGHT LOAD

Carburetor idle jet clogged or improperly adjusted.	Clean.
Spark plug gaps too narrow.	Set gap.
Intake air leak.	Tighten. Replace gaskets if necessary.
Faulty ignition.	Clean, adjust, or replace breaker points, spark plugs, condenser, etc., or time ignition.

#### ENGINE MISFIRES AT HEAVY LOAD

Defective spark plug.	Replace.
Faulty ignition.	Clean, adjust, or replace breaker points, spark plugs, condenser, etc., or time ignition.
Clogged carburetor.	Clean carburetor.
Clogged fuel screen.	Clean.
Defective spark plug cable.	Replace.

#### ENGINE MISFIRES AT ALL LOADS

Fouled spark plug.	Clean and adjust.
Defective or wrong spark plug.	Replace.
Leaking valves.	Grind valves.
Broken valve spring.	Replace.
Defective or improperly adjusted breaker points.	Adjust or replace breaker points.

#### ENGINE BACKFIRES AT CARBURETOR

Lean fuel mixture.	Clean carburetor. Adjust jets.
Clogged fuel filter.	Clean.
Air leak at intake manifold or carburetor flange.	Tighten mounting screws. Replace gaskets as necessary.
Poor fuel.	Fill with good, fresh fuel.
Spark advanced too far.	Re-set breaker points or time ignition.
Intake valve leaking.	Reface, seat or replace.



## STARTER REMOVAL

1. Slide set completely out on its rails. Remove front panel and blower scroll (Figure 41).

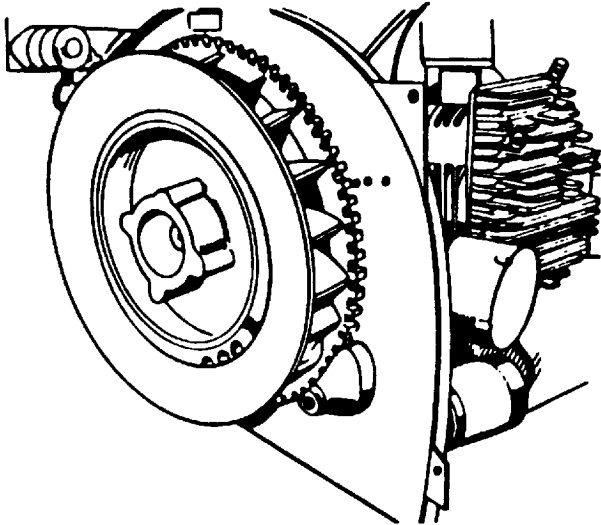


FIGURE 41. BLOWER SCROLL REMOVED

2. Remove flywheel with a flywheel puller or loosen center cap screw and direct a sharp blow to loosen. It helps to pull forward on one side of flywheel when striking with a hammer. If using this procedure be sure to leave center cap screw loosely in place or blower wheel will fall on floor.
3. Remove left and right hand air shrouds that cover cylinder heads.
4. Remove exhaust manifold.
5. Remove blower scroll backing plate (two screws on bottom - two on gear cover).

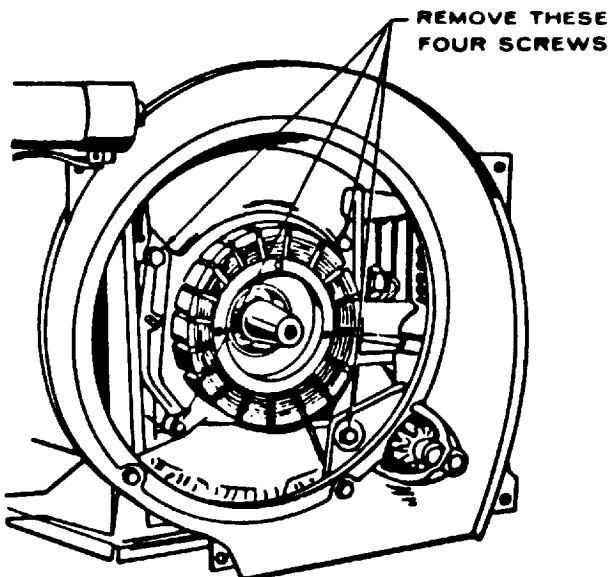


FIGURE 42. REMOVING BACKING PLATE

6. Disconnect heavy wire that connects to starter.
7. Remove two starter hold-down studs and lift out starter.

## STARTER DISASSEMBLY

Disassemble the starter as follows:

1. Loosen the nut that attaches the solenoid motor terminal to the field coil connector lead and take off the connector lead.

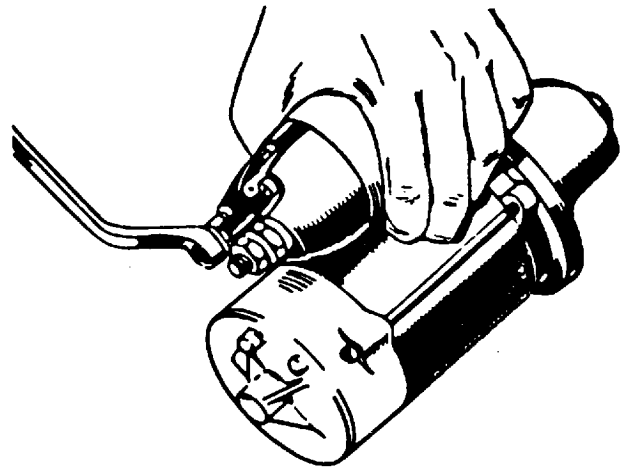


FIGURE 43.

2. Loosen the retaining screws and remove the solenoid from the front bracket. Simultaneously, the fiber washers, the return spring and the solenoid plunger will be removed.

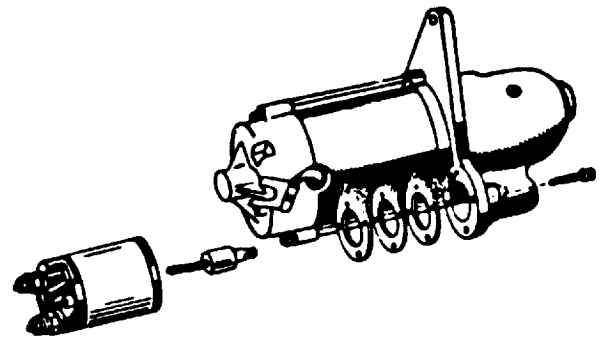
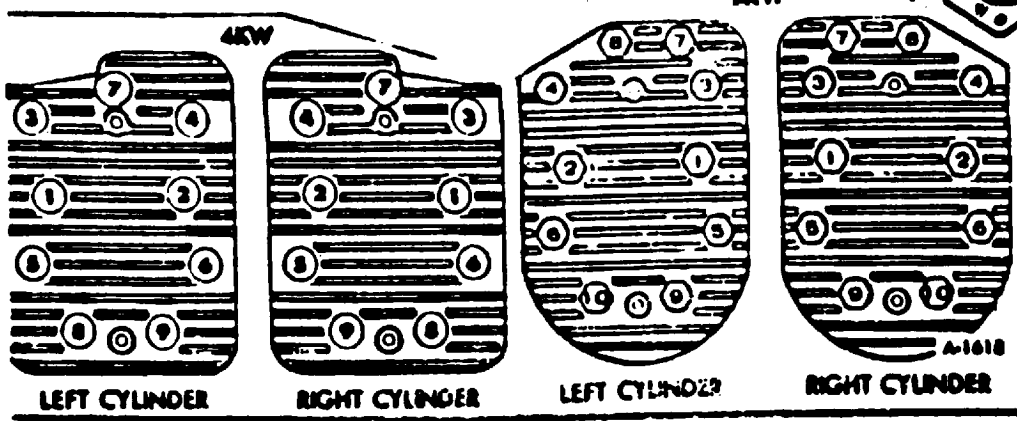
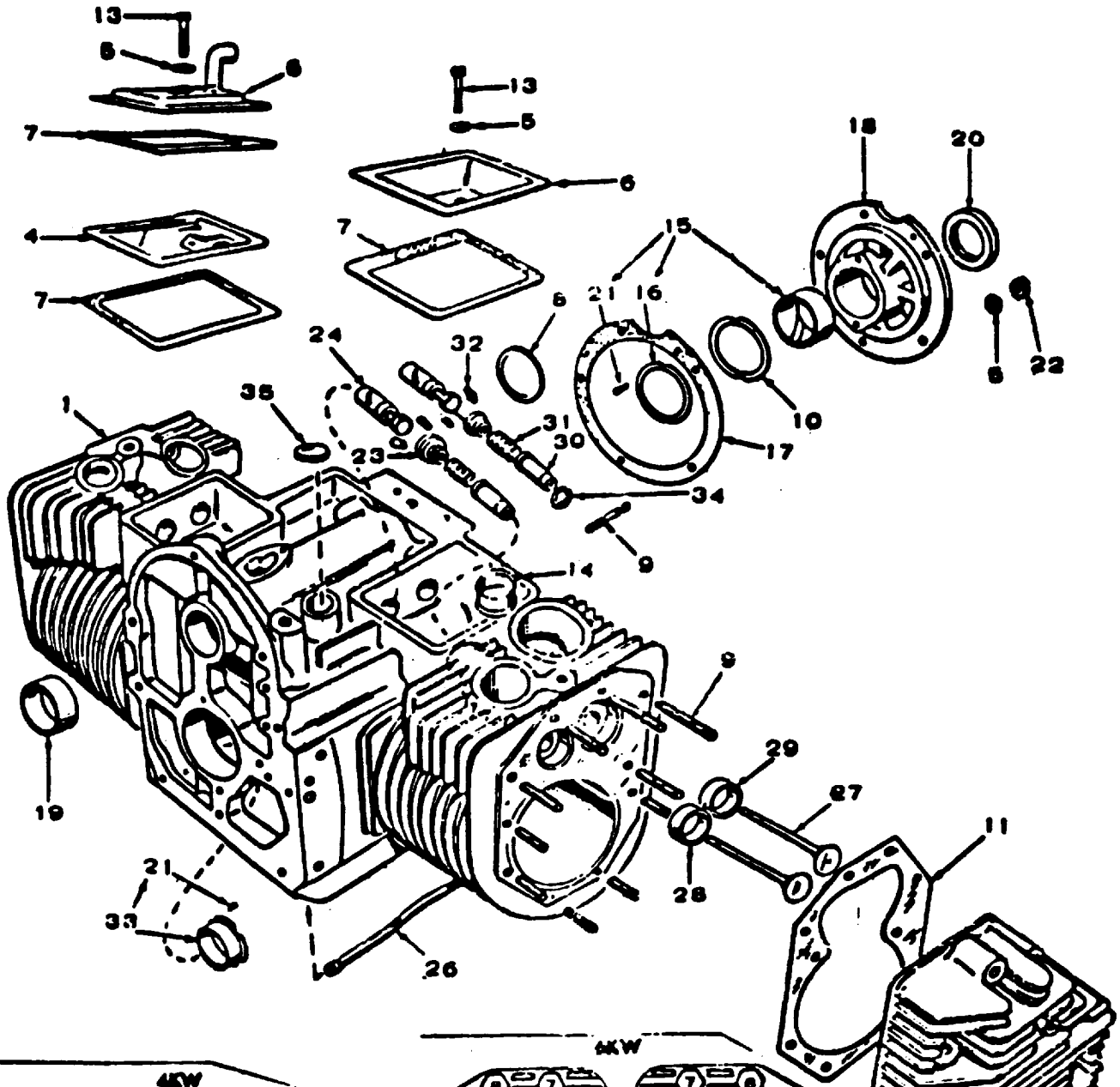


FIGURE 44

# CYLINDER BLOCK GROUP 6KW



-Cylinder Head Tightening Sequence

# TESTING MOTOR GENERATOR BATTERY CHARGING SYSTEM

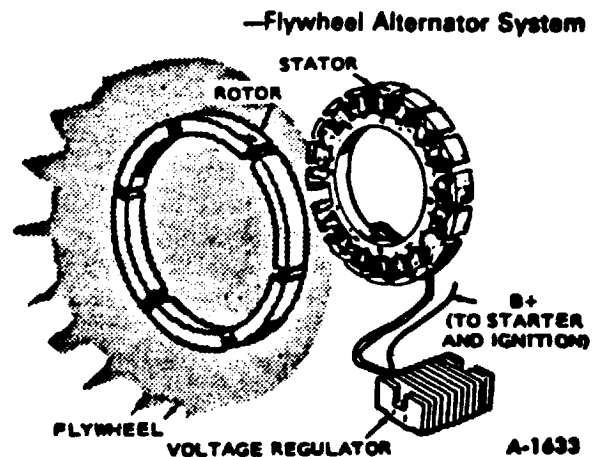
Basic Test	Procedure	Test Values
1. Battery	Battery Voltage - unit not running.	12 to 12.8 VDC
2. Regulator	Battery Voltage after unit is running 3 to 5 minutes.	13.6 to 14.7 VDC
3. Alternator Stator and Wiring with Fully Charged battery.	Ohmmeter reading from stator output - unit not running. Disconnect wire terminating at AC terminal of voltage regulator and wire terminating at BAT terminal of start solenoid. Insert ohmmeter between these wires.	.2 to .6 Ohms
4. Alternator Stator and Wiring.	Measure AC stator output voltage with unit running. Disconnect wire terminating at AC terminal of voltage regulator. Measure AC voltage (unit running) between this wire and BAT terminal of start solenoid.	25.2 to 30.8 VAC

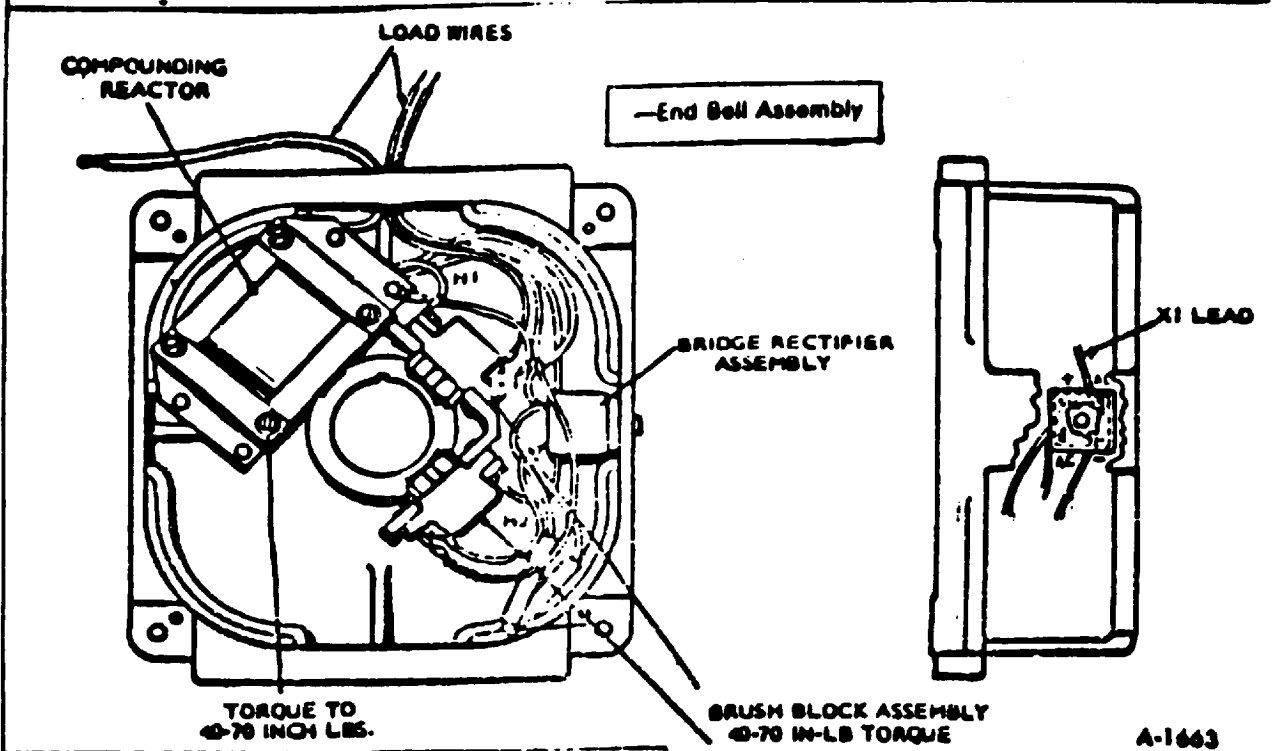
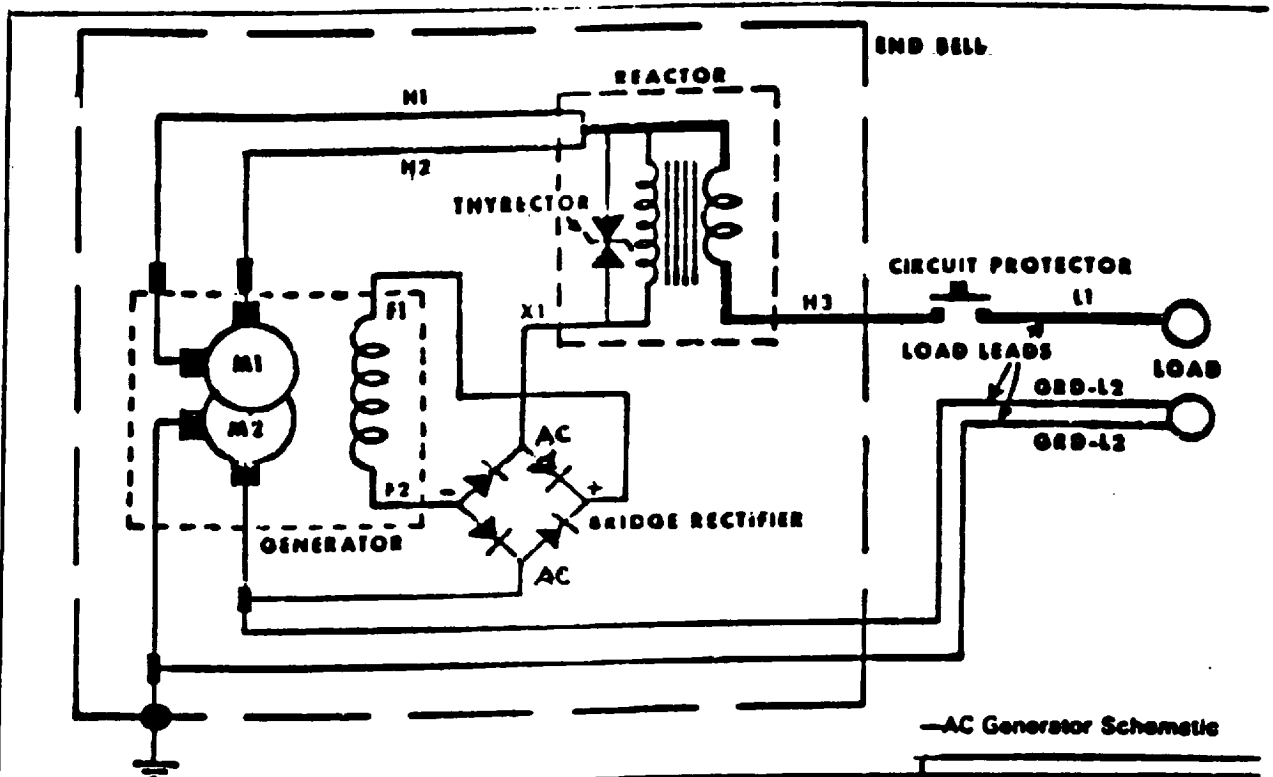
## FLYWHEEL ALTERNATOR

This unit is equipped with a permanent magnet flywheel alternator and solid-state voltage regulator-rectifier (output control). As with all solid-state electrical units, precautions are necessary when servicing. Observe the following:

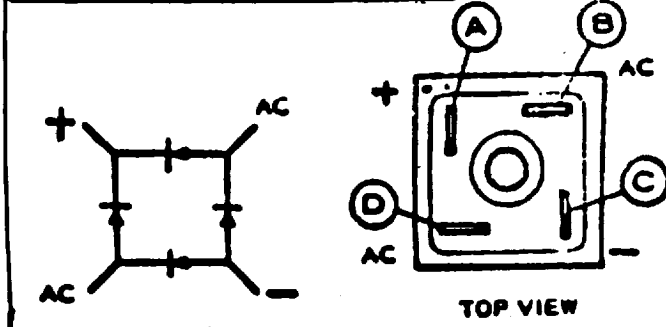
### PRECAUTIONS:

1. Do not connect battery cables in the wrong polarity.
2. Do not short together alternator stator leads.
3. Do not run without a battery. Damage will occur to regulator and battery ignition coil.





**NOTE: RED MARK APPEARS NEAR "+" LEAD**



BLACK LEAD	RED LEAD	RESISTANCE
A	B	8 ohms
A	D	8 ohms
B	C	8 ohms
D	C	8 ohms
B	A	Infinity
D	A	Infinity
C	B	Infinity
C	D	Infinity

# AC GENERATOR MAINTENANCE

## GENERAL

The generator uses a revolving armature and normally needs little care other than a periodic check of the brushes and collector rings. If a major generator repair becomes necessary, have the equipment checked and tested by a qualified electrician who is thoroughly familiar with the operation of electric generating equipment.

All accessories must be taken off and power plant must be removed from its slide rails for disassembly and repair of the generator.

## BRUSH REMOVAL AND REPLACEMENT

To gain access to brushes, remove plastic end bell screens. Measure brush wear as shown in Figure 64, using a small, narrow scale inserted into top of brush block. If brushes need replacing remove and tag wires connecting to brush blocks. Then remove brush blocks and lift out of end bell. Pull out the brushes and springs from bottom of brush block. Clean out any dirt or oil from brush block at this time.

New brushes are shaped to fit and seldom need sanding to seat properly. Always replace brushes as a set and use only the correct brushes as listed in the *PARTS CATALOG*. Never use a substitute brush which may appear to be the same but may have entirely different electrical characteristics.

Note that brush blocks are stamped "BRG END" on one side. Be sure this stamped side faces bearing end of generator for correct brush alignment. Tighten the brush block screws to 40-70 in-lb. (4-6 ft-lb.). If some sparking occurs after replacing brushes, run the plant with a light load until brushes seat properly. Check brush springs for freedom of movement.

## GENERATOR DISASSEMBLY

1. Remove power plant from its slide rails.
2. Remove all accessories attached to the generator.
3. Tag and remove all leads.
4. Loosen and lift out both brush rigs.
5. Remove four generator through-stud nuts.
6. Lift or pull end bell from frame assembly. Do not pry loose with a screwdriver, use a plastic hammer and tap around edges of end bell to loosen.
7. Remove frame (field) assembly, being careful not to let it rest or drag on the armature.

**CAUTION** Four seals are used between frame (field) assembly and engine-to-generator adapter. These seals must be used when reassembling generator or the generator will overheat.

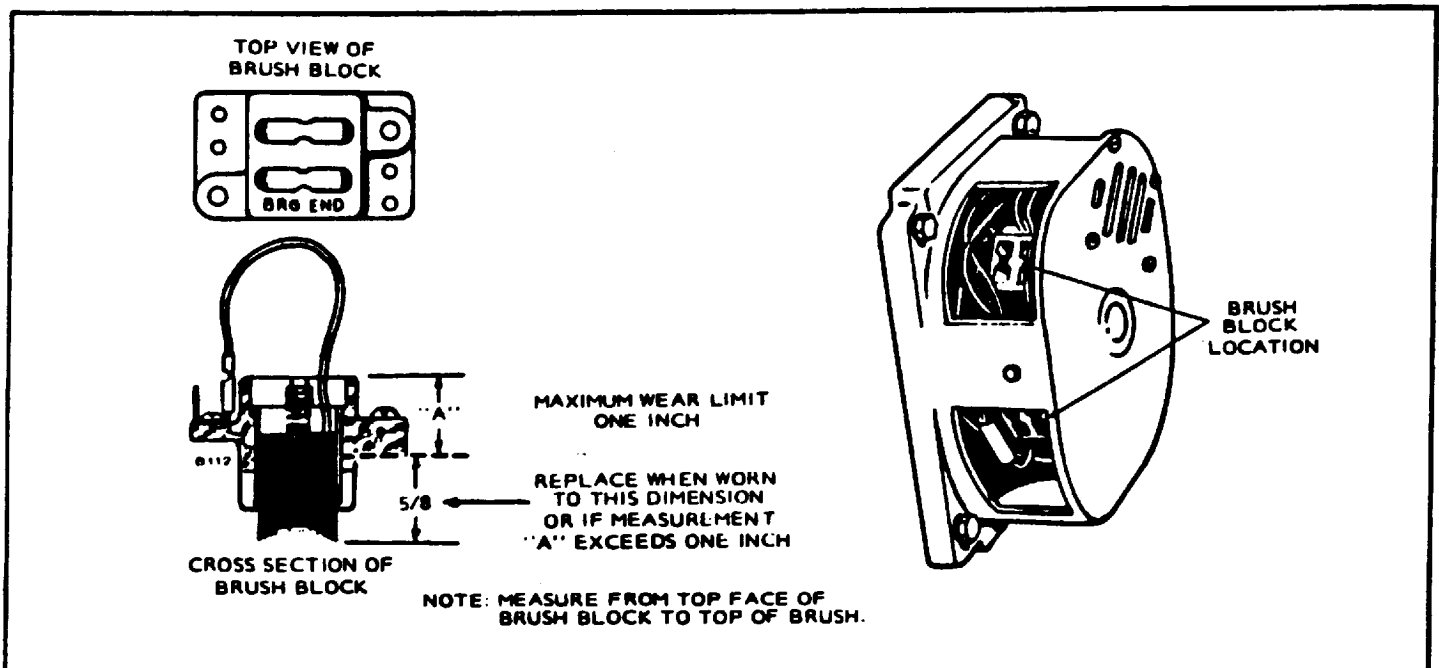
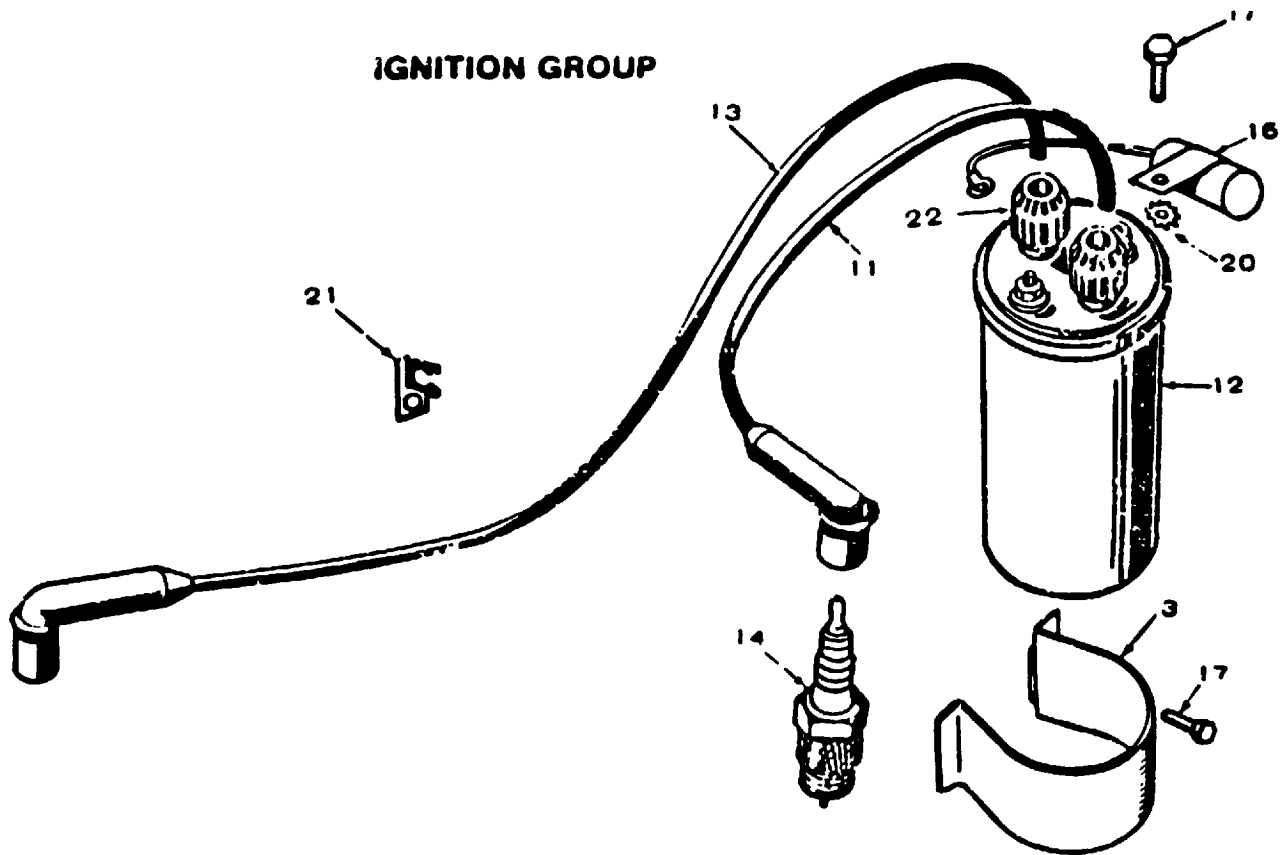


FIGURE 64. BRUSH WEAR LIMITS



- Check spark plug wires for loose connections and possible shorts.
- Check the coil for continuity and shorts. Test the primary and secondary windings as follows:

1. Use a volt/ohm/ammeter or equivalent.
2. Place black lead on ground(-) terminal of coil and red lead to positive (+) terminal. Primary resistance should read 0.50 to 4.73 ohms.
3. Change resistance setting on meter. Place meter leads inside of spark plug cable holes (Figure 1). Secondary resistance should read 10,800 to 15,400 ohms.

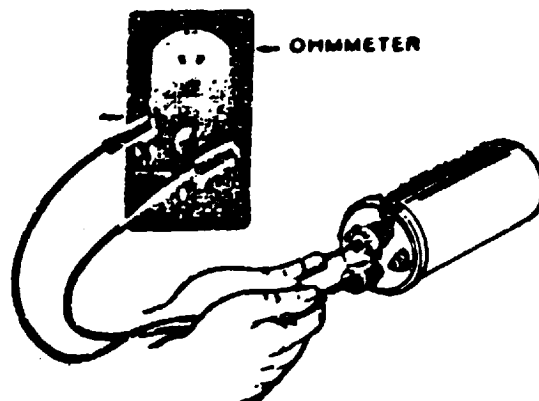


FIGURE 1. TESTING IGNITION COIL

<b>A.</b>	<b>ENGINE DOES NOT CRANK</b>	<b>YES</b>	<b>NO</b>
1A.	Check battery. Are battery terminals clean and are cables tight?	2A	—
2A.	Check battery cables for correct polarity. Is 12 volts present across battery terminals with engine stopped and is 8 volts or higher present with engine cranking?	3A	10A
3A.	Remove cover on printed circuit board. Jumper terminal 7 to 3. Press start switch. Does engine crank?	4A	5A
4A.	K2 contact is defective. Replace printed circuit board.	—	—
5A.	Jumper terminal 7 to 1. Does engine crank?	6A	7A
6A.	Start switch S3 is defective. Replace printed circuit board.	—	—
7A.	Jumper from S terminal of B1 starter motor to positive (+). Does engine crank?	8A	9A
8A.	Replace K1 start solenoid.	—	—
9A.	Starter is defective. Remove and perform tests listed in STARTING SYSTEM section and/or replace starter.	—	—
10A.	Replace battery.	—	—
<b>B.</b>	<b>ENGINE CRANKS BUT DOES NOT START</b>	<b>YES</b>	<b>NO</b>
1B.	Is F1 fuse on control board OK?	3B	2B
2B.	Replace with an identical 5 amp fuse. Correct problem which caused fuse to burn. (NOTE: Remote control leads may be shorted or grounded).	—	—
3B.	While engine cranks, check K1-I start solenoid voltage. Is 12 volts present between terminals 10 and 1?	5B	4B
4B.	Replace K1 start solenoid.	—	—
5B.	Jumper terminals 9 to 11. Does engine start when start switch is pushed?	6B	7B
6B.	K2 contacts are defective. Replace printed circuit board.	—	—
7B.	Fuel solenoid K4 must be open during starting and running. Remove fuel line from carburetor. Does fuel pulsate from line when start switch is pushed? <b>WARNING: Use extreme care for tests 7B and 8B. Direct the fuel flow into a suitable container and make sure area is well ventilated to prevent accumulation of gasoline fumes.</b>	11B	8B
8B.	Disconnect fuel solenoid from line and check fuel pump E2. Pump will click when operating properly. Does fuel pulsate from pump (solenoid disconnected) when start switch is pushed?	10B	9B
9B.	Fuel pump (or wiring) is defective and must be replaced.	—	—
10B.	Fuel solenoid is defective and must be replaced.	—	—
11B.	Is electric choke closed when engine is cranking?	13B	12B
12B.	Voltage at choke terminal when engine is cranking should be 12 volts. If choke does not move (at room temperature) with 12 volts applied, replace it. Also check wire from choke to control for shorts to ground.	—	—
13B.	The fault is in the ignition system. Check points, plugs, wires and coil. Refer to IGNITION section.	—	—

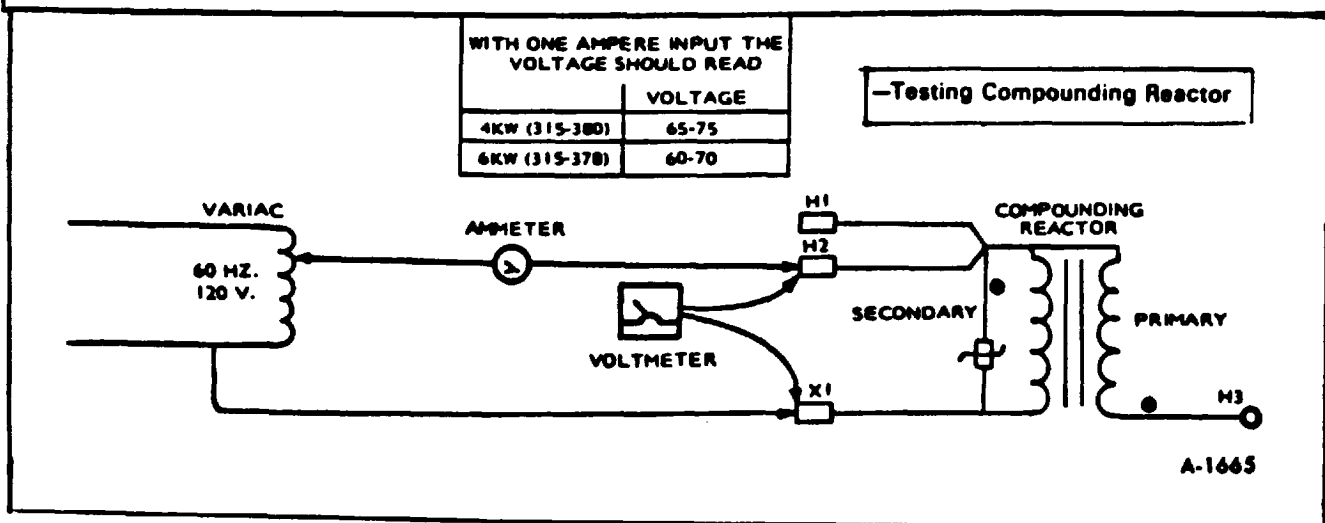
C.	ENGINE RUNS 3 OR 4 SECONDS - THEN STOPS*	YES	NO
1C.	Check oil level. Refill to FULL mark on dipstick. Does engine now continue to run?	—	2C
2C.	Check voltage from terminal 11 to 12. Is it 12 volts with engine stopped and does voltage drop to zero when engine runs?	—	3C
3C.	Check oil pressure sensor wire for shorts to ground by visually tracing wire from S2 low oil pressure switch to control. Is wire grounded?	4C	5C
4C.	Replace or repair wire making sure it isn't rubbing against anything that may again cause a grounding problem.	—	—
5C.	Replace low oil pressure switch S2.	—	—
	NOTE: Remote control leads may be shorted or grounded.		
D.	LOW BATTERY - LOW CHARGE RATE	YES	NO
1D.	With engine cranking, measure voltage at terminal 8 to BAT terminal of K1 start solenoid. Is 6 volts present?	2D	3D
2D.	Check battery connections. They must be clean and tight.	—	—
3D.	Check flywheel alternator G1 output. Disconnect AC lead that connects to voltage regulator VR1 and connect voltmeter to this lead and BAT terminal of K1 start solenoid. This checks AC open circuit voltage. Start engine. Is AC output voltage approximately 28 volts with unit running at 1800 rpm?	5D	4D
4D.	Replace alternator stator G1.	—	—
5D.	Connect a voltmeter across battery terminals. Start engine. Does DC voltage increase to 13 to 14-1/2 volts after engine is running for a few minutes?	—	6D
6D.	Remove and replace voltage regulator VR1.	—	—

## GENERATOR BEARING

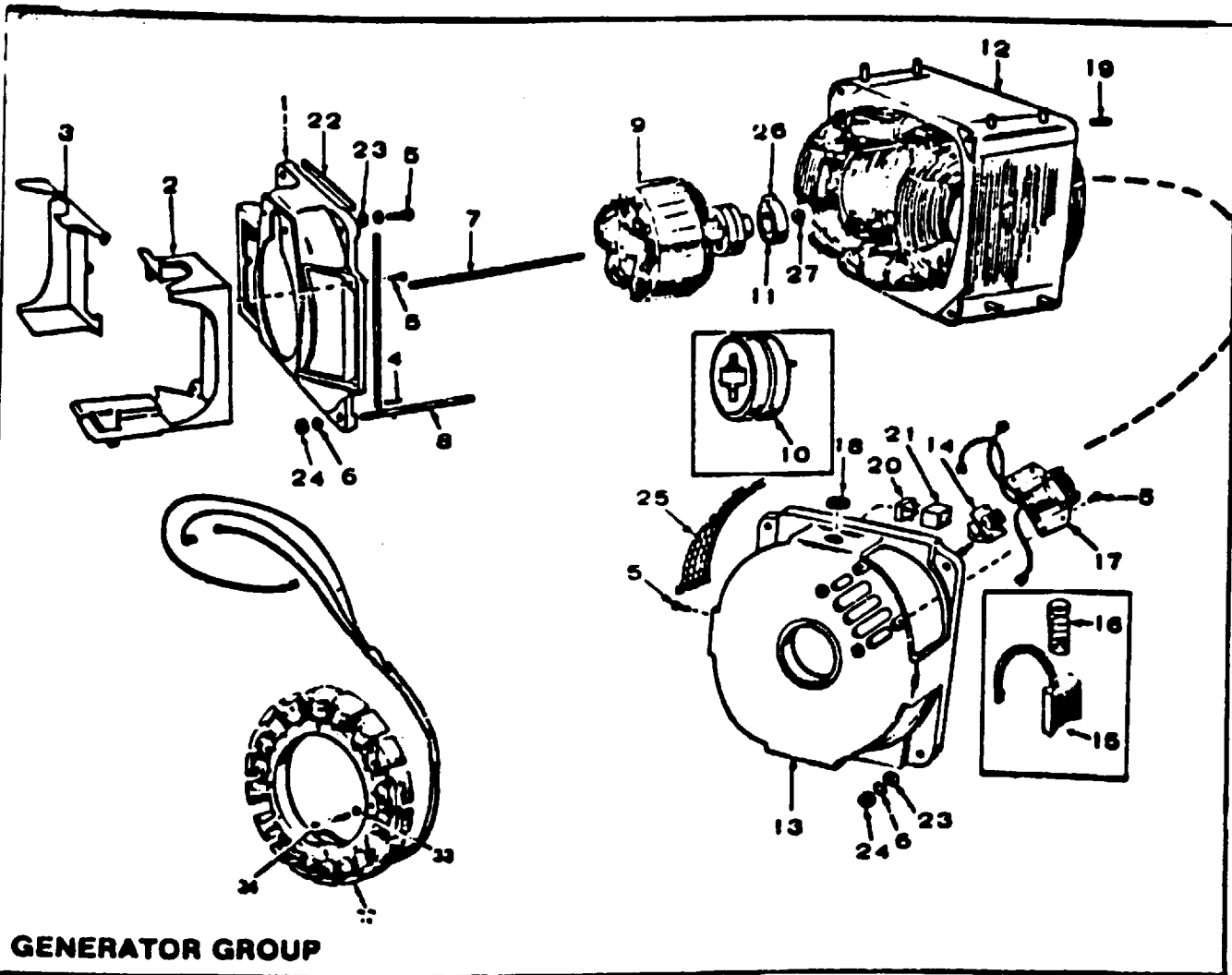
The generator is prelubricated and double-sealed. Replace bearing approximately every 5 years or at each engine overhaul.

## COMPOUNDING REACTOR

If output voltage is high with no electrical load connected to the generator, with generator running at 1800 rpm, then the compounding reactor is probably defective. Test as shown in Figure 88, using a Variac.







### GENERATOR GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	231-0182	1	Adapter, Control	10	204-0115	1	Ring, Collector
2	134-2628	1	Duct, Generator Air, Starter Baffle and Oil Filter Drain (Right Side)	11	510-0047	1	Bearing, Ball
3	134-2600	1	Duct, Generator Air (Left Side)	12	270-1858	1	Frame and Stator, Wound
4	818-0182	4	Pin, Roll - Generator Adapter	13	211-0274	1	Ball, End
5	SCREW, HEX HEAD 815-0340	8	Air Duct Mounting (#10-32 x 3/8")	14	212-0351	2	Block Assembly (Includes Brushes and Springs)
	800-0060	4	Adapter Mounting (3/8-16 x 1-1/4")	15	214-0098	4	Brush
	815-0358	4	Brush Block Mounting (#10-32 x 7/8")	16	212-1732	4	Spring, Brush
	815-0374	1	Rectifier Mounting (#8-32 x 1-1/4")	17	315-0378	1	Reactor, Compounding
	818-0358	4	Reactor Mounting (#10-32 x 7/8")	18	508-0178	1	Grommet, Output Leads
6	860-0045	8	Washer, Lock - Generator Through Stud (5/16")	19	516-0182	4	Pin, Roll - End Ball
7	520-0784	1	Stud, Rotor Through	20	305-0519	1	Plug, Rectifier Bridge
8	520-0730	4	Stud, Generator Mounting	21	305-0517	1	Bridge, Rectifier
9	201-1887	1	Armature Assembly, Wound (Includes Bearing and Collector Ring)	22	232-2368	4	Seal, Generator to Adapter
				23	WASHER, FLAT 526-0115	4	Generator Through Stud
					526-0068	4	Adapter Mounting
				24	862-0015	8	Nut, Generator Through Stud
				25	234-0481	3	Screen, End Ball
				26	232-0598	1	Clip, Generator Bearing Stop
				27	870-0273	1	Nut, Rotor Through Stud

CONDITION										CONTROL SYSTEM TROUBLESHOOTING GUIDE	
Cranks Slowly	Cranks - No Start	Fails to Crank	Runs 3 - 4 Seconds	Runs and Surges	Does Not Stop	Stops	No Stop in Low Oil	Low Charging	Corrective Action	PROBABLE CAUSE	
●		●								1	Bad Battery Connection
●		●								2	Low Battery - BT1
●		●								3	Faulty Starter - B1
	●	●								4	Faulty Start Solenoid - K1
				●		●		●		5	Faulty Alternator - G1
	●					●				6	Faulty Ign. - T1 Coil, S1 Points
	●			●		●				7	Faulty Fuel Pump - E2
			●			●	●			8	Faulty LOP Switch - S2
	●		●							9	Faulty Choke - E1
			●							10	Grounded LOP Circuit
	●		●	●		●				11	Low or No Fuel
			●			●				12	Low Oil Level
								●		13	Faulty Regulator - VR1
										14	Printed Circuit Board Faults
	●			●		●				15	Fuse Out - F1
	●			●						16	Faulty Disconnect Circuit
					●					17	Faulty Stop Switch - S3
	●	●		●						18	Faulty Contacts - K2
	●									19	Faulty Relay - K3
			●				●			20	Faulty LOP Circuit

Control System Troubleshooting Guide

### CORRECTIVE ACTION TO TROUBLESHOOTING GUIDE

1. Clean and tighten all battery terminals. Check for loose wires and correct connections. See steps 2 and 3.
2. Check specific gravity. Recharge or replace battery if necessary. See Step 5.
3. Check starter brushes and/or substitute with a new starter. Replace if defective. See Step 4.

4. When cranking, check K1 coil voltage. There should be approximately 12V DC across terminals 11 (+) and 7 (-), 10 (+) and 1 (-), B1-S (+) and 1 (-) ground. If this voltage is not present at any of these terminals, replace start solenoid. Check condition 18 to eliminate PC board faults.

5. Measure AC voltage of alternator G1 during cranking. Approximately 6 volts AC should be present at terminals 8 and K1 battery terminal. If there is zero volts then check the wiring for a short circuit. If the alternator fails to charge when running at 1800 RPM, replace alternator; see Step 13 and preceding paragraph, *Charge Ammeter*.

6. Visually check ignition points to see if they are opening and closing. If not, adjust to engine specifications. Voltage to ground at the battery side of T1 coil should be 12 volts. At the ignition point side to ground, the voltage should be zero when the points are closed and 12 volts when the points are open.

7. Remove S lead on starter B1. Push start button then listen for fuel pump clicking. Next check by connecting fuel pump lead directly to +12V. If it does not operate, replace fuel pump. See Step 11 also.

8. With engine not running, voltage from terminal 11 to 12 should be 12 volts. With proper oil level, start and run engine; voltage from terminal 11-12 should drop to zero volts. If not, replace low oil pressure switch. See steps 10, 12 and 20.

9. Manually check choke arm for free movement to be sure it is not stuck in the open or closed position. Voltage at choke terminal, supplied by K1-1 terminal should be 12 volts during cranking and drop to zero during run. See Step 4 to check choke supply voltage. If choke does not move at room temperature with 12 volts applied, replace.

10. Check oil pressure sensor wire for short to ground by visually tracking the wire routing under cover edges to S2 switch. Move wire to free space to correct problem. See Step 8.

11. Refill fuel tank.

12. Refill to proper oil level.

13. Insert an ammeter to measure charging current. It should be 8-10 amperes at 12 volts (1800 RPM - room temperature) then drop to zero amperes at 14-15 volts. If alternator is OK (Step 5) then replace regulator VRI.

14. All faults 16 thru 23 will be on the PC control board and should be checked with care. Control cover should be removed and relay covers can be removed to manually operate relay to confirm start and run functions.

15. Measure voltage at terminals 5 to GND. If not 12 volts, replace fuse.

16. Measure voltage across capacitor C1 terminals. During cranking, this should increase to approximately 6 volts and relay K2 should not be energized.

If voltage does not build up refer to Step 5 and also check CR1, C1 and R1. As engine starts, voltage should build up to 13 volts minimum and energize relay K2. If it does not, check coil (500 ohm).

17. When running, voltage at terminal 2 to 1 should be 10 volts. When stop switch is pushed this voltage should drop to zero. If it does not, replace switch.

18. During cranking, voltage from terminals 3 to 7 should be zero. When engine starts and runs this voltage should increase to 12 volts with start switch held in. If it does not increase to 12 volts, then these normally closed contacts are not opening and may be faulty. During cranking, voltage at terminals 6 to 1 should be 10 volts. When engine runs this voltage should increase to 12V. or above. If it does not increase, then K2 open contacts may not be closing. Replace K2 if faulty.

19. During start or run, 9 volts should be present at terminals 2 (+) and 1 (-) to energize K3. Check K2 contacts, CR5, CR7 and R2 for defects. If K3 does not pick up with 9V, replace K3.

Measure voltage from terminal 9 to 1 (-) when cranking. If fuse F1 is good but battery voltage is not present at terminal 9, replace K3, and/or check PC board.

20. With unit stopped, connect voltmeter to terminals 4 (+) and 1 (-), remove K2 relay cover and manually hold K2 contact closed. After a short time delay, the voltage at terminals 4 to 1 should decrease from 9 to 2 volts. Reset by releasing K2. If voltage does not appear at terminals 4-1 check R2, R3, R4, R5, R6, R7, C3, C4, Q1, CR6, CR7, and CR8. Replace defective part.

# OPERATION

## STARTING:

Push start switch S3. Battery current flows thru K1 solenoid, K2 contacts and start switch S3 to battery negative (GND). K1 solenoid closes contacts, feeding current to starter motor and to choke E1 plus K3 relay. K3 relay contacts close the circuit to the ignition coil T1 and fuel pump E2 plus fuel solenoid K4. The engine cranks and the fuel pump, fuel solenoid, and ignition operate to start the engine.

## ENGINE STARTS:

When the starting rpm increases, the alternator develops a voltage great enough to be rectified and energize relay K2. Relay K2 contacts close to hold relay K3 energized, and K2 normally closed contacts open to drop K1 start solenoid. K3 contacts maintain current to ignition coil, fuel pump, and fuel solenoid. The engine continues running and K2 remains energized.

## STOP ENGINE:

Relay K3, energized by K2, maintains ignition. To stop engine, push the stop switch which shorts out K3. Relay K3 drops out to remove power from the fuel pump, fuel solenoid and ignition coil. Resistor R2 absorbs the power that was supplied to K3 during the period the stop switch is held close as the engine slows to a stop.

## LOW OIL PRESSURE SHUTDOWN:

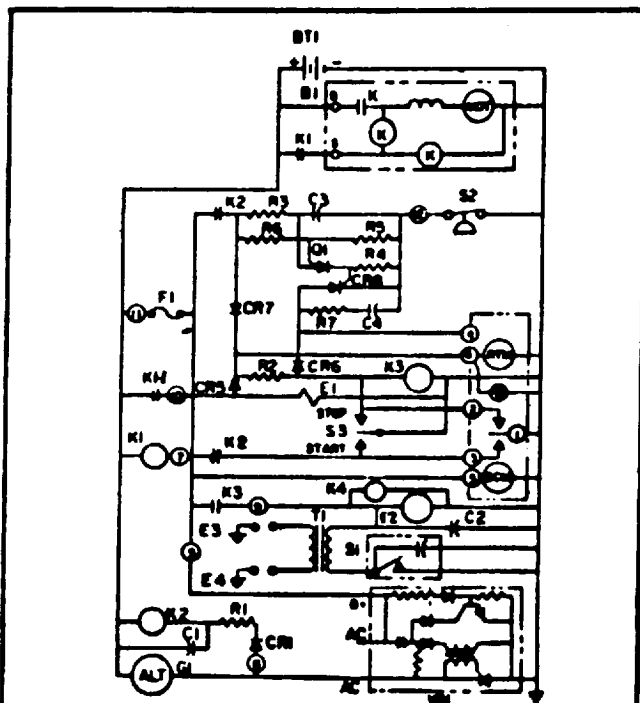
The control has a built-in time delay of 2 to 4 seconds for a low oil pressure shutdown. If a low oil pressure condition occurs, the low oil pressure

switch S2 closes to charge capacitor C3 through resistor R3. When the voltage on capacitor C3 matches the voltage of the divider R5-R6, the programmable unijunction transistor Q1 "fires" to trigger CR8. CR8 turns on to de-energize K3 relay. K2 contacts open as the engine stops and CR8 turns off.

## EMERGENCY START-STOP OPERATION

In an emergency situation the control board, either normal or defective, can be bypassed to start or stop the unit. To completely bypass all control board functions connect a jumper from terminals 9 to 5. This energizes the ignition and fuel pump. Then temporarily jumper terminals 1 and 7 to energize starter. Remove this jumper as soon as the engine starts and runs. **DO NOT** reconnect this jumper while the engine is running. To stop, remove the jumper from terminals 9 and 5.

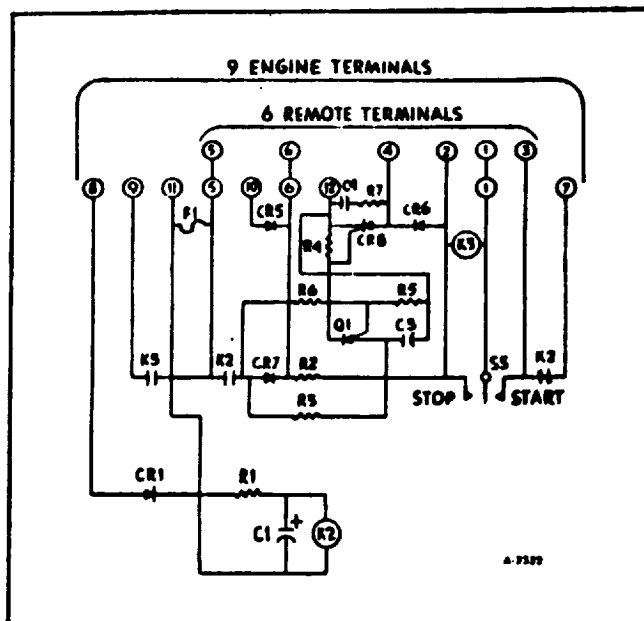
**CAUTION:** This emergency operation **DO NOT** provide fuse protection, start disconnect or low oil pressure shutdown and should not be used without monitoring the motor generator.



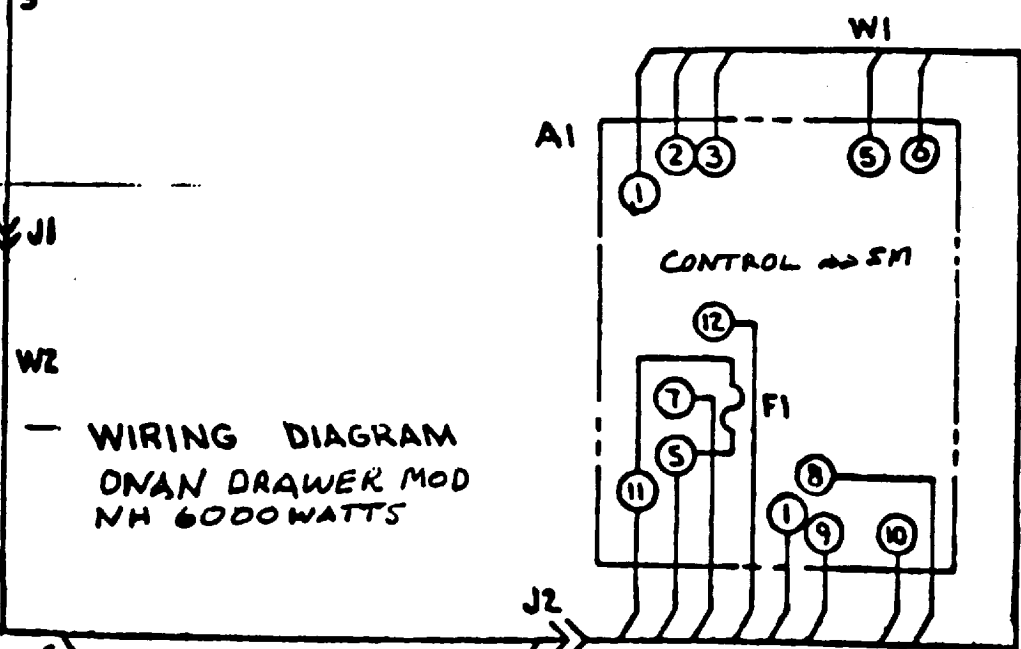
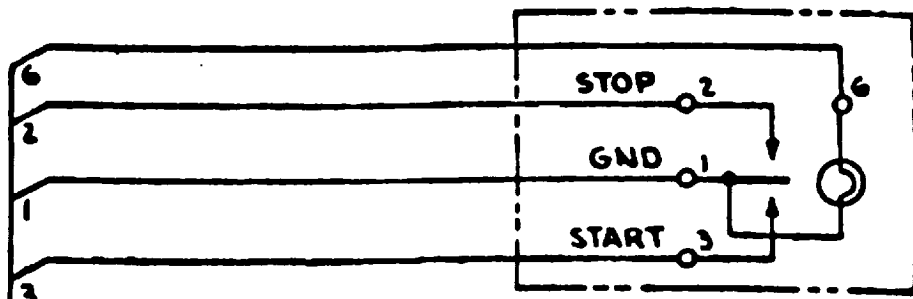
BT1 .....	Battery	B1 .....	Breaker Box
S1 .....	Starter	S2 .....	Low Oil Pressure Switch
E1 .....	Electric Choke	S3 .....	Start-Stop Switch
E2 .....	Fuel Pump	T1 .....	Ignition Coil
E3, E4 .....	Spark Plugs	VR1 .....	Voltage Regulator
F1 .....	5 amp. Fuse	RTM .....	Running Time Motor (Opt.)
Q1 .....	Alternator	BCM .....	Battery Condition Motor (Opt.)
K1 .....	Start Solenoid	K4 .....	Fuel Solenoid

A-4961

-Control Panel Wiring

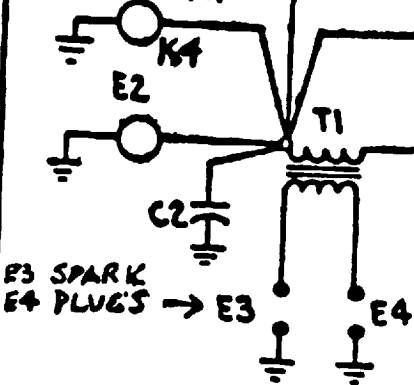


REMOTE CONTROLS

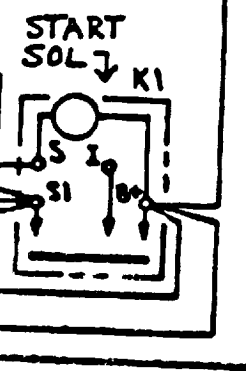
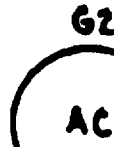
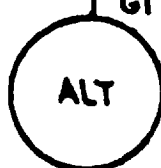
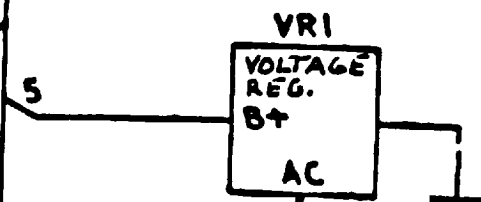
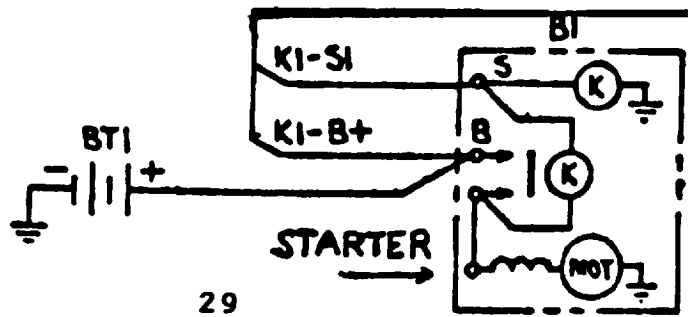


WIRING DIAGRAM  
ONAN DRAWER MOD  
NH 6000 WATTS

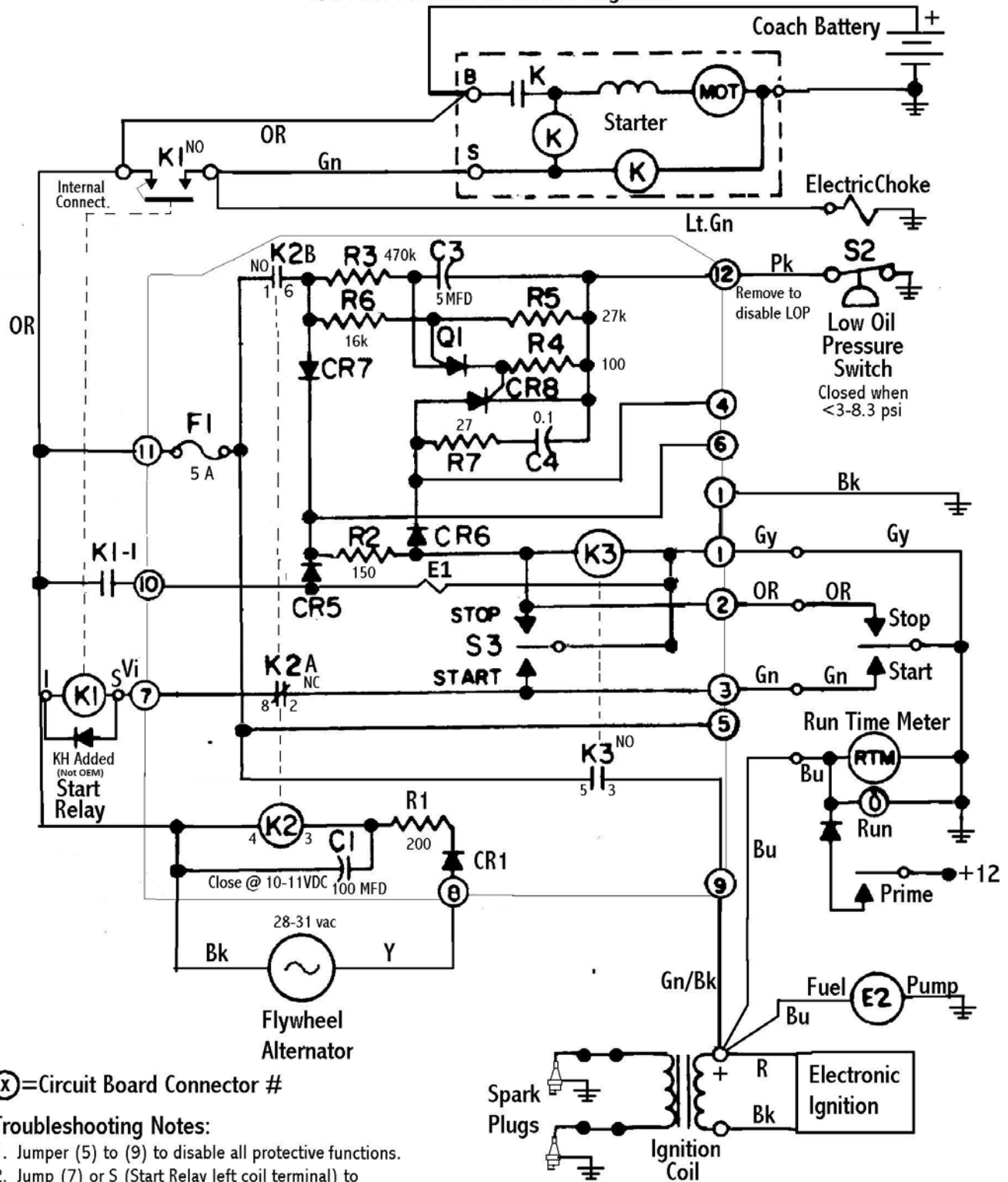
K4 SOL. FUEL  
E2 FUEL PUMP



OIL PRES SW  
S2



# 6 & 4kW Onan Generator Wiring w/Electronic Ignition w/o Fuel Solenoid or 12 VDC Regulator



(X) = Circuit Board Connector #

### Troubleshooting Notes:

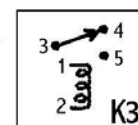
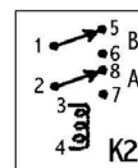
1. Jumper (5) to (9) to disable all protective functions.
2. Jump (7) or S (Start Relay left coil terminal) to ground to start by bypassing K2NC.
3. Jump (12) to Ground to test LOP stop within 3-4 sec.
4. Disconnect (12) to disable LOP  
CAUTION -- NO PROTECTION FROM OIL LOSS

R1=200 Ohm  
R2=150 Ohm  
R3=470k Ohm  
R4=100 Ohm  
R5=27k Ohm  
R6=16k Ohm  
R7=27 Ohm

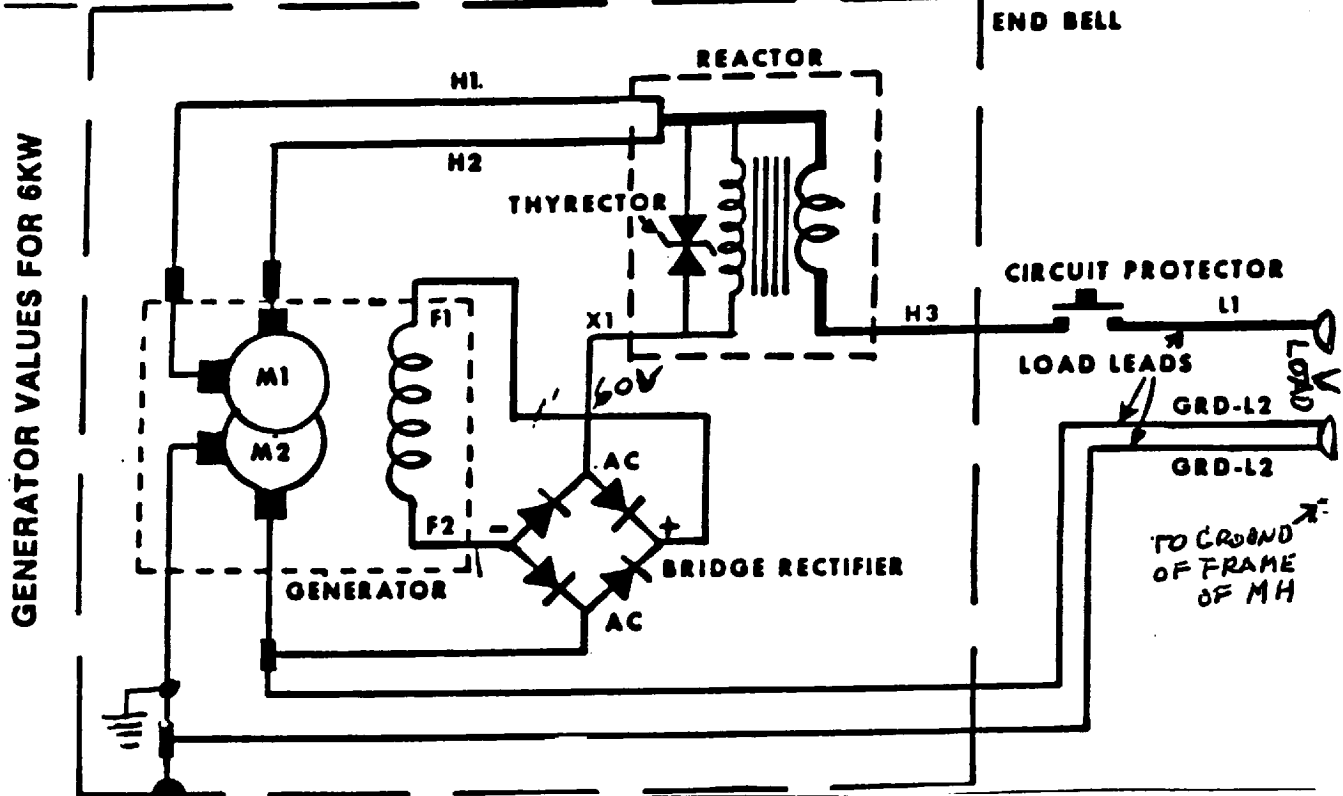
C1=100 MFD 25VDC  
C3=5MFD 25VDC  
C4=0.1MFD 100V  
Q1=UJT (2N6027)  
CR1-7=0.5A100V (1N4004)  
CR8=GCR 0.8a30v (2N5064)

K2=ECG #RLY5142 400 ohm 2A DPDT  
(Starter Disconnect / Hold Relay)  
K3=ECG #RLY6522R 1400 ohm  
(Run / Engine Stop Relay)

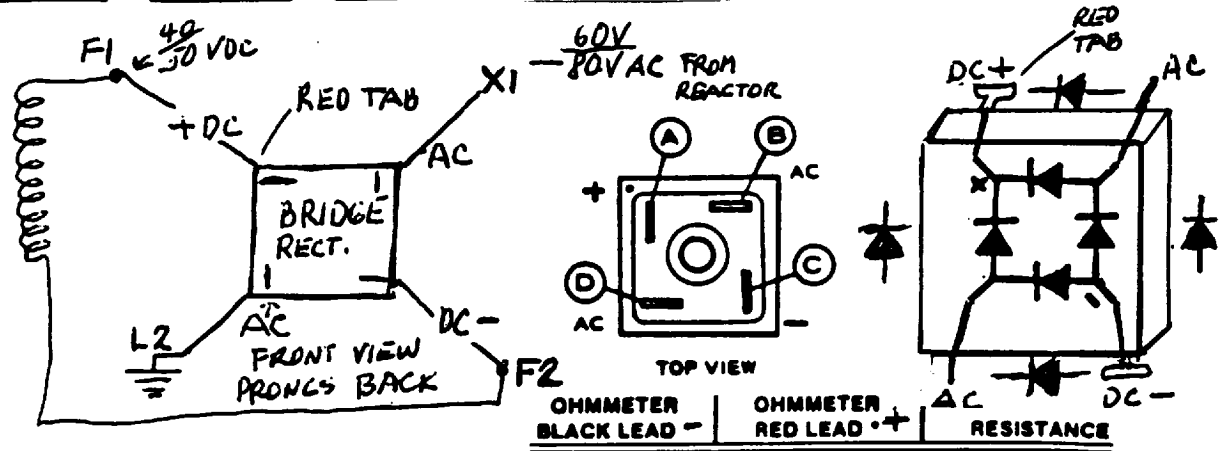
S2=NAPA OP6282 Close @ <3-8.3psi 1/8-27 NPT  
(Engine Low Oil Pressure Switch)



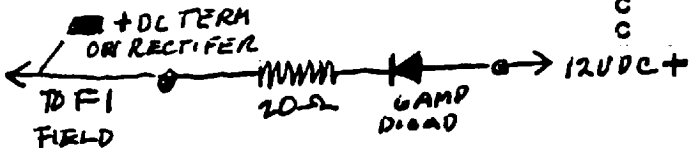
MODEL	TYPICAL N.L. VOLTS	TYPICAL F.L. VOLTS	N.L. VOLTS X1 to H1	N.L. VOLTS F1 to F2	RESISTANCE F1 to F2	RESISTANCE H1 to X1	CURRENT FULL LOAD
6KW	123	113	80 VAC	50V DC	38 Ohms	0.85 Ohms	50 Amps



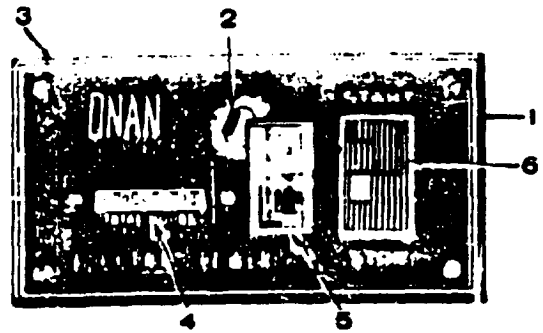
GENERATOR VALUES FOR 6KW



OHMMETER BLACK LEAD -	OHMMETER RED LEAD +	RESISTANCE
A	B	• 8 ohms
A	C	• 8 ohms
B	C	• 8 ohms
B	A	• 8 ohms
D	A	Infinity
D	B	Infinity
D	C	Infinity

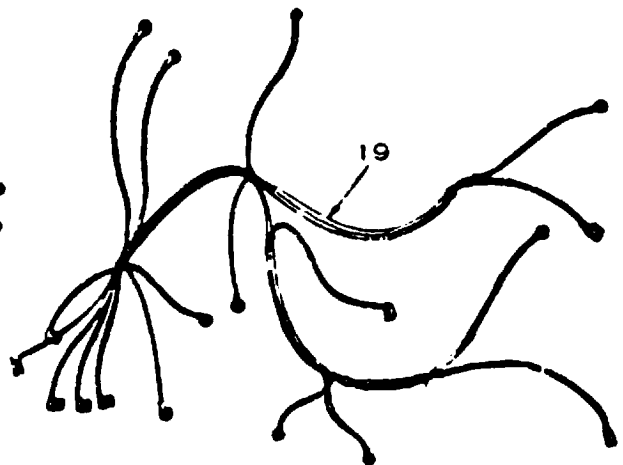
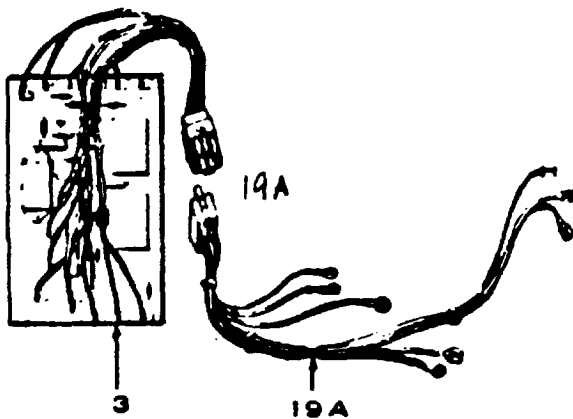


USE THIS MOMENTARILY TO FLASH FRAME FIELD TO START GENERATING CURRENT FROM GENERATOR ARMATURE SLID RINGS SOMETIMES FIELD ARMATURE LOSES MAGNETISM DUE TO LONG STORAGE + NEEDS TO BE SHOCKED TO PRODUCE A DC FIELD AROUND ARMATURE



REMOTE CONTROL GROUP - OPTIONAL EQUIPMENT

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	300-0986	1	Control Assembly, Deluxe Remote (Includes Parts Marked *)
2	359-0008	1	*Diode, Zener
3	301-3606	1	*Panel, Control
4	302-0885	1	+*Meter, Running Time
5	302-0888	1	*Meter, Battery Volt. ge
6	308-0341	1	+*Switch, Rocker
7	300-1131	1	Control Assembly, Deluxe Remote (Includes Parts Marked +)
8	301-3776	1	+Panel, Control



CONTROL GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
3	CONTROL BOARD (INCLUDES PARTS MARKED *)		
	300-1073	1	Without Wiring Harness, Spec A Only
	300-1074	1	With Wiring Harness Begin Spec B (Illustrated)
19	338-0697	1	Harness, Wiring - Control to Engine - Spec A Only
(19A)	338-0753	1	Harness, Wiring - Control to Engine - Begin Spec B

NOTE  
(19A) PLUG TYPE



900-0194  
SUPPLEMENTARY PARTS LIST (7/74)

These parts apply to the 4.0BF-1R/9500 and 6.0NH-1R/9500 Power Drawer Electric Power Plants. Use these parts in place of/or in addition to those parts listed in the Operators Manual and Parts catalog designated below. Parts listed apply to both models unless otherwise stated.

Parts similar in appearance to those in the parts catalog are not illustrated.

<u>MODEL</u>	<u>OPERATORS MANUAL AND PARTS CATALOG</u>
4.0BF-1R/9500	965-0315
6.0NH-1R/9500	940-0315

CRANKSHAFT, FLYWHEEL, CAMSHAFT AND PISTON GROUP

<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
11	PISTON AND PIN (INCLUDES RETAINING RINGS) - NH Only		
	112-0141	2	Standard
	112-0141-05	2	.005" Oversize
	112-0141-10	2	.010" Oversize
	112-0141-20	2	.020" Oversize
	112-0141-30	2	.030" Oversize
	112-0141-40	2	.040" Oversize

CYLINDER BLOCK GROUP

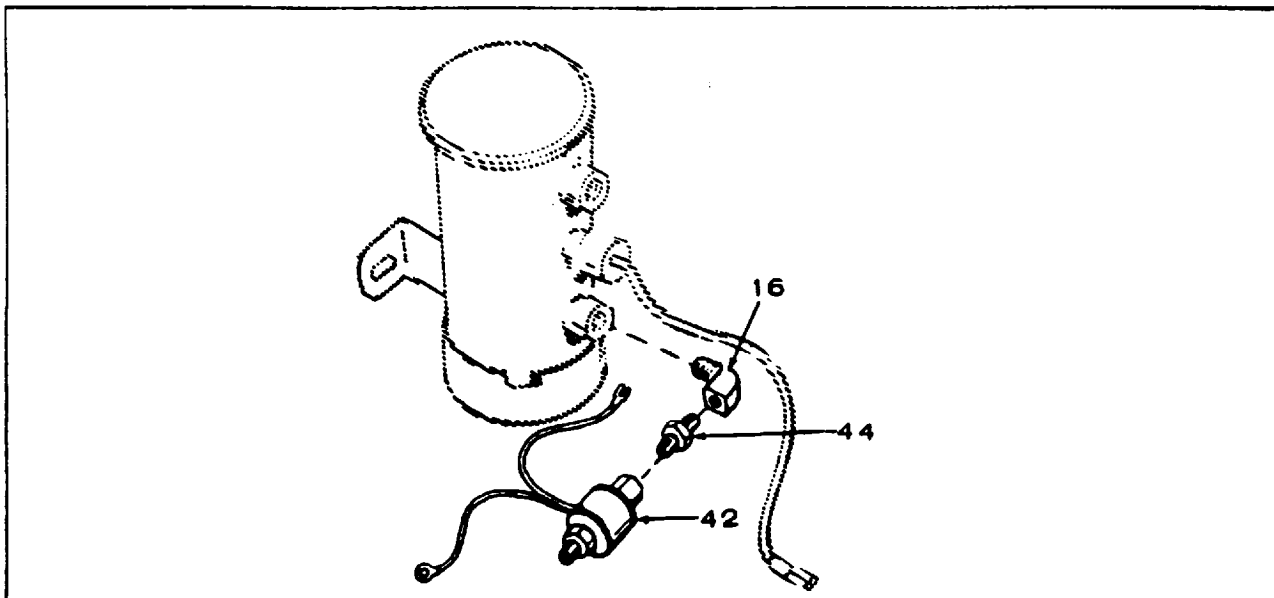
<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
30	110-1807	4	Guide, Valve (Included in Cylinder Block Assembly) - BF Only

GEAR COVER GROUP

<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
13	526-0065	5	Washer (5/16") Copper - Gear Cover Mounting

OIL SYSTEM GROUP

<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
7	PLUG, OIL DRAIN (Order by Size)		
	102-0716	1	1/2"
	102-0737	1	3/4"
8	GASKET, OIL DRAIN PLUG (Order by Size)		
	102-0743	1	1/2"
	102-0739	1	3/4"
26	502-0196	1	Elbow, (90°) - Street - Low Oil Pressure Switch - NH Only



FUEL SYSTEM GROUP

<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
12	LINE, FLEXIBLE FUEL (Order by Length)		
	501-0001	1	6" Long
	501-0003	1	9" Long
16	ELBOW (90°) - STREET - FUEL PUMP INLET		
	502-0020	1	BF
	502-0196	1	NH
37	502-0002	1	Elbow - Fuel Pump Outlet
41	DELETE		
42	307-1279	1	Valve, Solenoid
44	502-0082	1	Nipple - Hex - Fuel Pump Inlet

CARBURETOR PARTS GROUP

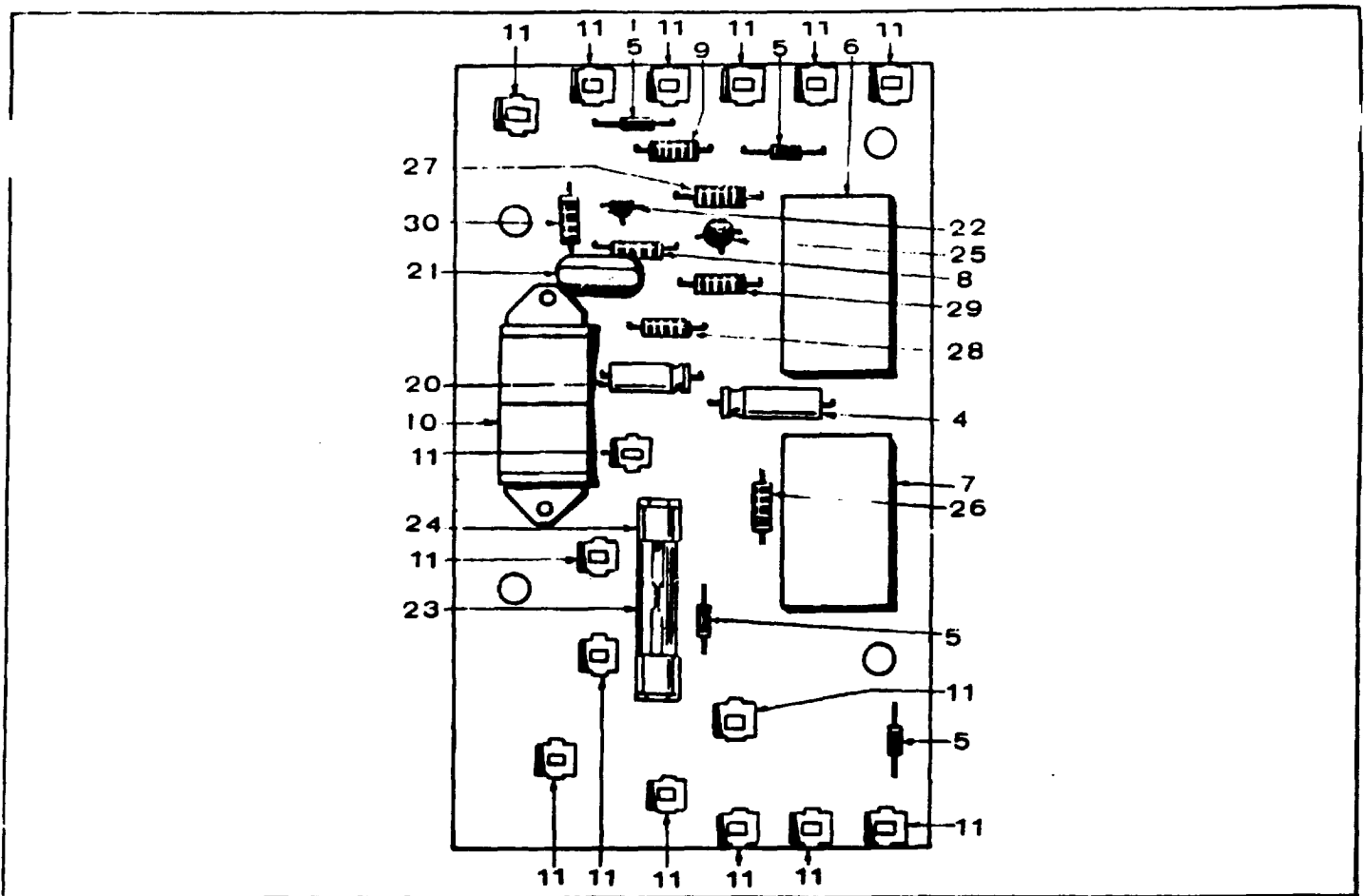
<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
11	GASKET, BOWL RETAINER (INCLUDED IN GASKET KIT)		
	146-0183	1	Black
	146-0196	1	Red

IGNITION GROUP

<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
16	312-0027	1	Condenser, Ignition

GOVERNOR, STATOR, CHARGING ALTERNATOR AND  
BLOWER HOUSING GROUP

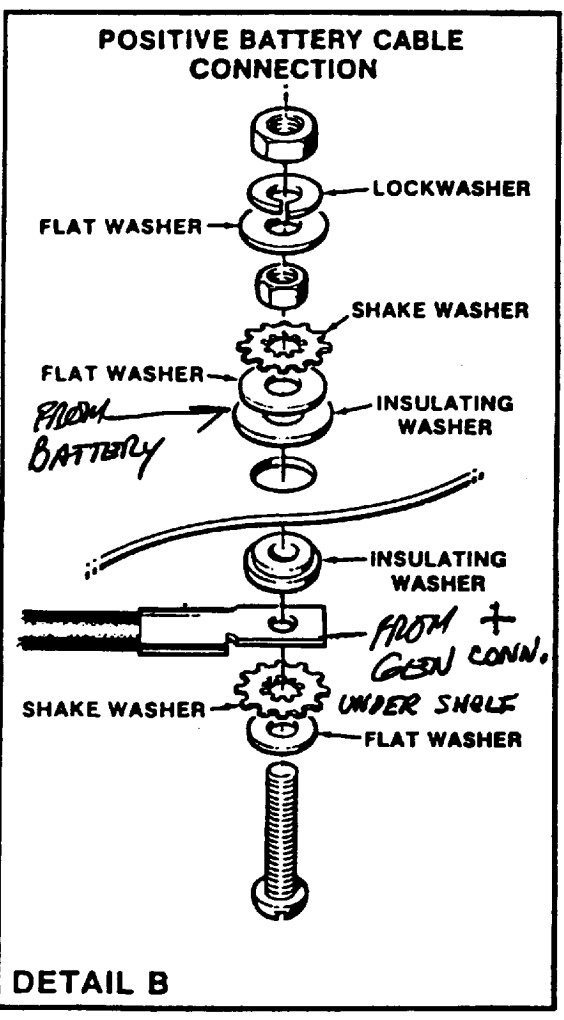
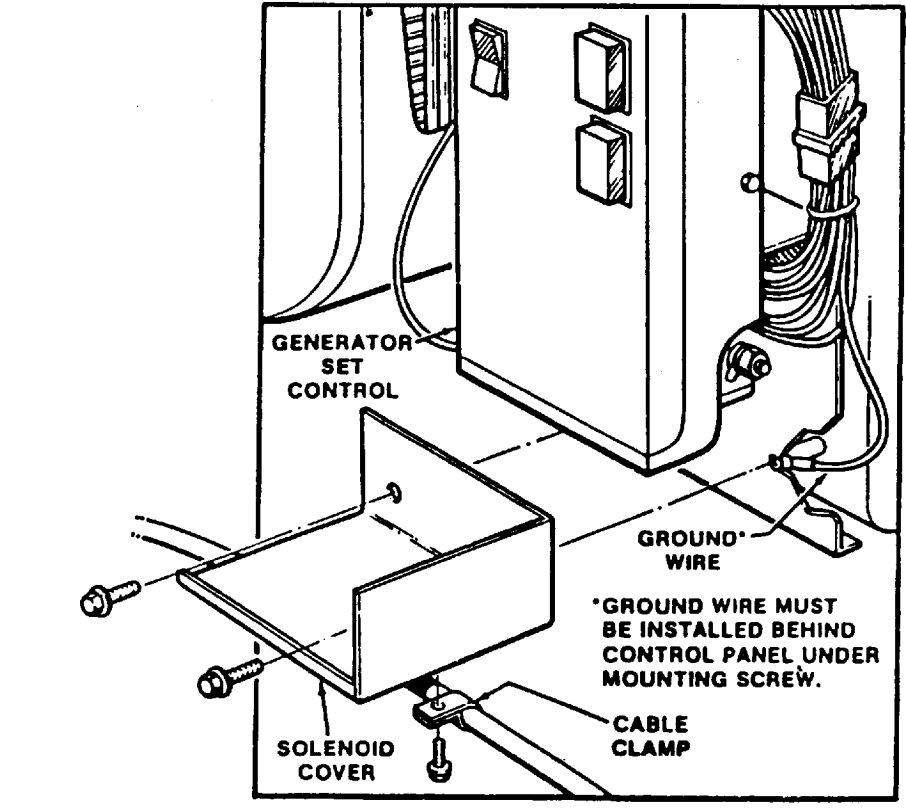
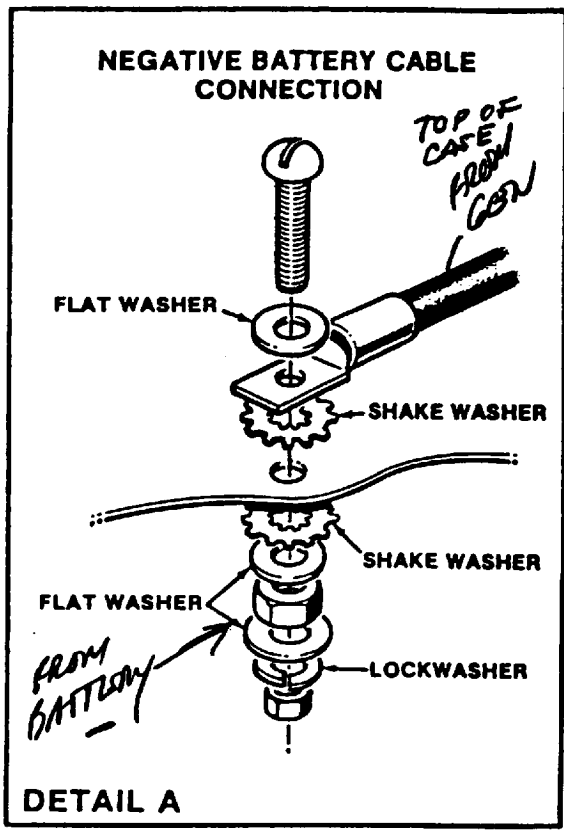
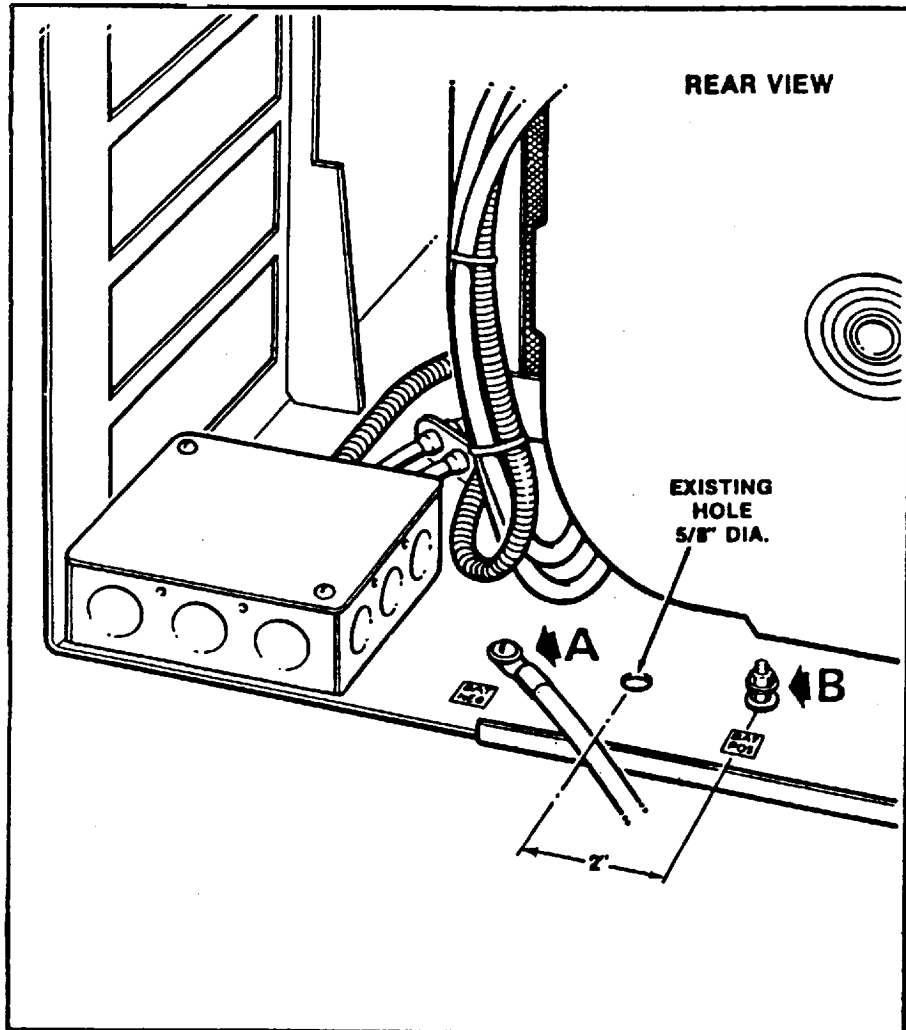
<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
3	150-1418	1	Stud, Governor Adjusting - BF Only
12	191-1106	1	Regulator, 12 Volt



CONTROL GROUP

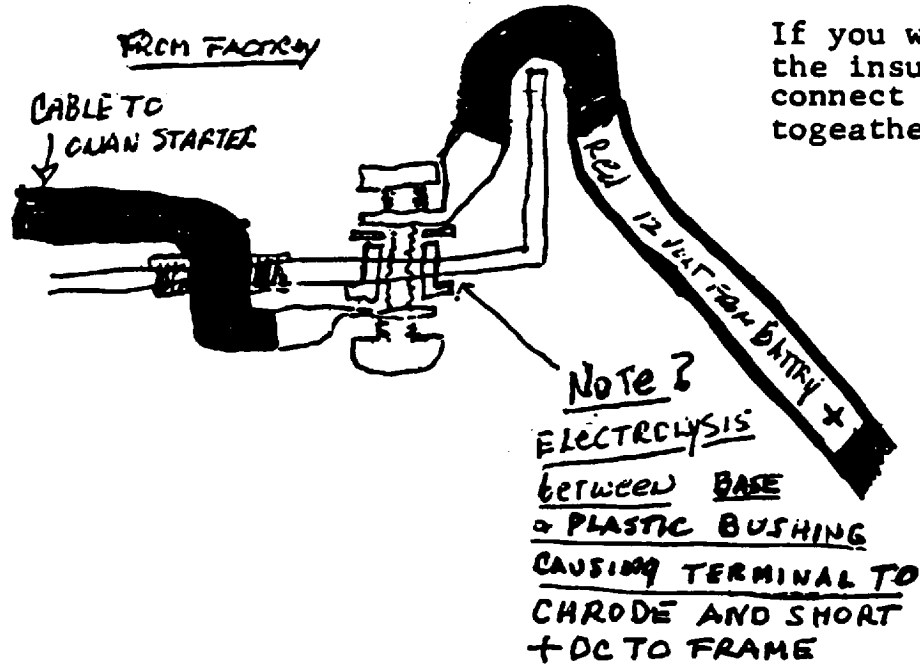
<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
3	300-1073	1	Control Assembly (Includes Parts Marked *)
4	356-0058	1	*Capacitor (100 Mfd., 25 VDC)
5	357-0004	4	*Rectifier, Silicon
6	307-1309	1	*Relay, Start Disconnect (Includes Dust Pad)
7	307-1308	1	*Relay, Engine Stop (Includes Dust Pad)
8	350-0524	1	*Resistor (100-Ohm, 1/2 Watt)
9	350-0526	1	*Resistor (150-Ohm, 1/2 Watt)
10	308-0320	1	*Switch
11	332-1511	15	*Tab, Stake
20	356-0046	1	*Capacitor (5 Mfd., 25 Volt)
21	355-0025	1	*Capacitor (.1 Mfd., 100 Volt)
22	364-0017	1	*Rectifier, Gate Control (8 Amp., 30 Volt)
23	321-0181	1	*Fuse, 5 Amp
24	321-0163	2	*Clip, Fuse Holder
25	361-0006	1	*Transistor, Unijunction
26	350-0370	1	*Resistor (200-Ohm, 1/2 Watt)
27	350-0568	1	*Resistor (470 K Ohm, 1/2 Watt)
28	350-0421	1	*Resistor (27 K Ohm, 1/2 Watt)
29	350-0416	1	*Resistor (16 K Ohm, 1/2 Watt)
30	350-0325	1	*Resistor (2.7 Ohm 1/2 Watt)

\* Parts Included in the 300-1073 Control Assembly

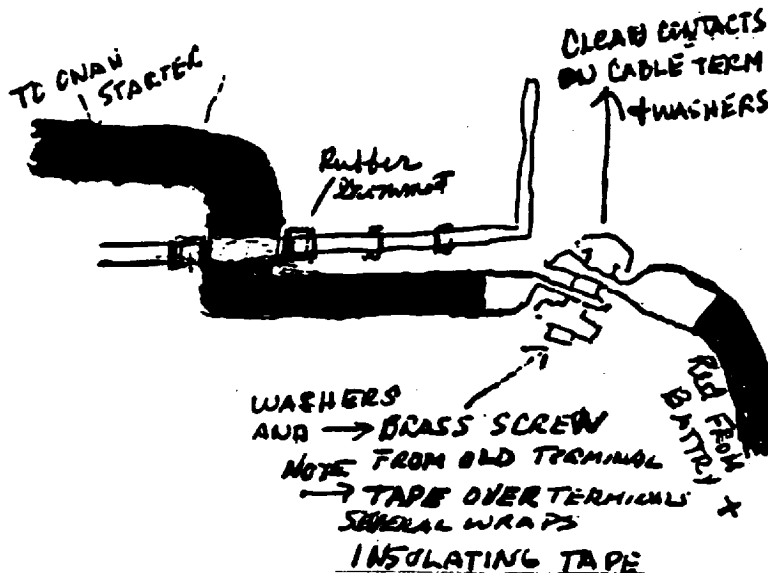


TYPICAL INSTALLATION DETAILS

The Pos. Cable From The Battery is connected to the Thru Terminal (insulated) in the ONAN frame to a double nut brass(thru insulated)screw. Some times the insulated washer failes due to Electrolis. causing the 12 Volt + to short to Frame.



If you wish you can remove the insulated bushing and connect the positive cables together as in the inst.

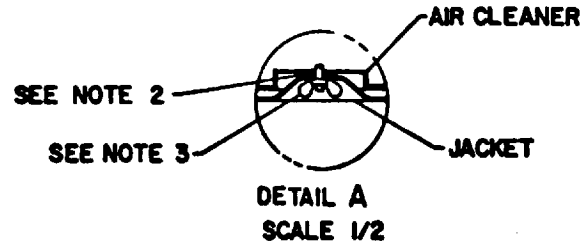
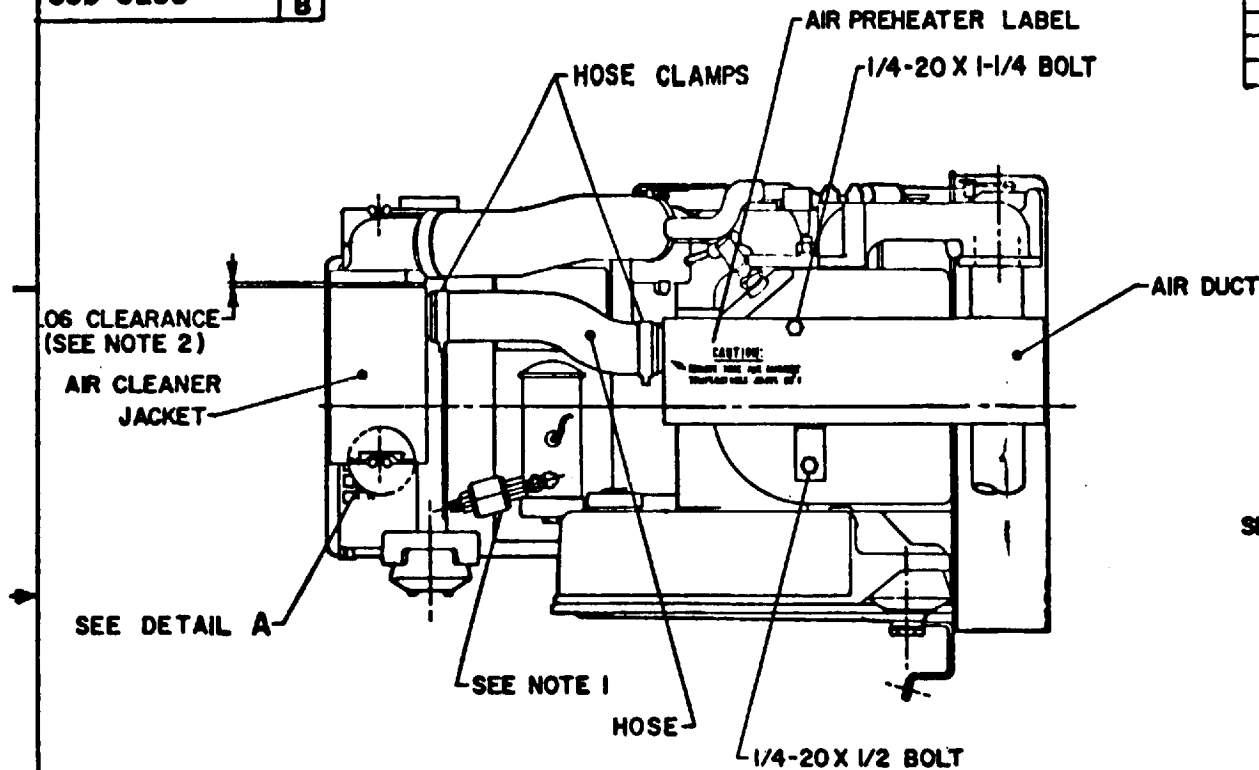


Also change if necessary The Gas supply hose( $\frac{1}{2}$  gas hose approved) from Onan frame supply to gas Solonad. Original is plastic and can crack and let in air causing pump to pump air and small amounts of gas to engine. the engin will run a little while and stop after starting agian.

539-0293

REV 8

REV	REVISION	DATE	BY	CHK	APP



38

**NOTES:**

1. TURN FUEL SOLENOID DOWNWARD TO CLEAR JACKET.
2. ADD WASHER(S) BETWEEN AIR CLEANER AND JACKET FOR .06 CLEARANCE.
3. USE EXISTING THRU STUD AND WING NUT ON AIR CLEANER TO MOUNT JACKET.

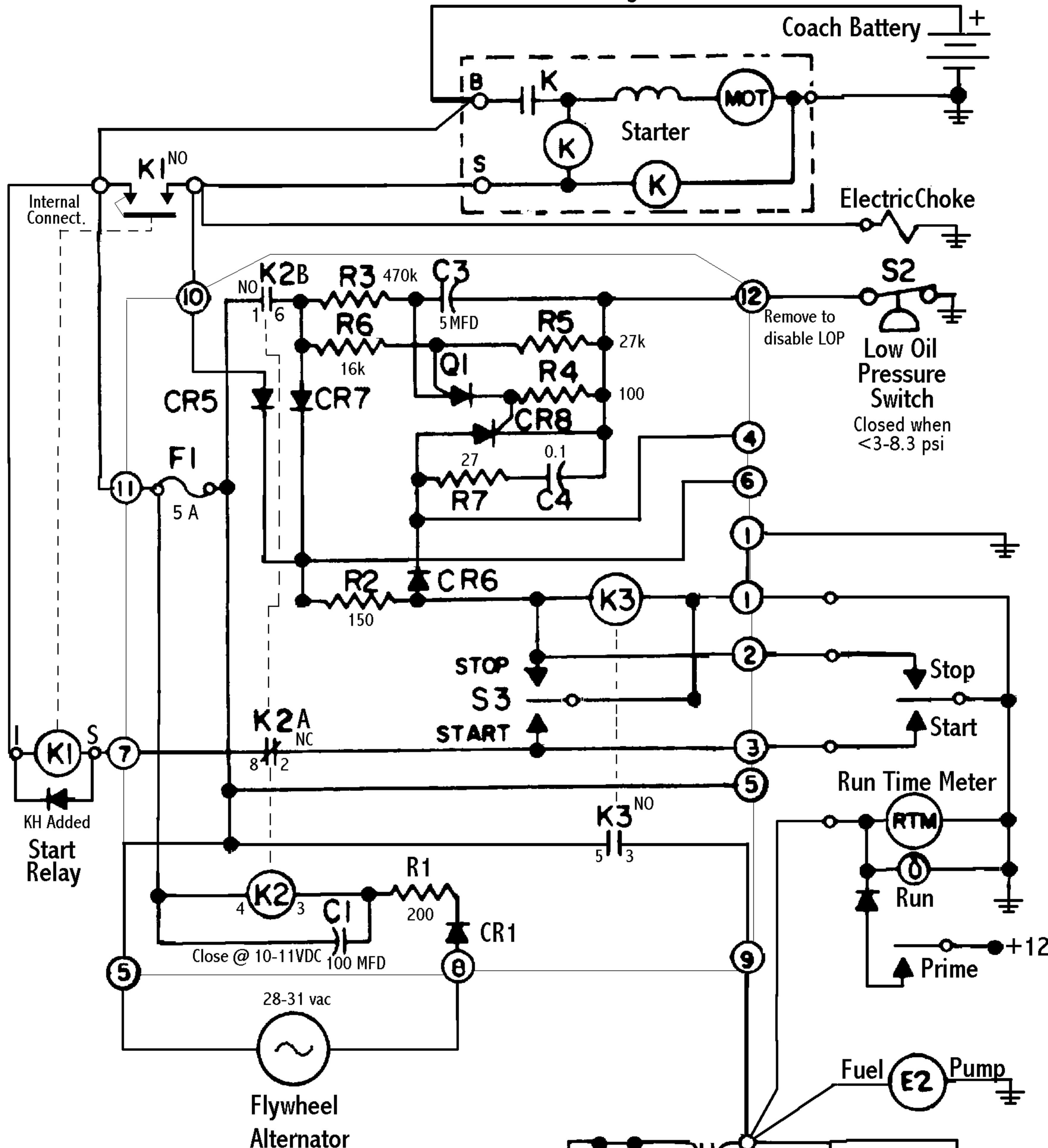
DEPT FROM	ITEM	PART NO.	QTY	BULK	DESCRIPTION OR MATERIAL
DR JM					DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
CRD HCP					
ENGR EDS					ILLUS-AIR PREHEATER
DATE	4-15-75			1/4	
FROM EDS (4-15-75)		6.ONH-IR/9000 & 9500			539-0293

NEXT ASSY	SIMILAR TO
TOLERANCES UNLESS OTHERWISE SPECIFIED	
FRACTIONS 2	DECIMALS
ANGLES . . . 2	2 PLACE 2
HOLES . . . .006	3 PLACE 2
.002	

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HUNTSVILLE

# Onan Generator Wiring w/Electronic Ignition w/o Fuel Solenoid or 12 VDC Regulator



(X) = Circuit Board Connector #

### Troubleshooting Notes:

1. Jumper (5) to (9) to disable all protective functions.
  2. Jump (7) or S (Start Relay left coil terminal) to ground to start by bypassing K2NC.
  3. Jump (12) to Ground to test LOP stop within 3-4 sec.
  4. Disconnect (12) to disable LOP
- CAUTION -- NO PROTECTION FROM OIL LOSS

R1=200 Ohm  
R2=150 Ohm  
R3=470k Ohm  
R4=100 Ohm  
R5=27k Ohm  
R6=16k Ohm  
R7=27 Ohm

C1=100 MFD 25VDC  
C3=5MFD 25VDC  
C4=0.1MFD 100V  
Q1=UJT (2N6027)  
CR1-7=0.5A100V (1N4004)  
CR8=GCR 0.8a30v (2N5064)

K2=ECG #RLY5142 400 ohm 2A DPDT  
(Starter Disconnect / Hold Relay)  
K3=ECG #RLY6522R 1400 ohm  
(Run / Engine Stop Relay)

S2=NAPA OP6282 Close @ <3-8.3psi 1/8-27 NPT  
(Engine Low Oil Pressure Switch)

