



Instruction Manual *for..*

SOUTHERN CROSS

A.C. GENERATING SET

Fig. 3155, 2 K.V.A., 240 Volt

Fig. 3155 2 k.v.a. A.C. Generating Sets

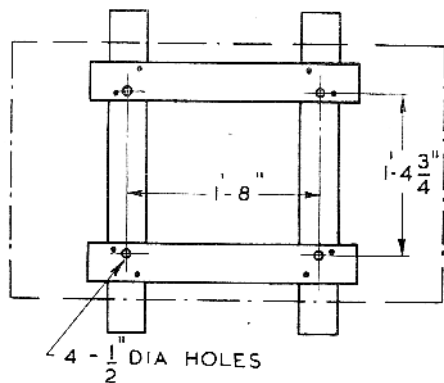
Installation

Foundation for Set

To obtain the best results from this set, install it on a firm foundation. A large block of concrete, with the foundation bolts set into it, makes a suitable foundation.

To Make Concrete Base

1. After deciding where the set is to be installed, sink a hole in the ground 1ft. to 1ft. 6in. deep and to the sizes on the General Arrangement Illustration on Page 2. Light soil requires a larger base than heavy, well-packed soil but always make the block larger for preference.
2. Make a wooden template to hold the foundation bolts in their correct positions while the concrete is being poured. (Refer to illustration below.) Slide the base on to the template and, using a $\frac{1}{2}$ in. bit, mark the positions for the holes. Remove the base and bore $\frac{1}{2}$ in. holes through the template.
3. Place template in position over the hole in the ground. Take the foundation bolts from the engine case, put large washers on them and then hang them from the template so the tops will project 3 inches above the concrete when the template is removed.
4. Drive in some small pegs around the ends of the crossboards to hold the template in position. Check that the template is level with a spirit level and pack under the ends if necessary.
5. Mix a batch of concrete, using 4 parts sharp stone or rubble, 2 parts sand and one part cement. See that the stone and sand are clean and do not contain any clay or dirt. If they do, wash carefully before mixing. A block 1ft. 6in. deep will require approximately 4 bags of cement, $\frac{1}{4}$ yard of sand and $\frac{1}{2}$ yard of stone.

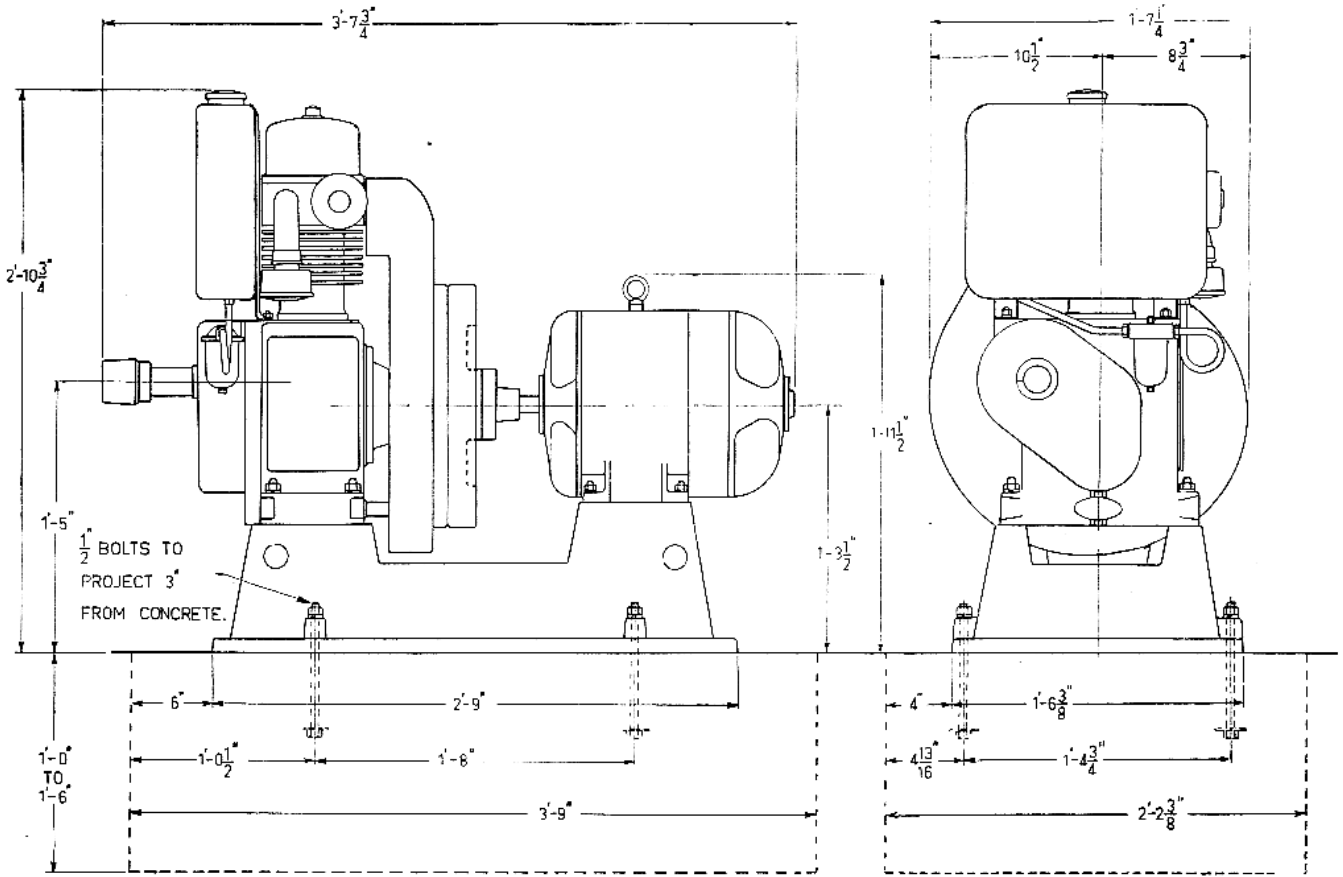


Bolt Template

6. Fill the hole with concrete and, at the same time, place old bars and bolts in for reinforcements.
7. Allow the concrete to set for two or three hours and then undo the nuts and carefully lift off the template, taking care not to disturb the bolts. If necessary, smooth off the top of the block, using a mixture of 2 parts sand and one part cement. Allow the concrete to set for a day.

Lining Up The Set

1. Lift the base into position on the concrete block and, with a spirit level, check that the base is level. Where necessary, place thin pieces of tin under the edge of the base to level it, and then tighten down the nuts on the foundation bolts.
2. Take the studs supplied in the generator box and screw them into the base, short-threaded end first. To tighten the studs into the base, screw two nuts on to each stud in turn, lock them together, tighten stud, using the spanner on the top nut, and then unlock nuts.
3. Unscrew the cylinder head cover nut on the engine, lift off the cylinder head cover and screw on the lifting shackle. Then lift the engine on to the base and replace the cover and cover nut.
4. Clean the face of the engine flywheel and fit the driving half of the flexible coupling. Screw it on to the engine crankshaft and tighten, using the starting handle as a tommy bar.
5. Slide the other half of the coupling on to the generator shaft, making sure the key is in position. Lift the generator into position on the base.
6. Slide the driven half of the coupling along until the faces of the two halves are almost touching.
7. The two halves of the coupling are the same diameter. Using a metal straight edge across the coupling halves, check if the diameters coincide on top, underneath, and on either side. Shift the generator and recheck with the straight edge at these four points until correct.
8. Then, using a set of feeler gauges, check the gap between the coupling halves at the top, underneath, and on either side. Shift the generator until the gap is the same all around the coupling, and, at the same time, check that the diameters coincide, using the straight edge as in (7) above. The generator must be adjusted until the maximum misalignment on the outside of the coupling is less than .005in. and the maximum variation in the gap between the coupling halves is less than .010in.
9. When the alignment is correct, bolt the engine and generator down, fitting the spring washers supplied. Then recheck the lining up.
10. Shift the driven half along the shaft to leave about 1/16in. gap between the halves and lock it in this position. Fit the rubbers and pegs and tighten.



General Arrangement of Fig. 3155, 2 K.V.A., A.C. Generating Set

WARNING: A shock from the wiring on this set could be fatal. Therefore all wiring should be done by a qualified electrician in accordance with recognised wiring rules.

Wiring Up Set

1. Undo the screws holding the front cover on the field resistance board and remove it. Mount this board on a wall in a convenient position close to the generating set, using wood screws.

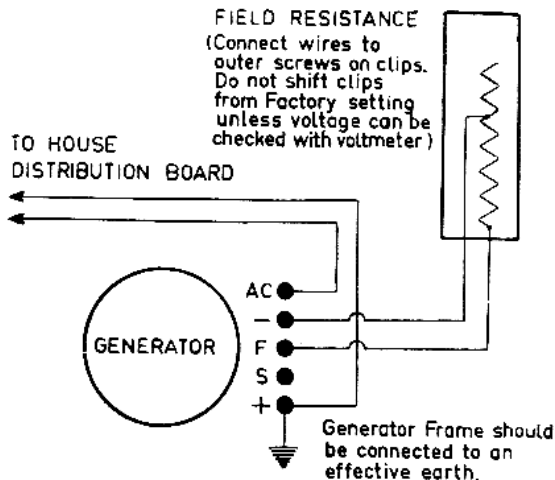
IMPORTANT: Pipe spacers are supplied for fitting on the mounting bolts immediately behind the the switch-board and field resistance board (if fitted). The air space thus provided will act as a safeguard against burning the wall if the board should ever become overheated due to a fault.

2. If electric starting is being fitted, mount the switch-board on a wall in a convenient position close to the generating set. Fix suitable bearers of about 3in. x 2in. timber at a convenient height and then bolt the switchboard to the bearers using the bolts supplied.
3. Refer to the wiring diagrams on Pages 2 and 3 which show the necessary connections.

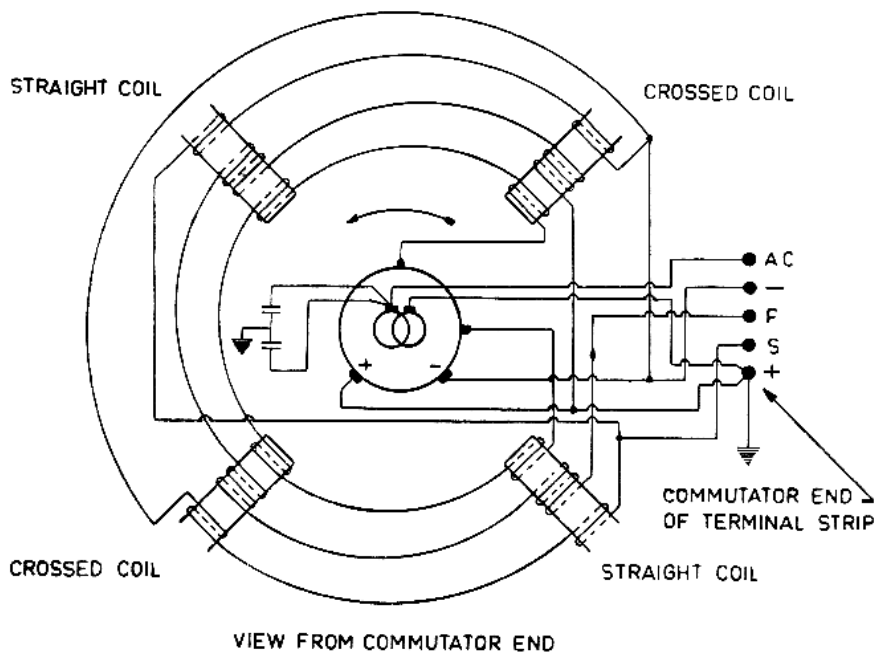
For a set without electric starting, it is recommended that 3/.029 wire be used for leads between the generator and field resistance board.

For a set with electric starting it is recommended that 7/.064 wire be used for the battery leads and leads "S to S" and "+ to +". Use 3/.029 wire for the remaining leads.

It is recommended that the wiring between the generator and field resistance board or electric starting switchboard be run in conduit; and, where there is a concrete floor, the conduit can be concreted in if screwed conduit is used.



Wiring to Field Resistance Board

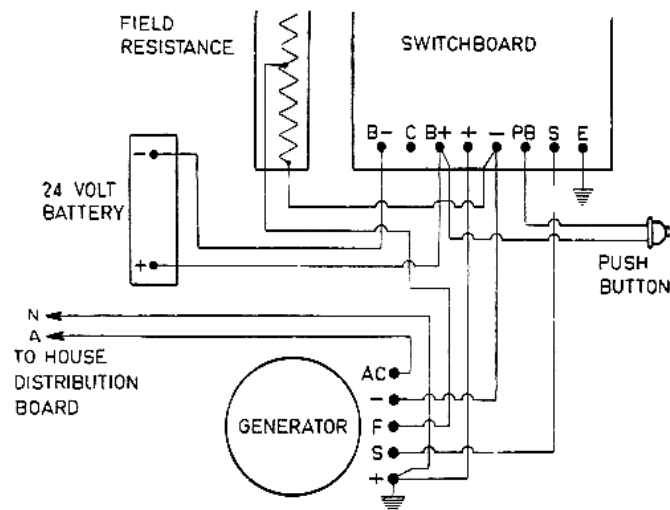


Wiring Diagram for 2 K.V.A., A.C. Generator, Mark EH-G

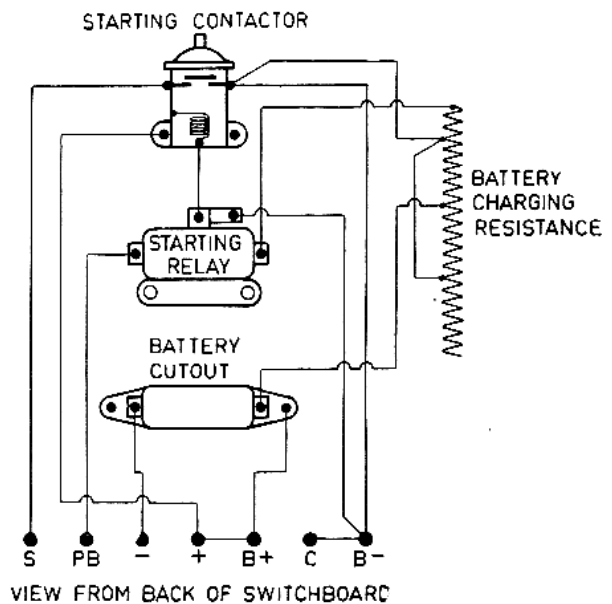
4. The size of overhead lines required for the installation will be governed by the distance the set is placed from the house and also the allowable voltage drop. The following wire sizes may be used for the distances shown and will ensure that the voltage drop does not exceed 5 volts at full load:—

Route Length measured along run of wiring between generator and house.	Wire Size for Overhead Lines. (Hard Drawn Bare Copper Cable.)
Up to 250 feet	7/.036
250 feet to 375 feet	7/.044
375 feet to 450 feet	7/.048

If, for the sake of economy, the above wire sizes are used over greater distances, the voltage drop will exceed 5 volts at full load and the result will be that the lights at the house will not be as bright, due to the reduced voltage.



Wiring of Set fitted with Electric Starting



Wiring Diagram for Electric Starting Switchboard

5. **Earthing:** IT IS IMPORTANT THAT ALL SETS BE EARTHED AS SHOWN BELOW. Any further earthing requirements for your particular installation will be decided by the installing electrician. For a set without electric starting, connect terminal marked “+” in generator terminal box to a piece of iron or copper bar driven into the ground outside the building. For a set with electric starting, connect terminal marked “+” in generator terminal box and terminal marked “E” in switchboard terminal box to a piece of iron or copper bar driven into the ground outside the building. Both terminals should be connected to the same piece of bar.

Running Instructions

To Start Set — By Hand

Carry out procedure shown under heading "Running Instructions" in Engine Instruction Manual.

To Start Set — Electrically

1. Prepare engine for first run as detailed in Engine Instruction Manual.
2. See that the fuel pump control rod is in the running position. (Refer to Engine Instruction Manual.) If this is not done the engine will be difficult to start as it will not receive sufficient fuel.
3. Press push button and, as soon as the engine commences to fire, release the push button. If the engine does not commence firing then the instructions for preparing the Engine for first run in the Engine Instruction Manual have not been followed.

NOTE:

- (a) Do not hold the push button closed for more than about 30 seconds at a time.
- (b) After each attempt to start, allow the battery to stand idle for at least one minute while the engine is checked over to see why it did not start.

To Stop Set

1. The engine can be stopped manually by pulling the fuel pump control rod towards the starting end of the engine and holding it there until the engine stops.
2. For sets fitted with remote stopping, press "stop" button and hold pressure on button for about 30 seconds. If pressure on button is released too soon, the engine may start again.

Speed of Set

The Diesel Engine, as supplied, is set to run at 1500 R.P.M. on full load, so it will not be necessary to make any adjustment to the speed of the Engine.

Electric Starting Batteries (if fitted)

Once every week, check the charge in the cells of the battery, using a hydrometer. Also check to see that the plates are covered with electrolyte, and, if necessary, add distilled water.

The charging rate for the electric starting batteries has been set at the Factory and should be suitable for most installations. However, if the batteries become low in charge or show signs of overcharging, it may be necessary to alter the charging rate. Overcharging can be recognised by excessive gassing and the frequent need for topping-up with distilled water.

To alter the charging rate, remove the front panel from the switchboard and examine the battery charging resistance. It will be noticed that there are three clips on the resistance.

Only alter the position of the two bottom clips—do not under any circumstances alter the position of the top clip.

To increase the charging rate, shift the two bottom clips closer to the top clip keeping the three clips equal distances apart; i.e., the middle clip should be half-way between the top and bottom clips.

To decrease the charging rate, shift the two bottom clips away from the top clip keeping the three clips equal distances apart, as above.

Use of Electrical Appliances

Lighting and Heating:

Fluorescent lamps, incandescent lamps, electric irons, jugs, toasters, heaters, radio and television may be used providing the total load of the appliances in use at any one time does not exceed the rated output of the set. If the set is fitted with electric starting, up to 100 watts of the output may be required for charging the starting batteries, depending on their state of charge. Therefore for a set with electric starting, the total load of appliances in use at any one time should not exceed the rated output less approximately 100 watts.

Motor Loads:

Listed below are some of the electric motor driven domestic appliances which may be used with this set and also the conditions under which they may be used.

At all times the total load must be kept within the rated output of the set and, where electric starting is fitted, an allowance must be made for charging the starting batteries as stated above.

Refrigerator:

The domestic type sealed unit refrigerator may be used, but it should be remembered that to obtain satisfactory operation of the refrigerator, particularly in hot weather, it will be necessary to leave the

set running for long periods or, alternatively, to start it frequently for short periods.

Washing Machines:

Most washing machines on the market are fitted with either 1-3rd or $\frac{1}{2}$ H.P. split phase induction motors. Providing this motor is replaced by a $\frac{1}{2}$ H.P. or smaller capacitor start induction motor, a washing machine may be used.

Floor Polisher, Vacuum Cleaner, Food Mixer, Portable Electric Drill:

These four appliances are usually fitted with universal type motors, that is AC/DC motors, and may be used. Providing the total load does not exceed the rated output of the set, no limit is placed on the number of appliances with universal type motors which can be used at any one time. As a rule, appliances using any universal type motor will be labelled either "240 Volt AC/DC" or just "240 Volts".

Induction Motors:

Appliances using induction motors tend to widen the voltage range over which the set will regulate, and for this reason it is necessary to limit their use. The total load of induction motor appliances in use at

any one time should never exceed that due to a domestic type sealed unit refrigerator plus one other appliance, such as a washing machine which is fitted with up to $\frac{1}{2}$ H.P. capacitor start induction motor. Induction motors are usually labelled "240 Volt AC".

Although a limit is placed on the total induction motor load which can be used, it should be understood that the balance of power from the set can be used at the

same time for lighting, heating appliances, or universal type motor driven appliances.

Where fluorescent lighting and electric motors are being used at the same time, it may be found that the fluorescent light will flick off for a fraction of a second when the motor is switched on. This is due to the heavy starting current which an electric motor draws when it is switched on, which drops the voltage momentarily causing the light to flick off.

Care of the Generator

In order to ensure trouble-free operation of the Generator it is necessary to observe a certain maintenance routine.

Cleaning

Keep all parts of the generator clean. It is most important that the commutator and slip rings be kept free from dust and dirt. The commutator, slip rings, brushes, brush holders and spindles, windings and terminals should be periodically wiped down with a clean, dry rag.

Bearings

When the Generator leaves the works the bearings are packed with grease, and do not require further attention before the plant is put into operation.

However, it is advisable to remove the end caps from the bearings about once a year to examine them. The balls and races should be clean and show no signs of rusting. There need only be a smear of grease on the bearing. If necessary, grease should be added to the bearing. Only fill the bearing cage, don't fill the cap with grease, or the bearing will overheat and grease will be forced from the bearing over the windings of the Generator.

Under no condition must oil or grease containing graphite be used.

Recommended grease is:—

SOUTHERN CROSS GREASE, or, if this is not available, any Ball Bearing Grease as recommended by a reputable oil company.

Brushes

Keep the Brushes free in their holders and all even in pressure. When the Main and Compensating Brushes are worn down to less than $\frac{5}{16}$ in. long, or the A.C. Brushes are less than $\frac{1}{4}$ in. long, they should be replaced with new brushes of the size and grade stamped on the name plate.

To Fit New Brushes

1. Remove the covers from the Commutator End End-Shield.
2. Remove the brushes from the holders. Loosen nuts which hold the brush leads to the brush holders and remove them.
3. Try new brushes of the size and grade shown on the name plate in the brush holder.
4. They should slide freely without sticking. If they are tight, ease them down carefully by rubbing the tight side lightly on a flat sheet of fine sand paper until they will just slide in the holder.
5. Put the brushes in the holder and connect the brush leads to the brush holders.
6. Place a piece of sand paper, sand side out, around the commutator and allow the brushes to seat on the sand paper.
7. Carefully draw the paper backwards and forwards until the brushes assume the correct curvature, taking care to keep it round the commutator so that a flat is not formed in the brush. When the process is nearly completed, fine glass paper should be used to obtain a very smooth finish.
8. After bedding carefully, clean away every trace of dust from the Commutator, Slip Rings, Brushes, and Holders. Make sure no specks of abrasive material are embedded in the face of the brush.
9. Replace the covers on the endshield and the generator may be started. It is advisable to run it on light load for a few hours before putting on full load to enable the brushes to settle down properly.

Troubles and Their Remedies

A. Sparking at the Brushes

The commutator and slip rings should be examined occasionally while the plant is running. They should be practically sparkless at all times. If sparking is excessive, steps should be taken to cure it or serious trouble may arise in a short time. Excessive sparking may be due to several causes:—

1. **Overload of Generator:**
Reduce load and observe whether sparking reduces.
2. **Jumping of Brushes Due to Vibration:**
To check for this trouble, proceed as follows: Place an insulated tool lightly on the brush tension arm. If vibration is felt, and if the sparking decreases with the added pressure, the sparking is probably caused by vibration. In this case, tighten the screw on the brush holder to increase the tension on the brush. This only applies to the two main brushes as an increase of pressure on the compensating brushes will cause increased sparking.
3. **Brushes not Sliding Freely in the Brush Holder:**
If the Generator is used in dusty conditions the brushes may become jammed in the holders with dust. Remove and clean both holders and brushes, taking care not to reverse brushes in holders.
4. **Wrong Grade of Brushes Being Used:**
Ensure that the correct brushes, as listed in the Parts List, are being used.

B. Radio Interference

A.C. Generators and motors, when running, may cause radio interference, and if this interference is allowed to get into the radio set it may result in so much noise that radio stations become inaudible behind the interference.

Radio interference may be suppressed, but it is almost impossible to completely eliminate it. The greater the degree of suppression required, the more expensive it becomes.

However, interference can be minimised by careful installation. When buying your radio set, get your radio man to suggest the best installation for your particular case.

The following items should be carefully studied before installing your radio, to make sure that interference is minimised:—

1. Locate the receiving aerial as far away as possible from the generating plant, and run it at right angles (not parallel) to the power lines from the engine shed to the house, keeping the aerial as high as possible. Use shielded wire from the lead-in to the house right to the set, or use the aerial filters and twin lead-in wires which are available from your radio store. Consult your radio man on this point and use the type of lead-in he recommends.
2. Make sure the generator and switchboard frames are effectively earthed (refer "Earthing", instructions on page 3.)
3. Keep the commutator and brush gear clean. Ensure that brushes are free in their holders and that there is no excessive sparking. Brushes sticking in the holders will spark badly, and will burn away and cause interference.
4. In new installations, it will be found that the noise will lessen over the first few weeks' running as the brushes bed down and acquire the normal smooth surface.
5. Where convenient placement of the aerial is not possible and the noise level is still objectionable, after ensuring that the above conditions are met with, it may prove necessary to fit an alternative suppression device, such as a larger suppressor condenser or a line filter. Consult your radio technician.
6. In extreme cases, where the above methods fail to suppress interference, it may possibly be eliminated by fitting one or more of the following condensers:—
 1. Fit a 4 mfd. condenser from the active A.C. brush to the generator frame (i.e., in parallel with the .2 mfd. condenser already fitted).
 2. Fit a .01 mfd. condenser from the "F" generator terminal to the generator frame and/or a .01 mfd. condenser from the "—" generator terminal to the generator frame.

Parts List

(See Illustration on Page 8.)

IMPORTANT: When ordering a part for the Generator or Switchboard, Please supply the following information from the Generator Nameplate:—

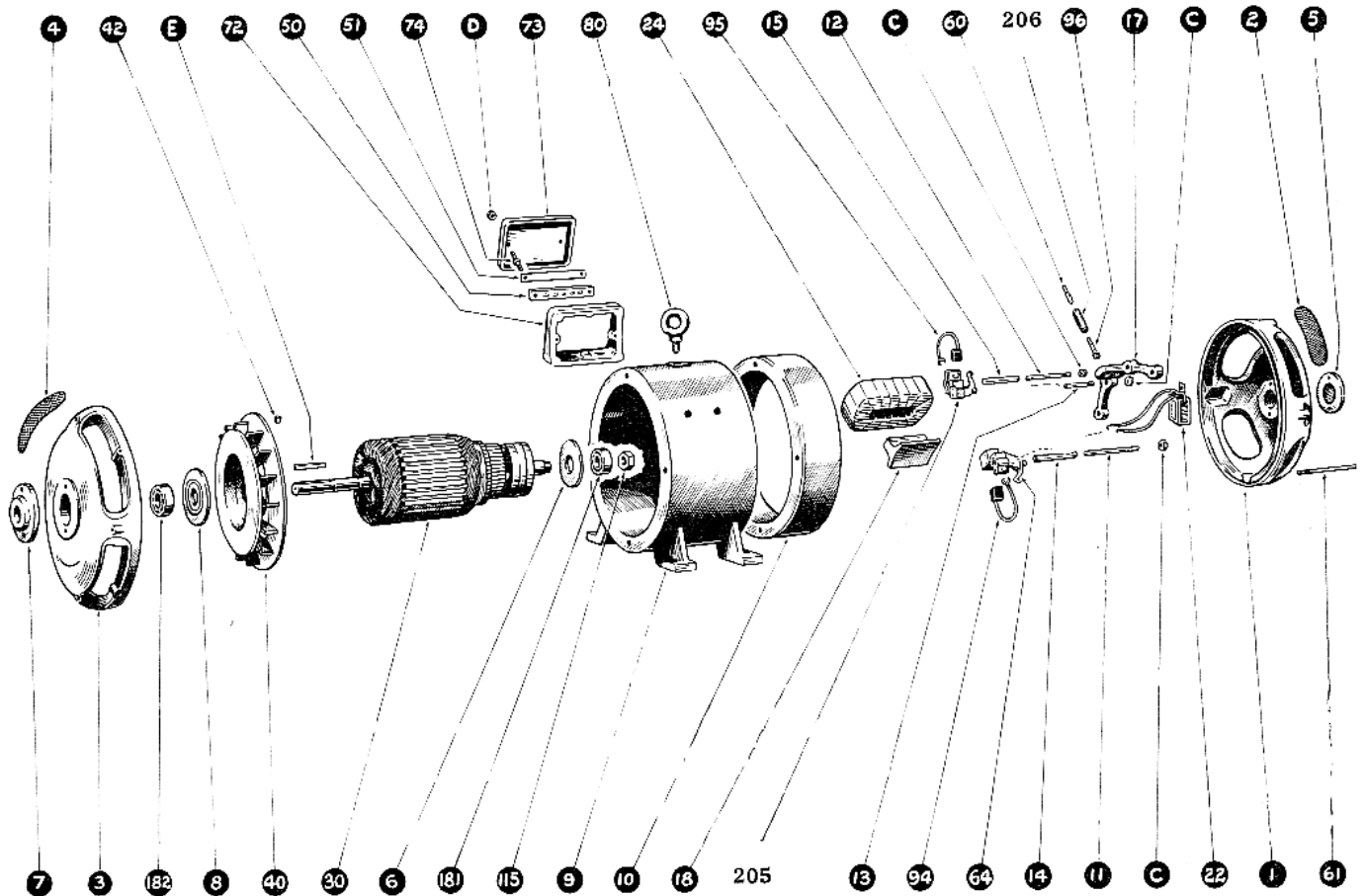
- (a) Mark Generator. (b) Generator No.
 (c) Name and Symbol No. of Part.

(1) 2 K.V.A., A.C. Generator, Mark EH-G

No. Off	Sym. No.	Name of Part.	No. Off	Sym. No.	Name of Part.
1	DL-G 1	Commutator End Endshield.	1	DL-G182	Drive End Bearing.
4	DL-G 2	Commutator End Endshield Cover.	1	EH-G198	Name Plate.
1	DL-G 3	Drive End Endshield.	2	EH-G205	Compensating Brush Holder.
4	DL-G 4	Drive End Endshield Cover.	2	EH-G206	A.C. Brush Holder.
1	DL-G 5	Commutator End Outside Bearing Cap.	4		A.C. Brush Connection Washer, 3/16in. Plain Brass.
1	DL-G 6	Commutator End Inside Bearing Cap.	2		Terminal Connection Marking Strip Washer, 5/16in. Plain M.S.
1	DL-G 7	Drive End Outside Bearing Cap.	2		Suppressor Condenser Screw, 5/16in. x 3/16in. Whit. Brass.
1	DL-G 8	Drive End Inside Bearing Cap.	2		Terminal Connection Screws, 1/2in. x 1/2in. Whit. Brass.
1	DM-G 9	Body.	2		Drive End Bearing Cap Setscrew, 1 1/2in. x 1/2in. Whit.
1	EH-G 10	Body Extension.	2		Commutator End Bearing Cap Setscrew, 1 1/2in. x 1/2in. Whit.
2	EH-G 11	Brush Holder Stud (Long).	2		Brush Carrier Screw, 3/8in. x 1/2in. Whit. Brass.
2	EH-G 12	Brush Holder Stud (Intermediate).	4		Drive End Endshield to Body Setscrew, 1 1/2in. x 5/16in. Whit.
2	EH-G 13B	Brush Holder Stud (Short).	2		Slip Ring Setscrew, 1 1/2in. x 5/16in. Whit.
2	EH-G 14	Brush Holder Stud Insulation (Long).	2		Commutator Setscrew, 2 1/4in. x 5/16in. Whit.
2	EH-G 15	Brush Holder Stud Insulation (Intermediate).	4		Main Pole Mounting Setscrew, 1 1/2in. x 3/8in. Whit.
5	DA-G 16	Terminal Connection.	8		Endshield Cover Screw, 3/8in. x 1/2in. Whit.
1	EH-G 17	Brush Carrier.	8	C	Brush Holder Stud Locknut, 3/8in. Whit.
4	EH-G 18	Main Pole.	2	D	Terminal Box Stud Nut, 5/16in. Whit.
1	EH-G 22	Suppressor Condenser.	4		A.C. Brush Connection Nut, 3/16in. Whit. Brass.
4	EH-G 24	Field Coils (2 Crossed, 2 Straight).	2		Suppressor Condenser Screw Nut, 3/16in. Whit. Brass.
1	EH-G 30	Armature.	4		Commutator End Endshield to Body Stud Nut, 5/16in. Whit.
1	DL-G 40	Fan.	2		A.C. Brush Holder Setscrews, 1/2in. x 1/2in. Whit.
1	DA-G 40	Field Resistance Housing Name Plate.	1	E	Generator Drive Key, 2 1/4in. x 5/16in. x 5/16in. Parl. Key.
1	IZ-B 42B	Fan Locking Screw.	2		A.C. Brush Connection Pin, 3/8in. x 3/32in. Cotter Pin.
1	DM-G 50	Terminal Strip.	2		Field Resistance Housing Front Panel to Frame Screw, 3/8in. x No. 10 Self-Tapping Screw.
1	EH-G 51	Terminal Marking Strip.	4		Field Resistance Clip Screw, 3/8in. x 3/16in. Whit. Brass.
1	EH-G 52	Slip Ring Assembly.			
2	EH-G 60	A.C. Brush Connection Stud.			
4	EH-G 61	Commutator End Endshield Stud.			
2	EH-G 64	Main Brush Holder.			
1	DM-G 72	Terminal Box.			
1	DM-G 73	Terminal Box Cover.			
2	DM-G 74	Terminal Box Stud.			
1	EH-G 75	Generator Earthing Connection.			
1	DM-G 80	Eye Bolt.			
2	DA-G 86	Field Resistance Housing Spacing Piece.			
2	EH-G 94	Main Brush.			
2	EH-G 95	Compensating Brush.			
2	EH-G 96	A.C. Brush.			
1	EH-G 99	Field Resistance.			
2	EH-G100	Field Resistance Clip.			
1	EH-G101	Field Resistance Housing Assembly.			
1	EH-G102	Field Resistance Housing Back Panel.	10		
1	EH-G103	Field Resistance Housing Side—R.H.			
1	EH-G104	Field Resistance Housing Side—L.H.			
1	EH-G105	Field Resistance Housing Front Panel.	4		
1	AW-D115	Peering Locknut.			
1	AO-B181	Commutator End Bearing.			

(2) Electric Starting Equipment, Mark FU-E

No. Off	Sym. No.	Name of Part.	No. Off	Sym. No.	Name of Part.
1	FU-E 1B	Control Box Front Panel Assembly.	2		Cutout Mounting Screw, $\frac{5}{16}$ in. x $\frac{3}{16}$ in. Whit. Brass.
1	DA-G 4B	Terminal Strip Cover.	2		Starting Relay Mounting Screw, 1in. x $\frac{1}{2}$ in. Whit. Brass.
1	DA-G 7B	Back Panel Assembly.	2		Starting Contactor Insulating Panel Bracket Mounting Screw, $\frac{5}{16}$ in. x $\frac{3}{16}$ in. Whit. Brass.
1	DA-G 14B	Terminal Strip.	2		Terminal Connection Screw, $\frac{1}{2}$ in. x $\frac{1}{4}$ in. Whit. Brass.
8	DA-G 16	Terminal Connection.	2		Terminal Strip Mounting Screw, $\frac{3}{16}$ in. x $\frac{1}{2}$ in. Whit. Brass.
2	FU-E 17	Control Box Terminal Strip Common Connection.	4		Resistance Clip Screw, $\frac{3}{16}$ in. x $\frac{3}{16}$ in. Whit. Brass.
1	FU-E 18	Control Box Terminal Connection Marking Strip.	2		Starting Contactor Mounting Screw, $\frac{5}{16}$ in. x $\frac{3}{16}$ in. Whit. Brass.
1	DA-G 26	Battery Charging Resistance.	10		(4) Resistance Clip Setscrew Nut, (2) Starting Contactor Mounting Screw Nut, (2) Starting Contactor Bracket Mounting Screw Nut, (2) Cutout Mounting Screw Nut— $\frac{3}{16}$ in. Whit. Brass.
4	DA-G 31	Resistance Clip.	3		(1) Terminal Strip Mounting Screw Nut, (2) Starting Relay Mounting Screw Nut— $\frac{1}{2}$ in. Whit. Brass.
1	DA-G 35C	Starting Contactor Insulating Panel.	15		Terminal Connection Washer, $\frac{1}{4}$ in. Plain Brass.
1	DA-G 36C	Starting Contactor Insulating Panel Mounting Bracket.			
1	DA-G 40	Switchboard Name Plate.			
1	FU-E 51	Starting Relay Assembly.			
1	FU-E 55	Battery Cutout Assembly.			
3	KC 67	(1) Starting Contactor Insulating Washer. (2) Starting Contactor to Bracket Insulating Washer.			
1	DA-G 71	Push Button.			
4	DA-G 86	Switchboard Spacing Piece.			
1	DA-G 92	Starting Contactor.			
17		Front Panel to Frame Screw, $\frac{3}{16}$ in. x No. 10 Self-Tapping Screw.			
4		Switchboard Mounting Bolt, $4\frac{1}{2}$ in. x $\frac{3}{16}$ in. Whit.			



(3) Mark KS-G Flexible Coupling

No. Off	Sym. No.	Name of Part.
1	KS-G 1	Coupling—Driving Half.
5	BQ-D 2	Flexible Coupling Pin.
1	KS-B 6	Flexible Coupling—Driven Half.
5	YC400	Flexible Coupling Rubber Bush.
1	AQ-E512	Coupling Driven Half Locking Screw.