

MOTOR-GENERATORS
135-CYCLE SIGNALING, 10.5 AND 40 WATT
REPLACEMENT PARTS AND PROCEDURES

1. GENERAL

1.01 This section covers the 10.5- and 40-watt KS-5001, KS-5066, and KS-5362 135-cycle signaling sets.

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

1.03 Part 2 of this section is called "**Replacement Parts**" and covers the method of ordering parts.

1.04 Part 3 of this section is called "**Replacement Procedures**" and covers the approved procedures for the replacement of the parts.

2. REPLACEMENT PARTS

2.01 When ordering replacement parts, other than brushes or ball bearings, give the name of the part as shown in the figures of this section and the complete nameplate data of the machine including the serial, KS numbers, and manufacturer's name. When parts used at both the motor end and generator end of the machine have the same name, the end of the machine for

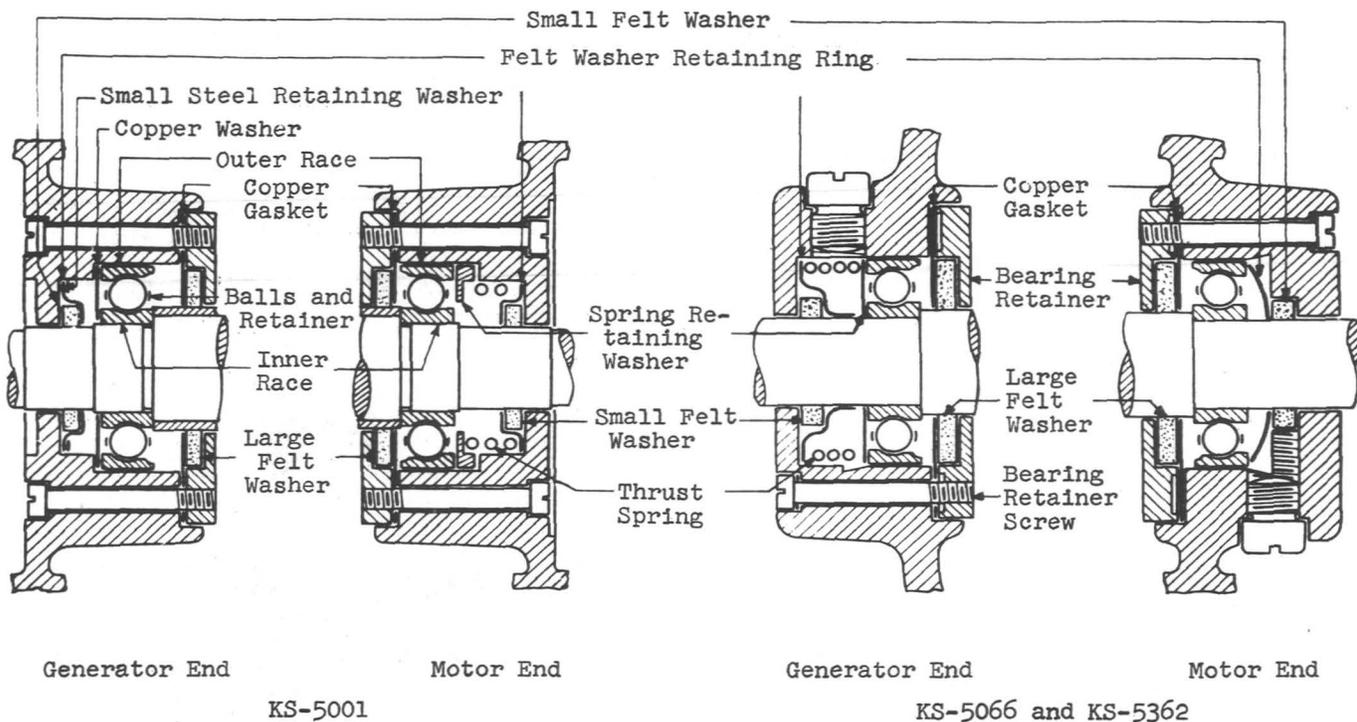


Fig. 1 - KS-5066 Machine

which the part is to be used should also be given. For example, one bearing retainer for the motor end of the KS-5362, L6 motor-generator set having the following nameplate data: General Electric; type CS5; 19 to 29 volts dc, 6.1 amperes dc; 35 volts ac, 1.14 amperes ac; 135 cycles; single phase; 40 watts; 2025 rpm; Serial No. 12345. Do not refer to the BSP number or any information in parentheses following the name of the part.

2.02 Order ball bearing replacements by catalog number. Brush replacements should be ordered in accordance with Section 171-110-802.

2.03 Miscellaneous parts such as screws, nuts, washers, etc., which are not named in the illustrations and which cannot be obtained locally should be ordered by referring to the associated part.



Note 1: In ordering parts, except bearings, specify the end for which they are required.

Note 2: If an inner ball race, balls and retainer or outer ball race needs to be replaced, it is recommended that the complete bearing assembly, which consists of inner and outer race and balls and retainer, be replaced as a unit, specifying a complete bearing assembly General Electric Company V-3510881.

Note 3: In case a bearing needs to be replaced, the felt washers shall also be replaced.

Fig. 2 - Bearing Assemblies

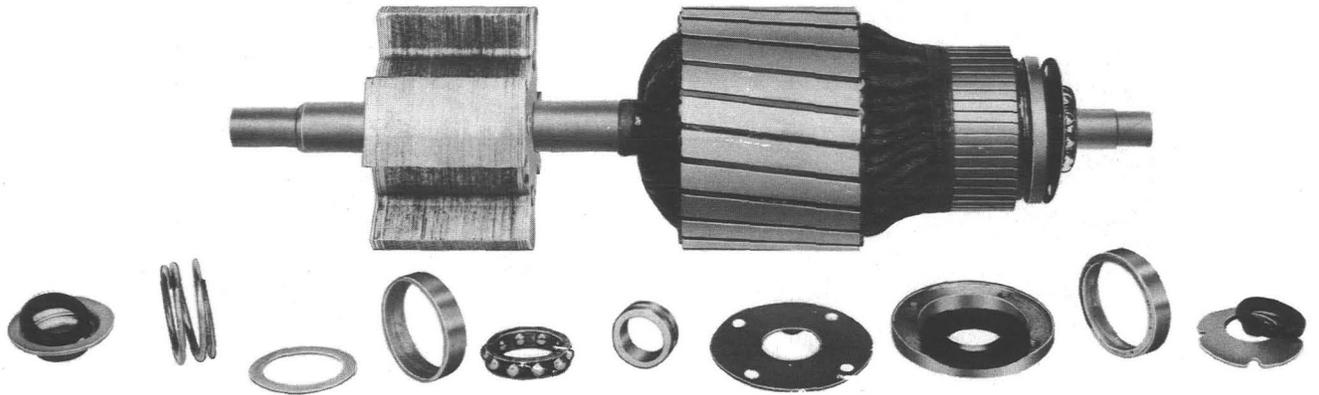
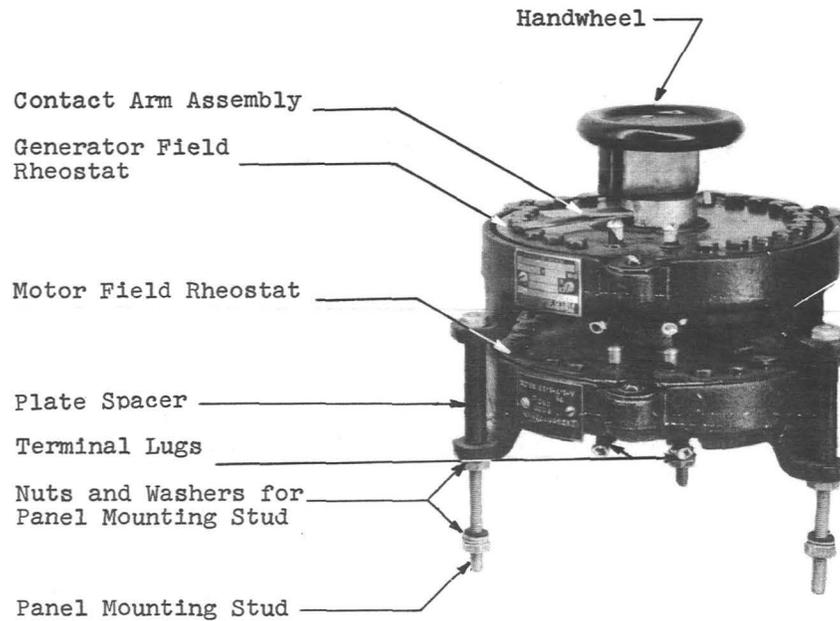


Fig. 3 - Rotor and Bearing Details — KS-5066 and KS-5362



Note 1: Specify whether handwheel is for rheostat for mounting on front or rear of panel.

Note 2: The motor field rheostat is associated with a certain motor and marked with the serial number of that motor.

Note 3: The resistor assembly of KS-5362, List 2, 4 and 5 consists of two tapped tube resistors on brackets. Each tube is marked to identify the associated motor or generator. Tubes may be obtained individually.

Fig. 4 - Resistor Assembly (Front of Board Rheostat Type Shown)

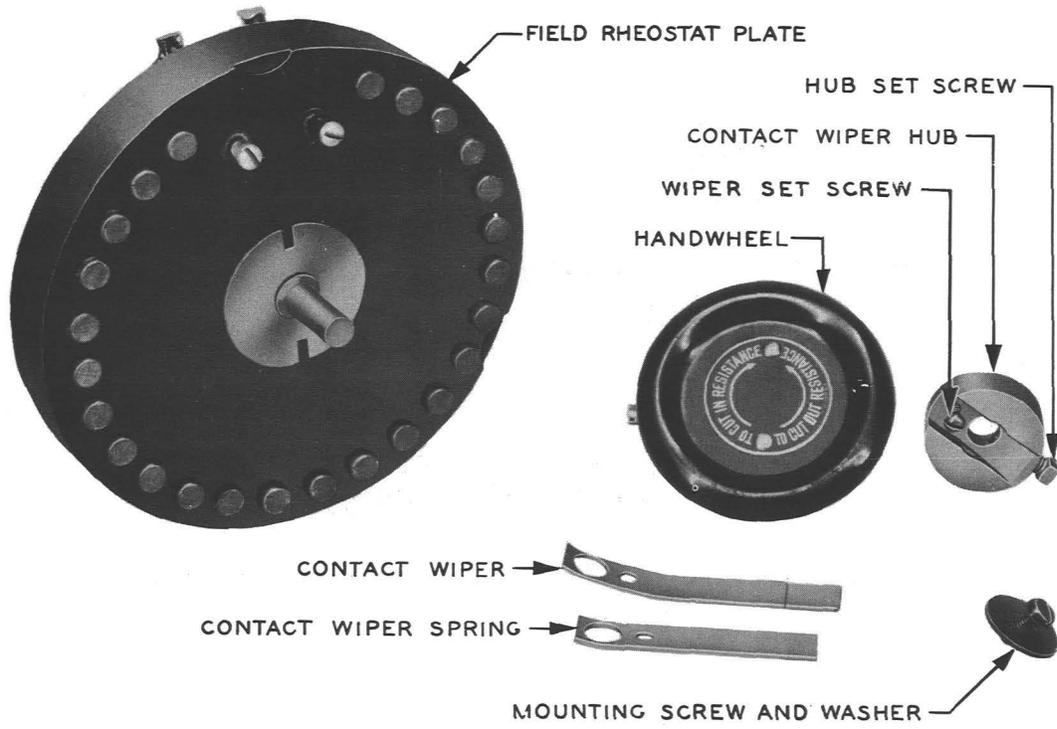


Fig. 5 - Rheostat — Details

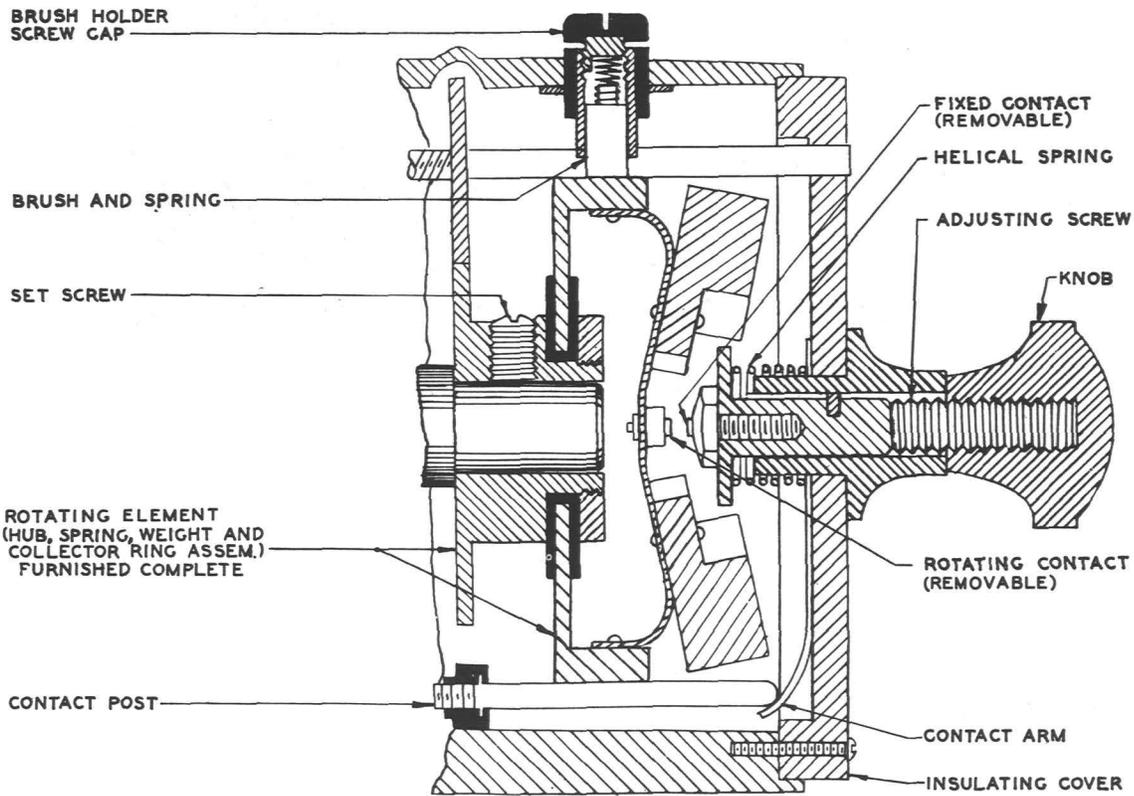


Fig. 6 - Center Contact-type Speed Regulator Assembly

Note 1: In the past, when replacing the rotating speed regulator contact, it was necessary to replace the contact, spring, weights, and supporting ring as a complete assembly. A replaceable contact was then designed for this assembly. Replacement of this contact on rotating assemblies in otherwise good mechanical conditions may be made in the field after the new design assembly has been obtained. To obtain this assembly, order “___ rotating element with replaceable contact.” After this change, only new rotating contacts need be ordered.

Note 2: Parts orders for center contact speed regulators for KS-5001 machines or those without KS marking should state whether the machine is arranged for speed reading on the regulator end.

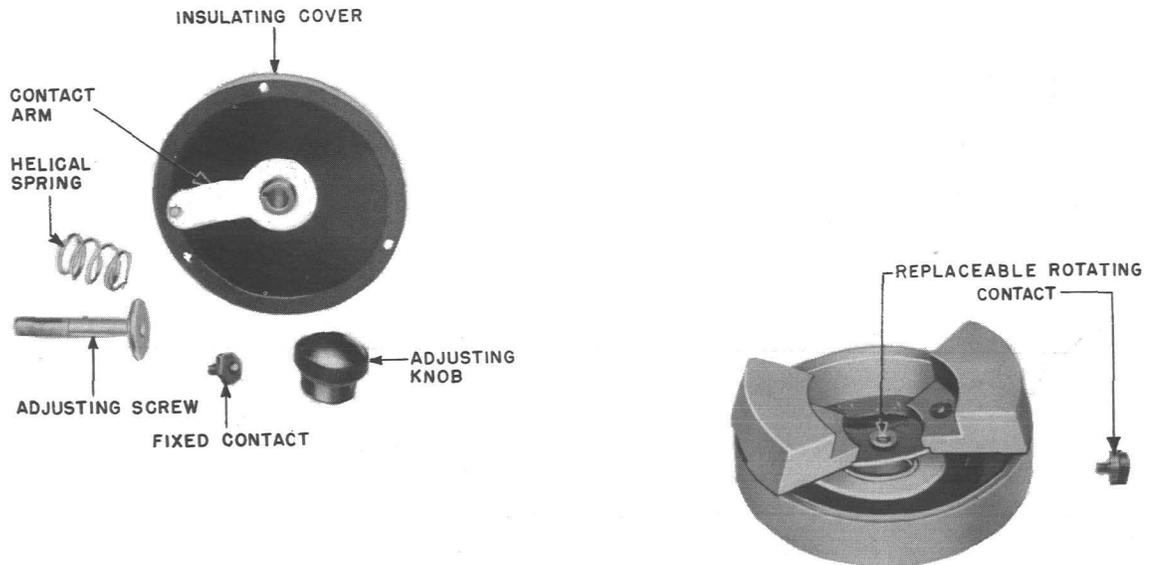
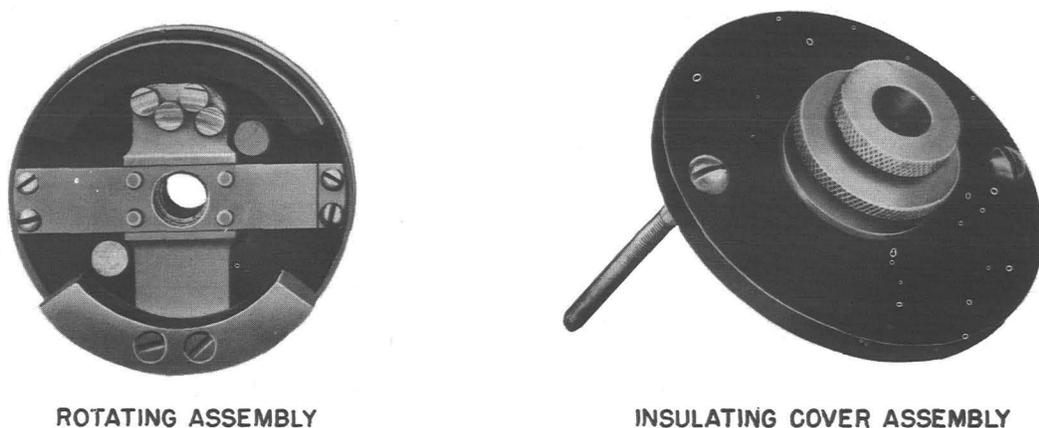


Fig. 7 – Insulating Cover and Rotating Element Details — Center Contact-type Speed Regulator

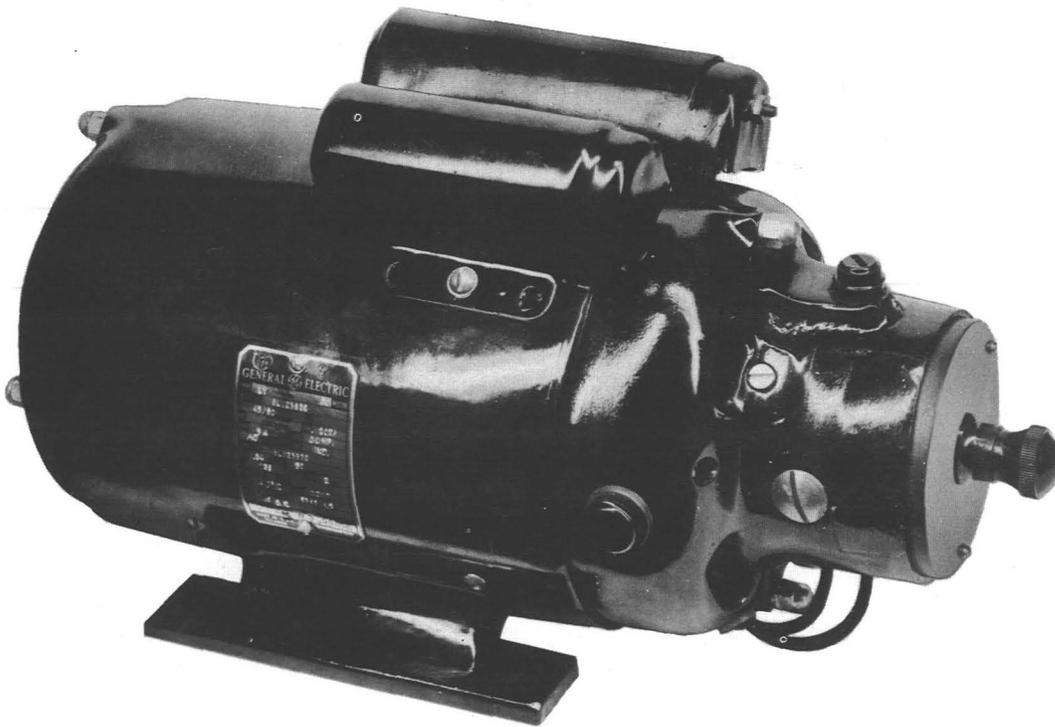


Note 1: If the regulator is the ring type, and any part, other than a brush or brush holder, requires replacement, order a complete new regulator of the center contact type, both insulating cover assembly and rotating assembly as follows.

Fig. 8 – Ring Type Speed Regulator

(a) If the shaft on the generator end of the machine is exposed so that the speed can be read from that end, a new end shield with speed taking shaft is not required on the speed regulator end. The order should call for a complete new center contact speed regulator, G. E. Co. drawing M-2062541, Gr. 7.

(b) Where it is necessary to take the speed readings at the regulator end, a new end shield with speed taking shaft is required. The order should call for a complete new center contact type speed regulator, G. E. Co. drawing M-4282827, Gr. 1 and one new commutator end flange, G. E. Co. drawing M-5018474, Gr. 1, complete with contact post assembly and assembly of shaft, washers, gear quill and spring.



Note: KS-5362, List 2, 4 and 5 Machines Have Two Tube Resistors Instead of Rheostats

Fig. 9 - KS-5362, List 5 Machine

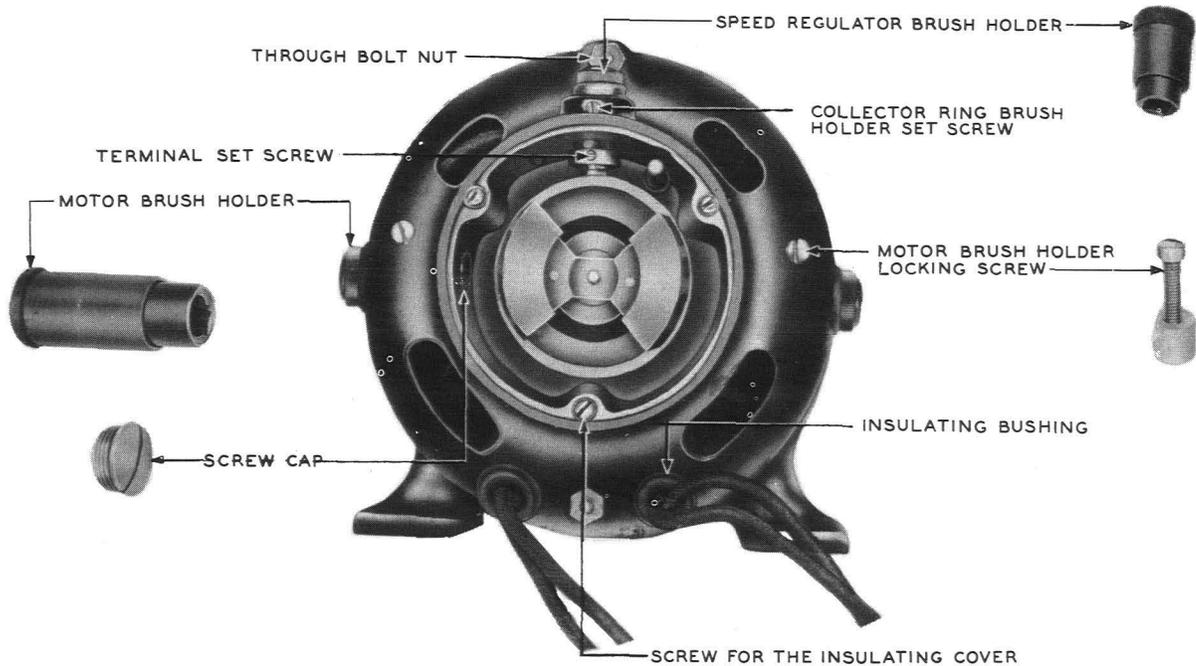


Fig. 10 - Motor - Speed Regulator End

3. REPLACEMENT PROCEDURES

3.001 *List of Tools and Materials* (Equivalents may be substituted)

TOOLS

Brush, Typewriter, Toothbrush Type
 File, Flat Smooth, 10", R-1776
 Pliers, P-Long-Nose, 6-1/2"
 Puller, Outer Race, E13-ORP-1
 Puller, Inner Race, E13-IRP-1
 Saw, Hack
 Screwdriver, 4" Regular
 Screwdriver, 3-1/2", KS-6854
 Screwdriver, Watchmakers, No. 3
 Stud, 309 Tool
 Wrench, Socket, 3/8" Hex. 46 Tool
 Wrench, Hex., Open End with 3/8" Opening

MATERIALS (See Sections 065-330-101 and 065-370-101)

Cloth, Cleaning, Twill Jean, D-98063
 Grease, 260-300P
 Oil, 130-190 S100
 Sandpaper, 4/0
 Spirits, Petroleum

Note: Puller, Outer Race, E13-ORP-1 and Puller, Inner Race, E13-IRP-1 are no longer available on order from the Western Electric Company. Where these pullers are not available in the telephone company and cannot be obtained locally, it is suggested that the motor-generator set be sent out for repair.

3.002 Remove the apparatus from service before making any replacements.

3.003 In removing brushes note the position of each brush in its holder; and put it back in the same holder and same position in the holder to insure that the contact will be the same as before removal.

3.004 After making any replacement of parts, the apparatus shall be checked and where necessary, readjusted. Replaced parts shall meet the requirements at time of turnover as specified in the section covering this equipment.

3.01 *Brushes*

(1) Brushes are released by removing the screw cap in the end of the brush holder. Before replacing the brush, check the brush

holder position as regards to its clearance of the associated ring or commutator and the alignment of one side of the brush with respect to the shaft. If the brush is received with the wearing face curved, be sure to insert the brush so that the curvature will be in the proper position. Final fitting should be done by running the machine a few hours with no load on the generator.

3.02 *Brush Holders*

(1) The brush holders are all held in place either with set screws or, in the case of the motor commutator brush holder, by a set screw through the end shield which pulls a wedge against the side of the holder. Since the wire connection to a brush is terminated in a collar around the brush holder on the inside of the frame as shown in Fig. 9, it is necessary to take off the collar and insulating washers before removing the brush holders. The collar is secured with a set screw accessible after removing the insulating cover on the end of the machine, in the case of the speed regulator brush holder or interrupter brush holder. Replacing the motor brush holders involves removing the end shield as covered under 3.07. Before putting the connection collars on the new brush holders, turn the holder so that the brush will line up with the shaft squarely, and then tighten the set screws to secure the brush holders. Be careful to put back any insulating washers associated with the collars.

3.03 *Center Contact-Type Speed Regulator Parts*

(1) The fixed contact on the inside of the cover may be removed by turning its mounting nut counterclockwise facing the nut. If other parts of the cover assembly need replacement, the knob must be unscrewed, which will necessitate readjusting the speed when the knob is replaced. However, if the distance between the contact, or some point on the mounting screw and the cover is measured prior to disassembly, the knob can be turned after assembly so that the fixed contact will be in approximately the same position as before, thus giving approximately the same speed. In assembling be sure that the pin in the adjusting screw slides smoothly in its slot.

(2) To replace the rotating element, remove the cover, the brush, and large cap on the side which gives access to the setscrew in back of the rotating assembly, as shown in Fig. 6. Loosen the setscrew and remove the element. After replacing the element, be sure that the setscrew registers on the spot provided on the shaft for that purpose. In case there are two spots on the shaft, due to replacement of a ring-type regulator by a center contact type, as covered in 3.04, use the spot 5/16 inch from the end of the shaft.

(3) To remove the rotating contact, first remove the insulating cover. Using pliers, remove the damaged rotating contact and replace with a new contact.

3.04 *Ring-type Speed Regulator Replaced Completely by Center-contact Type. Speed to be read at Regulator End Requiring New End Shield with Speed Taking Shaft.*

(1) Remove the rotor as covered in 3.07. Cut off the 5/16" diameter section (2-1 16" long) of the rotor shaft and smooth the new end. Respot the shaft for the 12/28 set screw at a distance 5/16" from the new end. Remove the brush holders from the old end shield and install them in the new one. Before putting the collars on the new brush holders turn the holder so that the brush will line up with the shaft squarely and then tighten the set screws to secure the brush holders. Be sure to put back any insulating washers associated with these collars. Assemble the machine as covered in 3.07 and adjust the brush holders, speed, etc. as necessary.

3.05 *Ring-type Speed Regulator Replaced Completely by Center-contact Type. Speed to be read at Generator End not Requiring a new End Shield.*

(1) Remove the rotor as covered in paragraph 3.07. The 5/16" diameter section of the shaft and 1/8" length of the larger part of the shaft should be cut off with a hack saw and the end smoothed with a file. In this case the total length of shaft to be cut off will be 2-3/16". The old set screw spot on the shaft should be reused. Reassemble the parts as covered in 3.07.

3.06 Speed Taking Shaft and Associated Parts

- (1) The parts may be readily replaced after removing the end shield as covered in 3.07.

3.07 Bearing Parts or Rotor

Note: If inner or outer ball race, or the balls and retainer, need to be replaced, install a complete new bearing assembly. It is desirable also to install new felt washers.

- (1) Remove all brushes and insulating covers. Remove the large screw caps on the side of the motor which give access to the set screw holding the speed regulator. Loosen the set screw and take off the speed regulator unit. Remove the four screws from the bearing housings on both ends of the machine. These screws secure the inside bearing retainers to the end shields as shown in Fig. 2. If work is to be done on one end shield, it will only be necessary to remove the four screws on that end shield as the opposite end shield can be left on the rotor. Remove the nuts from the end shield through bolts and pry the end shields from the frame by inserting a screwdriver in the small openings in the sides for that purpose. To avoid straining the leads, when removing the end shields, support the end shields by some means other than allowing them to hang on the leads. It is preferable to remove the generator end shield first and slide the rotor out that end.
- (2) Remove the outer ball races, spring, felt washers, etc. If the outer race sticks in the end shield, it may be easily removed with the outer race puller which is slid in through the annular ring behind the race in the end shield. The puller consists of a small hand nut operating to pull the ball end of a jack screw into the taper of a four prong collet. This expands the collet in back of the outer race. A bridge braces against the motor end shield and by turning the large hand nut the outer race is drawn out of the end shield. The parts inside of the housing may then be removed.
- (3) The balls and retainer can be removed with the fingers from the inner-race. The inner-race has a press fit on the shaft and may be easily removed with the inner-race puller. First slide the clamping collar away from the collet to release the jaws of the collet and

allow them to be slid over the inner race into the bearing slot of the race. After placing the jaws in the bearing slot slip up the clamping collar to clamp the jaws firmly in this position. Turn the jack screw clockwise against the end of the shaft to remove the race. The race may be readily removed from the puller by unclamping the jaws and continuing the forward motion of the jack screw to force out the race. Clean the bearing parts not replaced with a cloth dampened with petroleum spirits and wipe with a dry cloth.

- (4) Assemble the parts on the rotor in their proper position as shown in Fig. 2 or 3 which necessitates putting the new inner-race on the shaft last. Slip the new inner race on the shaft and place the flat side of a screwdriver against the edge of the race and tap the screwdriver lightly. Tap on all parts of the edge of the race to force the race squarely into place against the shoulder. Be careful not to damage the ball race surface. In some cases a simple tool has been made up for driving these races into place. The tool is usually made from a clean tube or pipe which just fits over the shaft and butts against the inner race which insures driving the race into place squarely without damage to the parts. Put the ball races in place and pack with grease.
- (5) Assemble the various parts in the end shield housing as shown in Fig. 2. The outer race will slide into the housing without the aid of any special tool but should have a fairly snug fit. It may be desirable to wipe the inside of the bearing chamber with a clean cloth moistened with a little oil, or with a trace of grease on the end of the finger before sliding the race into place. The screws may be replaced more readily by using a 309 tool which is similar to one of the regular screws except that the head is removed. It should be screwed into the bearing retainer and through the copper gasket and end shield before sliding the end shield into place. Check that the terminal collars on the brush holders are secured. After the end shield is put into place, three of the screws may be put in and then the stud may be removed and the fourth screw put in place. See that the shaft turns freely. Push the shaft inward against the thrust spring and release it to check that the thrust spring returns the shaft to its original posi-

tion. In replacing the speed regulator rotating assembly the set screw should register on the spot on the shaft provided for that purpose. Before putting on the regulator insulating cover wipe the speed regulator contacts with a dry cloth and do not touch with the bare fingers. Put the insulating cover on the regulator end in such a position that the contact arm on the inside will press against the contact post as shown in Fig. 6.

3.08 Resistor or Rheostats

Note: The generator rheostat is the one with the hand wheel, regardless of whether the rheostats are front or rear-of-board mounted.

(1) The replacement of a front-of-board mounted generator rheostat plate involves removing the set screws holding the hand wheel, the hub, and the three screws holding the plate. The leads should be marked for identification and disconnected either before or after removal of the plate as convenient. Replace the parts and, where the shaft is spotted to receive the set screws, be sure that the set screws register on the spots. See that the contact wiper makes good contact with the rheostat buttons.

(2) The replacement of a front-of-board mounted regulator resistance plate involves removal of the generator rheostat complete from the three mounting studs, the spacers from the studs, and the three machine screws holding the resistance plate. The leads to both rheostats should be marked for identification and removed either before or after the associated plate as convenient. Replace the parts and, where the shaft is spotted to receive the set screws, be sure that the set screws register on the spots. See that the contact wiper makes good contact with the rheostat buttons.

(3) The replacement of a rear-of-board mounted regulator resistance plate involves marking and disconnecting the four leads when convenient and removing the three mounting stud nuts to release the rheostat complete. Removal of the three machine screws in the frame, and the hub set screw, releases the plate. Replace the parts and, where the shaft is spotted to receive the set screws, be

sure that the set screws register on the spots. See that the contact wiper makes good contact with the rheostat buttons.

(4) The replacement of a rear-of-board mounted generator rheostat plate involves removal of the regulator rheostat complete as above. The generator rheostat shaft is released from the extension shaft and hand wheel by removing the cotter-pin nearer the rheostat in the coupling. This releases the complete generator rheostat which can be taken apart by removing the three machine screws in the frame and the set screw in the hub. The generator rheostat leads should be marked and disconnected when most convenient. Replace the parts and, where the shaft is spotted to receive the set screws, be sure that the set screws register on the spots. See that the contact wiper makes good contact with the rheostat buttons.

(5) Each tube resistor is marked to designate its associated motor or generator and can be readily replaced.

3.09 Speed Regulator Contact Filter

(1) The KS-5362, List 5, set (see Fig. 9) is equipped with a speed regulator contact filter consisting of a resistor and capacitor connected across the contacts to reduce the peak voltage and thereby reduce contact duty as much as practicable. List 5 is electrically interchangeable with list 4 and also mechanically interchangeable with list 4 with the exception that the over-all height is increased, approximately 1-13/16 inches, due to the filter being mounted on top of the machine. The filter, factory mounted, has separate covers for the resistor and capacitor filter elements. These covers are held to the outside of the generator frame by machine screws. Either element may be replaced separately by taking out its filter cover mounting screws, taking the cover off, removing the regulator end shield assembly as outlined in 3.07 to gain access to the internal filter wiring connections; and replacing the individual resistor or capacitor as desired. Reassemble the various parts in the reverse order from that in which they were disassembled.