

## KS-5286 TONE ALTERNATOR REPLACEMENT PARTS AND PROCEDURES

### 1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of the tone alternator, KS-5286. It also covers approved procedures for replacing these parts.

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 various parts which may be replaced in the field in the maintenance of this equipment. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts.

1.04 Part 3 of this section covers the approved procedures for the replacement of the parts listed under Part 2. This information is called "Replacement Procedures".

### 2. REPLACEMENT PARTS

2.01 The figures included in this part show the various replacement parts in their proper relation to other parts of the apparatus with their corresponding names.

2.02 When ordering replacement parts give the name of the part as shown in the figures of this section and also the complete nameplate data of the machine including the serial and KS numbers, for example, resistance unit for the tone alternator having the following nameplate data: serial no. 36260; KS-5286, L-5; excitation voltage range 20-28.

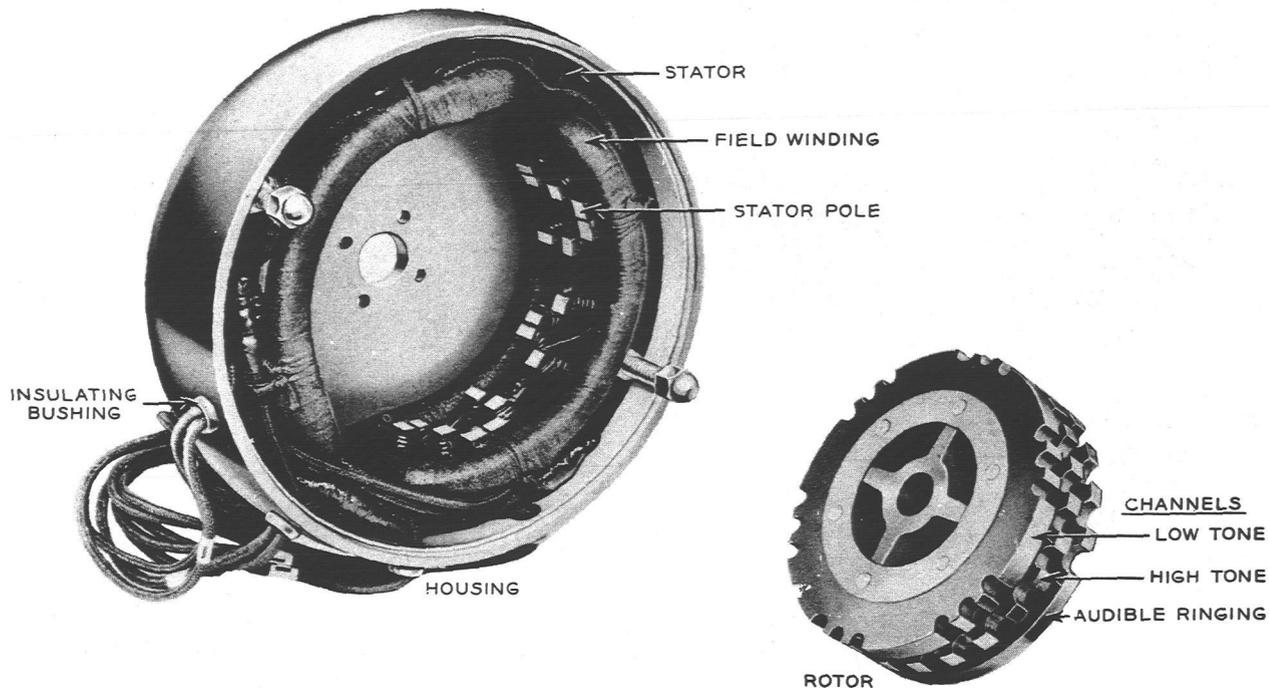


Fig. 1 - Tone Alternator, Battery Excitation

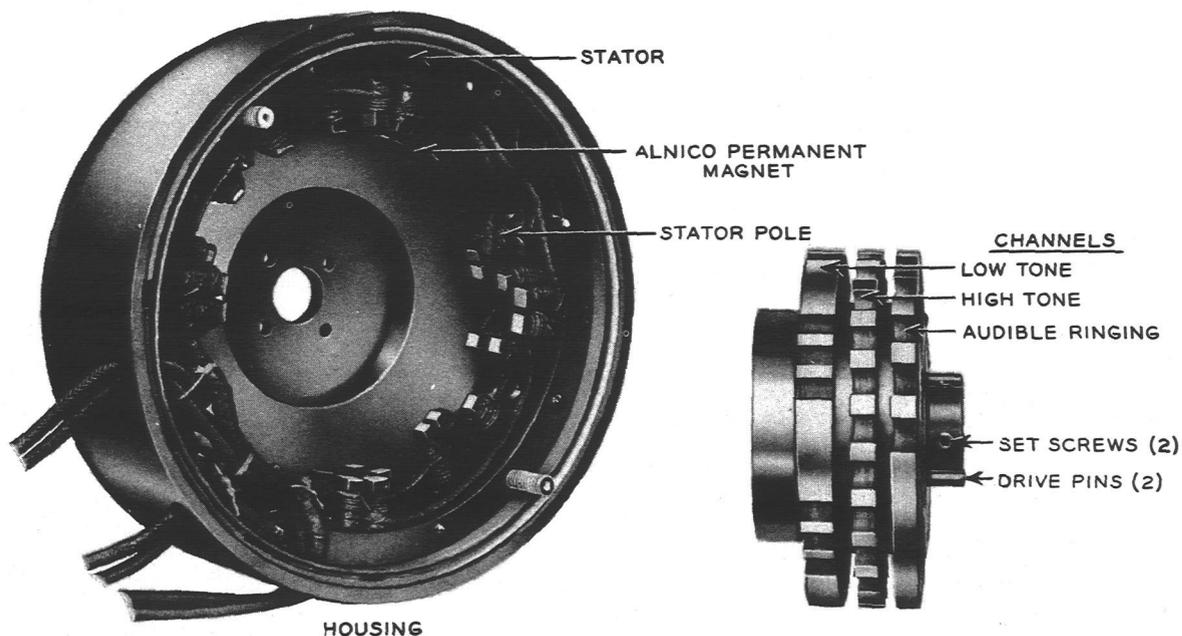


Fig. 2 - Tone Alternator, Permanent Magnet Excitation



ALTERNATOR  
COVER PLATE

FIELD  
RESISTOR

Fig. 3 - Coverplate and Field Resistor

### 3. REPLACEMENT PROCEDURES

#### 3.001 List of Tools, Gauges, and Materials (Equivalents may be substituted)

##### Tools

Copper, soldering, 1 lb.  
Hammer, ball peen, 1 lb. or hammer, claw,  
1 lb.  
Pliers, P-side-cutting, 8"  
Puller, rotor, KS-5331  
Screwdriver, KS-6854, 3-1/2"  
Screwdriver, regular, 4"  
Wrench, adjustable, single end, 6", R-1542  
Wrench, set screw, Allen, R-2671

##### Gauges

Gauge Nest, thickness, No. 131A  
Indicator, speed, Jones 5B, or  
Hasler Style A  
Scale, steel, 6", R-8550  
Voltmeter, ac-dc, Weston Model  
No. 622, thermo-couple type, ranges  
300-150-30-3  
Voltmeter, d-c, Weston Model No. 280,  
ranges 150-60-3

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

Block, hardwood  
Chalk  
Tape, friction  
Wedges, wooden

- 3.002 Remove the apparatus from service before making any replacements.
- 3.003 After making any replacement of parts, the apparatus should be checked and, where necessary, readjusted to meet the requirements specified in the section covering the Apparatus Requirements and Adjusting Procedures for this equipment.
- 3.004 No replacement procedures are specified for screws or other small parts when the procedure consists of a single simple operation.
- 3.01 Rotor (See Figs. 1 and 2)

(1) Before replacing an alternator rotor, it is necessary to remove the low speed interrupter gear case. Mark and remove the brushes on the interrupter and lift the brush holder studs out of their brackets, first loosening the acorn nuts, or, as an alternative procedure, mark and disconnect the leads. Remove the cap screws which secure the gear case to its support and lift it off, observing the position of any shims. Remove the drive link which is used for connecting the pins on the rotor with those on the coupling half of the interrupter. Remove the acorn nuts that secure the cover to the alternator frame. Mark the longitudinal position of the rotor on the shaft so that the new rotor may be replaced in the same position. With the small screwdriver or the set screw wrench, loosen the set screws that secure the rotor to the shaft extension.

(2) Attach the rotor puller to the rotor, placing the screws of the puller into the holes provided in the rotor for the purpose. Tighten the screws with a screwdriver until they are firm. Carefully tighten the forcing screw of the puller with the wrench, being very careful to see that the rotor does not brush against the stator, until the rotor is forced off the shaft.

(3) Mount the new rotor on the shaft with the driving pins facing outward. Take care not to damage the laminations in the rotor or stator. Tap it carefully with the hammer, placing a hardwood block on the edge of the rotor hub to protect it from the direct blow of the hammer. The rotor should be driven back until it rests in the marked position. Tighten the setscrews that secure the rotor to the shaft extension. Use a screwdriver or setscrew wrench, as applicable. Before putting on the coverplate make sure that the rotor turns freely. Replace the interrupter in the reverse order from that in which it was removed. Remount or replace the drive link as described in 3.07, or remount or replace the leather coupling as described in 3.08.

(4) When installing a rotor in a tone alternator which is equipped with permanent magnet excitation, proceed as outlined above, setting up the rotor puller as before, but with clearance between the forcing screw and the end of the shaft. As the work progresses back out the forcing screw as required to permit the rotor to be driven to its final position. This precaution will prevent the rotor from being drawn abruptly into the stator by the magnetic field, with resulting damage, in a case of loose fit at the shaft. The work should be planned so as to reduce to a minimum the time during which the rotor and stator are separated.

(5) When installing a tone alternator on a P-type ringing generator for the first time, mount the stator as outlined in 3.02 (2). Then mount the rotor as outlined in (3) and (4) above. Drive it back until the center-line through the outer rotor channel coincides with that through the outer stator channel. See Fig. 4, which shows a cross section of the alternator.

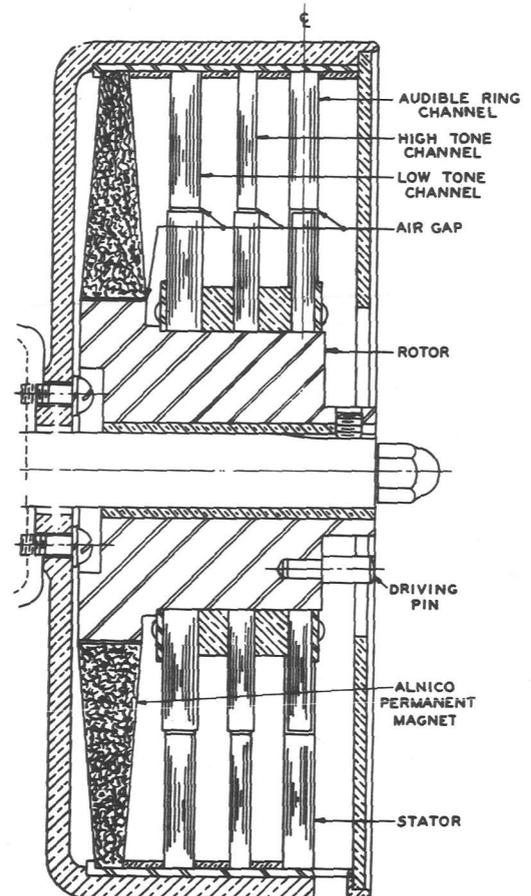


Fig. 4 - Cross Section of Tone Alternator

(6) Check the air gap as covered in the Apparatus Requirements and Adjusting Procedures section for this apparatus and if the requirement is met install the cover plate and re-install the gear case.

### 3.(2) Stator (See Figs. 1 and 2)

(1) To replace an alternator stator remove the rotor as outlined in 3.01. Then mark the leads before unsoldering the connections so that they may be reconnected correctly. With the large screwdriver remove the alternator mounting screws which hold the stator to the bearing housing, being careful not to lose the lock washers. Mount the new stator, then replace the rotor as outlined in 3.01.

(2) To attach an stator for the first time, it will be necessary to replace the existing P-type ringing generator bearing housing with the bearing housing specially adapted for mounting the stator. Proceed as follows: Before dismantling, and with the ringing machine running and carrying the office busy-hour load, make a fine chalk mark on the armature of the generator exactly opposite a corresponding mark on one of the pole-pieces. This mark is for use later to indicate the correct running position of the armature. Stop the set and remove the low speed interrupter gear case from the ringing machine sub-base, as covered in 3.01. Remove the brush rigging and the mounting bracket of the high speed interrupter. Loosen the set screws which secure the high speed interrupter drum to the shaft extension of the generator. Slide the drum off the shaft extension. Loosen the a-c brush holder yoke and allow it to rest on the collector rings. Drain the oil from the ringing generator bearing housing as outlined in the section covering the Apparatus Requirements and Adjusting Procedures for the associated equipment. Lay a piece of hard wood approximately 1/4 inch by 1 inch by 12 inches across the tops of the field winding spools and insert wedges between this cross piece and the armature. This is done in order to hold the armature in its proper position when the bearing is removed. Next remove the bolt which secures the bearing housing to the bearing pedestal on the collector ring end and remove the housing.

(3) Make sure that the rabbet on the bearing housing and the shoulder on the tone alternator which fits into the rabbet, are clean and free from paint and dirt so that the proper alignment, assuring the specified air

gap, may be obtained. The housing, complete with its alternator frame attached, should then be slid on to the shaft extension of the generator. The oil rings of the bearing will have to be lifted slightly when sliding the bearing on to the shaft extension. The housing should be moved along the shaft toward the generator until the edges of the housing and the pedestal are in line and the holes for the housing bolt are concentric. Insert and tighten the bolt.

Note: On the P-1/2 ringing generator it will be necessary to file off the bosses or pads on the pedestal which are used for mounting the brush holder brackets of the high-speed interrupter, as these pads interfere with the tone alternator stator seating properly.

(4) At this point test the running position and the end play of the ringing machine armature.

Note: The total end play should not exceed 1/32 inch and the armature should not move more than 1/64 inch to the right or left of the running position as determined in (2). A clearance of approximately 1/16 inch total is allowed between the diameter of the holes in the pedestals and the bearing housing bolts to permit some adjustment.

If sufficient end play can be taken up by moving the bearing housings toward each other it may not be necessary to insert spacing washers. If it is found necessary to insert spacing washers between the shoulders on the shaft and the inside edges of the bearings on both the collector ring and commutator ends of the shaft, to locate the armature at the running position and to restrict the end play to a total of 1/32 inch this may be done as follows: Remove the bolt which secures the bearing housing to the pedestal (collector ring end) and remove the housing from the shaft. Place the proper number of washers on the shaft, sliding them up to the shoulder of the shaft. These washers should be of a sufficient number and thickness so that when the bearing is again mounted in its proper position, as indicated by the armature running position mark referred to in (2), they will limit the end play between the running position and the position of the shaft when it is moved as far as it will go toward the bearing (collector ring end) to 1/64 inch. This same adjustment (adding washers)

may have to be made to the bearing on the commutator end. If so it will be necessary to disconnect the coupling, remove the four holding-down bolts of the ringing generator and swing it out of line, first marking its position on the subbase so that it may be replaced accurately. Take care not to disturb any shims which may be present. Remove the coupling half from the shaft extension in order to take off the bearing housing and insert the spacing washers. When this adjustment has been made the housing should again be secured to the pedestal by tightening the bolt. The wooden wedges under the generator armature should be removed, the a-c brush holder yoke referred to in (2) should be mounted on the bearing housing and the brush holder yoke clamping screw tightened. The armature, when rotated by hand, should turn freely without binding. Fill the bearing to the proper height with oil and connect up the coupling. The tone alternator rotor should not be installed until after the interrupter gear case is lined up as described in the following procedure.

(5) The holes in the base of the gear case should be placed over the corresponding holes in the subbase with the center of the gear case shaft extension in the same vertical and horizontal planes as the center line of the ringing generator shaft extension. It is a simple matter to get the vertical center lines of the shafts in the same plane but due to manufacturing variations and tolerances in the dimensions it may be found necessary to shim up the gear case to get the horizontal center lines of the shafts in the same horizontal plane. Since the generator shaft extension is nominally 3/4 inch in diameter and the gear case shaft extension is nominally 1/2 inch in diameter, the alignment of the shafts can be checked by holding a steel rule on the generator shaft extension above, below, and on each side, using the thickness gauge, and adjusting the gear case position until the distance between the steel rule and the gear case shaft extension is within  $\pm 0.003$  inch at all four points when the four cap screws are tightened down firmly. It will be necessary to remove the gear case in order to mount the tone alternator rotor on the ringing machine shaft extension. Care should be taken, however, first to mark the position of the gear case and not to disturb the arrangement of shims under it. The tone alternator rotor should be mounted as described in 3.01, and the coupling half should be mounted loosely on the shaft extension of the gear case, with the pins toward the ringing machine, before the gear case is bolted in place permanently. Remount or replace the drive link as described in 3.07, or remount or replace the leather coupling as described in 3.08.

### 3.03 Field Resistor (See Fig. 3)

(1) To replace a field resistor, loosen the terminal nuts and remove the leads. Insert the new resistor and connect the leads to the terminals. Tighten the terminal nuts.

(2) If the replacing resistor is not already connected internally to its terminals, select similar taps to those used on the resistor being replaced or proceed as follows: For the low-tone and high-tone channels, minimum load shall be the primary of one 115B repeating coil with the secondary open. For the audible ringing channel, minimum load shall consist of the primary of a 113A repeating coil with 12 microfarads in series with a 163A retard coil connected across the secondary.

(3) Remove the resistor from its cage, apply 50 volts excitation across the alternator field and the resistor in series. With the machine operating at a speed within the limits of 1100-1200 r.p.m. select the tap or combination of taps on the resistor which will give the nearest voltage to that indicated below.

	<u>Max.</u>
Low Tone	2.35 Volts
High Tone	2.35 Volts
Audible Ringing	1.00 Volts

Measure the speed of the machine with the speed indicator, the excitation voltage with the d-c voltmeter, and the voltage of the channel with a Weston Model 622 thermocouple-type voltmeter.

(4) After choosing the resistor taps with one channel, check the voltage on the other channels with the same resistor setting. If the voltages of the other channels are not approximately as specified, repeat the operation using another channel and select the taps which give voltages on all channels closest to those specified. If approximately of the values indicated, solder the proper connections and cut off the extra taps. Replace the resistor tube in the cage and leave it permanently connected in the circuit.

### 3.04 Insulating Bushing (See Fig. 1)

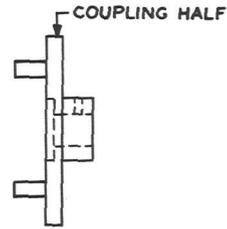
(1) To replace an insulating bushing, mark and disconnect the external connection. With a screwdriver pry the insulating bushing loose from the alternator frame. Remove it by drawing

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it off over the lead. Slide the new insulating bushing back over the lead and insert the bushing in its hole in the frame. Tap the bushing lightly with a screw-driver handle until the shoulder of the bushing rests firmly against the alternator frame. Then resolder the connection.

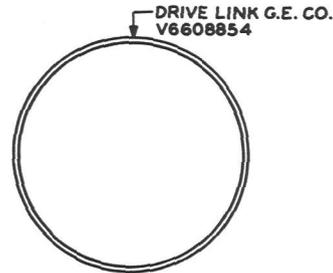
**3.05 Alternator Leads (See Figs. 1 and 2)**

(1) In replacing an alternator lead, remove the rotor as outlined in procedure 3.01. Be very careful not to damage the adjacent windings when the internal lead connection is being heated. After resoldering the new lead, see that the connection is properly insulated from the frame by the use of friction tape. Reinstall the rotor in accordance with 3.01.



**3.06 Coupling Half**

(1) To replace a coupling half, it will first be necessary to remove the interrupter gear case in accordance with procedure 3.01. Then loosen the coupling set screw and replace the coupling, being sure that the set screw is fastened in its original position on the flat part of the shaft. Remount the interrupter gear case in the reverse order.



**3.07 Drive Link (See Fig. 6)**

(1) To replace a drive link, loosen the coupling half setscrew, and slide the coupling half along the shaft toward the interrupter. Remove the old drive link.

Fig. 5 - Coupling Half, Drive Link and Leather Coupling

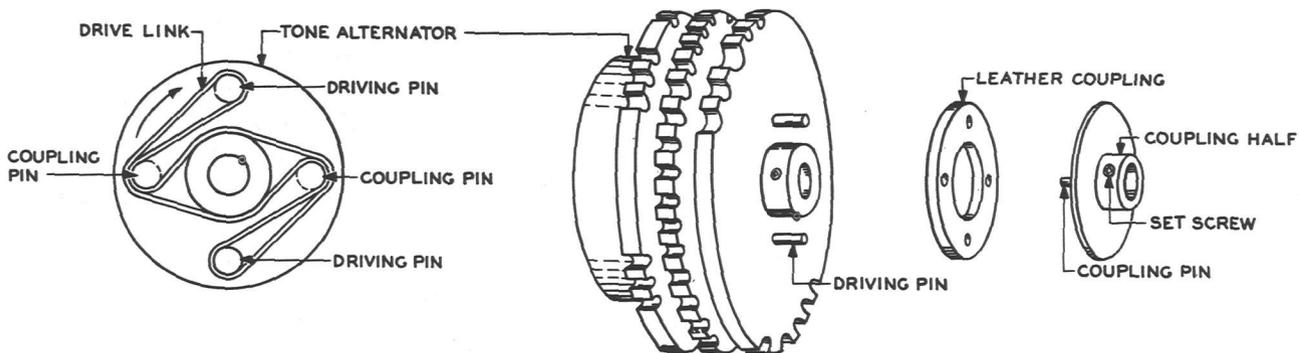
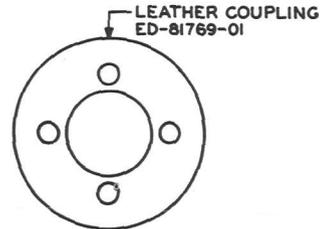


Fig. 6 - Arrangement of Drive Link and Leather Coupling

Install a leather coupling in accordance with 3.08 or install a new drive link as follows. Loop the new link over the upper driving pin. Bring the two sides of the link together and lace over the coupling pin on the left side. Separate the link and pass it on both sides of the rotor hub. Bring the two sides of the link together again and lace over the other coupling pin. Pass the remaining loop over the remaining driving pin. Slide the coupling half back in its original position and tighten the setscrew firmly.

### 3.08 Leather Coupling (See Fig. 6)

(1) To replace a leather coupling, it is necessary to remove the cap screws which secure the interrupter gear case to its support. Take care not to disturb any shims which may be present. Move the gear case along the base until the old leather coupling or drive link can be removed and the new leather coupling inserted.

(2) Place the leather coupling on the driving pins of the alternator rotor. If the pins of the coupling half do not line up with the two remaining holes in the leather coupling, rotate the coupling half sufficiently to do so. Remount the interrupter gear case on the base, in accordance with 3.02(5), making sure that any shims used are in their proper position and the pins of the coupling half enter the two remaining holes in the leather coupling. If the center lines are not in alignment, shims should be added or removed from under the feet of the interrupter mounting and the mounting lined up laterally so that the two centers coincide exactly after the mounting screws are tightened. Tighten the mounting cap screws.

Note: It is essential that the center lines of the two shafts be in alignment and the coupling pins straight since nonalignment will result in noise, vibration, and excessive wear.