MOTOR-DRIVEN GENERATORS
RINGING AND COIN CONTROL
COMMERCIAL TYPE
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers apparatus requirements and adjusting procedures for the KS-5396, KS-5396-01, KS-5396-02, and KS-5397 commercial type ringing and coin control motor-driven generators.

1.02 The section is reissued to include the KS-5397 generator, information covering Falk type F flexible couplings, and to bring the section generally up to date. Since this reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein. Refer to Section 171-110-701 for commutator and brush maintenance, Section 171-110-802 for brush replacements, Section 155-410-801 for generator replacement parts, and Section 171-110-801 for commutator resurfacing.

1.04 ***Phi (ϕ):*** Requirements are marked with a phi when they are not required to be checked before turnover.

1.05 ***Asterisk (*):*** Requirements are marked with an asterisk when to check for them would necessitate the dismantling or dismounting of apparatus or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

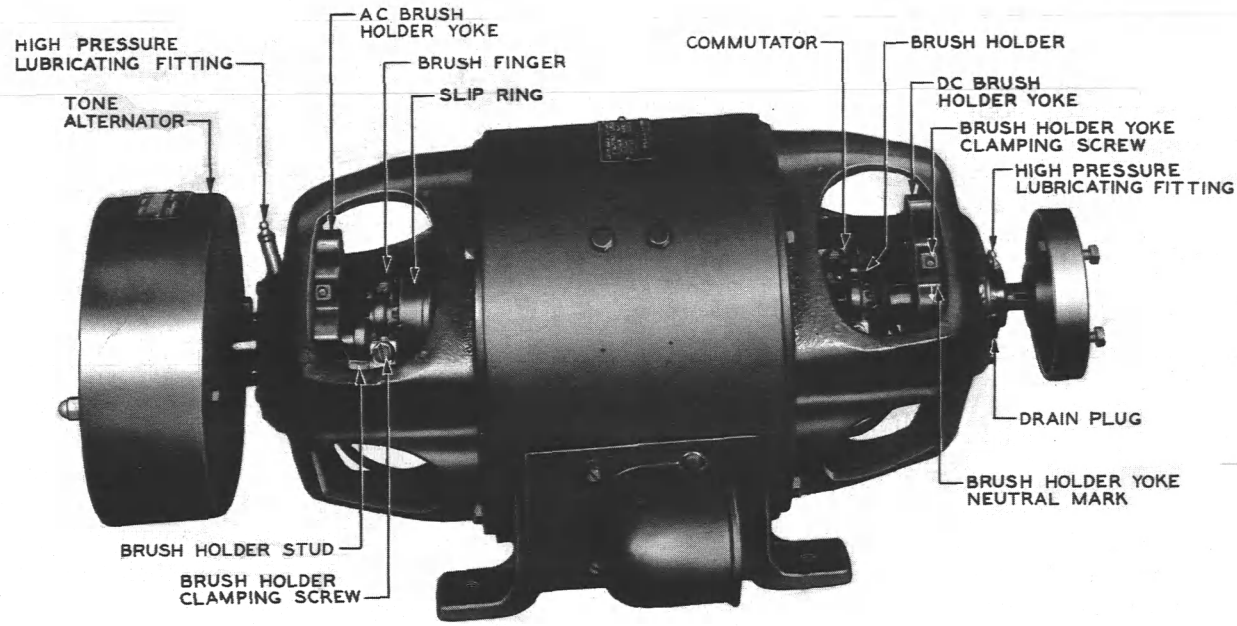


Fig. 1 – Typical Ringing Generator With Tone Alternator

1.06 Brush holder yoke position marks designating the position of the yoke for best commutation are located on the yoke and on the frame of the generator. These marks are established by the manufacturer and when the yoke is set with both marks in line, the brushes will usually be in the proper position for best commutation.

1.07 Excessive brush pressure produces mechanical wear, and insufficient pressure results in damage to the equipment through pitting of the commutator and dusting of the brushes. The requirements, as specified herein, represent a practical balance between the two and should result in satisfactory commutation.

1.08 Normal operation may be defined as a condition in which the generator is carrying any load from no load to full load, with the output voltage within the limits stamped on the nameplate.

1.09 For the purpose of this section, successful commutation is considered to have been obtained if neither the brushes nor the commutator are burned or damaged to the extent that abnormal maintenance is required. The presence of some visible sparking is not necessarily evidence of unsuccessful commutation.

1.10 If a ringing generator is to be operated for any reason with the dc brushes, but not the ac brushes in place, disconnect the associated voltage regulator from the ringing machine. If the regulator is not disconnected, appreciably higher than normal voltages may be obtained.

2. REQUIREMENTS

2.01 *Lubrication*

Ball Bearings

ϕ(a) Bearings shall be lubricated with 260-300P grease annually and when the bearings are accessible for other reasons.

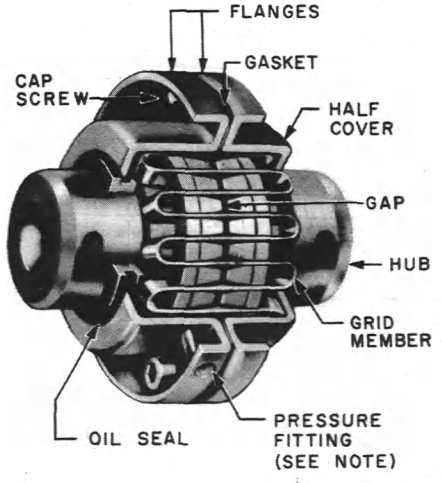
(b) Normally, the ball bearings shall not be lubricated when the machine is being put in service. However, if the machine has been in storage for 1 year or more, the bearings shall be lubricated as covered in (a).

Falk Type F Flexible Coupling

(c) The Falk type F flexible coupling, if provided, shall be lubricated every 2 years with 260-300P grease.

(d) There shall be no leakage of lubricant from the Falk coupling.

Caution: Falk type F flexible couplings equipped with grease pressure fittings shall never be lubricated with a pressure gun. When the coupling is dismantled for the first time for lubrication, the pressure fitting hole shall be sealed from the inside to prevent grease leakage.



NOTE: PRESSURE FITTINGS WERE FURNISHED ON SOME EARLY VINTAGE TYPE "F" COUPLINGS. THESE FITTINGS SHOULD NOT BE USED FOR LUBRICATION.

Fig. 2 – Falk Type F Coupling Assembly

2.02 *Output Voltage*

(a) With the generator speed within the limits of 1100-1200 rpm and with the ac voltage at the transformer taps to which the main load and the regulator are connected within the limits specified in Table A, the dc voltage, measured from each dc output terminal to terminal 2 (ground) of the transformer, shall be within the limits given in the table. This requirement shall be met under all conditions of rated load and temperature.

TABLE A – OUTPUT VOLTAGE

GENERATOR	TRANS-FORMER TAPS	AC VOLTAGE LIMITS (SEE NOTE 1)	DC VOLTAGE LIMITS (SEE NOTE 2) MIN	DC VOLTAGE LIMITS (SEE NOTE 2) MAX
KS-5396 AND KS-5397	4-8 4-7 4-6 4-5	103-108 98-103 83-88 75-80	100	120
KS-5396-01	4-8 4-7 4-6 4-5	104-108 99-103 84-88 76-80	100	120
KS-5396-02	6-8 4-5	104-108 84-88	115	120

Note 1: The ac voltage limits listed apply only when the taps are connected to the regulator. Where the taps are not connected to the regulator, the limits will be wider as shown in requirement 2.03, Table B.

Note 2: The dc voltage limits, measured between the dc output positive and negative terminals, will be twice the voltages given.

For checking generator speed, use the No. 5 or Type A Hasler speed indicator as covered in (b).

For checking voltage, use switchboard voltmeters if available, or the Weston Model 904 (ac) and 931 (dc) voltmeter.

(b) Where the generator is driven by a dc motor and the motor shaft is not accessible because of a shaft-mounted speed regulator, check the speed at the end of the driven equipment. Remove the flat plate from the end of the speed reduction unit associated with the mercury interrupter to expose the end of the high-speed shaft. Using the R-1102 spudger, or equivalent, hold the bearing in the unit in place against the end thrust while taking the reading. The flat plate has a sleeve which serves as the bearing holder, and must therefore, not be left off any longer than necessary. If a mercury interrupter is not provided, the end of the high-speed shaft will be accessible after removal of the cap from the tone alternator coverplate.

2.03 ***Output Current***

(a) With the ac voltage at the respective taps of the associated transformer within the limits specified in Table B, the generator shall deliver, continuously, the rated full-load current output given in Table B.

Use Weston Model No. 1 (dc) and Model 528 (ac) ammeter.

TABLE B – OUTPUT CURRENT

GENERATOR	TRANSFORMER TAPS	AC VOLTAGE LIMITS	OUTPUT CURRENT (amperes) GENERATOR FRAME TYPES BD-216 BY-107 AC	BD-216 BY-107 DC	BD-226 BY-108 AC	BD-226 BY-108 DC	BD-234 BY-109 AC	BD-234 BY-109 DC
KS-5396 AND KS-5397	4-8 4-7 4-6 4-5	101-110 96-105 81-90 73-82	1.00 1.00 1.25 1.25	0.25	3.00 3.00 4.00 4.00	0.38	6.00 6.00 8.00 8.00	0.50
KS-5396-01	4-8 4-7 4-6 4-5	101-110 96-105 81-90 73-82	1.50 1.50 1.75 1.75	0.25	3.50 3.50 4.50 4.50	0.38	6.50 6.50 8.50 8.50	0.50
KS-5396-02	6-8 4-5	101-110 81-90	1.60 2.00	0.25	3.20 4.00	0.38	4.80 6.00	0.50

Note: If it is not convenient to place meters in the circuit, and test the machine under load, a full-load condition is considered to be obtained if lamps of the number and wattage given in Table C are connected in parallel across the total secondary winding of the transformer (terminals 4, 4A or 4B, and 8 for KS-5396, KS-5396-01, and KS-5397 generators or terminals 6, 6A or 6B, and 8 for KS-5396-02 generators) with the voltage at these terminals within the limits of 103-108 ac volts. When loading the machine as outlined above, the effect of the dc load is negligible. Use standard 115-volt, 25-, 60-, 100-watt lamps.

TABLE C

GENERATOR	GENERATOR FRAME TYPES	NUMBER OF LAMPS		
		100 WATT	60 WATT	25 WATT
KS-5396 and KS-5397	BD-216 or BY-107	1		1
	BD-226 or BY-108	3		3
	BD-234 or BY-109	7		2
KS-5396-01	BY-107	1	1	1
	BY-108	3	1	3
	BY-109	7	1	2
KS-5396-02	BY-108	2		
	BY-109	4		
	BY-144	6		

2.04 ***Freedom of Rotating Parts:*** The generator armature shall turn freely in its bearing.

Gauge by feel.

ϕ2.05 ***Condition of Bearings:*** Ball bearings shall be free from excessive wear. If the generator operates satisfactorily under the office load and the other requirements of this section are met, the bearings shall be considered to be in satisfactory condition.

Note: Abnormal noise from a ball bearing is an indication of excessive wear.

Gauge by sound.

2.06 ***Noise and Vibration:*** The noise and vibration of a generator, under any normal operating conditions, shall not be excessive.

Gauge by sound and feel.

ϕ2.07 ***Commutation:*** The generator shall commutate successfully at any current between no-load and full-load, not exceeding rated current (amperes), at any voltage within the limits specified in requirement 2.03, and with the machine at any temperature within the limits specified in requirement 2.13.

ϕ2.08 ***Condition of Surface of Commutator and Collector Rings:*** The commutator and collector rings shall meet the applicable requirements covered in Section 171-110-701.

2.09** ***Brush Holders and Yokes

(a) The clearance between the commutator or collector ring and the adjacent edge of the brush holder shall be .

Min 1/32 inch
Max 1/8 inch

Use R-8550 scale.

Periodic check of this clearance should be made because of the gradual wear of the commutator surface and the resulting increase in the distance between commutator and brush holder.

(b) The brush holder yokes shall be located so that the position marks on the yoke and on the stationary surface adjacent to it are in line.

Gauge by eye.

(c) The brush holders shall be located so that the brushes will not overlap the end of the commutator or collector ring or ride upon that part of the commutator used for connection to the armature conductors.

Gauge by eye.

2.10** ***Brush Length: The length of the brush, measured on the long face of the brush, shall be

Before turnover Min 1-1/16 inch
After turnover Min 11/16 inch

Use R-8550 scale.

ϕ2.11 ***Brush Fit:*** The brushes shall meet the brush fit requirements covered in Section 171-110-701.

2.12 *Brush Pressure*

(a) The brush pressure on the commutator and collector rings shall be within the limits specified in Table D.

TABLE D – BRUSH PRESSURE

GENERATOR FRAME TYPES	COMMUTATOR BRUSHES			
	MIN.		MAX.	
	OZ.	GRAMS	OZ.	GRAMS
BD-216, BD-234 BD-107, DD-109	9	255	14	383
BD-226	12	340	18	510
	COLLECTOR RING BRUSHES			
	MIN.		MAX.	
	OZ.	GRAMS	OZ.	GRAMS
All Frames	6	170	9	255

Use the 79B push-pull tension gauge or the R-2202 spring balance.

(b) Brush pressure of all brushes on the same machine shall be as nearly uniform as practicable and at a value within the limits given in (a) which will give the best commutation.

To check brush pressure, proceed as follows. Loop a piece of cord under the brush finger as near as possible to the point where the finger touches the brush. Exert a radial pull on this finger by means of the gauge hooked in the cord. The reading of the gauge, just as the finger starts to move away from the brush, gives the total brush pressure. Make correction in pressure reading for position in which the gauge is held.

*2.13 ***Temperature:*** The temperature of bearings, windings, frame, and transformer shall not exceed

	MAX.
Bearings	80 C (176 F)
Windings and Frame	90 C (194 F)
Transformer	95 C (203 F)

Use the R-1032 thermometer.

This requirement need not be checked unless the temperature is thought to be excessive.

3. ADJUSTING PROCEDURES

3.001 *List of Tools, Gauges, Materials, and Test Apparatus*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-5000	Gun, Grease
KS-6320	Orange Stick
R-1102	Fibre Spudger
R-2512	8-Inch Adjustable Wrench
—	Gun Nozzle, Alemite Z-737
—	Gun, Grease, Lincoln Engineering Co, No. 5958
—	4-Inch E Screwdriver (or the replaced 5-inch regular screwdriver)
—	5-Inch E Screwdriver (or the replaced 5-inch regular screwdriver)
—	Allen Setscrew Wrench (furnished with Falk type F flexible coupling)
—	Brush, Typewriter, Toothbrush Type
GAUGES	
79B	Push-Pull Tension Gauge, 0-1000 Gram
KS-6909	Feeler Gauge
R-1032, Detail 1	Thermometer (or equivalent spirit-filled thermometer)
R-2202	Spring Balance
—	Tachometer, No. 5 or Hasler, Type A, Speed Indicator
MATERIALS	
KS-7860	Petroleum Spirits
KS-8372	Trichloroethylene
KS-14666	Cleaning Cloth
—	Grease, 260-300P
—	Felt Pad
—	EPOXI-PATCH-KIT 6C, Hysol Corp, Olean, N.Y., or METALSET-KIT A4, Smooth-On Mfg Co, Jersey City, N.J.

CODE OR SPEC NO.	DESCRIPTION
TEST APPARATUS	
—	893 Cord (equipped with two 360A tools) (1W13A cord); 364 Spade Terminal and 365 Connecting Clip or 411A Test Clip
—	Ammeter, DC, Weston Model No. 1, Range 1.8/0.6 Amperes
—	Ammeter, AC, Weston Model 528, Range 3/5/10 Amperes
—	Voltmeter, DC, Weston Model 931, Range 30/300 Volts
—	Voltmeter, AC, Weston Model 904, Range 150/300 Volts

3.002 Care should be exercised when using petroleum spirits in power rooms where there are dc machines, since commutation may be adversely affected by softening of commutator film by the fumes. To avoid the need for burnishing the commutators of dc machines after doing any cleaning called for in this section, provide adequate ventilation, use the absolute minimum amount of petroleum spirits, and keep the container closed when not in use.

3.01 ***Lubrication*** (Reqt 2.01)

Ball Bearings

(1) Where the ball bearing housing is equipped with both a pressure fitting and a drain plug, proceed as follows with the machine stopped.

(a) Wipe off the pressure fitting with a clean cloth to avoid forcing dirt into the bearing chamber and place a pan under the drain hole to catch excess grease.

(b) Remove the drain plug and scoop out as much of the old grease from the drain hole as possible with an orange stick. This should remove old coagulated grease and provide pressure relief as the new grease is forced in.

(c) While pumping new grease into the pressure fitting, watch the drain hole and the shaft adjacent to the bearing housing carefully. Stop greasing when grease appears at the drain hole or if grease oozes out along the shaft before it appears at the drain hole. If grease does ooze along the shaft before it comes out of the drain hole, remove the pressure fitting to relieve the grease pressure. With a clean cloth, wipe off any grease that may have oozed along the shaft.

(d) Start and run the machine until hot (this may take several hours). This will expand the grease and force the excess grease out of the drain hole (or pressure fitting hole if this fitting was removed). After the grease has expanded fully and stopped coming out, stop the machine and scoop out as much grease from the drain hole (or pressure fitting hole) as it is possible to reach with an orange stick. Remount the drain plug and pressure fitting, if removed.

(2) Where the ball bearing housing is equipped with both grease and drain plugs, proceed as follows.

(a) Place a pan under the drain hole to catch excess grease. Remove the grease and drain plugs and scoop out as much of the grease as possible with an orange stick.

(b) With the machine running, insert the nozzle of the KS-5000 grease gun into the grease hole. Slowly pump grease into the bearing. Run the machine long enough for excess grease to be expelled from the drain hole. Remount the grease and drain plugs. Using a clean cloth, wipe off any grease that might have oozed along the shaft.

(3) Where the ball bearing housing is equipped with both a grease cup and drain plug, proceed as follows with the machine stopped.

(a) Place a pan under the drain hole to catch excess grease. Remove the grease cup cap and drain plug and scoop out as much of the grease as possible with an orange stick.

(b) With the machine running, fill the grease cup with grease. Then force the grease into the bearing by screwing down the cap. Repeat this procedure until grease begins to drip from the drain hole. Run the machine long enough for excess grease to be expelled from the drain hole. Remount

the drain plug. Using a clean cloth, wipe off any grease that might have oozed along the shaft.

Falk Type F Flexible Couplings

(4) To lubricate Falk type F flexible couplings, remove the cap screws that fasten the two half covers and slide the covers back over the hubs to expose the hub teeth and gridmember.

(5) Locate the open end of the gridmember, pry it loose with a screwdriver, and remove it. Clean out all old lubricant from the gridmember, from the teeth on the hubs, between the hub end faces, and from the half covers, by scrubbing with a typewriter brush dipped in petroleum spirits. Inspect the paper gasket, and if it is damaged, replace it with a new one ordered from the manufacturer or made locally from 1/32-inch Vellumoid packing (Vellumoid Co), or similar oilproof paper gasket material.

(6) Fill all the slots between the teeth with lubricant; also, force as much lubricant as possible down into the gap between the coupling hub end faces. This is essential since if only the slots are filled, a portion of the lubricant is squeezed out when the gridmember is inserted. Later, when centrifugal force caused by rotation of the coupling takes effect, most of the small amount of lubricant remaining in contact with the teeth after inserting the gridmember is thrown into the cover, leaving the teeth practically dry. If the gap is filled however, not only will the space above the teeth be completely filled, but also the spaces around the teeth and gridmember because of the action of centrifugal force which throws the lubricant outward from the gap.

(7) Examine the gridmember and if it is not badly worn, reuse it; if it is worn to a sharp edge, replace it. Insert the gridmember in the slots by hand. Pack the spaces between and around the gridmember loops with as much lubricant as possible, filling the coupling to the limit. This is essential for proper functioning. Scrape off excess lubricant flush with the top of the gridmember convolutions. Draw the half covers up flush. Some excess lubricant will be pushed into the space between the half covers. Back the covers off enough to allow the insertion of a small steel scale, or similar implement so that when the covers are finally adjusted, there will be no layer of lubricant to keep them from seating properly. Draw the covers up again and fasten in place with cap screws. Wipe off excess lubricant.

(8) Examine the coupling after the first few hours of running to see whether the lubricant is leaking out. If there is no leakage or if it stops soon, lubrication of the coupling should be satisfactory. If lubricant is leaking from between the flanges, the cap screws may have to be tightened or the gasket replaced. Some of the surplus lubricant may work out along the shaft past the inner edge of the covers during the first few times the machine is run and after it is stopped. If this continues until an amount believed to be more than the surplus applied has escaped, pull back the covers and examine the lubricant as to quantity and consistency, that is, whether oil has separated out; repack if necessary.

(9) On the earlier vintage coupling, the half covers have a grease pressure fitting in the flanges. This fitting should not be used for lubricating the coupling. If the coupling should begin to leak before the regular inspection and lubrication period, the following procedure shall be followed to seal off the pressure fitting. It shall also be followed the first time the coupling is dismantled for inspection and relubrication.

(a) Clean out the pressure fitting holes from the inside, using trichloroethylene and a clean cloth. The holes should be cleaned as thoroughly as possible. The holes should then be filled flush to the inner surface of the half covers with epoxy resin compound. The outer end of the pressure fitting shall also be sealed off by filling the fitting with compound flush to the outer surface of the flange. The compound shall be permitted 24 hours to set and cure before the half covers are reassembled and the machine put back into operation.

(b) The epoxy resin compound is mixed on the job, following the instructions contained in either the EPOXI-PATCH-KIT 6C

or the METALSET-KIT A4. In separate tubes similar to toothpaste tubes, these kits furnish resin and hardener that can be mixed on a flat surface of discardable nature by squeezing out equal lengths from each tube and mixing with a spatula furnished in the kit.

Caution: Do not allow skin contact with unset and uncured compound. If contact should occur, wash immediately with hot water and soap.

3.02 ***Output Voltage*** (Reqt 2.02)

(1) If the requirement is not met, check requirements 2.07 through 2.12. If these requirements are met, examine the resistor unit, auxiliary resistance, voltage regulator, transformer, and generator windings for possible damage or loose connections. If the voltage is still outside the specified limits after the above checks, refer the matter to the supervisor.

(2) When 116-120-volt coin control is specified, adjust ac voltage to top of range as covered in (3). If minimum dc voltage is still below 116 volts, change tops as covered in (4).

(3) If special dc voltage limits are specified, they can sometimes be met by holding the ac voltage as near as practicable at one end, usually the top of its range. If this does not suffice, change the tops as covered in (4).

(4) Higher minimum dc voltage for the same minimum ac voltage can be obtained when necessary by disconnecting the previously used No. 4 fine adjustment tap lead and using instead, one of the two fine adjustment tap leads which had been taped and left unused. The lead to substitute may be found by trial.

3.03 ***Output Current*** (Reqt 2.03)

(1) If the requirement is not met, check requirement 2.02.

3.04 ***Freedom of Rotating Parts*** (Reqt 2.04)

(1) Examine the generator and remove any foreign objects that would interfere with rotation.

(2) Check that all bolts, screws, and nuts are tight and tighten, if necessary.

(3) Examine the generator for binding brushes or damaged bearings and adjust or replace parts, if necessary.

3.05 ***Condition of Bearings*** (Reqt 2.05)

(1) Replace worn bearings as covered in Section 155-410-801. Since this will require dismantling and uncoupling the generator, the matter should be referred to the supervisor.

3.06 ***Noise and Vibration*** (Reqt 2.06)

(1) Where excessive noise and vibration are present, check that all bolts are drawn up firmly.

(2) Check the generator alignment. If the machine is supported by wood blocks, check that the blocks bear evenly on the machine table. Correct any unevenness in the supports by the use of shims.

(3) If the noise and vibration continue to be excessive, the trouble may be caused by worn bearings. If this is found to be the case, replace worn bearings as covered in Section 155-410-801.

3.07 ***Commutation*** (Reqt 2.07)

(1) If the requirement is not met, check requirements 2.08 through 2.12.

3.08 ***Condition of Surface of Commutator and Collector Rings*** (Reqt 2.08)

(1) See Section 171-110-701 for procedures.

3.09 ***Brush Holders and Yokes*** (Reqt 2.09)

(1) To adjust the clearance between the brush holder and the commutator or collector ring, loosen the brush holder clamping screw and rotate the brush holder on its stud as required. After completing the adjustment, securely tighten the clamping screw.

(2) To relocate a brush, loosen the brush holder clamping screw and slide the brush holder on its stud to the desired position. Re-

check the clearance between the brush holder and the commutator or collector ring. Securely tighten the clamping screw.

(3) To adjust the position of the yoke, loosen the yoke clamping screw, shift the yoke as necessary, and securely retighten the clamping screw.

3.10 ***Brush Length*** (Reqt 2.10)

(1) Replace any short brushes.

3.11 ***Brush Fit*** (Reqt 2.11)

(1) If the requirement is not met, fit the brushes to the commutator or collector rings, as covered in Section A401.905.

3.12 ***Brush Pressure*** (Reqt 2.12)

(1) If the requirement is not met, adjust the pressure by increasing or decreasing the tension of the brush spring.

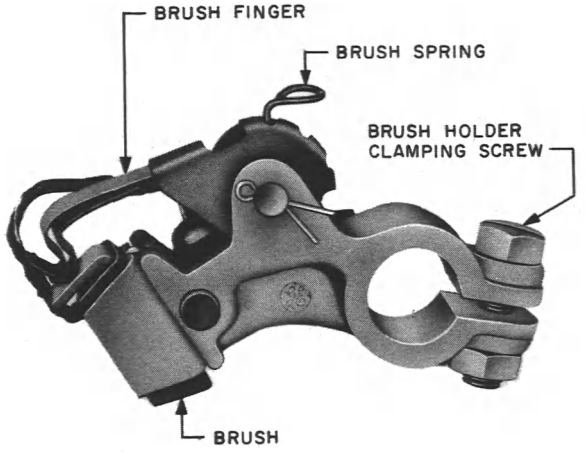


Fig. 3 – Brush Holder Assembly

3.13 ***Temperature*** (Reqt 2.13)

(1) If the temperature exceeds the specified limits, see that other requirements are met. If these requirements are met and the temperature is still outside the specified limits, refer the matter to the supervisor.