155-425-701

MOTOR-DRIVEN GENERATORS
RINGING AND COIN CONTROL
KS-15816
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers apparatus requirements and adjusting procedures for the KS-15816 Motor-driven Ringing and Coin Control Generators (see Fig. 1). These sets have separate motors, either ac or dc, and generators connected by flexible couplings.

1.02 Reference shall be made to Section A400.001 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein, Section A401.905 covering commutator and brush maintenance, Section A501.906 covering brush replacements, Section A501.177 for replacement parts, and Section A501.905 for commutator resurfacing.

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

1.04 ***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.

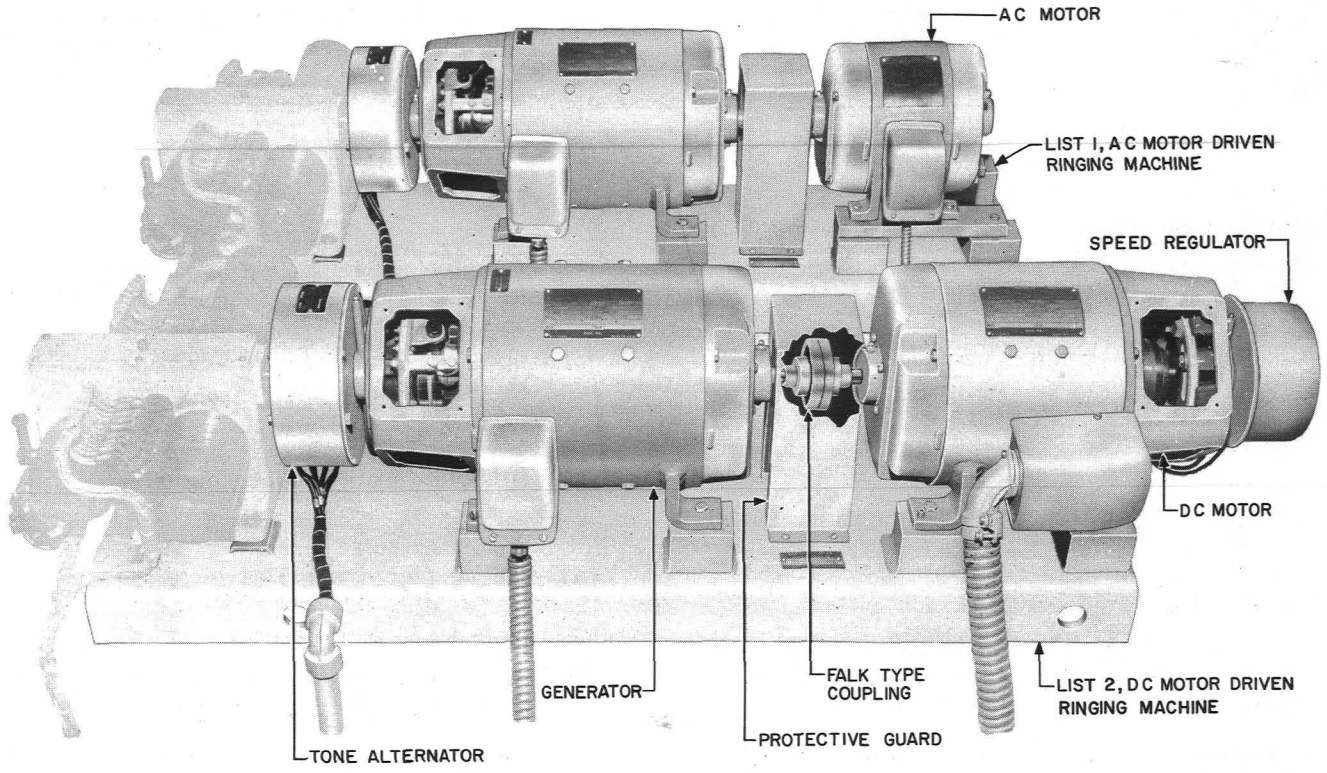


Fig. 1 – KS-15816 Ringing Machines

1.05 Brush-holder yoke position marks (see Fig. 4), 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 the best commutation.

1.06 Ordinarily, excessive brush pressure produces mechanical wear; insufficient pressure results in damage to the equipment through pitting of the commutator and dusting of the brushes. The pressure on the brushes in these machines is constant and does not vary; nor can it be controlled by external manipulation.

1.07 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.

1.08 Successful commutation, for the purpose of this section, may be said to have been obtained if neither the brushes nor the commutator are burned or injured to the extent that abnormal maintenance is required. The presence of some visible sparking is not necessarily evidence of unsuccessful commutation.

1.09 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 expected.

1.10 Hunting as applied to dc motors is defined as a condition in which the speed of the dc motor is periodically rising and falling. This condition may be present continually or intermittently.

2. REQUIREMENTS

2.01 ***Lubrication***

Ball Bearings

ϕ(a) Bearings shall be lubricated with 260-300P grease annually in service or after being dismantled.

(b) Normally, ball bearings shall not be lubricated when a machine is being put into service, but if it has been in storage for 2 or more years before being installed, they shall be lubricated.

Flexible Couplings

(c) The type F Falk flexible couplings furnished on these machines, (see Fig. 2) shall be inspected after 30 days running to determine if bolts should be tightened, and that lubrication seals are tight and not leaking grease. The coupling shall be inspected every 2 years at time of lubrication.

ϕ(d) The coupling shall be lubricated with 260-300P grease every 2 years.

Note: If coupling is found to be leaking through the pressure fitting, the coupling should be dismantled and the pressure fitting hole shall be sealed off.

Caution: The type F Falk coupling that is equipped with a grease pressure fitting shall never be lubricated with a pressure gun. When the coupling is dismantled for the first time and cleaned in order to inspect and relubricate, the pressure fitting hole shall be sealed from the inside to prevent grease leakage.

ϕ2.02 ***Speed***

(a) The synchronous speed of the ac motor shall be 1200 rpm. The manufacturer's rated load rpm, however, is shown on the motor nameplate.

(b) The rated speed of the dc motor shall be the same as the rated load speed of the ac motor.

(c) The speed of each motor, although nominally 1200 rpm, shall remain within the limits of 1100 to 1220 rpm under all operating conditions of machine temperature, load (no load to rated load), variations in the motor power supply voltage, and frequency (if ac).

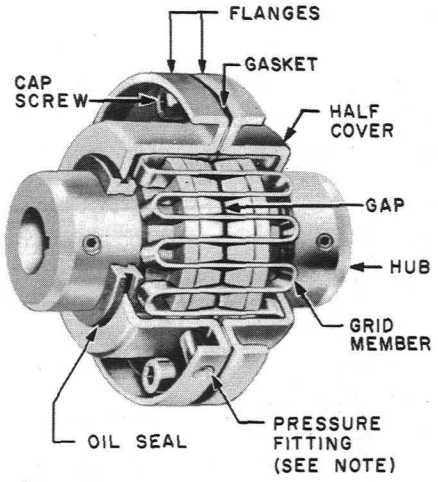
2.03 ***Hunting:*** The dc motor shall not hunt.

2.04 ***Voltage***

(a) The ac motor shall operate on any voltage between 190 and 253 volts and on any frequency between 58.8 and 61.2 cycles.

(b) The dc motor shall operate on any voltage between 45 and 52 volts.

(c) The nominal ac voltage at the generator shall be 175 volts and the ac current rating shall be 3 amperes. The dc voltage shall



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

Fig. 2 – Type F Falk Coupling Assembly

be 240 volts and the dc current rating shall be 0.5 ampere.

(d) Voltages across the taps of the transformer shall be those specified herein (see Table A).

TABLE A

PRIMARY		SECONDARY	
LINES ON TAPS	VOLTAGE	LINES ON TAPS	VOLTAGE
1B — 3B	164	4 — 5	86.0
1 — 3	170	4A — 5	87.7
1A — 3A	178	4B — 5	84.3
		6 — 7	86.0
		6A — 7	87.7
		6B — 7	84.3
		6 — 8	106
		6A — 8	107.7
		6B — 8	104.3

2.05 ***Capacity:*** The generator, when connected to its associated transformer, shall be capable of delivering its rated current output continuously at unity power factor.

Use switchboard instruments.

2.06 ***Freedom of Rotating Parts:*** The armatures of motors and generators shall rotate freely in their bearings.

Gauge by feel.

2.07 ***Direction of Rotation:*** The direction of rotation shall be clockwise when viewed from the generator end of the set.

ϕ2.08 ***Bearings:*** Ball bearings shall be free from excessive wear. If the motor-generator operates satisfactorily under office load and the other requirements of this section are met, the bearings shall be considered to be in a satisfactory condition.

Note: Ball bearings are characteristically more noisy in operation than sleeve bearings. Certain noises, such as the rolling noise of the balls in the race and the squealing noise of the ball cage, while undesirable, must be expected. However, abnormal noises may be an indication of worn bearings, improper assembly, or damage due to vibration or shock during transportation.

2.09 ***Noise and Vibration:*** The noise and vibration of motors or generator under normal operating condition shall not be excessive at any load from no load to the office load not exceeding rated nameplate current (amperes).

Gauge by sound and feel.

2.10 ***Commutation:*** The generator shall commutate successfully at any current between no load and the office load, not exceeding rated nameplate current (amperes), at any voltage within the limits specified in 2.04 and with the machine parts at any temperature within the limits specified in 2.15 (see 1.08).

2.11 ***Commutators***

ϕ(a) The commutator diameter of the dc motor and the generators shall not be less than 2-7/8 inches.

ϕ(b) The surface of the commutators shall be clean and free from scoring, pitting, or other deformation of the surface or structure, except that caused by normal wear.

Gauge by sight and feel.

ϕ(c) The commutators shall have no high, low, or loose segments or flat spots. The eccentricity of the commutators shall not be enough to cause poor commutation or poor operation (see 1.08).

ϕ(d) The mica between the commutator segments shall be undercut.

Gauge by sight and feel.

2.12 ***Brush Holders and Yokes***

ϕ(a) The clearance between the commutator or slip rings and the lower edge of the brush holder shall be 1/32 inch minimum and 1/8 inch maximum.

Note: The periodic check of this clearance is necessary because of the gradual wear in the commutator surface and the resulting increase in the distance between commutator and brush holder.

(b) The brush holders (see Fig. 3 and 4) used in these machines have a coiled spring which exerts a constant pressure on the brush regardless of the extent of brush wear. They do not require adjustment for pressure but should be checked each time that a brush is replaced to assure that the coil spring in the holder is bearing directly on the brush and is not entangled with the flexible copper leads.

ϕ(c) The yoke shall be located so that the position marks on the yoke and on the stationary surface adjacent to it are in line (see Fig. 4).

(d) The yoke shall be held securely in position.

(e) Electrical connections shall not overheat.

(f) The brush holders shall be so located that the brushes will not overlap the end of the commutator or slip rings or ride upon that part of the commutator used for connection to the armature conductors, under any condition of normal operation.

ϕ**2.13** ***Brush Length:*** The length of the brushes, measured on the long face of the brushes, shall be a minimum of 3/4 inch long.

Use scale.

ϕ**2.14** ***Brush Fit:*** All brushes shall be seated so that they have 100 per cent arc and at least 75 per cent of their area in contact with the commutator.

2.15 ***Temperature***

ϕ(a) With normal voltage and frequency (ac motor) applied to the motor, and the generator delivering its rated ac and dc output, the temperature rises of the motors, generator windings, and machine parts, above existing room temperature of 10C to 40C, shall not exceed the following values.

PART	MAXIMUM RISE ABOVE AMBIENT TEMPERATURE THERMOMETER	RESISTANCE
AC Motor Windings	50C(122F)	60C(140F)
AC Motor Frames, Cores, and Parts in Contact With Insulation	50C(122F)	—
DC Motor and Generator Windings	70C(158F)	100C(212F)
DC Motor and Generator Frames, Cores, and Parts in Contact With Insulation	70C(158F)	—
Commutators, Brushes, and Brush Holders	85C(185F)	—
Bearings	40C(104F)	—
Transformer Windings	—	55C(131F)
Transformer Cores	55C(131F)	—

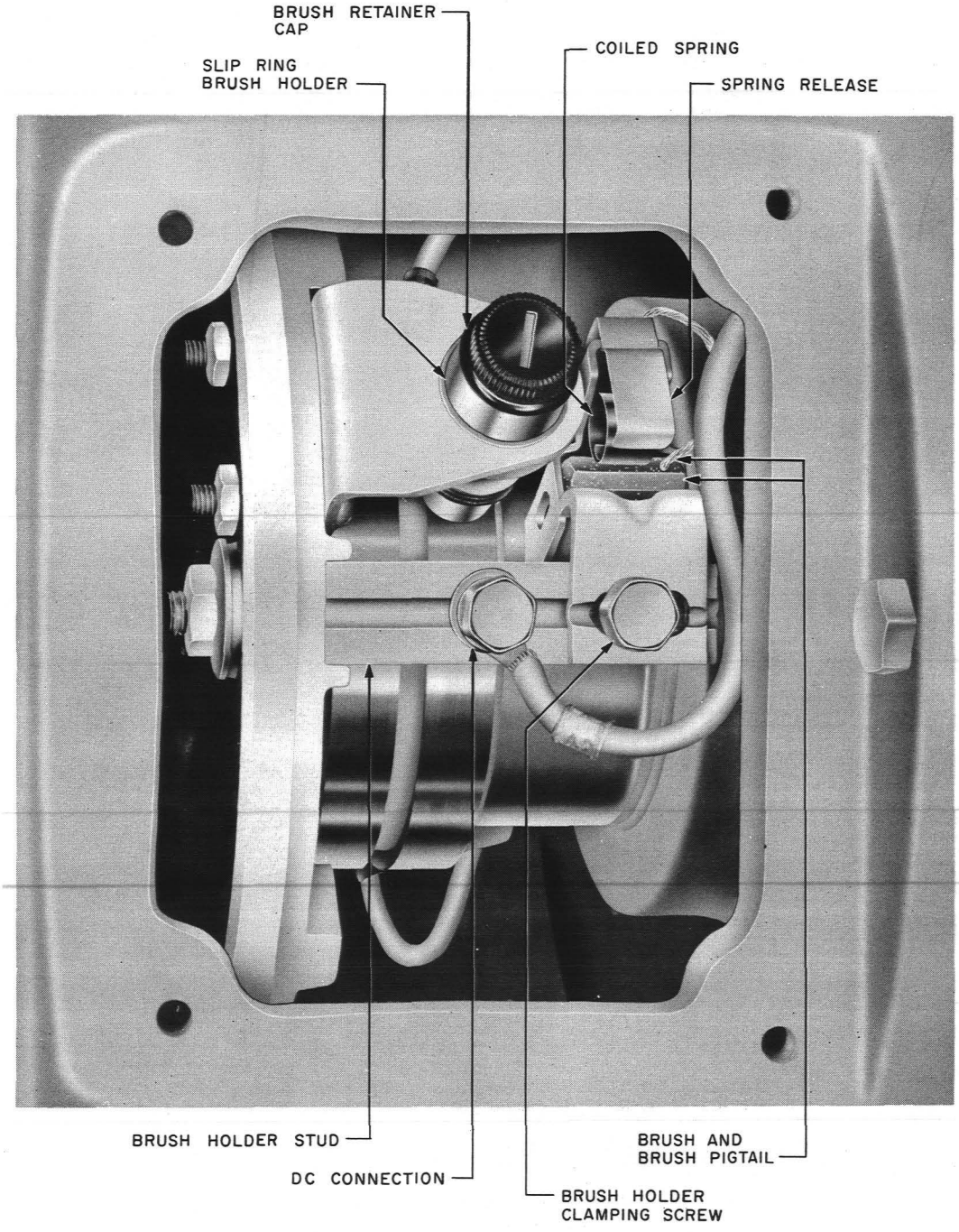


Fig. 3 – Yoke and Brush Rigging

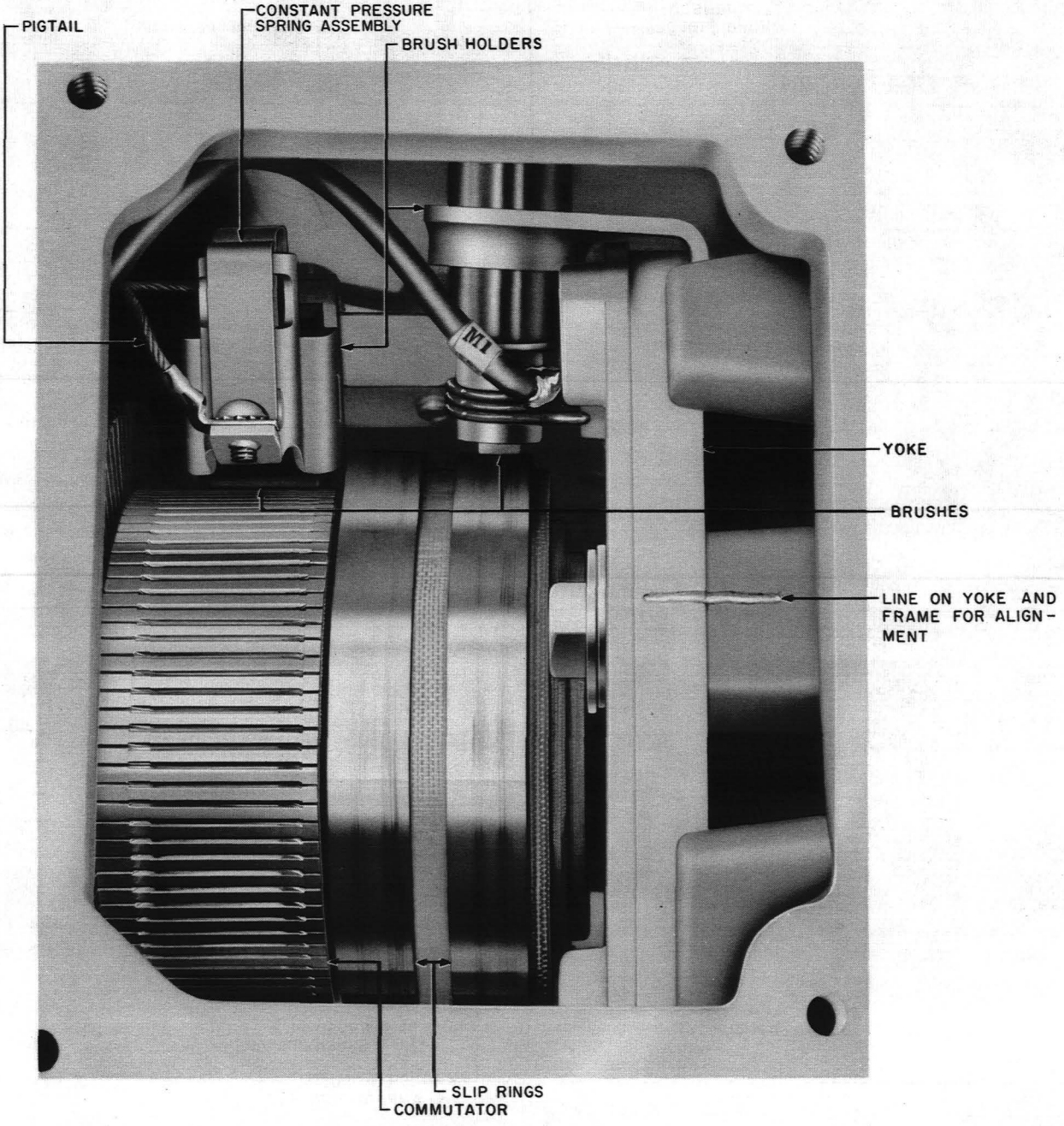


Fig. 4 – Yoke, Slip Rings, and Commutator

(b) If the temperature is thought to be excessive, it should be measured by thermometer, or by resistance method if desirable. To check the temperature, proceed as follows. Hold the bulb of the thermometer against the hottest spot on the outside of the bearing bracket, frame, or part under consideration. Cover the part of the bulb which is not in contact, with a piece of felt or the equivalent. Observe the highest temperature indicated.

Note: To check temperature of rotating parts, the generator set shall be shut off and the temperature shall be taken as soon as the rotating part comes to a full stop. Use thermometer and felt pad.

3. ADJUSTING PROCEDURES

3.001 *List of Tools, Gauges, and Materials*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-6320	Orange Stick
R-2512	8-inch Adjustable Wrench
—	4-inch E Screwdriver
—	5-inch E Screwdriver
—	Allen Set Screw Wrench (furnished with Type F Falk Coupling)
—	Gun Nozzle, Alemite Z-737
—	Gun, Grease, Lincoln Engineering Co, No. 5958
GAUGES	
R-8550	6-inch Steel Scale
KS-6909	Feeler Gauge
—	Thermometer, R-1032, Detail 1 (or equivalent spirit-filled thermometer)
—	Tachometer, No. 5 or Type A Boulin Instrument Corp (or equivalent)
—	Voltmeter, ac Weston Model 904 Range 150-300 Volts
—	Voltmeter, dc Weston Model 931, Range 30-300 Volts
MATERIALS	
KS-7860	Petroleum Spirits
KS-~~8372~~ 19578	Stabilized Trichlorethylene — 1 Pint Bottle
KS-14666	Cleaning Cloth
—	Grease 260-300P
—	Felt
—	EPOXI-PATCH — Kit 6C — Hysol Corp, Olean, N.Y. or
—	Metalset — Kit A4 — Smooth-on Mfg Co, Jersey City, N. J.

3.002 When using petroleum spirits for cleaning purposes in the power room, provide as much ventilation as practicable. After using the petroleum spirits, the commutators of all dc machines in the power room should be burnished in accordance with approved procedures for the machines involved, since the fumes from the petroleum spirits may soften commutator film and thus adversely affect commutation.

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.

Note: In any case, do not pump more than one full gun (approximately 5 ounces) into the bearing chamber even if grease does not appear at the drain hole or 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 possible with an orange stick. Replace the drain plug (and pressure fitting if removed).

(2) ***Flexible Couplings***

(a) To lubricate the flexible couplings, it will be necessary to remove the protective guards that are bolted to the base.

(b) On early vintage type F Falk couplings, the half covers have a grease pressure fitting in the flanges. This pressure fitting shall not be used for lubricating the coupling. If the coupling should start to leak oil 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.

(c) Clean out the pressure fitting holes from the inside using trichlorethylene and a clean cloth. The holes shall 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 by filling the fitting hole 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 in operation.

(d) 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. These kits furnish resin and hardener in separate tubes (similar to tooth paste tubes) that can be mixed on a flat surface (of discardable nature) by squeezing out equal lengths from each tube and mixing 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.

(e) To lubricate a type F Falk flexible coupling (see Fig. 2) remove the cap screws which fasten the covers with the Allen wrench, (provided with the flexible coupling) and slip the covers back clear of the hubs. Locate the open end of the gridmember, pry it loose with a screwdriver, and remove it completely. Clean out all old grease from the gridmember, from the teeth on the hubs, from between the hub end faces, and from the covers by scrubbing with a typewriter brush dipped in petroleum spirits. Inspect the paper gasket if one is provided. If it is damaged, replace it with a new one in accordance with Section A501.177. Also, inspect the teeth of the hub at this time. If the teeth are worn, the hub shall be replaced in accordance with Section A501.177.

(f) Fill all the slots between the teeth with ball bearing grease, also force as much grease 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 grease is squeezed out when the gridmember is inserted. Later, when centrifugal force caused by rotation of the coupling takes effect, most of the little amount of grease 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.

(g) Examine the gridmember, and if it is not badly worn re-use it; if it is worn to a sharp edge, replace it by a new one in accordance with Section A501.177. 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 covers over the hubs and pull up flush. Some excess lubricant will be pushed ahead of the cover into the space between the flanges.

(h) Back the covers off enough to allow the insertion of a small steel scale or similar implement and scrape off the excess lubricant so that when the covers are finally adjusted there will be no layer of grease to keep them from seating properly. Draw the covers up again and fasten in place with the cap screws. Wipe off excess lubricant.

(i) 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 it comes out between the flanges, tighten the cap screws, and if this is not effective, replace the gasket in accordance with Section A501.177. Some of the surplus grease 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 grease as to quantity and consistency; that is, whether oil has separated out, and repack if necessary.

3.02 ***Speed*** (Reqt 2.02)

(1) The speed of motors should be checked by applying a tachometer to the exposed shaft of either the motor or the driven ringing machine.

(2) If a frequency meter is available, the speed of a motor which is connected to the ringing machine can be determined from the output frequency of the driven machine's generator, since the frequency of the generated current and the speed of the motor are proportional. The following table should be used for reference.

CYCLES (GENERATOR)	RPM (MOTOR)
18	1080
19	1140
20	1200
21	1260
22	1320

(3) If the motor speed is not within the limits required, a check shall be made of the supply voltage to the motor, the condition of the brushes, the temperature, the freedom of rotation, and the condition of the speed regulator (dc motor only).

3.03 ***Hunting*** (Reqt 2.03)

(1) If the dc motor tends to hunt (see 1.10), check the brush setting on the motor and see that the commutator is in good condition with no excessive sparking at the brushes. See that the collector rings on the regulator are clean, that the brushes are not stuck in their holders and are making good contact, and that the main lever arm is working freely.

(2) Check the speed regulator for contact clearance and operation.

Note: On this ringing set, when the load transfers from the ac motor to the dc motor, there will be a momentary increase of speed. The speed will immediately fall off and should not be confused with hunting which may be experienced periodically or continually.

3.04 ***Voltage*** (Reqt 2.04)

(1) Check the input voltages of motors and the output voltages of the generator using either the switchboard voltmeters or the portable voltmeters specified herein.

(2) Check the voltages on the taps of the transformer using the portable voltmeters.

3.05 ***Capacity*** (Reqt 2.05)

(1) To determine that the ringing machine is delivering its rated capacities, check the capacities with an ammeter under normal and/or maximum conditions of office load.

3.06 ***Freedom of Rotating Parts*** (Reqt 2.06)

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

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

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

3.07 ***Direction of Rotation*** (Reqt 2.07)

(1) If the ac motor-driven machine rotates in the wrong direction, interchange two of the three leads connecting the motor to the power service.

(2) If the dc motor-driven machine rotates in the wrong direction, check the connections from the motor starter to the speed regulator, the commutating field, and the field rheostat and reconnect if incorrectly wired.

3.08 ***Bearings*** (Reqt 2.08)

(1) Replace all worn bearings. Since this will require dismantling and uncoupling the machine, the matter should be referred to the supervisor.

3.09 ***Noise and Vibration*** (Reqt 2.09)

(1) Where excessive noise and vibration are present, see that all nuts, bolts, and covers are fastened securely.

(2) If the noise and vibration continue to be excessive after the above adjustments have been made, the trouble may be caused by worn bearings. If this is found to be the case, the bearings should be replaced. See Section A501.177.

3.10 ***Commutation*** (Reqt 2.10)

(1) If commutation is not satisfactory, see that requirements 2.10 to 2.15 are being met. See 1.08 and Section A401.905.

3.11 ***Commutators*** (Reqt 2.11)

(1) See Section A401.905 for commutator care and Section A501.905 for commutator resurfacing.

Note: The operation of machines at light loads for prolonged periods of time will result in loss of commutation film and excessive deterioration of commutator and brushes. When machines are being operated at light average loads, the commutator should be frequently checked for loss of film. If there is an excessive or frequent loss of film, the matter should be referred to the suppliers local representative.

(2) When the commutator reaches the minimum diameter specified, the machine should be taken down and the armature returned to the shop for the installation of a new commutator, or a complete new armature should be installed. This matter shall be referred to the supervisor.

3.12 ***Brush Holders and Yokes*** (Reqt 2.12)

(1) To adjust the distance between the brush holder and the commutator, it is necessary to move the brush holder stud since the brush holder is fastened directly to the stud. Loosen the locknut that holds the stud in the yoke slot and move the stud and associated brush holder to the desired position.

(2) To adjust the distance between the brush holder and the slip rings, it is necessary to move the brush holder bracket similarly to the brush holder stud. Loosen the screws that hold the bracket in place and adjust for the proper distance.

Note: It should not be necessary to adjust for the angle of the brush holder since the brush holders, brush holder studs, and holder yoke are positioned mechanically and require no adjustment.

(3) In adjusting the clearance of the brush holder, it is desirable to work towards the minimum limit. If desired, a gauge instead of a scale may be used to measure the distance between the brush holder and the commutator.

(4) To adjust the position of a yoke, loosen the locknut or clamping screw, shift the yoke as necessary, and retighten.

(5) If it is suspected that poor commutation is the result of unequal or insufficient pressure on the brushes, it may be necessary to replace the constant brush holders, and the supplier or his approved representative should be consulted.

3.13 ***Brush Length*** (Reqt 2.13)
3.14 ***Brush Fit*** (Reqt 2.14)

(1) See Section A401.905.

3.15 ***Temperature*** (Reqt 2.15)

(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 as the motor-generator may have to be replaced. The supplier or his approved representative should be consulted.