# RINGING SETS
# KS-5032, KS-5492, KS-5504
# REQUIREMENTS AND ADJUSTING PROCEDURES

## 1. GENERAL

**1.01** This section covers small 20-cycle ringing sets as follows:

KS-5492 DC-AC Ringing Generator

KS-5504 15-watt Ringing Machine

KS-5032 Motor-driven Magneto Ringing Set

**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** 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.

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

**1.05** Requirements and associated procedures marked with a number sign (#) need not be checked by the installer, unless it is thought that the requirement is not being met or performance indicates that such a check is advisable.

**1.06** Requirements and associated procedures marked with an asterisk (*) need not be checked during maintenance, unless the apparatus or part is made accessible for other reasons, or performance indicates that such a check is advisable.

## 2. REQUIREMENTS

**2.01** ***Lubrication***

**Oil-ring Bearings**

(a) The bearings shall be adequately but not excessively lubricated with 130-190 S 100 oil. Where oil sights or gauges are provided, the oil level shall indicate 1/4 and 1/2 full. Gauge by sight.

(b) Oil rings shall turn and deliver oil to the shaft and bearings.

(c) After the initial filling, if no gauge is provided, for each month of operation add 6-8 drops of oil and modify interval and amount of oil as determined by experience for the particular machine installation.

(d) Periodically clean shaft between bearings and commutator or collector rings to prevent oil which may creep along shaft from getting on the commutator or collector rings.

#(e) Drain and replace oil with fresh oil every 2 years.

(f) If it is thought that dirt may have worked into the bearing, it shall be flushed and relubricated.

(g) Drain plugs and oil gauges shall be free from leaks.

**Wool-packed Bearings**

(h) Wool-packed bearings shall be lubricated with 6-7 drops of 130-190 S 100 oil at installation and every 3 months thereafter. Since operating conditions including temperature vary widely, this interval and the amount of oil should be modified as required to obtain adequate but not excessive lubrication. Where an overflow hole is provided in the bearing housing, a trace of oil should appear at the hole within a few days after lubrication. If

there is no overflow or open drain hole, it is suggested that a small hole be drilled through the bearing housing at a level slightly below the bottom of the shaft.

(i) Clean the shaft as in (d).

*Note:* In cases where difficulty is experienced with leakage of oil along the shaft of an old machine, the use of 50-55 S 210 oil or the replacement of the bearings is recommended.

**Ball Bearings**

#(j) The bearings shall be relubricated with fresh 260-300 P grease once a year in service and when being put into service after a year or more in storage.

*#(k) Bearings shall be cleaned and relubricated with fresh grease whenever the set is dismantled for other purposes.

(*l*) Clean shaft as in (d).

**2.02** ***Freedom of Rotating Parts:*** Rotors and armatures shall turn freely in their bearings.

**2.03** ***End Play:*** The end play shall be sufficient to permit the armature and rotor to run freely under all conditions of load but shall not be enough to permit brushes to override the edges of commutator or collector rings or ride on the part of the commutator used for connections.

***2.04** ***Automatic Centrifugal Switch KS-5504, KS-5032:*** The automatic centrifugal switch on the end of the motor shaft, shall disconnect the starting winding after starting and reconnect the winding on stopping. Contact surfaces on the centrifugal switch shall be clean and smooth.

**2.05** ***Noise and Vibration:*** The machine shall be free from disturbing noises due to mechanical causes, such as knocking in the bearings, noisy brushes, excessive vibration, etc, at any load from no load to full load. Gauge by sound and feel.

*#**2.06** ***The speed*** of the machine, with any voltage between the limits of 20.5 to 22 and 43 to 46 volts for battery-driven sets or a nominal 105-125 or 210-250 volts for line-driven sets, and a frequency within the limits of 60 ±2 cycles per second for a-c motors, at the motor terminals and any available office load from no load to not exceeding rated full load for the machine, shall remain within the limits specified.

Where the KS-5492-01 machine is used in J86212K, List 7 or List 8 ringing equipment to provide 20-cycle power to 1000-cycle supply circuits, the speed and output frequency of the ringing machine must be held within close limits. The speed must be set as near to 1200 rpm (20 cycles) as adjustment of the d-c brush yoke will permit when the machine is operating at no load or light load and the d-c input is at standard battery float voltage. (See Section 157-601-301 for standard battery float voltages.)

*Note:* The position of the d-c brushes at rated speed (1200 rpm) may cause slight sparking of the brushes. Unless sparking is excessive leave the brushes in this position. If sparking is excessive, refer to supervisor.

Min 1020 rpm (17 cycles)
Max 1380 rpm (23 cycles)

Use speed counter.

*#**2.07** ***Voltage:*** The ringing generator when driven by its associated motor and operating within the speed limits specified, at any office load from no load to not exceeding full load, and at any temperature within the limits specified, shall remain within the following voltage limits. Use a-c voltmeter. To avoid small load current readings, a resistance value representing full load is given for each machine for test purposes.

| KS | LIST NO. | FULL LOAD AMPS. | FULL LOAD OHMS | VOLTS MIN. | VOLTS MAX. |
|---|---|---|---|---|---|
| 5492 | 1 | 0.25 | 380 | 95 | 150 |
| | 2 | 0.33 | 230 | 75 | 112 |
| | 3 | 0.20 | 380 | 75 | 105 |
| 5492-01 | 1 | 0.20 | 375 | 75 | 90* |
| | 2 | 0.25 | 340 | 85 | 130* |
| | 3 | 0.20 | 375 | 75 | 90* |
| 5504 | 1 | 0.20 | 380 | 75 | 90 |
| | 2 | 0.15 | 670 | 100 | 120 |
| 5032 | 1 to 8 incl. | 0.19 | 400 | 75 | 110 |

*Minimum load of 0.025 ampere.

*Note (1):* KS-5032-01, Lists 5 to 8 inclusive, have a pulsating attachment in addition, capable of furnishing a current of not exceeding 0.01 ampere at a voltage within the range of 50 volts minimum, 75 volts maximum.

*Note (2):* If the current drawn by a voltmeter in measuring this pulsating voltage equals or exceeds 0.01 ampere, no additional load will be required on these windings.

**2.08** ***Commutator and collector ring surfaces*** shall be clean and free from scores, pits or other deformations of the surface or structure such as to cause unsuccessful commutation.

***2.09** ***Brush Holders***

(a) The brush holders shall have the edges which are adjacent to the commutator or collector ring surfaces within the limits of

Min 1/32″
Max 3/32″

from the commutator or collector ring surfaces. Gauge by eye. This requirement does not apply to sets having oil ring bearings.

(b) Two sides of the brush holder shall be parallel to the center line of the shaft.

Gauge by eye.

(c) The position of the brushes and brush yoke shall be circumferentially adjustable with respect to the frame and stator windings.

**2.10** ***Brush Fit:*** Brushes shall fit so that they are free in their holders, yet they shall not be loose enough to cause binding or unsuccessful commutation.

**2.11** ***Brush Pressure:*** The brush pressure shall be such that with the brush holder screw cap removed and the brush in its holder and resting against the commutator or collector ring the brush spring shall extend outside of its holder a minimum of

| | |
|---|---|
| KS-5492 | 1/8″ |
| KS-5504 | 1/2″ |
| KS-5032 | 1/2″ |

Use scale.

**2.12** ***Brush Length:*** The over-all length of the brush up to the spring shall be a minimum of 3/8″, (minimum of 1/2″ for motor brushes on motors having oil ring bearings). Use scale.

*#**2.13** The temperature as measured by thermometer shall not exceed

| | |
|---|---|
| Winding and Frame | 90C (194F) |
| Bearings (hottest exposed part) | 80C (176F) |

Use thermometer.

***Note:*** This requirement need be checked for only in instances where the fingers cannot be held on the outside of the bearing housing or machine frame as near the hottest part as possible.

## 3. ADJUSTING PROCEDURES

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

| CODE OR SPEC NO. | DESCRIPTION |
|---|---|
| **TOOLS** | |
| — | Burnisher, Contact No. 265C |
| — | Can, Oil 1/2 Pint or Equivalent |
| R-8550 | Scale, Steel, 6-Inch |
| — | Screwdriver, 4-Inch, Regular |
| — | Screwdriver, 3-Inch, Cabinet |
| — | Screwdriver, Watchmaker's, No. 3 |
| R-1542 | Wrench, Adjustable, 6-Inch |
| — | Wrench, Socket, 3/8-Inch, No. 46 |
| **GAUGES** | |
| — | Indicator, Speed, Jones No. 5B |
| R-1032, Detail 1 | Thermometer |
| — | Voltmeter, A-C, Weston Model 528, 0-150-Volt Scale |
| — | Voltmeter, D-C, Weston Model 280, 0-3-60-150-Volt Scale |
| **MATERIALS** | |
| KS-6824 | Compound, Sealing |
| KS-14666 | Cloth, Cleaning |
| — | Grease, 260-300P |

| CODE OR SPEC NO. | DESCRIPTION |
|---|---|
| **MATERIALS** | |
| — | Oil, 130-190 S 100 |
| — | Oil, Flushing |
| — | Pad, Felt (for temperature measurements) |
| KS-6320 | Stick, Orange |
| — | Spirits, Petroleum |
| — | Sandpaper, 4/0 |

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

**Oil Ring Bearings**

(1) Wipe off any dust or dirt on top of the oilers with a cleaning cloth, raise the cover and put 6-8 drops of oil from an oil can into the oiler, or, if a gauge is provided add enough oil to raise the oil to a level between 1/4 and 1/2 full as indicated by the gauge. If more than a few drops are being added, the machine should be stopped and the oil added slowly to allow the level to rise in the gauge. If it does not rise in the gauge, it is an indication that the passage to the gauge or the vent in the top is blocked and should be cleaned. Use a small copper wire to free the passage or vent. Wipe off any excess oil. If a bearing becomes excessively worn replace the sleeve bearing which will necessitate dismantling the machine as the lining can only be removed from the inside of the end shield.

(2) If an oil ring is bent or damaged, it should be replaced.

#(3) To replace the oil in a bearing, remove the drain plug in the bottom of the bearing chamber and drain the old oil into a suitable receptacle. Scrape the old sealing compound away from around the drain hole and clear all threads of particles which might interfere with obtaining a perfect seal. Wipe away all trace of oil, using petroleum spirits on a cloth. Allow it to evaporate before applying the sealing compound to the threads of the plug and the tapped hole. Replace the plug.

#(4) To flush a bearing chamber, drain out the old oil, replace the plug, fill the chamber with flushing oil, and bring the machine up to speed. Stop the machine. When it has come to rest, allow the flushing oil to drain out. After dripping has stopped, replace the drain plug under the procedure given in (3) above and fill the chamber to the proper level with lubricating oil.

(5) If an oil gauge leaks, the oil should be drained from the bearing chamber. If the leak occurs at the point where the gauge is screwed into the machine casting, the gauge should be removed, cleaned, and replaced under the procedure given in (3) above. Treat a leaking drain plug in a similar manner.

**Wool-packed Bearings**

(6) If oil does not appear at the drain or overflow hole of the bearing housing, be sure the drain or overflow hole is not blocked by dirt, gum, etc. The amount of oil added may be increased a small amount until oil does come out of the overflow within a few days after the periodic lubrication. Due to many variables, the best routine for each machine must be determined from operating experience.

**Ball Bearings**

#(7) To relubricate a ball bearing, remove the end plate from the bearing, and remove all the accessible grease using a cloth and, if necessary, an orange stick to release dry or caked grease. Then apply fresh grease around the balls, filling the space between the inner and outer ball ring flush with the sides of the rings. Fill the bearing chamber about 1/3 full of grease and replace the end plate.

**3.02** ***Freedom of Rotating Parts*** (Reqt 2.02)

(1) Turn the rotor of the motor and the armature of the generator by hand. If there is binding examine the machine for worn or loose brushes or worn bearings. Any worn bearings or brushes should be replaced. Allow due consideration for the polar action of the rotor on permanent magnet sets.

**3.03** ***End Play*** (Reqt 2.03)

(1) Excessive end play of the rotor may be reduced by adding one or more washers on the shaft between the bearings and the shoulder of the shaft except on machines equipped with ball bearings.

*3.04 *Automatic Centrifugal Switch KS-5504, KS-5032* (Reqt 2.04)

(1) Transfer of the motor from the starting to the running winding, with the opening of the centrifugal switch and closing of the switch again on stopping, will usually be indicated by a sudden snapping sound as the motor comes up to speed or slows down and the switch operates. If this sound is heard, it may be assumed that the switch is operating satisfactorily. If no sound is heard, the motor-end shield should be removed and the switch examined for sticking. Failure of a motor to start, particularly if there is a humming noise in the windings, may be due to the contacts of the centrifugal switch sticking open.

(2) The end shield is removed by taking off the screws or acorn nuts on the thru bolts with the aid of a screwdriver or 46 tool, holding the nuts on the other end of thru bolts with a second wrench if necessary. In removing the end shield, be careful not to injure the internal connections inside the motor housing. In some instances, it may be easier to remove the magneto generator from its base before removing the motor-end shield.

(3) The stationary contacts in the end shield should be open when the end shield is removed. Smooth the contacts with a contact burnisher or equivalent if they are rough or pitted. After smoothing, wipe with a cloth. Remove no more of the contact surfaces than absolutely necessary. KS-5032 motors with oil ring bearings have no stationary contacts.

(4) If the springs on the centrifugal switch actuating mechanism are bent or distorted, replace them. If the mechanism binds or is damaged, the complete rotating unit should be replaced.

3.05 *Noise and Vibration* (Reqt 2.05)

(1) See that all screws, bolts, and nuts are firm. Tighten as required with a screwdriver or wrench. Examine the brushes and replace any that are excessively loose or worn. Any worn bearings should also be replaced.

*#3.06 *Speed* (Reqt 2.06)

(1) If it is found necessary to check the speed, remove the cap in the end shield housing, if provided. Insert a speed indicator against the end of the shaft and determine the speed of the machine. If the speed of a line-driven set is outside the limits, check the power service voltage by means of a voltmeter. If the service voltage is within the limits but the motor speed is still outside its limits, examine for defective windings or connections and repair as necessary or replace the machine.

(2) The speed (output frequency) of the KS-5492-01 machine can be adjusted by rotating the brush yoke as explained in 3.09(3). With the speed indicator held against the shaft end, rotate the brushes to the position which will be nearest to the required speed setting and cause the least sparking for that speed.

*#3.07 *Voltage* (Reqt 2.07)

(1) To determine the voltage, make use of a portable a-c or d-c voltmeter as required, of suitable scale. If the voltage is not within the proper limits, check the speed of the machine and the voltage of the power service. If the voltage remains outside the limits with the speed and service voltage requirements met, examine the windings and connections of the ringing generator. Also see that the brush, brush holder, and contact surface requirements are met. If these conditions are satisfactory and the voltage is still outside the limits, replace the machine.

#3.08 *Commutator and Collector Ring Surfaces* (Reqt 2.08)

(1) Remove the brushes and the end shield on the commutator and collector ring ends of the generator or the brush holder plates on the KS-5032 magneto. Wipe the brushes and commutator or collector rings with a cloth moistened with petroleum spirits. Slightly rough collector rings or commutator surfaces may be smoothed with fine sandpaper before being wiped. Excessively rough commutator or collector ring surfaces will necessitate the removal of the armature and turning down in a lathe.

(2) To remove the armature, first remove the brush holder caps and brushes from the commutator and collector rings, marking the brushes for identification so that they may be replaced in the same holder and in the same

position in the holder. Remove the screws or nuts securing the end shields to the stator and slide the end shield off over the armature shaft being careful not to lose any spacing washers or to injure any of the leads on some of the older KS-5032 machines, it may be necessary to remove the magneto generator from its base before removing the motor-end shield. As the mounting feet on some machines are integral with the end shield, it will be necessary to first remove any mounting screws on these sets. After removing the end shield, slide the rotor out from the stator. Replace in the reverse order.

(3) To remove the rotor of the KS-5032 magneto, remove the brushes and brush holder plates as outlined above, marking the brushes for identification so that they may be replaced in the same holders and the same position in the holders. Remove the screws holding the bearing housing to the magneto frame and slide the bearing housing off the shaft being careful not to lose any spacing washers. After removing the bearing housings, slide the rotor out of the stator. Replace in the reverse order. In removing the rotor, it is advisable to place a "keeper" across the permanent magnets during the time the rotor is out to prevent weakening of the magnetic field which might result in lower voltages when reassembled.

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

(1) To adjust the AXIAL position of a brush holder on these machines, loosen with a watchmaker's screwdriver the set screw which secures the brush holder in position in the end shield housing and move the holder in or out to give the desired clearance. To do this, it will be necessary to remove the end shield. Before tightening the set screw, see that two sides of the brush holder are parallel to the center line of the shaft. Tighten the set screws firmly, replace the brushes, brush cap, and end shield covers. Brush holders on motors having oil ring bearings are not adjustable.

(2) To measure a brush holder clearance of the magneto of the KS-5032 set, remove the brush, insert a small stick through the brush holder against the commutator or collector ring, mark the position of the outer end of the brush holder on the stick, remove the stick and brush holder, and measure the length of the brush holder on the stick. The difference in length will be the distance of the brush holder from the commutator or collector ring. Adjustment of brush holder clearance on the magneto can only be made by inserting or removing insulating fibre washers between the brush holder plate and the frame of the magneto. Adjust as necessary.

(3) To adjust the circumferential position of the brushes and brush yoke in the KS-5492-01 machine, remove one of the vented covers on the end-bell at the d-c end of the machine and loosen but do not remove the brush yoke set screws in the end shield. (The two brush yoke set screws on each end of the machine are directly above and below the bearing housing and associated lubrication pipe.) Move the brush yoke in either rotary direction by using a stick of wood or other nonconducting implement. After the correct position is determined tighten the two brush yoke set screws and replace the vented plate.

3.10 ***Brush Fit*** (Reqt 2.10)

(1) To fit a brush, remove the brush from its holder, marking its position in the holder, wipe the brush and brush holder with cloth moistened with petroleum spirits. Any rough projections may be removed with fine sandpaper before wiping.

(2) In replacing brushes, see that they are put back in the same holder and in the same position in which they were originally. Brushes which are too loose in their holders should be replaced.

(3) Brushes are generally furnished with their faces curved to the approximate curvature of the commutator or collector ring. Final fitting of the brushes should be done by running the machine without load for a few hours if possible.

3.11 ***Brush Pressure*** (Reqt 2.11)

(1) Examine the brush springs and pigtails to see that the pigtails are not twisted sufficiently to shorten the length of the spring. Untwist as required. If the spring does not extend beyond the brush holder at least the minimum amount, the brush and spring should be

replaced. A temporary adjustment may be made by stretching the spring, but that should be done only until such time as a new brush and spring can be obtained.

**3.12** ***Brush Length*** (Reqt 2.12)

(1) Replace any short brushes.

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

(1) Under trouble conditions, the temperature of the machine may exceed the specified limits. Never estimate temperature by touching with the fingers.

(2) To measure the temperature of a bearing, hold the bulb of a thermometer with the machine running against the outside of the bearing housing as near as possible to where the bearing is located and, with a felt pad or equivalent, cover that portion of the bulb which does not touch the bearing housing. Observe the maximum temperature reading.

(3) The temperature of a machine frame or winding should be measured in a similar manner by holding the thermometer against the surface of the part whose temperature is to be measured, as near to the hottest spot as possible, covering any exposed portion of the thermometer bulb with a felt pad or equivalent. Observe the maximum temperature reading.

(4) If the oil ring bearings are excessively hot, make sure that the oil rings are delivering oil to the bearings. If waste packed bearings are hot, make certain that the waste has not glazed and that the bearing is getting sufficient lubrication. Replace any glazed waste. If the windings are too hot, make sure that the centrifugal switch has functioned to disconnect the starting winding or that there are no short circuits in the windings. Repair or replace as required.