STATIC RINGING GENERATORS
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the following static ringing generators.

KS-5523 (15 watts)
KS-5585 (7.5 watts)
KS-5593 (40 watts)
KS-5756 (100 milliamperes)
KS-15529 (250 milliamperes)
KS-15670 (500 milliamperes)

1.02 This section is reissued to include information on the 8G and 77G transformers used with the KS-5523 generators. Detailed reasons for reissue will be found at the end of the section.

1.03 Static ringing generators have circuits arranged to oscillate freely at a fundamental frequency of 20 cycles per second and harmonics thereof when connected to a 60-cycle supply. They are used to convert 60-cycle commercial power to 20-cycle ringing power. Similar generators are used to convert 50 cycles to 16-2/3 cycles. They have no moving parts, except for the armature of a starting relay in some generators. This armature is in motion only at the time of starting, and remains stationary against the relay pole face during normal operation of the generator.

1.04 The KS-5523, KS-5585, and KS-5593 generators use a relay to start the 20-cycle oscillations. When the 60-cycle supply is applied, the starting relay operates, opening its back contact and setting up a condition favorable for the 20-cycle oscillations. If the 20-cycle frequency is sustained, the starting relay will be held operated but, if the 20-cycle frequency is not sustained, the starting relay will release and a second start will be made. In general, not more that two or three successive starts of the starting relay are required. On those generators arranged for use on a 50-cycle source, the same operation will give a 16-2/3 cycle output.

1.05 The KS-5756, KS-15529, and KS-15670 generators use a T2 modulating transformer to start the 20-cycle oscillations. When the 60-cycle supply is applied to the T2 modulation transformer, which is biased by the dc output of a rectifying element, 60-cycle and weak 20-cycle oscillations combine to give a 40-cycle oscillation. This 40-cycle oscillation combines with the weak 20-cycle oscillation, using the principle of mutual negative resistance, to build up the 20-cycle oscillation to the point where it can sustain itself. Once the 20-cycle frequency becomes self-sustaining, the 40-cycle circuit becomes detuned by the action of an L2 variable inductance. Under heavier load requirements, the tuning of the 40-cycle circuit changes so that it produces 20-cycle power to supplement that produced by the 20-cycle circuit.

1.06 Transformers are available for use with the KS-5523 generator if required. An autotransformer is used with superimposed ringing and when potential above 75 volts is required. The other transformer is a combined autotransformer and insulating transformer which has the same autotransformer taps as the above and in addition has an insulated coil for use on special applications with special grounding arrangements. An autotransformer similar to that used with the KS-5523 generator is available for use on the KS-5593 generator. These transformers and autotransformers are not shown in the figures.

1.07 Audible ringing tone is produced by a tone coil. On most generators, high, medium, and low taps are provided on this coil to permit altering the audible tone characteristics if such change is approved by a supervisor. This coil requires no change in offices not having audible ringing and cannot be changed on equipment potted for use in the tropics. Generators shown in Fig. 5 and 7 may have tone removed from output leads by strapping out C3 capacitor.

1.08 On the KS-5523 and KS-5593 generators, the saturated coil is tapped for various line voltages, except on equipment potted for use in the tropics. Selection of taps should be as shown in Fig. 1 and 4.

1.09 The covers of the cases on most of the KS-5523 and KS-5593 generators are attached by screws, and operate cover switches to open the input circuit when the cover is removed.

1.10 Facing the bushing or connection base end of the case of KS-5523 and KS-5585 generators, the input 50- or 60-cycle leads enter the left-hand bushing or male base and the output 16-2/3 or 20-cycle leads emerge from the right-hand bushing or female base. On KS-5593, KS-5756, KS-15529, and KS-15670 machines, the input 50- or 60-cycle leads enter through a cord grip and the 16-2/3 or 20-cycle output leads come out through a porcelain or fiber bushing

1.11 *Asterisk (*):* Requirements are marked with an asterisk when to check for them would necessitate 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.

1.12 Major repairs should be attempted or replacement parts ordered only with the approval of the supervisor, since turning the static ringing generator in for repairs is usually preferable to making repairs on the job.

1.13 *Caution: Before performing any work inside the ringing generator case or checking requirements other than electrical or temperature requirements, disconnect the ringing generator from both the ac supply and the output. If the generator operates in an automatic control circuit, the automatic control should be made inoperative as described in the appropriate section covering the apparatus.*

1.14 *Caution: As the voltage across certain components of these generators is over 150 volts, care must be used when making measurements or adjustments. Do not allow a test pick to touch two metal parts at the same time, or destructive or dangerous short circuits may occur.*

2. REQUIREMENTS

***2.01** *Starting Relay* (where provided)

(a) The relay contacts shall be clean and free from buildups which might interfere with reliable contact.

Gauge by eye.

(b) The armature shall move freely throughout its travel.

Gauge by feel.

To check the requirement, slowly operate the armature manually with the KS-6320 orange stick.

***2.02** *Voltage:* With the output and the line voltage as shown, the generator output voltage shall be as shown in Table A.

***2.03** *Temperature:* The rise in temperature of the component parts of the generators in any convenient ambient temperature between the limits of 10 C and 40 C shall not exceed the following values.

	MAXIMUM RISE ABOVE AMBIENT
Reactor, Transformers, Tone Coil, etc	55 C (131 F)
Relay Coil	65 C (149 F)

Use the R-1032 thermometer.

Caution: Under trouble conditions, the generator temperature may exceed that shown above. Do not use the fingers to estimate temperature.

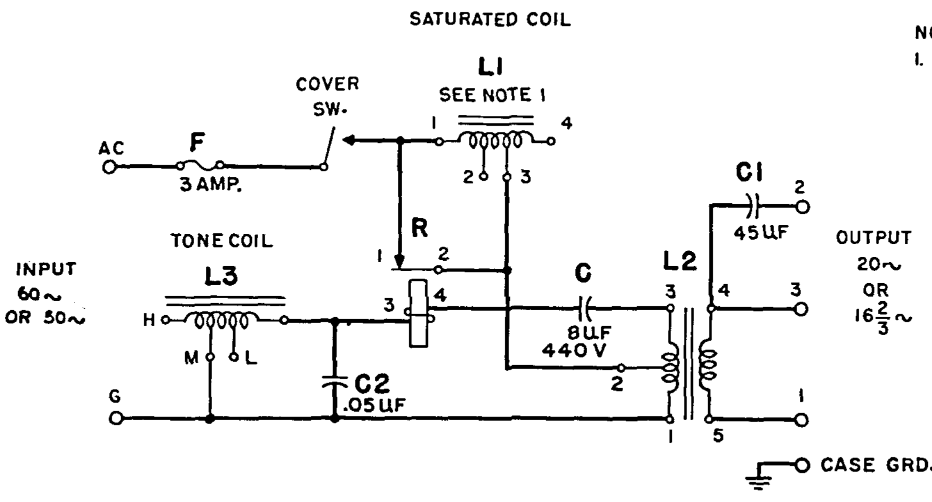
With the generator stopped, hold the bulb of the thermometer against the part in question covering that part of the bulb which is not in contact with the part by a small asbestos pad or equivalent. Readings should be taken as soon as possible after stopping the static ringing generator.

TABLE A

	LINE VOLTAGE RANGE	OUTPUT TAPS	FULL LOAD MAXIMUM OUTPUT (ma)	OUTPUT VOLTS FULL LOAD, LOW-LINE VOLTAGE MIN	OUTPUT VOLTS NO LOAD, HIGH-LINE VOLTAGE MAX
KS-5523	105-125	1-2, 1-3	200	75	90
8G or T2259 (Transformers)	105-125	1-75	200	75	90
8G or T2259 (Transformers)	105-125	1-95	160	95	130
TR2666 (Transformers)	105-125	1-75	200	75	90
TR2666 (Transformers)	105-125	1-95	160	95	130
77G or T4282 (Transformers)	105-125	1-75	200	75	90
77G or T4282 (Transformers)	105-125	1-95	160	95	130
77G or T4282 (Transformers)	105-125	3-4	110	75	90
KS-5585, L01, L02, L03, and L06	105-125	-	100	75	110
KS-5585, L05	105-125	-	40	94	101
KS-5593	95-135	1-2	500	75	90
	95-135	1-3	400	100	115
KS-5756	105-125	3-4 (86)	100	84	88
	105-125	3-5 (97)	100	94	101
KS-15529	105-125	0-4 (86)	250	84	88
	105-125	0-5 (97)	220	94	101
	105-125	0-6 (105)	200	101	110
KS-15670	105-250	0-86	500	84	88
	105-250	0-97	500	94	101
	105-250	0-105	500	101	110

Note

These voltages need be checked for only when ringers are not operating satisfactorily or there is other reason to believe the voltage is outside of limits.



NOTES:

1. INPUT VOLTAGE ADJUSTMENT

SUPPLY VOLTAGE VARIATION	ON L1 USE TAP
HIGH 115-125	NO. 4
AVERAGE 110-120	NO. 3
LOW 105-115	NO. 2

Fig. 1 — KS-5523 Static Ringing Generator

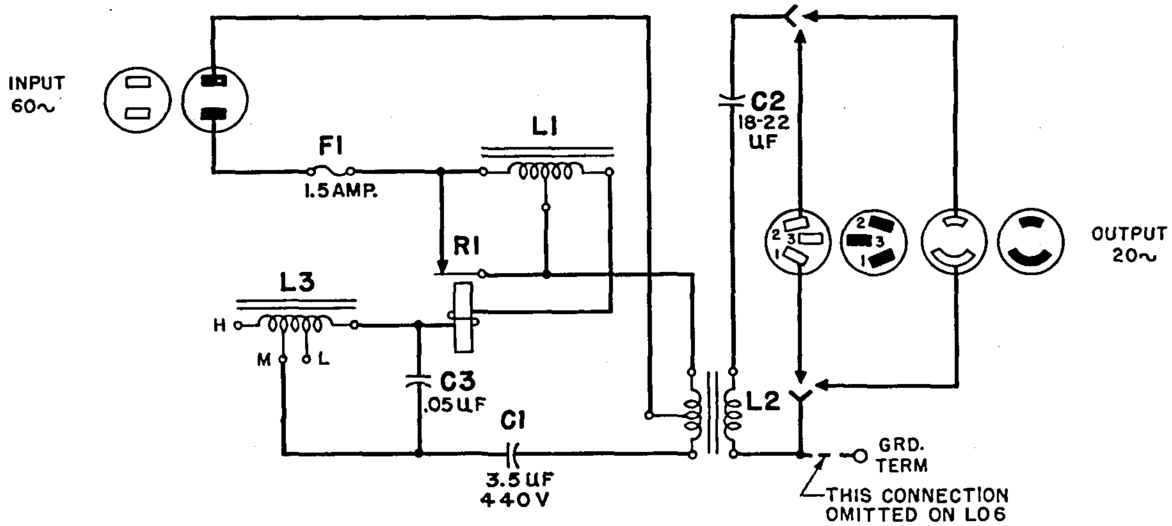


Fig. 2 – KS-5585, L01, L02, L05, and L06 Static Ringing Generator

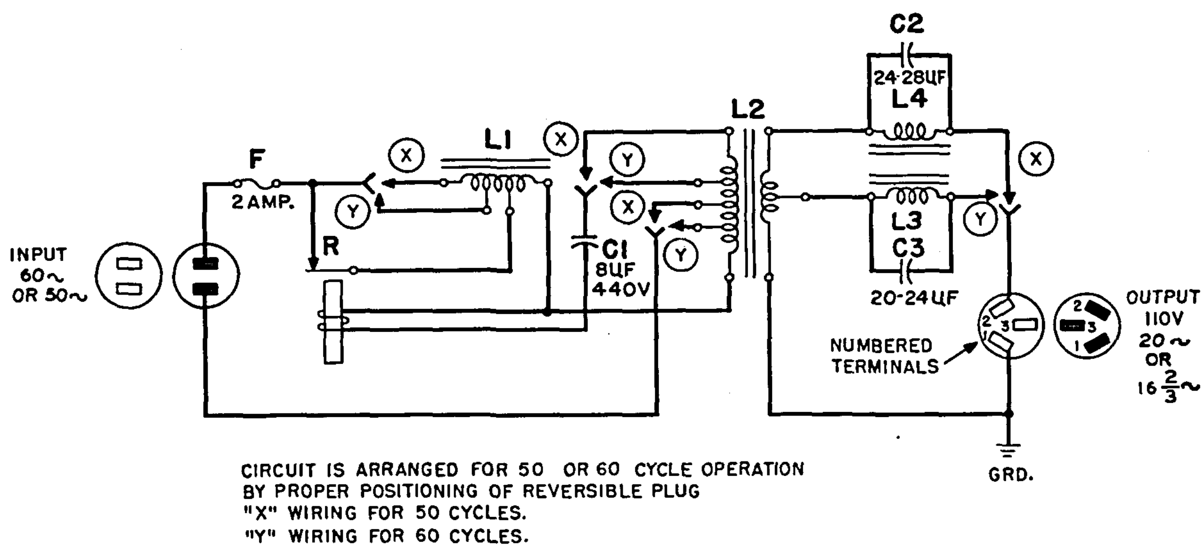


Fig. 3 – KS-5585, L03 Static Ringing Generator

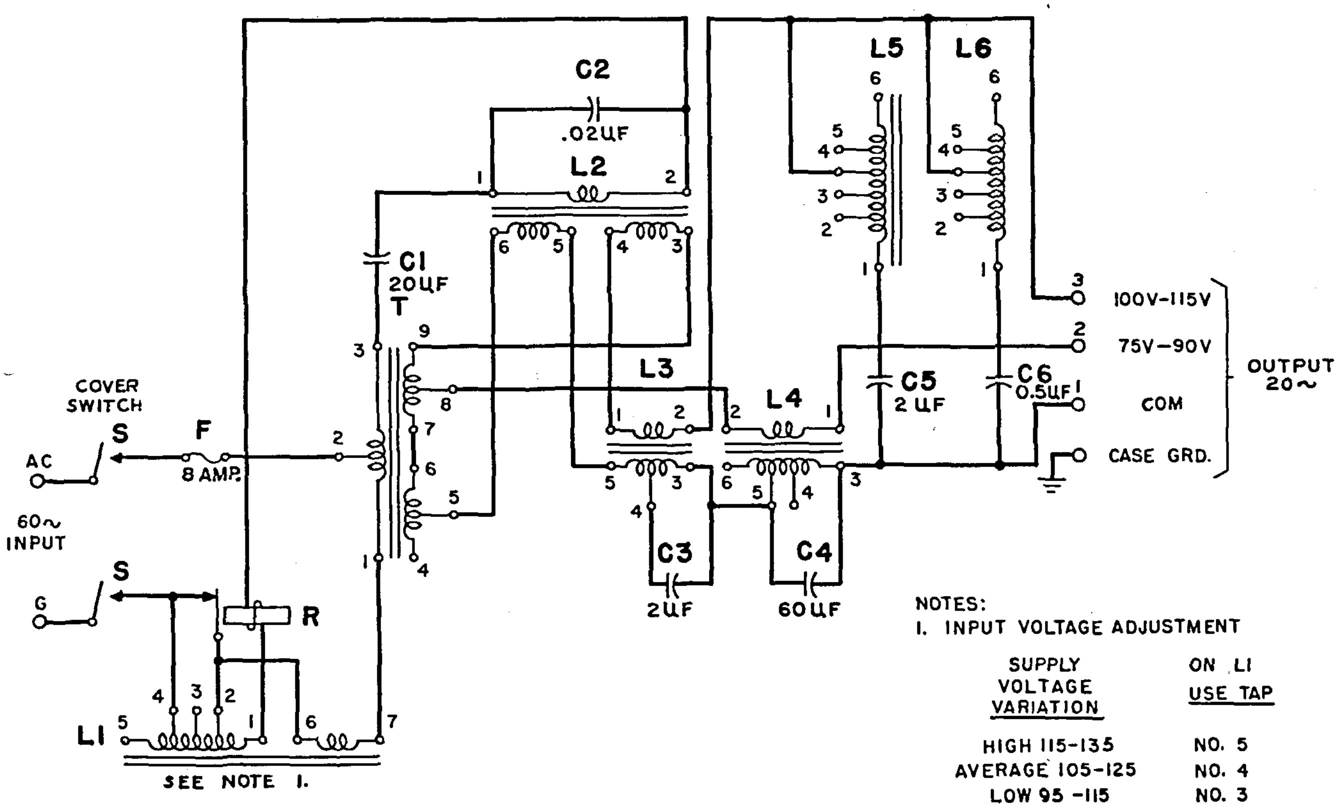


Fig. 4 – KS-5593, L01 Static Ringing Generator

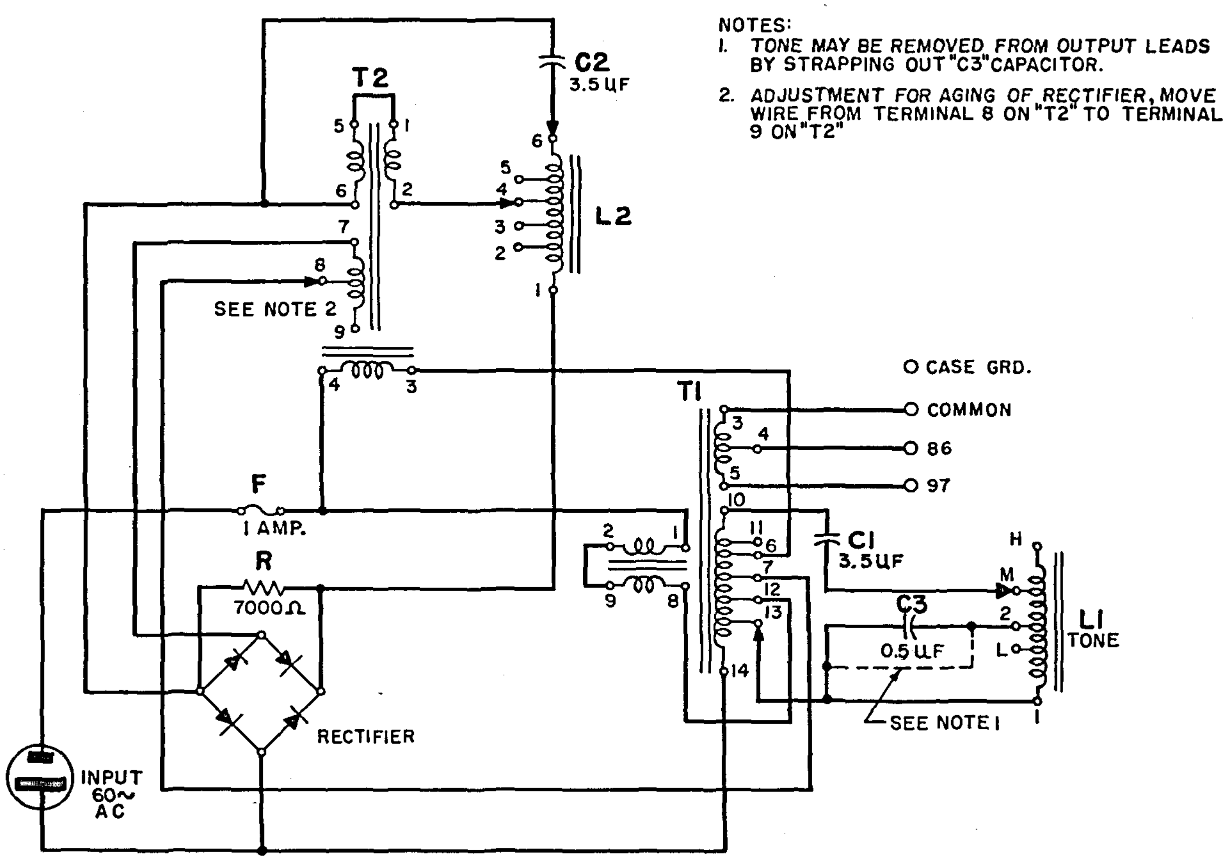


Fig. 5 – KS-5756 Static Ringing Generator

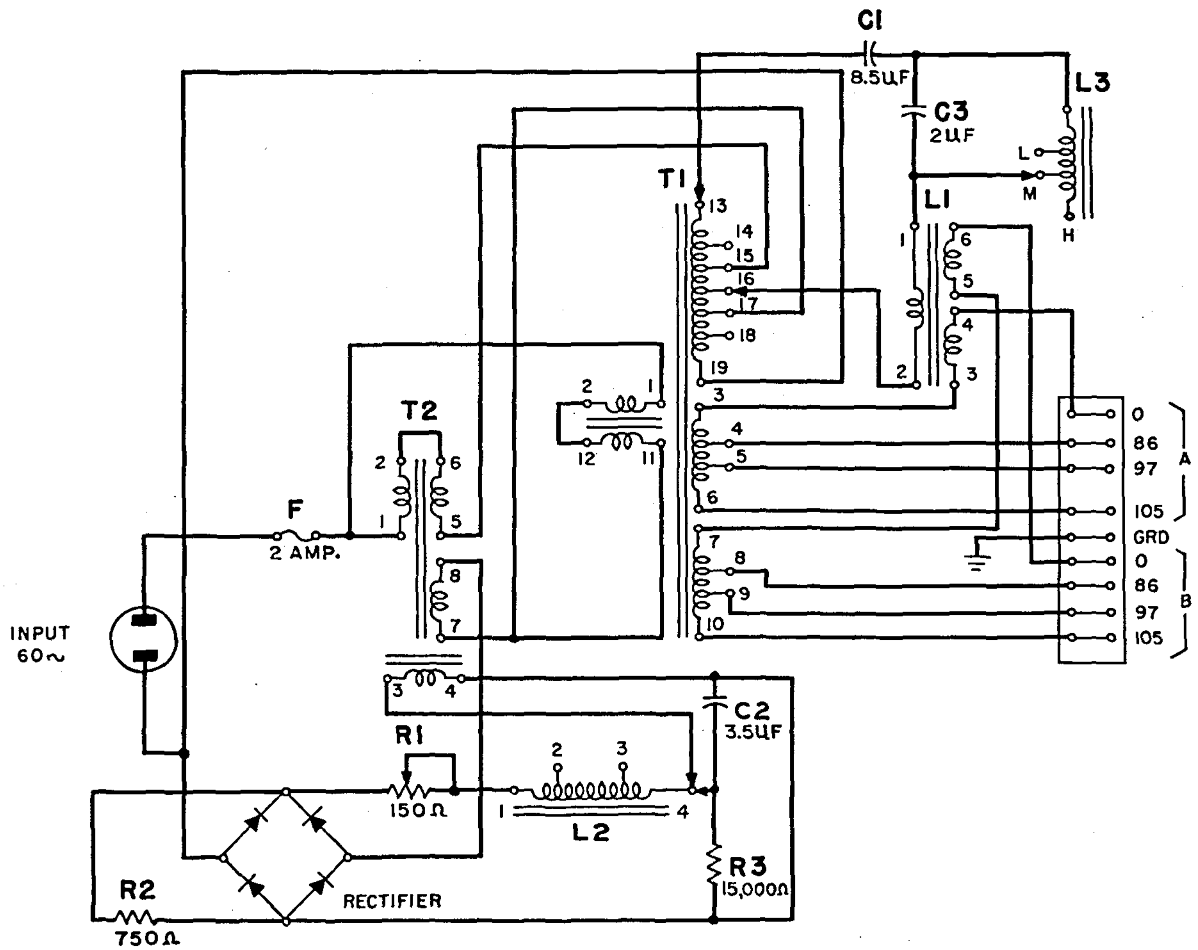
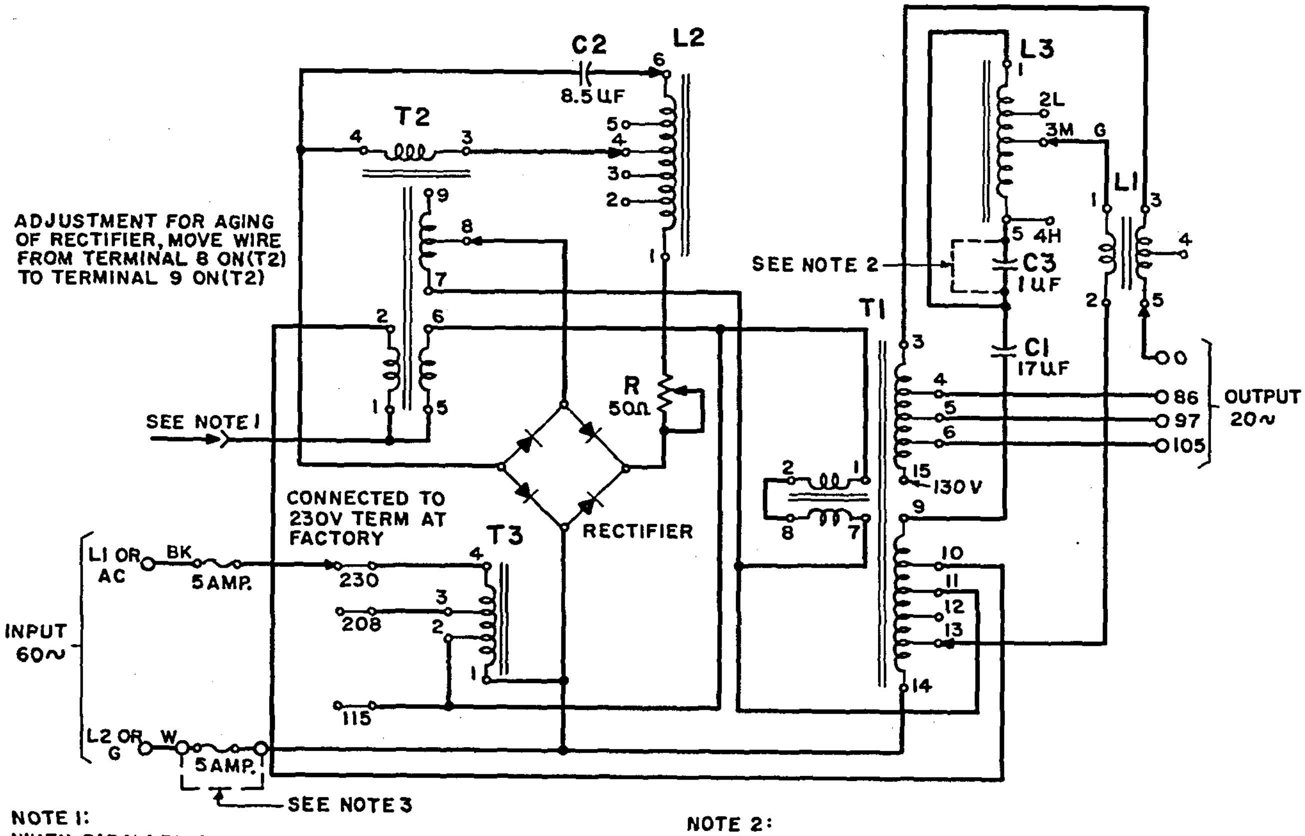


Fig. 6 – KS-15529 Static Ringing Generator

3. ADJUSTING PROCEDURES

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

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
373D	Contact Burnisher Holder
374A	Burnisher Blade
KS-6320	Orange Stick
KS-14208 (2 reqd)	Brush
—	4-Inch E Screwdriver (or the replaced 4-inch regular screwdriver)
GAUGES	
KS-14510	Volt-Ohm-Milliammeter
R-1032, Detail 1	Thermometer −5° to +150 C
—	Voltmeter, AC, Weston Model No. 528, Ranges 0-150-300
MATERIALS	
KS-2423	Cotton Twill Cloth
KS-7187	Bond Paper
KS-8372	Stabilized Trichloroethylene
—	Abrasive Cloth, 150 Grade
—	Asbestos Pad
—	1-Ounce Bottle



NOTE 1:
WHEN PARALLEL OPERATION OF 2 OR MORE BIASED CORE SUB-CYCLES IS REQUIRED, CONNECT EQUALIZING LEAD TO TERMINAL 1 OF (T2) TO CORRESPONDING TERMINAL ON OTHER SUB-CYCLES. CARE SHOULD BE TAKEN TO CONNECT CORRESPONDING INPUT AND OUTPUT TERMINALS.

NOTE 2:
TONE MAY BE REMOVED FROM OUTPUT LEADS BY STRAPPING OUT C3 CAPACITOR AND CONNECTING "G" LEAD TO TERMINAL 4H ON L3 COIL.

NOTE 3:
WHEN BLACK INPUT LEAD (L1) IS CONNECTED TO 115 VOLT TERMINAL, 5AMP FUSE IN WHITE INPUT LEAD (L2) SHOULD BE STRAPPED OUT.

Fig. 7 — KS-15670 Static Ringing Generator

CODE OR SPEC NO.	DESCRIPTION
TEST APPARATUS	
—	Adjustable Loading Resistors

OHMS	WATTS (MINIMUM)
250	50
500	10
1000	10
2500	10

3.01 *Starting Relay* (Reqt 2.01)

(1) ***General:*** Failure to start may be due to no line voltage, cover switch open, loose connections, or fuse inside case blown. These should be checked and corrected, if necessary, before doing any work on the relay. Before cleaning contacts or removing buildups, disconnect the power supply from the contacts (see 1.13 and 1.14).

(2) *Cleaning Contacts:* The purpose of cleaning contacts is to remove any gummy or dirty substances that would interfere with reliable contact. It is not necessary or desirable to keep contacts polished or shining. To clean contacts, proceed as follows.

(a) Pour a small quantity of the trichloroethylene into a 1-ounce bottle. It is important to avoid the use of contaminated trichloroethylene in cleaning the contacts; therefore, discard the trichloroethylene as soon as it appears slightly dirty.

(b) Dip the hairs of a clean KS-14208 brush their full length in the trichloroethylene. Remove excess fluid by wiping the brush on the edge of the bottle. Then, with the pair of contacts open, brush the entire surface of the contact to be cleaned with the moist brush.

(c) Brush the contacts with a dry, clean KS-14208 brush.

(3) *Removing Buildups:* There shall be as little smoothing of contacts as is consistent with satisfactory operation. Contacts should be smoothed while closed. Care must be taken that contacts are not forced out of their normal position while being held closed manually. Where practicable, use a KS-6320 orange stick to hold the contacts closed.

(a) To remove buildups, use a strip of 150 grade abrasive cloth or the 374A burnisher blade held in the 373D contact burnisher holder. Do not use abrasive cloth on silver contacts as it only results in a loss of silver and a reduction of life. Clean silver contacts as in (2) or smooth with the burnishing tool.

(b) Insert the abrasive cloth or burnisher blade between the contacts to be smoothed, and draw it back and forth until the buildups are reduced sufficiently to insure reliable contact. Exercise care to avoid reducing the height of the contact. After burnishing, brush the contacts with a dry, clean KS-14208 brush.

(4) *Relay Armature:* To clean armature and face of pole piece, draw a strip of KS-7187 bond paper between them while applying pressure to the armature with the KS-6320 orange stick.

3.02 *Voltage* (Reqt 2.02)

(1) If voltage is thought to be outside of limits, check that the saturated coil, if tapped and not potted for use in the tropics, is correctly connected for the prevailing line voltage. If connection is right and voltage is still outside of limits, notify supervisor.

(2) If the supervisor approves further check of voltage, disconnect the office load (and external transformers when a KS-5523 or KS-5593 generator is being checked) and apply a resistance load to the output terminals as designated in Table B. Where more than one test resistance is listed, it will only be necessary to apply one of the test loads to determine if the generator is functioning properly. Satisfactory operation on the resistance load

TABLE B

	OUTPUT TAPS	APPROXIMATE RESISTANCE LOAD (ohms)	MINIMUM POWER RATING OF RESISTANCE LOAD (watts)
KS-5523	1-2 or 1-3	375	15
KS-5585, L01, L02, L03, & L06	Output	750	7.5
KS-5585, L05	Output	2350	4
KS-5593	1-2	150	40
	1-3	250	40
KS-5756	3-4 (86)	840	10
	3-5 (97)	940	10
KS-15529	0-4 (86)	336	25
	0-5 (97)	427	25
	0-6 (105)	505	25
KS-15670	0-86	168	50
	0-97	188	50
	0-105	202	50

and unsatisfactory operation on office load would indicate that office load was too great (any external transformer could be defective and cause an overload) or that office load had poor power factor due possibly to the capacity introduced by long PBX feeders. Excessive chattering of an armature of a starting relay, where provided, is usually an indication of an overload on the output of the ringing generator. Notify supervisor of results of check. Overload on the 16-2/3 or 20-cycle output will reduce available ringing voltage and in extreme cases stop the 16-2/3 or 20-cycle oscillation.

Note: The resistance loads shown in Table B are obtained by selecting a suitable adjustable resistor from the list of test apparatus (3.001) and setting the resistance value with the aid of a KS-14510 volt-ohm-milliammeter. Do not exceed power rating of a resistor when selecting one for use in this test.

3.03 *Temperature* (Reqt 2.03)

(1) If the temperature exceeds the limit, check requirement 2.02. If the temperature is still outside the limit, refer the matter to the supervisor.

REASONS FOR REISSUE

1. To remove former 1.11 covering the (#) sign.
2. To revise 1.11 covering the (*) sign.
3. To add precautions against automatic control circuits (1.13) and high voltages (1.14).
4. To add a requirement for relay armature operation [2.01(b)].
5. To revise the temperature requirement and procedure (2.03) and (3.03).
6. To revise Table A to include the 8G and 77G transformers.
7. To revise Fig. 6 to show four terminals instead of six terminals on the L2 coil.
8. To revise the list of tools, gauges, and materials (3.001).
9. To replace petroleum spirits with trichloroethylene and to revise the method of cleaning relay contacts [3.01(2)].
10. To add information on the use of abrasive cloth to remove buildups [3.01(3)(a)].
11. To add information pertaining to armature chattering on starting relays [3.02(2)].