TELEPHONE SERVICE RINGERS

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1 GENERAL DESCRIPTION

1.1 This sub-section provides general information on all types of single-gong and two-gong ringers. Specific information, parts lists and special adjustments are given in the individual descriptive sub-sections.

1.2 Each ringer consists of a cast, non-magnetic, alloy frame on which all the component parts are mounted. A typical ringer is illustrated in Fig. 1-1. A laminated soft-iron core carries the single coil and is clamped to the soft-iron yoke which is bolted to the frame. The armature and clapper assembly is spring mounted to the frame so that the clapper may be vibrated by the armature, due to the magnetic field produced by the coil and yoke, to strike the gong(s). Increased sensitivity is provided by biasing the armature by means of a small permanent magnet clamped in the frame. A mechanical volume control is fitted on most types of ringer so that the user may adjust the sound output level. The coil is provided with flexible wire leads for connection to the other components in the telephone.

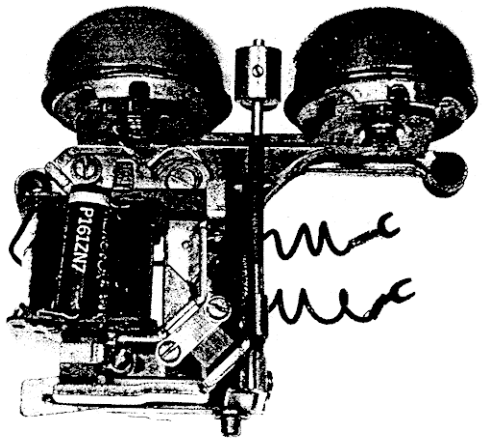

Fig. 1-1 TYPICAL RINGER

1.3 The ringers are designed to function from an alternating current source. Units are available for all the standard ringing frequencies from 16 to 66-2/3 cycles per second. The sensitivity is such that satisfactory operation is obtained on the longest circuits and the high impedance prevents excessive bridging and unbalance losses on multi-party lines. A three point, anti-vibration mounting to the telephone base is provided.

2 ASSOCIATED PUBLICATIONS

2.1 Specific details of each type of ringer are given in individual sub-sections in this section of the manual, each indexed by the type number of the ringer to which it applies. The information given in this sub-section is of a general nature and applies to all the telephone ringers.

2.2 The types of ringer which can be used with each type of telephone are noted in the sub-section in which the instrument is described. Extension ringers of similar type may also be used.

2.3 A list of ringer classification code numbers is given in sub-section 110. For any ringer unit without housing, the asterisk shown in the frequency selective ringer code numbers is always replaced by the letter "H".

2.4 The full code number for each type of ringer is given in the title of the individual descriptive sub-section. The classification code, noted above, must be inserted in place of the two dashes shown in each title in order to complete the code number.

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3 DISASSEMBLY AND ASSEMBLY

CAUTION

THE STRENGTH OF THE PERMANENT MAGNET IS ADJUSTED AFTER ASSEMBLY OF THE RINGER. DISASSEMBLY OF ANY OF THE PARTS OF THE MAGNETIC CIRCUIT MAY ADVERSELY AFFECT THE PERFORMANCE OF THE RINGER. SPECIAL EQUIPMENT IS NECESSARY TO REMAGNETIZE AND ADJUST THE STRENGTH OF THE MAGNET IN ORDER TO OBTAIN OPTIMUM PERFORMANCE.

3.1 The gongs and resonators, if fitted, are removed by unscrewing their lockwasher mounting screws. Note that earlier models of some ringers had the resonators riveted to the frame. The gong mounting control wheels of the frequency selective ringers are removed by unscrewing the hexagonal head, lockwasher screws.

3.2 In order to remove the magnet from a BA type ringer, first remove the armature and clapper assembly then slide the magnet out of the frame. Do not strain the tab of the frame holding the magnet as it may break off. The magnet of a frequency selective type ringer may be lifted out after the screws and clamping plate are removed.

3.3 The coil is removed from a BA type ringer by unscrewing the lamination clamping screws and from a frequency selective type ringer by loosening the shunt bar and slide plate clamping screws.

3.4 Reassembly is a reversal of the procedures given for disassembly. The following points must be noted:

3.4.1 All Ringers

a) The end of the magnet nearest the armature must repel the north seeking pole of a compass and the opposite end of the magnet must be tight against the pole piece assembly.

b) When facing the gong end of a two-gong ringer and with the frame facing downwards, gong "B" is on the left and gong "A" is on the right.

3.4.2 BA Type Ringers

a) When replacing the armature, the end of the bias spring must be located in its adjusting slot in the bracket on the frame.

b) When replacing the coil, the number of core laminations used should result in the coil core being comfortably filled but not force fitted. A minimum weight of 16 grams of laminations must be used.

4 LUBRICATION

4.1 Ringers without volume controls do not require lubrication.

4.2 First clean away all existing lubricant from the volume control mechanism then apply a light film of Lubriplate or similar non-drying lubricant to all rubbing surfaces of the volume control parts. Take care to avoid excessive lubrication.

5 TEST AND ADJUSTMENT

5.1 Thorough checking of ringers requires the use of specialized test equipment which will not always be available in the field. The portions of the procedures requiring the use of this test equipment are printed in upper case type. These steps may be omitted at the cost of a reduction in the overall performance of the ringer. Note that the strength of the permanent magnet will only be reduced by a small amount if care is taken not to disturb the armature, magnet and shunt bar or pole piece when changing a faulty coil.

5.2 The ringer under test must be firmly mounted in a test fixture, such as a telephone base plate which has been weighted to the normal weight of a complete instrument, in order to carry out the tests and adjustments correctly.

5.3 For test and adjustment purposes, telephone ringers may be conveniently divided into the two general classifications of straight line and frequency selective types. The generalized test and adjustment procedures for these two groups are given in the following paragraphs. Reference must also be made to the individual sub-section for each type of ringer where specific sensitivity values and test and adjustments figures are quoted.

5.4 An easily assembled test board for ringer testing is described in sub-section 152.

5.5 STRAIGHT LINE RINGERS

First check the individual sub-section, in which the specific ringer is described, for details of any special tests or adjustments. Then proceed as outlined below.

5.5.1 Mechanical Adjustments

a: The residual plate must lie flat on the rear face of the armature. Reshape the plate if necessary.

b: With the bias spring set in the low notch, nearest the coil, the armature must be firmly tensioned against the rear pole face. Bend the bias spring near its base to adjust.

c: The clapper stem must be straight and in line with the armature. Reshape the clapper stem if necessary.

d: There must be a clearance of about 1/16" between the clapper and the "B", or single, gong when the armature is held against the rear pole face. Slightly bend the rear pole face to obtain this clearance. Note that on two gong ringers the identifying letter on the "B" gong must be positioned directly above the mounting screw before making this adjustment which should result in the clapper stem being approximately in line with the notch in the frame bridge piece.

e: With the armature resting against the rear pole face there must be a clearance of .045" to .050" between the armature stud and the front pole face. Slightly bend the front pole face, at the portion parallel to the length of the magnet, to obtain the required clearance.

f: Check the stop rod, two gong ringer, or rubber cam, single gong ringer, adjustment as detailed in the individual ringer sub-section if the ringer is fitted with a volume control.

g: Slight readjustment of the "B" gong and/or clapper stem may be required in order to obtain an even, good quality ring during the electrical tests. The final adjustments, however, must meet the requirements outlined above.

5.5.2 Electrical Tests

The objective of the electrical tests is to obtain optimum balance between the forces, acting on the armature, from the bias spring and the permanent magnet. Take care to avoid demagnetization of the magnet if magnetization equipment is not available.

a: PLACE THE RINGER IN THE MAGNETIZING FIXTURE AND SATURATE THE MAGNET

b: Place the ringer in the test fixture and connect the leads to the test board, or equivalent circuitry. Switch in the 0.5 mf capacitor and switch out the resistive load.

c: Adjust the value of the series resistance to produce the specified (see individual ringer sub-section) voltages across the ringer coil and capacitor, in series, at each ringing frequency in turn. The ringer must function well withthe voltages given under the heading of "Maximum" and must ring steadily, with the clapper hitting both gongs, with the voltages given under the heading of "Minimum". With the voltages given under the heading of "Ultimate" the ringer should just tinkle with the volume control, if fitted, in the maximum loudness position. If the magnetic circuit has not been broken and the ringer has not been re-magnetized, adjustment of the bias spring tension will normally be all that is required to obtain the specified performance. If the ringer has been remagnetized it will be necessary to follow steps "d" through "e" below.

d: SWITCH THE DEMAGNETIZER TO "CHARGE" AND ADJUST THE VOLTAGE TO 60V.

e: SWITCH TO "DEMAGNETIZE" THEN RECHECK THE RINGER AS IN STEP "C". REPEAT THESE TWO STEPS, AS NECESSARY,, WITH DEMAGNETIZING VOLTAGE UP TO 70V.

f: Switch to "Dial Pulse Test" and dial a series of "0" pulses. If tinkling occurs increase the bias spring tension then recheck the sensitivity, as detailed above.

g: Set the bias spring in the high tension notch, away from the coil, then check the operation using the voltages given, in the individual ringer sub-section, for the high bias setting. If additional demagnetization is applied in order to meet the requirements with high bias recheck the sensitivity and rejection of dial pulses with the low bias setting.

h: Extreme difficulty in obtaining the correct functioning, as detailed above, is usually caused by incorrect mechanical adjustment or a coil with shorted turns. A coil mounted in a ringer should show an inductance of about 33 Henries with a dissipation factor of about 0.05 (Q about 20).

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5.6 FREQUENCY SELECTIVE RINGERS

First check the individual sub-section, in which the specific ringer is described, for details of any special tests or adjustments. Then proceed as outlined below.

5.5.1 Mechanical Adjustments

a: Slightly loosen the hexagonal head mounting screws and rotate the gongs away from the clapper, using a screwdriver through the slot in the control wheel, with its tip in one of the slots in the casting, as a lever.

b: The tuning stem must be parallel to the frame edge and the weight must be centered between the gongs of a two-gong ringer. Carefully adjust the stem near its base, if necessary.

c: If a separate clapper unit is fitted the ball must be centered between the gongs and be in line with their mounting screws on the two gong ringer or must rest 1/16" to 3/32" away from the gong and strike it within 1/8" of its edge on a single gong ringer. Slightly bend the clapper stem, forward of the angled section, to obtain these settings. Check that the clapper ball and stem are clear of the tuning weight by about 1/32". The clapper stem must rest against the rubber tubing on the tuning stem with a pressure within the range given in the individual ringer sub-section. Slightly bend the clapper stem near its base to obtain this adjustment.

d: Check that the two arms of the armature are straight and parallel to the frame; and the gaps between the armature and laminations are about equal. Damaged armatures should be replaced and not readjusted.

e: Loosen the slide plate clamping screw and adjust the eccentric screw to about the mid-point of its range. Tighten the clamping screw.

5.5.2 Electrical Tests

The objective of the electrical tests is to adjust the ringer mechanism for mechanical resonance and to set the electrical sensitivity.

a: PLACE THE RINGER IN THE MAGNETIZING FIXTURE AND SATURATE THE MAGNET.

b: Place the ringer in the test fixture and connect the leads to the test board, or equivalent circuitry. Switch in the required capacitor value, if the ringer does not have its own capacitor, as listed in Table 5-1. Switch in a series resistance of 6,000 ohms.

c: Momentarily apply ringing current at the highest frequency in the series in order to stabilize the magnet.

d: Connect ringing current at the correct frequency and adjust the tuning weight for maximum swing of the tuning stem and clapper. The range of weights commonly used on each type of ringer are given in Table 5-2. The weight must not extend more than 1/8" beyond the end of the tuning stem and must not strike the corner of the network assembly when the ringer is mounted in a telephone.

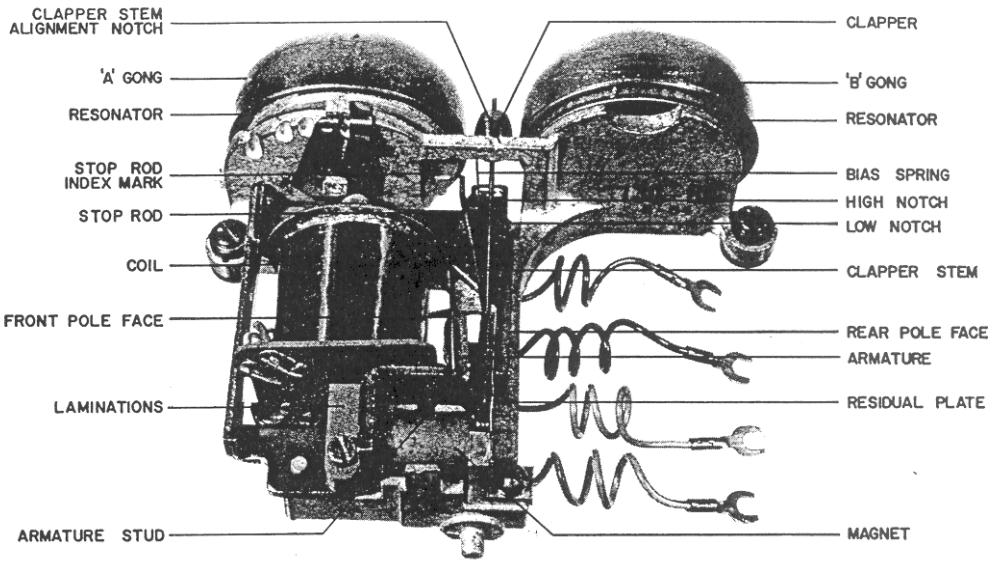
e: Switch in the resistive load. Adjust the value of the series resistance to produce the specified (see individual ringer sub-section) voltages across the ringer coil, or coil and capacitor if so stated, at the correct ringing frequency. The ringer must function well with the voltages given under the heading of "Maximum" and must ring steadily, with the clapper hitting both gongs, with the voltages given under the heading of "Minimum". With the voltages given under the heading of "Ultimate" the ringer should just tinkle with the volume control, if fitted, in the maximum loudness position. To effect the adjustments first connect ringing current to obtain the specified maximum voltage. Then rotate the gongs (see paragraph 5.5.1a for the method used) on two gong ringers, one at a time, so that the clapper strikes them uniformly. Then adjust the eccentric screw to set the sensitivity so that the ringer functions correctly at the other values of voltage. Slight readjustment of the gongs, clapper pressure, tuning weight and sensitivity may be made to obtain optimum performance. Take care not to increase the sensitivity too much as the armature will clatter when the unit is operated with zero series resistance.

f: Apply each of the other four ringing signals in the series with zero series resistance and check that cross-ringing is not present. If necessary reduce the sensitivity and re-check as detailed in step "e".

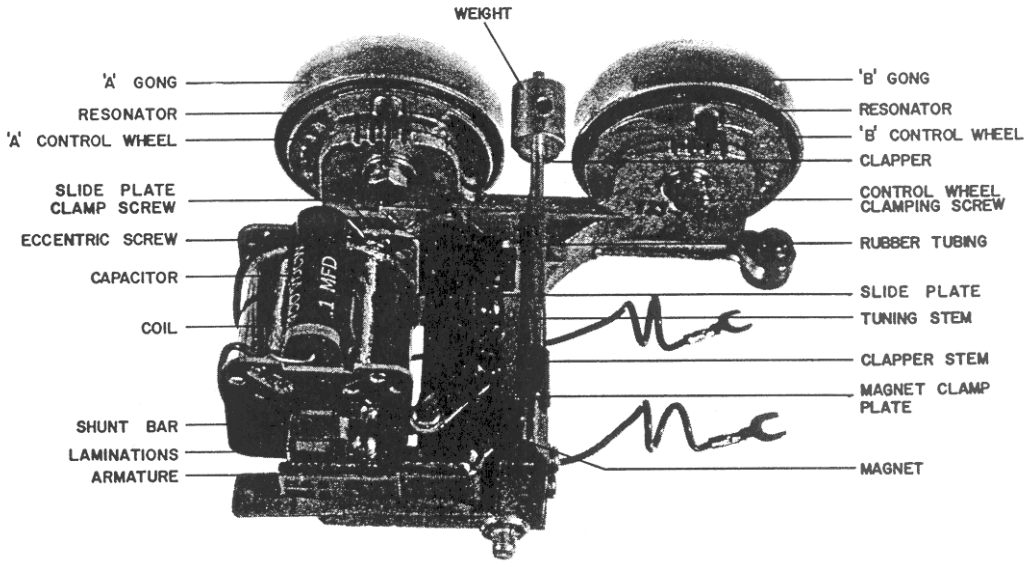
g: Switch to the dial pulse position and check that the ringer will not tinkle or bell tap while dialing a series of "0" digits.

h: Check the operation of the volume control, if fitted. See individual ringer sub-section.

i: Extreme difficulty in obtaining the correct functioning, as detailed above, is usually caused by incorrect adjustments or a coil with shorted turns. A coil mounted in a ringer should show an inductance of about 33 Henries with a dissipation factor of about 0.05 (Q about 20).



a) Straight Line Ringer



b) Frequency Selective Ringer

Fig. 5-1 IDENTIFICATION OF RINGER PARTS

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TABLE 5-1 FREQUENCY SELECTIVE RINGER CAPACITORS

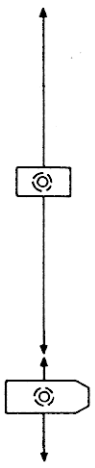
Capacitor Value	Ringer Frequencies
0.1 mf	50, 54, 60, 66, 66-2/3 cps
0.25 mf	40, 42 cps
0.35 mf	33-1/3 cps
0.5 mf	16, 16-2/3, 20, 25, 30 cps

TABLE 5-2 FREQUENCY SELECTIVE RINGER WEIGHTS

Length	Part Number	Style	Ringer Types and Frequencies		
11/32"	75585-15				
5/16"	75585-14				
3/8"	75585-13				
7/16"	75585-12		HA2 50 cps	HB4 66 cps	
1/2"	75585-11		HA3 66-2/3 cps	HC5 50 cps	
9/16"	75585-10		HB3 54 cps		HC2 60 cps
5/8"	75585-9				
11/16"	75585-8	"A"			
3/4"	75585-7				
13/16"	75585-6				
7/8"	75585-5				
15/16"	75585-4				
1"	75585-3		HA1 33-1/3 cps	HC3 30 cps	
1-1/16"	75585-2		HB2 42 cps	HC4 40 cps	
1-1/8"	75585-1				HB1 30 cps
1-1/4"	75585-16				
1-1/8"	84211-4		HA4 16-2/3 cps	HB5 16 cps	
1-3/16"	84211-3	"B"	HA5 25 cps	HC1 20 cps	
1-1/4"	84211-2				
1-5/16"	84211-1				

SEE PAGE 245.06

Weight Outline



Note: Slight variation of weight sizes, beyond the ranges shown, is permissible.

TYPE 136(--)470 AND TYPE 138(--)470 COMPACT STRAIGHT LINE RINGERS

The 136 compact ringer is a double wound coil, single gong, straight line, biased type of unit equipped with a mechanical volume control and assembled on a die-cast metal base with a molded plastic cover. The 138 ringer is identical except for the addition of a gas tube and the use of a large cover. In combination with the type 137 frequency selective ringer these units provide a complete range which meet the requirements of every need for a compact telephone line main or extension ringer. Screw terminals are provided for all lead connections. The base casting is fitted with four shock absorbing rubber feet through which the mounting screws are inserted.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Frame and Gong Assy.	190146	1	10	Terminal Board	190148-1	1
2	Support Pole Piece Assy.	75398	1	11	Rd. Hd. Mach. Screw	69778	1
3	Core Lamination	75395	* 18	12	Spacer	190141-1	1
4	Coil	180206-5	1	13	Lever Lock	190142-1	1
5a	Flat Fil. Hd. Mach. Screw	# 75409-2	2	14	Lever Stop	190143-1	1
b	Flat Fil. Hd. Mach. Screw	Ø 75409-4	2	15	Cord Retainer	190144-1	2
6	Magnet	75369	1	16	Rubber Foot	75371	4
7	Armature and Clapper Assy.	190066-1	1	17a	Cover (Type 136)	190192-1	1
8a	Rd. Hd. Lockwasher Screw	# 75408-2	4	b	Cover (Type 138)	190577-1	1
b	Rd. Hd. Lockwasher Screw	Ø 75408-4	1	18	Cabinet Lock Screw	190178-2	1
c	Rd. Hd. Mach. Screw	Ø 64127	3	19	Tube (Type 138 only)	75599	1
9	Capacitor	190440-1	1	20	Bracket (Type 138 only)	190576-1	1

NOTES: * Minimum weight of 16 grams of laminations must be used.
Items 5a and 8a used on type 136 assembly only.
Ø Items 5b, 8b and 8c used on type 138 assembly only.

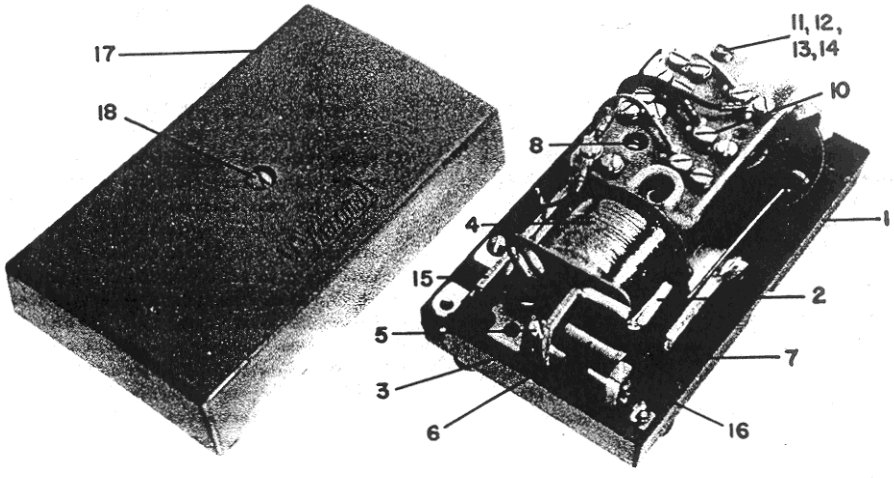


Fig. 1 TOP VIEW - COVER REMOVED

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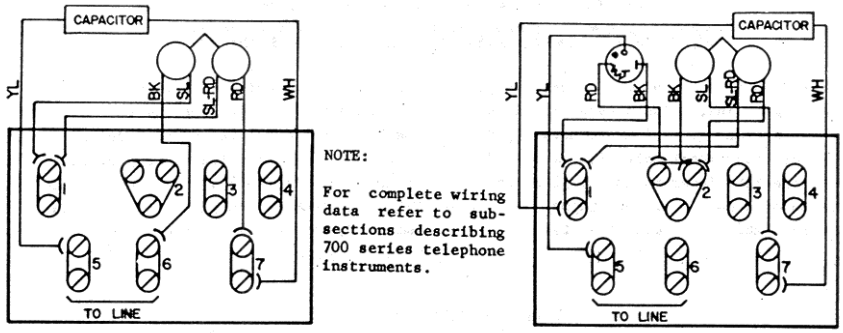

a) TYPE 136 (BRIDGED RINGING)

b) TYPE 138 (-VE RINGING)

Fig. 2 RINGER WIRING (AS SHIPPED)

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2C-RIN/GEN for complete test and adjustment-procedure.

Rubber Cam

With the control lever in the lowest volume position there must be a clearance of 1/16" between the tip of the rubber cam and the bushing of the clapper. Rotate the rubber cam on the shaft to obtain the required clearance. The top surface of the bushing of the clapper must be set between, level with and 1/32" below the top surface of the rubber cam. Bend the stem of the clapper near its base to effect this adjustment.

Lever Lock and Lever Stop

The lever lock may be set to prevent the volume control being moved from the loud position, if desired. The lever stop may be set to prevent the volume control lever from being lifted over the step of the frame into the cut-off position. No free movement of the clapper is permissible in the cut-off position.

Volume Control

Moving the volume control from the highest to the lowest position should result in a reduction in sound output of 10 db. This may be measured on a sound output meter. Slight repositioning of the rubber cam or clapper may be necessary to achieve this variation.

Sensitivity (using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil and capacitor.

Condition	Frequency	Max.V	Min.V	Ult.V
Low Bias	16 cps	44	36	26
	20 cps	63	48	37
	30 cps	88	56	40
High Bias	16 cps	67	58	47
	20 cps	87	77	61
	30 cps	120	107	81

Gas Tube

The type 138 ringer must first be checked, and adjusted if necessary, in the same manner as the type 136 ringer. Then connect the gas tube and apply the ringing signals in series with a 45 to 48 volt battery (refer to sub-section M1C-TST /RIN, for test circuit).

With the bias spring in the low tension position and the gas tube biased to conduction the ringer must function strongly with a series resistance of 10,000 ohms in circuit at frequencies of 16, 20 and 30 cps. When the gas tube is reverse biased the ringer must not function, or may tinkle very slightly, with no series resistance in circuit. It will probably be necessary to set the bias spring in the high notch in order to obtain these conditions.

TYPE 137 / 147 COMPACT FREQUENCY SELECTIVE RINGER

Type 137 is equipped with a single wound coil and type 147 is equipped with a double wound coil to provide 1000 ohm or 2650-ohm resistance for tip party identification.

In combination with types 136 and 138 provide a complete range of units which meet the requirements of every class of service for compact telephone line main or extension ringers. Screw terminals are provided for all lead connections and the base casting is fitted with shock absorbing rubber feet.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Frame and Gong Assy.	190194	1
2	Slide Plate & Lamination Assy.	75578	1
3	Binding Hd. Flat Washer Screw	84366-2	1
4	Eccentric Washer	75560	1
5	Coil	180206-5*	1
6	Shunt Bar	75566	1
7	Magnet	75562	1
8	Clamping Plate	75563	1
9	Rnd. Hd. Lockwasher Screw	79259-2	2
10	Capacitor	See Table 2	1
11	Retaining Clip	190472-1	1
12	Armature	See Table 2	1
13	Weight	See Table 2	1
14	Clapper Assy.	84215-3	1
15	Grommet	81958	1
16	Rnd. Hd. Lockwasher Screw	79259-2	4
17	Terminal Board	190188-1	1
18	Rd. Hd. Mach. Screw	75408-2	2
19	Cord Retainer	190181-1	1
20	Flat Fil. Hd. Mach. Screw	75409-2	1
21	Rubber Foot	75371	3
22	Cover	190197-2	1
23	Cabinet Lock Screw	190178-2	1
24	Binding Hd. Machine Screw	75576-2	1
25	Rubber Tubing (For Tuning Stem)	84217	1
26	Headless Set Screw	58687	1

Table 2 FREQUENCY SELECTIVE PARTS

Code	Frequency	Armature	Weight	Capacitor
HA1	33-1/3	75584-15		190440-3
HA2	50	75584-16		190440-5
HA3	66-2/3	75584-17		190440-5
HA4	16-2/3	75584-13		190440-4
HA5	25	75584-18		190440-4
HB1	30	75584-15		190440-4
HB2	42	75584-16		190440-2
HB3	54	75584-16		190440-5
HB4	66	75584-17		190440-5
HB5	16	75584-13		190440-4
HC1	20	75584-14		190440-4
HC2	60	75584-17		190440-5
HC3	30	75584-15		190440-4
HC4	40	75584-16		190440-2
HC5	50	75584-16		190440-5

NOTE: Refer to section 245 for detailed information on weight sizes and type numbers.

* Single-wound coil is no longer manufactured

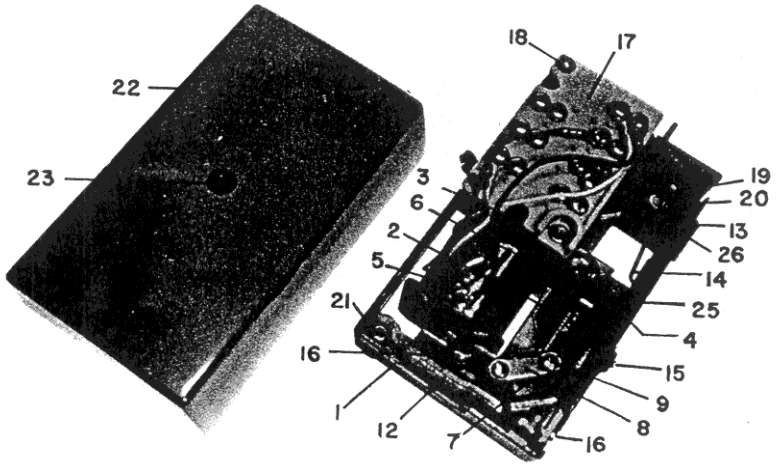

Fig. TOP VIEW - COVER REMOVED

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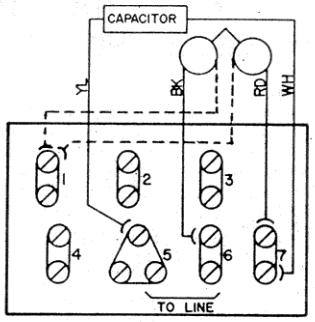

Broken lines apply to 147 only

NOTE: For complete wiring data refer to sub-sections describing 700 series telephone instruments.

Fig. 2 RINGER WIRING (AS SHIPPED)
(BRIDGED RINGING)

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2C-RIN/GEN for complete test and adjustment procedure.

Clapper Pressure

The pressure of the clapper stem against the rubber sleeve on the tuning stem must be set within the following ranges:

Ringer Frequency	Pressure	
16, 16-2/3, 20, 25 cps	0-1 ozs	0-30 grams
30, 33-1/3 cps	0-3 ozs	0-90 grams
40, 42, 50, 54, 60, 66, 66-2/3 cps	3-5 ozs	90-150 grams

The pressure must be measured at the top of the angled portion of the clapper stem.

Volume Control (Damper)

The sleeve on the volume control lever must rest tightly against the gong in the quiet position and must be clear of the gong in the loud position. Reshape the tip of the lever if necessary.

Sensitivity (using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil and capacitor.

Code	Frequency	Max.V	Min.V	Ult.V
HA1	33-1/3 cps	33	25	20
HA2	50 cps	80	68	56
HA3	66-2/3 cps	77	60	54
HA4	16-2/3 cps	24	17	12
HA5	25 cps	34	25	18
HB1	30 cps	42	33	22
HB2	42 cps	44	32	23
HB3	54 cps	76	63	50
HB4	66 cps	66	57	52
HB5	16 cps	20	14	8
HC1	20 cps	28	21	15
HC2	60 cps	90	79	58
HC3	30 cps	42	33	22
HC4	40 cps	47	35	28
HC5	50 cps	80	68	56

TYPE 139(--)470 EXTENSION RINGER

The 139 ringer is designed for use as an extension unit, it may be used as the main ringer if the telephone is not equipped with an internal ringer. The assembly consists of a type 130, 131 or 133 ringer mounted on a steel baseplate and protected by a molded, snap-on plastic housing. External connections are made to a terminal block mounted on the baseplate which is provided with mounting holes. Units fitted with type 130 or 131 ringer assemblies are equipped with volume controls.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Baseplate	84362-1	1
2	Terminal Board	190148-1	1
3	Rd. Hd. Mach. Screw	61906	2
4	Cable Hanger	78825-3	1
5	Bind. Hd. Mach. Screw	75392-3	1
6	Fastener Stud	79753-2	1
7	Link (only with freq. sel. rin)	79754	1
8	Fastener Stud (for item 7)	79753-1	1
9	Gas Tube (only with TBA ringer)	75599	1
10	Ringer	See Table 2	1
11	Capacitor Assembly	See Table 2	1
12	Cover	84259-1	1

Notes for Table 2

1. For ringer with volume control replace * by "W" and ** by "156".
2. For ringer less volume control replace * by "L" and ** by "157".

Table 2 RINGERS AND CAPACITORS

Code	Frequency	Ringer	Capacitor
LR	-	None	190440-6
BA	20	130(BA)470	190440-7
TBA	20	130(BA)470	190440-7
*A1	33-1/3	**(HA1)470	None
*A2	50	**(HA2)470	None
*A3	66-2/3	**(HA3)470	None
*A4	16-2/3	**(HA4)470	190440-6
*A5	25	**(HA5)470	190440-6
*B1	30	**(HB1)470	190440-6
*B2	42	**(HB2)470	None
*B3	54	**(HB3)470	None
*B4	66	**(HB4)470	None
*B5	16	**(HB5)470	190440-6
*C1	20	**(HC1)470	190440-6
*C2	60	**(HC2)470	None
*C3	30	**(HC3)470	190440-6
*C4	40	**(HC4)470	None
*C5	50	**(HC5)470	None

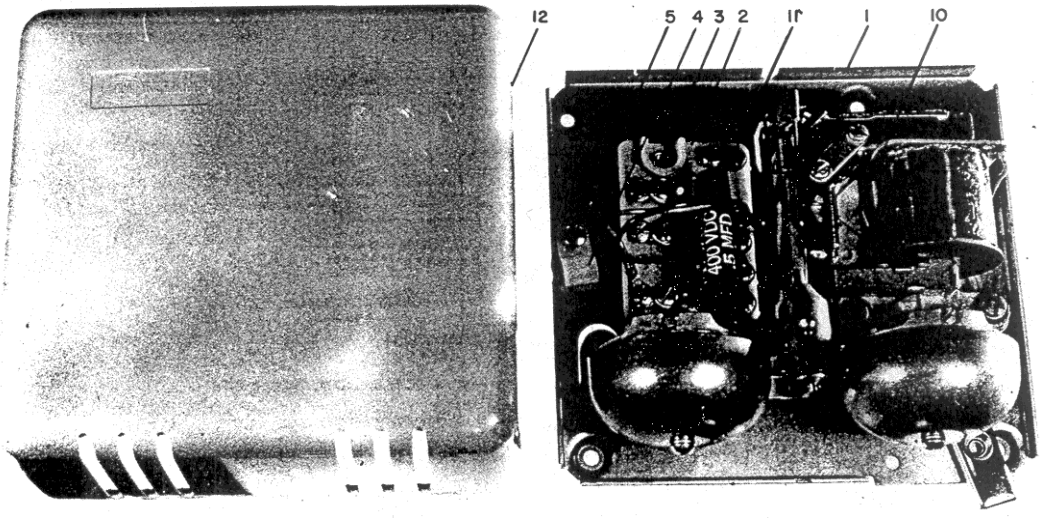

Fig. 1 TOP VIEW - COVER REMOVED

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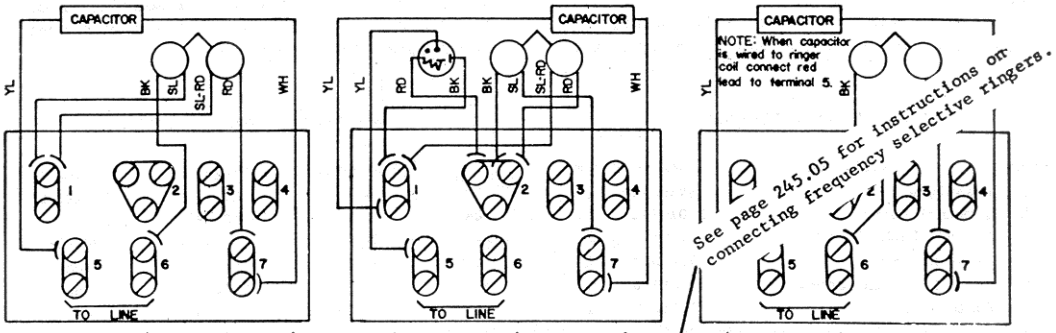
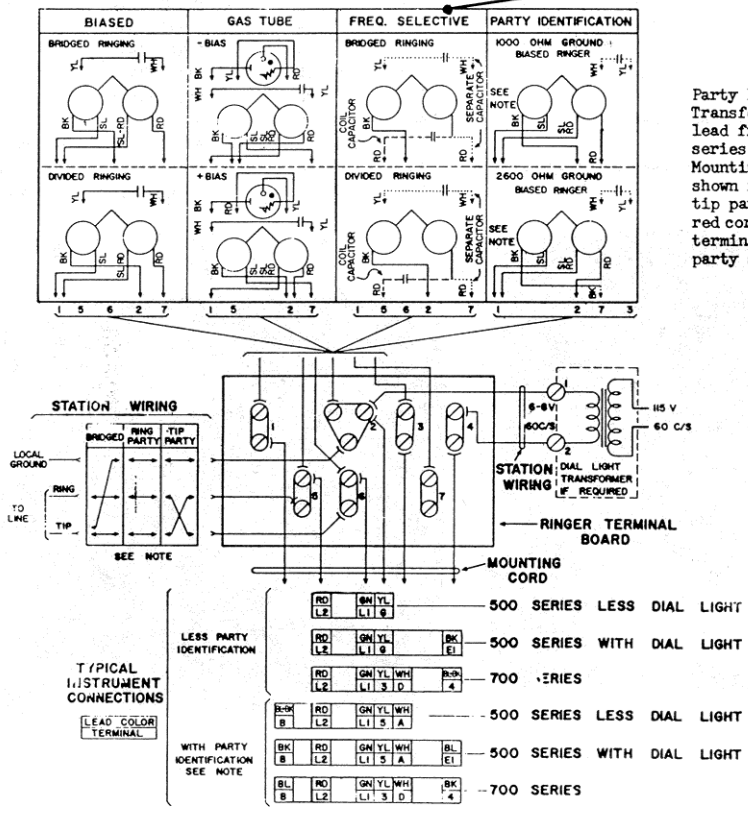
The cover of the assembly is removed by loosening the screw on the top edge of the cover, pulling the bottom of the cover away from the base then lifting the cover clear of the baseplate.

Refer to the appropriate descriptive sub-section for specific details of each of the ringer units which may be fitted in the type 139 extension ringer housing.



a) BA RINGER (Bridged Ringing) b) TBA RINGER (-ve Ringing) c) FS RINGER (Bridged Ringing)

Fig. 2 RINGER WIRING (AS SHIPPED)



NOTE

Party Identification: Transfer slate hook switch lead from L2 to A on 500 series telephone network. Mounting cord connections shown for ring party. For tip party reverse green and red cord conductors on ringer terminal board and use ring party station wiring.

Fig. 3 RINGER INSTALLATION WIRING

TYPE 75(--)301 EXTENSION RINGER

The 75(--)301 extension ringer is a loud ringing type designed for indoor or outdoor installation in noisy locations. It consists of a wall bracket supporting a horizontal base plate which has two, four inch diameter gongs mounted below it and the ringer mechanism mounted vertically above it. A rustproof, weather tight cover protects the ringer mechanism which is available in a range of types covering all ringing frequencies. The assembly is mounted with two screws through the wall bracket.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Bracket	79929	1
2	Baseplate	79926	1
3	Hex. Hd. Lockwasher Screw	79258-2	1
4	Gong (B)	79934	1
5	Gong (A)	79935	1
6	Bushing (Gong B)	79936	1
7	Washer (Gong B)	57171	1
8	Washer (Gong A)	242-2	1
9	Hex. Hd. Lockwasher Screw	79258-3	2
10	Washer	63990	2
11	Hex. Hd. Lockwasher Screw	79258-5	2
12	Terminal Strip	72233-5	1
13	Lockwasher - internal teeth	63988	2
14	Rd. Hd. Mach. Screw	64567	2
15	Cover	79923	1
16	Spring Washer	54368	3
17	Cabinet Lock Screw	75486-3	3
18	Ringer	See Table 2	1
19	Capacitor	See Table 2	1
20	Tubing (for item 19 leads)	71613	2

Table 2 RINGERS AND CAPACITORS

Code	Frequency	Ringer	Capacitor
BA	20	79938	75593-4
HA1	33-1/3	79939-1	75593-3
HA2	50	79939-2	75593-1
HA3	66-2/3	79939-3	75593-1
HA4	16-2/3	79939-4	75593-4
HA5	25	79939-5	75593-4
HB1	30	79939-6	75593-4
HB2	42	79939-7	75593-2
HB3	54	79939-8	75593-1
HB4	56	79939-9	75593-1
HB5	16	79939-10	75593-4
HC1	20	79939-11	75593-4
HC2	60	79939-12	75593-1
HC3	30	79939-13	75593-4
HC4	40	79939-14	75593-2
HC5	50	79939-15	75593-1

Illustration shows type 133(--)470 ringer installed in housing.

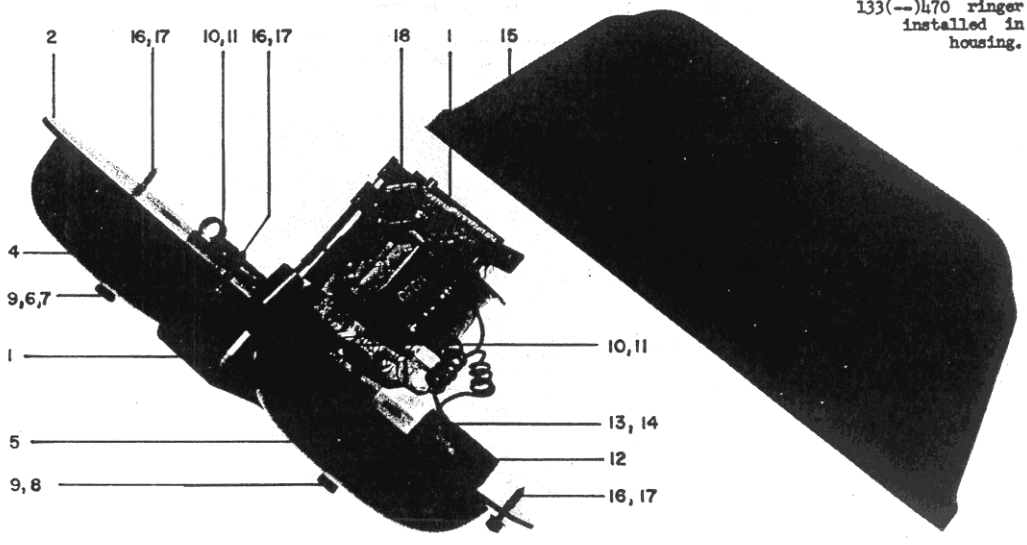


Fig. 1 FRONT VIEW - COVER REMOVED

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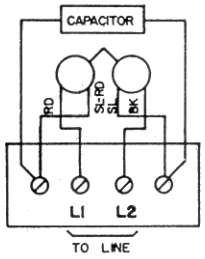
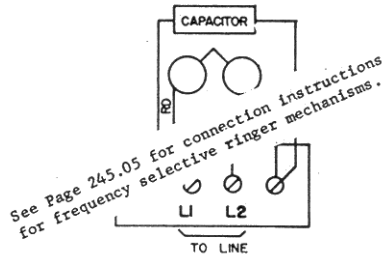
The cover of the ringer assembly may be lifted off after the three cabinet lock screws are loosened. If it is necessary to disassemble a ringer unit, take care to replace the gongs and mounting washers correctly (see Fig. 1 and Table 1).

Complete adjustments for the ringer mechanisms are given in the sub-sections indexed by the mechanism type number. It is necessary, however, for the mechanism to be mounted in a housing, complete with gongs, before it can be adjusted.



a) BA Ringer



b) FS Ringer

Fig. 2 WIRING DIAGRAMS

SPECIAL ASSEMBLIES

The 75(--)301 ringer is only supplied with either the 79938 or 79939 ringer installed or less ringer unit. It is possible to mount the following ringer types in the type 75 housing, however, the desired ringer and housing must be ordered separately:

131	141	145	156
133	142	146	157

These ringers are mounted on the baseplate in the same manner as types 79938 and 79939 after the gongs, resonators and control wheels have been removed.

It is not possible to mount ringers type 130(--)470 in the type 75 housing without considerable modification to the ringer frame.

TYPE 79938 STRAIGHT LINE RINGER MECHANISM

The 79938 ringer mechanism is a double wound coil, straight line, biased type of unit without gongs. It is assembled on an open die-cast metal frame. In combination with type 79939 frequency selective ringer mechanism it provides a range of telephone line ringer mechanisms for use with separately mounted gongs. Flexible wire leads are provided for the coil connections of the mechanism and the frame is provided with a number of alternative mounting holes.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Mounting Frame	79931	1
2	Coil	180206-1	1
3	Magnet	75369	1
4	Pole Piece Assembly	75398	1
5	Core Lamination	75395	*18
6	Rd. Hd. Lockwasher Screw	75408-2	1
7	Flat Fil. Hd. Mach. Screw	75409-2	2
8	Clapper Assembly	75393	1

* Minimum weight of 16 grams of laminations must be used.

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to section 240 for test and adjustment procedure.

Sensitivity (Using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil and capacitor.

Condition	Frequency	Max.V	Min.V	Ult.V
Low Bias	16 cps	44	36	26
	20 cps	63	48	37
	30 cps	88	56	40
High Bias	16 cps	67	58	47
	20 cps	87	77	61
	30 cps	120	107	81

NOTE: The ringer mechanism must be assembled on a suitable base, complete with gongs, in order to carry out the adjustment procedure.

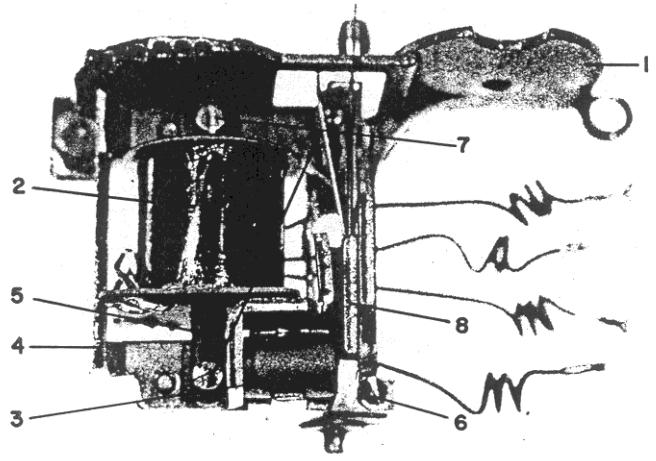


Fig. 1 TOP VIEW

TYPE 130(--)470 STRAIGHT LINE RINGER

The 130 ringer is a double wound coil, two gong, straight line, biased type of unit equipped with a mechanical volume control and assembled on an open, die-cast metal frame. In combination with types 131, 133, 141 and 142 frequency selective ringers it provides a complete range of units which meet the requirements of every class of telephone line ringer. Flexible wire leads are provided for the coil connections of the ringer. The unit is mounted to the telephone instrument base by a locating stud and two screws, each with a shock absorbing rubber bush.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Mounting Frame Assy.	75388	1
2	Gong (A)	75396	1
3	Gong (B)	75397	1
4	Resonator	75372	2
5	Rd. Hd. Lockwasher Screw	75408-2	3
6	Support Pole Piece Assy.	75398	1
7	Core Lamination	75395	* 18
8	Coil	180206-1	1
9	Flat Fil. Hd. Mach. Screw	75409-2	2
10	Magnet	75369	1
11	Armature & Clapper Assy.	75393	1
12	Rubber Foot	75371	2
13	Mounting Screw	75366	2

* Minimum weight of 16 grams of laminations must be used.

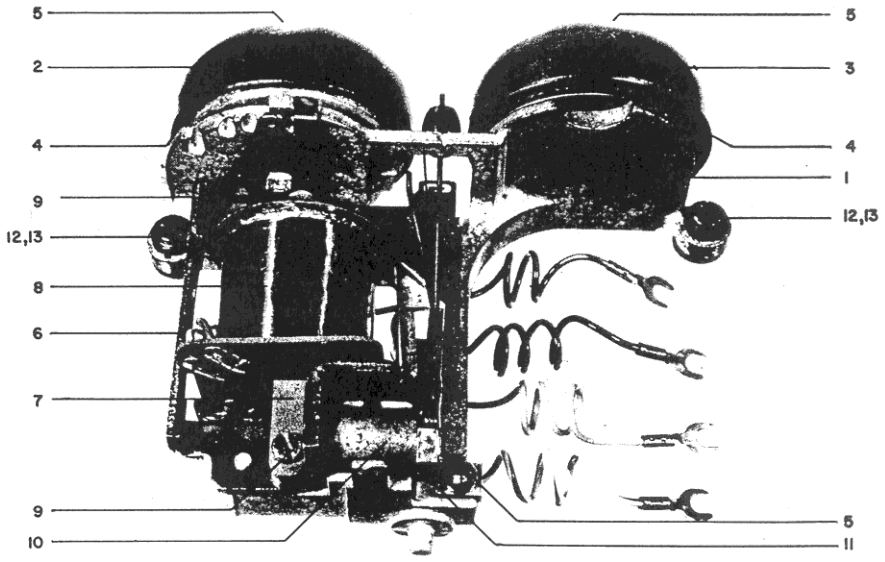


Fig. 1 TOP VIEW

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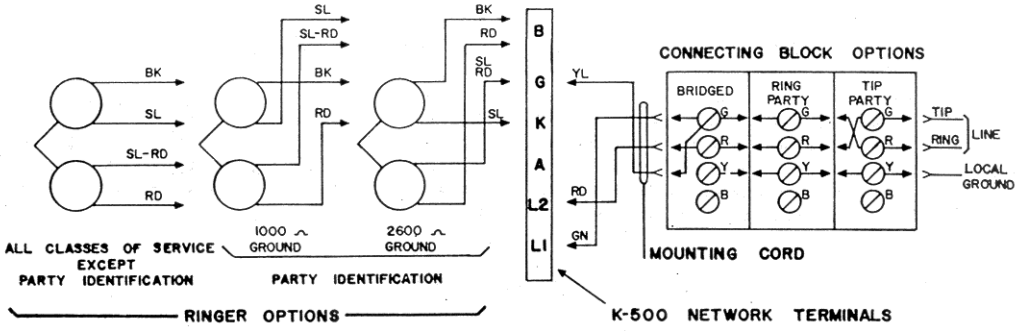

Fig. 2 TYPICAL WIRING DIAGRAMS

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2C-RIN/GEN for complete test and adjustment procedure.

Stop Rod

Rotate the "A" gong to the minimum loudness position. The stop rod must line up with the reference mark on the eccentric cam and, with the armature operated, must strike the rim of the cam in all volume positions except maximum loudness so that the clapper is held 1/16" away from the "A" gong. Bend the rod near its base to obtain these adjustments. Check that the stop rod does not touch the bias spring bracket or the "A" gong.

Ringer Cut-off

With the stop tab on the detent spring bent away from the frame and the control wheel rotated to the cut-off position check that the stop rod rests on the eccentric cam and prevents movement of the armature assembly.

Sensitivity(Using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil and capacitor.

Condition	Frequency	Max.V	Min.V	Ult.V
Low Bias	16 cps	44	36	26
	20 cps	63	48	37
	30 cps	88	56	40
High Bias	16 cps	67	58	47
	20 cps	87	77	61
	30 cps	120	107	81

Volume Positions

The adjusted ringer must function in such a manner that both gongs are equally audible in the three loudest positions of the volume control when the maximum voltages specified above are applied. This same condition is desirable, but not essential, in the lowest volume position of the control.

TWO-GONG FREQUENCY SELECTIVE RINGERS (TYPES 131, 133; 141, 142; 145, 146; 156, 157) and no. 79939 FREQUENCY SELECTIVE MECHANISM

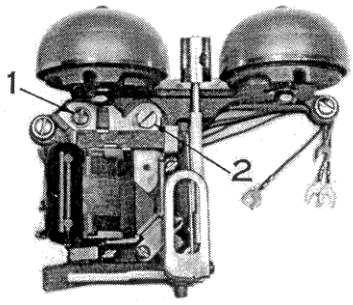

Figure 1. Type 156 Ringer
(1) Lockscrew
(2) Adjusting Cam

1. GENERAL

Ringers are two-gong, high-impedance, frequency selective type units with all components assembled on an open die-cast metal frame. Adjustment for sensitivity is facilitated by a slotted adjusting cam washer and locked by a separate lock screw. Provided with shock mounting grommets and mounting screws.

The 79939 frequency selective mechanism is identical to the ringers less gongs, resonators, wheels, volume control, mounting grommets and screws. Attaching hardware is included.

2. IDENTIFICATION

Each unit is identified by a code number and a frequency stamped in ink on the frame.

Type 131. Has single wound coil and volume control. No identifying ground. Manufacture discontinued; superseded by type 156.

Type 133. Same as type 131 except less volume control. Manufacture discontinued; superseded by type 157.

Type 141. Has double wound coil and volume control. Provides 1,000-ohm resistance to ground when required for TIP party identification. Manufacture discontinued; superseded by type 156.

Type 142. Same as type 141 except less volume control. Manufacture discontinued; superseded by type 157.

Type 145. Has double-wound coil and volume control. Provides 2650-ohm resistance to ground when required for TIP party identification. Manufacture discontinued; superseded by type 156.

Type 146. Same as type 145 except less volume control. Manufacture discontinued; superseded by type 157.

Type 156. Has double wound coil and volume control. Provides 1,000-ohm or 2,650-ohm resistance to ground, (at installer's option), when required for TIP party identification.

Type 157. Same as type 156 except less volume control.

No. 79939 FREQUENCY SELECTIVE MECHANISM. Designed for use in type 75 loud ringing bell. Units with 2-lead coil have been superseded by units with 4-lead coil.

NOTE: Types 131, 141 and 145 can be modified to type 156, and types 133, 142 and 146 can be modified to type 157 by installing the appropriate 180206-series coil. See Table II.

TABLE I. ORDERING INFORMATION

CODE	DESCRIPTION/FREQUENCY	
156( )470	Ringer (See description above)	
157( )470	Ringer (See description above)	
	HARMONIC	MECHANISM ONLY
(HA1)	33 1/3 cps	79939-1
(HA2)	50 cps(Same as HC5)	79939-2 or -15
(HA3)	66 2/3 cps	79939-3
(HA4)	16 2/3 cps	79939-4
(HA5)	25 cps	79939-5
	SYNCHROMONIC	
(HB1)	30 cps (Same as HC3)	79939-6 or -13
(HB2)	42 cps	79939-7
(HB3)	54 cps	79939-8
(HB4)	66 cps	79939-9
(HB5)	16 cps	79939-10
	DECIMONIC	
(HC1)	20 cps	79939-11
(HC2)	60 cps	79939-12
(HC3)	30 cps (Same as HB1)	79939-13 or -6
(HC4)	40 cps	79939-14
(HC5)	50 cps (Same as HA2)	79939-15 or -2

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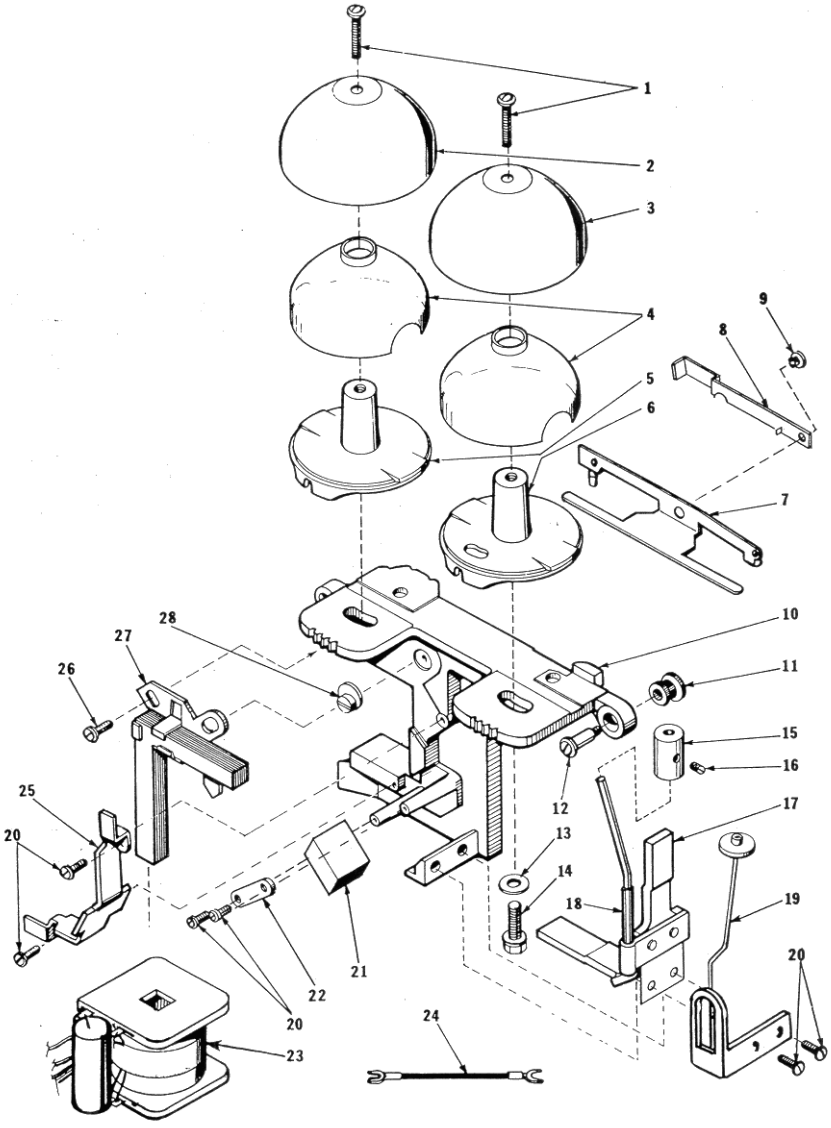


Figure 2. Two-Gong Frequency Selective Ringers-Exploded View
(Types 131, 133, 141, 142, 145, 146, 156, and 157)

Figure 4. Ringer Connections, 500 Type Telephone

	Ringers with 2 leads								Ringers with 4 leads															
													33 1/3 thru 66 2/3 cps											
	16 thru 30 cps				33 1/3 - 66 2/3cps				16 thru 30 cps				141, 142				145, 146				156, 157			
Ringer Coil Schematics →	A B Strap				A B				A B				A B				A B				A B			
Color of Ringer Lead	R			Bk	R	-	-	Bk	R	S-R	S	Bk	R	S-R	S	Bk	R	S-R	S	Bk	R	S-R	S	Bk
Bridged* or Divided	L2	G	A	K	L2	-	-	G	L2	A	K	G	L2	K	K	G	L2	K	K	G	L2	**	**	G
TIP Party 1000 ohm ANI#									K	B	B	G	A	B	B	G					A	**	B	G
TIP Party 2650 ohm ANI#									G	B	B	K					G	B	B	A	G	B	**	A

* For bridged ringing, connect YELLOW lead of mounting cord to "G" terminal at connecting block
** Insulate and store lead
# Move SLATE hookswitch lead from "L2" to "A" terminal of telephone network
A - 2650-ohm winding (DC resistance)
B - 1000-ohm winding (DC resistance)

{Refer to appropriate telephone circuit label for connecting inside wire and telephone mounting cord.

Figure 5. Ringer Connections in 139 Type Ringer Box

	Ringers with 2 leads								Ringers with 4 leads															
													33 1/3 thru 66 2/3 cps											
	16 thru 30 cps				33 1/3 thru 66 2/3 cps				16 thru 30 cps				141, 142				145, 146				156, 157			
Ringer Coil Schematics →	A B				A B				A B				A B				A B				A B			
Color of Leads	R	W	Y	Bk	R	-	-	Bk	R	S-R	S	Bk	W	Y	R	S-R	S	Bk	R	S-R	S	Bk	R	S-R	S	Bk
Bridged Ringing	7	7	5	6	5	-	-	6	7	1	1	6	7	5	5	1	1	6	5	1	1	6	5	*	*	6
Divided Ringing	7	7	5	2	5	-	-	2	7	1	1	2	7	5	5	1	1	2	5	1	1	2	5	*	*	2
TIP Party 1000 ohm ANI**									7	1	1	2	7	3	5	1	1	2					3	*	1	2
TIP Party 2650 ohm ANI**									2	1	1	7	7	3					2	1	1	3	2	1	*	3

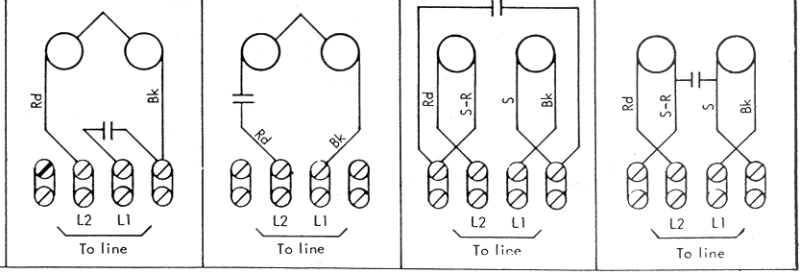
* Insulate and store lead
** For TIP party identification, transfer SLATE hookswitch lead from L2 to A on 500 type telephone network - Terminal 1 must be connected to "B" terminal of 500 type telephone network
A - 2650 ohm winding (DC resistance)
B - 1000 ohm winding (DC resistance)

NOTE: Refer to page 242.32 or circuit label No. 21619 for connecting inside wire and telephone mounting cord.

Figure 6.

Ringer mechanism connections in 75 type loud ringing bell.

Mechanism with 2 leads		Mechanism with 4 leads	
16 thru 30 cps	33 1/3 - 66 2/3 cps	16 thru 30 cps	33 1/3 - 66 2/3 cps



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4. REPLACING RINGER COIL (Figure 2)

(a) Removal of Coil

(1) Note position of adjusting cam (28) for purpose of reassembly.

(2) Remove lockscrew (26).

(3) Loosen the two screws (20) that secure the shunt bar (25) and loosen the shunt bar.

> CAUTION
> Do not remove the shunt bar as the magnet will be weakened

(4) Remove the lamination assembly (27) and coil assembly (23).

(b) Installation of Coil

(1) Select proper coil and install on lamination assembly with RED and SLATE-RED lead terminals toward gongs.

(2) Install adjusting cam if displaced in coil removal operation.

(3) Insert lamination assembly under shunt bar ends.

(4) Replace lockscrew (26) but do not tighten.

(5) Rotate adjusting cam several times to assure proper seating of slide plate assembly, then position it to approximate position previously noted.

(6) Tighten slide plate lockscrew (26) and shunt bar screws (20).

(7) When ringer is installed in a telephone in the field, the ringer may need readjusting for optimum performance. This adjustment is made with the adjusting cam. Loosen lock-screw (26) and shunt bar screws (20) slightly. Rotate the cam clockwise to increase sensitivity and counterclockwise to decrease sensitivity. Tighten the lockscrew and shunt bar screws after adjustment.

TABLE V. RINGER WEIGHTS

LENGTH			
BRASS	STEEL	PART NO.	FREQUENCY RANGE
1 5/16	-	84211 - 1	For 16 thru 25 cps
1 1/4	-	84211 - 2	
1 3/16	-	84211 - 3	
-	1 1/4	88495 - 16	
-	1 1/8	88495 - 1	
-	1 1/16	88495 - 2	
-	1	88495 - 3	For 30 thru 42 cps
-	15/16	88495 - 4	
-	7/8	88495 - 5	
-	13/16	88495 - 6	
-	3/4	88495 - 7	
-	11/16	88495 - 8	
-	5/8	88495 - 9	For 50 thru 66 2/3 cps
-	9/16	88495 - 10	
-	1/2	88495 - 11	
-	7/16	88495 - 12	
-	3/8	88495 - 13	
-	11/32	88495 - 15	
-	5/16	88495 - 14	

NOTE: Weights may be used slightly beyond the ranges shown

SPECIFIC TEST AND ADJUSTMENT DATA

NOTE: Refer to section 240 for complete test and adjustment procedure.

Clapper Pressure

The pressure of the clapper stem against the rubber sleeve on the tuning stem must be set within the following ranges:

Ringer Frequency	Pressure	
16, 16-2/3, 20, 25 cps	0-2 ozs	0-60 grams
30, 33-1/3 cps	1-3 ozs	20-90 grams
40, 42 cps	2-3 ozs	60-90 grams
50, 54 cps	3-4 ozs	90-120 grams
60, 66, 66-2/3 cps	3-5 ozs	90-150 grams

The pressure must be measured at the top of the angled portion of the clapper stem.

Volume Control (Damper)

In the high position both snubbers must be clear of the gongs.

In the middle position the snubber must rest firmly on gong "B".

In the low position both snubbers must rest firmly against their respective gongs.

Bend the spring arms carrying the snubbers to effect the adjustments.

Sensitivity(Using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil only for the 16 thru 25 cycle ringers and across the coil and capacitor for the 30 thru 66-2/3 cycle ringers.

Code	Frequency	Max.V	Min.V	Ult.V
HA1	33-1/3 cps	33	25	20
HA2	50 cps	80	68	56
HA3	66-2/3 cps	77	60	54
HA4	16-2/3 cps	24	17	12
HA5	25 cps	34	25	18
HB1	30 cps	42	33	22
HB2	42 cps	44	32	23
HB3	54 cps	76	63	50
HB4	66 cps	66	57	52
HB5	16 cps	20	14	8
HC1	20 cps	28	21	15
HC2	60 cps	90	79	58
HC3	30 cps	42	33	22
HC4	40 cps	47	35	28
HC5	50 cps	80	68	56

TYPES 148 AND 153 STRAIGHT LINE RINGERS

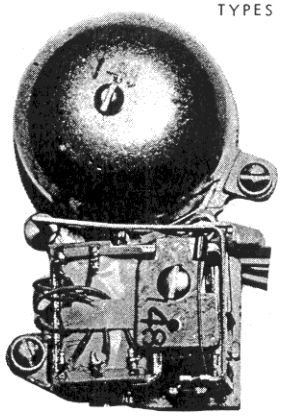

Figure 1. Type 148 Ringer

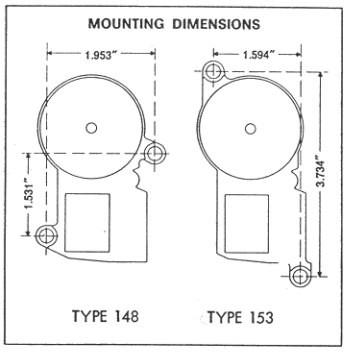

Figure 2. Location of mounting holes

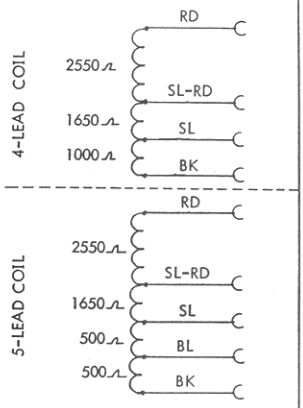

Figure 3. Schematics of ringer coils

1. GENERAL

The 148 and 153 ringers are single gong biased type units of miniature design, assembled on a die cast frame and equipped with mechanical volume control. The ringer coil is single wound and multi-tapped for party identification.. The 148 and 153 ringers are identical except for location of mounting holes. They are used in series with a. 47 mf. capacitor. (The capacitor is included with all 153 ringers but not with 148 ringers as the K-2554 and "Corinthian" phones include the capacitor).

1.1. VOLUME CONTROL

The volume control has been manufactured in two styles. The old style uses a wire spring mounted on the volume control lever. The current styles uses a flat spring which is staked to the ringer frame.

1.2. RINGER COIL

The ringer coil has been manufactured in two styles. The old style coil has four leads with 1000-ohm and 2650-ohm taps. The current style coil has five leads with 500-ohm, 1000-ohm, and 2650-ohm taps. The 5-lead coil is standard.

1.3. LAMINATION ASSEMBLY

Early models of the 148 and 153 ringers used two push nuts (7, figure 2) to hold the lamination assembly in place. Current models use L-shaped retainers, (7A, figure 4) for this purpose. The L-shaped retainers are recommended for any replacement purposes.

2. IDENTIFICATION

Each ringer is identified by a code number stamped in ink on the retaining plate.

Type 148 ringer is designed for use in the K-1554 and K-2554 "Tel-Touch" telephones

Type 148 E ringer is designed for use in the Corinthian multi-key telephones

Type 153 ringer is designed for use in the Trendline, (dial-in-handset), telephones

3. INSTALLATION

Two tapped blocks are provided on the telephone bases to accept the ringer mounting screws. When installing a ringer in a wall phone, (K-2554 or Trendline wall phone), be sure the stud of the volume control lever on the ringer rests in the slot of the volume control arm on the base.

4. CONNECTIONS

Connect the ringer leads as shown on the wiring diagram for the specific telephone and the specific application.

5. ADJUSTMENT

5.1. BIAS SPRING ADJUSTMENT

The ringer is shipped with the bias spring in the high bias position. (Notch "A" in figure 2). The ringer should be used in this position on very short loops. On longer loops, move the bias spring to low bias position, (notch "B" in figure 2). (Bias spring floats in low bias position.)

5.2. VOLUME CONTROL ADJUSTMENT

There are two positions on the volume control, High and Low.

6. MAINTENANCE

6.1. INSPECTION

If ringer fails, check that all leads are properly connected; air gap between armature and magnet is free of foreign material; bias spring is correctly positioned; gong is not obstructed; ringer coil is not open or shorted; and clapper to gong clearance is .010 to .020 inch, (adjust by rotating gong).

6.2 COIL REPLACEMENT (Figure 4)

Be sure to have an adequate supply of Retainers (7A) before proceeding as they may be damaged during removal. Index gong by marking gong and frame. Remove screw (8), gong (9), spacer washer, and resonator (10). Use a screwdriver and work retainers (7A) out. Remove laminations, roll coil out and roll new coil in, install laminations. Use slip-joint pliers or similar tool and install retainers (7A) one at a time. Install resonator, washer, gong and screw. Rotate to align index marks and tighten gong mounting screw.

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TABLE I. RINGER CHARACTERISTICS

(1) SENSITIVITY (Minimum Ringing Voltage):
Low bias position - **60v rms**
High bias position - **90v rms**

(2) COIL RESISTANCE, DC: - 5200 ohms

(3) IMPEDANCE:
Audio @ 400 hz - 90,000 ohms min.
@ 1,000 - hz - 200,000 ohms min.
@ Ringing Frequency - 8,000 ohms min.

(4) SOUND OUTPUT, (Measured at one meter)
60 to 65 db, relative to .0002 dy/cm^2

(5) LOOP CAPABILITY,
Two bridged, low bias position - 3,000 ohm

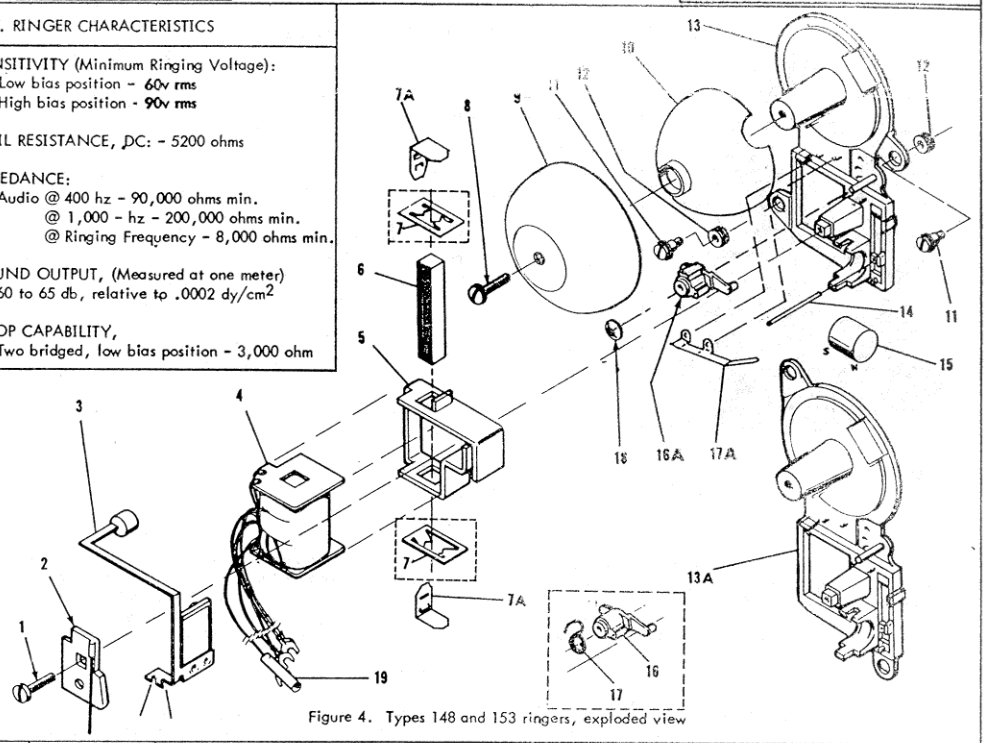

Figure 4. Types 148 and 153 ringers, exploded view

FIGURE NO.	INDEX NO.	PART NUMBER	NAME, Description (Indented items are included in the part under which they are indented)	QUANTITY USED ON: 148	148E	153
			TABLE II. ORDERING INFORMATION AND REPLACEABLE PARTS LIST			
		148 (BA) 470	Ringer, straight line biased, (For K-2554 telephones)	-		
		148E (BA) 470	Ringer, straight line biased, (For Corinthian multi-key phones)			
		153 (BA) 470	Ringer, straight line biased, (For Trendline telephones)			
		95995-003	Capacitor, (Not Shown)	1	1	1
		180300-1	Dust Cover, (Not Shown)	1	1	1
	1	63786 - 1	Screw, BHM	1	1	1
	2	88214-1	Retaining Plate Assembly	1	1	1
	3	88186-1	Armature and Clapper Assembly	1	-	1
	3	88186-2	Armature and Clapper Assembly	-	1	-
	4	180208 - 1	Coil Assembly (Has 5 leads)	1	1	1
	5	88174-1	Support Pole Piece	1	1	1
	6	88208-1	Lamination (Min. weight 9 3/4 grams)	18	18	18
	7	-	Nut, Push (Superseded by item 7A)	2	2	2
	7A	95969-1	Retainer, Lamination	2	2	2
	8	75408-2	Screw, Round Head Lockwasher	1	1	1
	9	75396-001	Gong	1	1	1
		60629 - 1	Washer	1	1	1
	10	75372 - 1	Resonator	1	1	1
	11	95966-2	Screw, special; (Ringer Mounting)	2	2	2
	12	88209-1	Grommet	2	2	2
	13	88177-2	Frame, 148 ringer	1	1	-
	13A	88177-3	Frame, 153 ringer	-	-	1
	14	88217-1	Pin	1	1	1
	15	88197-1	Magnet, (Not Magnetized)	1	1	1
	16	88173-1	Lever, Ringer Tone, (Old Style)	-	-	-
	16A	88885-1	Lever, Ringer Tone, (New Style)	1	1	1
	17	88184-1	Spring, Volume Control, (Old Style)	1	1	1
	17A	88884-1	Spring, Volume Control, (New Style), Stabilizer	1	1	1
	18	95972-1	Nut, Push	1	1	1
	19	88213-1	Sleeve, Insulating	1	1	1

TYPES 151 AND 152 FREQUENCY SELECTIVE RINGERS

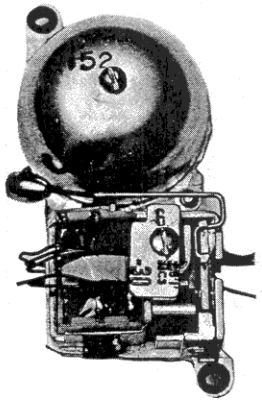

Figure 1. Type 152 Ringer

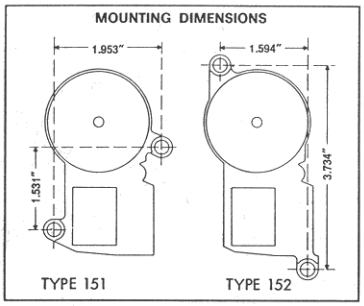

Figure 2. Location of mounting holes

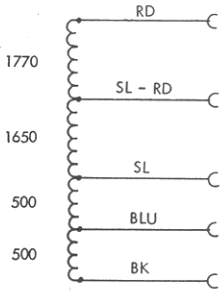

Figure 3. Schematic of ringer coil

1. GENERAL

The 151 and 152 ringers are single gong frequency selective units of miniature design, assembled on a die cast frame and equipped with mechanical volume control. The ringer coil is single wound and multi-tapped for party identification. The 151 and 152 ringers are identical except for location of mounting holes. They are used in series with a matching capacitor. (The capacitor is packed with each ringer when required.

1.1 RINGER COIL

The ringer coil has been manufactured in two styles. The old style coil has four leads with 1000-ohm and 2650-ohm taps. The current style coil has five leads with 500-ohm, 1000-ohm, and 2650-ohm taps. The 5-lead coil is standard.

2. IDENTIFICATION

Each ringer is identified by a code number stamped in ink on the gong with frequency shown on the retaining plate.

TYPE 151

The type 151 ringer is designed for use in K-1554 and K-2554 "TEL-TOUCH" wall telephones.

TYPE 152

The type 152 ringer is designed for use in the TRENDLINE* (dial in handset), telephones.

3. INSTALLATION

Two tapped blocks are provided on the telephone base to accept the ringer mounting screw. When installing a ringer in a wall phone, (K-2554 or TRENDLINE wall phone), be sure the stud of the volume control lever on the ringer rests in the slot of the volume control arm on the base.

4. CONNECTIONS

Refer to appropriate telephone circuit label.

5. ADJUSTMENTS

5.1 VOLUME CONTROL ADJUSTMENT

There are two positions on the volume control, High and Low.

5.2 WEIGHT TO GONG CLEARANCE ADJUSTMENT

Clearance varies with frequency but should be 0.030 to 0.10 inch. Coarse adjustment is made by bending clapper stem. Fine adjustment is made by rotating gong.

6. MAINTENANCE

If ringer is defective, check to see that:

(1) All leads are tight and secured to the proper terminals.

(2) Air gap between armature and magnet is free of dirt or foreign material.

(3) Gong is not obstructed.

(4) Ringer coil is not open or shorted.

(5) Clapper to gong clearance is 0.030 to 0.10 inch.

If ringer still fails to operate, replace ringer.

6.2 COIL REPLACEMENT (Figure 4)

Be sure to have an adequate supply of Retainers (12) before proceeding as they may be damaged during removal. Index gong by marking gong and frame. Remove screw (13), gong (14), spacer washer (15), and resonator (16). Use a screwdriver and work retainers (12) out. Remove laminations (11), roll coil (9), out and roll new coil in, install laminations. Use slip-joint pliers or similar tool and install retainers (7A) one at a time. Install resonator, washer, gong and screw. Rotate to align index marks and tighten gong mounting screw.

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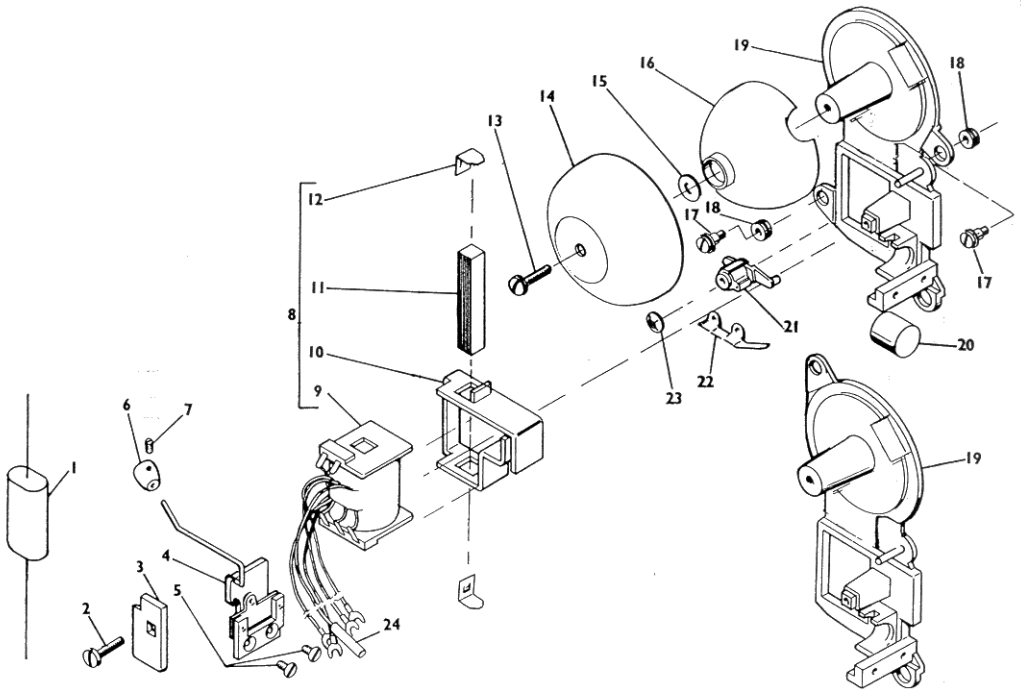

FIGURE NO.	INDEX NO.	PART NUMBER	(Indented items are included in the NAME, Description part under which they are indented)	QUANTITY USED ON: 151	152
		TABLE II.	ORDERING INFORMATION AND REPLACEABLE PARTS LIST		
		151 ( ) 470	Ringer, Frequency Selective, (For 2554 Telephone)	X	-
		152 ( ) 470	Ringer, Frequency Selective, (For Trendline Telephones)	-	X
			SUBSTITUTE FREQUENCY CODE AS FOLLOWS:		

HARMONIC		SYNCHROMONIC		DECIMONIC	
Code	Frequency	Code	Frequency	Code	Frequency
HA1	33 1/3cps	HB1	30 cps	HC1	20 cps
HA2	50 cps	HB2	42 cps	HC2	60 cps
HA3	66 2/3cps	HB3	54 cps	HC3	30 cps
HA4	16 2/3cps	HB4	66 cps	HC4	40 cps
HA5	25 cps	HB5	16 cps	HC5	50 cps

NOTE: HA2 is same as HC5; HB1 is same as HC3

	1	- - - - - - - -	Capacitor (included with each ringer when required)		
		95995 - 3	.47 mf, for frequencies 16, 16 2/3, 20 and 25 cps	1	1
		95995 - 4	.25 mf, for frequencies 30 and 33 cps	1	1
		95995 - 5	.15 mf, for frequencies 40 and 42 cps	1	1
		95995 - 6	.08 mf, for frequencies 50, 54, 60, 66 and 66 2/3 cps	1	1

TABLE II. ORDERING INFORMATION AND REPLACEMENT PARTS LIST, CONTINUED

FIGURE NO.	INDEX NO.	PART NUMBER	NAME, Description (Indented items are included in the part under which they are indented)	QUANTITY USED ON: 151	152				
	2	63786 - 1	SCREW	1	1				
	3	88483 - 1	PLATE, Retaining	1	1				
	4	--------	ARMATURE ASSEMBLY	1	1				
		180608 - 1	For Frequencies 16 and 16 2/3 cps						
		180608 - 2	For Frequencies 20 and 25 cps						
		180608 - 3	For Frequencies 30 and 33 1/3 cps						
		180608 - 4	For Frequencies 40 and 42 cps						
		180608 - 5	For Frequencies 50 and 54 cps						
		180608 - 6	For Frequencies 60, 66 and 66 2/3 cps						
	5	63975 - 1	SCREW, Armature Attaching	2	2				
	6	--------	WEIGHT (See Table Below)	1	1				

	FREQUENCIES						
	16, 16 2/3, 20	25, 30, 33 1/3	40, 42	50, 54	60	66	66 2/3
88508 - 1							X
88508 - 2						X	X
88508 - 3					X	X	X
88508 - 4				X	X	X	X
88508 - 5				X	X	X	
88508 - 6			X	X	X		
88508 - 7		X	X	X			
88508 - 8		X	X				
88508 - 9	X	X	X				
88508 - 10	X	X					
88508 - 11	X						
88508 - 12	X						

	7	58687 - 1	SETSCREW	1	1				
	8	88481 - 1	POLE PIECE ASSEMBLY, Frequencies 16 thru 33 1/3 cps	1	1				
	8	88481 - 2	POLE PIECE ASSEMBLY, Frequencies 40 thru 66 2/3 cps	1	1				
	9	180209 - 1	COIL ASSEMBLY	1	1				
	10	88174 - 1	POLE PIECE, Frequencies 40 thru 66 2/3 cps	1	1				
	10	88174 - 2	POLE PIECE, Frequencies 16 thru 33 1/3 cps	1	1				
	11	88208 - 1	LAMINATION	18	18				
	12	95969 - 1	RETAINER, Lamination	2	2				
	13	75408 - 2	SCREW	1	1				
	14	75396-001	GONG	1	1				
	15	60629 - 1	WASHER	1	1				
	16	75372 - 1	RESONATOR	1	1				
	17	95966 - 2	SCREW, Special (Ringer Mounting)	2	2				
	18	88209 - 1	GROMMET	2	2				
	19	88480 - 2	FRAME, (151 Ringer)	1	-				
	19A	88480 - 3	FRAME, (152 Ringer)	-	1				
	20	88197 - 1	MAGNET, (Not Magnetized)	1	1				
	21	88885 - 1	LEVER, Volume Control	-	1				
	21	180122 - 1	LEVER, Volume Control	1	-				
	22	88884 - 1	SPRING, Volume Control	1	1				
	23	88972 - 1	NUT, Push	1	1				
	24	88213 - 1	SLEEVE, Insulating	3	3				

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TABLE III. RINGER CHARACTERISTICS

1. COIL RESISTANCE, D.C.: 4420 ohms

2. IMPEDANCE, AUDIO:	Single Ringer	5 Bridged Ringers
@ 400 hz	90,000 ohms	14,500 ohms
@ 1000 hz	150,000 ohms	28,000 ohms
@ Ringing Frequency	(See Table)	3,000 ohms, min

3. SOUND OUTPUT (Measured at one meter):
60 to 66 db relative to .0002 dy/cm^2.

4. SENSITIVITY: *

Code	Freq. Hz	Minimum Voltage across Ringer, rms	Open Circuit Voltage, rms	Ringing Impedance (ohms)
HA1	33 1/3	40	125	13,000
HA2	50	50	140	22,000
HA3	66 2/3	55	140	11,500
HA4	16 2/3	45	105	12,000
HA5	25	40	110	8,000
HB1	30	40	125	12,000
HB2	42	40	135	13,000
HB3	54	50	140	22,000
HB4	66	55	140	11,500
HB5	16	45	105	12,000
HC1	20	45	105	10,500
HC2	60	55	140	15,000
HC3	30	40	125	12,000
HC4	40	40	135	12,000
HC5	50	50	140	22,000

*Ringer sensitivity varies slightly depending upon ringer position, horizontal or vertical

TYPE 144( )470 COMMON AUDIBLE SIGNAL UNIT

The 144 Common Audible Signal Unit is designed to provide a common buzzer signal from ringing signals on any one of up to three individual telephone exchange lines. The unit is intended to be used in conjunction with the type 576 three line and hold key telephone. A separate neon indicator lamp underneath each pick-up key on the telephone glows whenever a ringing signal is received on its own line, thus providing a definite indication of the calling line.

Simultaneous ringing signals on more than one line may cause the audible buzzer signal to vary from that normally heard with a single line signal, dependent upon the relative phase of the multiple ringing signals.

The complete unit is mounted in the telephone instrument in the position occupied by the usual mechanical type of ringer. No additional power supplies are required to operate the unit.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Mounting Bracket	86396	1
2	Socket	95649	3
3	Terminal Strip	95653	1
4	Rivet	60025	7
5	Resistor	62948-99	3
6	Tubing	50551-3	6
7	Resistor	64342-179	1
8	Capacitor	80678-3	1
9	Capacitor	75593-4	1
10	Tubing	71613	6
11	Capacitor	95286	1
12	Tubing	50551	2
13	Resistor	64342-181	1
14	Tubing (wire strap insulation)	50551-5	3
15	Wire Assembly (RD)	75326-11	1
16	Wire Assembly (BK) (Buzzer leads)	75326-70	2
17	Wire Assembly (BL)	75326-88	1
18	Wire Assembly (GR)	75326-91	1
19	Wire Assembly (BK)	75326-114	1
20	Tube (Type 5823)	95648	3
21	Rd. Hd. Mach. Screw	61906	2
22	Buzzer	95654	1
23	Bind. Hd. Mach. Screw	72594-3	2
24	Lock Washer	73949	2

NOTE:
Buzzer is shipped mounted on end of bracket. To install in telephone, dismount buzzer and insert screws through two of vent holes in baseplate to locate buzzer approximately as shown with respect to mounting bracket.

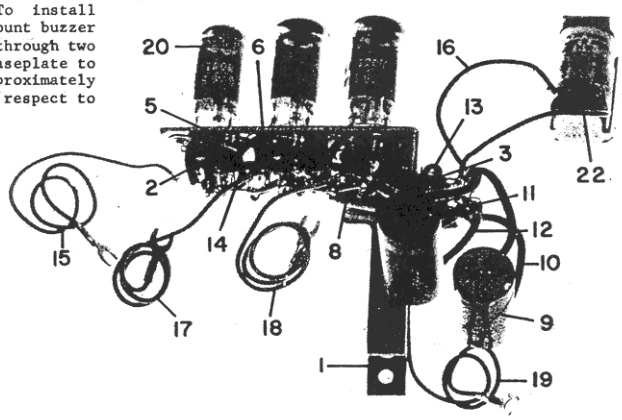

Fig. 1 TOP VIEW

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TEST DATA

Testing of the common audible signal units requires a sine wave source of ringing voltage at a frequency of 30±1 cps., with a distortion of not more than 5%. at a level of 75 volts under load. This voltage is applied through a 1 watt, 47 ohms ±10% resistor to each section of the signal unit in turn, connecting the common (black) lead to one side of the source and each of the red, blue and green leads, in turn, to the other side of the source.

The sound output from the buzzer must be vigorous and uniform in each case, without undue chatter.

If desired, the action of the gas tubes can be checked with a battery connected generator source. In this case the 'X' straps (see diagrams) must be cut and the common black lead must be connected to the positive (ground) side of the source. Reversal of the connections will reverse bias the gas tubes and prevent operation. The source voltage required in this case will be 95 volts.

Table 2 MINIMUM RINGING GENERATOR OUTPUT FOR VARIOUS LINE LOOP RESISTANCES

TYPE OF GENERATOR CONNECTION	LINE LOOP RESISTANCE (OHMS)	VOLTAGE REQUIRED FOR NUMBER OF UNITS ON LINE 1	2	3
BATTERY	0	95V	100V	115V
	600	105V	110V	120V
	1000	110V	115V	125V
	1200	112V	118V	128V
GROUND	0	75V	75V	75V
	600	77V	80V	82V
	1000	77V	81V	88V
	1200	78V	82V	90V

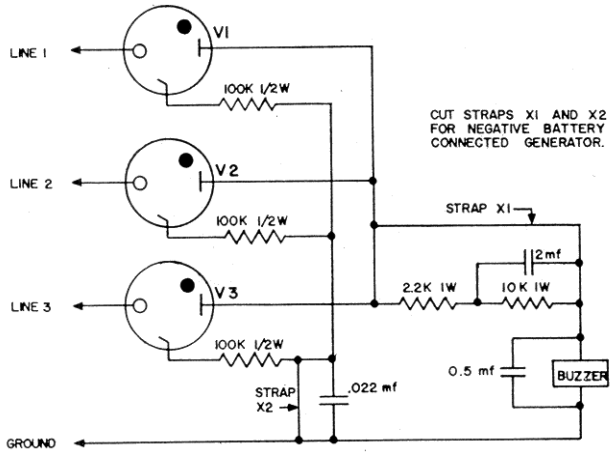

Fig. 2 SCHEMATIC DIAGRAM

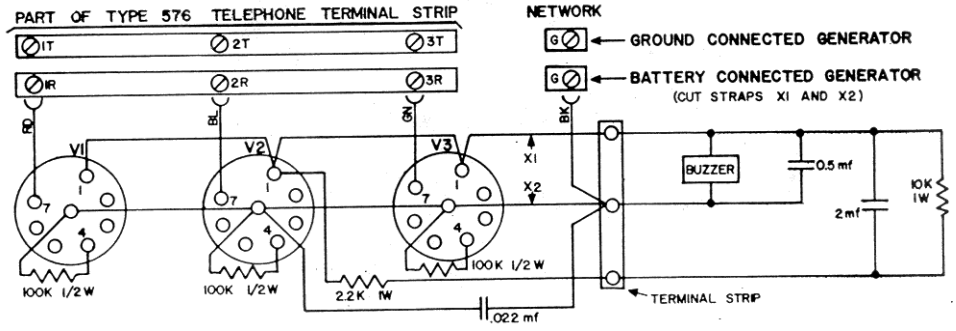

Fig. 3 WIRING AND INSTALLATION DIAGRAMS