ADDENDUM 997-308-500
ISSUE 1, JUNE 1978

RINGERS
SHOP PROCEDURE

1. GENERAL

1.01 This addendum to Issue 2 of this section deletes the disassembly and assembly procedures for the Type 46A Miniature Straight-Line Ringer and the Type 48 Ringer, and adds mechanical adjustment information for the Type 46A Miniature Straight-Line Ringer.

1.02 Microfiche Copy Recipients. Remove Issue 2 of this section from the file and replace it with the microfiche copy identified as Issue 2, Addendum 1. Changes are marked in the replacing copy.

1.03 Paper Copy Recipients. In ink or red pencil, make the changes indicated in part 2 of this addendum. Write "See Addendum" in the margin next to each change. File this addendum directly in front of the addended section.

2. CHANGES

2.01 In the table of contents, under parts 9 and 10, delete subpart titles "Disassembly" and "Assembly."

2.02 In paragraph 9.01, delete the last sentence and add the following:

> CAUTION: Do not disassemble the Type 46A Ringer. Disassembly causes serious damage to the magnetic circuit.

2.03 Delete the following: in part 9, subpart heading "Disassembly" and paragraph 9.02, and subpart heading "Assembly" and paragraph 9.03.

2.04 On page 25 of 32, after the subpart heading "Adjustment," add the following paragraph:

> 9.02 Make the following mechanical adjustments to the Type 46A Miniature Straight-Line Ringer:
>
> (a) Turn the gong clockwise until the clapper-to-gong clearance is between 0.020 and 0.005 inch.
>
> (b) Free the bias spring from its holder and adjust the spring so that it barely clears the end edge of the holder.

2.05 Renumber paragraph 9.04 to 9.03, delete the first two sentences, and insert the following:

> Ensure that the Type 46A Miniature Straight-Line Ringer meets the following electrical requirements (Table 22):

2.06 Delete the last sentence in paragraph 10.01 and add the following:

> CAUTION: Do not disassemble the Type 48 Ringer. Disassembly causes serious damage to the magnetic circuit.

2.07 Delete the following: in part 10, subpart heading "Disassembly" and paragraph 10.02, and subpart heading "Assembly" and paragraph 10.03.

2.08 Renumber paragraphs 10.04 and 10.05 to 10.02 and 10.03, respectively.

RINGERS
SHOP PROCEDURE

CONTENTS PAGE

1. GENERAL

1.01 This section provides the shop procedure for the GTE Automatic Electric line of ringers.

1.02 The shop procedure covers general identification, description, disassembly, assembly, cleaning and inspection, adjustment, and replacement parts information for the Type 33 Ringer Unit, and the Types 38, 42, 44, 45, 46, 46A, 48, and 860 Ringers.

1.03 This section is reissued to add information on new ringers and to update existing information. Due to the extensive changes involved, marginal arrows have been omitted. Remove the previous issue and addendum of this section from the binder or microfiche file and replace it with this issue.

2. INSPECTION AND CLEANING

2.01 After a period of use and exposure to foreign matter, each ringer or ringer unit may accumulate dirt, dust and grime. The presence of foreign matter, along with loose lead connections are subject to hamper the functions and operation of the ringer or ringer unit. To combat these conditions two procedures must be performed: inspection and cleaning of ringer or ringer unit components.

Inspection

2.02 Check the top, bottom, sides and corners of each ringer or ringer unit component for any excessive amount of foreign matter built-up. Inspect all components to see if all screws, nuts or springs are firmly secure. Examine all wiring leads for broken, unsoldered or loose lead connections. Inspect (visually or by a gauge instrument) for complete and accurate adjustments of each component.

Cleaning

2.03 To clean the ringer or ringer unit, wipe the reachable components gently with a dry, soft, clean cloth. When cleaning the small and tightly enclosed areas, use a 1-inch wide, flat, nonmetallic brush. Compressed air may also be used to expel any dust and accumulated matter from the components. The compressed air must be reduced to less than 30 psi, and effective chip guarding and personnel protective equipment must also be used.

3. IDENTIFICATION CODE

3.01 The identification code is used to identify the various functions and type of ringer or ringer unit used in a telephone set. Each ringer is identified according to an assigned, coded, part number. This code consists of a single alphabetical prefix, base number and a alphabetical, numerical, or alphanumerical suffix. The alphabetical prefix is followed by a five-digit number which defines the complete ringer or ringer-unit base number. The first letter of the suffix indicates the ringer coil used, unless otherwise specified. The second and third numbers of characters denotes the ringer frequency. The fourth character, when specified, refers to a sales order replacement. For further explanation of the ringer or ringer-unit suffix identification codes, refer to Table 1. As an example, a ringer or ringer unit with Part No. D-56548-ASAR would be explained as follows:

D – Base Number (prefix)

56548 – Base Number

A – Type Coil

SA – Frequency

R – Replacement Kit

4. TYPE 33 RINGER UNIT

Description

4.01 The Type 33 Ringer Unit (Figure 1) is a separate audible signaling device used with coin telephones, telephone sets not equipped with ringers, or when an auxiliary signal is required for other types of telephone sets. The Type 33 ringer unit, equipped with a Type 45 ringer or Type 48 ringer, is contained in a plastic housing measuring 5-1/2 inches wide, 5-1/4 inches long, and 2-1/8 inches deep. The square shaped housing is available in a variety of colors (Table 2). This ringer may be modified to provide straight-line, superimposed, or harmonic ringing. The ringer capacitor, on the ringer, is replaced by a cold cathode tube when superimposed ringing is desired. The ringer unit also contains a terminal strip where the ringer wiring, telephone line cord, and station wires (from the station protector) are connected. The ringer is essentially composed of two gongs, two ringer coil(s), and the clapper assembly (Table 3).

Disassembly

4.02 To disassemble the Type 33 Ringer Unit, proceed as follows:

(a) Unscrew the two cover, screws (item 2) from the cover assembly free of the baseplate assembly (item 3).

(b) Remove the cold cathode tube (item 8) (if equipped) from the baseplate assembly by removing the cold cathode tube mounting screw (item 9).

(c) Disconnect the ringer leads from the terminal strip (item 4).

(d) Remove the terminal strip by removing the two terminal strip mounting screws (item 5).

(e) Turn the baseplate and ringer assembly (item 6) face down and remove the three screws (item 7) from the rear of the baseplate assembly to free the ringer assembly.

NOTE: The Type 45 or 48 ringer is used with the Type 33 ringer unit. For disassembly procedures of the Type 45 ringer, see paragraph 7.03. For disassembly of the Type 48 ringer, see paragraph 10.02.

Assembly

4.03 To assemble the Type 33 Ringer Unit (Figure 1) proceed as follows:

(a) Mount the ringer assembly (item 6) on the baseplate assembly (item 3) and insert the three ringer mounting screws (item 7) from the rear of the baseplate and fasten.

(b) Position the ringer wiring leads so that the connection of each lead to the terminal strip will not be difficult.

(c) Mount the terminal strip (item 4) parallel to the right coil of the ringer. Insert and fasten the two terminal strip mounting screws (item 5). Connect each lead to the desired terminal strip terminal.

(d) If necessary renumber the terminal strip designations as shown in Figure 1. Replace the cold cathode tube (item 8) (if so equipped) in the upper left hand corner of the baseplate assembly (item 3). Install and fasten the cold cathode tube mounting screws (item 9) as shown in Figure 1.

(e) Place the cover assembly (item 1) over the ringer assembly and baseplate assembly. Insert and fasten the two cover screws (item 2) on each side of the cover assembly.

5. TYPE 38 RINGER

Description

5.01 The Type 38 Ringer (Figure 2) is used in the Type 900 Magneto telephone set. Its basic components consist of an armature assembly, gong assembly, bias adjuster, ringer magnet, yoke assembly, heelpiece and gong mounting plate. This ringer assembly is equipped with three optional coils. For a complete description of the components, part numbers, and coil options, refer to Table 4.

Disassembly

5.02 To disassemble the Type 38 Ringer (Figure 2), proceed as follows:

Table 1. Ringer Suffix Identification Code.

HARMONICS				DECIMONICS		OTHERS		
MULTIPLE		NONMULTIPLE						
FREQ (Hz)	2nd & 3rd SUFFIX	FREQ (Hz)	2nd & 3rd SUFFIX	FREQ (Hz)	2nd & 3rd SUFFIX	DESCRIPTION	FREQ (Hz)	SUFFIX
16.6	16	20	20	20	20	STRAIGHT LINE WITHOUT ADJUSTING WHEEL.	SL	ASLR
25	25	30	30	30	30	STRAIGHT LINE WITH ADJUSTING WHEEL.	SA	ASAR
33.3	33	42	42	40	40	45-65 Hz 50 VOLTS (32A14 PAX).	AC	AACR
50	50	54	54	50	51	SUPERIMPOSED WITHOUT ADJUSTING WHEEL	VT	---
						MANUALLY COMPENSATED TELEPHONES.	VT	AVTR*
						SELF-COMPENSATED TELEPHONES.	VT	CVTR*
66.6	67	66	66	60	60	UNTUNED 60 Hz 115 Vac.	CV	ACVR
						SUPERIMPOSED WITH ADJUSTING WHEEL	VA	---
						MANUALLY COMPENSATED TELEPHONES.	VA	AVAR*
						SELF-COMPENSATED TELEPHONES.	VA	CVAR*
						SALES ORDER REPLACEMENT	---	R
						TELEPHONE WITH MANUALLY ADJUSTED CIRCUIT (WITH CAP.).	---	AVA
						TELEPHONE WITH SELF-COMPENSATED NETWORK (WITH CAP.).	---	CVA
						OVERCOME CROSSRING DIFFICULTIES, ALLOWS USE OF HIGH AND LOW IMPEDANCE RINGER ON SAME LINE.	---	Y
						STANDARD RINGER COIL.	---	A
						IMPREGNATED RINGER COIL.	---	B
						RINGER COILS (LESS CAPACITOR)	---	C
						STANDARD RINGER COILS WITH SLOTTED GONGS.	---	D
						STANDARD RINGER COILS MAGNETO OPERATED.	---	M
						RINGER OMITTED.	--	XX

NOTE: *Cold cathode tube, D-52144A is not included with the ringer. It must be ordered separately.

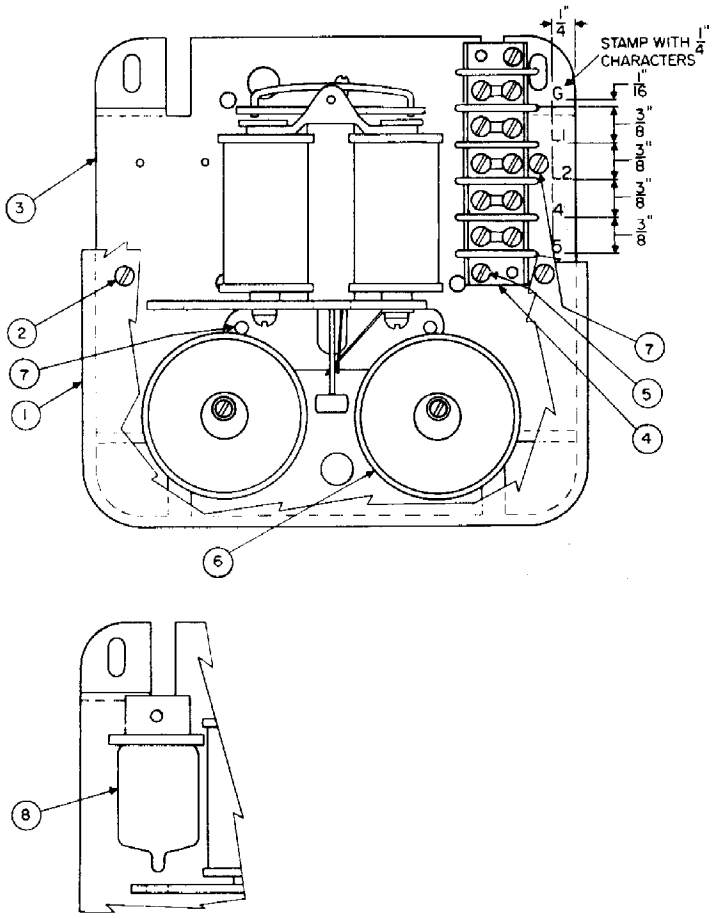

Figure 1. Type 33 Ringer Unit.

Table 2. Housing Color for Type 33 Ringer Unit.

ITEM NO.	COLOR	COLOR SUFFIX
	BLACK	A
	SAND BEIGE	B
	DAWN GRAY	C
	JADE GREEN	D
	CLASSIC IVORY	E
	GARNET RED	F
	TURQUOISE	G
	SUNLIGHT YELLOW	J
	FORGET-ME-NOT-BLUE	K
	CAMELLIA PINK	L
	GARDENIA WHITE	M

Table 3. Replacement Parts for Type 33 Ringer Unit.

ITEM NO.	DESCRIPTION	PART NUMBER	QUANTITY
1	COVER ASSEMBLY	D-490099-	1
2	COVER SCREW	D-760773-A	2
3	BASE PLATE ASSEMBLY	D-780832-A	1
4	TERMINAL STRIP	D-150024-A2	1
5	TERMINAL STRIP MOUNTING SCREW	D-760733-A	2
6	RINGER ASSEMBLY	D-56548-	1
7	RINGER MOUNTING SCREW	D-760735-A	4
8	COLD CATHODE TUBE (SUPERIMPOSED RINGING)	D-52144-A	1
9	COLD CATHODE TUBE MOUNTING SCREW	D-760887-A	1

(a) Remove the securing screws (item 11) from the center shell of the right and left gong (items 8 and 9) to free the gongs.

(b) Lift the bias spring from the bias adjuster (item 5) teeth, then remove the armature pivot screw (item 7) and carefully guide the clapper rod and bias spring through the round hole on the coil support bracket.

(c) Disconnect the ringer and gong mounting plate (item 10) from the heelpiece (item 1) by removing the two screws (item 11) from the flanges of the heelpiece.

(d) Remove the two screws (item 11) from under the base of the heelpiece support. After the right securing screw is removed, remove the bias adjuster (item 5). Use a small flat 1/2-inch open ended wrench to loosen and remove the two nuts (item 12) from the top side of the armature support bracket.

(e) Pull the armature support bracket upward to free it from the two threaded coil core studs. Remove the remaining two nuts (item 12) to free the right and left coil (items 13 and 14).

Assembly

5.03 To assemble the Type 38 Ringer (Figure 2), proceed as follows:

(a) Align the holes under the round fiberboard coil support of the right and left coil (items 13 and 14) parallel to the two holes on the base of the heelpiece (item 1).

(b) Place the bias adjuster (item 5) over the right coil-mounting hole. Insert each of the coil screws (item 11) from the bottom of the heelpiece base and fasten.

(c) Insert the two hexagon nuts (item 12) over the threads of the two coil core supports. Position the armature support bracket over the two threaded coil core studs. Replace the other two hexagon nuts (item 12) over the coil core studs and tighten.

(d) Align the heelpiece with the ringer and gong mounting plate (item 10). Install the two mounting screws (item 11) and fasten.

(e) Carefully guide the clapper assembly and bias spring through the round hole of the armature support bracket. Place the flat edge of the armature assembly (item 4) against the protruding pivot point on the rear flange of the armature support bracket.

(f) Install the armature adjusting screw (item 7) and nut (item 6) and fasten. Position the bias spring in one of the teeth of the bias adjuster (item 5).

(g) Place the gongs (items 8 and 9) on the two bottom flanges of ringer and gong mounting plate and insert the two screws and washers and fasten.

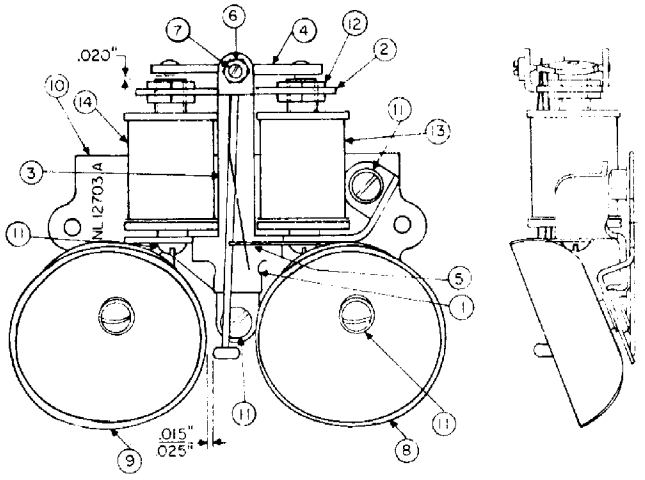

Figure 2. Type 38 Ringer.

Table 4. Replacement Parts for Type 38 Ringer.

ITEM NO.	DESCRIPTION	PART NUMBER	QUAN-TITY
1	HEELPIECE	NL-8881-A	1
2	YOKE ASSEMBLY	NL-8893-A	1
3	RINGER MAGNET	NL-8901-A	1
4	ARMATURE ASSEMBLY	NL-8985-A	1
5	BIAS ADJUSTER	NL-13523-A	1
6	ADJUSTING NUT	D-77041-A	1
7	ADJUSTING SCREW	D-760965-A	1
8	GONG, RIGHT	NL-11890-A	1
9	GONG, LEFT	NL-11986-A	1
10	RINGER AND GONG MOUNTING PLATE	NL-12678-A	1
11	SCREW, GONG, COIL, AND HEEL IRON MOUNTING	D-760985-A	6
12	HEXAGON NUT	D-77427-A	4
13	RINGER COIL, RIGHT (NL-12703-A)	NL-9978-A	1
	(NL-12703-B)	NL-8926-A	1
	(NL-12703-C)	NL-9980-A	1
14	RINGER COIL, LEFT (NL-12703-A)	NL-9979-A	1
	(NL-12703-B)	NL-8927-A	1
	(NL-12703-C)	NL-9981-A	1

Adjustment

5.04 Adjust the Type 38 Ringer with the gongs positioned toward the person doing the adjusting, then proceed as follows:

(a) Make sure that the armature pivot screw does not cause the armature to bind nor allow an excessive amount of side play in the armature. Tighten the lock nut securely.
(b) Position the clapper rod so that it is approximately straight and at right angles to the armature.

NOTE: Center of the clapper weight must strike the rim of the left gong and if necessary the clapper rod may be bent slightly to achieve this.

(c) Adjust the armature stroke to 0.020 inches as gauged between the residual and the core of the left coil with the right residual against the right coil.
(d) Adjust the gong so that, with the armature positioned against either coil core, there will be approximately 0.010 inches between the clapper weight and the gong to which it is nearest (gauged visually).
(e) The clapper rod should not strike any portion of the ringer or coil terminals while operating.
(f) Position the biasing spring in the first notch from the right where the tension obtained is sufficient to hold the residual lightly against the right coil core. Operate the ringer in accordance with the current flow requirements listed in Table 5 (use 20-hertz ringing current and rotate right gong to obtain a clear dual-tone ring and then tighten the gong retaining screw).
(g) Operate the ringer on direct ringing current and check for a strong clear response.

6. TYPE 42 AND 44 RINGERS

Description

6.01 The Type 42 (straight-line) and 44 (frequency) Ringers (Figure 3) are used in the Type 86, 87, Leich 100 and 700 series telephone sets. Both ringers are built on the same frame and employ the same coil. Each ringer has a single coil construction with a dc resistance of 3,800 ohms. The two types differ only in the style of armature used, and in the value of the associated capacitors, which mount on the ringer frame. Separate capacitor leads are provided to facilitate replacement. The Type 42 Ringer uses a 0.5 µF ringer capacitor and the Type 44 Ringer uses capacitors of various values, in order to maintain proper impedance at the various operating frequencies. For superimposed ringing service or to reduce inductive interference, gas-filled tubes are used in the Type 42 Ringers. See Tables 6 and 7 for description, part numbers, and ringer frequency information.

Disassembly

6.02 To disassemble the Type 42 or 44 Ringer (Figure 3), proceed as follows:

(a) Remove the capacitor mounting screw (item 9) located at the front of the capacitor and slide the enclosed capacitor (item 8) forward.
(b) Unscrew the gong mounting screws (item 17) from the bottom of the gong shell to free the gongs (items 15 and 16) and resonator assemblies (items 6 and 7).
(c) Remove the two screws from the metal support of the armature assembly and separate the clapper rod, weight (item 10) and armature assembly (item 11) from the magnet (item 1).
(d) Remove the two coil assembly screws (item 14) from the long, rectangular bar mounted through the coil to release the coil assembly (item 13).

Table 5. Current-Flow Requirement for Type 38 Ringer.

	COIL (WINDINGS)	CAPACITANCE (uF)	ADJ (mA)	CURRENT FLOW UNMOUNTED (mA)	MOUNTED (mA)
NL-12703-A	78-79	1.0	3.6	3.7	3.8
NL-12703-B	26-27	.5	1.5	1.6	1.7
NL-12703-C	80-81	.5	1.3	1.4	1.5

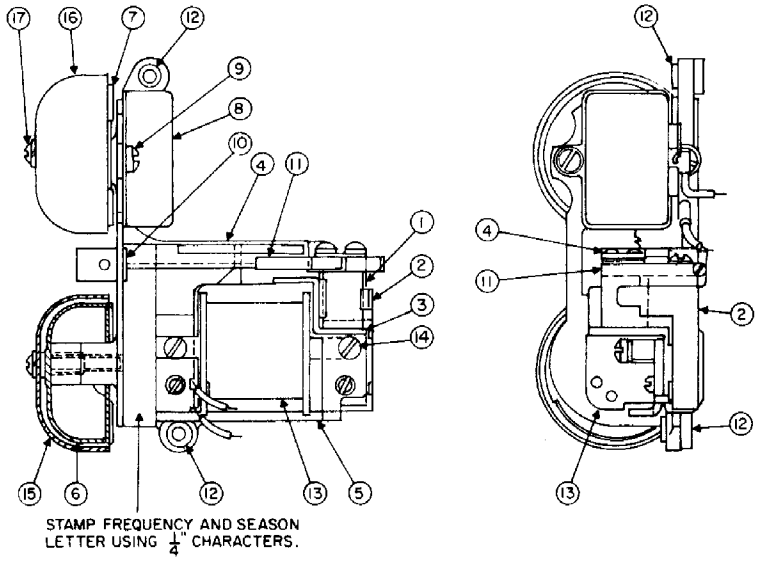

Figure 3. Type 42 and 44 Ringers.

Assembly

6.03 To assemble the Type 42 or 44 Ringer (Figure 3) proceed as follows:

(a) Mount the capacitor (item 8) on the left end of the L-shaped frame. Align the hook end at the rear of the capacitor to fit around the small post at the rear of frame. Install and fasten the capacitor mounting screws (item 9).

(b) Place the resonator assemblies (items 6 and 7) inside the gongs (items 15 and 16) and insert the gong mounting screws (item 17) from underneath the outer gong shells. Slide both assemblies up the shank of the screw and position, then fasten.

(c) Position the weight (item 10) clapper rod and bias spring into the open area located between the gongs. Situate the armature assembly (item 11) between the outer pole (item 4) and inner pole (item 3) then slide the armature assembly support to the rear and above the ringer base (item 2). Install and fasten the two armature assembly support screws.

(d) Place the coil assembly (item 13) into the box-shaped opening in the upper right hand section of the frame. Position the metal bar of the coil assembly to the left of the two screws securing the pole tie assembly (item 5). Install and fasten the coil assembly screws (item 14) at each end of the bar.

Adjustment

6.04 To adjust the Type 42 and 44 High Impedance Telephone Ringers, the ringer adjustment should be performed with the gongs positioned toward the adjuster.

6.05 To adjust the Type 42 and 44 Straight-Line Ringers, proceed as follows:

(a) Align the armature assembly making sure that it is straight and that supporting reed is not twisted or kinked.

(b) Position the clapper rod mounting bracket so that the clapper is in line with the left and right gong retaining screws and then tighten securely to frame.

(c) Adjust the inner pole-piece eccentric and position the magnet firmly against the clapper assembly mounting bracket and then tighten the adjacent coil retaining screw.

(d) With the clapper armature residual against the inner pole-piece, adjust the outer pole-piece eccentric for a minimum of 0.023 inch and a maximum of 0.027-inch clearance between the outer pole-piece and the armature residual. Tighten adjacent coil retaining screw.

(e) With the bias spring in the first notch from the right, the spring tension should cause the armature to rest lightly against the outer pole-piece. Approximately 2.6 mA dc through the coil, positive to red lead, is required to offset the proper bias spring tension.

(f) Set the left gong to obtain a minimum of 0.010 inch clearance (gauged visually) and tighten the gong retaining screw.

(g) With the bias spring in the first notch from right apply 3.2 mA of 20 Hz ringing current through the coil and capacitor. Rotate the right gong to obtain clear, dual-tone ringing and tighten the gong retaining screw.

Table 6. Replacement Parts for Type 42 and 44 Ringers.

ITEM NO.	DESCRIPTION	PART NUMBER	QUAN-TITY
1	MAGNET	D-56579-A	1
2	RINGER BASE	NL-13721-A	1
3	INNER POLE	NL-13750-A	1
4	OUTER POLE	NL-13751-A	1
5	POLE TIE ASSEMBLY (A SUFFIX RINGER)	NL-15758-A	1
6	RESONATOR ASSEMBLY	NL-15724-A	1
7	RESONATOR ASSEMBLY	NL-15755-A	1
8	CAPACITOR	SEE TABLE 7	1
9	CAPACITOR SCREW	6-32 x 1/8" BDGHIMS	1
10	WEIGHT	SEE TABLE 7	1
11	ARMATURE ASSEMBLY	SEE TABLE 7	1
12	GROMMET	D-67431-K10	2
13	COIL ASSEMBLY	NL-17565-A	1
14	COIL ASSEMBLY SCREW	6-32 x 3/4" FILHIM	2
15	GONG, LIGHT	NL-13725-A	1
16	GONG, HEAVY	NL-13726-A	1
17	SCREW, GONG MOUNTING	D-760963-A	2

(h) Operate the ringer on direct ringing current and check for a strong clear response.

(i) The final bias spring adjustment for preventing the bell from tapping when the ringer is connected across a standard dial (10 pulses per second) and 24 or 48 Vdc line circuit over a loop of negligible resistance, may be met by reversing the ringer leads and is normally done during the final inspection of the assembled telephone.

6.06 To adjust the Type 42 or 44 harmonic and decimonic ringer, proceed as follows:

(a) Make sure that the armature assembly is straight and that the supporting reed is not twisted or kinked.

(b) Position the clapper rod mounting bracket so that the clapper rod is in line with the left and right gong retaining screws, then tighten securely to the frame.

(c) Adjust the inner pole-piece eccentric to obtain the specified clearance at the narrowest points between the inner pole and the armature as specified in Table 8. Tighten the adjacent coil retaining screw.

(d) Adjust the outer pole-piece eccentric to obtain the specified clearance at the narrowest point between the outer pole-piece and the armature as shown in Table 8 and tighten the adjacent coil retaining screw.

Table 7. Ringing Frequency Operating Mode and Suffix Information on Type 42 or 44 Ringers.

FREQUENCY	RINGER DESCRIPTION	RINGER SUFFIX A	CAPACITOR FOR SUFFIX A RINGER	WEIGHT	ARMATURE ASSEMBLY
--	STRAIGHT-LINE OR SUPERIMPOSED (Type 42 Ringer)	D-56560-ASLR	NL-14702-G	--	NL-13722-A
16.6	HARMONIC (MULTIPLE)	D-56560-A16R	NL-14702-B	NL-14778-A	NL-14760-A
20	HARMONIC AND DECIMONIC (NONMULTIPLE)	D-56560-A20R	NL-14702-B	NL-13152-A	NL-13728-A
25	HARMONIC (MULTIPLE)	D-56560-A25R	NL-14702-C	NL-14778-A	NL-14761-A
30	HARMONIC AND DECIMONIC (NONMULTIPLE)	D-56560-A30R	NL-13150-C	NL-13150-A	NL-14761-A
33.3	HARMONIC (MULTIPLE)	D-56560-A33R	NL-14702-C	NL-14718-A	NL-14761-A
40	DECIMONIC	D-56560-A40R	NL-14702-D	NL-14723-A	NL-17761-A
42	HARMONIC (NONMULTIPLE)	D-56560-A42R	NL-14702-D	NL-14723-A	NL-14761-A
50	DECIMONIC	D-56560-A50R	NL-14702-E	NL-13147-A	NL-14761-A
54	HARMONIC (NONMULTIPLE)	D-56560-A54R	NL-14702-E	NL-14782-A	NL-14761-A
60	DECIMONIC	D-56560-A60R	NL-14702-F	NL-15740-A	NL-14761-A
66	HARMONIC (NONMULTIPLE)	D-56560-A66R	NL-14702-F	NL-14715-A	NL-14727-A
66.6	HARMONIC (MULTIPLE)	D-56560-A67R	NL-14702-F	NL-14715-A	NL-14727-A

NOTE: The following weights may be used instead of those specified above for the indicated frequencies, to obtain the proper operational results:

Frequency (Hz)	25	30	33.3	50	66
Weight Part No.	NL-15743-A	NL-13151-A	NL-13151-A	NL-13148-A	NL-13145-A

The Y suffix uses the same optional parts as the A suffix except suffixes Y25, Y30, Y33, which use capacitor NL-14702-B, and Y40 and Y42, which use capacitor NL-14702-G.

(e) Adjust the clapper weight and gongs to produce an audible ring at the current value and frequency shown in Table 8. To meet this requirement it may be necessary to select an alternate clapper weight from those listed in Table 7.

NOTE: Clapper weight may extend up to three-sixteenth inch beyond the end of the clapper rod if required.

(f) Gong spacing shall be approximately the value as specified in Table 8. Adjust the gongs so that the clapper weight strikes both gongs equally.

(g) The clapper of a frequency ringer must not strike either gong on any frequency in the same series but that frequency for which the ringer is designed. This requirement shall be met by applying ringing current (through a protective resistance only) to the bell on test for periods of approximately 1-second at 1-second intervals.

(h) It will usually be sufficient to check for overringing only on those frequencies where overring is most likely to occur. For overringing frequencies, refer to Table 9.

6.07 The current flow requirements for the Type 42 and 44 Ringers must be met with the ringer and proper capacitor connected in series. For capacitor values refer to Table 10 and proceed as follows:

(a) Straight-Line Ringer (Test with 20 Hz ringing current. Refer to paragraph 6.05(g).)

Adjustment Values	Inspection Values
3.2mA	Unmounted 3.4mA Mounted 3.6mA

(b) Harmonic and Decimonic Ringer (Table 8).

7. TYPE 45 RINGER

Description

7.01 The Type 45 Ringer (Figures 4 and 5) is essentially composed of two gongs, two ringer coils, and the clapper mounted on a heelpiece. An extension of the ringer heelpiece serves as the capacitor mounting bracket. This ringer is used in the Type 80, 80E, 82, 85, 88-T, 90M, 95 Telephone Sets and the Type 33 Ringer Unit. This assembly can also be equipped to function as a straight-line, superimposed, or harmonic ringer. The Type 45 ringer is supplied with standard A coils. When superimposed ringing is desired, the ringer capacitor on the ringer is replaced by a cold cathode tube. Refer to Tables 11 and 12 for a complete component parts list and Tables 13 and 14 for optional components used on the Type 45 Frequency and Sraight-line Ringer.

7.02 Do not disassemble the magnetic circuit of this ringer unless magnet treating equipment is available for reassembly.

Disassembly

7.03 To disassemble the Type 45 ringer (Figure 4 or 5) (part items refered to are called out in that order), proceed as follows:

(a) Remove the two gong screws (items 20, 4) and lock washers (items 21, 15) located inside the gong shells to free each gong (items 18, 19 and 12, 13).

(b) Remove the adjustable wheel (Figure 5) (item 19) from the coil core support by removing the adjusting wheel screw (item 3) and washer (item 2) from the center of the adjustable wheel.

(c) Disengage the bias spring from the bias spring holder (item 4, 1). Remove the two coil mounting screws (items 12, 8) from the base of the ringer and gong mounting bracket.

(d) Remove the front and rear magnet bars (items 22, 21) located between the coils (items 9, 10 and 6). Slide each coil outward and away from the coil support until the coil cores and coils are free.

Assembly

7.04 To assemble the Type 45 Ringer (Figure 4 or 5), proceed as follows:

(a) Elevate the armature (item 16, 9) and coil core support enough to slide each coil core into the U-shaped slot on each side of the coil core support.

(b) Situate the two rectangular shaped magnets (items 22, 21) into the plastic inserts located at the top and bottom of each coil.

(c) Install the left coil screw (item 12, 8) and secure. Place the bias adjuster (item 4, 1) over the threads of the right coil screw (item 12, 8) then insert and fasten. Position the bias spring in the bias adjuster notch so that the clapper weight (item 7, 13) will be centrally located between the gongs.

(d) Position the adjustable wheel (item 19) (if equipped) over the extended flange of the coil core support at the rear of the right coil. Install and fasten the washer (item 2) and screw (item 3) at the top of the wheel.

(e) Place the gongs (items 18, 19, 12, 13) over the mounting hole on the ringer and gong mounting bracket. Insert and secure the two gong mounting

Table 8. Stroke, Gong Spacing, and Current-Flow Requirements for Type 42 or 44 Harmonic and Decimonic Ringers.

FREQ.	PIECE NUMBER	DESCRIPTION	INNER OR SHORT POLE (INCH)	OUTER OR LONG POLE (INCH)	GONG (INCH)	CURRENT FLOW (mA)		
							INSPECTION	
						ADJ.	UNMT'D	MT'D
16.6	D-56560-A16 D-56560-Y16	MULTIPLE	0.040	0.038	0.625	2.0	2.1	2.3
20	D-56560-A20 D-56560-Y20	NONMULTIPLE, DECIMONIC	0.040	0.035	0.625	2.0	2.1	2.3
25	D-56560-A25 D-56560-Y25	MULTIPLE	0.035	0.035	0.625	2.0	2.1	2.3
30	D-56560-A30	NONMULTIPLE, DECIMONIC	0.035	0.032	0.625	1.9	2.0	2.2
33.3	D-56560-A33 D-56560-Y33	MULTIPLE	0.035	0.032	0.500	1.9	2.0	2.2
40	D-56560-A40 D-56560-Y40	DECIMONIC	0.035	0.032	0.500	2.1	2.2	2.4
42	D-56560-A42 D-56560-Y42	NONMULTIPLE	0.035	0.032	0.500	2.1	2.2	2.4
50	D-56560-A50 D-56560-Y50	MULTIPLE, DECIMONIC	0.035	0.032	0.500	2.2	2.3	2.5
54	D-56560-A54 D-56560-Y54	NONMULTIPLE	0.030	0.028	0.500	2.2	2.3	2.5
60	D-56560-A60 D-56560-Y60	DECIMONIC	0.030	0.028	0.500	2.2	2.3	2.5
66	D-56560-A66 D-56560-Y66	NONMULTIPLE	0.030	0.028	0.500	2.2	2.3	2.5
66.6	D-56560-A67 D-56560-Y67	MULTIPLE	0.030	0.028	0.500	2.2	2.3	2.5

Table 9. Frequency Check for Overringing on Type 42 or 44 Ringers.

RINGER FREQUENCY (HZ)	FREQUENCY CHECKED FOR OVERRING (HZ)
16.6	25
20	30
25	16.6, 33.3
30	20, 40, 42
33.3	16.6, 25, 50
40	20, 30, 50
42	30, 54
50	33.3, 40, 60, 66.6
54	42, 66
60	30, 50
66	54
66.6	33.3, 50

Table 10. Capacitor Values for Type 42 or 44 Ringer.

STRAIGHT LINE	0.50
16.6, 20	0.80
25, 30, 33.3	0.25
40, 42	0.15
50, 54	0.10
60, 66, 66.6	0.05

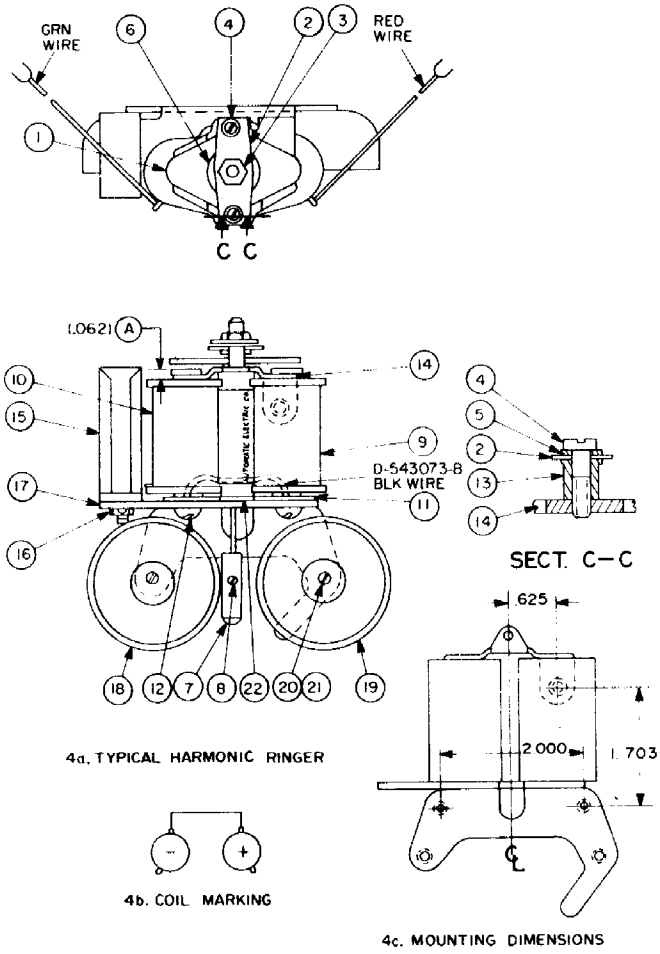

Figure 4. Type 45 Frequency Ringer.

screws (items 20, 14).

(f) Magnetize (saturate) with the south pole toward heel piece (item 17), this applies to all Type 45 Ringers.

Adjustment

7.05 This adjustment information applies to the small, high impedance Type 45 Ringer. These adjustments are also applicable to the Type 33 Ringer Unit. Typical ringer or ringer unit part numbers are listed as follows:

(a) D-56515, a straight-line ringer with coils wired in series.

(b) D-56516 or D-56517, an harmonic ringer coils wired in series.

(c) D-56535, D-56548 AVT and CVT, a superimposed ringer with 2,000-ohm coils wired in parallel (manufactured prior to 1961).

(d) D-56548 A51, decimonic ringer with coils wired in series.

(e) D-56548-AVT and CVT superimposed ringer with 1,000-ohm coils wired in series (manufactured after 1961).

7.06 To adjust a straight-line or superimposed Type 45 Ringer proceed as follows:

(a) Make sure that the armature does not bind on its bearing nor have excessive side play (minimum 0.004 inch, maximum 0.024 inch).

(b) The armature residual over the left hand coil shall cause the air gap between the armature and the coil core to be not less than 0.011 inch.

(c) Gauge the armature stroke between the residual and the core of the left-hand coil, making sure that the stroke doesn't measure less than 0.034 inch or more than 0.040 inch.

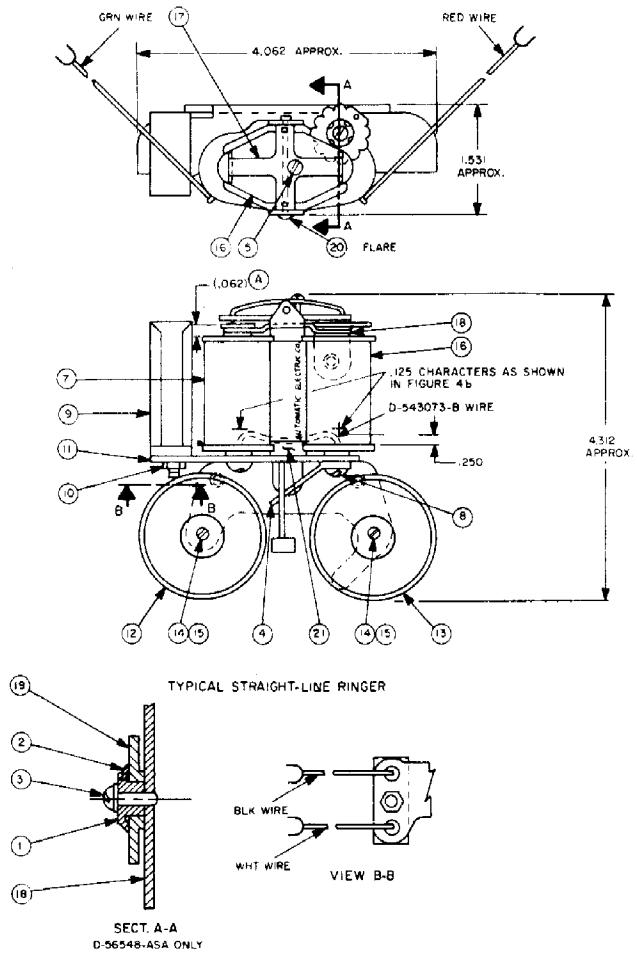

Figure 5. Type 45 Straight-Line Ringer.

(d) Adjust the clapper rod so that it is approximately straight and at right angles to the armature at all points.

(e) Make sure that the clapper rod does not strike the ringer frame while operating.

(f) Adjust the right-hand gong as follows:

(1) Adjust the right-hand gong (bias adjuster side) of a straight-line ringer so that with the armature against the left-hand coil core, the clapper shall clear the gong by approximately 0.010 inch.

(2) Adjust the right-hand gong (bias adjuster side) of a superimposed ringer so that with the armature against the left-hand coil core, the clapper shall clear the gong by approximately 0.060 inch.

(g) Adjust the left-hand gong as follows:

Table 11. Replacement Parts for Type 45 Frequency Ringer.

ITEM NO.	DESCRIPTION	PART NUMBER	QUANTITY
1	CLAPPER ASSEMBLY	D-56530-B	1
2	REED	D-10693-	(TABLE 13) 1
		D-10740-	(TABLE 13) 1
3	REED NUT	D-7734-A	1
4	REED SCREW	D-760645-	2
5	REED WASHER	D-1772-A	2
6	REED KNURLED NUT	D-77360-A	1
7	WEIGHT	D-56524-	(TABLE 13) 1
		D-56525-	(TABLE 13) 1
		D-56528-	(TABLE 13) 1
		D-56534-	(TABLE 13) 1
8	CLAPPER WEIGHT SET SCREW	D-7684-A	1
9	COIL (RIGHT)	D-284494-A (2000 OHMS)	1
		D-284498-A (860 OHMS)	1
		D-284506-A (200 OHMS)	1
		D-284496-A (150 OHMS)	1
		D-284502-A (1000 OHMS)	1
10	COIL (LEFT)	D-284493-A (2000 OHMS)	1
		D-284497-A (860 OHMS)	1
		D-284499-A (200 OHMS)	1
		D-284495-A (150 OHMS)	1
		D-284501-A (1000 OHMS)	1
11	HEEL PIECE SPACER (ON 60 66, 66.6 Hz ONLY)	D-65501-A	1
12	COIL SCREW	D-760934-A	2
13	POST	D-36091-A	2
14	YOKE	D-67430-A	1
15	CAPACITOR (SEE TABLE 14)	D-68690-A (.8 μF)	1
		D-68691-A (.2 μF)	1
		D-68692-A (.3 μF)	1
		D-68693-A (.4 μF)	1
		D-68695-A (.7 μF)	1
16	HEX NUT, CAPACITOR	D-7700-A	1
17	HEEL PIECE	D-63196-A	1
18	GONG (LIGHT)	D-56522-A	1
19	GONG (HEAVY)	D-56523-A	1
20	GONG SCREW	D-760646-A	2
21	GONG LOCKWASHER	D-17464-C	2
22	MAGNET	D-56497-B	2

Table 12. Replacement Parts for Type 45 Straight-Line Ringer.

ITEM NO.	DESCRIPTION	PART NUMBER	QUANTITY
1	SHOULDER BUSHING	D-750221-A	1
2	ADJUSTING WHEEL SPRING WASHER	D-17619-A	1
3	ADJUSTING WHEEL SCREW	D-760731-A	1
4	BIAS ADJUSTER	D-109705-A	1
5	ARMATURE SCREW (4-40x3/8 RHMS)	D-762044-E	1
6	COIL (RIGHT)	D-284494-A	1
7	COIL (LEFT)	D-284493-A	1
8	COIL SCREW	D-760934-A	2
9	CAPACITOR (SEE TABLES 13 AND 14)	D-68693-AR	1
10	CAPACITOR HEX NUT	D-7700-A	1
11	HEEL PIECE	D-63196-A	1
12	GONG (LIGHT)	D-56522-A	1
13	GONG (HEAVY)	D-56523-A	1
14	GONG SCREW	D-760646-A	2
15	GONG LOCKWASHER	D-17464-C	2
16	ARMATURE ASSEMBLY	D-56521-A	1
17	ARMATURE ADJUSTING PLATE	D-780544-A	1
18	YOKE	D-67427-A	1
19	ADJUSTING WHEEL	D-65494-A	1
20	BEARING PIN	D-37566-A	1
21	MAGNET	D-56497-B	2

(1) Adjust the left-hand gong of a straight-line ringer so that with the armature against the right-hand coil core, the clapper shall clear the gong by approximately 0.060 inch.

(2) Adjust the left-hand gong of a superimposed ringer so that with the armature against the right-hand coil core, the clapper shall clear the gong by approximately 0.010 inch.

(h) Make sure that the biasing spring is as straight as possible.

(i) Adjust the biasing spring as follows:

(1) Adjust the biasing spring of a straight-line ringer so that it is tensioned to the maximum value allowing the clapper to strike both gongs. Test in accordance with the current-flow requirements given in paragraph 7.08.

(2) Adjustment of the biasing spring prevents the bell from tapping when connected across a standard ten-pulse-per-second dial to a standard 48 or 24 Vdc selector over a 0-loop resistance. This requirement need only be met on one polarity and should be done during final inspection of the completed telephone.

(3) Adjust the tension of a biasing spring of a superimposed ringer in accordance with paragraph 7.08(d) and (e).

(j) Align the clapper of the straight-line ringer with a volume control cam so that the clapper strikes one gong on the "soft" setting of the cam.

7.07 To adjust the Type 45 Harmonic and Decimonic Ringer, proceed as follows:

Table 13. Interchangeable Usage of Type 45 Ringer Components at Various Operating Frequencies.

ITEM NO.	SUFFIX			C16R	C20R	C25R	C30R	C33R	C40R	C42R	C50R		C54R	C60R	C66R	C67R	CSAR	CVAR		
				A16R	A20R	A25R	A30R	A33R	A40R	A42R	A50R	A51R	A54R	A60A	A66R	A67A	ASAR	ACV	ACVR	AVA
				A16	A20	A25	A30	A33	A40	A42	A50	A51	A54	A60	A66	A67	ASA			AVAR
	FREQUENCY (Hz)			16.6	20	25	30	33.3	40	42	50	50	54	60	66	66.6	SL			
	FIGURE			2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1
2	REED		D-10693-										A	A	B	B				
			D-10740-	B	B	A	A	A	A	A	A	A								
7	WEIGHT		D-56524-		B	C														
			D-56525-							B										
			D-56526-				A	C	B											
			D-56528-								C	C	A	B	B	B				
			D-56534-	A																
9	RIGHT COIL	2000	D-284494-A	1	1	1	1	1	1	1	1	1	1				1			
		860	D-284498-A											1	1	1				
		200	D-284500-A															1	1	
		150	D-284496-A																	
		1000	D-284502-A																	1
10	LEFT COIL	2000	D-284493-A	1	1	1	1	1	1	1	1	1	1				1			
		860	D-284497-A											1	1	1				
		200	D-284499-A															1	1	
		150	D-284495-A																	
		1000	D-284501-A																	1
---	LABEL		D-530139-	CC	CD	CE	CF	CG	CH	CJ	CK	CR	CL	CM	CN	CU	AG	A	A	R
---	CORE ASSEMBLY		D-790530-A	2	2	2	2	2	2	2	2	2	2				2	2	2	2
			D-790597-A											2	2	2				
18	GONG (LIGHT)		D-56522-A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
19	GONG (HEAVY)		D-56523-A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
---	SPACER		D-65501-A											1	1	1				
---	WIRE		D-543073-B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	CAN CAPAC-ITOR (µF)	0.08	D-68690-A						1	1	1	1	1	1	1	1				
		0.2	D-68691-A				1	1												
		0.3	D-68692-A			1														
		0.4	D-68693-A														1			1
		0.7	D-68695-A	1	1													1	1	
	EPOXY CAPAC-ITOR (µF)	0.08	HD-680005-A						1	1	1	1	1	1	1	1				
		0.2	HD-680006-A				1	1												
		0.3	HD-680007-A			1														
		0.4	HD-680008-A														1			1
		0.7	HD-680009-A	1	1													1	1	

Table 14. Optional Components for Type 45 Frequency Ringers.

FREQUENCY SUFFIX		REED	WEIGHT	RIGHT COIL	LEFT COIL	CAN CAPACITOR	EPOXY CAPACITOR	CAPACITOR VALUE (μF)
AAC		D-10693-A	D-56525-B	D-284013-A	D-284014-A	D-68695-AR	HD-680009-A	0.7
ASA	CSA			D-284494-A	D-284493-A	D-68693-AR	HD-680008-A	0.4
AVA	CVA			D-284502-A	D-284501-A	D-68693-AR	HD-680008-A	0.4
CVA				D-284502-A	D-284501-A			--
ASL				D-284494-A	D-284493-A	D-68693-AR	HD-680008-A	0.4
AVT				D-284502-A	D-284501-A	D-68693-AR	HD-680008-A	0.4
CVT				D-284502-A	D-284501-A			--
ACV				D-284500-A	D-284499-A	D-68695-AR	HD-680009-A	0.7
A16	C16	D-10740-B	D-56534-A	D-284494-A	D-284493-A	D-68695-AR	HD-680009-A	0.7
A20	C20	D-10740-B	D-56524-B	D-284494-A	D-284493-A	D-68695-AR	HD-680009-A	0.7
A25	C25	D-10740-A	D-56524-C	D-284494-A	D-284493-A	D-68692-AR	HD-680007-A	0.3
A30	C30	D-10740-A	D-56526-A	D-284494-A	D-284493-A	D-68691-AR		0.2
A33	C33	D-10740-A	D-56526-C	D-284494-A	D-284493-A	D-68691-AR		0.2
A40	C40	D-10740-A	D-56526-B	D-284494-A	D-284493-A	D-68690-AR	HD-680005-A	0.08
A42	C42	D-10740-A	D-56525-B	D-284494-A	D-284493-A	D-68690-AR	HD-680005-A	0.08
A50	C50	D-10740-A	D-56528-C	D-284494-A	D-284493-A	D-68690-AR	HD-680005-A	0.08
A51		D-10740-A	D-56528-C	D-284494-A	D-284493-A	D-68690-AR	HD-680005-A	0.08
A54	C54	D-10693-A	D-56528-A	D-284494-A	D-284493-A	D-68690-AR	HD-680005-A	0.08
A60	C60	D-10693-A	D-56528-B	D-284498-A	D-284497-A	D-68690-AR	HD-680005-A	0.08
A66	C66	D-10693-B	D-56528-B	D-284498-A	D-284497-A	D-68690-AR	HD-680005-A	0.08
A67	C67	D-10693-B	D-56528-B	D-284498-A	D-284497-A	D-68690-AR	HD-680005-A	0.08

(a) Make sure that the armature supporting reed is not twisted or bent out of shape.

(b) With the armature at normal, set the stroke between each coil core and the armature (measured at the nearest point) as shown in Table 15.

NOTE: This adjustment may be varied from the values as required to meet steps (d) and (e) but such variation in adjustment shall not allow the armature to strike either coil core before the clapper strikes the corresponding gong.

(c) Make sure that the clapper rod is approximately straight and at right angles to the armature.

(d) Adjust the gongs so that the clapper ball strikes both gongs about equally hard. The total width between the gongs should be approximately as shown in Table 15.

NOTE: The ringer for the Type 90M and 95 wall-mounted telephone shall be adjusted with gongs in the vertical position. Refer to steps (h) and (i).

(e) Set the clapper weight as required to produce a strong ring when the ringer is operated on the correct frequency with the current as shown in Table 15. Allow a perceptible buildup time after the circuit to the ringer is closed to allow the clapper rod weight to strike both gongs. The increase in amplitude of the clapper rod vibration should be continued until the clapper strikes the gong. When the ringer is operated on the specified current value at the required frequency and the clapper rod is retarded by hand, or the ringer circuit is momentarily opened, the clapper rod must again start vibrating and strike both gongs when the clapper rod is released or the circuit is again closed.

NOTE: The clapper rod may extend a maximum of five thirty-seconds inch beyond the outer edge of the weight, but at no time may the weight extend beyond the clapper rod for ringers with staked clapper rod weights or ringers of 40 Hz and above. On all other ringers the weight may extend beyond the end of the rod but shall at no time extend more than one-half the distance from the screw threads to the end of the weight.

(f) The clapper of a harmonic ringer must not strike eigher gong on any frequency in the same series but that frequency for which the ringer is designed. This requirement shall be met by applying ringing current (through a protective resistance only) to the bell on test for periods of approximately one-half second at 1-second intervals.

(g) It will usually be sufficient to check for overring only on those frequencies where overring is most likely to occur. These frequencies are listed in Table 16.

(h) When the ringer is mounted in a Type 90M or Type 95 Wall-Mounted Telephone Set, the weight of the clapper pulls it closer to the lower (left) gong and further from the upper (right) gong. Thus, the left gong must be moved out and the right gong moved in to make the gong clearance approximately equal. For a preliminary adjustment, this can be judged by eye with the ringer in the mounted position. Final adjustment is made by touching-up the gong clearance to get a good ring on both gongs after the instrument is installed.

(i) After a 16.6 Hz ringer is mounted in a Type 90M or 95 Telephone Set, the gongs shall be set so that they are struck equally hard when the current through the ringer is 0.006 ampere. When inspected at the minimum current requirement, it will be satisfactory if only one gong is struck.

7.08 The following current flow requirements must be met with the ringer and proper capacitor connected in series. For capacitor values refer to Table 17:

(a) Straight-line ringer (Test with 20 hertz ringing current.) See paragraph 7.06 (i) (1) and (2).

Adjustment Values	Inspection Values
3.4mA	Unmounted 3.6mA Mounted 3.8mA

(b) Straight-line ringer when mounted in a Type 90M or Type 95 Wall Telephone Set, may require a readjustment of the biasing spring. With the telephone set mounted vertically, the biasing spring should be adjusted per paragraph 7.06 (i) (1) and (2) using the following current flow values;

Adjustment Value	Inspection Value
3.4mA	3.6mA

(c) The current flow requirements for harmonic and decimonic ringers are given in Table 15.

(d) The following current flow values apply only to unmounted superimposed ringers with 2,000-ohm coils wired in parallel (manufactured prior to 9/19/61). These values shall be met by adjustment of the biasing spring.

(1) The ringer shall not ring on 7.0 milliamperes of 20-Hz current. The clapper may vibrate slightly but shall not strike either gong.

(2) The ringer shall ring on 9.0 milliamperes of 20-Hz current. The clapper may strike one gong only.

(e) The following current-flow values apply only to unmounted superimposed ringers with 1,000-ohm coils wired in series (manufactured after 1961). These values shall be met by adjustment of the biasing spring.

Table 15. Stroke, Gong Spacing, and Current-Flow Requirements for Type 45 Harmonic and Decimonic Ringers.

FREQ. (Hz)	PIECE NUMBER	DESCRIPTION	STROKE (INCH)	GONG SPACING (INCH)	CURRENT FLOW (mA)		
						INSPECTION	
					ADJ.	UNMT'D	MOUNTED
16.6	D-56516-A D-56548-A16	Multiple (Type 40 Telephone Set) Multiple (Type 80 Telephone Set)	0.070	0.750	1.2	1.4	1.6
20	D-56516-F D-56548-A20	Nonmultiple, Decimonic	0.075	0.750	1.4	1.6	1.9
25	D-56516-B D-56548-A25	Multiple	0.060	0.625	1.6	1.7	1.8
30	D-56516-G D-56548-A30	Nonmultiple, Decimonic	0.050	0.625	1.2	1.3	1.4
33.3	D-56516-C D-56548-A33	Multiple	0.065	0.625	1.8	1.9	2.0
40	D-56516-L D-56548-A40	Decimonic	0.050	0.625	1.0	1.1	1.2
42	D-56516-H D-56548-A42	Nonmultiple	0.050	0.625	1.0	1.1	1.2
50	D-56516-D D-56548-A50	Multiple	0.045	0.5625	1.0	1.1	1.2
50	D-56516-N D-56548-A51	Decimonic	0.070	0.500	1.5	1.6	1.7
54	D-56516-J D-56548-A54	Nonmultiple	0.050	0.500	1.1	1.2	1.3
60	D-56516-M	Decimonic, 2000 Ω coils, magnetic iron cores and spacers, Type 40 Telephone Sets (manufactured prior to April, 1955).	0.040	0.500	1.1	1.2	1.3
60	D-56548-A60	Decimonic, 860 Ω coils, nickel iron cores and spacers, Type 80 Telephone Sets.	0.050	0.5625	1.8	1.9	2.0
60	D-56516-M	Decimonic, 860 Ω coils, nickel iron cores and spacers, Type 40 Telephone Sets (manufactured after April 1955).	0.050	0.6025	1.8	1.9	2.0
66	D-56516-K	Nonmultiple, 2000 Ω coils, magnetic iron cores and spacers, Type 40 Telephone Sets (manufactured prior to April, 1955).	0.035	0.500	1.0	1.1	1.2

Table 15. Stroke, Gong Spacing, and Current-Flow Requirements for Type 45 Harmonic and Decimonic Ringers (Continued).

FREQ. (Hz)	PIECE NUMBER	DESCRIPTION	STROKE (INCH)	GONG SPACING (INCH)	CURRENT FLOW (mA)		
					ADJ.	INSPECTION	
						UNMT'D	MOUNTED
66	D-56548-A66	Nonmultiple, 860Ω coils, nickel iron cores and spacers, Type 80 Telephone Set.	0.045	0.5625	1.8	1.9	2.0
66	D-56516-K	Nonmultiple, 860 Ω coils, nickel iron cores and spacers, Type 40 Telephone Set (manufactured after April, 1955).	0.045	0.5625	1.8	1.9	2.0
66.6	D-56516-E	Multiple, 2000 Ω coils, magnetic iron cores and spacers, Type 40 Telephone Set (manufactured prior to April, 1955).	0.035	0.500	1.0	1.1	1.2
66.6	D-56548-A67	Multiple, 860 Ω coils, nickel iron cores and spacers, Type 80 Telephone Set	0.045	0.5625	1.8	1.9	2.0
66.6	D-56516-E	Multiple, 860 Ω coils, nickel iron cores and spacers, Type 40 Telephone Set (manufactured after April, 1955).	0.045	0.5625	1.8	1.9	2.0

Table 16. Frequency Check for Overring for Type 45 Ringer.

RINGER FREQUENCY (Hz)	FREQUENCY CHECKED FOR OVERRING (Hz)
16.6	25
20	30
25	16.6, 33.3
30	20, 40, 42
33.3	16.6, 25, 50
40	20, 30, 50
42	30, 54
50 HARMONIC	25, 33.3, 66.6
50 DECIMONIC	20, 30, 40, 60
54	42, 66
60	30, 50
66	54
66.6	33.3, 50

Table 17. Capacitor Values for Type 45 Ringer.

RINGING (Hz)	CAPACITANCE (uF)
STRAIGHT LINE	0.4
16.6, 20	0.7
25	0.3
30,33.3	0.2
40, 42, 50, 54, 60, 66, 66.6	0.08

(1) The ringer shall not ring on 4.0 milliamperes of 20-Hz current. The clapper may vibrate slightly but shall not strike either gong.
(2) The ringer shall ring on 5.0 milliamperes of 20-Hz current. The clapper may strike one gong only.

7.09 The shop test procedure for a superimposed ringer mounted in a telephone set or in ringer boxes with No. 333-A tube (typical part No. L-4108 and L-5108) is as follows:

(a) The ringer should meet the requirement specified in paragraphs 7.05, 7.06, and 7.08.
(b) The test described in steps (c) and (d) is to be made using a 20-Hz ac generator whose output wave form approximates a sine wave. Where this test is not practical, the alternate test described in paragraph 7.10 may be used.
(c) The ringer should ring on 55 Vac (RMS) 20 Hz when in series with 48 ±2 Vdc (one side of the ac generator is connected to negative battery) under the following conditions:

(1) If the yellow wire of the tube goes to the positive ringer terminal, connect the ac generator lead to the negative ringer terminal. Connect the positive battery (48 Vdc) lead to the black and red wires of the tube.
(2) If the red and black wires of the tube go to the negative ringer terminal, then connect ac generator lead to yellow wire of the tube. Connect the positive battery (48 Vdc) lead to the positive ringer terminal.

(d) The ringer should not ring on 120 Vac (RMS) 20 Hz ac when connected in series with 48 ±2 Vdc (one side of the ac generator is connected to negative battery) under the following conditions:

(1) If the yellow wire of the tube goes to the positive ringer terminal, connect the ac generator to the black and red wires of the tube. Connect the positive battery to the negative ringer terminal.
(2) If the red and black wires of the tube go to the negative ringer terminal, connect the ac generator lead to the positive ringer terminal. Connect the positive battery to yellow wire of the tube.

7.10 The following optional test procedure is provided for a superimposed ringer when the shop test procedure described in paragraph 7.09 is difficult or impractical to perform:

(a) The ringer shall meet the applicable requirements specified in paragraphs 7.05, 7.06, and 7.08.
(b) The ringer shall ring on 88 to 105 Vac (RMS) 20 Hz when connected in series with a battery connected generator. Use X wiring for series connected coils and Y wiring for parallel connected coils. Battery voltage to be as specified in Table 18.
(c) The ringer shall not ring on 88 to 105 Vac (RMS) 20 Hz when connected in series with a battery connected generator. Use X wiring for series connected coils and Y wiring for parallel connected coils. Battery voltage to be as specified in Table 18.

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Table 18. Battery Voltage for Type 45 Ringer.

(Vac)	RING (Vdc)	NO-RING (Vdc)
88-90	15	10
91-95	10	15
96-100	5	20
101-105	0	25

8. TYPE 46 RINGER

Description

8.01 The Type 46 ringer (Figure 6) is a miniature straight-line ringer, distinctly different from the other ringers in shape and size. This ringer is used in the Type 182, 182A, 186, 187, 192A, and 890 STYLELINE® telephone sets when straight-line ringing is desired. It is rectangularly shaped having a single gong construction with the resonator assembly hidden under the gong assembly. Positioned directly opposite the gong and resonator assembly are the armature and clapper assembly, coil assembly, magnet, bias spring and bias spring holder assembly. Attached to the plastic frame enclosing the coil assembly are four leads used for interfacing with the transmission unit. Equipped separate from the ringer assembly is a capacitor with two spade ended terminals for connections onto the transmission unit terminals. The complete component description and part numbers are listed in Table 19.

Disassembly

8.02 To disassemble the Type 46 ringer, proceed as follows:

(a) Remove the screw (item 12) securing the gong (item 10) to the resonator assembly (item 11), then lift the gong and resonator assembly free of the mounting base (item 9).
(b) Disconnect the bias spring (item 1) from the bias spring holder (item 2). Unscrew the bias spring holder screw (item 3).
(c) Pull the armature and clapper assembly (item 4) upward to free them from the magnet (item 6) and pole piece (item 13).

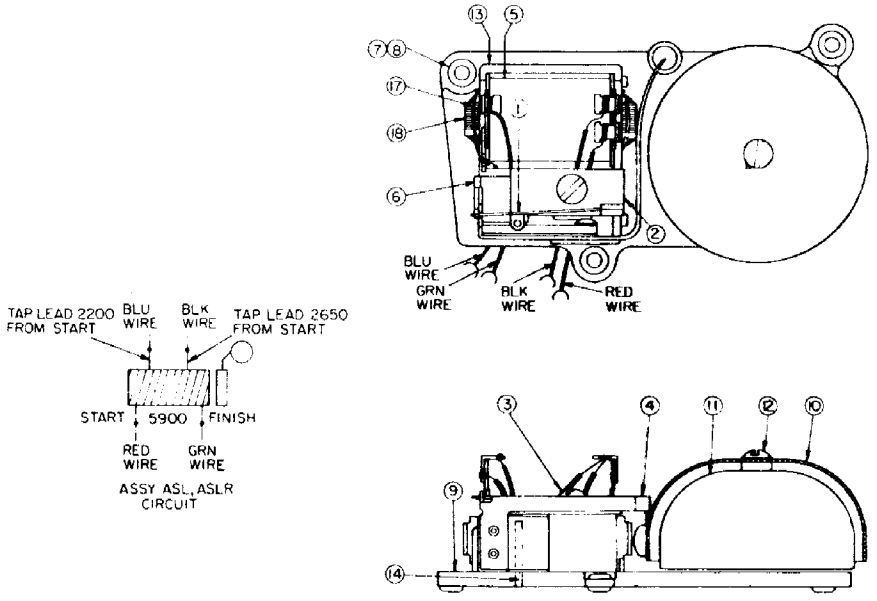

Figure 6. Type 46 Miniature Straight-Line Ringer.

(d) Position a finger on the magnet and lift the pole piece and coil assembly (item 5) upward to remove.

NOTE: When replacing a square spool coil with a round spool coil, it is necessary to replace the pole piece and adjust per paragraph 8.04.

Assembly

8.03 To assemble the Type 46 ringer (Figure 6), proceed as follows:

(a) Place the pole piece (item 13) and coil assembly (item 5) over the post just to the left of the magnet (item 6). Align the L-shaped portion of the pole piece to fit inside the small staked posts on the mounting base (item 9).
(b) Position the small clamp attached to the armature and clapper assembly (item 4) over the small pole opposite the magnet. (The south pole of the magnet must face the armature.)
(c) Place the bias spring (item 1) in the first notch of the bias spring holder (item 2). Position the hole on the extended flanges of the bias spring holder over the small pole separating the armature and magnet. Position the hole in the armature assembly over the protruding post and push downward to secure.
(d) Position the resonator assembly (item 11) over the mounting base post. Place the gong (item 10) over the resonator assembly. Install and fasten the gong and resonator assembly with mounting screw (item 12).

Adjustment

8.04 This adjustment applies only to the Type 46 Miniature Straight-Line Ringer (Figure 6). When shipped or moved the bias spring should be positioned in the high tension notch.

8.05 To adjust the Type 46 Ringer, proceed as follows:

(a) Position the permanent magnet so that it contacts both the pole piece and the armature bearing pin.
(b) The pole piece shall be positioned with respect to the mounting base so that the armature is essentially parallel to the long axis of the ringer and moves freely between the poles.
(c) The armature should have a perceptible amount of vertical free play with respect to the bearing pin.
(d) On ringers manufactured prior to October, 1972, the air gap between the armature and the magnet shall be 0.025 inch minimum. (Ringers manufactured after October, 1972 may be identified by the black base.)
(e) The air gap between the armature residual and the inner pole shall be as follows:

(1) On ringers manufactured prior to January, 1972, the air gap shall be 0.013 inch minimum and 0.017 inch maximum with the armature normal. The outer pole may be adjusted to obtain this condition.

NOTE: Ringer manufactured after January, 1972, may be identified by the clear coil cover material.

Table 19. Replacement Parts for Type 46 Ringer.

ITEM NO.	DESCRIPTION	PART NUMBER	QUAN-TITY
1	BIAS SPRING	D-109981-A	1
2	BIAS SPRING HOLDER	D-56597-A	1
3	BIAS SPRING HOLDER SCREW	D-760870-A	1
4	ARMATURE AND CLAPPER ASSEMBLY	D-56601-A	1
5	COIL ASSEMBLY: (NON-IMPREG)	D-284666-A	1
	(IMPREGNATED)	D-284666-B	1
6	MAGNET	D-56663-A	1
7	BUSHING	D-750317-A	3
8	GROMMET	D-67431-P10	3
9	MOUNTING BASE	D-780933-A	1
10	GONG	NL-13725-A	1
11	RESONATOR ASSEMBLY	NL-15724-A	1
12	SCREW, GONG, RESONATOR ASSEMBLY	D-760963-A	1
13	POLE PIECE	D-63538-A	1
14	PIN	D-37729-A	1
15	CAPACITOR (.47 μF) (SEE NOTE)	D-68837-A	1
16	MOUNTING SCREW (SEE NOTE)	D-761023-A	2
17	NUT	D-77371-AE	2
18	LAMINATION	D-790741-A	22

NOTE: Not Shown on Assembly Drawing of Type 46 Ringer.

(2) On ringers manufactured between January, 1972, and November 1972, the air gap shall be 0.018 inch minimum and 0.022 inch maximum with the armature normal. The outer pole may be adjusted to obtain this condition.

(3) On ringers manufactured after November, 1972, the air gap shall be 0.018 inch minimum and 0.025 inch maximum.

(f) Clearance between the gong and clapper shall be set for the best ring between 0.005 inch and 0.020 inch.

(g) The bias spring should preferably float free in the low notch, but it may have tension in either direction in the bias position, provided the ringer meets the requirement of paragraph 8.06(a). The bias spring must have tension when in the high-notch or high-bias position.

(h) The clapper shall strike the gong opposite to one of the resonator openings.

8.06 To adjust the Type 46 Ringer, the following electrical requirements must be met:

(a) The current flow requirement shall be met by using 20 Hz ringing current with a 0.47 uF capacitor connected in series with the coil. Bias spring shall be in the position indicated and the ringer may just ring or "tinkle" on ring values specified in Table 20.

(b) There shall be no bell tapping when the ringer and capacitor are connected in series across a standard 10 pps rotary dial to a standard 48- or 24-vdc selector over a 0 loop. This test shall be made with the bias spring in the high notch position. The dial shall have standard spark suppression consisting of a 0.1 uF capacitor in series with 100 ohms non-inductive connected across the pulsing contacts. A hesitant ringing on minimum ring is permissible but not on direct ring.

9. TYPE 46A RINGER

Description

9.01 The Type 46A Ringer (Figure 7) is a redesigned Type 46 Miniature Straight-Line Ringer. The ringer is used in the Types 102A, 182, 182A, 186, 187, 192A, 881, 890, and STYLELINE telephone sets when straight-line ringing is desired. It is rectangular in shape and has single-gong construction. The resonator assembly is plastic and fits under the gong assembly. Positioned across from the ringer and gong assembly are the coil and pole-piece assembly, the armature and clapper assembly, and the bias spring holder with the bias spring attached. Attached to the plastic frame enclosing the coil and pole-piece assembly are four leads used for interfacing with the transmission network. The complete parts list is enumerated in Table 21. Do not disassemble the magnetic circuit of this ringer unless magnet treating equipment is available.

Disassembly

9.02 To disassemble the Type 46A ringer, refer to Figure 7, and proceed as follows:

(a) Remove the mounting screw (item 10) securing the components in place.

(b) Lift the bias holder (item 8) containing the bias spring (item 9) upward to remove the bias holder from its mounting post.

(c) Lift the armature and clapper assembly upward to remove it from the ringer assembly.

(d) Lift the pin (item 2) upward to remove it.

(e) Lift the coil, pole-piece assembly, and magnet (item 6) upward to remove it.

(f) Remove the mounting screw securing the gong (item 5) and resonator (item 4) in place and remove them.

Table 20. Ringing Values for Ring and No-Ring of Type 46 Ringer.

	AD-JUST (mA)	INSPECT	
		UN-MOUN-TED (mA)	MOUN-TED (mA)
NO-RING-LOW BIAS	2.5	2.3	2.1
RING-LOW BIAS	3.7	3.9	4.1
RING-HIGH BIAS	5.8	5.9	6.5

Assembly

9.03 To assemble the Type 46A Ringer, refer to Figure 7 and proceed as follows:

(a) Place the coil and pole piece assembly (item 6) in place over the mounting post (Figure 7).

(b) Place the magnet (item 3) in its cradle and insert the pin (item 2).

(c) Insert the armature and clapper assembly (item 7) in place alongside the magnet cradle.

(d) Place the bias holder (item 8) in place over its mounting post, making sure the bias spring (item 9) sets into the notch in the armature and clapper assembly.

(e) Insert and fasten the mounting screw (item 10).

Table 21. Replacement Parts for Type 46A Ringer.

ITEM	DESCRIPTION	PART NUMBER	QUANTITY
1	MOUNTING BASE	HD-470006-A	1
2	PIN	HD-370023-A	1
3	MAGNET	HD-560009-A	1
4	RESONATOR	HD-560008-A	1
5	GONG	HD-560005-A	1
6	COIL AND POLE PIECE ASSEMBLY	HD-280008-A	1
7	ARMATURE AND CLAPPER ASSEMBLY	HD-715003-A	1
8	BIAS SPRING HOLDER	HD-540037-A	1
9	BIAS SPRING	HD-109981-A	1
10	SCREW	HD-765640-PT07	2

(f) Place the resonator (item 4) over its mounting post. Place the gong (item 5) over the resonator and fasten them to the mounting post with the mounting screw (item 10).

Adjustment

9.04 The Type 46A Miniature Straight-Line Ringer should not need mechanical adjustment. However, the following electrical requirements (Table 22) must be met:

(a) The current-flow requirement shall be met using 20 Hz ringing current with a 47-uF capacitor connected in series with the coil. The bias spring shall be in the position indicated and the ringer may just ring or "tinkle" on ring values specified in Table 22. To meet these ring values, magnetize (saturate) the ringer with the south pole toward the armature, then demagnetize it until the ringer responds to the minimum ring values.

(b) The ringer must have an audible ring on direct ring, using 16-2/3-Hz ringing current.

(c) There shall be no bell tapping when the ringer and capacitor are connected in series across a standard 100 pps dial to a standard 48- or 24-Vdc selector over a 0 resistance loop. This test shall be made with the bias spring in the biased position. The dial shall have a standard suppression consisting of a 0.33 uF capacitor in series with 100 ohms non-inductive connected across the pulsing contacts. A hesistant ring on minimum ring is permissable but not on direct ring.

10. TYPE 48 RINGER

Description

10.01 The Type 48 ringer (Figure 8) is a single-magnet, single-coil, double-gong, straight-line ringer and replaces the Type 45 ringer in its straight-line or superimposed ringing uses. For replacement parts, refer to Table 23. Do not disassemble the magnetic circuit of this ringer unless magnet treating equipment is available for reassembly.

Disassembly

10.02 To disassemble the Type 48 Ringer, refer to Figure 8 and proceed as follows:

(a) Remove the mounting screw (item 13) from the armature and clapper assembly (item 6). Make sure the bias spring is free from the pole piece notch before removing the armature and clapper assembly.

(b) Remove the magnet (item 5) from its mounting cradle.

(c) Remove the mounting screws (item 13) from the coil and pole piece assembly (item 4) and lift it upward to free it from the mounting base (item 2).

(d) To remove the right-hand (bias adjuster side) gong (item 9) and resonator (item 7) from their gong base, remove the mounting screw (item 10) and lift the gong and resonator upward to free them.

(e) To remove the gong (item 8), resonator (item 7), and gong base (item 3), remove the mounting screw (item 10) and lift upward on the gong base to remove these components from the ringer assembly.

(f) Remove the volume control lever from the mounting base.

Assembly

10.03 To assemble the Type 48 Ringer, refer to Figure 8, and proceed as follows:

(a) Assemble the volume control lever to the back of the mounting base.

(b) Align the coil and pole-piece assembly (item 4) over the post to the left of the magnet and insert and fasten the mounting screws (item 13).

(c) Place the magnet (item 15) into its mounting cradle.

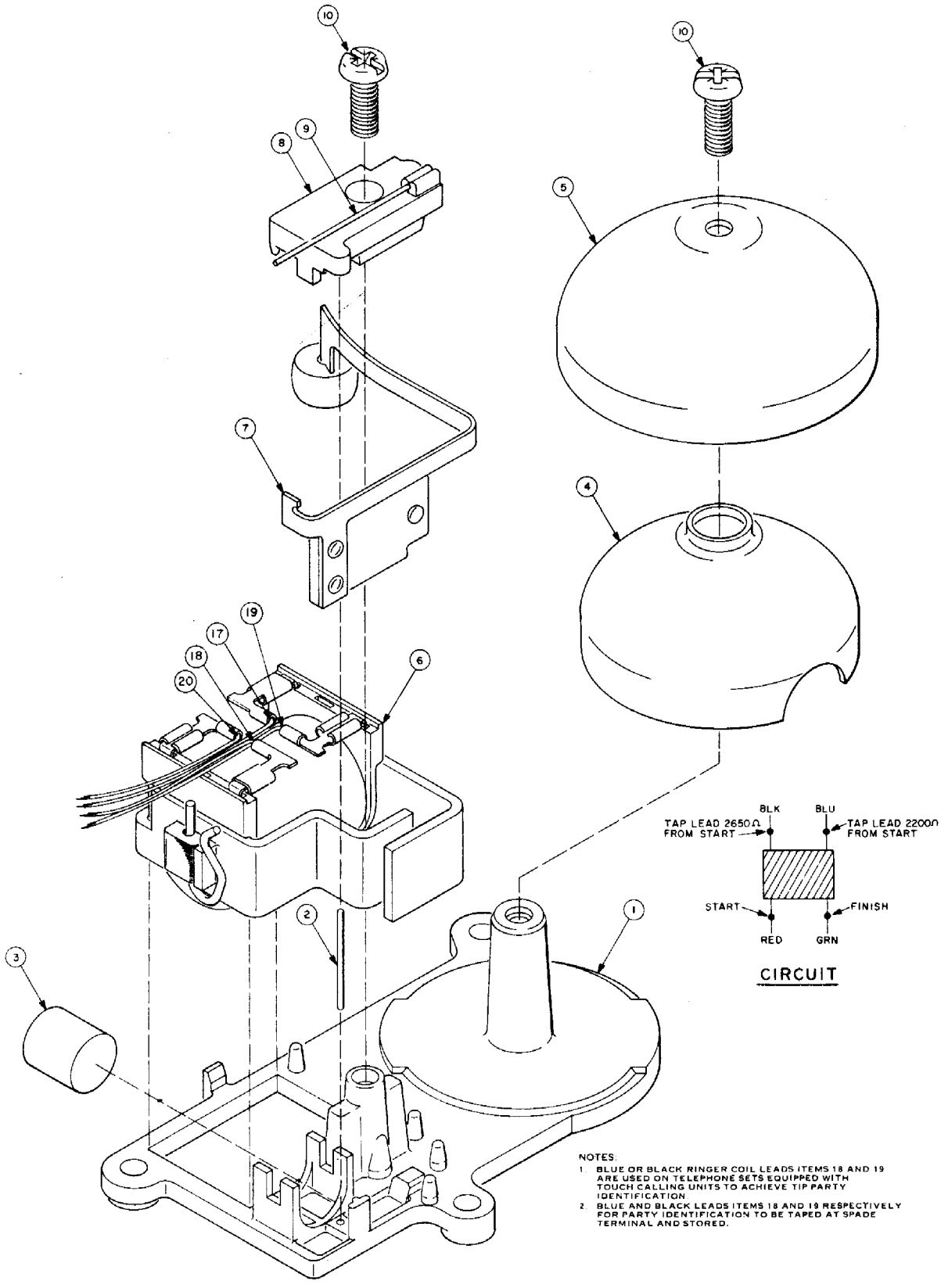

Figure 7. Type 46A Straight-Line Ringer.

Table 22. Ringing Values for Ring and No-Ring of Type 46A Ringer.

POSITION	HORIZONTAL (Vdc)	INSPECT	
		UNMOUNTED	MOUNTED
		HORIZONTAL AND VERTICAL (Vdc)	HORIZONTAL (Vdc)
No-Ring bias	40	38	38
Ring bias	57	60	65

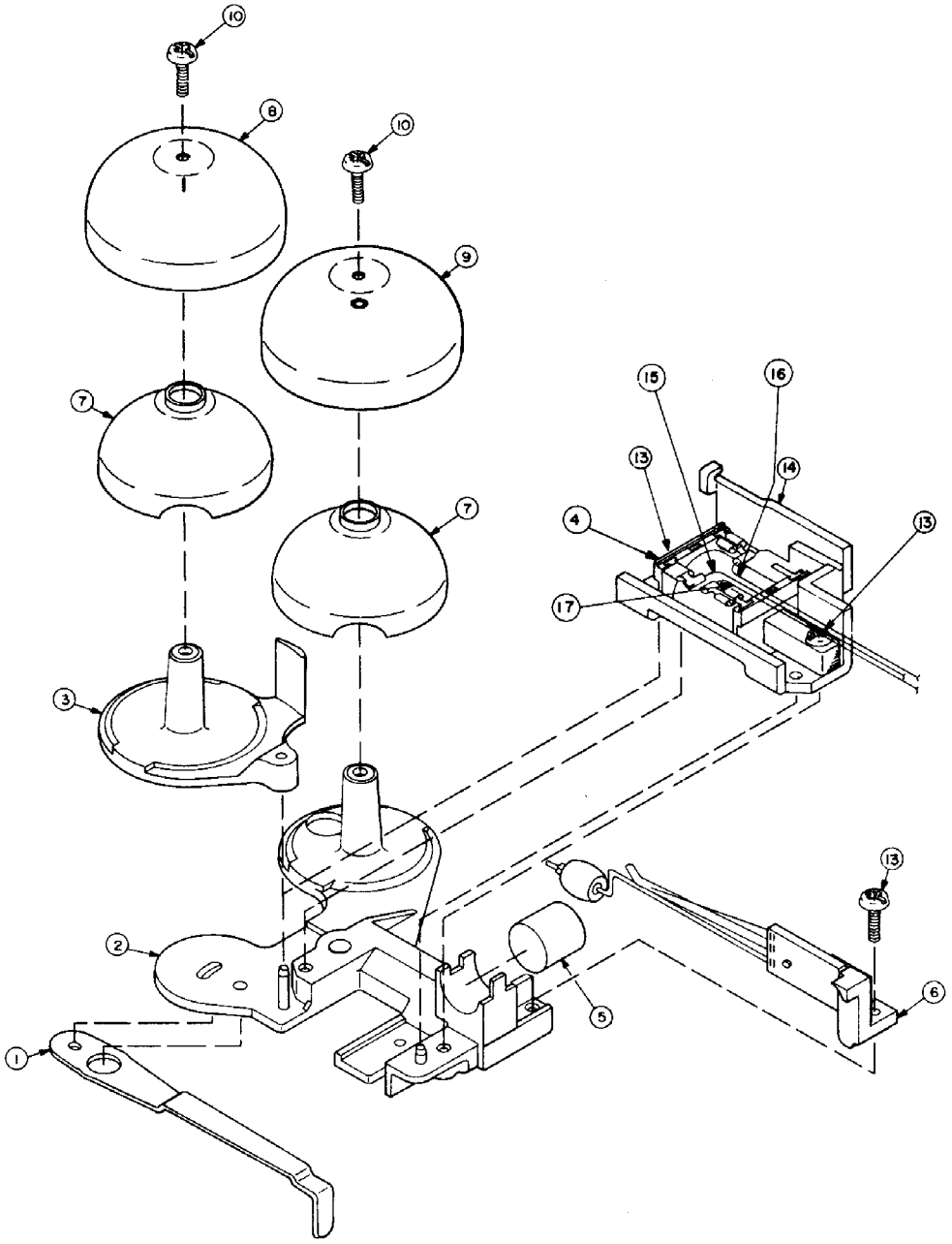

Figure 8. Type 48 Straight-Line Ringer.

Table 23. Replacement Parts for Type 48 Ringer.

ITEM	DESCRIPTION	PART NUMBER	QUANTITY
1	VOLUME CONTROL LEVER	HD-160017-A	1
2	MOUNTING BASE	HD-470009-A	1
3	GONG BASE	HD-470010-A	1
4	COIL AND POLE PIECE ASSEMBLY	HD-280011-A	1
5	MAGNET	HD-560012-A	1
6	ARMATURE CLAPPER ASSEMBLY	HD-715004-A	1
7	RESONATOR	HD-560008-A	2
8	GONG	HD-560005-A	1
9	GONG	HD-560011-A	1
10	SCREW	HD-705640-PT07	2
13	SCREW	HD-755640-PT10	3

(d) Position the armature and clapper assembly (item 6) in place next to the magnet and insert and fasten its mounting screws (item 13).

(e) Position the resonator assembly (item 7) over the mounting post. Place the right-hand gong ("0" marking) (item 9) over the resonator assembly. Install and fasten the gong and resonator assembly with the mounting screw (item 10).

(f) Position the gong mounting base (item 3) over its mounting pin. Place the resonator assembly over the gong mounting base and the left-hand ("1" marking) (item 8) over the resonator assembly. Install the gong and resonator assembly coil mounting screw (item 10).

Adjustment

10.04 The adjustment information applies to the Type 48 Straight-Line or Superimposed Ringer and is also applicable to the Type 33 Ringer Unit with the Type 48 Ringer. To adjust the Type 48 Ringer, proceed as follows:

(a) Make sure the armature supporting the reed spring is not twisted or kinked.

(b) The clapper arm shall not make contact with the pole piece.

(c) The outer pole of the pole piece shall be in a square and in parallel alignment with the biased armature. The air gap between the armature residual and the inner pole shall be between 0.032 and 0.037 inch.

(d) The volume-control lever shall have a perceptible to 0.015-inch clearance to the cam of the base with the volume-control lever set to loud and the armature in the unbiased position against the inner pole. (This is done so the ringer will tinkle in the soft position.)

(e) The right-hand gong or thick gong (with the "0" marking) shall be set so with the armature in the biased position against the other pole, there will be 0.015- to 0.030-inch space to the clapper weight.

(f) The left-hand gong or thin gong (with the "1" marking) shall be set so the armature in the unbiased position against the outer pole, be 0.015- to 0.030-inch space to the clapper weight. The volume control arm should be moved to the soft position and then returned to the loud position prior to positioning the clapper or gong clearance.

(g) The magnet must first be magnetized in the assembly process with the south pole of the magnet facing the armature. The magnet must then be demagnetized to meet the electrical requirements.

NOTE: After demagnetizing, the armature shall not stick to the inner pole.

10.05 The electrical requirements for the Type 48 Ringer are as follows:

(a) The current flow requirements shall be met by using 20-Hz ringing current with a 0.47 µF capacitor connected in series with the coil. With the ringer in the loud position, the ringer may just tinkle on minimum ringing values. The contact of the clapper weight with one gong is allowable at minimum ring values on "tinkle" (Table 24).

(b) There shall be no bell tapping in the normal polarity position when the ringer and capacitor are connected in series across a standard 10 pps dial to a standard 48-Vdc volt selector over a 0 resistance loop. This test shall be made with the bias spring in the biased position. The dial shall have a standard spark suppression circuit consisting of a 1-µF capacitor in series with a 100-ohm noninductive connected across the pulsing contacts.

(c) With the volume control lever in the soft position, and with the outside edge of the lever aligned with the edge of the ringer base, the ringer should tinkle on direct ring at least one gong.

Table 24. Type 48 Ringer Current Requirements.

OPERATION	ADJUSTMENT (Vdc)	INSPECTION (Vdc)	MOUNTED (Vdc)	RINGER RESPONSE
Dial Tapping	No Check	Check	Check	No tap on normal polarity
Direct Ringing	Line	Line	Line	Clear loud ring
Minimum Ring	42	44	48	Hesitant tinkle
No Ring	25	23	48	No ring allowed

(d) On direct ring values, the ringer should have an audible ring on 16-2/3 to 33-1/3 Hz with the volume control lever in the loud position.

11. TYPE 860 RINGER

Description

11.01 The Type 860 Ringer (Figure 9) used in conjunction with the Type 860 CALL COMMANDER® Telephone Set is a single gong, single coil, straight-line ringer. The components are mounted on a rectangular frame with the gong assembly positioned at one end of the base. Elevated on a mounted platform opposite the gong assembly is the capacitor, clapper assembly, armature assembly, bias-spring assembly and magnet. Extending over the outer rim of the gong assembly is the gong silencer lever that is used to regulate ringing volume. Connected to one of the two pieces of fiberboard that are used to enclose the coil assembly are two wiring leads that are to be connected to transmission-unit terminals. For a complete component description see Table 25.

Disassembly

11.02 To disassemble the Type 860 Ringer (Figure 9), proceed as follows:

(a) Remove the ringer coil (item 6) by removing the two screws (item 19) from each end of the metal coil support bar.
(b) Unscrew the armature mounting bracket screw (item 20) from the armature mounting bracket (item 14) to free the armature (item 13) clapper (item 16) clapper rod (item 17) and bias spring (item 9).

Assembly

11.03 To assemble the Type 860 Ringer, proceed as follows:

(a) Situate the ringer coil (item 6) into the open section in the center of the base (item 18). With each end of the bar of the coil assembly aligned over the mounting holes, install and fasten the ringer coil with the two ringer coil screws (item 19).
(b) Position the bias spring (item 9) inside the bias spring holder (item 10). Place the armature (item 13) between the pole piece (item 8) and the S-shaped flange supporting the magnet (item 7). Force the armature assembly and armature mounting bracket past the traction of the magnet to rest on the base. Insert the armature mounting bracket screw (item 20) and secure it.

Adjustment

11.04 This adjustment applies only to the ringers used in conjunction with the Type 860 Telephone Set. These ringers should be adjusted with the gong positioned away from the person doing the adjusting.

11.05 Adjust the Type 860 Ringer to meet the following mechanical requirements:

(a) The "L" shaped bracket of the bias spring and clapper assembly shall be as nearly in contact with surface A, B and C of Figure 10 as possible, after which the permanent magnet shall be positioned firmly against the L shaped bracket.
(b) The clapper rod and bias spring should be free of sharp kinks and bends. The outer pole should be in a square and parallel contact alignment with the biased armature. The inner pole should have a minimum clearance of one thirty-seconds inch from the armature with the clapper resting against the volume control cam in the loud setting.
(c) With the clapper rod positioned approximately five thirty-seconds inch above the gong rim, the clapper-to-gong clearance shall be one-sixteenth inch maximum in either the left or right bias spring detent notch but not less than one thirty-seconds inch with the biased spring in the right detent notch.

11.06 Adjust the Type 860 Ringer to meet the following operating requirements:

(a) The volume-control cam should contact the clapper in such a manner as to silence a direct line current

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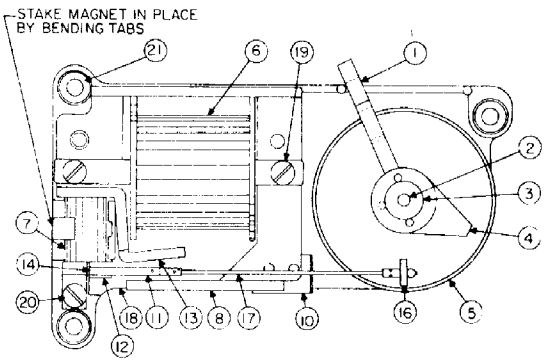

Figure 9. Type 860 Ringer.

ring with the cam actuating lever approximately 3/16 of an inch away from the "soft" or upper limit stop.

(b) The operational response of a properly adjusted ringer, using 20 Hz ringing current and a 0.47μF capacitor connected in series with the coil, shall comply with the current flow requirement shown in Table 26.

11.07 Position and adjust the bias spring using the following instructions:

(a) The bias spring shall be located in the right detent notch farthest from the coil under most operating conditions. However, when three or more ringers are bridged across the line and operation is not satisfactory, the bias spring may be placed in the left detent notch closest to the coil on all ringers. If satisfactory operation is not obtained by the bias spring positioning, the spring itself may be adjusted.

(b) If adjustment of the bias spring is necessary, check for compliance with paragraphs 11.05 (c) and 11.06 (b).

(c) If bell taps with bias spring in low notch and the ringer is properly connected, move bias spring to high notch. Repeat ringing test. If ringer fails to operate properly bias spring may be adjusted.

(d) If adjustment of the bias spring is necessary, check for compliance with paragraphs 11.05 (c) and 11.06 (b).

Table 25. Replacement Parts for Type 860 Ringer.

ITEM NO.	DESCRIPTION	PART NUMBER	QUAN-TITY
1	GONG SILENCER LEVER	D-16389-A	1
2	WASHER, GONG SILENCER	D-17664-A	1
3	WASHER, GONG SILENCER	D-17665-A	1
4	GONG SILENCER	D-56576-A	1
5	GONG	D-56577-A	1
6	RINGER COIL	NL-17565-A	1
7	MAGNET	D-56579-A	1
8	POLE PIECE	D-63534-A	1
9	BIAS SPRING (SEE NOTE)	D-109891-A	1
10	BIAS SPRING HOLDER	D-56574-A	1
11	REED	D-109890-A	1
12	REED DEFLECTION SPRING	D-109889-A	1
13	ARMATURE	D-71654-A	1
14	ARMATURE MOUNTING BRACKET	D-731766-A	1
15	ARMATURE BUMPER (SEE NOTE)	D-67431-C12	1
16	CLAPPER	D-56575-A	1
17	CLAPPER ROD	D-56578-A	1
18	BASE	D-780812-A	1
19	SCREW, RINGER COIL	D-762033-K	2
20	ARMATURE MOUNTING BRACKET SCREW	D-760870-A	1
21	GROMMET	D-67431-K10	3

NOTE: Not Shown On Assembly Drawing of Type 860 Telephone Ringer.

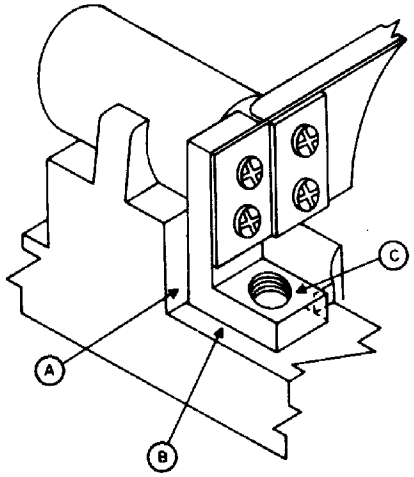

Figure 10. Bias Spring Bracket and Clapper Assembly for Type 860 Ringer.

Table 26. Operation and Current-Flow Requirements for Type 860 Ringers.

OPERATION	ADJ. CURRENT (MA)	INSPECTION UNMOUNTED (MA)	CURRENT MOUNTED (MA)	BIAS SPRING DETENT	RINGER RESPONSE
Dial Tapping				Right	No tap on (1) polarity
Direct Ring	Line	Line	Line	Right	Clear ring without excessive clatter
Minimum Ring	4.8	5.0	5.2	Right	Clearly audible
Minimum Ring	2.3	2.5	2.7	Left	Clearly audible
No Ring	1.4	1.2	1.0	Left	