GTE AUTOMATIC ELECTRIC
TYPE 880B SPEAKERPHONE TELEPHONE SET WITH TOUCH CALLING
INSTALLATION AND FIELD MAINTENANCE

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1. GENERAL

1.01 This section presents information on the GTE Automatic Electric Type 880B Speakerphone (NC-880) equipped with a Touch Calling unit. Included is a detailed description, operating instructions, installation instructions, field maintenance procedures, and a circuit description.

1.02 This section is reissued to correct information, and to remove information from the part on field maintenance that is a shop procedure. The changed information is indicated by marginal arrows. Remove Issue 1 of this section from the practices binder and replace with this Issue.

Features

1.03 The Type 880B speakerphone (Figure 1) may be used as a regular telephone set or as a loudspeaking telephone set. Use of the loudspeaking feature eliminates the need of holding the handset and also makes group conference calls possible.

1.04 A neon lamp is incorporated within the OFF/ON switch button. The lamp flashes whenever the switch button is in the ON position, indicating an off-hook condition.

1.05 The standard speakerphone uses a electronic type tone signal, in place of a ringer, for signaling.

1.06 The speakerphone is equipped with a new printed circuit transmission board which provides automatic level control on varying loop lengths, while maintaining adequate sidetone balance.

2. DESCRIPTION

Physical Description

2.01 Housing. The speakerphone (main unit assembly and speaker assembly combined) weighs 7 pounds. The main unit assembly measures 9-1/4 inches wide, 5 inches high, and 7-1/2 inches in depth. The associated speaker assembly measures 5-5/8 inches wide, 3-7/8 inches high, and 3-3/4 inches in depth. The lower housing of the main unit assembly is equipped with a polyurethane-polyester pad while the speaker assembly housing is equipped with a neoprene molded pad

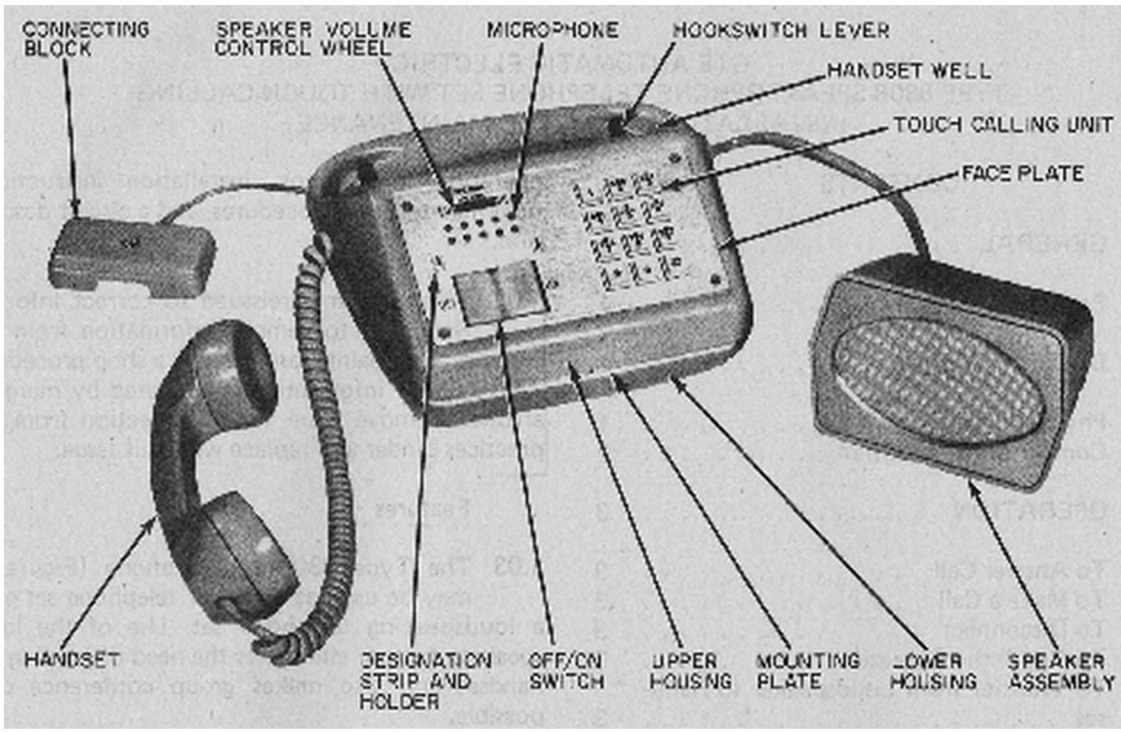


Figure 1. GTE Automatic Electric Type 880B Speakerphone Equipped with a Touch Calling Unit.

to protect desk and table tops. The speakerphone is available in the following six colors; black, sand beige, dawn gray, jade green, turquoise and gardenia white.

2.02 Face Plate. The Touch Calling buttons, switch button, and speaker volume control wheel all project through the brushed aluminum face plate at the front of the main unit assembly. Above the OFF/ON switch, which is located on the left side of the face plate, is the designation strip card and holder, a series of small holes for the microphone and the speaker volume control wheel. The Touch Calling unit is located on the right side of face plate.

2.03 Handset. The speakerphone is equipped with → a Type 810 or 811 handset which rests in wells at the rear of the upper housing. The hookswitch lever consists of two clear plastic bars, one in each of the handset wells. The retractile handset cord extends from the left side of the main unit assembly, and the line cord and speaker cord extend from the rear of the main unit assembly. The line and speaker cords are approximately 6 feet in length.

Component Description

2.04 Face plate components. The OFF/ON switch button is used for switching from handset to loudspeaking operation (or loudspeaking to handset operation). The speaker volume control wheel controls the output of the speaker. Depending on service requirements, the Type 880B speakerphone is also available with one of the four styles of rotary dials.

(a) Numerical 1-0.

(b) Metropolitan ABC.

(c) SATT A.

(d) SATT B.

Refer to Section 473-410-200 for additional information on the rotary dial version of the speakerphone.

2.05 Signal circuit board. In place of a ringer, the speakerphone uses an electronic circuit to generate a tone signal for signaling. The signal

circuit board is located in the speaker case. The signal circuit responds (on a non-selective basis) to any ringing frequency in the range of 16.6 to 66.6 Hz. The frequency of the electronic ringing tone is essentially constant regardless of ringing frequency.

2.06 If an external ringer is required or desired, the speakerphone may be ordered less the signal circuit board. In this case, a Type 45 ringer and Type 33 ringer cover must be used. A speakerphone without the signal circuit board has a blank circuit board inserted in its place, and the four tone signal leads are insulated and stored.

2.07 Amplifier circuit boards. The microphone amplifier circuit board is located in the main unit assembly. The speaker amplifier circuit board is located in the speaker assembly.

2.08 Transmission Unit. Speakerphone operation in the handset mode uses a physically smaller version of the transmission unit in the GTE Automatic Electric Type 80 (NC-Series) Telephone Set (dial pulse contact spark suppression filter capacitor is omitted on Touch Calling versions). Varistor action of the transmission unit provides automatic regulation for varying loop lengths, while maintaining adequate sidetone balance.

2.09 Touch Calling Signaling Unit. A series varistor-resistor combination is used to regulate the level of the generated tones with respect to loop length as the Touch Calling unit is being keyed. These two components also provide a low impedance shunt to high potential transients which may appear on the line. A resistor has also been added to reduce the receiver gain of the amplifier while the Touch Calling unit is being keyed. This prevents overly-loud local reception of the dual tone multi-frequency tones when in the loud speaking mode, just as a series resistor in the Touch Calling unit pads the handset receiver during keying when in the handset mode.

2.10 Connecting block. A connecting block having ten terminals is provided with each speakerphone to facilitate use with different ringing schemes, and to permit the use of an external power supply with speakerphone (when required). The connecting block also makes it possible to easily wire the speakerphone for use in key telephone systems.

2.11 Power is provided to the Type 880B speakerphone's transistorized components by a self-contained power supply. This power supply operates directly from the 48-volt dc central office battery, via the station interior wires. An external power supply may be needed in some cases. (Refer to paragraph 4.07.)

3. OPERATION

3.01 For handset operation, use the speakerphone as though it were a standard telephone. The switch button should remain in the OFF position.

To Answer Call

3.02 To answer a call, press the ON side of the switch button. The neon lamp (located in the switch button) will start flashing. Upon hearing the distant party, adjust the speaker volume by rotating the speaker volume control wheel.

To Make a Call

3.03 To make a call, press the ON side of the switch button. The neon lamp within the switch button will start flashing indicating line seizure. When dial tone is heard, press the appropriate buttons on the Touch Calling unit for the desired number and listen for ringback tone or busy tone. Upon hearing the distant party, adjust the speaker volume by rotating the speaker volume control wheel.

To Disconnect

3.04 To disconnect, press the OFF side of the switch button. The neon lamp will stop flashing.

NOTE: The switch button must be pressed to the OFF position (on-hook condition) at the end of a conversation in order to receive or initiate other calls.

To Recall the Operator

3.05 To recall the operator, alternately press the OFF and ON sides of the switch button (flash) until the operator answers. (To talk privately to the operator, transfer to handset operation and push one of the hookswitch bars to flash the operator.)

To Transfer from Loudspeaker to Handset

3.06 To change from loudspeaker to handset operation, lift the handset and depress the

OFF side of the switch button. The neon lamp in the switch button will stop flashing and the conversation may be continued via the handset. To switch from handset to loudspeaker operation, depress the ON side of the switch button and restore the handset.

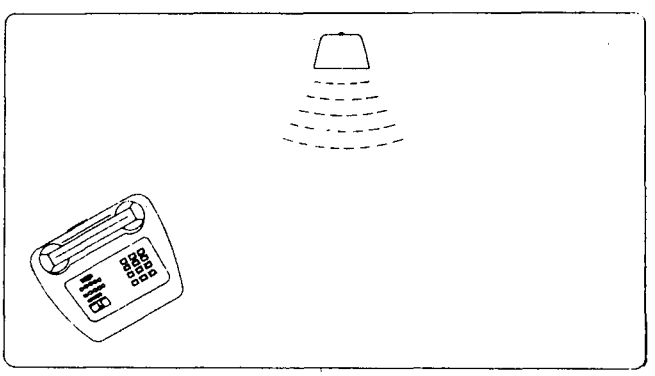
Group Conference Calls

3.07 The Type 880B speakerphone can be used for conferences. It is not necessary that the microphone be turned toward each person as he speaks. As the person speaking moves away from the microphone, the sound in the distant party's receiver decreases. When the speakerphone is used in quiet surroundings, the microphone will pick up words spoken several feet away. Under adverse conditions, such as a noisy room or a poor connection, speak within two feet of the microphone.

4. INSTALLATION

Mounting

4.01 Place the main unit assembly with attached speaker assembly in the desired location. Figure 2 shows a suggested arrangement of the speakerphone for best results. To minimize feedback, the main unit assembly must always be sufficient distance from the loudspeaker. The microphone (in the main unit assembly) should never face toward the loudspeaker. The angle between the side of the speakerphone and the nearest sound path from the loudspeaker should not exceed 90 degrees.



→ Figure 2. Suggested Arrangement for the Speakerphone Operation.

4.02 Mount the connecting block in an inconspicuous location on a wall or on the back of a desk.

Line Polarity

4.03 Line polarity is important at divided-ringing party-line stations. Connection information included in this section assumes that the interior wires between the protector (or PBX switchboard, etc.) and the telephone location on the customer's premises have their polarities identified by the following standard tracers:

(a) Red-negative (- ring).

(b) Green-positive (+ tip).

(c) Yellow-ground.

Electrical Connections

4.04 Interior wires. The Type 880B speakerphone (with signal circuit board for tone signaling) is shipped wired for bridged ringing. Table 1 provides wiring information for the various types of ringing. The interior wires connected to the speakerphone connecting block terminals as follows:

(a) The yellow (GRD) lead to terminal 4.

(b) The red (L1) lead to terminal 1.

(c) The green (L2) lead to terminal 6.

Stamping Designation Strip

4.05 The designation strip and holder are packaged separately within the packing. Stamp the designation strip with the appropriate station telephone number. Insert the spring clips through the designation strip holder. Place the designation strip behind the holder and insert the spring clips into the mounting holes in the face plate above the OFF/ON switch.

→ 4.06 External ringer. When an external ringer is to be used, a Type 45 ringer and Type 33 ringer cover must be ordered separately. The connections between the ringer, ringer cover, and the speakerphone for the various types of ringing are shown in Figures 3, 4, and 5. ←

4.07 External power supply. When the total loop resistance exceeds 750 ohms, or when certain low-voltage switchboards such as the Leich L55 or WECo No. 555 are used, "Y" wiring and an external Type 88 Power Supply Unit (L-7038-AO) is required. Refer to Section 490-100-200.

Table 1. Ringing Connections at the Connecting Block.

CONNECTING BLOCK TERMINALS	BRIDGED RINGING (SIGNAL CIRCUIT BOARD)		BRIDGED RINGING (EXTERNAL RINGER)		DIVIDED RINGING		DIVIDED RINGING	
					+ TIP		- RING	
	LINE CORD	INTERIOR WIRE	LINE CORD	INTERIOR WIRE	LINE CORD	INTERIOR WIRE	LINE CORD	INTERIOR WIRE
RING 1	BRN-GRN RED	RED	RED	RED	RED	RED	BRN-GRN RED	RED
2	BLACK	–	BLACK	–	BLACK	–	BLACK	–
3	–	–	BRN-GRN	–	–	–	–	–
GRD 4	–	YELLOW	YELLOW	YELLOW	BRN-GRN	YELLOW	YELLOW	YELLOW
5	BLUE	–	BLUE	–	BLUE	–	BLUE	–
+ TIP 6	YELLOW GREEN	GREEN	GREEN	GREEN	YELLOW GREEN	GREEN	GREEN	GREEN
7	WHITE	–	WHITE	–	WHITE	–	WHITE	–
8	BRN-YEL	–	BRN-YEL	–	BRN-YEL	–	BRN-YEL	–
9	BRN-BLK	–	BRN-BLK	–	BRN-BLK	–	BRN-BLK	–
10	BRN-RED	–	BRN-RED	–	BRN-RED	–	BRN-RED	–

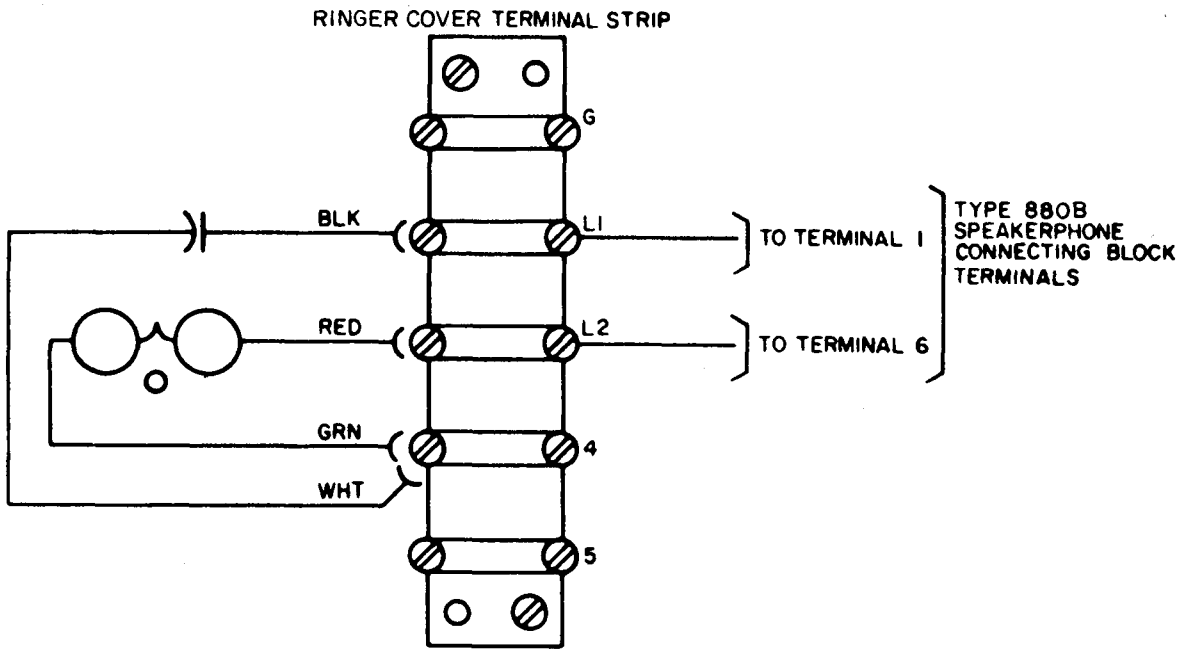


Figure 3. External Ringer Wired for Bridged Ringing.

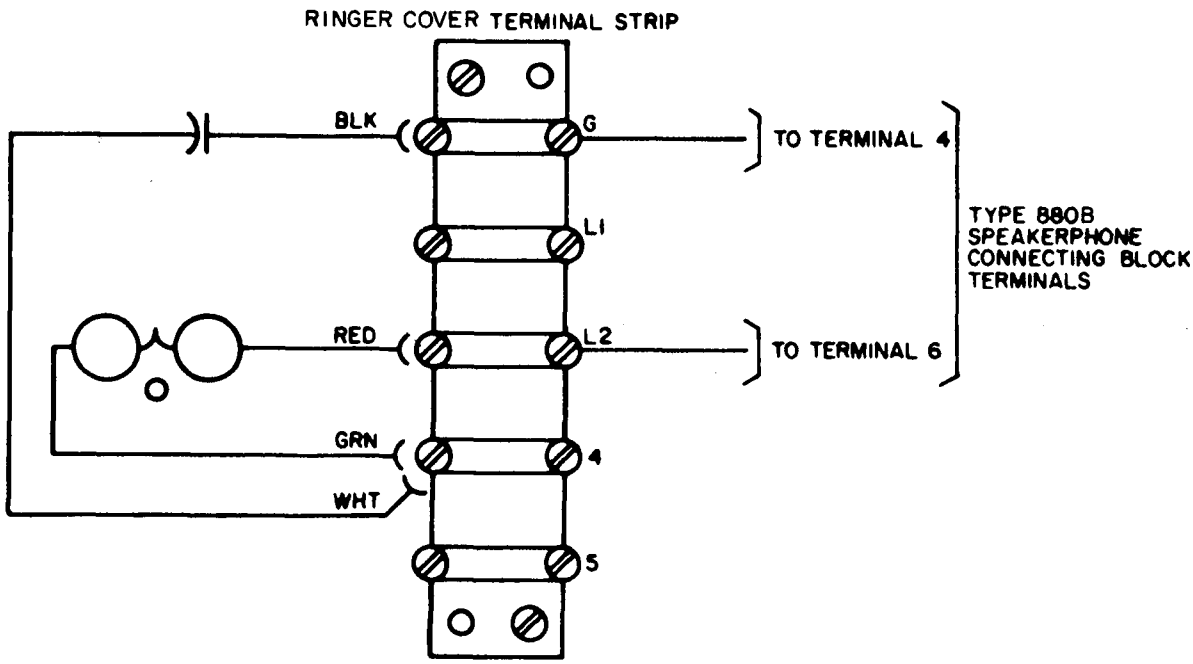


Figure 4. External Ringer Wired for (+ Tip) Ringing.

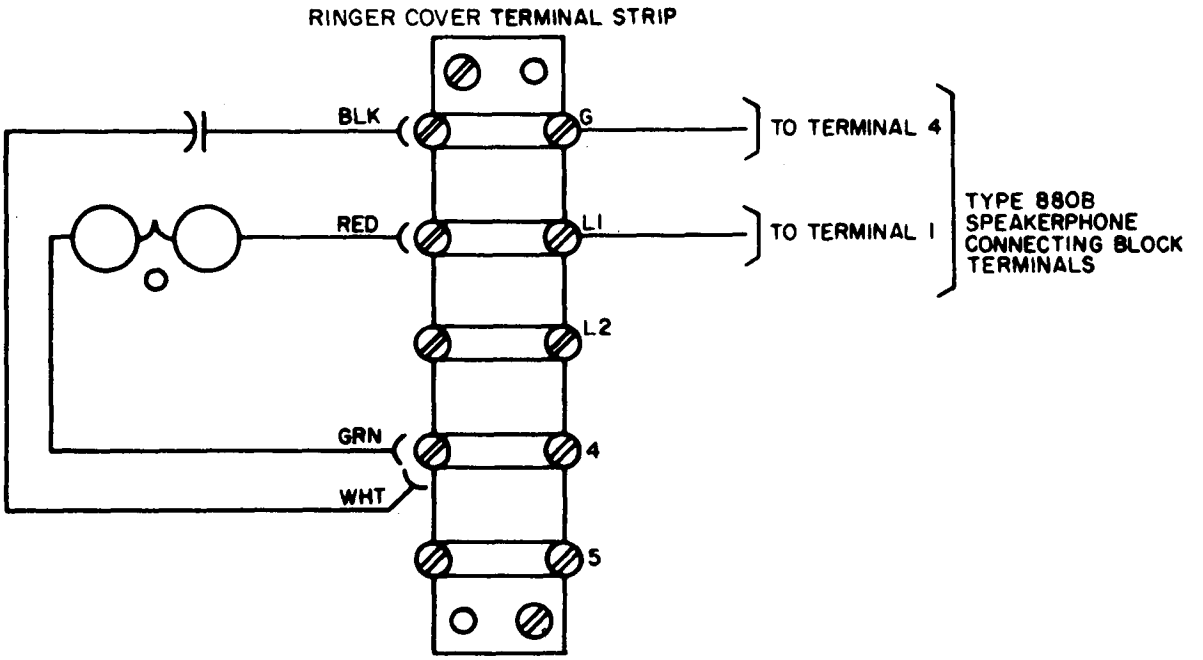


Figure 5. External Ringer Wired for (- Ring) Ringing.

Adjustments

4.08 Tone signal. The signal circuit board is located in the speaker assembly. To adjust the volume of the tone signal, insert a small screwdriver into the hole in the base of the speaker housing, and turn the screwdriver until the desired volume is attained.

4.09 Speaker volume. Adjust the speaker volume by rotating the speaker volume control wheel, so that the distant party's voice can be heard distinctly and without effort. Do not set the speaker volume higher than necessary since excessive volume may lead to acoustic feedback or "howling," and will also cause undesirable echo in the distant party's receiver.

Key Telephone Systems

4.10 When using the speakerphone in a 10A1, 10A2 or 16A Key Telephone System along with a Type 88 Power Supply Unit, the OFF/ON switch of the speakerphone controls the power supply unit. The A lead control is provided by the hookswitch or the OFF/ON switch.

4.11 When the handset is removed (or the ON side of the switch button is pressed), the relay of the key system operates and connects the telephone with line equipment through relay equipment.

5. FIELD MAINTENANCE

5.01 Because of the twine laced wiring of the 880B, field maintenance will be limited to replacement of the housings, handset, handset cord, and line cord. Refer to Figures 6 and 7 for internal views of the speakerphone.

5.02 Components which are not listed in Paragraph 5.01 cannot be replaced in the field. Therefore, replace the entire speakerphone. Attach a completed rejection card (Form S 6201) and return the speakerphone to the local storeroom.

Main Unit Housing Removal

5.03 To remove the upper housing, remove the four Phillips head screws located on the brushed aluminum face plate. Then lift off the face plate and remove the upper housing. To replace the upper housing just reverse the procedure.

5.04 To remove the lower housing of the main unit assembly, remove the three screws on the bottom.

Speaker Housing Removal

5.05 To remove the speaker housing, remove the Phillips head screw from the rear of the speaker assembly, and slide the housing back along the speaker cord. To replace the housing, reverse the above procedure.

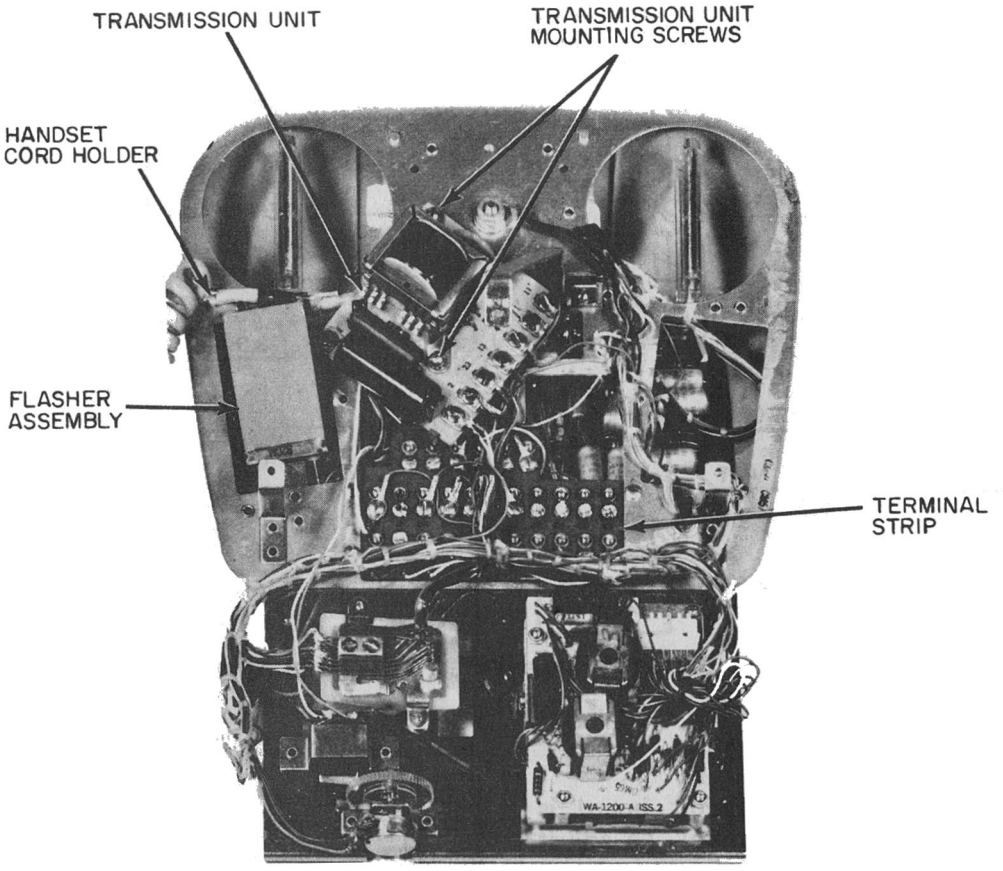


Figure 6. Top View of Main Unit Assembly with Upper Housing Removed and Backing Plate Turned Over.

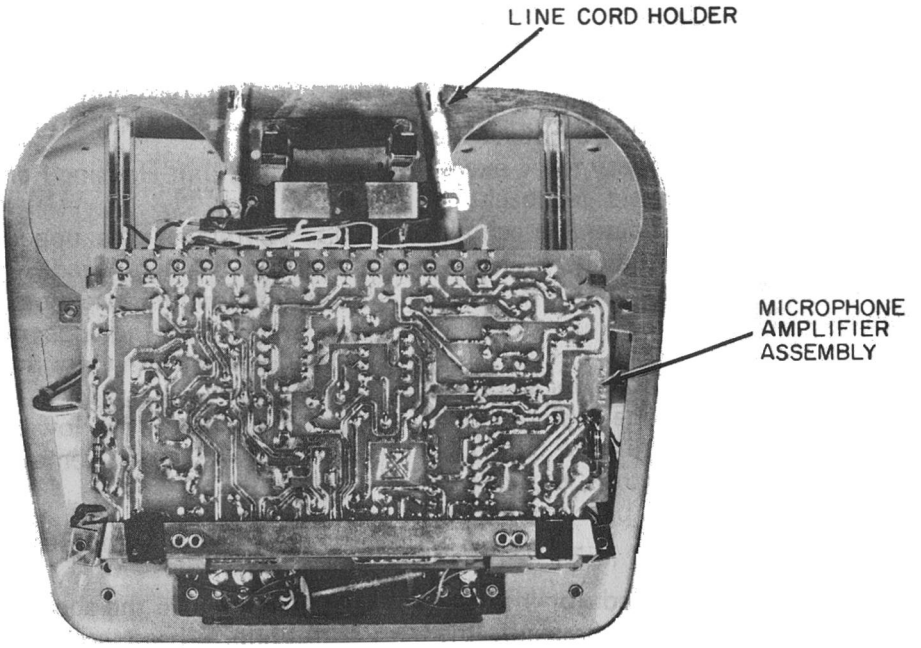


Figure 7. Bottom View of Main Unit Assembly with Lower Housing Removed.

Handset Replacement

5.06 Handset maintenance consists of replacing:

(a) Transmitter and receiver capsules.

(b) Handset cord.

(c) Complete handset.

For additional information pertaining to the handset components, refer to Section 473-802-300.

5.07 Use the following procedure to replace the handset cord:

(1) Remove the upper housing (refer to Paragraph 5.03).

(2) Disconnect the green and yellow leads from terminals 4H and 1H on the internal terminal strip respectively.

(3) Disconnect the red and black leads from terminals 5 and 23 of the transmission unit respectively.

(4) Release the handset cord holder from the mounting plate and remove the old cord.

(5) Remove the transmitter and receiver caps, disconnect and remove the capsules.

(6) Loosen the strain relief clamp screw to free the clamp and remove the cord.

(7) Insert the new handset cord feeding the black and yellow leads up through the handset to the receiver end. Reinstall the receiver capsule and replace the receiver cap.

(8) Secure the strain relief clamp under the retaining screw.

(9) Connect the red lead to the transmitter rim contact spring.

(10) Connect the green lead to the transmitter central contact spring.

(11) Replace the transmitter capsule and cap.

(12) Fasten the handset cord holder to the mounting plate.

(13) Connect the green to terminal 4H and the yellow lead to terminal 1H on the internal terminal strip.

(14) Connect the red lead to terminal 5 and the black lead to terminal 23 of the transmission unit.

(15) Replace the upper housing.

Line Cord Replacement

5.08 Use the following procedure to replace the line cord:

(1) Remove the lower housing.

(2) Release the amplifier circuit board by pressing aside the two spring type mounting brackets, and set it aside.

(3) Disconnect the line cord leads from the terminal strip.

(4) Release the line cord holder and pull out the old line cord.

(5) For bridged ringing, refer to the notes in Figure 9 and connect the new line cord leads to the terminal strip as follows:

(a) BRN-YEL to terminal EB.

(b) RED to terminal 1R.

(c) WHT to terminal 4T.

(d) BLK to terminal 3R.

(e) BRN-GRN to terminal 1T.

(f) YEL to terminal 2R.

(g) BRN-BLK to terminal CT.

(h) GRN to terminal 2T.

(i) BRN-RED to terminal RC.

(j) BLU to terminal ER.

(6) Hook the line cord holder to the speakerphone mounting plate.

(7) Remount the amplifier circuit board.

(8) Replace the lower housing.

5.09 Refer to Figure 9 and its appropriate note for divided ringing connections.

6. CIRCUIT DESCRIPTION

6.01 The Type 880B speakerphone (refer to Figure 9 for schematic diagram) contains two separate telephone circuits (basic and electronic). Each circuit contains components peculiar to the mode of operation, and also those which are common to both circuits. Switching between circuits is accomplished through an OFF/ON switch which is interconnected with a standard hookswitch. When the OFF/ON switch is in the OFF position, the hookswitch functions in the same manner as the hookswitch of a standard telephone set. When the OFF/ON switch is in the ON position, the switch serves as a hookswitch in the "off-hook" position. In addition to performing the same functions as a hookswitch, the OFF/ON switch also shunts the transmission network out of the circuit and closes the path between lines L1 and L2 and the rectifier, thus energizing the electronic circuits.

Basic Telephone Circuits

6.02 The Touch Calling circuit and ringer (or tone) circuit are identical for both standard telephone operation or loudspeaker telephone operation.

6.03 Figure 8 is a block diagram of the loudspeaker telephone circuit. Lines L1 and L2 are connected to the hybrid. The hybrid network is a bridge circuit used to couple the microphone and loudspeaker amplifiers to the line while minimizing the electrical coupling between these amplifiers. The ideal hybrid network should be exactly balanced against the impedance of the line, but since the balance actually varies with the characteristics of the particular line and its distant terminating impedance, some coupling always exists.

6.04 Sound waves produced by the user's voice are picked up by the microphone, amplified by the microphone amplifier, and applied to the hybrid for coupling to the line. Voice signals from the distant telephone flow into the hybrid via the line, are applied to the loudspeaker amplifier, amplified, and reproduced by the loudspeaker.

6.05 The circuitry is so arranged that the microphone and loudspeaker amplifier cannot operate at full gain simultaneously. When there is no signal in either channel, the loudspeaker

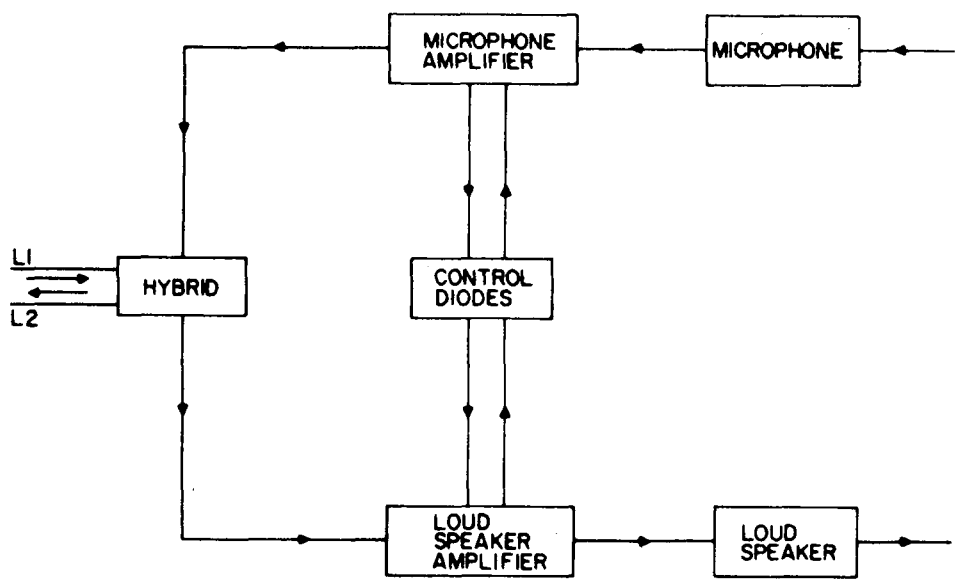


Figure 8. Block Diagram of Loudspeaker Telephone Circuit.

amplifier is at full gain while the microphone amplifier output is attenuated approximately 15 dB (attenuation is a general term used to denote a decrease in magnitude). Normal signal in the microphone channel causes the microphone amplifier to operate at full gain while the loudspeaker amplifier is attenuated approximately 20 dB.

6.06 The loudspeaking telephone is normally powered from the telephone line. Diodes CR1 through CR4 assure proper polarity of the supply voltage to the transistors regardless of telephone line polarity, while zener diode CR24 closely regulates the supply voltage so that no significant change in voltage occurs on loops from 0 to 750 ohms.

6.07 When a signal enters the microphone, it is amplified by transistor Q1. There is a delay in coupling the amplified signal to transistor Q2 because the low side of transformer T1 is floating. This condition is due to the audio appearing across the secondary of transformer T1 not being great enough (25 mv on a strong signal) to cause conduction of diodes D3 and D4, or D5 and D6. Some of the signal from transistor Q1 is coupled to the base of transistor Q4 and amplified by transistors Q4 and Q5, rectified by diode D1, and filtered. Some of this d-c signal then appears across control circuit diodes D3 through D8. The polarity of this signal is such that it causes these control diodes to conduct.

6.08 Since the diodes are now conducting and have a low internal resistance, the low side of the secondary winding of transformer T1 now has a ground path; the signal is transformer-coupled to transistor Q2, and amplified by transistors Q2 and Q3. The signal is then transformer-coupled to the telephone line via the resistance hybrid. Approximately 2-volts of dc control signal is required to increase the microphone amplifier gain by 15 dB. While the microphone amplifier gain is being increased, the diode control network is simultaneously decreasing the gain of the loudspeaker amplifier. The latter is accomplished by the control signal causing the conduction of diodes D7 and D8, thereby attenuating the speaker amplifier approximately 20 dB.

6.09 When there is no signal in the microphone channel and the distant party begins speaking, the incoming signal passes from the hybrid to transistor Q7, is amplified by transistors Q7, Q8, and Q9, and reproduced by the loudspeaker. Since the loudspeaker is to some degree acoustically coupled to the microphone, the signal would ordinarily enter the microphone. The microphone amplifier control circuit would greatly reduce the loudspeaker level, but the speaker control amplifier is connected to a rectifier and filter which are connected series-opposing with the microphone control rectifier and filter. Therefore, control voltage from the microphone circuit is effectively counteracted by loudspeaker control signal, provided the loudspeaker unit is placed a reasonable distance (preferably 2-1/2 feet or more) away from the microphone.

Flasher Unit

6.10 Since the handset of a loudspeaker telephone remains in its cradle while the telephone is in use, it would be very easy to leave the unit on after use if no indication of this condition were provided. A flashing neon lamp, encased in the OFF/ON switch, is used to indicate that the telephone is in use. The 11-volt supply powers transistor Q12, a 50-kHz transistor oscillator. The secondary of transformer T10 in the output circuit of transistor Q12 provides 150-volts at 50 kHz, which is then rectified and filtered. This output is applied to a neon lamp in the oscillator circuit, through a 5.6-megohm resistor and a 100K resistor, providing the required voltage to fire the neon lamp, which flashes due to the charge and discharge action of capacitor C36. The neon lamp flashes at the rate of 20 flashes per minute.

Electronic Ringer

6.11 The electronic ringer is responsive (on a non-selective basis) to any ringing frequency in the range from 16 to 66 Hz. The ac ringing current is rectified and filtered. The resulting dc voltage is used to power a two-frequency oscillator, Q11, operating at approximately 2,000 Hz and self-quenched (self-interrupted) at 12 Hz. The oscillator signal is amplified by a ringer output transistor, Q10, and applied to the loudspeaker.

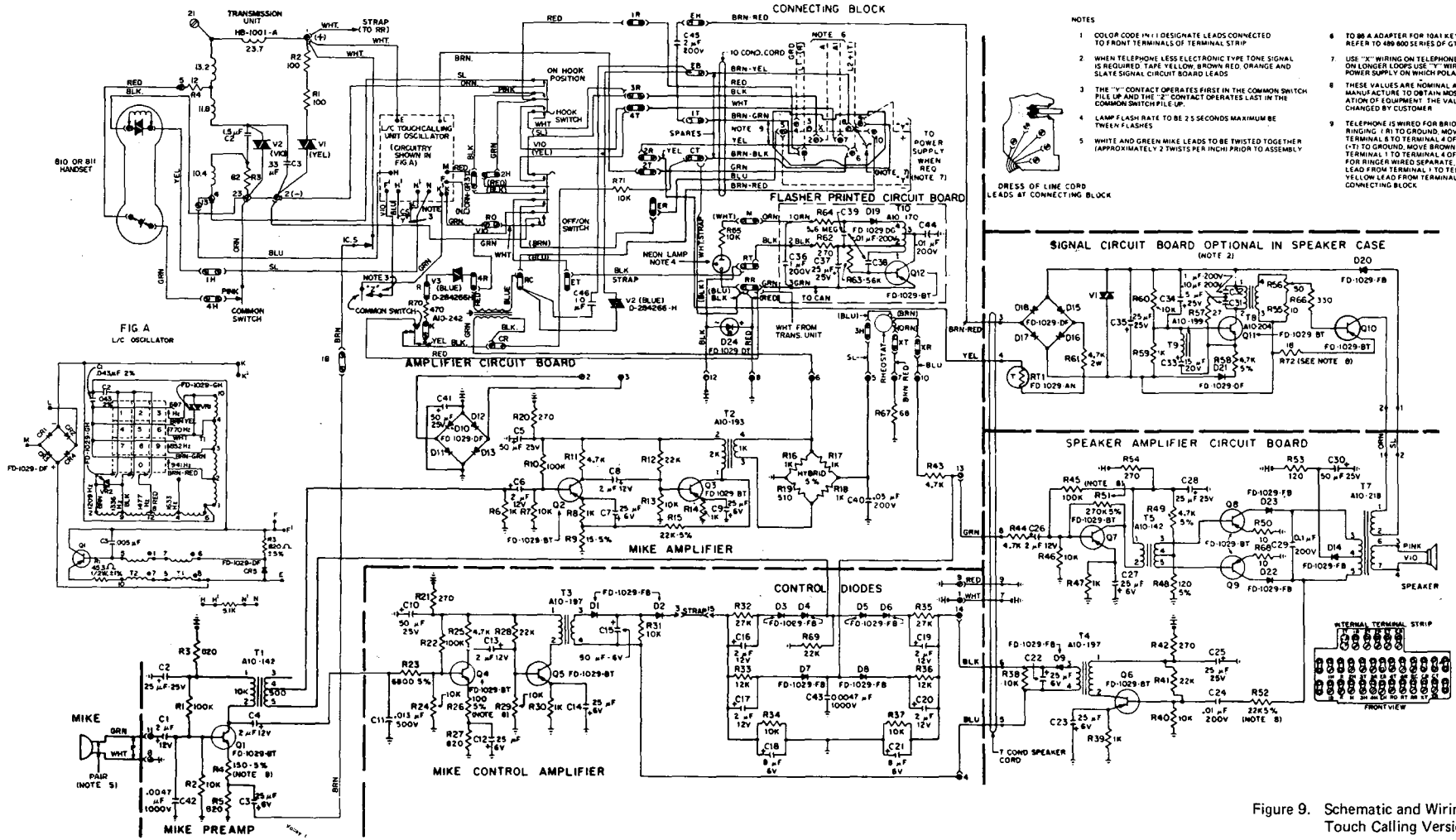


Figure 9. Schematic and Wiring Diagram of 880B Touch Calling Version.

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