

4A SPEAKERPHONE SYSTEM

1. IDENTIFICATION

1.01 The 4A speakerphone system is a hands-free voice switched system for use as a telephone adjunct and is a replacement for the 3-type speakerphone system.

1.02 This section is reissued to add information on:

- 108AR loudspeaker set
- 680AR and 680AR14 transmitters
- 82B connecting block
- Station busy lamp circuit

1.03 The 4A speakerphone system consists of a transmitter, loudspeaker set, power unit, and either a connecting block or adapter that when connected to a suitable telephone set, provides:

- Hands-free telephone operation
- On-hook dialing (when dial is not obstructed)
- Automatic switching from speakerphone to handset operation
- Transmitter muting for private conversation
- Visual indication when system is in use
- Cutoff common ringer or other signaling devices when desired.

1.04 Components of the 4A speakerphone system are shown in Fig. 2.

1.05 This system may be used with the 1A, 1A1, and 1A2 key telephone systems and all PBXs.

1.06 For additional schematic and circuit information refer to SD- and CD-69909-01, respectively.

Ordering Guide

1.07 Components which make up the 4A speakerphone systems are ordered separately as follows:

- Set, Loudspeaker, 108A-* (includes 7-foot D20N mounting cord)
- ♦Set, Loudspeaker, 108AR-* (includes 7-foot D20N mounting cord) for use when radio frequency interference is a problem♦
- Transmitter, 680A-* (includes 7-foot, D8S mounting cord)
- ♦Transmitter, 680A14-* (includes 14-foot, D8S mounting cord)
- Transmitter, 680AR-* (includes 7-foot, D8S mounting cord) for use when radio frequency interference is a problem
- Transmitter, 680AR14-* (includes 14-foot D8S mounting cord) for use when radio frequency interference is a problem♦
- Unit, Power, 85B1-49
- Only one required-*either* Block, Connecting, 82B-49 *or* Adapter, 223A-49 (includes 7-foot, M16C and 25 foot M2FG cords).

Note: ♦The 82B (when it becomes available) may be substituted for the 82A connecting block.♦

*Add color suffix.

1.08 Mounting cords are available only in satin silver (-87). The M2FG cord of the 223A adapter only comes in 25 foot length.

A 14-foot cord may be ordered for field replacement for the loudspeaker set or 223A adapter. Example:

Cord, D20N-87, 14 feet

Cord, M16C-87, 14 feet

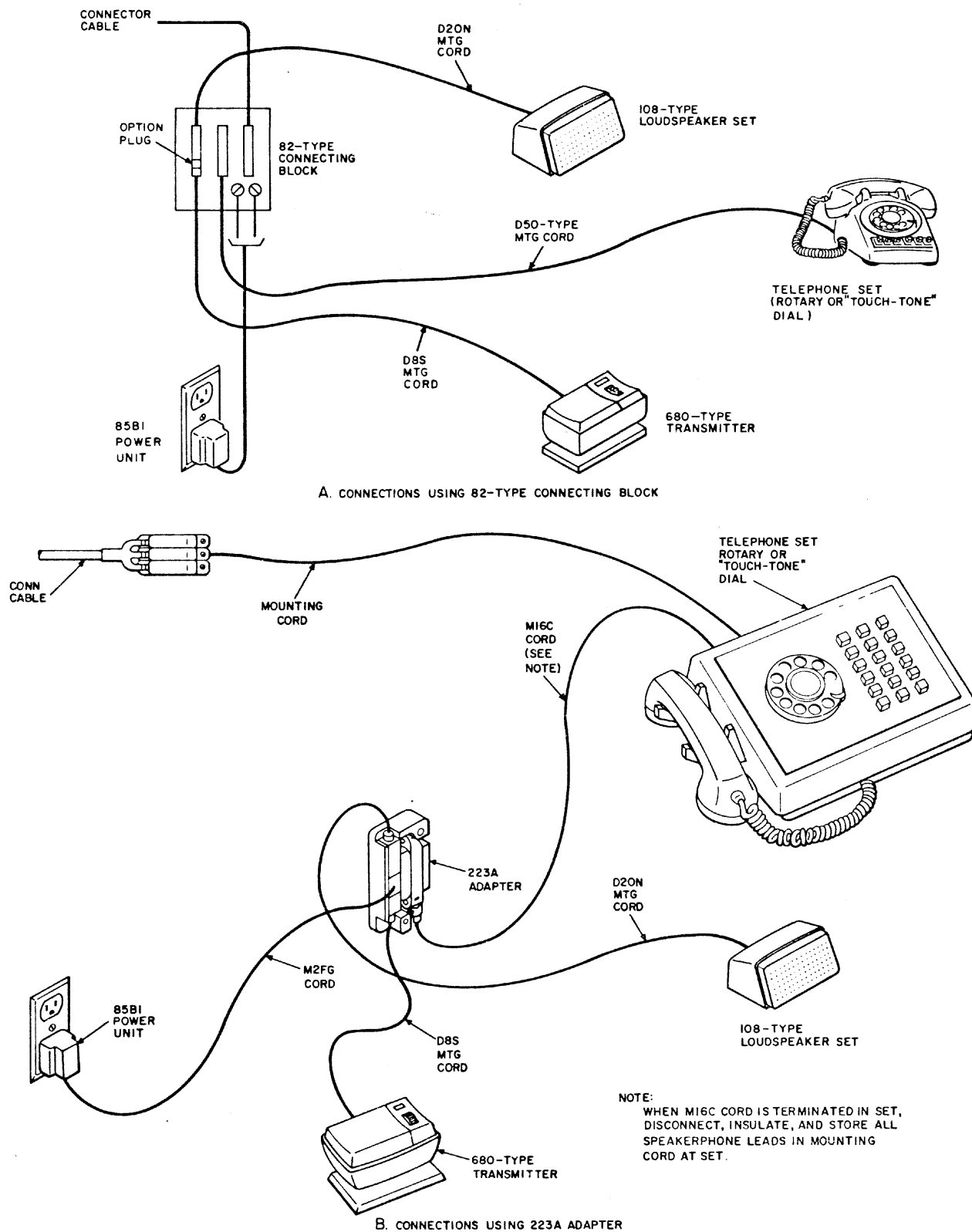


Fig. 1—Typical Arrangements of 4A Speakerphone System

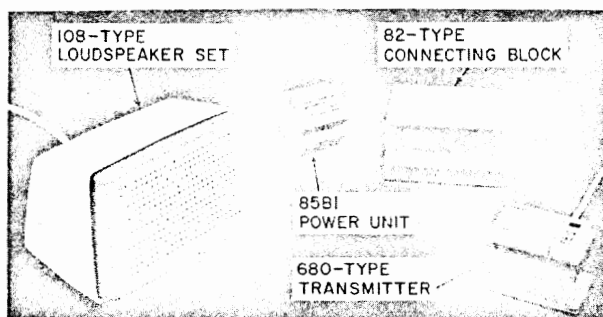


Fig. 2—Components of 4A Speakerphone System

1.09 The transmitter and loudspeaker set will be shipped in four promoted colors: Black (-03), Green (-51), White (-58), and Light Beige (-60). The following kits may be ordered if a color change is desired. Each kit contains all necessary color significant parts to convert both the loudspeaker and transmitter.

Kit of Parts	Color
D-180507	Black
D-180508	Ivory
D-180509	Moss Green
D-180510	Red
D-180511	Yellow
D-180512	White
D-180513	Lt. Beige
D-180514	Lt. Gray
D-180515	Aqua Blue

1.10 4A speakerphone circuitry:

- (1) The 4A speakerphone incorporates a voice-switching circuit, eliminates singing, and essentially eliminates far-end talker echo.
- (2) When there is no transmission of speech, gain is automatically removed from the transmitter circuit and added to the loudspeaker circuit. This avoids a singing condition while receiving.

(3) When speech is transmitted, the gain of the transmitter circuit increases to normal. Simultaneously, the gain of the loudspeaker circuit lowers to avoid singing as a result of the increased transmitter gain. The amount of the gain change depends upon the setting of the volume control.

(4) A circuit, referred to as a switchguard utilizes the voltage in the loudspeaker circuit to reduce the possibility that surrounding room noise will cause false operation of the switching circuit while receiving speech.

(5) A predetermined voice level is necessary to switch from the receiving to the transmitting condition. In the presence of steady room noise, a special circuit automatically raises the required threshold level to prevent operation of the switching control circuit by the noise. Talkers will still switch satisfactorily because they increase their levels under noisy conditions.

Radio Frequency Interference (RFI)

1.11 In areas where RFI is a problem, install a 680AR or 680AR14 transmitter and a 108AR loudspeaker set. These components are the same as the 680A and 680A14 transmitter and 108A loudspeaker set respectively with the exception that circuit components necessary to reduce RFI have been added.

680A, 680A14, 680AR, or 680AR14 Transmitter

1.12 The transmitter is a small unit incorporating the microphone, preamplifier, an indicator lamp, and the operating controls for the speakerphone. The controls include the ON OR QUIET button, the OFF button, and the volume control. The control button and a stationary button comprise the color significant portions of the transmitter. The ON OR QUIET button activates the system and, if held depressed, disables the microphone so that the speakerphone user may conduct a private conversation without the party at the far end hearing. The OFF button simply turns off the system. The volume control varies the received sound level. The indicator lamp lights when the system is on.

108A or 108AR Loudspeaker Set

1.13 The loudspeaker set contains the electronic circuitry, the loudspeaker, and the relay and transformer necessary to couple to the telephone system. The electronics, loudspeaker, and cord comprise the non-color-significant subassembly, and a color significant plastic housing completes the set.

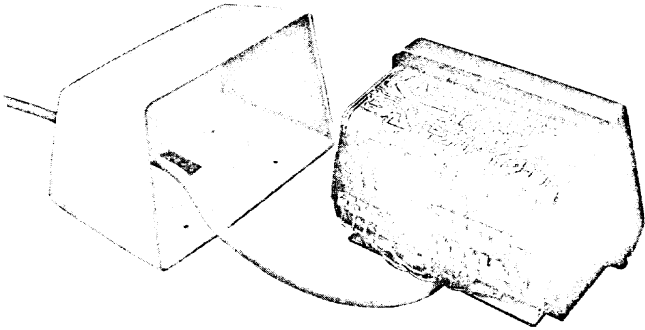


Fig. 3—108A Loudspeaker Set with Cover Removed

82-Type Connecting Block

1.14 The 82-type connecting block is used to interconnect the 4A speakerphone system (680-type transmitter, 108-type loudspeaker set, and the 85B1 power unit) for use with plug-ended 6-button key telephone sets. A reversible option plug provides the key system options, ringer cutoff or operation of an auxiliary relay. The connecting block includes three 50-pin connectors, one for the telephone set, one for the key system connector cable, and one that accepts the transmitter and loudspeaker set connectors with the reversible option plug. The arrow on the plug of the D20N mounting cord should point to the option required on the option plug. There are seven screw terminals (82A) or eleven screw terminals (82B) for AC power connections and 1A1, 1A2, or 1A key system operation (Fig. 6).

1.15 The 82B is the same as the 82A connecting block with the exception that access to terminals 10 and 35 from the speakerphone plug and terminals 21 and 46 from the telephone set and line receptacle are made available by means of screw-type terminals (Fig. 6).

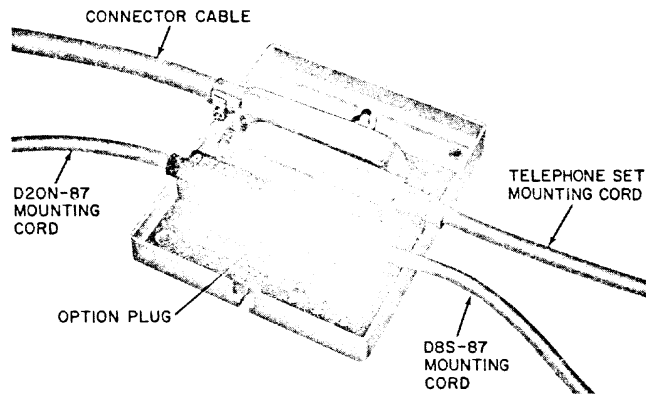


Fig. 4—82-Type Connecting Block with Cover Removed

223A Adapter

1.16 The 223A adapter interconnects the 4A speakerphone system (680-type transmitter, the 108-type loudspeaker set, and the 85B1 power unit) when the 82-type connecting block cannot be used. The adapter consists of a M16C cord (having a 50-pin connector on one end and spade-tipped leads on the other end), the M2FG cord, (for 85B1 power unit) and the plastic cover and base (Fig. 5). The M16C spade-tipped leads are to be connected to a connecting block or within the telephone set (Fig. 5).

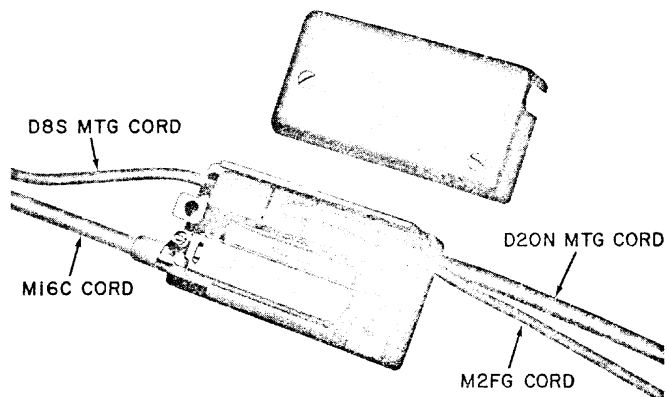


Fig. 5—223A Adapter

NOTE**85B1 Power Unit**

1.17 The power unit transforms the local customer-provided 115 volt, 60 Hz power to the voltage level required to operate the 4A speakerphone system. An 85B1 power unit (UL approved) can be used to power only one speakerphone system. The 85B1 power unit should be located less than 125 feet from the 108-type loudspeaker set when using 24 gauge wire.

1.18 A retaining clamp (841050818) will be shipped with the 85B1 power unit and should be mounted to the AC receptacle to hold power unit securely and to prevent accidental loss of power.

2. INSTALLATION

2.01 The telephone set intended for use in 4A speakerphone system must meet the following requirements:

- (1) Provide a set of line switch transfer contacts to disconnect the speakerphone when the handset is lifted.
- (2) Rotary dial sets dialed in an on-hook condition must provide two sets of off-normal (make) contacts in the dial for loudspeaker and receiver muting during dialing.
- (3) TOUCH-TONE® sets dialed in the on-hook condition must provide a set of make contacts (s and t) in the dial common switch to connect line power (IR) from the loudspeaker set to the dial oscillator. If a polarity guard is provided these contacts (s and t) must be isolated from the oscillator by the polarity guard.
- (4) Certain wiring precautions must be observed when multiplying sets wired for speakerphone. The T1, R1, IR or P4, IT or P3, LK and AG leads should be disconnected at or as close as possible to the set in those stations not having speakerphone. Even though none of the multiplied sets have speakerphone the leads involved should be disconnected. Failure to do so will result in:

- Tip and ring cross through the T1 and R1 leads
- False operation of an A relay through the AG lead

- Shorting the receiver input to loudspeaker set, disabling the loudspeaker through the P3 and P4 leads.

2.02 Planning an installation:

- (1) Avoid placing apparatus with plastic covers or parts in location where ambient temperatures may exceed 140 degrees F.
- (2) Plug the 85B1 power unit into an AC power outlet (not under control of a switch) and lock in place with retaining clamp furnished.
- (3) The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire.
- (4) Place loudspeaker set and transmitter within convenient reach of user and a minimum of one foot apart.
- (5) Transmitter must be at least two feet from transformer or any AC powered device.
- (6) There should be no obstructions between the user, loudspeaker set, and transmitter.
- (7) Make connections as shown in appropriate figures of this section or other sections in Division 512 for specific telephone set connections.
- (8) If 82-type connecting block is used, install audible signal cutoff using the "RING CUTOFF" or "AUX RELAY" option as needed. Use the leads to common signal control and common ringer or buzzer circuit for this cutoff feature (Fig. 7).
- (9) For station busy lamp circuit with 4A speakerphone system, refer to the appropriate Service section in Division 502 for telephone set involved.

3. OPERATION

Note: 4A speakerphone system permits normal use of the telephone set for originating, receiving, or transferring calls.

3.01 To originate a call using speakerphone:

- (1) Depress transmitter ON OR QUIET button and release. ON lamp will light indicating

85B1
PWR

108

680

(2) ————— (5)

(11) RWS (LINE)

(15) TIP (LINE)

(27) }
(28) } 85B1
TRNS

(3) ————— (8)

(4) ————— (7)

(1) ————— (9)

(7) ————— (6)

(5) ————— (4)

(21) ————— (2)

(6)
(23)

speakerphone is in the talking condition. Listen for dial tone transmitted through loudspeaker set. Telephone handset is not lifted during dialing (except where handset covers dial) [3.01 (3)].

- (2) Operate dial of telephone set in normal manner.
- (3) When originating calls from telephone sets which require off-hook dialing, dial in the normal manner, then depress and hold the ON OR QUIET button until the handset is restored.
- (4) When complete number is dialed, ringing tones, busy signals or called party answer will be heard from the loudspeaker set.
- (5) When called party answers, transmitter and loudspeaker set are used to carry on a hands-free conversation. Adjust volume level as desired.

Note: Best *operational* results are obtained at the lowest acceptable volume setting.

3.02 To answer an incoming call using speakerphone:

- (1) Telephone set ringer signals an incoming call.
- (2) Depress ON OR QUIET button on transmitter. Ringing is tripped and system is automatically connected to the line by the loudspeaker set.

3.03 To disable transmitter when it is desired not to transmit conversation in the room to a distant party:

- (1) Depress ON OR QUIET button to full extent of its travel and hold down during entire time transmitter is to be disabled.

Note: With transmitter disabled conversation will not be transmitted to the distant party, however, distant party can still be heard over the loudspeaker.

- (2) After private conversation is completed and it is desired to transmit to distant party again, release ON OR QUIET button. System is now restored to full hands-free capability.

3.04 To terminate a call on speakerphone, depress OFF button on transmitter. ON lamp will

extinguish and speakerphone system will be restored to the OFF condition.

3.05 Transferring from handset to speakerphone operation:

- (1) After dialing or during a conversation depress and hold ON OR QUIET button of transmitter.
- (2) Return handset to mounting, and release ON OR QUIET button.
- (3) Adjust volume as required.

3.06 Transferring from speakerphone to handset operation. Lift handset during speakerphone operation to automatically transfer to handset operation. When it is necessary to transfer back to speakerphone, refer to 3.05 to prevent disconnect.

4. MAINTENANCE



Remove power from 108-type loudspeaker set before attempting any maintenance of speakerphone components.

Tests and Adjustments

4.01 When system is installed or maintenance is performed on any component, make the following tests of speakerphone operation:

- (1) Place a speakerphone call to the testdesk.
- (2) Adjust loudspeaker volume to moderately loud listening level.
- (3) Have test center repeat the question "In what suburb does Joe live?" several times.
- (4) If choppiness is detected in the sentence, particularly in the first b in *suburb* and the t in *what*, increase the distance between the transmitter and loudspeaker set.
- (5) Repeat this test at a high listening level by turning the volume control to maximum volume.

4.02 If voice-switching caused by external telephone audible signaling devices is encountered:

- (1) Place audible signaling devices away from transmitter unit, if possible.
- (2) Lower volume of audible signaling devices to level that will not cause voice-switching feature to operate.
- (3) Install audible signal cutoff using the "RING CUTOFF" or "AUX RELAY" option as needed. Use the leads to common signal control and common ringer or buzzer circuit for this cutoff feature (Fig. 7).

4.03 If speakerphone fails to operate properly, refer to Table A for trouble analysis.

Cleaning

4.04 Clean plastic covers and housings with water dampened KS-2423 cloth or equivalent. Do not use scouring powders or cleaners.

Removal of Plastic Parts



Do not attempt any changes or repairs to either the 680-type transmitter or 108-type loudspeaker set other than to replace the loudspeaker set mounting cord or the respective plastic parts for either the transmitter or loudspeaker set.

4.05 The plastic housing on the 108-type loudspeaker set is held in place by two screws located

on the bottom of the set. To remove the plastic housing, remove the two screws from the bottom of the set and slide the cover off the chassis (Fig. 3).

Note: Do not remove the circuit board from the chassis.

4.06 The plastic covers on the 680-type transmitter snap into place. First, remove the stationary cover by squeezing with fingers on the front and back surface and lifting gently. Second, pry up the rocker cover with fingers, lifting along the edge adjacent to the thumb wheel.



The loudspeaker and transmitter are designed so that color significant components can be easily changed. In order to reduce shelf inventory it is suggested that the kits listed in 1.09 be stocked instead of extra loudspeakers and transmitters.

Change of Loudspeaker Set Cord

4.07 First remove housing as in 4.05. Next, loosen the screws that hold the spade tips, and remove the spade tips. Next remove the screw that fastens the stay band of the cord. Slide the spade tips and wafers out the hole in the bottom of the plastic chassis. To install the new cord, reverse the procedures.

Note: Be careful not to damage the circuit board, particularly the flexible areas of the bends.

TABLE A
4A SPEAKERPHONE SYSTEM TROUBLE ANALYSIS

TROUBLE INDICATION	PROBABLE CAUSE	CHECK
Speakerphone inoperative; indicator lamp does not light	No power, or open wiring	Power supply outlet with a neon lamp voltage tester or equivalent, or check LK lead lead for open
Lamp does not light but K-relay (108-type loudspeaker set) operates and releases when ON OR QUIET button is released	Loose connection in local wiring	Switchhook contacts or A1 and LK leads for open
Rotary dial pulses heard over loud-speaker	Dial wiring	For proper dial P3 and P4 leads
No dial tone heard when speakerphone is ON, but can be heard in handset	Open wiring	R1 and T1 leads from telephone set
No dial tone heard on speakerphone or handset	Open wiring	Tip or ring from line
Dial tone cannot be broken with dial when on speakerphone	Incorrect wiring	Connection of tip and ring from telephone line to telephone set
TOUCH-TONE dial inoperative when speakerphone is ON	Dial wiring	For proper IT and IR leads
Noise on speech transmission associated with fluorescent lamp operation	Electro-magnetic pickup	Position transmitter on different area of desk, table etc. to reduce noise.
Noise on speech transmission associated with radio frequency interference	High level radio frequency AM, FM, etc. in immediate area	Install AR coded loudspeaker and transmitter

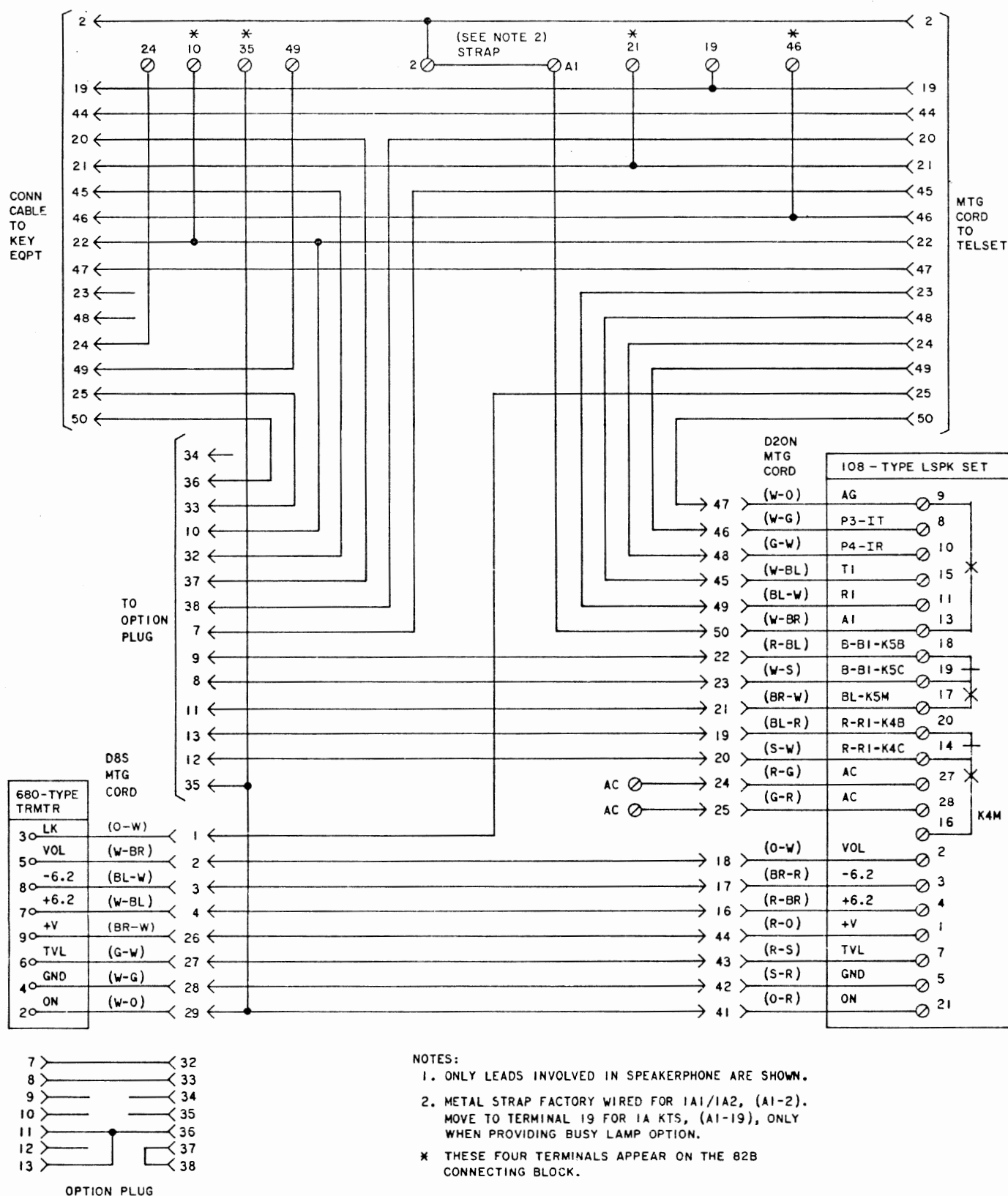
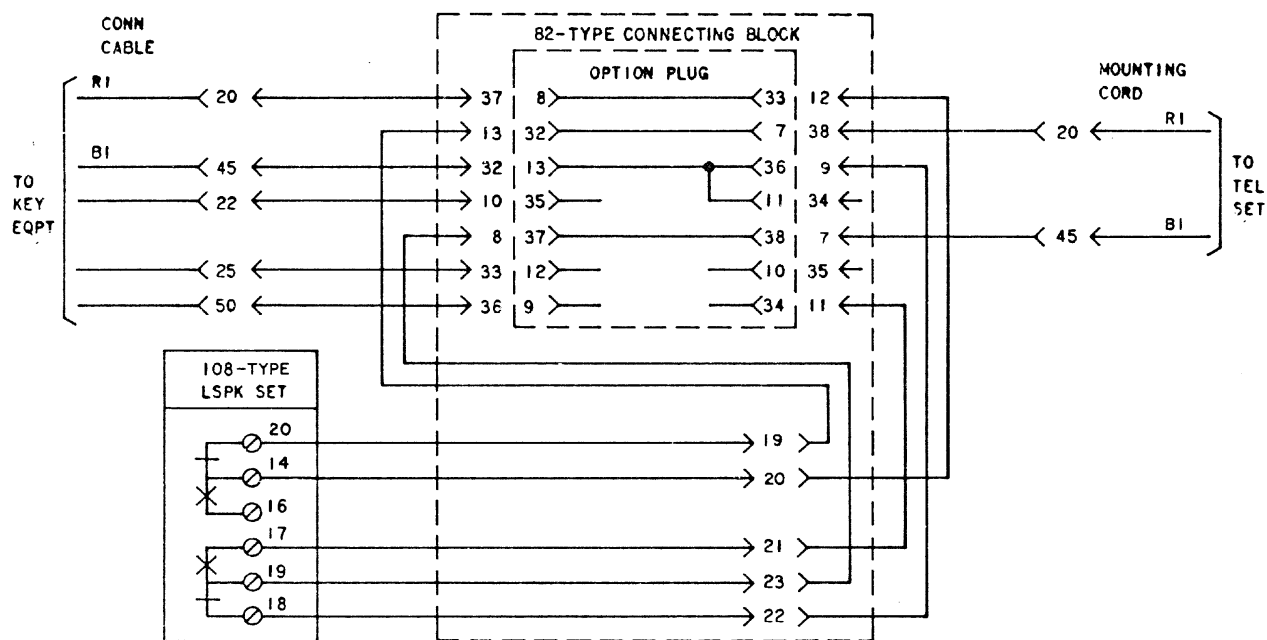
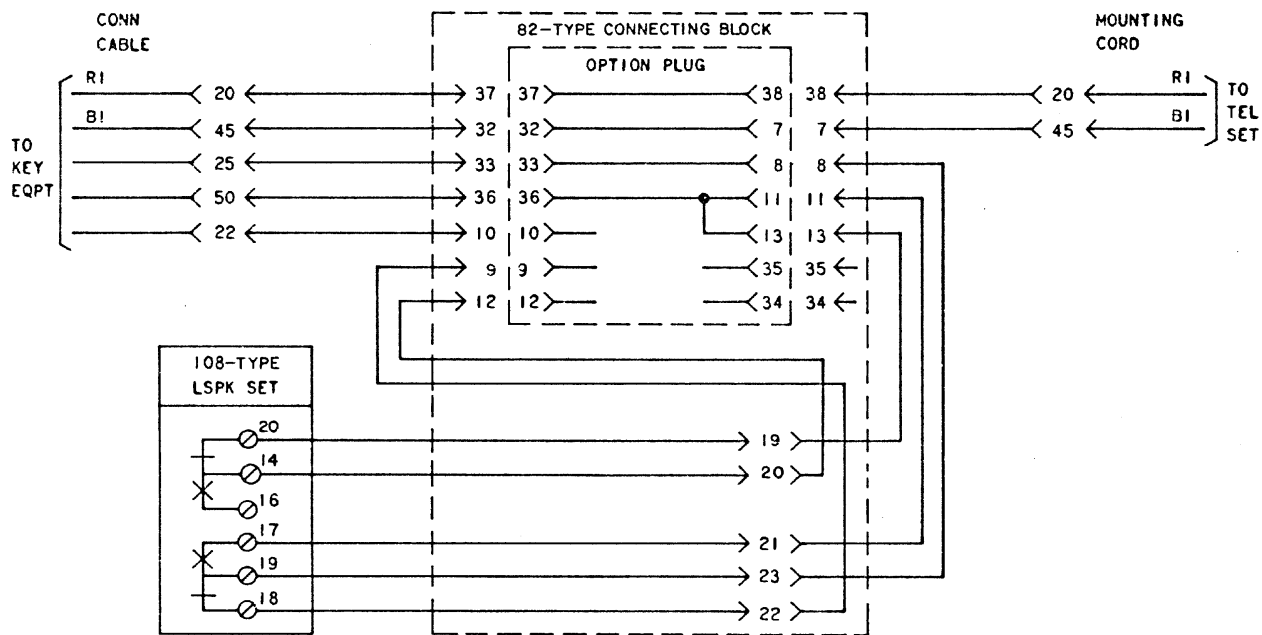


Fig. 6—Speakerphone Connections using 82-Type Connecting Block



A. OPTION PLUG POSITIONED FOR RINGER CUTOFF



B. OPTION PLUG POSITIONED FOR AUXILIARY RELAY OPERATION

Fig. 7—Wiring Involved in Options at 82-Type Connecting Block

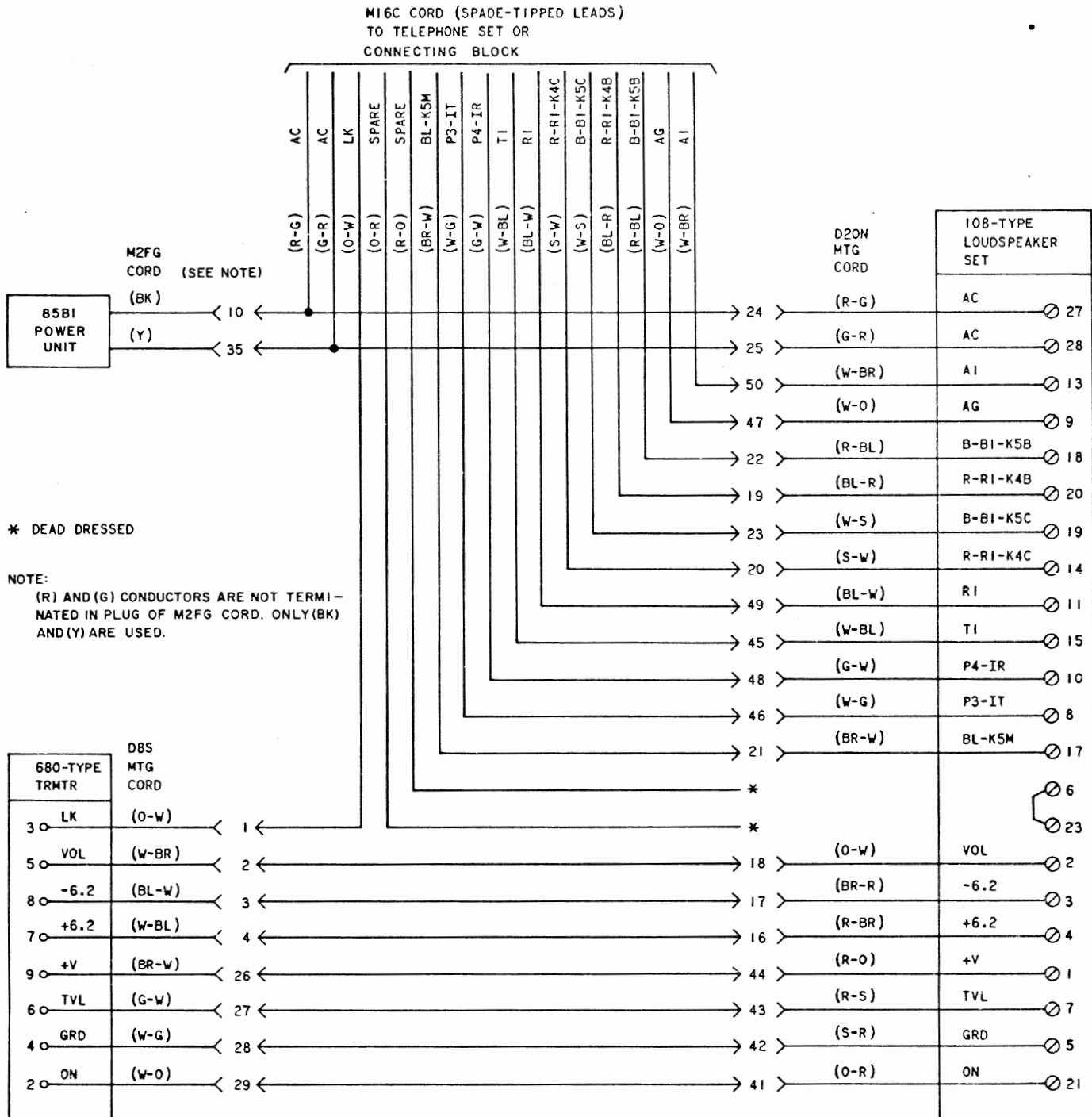


Fig. 8—Speakerphone Connections 223A Using Adapter