

# STATION SPECIALTIES SERVICE MANUAL

VOLUME II



325-71

OCTOBER 1980

## **Station Specialties Service Manual Vol II**

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**STATION  
SPECIALTIES  
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VOL II**



## Introduction

The practices in this manual provide installation and maintenance information for special apparatus which complements the use of both the Station and Key Telephone Service Manuals. For information not included in this manual, refer to the standard BSP files.

**Issue 2, October 1980**

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## 50A1 CONFERENCE SET

### IDENTIFICATION, INSTALLATION, CONNECTIONS, OPERATION, AND MAINTENANCE

#### 1. GENERAL

1.01 The section contains information on the 50A1 conference set which permits hands-free 2-way audience participation in a call placed over the telephone network. This set provides additional features such as A-lead control, multiple microphone use, and 2/4 wire operation not provided with the older 50A (MD) set. The 50A1 is sometimes referred to as the Portable Conference Telephone.

1.02 This section is reissued to include radio interference information.

1.03 The 50A1 conference set is susceptible to radio frequency interference when used near a high power transmitter. The set can be modified on a *where needed* basis at the service center to suppress this interference. Send the Conference Telephone to the Indiana Service Center with instructions to modify per B.S.R.S. 455.217 paragraph 18. "Mod for RFI" will be stamped on the underside of the base upon completion of modification.

#### 2. IDENTIFICATION

2.01 The 50A1 conference set (Fig. 1) consists of a 73B control unit, a modified 220A-58 hand telephone set plus the other accessories listed in paragraph 2.03 under the Ordering Guide.

##### A. Ordering Guide

2.02 The 50A1 conference set can be ordered as a complete unit as follows.

- Set, Conference, 50A1.

2.03 The following components of the 50A1 conference set are field replaceable and can be ordered separately:

- KS-20653L1 Carrying Case



Fig. 1—73B Control Unit, Front View

- Unit, Control, 73B (includes modified 220A-58 hand telephone set)
- KS-20660L1 (Green) microphone with 20-foot cord and color-coded plug
- KS-20660L2 (Gold) microphone with 20-foot cord and color-coded plug
- Set, Hand Telephone, 220A-58 (paragraph 5.03)
- Lamp, 51A
- Cord, Handset, H4DB-58
- KS-20660L3 Lavalier Assembly (2)
- KS-20689L1 Power Cord (10-foot length)
- Cord, Telephone Line, D4BU (25-foot length)
- Adapter, 225A

#### NOTICE

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TABLE A  
POLARITY GUARD AND S3A CORD CONNECTIONS  
TO MODIFY 2500S TELEPHONE SET

LEAD	COLOR	REMOVE FROM NET.	CONNECT TO		
			NET.	POLARITY GUARD	TERM. BOARD
Line Switch	W	C		S	
Dial	G-W BK	C RR		S T	
Polarity Guard	W G		C RR		
S3A Cord	W BL R	— — —	— L1 L2	—	1

- Holder, 54A (microphone desk stand) (2).
- 2.04 Replaceable Common Components of 73B Control Unit:**
- 840695142 Microphone and Front Housing Assembly
  - Key, 635BJ5
  - 840284152 Rear Housing Assembly
  - Ringer Assembly, P1B.
- 2.05 Associated Optional Apparatus or Equipment** (Required for auxiliary dial):
- Set, Telephone, 2500S
  - Cord, S3A
  - 819040528 (P-90D052) Guard Assembly.
- B. Design Features**
- 2.06** The 50A1 conference set is equipped with a TRIMLINE® hand telephone set and provides the following:
- Hands-free conference communication using any combination of the three microphones and a loudspeaker with output signal level adjustment
  - 2- or 4-wire operation
  - Handset communication using a TRIMLINE hand telephone set
  - Transferring between hands-free and handset during conversation
  - One-way communication using the loudspeaker only
  - A-lead control for use with key telephone systems
  - Means to provide audible TOUCH-TONE® signals for computer data input
  - Means to connect both transmitted and received signals to a public address system with output signal level adjustment
  - Lighted OFF key lamp to indicate when the set is in operation.
- C. Application**
- 2.07** This set can be used on individual or bridged service on CO or PBX line circuits with 1A1, 1A2, or 6A key telephone systems where A-lead control is provided. It may also be used with 1A KTS where connection to tip and ring only are required.
- 3. INSTALLATION AND CONNECTIONS**
- 3.01** Terminate incoming telephone line on 625C connecting block or equivalent. Place control

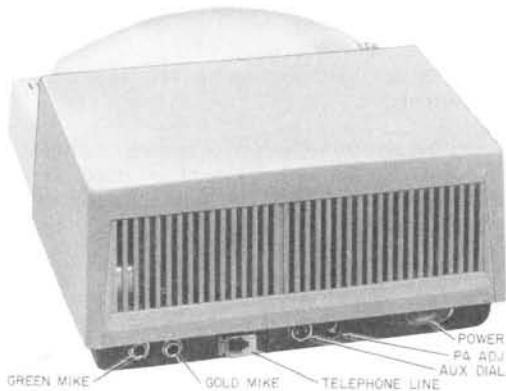
unit on a desk, table, etc. within 25 feet of the jack and within 10 feet of a grounded power outlet supplying 120 volts ac, 60 Hz.



**Ensure that the power cord is connected to an ac outlet not under control of a switch.**

**3.02** Arrange control unit so front is located at least six inches from table edge and with its loudspeaker facing the audience. For optimum performance, there should be no obstructions at the front, rear, or within one foot of the sides of the unit.

**3.03** Install telephone line cord, ac power cord, and, as required, microphones or auxiliary TOUCH-TONE dial telephone set to the appropriate jacks located on rear of control unit (Fig. 2).



**Fig. 2—73B Control Unit, Rear View**

**3.04** Provision is made for reproducing both transmitted and received signals over a customer-owned public address system. A public address adjustment (PA ADJ) (Fig. 2) control is located on the back of the set for adjusting the level of the transmitted signal at the PA terminals. Connections to the public address system are made to the screw terminals on the bottom of the unit (Fig. 3). Connections should be made using a shielded pair, grounded at the customers' equipment only. If desired, the conference set loudspeaker

can be deactivated by opening the shorting link between adjacent screw terminals on the base of the control unit (Fig. 3). Connection to and adjustment of the PA system is the customer's responsibility. Typical signal levels are  $-45\text{dbv}$  at 600-ohm impedance (balanced).



A - REAR HOUSING ASSY CAPTIVE SCREW ACCESS HOLES  
B - MICROPHONE AND FRONT HOUSING ASSY SCREWS AND CAPTIVE SCREW ACCESS HOLE

**Fig. 3—73B Control Unit, Bottom View**

**3.05** When the conference set is not in use or is being moved to another location, store the components and control unit in the carrying case.

**3.06** When installed behind a 1A1, 1A2, or 6A KTS, the A and A1 leads from the KTS should be connected to the T1 and R1 leads, respectively, of the control unit to obtain A lead control. There are several ways to connect the 50A1 to a key system termination.

- (1) A special connector (F-Specification 59888) can be ordered separately with a modular plug at the 50A1 end and a 153-type adapter wired to pick up tip, ring, A and A1 leads at the key system end.

(2) If the customer desires to continue using his present key set, use of a KS-19252L1 bridging adapter is recommended. A surface-mounted 625C connecting block can be connected to a 153C adapter, which is then plugged into the bridging adapter.

(3) If a 66-type connecting block is available, the 625C connecting block can be wired directly to it. Refer to appropriate section in Division 461 for connection information on 66-type connecting block and 153-type adapter.

**3.08** When 4-wire operation is required, remove the rear housing assembly and with a screwdriver rotate selector switch to the 4W position (Fig. 6). The transmit line should be connected to the T and R leads from the control unit and the receive line should be connected to the T1 and R1 leads.

#### 4. OPERATION

##### A. Rotary Dial Service—220A Hand Telephone Set

**4.01** The hand telephone set is used to establish all outgoing calls. Incoming calls may be answered using the hand telephone set or by depressing the SET MIKE ON button. Dial lamp power is provided when the power is connected.

##### B. TOUCH-TONE Service

**4.02** A 2220B TOUCH-TONE handset can be substituted for the 220A handset for TOUCH-TONE dialing and signaling with no modifications other than the lamp change noted in paragraph 5.03.

##### C. Hands-Free Operation

**4.03** The conference is transferred from the handset to hands-free operation by depressing one of the five locking key buttons (SET MIKE ON, GOLD MIKE, GREEN MIKE, AUX DIAL, or MIKES OFF) and then returning the handset to its cradle.

**4.04** A call is transferred to the handset mode and the control unit is deactivated whenever the handset is lifted.

**4.05** Incoming calls are heard through the set loudspeaker. The output level is adjusted

by means of the VOLUME control. Advance the VOLUME control only far enough for adequate listening level. However, when this control is set at 0, a lecturer speaking into the conference set will be heard more clearly at the remote location since the set will remain in the transmit mode.

#### SET MIKE ON

**4.06** When the SET MIKE ON key button is depressed, the control unit microphone is activated. The person talking should position himself in front of the unit, preferably at a distance of one or two feet for best transmission.

#### GOLD MIKE, GREEN MIKE

**4.07** To use remote microphones, plugs should be inserted into the labeled jacks located on the rear of the control unit. The microphones will be activated when the gold or green key button is depressed.

*Note:* Any combination of the three microphones can be used at one time by simultaneously depressing the appropriate buttons.

**4.08** The remote microphones can be hand-held, inserted in a desk stand, or used as a lavalier (Fig. 5). A talking distance of one foot is recommended.

#### MIKES OFF

**4.09** When this key button is depressed all microphones are disconnected from the circuit, leaving the conference set in the receive mode only.

#### AUX DIAL

**4.10** If TOUCH-TONE service is available, two means of signaling to a computer terminal are possible.

(a) The customer can be provided with a 2220B TOUCH-TONE handset in place of the 220A handset (see paragraph 5.03 for lamp change). Tone signaling may be accomplished by using the handset dial. The AUX DIAL key button need not be depressed.

**Note:** The signals will not be heard on the conference set loudspeaker.

(b) The customer may be provided with a 2500S telephone set modified in accordance with Table A and shown in Fig. 4. Tone signaling may be accomplished by inserting the 309 plug into the AUX DIAL jack on the rear of the control unit and depressing the AUX DIAL key button. The dial of the modified telephone set may be used without lifting the handset. Signals will be transmitted to both the telephone line and the conference set loudspeaker. The VOLUME control on front of the control unit adjusts the listening level of the TOUCH-TONE signals.

(c) If TOUCH-TONE service is not available, the modified 2500S telephone set must be used as described in (b) to provide signaling to a computer terminal.

#### OFF Button

4.11 When in the hands-free mode, depressing the nonlocking OFF-button deactivates the conference set, extinguishes the associated indicator lamp, and disconnects the call.

#### D. 2- or 4-Wire Operation

4.12 An internally mounted switch (Fig. 6) allows easy selection between 2- or 4-wire mode of operation. In the 4-wire mode, transmit and receive channels are each connected through separate pairs of the telephone line.

#### E. Ringer

4.13 This control unit is equipped with a P1B ringer. The ringer volume control is located on the bottom of the unit.

## 5. MAINTENANCE

**Caution:** *Disconnect ac power cord and the D4BU line cord before attempting any maintenance to the interior of the control unit.*

5.01 Set repair at customers' premises should be limited to replacement of those parts listed in the Ordering Guide. Repair of other components affects set performance and requires detailed testing.

5.02 To remove the front and rear housing assemblies from the 73B control unit, disconnect the hand telephone set first, using a KS-16750 type releaser or equivalent. Release the three captive screws located in access holes at sides and rear of the unit base pan (Fig. 3) and remove the rear housing assembly first. Then remove two screws located on the sides of the base pan and captive screw at the front to release microphone and front housing assembly. The proper dress of wires in the vicinity of the ringer gong, line switch, and internal microphone terminal connections should be maintained to prevent interference with the front housing assembly when it is replaced after performing maintenance.

5.03 Replace 220A hand telephone set by connecting plug of H4DB cord to hand telephone set jack, and to jack located on left side of control unit.

**Note:** Replace the 53B dial lamp furnished with the hand telephone set with a 53A lamp. Refer to appropriate section in Division 502 for replacement procedures.

5.04 If a light appears under the MIKES OFF button, it indicates dial light power is supplied on T1 and R1 leads. **Do not remove this lamp from the conference set.**



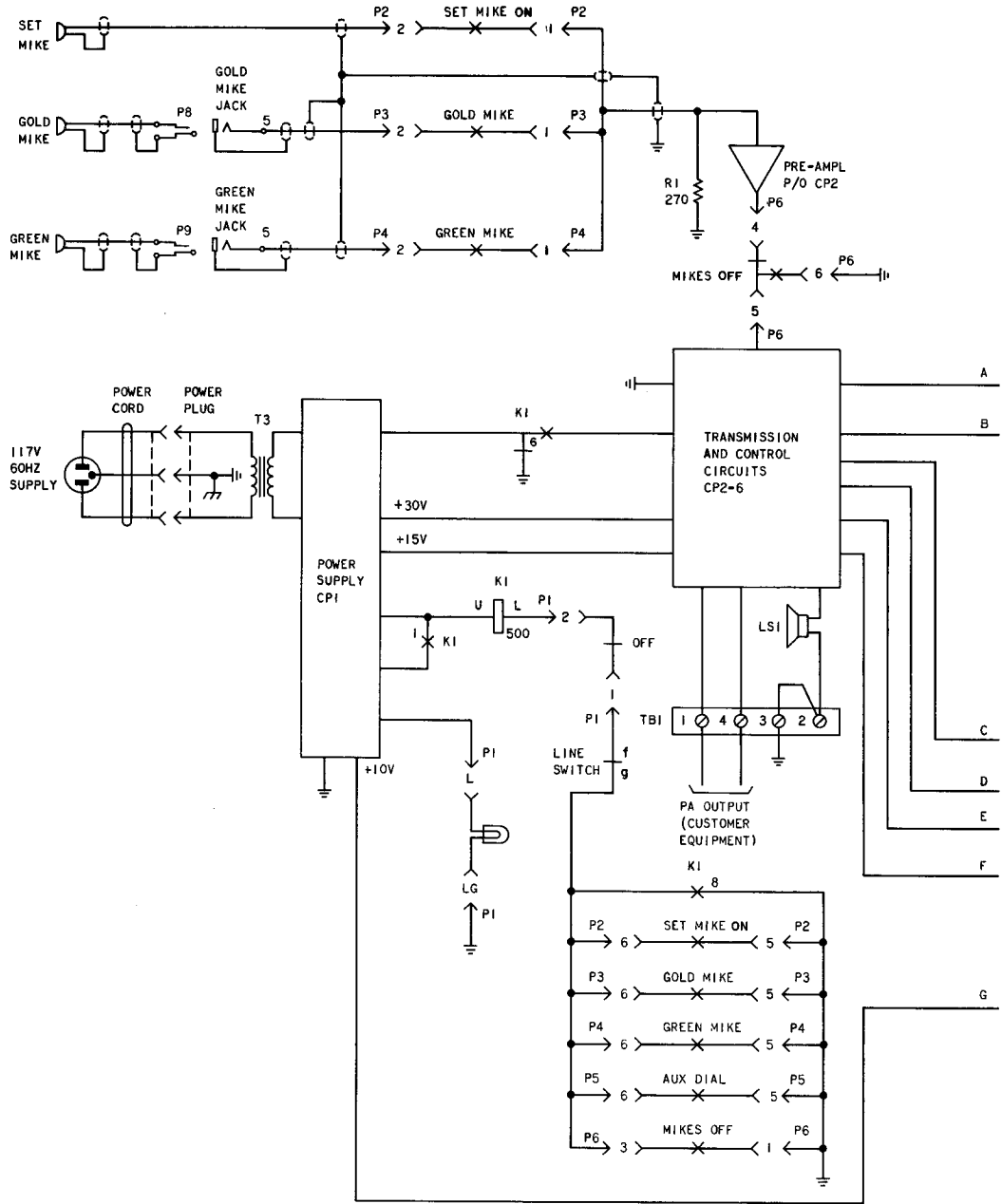


Fig. 4—50A1 Conference Set, Block Diagram (Sheet 1 of 2)

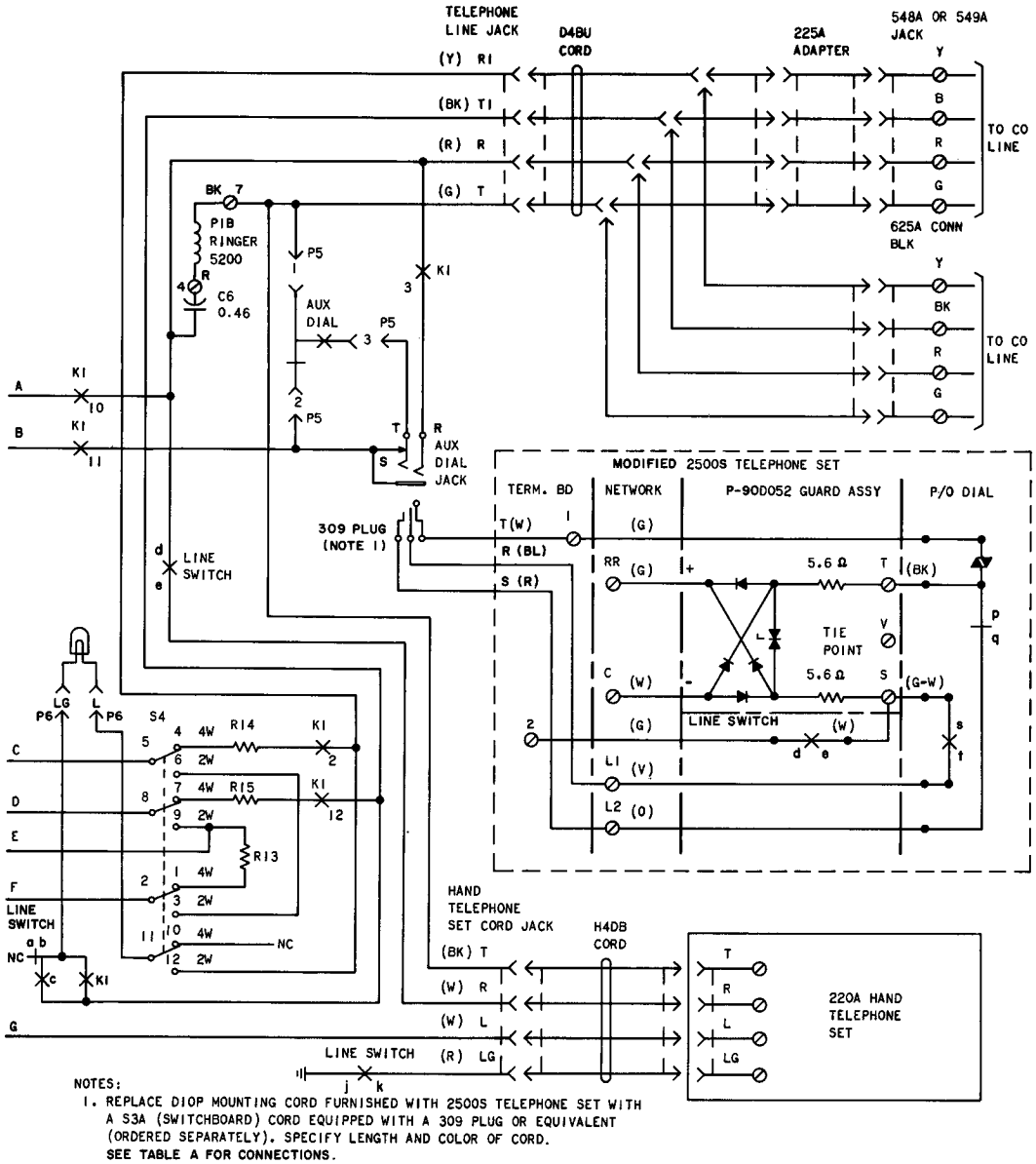


Fig. 4—50A1 Conference Set, Block Diagram (Sheet 2 of 2)

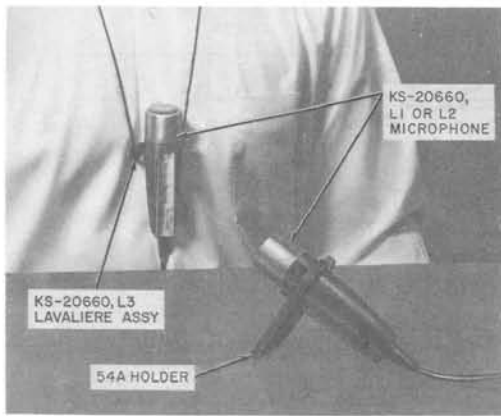


Fig. 5—Remote Microphones Using Lavalier and Holder

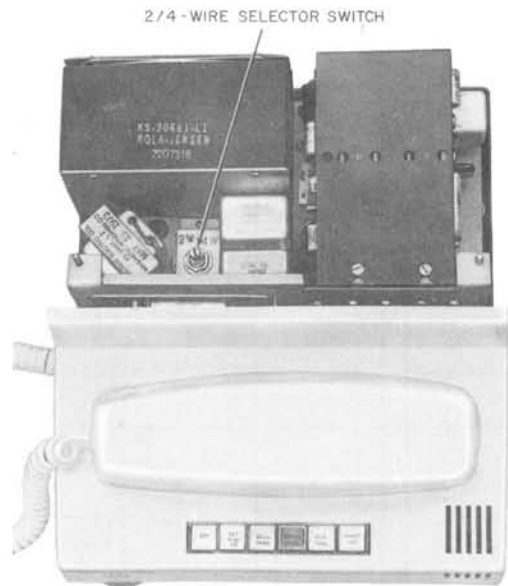


Fig. 6—73B Control Unit, Rear Housing Removed

## SPEAKERPHONE SYSTEM—3-TYPE

### 1. GENERAL

1.01 This section contains identification, installation, operation, connection, and maintenance information for the 3-type speakerphone system.

♦The 3-type speakerphone system and most of the associated components have been rated Manufacture Discontinued (MD). Information in this section is retained for existing installations only.♦

1.02 This section is reissued to show the following components MD:

- 55B Control unit
- 666B Transmitter
- 667B Transmitter
- 670A Transmitter
- 671A Transmitter
- 672A Transmitter
- 674A Transmitter
- 674B Transmitter
- 679A Transmitter
- 760A Loudspeaker
- D-180006 Kit of Parts
- D-180196 Kit of Parts

### 2. IDENTIFICATION

2.01 The ♦3-type (MD) speakerphone♦ system consists primarily of a loudspeaker, transmitter, and control unit 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.

2.02 Components of the 3-type speakerphone system are shown in Fig. 1, along with features of each component.

2.03 Replaceable parts of the 3-type speakerphone system should be limited to those parts available through supply channels, i.e., lamps, mounting cords, etc.

2.04 Control units are coded as follows:

- Rotary dial service—55A (MD)
- Rotary or TOUCH-TONE® service—55A\* (See note)
- Rotary or TOUCH-TONE service—55B
- MOD II-C PICTUREPHONE® set—55D (not to be used for telephone set speakerphone)

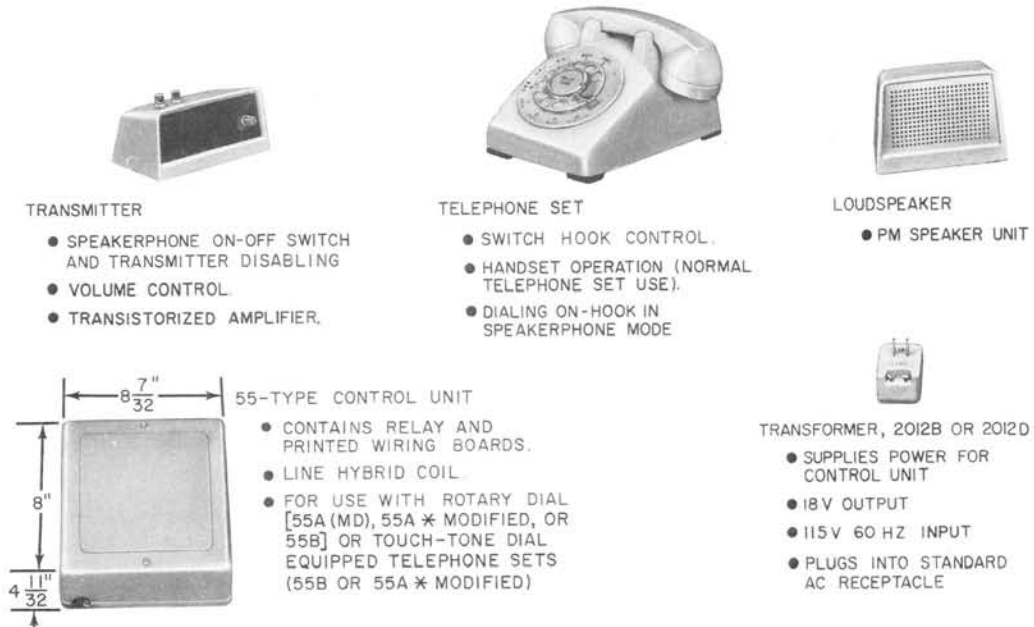
**Note:** The 55A control unit can be modified at the distributing house for TOUCH-TONE use. Modified units are identified by an asterisk following the code. Order as: Unit, Control, 55A—modified for TOUCH-TONE service.

2.05 The 55-type control unit features (Fig. 2):

- Four plug-in printed wiring boards incorporating transistorized amplifiers and associated transmission transformers

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**TRANSMITTER**

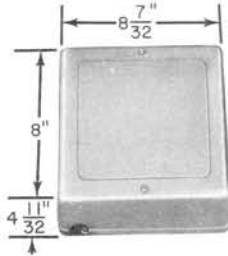
- SPEAKERPHONE ON-OFF SWITCH AND TRANSMITTER DISABLING
- VOLUME CONTROL
- TRANSISTORIZED AMPLIFIER.

**TELEPHONE SET**

- SWITCH HOOK CONTROL.
- HANDSET OPERATION (NORMAL TELEPHONE SET USE).
- DIALING ON-HOOK IN SPEAKERPHONE MODE

**LOUDSPEAKER**

- PM SPEAKER UNIT

**55-TYPE CONTROL UNIT**

- CONTAINS RELAY AND PRINTED WIRING BOARDS.
- LINE HYBRID COIL.
- FOR USE WITH ROTARY DIAL [55A (MD), 55A \* MODIFIED, OR 55B] OR TOUCH-TONE DIAL EQUIPPED TELEPHONE SETS (55B OR 55A \* MODIFIED)

**TRANSFORMER, 2012B OR 2012D**

- SUPPLIES POWER FOR CONTROL UNIT
- 18V OUTPUT
- 115V 60 HZ INPUT
- PLUGS INTO STANDARD AC RECEPTACLE

Fig. 1—♦Typical 3-Type Speakerphone System, Basic Components♦

- Voice-switching circuitry to control transmit and receive level
- Metal basepan for wall or desk mounting.

**2.06 The 3-type speakerphone circuitry.**

- (1) The 3-type speakerphone incorporates a voice-switching circuit which permits a substantial increase in receiving volume, 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 receiver volume control. The gain change is smaller at the lower (counterclockwise) settings and greater at the higher (clockwise) settings.

- (4) A circuit, referred to as a switch guard, utilizes the voltage across the loudspeaker 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.

**Loudspeakers**

- 2.07 **External**—♦760A (MD) equipped with R2FK-87♦ mounting cord. Consists of

permanent magnet, dynamic loudspeaker mounted on a metal base with plastic housing.

**2.08 Internal**—762A used with 752-, 1752-, and 2752-type panel sets. Consists of an 812162469 (P-21F246) speaker, neoprene rubber acoustic shield, plastic cover, and 13-inch spade-tipped leads.

### Transmitters

**2.09 External 666-type transmitters** consists of an AC1 transmitter unit, transistorized amplifier, etc. The 666A (MD) is equipped with a T11A mounting cord (Fig. 3). The 666B (MD) has a T7A cord (Fig. 4).

**2.10 External 670A (MD) and 671A (MD)** and are used in conference arrangements of 3-type speakerphone.

- 670A consists of an AC1 transmitter unit, transistorized amplifier, ON-OFF switch with 2-position ON switch for control of auxiliary 671A transmitters, volume control, plastic housing, and T9A mounting cord (Fig. 6).

- 671A consists of an AC1 transmitter unit and used as auxiliary station in conference arrangement, encased in a plastic housing; no cord is provided (Fig. 7).

**2.11** In areas where RF interference is a problem, install a modified 666B or 670A transmitter. These transmitters have been modified by the Western Electric service center. Modified units are identified by a stamp "MOD FOR RF" located near unit code stamping. Order units as follows: "Transmitter, 666B or 670A Modified per Specification X-4200."

**2.12 Internal transmitters** are all modular, designed to be an integral part of the telephone set or console. Connections are made through a KS-type connector or receptacle block and plugs. Components are similar to those in external transmitters.

- 667B (MD) —used in CALL DIRECTORS sets equipped with 590- or 650-series keys.

- 672A (MD) —used in 3640 and 3641 CALL DIRECTOR telephone sets

- 673A —used in nurses console in 3A hospital interphone system

- 674A (MD) —intended for use in 3673A-type telephone set

- 674B (MD) —use in 2671-type CALL-A-MATIC® telephone set

- 679A (MD) — used in current production CALL-DIRECTOR sets equipped with 635-type keys.

### Power Supply

**2.13** Power to operate the 55-type control units must be supplied by a 2012B or 2012D transformer (ordered separately). Due to lower voltage rating, a 2012A or 2012C transformer should not be used.

### Auxiliary Relay

**2.14** An auxiliary relay is required when 3-type speakerphone service is provided with a 750A or 755A PBX. For connections refer to Fig. 5.

## 3. INSTALLATION

**3.01** The telephone set intended for use in 3-type 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 control unit 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.

**3.02** Planning an installation.

- (1) Avoid placing apparatus with plastic covers or parts in locations where ambient temperatures may exceed 140 degrees F.

- (2) Control unit chassis is part of the electrical circuit and must be mounted on an insulated surface.
- (3) Control unit can be located a maximum of 100 feet from other system components (transmitter, loudspeaker, etc.) when (A1) leads are connected between both the control unit and transmitter and the control unit and the telephone set.
- (4) Locate transformer no more than 100 feet from control unit. The ac receptacle should not be controlled by a switch.
- (5) Place loudspeaker and transmitter within convenient reach of user and with nominal 3 feet spacing between the units and not facing one another.
- (6) There should be no obstructions between the user, loudspeaker, and transmitter.
- (7) To prevent inductive interference on conference system installations, use no more than 30 feet of shielded cable from master 670A transmitter to auxiliary 671A transmitters. Refer to section on speakerphone conference system for connections.
- (8) Make connections as shown in appropriate figures of this section or other sections in Division 512 for specific telephone set connections.

**3.03** The 55-type control unit can be used where necessary to cut off common ringers or signals to prevent pickup by speakerphone. This feature can be provided through break contacts of K1 relay in control unit. Refer to section in Division 512 for specific telephone set involved.

#### ***D-180196 Kit of Parts***

**3.04** The 667B transmitter, when installed in certain CALL DIRECTOR telephone sets is subject to pickup of mechanical spring vibrations when a held line button is released and the speakerphone system is on. This vibration is transmitted through the control unit and back over the line. To eliminate this condition the 667B transmitter should be replaced with one modified by Western Electric service center, ordered as follows: "Transmitter, 667B, Modified per D-180196."

**3.05** Packed with the modified 667B transmitter is a piece of split vinyl tubing to be assembled to the key pivot bar spring of the telephone set during installation of the transmitter.

**Note:** CALL DIRECTOR telephone sets may be ordered with the modification installed by specifying "Modified per D-180196."

#### **4. OPERATION**

**Note:** The 3-type speakerphone system permits normal use of the telephone set for originating, receiving, or transferring calls.

**4.01** To originate a call using speakerphone.

- (1) Depress transmitter ON button and release. ON lamp will illuminate indicating speakerphone is in the talking condition. Listen for dial tone transmitted through loudspeaker. Telephone set handset is not lifted (except where handset covers dial).
- (2) Operate dial of telephone set in normal manner.
- (3) When complete number is dialed, ringing tones, busy signals, and called party answer will be heard from the loudspeaker.
- (4) When called party answers, transmitter and loudspeaker 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 settings.

- (5) When originating calls from telephone sets which require off-hook dialing, the ON button must be depressed and held upon completion of dialing until the handset is restored.

**4.02** To answer an incoming call using speakerphone.

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

**4.03** To disable transmitter when it is desired not to transmit conversation in the room to a distant party.

- (1) Depress ON 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 button. System is now restored to full hands-free capability.

**4.04** To terminate a call on speakerphone: Depress OFF button on transmitter. ON lamp will extinguish and control unit will be restored to the idle condition.

**4.05** Transferring from handset to speakerphone operation.

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

**4.06** 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 4.05 to prevent disconnect.

#### **Conference Speakerphone Arrangement**

**4.07** The 670A (master) transmitter may initiate and receive calls with or without the 671A auxiliary transmitters in the circuit. To operate with master transmitter and auxiliary transmitters, turn the ON button so the white line is parallel to the front of the transmitter. To operate the master independently, turn the ON button so the white line is perpendicular to the front of the transmitter.

**4.08** Disabling the 670A transmitter also disables the 671A transmitters if the auxiliary

transmitters are connected to the master circuit. (White line of the ON button is parallel to the front of the transmitter.)

## **5. MAINTENANCE**



**Remove power from 55-type control unit before attempting any maintenance of speakerphone components.**

### **Tests and Adjustments**

**5.01** When system is installed or maintenance is performed on any component, make the following tests of speakerphone operation.

- (1) Place a call to the test desk and switch to speakerphone.
- (2) Adjust loudspeaker volume to moderately loud listening level by turning volume control of transmitter clockwise.
- (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*, make loudspeaker adjustment per 5.02.
- (5) Repeat this test at a high listening level by turning the volume control to the extreme clockwise position.

**5.02** An alternate loudspeaker connection is provided in each 55-type control unit to compensate for room conditions which causes voice-switching during reception. The effect of voice-switching is to chop portions of the incoming speech. To compensate for this condition, move loudspeaker lead (SP1) from terminal 33 to terminal 24 [55A (MD) or 55A\* Modified] or from terminal 29 to terminal 30 for the (55B) control unit.

**5.03** If radio frequency interference is experienced.

- (1) In 666A (MD) transmitter; place KS-13814L7 (0.02 mf) capacitor across terminals of AC1 transmitter unit, and/or place a 542C capacitor (0.25 mf) between terminal 9 of the terminal strip and one of the mounting screws used to secure the printed wiring board to the base.



(2) In 667A (MD) or 667B transmitter; solder a KS-13814L7 (0.02 mf) capacitor from terminal B to terminal D of the printed wiring board assembly or ground the transmitter unit case to the transmitter mounting plate.

(3) Install audible signal cutoff using the cutoff feature of 55-type control unit. Use the leads to common signal control and common ringer or buzzer circuit for this cutoff feature.

**5.04** If voice-switching caused by external 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.

***Cleaning***

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

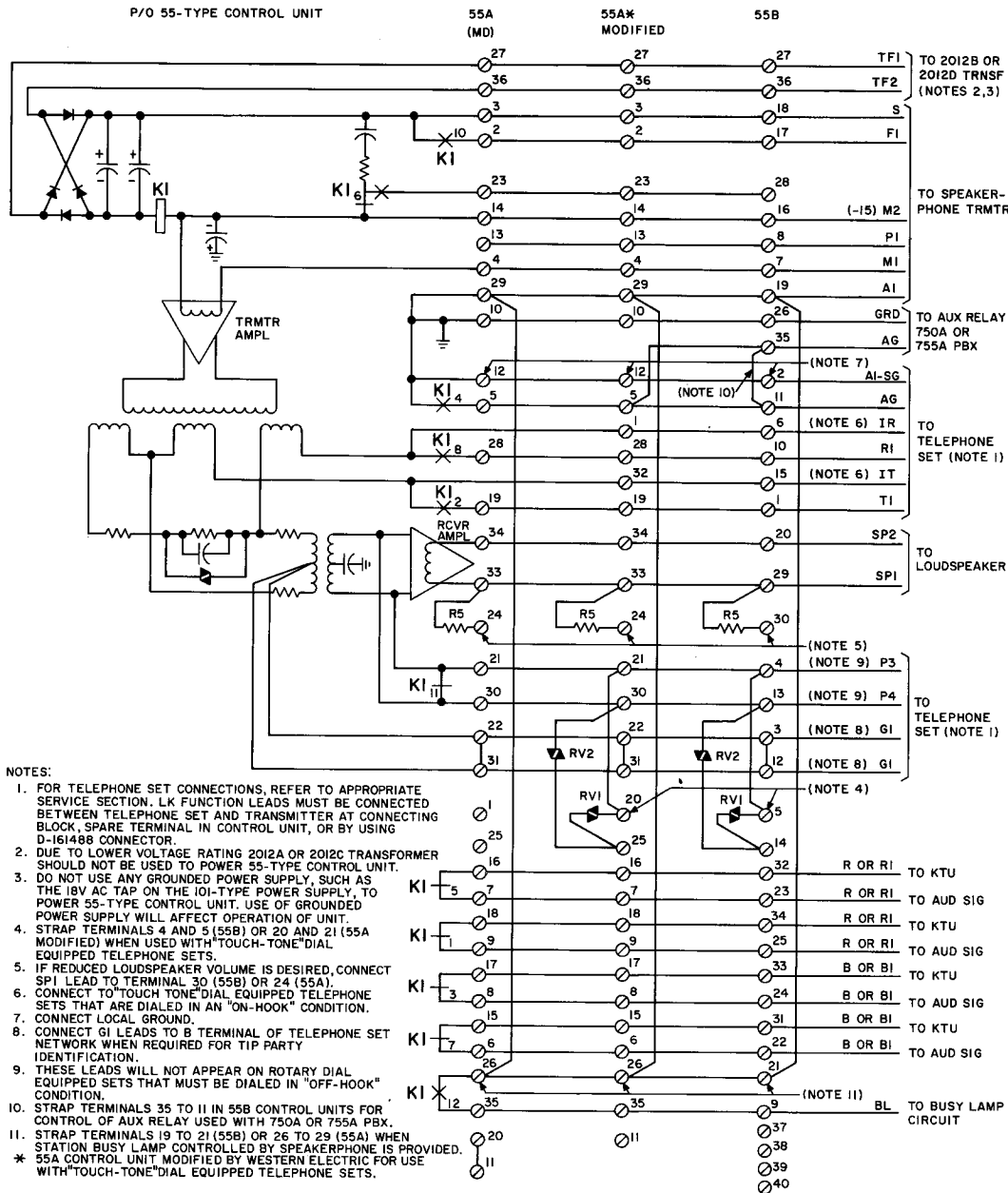


Fig. 2—55-Type Control Unit Connections

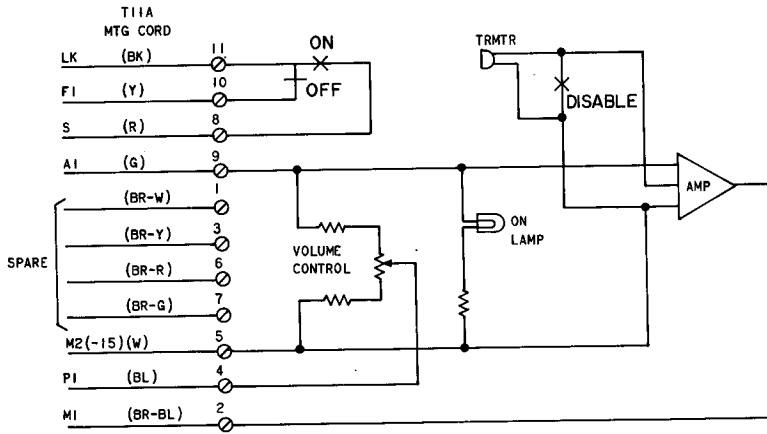


Fig. 3—666A (MD) Transmitter Connections

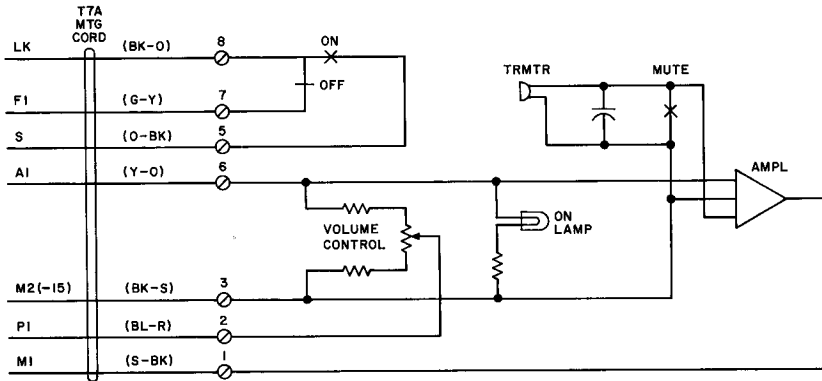


Fig. 4—666B (MD) Transmitter Connections

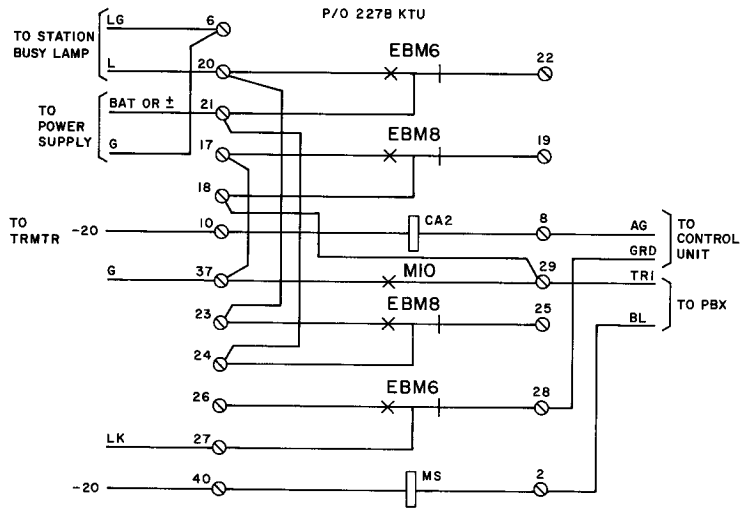


Fig. 5—Auxiliary Relay Circuit for Use With 750A or 755A PBX

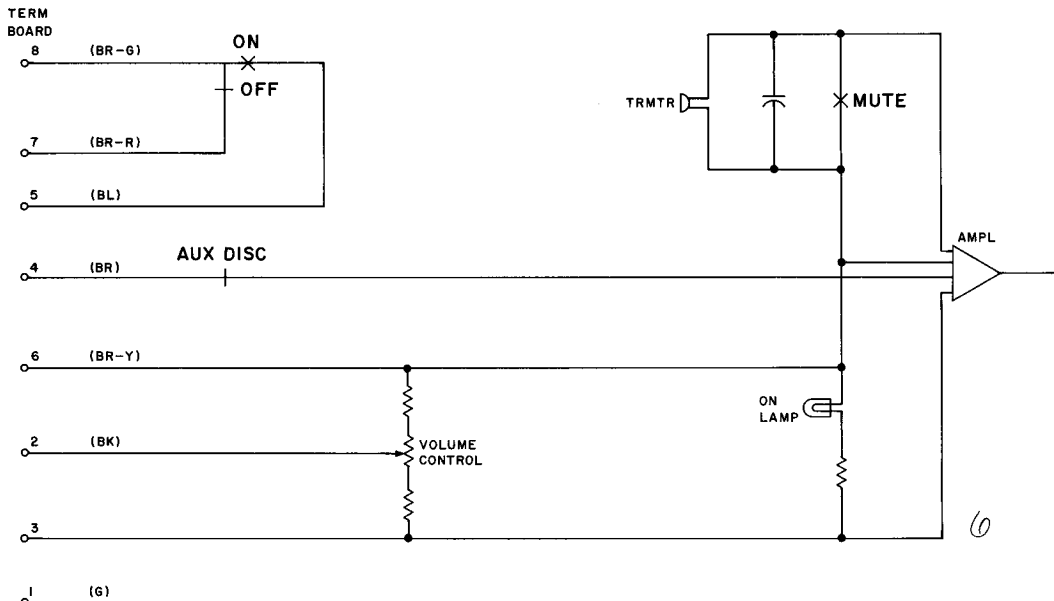


Fig. 6—670A (MD) Transmitter

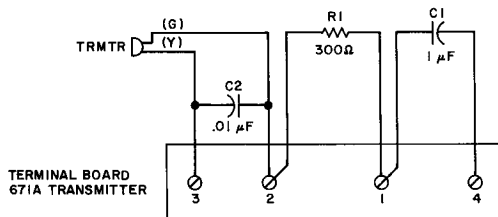


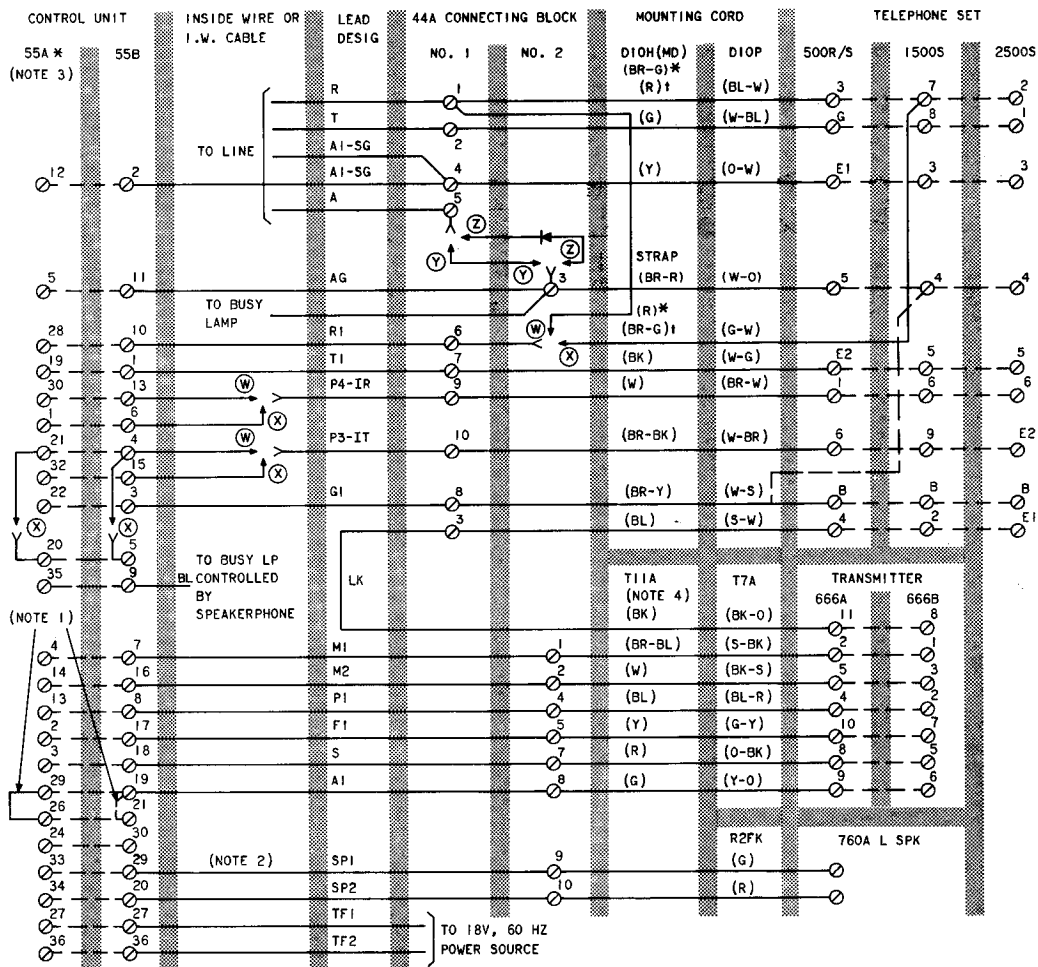
Fig. 7—671A (MD) Transmitter

**SPEAKERPHONE SYSTEM 3-TYPE**  
**500R/S, 1500S, AND 2500S TELEPHONE SET**  
**CONNECTIONS**

**1. GENERAL**

**1.01** This section is reissued to add information on the 1500S and 2500S telephone sets, formerly contained in Sections 512-621-402 and 512-622-405 which are hereby canceled.

**1.02** Refer to the appropriate Reference or Service section in the Division 502 for complete wiring information of the telephone set. Information on the components of the 3-type speakerphone system will be found in Section 512-620-100.



- NOTES:
1. ADD STRAP FOR BUSY LAMP CONTROLLED BY SPEAKERPHONE ONLY. \* COLOR CODE USED ON 500R/S
  2. IF REDUCED LOUDSPEAKER VOLUME IS DESIRED, MOVE SP1 LEAD TO TERM. 30 (55B) OR 24 (55A). † COLOR CODE USED ON 1500S
  3. MODIFIED FOR TOUCH-TONE USE.
  4. INSULATE AND STORE UNUSED LEADS.
- (W) 500R/S  
 (X) 1500S, 2500S  
 (Y) WITHOUT BUSY LAMP  
 (Z) WITH BUSY LAMP KS-15724, LI DIODE

Fig. 1—500R/S Telephone Set—Speakerphone Connections

**SPEAKERPHONE SYSTEM—3-TYPE**  
**511-, 1511-, AND 2511-TYPE TELEPHONE SETS**  
**CONNECTIONS AND MAINTENANCE**

**1. GENERAL**

**1.01** These sets are supplied factory-wired for use with 3-type speakerphone. Refer to Division 502 for complete telephone set wiring schematics.

**1.02** This section is reissued to:

- Include information on 1511- and 2511-type telephone sets
- Show 1511-type sets MD

**1.03** Information on the 1511-type sets was formerly found in Section 512-621-410 and 2511-type in Section 512-622-410 which are hereby canceled.¶

**2. MAINTENANCE**

**2.01** For the 511-, 1511-, and 2511-type telephone set maintenance information refer to the appropriate Reference section in Division 502. Refer to Division 512 for maintenance of speakerphone components used with these sets.



SECTION 512-620-415

NOTES:

1. MODIFIED FOR "TOUCH-TONE" USE.
2. CONNECT TO LOCAL GROUND OR TO AI FOR KTS USE.
3. FOR REDUCED LOUDSPEAKER VOLUME, CONNECT SP1 LEAD TO TERMINAL 24 (55A) OR 30 (55B).
4. TO BUSY LAMP CONTROLLED BY SPEAKERPHONE.
5. ADD STRAP FOR BUSY LAMP CONTROLLED BY SPEAKERPHONE ONLY.
6. INSULATE AND STORE UNUSED LEADS.

1 NETWORK TERMINAL

(W) 511C/D

(X) 1511D(MD)

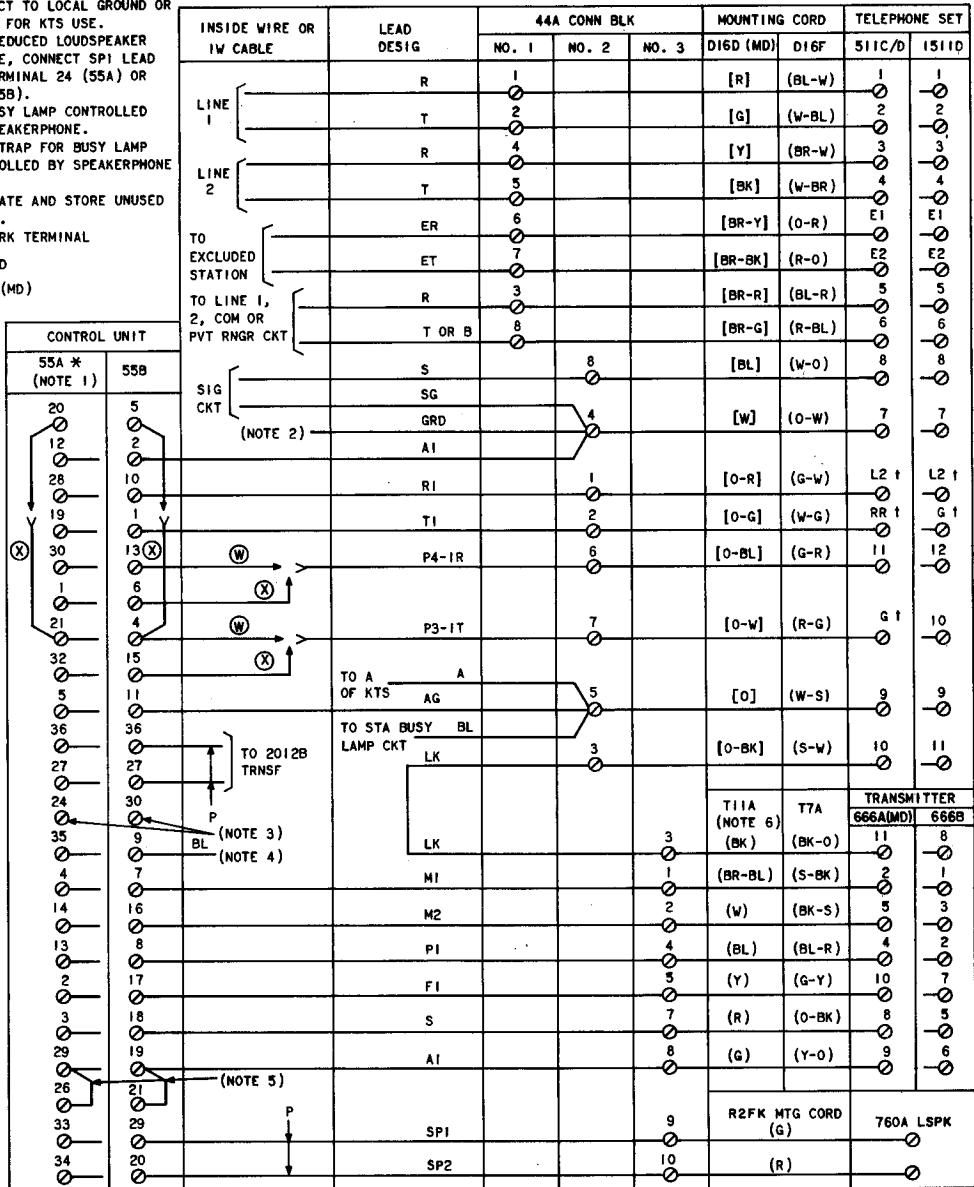


Fig. 1—511C/D and 1511D (MD) Telephone Set, Connections to 3-Type Speakerphone System

NOTES:

1. MODIFIED FOR "TOUCH-TONE" USE.
2. CONNECT TO LOCAL GROUND OR TO A1 FOR KTS USE.
3. FOR REDUCED LOUDSPEAKER VOLUME, CONNECT SP1 LEAD TO TERMINAL 24 (55A) OR 30 (55B).
4. TO BUSY LAMP CONTROLLED BY SPEAKERPHONE.
5. ADD STRAP FOR BUSY LAMP CONTROLLED BY SPEAKERPHONE ONLY.
6. INSULATE AND STORE UNUSED LEADS.

† NETWORK TERMINAL

⊙ 511F

⊗ 1511F (MD), 2511F

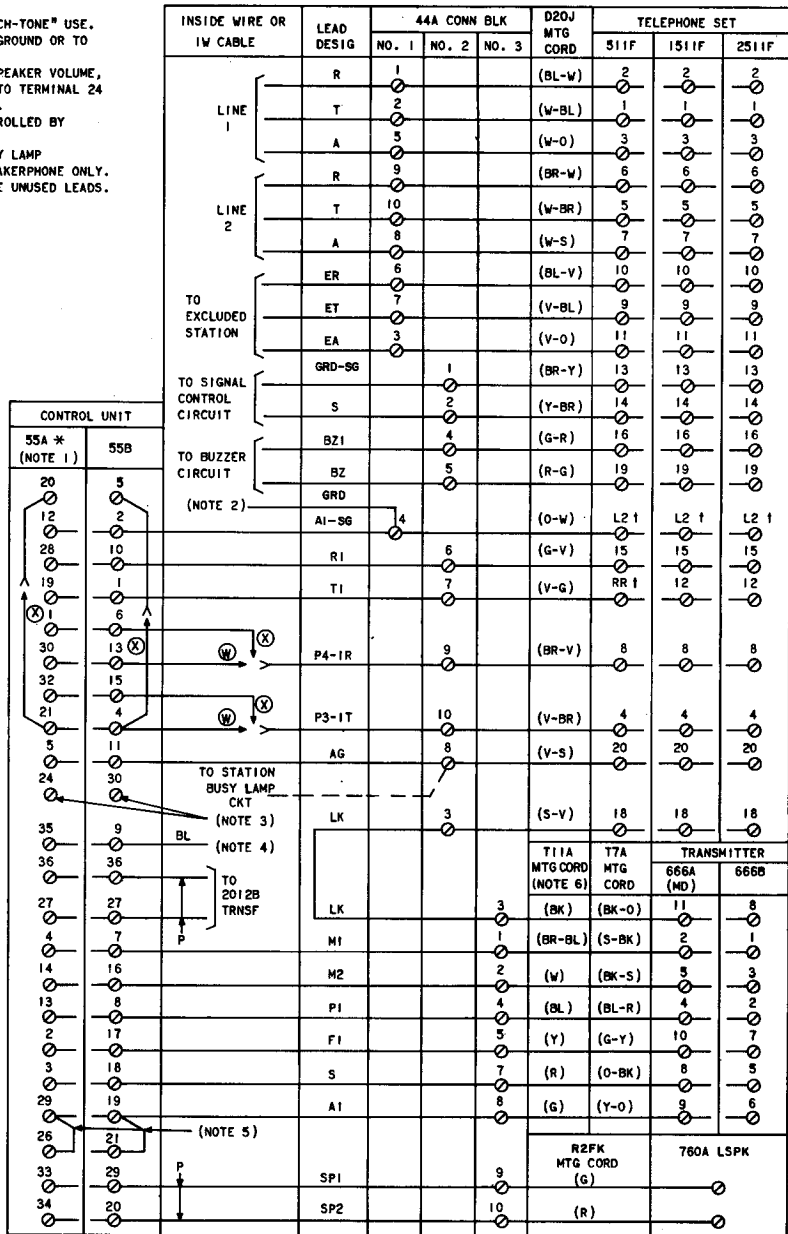


Fig. 2—511F, 1511F (MD), and 2511F Telephone Set, Connections to 3-Type Speakerphone System

NOTES:

1. MODIFIED FOR "TOUCH-TONE" USE.
  2. CONNECT TO LOCAL GROUND OR TO A1 FOR KTS USE.
  3. FOR REDUCED LOUDSPEAKER VOLUME CONNECT SPI LEAD TO TERMINAL 24 (55A) OR 30 (55B).
  4. TO BUSY LAMP CONTROLLED BY SPEAKERPHONE.
  5. ADD STRAP FOR BUSY LAMP CONTROLLED BY SPEAKERPHONE ONLY.
  6. INSULATE AND STORE UNUSED LEADS.
- † NETWORK TERMINAL  
 ⊕ 511H  
 ⊗ 1511H(MD), 2511H

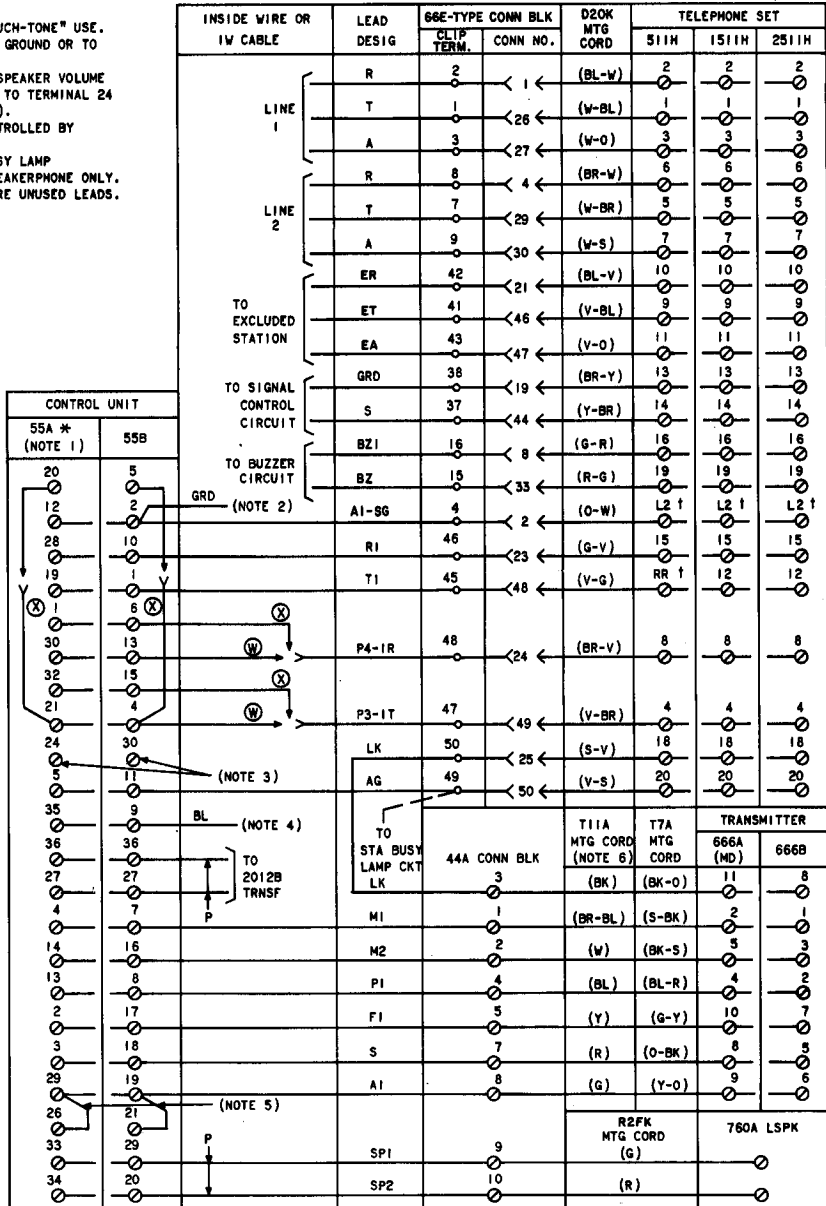


Fig. 3—511H, 1511H (MD), and 2511H Telephone Set, Connections to 3-Type Speakerphone System

**SPEAKERPHONE SYSTEM—3-TYPE**  
**558-, 1558-, AND 2558-TYPE TELEPHONE SETS**  
**CONNECTIONS AND MAINTENANCE**

**1. GENERAL**

**1.01** These sets are supplied factory-wired for use with 3-type speakerphone. Refer to Division 502 for complete telephone set wiring schematics.

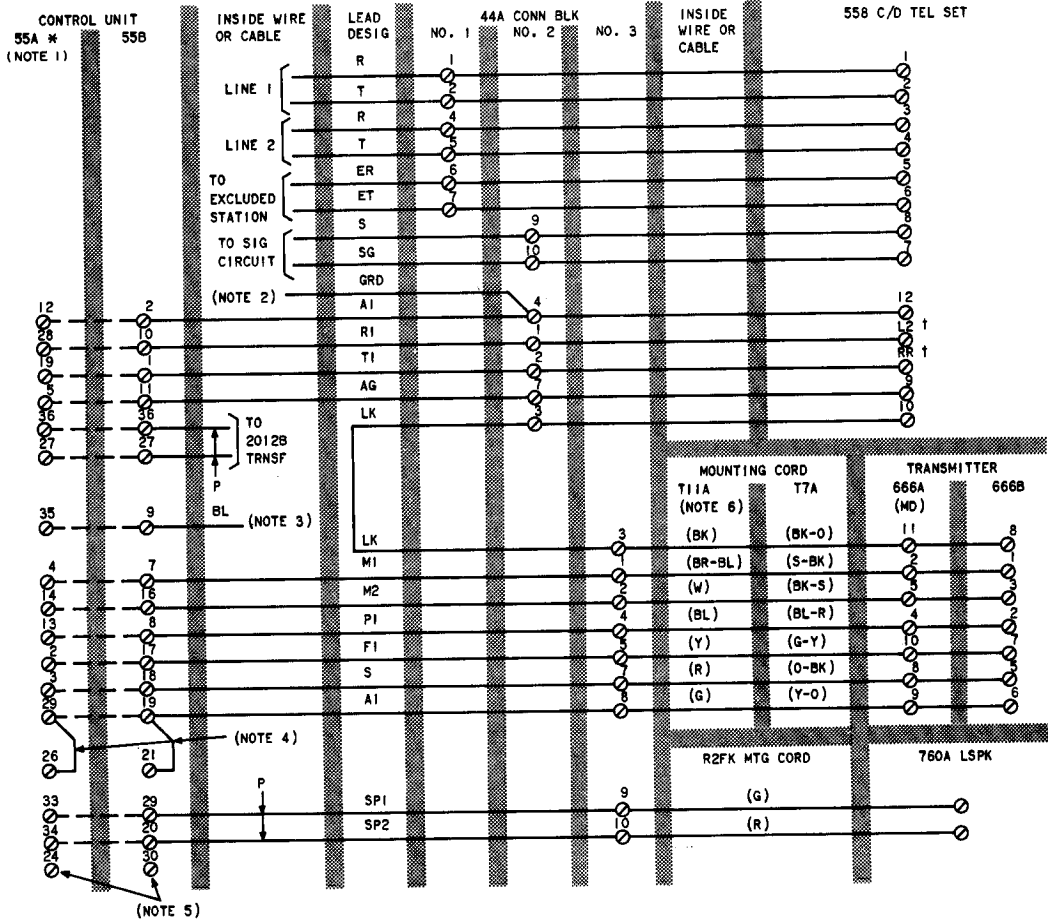
**1.02** This section is reissued to:

- Include information on 1558- and 2558-type telephone sets
- Show 1558D set MD

**1.03** Information on the 1558-type sets was formerly found in Section 512-621-413 and 2558-type in Section 512-622-413 which are hereby canceled.

**2. MAINTENANCE**

**2.01** For maintenance information refer to the appropriate Reference section for the 558-, 1558-, and 2558-type sets located in Division 502. Refer to Division 512 for maintenance of speakerphone components used with these sets.



- NOTES:
1. MODIFIED FOR "TOUCH-TONE" USE.
  2. CONNECT TO LOCAL GROUND OR TO A1 FOR KTS USE.
  3. TO BUSY LAMP CONTROLLED BY SPEAKERPHONE.
  4. ADD STRAP FOR BUSY LAMP CONTROLLED BY SPEAKERPHONE ONLY.
  5. FOR REDUCED LOUDSPEAKER VOLUME, CONNECT SP1 LEAD TO TERMINAL 24 (55A) OR 30 (55B).
  6. INSULATE AND STORE UNUSED LEADS.
- † NETWORK TERMINAL

Fig. 1—558C/D Telephone Set Connections to 3-Type Speakerphone System

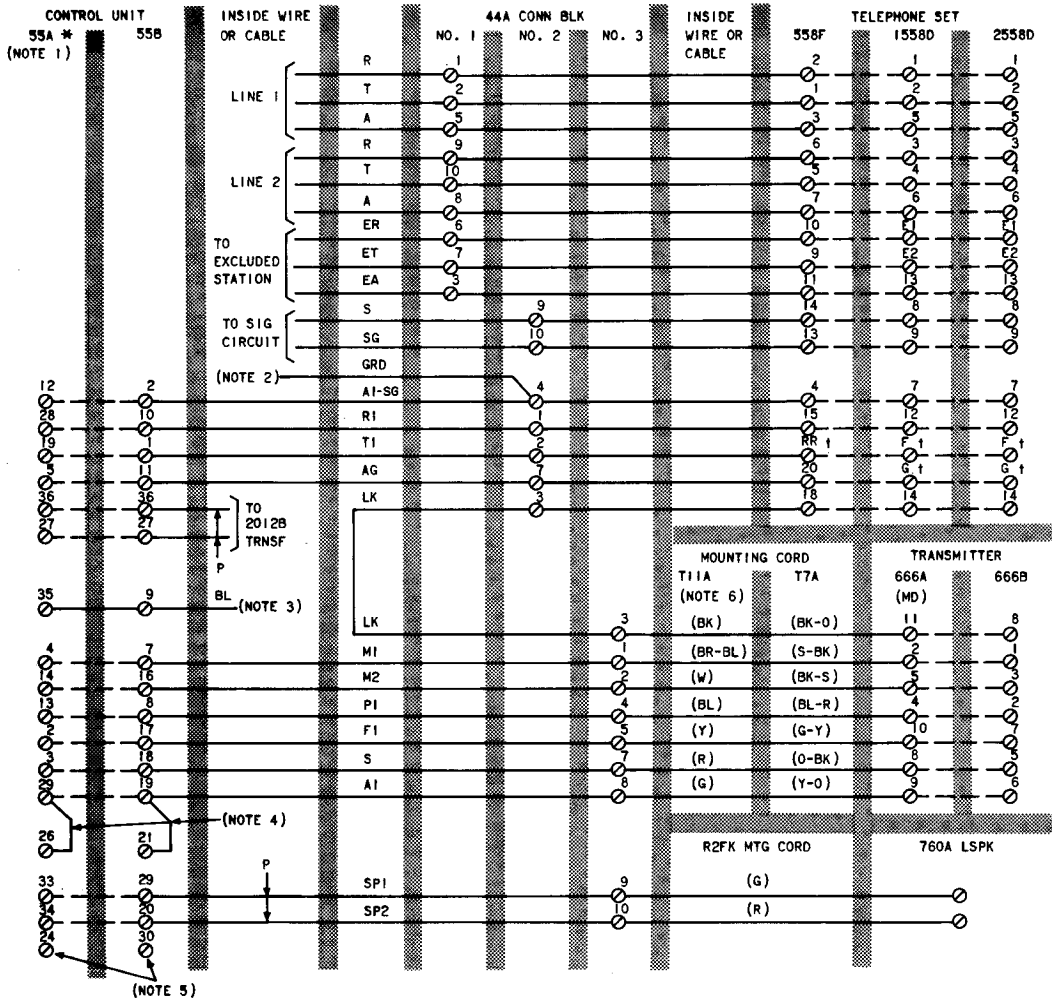


Fig. 2—558F, 1558D (MD), and 2558D Telephone Set, Connections to 3-Type Speakerphone System

## SPEAKERPHONE SYSTEMS—3-TYPE 565-, 1565-, AND 2565-TYPE TELEPHONE SETS CONNECTIONS

### 1. GENERAL

**1.01** This section shows connections between components of the 3-type speakerphone system and the 565-, 1565-, and 2565-type telephone sets.

**1.02** This section is reissued to show:

- Connection information for the 1565- and 2565-type telephone sets formerly found in Sections 512-621-415 and 512-622-415 which are hereby canceled
- KS-19252L1 bridging adapter

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

**1.03** The connections in this section are for use with 1A1 or 1A2 KTS. For conversion to 1A KTS or for complete telephone set connections refer to the appropriate section in Division 502.

**1.04** These sets may be used with the 55B or 55A\* modified control unit. Modified 55A

control units are identified by an asterisk following the code. The 565-type telephone set may be used with 55A (MD) control unit.

**1.05** When using a 666-type transmitter unit equipped with a T11A cord, insulate and store the spare conductors.

### 2. CONNECTIONS

Fig. 1—Connections for 565-Type Telephone Set Using 66E-Type Connecting Block

Fig. 2—Connections for 565-Type Telephone Set Using 149-Type Adapter

Fig. 3—Connections for 1565- or 2565-Type Telephone Set Using 66E-Type Connecting Block

Fig. 4—Connections for 1565- or 2565-Type Telephone Set Using 149-Type Adapter

Fig. 5—Use of KS-19252L1 Bridging Adapter

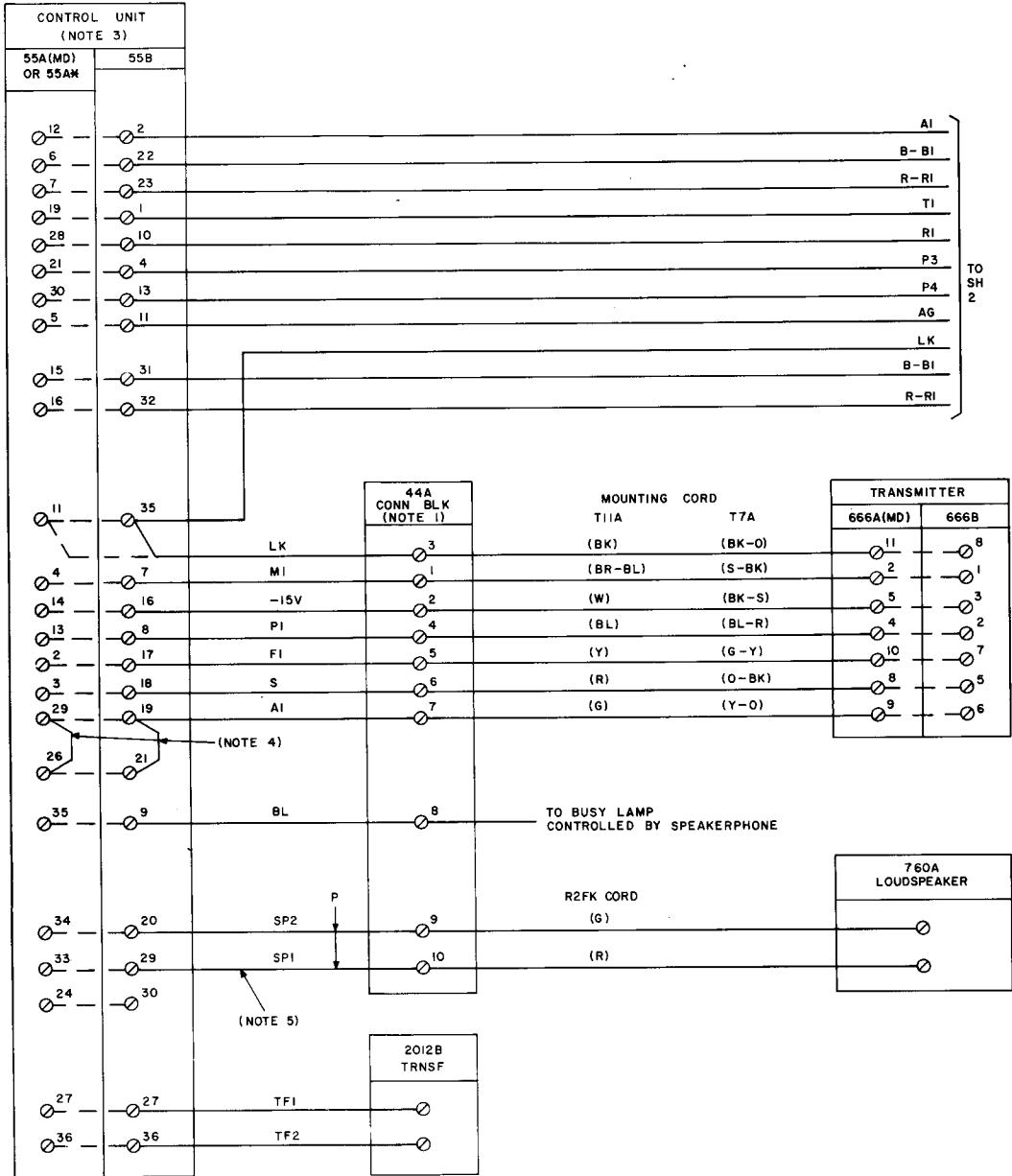
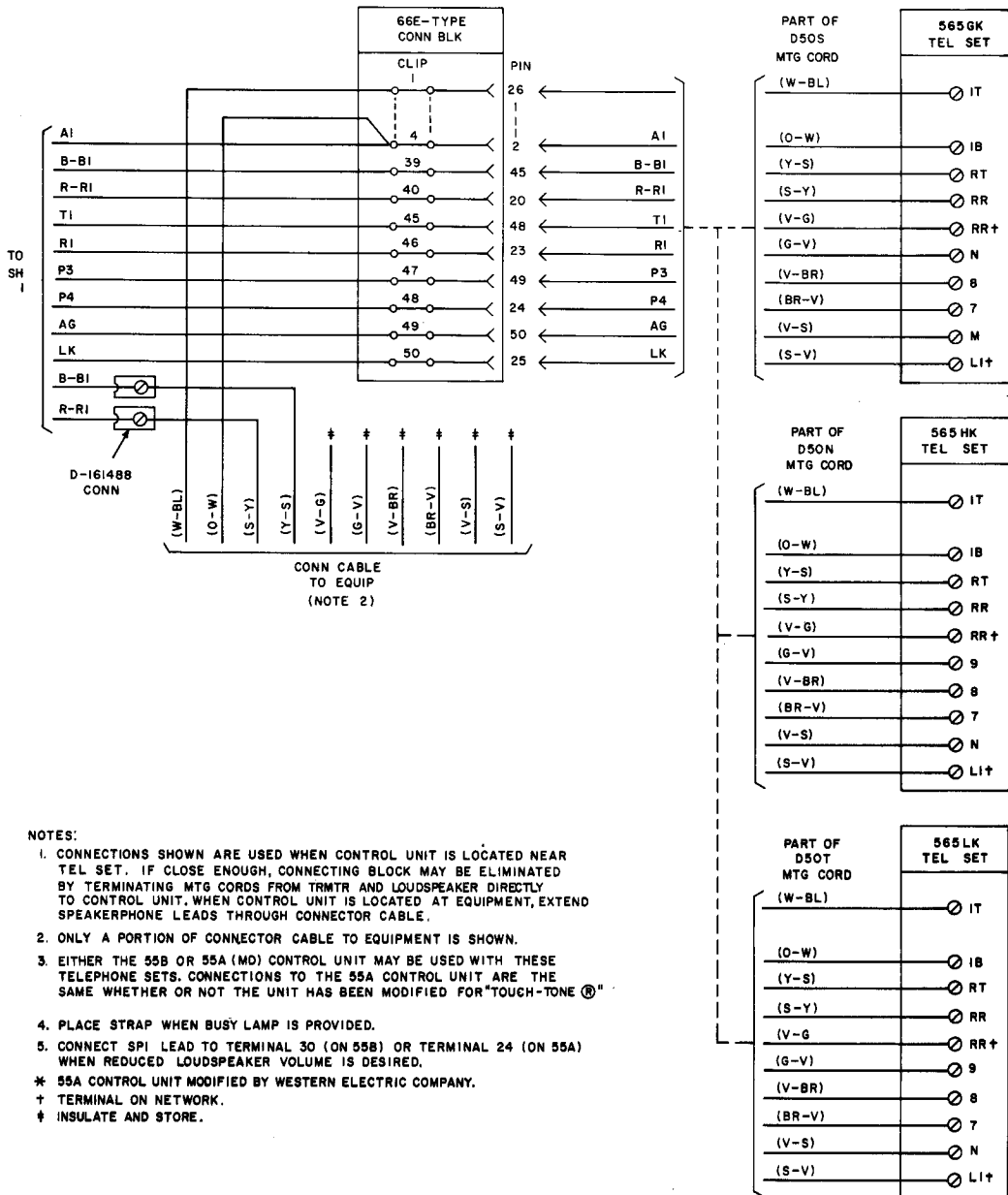


Fig. 1—Connections for 565-Type Telephone Set Using 66E-Type Connecting Block (Sheet 1 of 2)





NOTES:

1. CONNECTIONS SHOWN ARE USED WHEN CONTROL UNIT IS LOCATED NEAR TEL SET. IF CLOSE ENOUGH, CONNECTING BLOCK MAY BE ELIMINATED BY TERMINATING MTG CORDS FROM TRMTR AND LOUDSPEAKER DIRECTLY TO CONTROL UNIT. WHEN CONTROL UNIT IS LOCATED AT EQUIPMENT, EXTEND SPEAKERPHONE LEADS THROUGH CONNECTOR CABLE.
  2. ONLY A PORTION OF CONNECTOR CABLE TO EQUIPMENT IS SHOWN.
  3. EITHER THE 55B OR 55A (ND) CONTROL UNIT MAY BE USED WITH THESE TELEPHONE SETS. CONNECTIONS TO THE 55A CONTROL UNIT ARE THE SAME WHETHER OR NOT THE UNIT HAS BEEN MODIFIED FOR "TOUCH-TONE®".
  4. PLACE STRAP WHEN BUSY LAMP IS PROVIDED.
  5. CONNECT SPI LEAD TO TERMINAL 30 (ON 55B) OR TERMINAL 24 (ON 55A) WHEN REDUCED LOUDSPEAKER VOLUME IS DESIRED.
- \* 55A CONTROL UNIT MODIFIED BY WESTERN ELECTRIC COMPANY.  
 † TERMINAL ON NETWORK.  
 ‡ INSULATE AND STORE.

Fig. 1—Connections for 565-Type Telephone set Using 66E-Type Connecting Block (Sheet 2 of 2)

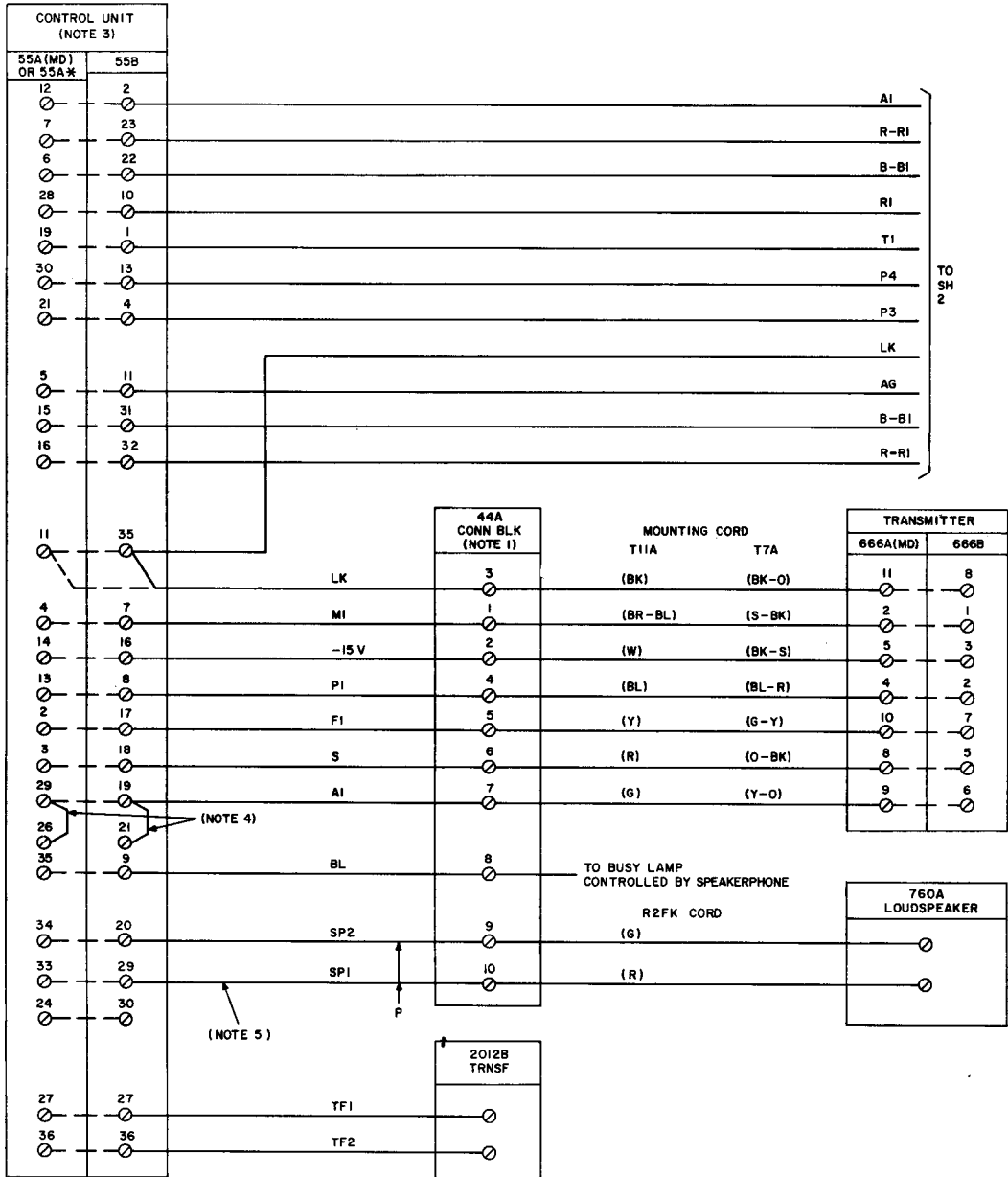


Fig. 2—Connections for 565-Type Telephone Set Using 149-Type Adapter (Sheet 1 of 2)

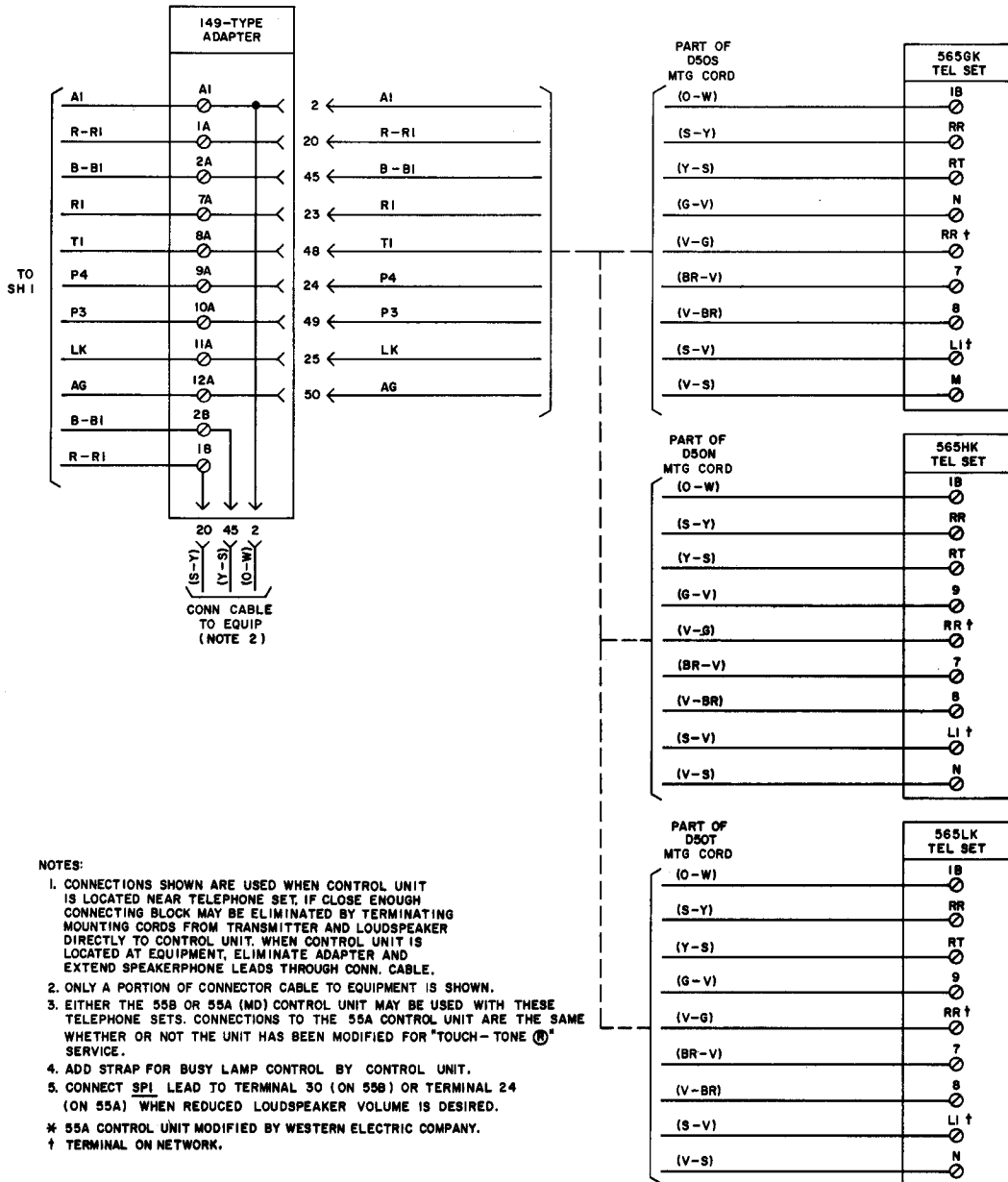


Fig. 2—Connections for 565-Type Telephone Set Using 149-Type Adapter (Sheet 2 of 2)

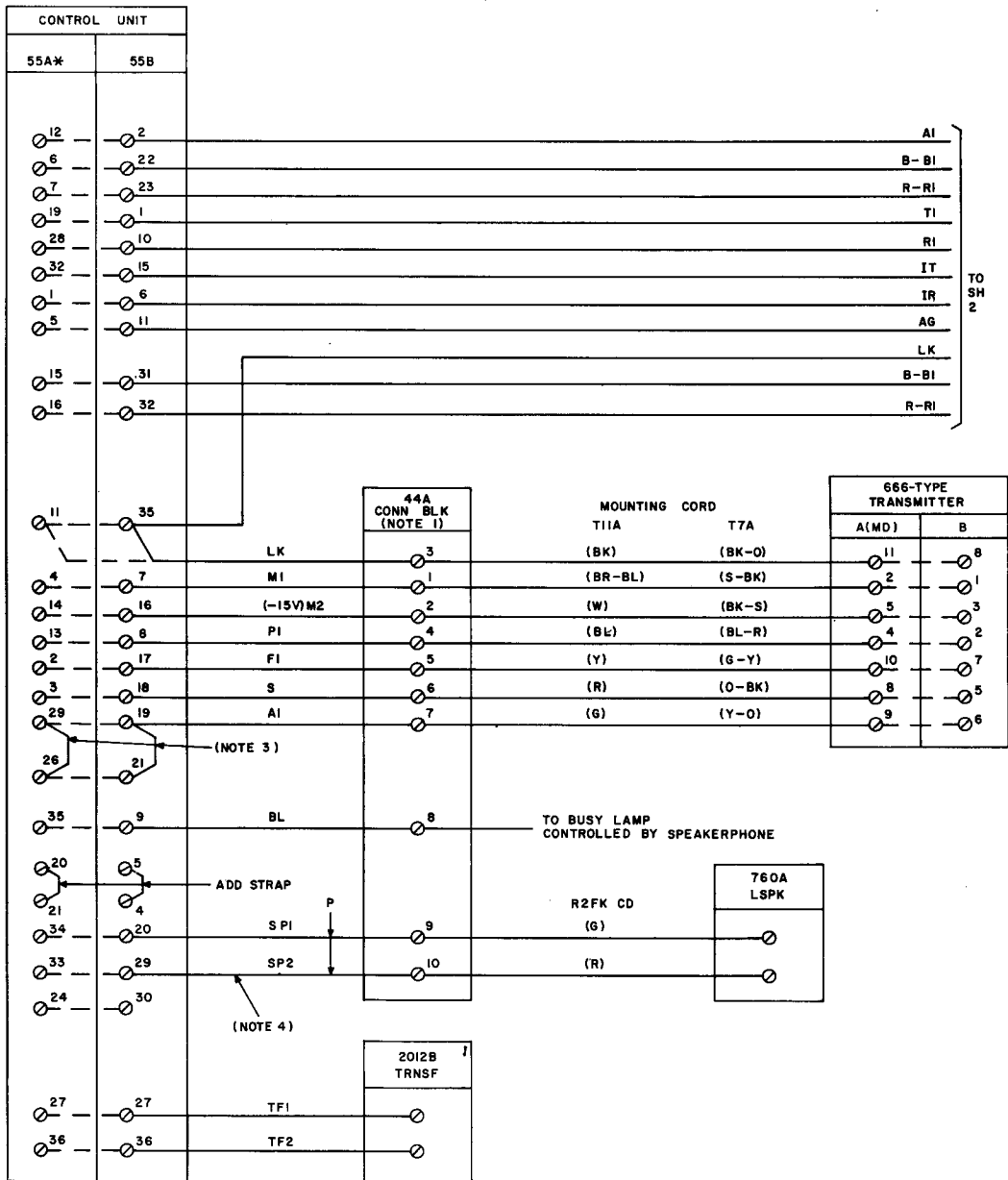


Fig. 3—Connections for 1565- or 2565-Type Telephone Set Using 66E-Type Connecting Block (Sheet 1 of 2)

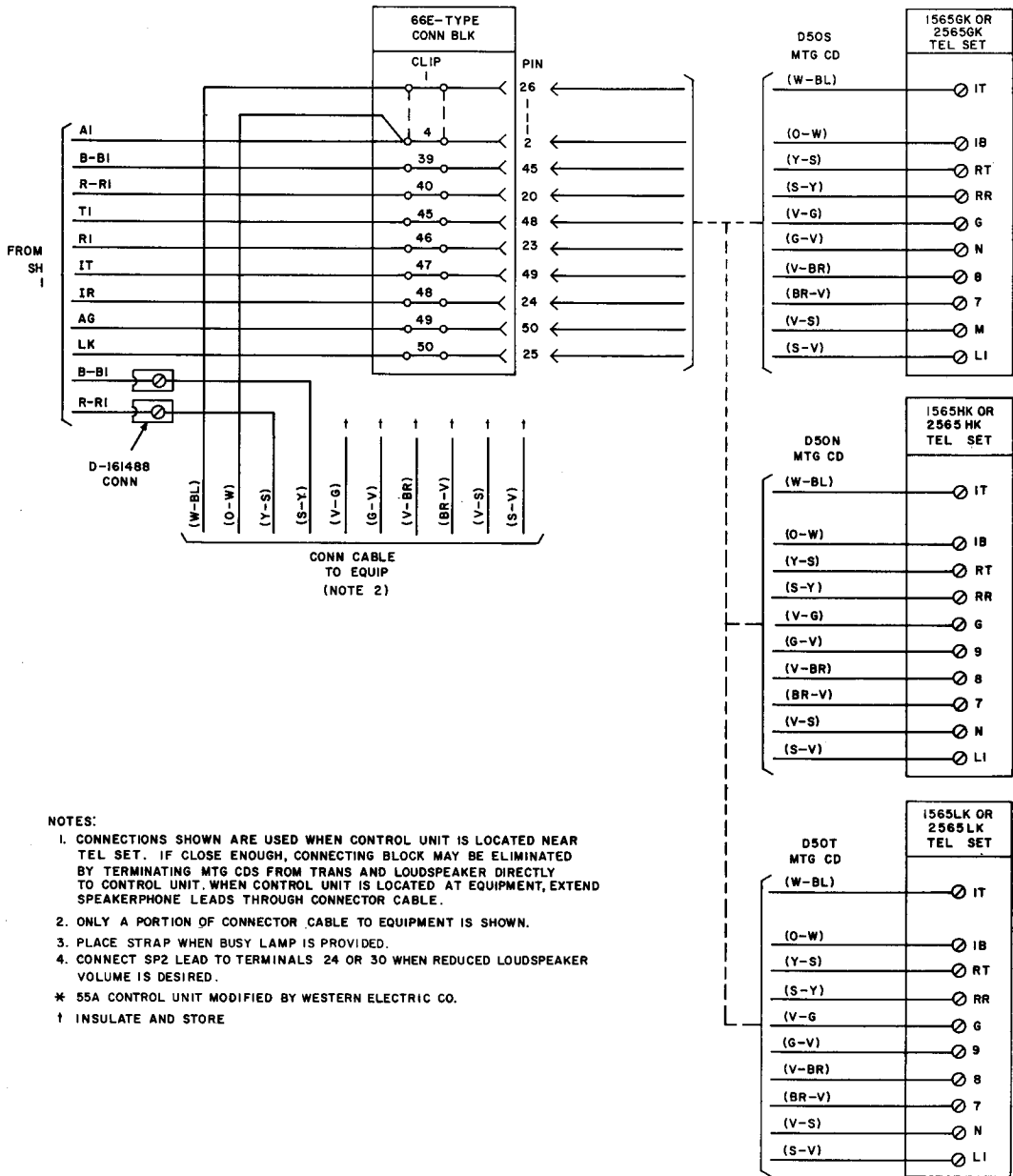


Fig. 3—Connections for 1565- or 2565-Type Telephone Set Using 66E-Type Connecting Block (Sheet 2 of 2)

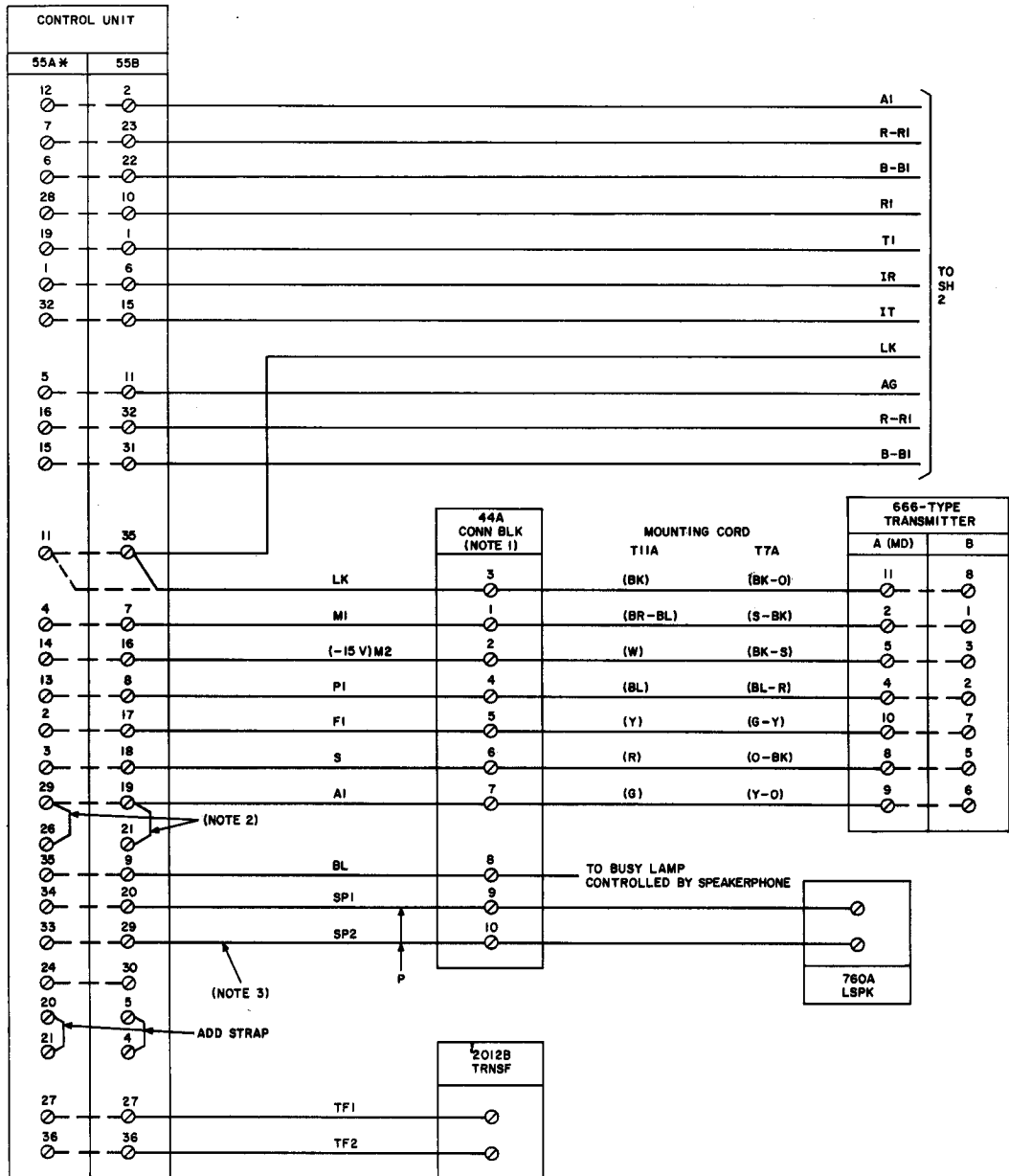
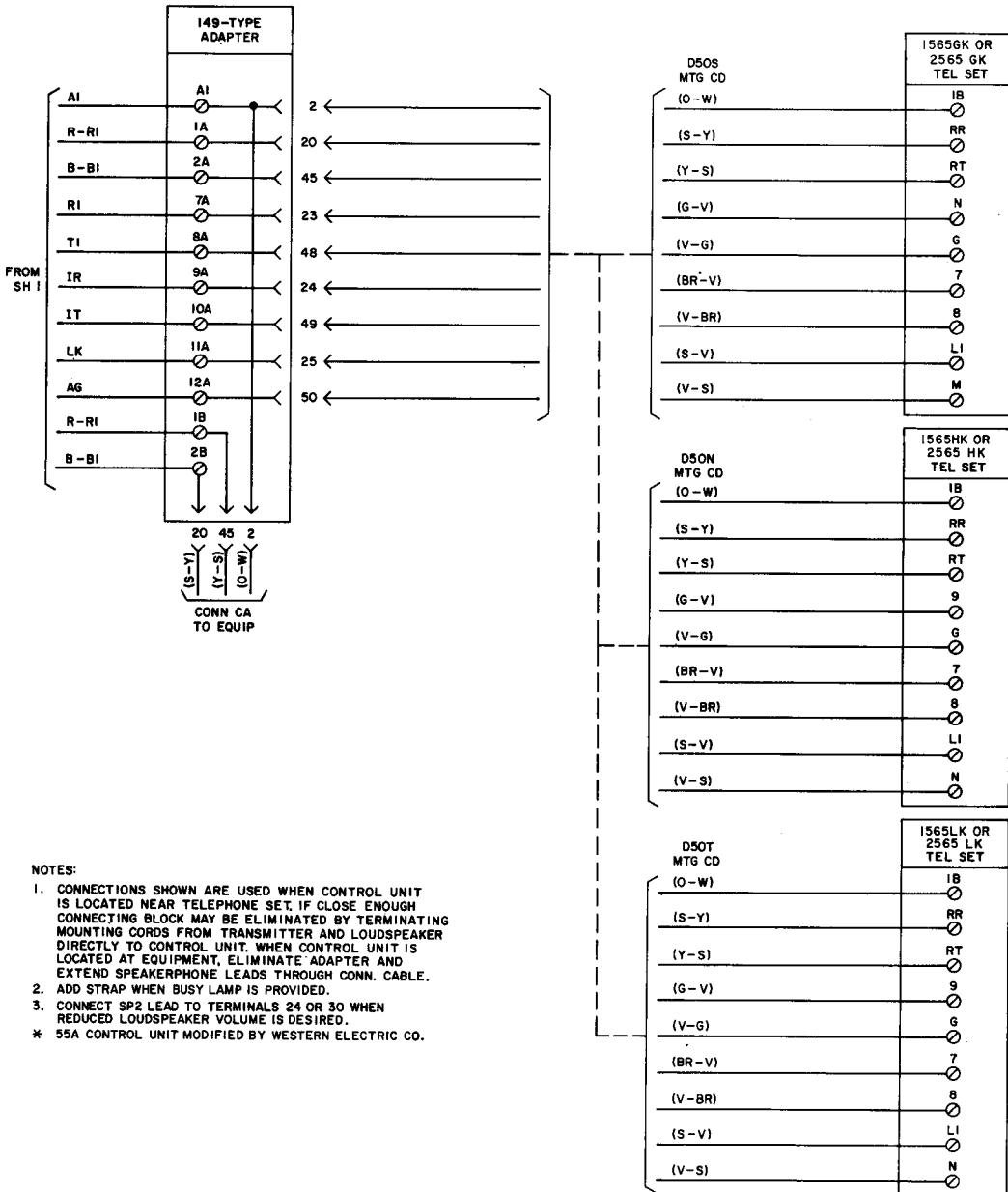


Fig. 4—Connections for 1565- or 2565-Type Telephone Set Using 149-Type Adapter (Sheet 1 of 2)



NOTES:

1. CONNECTIONS SHOWN ARE USED WHEN CONTROL UNIT IS LOCATED NEAR TELEPHONE SET. IF CLOSE ENOUGH CONNECTING BLOCK MAY BE ELIMINATED BY TERMINATING MOUNTING CORDS FROM TRANSMITTER AND LOUDSPEAKER DIRECTLY TO CONTROL UNIT. WHEN CONTROL UNIT IS LOCATED AT EQUIPMENT, ELIMINATE ADAPTER AND EXTEND SPEAKERPHONE LEADS THROUGH CONN. CABLE.
  2. ADD STRAP WHEN BUSY LAMP IS PROVIDED.
  3. CONNECT SP2 LEAD TO TERMINALS 24 OR 30 WHEN REDUCED LOUDSPEAKER VOLUME IS DESIRED.
- \* 55A CONTROL UNIT MODIFIED BY WESTERN ELECTRIC CO.

Fig. 4—Connections for 1565- or 2565-Type Telephone Set Using 149-Type Adapter (Sheet 2 of 2)

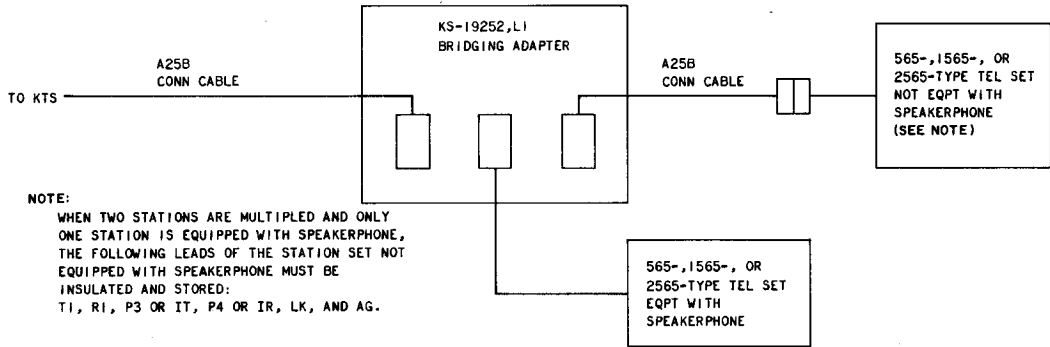


Fig. 5—Using KS-19252L1 Bridging Adapter



## 630-, 631-, 1630-, 1631-, 2630-, AND 2631-TYPE TELEPHONE SETS CONNECTIONS SPEAKERPHONE SYSTEM—3-TYPE

### 1. GENERAL

1.01 This section covers information for the 630-, 631-, 1630-, 1631-, 2630-, and 2631-type 18- or 30-button, rotary or TOUCH-TONE® dial telephone set when used with the 3-type (MD) speakerphone system.

1.02 This section is reissued to:

- Show 3-type speakerphone system MD
- Show 2021B transformer MD
- Add 2012D transformer
- Add modular telephone sets.

1.03 All single and double letter coded telephone sets are rated Manufactured Discontinued (MD). All modular telephone sets except 630DAM1, 631DAM1, 2630DAM1, and 2631DAM1 are also MD.

### 2. MODIFICATION

2.01 Codes -11, -12, and -13 of the 630-, 1630-, and 2630-type telephone sets and codes -16, -17, and -18 of the 631-, 1631-, and 2631-type telephone sets are factory-wired for speakerphone. Other codes can be modified by installing a transmitter in the third or fifth module and making the necessary wiring changes. In rotary sets replace the 8R or 8RA dial with an 8CA dial, where required.

A. 630A(MD), 630B(MD), 630C(MD), 630D(MD), 631A(MD), 631B(MD), 631C(MD), 631D(MD), 1630D(MD), 1631D(MD), 2630D(MD), and 2631D(MD) Telephone Sets

2.02 Convert as follows.

- (a) Remove telephone set faceplate and housing. (See Section 502-600-100 for procedures).
- (b) Remove key unit or apparatus blank in right-hand module position (third or fifth module) and plug in a 667B (MD) transmitter (ordered separately).
- (c) Connect spade-tipped leads of transmitter as shown in Fig. 1, 2, 3, 5 and Table A.
- (d) Install housing. (See Section 502-600-100 for procedures).
- (e) Install new faceplate and mat (ordered separately) in which cutouts for the transmitter are provided. Refer to the appropriate Reference section in Division 502 for ordering information.

B. 630DA(MD), 630DAM, 631DA(MD), 631DAM, 2630DA(MD), 2630DAM, 2631DA(MD), and 2631DAM Telephone Sets

2.03 Convert as follows.

- (a) Remove faceplate and housing. (See Section 502-600-100 for procedures).
- (b) Disconnect line plugs from key unit or apparatus blank in third module and remove key.
- (c) Install 679A (MD) transmitter in third or fifth module and connect slate plug to receptacle on rear of transmitter. Insulate and store balance of plugs.
- (d) Modify set per Fig. 4, 6 and Table D, F.
- (e) Replace housing. (See Section 502-600-100 for procedures).

### NOTICE

Not for use or disclosure outside the  
Bell System except under written agreement

(f) Install proper faceplate and mat. Refer to the appropriate Reference section for ordering information.

**3. CONNECTIONS**



**For proper operation of the 3-type speakerphone system, ground must be present on the A1-lead. Connect ground to the appropriate terminal on the telephone set or at the 55-type (MD) control unit.**

**3.01** Where required, ringer and buzzer operation can be interrupted through break contacts of the 55-type control unit to prevent pickup while using speakerphone.

**3.02** Connections are also shown for busy lamp controlled by speakerphone. Where it is desired to have the busy lamp controlled by speakerphone and line switch, refer to the Service section for the set involved.

**3.03** Either the 55A (MD) or 55B (MD) control unit may be used with sets equipped with rotary dials. Connections to the 55A control unit

are the same, whether or not the unit has been modified for TOUCH-TONE service.

**3.04** A 55B control unit or a 55A modified for TOUCH-TONE service must be used with sets equipped with TOUCH-TONE dials. Modified 55A units are indicated by an asterisk following the code stenciled on the unit.

**3.05** To retain the maximum number of keys in the CALL DIRECTOR® telephone sets and still have speakerphone feature, a 666A (MD) or 666B (MD) transmitter and 760A (MD) loudspeaker may be installed as adjuncts to the telephone set. Spare leads and hold key lamp leads from the first module are used to supply the external speakerphone function. When control unit and telephone set are at same location, an auxiliary mounting cord (D10R) may be used. When control unit is located at key equipment extend speakerphone leads using mounting cord and connector cable.

**3.06** Installation and maintenance information for these sets is found in Section 502-600-100. Refer to Section 512-620-100 for installation and maintenance of speakerphone components.

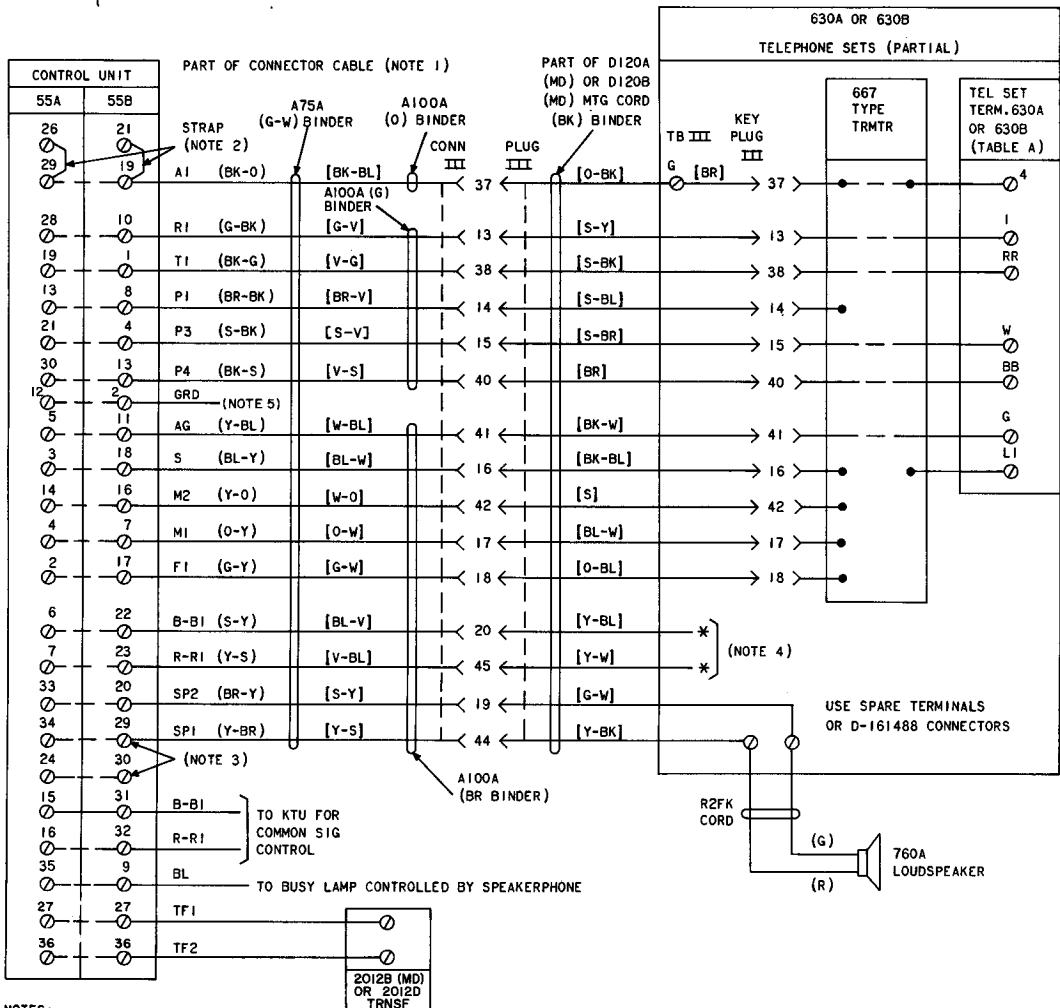
**TABLE A**  
**CONNECTIONS FOR 667-TYPE TRANSMITTER LEADS**

LEAD DESIG	TRANSMITTER		CONNECT TO*			
	667A (MD)	667B	630A 630B 630C TEL SETS	631A 631B 631C TEL SETS	630D 631D TEL SET	1630D, 1631D 2630D, 2631D TEL SET
R1	O-R	BL-Y	1		2	2
T1	O-G	Y-BL	RR†		RR†	10
P3 or IR	O-W	Y-G	W‡		11	11
P4 or IT	O-BL	G-Y	BB‡		12	12
AG	O	O-Y	G†		5	5
A1	Y	O-V	4		1	1
LK	O-BK	Y-O	L1†		9	9

\* Terminals on telephone set terminal board except where otherwise noted.

† Terminals on network.

‡ Terminals on dial.



NOTES:

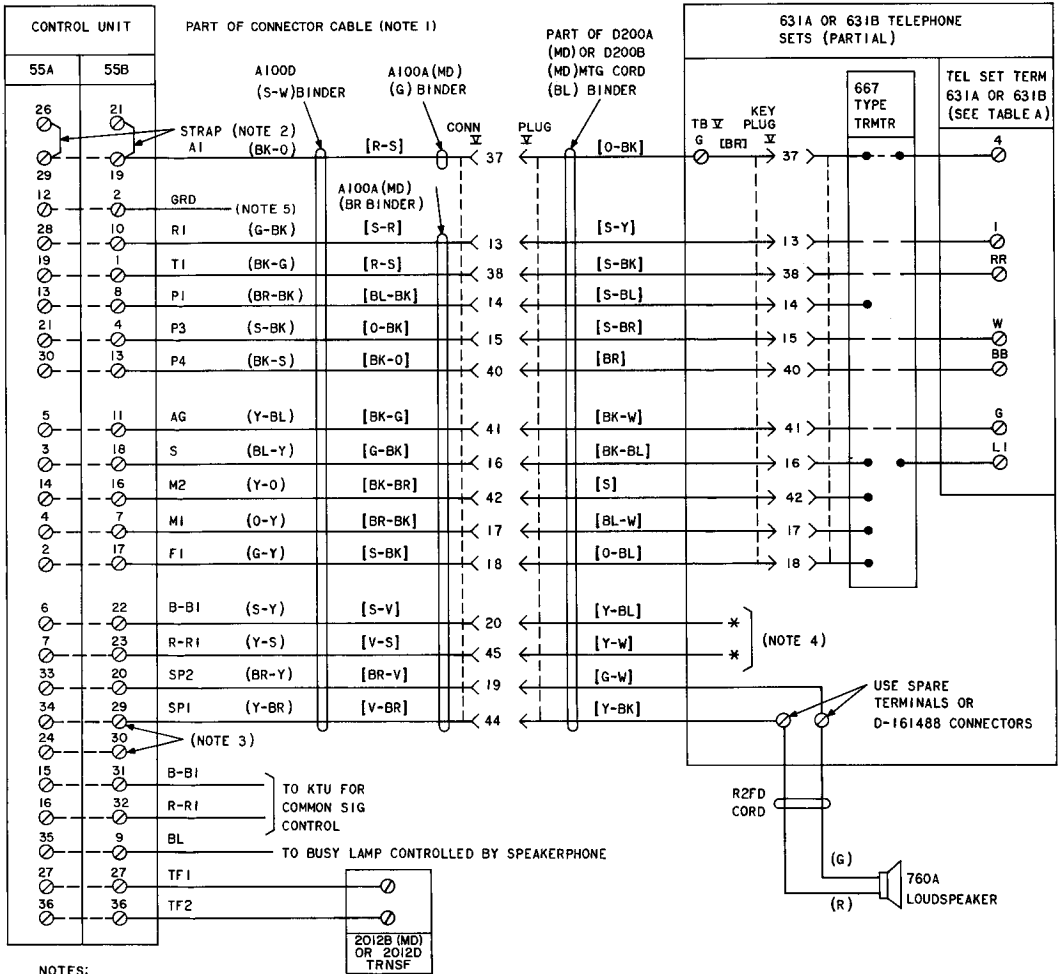
1. IF CONTROL UNIT IS LOCATED AT KEY EQUIPMENT EXTEND SPEAKERPHONE CONNECTIONS THROUGH APPROPRIATE LEADS IN (O), (G) AND (BR) BINDER GROUPS OF A100A (MD) OR (G-W) BINDER GROUP OF A75A CONNECTOR CABLE. FOR OTHER LOCATIONS CONNECT TO CONTROL UNIT USING A25-TYPE CONNECTOR CABLE, EVEN COUNT COLOR CODE ONLY.
2. ADD STRAP FOR STATION BUSY LAMP CONTROLLED BY SPEAKERPHONE
3. CONNECT SP1 LEAD TO TERMINAL 30 (ON 55B) OR TERMINAL 24 (ON 55A) WHEN REDUCED LOUDSPEAKER VOLUME IS DESIRED.
4. CONNECT [Y-BL] [Y-W] TO BUZZER OR RINGER (IN PLACE OF EXISTING LEADS) TO PROVIDE AUTOMATIC CUTOFF OF COMMON AUDIBLE SIGNAL DURING SPEAKERPHONE OPERATION.
5. CONNECT LOCAL GROUND.

\* INSULATED AND STORED

( ) CURRENT COLOR CODE

[ ] MD COLOR CODE

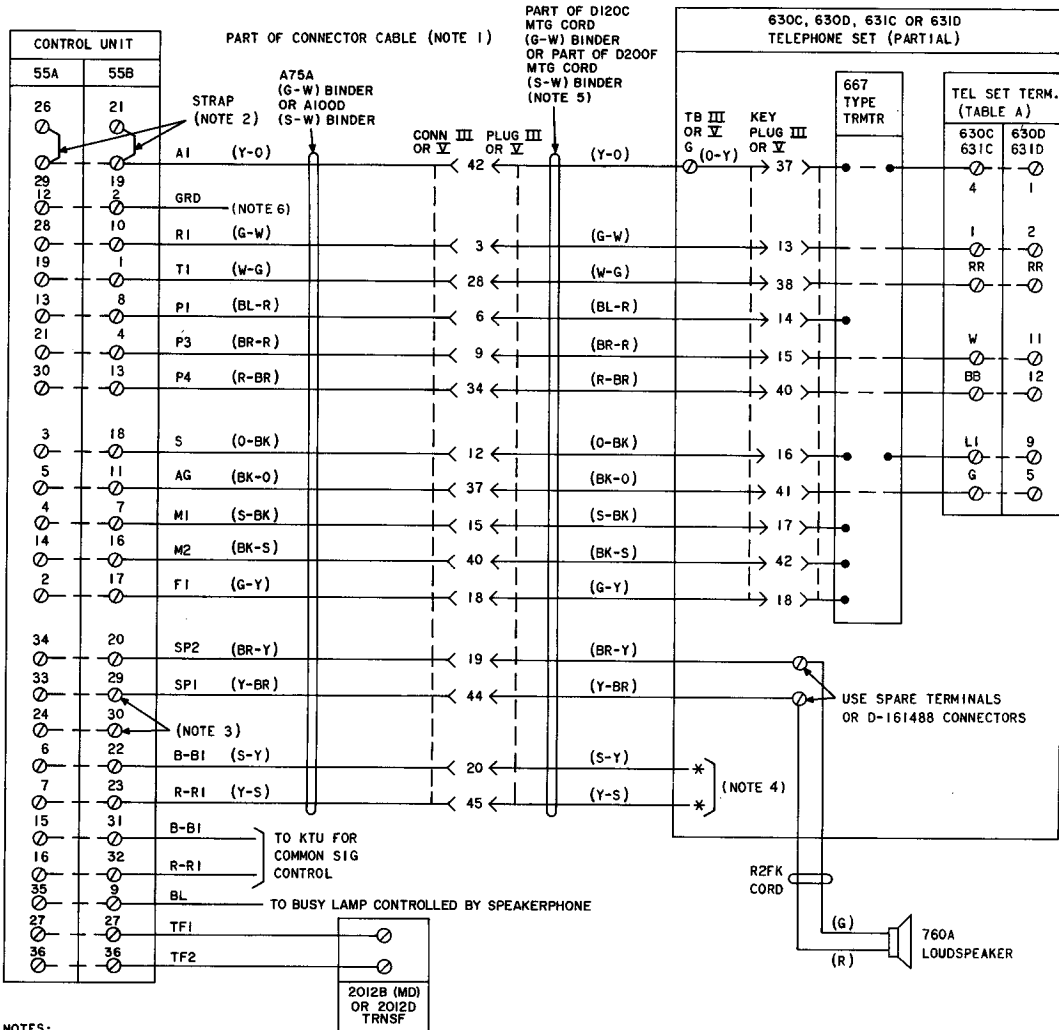
Fig. 1—630A or 630B Telephone Set, Connections



NOTES:

- IF CONTROL UNIT IS LOCATED AT KEY EQUIPMENT, EXTEND SPEAKERPHONE CONNECTIONS THROUGH APPROPRIATE LEADS IN (G) AND (BR) BINDER GROUP OF A100A (MD) OR (S-W) BINDER GROUP OF A100D CONNECTOR CABLE. FOR OTHER LOCATIONS, CONNECT TO CONTROL UNIT USING A25A CONNECTOR CABLE, EVEN COUNT COLOR CODE ONLY.
  - ADD STRAP FOR STATION BUSY LAMP CONTROLLED BY SPEAKERPHONE.
  - CONNECT SPI LEAD TO TERMINAL 30(ON 55B) OR TERMINAL 24(ON 55A) WHEN REDUCED LOUDSPEAKER VOLUME IS DESIRED.
  - CONNECT [Y-BL] [Y-W] TO BUZZER OR RINGER (IN PLACE OF EXISTING LEADS) TO PROVIDE AUTOMATIC CUTOFF OF COMMON AUDIBLE SIGNAL DURING SPEAKERPHONE OPERATION.
  - CONNECT LOCAL GROUND.
- \* INSULATED AND STORED  
 ( ) CURRENT COLOR CODE  
 [ ] MD COLOR CODE

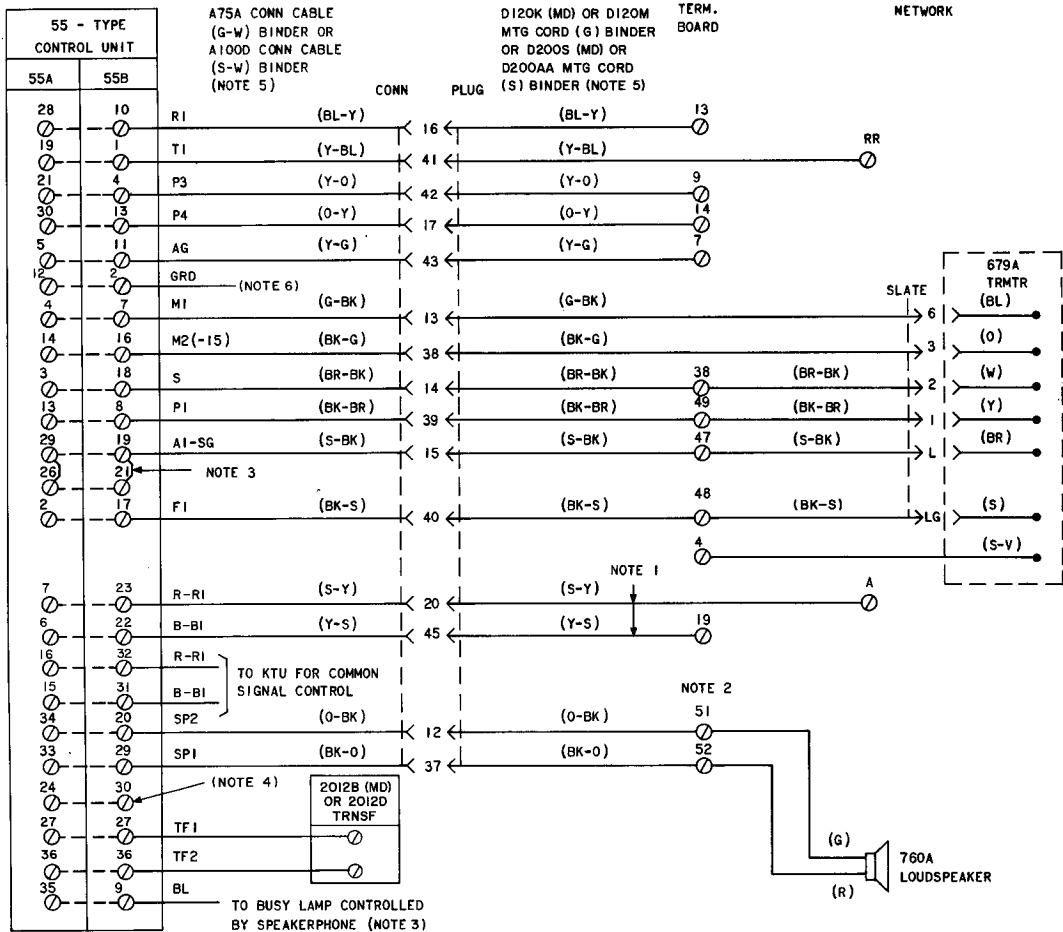
Fig. 2—631A or 631B Telephone Set, Connections



NOTES:

1. IF CONTROL UNIT IS LOCATED AT KEY EQUIPMENT, USE (G-W) BINDER GROUP OF A75A CONNECTOR CABLE (630-TYPE SET) OR (S-W) BINDER GROUP OF A100D CONNECTOR CABLE (631-TYPE SET) FOR SPEAKERPHONE LEADS; FOR OTHER LOCATIONS, CONNECT TO CONTROL UNIT USING A25-TYPE CONNECTOR CABLE.
  2. ADD STRAP FOR STATION BUSY LAMP CONTROLLED BY SPEAKERPHONE.
  3. CONNECT SPI LEAD TO TERMINAL 30 (ON 55B) OR TERMINAL 24 (ON 55A) WHEN REDUCED LOUDSPEAKER VOLUME IS DESIRED.
  4. CONNECT (S-Y) (Y-S) TO BUZZER OR RINGER (IN PLACE OF EXISTING LEADS) TO PROVIDE AUTOMATIC CUTOFF OF COMMON AUDIBLE SIGNAL DURING SPEAKERPHONE OPERATION.
  5. D120C MTG CORD AND A75A CONN CABLE USED WITH 630-TYPE TELEPHONE SET AND D200F MTG CORD AND A100D CONN CABLE USED WITH 631-TYPE TELEPHONE SET.
  6. CONNECT LOCAL GROUND.
- \* INSULATED AND STORED

Fig. 3—630C, 630D, 631C, or 631D Telephone Set, Connections



NOTES:

1. WHEN CONTROL UNIT IS USED TO CUT OFF RINGER OR BUZZER IN SET, CONNECT THESE LEADS AS SHOWN. INSULATE AND STORE (S-Y) AND (Y-S) FROM (BL) BINDER.
2. INSULATE AND STORE (O-BK) AND (BK-O) TO (BR) PLUG.
3. STRAP 26 TO 29(55A) OR 21 TO 19(55B) WHEN BUSY LAMP IS CONTROLLED BY SPEAKERPHONE. USE DC LAMP OR BUSY LAMP CONTROL CIRCUIT PER SD-69403-01.
4. CONNECT SPI LEAD TO 24(55A) OR 30(55B) WHEN REDUCED LOUSPEAKER VOLUME IS DESIRED.
5. D120M OR D120K (MD) MTG CORD AND A75A CONN CABLE USED WITH 630DA/DAM TELEPHONE SET AND D200AA OR D200S (MD) MTG CORD AND A100D CONN CABLE USED WITH 631DA/DAM TELEPHONE SET.
6. CONNECT LOCAL GROUND.

Fig. 4—630DA/DAM or 631DA/DAM Telephone Set, Connections

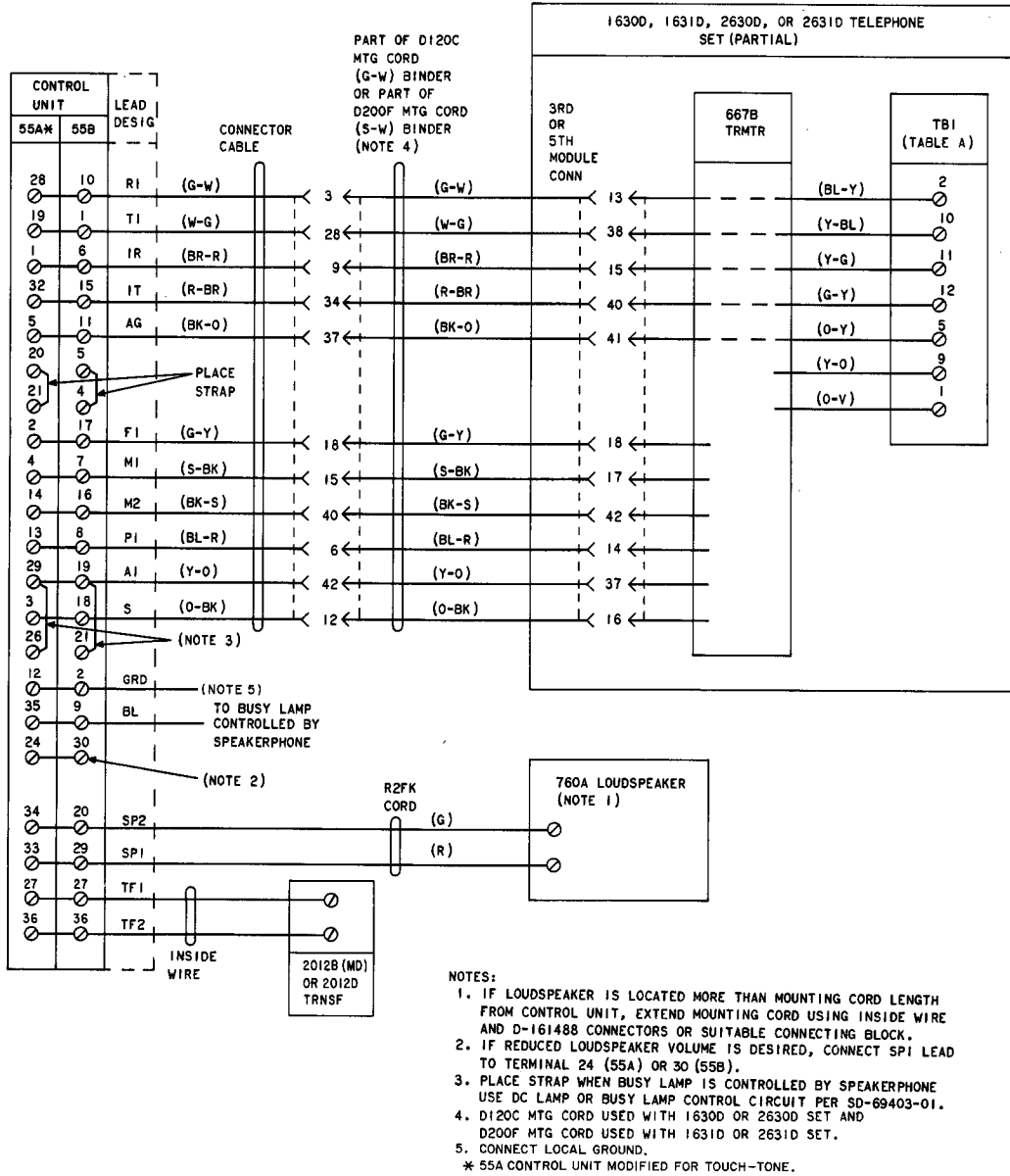


Fig. 5—1630D, 1631D, 2630D, or 2631D Telephone Set, Connections

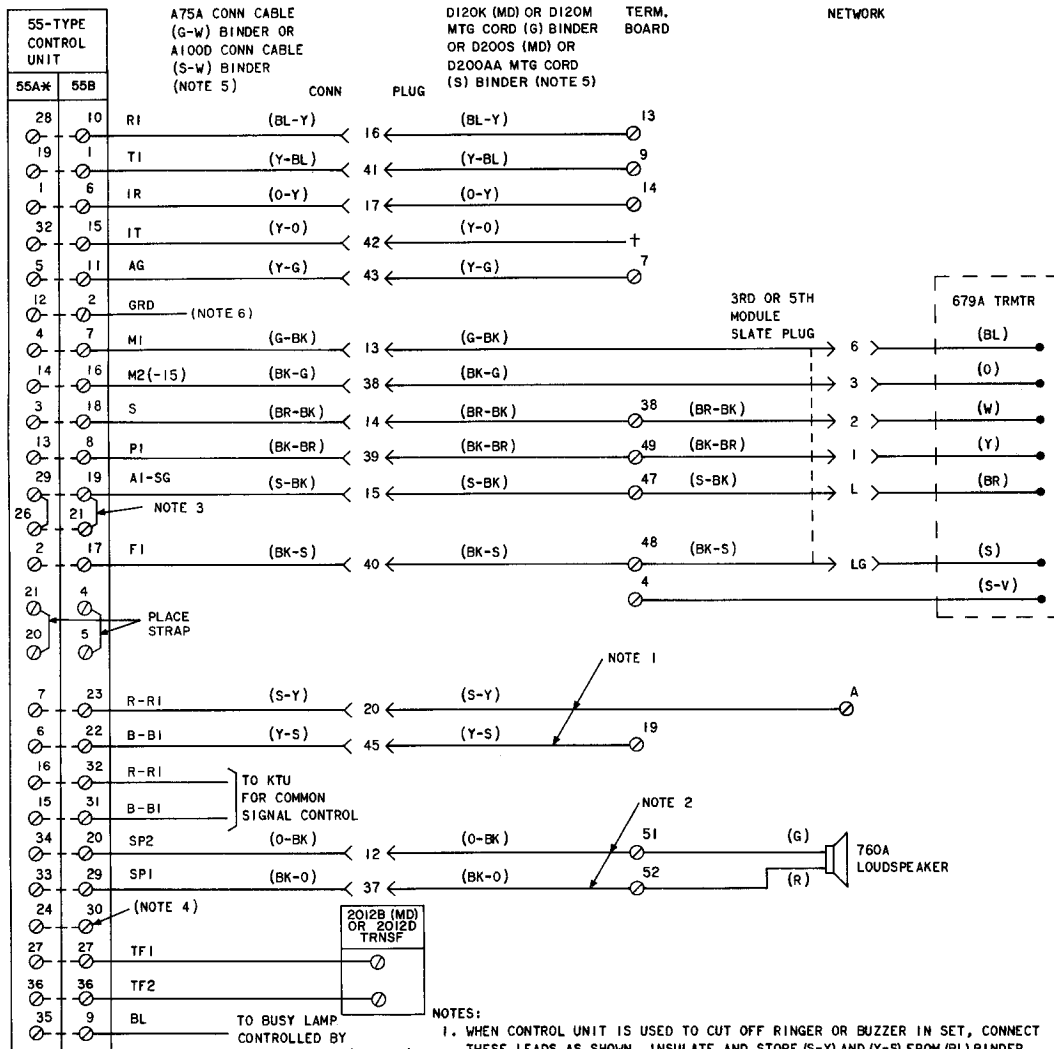


Fig. 6—2630DA/DAM or 2631DA/DAM Telephone Set, Connections



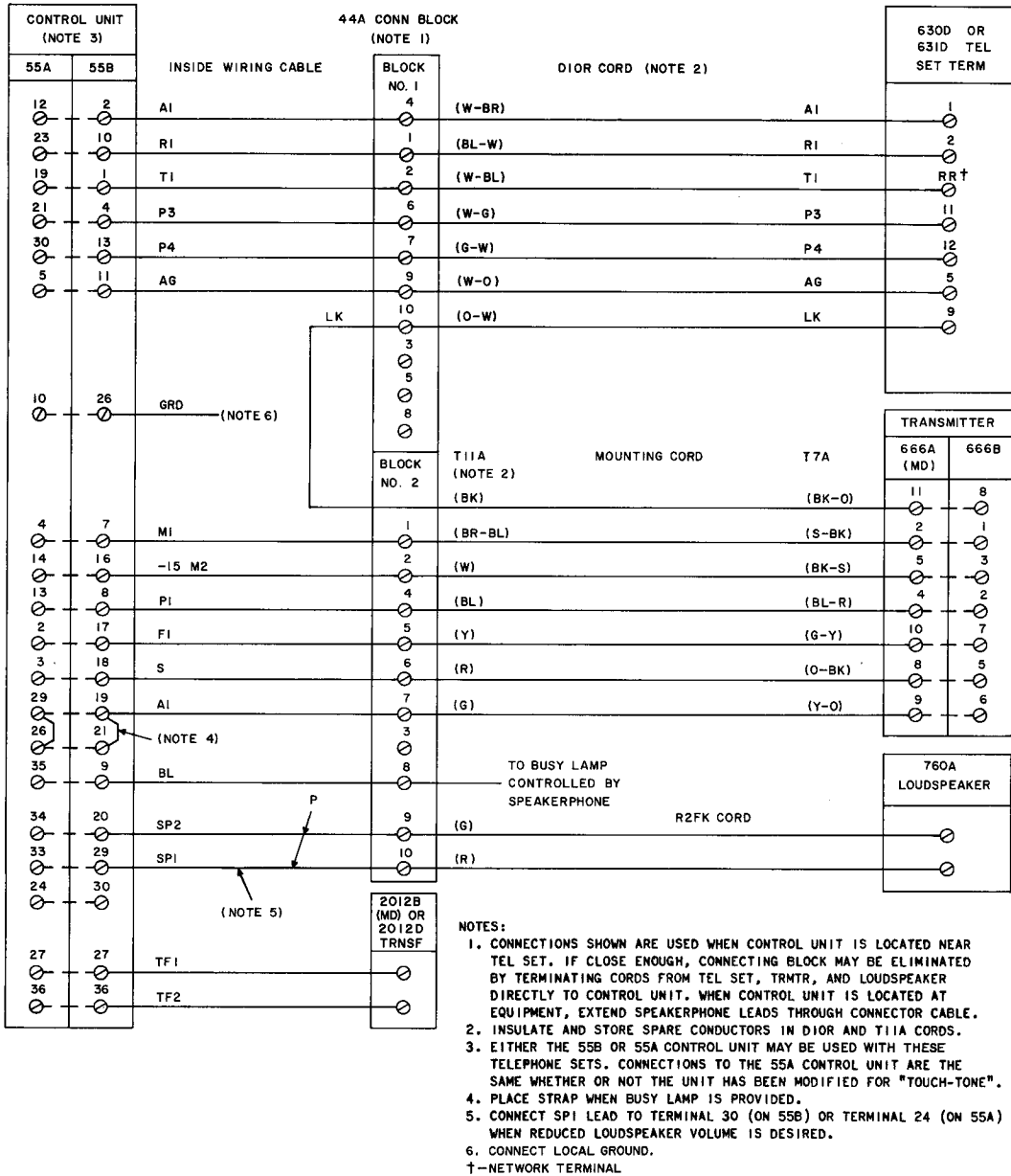


Fig. 7—630D or 631D Telephone Set Connections Using Auxiliary Cord and External Transmitter

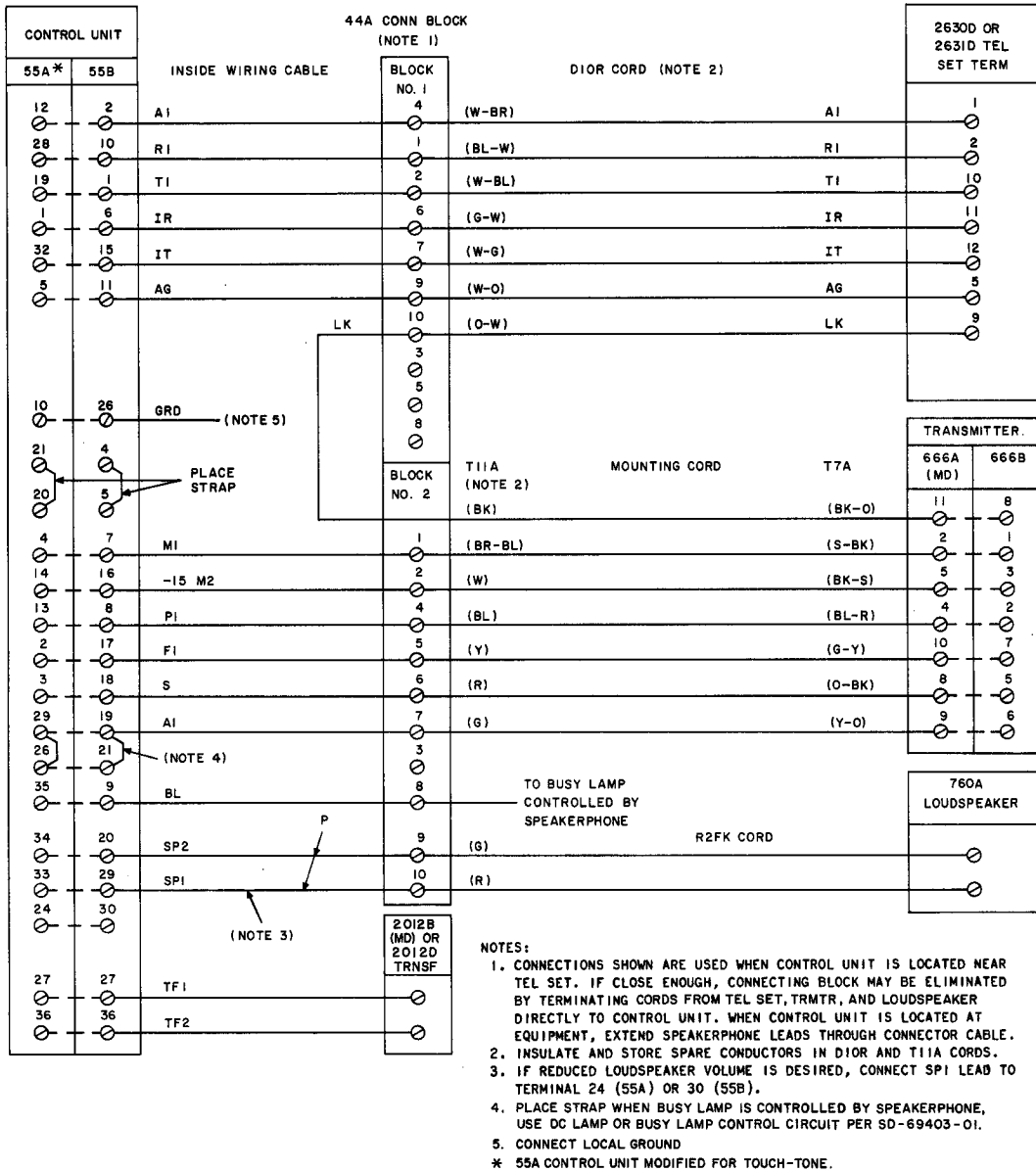


Fig. 8—2630D or 2631D Telephone Set Connections Using Auxiliary Cord and External Transmitter

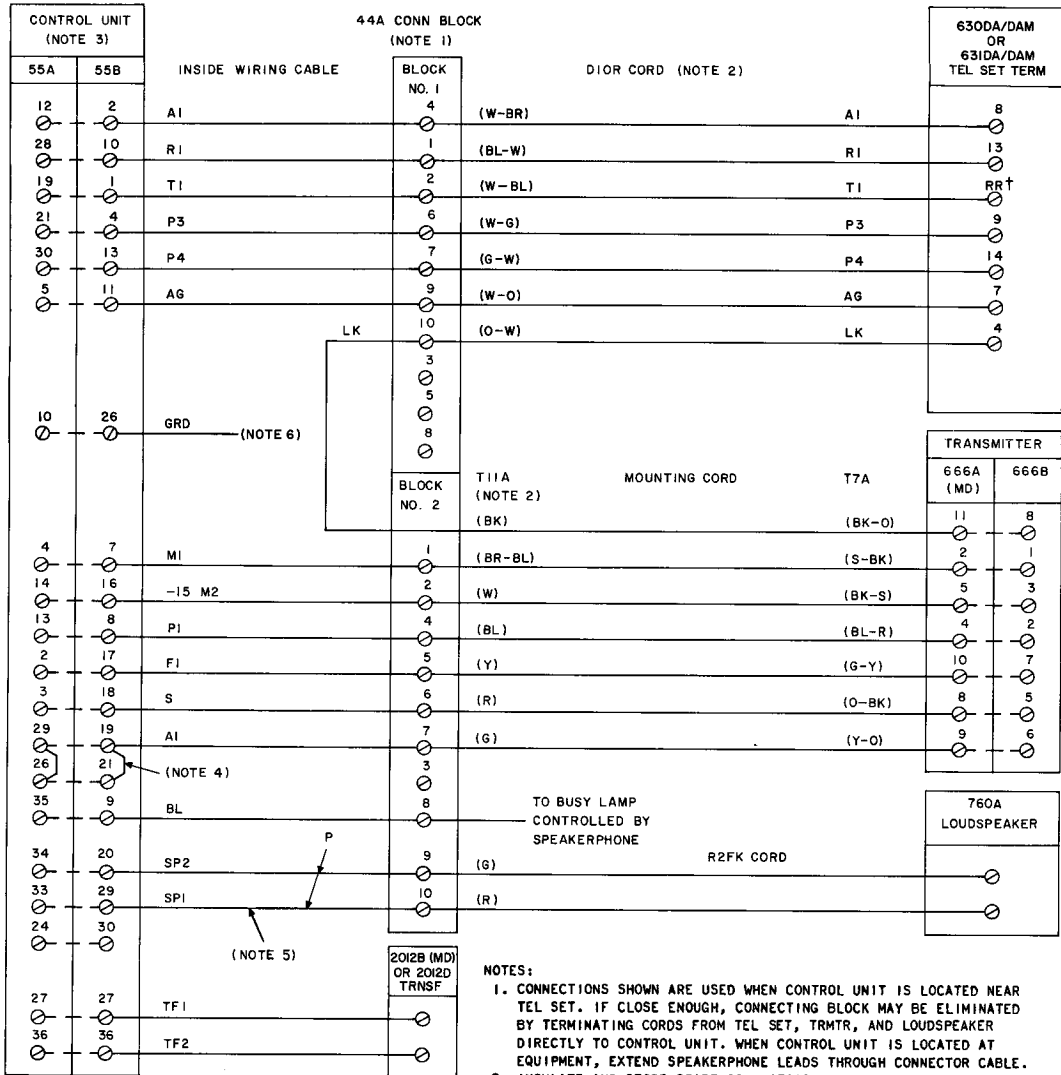


Fig. 9—630DA/DAM or 631DA/DAM Telephone Set Connections Using Auxiliary Cord and External Transmitter

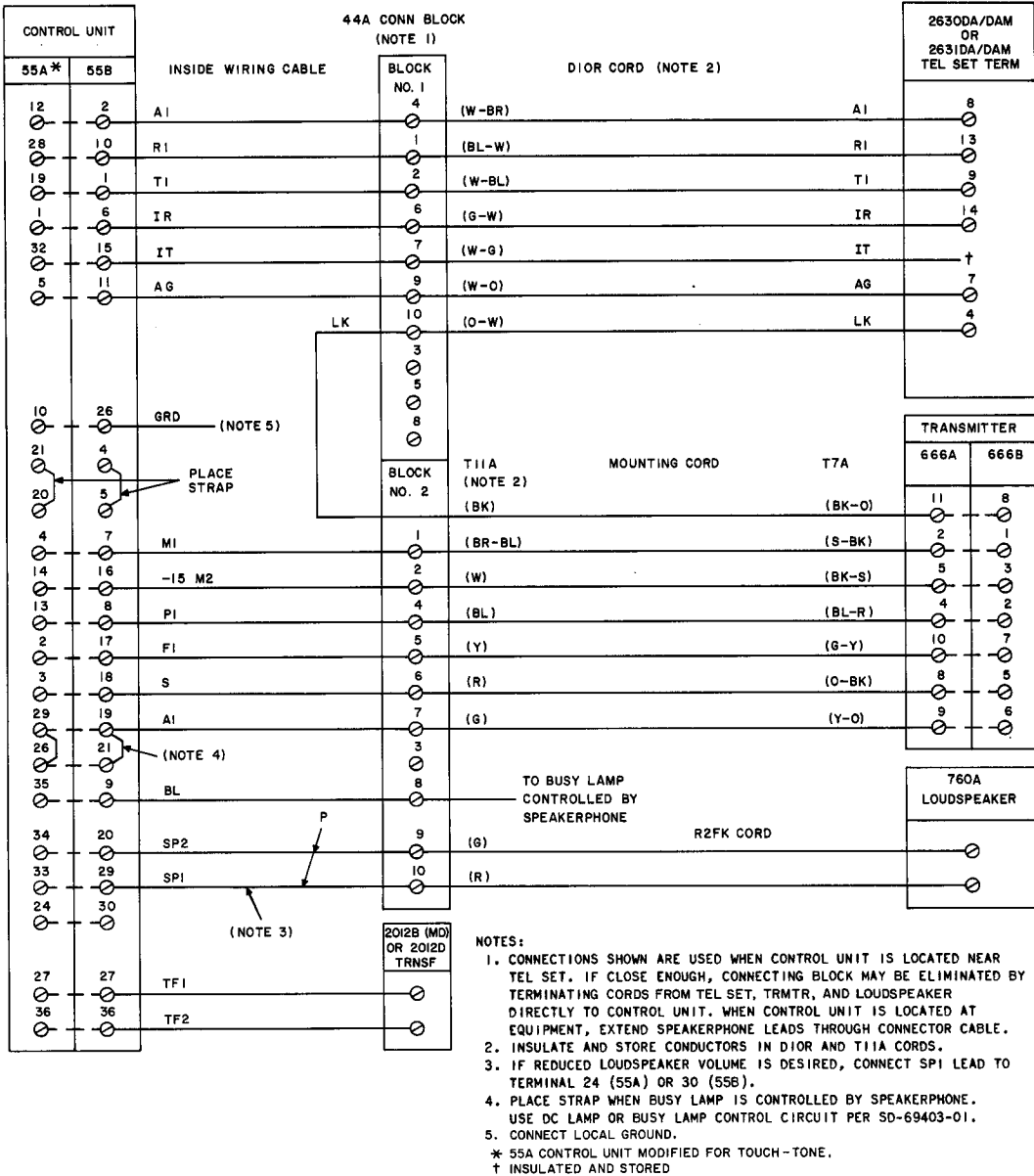


Fig. 10—2630DA/DAM or 2631DA/DAM Telephone Set Connections Using Auxiliary Cord and External Transmitter

TABLE B

CONNECTIONS FOR EXTERNAL SPEAKERPHONE  
630D OR 631D TELEPHONE SETS

WIRE OR LEAD	COLOR	LEAD DESIG.	REMOVE FROM	CONNECT TO
Mtg. Cord (BL-W Binder)	BL-Y	R1	*	2
	Y-BL	T1	*	RR†
	O-Y	AG	*	5
	Y-O	LK	G	9
	G-Y	P4	*	12
	Y-G	P3	*	11

\* Stored location.

† Network terminal.

TABLE C

CONNECTIONS FOR EXTERNAL SPEAKERPHONE  
2630D OR 2631D TELEPHONE SET

WIRE OR LEAD	COLOR	LEAD DESIG.	REMOVE FROM	CONNECT TO
Mtg. Cord (BL-W Binder)	BL-Y	R1	*	2
	Y-BL	T1	*	10
	O-Y	AG	*	5
	Y-O	LK	G	9
	Y-G	IR	*	11
	G-Y	IT	*	12

\* Stored location.

TABLE D

SPEAKERPHONE CONNECTIONS USING INTERNAL  
TRANSMITTER 630DA/DAM OR 631DA/DAM TELEPHONE  
SET

WIRE OR LEAD	COLOR	LEAD DESIG	FROM	TO
Mtg Cord (Note 3)	Y-BL	T1	46	RR†
	BL-Y	R1	44	13
	Y-O	P3	39	9
	O-Y	P4	*	14
	Y-G	AG	43	7 (Note 6)
	BR-BK	S	*	38
Slate Key Plug	BR-BK		30	
679A(MD) TRMTR	S-V	LK		4

\* Insulated and stored location.

† Terminal on network.

**Note 1:** Connections shown are used when transmitter is part of telephone set and speakerphone leads are connected through the mounting cord.

**Note 2:** When control unit is located near the telephone set an A25B connector cable may be plugged into the 3rd mounting cord plug (630DA/DAM) or 5th plug (631DA/DAM) and terminate on the control unit.

**Note 3:** Mounting cord conductors from (G) (630DA/DAM) or (S) (631DA/DAM) binder.

**Note 4:** Connect the slate plug from the 3rd or 5th module to the 679A transmitter. All other plugs in the module are insulated and stored.

**Note 5:** Set intended for speakerphone use must be equipped with an 8CA dial for the second set of off-normal contacts (P3 and P4 leads).

**Note 6:** Connect to L2† if busy lamp is also furnished.

TABLE E

EXTERNAL SPEAKERPHONE CONNECTIONS USING MOUNTING CORD LEADS (NOTE 1) 630DA/DAM OR 631DA/DAM TELEPHONE SET

COLOR	LEAD DESIG	FROM	TO
Y-BL	T1	2	RR†
BL-Y	R1	1	13
Y-O	P3	3	9
O-Y	P4	*	14
Y-G	AG	*	7 (Note 2)
G-Y	LK	*	4

\* Insulated and stored.

† Network terminal.

**Note 1:** Connections shown are used when control unit and apparatus unit are at same location. Leads are in (BL) binder.

**Note 2:** Connect to L2† if busy lamp is also furnished.

TABLE G

EXTERNAL SPEAKERPHONE CONNECTIONS USING MOUNTING CORD LEADS (NOTE 1) 2630DA/DAM OR 2631DA/DAM TELEPHONE SET

COLOR	LEAD DESIG	REMOVE FROM	CONNECT TO
Y-BL	T1	2	9
BL-Y	R1	1	13
Y-O	IT	3	*
O-Y	IR	†	14
Y-G	AG	*	7
G-Y	LK	*	4

\* Insulate and store.

† Stored location.

**Note 1:** Connections shown are used when control unit and apparatus unit are at same location. Leads are in (BL) binder.

**Note 2:** Lamp in hold position cannot be supplied due to lack of spare lead conductors.

TABLE F

SPEAKERPHONE CONNECTIONS USING INTERNAL TRANSMITTER 2630DA/DAM OR 2631DA/DAM TELEPHONE SET

WIRE OR LEAD	LEAD DESIG	REMOVE FROM	CONNECT TO	
Mtg Cord (Note 1)	Y-BL	T1	46	9
	BL-Y	R1	44	13
	Y-O	IT	39	*
	O-Y	IR	†	14
	Y-G	AG	43	7
	BR-BK	S	†	38
Plug Strap	BR-BK		30	
679A TRMTR	S-V	LK		4

\* Insulate and store.

† Stored location.

**Note 1:** Mounting cord conductors from G (2630DA/DAM) or S (2631DA/DAM) binder.

**Note 2:** Connect the slate plug from the 3rd or 5th module to the 679A transmitter. All other plugs in the module are insulated and stored.

## SPEAKERPHONE SYSTEM—3-TYPE

### 632-, 1632-, AND 2632-TYPE TELEPHONE SETS

### CONNECTIONS AND MAINTENANCE

#### 1. GENERAL

**1.01** This section contains the modification and connection information for the 632-, 1632-, and 2632-type telephone set when used with the 3-type speakerphone system. Maintenance of components installed in the set, as a result of the modification, is also covered.

**1.02** This section is reissued to include connection and maintenance information on 1632- and 2632-type telephone formerly found in Sections 512-621-432 and 512-622-432 which are hereby canceled.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

#### 2. MODIFICATION

**2.01** The 632A-11, -12, or -13, and 632C-11, -12, or -13; 1632C-11, -12, or -13; and 2632C-11, -12, or 13 telephone sets contain a 667B transmitter in the third module position and are wired for use with 3-type speakerphone. Other codes of 632-, 1632-, and 2632-type telephone sets may be converted for use with 3-type speakerphone by installing a 667B transmitter in the third module position.

**2.02** To install 667B transmitter:

- (1) Remove telephone set faceplate, mat, and housing. See Section 502-600-100 for procedures.
- (2) Remove key unit or apparatus blank in right-hand module position and plug in a 667B transmitter (ordered separately).
- (3) Connect transmitter spade-tipped leads as shown in Fig. 1 for 632-type, Fig. 2 for 1632-type, and Fig. 3 for 2632-type.

(4) If a 632-type set is equipped with 8R dial, replace with 8C dial (ordered separately).

(5) Install housing using reverse procedure.

(6) Install new faceplate and mat (ordered separately) in which transmitter cutouts are provided.

#### 3. CONNECTIONS



*For proper operation of the 3-type speakerphone system, ground must be present on the A1-lead. Connect ground to the appropriate telephone set terminal or at the 55-type control unit.*

**3.01** A 55B control unit or a 55A\* modified for TOUCH-TONE® service must be used with the 1632- and 2632-type telephone sets. The modified 55A\* control unit may also be used with the 632-type telephone set. Modified 55A\* control units are indicated by an asterisk following the code stenciled on the unit.

**3.02** Upon customer's request, services such as interrupted buzzer or ringer and station busy lamp control can be connected through relay contacts of the 55-type control unit.

**3.03** Connection is also shown for station busy lamp controlled by speakerphone. Where it is desired to have the busy lamp controlled by both speakerphone and line switch, refer to the Service section for the set involved.

#### 4. MAINTENANCE

**4.01** Maintenance of these telephone sets is found in Section 502-600-100. Maintenance for speakerphone components is provided in Section 512-620-100.

4.02 The 667B transmitter is subject to pickup and amplification of mechanical spring vibrations when used in some CALL DIRECTOR® telephone sets. This complaint can be eliminated by the installation of a factory modified transmitter, ordered as follows: "Transmitter, 667B, Modified per D-180196."

4.03 Packed with the modified 667B transmitter is a piece of split vinyl tubing which shall be assembled to the key pivot bar of the telephone set when installing the transmitter.

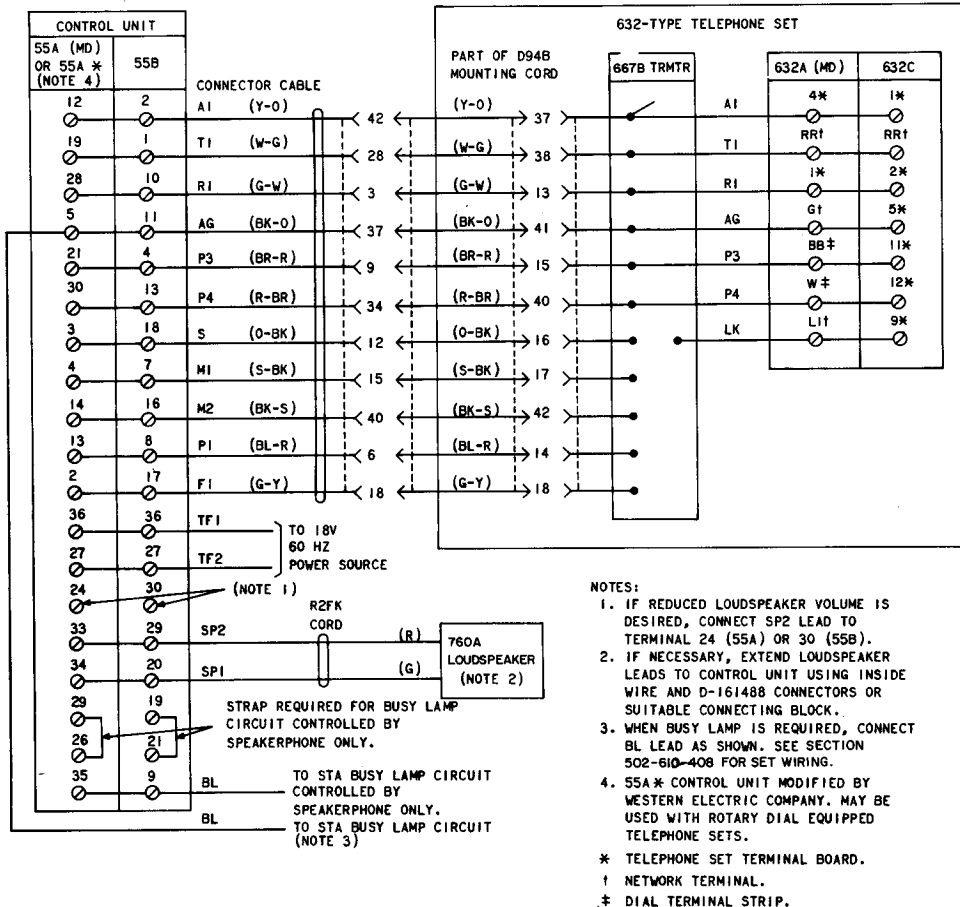


Fig. 1—632-Type Telephone Set, Connections To 3-Type Speakerphone System



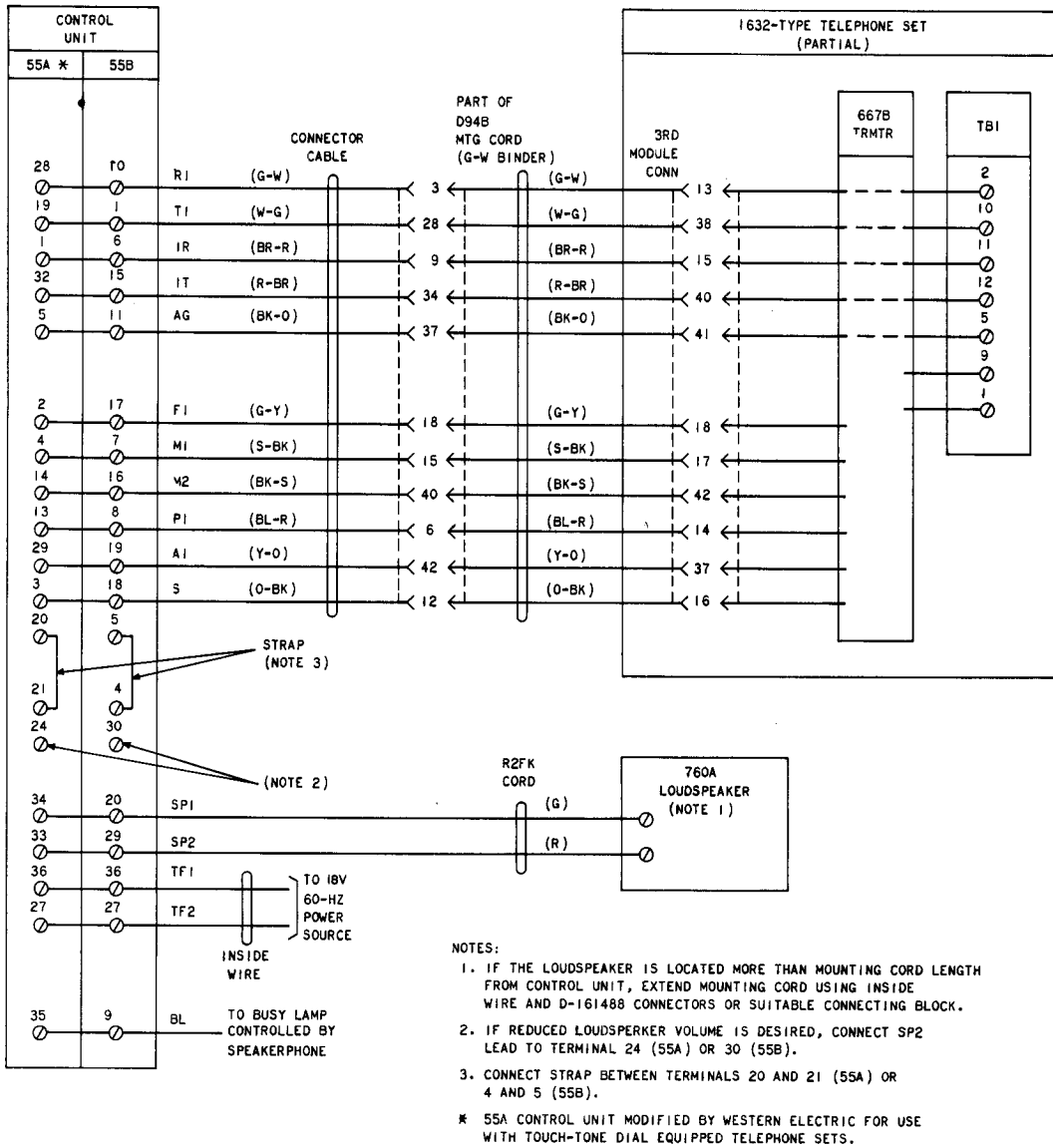


Fig. 2—1632-Type Telephone Set, Connections to 3-Type Speakerphone System

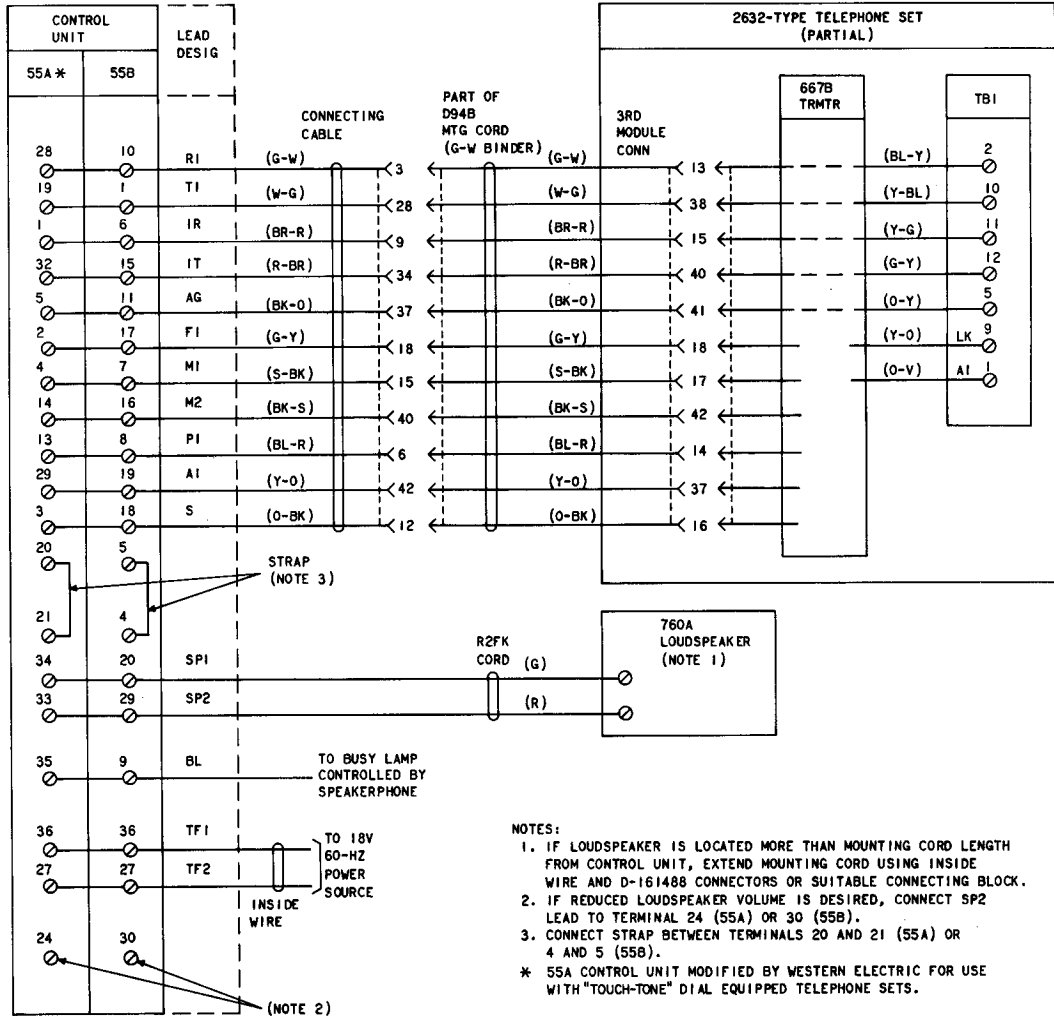


Fig. 3—2632-Type Telephone Set, Connections to 3-Type Speakerphone System

**SPEAKERPHONE SYSTEM—3-TYPE**  
**660A1 TELEPHONE SET**  
**CONNECTIONS AND MAINTENANCE**

**1. GENERAL**

- 1.01** This section is reissued to change section reference in 3.01.
- 1.02** Telephone sets equipped with an 8R dial must be equipped with an 8C dial when connected for use with 3-type speakerphone in addition to other modifications, see Table A.

Fig. 1—660A1 Telephone Set, Connections To 3-Type Speakerphone

Fig. 2—660A1 Telephone Set Wired For Speakerphone

**2. CONNECTION INDEX**

Table A—660A1 Telephone Set—Modification for Speakerphone

**3. MAINTENANCE**

- 3.01** Refer to Division 502 for maintenance information for the 660A1 telephone set and to Division 512 for maintenance of 3-type speakerphone components. ♦

**TABLE A**  
**660A1 TELEPHONE SET — MODIFICATION FOR SPEAKERPHONE**

WIRE OR LEAD		1A1 OR 1A2 KEY TEL SYS	INDIVIDUAL OR BRIDGED	RING PARTY	TIP PARTY							
Line Switch	(BR) [S-G] (Y) [S-W] (W) [S-BR]	TB1-1 TB1-P2 C of net	* TB1-P2 C of net	* TB1-P2 C of net	* TB1-P2 C of net							
Ringer Straps	(R) (BK)	L1 of net F of net	L1 of net F of net	L1 of net TB1-P2	F of net TB1-P2							
8C Dial (Note 1)	(Y) (Y) (W) (W) (BL) (G) or (BL)	TB2	<table border="0"> <tr><td rowspan="6" style="font-size: 3em; vertical-align: middle;">{</td><td>1</td></tr> <tr><td>2</td></tr> <tr><td>3</td></tr> <tr><td>4</td></tr> <tr><td>5</td></tr> <tr><td>6</td></tr> </table>			{	1	2	3	4	5	6
{	1											
	2											
	3											
	4											
	5											
	6											
Add Straps	M1W cord or equivalent	TB2-1 to 41-type dial, terminal 1 TB2-2 to 41-type dial, terminal 2										
D10R Mounting Cord (Note 2)	R (BL-W) T (W-BL) A1 (O-W)	TB1-L1 F of net. TB1-P2										
	T1 (W-O) P4 (G-W) P3 (W-G)	41-type dial, terminal 6 41-type dial, terminal 1 41-type dial, terminal 2										
	A (BR-W)	TB1-1	*	*	*							
	LK (W-BR) P1 (S-W) P2 (W-S)	TB1-L2 41-type dial, terminal P1 41-type dial, terminal P2										

Notes: 1. Replace 8R dial with 8C dial (order separately) \* Insulate and store.  
2. Replace D6AF cord with D10R (order separately) ( ) Current color code.  
[ ] MD color code.

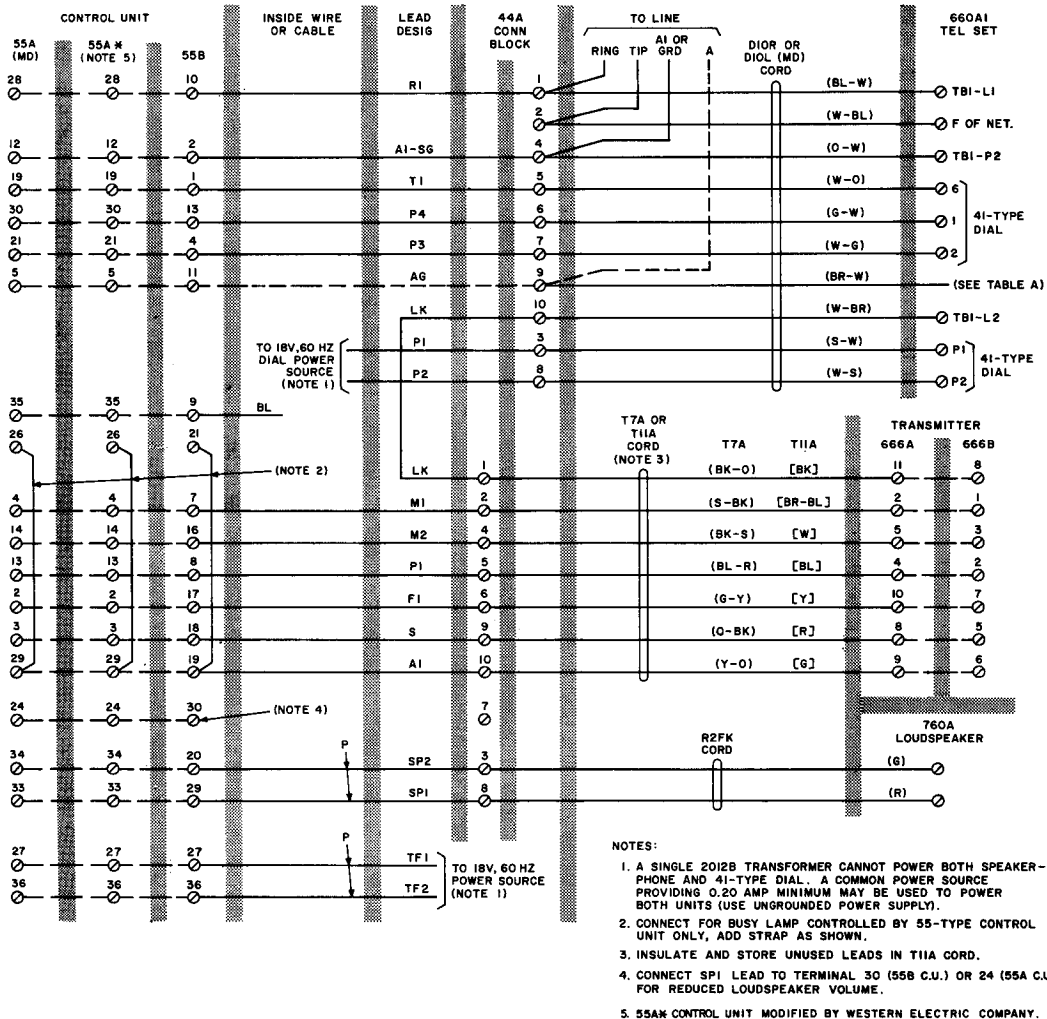


Fig. 1—660A1 Telephone Set, Connections to 3-Type Speakerphone

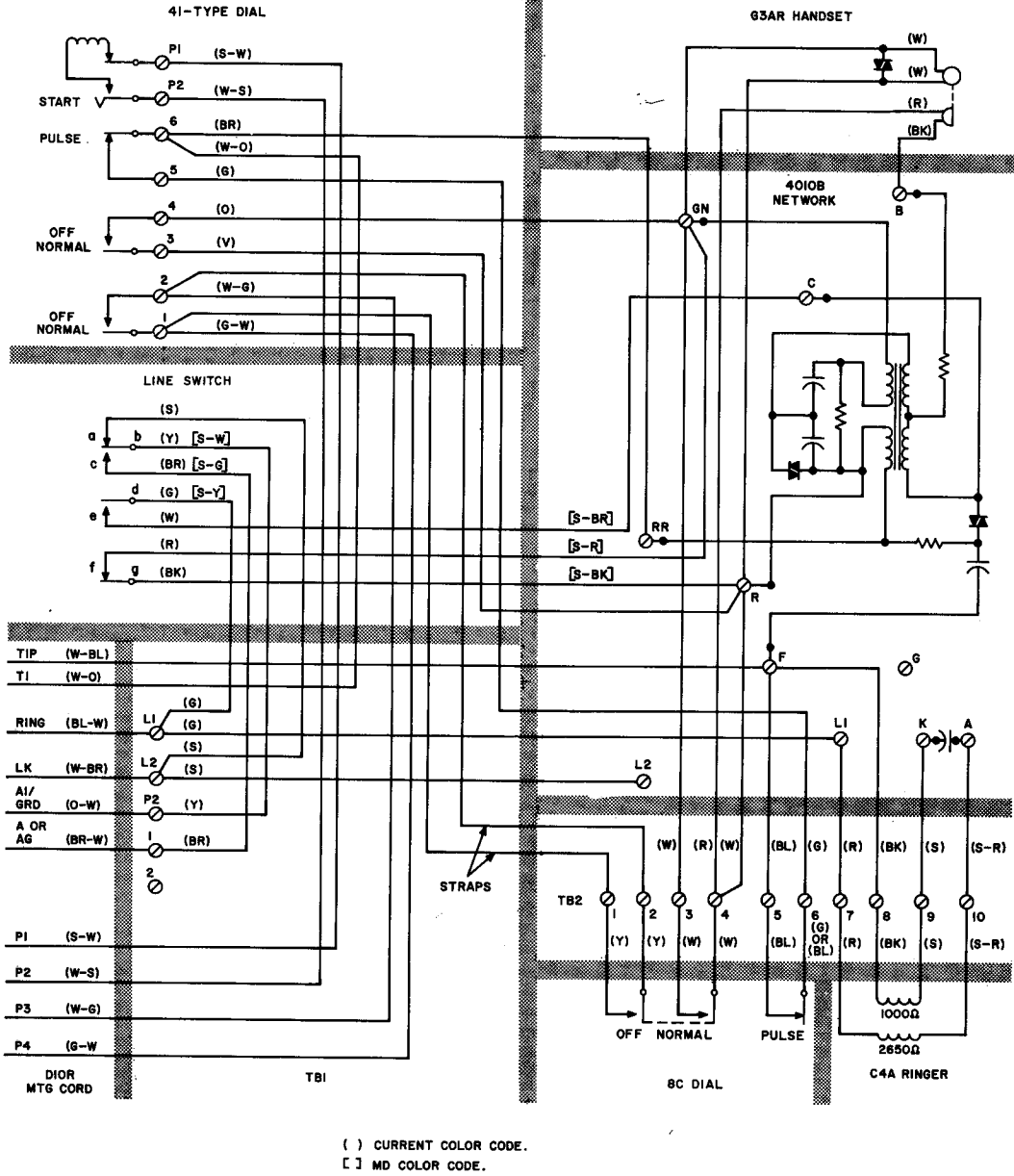


Fig. 2—660A1 Telephone Set Wired for Speakerphone

## SPEAKERPHONE SYSTEM—3-TYPE

### 662-TYPE TELEPHONE SET

### CONNECTIONS AND MAINTENANCE

#### 1. GENERAL

**1.01** This section covers connection of the 662-type telephone set when used with the 3-type speakerphone system.

**1.02** This section is reissued to:

- Remove information from Fig. 1 permitting maximum separation of 500 feet between control unit and transmitter and loudspeaker
- Add 2.03

#### 2. CONNECTIONS



*For proper operation of the 3-type speakerphone system, ground must be present on the A1-lead. Connect A1 ground to the appropriate terminal on the telephone set or at the 55-type control unit for 1A1 and 1A2 KTS. Connect SG ground for 1A KTS.*

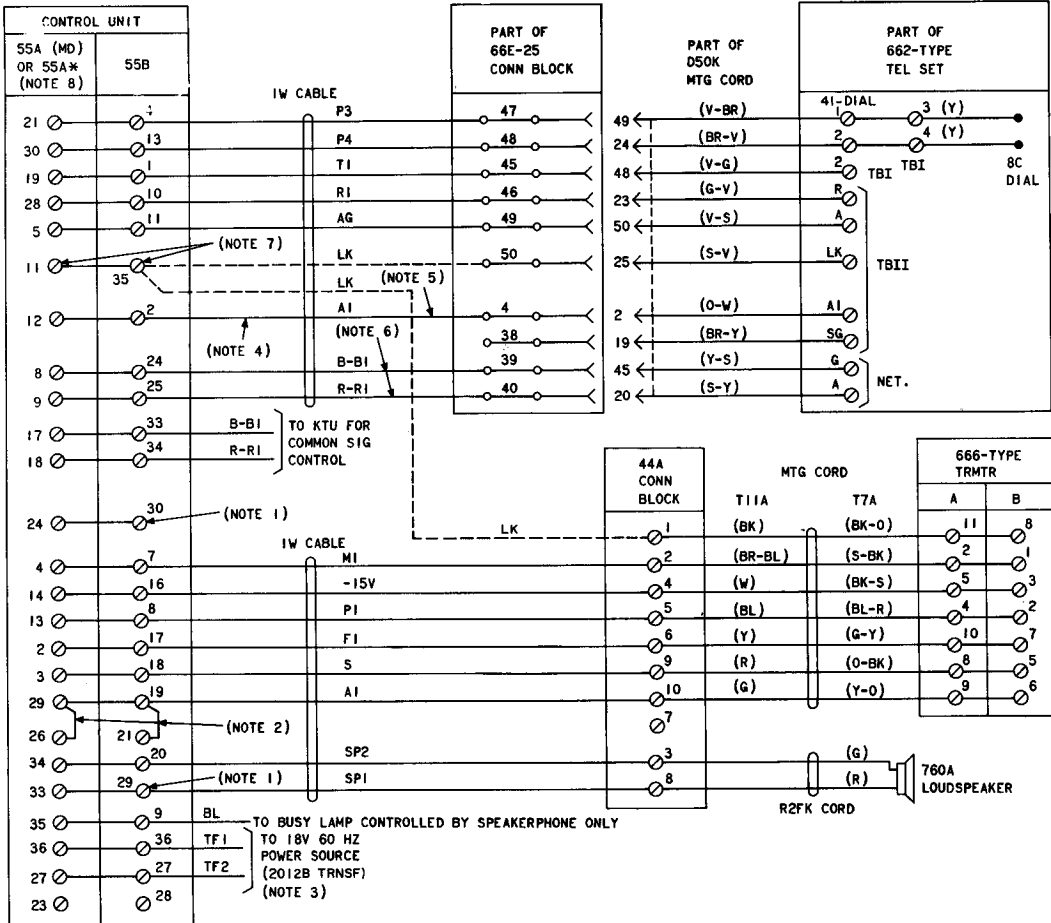
**2.01** Where required, ringer and buzzer operation can be interrupted through break contacts of the 55-type control unit to prevent pickup during use of speakerphone.

**2.02** Connections are also shown for busy lamp controlled by speakerphone. Where it is desired to have busy lamp controlled by speakerphone and line switch, refer to Service section for the 662-type telephone set.

**2.03** Sets are presently being manufactured with an 8R dial which must be replaced with an 8C dial when speakerphone is supplied. In addition straps must be added from 1 and 2 of the 41-type dial terminal board to 3 and 4, respectively, of TB1 to parallel the P3 and P4 leads with the off-normal contacts of the 8C and 41-type dials (Fig. 1).

#### 3. MAINTENANCE

**3.01** Maintenance of the 662-type telephone set is covered in Division 502. Maintenance of speakerphone components is covered in Division 512.



- NOTES:
- IF REDUCED LOUDSPEAKER VOLUME IS DESIRED, CONNECT SPI LEAD TO TERMINAL 30 (55B) OR 24 (55A).
  - STRAP TERMINALS 19 TO 21 (55B) OR 26 TO 29 (55A) WHEN STATION BUSY LAMP CONTROLLED BY SPEAKERPHONE IS PROVIDED.
  - DO NOT USE A GROUNDED 18V AC POWER SUPPLY.
  - LOCAL OR KTS GROUND MUST BE PRESENT ON A1 LEAD.
  - CONNECT TO 38 OF 66E-25 CONNECTING BLOCKS FOR 1A KTS.
  - WIRE RINGER CIRCUIT AS SHOWN WHEN INTERRUPTED RINGER IS DESIRED. BUZZER MAY BE WIRED IN SIMILAR MANNER.
  - TIE POINT FOR LK LEADS BETWEEN TELEPHONE SET AND TRANSMITTER IF CONTROL UNIT IS NEAR TELEPHONE SET. LK LEAD SHOULD BE WIRED DIRECT BETWEEN TELEPHONE SET AND TRANSMITTER WHEN CONTROL UNIT IS NOT NEAR TELEPHONE SET.
  - 55A\* CONTROL UNIT MODIFIED BY WESTERN ELECTRIC MAY BE USED FOR ROTARY DIAL EQUIPPED TELEPHONE SETS.

Fig. 1—662-Type Telephone Set, Connections

## SPEAKERPHONE SYSTEM—3-TYPE 752-, 1752-, AND 2752-TYPE TELEPHONE SETS CONNECTIONS AND MAINTENANCE

### 1. GENERAL

**1.01** This section contains connection information for 752-, 1752-, and 2752-type telephone sets when used with a 3-type speakerphone system.



*If 3-type speakerphone is to be provided in conjunction with 1A home interphone, refer to Sections 512-510-410, 512-510-430 or 512-510-450 for connections of the 752-, 1752-, or 2752-type telephone sets.*

**1.02** This section is reissued to include connection information for the 1752- and 2752-type telephone sets, formerly found in Sections 512-621-480 and 512-622-480, which are hereby canceled.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

**1.03** These sets are equipped with loudspeaker, transmitter, and speakerphone ON-OFF and volume controls. No conversion or wiring changes

are necessary for speakerphone operation. Refer to Sections 502-736-401, 502-737-401, or 502-738-401 for telephone set internal connections.

### 2. CONNECTION INDEX

Fig. 2—752-Type Telephone Set, Connections to 3-Type Speakerphone System

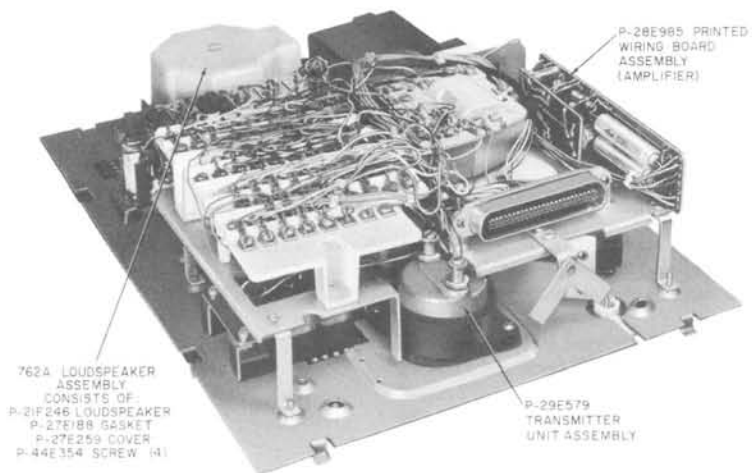
Fig. 3—1752- or 2752-Type Telephone Set, Connections to 3-Type Speakerphone System

### 3. MAINTENANCE

**3.01** Maintenance of the speakerphone components of these sets (Fig. 1) is limited to checking for loose or broken connections and replacement of defective units.

**3.02** Refer to Section 512-620-100 for additional information on 3-type speakerphone system requirements and maintenance.





**Fig. 1—Speakerphone Components**

NOTES:

1. CONNECT FOR BUSY LAMP CONTROLLED BY SPEAKERPHONE CONTROL UNIT ONLY; ADD STRAP TERMINAL 19 TO 21(55B) OR 26 TO 29(55A\*).
2. CONNECT SP2 LEAD TO TERMINAL 30(55B) OR 24(55A) CONTROL UNIT IF REDUCED LOUDSPEAKER VOLUME IS DESIRED.
3. MODIFIED UNITS ARE IDENTIFIED BY AN ASTERISK FOLLOWING THE CODE.
4. INTERCONNECTIONS MAY BE MADE USING AN A25B CONNECTOR CABLE WHEN THE 55-TYPE CONTROL UNIT IS LOCATED AT THE KEY EQUIPMENT.

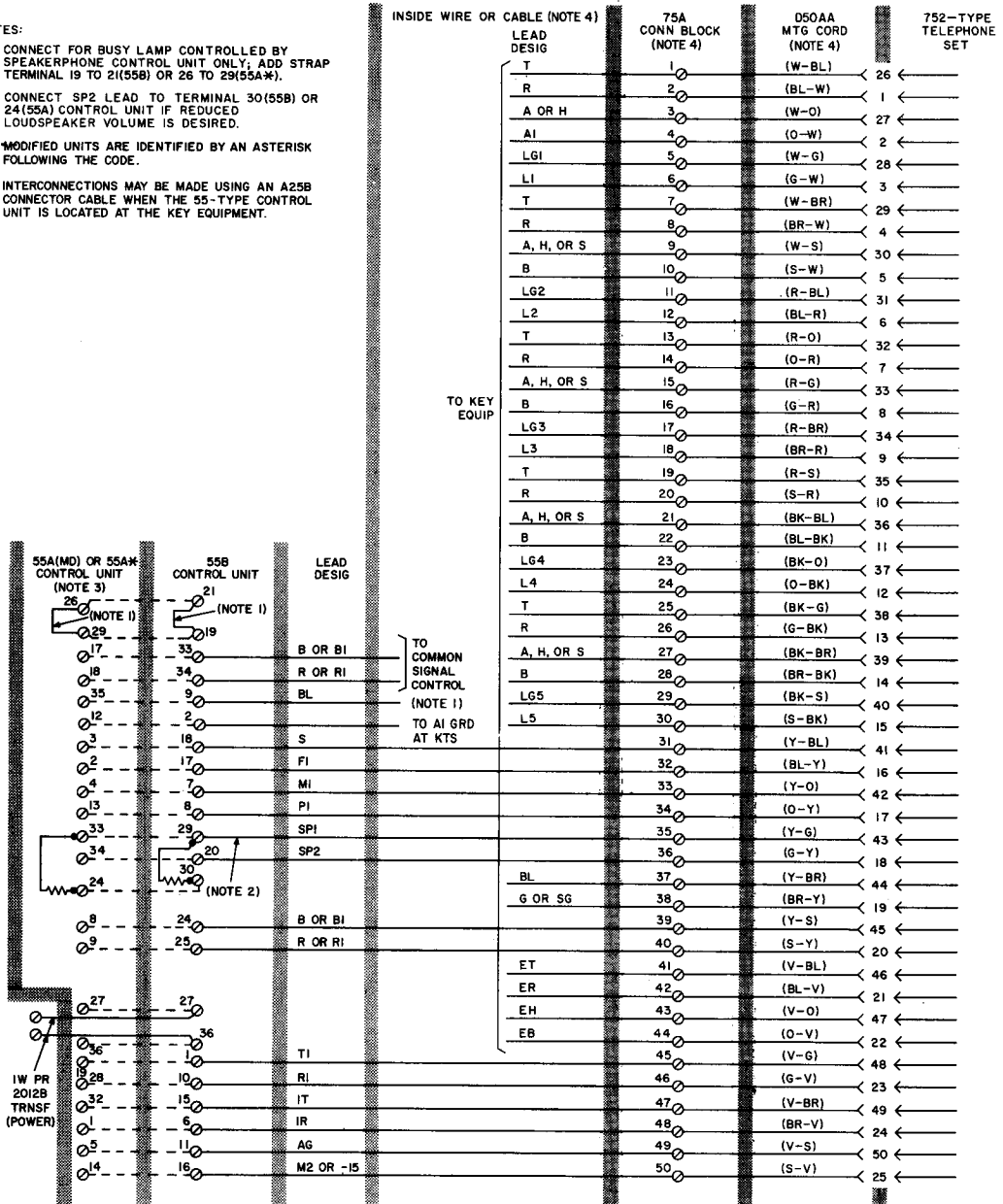


Fig. 2—752-Type Telephone Set, Connections to 3-Type Speakerphone

NOTES:

1. CONNECT FOR BUSY LAMP CONTROLLED BY SPEAKERPHONE CONTROL UNIT ONLY; ADD STRAP TERMINAL 19 TO 21(55B) OR 26 TO 29(55A\*).
2. CONNECT SP2 LEAD TO TERMINAL 30 (55B) OR 24(55A) CONTROL UNIT IF REDUCED LOUDSPEAKER VOLUME IS DESIRED.
3. THE 55A CONTROL UNIT MUST BE MODIFIED FOR USE WITH THE TOUCH-TONE® DIAL EQUIPPED SETS. MODIFIED UNITS ARE IDENTIFIED BY AN ASTERISK FOLLOWING THE CODE.
4. INTERCONNECTIONS MAY BE MADE USING AN A25B CONNECTOR CABLE WHEN THE 55-TYPE CONTROL UNIT IS LOCATED AT THE KEY EQUIPMENT.

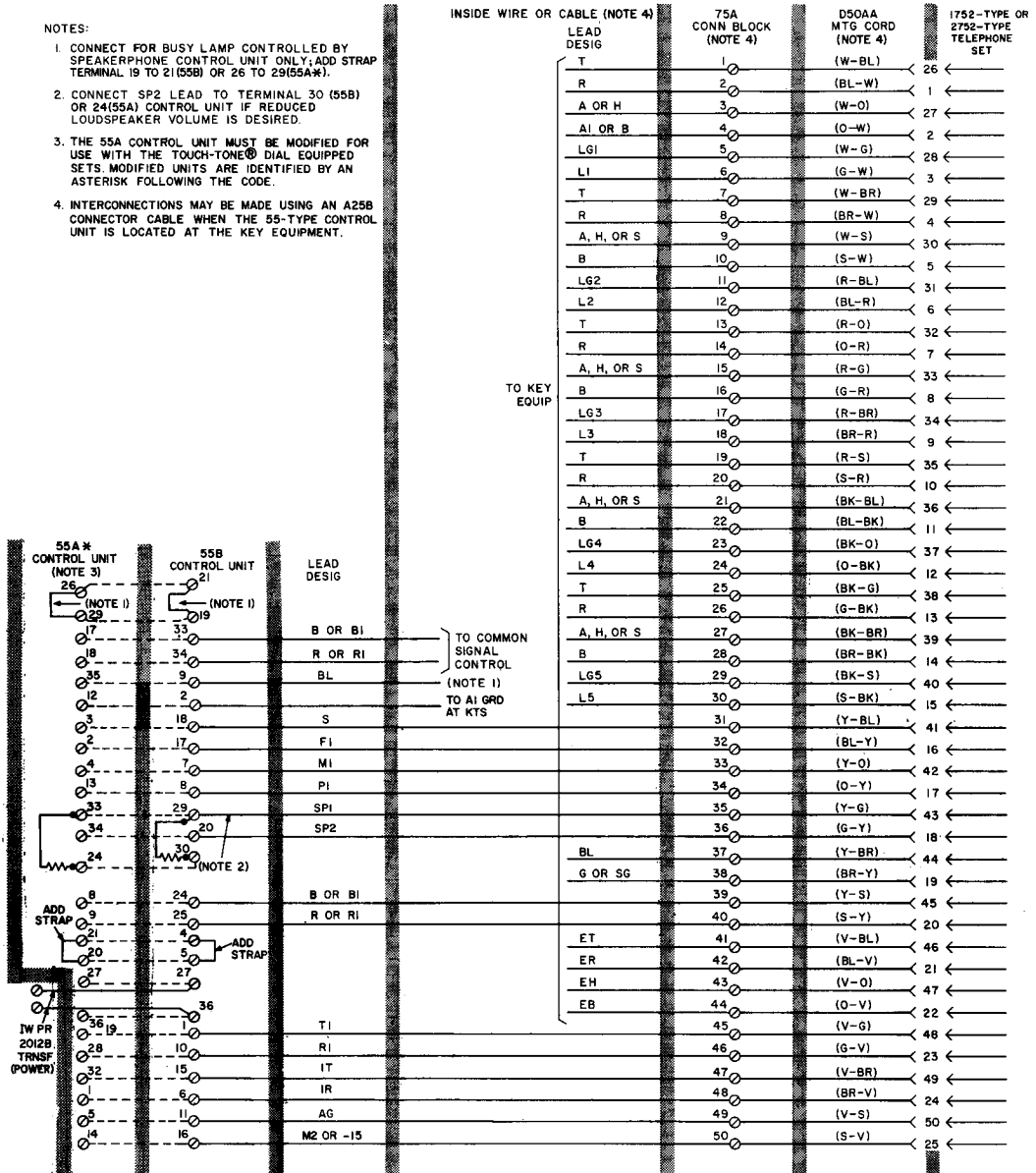


Fig. 3—1752- or 2752-Type Telephone Set, Connections to 3-Type Speakerphone

**SPEAKERPHONE SYSTEMS—3-TYPE**  
**832-, 2832-, 833-, AND 2833-TYPE TELEPHONE SETS**  
**CONNECTIONS**

**1. GENERAL**

**1.01** This section shows connections between components of the 3-type speakerphone system and the 832-, 833-, 2832-, and 2833-type telephone sets.

**1.02** This section is reissued to:

- Show wiring changes which must be made when using speakerphone with BM and CM coded modular telephone sets.
- Revise Table A and Fig. 1 and 2.

**1.03** The 832- and 2832-type telephone sets are special 10-, 11-, and 13-button set initially designed to work with the 7A Communication System.

**1.04** The 833- and 2833-type telephone sets are special 20-button sets initially designed to work with the 14A Communication System.

**2. CONNECTIONS**

**2.01** Due to lack of available conductors in the mounting cords, the 55B control unit must be installed at the same location as the telephone set. The speakerphone leads are connected to the telephone set using a D10R auxiliary cord (Fig. 1, 2, and Table A).

**2.02** Refer to Section 512-620-100 for maintenance and ordering information of speakerphone components used with these sets.

**2.03** In order to reduce the tone or voice level on incoming calls while using speakerphone, a wiring change must be made to amplifier. The change uses the (O-W) and (W-O) conductors in the D10R cord and is shown in Table A.

**NOTICE**

Not for use or disclosure outside the  
Bell System except under written agreement

**TABLE A**  
**3B SPEAKERPHONE CONNECTIONS (USING AUXILIARY MOUNTING CORD)**

CONNECT LEADS FROM				LEAD DESIG	CORD COLORS			CONNECT LEADS TO 55B CONTROL UNIT TERM. ‡
TEL SET TERM. ¶¶	TRMTR TERM.	SPEAKER TERM.	TRNSF TERM.		D1OR	T7A	R2FK	
24				P4*	W-S			13
				IR†				6
30				P3*	S-W			4
				IT†				15
25†				T1	W-BL			1
RR§*								
6				R1	BL-W			10
29				LK	W-BR			35
8				AG	BR-W			11
10				A1	W-G			2
19¶					O-W			32
**					W-O			23
	8			LK		BK-O		35
	7			F1		G-Y		17
	5			S		O-BK		18
	6			A1		Y-O		19
	3			M2		BK-S		16
	2			P1		BL-R		8
	1			M1		S-BK		7
		††		SP2			G	20
		††		SP1			R	29§§
			‡‡	TF1				27
			‡‡	TF2				36

\* For rotary dial tel set.

† For TOUCH-TONE tel set.

‡ Strap terminals 4 and 5 on control unit when used with TOUCH-TONE tel sets.

§ Located on network.

¶ Also remove W-S lead from telephone set amplifier terminal 1 and connect it to terminal 19.  
 (If telephone set is equipped with D50AL-87 cord, use D-161488 connector instead of terminal 19.)

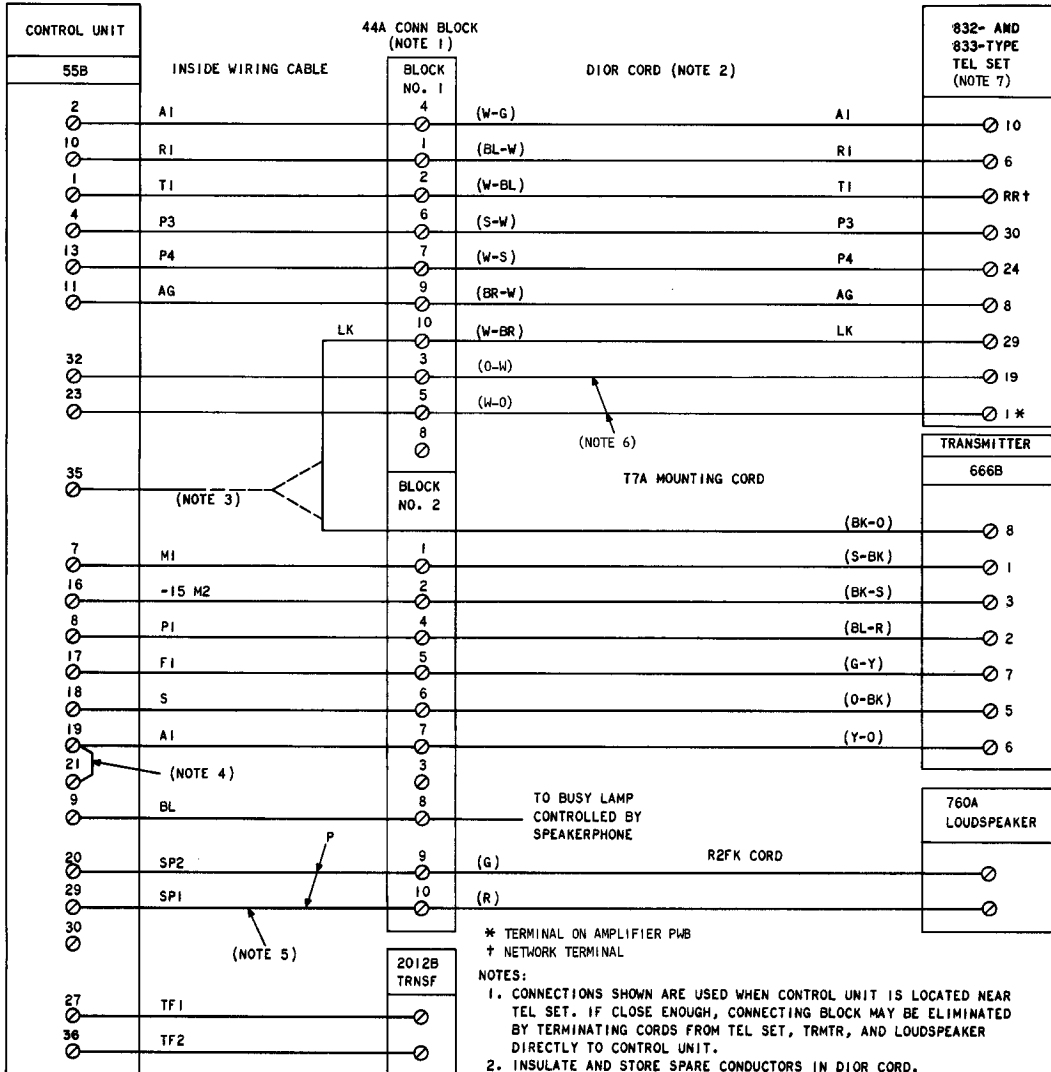
\*\* Connect W-O lead to terminal 1 on tel set amplifier.

†† Speaker terminals are not designated.

‡‡ Use inside wire.

§§ Connect lead to terminal 30 if a reduction in volume is desired.

¶¶ If modular set with new line switch is used, remove (o) lead from terminal 27 and connect to terminal 22.



6. REMOVE (W-S) LEAD FROM TERMINAL 1 OF AMPLIFIER PWB AND CONNECT WITH (O-W) LEAD OF DIOR CORD TO TERMINAL 19 OF TELEPHONE SET.
7. IF MODULAR SET WITH NEW LINE SWITCH IS USED, REMOVE (O) LEAD FROM TERMINAL 27 AND CONNECT TO TERMINAL 22.

Fig. 1—832- and 833-Type Telephone Sets—3-Type Speakerphone Connections

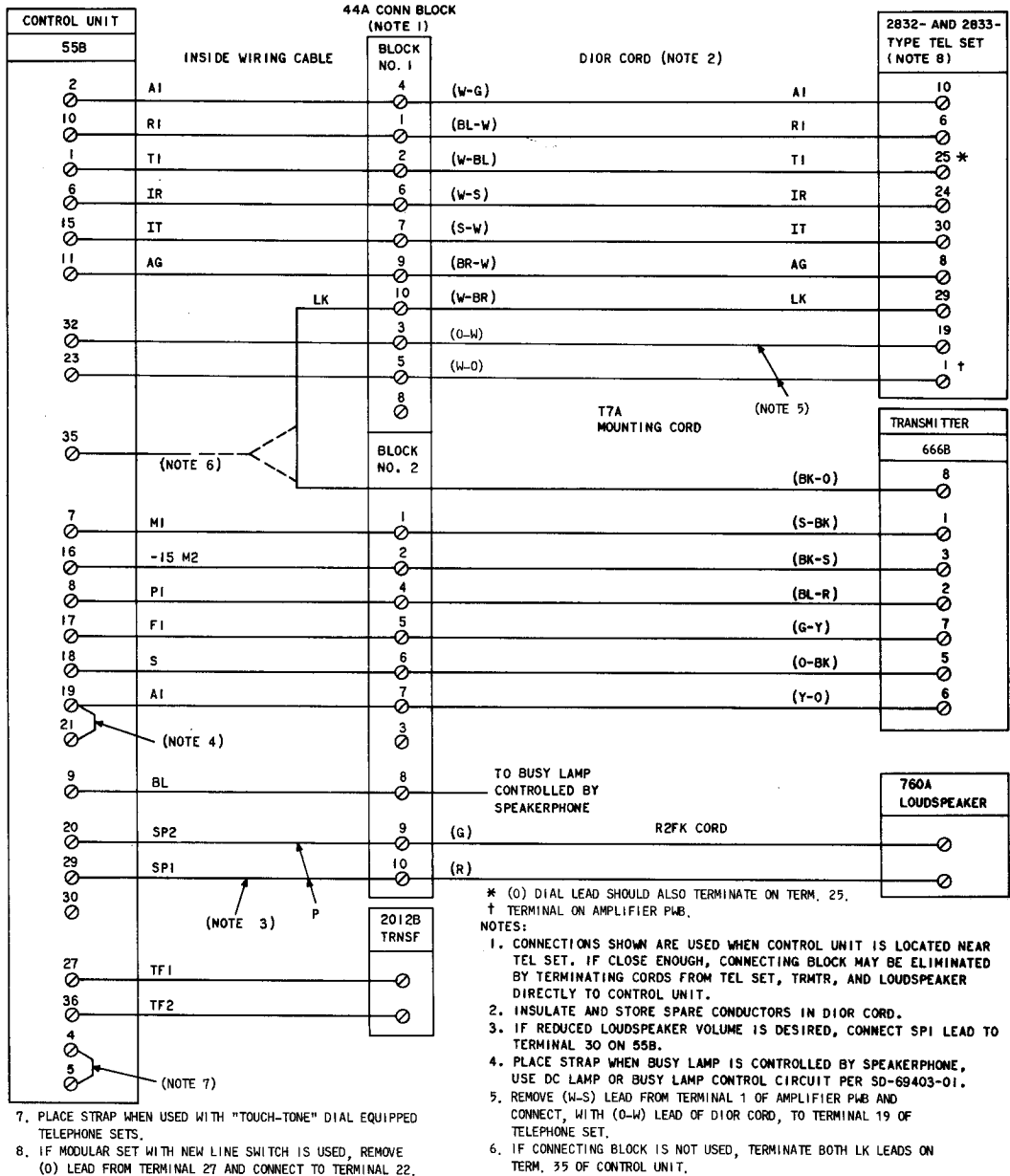


Fig. 2—2832- and 2833-Type Telephone Sets—3-Type Speakerphone Connections

## SPEAKERPHONE SYSTEM—3-TYPE

### 851- AND 2851-TYPE TELEPHONE SETS

### CONNECTION AND MAINTENANCE

#### 1. GENERAL

**1.01** These sets are supplied factory-wired for use with 3-type speakerphone except that any 851-type telephone set that is equipped with an 8R dial, the dial must be replaced with an 8C dial to provide a second set of off-normal contacts (P3 and P4 leads). Refer to Section 503-601-101 for set wiring and ringer connections.

**1.02** This section is reissued to include connection information for the 2851-type telephone sets formerly found in Section 512-622-495, which is hereby canceled.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

#### 2. CONNECTION INDEX

Fig. 1—851-Type Telephone Set, Connections to 3-Type Speakerphone System

Fig. 2—2851-Type Telephone Set, Connections to 3-Type Speakerphone System

Fig. 3—2851-Type Telephone Set, Connections to 3-Type Speakerphone System When Control Unit is Located at the KTS Equipment.

#### 3. MAINTENANCE

**3.01** For maintenance information refer to Section 503-601-101 for the 851- and 2851-type telephone sets and to Section 512-620-100 for the speakerphone components used with these sets.



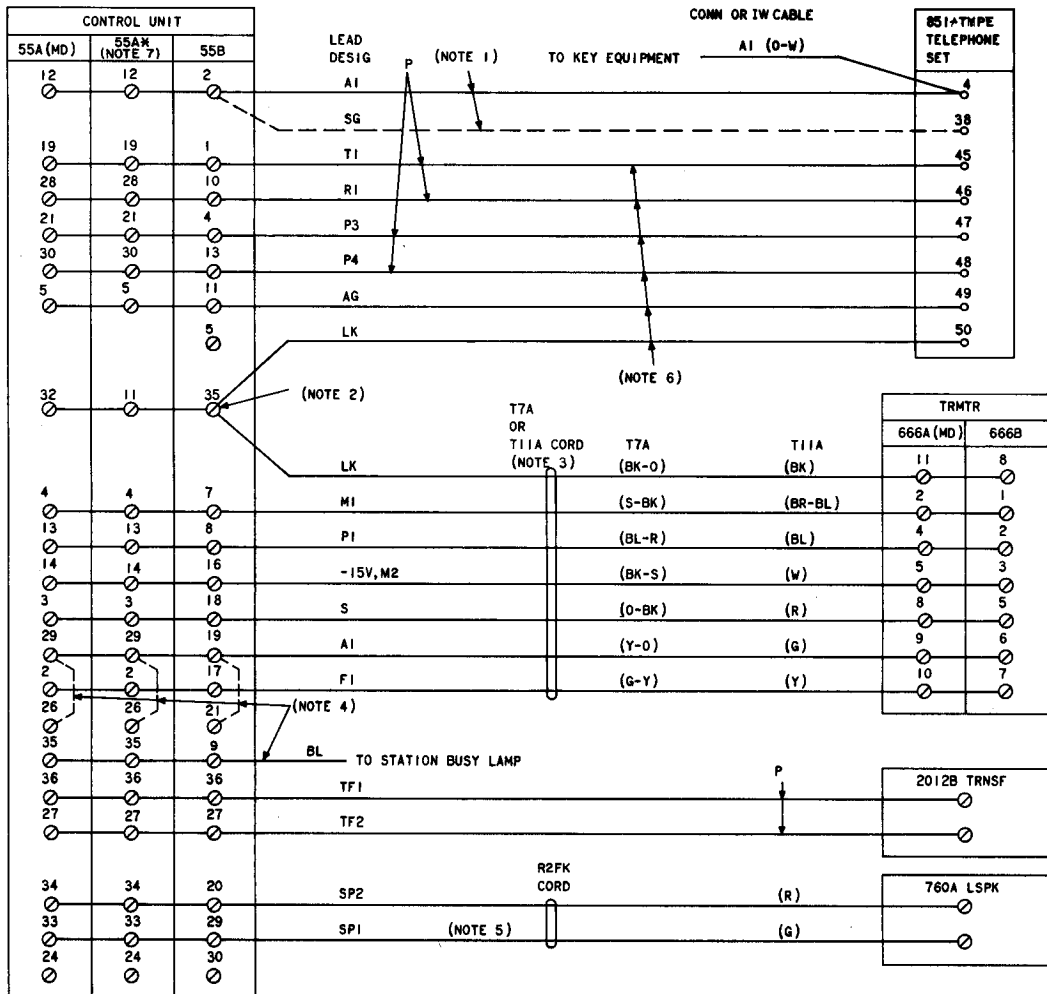
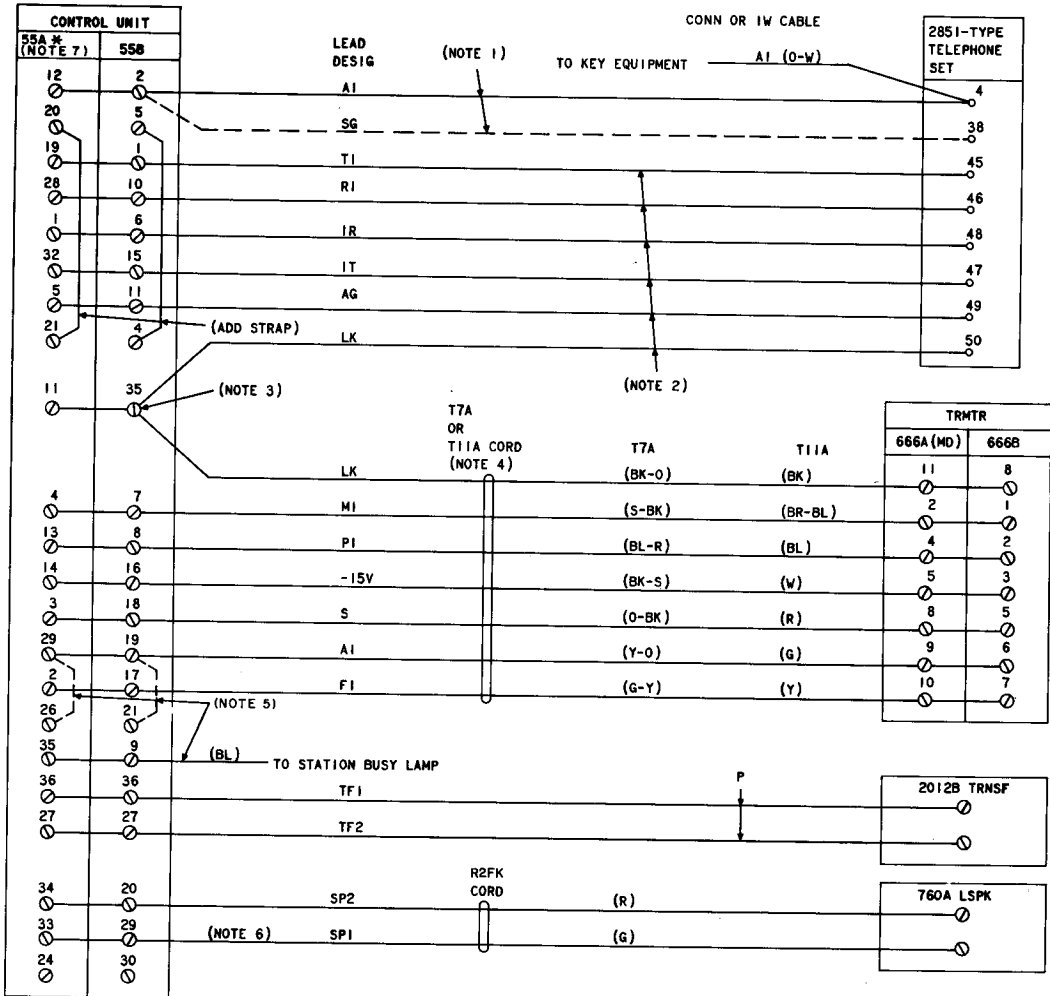


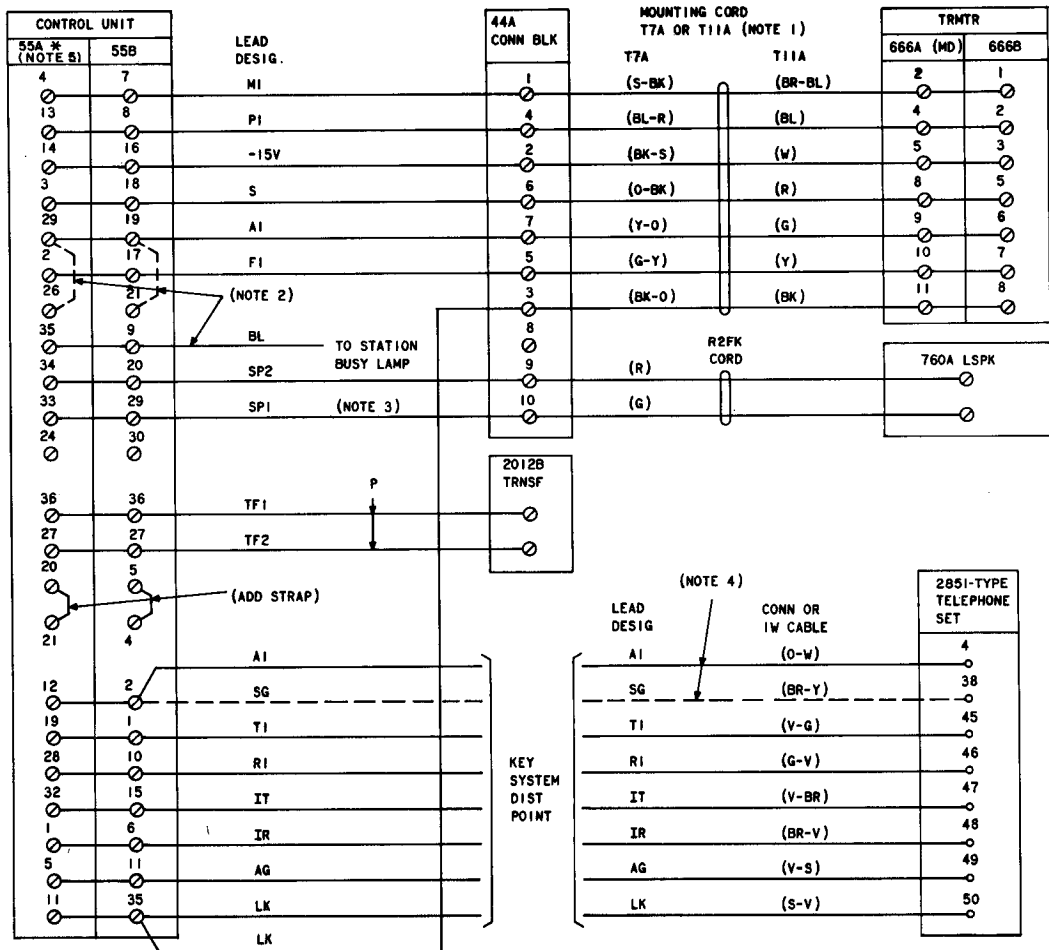
Fig. 1—851-Type Telephone Set, Connections to 3-Type Speakerphone System



NOTES:

1. FOR 1A1, 1A2 AND 6A KEY TELEPHONE SYSTEMS, CONNECT AI LEAD TO TERMINAL 4 ON CLIP-TYPE CONNECTING BLOCK, FOR 1A KEY TELEPHONE SYSTEM CONNECT SG LEAD TO TERMINAL 38 ON CLIP-TYPE CONNECTING BLOCK AND MOVE (Y) LINE SWITCH LEAD FROM 4 TO 11 OF SCREW TERMINAL FIELD.
2. DO NOT CONNECT TI, RI, IR, IT, AG AND LK LEADS IN CABLE TO KEY EQUIPMENT.
3. TIE POINT FOR LK LEADS BETWEEN TELEPHONE SET AND TRANSMITTER WHEN CONTROL UNIT IS LOCATED NEAR TELEPHONE SET.
4. INSULATE AND STORE UNUSED LEADS OF T11A CORD.
5. STRAP AS INDICATED AND CONNECT (BL) LEAD WHEN STATION BUSY LAMP IS CONTROLLED BY SPEAKERPHONE.
6. TO REDUCE LOUDSPEAKER VOLUME, CONNECT SP1 LEAD TO TERMINAL 24 (55A) OR 30 (55B).
7. 55A\* CONTROL UNIT MODIFIED BY WESTERN ELECTRIC CO. FOR USE WITH "TOUCH-TONE" ® TELEPHONE SETS.

Fig. 2—2851-Type Telephone Set, Connections to 3-Type Speakerphone System



- NOTES:
1. INSULATE AND STORE UNUSED LEADS OF T11A CORD.
  2. STRAP AS INDICATED AND CONNECT (BL) LEAD WHEN STATION BUSY LAMP IS CONTROLLED BY SPEAKERPHONE.
  3. TO REDUCE LOUDSPEAKER VOLUME, CONNECT SP1 LEAD TO TERMINAL 24 (55A) OR 30 (55B).
  4. FOR 1A1, 1A2, AND 6A KEY TELEPHONE SYSTEMS CONNECT AI LEAD TO TERMINAL 4 ON CLIP-TYPE CONNECTING BLOCK, FOR 1A KEY TELEPHONE SYSTEMS CONNECT SG LEAD TO TERMINAL 38 ON CLIP-TYPE CONNECTING BLOCK AND MOVE (Y) LINE SWITCH LEAD FROM 4 TO 11 OF SCREW TERMINAL FIELD
  5. 55A\* CONTROL UNIT MODIFIED BY WESTERN ELECTRIC CO. FOR USE WITH "TOUCH-TONE" TELEPHONE SETS.

Fig. 3—2851-Type Telephone Set, Connections to 3-Type Speakerphone System When Control Unit is Located at KTS Equipment

## 4A SPEAKERPHONE COMPONENTS

### IDENTIFICATION, INSTALLATION, OPERATION, AND MAINTENANCE

#### 1. GENERAL

**1.001** This addendum supplements Section 512-700-100 Issue 5. Place this pink sheet ahead of Sheet 1 this section.

**1.002** This addendum is issued to:

- Add Ivory 680AE transmitter
- Add Ivory 108AA loudspeaker

Kit of Parts	Color—Suffix
D-180507	Black (-03)
D-180508	Ivory (-50)
D-180509	Moss Green (-51)
D-180510	Red (-53)
D-180511	Yellow (-56)
D-180512	White (-58)
D-180513	Lt. Beige (-60)
D-180514	Lt. Gray (-61)
D-180515	Aqua Blue (-62)

#### 2. CHANGES TO SECTION

**2.001** On page 2 paragraph 2.08 revise as shown in this addendum.

**2.08** The transmitter and loudspeaker set will be shipped in five promoted colors: Black (-03), Ivory (-50), 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.

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Page 1  
1 Page

## 4A SPEAKERPHONE COMPONENTS

### IDENTIFICATION, INSTALLATION, OPERATION, AND MAINTENANCE

#### 1. GENERAL

**1.01** This section contains information for the 4A speakerphone system.

**1.02** This section is reissued to:

- Show 680A and 680AD transmitters MD
- Add information on 680AE transmitter
- Add safety information for the 85B1 power unit

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

#### 2. IDENTIFICATION

**2.01** The 4A speakerphone system is a hands-free voice switching system for use as a telephone adjunct and is a replacement for the 3-type speakerphone system which is manufacture discontinued (MD).

**2.02** 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 cutoff for private conversation
- Visual indication when system is in use
- Cutoff common ringer or other signaling devices when desired.

**2.03** Components of the 4A speakerphone system are shown in Fig. 3.

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

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

#### A. Ordering Guide

**2.06** Components which make up the various arrangements of the 4A speakerphone system are ordered separately as follows:

- Set, Loudspeaker, 108AA-\* (includes 7-foot D20N mounting cord)
- Transmitter, 680AE-\* (includes 7-foot, D8S mounting cord)
- Transmitter, 680AE14-\* (same as 680AE except includes 14-foot D8S mounting cord)
- Unit, Control 80B-49† (one required for each 4-wire or combination of 2-wire/4-wire station equipped with 4A speakerphone)
- Unit, Power, 85B1-49
- Block, Connecting, 82B-49†
- Adapter, 223C-49†
- Adapter, 223D-49†

\*Add color suffix; refer to paragraph 2.08.

†Only one of these four components required per installation, depending on telephone set type.

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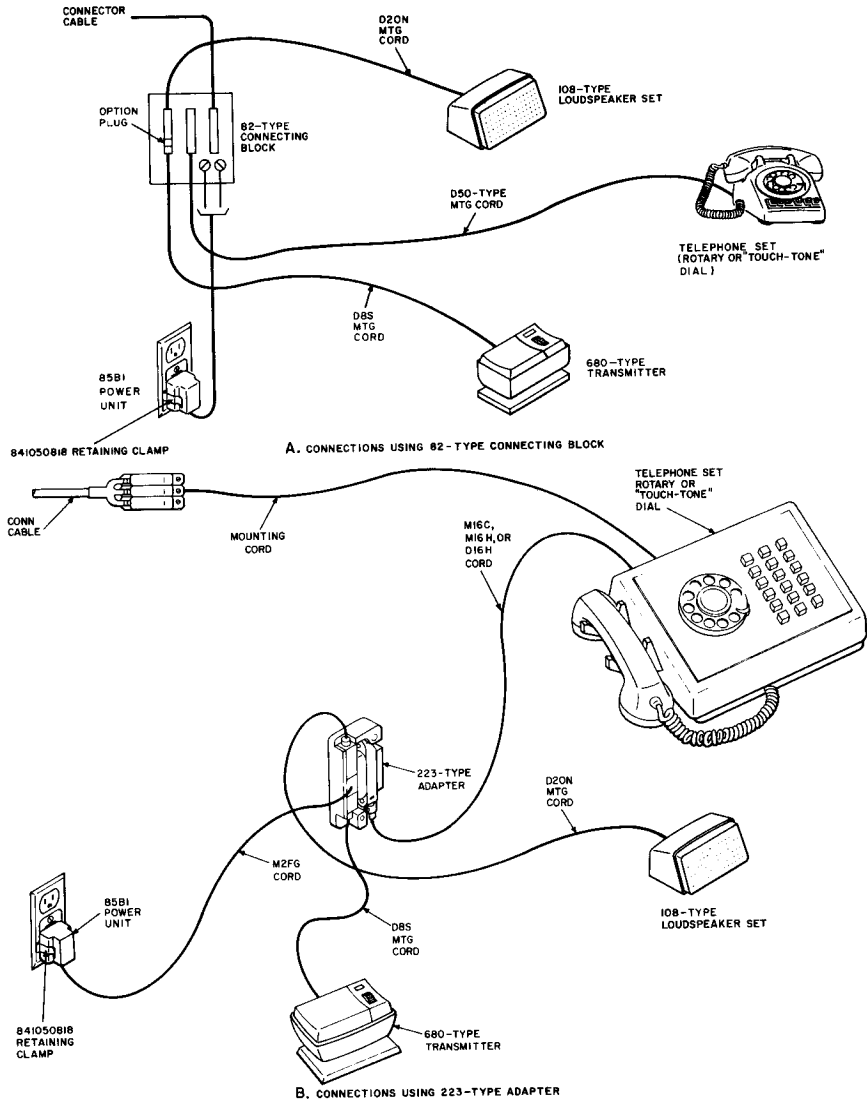


Fig. 1—Typical Arrangements of 4A Speakerphone System

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

Cord, D20N-87, 14 feet (108-type loudspeaker set)

Cord, D16H-50, 14 feet (223C adapter)

Cord, M16H-87, 14 feet (223D adapter)

2.08 The transmitter and loudspeaker set will be shipped in four promoted colors: Black (-03),

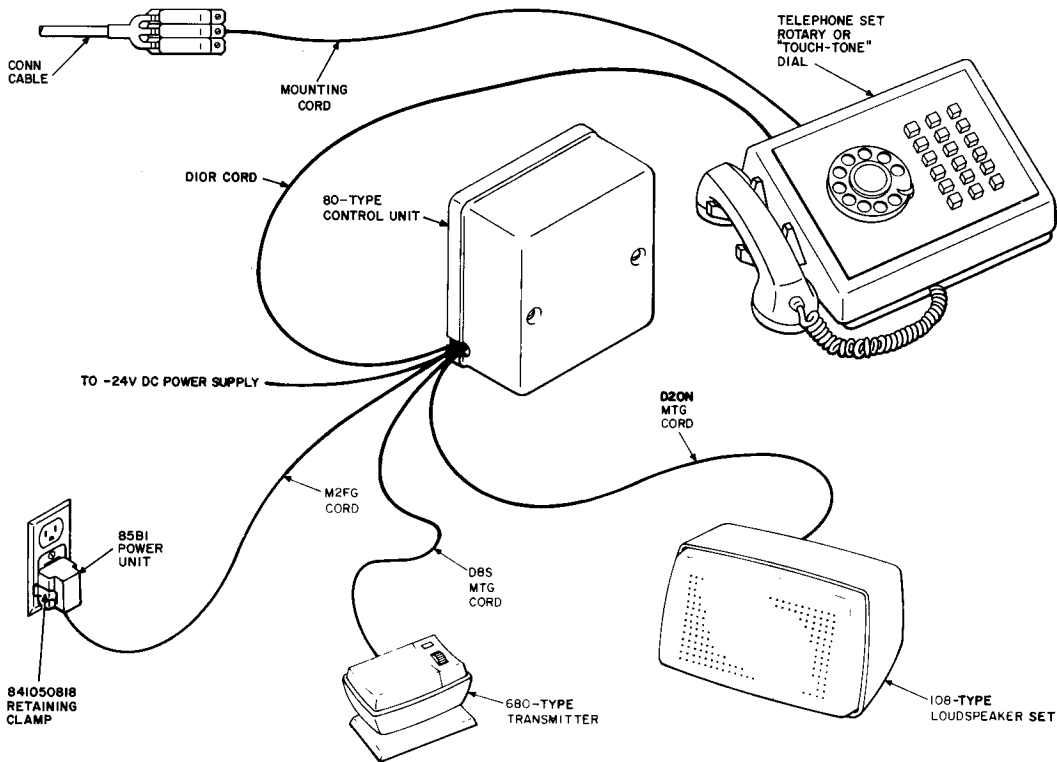


Fig. 2—Typical Arrangement of 4A Speakerphone System With 2- or 4-Wire Telephone Set

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

2.09 4A Speakerphone System Circuits.

- (1) The 4A speakerphone incorporates a voice-switching circuit which eliminates singing and essentially eliminates far-end talker echo.
- (2) When there is no transmission of speech, loss is automatically inserted in the transmit circuit and gain is added to the receive circuit.

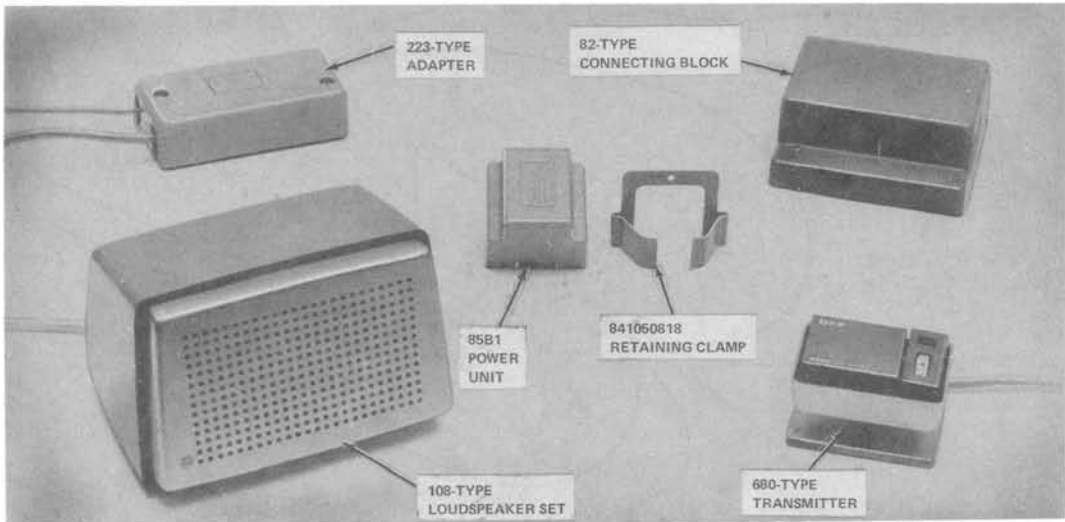


Fig. 3—Components of 4A Speakerphone System

This simultaneous transfer of loss and gain 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 prevent false operation of the switching circuit from the receive speech output of the loudspeaker which is picked up by the microphone.

(5) A predetermined voice level is necessary to switch from the receiving to the transmitting condition. In the presence of steady room noise, such as a fan or an air conditioner, a special circuit, called noise-guard circuit, automatically raises the required threshold level to prevent operation of the switching control circuit by the noise. Talkers should still switch satisfactorily because they generally increase their speaking levels under noisy conditions.

#### B. Radio Frequency Interference (RFI) and/or Static Electricity Discharge Protection

2.10 In areas where RFI and/or static electricity is a problem, install a 680AD (MD) or 680AE transmitter and a 108AA loudspeaker set.

C. 680A (MD), 680A14 (MD), 680AR (MD), 680AR14 (MD), 680AD (MD), 680AD14 (MD), 680AE, or 680AE14 Transmitter

2.11 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, but has no effect on the level of speech transmitted to the telephone line. The indicator lamp lights when the system is on.



2.12 The 680AE transmitter provides RFI and static discharge protection and replaces all other 680-type transmitters listed previously.

**Note:** Whenever the 680AD transmitter is used with either a 108A or 108AR loudspeaker set it is necessary to install a 106A varistor (shipped with the transmitter) between terminals 7 (TVL) and 5 (GRD) in the loudspeaker set to prevent damage to the loudspeaker set from discharge of static electricity.

**D. 108A (MD), 108AR (MD), or 108AA Loudspeaker Set**

2.13 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.

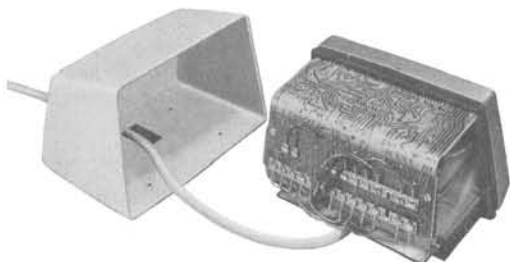


Fig. 4—Typical 108-Type Loudspeaker Set With Cover Removed

2.14 The 108AA loudspeaker replaces the 108A and 108AR loudspeakers and provides the following additional options or features:

- Improved RFI suppression
- Protection against discharge of static electricity
- Provision for increased switchguard action by means of screw terminal connections. (Refer to paragraph 5.02.)

**Note:** Whenever the 108A or 108AR loudspeaker set is used with the 680AD transmitter it is necessary to install a 106A

varistor (shipped with the transmitter) between terminal 7 (TVL) and 5 (GRD) in the loudspeaker set to prevent damage to the loudspeaker set from discharge of static electricity.

**E. 82A (MD) or 82B Connecting Block**

2.15 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 on the 82A and eleven screw terminals on the 82B connecting block (Fig. 9 and 10).

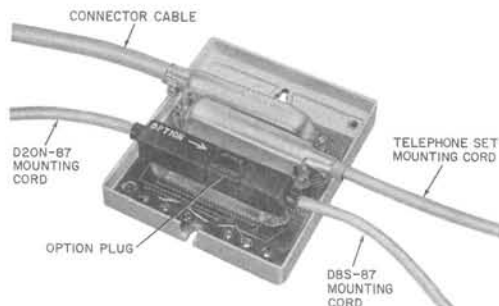


Fig. 5—82-Type Connecting Block With Cover Removed

2.16 The 82B is the same as the 82A connecting block with the exception that on the 82B 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. 9).

**F. 223A (MD), 223C, or 223D Adapters**

2.17 The 223-type adapter (Fig. 6) interconnects the 680-type transmitter, the 108-type loudspeaker set, the 85B1 power unit and certain

codes of telephone sets. The adapter consists of a plastic housing and a cord with a 50-pin connector on one end and either spade-tipped terminations or a post-type connector on the other end. The connector end accepts plugs from the transmitter and loudspeaker set and the plug from an M2FG cord (furnished with the adapter) which connects to the 85B1 power unit. The cord from the adapter connects to the telephone set. Three codes of the 223-type adapter are described as follows.

(a) **223A (MD) Adapter:** This adapter is equipped with an M16C cord having a 50-pin connector on one end and spade-tipped conductors on the other end for connection to telephone sets with screw terminal fields, see Fig. 11.

(b) **223C Adapter:** This adapter is equipped with a D16H-50 cord having a 953-type connector for connection to telephone sets equipped with square-post connection fields, see Fig. 12.

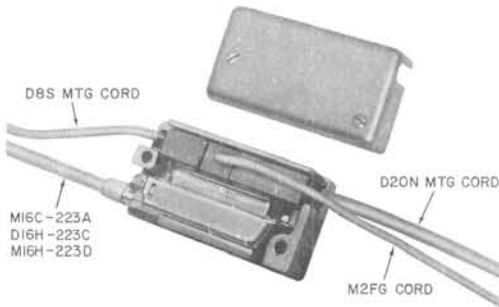


Fig. 6—223A (MD), 223C, or 223D Adapter

(c) **223D Adapter:** This adapter is the same as the 223A adapter except that it is equipped with a M16H-87 cord instead of the M16C (MD) cord. The (O-R) lead of the M16H cord is connected through to provide a remote ON lead for enabling the one-touch calling feature of the TOUCH-A-MATIC® telephone sets and adjunct dials, see Fig. 11.

#### G. 80A (MD) or 80B Control Unit

2.18 One 80-type control unit is required for each 4-wire or combination 2-wire/4-wire station used with 4A speakerphone.

2.19 The 80-type control unit (Fig. 2 and 7) provides for connecting the 4A speakerphone system to either a 2- or 4-wire telephone transmission network. All standard operating features of the 4A speakerphone system are retained. Attached to the chassis of the control unit is a connector (same as that used in the 223-type adapter) to which the 108-type loudspeaker set, the 680-type transmitter and the 85B1 power unit are connected.

2.20 The 80B control unit replaces the 80A control unit. The 80B is the same as the 80A with one exception; an additional connection from the 4A speakerphone system has been added on a screw terminal of the 80B which is required for enabling the one-touch calling feature with TOUCH-A-MATIC telephone sets and dials.

2.21 For additional schematic and circuit information, refer to SD- and CD-69923-01, respectively. For typical connection information, refer to Section 512-730-460.

#### H. 85B1 Power Unit

2.22 The power unit transforms the local customer-provided 115-volt, 60 Hz power to the voltage required to operate the 4A speakerphone system.

2.23 A retaining clamp (841050818) (Fig. 1 and 2) will be shipped with the 85B1 power unit.

### 3. INSTALLATION

#### A. Telephone Sets

3.01 The telephone sets specified for use in 4A speakerphone system provide the following features.

- (1) A set of normally closed (with handset on-hook) line switch contacts to disconnect the speakerphone when the handset is lifted.
- (2) Two sets of off-normal (make) contacts in the dial (rotary dial sets dialed in an on-hook condition) to short loudspeaker receive path and handset receiver during dialing.
- (3) A set of make contacts (s and t) in the dial common switch (TOUCH-TONE® sets dialed in the on-hook condition) to connect line power IR lead from the loudspeaker set to the dial oscillator. If a polarity guard is provided these

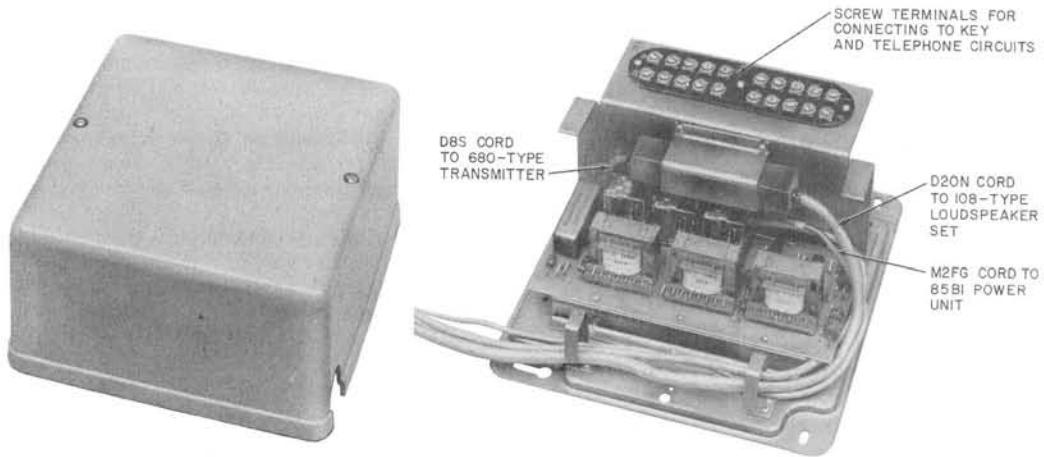


Fig. 7—80-Type Control Unit With Cover Removed

contacts (s and t) are isolated from the oscillator by the polarity guard.

**3.02** 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 can 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.

**3.03** An 85B1 power unit (UL approved) can be used to power only one speakerphone system. When power is provided via connector cable from a remote location the 85B1 power unit should be located less than 85 feet from the 108-type loudspeaker set when using 26 gauge wire or less than 125 feet from the 108-type loudspeaker set when using 24 gauge wire.

**3.04** A retaining clamp (841050818) (Fig. 1 and 2) should be mounted to the ac receptacle to hold the power unit securely and to prevent accidental loss of power.

**Danger:** For safety, securely attach retaining clamp to ac outlet using outlet cover screw **BEFORE** attempting to install 85B1 power unit. See Fig. 8. The power unit and any other cord plugged into the ac outlet should always be unplugged completely from outlet **BEFORE** attempting to attach or remove the clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs of the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamp on outlets where the cover mounting screw holds the duplex outlet in the box.

**Warning:** Care should be taken to trim and dress leads connecting to low voltage output of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power sources does not occur. If more than one power unit is plugged into a multiple receptacle

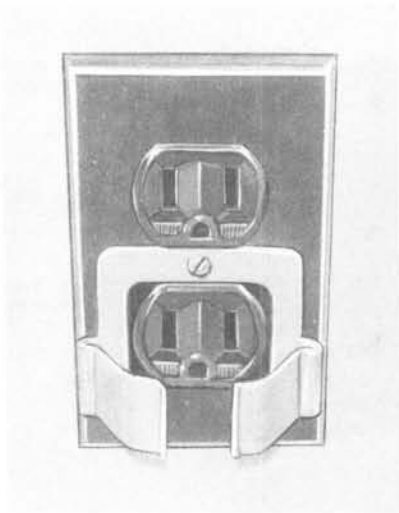


Fig. 8—841050818 Retaining Clamp Mounted on AC Outlet Box Using Outlet Cover Screw

*strip, there must be at least one-inch separation between power units. Only UL listed receptacle strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.*

#### C. Planning An Installation

**3.05** When planning an installation, observe the following.

- (1) Avoid placing apparatus with plastic covers or parts in location where ambient temperatures may exceed 140 degrees F.
- (2) Install 85B1 power unit observing procedures in paragraph 3.03 and 3.04.
- (3) Place loudspeaker set and transmitter within convenient reach of user and a minimum of one foot apart.

- (4) Transmitter must be at least two feet from transformer or any ac powered device.
- (5) There should be no obstructions between the user, loudspeaker set, and transmitter.
- (6) Make connections as shown in appropriate section for specific telephone set which indicate grandfathered and registered arrangements.
- (7) 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. 10).
- (8) For station busy lamp circuit with 4A speakerphone system, refer to the appropriate Service section for telephone set involved.

#### 4. OPERATION

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

**4.01** To originate a call using speakerphone.

- (1) Depress transmitter ON OR QUIET button and release. The ON lamp will light indicating speakerphone is turned on, listen for dial tone transmitted through loudspeaker set. Telephone handset is not lifted during dialing (except where handset covers dial [paragraph 4.01(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 the complete number is dialed, ringing tones, busy signals or called party answer will be heard from the loudspeaker set.
- (5) When the called party answers, the 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.

**4.02** To answer an incoming call using speakerphone, depress ON OR QUIET button on transmitter. Ringing is tripped and system is automatically connected to the line through the loudspeaker set.

**4.03** To disable the 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, the distant party can still be heard over the loudspeaker.

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

**4.04** 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.

**4.05** To transfer from handset to speakerphone operation.

- (1) 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.

**4.06** To transfer from speakerphone to handset operation, lift handset which will automatically turn off speakerphone.

## 5. MAINTENANCE



**Remove power from 4A speakerphone system before attempting any maintenance of speakerphone components. Observe procedures in paragraph 3.04.**

## A. Tests and Adjustments

**5.01** When system is installed or maintenance is performed on any component, make the following tests.

- (1) Place a speakerphone call to the test desk.

**Note:** Excessively loud TOUCH-TONE signals will result at loudspeaker output during dialing if connections of IT and IR leads are reversed in the telephone set. Speakerphone test call should verify that TOUCH-TONE signals are not excessively loud.

- (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 clipping 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. If condition still exists, see paragraph 5.02.

- (5) Repeat this test at a high listening level by turning the volume control to maximum volume.

**5.02** An alternate loudspeaker connection is provided in each 108AA loudspeaker to compensate for room conditions which cause voice-switching during reception. The effect of voice-switching is to clip portions of the incoming speech. To compensate for this condition, proceed as follows.

- (1) Remove cover of 108AA loudspeaker to access terminal strip (paragraph 5.06).
- (2) Move red loudspeaker lead from terminal 29 to terminal 32.

**Note:** Use care when locating spade tip lead on terminal so as not to contact adjacent circuit paths.

**5.03** If voice-switching is caused by external telephone audible signaling devices, proceed as follows.

- (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. 10).
- 5.04 If speakerphone fails to operate properly, refer to Table A for trouble analysis.

#### B. Cleaning

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

#### C. 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.***

- 5.06 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. 4).

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

- 5.07 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 lifting along the edge adjacent to the thumb wheel.



***The loudspeaker set 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 paragraph 2.08 be stocked instead of extra loudspeaker sets and transmitters.***

#### D. Change of Loudspeaker Set Card

- 5.08 First remove housing as in paragraph 5.06. Two of the mounting cord leads are secured individually, the rest are permanently connected to plastic wafer strips (see Fig. 4). Loosen, but do not remove screws that secure individual leads and wafer strips. ***Do not attempt to remove spade tips from wafer strips.*** Next remove the screw that fastens the stay band of the cord. Slide the spade tips and wafers through 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 does not light	No power, or open wiring	Power supply outlet with a neon lamp voltage tester or equivalent, or check LK 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 loudspeaker	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 TI, RI, IT, and IR leads
Excessively loud TOUCH-TONE signals at loudspeaker output during dialing	Incorrect Connections	For proper IT and IR connections
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 680AR, 680AD, or 680AE transmitter and 108AR or 108AA loudspeaker set.

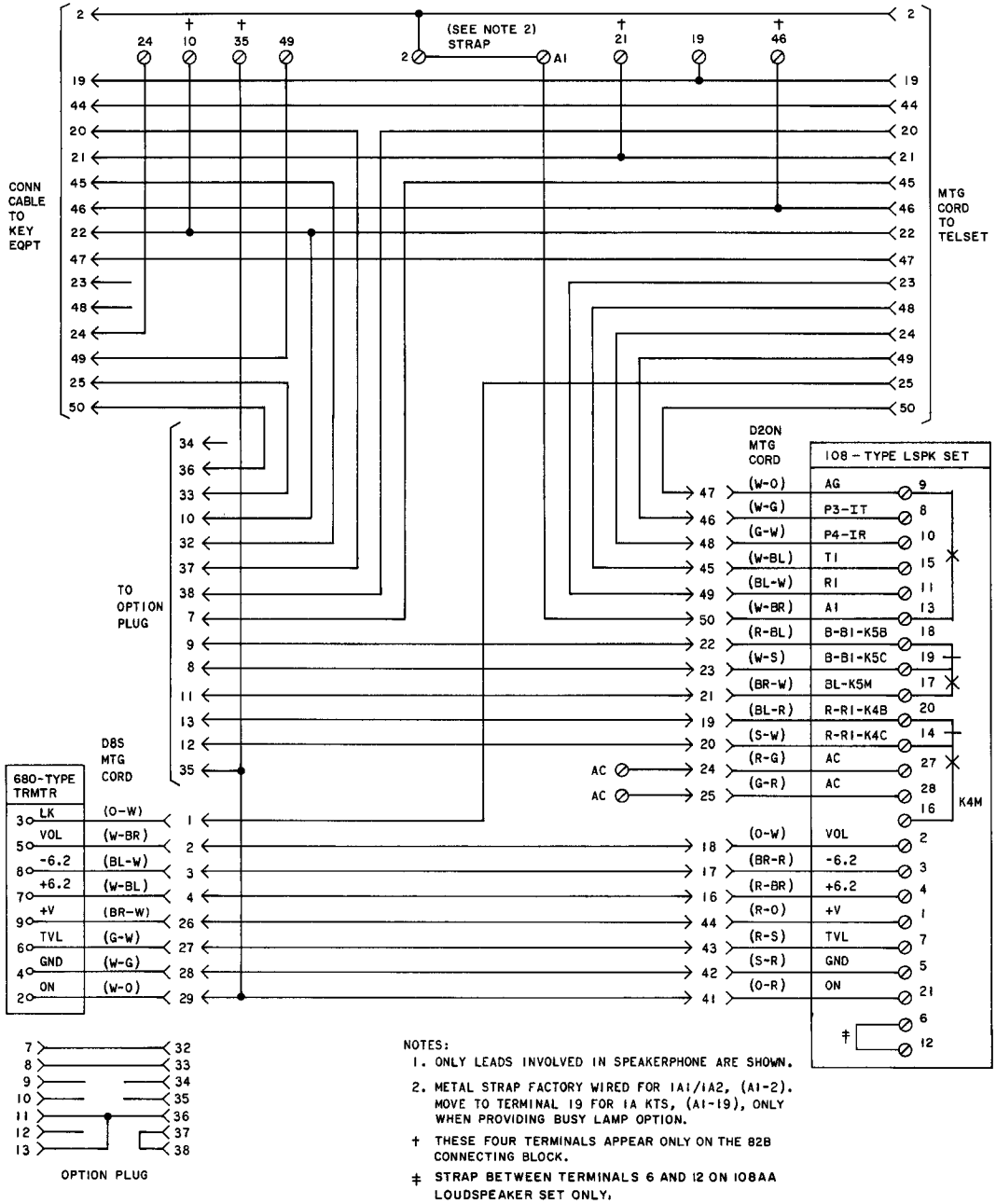
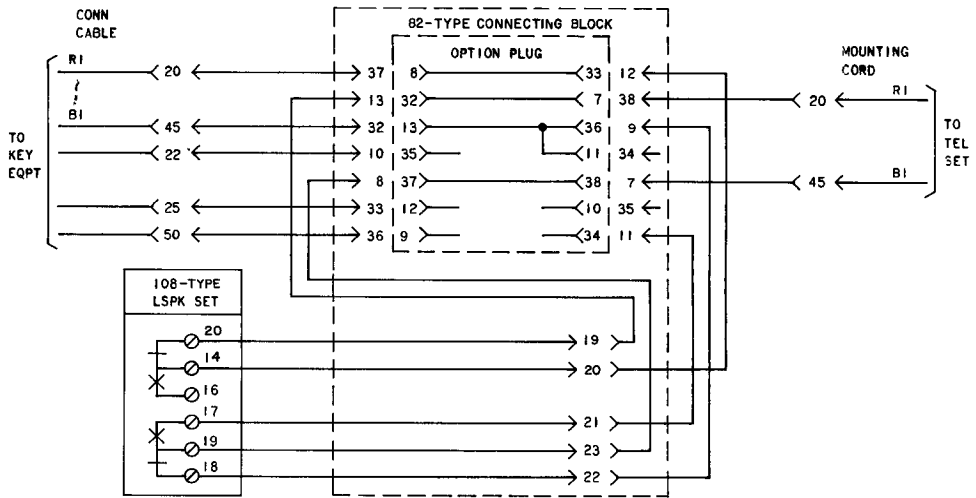
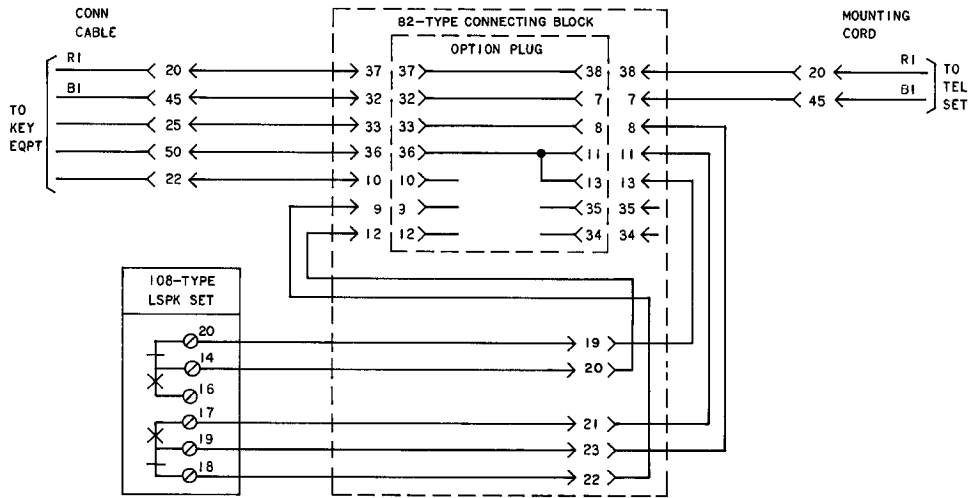


Fig. 9—4A Speakerphone System Connections Using 82-Type Connecting Block





A. OPTION PLUG POSITIONED FOR RINGER CUTOFF



B. OPTION PLUG POSITIONED FOR AUXILIARY RELAY OPERATION

Fig. 10—Wiring Involved in Options at 82-Type Connecting Block

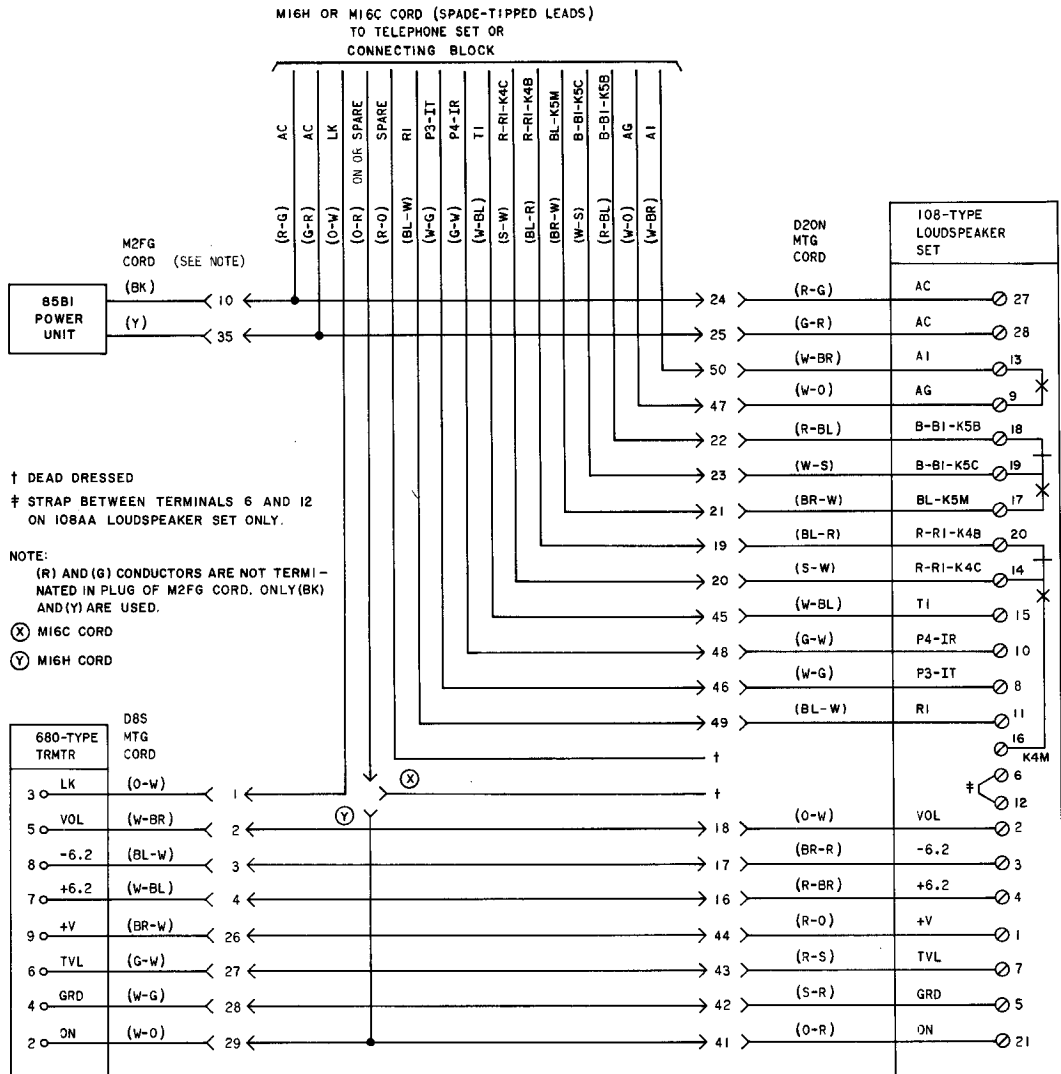


Fig. 11—4A Speakerphone System Connections Using 223A (MD) or 223D Adapter

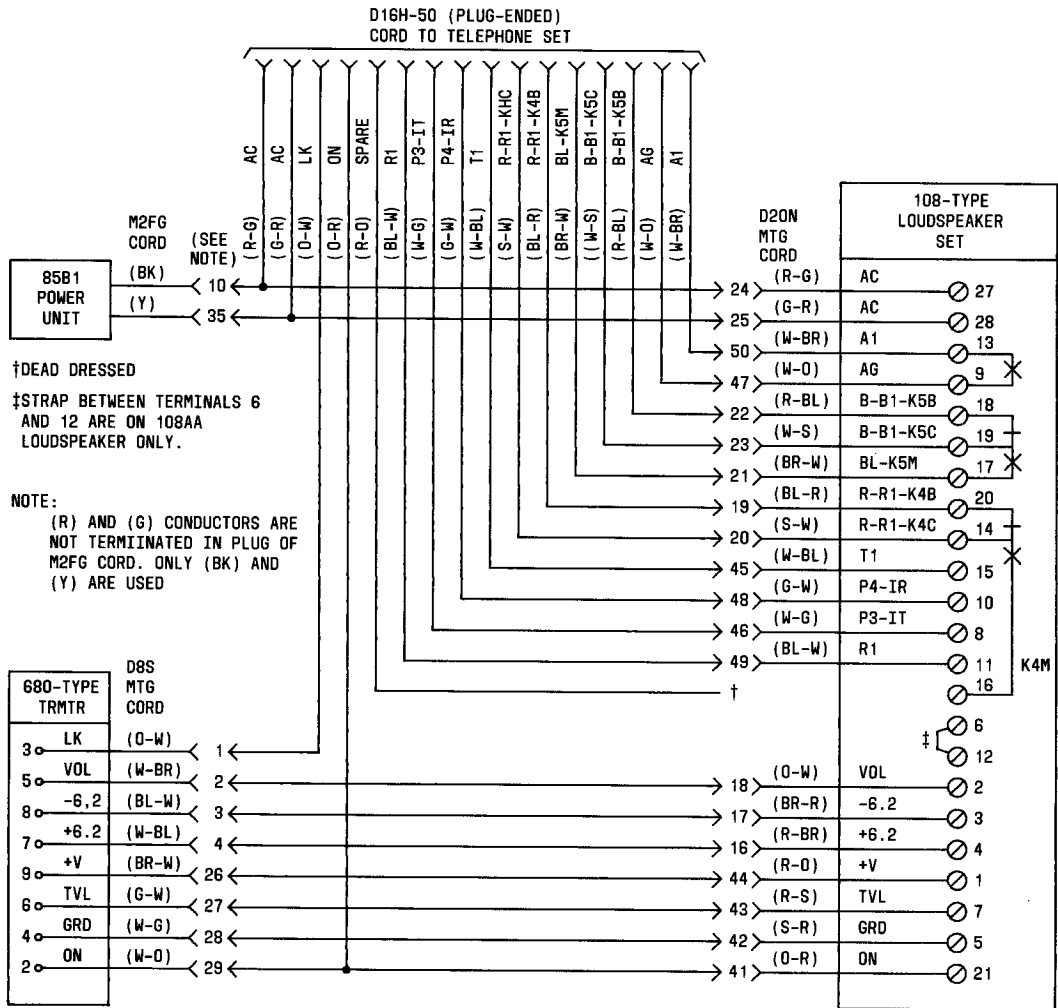


Fig. 12-4A Speakerphone System Connections Using 223C Adapter

**SPEAKERPHONE SYSTEM—4A**  
**500S, 500SM, 2500S, AND 2500SM TELEPHONE SETS**  
**CONNECTIONS**

**1. GENERAL**

**1.01** Refer to Section 512-700-100 for detailed information on the components of the 4A speakerphone system.

**1.02** This section is reissued to add connections for 500SM and 2500SM (modular) telephone sets.

**1.03** To provide 4A speakerphone feature at the 500- and 2500-type telephone sets, refer to Fig. 1 or 2 for layout arrangement of the components required for the system and Fig. 2 through 6 for individual lead connections.

**2. CONNECTIONS**

**223A Adapter**

**2.01** The cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power unit are installed in the proper receptacle of the 223A adapter. The cover must be fastened securely to assure proper mating of connectors.

**108-Type Loudspeaker Set**

**2.02** The loudspeaker set and transmitter must be placed a minimum of one foot apart.

**680-Type Transmitter**

**2.03** The transmitter must be at least two feet from transformer or any AC powered device.

**85B1 Power Unit**

**2.04** Power can be supplied by connecting 85B1 power unit as shown in Fig. 1 through 6.

**2.05** Use an AC power outlet (not under control of a switch) located as close as possible to the system being installed. A 841050818 retaining clamp will be shipped with the 85B1 power unit and should be mounted to the AC receptacle to hold power unit securely.

*Caution: Do Not Ground Power Unit*

**2.06** The M2FG cord is furnished as part of the 223A adapter for connecting the 85B1 power unit.

**2.07** The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire. Refer to Section 512-700-100 for detailed information on power supply applications.

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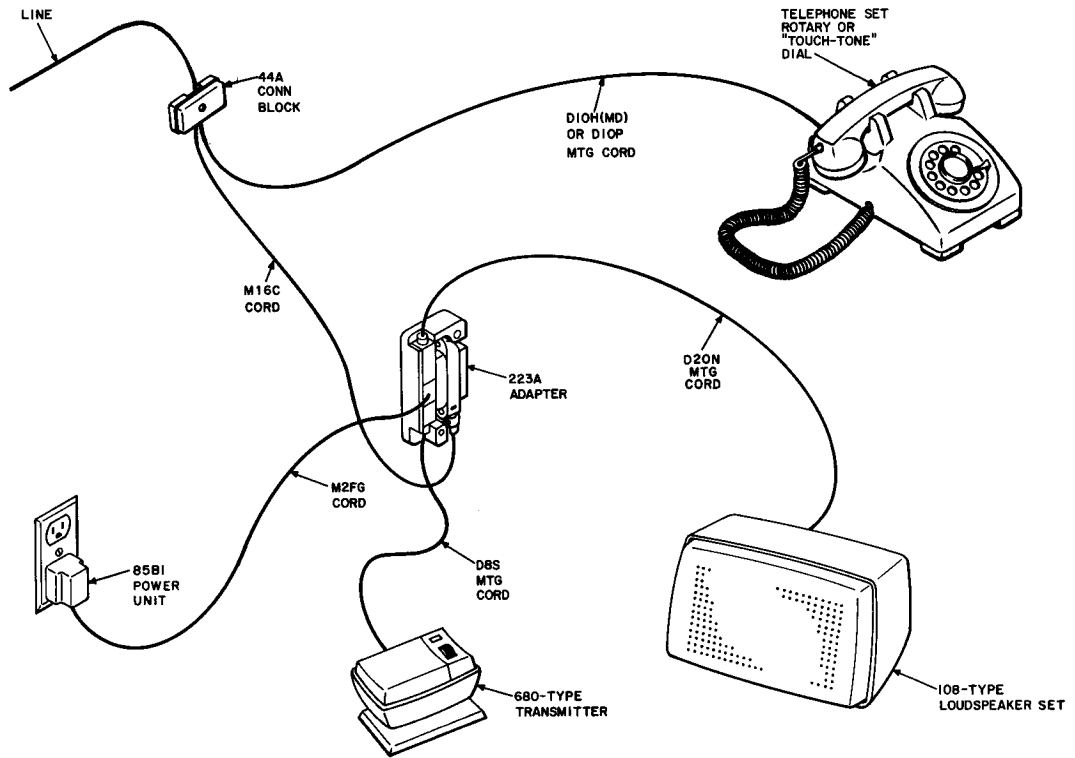


Fig. 1—Speakerphone Arrangement, 500S or 2500S Telephone Set

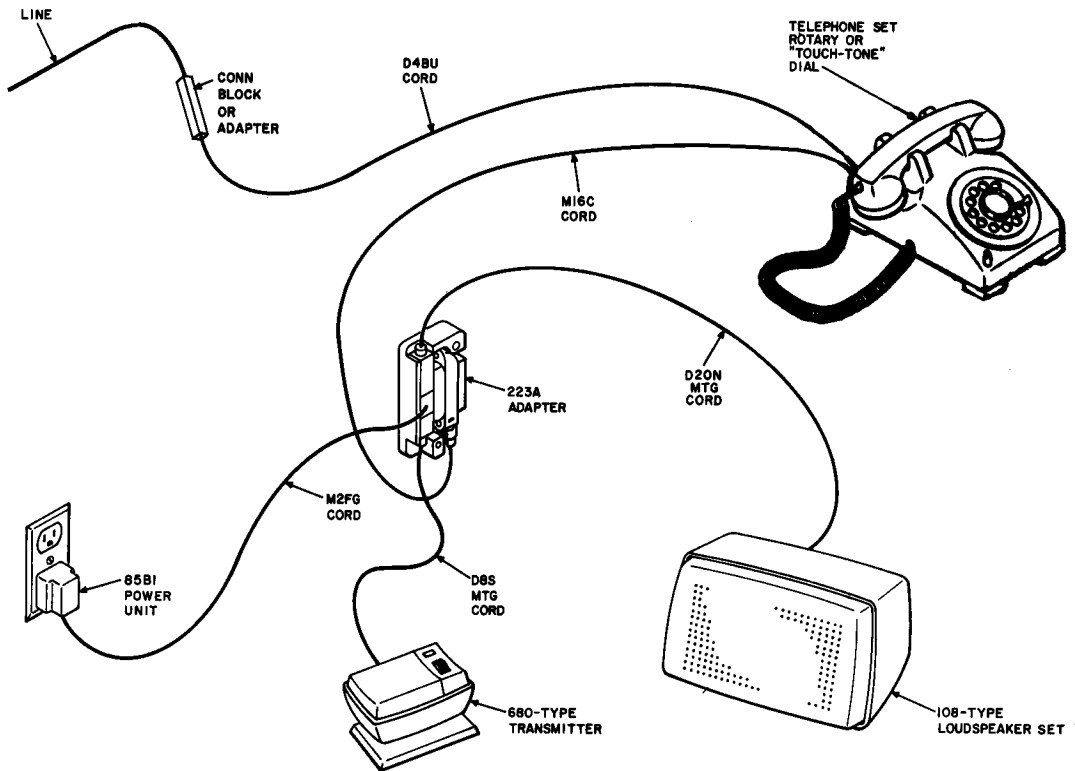
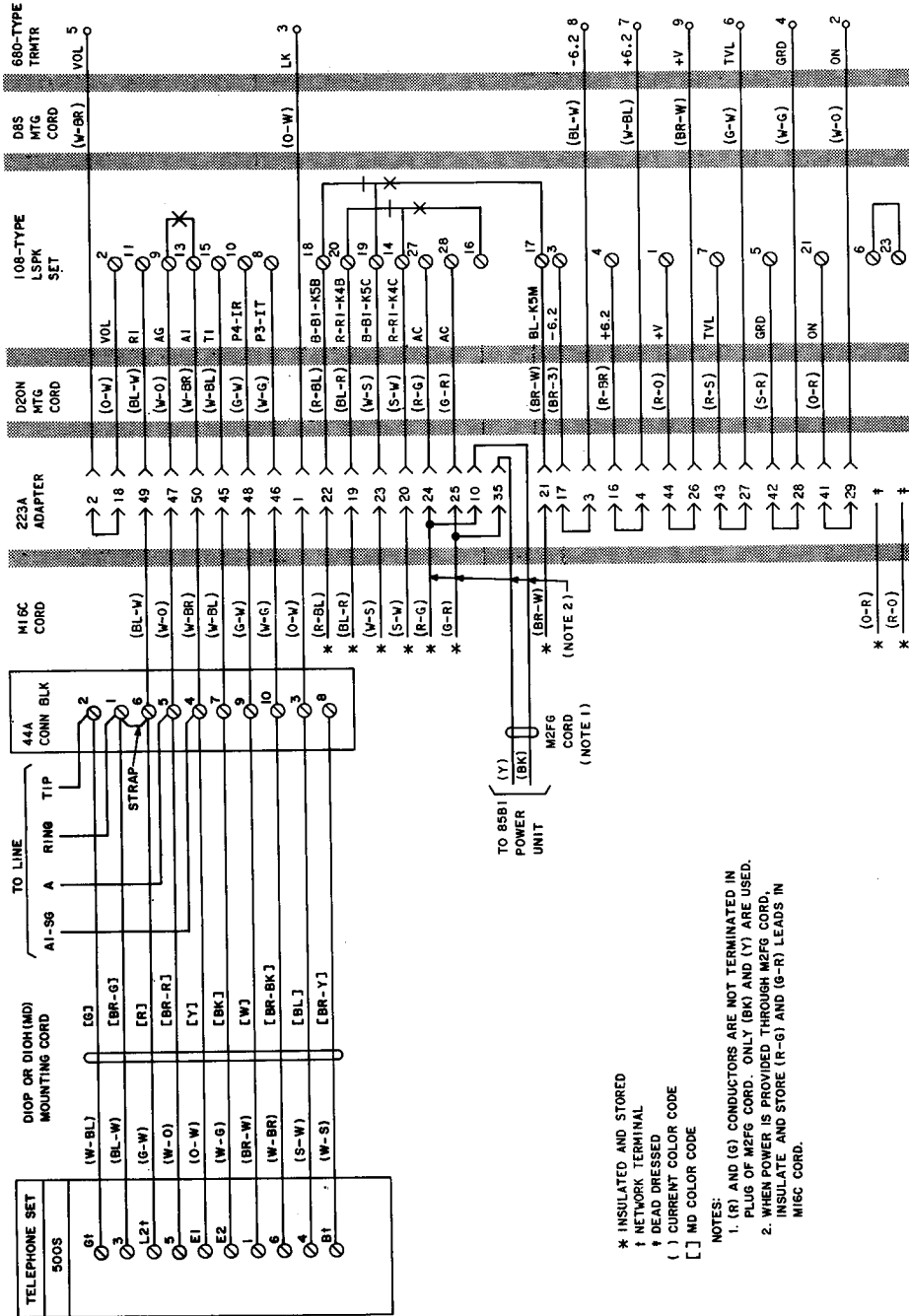


Fig. 2—Speakerphone Arrangement, 500SM or 2500SM Telephone Set



- \* INSULATED AND STORED
  - † NETWORK TERMINAL
  - ‡ DEAD DRESSED
  - ( ) CURRENT COLOR CODE
  - [ ] MD COLOR CODE
- NOTES:  
 1. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUS OF M2FG CORD. ONLY (BK) AND (Y) ARE USED.  
 2. WHEN POWER IS PROVIDED THROUGH M2FG CORD, INSULATE AND STORE (R-G) AND (G-R) LEADS IN MISC CORD.

Fig. 3—500S Telephone Set, Connections to 4A Speakerphone

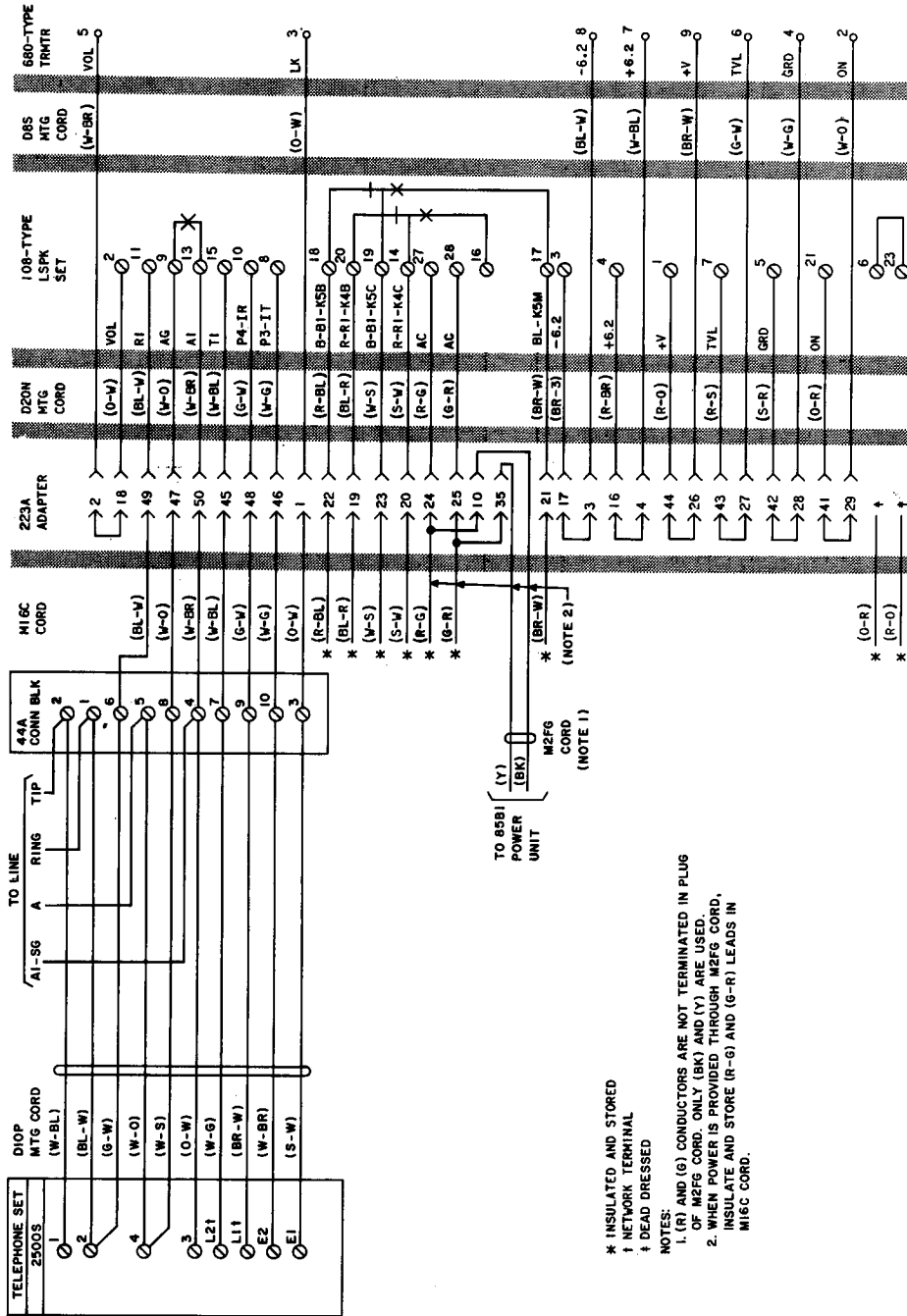
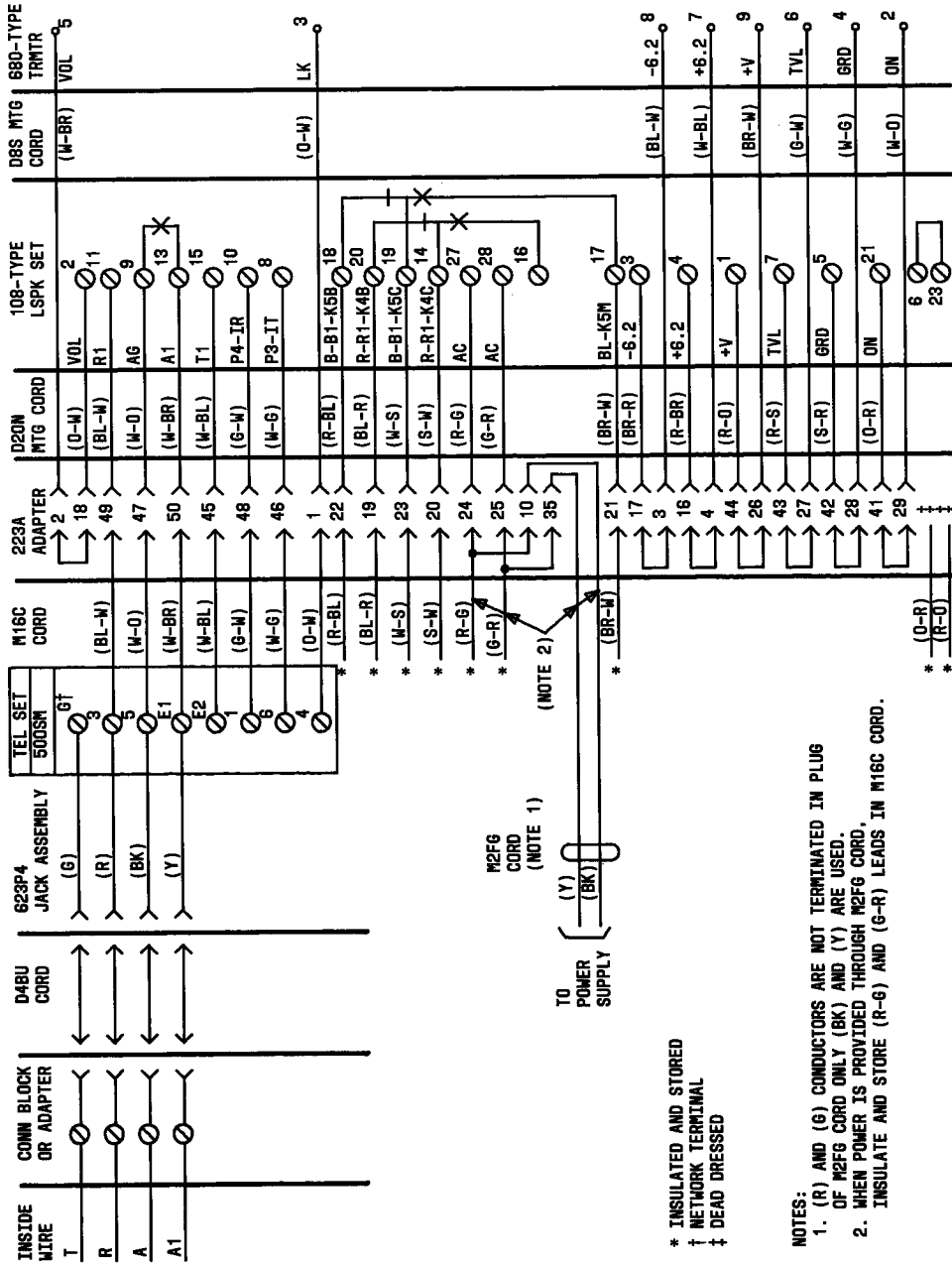


Fig. 4—2500S Telephone Set, Connections to 4A Speakerphone

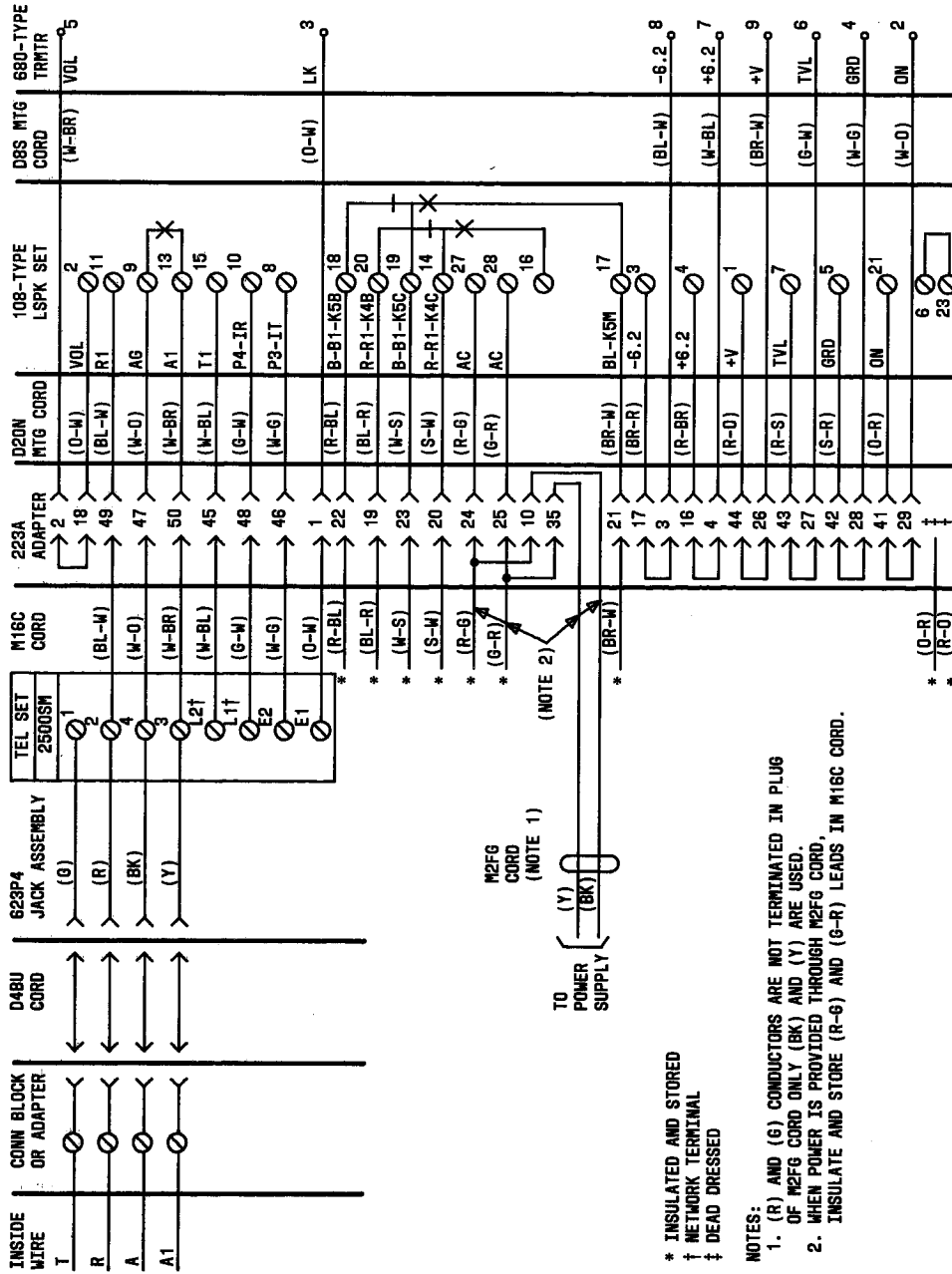




\* INSULATED AND STORED  
 † NETWORK TERMINAL  
 ‡ DEAD DRESSED

NOTES:  
 1. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD ONLY (BK) AND (Y) ARE USED.  
 2. WHEN POWER IS PROVIDED THROUGH M2FG CORD, INSULATE AND STORE (R-G) AND (G-R) LEADS IN M16C CORD.

Fig. 5—500SM Telephone Set, Connections to 4A Speakerphone



\* INSULATED AND STORED  
 † NETWORK TERMINAL  
 ‡ DEAD DRESSED

NOTES:  
 1. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD ONLY (BK) AND (Y) ARE USED.  
 2. WHEN POWER IS PROVIDED THROUGH M2FG CORD, INSULATE AND STORE (R-G) AND (G-R) LEADS IN M16C CORD.

Fig. 6—2500SM Telephone Set Connections to 4A Speakerphone†

## 511- AND 2511-TYPE TELEPHONE SETS CONNECTIONS SPEAKERPHONE SYSTEM—4A

### 1. GENERAL

1.01 This section contains information for the 511- and 2511-type telephone sets used with the 4A speakerphone system.

1.02 This section is reissued to:

- Add safety information for installing or removing the 85B1 power unit
- Add information to identify typical grandfathered arrangements
- Revise Fig. 6.

1.03 Refer to Section 512-700-100 for detailed information on the components of the 4A speakerphone system.

1.04 To provide 4A speakerphone feature for these telephone sets, refer to Fig. 1 and 2 for layout arrangement of the components required, and Fig. 3 through 7 for individual connections.

1.05 The 511D (MD) telephone set is factory-wired for non-KTS use (Fig. 3). The 511F (MD), 511H (MD), 511HM, 2511F (MD), 2511H (MD), and 2511HM telephone sets are factory-wired for use with 1A1 or 1A2 KTS (Fig. 4, 5, and 6).

1.06 These sets are not registered under the Federal Communication Commission Registration Program for direct connection to CO or PBX lines. Unless the arrangement involving these sets qualifies for grandfather status, it may only be installed at a station associated with a KTS.

### 2. CONNECTIONS

#### A. 223-Type Adapter

2.01 The cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power unit are installed in the proper receptacle of the 223A (MD) or 223D adapter. The cover must be fastened securely to assure proper mating of connectors.

#### B. 108-Type Loudspeaker Set

2.02 The loudspeaker set and transmitter must be placed a minimum of one foot apart.

#### C. 680-Type Transmitter

2.03 The transmitter must be at least two feet from transformer or any ac powered device.

#### D. 85B1 Power Unit

2.04 Power shall be supplied by connecting 85B1 power unit as shown in Fig. 1, 2, 3, and 7.

2.05 Use an ac power outlet (not under control of a switch) located as close as possible to the system being installed. A retaining clamp will be shipped with the power unit and should be mounted to the ac receptacle to hold power unit securely to prevent accidental loss of power.

**♦Danger: For safety, securely attach a retaining clamp to ac outlet using outlet cover screw before attempting to install 85B1 power unit. When removing 85B1 power unit, always unplug the power unit completely from the outlet before attempting to remove the retaining clamp. This will prevent the possibility of a loosened retainer**

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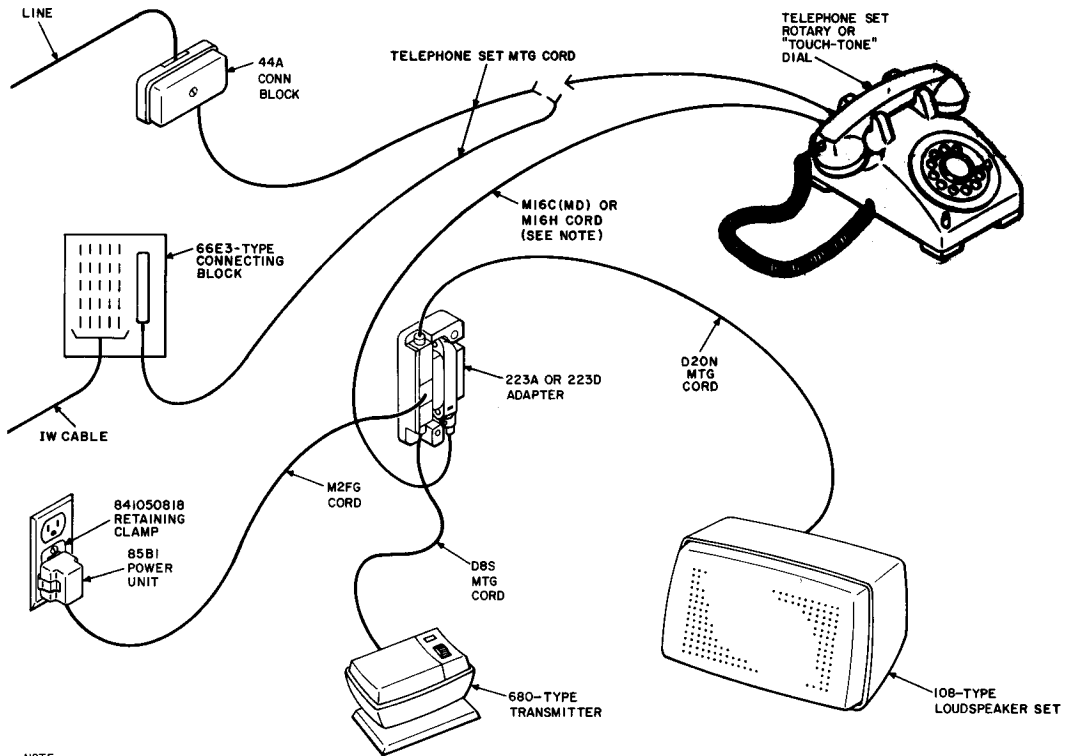
*clamp or metallic outlet cover making contact with the ac prongs of the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamp on outlets where the cover mounting screw holds the duplex outlet in the box.*

*Warning: Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power sources do not occur. If more than one power unit is plugged into a multiple receptacle power strip, there must be at least one inch separation between power units. Only*

*UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.*

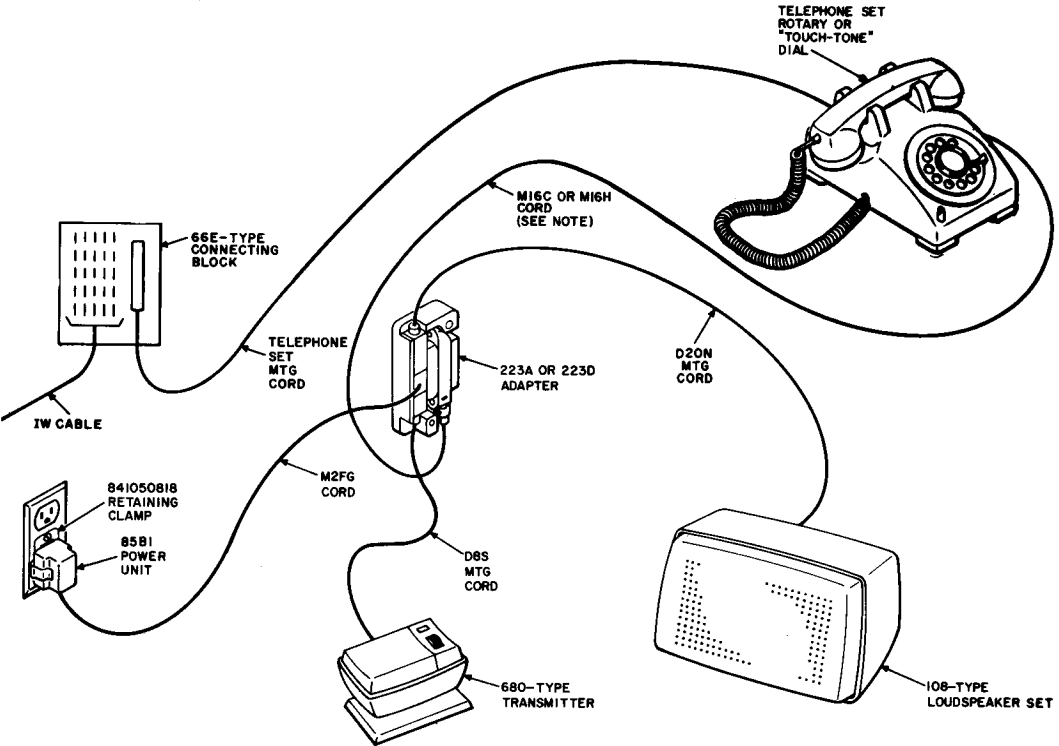
**2.06** The M2FG cord is furnished as part of the 223-type adapter for connecting the 85B1 power unit.

**2.07** The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or less than 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for detailed information on power supply application.



NOTE:  
 WHEN M16C (MD) OR M16H CORD IS TERMINATED IN SET, DISCONNECT, INSULATE, AND STORE ALL SPEAKERPHONE LEADS IN TELEPHONE SET MOUNTING CORD AT SET. WHEN M16C OR M16H CORD IS TERMINATED AT 66E3-25 CONNECTING BLOCK, DISCONNECT, INSULATE, AND STORE ALL SPEAKERPHONE LEADS IN THE IW CABLE. CONNECT M16C OR M16H CORD TO CONNECTING BLOCK USING 161A ADAPTERS.

**Fig. 1—Typical Grandfathered 4A Speakerphone System Arrangement, 511- and 2511- (Nonmodular) Type Telephone Set Using 223A or 223D Adapter**



NOTE:  
 WHEN M16C OR M16H CORD IS TERMINATED IN SET, DISCONNECT, INSULATE, AND STORE ALL SPEAKERPHONE LEADS IN TELEPHONE SET MOUNTING CORD AT SET. WHEN M16C OR M16H CORD IS TERMINATED AT 66E3-25 CONNECTING BLOCK, DISCONNECT, INSULATE, AND STORE ALL SPEAKERPHONE LEADS IN THE IW CABLE. CONNECT M16C OR M16H CORD TO CONNECTING BLOCK USING 161A ADAPTERS.

Fig. 2—Typical Grandfathered 4A Speakerphone System Arrangement, 511HM and 2511HM Telephone Set Using 223A or 223D Adapter

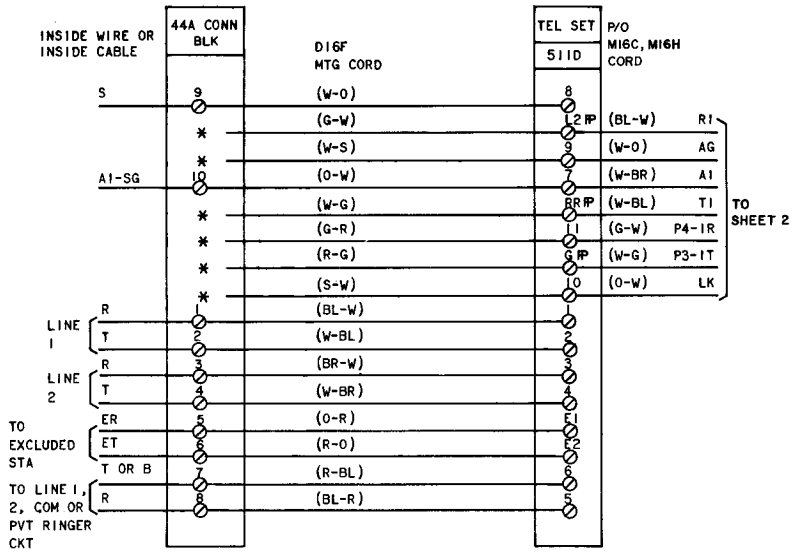
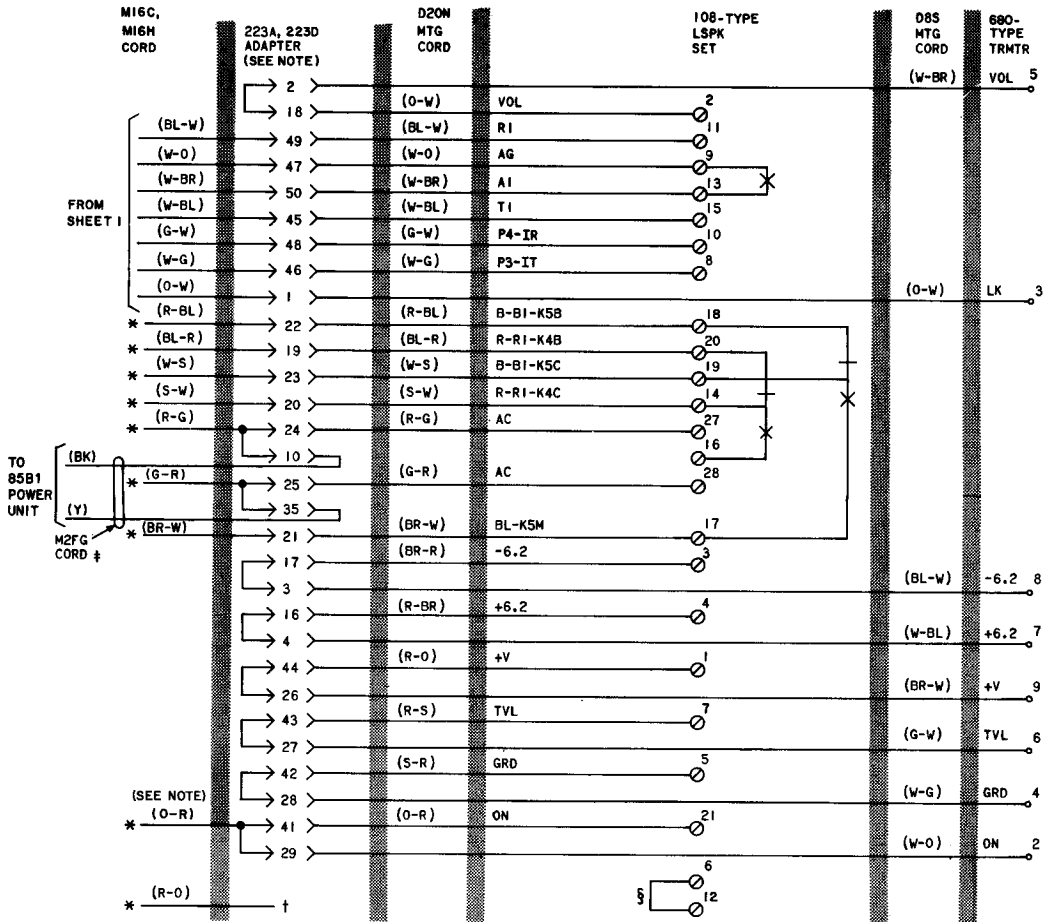


Fig. 3—Grandfathered 4A Speakerphone System Arrangement, Connections to 511D Telephone Set With 2-Line Pickup, Signaling and Exclusion (Not to be used with 1A1 or 1A2 KTS) (Sheet 1 of 2)



\* INSULATE AND STORE  
 † DEAD DRESSED  
 ‡ (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD. ONLY (BK) AND (Y) CONDUCTORS ARE USED.  
 § STRAP APPEARS ON 108AA ONLY  
 ¶ NETWORK TERMINAL  
 NOTE:  
 (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.

Fig. 3—Grandfathered 4A Speakerphone System Arrangement, Connections to 511D Telephone Set With 2-Line Pickup, Signaling and Exclusion (Not to be used with 1A1 or 1A2 KTS) (Sheet 2 of 2)



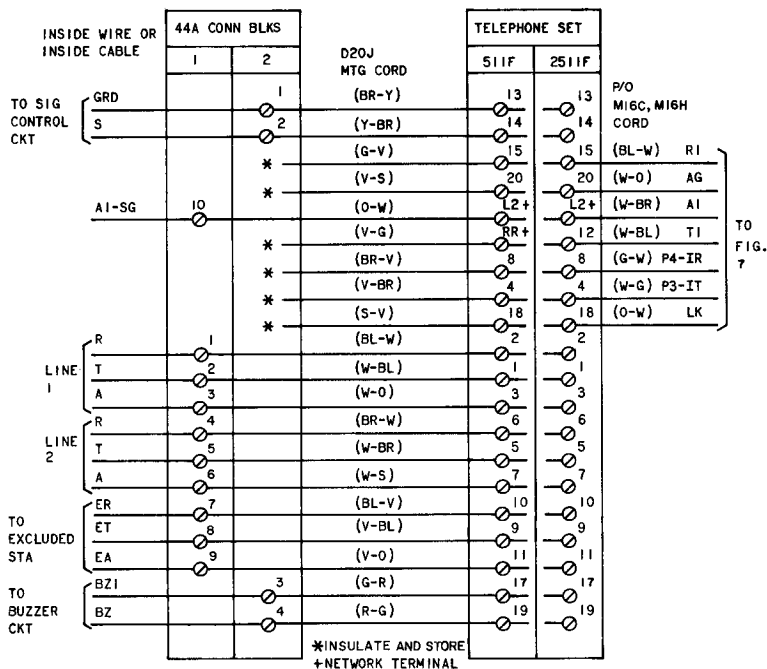


Fig. 4—511F and 2511F Telephone Set Connections, 2-Line Pickup With Exclusion on Line 1, Signaling, and 4A Speakerphone (Used With 1A1 or 1A2 KTS)

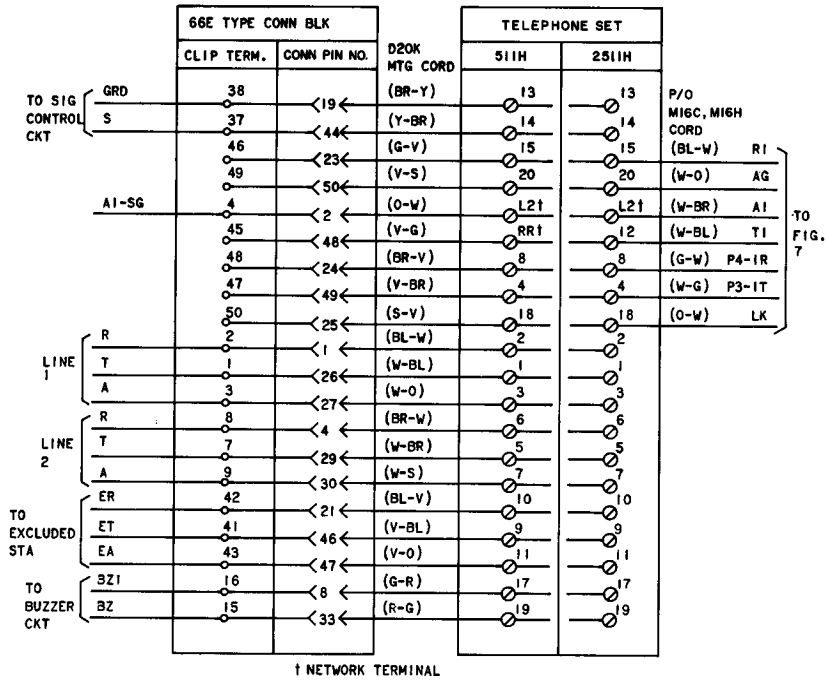
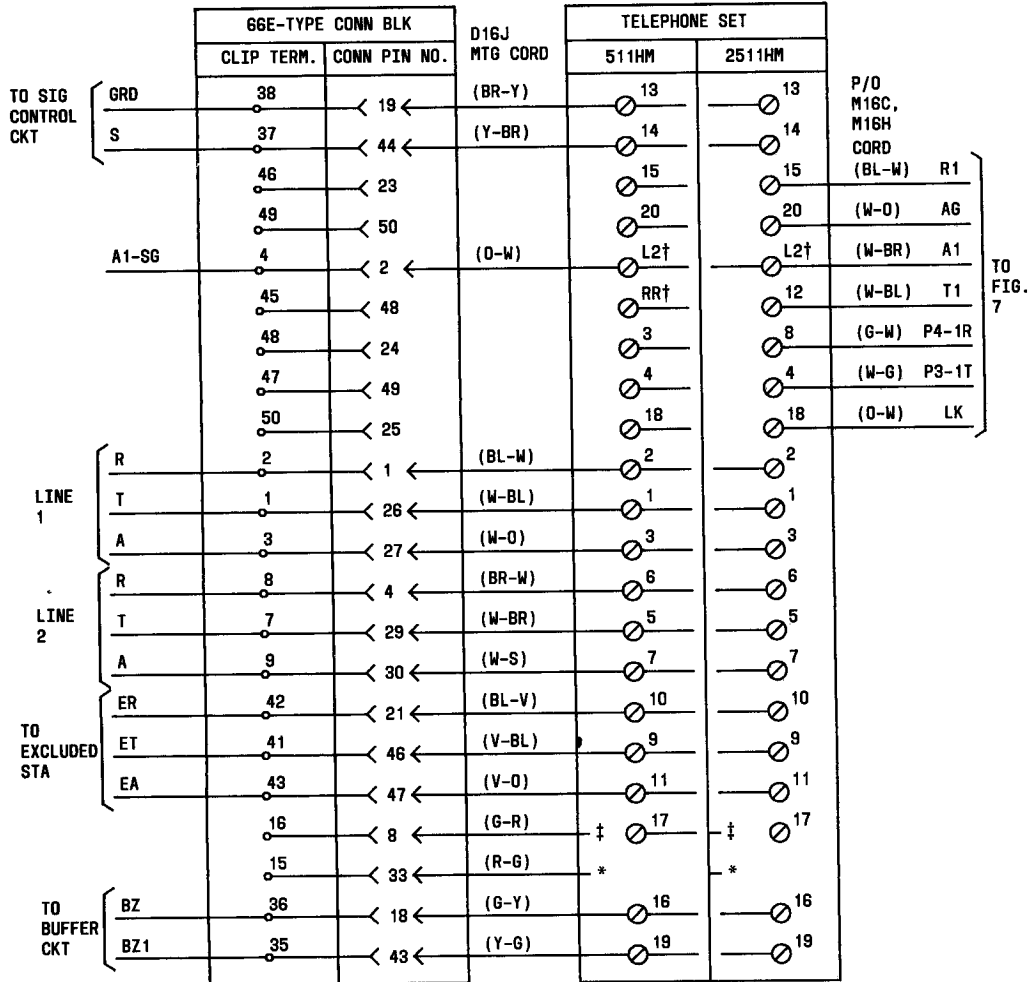


Fig. 5—511H and 2511H Telephone Set 2-Line Pickup With Exclusion on Line 1, Signaling, and 4A Speakerphone (Used With 1A1 or 1A2 KTS)†

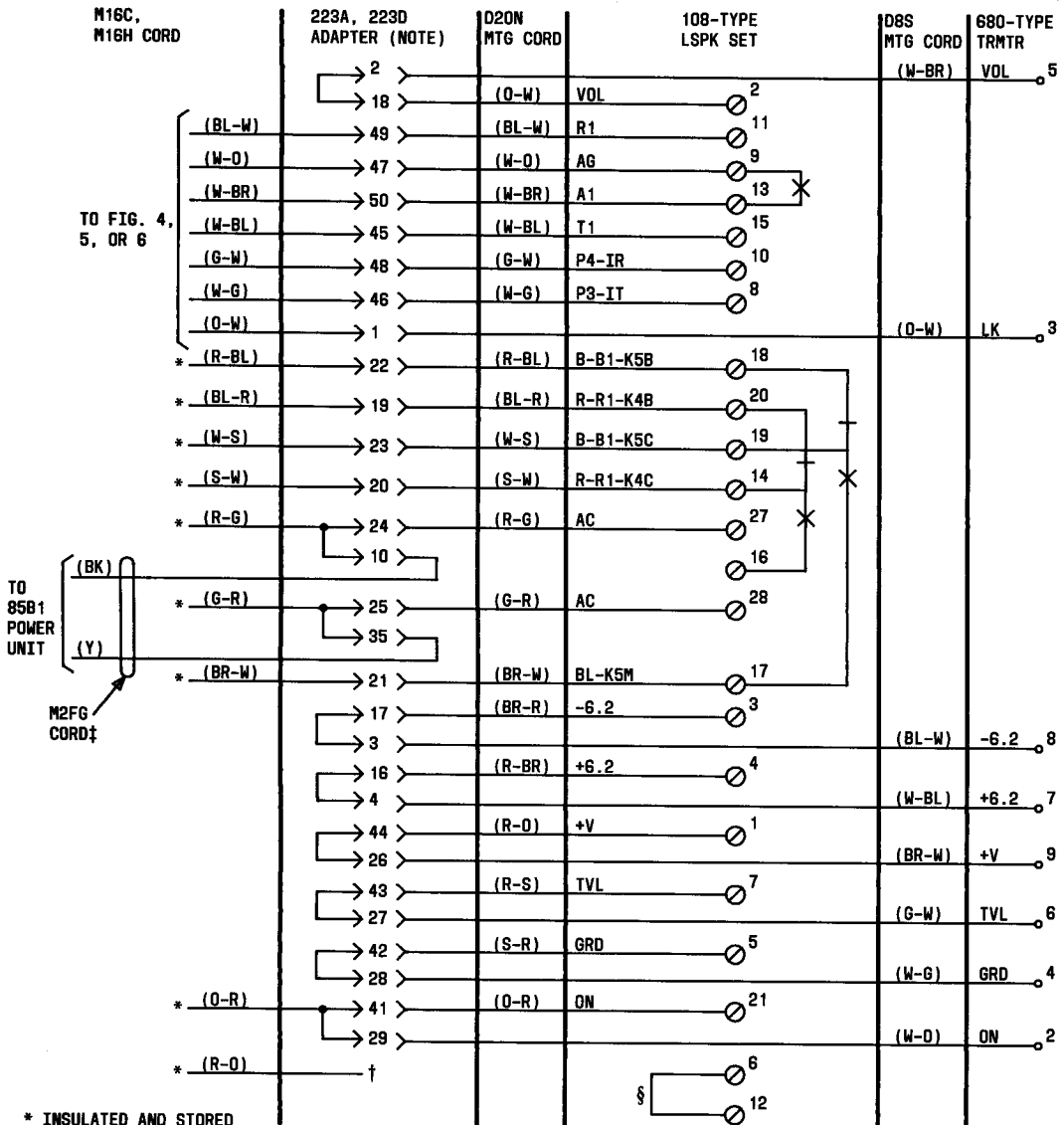


\* INSULATE AND STORE

† NETWORK TERMINAL

‡ INSULATED AND STORED IN SET. CONNECT TO TERMINAL NO. 17 WHEN SET IS USED WITH 1A KTS.

Fig. 6—511HM and 2511HM Telephone Set Connections, 2-Line Pickup With Exclusion on Line 1, Signaling, and 4A Speakerphone (Used With 1A1 or 1A2 KTS)¶



\* INSULATED AND STORED

† DEAD DRESSED

‡ (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD. ONLY (BK) AND (Y) CONDUCTORS ARE USED

§ STRAP APPEARS ON 108AA ONLY

NOTE: (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER

Fig. 7—4A Speakerphone Connections Using 223A (MD) or 223D Adapter

558D, 558F, 558FM, 2558D, AND 2558DM TELEPHONE SETS  
CONNECTIONS  
SPEAKERPHONE SYSTEM—4A

1. GENERAL

1.01 Refer to Section 512-700-100 for detailed information on the components of the 4A speakerphone system.

1.02 This section is reissued to:

- Add information to identify registered and typical grandfathered arrangements
- Add safety information for installing or removing the 85B1 power unit
- Add 223D adapter and M16H mounting cord
- Show 223A adapter and M16C mounting cord MD.

1.03 To provide 4A speakerphone feature at the 558- and 2558-type telephone sets, refer to Fig. 1 or 2 for layout arrangement of the components required for the system and Fig. 3, 4, 5, or 6 for individual lead connections.

2. CONNECTIONS

A. 223-Type Adapter

2.01 The cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power unit are installed in the proper receptacle of the 223A (MD) or 223D adapter. The cover must be fastened securely to assure proper mating of connectors.

B. 108-Type Loudspeaker Set

2.02 The loudspeaker set and transmitter must be placed a minimum of one foot apart.

C. 680-Type Transmitter

2.03 The transmitter must be placed at least two feet from transformer or any ac powered device.

D. 85B1 Power Unit

2.04 Power shall be supplied by connecting 85B1 power unit as shown in Fig. 1 or 2.

2.05 Use an ac power outlet (not under control of a switch) located as close as possible to the system being installed. A retaining clamp will be shipped with the power unit and should be mounted to the ac receptacle to hold power unit securely and to prevent accidental loss of power.

**Danger:** *For safety, securely attach a retaining clamp to ac outlet using outlet cover screw BEFORE attempting to install 85B1 power unit. When removing 85B1 power unit, always unplug the power unit completely from the outlet BEFORE attempting to remove the retaining clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs of the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamp on outlets where the cover mounting screw holds the duplex outlet in the box.*

**Warning:** *Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power source does not occur. If more than one power unit is*

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*plugged into a multiple receptacle power strip, there must be at least one inch separation between power units. Only UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.*

2.06 The M2FG cord is furnished as part of the 223-type adapter for connecting the 85B1 power unit.

2.07 The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for detailed information on power supply applications.

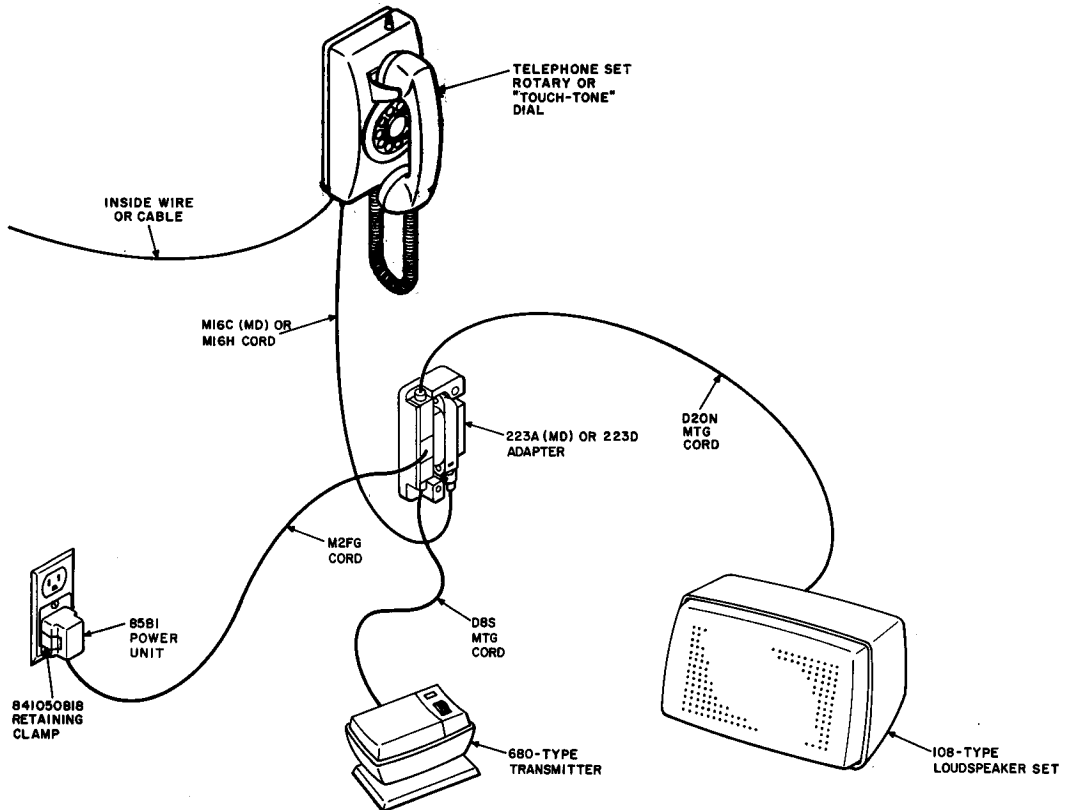


Fig. 1—Typical Grandfathered 4A Speakerphone System Arrangement, 558D, 558F, and 2558D Telephone Sets Using 223A (MD) or 223D Adapter

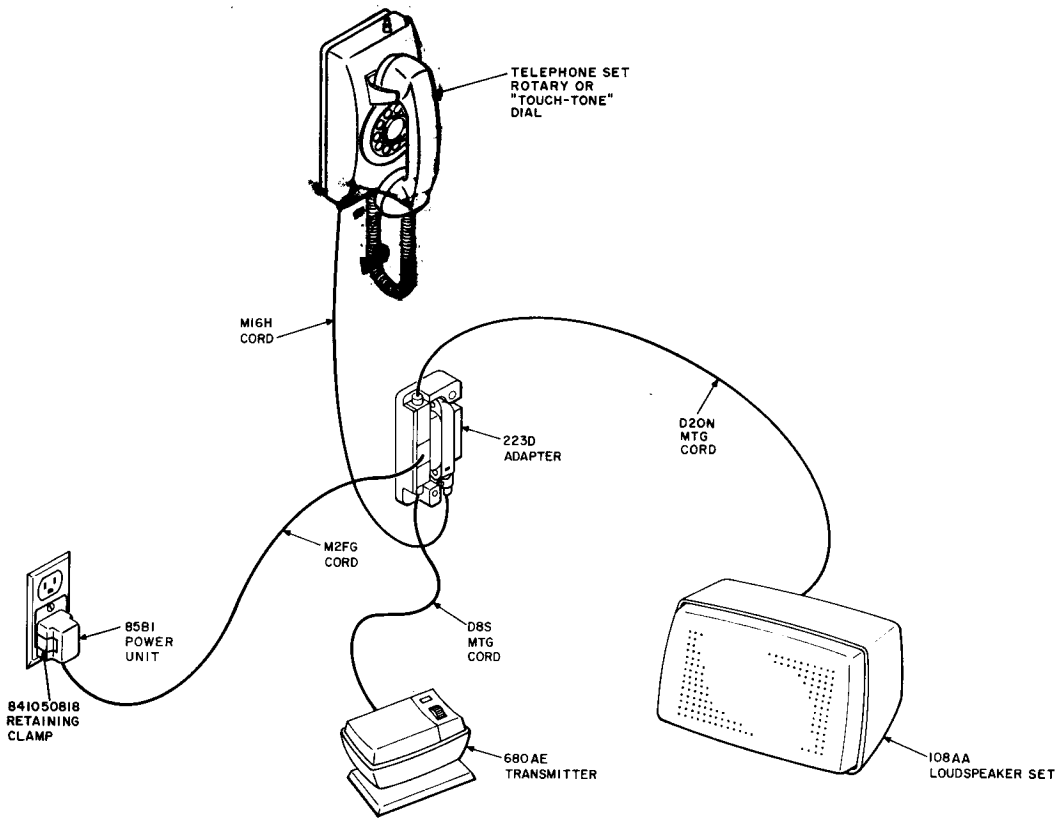


Fig. 2—Registered 4A Speakerphone System Arrangement, 558FM and 2558DM Telephone Sets Using 223D Adapter

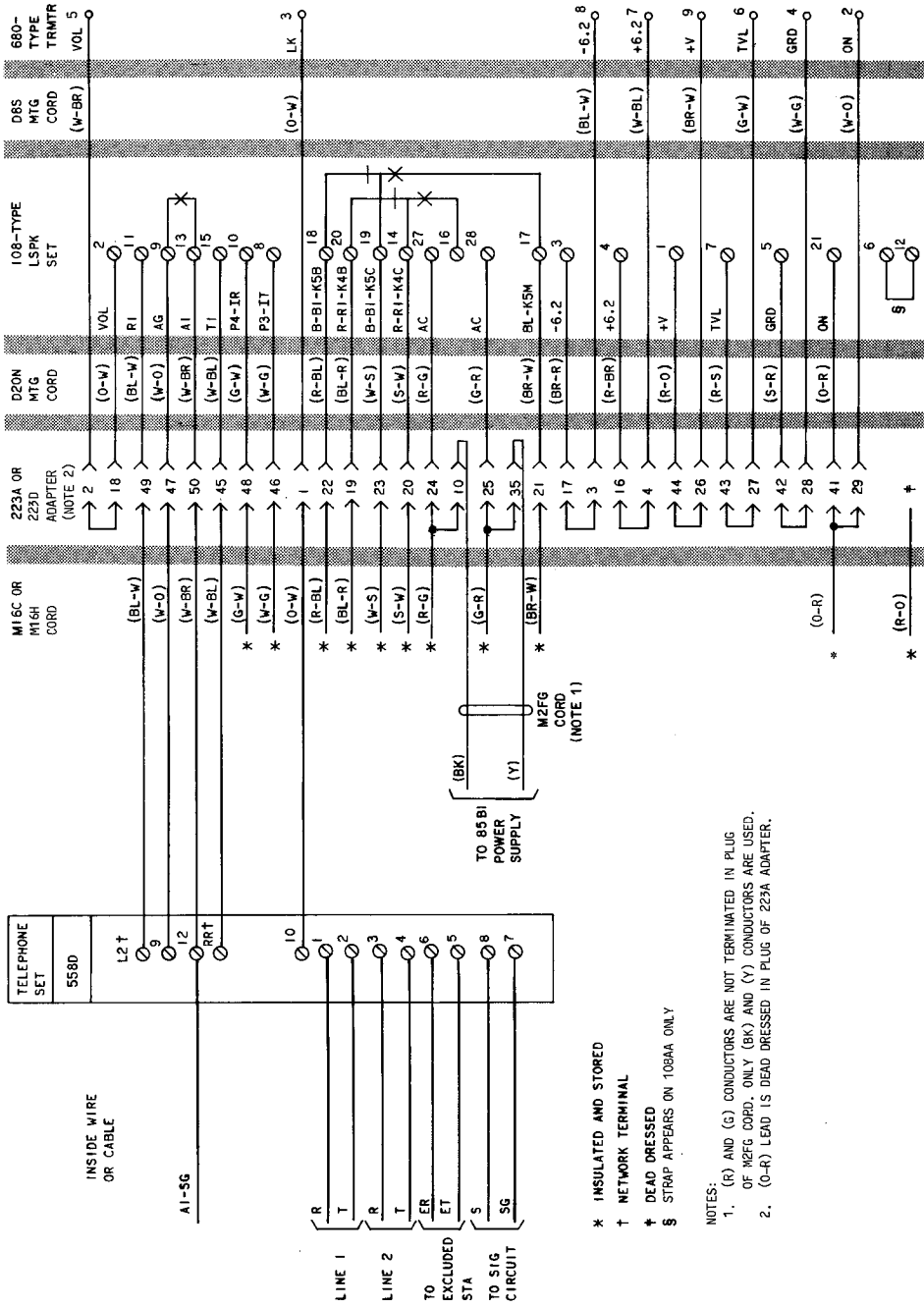
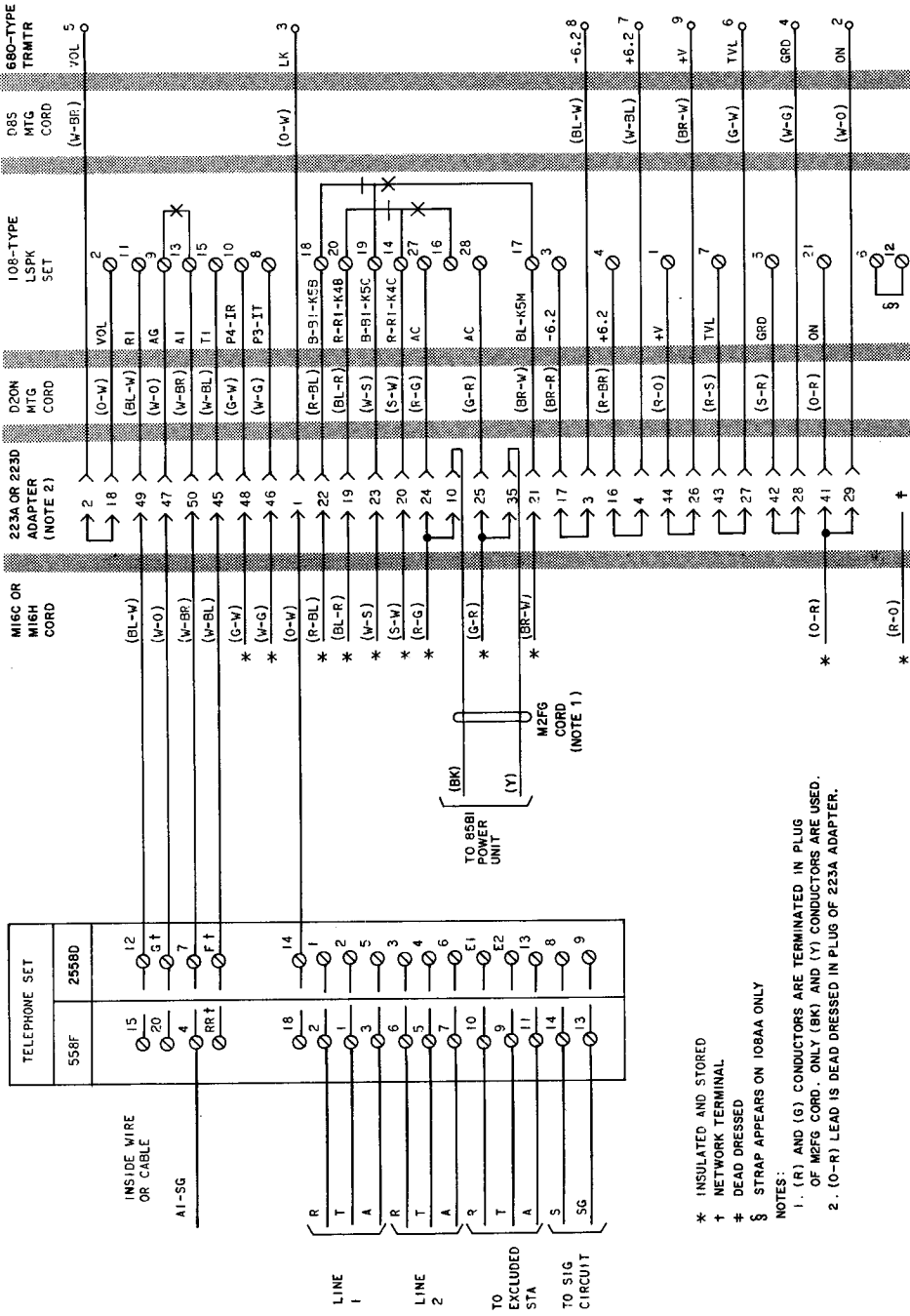


Fig. 3 — Typical Grandfathered 4A Speakerphone System Arrangement, Connections to 558D Telephone Set





- \* INSULATED AND STORED
  - † NETWORK TERMINAL
  - ‡ DEAD DRESSED
  - § STRAP APPEARS ON IOBAA ONLY
- NOTES:
1. (R) AND (G) CONDUCTORS ARE TERMINATED IN PLUG OF MZFG CORD. ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  2. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.

Fig. 4—Typical Grandfathered 4A Speakerphone System Arrangement, Connections to 558F and 2558D Telephone Sets

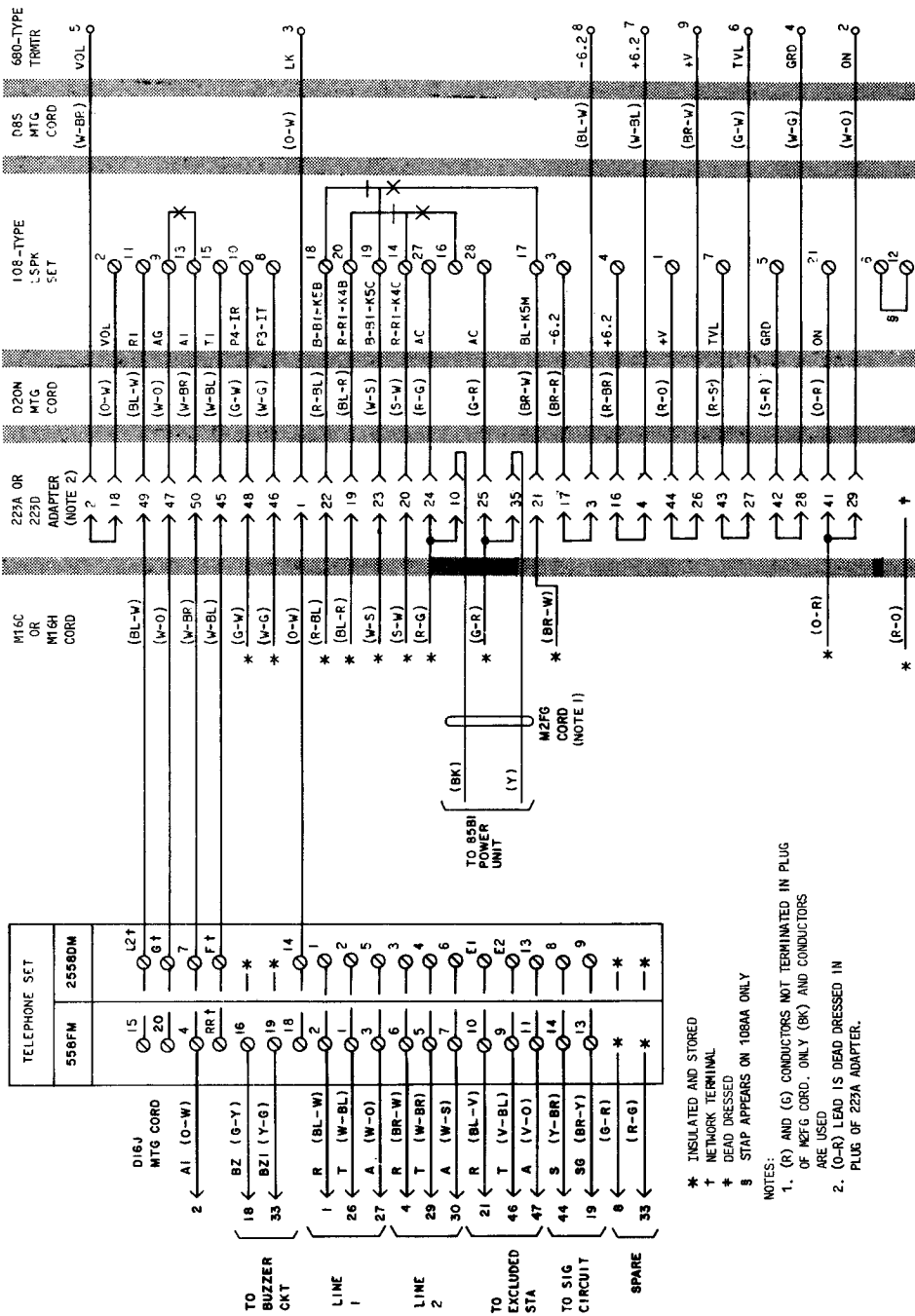


Fig. 5—Typical Grandfathered 4A Speakerphone System Arrangement, Connections to 558FM and 2558DM Telephone Sets†

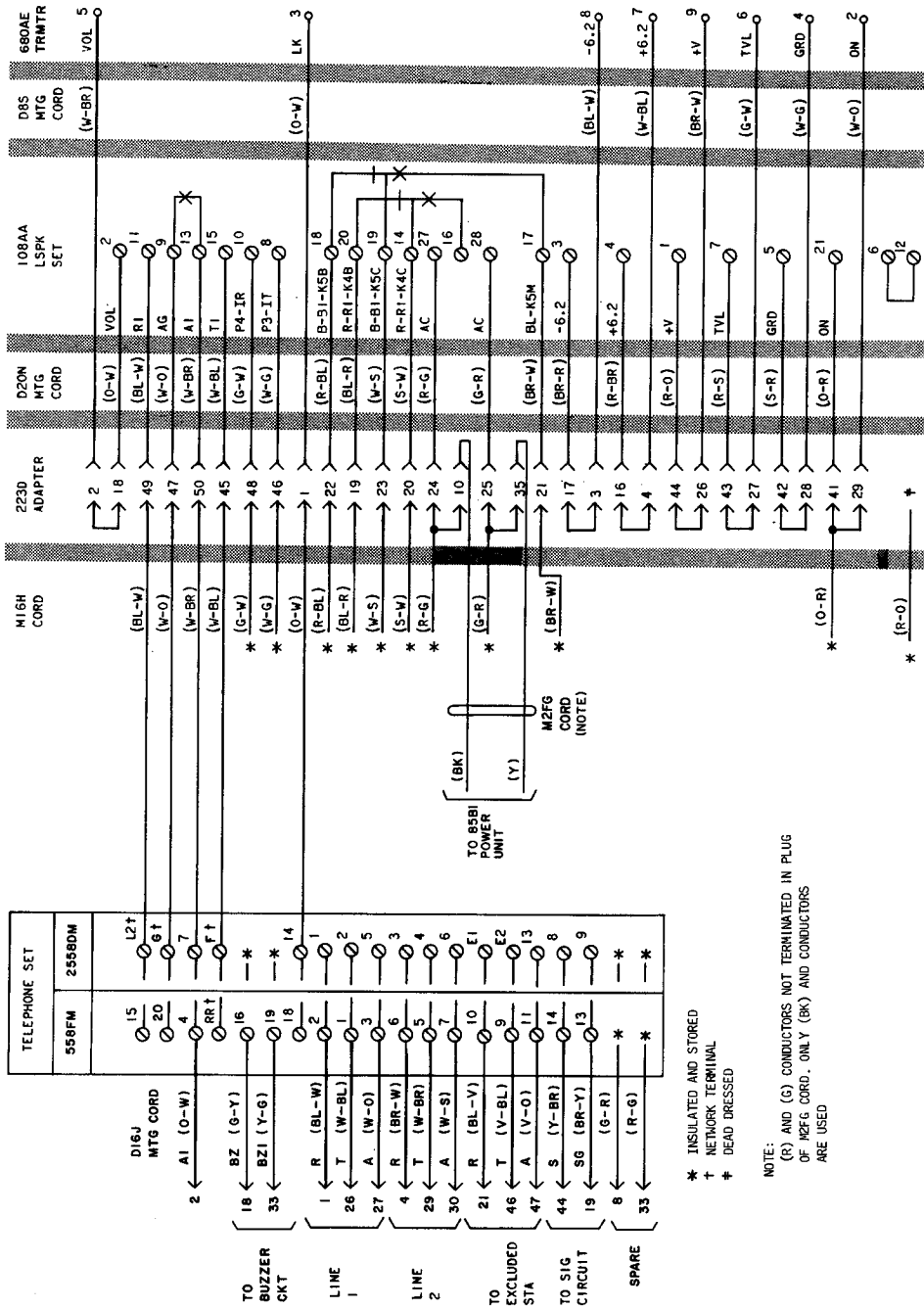


Fig. 6—Registered 4A Speakerphone System Arrangement, Connections to 558FM and 2558DM Telephone Sets

## 565- AND 2565-TYPE PLUG-ENDED TELEPHONE SETS

### CONNECTIONS

#### SPEAKERPHONE SYSTEM—4A

#### 1. GENERAL

1.01 Refer to Section 512-700-100 for detailed information on the components of the 4A speakerphone system.

1.02 This section is reissued to:

- Revise safety information for the 85B1 power unit
- Update information, Fig. 1, 4, and 5.

1.03 To provide speakerphone at stations supplied by connector cable, use an 82-type connecting block (Fig. 1A). Those stations supplied by inside wiring cable require a 66E3-25 or equivalent connecting block and 223A (MD) or 223D adapter (Fig. 1B).

#### 2. CONNECTIONS

##### A. 82-Type Connecting Block

2.01 The connector cable and cords from the telephone set, 108-type loudspeaker set, and 680-type transmitter are installed in the proper receptacles of the connecting block (Fig. 1A and 2). Cover must be fastened securely to assure proper mating of connectors.

2.02 The option plug furnished with 82-type connecting block (Fig. 3) must be positioned depending on services required. The arrow on the D20N mounting cord plug should point to the option selected on the option plug. "RING CUTOFF" provides cut off of the telephone set ringer through the loudspeaker relay contacts while on speakerphone (Fig. 3A). "AUX RELAY" provides a contact closure for operation of an auxiliary relay key telephone unit when it is desired to cut off several signals. The signal circuits must be wired through

the contacts of the auxiliary relay (Fig. 3B). The option plug should be in this position if no ringer cut off is desired. In this case the auxiliary relay is not required.

**Caution: Do not use (S-V) and (V-S) pair for any other purpose as it is designated for auxiliary relay operation only.**

##### B. 223A (MD) or 223D Adapter

2.03 The same options are available using the 223A or 223D adapter as with the 82-type connecting block. The 223D replaces the 223A which is MD. These adapters are interchangeable when used with the 565- or 2565-type telephone sets.

2.04 Cords from the loudspeaker set, transmitter, and power unit are plugged into the adapter (Fig. 1B). Cover must be fastened securely to assure proper mating of connectors. The telephone set mounting cord is plugged into the 66E3-25 connecting block (Fig. 1B). Access to speakerphone leads is obtained through the M16C (MD) or M16H cord, either in set (Fig. 4) or at the connecting block (Fig. 5). At the 66E3-25 connecting block, 161A adapters must be used to connect the spade tips of the M16C or M16H cord. Install the adapters as outlined in Section 461-604-100.

2.05 When the 565- or 2565-type telephone set is multiplied with sets furnishing speakerphone features, certain leads must be disconnected, insulated, and stored to avoid interference with working circuits. The designation of leads to be removed are as follows: T1 (V-G), R1 (G-V), P3 or IT (V-BR), P4 or IR (BR-V), AG (V-S), and LK (S-V).

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**C. 108-Type Loudspeaker Set**

**2.06** The loudspeaker set and transmitter must be a minimum of one foot apart to avoid feedback.

**D. 680-Type Transmitter**

**2.07** The transmitter must be at least two feet from transformer or any ac powered device to avoid noise in the transmitter.

**E. 85B1 Power Unit**

**2.08** Use an ac power outlet (not under control of a switch) located as close as possible to the system being installed. A retaining clamp (Fig. 1) will be shipped with the 85B1 power unit and should be mounted to the ac receptacle to hold power unit securely to prevent accidental loss of power.

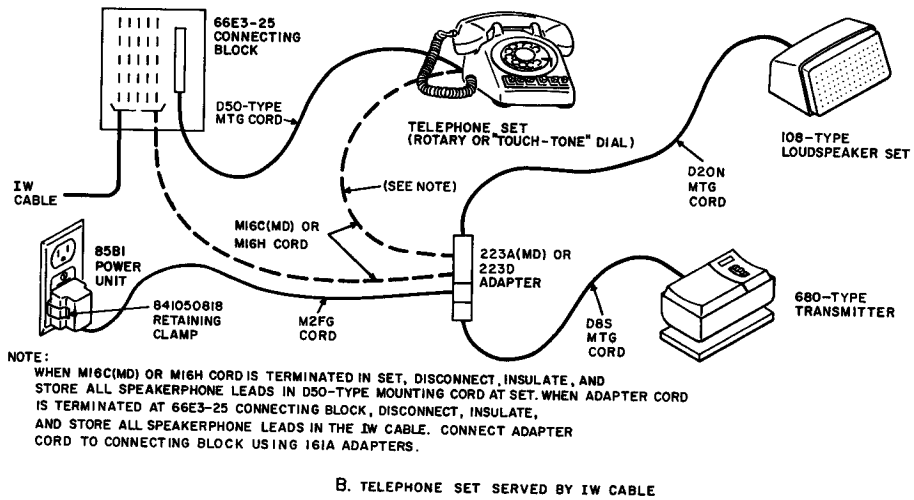
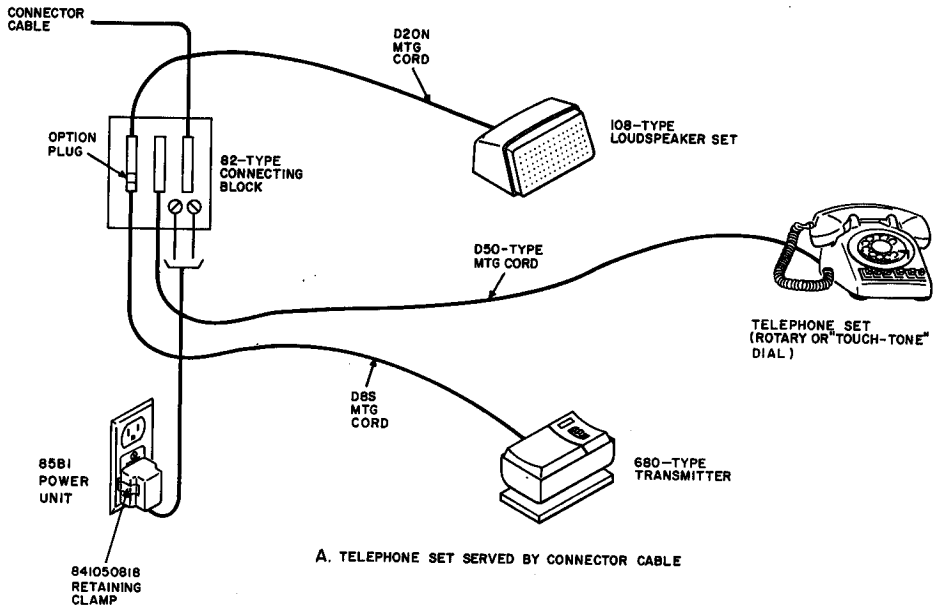
**2.09** Power can be supplied by making connections as shown in Fig. 1, 2, 4, or 5.

**2.10** The M2FG cord is furnished as part of the 223A or 223D adapter for connecting the 85B1 power unit.

**2.11** The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or less than 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for detailed information on power supply applications.

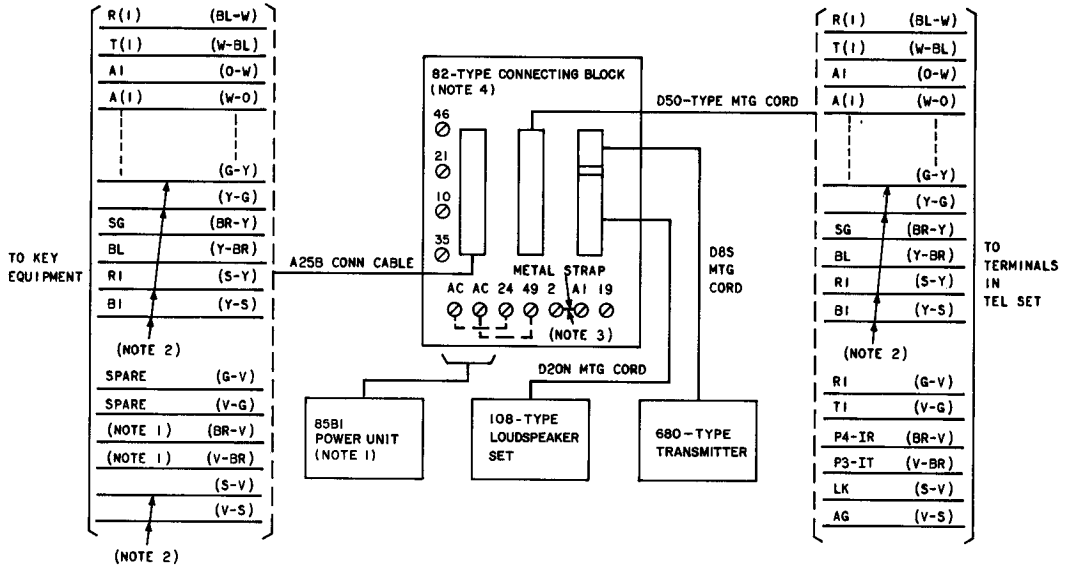
**Danger:** For safety, securely attach retaining clamp to ac outlet using outlet cover screw **BEFORE** attempting to install 85B1 power unit. The power unit and any other cord plugged into the ac outlet should always be unplugged completely from outlet **BEFORE** attempting to attach or remove the clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs of the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamps on outlets where the cover mounting screw holds the duplex outlet in the box.

**Warning:** Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power source does not occur. If more than one power unit is plugged into a multiple receptacle power strip, there must be at least one inch separation between power units. Only UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.



NOTE:  
 WHEN M16C(MD) OR M16H CORD IS TERMINATED IN SET, DISCONNECT, INSULATE, AND STORE ALL SPEAKERPHONE LEADS IN D50-TYPE MOUNTING CORD AT SET. WHEN ADAPTER CORD IS TERMINATED AT 66E3-25 CONNECTING BLOCK, DISCONNECT, INSULATE, AND STORE ALL SPEAKERPHONE LEADS IN THE IW CABLE. CONNECT ADAPTER CORD TO CONNECTING BLOCK USING 161A ADAPTERS.

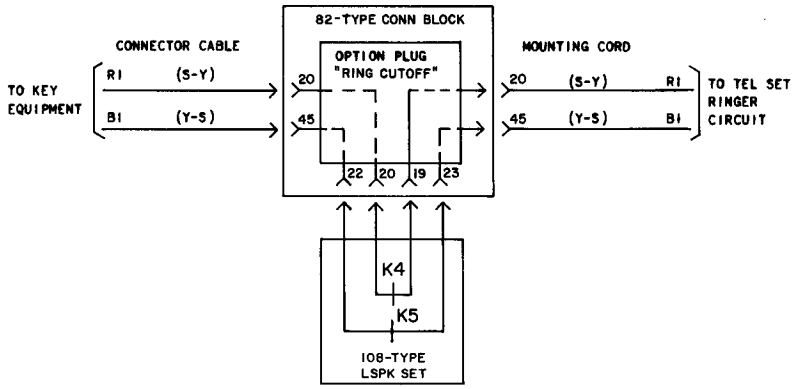
Fig. 1—4A Speakerphone Arrangements, 6-Button Key Telephone Set



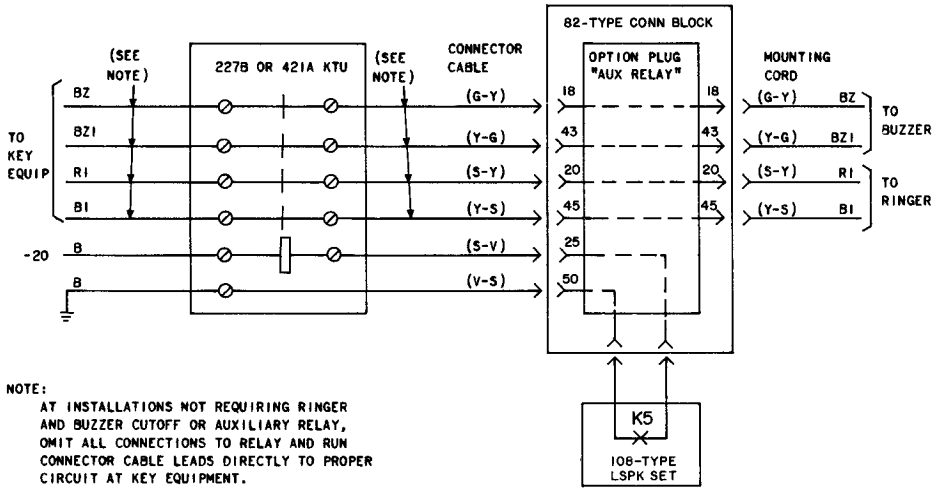
NOTES:

1. LEADS FROM POWER UNIT MAY BE CONNECTED DIRECTLY TO 82-TYPE CONNECTING BLOCK OR FED THROUGH CONNECTOR CABLE USING (BR-V) AND (V-BR) LEADS. IF CONNECTOR CABLE IS USED, STRAP TERMINAL 24 TO ONE OF AC TERMINALS AND 49 TO OTHER AT 82-TYPE CONNECTING BLOCK.
2. LEADS INVOLVED IN OPTIONS. SEE FIG. 3.
3. METAL STRAP FACTORY WIRED FOR IA1/IA2 KTS (A1-2). MOVE TO TERMINAL 19 FOR IA KTS (A1-19), ONLY WHEN BUSY LAMP OPTION IS PROVIDED.
4. TERMINALS 10, 21, 35 AND 46 ON 82B CONNECTING BLOCK ONLY.

Fig. 2—4A Speakerphone Connections Using 82A (MD) or 82B Connecting Block



A. RINGER CUTOFF OPTION

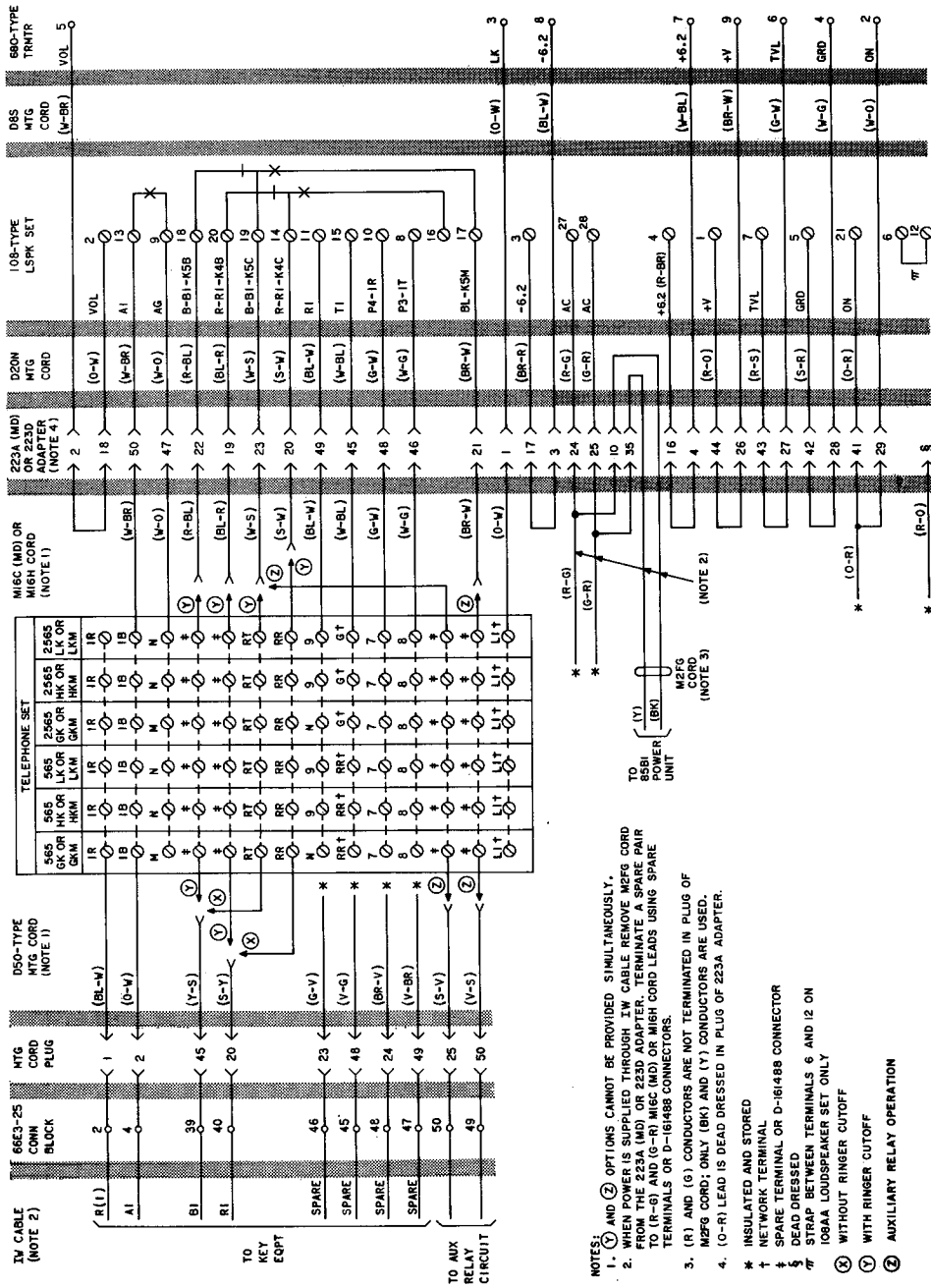


NOTE:  
 AT INSTALLATIONS NOT REQUIRING RINGER  
 AND BUZZER CUTOFF OR AUXILIARY RELAY,  
 OMIT ALL CONNECTIONS TO RELAY AND RUN  
 CONNECTOR CABLE LEADS DIRECTLY TO PROPER  
 CIRCUIT AT KEY EQUIPMENT.

B. AUXILIARY RELAY OPTION

Fig. 3—Wiring Involved in Options at 82A (MD) or 82B Connecting Block





- NOTES:
- ① AND ② OPTIONS CANNOT BE PROVIDED SIMULTANEOUSLY.
  - WHEN POWER IS SUPPLIED THROUGH IW CABLE REMOVE M2FG CORD FROM THE 223A (MD) OR 223D ADAPTER. TERMINATE A SPARE PAIR TO (R-G) AND (G-R) MIBC (MD) OR MICH CORD LEADS USING SPARE TERMINALS OR D-161488 CONNECTORS.
  - (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  - (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.
- \* INSULATED AND STORED
  - † NETWORK TERMINAL
  - ‡ SPARE TERMINAL OR D-161488 CONNECTOR
  - § DEAD DRESSED
  - ¶ STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUSPEAKER SET ONLY
  - Ⓢ WITHOUT RINGER CUTOFF
  - Ⓣ WITH RINGER CUTOFF
  - Ⓤ AUXILIARY RELAY OPERATION

Fig. 4-44A Speakerphone Connections, 223-Type Adapter Terminated in Set

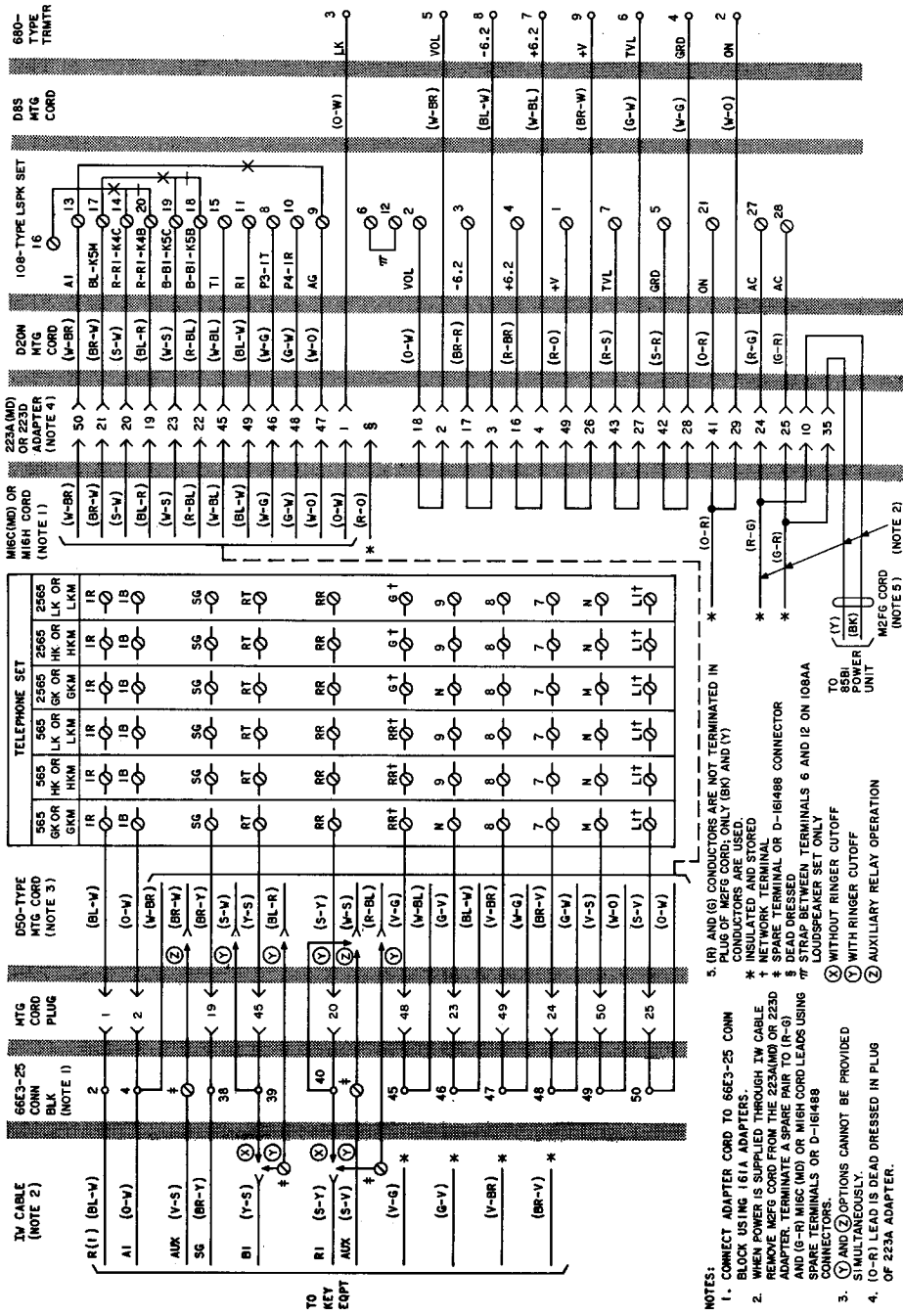


Fig. 5—44A Speakerphone Connections, 223-Type Adapter Terminated at 66E3-25 Connecting Block

- NOTES:
1. CONNECT ADAPTER CORD TO 66E3-25 CONN PLUG USING 161A ADAPTERS.
  2. WHEN POWER IS SUPPLIED THROUGH TW CABLE REMOVE MFGS CORD FROM THE 223A(MD) OR 223D ADAPTER. TERMINATE A SPARE PAIR TO (R-G) AND (G-R) MISC (MD) OR MICH CORD LEADS USING SPARE TERMINALS OR D-161488 CONNECTORS.
  3. (1) AND (2) OPTIONS CANNOT BE PROVIDED SIMULTANEOUSLY.
  4. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.
5. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF MFGS CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.

\* INSULATED AND STORED

† NETWORK TERMINAL

‡ SPARE TERMINAL OR D-161488 CONNECTOR

§ DEAD DRESSED

¶ STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUDSPEAKER SET ONLY

ⓧ WITHOUT RINGER CUTOFF

ⓞ WITH RINGER CUTOFF

Ⓣ AUXILIARY RELAY OPERATION

## 566MD AND 566MDM TELEPHONE SET CONNECTIONS SPEAKERPHONE SYSTEM—4A

### 1. GENERAL

1.01 This section contains information for the 566MD (MD) and 566MDM telephone set working with a 755A PBX to provide 4A speakerphone service.

1.02 This section is reissued to:

- Add safety information for the 85B1 power unit
- Revise Fig. 1 and 2
- Show 227A KTU MD
- Add 227B KTU.

1.03 For detailed information on the components of the 4A speakerphone system, refer to Section 512-700-100.

1.04 To provide speakerphone, a 66E3-25 or equivalent connecting block and a 223A (MD) or 223D adapter (Fig. 1) is required.

### 2. CONNECTIONS

#### A. 223A (MD) or 223D Adapter

2.01 Cords from the loudspeaker set, transmitter and power unit are plugged into the adapter (Fig. 1). Adapter cover must be fastened securely to assure proper mating of connectors. The telephone set mounting cord is plugged into the 66E3-25 connecting block (Fig. 1). Access to the speakerphone leads is obtained through the M16C (MD) or M16H cord at the connecting block. At the 66E3-25 connecting block, 161A adapters must be used to connect the spade tips of the M16C or M16H cord. Install the adapters as outlined in Section 461-604-100.

#### B. 108-Type Loudspeaker Set

2.02 Loudspeaker set and transmitter must be a minimum of one foot apart, to avoid feedback.

#### C. 680-Type Transmitter

2.03 Transmitter must be at least two feet from transformer or any ac power device to avoid noise in the transmitter.

#### D. 85B1 Power Unit

2.05 Use an ac power outlet (not under control of a switch) located as close as possible to the system being installed. A retaining clamp (Fig. 1) will be shipped with the 85B1 power unit and should be mounted to the ac receptacle to hold power unit securely to prevent accidental loss of power.

2.06 Power can be supplied by making connections as shown in Fig. 2.

2.07 The M2FG cord is furnished as part of the 223-type adapter for connecting the 85B1 power unit.

2.08 The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or less than 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for details on power supply information.

***Danger: ♦For safety, securely attach retaining clamp to ac outlet using outlet cover screw before attempting to install 85B1 power unit. The power unit and any other cord plugged into the ac outlet should always be unplugged completely from outlet before attempting to attach or remove***

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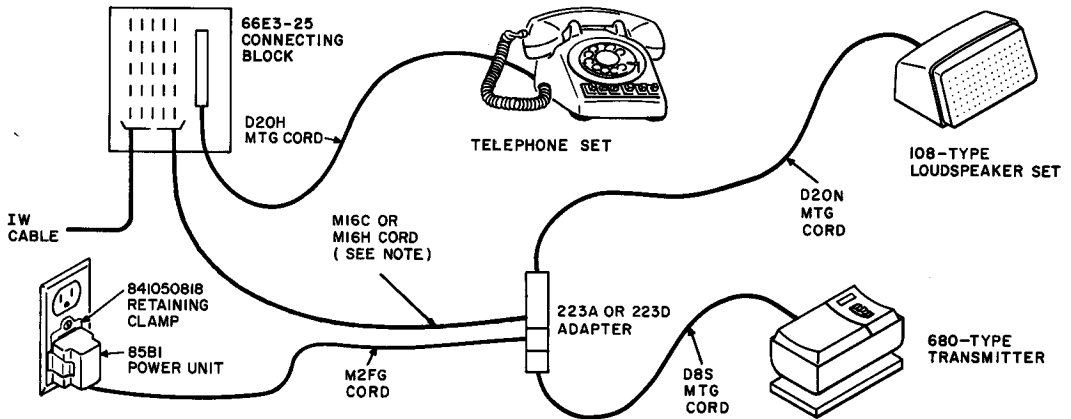
*the clamp. This will prevent the possibility of a loosened retainer clamp on metallic outlet cover making contact with the ac prongs on the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamp on outlets where center mounting screw holds the duplex outlet in the box.*

**Warning:** *⚡Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power source does not occur. If more than one power unit is plugged into a multiple receptacle*

*power strip, there must be at least one inch separation between power units. Only UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.*

**E. 227A (MD) or 227B Key Telephone Unit (KTU)**

**2.09** The 227A (MD) or 227B KTU controlled by the station set switchhook or the speakerphone relay provides switchhook functions for the telephone set or speakerphone, and can also provide for station busy lamp control as required.



NOTE:  
 DISCONNECT, INSULATE, AND STORE ALL SPEAKERPHONE LEADS  
 IN THE IW CABLE. CONNECT M16C OR M16H CORD TO  
 CONNECTING BLOCK USING 161A ADAPTERS.

Fig. 1—4A Speakerphone System Arrangement 566MD (MD) or 566MDM Key Telephone Set Using 223A (MD) or 223D Adapter

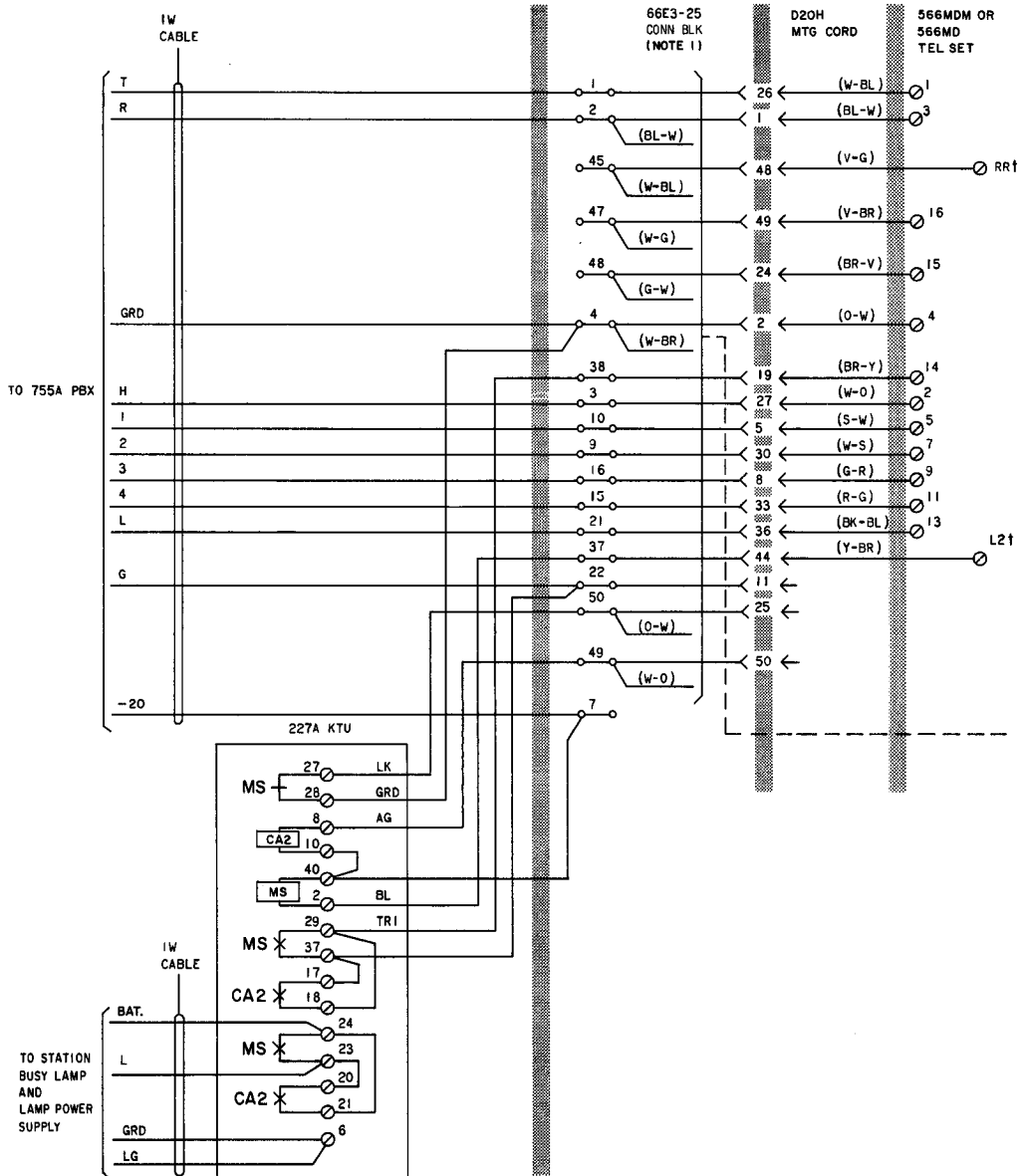
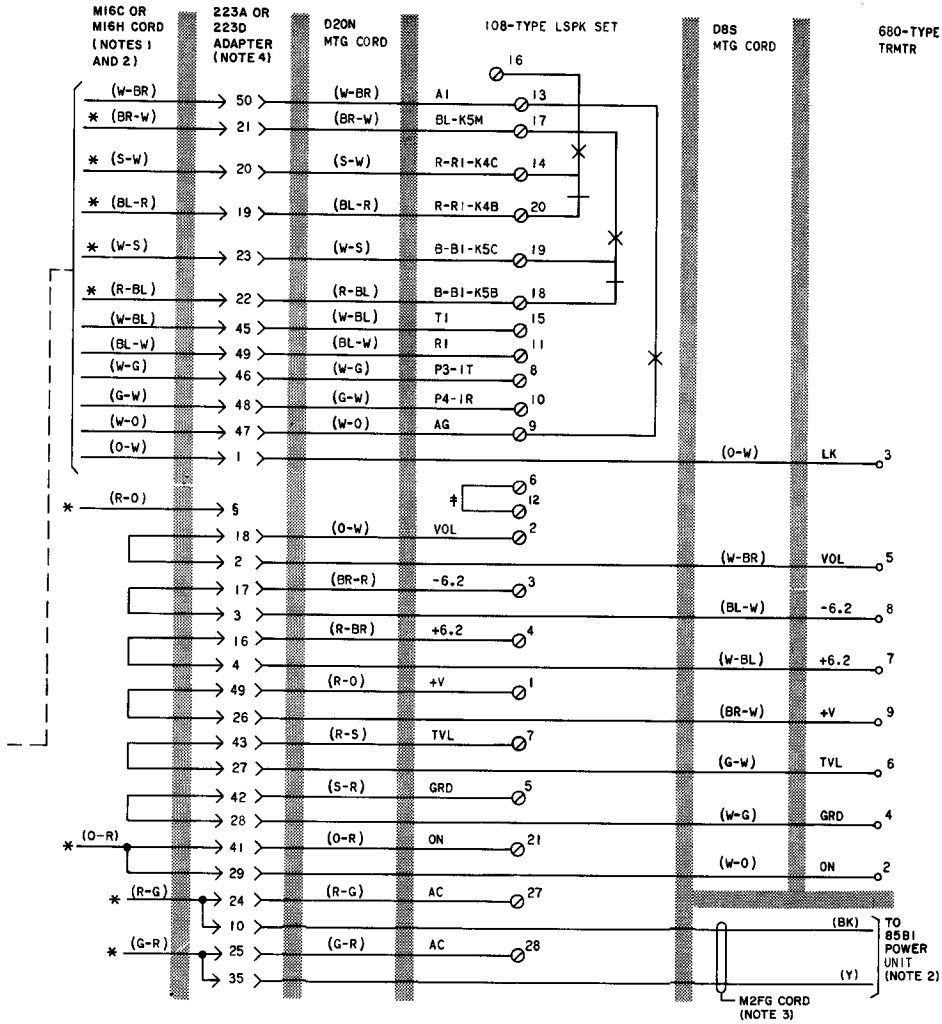


Fig. 2—4A Speakerphone System Arrangement, Connections to 566MD (MD) or 566MDM Telephone Set With 755A PBX (Sheet 1 of 2)



NOTES:

1. CONNECT ADAPTER CORD TO 66E3-25 CONN BLOCK USING 161A ADAPTERS.
  2. WHEN POWER IS SUPPLIED FROM KEY EQUIPMENT CONNECT BUZZER PAIR (Y-O), (O-Y) TO (R-G), (G-R) LEADS IN M16C OR M16H CORD USING SPARE TERMINALS OR D-1614BB CONNECTORS. BE SURE TO DISCONNECT BUZZER AND REMOVE M2FG CORD FROM 223A OR 223D ADAPTER.
  3. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  4. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.
- \* INSULATED AND STORED  
 + NETWORK TERMINAL  
 † STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUDSPEAKER SET ONLY.  
 § DEAD DRESSED

Fig. 2—4A Speakerphone System Arrangement, Connections to 566MD (MD) or 566MDM Telephone Set With 755A PBX (Sheet 2 of 2)

630-, 631-, 632-, 634-, 635-, 2630-, 2631-, 2632-,  
2634-, AND 2635-TYPE TELEPHONE SETS  
CONNECTIONS  
SPEAKERPHONE SYSTEM—4A

1. GENERAL

1.01 This section contains information for using 630-, 631-, 632-, 634-, 635-, 2630-, 2631-, 2632-, 2634-, and 2635-type telephone sets with the 4A speakerphone system.

1.02 This section is reissued to:

- Add 223D adapter and M16H cord
- Show 223A adapter and M16C cord MD
- Add safety information for the 85B1 power unit.

1.03 Refer to Section 512-700-100 for detailed information on the components of the 4A speakerphone system.

1.04 To provide 4A speakerphone feature at these CALL DIRECTOR® stations, refer to Fig. 1 for connector cable and plug-ended mounting cord connection arrangements and Fig. 2, 3, 4, or 5 for individual lead connections of the components required for the system.

1.05 Rotary telephone sets equipped with an 8R or 8RA dial must be equipped with 8C or 8CA dial when used with 4A speakerphone. The second set of off-normal contacts on 8C or 8CA dial shall connect to the same terminals as P3 and P4 leads from the speakerphone.

2. CONNECTIONS

A. 223-Type Adapter

2.01 The cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power

unit are installed in the proper receptacle of the 223A (MD) or 223D adapter. The cover must be fastened securely to assure proper mating of connectors.

2.02 These CALL DIRECTOR sets can be wired for *Ringer Cutoff* (Fig. 2, 3, 4, or 5). Ringer cutoff feature provides for cutting the telephone set ringer off through relay contacts located in the loudspeaker set while on speakerphone.

2.03 *Auxiliary Relay* feature (Fig. 2, 3, or 4) provides a relay contact closure for operation of an auxiliary relay key telephone unit when it is desired to cut off several signals. The signal circuits must be wired through the contacts of the auxiliary relay. *Auxiliary Relay* feature cannot be provided in the 634-, 635-, 2634-, and 2635-type telephone sets due to insufficient mounting cord conductors.

2.04 When these telephone sets are multipled with sets furnishing speakerphone features, certain leads must be disconnected, insulated, and stored to avoid interference with working circuits. The designation of leads to be removed are as follows: T1 (V-G), R1 (G-V), P3 or IT (V-BR), P4 or IR (BR-V), AG (V-S), and LK (S-V).

B. 108-Type Loudspeaker Set

2.05 The loudspeaker set and transmitter must be a minimum of one foot apart.

C. 680-Type Transmitter

2.06 The transmitter must be at least two feet from transformer or any ac powered device.

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D. 85B1 Power Unit

2.07 Power can be supplied by connecting 85B1 power unit as shown in Fig. 1, 2, 3, 4, and 5.

2.08 The M2FG cord is furnished as part of the 223A(MD) or 223D adapter for connecting the 85B1 power unit.

2.09 Use an ac power outlet (not under control of a switch) located as close as possible to the system being installed. An 841050818 retaining clamp will be shipped with the 85B1 power unit and should be mounted to the ac receptacle to hold power unit securely.

**Danger:** For safety, securely attach retaining clamp to ac outlet using outlet cover screw BEFORE attempting to install 85B1 power unit. The power unit and any other cord plugged into the ac outlet should always be unplugged completely from outlet BEFORE attempting to attach or remove the retaining clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs of the 85B1 power unit when partially

withdrawn from outlet. Do not use retaining clamp on outlets where the cover mounting screw holds the duplex outlet in the box.

**Warning:** Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power source does not occur. If more than one power unit is plugged into a multiple receptacle power strip, there must be at least one inch separation between power units. Only UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.

2.10 The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or less than 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for detailed information on power supply applications.

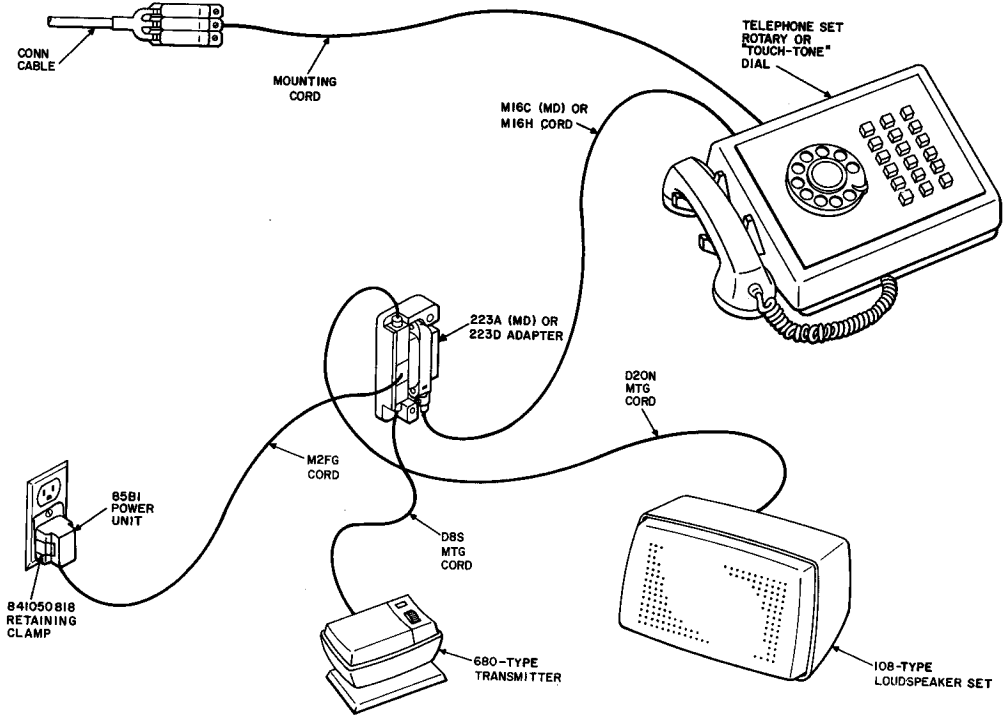
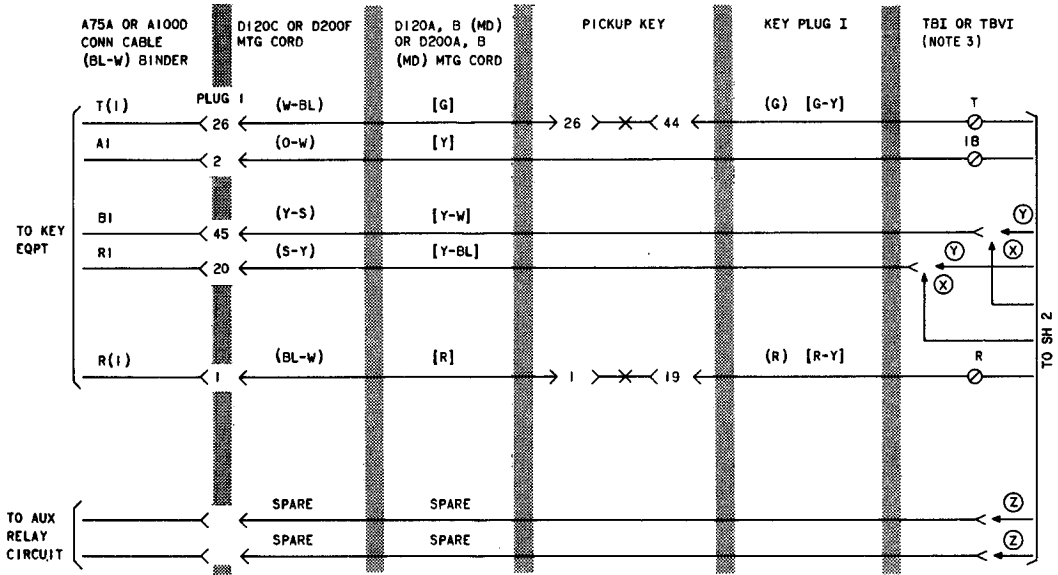


Fig. 1—4A Speakerphone System Arrangement, CALL DIRECTOR Telephone Sets Using 223A (MD) or 223D Adapter



NOTES:

1. SINGLE LETTER CODED TELEPHONE SETS ARE MD
2. WHEN POWER IS SUPPLIED VIA A SPARE PAIR IN CONNECTOR CABLE AND SET MOUNTING CORD, CONNECT THAT PAIR TO THE (R-G) AND (G-R) LEADS IN ADAPTER CORD USING SPARE TERMINALS OR D-161488 CONNECTORS AND REMOVE M2FG PLUG FROM THE ADAPTER.
3. (Y) AND (Z) OPTIONS CANNOT BE PROVIDED SIMULTANEOUSLY.
4. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
5. THE 223A(MD) OR 223D ADAPTER CONSISTS OF A M16C(MD) OR M16H CORD, M2FG CORD, AND A PLASTIC COVER AND BASE. THE PLUG OF THE ADAPTER CORD INTERCONNECTS THE M2FG, DBS, AND D20N CORD CONNECTORS.
6. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A (MD) ADAPTER

- (X) WITHOUT RINGER CUTOFF
- (Y) WITH RINGER CUTOFF
- (Z) AUXILIARY RELAY OPERATION

- \* INSULATED AND STORED
- † NETWORK TERMINAL
- ‡ SPARE TERMINAL OR D-161488 CONNECTOR
- § DIAL TERMINAL
- ¶ DEAD DRESSED
- \*\* STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUDSPEAKER SET ONLY.

Fig. 2—4A Speakerphone System Arrangement, Connections to 630A, B, C, D; 631A, B, C, D; 2630D; or 2631D Telephone Set (Sheet 1 of 2)

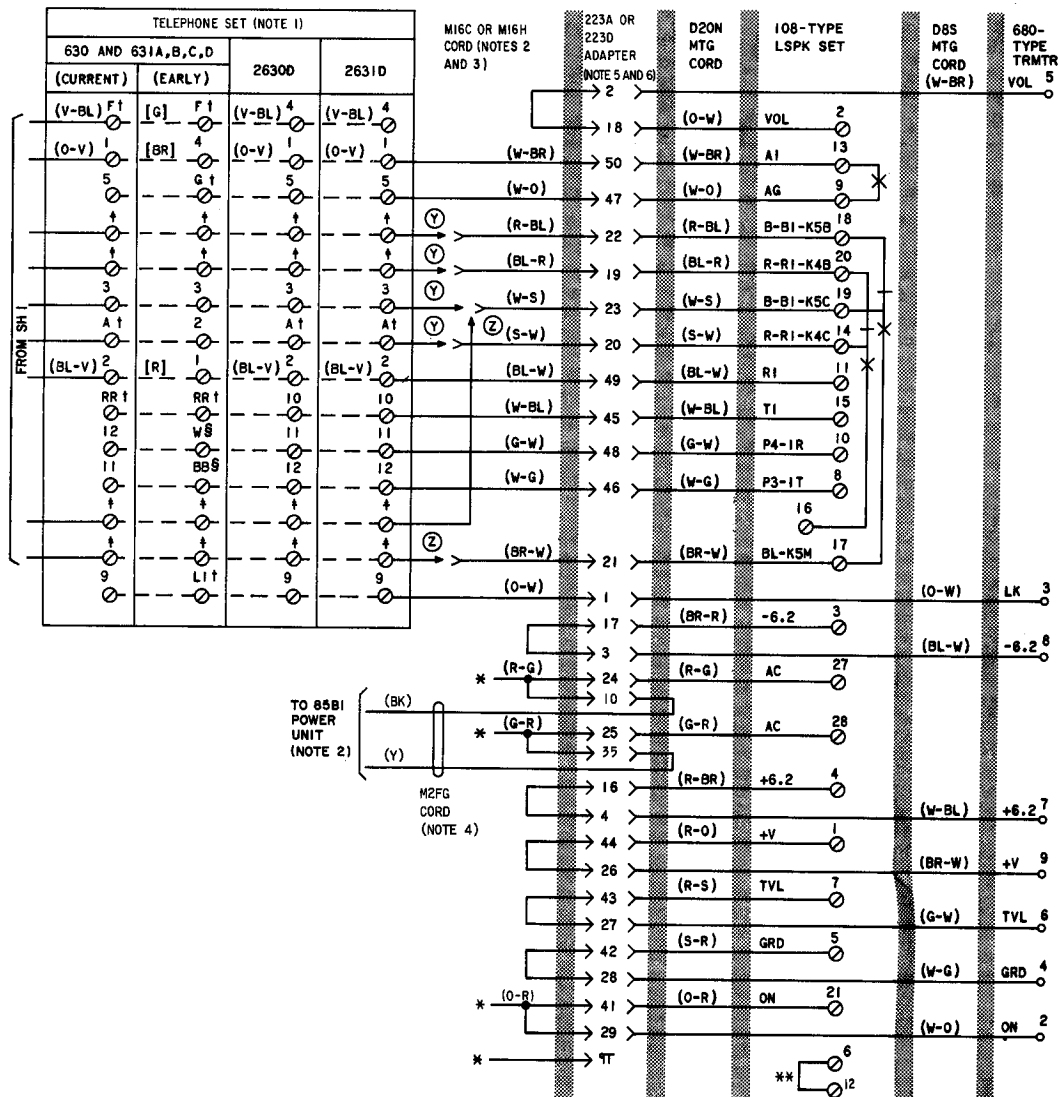
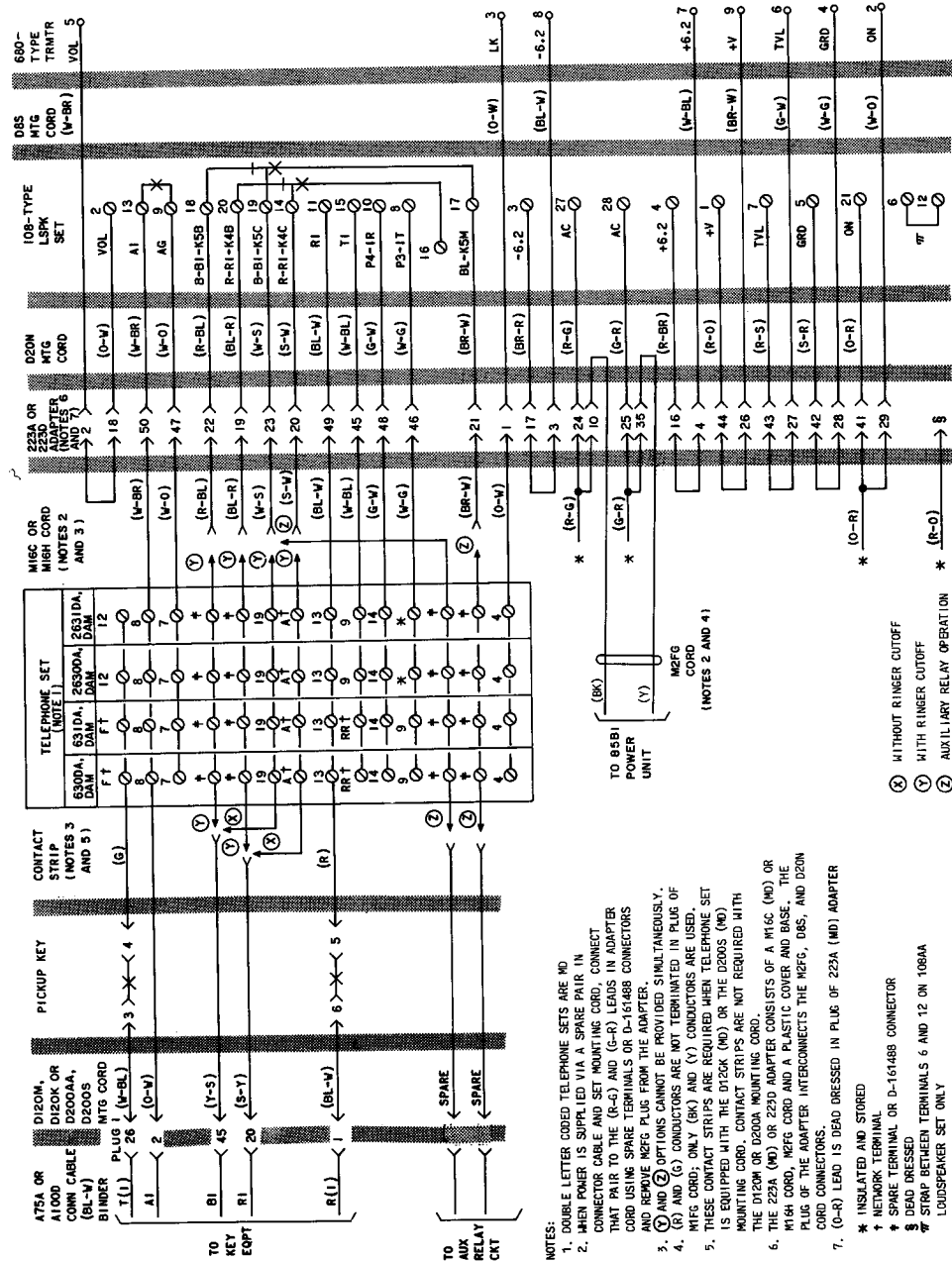


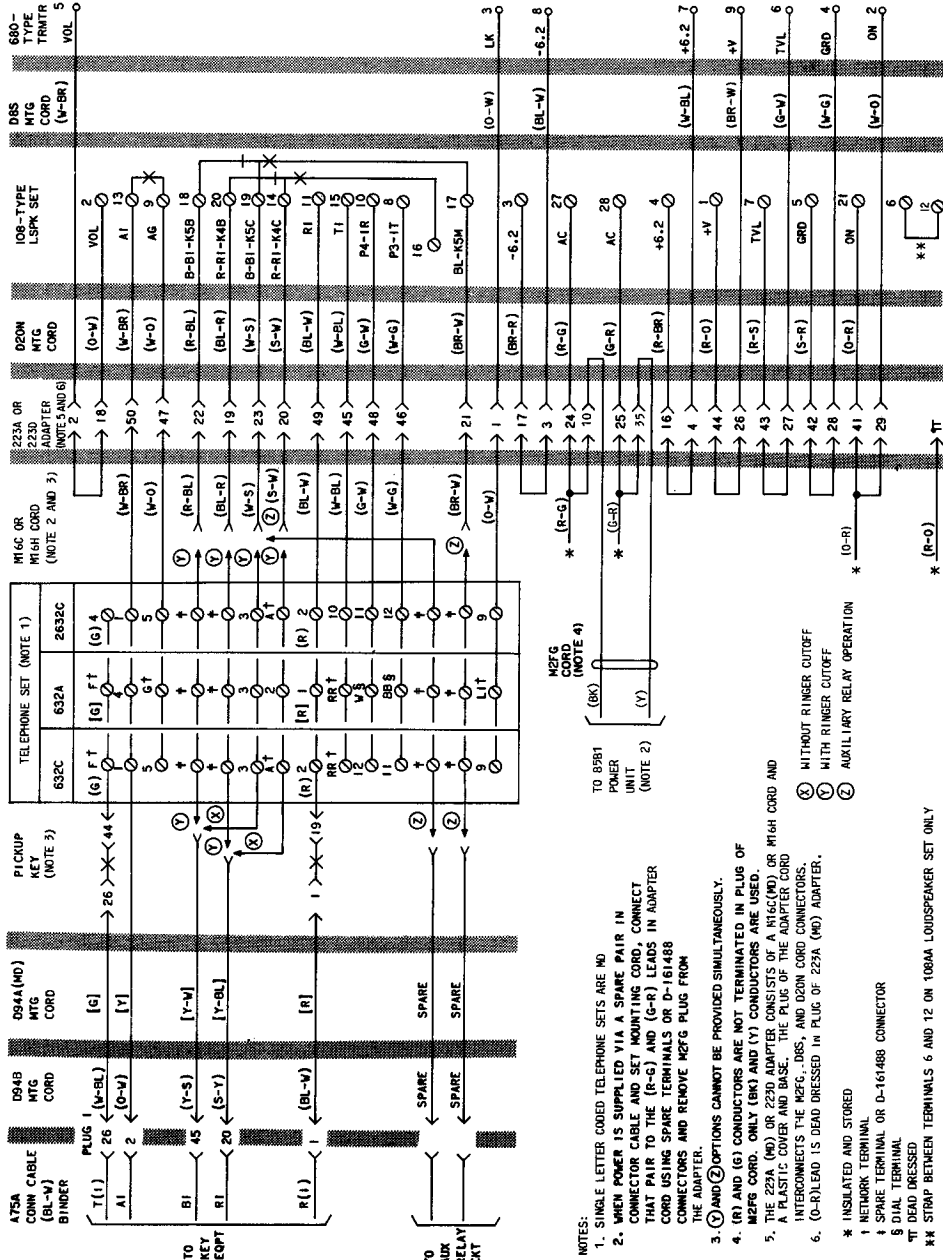
Fig. 2—4A Speakerphone System Arrangement, Connections to 630A, B, C, D; 631A, B, C, D; 2630D; or 2631D Telephone Set (Sheet 2 of 2)¶



- NOTES:
1. DOUBLE LETTER CODED TELEPHONE SETS ARE MD
  2. WHEN POWER IS SUPPLIED VIA A SPARE PAIR IN CONNECTOR CABLE AND SET MOUNTING CORD, CONNECT THAT PAIR TO THE (R-G) AND (G-R) LEADS IN ADAPTER CORD USING SPARE TERMINALS OR D-161488 CONNECTORS AND REMOVE M2FG PLUS FROM THE ADAPTER.
  3. (X) AND (Z) OPTIONS CANNOT BE PROVIDED SIMULTANEOUSLY.
  4. (G) AND (S) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  5. THESE CONTACT STRIPS ARE REQUIRED WHEN TELEPHONE SET IS EQUIPPED WITH THE D122CK (MD) OR THE D200S (MD) MOUNTING CORD. CONTACT STRIPS ARE NOT REQUIRED WITH THE D120M OR D200A MOUNTING CORD.
  6. THE 223A (MD) OR 2230 ADAPTER CONSISTS OF A M16C (MD) OR M18A CORD, M2FG CORD AND A PLASTIC COVER AND BASE. THE PLUS OF THE ADAPTER INTERCONNECTS THE M2FG, D200, D200A AND D200B CORD CONNECTORS.
  7. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A (MD) ADAPTER

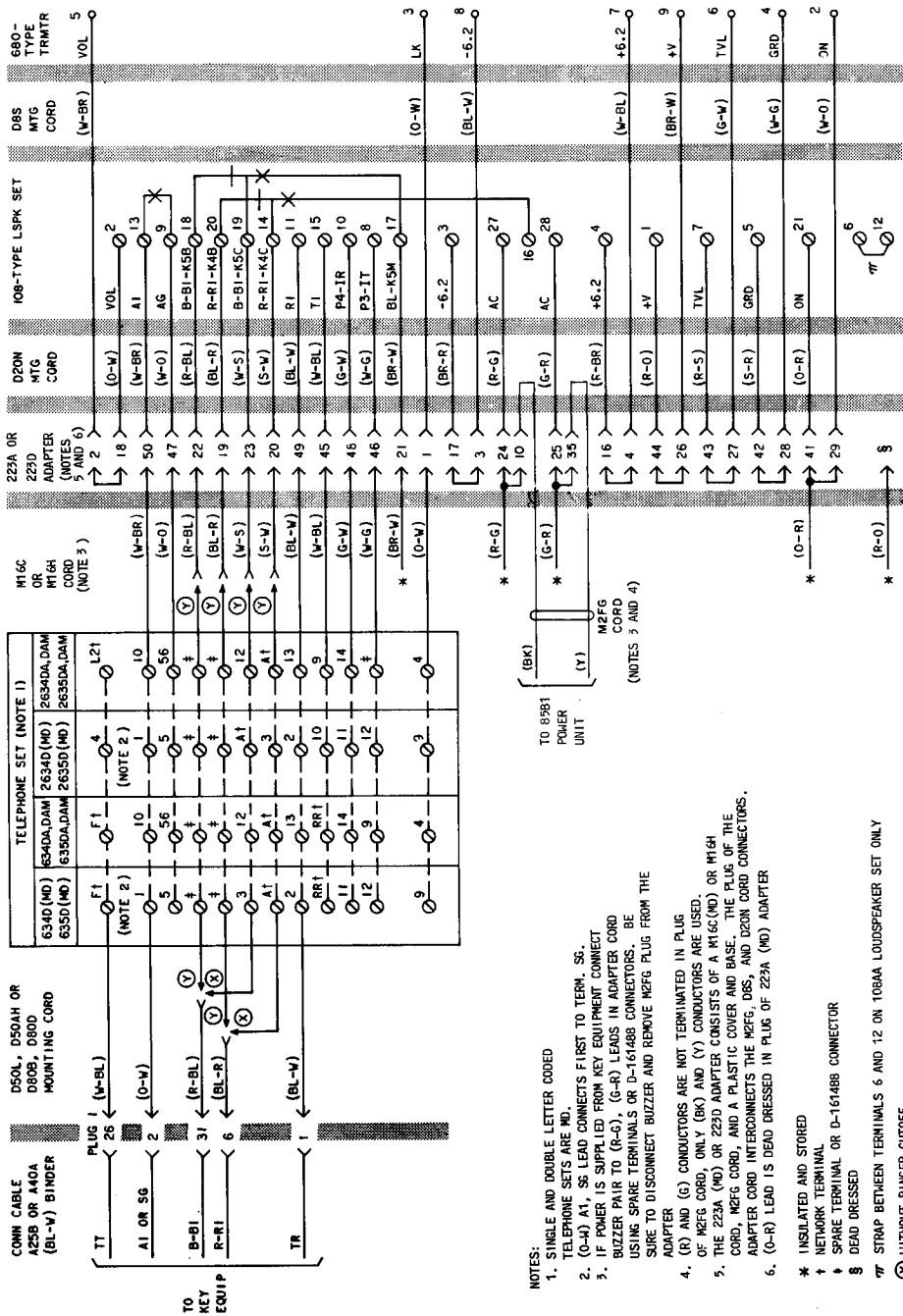
- \* INSULATED AND STORED
- † NETWORK TERMINAL
- ‡ SPARE TERMINAL OR D-161488 CONNECTOR
- § DEAD DRESSED
- ¶ STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA
- ⊗ LOUDSPEAKER SET ONLY
- ⊙ WITHOUT RINGER CUTOFF
- ⊙ WITH RINGER CUTOFF
- ⊚ AUXILIARY RELAY OPERATION
- \* (R-O)

Fig. 3—4A Speakerphone System Arrangement, Connections to 630DA, DAM; 631DA, DAM, 2630DA, DAM, 2631DA, DAM Telephone Set



- NOTES:
1. SINGLE LETTER CODED TELEPHONE SETS ARE MD
  2. WHEN POWER IS SUPPLIED VIA A SPARE PAIR IN CONNECTOR CABLE AND SET MOUNTING CORD, CONNECT THAT PAIR TO THE (R-G) AND (G-R) LEADS IN ADAPTER CORD USING SPARE TERMINALS OR D-161488 CONNECTORS AND REMOVE M2FG PLUG FROM THE ADAPTER.
  3. (Y) AND (Z) OPTIONS CANNOT BE PROVIDED SIMULTANEOUSLY.
  4. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUS OF M2FG CORD. ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  5. THE 223A (MD) OR 223D ADAPTER CONSISTS OF A 8146(MD) AND A PLASTIC COVER AND BASE. THE PLUG OF THE ADAPTER CORD INTERCONNECTS THE M2FG, D85, AND D20M CORD CONNECTORS.
  6. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A (MD) ADAPTER.
- \* INSULATED AND STORED
- 1 NETWORK TERMINAL
  - 2 SPARE TERMINAL OR D-161488 CONNECTOR
  - 3 DIAL TERMINAL
  - 4 DEAD DRESSED
  - \*\* STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUDSPEAKER SET ONLY

Fig. 4—M4A Speakerphone System Arrangement, Connections to 632A, 632C, or 2632C Telephone Set



- NOTES:
1. SINGLE AND DOUBLE LETTER CODED TELEPHONE SETS ARE MD.
  2. (O-W) A1, SG LEAD CONNECTS FIRST TO TERM. 56.
  3. IF POWER IS SUPPLIED FROM KEY EQUIPMENT CONNECT BUZZER PAIR TO (R-G). (G-R) LEADS IN ADAPTER CORD USING SPARE TERMINALS OR D-161488 CONNECTORS. BE SURE TO DISCONNECT BUZZER AND REMOVE M2FG PLUG FROM THE ADAPTER
  4. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD, ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  5. THE 223A (MD) OR 223D ADAPTER CONSISTS OF A M16C(MD) OR M16H CORD, M2FG CORD, AND A PLASTIC COVER AND BASE. THE PLUG OF THE ADAPTER CORD INTERCONNECTS THE M2FG, D8S, AND D20N CORD CONNECTORS.
  6. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A (MD) ADAPTER
- \* INSULATED AND STORED
  - † NETWORK TERMINAL
  - ‡ SPARE TERMINAL OR D-161488 CONNECTOR
  - § DEAD DRESSED
  - ¶ STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUDSPEAKER SET ONLY
  - ⊗ WITHOUT RINGER CUTOFF
  - ⊙ WITH RINGER CUTOFF

Fig. 5—4A Speakerphone System Arrangement, Connections to 634D, DA, DAM; 635D, DA, DAM; 2634D, DA, DAM; or 2635D, DA, DAM Telephone Set

## 660A1, 2660A1, AND 2660A1M TELEPHONE SETS

### CONNECTIONS

#### SPEAKERPHONE SYSTEM—4A

#### 1. GENERAL

1.01 Refer to Section 512-700-100 for detailed information on components of the 4A speakerphone system.

1.02 This section is reissued to:

- Add information to identify registered and typical grandfathered arrangements
- Add safety information for the 85B1 power unit
- Delete 4A speakerphone and key telephone system wiring figures for 660A1, 2660A1, and 2660A1M telephone sets
- Delete key telephone system modifications in Tables A through D.

1.03 This section provides information necessary to modify and connect the 660A1 (MD), 2660A1 (MD), and 2660A1M telephone set to provide speakerphone service (Fig. 1 and 2).

1.04 Rotary dial telephone sets equipped with an 8RA dial must be equipped with an 8CA dial when used with 4A speakerphone. The second set of off-normal contacts on 8CA dial shall connect to same set terminals as P3 and P4 leads from speakerphone.

1.05 The D6AF or D4BT mounting cord furnished with 660A1 or 2660A1 sets must be replaced by a D10R mounting cord (ordered separately). In addition the telephone set must be modified per Tables A, B, or C.

1.06 The housing on earlier versions of the 2660A1M telephone set must be notched to accommodate the M16C (MD) or M16H adapter cord.

Refer to Section 503-100-100 for notching information. In addition the telephone set must be modified per Table D.

#### 2. CONNECTIONS

##### A. 223-Type Adapter

2.01 Cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power unit are installed in proper receptacle of the 223A (MD) or 223D adapter. The cover must be fastened securely to assure proper mating of connectors.

##### B. 108-Type Loudspeaker Set

2.02 Loudspeaker set and transmitter must be placed a minimum of one foot apart.

##### C. 680-Type Transmitter

2.03 Transmitter must be at least two feet from the transformer or any ac powered device.

##### D. 85B1 Power Unit

2.04 Power shall be supplied by connecting power unit as shown in Fig. 3 through 6.

2.05 Use an ac power outlet (not under control of a switch) located as close as possible to the system being installed. A retaining clamp will be shipped with power unit and should be mounted to the ac receptacle to hold power unit securely to prevent accidental loss of power (Fig. 1 and 2).

**Caution: Never attempt to use the same power supply for the card dialer and the 4A speakerphone system.**

2.06 The power unit should be located less than 125 feet from 108-type loudspeaker set when

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using 24 gauge wire or 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for detailed information on power supply applications.

2.07 The M2FG cord is furnished as part of the 223-type adapter for connecting the power unit.

**Danger:** For safety, securely attach a retaining clamp to ac outlet using outlet cover screw BEFORE attempting to install 85B1 power unit. The power unit and any other cord plugged into the ac outlet should always be unplugged completely from outlet BEFORE attempting to attach or remove the clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs of the 85B1 power unit when partially withdrawn from outlet. Do not use

**retaining clamp on outlets where cover mounting screw holds the duplex outlet in the box.**

**Warning:** Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power source does not occur. If more than one power unit is plugged into a multiple receptacle power strip, there must be at least one inch separation between power units. Only UL listed receptacle power strips with adequate power rating shall be used. A continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.

◆ TABLE A ◆

660A1 TELEPHONE SET EQUIPPED WITH C4B RINGER –  
MODIFICATION FOR 4A SPEAKERPHONE

APPARATUS	WIRE OR LEAD		INDIVIDUAL OR BRIDGED (NOTE 3)	RING PARTY (NOTE 3)	TIP PARTY WITHOUT IDENT. (NOTE 3, 4)
	LEAD DESIG	COLOR			
Line Switch		(BR) [S-G] (Y) [S-W] (W) [S-BR]	* TBI-P2 C		
Ringer Straps		(R)	L1		
8CA Dial (Note 1)		(Y) (Y) (W) (W) (BL) (G) or (BL)	TBII 1 TBII 2 TBII 3 TBII 4 TBII 5 TBII 6		
Add Straps (M1W cord or equivalent)			TBII-1 to 41-type dial, terminal 1 TBII-2 to 41-type dial, terminal 2		
			K of Net. to F of Net.	K of Net. to P2 of TB1	
Strap		(G)	L1 of Net to L1 of TB1	L1 of Net. to F of Net.	
D10R Mounting Cord (Note 2)	R	(BL-W)	TBI-L1		
	T	(W-BL)	F		
	A1	(O-W)	TBI-P2		
	T1	(W-O)	41-type dial, terminal 6		
	P4	(G-W)	41-type dial, terminal 1		
	P3	(W-G)	41-type dial, terminal 2		
	A-AG	(BR-W)	*		
	LK	(W-BR)	TBI-L2		
	P1	(S-W)	41-type dial, terminal P1		
	P2	(W-S)	41-type dial, terminal P2		

Note 1. Replace 8RA dial with 8CA dial (order separately).

Note 2. Replace D6AF mounting cord with D10R mounting cord (order separately).

Note 3. Terminals on network unless otherwise noted.

Note 4. 4A speakerphone system is not designed for tip party identification service.

\* Insulate and store.

( ) Current color code.

[ ] MD color code.

♦ TABLE B ♦

660A1 TELEPHONE SET EQUIPPED WITH C4A RINGER –  
MODIFICATION FOR 4A SPEAKERPHONE

APPARATUS	WIRE OR LEAD		INDIVIDUAL OR BRIDGED (NOTE 3)	RING PARTY (NOTE 3)	TIP PARTY WITHOUT IDENT. (NOTE 3, 4)
	LEAD DESIG	COLOR			
Line Switch		(BR) [S-G] (Y) [S-W] (W) [S-BR]		*	TBI-P2 C
Ringer Straps		(R) (BK)	L1 F		L1 TBI-P2
8CA Dial (Note 1)		(Y) (Y) (W) (W) (BL) (G) or (BL)			TBII 1 TBII 2 TBII 3 TBII 4 TBII 5 TBII 6
Add Straps (M1W cord or equivalent)					TBII-1 to 41-type dial, terminal 1 TBII-2 to 41-type dial, terminal 2
D10R Mounting Cord (Note 2)	R	(BL-W)			TBI-L1
	T	(W-BL)			F
	A1	(O-W)			TBI-P2
	T1	(W-O)			41-type dial, terminal 6
	P4	(G-W)			41-type dial, terminal 1
	P3	(W-G)			41-type dial, terminal 2
	A-AG	(BR-W)			*
	LK	(W-BR)			TBI-L2
	P1	(S-W)			41-type dial, terminal P1
	P2	(W-S)			41-type dial, terminal P2

Note 1. Replace 8RA dial with 8CA dial (order separately).

Note 2. Replace D6AF mounting cord with D10R mounting cord (order separately).

Note 3. Terminals on network unless otherwise noted.

Note 4. 4A speakerphone system is not designed for tip party identification service.

\* Insulate and store.

( ) Current color code.

[ ] MD color code.

♦ TABLE C ♦

2660A1 TELEPHONE SET EQUIPPED WITH M1A OR M1B RINGER –  
MODIFICATION FOR 4A SPEAKERPHONE

APPARATUS	WIRE OR LEAD		INDIVIDUAL OR BRIDGED (NOTE 1)	RING PARTY (NOTE 1)	TIP PARTY WITHOUT IDENT. (Note 1, 4)
	LEAD DESIG	COLOR			
Line Switch		(BK)	*	*	*
		(Y)	G	A	G
		(S)	Connect to (S-W) mounting cord lead †		
		(G)	L2		
Dial		(W)	C		
Ringer Strap		(G)	A	G	A
		(G)	TBI-7 to L2		TBI-7 to G
D10R Mounting Cord (Note 2, 3)	R	(BL-W)	L2	L2	L2
	T	(W-BL)	A	G	A
	A1	(O-W)	G	A	G
	A-AG	(W-O)	*	*	*
	T1	(W-G)	Connect to (O) dial lead †		
	IR	(BR-W)	Connect to (V) dial lead †		
	IT	(W-BR)	*		
	LK	(S-W)	Connect to (S) line switch lead †		

Note 1. Terminals on network unless otherwise noted.

Note 2. Replace D6AF mounting cord with D10R mounting cord (order separately).

Note 3. Insulate and store (G-W) and (W-S) mounting cord leads.

Note 4. 4A speakerphone system is not designed for tip party identification service.

\* Insulate and store.

† Use D-161488 connector.

◆ TABLE D ◆

2660A1M TELEPHONE SET EQUIPPED WITH M1A OR M1B RINGER –  
MODIFICATION FOR 4A SPEAKERPHONE (NOTE 3)

WIRE OR LEAD			INDIVIDUAL OR BRIDGED (NOTE 1)	RING PARTY (NOTE 1)	TIP PARTY WITHOUT IDENT. (NOTE 1, 4)
APPARATUS	LEAD DESIG	COLOR			
623P4 Jack Assy	R	(R)	L2 G L1 *		
	T	(G)			
	A1-SG	(Y)			
	A	(BK)			
Line Switch		(BR)	*		
		(S)			
Dial		(G)	G		
Ringer Strap		(G)			TBI-7 to G
M16C or M16H Adapter Cord (Note 2, 3)	R1	(BL-W)	L2 L1 *		
	A1	(W-BR)			
	AG	(W-O)			
	T1	(W-BL)	Connect to (O) dial lead † Connect to (V) dial lead †		
	IR	(G-W)			
IT	(W-G)	*			
LK	(O-W)	Connect to (S) line switch lead †			
Strap Between Net. Term		(G)			A to L1

Note 1. Terminals on network unless otherwise noted.

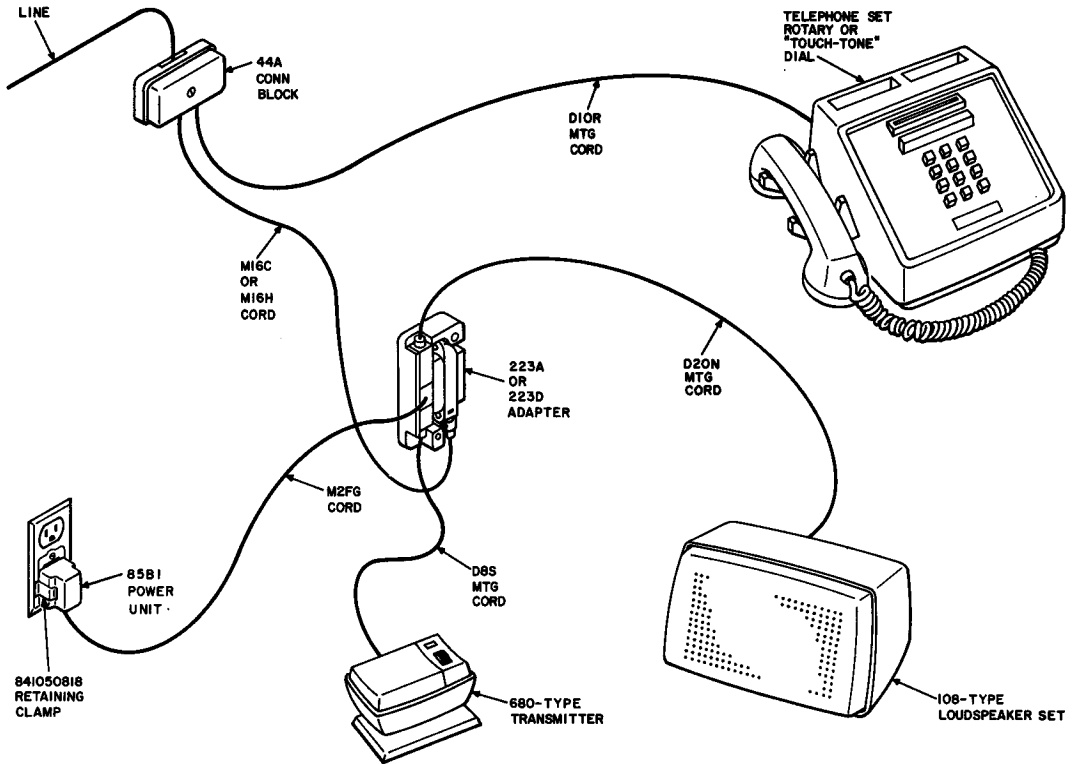
Note 2. Insulate and store unused leads in adapter cord.

Note 3. If housing must be notched to accommodate the adapter cord, refer to Section 503-100-100 for notching information.

Note 4. 4A speakerphone system is not designed for tip party identification service.

\* Insulate and store.

† Use D-161488 connector.



**Fig. 1—Typical Grandfathered 4A Speakerphone System Arrangement, 660A1 (MD) or 2660A1 (MD) Telephone Sets Using 223A (MD) or 223D Adapter**

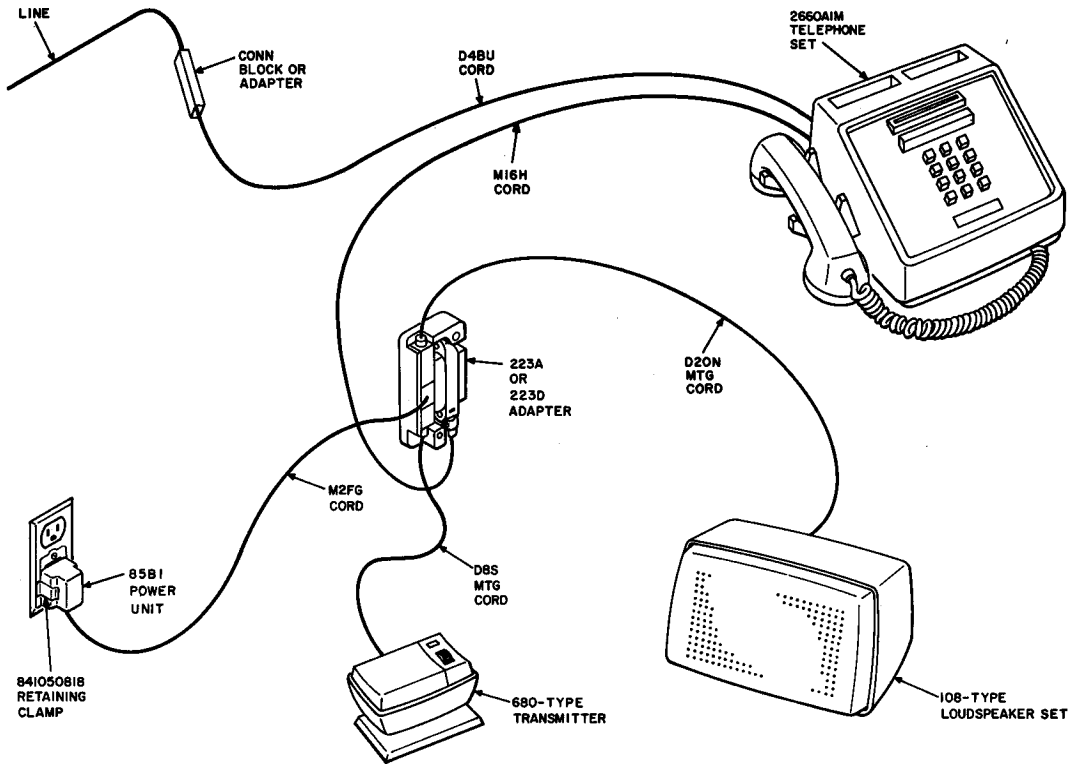
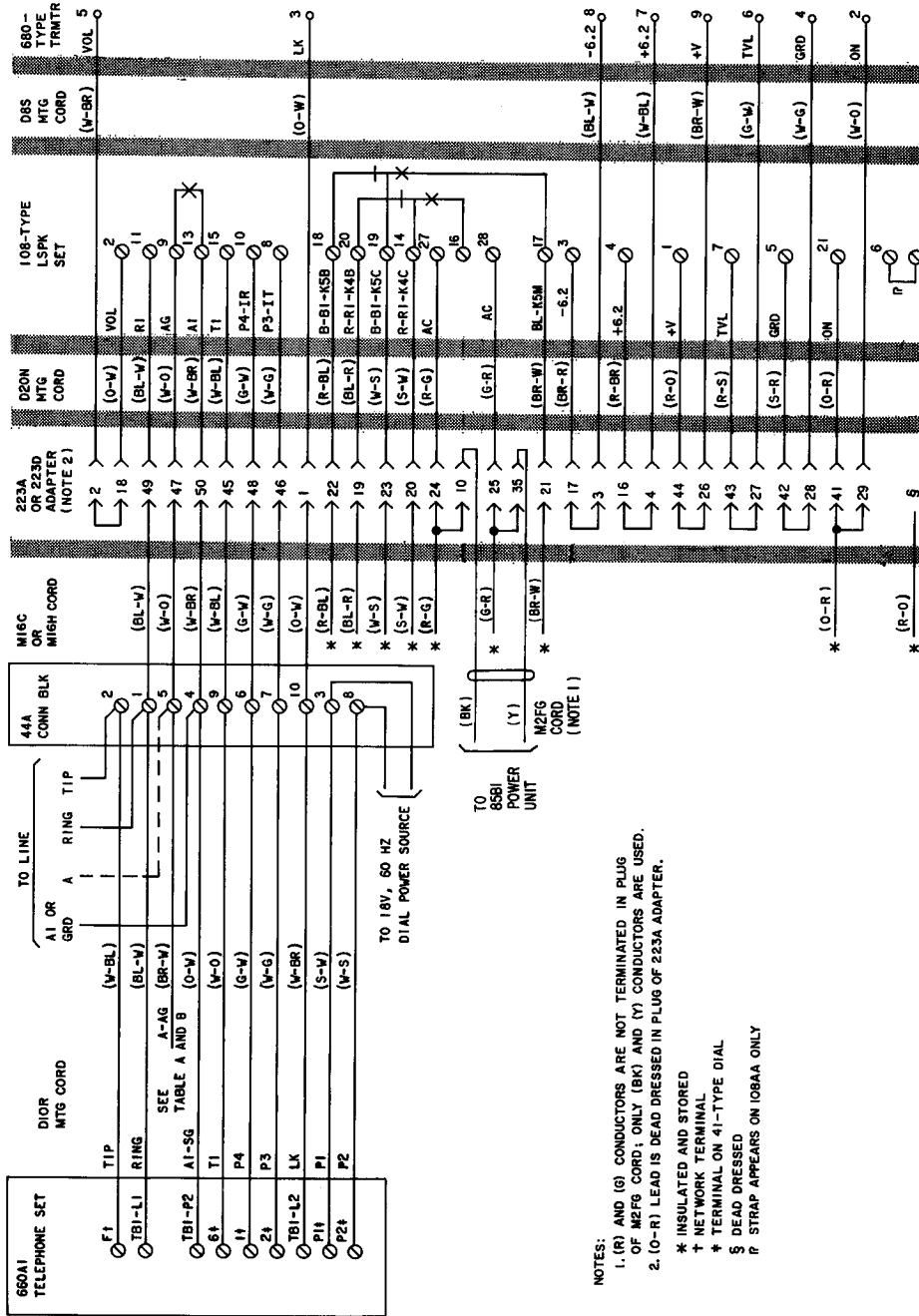


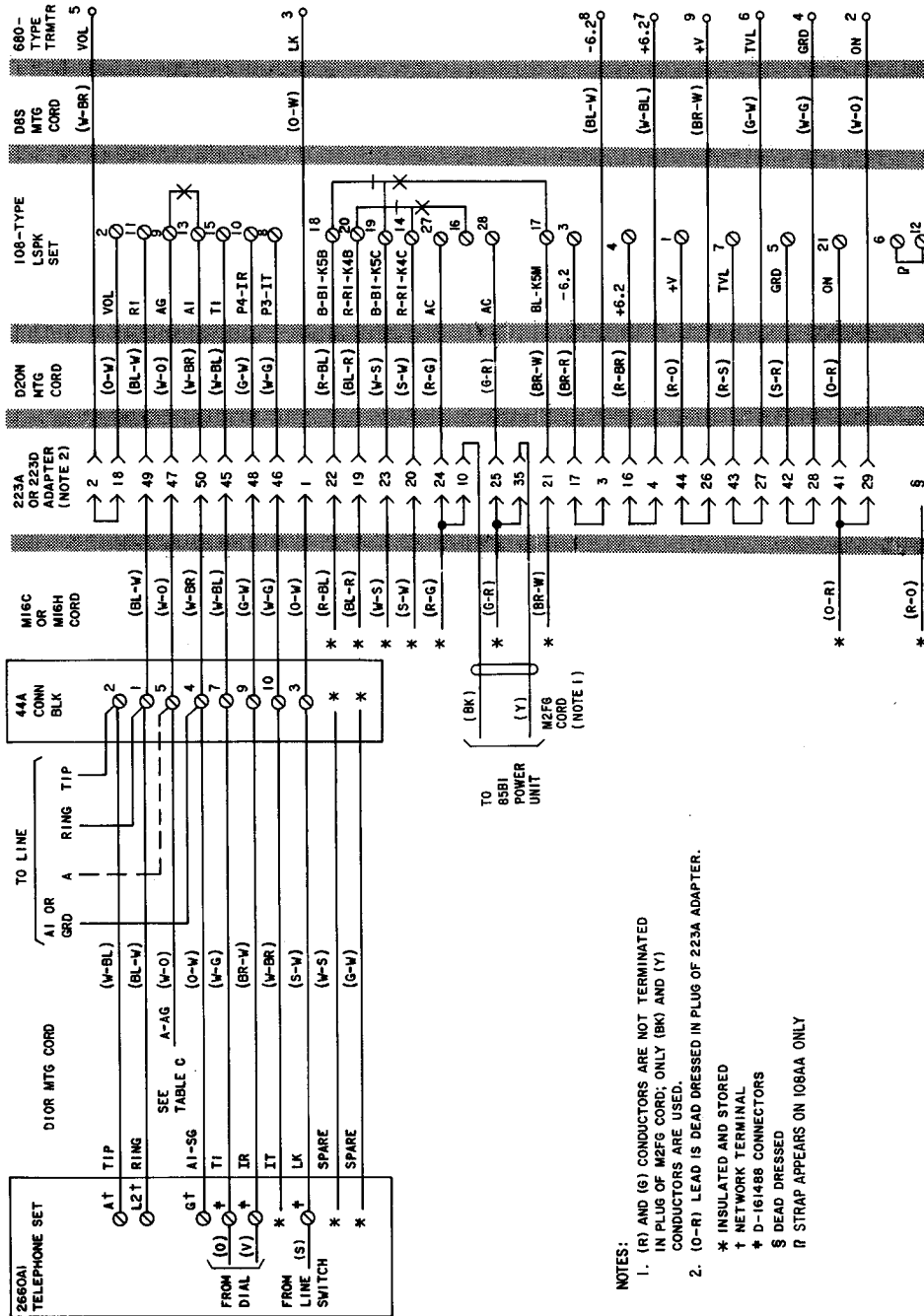
Fig. 2—Registered or Typical Grandfathered 4A Speakerphone System Arrangement, 2660A1M Telephone Set Using 223A (MD) or 223D Adapter



- NOTES:
1. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  2. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.
- \* INSULATED AND STORED
  - † NETWORK TERMINAL
  - ‡ TERMINAL ON 41-TYPE DIAL
  - § DEAD DRESSED
  - P STRAP APPEARS ON 108AA ONLY

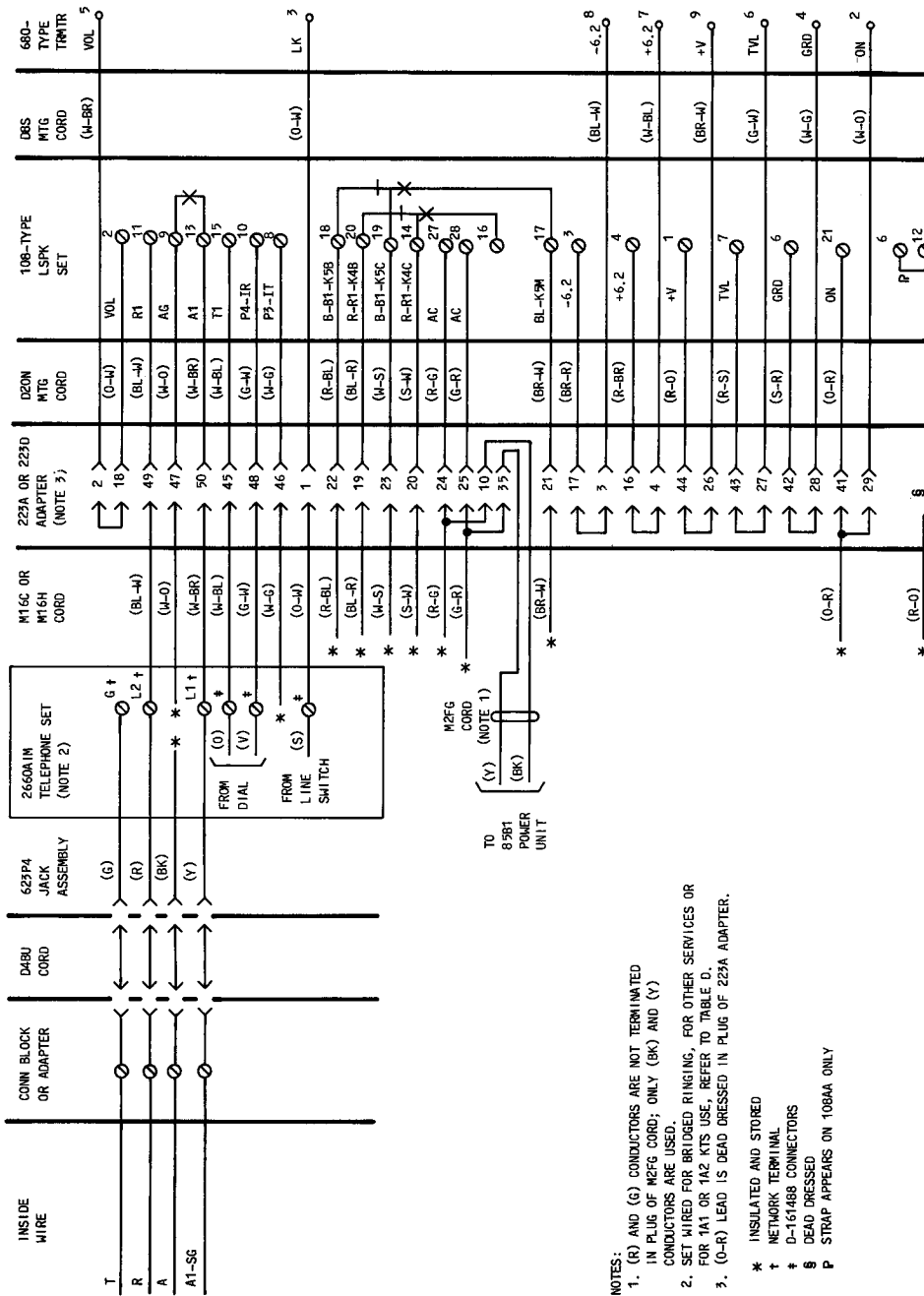
Fig. 3—Typical Grandfathered 4A Speakerphone System Arrangement, Connections to 660A1 (MD) Telephone Set†





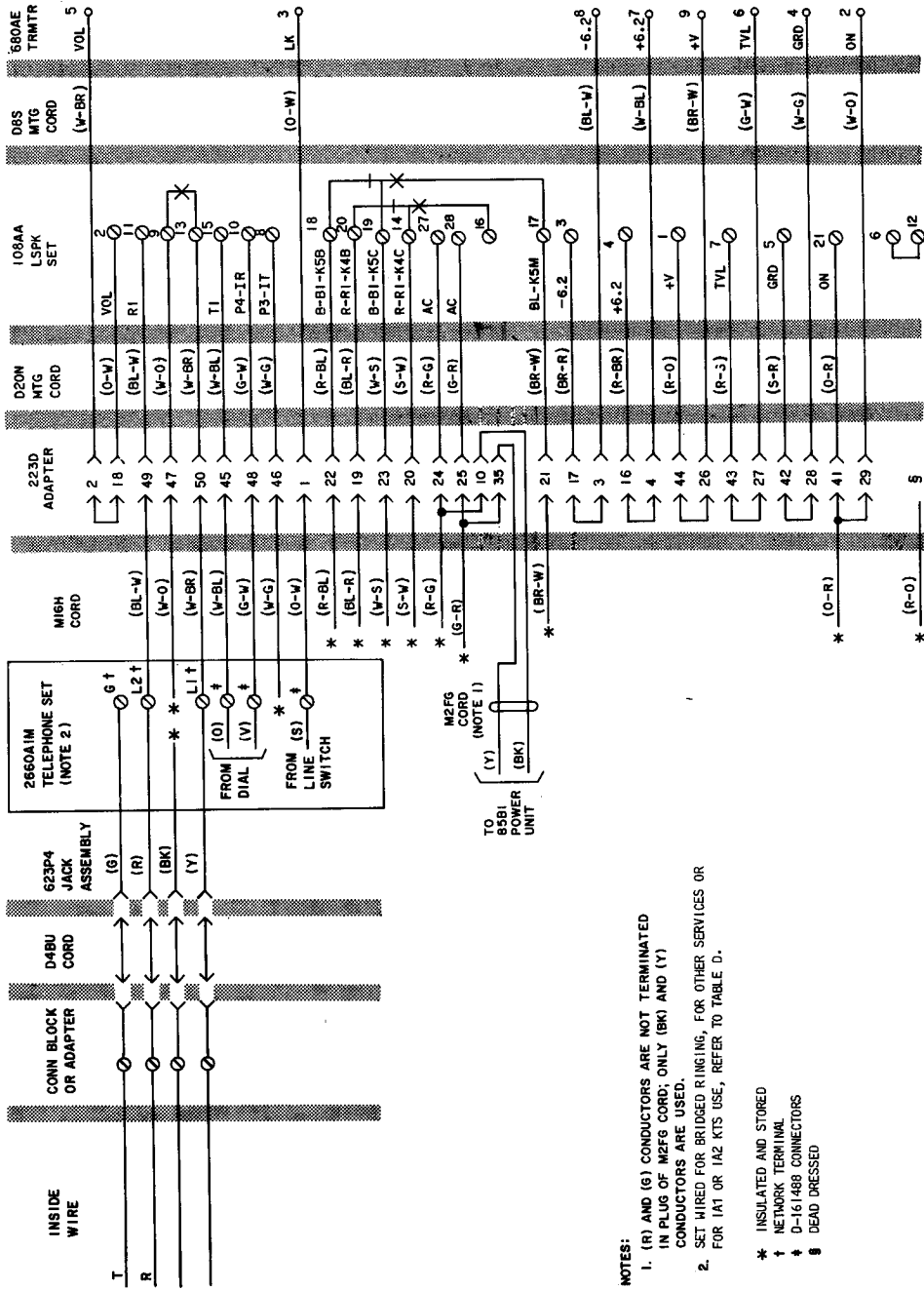
- NOTES:
- (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  - (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.
- \* INSULATED AND STORED
  - † NETWORK TERMINAL
  - ‡ D-161488 CONNECTORS
  - § DEAD DRESSED
  - ¶ STRAP APPEARS ON 106AA ONLY

Fig. 4—Typical Grandfathered 4A Speakerphone System Arrangement, Connections to 2660A1 (MD) Telephone Set†



- NOTES:
1. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  2. SET WIRED FOR BRIDGED RINGING. FOR OTHER SERVICES OR FOR 1A1 OR 1A2 KTS USE, REFER TO TABLE D.
  3. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 225A ADAPTER.
- \* INSULATED AND STORED  
 † NETWORK TERMINAL  
 ‡ D-161468 CONNECTORS  
 § DEAD DRESSED  
 P STRAP APPEARS ON 108AA ONLY

Fig. 5 — Typical Grandfathered 4A Speakerphone Arrangement, Connections to 2660A1M Telephone Set†



- NOTES:**
1. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2EG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  2. SET WIRED FOR BRIDGED RINGING. FOR OTHER SERVICES OR FOR IA1 OR IA2 KTS USE, REFER TO TABLE D.
- \* INSULATED AND STORED  
 † NETWORK TERMINAL  
 ‡ D-161488 CONNECTORS  
 § DEAD DRESSED

Fig. 6—Registered 4A Speakerphone System Arrangement, Connection to 2660A1M Telephone Set

## SPEAKERPHONE SYSTEM—4A

### 662- AND 2662-TYPE TELEPHONE SETS

#### 1. GENERAL

**1.01** This section contains connection and modification information for using 662- and 2662-type telephone sets with the 4A speakerphone system. Refer to Section 512-700-100 for detailed information on the 4A speakerphone.

**1.02** This section is reissued to:

- Show 662A1 and 2662A1 telephone sets MD
- Add safety information for installing and removing 85B1 power unit
- Add 223D adapter and M16H Cord
- Show 223A adapter and M16C cord MD
- Revise Fig. 1, 4, and 5.

**1.03** Rotary telephone sets equipped with an 8RA dial must be equipped with an 8CA dial when connected for 4A speakerphone. ♦The second set of off-normal contacts on the 8CA dial must be connected in the set to the same terminals as the speakerphone, P3 and P4 leads (Table A).♦

#### 2. CONNECTIONS

**2.01** Mounting cord leads must be connected as shown in Table A, except when M16C (MD) or M16H cord is terminated inside telephone set (Fig. 1B).

**2.02** To provide speakerphone at stations supplied by A25B connector cable, use an 82-type connecting block (Fig. 1A). Those stations supplied by inside wiring cable require a 223A (MD) or 223D adapter and 66E3-25 or equivalent connecting block (Fig. 1B).

#### 82-Type Connecting Block

**2.03** The connector cable and cords from the telephone set, 108-type loudspeaker set, and 680-type transmitter are installed in the proper receptacles of the connecting block (Fig. 1A and 2).

**2.04** The option plug, furnished as part of the 82-type connecting block (Fig. 1 and 3) must be positioned depending on services required. The arrow on the plug of the D20N cord points to the option selected on the option plug. RING CUTOFF provides cut off of the telephone set ringer through the loudspeaker relay contacts while on speakerphone (Fig. 3A). AUX RELAY provides a contact closure for operation of an auxiliary relay key telephone unit when it is desired to cut off several signals. The signal circuits, must be wired through the contacts of the auxiliary relay (Fig. 3B). The option block should be in this position also if no ringer cut off is desired. In this case the auxiliary relay is not required.

**Caution:** Do not use the (S-V), (V-S) pair for any other purpose as it is designated for auxiliary relay operation.

**2.05** The cover must be fastened securely to assure proper mating of connectors.

#### ♦223A (MD) or 223D Adapter♦

**2.06** Cords from the loudspeaker set, transmitter, and power unit are plugged into the adapter in same relative positions as on the 82-type connecting block. The cover must be fastened securely to assure proper mating of connectors. The telephone set mounting cord is plugged into the 66E3-25 connecting block (Fig. 1B). Access to speakerphone leads is obtained through the ♦M16C (MD) or M16H♦ cord, either in the set (Fig. 4) or at the connecting block (Fig. 5). At the 66E3-25 connecting block, 161A adapters must be used to

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connect the spade tips of the M16C or M16H cord. Install the adapters as outlined in Section 461-604-100.

**2.07** The same options are available using the 223A or 223D adapter as with the 82-type connecting block. Unused speakerphone leads in the mounting cord, or IW cable shall be disconnected as near the telephone set as possible to prevent interface with working circuits (refer to Table A). These leads shall never be multiplied between telephone sets. Refer to Section 502-110-100 for more detailed information.

**108-Type Loudspeaker Set**

**2.08** Loudspeaker set and transmitter must be a minimum of one foot apart.

**680-Type Transmitter**

**2.09** Transmitter must be at least two feet from transformer or any ac powered device.

**85B1 Power Unit**

**2.10** Use an ac power outlet (not under control of a switch) as close as possible to the system being installed. A retaining clamp (841050818) will be shipped with the 85B1 power unit.

**Caution: Do Not Ground Power Unit, and never attempt to use the same power supply for the card dialer and 4A speakerphone system.**

**2.11** Power can be supplied by making connections as shown in Fig. 1, 2, 4, or 5.

**2.12** The M2FG cord is furnished as part of the 223A or 223D adapter for connecting the 85B1 power unit.

**2.13** The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire. Refer to Section 512-700-100 for detailed information on power supply

**Danger: Securely attach retaining clamp to ac outlet using outlet cover screw BEFORE attempting to install 85B1 power unit. When removing 85B1 power unit, always unplug the power unit completely from the outlet BEFORE attempting to remove the retaining clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs of the 85B1 power unit when partially withdrawn from outlet. Do not use an 841050818 or similar retaining clamps on outlets where the cover mounting screw holds the duplex outlet in the box.**

**Warning: Care should be taken to trim and dress leads connecting to low voltage output of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power sources does not occur.**

♦TABLE A♦

TELEPHONE SET MODIFICATIONS FOR 4A SPEAKERPHONE

LEAD DESIG	LEAD COLOR¶	FROM	TO 662(MD) TELSET	TO 2662A1 (MD) OR 2662A1M TELSET
R1	G-V	*	R-TBII	
T1	V-G		2-TBI	9-TBII
P4-IR	BR-V		2-41 Dial†	10-TBII§
P3-IT	V-BR		1-41 Dial‡	*
LK	S-V		LK-TBII	
AG	V-S		A-TBII	

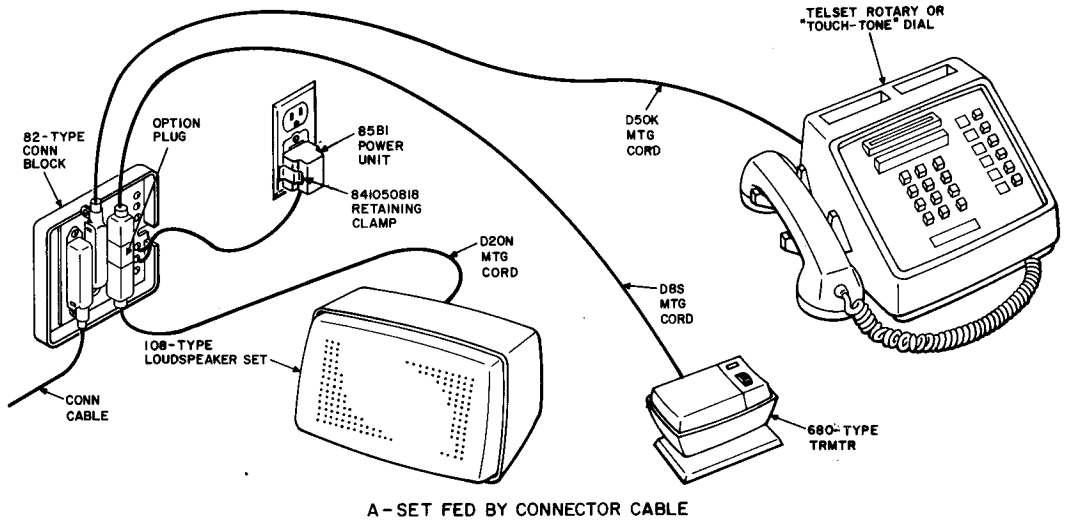
\* Insulated and stored.

† Place strap between terminal 2 of 41-type dial and 4 of TBI.

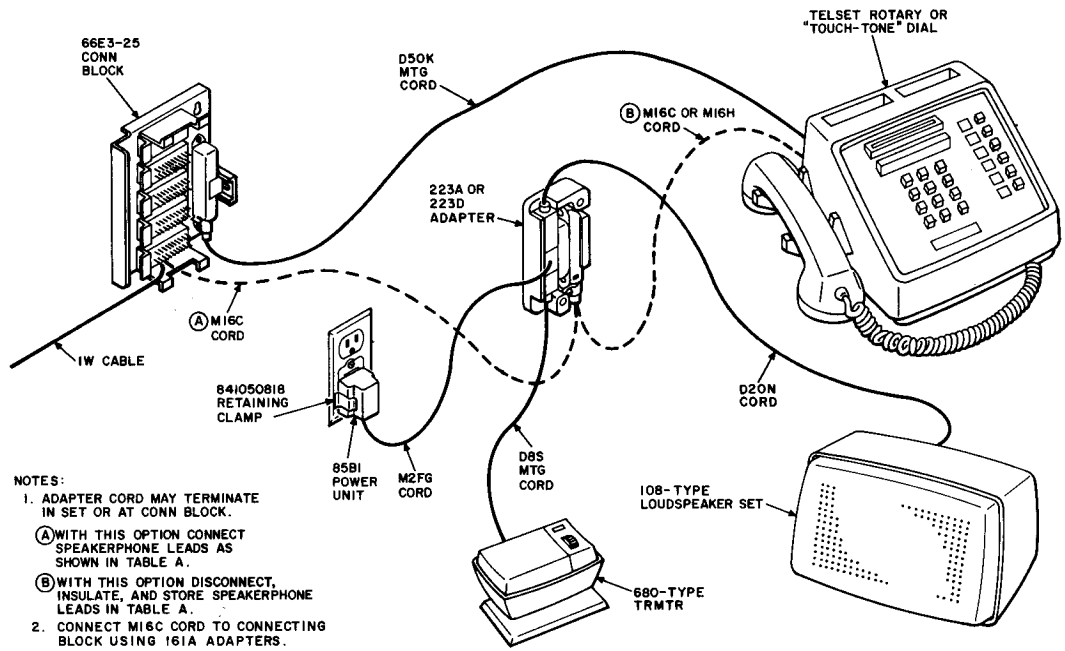
‡ Place strap between terminal 1 of 41-type dial and 3 of TBI.

§ Move (V) dial lead from insulated and stored to terminal 10 of TBII.

¶ These leads shall never be multiplied between telephone sets. For more detailed information see Section 502-110-100.



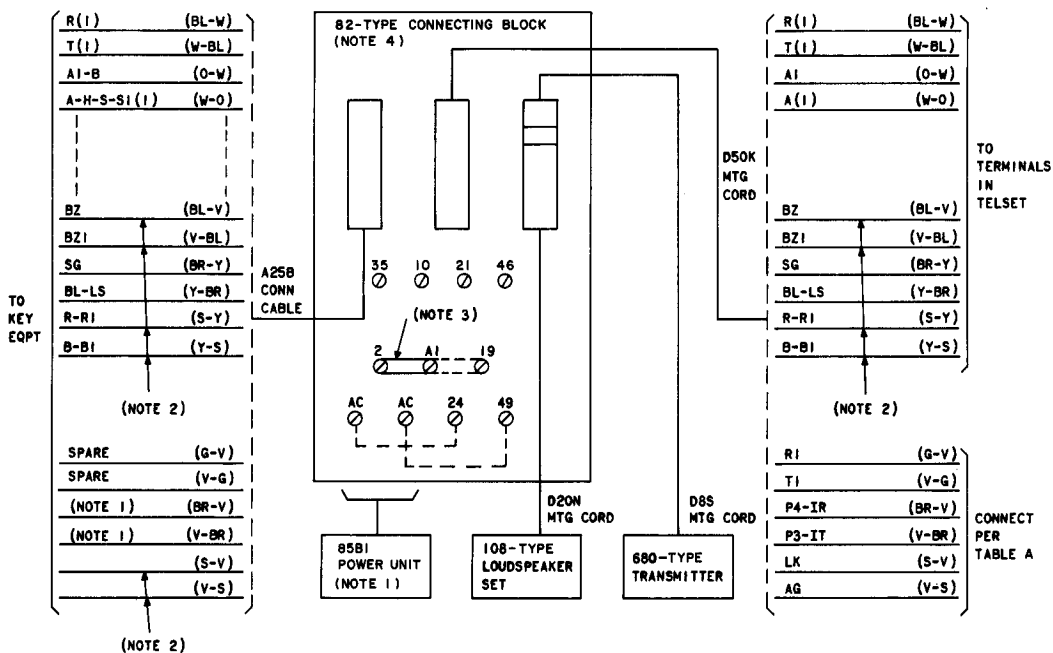
A-SET FED BY CONNECTOR CABLE



- NOTES:
1. ADAPTER CORD MAY TERMINATE IN SET OR AT CONN BLOCK.
  - Ⓐ WITH THIS OPTION CONNECT SPEAKERPHONE LEADS AS SHOWN IN TABLE A.
  - Ⓑ WITH THIS OPTION DISCONNECT, INSULATE, AND STORE SPEAKERPHONE LEADS IN TABLE A.
  2. CONNECT M16C CORD TO CONNECTING BLOCK USING 161A ADAPTERS.

B-SET FED BY INSIDE WIRING CABLE

Fig. 1—Speakerphone Arrangement, 662- or 2662- Type Telephone Set



NOTES:

1. LEADS FROM 85BI POWER UNIT MAY BE CONNECTED DIRECTLY TO 82-TYPE CONNECTING BLOCK OR FED THROUGH CONNECTOR CABLE USING (BR-V) AND (V-BR) LEADS. IF CONNECTOR CABLE IS USED STRAP TERMINAL 24 TO ONE AC TERMINAL AND 49 TO OTHER AC TERMINAL AT 82-TYPE CONNECTING BLOCK.
2. LEADS INVOLVED IN OPTIONS. SEE FIG. 3.
3. METAL STRAP FACTORY WIRED FOR 1A1/1A2 KTS, (A1-2). MOVE TO TERMINAL 19 FOR 1A KTS, (A1-19), ONLY WHEN BUSY LAMP OPTION IS PROVIDED.
4. TERMINALS 10, 21, 35, AND 46 ON 82B CONNECTING BLOCK ONLY.

Fig. 2—Speakerphone Connections Using 82-Type Connecting Block



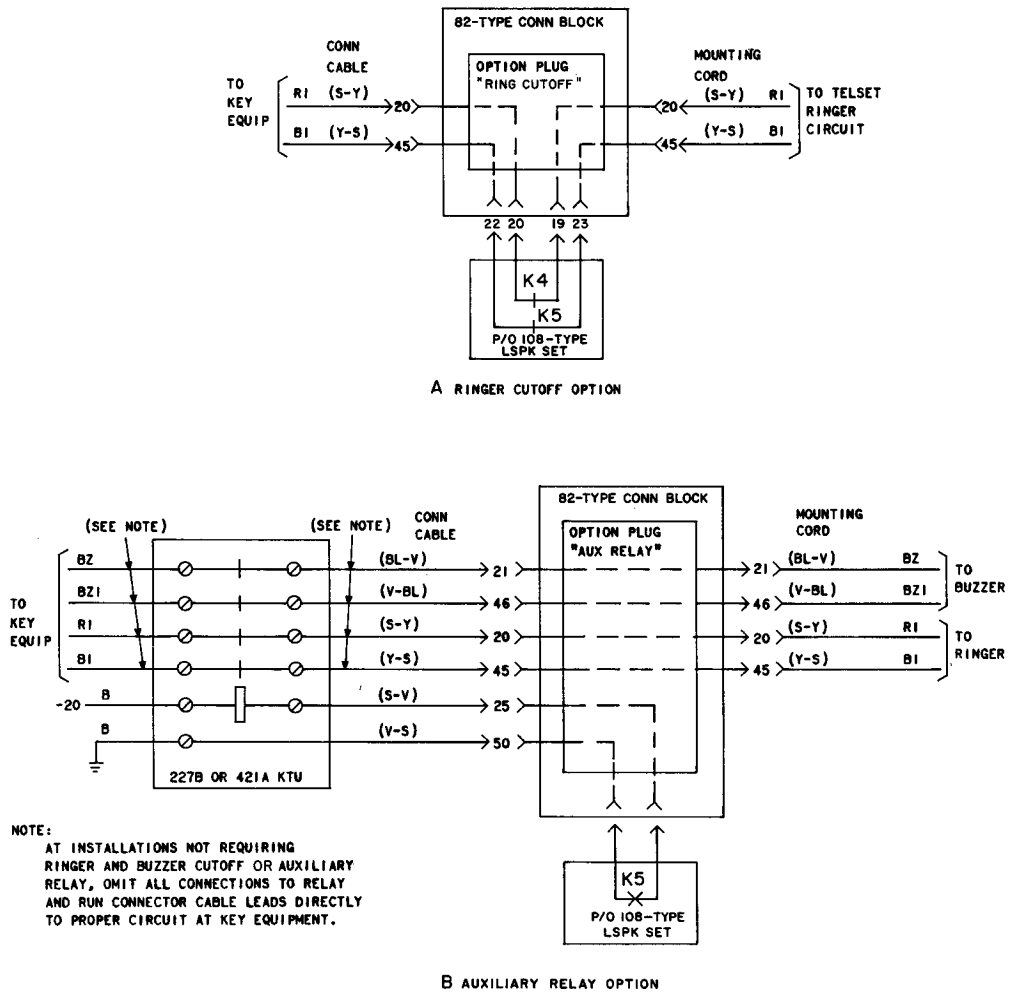


Fig. 3—Wiring Involved In Options at 82-Type Connecting Block

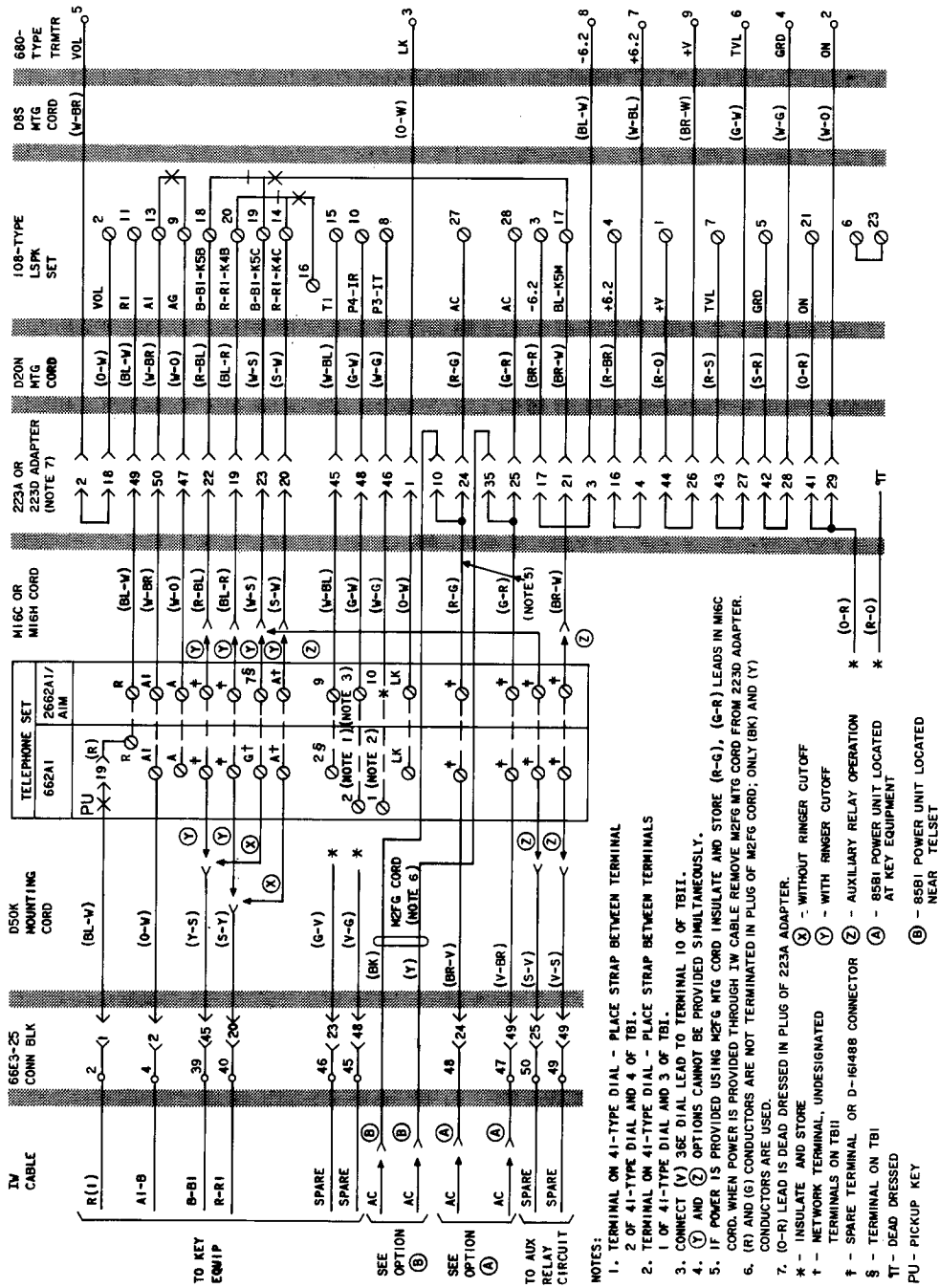
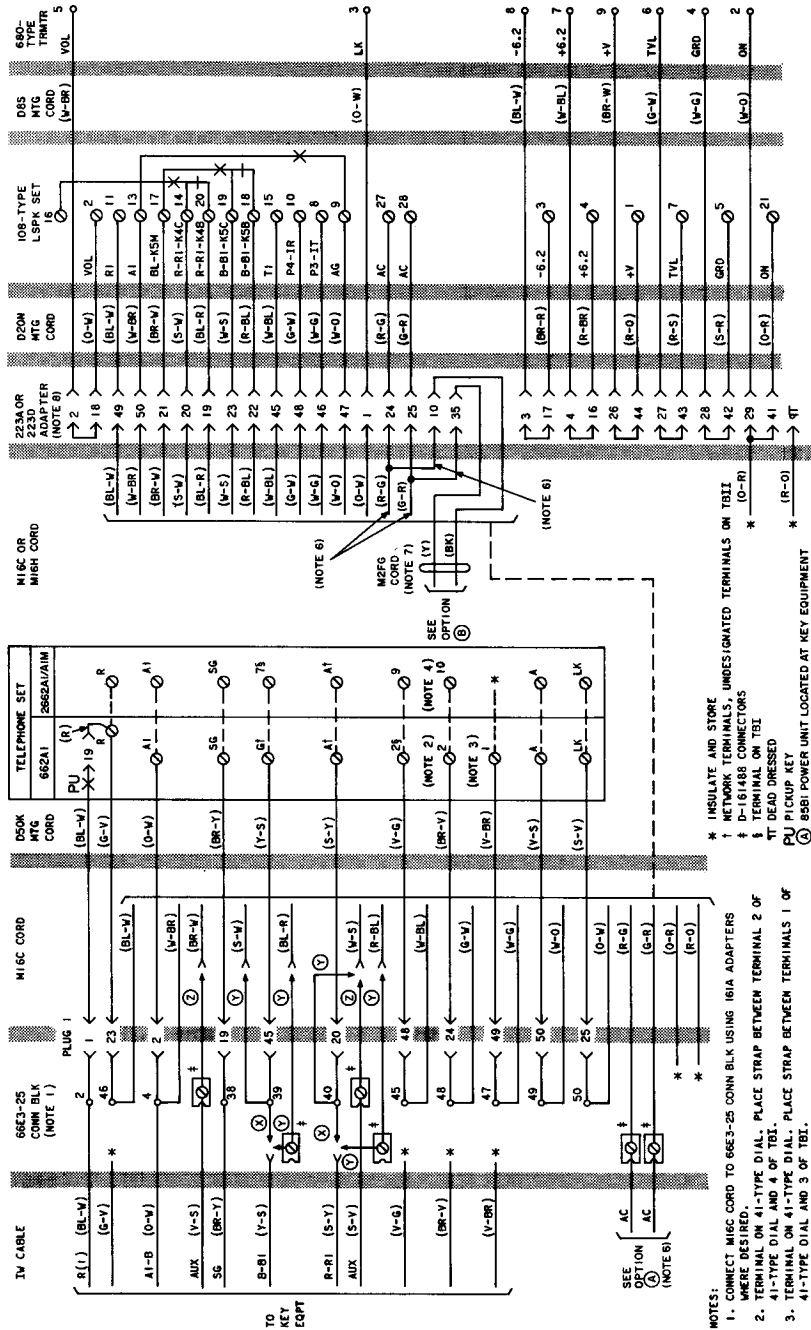


Fig. 4—Speakerphone Connections, Adapter Terminated In Set



- TO KEY CRYPT
- SEE OPTION (NOTE 6)
- AC AC (NOTE 6)
- INSULATE AND STORE
- 1 NETWORK TERMINALS, UNDESIGNATED TERMINALS ON TS211
- 2 D-151A88 CONNECTORS
- 3 TERMINAL ON TS1
- 4 DEAD DRESSED
- 5 PU PICKUP KEY
- 6 8581 POWER UNIT LOCATED AT KEY EQUIPMENT
- 7 8581 POWER UNIT LOCATED NEAR TELEPHONE SET
- 8 WITH RINGER CUTOFF
- 9 WITH RINGER CUTOFF
- 10 AUXILIARY RELAY OPERATION
- TO KEY CRYPT
- NOTE 1. CONNECT MISC CORD TO 66E3-25 CONN BLK USING 161A ADAPTERS
- NOTE 2. TERMINAL ON 41-TYPE DIAL. PLACE STRAP BETWEEN TERMINAL 2 OF 41-TYPE DIAL AND 4 OF TS1.
- NOTE 3. TERMINAL ON 41-TYPE DIAL. PLACE STRAP BETWEEN TERMINALS 1 OF 41-TYPE DIAL AND 3 OF TS1.
- NOTE 4. CONNECT (V) 3SE DIAL LEAD TO TERMINAL 10 OF TS11.
- NOTE 5. (S) AND (R) OPTIONS CANNOT BE PROVIDED SIMULTANEOUSLY.
- NOTE 6. IF POWER IS PROVIDED USING M2FG MTS CORD INSULATE AND STORE THROUGH IV CABLE REMOVE M2FG MTS CORD FROM 2233 ADAPTER.
- NOTE 7. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD. ONLY (BK) AND (Y) CONDUCTORS ARE USED.
- NOTE 8. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.

Fig. 5—Speakerphone Connections, Adapter Terminated at 66E3-25 Connecting Block

702B, 702BM, 2702B, AND 2702BM TELEPHONE SETS  
CONNECTIONS  
SPEAKERPHONE SYSTEM—4A

1. GENERAL

1.01 Refer to Section 512-700-100 for detailed information on components of the 4A speakerphone system.

1.02 This section is reissued to:

- Add information to identify registered and typical grandfathered arrangements
- Add safety information for installing or removing the 85B1 power unit
- Add information to provide 4A speakerphone connections for 702BM and 2702BM telephone sets
- Add information on 2012C transformer
- Add 223D adapter and M16H mounting cord
- Show 223A adapter and M16C mounting cord MD

1.03 To provide 4A speakerphone feature at these telephone sets, refer to (Fig. 1 and 2) for layout arrangement of the components required for the system and (Fig. 3, 4, and 5) for individual lead connections.

1.04 These sets are factory-wired for non-KTS use. ♦If used with speakerphone and KTS, refer to Tables A and C for modification and connections of the 702-type sets and Tables B and D for the 2702-type sets.♦

2. CONNECTIONS

A. 223-Type Adapter

2.01 The cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power unit are installed in the proper receptacle of the 223A (MD) or 223D adapter. The cover must be fastened securely to assure proper mating of connectors.

B. 108-Type Loudspeaker Set

2.02 The loudspeaker set and transmitter must be placed a minimum of one foot apart.

C. 680-Type Transmitter

2.03 The transmitter must be at least two feet from transformer or any ac power device.

D. 85B1 Power Unit

2.04 Power shall be supplied by connecting 85B1 power unit as shown in Fig. 1 through 5.

2.05 Use an ac power outlet (not under control of a switch) located as close as possible to the system being installed. A retaining clamp will be shipped with the power unit and should be mounted to the ac receptacle to hold power unit securely and prevent accidental loss of power.

***Danger: ♦For safety, securely attach retaining clamp to ac outlet using outlet cover screw BEFORE attempting to install 85B1 power unit. When removing 85B1 power unit, always unplug the power unit completely from the outlet BEFORE attempting to remove the retaining clamp. This will prevent the possibility of a loosened***

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*retainer clamp or metallic outlet cover making contact with the ac prongs of the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamp on outlets where the cover mounting screw holds the duplex outlet in the box.*

**Warning:** *Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power sources does not occur. If more than one power unit is plugged into a multiple receptacle power strip, there must be at least one inch separation between power*

*units. Only UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.*

**2.06** The M2FG cord is furnished as part of the 223-type adapter for connecting the 85B1 power unit.

**2.07** The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for detailed information on power supply applications.

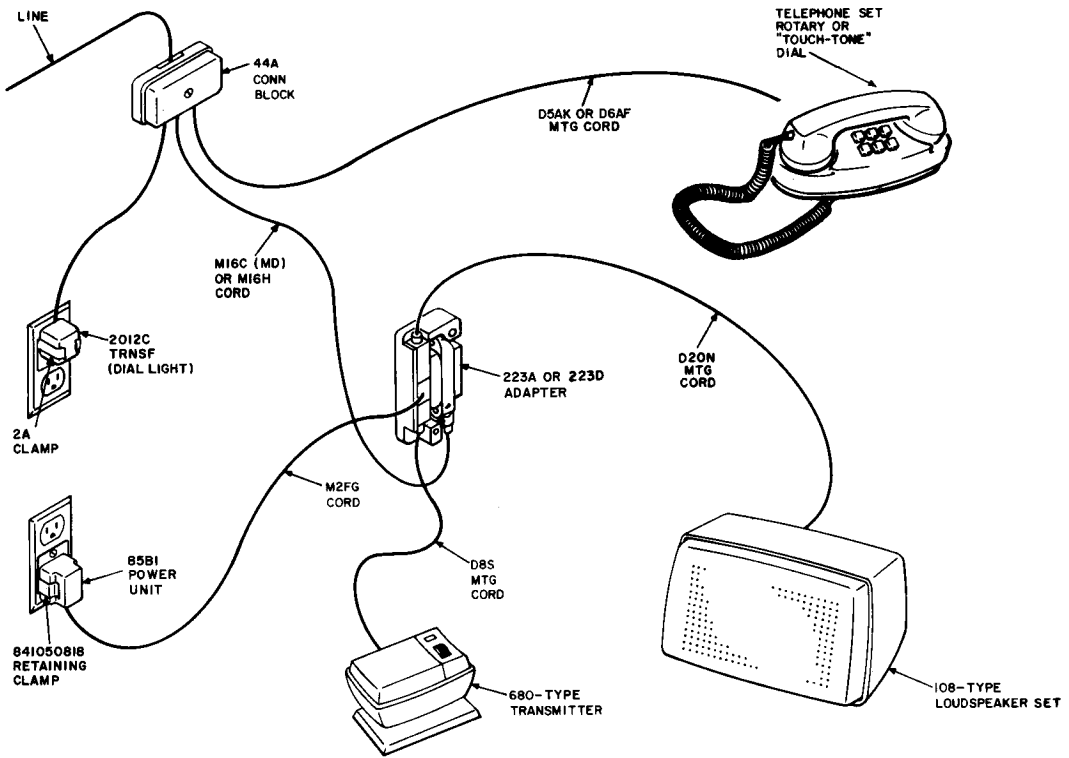


Fig. 1—Typical Grandfathered 4A Speakerphone System Arrangement, 702B (MD) and 2702B (MD) Telephone Set Using 223A (MD) or 223D Adapter

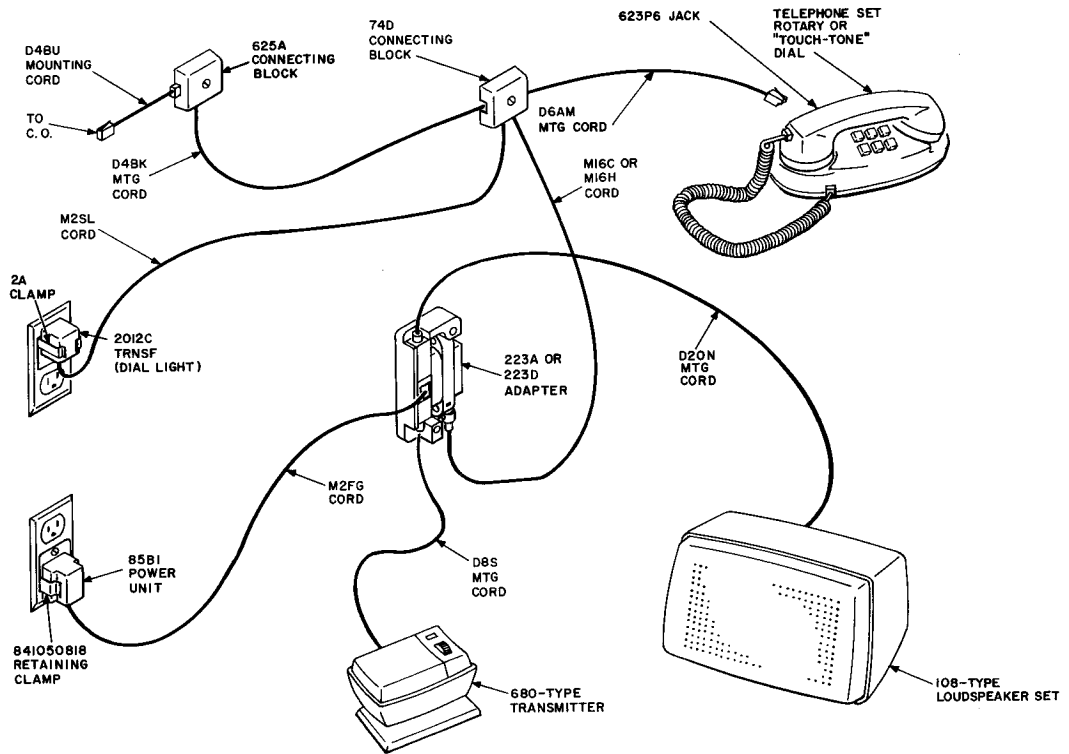


Fig. 2—Registered or Typical Grandfathered 4A Speakerphone System Arrangement 702BM and 2702BM Telephone Set Using 223A or 223D Adapter

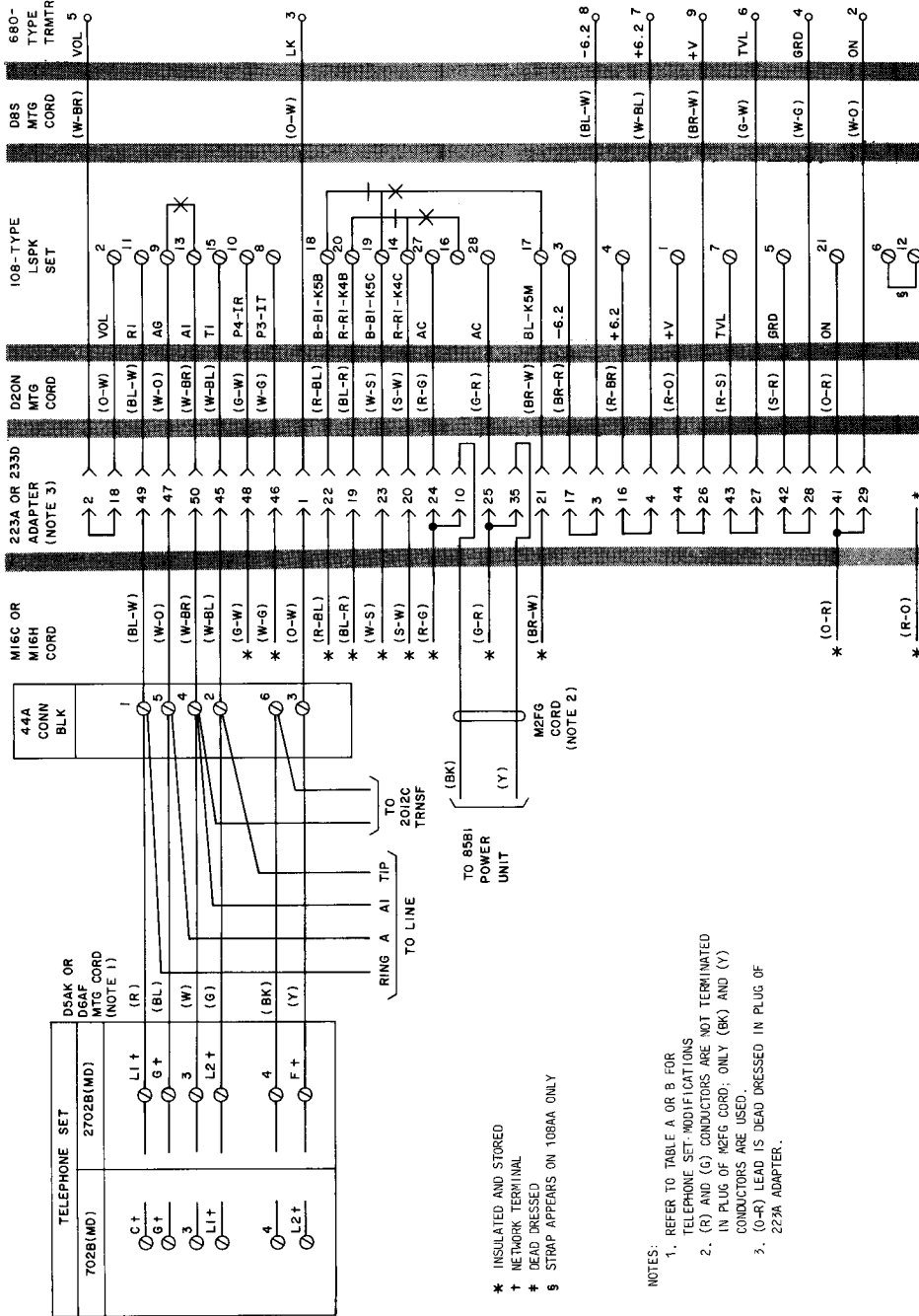


Fig. 3—Typical Grandfathered 4A Speakerphone System Arrangement, Connections to 702B (MD) and 2702B (MD) Telephone Sets

- NOTES:
1. REFER TO TABLE A OR B FOR TELEPHONE SET MODIFICATIONS
  2. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  3. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.

- \* INSULATED AND STORED
- † NETWORK TERMINAL
- ‡ DEAD DRESSED
- § STRAP APPEARS ON 108AM ONLY



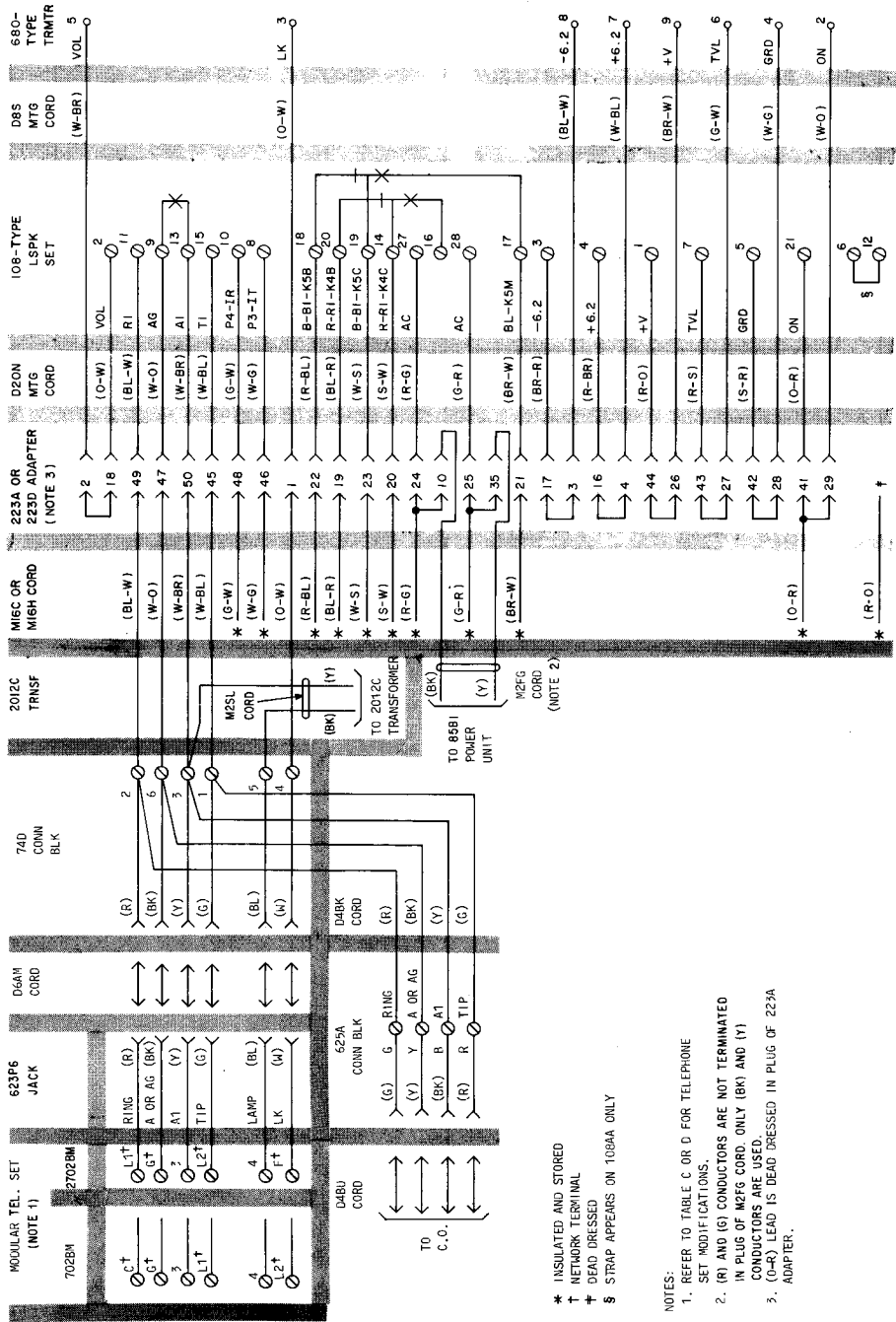


Fig. 4—Typical Grandfathered 4A Speakerphone System Arrangement, Connections to 702BM and 2702BM Telephone Sets

- NOTES:
1. REFER TO TABLE C OR D FOR TELEPHONE SET MODIFICATIONS.
  2. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2EG CORD. ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  3. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.

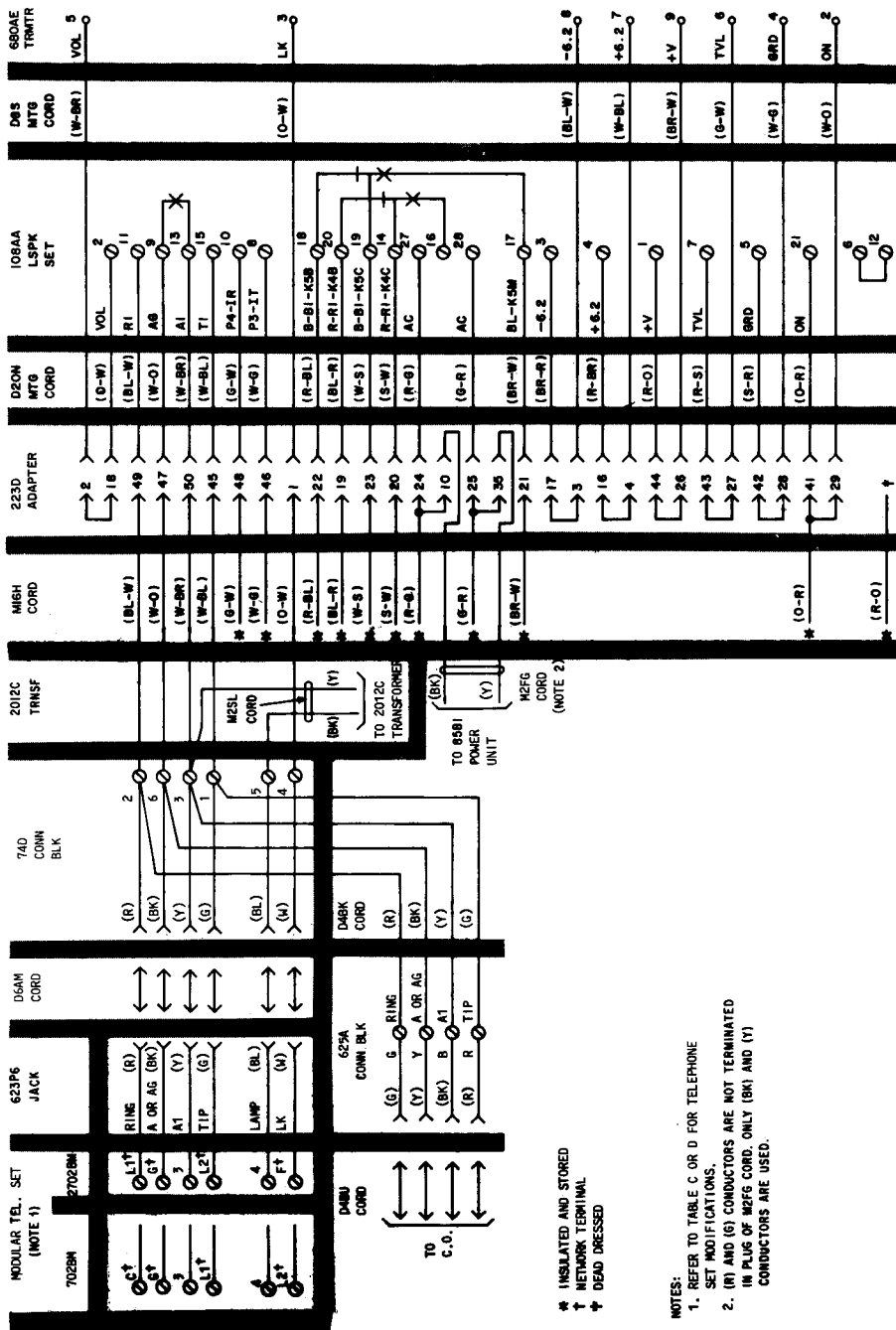


Fig. 5—Registered 4A Speakerphone System Arrangement, Connections to 702BM and 2702BM Telephone Sets

♦TABLE A♦

## 702B TELEPHONE SET

## MODIFICATIONS FOR 4A SPEAKERPHONE

WIRE OR LEAD	COLOR	REMOVE FROM NET.	CONNECT TO	
			NET.	TERM. BLOCK
Line Switch	S	A	L2	
	Y	L2		3
	BR	C	G	
Ringer	BK	G	L1	
Network	BK	A	*	
Strap ‡			A ↔ C	
D5AK or D6AF Mounting Cord (See Note)	R		C	
	BL †		G	
	Y		L2	
	G		L1	
	W			3
	BK			4

\*Insulate and store.

†D6AF mounting cord only.

‡M1W cord or equivalent.

*Note:* Replace D5AK mounting cord with D6AF mounting cord when both KTS and speakerphone are required.

♦TABLE B♦

## 2702B TELEPHONE SET

## MODIFICATIONS FOR 4A SPEAKERPHONE

WIRE OR LEAD	COLOR	REMOVE FROM NET.	CONNECT TO	
			NET.	TERM. BLOCK
Line Switch	W	F	C	
	S	A	F	
	Y	L2		3
	BR	C	G	
Ringer	BK	G	L1	
Network Strap	BK	*	A	
D5AK or D6AF Mounting Cord (See Note)	R		L1	
	G		L2	
	BL†		G	
	Y		F	
	W			3
	BK			4
Dial	G	F	L2	

\*Remove from stored location.

†D6AF mounting cord only.

*Note:* Replace D5AK mounting cord with D6AF mounting cord when both KTS and speakerphone are required.

◆TABLE C◆

## 702BM TELEPHONE SET

## MODIFICATIONS FOR 4A SPEAKERPHONE

WIRE OR LEAD	COLOR	REMOVE FROM NET.	CONNECT TO	
			NET.	TERM. BLOCK
Line Switch	S	A	L2	
	Y	L2		3
	BR	C	G	
Ringer	BK	G	L1	
Network	BK	A	*	
Strap†			A↔C	
623P6 Jack	R		C	
	BK		G	
	W		L2	
	G		L1	
	Y			3
	BL			4

\*Insulate and store.

†M1W cord or equivalent.

◆TABLE D◆

## 2702BM TELEPHONE SET

## MODIFICATIONS FOR 4A SPEAKERPHONE

WIRE OR LEAD	COLOR	REMOVE FROM NET.	CONNECT TO	
			NET.	TERM. BLOCK
Line Switch	W	F	C	
	S	A	F	
	Y	L2		3
	BR	C	G	
Ringer	BK	G	L1	
Network Strap	BK	*	A	
623P6 Jack	R		L1	
	G		L2	
	BK		G	
	W		F	
	Y			3
	BL			4
Dial	G	F	L2	

\*Remove from stored location.

## 830-, 831-, 2830-, AND 2831-TYPE TELEPHONE SETS

### CONNECTIONS

#### SPEAKERPHONE SYSTEM—4A

#### 1. GENERAL

**1.01** This section contains information necessary to connect the 830-, 831-, 2830-, or 2831-type telephone set to provide speakerphone service. Refer to Section 512-700-100 for detailed information on components of the 4A speakerphone system.

**1.02** This section is reissued to:

- Add safety information for the 85B1 power unit
- Show 223A adapter and M16C cord MD
- Add 223D adapter and M16H cord
- Add 108AA loudspeaker set
- Add 841050818 retaining clamp.

**1.03** Rotary telephone sets equipped with an 8RA dial must be equipped with an 8CA dial when used with 4A speakerphone. The second set of off-normal contacts on 8CA dial shall connect to the same terminals as P3 and P4 leads from the speakerphone.

#### 2. CONNECTIONS

##### A. 223-Type Adapter

**2.01** The cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power unit are installed in the proper receptacles of the 223A (MD) or 223D adapter. The cover must be fastened securely to assure proper mating of connectors.

**2.02** Ringer Cutoff can be provided by connecting ringer leads as shown in Fig. 2. Ringer cutoff provides cut off of the telephone set ringer

through the loudspeaker set relay contacts while on speakerphone.

**2.03** Due to insufficient mounting cord conductors in the other sets, the auxiliary relay feature can only be used in the 831DM, and 2831DM (modular) telephone sets. The auxiliary feature provides a contact closure for the operation of an auxiliary relay key telephone unit when it is desired to cut off several signals.

##### B. 108-Type Loudspeaker Set

**2.04** Loudspeaker set and transmitter must be a minimum of one foot apart.

##### C. 680-Type Transmitter

**2.05** Transmitter must be at least two feet from transformer or any ac powered device.

##### D. 85B1 Power Unit

**2.06** Use an ac power outlet (not under control of a switch) as close as possible to the system being installed. 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 to prevent accidental loss of power.

**2.07** Power can be provided by making connections as shown in Fig. 1 and 2.

**2.08** The M2FG cord is furnished as part of the 223A (MD) or 223D adapter for connecting the 85B1 power unit.

**2.09** The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or less than 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for detailed power supply information.

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**Danger:** ♦For safety, securely attach retaining clamp to ac outlet using outlet cover screw **BEFORE** attempting to install 85B1 power unit. The power unit and any other cord plugged into the ac outlet should always be unplugged completely from outlet **BEFORE** attempting to attach or remove the retaining clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs on the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamp on outlets where cover mounting screw holds the duplex outlet in the box.♦

**Warning:** ♦Care should be taken to trim and dress leads connecting to

low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power source does not occur. If more than one power unit is plugged into a multiple receptacle power strip, there must be at least one inch separation between power units. Only UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.♦

♦TABLE A♦

SPEAKERPHONE MODIFICATION FOR TELEPHONE SETS  
EQUIPPED WITH NEW LINE SWITCH (NOTE)

TELEPHONE SET	LEAD COLOR	REMOVE FROM TERM.	CONNECT TO TERM.
830DM, 831DM, 2830DM, 2831DM, or 830CM, 831CM, 2830CM and 2831CM (MFR after 1-77)	G	16	8
830CM(MFR Before 2-77)	G	16	F
831CM(MFR Before 2-77)	G	16	F
	G		
2830CM or 2831CM(MFR Before 2-77)	G	8	16

*Note:* The new line switch can be identified by two additional leads which are (BL). No modification is required on sets equipped with old line switch [no (BL) leads].



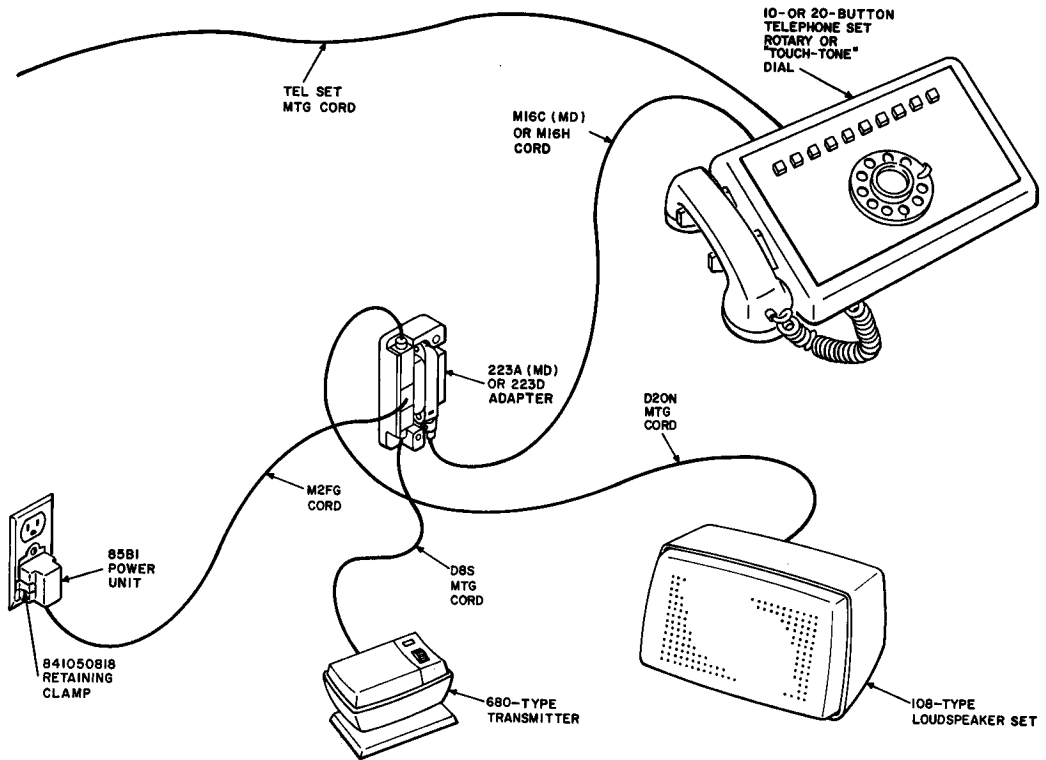


Fig. 1—4A Speakerphone System Arrangement, 10- or 20-Button Telephone Set

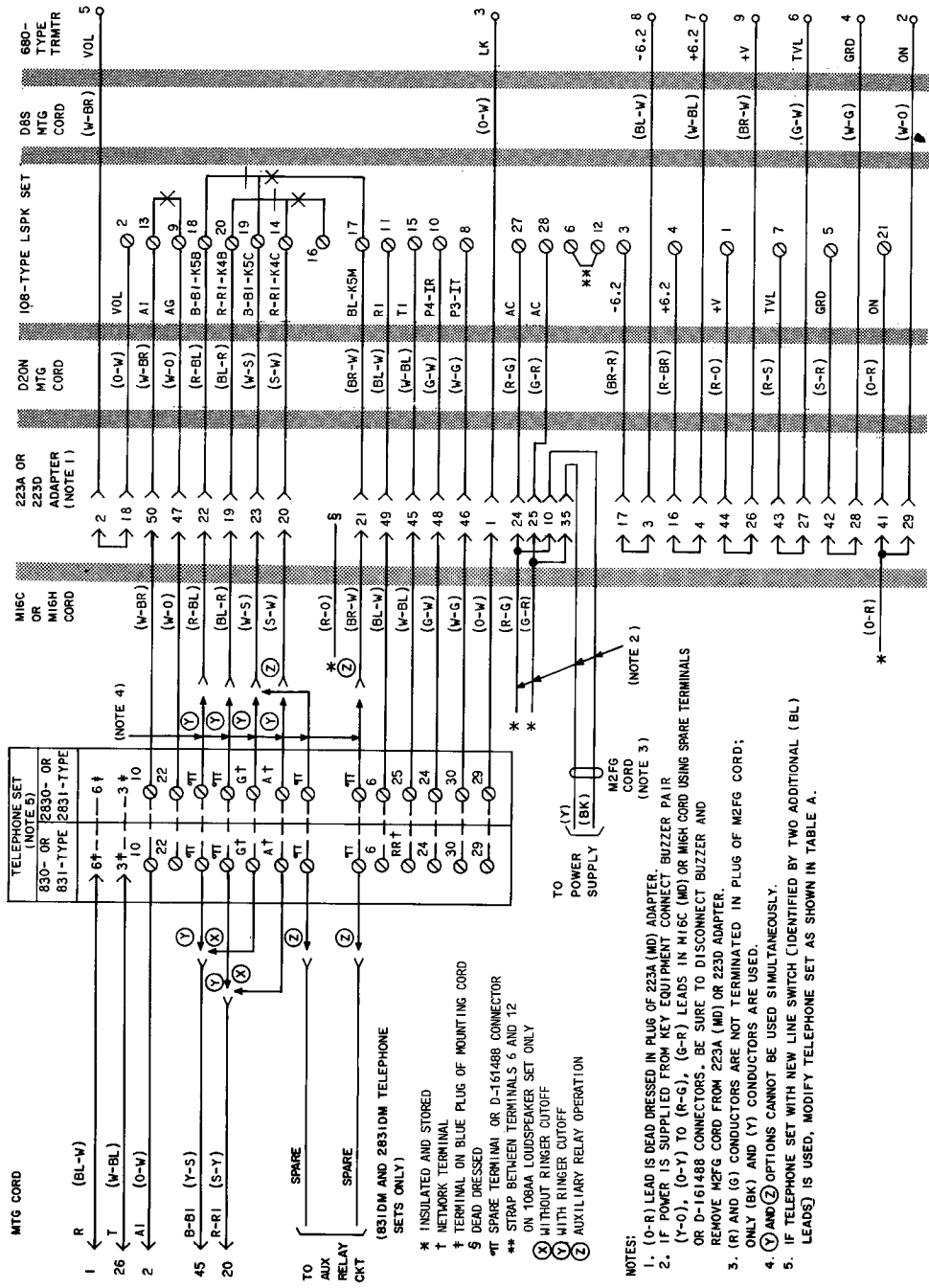


Fig. 2—4A Speakerphone System Arrangement, Connections to 10- or 20-Button Telephone Set

**832-, 833-, 2832-, AND 2833-TYPE TELEPHONE SETS**  
**CONNECTIONS**  
**SPEAKERPHONE SYSTEM—4A**

**1. GENERAL**

**1.01** This section contains information necessary to connect the 832-, 833-, 2832-, or 2833-type telephone sets to provide 4A speakerphone service. Refer to Section 512-700-100 for detailed information on components of the 4A speakerphone system.

**1.02** This section is reissued to:

- Revise safety information for the 85B1 power unit
- Add 108AA loudspeaker set.

**1.03** Refer to Section 512-700-100 for detailed information on components of the 4A speakerphone system.

**1.04** The 832- and 2832-type telephone sets are special 10-, 11-, or 13-button sets initially designed to work with the 7A Communication System.

**1.05** The 833- and 2833-type telephone sets are special 20-button sets initially designed to work with the 14A Communication System.

**2. CONNECTIONS**

**A. 223-Type Adapter**

**2.01** Telephone sets are connected to the speakerphone system by means of a 223A (MD) or 223D adapter which consists of the following.

- (a) Plastic housing.
- (b) M16C (MD) or M16H cord for connecting to telephone set.

(c) M2FG cord for connecting the power supply.

**Note:** Cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power unit plug into the connector of the M16C (MD) or M16H cord.

**2.02** After cords are installed in the proper receptacles of the adapter, the cover must be fastened securely to assure proper mating of connectors.

**B. 108-Type Loudspeaker Set**

**2.03** The loudspeaker set and transmitter must be a minimum of one foot apart and not directly facing each other.

**C. 680-Type Transmitter**

**2.04** The transmitter must be at least two feet from transformer or any ac powered device.

**D. Power Supply**

**2.05** Power is supplied by connecting an 85B1 power unit using M2FG cord as shown in Fig. 1 and 2.

**2.06** Use an ac power outlet (not under control of a switch) located as close as possible to the system being installed. 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.

**2.07** The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or less than 85 feet when using 26 gauge wire. Refer to Section

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512-700-100 for detailed information on power supply applications.

**Danger:** ⚡For safety, securely attach retaining clamp to ac outlet using outlet cover screw **BEFORE** attempting to install 85B1 power unit. The power unit and any other cord plugged into the ac outlet should always be unplugged completely from outlet **BEFORE** attempting to attach or remove the retaining clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs on the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamp on outlets where cover mounting screw holds the duplex outlet in the box.⚡

**Warning:** ⚡Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1

**power unit to assure that inadvertent connection to conducting surfaces or other power source does not occur. If more than one power unit is plugged into a multiple receptacle power strip, there must be at least one inch separation between power units. Only UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the power unit to be in close proximity to the ac line source is not recommended.**⚡

**2.08** These sets are not provided with **ringer cutoff** or **auxiliary relay** optional features associated with most CALL DIRECTOR® sets when using 4A speakerphone. The wiring changes shown in the top portion of Table A serve to reduce the tone or voice level on incoming calls while in speakerphone mode.

**TABLE A**  
**SPEAKERPHONE CONNECTIONS**

WIRE OR LEAD	LEAD DESIG	COLOR	REMOVE	CONNECT TO TEL SET TERM.	
Line Switch Lead		W-S	Term. 1 of Amplifier PWB Assy	Connect these leads together using spare terminal in set or D-161488 connector	
		S-W			
Leads in Adapter Cord*		BL-R		Term. 1 of amplifier PWB Assy	
	T1	W-BL		§	
	R1	BL-W		6	
	AG	W-O		8	
	LK	O-W		29	
	P3†	IT‡	W-G		30
	P4†	IR‡	G-W		24
	A1	W-BR			10
(See Note)		O	27	22	

Note: This change is necessary on modular type sets. On early production sets, (O) lead is on terminal 22.

\* Insulate and store spare leads.

† Rotary dial telephone set.

‡ TOUCH-TONE® telephone set.

§ Terminal RR of network for rotary dial sets. Terminal 25 for TOUCH-TONE dial sets.

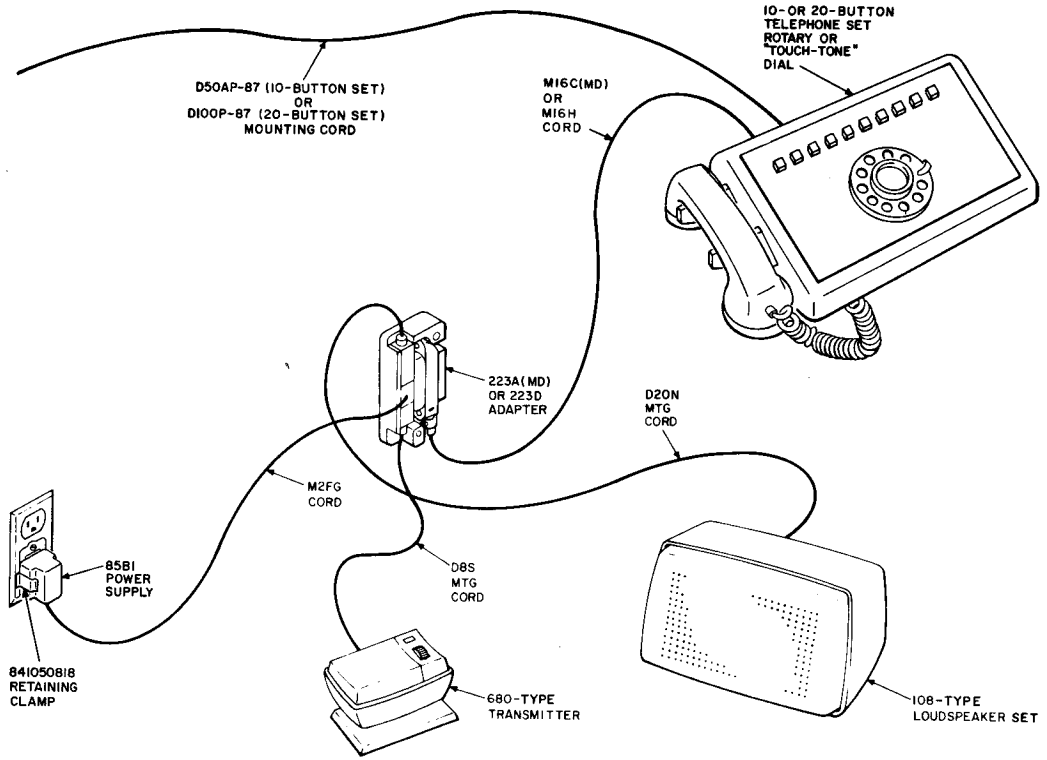
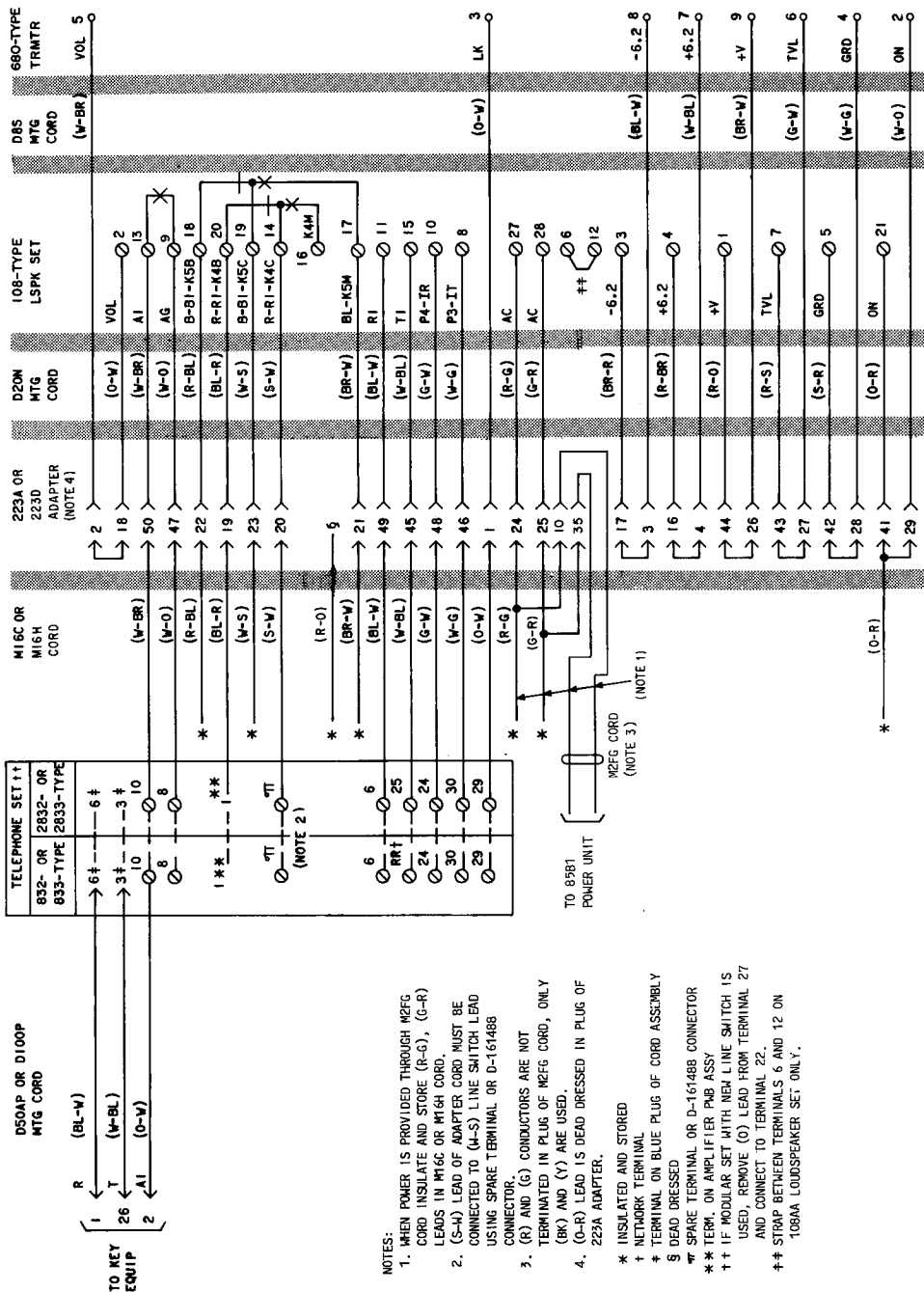


Fig. 1—4A Speakerphone System Arrangement, 10- or 20-Button Telephone Set



- NOTES:**
- WHEN POWER IS PROVIDED THROUGH M2FG CORD INSULATE AND STORE (R-G), (G-R) LEADS IN M16C OR M16H CORD. (S-W) LEAD OF ADAPTER CORD MUST BE CONNECTED TO (W-S) LINE SWITCH LEAD USING SPARE TERMINAL OR D-161488 CONNECTOR.
  - (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD, ONLY (BK) AND (Y) ARE USED. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.
  - INSULATED AND STORED NETWORK TERMINAL TERMINAL ON BLUE PLUG OF CORD ASSEMBLY DEAD DRESSED SPARE TERMINAL OR D-161488 CONNECTOR TERM. ON AMPLIFIER PAB ASSY †† IF MODULAR SET WITH NEW LINE SWITCH IS USED, REMOVE (O) LEAD FROM TERMINAL 27 AND CONNECT TO TERMINAL 22. STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUDSPEAKER SET ONLY.

Fig. 2—4A Speakerphone System Arrangement, Connections to 10- or 20-Button Telephone Set

## 851- AND 2851-TYPE TELEPHONE SETS

### CONNECTIONS

#### SPEAKERPHONE SYSTEM—4A

#### 1. GENERAL

**1.01** This section contains information necessary to connect the 851- and 2851-type telephone sets to provide 4A speakerphone service. Refer to Section 512-700-100 for detailed information on components of the 4A speakerphone system.

**1.02** This section is reissued to:

- Revise safety information for the 85B1 power unit
- Revise Fig. 2 and 3
- Add installation information pertaining to the length of adapter cord.

**1.03** Rotary telephone sets equipped with an 8RA dial must be equipped with an 8CA dial when used with 4A speakerphone. The two (Y) leads of second set of off-normal contacts on 8CA dial shall connect to same set terminals as P3 and P4 speakerphone leads.

#### 2. CONNECTIONS

##### A. 223-Type Adapter

**Note:** When planning an installation of 4A speakerphone components with the 851- or 2851-type telephone set, careful consideration must be given to the location of the 223A (MD) or 223D adapter because the M16C (MD) or M16H adapter cord is available in 7- and 14-foot lengths only.

**2.01** Telephone sets are connected to the speakerphone system by means of a 223A (MD) or 223D adapter which consists of the following.

(a) Plastic housing.

(b) M16C (MD) or M16H cord for connecting to telephone set.

(c) M2FG cord for connecting the power supply.

**Note:** Cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power unit plug into the connector of the adapter cord.

**2.02** After cords are installed in the proper receptacles of the adapter, the cover must be fastened securely to assure proper mating of connectors.

**2.03** *Ringer Cutoff* can be provided by connecting ringer leads as shown in Fig. 2 or 3. Ringer cutoff provides cut off of the telephone set ringer through the loudspeaker set relay contacts while on speakerphone.

**2.04** *Auxiliary Relay* feature provides a contact closure for operation of an auxiliary relay key telephone unit when it is desired to cut off several signals (Fig. 2 or 3).

**2.05** When a nonspeakerphone equipped 851- or 2851-type telephone set is multiplied with sets furnishing speakerphone features, certain leads must be disconnected, insulated, and stored to avoid interference with working circuits. The designation of leads to be removed are as follows: T1 (V-G), R1 (G-V), P3 or IT (V-BR), P4 or IR (BR-V), AG (V-S), and LK (S-V). Refer to Section 502-110-100 for detailed information.

##### B. 108-Type Loudspeaker Set

**2.06** Loudspeaker set and transmitter must be a minimum of one foot apart.

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**C. 680-Type Transmitter**

**2.07** Transmitter must be at least two feet from transformer or any ac powered device.

**D. 85B1 Power Unit**

**2.08** Use an ac power outlet (not under control of a switch) as close as possible to the system being installed. 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.

**2.09** Power can be provided by making connections as shown in Fig. 1, 2, and 3.

**2.10** The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or less than 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for detailed information on power supply applications.

***Danger:*** ♦For safety, securely attach retaining clamp to ac outlet using outlet cover screw before attempting to install 85B1 power unit. The power unit and any other cord plugged into the ac outlet should always be

***unplugged completely from outlet BEFORE attempting to attach or remove the retaining clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs on the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamp on outlets where cover mounting screw holds the duplex outlet in the box.♦***

***Warning:*** ♦Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power source does not occur. If more than one power unit is plugged into a multiple receptacle power strip, there must be at least one inch separation between power units. Only UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the transformer to be in close proximity to the ac line source is not recommended.♦

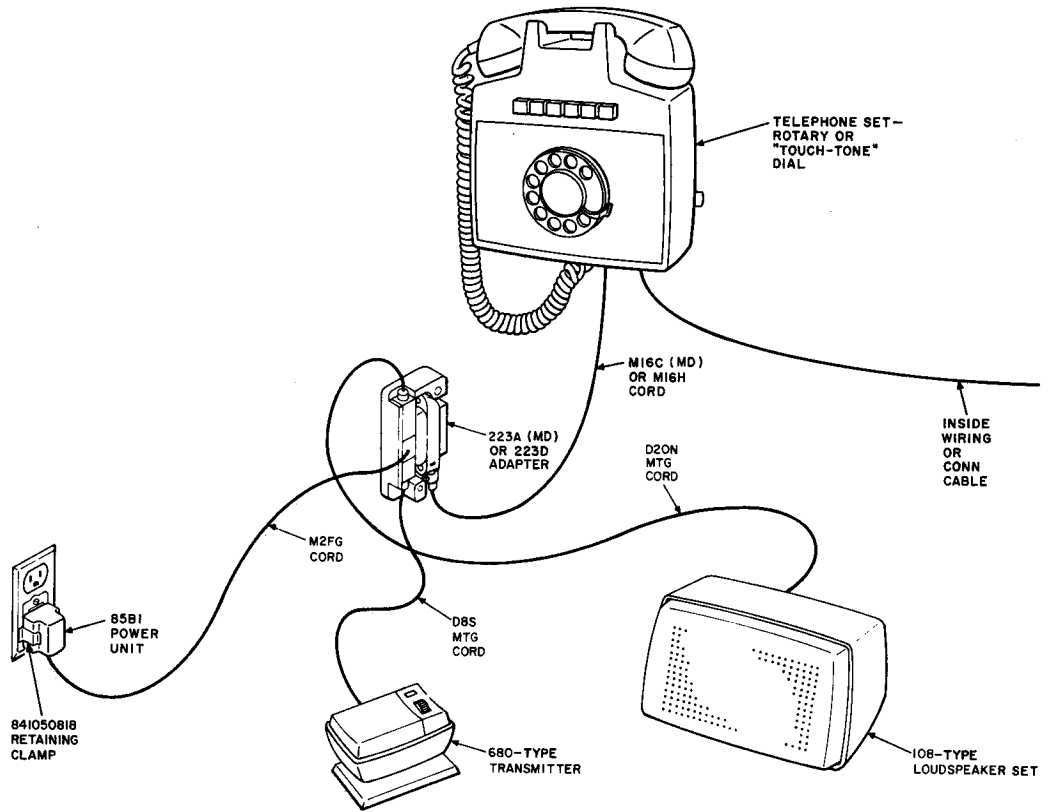
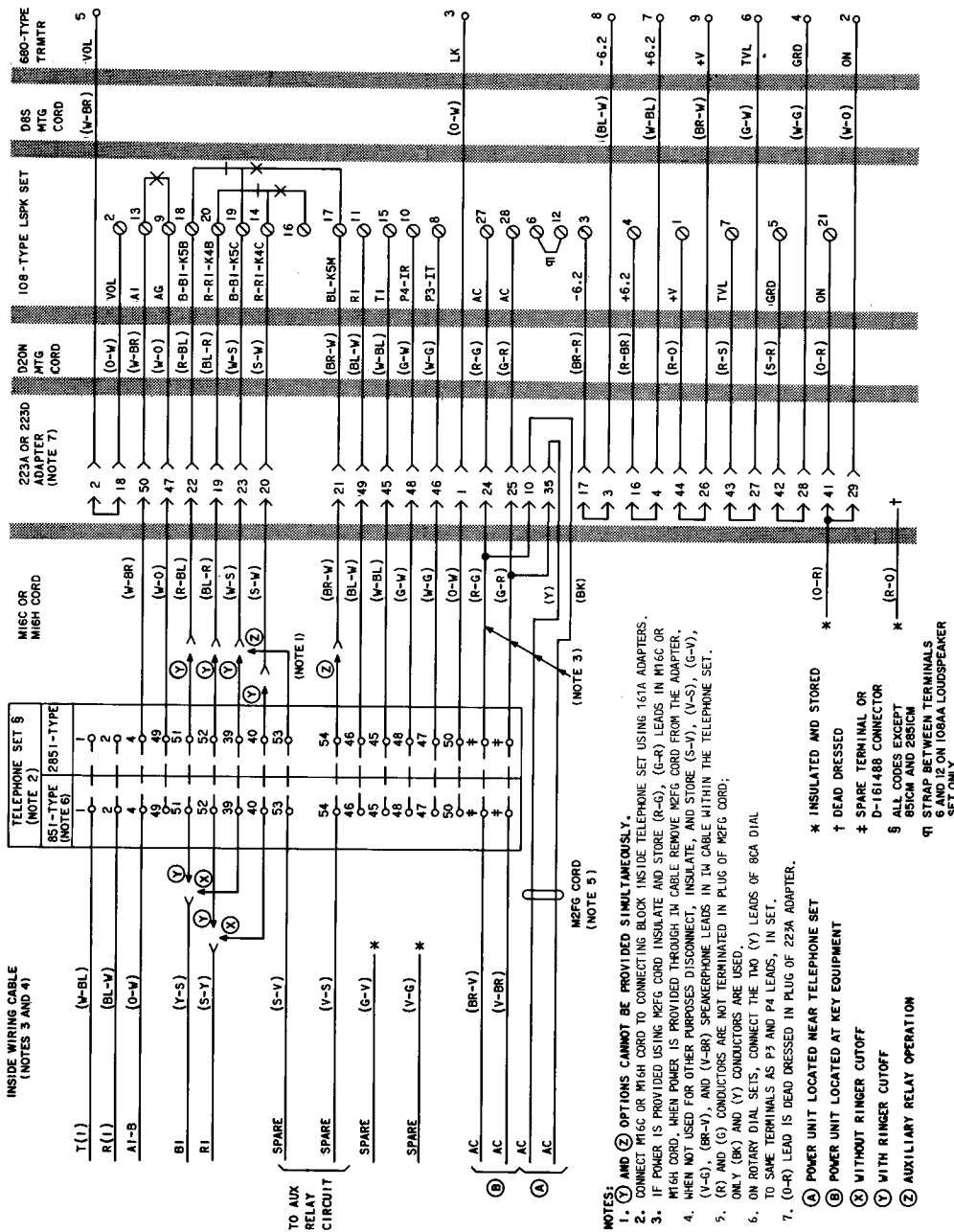


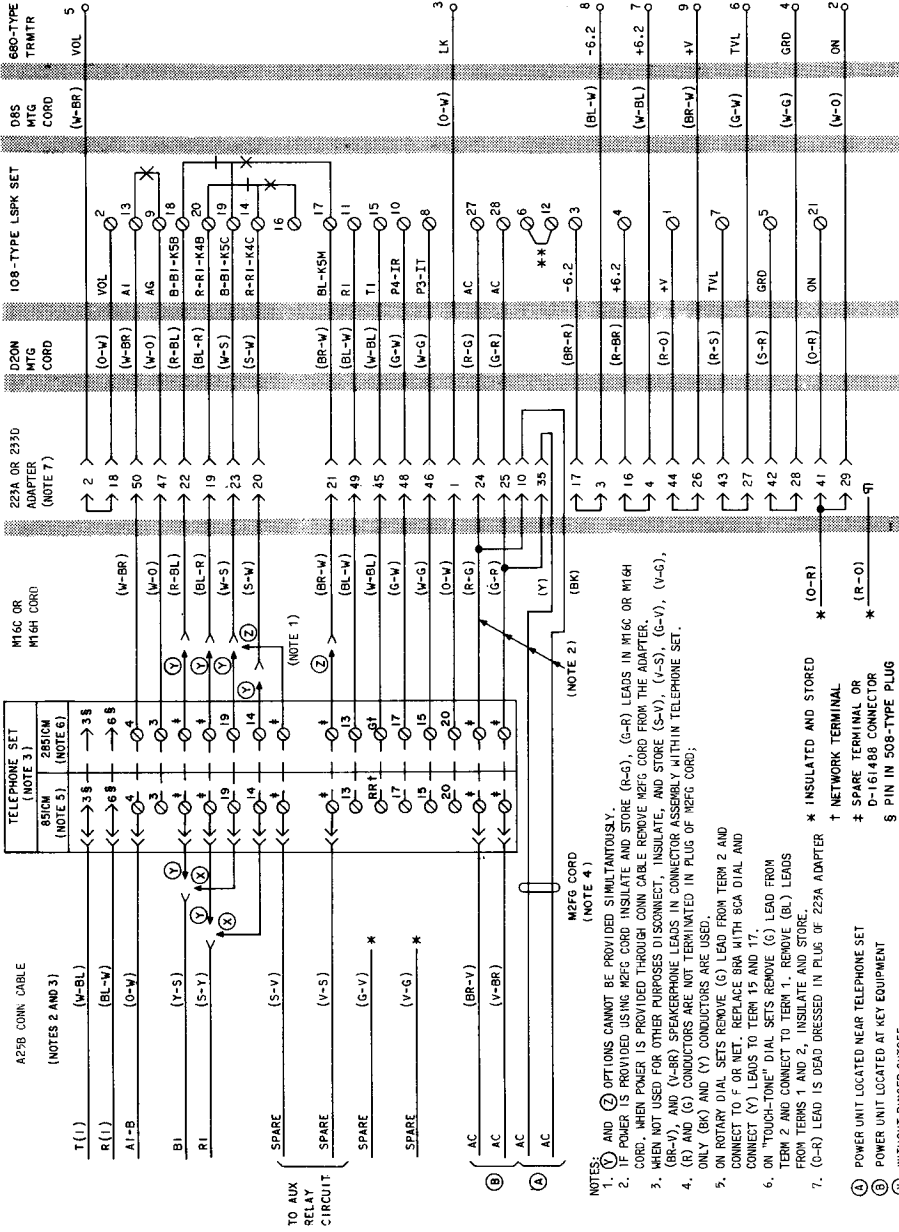
Fig. 1—4A Speakerphone System Arrangement, 6-Button Wall Telephone Set



INSIDE WIRING CABLE (NOTES 3 AND 4)

- NOTES:**
1. (1) AND (2) OPTIONS CANNOT BE PROVIDED SIMULTANEOUSLY.
  2. CONNECT W/6G OR W/8H CORD TO CONNECTING BLOCK INSIDE TELEPHONE SET USING 161A ADAPTERS.
  3. IF POWER IS PROVIDED USING W/6G CORD INSULATE AND STORE (R-G), (G-R) LEADS IN W/6G OR W/8H CORD. WHEN POWER IS PROVIDED THROUGH IN CABLE REMOVE W/6G CORD FROM THE ADAPTER.
  4. WHEN NOT USED FOR OTHER PURPOSES DISCONNECT, INSULATE, AND STORE (S-V), (V-S), (G-V), (V-G), (BR-V), AND (V-BR) SPEAKERPHONE LEADS IN IN CABLE WITHIN THE TELEPHONE SET.
  5. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF W/6G CORD. ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  6. ON ROTARY DIAL SETS, CONNECT THE TWO (Y) LEADS OF 8CA DIAL TO SAME TERMINALS AS P3 AND P4 LEADS, IN SET.
  7. (O-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER.
- (A) POWER UNIT LOCATED NEAR TELEPHONE SET
  - (B) POWER UNIT LOCATED AT KEY EQUIPMENT
  - (X) WITHOUT RINGER CUTOFF
  - (Y) WITH RINGER CUTOFF
  - (Z) AUXILIARY RELAY OPERATION
- \* INSULATED AND STORED  
 † DEAD DRESSED  
 ‡ SPARE TERMINAL OR D-161488 CONNECTOR  
 § ALL CODES EXCEPT 851GCM AND 2851GCM  
 ¶ STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUDSPEAKER SET ONLY

Fig. 2-44A Speakerphone System Arrangement, Connections to Early Version 851- and 2851-Type Telephone Sets



- NOTES:
1. (Y) AND (Z) OPTIONS CANNOT BE PROVIDED SIMULTANEOUSLY.
  2. IF POWER IS PROVIDED USING MFC CORD INSULATE AND STORE (R-G), (G-R) LEADS IN M16C OR M16H CORD. WHEN POWER IS PROVIDED THROUGH COIN CABLE REMOVE MFC CORD FROM THE ADAPTER.
  3. WHEN NOT USED FOR OTHER PURPOSES DISCONNECT, INSULATE, AND STORE (S-V), (V-S), (G-V), (V-G), (BR-V), AND (V-BR) SPEAKERPHONE LEADS IN CONNECTOR ASSEMBLY WITH IN TELEPHONE SET.
  4. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF MFC CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  5. ON ROTARY DIAL SETS REMOVE (G) LEAD FROM TERM 2 AND CONNECT TO F OR MET. REPLACE 8RA WITH SCA DIAL AND CONNECT (Y) LEADS TO TERM 15 AND 17.
  6. ON "TOUCH-TONE" DIAL SETS REMOVE (G) LEAD FROM TERM 2 AND CONNECT TO TERM 1. REMOVE (BL) LEADS FROM TERMS 1 AND 2. INSULATE AND STORE.
  7. (G-R) LEAD IS DEAD DRESSED IN PLUG OF 223A ADAPTER
- \* INSULATED AND STORED  
 † NETWORK TERMINAL  
 ‡ SPARE TERMINAL OR D-161488 CONNECTOR  
 § PIN IN 508-TYPE PLUG  
 ¶ DEAD DRESSED  
 \*\* STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUDSPEAKER SET ONLY

Fig. 3—4A Speakerphone System Arrangement, Connections to 851CM or 2851CM Telephone Sets†

## 852- AND 2852-TYPE TELEPHONE SETS CONNECTIONS SPEAKERPHONE SYSTEM—4A

### 1. GENERAL

**1.01** This section contains information necessary to connect the 852- and 2852-type telephone sets to provide 4A speakerphone service. Refer to Section 512-700-100 for detailed information on components of the 4A speakerphone system.

**1.02** This section is reissued to:

- Add safety information for the 85B1 power unit
- Revise Fig. 2.

**1.03** Rotary telephone sets equipped with an 8RA dial must be equipped with an 8CA dial when used with a 4A speakerphone.

### 2. CONNECTIONS

#### A. 223D Adapter

**Note:** When planning an installation of 4A speakerphone components with the 852- or 2852-type telephone set, careful consideration must be given to the location of the 223D adapter because the M16H cord is available in 7- and 14-foot lengths only.

**2.01** Telephone sets are connected to the speakerphone system by means of a 223D adapter which consists of the following.

- (a) Plastic housing.
- (b) M16H cord for connecting to telephone set.
- (c) M2FG cord for connecting the power supply.

**Note:** Cords from the 108-type loudspeaker set, 680-type transmitter, and 85B1 power unit plug into the connector of the M16H cord.

**2.02** After cords are installed in the proper receptacles of the adapter, the cover must be fastened securely to assure proper mating of connectors.

**2.03** **Ringer Cutoff** can be provided by connecting ringer leads as shown in Fig. 2. Ringer cutoff provides cut off of the telephone set ringer through the loudspeaker set relay contacts while on speakerphone.

**2.04** **Auxiliary Relay** feature provides a contact closure for operation of an auxiliary relay key telephone unit when it is desired to cut off several signals (Fig. 2).

**2.05** When an 852- or 2852-type telephone set is multiplied with sets furnishing speakerphone features, certain leads must be disconnected, insulated, and stored to avoid interference with working circuits. The designation of leads to be removed are as follows: T1 (V-G), R1 (G-V), P3 or IT (V-BR), P4 or IR (BR-V), AG (V-S), and LK (S-V).

#### B. 108-Type Loudspeaker Set

**2.06** Loudspeaker set and transmitter must be a minimum of one foot apart.

#### C. 680-Type Transmitter

**2.07** Transmitter must be at least two feet from transformer or any ac powered device.

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**D. 85B1 Power Unit**

**2.08** Use an ac power outlet (not under control of a switch) as close as possible to the system being installed. 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 to prevent accidental loss of power.

**2.09** Power can be provided by making connections as shown in Fig. 1 and 2.

**2.10** The M2FG cord is furnished as part of the 223D adapter for connecting the 85B1 power unit.

**2.11** The 85B1 power unit should be located less than 125 feet from 108-type loudspeaker set when using 24 gauge wire or less than 85 feet when using 26 gauge wire. Refer to Section 512-700-100 for detailed information on power supply applications.

***Danger:*** ♦For safety, securely attach retaining clamp to ac outlet using outlet cover screw before attempting to install 85B1 power unit. The power unit and any other cord plugged into the ac outlet should always be unplugged completely from outlet

***BEFORE attempting to attach or remove the retaining clamp. This will prevent the possibility of a loosened retainer clamp or metallic outlet cover making contact with the ac prongs on the 85B1 power unit when partially withdrawn from outlet. Do not use retaining clamp on outlets where cover mounting screw holds the duplex outlet in the box.♦***

***Warning:*** ♦Care should be taken to trim and dress leads connecting to low voltage output terminals of 85B1 power unit to assure that inadvertent connection to conducting surfaces or other power source does not occur. If more than one power unit is plugged into a multiple receptacle power strip, there must be at least one inch separation between power units. Only UL listed receptacle power strips with adequate power rating shall be used. Use of a continuous terminal power strip that allows the secondary output terminals of the transformer to be in close proximity to the ac line source is not recommended.♦

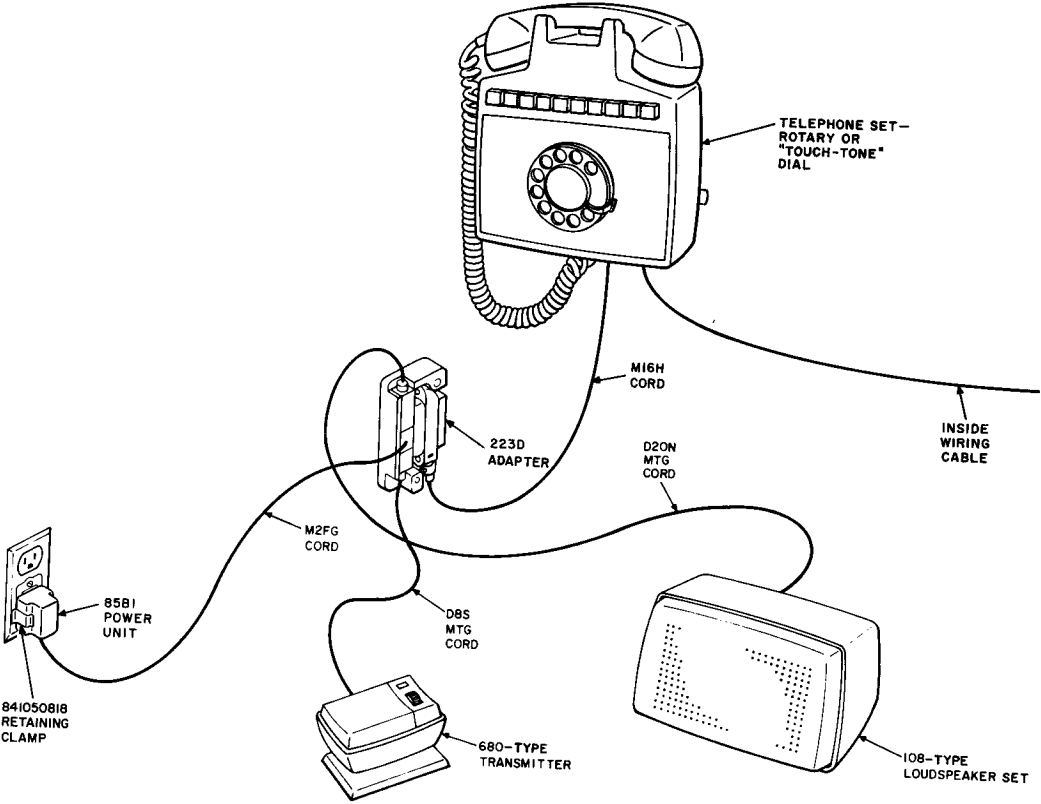
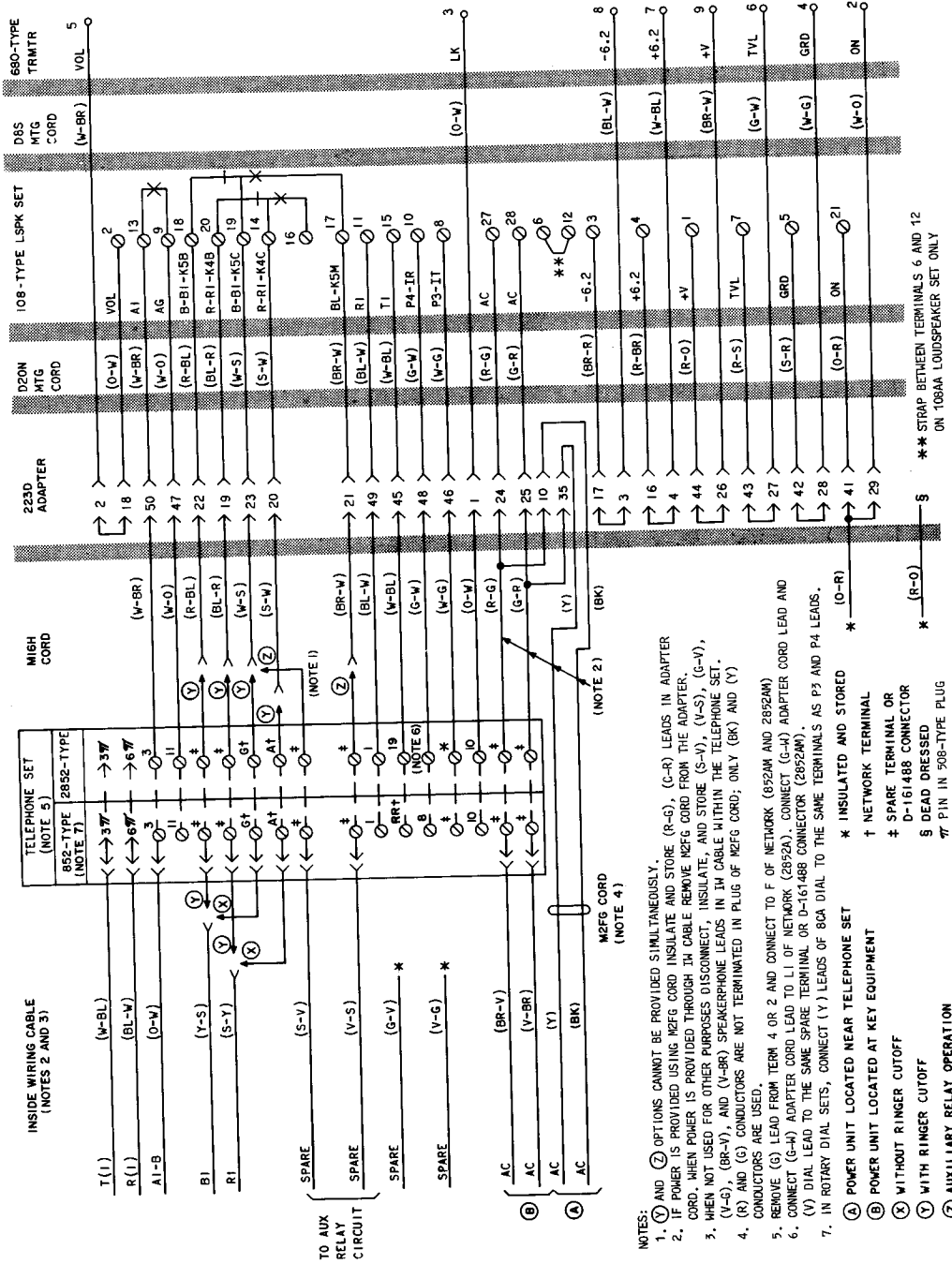


Fig. 1—4A Speakerphone System Arrangement, 10-Button Wall Telephone Sets



- NOTES:**
1. (1) AND (2) OPTIONS CANNOT BE PROVIDED SIMULTANEOUSLY.
  2. IF POWER IS PROVIDED USING M2FG CORD INSULATE AND STORE (R-G), (G-R) LEADS IN ADAPTER CORD. WHEN POWER IS PROVIDED THROUGH IN CABLE REMOVE M2FG CORD FROM THE ADAPTER.
  3. WHEN NOT USED FOR OTHER PURPOSES DISCONNECT, INSULATE AND STORE (S-V), (G-V), (V-G), (BR-V), AND (V-BR) SPEAKERPHONE LEADS IN IN CABLE WITHIN THE TELEPHONE SET.
  4. (R) AND (G) CONDUCTORS ARE NOT TERMINATED IN PLUG OF M2FG CORD; ONLY (BK) AND (Y) CONDUCTORS ARE USED.
  5. REMOVE (G) LEAD FROM TERM 4 OR 2 AND CONNECT TO F OF NETWORK (892AM AND 2892AM).
  6. CONNECT (G-W) ADAPTER CORD LEAD TO L1 OF NETWORK (2892A). CONNECT (G-W) ADAPTER CORD LEAD AND (V) DIAL LEAD TO THE SAME SPARE TERMINAL OR D-161488 CONNECTOR (2892AM).
  7. IN ROTARY DIAL SETS, CONNECT (Y) LEADS OF 8CA DIAL TO THE SAME TERMINALS AS P3 AND P4 LEADS.
- (A) POWER UNIT LOCATED NEAR TELEPHONE SET  
 (B) POWER UNIT LOCATED AT KEY EQUIPMENT  
 (X) WITHOUT RINGER CUTOFF  
 (Y) WITH RINGER CUTOFF  
 (Z) AUXILIARY RELAY OPERATION
- \* INSULATED AND STORED  
 † NETWORK TERMINAL  
 ‡ SPARE TERMINAL OR D-161488 CONNECTOR  
 § DEAD DRESSED  
 ¶ PIN IN 508-TYPE PLUG
- \*\* STRAP BETWEEN TERMINALS 6 AND 12 ON 108AA LOUDSPEAKER SET ONLY

Fig. 2.—4A Speakerphone System Connections, Connections to 852- and 2852-Type Telephone Sets



## KEY EQUIPMENT—4A

### IDENTIFICATION, INSTALLATION, AND MAINTENANCE

#### 1. GENERAL

1.01 This section is reissued to:

- Add 1035C3A dial, show 1025A3 and 1025W3A dials MD; Table A
- Show 688A and B subscriber sets MD.

1.02 The 688-type subscriber set contains a transistor amplifier to compensate for the low output level of the transmitter of the 52-type head telephone set. It is recommended that the 688-type subscriber set be used in all new installations in preference to the 685-type subscriber set which is not equipped with an amplifier.

#### 2. IDENTIFICATION

2.01 The basic 4A key equipment (Fig. 1) consists of:

- Subscriber set
- Dial
- Head telephone set
- Key

2.02 The 4A key equipment utilizes a head telephone set to permit hands-free operation. The circuit provides:

- Two-way service between a central office or PBX and the subscriber station.
- Hold feature, if desired.

**Note:** 4A key equipment should not be used where tip party identification is required.

2.03 See Table A for selection of components for the various configurations of the 4A key equipment.

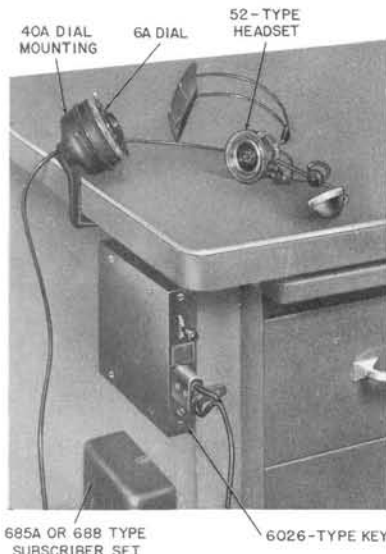


Fig. 1—Typical 4A Key Equipment Installation

#### 3. INSTALLATION

3.01 Install components of 4A key equipment such as subscriber sets, 105-type apparatus boxes, dials, etc, following standard practices for the apparatus involved.

3.02 In selecting a mounting location for the 6026-type key, avoid knee well installations or other locations where damage or accidental operation of equipment or injury to customer might occur.

3.03 When installing the key on the side of a desk or table, the face of the key should be flush with the edge of the desk or table (Fig. 1).



Fig. 2—Battery Feed Filter and Holding Relay Equipment

3.04 The 6026-type key housing can be reversed for mounting on either the right or left side of a desk or table.



*To minimize crosstalk, wiring between the subscriber set and 6026-type key should not exceed 10 feet. Avoid paralleling with other telephone wires.*

3.05 When required, the 5A and 32A KTU's (Fig. 2) may be located remotely from the subscriber set and 6026-type key.

3.06 Dial mountings may be installed on top of or at either end of a desk or table. The

6000D, 6044B, or 6044D dial mountings require drilling through the top of the desk or table for passage of the wires.



*Obtain customer's permission before drilling hole in desk or table.*

3.07 Where drilling is not permissible, install dial mounting as follows:

- (a) For side of desk, where top overhang permits, attach a 40A dial mounting to the overhang (Fig. 1).
- (b) Where a greater angle is desired, use a 43A dial mounting in conjunction with a G1 handset mounting (line switch removed).

3.08 To install a filter on a 6-type dial in a mounting, use another 64A dial adapter as an extra spacer. A 61A filter, a P-295735 mounting bracket, three No. H-36 RHM screws, and two 1/4-inch No. 4 self-tapping screws are also required. Mount filter on the underside of mounting bracket with self-tapping screws. A D-161488 connector may be used to connect filter leads to the dial and key.



*When a 688B (MD) or 688C subset is used, wiring changes must be made at the 6026B or 6026D key. See connections section for these required changes.*

#### 4. MAINTENANCE

4.01 Maintenance of subscriber sets, ringers, dials, batteries, head telephone sets, key telephone units, and associated apparatus is covered in the particular section on each item.

4.02 Use PBX installation and maintenance sections as guides for correcting troubles on relays, keys, or jacks.

4.03 Make circuit operation tests in accordance with SD-69087-01.

◆ TABLE A ◆

## COMPONENT PARTS OF 4A KEY EQUIPMENT

EQUIPMENT		REMARKS
Adapter, dial	52D	Used with 40A, 6000D dial mounting in addition to the 64A dial adapter.
	59B	Used with the 6044B dial mounting.
	59D	Used with the 6044D dial mounting.
	64A	Used with 40A, 6000D dial mounting in addition to the 52D dial adapter.
Box, apparatus, 105 type		For mounting key telephone units (Fig. 2).
Dial, 6 type*		Used with 40A, 43A, 6000D, 6044B or D dial mounting (Fig. 1).
Dial, 1025A3 and 1025W3 (MD)		Use D10P or D10R mounting cord — specify length when ordering.
Dial, 1035C3A		Use D14M mounting cord — specify length when ordering.
Filter, 61A		Used to suppress radio frequency induction due to dialing.
Key, 6026B		3-position lever-type key arranged for "OFF", talking, and holding; equipped with 361C jack, 215A jack, 3B varistor, and terminal block (Fig. 1).
Key, 6026D		Similar to the 6026B key, but arranged for "OFF" and talking only; 2-position lever-type key (Fig. 1).
Mounting, dial	40A	For fastening to the underside of a desk top overhang (Fig. 1).
	43A	To hold dial at 45, 60, 75, or 90 degree angle from a horizontal position.
	6000D	Mounted on top of a desk at a 20-degree angle.
	6044B, D	Mounted on top of a desk at a 37-degree angle.
Resistor, 100 ohm KS-14603, List 2D		Used with a 5A KTU (Fig. 2).
Set, subscriber, 685A		Common battery talking, common battery signaling (Fig. 1).
Set, subscriber, 688A (MD), B (MD), and C		Common battery talking, common battery signaling.
Set, head telephone 52- or 53-type		Attendant telephone (Fig. 1).
Units, key telephone (Fig. 2)	5A	Hold relay.
	32A	Used as a transmitter current limiting network when the total loop conductor to the central office or nearest long line termination is less than 300 ohms. This includes both station and central office conductor loops in the case of PBX extensions.

\* When installing the 6J, K, or L, dial, use a 6044D dial mounting.

## KEY EQUIPMENT—4A

### COMMON BATTERY TALKING—COMMON BATTERY SIGNALING CONNECTIONS

#### 1. GENERAL

1.01 This section contains connections for the 4A key equipment. Refer to SD-69087-01 for full schematics of components used in the system.



*To minimize the possibility of crosstalk, the wiring between the subscriber set, 6026-type key, and dial should not exceed 10 feet. Avoid paralleling with other telephone wires.*

1.02 This section is reissued to:

- Revise Fig. 3, 10, 11, and 12 to show factory strap between terminals 4 and 5 of 6026B key which is to be removed.

#### 2. CONNECTION INDEX

Fig. 1—685A Subset and Rotary Dial, With Hold

Fig. 2—685A Subset and Rotary Dial, With or Without A Lead Control

Fig. 3—688C Subset and Rotary Dial, With Hold

Fig. 4—688A (MD) Subset and Rotary Dial, A Lead Control

Fig. 5—688B (MD) Subset and Rotary Dial, A Lead Control

Fig. 6—688C Subset and Rotary Dial, A Lead Control

Fig. 7—688C Subset and 1025A3 (MD) Dial, A Lead Control

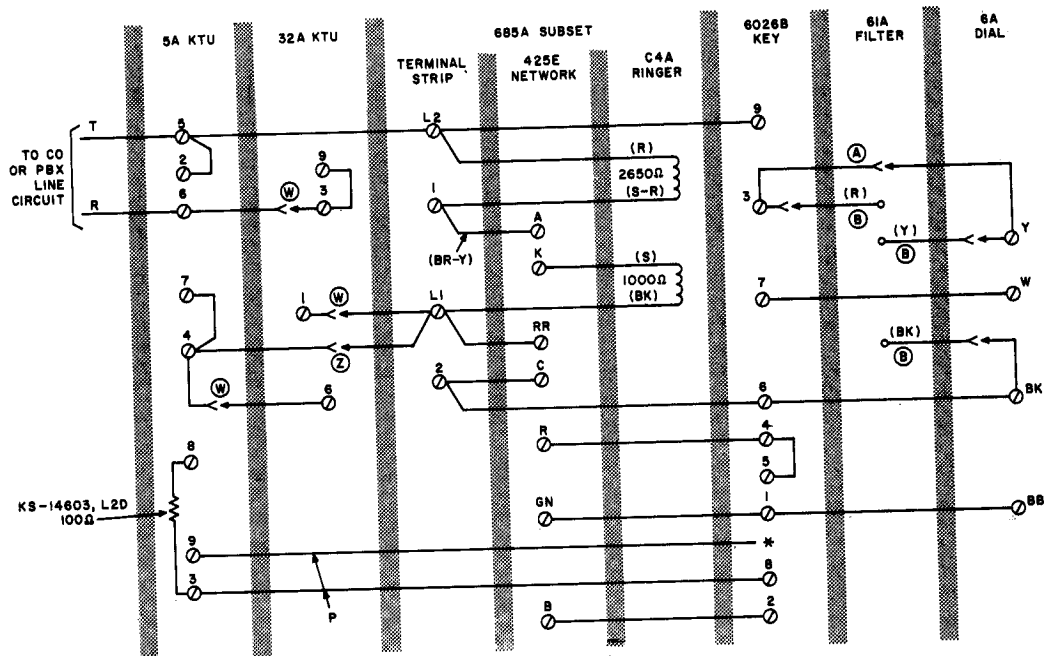
Fig. 8—688C Subset and 1025W3A (MD) Dial, A Lead Control

Fig. 9—688C Subset and 1035C3A Dial, A Lead Control

Fig. 10—688C Subset and 1025A3 (MD) Dial, With Hold

Fig. 11—688C Subset and 1025W3A (MD) Dial, With Hold

Fig. 12—688C Subset and 1035C3A Dial, With Hold



- \* INSULATE AND STORE
- (W) LOOP LESS THAN 300 OHMS
- (Z) LOOP MORE THAN 300 OHMS
- (A) WITHOUT 6IA FILTER
- (B) WITH 6IA FILTER

Fig. 1—685A Subset and Rotary Dial, With Hold

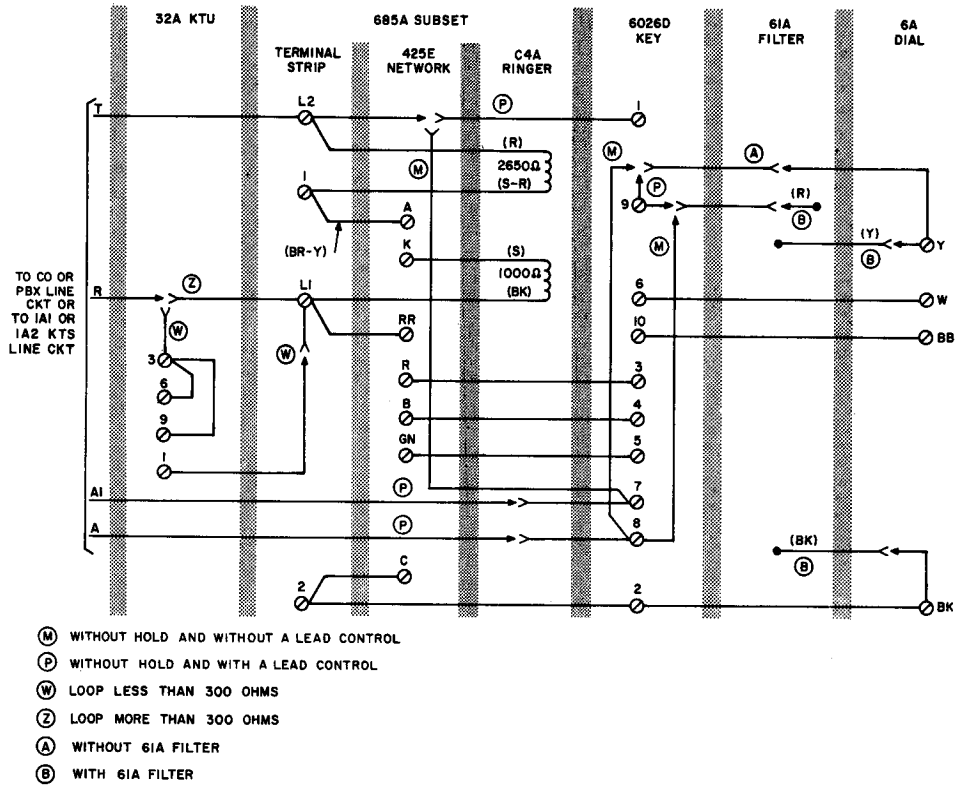


Fig. 2—685A Subset and Rotary Dial, With or Without A Lead Control

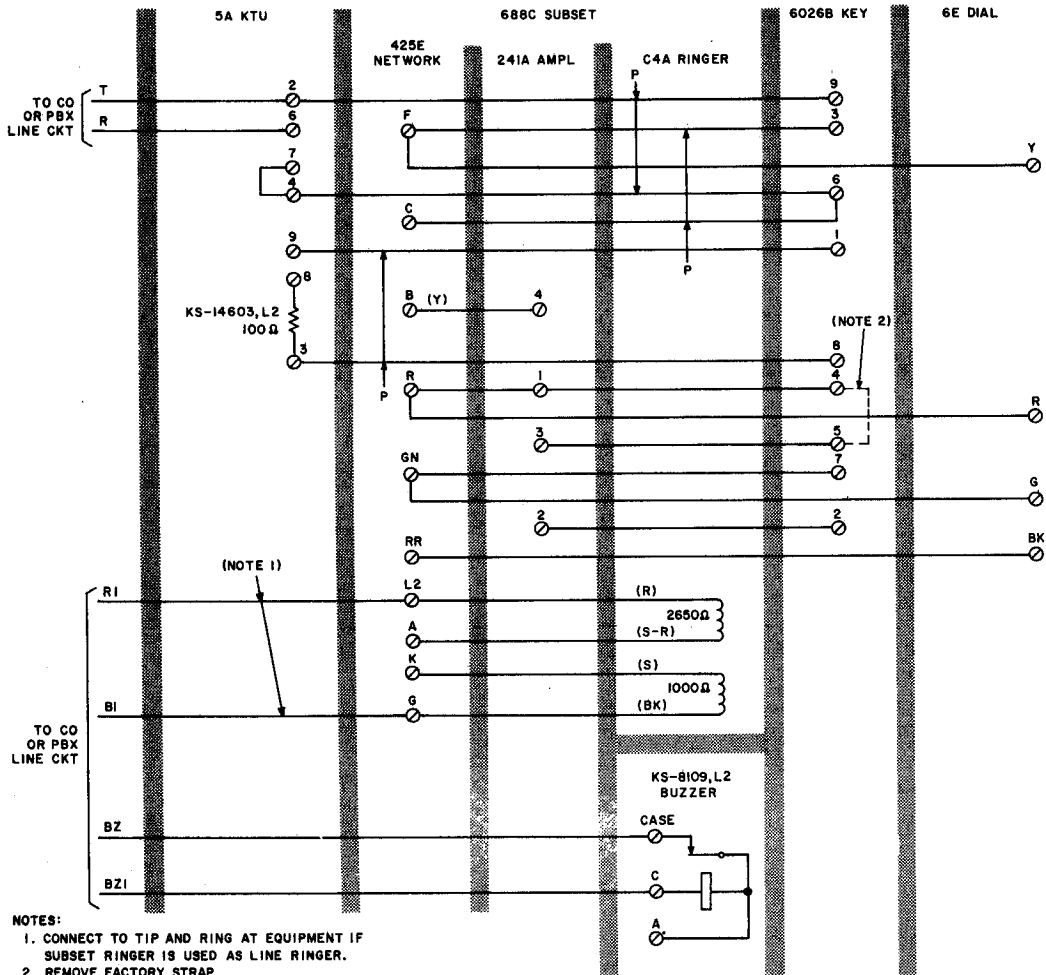
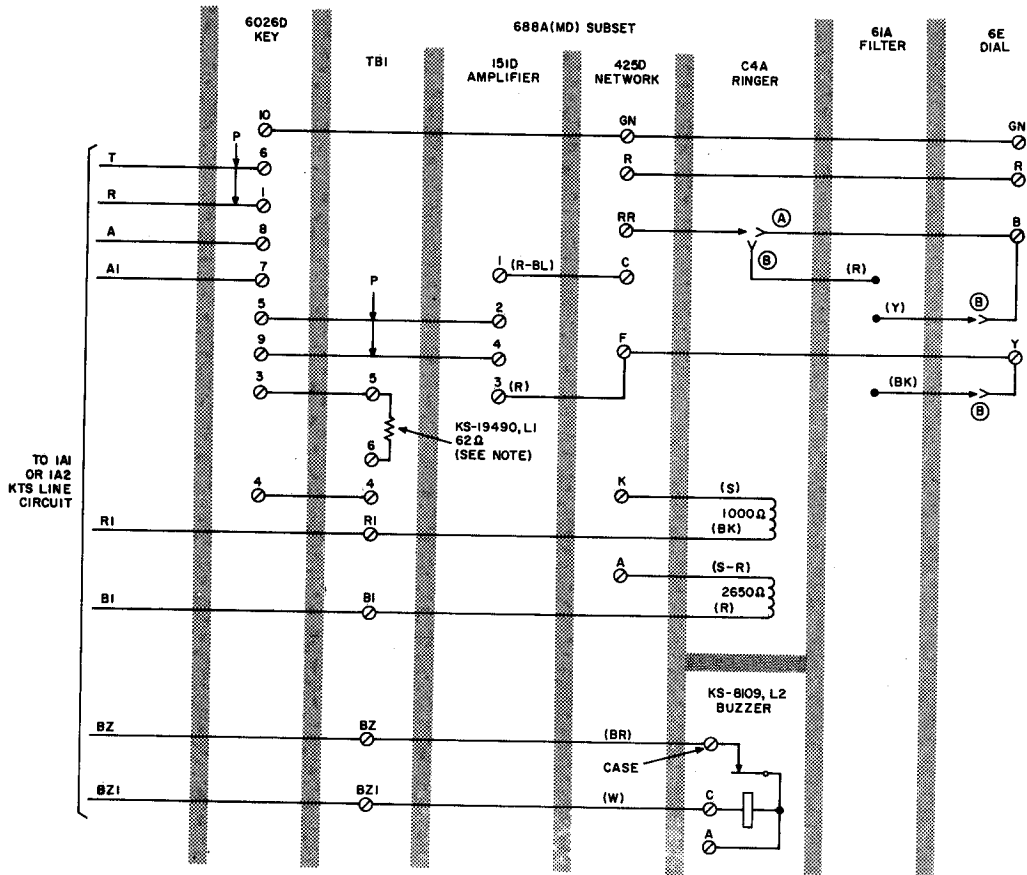


Fig. 3—688C Subset and Rotary Dial, With Hold

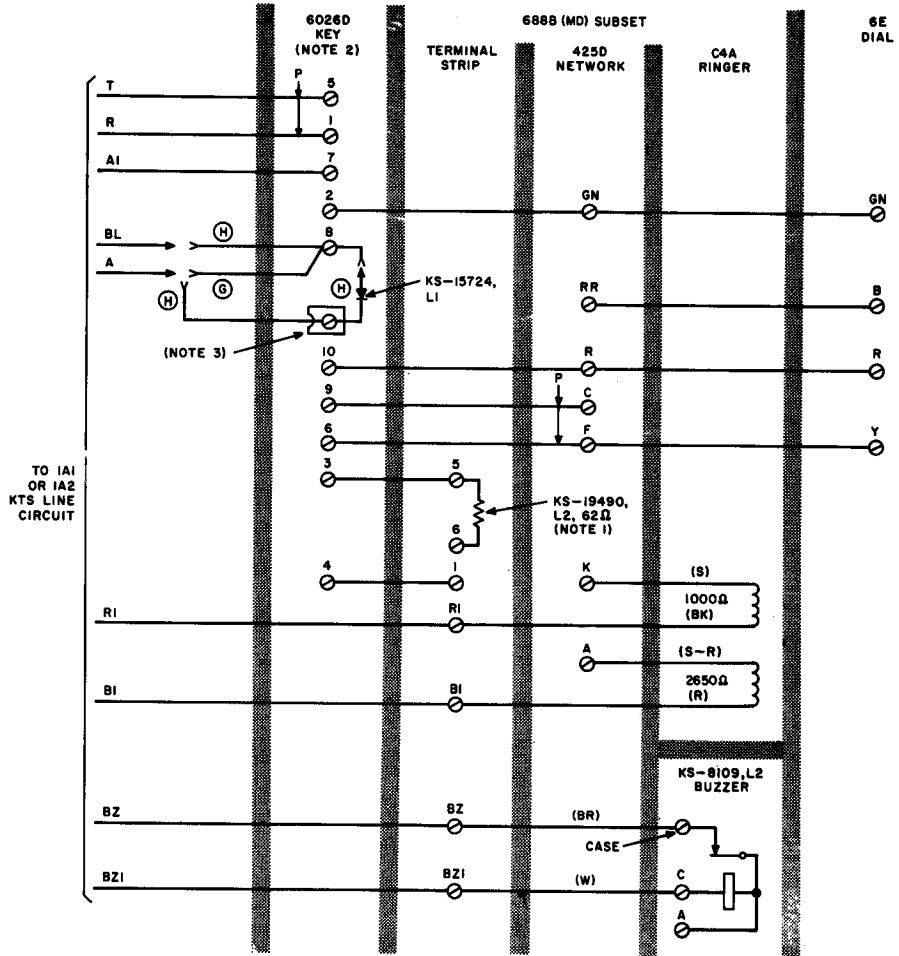


NOTE:  
IF MORE TRANSMITTER GAIN IS REQUIRED,  
REPLACE WITH A 30 OHM RESISTOR.

- Ⓐ WITHOUT 6IA FILTER
- Ⓑ WITH 6IA FILTER

Fig. 4—688A (MD) Subset and Rotary Dial, A Lead Control

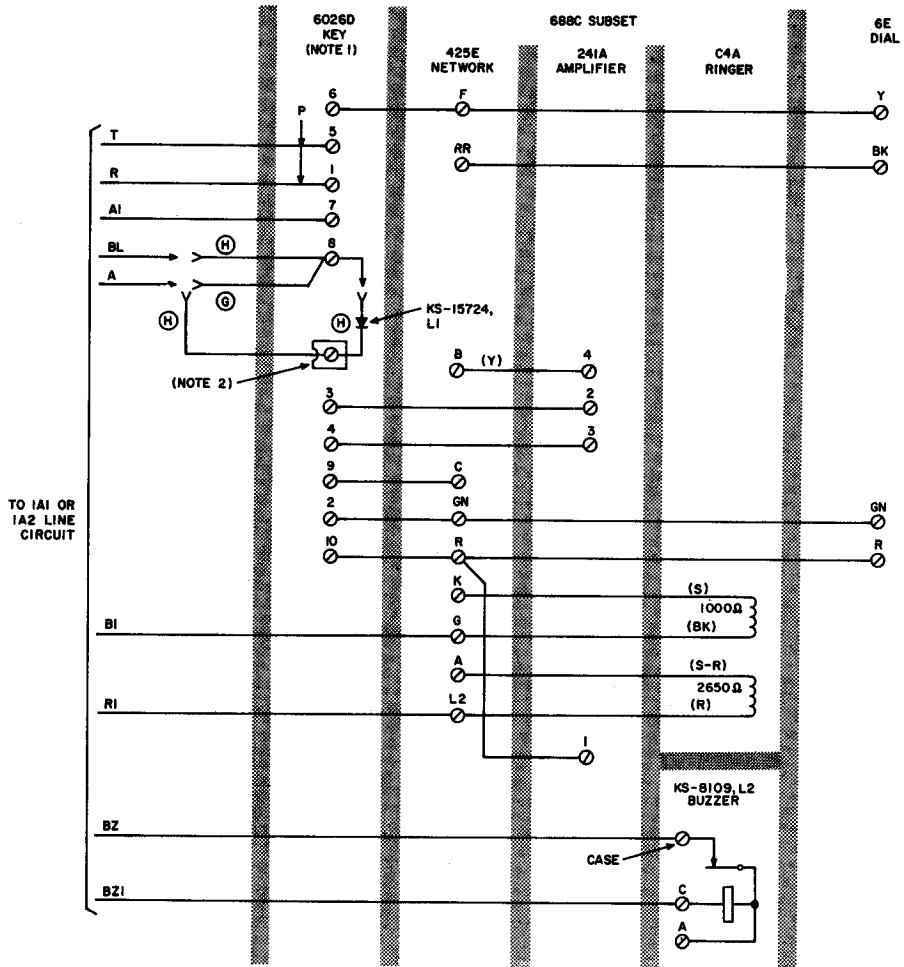




NOTES:

1. IF MORE TRANSMITTER GAIN IS REQUIRED, REPLACE WITH 30Ω RESISTOR.
  2. MODIFY KEY BY MOVING (BK) SPADE-TIPPED LEAD CONNECTED TO VARISTOR FROM TERMINAL 3 TO 2.
  3. USE D-161488 CONNECTOR.
- ⓐ WITHOUT BUSY LAMP.
- ⓑ WITH BUSY LAMP.

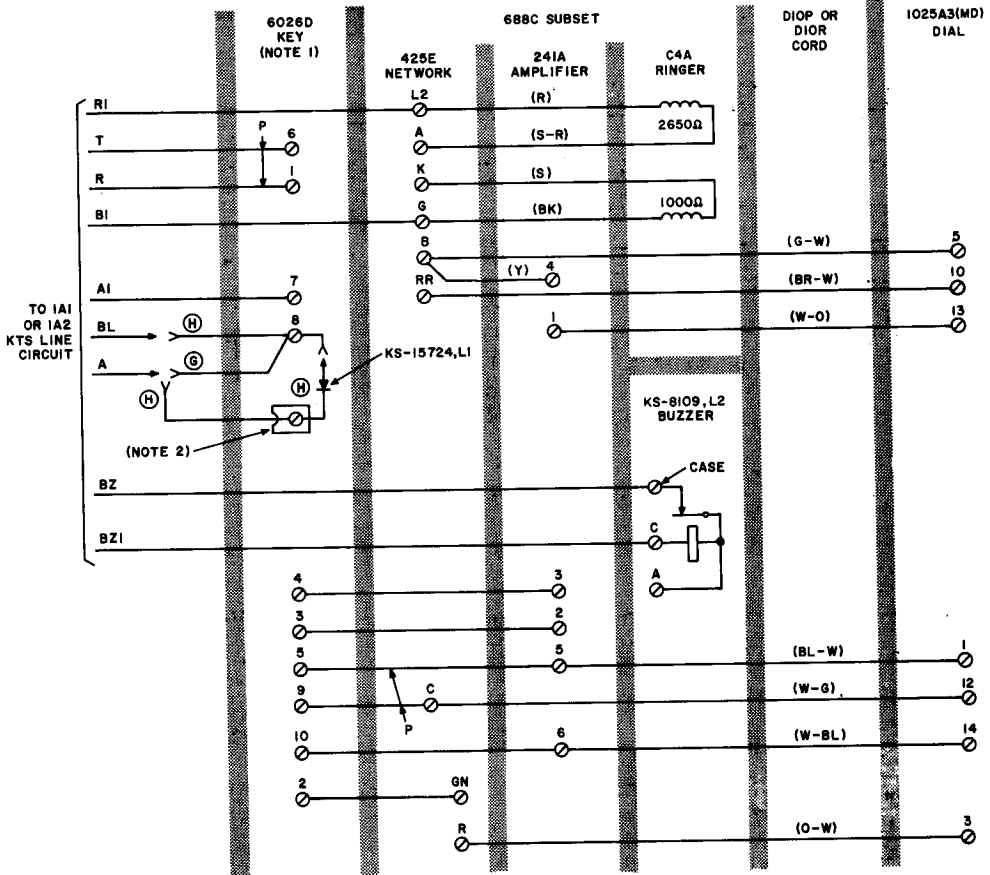
Fig. 5—688B (MD) Subset and Rotary Dial, A Lead Control



NOTES:

1. MODIFY KEY BY MOVING (BK) SPADE-TIPPED LEAD CONNECTED TO VARISTOR FROM TERMINAL 3 TO 2.
  2. USE D-161488 CONNECTOR.
- Ⓒ WITHOUT BUSY LAMP
- Ⓓ WITH BUSY LAMP

Fig. 6—688C Subset and Rotary Dial, A Lead Control



NOTES:

1. MODIFY KEY BY MOVING (BK) SPADE-TIPPED LEAD CONNECTED TO VARISTOR FROM TERMINAL 3 TO 2.
2. USE D-161488 CONNECTOR.

- Ⓒ WITHOUT BUSY LAMP
- Ⓓ WITH BUSY LAMP

Fig. 7—688C Subset and 1025A3 (MD) Dial, A Lead Control

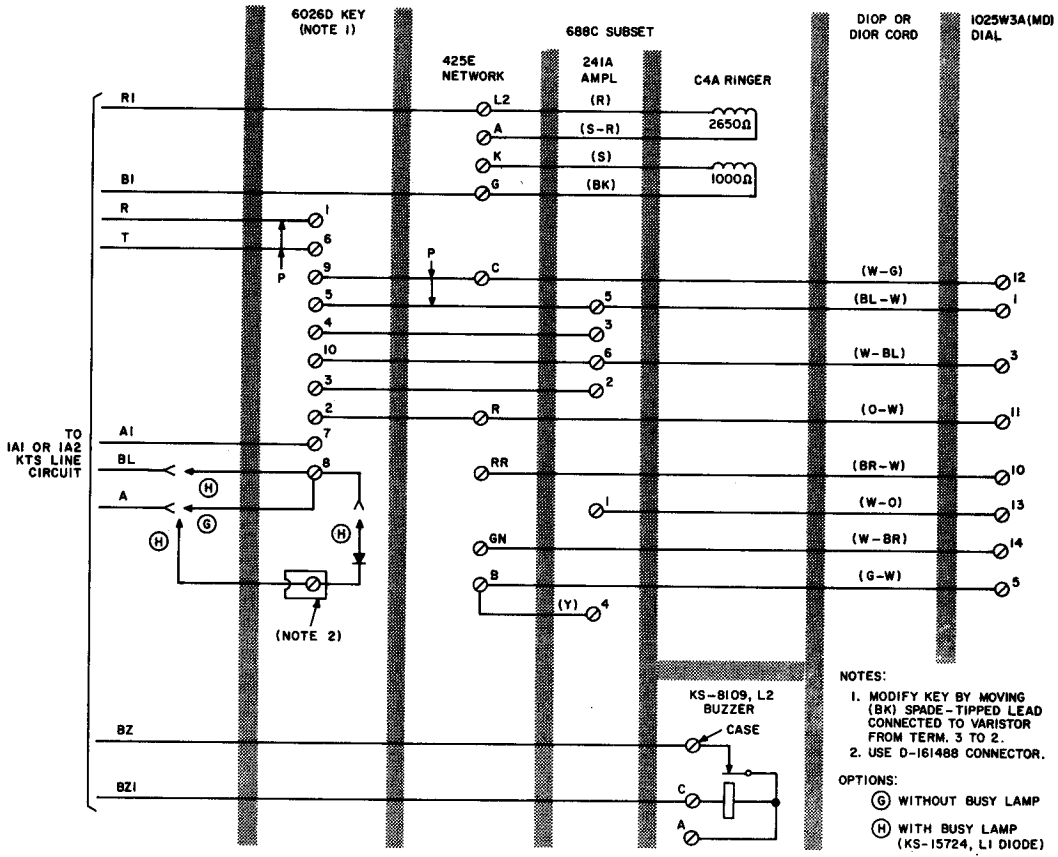


Fig. 8—688C Subset and 1025W3A (MD) Dial, A Lead Control

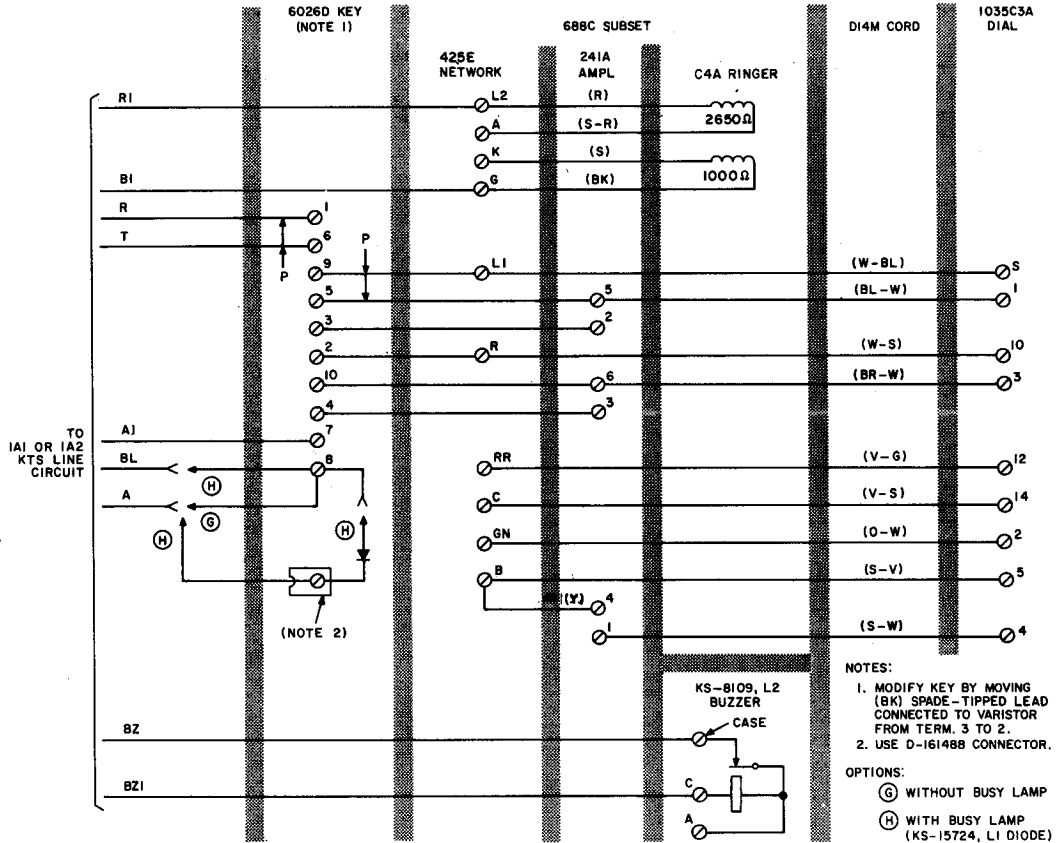


Fig. 9—688C Subset and 1035C3A Dial, A Lead Control

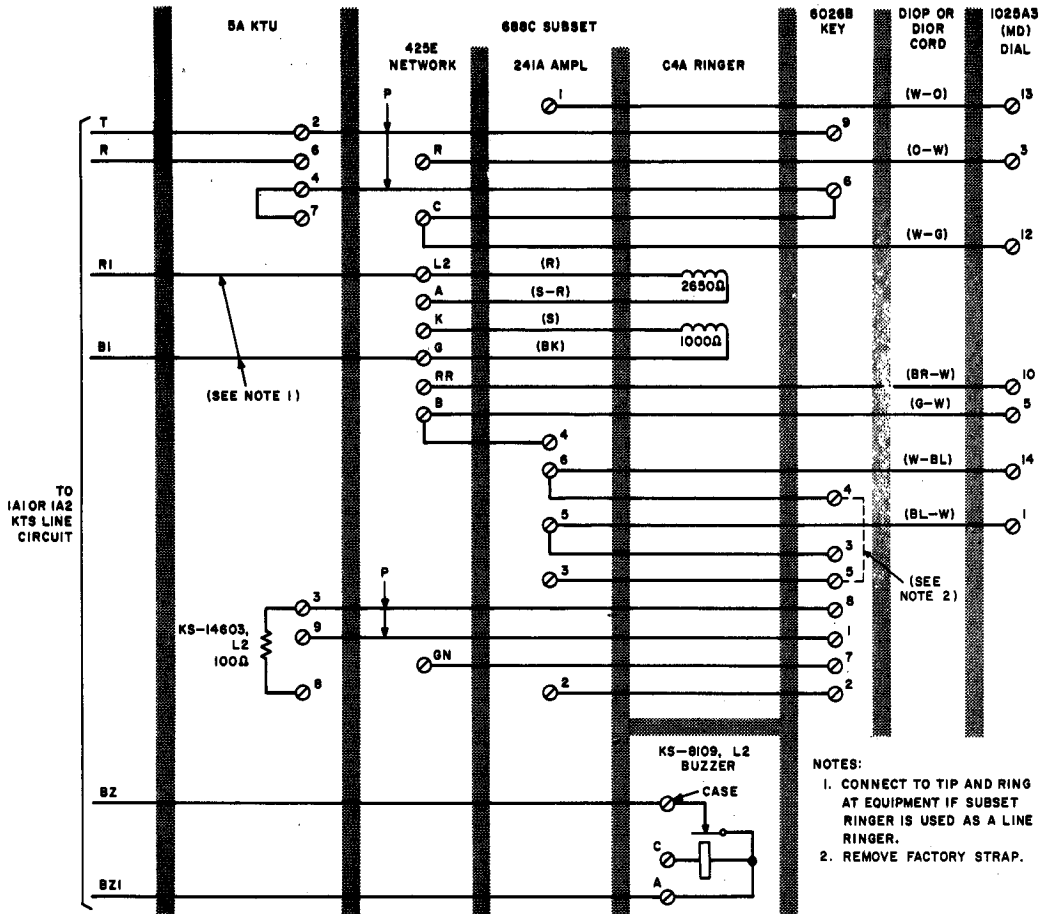


Fig. 10—688C Substation and 1025A3 (MD) Dial, With Hold

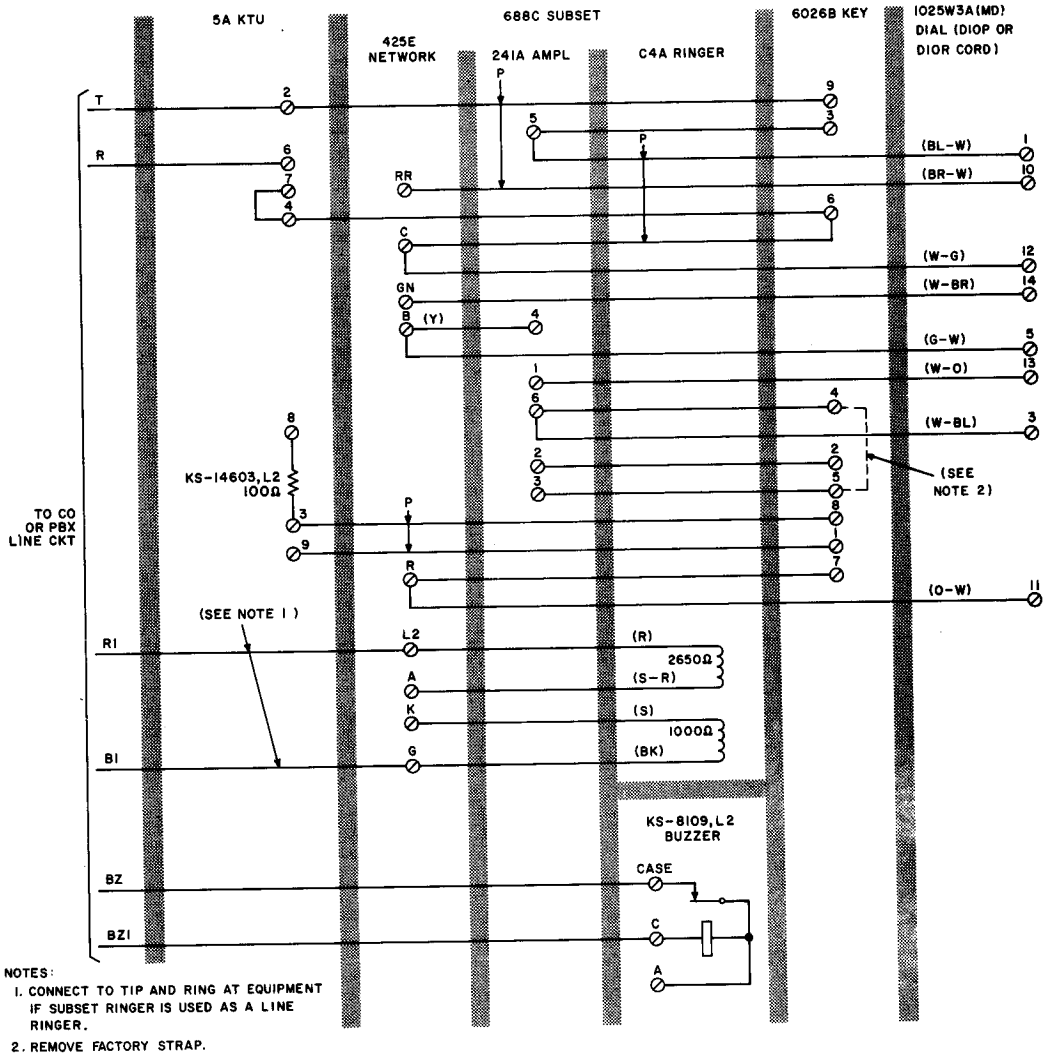


Fig. 11—688C Subset and 1025W3A (MD) Dial, With Hold

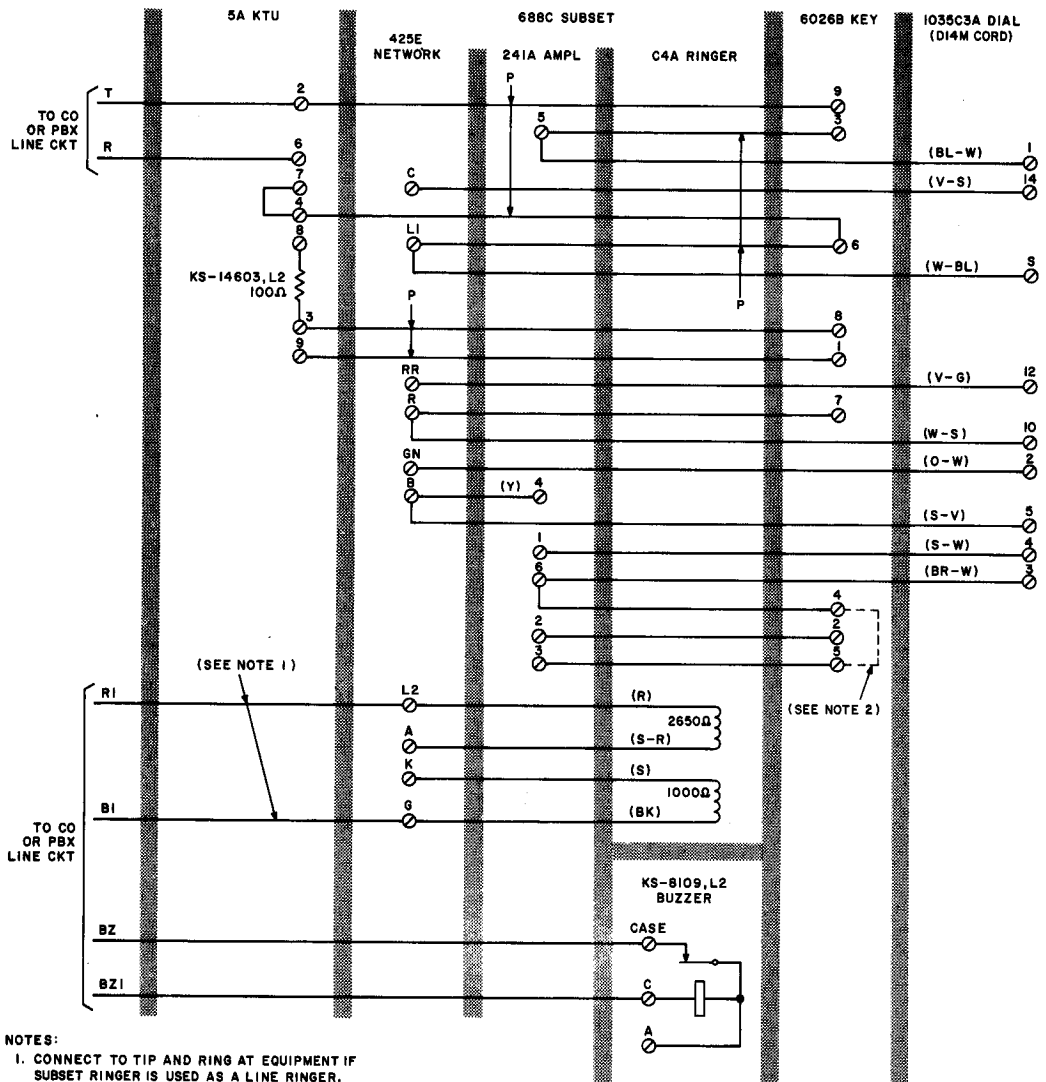


Fig. 12—688C Subset and 1035C3A Dial, With Hold



## KS-19245, LISTS 1, 13, AND 24 TELEPHONE ANSWERING SETS IDENTIFICATION, INSTALLATION, OPERATION, AND CONNECTIONS

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**1. GENERAL**

**1.01** This section contains information on the KS-19245, List 1 (MD) (Fig. 1), List 13 (MD), and List 24 (Fig. 2) telephone answering set.

**1.02** This section is reissued to:

- Add List 24 telephone answering set

- Add List 25 exclusion adapter
- Show List 13 telephone answering set (MD)
- Show connections to allow message overflow to a second answering set (Fig. 37)
- Add 267-type adapter.

**2. IDENTIFICATION**

**2.01** The KS-19245, Lists 1, 13, and 24 telephone answering sets (Fig. 1 and 2) are automatic answering sets for either answer and record, or answer only service.

- This answering set is used with individual lines, PBX extension lines, 2-party selective flat or message rate lines, and key telephone systems.
- Use of the telephone answering set in installations that have Dial Long Lines (DLL) circuits is nonstandard and not recommended. The dc calling party control features of the set are not compatible with a DLL circuit since DLL circuits do not regenerate disconnect signals toward the subscriber.
- The KS-19245, Lists 13 and 24 telephone answering set replaces the KS-19245, List 1 set and provides the same operational features plus calling party control (CPC) options, ring delay, and an input jack for modular mounting cord installations.
- The KS-19245, List 24 telephone answering set replaces the KS-19245, List 13 telephone answering set and provides a six terminal input jack for modular mounting cord installation.

**NOTICE**

Not for use or disclosure outside the  
Bell System except under written agreement

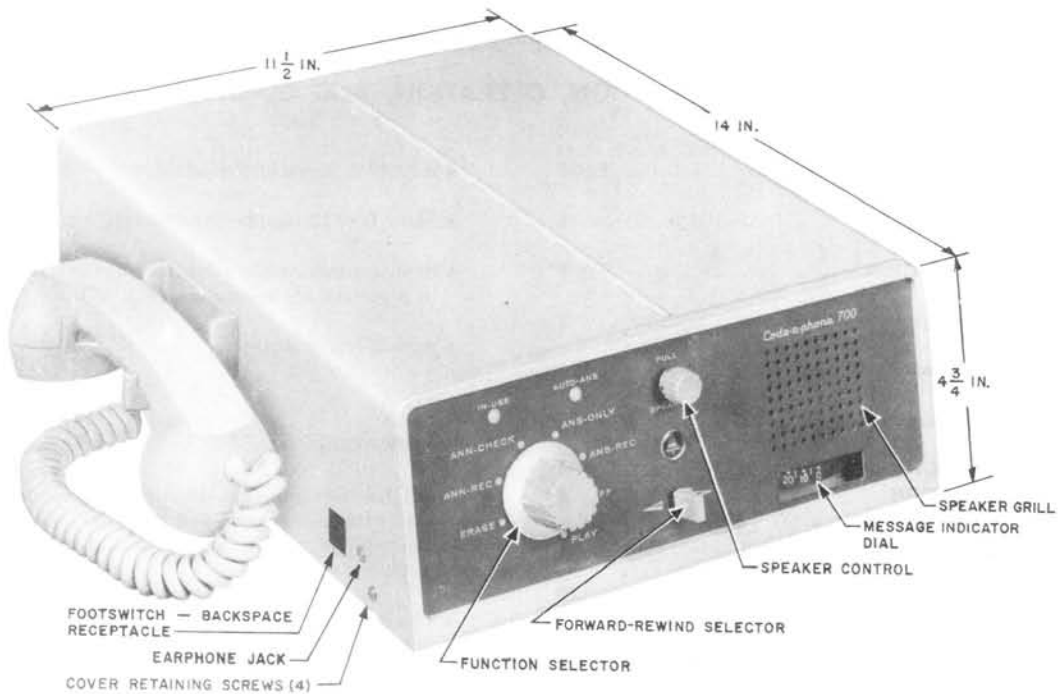


Fig. 1—KS-19245, List 1 (MD) Telephone Answering Set

**Note:** The Lists 13 and 24 set will operate on either 20 or 30 Hz ringing. The List 1 set is recommended only on 20 Hz ringing.

- Proper message playback volume and erasure cannot be guaranteed if the List 6 tape cartridge is moved from a List 1 answering set to a List 13 or 24 answering set (or vice versa). This incompatibility does not exist between the Lists 13 and 24 answering sets. If a tape cartridge is to be moved between different vintage sets, it must be fully erased on both vintage sets before new recordings are made.

#### A. Design Features

2.02 The following are design features:

- Announcement recording on magnetic tape with capacity of 3 minutes

- Adjustment for limiting announcement recording interval
- Handset, for recording announcements, and for checking recorded announcements or playback of recorded incoming messages
- Earphone jack, for use with KS-19245, List 9 earphone, for playback of recorded incoming messages
- Tape cartridge, for recording of incoming messages, with maximum recording time of 2 hours
- Adjustment for incoming message recording time for 1 or 2 hours
- Automatic switching to an auxiliary answering set when the messages on the main set exceed two hours

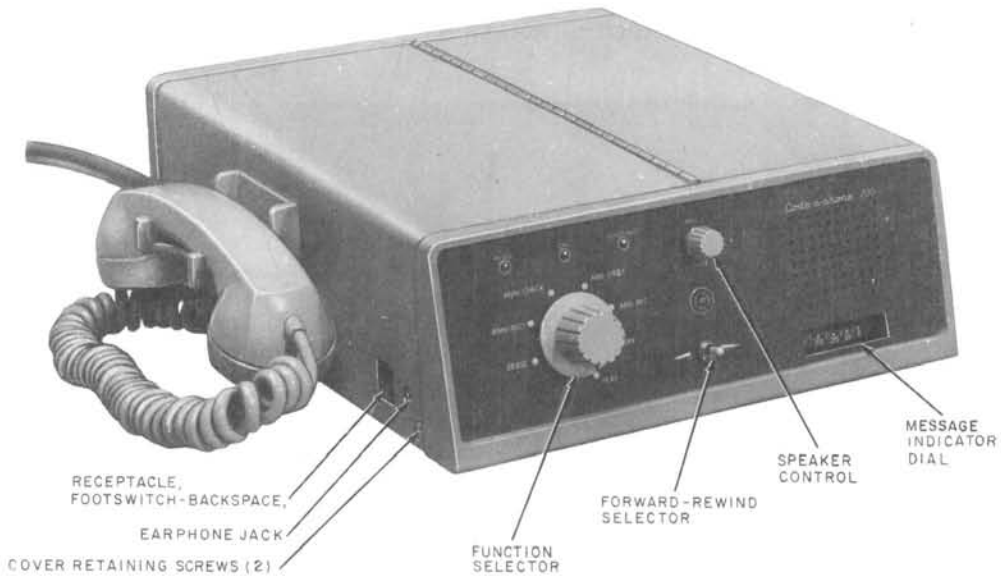


Fig. 2—KS-19245, List 13 (MD) and List 24 Telephone Answering Set

- Voice control operation during incoming message recording
- DC calling party control during automatic answer cycle
- Answer only operation
- Footswitch receptacle to be used with KS-19245, List 8 foot switch for operation during playback of recorded incoming messages
- Message indicator dial to show position of message tape
- Calling party control options provide selection of interrupt time from 0.5 to 450 milliseconds (Lists 13 and 24 only)
- Ring delay. Answer on first ring or after approximately 12 seconds of ringing (Lists 13 and 24 only)
- Modular connections (Lists 13 and 24 only)

- Housed in a metal case. The cover has a light olive gray textured finish and the front panel has a blue-gray enamel finish. Dimensions of the Lists 1, 13, and 24 sets are shown on Fig. 1. Weight of List 1 set is 31 pounds and Lists 13 and 24 sets is 24 pounds.

#### B. Optional Features

2.03 The following are optional features:

- Voice Control Disable
- Calling Party Control (CPC)
- Speak-up (Talk-down) Tone Disable
- Ring Delay (Lists 13 and 24 set only)

**Note:** The preceding options are implemented by soldering or removing a jumper strap in the List 1 set, or repositioning a jumper plug in the List 13 or 24 answering set.

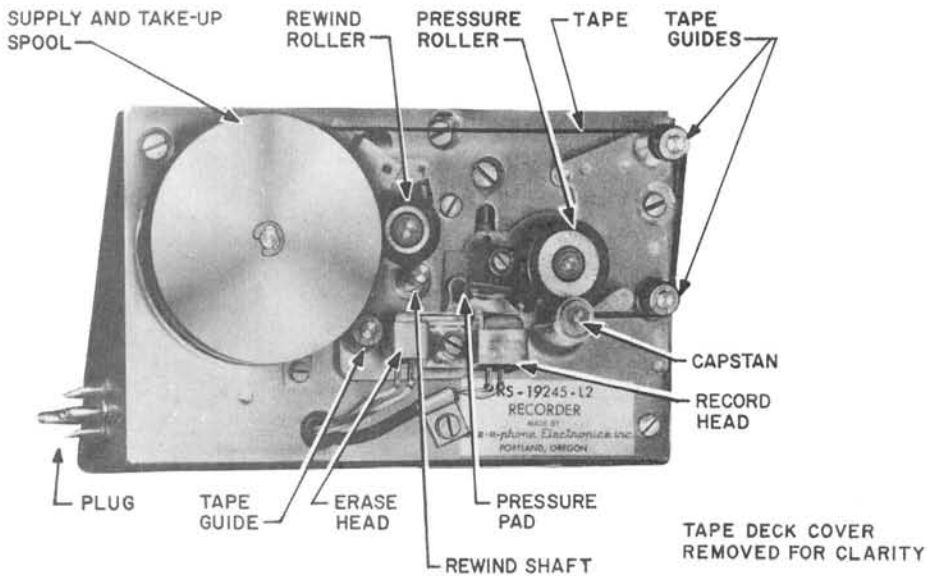


Fig. 3—KS-19245, List 2 Recorder (Reel Side)

- Exclusion of associated telephone when answering set is answering calls
- Message Recording Capacity
- Announcement Recording Capacity.

### C. Ordering Guide

#### 2.04 Order as follows.

(a) The KS19245, List 24 telephone answering set

- D4BU mounting cord and 267-type adapter (for standard installation)
- D6AP mounting cord and KS-19245, List 25 adapter (when exclusion or overflow answering is provided)
- Associated telephone set.

(b) The KS-19245, List 13 or 24 replaceable components may be ordered as follows:

- D4BU Mounting Cord
- D6AP Mounting Cord
- A3 Power Supply, KS-19245, List 19
- A4 Amplifier Board, KS-19245, List 15
- A5 Deck Control Board, KS-19245, List 16
- A6 Logic Board, KS-19245, List 17
- A8 Tape Deck, KS-19245, List 21 (List 13 only)
- A8 Tape Deck, KS-19245, List 22 (List 24 only)
- Cartridge, KS-19245, List 6.

**Note:** The Lists 13 and 24 sets come equipped with power cord.

- (c) The KS-19245, List 1 replaceable components may be ordered as follows:
- Recorder (Announcement), KS-19245, List 2
  - Recorder (Message), KS-19245, List 3
  - Amplifier, KS-19245, List 4
  - Amplifier, KS-19245, List 5
  - Cartridge, KS-19245, List 6
  - Cord, Power, KS-19245, List 11.
- (d) The following optional equipment may be ordered separately as required:
- Earphone, KS-19245, List 9
  - Tape Cartridge, KS-19245, List 6
  - Footswitch, KS-19245, List 8
  - Backspace Unit, KS-19245, List 12
  - Service Manual, KS-19245, List 18 (List 13 or 24 only).

### 3. COMPONENTS AND ACCESSORIES DESCRIPTION

#### 3.01 *KS-19245, List 1 Telephone Answering Set.*

- (a) The KS-19245, List 2 Recorder (Fig. 3 and 4) is the announcement recording mechanism. It provides a maximum recording capacity of 3 minutes, and incorporates a variable cycle feature that limits the reproduce cycle to the duration of the recorded announcement only. This recorder is equipped with 1/4-inch wide plastic base magnetic recording tape installed on special reels. The tape and reels form an integral part of the recording mechanism and **cannot** be changed by the customer since replacement of either requires partial disassembly of the mechanism. Facilities are provided for limiting the maximum recording time to 15-second increments (from 15 seconds to 90 seconds) or 30-second increments (from 90 seconds to 180 seconds). This is done by adjusting the variable limit switch assembly. The adjustment may only be made by the installer.

- (b) The KS-19245, List 3 Recorder (Fig. 5 and 6) is the incoming message recording mechanism. It provides a maximum recording capacity of 2 hours on 1/4-inch wide plastic base magnetic recording tape. This tape is contained in the KS-19245, List 6 cartridge which may be conveniently changed by the customer. Facilities are provided for limiting the message recording time to 1 or 2 hours. This is done by adjusting the limit switch actuator (Fig. 6). The adjustment may only be made by the installer.

- (c) The KS-19245, List 4 Amplifier (Fig. 7) is a printed circuit wiring board transistor amplifier for recording and reproducing. The amplifier incorporates an automatic volume control feature. It also contains the 1400-cycle oscillator and notch rejection filter.

- (d) The KS-19245, List 5 Amplifier (Fig. 8) is a printed circuit wiring board. It contains the voice-operated circuit and the calling party control circuit.

- (e) The KS-19245, List 6 Cartridge (Fig. 9) provides a 1/4-inch wide plastic base magnetic recording tape with a capacity for 2 hours of incoming message recording time.

- (f) The KS-19245, List 11 Power Cord is an 8-foot light olive gray colored cord. It is plug-connected to the answering set and provides for connection to a 3-wire, 110-volt ac outlet.

#### 3.02 *KS-19245, Lists 13 and 24 Telephone Answering Sets.*

- (a) The KS-19245 Tape Deck (Fig. 10 and 11) contains both the announcement and message recording mechanism. The announcement record mechanism (Fig. 10) provides a maximum recording capacity of 3 minutes and incorporates a variable cycle feature that limits the reproduce cycle to the duration of the recorded announcement only. This recorder is equipped with 1/4-inch wide plastic base magnetic recording tape installed on special reels. The tape and reels form an integral part of the recording mechanism and **cannot** be changed by the customer since replacement of either requires partial disassembly of the mechanism. Facilities are provided for limiting the maximum recording time to 15-second increments (from 15 seconds to 90 seconds) or 30-second increments (from 90 seconds to 180

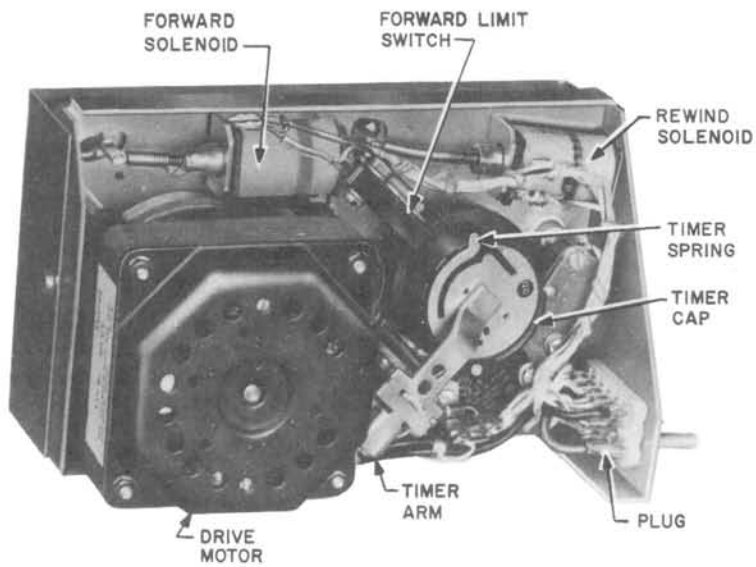


Fig. 4—KS-19245, List 2 Recorder (Motor Side)

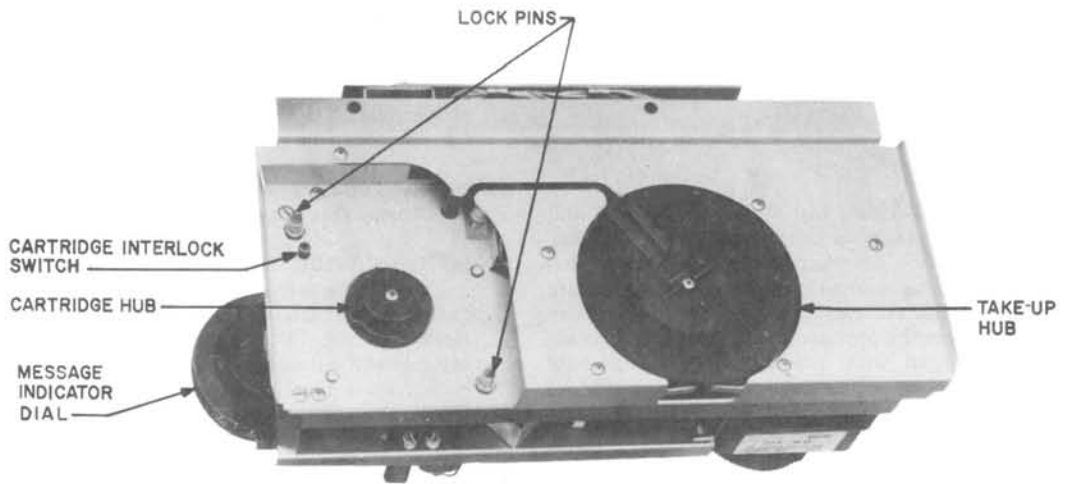


Fig. 5—KS-19245, List 3 Recorder (Reel Side)

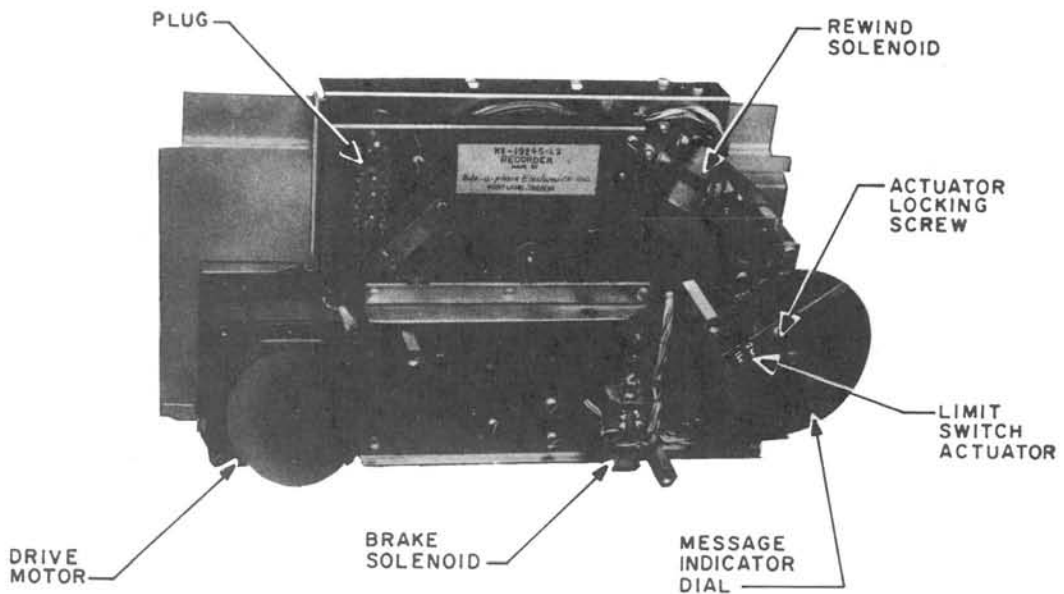


Fig. 6—KS-19245, List 3 Recorder (Motor Side)

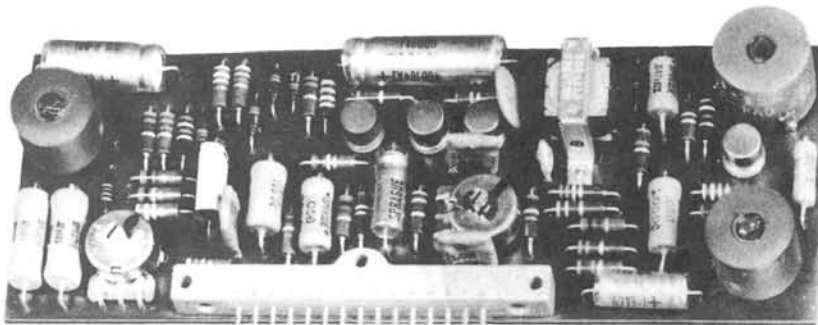


Fig. 7—KS-19245, List 4 Amplifier

seconds). This is done by adjusting the timer cap. The adjustment may only be made by the installer. The incoming message recording mechanism (Fig. 11) provides a maximum recording capacity of 2 hours on 1/4-inch wide plastic base magnetic recording tape. This tape is contained in the KS-19245, List 6 cartridge which may be conveniently changed by the customer. Facilities are provided for limiting the message recording

time to 1 or 2 hours. This is done by adjusting the limit switch actuator (Fig. 10). The adjustment may only be made by the installer.

(b) The KS-19245, List 19 Power Supply, A3, (Fig. 12) is a combination subchassis consisting of a power transformer, and a printed circuit wiring board containing the regulated power supply circuitry, and line connection terminals.

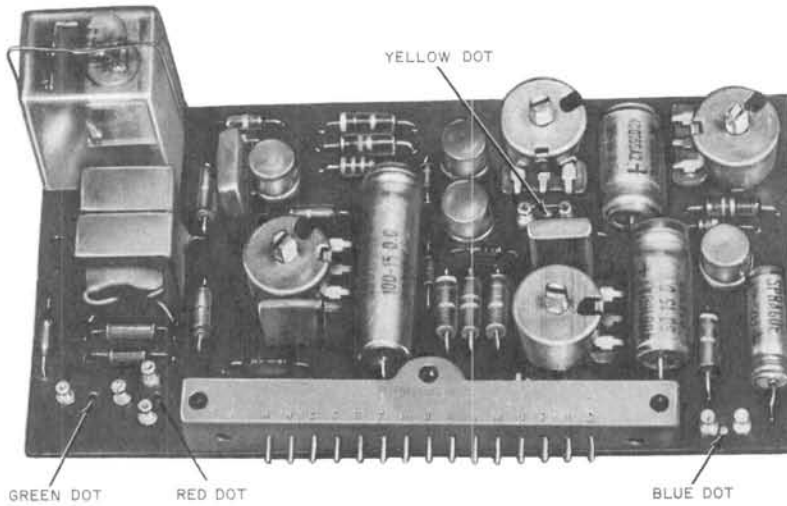


Fig. 8—KS-19245, List 5 Amplifier

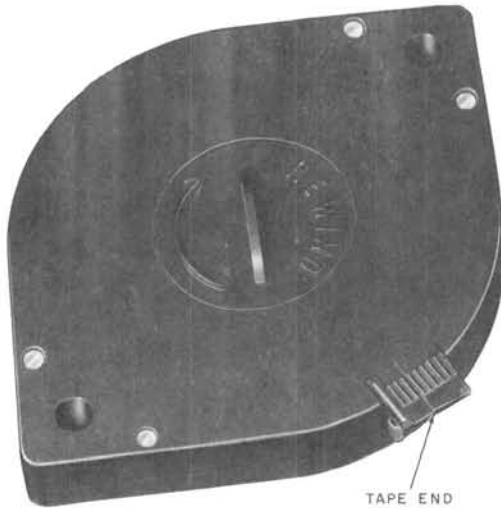


Fig. 9—KS-19245, List 6 Cartridge

(c) The KS-19245, List 15 Amplifier Board, A4, (Fig. 13) is a printed circuit wiring board containing the record/playback amplifier, automatic gain control, tone generator, and relay driver circuitry.

(d) The KS-19245, List 16 Deck Control Board, A5, (Fig. 14) is a printed circuit wiring board containing the necessary control circuitry for operating the tape recording and playback mechanism.

(e) The KS-19245, List 17 Logic Board, A6, (Fig. 15) is a printed circuit wiring board containing the line seizure, ring-up circuitry, and installer options.

### 3.03 Optional Equipment.

(a) The KS-19245, List 8 Footswitch (Fig. 16) provides for foot control operation during playback of the recorded incoming messages. The footswitch pedal has two active positions, one for control of playback and the other for rewind.

(b) The KS-19245, List 9 Earphone (Fig. 17) enables listener to play back the recorded



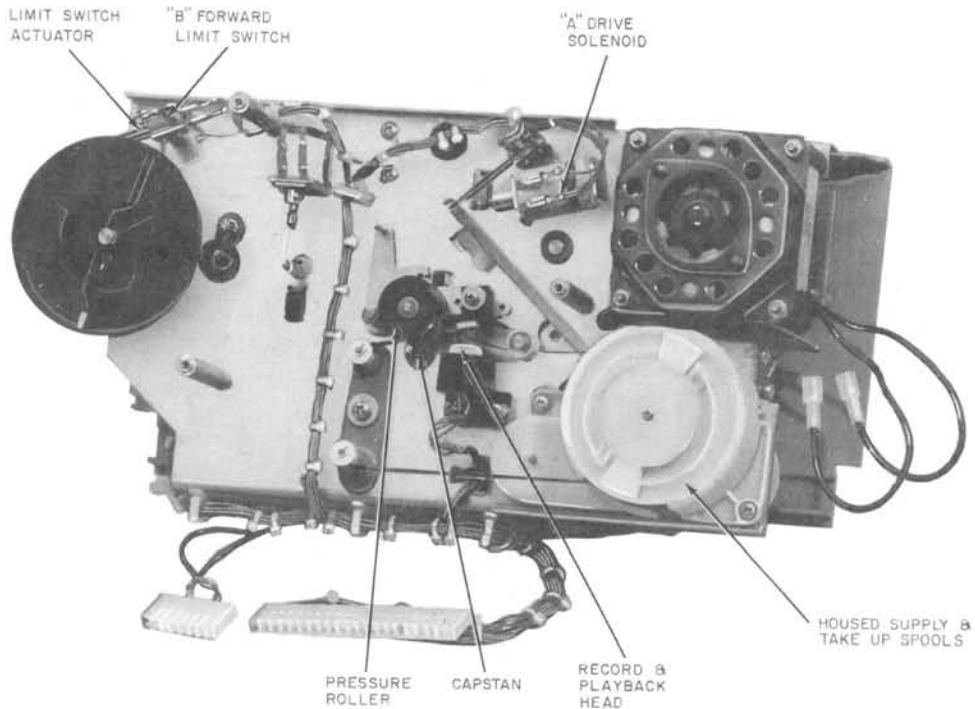


Fig. 10—KS-19245, List 21 Tape Deck With Trimplate Removed (Announcement Side)

incoming messages; for example, during transcribing. The plastic holder on the ear piece may be of either version as shown in Fig. 17.

(c) The KS-19245, List 12 Backspace Unit (Fig. 18), allows automatic backspacing of the message tape a few words each time the playback activated control on the foot switch pedal is released. The user can control the amount of backspace (up to approximately 12 words) by adjusting the backspace control. Automatic backspacing may be disabled by turning the backspace control to its zero position.

(d) The KS-19245, List 25 adaptor (Fig. 19) allows for exclusion of the associated telephone set (Fig. 35) when the List 24 answering set is answering calls or the connection of an auxiliary answering set to automatically answer calls and

record messages when the 2 hour tape on the first List 24 is full.

#### 4. OPERATION



*When an answering set that has been stored in a cool or air conditioned area is first installed in a warm office it may be a little sluggish in the fast forward and rewind mode due to moisture condensation. It is recommended that set be left in its original shipping cartons and be warm when installed. If this is not possible allow 30 minutes of operation in the PLAY mode.*

4.01 Refer to Fig. 1 or 2.

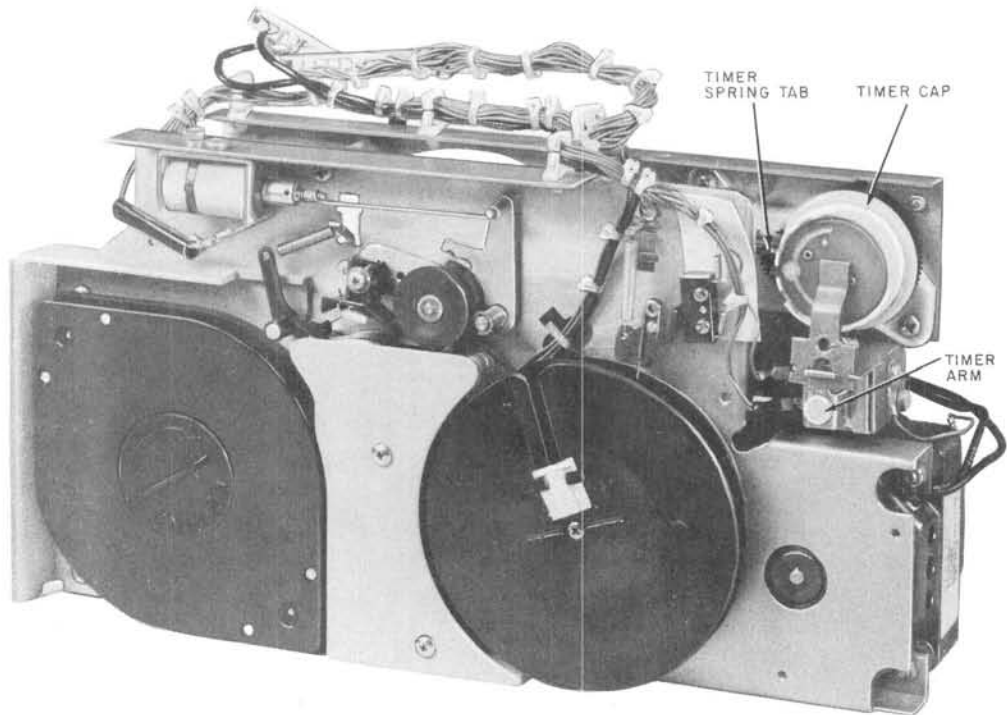


Fig. 11—KS-19245, List 21 Tape Deck With Trimplate Removed (Message Side)

**Caution:** *Damage to the message tape and answering set will result if the message tape end is not properly secured in the snap retainer of the answering set.*

**Note:** The answering set will not function properly unless the tape cartridge is properly seated.

#### A. Announcement

##### 4.02 *Announcement Record.*

- (1) Set function selector to ANN-REC.
- (2) Lift handset, depress and hold handset button. Commence dictating announcement when IN-USE lamp lights.

**Note:** As new announcement is recorded, old announcement will be erased. Release handset button immediately after announcement is complete. If announcement is too long, IN-USE lamp will extinguish and the announcement must then be shortened and rerecorded. (For optional announcement capacity, see paragraph 5.06.)

##### 4.03 *Announcement Check (Using Handset).*

- (1) Set function selector to ANN-CHECK.
- (2) Lift handset, depress and hold handset button.

**Note:** Announcement will be played repeatedly as long as a handset button is held depressed.

##### 4.04 *Announcement Check (Using Speaker).*

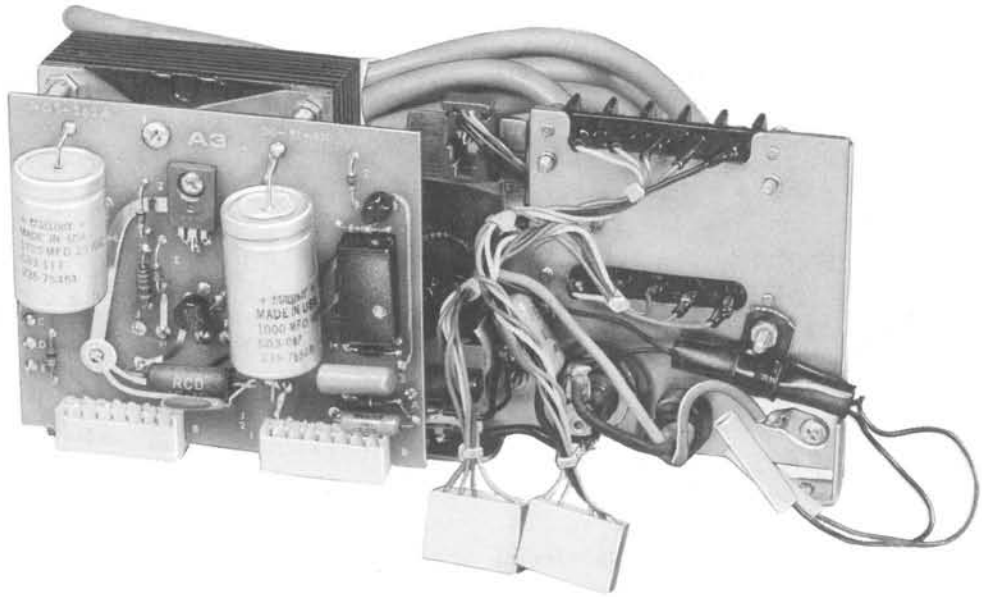


Fig. 12—KS-19245, List 19 Power Supply

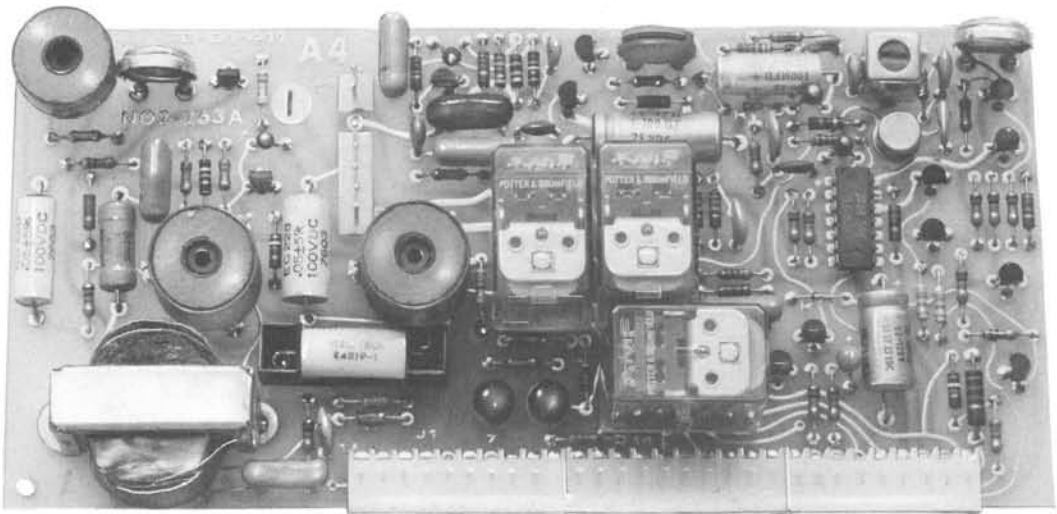


Fig. 13—KS-19245, List 15 Amplifier Board

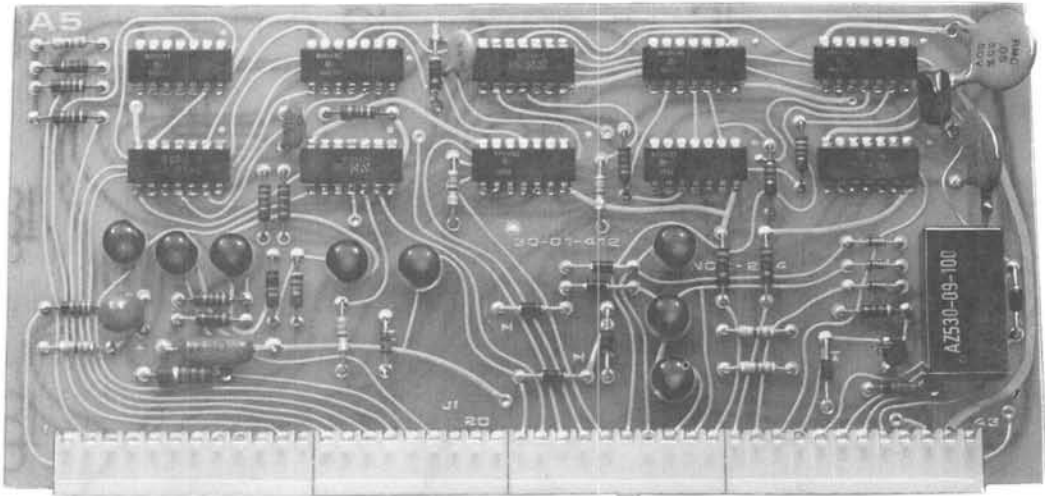


Fig. 14—KS-19245, List 16 Deck Control Board

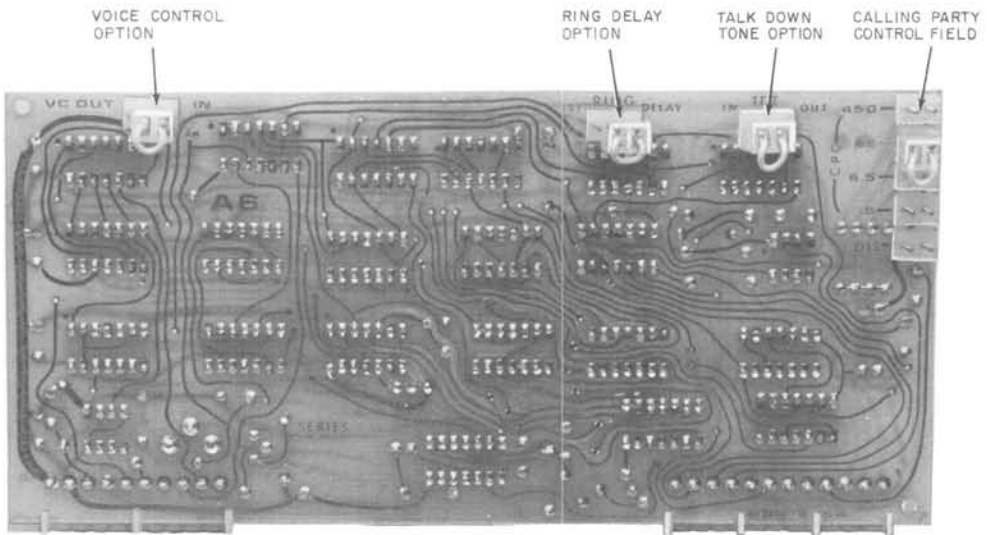


Fig. 15—KS-19245, List 17 Logic Board



Fig. 16—KS-19245, List 8 Footswitch



Fig. 17—KS-19245, List 9 Earphones

- (1) Set function selection to ANN-CHECK.
- (2) Pull out SPEAKER control knob.
- (3) Depress and hold handset button (List 1 only).
- (4) Rotate SPEAKER control knob to adjust volume.

**Note:** Announcement will be played back repeatedly as long as handset button is held depressed or speaker control knob is pulled out.

## B. Automatic Answer

**4.05 Automatic Answer and Record.** After announcement has been recorded and checked, set is ready to be placed in automatic answer.

**Note:** The set will not operate in the automatic answer mode unless the List 6 cartridge is properly seated.

- (1) Set function selector to ANS-REC.
  - (a) AUTO-ANS lamp lights.
  - (b) Ringing current starts automatic answer cycle.
  - (c) IN-USE lamp lights and AUTO-ANS lamp extinguishes, indicating incoming call.
  - (d) A dc termination which trips ringing is automatically placed across line.
  - (e) Recorded announcement is reproduced on line.
  - (f) At end of announcement, a single short beep tone will be transmitted to calling party as an indication for calling party to start talking.
  - (g) Message is recorded on message tape.

**Note:** Connection of telephone answering set to line is under control of a voice operated circuit and a calling party control circuit.

(h) The voice operated circuit will allow automatic recording of speech from line so long as speech of proper level is present on line, up to the capacity of tape. If for a period of approximately 4 seconds the level of speech has been lower than required for satisfactory recording, speak-up (talk-down) tone is transmitted to calling party as signal to speak louder. Tone is removed when speech level is raised. If speech level is not raised within approximately 8 seconds, the set will automatically disconnect.

(i) Installation where the central office provides a momentary interruption of central office battery accompanying calling

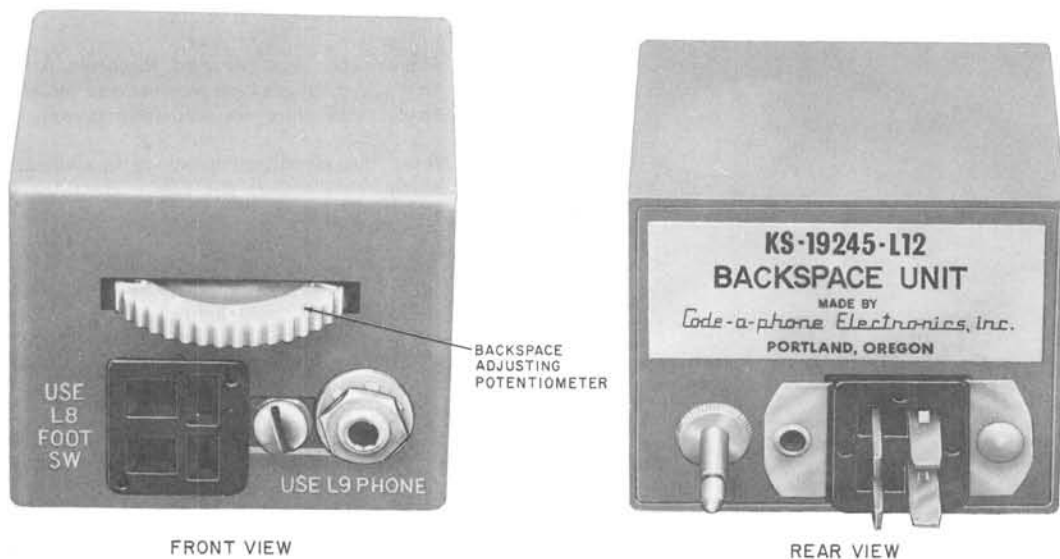


Fig. 18—KS-19245, List 12 Backspace Unit

party hang-up, the calling party control circuit will disconnect the set from the line.

(j) Lists 13 and 24 sets have Calling Party Control (CPC) interrupt time options which are selected and set depending on the type of central office.

(k) Amount of tape recorded is indicated by message indicator dial.

**4.06 Automatic Answer Only:** After announcement has been recorded and checked, set is ready to be placed in automatic answer.

**Note:** The set will not operate in the automatic answer mode unless the List 6 tape cartridge is properly seated.

(1) Set function selector to ANS-ONLY.

(a) AUTO-ANS lamp lights.

(b) Ringing current starts automatic answer cycle.

(c) IN-USE lamp lights, and AUTO-ANS lamp extinguishes, indicating incoming call.

(d) A dc termination which trips ringing is automatically placed across line.

(e) Recorded announcement is reproduced on line.

(f) In installations where the central office provides a momentary interruption of central office battery accompanying calling party hang-up, the calling party control circuit will disconnect the set from the line. Lists 13 and 24 sets have CPC interrupt time options which are selected and set depending on the type of central office.

(g) At end of announcement, set disconnects from line.

### C. Rewind

**4.07 Forward or Rewind:** Set function selector to PLAY.

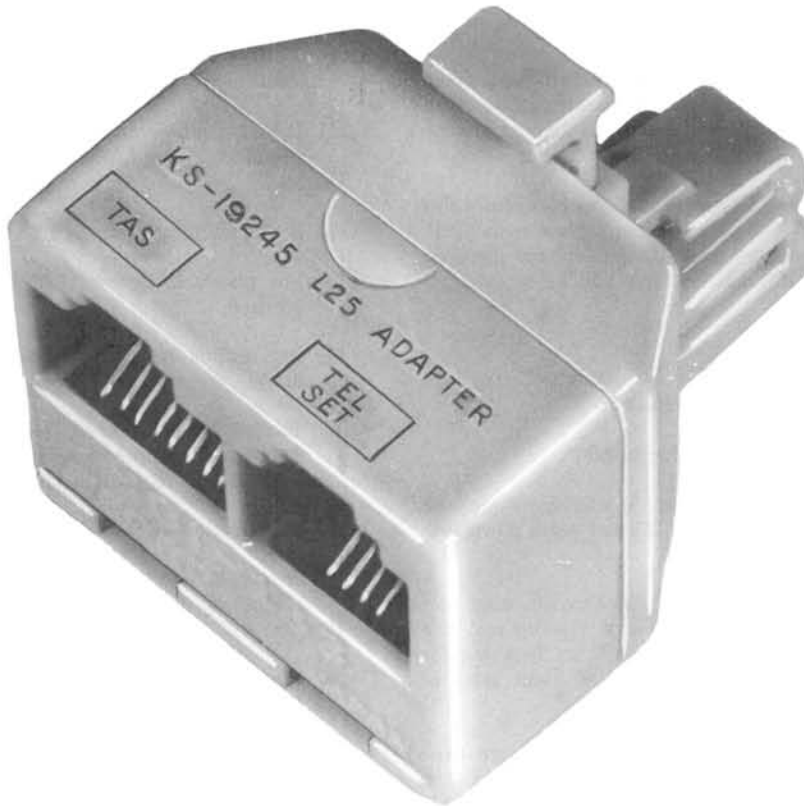


Fig. 19—KS-19245, List 25 Modular Adapter

- (a) To rewind, operate forward-rewind lever to the left.
- (b) To advance tape, operate forward-rewind lever to the right.

**D. Message**

**4.08 Erase Message:** Set function selector to ERASE.

- (a) **Rewind erase:** Operate forward-rewind selector to the left.
- (b) **Forward erase:** Operate forward-rewind selector to the right.

**4.09 Message Playback (Using Handset).**

- (1) Set function selector to PLAY.
- (2) Rewind tape as outlined in paragraph 4.07.
- (3) Lift handset; depress and hold handset button.

**4.10 Message Playback (Using Speaker).**

- (1) Set function selector to PLAY.
- (2) Rewind tape as outlined in paragraph 4.07.
- (3) Pull out SPEAKER control knob.

- (4) Rotate SPEAKER control knob to adjust volume.

**4.11 Message Indicator Dial:** Message indicator dial is used to locate position of a particular message or to determine amount of tape available for message recording.

**4.12 Turning Telephone Answering Set Off:** Set the function selector to OFF. Set will be disconnected from telephone line and dc power to internal circuitry will be removed.

#### E. Cartridge

##### 4.13 Cartridge Installation.

- (1) Set function selector to OFF.
- (2) Place cartridge (Fig. 9) over cartridge lock pins and hub (Fig. 25) and press down into place.
- (3) Slide tape end (Fig. 9) through tape slot (Fig. 25) and into slot of take-up reel and lock into place. Make certain, by listening for a snap, that both the left and right sides of the tape end are locked in place.

**Caution:** *Damage to the message tape and answering set will result if the message tape end is not properly secured in the snap retainer of the take-up reel before operating the set.*

**Note:** The answering set will not function properly unless the tape cartridge is properly seated.

##### 4.14 Cartridge Removal (Fig. 25).

- (1) Rewind tape into cartridge (0 setting on tape indicator). Refer to paragraph 4.07.
- (2) Set function selector to OFF.
- (3) Remove tape end from take-up reel by depressing and backing out of slot.
- (4) Turn cartridge hub clockwise by hand to rewind remaining tape into cartridge.
- (5) Grasp cartridge and lift up.

#### ACCESSORIES

##### 4.15 Footswitch KS-19245, List 8 (Fig. 16).

- (1) Insert footswitch plug into footswitch receptacle (List 1, Fig. 1; Lists 13 and 24, Fig. 2).
- (2) Set function selector to PLAY.
- (3) For playback, depress foot switch to first position.
- (4) For rewind, depress foot switch all the way down.

##### 4.16 Earphone KS-19245, List 9 (Fig. 17): To monitor recorded message with earphone for transcribing in footswitch operation.

- (1) Set function selector to PLAY.
- (2) Insert footswitch plug into footswitch receptacle (List 1, Fig. 1; Lists 13 and 24, Fig. 2).
- (3) Plug earphone into earphone jack (List 1, Fig. 1; List 13, Fig. 2).
- (4) Operate foot switch as described in paragraph 4.15.
- (5) Rotate SPEAKER control knob to adjust volume.

##### 4.17 Backspace Unit KS-19245, List 12 (Fig. 18).

- (1) Set function selector to PLAY.
- (2) Push in speaker control knob.
- (3) Insert backspace unit into receptacle on answering set (List 1, Fig. 1; Lists 13 and 24, Fig. 2).
- (4) Insert footswitch plug into footswitch receptacle on backspace unit (Fig. 26).
- (5) Insert earphone into earphone jack on backspace unit (Fig. 26).



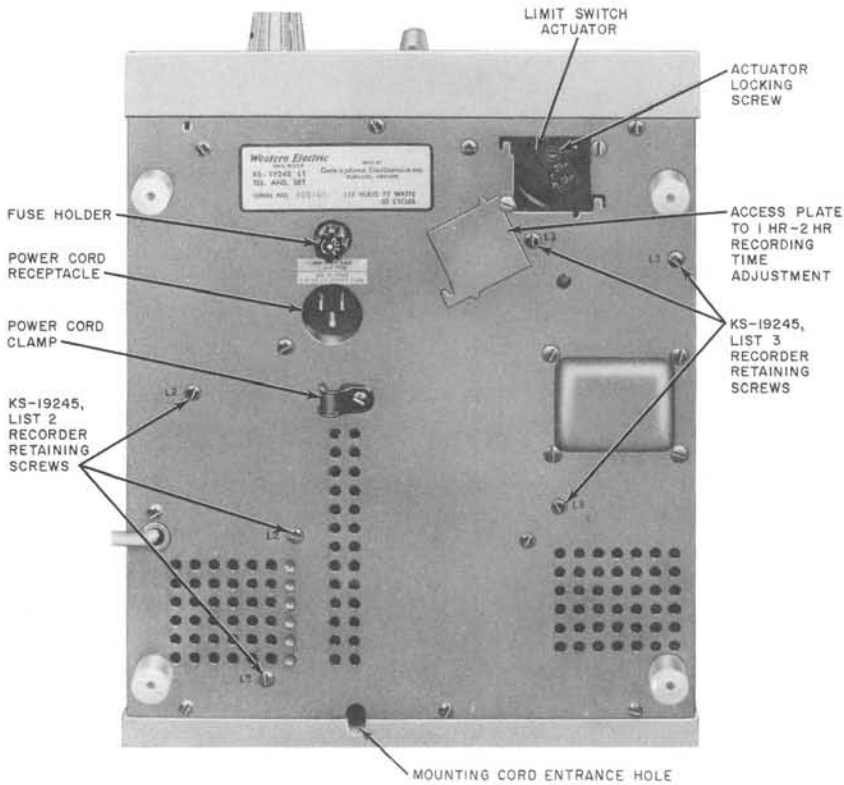


Fig. 20—KS-19245, List 1 (MD) Telephone Set—Bottom View

- (6) Adjust backspace control on backspace unit for automatic backspace of desired interval.

**Note:** Maximum backspace interval equivalent to approximately a dozen words may be obtained with the backspace control in maximum setting. Automatic backspace may be disabled by turning backspace control to its zero position.

## 5. OPTIONS

**Caution:** Do not use options listed in Part 5 without proper authorization.



Handle set components with care at all times to avoid damage.

### 5.01 Voice Control (VC) Disable.

- (a) **KS-19245, List 1:** Solder a strap between the terminals identified with a blue dot on the KS-19245, List 5 amplifier board (Fig. 8).
- (b) **KS-19245, Lists 13 and 24:** Move voice control from IN to OUT on List 17 logic board (Fig. 15).



This option may be employed only when other means are available for disconnecting the set at the end of a call or when provisions are made for turning the function selector switch to the off position at the end of the recording.

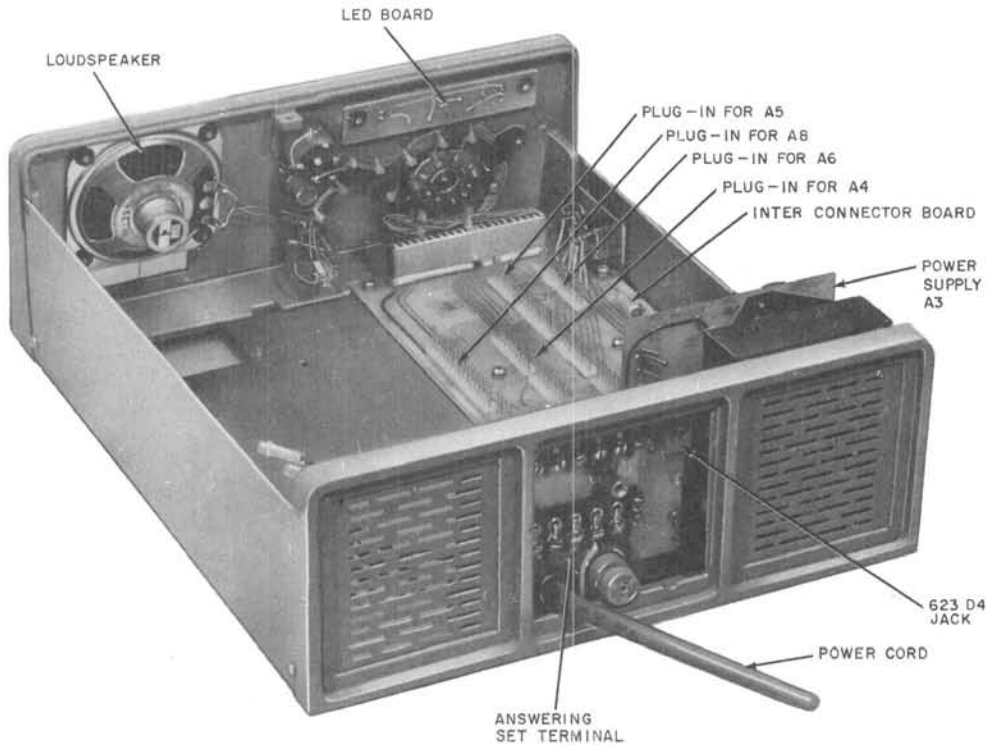


Fig. 21—KS-19245, List 13 (MD) or List 24 Telephone Set—Cover and Components Removed

#### 5.02 Calling Party Control (CPC).

- (a) **KS-19245, List 1:** To disable calling party control, solder strap between terminals identified by a green dot on the KS-19245, List 5 amplifier board (Fig. 8).
- (b) **KS-19245, Lists 13 and 24:** Move calling party control plug to required position per Table B (Fig. 15).



Calling party control is provided on this set to disconnect when momentary interruption of line current occurs due to calling party disconnect. CPC options (Lists 13 and 24 only) are used to hold set on line during momentary interruptions

due to CO or PBX reswitching (Table B).

#### 5.03 Speak-up (Talk-down) Tone Disable.

- (a) **KS-19245, List 1:** Remove the strap between the terminals identified by a yellow dot on the KS-19245, List 5 amplifier board (Fig. 8).
- (b) **KS-19245, Lists 13 and 24:** Move talk-down tone plug from IN to OUT on List 17 logic board (Fig. 15).



Use of this option does not affect the one second start and disconnect beep tones.

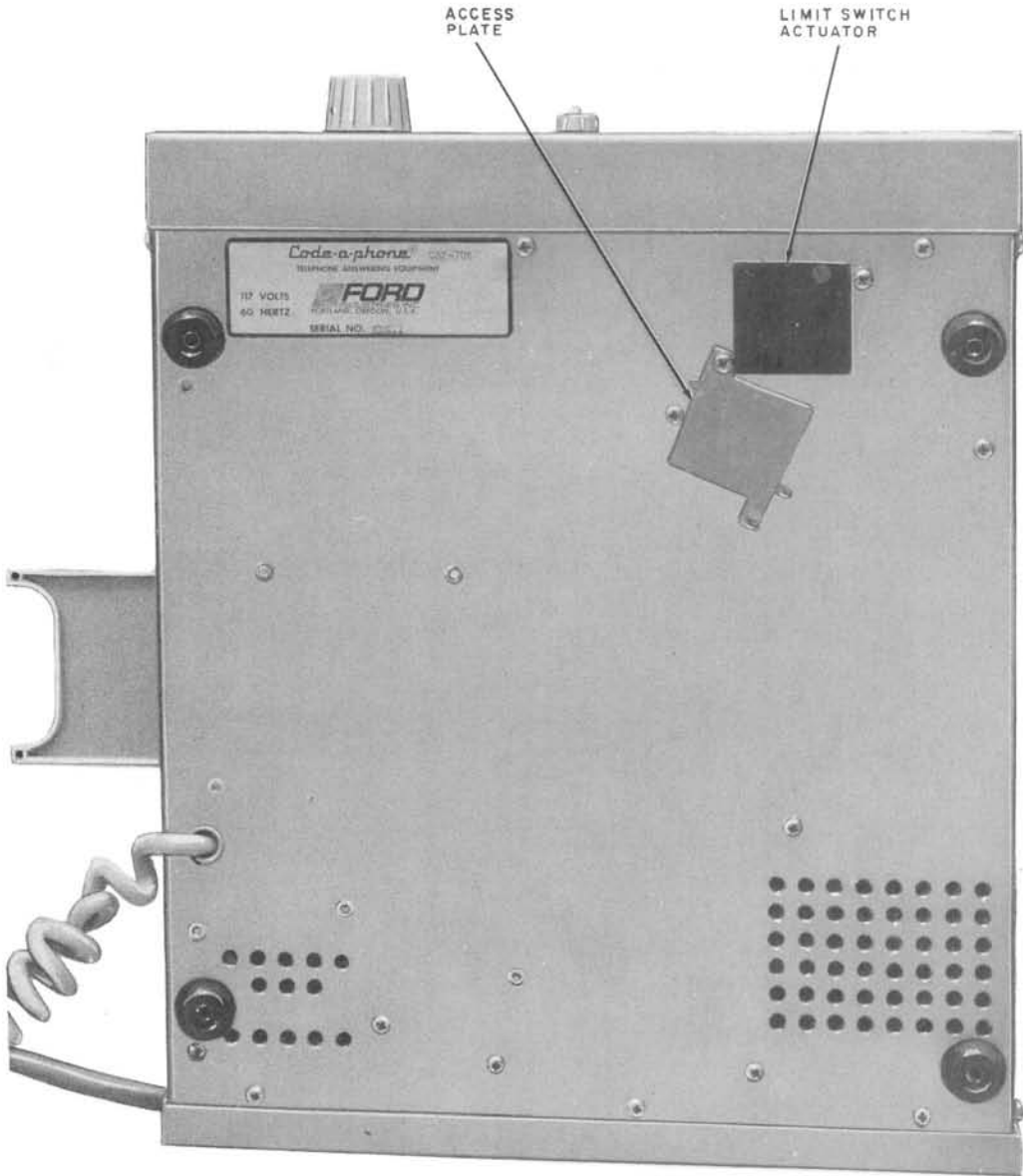


Fig. 22—KS-19245, List 13 (MD) Telephone Answering Set—Bottom View

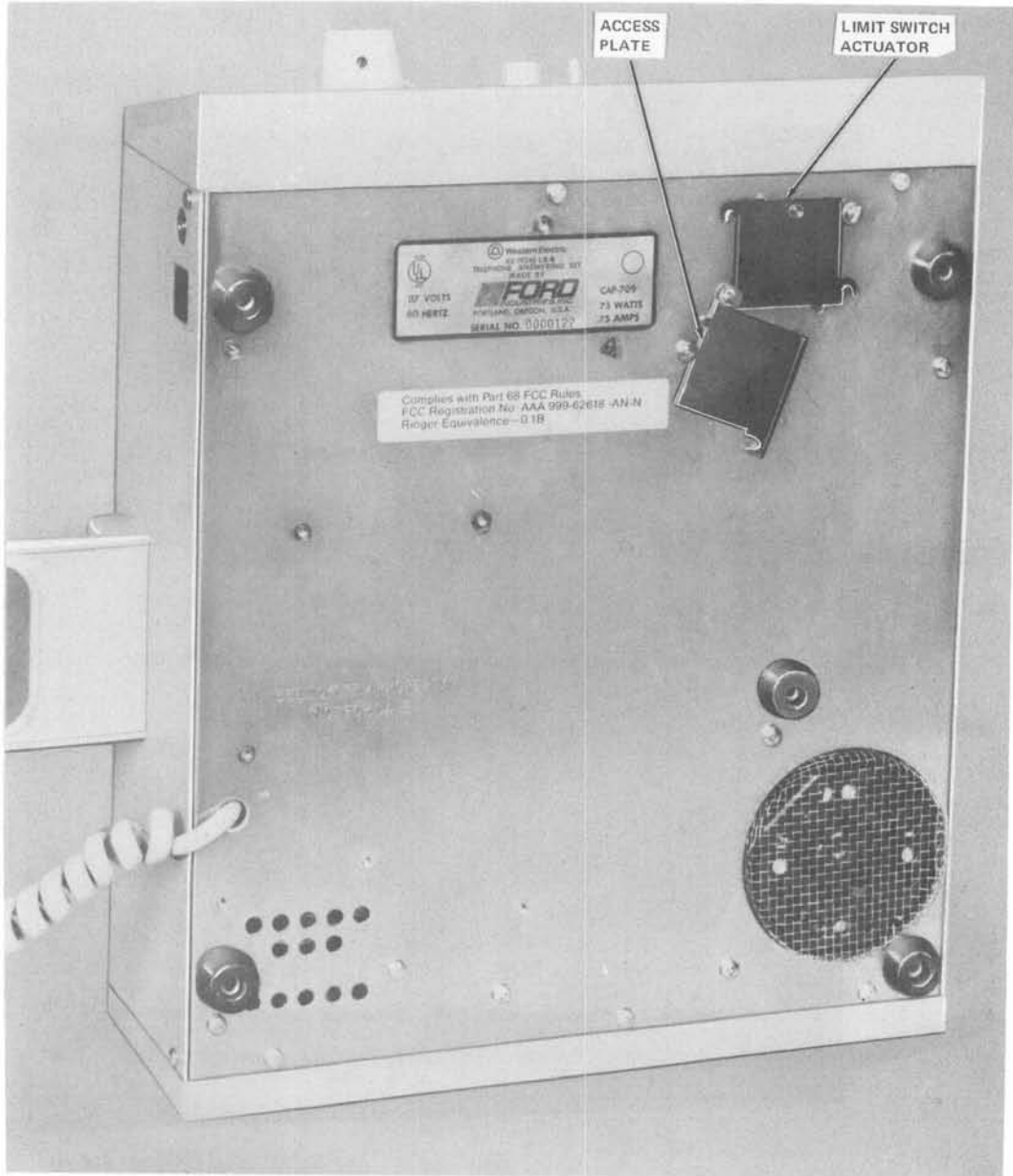


Fig. 23—PKS-19245, List 24 Telephone Answering Set—Bottom View

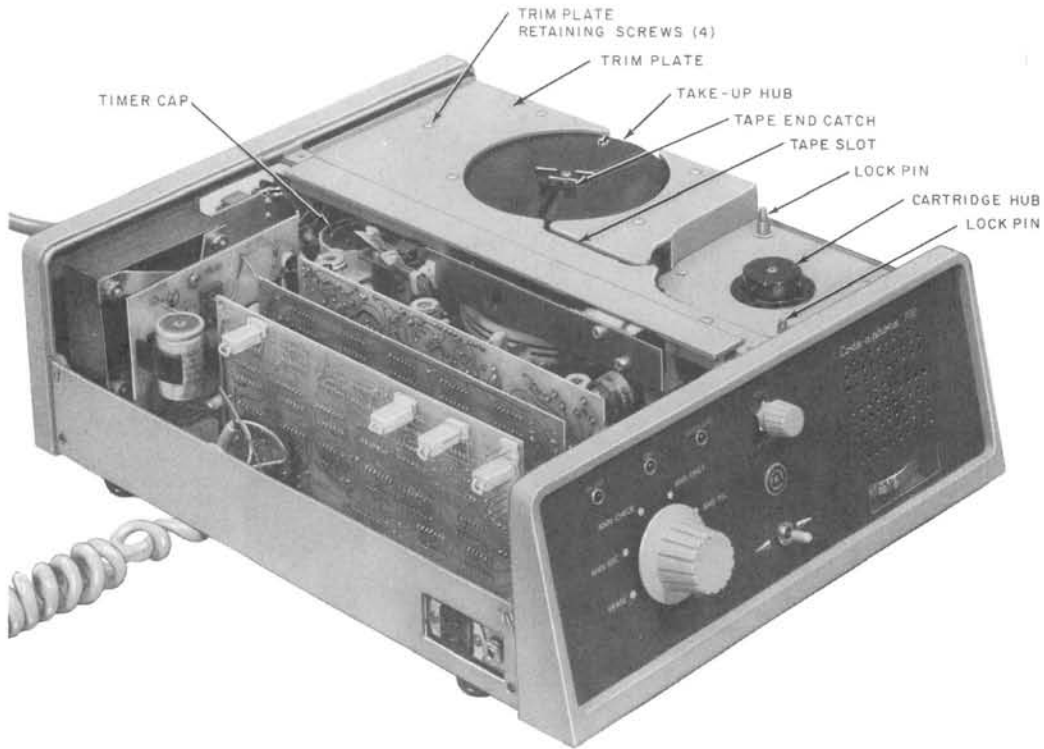


Fig. 24—KS-19245, List 1 (MD) Telephone Answering Set—Cover and Components Removed

**5.04 Ring Delay Option: KS-19245, Lists 13 and 24:** Move ring delay plug from 1ST to DELAY on List 17 logic board (Fig. 15).

**5.05 Message Recording Capacity Option:** Adjust message recording capacity (List 1, Fig. 20; List 13, Fig. 22; List 24, Fig. 23).

**Caution:** Damage to the message tape and answering set will result if the message tape end is not properly secured in the snap retainer of the take-up reel before operating set.

**Note:** The set is shipped with message recording capacity adjusted for 1 hour. To adjust to maximum recording capacity of 2 hours, proceed as follows.

- (1) Insert plug of power cord into ac outlet.
- (2) Run the set in rewind to obtain an elapsed message indicator dial reading of 0 (set will stop automatically).

**Caution:** Before proceeding with any further adjustments or connections, remove power cord from ac outlet.

- (3) Remove access plate.
  - (a) Loosen two access plate mounting screws.
  - (b) Move plate aside.
- (4) Adjust limit switch actuator (List 1 set only, Fig. 20).

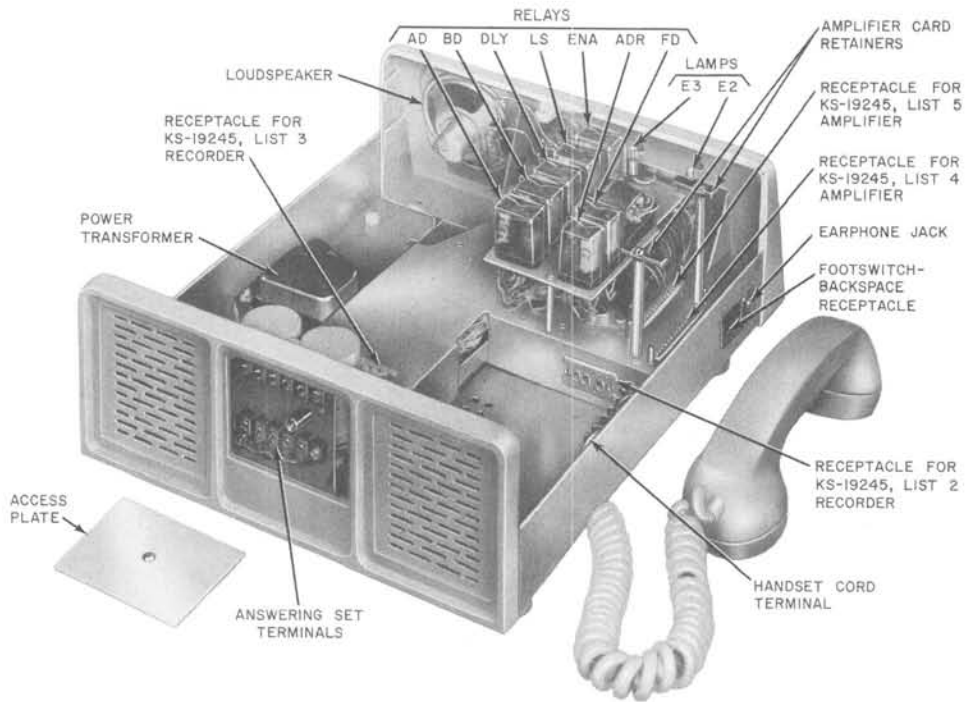


Fig. 25—KS-19245, List 13 (MD) and List 24 Telephone Answering Set—Cover Removed

- (a) Loosen actuator locking screw.
  - (b) Slide actuator to 2hr position.
  - (c) Tighten actuator locking screw.
- (5) Adjust limit switch actuator (List 13 set, Fig. 22; List 24 set, Fig. 23) by sliding actuator to 2hr position. A detent will lock actuator in position (Fig. 22).
  - (6) Replace access plate.
- 5.06 Announcement Recording Capacity Option:**  
Adjust announcement recording capacity.
- Note:** The set is shipped with an announcement capacity setting of 30 seconds. Announcement capacity may be adjusted for 15, 30, 45, 60, 75, 90, 120, 150, or 180 seconds. To change setting proceed as follows.
- (1) Remove top cover (Fig. 1 and 24).
    - (a) Remove four cover retaining screws.
    - (b) Remove cover.
  - (2) List 1 set only.
    - (a) Loosen amplifier board retainers (2) (Fig. 24).
    - (b) Remove List 4 amplifier board.
  - (3) Lists 13 and 24 sets only.
    - (a) Remove the four trimplate retaining screws (Fig. 25).
    - (b) Remove trimplate.



Fig. 26—KS-19245 Type Telephone Answering Set—With Accessories



Fig. 27—KS-19245, List 1 (MD) Telephone Answering Set—Terminal Board

- (4) Release timer cap by carefully depressing time arm (List 1, Fig. 4; Lists 13 and 24, Fig. 11).

**Caution:** Do not rotate recorder motor or tape reels by hand.

- (5) Adjust recording capacity by carefully lifting tab of timer spring from slot and rotate to position of desired interval (List 1, Fig 4; Lists 13 and 24, Fig. 11).

**Caution:** Do not lift tab over raised portion of timer cap. To increase interval, rotate tab clockwise. To reduce interval, rotate tab counterclockwise.

- (6) **List 1 only:** Replace List 4 amplifier board and tighten retainers.

- (7) **Lists 13 and 24 only:** Replace trimplate and secure with retaining screws.

- (8) Replace top cover.

**6. INSTALLATION****6.01 Location.**

- (a) Locate telephone answering set where it will be convenient for customer.
- (b) Do not place set where it will be exposed to weather or extreme heat. The supporting surface should be able to support more than 31 pounds for List 1 and 24 pounds for Lists 13 and 24.

**6.02 Power.**

- (a) The KS-19245, Lists 1, 13, and 24 set is designed to operate on 110/125-volt ac 60 Hz power source.

**Caution:** *In no case should the answering set be connected to DIRECT CURRENT. This would result in serious damage to the answering set.*

- (b) If direct current is the only available power source, a KS-15662, List 1 inverter must be used. Installation of this inverter is described in Section 514-112-100.
- (c) A 1-ampere (3AG1) fuse is provided in these answering sets for protection.

**Warning:** *Disconnect power cord from ac outlet before checking fuse.*

- (d) A List 11 power cord (shipped loose) connects to receptacle on List 1 set only (Fig. 20). Lists 13 and 24 set power cord is wired to set (Fig. 21).
- (e) Customer must provide and maintain a standard ac outlet for operation of the Lists 1, 13, and 24 telephone answering set. Outlet should not be controlled by a switch.
- (f) In locations where only a two prong ac outlet is available, a power cord adapter, with its grounding lead connected to a ground, must be used (refer to Section 167-400-210).

**6.03 Line Connections** Remove terminal board access plate located at the rear of the answering set (Fig. 27 or 28).

- (a) For List 1 only, insert suitable mounting cord through hole provided in base of answering set (Fig. 20) and make connections for type of service required as shown in Table A.
- (b) For List 13 only, insert a D4BU mounting cord (ordered separately) into the 623D4 jack at rear of set (Fig. 28).
- (c) For List 24 only insert D6AP mounting cord (ordered separately) into the 623D6 jack in rear of answering set (Fig. 28).
- (d) For List 24 only, to wire answering set for exclusion or overflow answering, see Fig. 36 or 37.
- (e) For Lists 1, 13, and 24 replace access plate.

**6.04 Test at Time of Installation.**

- (a) Insert the power cord into ac outlet. Refer to Part 4 and check the following.
  - (1) Announcement recording and erasure.
  - (2) Announcement check.
    - (a) With handset.
    - (b) With speaker.
  - (3) Automatic answer - ANS and REC.
    - (a) Automatic answer ready lamp.
    - (b) Ring-up.
    - (c) In-use lamp.
    - (d) Announcement monitoring in speaker.
    - (e) Transfer beep tone.
    - (f) Message monitoring in speaker.
    - (g) Talk-down tone.
    - (h) Voice control—timeout.
    - (i) Disconnect beep tone.
  - (4) Automatic answer - answer only.



- (a) Ring-up.
  - (b) Announcement monitoring in speaker.
  - (c) Disconnect at end of announcement.
- (5) Message playback.
- (a) With handset.
  - (b) With speaker.
  - (c) With earphone (optional accessory).
- (6) Fast forward and rewind of message tape.
  - (7) Erase message.
  - (8) Foot switch (optional accessory).
  - (9) Backspace unit (optional accessory).
- (b) The set should now be ready for operation.  
Instruct the subscriber of proper operation of set and accessories (Part 4).

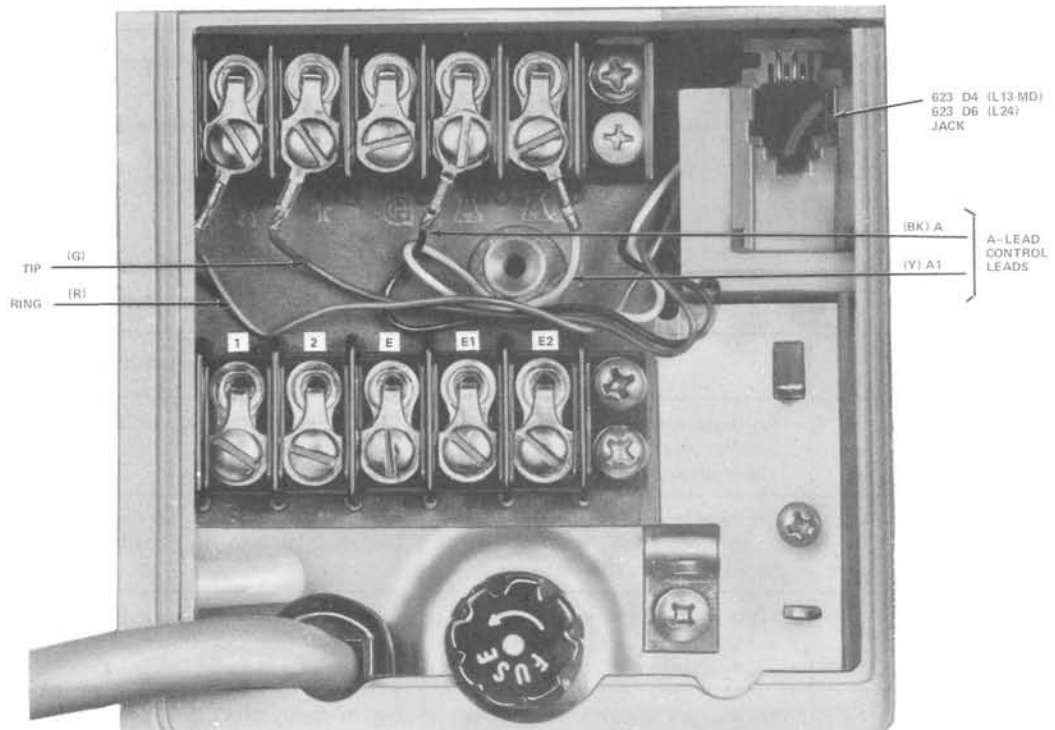


Fig. 28—KS-19245, List 13 (MD) Telephone Answering Set—Terminal Board

**TABLE A**  
**MOUNTING CORD CONNECTIONS**

CORD CONDUCTOR COLOR	AT CONNECTING BLOCK ON TEL ANS SET	SIDE OF LINE WIRE TO WHICH CORD CONDUCTOR IS TERMINATED		
		INDIVIDUAL, PBX, OR BRIDGED SERVICE†	2-PARTY SELECTIVE OR MESSAGE RATE SERVICE*	
			RING PARTY	TIP PARTY
Red	R	Ring	Ring	Tip
Green	T	Tip	Tip	Ring
Yellow	G	NC	Ground	Ground
Black	B	NC	NC	NC

\* Remove strap between T and G on telephone answering set connecting block and place local ground on G.

† Remove local ground and strap T and G punchings on telephone answering set connecting block.

**TABLE B**  
**KS-19245, LISTS 12 AND 24 CALLING PARTY CONTROL SELECTIONS**

PLUG POSITION CPC FIELD (A6)	FUNCTION	TYPE CENTRAL OFFICE AND PBX
450	Set disconnects when line current is interrupted for approximately 450 milliseconds (350 to 600 ms)	Lines originating in No. 1 ESS and No. 2 ESS, or 812 PBX.
95	Set disconnects when line current is interrupted for approximately 95 milliseconds (50 to 140 ms)	Lines originating in No. 5 Crossbar, Centrex, 770, 800, 801, or 805 PBX.
6.5	Set disconnects when line current is interrupted for approximately 6.5 milliseconds (5 to 8 ms)	Standard setting. Lines originating in all electromechanical switching systems except those specified above.
0.5	Set disconnects when line current is interrupted for approximately 0.5 milliseconds.	Not normally used.
DIS	Disables Calling Party Control option. Set will not disconnect when line current is interrupted.	Use only when special arrangements do not provide line current. Disconnect arrangements must be provided.

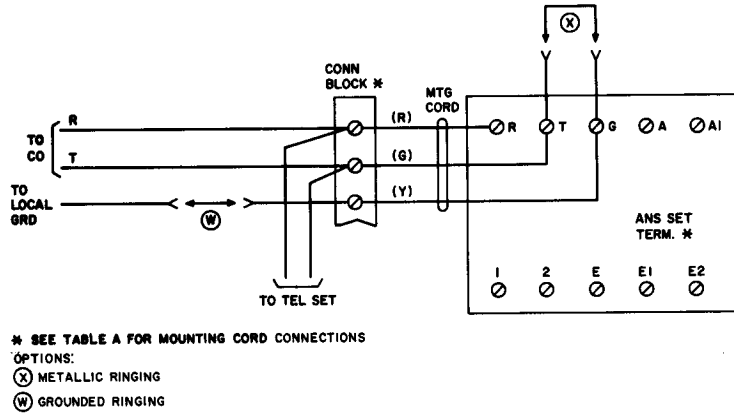


Fig. 29—KS-19245, List 1 (MD) Telephone Answering Set—Connections With Telephone Set Only

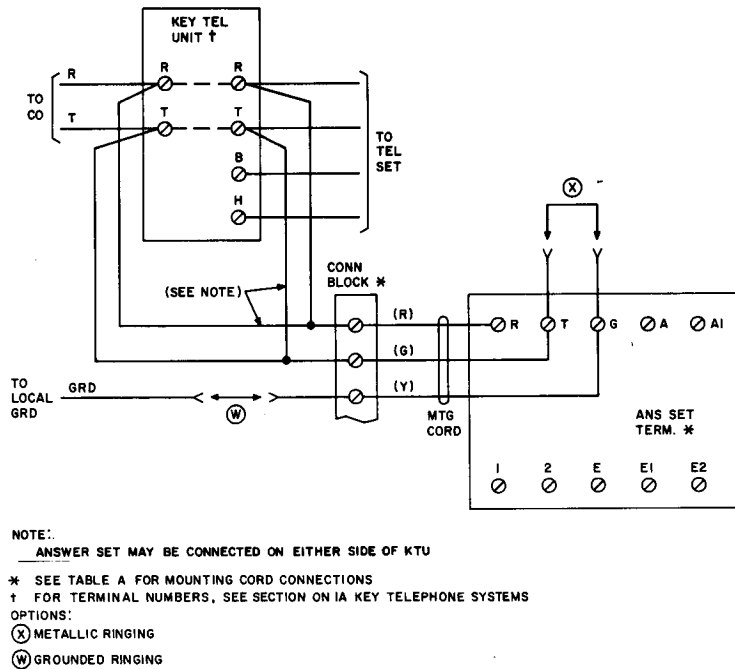


Fig. 30—KS-19245, List 1 (MD) Telephone Answering Set, Connections With 1A Key Telephone System†

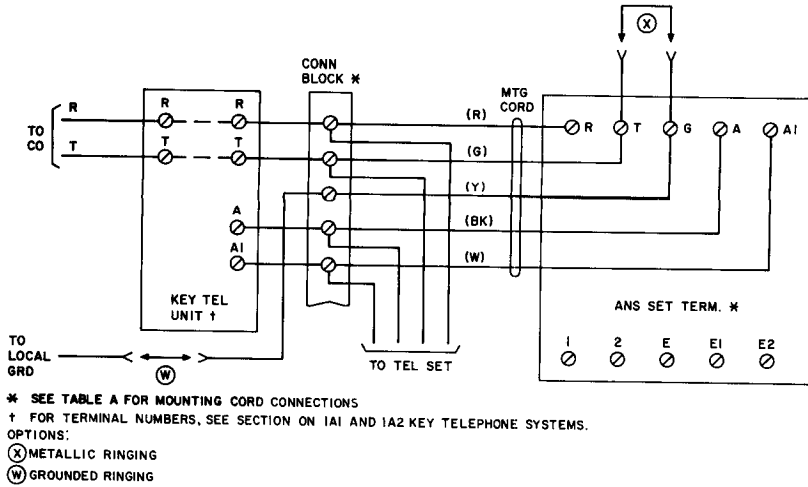


Fig. 31—KS-19245, List 1 (MD) Telephone Answering Set, Connections With 1A1 and 1A2 Key Telephone Systems

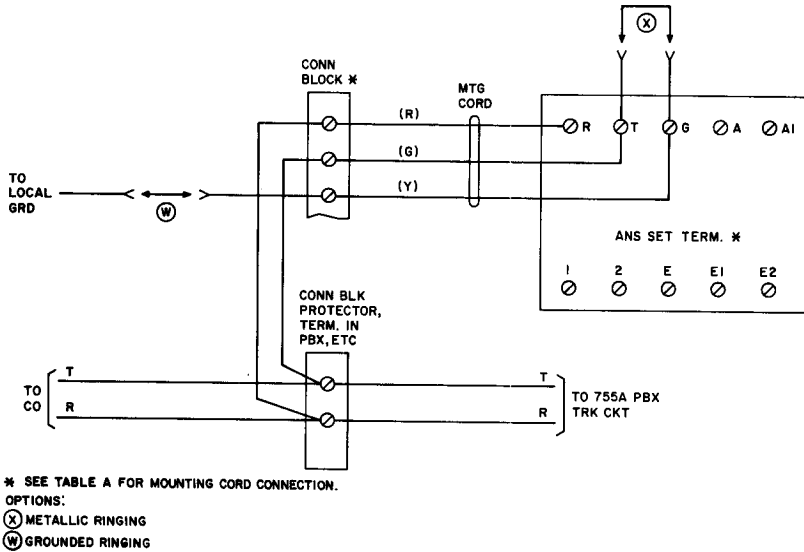


Fig. 32—KS-19245, List 1 (MD) Telephone Answering Set, Connections With 755A PBX

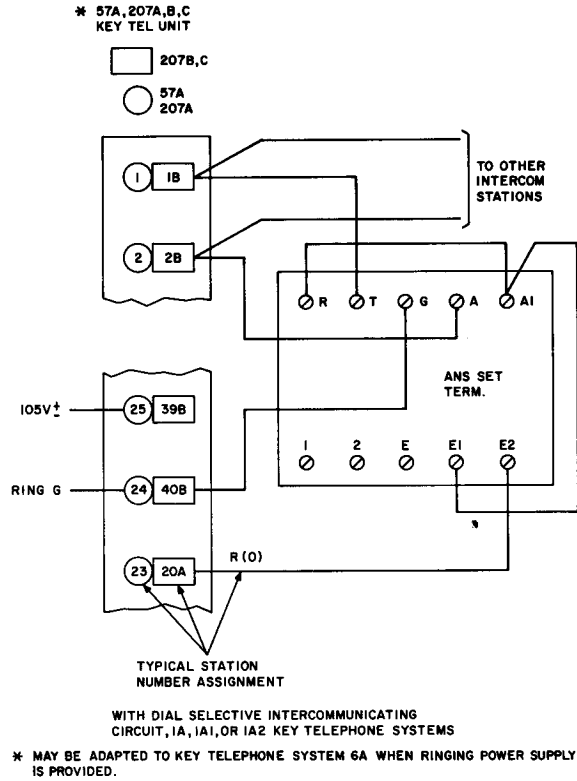
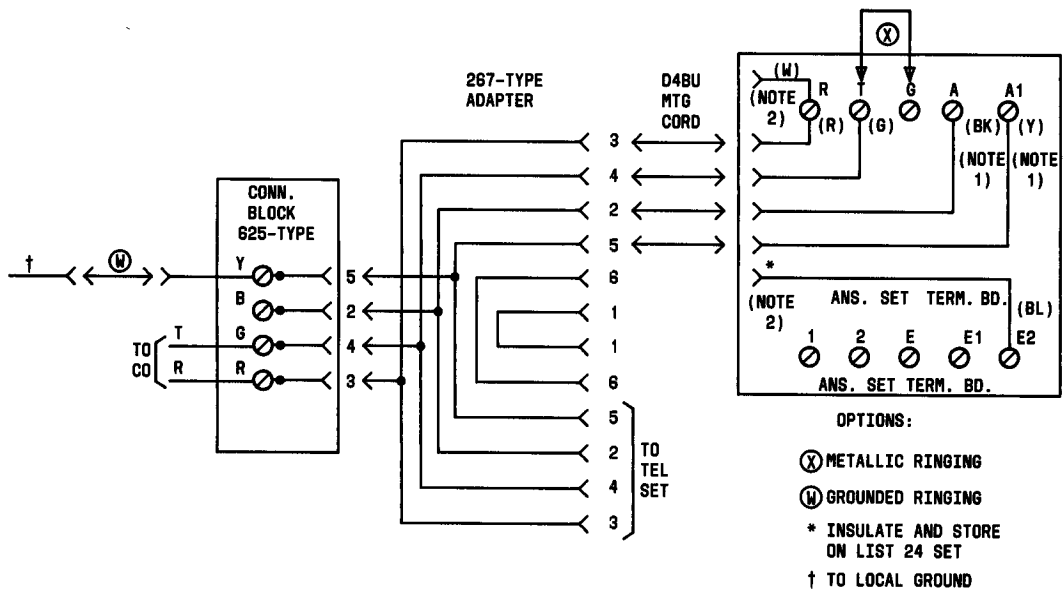


Fig. 33—KS-19245, List 1 (MD) Telephone Answering Set, Connections With Dial Selective Intercom Circuit, 1A, 1A1, or 1A2 Key Telephone Systems



NOTES:

1. THE SET IS RECEIVED EQUIPPED FOR METALLIC RINGING AND A-LEAD CONTROL. IF A-LEAD CONTROL IS NOT REQUIRED THE BLACK (BK) AND YELLOW (Y) LEADS MUST BE REMOVED FROM THE A AND A1 TERMINALS, INSULATED AND STORED. FOR GROUNDED RINGING, INSULATE AND STORE BLACK (BK) LEAD. CONNECT YELLOW (Y) LEAD TO TERMINAL G AND REMOVE STRAP BETWEEN TERMINALS T AND G.
2. 623D4 JACK L13, 623D6 JACK L24.

Fig. 34—KS-19245, List 13 (MD) and List 24 Telephone Answering Set—Connections (Four Terminal Modular)

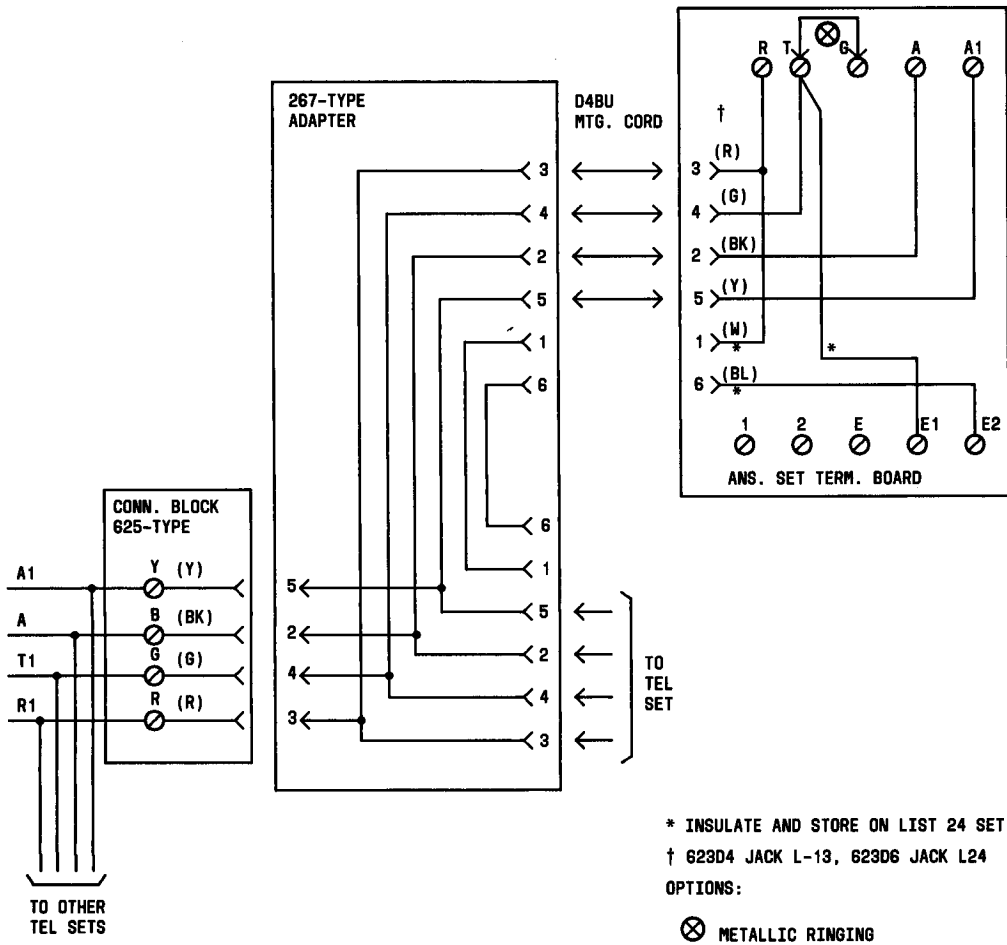
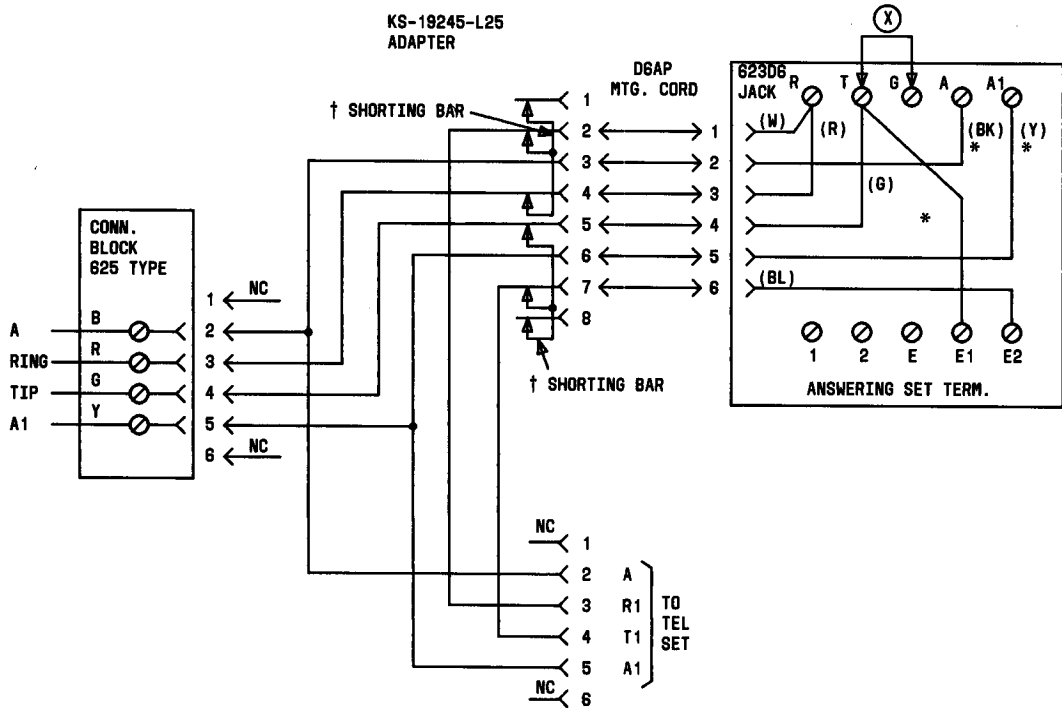


Fig. 35—KS-19245, List 13 (MD) and List 24 Telephone Answering Sets, Connections for Key Telephone Systems (Four Terminal Modular)



OPTIONS:

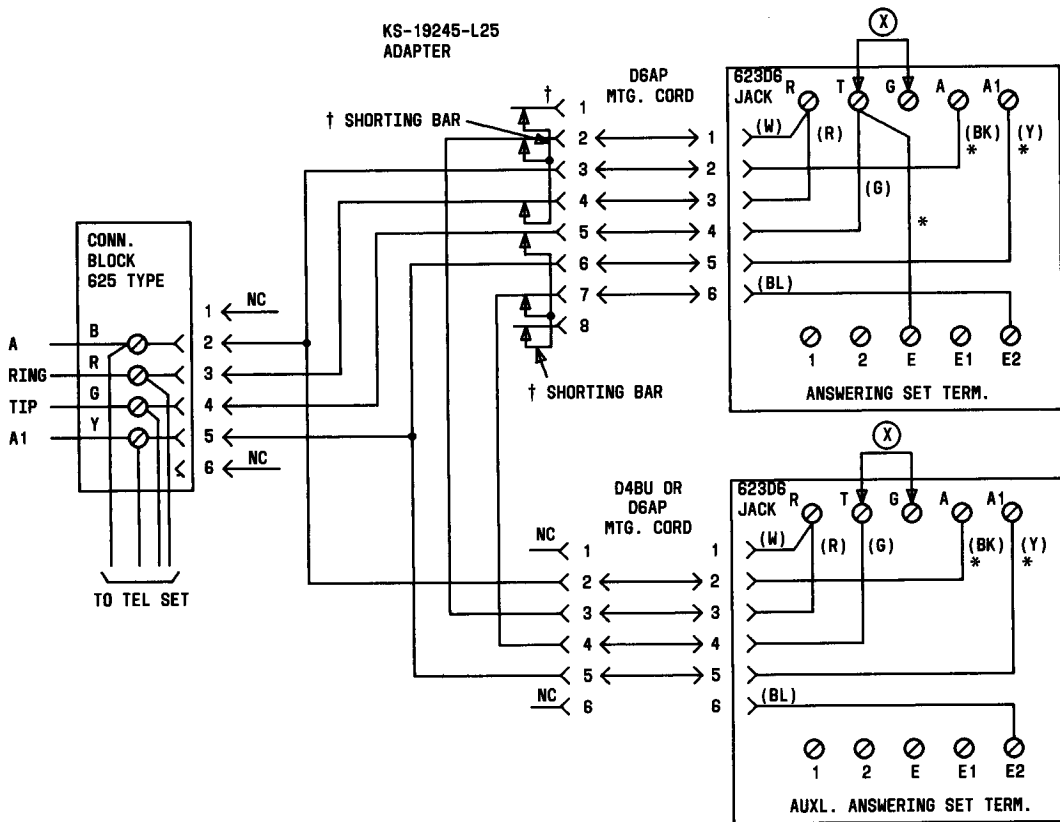
(X) METALLIC RINGING

\* IF A LEAD CONTROL IS NOT REQUIRED, THE BLACK (B) AND YELLOW (Y) LEADS MUST BE REMOVED FROM THE A AND A1 TERMINALS, INSULATED AND STORED. THE T-E CONNECTION IS AN INSTALLER SUPPLIED STRAP.

† WHEN PLUG IS NOT INSERTED IN THE L25 ADAPTER PINS 1 AND 2 ARE SHORTED TO PIN 4 AND PIN 5 IS SHORTED TO PINS 7 AND 8. WHEN THE PLUG IS INSERTED THE SHORT IS REMOVED.

Fig. 36—KS-19245, List 24 Telephone Answering Set, Connections for Telephone Set Exclusion





OPTIONS:

(X) METALLIC RINGING

\* IF A LEAD CONTROL IS NOT REQUIRED, THE BLACK (B) AND YELLOW (Y) LEADS MUST BE REMOVED FROM THE A AND A1 TERMINALS, INSULATED AND STORED. THE T-E CONNECTION IS AN INSTALLER SUPPLIED STRAP.

† WHEN PLUG IS NOT INSERTED IN THE L25 ADAPTER PINS 1 AND 2 ARE SHORTED TO PIN 4 AND PIN 5 IS SHORTED TO PINS 7 AND 8. WHEN THE PLUG IS INSERTED THE SHORT IS REMOVED.

Fig. 37—KS-19245, List 24 Telephone Answering Set, Connections for Overflow Messages on Auxiliary Answering Set

KS-19245, LIST 1  
TELEPHONE ANSWERING SET  
MECHANICAL ADJUSTMENT AND MAINTENANCE

1. GENERAL

1.001 This addendum supplements Section 514-155-300, Issue 3. Place this pink sheet ahead of Page 1 of the section.

1.002 This addendum is reissued to revise paragraphs 15.03 and 15.04.

1.003 Issue 1 of this addendum was issued to:

- Revise 2.03
- Add 2.04
- Revise 3.02

2. CHANGES TO SECTION

ISSUE 1 CHANGES

2.001 On Page 2, change paragraph 2.03 as follows.

2.03 *IN-USE Lamp E2 (All Sets):*

- (1) Remove top cover (2.01).
- (2) Remove List 5 amplifier (3.03).
- (3) Pull out and hold spring clip, if present, on side of lamp socket and remove lamp E2 (Fig. 4).
- (4) Replace lamp E2, List 5 amplifier, and top cover.

2.002 On Page 2 add paragraph 2.04 as follows.

2.04 *AUTO-ANS Lamp E3 (All Sets):*

- (1) Remove top cover (2.01).

- (2) Remove ENA relay (3.04).

- (3) Pull out and hold spring clip, if present, on side of lamp socket and remove lamp E3 (Fig. 4).

- (4) Replace lamp E3, ENA relay and top cover.

2.003 On Pages 2 and 3 change paragraph 3.02 as follows.

3.02 *KS-19245, List 3 Recorder:*

- (1) Remove top cover (2.01).

- (2) Remove List 6 cartridge (6.01).

- (3) Remove four screws and remove side cover (Fig. 7).

- (4) Remove three retaining screws (Fig. 2) located on the bottom of the set.



*Do not lift or pry on the trim plates (Fig. 3).*

- (5) Firmly grasp chassis of List 3 recorder and carefully withdraw until plug-in receptacle is disengaged (Fig. 4).

- (6) Carefully move recorder toward rear of set to clear plastic MESSAGE INDICATOR DIAL (Fig. 9) and remove recorder from set.

- (7) Plug new recorder into the plug-in receptacle (Fig. 4).

- (8) Replace and tighten the three retaining screws.

NOTICE

Not for use or disclosure outside the Bell System except under written agreement

(9) Replace List 6 cartridge (6.02).

- List 6 cartridge properly installed

(10) Replace side and top covers.

- Lamp bulb.

**ISSUE 2 CHANGES**

**2.004** On Page 9 change paragraph 15.03 as follows.

**2.005** On Pages 9 and 12 change paragraph 15.04 as follows.

**15.03** ON-OFF (medallion) lamp lighted. Check following if otherwise:

**15.04** Functions (Preliminary Check).

- Function selector—Any position other than OFF
- Power cord properly installed
- Fuse not blown

**A. Announcement Record and Announcement Check**

Following conditions should exist:

- Function Selector—ANN-REC or ANN-CHECK position
- ON-OFF (medallion) lamp lighted
- Forward limit switch on List 3 recorder not operated.

***Danger: Disconnect power cord before checking fuse.***

**KS-19245, LIST 1**  
**TELEPHONE ANSWERING SET**  
**MECHANICAL ADJUSTMENT AND MAINTENANCE**

**1. GENERAL**

**1.01** This section is reissued to add information on lamp replacement.

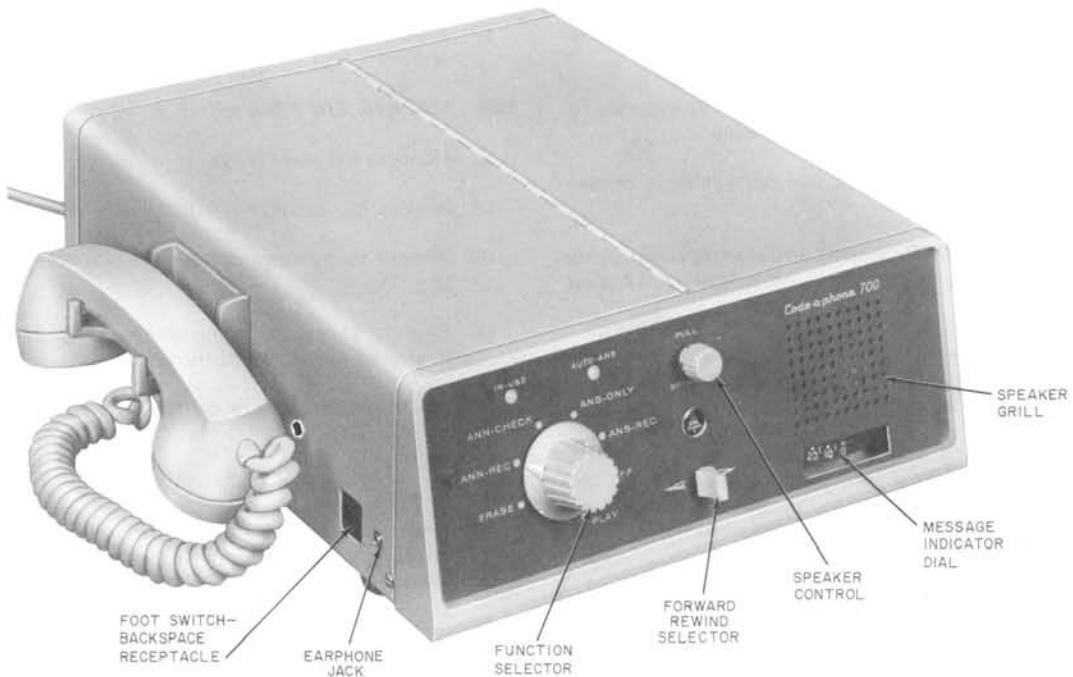
**1.02** The KS-19245, List 1 telephone answering set (Fig. 1) has been designed to facilitate maintenance by the use of plug-in assemblies. In general it is not recommended that replacement of component parts of these plug-in assemblies be attempted, since readjustments requiring special equipment and procedures will usually be required.

**1.03** It is intended that CD- and SD-99306-01 be used with this section.

*Caution: Before performing any maintenance on this set, disconnect power cord from the ac outlet.*

**1.04** Refer to Chart A for probable cause and corrective action of a trouble report. Table A lists replacement parts.

**1.05** The stenciling on the front panel of KS-19245, List 1 telephone answering set may be



**Fig. 1—KS-19245, List 1 Telephone Answering Set**

protected from excessive wear by applying a coat of 639A flat clear lacquer or its equivalent.

## 2. REPLACEMENT OF LAMPS

### 2.01 ON-OFF Lamp E1 on Telephone Answering Sets With Serial Numbers 100 Through 15200:

- (1) Remove top cover.
  - (a) Remove four retaining screws.
  - (b) Lift cover from set.
- (2) Remove List 3 recorder (3.02).

**Note:** ON-OFF lamp E1 is mounted on a bracket with a slotted screw hole and is located directly beneath the speaker control switch.

- (3) Loosen the retaining screw (Fig. 10) in the slotted screw hole until bracket is free. Pivot the bracket about the screw to expose lamp and lamp socket.
- (4) Pull out and hold spring clip on side of lamp socket and remove lamp.
- (5) Replace lamp E1 and reassemble in reverse order.

### 2.02 ON-OFF Lamp E1 on Telephone Answering Sets With Serial Numbers 15201 And Higher:

- (1) Remove the Bell System Medallion from the front panel by grasping it from the front and extracting it.
- (2) Using a 558A switchboard lamp extractor, remove the lamp from its socket.
- (3) Replace lamp E1 and medallion.

### 2.03 IN-USE Lamp E2 (All Sets):

- (1) Remove top cover (2.01).
- (2) Remove ENA relay (3.04).
- (3) Pull out and hold spring clip on side of lamp socket and remove lamp E3 (Fig. 4).

- (4) Replace lamp E3, ENA relay and top cover.⚡

## 3. REPLACEMENT OF PLUG-IN UNITS

### 3.01 KS-19245, List 2 Recorder:

- (1) Remove top cover (2.01).
- (2) Remove List 2 recorder (Fig. 3):
  - (a) Remove three retaining screws located on bottom of set (Fig. 2).
  - (b) Grasp List 2 recorder by its motor and chassis and carefully remove it from its plug-in receptacle.
- (3) Plug new recorder into the plug-in receptacle (Fig. 4).
- (4) Replace and tighten the three retaining screws.
- (5) Replace outer cover and tighten four retaining screws.

### 3.02 KS-19245, List 3 Recorder:

- (1) Remove top cover (2.01).
- (2) Remove list cartridge (6.01).
- (3) Remove four screws and remove side cover (Fig. 7).
- (4) Remove three retaining screws (Fig. 2) located on the bottom of the set.



**Do not lift or pry on the trim plates (Fig. 3).**

- (5) Firmly grasp chassis of List 3 recorder and carefully withdraw until plug-in receptacle is disengaged (Fig. 4).
- (6) Carefully move recorder toward rear of set to clear plastic MESSAGE INDICATOR DIAL (Fig. 9) and remove recorder from set.⚡
- (7) Plug new recorder into the plug-in receptacle (Fig. 4).

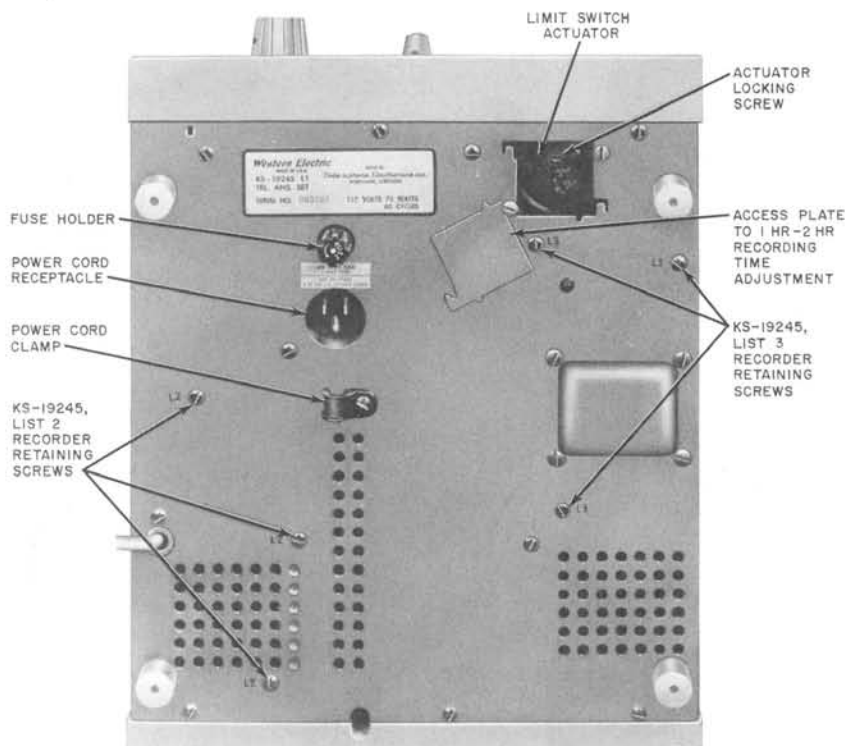


Fig. 2—KS-19245, List 1 Telephone Answering Set, Bottom View

- (5) Firmly grasp chassis of List 3 recorder and carefully withdraw until plug-in receptacle is disengaged (Fig. 4).
- (6) Carefully move recorder toward rear of set to clear plastic MESSAGE INDICATOR DIAL (Fig. 9) and remove recorder from set.
- (7) Plug new recorder into the plug-in receptacle (Fig. 4).
- (8) Replace and tighten the three retaining screws.
- (9) Replace List 6 cartridge (6.02).
- (10) Replace side and top covers.

### 3.03 *KS-19245, Lists 4 and 5 Amplifiers:*

- (1) Remove top cover of answering set (2.01).
- (2) Loosen retaining screws of the circuit board retainers.
- (3) Remove amplifier from its plug-in receptacle.
- (4) Plug new amplifier into plug-in receptacle (Fig. 4) and tighten screw of circuit board retainers.
- (5) Replace top cover.

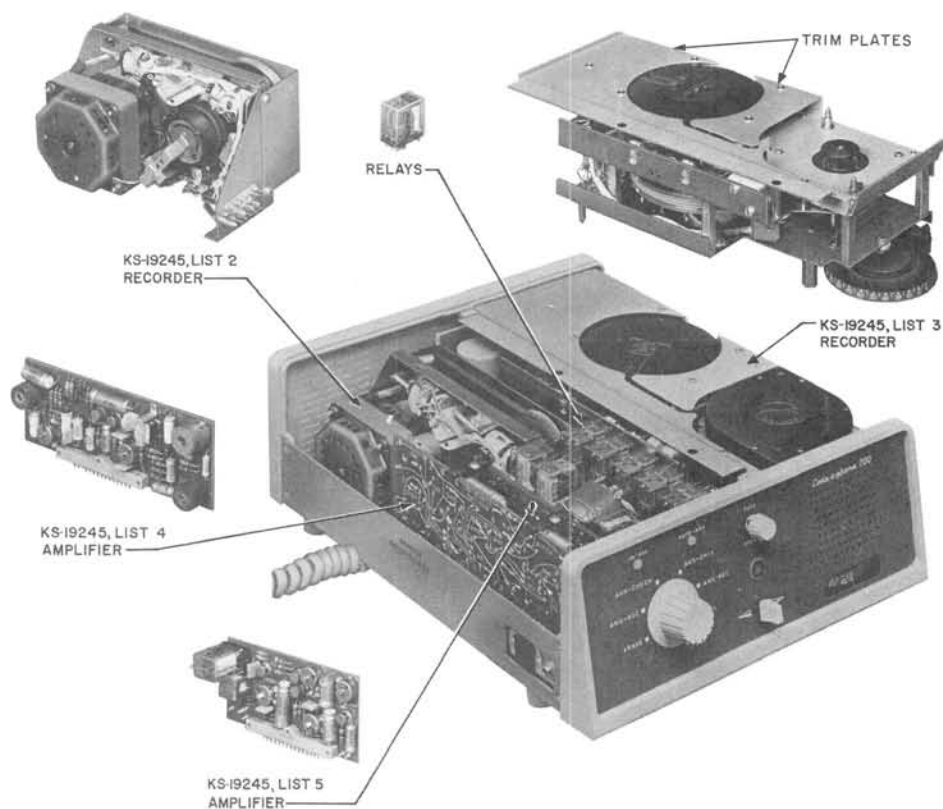


Fig. 3—KS-19245, List 1 Telephone Answering Set, Top Cover Removed

**3.04 Replacement of AD, BD, DLY, ENA, ED, LS, or ADR relays (Fig. 4):**

- (1) Remove top cover of answering set (2.01).
- (2) Slide wire spring retainer from relay.
- (3) Remove relay from its plug-in socket (Fig. 3).
- (4) Plug new relay into the plug-in socket (Fig. 4).
- (5) Engage wire spring retainer.
- (6) Replace top cover.

**4. REPLACEMENT OF MOTOR**

**4.01 KS-19245, List 2 Recorder (Fig. 5):**

- (1) Unsolder motor leads.
- (2) Remove four nuts and lock washers.
- (3) Remove drive belt from motor pulley. Remove motor.
- (4) Install new motor. Replace drive belt on motor pulley.
- (5) Replace and tighten lockwashers and nuts.

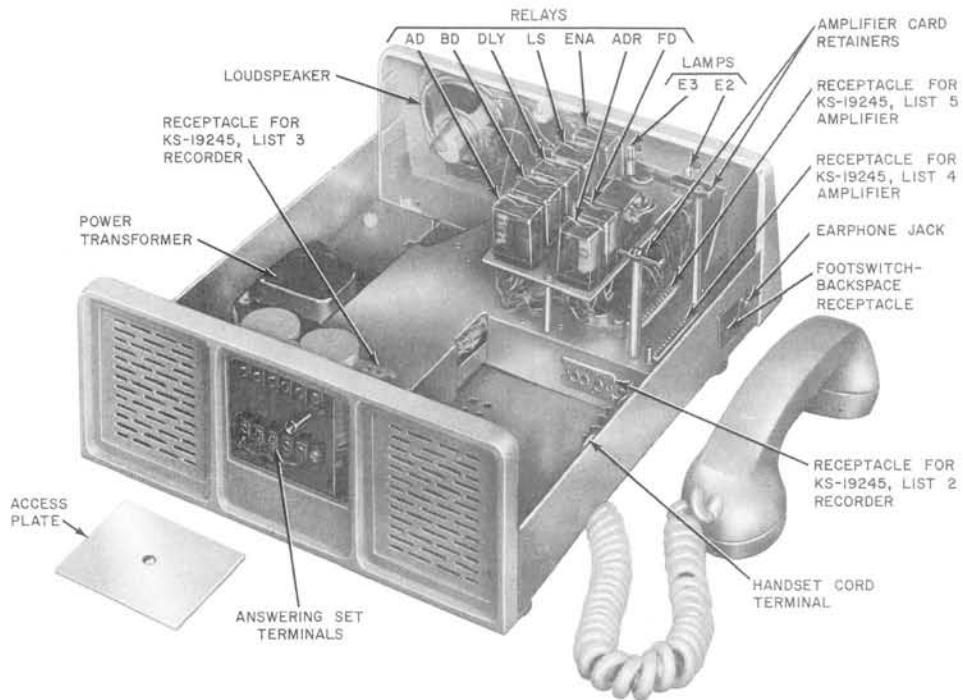


Fig. 4—KS-19245, List 1 Telephone Answering Set, Cover and Plug-In Components Removed

- (6) Solder motor leads.

#### 4.02 KS-19245, List 3 Recorder (Fig. 6):

- (1) Unsolder motor leads.
- (2) Remove four nuts and lockwashers.
- (3) Remove the three drive belts from the motor pulley. Remove motor.
- (4) Install new motor. Replace the three drive belts on the motor pulley.
- (5) Replace and tighten lockwashers and nuts.
- (6) Solder motor leads.

#### 5. REPLACEMENT OF BELT ON KS-19245, LIST 2 RECORDER (Fig. 5)

##### 5.01 Capstan Flywheel Belt:

- (1) Remove motor (4.01).
- (2) Remove drive belt.
- (3) Remove faulty capstan flywheel belt and install new belt.
- (4) Install drive belt. Replace motor.

##### 5.02 Rewind Belt:

- (1) Remove motor (4.01).
- (2) Remove faulty drive belt.
- (3) Install new belt. Replace motor.



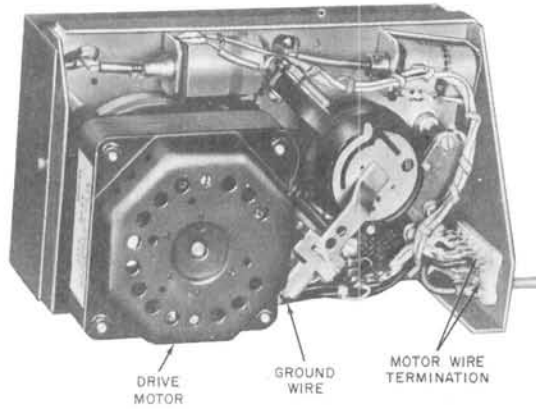


Fig. 5—KS-19245, List 2 Recorder, Motor Side

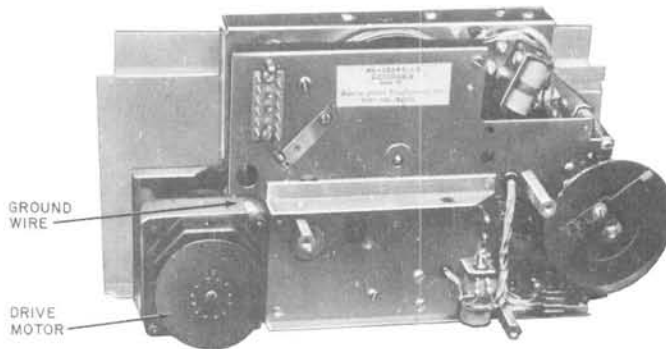


Fig. 6—KS-19245, List 3 Recorder, Motor Side

## 6. REPLACEMENT OF KS-19245, LIST 6 CARTRIDGE

### 6.01 Cartridge Removal:

- (1) Rewind tape into cartridge (0 setting on message indicator dial).
- (2) Set function selector to off.
- (3) Remove tape end from take-up reel by depressing and backing out of slot.

- (4) Turn cartridge hub clockwise by hand to rewind remaining tape into cartridge.
- (5) Grasp cartridge and lift up.

### 6.02 Cartridge Installation (Fig. 7):

- (1) Place cartridge over cartridge lock pins and hub, snap down into place.
- (2) Slide tape end through tape slot into slot of take-up reel and snap into place.



Fig. 7—Resetting "0" Registration on Message Indicator Dial

## 7. REPLACEMENT OF SPEAKER

7.01 To replace speaker:

- (1) Remove top cover (2.01).
- (2) Remove KS-19245, List 3 recorder (3.02).
- (3) Unsolder speaker leads.
- (4) Remove four nuts and withdraw speaker (Fig. 4).
- (5) Install new speaker and tighten nuts.
- (6) Solder speaker leads.
- (7) Replace List 3 recorder.
- (8) Replace top cover.

## 8. RESETTING 0 REGISTRATION ON MESSAGE INDICATOR DIAL

8.01 Remove tape cartridge (6.01).

8.02 Set dial to 0:

- (1) Rotate cartridge hub (Fig. 7) by hand in either direction to set dial at 0.

or

For more rapid resetting, run set in rewind as follows (Fig. 7):

- (a) Insert folded paper in take-up reel slot.
- (b) Rotate take-up reel by hand to allow folded paper to operate limit switch.

- (c) Plug in power cord.
- (d) Set selector to PLAY.
- (e) Restrain take-up reel and depress cartridge interlock switch.
- (f) Operate REWIND lever until 0 setting is obtained.

## 9. BROKEN OR ENTANGLED MESSAGE TAPE

**9.01** Broken or entangled message tape should be replaced with a new KS-19245, List 6 cartridge. If necessary reset message indicator dial to 0. (Refer to Part 8.)



*To recover recorded messages on broken tape, splice broken tape ends using splicing tape and tools obtained locally. After splicing tape, message indicator dial should be reset to 0. After messages are recovered tape cartridge should be replaced.*

## 10. ADJUSTMENTS

### 10.01 Message Recording:

- (1) Insert plug of power cord into ac outlet.
- (2) Run the set in rewind to obtain a message indicator dial reading of 0 (set will stop automatically).

**Caution:** *Before proceeding with adjustment, remove power cord from ac outlet.*

- (3) Remove access cover (Fig. 2).
- (4) Adjust limit switch actuator (Fig. 2):
  - (a) Loosen actuator locking screw.
  - (b) Slide actuator to desired setting (1 HR or 2 HR).
  - (c) Tighten actuator locking screw.
- (5) Replace access cover.

### 10.02 Announcement Recording:

- (1) Remove top cover (2.01).

- (2) Remove KS-19245, List 4 amplifier (3.03).
- (3) Release timer cap by carefully depressing timer arm.

**Caution:** *Do not rotate recorder motor by hand.*

- (4) Adjust recording capacity by carefully lifting tab of timer spring from slot and rotating to position of desired interval (Fig. 8).

**Caution:** *Do not lift tab over raised portion of timer cap. To increase interval, rotate tab clockwise. To reduce interval, rotate tab counterclockwise.*

- (5) Replace KS-19245, List 4 amplifier.
- (6) Replace top cover.

## 11. LUBRICATION

**11.01** No lubrication should be done in the field on KS-19245, List 1 telephone answering sets.

## 12. CLEANING

**12.01** Clean recording and erase heads by wiping with a clean KS-2423 cloth, moistened slightly with trichloroethane or approved equivalent. Remove all excess cleaner with a dry KS-2423 cloth.

**12.02** Drive belts, capstans, and drive surfaces of pulleys shall be free of oil, dirt, or other foreign matter. To clean, use a KS-2423 cloth moistened with (type cleaner) 1, 1, 1, trichloroethane or approved equivalent.

**12.03** Clean pinch rollers only if excessive build-up of foreign particles is present. Use KS-2423 cloth moistened slightly with (type cleaner) 1, 1, 1, trichloroethane. Wipe off any excess cleaner immediately with dry KS-2423 cloth and allow time for rubber surface to dry before running set.

## 13. ACCESSORIES

**13.01** Limit maintenance on foot switch, head set, or backspace unit to correcting loose connections. Replace and return accessories to

Western Electric Company for repairs of any other troubles.

#### 14. CHECK POINTS



*Upon completion of any maintenance work the following steps should be taken to insure answering set is in proper operating condition.*

(1) Insert power cord into ac outlet. Refer to Division 514 section entitled: KS-19245, List 1 Telephone Answering Set, Operation, and check the following:

- (a) Announcement recording and erasure
- (b) Announcement check:
  - With handset
  - With speaker
- (c) Automatic answer—answer and record:
  - Automatic answer ready lamp
  - Ring-up
  - In-use lamp
  - Announcement monitoring in speaker
  - Transfer beep tone
  - Message monitoring in speaker
  - Talk-down tone
  - Voice control—time-out
  - Disconnect beep tone
- (d) Automatic answer—answer only:
  - Ring-up
  - Announcement monitoring in speaker
  - Disconnect at end of announcement
- (e) Message playback:
  - With handset

- With speaker
- With earphone (optional accessory)
- (f) Fast forward and rewind of message tape
- (g) Erase messages
- (h) Foot switch (optional accessory)
- (i) Back space unit (optional accessory)

#### 15. CHART A



*Before proceeding with operational procedure make the following visual inspection.*

#### VISUAL INSPECTION

- 15.01** Check connections for type of service.
- 15.02** Check that plug-in assemblies are properly installed, with plugs firmly in place:
  - List 2 Recorder
  - List 3 Recorder
  - List 4 Amplifier
  - List 5 Amplifier
  - Relays
  - List 6 Cartridge
- 15.03** ON-OFF (medallion) lamp lighted. Check following if otherwise:
  - Function selector—Any position other than OFF
  - Power cord properly installed
  - Fuse not blown
  - List 6 cartridge properly installed
  - Lamp bulb
- 15.04** Functions (Preliminary Check)

TABLE A

PART	ORDERING INFORMATION*	REMARKS
Recorder	KS-19245, List 2	Announcement recording mechanism
Motor M 201	B-559822	Component of KS-19245, List 2 Recorder
Belt (Drive belt)	B-559817-1	Component of KS-19245, List 2 Recorder
Belt (Capstan flywheel)	B-559817-2	Component of KS-19245, List 2 Recorder
Shock Mount, Motor	B-559821	Component of KS-19245, List 2 Recorder
Recorder	KS-19245, List 3	Incoming message mechanism
Motor M 301	B-650602	Component of KS-19245, List 3 Recorder
Motor Fan	B-558996	Component of KS-19245, List 3 Recorder
Shock Mount, Motor	B-559821	Component of KS-19245, List 3 Recorder
Dial Assembly	B-559988	Component of KS-19245, List 3 Recorder
Hub Cartridge Drive	B-559923	Component of KS-19245, List 3 Recorder
Take-up Spool Assembly	B-563465	Component of KS-19245, List 3 Recorder
Deck	B-559921	Component of KS-19245, List 3 Recorder
Island, Trim Deck	B-559922	Component of KS-19245, List 3 Recorder
Amplifier	KS-19245, List 4	Printed wiring card for recording and reproducing
Amplifier	KS-19245, List 5	Printed wiring card containing voice operated and calling party control circuits
Relay VC	Allied Control Co. or equiv. TS 154-C-C 8.5 MADC- 1000 ohms	Component of KS-19245, List 5 Amplifier
Relay CPC	B-560101	Component of KS-19245, List 5 Amplifier
Control Knob Assembly	B-560078	Function selector
Control Knob Assembly	B-560081	Speaker control
Knob Control	B-560070	Forward — rewind selector

\* Parts identified by B-numbers, order as: "B — Part of KS-19245, List 1 Telephone Answering Set."

TABLE A (Cont)

PART	ORDERING INFORMATION*	REMARKS
Power Cord	KS-19245, List 10	For use with a 2-wire 110-volt ac outlet
Power Cord	KS-19245, List 11	For use with a 3-wire parallel-blade, 110-volt ac outlet
Cartridge	KS-19245, List 6	Contains recording tape for incoming messages
Retainer, Circuit Board	B-560824	Secures KS-19245, List 4 and List 5 amplifiers
Hand Set (Furnished with Cord)	G-5KR-61	Used to record and monitor
Cord	H6E-61	Used with G-5KR-61 handset
Hanger, Handset	B-560066	Handset cradle
Speaker	Quam 3.2 ohms 3 inch diam, 30A05 or 09149	Monitors announcement and message tapes
Relay RU	Allied Control Co., Inc. SWX-63-13, 800 ohms	Component of chassis assembly
Relays AD,BD,DLY, ENA,FD, or LS	Allied Control Co., Inc. TF154-CC-CC 24 VDC-700 ohms	Component of chassis assembly
Relay ADR	Allied Control Co., Inc. TF154-C-C 24 VDC-700 ohms	Component of chassis assembly
Plate, Rectangular	B-560085	Access to mounting cord terminal board
Cover Access	B-560083	Access to 1 hr, 2 hr limit switch actuator of List 3 recorder
Operating Instruction Label	B-559781	Contains operating instructions of answering set, adheres to cover
Fuse Holder	Bussman Fuse Holder 342004; obtain locally	Located on bottom of set. Houses 1 lamp fuse
Fuse	3AG1 amp; obtain locally	Provides electrical protection
Lamp Miniature	No. 334-LSV† (Chicago Miniature Lamp Co.), GE #388†, or equivalent	IN-USE, AUTO-ANS and ON-OFF lamp bulbs
Foot	B-550086	Located on bottom of set

\* Parts identified by B-numbers, order as: "B — Part of KS-19245, List 1 Telephone Answering Set."

† 25,000 Hour Life

**A. Announcement Record and Announcement Check**

Following conditions should exist:

- Function Selector—ANN-REC or ANN-CHECK position
- ON-OFF (medallion) lamp lighted
- Forward limit switch on List 3 recorder not operated

(Message indicator dial reading less than 100 for 1-hour message recording adjustment and less than 200 for 2-hour message recording adjustment)

**B. Automatic Answer—Answer Only**

Following conditions should exist:

- Function Selector—ANS-ONLY position
- ON-OFF (medallion) lamp lighted
- AUTO-ANS lamp lighted
- Minute end of tape warning switch not operated

(Message indicator dial reading less than 90 for 1-hour message recording adjustment and less than 190 for 2-hour message recording adjustment)

**C. Automatic Answer—Answer and Record**

Following conditions should exist:

- Function Selector—ANS-REC position
- ON-OFF (medallion) lamp lighted
- AUTO-ANS lamp lighted
- 3-minute end of tape warning switch not operated

(Message indicator dial reading less than 90 for 1-hour message recording and less than 190 for 2-hour adjustment)

**D. Message Playback**

Following conditions should exist:

- Function Selector—PLAY position
- ON-OFF (medallion) lamp lighted
- Forward limit switch on List 3 recorder not operated

(Message indicator dial reading less than 100 for 1-hour message recording adjustment and less than 200 for 2-hour message recording adjustment)

**E. Fast Forward—Rewind**

Following conditions should exist:

- Function Selector—PLAY position or ERASE position
- ON-OFF (medallion) lamp lighted
- Fast forward—forward limit switch on List 3 recorder not operated

(Message indicator dial reading less than 100 for 1-hour message recording adjustment and less than 200 for 2-hour message recording adjustment)

**15.05 Lamp Bulbs (IN-USE, AUTO-ANS, and ON-OFF):**

General Electric No. 334 Lamp (rated 1000 hours) should be replaced by General Electric No. 388 or Chicago Miniature No. 334-LSV Lamp (both rated 25,000 hours).

**15.06 Drive Belt Slippage:** Silicone oil from the drive motors creeps along the shafts and eventually over the pulleys until it reaches the belts. This causes the belts to stretch somewhat and also reduces the friction between the belts and the pulleys, both of which causes warble. Stretched belts work satisfactorily if they and the pulley surfaces are cleaned per 12.02.

## 16. OPERATIONAL PROCEDURE



*The following tests require operation of the set with outer cover removed and 24 vdc on exposed terminals. Do not operate solenoids, tape reels or other mechanism parts by hand.*

- 16.01 If securing of loose connections or replacement of fuse, lamp bulbs, List 2 recorder, List

3 recorder, List 4 amplifier, List 5 amplifier, List 6 cartridge, List 10 or 11 power cords, or plug-in relays does not correct trouble, return set to Distributing House.

- 16.02 Refer to Fig. 8 and 9 for reference with operational procedure.

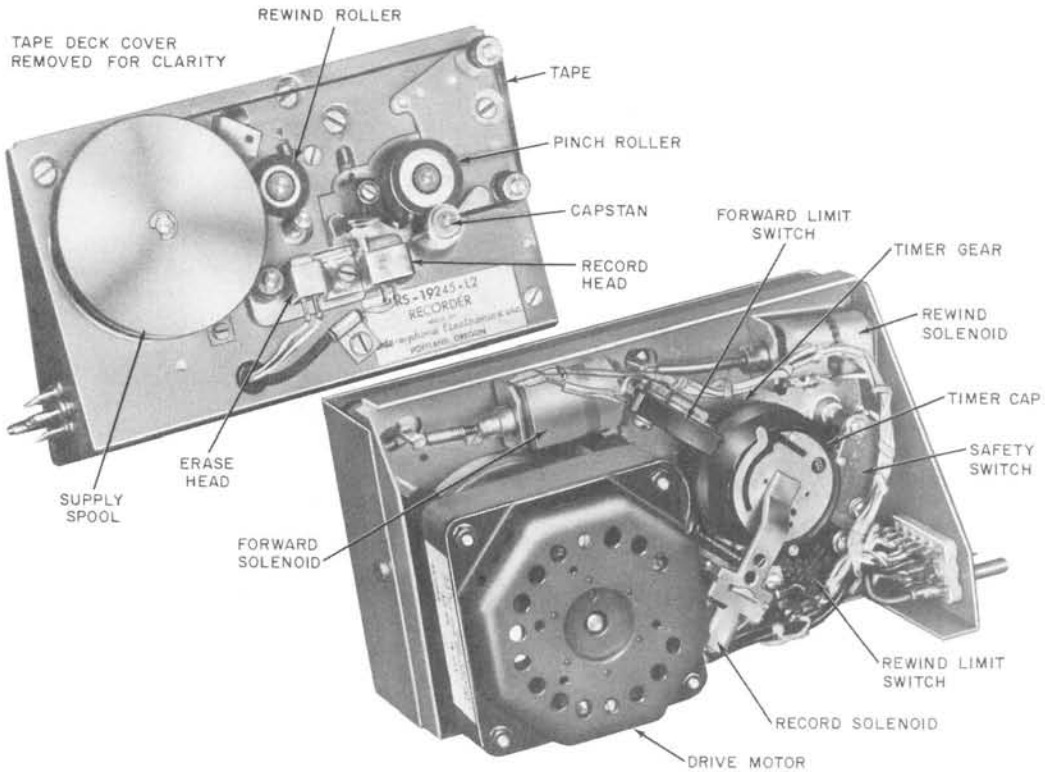


Fig. 8—KS-19245, List 2 Recorder Front and Rear Views



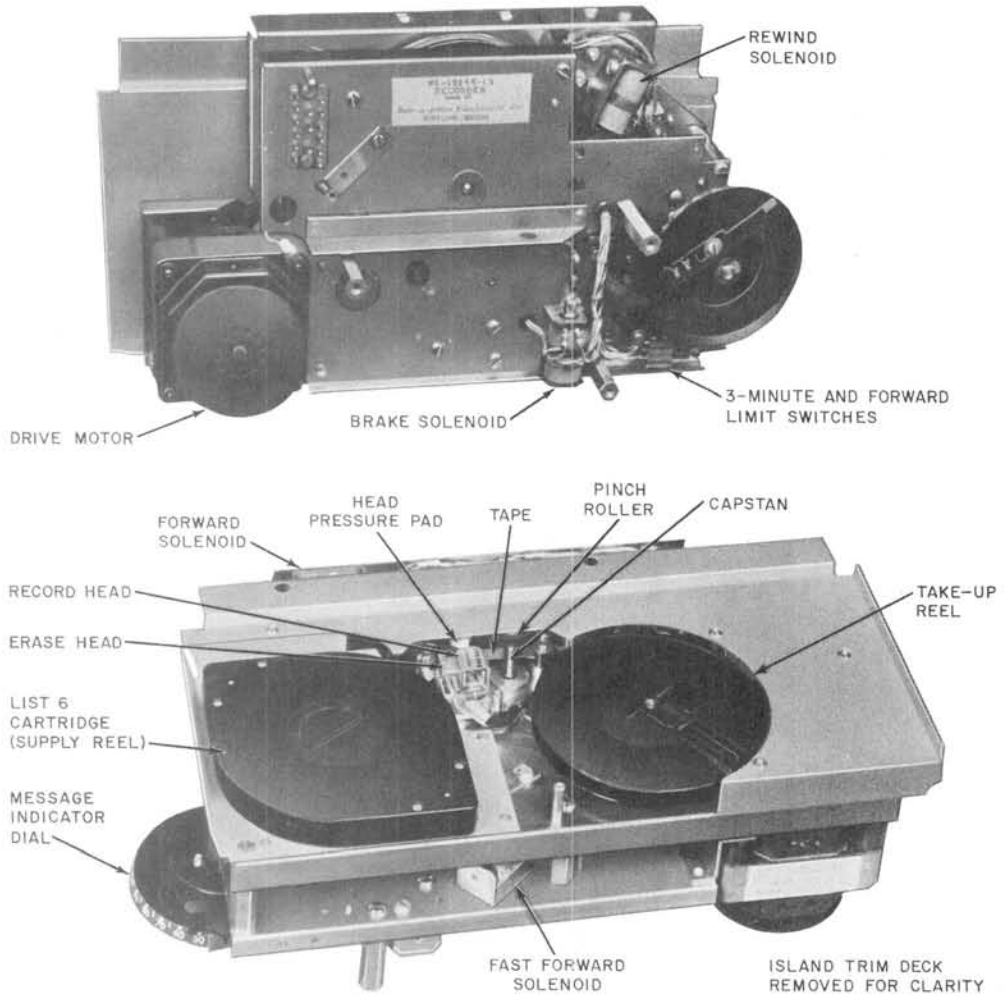


Fig. 9—KS-19245, List 3 Recorder Front and Rear Views

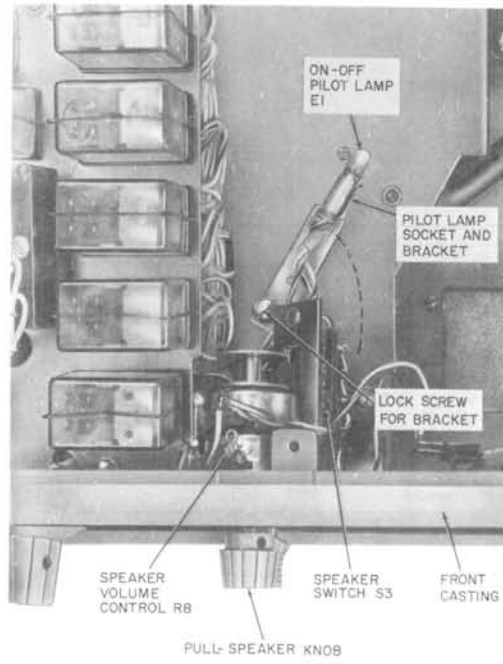


Fig. 10—ON-OFF Lamp E1 on Pivoted Position

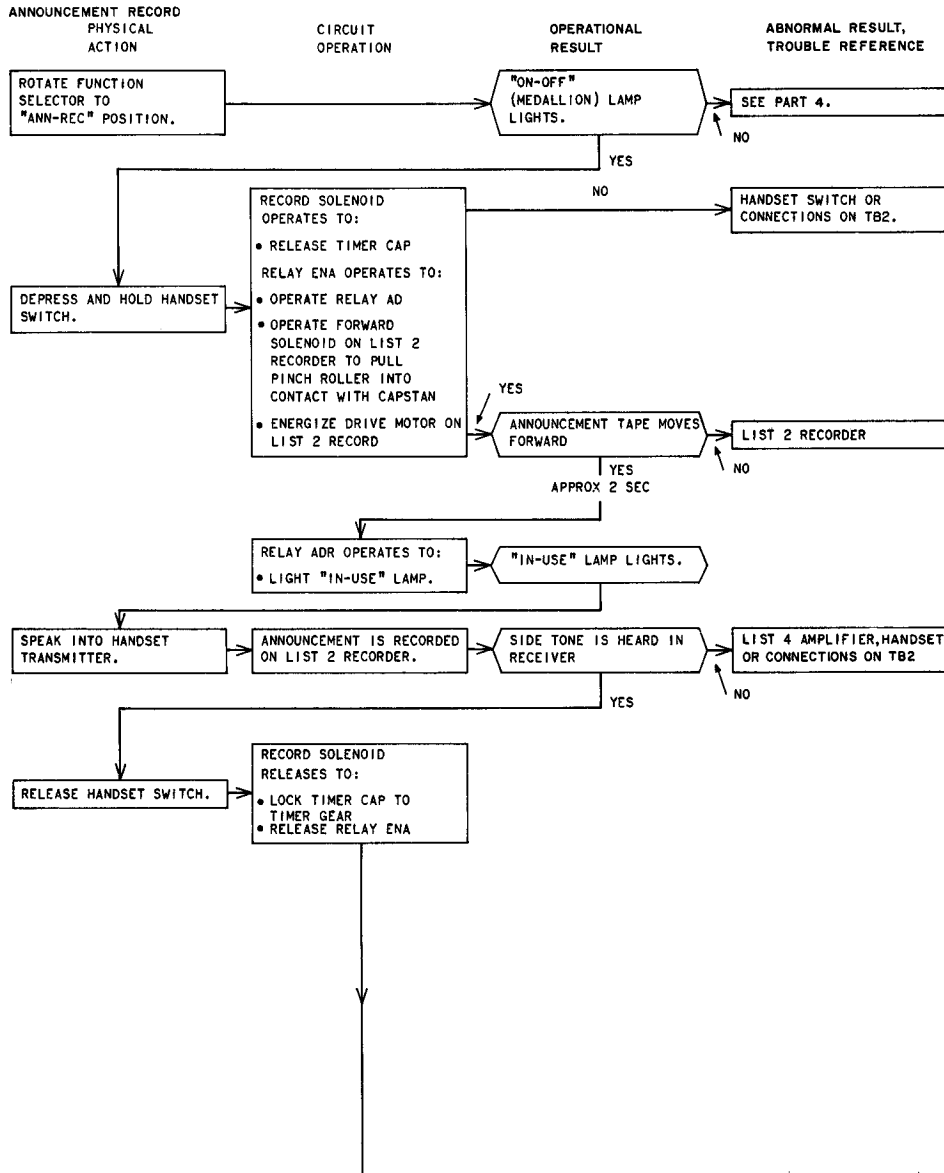


Fig. 11—Chart A (Sheet 1)

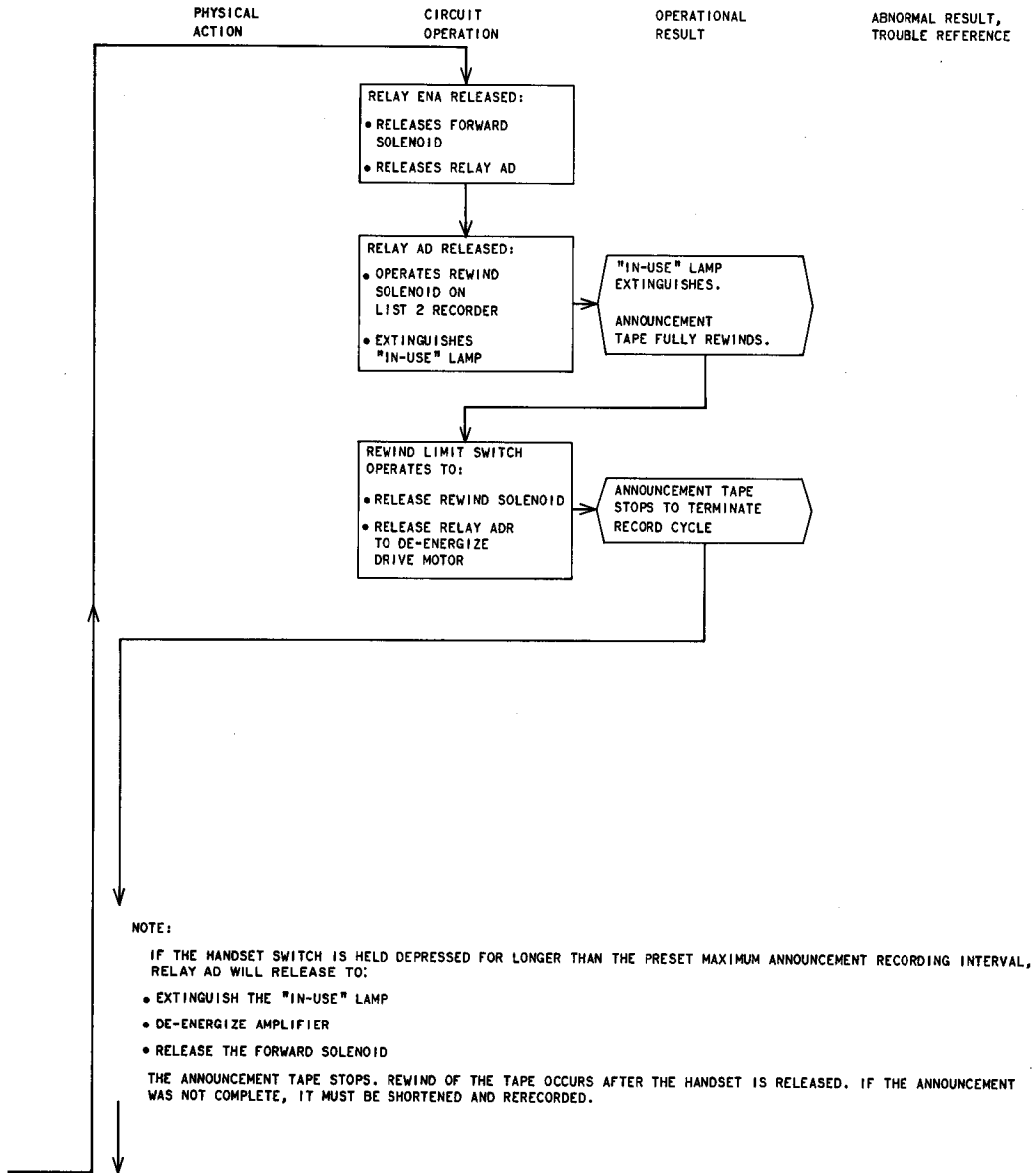


Fig. 11—Chart A (Sheet 2)

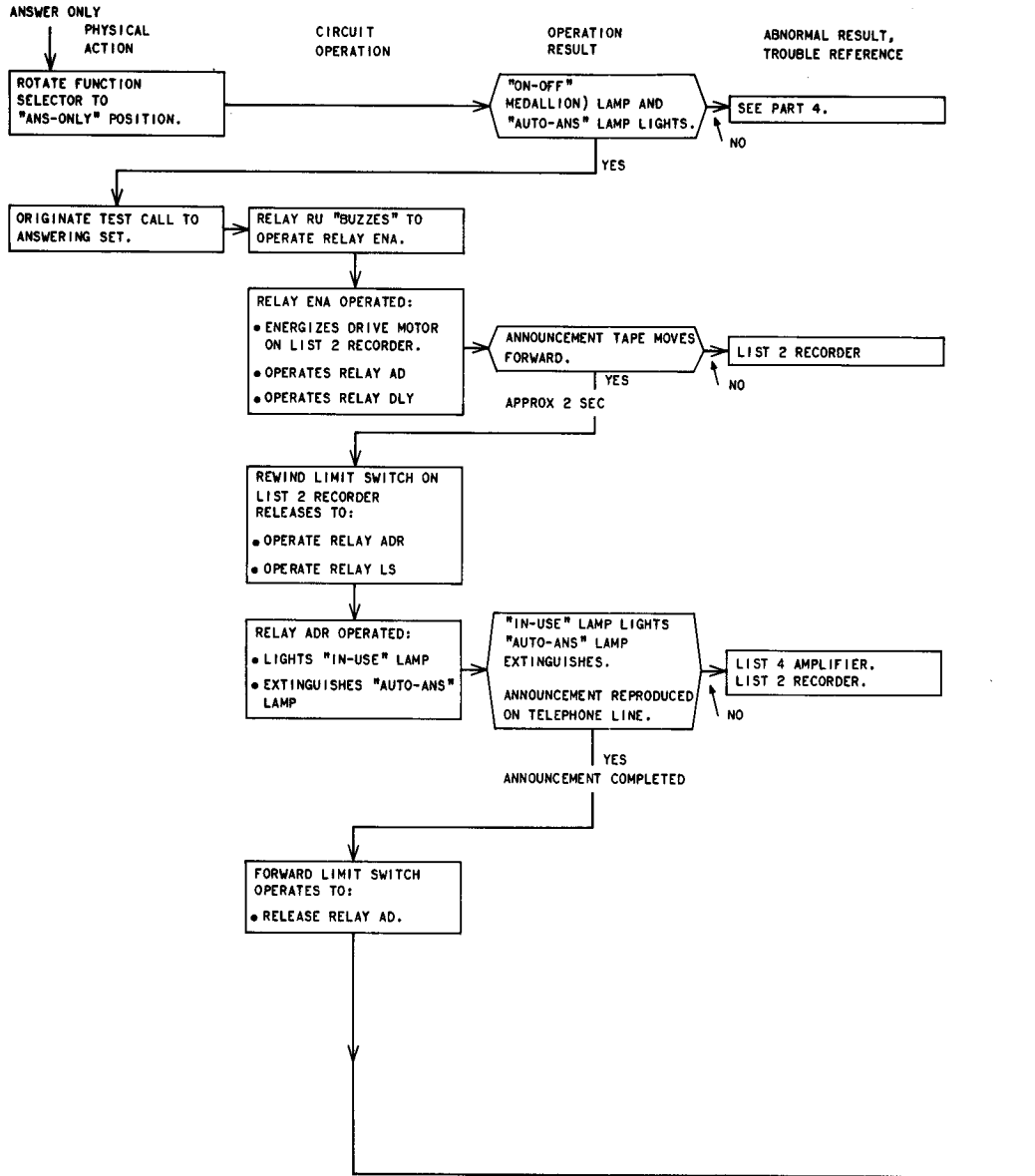


Fig. 11—Chart A (Sheet 3)

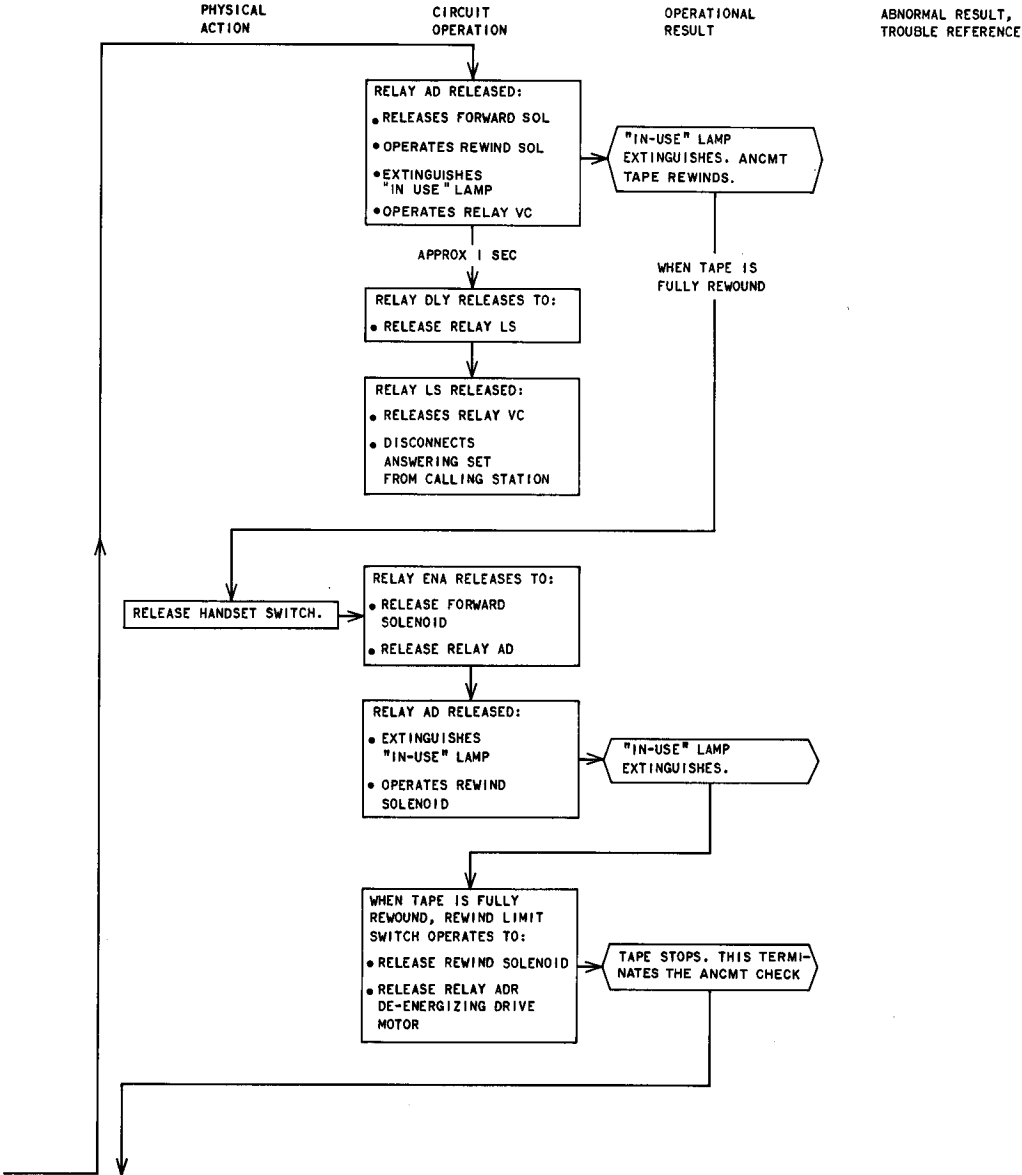


Fig. 11—Chart A (Sheet 4)

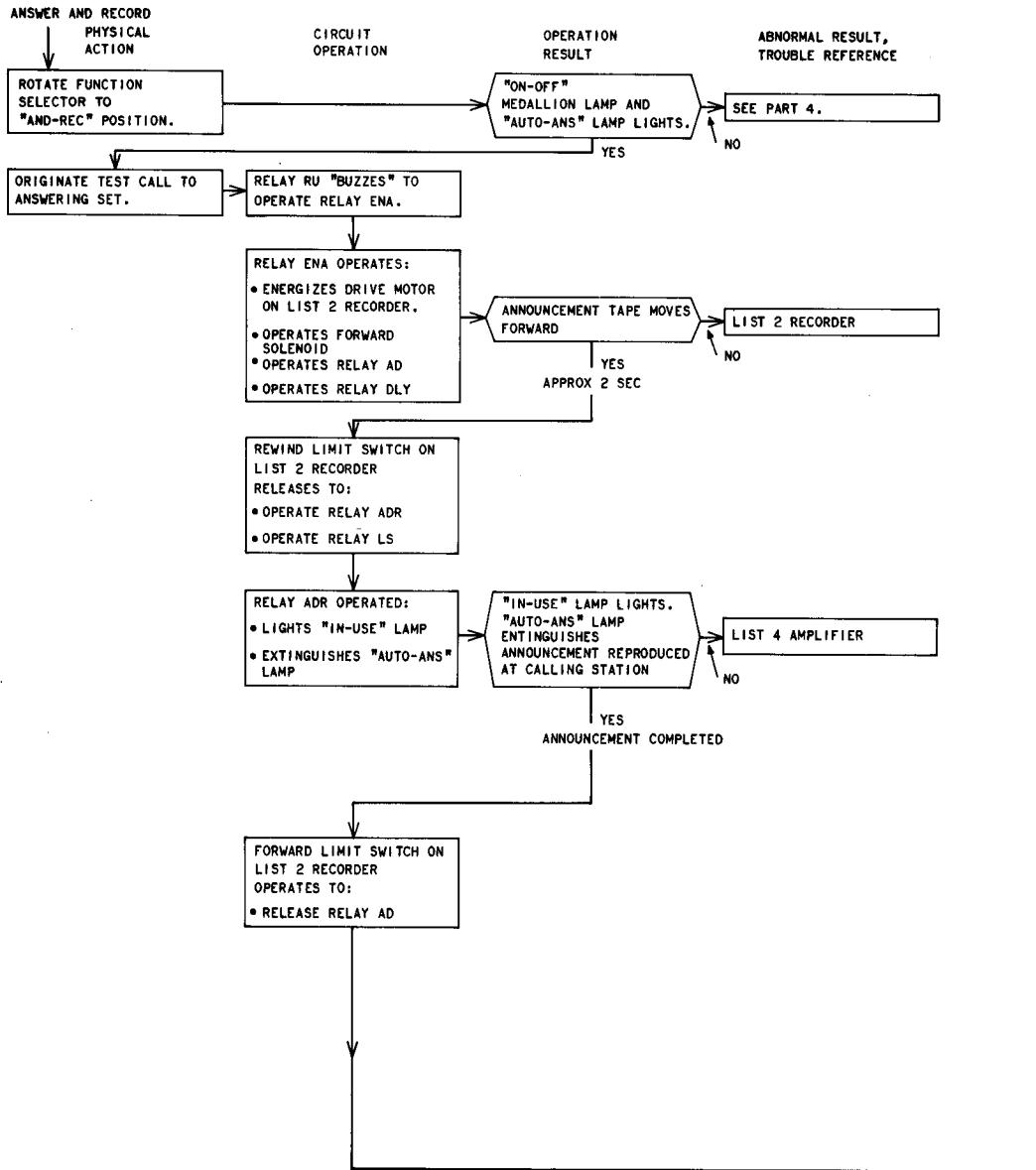


Fig. 11—Chart A (Sheet 5)

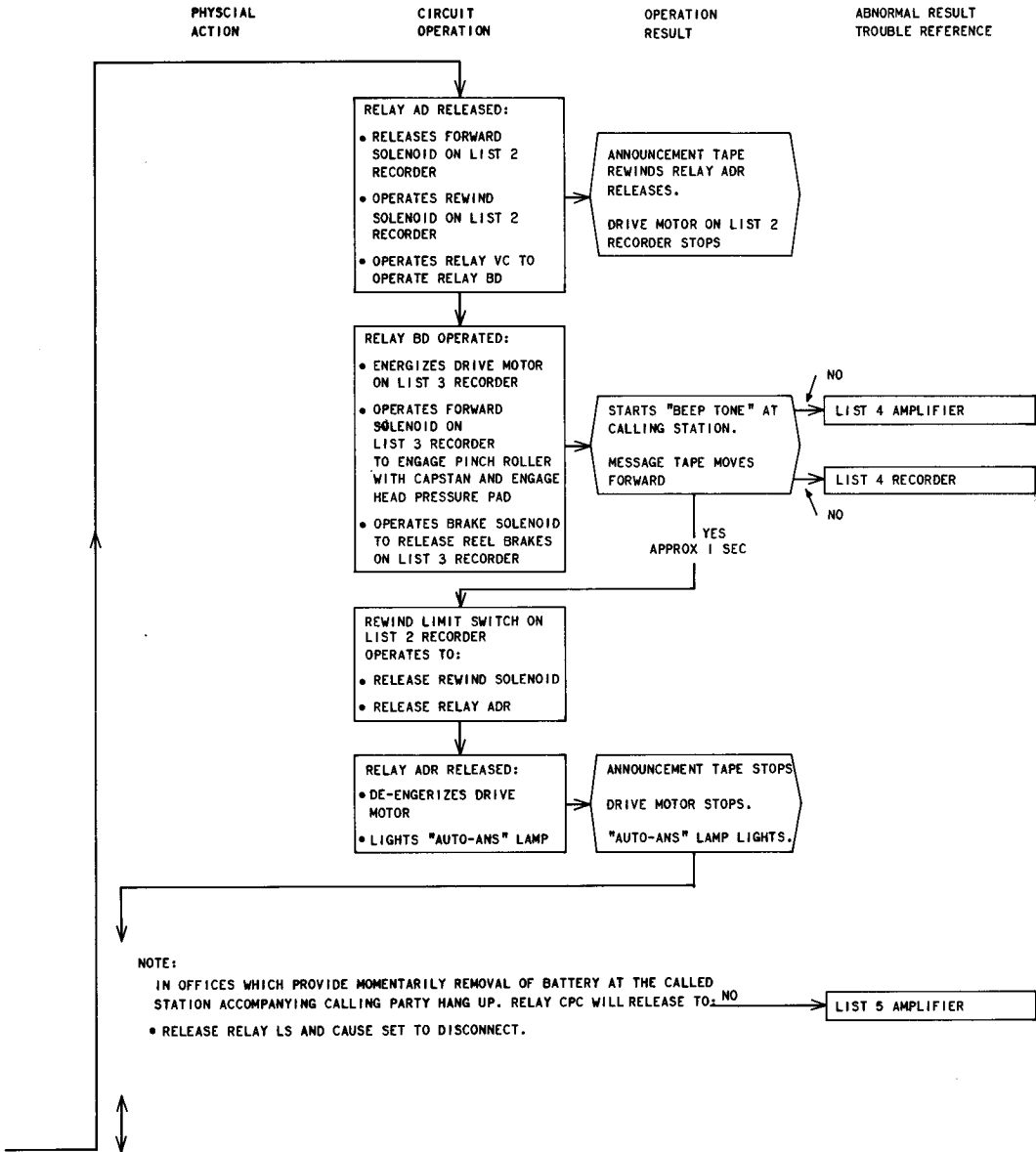


Fig. 11—Chart A (Sheet 6)†



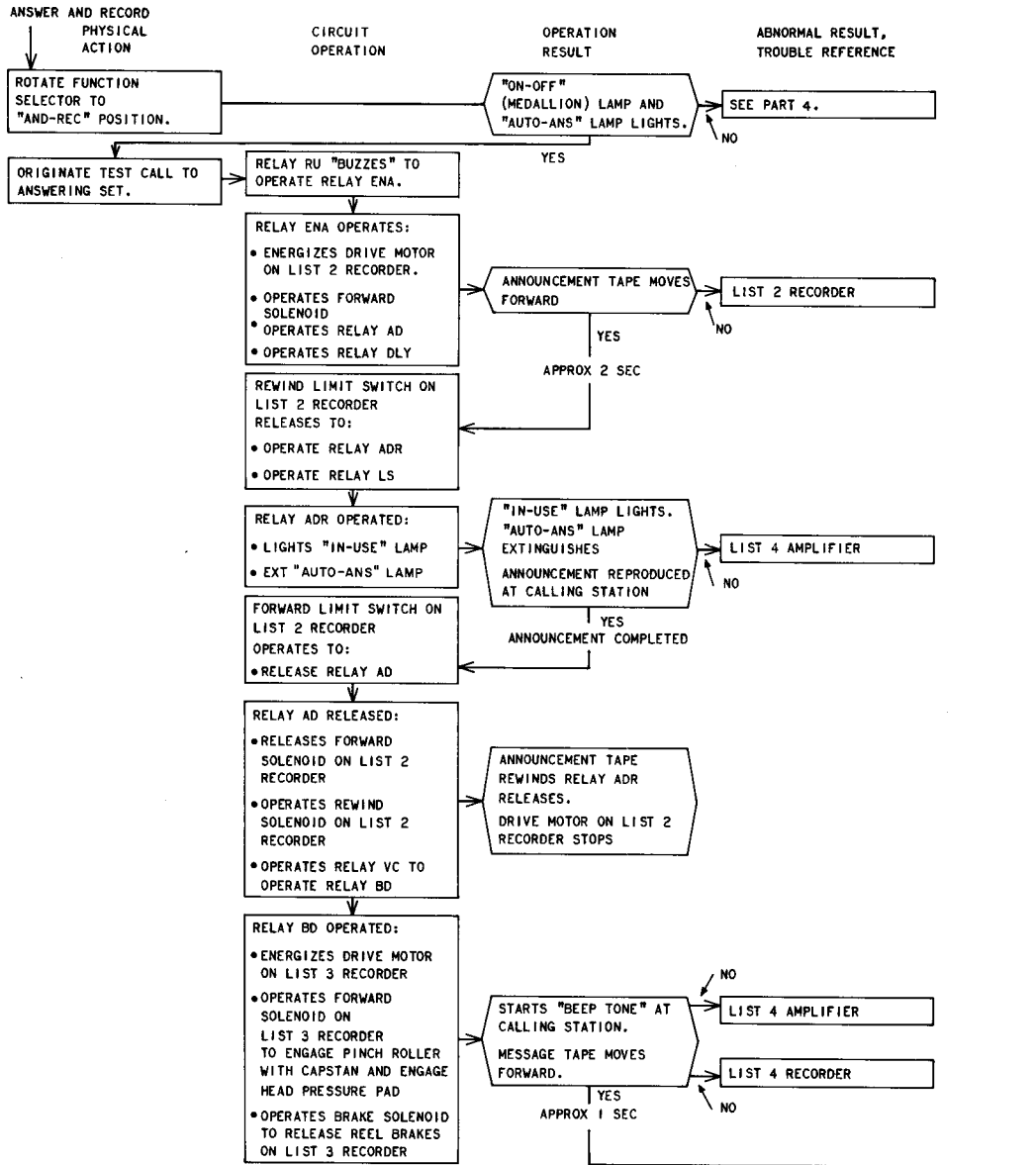


Fig. 11—Chart A (Sheet 7)

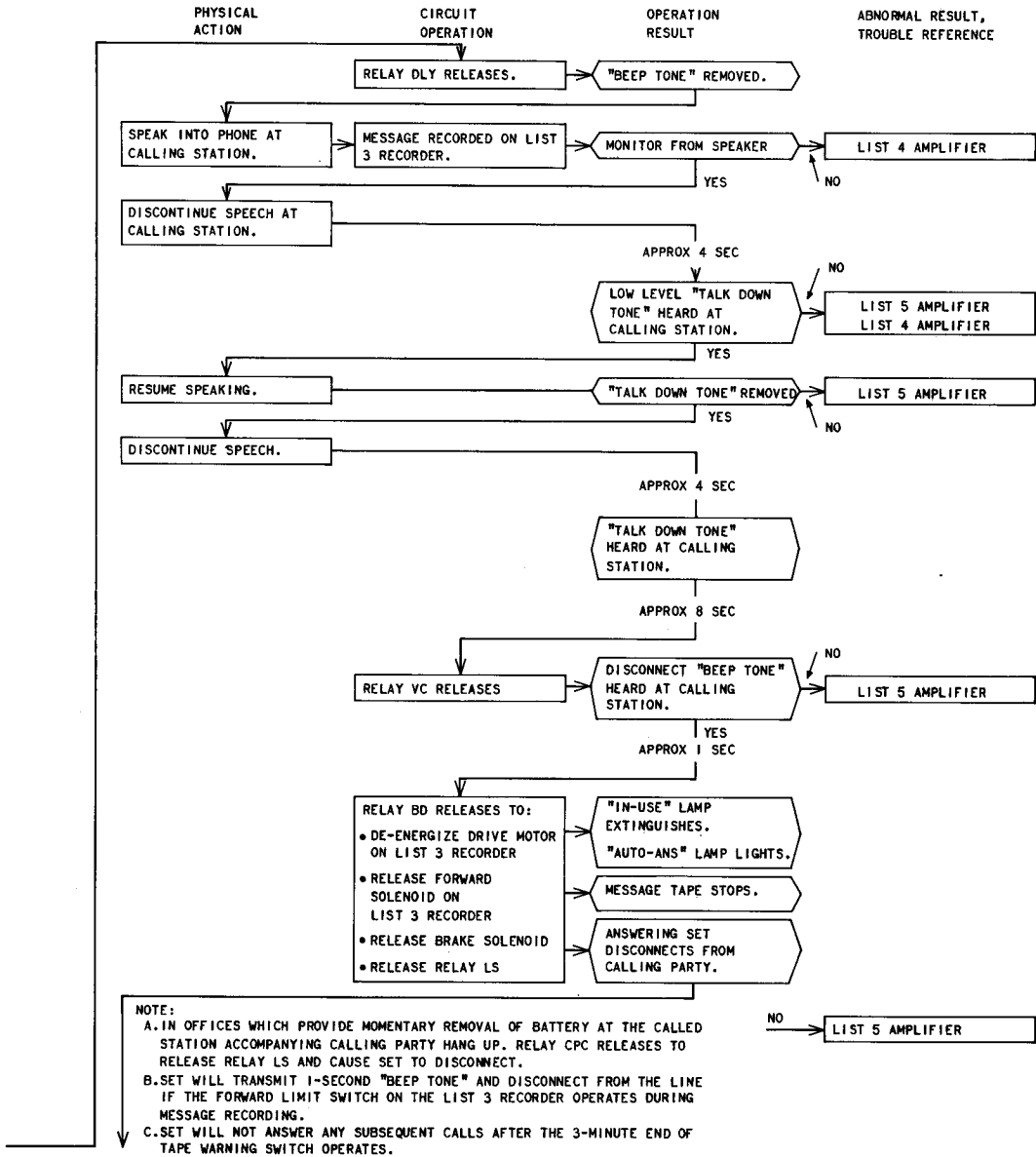


Fig. 11—Chart A (Sheet 8)

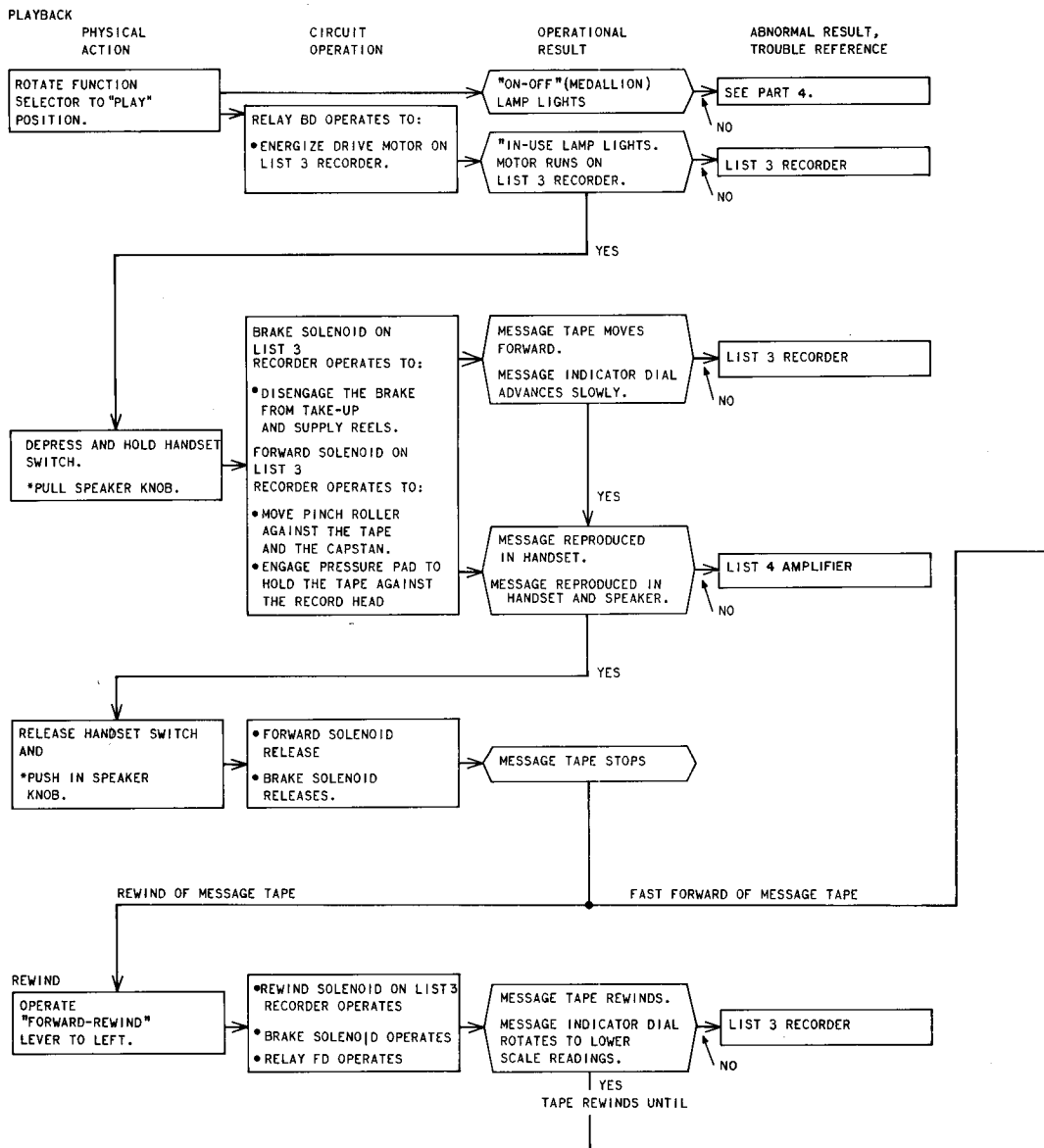


Fig. 11—Chart A (Sheet 9)

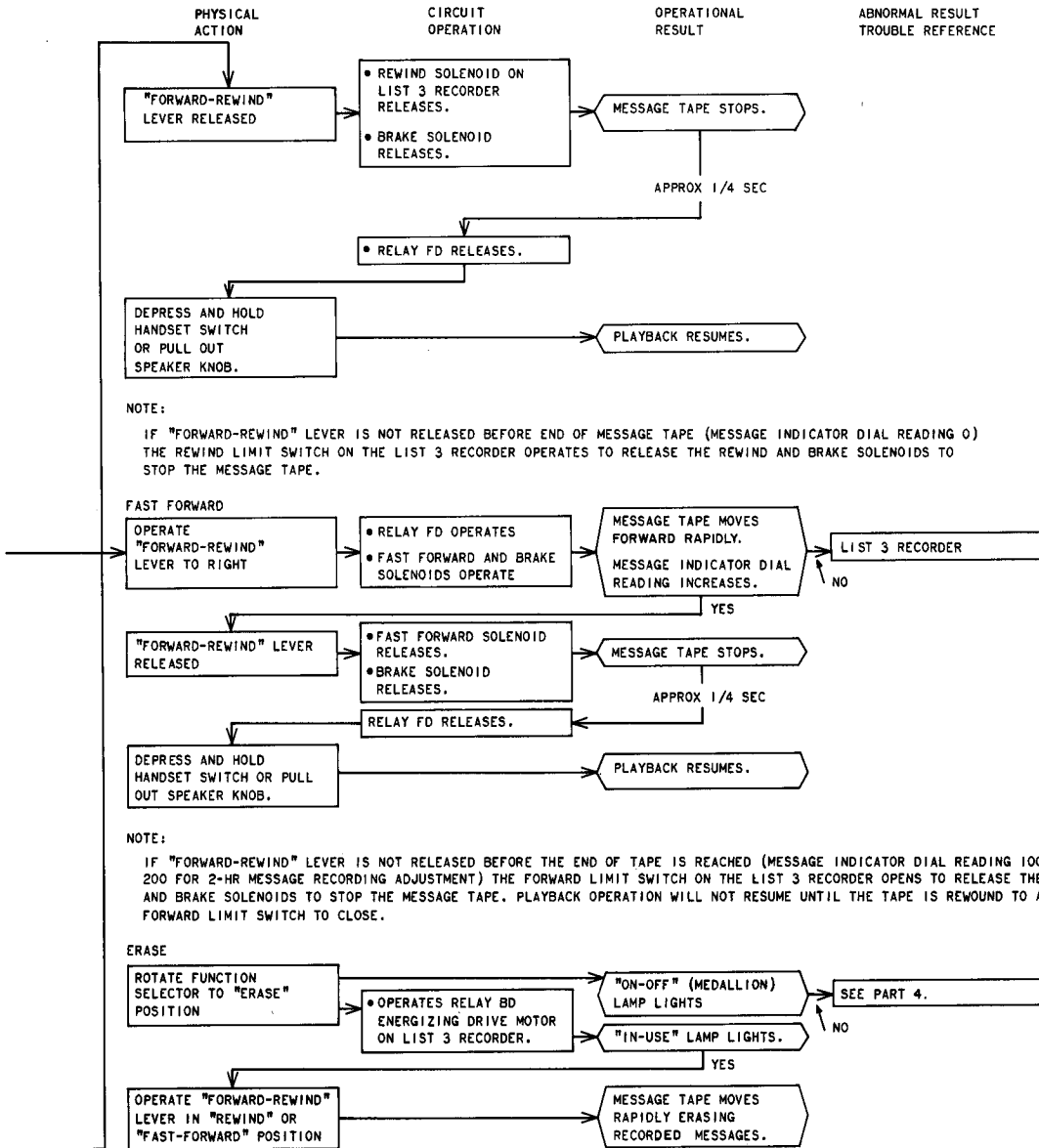


Fig. 11—Chart A (Sheet 10)

## KS-19245, LISTS 13 AND 24 TELEPHONE ANSWERING SETS MAINTENANCE

### 1. GENERAL

1.01 This section contains information for the KS-19245, Lists 13 (MD) and 24 (Fig. 1) telephone answering set. For additional information on identification, installation, connections, and operation, refer to Section 514-155-100.

1.02 This section is reissued to:

- Add KS-19245, List 24 telephone answering set
- Show the KS-19245, List 13 telephone answering set MD.

1.03 The KS-19245, Lists 13 (MD) and 24 telephone answering sets have been designed to facilitate maintenance by the use of plug-in assemblies. Field replacement of component parts of these plug-in assemblies is not recommended, since readjustments requiring special equipment and procedures will usually be required. Table A identifies components that are replaceable in the field.

### 2. MAINTENANCE PROCEDURE

2.01 *When trouble is encountered, perform the following preliminary inspection.*

**Note:** For location and detailed information, refer to Section 514-155-100.

- (1) Check that the power cord is plugged into an ac outlet not controlled by a switch and fuse is not blown.
- (2) Check that the List 6 cartridge is properly seated and the tape end is properly secured in the take-up reel.

**Note:** Proper message playback volume and erasure cannot be guaranteed if the List 6 tape cartridge is moved from a List 1 answering

set to a List 13 or 24 answering set (or vice versa). This incompatibility does not exist between the Lists 13 and 24 answering sets. If a tape cartridge is to be moved between different vintage sets, it must be fully erased on both vintage sets before new recordings are made.

- (3) Verify the message tape is not at the end limit by making certain that the message indicator dial is reading less than 80.
- (4) Check phone connection at set terminal board for type of service.
- (5) Remove cover retaining screws from left side.
- (6) Lift left side cover and remove circuit board retainer.
- (7) Remove power cord from ac outlet.
- (8) Check options for proper selection.
- (9) Check that A4, A5, and A6 circuit boards are properly installed.
- (10) Check that cable connecting plugs for power supply and tape deck (Fig. 6) on the interconnect board and the cable connecting plug on the A4 board (Fig. 3) are firmly in place.
- (11) Replace circuit board retainer, left side cover and reinsert ac power cord.

2.02 When preliminary inspection does not correct trouble, refer to Part 9 and Table B for Trouble Analysis.

2.03 Perform final test Part 8.

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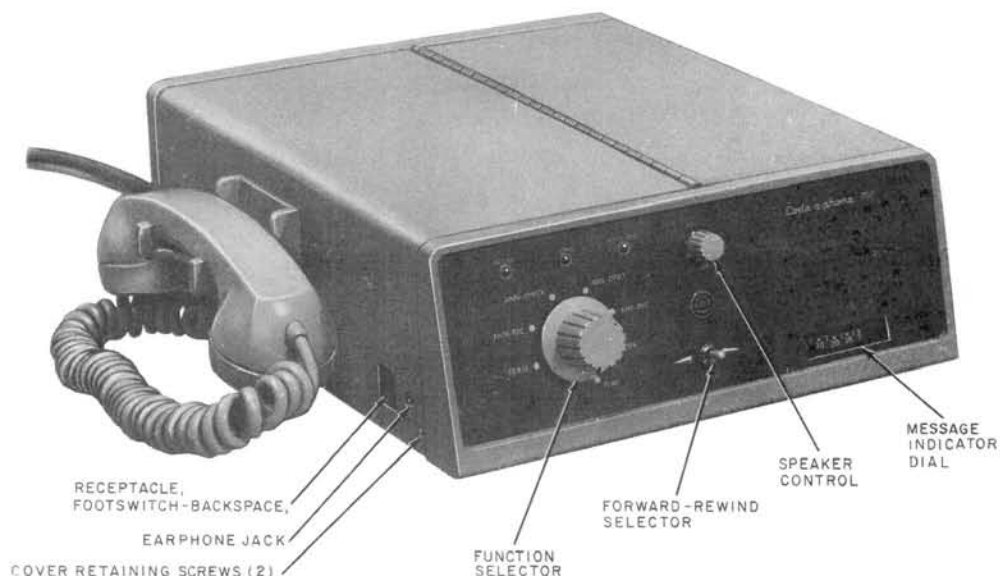


Fig. 1—KS-19245, Lists 13 (MD) and 24 Telephone Answering Set

♦ TABLE A ♦

## REPLACEABLE COMPONENTS

ITEM	ORDERING INFORMATION
Amplifier Board (A4)	KS-19245, List 15
Backspace Unit (Accessory)	KS-19245, List 12
Tape Cartridge	KS-19245, List 6
Control Knob (Function Selector)	B-560078*
Control Knob (Speaker Control)	B-560081*
Deck Control Board (A5)	KS-19245, List 16
Earphones (Accessory)	KS-19245, List 9
Footswitch (Accessory)	KS-19245, List 8
Fuse (F1)	3AG1 †
Handset (with cord)	G5KR-61
Logic Board (A6)	KS-19245, List 17
Mounting Cord	D4BU (List 13 or 24)
Mounting Cord	D6BU (List 24 only)
Power Supply Assembly	KS-19245, List 19

\* Order as "B-Part of KS-19245, List 13 Telephone Answering Set."

† Obtain locally.

## 3. ADJUSTMENTS



*The only field adjustment on the telephone answering set is to reset the Message Indicator Dial to zero (0).*

## 3.01 Resetting Message Indicator to 0.

- (1) Manual method (Fig. 2).
  - (a) Remove tape cartridge.
  - (b) Rotate cartridge hub by hand in either direction to set dial to 0.
- (2) Rapid rewind method (Fig. 2).
  - (a) Insert folded paper in take-up reel slot.
  - (b) Rotate take-up reel by hand to allow folded paper to operate limit switch.
  - (c) Plug in power cord.

- (d) Set selector to PLAY.
- (e) Restrain take-up reel and depress cartridge interlock switch.
- (f) Operate REWIND lever until 0 setting is obtained.

#### 4. REPLACEMENT PROCEDURES

**Danger: Remove power cord and telephone connections before attempting repairs on set.**

##### 4.01 Plug-in Circuit Boards (A4, A5, and A6; Fig. 3).

- (1) Remove top cover.
  - (a) Remove two cover retaining screws from left side.
  - (b) Lift left side cover.
- (2) Remove circuit board retainer.
- (3) Remove circuit board.

**Note:** If circuit board A4 is removed disconnect cable connecting plug.

- (4) Insert new circuit board into plug-in receptacle.

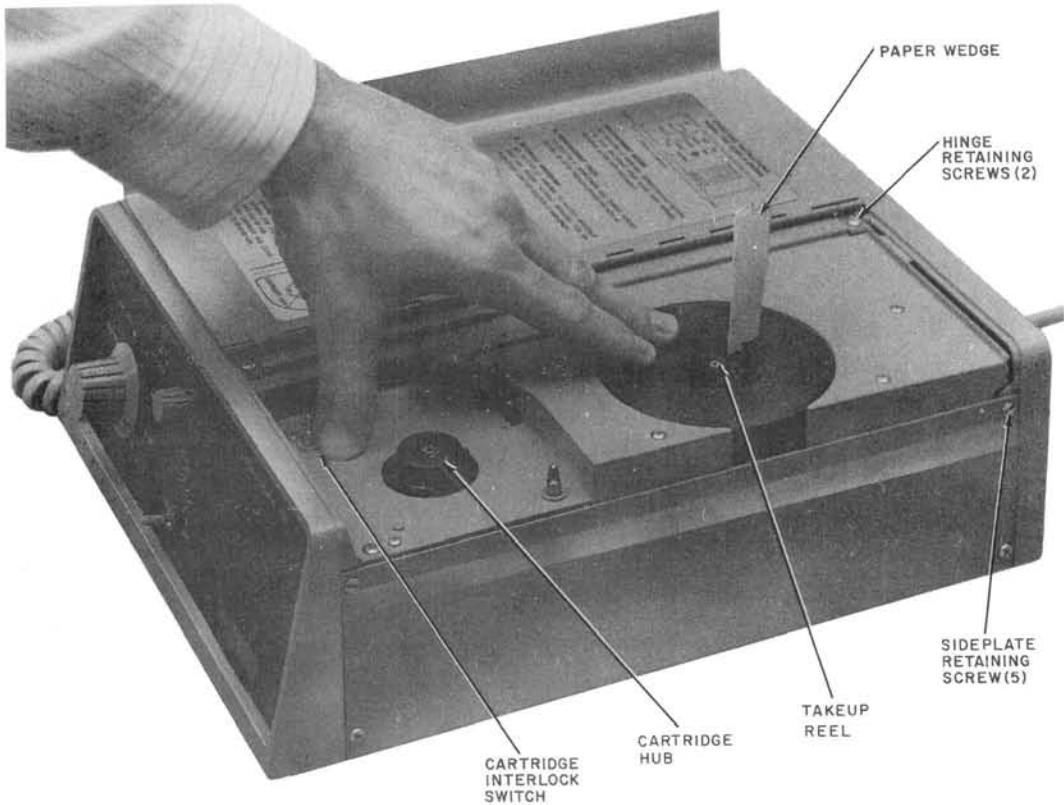


Fig. 2—Resetting "0" Registration on Message Indicator Dial

**Note:** If circuit board A4 is replaced connect cable connecting plug.

- (5) Replace circuit board retainer making certain that all circuit boards are in the slots of the retainer and that index tab of the retainer fits into the slot in tape deck assembly.
- (6) Replace top cover and secure with two retaining screws.

**4.02 Power Supply Assembly.**

- (1) Remove top cover (Fig. 3).
  - (a) Remove two cover retaining screws from left side.

- (b) Lift left side of cover and remove circuit board retainer.
- (c) Lift right side of cover.
- (d) Remove two hinge retaining screws (Fig. 2).
- (e) Remove cover and lay aside.

(2) Remove tape deck.

- (a) Remove cable connecting plug for A4 circuit board (Fig. 3).
- (b) Remove A4 circuit board.

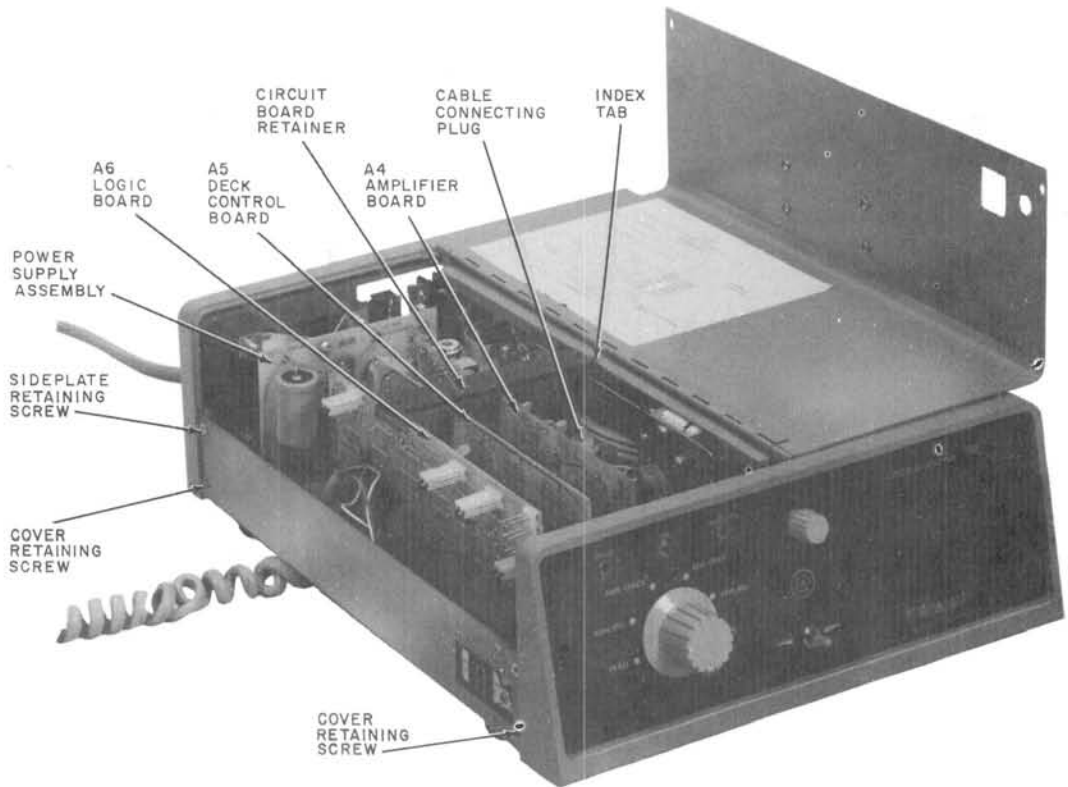


Fig. 3—Top Cover Removed, Internal View of Components



- (c) Remove cable connecting plug for tape deck (Fig. 6).
- (d) Lay the set on its right side and remove the three retaining screws for the tape deck (List 13 (MD), Fig. 4; List 24, Fig. 5).
- (e) Place the set in normal upright position.
- (f) Lift the rear of the tape deck and slide the tape deck back while lifting up.

**Warning: Use caution in handling the tape deck so as to prevent damage to fragile mechanical subassemblies.**

- (g) Once tape deck is clear of chassis, place tape deck next to chassis.
  - (h) Disconnect the two tape deck assembly power leads (Fig. 6).
- (3) Remove power supply assembly.
- (a) Disconnect the two cable connectors for power supply assembly (Fig. 6).
  - (b) Lay the set on its left side and remove the four retaining screws from the power supply assembly (Fig. 4).
  - (c) Place set in normal upright position.
  - (d) Lift the power supply assembly from its plug-in receptacles and from the chassis.
- (4) Insert new power supply assembly.
- (a) Align power supply assembly with receptacles and push down until firmly seated (Fig. 6).
  - (b) Lay the set on its left side and install the four retaining screws (Fig. 4).
  - (c) Place set in normal upright position.
  - (d) Connect the two cable connecting plugs for power supply assembly (Fig. 6).

(5) Reinstall tape deck.

- (a) With tape deck resting next to chassis, connect the two tape deck assembly power leads (Fig. 6).

- (b) Lower the front of the tape deck into the inside front of the chassis until it seats.

**Warning: Use caution in handling the tape deck so as to prevent damage to fragile mechanical subassemblies.**

- (c) Use one hand to properly position the power leads (between the rear of the tape deck and the rear of the chassis) while lowering the rear of the tape deck into the chassis.
  - (d) Lay the set on its right side and install the three retaining screws (Fig. 4).
  - (e) Connect the cable connecting plug for the tape deck to its receptacle (Fig. 6).
  - (f) Install A4 circuit board.
  - (g) Install cable connecting plug for A4 (Fig. 3).
- (6) Install cover.
- (a) Lay folded cover on left side of chassis.
  - (b) Install two hinge retaining screws (Fig. 2).
  - (c) Close right side of cover.
  - (d) Open left side of cover and install circuit board retainer (Fig. 3).
  - (e) Close left side of cover and install two cover retaining screws.

#### 4.03 Cartridge, List 6.

- (1) Lift right side of cover.
- (2) To remove cartridge.
  - (a) Rewind tape into cartridge [zero (0) setting on message indicator dial].
  - (b) Set function selector to off.
  - (c) Remove tape from take-up reel by depressing tab on tape and backing tape out of slot. (Refer to Section 514-155-100.)
  - (d) Turn cartridge hub clockwise by hand to rewind remaining tape into cartridge.

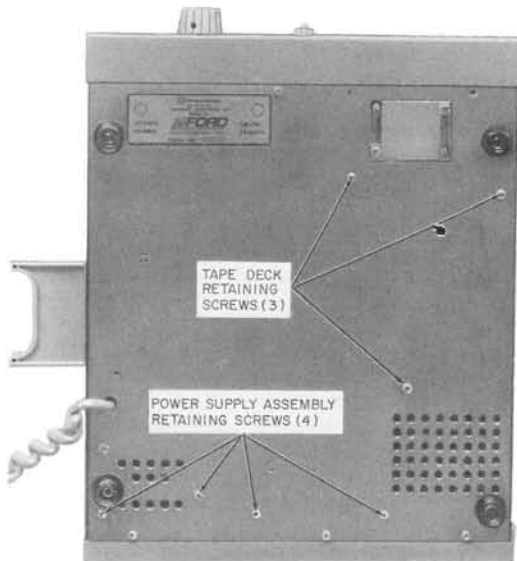


Fig. 4—List 13 (MD) Bottom View, Showing Power Supply and Tape Deck Retaining Screws

- (e) Grasp cartridge and lift up.
- (3) To install cartridge (Fig. 2).
  - (a) Place cartridge over cartridge lock pins and hub, snap down into place.
  - (b) Slide tape end through tape slot into slot of take-up reel and snap into place.

**Warning:** *Damage to the message tape and answering set will result if the message tape end is not properly secured in the snap retainer of the take-up reel before operating the set.*

#### 4.04 Broken or Entangled Message Tape.

- (1) Broken or entangled message tape should be replaced with a new KS-19245, List 6 cartridge. If necessary reset message indicator dial to 0 (paragraph 3.01).
- (2) To recover recorded messages on broken tape, splice broken tape ends using splicing tape and tools obtained locally. After splicing

tape, message indicator dial should be reset to 0. After messages are recovered tape cartridge should be replaced (paragraph 4.03).

#### 4.05 Handset.

- (a) Remove two cover retaining screws from left side (Fig. 3).
- (b) Lift cover and remove circuit board retainer (Fig. 3).
- (c) Remove A6 circuit board and lay it aside.
- (d) Remove handset connections from TB1 terminal strip.
- (e) Unhook the handset cord from its retainer.
- (f) Pull handset cord out through hole in chassis.
- (g) Pass new handset cord through hole in chassis.
- (h) Hook the handset cord into retainer.
- (i) Make the handset connections on the TB1 terminal strip (Fig. 7).
- (j) Replace the A6 circuit board.
- (k) Replace the circuit board retainer making certain that all circuit boards are in the slots of the retainer and that the index tab of the retainer fits into the slot in the tape deck assembly (Fig. 3).
- (4) Close cover and install two retaining screws (Fig. 3).

#### 5. LUBRICATION

- 5.01 No lubrication of set should be attempted in the field.

#### 6. CLEANING

- 6.01 No internal cleaning of set should be attempted in the field.

**TABLE B**  
**TROUBLE ANALYSIS**

STEP	TROUBLE	ADDITIONAL SYMPTOMS	REMEDIAL ACTION
1	Improper effect from use of any front panel control	Improper lighting of AUTO-ANS, or IN-USE lamp	(1) Make certain that tape cartridge is firmly in place (2) Make certain that rewind switch is in center position (3) Replace A5 board (4) Replace A6 board (5) Replace A4 board (6) Replace power supply assembly (7) Replace answering set
2	Line not seized upon ringup	AUTO-ANS lamp does not light	(1) Make certain that tape cartridge is firmly in place (2) Replace A6 board (3) Replace A4 board (4) Replace A5 board (5) Replace power supply assembly (6) Replace answering set
3	Distorted speech or tones	Improper levels for speech or tones	(1) Replace A4 board (2) Replace A5 board (3) Replace A6 board (4) Replace power supply assembly (5) Replace answering set
4	ON lamp does not light when function switch is moved from off position		(1) Check fuse and ac supply (2) Replace power supply assembly (3) Replace answering set
5	Speed of message tape reels is slow or uneven		(1) Replace tape cartridge (2) Replace answering set
6	Only one message tape spool turns		(1) Replace tape cartridge (2) Reset message indicator to zero (See 3.01)

## 7. ACCESSORIES

**7.01** Limit maintenance on foot switch, headset, or backspace unit to correcting loose connections. Replace if defective.

## 8. FINAL TEST

### 8.01 *Operational Test.*

- (1) Set the function selector to ANN-REC and record a test announcement.
- (2) Set the function selector to ANN-CHECK and play back the announcement using both the handset and speaker.
- (3) Set the function selector to ANS-ONLY position.

(4) Call the unit from a separate telephone and listen to test announcement, the in-use lamp should light as soon as the set answers.

(5) Return to answering set and set function selector to ANS-REC position, AUTO-ANS lamp should light.

(6) Call unit again from a separate telephone. The answering set should answer the call, light the in-use lamp, transmit recorded announcement, and then transmit a beep tone.

(7) Dictate a short test message then be silent for approximately 4 seconds. If speak up tone (talk down tone) TDT feature is not disabled, a low level tone should be transmitted. When tone is transmitted start talking again. The tone should stop.

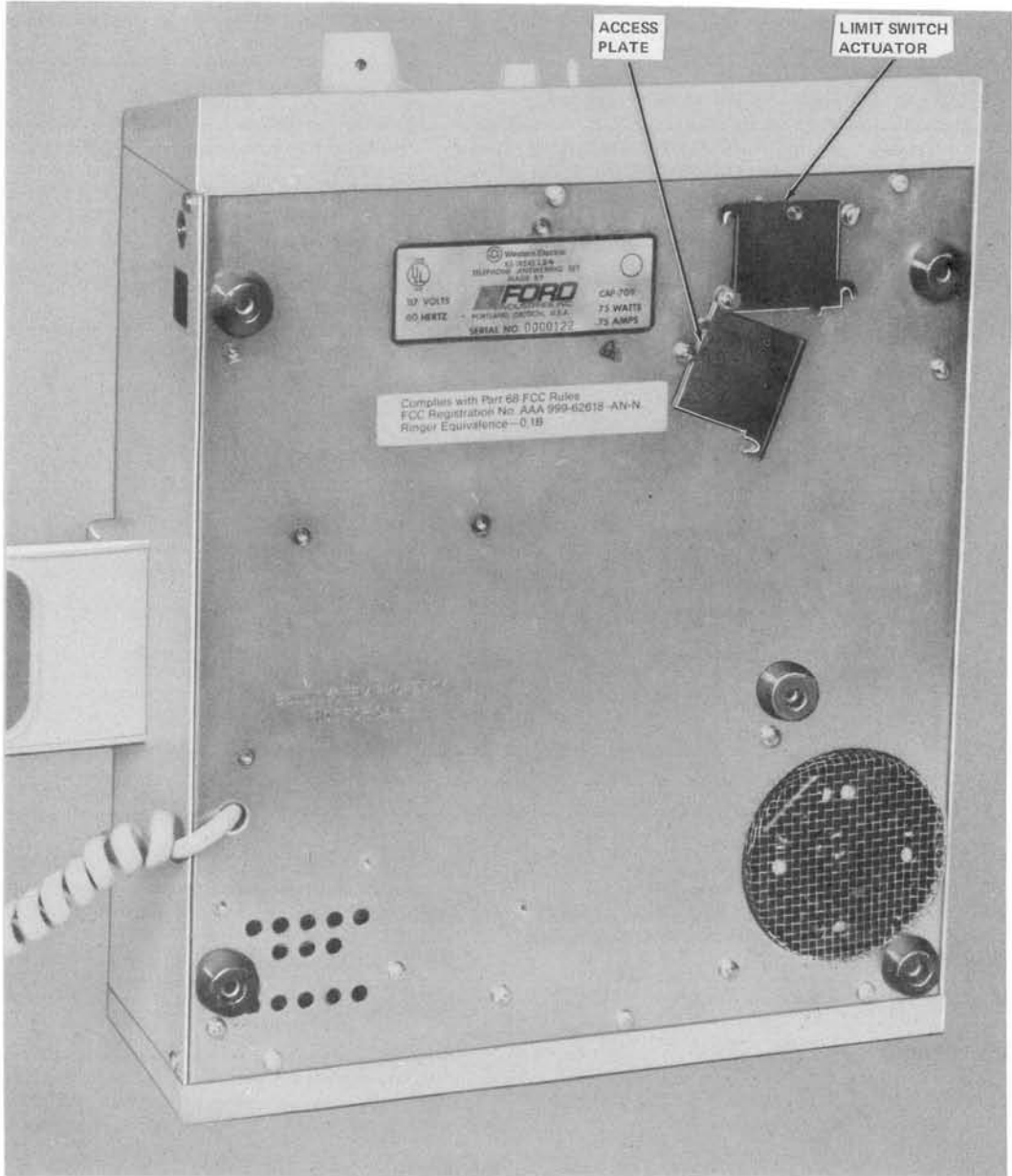


Fig. 5—List 24 Answering Set, Bottom View

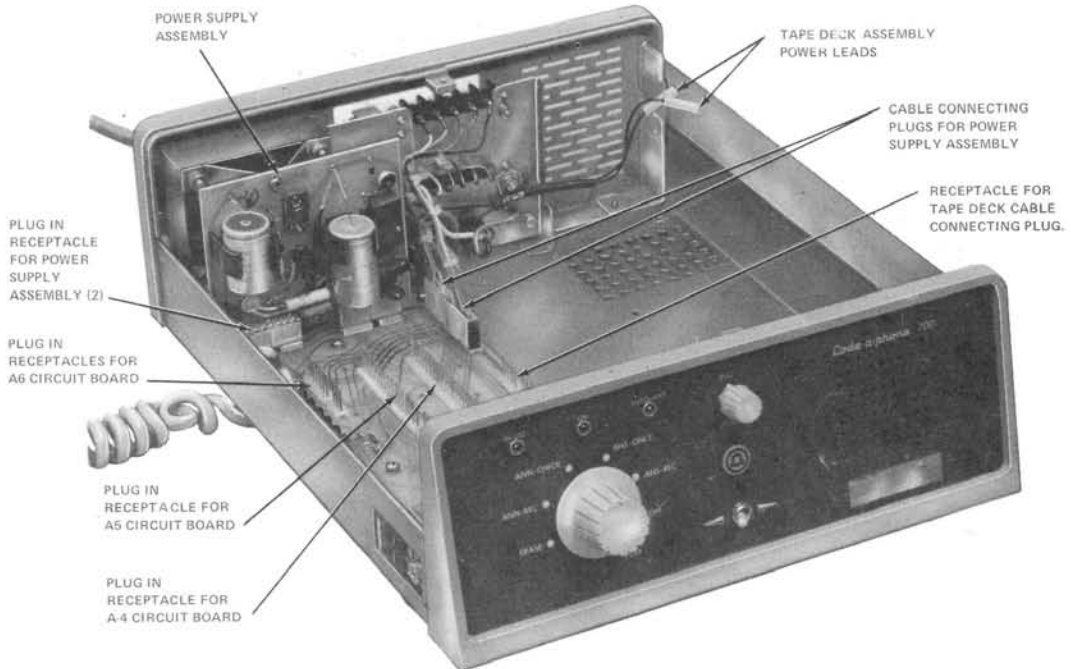


Fig. 6—Top Cover, Circuit Boards and Tape Deck Removed

(8) Be silent for approximately 12 seconds. If voice control feature is not disabled the speak up tone should be followed by a loud disconnect tone and the answering set should disconnect from the line.

(9) If calling party control (CPC) feature is not disabled, call unit again. Once the set has answered the call, momentarily disconnect the set from the telephone line or apply a short

across tip and ring for 1 second. The unit should disconnect.

(10) Set the function selector to PLAY position and rewind message tape. Play back test message, using both handset and speaker.

(11) Set the function selector to ERASE position. Operate the fast forward switch until all the test messages are erased. Operate the

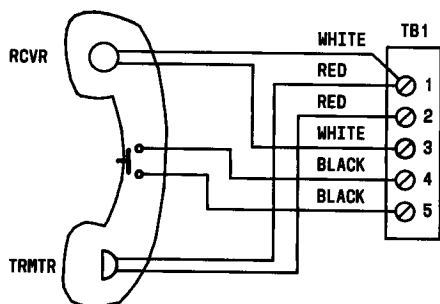


Fig. 7—Handset Connections

rewind switch to bring the tape indicator back to zero.

- (12) Set the function selector to PLAY position and verify that messages are erased.
- (13) Set function selector to ANN-REC and cover handset mouthpiece while depressing handset switch. This will erase test announcement.
- (14) Verify operation of all accessories if used by customer.

## 9. TROUBLE ANALYSIS

### 9.01 Preliminary Inspections.

**Note:** Make certain that preliminary inspection (paragraph 2.01) is carried out before attempting to analyze a trouble in more detail.

### 9.02 Trouble Analysis Procedure.

- (1) Refer to Table B to identify the trouble.
- (2) If trouble is unknown, start with Step 1 (Table B).
- (3) When trouble is identified, check Additional Symptoms column to verify the malfunction.
- (4) Proceed to Remedial Action column and follow the replacement sequence as listed.

**Danger:** Disconnect power cord before replacing plug-in units or checking fuse.

- (5) Each time a plug-in unit is replaced, check operation of the answering set. If trouble is not corrected, continue to replace plug-in units until trouble is corrected.

**Note:** Leave new plug-in units in place as the replacement sequence is followed as more than one unit may be defective.

- (6) If trouble is corrected and if more than one plug-in unit was replaced, reinstall original plug-in units, one-by-one, to further identify good or defective units.
- (7) If trouble was not corrected, replace entire answering set. Reinstall all original plug-in units in the removed answering set before it is returned as unserviceable.
- (8) Insure proper operation of answering set by performing operational test in Part 8.

## KS-16765, LISTS 1 AND 2 ANNOUNCEMENT SETS IDENTIFICATION AND MAINTENANCE

### 1. GENERAL

**1.01** Refer to CD- and SD-95286-01 for List 1 and CD- and SD-95283-01 for List 2 announcement sets.

**1.02** This section is reissued to emphasize the importance of regular lubrication and to add new lubrication requirements.

### 2. IDENTIFICATION

**2.01** The KS-16765, Lists 1 and 2 announcement sets (Fig. 1) feature:

- (a) Recording and reproducing of announcements on a magnetic recording band.
- (b) Announcement recording capacity of 2 minutes with provision for increasing to 3 minutes on most sets.



*Recording capacity of 3 minutes is provided on announcement sets with List 3 recorders. Announcement sets equipped with B-650412 drive assemblies, may be identified by a black star located at the upper right corner of the announcement set nameplate or identified by checking the serial number of the announcement set. All Lists 1 and 2 announcement sets having serial numbers higher than 22737 and 19395, respectively, can be arranged for 3-minute recording capacity by installing the B-650417 drive pulley. Sets without the black star and with serial numbers lower than 22737 and 19395, respectively, are limited to a 2-minute recording capacity.*

- (c) Adjustment for limiting announcement recording interval to less than maximum capacity.

- (d) Variable cycle that automatically adjusts reproduce cycle to length of recorded announcement.

**2.02** List 1 announcement set is designed and intended for:

- (a) Loop start operation.
- (b) Installation on a customers premises.
- (c) Remote control, up to several hundred feet, by either the pushbutton of a key telephone set or a 6040H or 6041H key with a 500-type telephone.

**2.03** List 2 announcement set is designed and intended for:

- (a) Ground start operation.
- (b) Central office installation or when used with a 2A, 2B, or 3A ACD installation on a customers premises
- (c) Local control using the dictate-check key on the announcement set with an operator telephone set plugged into the telephone jacks (Fig. 4).
- (d) Use with the KS-16765, List 7 mounting bracket and KS-16765, List 8 connecting cord if the set is to be mounted in a 23-inch relay rack.

**2.04** Lists 1 and 2 sets may be wall mounted or placed on a desk, table, or shelf.

**2.05** Each set weighs approximately 40 pounds and is housed in a metal cabinet that has a removable front and back (Fig. 2, 3, 4, and 5). The cover has a blue gray enamel finish and the chassis has a light olive gray finish. Dimensions are shown in Fig. 1.

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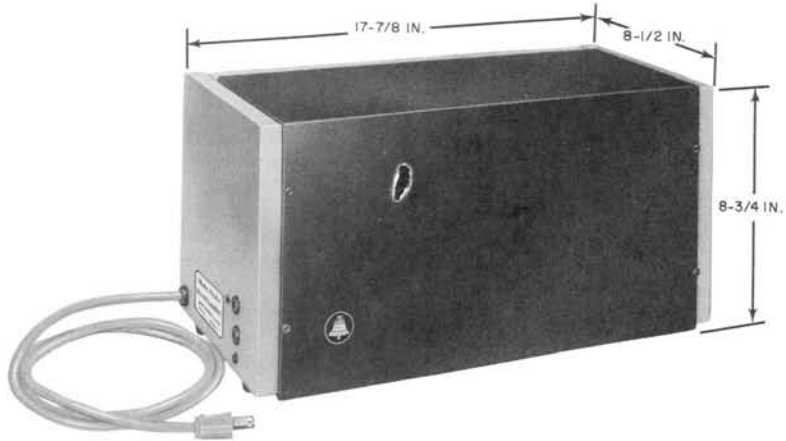


Fig. 1—KS-16765, Lists 1 and 2 Announcement Set Dimensions

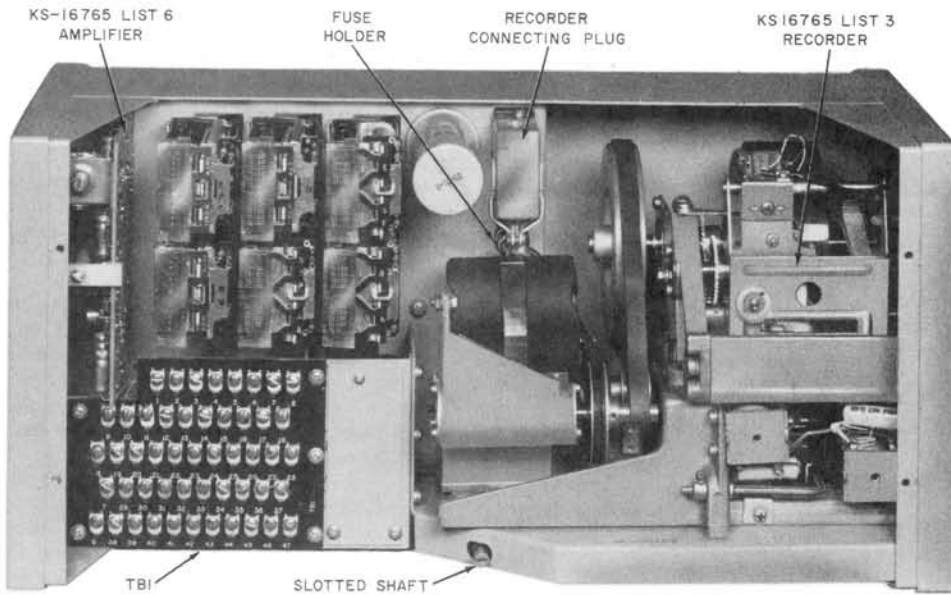


Fig. 2—KS-16765, List 1 Announcement Set, Front Cover Removed



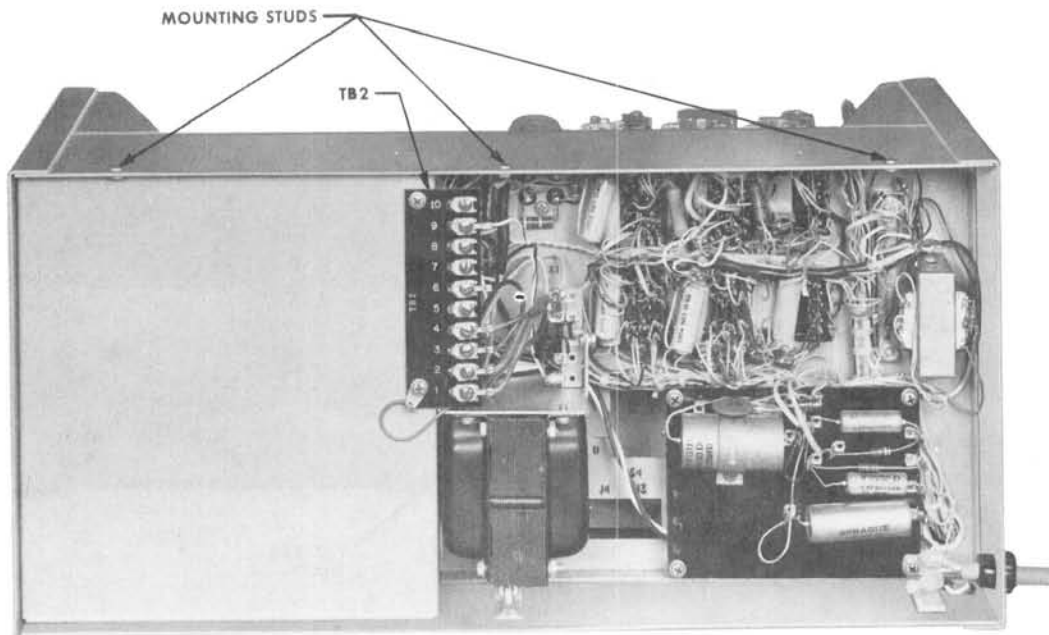


Fig. 3—KS-16765, List 1 Announcement Set, Rear Cover Removed

**2.06** A power source of 110/125-volt, 60 cycle ac is required for these sets. Outlet and power are provided by the customer.

**2.07** A 1/2-amp fuse is provided in these sets for electrical protection (Fig. 2 and 4).

**2.08** The KS-16765, Lists 1 and 2 announcement sets (Fig. 2, 3, 4, and 5) incorporate the following:

- KS-16765, List 3 Recorder
- KS-16765, List 6 Amplifier
- Chassis

**2.09** The KS-16765, List 3 recorder (Fig. 6 and 7) is the announcement recording mechanism. It consists of a magnetic record-reproduce head, an apparatus for tracking and switching, and a magnetic recording band on a drum. The drum is revolved by the B-650412 drive assembly (Fig. 10)

which is fitted with one of the two interchangeable pulleys that control the maximum recording duration.

**2.10** The B-650417 3-minute pulley (Fig. 8) is used to increase the maximum announcement recording capacity from 2 to 3 minutes. The 3-minute pulley reduces the angular speed of the recording drum, thereby increasing the announcement capacity.



*Earlier announcement sets without a black star beside the nameplate cannot be fitted with the 3-minute pulley and are limited to a recording duration of 2 minutes.*

**2.11** As shown in Fig. 8 the 3-minute pulley differs from the 2-minute in that the smaller diameter extension is not provided and hence, the flat drive belt is driven directly from the shaft.

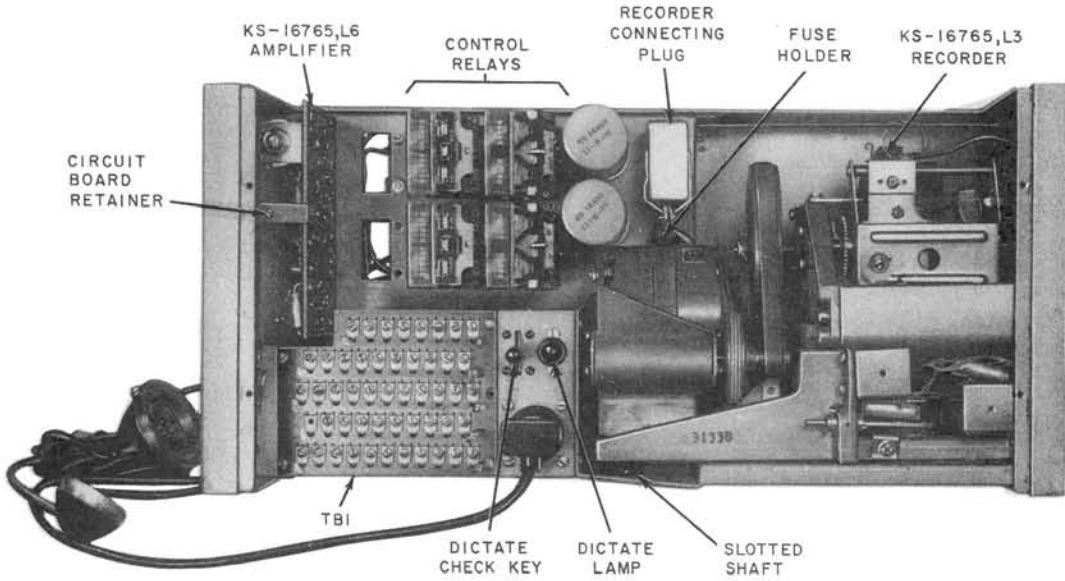


Fig. 4—KS-16765, List 2 Announcement Set, Front Cover Removed

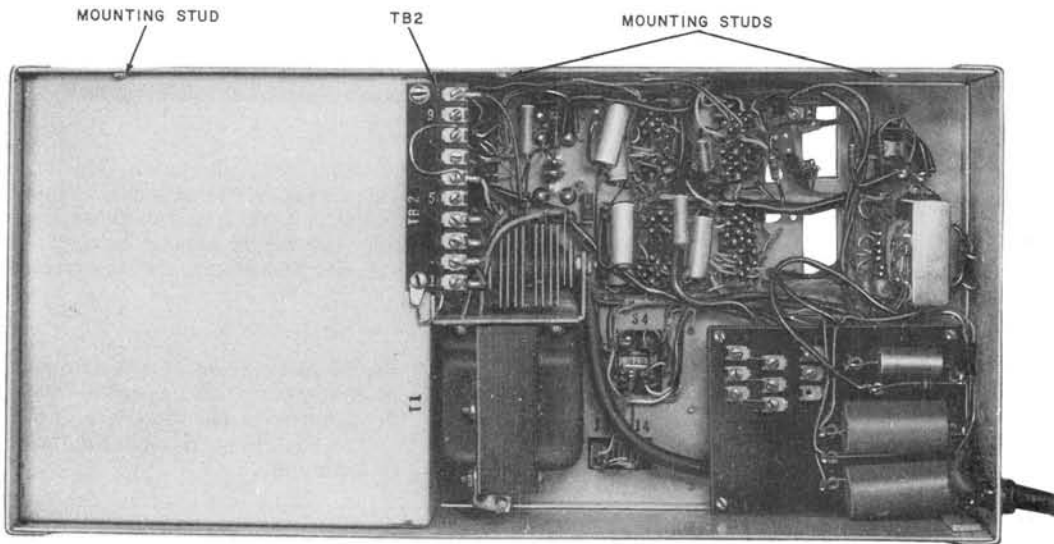


Fig. 5—KS-16765, List 2 Announcement Set, Rear Cover Removed

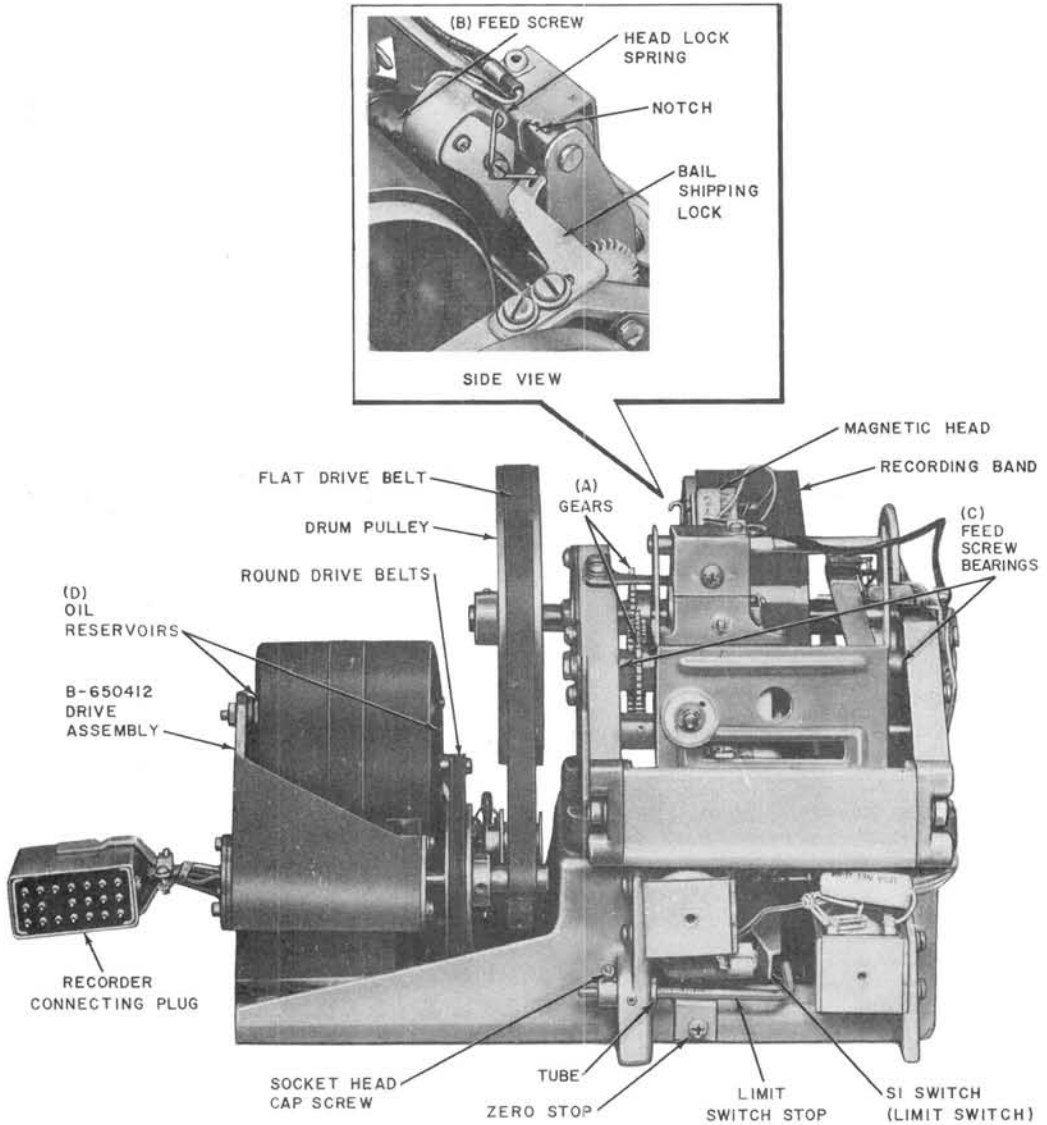


Fig. 6—KS-16765, List 3 Recorder, Front View

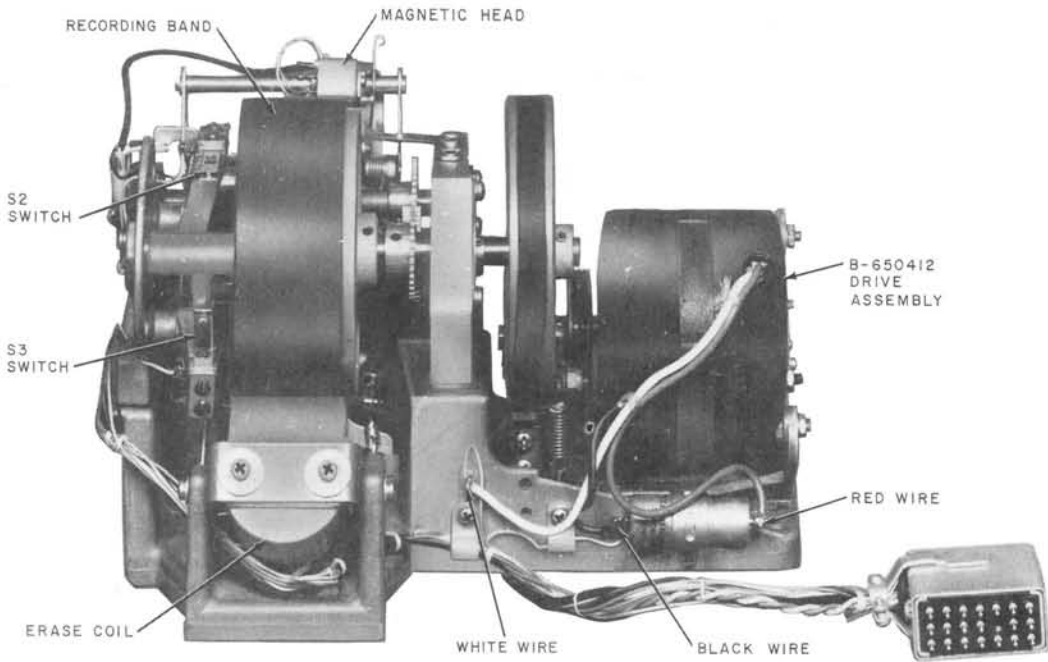


Fig. 7—KS-16765, List 3 Recorder, Rear View



*The B-650417 3-minute pulley is not furnished as part of the set and must be ordered separately.*

2.12 Facilities are provided for limiting the maximum recording interval to any portion of the total capacity. This is accomplished by adjustment of the limit switch stop (Fig. 6).

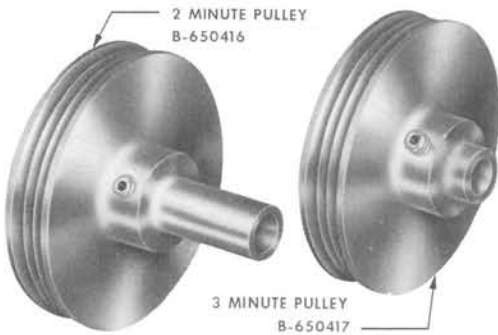


Fig. 8—Drive Pulleys



*The seven marks on the limit switch stop may be used as guides for setting the maximum recording interval.*

MARK	2-MINUTE CAPACITY TIME IN SEC.	3-MINUTE CAPACITY TIME IN SEC.
	(B-650416 PULLEY)	(B-650417 PULLEY)
1	0	0
2	15	22-1/2
3	30	45
4	45	67-1/2
5	60	90
6	90	135
7	120	180

**2.13** For intervals other than those shown, it will be necessary to estimate the setting between the two appropriate marks. The mark nearest the bent end of the stop (No. 1) represents 0 second.

**2.14** The KS-16765, List 6 amplifier (Fig. 9) is of printed wiring board construction and provides amplification for both recording and reproducing, an automatic volume control feature for minimizing variation in level of recorded speech, and a high frequency oscillator to provide the bias current required for magnetic recording. List 6 amplifier supersedes List 4 amplifier and may be used as a replacement in all Lists 1 and 2 announcement sets.



*Earlier type KS-16765, Lists 1 and 2 announcement sets are equipped with List 4 amplifiers. List 4 amplifier should not be used in List 1 sets with serial numbers above 8135 or in List 2 sets with serial numbers above 5558.*

**2.15** Earlier type KS-16765, Lists 1 and 2 announcement sets that have a 60 Hz hum in the output of the set, can be upgraded in the field with a kit of parts to reduce the hum level. This kit is to be ordered directly from the manufacturer. The kit of parts consists of a 10 ohm, 3 watt resistor and 750 ufd capacitor. Sets manufactured after the first quarter of 1971 are equipped with this modification. Installation information for this kit of parts is contained in the kit of parts package.

Ordering information for the modification kit is as follows:

(Qty) KS-16765 Filter Assembly Kit

Order directly from: Wilcox Electric, 14th and Chestnut Street, Kansas City, Missouri, 64127

Cost and shipping charges billed by manufacturer.

### 3. MAINTENANCE

**3.01** Work performed in customers' premises should be limited to:

- Verification and analysis of trouble
- Adjustments, lubrication, and cleaning as described in this section
- Replacement and repair of major components

**3.02** Requirements that are gauged by eye should be checked with gauges if there is any doubt.

**3.03** Refer to Table A for piece part information.

**3.04** Clean recording band and head on every maintenance visit.



*Before performing any maintenance on the set, disconnect power cord from the ac outlet.*

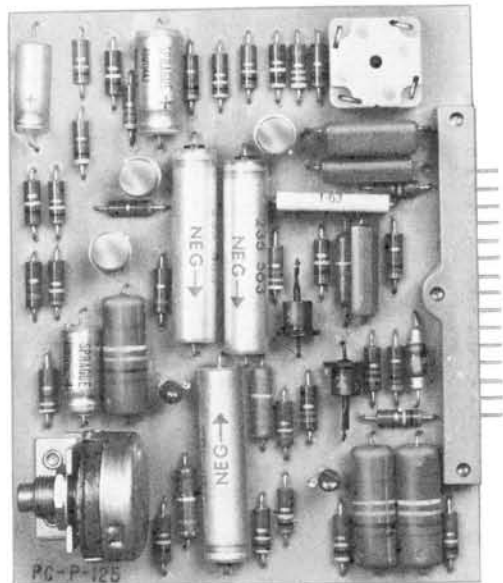


Fig. 9—KS-16765, List 6 Amplifier

TABLE A

PART	ORDERING INFORMATION	REMARKS	FIG.
Recorder	KS-16765, List 3	Announcement Mechanism	Fig. 4
Drive Assembly	B-650412	Component of KS-16765 List 3 Recorder	Fig. 6
Motor	B-650418	Component of B-650412 Drive Assembly	Fig. 6, 10
Drive Belt*	B-651981	Component of B-650412 Drive Assembly	Fig. 6, 10
Belt†‡	B-651703-1	Component of KS-16765, List 3 Recorder	Fig. 6
Belt	B-651703-2	Used on List 1 announcement sets equipped with KS-15914, List 1 or List 2 motors	
Pulley, 2-minute	B-650416	Component of B-650412 Drive Assembly	Fig. 8
Pulley, 3-minute	B-650417	Used to convert announcement set to 3-minute announcement interval	Fig. 8
Pulley Assembly	B-190932	"Idler Pulley Assembly"—Component of List 3 Recorder	Fig. 10
Spring	B-190920	"Idler Tension Spring"—Component of List 3 Recorder	Fig. 10
Stop	B-190915	Announcement Length Adjustment	Fig. 6
Amplifier	KS-16765, List 6	Printed Wiring Card for Recording and Reproducing	Fig. 9
Cover Assembly	B-190892	Front Cover of Announcement Set	Fig. 1
Cover, Rear	B-190890	Rear Cover of Announcement Set	
Fuse	AGC 1/2 amp; obtain locally	Provides Electrical Protection	Fig. 2, 4
Screw	B-190900	Captive screws of Front Cover Assembly	Fig. 1

\* Referred to in text as round drive belt.

† Referred to in text as flat drive belt.

‡ Furnished with B-650412 drive assembly.

**Note:** Parts identified by B-Number, Order As "B-....., part of KS-16765, List 1, 2 Announcement Sets."

#### REPLACEMENT OF MAJOR COMPONENTS

##### 3.05 KS-16765, List 3 recorder (Fig. 6 and 7):

- (1) Remove announcement set front cover.
  - Loosen four captive screws on front cover (Fig. 1).
  - Remove cover by sliding forward.
- (2) Remove recorder connecting plug from plug-in receptacle.

- (3) Remove List 3 recorder.
  - Remove three retaining screws located on bottom of announcement set.
  - Grasp recorder by its motor and chassis and carefully withdraw it from the cabinet.
- (4) Insert new recorder into cabinet.
  - Tighten three retaining screws.
- (5) Release bail shipping lock.
  - Loosen mounting screws.

- Move bail shipping lock to extreme position away from bail.
  - Position bail shipping lock to maintain adequate clearance between end of lock and head mounting bracket.
  - Tighten mounting screws.
- (6) Disengage head lock spring.
- Disengage head lock-spring from screw head located on the record-reproduce head.
  - Place head lock spring in notch on carriage bracket. Do not permit spring to rest on slide rod.
- (7) Adjust announcement record capacity as described in 3.22.
- (8) Insert recorder connecting plug into plug-in receptacle.
- (9) Replace announcement set cover and tighten four captive screws.

**3.06 KS-16765, List 6 amplifier (Fig. 2, 4, and 9):**

**Caution: Do not remove or plug in List 4 or 6 amplifier while power is on. Failure to observe this precaution may cause failure of or damage to electron tube filaments.**

- (1) Remove announcement set cover (3.05).
- (2) Remove List 6 amplifier.
  - Loosen retaining screw of circuit board retainer.
  - Carefully remove amplifier from its plug-in receptacle.
- (3) Insert new amplifier into plug-in receptacle, tighten screw of circuit board retainer.
- (4) Replace announcement set cover.
  - Tighten four captive screws.



**Earlier type KS-16765, Lists 1 and 2 announcement sets are equipped with List 4 amplifiers. Faulty List 4 amplifiers may be replaced in these sets with either List 4 or List 6 amplifier. List 6 amplifier can be used in all KS-16765, Lists 1 and 2 announcement sets. List 4 amplifier can only be used in List 1 sets with serial number 8135 or lower and in List 2 sets with serial number 5558 or lower.**

**3.07 Power Supply—Modification to Reduce 60 Hz Hum Level:**

**Caution: Remove power cord before performing any work on the power supply to prevent shock and damage to equipment.**

- (a) Complete installation procedure is included with the kit of parts for both List 1 and List 2 announcement sets. A complete schematic of the power supply will be found in SD-95286-01 and SD-95283-01 for the KS-16765, Lists 1 and 2 sets, respectively.

**3.08 Relays and Fuses (Fig. 2 and 4):** Relays in these announcement sets shall be maintained and adjusted in accordance with Division 040 of the Plant Series covering wire spring relays.

**3.09** Circuit requirement table for these relays is included in SD-95286-01 and SD-95283-01.

**3.10** Faulty relays will necessitate replacement of the announcement set.

**3.11** The line fuse provided for this set is mounted just below the recorder connector plug (Fig. 2 and 4). The set is equipped with a 1/2-amp AGC fuse. Sets equipped with 1 ampere AGC fuse will be changed to the 1/2 ampere AGC fuse. For fuse inspection or replacement, remove recorder connector plug from receptacle, turn fuse holder counterclockwise and withdraw.

**3.12 B-650412 Drive Assembly (Fig. 10):**

- (1) Remove announcement set cover (3.05).
- (2) Remove List 3 recorder (3.05).
- (3) Remove flat drive belt.

- (4) Remove drive assembly.
  - Unsolder motor leads.
  - Remove four Phillips head screws located on bottom of casting.
  - Lift out drive assembly.
- (5) Remove idler pulley assembly, tension spring and associated nut, washers and details. Install these items on the new B-650412 drive assembly (Fig. 10).
- (6) Install new drive assembly.
  - Tighten four Phillips head screws.

- Solder motor leads (Fig. 7).

- (7) Install flat drive belt (3.17).



*Before securing List 3 recorder to cabinet, energize recorder and run to observe that flat drive belt runs squarely on drum pulley and does not slip or bind.*

- (a) If belt runs to either side of pulley, correct by loosening mounting screws and pivoting idler pulley assembly. Tighten mounting screws after adjusting.
- (b) If belt slips or binds, correct by moving idler tension spring to another hole on idler pulley arm.

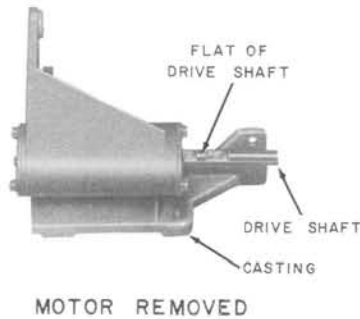
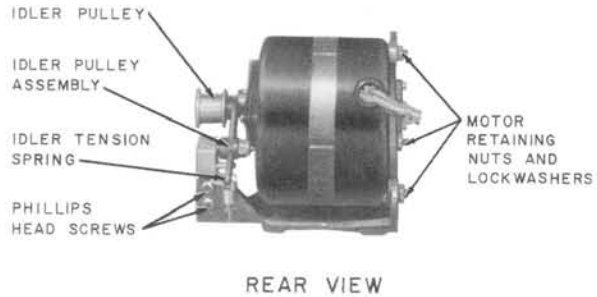
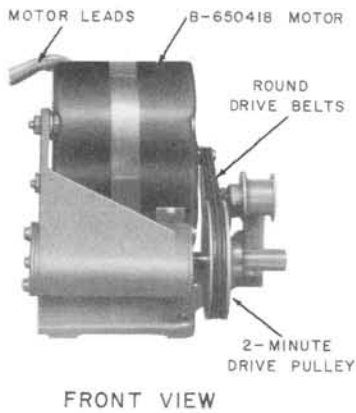


Fig. 10—B-650412 Drive Assembly



- (8) Insert List 3 recorder into cabinet.
- Tighten three retaining screws.
- (9) Insert recorder connecting plug into plug-in receptacle.
- (10) Replace announcement set cover.
- Tighten four captive screws.

### 3.13 **Motor Replacement (Fig. 10):**

- (1) Remove List 3 recorder (3.05).
- (2) Remove flat drive belt.
- (3) Remove drive assembly.
- Unsolder motor leads.
  - Remove four Phillips head screws located on bottom of casting.
  - Lift out drive assembly.
- (4) Remove three round drive belts from motor shaft and drive pulley.
- (5) Disengage idler tension spring.
- (6) Remove idler pulley assembly.
- Remove two Phillips head screws located on mounting bracket.
- (7) Remove 2-minute drive pulley (Fig. 8).
- Loosen set screw located on collar of pulley.
  - Slide pulley off drive shaft.
- (8) Remove motor.
- Remove three nuts and lock washers.
  - Lift off motor.
- (9) Install new motor.
- Tighten three nuts and lock washers.
- (10) Replace 2-minute drive pulley (Fig. 8).

- Insert pulley on shaft.
- Align pulley with motor shaft.
- Tighten set screw.

**Note:** Tighten set screw against the flat of the drive shaft.

- (11) Install three round drive belts (3.18).
- (12) Replace idler pulley assembly.
- Tighten two Phillips head screws.
- (13) Engage idler tension spring.
- (14) Install drive assembly.
- Tighten four Phillips head screws.
  - Solder motor leads (Fig. 7).
- (15) Install flat drive belt, and observe the **Read** (3.17).
- (a) If belt runs to either side of pulley, correct by loosening mounting screws and pivoting idler pulley assembly. Tighten mounting screws after adjusting.
- (b) If belt slips or binds correct by moving idler tension spring to another hole on idler pulley arm.
- (16) Insert List 3 recorder in cabinet.
- Tighten three retaining screws.
- (17) Insert recorder connecting plug into plug-in receptacle.



**Earlier type announcement sets are equipped with KS-15914, List 1 or 2 motor. Faulty List 1 or 2 motor may be replaced with B-650412 drive assembly:**

### 3.14 **To install B-650412 drive assembly:**

- (1) Remove List 3 recorder (3.05).
- (2) Remove flat drive belt and discard.

- (3) Remove motor assembly.
    - Unsolder motor leads (Fig. 7).
    - Remove four Phillips head screws located on bottom of casting.
    - Lift out motor.
  - (4) Remove idler pulley assembly, tension spring and associated nut, washers and details. Install these items on the B-650412 drive assembly.
  - (5) Install B-650412 drive assembly.
    - Tighten four Phillips head screws.
    - Solder motor leads (Fig. 7).
  - (6) Install B-651703-1 flat drive belt, and observe the **Read** (3.17).
    - (a) If belt runs to either side of pulley, correct by loosening mounting screws and pivoting idler pulley assembly. Tighten mounting screws after adjusting.
    - (b) If belt slips or binds, correct by moving idler tension spring to another hole on idler pulley arm.
  - (7) Insert List 3 recorder into cabinet.
    - Tighten three retaining screws.
  - (8) Insert recorder connecting plug into plug-in receptacle.
- (3) Remove three round drive belts.
  - (4) Remove drive assembly.
    - Remove four Phillips head screws located on bottom of casting.
    - Lift out drive assembly.
  - (5) Disengage idler tension spring.
  - (6) Remove 2-minute drive pulley.
    - Loosen set screw located on collar of pulley.
    - Slide pulley off shaft.
  - (7) Install 3-minute pulley:
    - Insert pulley on drive shaft.
    - Align pulley with motor shaft.
    - Tighten set screw against the flat of the drive shaft.
  - (8) Install drive assembly.
    - Tighten four Phillips head screws.
  - (9) Install flat drive belt, and observe the **Read** (3.17).
  - (10) Insert List 3 recorder into cabinet.
    - Tighten three retaining screws.
  - (11) Insert recorder connecting plug into plug-in receptacle.

### 3.15 B-650417, 3-Minute Pulley (Fig. 8):



*KS-16765, Lists 1 and 2 announcement sets equipped with B-650412 drive assemblies may be converted from 2-minute announcement recording capacity to 3-minute by installing the B-650417, 3-minute pulley.*

### 3.16 Procedure for converting:

- (1) Remove List 2 recorder (3.05).
- (2) Remove flat drive belt.

### Belt Replacement



*Replace belts if they are broken, cracked, nicked, stretched, or have oil or grease on their surfaces.*

### 3.17 Flat Drive Belt:

- (1) Remove faulty flat drive belt from drum pulley and drive pulley shaft.
- (2) Install new flat drive belt with unground (shiny) side in contact with the drum pulley,

on center of drum pulley, and so that edges of belt will not ride up on the flanges of the idler pulley (Table A).



**Before securing List 3 recorder to cabinet, energize recorder and run to observe that flat drive belt runs squarely on drum pulley and does not slip or bind.**

**Note:** Flat rubber drive belts B-651703-1 for use with B-650412 drive assembly (Part of List 3 recorder) are larger in diameter than belts B-651703-2 used with KS-15914 (MD), List 1 or 2 motor (Part of List 3 recorder).

### 3.18 Round Drive Belt:

- (1) Remove flat drive belt from drum pulley and drive pulley shaft.
- (2) Remove faulty round drive belt.
- (3) Install new round drive belt.
  - Verify that drive belts are parallel with each other between the motor shaft and drive pulley.
- (4) Install flat drive belt, and observe *Read* (3.17).

### MECHANICAL ADJUSTMENTS (Fig. 6 and 7)

#### 3.19 Zero Position of Carriage Assembly:

Position where the side of the carriage nearest the motor is in contact with the adjacent side of the bail assembly with the bail assembly in the unoperated position.

**3.20 Zero Position of the Limit Switch:** Position where the limit switch lever is in contact with the zero stop with the carriage assembly in the zero position.

**3.21 Magnetic Head in the Electrically Operated Position:** Position where the magnetic head is in contact with the surface of the recording band and the half nut and feed screw of the carriage assembly are engaged.

**Note:** To engage magnetic head in the electrically operated position, carefully rotate drum pulley by hand to position where switch

3 is operated. Supply 48 volts dc to pins 7 (-) and 14 (+) of connecting plug of List 3 recorder.

#### 3.22 Announcement Length Adjustment (Fig. 6):

The announcement set is shipped with the announcement length adjusted for 30 seconds, however this adjustment may be set for an interval up to the maximum capacity by adjustment of the limit switch stop. The seven marks on the limit switch stop may be used as guides for setting the maximum announcement recording interval. For intervals other than those shown, it will be necessary to estimate the setting between the two appropriate marks. The mark nearest the bent end of the stop (No. 1) represents 0 seconds. To change announcement record interval, proceed as follows:

- (1) Loosen socket head cap screw.
- (2) Position the limit-switch stop to desired setting, desired setting should be flush with left side of tube.
- (3) Tighten socket head cap screw.

#### 3.23 Switch Springs (S1, S2, and S3) (Fig. 6 and 7):

##### (a) Contact separation and follow:

- (1) In the unoperated position, S1 switch contacts shall have a separation between contacts of:

Min. 0.008 inch

Max. 0.015 inch

Gauge by eye

- (2) In the unoperated position, S2 and S3 switch contacts shall have a separation between contacts of:

Min. 0.006 inch

Max. 0.015 inch

Gauge by eye.

- (3) When S2 and S3 switches are operated by the insulated pin of the drum, the contact follow shall be:

Min. 0.010 inch

Max. 0.020 inch

Gauge by eye.

- (4) Contact separation and follow of these springs are interdependent. Care should be taken when adjusting to meet one requirement that the other is also met. Adjustments should be made using the No. 534E spring adjuster on the stationary springs, and the No. 524A or No. 524B spring adjuster on the operating springs. To adjust, place the adjuster on the spring and slide it back to where the spring leaves the insulator. Adjust the spring up or down as required.

(b) *Contact alignment (Fig. 11):*

- (1) The contacts shall line up so that the width on the contact surface of each contact bar falls wholly within the length of its mating bar.

Gauge by eye.

- (2) If any switch fails to meet the contact alignment requirement, replace List 3 recorder.

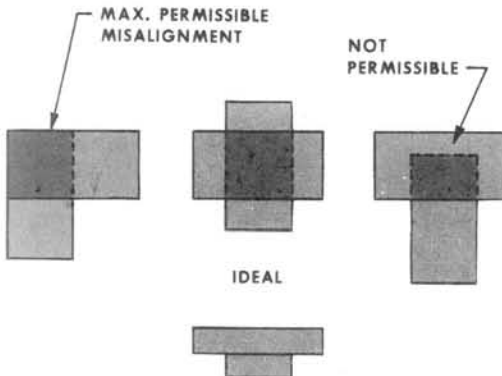


Fig. 11—Contact Alignment

- 3.24 Erase Coil (Fig. 12):** The erase coil assembly shall be so positioned that the central plane of the pole piece gap is radial with respect to the recording band. Gauge by eye.

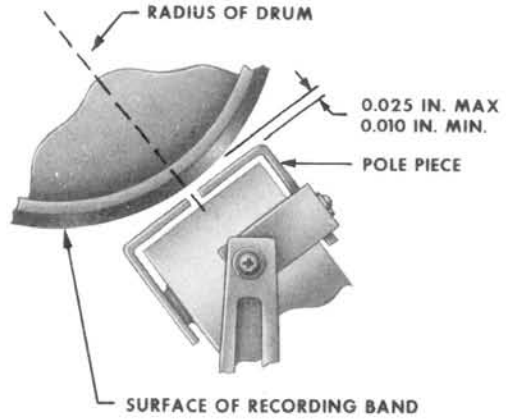


Fig. 12—Erase Coil Clearance

(a) *To adjust pole piece:*

- (1) Loosen the 3 screws that fasten the pole piece bracket to the base.
- (2) Adjust erase coil forward or backward to correct position.
- (3) Tighten screws.

There shall be a clearance between the recording band and the surface of the erase coil pole pieces throughout one complete revolution of the drum of:

Min. 0.010 inch

Max. 0.025 inch

Gauge by eye.

(b) *To adjust separation:*

- (1) Loosen the two screws that fasten erase coil to bracket.

- (2) Move erase coil either toward or away from drum to correct position.
- (3) Keep same separation over the width of the drum.
- (4) Tighten screws after making adjustment.

### 3.25 Magnetic Head Lifter Tab Position (Fig. 13):

With magnetic head in electrically operated position, the clearance between the magnetic head bracket and the tab shall be a minimum of 1/32-inch. Gauge by eye. (Fig. 13A). With magnetic head in electrically operated position, the clearance between the magnetic head and the tab shall be a minimum of 1/32 inch. Gauge by eye, (Fig. 13B). With the magnetic head unoperated, the clearance between the magnetic head and the recording band shall be a minimum of 1/32 inch. Gauge by eye. Head lifter tab may be bent to meet these requirements. Use No. 325 adjuster. **Do not damage wiring.**

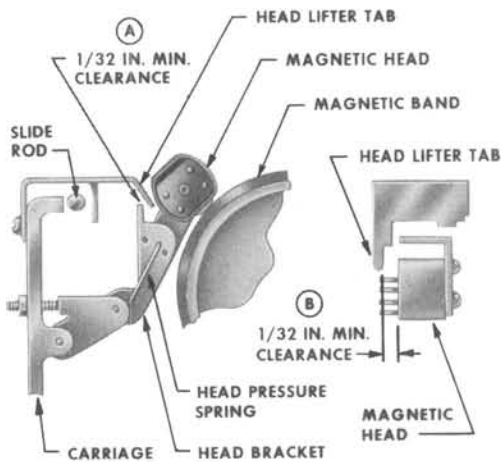


Fig. 13—Head Lifter Tab Clearance

**3.26 Carriage:** The carriage assembly shall return freely and without hesitation to its starting position.

**Note:** Check this requirement in several positions, one of which is close to the zero position of the carriage.

Head retainer shipping lock spring shall be in the notch provided on the carriage and should not bear on the slide rod.

### 3.27 Limit Switch:

- (a) Replace recorder if:
  - Limit switch does not return freely to its zero position when limit switch arm is released by operation of L2 solenoid.
  - Message is clipped on reproduce.

### 3.28 Magnetic Head Pressure (Fig. 14):

With the magnetic head in the electrically operated position, the pressure of the magnetic head on the recording band shall be a minimum of 28 grams, a maximum of 43 grams. Use No. 68B gauge to measure this quantity by placing tip of gauge under recording head bracket between the two mounting screws and measuring the pressure on a line passing through the drum center and between the two screws. The end of the head pressure spring shall be placed in the hole which provides the maximum pressure within the permissible range.

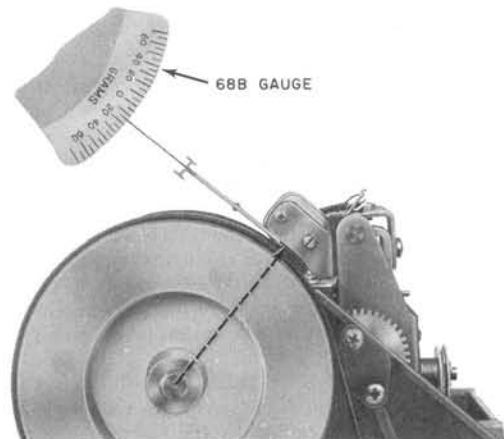


Fig. 14—Magnetic Head Pressure

**3.29 Bail Stop Position (Fig. 15):** With the magnetic head in the electrically operated position, the clearance between the side of the slot in the bail assembly and the side of the bail stop

farthest from the drum shall be 1/32-inch minimum throughout the entire carriage travel. If the clearance between the bail stop and bail assembly in the operated position is not satisfactory, adjust the bail stop as required by using the No. 325B adjuster to bend the bail stop. Check clearance with the 92K feeler gauge. This requirement should be checked everytime the recorder is lubricated.

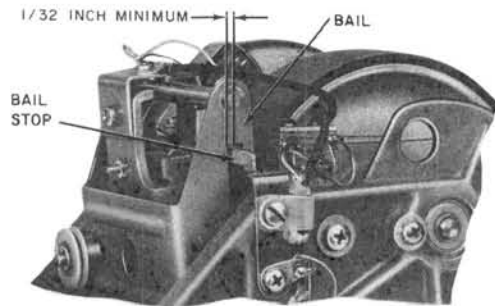


Fig. 15—Bail Stop Adjustment

## LUBRICATION

**3.30** The life and continued proper operation of the announcement set is dependent upon a well administered and properly executed lubrication program. Therefore, it is critically important that before being placed in operation, the announcement set shall have been lubricated as specified and that after being placed in service, the set must be lubricated every three months with the KS-16326, List 1 oil and KS-19139, List 4 lubricant as specified in 3.37. Experience may prove that sets receiving severe service may need lubricating more often.

**3.31** One drop of KS-16326, List 1 oil is the amount of oil discharged from the nozzle of the No. 486A oil can when the sides of the oil can are depressed once and held depressed until the drop is released from the nozzle.

**3.32** A film of KS-19139, List 4 lubricant is the amount of lubricant deposited on the surface of a part after being brushed with the KS-14164 brush which has been dipped into the lubricant to

a depth of 3/8-inch and brushed lightly against the side of the container as the brush is removed.

### 3.33 Lubricate as follows:

**Caution:** Do not allow any KS-16326, List 1 oil or KS-19139, List 4 lubricant to get on the recording band, drive belt, pulley surfaces, or motor shaft.

(a) Apply a thin film of KS-19139, List 4 lubricant to surfaces of all gear teeth, Fig. 6(A), threads of feed screw, Fig. 6(B), and half nut which is mounted on bracket assembly. Stir lubricant thoroughly before using.

(b) Apply two drops of KS-16326, List 1 oil to the bearings at each end of the feed screw, Fig. 6(C). Apply where feed screw enters bearing.

**Caution:** Do not remove feed screw bearing plate or bail stop.

(c) Motors:

(1) Sets equipped with KS-15914, List 1 motor require two drops of KS-16326, List 1 oil to each of the two motor shaft bearing oil holes and two drops to the oil hole of the rear bearing of motor. Keep oil off motor shaft, belt, and band.

(2) Sets equipped with KS-15914, List 2 motor, no lubrication of motor required.

(3) Sets equipped with B-650412 drive assembly containing a B-650418 motor requires two drops of KS-16326, List 1 oil to each of the two oil reservoirs [one at the shaft and one at the rear of the motor, Fig. 6(D)], as applicable. Earlier models of the motor require no lubrication.

(d) Record of Lubrication: The telephone company should maintain a record showing the dates lubricants were applied to the recording band (3.34), the gear teeth, feed screw, and half nut [3.33(a)], and the feed screw bearings and motor [3.33 (b) and (c)].

**CLEANING**

**Note:** Always clean recording band and head on same visit. The recording band shall be cleaned and lubricant every three months.

**3.34 To clean recording band:**

- (1) Moisten a clean KS-2423 twill jean or other approved lint-free cloth slightly with KS-16328, List 2 cleaner-lubricant.
- (2) Wipe recording band thoroughly.
- (3) Wipe dry with another clean, dry, lint-free cloth.
- (4) Repeat if necessary. The band should have a dry polished surface with no trace of dirt remaining.
- (5) After cleaning, lubricate the band, by applying a thin film of G.E. SF-1147 200 Cs silicone oil to the recording band using a KS-2423 cloth.

**3.35 To clean recording head pole piece.**

- (1) Pivot head away from recording band and lock against carriage with head locking spring.
- (2) Place a clean, dry KS-2423 cloth over band and adjacent parts to prevent damage by cleaner.

(3) Moisten another clean KS-2423 cloth with KS-16328, List 2 cleaner and rub surface of pole piece clean.

(4) Dry recording head surface and any surfaces contacted by the cleaner with a clean KS-2423 cloth.

**3.36** For more detailed information on the maintenance and lubrication of the KS-16765, List 3, refer to Sections 034-354-701 and 034-354-801.

**3.37 Ordering Information for Lubricants:**

KS-19139, List 4  
(Lubricant)

American Oil and  
Supply Company  
238 Wilson Avenue  
Newark, New Jersey  
07105

G. E. SF-1147  
(Silicone Oil)

Wilcox Electric  
Company  
14th and Chestnut  
Street  
Kansas City, Missouri  
64127  
Part # 264847-1

KS-16328, List 2  
(Cleaner-Lubricant)

WECO Supply Center  
650 Liberty Avenue  
Union, New Jersey  
07083

KS-16326, List 1  
(Oil)

## KS-16765, LIST 1, 2 ANNOUNCEMENT SETS INSTALLATION, CONNECTIONS, AND OPERATION

### 1. GENERAL

1.01 The List 1 announcement set is designed for loop-start operation on a customer's premises and the List 2 for ground start operation from the local equipment in the central office. The List 2 may also be located on a customer's premises when used with a 2A, 2B, or 3A ACD.

1.02 This section is reissued to:

- Add information on kit of parts to remove 60 Hz hum in power supply
- Change line current fuse rating
- Add lubrication information at time of installation
- Add ACD information to Table A.

1.03 These announcement sets (Fig. 1) contain fragile apparatus. To prevent damage, handle the sets carefully at all times.

1.04 Refer to CD- and SD-95286-01 for List 1 and CD- and SD-95283-01 for List 2 announcement sets.

### 2. INSTALLATION

2.01 The KS-16765, List 1 and 2 announcement sets are designed to operate on 110/125-volt ac power supply.



*Do not connect these announcement sets to direct current; this will seriously damage sets.*

2.02 If direct current is the only available power supply, a KS-15662, List 1 vibrator-inverter must be used. Installation of this inverter is covered in Section 514-112-100.

2.03 A 1/2-amp fuse is provided in both sets for electrical protection. **Sets equipped**

*with 1-amp AGC fuse will be changed to 1/2-amp AGC fuse.*

2.04 The customer must provide and maintain a standard ac outlet for operation of the announcement set. The outlet must not be controlled by a switch.

2.05 Announcement sets with B-650412 drive assemblies, equipped for 3-minute announcement recording capacity should **not** be installed for group alerting or in 8A announcement system without proper authorization. (Use of a set equipped with a 3-minute capacity will excessively increase the time between announcements for continuous operations in these systems.)

2.06 Earlier type KS-16765, List 1 and 2 announcement sets that have a 60 Hz hum in the output of the set, can be upgraded in the field with a kit of parts to reduce the hum level. This kit is to be ordered directly from the manufacturer. The kit of parts consists of a 10 ohm, 3 watt resistor and 750  $\mu$ fd capacitor. Sets manufactured after the first quarter of 1971 are equipped with this modification.

Ordering information for the modification kit is as follows:

(Qty) KS-16765 Filter Assembly Kit

Order directly from: Wilcox Electric Company,  
14th and Chestnut Street, Kansas City,  
Missouri, 64127

Cost and shipping charges billed by manufacturer.

2.07 Complete installation procedure is included with the kit of parts for both List 1 and 2 announcement sets. A complete schematic of the power supply will be found in SD-95286-01 and SD-95283-01 for the KS-16765, List 1 and 2 sets, respectively.



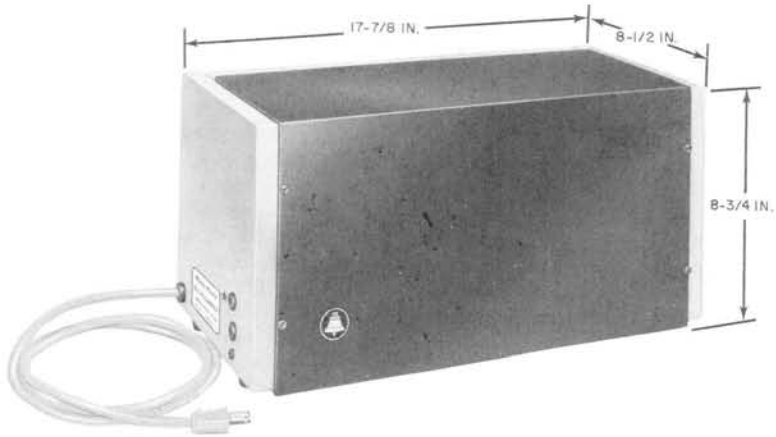


Fig. 1—KS-16765, Lists 1 and 2 Announcement Sets, Dimensions

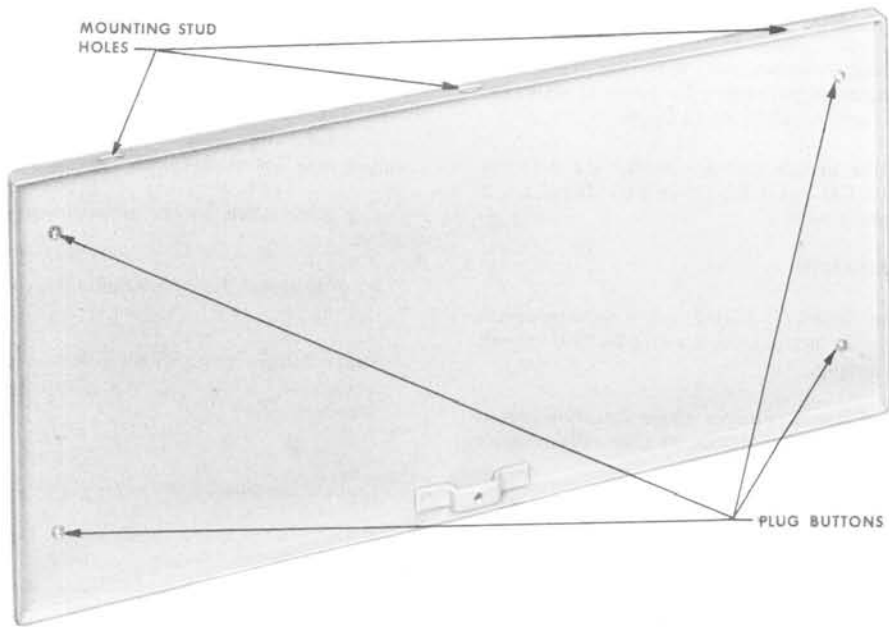


Fig. 2—KS-16765, Lists 1 and 2, Rear Cover

**Warning:** Remove power cord before performing any work on the power supply to prevent shock and damage to equipment.



Before being placed in operation, the announcement set shall have been lubricated as specified. After being placed in service, the set should be lubricated every six months. Experience may prove that sets receiving severe use may need lubricating more often. Refer to Sections 514-210-100 and 034-354-701.

## LOCATIONS

**2.08** The announcement set may be placed on a desk, table, or shelf or fastened to a wall. Since the List 1 set is remotely controlled, it need not be located adjacent to the telephone set which controls it.

**2.09** When wall installation is required, be sure wall is substantial enough to support 40 pounds, the weight of the announcement set. The 81-type backboard may be used when required.



Allow enough clearance under set to permit removing the three recorder mounting screws from the bottom of the set should it be necessary to replace the recorder. Leave enough slack in the wiring cable so that set may be dismantled without being disconnected.

**2.10** Locate the set in accordance with customer wishes after considering the following:

- Set must be located within 6 feet of a customer-provided, 110/125-volt, 60-cycle ac outlet.
- Set must be installed in a reasonably level position.
- Avoid locations that are exposed to weather or extreme heat conditions.

## INSTALLING



Do not connect announcement set to power supply until all installation work is completed.

**2.11** Refer to the appropriate sections to install the telephone set, cable, drop wire, connecting block, and inside wiring used with a List 1 set (Fig. 3 and 4) and to install the inside wiring used with a List 2 set (Fig. 5 and 6).

**2.12** When List 1 announcement set and its associated key telephone set (or key unit) are located together, the mounting cord of the telephone set (or key unit) may be connected directly to the announcement set. To do this, remove and discard the large rubber grommet from the center entrance hole. Feed the mounting cord through the entrance hole and fasten cable stay hook with cable clamp screw. Discard the cable clamp.

## MOUNTING

**2.13** To mount either announcement set:

- (1) Remove front cover
  - Loosen four captive screws in front of cover (Fig. 1). Slide cover forward.
- (2) Remove rear cover
  - Turn slotted shaft counterclockwise with a screwdriver. This forces rear cover off.



Before proceeding, make changes on TB2 if required. TB2 is located in rear of set and is not accessible after set is mounted.

- (3) Remove the four plug buttons from announcement set rear cover (Fig. 2).
  - (4) Mount rear cover to wall surface using four No. 14 screws or equivalent.
  - (5) Hold set with top tipped slightly back. Insert the three mounting studs (Fig. 3 and 4) located on the underside of the top of the set into the three mounting stud holes in the top edge of the rear cover.
- THINK** Be sure mounting studs are securely seated before releasing set.
- (6) Tighten slotted shaft by turning clockwise with a screwdriver. This locks set to rear cover.

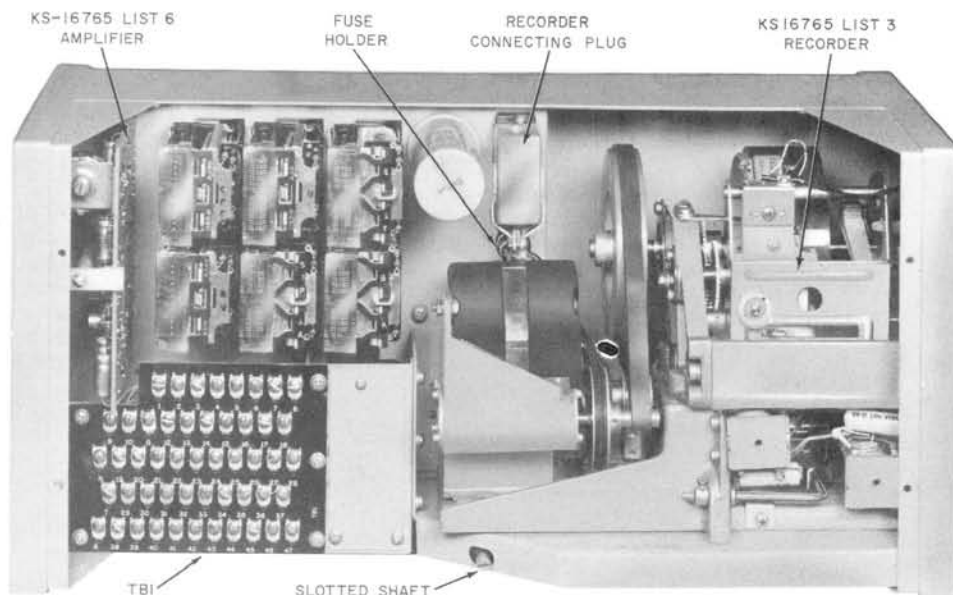


Fig. 3—KS-16765, List 1 Announcement Set, Front Cover Removed

#### SERVICING

2.14 To release bail shipping lock (Fig. 7):

- (1) Loosen the two mounting screws.
- (2) Move bail shipping lock to extreme position away from bail.
- (3) Tighten mounting screws.



*After tightening mounting screws, check to see that there is adequate clearance between the tab end of the bail shipping lock and the recording head mounting.*

2.15 To remove head lock spring (Fig. 7):

- (1) Remove head lock spring from screw head on magnetic head and place in notch of carriage bracket.



*Be sure head lock spring is securely in notch and does not rest on slide rod.*

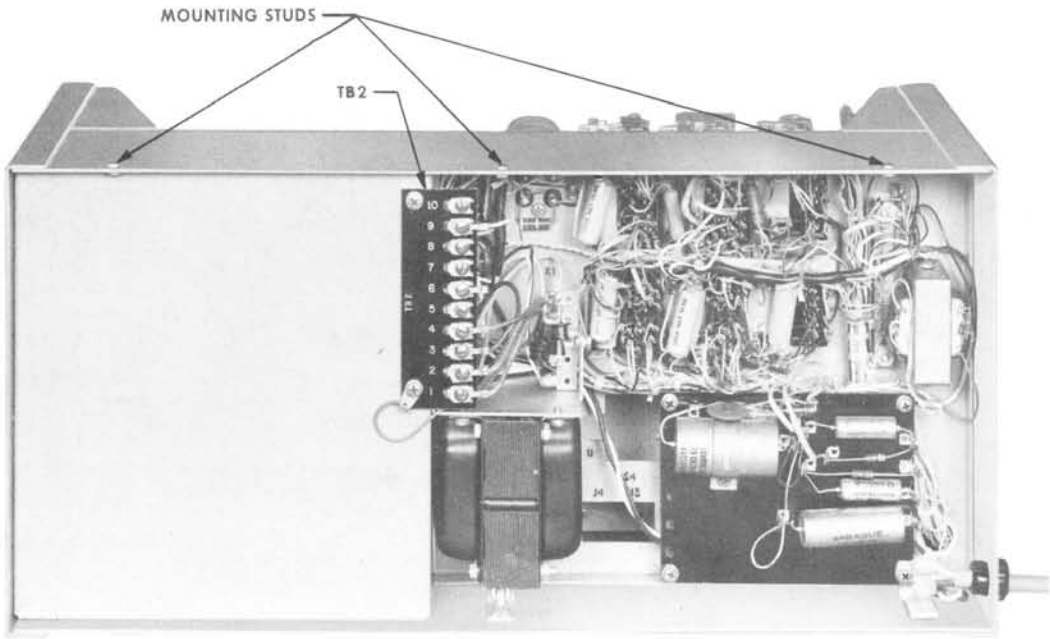


Fig. 4—K5-16765, List 1 Announcement Set, Rear Cover Removed

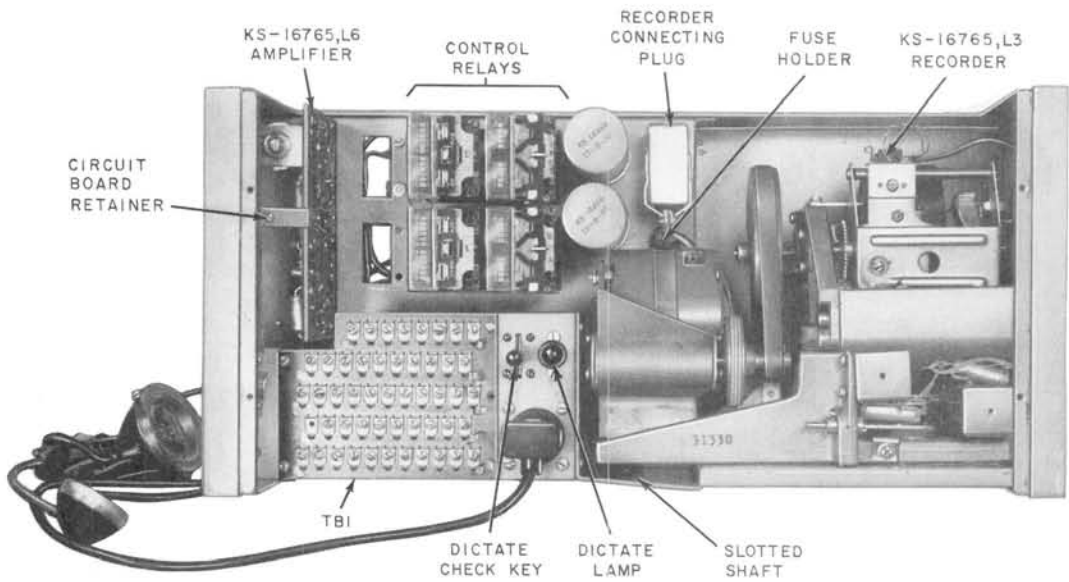


Fig. 5—KS-16765, List 2 Announcement Set, Front Cover Removed

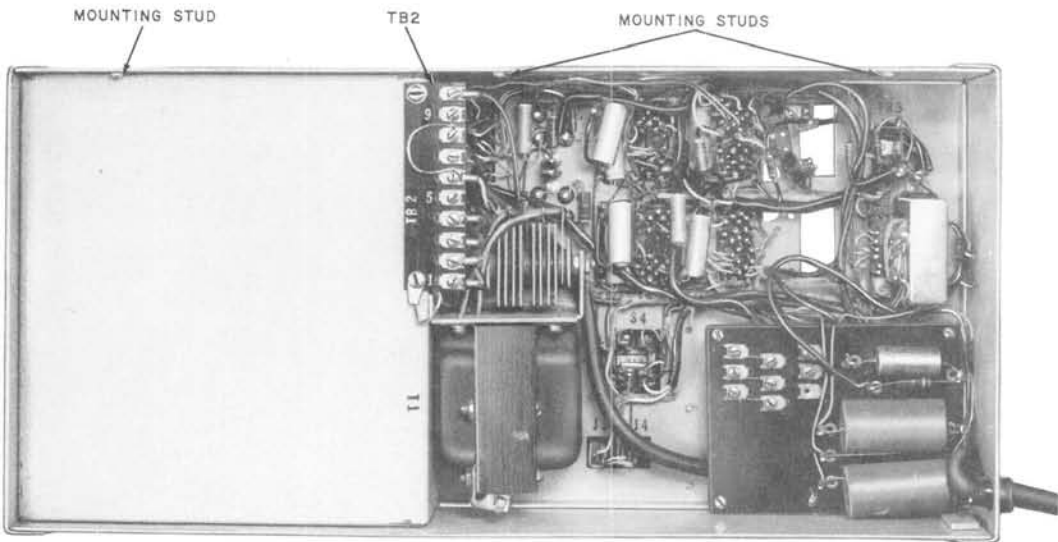


Fig. 6—KS-16765, List 2 Announcement Set, Rear Cover Removed

**2.16 Announcement length adjustment:** The announcement set is shipped with the announcement length adjusted for 30 seconds, however this adjustment may be set for any interval up to the maximum capacity by adjustment of the limit switch stop (Fig. 7). The seven marks on the limit switch stop may be used as guides for setting the maximum announcement recording interval.

MARK	2-MINUTE CAPACITY TIME IN SEC.	3-MINUTE CAPACITY TIME IN SEC.
	(B-650416 PULLEY)	(B-650417 PULLEY)
1	0	0
2	15	22-1/2
3	30	45
4	34	67-1/2
5	60	90
6	90	135
7	120	180

For intervals other than those shown, it will be necessary to estimate the setting between the two appropriate marks. The mark nearest the bent end of the stop (No. 1) represents 0 seconds. To change announcement record interval, proceed as follows:

- (1) Loosen socket head cap screw (Fig. 7).
- (2) Position limit-switch stop to desired setting; flush with left side of tube.
- (3) Tighten socket head cap screw.

### 3. CONNECTIONS

**3.01** Connections for the announcement set will vary with the system in which it is being used. Select the appropriate section from the following:

- (a) 100A Telephone Answering System (Section 473-675-201)

- (b) Group Alerting System (Section 480-310-400)
- (c) 8A Announcement System Using KS-16765, List 1 Announcement Set (Section 514-615-200)
- (d) 7A Announcement System Using KS-16765, List 2 Announcement Set (Section 951-116-100)
- (e) 2A Automatic Call Distributor (ACD) (Section 476-216-210)
- (f) 2B Automatic Call Distributor (ACD) (Section 476-270-203)
- (g) 3A Automatic Call Distributor (ACD) (Section 981-236-100)

**3.02** After completing connections for type of service required, insert power cord into ac outlet. Refer to appropriate section listed in 3.01 and test operation of announcement set.

**3.03** The set is now ready for operation. Replace announcement set cover and instruct the customer in the proper operation of set.

### 4. OPERATION

**4.01** The operation of the announcement sets will vary with the system in which they are used.

**4.02** Refer to SD-, CD-95286-01 and SD-, CD-95283-01 for Lists 1 and 2, respectively, for detailed operational information in a particular system. Sequence charts and functional sketches are included.

**4.03** Operating instructions for the particular system which either announcement set is used are covered in the SDs and CDs listed in Table A.

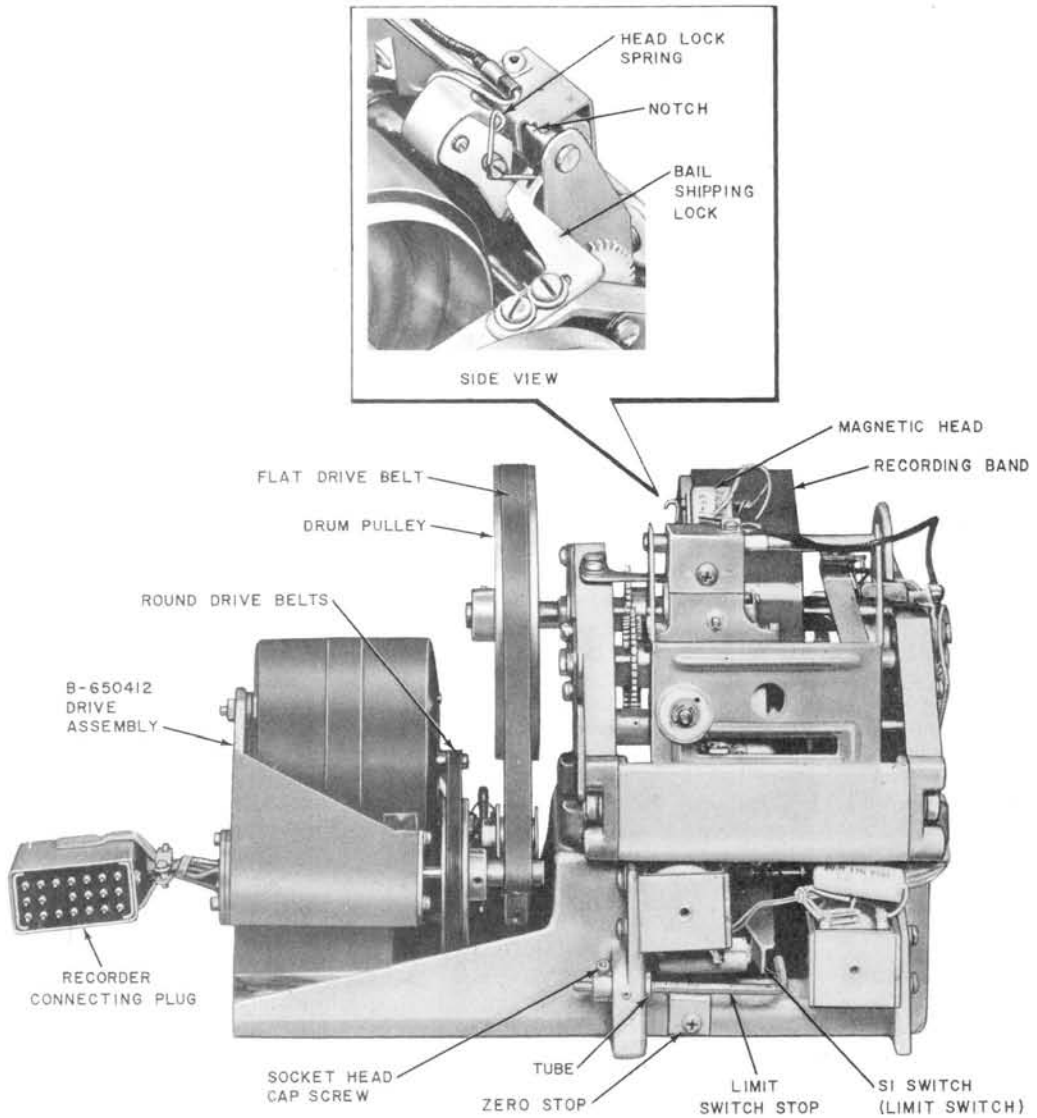


Fig. 7—KS-16765, List 3 Recorder

◆ TABLE A ◆

PLANT	TYPE OF OPERATION	APPLICABLE SD & CD
100A Telephone Answering System	Automatic Answer	SD & CD-95286-01
8A Announcement System Using KS-16765, List 1 Announcement Set or 2-Type Telephone Answer Set	Automatic Answer	SD & CD-95286-01 and SD & CD-95293-01
Group Alerting System	Automatic Announce	SD & CD-95286-01 and SD & CD-69385-01
7A Announcement System Using KS-16765, List 2 Announcement Set.	Automatic Answer	SD & CD-95283-01
2A Automatic Call Distributor (ACD)	Automatic Answer	SD & CD-95283-01
2B Automatic Call Distributor (ACD)	Automatic Answer	SD & CD-1E088-01
3A Automatic Call Distributor (ACD)	Automatic Answer	SD & CD-65979