

SEE ADDENDUM

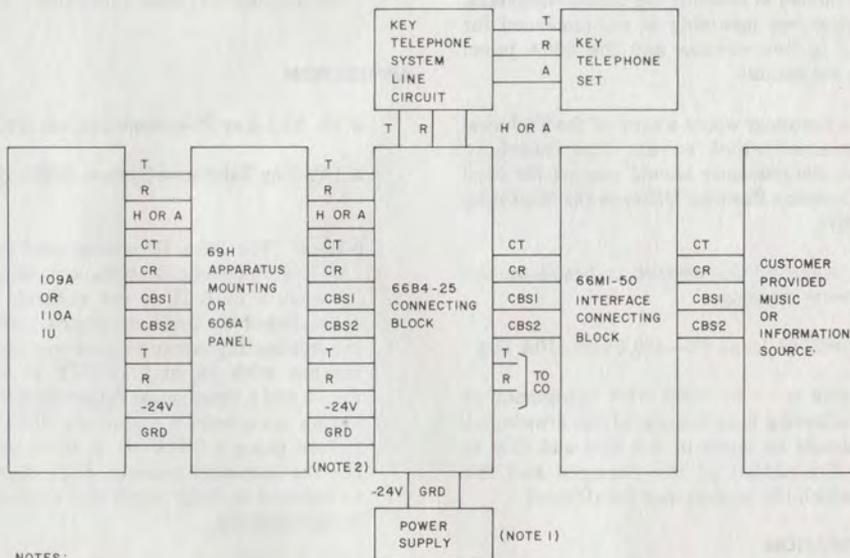
**VOICE CONNECTING ARRANGEMENT LVH  
109A AND 110A INTERCONNECTING UNITS  
69H APPARATUS MOUNTING  
606A PANEL**

**1. GENERAL**

**1.01** This section contains identification, installation, operation, maintenance, and connecting information for Voice Connecting Arrangement (VCA) LVH (Fig. 1). VCA LVH is equipped with 109A or 110A interconnecting unit(s) (IU) (Fig. 2) and 69H apparatus mounting(s) or 606A panel(s). This arrangement provides a voiceband connection between a customer-provided (CP) music or information source and a line or lines on hold in a key telephone system (KTS).

**1.02** This section is reissued to:

- Clarify the information concerning the termination of the CP music or information source with an 8-ohm resistor.
- Delete detailed information on the 606A panel formerly contained in this section which is currently contained in Section 463-300-103.
- Revise Fig. 7.



NOTES:  
1. POWER SUPPLY CONNECTS TO T1(-24V) AND T2 (GRD) ON BACK OF 606A PANEL.  
2. INSULATE AND STORE UNUSED LEADS.

**Fig. 1—Block Diagram—Voice Connecting Arrangement LVH**

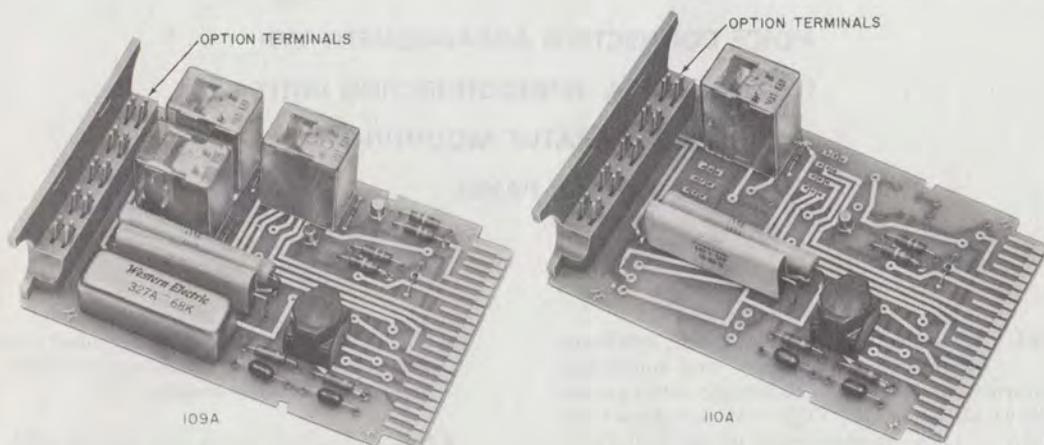


Fig. 2—109A and 110A Interconnecting Units

**1.03** The size of the job at initial installation and the expected growth should be the determining factors in selecting the proper equipment. The 69H apparatus mounting is recommended for use for one to two circuits and the 606A panel for three to six circuits.

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05** This issue of the section is based on the following drawing:

SD-69627-01 Issue 2B—109A and 110A IUs

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

## 2. IDENTIFICATION

### PURPOSE

- To adapt a CP source of recorded music or information to a line placed on hold in a KTS.

- To limit excessive levels from customer-provided equipment (CPE) and to provide protection for personnel against hazardous voltages.

### APPLICATION

- 1A, 1A1 Key Telephone System (110A IU)
- 1A2 Key Telephone System (109A IU).

◆**Note:** The 109A IU can be used in 1A and 1A1 Key Telephone Systems instead of a 110A IU when a 110A IU is not available or when necessitated by local conditions. **However**, the connecting arrangement must be wired for use with 1A or 1A1 KTS as shown in Fig. 4 and a strap **must be provided** between option terminals 5 and 6 on the 109A IU. Before using a 109A IU in place of a 110A IU, the increased current drain (0.060 amps as opposed to 0.030 amps) and expense should be considered.◆

### ORDERING GUIDE

- Unit, Interconnecting, 109A (one per each 1A2 KTS line circuit to be connected to CP music or information source).

- Unit, Interconnecting, 110A (one per each 1A or 1A1 KTS line circuit to be connected to CP music or information source).

#### Associated Apparatus (Order Separately)

##### For 69H Apparatus Mounting

- Mounting, Apparatus, 69H (one per two 109A or 110A IUs)
- Supply, Power, 19C2 or equivalent (locally engineered and installed when existing KTS power supply is insufficient)
- Mounting, Apparatus, 16-Type (if required to mount 69H)
- Bracket, Mounting, 99B
- Cable, Connector, A25B, single-ended (one per 69H apparatus mounting)
- Block, Connecting, 66M1-50 (Fig. 3)
- Block, Connecting, 66B4-25 (one per 69H apparatus mounting)
- Resistor, KS-14603, L3A, 8.25-ohm (or equivalent 8-ohm, 1-watt resistor, one per CP music or information source)—leads no larger than 19-gauge for clip-type terminal



**Use only ONE resistor PER CP MUSIC OR INFORMATION SOURCE. The use of more than one resistor per source causes an impedance mismatch, resulting in the deterioration of voice frequency transmission.**

- Resistor, KS-14603, L3A, 511-ohm (or equivalent 500-ohm, 2-watt resistor)—for test purposes, if required (see 5.02).
- Clip, Bridging, B (Fig. 3, as required, shipped 25 per package)
- Wire, "D" inside or equivalent (for cabling from 66B4-25 connecting block to 66M1-50 interface connecting block).

##### For 606A Panel

- Panel, 606A (one per six 109A or 110A IUs)

- Supply, Power, 19C2 or equivalent (locally engineered and installed when existing KTS power supply is insufficient)
- Mounting, Apparatus, 16-Type (if required to mount 606A panel)
- Bracket, Mounting, 99B (as required)
- Cable, Connector, A25B, single-ended (one per three circuits—maximum, two per 606A panel)
- Fuse, 24E, 1/2 ampere (eight per 606A panel)
- Block, Connecting, 66M1-50 (Fig. 3)
- Block, Connecting, 66B4-25
- Resistor, KS-14603, L3A, 8.25-ohm (or equivalent 8-ohm, 1-watt resistor, one per CP music or information source)—leads no larger than 19-gauge for clip-type terminals



**Use only ONE resistor PER CP MUSIC OR INFORMATION SOURCE. The use of more than one resistor per source causes an impedance mismatch, resulting in the deterioration of voice frequency transmission.**

- Resistor, KS-14603, L3A, 511-ohm (or equivalent 500-ohm, 2-watt resistor)—for test purposes, if required
- Clip, Bridging, B (Fig. 3, as required, shipped 25 per package)
- Wire, "D" inside or equivalent (for cabling from 66B4-25 connecting block to 66M1-50 interface connecting block).

#### DESIGN FEATURES

##### 109A and 110A Interconnecting Units

- Components mounted on 4-inch 40-pin printed wiring board.
- Provides a dry contact closure to signal CPE.
- Provides voice frequency coupling to CPE.

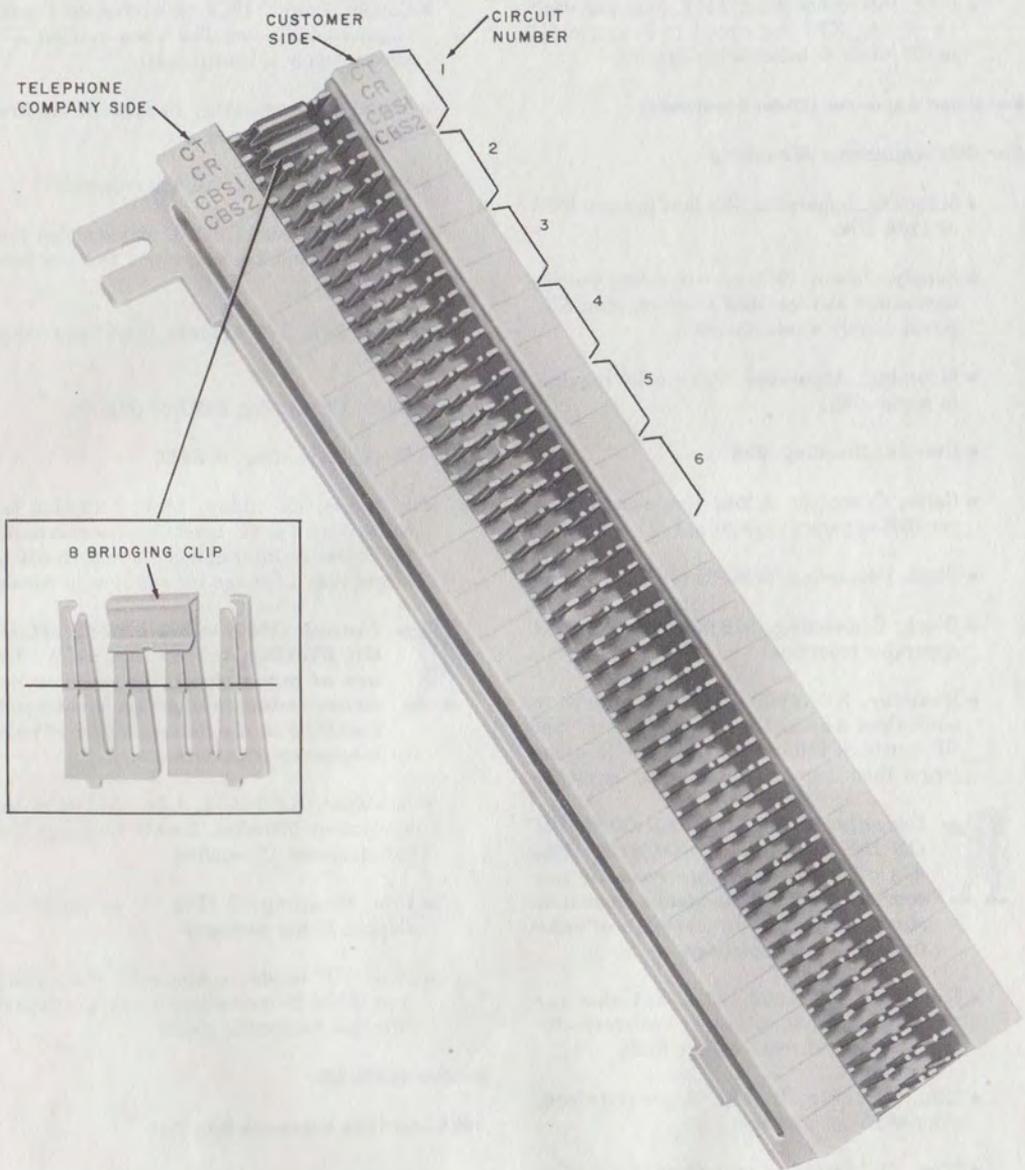


Fig. 3—Typical Interface Connecting Block

- Provides option strapping terminals.
- 109A IU designed for A-lead control (1A2 KTS) directly from the associated key telephone set.
- 109A IU requires 0.060 ampere 26V dc.
- 110A IU designed for H-lead ground from 1A1 KTS line circuit or from busy and supervisory relay circuit of 1A KTS.
- 110A IU requires 0.030 ampere at 26V dc.

### 69H Apparatus Mounting

- Provides facilities for mounting two 109A or 110A IUs.
- Equipped with two 40-pin connectors factory-wired to one 50-pin KS-type plug.
- Mounts on 99A or 99B brackets on standard relay rack or 16-type apparatus mounting.

## 3. INSTALLATION

### 69H Apparatus Mounting

- 3.01** Install the 69H apparatus mounting on a standard 23-inch relay rack or in a 16-type apparatus mounting. Connect a ground wire to rack or mounting.
- 3.02** Electrical connection is made to the 69H apparatus mounting through an A25B connector cable. Terminate the raw end of the cable to a 66B4-25 connecting block following the wiring plan shown in Fig. 1 and 6. Insulate and store all spare conductors. Refer to Part 6 for wire strap and resistor connections.
- 3.03** Extend CT, CR, CBS1, and CBS2 leads from the 66B4-25 connecting block to the 66M1-50 interface connecting block for access to the CPE. Stencil lead designations on the 66M1-50 connecting block as shown in Fig. 3.
- 3.04** The 66M1-50 interface connecting block should be located as close as possible to the 66B4-25 connecting block. Locate so that the maximum loop resistance between the CT and CR leads will not exceed approximately 1.25 ohms (less than 25 feet of No. 24 gauge) when measured at the 66B4-25

connecting block with the 8-ohm resistor disconnected and the CT and CR leads shorted at the CPE.

- 3.05** The customer must terminate the CPE to the 66M1-50 connecting block using the four terminals stenciled on the customer side.

### 606A Panel

- 3.06** Install the 606A panel as outlined in Section 463-300-103.
- 3.07** Terminate the raw end of the single-ended A25B connector cable(s), used with the 606A panel, to the 66B4-25 connecting block following the wiring plan shown in Fig. 1 and 7. (Refer to Part 6 for wire strap and resistor connection).
- 3.08** Extend CT, CR, CBS1, and CBS2 leads from the 66B4-25 connecting block to the 66M1-50 interface connecting block for access to the CPE. Stencil lead designations on 66M1-50 connecting block as shown in Fig. 3.
- 3.09** The interface connecting block should be located near the 66B4-25 connecting block. Locate so that maximum dc loop resistance of the CT and CR leads does not exceed 1.25 ohms (less than 25 feet of No. 24 gauge) when measured at the 66B4-25 connecting block with the 8-ohm resistor disconnected and the CT and CR leads strapped at the CPE.
- 3.10** The customer must terminate the CPE to the 66M1-50 connecting block using the four terminals stenciled on the customer side.
- ### 109A or 110A Interconnecting Unit
- 3.11** Loosen screw securing retaining clip to apparatus mounting or panel and raise clip or designation bar to provide access.
- 3.12** Align IU in mounting guides and properly seat printed wiring board in connector.
- 3.13** Position retaining clip or designation bar and tighten screw.
- 3.14** Stencil circuit designation and connection information, as required, on retaining clip or designation strip.
- 3.15** Perform tests shown in Part 5 after installation.

**4. OPERATION****1A or 1A1 Key Telephone System (110A IU, Fig. 4)****4.01 Incoming Call:**

An incoming central office (CO) call is answered and placed on hold in the normal manner.

**1A Key Telephone System**

(a) Depressing the HOLD key of the telephone set causes the L relay in the 1A hold circuit to release which in turn causes H relay to operate and lock up on line current. Relay H operated causes the SR relay to operate in the busy and supervisory circuit which extends ground over the H lead of the 1A KTS to the H lead of the 110A IU.

(b) Ground on the H lead of the 110A IU causes the H relay in the 110A IU to operate. Relay H operated provides a contact closure across leads CBS1, CBS2 toward the CP music or information source and completes a voice frequency transmission path from the CPE over leads CT, CR, through the voice coupler circuit, to tip and ring of the held party.

**1A1 Key Telephone System**

(a) Depressing the HOLD key of the telephone set causes the A relay in the 1A1 line circuit to release which in turn causes the H relay to operate. Relay H operated extends ground over the HA lead of the 1A1 KTS to the H lead of the 110A IU.

(b) Ground on the H lead of the 110A IU provides a contact closure and voice frequency transmission path in the same manner as the 1A KTS.

**4.02 Disconnection:**

(a) Depressing a line pickup key associated with the incoming line placed on hold releases SR relay in the busy and supervisory relay circuit (1A KTS) or the H relay in the line circuit KTU (1A1 KTS) causing H relay of the 110A IU to release. H relay released transfers control of the connection to the KTS line circuit and removes the voice coupler from the line.

(b) If the calling party goes on-hook while connected to the CP source, removal of control ground from the line releases H relay in the 110A IU causing the circuit to restore to normal.

**1A2 Key Telephone System (109A IU, Fig. 5)****4.03 Incoming Call:**

(a) An incoming CO call is answered and placed on hold in the normal manner. Going off-hook places a ground on the A lead to the 109A IU operating the A relay which operates C relay. The A and C relays operated provide a voice frequency transmission path through the 109A IU by bypassing L relay in the tip side of the line. When the line is placed on hold, ground is removed from the A lead to the 109A IU, releasing the A relay. C relay is held operated momentarily by the diode across its winding. With C relay momentarily operated and the A relay released, L relay operates causing H relay to operate which supplies a holding ground for C relay, provides a contact closure across leads CBS1, CBS2 toward the CP music or information source, and completes a voice frequency transmission path from the CPE over leads CT, CR, through the voice coupler circuit, to tip and ring of the held party.

**4.04 Disconnection:**

(a) Depressing the line pick-up button associated with the calling party placed on hold operates the A relay in the 109A IU, releasing L relay. Release of L relay releases H relay, opening the circuits to the CPE and restoring the talking path to the telephone set.

**5. MAINTENANCE**

**5.01** Check the CO pair and check for loose or broken connections and blown fuses.

**5.02** Open the circuit under test at the interface connecting block by removing B bridging clips (or wire straps). Perform the following tests:

**109A Interconnecting Unit (Fig. 5)**

(a) Connect a 1013A (or equivalent) hand test set across CT and CR on the Telephone Company side of the 66M1-50 interface connecting

block. Operate switch on hand test set to MON position.

(b) Connect another hand test set across leads T and R of the 66B4-25 connecting block (W-S and S-W leads). Operate switch of hand test set to TALK. Central office dial tone should be heard. Dial number to return 1000-Hz tone on line.

(c) Connect an 81A or KS-16990, List 1 test set across CBS1 and CBS2. Set test set to continuity position.

(d) Ground the A lead on the 66B4-25 connecting block; the A relay should operate. Remove ground from the A lead. The A relay should release and the L and H relays should operate. The test set across CBS1 and CBS2 should indicate continuity, and 1000-Hz test tone should be heard on the 1013A hand test set connected to CT and CR.

(e) Reapply ground on the A lead. The A relay should operate and the L and H relay should release. An open circuit should appear across CBS1 and CBS2, and 1000-Hz test tone should not be heard at CT and CR. Switch the hand test set across the T and R to MON. 1000-Hz test tone should not be heard.

#### 110A Interconnecting Unit (Fig. 4)

(a) Connect a 1013A (or equivalent) hand test set across CT and CR on the Telephone Company side of the 66M1-50 interface connecting block. Operate switch on hand test set to MON position.

(b) Connect an 81A or KS-16990, List 1 test set across CBS1 and CBS2. Place test set in continuity position.

(c) Connect another hand test set across T and R of the 66B4-25 connecting block (to draw loop current). Operate switch of hand test set to TALK. Central office dial tone should be heard. Dial number to return 1000-Hz tone on line.

(d) Connect ground to H or HA lead on the 66B4-25 connecting block. Relay H should operate. Continuity should be indicated at CBS1

and CBS2, and 1000-Hz test tone heard in the hand test set connected to CT and CR.

(e) Remove ground from H or HA lead. The H relay should release, an open circuit should appear at CBS1 and CBS2, and 1000-Hz test tone will not be heard at CT and CR. Operate switch of hand test set across T and R to MON. 1000-Hz test tone should not be heard.

**5.03** When trouble is suspected in the IU, exchange it with another unit known to be functioning properly.

**Caution:** Remove fuse for particular circuit before replacing IU.

**5.04** Remove the test connections to restore circuit to normal and replace B bridging clip (or wire straps).



**Do not attempt any tests or repairs to the customer-provided equipment.**

#### 6. CONNECTIONS

**Note:** Since the HA leads are multiplied between lines in the 1A1 KTS, isolation of the HA lead is necessary to prevent the H relays of all IUs from operating when any line of the KTS goes on hold. To provide isolation of the HA lead when a 202-type KTU is used, remove any existing HA lead from the KTU terminal shown in Table A and connect to a spare terminal. Connect the HA lead from the 110A IU to the vacated terminal. Connect a KS-15724, List 1 or equivalent diode between the two terminals, observing polarity as shown in Fig. 4. To provide isolation of the HA lead when a 230-, 238-, or 239-type KTU is used, use a 227B KTU as shown in Fig. 8 and Table A.

**6.01** Provide straps on the 66B4-25 connecting block(s) between terminals 40 and 41, 43 and 44, 46 and 47, and 49 and 50 as shown in Fig. 6 and 7.

**6.02** Place a KS-14603, L3A, 8-1/4 ohm resistor or 8-ohm 1-watt resistor (furnished locally) across CT and CR leads to CPE at the 66B4-25 connecting block (see Fig. 6 and 7). The resistor should have pigtailed no larger than 19 gauge to connect in the quick-connect clip-type terminals.

If wire size is larger than 19 gauge, pigtailed should be soldered to the terminals.



*Use only ONE resistor PER CP MUSIC OR INFORMATION SOURCE. The use of more than one resistor per source causes an impedance mismatch, resulting in the deterioration of voice frequency transmission.*

**6.03** For connection information when using the 69H apparatus mounting, refer to Fig. 6, 8, and Table A.

**6.04** For connection information when using the 606A panel, refer to Fig. 7, 8, and Table A.

**6.05** The same power supply used for the 1A, 1A1, or 1A2 KTS should be used for the voice connecting arrangement if capacity is sufficient.

**6.06** Refer to the appropriate section in Division 518 for 1A, 1A1, or 1A2 KTS information and connections.

TABLE A

1A1 KTS CONNECTIONS USING DIODE (FIG. 4)					1A1 KTS CONNECTIONS USING 227B KTU (FIG. 8)					
110A IU	202A	202B	202C 202D	TEL SET	110A IU	230A 230B	238A 239A	227B	TEL SET	KTS
T	1	31	7		T	7	7			
R	2	32	8		R	8	8			
HA	23	37	21		HA			12		
	9	1	1	T				11		GRD
	11	2	2	R				1		GRD
	13	3	3	A		18	21	2		
						1	1		T	
						2	2		R	
						3	3		A	

Notes:

- For separately wired line circuits using a 202-type KTU, isolation of the HA lead to the 110A IU is provided by diodes. For multiple-wired line circuits using a 230-, 238-, or 239-type KTU, isolation of the HA lead to the 110A IU is provided by a 227B KTU.
- Connections shown are for the first circuits of the 230-, 238-, or 239-type KTUs. For additional circuit connections refer to Section 518-114-425.

NOTES:

1. USE LOWER ROWS OF TERMINALS (ROW 40-50) AS COMMON BUSS.
2. MULTIPLE TO OTHER IU'S COMMON TO THIS MUSIC OR INFORMATION SOURCE.
3. PROVIDE ONE 8 OHM, 1 WATT RESISTOR PER CP MUSIC OR INFORMATION SOURCE.  
**DO NOT PROVIDE ONE FOR EACH IU OR CONNECTING BLOCK.**
4. GROUNDS SHOULD BE BONDED WITH SEPARATE POWER SUPPLIES.
5. MOVE EXISTING HA LEAD TO SPARE TERMINAL AND INSTALL DIODE.

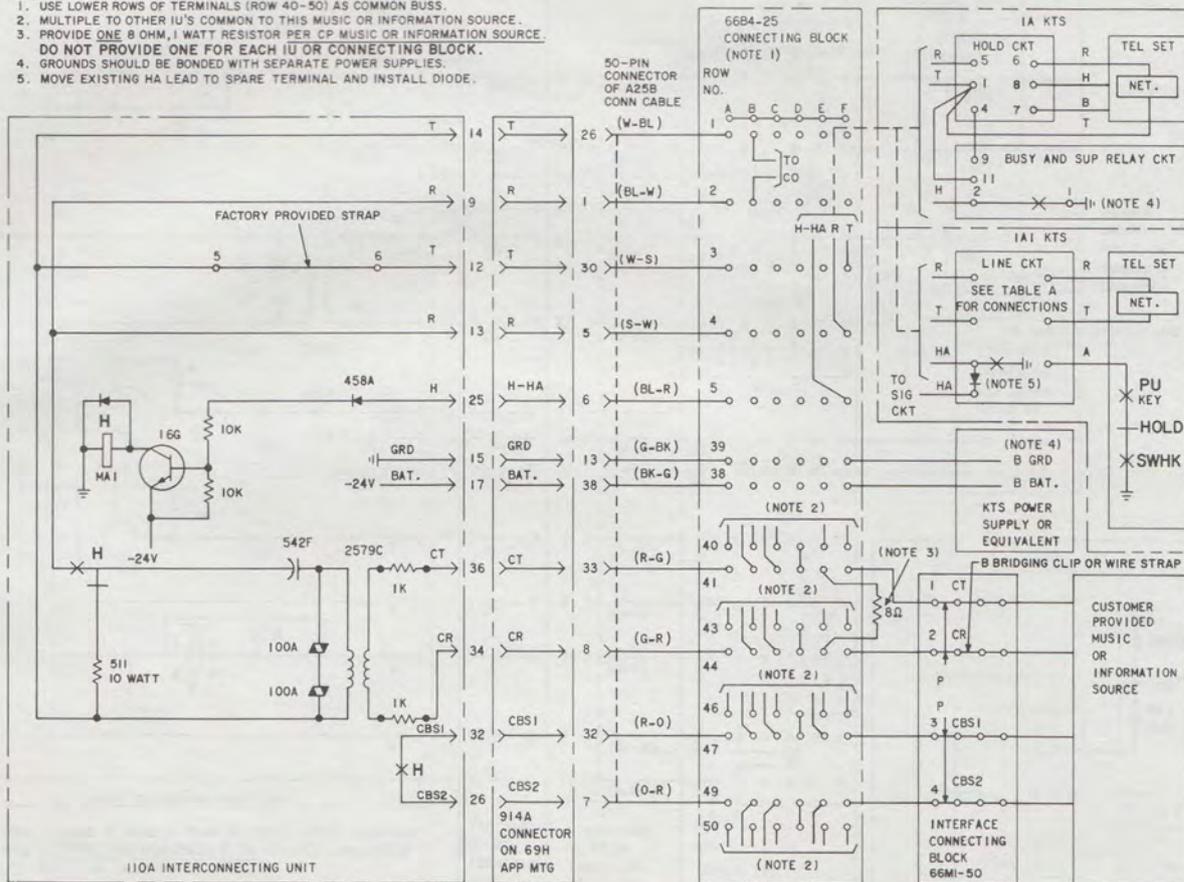


Fig. 4—Connections for Voice Connecting Arrangement LVH with 1A and 1A1 KTS

## NOTES:

1. USE LOWER ROWS OF TERMINALS (ROW 40-50) AS COMMON BUSS.
2. MULTIPLE TO OTHER IU'S COMMON TO THIS MUSIC OR INFORMATION SOURCE.
3. PROVIDE ONE 8 OHM, 1 WATT RESISTOR PER CP MUSIC OR INFORMATION SOURCE. DO NOT PROVIDE ONE FOR EACH IU OR CONNECTING BLOCK.
4. GROUNDS SHOULD BE BONDED WITH SEPARATE POWER SUPPLIES.

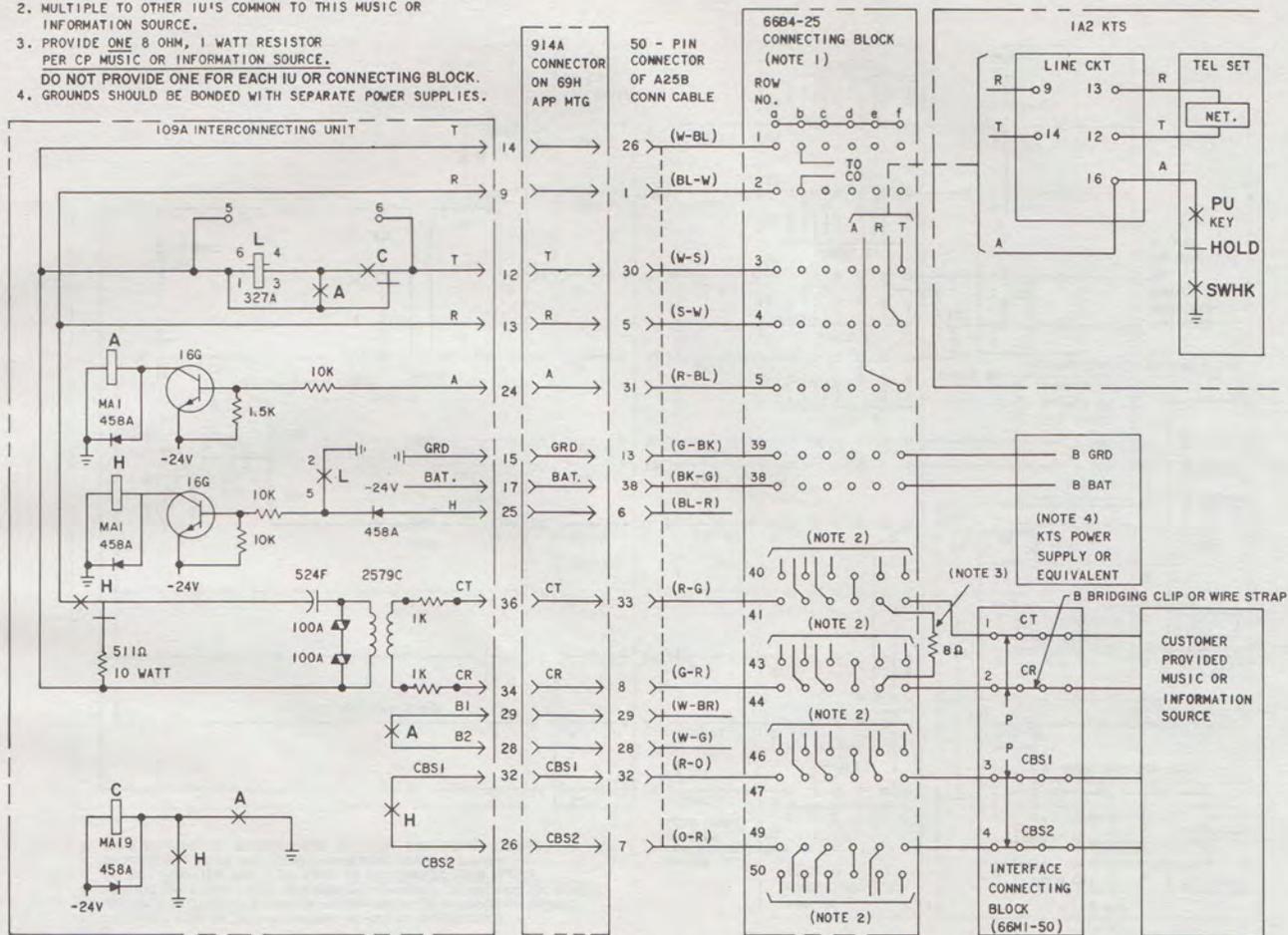


Fig. 5—Connections for Voice Connecting Arrangement LVH with 1A2 KTS

CONNECTIONS FOR CONNECTING ARRANGEMENT LVH

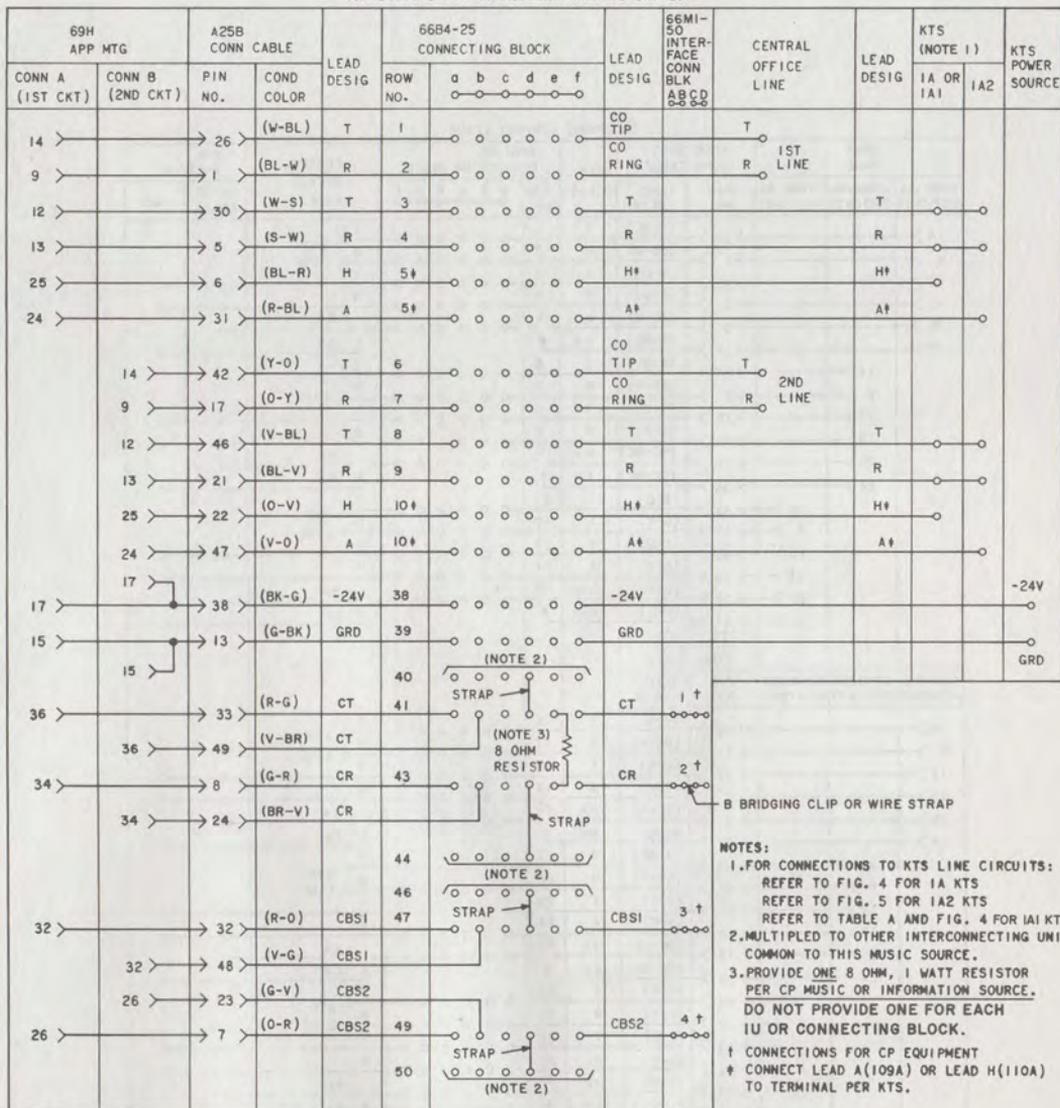


Fig. 6—Connections for Voice Connecting Arrangement LVH Using 69H Apparatus Mounting

TELEPHONE COMPANY LEADS

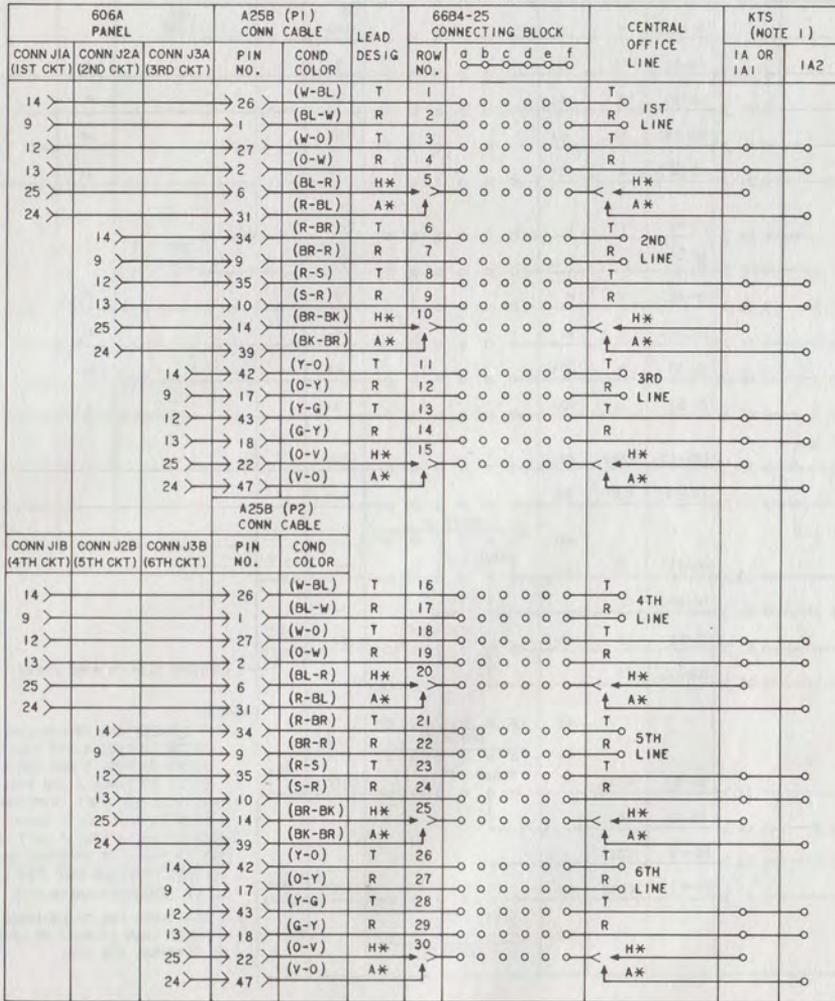
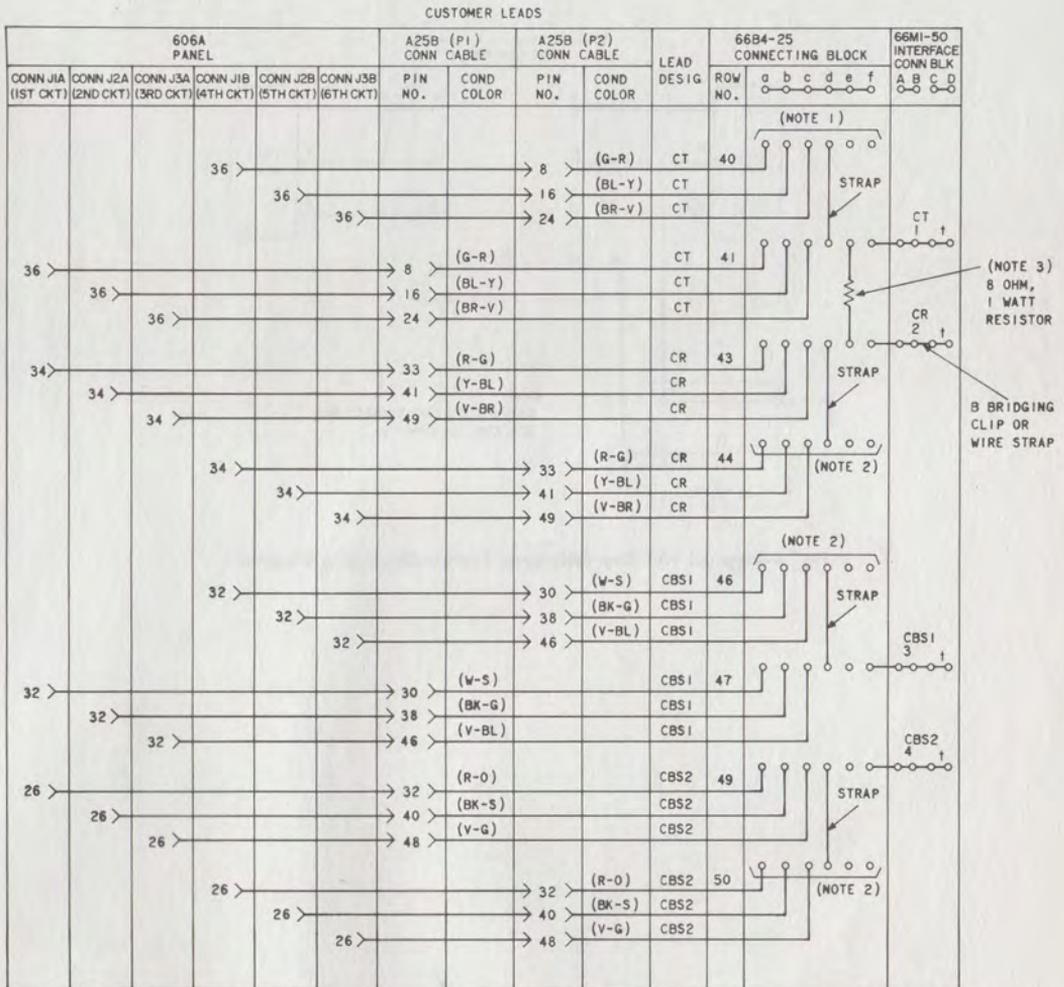


Fig. 7—Connections for Voice Connecting Arrangement LVH Using 606A Panel (Sheet 1)



## NOTES:

- FOR CONNECTIONS TO KTS LINE CIRCUITS:  
REFER TO FIG. 4 FOR 1A KTS  
REFER TO FIG. 5 FOR 1A2 KTS  
REFER TO FIG. 4 AND TABLE A  
FOR 1A1 KTS
- MULTIPLIED TO OTHER INTERCONNECTING  
UNITS COMMON TO THIS CP MUSIC OR  
INFORMATION SOURCE.

- PROVIDE ONE 8 OHM, 1 WATT RESISTOR  
PER CP MUSIC OR INFORMATION SOURCE.  
DO NOT PROVIDE ONE FOR EACH IU OR  
CONNECTING BLOCK.

- \* CONNECT LEAD H TO TERMINAL WHEN  
110A IU IS USED; CONNECT LEAD A  
TO TERMINAL WHEN 109A IU IS USED.  
† CONNECTIONS FOR CP EQUIPMENT.

Fig. 7—Connections for Voice Connecting Arrangement LVH Using 606A Panel (Sheet 2)

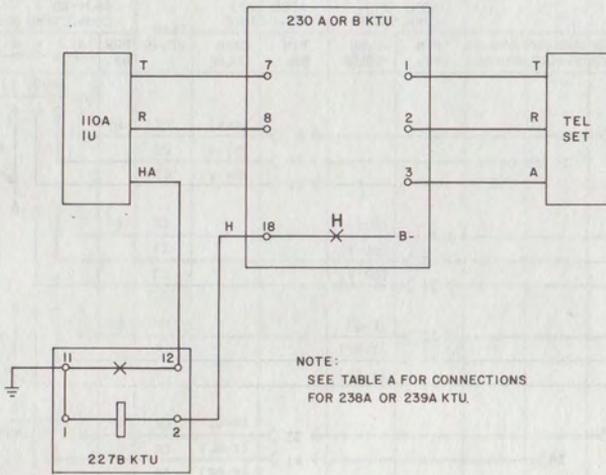


Fig. 8—Typical IA1 Key Telephone System Connecting Diagram