

**SWITCHING SYSTEM NO. 400**  
**J53035A, LISTS 10 AND 11 CABINET ASSEMBLIES**  
**METHOD OF CONNECTING**

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INTERNALLY MOUNTED . . . . .	6	1. GENERAL	
EXTERNALLY MOUNTED . . . . .	8	1.01 This section provides the method of connect- ing the Switching System No. 400 (20-40 Dial Pak) in the J53035A, Lists 10 and 11, manufacture discontinued (MD) cabinet assemblies.	
EXTERNAL POWER SUPPLY . . . . .	8	1.02 This section is reissued to rate the Switching System No. 400, 20-40 Dial Pak, MD. Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.	
5. KEY TELEPHONE UNITS (KTUs) . . . . .	12	1.03 Equipment added to a system should be mounted in accordance with Section 518-710-200.	
INTERNALLY MOUNTED . . . . .	12	1.04 Terminal strips on individual units, within the system, are wire-wrap type. For information on connecting to this type of terminal see Section 069-132-811.	
EXTERNALLY MOUNTED . . . . .	12	1.05 The 66E1-32 connecting blocks in the crown of the cabinet are split 4-clip, 32 terminal blocks. The method of designating and counting blocks is shown in Fig. 1. Blocks G through L appear in List 11	
6. DIRECT STATION SELECTION (DSS) UNITS [LIST 11 (MD) CABINET ASSEMBLY] . . . . .	12		
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**NOTICE**

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

(MD) cabinet assembly only. For information covering this type of block see Sections 461-616-101 and 461-616-102.



*On initial installations strap all stations for either assigned or unassigned service.*

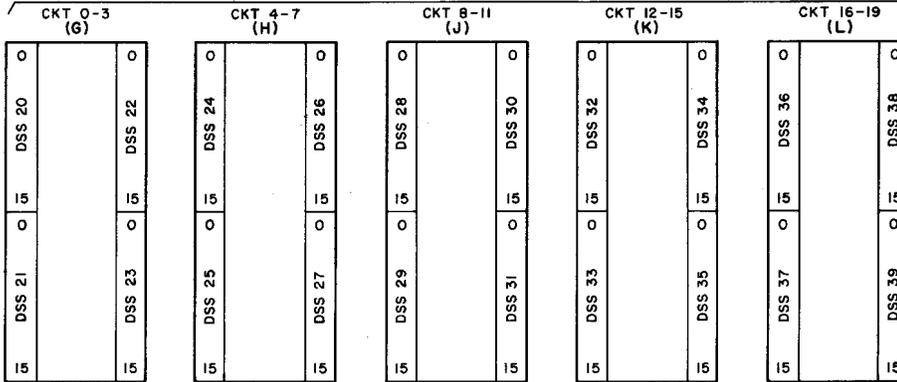
**2. STATION LINES**

**2.01** Arrangement of station lines for assigned, unassigned, or hunting is provided by placing or removing straps on terminal strip B of the line, link, and connector unit associated with each tens group.

**2.02** Terminal strip B for each tens group is located as follows:

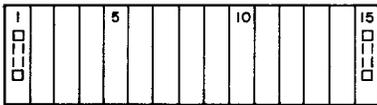
- Lines 20-29, slide 3, mounting space 15
- Lines 30-39, slide 3, mounting space 21

**66E1-32 CONNECTING BLOCKS, DSS CROWN**



(M)

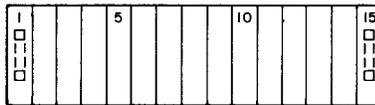
CKT	0	1	2	3	4	5	SP	0	1	2	3	4	5	0-1	2-3
DESIG	- 48V					GRD					SF				



277A TS

(N)

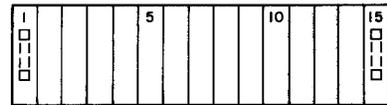
4-5	0-1	2-3	4-5	0-1	2-3	4-5	0-1	2-3	4-5	LG	0-5	BI	0-5	RI
SF	LK		CO		TO		LG		BI		RI			



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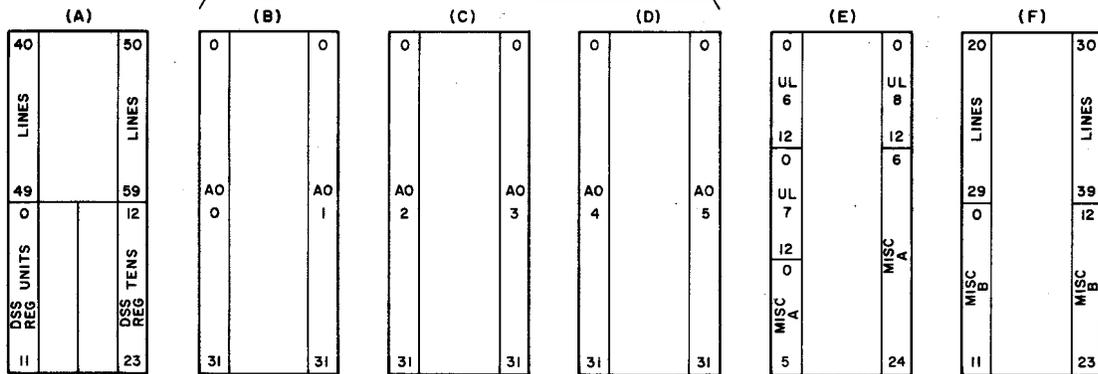
(O)

0-1	2-3	4-5	LW	0-1	2-3	4-5	LF	0-1	2-3	4-5	±10V	0-1	2-3	4-5
RI			LW			LF			±10V					



277A TS

**ADD-ON AND/OR KEY TEL CKTS**

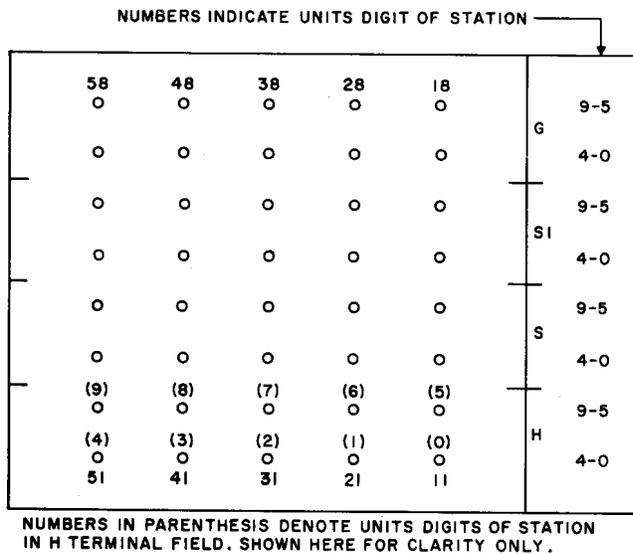


66E1-32 CONNECTING BLOCKS

**Fig. 1—Layout of Connecting Blocks and Terminal Strips in Crown of List 10 (MD) and 11 (MD) Cabinet Assemblies**

- Lines 40-49, if provided, slide 1, mounting space 1
- Lines 50-59, if provided, slide 1, mounting space 7.

**2.03** Terminal strip B of each line, link, and connector unit has an H, S, S1, and G terminal for each station within the tens group (see Fig. 2).



**Fig. 2—Terminal Strip of Line, Link, and Connector Unit**

**ASSIGNED STATION LINES**

**2.04** To place station in service proceed as follows:

- (1) Connect **T** and **R** leads from station to designated terminals in crown of cabinet as shown in Fig. 3. Refer to Fig. 1 for position of blocks A and F.

**Note:** List 11 cabinet assemblies are shop wired with a jumper cable from station lines 20-39 terminal block F to their respective DSS terminal block G through L in crown. When installing a station line not arranged for direct station selection (DSS) disconnect **T** and **R** leads of jumper cable from station line block F and terminate leads from station. Insulate and turn back leads of jumper cable.

- (2) Remove strap between terminals S1 and G and place strap between terminals S1 and S on ter-

terminal strip B of line, link, and connector unit (see Fig. 4).

**UNASSIGNED STATION LINES**

**2.05** To remove a station from service proceed as follows:

- (1) Remove **T** and **R** leads of station from designated terminals in crown of cabinet.
- (2) Remove strap between terminals S1 and S and place strap between terminals S1 and G on terminal strip B of line, link, and connector unit. This places the station in a busy condition.

**Note:** Check H terminal field on terminal strip B and remove hunting feature from station if provided.

**HUNTING ARRANGEMENTS**

**2.06** Hunting for station lines may be arranged within each tens group as follows:

- One-way nonsequential
- One-way sequential
- Two-way nonsequential
- Combination of one-way and two-way nonsequential.

**2.07** For one-way hunting purposes each line, link, and connector unit is furnished with two 426A diodes (H0 and H1) wired to terminal strip A. Terminal strip A is a plug-in assembly to facilitate placing of additional diodes in field (see Fig. 5). Strapping between terminal strip A and H terminal field of strip B inserts diodes into the circuit.

**2.08** To facilitate removal of plug-in assembly, strapping between terminal strips A and B shall be as shown in Fig. 6.

**One-Way Nonsequential Hunting**

**2.09** One-way nonsequential hunting is provided by inserting diodes between H terminals of the lines included in the group with the arrow on each diode pointing in the hunting direction desired (see Fig. 7). If line 20 is dialed and found busy, call will be

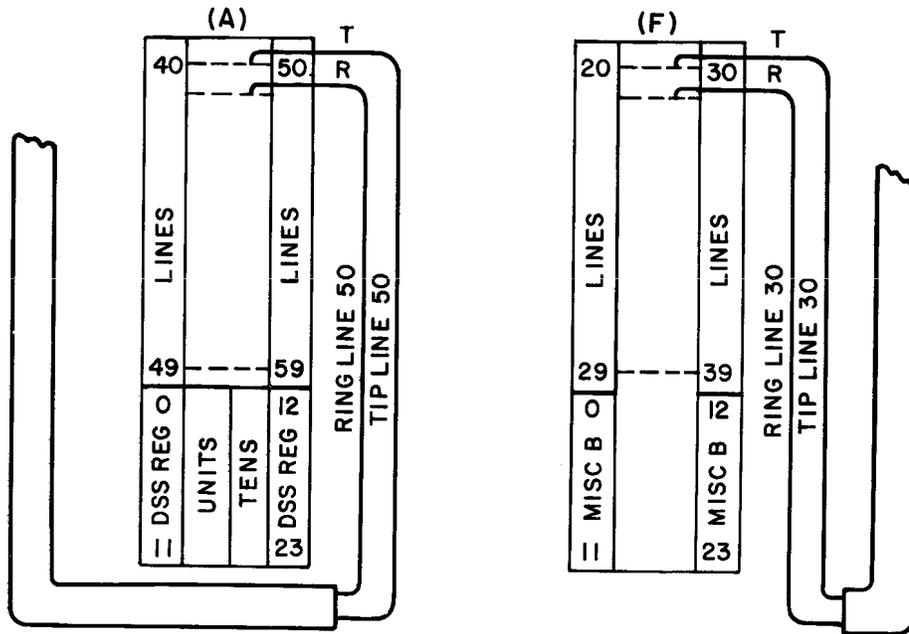


Fig. 3—Method of Terminating Tip and Ring Leads

completed to line 24 if the *ZU* relay is released or to line 29 when the *ZU* relay is operated. If line 24 is dialed and found busy, call will be completed to line 29 if idle. If line 29 is dialed and found busy, call will be routed to busy tone.

**One-Way Sequential Hunting**

2.10 One-way sequential hunting can be provided only if all the lines to be included are in the same subgroup of 5 lines (0-4 or 5-9) and the hunting sequence conforms with the numerical sequence of the line numbers. For example, as shown in Fig. 8, if line 20 is dialed and found busy, call will be completed to line 22 if idle. If line 22 is busy however, call will be completed to line 24, if idle. If line 24 is dialed and found busy, call will be routed to busy tone.

**Two-Way Nonsequential Hunting**

2.11 A two-way nonsequential hunting group is formed by providing straps between the H terminals of the lines included in the group (see Fig. 9).

**Combination of One- and Two-Way Nonsequential Hunting**

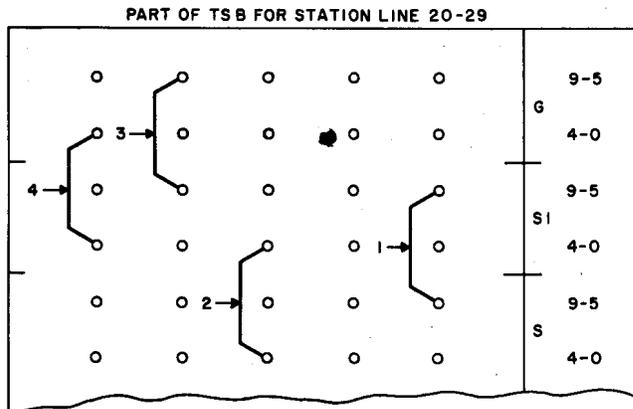
2.12 A combined hunting group is formed by providing straps and diodes between the H terminals

of the lines included in the group to produce the desired hunting pattern. For example as shown in Fig. 10, if line 20 is dialed and found busy, call will be completed to line 26, if idle. If line 26 is dialed and found busy, call will be completed to line 20 if idle. If line 27 is dialed and found busy, call will be completed to line 20 if the *ZU* relay is released, or to line 26 when the *ZU* relay is operated. References for Part 2 are as follows:

- SD-69463-01
- SD-69469-01
- SD-69470-01.

**3. LINE, LINK, AND CONNECTOR UNITS FOR STATION LINES 40-49 AND 50-59**

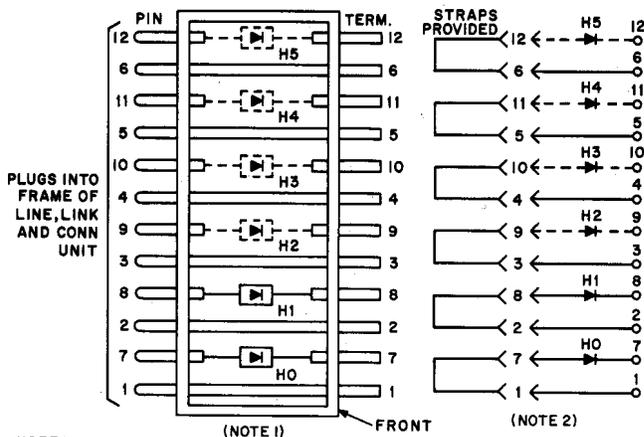
3.01 To place these units in service after they have been mounted, straps have to be placed and removed on terminal strips of dial pulse registers 0 and 1. Terminal strips are located on mounting spaces 8 (register 0) and 12 (register 1) of slide 2. Proceed as follows:



EXAMPLES

- 1-STATION 25, ASSIGNED
- 2-STATION 22, ASSIGNED
- 3-STATION 28, UNASSIGNED
- 4-STATION 24, UNASSIGNED

Fig. 4—Typical Strapping on Terminal Strip B of Line, Link, and Connector Unit (Station Lines 20-29)



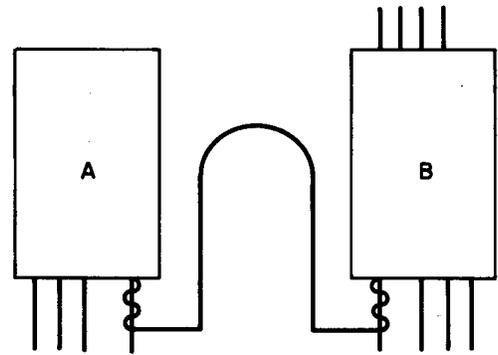
NOTES:

- 1. DIODES H0 AND H1 PROVIDED. INSTALL REMAINING DIODES (426A) AS REQUIRED.
- 2. DIODE ARRANGEMENT SHOWN FOR CLARITY.

Fig. 5—Terminal Strip A (Diode Assembly on Line, Link, and Connector Unit

(a) For lines 40-49

- (1) Remove strap between terminals 22 and 12, and place strap between terminals 22 and 32 on each dial pulse register terminal strip.
- (2) Install 70A fuse, if not provided, in fuse position L4 on fuse panel designated L, LK, AND CONN. Fuse panel located slide 1.



TOP VIEW

Fig. 6—Method of Dressing Straps Between Terminal Strips A and B

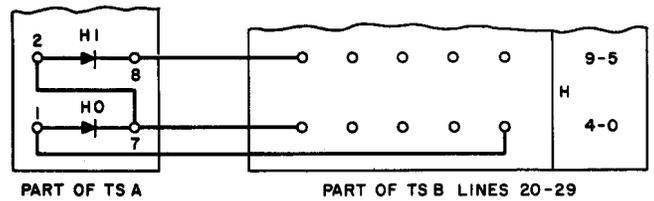


Fig. 7—One-Way Nonsequential Hunting Group Consisting of Station Lines 20, 24, and 29

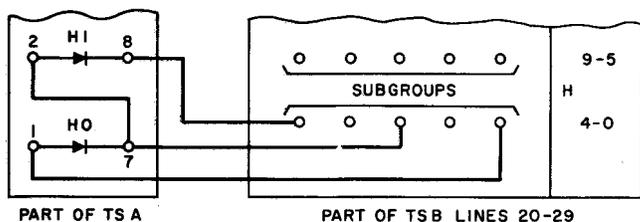


Fig. 8—One-Way Sequential Hunting Group Consisting of Station Lines 20, 22, and 24

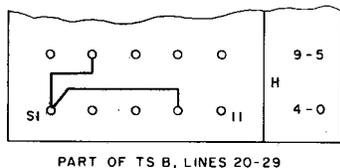


Fig. 9—Two-Way Nonsequential Hunting Group Consisting of Station Lines 21, 24, and 28

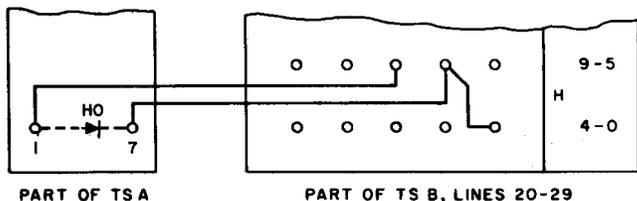


Fig. 10—Combination of One- and Two-Way Nonsequential Hunting Group Consisting of Station Lines 20, 26, and 27

- (3) For lines 50-59
- (4) Remove strap between terminals 23 and 13, and place strap between terminals 23 and 33 on each dial pulse register terminal strip.
- (5) Install 70A fuse, if not provided, in fuse position L5 on fuse panel designated L, LK, AND CONN. Fuse panel located slide 1. References for Part 3 are as follows:
  - (a) SD-69463-01
  - (b) SD-69469-01
  - (c) SD-69470-01.



All station lines associated with each line, link, and connector unit must be strapped for assigned or unassigned service when installing these units. See paragraph 2.04 and 2.05.

#### 4. ADD-ON LINE UNITS

##### INTERNALLY MOUNTED

4.01 Internally mounted add-on line units (J53035CH, List 1) are plug-in types. Lists 10 and 11 (MD) cabinet assemblies are factory equipped with two add-on units wired to positions 0 and 1 in the crown (see Fig. 11 and Tables A, B, and C).

4.02 An add-on line unit consists of two 1A1 Key Telephone System line circuits coupled together by a bridging circuit. A central office (CO) or PBX line is assigned to one line circuit and a Switching System No. 400 station line is assigned to the other, with both lines appearing at the same multibutton key telephone set. The bridging circuit which couples the two line circuits is activated by a signal key.



*Trouble may occur between line circuits of an add-on line unit, when an add-on line circuit or portion thereof multiples at another telephone set. The trouble occurs only when a station is using a portion of one add-on line unit and the other station operates the common signaling key to activate another add-on line unit. To avoid this type trouble, provide a separate signal key per add-on line circuit, whenever add-on circuits or portions thereof are multiplied at stations other than auxiliary answering positions.*

4.03 The line circuits associated with add-on line units are identical in operation to and provide the same features as the 202D key telephone unit (KTU), except for the following items:

- (a) The HA lead normally used to control winking hold is not provided.
- (b) Internal strip-mounted units require -48 Vdc for relay operation.

4.04 These line circuits can be used for regular 1A1 Key Telephone System installations when not required for add-on feature use. Proceed as follows:

TABLE A (FOR FIG. 11)

ADD-ON AND KEY TELEPHONE CIRCUIT  
ASSIGNMENTS

CROWN TERMINAL STRIPS				
CIRCUITS	BLOCK B	BLOCK C	BLOCK D	EQUIPMENT NUMBER
Add-on	0-1	2-3	4-5	J53035CH List 1 (MD)
		or		
Key Tel	—	0-5	6-11	J53035CJ List 1 (MD)

TABLE B (FOR FIG. 11)

## FUSE AND TERMINAL BLOCK ASSIGNMENTS

FUSES	ADD-ON CIRCUIT NO.		KEY TEL CIRCUIT NO.	CROWN TS BLOCK	FACTORY EQUIPPED WITH
0	0	—	—	B	Add-on
1	1	—	—	B	Add-on
2	2	or	0-2	C	Optional
3	3	or	3-5	C	Optional
4	4	or	6-8	D	Optional
5	5	or	9-11	D	Optional

- (1) Block **Z** and **W** relays nonoperated with blocking tools.
  - (2) Do not provide **S** (**SG**) lead to station.
  - (3) If each line circuit requires a separate ringer, connect **R1** and **B1** leads as required to proper clips of crown terminal strips B, C, or D for the respective KTU involved (see Fig. 11).
- 4.05** The R relay of each line circuit can be modified to provide a nonlocking arrangement. For this modification, move the upper make wire spring

contact from its guide in contact 4 to the lower guide of contact position 5. Move the lower make wire spring contact 4 to the upper guide of contact position 3. Contact positions 3 and 5 are unequipped and the stationary contacts are unwired.

**4.06** The internally mounted common equipment for line circuits of add-on units and KTU is located with the power supply on slide 1. It consists of a **TO** relay for time-out purposes and an interrupter which provides flashing, winking, and ringing interruptions. The common equipment is furnished wired to terminal strips M, N, and O in crown. From

TABLE C (FOR FIG. 11)

## OPTIONS

OPTION	FEATURE
H	Wink Hold Lamp (Furnished)
J	Steady Hold Lamp
S	External $\pm 10$ Volt Supply and Interrupter
T	Internal $\pm 10$ Volt Supply and Interrupter (Furnished)
V	Grounded Ringing
X	Metallic Ringing (Furnished)

terminal strips M, N, and O, these leads are distributed to all internal add-on and/or key telephone unit locations and to the miscellaneous terminal strip in crown of cabinet for connection to external add-on or key telephone units. **Use the internally mounted TO relay and interrupter with the internal  $\pm 10V$  power supply only.**

**4.07** The internally mounted  $\pm 10V$  power supply will furnish up to 2 amperes (fifty 51A line lamps) for add-on and key telephone units.

**4.08** When more than fifty 51A line lamps are required, install external  $\pm 10$ -volt power supply and common control equipment (TO relay and interrupter) such as a 232-type KTU. Connect as shown in Note 1 of Fig. 12, 13, and 34. However, the internal interrupter will always furnish the **SF** lead.

**EXTERNALLY MOUNTED**

**4.09** Externally mounted add-on units (two 249A and one 250A KTU per add-on line) may be mounted in any standard apparatus cabinet designed to mount 200-type KTU (see Fig. 12 for connections).

**4.10** The 249A KTU can be used for regular 1A1 Key Telephone System installations when not required for the add-on feature. Proceed as follows:

- (1) Block **Z** and **W** relays of 250A KTU nonoperated with blocking tool.
- (2) Do not provide **S** (**SG**) lead to station.
- (3) If each line circuit requires a separate ringer:

- (a) Remove strap between terminals 10 of 249A units
- (b) Connect R1 and B1 leads from station ringers to terminals 10 and 25 of each unit, respectively.

**EXTERNAL POWER SUPPLY**

**4.11** Figure 13 provides connections for external  $\pm 10V$  power supply, interrupter, and time-out circuit.

**4.12** If the external interrupter is to serve more than one externally mounted add-on and key telephone system, use auxiliary time-out circuit wired as shown in Fig. 13.

**4.13** Due to the dc voltage difference of the internal and external power supplies, a line circuit used with the internal interrupter and time-out circuit cannot be used to control an external interrupter and time-out circuit. Conversely, a line circuit associated with an external interrupter and time-out circuit cannot be used to control an internal interrupter and time-out circuit.

**4.14** Ground external power supply to same ground used for Switching System No. 400 cabinet with No. 14 gauge wire or equivalent. References for Part 4 are as follows:

- SD-69463-01
- SD-69466-01
- SD-69474-01.

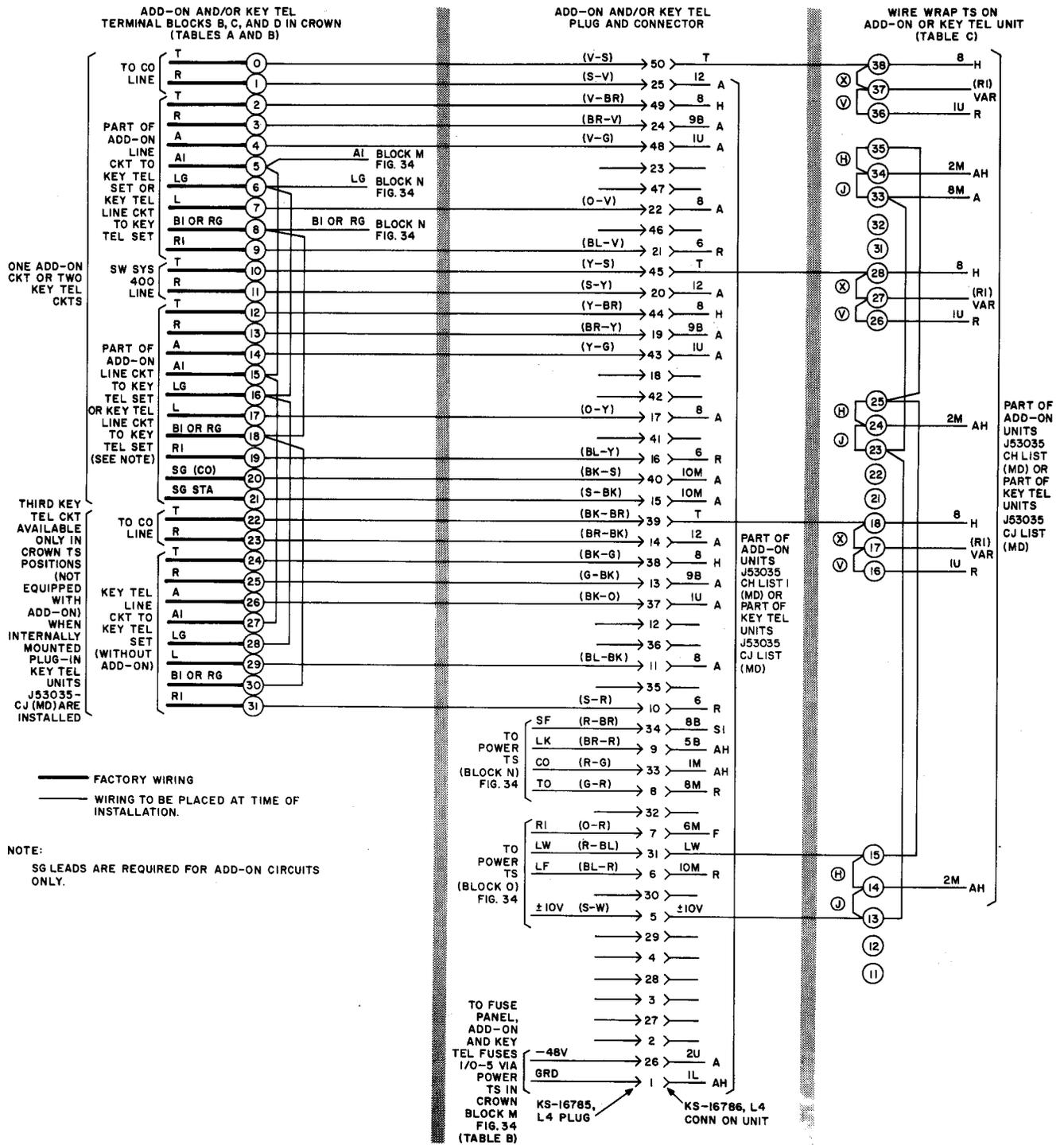


Fig. 11—Connections for Internal Add-on and Key Telephone Units

NOTES

1.

WIRING OPTIONS

OPTION	FEATURE
H	WINK HOLDLAMP
J	STEADY HOLDLAMP
S	EXT. ±10 VOLT PWR SUP AND INTER
T	INT ±10 VOLT PWR SUP AND INTER (FUR)
V	GROUNDING RINGING
X	METALLIC RINGING (FUR)

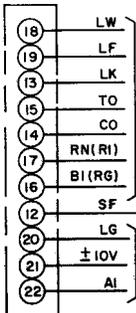
2. MULTIPLE TO OTHER INTERNAL OR EXTERNAL ADD-ON CIRCUITS ASSOCIATED WITH SAME TELEPHONE SET. TO PROVIDE CONNECTION TO INTERNAL UNIT STRAP AS FOLLOWS:

FROM 249A KTU	TO ASSOCIATED ADD-ON TERM BLOCK IN CROWN
TERM	TERM
(28) S(SG)	(20,21)
(10) (R1)	(9,19)

3. PROVIDE ONLY ONE S(SG), R1 AND BI(RG) LEAD TO TELEPHONE SET FOR ALL MULTIPLIED ADD-ON CIRCUITS, DESIGNATIONS IN PARENTHESIS INDICATE DESIGNATIONS SHOWN ON SD DRAWINGS, GROUND OTHER SIDE OF SIGNAL KEY.

4. CONNECT FIRST EXTERNALLY MOUNTED ADD-ON LINE UNIT TO MISC B TERM. STRIP ON BLOCK F IN CROWN WITH (T) OPTION OR TO EXTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER WITH (S) OPTION WIRE ALL OTHER UNITS TO PRECEDING EXTERNALLY MOUNTED ADD-ON OR KEY TEL UNIT. SEE FIG.13

MISC B TERM. STRIP, BLK F IN CROWN



(NOTE 4)

WIRE TO FIRST UNIT ONLY

USE AS NEEDED

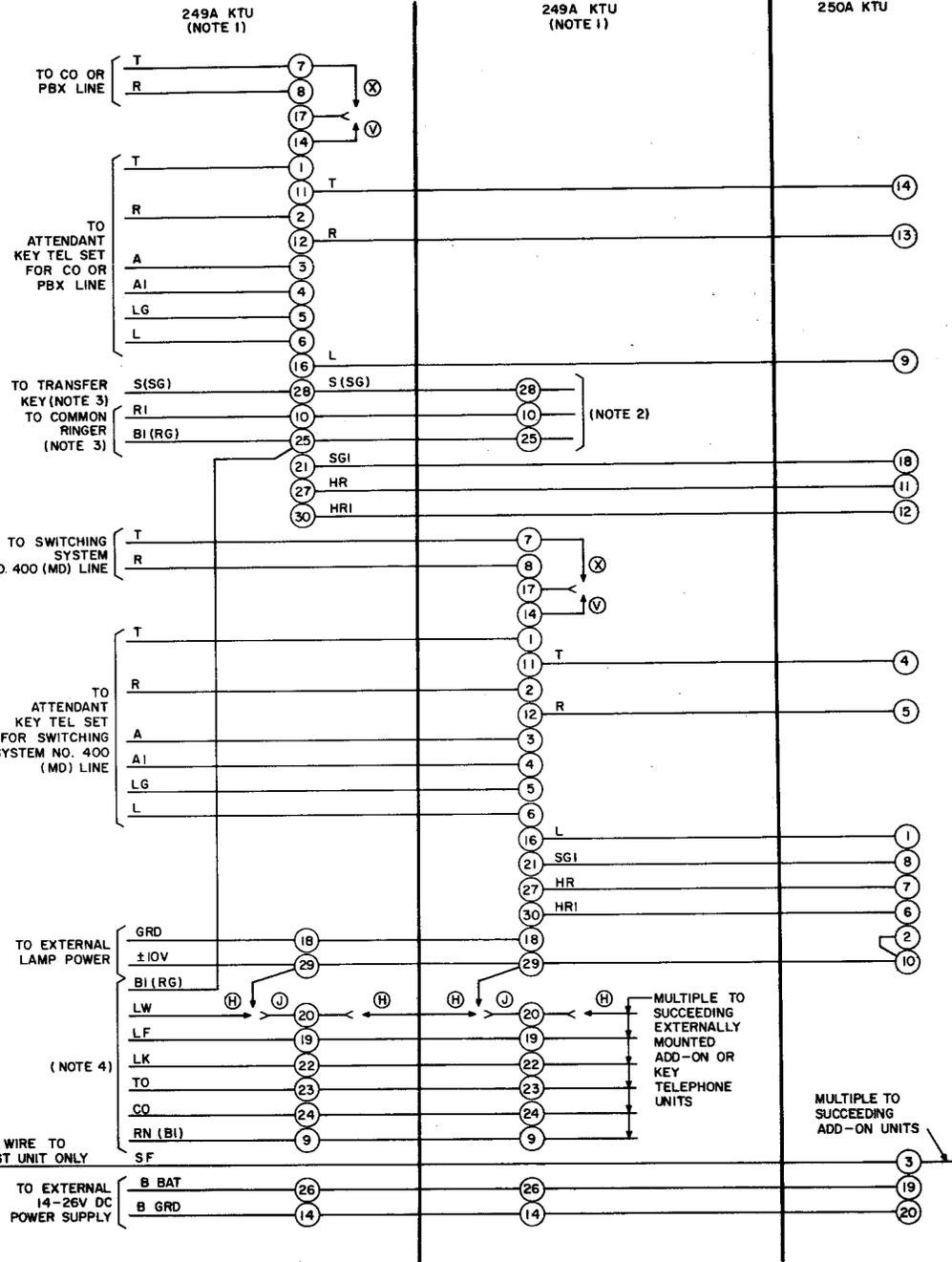


Fig. 12—Connections for External Add-on Circuits



## SECTION 518-710-402

### 5. KEY TELEPHONE UNITS (KTUs)

#### INTERNALLY MOUNTED

**5.01** Internally mounted (plug-in) KTUs units contain 3-line circuits mounted on a 2- by 23-inch mounting plate. These line circuits are identical in operation to and provide the same features as 202D KTUs except 48 Vdc is used for relay operation, and the *HA* lead is not provided. To control winking hold, use the CO lead (see Fig. 13).

**5.02** A Switching System No. 400 line assigned to a multibutton key telephone set can be connected to line circuits of KTUs, to provide the same features as found on central office or PBX lines (ie, pickup, flashing, holding, etc).

**5.03** Figure 11 shows the connections for internally mounted J53035CJ, List 1 (MD) plug-in KTUs. Necessary leads for KTUs (9-12, 6-8, 3-5, and 0-2) are terminated in a KS-connector at the respective mounting plate locations. Install 70A fuses, if not provided, in fuse positions 2-5 as required, on fuse panel designated ADD-ON & K TEL. Fuse panel located on slide 1.

**5.04** The common equipment, for line circuits whether internally or externally mounted, is the same as used for add-on line units (see paragraph 4.06).

**5.05** Internally mounted KTUs are furnished with X and H options shop wired (see Fig. 11).

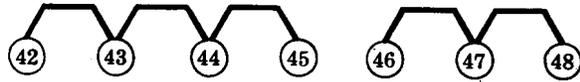
**5.06** The R relay of each line circuit can be modified to provide a nonlocking arrangement (see paragraph 4.05).

**5.07** When station busy lamp circuit is provided, a KS-15724, List 1 diode must be furnished locally and installed in the telephone set in series with the BL lead. For connections refer to applicable telephone set connection section.

#### EXTERNALLY MOUNTED

**5.08** Externally mounted KTUs may be standard 1A1 Key Telephone System line circuits [202D (MD), 230B (MD) KTU, etc]. Connections are shown in Fig. 14. References for Part 5 are as follows:

- SD-69463-01
- SD-69466-01
- SD-69474-01.



### 6. DIRECT STATION SELECTION (DSS) UNITS [LIST 11 (MD) CABINET ASSEMBLY]

#### AUXILIARY RELAY UNITS AND AUXILIARY REGISTER UNIT (INTERNALLY MOUNTED)

**6.01** List 11 cabinet assemblies are shop wired with straps on terminal strips of dial pulse registers 0 and 1 as follows:

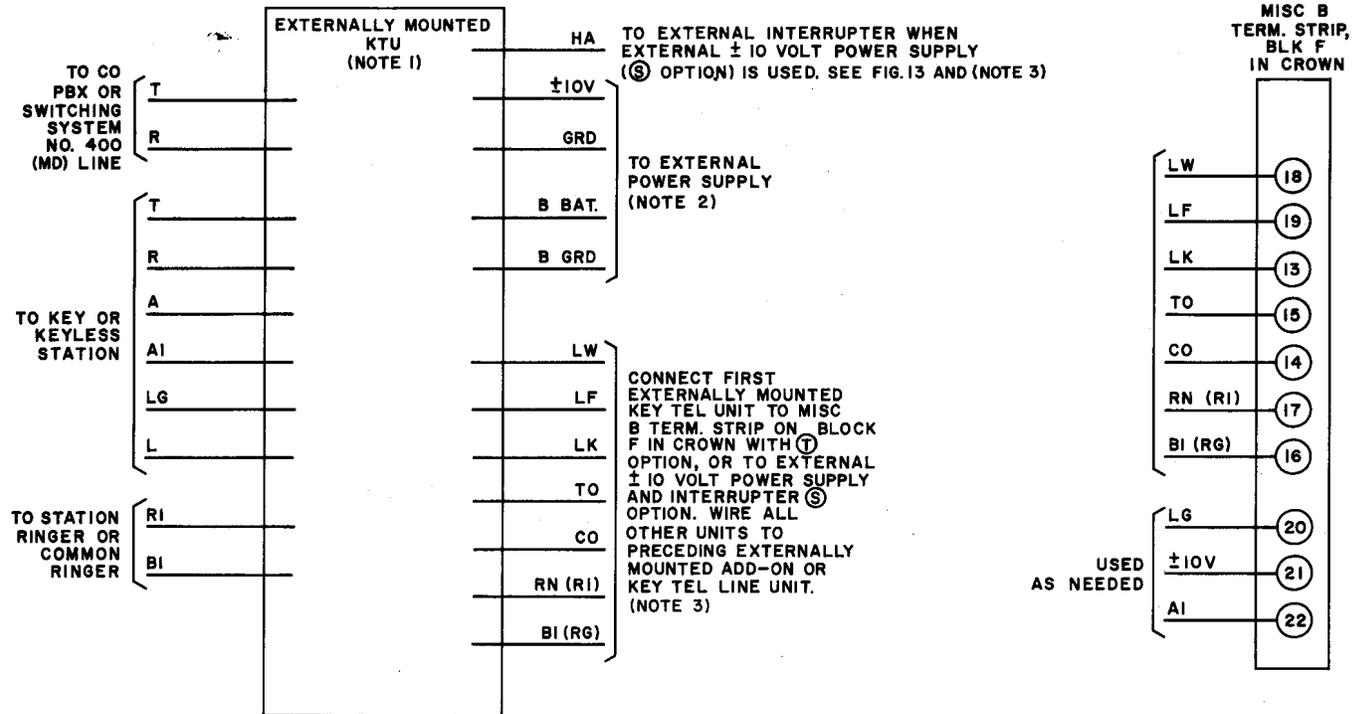
When initially installing DSS, remove straps from terminals 43 to 44 and 47 to 48 on terminal strip of each dial pulse register unit. Terminal strips are located on slide 2 mounting spaces 8 (register 0) and 12 (register 1).

**Note:** DSS is not provided for the List 10 cabinet assembly. If required, it must be engineered and installed locally.

**6.02** List 11 (MD) cabinet assemblies are shop wired so that internally mounted auxiliary relay units are assigned to station lines 20-30, respectively.

**6.03** For DSS, List 11 (MD) cabinet assemblies are furnished with:

- (a) Two auxiliary relay units (0-3 and 4-7) wired as shown in Fig. 15, 16, and 20).
- (b) Four plug-in diode assemblies J53035BC, List 2 (MD) mounted in jacks, on each auxiliary relay unit (Fig. 22).
- (c) Auxiliary register unit wired as shown in Fig. 20.
- (d) Local cabling for adding three additional auxiliary relay units in cabinet.
- (e) A jumper cable from station lines 20-39 on terminal block F to their respective DSS terminal



NOTES:

1. MAY BE ANY STANDARD IAI KEY TELEPHONE SYSTEM LINE CIRCUIT (202D, 230B KTU, ETC). OPTIONS REQUIRED MUST BE WIRED IN LOCALLY. FOR CONNECTIONS SEE SECTION COVERING TYPE OF UNIT PROVIDED.
2. GROUND EXTERNAL POWER SUPPLY TO SAME GROUND USED FOR SWITCHING SYSTEM NO. 400 (MD) CABINET WITH A NO. 12 WIRE.

3. WIRING OPTIONS

OPTION	FEATURE
S	EXTERNAL ± 10 VOLT POWER SUPPLY AND INTERRUPTER
T	INTERNAL ± 10 VOLT POWER SUPPLY AND INTERRUPTER (FURNISHED)

Fig. 14—Connections for External Key Telephone Units

block G-L in crown (refer to Fig. 1 for location of blocks in crown).

6.04 To add additional auxiliary relay units to List 11 (MD) cabinet assembly, proceed as follows:

- (1) Install unit as per section entitled Switching System No. 400, Installation.
- (2) Connect unit as shown in Fig. 17, 18, 19, and 20. Figure 17, 18, and 19 extend the necessary leads from unit to associated DSS terminal blocks in crown for connection to station. Leads will be found in tube at equipment mounting location. Figure 20 shows the multiple strapping to preceding unit. These leads have to be provided.

(3) Install plug-in diode assemblies into appropriate jacks as required.

(4) To place station arranged for DSS in service (see paragraph 6.07).

AUXILIARY RELAY UNITS (EXTERNALLY MOUNTED)

6.05 To add externally mounted auxiliary relay units to List 11 (MD) cabinet assembly equipped with internal units, proceed as follows:

- (1) Install auxiliary relay units in external cabinet.
- (2) Connect unit as shown in Fig. 20 and 21. Connection to external unit shown in Fig. 21 can

be direct or through a distributing terminal. Figure 20 shows multiple strapping that is required between the first externally mounted unit and the last internally mounted unit. Connections for multiple strapping cannot be made in crown DSS REG terminal block because only one wire can be terminated in clip. Cable from external unit to internal unit should follow existing cables to avoid interfering with opening and closing of slide.

(3) Install plug-in diode assemblies into appropriate jacks as required.

(4) To place station arranged for DSS in service (see paragraph 6.07).

**6.06** When the line, link, and connector unit for station lines 50-59 is added to a List 11 (MD) cabinet assembly, all internally mounted auxiliary relay units must be mounted externally. See Table G and proceed as follows:

(1) Remove all internal units after disconnecting leads from LA, LB, LG, and REG LK terminal strips (see Fig. 15, 16, 17, 18, 19, and 20). Do not disconnect leads used for wiring of unit. Store leads in tubes at mounting place locations.

(2) Remove leads from inside clips of DSS REG terminal block A in crown. Turn back leads on form.

(3) Remove leads from outside clips of DSS terminal blocks G-L in crown. Turn back leads on form.

(4) Mount units in external cabinet.

(5) Connect units as shown in Fig. 15, 16, 17, 18, 19, and 20. Provide cable for connection from first externally mounted unit to inside clips of DSS REG terminal block A in crown for multiple strapping as shown in Fig. 20, and to outside clips of DSS terminals G-L for reconnecting leads required for stations as shown in Fig. 15, 16, 17, 18, and 19.

#### PLACING STATION ARRANGED FOR DSS IN SERVICE

**6.07** To place station arranged for DSS in service, proceed as follows:

(1) Remove straps on dial pulse registers 0 and 1 as covered in paragraph 6.01, if this is first station assigned.

**TABLE D**

**COMBINATIONS OF DSS EQUIPPED LINES**

NUMBER OF STATION LINES INSTALLED	INTERNALLY MOUNTED DSS UNITS	EXTERNALLY MOUNTED DSS UNITS
20	20	None
21-30	16	5-14
31-40	None	31-40

(2) Connect station line in crown to assigned auxiliary relay unit. In list 11 (MD) cabinet assemblies station lines 20-39 are already wired to respective DSS terminal blocks in crown. (To assign station line, see paragraph 2.04.)

(3) Connect telephone set leads and signal key leads as shown in Fig. 15, 16, 17, 18, 19, and 21. When key sets are used, line circuits of key telephone units are inserted between telephone set and DSS equipment.

(4) Provide straps between the tens and units terminal strips on auxiliary relay units to assign called stations to signal keys (see Fig. 22). References for Part 6 are as follows:

(a) SD-69463-01

(b) SD-69467-01

(c) SD-69470-01.

#### 7. UNIVERSAL LINE CIRCUITS

**7.01** Universal line circuits may be assigned to the following:

- Station lines, Fig. 23

- 3A code call, Fig. 24

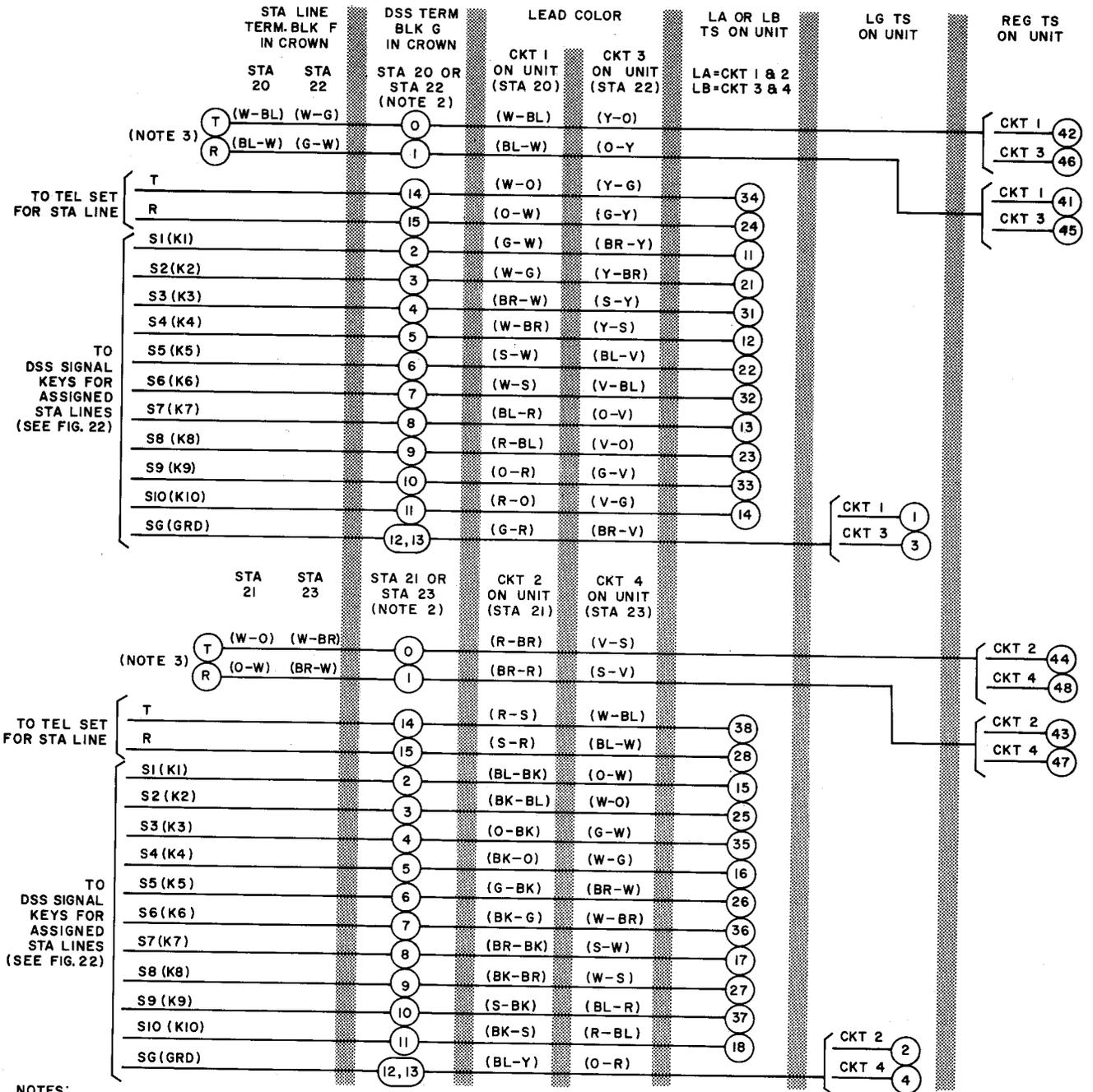
- Interface trunk, Fig. 24

- 2-way tie trunk, Fig. 25

- Telephone dictation trunk, Fig. 25

- Automatic Trunk Level Interconnect Unit, Fig. 25

AUXILIARY RELAY UNITS 0-3  
STATION LINES 20-23  
MOUNTING SPACES 14 AND 13-SLIDE 1  
(NOTE 1)

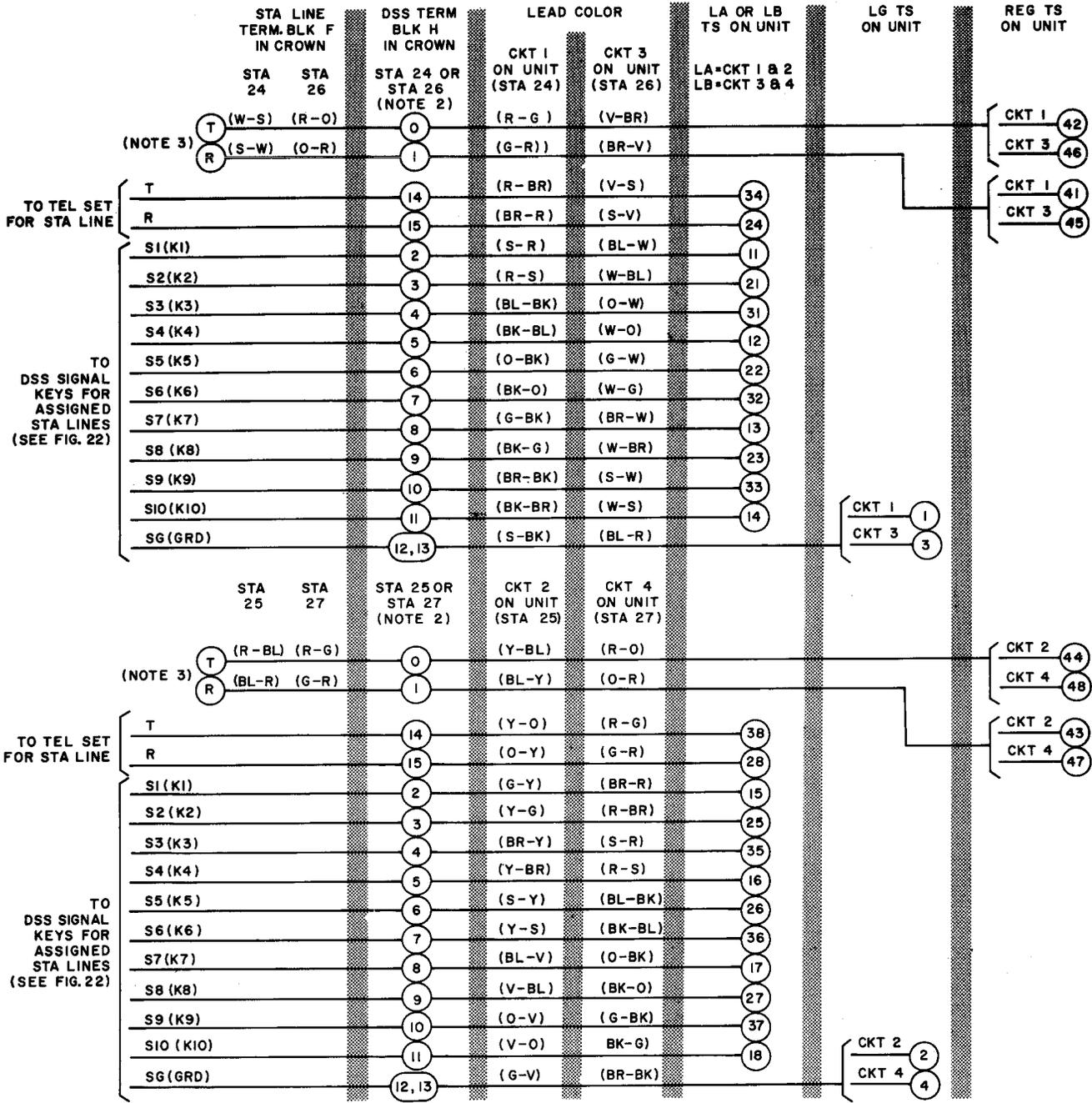


NOTES:

1. ADDITIONAL STRAPPING SHOWN IN FIG. 20 AND 22.
2. EACH STATION IS ASSIGNED TERMINALS 0-15 ON DSS TERMINAL BLOCKS IN CROWN. (SEE FIG. 1)
3. STATION LINES 20-39 ARE FURNISHED WIRED TO THEIR RESPECTIVE DSS TERMINAL BLOCKS IN CROWN.

Fig. 15—Connections for Auxiliary Relay Units 0-3 [Furnished Wired With List 11 (MD) Cabinet Assembly]

AUXILIARY RELAY UNITS 4-7  
STATION LINES 24-27  
MOUNTING SPACES 12 AND 11 - SLIDE 1  
(NOTE 1)

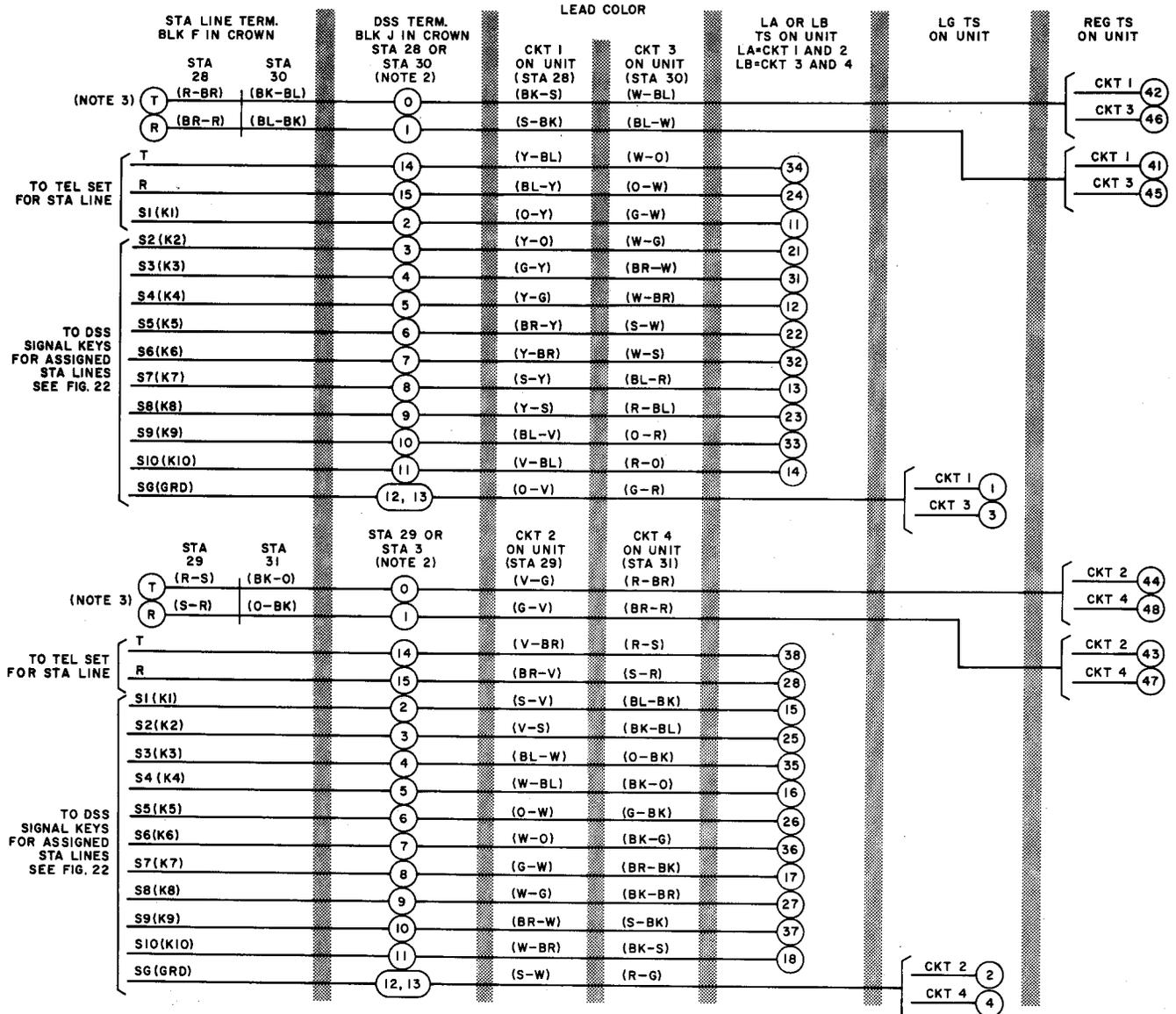


NOTES:

1. ADDITIONAL STRAPPING SHOWN IN FIG. 20 AND 22.
2. EACH STATION IS ASSIGNED TERMINALS 0-15 ON DSS TERMINAL BLOCKS IN CROWN.
3. STATION LINES 20-39 ARE FURNISHED WIRED TO THEIR RESPECTIVE DSS TERMINAL BLOCKS IN CROWN.

Fig. 16—Connections for Auxiliary Relay Units 4-7 [Furnished Wired With List 11 (MD) Cabinet Assembly]

AUXILIARY RELAY UNITS 8-II  
STATION LINES 28-31  
MOUNTING SPACES 10 AND 9—SLIDE 1  
(NOTES 1 AND 4)



- NOTES:
1. ADDITIONAL STRAPPING SHOWN IN FIG. 20 AND 22.
  2. EACH STATION IS ASSIGNED TERMINALS 0-15 ON DSS TERMINAL BLOCKS IN CROWN.
  3. STATION LINES 20-39 ARE FURNISHED WIRED TO THEIR RESPECTIVE DSS TERMINAL BLOCKS IN CROWN.
  4. ALL LEADS FROM EQUIPMENT LOCATIONS ARE SHOP TERMINATED IN CROWN DSS TERMINAL BLOCKS.

Fig. 17—Connections for Auxiliary Relay Units 8-11

AUXILIARY RELAY UNITS 12-15  
STATION LINES 32-35  
MOUNTING SPACES 8 AND 7-SLIDE 1  
(NOTES 1 AND 4)

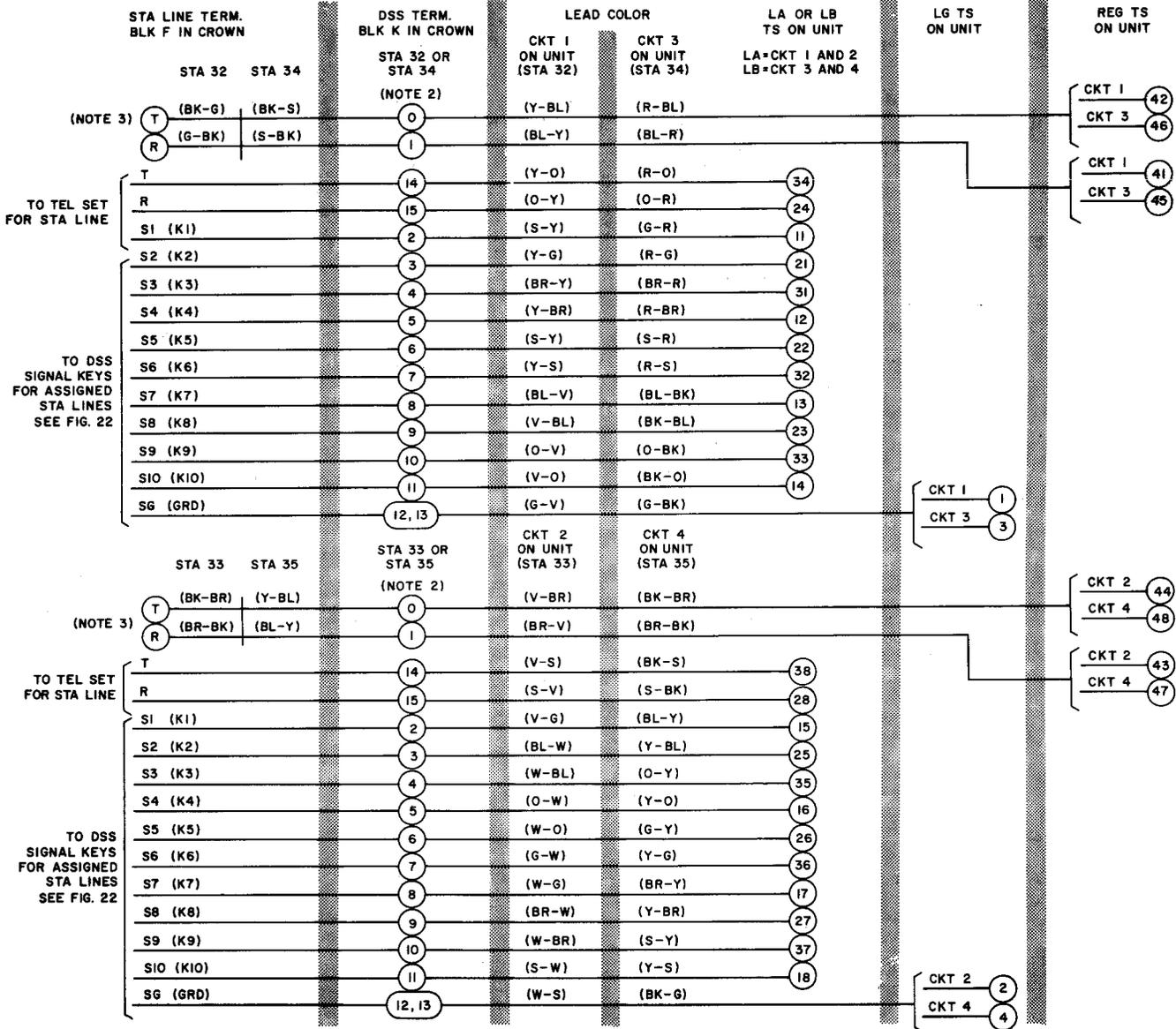
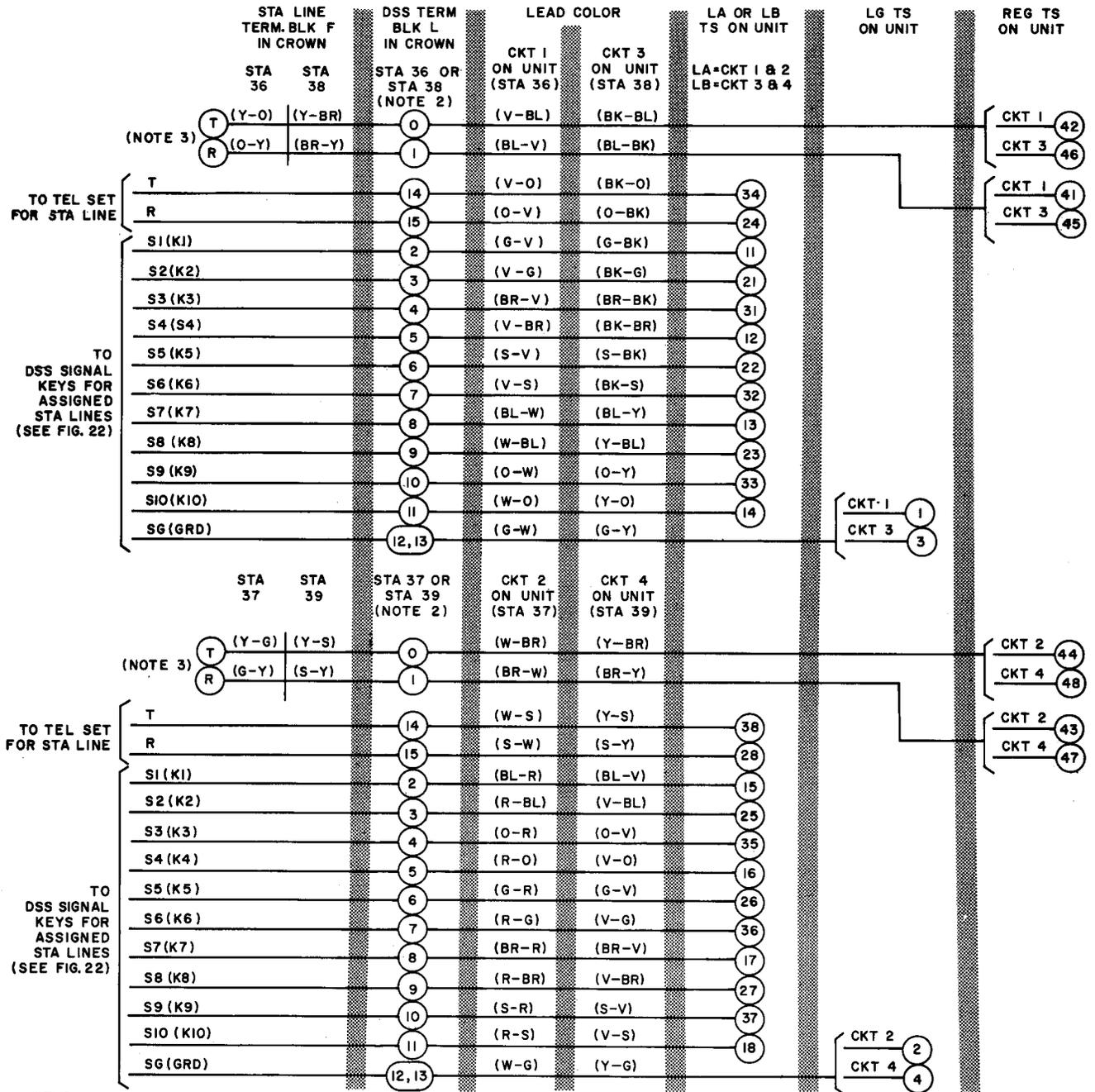


Fig. 18—Connections for Auxiliary Relay Units 12-15

AUXILIARY RELAY UNITS 16-19  
STATION LINES 36-39  
MOUNTING SPACES 6 AND 5-SLIDE 1  
(NOTE 1 AND 4)



NOTES:

1. ADDITIONAL STRAPPING SHOWN IN FIG. 20 AND 22.
2. EACH STATION IS ASSIGNED TERMINALS 0-15 ON DSS TERMINAL BLOCKS IN CROWN.
3. STATION LINES 20-39 ARE FURNISHED WIRED TO THEIR RESPECTIVE DSS TERMINAL BLOCKS IN CROWN.
4. ALL LEADS FROM EQUIPMENT LOCATIONS ARE SHOP TERMINATED IN CROWN DSS TERMINAL BLOCKS.

Fig. 19—Connections for Auxiliary Relay Units 16-19

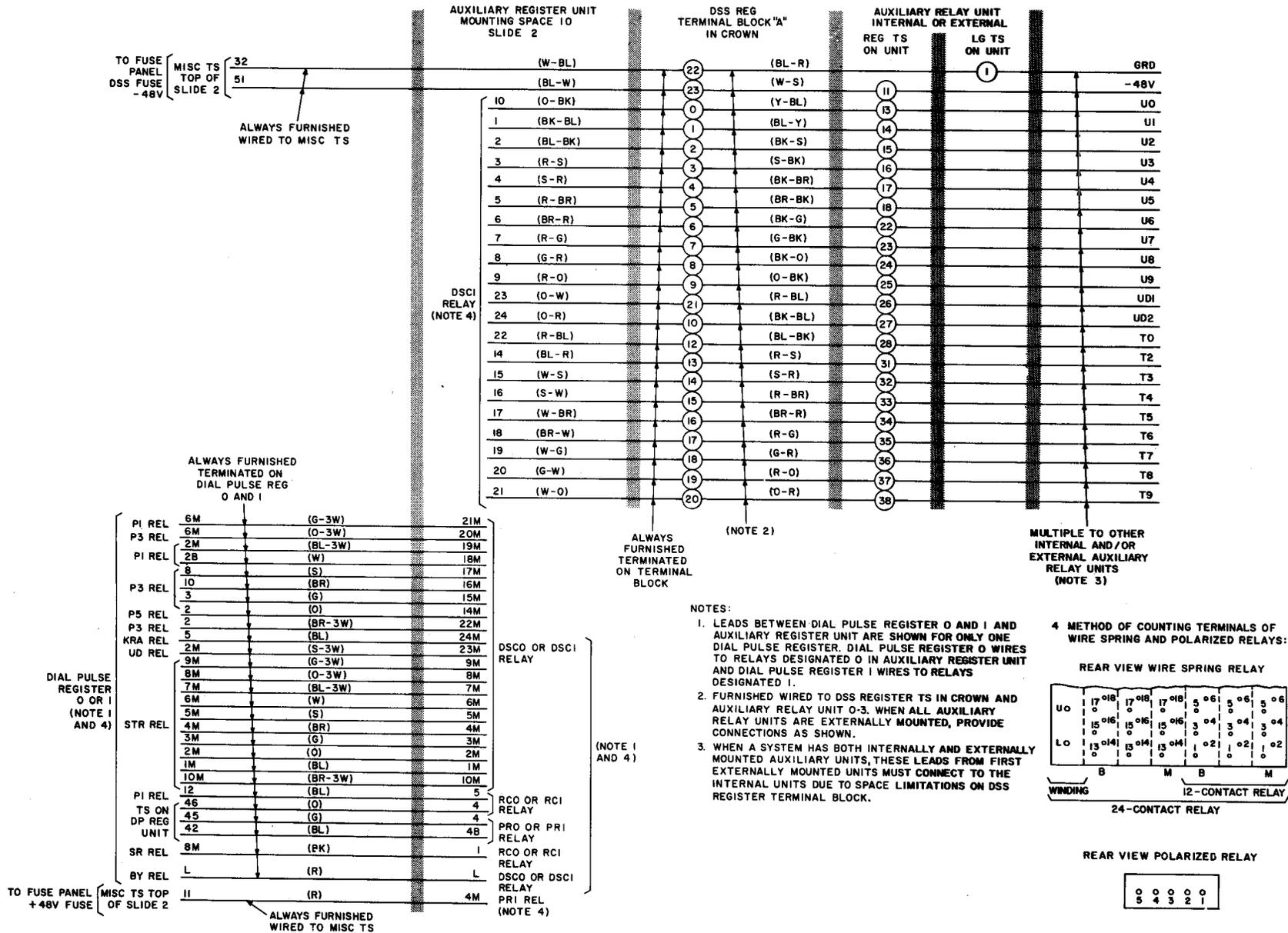
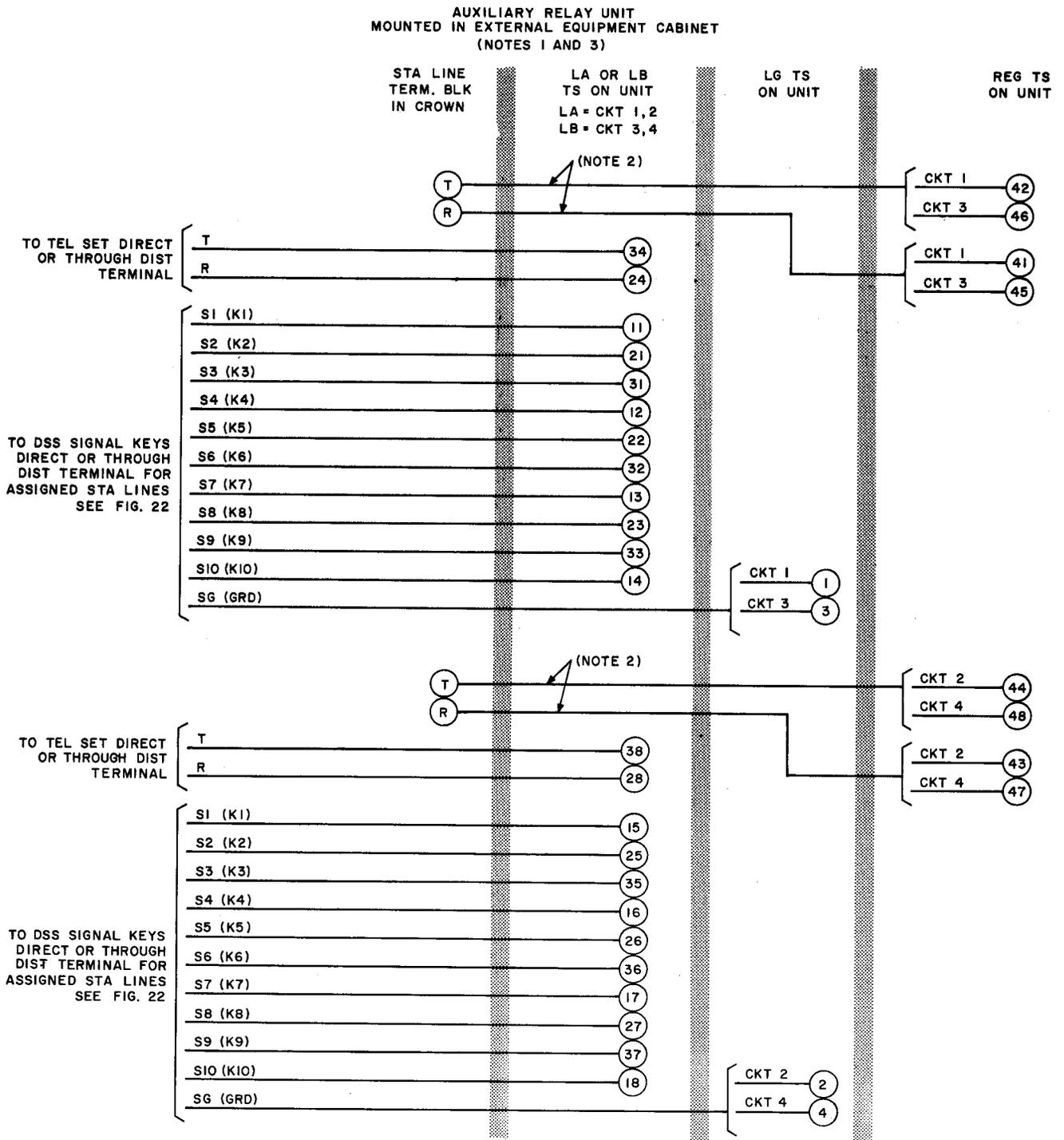


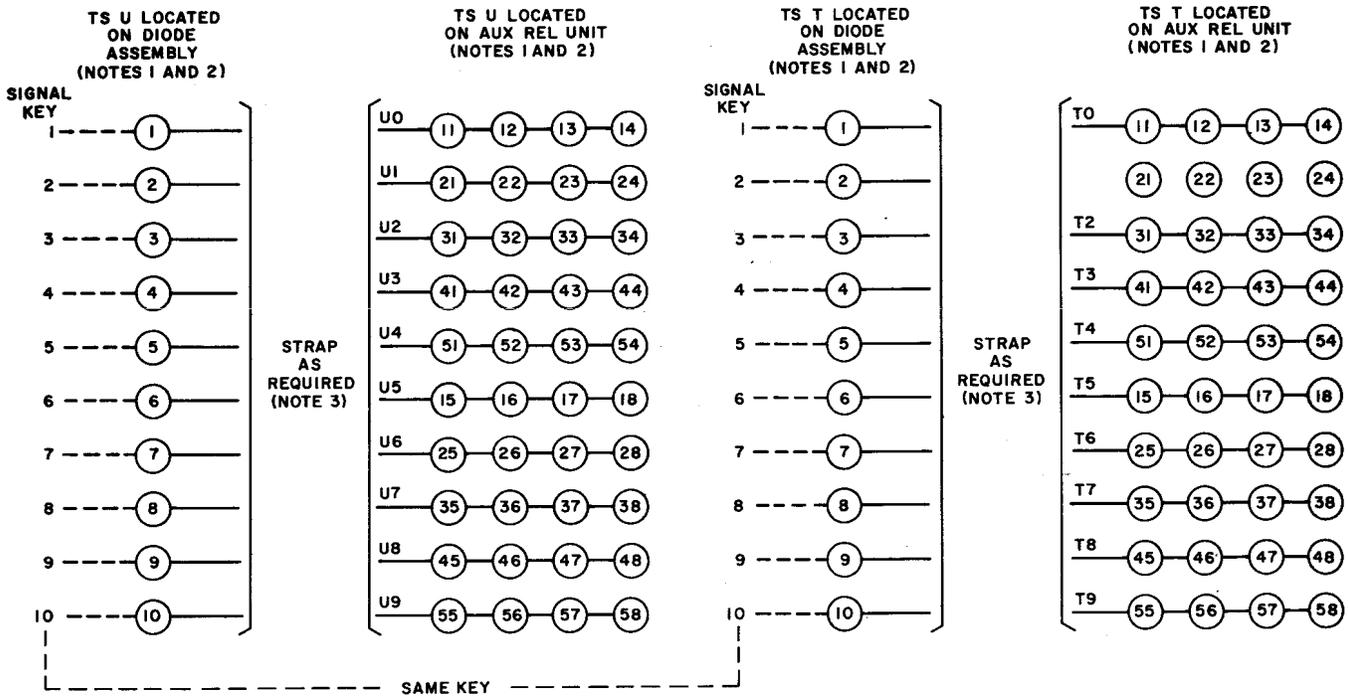
Fig. 20—Connections for Auxiliary Register Unit and Auxiliary Relay Units [Furnished Wired in List 11 (MD) Cabinet Assembly]



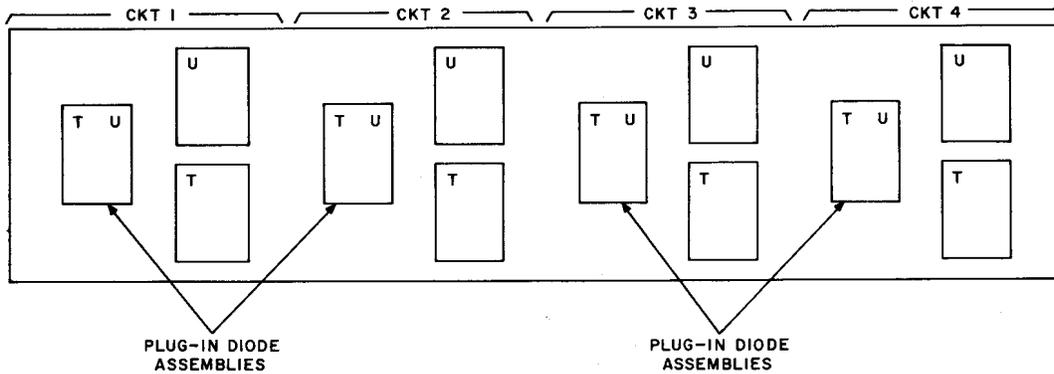
**NOTES:**

1. CONNECTIONS SHOWN ARE FOR ONE AUXILIARY RELAY UNIT ONLY. CONNECT ALL EXTERNAL UNITS AS SHOWN.
2. MAY CONNECT TO ANY STATION LINE.
3. ADDITIONAL STRAPPING SHOWN IN FIG. 20 AND 22.

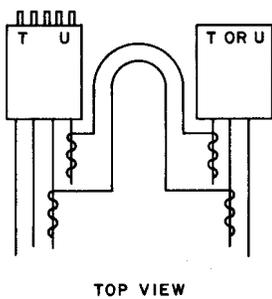
**Fig. 21—Connections for Externally Mounted Auxiliary Relay Units**



NOTE 1: LOCATION OF TERMINAL STRIPS ON AUXILIARY RELAY UNIT.



NOTE 2: STRAP AS SHOWN TO FACILITATE REMOVAL OF ASSEMBLY FOR DIODE REPLACEMENT.



NOTE 3: STRAP AS REQUIRED TO ASSIGN STATION LINE TO SPECIFIC SIGNAL KEY. FOR EXAMPLE, TO ASSIGN STATION 35 TO SIGNAL KEY 1, STRAP AS FOLLOWS:

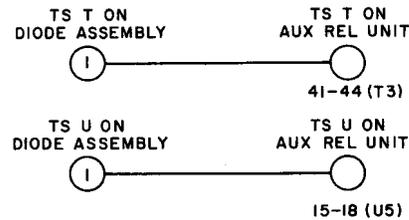


Fig. 22—Connections for Assigning Station Lines to Signal Keys for DSS

- Loudspeaker paging trunk (may include external music source), Fig. 25.

**7.02** Universal line circuits 6, 7, and 8 are normally assigned to single digits 6, 7, and 8, respectively. However, digits 9 and 0 may also be used by appropriate strapping in the dial pulse register.

**7.03** To place universal line in service using Fig. 23, 24, or 25:

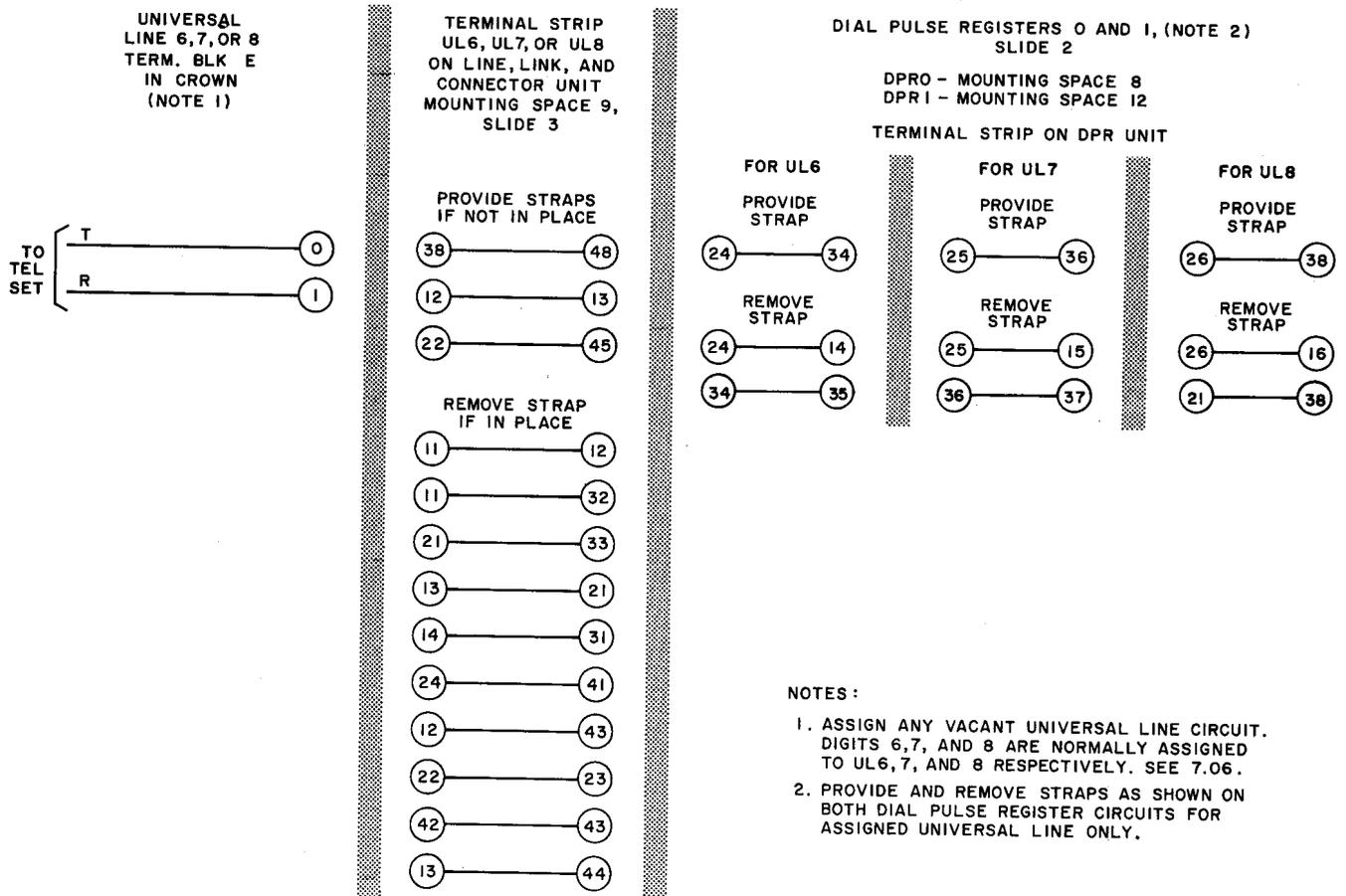
- (1) Make connections as shown to terminals in crown of unassigned universal line. See Fig. 1 for location of block E and method of counting terminals.
- (2) Assign battery pair to equipment, if required.
- (3) Provide and remove straps on terminal strip of assigned universal line on line, link, and

connector unit (terminal strip UL6 if universal line 6 is assigned, etc).

- (4) Provide and remove straps for assigned universal line on terminal strips of each dial pulse register.

**7.04** To remove universal line from service:

- (1) Remove leads of external circuits from terminals in crown of line being removed from service.
- (2) On terminal strip of each dial pulse register located on mounting spaces 8 and 12 of slide 2 perform the following:
  - (a) For universal line 6, remove strap between 24 and 34 and provide strap between 24 and 14.



**Fig. 23—Connections for Universal Line Circuit Assigned to Station Line**

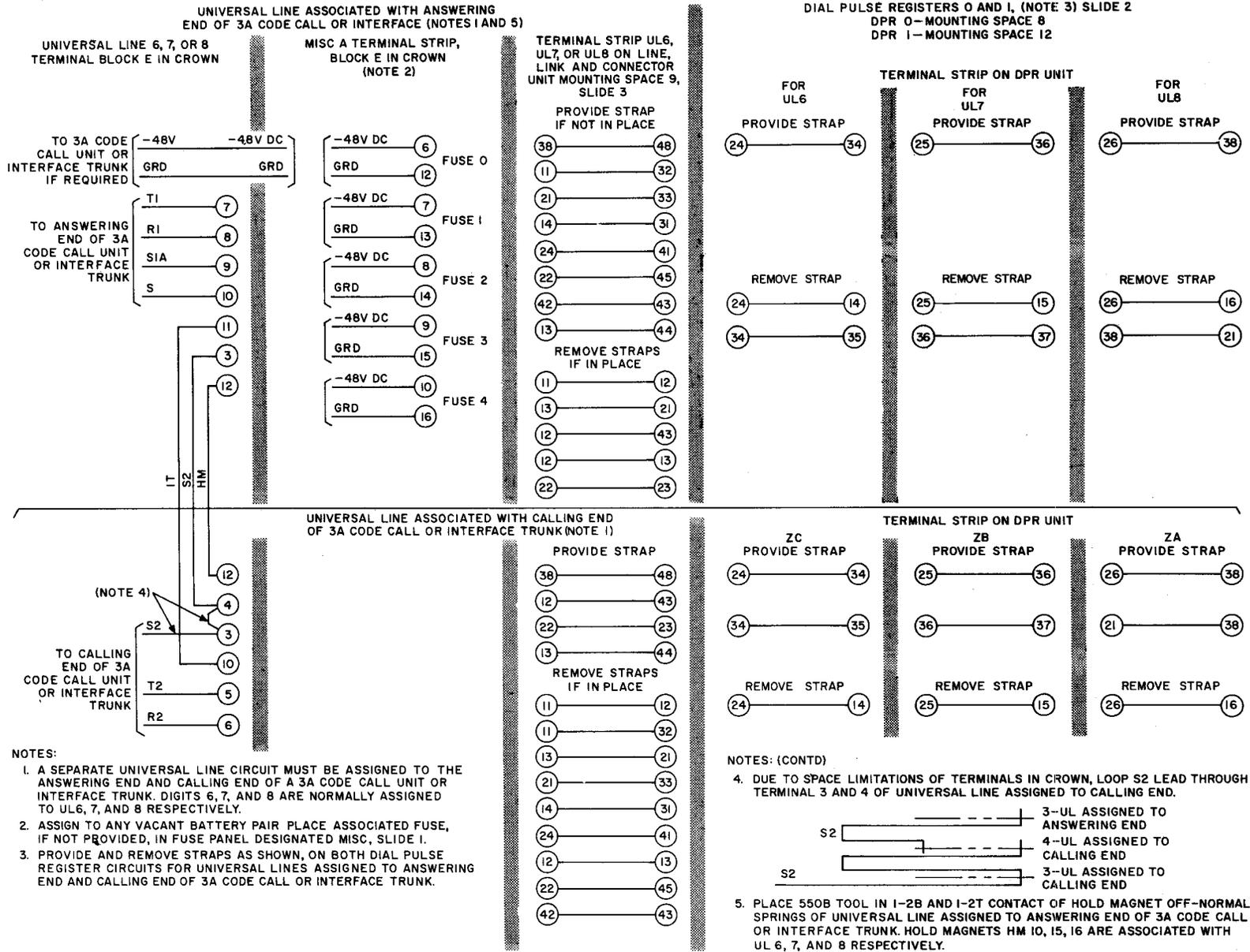
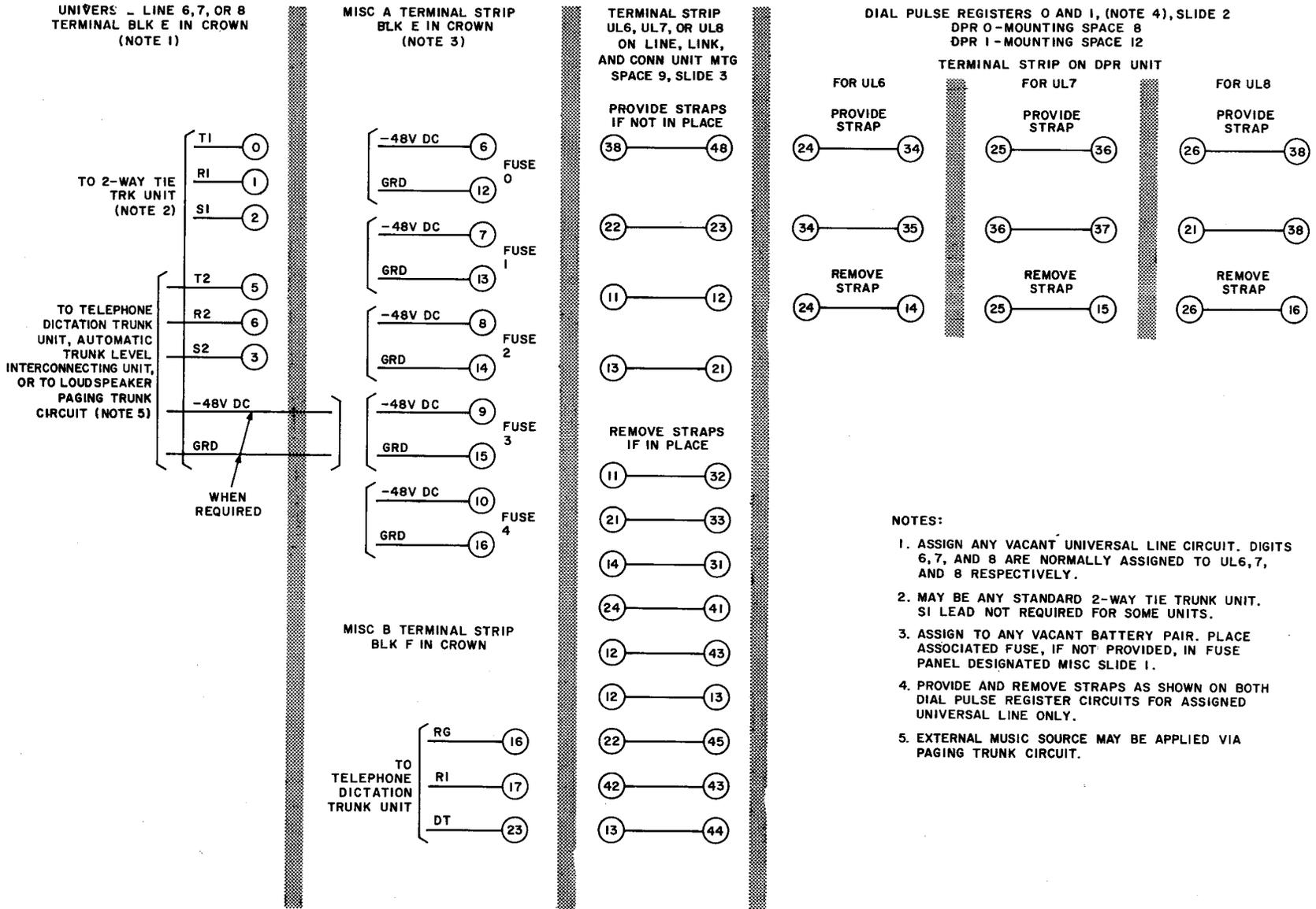


Fig. 24—Connections for Universal Line Circuits Assigned to Answering and Calling Ends of a 3A Code Call Unit or Interface Trunk



- NOTES:**
1. ASSIGN ANY VACANT UNIVERSAL LINE CIRCUIT. DIGITS 6, 7, AND 8 ARE NORMALLY ASSIGNED TO UL6, 7, AND 8 RESPECTIVELY.
  2. MAY BE ANY STANDARD 2-WAY TIE TRUNK UNIT. SI LEAD NOT REQUIRED FOR SOME UNITS.
  3. ASSIGN TO ANY VACANT BATTERY PAIR. PLACE ASSOCIATED FUSE, IF NOT PROVIDED, IN FUSE PANEL DESIGNATED MISC SLIDE 1.
  4. PROVIDE AND REMOVE STRAPS AS SHOWN ON BOTH DIAL PULSE REGISTER CIRCUITS FOR ASSIGNED UNIVERSAL LINE ONLY.
  5. EXTERNAL MUSIC SOURCE MAY BE APPLIED VIA PAGING TRUNK CIRCUIT.

**Fig. 25—Connections for Universal Line Circuit Assigned to Two-Way Tie Trunk Unit, Loudspeaker Paging Trunk Unit, or Telephone Dictation Trunk**

(b) For universal line 7, remove strap between 25 and 36 and provide strap between 25 and 15.

(c) For universal line 8, remove strap between 26 and 38 and provide strap between 26 and 16.

(3) Digits 6, 7, and 8 are now connected to the busy tone trunk and all calls directed to these digits will receive the busy signal.

**7.05** The following SD drawings should be used for connecting information of listed equipment.

- Dial Repeating Type Tie Trunks—SD-65718-01 or SD-65755-01 (typical circuits)
- Recorded Telephone Dictation Trunk— SD-5E038-01
- 3A Code Call Circuit—SD-66610-01
- Automatic Trunk Level Interconnect Unit—SD-1E255-01
- Interface Trunk Circuit—SD-66926-01
- Loudspeaker Paging Trunk—SD-65747-01.

**7.06** A two-way hunting group of the three universal lines can be formed by strapping between hunt leads which appear on terminal 18 of terminal strips UL6, UL7, and UL8. Terminal strips are located on line, link, and connector unit, slide 3, mounting space 9. References for Part 7 are as follows:

- SD-69463-01
- SD-69469-01
- SD-69470-01.

**8. TOUCH-TONE CALLING**

**C1 RECEIVERS (INTERNALLY MOUNTED)**

**8.01** Install two C1 receivers (ordered separately) in mounting plate positions 14 and 13 of slide 1. Join connectors N0 and N1 with plugs provided on receivers 0 and 1, respectively, as shown in Fig. 26.

**8.02** Install 70A fuses, if not provided, in fuse positions TT0 and TT1. Fuses TTA and TTB fur-

nish protection for the 404C tone generator. Fuse panel is located on slide 1.

**A3 RECEIVERS (EXTERNALLY MOUNTED)**

**8.03** Install TOUCH-TONE calling receiver mounting shelf and applique circuit in external cabinet as described in Section 518-710-200.

**8.04** Install a KS-19162, List 1 plug on one end of locally furnished 25-pair D inside wiring cable. Insert this plug in connector AA (in cabinet crown) and terminate raw end of cable on terminal strips A and B of the TOUCH-TONE calling applique unit as shown in Fig. 27.

**8.05** Using 24-gauge strapping wire, install straps between TOUCH-TONE calling applique unit (terminal strips A and B), and the TOUCH-TONE calling receiver mounting shelf (terminal strip G) as shown in Fig. 27.

**8.06** Insert TOUCH-TONE calling A3 receivers A and B in TOUCH-TONE calling receiver mounting shelf. Install 70A fuses, if not provided, in fuse positions TT0 and TT1. References for Part 8 are as follows:

- SD-66888-01
- SD-67027-01
- SD-69463-01
- SD-69471-01
- SD-98148-01.

**9. STATION MAKE-BUSY UNITS**

**9.01** Install one J53035CK, List 1 (MD) unit and required number of J53035CK, List 2 (MD) units in an external apparatus cabinet. Figure 28 provides the equipment and cabling layout for a full complement of thirty key telephone sets arranged for the station make-busy feature.

**9.02** Figure 29 is a block diagram showing both internally and externally mounted key telephone unit (line circuit) arrangements. When CO or PBX lines have multiple appearances in key telephone sets, the "A" leads must be isolated by installing 446F diodes as shown in Fig. 30. One diode (M) is

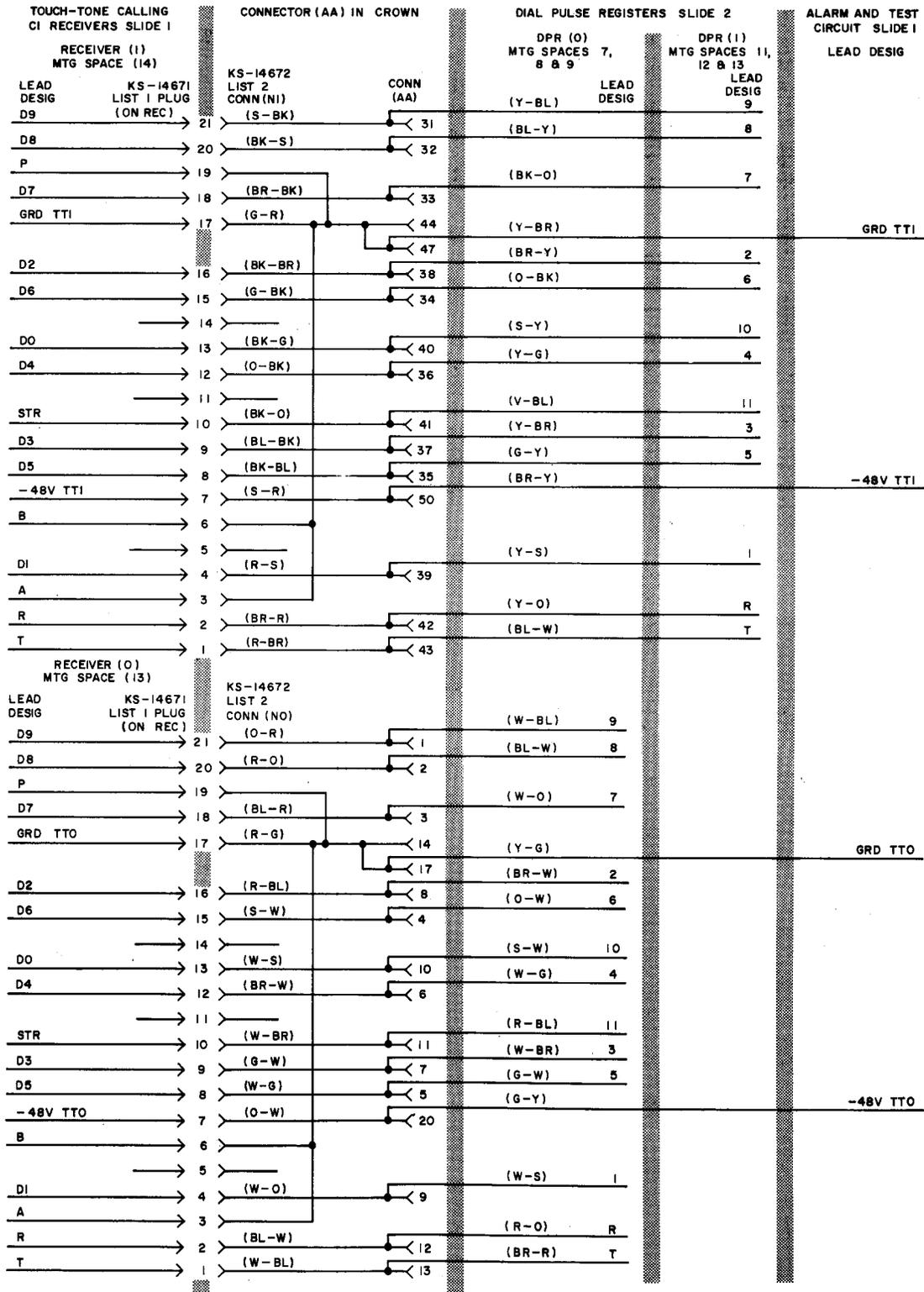
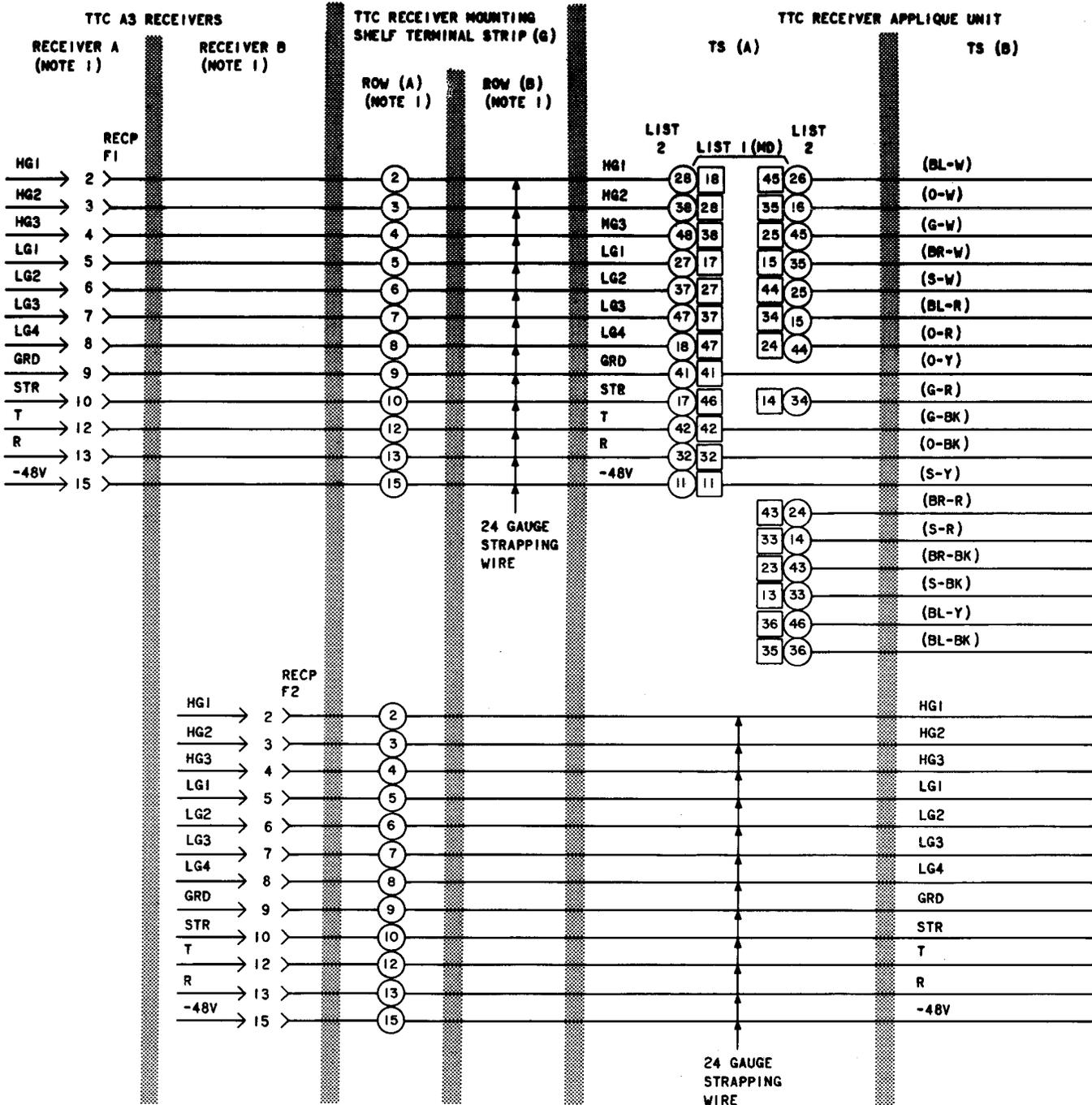


Fig. 26—Connections for TOUCH-TONE Calling C1 Receivers (Internally Mounted)



NOTES:

1. WHEN A3 RECEIVER IS EQUIPPED WITH CIRCUIT PACK B6 (4 X 4, EIGHT CHANNEL RECEIVER) INSTEAD OF CIRCUIT PACK B7 (4 X 3, SEVEN CHANNEL RECEIVER), PLACE A 2400 OHM  $\pm 5\%$  2-WATT RESISTOR BETWEEN TERMINALS -1 AND 15, ROW A OR B, ON TERMINAL STRIP G.
2. INSTALL A KS-19162, LIST I PLUG ON LOCALLY FURNISHED 25-PAIR D INSIDE WIRING CABLE OR EQUIVALENT.

Fig. 27—Connections for TOUCH-TONE Calling A3 Receivers (Externally Mounted)  
(Sheet 1 of 2)



required per primary line appearance and two diodes (M and MB) per secondary line appearance.

**9.03** Figure 31, sheets 1 through 6, provides connections for one List 1 unit and three List 2 units. When station busy lamp indication is required, a locally furnished 6-pair inside wiring cable must be installed and connected as shown in Fig. 31, sheets 4 and 5. References for Part 9 are as follows:

- SD-69463-01
- SD-69466-01.

## 10. ALARM CIRCUIT

**10.01** This circuit provides alarm indications by lighting the TR lamp located on slide 1 of cabinet assembly (always provided) and by transmitting an alarm signal to the central office (optional).

**10.02** When providing the central office alarm, connect **T** and **R** of alarm pair to terminals 0 and 1 respectively of miscellaneous A terminal strip, block E in crown. Two types of alarm signals are available: marginal or reverse battery.



**Both types are shop wired as shown in Fig. 32. Remove option not required at contacts of TR relay, located slide 1, mounting space 17.**

**10.03** Three types of failures will bring in an alarm:

- Operation of either a positive or negative 48V battery supply fuse.
- Operation of a 10 Vac fuse in power supply.
- A marker trouble which prevents the marker from timing out and releasing within a period of 7.5 to 15 seconds.

**10.04** To restore alarm circuit to normal, replace operated fuse and/or momentarily operate AR key (located slide 1, mounting space 16) if marker failure caused alarm. References for Part 10 are as follows:

- SD-69463-01
- SD-69471-01.

## 11. FUSE PANEL

**11.01** A 70E fuse is provided for the DSS +48V circuit. The 70A fuses are provided for all other circuits of the Switching System No. 400 as shown in Fig. 33. Fuse panel is located on slide 1, mounting spaces 16 and 17. Reference for Part 11 is as follows:

- SD-69471-01.



**On initial installations remove 70A fuses and replace with 72A dummy fuses for all unused circuits.**

## 12. POWER SUPPLY

**12.01 DANGER: Disconnect ac supply before working on power plant except as necessary to make tests. While making tests, avoid all contact with terminals, as high voltages are present.** Power for the Lists 10 and 11 (MD) cabinet assemblies is supplied by a J86812A, List 1C power plant located top of slide 1. It consists of the following:

- (a) KS-19642, List 1 or 2, rectifier, furnishing - 48V for relay operation and talking purposes
- (b) J86812B, List 1 equipment, supplying the following:
  - (1) +48 Vdc for operation of the SC relay associated with DSS
  - (2) ±10V for station lamp and interrupter motor operation
  - (3) 90 or 105V 20 cycles for operating ringers and bells
  - (4) Busy tones
  - (5) KS-15984, List 1 plug-in type interrupter supplying various interruptions required for lamps, busy tone, ringing, etc.

**12.02** Two 16,000 microfarad capacitors located in the crown of the cabinet are furnished wired across the -48 Vdc output. These capacitors are used for filtering purposes as well as to sustain the system in case of power failure of less than 1/4-second duration.

**12.03** Two line switches for the ac input supply are provided; one is located on the front panel of

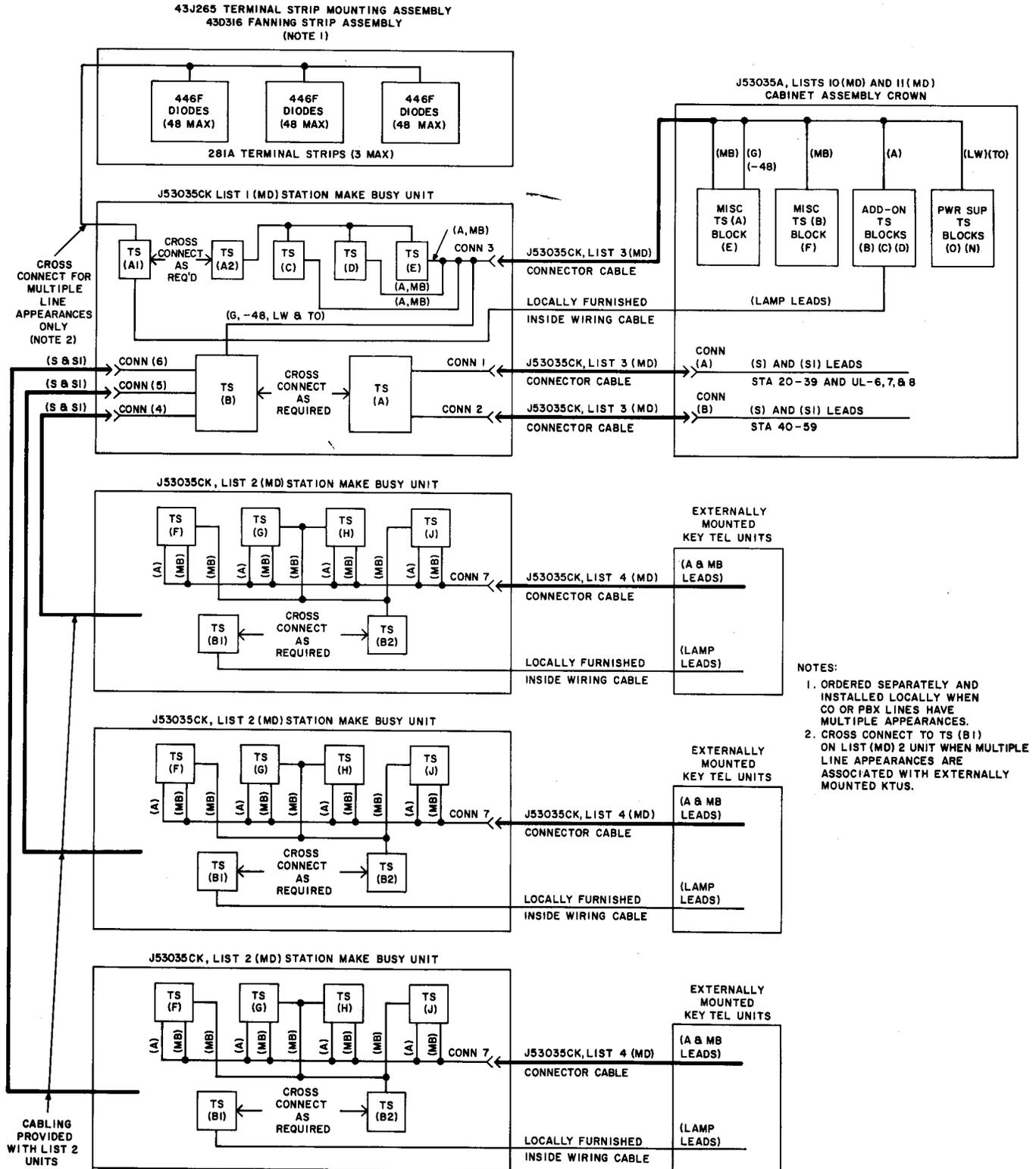
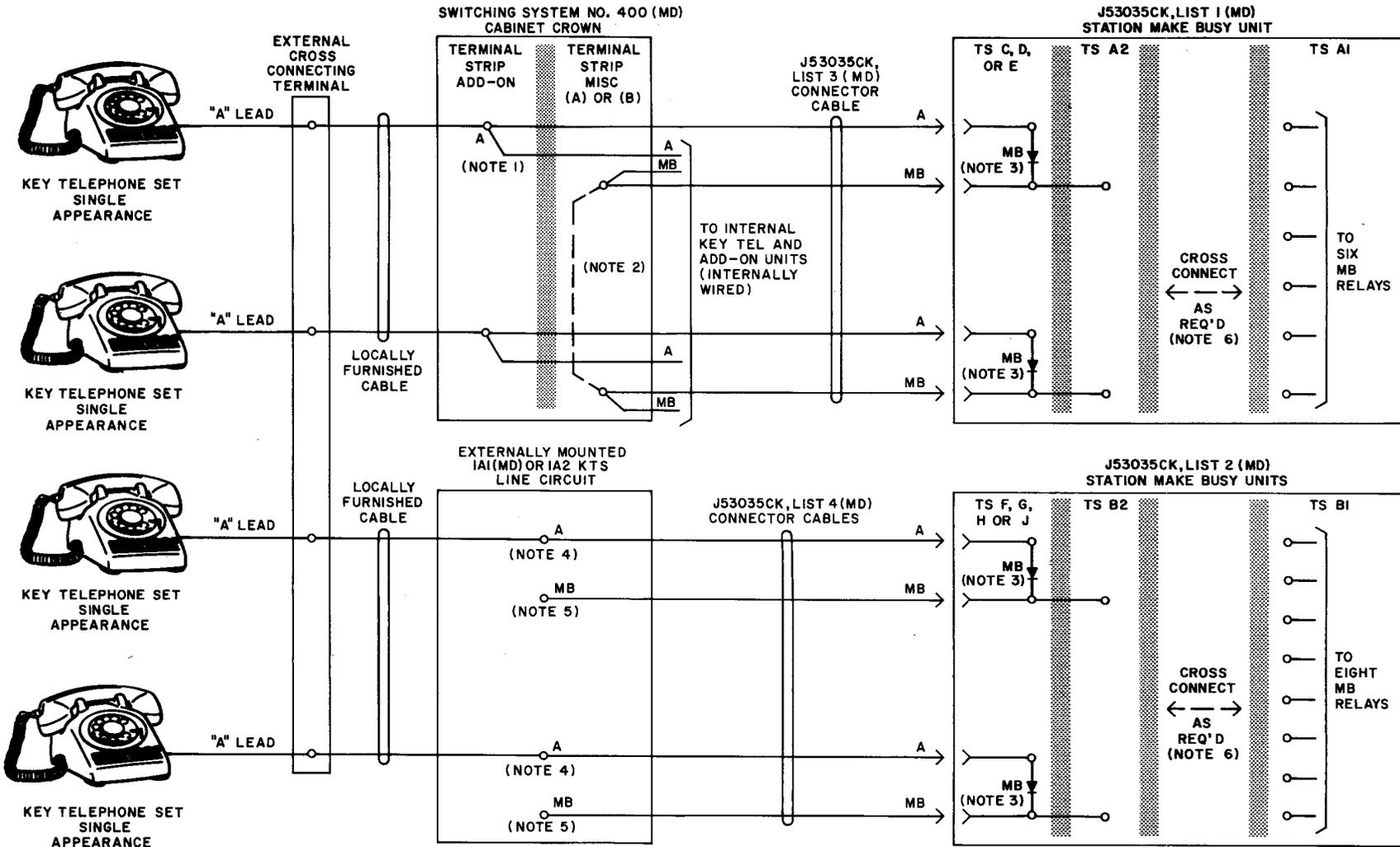


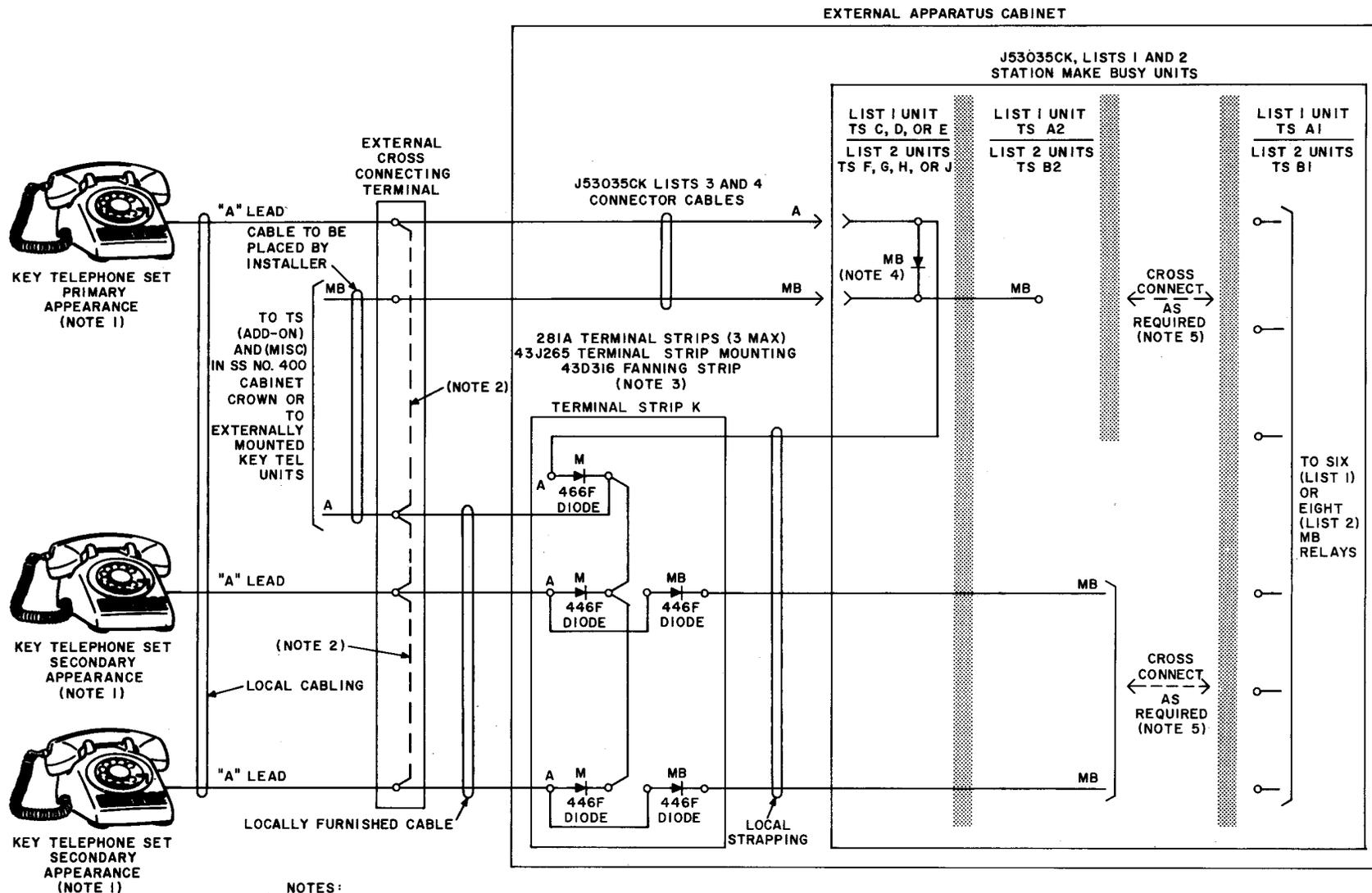
Fig. 28—Station Make-Busy Equipment and Cabling Layout



NOTES:

1. (A)LEADS TO LIST 1 UNIT REQUIRE HAND SPLICE TO EXISTING(A)LEADS IN CABINET CROWN.
2. REMOVE STRAPS ONLY FOR CIRCUITS ASSIGNED TO STATION MAKE BUSY UNIT. BRIDGE REMAINING STRAPS.
3. 446F DIODES FURNISHED WIRED.
4. CONNECT THE (A) LEAD FROM THE LIST 2 UNIT TO THE (A) LEAD IN THE LINE CIRCUIT OF THE IA1 OR IA2 KTS.
5. CONNECT THE (MB) LEAD FROM THE LIST 2 UNIT TO THE (TO) LEAD IN THE IA1 KTS LINE CIRCUIT, AND TO THE ST LEAD IN THE IA2 KTS LINE CIRCUIT.
6. ONE KEY TELEPHONE SET, WITH UP TO 4 CO OR PBX LINE APPEARANCES MAY BE ASSIGNED TO ONE MB RELAY.

Fig. 29—Station Make-Busy Block Diagram, Single Appearance Lines, Internally and Externally Mounted



**NOTES:**

1. MULTIPLE LINE APPEARANCES REQUIRE THE ADDITION OF ONE DIODE (M) FOR THE PRIMARY APPEARANCE AND TWO DIODES (M AND MB) FOR EACH SECONDARY APPEARANCE, TO ISOLATE "A" LEADS.
2. DASHED LINES INDICATE COMMON "A" LEAD STRAPPING WHICH MUST BE REMOVED.
3. MUST BE ORDERED SEPARATELY AND INSTALLED LOCALLY ABOVE THE LIST 1 UNIT, FORTY-EIGHT 446F DIODES MAY BE MOUNTED ON ONE 281A TERMINAL STRIP.
4. MB DIODES FURNISHED WITH J53035CK LIST 1 AND 2 UNITS
5. ONE KEY TELEPHONE SET, WITH UP TO 4 CO OR PBX LINE APPEARANCES MAY BE ASSIGNED TO ONE MB RELAY.

**Fig. 30—Station Make-Busy Block Diagram Showing Method of Isolating (A) Leads for Multiple Appearances of CO or PBX Lines**

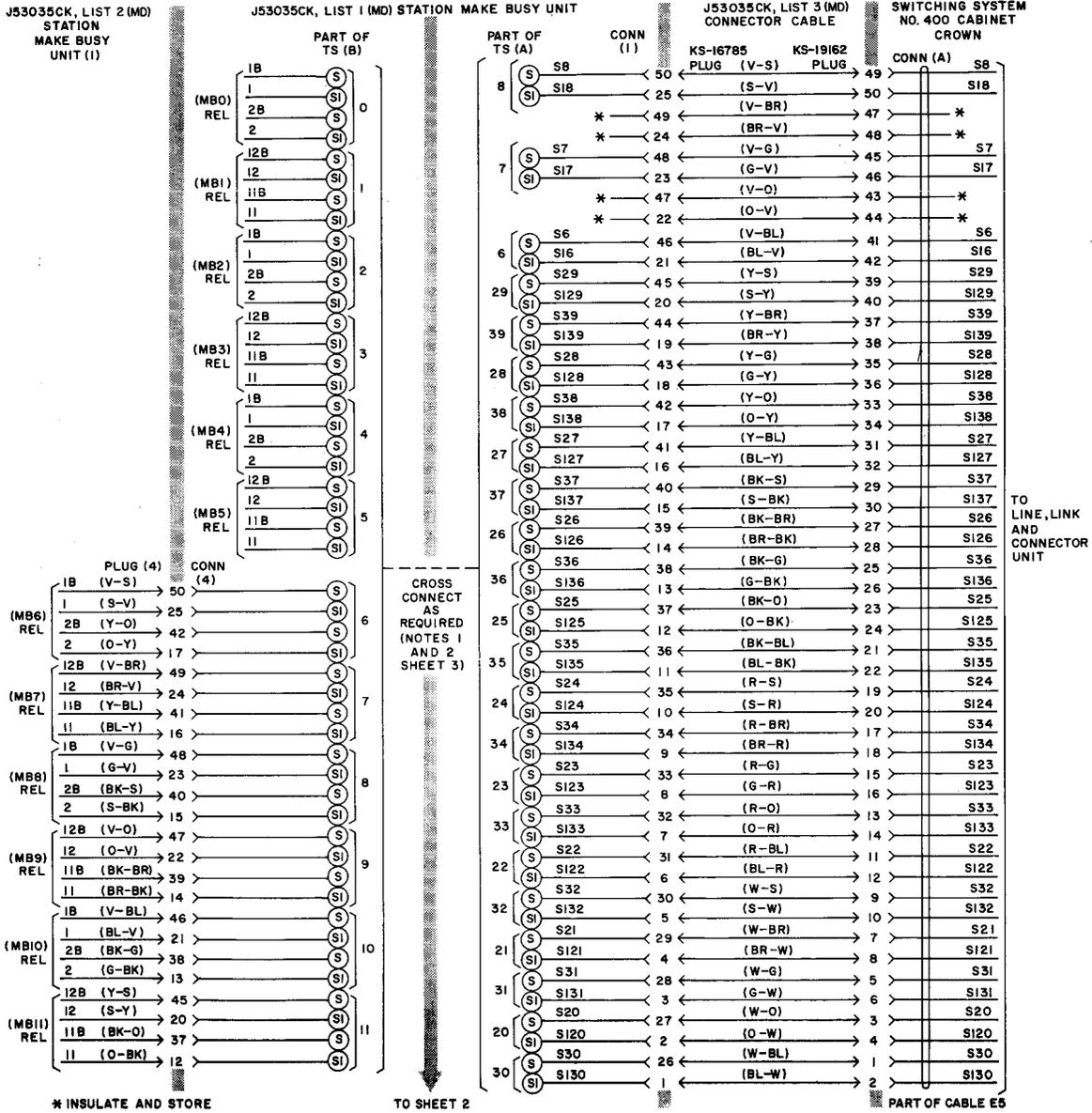


Fig. 31—Connections for Station Make-Busy Units (Sheet 1 of 6)

J53035CK,  
LIST 2 (MD)  
STATION  
MAKE BUSY  
UNIT (3)

J53035CK,  
LIST 2 (MD)  
STATION  
MAKE BUSY  
UNIT (2)

J53035CK, LIST 2 (MD) STATION  
MAKE BUSY UNIT (1)

J53035CK, LIST 1 (MD) STATION MAKE BUSY UNIT

J53035CK, LIST 3 (MD)  
CONNECTOR CABLE

SWITCHING SYSTEM NO. 400  
CABINET CROWN

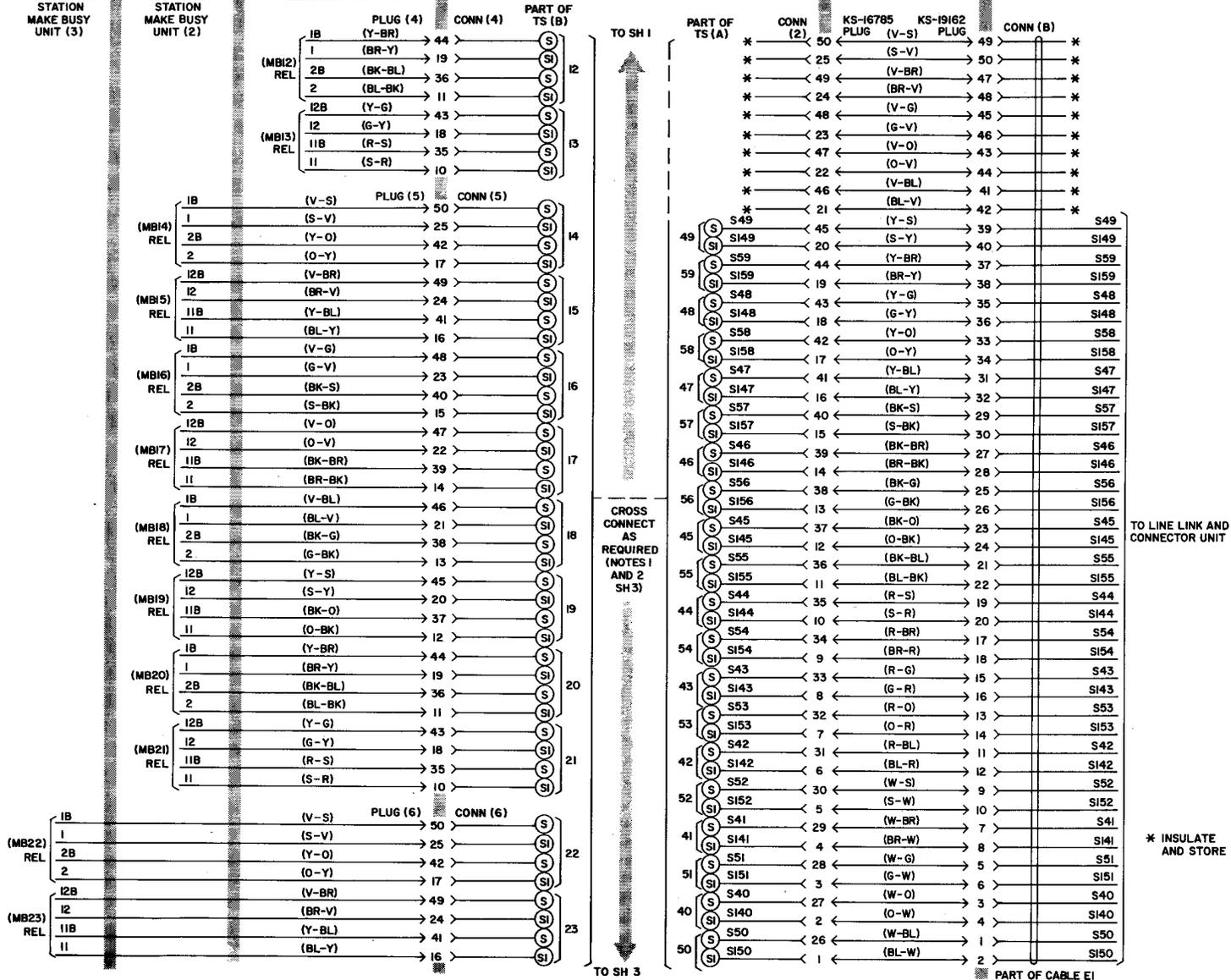


Fig. 31—Connections for Station Make-Busy Units (Sheet 2 of 6)



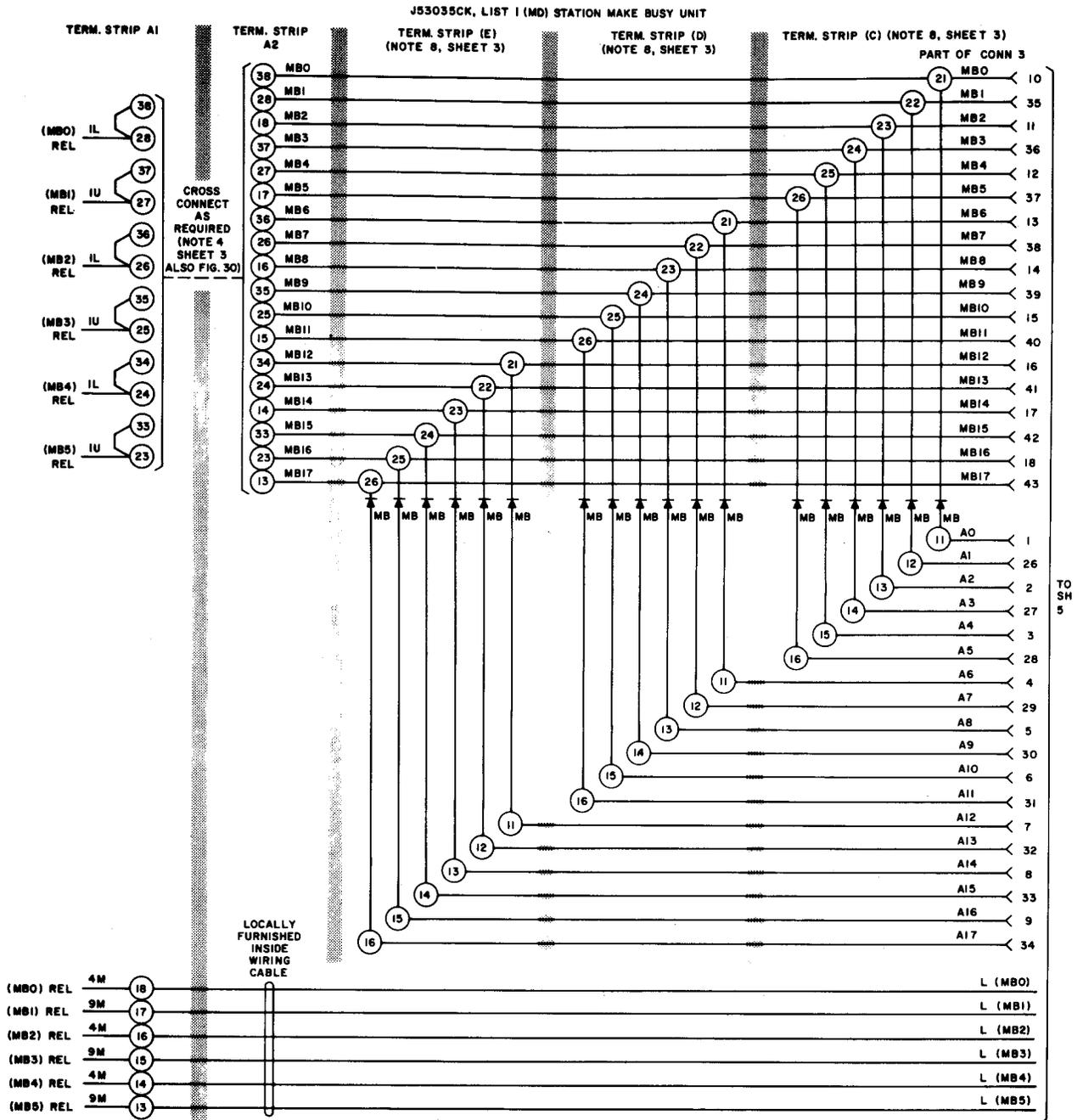


Fig. 31—Connections for Station Make-Busy Units (Sheet 4 of 6)

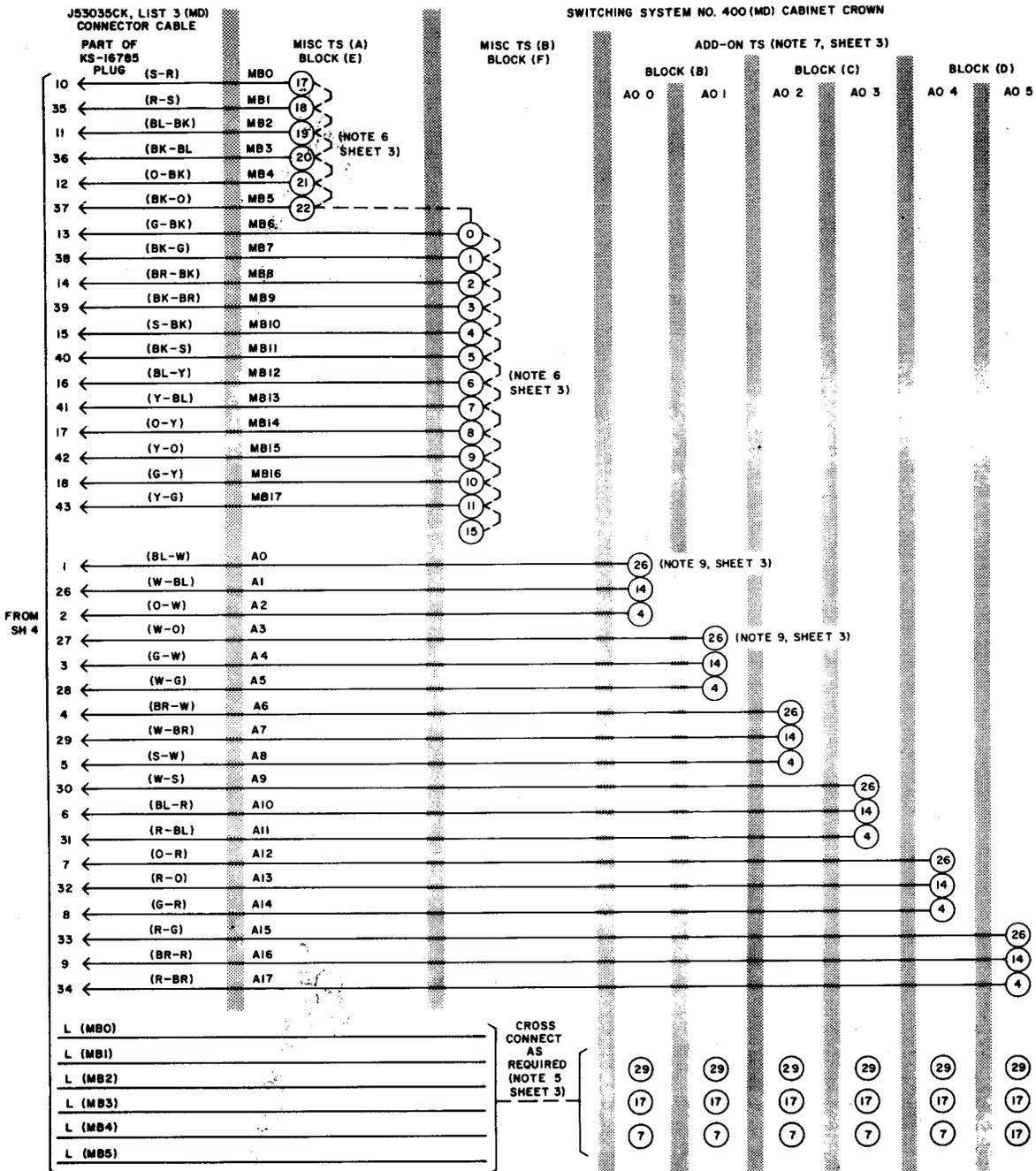


Fig. 31—Connections for Station Make-Busy Units (Sheet 5 of 6)



the KS-19642, List 1 or List 2 rectifier, and one is on the front panel of the J86812B, List 1 equipment in the upper right-hand corner. The switch located on J86812B, List 1 equipment controls the ac input for the entire power plant, while the switch on the rectifier unit controls the ac input for this unit only.



**When returning KS-15984, List 1 interrupter to distributing house, for any reason, attach ticket stating reason for return.**

**12.04** Figure 34 provides connections for crown power terminal strips, miscellaneous terminal strips, and fusing.

**12.05** Fusing of the J86812A power plant is as follows:

#### **Input Fuses**

- (a) 10-ampere fuse designated FN located near switch on front panel of KS-19642, List 1 or List 2 rectifier unit.
- (b) 2-ampere fuse designated F1 located on front panel of J86812B, List 1 equipment.

#### **Output Fuses (located front panel of J86812B, List 1 equipment)**

- (a) 70B, 2-ampere designated  $\pm 10V$  (for station lamps).
- (b) 70A, 1-1/3 ampere designated INT ( $\pm 10V$  for interrupter motor).
- (c) 70B, 2-ampere designated RB1 ( $-48 Vdc$  superimposed on ringing voltage for tripping during ringing cycle).
- (d) Busman ABC-15, 15-ampere designated  $-48V$  ( $-48 Vdc$  for distribution to circuits via fuse panel).

**12.06** The KS-15984, List 1 interrupter furnished as part of the J86812B, List 1 equipment is located on the back of slide 1. The interrupter requires no lubrication and maintenance should be limited to cleaning dirty contacts.

**12.07** To place power plant in service proceed as follows:

- (a) Place line switches for ac input supply of both the KS-19642, List 1 or List 2 rectifier unit and the J86812B, List 1 equipment to the OFF position.
- (b) Using 300 Vac scale, connect volt-ohm-milliammeter to terminals 1 and 2 of TS1, located upper left-hand side on back of J86812B, List 1 equipment as viewed from back.
- (c) Insert power cord into receptacle and place line switch on J86812B, List 1 equipment to ON position. Take reading of ac input supply voltage.
- (d) Remove power cord and place line switch to OFF position. Disconnect meter.
- (e) Connect green spade-tipped wire from F1 fuse terminal to terminal 7 (111 volts), 6 (117 volts), or 5 (123 volts) of TS1 depending on the ac input voltage as read on the meter. This regulates the output of  $\pm 10$  volts and  $+48 Vdc$  only.

**Note:** Green spade-tipped wire from F1 fuse terminal may be found on 5, 6, or 7 of TS1, depending on the input voltage when power plant was factory tested.

- (f) Insert power cord into receptacle and place line switch of J86812B, List 1 equipment to ON position.
- (g) Place line switch of rectifier unit to ON position. Meter on unit should indicate between 45-52 volts. Power plant is now in service. References for Part 12 are as follows:

- (a) SD-69463-01
- (b) SD-69471-01
- (c) SD-81564-01
- (d) SD-81577-01.

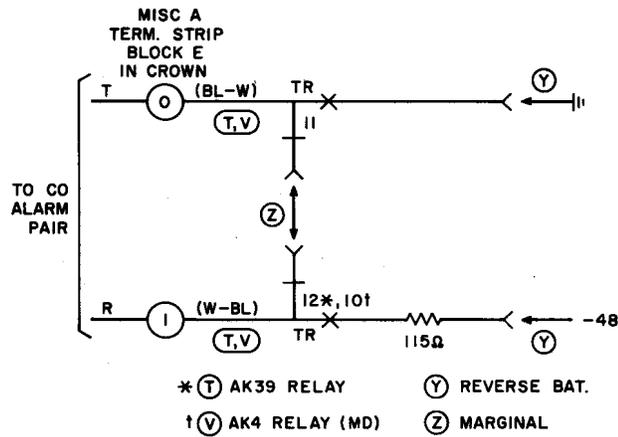


Fig. 32—Alarm to Central Office

0	1	2	3	4	5	0	1	2	3	4	DSS
ADD-ON AND KEY TEL						MISC					-48
L1	L2	L3	L4	L5	SMO	SME	JTO	JTE	ABS	FT	CPL
LINE, LINK, AND CONN						JCT		ALM			

RA	RB	RC	RA	RB	RC	TTA	TTB	TTO	TTI	VAC	
REG 0			REG 1								
A	B	C	D	E	F	G	H	TO	TI	UA	UB
MARKER											

LIST 1 (MD)

TR	0	1	2	3	4	5	0	1	2	3	4	TTA	TTB	TTO	TTI
ADD-ON AND KEY TEL						MISC									
A	B	C	D	E	F	G	H	TO	TI	UA	UB	JTO	JTE	ABS	FT
MARKER							JCT		ALM						

DSS	RA	RB	RC	RA	RB	RC	CPL
+48	REG 0			REG 1			
DSS	L1	L2	L3	L4	L5	SMO	SME
-48	LINE, LINK, AND CONN						

LIST 2

Fig. 33—Switching System No. 400 (MD) Fuse Panel

