

**SWITCHING SYSTEM NO. 400**  
**METHOD OF CONNECTING**  
**J53035A, LISTS 3, 4, 8, AND 9 CABINET ASSEMBLIES**

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**NOTICE**

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



on connecting to this type of terminal see Section 069-132-811.

1.05 The various connection figures and tables in this section will be useful for maintenance of the switching system but for a detailed description of operations see CD and SD sections provided with each cabinet assembly.

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.



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

2.02 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 (Fig. 2).

NUMBERS INDICATE UNITS DIGIT OF STATION

58	48	38	28	18	G	9-5
○	○	○	○	○		4-0
○	○	○	○	○	S1	9-5
○	○	○	○	○		4-0
○	○	○	○	○	S	9-5
○	○	○	○	○		4-0
(9)	(8)	(7)	(6)	(5)	H	9-5
○	○	○	○	○		4-0
(4)	(3)	(2)	(1)	(0)		
○	○	○	○	○		
51	41	31	21	11		

NUMBERS IN PARENTHESIS DENOTE UNITS DIGITS OF STATION IN H TERMINAL FIELD. SHOWN HERE FOR CLARITY ONLY.

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

2.03 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
- Lines 40-49, if provided, slide 1, mounting space 1
- Lines 50-59, if provided, slide 1, mounting space 7.

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:** Lists 4 and 9 (MD) 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 terminal strip B of lines link, and connector unit (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.

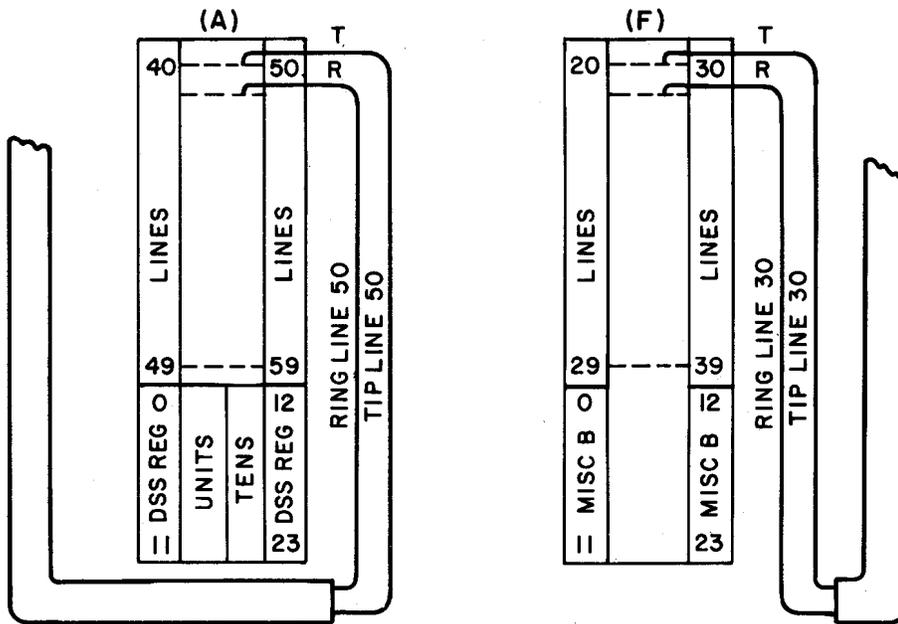


Fig. 3—Method of Terminating Tip and Ring Leads

## 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 (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

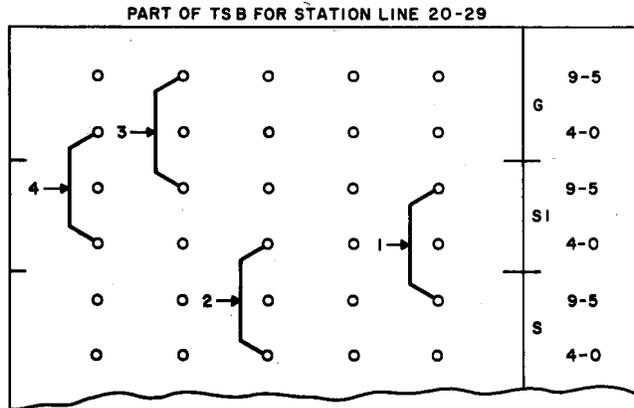
lines included in the group with the arrow on each diode pointing in the hunting direction desired (Fig. 7). If line 20 is dialed and found busy, call will be completed to line 24 if the **ZU** relay is released or to line 29 if the **ZU** relay is operated. If line 24 is dialed and found busy, call 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 (Fig. 9).



EXAMPLES

- 1-STATION 25, ASSIGNED
- 2-STATION 22, ASSIGNED
- 3-STATION 26, UNASSIGNED
- 4-STATION 24, UNASSIGNED

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

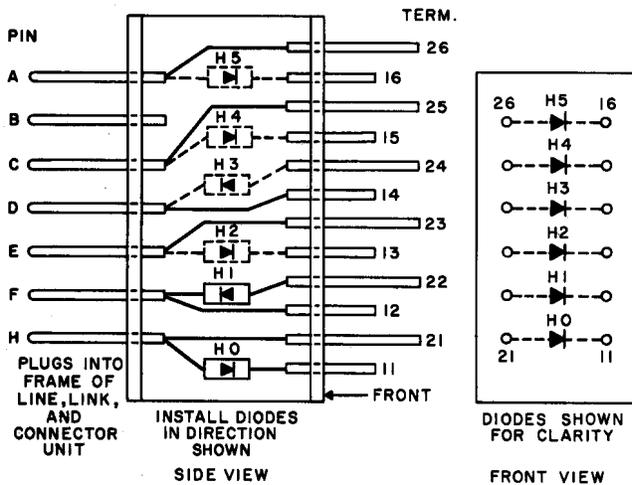
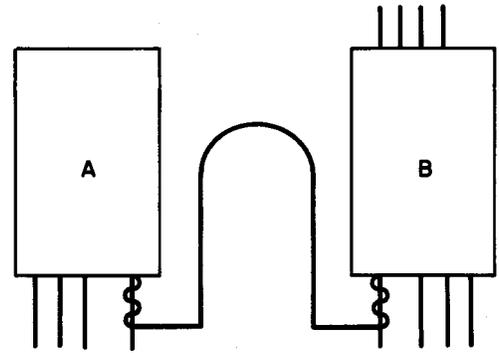


Fig. 5—Front and Side View of Terminal Strip A

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.



TOP VIEW

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

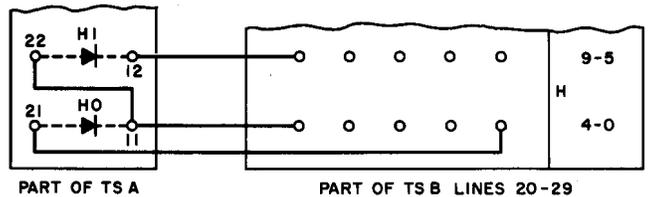


Fig. 7—One-Way Nonsequential Hunting Group Consisting of Station Lines 20, 24, and 29

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 if the ZU relay is operated. References for Part 2 are as follows:

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

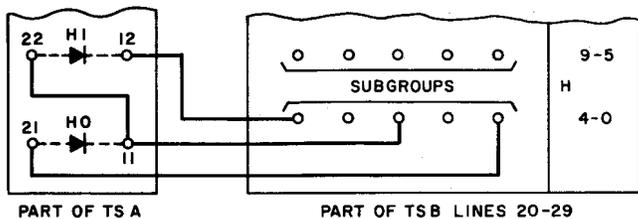


Fig. 8—One-Way Sequential Hunting Group Consisting of Station Lines 20, 22, and 24

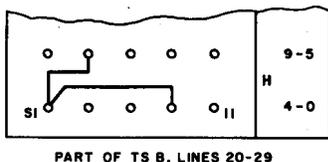


Fig. 9—Two-Way Nonsequential Hunting Group Consisting of Station Lines 21, 24, and 28

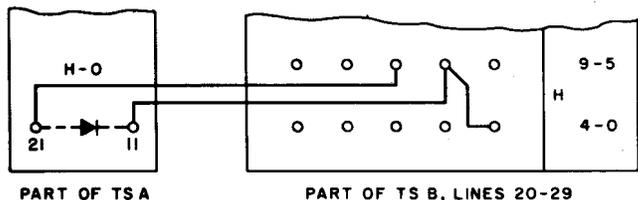


Fig. 10—Combination of One- and Two-Way Nonsequential Hunting Group Consisting of Station Lines 20, 26, and 27

### 3. 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:

- (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 on slide 1.

- (a) For lines 50-59

- (1) Remove strap between terminals 23 and 13, and place strap between terminals 23 and 33 on each dial pulse register terminal strip.

- (2) Install 70A fuse, if not provided, in fuse position L5 on fuse panel designated L, LK, AND CONN. Fuse panel located on 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 paragraphs 2.04 and 2.05.*

### 4. ADD-ON LINE UNITS

#### INTERNALLY MOUNTED

4.01 Internally mounted add-on line units J53035CH, List 1 (MD), are plug-in types. Lists 3, 4, 8, and 9 (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 or PBX line is assigned to one line circuit and a switching system 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.

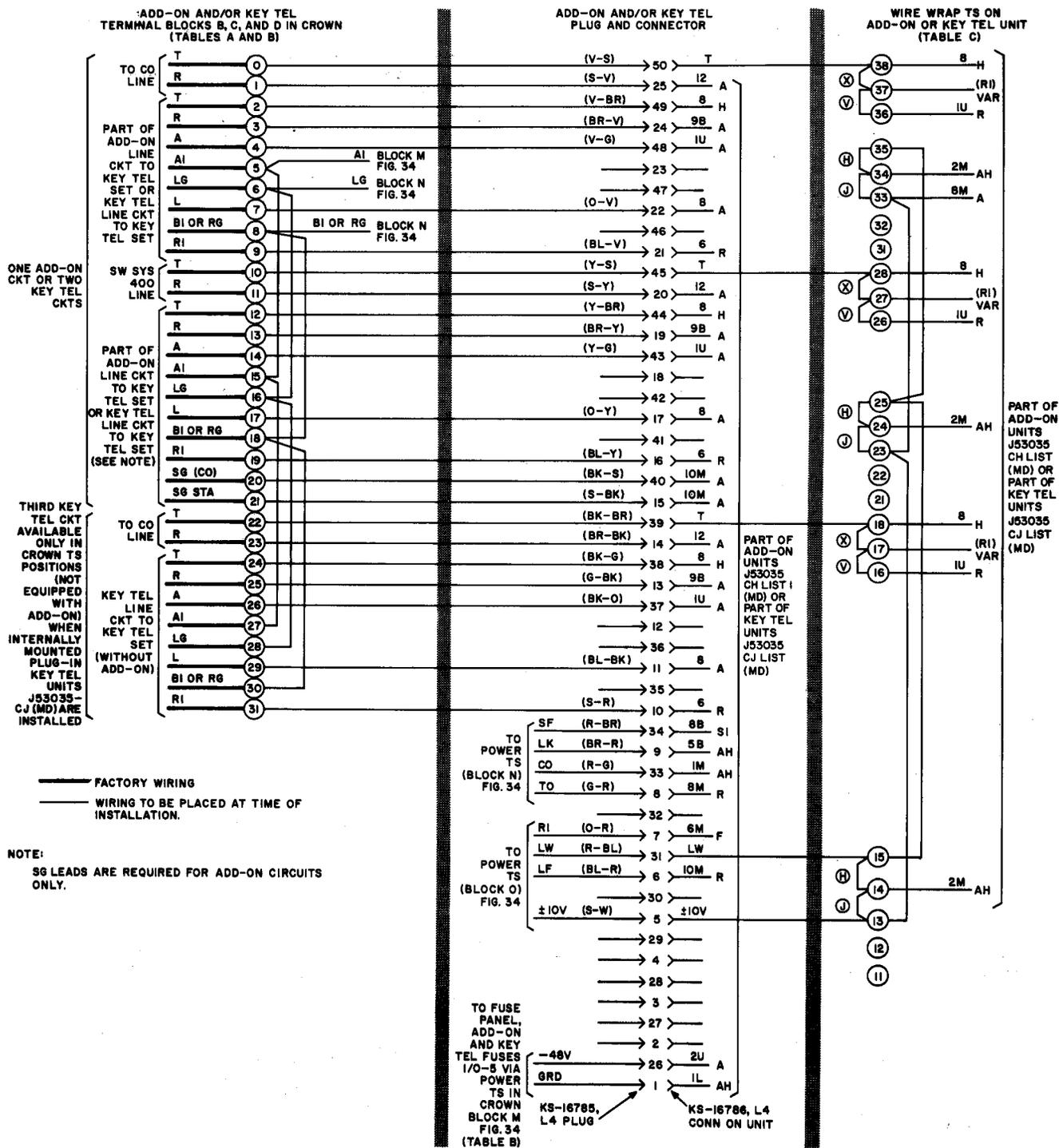


Fig. 11—Connections for Internal Add-On and Key Telephone Units

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



*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.*

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)

**4.03** The line circuits associated with add-on line units are identical in operation to and provide the same features as the 202D 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:

- (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 key telephone unit involved (Fig. 11).

**4.05** The R relay of each line circuit can be modified to provide a nonlocking arrange-

ment. 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 key telephone units 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 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  $\pm 10V$  power supply and common control equipment (*TO* relay and interrupter) such as a 232-type KTU. Connect as shown in Fig. 13 and 32. 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 key telephone units (Fig. 12).

**4.10** The 249A key telephone units 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. 12 gauge wire or equivalent. References for Part 4 are as follows:

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

#### 5. KEY TELEPHONE UNITS

##### INTERNALLY MOUNTED

**5.01** Internally mounted (plug-in) key telephone 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 key telephone units except 48Vdc is used for relay operation, and the *HA* lead is not provided. To control winking hold, use the *CO* lead (Fig. 13).

**5.02** A Switching System No. 400 line assigned to a multibutton key telephone set can be connected to line circuits of key telephone units, 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 key

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	GROUNDED 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 (RI)	(9, 19)

3. PROVIDE ONLY ONE S(SG), RI 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

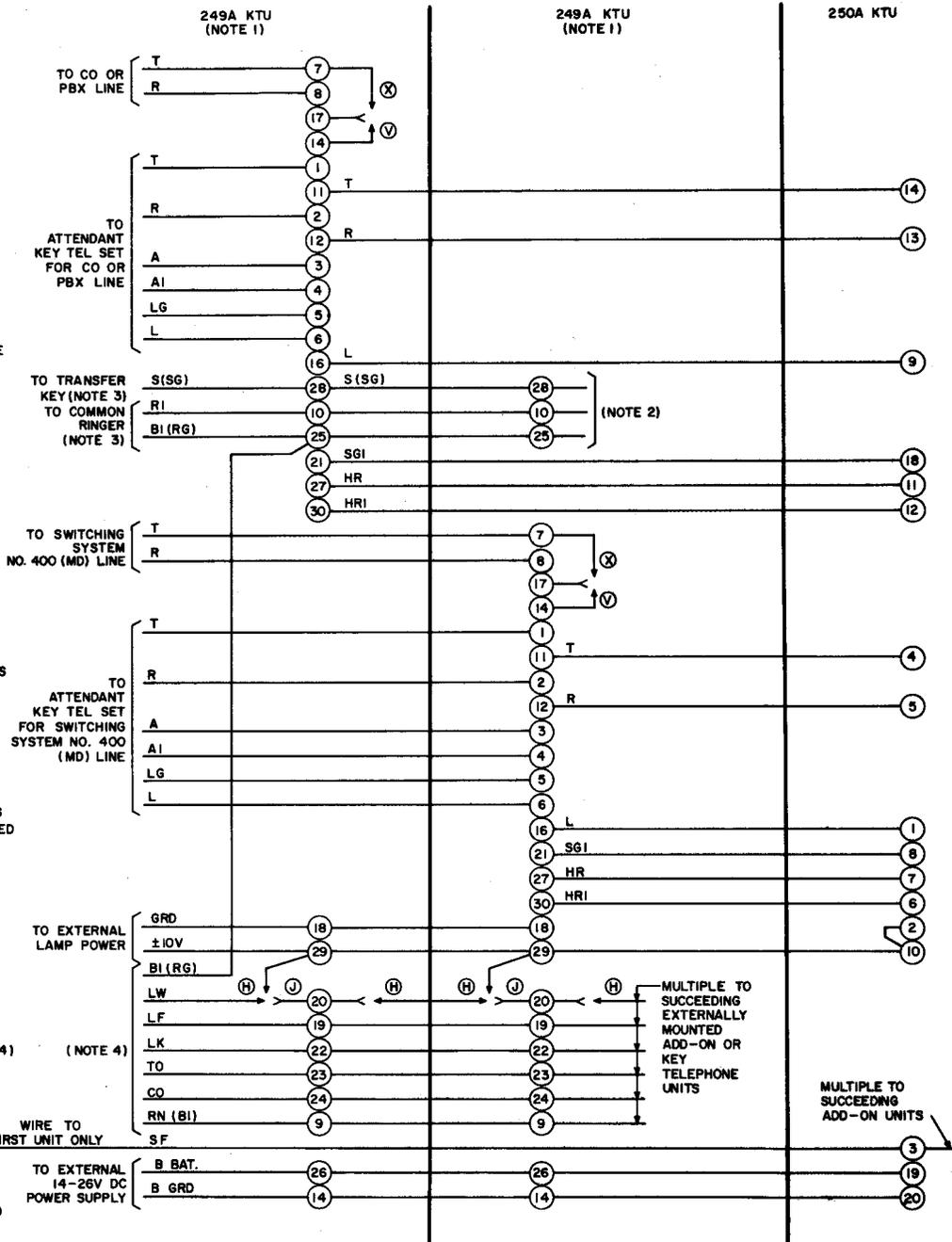
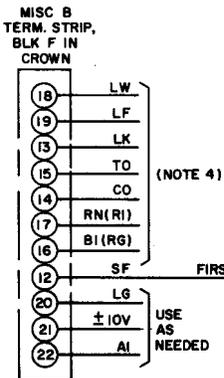


Fig. 12—Connections for External Add-On Circuits



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telephone units. Necessary leads for key telephone units (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 through 5, as required, on fuse panel designated ADD-ON & K TEL. Fuse panel is 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 key telephone units are furnished with X and H options shop wired (Fig. 11).

**5.06** The R relay of each line 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 key telephone units may be standard 1A1 Key Telephone System line circuits (202D, 230B KTU, etc). Connections are shown in Fig. 14. References for Part 5 are as follows:

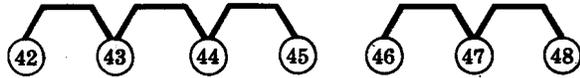
- SD-69463-01
- SD-69466-01
- SD-69474-01.

## 6. DIRECT STATION SELECTION (DSS) UNITS

**6.01** The DSS units consist of:

- (a) Auxiliary relay units J53035BC, List 1 (MD) internally or externally mounted, one per four lines.
- (b) Auxiliary register unit J53035CB, List 1 (MD) internal only, one per system.

**6.02** Lists 3, 4, 8, and 9 (MD) cabinet assemblies are shop wired with straps on terminal strips of dial pulse registers 0 and 1 as follows:

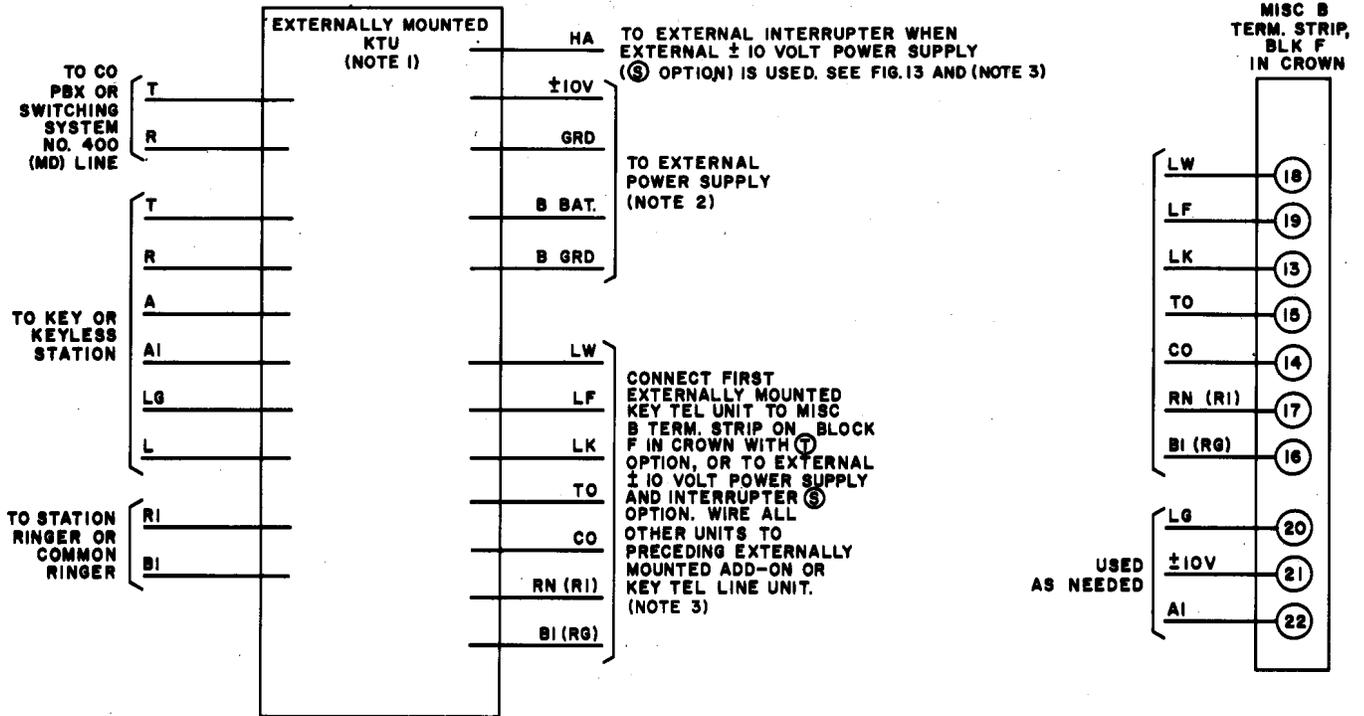


When initially installing DSS, remove straps from terminals 43 to 44 and 47 to 48 on terminal strip of each dial pulse register unit. Terminal strips are located on slide 2 mounting spaces 8 (register 0) and 12 (register 1). This is shown as V and W options on SD-69470-01-G1 CAD 1.

**6.03** Lists 4 and 9 (MD) cabinet assemblies are shop wired so that internally mounted auxiliary relay units 0-19 are assigned to station lines 20-39, respectively.

**6.04** For DSS, lists 4 and 9 (MD) cabinet assemblies are furnished with:

- (a) Two auxiliary relay units (0-3 and 4-7) wired as shown in Fig. 15 and 16.



**NOTES:**

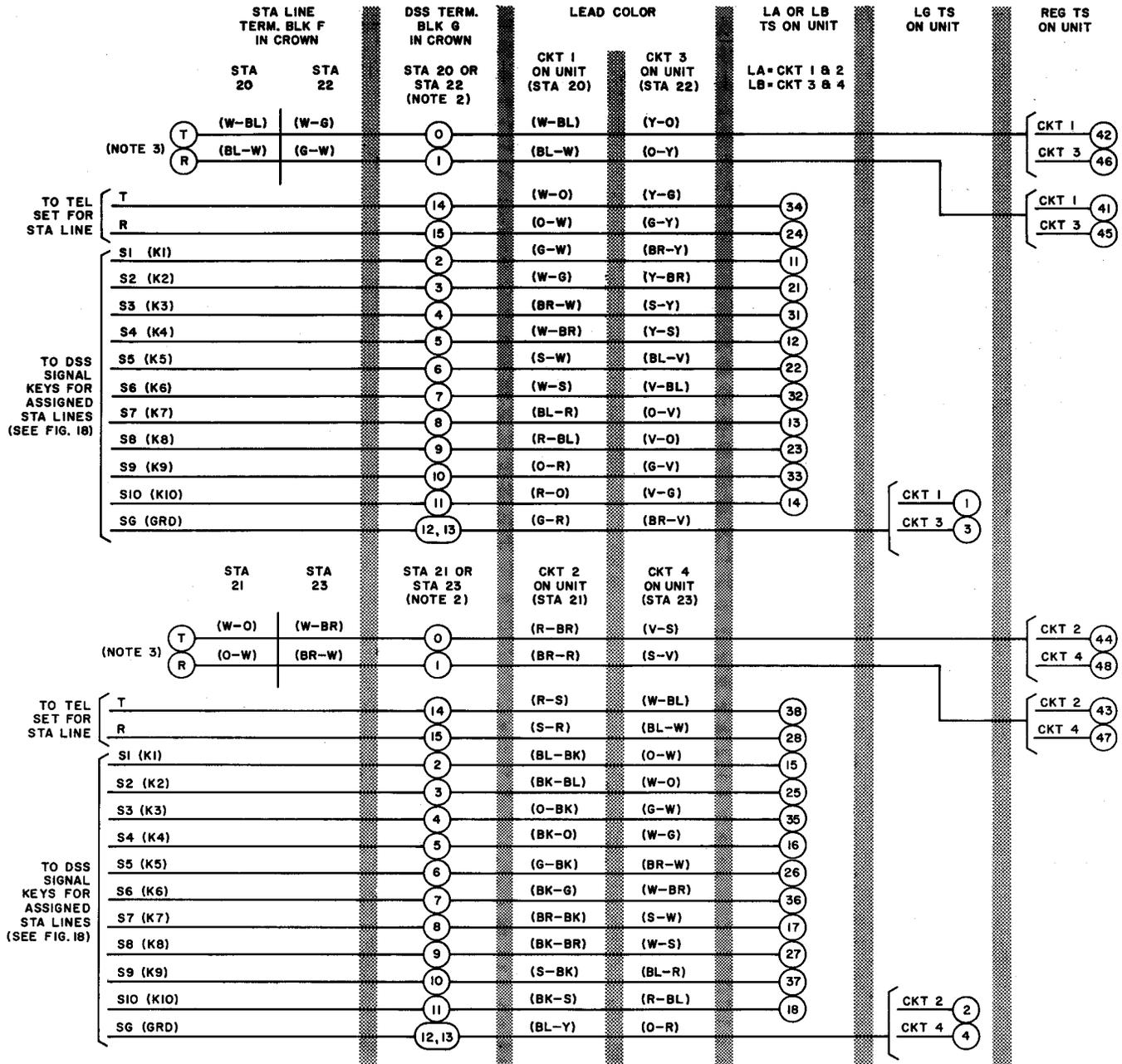
1. MAY BE ANY STANDARD IAI KEY TELEPHONE SYSTEM LINE CIRCUIT (202D, 230B KTU, ETC). OPTIONS REQUIRED MUST BE WIRED IN LOCALLY. FOR CONNECTIONS SEE SECTION COVERING TYPE OF UNIT PROVIDED.
2. GROUND EXTERNAL POWER SUPPLY TO SAME GROUND USED FOR SWITCHING SYSTEM NO. 400 (MD) CABINET WITH A NO. 12 WIRE.

**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**

AUXILIARY RELAY UNIT 0-3  
STATION LINES 20-23  
MOUNTING SPACE 15 AND 14-SLIDE  
(NOTES 1 AND 5)



NOTES:

1. AUXILIARY RELAY UNITS 0-3 AND 4-7 ARE FURNISHED WIRED AS SHOWN WITH LIST 4 AND 9 CABINET ASSEMBLIES.
2. EACH STATION IS ASSIGNED TERMINALS 0-15 ON DSS TERMINAL BLOCKS IN CROWN OF CABINET. SEE FIG. 1.
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.
5. ADDITIONAL STRAPPING SHOWN IN FIG. 16 AND 18.

Fig. 15—Connections for Auxiliary Relay Units, Lists 4 and 9 (MD) Cabinet Assemblies (Sheet 1 of 5)

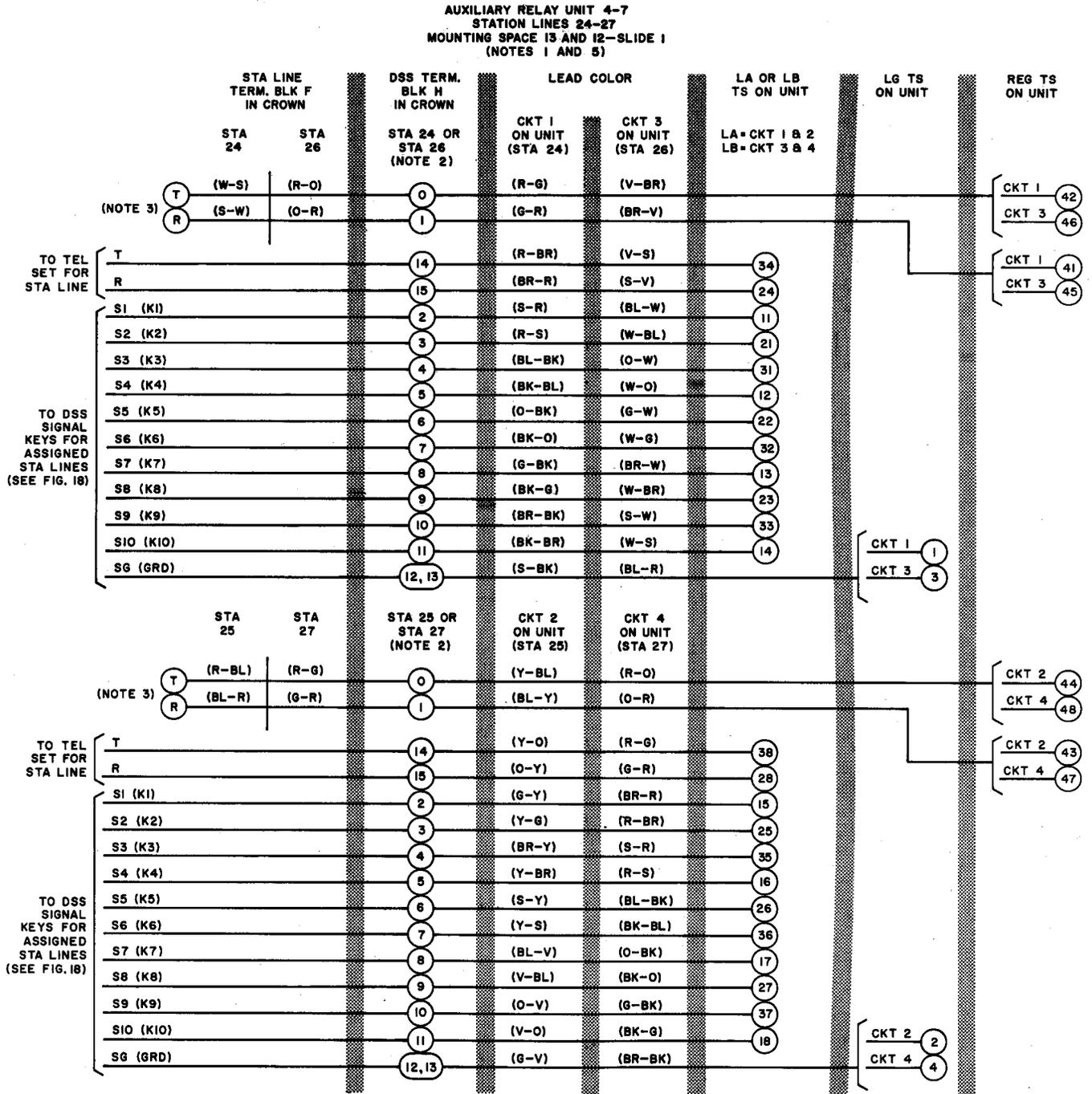


Fig. 15—Connections for Auxiliary Relay Units, Lists 4 and 9 (MD) Cabinet Assemblies (Sheet 2 of 5)

AUXILIARY RELAY UNIT 8-II  
STATION LINES 28-31  
MOUNTING SPACE 11 AND 10-SLIDE 1  
(NOTES 4 AND 5)

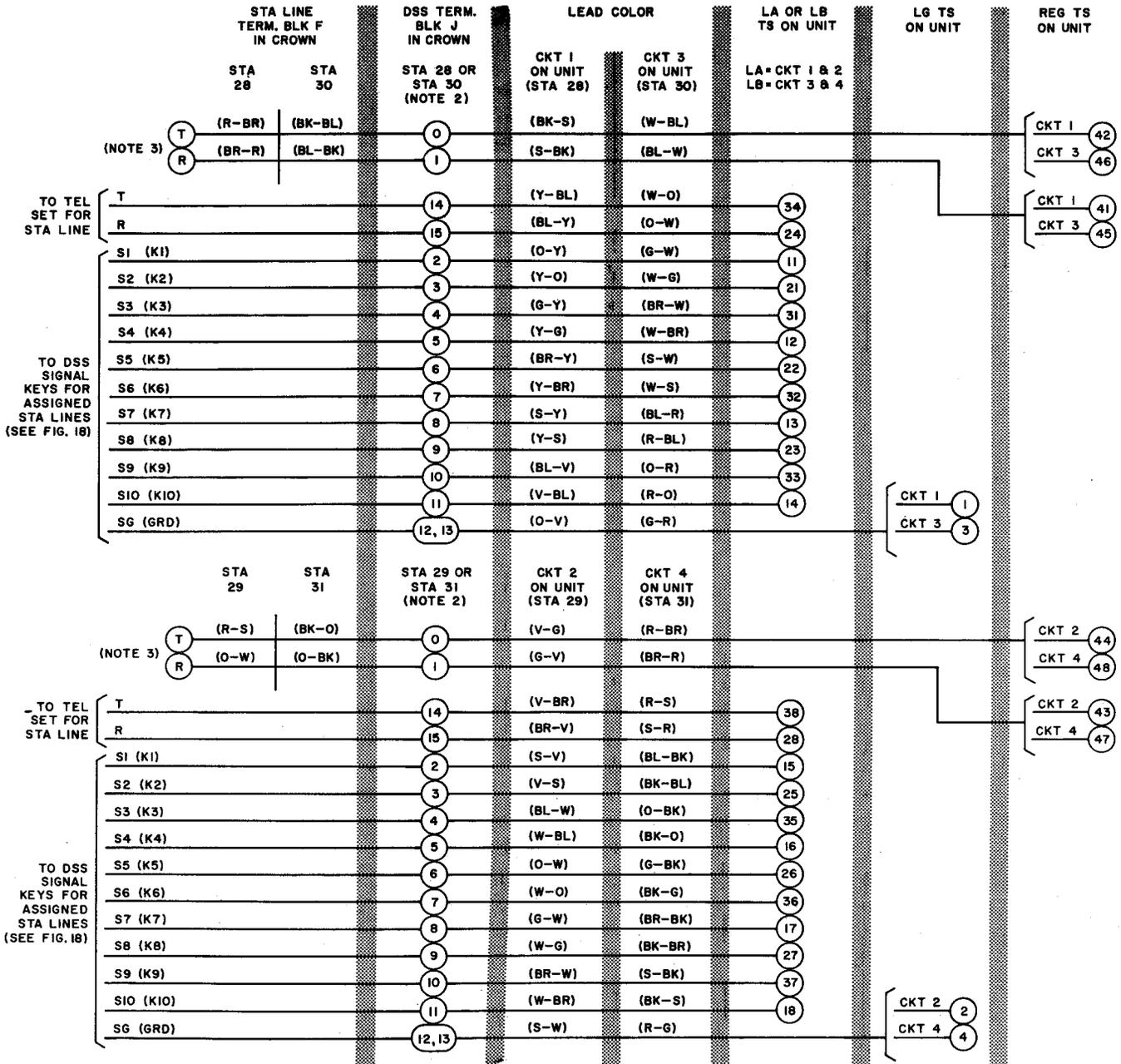


Fig. 15—Connections for Auxiliary Relay Units, Lists 4 and 9 (MD) Cabinet Assemblies (Sheet 3 of 5)



AUXILIARY RELAY UNIT 16-19  
 STATION LINES 36-39  
 MOUNTING SPACE 7 AND 6—SLIDE 1  
 (NOTES 4 AND 5)

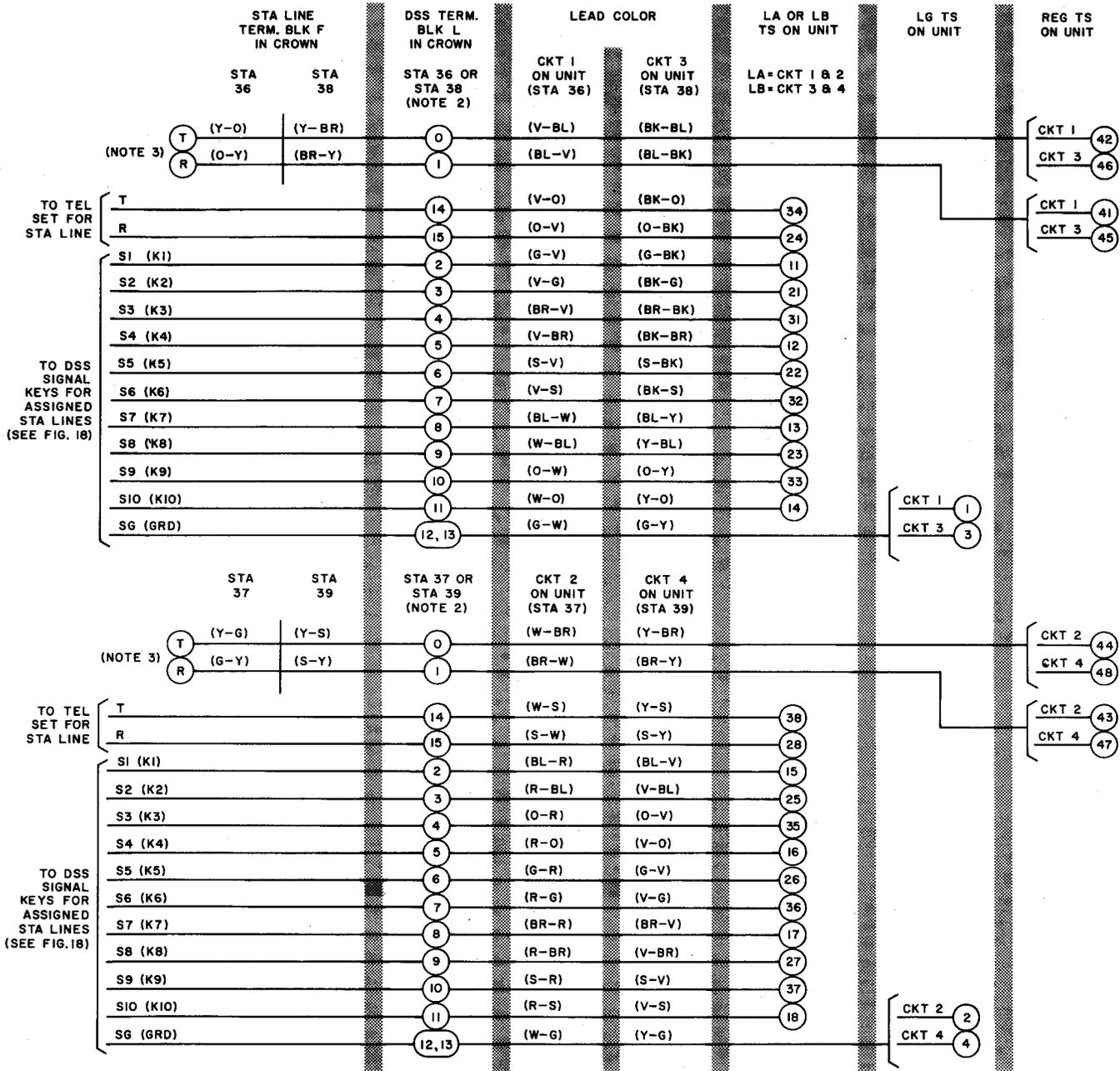


Fig. 15—Connections for Auxiliary Relay Units, (Lists 4 and 9 (MD) Cabinet Assemblies (Sheet 5 of 5)



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- (b) Four plug-in diode assemblies J53035BC, List 2 (MD) mounted in jacks on each auxiliary relay unit (see Note 1, Fig. 18 for location).
- (c) Auxiliary register unit wired as shown in Fig. 16.
- (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 block G-L in crown (refer to Fig. 1 for location of blocks in crown).

**6.05** For DSS, list 3 (MD) cabinet assemblies are furnished only with:

- (a) A cable from DSS REG terminal block A in crown to mounting space location of auxiliary register unit.
- (b) Necessary leads from dial pulse registers 0 and 1 to mounting space location of auxiliary register unit.

**Note:** When DSS is required with a list 8 (MD) cabinet assembly it must be engineered and installed locally.

### ADDING AUXILIARY RELAY UNITS TO LISTS 4 AND 9 (MD) CABINET ASSEMBLIES

**6.06** Proceed as follows:

- (1) Install units as per Section 518-710-200.
- (2) Connect units as shown in Figure 15 and 16. Figure 15 extends the necessary leads from units to associated DSS terminal blocks in crown for connection to station. Leads will be found in tube at equipment mounting location. Figure 16 shows the multiple strapping to preceding unit. These leads must be provided.
- (3) Install plug-in diode assemblies into appropriate jacks as required.
- (4) To place station arranged for DSS in service, see paragraph 6.11.

### ADDING EXTERNALLY MOUNTED AUXILIARY RELAY UNITS TO LISTS 4 AND 9 (MD) CABINET ASSEMBLIES EQUIPPED WITH INTERNAL UNITS

**6.07** Proceed as follows:

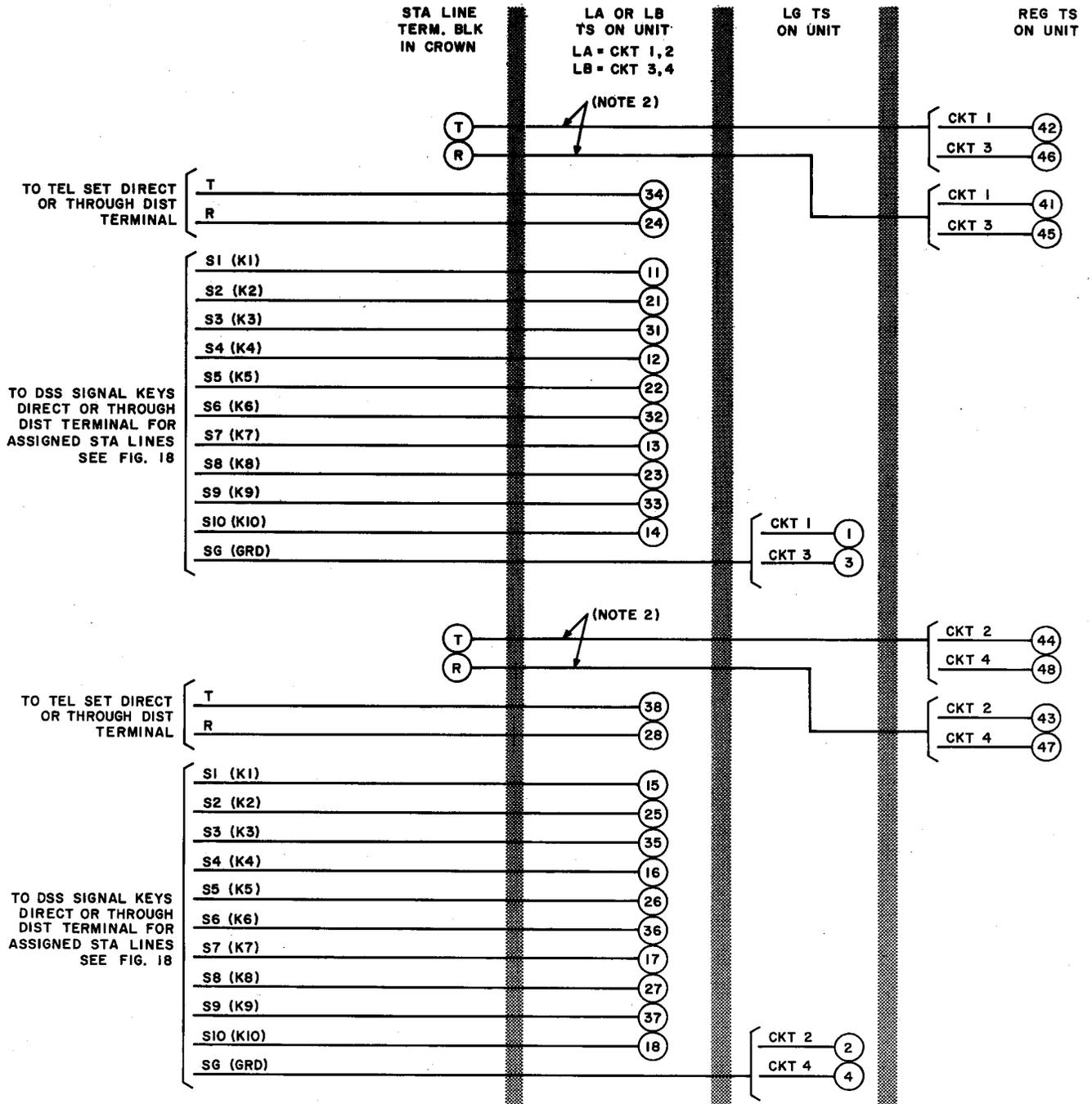
- (1) Install auxiliary relay units in external cabinet.
- (2) Connect units as shown in Fig. 16 and 17. Connection to external unit shown in Fig. 17 can be direct or through a distributing terminal. Figure 16 shows multiple strapping that is required between the first externally mounted unit and the 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. When available, the 183A2 adapter will enable multiple strapping on crown terminal blocks. See Section 461-604-100 for its use. 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 6.11.

### MOUNTING ALL AUXILIARY RELAY UNITS ASSOCIATED WITH LISTS 4 AND 9 (MD) CABINET ASSEMBLIES IN EXTERNAL UNIT CABINET

**6.08** When the line, link, and connector unit for station lines 50-59 is added to a List 4 or 9 (MD) cabinet assembly, all internally mounted auxiliary relay units must be mounted externally. See Table D and proceed as follows:

- (1) Remove all internal units after disconnecting leads from LA, LB, LG, and REG LK terminal strips (Fig. 15 and 16). 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.

AUXILIARY RELAY UNIT  
MOUNTED IN EXTERNAL EQUIPMENT CABINET  
(NOTES 1 AND 3)



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. 16 AND 18.

Fig. 17—Connections for Externally Mounted Auxiliary Relay Units

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

(5) Connect units as shown in Fig. 15 and 16. 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. 16, and to outside clips of DSS terminals G-L for reconnecting leads required for stations as shown in Fig. 15.

#### ADDING DSS TO J53035A, LIST 3 (MD) CABINET ASSEMBLY

**6.09** The DSS can be added to a list 3 (MD) cabinet assembly by installing the following items of equipment.

- (a) One J53035A, List 6 (A&M only) which includes, five connecting blocks (66E1-32), one auxiliary register unit, J53035CB, List 1 (MD), and associated wiring material and mounting hardware
- (b) Auxiliary relay units, J53035BC-1, List 1 (MD) one required per four line circuits equipped with DSS
- (c) Plug-in DSS tens and units diode assembly, J53035BC, List 2 (MD) one required for each line circuit equipped with DSS, up to a maximum of four per auxiliary relay unit.

**6.10** To add the above DSS equipment proceed as follows:

- (1) Mount auxiliary register unit in mounting space 10, slide 2 (one per system).

(2) Connect auxiliary register unit as shown in Fig. 16. Leads will be found in tube at equipment mounting space location.

(3) Install auxiliary relay units in slide 1, mounting spaces 15 to 6. Each unit requires two spaces. For example, the first unit (circuits 0-3 for lines 20-23) will occupy spaces 15 and 14. Then continue downward, adding units as required. The last unit placed (circuit 16-19 for lines 36-39) will occupy spaces 7 and 6, making 20 DSS equipped lines which is the maximum that can be internally mounted. If the switching system contains the 40 to 49 group of station lines, then the maximum number of internally mounted DSS equipped lines is 16. When the system is equipped with more than 30 station lines, all auxiliary relay units for DSS must be mounted in an external cabinet (see Table D).

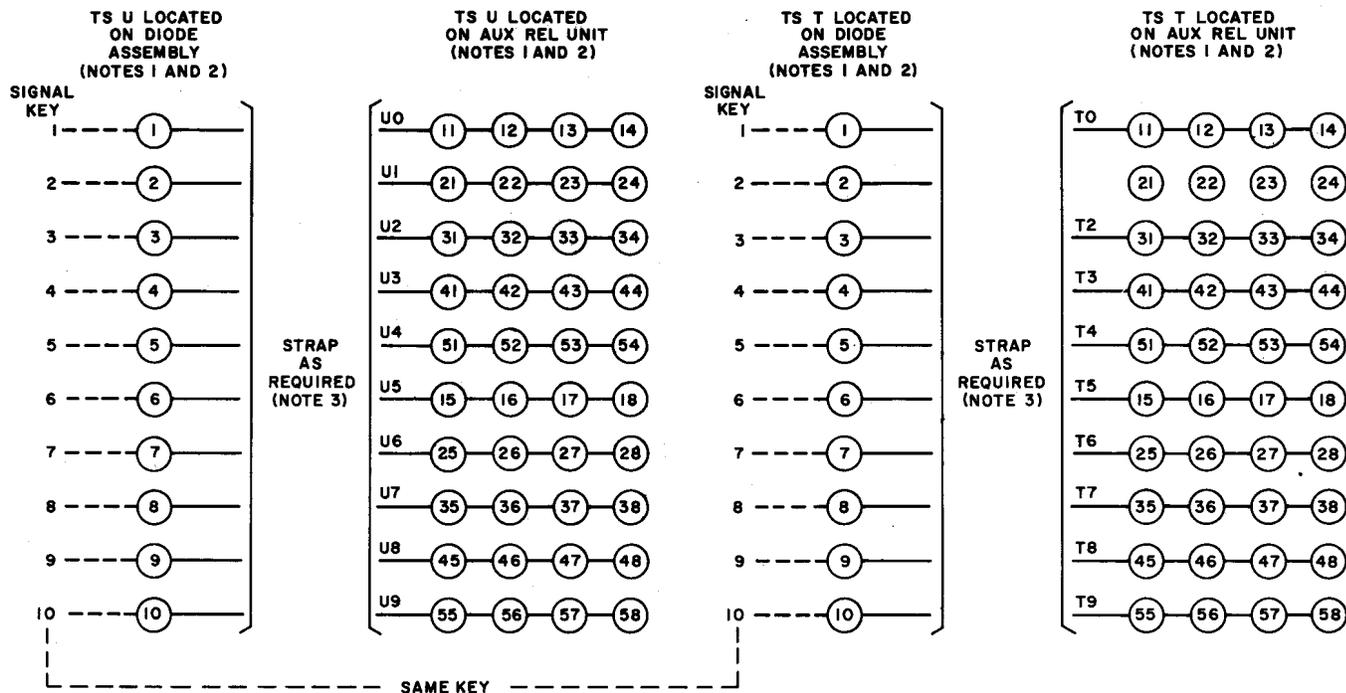
(4) For internally mounted auxiliary relay units, connect as shown in Fig. 15, 16, and 18.

(5) For externally mounted auxiliary relay units, connect as shown in Fig. 16, 17, and 18. Provide cable from first externally mounted unit to DSS register terminal block A (Fig. 1) in crown. For multiple strapping, wire as shown in Fig. 16, Note 4. Leads from the external unit to the station may be run directly as shown in Fig. 17. They may also be run through a distribution terminal if desired.

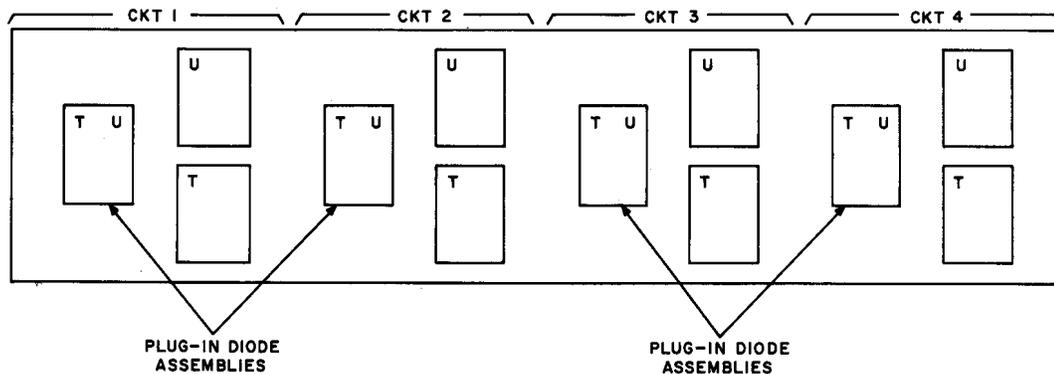
#### PLACING STATION ARRANGED FOR DSS IN SERVICE

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

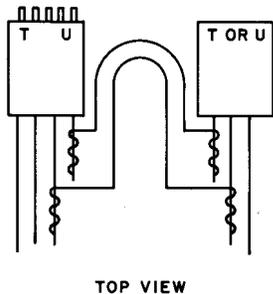
- (1) Remove straps on dial pulse registers 0 and 1 as covered in paragraph 6.02 if this is first station assigned.
- (2) Connect station line in crown to assigned auxiliary relay unit. In lists 4 or 9 cabinet assemblies station lines 20-39 are already wired to respective DSS terminal blocks in crown. (To assign station line, see paragraph 2.04).
- (3) Connect telephone set leads and signal key leads as shown in Fig. 15 and 17. 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 the units' terminal strips on auxiliary relay units to as-



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:

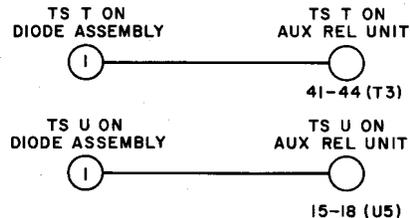


Fig. 18—Connections for Assigning Station Lines to Signal Keys for DSS

sign called stations to signal keys (see Fig. 18).  
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:

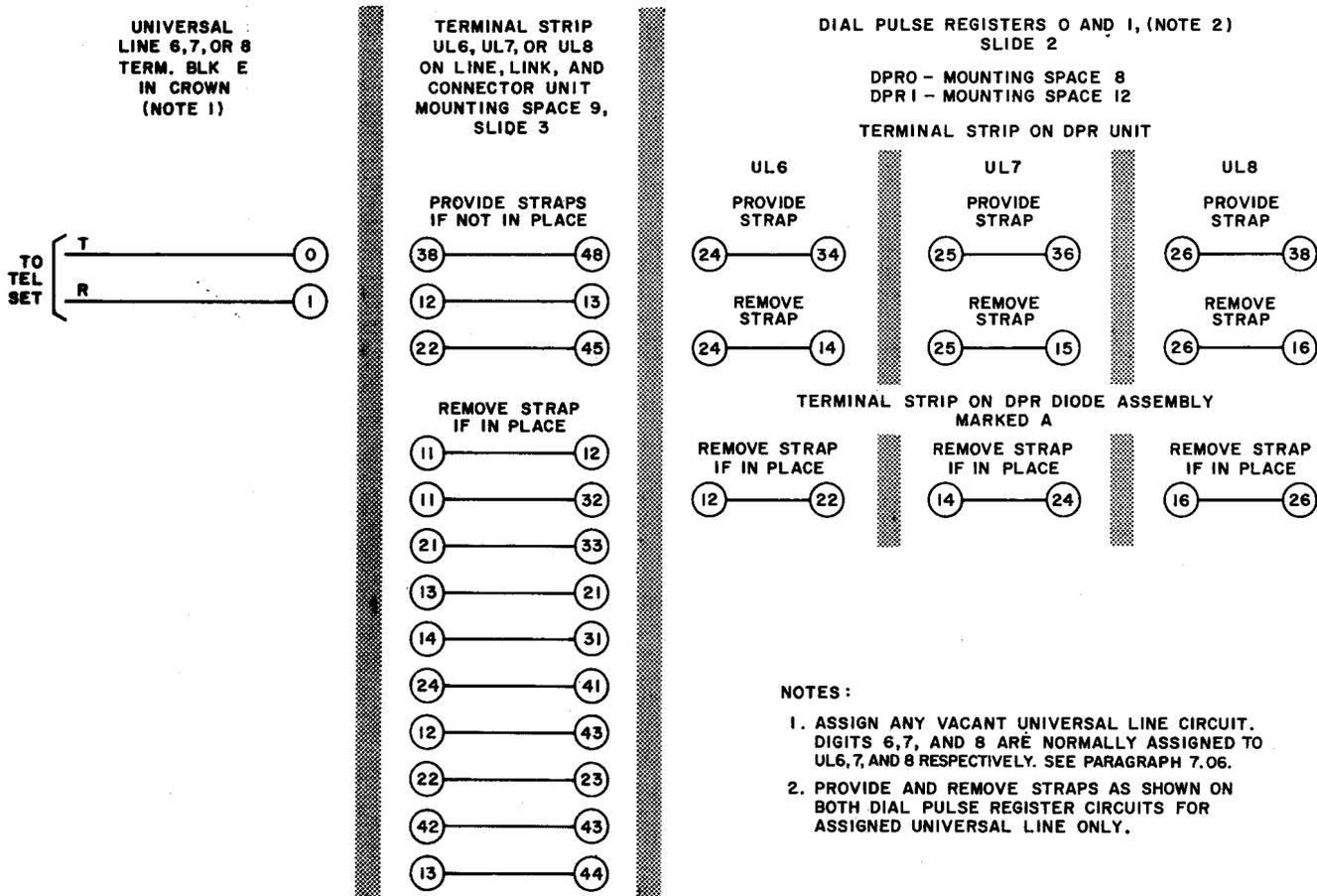
- Station lines, Fig. 19
- 3A code call, Fig. 20
- Interface trunk, Fig. 20
- 2-Way tie trunk, Fig. 21

- Telephone dictation trunk, Fig. 21
- Loudspeaker paging trunk (may include external music source), Fig. 21.

**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** Place universal line in service using Fig. 19, 20, or 21 as follows:

- (1) Make connections as shown to terminals in crown of assigned universal line. See Fig. 1 for location of block E and method of counting terminals.
- (2) Assign battery pair to equipment, if required.



**Fig. 19—Connections for Universal Line Assigned to Station Line**

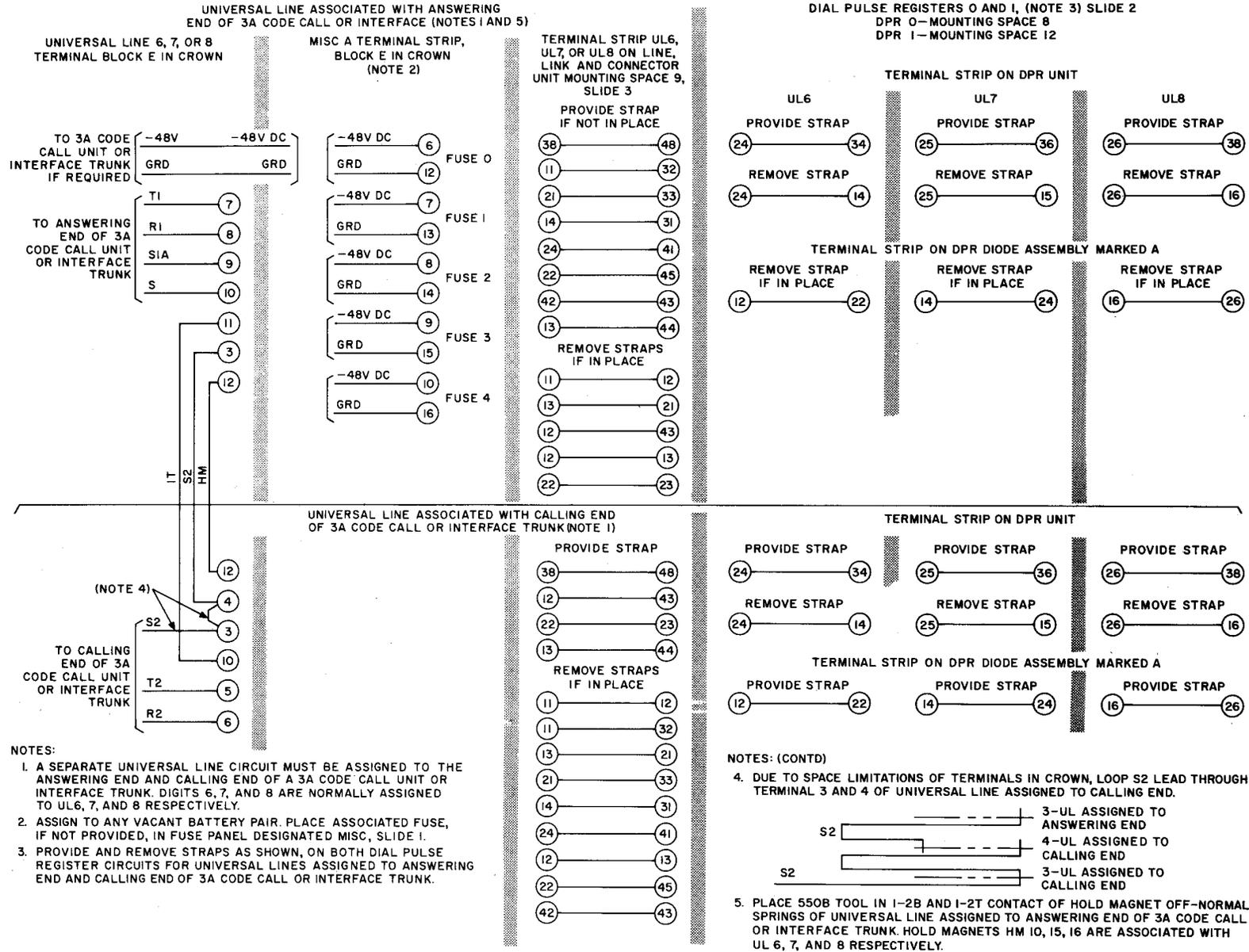


Fig. 20—Connections for Universal Line Circuits Assigned to Answering and Calling Ends of a 3A Code Call Unit or Interface Trunk

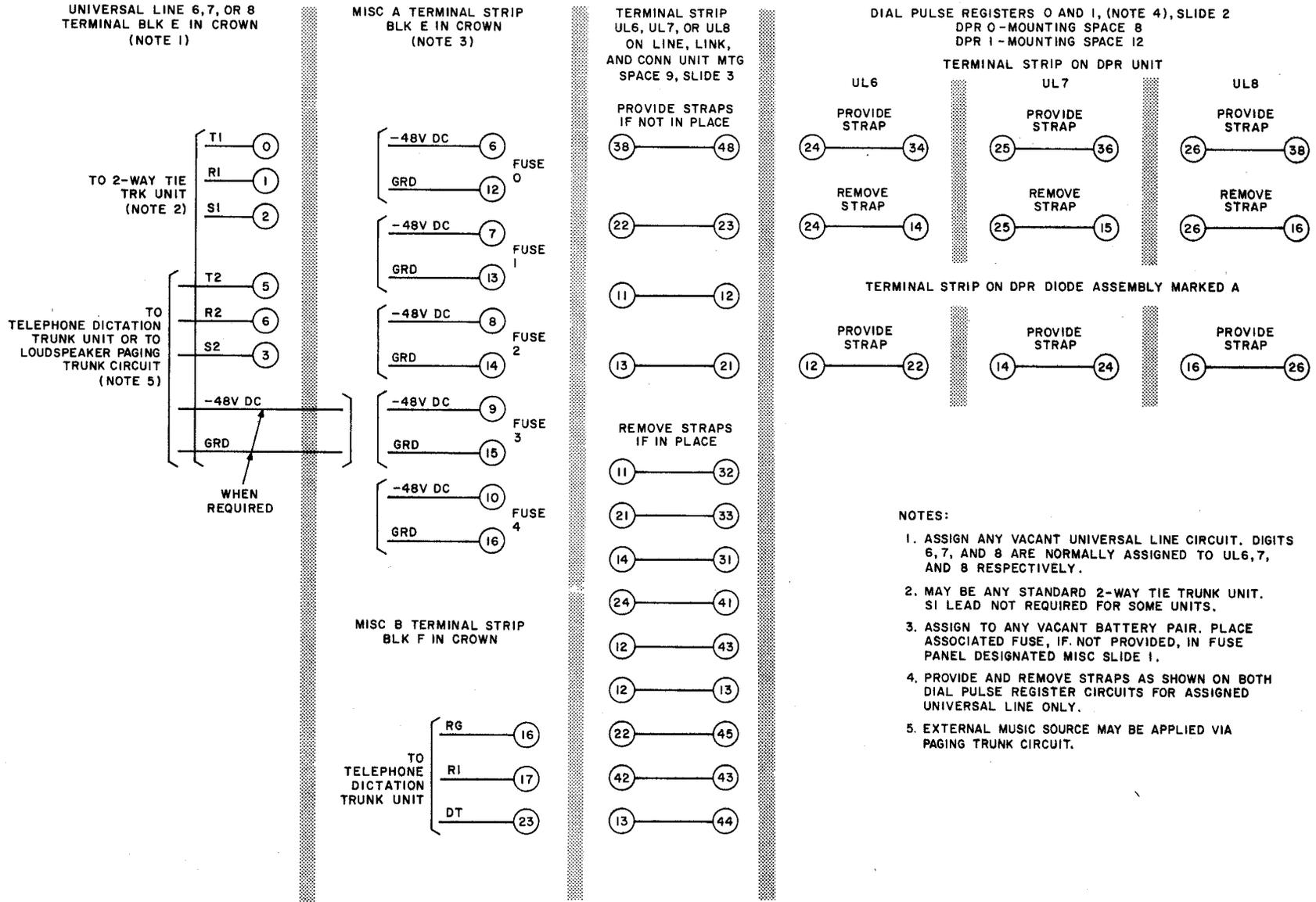


Fig. 21—Connections for Universal Line Circuit Assigned to Two-Way Tie Trunk, Loud-speaker Paging Trunk, or Telephone Dictation Trunk

(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** Remove universal line from service as follows:

(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.

(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 connection information of listed equipment.

- Dial Repeating Type Tie Trunks—SD-65718-01 or SD-65755-01 (typical circuits)
- Recorded Telephone Dictation Trunk—SD-65788-01
- 3A Code Call Circuit—SD-66610-01
- Interface Trunk—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**

**ADDITION OF INTERNALLY MOUNTED C1 RECEIVERS TO LIST 3 (MD) CABINET ASSEMBLY**

**8.01** Conversion kit J53035A, List 7, for adding TOUCH-TONE calling to the List 3 (MD) cabinet assembly, is rated MD.

**8.02** When internal application of TOUCH-TONE calling is required, the following equipment and cabling must be ordered separately and installed locally:

- One 404C tone generator
- Two J58844A, List 1 receivers (Type C1), replaced by J58844B, List 1
- One KS-14528, List 2 connector
- Two KS-14672, List 2 connectors
- Two AF156 (P2A relays).

**8.03** Install two type C1 receivers, two KS-14672, List 2 connectors and 16-pair cable (furnished locally) as explained in Section 518-710-200. Connect the free end of the 16-pair cable to dial pulse registers (0) and (1), slide 2, as shown in Fig. 22.

**8.04** Replace the two AF63 (P2A) relays in the dial pulse registers with two AF156 (P2A) relays.

**8.05** Mount the 404C tone generator in position 15 on slide 1. Install 5 conductors on KS-14528, List 2 connector and connect free ends of conductors to alarm test time out and fuse panel (slide 1, as shown in Fig. 23). Plug connector into tone generator and install fuses as required.

**ADDITION OF INTERNALLY MOUNTED C1 RECEIVERS TO LIST 8 (MD) CABINET ASSEMBLY**

**8.06** Install two type C1 receivers (ordered separately) in mounting plate positions 14 and 13

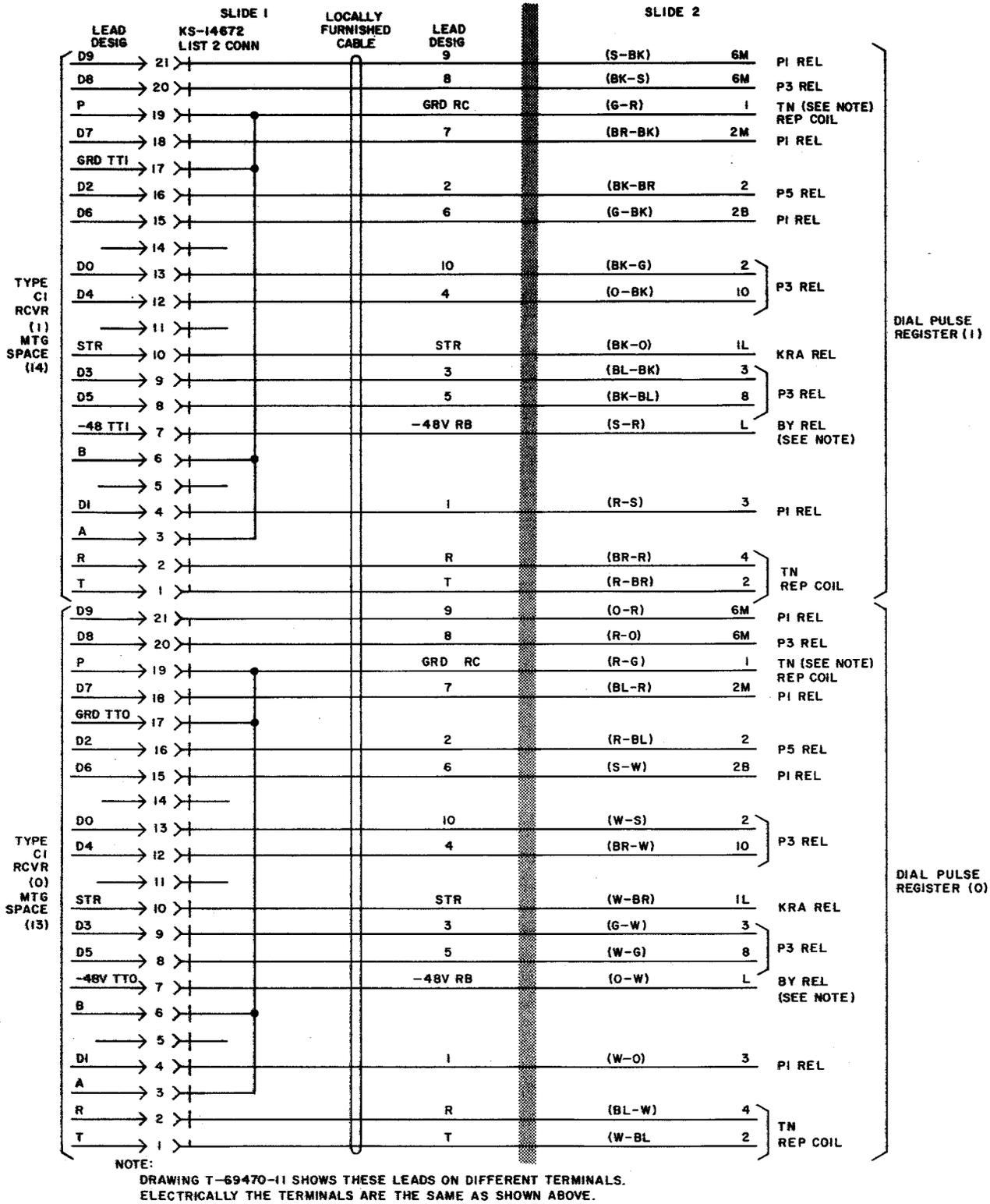


Fig. 22—Connections for Adding Type C1 Receivers for TOUCH-TONE Calling to List 3 (MD) Cabinet Assembly

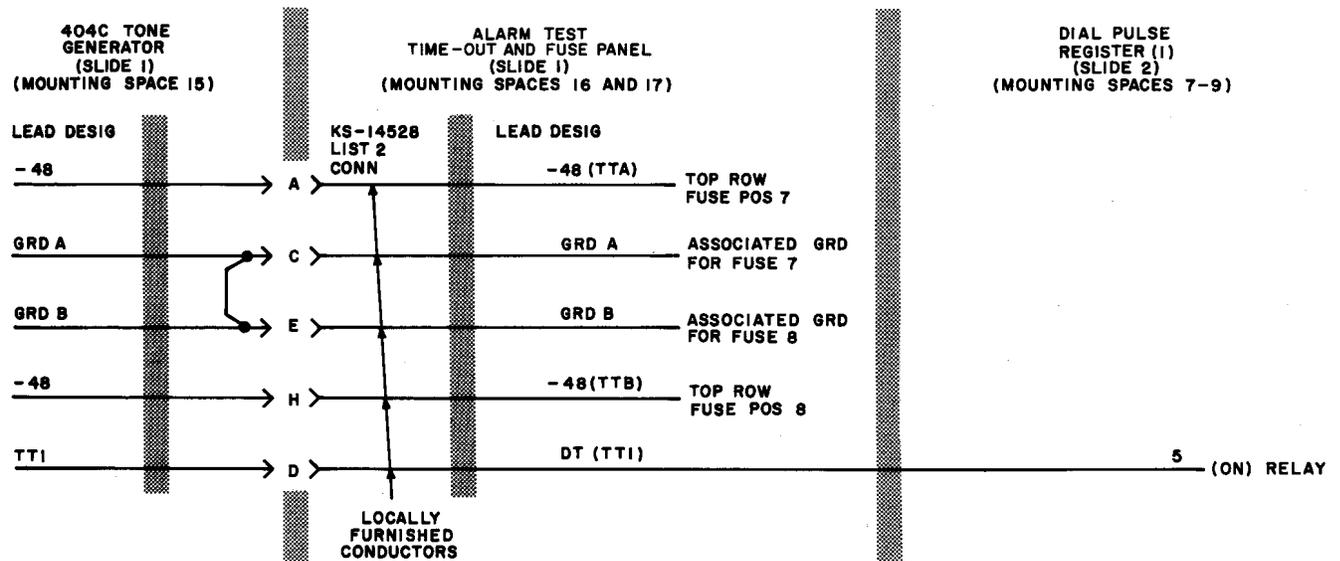


Fig. 23—Connections for 404C Tone Generator, List 3 (MD) Cabinet Assembly

on slide 1. Join the KS-14672, List 2 connector, provided at each mounting space, with their respective plugs located on each receiver.

**8.07** If 404C tone generator has not been provided with the list 8 (MD) cabinet assembly, order separately and install per paragraph 8.05 and Fig. 23.

#### ADDITION OF EXTERNALLY MOUNTED A3 RECEIVERS TO LIST 3 (MD) CABINET ASSEMBLY

**8.08** The following equipment and cabling must be ordered separately and installed locally:

- One 404C tone generator
- One KS-14528, List 2 connector
- Two J99289B receivers (type A3)
- One J99289A mounting shelf
- One J58847AE [(MD) replaced by J58847CE (A&M) TOUCH-TONE calling receiver applique unit (2-circuit)]
- Two AF156 (P2A) relays
- 25-pair cabling.

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

**8.10** Place 24-gauge strapping wire between applique unit (terminal strips A and B), and the mounting shelf (terminal strip G) as shown in Fig. 24.

**8.11** Install 25-pair inside wiring cable between TOUCH-TONE calling applique unit and dial pulse registers on slide 2 in the 400 Switching System cabinet. Terminate conductors as shown in Fig. 24.

**8.12** Insert TOUCH-TONE calling A3 receivers A and B in the receiver mounting shelf. Refer to paragraph 8.05 and Fig. 23 for installing the 404C tone generator.

**8.13** Replace the two AF63 (P2A) relays, in the dial pulse registers, with two AF156 (P2A) relays.

#### ADDITION OF EXTERNALLY MOUNTED A3 RECEIVERS TO LIST 8 (MD) CABINET ASSEMBLY

**8.14** The same equipment and cabling listed in paragraph 8.08 must be ordered separately and installed per paragraphs 8.08, 8.10, and 8.12. In addition, two KS-14671, List 1 plugs must be ordered separately and installed on one end of the 25-pair cable (Fig. 25), and joined with the two connectors

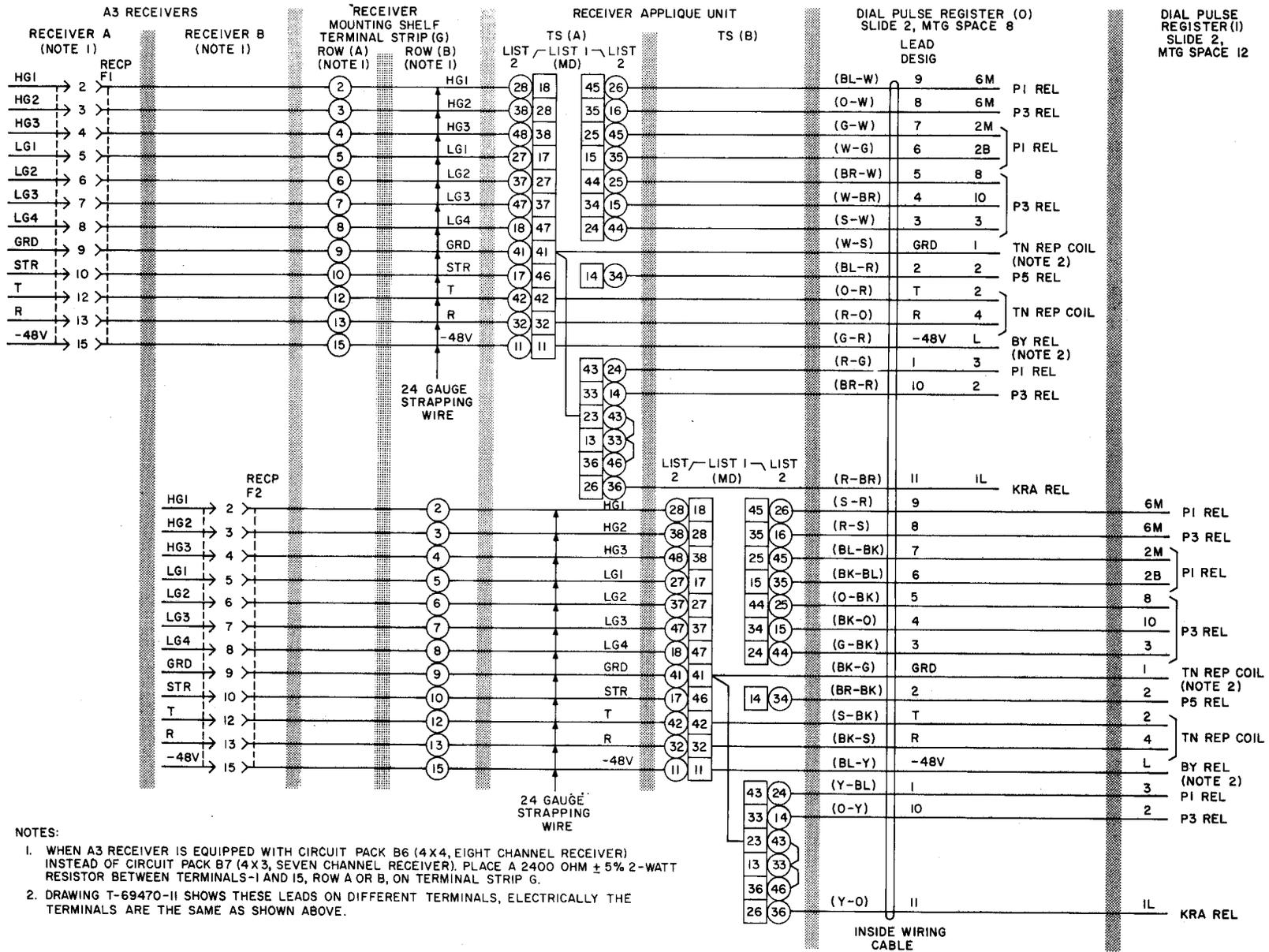


Fig. 24—Connections for Adding Externally Mounted Type A3 Receivers to List 3 (MD) Cabinet Assembly

provided in mounting spaces 13 and 14 on slide 1 in the switching system cabinet.

**8.15** Refer to paragraph 8.05 and Fig. 23 for installing the 404C tone generator. References for Part 8 are as follows:

- SD-67027-01
- SD-69463-01
- SD-69470-01
- SD-69471-01
- SD-98148-01.

## 9. STATION MAKE-BUSY UNITS, LISTS 3, 4, 8, AND 9 (MD) CABINET ASSEMBLIES

**9.01** Install one J53035CK, List 1 (MD) unit and required number of J53035CK, List 2 (MD) units in an external apparatus cabinet as described in Section 518-710-200. Figure 26 provides the equipment and cabling layout for a full complement of 30 key telephone sets arranged for the station make busy feature.

**9.02** Figure 27 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. 28. One diode (M) is required per primary line appearance and two diodes (M and MB) per secondary line appearance.

**9.03** Figure 29, sheets 1 through 6, provides connections for one List 1 (MD) unit and three List 2 (MD) 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. 29, 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 as follows:

- By lighting the **TR** lamp located on slide 1 of cabinet assembly (always provided)

- 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. 30. Remove option not required at contacts of TR relay, located slide 1, mounting space 17.**

**10.03** Three types of failures that will bring in an alarm are as follows:

- 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 as shown in Fig. 31. 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.**

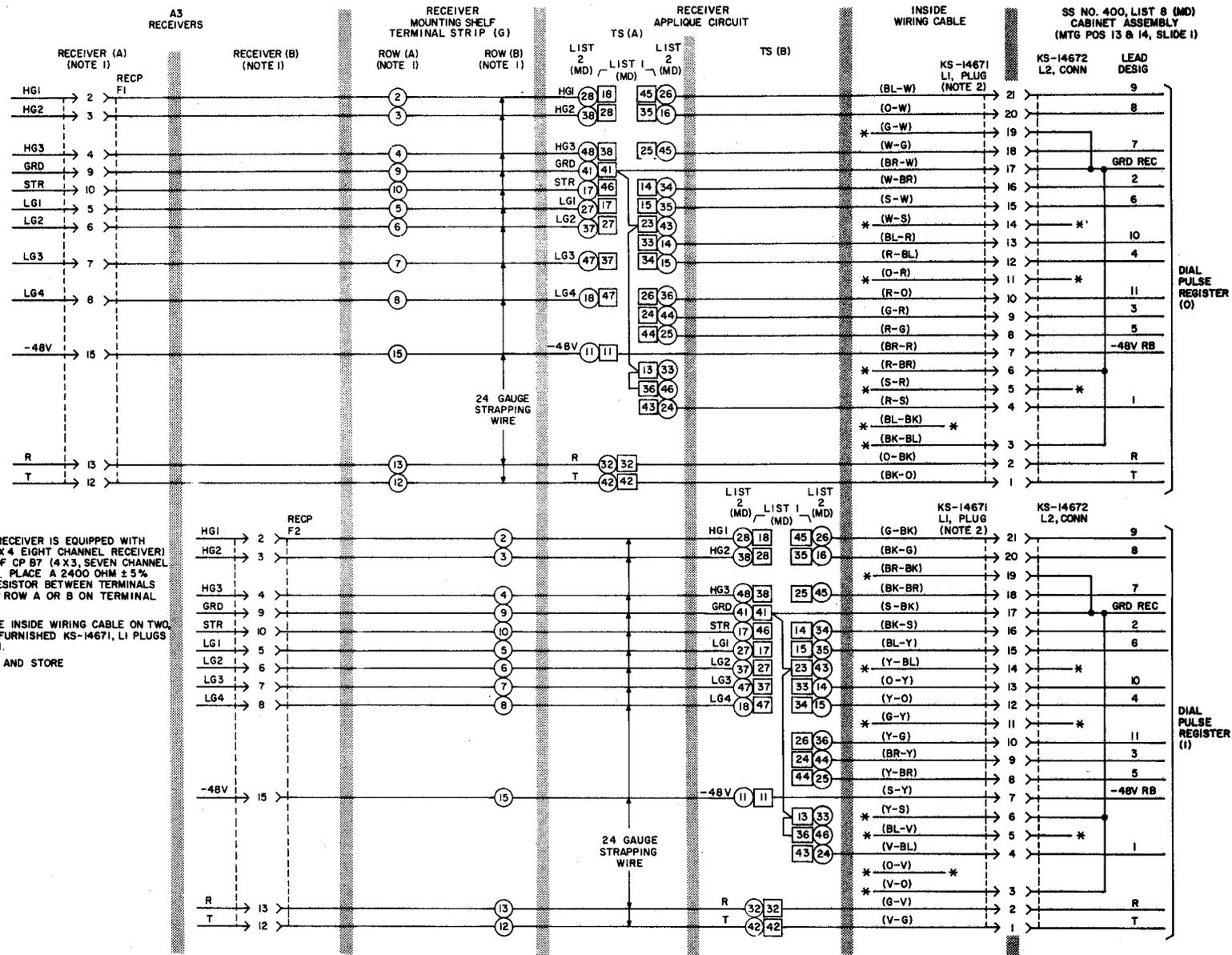
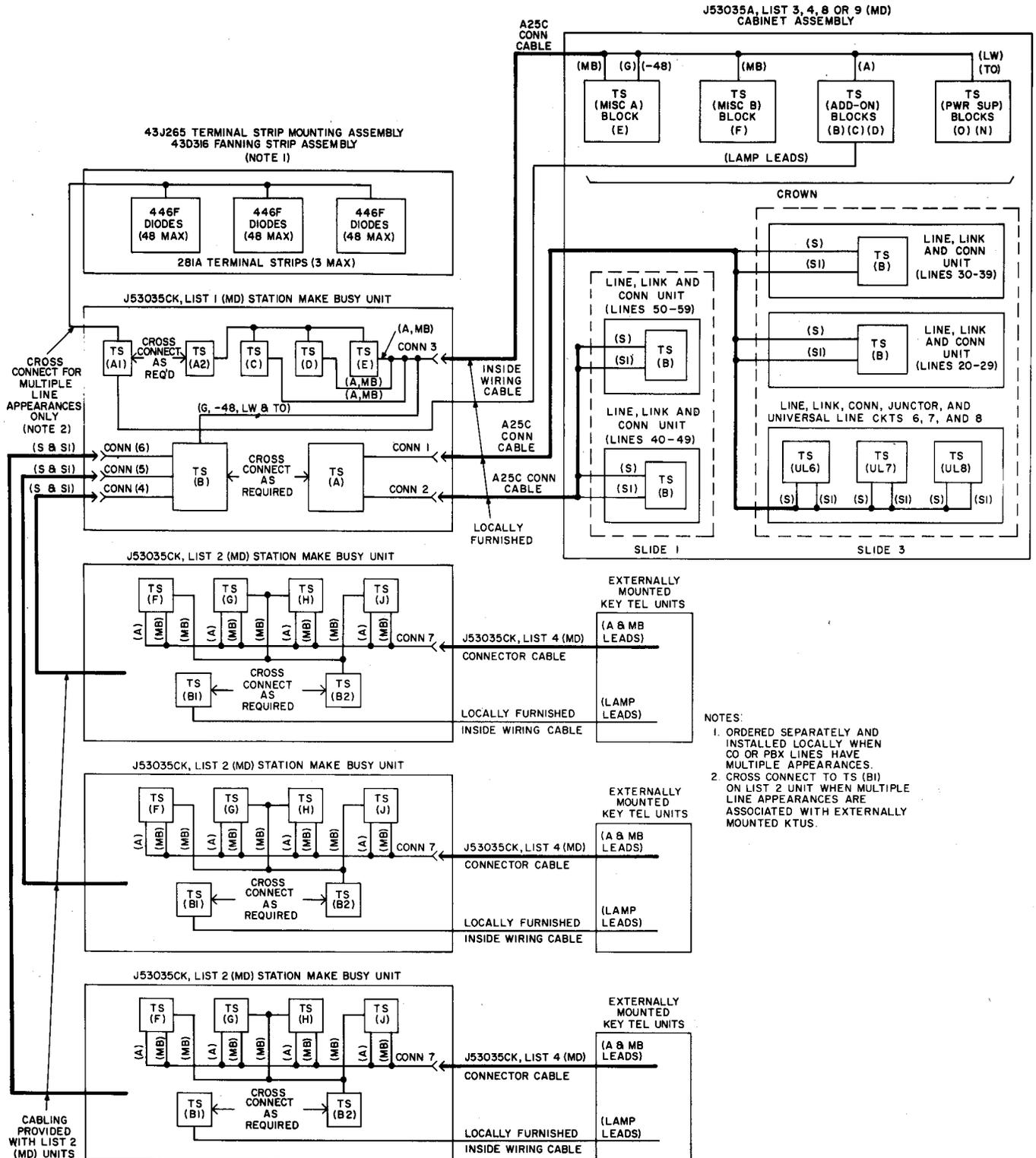
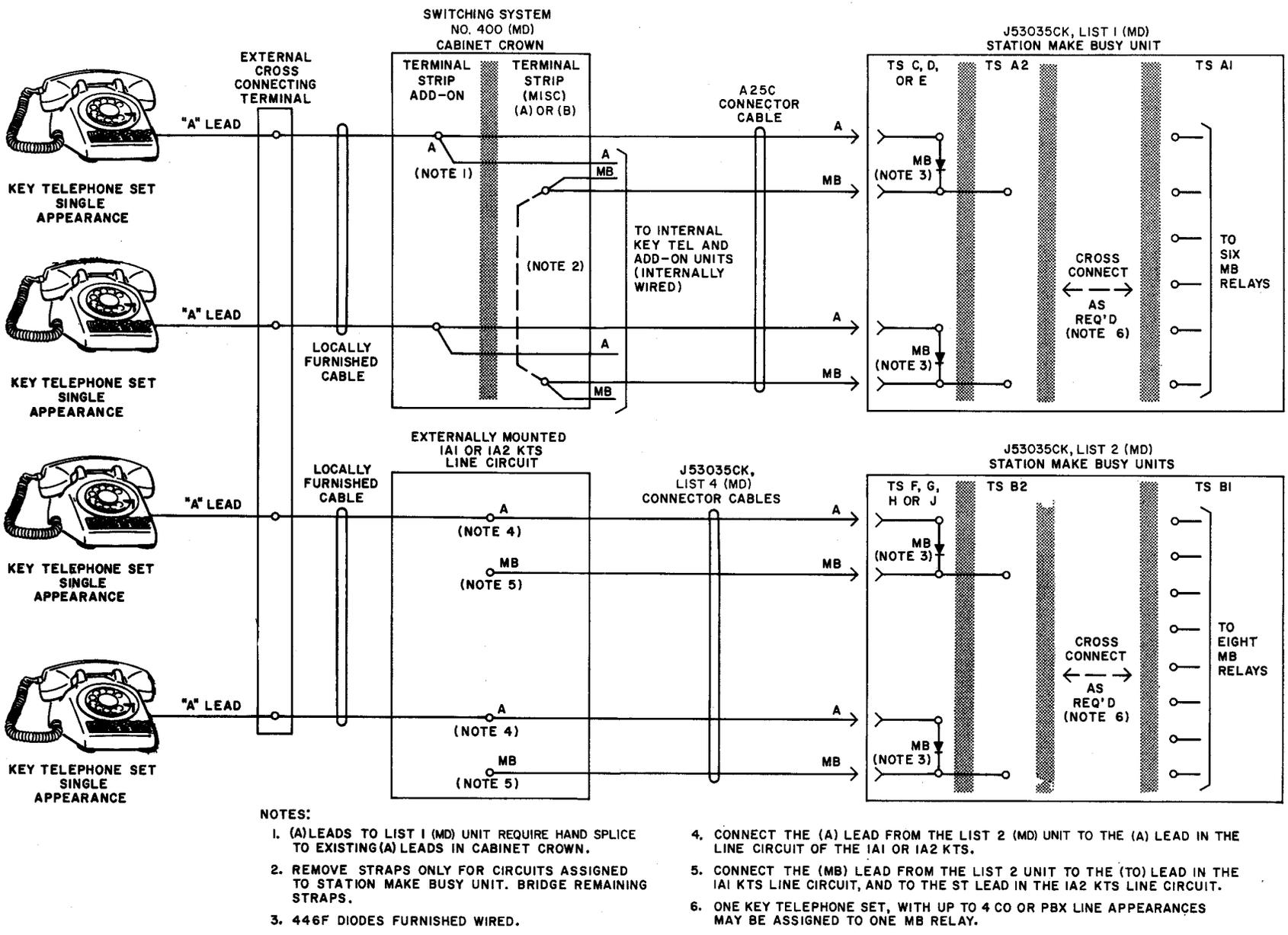


Fig. 25—Connections for Adding Externally Mounted Type A3 Receivers to List 8 Cabinet Assembly



- NOTES:
1. ORDERED SEPARATELY AND INSTALLED LOCALLY WHEN CO OR PBX LINES HAVE MULTIPLE APPEARANCES.
  2. CROSS CONNECT TO TS (B1) ON LIST 2 UNIT WHEN MULTIPLE LINE APPEARANCES ARE ASSOCIATED WITH EXTERNALLY MOUNTED KTUS.

Fig. 26—Station Make-Busy Equipment and Cabling Layout



- NOTES:
1. (A) LEADS TO LIST 1 (MD) 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 (MD) 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. 27—Station Make-Busy Block Diagram, Single Appearance Lines, Internally and Externally Mounted KTUs



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

J53035CK, LIST 1 (MD) STATION MAKE BUSY UNIT

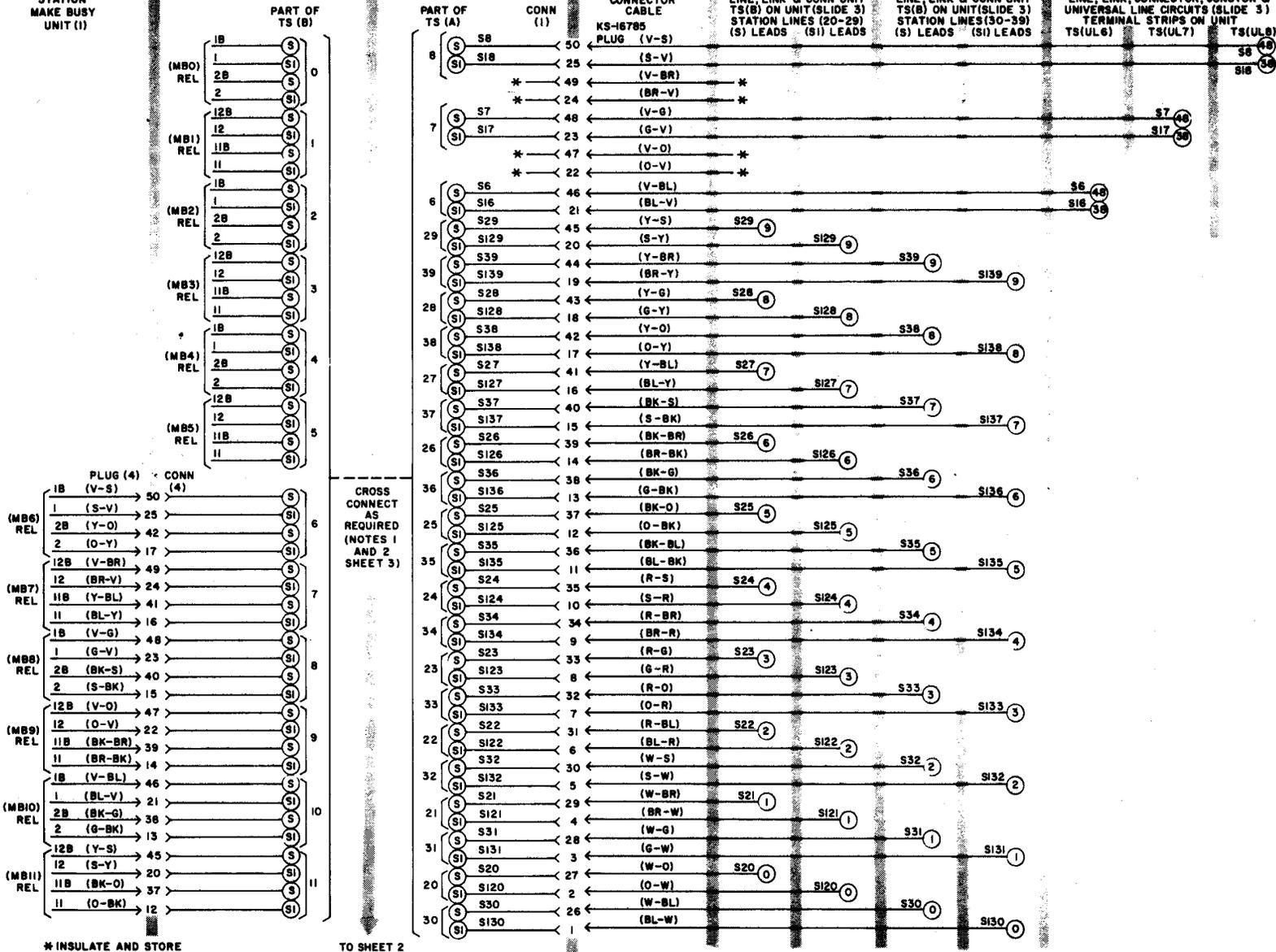


Fig. 29—Connections for Station Make-Busy Units (Sheet 1 of 6)

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

A25 C  
CONNECTOR CABLE

SWITCHING SYSTEM NO. 400 (MD) CABINET  
LINE, LINK & COMM UNIT  
TS(B) ON UNIT (SLIDE 1)  
STATION LINES (40-49)  
(S) LEADS

SWITCHING SYSTEM NO. 400 (MD) CABINET  
LINE, LINK & COMM UNIT  
TS(B) ON UNIT (SLIDE 1)  
STATION LINES (50-59)  
(S) LEADS

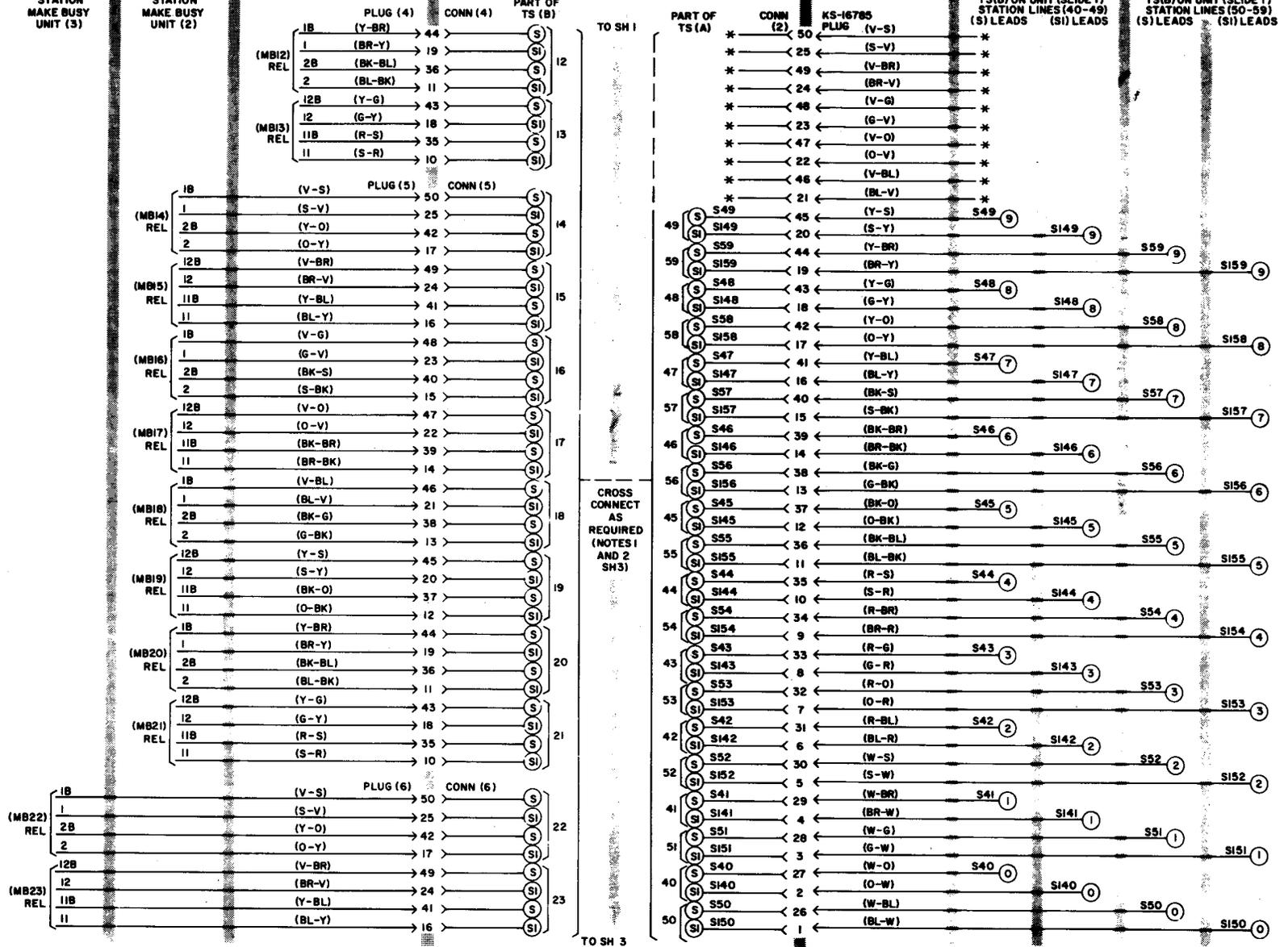
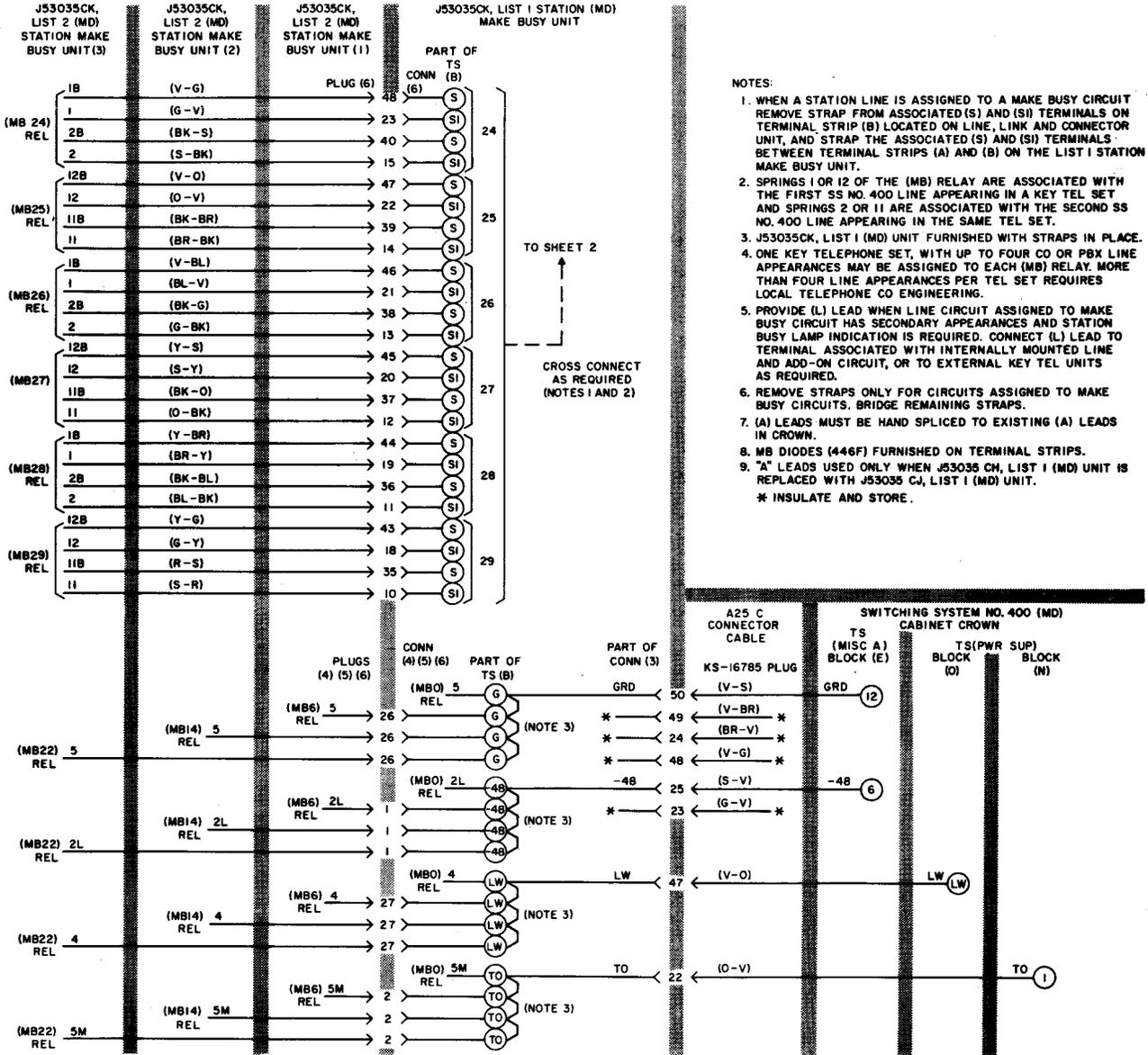


Fig. 29—Connections for Station Make-Busy Units (Sheet 2 of 6)



- NOTES:
1. WHEN A STATION LINE IS ASSIGNED TO A MAKE BUSY CIRCUIT REMOVE STRAP FROM ASSOCIATED (S) AND (SI) TERMINALS ON TERMINAL STRIP (B) LOCATED ON LINE, LINK AND CONNECTOR UNIT, AND STRAP THE ASSOCIATED (S) AND (SI) TERMINALS BETWEEN TERMINAL STRIPS (A) AND (B) ON THE LIST I STATION MAKE BUSY UNIT.
  2. SPRINGS 1 OR 12 OF THE (MB) RELAY ARE ASSOCIATED WITH THE FIRST SS NO. 400 LINE APPEARING IN A KEY TEL SET AND SPRINGS 2 OR 11 ARE ASSOCIATED WITH THE SECOND SS NO. 400 LINE APPEARING IN THE SAME TEL SET.
  3. J53035CK, LIST I (MD) UNIT FURNISHED WITH STRAPS IN PLACE.
  4. ONE KEY TELEPHONE SET, WITH UP TO FOUR CO OR PBX LINE APPEARANCES MAY BE ASSIGNED TO EACH (MB) RELAY. MORE THAN FOUR LINE APPEARANCES PER TEL SET REQUIRES LOCAL TELEPHONE CO ENGINEERING.
  5. PROVIDE (L) LEAD WHEN LINE CIRCUIT ASSIGNED TO MAKE BUSY CIRCUIT HAS SECONDARY APPEARANCES AND STATION BUSY LAMP INDICATION IS REQUIRED. CONNECT (L) LEAD TO TERMINAL ASSOCIATED WITH INTERNALLY MOUNTED LINE AND ADD-ON CIRCUIT, OR TO EXTERNAL KEY TEL UNITS AS REQUIRED.
  6. REMOVE STRAPS ONLY FOR CIRCUITS ASSIGNED TO MAKE BUSY CIRCUITS. BRIDGE REMAINING STRAPS.
  7. (A) LEADS MUST BE HAND SPLICED TO EXISTING (A) LEADS IN CROWN.
  8. MB DIODES (446F) FURNISHED ON TERMINAL STRIPS.
  9. "A" LEADS USED ONLY WHEN J53035 CH, LIST I (MD) UNIT IS REPLACED WITH J53035 CJ, LIST I (MD) UNIT.  
\* INSULATE AND STORE.

Fig. 29—Connections for Station Make-Busy Units (Sheet 3 of 6)

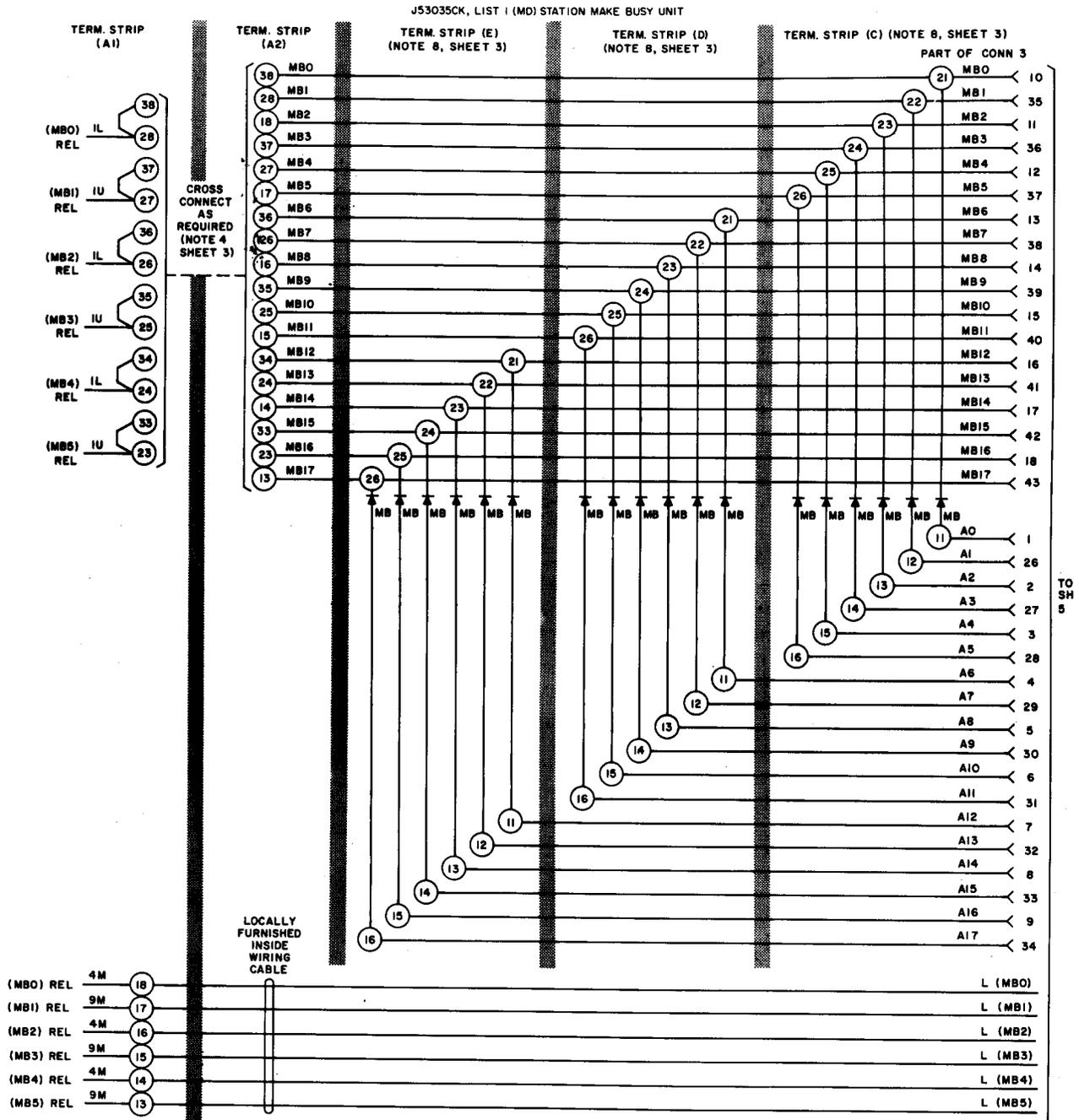


Fig. 29—Connections for Station Make-Busy Units (Sheet 4 of 6)

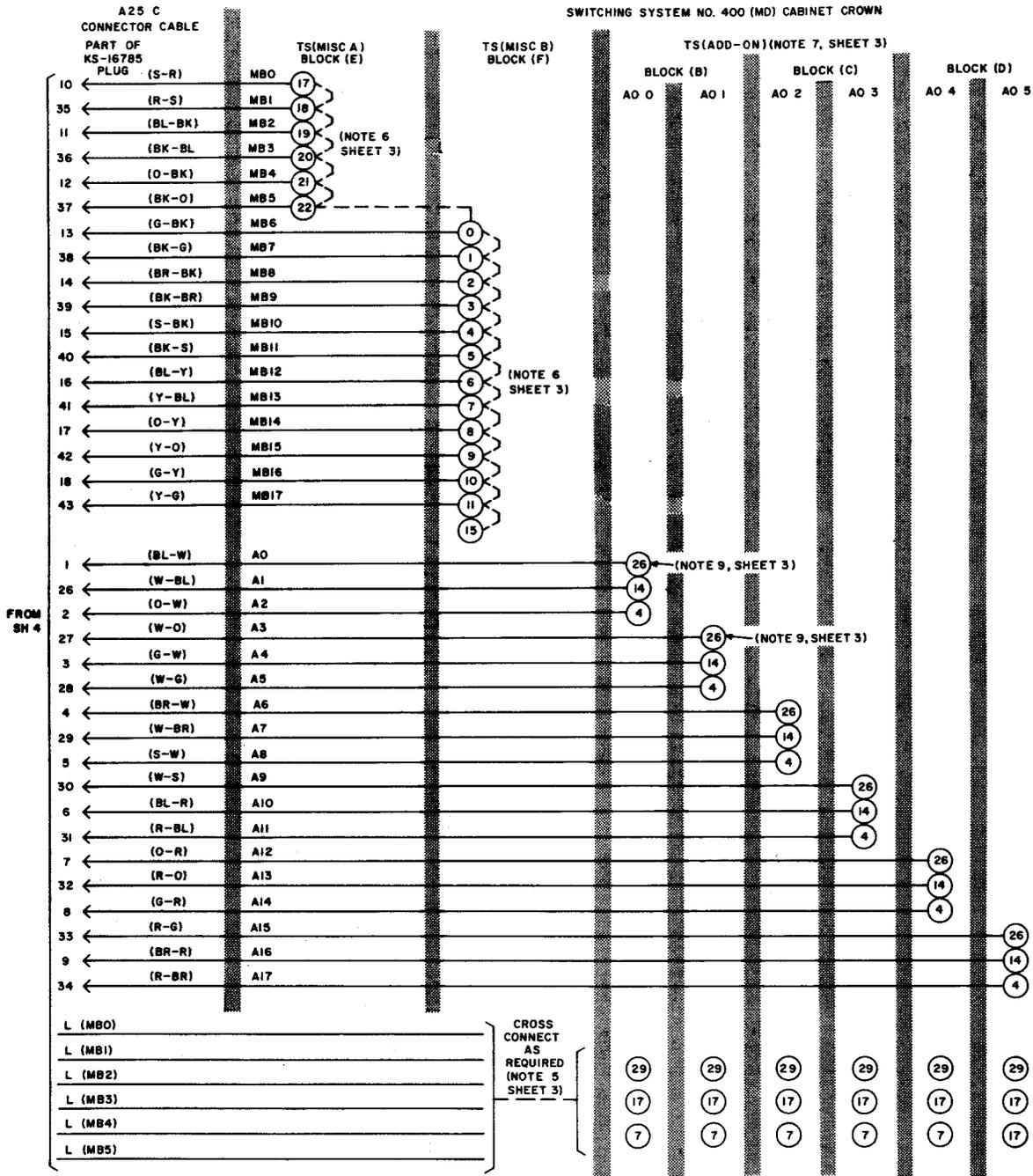


Fig. 29—Connections for Station Make-Busy Units (Sheet 5 of 6)

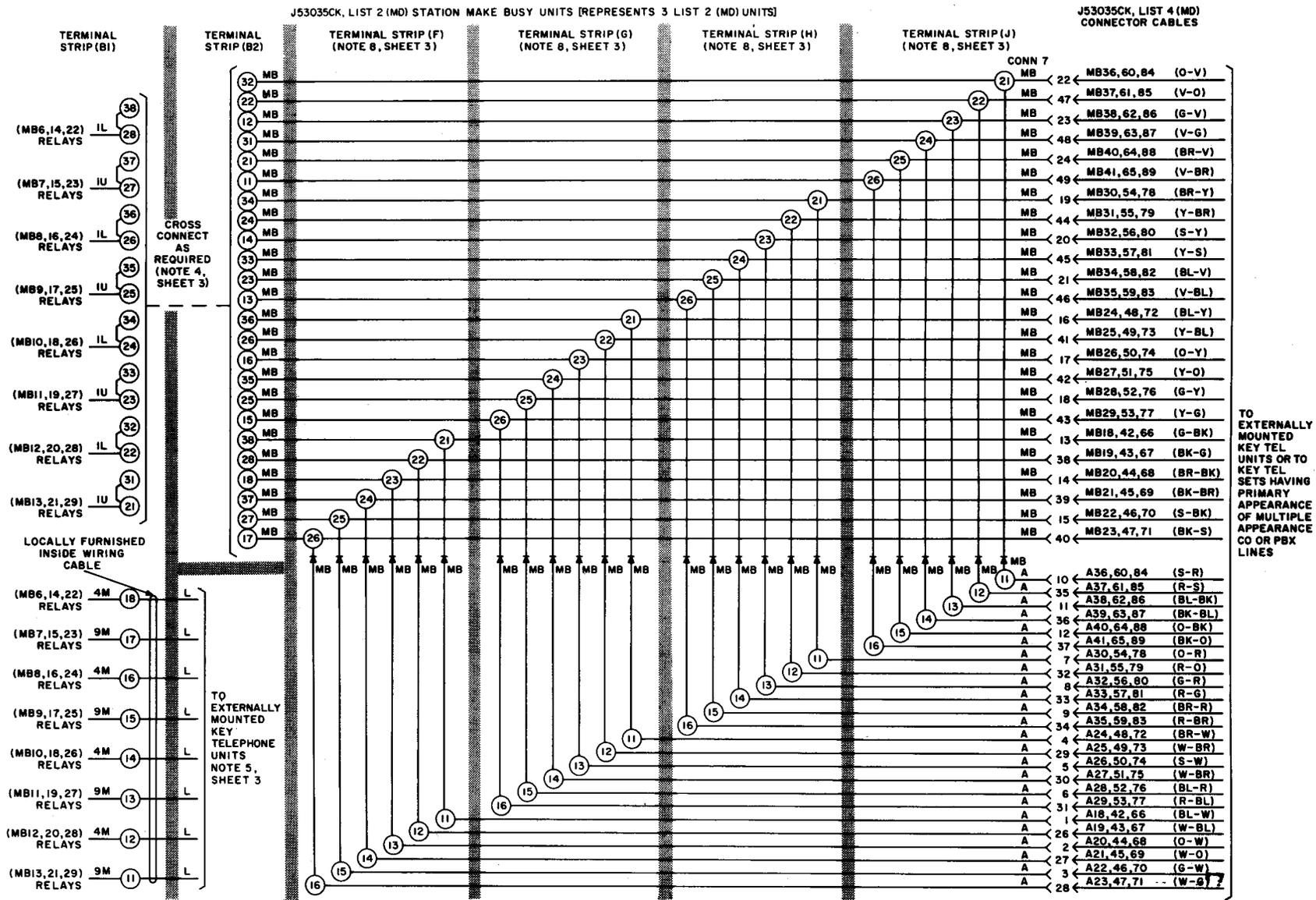


Fig. 29—Connections for Station Make-Busy Units (Sheet 6 of 6)

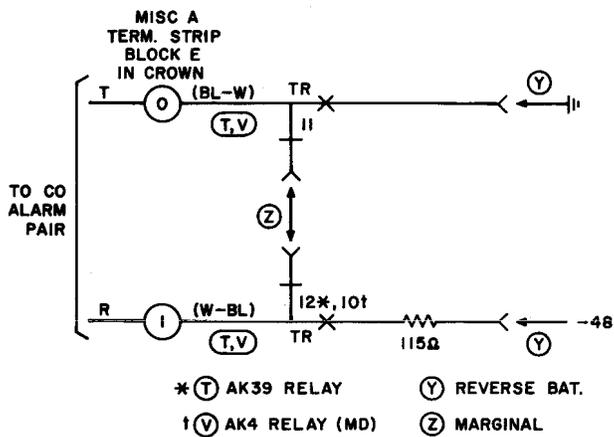


Fig. 30—Alarm to Central Office

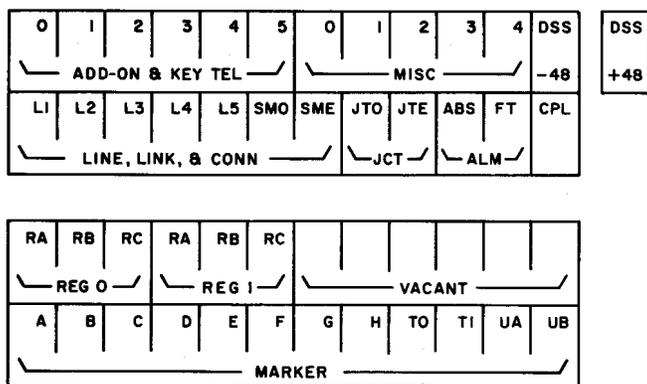


Fig. 31—Switching System No. 400 Fuse Panel

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 Switching System No. 400 is supplied by a J86812A, L1 power plant located top of slide 1. It consists of the following:

- (a) J87250B, L1 rectifier supplying -48 Vdc for relay operation and talking purposes.
- (b) J86812B, L1 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) Tone
- (5) KS-15984, L1 plug-in type interrupter supplying various interruptions required for lamps, busy tone, ringing, etc.

12.02 Three 7000-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 the J87205B, L1 rectifier unit just below the output meter, and one is on the front panel of the J86812B, L1 equipment in the upper right hand corner. The switch located on J86812B, L1 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.

12.04 Fusing the J86812A, L1 power plant is as follows:

Input Fuses

- (a) Busman MDX 6.25 ampere designated FN located front panel of J87205B, L1 rectifier unit.
- (b) Busman MDL-2, 2-ampere fusetron designated F1 located front panel of J86812B, L1 equipment.

Output Fuses (located front panel of J86812B, L1 equipment)

- (a) 70B, 2-ampere designated ±10V (for station lamps)
- (b) 70A, 1-1/3 ampere designated Int (±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).

**12.05** The KS-15984, L1 interrupter furnished as part of the J86812B, L1 equipment is located on the back of slide 1. The interrupter requires no lubrication and maintenance should be limited to cleaning dirty contacts.



**When returning KS-15984, L1 interrupter to distributing house, for any reason, attach ticket stating reason for return.**

**12.06** Figure 32 provides connections for crown power terminal strips, miscellaneous terminal strips, and fusing.

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

- (1) Place line switches for ac input supply of both the J87205B, L1 rectifier unit and J86812B, L1 equipment to the OFF position, which is down.
- (2) Using a 300 Vdc scale, connect volt-ohm-milliammeter to terminals 1 and 2 of TS1, located upper left hand side on back of J86812B, L1 equipment as viewed from back.
- (3) Insert power cord into receptacle and place line switch on J86812, L1 equipment to ON position. Take reading of ac input supply voltage.
- (4) Remove power cord and place line switch to OFF position. Disconnect meter.

(5) 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  $\pm 10$  V 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.

(6) Insert power cord into receptacle and place line switch of J86812B, L1 equipment to ON position.

(7) Place line switch of rectifier unit to ON position. Meter on unit should indicate between 45 and 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.

