SWITCHING SYSTEM NO. 400
J53035A, LISTS 1 AND 2 CABINET ASSEMBLIES
METHOD OF CONNECTING

CONTENTS PAGE

1. GENERAL 1
2. STATION LINES 2
ASSIGNED STATION LINES 2
UNASSIGNED STATION LINES 2
HUNTING ARRANGEMENTS 2
A. One-Way Nonsequential Hunting . 2
B. One-Way Sequential Hunting . . . 4
C. Two-Way Nonsequential Hunting . 4
D. Combination of One- and Two-Way Nonsequential Hunting 4
3. LINE, LINK, AND CONNECTOR UNITS FOR STATION LINES 40-49 AND 50-59 . . . 4
4. ADD-ON LINE UNITS (INTERNALLY OR EXTERNALLY MOUNTED) 5
5. KEY TELEPHONE UNITS (INTERNALLY OR EXTERNALLY MOUNTED) 8
6. DIRECT STATION SELECTION (DSS) UNITS . 8
A. Adding Auxiliary Relay Units to List 2 (MD) Cabinet Assembly 9
B. Adding Externally Mounted Auxiliary Relay Units to List 2 (MD) Cabinet Assembly Equipped With Internal Units 9
C. Mounting All Auxiliary Relay Units Associated With List 2 (MD) Cabinet Assembly in External Cabinet . . . 9

CONTENTS PAGE

D. Adding DSS to J53035A, List 1 (MD) Cabinet Assembly 10
E. Placing Station Arranged for DSS in Service 10
7. UNIVERSAL LINE CIRCUITS 11
8. "TOUCH-TONE®" CALLING 11
9. STATION MAKE-BUSY UNITS 12
10. ALARM CIRCUIT 12
11. FUSE PANEL 13
12. POWER SUPPLY 13

1. GENERAL

1.01 This section provides the method of connecting the Switching System No. 400 (20-40 Dial Pak) in the J53035A, Lists 1 and 2, manufacture discontinued (MD) cabinet assemblies.

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.

1.03 Equipment added to a system should be mounted in accordance with Section 518-710-200.

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.

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

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 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.

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 (Fig. 2).

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 2 (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 line, 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.

HUNTING ARRANGEMENTS

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

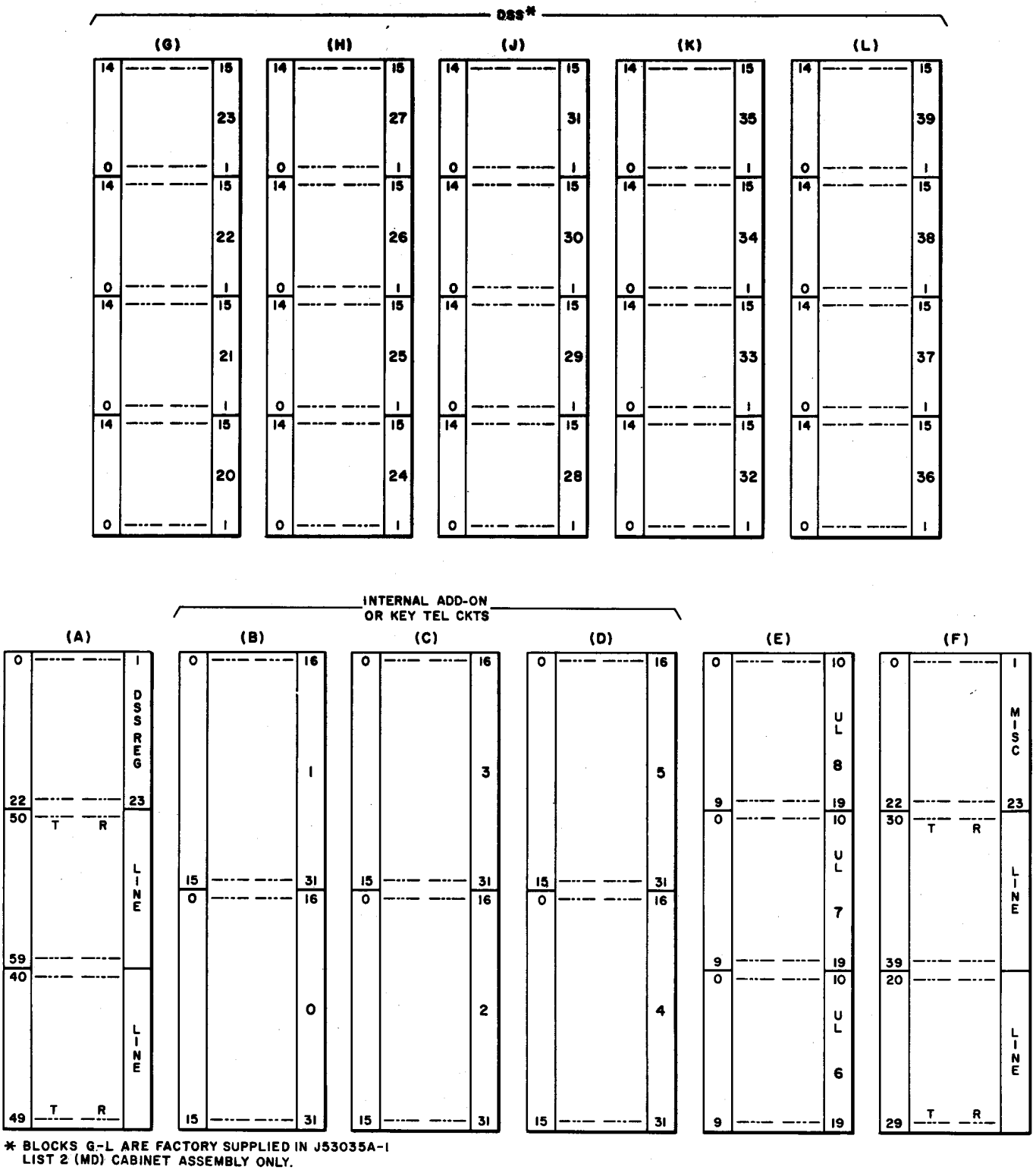
- One-way nonsequential
- One-way sequential
- Two-way nonsequential
- Combination of one-way and two-way nonsequential.

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.

A. One-Way Nonsequential Hunting

2.09 One-way nonsequential hunting is provided by inserting diodes between H terminals of the



* BLOCKS G-L ARE FACTORY SUPPLIED IN J53035A-1 LIST 2 (MD) CABINET ASSEMBLY ONLY.

Fig. 1—Method of Designating and Counting Connecting Blocks in Crown

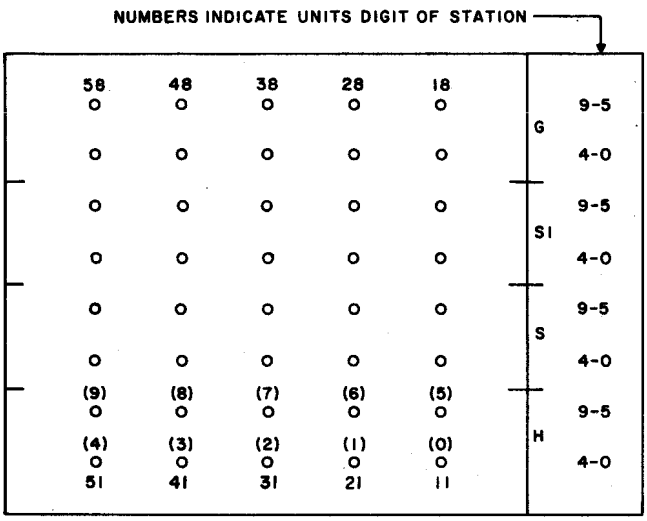


Fig. 2—Terminal Strip B of Line, Link, and Connector Unit

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.

B. 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.

C. 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).

D. 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 if 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:

(a) The following is 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.

(b) The following is 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 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.

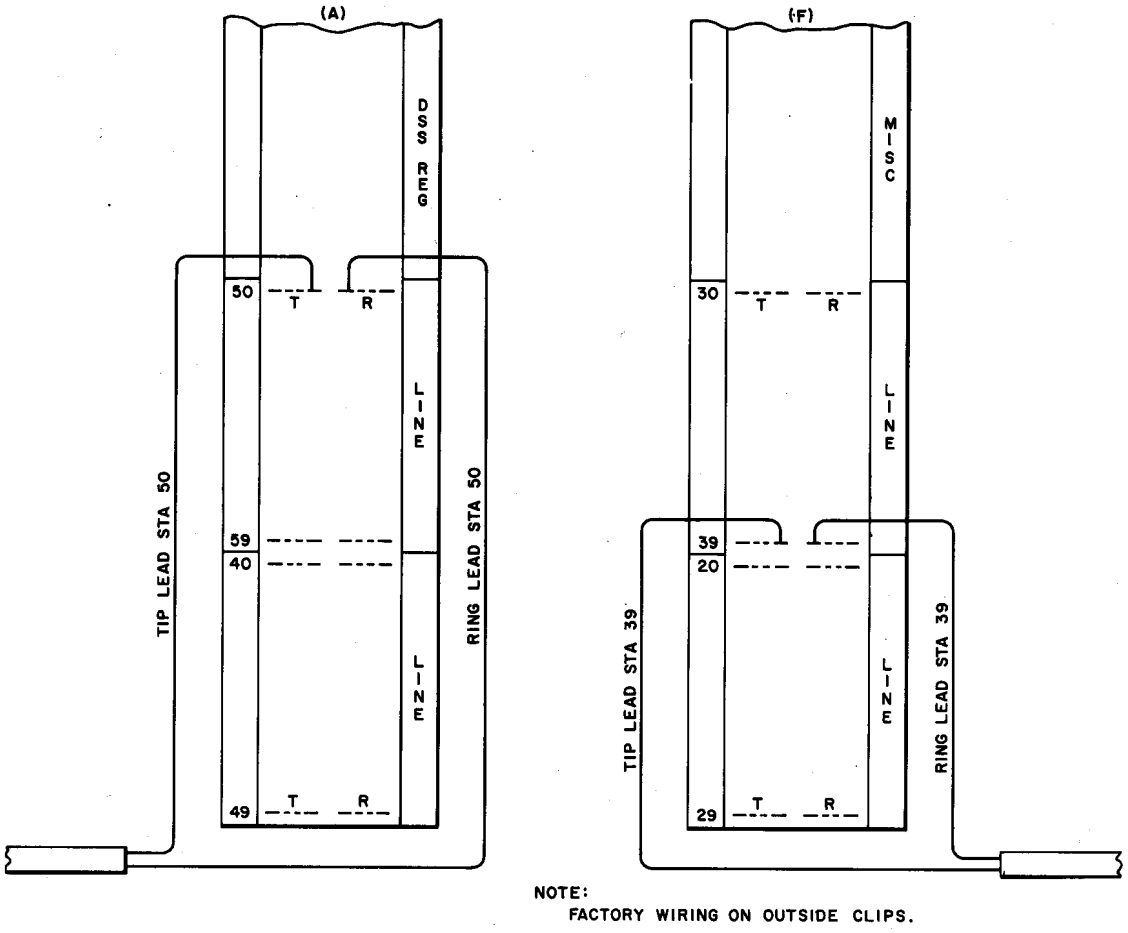
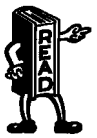


Fig. 3—Method of Terminating T and R Leads in Lists 1 and 2 (MD) Cabinet Assemblies

4. ADD-ON LINE UNITS (INTERNALLY OR EXTERNALLY MOUNTED)

4.01 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 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 ar add-on line circuit or portion thereo. 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 multipled at stations other than auxiliary answering positions.

4.02 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.

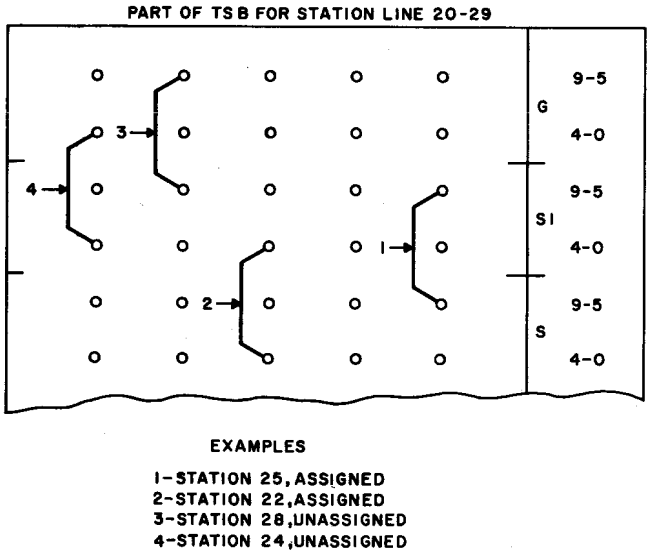


Fig. 4—Typical Strapping of Terminal Strip B of Line, Link, and Connector Unit (Station Lines 20-29)

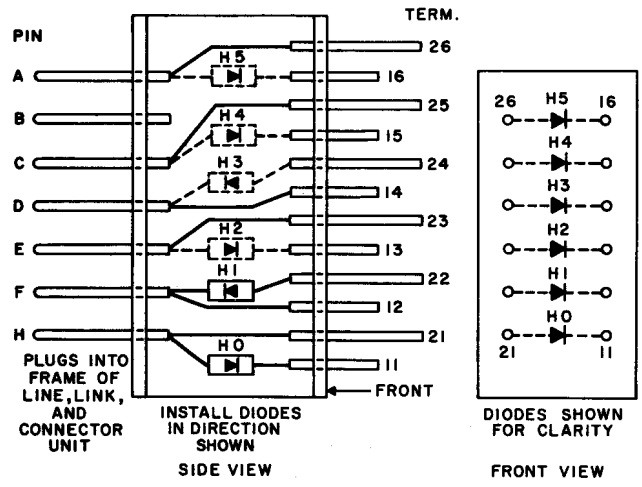


Fig. 5—Front and Side View of Terminal Strip A

(b) Internal strip-mounted units require 48 Vdc for relay operation.

4.03 These line circuits can be used for regular 1A1 Key Telephone System installations when not required for add-on feature use.

4.04 The ringing circuit for each line is arranged for either metallic or grounded ringing.

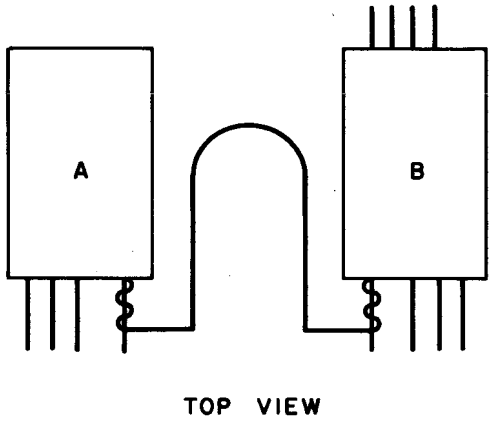


Fig. 6—Method of Dressing Straps Between Terminal Strips A and B

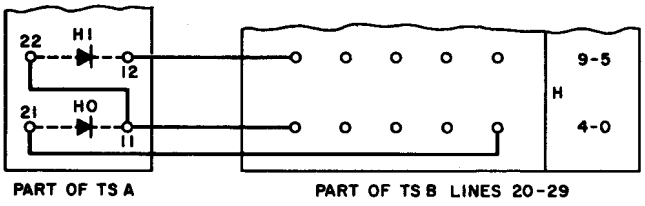


Fig. 7—One-Way Nonsequential Hunting Group Consisting of Station Lines 20, 24, and 29

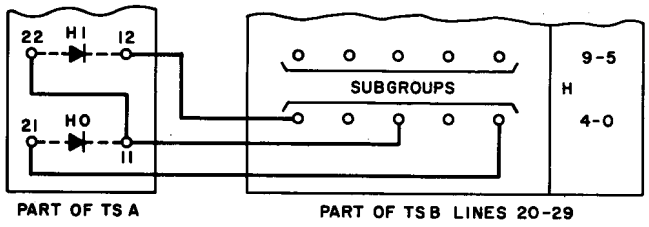


Fig. 8—One-Way Sequential Hunting Group Consisting of Station Lines 20, 22, and 24

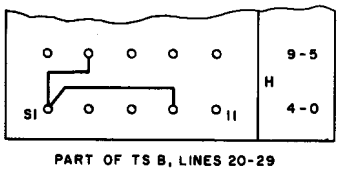


Fig. 9—Two-Way Nonsequential Hunting Group Consisting of Station Lines 21, 24, and 28

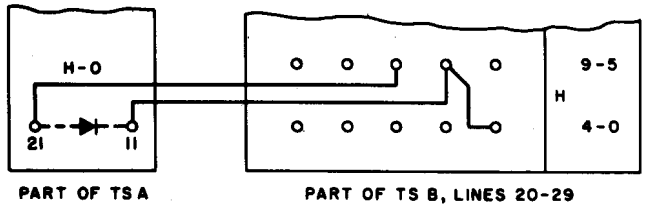
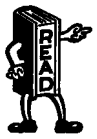


Fig. 10—Combination of One- and Two-Way Nonsequential Hunting Group Consisting of Station Lines 20, 26, and 27



Internally mounted add-on line units of early manufacture were furnished with X and V options shop wired. On initial installation of these units, the option not required must be removed.

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 internal 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 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.

The internal ±10-volt power plant will supply a total of fifty 51A lamps. When more than fifty 51A lamps are required, use external ±10-volt power plant, interrupter, and time-out circuit. Connect as shown in Fig. 11, 12, and 31.

4.07 The line circuits are arranged for either the steady hold lamp or winking hold lamp feature.

Internally mounted add-on line units of early manufacture were furnished with J and H options shop wired. On initial installation of these units, the option not required must be removed.

4.08 Figure 11 shows the connections for add-on units 0 and 1 as furnished with each cabinet assembly. It also shows the necessary connections to be made when add-on units 2-5 are added to the system. Leads for add-on units 2-5 will be found in a tube at the respective mounting plate locations. Install 70A fuses, if not provided, in fuse positions 0-5, as required, on fuse panel designated ADD-ON & K TEL. Fuse panel located on slide 1.

4.09 Figure 12 shows the connections to be made when adding external add-on units to the system. Two 249A and one 250A key telephone units are required to provide the add-on feature for a central office or PBX Line. References for Part 4 are as follows:

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

5. KEY TELEPHONE UNITS (INTERNALLY OR EXTERNALLY MOUNTED)

5.01 Internally mounted key telephone units contain 3-line circuits mounted on a 2-inch by 23-inch mounting plate. These line circuits are identical in operation to and provide the same features as 202D key telephone units except 48 Vdc is used for relay operation.

5.02 Externally mounted key telephone units may be standard 1A1 key telephone system line circuits (202D, 230B KTU, etc).

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

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 of early manufacture were furnished with ***X, V, J,*** and ***H*** options shop wired. On initial installation of these units, options not required must be removed.

5.06 A switching system 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).

5.07 Figure 13 shows the connections for internally mounted J53035CG, List 1 (MD) key telephone units. Necessary leads for key telephone units (9-12, 6-8, 3-5, and 0-2) will be found in a tube 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.

5.08 Figure 14 shows the connections to be made when adding external panel mounted key telephone units.

5.09 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. References for Part 5 are as follows:

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

6. DIRECT STATION SELECTION (DSS) UNITS

6.01 Direct station selection (DSS) units consist of:

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

6.02 List 1 and 2 (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 circuit. 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 List 2 (MD) cabinet assemblies are shop wired so that internally mounted auxiliary relay units 0-19 are always assigned to station lines 20-39, respectively.

6.04 For DSS, list 2 (MD) cabinet assemblies are furnished with the following:

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

(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 1 cabinet assemblies are furnished only with the following:

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

A. Adding Auxiliary Relay Units to List 2 (MD) Cabinet Assembly

6.06 Proceed as follows:

(1) Install unit as per Section 518-710-200.

(2) Connect unit as shown in Fig. 15 and 16. Figure 15 extends 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 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.

B. Adding Externally Mounted Auxiliary Relay Units to List 2 (MD) Cabinet Assembly Equipped With Internal Units

6.07 Proceed as follows:

(1) Install auxiliary relay units in external cabinet. Connect units as shown in Fig. 16 and 17.

(2) Connection to external unit shown in Fig. 17 can be direct or through a distributing terminal. Fig. 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. 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.

C. Mounting All Auxiliary Relay Units Associated With List 2 (MD) Cabinet Assembly in External Cabinet

6.08 When the line, link, and connector unit for station lines 50-59 is added to a list 2 (MD) cabinet assembly, all internally mounted auxiliary relay units must be mounted externally. See Table A and proceed as follows:

TABLE A

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

(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 plate 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 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.

D. Adding DSS to J53035A, List 1 (MD) Cabinet Assembly

6.09 The DSS can be added to a list 1 (MD) cabinet assembly by installing the following items of equipment:

(a) One J53035A, List 5 (MD) which includes:

- Five connecting blocks (66E1-32)
- One auxiliary register unit, J53035CB, List 1 (MD)
- Associated wiring material and mounting hardware.

(b) Auxiliary relay units, J53035BC, 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 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 (mounting spaces 14 to 5 if 404C tone generator is used). 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 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 (Table A).

(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 form 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.

E. Placing Station Arranged for DSS in Service

6.11 Proceed as follows:

(1) Remove straps on dial pulse register 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 list 2 cabinet assembly 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 assign called stations to signal keys (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 system, 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 To place universal line in service using Fig. 19, 20 or 21 proceed as follows:

(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 proceed 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 connecting 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 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

8.01 Conversion kit J53035A, List 7, for adding TOUCH-TONE calling to the list 1 (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, replaced by J58844B, receivers (Type C1)

- One KS-14528, List 2 connector
- Two KS-14672, List 2 connectors
- Two AF156 (P2A) relays.

8.03 Install the 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 five conductors on KS-14528, List 2 connector, connect free end of conductors as shown in Fig. 23 and plug connector into tone generator. Install fuses as required.

8.06 When external application of TOUCH-TONE calling is required with the List 1 (MD) cabinet assembly, 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), J58847CE (A&M) TOUCH-TONE calling receiver applique unit (two-circuit)
- 25-pair cabling.

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

8.08 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.

8.09 Install 25-pair inside wiring cable between TOUCH-TONE calling applique unit and dial pulse registers on slide 2 in the switching system cabinet. Terminate conductors as shown in Fig. 24.

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

8.11 When TOUCH-TONE calling is required in addition to DSS, it must be engineered and installed locally. 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

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 25 provides the equipment and cabling layout for a full compliment of 30 key telephone sets arranged for the station make-busy feature.

9.02 Figure 26 is a block diagram showing both internally and externally mounted key telephone unit (line circuit) arrangements. When central office (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. 27. One diode (M) is required per primary line appearance and two diodes (M and MB) per secondary line appearance.

9.03 Figure 28 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. 28, sheets 4 and 5. References for Part 9 are as follows:

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

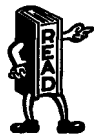
10. ALARM CIRCUIT

10.01 This circuit provides alarm indications as follows:

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

(b) 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 23 and 22, respectively, of miscellaneous terminal block F in crown. Two types of alarm signals are available, marginal or reverse battery.



Both types are shop wired as shown in Fig. 29. 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:

(a) Operation of either a positive or negative 48V battery supply fuse

(b) Operation of a 10 Vac fuse in power supply

(c) A marker trouble which prevents the marker from timing out and releasing within a period of 7.5 to 15 seconds.

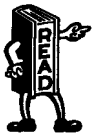
10.04 To restore alarm circuit to normal replace operated fuse, and/or momentarily operate AR key (located slide 1, mounting space 16) if marker failure caused alarm. References for Part 10 are as follows:

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

11. FUSE PANEL

11.01 A 70E fuse is provided for DSS (+48 volt). The 70A fuses are provided for all other circuits of the switching system as shown in Fig. 30. 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 switching system is supplied by a J86812A, List 1 power plant located on top of slide 1. It consists of the following:

(a) J87205B, List 1 rectifier supplying −48 volt dc 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 direct station selection.

(2) ±10 volts for station lamp and interrupter motor operation

(3) 90 or 105 volts 20 cycles for operating ringers and bells

(4) Tone

(5) KS-15984, List 1 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, List 1 rectifier unit just below the output meter 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.

12.04 Fusing for the J86812A, List 1 power plant is as follows:

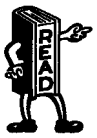
(a) Input Fuses

- Busman MDX, 6.25-ampere, designated FN, located front panel of J87205B, List 1 rectifier unit
- Busman MDL-2, 2-ampere fusetron, designated F1, located front panel of J86812B, List 1 equipment.

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

- 70B, 2-ampere, designated ±10 volts (for station lamps)
- 70A, 1-1/3 ampere, designated INT. (±10 volts for interrupter motor)
- 70B, 2-ampere, designated RB1 (−48 Vdc superimposed on ringing voltage for tripping during ringing cycle).
- Busman ABC-15, 15-ampere, designated −48 volt (−48 Vdc for distribution to circuits via fuse panel).

12.05 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.



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

12.06 Figure 31 provides connections for external ±10 volt power supply interrupter and timeout circuit.

12.07 To place power plant in service proceed as follows:

(1) Place line switches for ac input supply of both the J87205B, List 1 rectifier unit and J86812B, List 1 equipment to the OFF position, which is down.

(2) 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).

(3) Insert power cord into receptacle and place line switch on J86812B, List 1 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 volt), 6 (117 volt), or 5 (123 volt) of TS1 depending on the ac input voltage as read on the meter. This regulates the output of ±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.

(6) Insert power cord into receptacle and place line switch of J86812B, List 1 equipment to ON position.

(7) Place line switch of rectifier unit to ON position. Meter on unit should indicate between 45-52 volts.

(8) 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.

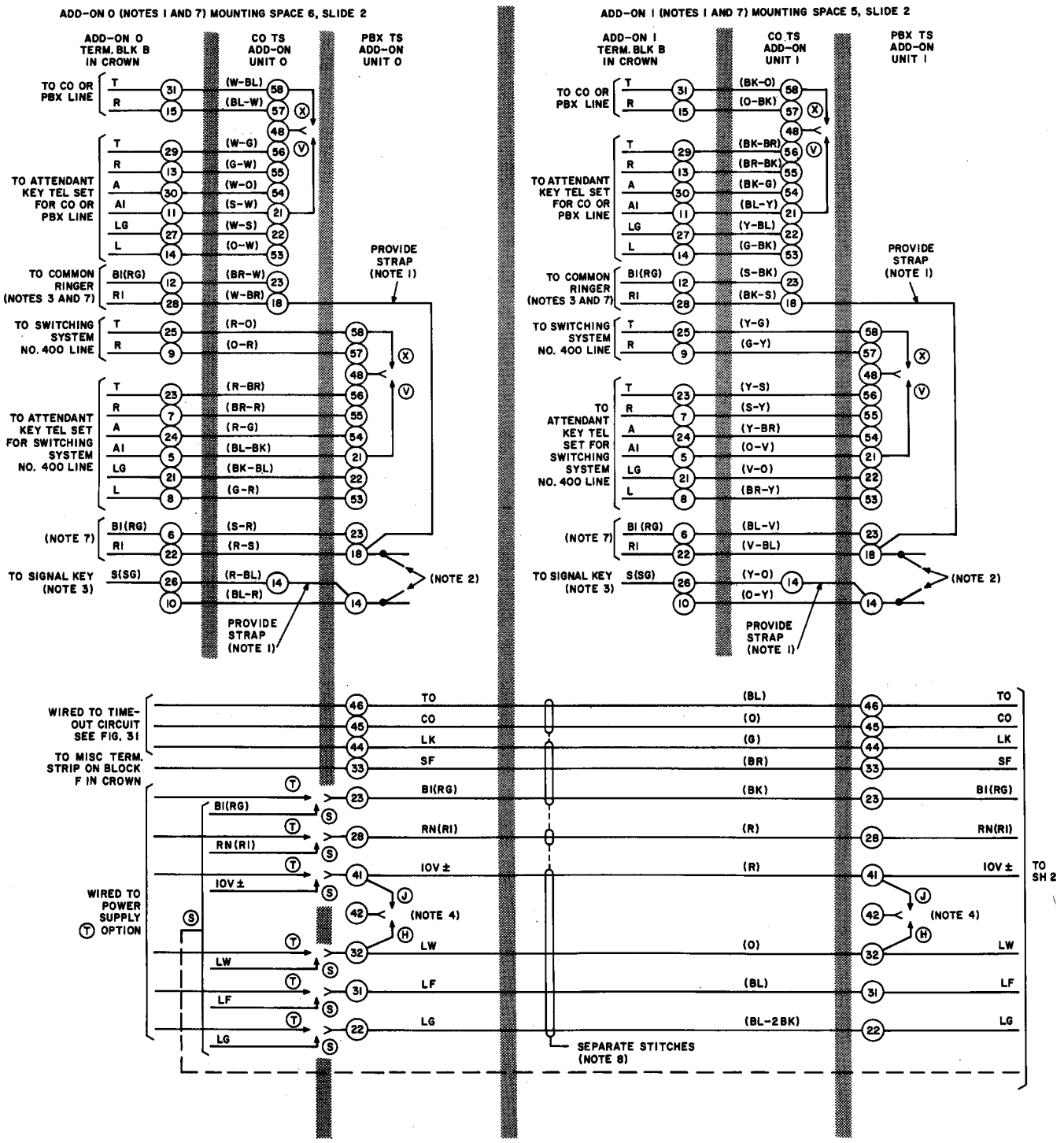


Fig. 11—Connections for Internal Add-On Units, Lists 1 and 2 (MD) Cabinet Assemblies (Sheet 1 of 4)

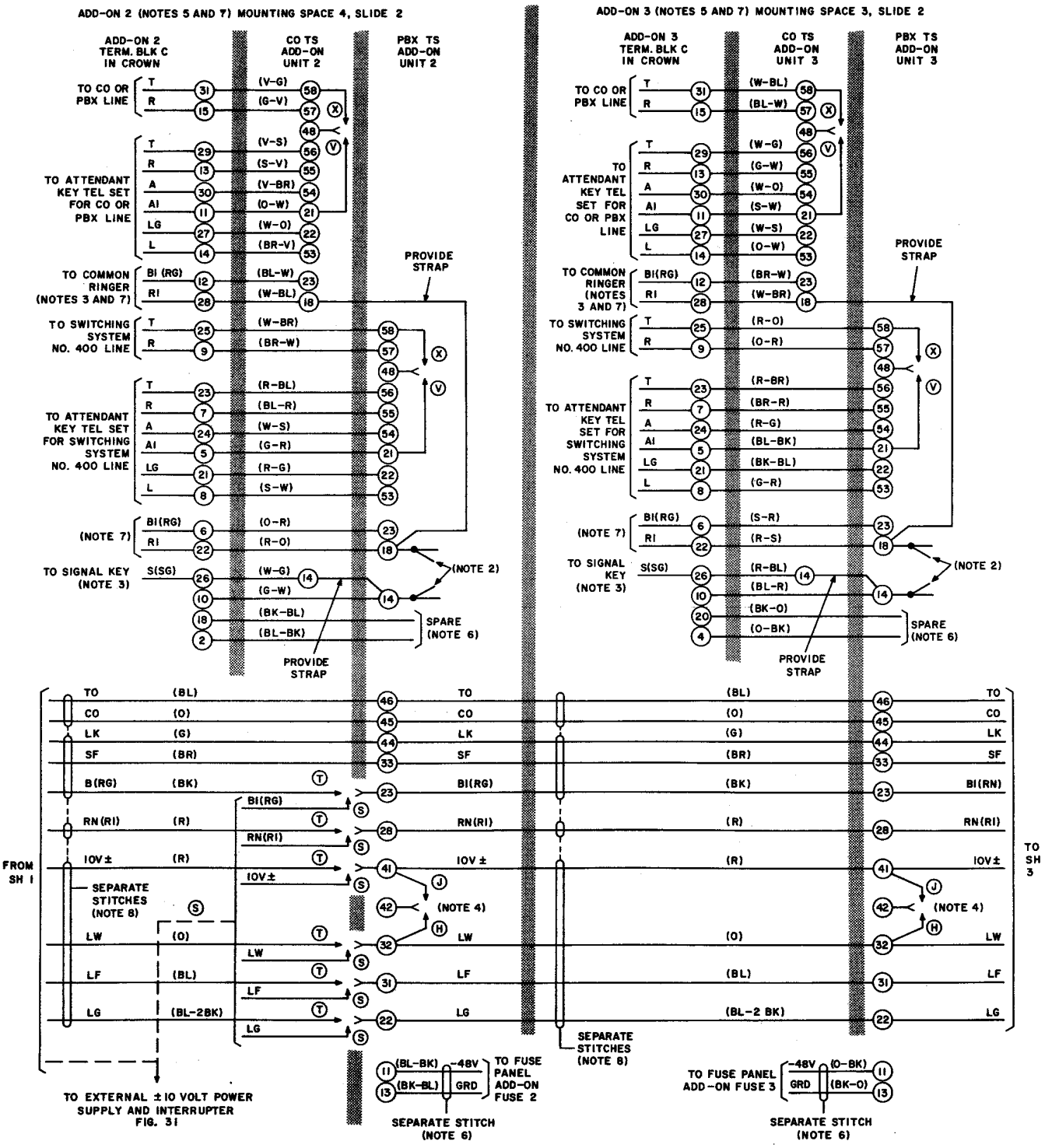


Fig. 11—Connections for Internal Add-On Units, Lists 1 and 2 (MD) Cabinet Assemblies (Sheet 2 of 4)

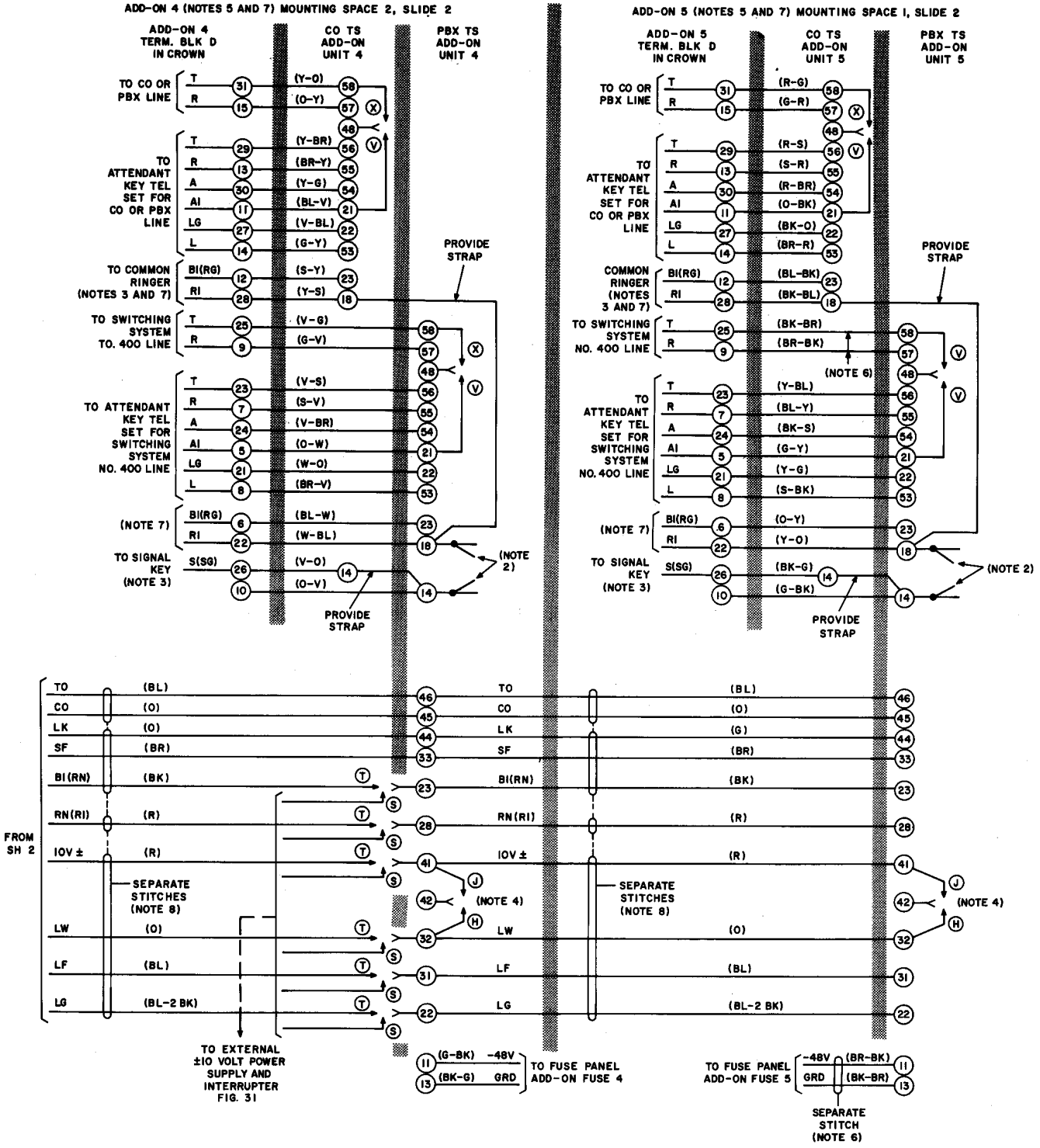


Fig. 11—Connections for Internal Add-On Units, Lists 1 and 2 (MD) Cabinet Assemblies (Sheet 3 of 4)

NOTES:

1. ADD-ON UNIT 0 AND 1 FURNISHED WIRED INTERNALLY EXCEPT AS NOTED.
2. MULTIPLE TO OTHER ADD-ON UNITS ASSOCIATED WITH SAME TELEPHONE SET.
3. PROVIDE ONLY ONE S(SG), RI AND BI(RG) LEAD TO TELEPHONE SET FOR ALL MULTIPLED ADD-ON CIRCUITS. DESIGNATIONS IN PARENTHESES INDICATE LEAD AS SHOWN ON SD DRAWINGS. GROUND OTHER SIDE OF SIGNAL KEY.
4. THESE OPTIONS APPEAR ONLY ONCE FOR THE TWO LINE CIRCUITS ON THE ADD-ON UNIT. FOR EXAMPLE IF (H) OPTION IS USED, BOTH LINES WOULD HAVE THE WINKING HOLD LAMP FEATURE.
5. ALL LEADS FROM EQUIPMENT LOCATIONS ARE TERMINATED IN CROWN TERMINAL BLOCKS. ALL COMMON STRAPS (TO, CO, ECT) SHOWN IN SEPARATE STITCHES ARE TERMINATED ON ADD-ON UNIT 1 AND LOOPED THROUGH THE RESPECTIVE EQUIPMENT LOCATIONS.
6. ON EARLY MODELS DUPLICATE COLORS USED FOR BATTERY AND GROUND AND FOR CONNECTION OF EQUIPMENT TO CROWN WERE NOT IDENTIFIED BY A SEPARATE STITCH AS SHOWN. WHERE THIS IS ENCOUNTERED, IDENTIFY PROPER LEADS BEFORE CONNECTING.
7. LINE CIRCUITS OF THESE UNITS CAN BE USED FOR REGULAR IAI SYSTEM INSTALLATIONS WHEN NOT REQUIRED FOR THE ADD-ON FEATURE. PROCEED AS FOLLOWS:
   1. BLOCK Z AND W RELAYS NONOPERATED WITH BLOCKING TOOL.
   2. DO NOT PROVIDE S(SG) LEAD TO STATION.
   3. IF EACH LINE CIRCUIT REQUIRES A SEPARATE RINGER:
      (A) BREAK STRAP BETWEEN TERMINALS 18 OF CO AND PBX TERMINAL STRIP ON UNIT.
      (B) CONNECT RI AND BI LEADS TO TERMINALS 28 AND 12 RESPECTIVELY IN CROWN FOR LINE CIRCUIT ASSOCIATED WITH CO OR PBX LINE.
      (C) CONNECT RI AND BI LEADS TO TERMINALS 22 AND 6 RESPECTIVELY IN CROWN FOR LINE CIRCUIT ASSOCIATED WITH SWITCHING SYSTEM NO. 400 LINE.
8. ON EARLY MODELS COLOR AND STITCHING FOR COMMON STRAPS WERE AS FOLLOWS:

TO	(BL)
CO	(O)
BI (RG)	(BK)
LG	(BL-2 BK)
LK	(G)
SF	(BL)
60V ±	(R)
LW	(O)
LF	(BL)
RN (RI)	(R)

OPTIONS: (SEE 4.04 AND 4.07 AND FIG. 31)

- (H) WINK HOLD LAMP (FURNISHED).
- (J) STEADY HOLD LAMP
- (S) EXTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER.
- (T) INTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER (FURNISHED).
- (V) GROUND RINGING.
- (X) METALLIC RINGING (FURNISHED).

Fig. 11—Connections for Internal Add-On Units, Lists 1 and 2 (MD) Cabinet Assemblies (Sheet 4 of 4)

NOTES:

1. 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. AND
   3 IF EACH LINE CIRCUIT REQUIRES A SEPARATE RINGER:
   (A) BREAK STRAP BETWEEN TERMINALS 10 OF 249A UNITS.
   (B) CONNECT RI AND BI LEADS FROM STATION RINGERS TO TERMINALS 10 AND 25 RESPECTIVELY. ON EACH UNIT.
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 TERM.	TO ASSOCIATED ADD-ON TERM. BLOCK IN CROWN TERM.
S(SG)	10
RI	22

3. PROVIDE ONLY ONE S(SG), RI, AND BI(RG) LEAD TO TELEPHONE SET FOR ALL MULTIPLED ADD-ON CIRCUITS, DESIGNATIONS IN PARENTHESES INDICATE LEAD DESIGNATIONS AS SHOWN ON SD DRAWINGS. GROUND OTHER SIDE OF SIGNAL KEY.
4. GROUND EXTERNAL POWER SUPPLY TO SAME GROUND USED FOR SWITCHING SYSTEM NO. 400 CABINET WITH NO. 14 WIRE OR EQUIVALENT.

OPTIONS

- (H) WINK HOLD LAMP
- (J) STEADY HOLD LAMP
- (S) EXTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER
- (T) INTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER (FURNISHED)
- (V) GROUNDED RINGING
- (X) METALLIC RINGING (FURNISHED)

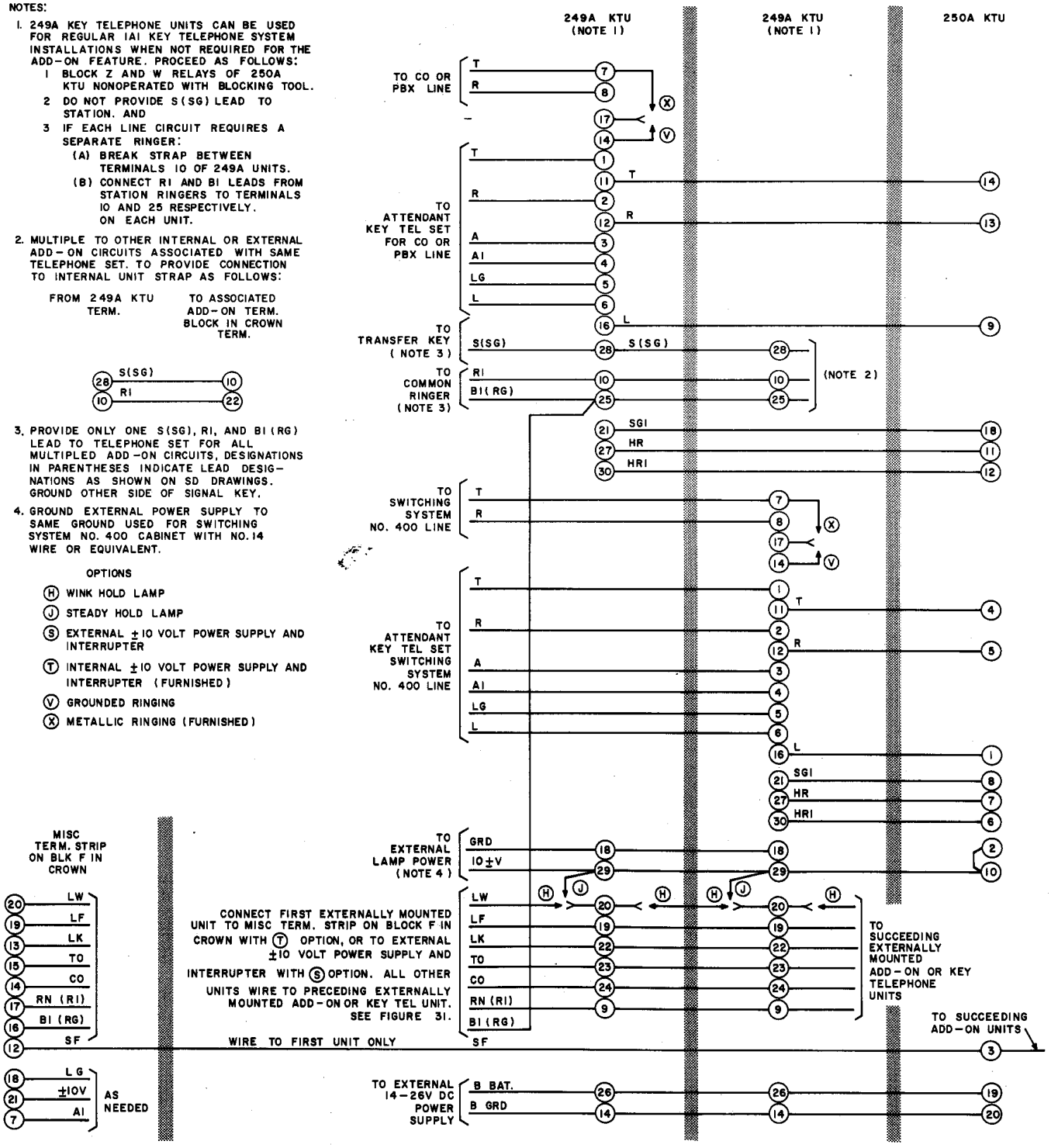


Fig. 12—Connections for External Add-On Circuit, Lists 1 and 2 (MD) Cabinet Assemblies

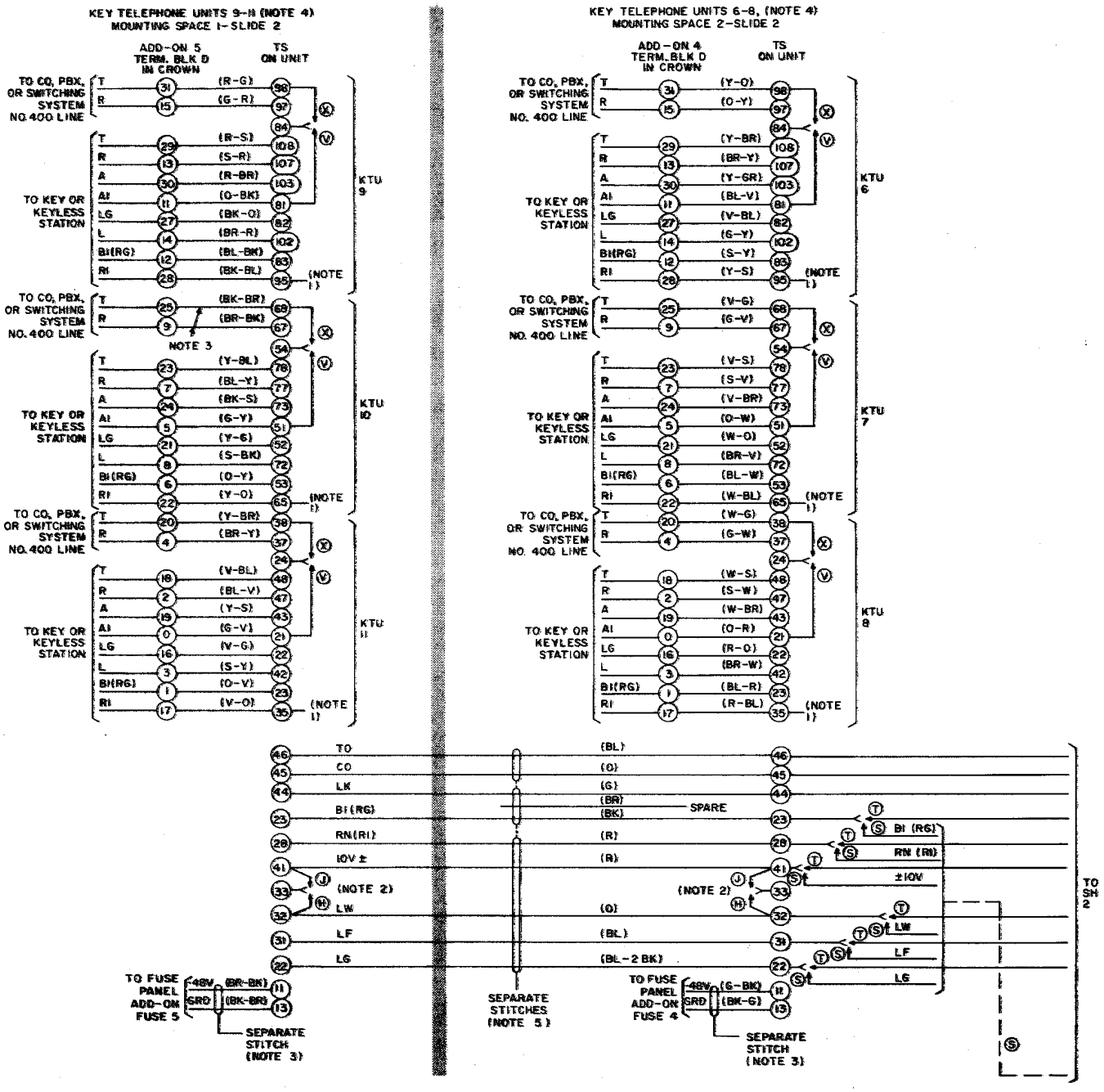


Fig. 13—Connections for Internal Key Telephone Units, Lists 1 and 2 (MD) Cabinet Assemblies (Sheet 1 of 2)

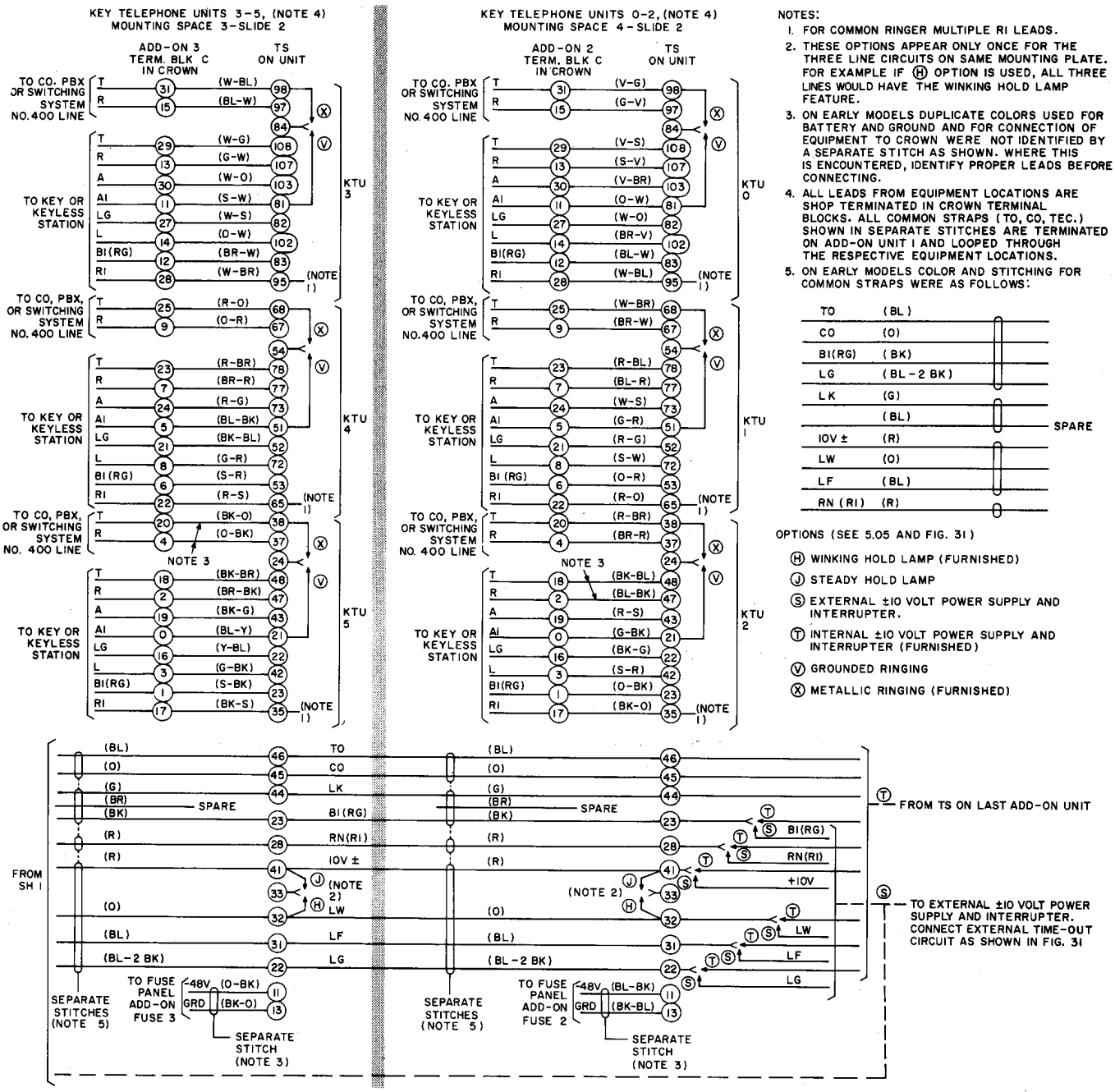
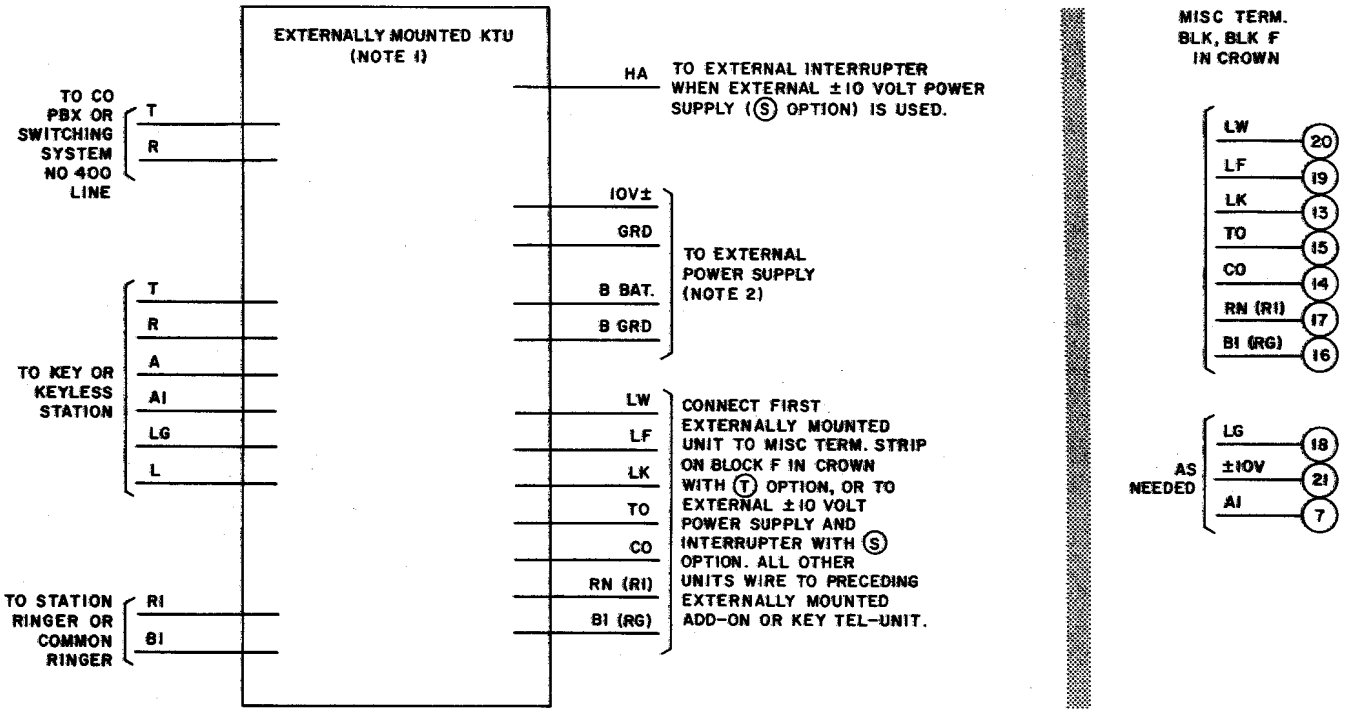


Fig. 13—Connections for Internal Key Telephone Units, Lists 1 and 2 (MD) Cabinet Assemblies (Sheet 2 of 2)



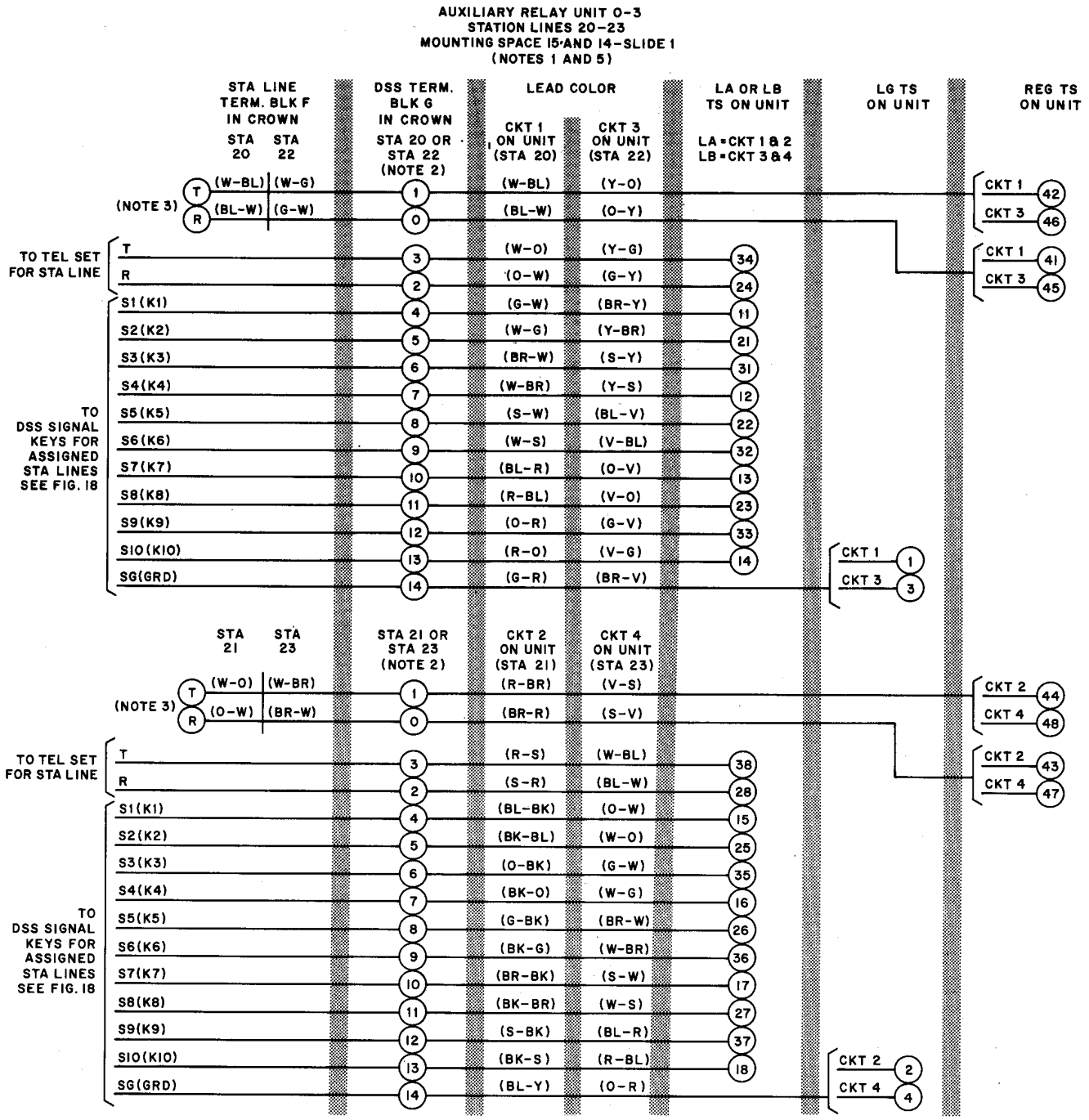
NOTES:

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 CABINET WITH A NO. 12 WIRE.

Ⓢ EXTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER.

Ⓣ INTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER (FURNISHED).

Fig. 14—Connections for External Key Telephone Units Associated With Lists 1 and 2 (MD) Cabinet Assemblies



NOTES:

1. AUXILIARY RELAY UNITS 0-3 AND 4-7 ARE FURNISHED WIRED AS SHOWN WITH LIST 2 CABINET ASSEMBLY.
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. AUXILIARY RELAY UNITS TO BE INSTALLED IN MOUNTING SPACES 14 TO 5 IF 404C TONE GENERATOR IS IN MOUNTING POSITION 15.

Fig. 15—Connections for Auxiliary Relay Units, List 2 (MD) Cabinet Assembly (Sheet 1 of 5)

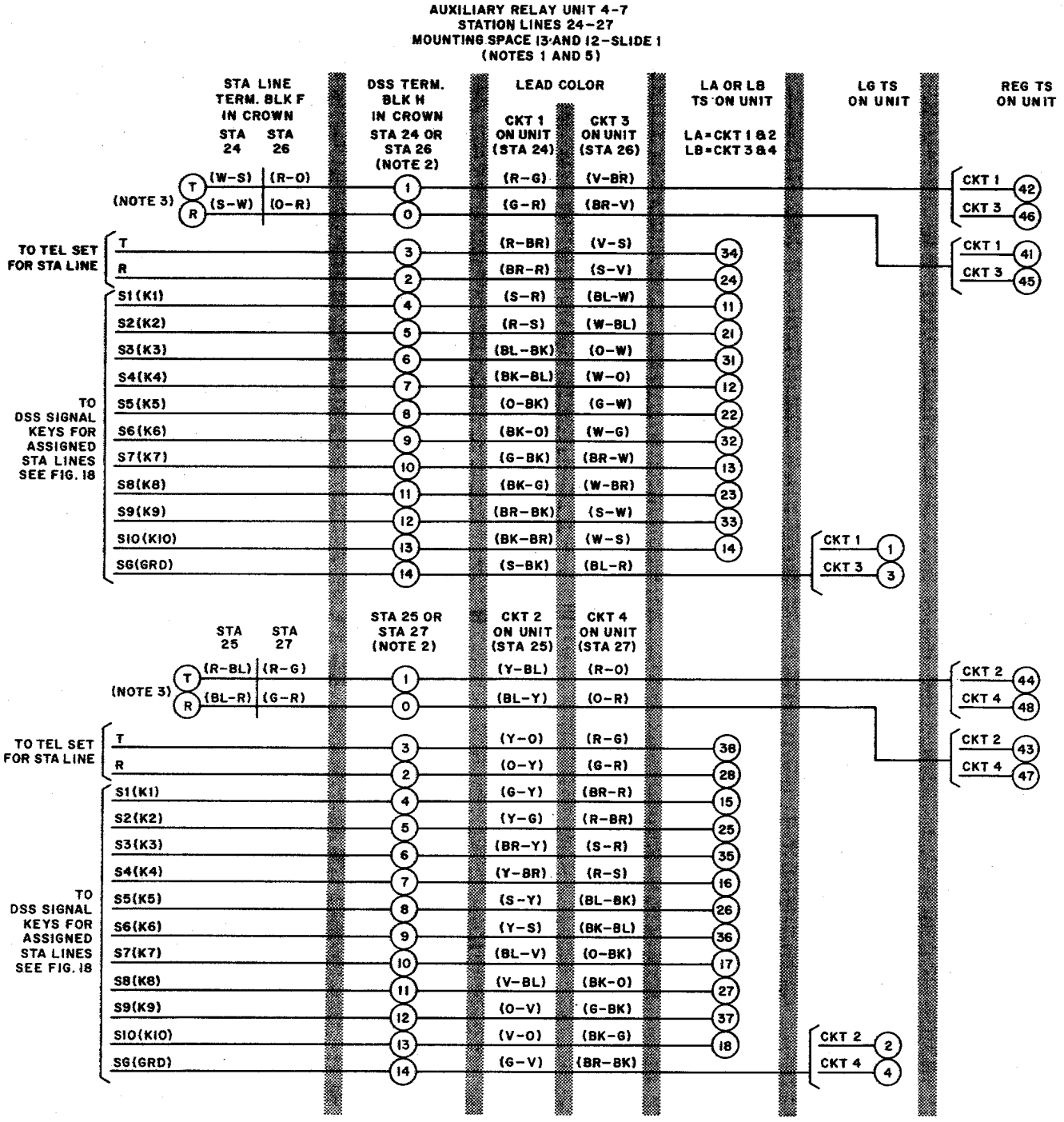


Fig. 15—Connections for Auxiliary Relay Units, List 2 (MD) Cabinet Assembly (Sheet 2 of 5)

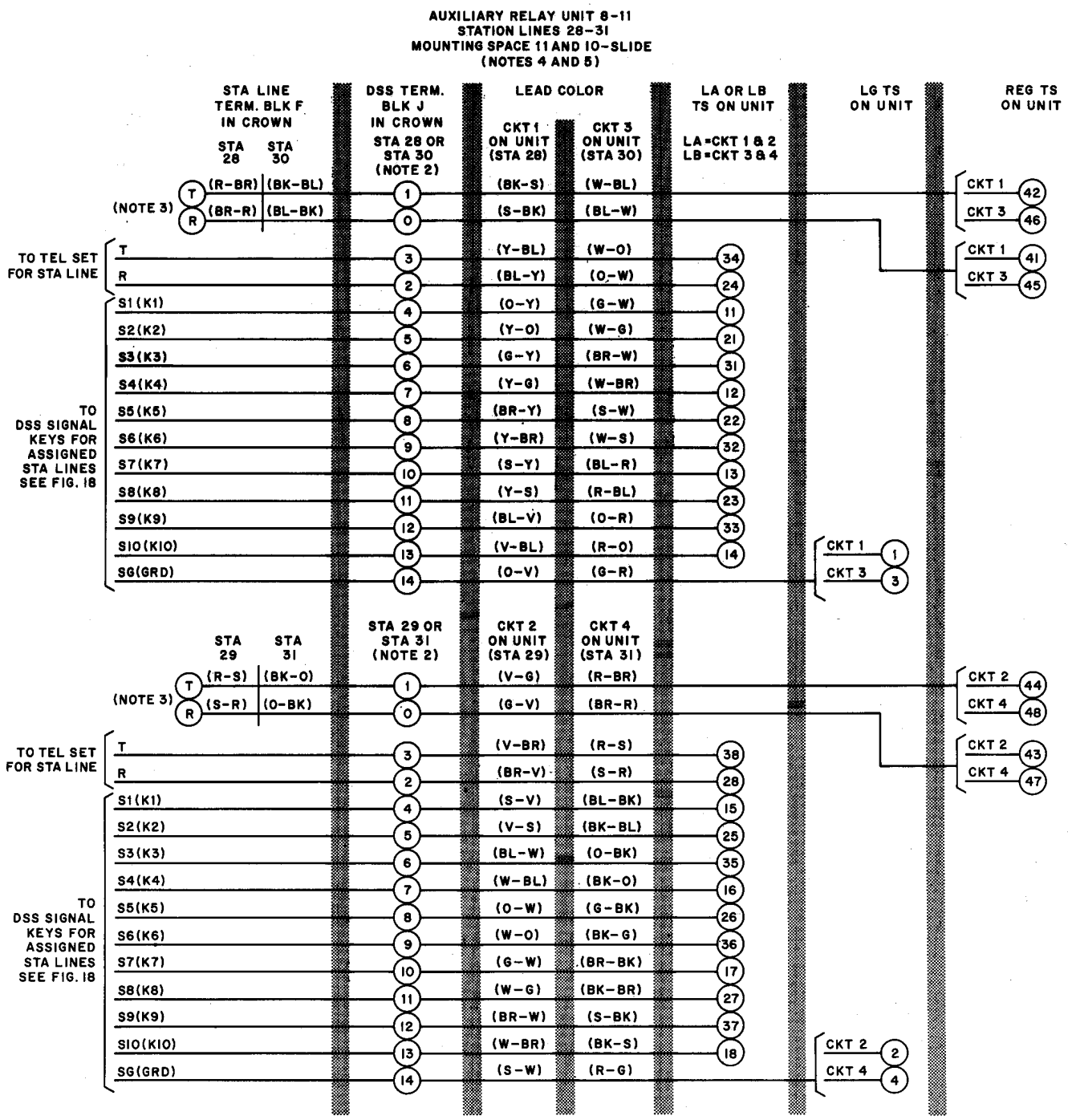


Fig. 15—Connections for Auxiliary Relay Units, List 2 (MD) Cabinet Assembly (Sheet 3 of 5)

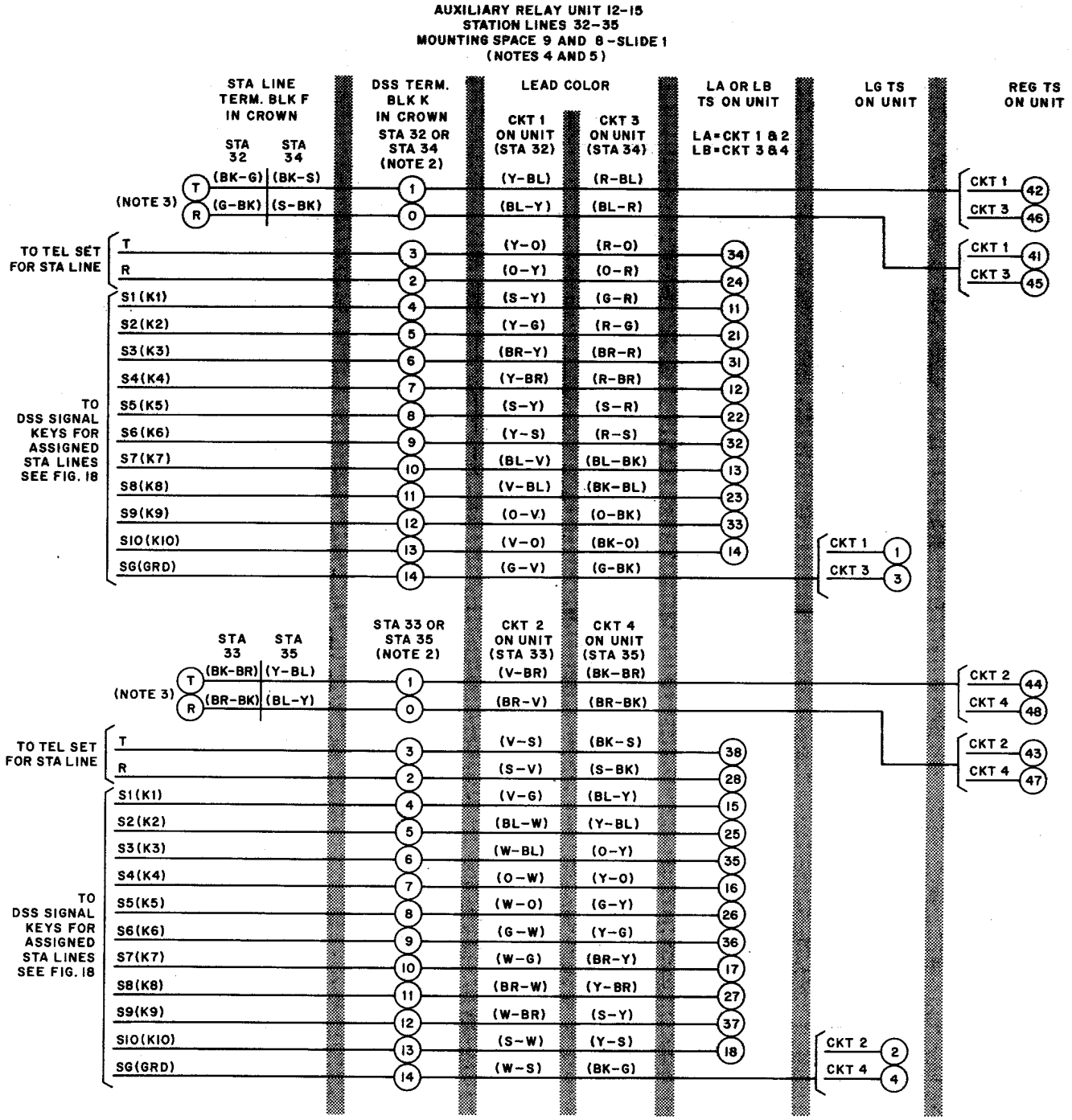


Fig. 15—Connections for Auxiliary Relay Units, List 2 (MD) Cabinet Assembly (Sheet 4 of 5)

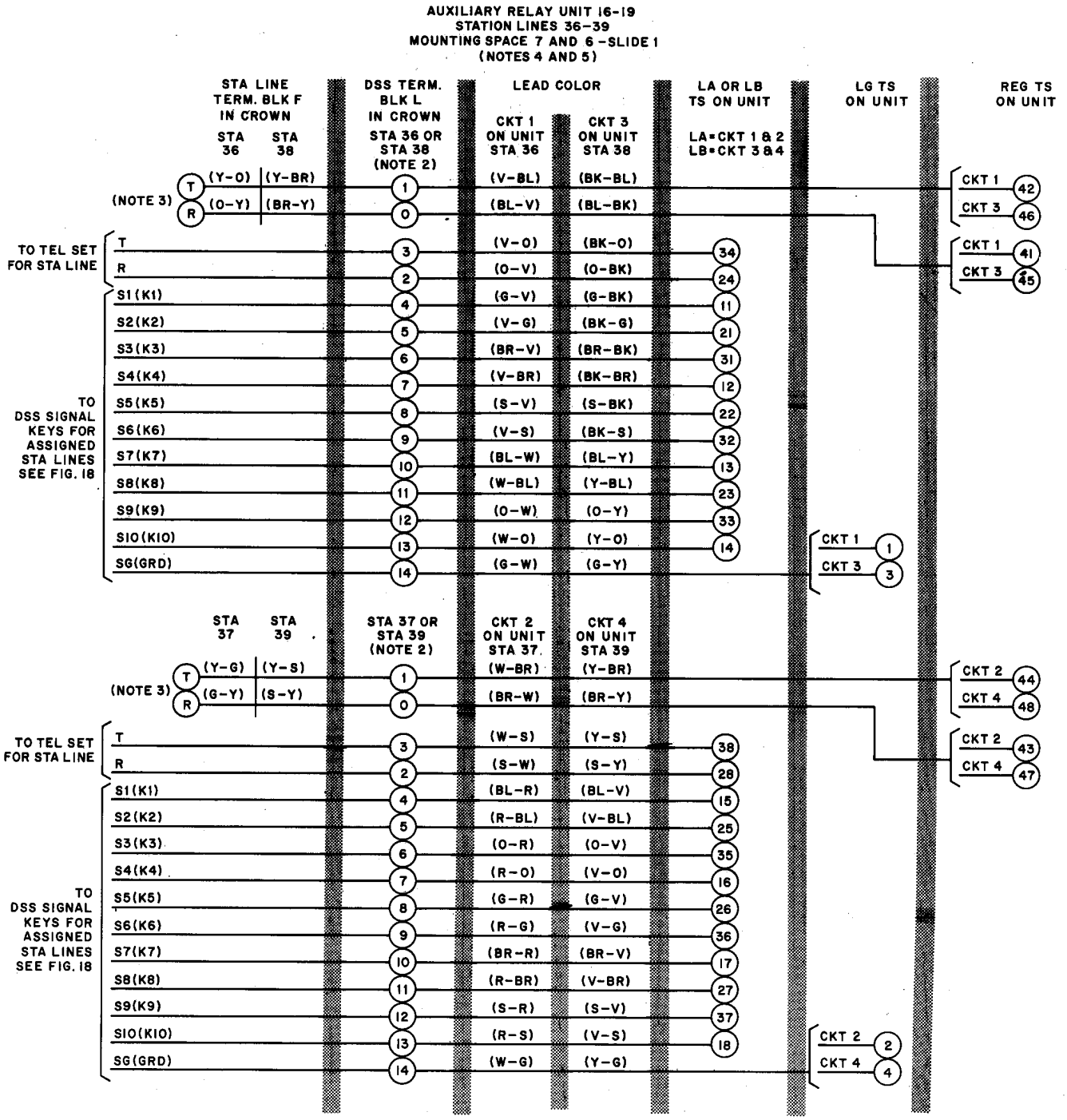


Fig. 15—Connections for Auxiliary Relay Units, List 2 (MD) Cabinet Assembly (Sheet 5 of 5)

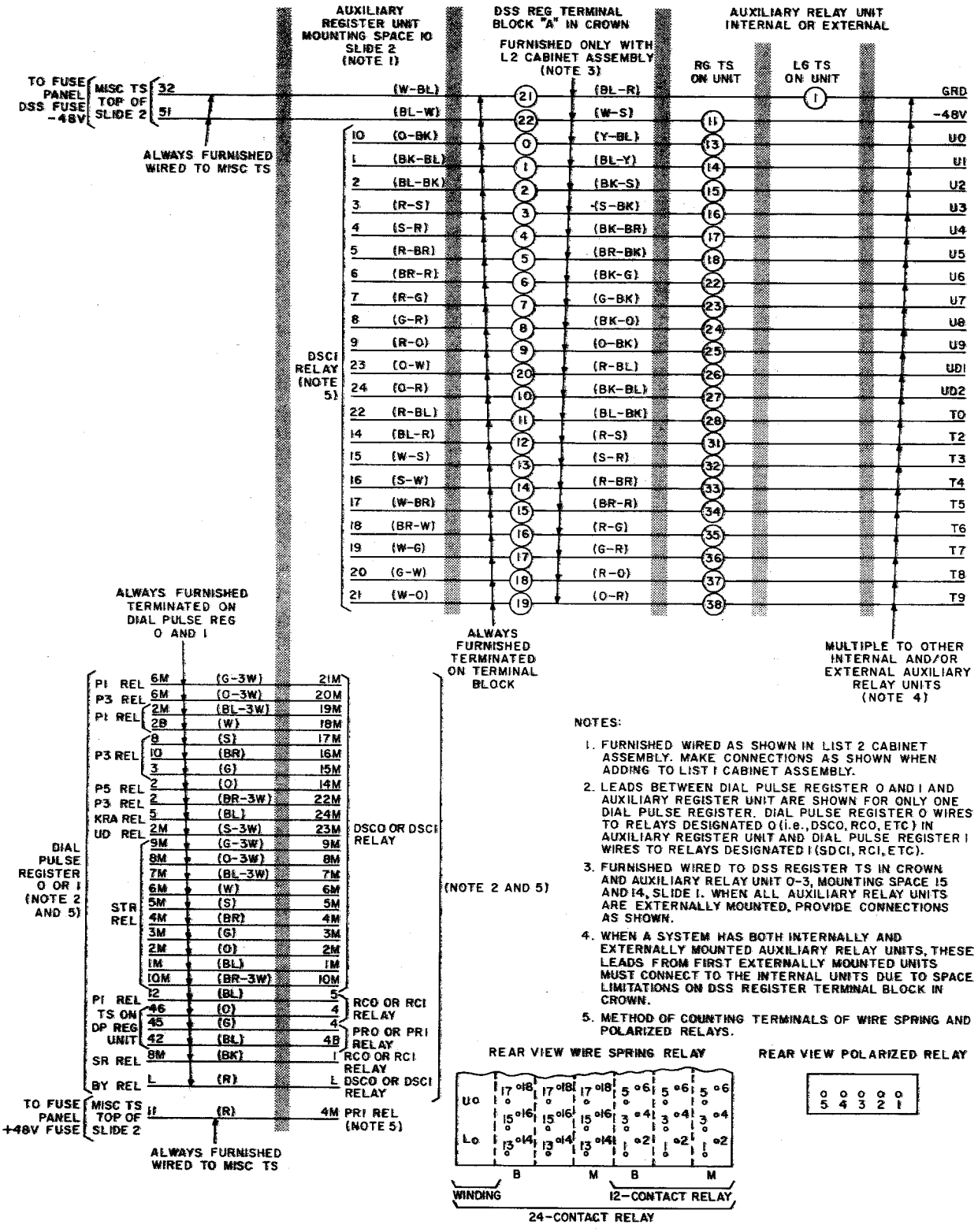
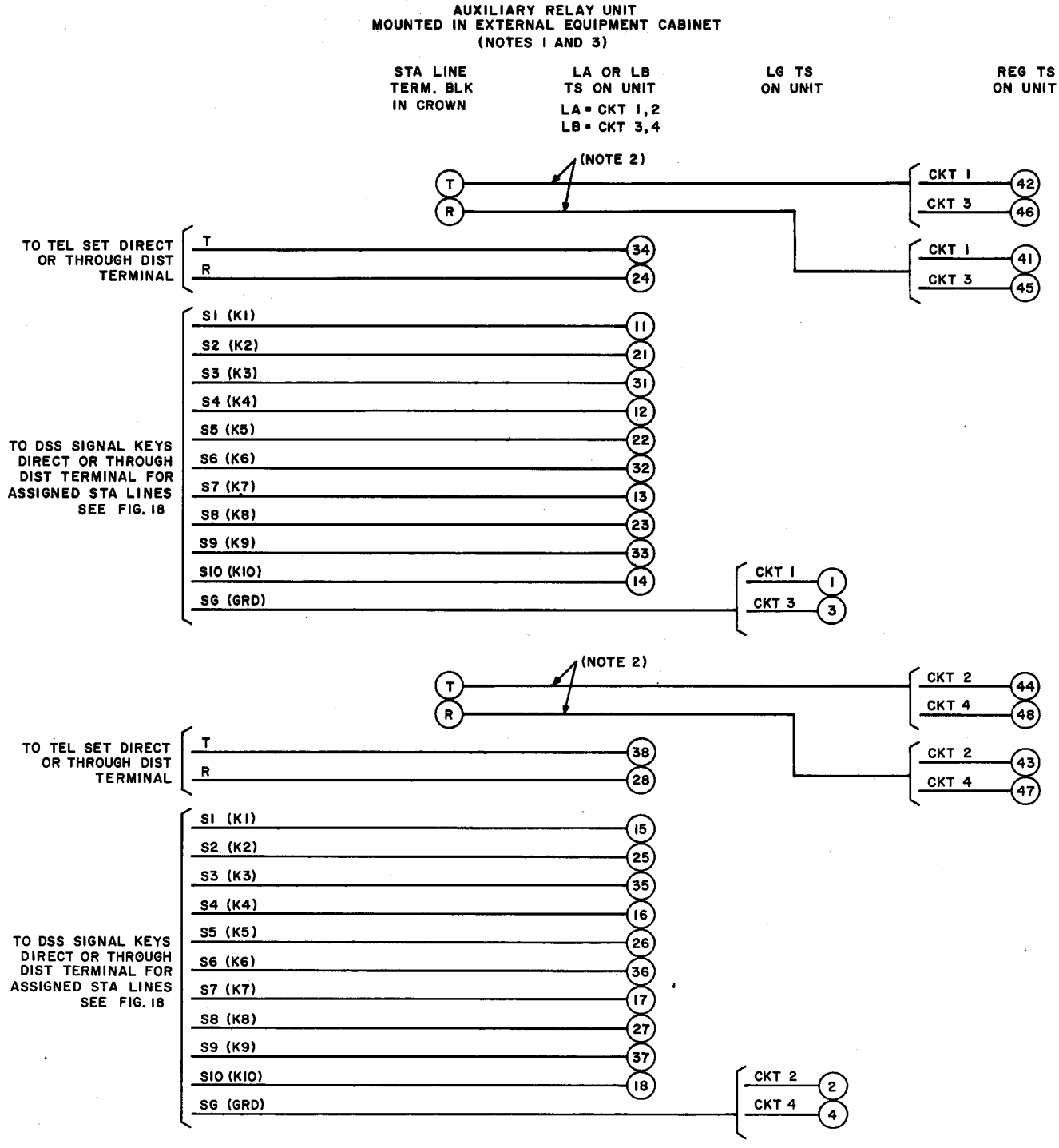


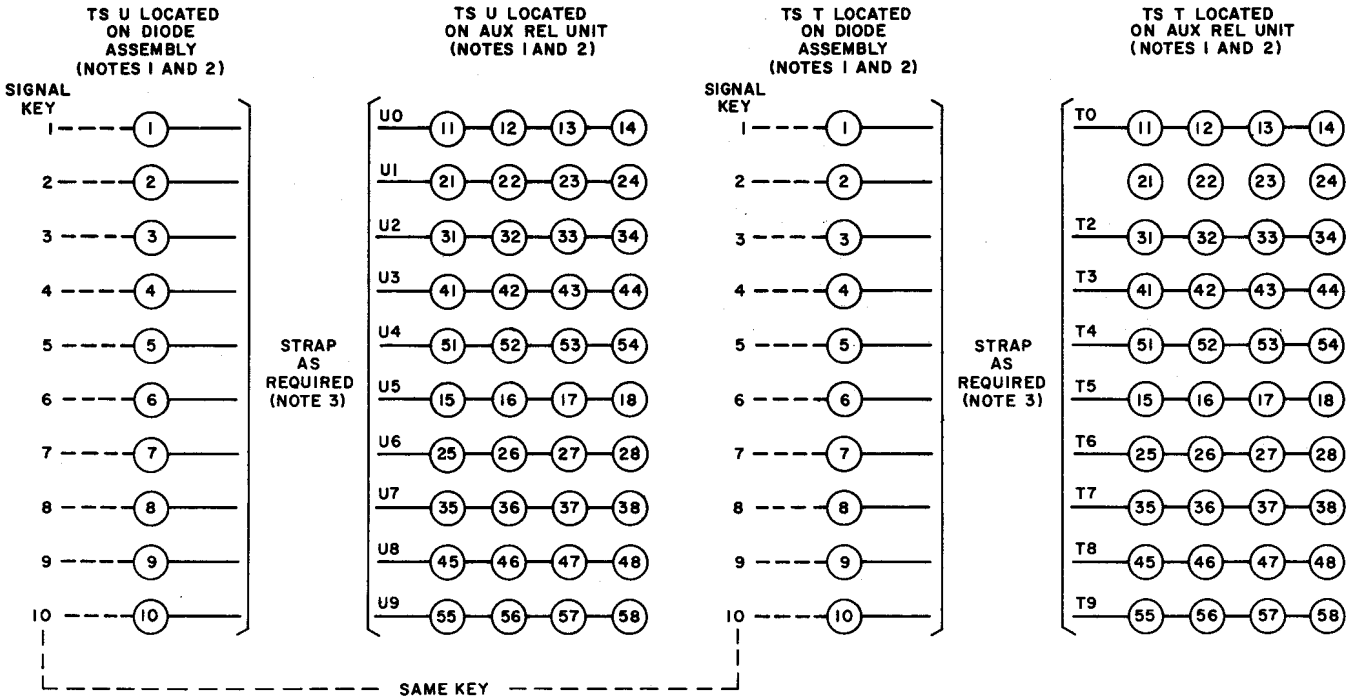
Fig. 16—Connections for Auxiliary Register Unit and Auxiliary Relay Units, List 2 (MD) Cabinet Assembly



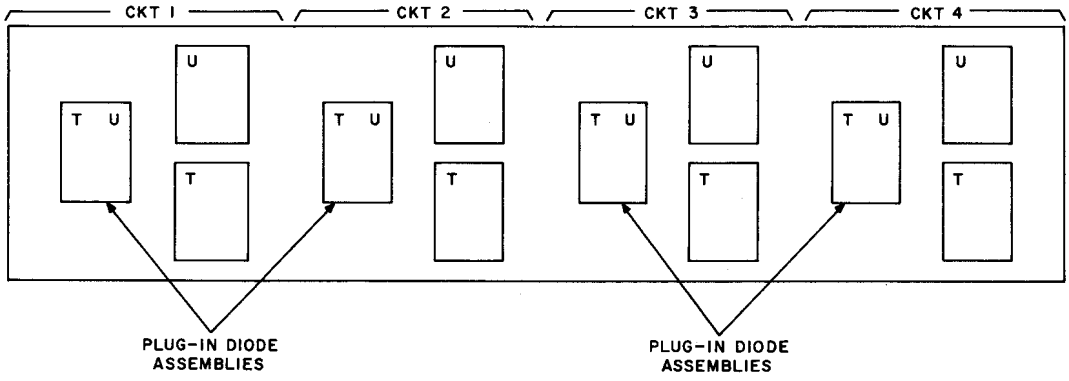
NOTES:

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. 16 AND 18.

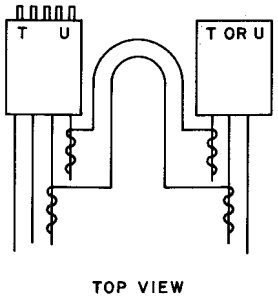
Fig. 17—Connections for Externally Mounted Auxiliary Relay Units, List 2 (MD) Cabinet Assembly



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:

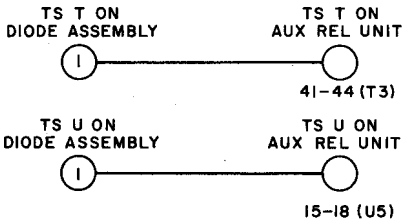


Fig. 18—Connections for Assigning Station Lines to Signal Keys for DSS, List 2 (MD) Cabinet Assembly

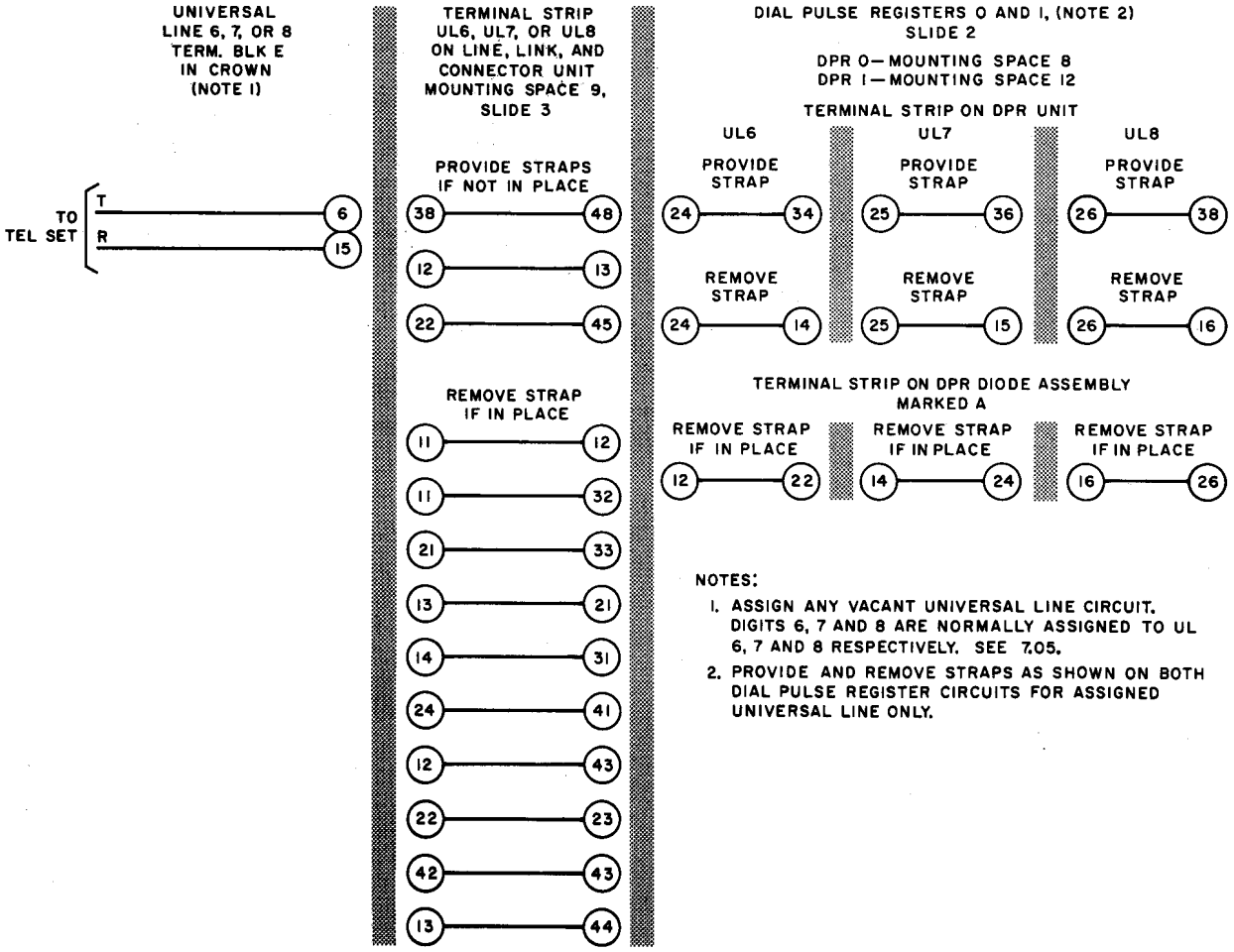
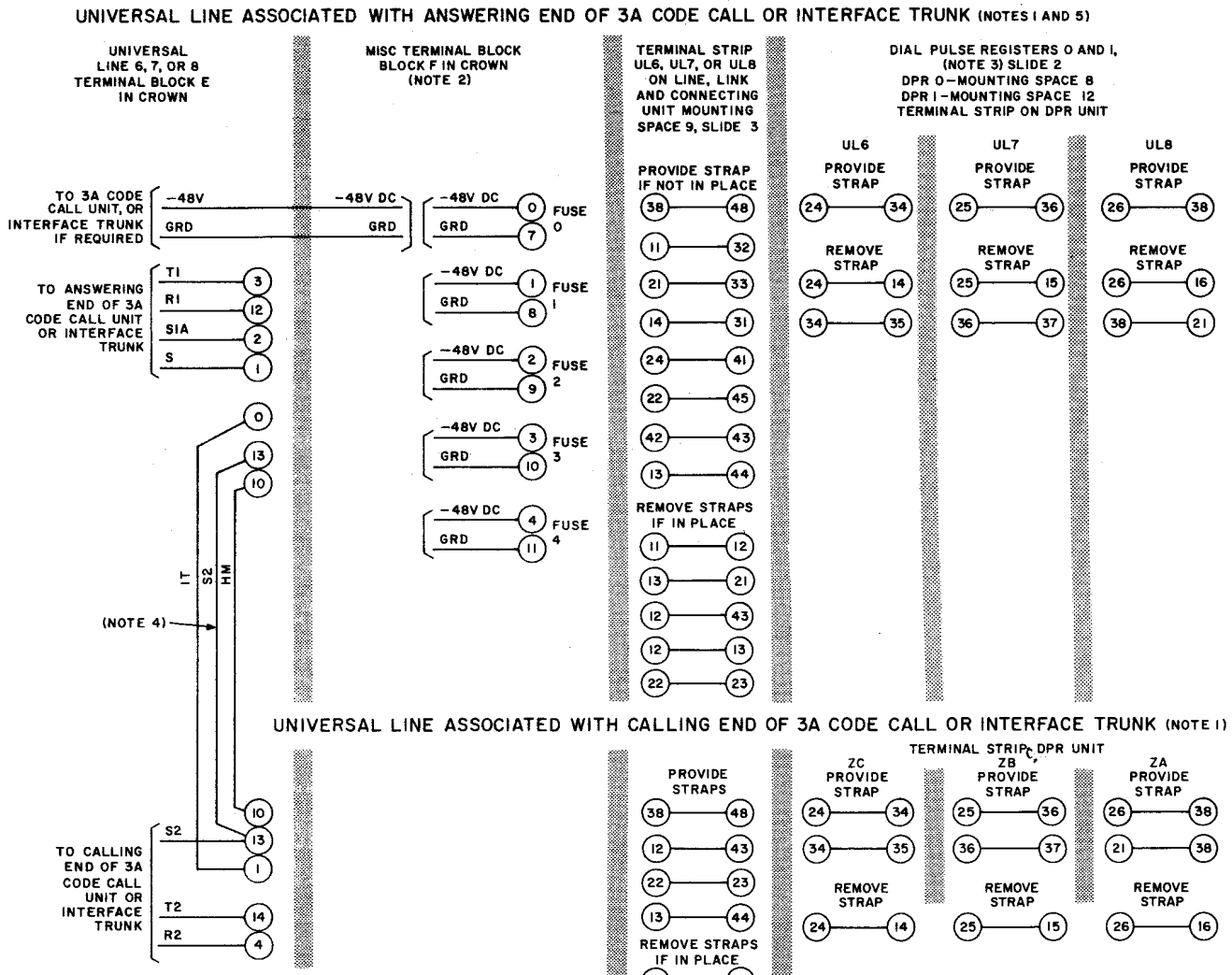
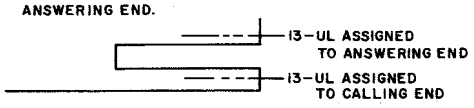


Fig. 19—Connections for Universal Line Assigned as Station Line



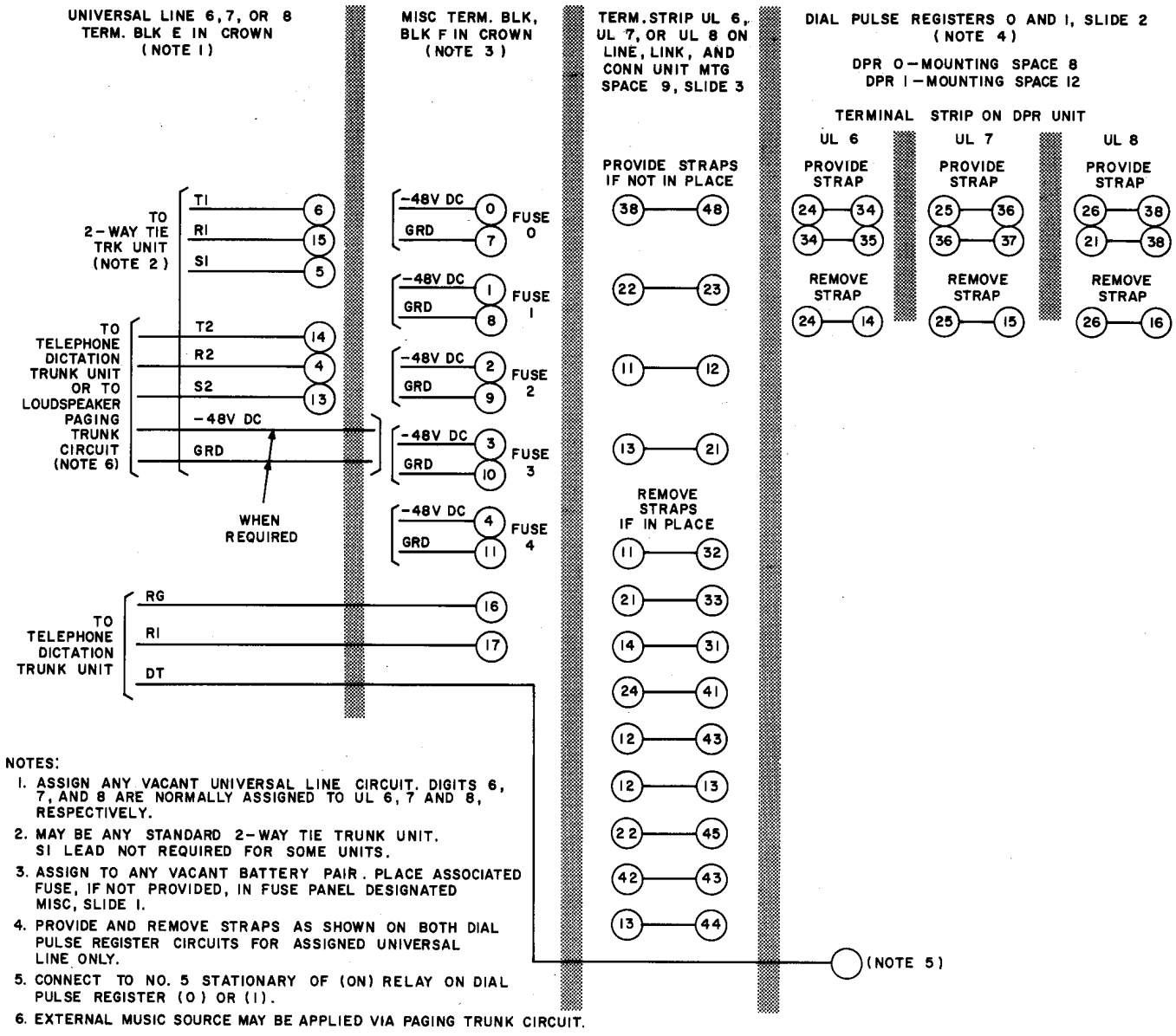
NOTES:

1. A UNIVERSAL LINE MUST BE ASSIGNED TO THE ANSWERING END AND CALLING END OF 3A CODE CALL UNIT. DIGITS 6, 7 AND 8 ARE NORMALLY ASSIGNED TO UL 6, 7 AND 8 RESPECTIVELY.
2. ASSIGN TO ANY VACANT BATTERY PAIR. PLACE ASSOCIATED FUSE, IF NOT PROVIDED, IN FUSE PANEL DESIGNATED MISC, SLIDE 1.
3. PROVIDE AND REMOVE STRAPS AS SHOWN ON BOTH DIAL PULSE REGISTER CIRCUITS FOR UNIVERSAL LINE ASSIGNED TO ANSWERING END AND CALLING END OF 3A CODE CALL.
4. DUE TO SPACE LIMITATIONS OF TERMINALS IN CROWN, LOOP S2 LEAD THROUGH TERMINAL 13 OF ASSIGNED UNIVERSAL LINE AND CONTINUE WITH LEAD TO TERMINAL 13 OF UNIVERSAL LINE ASSIGNED TO ANSWERING END.



5. PLACE 550B TOOL IN 1-2B AND 1-2T CONTACT OF HOLD MAGNET OFF-NORMAL SPRINGS OF UNIVERSAL LINE ASSIGNED TO ANSWERING END OF 3A CODE CALL. HOLD MAGNETS HM 10, 15, 16 ARE ASSOCIATED WITH UL 6, 7 AND 8 RESPECTIVELY.

Fig. 20—Connections for Universal Lines 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 UL 6, 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. CONNECT TO NO. 5 STATIONARY OF (ON) RELAY ON DIAL PULSE REGISTER (0) OR (1).
6. EXTERNAL MUSIC SOURCE MAY BE APPLIED VIA PAGING TRUNK CIRCUIT.

Fig. 21—Connections for Universal Line Circuit Assigned to Two-Way Tie Trunk Unit, Loudspeaker Paging Trunk Unit, or Telephone Dectation Trunk Unit

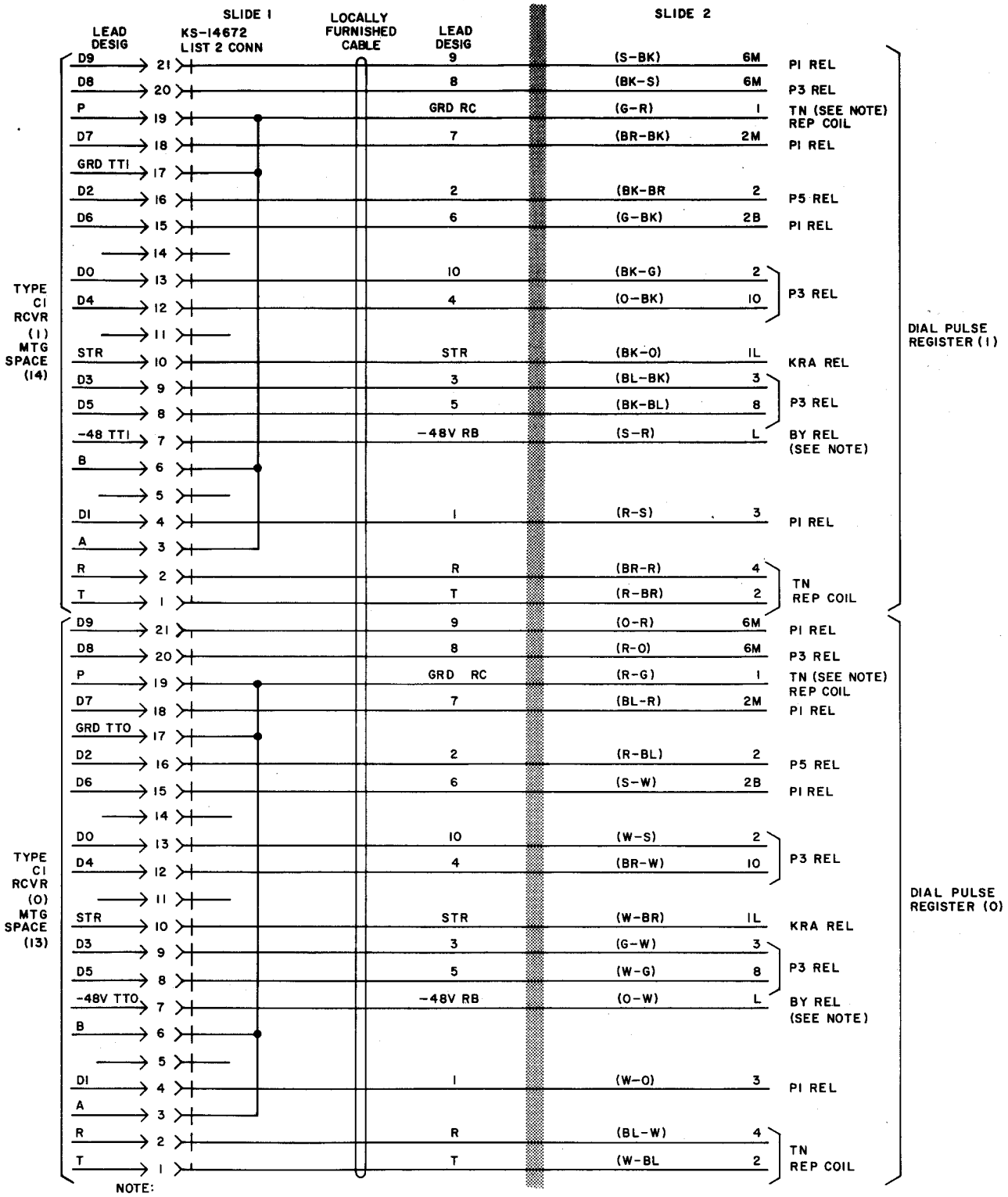


Fig. 22—Connections for Adding Type C1 Receivers for TOUCH-TONE calling to List 1 (MD) Cabinet Assembly

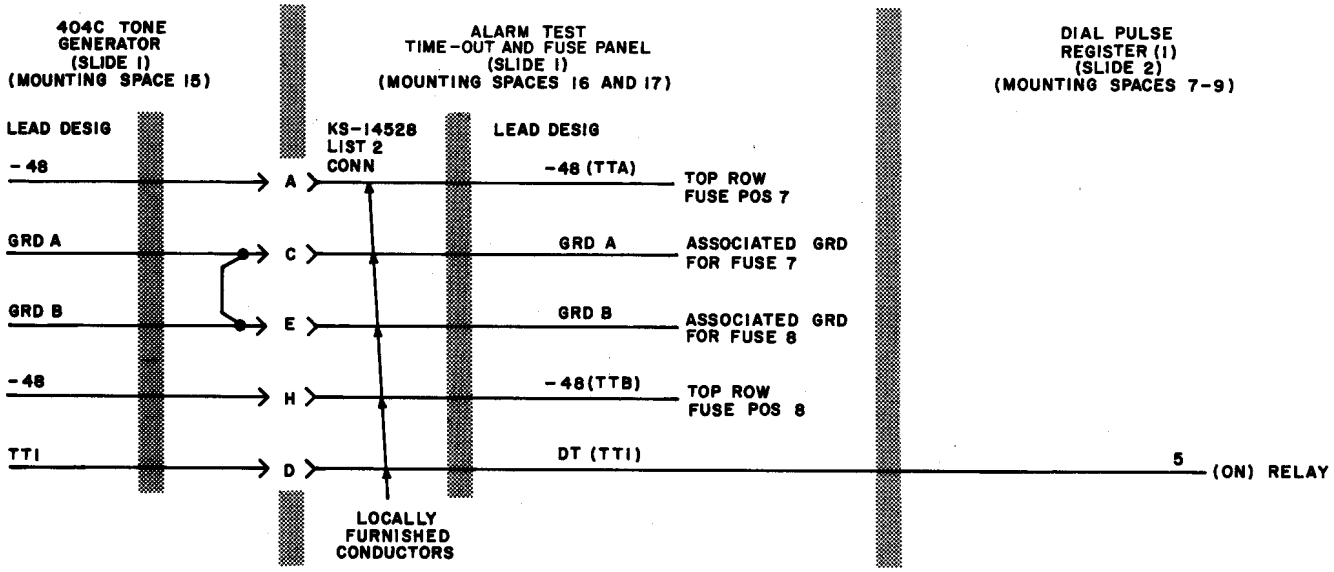
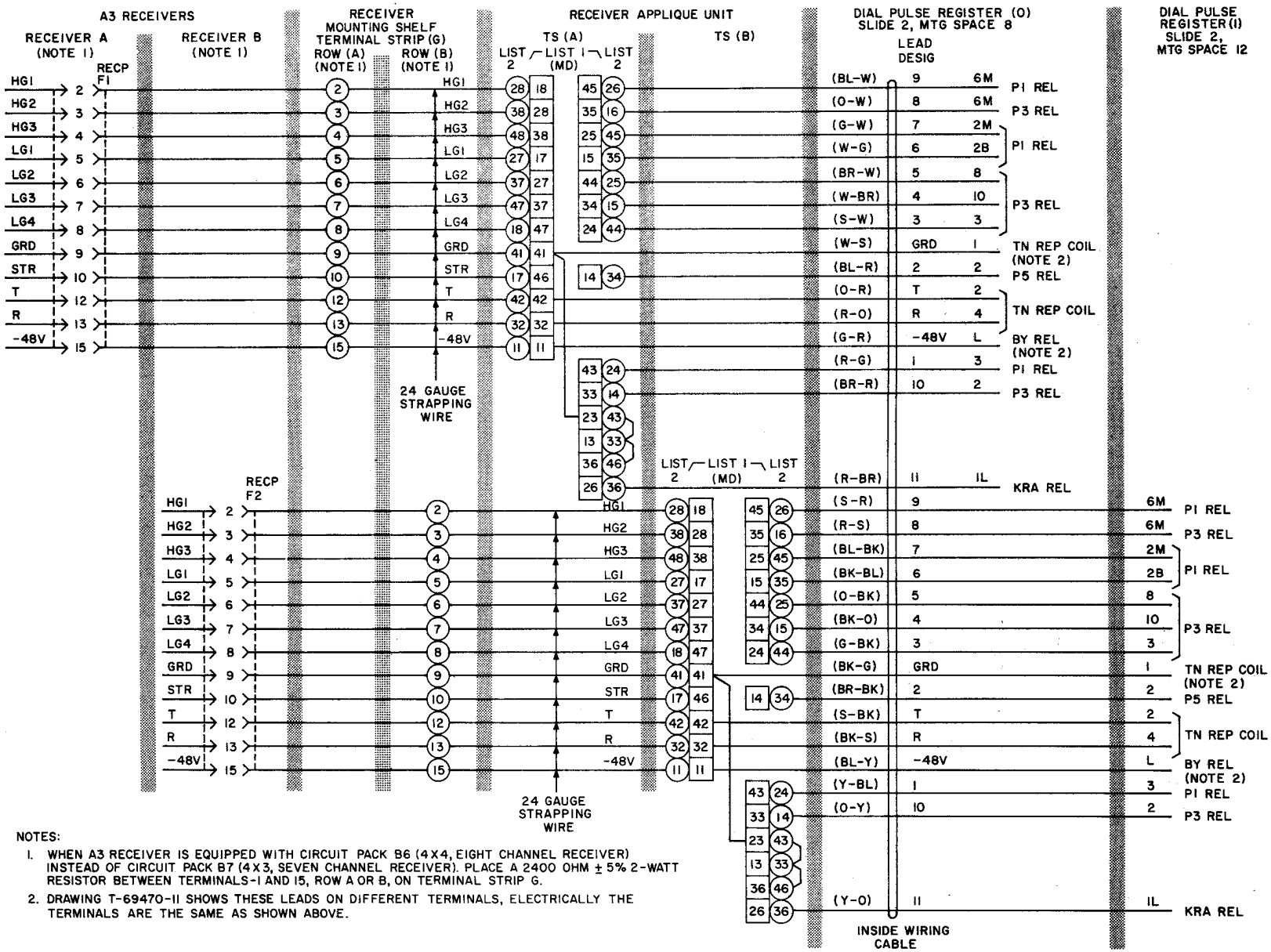


Fig. 23—Connections for 404C Tone Generator, List 1 (MD) Cabinet Assembly



NOTES:

1. WHEN A3 RECEIVER IS EQUIPPED WITH CIRCUIT PACK B6 (4X4, EIGHT CHANNEL RECEIVER) INSTEAD OF CIRCUIT PACK B7 (4X3, SEVEN CHANNEL RECEIVER). PLACE A 2400 OHM ± 5% 2-WATT RESISTOR BETWEEN TERMINALS-1 AND 15, ROW A OR B, ON TERMINAL STRIP G.
2. DRAWING T-69470-11 SHOWS THESE LEADS ON DIFFERENT TERMINALS, ELECTRICALLY THE TERMINALS ARE THE SAME AS SHOWN ABOVE.

Fig. 24—Connections for Adding Externally Mounted Type A3 Receivers to List 1 (MD) Cabinet Assembly

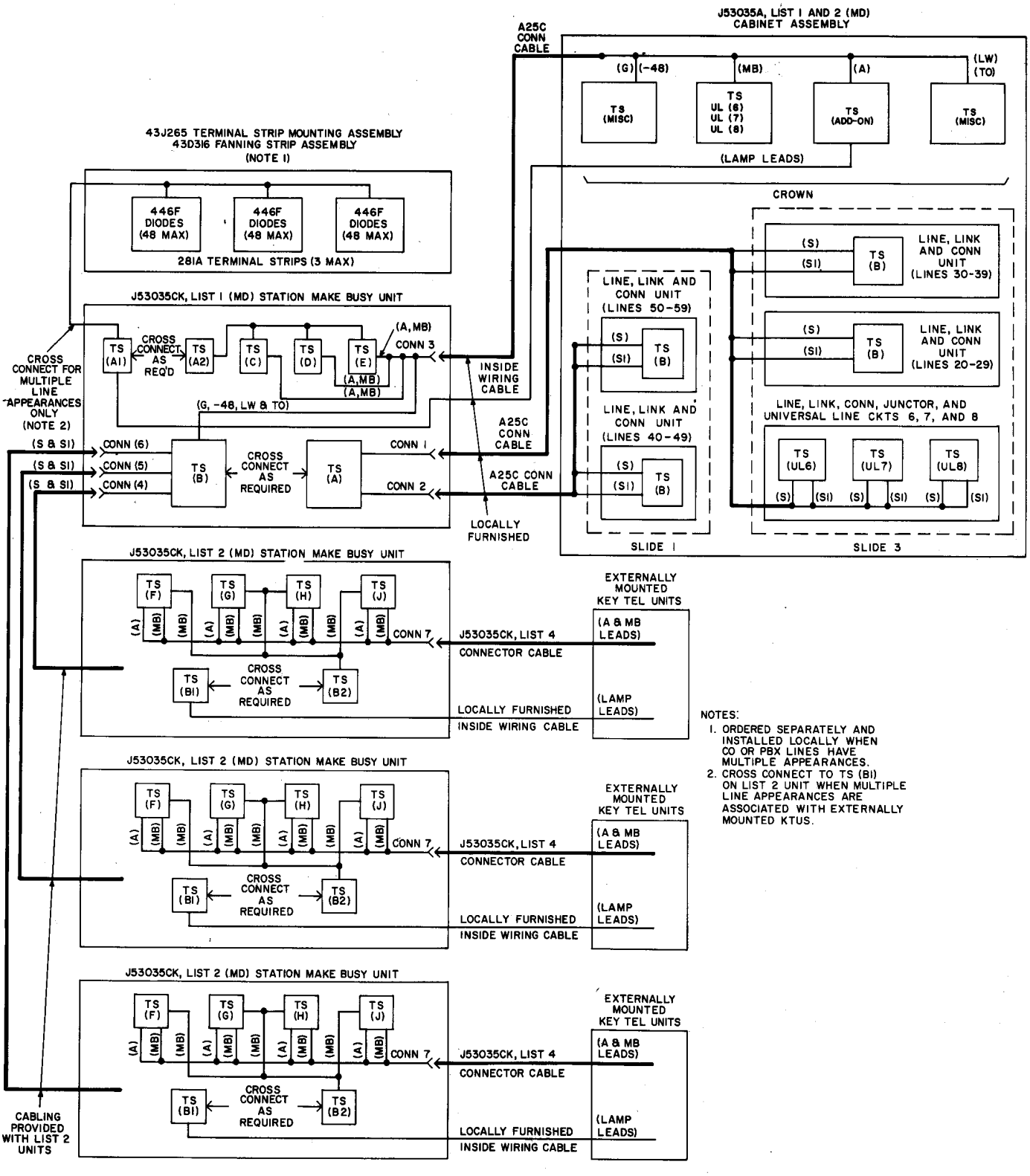
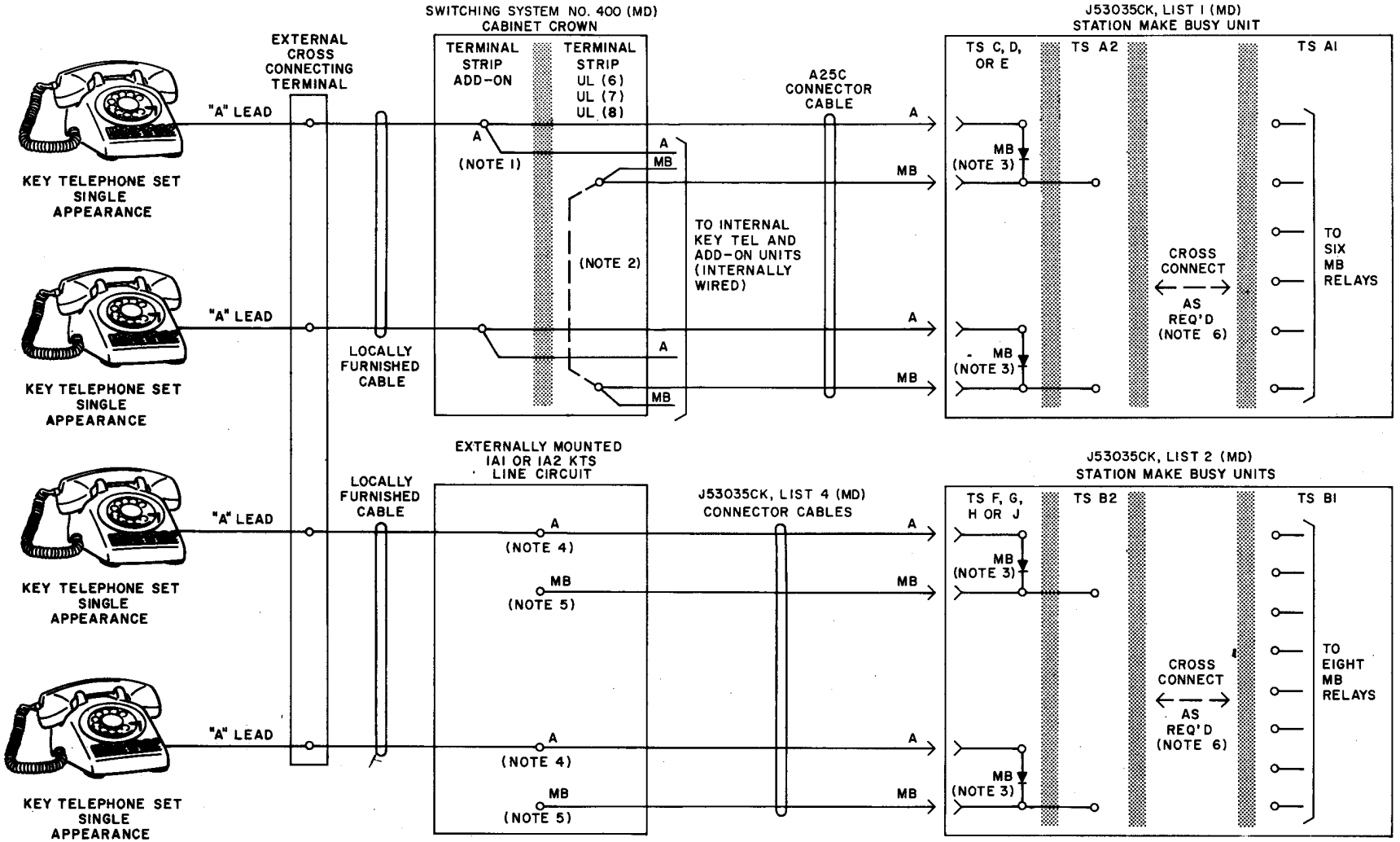


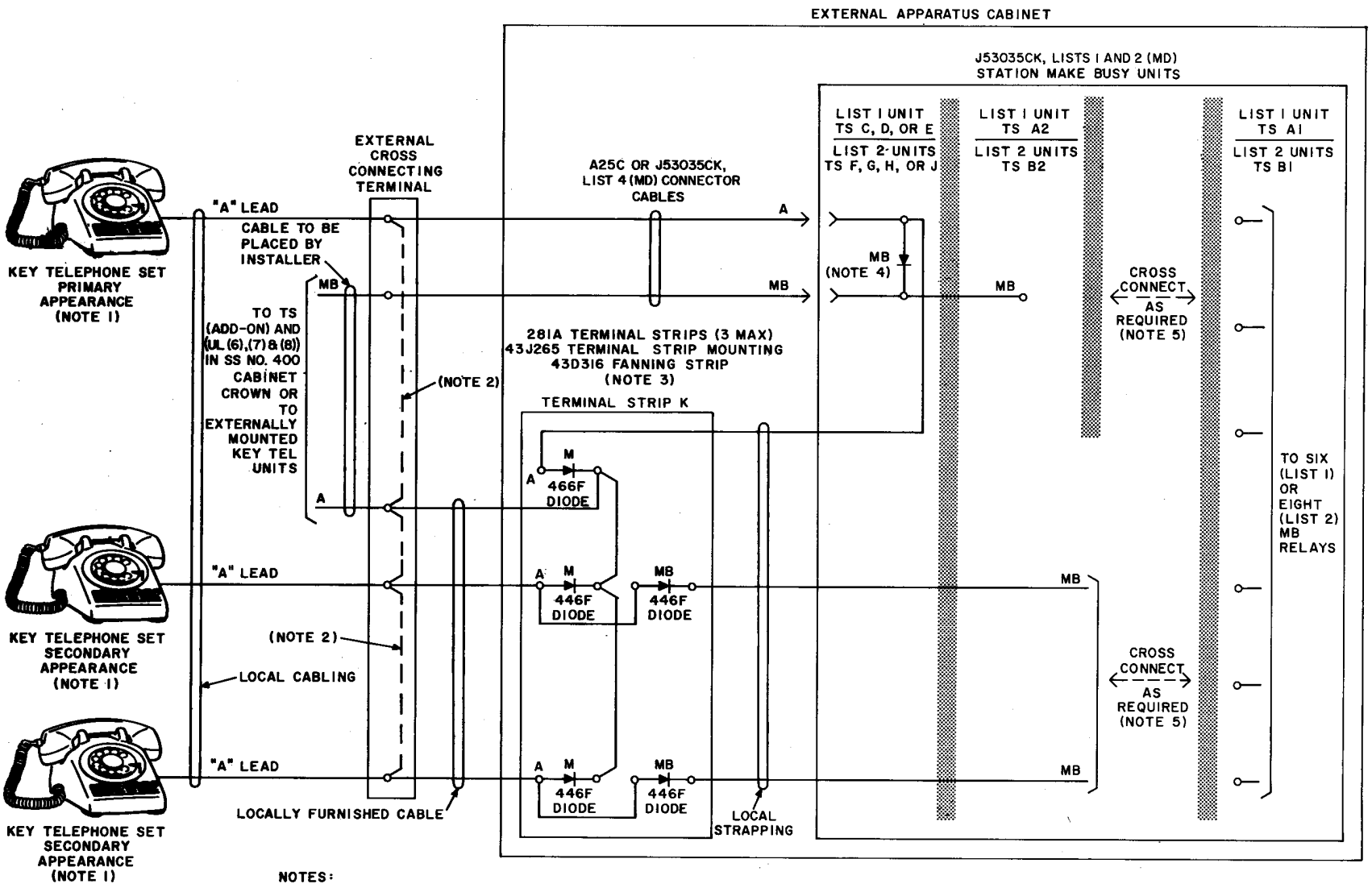
Fig. 25—Station Make-Busy Equipment and Cabling Layout



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. 26—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 I UNIT, FORTY-EIGHT 446F DIODES MAY BE MOUNTED ON ONE 281A TERMINAL STRIP.
4. MB DIODES FURNISHED WITH J53035CK LIST I AND 2 (MD) UNITS
5. 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, Showing Method of Isolating (A) Leads for Multiple Appearances of CO and PBX Lines

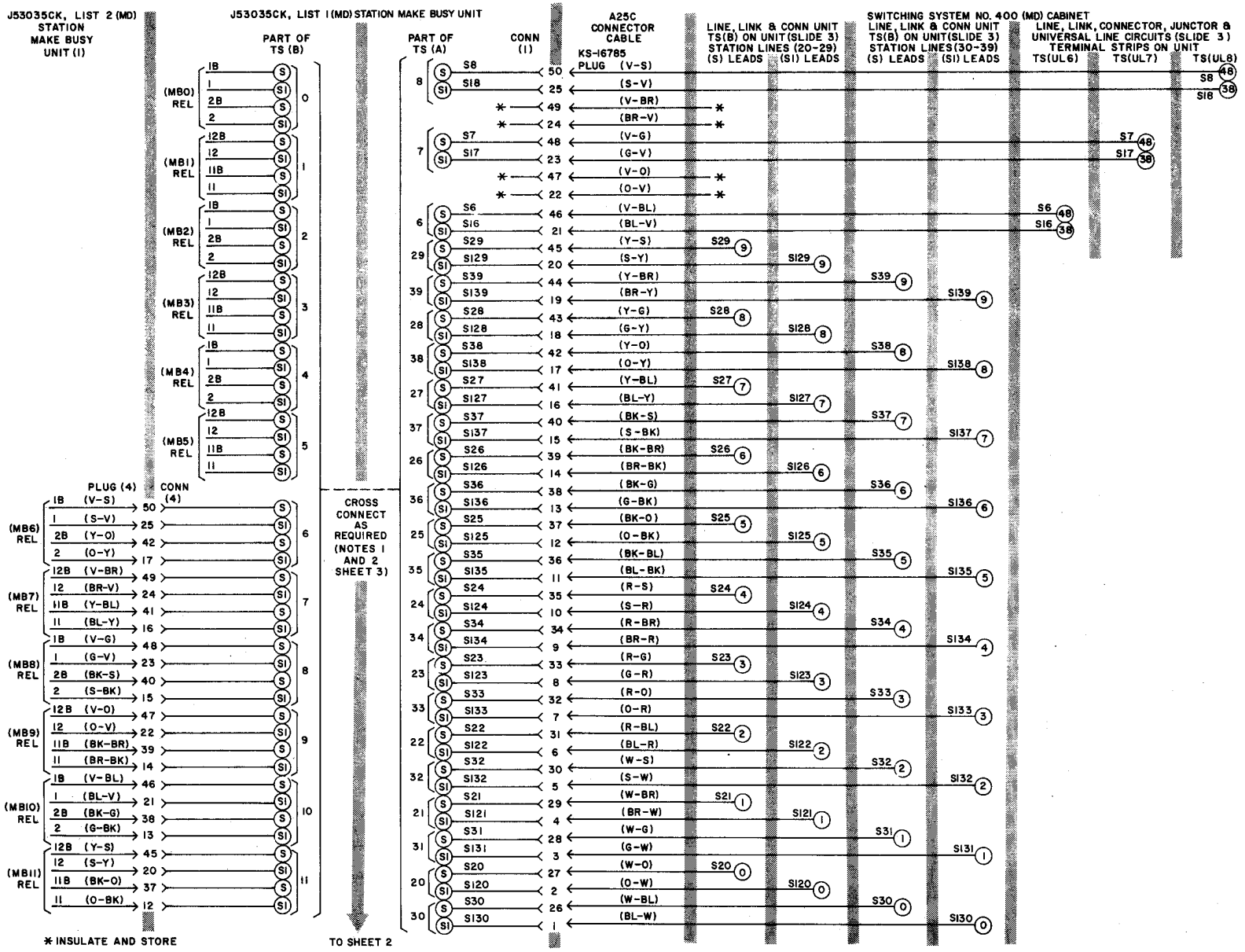


Fig. 28—Connections for Station Make-Busy Units (Sheet 1 of 6)

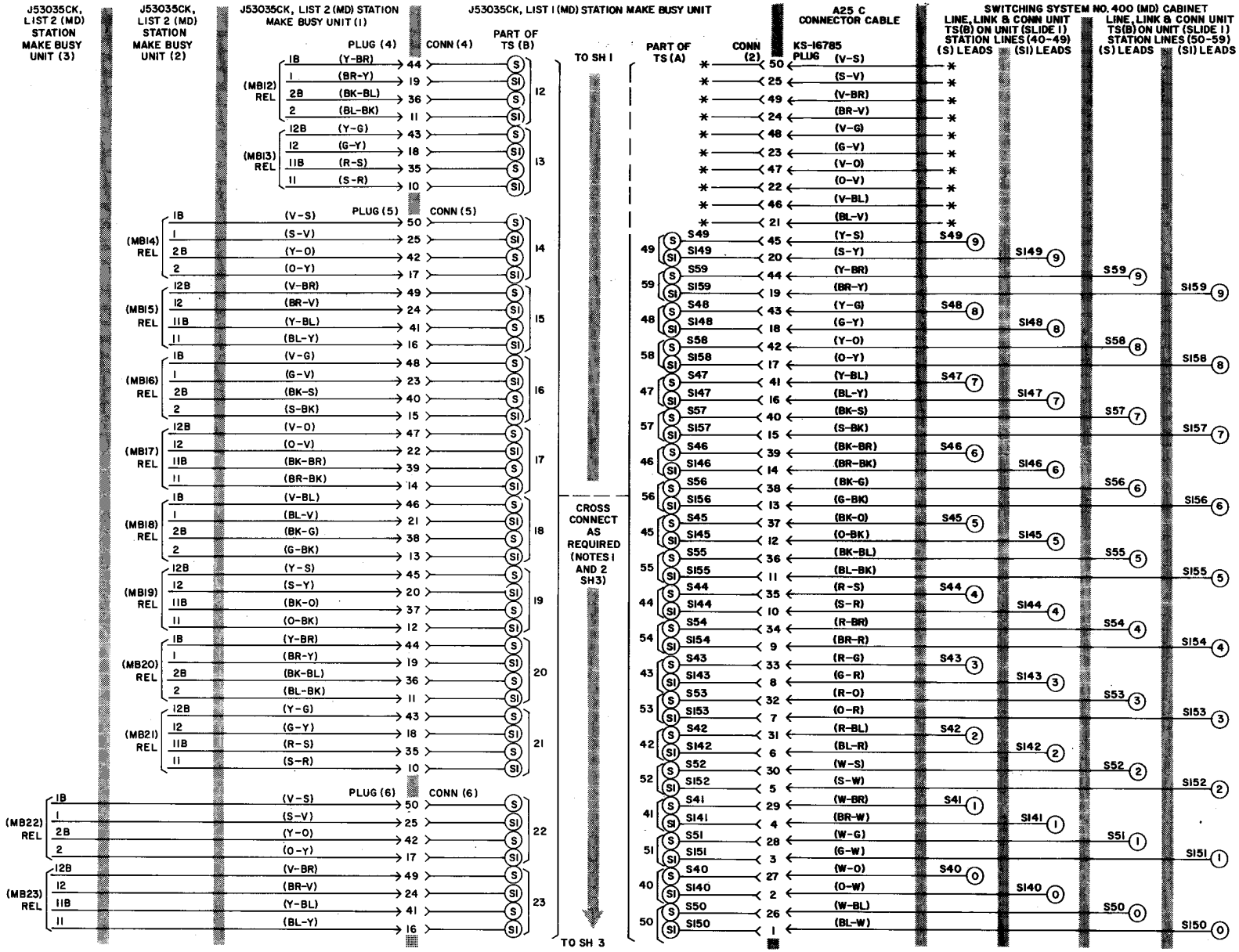


Fig. 28—Connections for Station Make-Busy Units (Sheet 2 of 6)

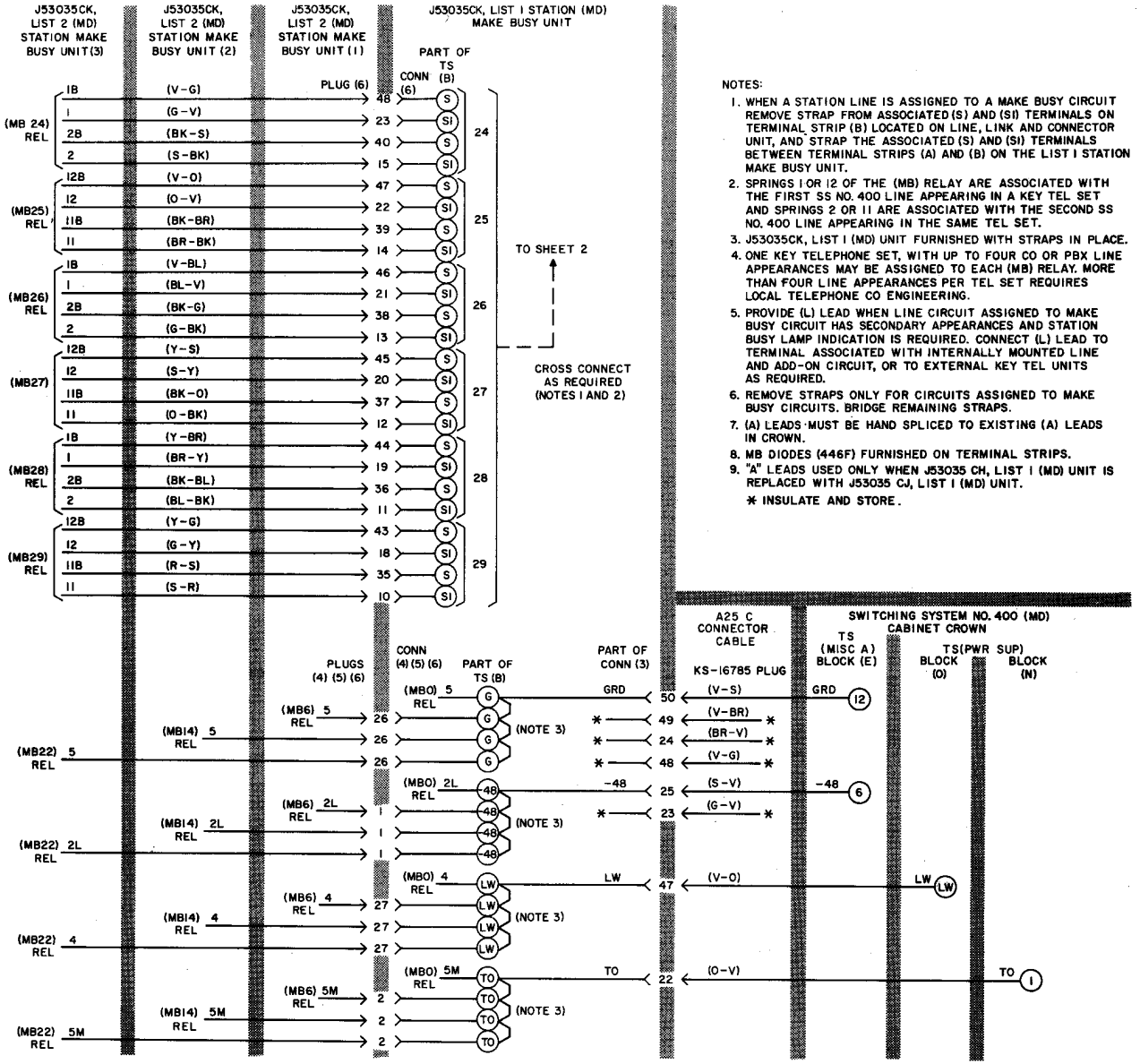


Fig. 28—Connections for Station Make-Busy Units (Sheet 3 of 6)

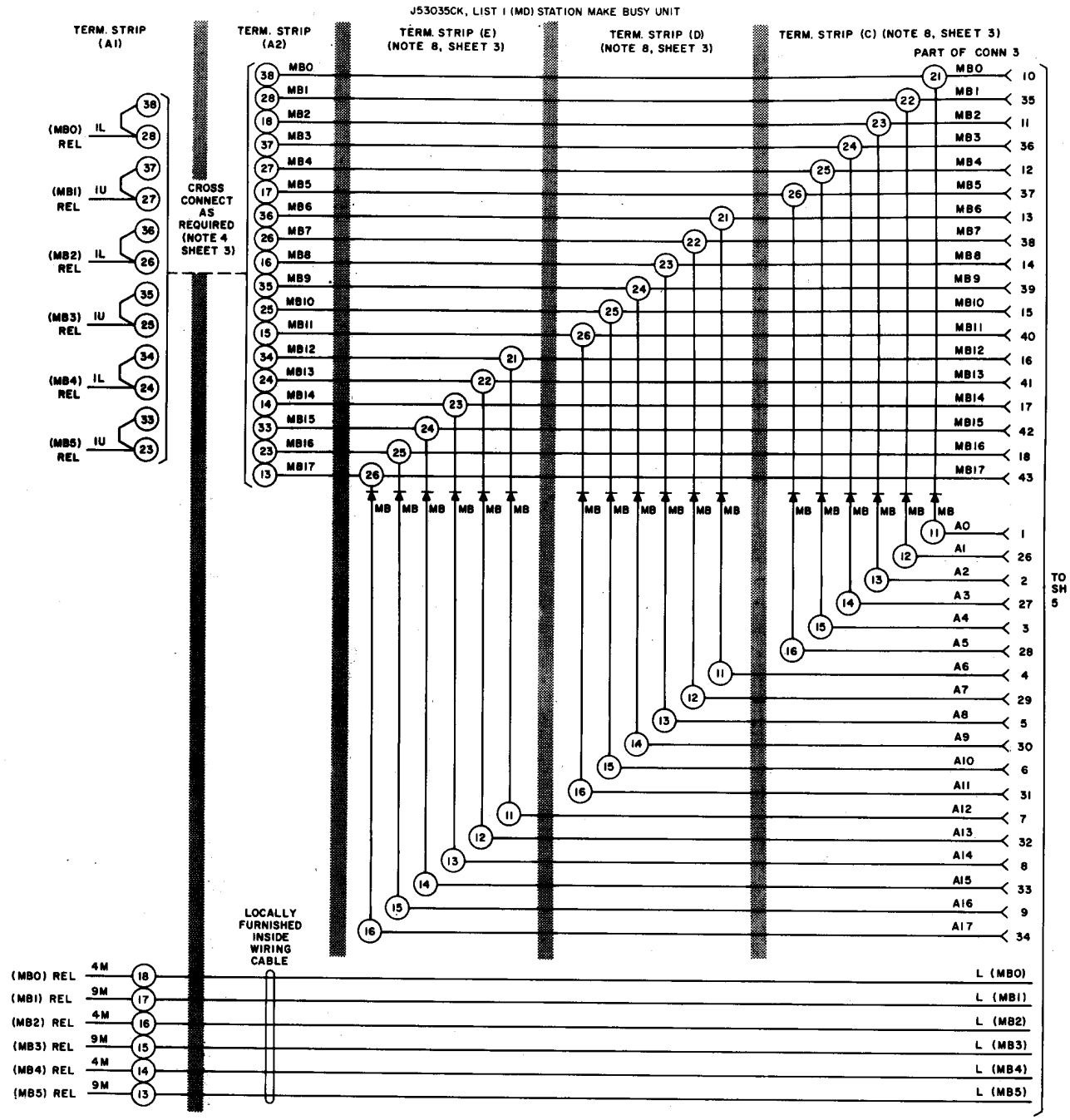


Fig. 28—Connections for Station Make-Busy Units (Sheet 4 of 6)

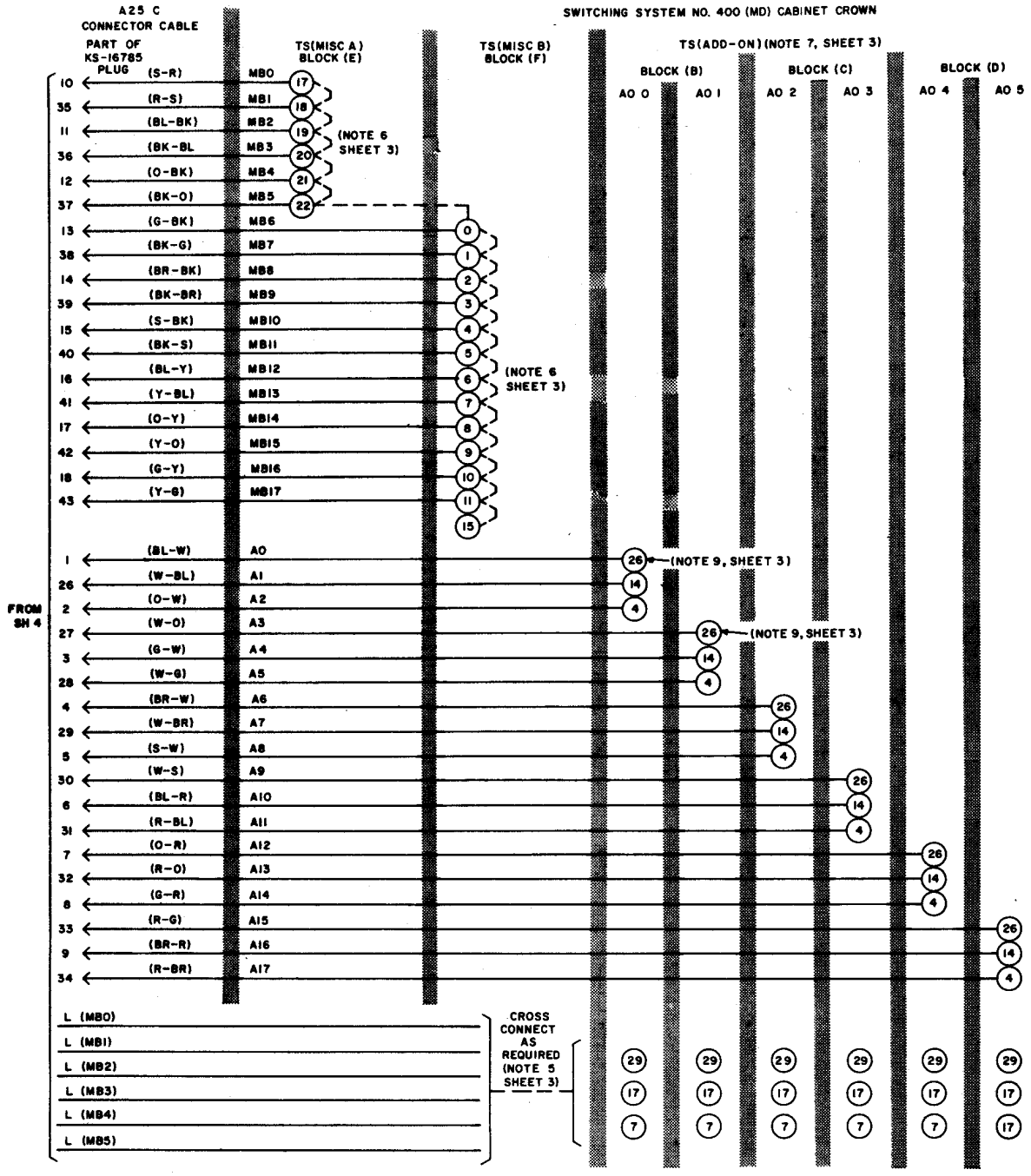


Fig. 28—Connections for Station Make-Busy Units (Sheet 5 of 6)

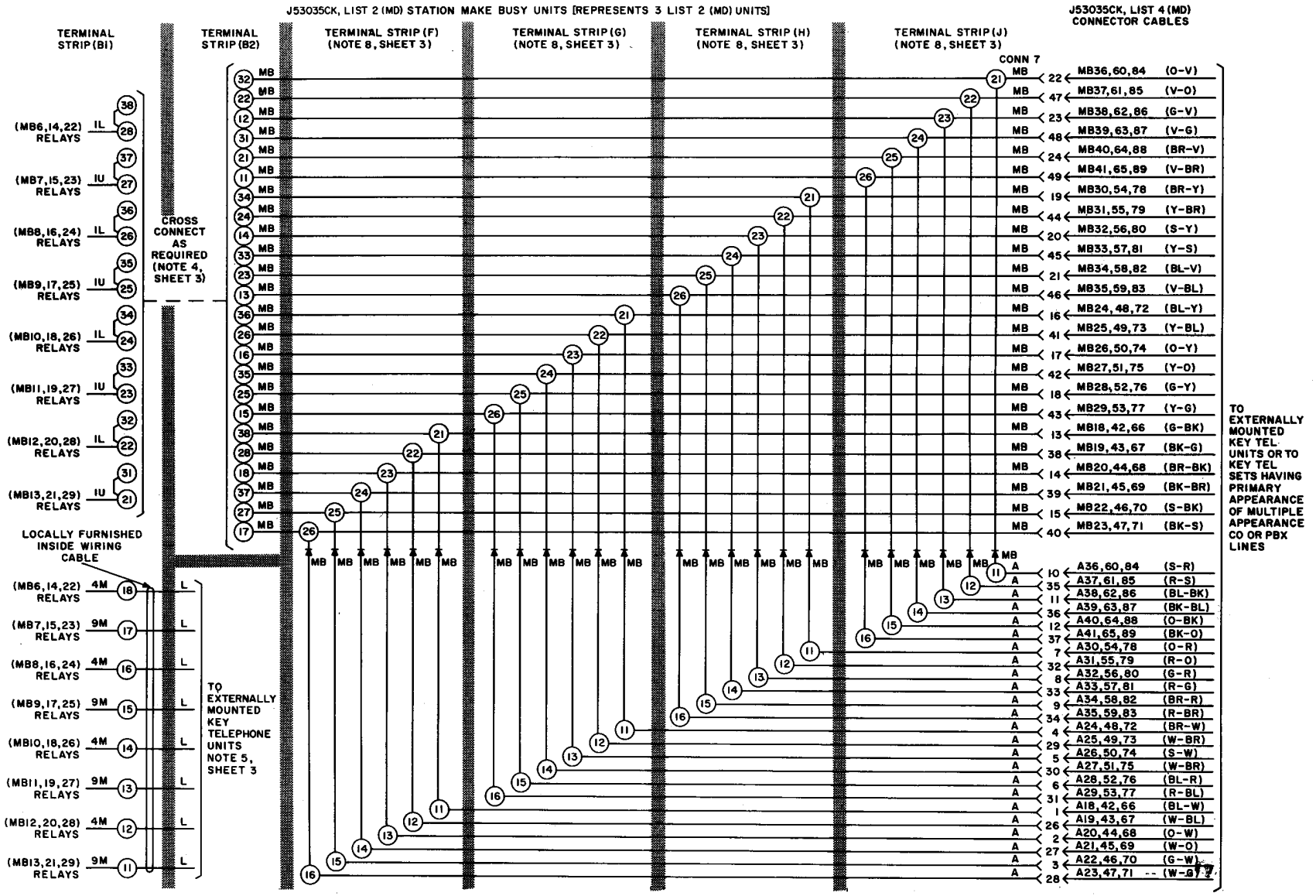


Fig. 28—Connections for Station Make-Busy Units (Sheet 6 of 6)

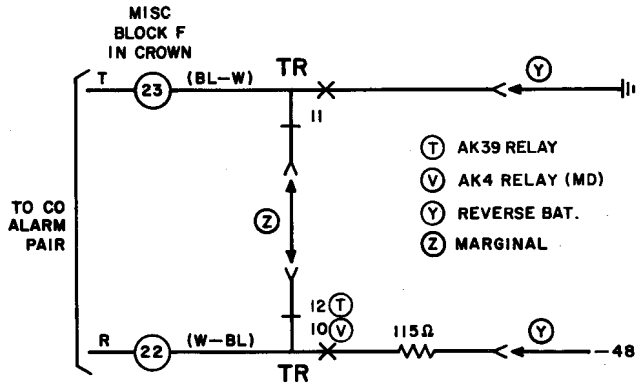


Fig. 29—Alarm to Central Office

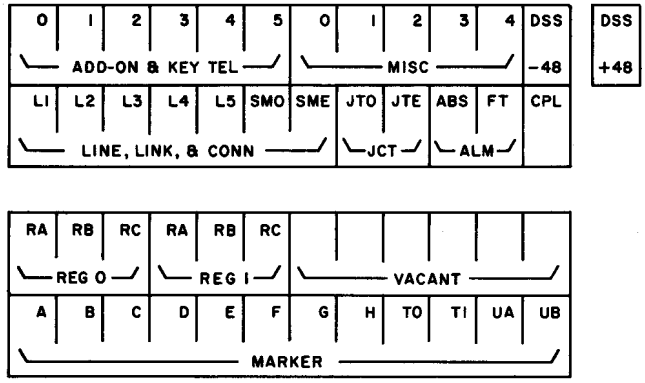
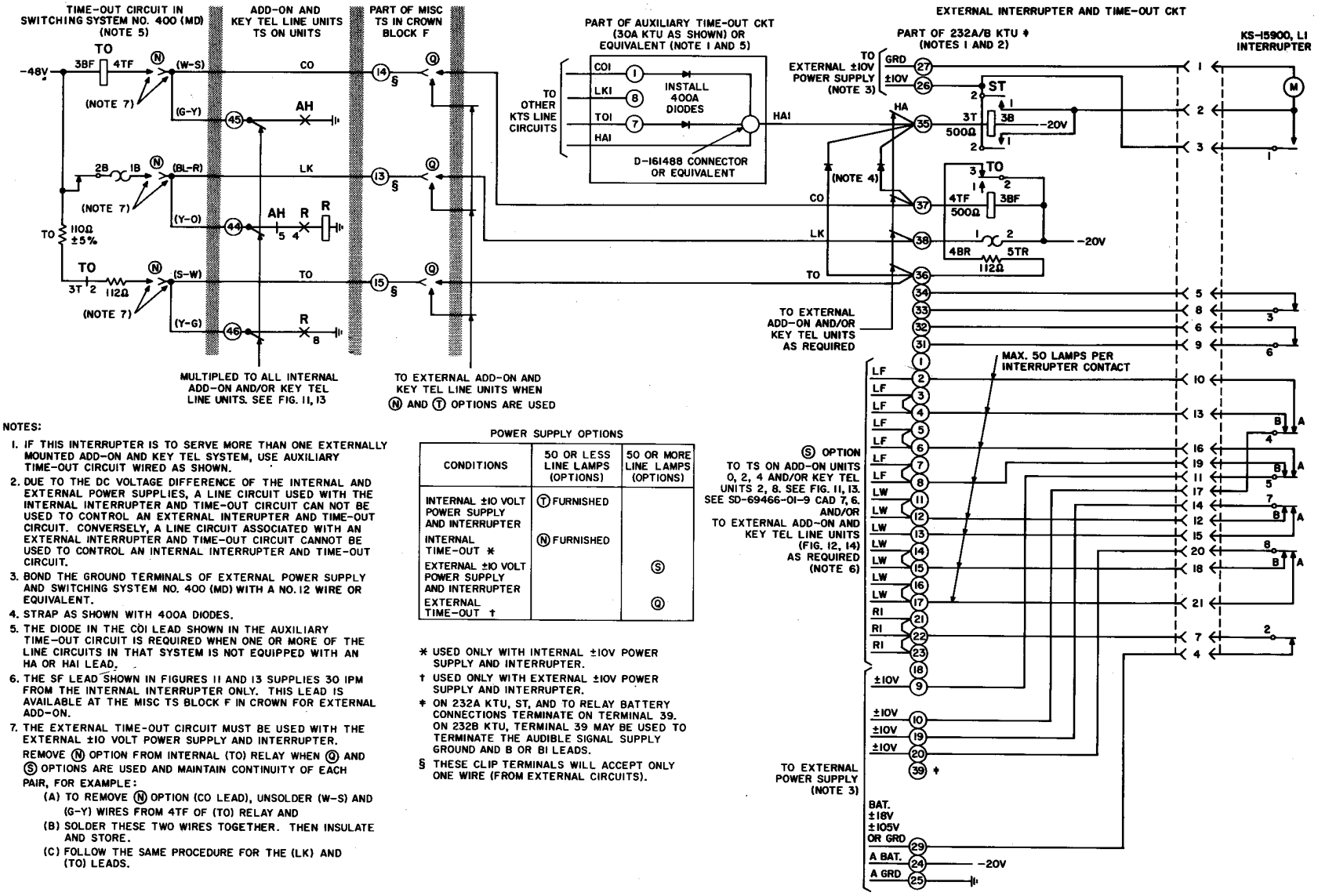


Fig. 30—Switching System No. 400 Fuse Panel



NOTES:

1. IF THIS INTERRUPTER IS TO SERVE MORE THAN ONE EXTERNALLY MOUNTED ADD-ON AND KEY TEL SYSTEM, USE AUXILIARY TIME-OUT CIRCUIT WIRED AS SHOWN.
2. 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 CAN NOT BE USED TO CONTROL AN EXTERNAL INTERUPTER 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.
3. BOND THE GROUND TERMINALS OF EXTERNAL POWER SUPPLY AND SWITCHING SYSTEM NO. 400 (MD) WITH A NO. 12 WIRE OR EQUIVALENT.
4. STRAP AS SHOWN WITH 400A DIODES.
5. THE DIODE IN THE COI LEAD SHOWN IN THE AUXILIARY TIME-OUT CIRCUIT IS REQUIRED WHEN ONE OR MORE OF THE LINE CIRCUITS IN THAT SYSTEM IS NOT EQUIPPED WITH AN HA OR HAI LEAD.
6. THE SF LEAD SHOWN IN FIGURES 11 AND 13 SUPPLIES 30 IPM FROM THE INTERNAL INTERRUPTER ONLY. THIS LEAD IS AVAILABLE AT THE MISC TS BLOCK F IN CROWN FOR EXTERNAL ADD-ON.
7. THE EXTERNAL TIME-OUT CIRCUIT MUST BE USED WITH THE EXTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER.
   REMOVE Ⓝ OPTION FROM INTERNAL (TO) RELAY WHEN Ⓠ AND Ⓢ OPTIONS ARE USED AND MAINTAIN CONTINUITY OF EACH PAIR, FOR EXAMPLE:
   (A) TO REMOVE Ⓝ OPTION (CO LEAD), UNSOLDER (W-S) AND (G-Y) WIRES FROM 4TF OF (TO) RELAY AND
   (B) SOLDER THESE TWO WIRES TOGETHER. THEN INSULATE AND STORE.
   (C) FOLLOW THE SAME PROCEDURE FOR THE (LK) AND (TO) LEADS.

POWER SUPPLY OPTIONS

CONDITIONS	50 OR LESS LINE LAMPS (OPTIONS)	50 OR MORE LINE LAMPS (OPTIONS)
INTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER	Ⓣ FURNISHED	
INTERNAL TIME-OUT *	Ⓝ FURNISHED	
EXTERNAL ±10 VOLT POWER SUPPLY AND INTERRUPTER		Ⓢ
EXTERNAL TIME-OUT †		Ⓠ

* USED ONLY WITH INTERNAL ±10V POWER SUPPLY AND INTERRUPTER.
† USED ONLY WITH EXTERNAL ±10V POWER SUPPLY AND INTERRUPTER.
* ON 232A KTU, ST, AND TO RELAY BATTERY CONNECTIONS TERMINATE ON TERMINAL 39. ON 232B KTU, TERMINAL 39 MAY BE USED TO TERMINATE THE AUDIBLE SIGNAL SUPPLY GROUND AND B OR B1 LEADS.
§ THESE CLIP TERMINALS WILL ACCEPT ONLY ONE WIRE (FROM EXTERNAL CIRCUITS).

Fig. 31—Connections for External 10-Volt Power Supply, Interrupter, and Time-Out Circuit