

CABLING DIAGRAMS FOR SCHEMATIC CIRCUIT DRAWINGS GENERAL EQUIPMENT REQUIREMENTS

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1. GENERAL

1.01 This section describes the assignment of terminals for cabling, lead multipling, and cross-connecting information for circuit schematic drawings.

1.02 This section is reissued to incorporate previous addendum changes.

1.03 This section for the most part is informational in character reflecting current practices, since the assignment of terminals, lead multipling, and cross-connecting information are generally design matters. Where not positively directed herein, or where the cabling information is not covered in the design information, this section may be considered as a guide. It is the responsibility of the Bell Telephone Laboratories engineer to cover the assignment of terminals, lead multipling, and cross-connecting information on the circuit schematic drawings or specifications.

1.04 Except for distributing frames, when cross connections are subject to periodic changes, the application, location, and assignment of terminals and color, gauge and type of wire used, which have sometimes been covered in Bell System Practices, have been included on more recent schematic drawings. Whenever existing schematic drawings are reissued, consideration should be given to the inclusion of this type of information.

1.05 Cabling, terminal assignment, lead multipling, and some cross-connecting information is included on circuit schematic drawings in separate figures to show the method of wiring between units of equipment or pieces of apparatus. These figures, previously referred to as cross-connection figures, are now referred to as Cabling Diagrams (CADs) to distinguish them from the cross-connection information referred to in 1.04 above.

1.06 On CAD figures, wiring which is internal to the equipment is in general shown on the right side of the terminal convention and drawn to the right to indicate a shop connection. This is referred to herein as the shop side of the terminal strip. Wiring which is external to the equipment is in general shown on the left side of the terminal convention and drawn to the left to indicate an installer connection. This is referred to herein as the installer side of the terminal strip. The proper location of the lead on the terminal convention should be followed even if for some reason the shop must connect to the installer side or the installer must connect to the shop side of the terminal strip. (See Fig. 1.) It should be recognized that in some cases, as a matter of economy, the shop may connect what is normally called installer wiring.

1.07 CADs cover the assignment of terminals and the method of tying in connecting circuits. They show:

- (a) The assignment of all terminals including terminals on distributing frames.
- (b) All wiring connected to each terminal.

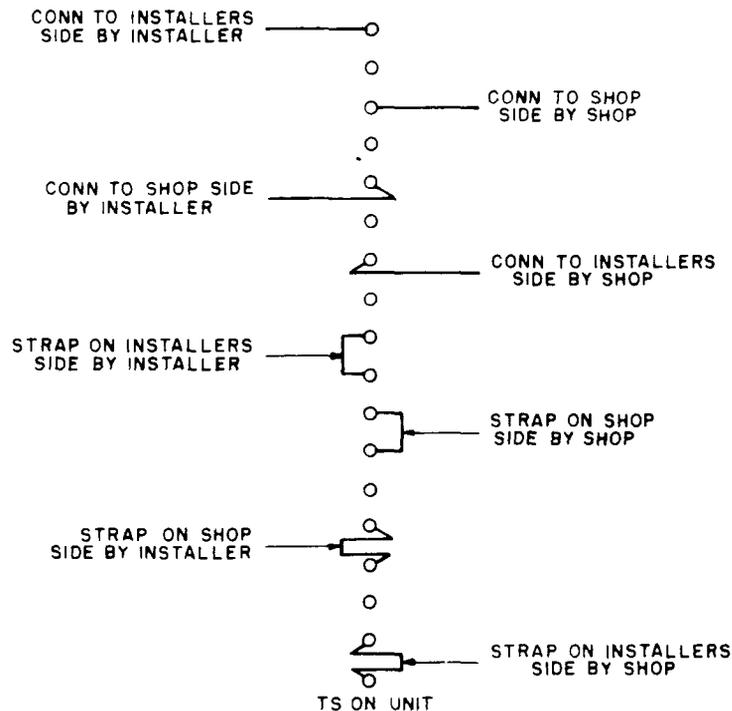


Fig. 1 - Method of Showing Shop and Installer Wiring on Terminal Strips

(c) Switchboard cable from other units, bays, or frames which is carried directly to apparatus (not through terminals), for example, switchboard cable terminating directly on multicontact relays.

(d) The wiring method for each lead where the method is not obvious.

Examples: (1) Switchboard cable, (2) switchboard cable or bulk wire via cable racks, (3) "loose wire" (within bay or frame), (4) cross connections, (5) straps, (6) local cable, (7) supplementary local cable.

(e) The point of connection at a terminal where terminal includes more than one notch or where a specific location is required for a solderless wrapped connection on a terminal.

Examples: (1) "Connect in inner notch." (2) "SS" surface strapping. (3) "SH" shank connection.

(f) The conditions controlling the running, connection, or removal of any variable wiring which is not identified with an option designation.

1.08 Enough information is shown to insure proper identification of apparatus, terminal assignments, cable, and wire. In general, no apparatus other than terminal strips or terminals shall be shown as part of the CAD. Leads to other circuits on the same frame via local cable that are bypassing terminal strips need not be shown in the CAD unless required. Pairing of leads shall be shown in the CAD but only on the installer side of the drawing. The explanation of the various symbols used to describe the position of terminal strips and type of wiring is covered in Section 005-150-101.

1.09 In general, distributing frame cabling diagrams shall be shown as CAD figures separate from those for the relay units, switchboards, etc.

(a) On trunk and line circuits cross connected to toll switchboards, and on station system circuits the distributing frame information shown on the schematic drawing may be considered typical. On wiring diagrams, the terminals may be assigned and designated as required, within the framework of the requirements stated herein.

1.10 Where standard arrangements permit either cross connections or direct cabling, both shall be shown. (See Fig. 2.)

1.11 CAD figures shall not include ordering information normally called for elsewhere in the drawing and in no case should they cover outside plant information.

1.12 In connection with certain toll equipment, such as program transmission, carrier telephone, PBX, and certain electronic switching systems, a separate drawing is prepared, called an application schematic, on which a complete set of cabling diagrams is shown, including cross-connection, terminal strip, and cabling information for all of the individual circuits shown thereon. Where this is done, no cabling information appears on the individual circuits and an equipment note shall be shown referring to the application schematic for this information. In some cases where the individual circuits do not cover complete terminal strip information, it may be desirable to do so by means of cabling diagrams on the application schematic.

1.13 In step-by-step systems, separate drawings are sometimes prepared to show line cabling and cross-connecting information for the various approved distributing frame arrangements. The line circuit schematics refer to these drawings by numbers in notes on the circuit schematic drawings.

1.14 On some of the larger circuits (such as markers) where a large number of functional schematics are involved, separate CAD

figures are provided for each App Fig. (Apparatus Figure) showing only the local cable, relay designation, relay contact number, and lead designations. These CAD figures are associated with other CAD figures which show the above mentioned local cable, terminal strip, and switchboard cabling to other frames. With this arrangement, the CAD figures associated with the App Fig. are numbered from 1 to 99 (the CAD figure number generally agrees with the App Fig. number). The CAD figures associated with the switchboard cabling are numbered from 100 up.

1.15 In some PBX systems where a large amount of the cabling is connected to connectors, a separate schematic drawing has been prepared to cover the complete cabling information for one system. One such method used on a PBX system (757A), shows the CAD figures in tabular form, see SD-66735-01. Another approach, part tabular, part pictorial, has been on the 2A Automatic Call Distributing System, see SD-67008-01. The above principle has also been applied to the No. 1 AMA system except that the tabular form CADs are not separate drawings, see SD-40034-01.

2. DETAILS OF CABLING, TERMINAL ASSIGNMENT, AND CROSS-CONNECTING INFORMATION

A. Numbering of Figures

2.01 On all new drawings the CAD figures shall be numbered consecutively starting with one and have a prefix CAD; that is, CAD 1,

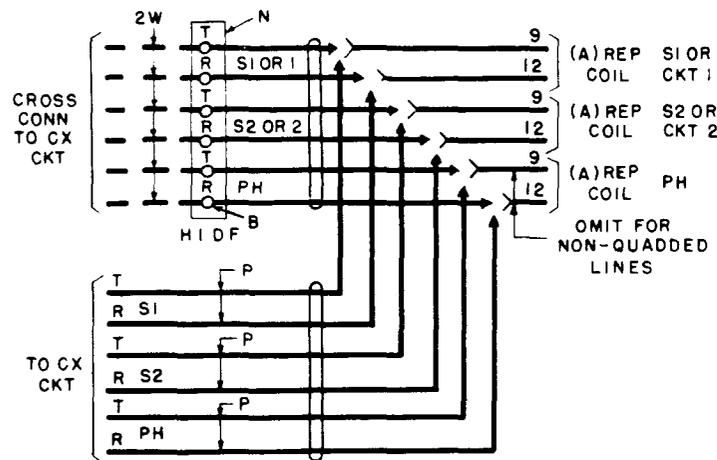


Fig. 2 - Method of Showing Cross Connections or Direct Cabling

CAD 2, etc. On existing drawings, the figures shall be numbered as follows.

(a) On reissued drawings on which there are no CAD figures and CAD figures are to be added, use CAD 1, CAD 2, etc. for the added figures.

(b) On reissued drawings on which there are cabling diagram figures numbered Fig. 51, Fig. 52, etc. and a cabling diagram figure is to be added, use the same numbering system as shown on the drawing for the added figure; that is, continue with Fig. 53.

(c) On reissued drawings on which the CAD figures are numbered using a suffix letter K, L, M, etc; that is, 4K, and a cabling diagram figure is to be added, use CAD 1, etc. for the added figure.

(1) The reason for not continuing with the use of the schematic figure number with an additional suffix letter is because of the many complications encountered with the use of this system.

(d) On reissued drawings using both the suffix letter, 4K, etc. and Fig. 51, Fig. 52, etc. and a cabling diagram is to be added, continue with the numbering system using Fig. 53 for the added figure.

(e) On reissued drawings that are converted from the attached contact schematic type to detached contact schematic type, the cabling diagrams shall be numbered CAD 1, CAD 2, etc. Consideration should be given to a conversion table for office records.

2.02 The CAD figure, except on detached-contact schematics, shall carry a reference to the associated circuit schematic figure number or numbers. These cross-references shall be shown in the following manner, using an adequate descriptive figure title where necessary.

CAD 1
(FOR FIG. 1 & 2)
TOLL SWBD 3C

CAD 2
(FOR FIG. 3)
TOLL SWBD 3CF

CAD 3
(FOR FIG. 1 & 2)
ALM REL

CAD 4
(FOR FIG. 1 & 2)
AIS PIL LP

(a) On some of the larger circuits (such as senders and markers) where several sheets are involved, a cross-reference table between the circuit schematic figures and associated cabling diagram figures may be provided, or the corresponding cabling diagram figure number may be shown under the title of the schematic figure number in the following manner.

FIG. 6
COIN
CAD 1

2.03 On detached-contact schematics, the associated apparatus figure number or numbers shall be shown under the CAD figure in the following manner.

CAD 1
(FOR FIG. 1, 2, 4)

(a) The cross-connecting information, formerly contained in Bell System Practices covering operating methods, is being transferred to the circuit schematic drawing where it will be shown along with explanatory notes numbered in the 400 series.

B. Conventions — General

2.04 Standard conventions for cables, cross connections, talking and signaling leads, etc. as covered in Section 005-108-111 are used in the CADs. (See Fig. 3, 4, and 5.)

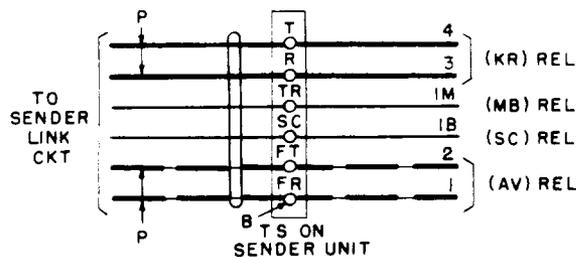


Fig. 3 — Conventions For Talking, Signaling, Etc, Leads

2.05 The same convention is used for both line jacks and protectors. Unless indicated as line jacks, the symbol will be interpreted as meaning protectors. (See Fig. 5 and 6.)

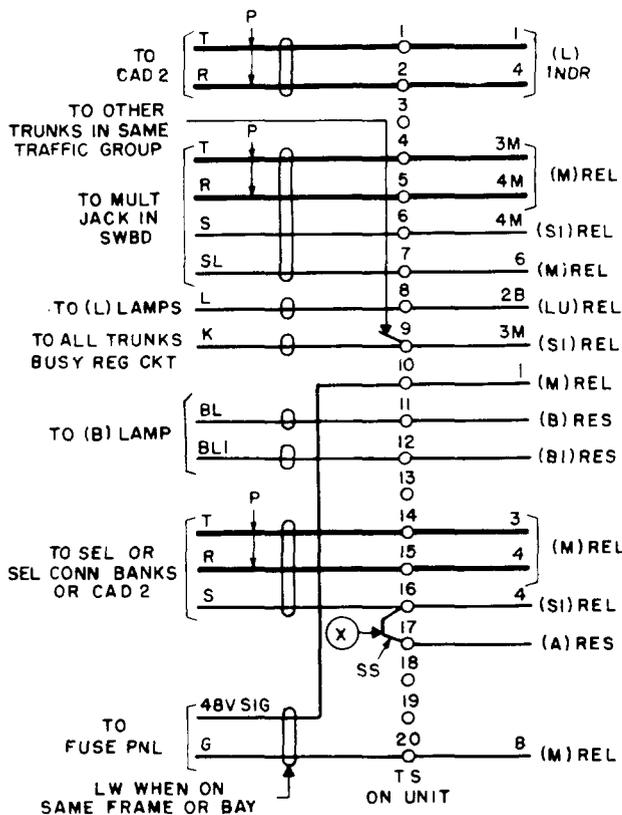


Fig. 4 - Terminations Shown at Ends of Leads (224-type terminal strip shown)

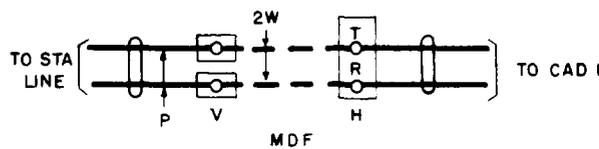


Fig. 5 - Protectors Shown on Vertical Side of the MDF

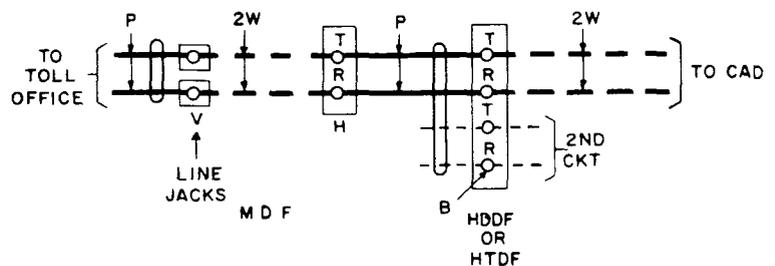


Fig. 6 - Distributing Frame Information Shown as Separate Figure, Also Method of Showing Line Jacks

2.06 When the shield of shielded wiring (with or without a ground tracer) is connected to a terminal, it is shown by a solid lead from the shield convention to the terminal. (See Fig. 7).

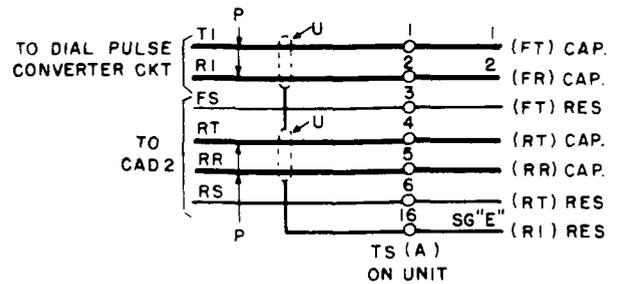


Fig. 7 - Method of Showing Shielding (203-type terminal strip shown)

C. Terminal Strip Conventions

2.07 The terminal strip convention shall not be shown around the terminals, except distributing frame terminal strips (see 2.08) or where it is necessary to show the location of terminals with respect to each other (see Fig. 3). In general, all the terminals (used and unused) are shown in vertical rows and are numbered from top to bottom or bottom to top. (See Fig. 8 and 9.) Terminals may be shown out of order where it improves the layout of the diagram or where a special grouping is desired.

2.08 On distributing frame terminal strips the terminal strip convention shall be shown around the entire row of terminals which are

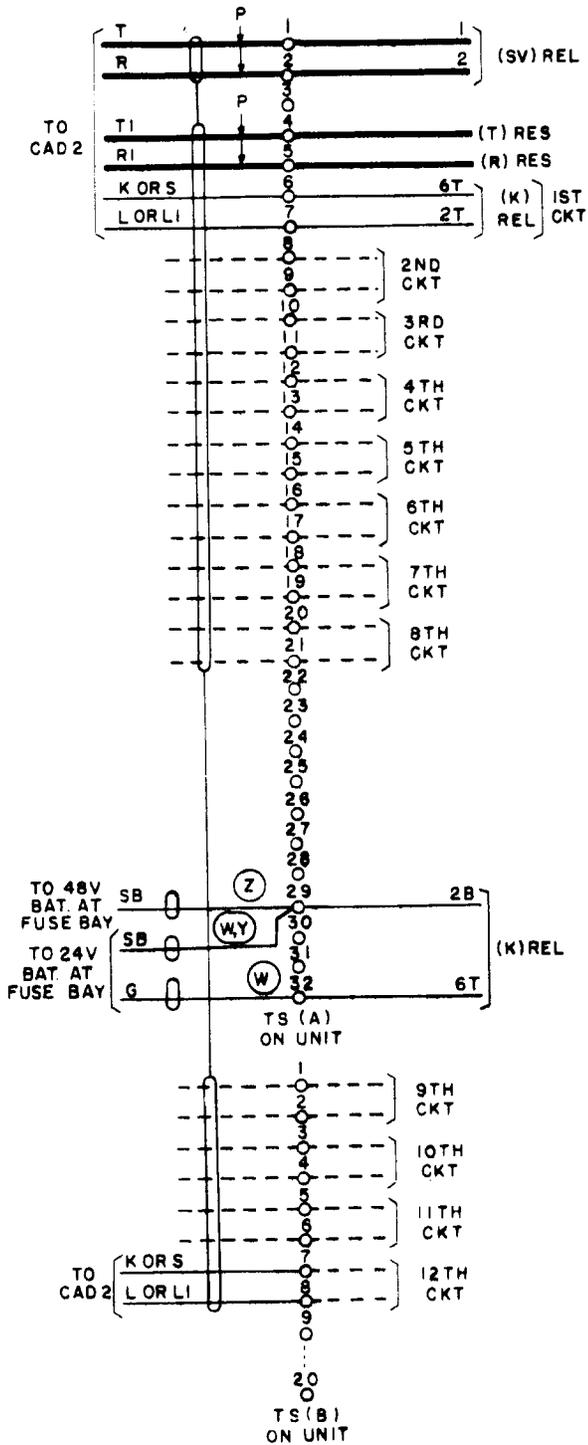


Fig. 8 - Terminals Numbered From Top to Bottom (224-type terminal strip shown)

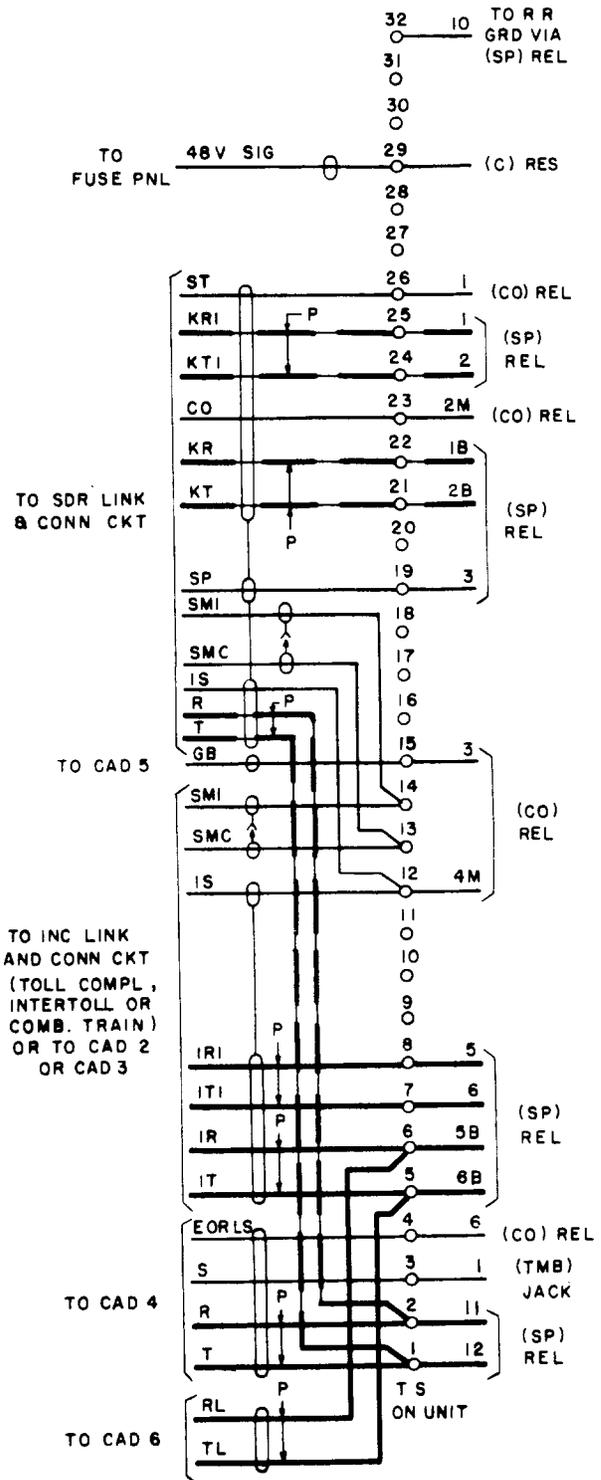


Fig. 9 - Terminals Numbered From Bottom to Top (227-type terminal strip shown)

perpendicular to the fanning strip, except as otherwise indicated below. (See Fig. 10.)

(a) Where miscellaneous terminals on a distributing frame terminal strip are shown and they do not include the entire row, the terminal strip convention may be broken off to include only the terminals involved. In this case, the convention may be broken off at both ends, and if orientation of the terminals is necessary, the one nearer the base should be marked "Terminal Toward Base."

(b) In general, cabling diagram figures shall not depict terminal strips and wiring shown in some other figure or drawing. Where unusual circumstances warrant repeating this information, the terminal strip and wiring shall be shown in light dash lines with a note indicating the figure or drawing in which they appear. The terminal strip convention may be broken off and only the terminals involved shown.

2.09 The convention for the 66-type connecting block is shown in Fig. 11 and 12. All terminal clips are shown when this block is shown in the CAD section of a drawing. When the connecting block used has two or more separate

clip multiples in one horizontal row, the representation of the terminals shall be staggered as shown in Fig. 12 or the lower half of Fig. 11.

2.10 When the terminal strip is equipped with U-shaped or similar type terminals, such as the 284-, 285- or 203-type terminal strip, it is only necessary to show one terminal symbol for each terminal on the CAD figure. (See Fig. 17.) Two terminal symbols connected with a solid line may be shown when necessary.

D. Orientation Symbols

2.11 When the terminal strip convention shows a row of terminals which are perpendicular to the fanning strip, the terminal nearest to the base (fanning strip) is designated with the symbol B. When two fanning strips are provided, the terminals nearest the lower (for horizontal mounting) or right (for vertical mounting) fanning strip are designated with the symbol B. Where shown in the same figure, adjacent rows of terminals which are perpendicular to the fanning strip are indicated by joining them with a line designated E. The top or left row of terminals on the terminal strip is designated with the symbol K. (See Fig. 10.)

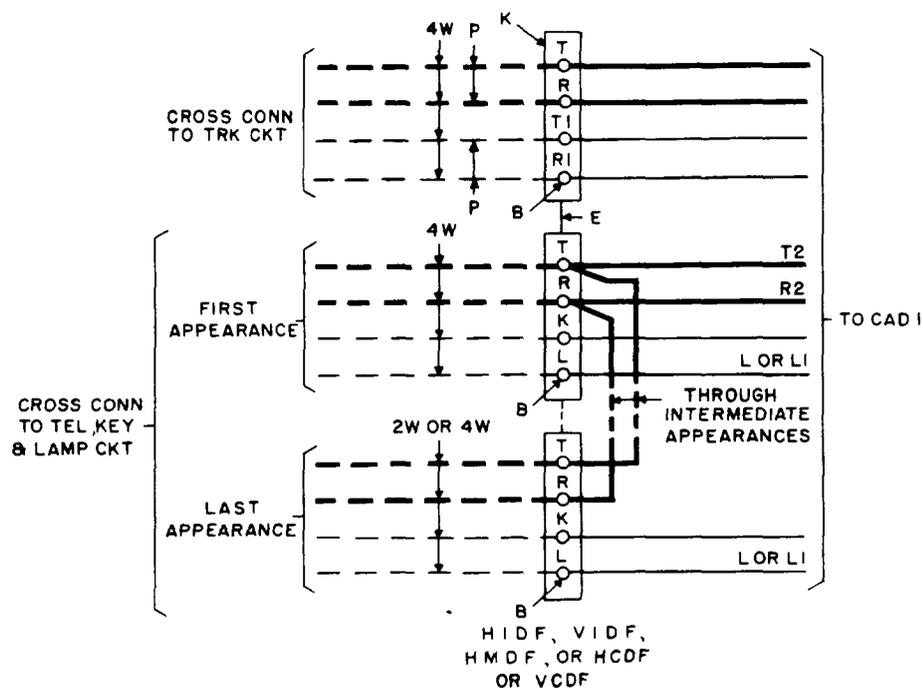


Fig. 10 - Distributing Frame Terminal Strips

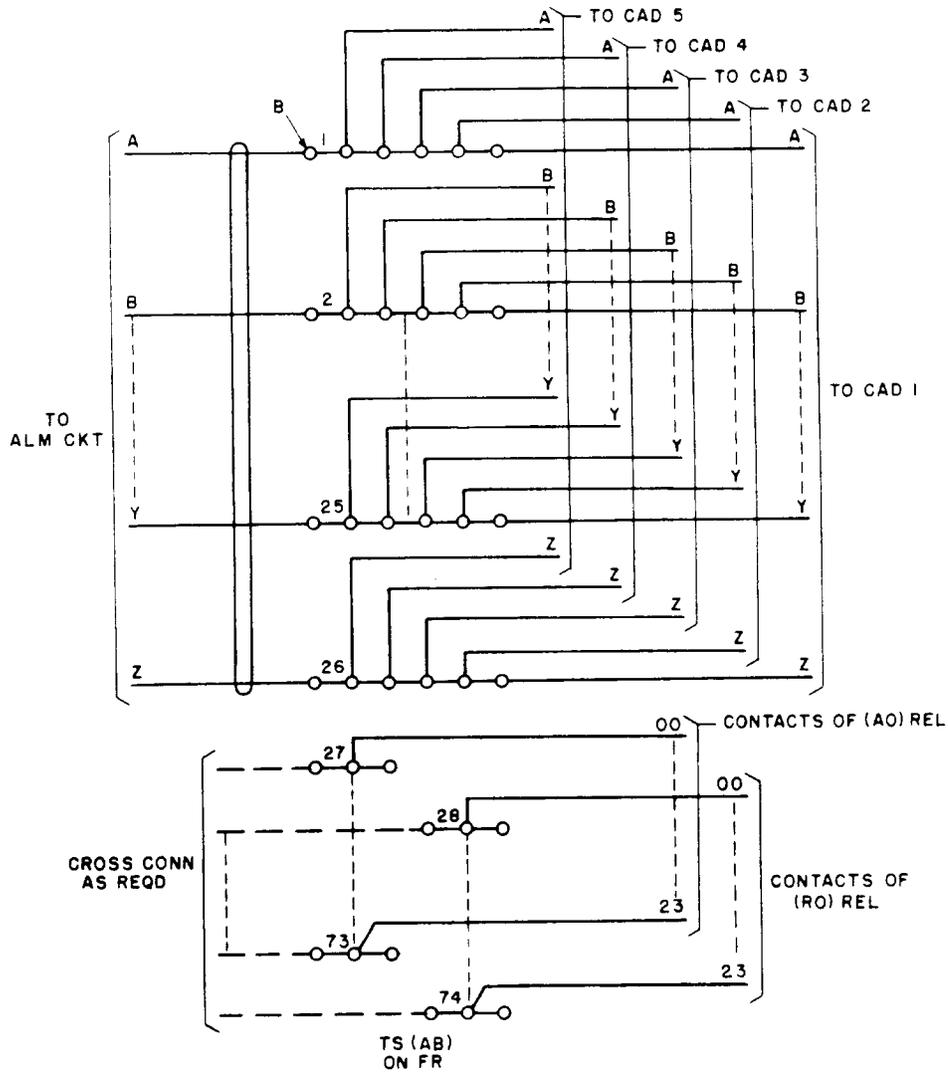


Fig. 11 - Method of Showing Clip-Type Terminals (66B5-37 Connecting Block shown)

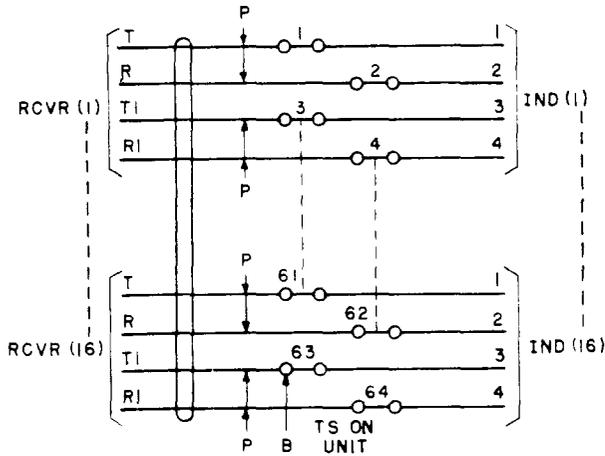


Fig. 12 - Terminal Assignment for Clip-Type Terminals (66E1-32 Connecting Block shown)

2.12 On 216- and similar-type terminal strips, where there are two points of connection on the same terminal, leads which are intended to be connected to the lower terminal on the terminal strip shall be indicated with an arrow and note "Connect To Lower Terminal." (See Fig. 13.)

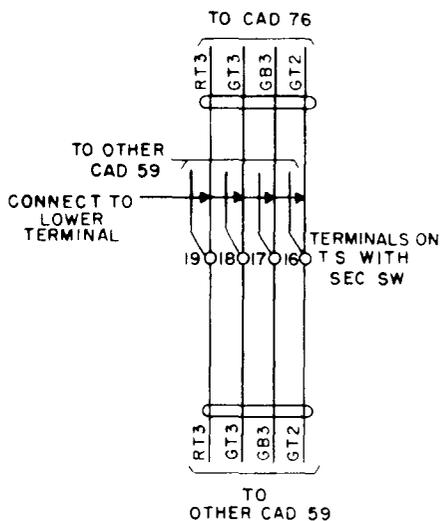


Fig. 13 - Method of Showing Connection to 216-Type Terminal Strip

2.13 On 236- and similar-type terminal strips (used on marker test and similar type frames in dial systems), the side containing the cross-connecting field is looked upon as the

front of the terminal strip and is mounted with the cross-connecting field at the front of the frame. Strapping terminals are provided on the rear of the two ends of each segment. The right-hand terminal looking at the rear of the terminal strip shall be designated K4. (See Fig. 14.)

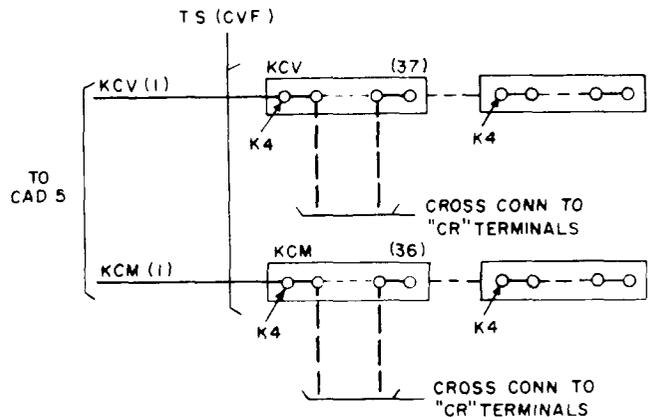


Fig. 14 - Use of K4 to Indicate Right-Hand Terminal Lug of a Group of Terminals Looking at Rear of 236- or Similar-Type Terminal Strip

2.14 Except as stated herein, generally all terminals on the same terminal strip shall be shown in one vertical row. A notation shall be shown below each vertical group or row of terminals in a figure to identify the terminal strip and show its location. (See Fig. 15.)

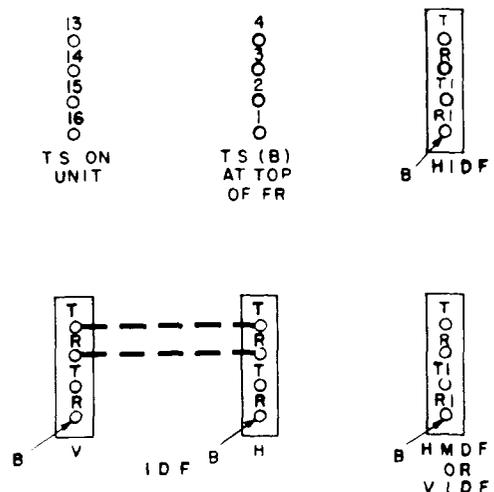


Fig. 15 - Method of Identifying Terminal Strips

2.15 *Distributing Frames*

(a) *On distributing frames other than the electronic type*, the terminals on the horizontal side of the frame shall be shown in a vertical row and those on the vertical side shall appear in another vertical row. Each side of the distributing frame is indicated by placing the designation H or V below the bottom row of terminals on each side. The frame designation as MDF, IDF, etc, is located centrally below the two rows of terminals. (See Fig. 15.) When only one side of the distributing frame is shown, the entire designation is placed below the bottom row of terminals on the frame. (See Fig. 10.)

(1) If the distributing frame CAD figure covers frames of different construction, such as a CDF and a single-sided distributing frame (having no horizontal terminal strips), the complete frame designations should be placed below each vertical row of terminals.

(b) *On distributing frames used in Electronic Switching Systems No. 1*, the cable side (C) and the equipment side (E) or the trunk side (T) and the network side (N) of the distributing frame are shown in two vertical rows. The designation placement for these frames is similar to the above distributing frames. (See Fig. 16.)

E. Terminal Assignment

General

2.16 Wherever practicable within a system, the assignment of all terminals of similar-type circuits shall be consistent with respect to the designation and position on terminal strip. Leads having identical functions shall be assigned identical designations and identical positions on the terminal strips.

2.17 As far as practicable, the assignment of "tip" and "ring" and the location of battery and ground on terminal strips should be in accordance with 2.18 to 2.23, inclusive.

(a) Leads from power sources not protected by suitable resistors, resistance lamps, or relay windings capable of carrying the full-current load during accidental short circuit should be assigned to terminals separated, both in the same and adjacent rows, from terminals carrying ground or other power sources.

(b) There should also be a separation between battery terminals and terminals having leads to ground through apparatus windings which are not self-protecting from a fire hazard standpoint.

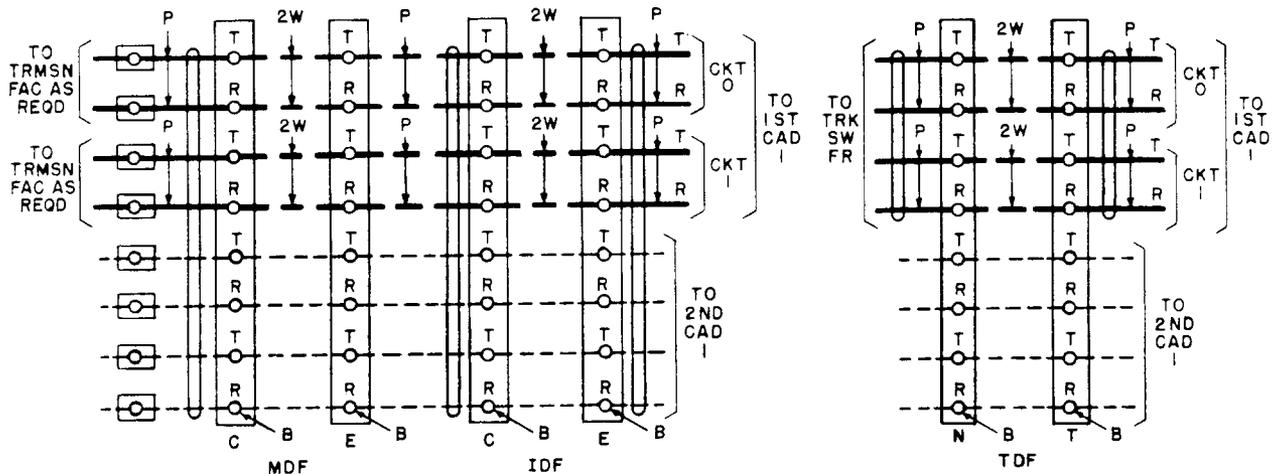


Fig. 16 - Method of Showing Distributing Frames for Electronic Switching Systems

Specific

2.18 On 150-, 178-, 268-, 183-, and similar-type terminal strips, in assigning terminals in a row of terminals which are perpendicular to the fanning strip, the "tip" lead should be shown connected to the terminal farthest from the fanning strip; "ring" to the next farthest terminal from the fanning strip; "sleeve" next; and so on in toward the fanning strip.

2.19 On 203-, 259-, and 284-type terminal strips, "tip" and "ring" should be shown connected to the lowest numbered terminals on the terminal strip. (See Fig. 17.)

- (a) Connect ground to the highest numbered terminal and allow at least two intervening terminals between battery and ground.
- (b) At least two intervening terminals should separate two battery terminals of different potentials, or ringing battery and ground. Separation also should be provided, when necessary, to avoid inductive interference, the amount of separation to depend on the requirements of the particular job. (See Fig. 17.)

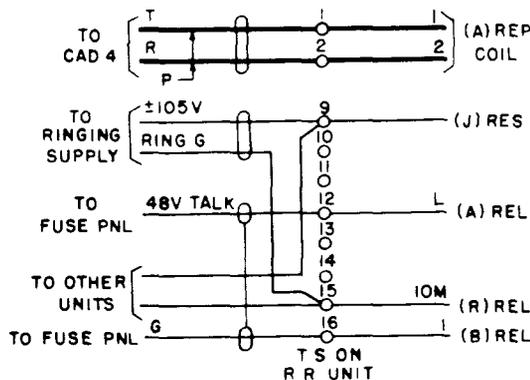


Fig. 17 - The 203-Type Terminal Strip

2.20 The 224-Type Terminal Strips

224A and 224F

(a) In general, "tip" and "ring" should be connected to the lowest numbered terminals serving the circuit. (See Fig. 18.) Where one terminal strip serves two circuits, assign terminals on the top half of the terminal strip for one circuit and to the bottom half for the other circuit. (See Fig. 19.) Where several sets

of "tip" and "ring" connections are involved, it is satisfactory, where so desired, for the sets to be assigned to terminals on both the top and bottom rows of the terminal strip. (See Fig. 20.)

(b) In general, where one terminal strip per circuit is provided, assign battery to terminal 16 and ground to terminal 32 as shown in Fig. 18. In the case of one-half terminal strip per circuit, assign battery to terminal 16 and ground to terminal 9. In the event that space does not permit the above, at least two intervening terminals should separate battery and ground. At least two intervening terminals should separate two battery leads of different potentials. When two or more battery leads of the same voltage are required for one circuit, the additional leads shall be assigned terminals adjacent to the first battery lead on lower numbered terminals.

224B and 224G

(c) On 224B and 224G terminal strips (10 terminals in each row) a plan similar to that shown for the 224A and 224F shall be followed.

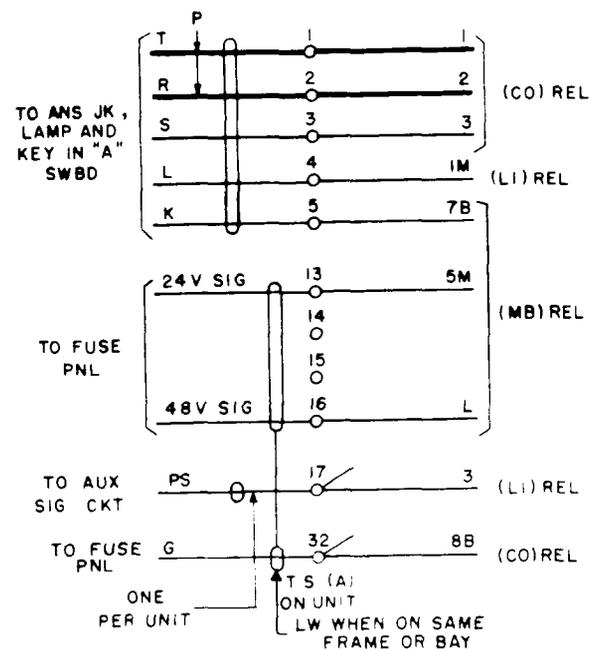


Fig. 18 - Terminal Assignment on 224-Type Terminal Strip - One Per Circuit

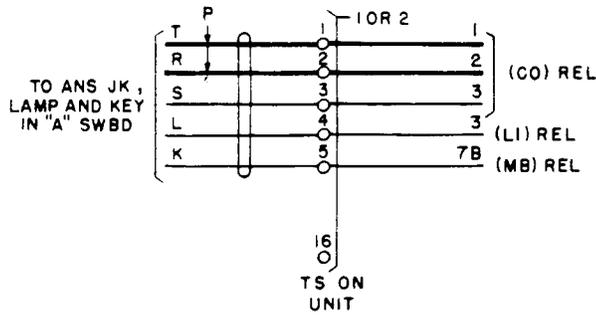


Fig. 19 — 224-Type Terminal Strip — Two Circuits Per Terminal Strip

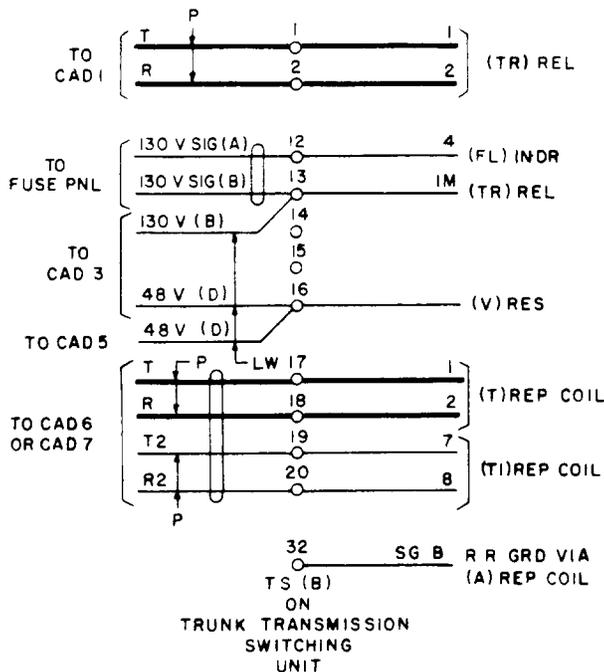


Fig. 20 — Terminal Assignment on 224-Type Terminal Strip

2.21 D-Type Terminal Strip: Since switchboard cabling will be terminated on a horizontal row basis, all pairs, triples, and so forth such as T and R or T, R, and S shall be assigned adjacent horizontal row terminal numbers. The "tip" lead should be shown connected to the left terminal, the "ring" to the next terminal, T1 or S next, and so on from left to right as viewed from the apparatus side of the terminal strip. (See Fig. 21.) When the number of paired leads exceeds the number of available

terminals in a horizontal row, avoid splitting of pairs by assigning the terminals in pairs beginning at the top. Additional paired leads shall be added to the next lower rows.

Example: In assigning T, R, T1, R1, BAT and GRD leads on a D3A terminal strip, the leads shall be assigned as follows.

BAT-11, GRD-31, T-38, R-28, T1-37, and R1-27.

When no switchboard cable leads are connected to the terminal strip, local cable leads may be assigned on a horizontal or vertical row basis as best suits each individual condition. In general, assign battery and ground leads as follows.

(a) **On relay rack mounted units,** battery and ground shall be assigned on the lowest horizontal rows with unassigned terminals left between different potentials and between battery terminals and ground terminals in the same and adjacent rows.

(b) **For functional units on frames:** Where only one or two battery and ground leads are involved, the relay rack procedure may be followed. Where more than two battery and ground leads are required, as on sender and register frame control units, the battery leads shall be assigned to the bottom horizontal row or rows and the ground terminals to the topmost row or rows. Unassigned terminals shall be left between battery terminals of different potentials in the same and adjacent rows.

2.22 Connectors (male and female type used as terminal strips): In some switching systems it has been the practice to use connectors as terminal strips. The connectors are made up of male and female halves and constitute a plug-in arrangement. They are used when quick connection of a multitude of leads is required. In general, these connectors should be treated in a similar manner as that shown for terminal strips. (See Fig. 22.)

(a) On amphenol or similar type connectors where the physical make-up of the connector is two rows of terminals, the tip and ring or battery and ground are usually assigned to opposite sides.

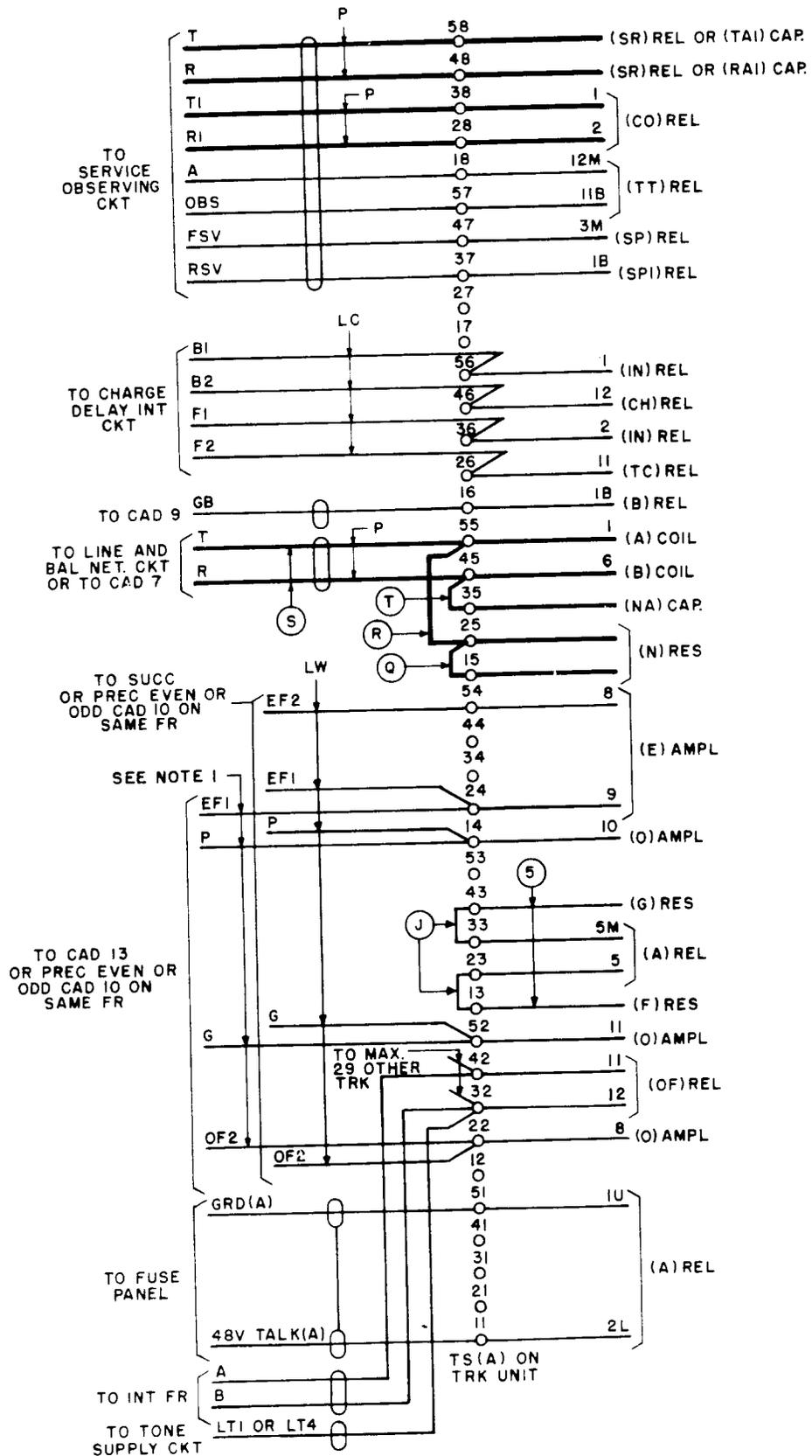


Fig. 21 - D-Type Terminal Strip

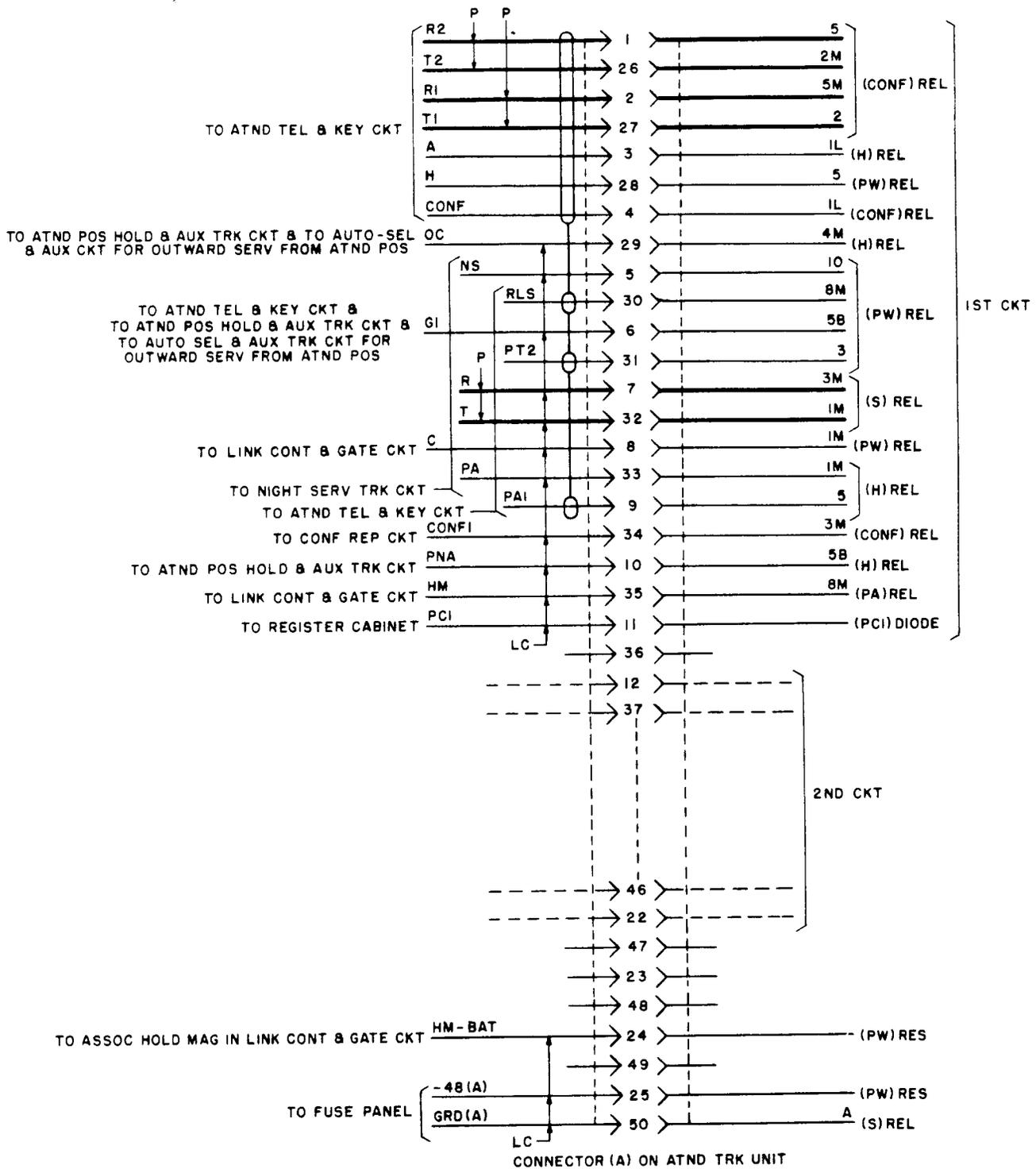


Fig. 22 - Method of Showing Connectors (KS-16785 Plug and KS-16786 Connector shown)

G. Lead Terminations

2.28 The termination of both ends of leads shall be indicated. Leads terminating at apparatus shown on the same drawing shall indicate, by means of the apparatus designation and name, the particular piece of apparatus, when it connects to only one piece of apparatus. When it connects to more than one piece of apparatus, indicate any one of the pieces of apparatus to which it is connected. While the piece of apparatus so indicated in these cases does not necessarily have to be that to which the lead is directly connected in the actual wiring of the equipment, it is preferable that this piece of apparatus be the one that is indicated.

2.29 When a lead (shop side) may or may not pass through a piece of optional apparatus before termination, both pieces of apparatus should be included as shown in Fig. 25.

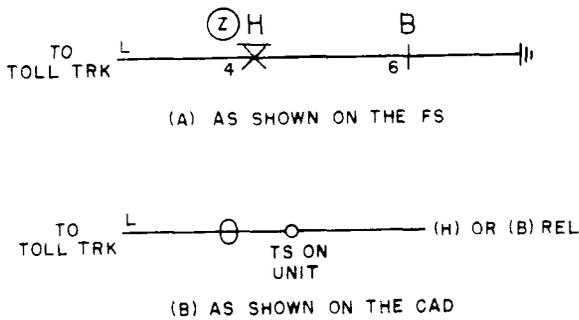


Fig. 25 - Method of Showing Lead Termination Through Optional Apparatus

2.30 Local cable leads connected to two or more terminals on 224- and similar-type terminal strips shall terminate on the higher-numbered or left terminal of the group of terminals strapped together, as viewed from the wiring side. On existing CAD figures where this practice is not followed, the feeder lead may be connected to the higher-numbered terminal in the actual wiring of the equipment.

2.31 Apparatus code numbers are not to be used as a means of identification unless absolutely necessary. It is preferable to show the spring and terminal numbers on all leads but they may be omitted where desirable. In cases where one spring on a specific relay is specified and several springs of that relay are

strapped together, the connection may be made to any one of the electrically common terminals. Fig. 26 depicts leads terminating at U-type relays. For wire-spring relays, the movable twin contact springs shall be numbered the same as their associated fixed springs with the appropriate suffix M (make) or B (break).

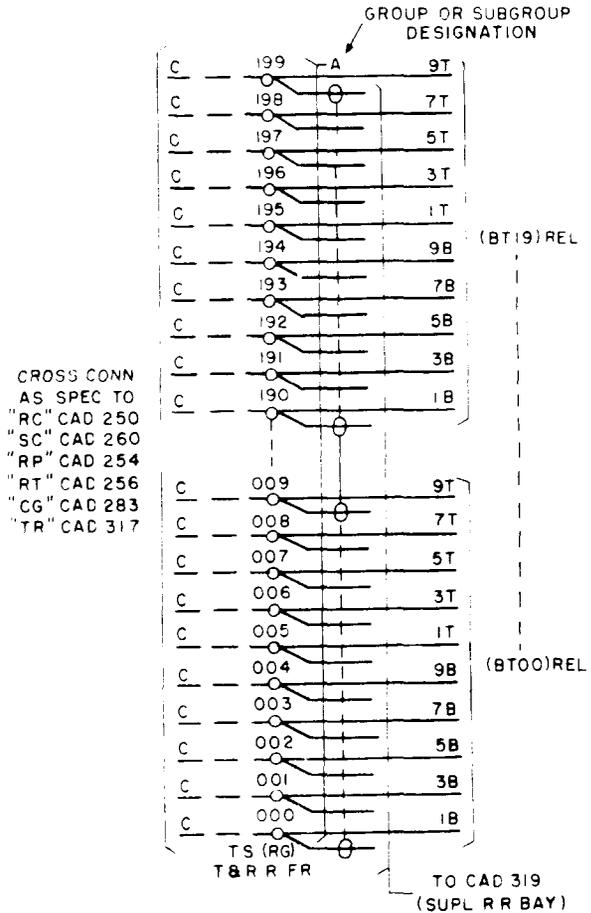


Fig. 26 - Spring and Terminal Numbers

2.32 Leads terminating on apparatus or equipment shown on another circuit drawing shall be grouped, when convenient, in one bracket indicating by notation the connecting circuit. The lead designations shall correspond to those on the circuit schematic drawing and connecting circuit.

(a) Where no fuse bay is used in an office, the battery and ground leads for relay rack units shall be designated "To Fuse Pnl" in all cases except where the fuse panel is lo-

cated on a specific equipment unit, such as a step-by-step switch shelf, in a PBX switchboard, etc. Use of the term "bus bar on fuse panel" or "fuseboard" shall be avoided. Leads shall be designated with complete data. Where only one ground return lead is required, and two or more fuses are provided, the ground shall be assigned a designation to make it definite where it should be run. (See Fig. 27.)

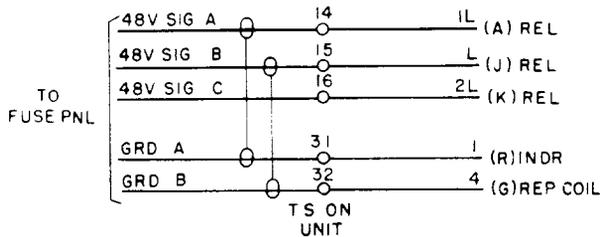


Fig. 27 - Battery and Ground Lead Designations

H. Switchboard Cabling and Wire

2.33 See 1.06 and Fig. 1 for the general assignment of switchboard cabling and wire.

2.34 Cable symbols shall be shown for switchboard cable and for wire which is to be run on cable racks (excluding power wire and wire associated with emergency alarm and fire detection equipment). Where leads are run as frame loose wire, they may be marked LW.

2.35 Leads in separate cables shall be shown in separate cable symbols. Careful consideration must be given to the separation of ringing and tone leads when these leads are run in switchboard cable. See Section 800-612-162. Leads in the same cable are shown within the same cable symbol, or in separate cable symbols joined together with a line, when in the same CAD figure. (See Fig. 28.)

2.36 On CADs where switchboard cable terminates on a multicontact relay, all the relay contact numbers shall be shown and all other wiring such as local cable, etc, terminating at the relay shall be shown. (See Fig. 29.)

2.37 Generally local cable leads shall be shown connected on the right of the terminal convention regardless of whether the leads are extended to the left or the right. (See Fig. 1.) These leads may be marked LC where it is not obvious that they are local cable.

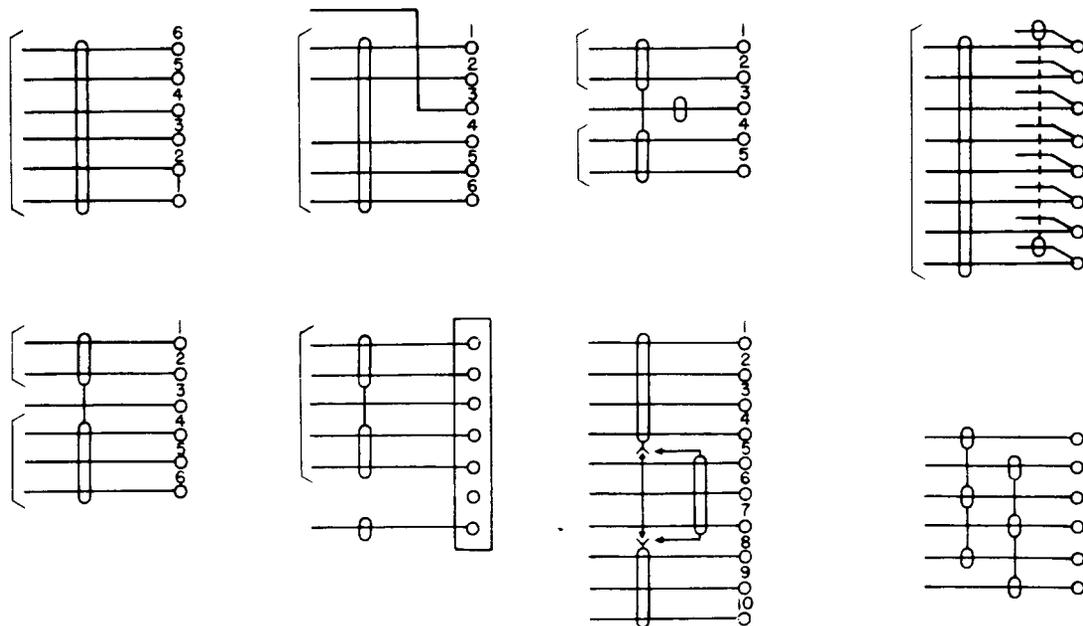


Fig. 28 - Method of Showing Cables or Wire Run on Cable Rack

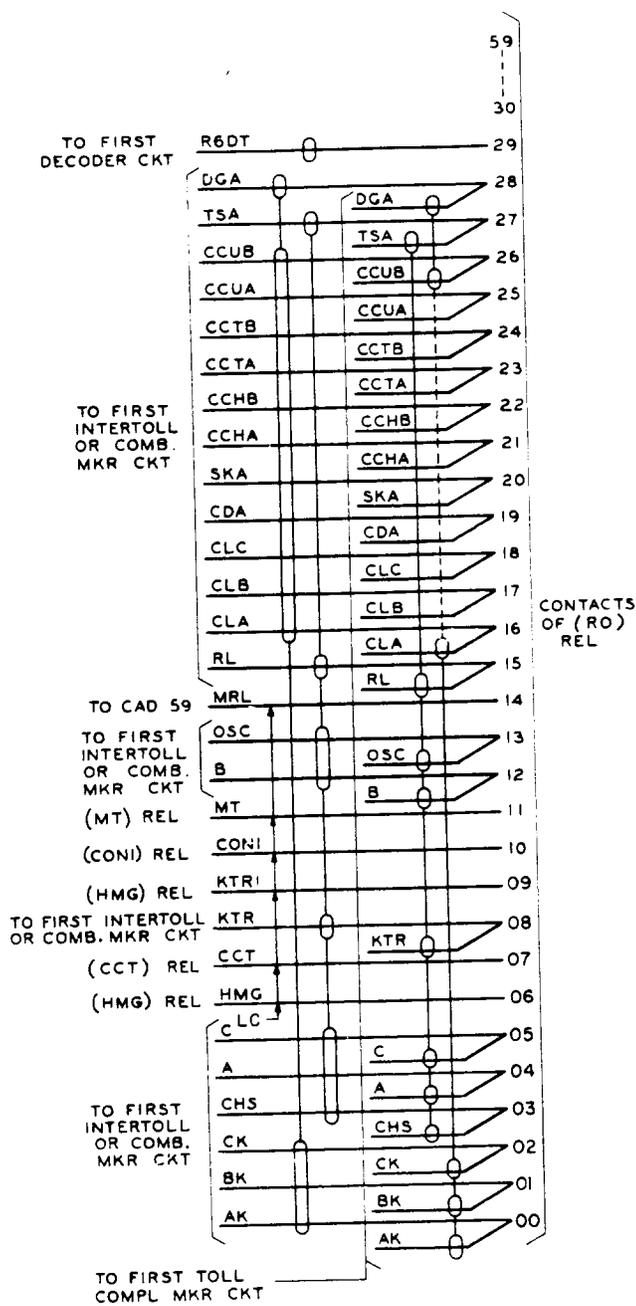


Fig. 29 - Switchboard Cable Run Direct to Relay

2.38 When like terminals are multiplied together on a geographical basis, that is, considering physical location rather than the numbering of circuits, the multiple convention may be shown by means of an undesignated stub as shown in Fig. 30(a), a designated stub as shown in Fig. 30(b), or a limitation on the stub as shown in Fig. 30(c).

2.39 When it is essential that like terminals are to be multiplied together in a numerical order for like frames, the multiple convention (as shown in Fig. 31) designated "To Preceding Frame" and "To Succeeding Frame" is used.

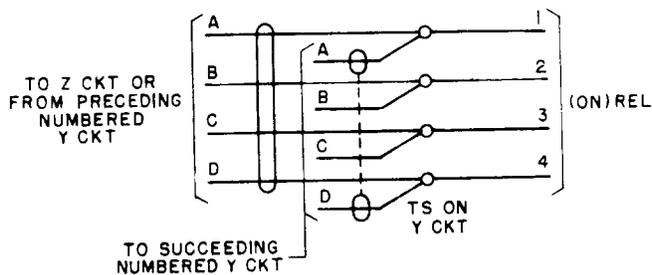


Fig. 31 - Method of Showing Leads Multiplied in Numerical Sequence

2.40 When it is essential that terminals are to be connected together as in a series chain, the leads shall be designated "To Preceding" and "To Succeeding" circuits as required. (See Fig. 32.)

I. Wires Functionally Unassigned

2.41 Where certain springs or terminals on 263-, 286-, 287-, or similar-type relays and 218-, CA-, BU-, or similar-type terminal strips are not assigned a circuit function, the switchboard cable leads shall be shown connected to the unassigned terminals and designated with

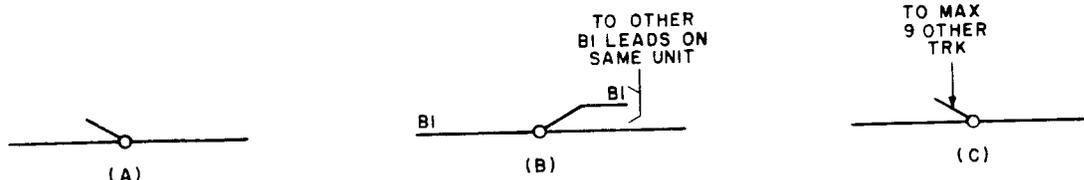


Fig. 30 - Method of Showing Leads Multiplied on a Geographical Basis

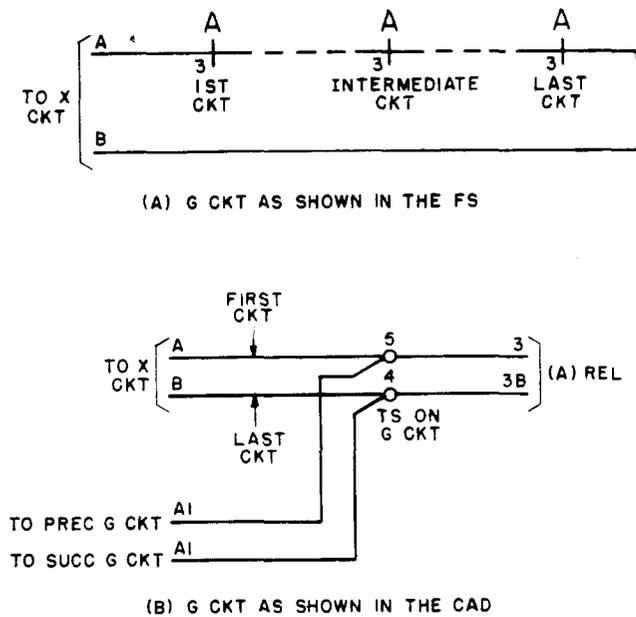


Fig. 32 - Method of Showing Leads Connected in a Series Chain

the terminal number as shown in Fig. 33 except when circuit operation does not permit this. The other end of such wiring (and also any multiple of this wiring through intervening apparatus) shall, in general, show the switchboard cable terminated as follows.

- (a) At other 263-, 286-, and 287-type relays or 218-, CA- or BU-type terminal strips, show connected as above.
- (b) At terminal strips having fanning strips, show connected as above.
- (c) At terminal strips, without fanning strips, show terminations for leads assigned a circuit function only.
- (d) At apparatus other than that previously covered by this paragraph, show terminations for leads assigned a circuit function only.

J. Cross Connections

2.42 Distributing Frames: In order to avoid congestion and to facilitate maintenance on distributing frames, not more than one cross-connection wire shall usually be assigned to each terminal.

- (a) An exception is in the case of cross-connections of 4-party lines in step-by-step offices where the provision of space on the distributing frame for the usual 4-party bunching

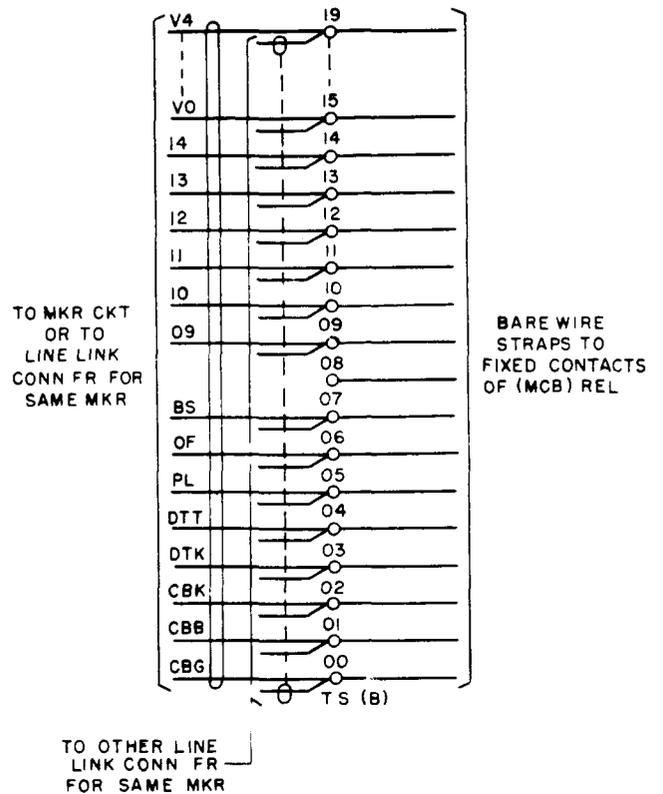


Fig. 33 - Method of Showing Wires Functionally Unassigned

blocks is impracticable or not considered justifiable. This requires the doubling up of the cross-connections of parties 3 and 4 with those of parties 1 and 2, respectively.

2.43 Cross Connecting Fields: On common control cross-connections such as marker frames, it is preferable to have one cross-connection per terminal (see Fig. 26) but more than one may be permitted.

2.44 Where cross connections may be terminated at one or more of several locations, they shall be run to a bracket designated to indicate all of the possible terminations. (See Fig. 10.) On detached-contact schematics, a reference to the section on cross-connection information only is necessary.

Example: "Cross-Connect To CAD 5. See Note 4.02."

K. Straps

2.45 The CAD shall show the strap connections on that side of the terminal strip on which they actually are to be placed by the

shop or by the installer. (See Fig. 1.) Where surface strapping is required, (straps on outer end of soldered terminals) these straps should be so indicated by the designation "SS". (See Fig. 4.)

2.46 On 203-, 259-, and 284-Type Terminal Strips, show straps on the switchboard cable side only, and then only in those cases where the entire side is free from incoming leads (reserved for strapping or cross connections) or where there are only a few segregated incoming leads, thus leaving the major part of the strip clear for strapping. Otherwise, loop leads are used.

2.47 224-Type Terminal Strips: In general, fixed straps between terminals on same terminal strip are located on the rear (wiring) side. Strapping to provide circuit options subject to change in the field, or to provide universal wiring features are located on the front (apparatus) side unless otherwise specified on the wiring drawing.

2.48 Limit the use of insulated straps on distributing frames in such a way that bare straps can be used in preference to insulated straps wherever possible. In this connection, avoid strapping at the base of terminals of adjacent rows which are perpendicular to the fanning strip when switchboard cable or other wiring on the installer side of the terminal strip is to be connected to any of the other terminals in those rows. This will obviate any crossing or shorting of the wires with the bare strap as the dressing of the skimmers requires that they lie close to the base of the terminal strip.

L. Optional Wiring

2.49 Generally, each CAD includes all the circuit options for that cabling diagram, if these can be clearly indicated. In unusual cases, separate cabling diagrams showing the same terminals may be warranted when optional features would otherwise be confusing. In any case, the options should be clearly explained by a note or by option letters. Several methods of showing options are shown in Fig. 34.

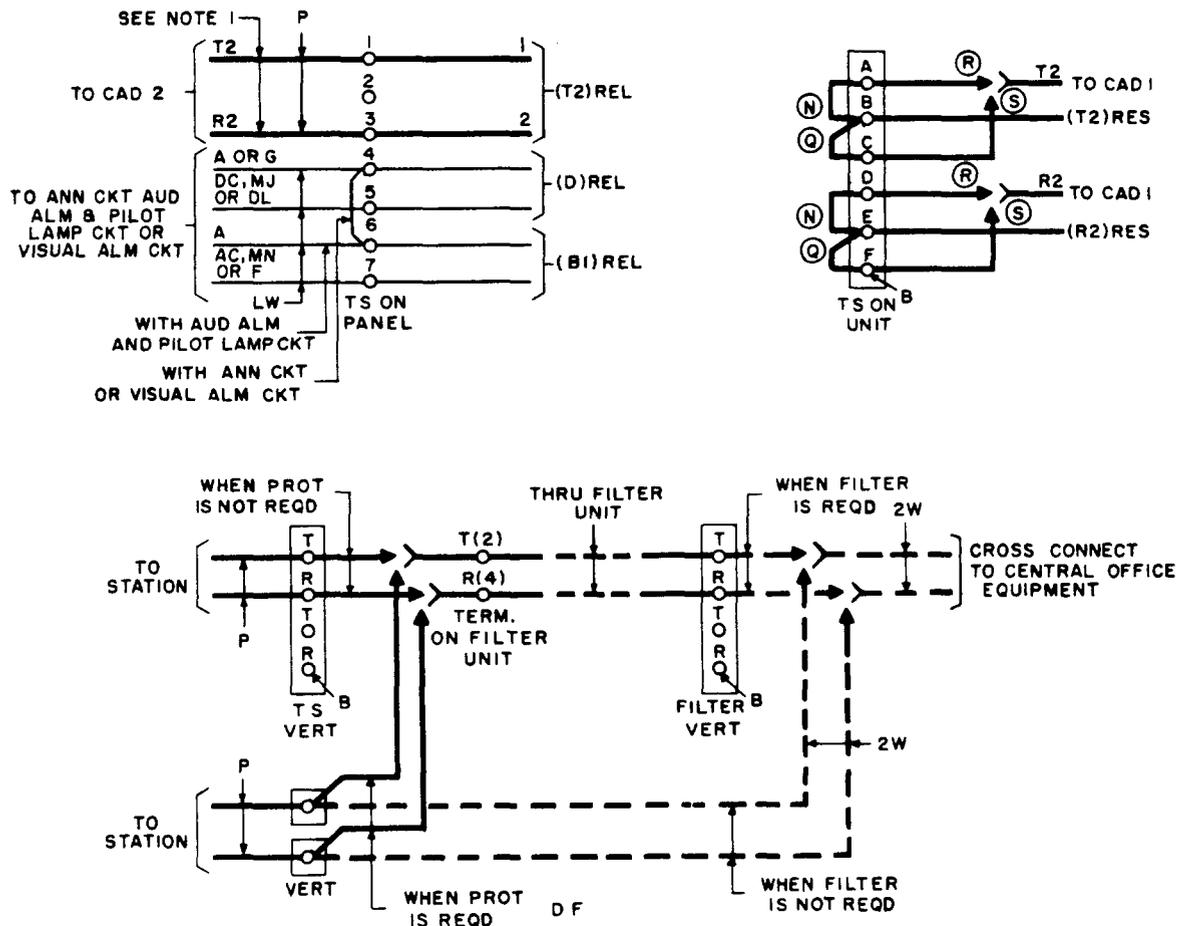


Fig. 34 - Method of Showing Optional Wiring