EXPLANATION OF FLAT-TYPE TERMINAL ASSEMBLIES
STEP-BY-STEP FRAMES

1. GENERAL

1.01 This section, with Western Electric Company, Incorporated Special Method No. 12 which is attached, covers educational information with relation to the flat-type terminal assembly. Included in this Special Method No. 12 is a detailed description of the selector terminal assembly, line switch terminal assembly, and the relay rack terminal assembly.

1.02 Although this attachment includes a great deal of information necessary for the installer, it is felt that it will also be helpful to the maintenance forces should a difficult case of trouble occur.

Attached:
Western Electric Co., Inc.
Special Method No. 12

Special Method No. 12
Western Electric Company, Incorporated
Installation Department

7-19-45

EXPLANATION OF FLAT TYPE TERMINAL ASSEMBLY

STEP-BY-STEP FRAMES

1. PRELIMINARY INFORMATION

1.1 As a general working knowledge of the terminal assembly drawings is essential in performing the work of wiring and connecting this particular type of apparatus, the following discussions on Selector, Line Switch, and Relay Rack terminal assemblies should be thoroughly understood. No attempt has been made to go into every detail, or show every case which might appear on a terminal assembly drawing, but the figures chosen are representative of such drawings and have all the common symbols and conditions which might be encountered.

1.2 The figures accompanying this section are exact copies of terminal assembly drawings from an actual job, on which additional numbers have been placed in squares for convenience in making references in the following discussion.

1.3 All information in this section covers typical cases and should not be taken as authority for work on any particular job.

2. SELECTOR TERMINAL ASSEMBLY

2.01 A selector board consists of 2 bays associated together, and each fully equipped bay consists of 6 shelves of 20 switches each.

2.02 Each selector board has a terminal assembly associated with it. A selector terminal assembly drawing is made for each board of selectors on the job, and is a graphic representation of the board.

2.03 On the sample terminal assembly drawing, Figure 1, (1) indicates that the switches are all special selectors. However, if they were any other type, as 1st, 2nd, 3rd, or 4th, this would be shown as such, in place of the word "Special." Each board is divided into two bays, each bay having a certain number and designated as right or left, as at (2). In general the different types of selector bays number as follows:

1st selectors	100, 101, 102, etc.
2nd "	200, 201, 202, etc.
3rd "	300, 301, 302, etc.
4th "	400, 401, 402, etc.
SPECIAL selectors	600, 601, 602, etc.

2.04 Each fully equipped bay is made up of 6 shelves. These shelves are always divided into at least 2 sections (or divisions) and occasionally some of the shelves are divided into 3 divisions. The heavy line (3) when broken only in one place refers to a fully equipped shelf of two divisions. In this case the divisions are designated by letters as "A", "B", etc., one letter being used for each ten switches. The divisions letter from left to right and down. The shelves are referred to by the two division letters, as the AB shelf or the IJ shelf, etc., of any particular bay. Whenever a shelf is divided into more than two divisions (4), this is shown by breaking the shelf line in another place. In this case the letter designations are not changed, but the divisions are designated by an X and Y added to the original letter, as AX and AY of the AB shelf, bay 601.

2.05 A shelf fully equipped holds twenty switches which number from left to right. The switches in a bay of six shelves are numbered consecutively from 1 to 120. The numbers just above the line (3) are the numbers of the first and last switches of the divisions. Unequipped shelves are shown by a heavy broken line (5) -- one short dash for each switch left out. When a number is placed above one dash, as at (6), it shows that there is a switch in that position. Thus the IJ shelf of bay 601 is equipped as follows: The first 3 positions of the shelf equipped (81, 82, and 83), the next two positions (84 and 85) vacant, the next position (86) equipped, the next 4 (87, 88, 89, and 90) vacant, positions 91, 92, 93, 94 and 95 equipped, and the remainder (last 5 positions) vacant. The general type of circuits with which they are associated is shown just above the shelf (7). When there are switches for more than one type of circuit, it is necessary to give the switch numbers as well. When more than one shelf is equipped with the same type of circuit, the name of the circuit is placed only above the upper shelf of the group, as shown at (8).

2.06 Each selector is usually equipped with two banks, the upper connected to all the private wires and the lower bank to all the line wires. Banks of a division are multipled and these wires made into a local form and run to the terminals of the terminal assembly. The line (9) below the shelf line (3) represents these multiple wires which may consist of 300 to 600 wires, depending on the type of selectors used. If the lines bend up to

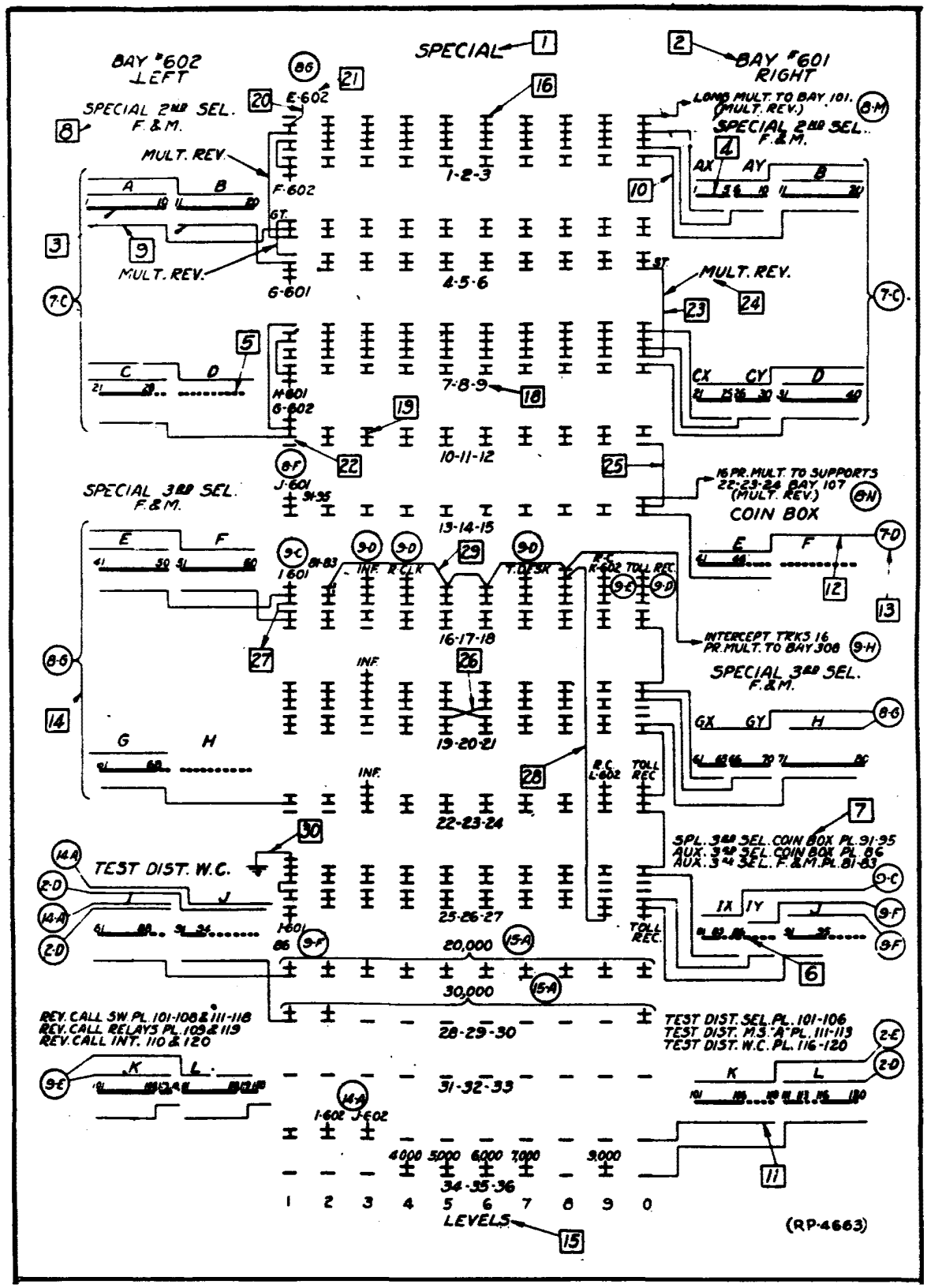

FIG. 1 TYPICAL SELECTOR TERMINAL ASSEMBLY DRAWING

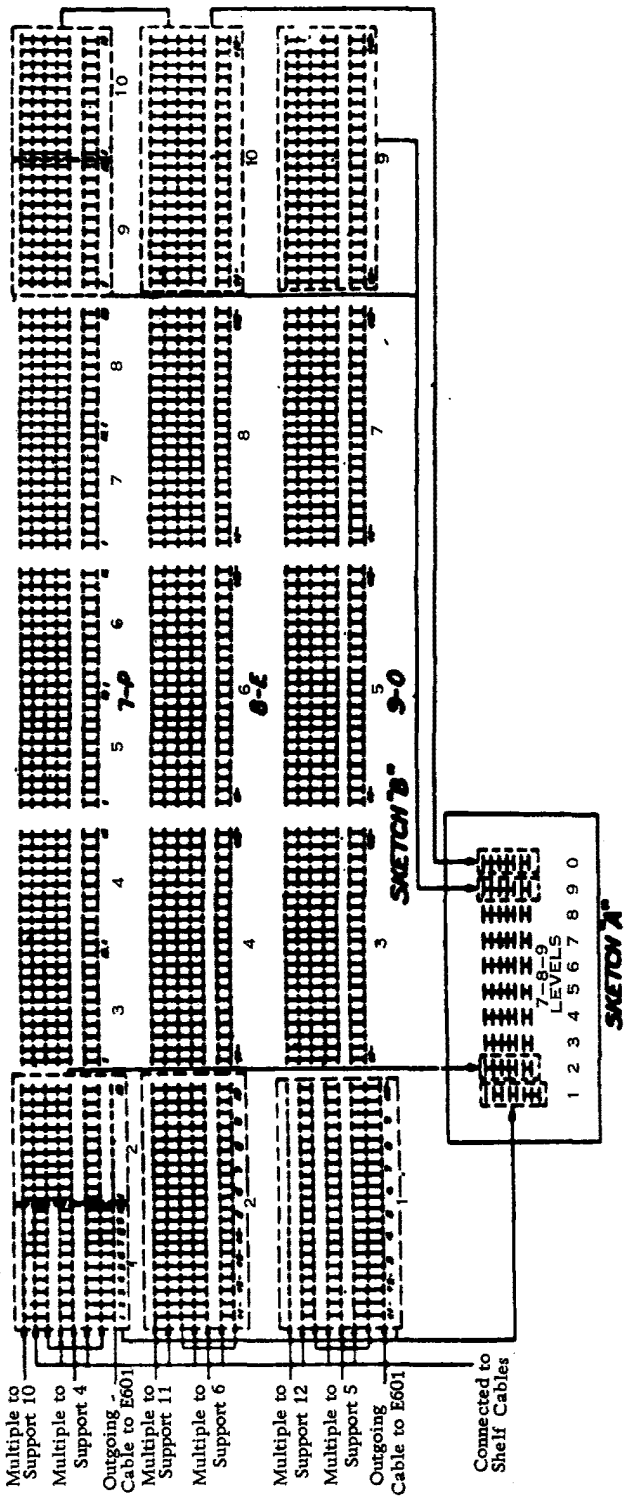

FIG. 2 DETAIL VIEW OF SELECTOR TERMINAL ASSEMBLY

contacts above the shelf line as at (10), the forms when made will bend up, because the terminal strips connected to this form are mounted on 3 supports directly above the 3 for the corresponding shelf of the associated bay. This side of the board is known as the "high" side, and is usually the right side. The opposite side is called the "low" side, and the form when completed will bend down. It will be noticed that where a division is only partly equipped as at (11), the bank multiple is furnished complete. This means that the banks and multiple are mounted on the shelf in the vacant positions with a supporting detail in place of the switch.

2.07 Incoming cables to the switches are represented by the line (12) which is above the shelf line. The number and letter in the circle (13) is the cable run designation of the incoming cable. Very often one cable run serves more than one shelf as at (14). This is shown by placing a bracket to include all the shelves served by the cable run. Although these cables are represented on the terminal assembly drawing, they do not connect to terminal strips but are shelf cables which are run on the cable pins at the rear of each shelf of switches.

2.08 The terminal assembly located at one end of the board and extending from bay to bay, is made up of 36 groups of terminal strips mounted on horizontal iron supports. Usually the entire unit is called the "Terminal Assembly" and the terminal strips mounted on one support called a "support." The terminal assembly is graphically represented on the terminal assembly drawing by 10 vertical rows of short heavy horizontal lines which number 1 to 0 from left to right as shown at (15). Sketch A of Figure 2 shows the portion of the terminal assembly drawing for supports 7, 8, and 9 as indicated at (18). Figure 2, Sketch B, is a development of this portion of the terminal assembly drawing, i.e., it shows the actual number of terminals represented by Sketch A of the same figure. It will be seen by referring to Figure 2, Sketch A, that the portion of Figure 1 shown in this figure represents three supports numbered 7, 8, and 9 from the top down. Number 7, or the top support of the three, is for the private lines of all levels. The second support (No. 8) is for the positive and negative lines of the even levels, the third support (No. 9) being for the positive and negative lines of the odd levels. Figure 2 shows that the first vertical row of short horizontal lines represents the first one-half section (10 terminals) on each of the terminal strips on support number 7 and the first section (20 terminals) of all strips on the odd support. The second vertical row of

short horizontal lines represents the second half of section one of all terminal strips on the private support, and the first section of all terminal strips of the even support. Levels 3 to 0 are represented the same way in these two figures.

2.09 To extend the bank circuits out of the board, the outside circuits are equipped with terminal strips similar to those of the bank wires and these are assembled on the support with the bank terminal strips. An insulating strip is placed between them, and the front lugs of both strips are bent together and soldered.

2.10 Lugs that are to be soldered together are shown connected by a heavy vertical line (19) connecting the short heavy horizontal lines (16). Corresponding lugs of any level of each terminal strip line touched by this line are to soldered together. When this line is connected to a number and letter in a circle as at (20), it shows that this level goes out on a cable of the cable run designated. When this solder line is omitted as at (22), the terminals are not connected.

2.11 Usually there is a letter and number under or near the circle as at (21) which refers to the equipment to which the cable is connected. Thus E-602 means that this cable of cable run 8-G terminates on the E division of the EF shelf of the selector bay 602. If this designation was "C" followed by a two digit number, it would refer to the certain connector bay. As the cable designations on the terminal assembly drawing are the same as listed in the job cabling specification (CAB), the two can be compared if there is any doubt as to where the cables terminate.

2.12 Shelves are multiplied as shown at (23). This is done by what is called up and down multiple which comes in various lengths. One end of the multiple cable is formed straight or according to the regular color code, and the other end may be completely reversed or any number of wires slipped. A multiple reverse (24) means that circuit number 1 of any level will be connected with the number 10 circuit of the level to which it is multiplied, the No. 2 to No. 9, No. 3 to No. 8, etc. "Slip one" means that circuit No. 1 (straight end) is connected to circuit No. 10 (slip end), No. 2 to No. 1, No. 3 to No. 2, etc. "Slip two" means that circuit No. 1 and No. 2 (straight end) are connected with circuits No. 9 and No. 10 (slip end), No. 3 with No. 1, No. 4 with No. 2, etc. Whenever the straight end or slip end is not designated, the straight end will serve the upper support multiplied. When no slip is specified as at (25) the multiple will be straight at both ends and will multiple lug No. 1 with lug No. 1, No. 2 with No. 2, etc. Whenever it is desired to introduce a slip between strips within the same support, it is done by either a "fish back" (26) or "hair pin" multiple (27). The fish back multiple consists of a single form with two terminal strips connected and made so that the one terminal strip is multiplied with the other as specified. The hair pin multiples perform the same function as the "fish backs," but are made up differently. These hair pin multiples are made of 51 pair cable and resemble the up and down multiple, except the vertical portion is much shorter. Either the "fish back" or "hair pin" multiple may be slipped or reversed as the up and down multiple, and the designation rules that apply to the slip and reverse of up and down multiple also apply to the multiple within a support. Long multiple cable (multiple cable between bays) follow the rules outlined above for up and down multiple, whenever a slip is specified.

2.13 When one level is multiplied with any other level on another support as at (28), the installer usually makes the form or uses a cable made similar to the up and down multiple. This is also true when more than one level (but not all ten) are multiplied with levels of other supports. In the case shown in Figure 1, one six pair cable could be used between level 8 support 16, and level 9 support 25. An 11 pair cable would be used between level 8 support 18, and level 19 support 27. These cables connect level 9 of the switches 86, 91, 92, 93, 94 and 95 of the IJ shelf bay 601 to the 8th level of the switches 41-50 and 51-60 of the EF shelf bay 602, which in turn are connected to an intercepting trunk multiple to bay 308 through cable run 9-H. This level 8 is also multiplied to levels 2, 5, and 6 of the same terminal strip by a special form made by the installer as shown at (29).

2.14 Sometimes a level will be grounded at the terminal assembly as at (30). However, this practice is not common.

3. LINE SWITCH TERMINAL ASSEMBLY

3.1 The line switch terminal assembly is mounted on the top of the line switch uprights directly above the bay with which it is associated.

3.2 This assembly is 100 terminals wide and on the assembly drawings each terminal is shown. Figure 3 shows only sixty of these one hundred terminals, but the last

forty terminals are identical with the first forty except that the "Div. A" is "Div. C," and "Div. B" is "Div. D," and the numbering of the trunks continues to 49 and 99 in the cases of the line trunks, and to 99 in the case of the private trunks. The lugs of only the first trunk are designated as to which is "positive," "negative," "hold," or "release," the others following in the same manner.

3.3 On the extreme left of the drawing are the names of the various circuits with which the terminal strips are associated. The small letter "X" between the name and the terminal strip designation denotes that the particular strip is not in the assembly when the board is received, and that the installer must place it when the assembling and wiring is being done.

3.4 Each of the small horizontal lines placed in horizontal rows represents one terminal lug, and the vertical line between these horizontal lines represents a soldered connection between the lugs so shown.

3.5 The vertical lines between sections (Figure 3) with their horizontal arrows refer to the position of the insulators, the piece part number of which is given at the bottom of the line.

3.6 When meters are not furnished on primary line switches, the fourth and fifth strips from the top are left out and the third and sixth terminal strips are soldered together as shown by the dotted lines at "A".

4. RELAY RACK TERMINAL ASSEMBLY

4.1 The relay rack terminal assembly is mounted on two horizontal supports at the top of the rack. The wiring to the equipment mounted on the rack is made into a local form, run and connected to terminal strip mounted on these two supports. This work is all done in the shop, as the racks are received on the job fully equipped. Cables connecting to these circuits form down to this terminal assembly and are made into one form, with horizontal legs breaking off directly back of the terminal strip to which they are to be connected. These cables are connected on the job to terminal strips similar to the ones connected to the local relay wiring. To extend a circuit in or out of the relay rack, the cable terminal strip is placed on top of the terminal strip serving the wires of the relay rack form accociated with that particular circuit, the two or more strips being soldered together.

4.2 Each bay has a different connecting arrangement and thus different drawings are made for each. Figure 4 is an exact copy of one of these drawings. A careful study and thorough understanding of this type of drawing is necessary in order to assemble and connect these relay rack terminal assemblies correctly.

4.3 It will be noted from Figure 4 that the assembly drawing for any particular bay is divided into two portions designated by a heavy line under each portion as (1). The assembly is 60 terminals wide and the terminals

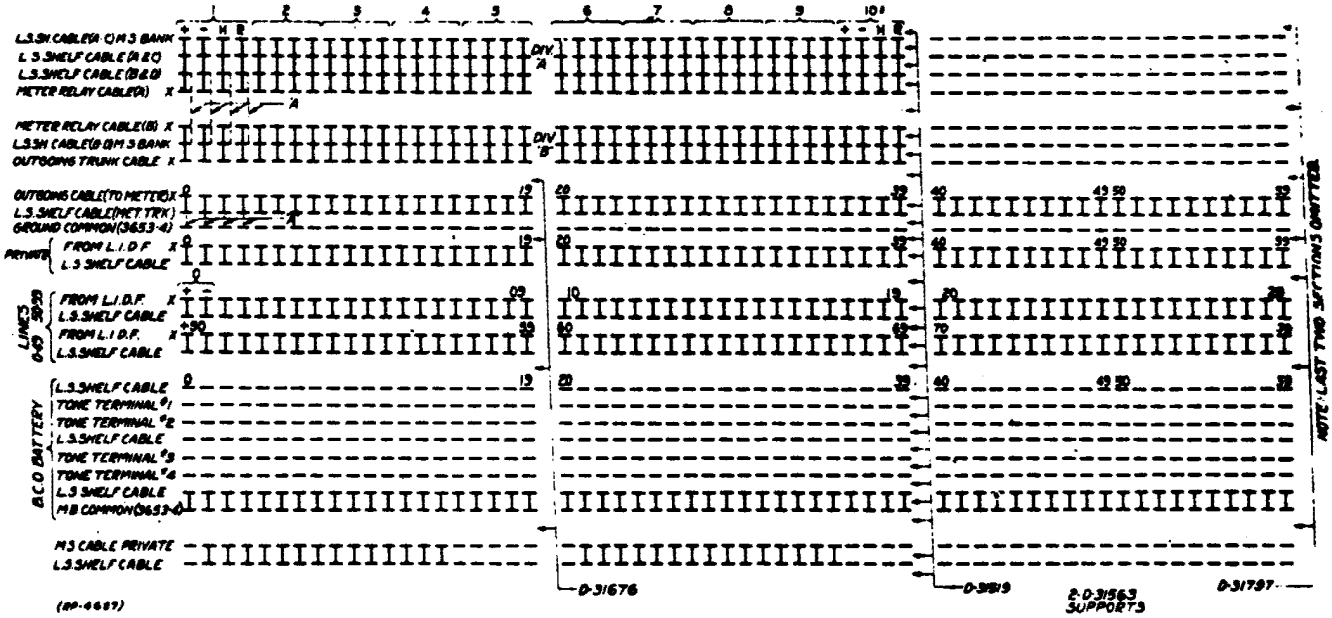

FIG. 3 TYPICAL LINE SWITCH TERMINAL ASSEMBLY DRAWING

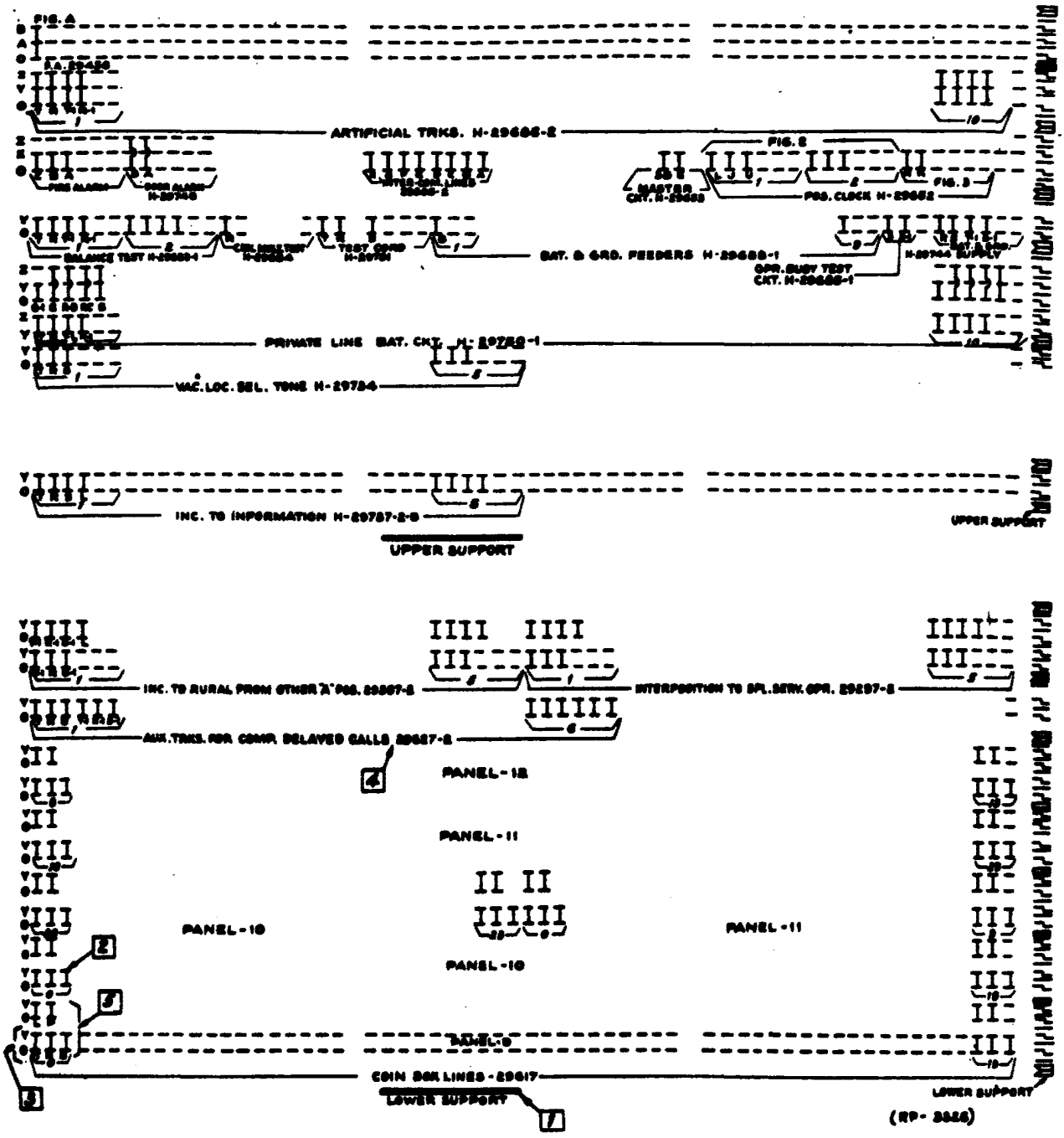

FIG. 4 TYPICAL RELAY RACK TERMINAL ASSEMBLY DRAWING

divided as usual, into groups of twenty each. The short horizontal line (2) represents one lug of a terminal strip. On the two lower terminal strips (3), all of the terminals are shown and the name and number of the circuit added as at (4). The terminals of only the first and last circuits are designated "T," "R," "S," etc. The terminals are numbered from left to right, as 0 to 19, etc., which means that the lugs associated with the other trunks though left out of the drawing are present on the actual assembly between the lugs of these two trunks.

4.4 The location in the MSA board on which these circuits appear is marked on the drawing as "Panel 10," "Panel 11," etc.

4.5 By this arrangement the number of wires per circuit and how they are designated can be told at a glance. For instance, Coin Box Lines, Circuit No. 29617, terminate on the lower support; the first four terminal strips serve Panel No. 9 of the MSA board (numbers 0 to 19); and there are five wires to each circuit. The "tip," "ring" and "sleeve" are on the first two terminal strips and the "lamp" and "private" on the next two. In order to have the "L" and "P" wires directly over the "T," "R," and "S" wires of the same numbered trunk, one lug directly over the "S" lug of the lower strips is left vacant. This is shown at (5).

4.6 The letter symbols at the left end of each terminal strips designation is explained as follows:

O - refers to terminal strips attached to local cables. (This work is done in the shop.)

Y - refers to terminals attached to cables running to IDF.

A - refers to terminals attached to outgoing tie cables.

B - refers to terminals attached to incoming tie cables.

Z - refers to terminals attached to miscellaneous cables.

4.7 These same symbols are shown on the circuit drawings specified on the terminal assembly drawing.

4.8 The symbols found on the right end of the drawing refer to the different terminal strips and insulators used when finally putting the assembly together. The symbols and their interpretations are shown on Figure 5, and as listed below:

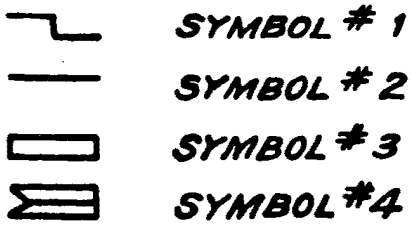

FIG. 5 SYMBOLS USED ON RELAY RACK TERMINAL ASSEMBLY DRAWINGS

Symbol No. 1, Figure 5, represents the standard 60 terminal A. E. style terminal strips - D-31708.

Symbol No. 2, Figure 5, represents the thin (1/64") red fibre insulator D-31706.

Symbol No. 3, Figure 5, represents the thick (1/16") red fibre insulator D-31707.

Symbol No. 4, Figure 5, may represent one of the following:

A - Two of the thick (1/16") red fibre insulators placed together.

B - The supporting detail, and the thick, large hole, fibre insulator D-31705.

C - The top aluminum finished steel clamping strip.

4.9 It is often the case that all the insulators are not shown and in this case refer to Figure 4 of this section. It is common practice when more than one assembly drawing is shown on one sheet that only one assembly drawing of that sheet will show the details of the pile up.

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