MAIN DISTRIBUTING FRAMES
COMBINED DISTRIBUTING FRAMES
PROTECTOR FRAMES
FOR
CENTRAL OFFICE BUILDINGS
DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the various types of main distributing frames, combined distributing frames, and protector frames commonly used in larger multiunit central office buildings.

1.02 This section is reissued for the following reasons:

(a) To include information pertaining to combined distributing frames, conventional B-type main distributing frames having both protective apparatus and interconnecting facilities on one frame and the modular frames developed for Electronic Switching Systems (ESSs)

(b) To change the title of this section to allow a broader coverage of main distributing frames and to include combined distributing frames.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The main distributing frame in a central office building is primarily an interface between outside plant cable pairs and central office equipment. A combined distributing frame is basically a main distributing frame which is used to interconnect trunks and miscellaneous equipment in addition to central office equipment.

1.04 Some of the basic type frames and terms used are:

- Main Distributing Frame (MDF)
- Combined Distributing Frame (CDF)
- Conventional Frame
- Modular Frame
- Protector Frame

- B-Type MDF.

1.05 ***Main Distributing Frame (MDF):*** Basically the MDF is that frame in a central office building where provision is made for a flexible association of outside plant cable pairs to central office equipment. The cable pairs and the central office equipment are interconnected on the MDF by means of cross connection jumpers. The outside plant cable pairs may terminate on protective apparatus mounted directly on the MDF, or they may terminate on protective apparatus mounted on a separate protector frame. Where a separate protector frame and MDF are used, office cabling (tie cables) connects the outside cable pairs from the protector frame to the MDF.

1.06 ***Combined Distributing Frame (CDF):*** A CDF is that frame in a central office building having provisions for trunk and miscellaneous interconnections in addition to outside plant to central office interconnections. A combined distributing frame can be a frame similar to the conventional B-type frame, or it can be an ESS-type modular frame. Modular ESS type frames are used as CDFs only in No. 2 ESS offices. Modular ESS frames, when used for No. 1 ESS offices, are employed only for associating outside plant cable pairs to central office line equipment, and a separate trunk frame is used for interconnecting trunks.

1.07 ***Conventional Frame:*** A type of frame constructed of a steel framework employing vertical angles, channel transverse arms, top and base angles, rectangular tie bars, and angle guard rails. Conventional frames can be of various heights and lengths as necessary to serve the particular central office building where it is located.

1.08 ***Modular Frame:*** A type of frame designed especially for ESS central offices and consisting of single sided modules of definite dimensions. The number of modules required is determined by the ultimate frame design for a particular central office.

1.09 ***Protector Frame:*** A frame either conventional or modular on which is mounted protective apparatus or jacks and where outside plant cable pairs are terminated. Conventional protector frames are double sided and modular protector frames are single sided. No cross-connections are made on a protector frame, and an MDF must be used in conjunction with a protector frame.

1.10 ***B-Type MDF:*** This is a single unit conventional frame that provides for all protective apparatus mounting, outside plant cable pair terminations, and cable pair to central office equipment interconnections on a single frame. No separate protector frame is used with a B-type MDF. (This type frame may be used as a CDF.)

1.11 Some early design frames are designated as A-type MDFs. A-type frames will not be separately described in this section as they are basically the same as B-type frames differing only in the following respect. On A-type frames, outside plant cable pairs are terminated on terminal strips on the horizontal side of the frame; central office equipment is terminated on fuse mountings or protectors mounted on the vertical side of the frame. On B-type frames, outside plant cable pairs are terminated on protectors, connectors, or jacks mounted on the vertical side of the frame; central office equipment is terminated on terminal strips on the horizontal side.

1.12 A modular MDF may be associated with either a conventional or a modular protector frame.

1.13 ESS central offices may be terminated on modular MDFs or conventional MDFs depending on local practice.

1.14 In a No. 1 ESS office the distributing frame is referred to as an MDF. In a No. 2 ESS office the distributing frame is referred to as a CDF.

2. CONVENTIONAL FRAMES

B-TYPE MAIN DISTRIBUTING FRAME

2.01 The B-type MDF (Fig. 1) is a single frame which has protector, connector, or jack mountings on one side (vertical) of the frame and terminal blocks on the other side (horizontal) of the frame. Outside plant cable pairs are terminated on the protectors, connectors, or jacks; central office equipment is terminated on the terminal blocks. Detailed descriptions of the various type protectors, connectors, and jacks used on MDFs are found in Sections 201-206-101, 201-207-101, and 201-208-101.

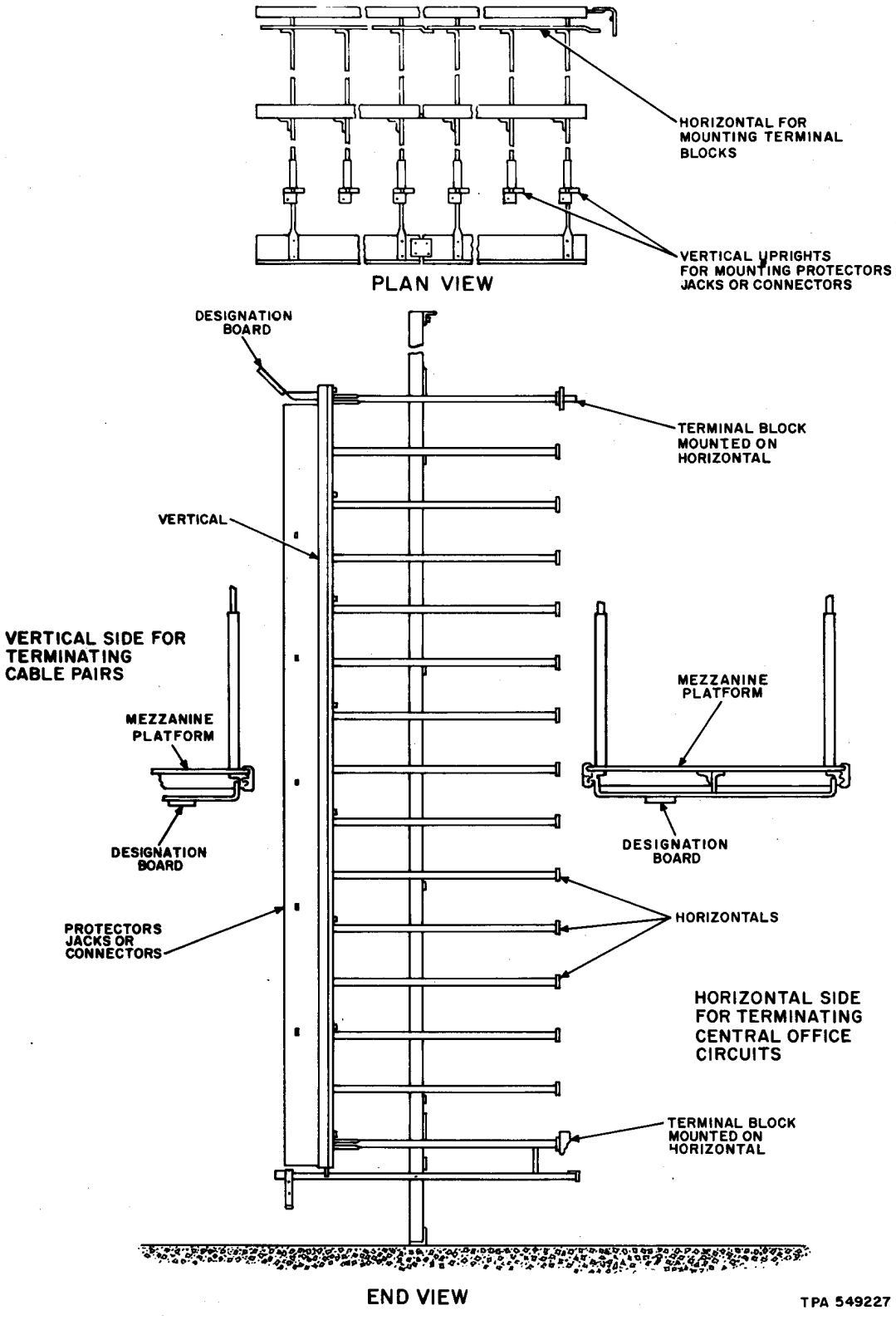

Fig. 1—B-Type Main Distributing Frame (MDF)

2.02 Cross-connections are made between the outside plant on the vertical side and the central office equipment on the horizontal side.

2.03 Various vintage B-type frames have an assortment of equipment arrangements and vary in height (Table A). Most of the 14-1/2 foot frames were originally designed with a mezzanine platform shown in Fig. 1. In some installations rolling ladders are installed instead of mezzanine platforms to provide access to the upper levels of the frame. The cables were split with some pairs appearing on a vertical above the mezzanine platform and some pairs appearing on the vertical below the mezzanine platform. Where the mezzanine platform was not installed or was removed, the pairs are terminated over the full length of the vertical. Due to rearrangements and the introduction of newer types of protector mountings, jacks, or connectors, cable pairs may be terminated as above or may be terminated on adjacent consecutive verticals—all above or all below the mezzanine platform. In some instances, cables may be split with some pairs appearing in one location and some pairs in another location. Local cabling records must be consulted in order to determine the exact location of cable pairs.

2.04 The vertical uprights of the frame are generally spaced on 8-inch centers, and the protectors, connectors, or jacks are bolted directly to the uprights. The cable pair terminating capacity of a vertical depends on the height of the frame and the type of terminating apparatus installed. Table A lists the number of cable pairs that can be terminated on verticals of various height frames using various type protectors, connectors, or jacks.

2.05 The length of a frame and the number of verticals provided vary with the size of the central office building that the frame is designed to serve.

2.06 Terminal blocks mounted on the horizontal side of the MDF may be of assorted sizes, shapes, and capacities. Basically the various type terminal blocks all serve the same purpose. The terminal blocks provide a means for terminating and cross connecting the central office equipment appearing on the frame. Plant records must be consulted to determine the locations of central office equipment on the frame and the method of terminating on the individual terminal block terminals.

2.07 The number of horizontals and the spacing of the horizontals on the MDF vary according to each particular installation; Fig. 1 shows a typical B-type MDF.

DESIGNATIONS

2.08 Verticals on the B-type frame are numbered consecutively from one up starting at either end of the frame depending on direction of growth (left to right or right to left). Designation boards (Fig. 1 and 2) are provided for the top of the frame; when the frame is equipped with a mezzanine platform, duplicate boards are located under the mezzanine platform. On the designation boards, the vertical number and the numbers of the cables appearing in the vertical are stamped directly above or immediately in front of each vertical. Where more than one cable appears in a vertical and a mezzanine platform is provided, a horizontal dividing

TABLE A

NUMBER OF PAIRS TERMINATED PER VERTICAL ON VARIOUS FRAMES (CONVENTIONAL)

FRAME HEIGHT (FEET)	C-50 OR E-50 PROTECTOR	300 CONNECTOR	444C-TYPE JACK	301 CONNECTOR	302A2 CONNECTOR (SEE NOTE)	303 CONNECTOR
14-1/2	400	400	800	800	800	800
12-1/2	300	300	600	600	600	600
11-1/2	300	300	600	600	600	600
7	200	200	400	400	—	400

Note: Double-sided protector frames only

line separates the numbers of the cables appearing in the upper and lower half of the vertical.

2.09 On the horizontal side of the frame, the vertical number and the cable numbers are stamped on the vertical metal framework. These designations are stamped between the fifth and sixth and ninth and tenth horizontal shelves. The designations are readily visible from the horizontal side of the frame and are provided as a convenience when running cross-connections. Starting with the bottom shelf, the horizontal shelves are lettered A, B, C, etc.

2.10 Cable and pair designations on the protectors, connectors, jacks, or terminal strips are covered in the 636 division of Bell System Practices.

3. DOUBLE SIDED PROTECTOR FRAME AND DISTRIBUTING FRAME

3.01 This type of MDF has a double sided protector frame and a separate but parallel distributing frame (Fig. 3). The protector frame portion has protectors, connectors, or jacks mounted on verticals on both sides of the frame. The distributing frame portion has terminal blocks mounted on verticals on the side facing the protector frame and terminal blocks mounted on horizontals on the side away from the protector frame. The capacity per vertical of this type frame for terminating outside plant is doubled over the B-type MDF described in Part 2. This arrangement also permits a greater number of central office units to be served per given length of frame.

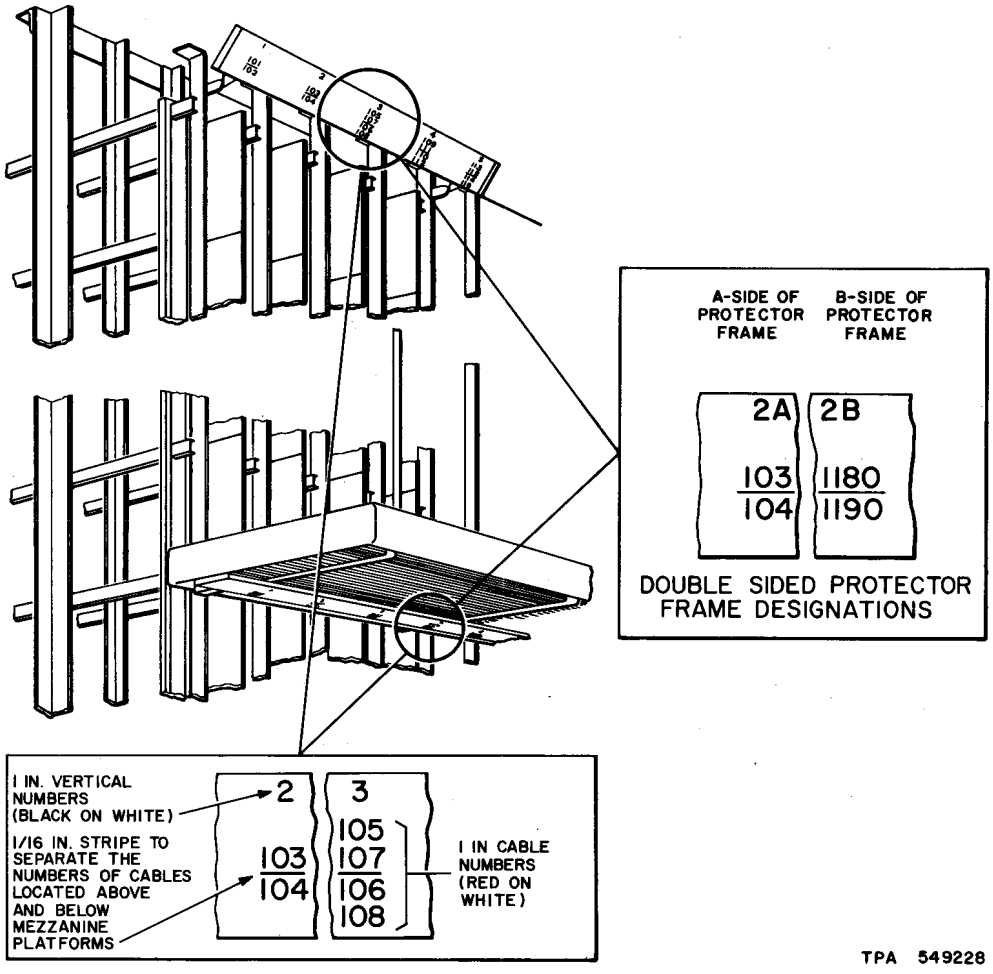

Fig. 2—Typical Designations on Vertical Side of MDF With Mezzanine

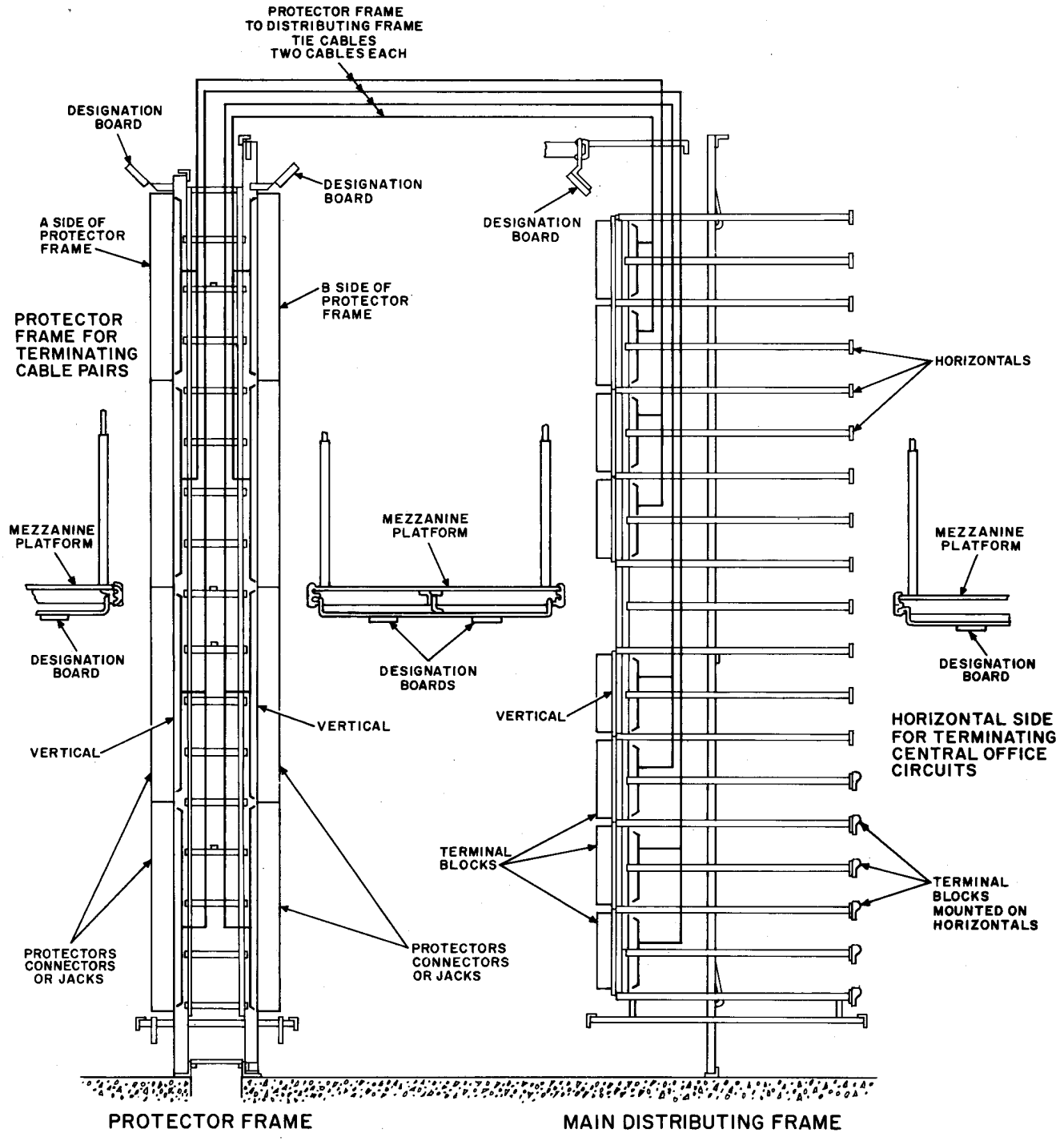

Fig. 3—Main Distributing Frame (MDF) With Double Sided Protector Frame

3.02 The outside plant cable pairs are terminated on protectors, connectors, or jacks which are mounted on verticals on both sides of the protector frame. Central office equipment is terminated on terminal blocks which are mounted on the horizontal side of the distributing frame. The protectors, connectors, or jacks on the protector frame are cabled to the terminal blocks mounted on the vertical side of the distributing frame. Each distributing frame vertical accommodates two verticals, one from each side of the protector frame. Sections 201-206-101, 201-207-101, and 201-208-101 describe the various types of protectors, connectors, or jacks.

3.03 Where a double-sided frame is employed, all cross connections are made on the distributing frame.

3.04 The double sided protector frame and distributing frame can vary in height and equipment arrangement. Descriptions in 2.03 for the combined B-type MDF also apply except reference shall be made to Fig. 3.

3.05 Each vertical of the protector frame is made of uprights spaced the proper distance apart and arranged for mounting equipment back to back. The protectors, connectors, or jacks are bolted to the vertical uprights. The verticals are generally spaced on 8-inch centers along the length of the frame. The capacity of a vertical depends on the height of the frame and the type of protector, connector, or jack provided (Table A). The number of verticals on a frame depends on the size of the central office building that the frame is intended to serve.

3.06 The vertical side of the distributing frame is arranged for mounting terminal blocks. These blocks are of varying capacity depending on the number of cable pairs terminated on the associated verticals on the protector frame. Verticals on the protector frame are cabled directly to and combined on a vertical of the distributing frame (Fig. 3). A 16-inch space is left in the middle of the vertical on the distributing frame at the level of the mezzanine platform where provided. If ladders are used this space is not required.

3.07 Terminal blocks mounted on the horizontal side of the distributing frame are for terminating central office equipment. Descriptions in 2.06 and 3.07 for the combined B-type MDF also apply except reference shall be made to Fig. 3.

DESIGNATIONS

3.08 Designation boards are furnished for both sides of the protector frame and the vertical side of the distributing frame. The designation boards are mounted at the top of the frame; when a mezzanine platform is provided, a duplicate set of designation boards are located under the mezzanine platform (Fig. 3). The number of the vertical and the numbers of the cables appearing in that vertical are stamped on the designation boards as described in 2.08 for the combined B-type MDF and shown in Fig. 2 with the exception that a letter A or B is added to the vertical numbers on the protector frame. The letter A is added to the protector frame vertical numbers on the side away from the distributing frame, and the letter B is added to the protector frame vertical numbers on the side near the distributing frame. For example, vertical 39-A would be on the far side associated with the 39th vertical on the frame. On some installations several protector frame verticals may be omitted at selected intervals to provide aisle space. Where these verticals are omitted, the associated vertical numbers are also omitted.

3.09 Vertical numbers and cable numbers are also stamped on the vertical metal framework on the horizontal side of the frame as described in 2.09.

3.10 Cable and pair designations on the protectors, connectors, jacks, and terminal strips are covered in the 636 division of Bell System Practices.

MAINTENANCE EQUIPMENT

3.11 Jack boxes for test lines and plugging up lines are placed at regular intervals along the vertical side of the frame.

3.12 Test lines and plugging up lines from test desks require protection but no cross connection facilities. The first vertical of an MDF, where growth is from left to right, is ordinarily not furnished with jumper rings and is not used for terminating outside plant. Because of this and in order to provide a definite and uniform location for the plugging up and test line protectors, the first vertical of a frame is reserved, irrespective of direction of growth, for these lines.

4. MODULAR FRAMES (ESS TYPE)

4.01 The frames originally developed for ESS central offices are the modular protector frame (Fig. 4) and the modular distributing frame (Fig. 5). When the distributing frame is used with No. 1 ESS, it is referred to as an MDF; when the distributing frame is used with No. 2 ESS, it is referred to as a CDF (1.03). These frames and the associated connectors, protectors, and connecting blocks have been developed to provide a more efficient method of connecting outside plant cable pairs to central office equipment. The frames are designed to be used with an assignment procedure, termed preferential assignment, in which attempts are made to find the shortest cross connections which meet the subscriber need and satisfy traffic and load balancing requirements. The distributing frame should only be used where approximately 95 percent of the jumpers can be expected to be short or medium length jumpers (4.09). If this standard is met, considerably reduced operational costs can be obtained over a conventional MDF. A conventional MDF should be used if difficulty is anticipated in meeting the preferential assignment requirements.

4.02 The modular MDF is commonly used with the modular protector frame but may be used with a conventional protector frame. This description deals only with the modular combination.

4.03 Both the protector frame and the MDF modules consist of a basic framework which is 8-feet high and 6-feet, 6-inches long. Ladders or mezzanine platforms are not provided with the modular frames. Frames are single sided and are usually installed face to face on either side of a maintenance aisle (Fig. 6). In order to maintain preferential assignment and avoid costly future retermination expenses, the ultimate frame length should be installed initially and growth should be spread uniformly over the entire frame length.

PROTECTOR FRAME

4.04 The protector frame module consists of 12 vertical sections (Fig. 4). Each vertical accommodates five 302-type connectors, each connector having a terminating capacity of 100 cable pairs for a total of 500 pairs per vertical or 6000 pairs per module. Outside plant cable pairs and tie cable pairs from the MDF or CDF are terminated on wire-wrap terminals at the rear of the 302-type connectors. Detailed descriptions of the 302-type connectors and associated protector units are found in Sections 201-202-101 and 201-208-101.

4.05 The protector frame verticals are numbered 01 through 12 for the first module. Verticals on additional modules are numbered 13 through 24, 25 through 36, etc. Numbering may run from left to right or right to left.

DISTRIBUTING FRAME

4.06 The distributing frame when used for No. 1 ESS is referred to as an MDF; the distributing frame when used for No. 2 ESS is referred to as a CDF. The purpose of this frame in either case is similar. It provides for a flexible association of outside plant cable pairs to central office equipment. The CDF in No. 2 ESS also provides trunk and miscellaneous associations. The MDF and CDF modules are physically the same but differ in the way cable pair and equipment assignments are made.

4.07 The distributing frame module consists of 10 vertical files located on 7.8-inch centers (Fig. 5). Each vertical file is equipped with nineteen 66H-type (earlier design frames) or nineteen 78B1-type (later design frames) connecting blocks. Each connecting block has 64 terminal pairs for a total of 1216 terminal pairs per vertical file and 12,160 terminal pairs per distributing frame module. Terminals on the connecting blocks are of the quick connect type and provide for two connections per terminal on the front of the terminal. The rear of each terminal provides for two solderless wire wrap connections. All cross-connections are made from the front of the distributing frame. The method for making cross-connections to the quick connect terminals is covered in Sections 069-125-811 and 069-126-811. Cable pairs from central office equipment and tie cables from the protector frame are terminated on the solderless wire wrap terminals on the rear of the connecting blocks.

4.08 Each pair of vertical files is separated by a vertical jumper wire trough. A horizontal jumper wire trough is located at the bottom of the frame, and a divided jumper wire trough is located at the top of the frame (Fig. 6). Earlier design frames have an undivided trough at the top of the frame (Fig. 6). The capacity of the wiring troughs using the 22-ga W-type paired cross connection wire is listed in Table B.

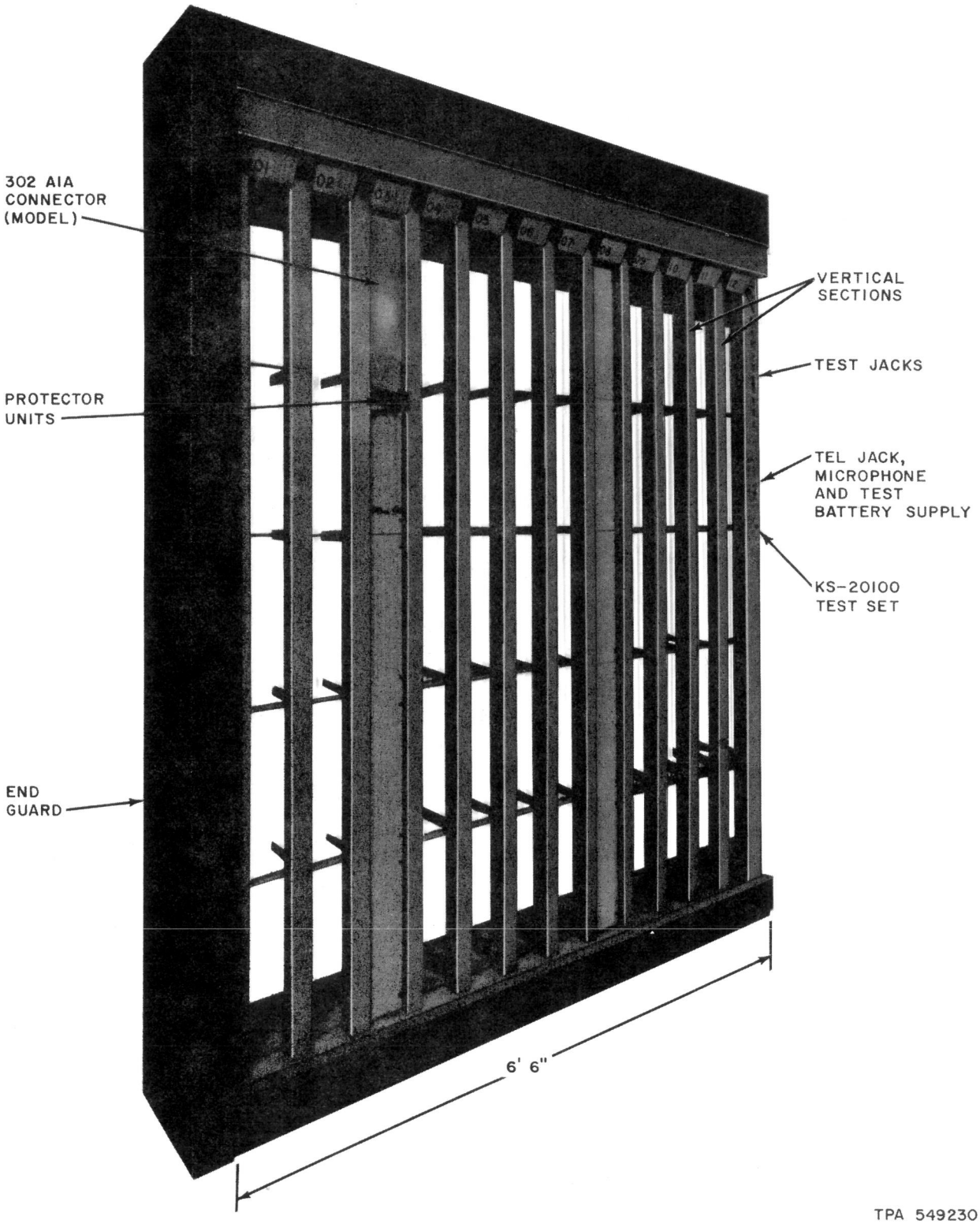

Fig. 4—Protector Frame Module—Front View

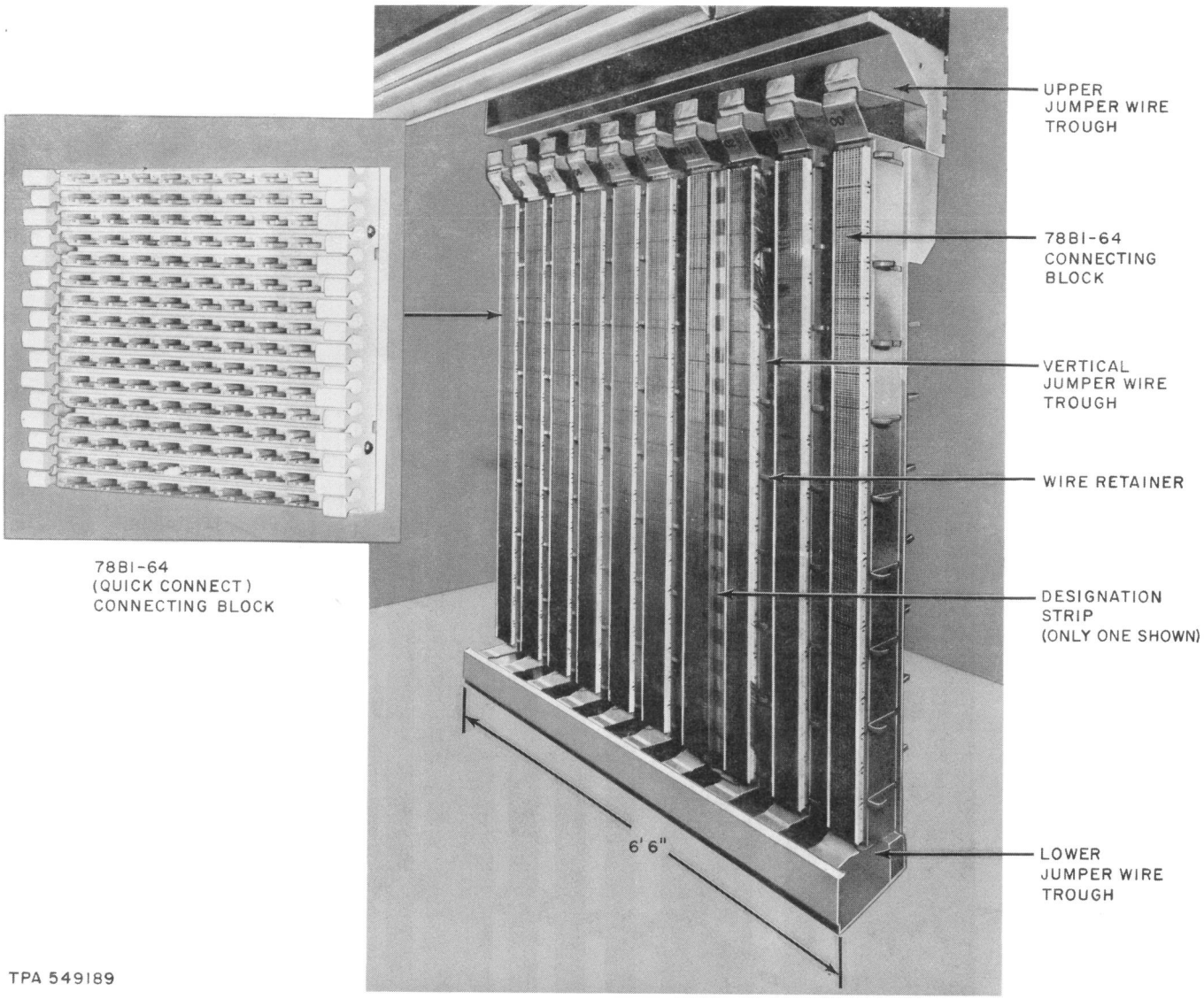

Fig. 5—Distributing Frame Module

4.09 Cross-connect jumpers used on the modular distributing frames are identified as short, medium, and long. Short jumpers are those that are run between adjacent vertical files and are placed in the vertical jumper troughs. Medium length jumpers run between terminals of nonadjacent vertical files that may be separated by as many as ten vertical files. Medium length jumpers are placed in the bottom horizontal jumper trough or in the lower section of the divided horizontal trough at the top of the frame. Long jumpers are placed in the upper section of the divided trough at the top of the frame. The upper section of the divided trough is accessed through ports at the top of the vertical wiring channels. A wiring needle (KS-20096) is used to draw wires from the uppr section of the divided trough into the vertical wiring channels through the ports (Fig. 6). On earlier design frames medium and long jumpers are placed together in the undivided trough at the top of the frame.

4.10 Each vertical file is equipped with a T-shaped swinging terminal designation strip holder that extends the full length of the vertical file and covers one half of the vertical jumper trough. The holder is hinged at the top and bottom and may be swung to the left or right of the vertical file to provide full access to either vertical jumper

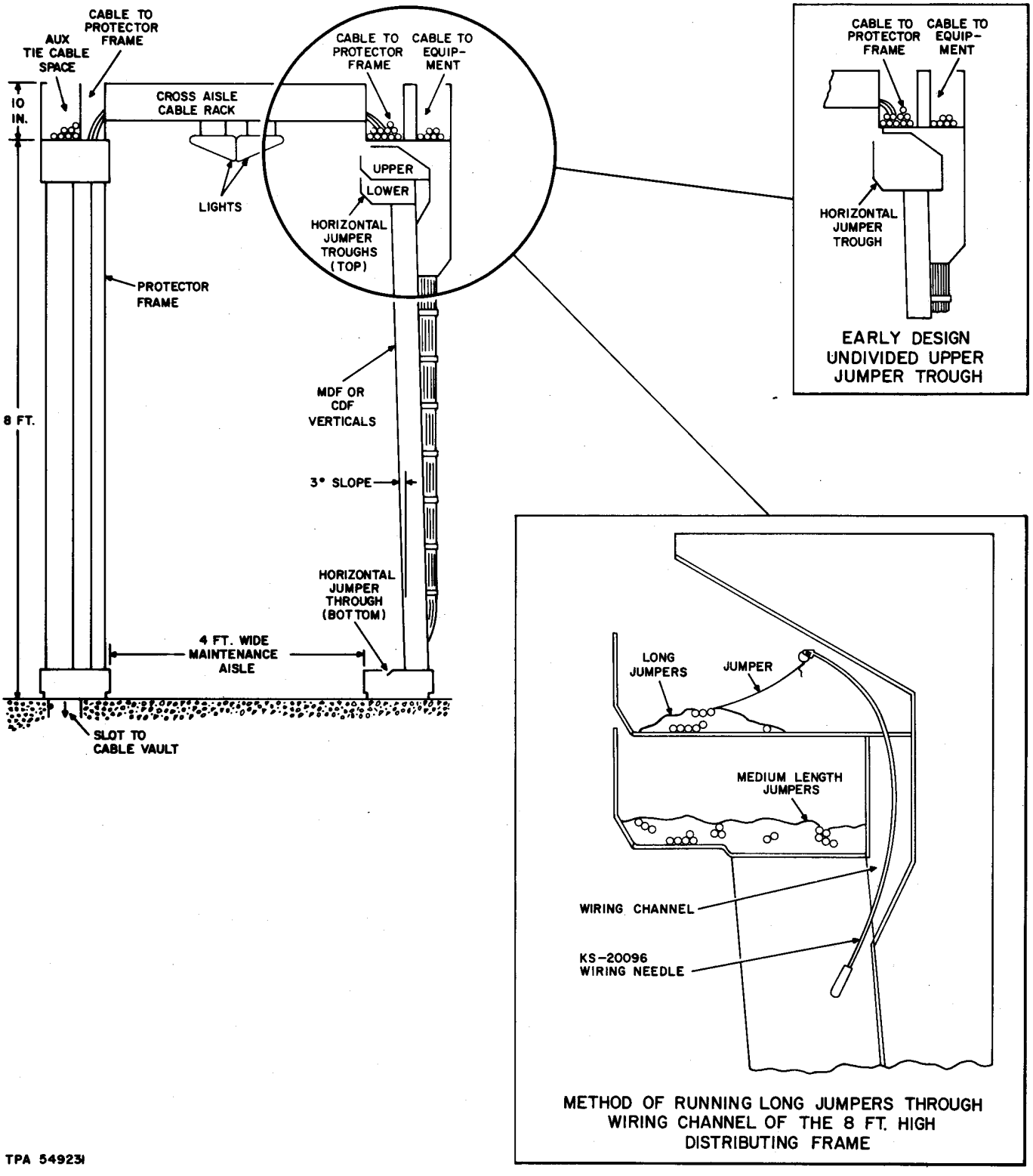

Fig. 6—Typical Protector Frame and Distributing Frame (MDF or CDF) Arrangement

TABLE B

TYPE OF FRAME			MDF CDF
CROSS-CONNECTION PAIRS PER MODULE			6080
PAIRS PER VERTICAL			1216
SHORT JUMPER PAIRS IN A VERTICAL TROUGH			1200
LONG JUMPER PAIRS IN HORI-ZONTAL TROUGHS	TOP	UPPER SECTION	3200
		LOWER SECTION	3100
	BOTTOM		4700
	TOTAL		11,000

trough. Designation cards are duplicated and placed on both sides of the designation strip holder to provide terminal identification when the holder is in either position.

4.11 Distributing frame verticals are numbered 00 through 09 for the first module (Fig. 7). Verticals on additional modules when furnished are numbered 10 through 19 and 20 through 29, etc. The numbering may be from right left or left to right but in any case, it should be consistent with the numbering on the protector frame verticals.

4.12 The protected cable pairs are permanently wired from the protector frame to the distributing frame via tie cables. Outside plant cables pairs are assigned to odd vertical files of the MDF in No. 1 ESS offices and to even vertical files of the CDF in No. 2 ESS offices.

4.13 Each cable pair is associated with a pair of connecting block terminals on the distributing frame. There are 19 connecting blocks accommodating 64 pairs per block on a vertical for a total terminating capacity of 1216 pairs per vertical. Since only the odd or even verticals are used for cable pair terminations, the capacity per distributing frame module is 6080 pairs. The alternate verticals are used for terminating central office equipment and similarly provide for 6080 terminations. Therefore, 6080 cross-connect pairs can be accommodated on each distributing frame module.

4.14 Connecting blocks on the verticals have eight terminals in a row horizontally, and four pairs can be terminated on each row. Each connecting block is divided down the middle vertically with two pair terminations in the left half and two pair terminations in the right half of each row. Cross connections that cross the midpoint of each vertical row should be avoided because this overloads the narrow wiring channels in the connecting block.

4.15 The cable pairs are spread in groups of 20 over the frame horizontally and not vertically as with conventional frames. The first group of 20 pairs (1 through 20) are in the first vertical, the second group of 20 pairs (21 through 40) are in the third vertical, etc. (Fig. 7). Each 20-pair group is further divided into 10 pairs to the left half of the vertical and 10 pairs to the right half of the vertical. Central office equipment terminating assignments are similarly divided into left-hand groupings and right-hand groupings and are also spread over the frame horizontally. This method of assigning provides the greatest amount of exposure for direct access with short jumpers between cable pairs and central office equipment. Every central office equipment termination has access by one short cross-connection jumper to 608 pairs, where the midpoint of a vertical is not crossed.

4.16 In the cases of small offices miscellaneous circuits may be uniformly distributed over an integral number of connecting blocks across the bottom of the distributing frame.

4.17 Each individual distributing frame installation differs according to the type of office served (No. 1 ESS or No. 2 ESS), the size of the office, and the growth potential of the office, etc; local records must be consulted to determine the exact assignment procedures used and cable and equipment spreads.

DESIGNATIONS

4.18 Above each protector frame vertical (both front and rear) is a designation card holder. Printed cards bearing the proper vertical number are placed in the left-hand portion of the card holder. Another card having five horizontal spaces representing the five 302-type connectors in the vertical are inserted in the right-hand portion of the holder. On this card is shown the cable

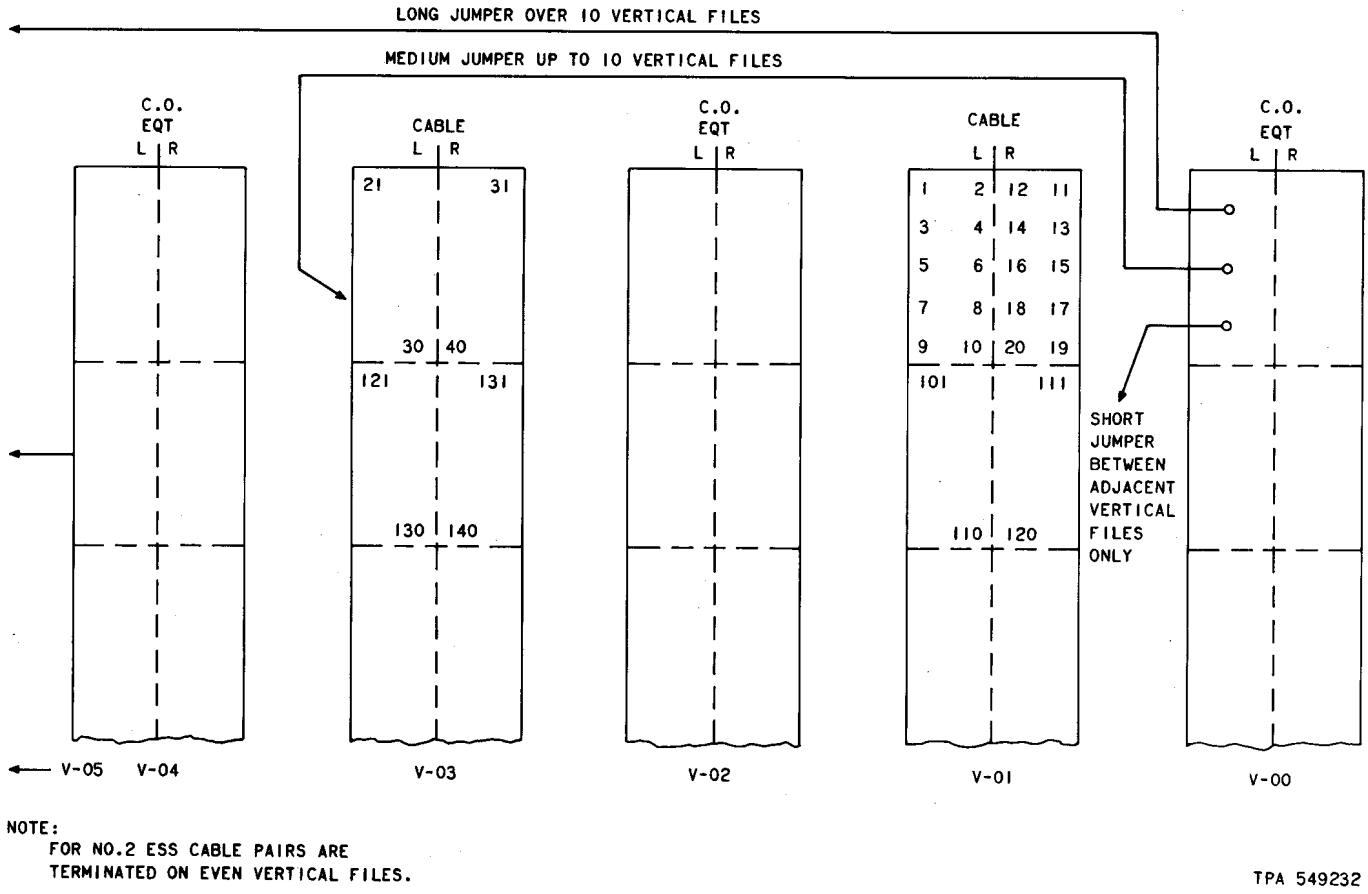

Fig. 7—Typical Distributing Frame Arrangement For No. 1 ESS (Right to Left Growth)

number and the first pair number associated with each 302-type connector. Additional cable and pair identification also appears on each 302-type connector; this information is covered in Section 201-208-101.

4.19 Above each distributing frame vertical (both front and rear) is a designation strip holder. Printed cards bearing the proper vertical number are inserted into the rear holder and into the left-hand portion of the front holder. Cards bearing a summary of appearances in the vertical are inserted into the right-hand portion of the front designation strip holder (for example, cable and pair number).

4.20 Each distributing frame vertical has T-shaped hinged vertical designation strips. Cards bearing identification of the terminals in the vertical are inserted into this strip. Cards are provided for each type of cable or equipment termination, and space is provided on the cards for maintenance personnel to mark designations that are different for each cable termination (for example, concentrator number).

4.21 In order to readily identify connecting blocks for cable pair terminations and connecting blocks for central office terminations, designation cards for alternate distributing frame verticals are colored differently. Designation cards also alternate in color down each vertical for identification of different hundreds groups of cable pairs and different groups of central office or miscellaneous equipment. Distributing frame verticals bearing cable pair terminations are designated by alternate blue and grey cards beginning with blue at the top of each vertical. Each card bears the cable and pair numbers appearing in the associated connecting blocks. Distributing frame verticals bearing central office or miscellaneous equipment terminations are designated by alternating yellow and grey cards beginning with yellow at the top

of each vertical. In each case duplicate cards are provided for the other side of the designation strip with the designations properly reversed. Supplementary designation cards are available; these are blank cards and may be used for special designations.

4.22 The rear (wiring side) of the distributing frame verticals are provided with colored strips to identify terminals. Each even numbered vertical bears an identification strip every 16th horizontal row of terminals beginning with the top row. Each odd numbered vertical bears an identification strip every 25th horizontal row of terminals beginning with the top row. Every such group of terminals is designated by a stamped character on the adjacent framework. Terminal groups are designated sequentially by letters A through W (omitting I, O, Q, and V). Any terminal can be identified by the vertical number, group number, and terminal number within the group.

MAINTENANCE EQUIPMENT

4.23 Provision is made on the protector frame for mounting miscellaneous maintenance equipment. When the protector frame and the distributing frame are located across on aisle from each other, the maintenance equipment is readily accessible from either frame and is not duplicated on the distributing frame. However where the distributing frame is remote from the protector frame, a test panel and transmitter panel can be mounted on the distributing frame.

4.24 The right-hand vertical framework of each protector frame module has provisions for mounting the following miscellaneous maintenance equipment (Fig. 4).

(a) A jack panel consisting of A and B telephone jacks together with pin jacks for −48 volts, +24 volts, ground and high resistance ground.

(b) A test panel accommodating up to 20 telephone jacks (10 pairs) per panel. These jacks are installed as required for various testing circuits (manual varley, automatic varley, test trunk in and out, etc). The jacks are multipled to each protector frame module or where a larger number of test jacks are required; 20 pairs of test jacks can be made available if the test circuits are multipled to every other module rather than every module.

(c) A KS-20100 test set for checking protector units. (Some early design frames not having provisions for mounting the KS-20100 test set on the modules are provided with a wall mounted test set which is installed at some convenient location near the frames).

(d) An intercom system to the test desk. This consists of a transmitter, switch, and lamp mounted on the protector frame and a loudspeaker mounted on the cable rack above the frame.

4.25 When the distributing frame is remote and the maintenance facilities mounted on the protector frame are not accessible, a jack panel and a transmitter panel can be mounted on the distributing frame. The jack panel consists of A and B telephone jacks together with pin jacks for −48 volts, +24 volts, ground, and high resistance ground. This panel is substituted for a connecting block. When the panel is used, it replaces the lowest block in an even numbered vertical of the distributing frame and only one panel per module is used. A 677A transmitter panel when required for central office maintenance is installed on the distributing frame. This transmitter panel replaces the sixth connecting block from the top, one every other module (00, 02, 04, etc) in any even numbered vertical of the frame.

4.26 The end guards of both the protector frame and the distributing frame contain a storage area and are provided with doors. On the distributing frame this area is used for storing test cords, and on the protector frame this area is used for storing test cords and protector units.

4.27 Service observing jack panels to provide for up to 500 service observing circuits may be provided as needed. Each jack panel accommodates 50 jacks, and the panels are mounted on the rear of the distributing frame above the odd numbered verticals.