BELLPAC** TECHNOLOGY
COMMON USE HARDWARE, NUMBERING AND COUNTING

CONTENTS

1. GENERAL

1.1 Scope of Section

This section briefly describes the BELLPAC System of Electronic Module Packaging. While this packaging system is very similar to 1A technology in scope and content, its differences provide a viable "next generation" step towards universal Bell System design standards.

1.1.1 The BELLPAC system is comprised of a set of circuit packs, connectors (both circuit pack and backplane) and shelf hardware. The physical design of this system currently provides a range of circuit pack connectors having connection points from 50 to 300 pin-outs. Circuit packs and corresponding apparatus mounts range from 30 to 300 square inches. Individual circuit packs will vary from simple double-sided boards to fine line multi-layered boards.

1.1.2 The basic building block concept of BELLPAC Technology is illustrated in Figure 1. Two significantly outstanding differences between BELLPAC and 1A technology appear as follows:

a. The .025 inch square pins of the backplane are no longer soldered into the MLPWB. Instead they are press fitted into the plated through holes and are referred to as "1B Compliant Pins."

b. BELLPAC uses a series of circuit card connectors (963 type) which are attached directly to the circuit pack. In 1A technology the 947 type card connectors are mounted on the MLPWB backplane.

1.1.2.1 As Figure 1 illustrates the circuit cards with the attached 963 type connectors (female contacts) mate directly to the .025 square (.125 grid) pins of the backplane. Proper alignment of the circuit card to the pin field is assured by the card guide and the parts identified as ramp and spacer aligner.

1.1.2.2 The support structure for a BELLPAC Backplane as shown in Figure 1 is the mounting plate. The backplane is self-aligning via precision holes and pins. The apparatus housings fasten to the mounting plate and provide support for the circuit cards.

1.1.2.3 A new series of connectors are available for terminating discrete wire, flat cable and components to the wiring side of BELLPAC Backplanes. These are coded 982 type paddleboards, similar to the 942 and 943 type used on 1A technology.

1.2 Associated Drawing and Reference Information

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1.2.1 Expanded information such as part numbers, supplemental assembly information and installation repair methods may be found in the following documents:

ED-4C249-10 Coordinate Numbering Plan for Locating Equipment Center Lines, Associated Requirements for Numbering and Lettering.

ED-4C250-10 BELLPAC Technology, Common use Hardware Equipment Arrangement.

Handbook 9, Section 130.3
Handbook 261, Section 907.1 - Dual Section - Repair of BELLPAC Technology Multi-Layer Printed Wiring Board Backplanes.

Handbook 261, Section 906 - 1A and BELLPAC Technology Backplane Cable and Wiring Requirements, Common Defects and Repair Methods.

X-74425 -BELLPAC System Guidelines

X-18616 - Guidelines for Assembly of BELLPAC Shelves

2. SPECIFIC HARDWARE INFORMATION

NOTE: For Detailed Part and Comcode Information, Refer to ED-4C250-10.

2.1 Circuit Packs, Codes, Sizes, Numbering

2.1.1 The BELLPAC System has 25 circuit pack codes in nine sizes. The exact codes and sizes are listed in Figure 2. The two character codes indicate the following:

1st Character = Connector Type	2nd Character = Board Size
S = 963G	N = 8 x 13
T = 963C	N = 8 x 9
A = 963M	L = 8 x 7
U = 963L	K = 6 x 13
	J = 6 x 9
	H = 6 x 7
	G = 4 x 9
	F = 4 x 7

There are some exceptions to these rules because not all code combinations are available for BELLPAC Circuit Packs (for the 963M connectors, double characters are used to designate size.)

2.1.2 Figures 3 and 4 provide a composite of the various circuit pack connectors and hardware options. Figure 5 shows the connector pin numbering scheme as viewed from the backplane.

2.2 Common Use Bay Equipment, Shelf Hardware (Frame, Apparatus Mountings)

2.2.1 Framework - The BELLPAC System normally uses either the 12- or 18-inch deep uniframe or electronic switching frameworks that are 7 feet tall. The basic framework dimensions are as follows:

Type of Frame	Total Width	Bay Width Between Inner Surfaces of Uprights
Single Bay	2 ft. 1-15/16 in.*	23.5 in.
Single Bay	3 ft. 2-15/16 in.	36.5 in.
Double Bay	4 ft. 3-15/16 in.	23.5 in. each
Double Bay	5 ft. 4-15/16 in.	23.5 in. & 36.5 in.
Triple Bay	6 ft. 4-15/16 in.	23.5 in. each

*Uniframe

2.2.2 Shelf Assemblies - A typical shelf assembly includes several apparatus mountings, a mounting plate, backplane subassembly, card guides, designation strip, and coded circuit packs (see Figure 1). BELLPAC Shelf Assemblies are removable from the front of the equipment framework to enable rapid replacement.

2.2.2.1 Mounting Plates - The mounting plate mechanically supports the shelf assembly components (apparatus housings, backplane etc.) and units the complete assembly to the framework (see Figure 6). Mounting plates are made in heights of 4, 6 and 8 inches. Frame mounting bars attach to the back of the frame uprights to form a mounting surface accessible from this front.

2.2.2.2 Apparatus Mountings - The BELLPAC apparatus mountings attach to the mounting plate from the front side of the frame. This allows installation and removal of the apparatus mounting from the backplane to facilitate backplane compliant pin repair and field changes (see Figure 7).

2.2.2.2.1 The apparatus mountings provide circuit pack mounting on 1/4 inch centers with a 1/2 inch minimum distance between circuit packs. Insertable plastic card guides provide circuit pack alignment and plastic designation strips identify the circuit pack code. Spacers are used to fasten the front of the apparatus mountings together when the mountings are adjacent.

2.3 Backplanes and Associated Hardware

2.3.1 Backplane Assemblies consist of the backplane printed wiring board (multilayer, double sided, etc.), compliant pins, backplane spacers, target pins, spacer aligners, the mounting plate and circuit card alignment ramps.

2.3.1.1 Compliant Pin Backplanes - The BELLPAC System uses .025 square terminal pins with a compliant center section which is press-fit into the plated through holes of the backplane printed wiring board (see Figure 9). The compliant pins are not soldered into the backplane as in 1A technology therefore improving the reliability of this connection and providing a more repairable product.

2.3.1.2 Spacer Aligner - (Figure 8) This positions the backplane the appropriate distance from the mounting plate, insulates this backplane from the mounting plate and aligns the card ramps to the terminal pin field.

2.3.1.3 Backplane Spacer - (Figure 8) positions the sides of backplane the same distance from the mounting plate as the spacer aligner. It also insulates the backplane from the mounting plate.

2.3.1.4 Target Pin - (Figure 8) These align the entire backplane to the mounting plate.

2.3.2 Power Terminals are used to bring a power lead into a printed wiring board backplane. The BELLPAC System uses the 221B terminal shown in Figure 10. This terminal is "L" shaped with four compliant pins and an insulating block in its base. The terminal is press fit directly into the plated through holes of the backplane.

2.3.2.1 The mating connector receptacles will usually be a crimped connector such as AMP 250 series, FASTON, Thomas and Betts, STAKON etc.

2.3.3 Shorting Contacts provide a method for electrically shorting two adjacent pins or a BELLPAC backplane. As shown in Figure 11 the F-608191 Contact is inserted into the backplane from the connector side. With the circuit pack in place, the 963 connector mounting keeps the contacts in an open position away from the terminal pins. When the circuit pack is removed, the contacts close and shorts the two pins together.

2.3.4 127 Type Apparatus Mountings

2.3.4.1 127 type apparatus mountings are used to retain 982 and 963N type connectors on the wiring side of the backplane. These apparatus mountings should not be confused with those used for mounting circuit packs (sometimes referred to as apparatus housings (see Figure 7). These apparatus mountings are similar in function to the 82A and 82B apparatus mounts used in 1A technology for retaining the 942 paddleboard connectors. The apparatus mounting consists of a plastic guide block, two lock springs and two retainer springs (see Figure 12 and 13).

2.3.4.2 The 127A can retain four 982-type, 2 x 12 contact connectors or any combination of 982-type connectors in a cluster of 4 x 25 pin array. The 127B can retain six 982-type 2 x 12 contact connectors or any combination of 982-type connectors in a cluster of 6 x 25 pin array.

2.3.4.3 The 127 type apparatus mountings are removed by pushing the lower part of the retainer towards the pin field with a pointed device (a screwdriver) until the retainer hooks clear the support flanges.

2.3.5 982 and 963N Connectors

2.3.5.1 982 and 963N Connectors can terminate discrete wires and flat cable components. They provide backplane interconnection. These connectors are similar in design and function to the 942-type connectors used in 1A technology. See Figure 14 for typical terminal identification.

2.3.5.2 Only the R-5163 Connector Removal Tool (credit card) is approved for removing BELLPAC type Connectors from the 127 type apparatus mountings.

2.3.5.3 To remove the connector, insert the R-5163 between the lock spring and the connector. This deflects the lock spring

and permits the connector to slide out of the apparatus mounting (see Figure 15).

3. EQUIPMENT LOCATION NUMBER (EQL)

3.1 Vertical and Horizontal Equipment and Apparatus Location

3.1.1 All equipment and apparatus mounted on frames utilizing BELLPAC technology are located by the intersection point of vertical and horizontal center lines specified as an equipment location number (EQL). The basic EQL number is nine digits in groups of three. The digit designations are defined as follows:

	EQL NUMBER		
X	XX	XXX	XXX

FRAME BAY NO.
VERTICAL LOCATION
HORIZONTAL LOCATION
PIN NUMBER

3.1.2 To utilize the EQL number, the installer must envision the frame as a coordinate grid of vertical and horizontal lines. The vertical lines as viewed from the frame front (see Figure 16) are spaced .125 (1/8 inch) apart starting 1-1/4 inches from the left side of the frame upright. The horizontal lines begin at the floor or frame base and are spaced at one inch intervals to the top of the frame.

3.1.2.1 Frame vertical EQL position numbers will be stamped on the rear side of the right frame upright or, if obscured, on the right frame mounting bar and on the left frame upright in the front. Stamping will be every four positions beginning with 08 (08, 12, 16,.....,76, 80). Position 00 is the floor or frame base.

3.1.2.1.1 Double and triple bays are further identified by having the middle uprights numbered as above, and the bay numbers (0,1,2) stamped.

3.1.2.2 Horizontal EQL numbers in most cases will be silk screened or etched on the backplane or mounting plate. If the EQL number is not marked, it will be necessary to determine the pin location by manually counting the pin columns as stated in Paragraph 3.2.4.

3.2 Pin Field Numbering

3.2.1 Connector pin fields are defined as all of the terminal pins on a BELLPAC Backplane that correspond to the mating circuit pack connector. A connector pin field may be two, four or six columns wide (see Figure 16).

3.2.2 Terminal pin fields are only one column wide.
Terminal pin fields may be continuously adjacent to each other as required. (Example - terminal pin fields between connector pin fields.)

3.2.3 Terminal pins are also available within certain connector pin fields. These will be on the bottom, on top and within the middle of the connector field.

3.2.4 As show in Figure 16, the pin field vertical EQL (1" increments) corresponds to the vertical center of the circuit pack apparatus mounting. The horizontal EQL begins with 000, 1-1/4 inches from the left side of the frame upright and proceeds in 1/8 inch increments across the backplane. The horizontal EQL of the connector or terminal pin field is the EQL directly to the right of the "0" column of the field.

3.2.4.1 A 963G and 963L connector would not be mixed in the same apparatus mounting and are only shown in Figure 15 for illustration purposes. Typically, the EQL pin identifications for the third pin down from the top in the right most column for each field would be as follows:

LEFT BAY = 0 AND VERTICAL LEVEL = 32
TERMINAL PIN FIELD - 032-096-056
TYP 963G-114 CONN. PIN FIELD - 032-100-154
TYP 963L-300 CONN. PIN FIELD - 032-106-556

3.2.5 Components such as 127-type apparatus mounts, 982 paddleboards, and power terminals are located on the backplane wiring side (back of frame) by the components lower leftmost terminal (see Figure 17). The horizontal EQL of this component will be the column number of the pin field in which the lower leftmost terminal resides, unless the terminal resides within a connector field. Then the horizontal EQL will be the same as the connector field.

Engineering Planning Manager
(Installation)

Attachment:
Figures 1 - 17

Reason for Reissue:
Revised Paragraph 2.3.4 to 2.3.5.3

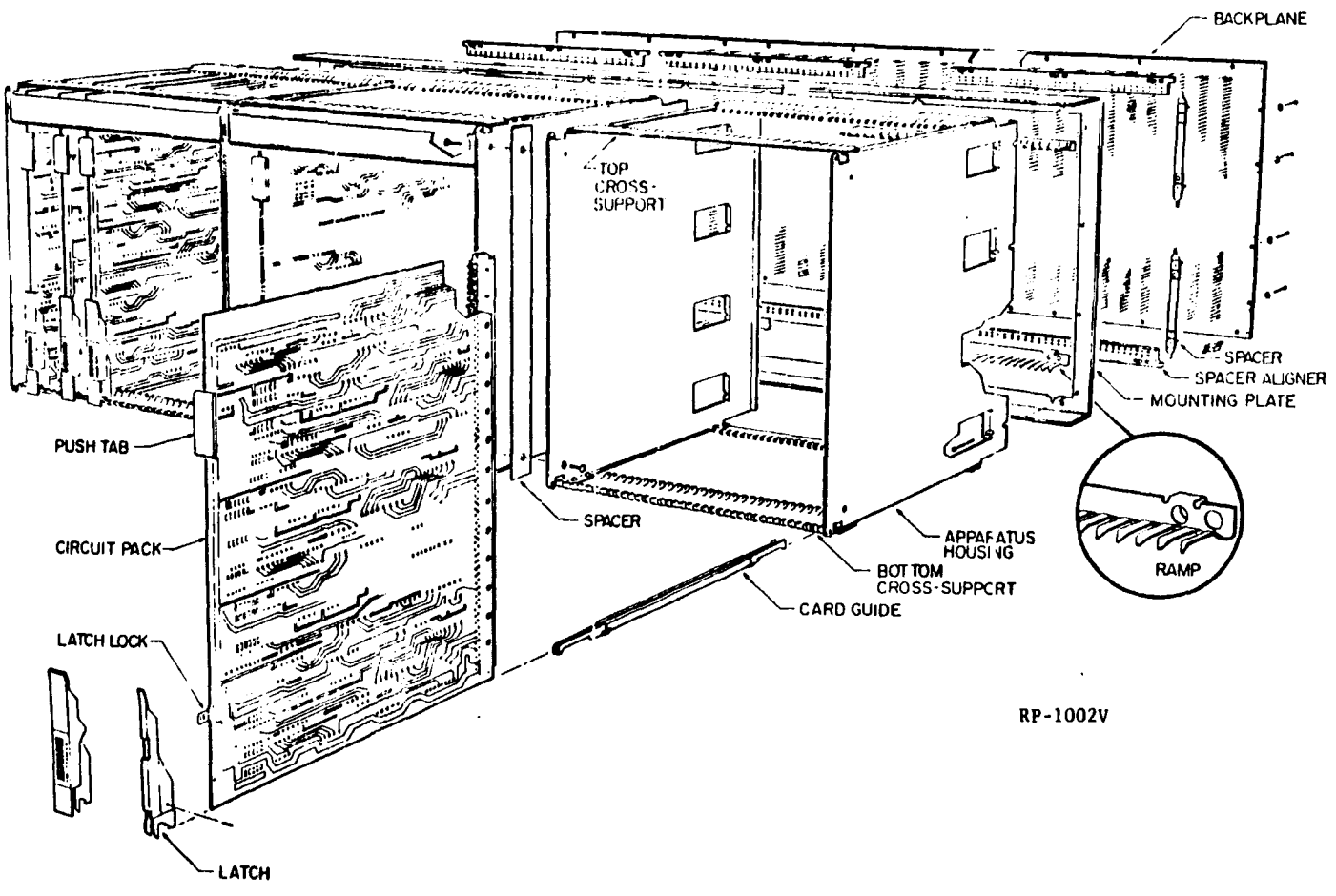

FIG. 1 (PAR 1.1.2 and 2.2.2)

Code	Size H x L (in.)	Connectors	Pin-Out	Usage
SF	3.67 x 7.875	963G-50	50	Low
SG	3.67 x 9.875			Low
SH	5.67 x 7.875	963G-82	82	Low
SJ	5.67 x 9.875			Low
SK	5.67 x 13.875			None
SL	7.67 x 7.875	963G-114	114	Medium
SM	7.67 x 9.875			Medium
SMN	7.67 x 10.917			None
SN	7.67 x 13.875			Medium
ALL	7.67 x 7.975	963M-150	150	None
AMM	7.67 x 9.975			None
AMN	7.67 x 11.017			None
ANN	7.67 x 13.975			None
TF	3.67 x 7.375	963C-100	100	Low
TG	3.67 x 9.375			None
TH TJ TK		NOT DESIGNED		
TL	7.67 x 7.375	963C-200*	200	Medium
TM	7.67 x 9.375			Medium
TY	7.67 x 10.417			Medium
TN	7.67 x 13.775			High
UL	7.67 x 7.375	9.63L-300	300	None
UM	7.67 x 9.375			None
UN	7.67 x 13.375			Low

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*Twin 963C-100 is used until 963C-200 becomes available.

BELLPAC CIRCUIT PACK CODES AND SIZES

FIG. 2 (PAR. 2.1.1)

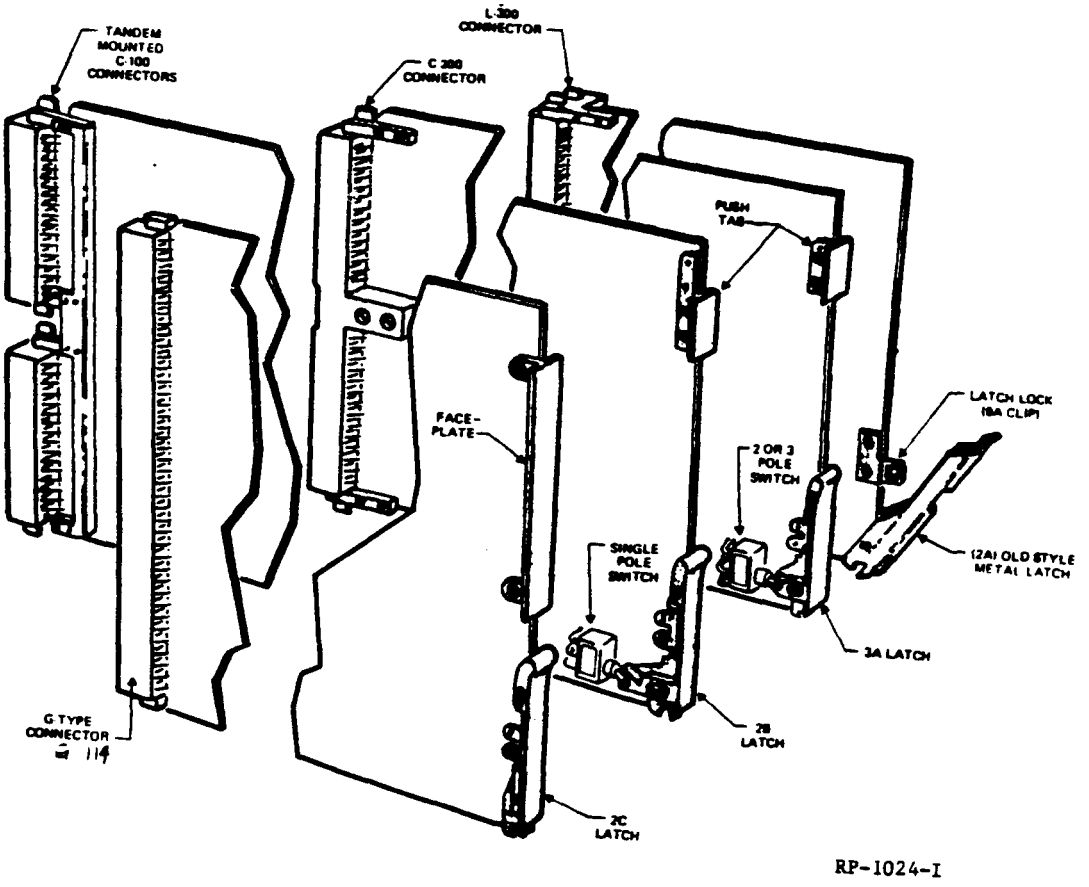


FIG. 3 COMPOSITE OF CIRCUIT PACK OPTIONS
(PAR. 2.1.2)

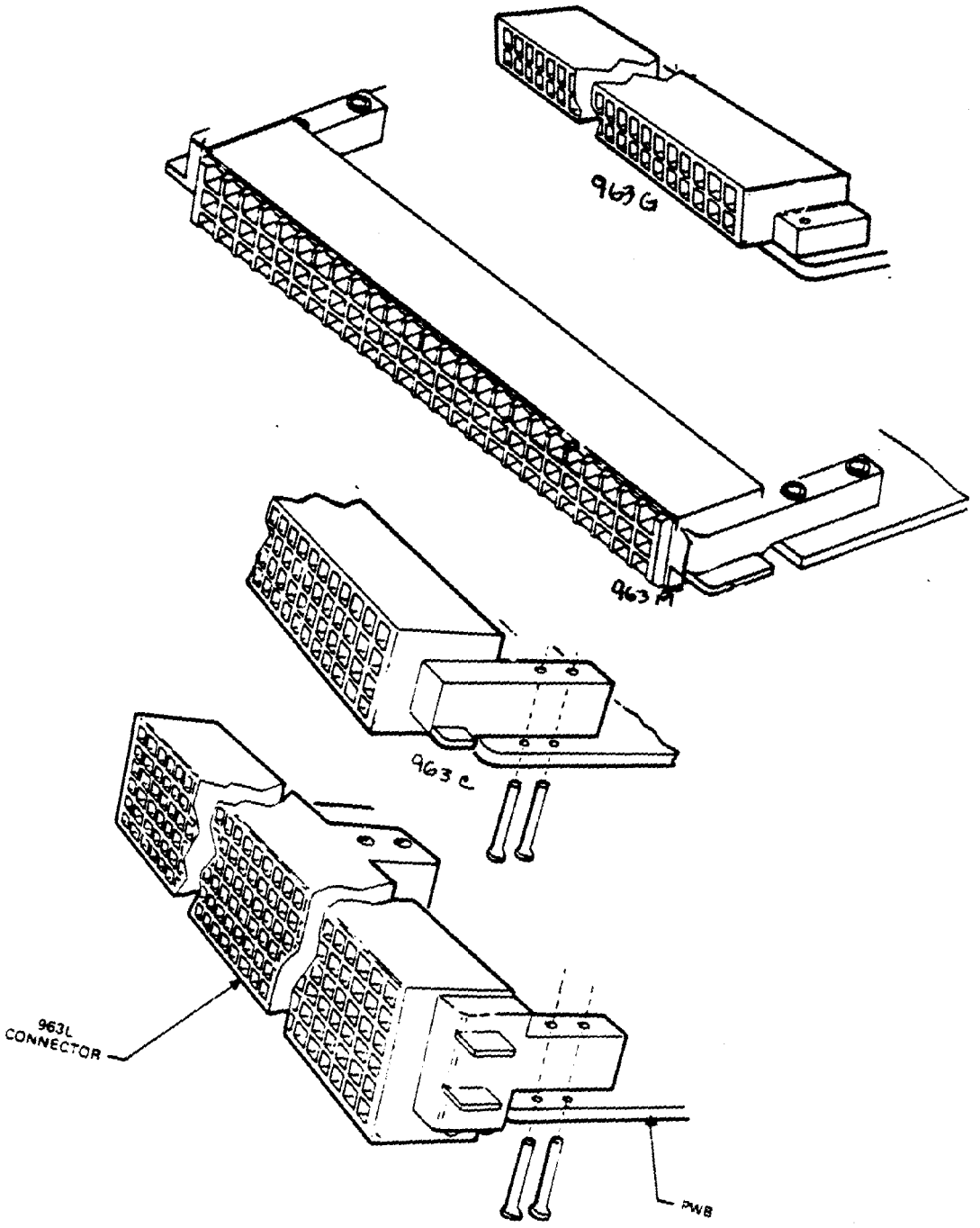


FIG. 4 CIRCUIT BOARD CONNECTORS
(PAR. 2.1.2)

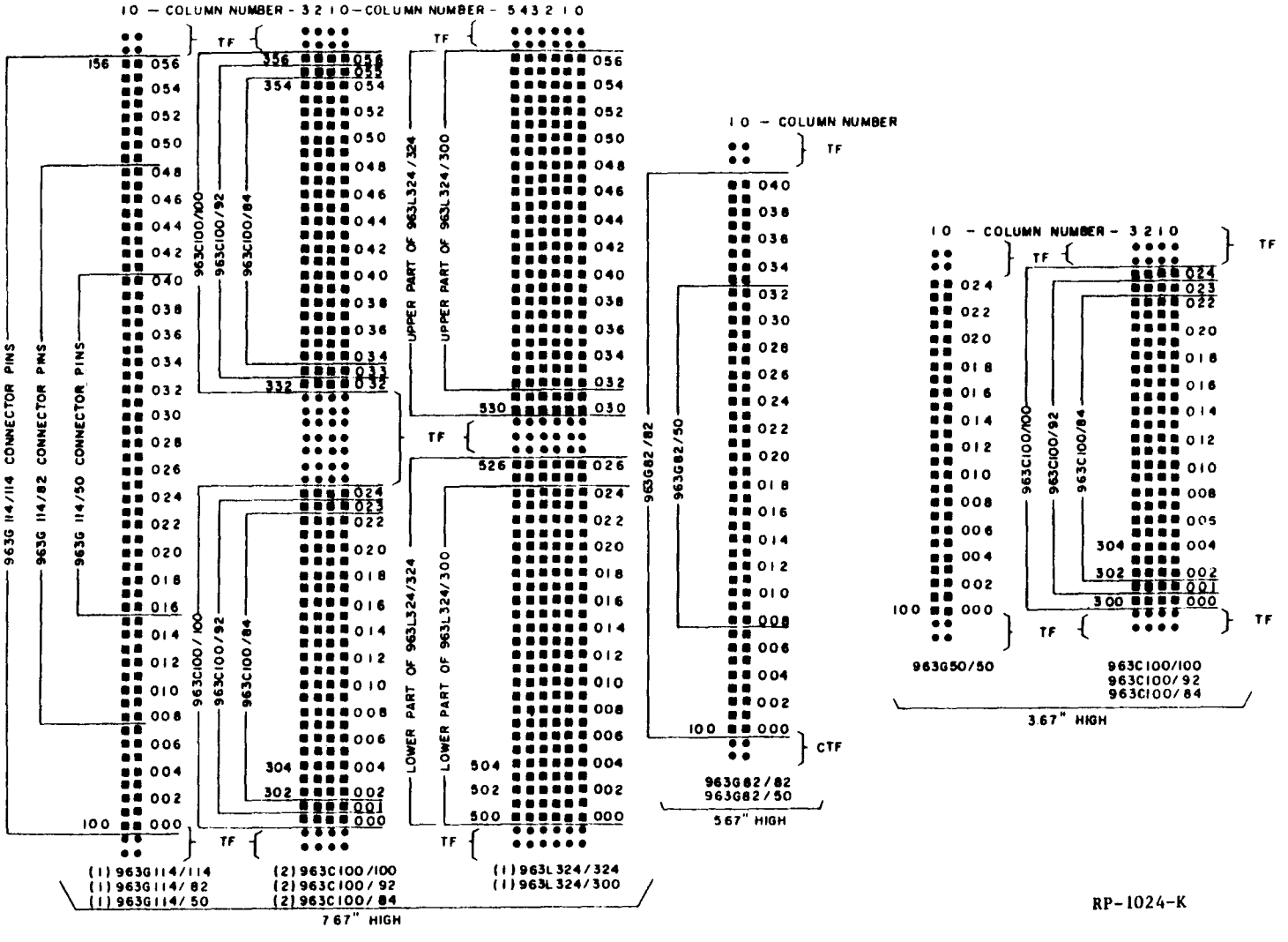


FIG. 5 CONNECTOR PIN NUMBERING FOR CIRCUIT PACKS VIEWED FROM BACKPLANE (PAR. 2.1.2)

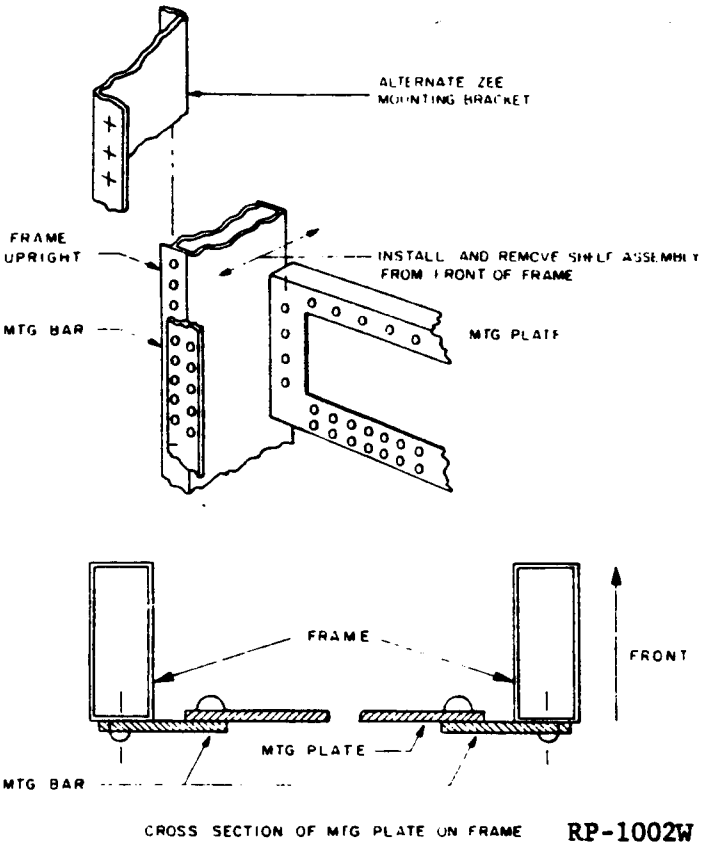


FIG. 6 FRONT-REMOVABLE MOUNTING PLATE (PAR. 2.2.2.1)

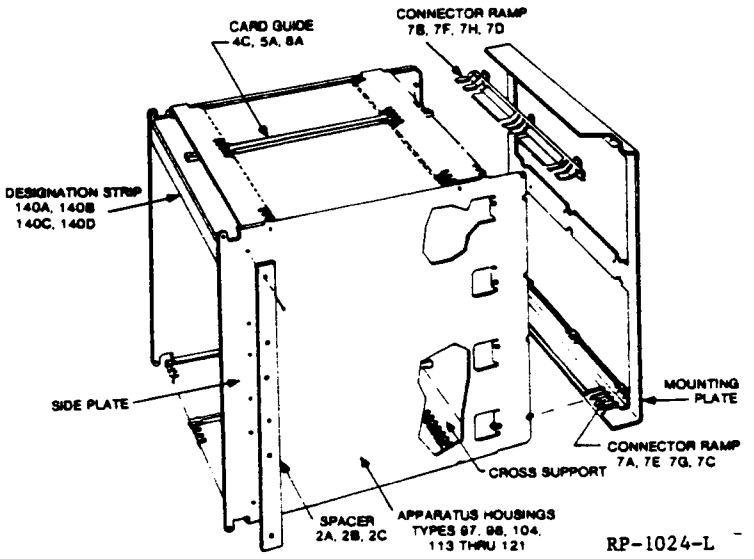


FIG. 7 APPARATUS MOUNTING AND ASSOCIATED HARDWARE (PAR. 2.2.2.2 and 2.3.4)

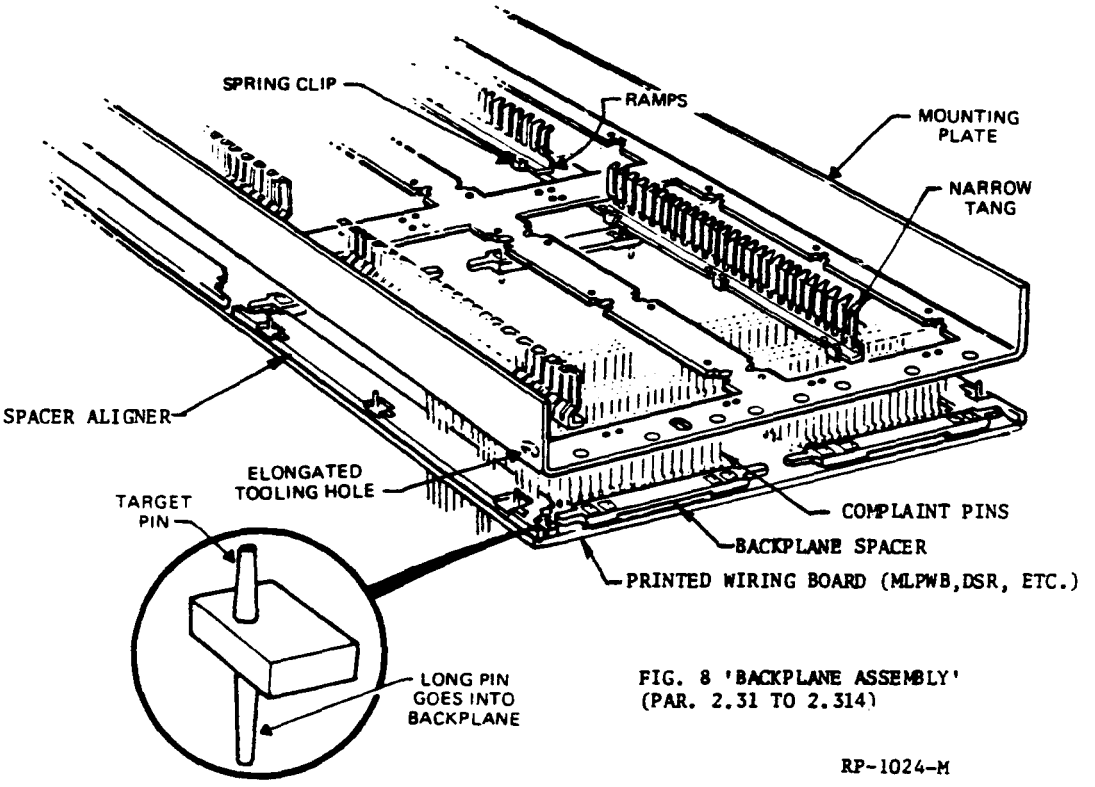


FIG. 8 SPACER ALIGNMENT
(PAR. 2.3.1.2)

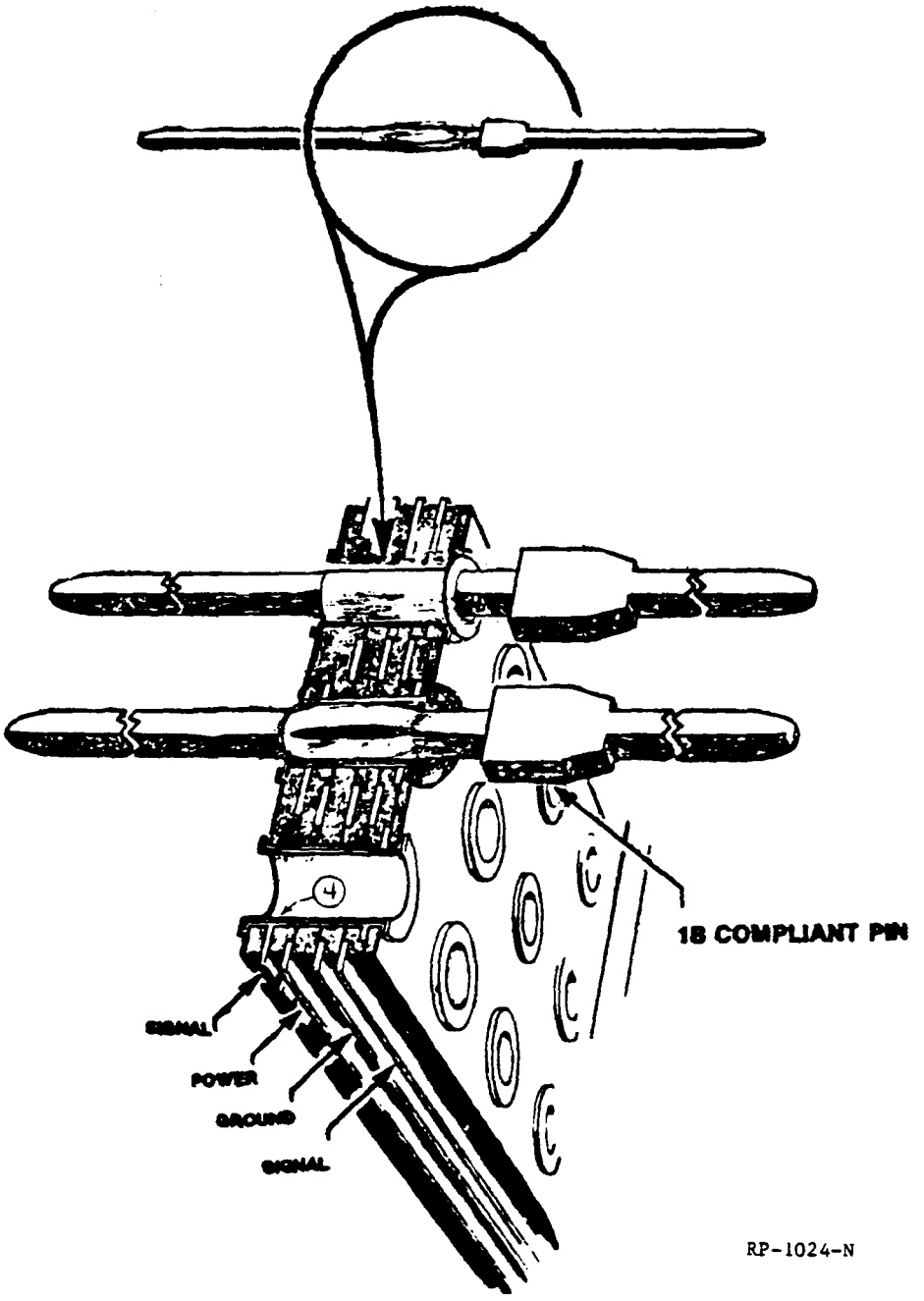
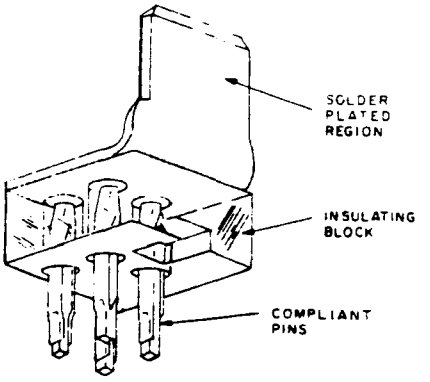


FIG. 9 COMPLIANT PIN BACKPLANE
(PAR. 2.3.1.1)



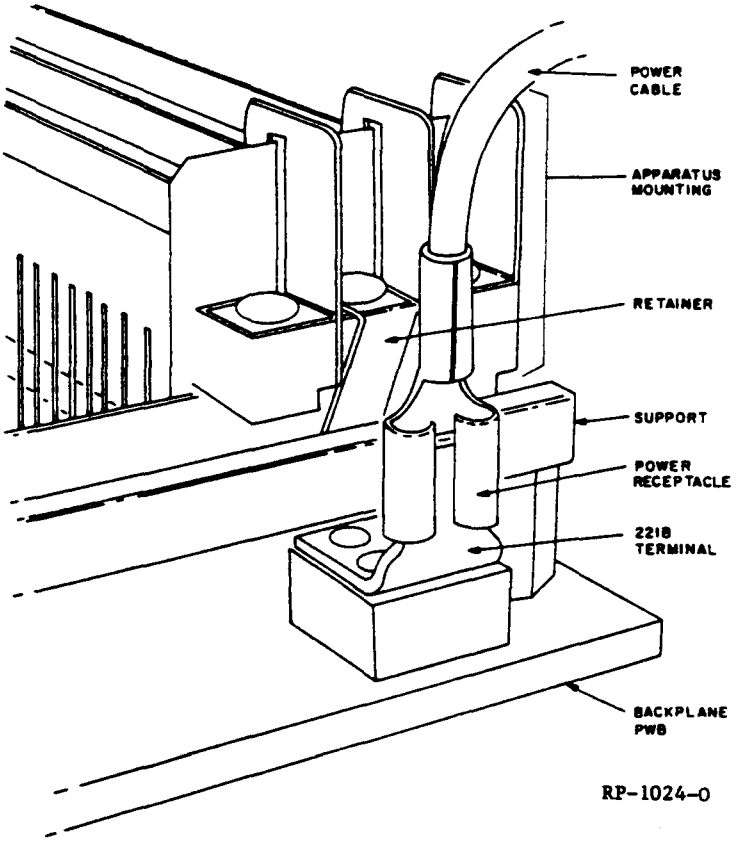


FIG. 10 POWER TERMINAL
(PAR. 2.3.2)

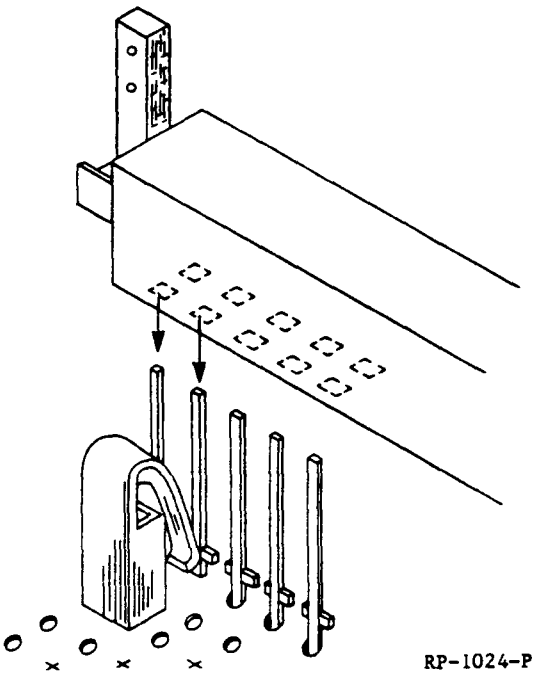


FIG. 11 SHORTING CONTACT WITH CONNECTOR
(PAR. 2.3.2)

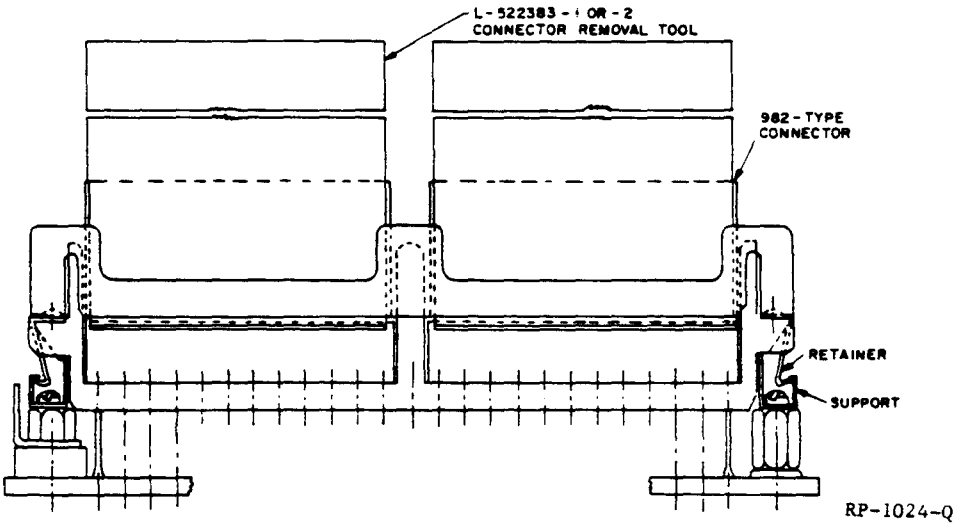


FIG. 12 127 TYPE APPARATUS MOUNTING
(PAR. 2.3.4)

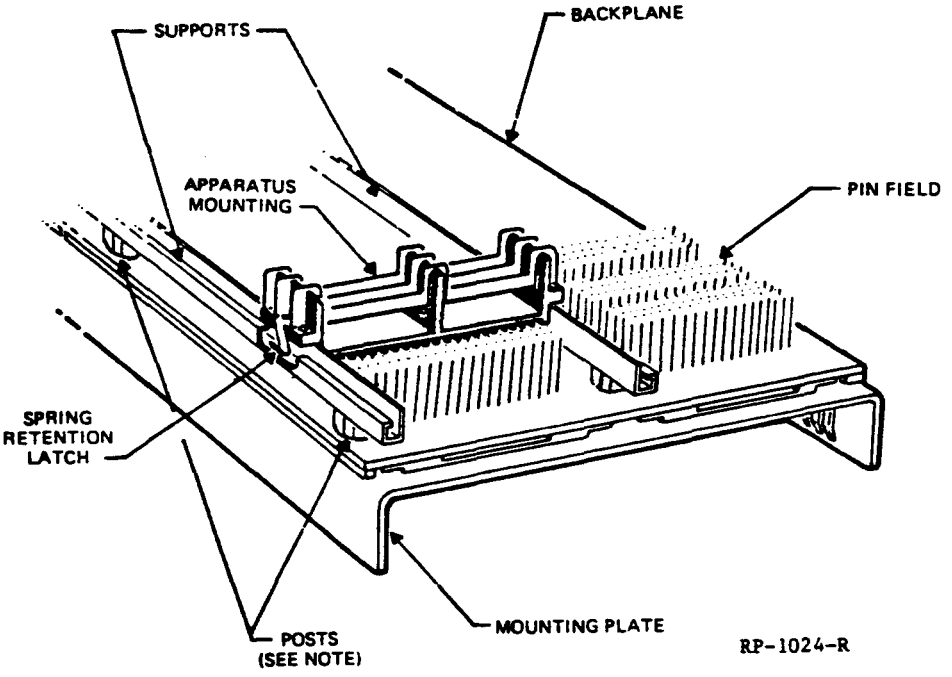


FIG. 13 127 TYPE APPARATUS MOUNT
(PAR. 2.3.4)

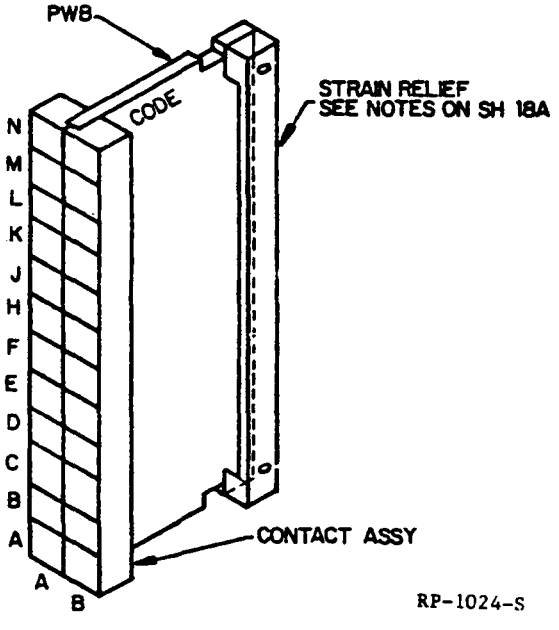


FIG. 14 982 TYPE CONNECTOR TYPICAL
TERMINAL IDENTIFICATION (PAR. 2.3.5)

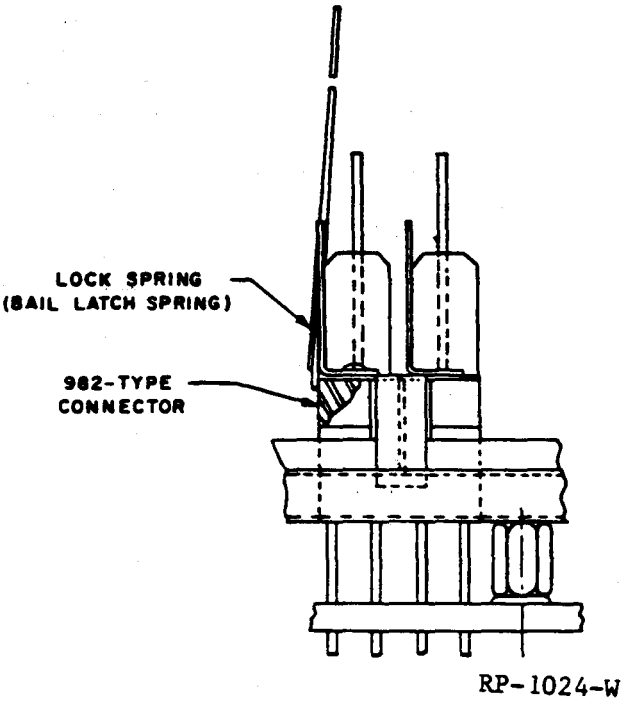


FIG. 15 REMOVAL OF CONNECTORS
(PAR. 2.3.5.3)

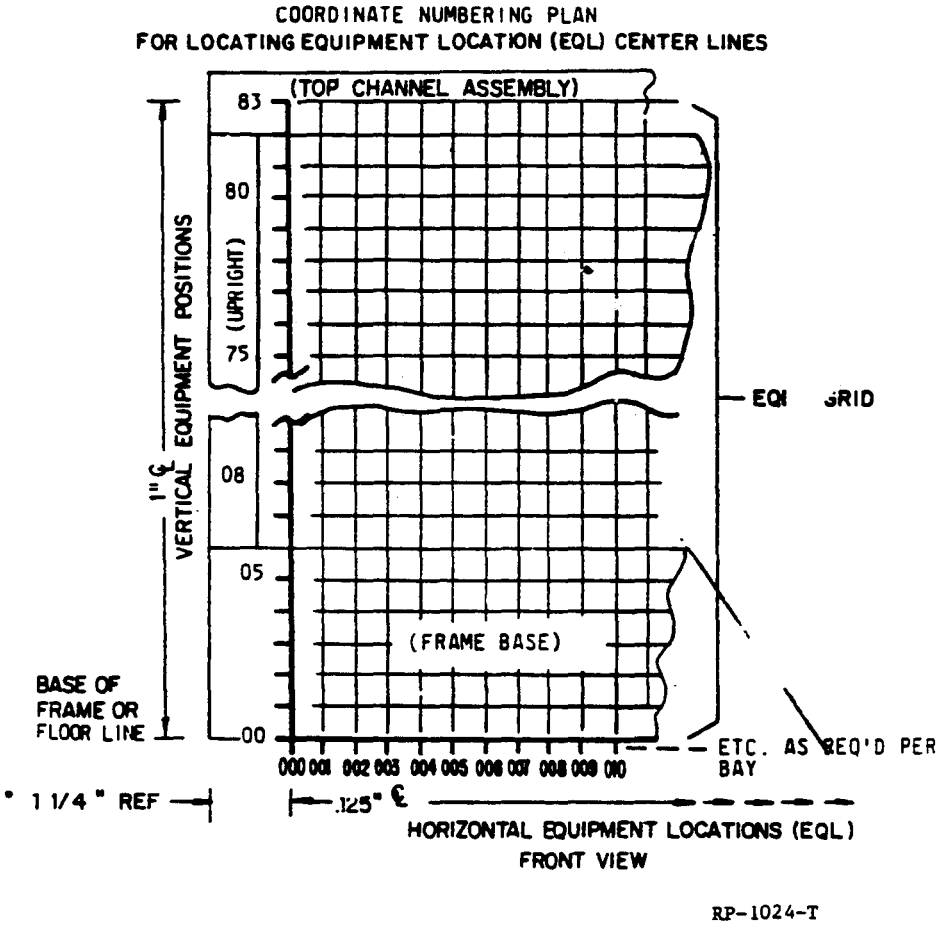


FIG. 16 (PAR. 3.1.2, 3.2.1 and 3.2.4)

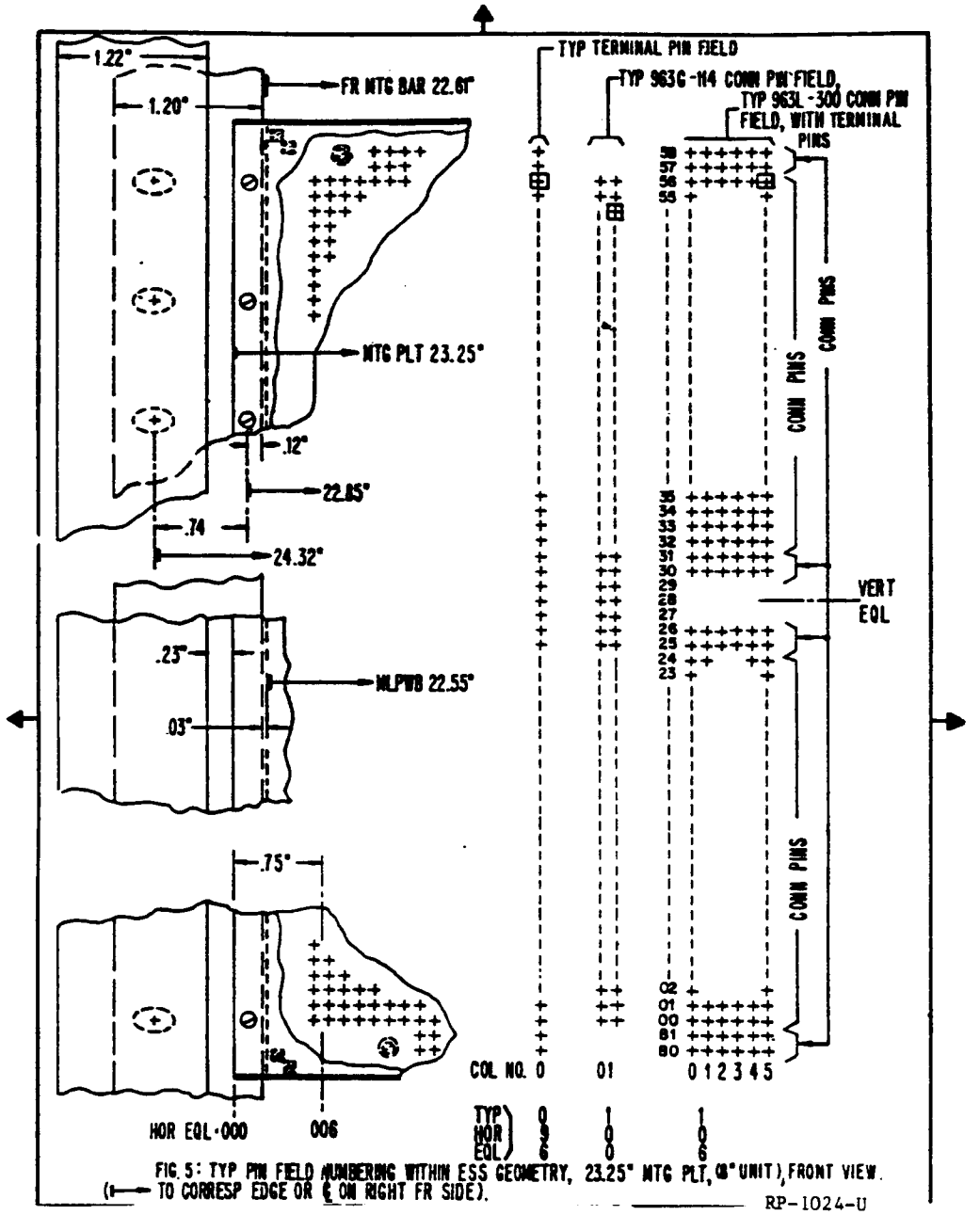

TYP TERMINAL PIN FIELD
TYP 963C-114 CONN PIN FIELD
TYP 963L-300 CONN PIN FIELD, WITH TERMINAL PINS
1.22"
1.20"
FR MTG BAR 22.61"
MTG PLT 23.25"
.12"
22.85"
.74
24.32"
.25"
MLPWB 22.55"
.03"
.75"
CONN PINS
CONN PINS
CONN PINS
VERT EQL
COL NO. 0
01
0 1 2 3 4 5
TYP HOR EQL 0 9 6
1 0 0
1 0 6
HOR EQL-000
006
FIG. 5: TYP PIN FIELD NUMBERING WITHIN ESS GEOMETRY, 23.25" MTG PLT, (8" UNIT), FRONT VIEW.
(← TO CORRESP EDGE OR ℄ ON RIGHT FR SIDE).
RP-1024-U

FIG. 16 (Cont'd)

COMPONENTS RESIDING ON BELLPAC TECHN BACKPLANES ARE LOCATED PER LOWER RIGHTMOST PIN MATING WITH SUCH COMPONENT -- FROM A UNIT FRONT VIEW THIS TRANSLATES TO LOWER LEFTMOST PIN ON THE WIRING SIDE THE EQL OF THE LOCATING PIN IS THAT OF ITS FIELD THE EQL OF A COMPONENT IS THAT OF ITS LOCATING PIN

BELLPAC APPARATUS MOUNTING EXTEND ON THEIR ENDS OVER TWO PIN ROW POSITIONS, WHERE NO PINS ARE MOUNTED THE FIG 5A EXAMPLES ARE LOCATED AS FOLLOWS. (LET BAY=B, AND PIN FIELD VERT EQL = YY)

A: BYY - 016 - 200

B: BYY - 014 - 032

BELLPAC BACKPLANE CONNECTORS CAN EXIST IN DIFFERENT SIZES AND ARE LOCATED ON THE BACKPLANE WIRING SIDE, PER LOWER LEFTMOST PIN. FIGURE 5A EXAMPLES ARE LOCATED AS FOLLOWS;

C BYY - 016 - 000

D BYY - 016 - 204

E: BYY - 014 - 047

BELLPAC PWR LUG ASSEMBLIES ARE LOCATED ON THE BACKPLANE WIRING SIDE, PER LOWER LEFTMOST PIN, PLUS THEY REQUIRE A PICTORIAL DETAIL OF THEIR MOUNTING ORIENTATION FIG 5A EXAMPLES ARE LOCATED AS FOLLOWS

F BYY-023-080

G BYY-007-051

H&J H BYY-022-057

J BYY-016-357

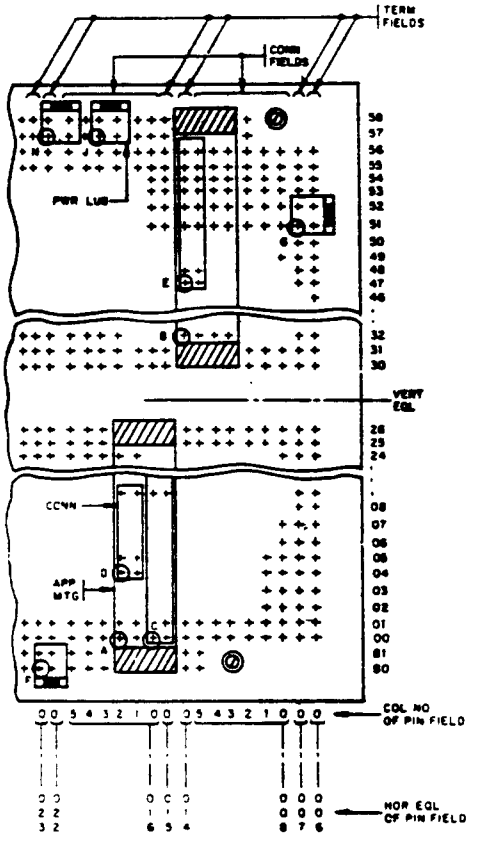


FIG. 5A

TYPICAL PLACEMENT OF BELLPAC TECHN COMPONENTS ON REAR (WIRING) SIDE OF 8" MLPWB

NOTE:

YY-VERTICAL EQL'S ON ONE INCH INCREMENTS

HORIZONTAL EQL'S ARE ON 1/8" INCREMENTS

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FIG. 17 (PAR. 3.2.5)