MOUNTING RELAY RACK UNITS, FUSE PANELS, MOUNTING PLATES AND SIMILARLY MOUNTED EQUIPMENT

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1. GENERAL

1.1 Scope

1.11 This section covers the specific requirements and installing procedures for mounting relay rack units, fuse panels, mounting plates and similarly mounted equipment.

1.12 The requirements covered in this section shall be followed except as modified by applicable specifications and drawings.

1.13 Apparatus shall be located on relay rack bays as shown on equipment drawings.

1.14 Refer to the chart above for the location of other information to which reference may be necessary when performing operations covered by this section.

1.2 Precautions

1.21 General safety precautions against personal injury and equipment damage are outlined in Handbook 0 and Section 1 in this handbook. These precautions are to be observed at all times as they apply to the operations being performed. Specific precautions to be taken are covered in this section.

1.3 Arrangement of Tools

1.31 Prior to starting operations covered by this section, the tools and other items required should be arranged at the work locations so as to minimize fatigue and inconvenience when handling.

1.4 Verification

1.41 Items for the verification of the equipment installed by the operations covered in this section are listed in Section 50V.

1.42 The items in Section 50V also may be used as a self-check guide when performing operations covered by this section.

2. INSTALLING EQUIPMENT

2.1 In addition to the tools supplied in the general kits, the tools listed below will be required for the operations covered in this section.

NOTICE - NOT FOR USE OR DISCLOSURE OUTSIDE THE BELL SYSTEM EXCEPT UNDER WRITTEN AGREEMENT

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2.11 Tools

R-2767 Blade, Hand Hack Saw, 12" - 18 Teeth (Panel Type Units)
R-3133 Bracket, Hoisting (Angle Type Units)
R-1844 Hoist, Chain, 1/4 Ton
R-1497 Hoist, Rope, Self-Locking
R-2044 Hook, Hoisting (Bar Type Units)
R-2875 Loop, Hoisting (Bar Type Units)
R-2281 Saw Frame, Hack, 10" and 12" (Panel Type Units)
R-72068 "U" Bolt

2.12 Supplies

542.1 Cloth Drafting Tape

3. RELAY RACK UNITS - GENERAL

3.1 Description

3.11 A relay rack unit is an arrangement whereby the equipment for one or more circuits is mounted together in one self-contained unit arranged for mounting on a relay rack bay. The apparatus is mounted in the usual manner on mounting plates or panels which, if more than one is required, are in turn secured to a unit framework consisting of bars or angles, arranged vertically. The design is such as to permit the unit to be completely manufactured in the shop and either assembled on the relay rack bay in the shop or shipped to the field where it is placed in position on the relay rack bay by the Installer.

3.2 Mounting of P-255706 Retaining Clips

3.21 Units consisting of one or more 1-3/4" mounting plates may require the addition of one or more P-255706 retaining clips, a device for retaining the loose wiring at breakout locations. Check Handbook 9 and/or the cabling drawings for the location of the clips on the unit. A sufficient number of the retaining clips for these units will be shipped to the job in one lot.

3.22 Where a P-255706 retaining clip is required on a unit consisting of a 2" mounting plate the retaining clip will be shipped loose with the unit. On units consisting of 2 or more 2" mounting plates, the retaining clips will be assembled on the units by the shop, as indicated by the equipment drawings. The equipment drawings for the 1-3/4" mounting plate units will not be changed to include the retaining clips on account of the large number of drawings involved and the fact that they will eventually be replaced by 2" mounting plate units.

3.23 The retaining clips shall be mounted so that they are in contact with the wiring side of the mounting plate as indicated in Figure 6. This can be done before, during or after the mounting of the unit on the frame, as will be most convenient. However, mounting the retaining clips before or during the mounting of the unit will avoid the two man operation which is likely to be required if the clips are installed after the units are mounted.

4. MOUNTING SCREWS AND LOCK WASHERS

4.1 High tensile strength machine screws should be used for fastening units to frames and for fastening mounting plates and associated designation strips, 25-type jack fasteners, mounting clips, and magnetic shields on frames, racks, and mounting units, unless otherwise specified. The following 0.216"-24 special head machine screws are to be employed for this purpose.

Piece Part	Length	Piece Part	Length
P-148634	1/4"	P-353502	9/16"
P-353501	5/16"	P-353448	5/8"
P-353446	3/8"	P-353449	3/4"
P-353500	7/16"	P-353503	7/8"
P-353447	1/2"	P-353450	1"

(a) Self tapping screws should be used to mount the above mentioned equipment on sheet metal structures. Such as No. 5 Crossbar frames that are perforated for them. The following 0.216" - 24 pan head self-tapping screws are to be used for this purpose.

Piece Part	Length	Piece Part	Length
P-174396	3/8"	P-174399	1"
P-174397	1/2"	P-251936	1-1/8"
P-388493	5/8"	P-251937	1-1/4"
P-388494	3/4"	P-251938	1-3/8"
P-174398	7/8"	P-251939	1-1/2"

NOTE: While installing self-tapping screws, the equipment below should be protected from any metal chips that may be produced by the threading action of the screws. To catch the chips, place a piece of 542.1 Cloth Drafting Tape over the screw hole in the frame upright on the side from which the screw ends will protrude.

(b) Swageform (Type SW) Thread Forming Tapping Screws (0.216-24 & 0.190-32 Slotted Hex. Washer Head) may be substituted for the above self-tapping screws.

COMCODE NO.	Size
900046558	.216-24 x 1/2"
900081894	.216-24 x 7/8"
900081886	.216-24 x 5/8"
900081902	.216-24 x 3/4"
900081910	.216-24 x 1"
900081878	.190-32 x 1/2"
900081860	.190-32 x 1/2"
900081928	.216-24 x 1-1/2"
840026876	.216-24 x 1-1/8"
840026884	.216-24 x 1-1/4"
840026892	.216-24 x 1-3/8"

4.2 Unless otherwise specified, lock washers are not used under the heads of mounting screws securing units and panels to framework except as follows:

4.21 To insure satisfactory electrical bonding between equipment and the supporting framework and also to prevent screws from working loose during shipment, suitable lock washers should be employed with the screws on bulb-angle frames as follows:

(a) For crossbar switches and mounting units for crossbar switches.

(b) For multicontact relays and multicontact relay mounting units.

(c) For BL4A, BL7A, and similar long-type terminal strips.

(d) For cable brackets, terminal strip mounting details, etc. (except where mounted by the Installer).

Other exceptions are brackets fastened to junctor grouping frames in crossbar and toll switching offices.

4.3 Use a full complement of screws for mounting all units and mounting plates unless otherwise specified. Tighten all screws securely, being careful to avoid burrs on the screw slots. The 943 and 954 type mounting plates require only one mounting screw at each end, the extra slot being provided to make possible a greater variation in mounting locations.

5. RELAY RACK UNITS - VERTICAL MOUNTING ANGLE TYPE

5.1 Vertical mounting, angle type units consist of mounting plates mounted on two side vertical mounting angles. The units usually occupy the space of 11 or more 1-3/4" mounting plates. Near the top, on the outer face of each vertical angle are two 1/4"-20 tapped holes spaced 5" apart for attaching the R-3133 Hoisting Bracket (See Figure 1). Some of the earlier units have 5/16" slots in place of the tapped holes in which case nuts will be used on the ends of 1/4"-20 x 5/8" H.H. Cap Screws for attaching the hoisting bracket.

5.2 The procedure outlined in the following paragraphs will facilitate mounting angle type units when using either the R-1844 Chain Hoists or R-1497 Self-Locking Rope Hoist and the R-3133 Hoisting Bracket.

5.21 To support either the chain hoist or rope hoist, an R-72068 "U" Bolt and a pair of framing channels may be bolted to the top of the auxiliary framing. These channels should run above the auxiliary framing, parallel to the cable rack and on the same side of the bay on which the unit is to be mounted, approximately 18" from the face of the line-up.

5.22 Remove the outer packing of the shipping case in conformance with Section 70E of Handbook 3, permitting the unit to stand vertically in the wooden "H" frame. Remove the iron strap which encircles the top of the frame. Slide the top packing assembly out horizontally after removing the two small pieces of plywood at the top corners on one side of the frame.

5.23 Convey the unit in the remaining shipping frame on the R-2510 Dolly Truck to the front of the bay on which the unit is to be mounted.

5.24 Attach a Det. 1 Strut to the angles on each side of the unit using 1/4"-20 x 5/8" H.H. Cap Screws as indicated in Figure 1. If the angles have slotted instead of tapped holes, use 1/4"-20 nuts with the 5/8" screws. In either case, an R-1542 6" Adjustable Wrench may be used to tighten the screws securely.

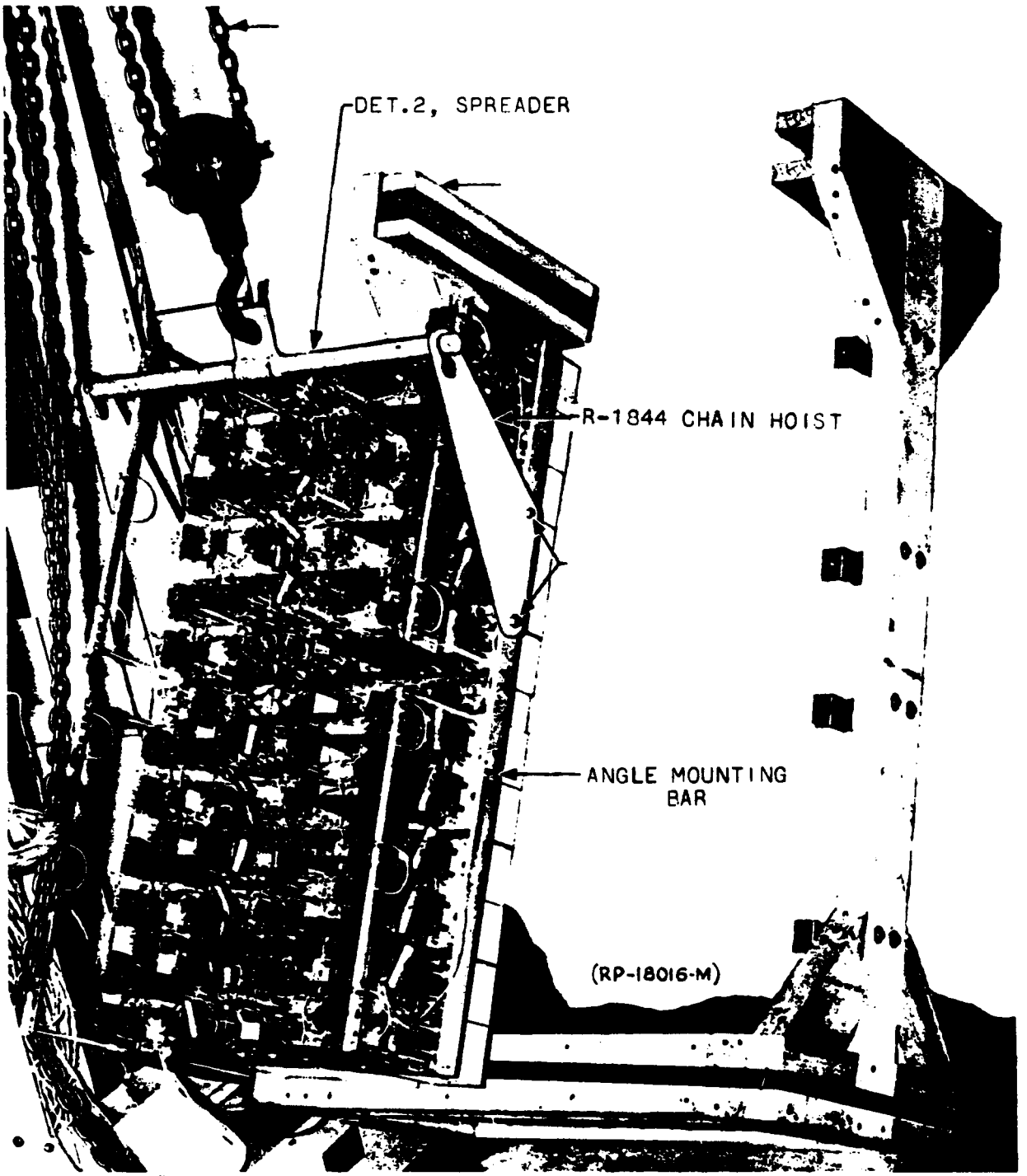


FIG. 1 USE OF R-3133 HOISTING BRACKET FOR HOISTING VERTICAL MOUNTING, ANGLE TYPE RELAY UNITS (PARS. 5.1, 5.24)

5.25 Raise the unit in the shipping frame slightly off the floor and remove the 4 metal brackets bolted to each of the two side vertical mounting angles in order to release the unit from the shipping frame.

CAUTION: WHEN HOISTING THE UNIT STAND AT ONE SIDE TO AVOID INJURY IN CASE THE UNIT SHOULD FALL.

5.26 On unequipped or partially equipped bays, place the units from the bottom up. Raise each unit to the level at which it is to be mounted, push the lower part against the upright of the bay and fasten it in place temporarily with four mounting screws. Insert the remaining mounting screws with the cable supports and spacers where required, replacing the initial four mounting screws when the others have been tightened.

5.261 A drift pin may be used for aligning the holes in the unit angles and the holes in the bay uprights. In some cases it may be necessary to shift individual mounting plates to facilitate mounting of the units.

6. RELAY RACK UNITS - VERTICAL MOUNTING BAR TYPE

6.01 Vertical mounting bar type units consist of two or more mounting plates mounted on two side vertical mounting bars. Units of this type having seven or more 1-3/4" mounting plates, or the equivalent, are equipped with band iron hoisting loops (See Figure 2) to provide a means of attaching a hoist when mounting the unit in the field.

6.02 When hoisting loops are provided, use the hoisting hook, R-2044, for attaching the hoist to the unit (See Figure 2). This tool can be used for both 19" and 23" units by moving the two shorter bars to the inner or outer positions as illustrated.

6.03 Remove the top only of the packing case when hoisting large units and cut the iron strap which encircles the inner details of the case. Remove the wooden filler from the grooves in which the unit sets and attach the hoisting hook. It will be necessary to spread the loops with a screwdriver if they have been flattened by the filler detail. Never use a hammer for this purpose, due to the danger of damaging the loop.

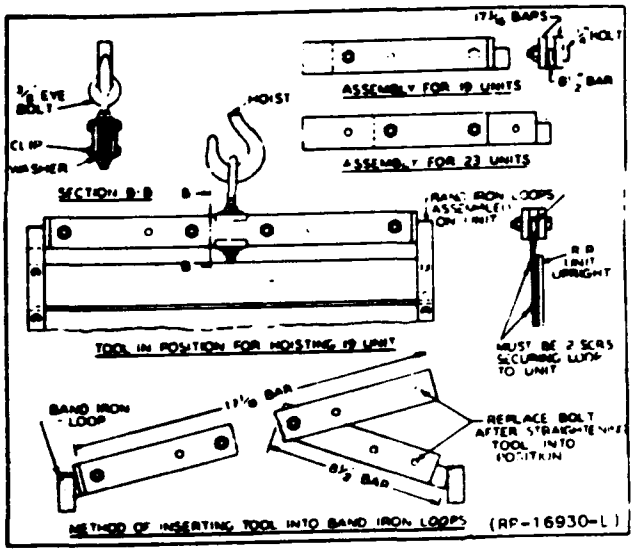


FIG. 2 USE OF HOOK R-2044 FOR HOISTING VERTICAL MOUNTING, BAR TYPE RELAY RACK UNITS (PARS. 6.01, 6.02, AND 6.04)

CAUTION: Before any relay rack units, which are provided with band iron hoisting loops, are hoisted off the floor, a visual check of each loop shall be made to determine whether there is any noticeable splitting or cracking of the metal along the top portion of the loop. The inside as well as the outside of the loop should be checked for this condition. Where such a condition exists, the damaged loop or loops shall be removed and other adequate loops or hoisting details shall be provided locally.

6.04 Make certain that each band iron loop is fastened to the unit with two screws. If only one screw is provided, assemble a second screw after hoisting the unit out of the case just sufficiently to expose the mounting screw holes. (See Figure 2).

6.05 The procedure outlined in Paragraphs 7.2 to 7.42 will facilitate mounting units where a chain or rope hoist is not used.

6.06 Hoist the unit out of the shipping case and directly onto the frame.

CAUTION: WHEN HOISTING THE UNIT STAND AT ONE SIDE TO AVOID INJURY IN CASE THE UNIT SHOULD FALL.

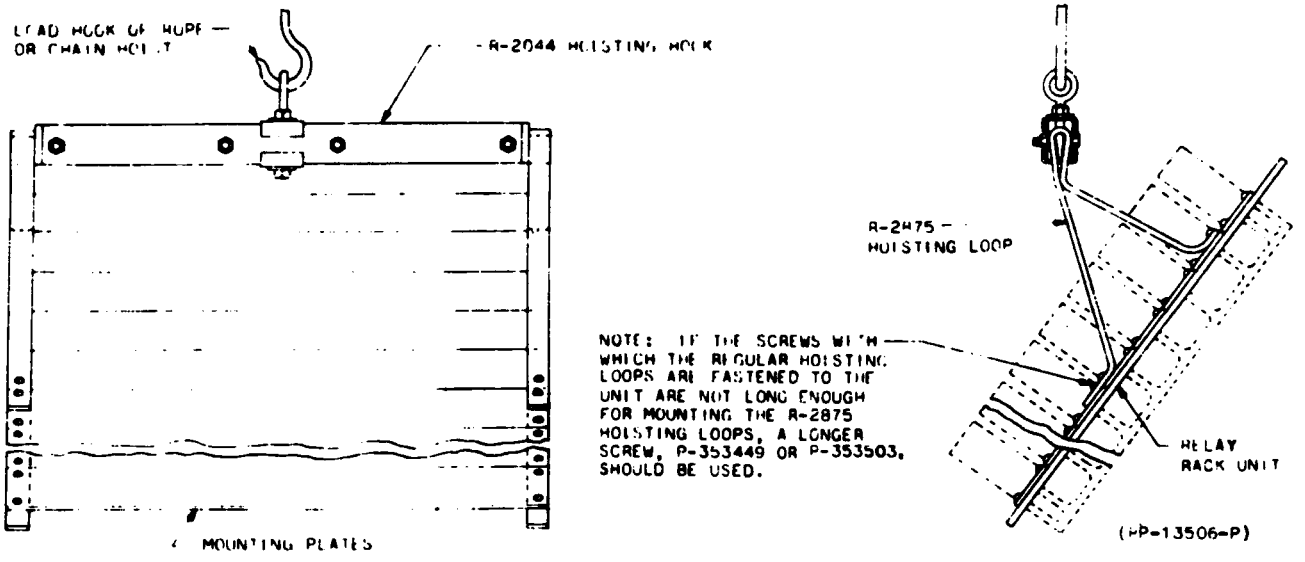


FIG. 3 BAR TYPE RELAY RACK UNIT BEING HOISTED WITH THE R-2875 HOISTING LOOP AND R-2044 HOISTING HOOK (PARS. 6.10, 6.101)

6.07 Leave mounting screws finger tight until all have been placed in position.

6.08 Remove the band iron hoisting loops after the unit has been secured to the frame uprights.

6.09 The screws with which the hoisting loops are fastened to the relay rack units should be replaced with the mounting screws furnished separately with the units. These screws are enclosed in a bag or envelope attached to the units.

6.10 The R-2875 Hoisting Loops, shown in Figure 3, will facilitate hoisting relay rack units in positions where the hoist cannot ordinarily be located sufficiently high to lift the top unit into place on account of interference with cable racks, air conditioning ducts or other obstructions. They can also be used to advantage when mounting a unit directly under another unit already in place and when removing or relocating units.

6.101 Mount the R-2875 Hoisting Loops on the unit, one on each side and slightly above the weight center. (See Figure 3). Locate the hoist so that the rope or chain will not interfere with other equipment. Place the R-2044 Hook in the R-2875 Loops as shown in Figure 3 and attach the load hook of the hoist to the eye bolt on the R-2044 Hook. One man can usually guide the unit into place.

7. RELAY RACK UNITS - WIDE PANEL TYPE

7.1 Wide panel type relay rack units consist of a single sheet metal mounting panel equivalent in size to two or more 1-3/4" mounting plates. On account of the slotted mounting holes the use of band iron hoisting loops attached to the unit through these slots is not safe.

7.2 Mount units starting at the lowest equipped position on the bay. The top of the unit directly below can then be used to rest the bottom edge of the unit being mounted. Place the end of a screwdriver between the two units to line up the mounting slots in the unit being mounted with the tapped mounting holes in the uprights.

7.3 Leave mounting screws finger tight until all have been placed in position.

7.4 When the position directly below that of the unit to be mounted is unequipped, either of the following methods will facilitate mounting the unit. Using screws slightly longer than those provided with the unit, (so that they may extend out beyond the face of the unit and yet engage all threads in the upright) proceed as follows:

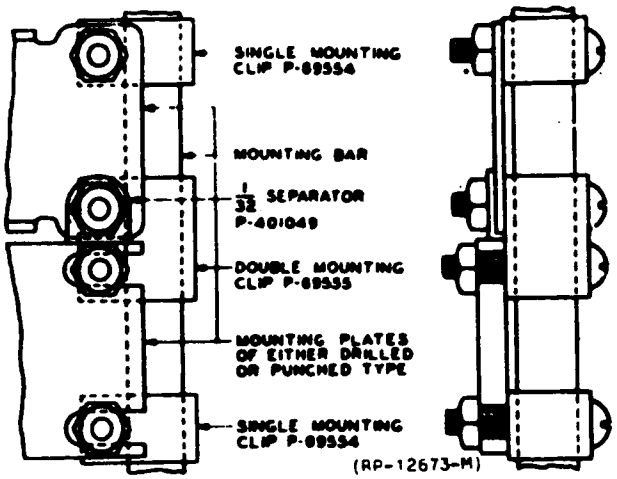


FIG. 4 MOUNTING PLATE SEPARATORS FOR 1/32" SEPARATION (PAR. 8.22)

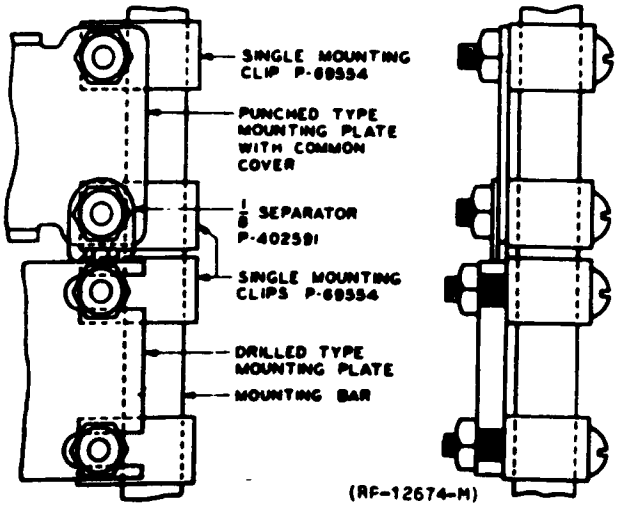


FIG. 5 MOUNTING PLATE SEPARATORS FOR 1/8" SEPARATION (PAR. 8.23)

7.41 (First Method) - Using a hack saw, deepen the slots in the heads of two of the screws to approximately 1/8" below the underside of the heads, then cut off the heads.

7.411 Place one of the headless screws in a mounting screw hole in each frame upright corresponding to two of the slots in the unit to be mounted. The screws will thus serve as pilots in guiding the unit into the proper position. After the mounting screws have been installed in the other positions, remove the headless screws and install the regular mounting screws.

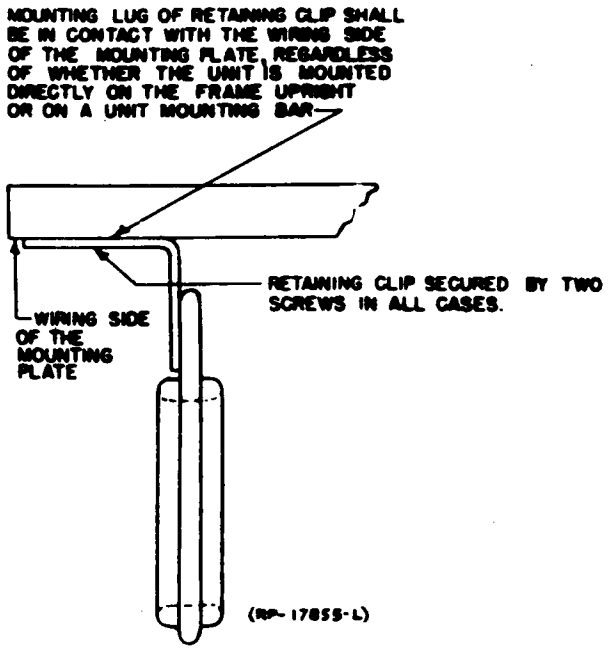


FIG. 6 METHOD OF MOUNTING P-255706 RETAINING CLIPS ON RELAY RACK UNITS (PAR. 3.23)

7.42 (Second Method) - Place a screw in a mounting hole in each upright directly below the unit to be mounted to serve as a temporary support for the unit being mounted. Where this method is followed, it will be necessary to raise the unit an additional 1/4" when inserting the regular mounting screws.

8. MOUNTING PLATES

8.1 All Mounting Plates

8.11 On mounting plates with common can covers, remove the covers and examine relays on a representative number of mounting plates to detect any extensive damage in packing, storing or handling, and to avoid mounting and wiring moldy, rusted, or damaged relays before such conditions are discovered.

(Dimensions From Guard Rail To Bottom Hole of Mounting Plate Position)

MTG Plate Pos.	Channel Frwk. ED-91590-70 Size 1-3/4" (G-8)	Channel Frwk. ED-91590-70 Size 1-3/4" (All Other Except G-9)	Bulb-Angle Framework ED-91837-71, ED-91183-30 Size 1-3/4"	Bulb-Angle Framework ED-91837-71, ED-91183-30 Size 2"	Box Type Framework J23064 E-51,F-51,G-50 Size 2"	Box Type Framework J23064 E-51,F-51,G-50 Size 1-3/4 (Using Adapters)	MTG Plate Pos.
1	4-1/2	6-1/4	4-1/4	4-1/2	5-1/4	5-1/16	1

MTG Plate Pos.	Duct-Type Framework ED-97171-50 Size 1-3/4" (G-3 & G-5)	Duct-Type Framework ED-97171-50 Size 2" (G-1)
1	3/4"	1/2"

FIG. 7 MOUNTING PLATE LOCATIONS FOR 11'-6" RELAY RACK BAYS (PAR. 8.12)

8.12 A chart for locating the first mounting plate on Channel, Bulb-Angle, Duct, and Box Type relay racks is shown in Figure 7. This chart gives the dimensions in inches from the guard rail to the lower or bottom hole of each mounting plate position.

8.13 Placing mounting plates so that the code number is at the right, when facing the front, will insure that the apparatus is right side up.

8.14 Mounting plates with open slots may be readily mounted by equipping one side of each bay with screws before mounting the plates.

8.15 Single Mounting Plate Units shall be fastened to the frame uprights with four screws when shop mounted. Where units are shipped separately and are mounted on frames by the Installer, they shall be fastened to the frame uprights with two screws, one in the top hole at each end of the mounting plate, except on hardened site or earthquake protected installations, where all four mounting screws are required.

8.16 Where circuits are wired only and where the regular mounting plates have not been provided, dummy mounting plates should be furnished for supporting the forms as covered in Section 29I of Handbook 9.

8.2 Clip Fastened Mounting Plates

8.21 Individual mounting plates fastened with mounting clips should be level within 1/16".

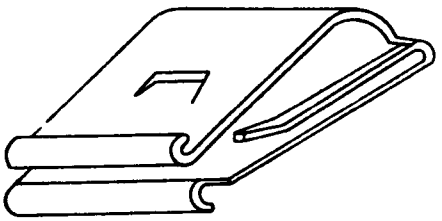
8.22 Except as covered in Paragraph 8.23 mounting plates fastened by means of clips should be separated from one another by means of 1/32" mounting plate separators as shown on Figure 4. The separator may be placed at either the top or bottom of the mounting plate except that, where the adjacent plates are of different thicknesses the separator should be placed over the thinner plate.

8.23 Where a drilled type mounting plate is located adjacent to a punched type plate having a common cover, a 1/8" mounting plate separator, as shown in Figure 5, should be used between the two plates where possible. Adjust the equipment when necessary to allow for this space. When the separators are used, the mounting plates should be supported by four single mounting clips instead of two double clips.

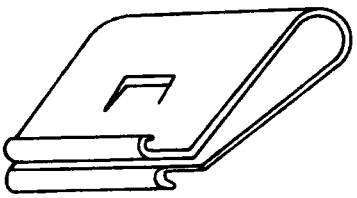
8.3 Spring Clip Assembled Mounting Plates

8.31 Spring steel mounting clips are U shaped and approximately 3/4" square. Two types of clips, a plain (P-44J074)

and a spacer (P-44J075), are required for assembling units. The spacer clip is used for two plate units and at alternate mounting positions between plain clips as required for three to five plate units to compensate for the difference between the 1" interval frame mounting hole locations and the slightly smaller mounting plate width. (See Figure 8).



SPACER CLIP
P-44J075



NON-SPACER CLIP
P-44J074

RP-0233 RM-2

FIG. 8 SPACER CLIPS

8.32 Two clips, one at each end, are used to assemble two adjacent plates. D shaped holes in the mounting plates anchor the clips and prevent shifting. Normally, all clips will be assembled to mounting plates in the shop.

8.33 Mounting Crossbar, Panel, Step-By-Step, and Common Systems units consisting of two to five 189A type 2" x 23" mounting plates or two to five 178A type 2" x 30" mounting plates in accordance with Drawing ED-27723-01 or the following:

(a) Two to five plate units

(1) Spring clip assembled units use four screws, one in the top hole at each end of the top and bottom mounting plates.

(2) On hardened site or earthquake protected installation install two screws in each unit mounting plate, one in the top hole at each end of the plate and in addition install two screws in the bottom holes of the bottom mounting plate (one at each end).

8.34 All other units mounted in the field are to be installed using all mounting screw locations.

8.35 During handling operations, unit spring clips may flex slightly leaving momentary openings between mounting plates. Use care when picking up and mounting units to avoid having surface wiring pinched between mounting plates. After a unit is mounted inspect for this condition.

8.36 Ordinarily, the spring clips will not be removed once a unit is mounted. If it is necessary to remove a clip, use two screwdrivers to pry the clip ends apart. Place the screwdriver blades in the curled ends of the clip. Exert sufficient force in opposite directions to separate the clip enough to clear the D hole in the mounting plate.

8.4 Bar Assembled Mounting Plates

8.41 Units having mounting bars with clearance holes at 2" intervals, shall use four mounting screws, one in each of the clearance holes at each end of the top and bottom mounting plates, when installing up to six mounting plates. When installing 7 to 36 mounting plates, all intermediate clearance holes shall be equipped with mounting screws, and a full compliment of screws shall be used in securing mounting plates to mounting bars.

8.42 Units having mounting bars with clearance holes at 4" and 7" intervals shall have mounting screws in all clearance holes and a full complement of screws in all holes, securing the mounting plates to the bar.

NOTE: This condition covers all 1-3/4" and 2" type mounting plates.

9. FUSE AND HEAT COIL PANELS

9.1 Fuse panels are shipped mounted on adapters. Before mounting the fuse panel on the relay rack, the panel should be shifted on the adapter, so that when the adapter is fastened in position on the rack, the fuse panel will be in the proper location.

9.2 The front faces of adjoining unit-type fuse and heat coil panels of the same nominal thickness should not be out of plane more than 3/32" and the space between adjoining panels should not exceed 3/32".

9.21 Pieces of sheet fibre, cut as required, may be used when it is necessary to shim the panels.

9.3 To prevent the possibility of a short circuit when adding a unit fuse panel to a working fuse bay, it is advisable to remove the ground bus bar from the fuse panel to be mounted, by taking out three screws and one stud.

CAUTION: LIVE EQUIPMENT SHOULD BE PROTECTED AS COVERED IN HANDBOOK 18 AND THE SECTION ON "PREVENTING SERVICE INTERRUPTIONS AND ABNORMAL MAINTENANCE EFFORT" IN HANDBOOK O AND HANDBOOK 3.

10. COMMON CAN COVERS

10.1 Common can covers stamped with a dot in one corner should be mounted with the dot in the upper lefthand corner.

11. ALIGNMENT OF APPARATUS

11.1 All apparatus not having movable parts, such as capacitors, coils, networks, resistors and similar apparatus when mounted in a group on one mounting plate, should be aligned so that the top edges will not be tilted out of horizontal alignment more than approximately 1/6" as gauged by the eye nor should any apparatus be rotated or tilted sidewise from its normal position more than approximately 1/6" as gauged by the eye.

11.2 Where bay equipment consists of several adjacent like units, all units or panels in a group of like units should be dressed to the left so that the left-hand ends of the plates or panels will be aligned within 1/16" of each other. However, where equipment with panel covers is mounted on cable duct-type bays, the units shall be dressed to the left so that the left-hand ends of the plates or panels are within 1/64" of each other. This can be most effectively done by using a straight edge between adjacent panels. No further alignment of apparatus between adjacent units will be required.

→ Arrowed lines indicate new or changed information.

[Vertical line at side of paragraphs indicates requirements.

Engineering Planning Manager
(Installation)

Reason for Reissue:
To add information to Paragraph 8.15 concerning field mounted single plate units in hardened, and earthquake protected areas.