

**BELL SYSTEM PRACTICES**  
**Private Branch Exchange**  
**Installation and Maintenance**

**SECTION B502.305**  
**Issue 1, 8-25-30**  
**Standard**

## **MOUNTING AND ALIGNING MISCELLANEOUS APPARATUS**

### **1. GENERAL**

1.01 This section covers the general requirements and methods for mounting and aligning miscellaneous apparatus.

### **2. TOOLS AND MATERIALS**

- 2.01 Screw-drivers, as required.
- 2.02 Socket Wrenches, as required.
- 2.03 No. 116 Tool (lamp extractor).
- 2.04 No. 319-B Tool (lamp cap and number plate extractor).
- 2.05 Bench Level, 12" (or equivalent).

### **3. REQUIREMENTS**

#### **Alignment of Apparatus on Strip Mountings**

3.01 Apparatus on strip mountings in the face of switchboards, should be aligned as follows:

- (a) Lined up against the stile strip at the left, except in cases where to line up the apparatus at the left, would expose the opposite end of the apparatus strip with the stile casing in place.
- (b) Lined up so that lines intended to be horizontal or vertical are horizontal or vertical, respectively, and so that corresponding strips of apparatus in all panels are in the same horizontal line, unless otherwise specified. The variation in horizontal alignment between corresponding strips in any two adjacent panels should not exceed  $1/32$ ".

#### **Symbols on Lamp Caps, Number Plates, and Similar Apparatus**

3.02 Line up so that like symbols are similarly located with respect to vertical and horizontal alignment.

### **Terminal Strips**

3.03 Line up adjacent terminal strips, such as the 35, 65 and similar types so that they are not more than 1/8" out of alignment.

### **Apparatus Having Spring Contact Surfaces**

3.04 Apparatus having spring contact surfaces, designed to permit mounting with the springs either horizontally or vertically should be mounted, wherever possible, with the springs in a vertical plane, in order to reduce the liability of dust collecting on the contact surfaces.

### **Apparatus Blanks**

3.05 Fit apparatus blanks so that they will not come out during ordinary use of the equipment. When they are too loose, place a small piece of canvas or twine around the portion of the apparatus blank entering the drilling for the apparatus.

### **Condensers**

3.06 **In Roof of Sections:** Mount condensers with the terminal lugs toward the rear, to permit accessibility for soldering.

3.07 **57 Type Condensers:** Mount with terminals near the top or left (facing wiring side) when the terminals are not centrally located.

### **Cord Fasteners**

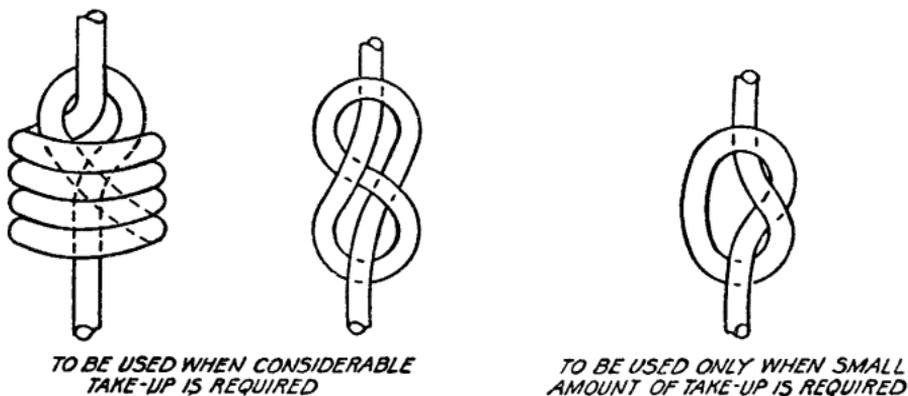
3.08 Mount so that they line up with each other, and when on cord shelves, mount them so that they are at right angles to the length of the cord shelf. Locate fasteners properly over drillings so that the cord tips can be readily inserted.

### **Cord Hooks**

3.09 Mount strip type cord hooks so that they are in alignment with each other and with the lower edge of the cord shelf.

## Cord Weights

3.10 Leave cord weights as low as possible, but not closer than approximately 1" from the base of the section. When weights come less than 1" from the base of the section, tie up the cords as shown in Fig. 1. Locate the cord knots as near the cord hooks as possible.



**Fig. 1—Knots for Taking up Slack in Cords.**

## Designation Strips

3.11 Mount 8-L and similar type designation strips so that the paper strips can be inserted from the left.

## Fuses

3.12 **Alarm Type Fuses:** Install 35, 43, 44 and similar type fuses with the side mounting slot of the fuse attached to the battery side of the circuit, to insure proper contact between the alarm bar and the alarm spring of the fuse.

3.13 **Non-alarm Type Fuses:** Install 24 and similar type fuses, when mounted vertically, with the side mounting slot of the fuse to the right. When mounted horizontally, place the side mounting slot at the bottom.

3.14 **Dummy Fuses:** Install dummy fuses in all unequipped fuse and heat coil positions on panels, to assist in identifying unequipped studs.

### **Heat Coils**

3.15 Mount alarm type heat coils, such as the 74 and similar types, with the side mounting slots of the coil mounting attached to the battery side of the circuit, to insure proper contact between the alarm bar and the alarm spring of the heat coil.

### **Mounting Apparatus in Face of Switchboards**

3.16 **Jack Mountings, Lamp Socket Mountings, Designation Strips** and similar apparatus in the face of switchboards should meet the following requirements:

- (a) Securely held in place by jack fasteners or other means as may be provided for this purpose.
- (b) Fairly tight but easily removable.
- (c) No appreciable space between mountings

3.17 **Jack Mountings, 141 and Similar Types:** Mountings for 141 type jacks with vertical springs should be placed with the brass mounting strip under the jacks when the face of the mounting is  $1/2''$  thick and above the jacks when it is more than  $1/2''$  thick.

3.18 **Jack Spaces:** Where top jack spaces in switchboards are arranged to extend above the lower edge of the top moulding to allow for shrinkage, such jack spaces should not be cut to fit.

### **Keys**

3.19 **Keys in a key shelf** should be spaced so as to be evenly distributed over the space allotted on the equipment drawing.

3.20 **Individually Mounted Shell Type Keys:** Mount so that the front edge of the key shells will be flush with the surface in which they appear. Mount chamfered shells so that the top of the shell projects above the keyshelf by an amount equal to the depth of the chamfer. A variation of  $1/32''$  either way from these locations is permissible, except that the variation between any two adjacent keys in the same panel should not exceed  $1/32''$ .

## Lamp Caps

3.21 Lamp caps should fit in their mountings so as not to be readily turned when the turning of the caps might cause confusion in the interpretation of the symbols or designations.

## Lamp Sockets, Individually Mounted

3.22 Front edge of sockets should be flush with the surface in which they appear. A variation of  $1/32''$  either way will be permissible, except that the variations between any two adjacent sockets in the same panel should not exceed  $1/32''$ . Shells or frames should not be grounded through the framework by means of wiring, or in any other manner.

## Mounting Plates

3.23 **Individual mounting plates** should be level within  $1/16''$ .

3.24 **Fastening mounting plates** and associated designation strips and magnetic shields on frames, racks and units: Use machine screws, unless otherwise specified. The screws listed below are suitable for this purpose. Ends of machine screws should not extend more than their diameter beyond the nut, except where not conspicuous and where there is no liability of damage to equipment or wiring, or danger of personal injury by the protruding portion. Screws should be free from defaced heads and stripped threads, and not burred or bent to such an extent as to interfere with the placing or removal of a nut, unless otherwise specified. Screws should not be so short that more than one complete thread of the nut remains unengaged.

.216 - 24 x  $1/4''$  R.H.I.M. Screw (P-205327)

.216 - 24 x  $3/8''$  R.H.I.M. Screw (P-160187)

.216 - 24 x  $1/2''$  R.H.I.M. Screw (P-160021)

.216 - 24 x  $5/8''$  R.H.I.M. Screw (P-94447)

3.25 **Mounting Plates Secured by Means of Clips:** Space plates as follows:

- (a) When a drilled type mounting plate is located adjacent to a punched type plate having a common cover, use a  $1/8''$  mounting plate separator as shown in Fig. 2 between the two plates, where possible. Adjust the posi-

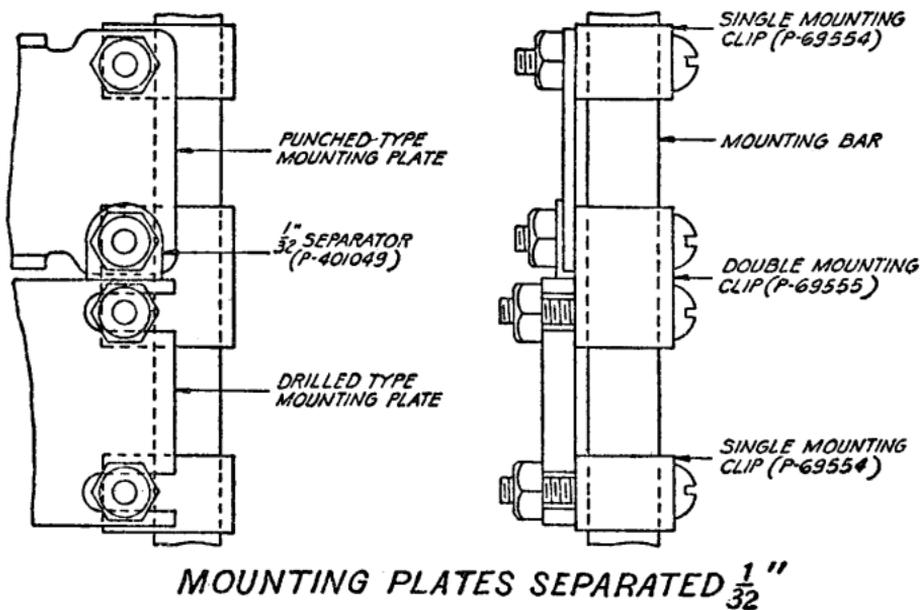
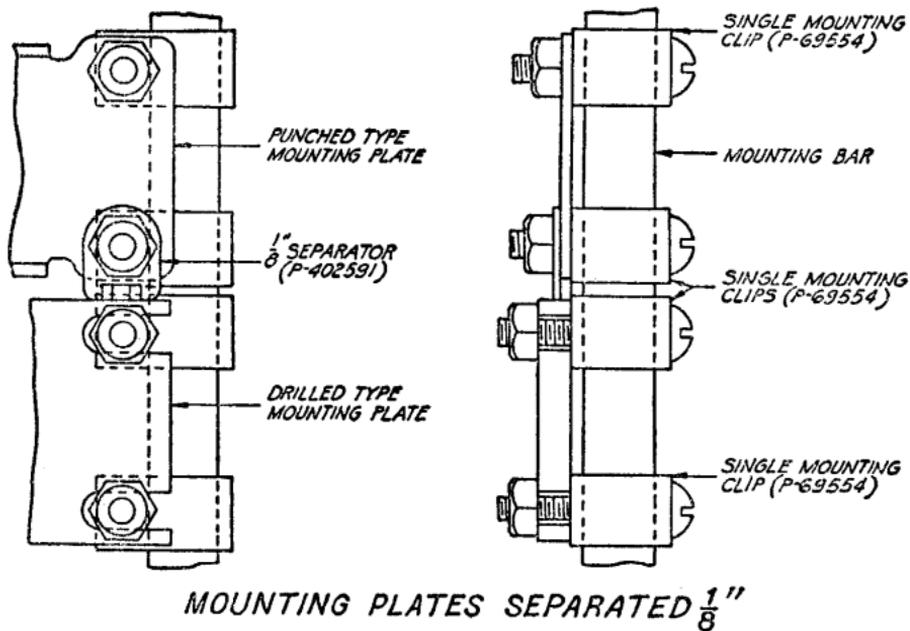


Fig. 2—Mounting Plate Separators.

tion of the equipment where necessary to allow for this space. Use four single mounting clips instead of two double clips.

- (b) Except as in (a), separate the mounting plates by means of a 1/32" mounting plate separator as shown in Fig. 2, unless otherwise specified. Place the separator at either the top or bottom of the mounting plate. Where adjacent plates are of different thicknesses, place the separator over the thinner plate.

### **Number Plates**

3.26 Mount flush type number plates so that they are flush with the adjacent framework. A variation of .01" either way may be allowed.

### **Plug Seats**

3.27 Mount plug seats so that the variation between the centers of drillings in the plug seats and plug shelf will not interfere with the proper operation of the cords and plugs.

### **Relays, Repeating Coils, Resistances, and Similar Apparatus**

3.28 A slight variation may be allowed in mounting this apparatus on angle brackets or in the roof of switchboards or similar locations. An exception shall be made in the case of repeating coils, induction coils, and retardation coils, used in connection with operators' telephone circuits, in which case do not decrease the dimensions between adjacent sets.

### **Resistances, 19 Type Having Unequal Windings**

3.29 When mounted vertically, place so that the low resistance winding will be at the top, thus bringing the code label on the left. When mounted horizontally, place so that the low resistance winding will be toward the right, thus bringing the code label on the top.

## **4. METHODS**

### **Protection Against Personal Injury**

4.01 **Mounting Apparatus:** It usually is advantageous to mount shop wired units before running in the cabling to these units. Cabling to other apparatus usually should be run in and formed before the apparatus is mounted, to prevent

injuries to hands and arms that might occur from striking apparatus terminals, and to prevent damage to apparatus during cabling and forming operations.

4.02 **Use screw-drivers** in such a manner as to avoid injury if screw-driver slips.

### **Cords**

4.03 **Place cords in the proper hole in the plug shelf.** Push the cord tips in one at a time. Pull cords in from rear of section.

4.04 **Knot the cord, if necessary,** as shown in Fig. 1, after determining what knot should be used by trying with the cord weight in position.

4.05 **Place eyelet tip on cord hook and cord tips under cord fastener screws.** Unless otherwise specified, tip of cord is white, ring blue, and sleeve red.

### **Face Equipment**

4.06 **Jack fasteners should be unscrewed** sufficiently to allow insertion of apparatus.

4.07 **Holding the jack strips** against the stile strip at the left of a panel while tightening jack fasteners will align jacks vertically in most cases.

4.08 **Irregularities in vertical alignment of jack strips** may be corrected by loosening the jack fasteners for the strip involved, inserting two plugs in the jacks and pressing the strip into position. Press on plugs close to the face of the jack strip to avoid danger of damaging jacks or plugs.

### **Fuses**

4.09 It usually is economical to use 24 type fuses during tests made prior to placing equipment in service. If these fuses are used, be sure that alarm type fuses are mounted after the test operations are completed.

### **Lamps, Lamp Caps, Lamp Sockets and Lamp Socket Mountings**

4.10 **Lamp Socket Mountings:** Mount so that battery strap will be farthest from associated jacks.

- 4.11 **To prevent dirt getting into lamp sockets** install lamps and lamp caps in key shelves as soon as practicable.
- 4.12 **Code of lamps** should agree with the code shown on the wiring diagram.
- 4.13 **When inserting lamps** see that contacts of lamp make with springs in socket. Push in about flush with face of socket. Use the No. 116 tool for removing defective lamps.
- 4.14 **Placing Lamp Caps:** When the turning of lamp caps in the sockets might cause confusion, fit tightly by spreading prongs when necessary. Use the No. 319-B tool for removing lamp caps.
- 4.15 **Mounting Individually Mounted Lamp Sockets and Jacks:** A No. 4 brass washer may be used under the lugs when necessary to bring the front edge flush with the surface.

#### **Mounting Plates**

- 4.16 **A full complement of screws** should be used with all mounting plates. Tighten all screws securely, being careful to avoid burrs on the screw slots.
- 4.17 **Mounting plates secured by clips** should be checked with a level to insure meeting requirements.
- 4.18 **Relays:** Mount individual relays with the full complement of screws and washers, and tighten securely. In general, insulating washers are provided to insulate relays from the mounting plate.

### **5. VERIFICATION ITEMS**

5.01 The items listed below may be used for checking the work as it proceeds and for verifying the quality when the work is completed.

#### **5.02 Face Equipment in Switchboards**

- (a) Stile casing screw head slots not excessively burred; finish of casing not rusted or marred.
- (b) Ends of jacks and lamp mountings not exposed; space for inserting designation card at left.
- (c) Spots and numbers in vertical alignment.

- (d) No appreciable space between mountings and jack spaces.
- (e) Top jack spaces not cut to fit where they are arranged to extend above the lower edge of the top moulding.
- (f) Removable number plates fit tight, lamp caps tight when turning would cause confusion of symbols.

### **5.03 Keyshelf Equipment and Piling Rail**

- (a) Cord weights clear floor by 1".
- (b) Plugs seat properly in hole in plug seats.
- (c) Number plates seated flush, tight.
- (d) Lamp sockets flush; not grounded.
- (e) Keys and key spaces flush; no appreciable space between mountings; not damaged.
- (f) Key tops and lever handles tight.
- (g) Apparatus blanks fit properly.

### **5.04 Rear Equipment, Switchboards**

- (a) Head slots of jack fasteners not excessively burred; wings properly hold mountings.
- (b) Cord knots properly made; eyelet tips placed on hook.
- (c) Mounting plates secured by clips level within 1/16"; spaced by 1/32" separator, or a 1/8" separator between drilled and punched type mounting plates; full complement of screws used, slots not burred.
- (d) Insulating washer under flat type resistances; 19 type resistance mounted with lower resistance at top or right; label side at top or left.

### **5.05 Fuses and Heat Coils**

- (a) Non-alarm type fuses mounted with the side slot opening toward the right or bottom; dummy fuses installed at unequipped fuse and heat coil positions on panels.
- (b) Alarm type fuses and 74 type heat coils mounted with side slot to the battery side of the circuit.