

**FUSE BAY**  
**ANGLE RELAY RACK TYPE**  
**EQUIPMENT DESIGN REQUIREMENTS**  
**COMMON SYSTEMS**

**1. GENERAL**

**Scope**

**1.01** This specification, together with the supplementary information listed herein, covers the equipment design requirements for the framework, equipment, and cabling of angle relay rack type fuse bays, superseding fuse board frameworks per J97024. Specification J97024 shall be followed for additions where space has been allocated for this type of fuse board. Equipment included in this specification may be ordered by specifying the code and group numbers covered in Part 4.

**1.02** This specification is reissued to incorporate previous appendix changes.

**Capacity**

**1.03** The 11'-6" fuse bay is arranged for 26 fuse panels, 4-1/2" in width. The 10'-6" fuse bay is arranged for 23 fuse panels.

**Description**

**1.04 *General:*** The fuse bays covered by this specification are of the type originally developed for crossbar offices, in which the bulb angle shape is used for the framework. The panels are mounted between the uprights so that their faces are set back from the front edge or bulb of the angle. The cabling to the fuse bay is butted at the top of the bay and run down through fanning rings to the panels served. Each panel is equipped with a horizontal fanning detail thus permitting cables to be run in and connected one or a few at a time as a job progresses, no sewing being required.

**1.05 *Framework:*** The fuse bays are available in single welded bay frameworks employing

standard angle relay rack drilled for 1-3/4" x 23" mounting plates. This permits utilizing the space on partially equipped fuse bays for relay rack equipment and is in keeping with decentralization of fusing. The bays are made with 3-1/2" x 1-1/2" bulb angle uprights, twin top angles and sheet metal frame base. Bays are also available employing conventional floor angles and angle guard rails.

**1.06** The fuse bays are furnished in 11'-6" and 10'-6" heights, the latter being made available for use in toll offices located in buildings having non-standard ceilings.

**1.07 *Width:*** The fuse bays are furnished in one width only of 2'-0-5/8" measured between backs of uprights. This width permits mounting of 60 capacity double row fuse panels or 30 capacity individually mounted type fuse panels. Where heavy cabling is employed, as at PBX fuse bays, an additional 3-1/2" space in a lineup is required so that the cabling can be accommodated within prescribed limits. This extra space is at the left end of the bay, facing the rear. For bays with the sheet steel base a separate base filler is used to obtain it. For bays with the open type base a frame structure with extended base angle and guard rails is provided.

**1.08 *Ladder guard rails*** are available in two designs, namely, sheet metal frame base construction and open type employing 1-1/2" x 1-1/2" angles. The sheet metal type base is welded to the bay uprights and is designed to provide a 10" or 1'-0" wide ladder guard for lining up with frameworks having similar base construction. The angle type guard rails can be spaced 1'-0", 1'-3" or 1'-8" apart for use in lining up with frames employing floor angles and angle type guard rails of these widths.

**1.09 *End guards*** of the cabinet type are available for use with bays having sheet metal frame

bases, and open bar type for use with bays having angle guard rails.

**1.10 Shop Assembly:** Employing welded structures fully equipped with adapters, cable brackets and insulators, this type of fuse bay lends itself to complete assembly in the factory.

#### Panel Assemblies

**1.11 Material:** All panels, except those for resistance lamps and filters, are made of 5/8" thick impregnated asbestos composition with a 1/16" bevel and dull black finish.

**1.12 Fuse Panels:** Two types of fuse panels are employed, one being bus-bar type arranged for 60 fuses in two rows of 30 fuses each, with or without ground bar, and the other a single row of 30 individually mounted fuses. Both are designed to mount No. 35 type fuses and are available either with or without fanning details.

**1.13 Telegraph Heat Coil Panels:** These panels are arranged to mount 30 or 60 No. 74E heat coils and an associated No. 67 type resistance with each heat coil mounting. The panels are double row type, the heat coils mounting on 1" centers for the 30 capacity panel and on 1/2" centers for the 60 capacity panel.

**1.14 Blank and Combination Ground Terminal, Tone Terminal and Fuse Alarm Panels:** Blank panels are available universally drilled to mount ground terminal details, tone terminal blocks, fuse alarm resistance mounting plates and associated common No. 35 type fuse, as required. The panels are also used to support battery and ground details, or for filling unequipped panel positions when specified by the Telephone Company.

**1.15 Panels for mounting 11 or 13 type resistance lamps** on fuse boards are made of 7/32" steel, 4-15/32" wide, arranged to mount 60, 11 or 13 type resistance lamps in 4 rows of 15 each, spaced on 1" vertical and horizontal centers. These lamps require no socket, being held by a single screw on the rear of the panel. The panels may be furnished with or without ground punchings for doubling up paired ground leads.

**1.16 Filter panels** are available for use in providing quiet battery for talking, filament or plate supplies. For talking battery the filter is made

up of a retardation coil of size as required (10, 20, 50, 112 or 200 amperes) with a pair of condensers bridged to ground with each condenser protected by a 15 ampere fuse. For filament supply the filter is similar except using 3 condensers. The 130 volt plate supply filter employs no coil but simply 3 condensers with a common fuse.

#### Subdivisions of Equipment

##### Framework

- ED-20670-01—End Guards for Use with 1'-3" or 1'-8" Angle Guard Rails
- ED-25528-01—Details for Closing Unequipped Frame Space—Crossbar System
- ED-90019-01—Fuse Record Book and Holder
- ED-90266-01—Guard Rail Junction Details
- ED-90335-01—Vertical Bus Bar Supports and Panel Guards
- ED-90352-01—Fuse Adapter for Mounting NEC Code Fuses
- ED-90838-01—End Guards for Use with 1'-0" Angle Guard Rails
- ED-91210-01—Bay Ground Bar—Crossbar System
- ED-91261-01—Fuse Record Book Holder—Fuse Bay with Sheet Metal Frame Base
- ED-91423-01—Cabinet Type End Guards 10" or 1'0" Wide
- ED-91640-01—Fuse Bay with 10" Sheet Metal Base
- ED-91774-01—Fuse Bay with 1'-0", 1'-3" or 1'-8" Angle Type Guard Rails
- ED-91804-01—Details for Closing Unequipped Frame Space—Common Systems
- ED-60691-01—Open Type End Guard, for Use with Fuse Bay 10'-6" with Angle Guard Rails, 1'-0", 1'-3" and 1'-8" Width
- ED-90425-01—Fuse Board Panels—Panels for Individually Mounted Fuses
- ED-90426-01—Fuse Board Panels—Double Row Fuse Panels
- ED-91838-01—Cabinet Type End Guard for Fuse Bays 10'-6" High
- ED-91840-01—Fuse Bay with 1'-0" Sheet Metal Base
- ED-91839-01—Method of Joining Uprights of Different Types of Frames

##### Panel Assemblies

- ED-90434-01—Telegraph Heat Coil Panels
- ED-91061-01—Resistance Lamp Panels
- ED-91137-01—Blank and Miscellaneous Combination Panels

ED-91219-01—Telegraph Heat Coil Panel with Staggered Resistance Mountings  
 ED-91448-01—Double Row Fuse Panel Assemblies—Equipped with Fanning Details  
 ED-91449-01—Filter Panels—10, 20, and 50 Ampere with 3 Condensers  
 ED-91450-01—Filter Panels—112 and 200 Ampere with 2 or 3 Condensers, and 130 Volt Plate Battery Filter  
 ED-91453-01—Panels with Individually Mounted Fuses—Equipped with Fanning Details  
 ED-91504-01—Filter Panels—10, 20, and 50 Ampere with 2 Condensers  
 ED-91820-01—Equipment Guards

## 2. SUPPLEMENTARY INFORMATION

800-600-000—List of General Equipment Requirement Sections  
 801-000-000—Equipment Design and General Equipment Requirements and Engineering Information—Common Systems

Floor Plan Data  
 Section 9.2, Sheet 7—Crossbar  
 Section 10.2, Sheet 5—Toll Sw. System No. 4  
 Section 2.2, Sheet 18—Manual  
 Section 3.3, Sheet 32—Toll, Sheet Metal Base  
 Section 3.3, Sheet 37—Toll, Angle Guards  
 Section 4.4, Sheet 8—Panel, Angle Guards  
 Section 5.3, Sheet 14—Step-by-Step, Angle Guards

Power Data  
 Section 16.32, Sheet 1—States Electric Co. Terminal Blocks

## 3. DRAWINGS

### Circuit

SD-96211-01—Common Systems—Filter Circuit  
 SD-62465-07—Program Transmission—130 Volt Plate Filter

### Framework and Equipment

ED-20670-01—End Guards for Use with 1'-3" or 1'-8" Angle Guard Rails  
 ED-25528-01—Details for Closing Unequipped Frame Space—Sheet Metal Type Frame Base, Crossbar  
 ED-25529-01—Guard Rail Junction Details Between 10" Sheet Metal Base Frame and Other Frame Having 1'-0", 1'-3" and 1'-8" Guard Rails

ED-90266-01—Relay Racks—Method of Joining  
 ED-90838-01—End Guards for Use with 1'-0" Angle Guard Rails  
 ED-91423-01—Cabinet Type End Guards 10" or 1'-0" Wide  
 ED-91640-01—Fuse Bay with 10" Sheet Metal Base  
 ED-91774-01—Angle Relay Rack Fuse Bay with 1'-0", 1'-3", or 1'-8" Angle Type Guard Rails  
 ED-91804-01—Details for Closing Unequipped Frame Space—Sheet Metal Type Frame Base—Common Systems  
 ED-91809-01—Equipment  
 ED-60691-01—Open Type End Guard, for Use with Fuse Bay 10'-6" with Angle Guard Rails, 1'-0", 1'-3" and 1'-8" Width  
 ED-90425-01—Fuse Board Panels—Panels for Individually Mounted Fuses  
 ED-90426-01—Fuse Board Panels—Double Row Fuse Panels  
 ED-91838-01—Cabinet Type End Guard for Fuse Bays 10'-6" High  
 ED-91840-01—Fuse Bay with 1'-0" Sheet Metal Base  
 ED-91839-01—Method of Joining Uprights of Different Types of Frames

### Panel Assemblies

ED-90434-01—Telegraph Heat Coil Panels  
 ED-91061-01—Resistance Lamp Panels—No. 11 or 13 Type Lamps  
 ED-91137-01—Blank and Miscellaneous Combination Panels (Fuse Alarm, Ground, and Tone Terminal)  
 ED-91219-01—Telegraph Heat Coil Panels with Staggered Resistance Mountings  
 ED-91448-01—60 Capacity Double Row Type Fuse Panels—With Fanning Details  
 ED-91449-01—Filter Panels—10, 20, and 50 Ampere—3 Condensers  
 ED-91450-01—Filter Panels—112 and 200 Ampere, 2 or 3 Condensers and 130 Volt Plate Battery Filter  
 ED-91453-01—30 Capacity Individually Mounted Type Fuse Panel—With Fanning Details  
 ED-91504-01—Filter Panels—10, 20 and 50 Ampere—2 Condensers

### Cabling

ED-91203-01—Fuse Bay—Cabling  
 ED-91523-01—Cabling to One or Two Fuse Panels

on the Same Bay with Relay Rack Equipment

ED-91695-01—Bus Bar Connections—Separate Battery Supply for Alternate Panels—Common Ground

#### Miscellaneous

ED-90019-01—Fuse Record Book and Holder—For Bar Type End Guards

ED-90093-01—Grounding Arrangements

ED-90335-01—Miscellaneous Details

ED-90352-01—Adapter for Mounting N.E. Code Fuses, 0 to 30 Amperes

ED-91210-01—Grounding Details

ED-91220-01—Fanning Details, Multipanel Adapters, Etc.

ED-91261-01—Fuse Record Book Mounting—Sheet Metal Frame Base

ED-91593-01—Fuse Panel—Design Details

ED-91820-01—Equipment Guard

#### 4. EQUIPMENT

##### Framework

**ED-20670-01—Open Type End Guards for 11'-6" Fuse Bays with 1'-3" or 1'-8" Angle Guard Rails**

**Group 11**—End guard for fuse bay per ED-91774-01, group 1, with 1'-3" guard rails—A&M Only

**Group 12**—End guard for fuse bay per ED-91774-01, group 1, with 1'-8" guard rails—A&M Only

**Group 13**—End guard for right end facing front of fuse bay arranged for heavy cabling per ED-91774-01, group 2, with 1'-3" guard rail—A&M Only

**Group 14**—End guard for right end facing front of fuse bay arranged for heavy cabling per ED-91774-01, Group 2, with 1'-8" guard rail—A&M Only

**Group 15**—End guard for right end facing front of fuse bay arranged for heavy cabling per ED-91774-01, group 4, with 1'-3" guard rails

**Group 16**—End guard for right end facing front of fuse bay arranged for heavy cabling per ED-91774-01, group 4, with 1'-8" guard rails

**Group 17**—End guard for fuse bay per ED-91774-01, group 3, with 1'-3" guard rails

**Group 18**—End guard for fuse bay per ED-91774-01, group 3, with 1'-8" guard rails

**ED-60691-01—Open Type End Guards for Fuse Bay 10'-6" High with 1'-0", 1'-3" or 1'-8" Guard Rails—A&M Only**

**Group 4**—End guard for fuse bay with 1'-0" guard rails

**Group 5**—End guard for fuse bay with 1'-3" guard rails

**Group 6**—End guard for fuse bay with 1'-8" guard rails

**ED-25528-01—Details for Closing Unequipped Frame Space—Crossbar System**

**Group 4**—Details for closing space of unequipped frame 2'-0-5/8" long

**ED-90019-01—Fuse Record Book and Holder**

**Group 1**—Holder assembly—end guard mounting

**Group 2**—Holder assembly—wall or column mounting

**Group 3**—Fuse record book, 3/4" thickness with 97 sheets

**Group 4**—Fuse record book, 1/4" thickness with 22 sheets

**Group 5**—Fuse record book, 1/2" thickness with 62 sheets

**Group 6**—Fuse record book, 1" thickness with 138 sheets

**ED-90266-01—Guard Rail Junction Details**

**Group 2**—Guard rail junction details between fuse bay and I-beam relay rack 1/2" floor angle separation

**Group 7**—Guard rail junction details between fuse bay and channel relay rack 2" separation, or I-beam relay rack 1" separation

**Group 9**—Guard rail junction details between fuse bay and I-beam relay rack 2" floor angle separation

**Group 10**—Guard rail junction details between fuse bay and I-beam relay rack 2-1/2" floor angle separation or channel relay rack 3-1/2" floor angle separation

**ED-90335-01—Vertical Bus Bar Supports and Panel Guards**

**Group 4**—Adapters for one fuse panel

**Group 8**—Support for vertical bus bar in unequipped panel positions

**ED-90352-01—Fuse Adapter for Mounting NEC Code Fuses**

**Group 1**—Fuse adapter

**ED-90838-01—Open Type End Guards for Use with Fuse Bay with 1'-0" Angle Guard Rails**

**Group 14**—End guard for fuse bay 11'-6" high per ED-91774-01, group 1, with 1'-0" guard rails—A&M Only

**Group 15**—End guard for left end facing rear of fuse bay with heavy cabling 11'-6" high per ED-91774-01, group 2, with 1'-0" guard rails—A&M Only

**Group 16**—End guard for fuse bay 11'-6" high per ED-91774-01, group 3, with 1'-0" guard rails

**Group 17**—End guard for left end facing rear of fuse bay with heavy cabling 11'-6" high per ED-91774-01, group 2, with 1'-0" guard rails

**ED-91210-01—Bay Ground Bar—Crossbar System**

**Item 11**—Ground junction details—1" x 1/8" ground bar to vertical fuse bay signal ground bonding bar

**Item 13**—1" x 1/8" ground bar—for one 23" bay

**Item 18**—1" x 1/8" ground bar with terminal punchings—for one 23" bay

**ED-91261-01—Fuse Record Book Holder—Fuse Bay with Sheet Metal Frame Base**

**Group 1**—Fuse record book holder

**ED-91423-01—Cabinet Type End Guard Assemblies**

**Group 1**—End guard 10" wide

**Group 7**—End guard 10" wide for left end of bay facing rear of fuse bay arranged for heavy cabling

**Group 9**—End guard 1'-0" wide

**Group 11**—End guard 1'-0" wide for left end of

bay facing rear of fuse bay arranged for heavy cabling

**ED-91640-01—Fuse Bay Assemblies with Sheet Metal Frame Base**

**Group 1**—Bay 11'-6" high with 10" frame base

**Group 3**—Bay 11'-6" high with 10" frame base arranged for heavy cabling

**Group 6**—Fuse bay 10'-6" high, 10" sheet metal base—A&M Only

**ED-91774-01—Fuse Bay Assemblies Having Angle Guard Rails**

**Group 1**—Fuse bay 11'-6" high—less guard rail supports—with fuse panel 10" from floor—A&M Only

**Group 2**—Fuse bay 11'-6" high—less guard rail supports—with fuse panel 10" from floor, arranged for heavy cabling—A&M Only

**Group 3**—Fuse bay 11'-6" high—less guard rail supports—with fuse panel 1'-0" from floor

**Group 4**—Fuse bay 11'-6" high—less guard rail supports—with fuse panel 1'-0" from floor, arranged for heavy cabling

**Group 5**—Fuse bay 10'-6" high—less guard rail supports—with fuse panel 1'-0" from floor—A&M Only

**Group 7**—Guard rail support for 1'-0" guard rail width, 1-3/4" between upright and front guard rail

**Group 8**—Guard rail support for 1'-3" guard rail width, 2-3/4" between upright and front guard rail

**Group 9**—Guard rail support for 1'-8" guard rail width, 3-1/4" between upright and front guard rail

**Group 10**—Guard rail support for 1'-0" guard rail width, 2" between upright and front guard rail—A&M Only

**Group 11**—Guard rail support for 1'-3" guard rail width, 5-1/2" between upright and front guard rail—A&M Only

**Group 12**—Guard rail support for 1'-8" guard rail width, 6-1/2" between upright and front guard rail—A&M Only

**Group 15**—Separation details between fuse bay and channel relay rack 2" separation, 1'-3" or 1'-8" angle guard rail width—A&M Only

**Group 16**—Separation details between fuse bay and I-beam relay rack with 1" separation,

1'-0" angle guard rail width—A&M Only

- Group 17**—Separation details between fuse bay and I-beam relay rack with 1" separation, 1'-3" or 1'-8" angle guard rail width—A&M Only
- Group 19**—Separation details between fuse bay per group 2 and I-beam relay rack with 5-9/16" separation of uprights, 1'-3" or 1'-8" guard rail width—A&M Only
- Group 20**—Separation details between fuse bay per group 2 and channel relay rack with 3-19/32" separation of uprights—A&M Only
- Group 21**—Separation details between fuse bay per group 2 and I-beam relay rack with 4-1/2" separation of uprights, 1'-0" guard rail width—A&M Only
- Group 22**—Separation details between fuse bay per group 2 and I-beam relay rack with 4-1/2" separation of uprights, 1'-3" and 1'-8" guard rail width—A&M Only

***ED-91804-01—Details for Closing Unequipped Frame Space—Common Systems***

- Group 2**—Details for closing space of unequipped frame 2'-0-5/8" long—10" frame base
- Group 4**—Details for closing space of unequipped frame 2'-0-5/8" long—1'-0" frame base
- Group 9**—Details for closing space of unequipped frame 2'-4-1/8" long—10" frame base
- Group 10**—Details for closing space of unequipped frame 2'-4-1/8" long—1'-0" frame base
- Group 11**—Details for mounting pipe guard when unequipped space is between fuse bay and channel relay rack

***ED-91838-01—Cabinet Type End Guards for Fuse Bay 10'-6" High—A&M Only***

- Group 1**—End guard complete for fuse bay with 10" guard rail width
- Group 3**—End guard complete for mounting 3-1/2" out from frame upright for right end of fuse bay arranged for heavy cabling with 10" guard rail width
- Group 4**—End guard complete for fuse bay with 1'-0" guard rail width
- Group 6**—End guard complete for mounting 3-1/2" out from frame upright for right end of fuse bay arranged for heavy cabling with 1'-0" guard rail width

***ED-91839-01—Method of Joining Uprights for Different Types of Frameworks***

- Group 1**—Separation details between fuse bay and I-beam relay rack with 1/2" floor angle separation without cabling on adjacent I-beam and no extension of cabling beyond angle upright
- Group 2**—Separation details between fuse bay and I-beam relay rack with 1" floor angle separation with cabling on adjacent I-beam upright
- Group 3**—Separation details between fuse bay and I-beam relay rack with 2" floor angle separation with normal extension of cabling beyond single upright
- Group 4**—Separation details between fuse bay and I-beam relay rack with 2-1/2" floor angle separation with abnormal cabling on angle upright
- Group 5**—Separation details between right end of fuse bay with heavy cabling and an I-beam relay rack with 1" floor angle separation with cabling on adjacent I-beam upright
- Group 6**—Separation details between fuse bay and channel relay rack with 1/8" separation of uprights without cabling on channel upright and no extension of cabling on angle upright
- Group 7**—Separation details between fuse bay and channel relay rack with 2" floor angle separation with cabling on adjacent channel upright or normal cabling on angle upright
- Group 8**—Separation details between right end of fuse bay with heavy cabling and channel relay rack without cabling on adjacent channel upright
- Group 9**—Separation details between right end of fuse bay with heavy cabling and channel relay rack with cabling on adjacent channel upright

***ED-91840-01—Fuse Bay Assemblies with 1'-0" Sheet Metal Base***

- Group 1**—Fuse bay 11'-6" high
- Group 2**—Fuse bay 11'-6" high arranged for heavy cabling
- Group 3**—Fuse bay 10'-6" high—A&M Only

**Panel Assemblies*****ED-90425-01—Fuse Board Panels—Panels for Individually Mounted Fuses******Group 2***—Fuse panel assembly—30-fuse capacity***ED-90426-01—Fuse Board Panels—Double Row Fuse Panels******Group 2***—Fuse panel assembly—60-fuse capacity with ground bar***Group 6***—Fuse panel assembly—60-fuse capacity without ground bar***Group 9***—Fuse panel assembly—60-fuse capacity, 30 arranged for 3- or 5-ampere fuses—with ground bar***Group 10***—Fuse panel assembly—60-fuse capacity—without ground bar and fuse numbering***ED-90434-01—Telegraph Heat Coil Panels******Group 2***—30 capacity***ED-91061-01—Resistance Lamp Panels******Group 7***—60 capacity 11 or 13 type resistance lamps—without ground punchings***Group 8***—60 capacity 11 or 13 type resistance lamps—with 60 ground punchings***ED-91137-01—Blank and Miscellaneous Combination Panels******Group 2***—Blank panel***Group 5***—Ground terminal bar—6 terminal capacity***Group 6***—Ground terminal bar—12 terminal capacity***ED-91219-01—Telegraph Heat Coil Panel with Staggered Resistance Mountings******Group 1***—60 capacity***ED-91448-01—Double Row Fuse Panel Assemblies—Equipped with Fanning Details******Group 1***—60 capacity—with ground bar***Group 2***—60 capacity—without ground bar***Group 3***—60 capacity with bottom row arranged for 3 or 5 ampere fuses—with ground bar***ED-91449-01—Filter Panel—10, 20, and 50 Ampere with 3 Condensers******Group 3***—10 ampere capacity***Group 4***—20 ampere capacity***Group 5***—50 ampere capacity***ED-91450-01—Filter Panels—112 and 200 Ampere with 2 or 3 Condensers and 130 Volt Plate Battery Filter******Group 1***—112 ampere capacity with 2 condensers***Group 2***—200 ampere capacity with 2 condensers***Group 12***—One 130 volt plate battery filter panel***Group 14***—200 ampere capacity with 3 condensers***ED-91453-01—Panel for Individually Mounted Fuses and Equipped with Fanning Details******Group 1***—30 capacity***ED-91504-01—Filter Panels—10, 20, and 50 Ampere with 2 Condensers******Group 1***—10 ampere capacity***Group 2***—20 ampere capacity***Group 3***—50 ampere capacity***ED-91820-01—Equipment Guards******Group 1***—Equipment guard for fuse panel***Group 2***—Equipment guard for lamp panel**5. GENERAL NOTES****Fuse Bay Application**

**5.01** The fuse bays covered herein shall be used for new offices and for new fusing centers on additions to existing offices. For additions to fuse boards per specification J97024, continue with equipment of the same type.

**Arrangement of Equipment in Bay**

**5.02** Fuse panels shall be equipped from the bottom of the bay up. In general, locate talking battery panels at the bottom and panels with signal and miscellaneous voltages immediately above with voltages increasing toward the top of the bay. Exceptions may be made for special reasons such as locating important fuses low enough to be accessible without using a ladder or for

cabling reasons. Allow space for ultimate panel equipment for each type of voltage to permit bonding of all panels of like voltage and current characteristics together. Locate resistance lamp panels as high up in the bay as practicable above the fuse panels. A combination ground, tone terminal and fuse alarm resistance mounting panel, when required, shall mount in the uppermost panel position. Quiet battery filters when required shall be located at the top of the bay immediately under this panel so as to connect conveniently to power feeders coming off the cable racks.

**5.03** Space left available on a fuse bay, after allowing for the ultimate growth, may be utilized for mounting miscellaneous relay equipment, the adapter bars being cut off to permit mounting the plates directly on the frame uprights.

#### Location of Fuse Bays

**5.04** *All equipment* on a floor shall be fused on that floor for maintenance reasons.

**5.05** *Fuses and resistance lamps should be decentralized* to minimize service hazards and the concentration of switchboard and power cables, so that it should rarely be necessary to locate more than one fuse bay at any one fusing center. In no case should more than two bays be located at one point.

**5.06** *For regular lines of relay rack*, as an approximate rule, provide a fusing center at the head of each line of 15 or more bays, a center for alternate lines of 10 to 15 bays each or a center every third line for lines having less than ten bays each. Except for miscellaneous circuits described below, limit each fusing center to the bays it is laid out to serve.

**5.07** *For scattered relay rack bays*, such as occurs when filling out lines of dial frames, limit the fusing at any one center to the capacity of one bay and locate centrally with respect to the equipment served.

**5.08** *Miscellaneous fuses*, or specific fuses associated with equipment other than relay rack equipment, should be concentrated at central points on each floor. Where the amount is such that, if locating it with fuses for relay rack equipment would result in the furnishing of an additional bay, all the miscellaneous fusing should

be placed on the overflow bay located, preferably, at a point by itself. Miscellaneous fusing includes ringing, 110 volt coin control, tones, test battery supply, and signal battery for various purposes. In step-by-step offices it includes fusing for connector shelf pickup wiring, talking and ringing supply for transmission selectors, and battery for line message registers relays. Locate all coin control fuses for a given floor at one point. If a fusing center is not already available on a particular floor for miscellaneous fuses, one shall be created by the furnishing of a bay of framework especially for the purpose with such panels as are necessary. PBX fuse bays in general, are classed as miscellaneous. However, as job conditions dictate, it may best serve maintenance to concentrate all PBX fuse bays at one point.

**5.09** *Locate at End Aisles:* Fuse bays should, in general, be located at the main aisle end of frame lineups but may be located on end aisles or occasionally within lineups to more closely associate the bays with the equipment served.

**5.10** *Alarm Equipment:* Locate alarm resistances, when of the 100 or 119 type, on the fuse panel with the alarm lamp and fuses being alarmed. Any relays which may be required shall be located on an adjacent or nearby relay rack bay or on an alarm frame. Alarm resistances of the 18, 19, or 40 type can be accommodated on the combination panel at the top of the fuse bay as covered by paragraph 5.25.

#### Equipment

##### Double Row Fuse Panels

**5.11** These panels are of the bus bar type only and are arranged to mount two horizontal rows of 30 No. 35 type fuses each, fed by a centrally located battery bar on the front of the panel. This type of panel shall be used in all cases where a group of fuses have a common power supply.

**5.12** Panels with ground bars shall be provided except where the circuits obtain their ground elsewhere, such as at the relay rack, in which case panels having the ground bar omitted shall be used.

**Panels for Individually Mounted Fuses**

**5.13** Single row fuse panels arranged for 30 individually mounted No. 35 type fuses shall be used where two or more small groups of fuses of different voltage or current characteristics can be accommodated per panel such as ringing, tone, coin control, generator, and similar arrangements. Fuse posts and ground terminals are strapped with No. 14 and 18 bare strap wire respectively in the shop, the strap wire being cut as required for splitting of fuse groups. Provide a 5D or 5F fuse post in the right end position, facing the front, of each group of fuses of less than 3-ampere capacity. The 5D post is used on panels equipped with fanning strips and the 5F post on panels without fanning strips.

**Separation Between Fuse Groups**

**5.14** Where 35 type fuses of like voltage and current characteristics but different capacities are to be mounted on the same panel, a fuse post shall be removed in order to separate the groups. Fuse posts in positions 11 and 21 of the top row, on panels equipped with fanning strips, can not be removed since they are required to support the fanning strip.

**5.15** Where 35 type fuses of different voltage or current characteristics are to be mounted on the same panel, two adjacent sets of fuse posts and their alarm studs shall be removed to separate the groups. This arrangement is possible only with panels arranged to mount fuses individually. Fuse posts in positions 11 and 21 of the top row, on panels equipped with fanning strips, can not be removed since they are required to support the fanning strip.

**Modification of Panels for 3 and 5 Ampere Fuses**

**5.16** The fuse panels furnished are arranged for 35 type fuses smaller than 3-ampere capacity in all positions, except for panels per group 3 of ED-91448-01 and group 9 of ED-90426-01 which are arranged for 3- or 5-ampere fuses in the bottom row. Where 3- or 5-ampere fuses are to be mounted in any other fuse positions, fuse posts shall be replaced in accordance with the following:

**FUSE POST FURNISHED**

**REPLACING FUSE POST**  
(where 3- or 5-ampere fuses are required)

5A	6B
5D	6F
5E	6C
5F	6E

**N.E. Code Fuses**

**5.17** Where N.E. code fuses are to be mounted on fuse bays, as for interrupter and ringing circuits, adapters per the drawing listed herein shall be used. In general, they shall be mounted on panels arranged for individually mounted fuses, since the demand for N.E. code fuses is usually limited to 2 or 3.

**Telegraph Heat Coil Panels**

**5.18** Telegraph heat coil panels shall, in general, be located on a separate bay and are required for mounting 74E heat coils and associated 67 type resistances for telegraph battery taps. If located on a bay with fuse panel equipment, the heat coil panels shall be located in the upper section of the bay due to heat dissipation.

**5.19** Heat coil panels of double capacity having staggered resistances, designed for use with TTY switchboard may be employed where the 67 type resistances do not exceed 120 ohms each, otherwise undue heating will result.

**Telegraph Fuse Bays**

**5.20** In telegraph fuse bays having 130 volt positive and 130 volt negative in the same bay, the panels with positive battery shall be separated from the panels with negative battery by at least one blank panel or by one or more panels supplying low voltage fuses such as 24 or 34 volt.

**Resistance Lamp Panels**

**5.21** Resistance lamp panels for 11 or 13 type lamps or mounting plates for 12 type resistance lamps shall be mounted as far from the floor as possible to avoid having the lamps struck by persons passing in the aisle. In general, locate the lamps in the same bay with any associated fusing. When 12 type lamps are specified they shall be mounted

on 609B mounting plates and the fuse bay adapter bars shall be cut to permit mounting these plates directly on the frame uprights.

#### **Ground Terminal Panel**

**5.22** Since the requirements for the ground terminal panel vary with each job, the panel assembly shall be made up from a universally drilled blank panel, ground terminal bar and tone terminal blocks being furnished as required. The assembly serves for terminating and doubling up miscellaneous ground and tone leads.

**5.23** The ground terminal panel shall be mounted near the top of a fuse board. This arrangement assumes the leads enter the bay from the cable rack. In case the leads come from below the ground terminal panel may be located at the bottom of the bay. However, with fuse bays having a sheet metal base, cabling cannot be brought into the bottom of the frame through sleeves in the floor.

**5.24** In general, 5 circuit terminal blocks per Power Data Section 16.32, Sheet 1, Item 105 will provide ample capacity. Where an especially large capacity is required a 15 circuit block per Item 115 on special drillings may be used. This block will mount on a 1'-11" panel together with a 12 terminal ground bar.

#### **Fuse Alarm Panel**

**5.25** The fuse alarm panel is designed to mount the alarm circuit fuse and the alarm resistances of 18, 19 or 40 type which must be located as close to the associated fuses as possible. All associated relays should be mounted on the floor alarm board or office alarm frame in dial offices and on the miscellaneous relay rack in manual and toll offices.

**5.26** As a rule, the fuse alarm equipment can be combined on the same blank panel with the ground terminal panel and located at the top of the bay. A separate panel located near the top of the bay may be employed when the panel capacity will not permit the combination.

#### **Blank Asbestos Composition Panels**

**5.27** When a panel space is required for supporting bus bars or for terminating large power

feeders to the bay, a blank asbestos composition panel shall be employed at such point on the bay as required.

**5.28** Blank panels shall be used in all unequipped fuse panel positions only when specified by the Telephone Company.

#### **Quiet Battery Filters**

**5.29** Decentralized quiet battery filters for talking battery, filament or plate supply when required shall be mounted at the top of the fuse bay, immediately under the combination ground terminal and fuse alarm panel, to facilitate connecting to overhead power cables and also to leave the lower part of the bay available for fuses for easier maintenance. Appearance of the bay is also a factor. Provide a filter for each fusing center. It is permissible to locate the filter in an adjacent relay bay in rare cases where to do so will save a bay of framework. The condition is not desirable and, when used, the leads leaving the filter should be as short as possible.

#### **Fuse Panels**

**5.30** As indicated under Part 4 "Panel Assemblies", single and double row fuse panels, either equipped with fanning details or without fanning details are available for use on these fuse bays. Those equipped with fanning details permit the elimination of horizontal sewed forms to fuse panels and shall be used in all cases except for panels serving PBX battery feeders, where 16 gauge wire is specified. This latter condition requires the use of horizontal sewed forms, and fuse panels without fanning details shall be used.

#### **Framework**

**5.31** *Angle type ladder guard rails* shall be provided on both front and rear of all bays not having a sheet metal frame base. Furnish two supports for angle guard rails in the originating bay and one in each additional bay.

#### **Equipment Guard**

**5.32** All fuse bays shall have an equipment guard located at the 10th panel position (4'-4-3/4")

from the floor. Additional guards shall be located as follows:

(a) If the bay contains any resistance lamps below the 4'-4-3/4" level additional guards shall be located at panel positions 8, 6, etc., depending on how far down the lamps extend. A guard is not required below the 2nd panel position.

(b) As indicated elsewhere herein, the higher potentials, such as 110 volt coin collect, 130 volt plate battery, and 130 volt positive or negative telegraph battery, shall be located insofar as possible in the upper portion of a bay. If, however, any panels containing these potentials are located below the 4'-4-3/4" level, they shall be protected by additional guards in the same manner as resistance lamps, and resistance lamp panels.

**5.33 End Guards and Closing Details:** No end guard shall be furnished on the end of a fuse board located 8" or less from a wall or column, or 2'-8" or less from an adjacent frame in the same lineup. In the latter case guard rails shall be made continuous. In practice the 2'-8" space will be met only in panel offices where the fuse board is in line with double sided frames and a clearance of 2'-8" is required for the removal of the multiple banks. In relay rack lineups where a single bay of relay rack is omitted the space will not exceed 2'-0" approximately. Where the space of one bay of ultimate equipment is left within a lineup it should be closed by means of details per ED-25528-01 or ED-91804-01 for sheet metal frame base construction. Where the fuse bay lines up with frames of different guard rail width junctioning details per ED-25529-01 or ED-90266-01 should be furnished as required

**5.34 A framework ground lead need not be provided,** except where bays are isolated, that is, braced to the ceiling or otherwise supported independent of the main auxiliary framing structure, since framework is adequately grounded through the auxiliary framing, cable rack and conduit system, when furnished. In isolated bays framework ground will be obtained by means of a No. 6 ground lead between a lug on the framework upright and the source of ground. If a signal ground bus bar is located on the fuse bay this shall be used as the ground source. When a ground terminal panel is furnished the lead from the framework shall be

terminated on this panel, the latter being connected to the ground source. Where there are two or more adjacent bays in an isolated lineup the frameworks shall be grounded by a single No. 6 lead terminated in a lug located on an upright of one of the bays.

#### **Cabling**

**5.35 All switchboard and local cables** shall be carried down the left side of the bay, facing the rear, the switchboard cables to be butted at the top of the bay and run through the fanning rings down to their respective panels. Where this vertical bay wiring does not exceed 12 square inches in section, as for 22 and 24 gauge wiring, the regular fuse bay and associated rings will be adequate.

**5.36 Heavy Cabling Conditions:** For bays having over 12 square inches of vertical cabling, as with 16 gauge wiring on PBX fuse bays, use fuse bays "arranged for heavy cabling" which are provided with larger rings and a 3-1/2" frame base filler or floor angle extension on the cabling end of the bay. Use this type of bay where more than 4 double row fuse panels, or the equivalent, are wired with 16 gauge wire. When only a few panels in a bay are wired with 16 gauge wire they should be located toward the top of the bay to provide the best cabling arrangement. On account of cabling difficulties, the number of panels per bay should further be limited to 22 when all are of the double row type and wired with 16 gauge wire.

**5.37 Power cables** shall be brought down the right side of the bay, facing the rear and supported every 1'-3" maximum.

#### **Vertical Bonding Bars**

**5.38 Battery and ground connections shall,** in general, be made in accordance with the drawings listed herein. The vertical bus bars connecting groups of panels of the same voltage and current characteristics shall be 1-1/2" by 1/4" bus bars and shall be installed initially for all ultimate panels.

**5.39 Vertical bus bars passing unequipped panel positions** shall be supported not less than once every seventh position and shall be supported at the free end when two or more panel

positions at the top of the group of fuse panels are unequipped. Support details shall be provided as covered on the miscellaneous detail drawing.

**5.40** *In No. 3 toll offices*, the vertical bus bar connections for the toll line relay and busy signal fuse equipment shall consist of a continuous battery bus bar for all the equipment in the bay, unless otherwise specified by the customer. When specified, the fuse panels accommodating the inward and outward toll line busy signal fuses shall have vertical bus bar connections separate from the panels accommodating the toll line relay, lamp and thru busy signal circuit fuses.

**5.41** *The filament and signal ground supply* to fuse panels on repeater fuse bays shall have their ground bars bonded together by a common vertical bus bar. Adjacent bays shall be similarly bonded together.

#### Numbering

**5.42** *Rows of fuses and resistance lamps* shall be numbered from 1 up starting with the bottom row, the numbering to be stamped on the panels. Within a double row fuse panel the fuse assignment shall be from top down. If only one row is equipped initially, the row so equipped shall be the top row.

(a) This change in practice should apply to new fuse bays only. It does not apply to panels added to existing fuse bays where bottom up equipment of the two rows within a panel has already been established.

(b) Top down assignment should also apply to resistance lamp panels.

**5.43** *Position numbers of fuses and resistance lamps* on the panels shall be numbered from 1 up starting at the left facing the front, each row being numbered separately. These numbers shall be stamped on the panel except where the actual circuit names and numbers are simple enough to permit stamping directly on the panels.

#### Miscellaneous

**5.44** *Spare fuse holders* for mounting spare 35-type fuses shall be furnished and located as covered on the common systems end guard

drawing and in the panel and crossbar end guard specifications. These are coded 10A for use on open or bar type end guards and 11A for cabinet type end guards.

**5.45** *Ringling, coin control and 130 volt plate circuits* (except plate circuits using the 35R .180 ampere fuse) shall be fused with 35 type fuses which have their fuse wire protected by a porcelain tube, i.e., 35J, 35K, etc. Where the ringling plant provides two separate sources of LT1 (paths busy tone) supply, equipment supplied with this tone, such as step-by-step selector frames, shall be fed by two separately fused leads from the ringling power board. Place odd circuits in one fuse group and even circuits in the second group.

(a) The 35R, 0.180-ampere fuse when used as a distribution fuse for potentials in excess of 100 volts should have in series with it a 5-ohm resistance with a minimum rating of 1/2 watt. The object of the resistance is to prevent excessive flashing which might result in the operation of adjacent fuses, the operation of the main fuse in the power feeder, or both. The resistance should be mounted on the end of the fuse post as covered in paragraph 2.21(e) of BSP 800-612-154. The 5-ohm resistance affords protection against the operation of the main fuse if the latter has a capacity of 15 amperes or more, or if the battery has a capacity of 100 ampere-hours or less.

**5.46** *A fuse record book* shall be furnished when the fuse and lamp numbering is such that it cannot readily be stamped on the panels. When one or more panels on a bay require a fuse record book this treatment shall apply to all the panels of the bay. The panels shall be stamped with the fuse capacities, row numbers, and fuse or lamp position numbers. The row numbers, fuse capacities, circuit names, numbers, etc., shall be placed in the book for all panels. If the required capacity of the book is greater than 97 sheets the size shall be specified per ED-90019-01, Table 2.

**5.47** *A fuse record book holder* shall be furnished for each record book and mounted on the fuse bay end guard, within the sheet metal frame base when provided, or on an adjacent wall or column.

**5.48** A channel or I-beam bay should be furnished where the frame height is less than 11'-6", pending the standardizing of angle type bays under 11'-6" high, or where it is desired to mount one or two fuse panels on a channel or I-beam bay

with other equipment. Fuse panels equipped with fanning details should be used and mounted by means of regular channel or I-beam adapters. The cabling of panels mounted on channel or I-beam bays is shown on cabling plan ED-91203-01.

Bell Telephone Laboratories, Inc.