

**FUSE BAY**  
**BULB ANGLE TYPE RELAY RACK**  
**ARRANGED FOR 70-TYPE FUSES**  
**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 to be used in the engineering, manufacture, and installation of bulb angle type relay rack fuse bays employing 22- and 23-module type fuse blocks for 70-type fuses.

**1.02** This specification is reissued to:

- (a) Modify paragraph 5.31 to remove reference to fuse panels wider than 2 inches. This change agrees with ED-95169-01, Issue 4D.
- (b) Modify paragraph 5.32 to remove reference to fuse numbering. This change agrees with ED-95178-01, Issue 3D.

**CAPACITY**

**1.03** The fuse bay frameworks are arranged for the mounting of thirty-three, forty-six, or sixty 2- by 23-inch mounting plates. The fuse panels used in this fuse bay are standard 2- by 23-inch mounting plates equipped with 40 fuse positions and one fuse alarm lamp. Table A shows the maximum fuse capacities of the frames.

**DESCRIPTION**

**1.04 General:** The fuse bays covered by this specification are of the type developed to incorporate the 22 and 23 fuse blocks for 70-type fuses and are assembled on a bulb angle type relay rack framework. The fuse panels are mounted between the uprights so that the cap of the fuse

TABLE A

FRAME HEIGHT	NUMBER OF 2- BY 23-INCH MTG SPACES	MAX FUSE CAPACITY
7-0	33	1320
9-0	46	1840
11-6	60	2400

blocks lacks being flush with the front edge or bulb of the angle by 3/8 inch.

**1.05 Framework:** The fuse bay is available in a single welded framework employing a standard bulb angle relay rack drilled for 2- by 23-inch mounting plates. This permits utilizing the space on partially equipped fuse bays for miscellaneous relay rack equipment and is in keeping with decentralization of fusing. The bays are made with 3-1/2 by 1-1/2 inch bulb angle uprights and twin top angles. Ten- or 12-inch sheet metal frame bases are used for the 11-6 and 9-0 frames, but only the 12-inch base is used for the 7-0 frame.

**1.06 Height:** The fuse bays are furnished in three heights, 11 feet 6 inches, 9 feet 0 inch, and 7 feet 0 inch.

**1.07 Width:** The fuse bays are furnished in only one width of 2 feet 5/8 inch measured between backs of uprights. This width permits mounting of standard 23-inch long mounting plates in widths of 2-inch increments. Where heavy cabling is employed, an additional 3-1/2 inch space in a lineup is required for the 11-foot 6-inch and 9-foot frames or a 2-inch spacer for the 7-foot frames so that the cabling can be accommodated within prescribed limits. This extra space is at

the left end of the bay, facing the rear or wiring side.

**1.08 Ladder guardrails** are provided by the sheet metal frame base construction. The sheet metal frame base is welded to the bay uprights and is designed to provide a 10- or 12-inch wide ladder guard for lining up with frameworks having similar base construction.

**1.09 End guards** of the cabinet type are available for use with these bays.

**1.10 Shop Assembly:** This type of fuse bay, which employs welded structure, is of the type that lends itself to complete installation of equipment in the shop; the only exceptions are fragile items such as resistance lamps.

**1.11 Cabling:** The fuse bay cabling is butted at the top of the bay and run loose through fanning rings to the required fuse panel. Each fuse panel is equipped with a small fanning ring to provide a convenient break-off point from the vertical cabling. The fuse panel wiring from the fanning ring is run as surface wiring. The wiring for the top row of fuse and ground terminals is run through the trough formed between the top row of fuse terminals on the panel served and the bottom row of fuse terminals on the above adjacent fuse panel; the wiring for the bottom row of terminals is run through the trough between the panel served and the lower adjacent fuse panel. This cabling arrangement allows cables to be run in and connected one or a few at a time as a job progresses; a minimum of ties is required for completion of the wiring.

**1.12 Material:** All panels, with the exception of the filter panels and telegraph heat coil panels, are standard channel type (2- by 23- or 4- by 23-inch) mounting plates. The filters are mounted on sheet metal (steel) panels that are provided with the filters, and the telegraph heat coils are assembled on asbestos panels.

**1.13 Fuse Panels:** Two basic types of fuse panels are employed, which are as follows:

(a) **Single voltage fuse panels**, which employ the new 22- and 23-type fuse blocks, are arranged to provide 40 fuse positions for 70-type fuses and one fuse alarm lamp. These fuse panels are provided with or without ground

terminals as required by the particular installation. This type of fuse panel is designed to accommodate only a single potential per panel.

(b) **Multivoltage fuse panels** are provided to accommodate tone, fused grounds, or other potentials in which only a few fuse positions are required for the complete job.

**1.14 Telegraph heat coil panels** are arranged to mount 60 74E heat coils and an associated 67-type resistor with each heat coil mounting. The panels are double rows with the heat coils mounted on 1/2-inch centers.

**1.15 Ground and tone terminal panels** are arranged on a job basis to provide a common point for bonding of the relay rack ground bars on the lineups served by the fuse bay to the signal battery ground feeder and for terminating and doubling up miscellaneous ground leads. The panels are also used to provide a disconnect type terminal for connection of the signal leads to the tone supply leads.

**1.16 Resistance lamps, 11- or 13-type**, on fuse bays are assembled on 4- by 23-inch channel type mounting plates and are arranged to mount 45-, 11-, or 13-type resistance lamps in three rows of 15 lamps each, spaced on 1-inch vertical and horizontal centers. These lamps require no socket, since they are held by a single screw on the rear of the panel. The panel may be furnished with or without ground punchings.

**1.17 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 (or coils) and a pair (or one) of electrolytic capacitors, with a 15-ampere fuse in series with each capacitor, between the load side of the retardation coil and ground. An alarm type fuse is wired in parallel with each 15-ampere fuse. This alarm fuse is usually located on one of the fuse panels served by the filter. The filters are furnished in ratings of 0 to 5, 0 to 15, 6 to 15, 16 to 25, 26 to 50, 51 to 112, and 113 to 200 amperes. The +48 volt filters are not available in the 0- to 15- and 113- to 200-ampere ratings.

**2. SUPPLEMENTARY INFORMATION**

801-000-000—Equipment Design and General Equipment Requirements and Engineering Information—Common Systems

800-600-000—List of General Equipment Requirement Sections

J97025—801-006-155—Relay Rack—Angle Type—Framework and Cabling

J99226—801-025-168—Battery Filters—Equipment and Wiring

Floor Plan Data—

Section 3.3, Sheet 32, Manual—Toll

Section 4.4, Sheet 9, Panel

Section 5.3, Sheet 18, Step-by-Step

Section 9.2, Sheet 7, Crossbar

Section 10.2, Sheet 5, No. 4, 4A, and 4M Toll

KS-5482-01—Power Wire and Cable

KS-5517—Lug (Solderless Terminal)

KS-5537—Connector (Parallel Cable Type)

KS-15977—Connector (Terminal Lug, Parallel-Tap, and Splice Types)

**3. DRAWINGS**

WE drawings should be ordered by referring to the prefix and the base number and requesting the current dash (—) number.

**Circuits**

SD-27899-01—Crossbar Systems No. 1—+ 48 Volt Filter Circuit

SD-32537-01—Step-by-Step Systems—+ 48 Volt Battery Filter Circuit

SD-95571-01—Filter Circuit—24 and 48 Volts

SD-96511-01—Filter Circuit—130-Volt Plate

**Framework and Equipment**

ED-91261-( )—Fuse Record Book Holder Assembly

ED-95169-01—Typical Fuse Bay Equipment

ED-95170-( )—Fuse Bay—Angle Relay Rack Type Assemblies

**Panel Assemblies**

ED-27755-( )—No. 1 Crossbar—+ 48 Volt Talk Battery Filter Unit—Miscellaneous Fuse Bay Mounted

ED-32375-( )—Step-by-Step Systems—+ 48 Volt Talking Battery Filter Equipment—Miscellaneous Fuse Bay or Relay

**Rack Mounted**

ED-91219-( )—Group 5—Telegraph Heat Coil Panels

ED-95172-( )—Filter—130-Volt Plate

ED-95173-( )—Fuse Panel Assembly (Single Voltage)

ED-95174-( )—Filter—0-50 Amperes—24 and 48 Volts

ED-95175-( )—Filter—51-200 Amperes—24 and 48 Volts

ED-95176-( )—Combination Panel Assembly

ED-95177-( )—Resistance Lamp Panel Assembly

ED-99354-( )—Fuse Panel Assembly (Multivoltage)

**Cabling**

ED-95171-01—Typical Fuse Bay Cabling

**Miscellaneous**

ED-95178-01—Fuse Record—Typical Arrangement of Fuse Record Book and Marking of Fuse Panels

**4. EQUIPMENT**

The equipment which is covered by this specification shall be ordered in accordance with the drawings listed in Part 3.

**5. GENERAL NOTES****Fuse Bay Application**

**5.01** The fuse bay covered herein shall be used for new offices and for additions to existing offices. For additions to existing J97033 fuse bays, 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 filtered battery panels at the bottom and panels with signal and miscellaneous voltages immediately above with voltages increasing in potential 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 in the bay as practicable above the fuse panels. A combination ground terminal and tone terminal panel, when furnished, shall be

mounted in the uppermost panel position. Quiet battery filters, when required, shall be located at the top of the bay immediately under the combination panel so that connection to power feeders coming off the cable racks is convenient.

**5.03** Space left available on the fuse bay, after allowing for the ultimate growth, may be utilized for mounting miscellaneous relay rack equipment.

#### 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 fuse bays be located at one point.

**5.06** *For regular lines of relay rack bays*, provide a fusing center at the head of each line of 15 to 30 bays, a center for alternate lines of 10 to 15 bays each, or a center every third line for lines having less than 10 bays per line. This pattern should be followed, with rare exceptions, to provide a low impedance power source to the equipment served by the fuse bay. Exceptions to this requirement should be restricted to the miscellaneous circuits described below.

**5.07** *For scattered relay rack bays* as occur when filling out lines of frames, limit the fusing at any one center to the capacity of one bay that is centrally located 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. When the addition of miscellaneous fuses to an existing fusing center results in the need for an additional bay, all the miscellaneous fusing should be placed on the overflow fuse 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 register 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. In general, PBX fuse bays are classified as miscellaneous; however, as job conditions dictate, all PBX fuse bays may be concentrated at one point.

**5.09** *Locate at End of Lineup:* Fuse bays shall, 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 fuse bays with the equipment served.

**5.10** *Alarm Equipment:* Locate alarm resistances 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 an alarm frame. Alarm resistances of the 18-, 19-, or 40-type shall be located on the panel with the alarm relays.

#### Equipment

**5.11** *Common Battery Fuse Panels:* As indicated on the drawings listed under Part 3 **Panel Assemblies**, only one basic type of fuse panel is employed with a battery bus bar that is common to all fuse positions, as well as an alarm bar which is common to all fuse positions. This fuse panel may be furnished with or without ground terminals as required by the particular job. The ground terminals, when provided, are insulated from the mounting plate.

**5.12** Fuse panels with ground terminals shall be provided except where the circuits obtain their ground elsewhere in which case panels without ground terminals may be used.

**5.13** *Multivoltage fuse panels* arranged for mounting either the 70 alarm type or the glass tube type shall be used where two or more small groups of fuses for voltages of different characteristics, such as ringing, tone, coin control, etc, are required.

#### Telegraph Heat Coils

**5.14** Telegraph heat coil panels shall, in general, be located on a separate fuse bay; these are required for mounting 74E heat coils and associated

67-type resistors for telegraph taps. If located on a bay with other fuse panel equipment, the heat coil panels shall be located in the upper section of the fuse bay due to heat dissipation and the exposed terminals and bus bars on the front of the panel.

**5.15** Heat coil panels of full capacity having staggered resistances may be employed if the 67-type resistances do not exceed 120 ohms each; otherwise, undue heating, as covered on ED-91219-( ), will result.

#### **Telegraph Fuse Bays**

**5.16** In telegraph fuse bays having 130-volt positive and 130-volt negative in the same bay, the panels with positive battery shall be separated by at least one (4-inch wide minimum) blank panel or two or more panels supplying low voltage fuses, such as 24 or 34 volts.

#### **Resistance Lamp Panels**

**5.17** Resistance lamp panels for 11- or 13-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 their associated fusing.

#### **Ground and Tone Terminal Panel**

**5.18** Since the requirements for the ground and tone terminal panel vary with each job, the panel assembly shall be made up from a universally drilled blank panel, with the ground terminal bar and tone terminal blocks being furnished as required. The assembly is used for terminating and doubling up miscellaneous ground and tone leads and for bonding the relay rack ground bars of the lineups served by this fuse bay to the signal battery ground leads feeding the fuse bay.

**5.19** The ground and tone terminal panel shall be mounted in the uppermost position of the fuse bay. This arrangement assumes the power feeders enter the bay from the cable rack, since this type of fuse bay employs frameworks with sheet metal bases which prevent the cabling from being brought into the bottom of the framework through sleeves in the floor.

**5.20** In general, 5-circuit terminal blocks will provide ample capacity. Where an especially

large capacity is required, a 10-circuit block may be used.

#### **Blank Panels**

**5.21** Blank 189A or 233A mounting plates shall be used in unequipped fuse panel positions only when specified by the telephone company.

#### **Quiet Battery Filters**

**5.22** Decentralized quiet battery filters for talking battery, filament, or plate supplies when required shall be mounted at the top of the fuse bay immediately under the ground and tone terminal panel to facilitate connecting to overhead power cables. Provide a filter for each fusing center. It is permissible to locate the filter on an adjacent relay rack bay or framework; however, this condition is not desirable and when used, the leads leaving the filter should be as short as possible.

#### **Framework**

**5.23** The framework shall be standard angle type relay rack, drilled for thirty-three, forty-six, or sixty 2- by 23-inch mounting plates and employing either a 10-inch or 12-inch sheet metal frame base. The sheet metal frame base is designed to serve as a ladder guardrail.

**5.24** *Equipment guards* shall be provided for all resistance lamp panels.

**5.25** *End Guard and Closing Details:* No end guard shall be furnished on the end of a fuseboard located 8 inches or less from a wall or column or 2 feet 8 inches or less from an adjacent frame in the same lineup. In the latter case, guardrails shall be made continuous. In practice the 2-foot 8-inch space will be met only in panel offices where the fuse bay is in line with double-sided frames and a clearance of 2 feet 8 inches 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 feet 7/8 inch. Where the space of one bay of ultimate equipment is left within the lineup, it should be closed by means of details as shown on ED-25528-71 or ED-91804-70 for sheet metal frame base construction. Where the fuse bay lines up with frames of different guardrail design, junctioning details per ED-25529-70 should be furnished as required.

**5.26** *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 connected to this panel; the panel is 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**

**5.27** *All switchboard and local cables* shall be carried down the left side of the bay facing the rear and the switchboard cables shall 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- or 24-gauge wiring), the regular fuse bay and associated rings will be adequate.

**5.28** *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 inch frame base filler on the cabling end of the bay. Use this type of bay where more than six 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.

**5.29** *Power cables* shall be brought down the right side of the bay facing the rear and supported every 1-1/2 feet maximum.

#### **Vertical Bonding**

**5.30** *Battery and ground connections* shall, in general, be made in accordance with the

drawings listed herein. The vertical bonding conductors, connecting groups of panels of the same voltage and current characteristics, shall be calculated for the ultimate number of panels and shall be installed initially.

#### **Numbering**

**5.31** *Position number of panels* installed on the fuse bay shall be from 1 up starting with the first 2-inch wide position 10 inches from the floor level and each 2-inch increment to the height of 10 feet 10 inches. These position numbers shall be stamped on the panels as shown on ED-95169-01.

**5.32** *Position Number for Fuses:* Fuses shall be numbered from left to right viewing the apparatus side. These numbers shall be stamped on both sides of the panel with the numbering on the wiring side reading from right to left. See ED-95178-01 for details.

**5.33** *Position number for resistance lamps* on resistance lamp panels shall be from 1 to 15 starting at the left facing the front; each row is numbered separately. The rows shall be designated A, B, C, etc, starting with the lowest row and continuing up to the top row of lamps provided in the fuse bay. The row letter and position number shall be stamped on the panel reading from left to right on the apparatus side and right to left on the wiring side.

#### **Miscellaneous**

**5.34** Fuse holders for mounting spare fuses shall be furnished and located as covered on the common systems end guard drawing and in the panel and crossbar end guard specifications.

**5.35** *A fuse record book* shall be furnished with each fuse bay. The panel position number, fuse position number, potential, fuse capacity, circuit number, circuit description, functional designation, and the equipment location shall be placed on a separate sheet in the fuse record book for each panel furnished.

**5.36** *A fuse record book holder* is provided in the sheet metal frame base of the angle-type relay rack framework that is furnished as part of this fuse bay.

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