CONVENTIONAL DISTRIBUTING FRAMES
TYPES OF PROTECTION ON B-TYPE FRAMES AND DOUBLE-SIDED PROTECTOR FRAMES WITH SEPARATE DISTRIBUTING FRAMES

1. GENERAL

1.01 This section explains the types of protection and application of carbon blocks and heat coils used with telephone equipment for voltage and current protection of exposed telephone circuits to protect central office switching equipment.

1.02 The reasons for reissuing this section are listed below. Since this reissue is a general revision, no revision arrows have been used to denote significant changes. The Equipment Test Lists are not affected.

(1) Change the title to Conventional Distributing Frames—Types of Protection on B-Type Frames and Double-Sided Protector Frames With Separate Distributing Frames

(2) To cover the types of protection necessary for B-type frames.

(3) Move the warning markers and guards to the descriptive sections in which the associated equipment is covered.

1.03 Protection for B-type distributing frames is covered in this section. The outside cable conductors on the B-type main distributing frame are terminated on the vertical side of the frame on protector mountings, 444-type jacks (301-type connectors) or 300-, 303-, or 305 type connectors. On double-sided protector frames, outside cable pairs are terminated on jacks or 302- or 308-type connectors mounted on verticals on both sides of the frame. Cables are then run to terminal strips on the vertical side of a main distributing frame. Cables from the central office equipment are terminated on terminal strips mounted on the horizontal side of the main distributing frame.

Note: The term ***connector*** is applied to distinguish the newer cable terminating devices (300-, 301-, 302-, 303-, 305-, and 308-type connectors) from the term ***protector*** which has been applied to terminating mounting assemblies such as C50, E50, etc.

2. PROTECTION CONSIDERATIONS

2.01 The purpose of central office protection is to ensure the safety of telephone personnel and reduce the possibility of equipment damage due to lightning and foreign voltage contacts with the outside plant.

2.02 To determine the types of protection required for a specific telephone plant, it is necessary to determine whether the plant is considered to be ***exposed*** or ***unexposed*** as follows:

(a) ***Exposed Plant:*** Telephone plant that is subject to lightning, possible contact with power conductors operating at more than 300 volts to ground, power induction, or a rise in ground potential of more than 300 volts to ground, is classified as ***exposed.***

(b) ***Unexposed Plant:*** Telephone plant not subject to the conditions described in (a).

2.03 To determine the exposure status of a plant, the possibility of changes in exposure due to changes in cable distribution systems must be considered.

3. CLASSES OF CONDUCTORS

3.01 Conductors entering a central office are generally classified according to the type of

central office protection as ***exposed*** or ***unexposed.*** Protection is divided into three classes as follows:

(a) ***Class P:*** Applies to conductors requiring full protection consisting of carbon protector blocks and heat coils

(b) ***Class TP:*** Applies to conductors requiring carbon protector blocks only

(c) ***Class NP:*** Applies to conductors requiring neither heat coils nor carbon protector blocks.

Note: For administrative purposes or for engineering reasons, conductors which are considered to be in a certain class may be placed in a different class according to local instructions.

4. PROTECTION

(a) ***Voltage Protection:*** Voltage protection is provided by two protector blocks for each pair. The airgap between the carbons in the protector block is 3 mils. One electrode of each protector block is connected to ground; the other electrode to the conductor being protected. When the voltage on the conductor exceeds the sparkover value, the conductor is grounded by arcing across the 3-mil airgap between the carbons in the protector block. The carbon will usually return to its original state after the abnormal voltage is removed. If an excessive current flows across the airgap, the carbons may become shorted and permanently ground the conductor being protected. Protector blocks are required on ***all exposed circuits*** and may be used on unexposed subscriber loop circuits for plant flexibility.

(b) ***Current Protection:*** Current protection is provided by heat coils which protect telephone equipment against damage from sneak currents. ***Sneak currents*** are foreign currents that flow through equipment to ground. They are driven by a voltage that is too low to arc over the carbon blocks and the magnitude of the current is too low to protect by fused cable conductors. Protective heat coils consist of a coil of wire wound around a metal tube. Inside the tube is a metal pin soldered to the tube with low melting point alloy and connected to one end of the coil. The arrangement is such that the coil is in series with the conductor to be protected. If an overcurrent condition develops, the coil will heat and melt the low temperature alloy. The metal pin, under pressure of the mounting spring, will be forced through the tube to connect the line to ground. This diverts the damaging currents to ground and prevents damage to central office equipment.

(c) Heat coils are used on ***all*** exposed circuits except toll circuits, and subscriber loop pairs terminated in high-frequency carrier cabinets. Various types of carrier circuits such as Subscriber Loop Multiplex Systems (SLM*), Subscriber Loop Carrier Systems (such as SLC*-40, SLC-1, etc), and T-Carrier on cable pairs classified as ***exposed*** require heat coils. These carrier circuits, without protection, leave the equipment vulnerable to a fire hazard. Toll circuits (except T-1 carrier) do not require heat coils because they terminate on repeat coils or other impedance matching devices not subject to overheating from sneak currents. Where the number of full circuits in a group is small compared with the exchange component, general practice is to use the same type of terminating apparatus for the whole group for administrative reasons.

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5. TYPES OF PROTECTIVE APPARATUS

5.01 On any particular B-type main distributing frame, any of the following types of protective apparatus or jacks may be found alone or in various combinations.

Note: Protective apparatus may be designated as protector mountings or connectors (see note in paragraph 1.03).

C-, E-TYPE AND SIMILAR PROTECTOR MOUNTINGS

5.02 The C- and E-type protectors are used in terminating exposed outside plant cable pairs. The C-type protectors provide both current and voltage protection through the use of heat coils and carbon protector blocks. The E-type protectors provide voltage protection only, through the use of protector blocks. For further information on the C- and E-type protectors, refer to Section 201-206-101. Both the C- and E-type protectors are rated manufacture discontinued.

444-TYPE JACKS (301-TYPE CONNECTORS)

5.03 The 444-type jacks (301-type connectors) are used in terminating unexposed outside plant cable pairs. The 444-type jacks provide no protection and are rated additions and maintenance only. For further information on the 444-type jacks, refer to Section 201-206-101.

300-TYPE CONNECTORS

5.04 The 300-type connectors are used in terminating exposed outside plant cable pairs. The 300-type connectors provide both current and voltage protection through heat coils and carbon protector blocks. For further information on the 300-type connectors, refer to Section 201-207-101.

302-, 303- AND 305-TYPE CONNECTORS

5.05 The 302-, 303-, and 305-type connectors are used in terminating unexposed or exposed outside plant cable pairs. These connectors provide voltage only, current and voltage, or neither current nor voltage through the use of the 3-, 4-, or 5-type protector units. For further information on the protector units, refer to Section 201-208-100.

6. CONDUCTORS ON B-TYPE FRAMES

C-, E-TYPE AND SIMILAR PROTECTOR MOUNTINGS

A. Spare Conductors

6.01 A conductor is considered spare if connected to the protector but not to other office equipment.

6.02 Spare conductors shall be protected with protector blocks per Table A.

B. Working Conductors

6.03 Working conductors shall be protected with protector blocks and heat coils per Table A.

C. Conductors Requiring Mutual Drainage Reactors (Drainage Coils) or Relay Protective Equipment

6.04 Where circuits on main frames require drainage coil or relay protector equipment to minimize interference, protector blocks shall be provided as follows:

(a) ***Protector Mountings at Main Frame:*** The protector mountings, associated with circuits to which the drainage coil assembly or relay protector is connected, shall be equipped with 28- and 29B-type protector blocks where the protector mountings are on 3/8-inch centers and 26- and 30-type protector blocks where the protector mountings are on 1/2-inch centers.

Note: Where the mutual drainage reactors are used, 15-type dummy blocks are used for 3/8-inch protectors or 9-type dummy blocks are used for 1/2-inch protectors. Information on mutual drainage reactors is covered in Engineering Section 876-101-100.

(b) ***Protector Mountings at Drainage Coil Assembly or Relay Protector Mounting:*** The protector mountings associated with the drainage coil assembly or relay protector shall be equipped with 26- and 27-type protector blocks.

444-TYPE JACKS (301-TYPE CONNECTORS)

A. Working Conductors Except Special Lines

6.05 The 444-type jacks provide for connecting class NP cable conductors to central office circuits through normally closed precious metal contacts. This is essentially the same as standard protectors equipped with dummy metal heat coils and dummy protector blocks. No electrical protective devices are used.

B. Special Lines

6.06 Special lines shall be equipped with markers, guards, and terminal punching insulators as specified by local instructions. A description of the apparatus provided for guarding against service interruptions is given in the descriptive section associated with the connector being guarded.

300-TYPE CONNECTORS

Note: Piece-part numbers for the colored caps and designation plates specified in the following paragraphs for use on the 300-type connector are given in Section 201-207-101.

A. Spare Conductors

6.07 A conductor is considered spare if connected to the connector but not to other office equipment.

6.08 Spare conductors shall be protected. For convenience and ease of designation, the protector may be left in the open position. The white line on the cap will be vertical and the cap will protrude farther than the faceplate. The black capped assemblies serve as a designation of class P conductors. In the open position, the protective carbons (32B protector blocks) are effective. The protector units are equipped as listed in Table B.

Note: To further identify these lines, tags or other indicating devices may be used.

B. Working Conductors

6.09 Working conductors shall be provided with protector units equipped as listed in Table B.

6.10 The following four types of class P circuits requiring protection shall have protector blocks equipped as listed in Table B.

(a) Customer lines.

(b) Battery feeders.

(c) Special lines (telegraph loops, radio broadcast lines, police and fire alarms, etc).

(d) Denied lines—The protector units shall be in the open position. The white line on the cap will be vertical and the cap will protrude farther from the faceplate.

Note: To further identify these lines, tags or other identifying devices may be used.

C. Conductors Requiring Drainage Coil or Relay Protective Equipment

6.11 Where circuits on main frames require drainage coil or relay protector equipment to minimize interference, protector blocks shall be provided as follows.

(a) ***Protector Mountings at Main Frame:*** The protector mountings associated with circuits to which the drainage coil assembly or relay protector is connected shall be equipped with 32A and 33B protector blocks.

Note: Where the mutual drainage reactors are used, the 34A1 dummy protector is used instead of the 32A and 33B combination.

(b) ***Protector Mountings at Drainage Coil Assembly or Relay Protector Mounting:*** The protector mountings associated with the drainage coil assembly or relay protector shall be equipped with 32B and 33B protector blocks.

302-, 303-, 305-, AND 308-TYPE CONNECTORS

Note: Code designations for the protector units, designation pins, etc, for use on the 302-, 303-, 305-, and 308-type connectors are given in Section 201-208-100.

A. Spare Conductors

6.12 A conductor is considered spare if it is connected to the connector but not to other office equipment.

6.13 Spare conductors shall be provided with protector units as listed in Table C.

B. Working Conductors

6.14 Working conductors shall be provided with protector units as listed in Table C.

TABLE A

C-, E-, AND SIMILAR TYPE PROTECTOR MOUNTINGS (M.D.)

ITEM	CLASS P	CLASS TP	CLASS NP
Spare Conductors	Protector Blocks No Heat Coils	Protector Blocks No Heat Coils	Dummy Protector Blocks No Heat Coils
Working Conductors	*Customer Lines* Protector Blocks and Heat Coils	*Working Lines* Protector Blocks, Metal Dummy Heat Coils, or Soldered Straps *(Note 2)*	*Working Lines* Dummy Protector Blocks, Metal Dummy Heat Coils, or Soldered Straps *(Note 2)*
	Battery Feeders Protector Blocks and Yellow 75A Heat Coils		
	Special Lines (Note 3) Protector Blocks, Heat Coils, Guards KS-14539 or Equivalent, Terminal Punching Insulators, Indicators KS-6660 or Equivalent *(Note 4)*	*Special Lines (Note 3)* Protector Blocks, Metal Dummy Heat Coils or Soldered Straps *(Note 2)*, Terminal Punching Insulators, Indicators KS-6660 or Equivalent, Guards KS-14539 or Equivalent *(Note 4)*	*Special Lines (Note 3)* Dummy Protector Blocks, Metal Dummy Heat Coils or Soldered Straps *(Note 2)*, Terminal Punching Insulators, Indicators KS-6660 or Equivalent, Guards KS-14539 or Equivalent *(Note 4)*
	Denied Lines Protector Blocks Insulating Dummy Heat Coils		

Notes:

1. Where TP or NP conductors do not appear on the main frame in well defined groups which readily distinguish them from class P conductors, heat coils and protector blocks should be used in order to minimize the probability of accidentally omitting such protection from class P conductor terminations.
2. Not required where heat coil springs are not provided.
3. Procedures for the protection of special lines against service interruptions are covered in Section 201-206-101.
4. A description of apparatus provided for guarding against service interruptions is covered in Section 201-206-101.

TABLE B

300-TYPE CONNECTORS

ITEM	CLASS P	CLASS TP	CLASS NP
Spare Conductor	Protector Blocks, 76A Heat Coils, and Black Caps/White Line	Protector Blocks, Metal Dummy Heat Coils, Gray Caps, and Gray Designation Plates	Dummy Protector Blocks, Metal Dummy Heat Coils, and Gray Designation Plates Black Cap/Blue Line
Working Conductors	*Customer Lines* Protector Blocks, 76A Heat Coils, and Black Caps/White Line	Protector Blocks, Metal Dummy Heat Coils Black Caps, and Gray Designation Plates	Dummy Protector Blocks, Metal Dummy Heat Coils, and Gray Designation Plates Black Cap/Blue Line
	Battery Feeders Protector Blocks, Yellow 75A Heat Coils, Yellow Caps, and Yellow Designation Plates		
	Special Lines (Note 1) Protector Blocks, Heat Coils*, Red Caps, and Red Designation Plates	*Special Lines (Note 1)* Protector Blocks, Metal Dummy Heat Coils Red Caps, and Red Designation Plates	*Special Lines (Note 1)* Dummy Protector Blocks, Metal Dymmy Heat Coils, Red Caps, and Red Designation Plates
	Denied Lines Protector Blocks, No Heat Coils, Green Caps, and Green Designation Plates *(Note 2)*		

Notes:

1. A description of apparatus provided for guarding against service interruptions is covered in Section 201-207-101.
2. To avoid restoring service to a customer line with a protector unit containing a green cap, heat coils are not used in the protector unit.

*The heat coils will be specified locally.

TABLE C

302-, 303-, 305-, AND 308-TYPE CONNECTORS
PROTECTORS AND CLASS OF PROTECTION

ITEM	CLASS P 4-Type Protector Units	CLASS TP 3-Type Protector Units	CLASS NP 5-Type Protector Units
Spare Conductors	Black Housing No Designation Pins	Black Housing No Designation Pins	Gray Housing No Designation Pins
Working Conductors	*Customer Lines*		
	Black Housing No Designation Pins	Black Housing No Designation Pins	Gray Housing No Designation Pins
	Battery Feeders		
	Yellow Housing Yellow Designation Pins	Yellow Housing Yellow Designation Pins	Yellow Housing Yellow Designation Pins
	Special Service Circuit (Note 1)		
	Red Housing Red Designation Pins	Red Housing Red Designation Pins	Red Housing Red Designation Pins
	Denied Circuit (Note 2)		
	Green Housing Green Designation Pins	Green Housing Green Designation Pins	Green Housing Green Designation Pins

Notes:

1. A description of apparatus provided for guarding against service interruptions is covered in Sections 201-208-101 and 201-208-105.
2. No continuity between outside plant and central office.