

SECURING CABLE AND WIRE
BASIC INFORMATION

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| <ul style="list-style-type: none">1. <u>GENERAL</u>1.1 <u>Scope of Section</u>1.11 This section covers the basic information concerning the securing of cable and wire to all types of cable racks. For detailed information, see other sections of this handbook.1.2 <u>General Information Pertaining to Arrangement of Tools, Precautions, Verification, Specs and Drawings and Figures</u>1.21 Refer to Section 1 of this handbook for information pertaining to these items.2. <u>INSTALLING EQUIPMENT</u>2.1 The tools and supplies generally used for operations covered in the 300 Series are as follows: | <ul style="list-style-type: none">2.11 <u>Tools</u>R-2195 Pliers, Side Cutting 8" (See Note 1)R-2542 Remover, Clip, CableR-3208 Screwdriver, Cabinet, 3" (See Note 2)R-2118 Strap, TrunkR-6443 Cutter, DiagonalR-3209 Needle, Insulated, Cable SewingR-2712 Strap, WebNOTE 1: For cutting excess from clips when disposing of projecting ends.NOTE 2: For mounting anchor clips.2.12 <u>Supplies</u>R-2916 TwineR-3359 Tape, Gray Plastic Adhesive, 1/2"R-3428 Tape, Gray Plastic Adhesive, 3/4"RM-583101 Fiber Sheet, Gray, 1/64"P-409474 Protection Detail, Fiber Gray (See Note)KS-5370 Cable Clips |
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NOTICE - NOT FOR USE OR DISCLOSURE OUTSIDE THE BELL
SYSTEM EXCEPT UNDER WRITTEN AGREEMENT

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- A-1 Anchor Clips
- SA-S Start Clips
- SD-S Start Clips
- RA-S Regular Clips
- RB-S Regular Clips

NOTE: Gray fiber details P-409474 are furnished on equipment. If necessary, these details may be made of 1/64" gray fiber, RM-591862, or requisitioned from Installation Stockkeeping.

Purchase: Strap Iron for supporting cables,
Locally 1/8" x 1" per Figure 8, Section 320.

Purchase: Carpenter's Aprons (See Note).
Locally

NOTE: Aprons used to carry clips, clip remover, bolts, nuts, and similar items.

3. PRELIMINARY PLANNING FOR THE SECURING OF CABLES

3.1 General

3.11 Plans for securing of cable must be made before cables are run so that anchor clips or cable retaining brackets may be assembled on the racks.

3.2 Cable Clip (KS-5370)

3.21 Cable clips per KS-5370 are to be obtained prior to the Installation start date.

3.211 Cable clips can be obtained from Installation Stockkeeping by forwarding an Installer's Requisition.

3.22 The Installer will be responsible for ordering cable clips for existing office additions and new offices.

NOTE: The Installer is required to provide cable clips for securing vertical cable runs in systems designed to have unsecured cable runs (No. 5 Crossbar, etc.).

3.23 The Installer can obtain the required amount of cable clips in either of two ways:

- (a) Kit 86 contains enough clips to secure 120,000 feet of cable.
- (b) When the quantity of cable to be secured does not require a complete 86 Kit or exceeds 120,000 feet, the Installer can compute the approximate amount of cable clips needed by referring to Table A, B, C, and D.

TABLE A

Width Cable Rack	No. of A-1 Anchor Clips Required Per Stock Length of Cable Rack	
	Horizontal	Vertical
5	15	24
10	27	44
12	31	53
15	34	63
20	50	84
25	60	101
30	70	121

TABLE B

RA-S, RD-S CLIP		
NUMBER OF FEET	CLIPS FOR OLD CABLE RACK	CLIPS FOR NEW CABLE RACK
1 to 4,000	100	100
5,000	200	200
12,000	200	200
13,000	200	300
17,000	200	300
18,000	300	400
22,000	300	400
23,000	400	500
27,000	400	500
28,000	400	600
29,000	400	600
30,000	500	600
32,000	500	600
33,000	500	700
35,000	500	700
36,000	600	700
37,000	600	700
38,000	600	800
42,000	600	800
43,000	700	900
46,000	700	900
47,000	700	1,000
49,000	700	1,000
50,000	800	1,000

TABLE B (Cont'd)

RA-S, RB-S CLIP		
NUMBER OF FEET	CLIPS FOR OLD CABLE RACK	CLIPS FOR NEW CABLE RACK
52,000	800	1,000
53,000	800	1,100
57,000	800	1,100
58,000	900	1,200
62,000	900	1,200
63,000	1,000	1,300
67,000	1,000	1,300
68,000	1,000	1,400
69,000	1,000	1,400
70,000	1,100	1,400
72,000	1,100	1,400
73,000	1,100	1,500
74,000	1,100	1,500
75,000	1,200	1,500
76,000	1,200	1,600
77,000	1,200	1,600
82,000	1,200	1,600
83,000	1,300	1,700
87,000	1,300	1,700
88,000	1,300	1,800
92,000	1,300	1,800
93,000	1,500	1,900
95,000	1,500	2,000

TABLE C

SA-S CLIP		
NUMBER OF FEET	CLIPS FOR OLD CABLE RACK	CLIPS FOR NEW CABLE RACK
1 to 9,000	100	100
10,000	100	200
16,000	100	200
17,000	200	200
18,000	200	300
25,000	200	300
26,000	200	400
27,000	200	400
28,000	300	400
33,000	300	400
34,000	300	500
38,000	300	500
39,000	400	500
42,000	400	500
43,000	400	600
49,000	400	600
50,000	500	700
57,000	500	700
58,000	500	800
60,000	500	800
61,000	600	800
65,000	600	800
66,000	600	900
72,000	600	900
73,000	700	900
74,000	700	1,000
81,000	700	1,000
82,000	700	1,100
83,000	700	1,100
84,000	800	1,100
88,000	800	1,100
89,000	800	1,200
94,000	800	1,200
95,000	900	1,200
96,000	900	1,300

TABLE D

SB-S CLIP		
NUMBER OF FEET	CLIPS FOR OLD CABLE RACK	CLIPS FOR NEW CABLE RACK
1 to 14,000	100	100
15,000	100	200
19,000	100	200
20,000	200	200
24,000	200	200
25,000	200	300
34,000	200	300
35,000	200	400
39,000	200	400
40,000	300	400
44,000	300	400
45,000	300	500
54,000	300	500
55,000	300	600
57,000	300	600
58,000	400	600
64,000	400	600
65,000	400	700
74,000	400	700
75,000	500	800
84,000	500	800
85,000	500	900
89,000	500	900
90,000	600	900
94,000	600	900
95,000	600	1,000

4. SECURING CABLE AND WIRE

4.1 Bar-Type and Modified Ladder Type Cable Racks

4.11 The cable on bar-type, modified ladder type (P33B202), and wide cable rack (841210065), is unsecured and shall be placed in an orderly manner so there will be adequate capacity for all cables. The cables will lie reasonably flat and shall not be pulled to one side of the rack at turns or bends.

4.12 (a) Wires run with unsecured cable shall be banded with two strands of twine approximately every 72 inches (six feet).

(b) The following requires additional ties be applied, when necessary, to keep the loose wires in reasonably good formation on the cable rack.

(c) Intermediate ties shall be applied to secure the loose wires where it appears that the wires might have a tendency to curl, droop or spread, or where the wires tend not to stay reasonably parallel to the cable or cables with which they are run.

(d) Ties shall be applied at those points where the wires change direction, such as at turns or where they enter or leave the cable rack.

(e) On short runs of loose wire where one tie would normally be used to secure the straight portion of the run, the tie shall be approximately centrally located between the turn offs.

4.2 Ladder-Type Cable Rack

4.21 Cables are secured to ladder-type cable racks usually by clipping. See Section 310 for details covering clipping.

4.22 There are several conditions where cable is secured to ladder-type cable rack by sewing. See Section 320 in this handbook for details covering sewing.

4.3 Ladder-Type Cable Rack with Snap-On Cable Brackets

4.31 The high and low level transmission leads in carrier systems shall not be secured except to help the cable lay reasonably flat on the rack or at turn off points.

4.32 See Section 140 of this handbook covering detailed information concerning cable rack brackets.

4.33 A more detailed description of the various cable rack types can be found in Handbook 30.

5. CABLE ARRANGEMENTS

5.1 On Cable Racks

5.11 The arrangement of the cables on the cable racks will have been predetermined and the cable located in their proper relative position when run in.

5.12 Cables in regular runs are given a predetermined arrangement in the cross-sectional views on the job cabling plan drawings.

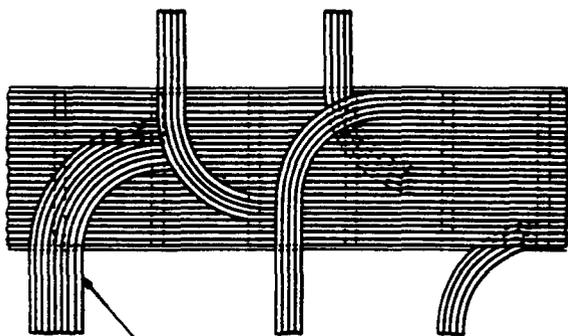
5.121 Place oval and flat cables on edge or flat depending on their position as indicated in the cross-sectional views on the cabling drawings. Oval cables will normally be placed on edge unless they terminate in switchboard or desks.

5.13 Cables in miscellaneous runs are not ordinarily given a predetermined arrangement on the job drawing. They are installed in complete layers across the width of the cable rack, except when other arrangements are indicated on the drawings.

5.14 On No. 5 Crossbar break off cables from the cross-aisle racks through both the cross-aisle and over-frame cable rack to the frame upright. Where the cross-aisle racks are continuous as shown in Section 13A, Handbook 30, it is not permissible to run cables on the over-frame racks under the cross-aisle racks as they would interfere with the cable breaking through the over-frame racks.



FIG. 1 CABLES TURNED THROUGH CABLE RACK (PAR. 5.22)



CABLES TURNING OFF THE RACK FROM ANY GIVEN LAYER SHOULD PASS OVER THE CABLES OF THE SAME LAYER RATHER THAN UNDER THEM.

RP-11096

FIG. 2 CABLES TURNED OVER SIDE OF CABLE RACK (PAR. 5.231)

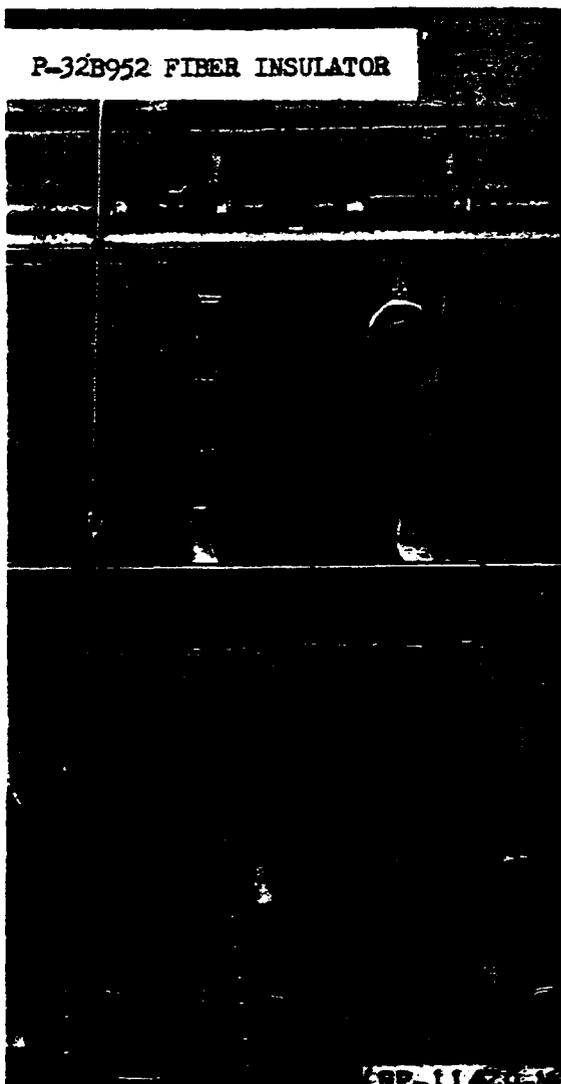


FIG. 3 CABLES TURNED FROM CABLE RACK AT DISTRIBUTING FRAMES (PAR. 5.231)

5.2 At Turns From Cable Racks

5.21 The turning of cables from the cable rack, either through or off the side, is determined when the cables are run, as covered in other sections of this handbook.

5.22 Cables are turned through the cable racks when, under certain specific conditions, the racks are directly over the frames. Figure 1 illustrates the method of arranging and grouping cables brought from the cable rack in this manner.

5.23 Cables turned off the side of the cable rack are to be arranged as follows:

5.231 Make square turn offs as illustrated in Figures 2 and 3. Square turn offs as illustrated, result in a good appearance with minimum effort.

5.232 Taper the cables across the cable rack, as shown in Figure 4, where cables can be arranged to break off the rack in a uniform manner from the near side of the rack. Tapering the cables across the cable rack at turn offs results in a good appearance, economical use of cables and a minimum of blocking.

5.24 Cables to be turned upward as they leave the cable rack are turned off horizontally and then up so as not to interfere with running other cables.

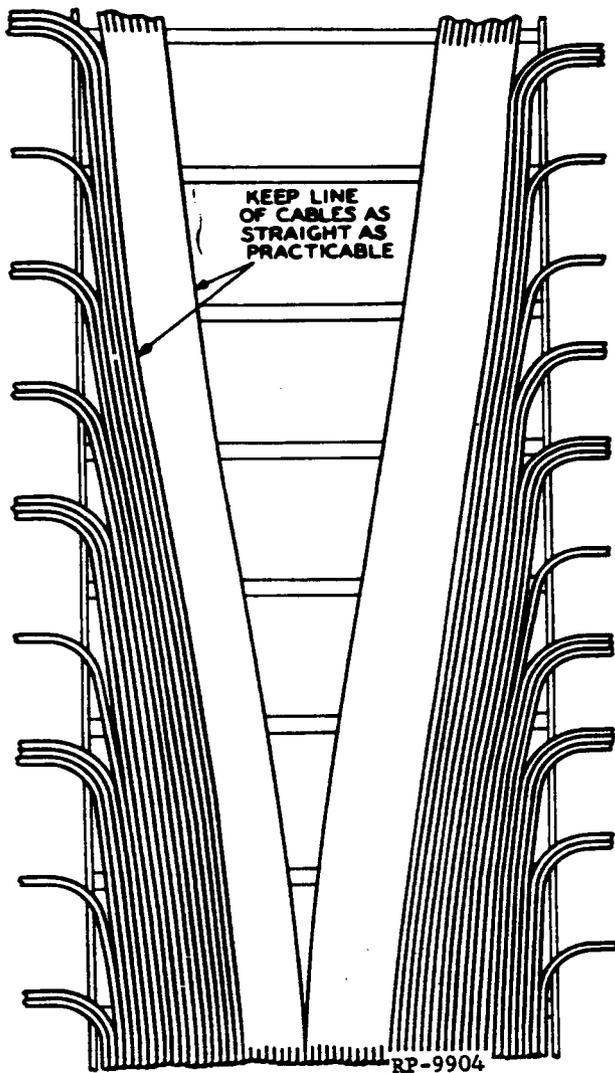


FIG. 4 TAPERED TURN OFF (PARS. 5.231, 5.232)

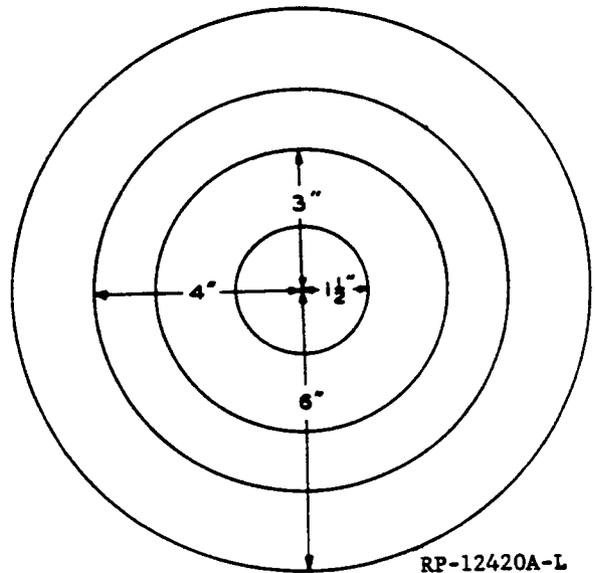


FIG. 5 TEMPLATE LAYOUT (PAR. 5.3311)

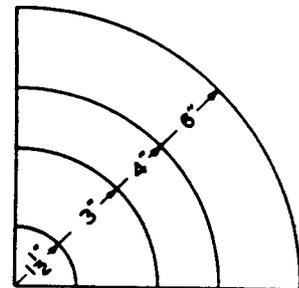


FIG. 6 TEMPLATE (PAR. 5.3312)

5.3 Radii of Cable Bends

5.31 Uniformity at all bends, turns, and offsets is to be maintained.

5.32 Bends are to be formed gradually by hand so no excessive strain is placed on the cable at any one point.

5.33 Cable Bending Radii Template

5.331 Too sharply bending or twisting a cable during a forming operation will injure the insulation. Install cables so that bends are made on radii that are equal to or greater than the minimum bending radii permitted. A template made of fiber or similar material, (cut to form a quadrant, a quarter of a circle, with its radius equal to the minimum bending radius requirements of the cable) may be used for laying out and measuring bends. Bend the inside cable of a run (or the cable having the sharpest bend) to conform to, or fall outside of, the curvature of the template.

5.3311 To make a template for 243A and smaller cable, cut out a circle with a 6" radius on a piece of fiber or cardboard, as illustrated in Figure 5. At the same time, draw circles using the same center point with 4", 3", and 1-1/2" radii.

5.3312 Cut out one-quarter of the circle as illustrated in Figure 6.

5.3313 Now for example, if 243A cable is to be bent around a 90° turn, measure 6" each way from the corner junction point of the cable racks and mark the rack as shown in Figure 7. Then place the template in position, as shown, to form the arc which will be the radius of the cable at the bend.

5.3314 Where the first cable to be laid is on the far side of the 90° angle, add to the minimum bending radius of one cable the width of the other cables which are to go on the rack. Thus, if ten 243A cables are to be laid, each cable being 1.1" diameter, add 9 x 1.1" or 9.9" to the 6" template. This will give the location of the inside of the first cable on the far side of the turn.

5.34 All requirements are met when the bending radii shown in Table E are established. If necessary to use smaller radii, reference to Section 100 of this handbook may indicate some leeway on some codes of cables.

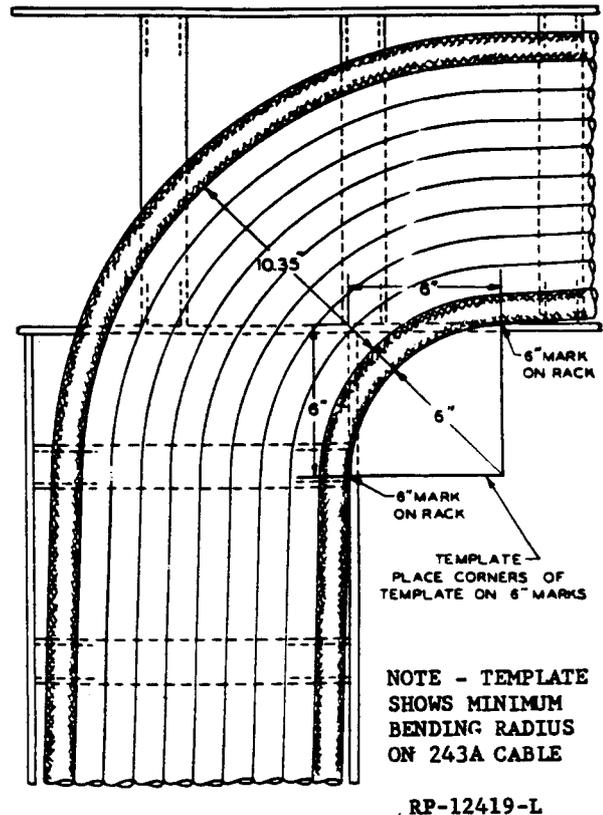


FIG. 7 USING TEMPLATE TO CONTROL BENDING RADIUS (PAR. 5.3313)

TYPE OF CABLE	DIAM	BENDING RADIUS
Round	Up to 1/2"	3"
	Over 1/2" to 1"	4"
	Over 1"	6"
<u>Oval</u>		
Bend on Flat of Cable		2"
Bend on Edge of Cable		3"
<u>Flat</u>		
Bend on Flat of Cable		3"
Bend on Edge of Cable	Less than 1"	6"
	1" to 1-1/2"	8"
	1-1/2" and Over	12"

TABLE E NORMAL BENDING RADII FOR SWITCHBOARD CABLES (PAR. 5.34)

6. VERIFICATIONS

VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS		REFERENCE	
		Par. No.	Fig. No.
6.1	<u>ARRANGEMENTS OF SWITCHBOARD CABLE AND WIRE ON RACKS</u>		
	6.11 <u>Regular Runs</u>		
(P)	6.111 Cables arranged according to predetermined arrangement in cross-sectional views on job cabling drawings.	5.12	
(P)	6.112 Oval cables normally placed on edge unless they terminate in switchboards or desks.	5.121	
	6.113 Cables on cross-aisle racks run over the over-frame cable rack.	5.14	
	6.12 <u>Miscellaneous Runs</u>		
(P)	6.121 Installed in complete layers across width of rack, except when other arrangement is indicated on cable drawings.	5.13	
	6.13 <u>Bending Radii</u>		
	6.131 Proper bending radii used and uniformity maintained at all bends, turns, and offsets.	5.31 5.32 5.34	8
	6.2 <u>Securing of Switchboard Cable and Wire on Cable Racks</u>		
	6.21 <u>Bar Type and Modified Ladder Type Cable Rack</u>		
	6.211 Wires run with unsecured cable are banded with two strands of R-2916 Twine every 72 inches.	4.12	

→ Indicates new or changed information

[Vertical line at side of paragraphs indicates requirements.

Engineering Planning Manager
(Installation)

Reason for Reissue:
Change in requirements for banding of wire to unsecured cable.