

CROSS CONNECTIONS
COMMON METHODS AND REQUIREMENTS

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1. GENERAL INFORMATION

1.1 Scope of Section

1.11 This section covers the general requirements and methods of running and connecting wiring designated on assignment sheets or drawings as "cross connections" for conventional type distributing frames or on equipment frame cross connect fields.

1.12 The requirements covered in this section shall be followed unless modified by job specifications or drawings.

1.13 Distributing Frame Cross Connections are subject to frequent change due to traffic changes, class of service changes, etc., therefore, a durable type of insulation is used for this type of wire. For the latest types of distributing frame wire now available, refer to Table A.

1.131 "L", "U" and "W" types of jumper wire have been rated (MD) Manufacture Discontinued. However, some Operating Companies may still be holding a supply of some of these types of wire on the shelf. Therefore, it may be used if they so specify.

1.14 Each figure in this section illustrates only the conditions to which reference is made in the text and is not to be considered as covering the requirements for other conditions that may be shown.

1.2 Precautions Against Personal Injury, Equipment Damage and Service Interruptions

1.21 The specific precautions to be taken against personal injury, equipment damage and service interruptions are covered in this section. General precautions are covered in Handbook 0 and are to be observed at all times as they apply to the operation being performed.

1.22 Precautions which are to be observed in connection with the performance of cross connect operations, are as follows:

A. When working from ladders, maintain a secure footing. Use a 448A Tool, or broom handle with a notch cut in one end for passing cross connections through the Distributing Frame Rings. This will eliminate the possibility of overreaching.

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- B. Do not stand or climb on any part of the frame.
- C. Eye protection of an approved type must be worn while working on the Distributing Frame or other highly congested wiring areas.
- D. Avoid any practice that will tend to produce or scatter lint or dust particles, such as, dragging wire over terminals or sharp edges of frames, unnecessary handling of cross connections on the shelves or dropping coiled wire from elevated positions.
- E. When passing or pulling cross connections, use care to avoid injury to hands or arms on terminals or projecting iron details.
- F. Double back the end of the cross connection wire about 1" before starting to unreel it. This precaution will reduce the risk of puncture wounds and eye injuries.
- G. Avoid any practice that will cause the cross connection to kink, tangle or otherwise introduce conditions that may adversely affect maintenance or appearance.
- H. When disengaging cross connections which have become caught on terminals or other objects, use extra care to avoid damaging the wire insulation or bending terminals.
- I. Exercise care when connecting or removing jumpers and when cleaning terminals to avoid accidental contact or short to adjacent terminals with pliers, bare wire ends or soldering/wire wrapping tools.
- J. Use extreme care when working on or near battery and ringing supply feeders. Contact with these terminals with tools or other metallic objects may result in personal shock or injury. This could also operate a fuse and disengage service to subscribers.
- K. Particular care should be exercised when working near special service lines such as telegraph loops, fire, police, hospitals and private line carrier services. Serious trouble may result from a momentary cross or short. Do not connect a hand set or receiver across these terminals.
- L. When running jumpers, do not leave the ends of the wire projecting beyond the front edge of the terminal strip. This practice will avoid the possibility of a puncture wound or eye injury (fold leads back).
- M. If a jumper is found connected to the terminals to which you are running jumper leads to, do not disconnect them. Contact the Operating Company and let them locate the problem.
- N. Exercise care when removing shielding or trimming the shielded wire ends. In order to avoid puncturing the skin or fingers with the wire ends or wire braid.
- O. Do not tap terminal strips with a screwdriver or other tools to dislodge loose solder or pieces of wire. This practice may damage the terminal strip or terminals.

2. INSTALLING EQUIPMENT

2.1 The tools and supplies required for jumper running operations covered in this section are listed below:

2.2 Tools

KS-8047L-1 Wire Reel
 R-4473 Cutting and Skinning Tool
 R-3088 Wire Skinning Tool
 R-4547 Bradley Skinning Tool
 KS-20962 Distributing Frame Wire Bag
 *Also tools contained in Installers 168 Kit.

2.3 Supplies

ID-70 Universal Cross Connect Work Sheets
 R-3412 Wire Markers
 R-3694 Wire Markers

3. SPECIFIC INFORMATION

3.1 Assignments

3.11 Cross connection assignments determined by equipment arrangements or options: The assignments are usually indicated on job drawings listed in the job specifications. In some cases, these cross connections are applied in the shops.

3.12 When cross connection assignments, which are determined by equipment arrangements or options, are to be placed in the field and individual jumpers are required to serve groups of terminals, prepare point-to-point running sheets for all cross connection wiring of such groups. This is necessary to facilitate the placement of the wiring as the interconnections between terminals within the same group. In many cases, these connections are made with bare or insulated straps.

3.13 Cross Connection Assignments Furnished by the Telephone Company: Refer to Handbook 3, Section 4, for listing of equipment types requiring this type of information and schedules for availability at the job location.

3.2 Wire Type

3.21 The type, gauge and color of the cross connect wire is information that should be reflected on the "SD" and/or "T" drawings. When this information is conflicting or incomplete, contact your Regional Technical Assistance Center (RTAC) Organization. Be sure to use the correct wire gauge color and type cross connect wire.

3.211 Prior to running cross connections on equipment frames, refer to the "SD" and/or "T" drawings. A very recent change has replaced the "BW" and "DP-1" types of wire with "DP-2" wire. Refer to Table F for gauge, color and COMCODE information.

NOTE: Description of the various types of wire used for cross connecting are reflected in Tables A through F.

3.22 Color of Wire: When the color of the cross connection wire (except for the "MD" type L, W or U distributing frame wire) is not specified on the associated drawings, use black wire of the type and gauge specified.

3.23 Distributing Frame Wire: Except as otherwise specified in the associated wiring diagrams or supplementary job information, the type and color arrangements shown in Table A should be observed.

<u>CODE</u>	<u>NO. OF COND.</u>	<u>NOTES</u>	<u>COMCODE NO.</u>	<u>TIP</u>	<u>RING</u>	<u>SLEEVE</u>	<u>OTHER</u>
DT20S	1	1,2	102448974	BR	-	-	-
DT20P	2	1,2	102448966	BR	& BL	-	-
DT22S	1	1,2	102484037	S	-	-	-
DT22P	2	1,2	102337870	W	& BL	-	-
DT22P	2	1,2	102421948	W	& R	-	-
DT22P	2	1,2	102421922	W	& G	-	-
DT22P	2	1,2	102421930	W	& O	-	-
DT22T	3	1,2	102448990	W	& BL	& R	-
DT22M	4	1,2	102448982	W	& BL	R	& G
DT24P	2	1,2,3	102379195	Y	& BL	-	-
DT24P	2	1,2	102484045	W	& BR	-	-
DY22P	2	1,2,4	842213696	BK	& V	-	-

NOTES:

- 1 - "W" type distributing frame wire has been replaced by "DT" or "DY" type wire.
- 2 - "DT and DY" are both irradiated PVC types of wire.
- 3 - Used on "COSMIC" distributing frame.
- 4 - Replaces "DFW" type wire used on 66-type connecting blocks.

TABLE A

TYPES OF DISTRIBUTING FRAME WIRE
(PARS. 1.13, 3.211, and 3.23)

22P SHIELDED WIRE					
<u>Singles</u>		<u>Pairs</u>		<u>Triples</u>	
<u>P-Wire</u>	<u>Color</u>	<u>P-Wire</u>	<u>Color</u>	<u>P-Wire</u>	<u>Color</u>
P-357160	S	P-357176	BL, B-R	P-357179	BR, BR-R, S-R
P-357158	R	P-357175	O, O-R	P-357180	Y, Y-G, R-G
P-357159	BK	P-357172	BR, BR-R		
P-357162	R-G	P-357170	S, S-R		
P-357161	R-S	P-357171	R, R-G		
		P-357173	BK, BK-R		
		P-357174	Y, Y-G		
24P SHIELDED WIRE					
<u>Singles</u>		<u>Pairs</u>			
<u>P-Wire</u>	<u>Color</u>	<u>P-Wire</u>	<u>Color</u>		
P-46B749	BL	P-46B752	BL, BL-W		
P-46B750	O	P-46B754	BR, R		
P-46B751	BR	P-46B695	BR, BR-R		
P-46B748	S	P-46B676	S, S-R		
P-46B673	R	P-46B753	R, S		
P-46B674	BK	P-46B675	R, R-G		
		P-46B696	Y, Y-G		
22P-5 SHIELDED WIRE					
<u>Singles</u>		<u>Pairs</u>		<u>Triples</u>	
<u>COMCODE No.</u>	<u>Color</u>	<u>COMCODE No.</u>	<u>Color</u>	<u>COMCODE No.</u>	<u>Color</u>
842696361	S	842696452	BL, BL-R	842696593	R-BR, BR, BR-W
842696346	R	842696502	BR, R-BR	842696601	Y, Y-G, R-G
842696353	BK	842696486	S, S-R		
842696437	R-S	842696494	R, R-G		
842696445	R-G	842696510	BK, R-BK		
		842696528	Y, Y-G		
		842696536	R-O, R-G		
24P-5 SHIELDED WIRE					
<u>Singles</u>		<u>Pairs</u>			
<u>COMCODE No.</u>	<u>Color</u>	<u>COMCODE No.</u>	<u>Color</u>		
842696403	BL	842696452	BL, W-BL		
842696411	O	842696577	BR, R-BR		
842696429	BR	842696569	S, R-S		
842696395	S	842696551	R, R-G		
842696379	R	842696585	Y, Y-G		
842696387	BK	842696478	BR, R		
		842696460	R, S		

TABLE B

"P"-TYPE SHIELDED WIRE USED ON TRANSMISSION
EQUIPMENT BAYS (PAR. 3.211)

BF-TYPE SHIELDED WIRE					
<u>S-22</u>		<u>P-22</u>		<u>P-21</u>	
<u>P-Wire</u>	<u>Color</u>	<u>P-Wire</u>	<u>Color</u>	<u>P-Wire</u>	<u>Color</u>
P-388070	BL	P-388078	BL, W	P-43F042	BL, W
P-388071	O	P-388083	BL, R	P-43F043	O, W
P-388072	G	P-388088	BL, BK	P-43F044	G, W
P-388073	BR	P-388079	O, W	P-43F045	BR, W
P-388074	S	P-388084	O, R	P-43F046	S, W
P-388075	W	P-388089	O, BK	P-43F047	BL, R
P-388076	R	P-388080	G, W	P-43F048	O, R
P-388077	BK	P-388085	G, R	P-43F049	G, R
		P-246362	G, BK	P-43F050	BR, R
		P-246368	BR, S	P-43F051	S, R
		P-388081	BR, W	P-43F052	BL, BK
		P-388086	BR, R	P-43F053	O, BK
		P-246363	BR, BK		
		P-388082	S, W		
		P-388087	S, R		
		P-246367	S, BK		
		P-46A141	W, BK		

TABLE C

"BF" TYPE SHIELDED WIRE USED ON TRANSMISSION
EQUIPMENT BAYS (PAR. 3.211)

DL-TYPE SHIELDED WIRE					
<u>S-24</u>		<u>P-22</u>		<u>P-24</u>	
<u>P-Wire</u>	<u>Color</u>	<u>P-Wire</u>	<u>Color</u>	<u>P-Wire</u>	<u>Color</u>
P-46F609	BL	P-442014	BL, W	P-442023	S, R
P-46F610	O	P-442015	O, W	P-442024	BL, BK
P-46F611	G	P-442016	G, W	P-442025	O, BK
P-46F612	BR	P-442017	BR, W	P-442026	G, BK
P-46F613	S	P-442018	S, W	P-442027	BR, BK
P-46F614	W	P-442019	BL, R	P-442028	S, BK
P-46F615	R	P-442020	O, R	P-442029	W, BK
P-46F616	BK	P-442021	G, R	P-442030	BR, S
		P-442022	BR, R		

TABLE D

"DL" TYPE SHIELDED WIRE USED ON TRANSMISSION
EQUIPMENT BAYS (PAR. 3.211)

BK-TYPE SHIELDED WIRE (20 GAUGE)					
<u>Singles</u>		<u>Pairs</u>		<u>Triples</u>	
<u>P-Wire</u>	<u>Color</u>	<u>P-Wire</u>	<u>Color</u>	<u>P-Wire</u>	<u>Color</u>
P-246302	BL	P-246313	R, R-G	P-246315	R, BK, S
P-246303	O	P-246314	R, BK	P-246491	Y, Y-G, R-G
P-246304	G	P-246490	Y, Y-G		
P-246305	BR				
P-246306	S				
P-246309	W				
P-246307	R				
P-246308	BK				
P-246333	R-G				

TABLE E

"BK" TYPE SHIELDED WIRE USED ON TRANSMISSION
EQUIPMENT BAYS (PAR. 3.211)

"DP" TYPE (IPVC) SINGLE WIRE							
*20 Gauge		*22 Gauge		*24 Gauge		*26 Gauge	
Color	COMCODE No.	Color	COMCODE No.	Color	COMCODE No.	Color	COMCODE No.
BL	842692022	BL	842691719	BL	842691032	BL	842690729
O	842692030	O	842691727	O	842691040	O	842690737
G	842692048	G	842691735	G	842691057	G	842690745
BR	842692055	BR	842691743	BR	842691065	BR	842690752
S	842692063	S	842691750	S	842691073	S	842690760
W	842692071	W	842691768	W	842691081	W	842690778
R	842692089	R	842691776	R	842691461	R	842690786
BK	842692097	BK	842691784	BK	842691479	BK	842690794
V	842692113	Y	842691792	Y	842691487	Y	842690802
		V	842691800	V	842691495	V	842690810

"DP" TYPE (IPVC) PAIRS					
*22 Gauge		*24 Gauge		*26 Gauge	
Color	COMCODE No.	Color	COMCODE No.	Color	COMCODE No.
BL, O	842692766	BL, O	842692568	BL, O	842692360
G, BR	842692774	G, BR	842692576	G, BR	842692378
BR, BL	842692683	BR, BL	842692485	BR, BL	842692287
R, O	842692691	R, O	842692493	R, O	842692295
R, G	842692709	R, G	842692501	R, G	842692303
R, BR	842692717	R, BR	842692519	R, BR	842692311
R, S	842692725	R, S	842692527	R, S	842692329
R, W	842692733	R, W	842692535	R, W	842692337
R, BK	842692741	R, BK	842692543	R, BK	842692345

"DP" TYPE (IPVC) TRIPLES					
*22 Gauge		*24 Gauge		*26 Gauge	
Color	COMCODE No.	Color	COMCODE No.	Color	COMCODE No.
BL-BK, W-BL, Y-BL	842692881	BL-BK, W-BL, Y-BL	842692832	BL-BK, W-BL, Y-BL	842692782
O-BK, W-O, Y-O	842692899	O-BK, W-O, Y-O	842692840	O-BK, W-O, Y-O	842692790
G-BK, W-G, Y-G	842692907	G-BK, W-G, Y-G	842692857	G-BK, W-G, Y-G	842692808
BR-BK, W-BR, Y-BR	842692915	BR-BK, W-BR, Y-BR	842692865	BR-BK, W-BR, Y-BR	842692816
S-BK, W-S, Y-S	842692923	S-BK, W-S, Y-S	842692873	S-BK, W-S, Y-S	842692824
BL, BL-W, W	842696650	BL, BL-W, R-BL	842694150	BL, BL-W, R-BL	842694127
BL, BL-W, R-BL	842694176	W, G, G-W	842694143	W, G, G-W	842695751
W, G, G-W	842695769	Y-Y-G, RG	842694168	Y, Y-G, R-G	842694135

*Indicates that other color combinations are available.

NOTE: Quad multiple twin leads are also available.

TABLE F

"DP" TYPE (IPVC) WIRE USED ON A VARIETY OF EQUIPMENT FRAMES (PAR. 3.211)

3.3 Reuse of Distributing Frame Wire

3.31 Only U-type wire with red tracer, W-type and DT-type (irradiated PVC) may be reused. Older types of wire must not be reused because they lack fire retardant properties.

4. JUMPER RUNNING

4.1 Methods

4.11 When handling wire or running jumpers, especially on a Distributing Frame, do not allow the wires to become kinked or caught on the terminals. Jumpers that become caught on terminals or other objects should be freed carefully so the wire will not be damaged or the terminals bent or broken.

4.12 Distributing Frame jumpers should be run in the most direct route and well behind the terminal blocks so as not to block the access to terminals for future cross connections.

4.121 Short Distributing Frame cross connections should be run beneath or behind other cross connections under the following conditions:

(a) On the horizontal side of the frame where they do not extend beyond six vertical either to the left or right of the distributing ring, it is not necessary to lay these jumpers at the bottom of the pileup.

(b) On the vertical side of the frame where they do not extend more than two horizontal shelves above or below the distributing ring.

4.122 Do not pull jumpers through the terminal strip fanning holes. Abrasive damage to the wire insulation may occur. The jumpers should be run through the distributing rings and then laid carefully into the terminal strip fanning holes.

4.123 Do not run jumpers through fanning strip holes that contain cable leads unless the condition is specified in an approved instruction.

4.124 Slack: Three to four inches of slack should be left in all Distributing Frame jumpers except when a jumper is transferred. Slack should be left if the jumper is long enough, however, it may be omitted if necessary. Do not run the jumpers taut. Excessive slack should also be avoided.

4.125 Never stretch a jumper wire. While it is possible to stretch a jumper, the likelihood of injuring the insulation or reducing the wire gauge is prevalent. Tight jumpers are also very hard to trace and also tend to create pileups.

4.126 In general, each end of a Distributing Frame jumper should be cut off approximately six inches beyond the front edge of the terminal strip. 89 and 93 type connecting blocks should allow approximately one foot of additional length past the top front edge of the block. This excess wire should be anchored until required by bending it back over the fanning strip and looping it with a single turn around the jumper. Do not leave the wire ends projecting beyond the front edge of the blocks. It is possible that eye damage may be inflicted by wire ends projecting out into the aisle of the frame area.

4.13 Identification: When two or more cross connections of the same type and color are to be fanned through the same fanning strip hole, the cross connections should be temporarily marked for identification purposes to insure connection to the proper terminals. The method of marking to be employed will be dependent upon the number and arrangement of wires in the same hole. One of the following methods should be used.

4.131 When two or three cross connections of the same type and color are in the same fanning hole, place a single knot on the second wire and two knots on the third wire. The wires in the same hole may be cut to different lengths instead of using knots, however, care must be exercised to insure that variations of the slack in the wires do not change the order of the varied lengths.

4.132 When three or more cross connections of the same type and color are in the same fanning hole, tag the wires or run in and connect one or two of the wires in each

hole before running and connecting the remaining wires in the same holes. This should reduce the identification and sorting effort required. When wire tagging is necessary, use the R-3412 Wire Markers. Place the marker on the section of wire that is to be scrapped.

4.14 The conductors of the Distributing Frame jumpers should be untwisted so that none of the twist remains within the fanning strip after the wire is terminated. However, the jumper should not be untwisted more than one full twist in back of the fanning strip.

4.15 Cross connections run on equipment frames for various systems, should be run using the following general parameters:

4.151 Cross connection information for various equipment frame cross connect fields should either be specified on the individual drawings (wiring or schematic) or be furnished by the Operating Company.

4.152 Between horizontal to horizontal or vertical to vertical terminal strips on adjacent mounting bars: The cross connections should be run directly between the terminals specified without appreciable slack, but not taut. When fanning strips and/or fanning grids are not provided, the cross connections may be run only straight, without crossovers, between terminal rows in horizontal or vertical alignment of the rows of both terminal strips. When fanning grids are provided, the crossovers between different horizontal or vertical rows should be made, as illustrated in Figure 1 or 2.

4.153 Between horizontal to horizontal or vertical to vertical terminal strips separated by other apparatus: In general, fanning rings or other retaining devices are provided to permit bypassing the intervening apparatus. The cross connections should be run without appreciable slack, but not taut. However, it may be necessary to temporarily tie back groups of jumpers before connecting to insure that jumpers to be run later will not cause the previously run jumpers to become taut. The jumpers shall be distributed over the rings or retaining devices, as specified on the associated frame drawings, or as necessary to avoid congestion or exceeding the capacity of the retaining devices.

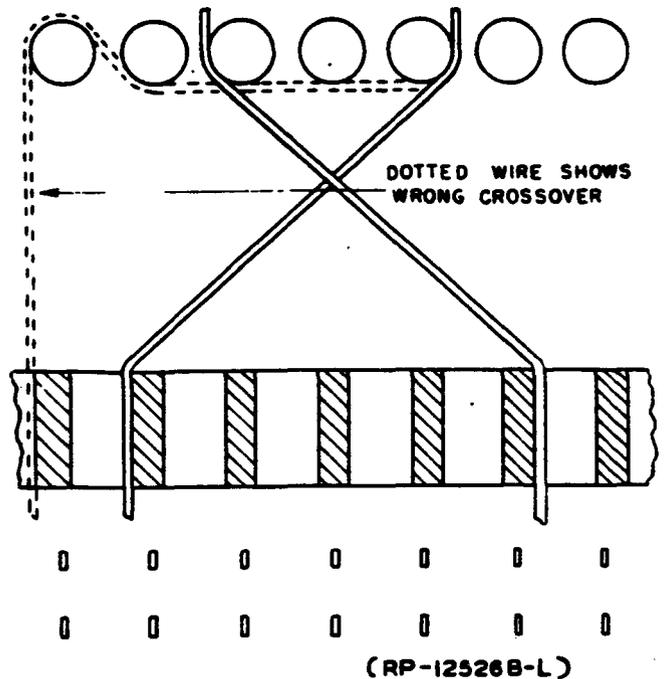


FIG. 1 METHOD OF RUNNING CROSS CONNECTIONS WHERE CROSSOVER IS REQUIRED (TERMINATING MARKER) (PAR. 4.152)

4.154 Before running jumpers between different terminal strips, determine whether the jumpers from common functionally designated terminals must be run as separate jumpers to each assigned terminal or as separate jumpers for prescribed groups of assigned terminals. This can be determined by reference to the associated drawings (T or SD) involved. Where strapping is involved, refer to the 400 Series Sections of this handbook.

NOTE: For cross connecting arrangements on which common functionally designated terminals serve groups of terminals on another terminal strip, it will be advantageous to prepare point-to-point running sheets to indicate the required grouping of terminals and the terminating point of the feeder lead from the common functional terminal.

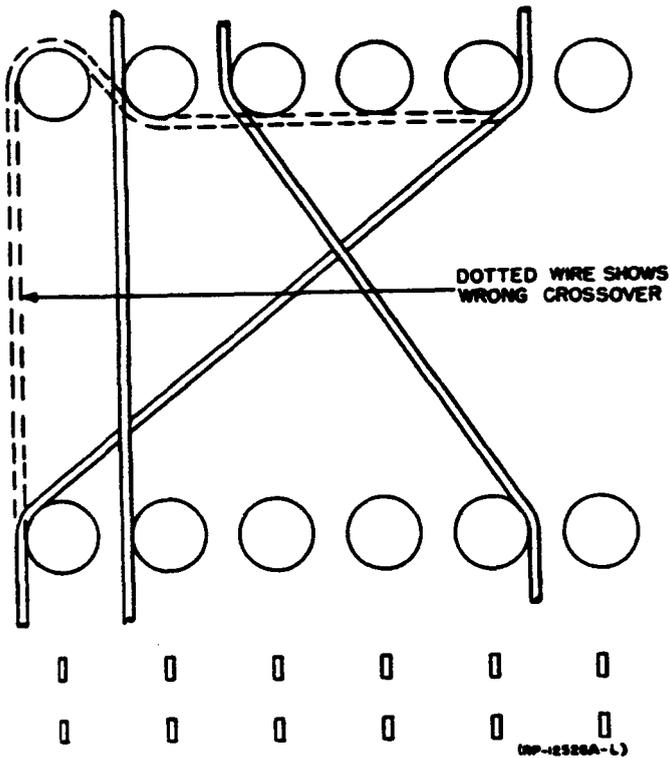


FIG. 2 METHOD OF RUNNING CROSS CONNECTIONS WHERE CROSSOVER IS REQUIRED (PAR. 4.152)

4.155 Between terminals on the same terminal strip: This operation is normally considered as a terminal strip strapping operation. Therefore, refer to the 400 Series of this handbook for methods and requirements.

4.2 Insulation Removal

4.21 Prior to removing insulation from the Distributing Frame jumper wires, a Distributing Frame wire bag, or wire connecting bag should be placed on the shelf directly below the work location. When older type textile insulated wire is being used, it is important, so far as practicable, that fraying of insulation be held to a minimum. Use the R-2291 (Short Nose Pliers), R-3088 (Wire Skinning Tool) or R-4547 (Bradley Tool) to remove wire insulation for soldered type connections.

4.211 If solderless wrapped connections are required, utilize the R-4473 (Combination Cut and Skin) Tool to provide the desired length of bare wire. Refer to the 300 Series of this handbook for detailed description and use of all skinning tools.

4.3 Terminating

4.31 Solder-Type Terminals

4.311 At Notched Terminals: The basic methods and requirements as outlined in Sections 320 and 322 of this handbook, apply to the connecting and soldering operations at notched terminals except for variations of the terminating point of the wire ends, as outlined below.

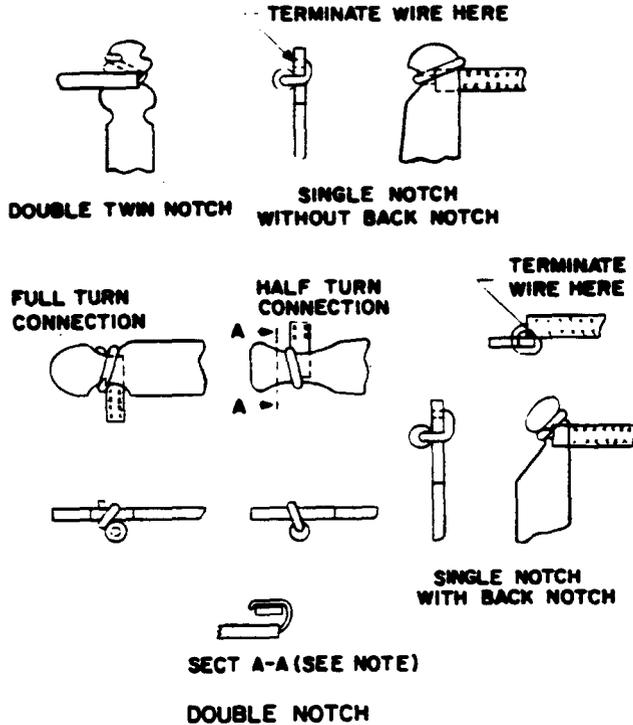
4.312 In general, all cross connections shall be terminated in the notch by wrapping the wire around the terminal and then broken off the back edge by applying a steady taut pull.

4.313 At Distributing Frame Terminal Strips: The wire ends, excepting No. 20 gauge wires, shall be brought around the back edge of the terminals and broken off at the point, illustrated in Figure 3, for the type of terminal involved. No. 20 gauge wires should be cut off with cutters at the terminating points indicated.

4.314 At Equipment Frame Cross Connection Fields: Cross connection wire ends shall be connected as specified in Paragraphs 4.3141 or 4.3142.

4.3141 Soldered Type Connections: The end of the cross connection wire, which is connected first, shall be connected with a full turn of bare wire wrapped around the terminal (all notched terminal types), as illustrated in Figure 3, under the heading "Full Turn Connection". The other end of the wire shall be connected with a half turn connection by wrapping the wire around the back edge of the terminal and breaking it off at the points indicated for the various types of notched terminals, as indicated in Figure 3. However, at twisted type terminals, such as those on 221 type terminal strips, cut the wire ends off with cutters instead of breaking them off.

NOTE: The wire end connected first may be terminated at the back edge of the terminal provided this connection is soldered before skinning and connecting the other end of the wire.



NOTE- WIRE MAY BE BENT OVER EDGE OF TERMINAL AND CUT OR BROKEN OFF.

RP-1939I

FIG. 3 CONNECTING CROSS CONNECTION WIRE AT TERMINAL STRIPS (PAR. 4.313, 4.314)

4.3142 Non-Soldered Hand-Wrapped Connections: When non-soldered hand-wrapped connections are specified by the Telephone Company, make the connections as follows:

(a) With the insulation of the wire along the left side of the terminal up to the notch, wrap two turns of bare wire around the terminal at the notch, clockwise on the upper or

counter-clockwise on the lower terminal. Place each turn in the notch with the turns parallel and close together and maintain a steady tension on the wire while wrapping to insure good contact between the edges of the terminal and the wire.

(b) After completing the second turn, pull the wire through the notch and break it off at the edge of notch on the right side by holding the wire end under tension and wiggling the wire back and forth. On twisted terminals, cut the wire ends off with cutters if the terminals tend to bend when using the breakoff method.

CAUTION: USE CARE TO PREVENT INJURY WHEN BREAKING OFF WIRES, PARTICULARLY WHEN PULLING IN AN UPWARD DIRECTION.

NOTE: Do not attempt to make the wrapping tighter by squeezing the wire against the side of the terminals with pliers as this will tend to relax the grip of the wire at the corners of the terminal.

(c) When two or more wires are to be connected to the same terminal, wrap and solder the connections, as specified in Paragraph 4.3141.

4.32 Solderless-Wrap Terminals

4.321 The general methods and requirements for solderless wire wrap connections, as covered in Section 310 of this handbook, apply for cross connections except as follows:

4.322 At terminals used only for cross connections, a defective cross connection wire connection shall not be soldered except when there is solder on the terminal from a previously made connection. The defective connection shall be removed and replaced by a satisfactory solderless wrapped connection. Replace the cross connection run if there is insufficient slack to reskin the wire.

4.323 When switchboard or local cable leads are connected to the same terminals with cross connections, faulty cable lead connections must be soldered when they cannot be replaced. Therefore, the cross connection wire end must also be soldered. In these cases, use three (3) turn wrapped connections to facilitate future disconnection of the cross connections affected. Examples of this condition may occur on Step-by-Step OGT Terminal Strips or Distributing Terminal Assemblies.

4.324 When there is insufficient terminal length to make the number of qualified cross connection terminations required on the terminal, the extra connection(s) may be placed on the end of the terminal or over-wrapped with a 1-1/4" turn connection. All connections on the terminal must be soldered.

However, an effort should be made to reroute or reassign the cross connections so as to permit application of solderless wrap connections within the limitations of the terminal design.

4.33 Slotted-Beam Terminals

4.331 This type of terminal is being utilized on the new vintage of Distributing Frame connecting blocks. It does not require any insulation removal operation and can be easily terminated with a quick-connect tool. Refer to Section 340 of this handbook to select the proper tool and information on termination procedures.

5. VERIFICATION

	Verification Items and Brief Statement of Requirements	Reference	
		Par. No.	Fig. No.
5.01	Use proper wire gauge, type, and color. See Tables A-F.	3.21 3.22	
5.02	Use DP-2 type wire to replace BW and DP-1 types, Table F.	3.211	
5.03	Use proper Distributing Frame wire type, Table A.	3.23	
5.04	Reuse only "U, W, and DT" types of wire.	3.31	
5.05	Distributing Frame jumpers run in most direct route and well behind the terminal blocks.	4.12	
5.06	Short Distributing Frame jumpers run beneath or behind others:	4.121	
	1. At horizontal side when not extended beyond six verticals to left or right side of distributing ring.	4.121a	
	2. At vertical side when not extended more than two horizontal shelves above or below the distributing ring.	4.121b	
5.07	Do not run jumper wires through fanning strip holes that contain cable leads.	4.123	
5.08	Avoid taut Distributing Frame jumpers. Provide 3" - 4" of slack.	4.124	
5.09	Do not stretch jumper wires to reach termination points.	4.125	
5.10	Do not leave wire ends projecting beyond front edge of terminal strip.	4.126	

5. VERIFICATION (Cont'd)

Verification Items and Brief Statement of Requirements		Reference	
		Par. No.	Fig. No.
5.11	Untwist jumper leads within terminal area.	4.14	
5.12	<u>Cross Connections Within Equipment Frames</u>	4.15	
5.121	Cross connection information on drawings or provided by Operating Company.	4.151	
5.122	Between horizontal to horizontal or vertical to vertical terminal strips on adjacent mounting bars. Refer to Figures.	4.152	1, 2
5.123	Between horizontal to horizontal or vertical to vertical terminal strips separated by other apparatus.	4.153	
5.124	Terminal-Terminal on same block is considered as strapping. See 400 Series.	4.155	
5.13	<u>Solder-Type Terminations</u>	4.31	
5.131	Meet requirements of Sections 320 and 322.	4.311	
5.132	Terminate wire in notch of terminal.	4.312	
5.133	At Distributing Frame terminal strips wire should be wrapped around back edge of terminal and broken off.	4.313	3
5.134	At equipment frames, use full wrap at start and a half-wrap at end of cross connection.	4.3141	3
5.14	<u>Non-Soldered Hand-Wrapped Terminals</u>		
5.141	Only when specified by the Operating Company.	4.3142	
5.142	Set insulation at terminal notch, make two complete parallel turns around and in terminal and break off.	a,b	
5.15	<u>Solderless-Wrap Terminals</u>	4.32	
5.151	Requirements of Section 310 apply except for:	4.321	
5.152	Do not solder defective cross connections - reapply.	4.322	
5.153	When cable lead is soldered and cross connection is on same terminal solder.	4.323	
5.154	Insufficient terminal length - use 1-1/4 turns and solder.	4.324	
5.16	<u>Slotted-Beam Terminals</u>	4.33	
5.161	Use correct tool. Refer to Section 340.	4.331	

Vertical lines at side of paragraphs indicates requirements.

Engineering Planning Manager
(Installation)

Reason for Reissue:

Completely update 500 Series by combining sections and eliminating redundant, obsolete information.