STRAPPING SPECIFIC APPARATUS

CONTENTS

1. GENERAL

1.1 Scope of Section

1.11 This section covers specific methods and requirements for strapping apparatus listed in alphabetical order.

1.12 The methods and requirements contained herein may be at variance with the common requirements listed in Section 400 of this handbook. Where differences are noted, the methods portrayed in this section shall be applied.

1.13 Figures in this section may portray associated conditions not within the scope of strapping. Methods and requirements should be derived from the illustrations only when expressly specified in the associated text.

1.2 Precautions Against Personal Injury, Equipment Damage and Service Interruptions

1.21 General precautions to be taken against personal injury, equipment damage and service interruptions are covered in Handbook 0 and are to be observed at all times as they apply to the operations being performed. Specific precautions, when applicable, are included in this section with the associated method.

2. REQUIREMENTS AND METHODS FOR SPECIFIC APPARATUS

2.01 Banks

2.011 Where straps are run between different levels of the same bank, run them similar to regular bank wiring. Make all bank level changes at the most convenient point.

2.012 Run insulated bank straps away from adjacent terminals to avoid possible shorts or crosses (see Figure 1). Bare wire strapping run to adjacent terminals should be run as shown in Figure 2.

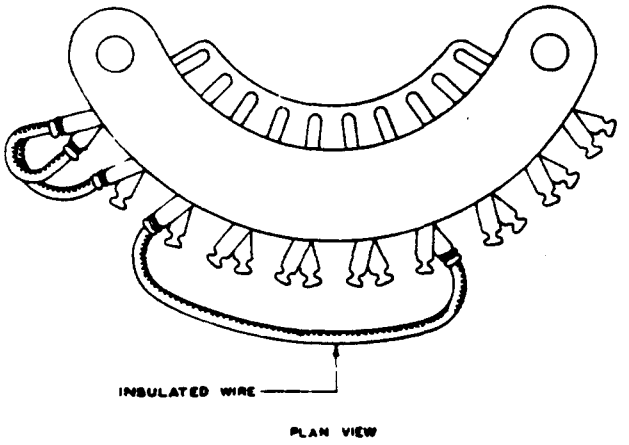


FIG. 1 INSULATED STRAPPING OF BANK TERMINALS (PAR. 2.012)

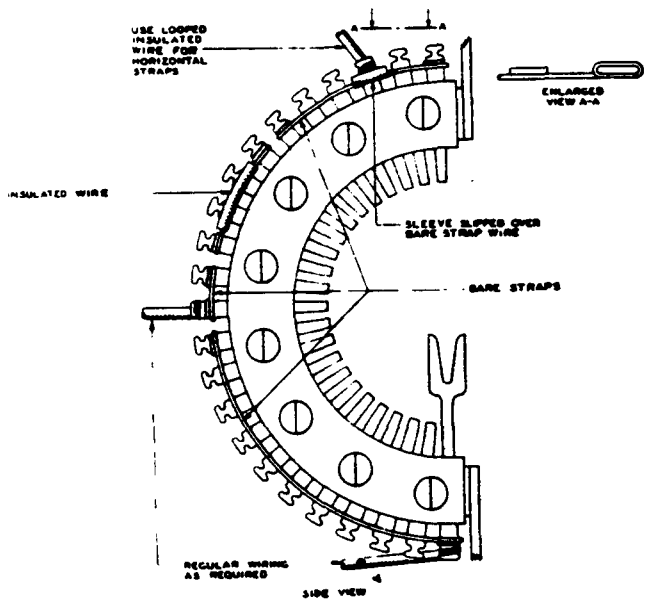


FIG. 2 BARE WIRE STRAPPING OF BANK TERMINALS (PAR. 2.012)

2.02 Capacitors

2.021 There are many codes of capacitors, all of which may or may not require strapping. The basic requirement for strapping the capacitors is to avoid the possibility of shorting. Therefore, bare wire straps may be used on adjacent terminals of the same capacitor. Insulated straps should be utilized on nonadjacent terminals and between individually mounted capacitors terminals. (Refer to Figure 3.)

2.03 Distributing Terminal Assembly (DTA)

2.031 Vertical Strapping: Connect the straps as shown in Figure 4 and as follows:

(a) At the top of a continuous strap, connect the strap wire to the bottom lug of the terminal with a clockwise one and one-half turn.

(b) At the bottom of a continuous strap, connect the strap wire to the upper lug of the terminal with a clockwise one and one-half wrap.

2.032 When adding vertical strapping, run all continuous straps of a group before soldering. All slack should be removed in the straps prior to soldering.

CAUTION:	WHEN SELECTOR SHELVES OR DIVISIONS THEREOF ARE BEING ADDED TO A WORKING FRAME, INSTALL STRAPS AFTER THE COMPLETION OF THE BANK MULTIPLE TESTS.

2.033 Horizontal Strapping: Straps should be run with 20 gauge bare tinned wire (P-146465) and connected as shown in Figure 4. Strapping of solderless wrap terminals shall meet the requirements of Section 310 of this handbook.

2.034 Multiple Reversal Forms: Place multiple reversal forms approximately midway between the lowest terminals of the upper terminal strip and the uppermost terminals of the lower terminal strip and connect in the same manner as straight vertical strapping.

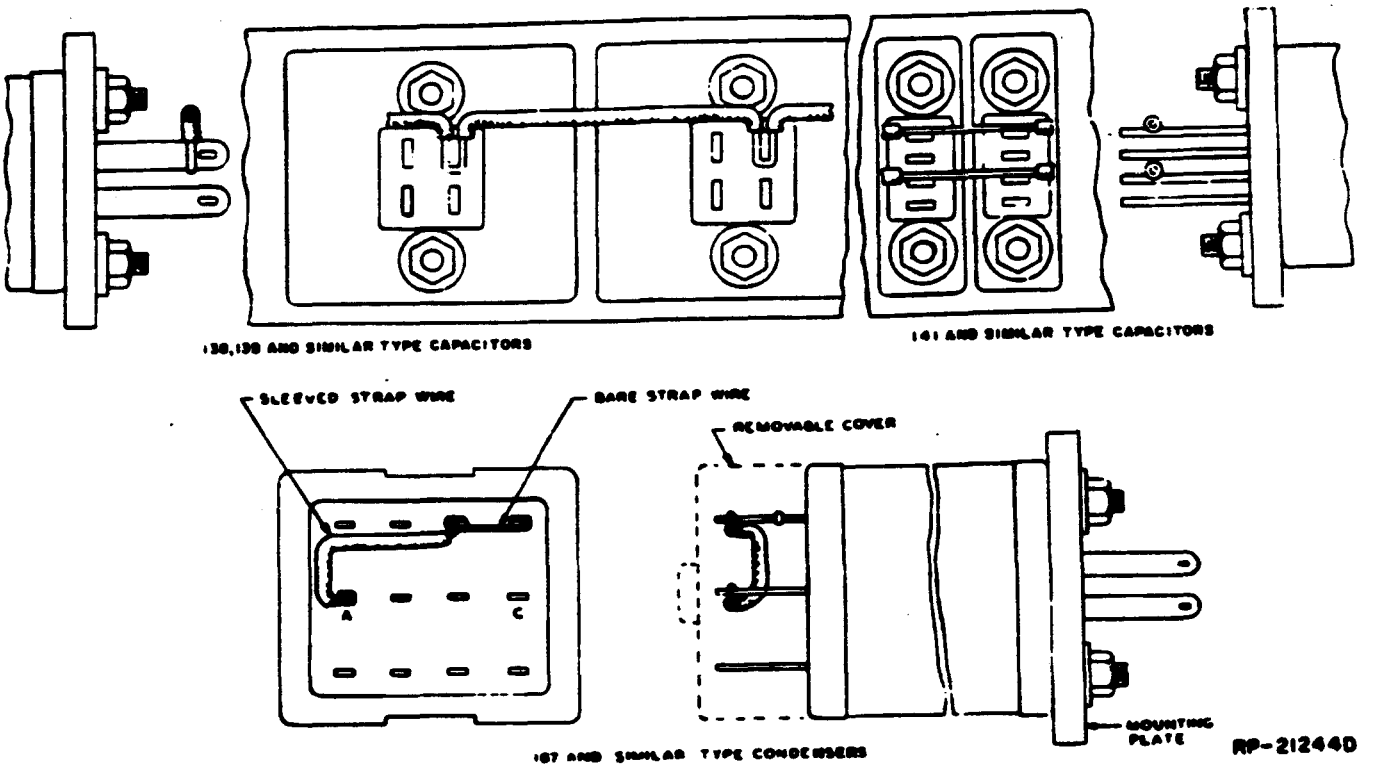


FIG. 3 METHOD OF STRAPPING CAPICATORS (PAR. 2.021)

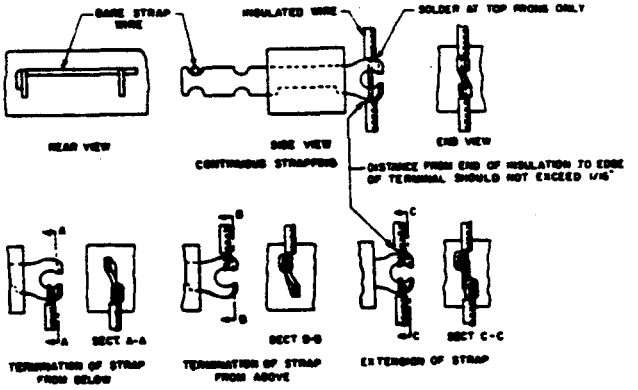


FIG. 4 STRAPPING (DTA) TERMINALS
(PAR. 2.031 and 2.033)

CAUTION:	THE LEADS AT EACH SWITCH ON MULTIPLE REVERSAL FORMS ARE STAGGERED IN LENGTH FOR IDENTIFICATION PURPOSES. BEFORE CUTTING OFF EXCESS WIRE AT THE UPPER LEADS, MAKE SURE OF SUFFICIENT LENGTH AT THE LOWER ENDS AND THAT IDENTIFICATION LENGTH DIFFERENTIALS ARE RETAINED.

2.04 Fuse Panels

2.041 Most fuse panels are furnished pre-strapped from the shops, however, due to modifications changing potential or load, straps must be changed in the field.

2.042 Solder Type Posts: Strap fuse posts of the No. 5, No. 6 and similar types, and the associated ground terminals on fuse panels as shown in Figure 5. Provide a connecting loop in such common straps for the connecting of the incoming supply leads. In general this loop shall be located between the first two fuse posts in each group strapped together. When the incoming supply leads are larger than 14 gauge, they should be connected to terminal punchings as provided.

2.043 Strap the fuse alarm lamp sockets or associated resistors which are in line vertically on adjacent panels together with an insulated straight strap. Provide a connecting loop for termination of the incoming lead. This loop should be located between the two top panels initially installed. All straps should be formed to sufficiently clear all apparatus.

2.044 Solderless Wrap Type Posts: Where strap modifications are required on existing fuse panels, insulated strapping of the proper gauge should be used when fuse posts are located nonadjacent. Adjacent terminals may be strapped with bare tinned wire of the proper gauge (see wiring drawing).

CAUTION:	EXERCISE EXTREME CARE WHEN WORKING AROUND LIVE FUSE POSTS. PROTECT THE AREA CORRECTLY AND BE SURE THE WRAPPING TOOL IS NOT GROUNDED. REMOVE VOLTAGE POTENTIAL FROM FUSE POSTS WHENEVER POSSIBLE. ALWAYS WEAR SAFETY GLASSES WHEN WORKING ON OR AROUND FUSE PANELS.

2.05 Interrupters

2.051 Where 165 and other similar types of interrupters require field strapping, they shall be strapped following the basic general requirements of Section 400 of this handbook. Refer to Figure 6 for typical interrupter strapping.

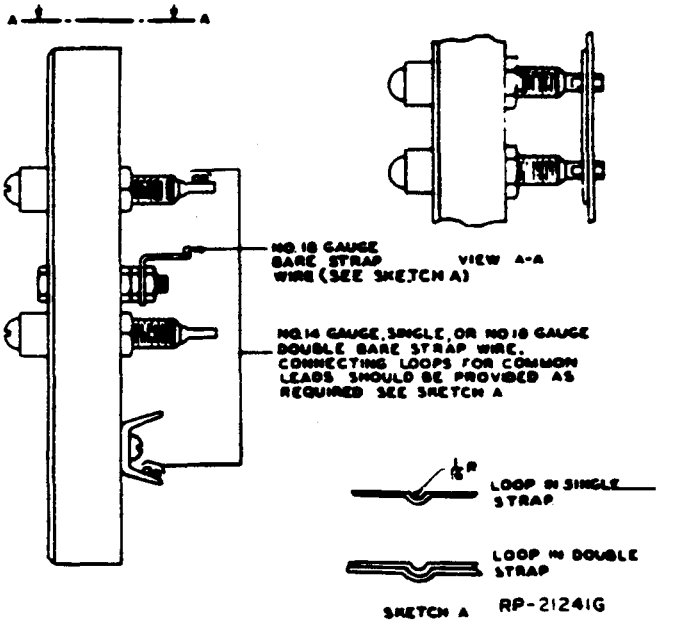


FIG. 5 STRAPPING OF FUSE POSTS (PAR. 2.042)

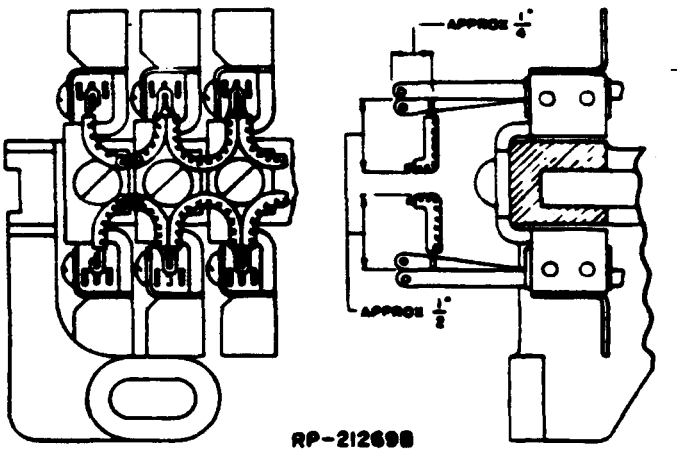


FIG. 6 STRAPS AT 165 AND SIMILAR TYPE INTERRUPTERS (PAR. 2.051)

2.06 Jacks

2.061 The straps between individually mounted jacks should be run as loop leads in the form unless otherwise specified.

2.062 Strip mounted jacks should be strapped directly from terminal to terminal in the same manner as indicated in Figure 9 applicable to lamp mountings unless the straps cause interference with other terminals in which case loop leads should be used. A connecting loop may be provided for the termination of feeder leads and multiple loops for convenience when connecting.

2.063 The sleeve terminals of 92 jacks on 228 mountings usually are strapped in the shop with 1/8" x 1/64" flat tinned copper (RM-533901) laid across the top of the terminals to provide increased solderability and greater clearance between other terminals. The feeder leads and multiple loops must be connected through the terminal hole.

2.07 Keys

2.071 Straps on keys should be connected at the special terminal notch or hole provided for them. Where the straps will not interfere with wiring or maintenance of the key, they may be connected at the regular wiring terminal notch or hole instead of at the strapping notch or hole. In all cases locate the straps uniformly throughout the particular unit of equipment.

2.072 On strip type keys, straps are used only between corresponding springs in adjacent spring groups as shown in Figure 7. Use loop leads for straps between nonadjacent groups.

2.073 On A10 and similar type narrow base keys with 9/16" base, use formed straps as shown in Figure 8 to avoid congestion and permit proper removal of the keys from the keyshelf mounting. Tie longer straps together with one strand of sewing twine as shown to prevent them from spreading apart. Dress straps approximately 7/18" from the terminals.

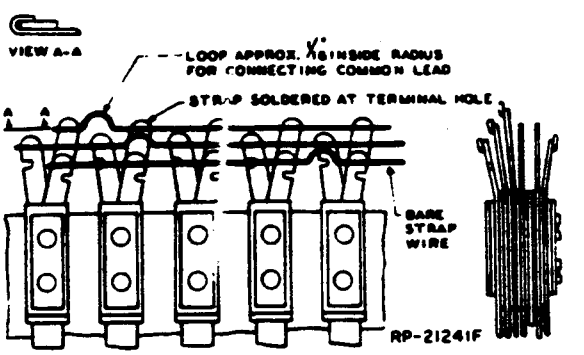


FIG. 7 STRAPS AT STRIP TYPE KEYS (PAR. 2.072)

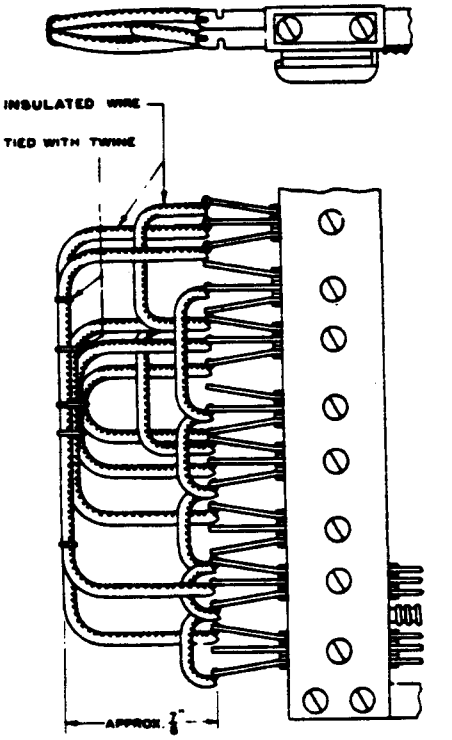
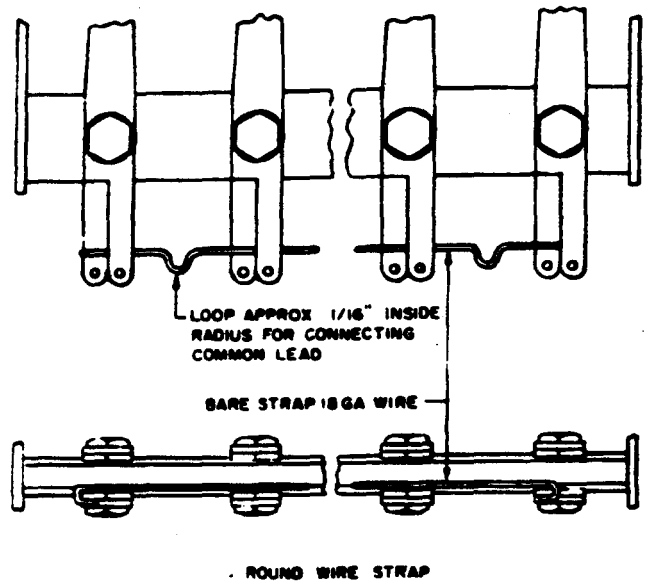


FIG. 8 STRAPS AT A10 AND SIMILAR NARROW BASE KEYS (PAR. 2.073)

2.08 Lamp Sockets and Mountings

2.081 On 46A and similar type lamp sockets mounted on strip mounting plates or panels, such as the 563A panel, straps may be used instead of loop leads.

2.082 On lamp socket mountings place bare straps, where required, on the lower terminals as shown in Figure 9 or as specified on the wiring drawing.



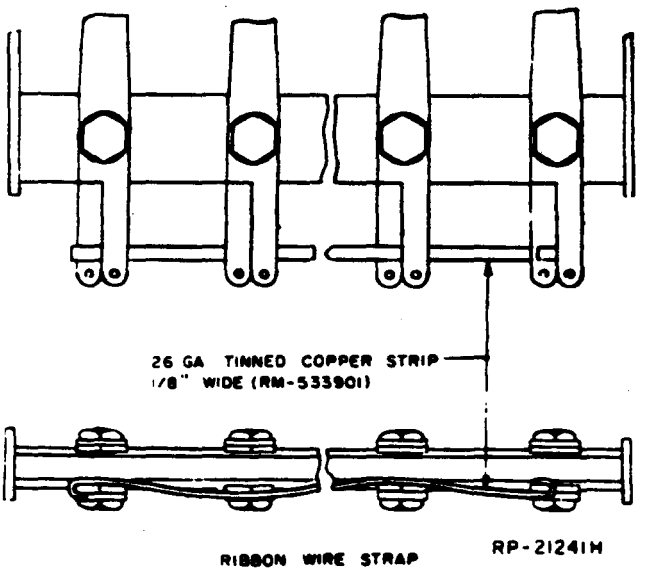


FIG. 9 STRAPS ON STRIP TYPE LAMP MOUNTING (PAR. 2.062 and 2.082)

2.09 Message Registers

2.091 Use straight straps, bare or insulated, as required for strapping message registers on strip mounting plates. A loop with 1/16" inside radius should be provided at the center of the strap for connecting the incoming lead.

2.0911 Where registers are added, extend the common strap by using a straight splice between the last two pieces of the original apparatus and connect the strap to the added apparatus.

2.10 Networks

2.101 Network strapping should utilize insulated straps for nonadjacent terminals. Bare tinned wire of the proper gauge may be utilized for adjacent terminals providing they allow access to the wiring of the other terminals. When the above information varies from the wiring drawing always use the drawing information.

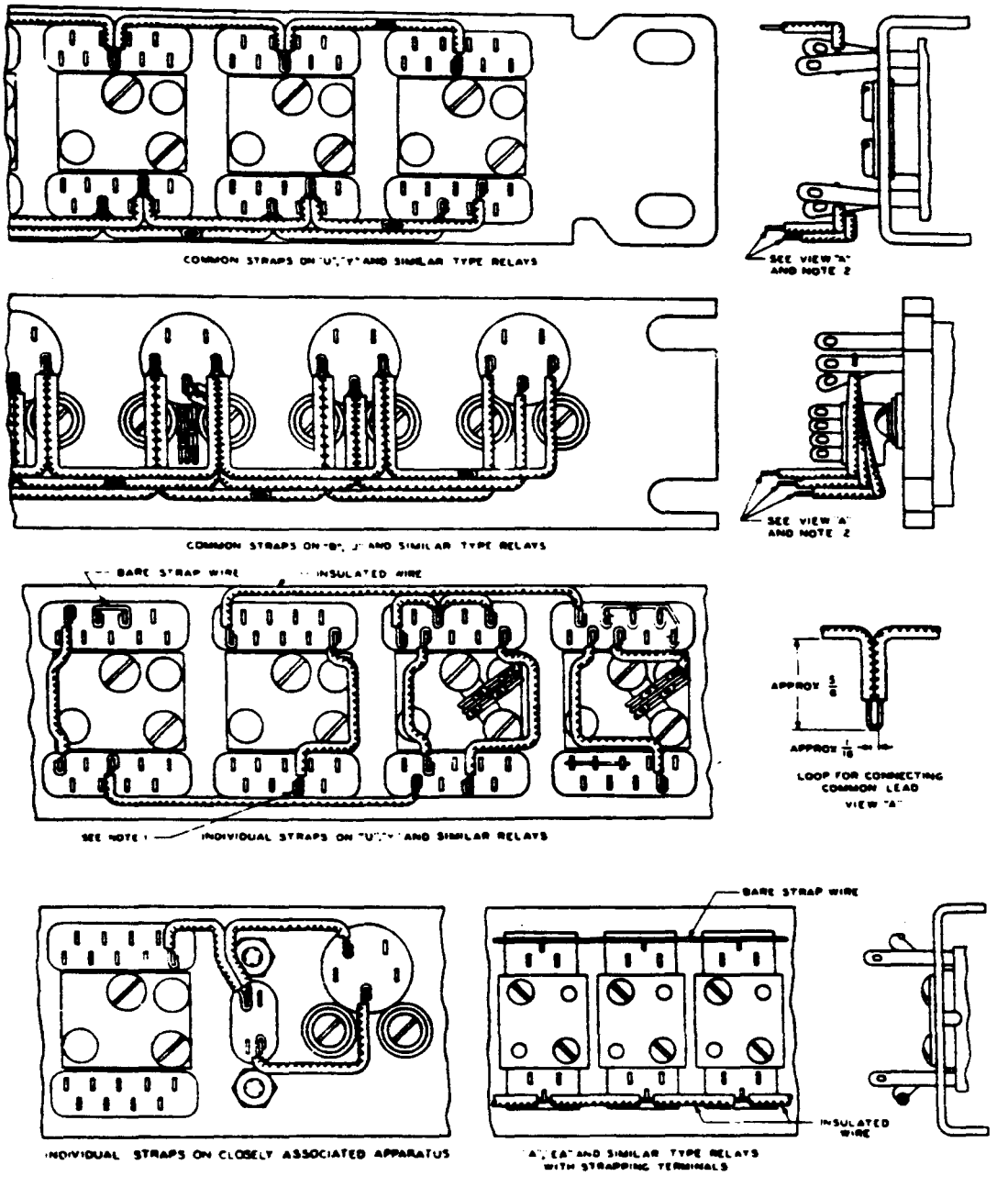
2.11 Protectors

2.111 Due to the improved design of the 300, 302, 303 and 305 connectors, protectors do not require any strapping. If the Bell Operating Company (BOC) requests other protectors to be strapped, strap the two ring terminals of the protector with a bare tinned 20 or 22 gauge wire between the terminals. Use a 6 inch piece of 20 or 22 gauge cross-connect wire to strap the two tip terminals of the protector together. (Except on "C" type protectors.)

2.112 When strapping on "C" type protectors, use a 6 inch piece of 22 gauge cross-connect wire to strap the tip and/or ring terminals. Run the wires through the fanning strip holes and solder them to the heat coil springs on the right side of the protector mounting.

2.12 Relays

2.121 Solder Type: Strap a strip mounted relay unit having notched or perforated terminals as shown in Figure 10.



NOTES
1. THE LOCATION, CONNECTION AND DRESS OF STRAPS SHOWN ARE TYPICAL AND MAY BE VARIED TO SUIT PARTICULAR CONDITIONS. FOR EXAMPLE IT WILL BE SATISFACTORY TO TERMINATE THE END OF A STRAP ON EITHER SIDE OF A TERMINAL TO FACILITATE THE CONNECTING OPERATION
2. THE CONNECTING LOOPS IN COMMON STRAPS SHOULD BE LOCATED AT RIGHT OR LEFT END OF PLATE AS REQUIRED

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FIG. 10 RELAY STRAPPING OF NOTCHED OR PERFORATED TERMINALS (PAR. 2.121, 2.123)

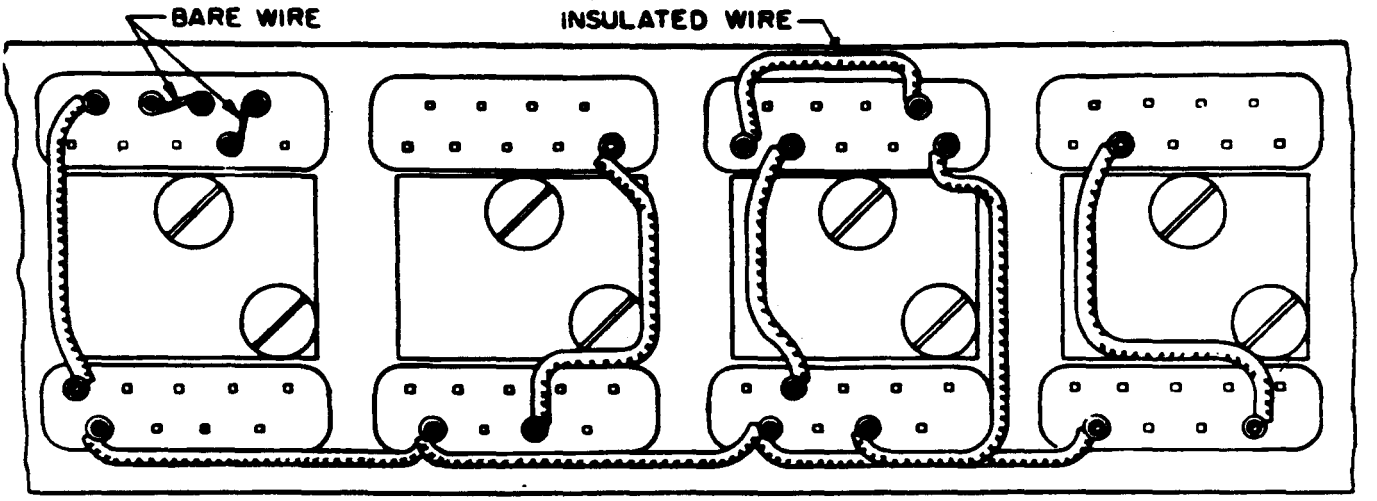
2.122 Straps may be either insulated or bare wire depending of whether the terminals are adjacent (bare) or nonadjacent (insulated) and providing they do not obstruct access to the wiring mounting screws, associated terminal punchings, or cover the relay designations.

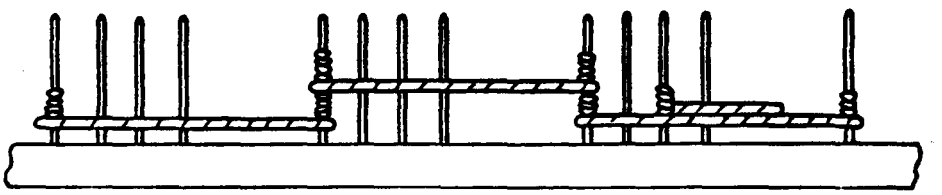
2.123 Formed straps and bare wire banjo straps may be utilized providing they meet the basic requirement of Section 400 of this handbook. (See Figure 10.)

2.124 Solderless Wrap: Strap a strip mounted relay unit with solderless wrap terminals as shown in Figure 11. Strapping shall not obstruct access to the wiring, mounting screws, associated terminal punchings, or cover the relay designations. Straps are normally terminated as individual straps. However, the Continuous Bare Wire Strapping Tool (R-4361) may be utilized providing basic 400 section requirements are met.

2.125 Wire Spring Relays: Strapping of wire spring relay terminals may be made with bare wire providing the terminals are adjacent in the make, fixed or break vertical rows. All other strapping should utilize insulated strapping. All strapping should avoid obstructing access to wiring, terminal punching, mounting screws, and viewing of the relay designations. Refer to Figure 12. (This excludes wire spring multi-contact relays).

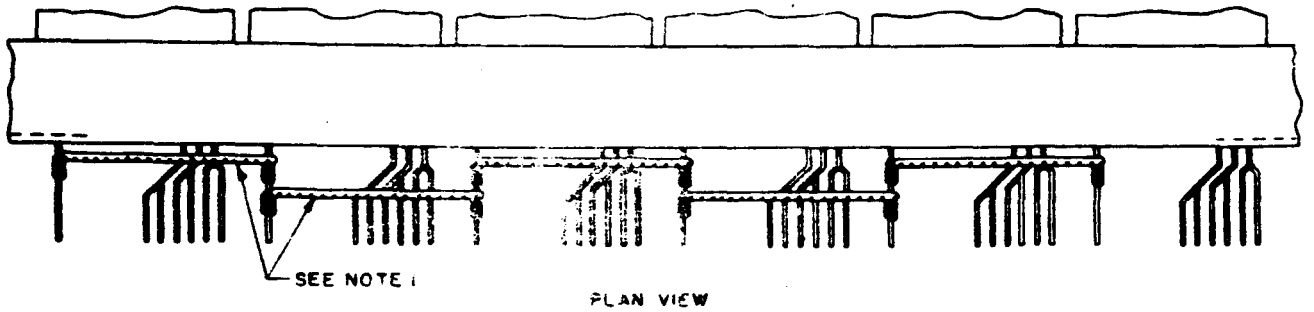
2.126 Multi-Contact Relays: When extending strapping (bare wire banjo) to unequipped intermediate or end relay positions of frames that are partially equipped, the strapping should conform to Figures 13 and 14.

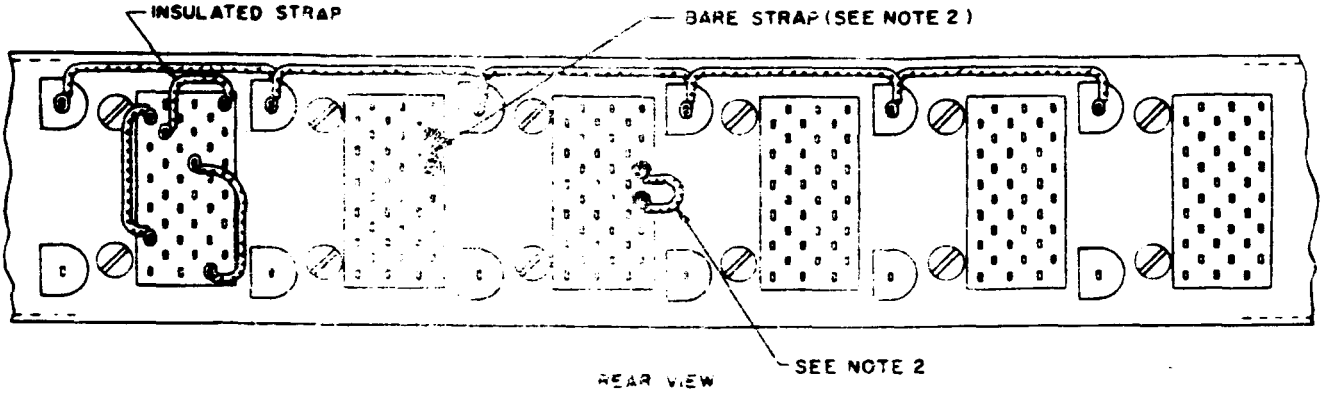




VIEW A - A

FIG. 11 RELAY STRAPPING OF SOLDERLESS WRAP TERMINALS (PAR. 2.124)





NOTES:
1. ARRANGEMENT OF STRAPS WHEN FOUR OR MORE TERMINALS ARE CONNECTED IN COMMON.
2. ALTHOUGH USE OF BARE STRAPPING IS POSSIBLE, INSULATED STRAPS ARE RECOMMENDED TO FACILITATE APPLICATION AND AVOID INTERFERENCE.

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FIG. 12 STRAPPING FOR SPRING RELAYS (PAR. 2.125)

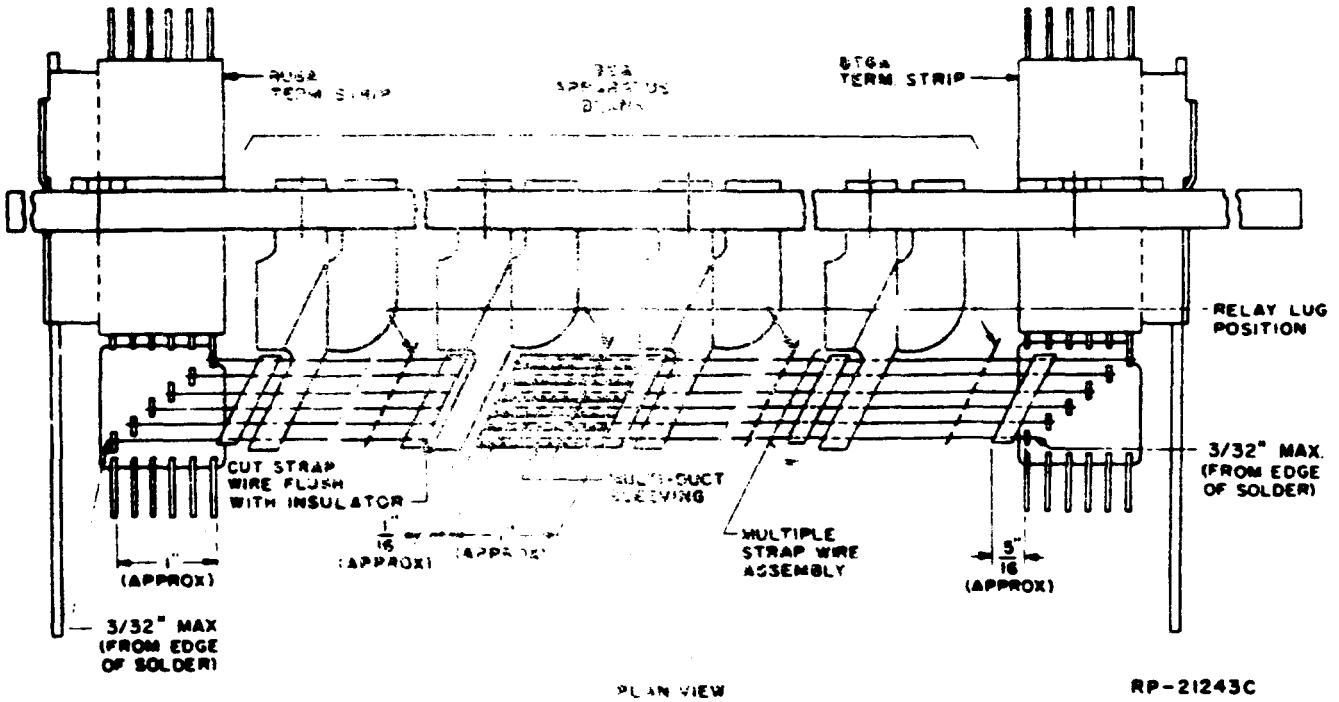


FIG. 13 TYPICAL ADDITION OF MULTIPLE STRAP WIRE BETWEEN UNEQUIPPED POSITIONS OF MULTI-CONTACT TYPE RELAYS (PAR. 2.126)

NOTES:

1. FURNISH ONE APPARATUS BLANK AND TEN MULTI-DUCT SLEEVES FOR FIVE OR LESS UNEQUIPPED RELAY POSITIONS. FURNISH A SECOND APPARATUS BLANK FOR SIX OR MORE UNEQUIPPED POSITIONS. THE SECOND BLANK SHALL BE LOCATED MIDWAY BETWEEN THE LAST EQUIPPED RELAY AND THE APPARATUS BLANK IN THE END POSITION
2. TO ALLOW FOR THE DIFFERENCE IN THE SPACING DIMENSIONS BETWEEN THE MULTI-DUCT SLEEVING AND THE RELAY SPADE TERMINALS, THE SLEEVING MAY BE SPLIT AT THE END ADJACENT TO THE LAST EQUIPPED RELAY INTO TWO EQUAL OR NEAR EQUAL GROUPS FOR A DISTANCE UP TO APPROX THE CENTER OF THE NEXT POSITION
3. TO INSTALL ADDITIONAL RELAYS, REMOVE SLEEVES FROM THE SUPPORT, SLIDE THE SLEEVING BACK AS REQUIRED AND CUT OFF SURPLUS.
4. USE MULTI-DUCT SLEEVING HAVING THE SAME NUMBER OF DUCTS AS THE NUMBER OF STRAPS IN THE GROUP TO BE SLEEVED. HOWEVER, IT IS PERMISSIBLE TO HAVE ONE UNUSED DUCT IN THE SLEEVING. DO NOT SUBSTITUTE TWO OR MORE MULTI-DUCT SLEEVES HAVING SMALLER NUMBERS OF DUCTS FOR ONE MULTI-DUCT SLEEVING HAVING A LARGER NUMBER OF DUCTS
5. WHEN THE UNEQUIPPED POSITION IS AT THE RIGHT END OF THE RELAY ASSEMBLY (AS VIEWED FROM REAR OF FRAME), 1 3/8 INCH MIN STRAP WIRE SHALL BE STORED IN THE SAME MANNER AS SHOWN FOR THE LEFT END.

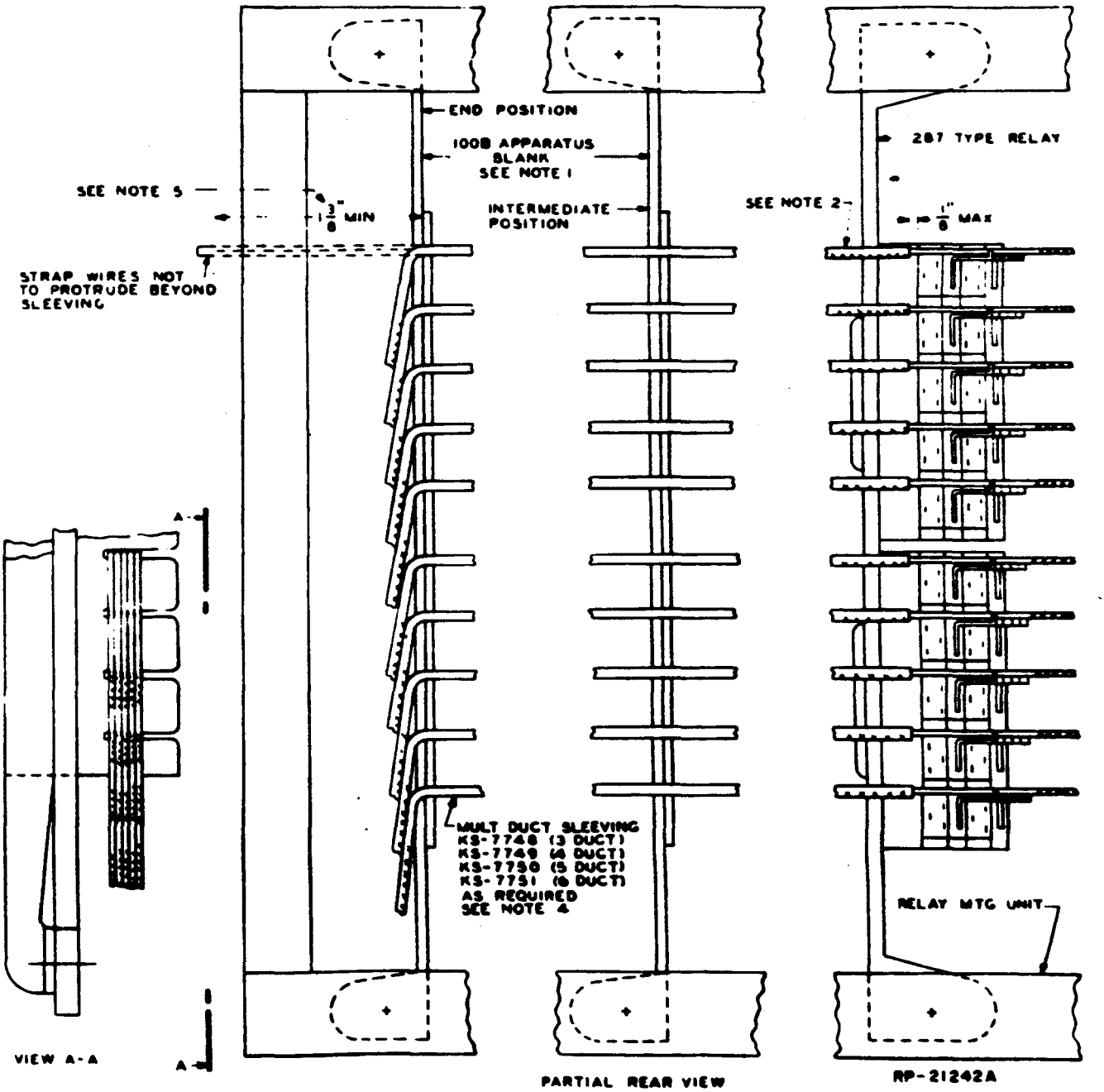


FIG. 14 TYPICAL ADDITION OF MULTIPLE STRAPPING TO END POSITIONS OF MULTI-CONTACT RELAYS (PAR. 2.126)

2.127 When bare wire banjo straps are to be extended to new relay positions, the ends of the leads can be "hooked" together with simple small loops and soldered, or they can be spliced together utilizing the KS-21256 Solder Sleeves. These sleeves are made of heat shrinkable sleeving with an internal ring of solder which requires shrinking with a heat shrink gun. The ends of the bare wires should be overlapped approximately at the solder ring located in the approximate center of the overlapped wire.

2.1271 When the bare wire is "hooked" together and soldered, they should have staggered splices to provide a minimum of 1/16" clearance between the banjo wires. When the solder sleeve method is used, the splices should utilize the methods and requirement of Section 370 of this handbook.

CAUTION: THE END REFLECTOR USED TO RETAIN THE HEAT OF THE R-4444 HEAT GUN IS MADE OF METAL, THEREFORE, CARE SHOULD BE EXERCISED TO AVOID "SHORTING" AND CREATING SERVICE PROBLEMS TO THE COMMON CHAIN. ALSO THIS TOOL PROVIDES APPROXIMATELY 700° OF HEAT AT THE TIP, THEREFORE, ADEQUATE PROTECTION SHOULD BE PROVIDED TO ELIMINATE POSSIBLE WIRE OR APPARATUS DAMAGE.

2.1272 Bare wire banjo straps should be applied one at a time to avoid possible shorting. Provide protection as required. Where terminals have soldering notches, the bare wire shall be securely soldered in these notches. Use of the R-4463 Bent Notched Soldering Tip and the 537A Strap Wire Tool will assist in this strapping operation (see Figure 15).

2.13 Repeating Coils

2.131 Strap the various types of repeat coils according to the basic strapping requirement of Section 400. Refer to Figure 16 for a typical example of strapping 62, 93 and 94 types.

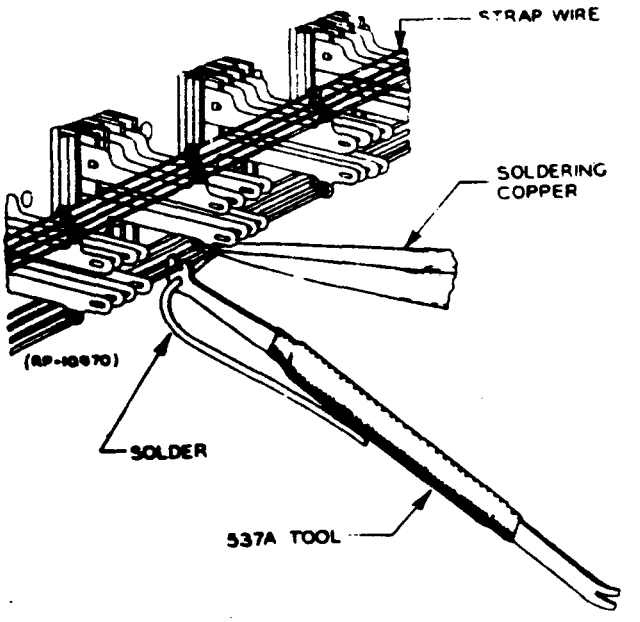


FIG. 15 USE OF STRAP WIRE TOOL

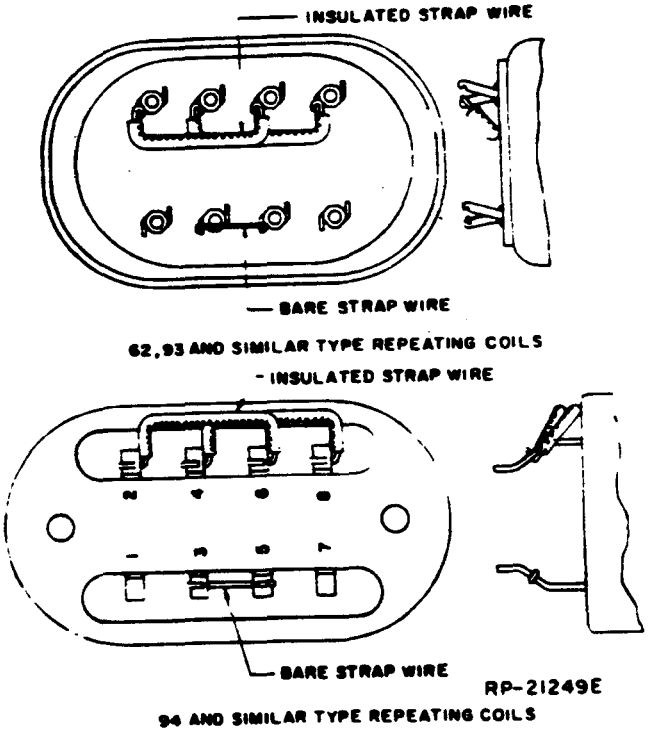
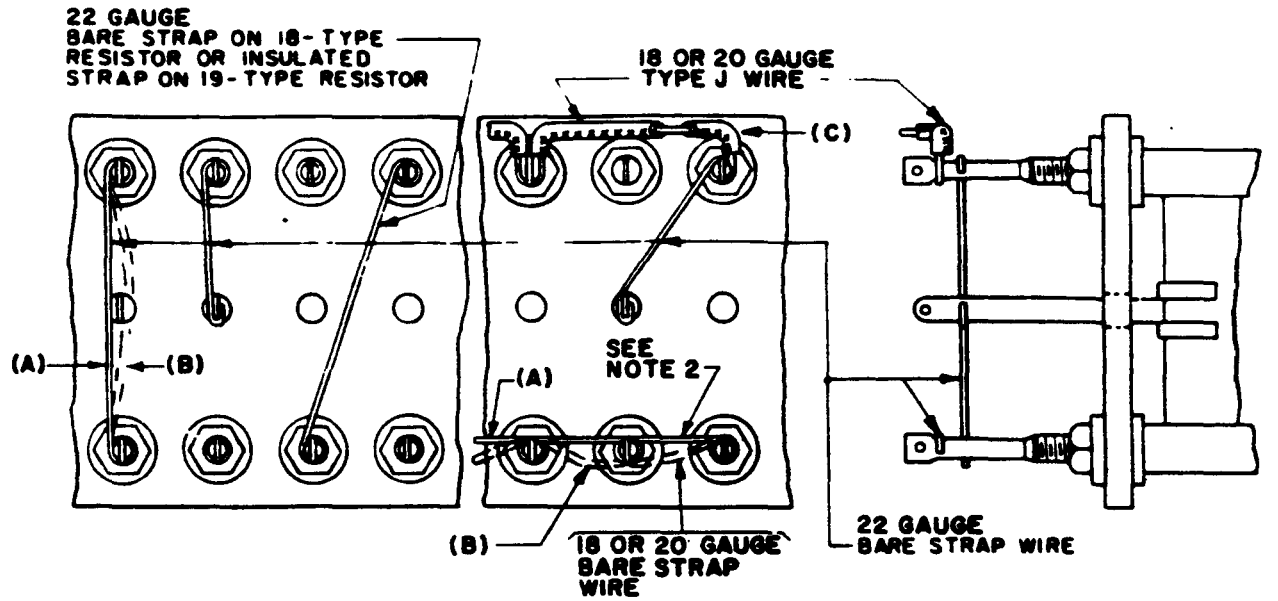


FIG. 16 STRAPS AT 62, 93, 94 AND SIMILAR TYPE REPEATING COILS (PAR. 2.131)

2.14 Resistors

2.141 Flat 18 or 19 type resistors, mounted on a strip, generally can be strapped with bare wire for adjacent terminals and insulated wire for nonadjacent terminals (see Figure 17).



NOTES:
1. THE COMMON BARE STRAP WIRE, CONNECTED TO THE UPPER SIDE OF THE RESISTOR POSTS (AS SHOWN BY SOLID LINES), MAY BE CONNECTED TO THE UNDER SIDE OF THE POST ON ALTERNATE RESISTORS (AS SHOWN BY DASH LINES). A SIMILAR ARRANGEMENT MAY ALSO BE USED WHEN APPLYING INDIVIDUAL STRAPS VERTICALLY TO THE TOP, MIDDLE AND BOTTOM POSTS OF THE SAME RESISTOR OR THE WIRE MAY BE WRAPPED AROUND THE MIDDLE POST.
2. PLACE CONNECTING LOOP WHEN REQUIRED FOR COMMON STRAP FEEDER LEAD.

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FIG. 17 TYPICAL 18, 19 TYPE RESISTOR STRAPPING (PAR. 2.141, 2.411, 2.142)

2.1411 Some flat type resistors have performed terminals and others have rectangular unperforated terminals. Both types should be strapped according to Figure 17, methods (A) or (B). Bare wire straps connected according to method (A) are sufficient. However, where improved solderability is required apply method (B) one complete turn of bare wire or a simple hook connection is satisfactory for soldering.

2.142 When resistors have solderless wrap terminals, bare wire may be used for strapping adjacent terminals of the same or adjacent resistors. Insulated straps shall be used for nonadjacent terminals as shown in Figure 17. The wrapped connection should be placed near the base of terminals unless otherwise specified on the wiring drawing. All strapping should not obstruct access to the wiring or cover the resistor designations.

2.15 Resistor Lamps

2.151 Resistor lamp terminals may be perforated, nonperforated or solderless wrap type. Adjacent terminals may be strapped with bare wire and nonadjacent terminals should utilize insulated wire. (SW) connections should be placed near the base of the terminals unless otherwise specified on the wiring drawing. Straps should not obstruct the wiring, access to the mounting screws, or limit vision of lamp designations.

2.16 Sockets

2.161 Electron tube or lamp socket terminals may either be solder or solderless wrap type. Adjacent terminals may be strapped with bare wire and nonadjacent terminals should use insulated wire unless otherwise instructed on the wiring drawing. When sockets have floating type terminals, slack should be allowed in the strap to provide free movement.

2.17 Switches, Crossbar

2.171 The magnets of crossbar switches may have either perforated or nonperforated solder type terminals or solderless wrap type terminals. Strapping of these terminals is normally done in the shops, however, when the field is required to strap the magnets, they should be strapped according to Figure 18.

2.1711 The requirements reflected in Figure 18 will apply to both solder and solderless type terminals. For solder type terminals one full turn or a simple hook connection should be used before soldering. If the terminals are (SW) they should be applied near the base of the terminal and meet the requirements of Section 310 of this handbook.

2.172 Vertical strapping of X-Bar switches should conform to Figure 19. Bare wire strapping may be used for adjacent terminals and insulated wire small be used for nonadjacent terminals. Strapping shall not obstruct access to the wiring or vision of the functional designations.

2.18 Terminal Strips

2.181 Solder Type: Generally No. 22 gauge bare or insulated strap should be used. However, when an increased soldering surface is required, No. 18 gauge bare wire can be utilized providing proper separation can be maintained between straps, terminals and other metal parts.

2.1811 Straps should be placed near the base of the terminal or in the soldering notches as determined from the associated wiring drawing. Refer to Figure 20 for typical examples of terminal strapping.

2.1812 Distributing Frame Type: Bare wire straps may be used for strapping adjacent terminals of the same row (perpendicular to the fanning strip) and adjacent terminals (parallel to the fanning strip) of the farthest row away from the base of the strip. Do not bare wire strap adjacent terminals of other rows running parallel to the fanning strip. Insulated straps shall be used for strapping all nonadjacent terminals. Running of straps should conform to Figure 21.

2.1813 There are a vast number of coded terminal strips which mount on distribution frames, relay racks and other equipment frames. It is, therefore, impossible to cover each code. The associated wiring drawings should specify the gauge and code of wire to be used. When the drawing does not specify the above information, the following basic rules should be followed:

(a) Use bare strap wire of the same gauge of wire feeding the circuit for adjacent terminals. (Exception Paragraph 2.183).

(b) Use insulated straps of the same gauge of wire feeding the circuit for nonadjacent terminals.

(c) Strapping should not interfere with the termination of the wiring.

(d) Strapping should not obscure the vision of the functional designations of the apparatus.

(e) A common strap termination on three (3) or more pieces of apparatus should be arranged so the internal apparatus can easily be removed.

2.182 Solderless Wrap Type: Generally No. 24 gauge bare or insulated wire should be used for strapping of (SW) terminals. This information should be specified on the associated wiring drawing. When a drawing does not specify this code of wire, "BU" type black insulated wire should be use for strapping at (SW) terminals. "BW" or "DP-2" types of black insulated wire should be utilized when soldering at the base strapping notch when an (SW) terminal is required.

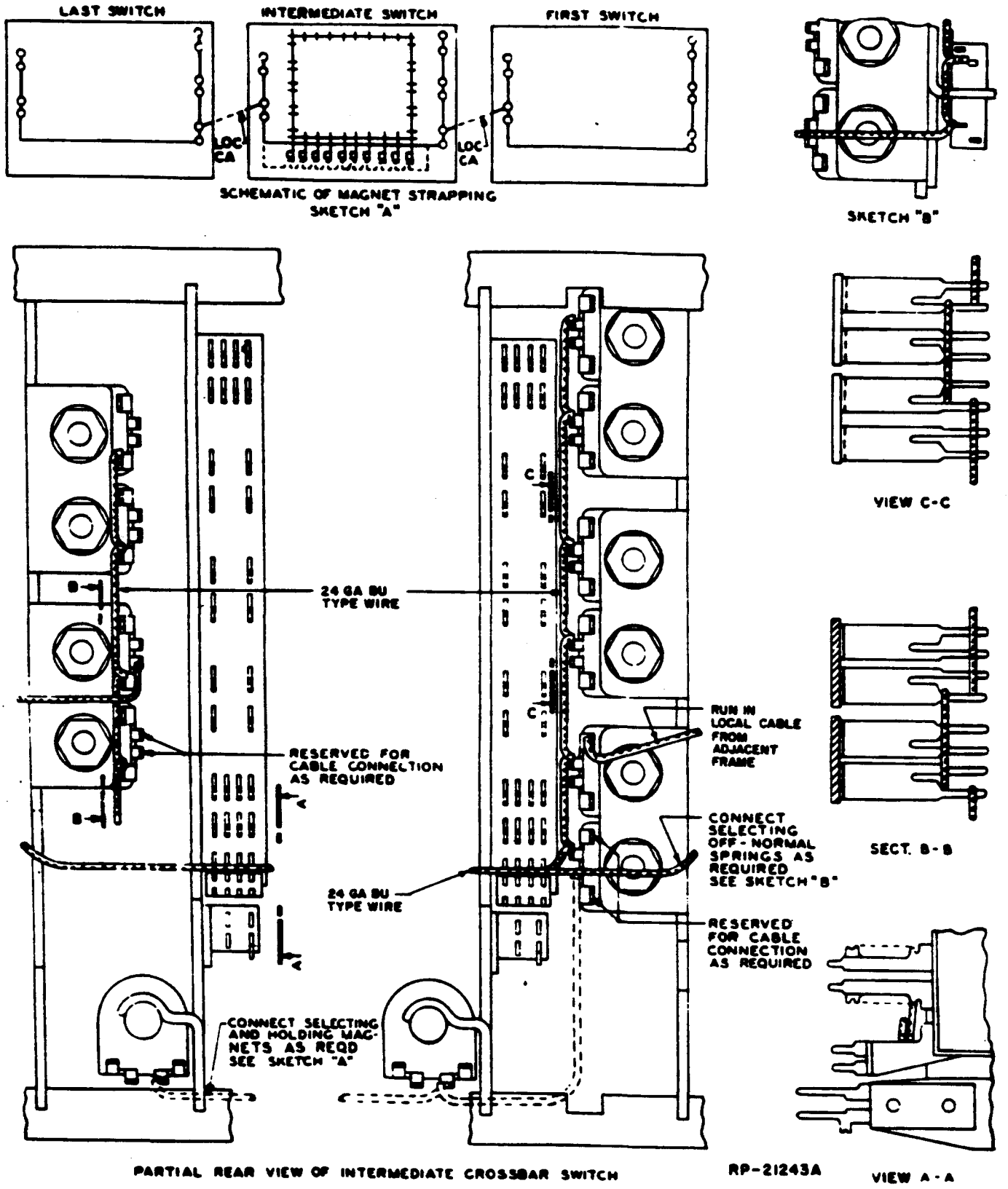


FIG. 18 CROSSBAR SWITCH MAGNET STRAPPING (PAR. 2.171 and 2.1711)

NOTES:

1. INDIVIDUAL STRAPS MAY BE WRAPPED AROUND A TERMINAL OR PASSED THROUGH THE HOLE IN THE TERMINAL PROVIDED THERE IS NO INTERFERENCE WITH THE CONNECTING OR REMOVAL OF OTHER WIRING EXCEPT THAT INDIVIDUAL STRAPS SUBJECT TO CHANGE IN SERVICE SHALL NOT BE PASSED THROUGH THE HOLE IN TERMINALS SUCH STRAPS WILL BE IDENTIFIED ON THE MANUFACTURING CIRCUIT DRAWING.
2. WHERE SPLIT HORIZONTAL MULTIPLES ARE TO BE GROUPED TOGETHER, THE SPLIT SHOULD BE BRIDGED BY MEANS OF A "U" SHAPED LOCAL CABLE FORM CONNECTING THE GROUPS OF TERMINALS ON ADJACENT SWITCH VERTICAL UNITS. THIS FORM SHOULD BE SUPERIMPOSED ON THE HORIZONTAL FORM ALONG THE BOTTOM OF THE SWITCH AND THE SKINNERS TO THE HORIZONTAL MULTIPLE TERMINALS SHOULD BE DRESSED SIMILAR TO OTHER LEADS TO SWITCH HORIZONTAL TERMINALS.
3. WHEN THE 20 GA HORIZONTAL LEVEL STRAPPING IS NOT CONNECTED, THREE VERTICAL MULTIPLE TERMINALS MAY BE STRAPPED TOGETHER.
4. THE 20 GA HORIZONTAL LEVEL BARE STRAP WIRE SHALL NOT EXTEND MORE THAN 3/32" MAX. BEYOND EDGE OF SOLDER AT END OF STRAP.

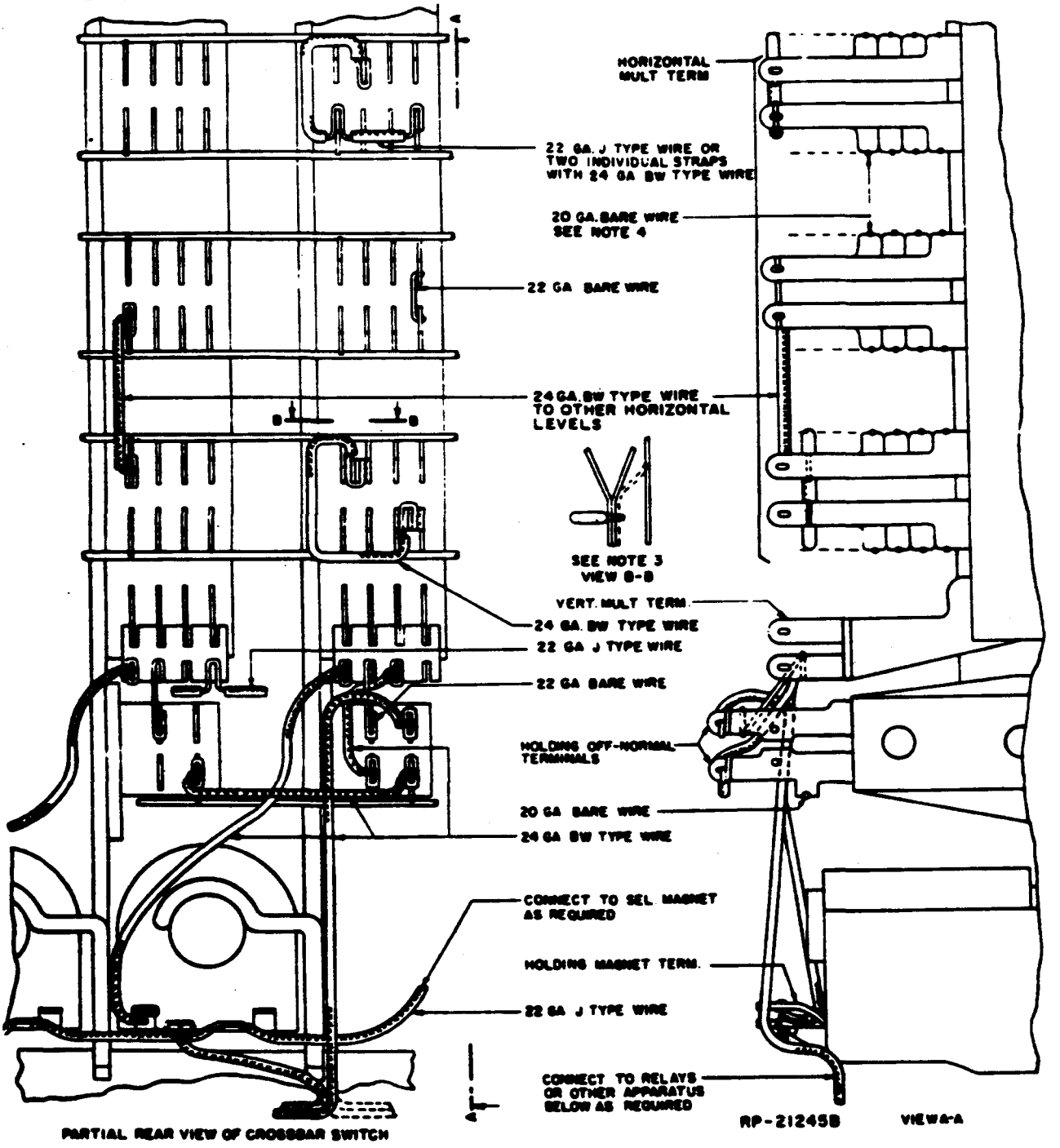
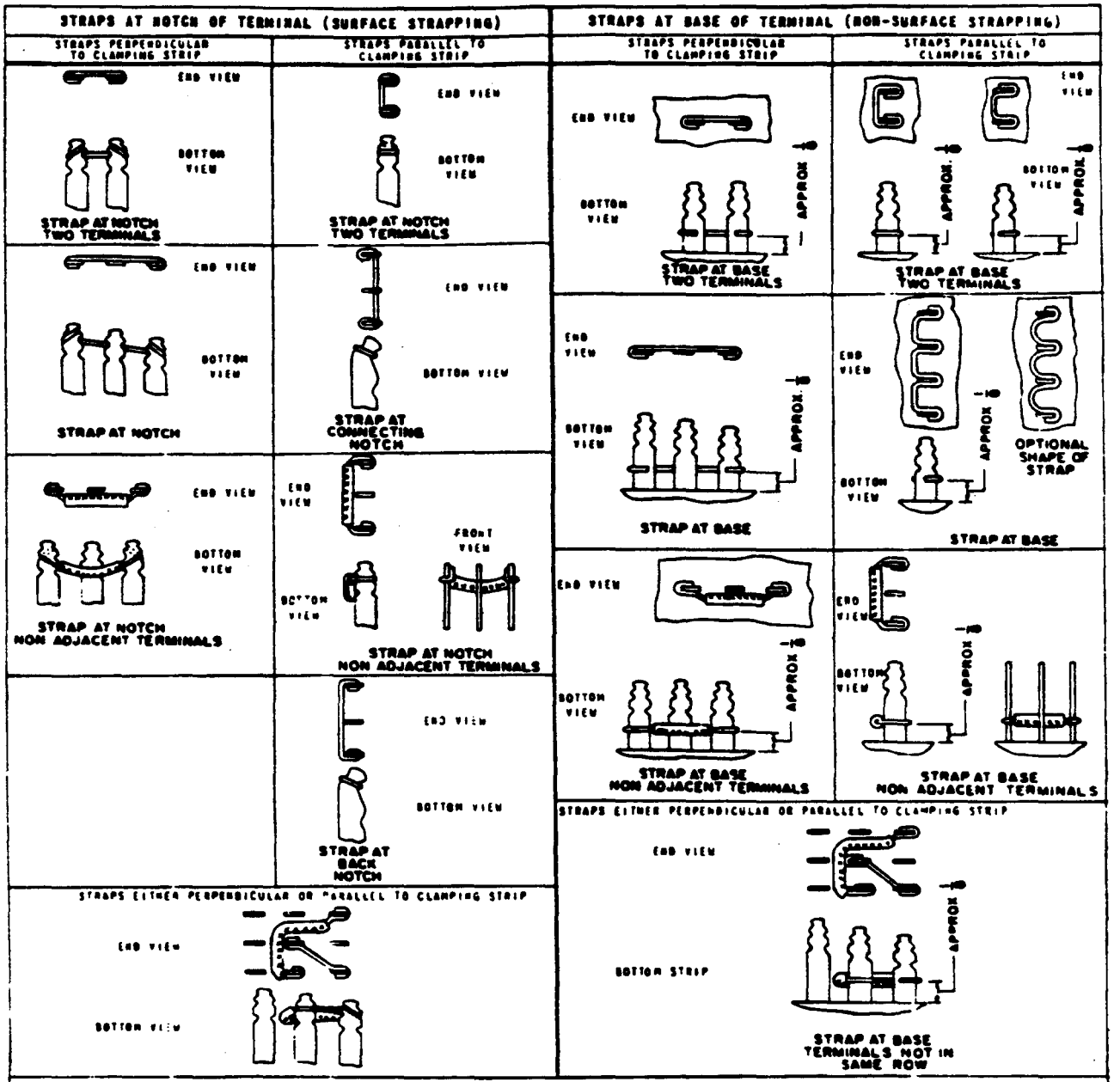


FIG. 19 CROSSBAR SWITCH VERTICAL STRAPPING (PAR. 2.172)



NOTES: (1) The location, connection and dress of straps shown are typical and may be varied to suit particular conditions. Generally, the soldering requirements will determine whether the strap is to be placed over or under adjacent terminals.

(2) Indicated views are for straps placed on left-hand side (facing the strip) of a vertically mounted terminal strip and are designed in general to permit top or right-hand soldering of wire ends. Bare straps connecting three or more terminals are placed so the intermediate terminals may be soldered on top or right side, or in the notches and wire ends may require soldering on both sides of terminal.

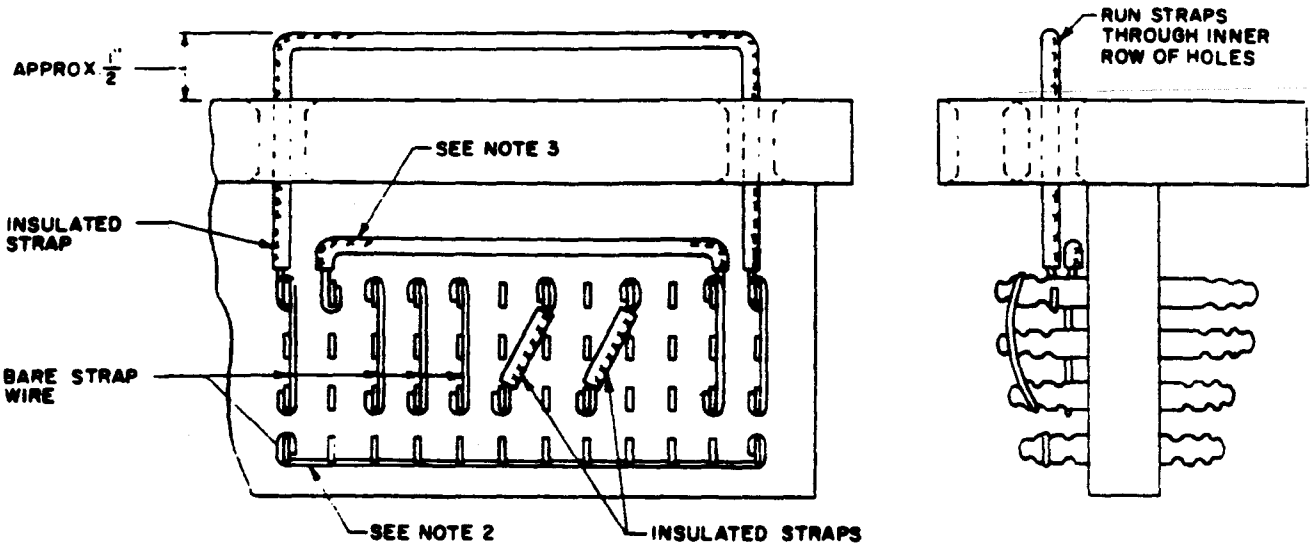
(3) To apply these views for straps on the bottom side of horizontally mounted terminal strips, rotate the views as necessary to cause insulated straps to pass other terminals in the same row on the left side or the rear and bare straps to be in position for soldering in the notches or right hand side of terminals.

(4) Terminal strips strapped in the shop will generally conform with figure, except as covered in Note 5, although, due to manufacturing conditions, there may be some variations. These variations by the shop should be considered satisfactory provided they do not interfere with installing operations and meet the soldering requirements.

(5) The use of formed straps for surface strapping has been authorized for the shop.

RP 21247A

FIG. 20 TYPICAL BASE AND NOTCH TYPE STRAPPING (PAR. 2.1811)



NOTES:

1. THIS FIGURE ILLUSTRATES ONLY THE METHOD OF RUNNING STRAPS. CONNECT THE STRAPS AS ILLUSTRATED IN FIGURE 1 AS SURFACE STRAPS OR BASE STRAPS AND LOCATE THEM ON THE SIDE OF THE TERMINAL STRIP SPECIFIED ON THE ASSOCIATED DRAWINGS.
2. STRAIGHT BARE STRAPS IN TERMINAL NOTCHES FOR SURFACE STRAPPING ONLY. USE FORMED BARE STRAPS FOR BASE STRAPPING.
3. FOR BASE STRAPPING ONLY FOR SURFACE STRAPPING RUN STRAPS THROUGH INNER FANNING HOLES.

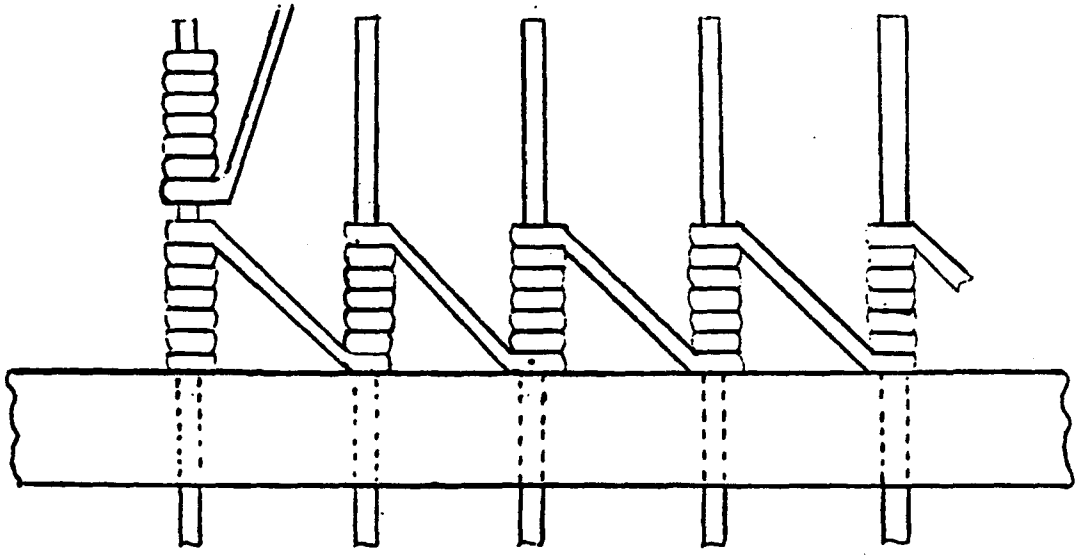
RP-21269A

FIG. 21 STRAPS BETWEEN TERMINALS IN DIFFERENT ROWS (PAR. 2.1812)

2.1821 Straps on approved (SW) terminals should be placed far enough down on the terminal to permit termination of the wiring on that given terminal. The wiring diagram should specify the number of leads terminating on the terminals.

2.1822 When drawings do not specify the code of wire to be used, follow the simple basic rules of Paragraph 2.183. All solderless wrap strap connections shall meet the requirements of Section 310 of this handbook.

2.1813 When strapping adjacent terminals, the R-4361 continuous bare wire strapping tool may be used. When this tool is used on adjacent terminals, the wrapped connections should conform to Figure 22.



NOTE: When surface strapping is specified connect the incoming lead at base of terminal and use a similar strapping arrangement.

FIG. 22 ADJACENT TERMINAL STRAPPING USING THE R-4361 TOOL (PAR. 2.1823)

3. Verification: The following is a brief statement of the requirements with the associated paragraph and figure.

Verification Item and Brief Requirement Statement		REFERENCE PAR.	REFERENCE FIG.
3.01	Banks - Straps should conform to Figures 1 and 2	2.012	1,2
3.02	Capacitors - Straps should conform to Figure 3	2.021	3
3.03	Distributing Terminal Assembly (DTA) - Straps should conform to Figure 4	2.031	4
	Vertical		
	(A) 1-½ turns at top of continuous strap on bottom lug	2.031a	
	(b) 1-½ turns at bottom of continuous strap on upper lug	2.031b	
	(c) Straps run without slack	2.032	
	Horizontal		
	(a) Use 20 gauge wire and conform to Figure 4	2.033	4
	(b) (SW) connections meet requirements of Section 310 multiple reversal form - same as vertical strapping	2.033 2.034	
3.04	Fuse Panels - Solder type to conform to Figure 5	2.042	5
	(a) Provide connecting loop between first two fuses	2.042	
	(b) The alarm lamps and resistors should be strapped with insulated straight straps	2.043	
	(c) (SW) connections use insulated strap of proper gauge on nonadjacent terminals and bare wire on adjacent terminals	2.044	
3.05	Interrupters - Straps should conform to Figure 6	2.051	6
3.06	Jacks - Between individually mounted jacks. Use loop leads	2.061	
	(a) Strip mounted jacks conform to Figure 9	2.062	9
	(b) Feeder leads of multiple loops use terminal holes	2.063	9
3.07	Keys - Straps connected at notch or hole provided	2.071	
	(a) Do not interfere with wiring or maintenance of key		
	(b) Strap keys uniform on particular units		
	(c) Strip type mounted keys conform to Figure 7	2.072	7
	(d) Strap narrow based keys - use formed straps	2.073	8
3.08	Lamp Sockets and Mountings - Strip mounted may use straps instead of loop leads	2.081	
	(a) Bare wire straps on lower terminal per Figure 9	2.082	9

Verification Item And Brief Requirement Statement		REFERENCE PAR.	FIG.
3.09	Message Registers - Use straight straps either bare or insulated as required - provide connecting loop	2.091	
	(a) Extend straight strap by splicing between last two appearances	2.0911	
3.10	Networks - Use insulated wire for nonadjacent terminals and bare wire for adjacent terminals	2.101	
3.11	Protectors - When required use 22 or 20 gauge wire tinned bare or insulated as required by (BOC)	2.111	
	(a) Use X-connect wire to strap "c" type protectors	2.112	
3.12	Relays - Strap solder terminals according to Figure 10	2.121	10
	(a) Bare wire on adjacent terminals and insulated wire on nonadjacent terminals	2.122	
	(b) Do not obstruct access to the wiring, mounting screws, terminal punchings, or cover relay designations		
	(c) Formed and bare wire straps meet Section 400 requirements	2.123	
	(d) (SW) strip mounted relays conform to Figure 11	2.124	11
	(e) (SW) meets requirements of 3.12 b and c		
	(f) Wire Spring Relays - Use bare wire for adjacent terminals in same vertical row of make, break of fix contacts. Also meets requirements of 3.12 b and c	2.125	12
	(g) Multi-contact relay strapping conform to Figures 13 and 14	2.126	13,14
	(h) Extend banjo wire with soldered "hook" - type or with KS-21256 solder sleever connections	2.127	
	(i) "Hook" and soldered connections staggered 1/16" clearance	2.1271	
	(j) Banjo wire soldered in notches when provided	2.1272	15
3.13	Repeating Coil - Straps conform to Figure 16	2.131	16
3.14	Resistors - Flat strip mounted resistors conform to Figure 17	2.141	17
	(a) Flat type resistors can be strapped according to methods (A) or (B) of Figure 17	2.1411	17
	(b) (SW) connections may use bare wire for adjacent and insulated wire for nonadjacent terminals	2.142	17
	(c) Do not obstruct wiring or cover designations	2.142	
3.15	Resistor Lamps - Adjacent terminals may use bare wire, nonadjacent terminals use insulated wire	2.151	
	(a) (SW) connections near base of terminals		
	(b) Do not obstruct wiring, mounting screws or limit vision of designations.		

Verification Item And Brief Requirement Statement		REFERENCE PAR.	FIG.
3.16	Sockets - Adjacent terminals may use bare wire, nonadjacent terminals use insulated wire	2.161	
	(a) Allow slack in strap for floating contacts		
3.17	Switches, Crossbar - Should conform to Figure 18	2.171	18
	(a) (SW) connections made near the base of the terminal and meet requirements of Section 310	2.1711	
	(b) Vertical strapping should conform to Figure 19	2.172	19
	(c) Bare wire may be used on adjacent terminals and insulated wire on nonadjacent terminals	2.172	
	(d) Do not obstruct wiring or vision of designations	2.172	
3.18	Terminal Strips - Bare wire may be used providing separation can be maintained between straps, terminals, etc.	2.181	
	(a) Straps placed properly, refer to Figure 20	2.1811	20
	(b) Distributing frame type terminal strips	2.1812	
	1) Bare wire may be used on adjacent terminal of the same row running perpendicular to the fanning strip		
	2) Bare wire may be used on adjacent terminals running parallel to the fanning strip on the last row away from the terminal strip base		
	3) Use insulated wire for all nonadjacent terminal strapping	2.1812	21
	(c) When wiring drawing does not specify gauge, code, etc, follow basic rules:	2.1813	
	1) Use bare strap wire of same gauge feeding circuit for adjacent terminals	(a)	
	2) Use insulated wire strap of same gauge feeding circuit for nonadjacent terminals	(b)	
	3) Strapping not to interfere with circuit wiring	(c)	
	4) Strapping not to obscure vision or designations	(d)	
	5) Common straps to three (3) or more pieces of apparatus arranged so internal apparatus can be removed	(e)	
	(d) (SW) type - 24 BU (black) utilized when drawing does not specify type of wire	2.182	

Verification Item And Brief Requirement Statement	REFERENCE PAR.	REFERENCE FIG.
1) When (SW) terminal requires soldering, use either 24BW or 24DP-2 type when not specified		
2) Straps placed down on terminal to allow the termination of the wiring	2.1821	
3) Follow basic rules of Paragraph 3.18c and Section 310 of this handbook	2.1822	
(e) Continuous bare wire strapping to conform to Figure 22	2.1823	22

[Vertical line at side of paragraph indicates requirement

Engineering Planning Manager
(Installation)

Reason for Reissue:
Update and combine information from sections 401, 402, 403 and 404.