

WIRE SKINNING  
TOOLS, METHODS AND REQUIREMENTS

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1. GENERAL
    - 1.1 Scope of Section
      - 1.11 This section covers the methods and requirements for skinning textile and/or plastic insulated switchboard cable wire, bulk wire and cross connection wire for soldered, solderless wrapped and wrapped and soldered connections.
      - 1.12 This section also includes a description of the various tools used to skin both plastic and textile insulated conductors. Refer to the 700 series sections of this handbook for handling coaxial and shielded office cables.
      - 1.13 The requirements covered in this section shall be followed except as modified by applicable specifications and drawings.
      - 1.14 Each figure in this section illustrates only 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 involved.
    - 1.2 Precautions
      - 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. INSTALLING EQUIPMENT
    - 2.1 Tools

R-1138	Adapter, Plug, Polarized
R-2738	Bag, Connecting, General
R-2563	Bracket, Lamp
R-2211	Lead, Lamp, Portable
R-3843A	Lamp, Fluorescent, 15 watt
R-4226	Lamp, Fluorescent, 30 watt
R-2434	Scissors, 8"
R-1682	Scissors, Electricians, 5"
R-3145	Seat, Rolling Ladder Skinning Tools
R-3306	Attachment, Cutting and Skinning
R-6433	Cutters, Diagonal
R-3088	Wire Skinning Tool
R-4473	Tool, Combination Cutting & Skinning

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SYSTEM EXCEPT UNDER WRITTEN AGREEMENT

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## 2.2 Supplies

RM-626122 Canvas, 29" Wide  
 RM-583101 Fiber, Sheet, Grey, 1/64"  
 R-2131 Lamp, 75 Watt, Rough Service

## 3. PREPARATORY OPERATIONS

### 3.1 Equipment Protection

3.1 Where practicable keep slivers of wire, wire ends or pieces of insulation from falling into equipment by using connecting bags, sheet fiber or canvas to catch falling debris during skinning operations.

### 3.2 Check Butts and Forms

3.21 At locations using fanned forms, such as distributing frames, check to see that cable butts are secure before skinning wires. Secure forms where necessary.

### 3.3 Handling Wire Ends

3.31 Special care shall be taken when trimming off the excessive length of the wire ends with the R-2434 Scissors. Hold the free hand far enough away from the cutting point to avoid possible hand injury in case the scissors should slip while trimming the wire ends.

### 3.4 Solderless Wrap Connections

3.41 When skinning wires for solderless wrap connections, cut off this excess wire end lengths with the R-2434 (8") Scissors approximately (8"-10") beyond the skinning point.

3.42 Where there are color duplications of the tip leads, such as in the ABAM and ABMM type cables, the length of (8"-10") is sufficient. However, the individual cable pairs should be twisted tightly together to avoid possible wiring errors.

### 3.5 Soldered Connections

3.51 Where leads of a sewed form are to be connected to various "Solder" type terminals, they should be cut off at least 1-1/2" beyond the skinning point. This long "Shiner" length will provide sufficient room to grip the clipping when being cut away from the completed connection. Care should be taken to provide adequate protection for the equipment mounted below. ELIMINATE ANY POSSIBILITY OF A SERVICE INTERRUPTION.

3.52 At terminal strips, cut off the excess wire end lengths with the R-2434 (8") Scissors approximately 6" beyond the clamping strip. Care should be taken to identify cable pairs when duplicate colored pairs are fanned through the same fanning strip hole.

## 3.6 SKINNER LENGTH REQUIREMENTS

3.61 The length of individual skinners shall be such that the wire, after connection, will be dressed in a neat appearing workmanship manner.

3.62 Where new apparatus is being added into an area with other existing similar apparatus, the lead dress shall be the same. If a new type of apparatus is being added for the first time, refer to the equipment application drawing for the proper lead dress. If no dress path is provided, dress the leads according to Paragraph 3.61.

## 4. SKINNING WIRE ENDS

### 4.1 General Information

4.101 When skinning switchboard, bulk and cross connection wire use the prescribed tools and methods covered in Paragraph 7.

4.102 All Skinning of textile insulated wire shall be done, as far as practicable, so as not to leave the insulation frayed.

4.103 Care should be taken not to nick or scrape the "shiner" portion of the wire used for making solderless wrapped connections.

4.104 Skinned wires should be free from kinks.

4.105 Do not skin loop leads carried through sewed forms for unequipped circuits.

4.106 Where the skinner length of local cable wires is not known and they are left long enough to reach apparatus which is not furnished initially, the skinner leads need not be skinned.

4.107 Skin the unused wires in universal local cable forms, except the unused portion of cut loop leads.

- 4.108 The spare and unused wires in switchboard cable forms, except in cable splices, are not skinned.
- 4.109 Wires to be terminated at live equipment should be skinned individually when they are being connected. This will reduce annoyance to subscribers and reduce office troubles.
- 4.110 Use a skinning guide to obtain uniform skinner lengths. (See Paragraph 4.41.)
- 4.111 Hold wires back of the skinning point to prevent loop wires pulling out of form, breaking of skinners, or possible damage to insulation caused by pulling against stitches.
- 4.112 When the twist in paired wires interferes with skinning, the wires may be untwisted the entire length of skinner except when the apparatus is equipped with a fanning strip or where "tight twisted" pairs are required.
- 4.113 When the apparatus is equipped with a fanning strip the wires may be untwisted to a point a short distance behind the rear terminal.
- 4.114 Untwist skinners of paired wires at the front end of 224 (Well) Type Terminal Strips for a distance approximately equal to the depth of the well.
- 4.2 Skinning Precautions
- 4.21 Use care in handling skinning tools to avoid personal injury and equipment damage. Keep tools away from equipment terminals to prevent accidental shorts and crosses.
- 4.22 Nicking, scrapping or kinking the wire, or damaging the tin on tinned wire may have a detrimental effect on connections. This applies particularly to solderless wrapped connections.
- 4.23 Bent or kinked wires are difficult to insert into the wire feed slot of the wire wrapping bit. They also cause excessive wrapping bit and sleeve wear which reduces bit life. A scored sleeve often prevents a wrapping bit from indexing properly and in time will keep the tool from making satisfactory connections.

4.24 Wire ends that have been skinned and that are laying loose in a form, can cause personal injury and may affect service if shorted into live working equipment. Wear your safety glasses and use caution when handling the wire ends.

4.25 Care should be exercised in using any skinning tool to prevent distortion or curling of the skinned portion of the wire when removing insulation. To avoid these troubles, remove insulation with a reasonably straight pulling action.

4.3 Shiner Length Requirements

4.31 For skinning purposes a shiner length may be considered as that portion of the wire from which the insulation has been removed to provide bare wire for connecting purposes. Use shiner lengths in accordance with the following instructions for the various conditions listed:

(a) Solderless Wrapped Connections

At terminals designed for solderless wrapped connections use shiner lengths as indicated:

<u>Shiner Length</u>	<u>Wire Gauge</u>	<u>Type of Terminal</u>
1-1/2"	24	.009/.010" Embossed
1-5/8"	20, 22 or 24	Square Rectangular or Embossed
1-5/8"	22, 24	Twisted and Coined, Serrated
2"	26, 28, 30	Square, Rectangular or Embossed
1-1/8"	26, 28, 30	.025 Square
1-5/8"	26	.009 and .010 Embossed

NOTE: For solderless wrap connecting methods and requirements, refer to Section 310 of this handbook.

(b) Soldered Wrapped Connections

When required to make soldered connections on terminals that were designed for wire wrapping, a shiner length of 3/4" will provide the desired (3) turns; however, a shiner length of 3/8" will provide the minimum (1-1/4) turns allowable.

(c) Soldered Connections

At terminals designed for soldered connections, a shiner length of 3/4" is adequate for connections at notched type terminals. A 1-1/2" shiner length should be used for connections at perforated terminals to provide sufficient holding length when the wire ends are cut after being soldered. At miscellaneous terminals the shiner length is generally dependent upon the individual terminal design.

4.4 Skinning Aids

4.41 For apparatus with fixed skinner lengths, a skinner length guide can be devised by attaching a length of gray fiber or insulated 12 or 14 gauge wire placed under the fillister head screw and adjusted so the distance from the end of the wire to the wire slot in the skinning assembly equals the desired skinner length.

4.5 Check Skinning Blades

4.51 To insure that the wires to be skinned will not be nicked, scraped or otherwise damaged, before starting skinning operations check to see that skinning components are not bent, worn or out of adjustment.

4.52 Use a piece of scrap wire for test purposes. Skin a wire and then reapply the tool removing an additional 1/2" of insulation. Check the wire at the first skinning point to insure that it has not been nicked, scraped or excessively flattened.

4.53 Because of the manufacturing process used to produce the skinning blades for the R-4473 Tool, a slight step or burr may occur where the entry radius meets the skinning slot of the blade. This condition can be repaired in the field by removing the burr with R-2799, 320 Grit Aluminum Oxide Cloth.

5. SKINNING TOOL APPLICATIONS

5.1 A number of different tools are available for skinning plastic or textile insulated switchboard, bulk and cross connection wire ends when preparing to make soldered or solderless wrap connections. The type of tool used will depend on the wire gauge, insulation and the type of connection to be made (soldered or wrapped).

5.11 Refer to Figure 1 to find the recommended skinning tool for the more commonly used types of wire under the conditions listed.

5.12 Descriptions of the various skinning tools and operating instructions may be found in Paragraph 7.

5.13 To obtain the best results apply the tools in accordance with the information provided. Where more than one tool is listed local conditions or individual preferences may dictate the choice of a tool.

6. SKINNING WIRES AT SPECIFIC APPARATUS6.1 Fuse Panels With Fanning Strips

6.11 At fuse panels equipped with fanning strips, determine the skinning point by pulling the fanned skinner around the terminal to which it is to be connected to the next terminal on the right as viewed from the wiring side. Skin lead at this point, connect and dress lead into a loop at the side of the fuse post.

6.2 Terminal Strips - General

6.21 At terminal strips designed for soldered connections, skin the wire ends approximately one terminal past the connecting point to allow a relaxed (not taut) wire dress.

6.22 At terminal strips designed for wire wrapped connections, skin as many wires as practicable before connecting to avoid the need for constant switching from skinning tool to wrapping tool.

6.221 At solderless wrapped type terminal strips that have fanning strips arranged with one hole or slot for each two rows of terminals, where practical, skin four wires at a time, skinning wires serving two adjacent terminals in both rows. Use the terminals in both rows. Use the terminals farthest from the fanning strip as the skinning point.

6.222 At solderless wrapped type terminal strips that have fanning strips with one hole or slot for each row of terminals, skin the two wires for adjacent terminals (in the same vertical row associated with the same fanning slot) at the same time. Use the terminal farthest from the fanning strip as the same skinning point.

TYPE OF CONNECTION	SOLDERLESS WRAPPED				WRAPPED AND SOLDERED				SOLDERED
	20	22	24	26	20	22	24	26	
WIPE GAUGE (NOTE 4)	20	22	24	26	20	22	24	26	20-26
SHINER LENGTH (NOTE 1)	1-5/8	1-5/8	1-5/8	2	3/4	3/4	1/4		3/4
SWED CABLE AND BULK WIRE INSULATION CODES SKINNING TOOLS (NOTES 2,3,66)									
PLASTIC M1, M1L		R-3907(4) R-3306(1)	R-3907(5) R-3306(1)	P-3403(6) R-3306(1)			R-3907(5) R-3088(1)		R-3088(1) R-3907(4) R-3403(6) R-4547(3)
TEXTILE M2, M2L NOTE 3			R-3907(1)				R-3907(1) R-3088(1) R-4547(1)		
BRAIDED TEXTILE M2, M2L, J1	R-3088(1) R-4547(1)	R-3907(1) R-3306(1)	R-3907(1) R-3306(1)						
TEXTILE & PLASTIC U20, U22, M2L, M2L, C3	R-3088(1) R-4547(1)	R-3907(1) R-3306(1)	R-3907(1) R-3306(1)	R-3403(1) R-3306(1)	R-3088(1) R-4547(1)	R-3088(1) R-4547(1)	R-3088(1)	R-3088(1)	R-3088(1) R-4547(1)
BRAIDED TEXTILE AND PLASTIC M1L, M2L		R-3907(1) R-3306(1)	R-3907(1) R-3306(1)		R-3088(1) R-4547(1)	R-3088(1) R-4547(1)	R-3088(1)		R-3088(1) R-4547(1)
SPECIAL PLASTICS W, DT	R-3088(1) R-4547(1)	R-3907(1) R-3306(1)	R-3907(1) R-3306(1)		R-3088(1) R-4547(1)	R-3088(1) R-4547(1)	R-3088(1)		R-3088(1) R-4547(1)
A CABLE		R-3907(4) R-3306(1)	R-3907(5) R-3306(1)	P-3403(6) R-3306(1)		R-3088(1) R-4547(1)	R-3088(1)	R-3088(1)	R-3088 R-4547
M CABLE	R-3088(1) R-4547(1)	R-3907(1) R-3306(1)	R-3907(1) R-3306(1)		R-3088(1) R-4547(1)	R-3088(1) R-4547(1)	R-3088(1)		R-3088(1) R-4547(1)
R CABLE		R-3907(1) R-3306(1)	R-3907(1) R-3306(1)			R-3088(1) R-4547(1)	R-3088(1)		R-3088(1) R-4547(1)

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**NOTES:**

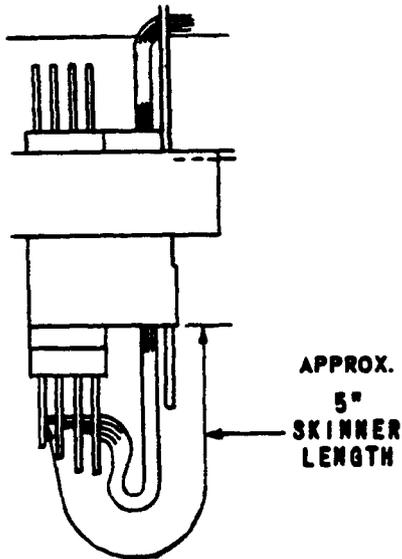
- (1) The shiner length for connections depends upon the type of apparatus terminal. See Paragraph 4.31c.
- (2) An R-3306 attachment is used at cross-connection fields and other locations where each wire end is cut, skinned and connected in sequence.
- (3) Circled numbers after tool code indicates the maximum number of conductors that may be stripped with the insulation type indicated.
- (4) For 28 and 30 gauge wire use the R-4473 with details 16 (30GA) or 17 (28GA).

FIG. 1 APPLICATIONS FOR WIRE SKINNING TOOLS (PARS. 5.11, 6.51d, 7.142)

6.3 D-Type Terminal Strips

6.31 When skinning leads on the apparatus side of the terminal strip use approximately a 5" skinner length, measured in accordance with Figure 2.

NOTE: Before skinning the switch-board cable leads on the apparatus side of "D" type terminal strips, the wire guide shall be in the final position. Cable leads should be dressed similar to those shown in Figure 2.



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FIG. 2 SKINNING POINT D TYPE TERMINAL STRIPS (PAR. 6.31)

6.4 Well Type Terminal Strips (SWC)

6.41 Use approximately a 3" skinner length, measured from the face of the terminal strip, to stay within the 4-1/4" loop dress specified for these terminal strips. See Figure 3.

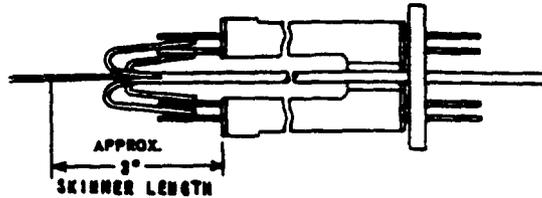


FIG. 3 SKINNING POINT 224 TYPE TERMINAL STRIPS (WIRE WRAPPED) (PAR. 6.41)

6.5 Distributing Frame Terminal Strips (SWC)

6.51 When skinning cable leads that terminate on 4, 6 or 8 point solderless wrap terminal strips that are mounted on a distributing frame, the following procedures should be used:

- (a) After the cable leads have been fanned through the fanning strip holes, remove any excess slack from behind the block by a firm pulling action on all the cable pairs.
- (b) Starting at the first terminal row, either left or right side depending on growth, measure out to the end of the next to last terminal located away from the fanning strip.
- (c) This is the skinning point for all cable leads in that row. (Perpendicular to fanning strip.) If the fanning strip accommodates two rows/fanning hole, skin all leads for each row at that given point. (See Figure 4.)
- (d) Eight cable pair (16 leads) cannot all be skinned at one time, therefore, skin as many leads at one time as possible. Because wire insulation types and wire gauges, the amount of leads that can be skinned at one time varies (see Figure 1).

- (e) Use this method for skinning all cable leads of the block, proceed to connect all leads. When completed, rotate the block down and secure in place if it was tilted for connecting.

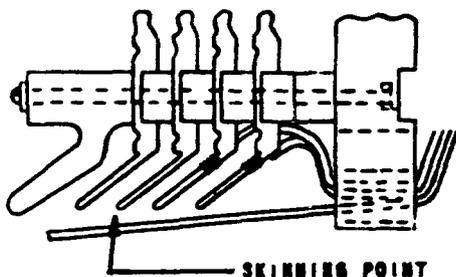


FIG. 4 SKINNING POINT DISTRIBUTING FRAME  
 TERMINAL STRIPS-WIRE WRAPPED  
 (PAR. 6.51c)

6.6 Crossbar Switch - Crosspoint  
 Terminals

6.61 The use of 1-1/2" shiner on 24 gauge wire will provide adequate bare wire for making a qualified connection. However, for 22 gauge wire (which must be soldered) a shiner of 3/8" to 3/4" will provide the necessary 1-1/4 to 3 turns required for soldering.

6.62 In many cases a crosspoint terminal may have 2 leads on a terminal, and a 3rd lead is required. This terminal usually will not accommodate 3 solderless wrapped connection; therefore the 3rd connection will have to be wrapped over the other connections and soldered. It is recommended to use the R-3654 Wrap and Solder Bit for this application. A shiner length of 3/8 - 1/2" will provide the necessary 1-1/4 turns minimum requirement.

7. TOOLS - DESCRIPTION AND USE

7.1 R-4473 Tool, Combination Cutting  
 and Skinning

7.11 General

7.111 This tool is a lightweight (4-1/2 oz.) plier type tool approximately 4-1/2" long with a 3-1/8" adjustable shaft. The skinning end of the shaft holds replaceable blade assemblies ranging from 30 to 22 gauge. The shaft is threaded to provide an adjustable shiner length ranging from 3/4" to 2".

7.112 Each tool comes equipped with a plastic pouch and three blade assemblies (22/24 and 26 gauge). The pouch with spare blades is intended to be kept in the instruction card pocket of the installers 168 Kit. Refer to Handbook 250 for ordering information of blade assemblies for 28/30 gauge wires.

7.12 Adjusting Shiner Length

7.121 The shiner length is adjusted by loosening the adjusting screw (refer to Figure 5) and rotating the threaded shaft. Whenever the shiner length is changed, be sure that the adjusting screw is loosened two full turns or damage may occur to the threaded shaft.

7.122 Always tighten the adjusting screw on the flat portion or the threaded shaft. When tightening, slightly rotate the threaded shaft in a back and forth motion to insure that the screw is properly seated on the flat spot of the shaft.

7.123 The threaded shaft has three color coded dots that are used to determine the correct shiner length. Additionally, two rivets on the blade assemblies are color coded to match the dots on the shaft. When the color coded dots on the blade rivets match the dots on the threaded shaft and are aligned with the bushing as shown in Figure 5, the following parameters are in effect:

<u>BLADE AND DOT</u>	<u>WIRE GAUGE</u>	<u>SHINER LENGTH</u>
Blue	26	2"
Orange	22, 24	1-5/8"
Green	28, 30	1-1/8"

These shiner lengths will produce the correct number of wraps for most common types of wire wrap terminals. Refer to Handbook 9, Section 310 for additional information and wire wrap requirements.

### 7.13 Replacing Skinning Blades

7.131 The riveted skinning blades are replaced by removing the screw, lockwasher, and support washer from the end of the threaded shaft as shown in Figure 5.

7.132 The skinning blades used in the R-4473 are inexpensive items. To avoid difficulty when skinning wires, replace them at the first sign of wear or other troubles. Refer to Paragraph 4.51 for checking methods of skinning blades.

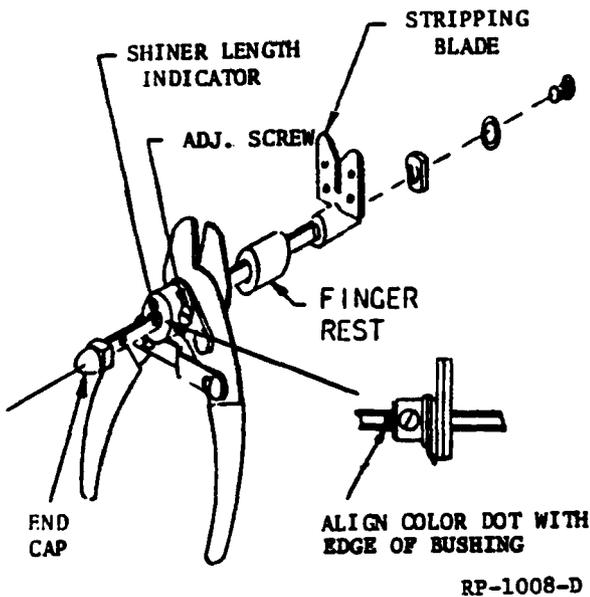


FIG. 5 R-4473 TOOL, COMBINATION CUTTING AND SKINNING (PARS. 7.121, 7.123)

### 7.14 Using the R-4473 Tool

7.141 For single or multiwire skinning hold the tool with the fingers positioned so that the forefinger rests against the neoprene finger cushion on the threaded adjusting shaft. Check that the tool is set for the correct shiner length.

7.142 Select the wires to be skinned. The R-4473 will effectively skin up to six wires at once. The quantity of wires that can be skinned at one time is dependent upon insulation types, forming tools, and the securing method of the cable form. Refer to Figure 1 for the maximum number of wires that may be stripped with various insulation types. Always strip as many leads as possible for each situation.

7.143 Fan the selected wires between the thumb and forefinger of the opposite hand in a flat, unbunched formation. Place the leads into the cutter portion of the tool first and hold in place by applying a slight pressure to the handles. Insert the wires into the skinning blades by rotating the blade slot into the wire.

7.144 Cut the wire by applying additional pressure to the handles. Remove the insulation by pulling away from the wires with an even, steady motion.

7.145 If necessary, hold the wires back of the skinning point while removing insulation to avoid disturbing wire retaining devices.

### 7.2 R-3088 Wire Skinning Tool

7.21 The R-3088 is a plier type tool with two cutting blades in the nose position. V notches in the blades are used for skinning wires. The opening between the V notches can be varied to accommodate different wire gauges. An adjustable stop is provided for regulating the size of the opening. See Figure 6.

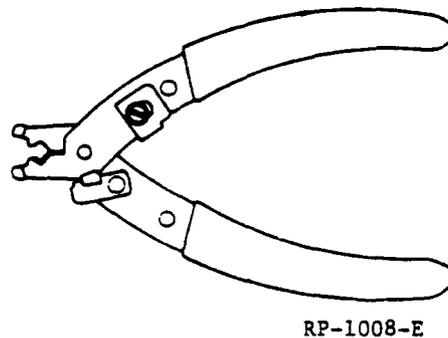


FIG. 6 WIRE SKINNING TOOL R-3088 (PAR. 7.21)

### 7.22 Using the R-3088 Tool

7.221 Adjust the V notch opening in the skinning blades for the gauge of the wire being skinned. The opening required can be determined by closing the blades over a bare portion of the wire. The edges of the blades at the notch location should just come in contact with the bare wire.

7.222 The earlier model of the R-3088 has a flat blade stop with an adjusting screw. To adjust, loosen the screw and move the stop forward or backward to obtain the desired blade closure. Securely tighten the screw to maintain the desired blade closure.

7.223 The latest model of the R-3088 has a disc type blade stop with an adjusting screw. To adjust, loosen the screw and rotate the disc until the desired blade closure is obtained. Securely tighten the stop to maintain the right closure.

7.23 To skin PVC or textile insulated wire with the R-3088 Tool, first place the wire so the skinning point rests in the notches of the skinning tool. Only one wire can be skinned at a time.

7.231 Close the blades of the tool until the insulation has been cut. Remove the insulation by sliding the tool along the wire in a closed position and at a right angle to the wire.

7.232 Apply general pressure when closing the tool blades to avoid disturbing the stop setting. If heavy pressure is required to remove the insulation, it is an indication the tool is either out of adjustment or is not being used properly.

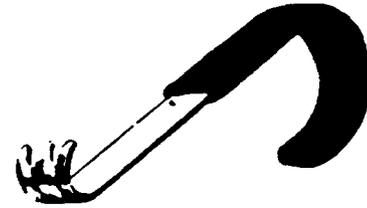
### 7.3 R-4547 Bradley Skinning Tool

7.31 This is a flat stock (1/2" wide) chrome finish type tool approximately 4" long with a curved insulated handle grip at one end and a short curved twin slotted (20 and 22 gauge) wire skinning blade at the opposite end.

No arrows due to extensive changes.

#### Reason for Reissue:

Update all information and combine Sections 300 and 301 together.



RP-1008-F

FIG. 7 R-4547 BRADLEY SKINNING TOOL  
(PAR. 7.31)

### 7.32 Using the R-4547 Tool

7.321 This tool was standardized for stripping cross-connection wire requiring a solder connection, therefore, to obtain approximately a 3/4" shiner, apply the following procedure:

7.322 Fan the jumper leads through the appropriate terminal strip fanning strip hole and determine the skinning point.

7.323 Set the curved insulated handle in the hand between the 3rd and 4th fingers.

7.324 Grasp the jumper wire with the opposite hand, loose end extending from the heel side.

7.325 At the proper skinning point, place the wire in the proper slot according to the wire gauge (20 or 22 gauge).

7.326 Just behind the stripping slot, press down firmly on the wire until it is secure in the slot. Then pull tool back toward the loose end until the desired shiner length is obtained.

Engineering Planning Manager  
(Installation)