

CONVENTIONAL DISTRIBUTION FRAMES

TERMINAL STRIPS

REPAIR PROCEDURES

1. GENERAL

1.01 This section covers procedures for replacing broken terminals of cast resin terminal strips, replacing or repairing damaged fanning strips with split fanning strips without disconnecting wiring to the terminal strip.

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

- (1) To incorporate field comments
- (2) To add reference to Section 069-140-811
- (3) To change the title from Piece Parts and Replacement Procedures to Repair Procedures
- (4) To generally update this section.

2. TOOLS AND MATERIALS

2.01 *List of Tools and Materials for Replacing Broken Terminals:*

TOOLS CODE OR SPEC. NO.	DESCRIPTION
658B	Terminal extractor
KS-8740,L1	Soldering copper (or other KS-8740 coppers rated at 95 watts)
KS-16748	Inserter
—	4-ounce riveting hammer

K521257

Pliers

—

All angle drill, Albertson and Co, Inc, No. 1495-WE (or equivalent)

—

Hand drill, North Bros Mfg Co, No. 1446 (or equivalent)

—

55 gauge twist drill (0.052 inch)

—

1/16-inch twist drill

MATERIALS

DESCRIPTION

P-463179

Terminal (1-3/4 inches long)

P-463180

Terminal (1-9/16 inches long)

P-463181

Terminal (1-3/8 inches long)

P-11A296

Terminal (2 inches long)

P-11A313

Terminal (1-1/2 inches long)

P-11B008

Terminal (1-27/64 inches long)

P-16A200

Terminal (2-5/16 inches long)

P-46F261

Terminal (1-3/4 inches long)

P-46F394

Terminal (1-3/4 inches long)

2.02 *List of Tools and Materials for Repairing or Replacing Wooden Fanning Strips:*

**TOOLS
CODE OR
SPEC NO.**

DESCRIPTION

—

1-1/4 inch wood chisel

NOTICE

Not for use or disclosure outside the Bell System except under written agreement

- 6-inch C screwdriver
 - Three 5-inch "C" clamps
- Note:** Two cabinetmaker clamps may be used where available instead of the "C" clamps.
- Riveting hammer, 4 ounces
 - Three small wooden wedges 1/4 to 1/2 inch wide

MATERIALS	DESCRIPTION
—	Distributing frame bag
—	Small vessel in which to mix the glue
—	Small stick or brush to apply glue
—	00 Sandpaper
—	Two narrow strips of fiber or wood the length of the block for separating the layers of wire
—	Two strips of 1- by 1-inch hardwood, the length of the block
—	Two 12-inch pieces of 20-gauge insulated wire
—	6-ply twine
—	Split fanning strips as required
—	CASCAMITE* waterproof glue (powered) 3-1/2 ounce can or CASCO* water resistant casine glue (powered) 2-ounce can

Note: CASCAMITE glue deteriorates in the can sooner than the CASCO glue. However, if either glue has deteriorated as evidenced by the powder becoming caked, it should be discarded.

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3. REPLACING BROKEN TERMINAL

A. General

3.01 These procedures are applicable to most cast resin terminal strips having the following types of terminals: flat punched terminals arranged for soldered connections [Fig. 1 (A)], flat punched terminals arranged for wrapped connections [Fig. 1 (B), (C), and (D)], and drawn wire terminals [Fig. 1 (E) and (F)]. It is not practicable to apply these procedures to terminal strips having flat punched terminals on which the center spacing of the terminals in either direction is less than 9/32 inch or drawn wire terminals on which this center spacing is less than 3/16 inch.

3.02 No attempt should be made to replace a terminal of a type not covered in paragraph 3.01. Nonreplaceable terminals include terminals which are interconnected within the cast resin block and terminals in blocks having a thickness (dimension along length of terminal) greater than 5/8 inch. Examples of the former are U-shaped terminals (ends of the U appearing on same side of block) and terminals punched in the form of a comb having two terminals projecting from one side of the terminal strip and a number of terminals from the other side.

3.03 All precautions to prevent interference to working circuits must be observed in connection with the replacement of broken terminals.

3.04 Occasionally, mounting conditions may be encountered which will prevent the application of the procedures as covered herein. In such cases, it will be necessary to loosen or dismount the terminal strip to gain access to the broken terminal.

3.05 Tag and remove the leads from the terminal to be replaced and from the adjacent terminals. Tag and remove any other leads which would interfere with the proper positioning of the terminal extractor (Fig. 2) on the terminals or which are connected to terminals which might be crossed by the terminal extractor either in removing the broken terminal or in positioning the replacement terminal. After replacing the terminal, reconnect all leads which were removed. When making or removing connections, reference should be made to Section 069-132-811 for wrapped connections or Section 069-140-811 for soldered connections.

3.06 If soldered connections were made to the terminal to be replaced or to the adjacent terminals [Fig. 3 (A)], remove all excess solder in order to facilitate proper positioning of the terminal extractor.

3.07 If a flat punched terminal is being replaced and the broken end of the terminal to be replaced extends more than about 3/16 inch from the face of the terminal strip, break it off as close as possible to the face of the strip using the B long-nose pliers. If the stub of the terminal projecting beyond the face of the terminal strip is bent or twisted, straighten it with the B long-nose pliers to facilitate removal.

B. Removing Broken Terminal

3.08 Turn the extractor nut on the terminal extractor, if necessary, to position the jaws so that they project slightly beyond the ends of the legs of the frame. Position the extractor on the terminal strip so that the jaws straddle the undamaged end of the terminal to be replaced and the positioning slots in the legs of the frame engage the adjacent terminals [Fig. 3 (A)]. Press the extractor frame and jaws firmly against the terminal strip, as shown in Fig. 4.

3.09 Tighten the clamping screw fingertight. Apply the ratchet wrench to the screw with the side of the wrench marked IN outermost and securely tighten the screw.

3.10 Tighten the extractor nut fingertight. Apply the ratchet wrench to the nut with the side marked IN outermost and turn the nut clockwise until the terminal being extracted is free of the terminal strip. If the jaws reach the limit of their travel before the terminal is free of the terminal strip, loosen the jaws and repeat the procedure covered previously.

3.11 Remove the tool from the terminal strip and remove the terminal from the jaws of the extractor.

C. Inserting New Terminal

Flat Punched Terminals Arranged for Soldered Connections

3.12 Select the proper replacement terminal as follows. Determine the amount the terminal

should project beyond the terminal strip by measuring the projection of a terminal in the same row, parallel to the base of the strip, as the terminal being replaced. Refer to Fig. 5 to determine the replacement terminal which will project this distance (A).

3.13 To insert the replacement terminal in the terminal strip, proceed as follows. Grasp one end of the terminal firmly with the B long-nose pliers. Thoroughly heat the portion of the terminal extending about 1/2 inch from the other end by holding this portion flat against the well-tinned tip of the 95-watt KS-8740 soldering copper for approximately 1 minute. Immediately insert the heated end of the terminal into the hole from which the broken terminal was removed, inserting the new terminal from the side of the terminal strip at which the other terminal broke. Exert a steady pressure and push terminal through the terminal strip until it extends at least 1/8 inch beyond the other side of the strip.

Caution: *While inserting the new terminal into the terminal strip, take care to keep the heated end away from the insulation of adjacent wires.*

3.14 Grip the 1/8-inch section of the terminal projecting through the terminal strip in the jaws of the 658B terminal extractor following a procedure similar to that covered in paragraphs 3.08 and 3.09.

3.15 Using a procedure similar to that covered in paragraph 3.10, draw the replacement terminal through the terminal strip until the end of it lines up with the other terminals in the same row parallel to the base of the terminal strip. The use of a piece of paper or other nonconducting material having a straight edge will facilitate proper positioning of the terminal.

3.16 Loosen the clamping screw on the terminal extractor, using the ratchet wrench applied with the side marked OUT outermost. Occasionally, it may be necessary to loosen the extractor nut to disengage the jaws from the terminal. Remove the tool.

Flat Punched Terminals Arranged for Wrapped Connections

3.17 Using the 1/16-inch twist drill with the hand or electric drill, enlarge the ends of the rectangular hole from which the broken terminal was removed as shown in Fig. 6. To do this, run the twist drill through the hole once at each end of the hole. Take care to hold the drill perpendicular to the face of the block and drill as close to each end of the hole as possible. Insert one end of the replacement terminal (see Fig. 7) into the slotted end of the KS-16748 inserter (Fig. 8) so that the shoulder on the terminal is seated in the slot in the inserter. Insert the free end of the terminal into the hole from which the broken terminal was removed. Push the terminal into the hole until the shoulder of the terminal begins to enter the hole. Then tap the end of the inserter with the 4-ounce riveting hammer until the slotted end of the inserter touches the face of the terminal strip. Remove the inserter from the terminal.

3.18 Select the proper replacement terminal by referring to Fig. 9 and 10. Using the 0.052-inch twist drill and the hand or electric drill, enlarge the hole from which the broken terminal was removed by running the twist drill through the hole once. Take care to hold the drill perpendicular to the face of the block and drill as close to each end of the hole as possible.

3.19 To insert the replacement terminal in the terminal strip, proceed as follows. Grasp one end of the terminal firmly with the B long-nose pliers. Thoroughly heat the portion of the terminal extending about 1/3 inch from the other end by holding this portion flat against the well-tinned tip of the 95-watt KS-8740 soldering copper for approximately 1 minute. Then immediately insert the heated end of the terminal into the hole from which the broken terminal was removed, inserting the new terminal from the side of the terminal strip at which the other terminal broke. Exert a steady pressure and push the terminal through the terminal strip until it extends at least 1/8 inch beyond the other side of the strip.

Caution: *While inserting the new terminal into the terminal strip, take care to keep the heated end away from the insulation of adjacent wires.*

3.20 Grip the 1/8-inch section of the terminal projecting through the terminal strip in the jaws of the 658B terminal extractor following a procedure similar to that covered in paragraphs 3.08 and 3.09.

3.21 Using a procedure similar to that covered in paragraph 3.10, draw the replacement terminal through the strip until the end lines up with the other terminals in the same row parallel to the base of the terminal strip. The use of a piece of paper or other nonconducting material having a straight edge will facilitate proper positioning of the terminal.

3.22 Loosen the clamping screw on the terminal extractor, using the ratchet wrench applied with the side marked OUT outermost. Occasionally, it may be necessary to loosen the extractor nut to disengage the jaws from the terminal. Remove the tool.

Drawn Wire Terminals

3.23 Select the proper replacement terminal by referring to Fig. 11 and 12. Using the 0.052-inch twist drill and the hand or electric drill, enlarge the hole from which the broken terminal was removed by running the twist drill through the hole once. Take care to hold the drill perpendicular to the face of the block. Insert one end of the replacement terminal in the slotted end of the KS-16748 inserter. In the case of the single-ended terminal, insert the long end of the P-11B008 terminal (see Fig. 1F and Fig. 12) in the tool. Then insert the free end of the terminal into the hole in the terminal strip. (In the case of the single-ended terminal, this should be done at the side of the terminal strip from which the long ends of the terminals project.) Tap the end of the inserter with the 4-ounce riveting hammer until the slotted end of the inserter touches the face of the terminal strip. Remove the inserter from the terminal and position the inserter on the terminal so that the terminal is seated in the hole in the unslotted end of the inserter. Tap the slotted end of the inserter with the hammer until the other end touches the face of the terminal strip. Remove the inserter from the terminal. In the case of the P-11A313 terminal, tap the end of the terminal with the hammer until the ends line up with the ends of the other terminals in the terminal strip.

4. REPAIRING OR REPLACING WOODEN FANNING STRIPS

A. General

4.01 Figures 13 and 14 illustrate the method of preparing new wooden fanning strips which are to replace broken fanning strips. Figure 15 illustrates a wooden fanning strip that may be made locally for replacement, using a regular wooden fanning strip of the proper type for a pattern.

4.02 The method illustrated in Fig. 13 provides for splitting the fanning strip into five parts by means of four straight cuts. This method might be preferable when a number of fanning strips are to be prepared at one time. Assembling and installing this fanning strip is a little more involved than the arrangement shown in Fig. 14 or 15.

4.03 The method shown in Fig. 14 provides for splitting the fanning strip into three parts by cutting as illustrated from hole to hole. Splitting the strips in this manner is more involved than in Fig. 15, but is somewhat easier to assemble and install, and the strip is less liable to break.

4.04 Figure 15 illustrates a fanning strip that may be made locally and might be more practical where a great number of fanning strips of the same type are required for replacement. This fanning strip is made in four parts and eliminates the individual holes in the cable side. This simplifies assembling and installation considerably.

4.05 All precautions pertaining to the prevention of interference to working lines must be observed in connection with the removal of the damaged fanning strip and the installation of the split fanning strip.

4.06 Use the distributing frame bag to protect equipment below which is being worked on.

B. Removal of Damaged Wooden Fanning Strips

4.07 Separate the wires associated with the upper holes in the fanning strip from those in the lower holes by inserting a thin strip of wood or fiber between the rows lengthwise of the block. Do this for the wiring on both top and bottom of the terminal lug assembly.

4.08 Loosen the assembly screws (holding the terminal lug assembly) sufficiently to provide clearance for insertion of the two 12-inch pieces of 20-gauge insulated wire between the lug assembly and the fanning strip. Loop one of these wires around the lug assembly near each end and twist the ends firmly. This is for the purpose of holding the lugs and insulating strips intact while the fanning strip is being replaced. This procedure is not necessary if the terminal strip is of the molded plastic type.

4.09 Break out the wood of the broken fanning strip with a chisel or other suitable tool, being careful not to damage any of the wiring or cables.

4.10 Remove all of the assembly and mounting screws, the remainder of the old fanning strip, and the metal clamping plate or nuts from the rear of the strip. If the terminal strip is of the molded plastic type, remove the mounting screws and then remove the assembly screws which are at the rear of the fanning strip.

C. Installation of Split Wooden Fanning Strip

4.11 Some of the more recent fanning strips are provided with nuts instead of a metal clamping strip. The nuts are recessed in counterborings in the rear face of the fanning strip. In replacing this type of fanning strip, it will be necessary to counterbore the rear face of the new strip in a similar manner. To make these counterborings, a 1/4-inch drill should be used, boring to a depth of approximately 3/16 inch. The nuts are then forced into the counterborings and should fit tightly.

4.12 Inspect the surfaces of the split fanning strips which are to be glued and, if necessary, clean lightly with 00 sandpaper. Care should be taken not to change the contour of the surfaces which would prevent a perfect joint.

4.13 Mount the terminal lug assembly on the main section of the split fanning strip by means of the terminal lug assembly screws and clamping plate or nuts. Turn the screws just enough to hold the assembly in place. If the terminal strip is of the molded plastic type, tighten the assembly screws securely.

Fanning Strips per Fig. 13

4.14 Where split fanning strips which are split in five sections, as in Fig. 13, are used, and the terminal lug assembly has been mounted on the new center section as outlined in paragraph 4.13, cut and remove the 20-gauge tie wires, when used, and draw down the terminal lug assembly screws securely.

4.15 Place the remaining sections in their respective positions ready for gluing, being careful to fan out the wires with respect to their associated holes in the fanning strip.

4.16 Mix the glue in a small vessel following the directions on the container.

4.17 Check the alignment of pins and holes of the sections. Apply the glue with a suitable brush or small stick. Place the sections together and check that the wires are in their respective holes. Place the two mounting screws, one at each end of the first associated section assembled, and fasten securely to the frame.

4.18 Glue and assemble the other sections in a like manner with the exception that the last two mounting screws be placed and secured just enough to hold the assembly in place. The pins should hold them in alignment.

Fanning Strips per Fig. 14 and 15

4.19 Where split fanning strips per Fig. 14 and 15 are used, mount the assembly (see paragraph 4.13) on the frame using the four mounting screws for Fig. 14 and two mounting screws for Fig. 15. Cut and remove the 20-gauge tie wires, when used, and draw down the terminal lug assembly screws securely.

4.20 Fan out the wiring so that it is associated with the correct holes in the fanning strip.

4.21 Mix the glue in a small vessel, following the directions on the container.

4.22 Check the alignment of pins and holes of the sections. Apply the glue with a suitable brush or small stick. Place the sections together and check that the wires are in their respective holes. The pins should hold them in alignment.

Clamping or Binding Split Fanning Strips

4.23 In clamping or binding the split fanning strips after they have been joined together, any one of the following methods may be used:

- Three "C" clamps and two pieces of 1- by 1-inch hardwood strips
- Two cabinetmaker clamps
- 6-ply twine and three small wooden wedges, 1/4 to 1/2 inch wide.

4.24 "C" Clamps: Place one of the 1- by 1-inch pieces of hardwood on the top edge of the fanning strip and the other on the bottom edge. Secure them in place with one of the "C" clamps placed near the middle of the block. Align both of the hardwood strips and apply the two other "C" clamps, one at each end of the block, and draw down all three to a very firm and reasonably uniform pressure. All the glued surfaces must be in firm contact to secure a permanent joint.

4.25 Cabinetmaker Clamps: Place a clamp at each end of the fanning strip and draw down to a very firm and reasonably uniform pressure. It is not necessary to use the 1- by 1-inch hardwood pieces with these clamps.

4.26 6-Ply Twine and Three Wedges: Bind each end and the center of the fanning strip with several turns of the 6-ply twine. If the bindings appear to be too loose to hold the sections of the fanning strip firmly together, tighten them by inserting the small wooden wedges between the twine and the top of the fanning strip.

4.27 Precautions should be taken to prevent accidental disturbance of the strip while the glue is setting. When practicable, rolling ladders may be blocked to prevent contact with the strip or clamps.

4.28 The circuits appearing on the repaired block should be inspected and tested immediately after the fanning strips have been clamped or bound.

4.29 About 1 or 2 hours after the fanning strips have been clamped or bound, inspect the glued joints for glue which may have been forced out by pressure and remove the surplus.

4.30 Leave the clamps or binding in place about 24 hours to permit the glue to set properly and then remove the clamps or binding, install the two remaining mounting screws for fanning strips per Fig. 15 (see paragraph 4.19), and check tightness of all mounting and terminal lug assembly screws.

D. Repairing Broken Wooden Fanning Strips

4.31 In some cases, broken wooden fanning strips may be repaired rather than replaced. Glue is used, as outlined in paragraphs 4.32 through 4.35, to repair these types of breaks.

4.32 Position the wiring so it is associated with the correct holes in the fanning strip.

4.33 Mix the powdered glue in a small vessel, following the directions on the container.

4.34 Apply the glue to both edges at the break using a suitable brush or small stick.

4.35 Clamp or bind the broken fanning strip similar to the method in paragraphs 4.23 through 4.30 for the split fanning strips.

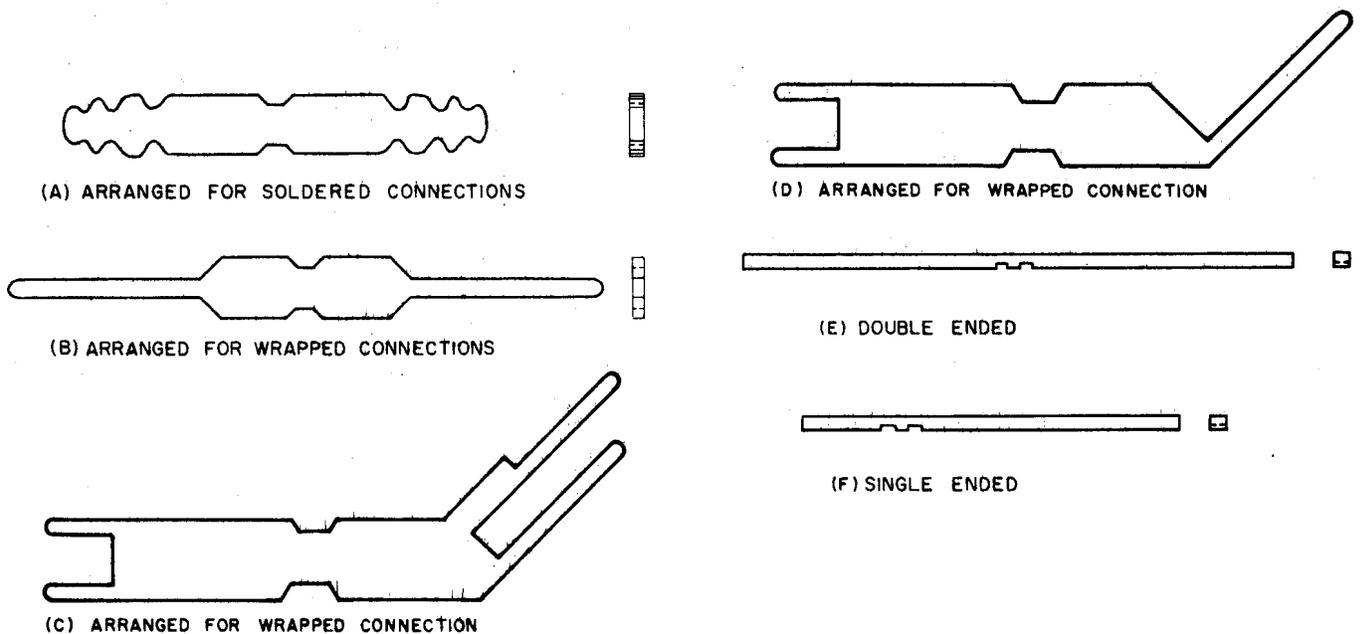


Fig. 1—Replacement Terminals

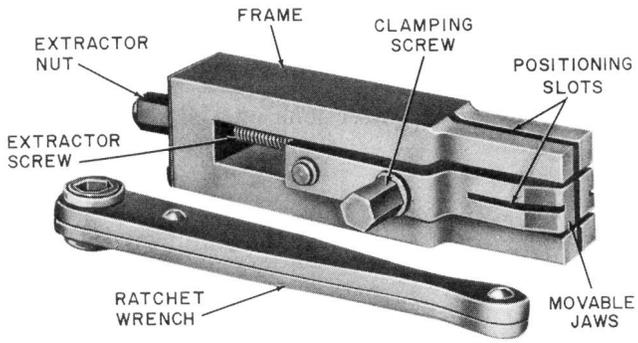


Fig. 2—658B Terminal Extractor

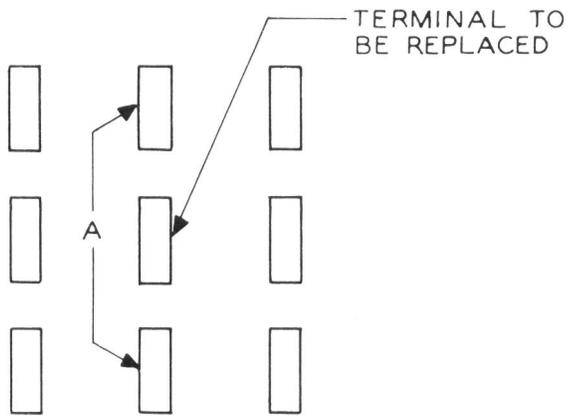


Fig. 3—Terminal to be Replaced and Adjacent Terminals

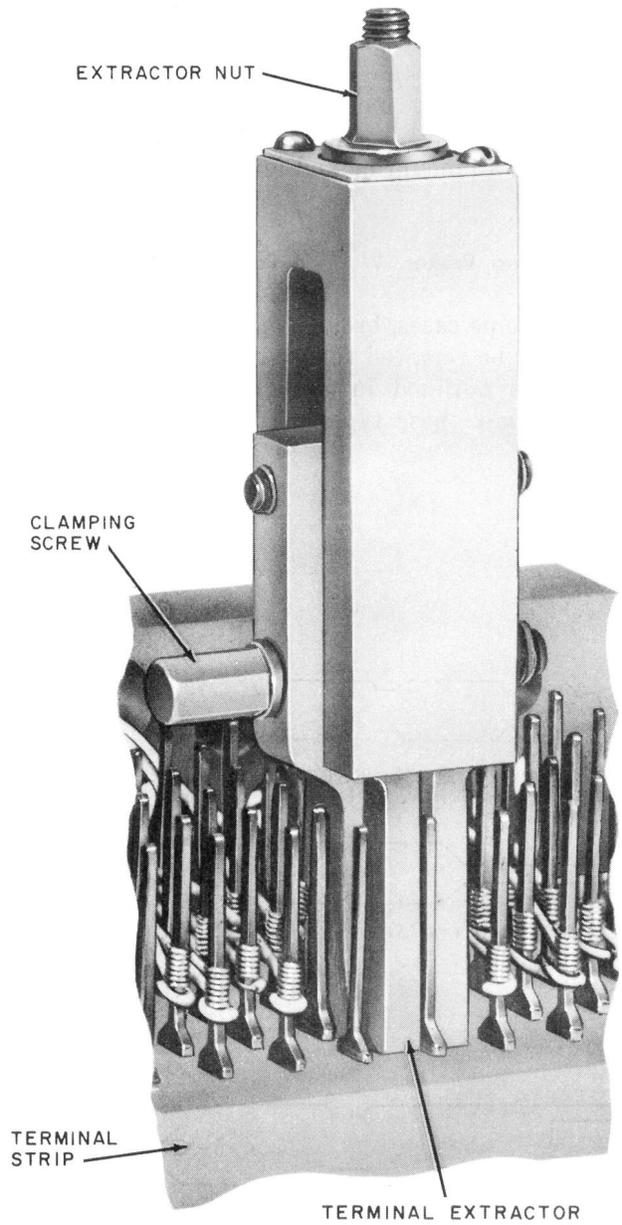
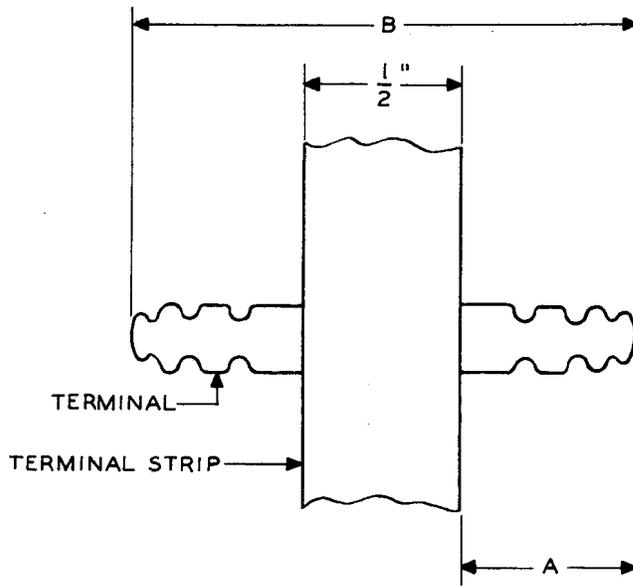


Fig. 4—Positioning 658B Terminal Extractor



TERMINAL	DIM A	DIM B
P-463179	$\frac{5}{8}$ "	$1\frac{3}{4}$ "
P-463180	$\frac{17}{32}$ "	$1\frac{9}{16}$ "
P-463181	$\frac{7}{16}$ "	$1\frac{3}{8}$ "

Fig. 5—Flat Punched Terminals Arranged for Soldered Connections

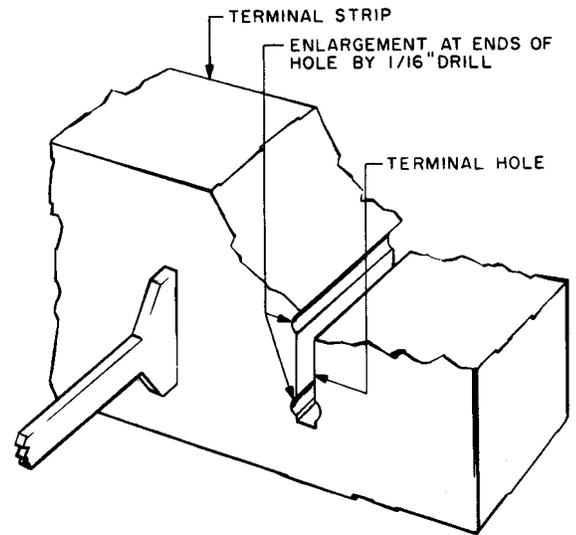


Fig. 6—Enlargement of Ends of Terminal Holes

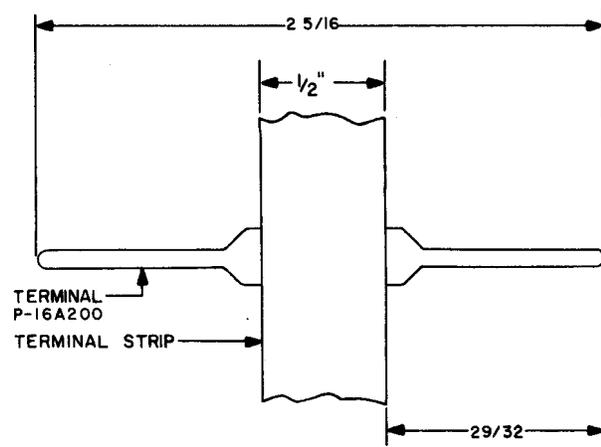


Fig. 7—P16A200 Flat Punched Terminals Arranged for Wrapped Connection

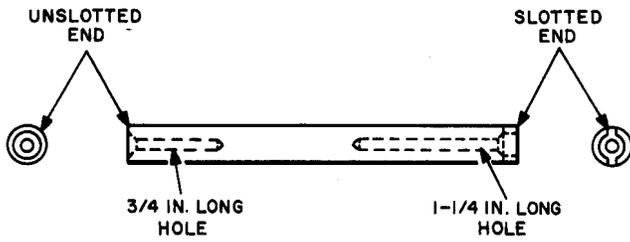
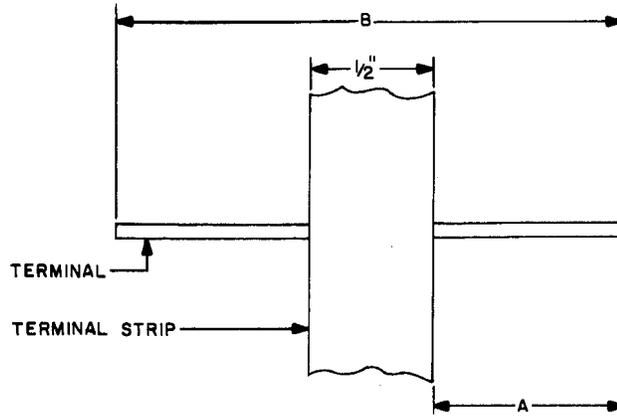


Fig. 8—KS-16748 Inserter



TERMINAL	DIM A	DIM B
P-11A296	3/4"	2"
P-11A313	1/2"	1 1/2"

Fig. 11—Double-Ended Drawn Wire Terminals Arranged for Wrapped Connections

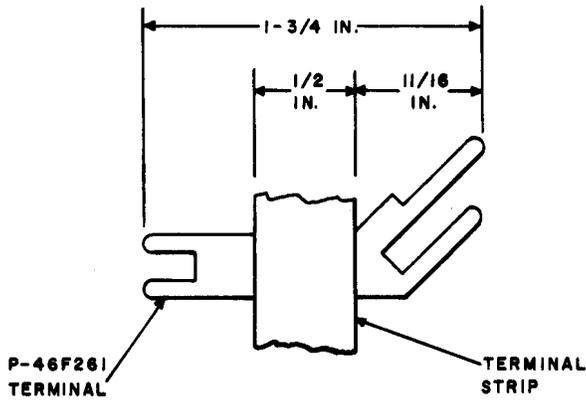


Fig. 9—P-46F261 Flat Punched Terminals Arranged for Wrapped Connections

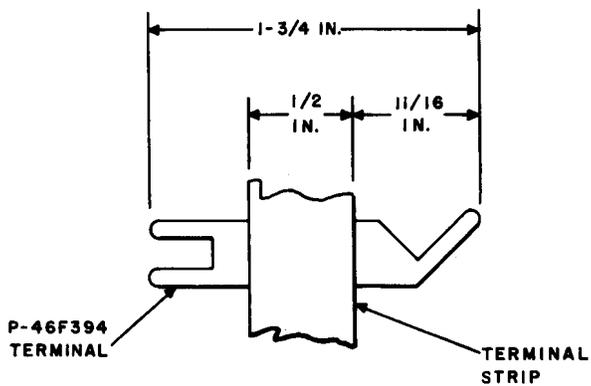


Fig. 10—P-46F394 Flat Punched Terminals Arranged for Wrapped Connections

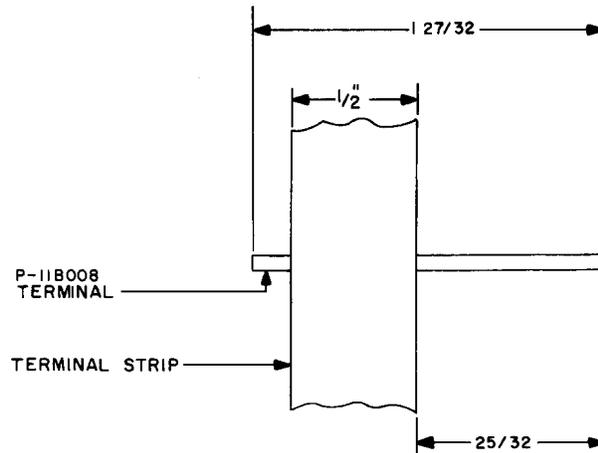
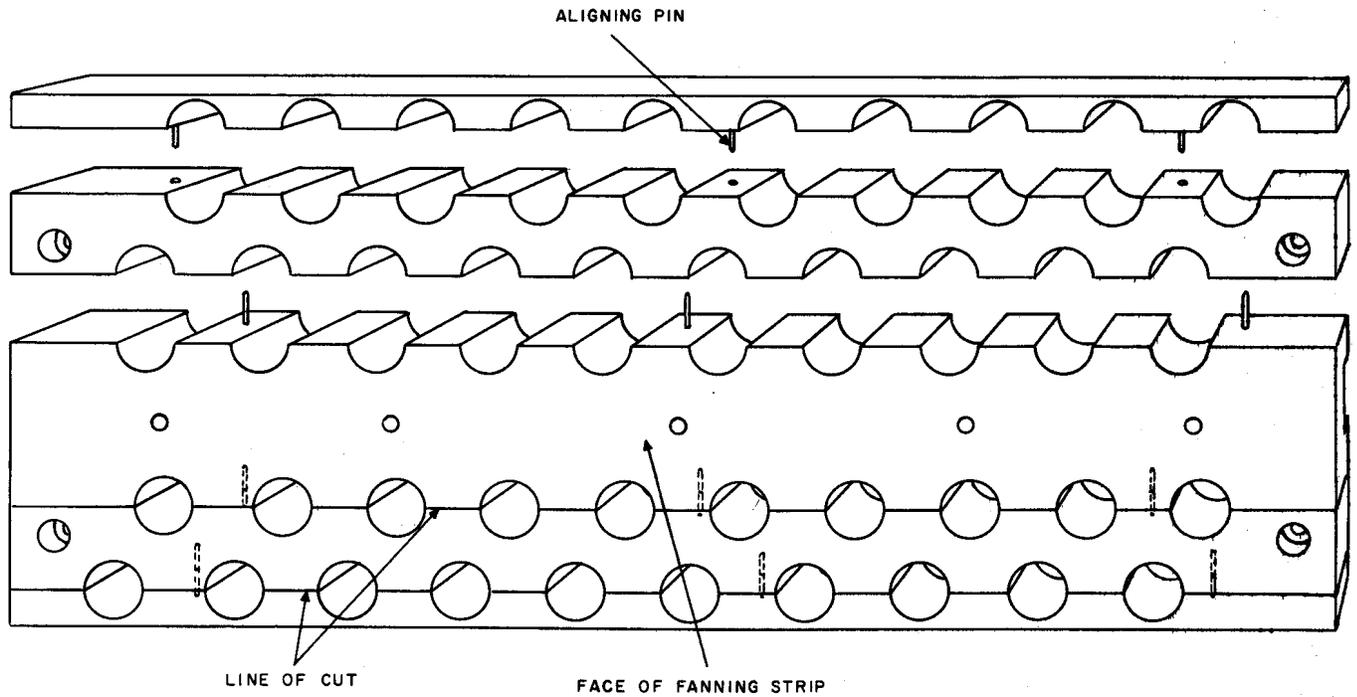


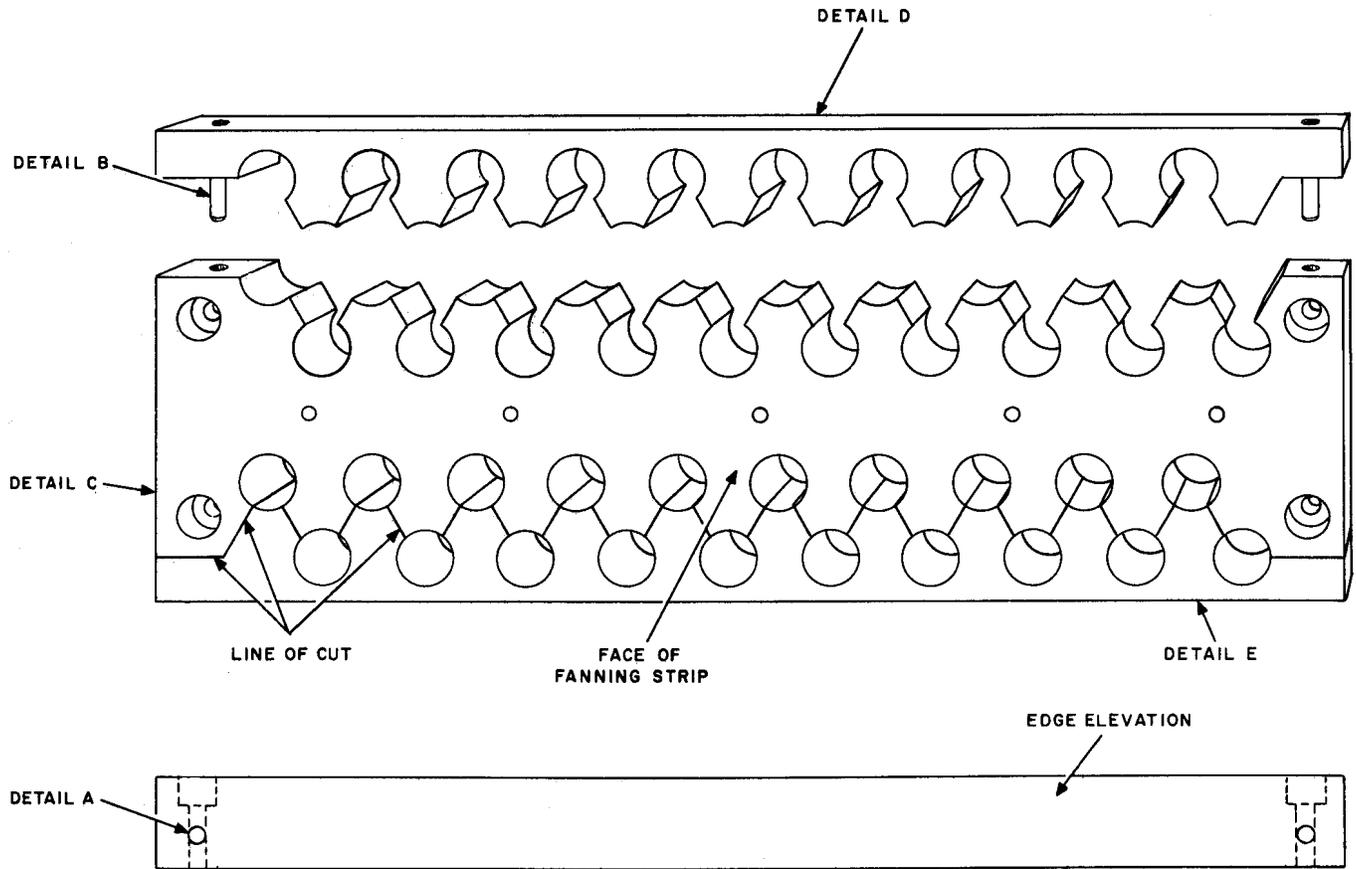
Fig. 12—P-11B008 Single-Ended Drawn Wire Terminals Arranged for Wrapped Connections



NOTES :

1. THE CUTS SHOULD BE MADE WITH A THIN SAW BLADE SO THAT A MINIMUM AMOUNT OF WOOD IS REMOVED
2. THE ALIGNING PINS MAY BE MADE OF NO 16 WIRE OR EQUIVALENT

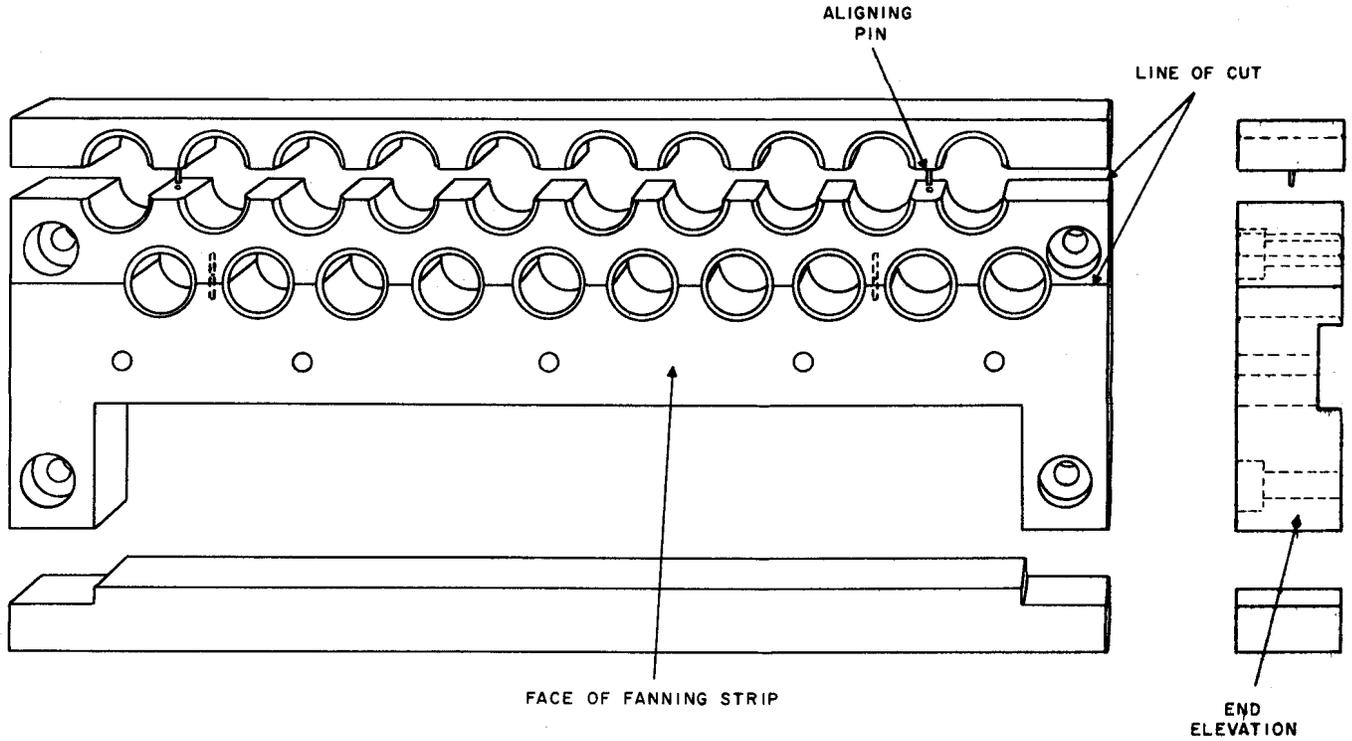
Fig. 13—Fanning Strip Split into Five Parts



NOTES:

1. DETAIL "A" IS 5/32 IN. WOOD DOWEL GLUED INTO DETAIL "C" WITH SNUG FIT INTO DETAIL "E".
2. DETAIL "B" IS 5/32 IN. WOOD DOWEL GLUED INTO DETAIL "D" WITH SNUG FIT INTO DETAIL "C".
3. END OF ALL DOWELS SHALL BE FLUSH WITH EDGE SURFACE OF FANNING STRIP AND THE INSIDE OF THE MOUNTING SCREW HOLES.
4. THE LINE OF CUT SHOULD BE MADE WITH A THIN SAW BLADE SO THAT A MINIMUM AMOUNT OF WOOD IS REMOVED.
5. ALL ANGLE CUTS SHALL BE MADE AS SHOWN.

Fig. 14—Fanning Strip Split into Three Parts



NOTES:

1. TO BE MADE OF STRAIGHT-GRAIN MAPLE OR EQUIVALENT.
2. COUNTERSINK HOLES JUST SUFFICIENTLY TO REMOVE ROUGH EDGES.
3. THE ALIGNING PINS MAY BE MADE OF NO. 16 WIRE OR EQUIVALENT.

Fig. 15—Fanning Strip Split into Four Parts