

MISCELLANEOUS CONNECTIONS METHODS AND REQUIREMENTS

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1. GENERAL

1.1 Scope of Section

1.1.1 This section covers the requirements and methods for miscellaneous connecting on No. 6 vertical ground wires, screw type terminals, split type terminals, and quick connect "single" or "twin clip" terminals. It also covers procedure for replacing clip type terminals.

1.1.2 The requirements and methods covered in this section shall be followed except as modified by applicable specifications and drawings.

1.1.3 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

1.2.1 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 and Supplies

2.1.1 The tools and supplies generally required for operations covered in this section are listed below:

R-2733	Soldering Iron
R-2916	Twine
R-3795 (724A)	Wire Removal Tool
R-4389	Rosin Core Solder
R-4580 (714-B)	Quick-Connect Tool
R-4710	"C" Impact Tool
756C-2	Quick-Connect Tool
756-D	Quick-Connect Tool
788A-1	Tool Handle
788D-4	Tool, 1 Pair
	Insertion/Cutoff
788J-1	5 Pair Impact Tool
788K-1	Wire Holding Tool
788M-1	Tool Head Replacement
833-A	Single Wire Insertion/Cutoff Tool
	5 Pair Cutoff Tool Head
834-A	5 Pair Cutoff Tool
834-B	5 Pair Cutoff Tool
AT8762-D	Tool Handle

Tools contained in the installer's 168 Kit are not listed above.

3. MISCELLANEOUS CONNECTIONS

3.1 Connecting No. 6 Vertical Ground

3.1.1 Individual ground leads at frames and racks, when specified, shall be connected to the No. 6 vertical ground lead by wrapping the individual ground lead around the

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vertical lead with two or three closely wound turns in order to prevent the solder from running down the vertical lead when soldering, use either sewing twine or one wrap of the insulated portion of the insulated ground lead as shown in Figure 1.

NOTE: Shop wired bays will not have the one turn of insulated wire around the vertical leads, as the wires are soldered to it while the frame is in a horizontal position.

3.2 Where the mounting plate is equipped with a ground lead support having a terminal for connecting the ground strap, solder the support to the ground wire and connect the ground strap to the terminal of the support. In order to prevent the solder from running down the vertical lead, use sewing twine as shown in Figure 2.

3.3 Screw Type Terminals

3.3.1 Connect the wire with one complete turn around the screw in a clockwise direction as shown in Figure 3. The wire end may project a maximum of 3/32" beyond screw head or washer if a washer is provided. Where two wires (maximum) are to be connected, twist the bare portions together before placing around the screw. This applies to wire gauges smaller than No. 18 Ga. or larger wire is to be connected, terminate one lead under the head of the screw with the additional leads wrapped around the first lead and soldered to it.

3.3.1.1 When connecting No. 24 Ga. or smaller diameter solid wire to screw terminals, the wire has a tendency to break off when the screw is tightened, due to the small diameter of the wire. In order to safeguard against this wire breakage, either use supplementary terminals attached to the wire, or washers under the screw heads to obtain a good connection. Washers may have to be purchased locally if not furnished with the equipment.

3.3.1.2 When connecting stranded wire to screw terminals, and supplementary terminals are not provided, the strands of the wire shall be twisted together and soldered before the connection is made.

3.4 Split Type Terminals

3.4.1 Solderless connections at split type terminals shall be made by removing the insulation approximately 1/8" from the wire end and pushing this portion to approximately half the depth of the slot in the terminal, with the insulation drawn up to the terminal. The insulated portion of the wire is then given a full wrap (counter-clockwise for upper connection and clockwise for lower connection) around the terminal in front of the bare wire protruding through the slot, as shown in Figure 4.

4. QUICK-CONNECT TERMINATIONS

4.1 General

4.1.1 Quick-connect terminals have been designed to permit connection of selected wire without having to remove the conductor insulation. This procedure is commonly referred to as insulation displacement or quick-connecting. The success of a quick-connect termination depends upon the design of the terminal, the wire gauge and type of insulation, the use of the correct tool, and of course the technique use to insert the conductor into the slotted beams.

4.1.2 When performing a quick-connect operation for the first time, several terms may be used on a drawing, specification, or handbook which may be unfamiliar. They are:

- a. Connector is a term used to describe an entire piece part as shown in Figure 16. It is also used where several piece part terminals are bonded together with a common bar such as that of the 66B4-25 connecting block which contains 50 rows of "6 clip" terminals. Each row of terminals is capable of terminating from 1 to 6 conductors.
- b. Ended Termination is a term used to define the end of a multiple lead or a single wire termination which does not continue on to another terminal.
- c. Looping Termination is used where a single conductor continues on or "loops" through to another terminal.
- d. Slotted Beam is used to describe the two sides of beams of a quick-connect terminal where the wire is inserted, the insulation displaced, and where the conductor makes metallic contact with the terminal.

4.1.3 The 66, 78, 88, 89, 93, and 94-type connector block designs are approved for terminating either 22, 24 or 26 Ga. tinned or untinned solid wire with plastic insulation (no textile). Refer to Table A for wire gauge and tools used on the various types of blocks.

PRECAUTION: DO NOT ATTEMPT TO TERMINATE TEXTILE INSULATED WIRE IN SLOTTED BEAM TERMINALS OF THE ABOVE BLOCKS. THIS MAY CREATE OPENS OR INTERMITTENT CASES OF TROUBLE.

4.1.4 Slotted beam terminals are designed to accommodate only one wire end per terminal slot. Under no circumstance will more than one wire end per terminal slot be allowed. Also do not attempt to make a connection if the terminal is found to be bent or opened wide. Refer to the paragraph on the replacement procedure for damaged terminals.

4.1.5 When a wire has been terminated in a quick-connect terminal, then removed due to a modification or wiring error, the contact portion of that lead must be cut off and a new point of contact provided for retermination.

4.1.6 Quick-connect terminals must be clear of any previously connected bare wire or insulation that might be lodged between the contacts before another connection can be applied to that terminal. The 724A Tool should be used to clear the contacts prior to retermination.

4.1.7 After terminating with the proper connecting tool, the wire end shall not protrude more than 1/8" away from the terminal, and there shall be a clearance of at least 1/32" away from other wire ends or metalwork. See Figure 6.

4.2 AT 8762-D Tool

4.2.1 The AT 8762-D is a custom designed tool handle that has a high-low impact feature (either may be used) and a storage compartment at the butt end of the tool for retaining a spare blade. This tool handle must be used with either of the following blades: (Refer to Figure 5.)

- a. The 8762-D-88 is a Rotatable Double Ended Blade which may be used to terminate a single lead in an 88/108 or 109-type connector. One end of the blade is used for lead insertion only while the opposite end of the blade will seat and cut off the lead. To insert the blade in the tool handle, simply align the slot on the barrel of the blade with the pin located inside the nose piece. Insert the blade and then rotate 1/4 turn clockwise to lock in place.
- b. The 8762D-66 Blade (which is stamped "66") looks similar to the D-88 Blade (which is stamped "88"), but is readily recognizable by the blunt hollow ends. This blade actually fits over the entire terminal for either seating or seating and cutting off leads terminating on 66-type (except 66G and 66H) connector blocks.

NOTE: Be sure to use the correct blade on the above designated terminal types. Misuse will lead to opens or damaged terminals.

4.2.2 The insertion end of these blades are to be used where leads loop through from one terminal to the next as in a common multiple or where leads are being seated into a wiring block. The insertion end of the blades does not have a cutting edge.

4.2.3 The insertion/cutoff end of these blades are to be used when a single lead terminates (ends) in a slotted beam

terminal of an 88/108 or 109-type connector, also in the beams of a 66-type (except 66G and 66H) connector block. (Refer to Table A.)

CAUTION: BE SURE THE CUTTING EDGE OF THE TOOL IS PLACED ON THE CORRECT SIDE OF THE TERMINAL PRIOR TO IMPACTING.

4.3 R-4580 (714B) Tool (MD)

4.3.1 This is a yellow and black handled spring loaded impact quick-connect tool with a double ended rotatable blade (insertion head). This tool is similar to the 714B Tool which will manually seat or seat and cut off conductors in the terminals of the 66B, C, M, R or Y Connector Blocks. See Table A. One end of the blade will seat a single conductor in the terminal and the opposite end will seat and cut off a single conductor in a terminal. This tool cannot be used on other codes of quick-connect terminal blocks.

4.3.2 Set the tool blade in the proper position to seat or seat and cut off prior to starting. Dress the conductor down through the fanning strip and then into the slotted beam of the correct terminal. Place the tool blade over the terminal and firmly push forward with the butt of the hand until the tool "Bottoms Out." At this point, the conductor should be properly seated or seated and cut off. Do not rock the tool back and forth because this action can break off the lead or crack the retaining wall of the connector block.

4.3.3 This tool has been rated (MD) which means that no more are being purchased. However, this tool is still viable and works well, but has been replaced by the AT 8762-D Impact Handle equipped with an 8762D-66 Blade.

4.4 756C Tool (MD)

4.4.1 The older model of the 756C Quick-Connect Tool has a green plastic handle. The latest model (see Figure 7) has a wood grained plastic handle. Both of these tools have a double ended insertion head. One end of the insertion head is designed for inserting 24 Ga. conductors into the "twin clip" terminals of the 78C-type connector blocks (refer to Table A). The other end is designed for inserting 24 Ga. conductors into the "single clip" terminals. The blade portion of the tools has a black nylon coating to prevent shorting of terminals.

4.4.2 The 756C Tool does not have cutoff blades. Therefore, the conductors must be cut to the proper length prior to termination. After the conductor has been cut to length, insert either the tip or ring lead into the lower hole of the tool, bend it across the tool face and proceed to terminate in the same manner as described in Paragraph 4.3.4. The new 756C-2

Tool is the preferred tool for cross-connecting on the 78C (COSMIC) Blocks.

4.5 756D Tool (MD)

4.5.1 The older model of the 756D Quick-Connect Tool has a green plastic handle. The latest model (see Figure 8) has a wood grained plastic handle. Both these tools are replacements for the 756B-2 Tool which can be used interchangeably. This tool is designed to seat 22 Ga. plastic insulated wire in the slotted beam terminals of the 78A, 78B, and 89C and D Connector Blocks (refer to Table A). The new 756C-2 Tool is the preferred tool for cross-connecting on the 78A and 78B Connecting Blocks.

4.6 756C-2 Tool

4.6.1 This is a recently standardized tool that will replace both the 756C and 756D Tools. This is a manual non-impact tool with a yellow handle and a double ended rotatable blade.

4.6.2 One end of this double ended blade is designed to seat (no cutoff) leads in the terminals of the 78A, 78B, 78C, 89C and D-type connector blocks. The opposite end of the blade is designed to seat (no cutoff) leads in the recently designed 3 beam terminal of the 89TB and 112-type connector blocks.

4.6.3 When using this tool, the leads being terminated must be cut to length, inserted into the holes in the face of the tool, and then terminated in a manner described in Paragraphs 4.3.5 a through e. (See Table A.)

4.7 788 Series Tools

4.7.1 The 788 series of tools are used to terminate conductors in the 88-type wiring blocks and the associated 88/108-type connecting blocks. The individual tools are listed below. However, refer to Section 121 of this handbook covering "QCX" Distributing Frame Installation.

788A-1	Tool Handle used to retain the 788C-1 Tool Head
788D-4	Tool, 1 Pair Insertion/Cutoff
788J-1	5 Pair Insert or Insert/Cutoff Impact Tool
788K-1	Wire Holding Tool to retain leads in block
788M-1	Tool Head Replacement

(See Figures 9 through 11 and Table A.)

4.8 833-A Tool

4.8.1 This manual tool is used for insertion or insertion/cutoff of individual 22 Ga. IPVC cross-connect wires terminating on the 109-type connectors of the 93-type connecting blocks. For detailed information, refer to Section 125 of this handbook for 93-type block installations (see Figures 12 and Table A).

4.9 834-B Tool

4.9.1 This is a spring loaded impact tool that seats and cuts off up to ten 24 Ga. IPVC wires on the index strip of a 93-type connecting block or on the associated 109-type connector. It is also used to seat leads in the 93-type connecting block. Should the tool head become damaged, it can be discarded and replaced with an 834-A Replacement Head. Refer to Section 125 of this handbook for 93-type block installations (see Figures 13 and Table A).

4.10 R-4710 Tool

4.10.1 The R-4710 "C" Impact Tool is used to "seat" only leads terminating on the 94-type connecting block used on "D3 and D4" channel banks. Refer to Section 124 of this handbook for detailed information.

4.11 R-3795 (724A) Tool

4.11.1 The R-3795 Quick-Connect Wire Removing Tool is used to remove wires from clip type terminals of the 66, 78 and 112-type connecting blocks. The tool consists of a two-pronged forked end with long slender handle (see Figure 14).

4.11.2 Place the R-3795 Tool (no other tool should be used) under the wire to be removed so that the terminal fits into the groove of the forked end. (See Figure 15.) Grasp the tool handle and pull gently outward toward the tip of the terminal. This will unseat the wire from the terminal. Care should be taken not to interfere with leads on other terminals. Clip off the wire end beyond the 90° bend and pull the wire out through the fanning strip.

4.11.3 Remove all pieces of insulation remaining around the terminals with an insulated tool, such as a KS-6320 Orange Stick or the KS-22035 Spudger.

5. TERMINAL REPLACEMENT PROCEDURE

5.1 The piece-part clip terminals used in either type connecting block are illustrated in Figure 16.

PRECAUTION: EXTREME CARE SHOULD BE TAKEN WHEN REPLACING DEFECTIVE TERMINALS TO AVOID SHORTS, CROSSES, AND POSSIBLE SERVICE INTERRUPTIONS.

5.1.1 Tag and remove the leads from the terminal to be replaced.

5.1.2 Remove the defective terminal by using a pair of long nose pliers. Grasp the wire-wrap portion of the terminal as near the block as possible and carefully twist the terminal until it breaks. (See Figure 17.)

5.1.3 Grasp the remainder of the terminal by the clip end (front of the block) with the long nose pliers and pull the terminal away from the block.

5.1.4 Select the proper replacement terminal (see Figure 16) and insert the wire-wrap end into the empty terminal slot from the front side. Be sure the terminal is in the correct position by observing the shape of the terminal slot and the adjacent terminals.

5.1.5 Using the long nose pliers, apply a steady pressure and push the terminal through the block until it snaps in place. Check the adjacent terminals to be sure the terminal is locked in place.

5.1.6 If the nylon retaining spurs fail to secure the terminal in place, twist the base of the wire-wrap end of the terminal approximately 20°. (See Figure 18.)

5.1.7 Reconnect all leads and remove the identification tags.

NOTE: Avoid any excessive tool pressure on the wire-wrap end of the terminal which might cause the terminal to break the nylon spurs inside the block and force the terminal to protrude out on the clip side of the block. If this condition exists, reinsert the terminal in the block and twist the base of the wire-wrap side of the terminal as shown in Figure 18.

clips, rotate the tool end into the single clip position and tighten in place.

b. These tools do not have a cutoff feature, therefore, cut the leads to the proper length prior to termination (see Figure 19).

c. Grasp the tool in the palm of the hand bearing firmly against the heel of the tool handle.

d. After inserting the wire in the proper hole at the end of the tool head, pull the lead straight down across the blade slot and back to the handle as shown in Figure 20.

e. Hold the lead as shown in Figure 20 through 22 and insert it straight into the slotted beam terminal on a level horizontal plane.

NOTE: When the jumper lead is held straight down under the tool as shown in Figure 23, the conductor will be centered in the beams and the results will be good as shown in Figure 24. When the lead is held off at an angle (45° shown) and then depressed to the right as shown in Figure 25, the results will be bad and a defect is a possibility.

6. CROSS-CONNECTION PROBLEM

6.1 There have been reports of broken and fractured cross-connect (jumper) wire which has been terminated (quick-connected) on 78A1-64 Connecting Blocks in the 1A ESS System Central Offices.

6.1.1 It has been determined that the angle in which the wire was being held in the tool head at the time of insertion into the slotted beams was causing the problem.

6.1.2 A right handed crafts person holding a wire off to the left side of the terminal, down at approximately 45° angle, and of the vertical face of the block at approximately a 45° angle, during the time of insertion was creating fractured and broken connections.

6.2 To avoid the possibility of terminating defective jumper wire cross-connections, the following instructions should be adhered to:

6.3 When terminating cross-connect wires into the slotted beam terminals of the 78A1-64 Connecting Block with a 756-type tool, the following procedures should be followed:

a. The quick-connect tools are double ended for terminating in "single" or "twin"

7. VERIFICATION ITEMS

	<u>VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS</u>	REFERENCE	
		<u>PAR NO</u>	<u>FIG NO</u>
7.1	<u>Vertical Ground Leads</u>	3.1	
7.1.1	Bare wire of individual ground lead should be wrapped around vertical ground lead with two or three closely wound turns and soldered.	3.1.1	1
7.1.2	When mounting plate is equipped with a ground lead support, solder ground lead to the support terminal and solder the support to the vertical ground lead.	3.2.2	2
7.2	<u>Screw Type Terminals</u>	3.3	
7.2.1	The bare wire portion of the lead should be wrapped one complete turn around the screw in a clockwise direction, wire end can protrude 3/32" beyond the screwhead.	3.3.1	3
7.2.2	If more than one wire is to be connected (18 Ga. or smaller), twist together first.	3.3.1	
7.2.3	If more than one wire is to be connected (18 Ga. or larger), connect one lead under the screwhead and the second lead should be wrapped and soldered to the first lead.	3.3.1	
7.2.4	When connecting stranded wire, twist together and solder first.	3.3.1.2	
7.2.5	When connecting 24 Ga. or smaller diameter solid wire, use washer under screwhead or supplementary terminals.	3.3.1.1	
7.3	<u>Split Type Terminals</u>	3.4	
7.3.1	Remove 1/8" of insulation from wire and push that portion into the slot approximately half of the depth of the terminal. Then make one full wrap of the insulated portion of the wire around the terminal.	3.4.1	4
7.4	<u>Quick-Connect Terminations</u>	4.	
7.4.1	When retermination is required, provide a new wire end.	4.1.5	
7.4.2	Terminal must be clear of previously terminated wire or insulation.	4.1.6	
7.4.3	Only one wire terminated in each terminal.	4.1.4	
7.4.4	No terminations attempted on defective terminals.	4.1.4	
7.4.5	Do not terminate textile insulated types of wire in Quick-Connect terminals.	4.1.3	
7.4.6	The wire end shall not protrude more than 1/8" away from terminal and must have a 1/32" clearance from other wire ends and metalwork.	4.1.7	6
7.5	<u>Quick-Connect Tools</u>		
7.5.1	Use correct tool on connector block code being installed.	4.1.3	Table A
7.6	<u>Terminal Replacement Procedure</u>	5.	
7.6.1	Correct terminals used for replacement. (P-18E827 and P-18E768 for 66-type connecting blocks) and (P-47L603 and P-47L310 for 78-type connecting blocks), and (842367823 for 112-type connecting block).	5.1.4	16
7.6.2	Replacement terminals properly seated in the connecting block.	5.1.5	

<u>VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS</u>		REFERENCE	
		<u>PAR NO</u>	<u>FIG NO</u>
7.6.3	If nylon spurs fail to secure the replacement terminal, it should be twisted approximately 20° to retain the terminal.	5.1.6	18

] Indicates information subject to verification.

Engineering Planning Manager
(Installation)

Attachment:
Table A
Figures 1 through 25

Reason for Reissue:
To update information on Quick-Connecting.

TABLE A. QUICK-CONNECTING TOOLS

CONNECTOR CODE	WIRE TYPE AND GAUGE							Q-C TOOLS	INITIAL USAGE
	CABLE WIRE			CROSS-CONNECT WIRE					
	BU	BY	DM	DP	DT	DY	YI		
All 66- except G & H	22, 24	26	22, 24, 26	22, 24	22			AT 8762-D R-4580(MD)	Various
78A					22			756D 756C-2	ESS - TDF & MDF
78B					22			R-4406 756B-2 756D 756C-2	ESS - TDF & MDF
78C					24			756C 756C-2	COSMIC
88/108	22, 24	26	22, 24	22, 24	22		24	AT 8762-D 788C-1,D-4 J-1	QCX & Outside Plant
89C,D, & TB					22			756D 756C-2	MDF, CDF, SMDF
93/109	22, 24	26	22, 24, 26		22			AT 8762-D 833A 834B	MDF, CDF LPCDF
94	22, 24	26	22, 24, 26					R-4710	D3, D4 Channel Banks
112					24			756C-2	COSMIC

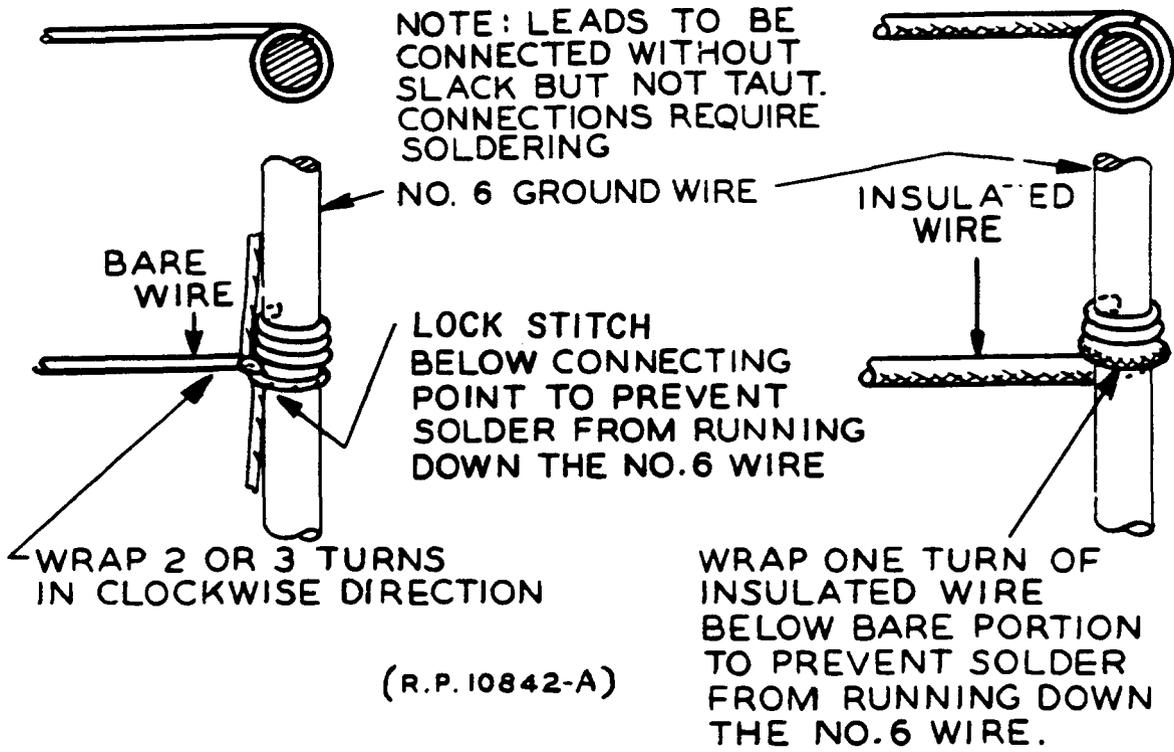


FIG. 1 CONNECTING GROUND LEADS TO NO. 6 GROUND LEAD

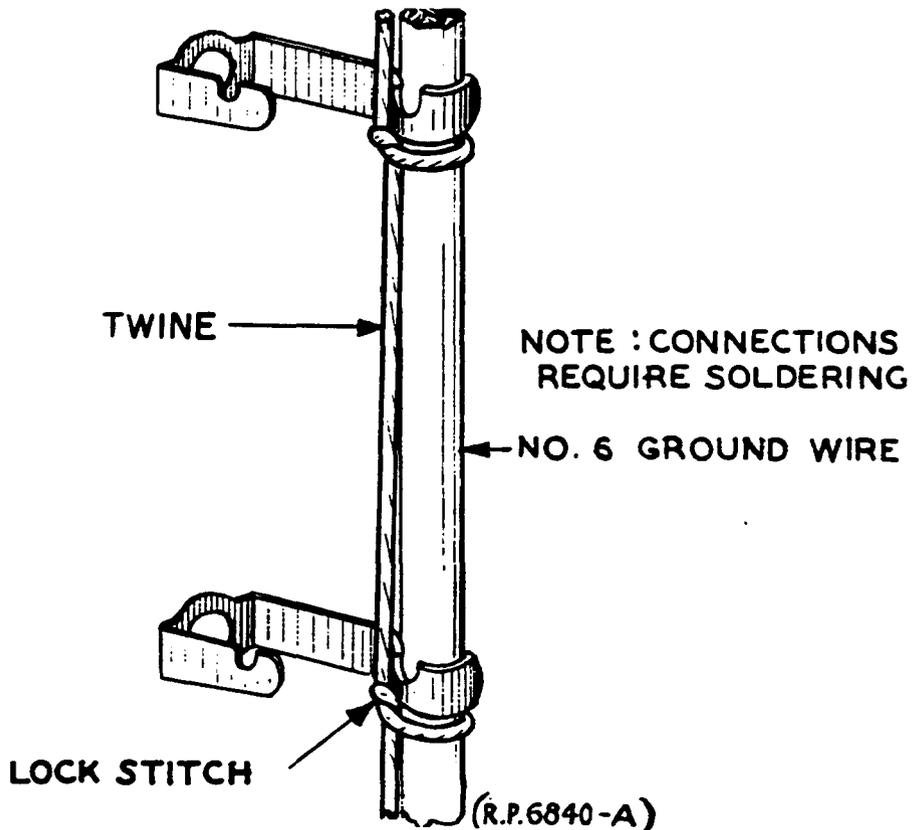


FIG. 2 SOLDERING MOUNTING PLATE TERMINALS TO NO. 6 GROUND WIRE

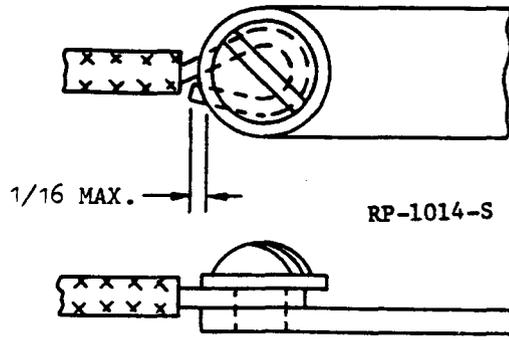


FIG. 3 SOLDERLESS CONNECTIONS AT SCREW TYPE TERMINALS

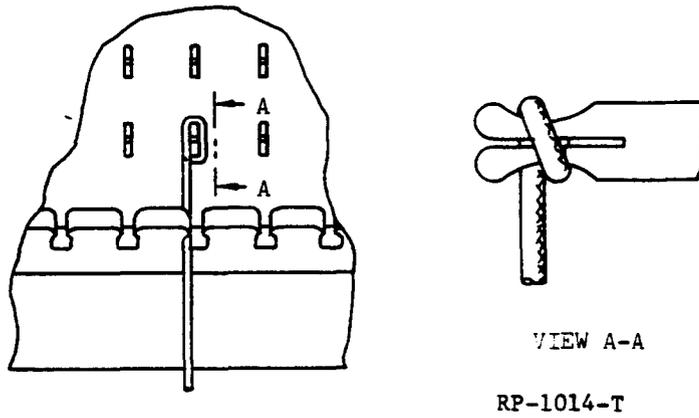


FIG. 4 SOLDERLESS CONNECTION AT SPLIT TYPE TERMINALS

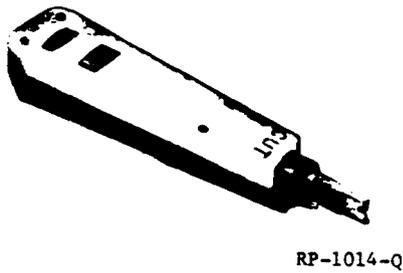
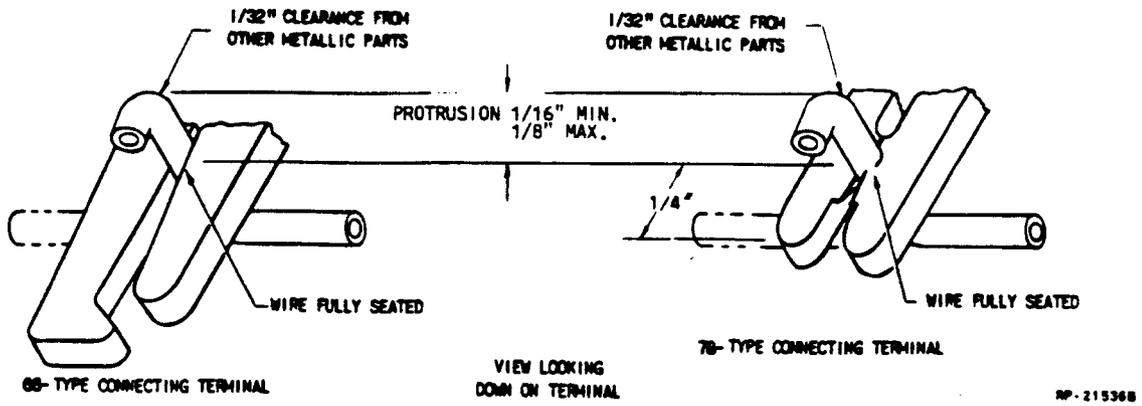


FIG. 5 AT 8762-D IMPACT TOOL



NOTE: THIS FIGURE ONLY APPLIES TO CONNECTIONS WHERE THE LEADS WERE INSERTED INTO THE TOOL FACE PRIOR TO TERMINATION.

FIG. 6 TYPICAL WIRE END CONNECTED AND FULLY SEATED IN TERMINALS WHEN THE TOOLS PER TABLE A WERE USED.

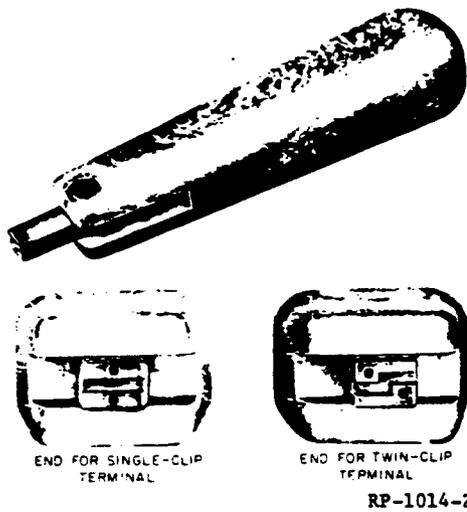


FIG. 7 756C QUICK-CONNECT TOOL

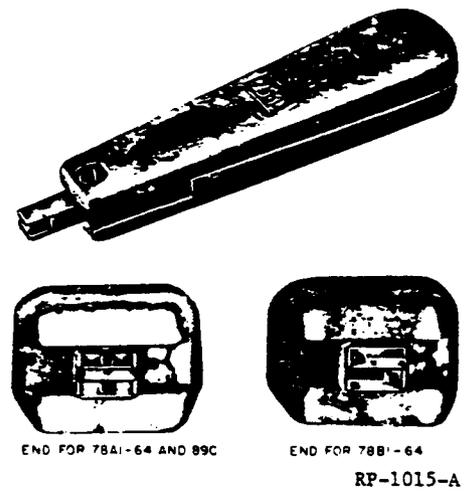


FIG. 8 756D TOOL

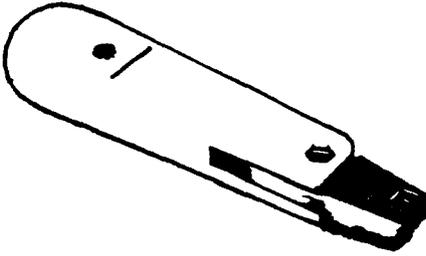


FIG. 9 788D4 1-PAIR INSERTION/CUTOFF TOOL

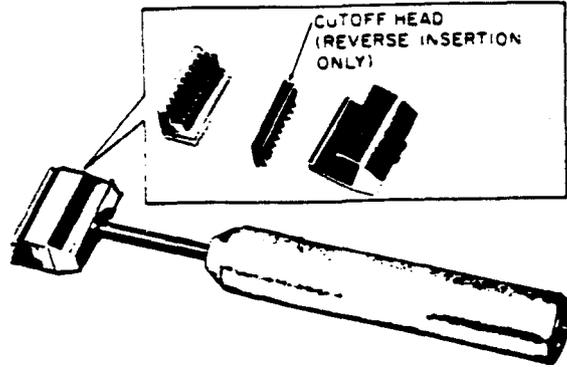


FIG. 10 788J1 IMPACT TOOL

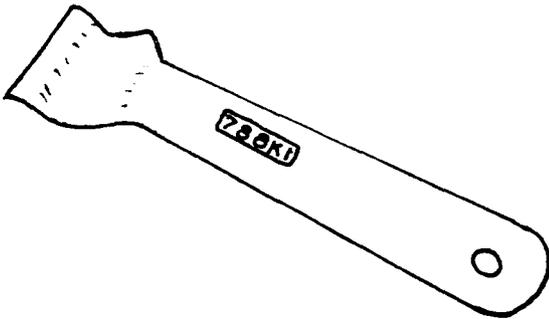


FIG. 11 788K1 LEAD RETENTION TOOL

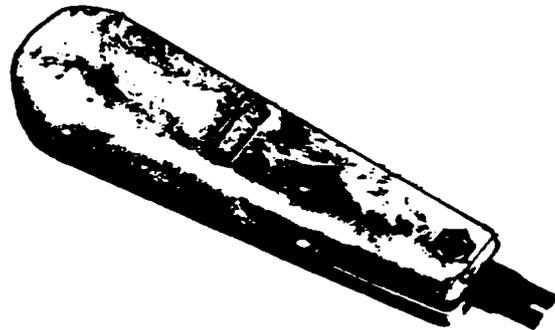


FIG. 12 833A INSERTION TOOL

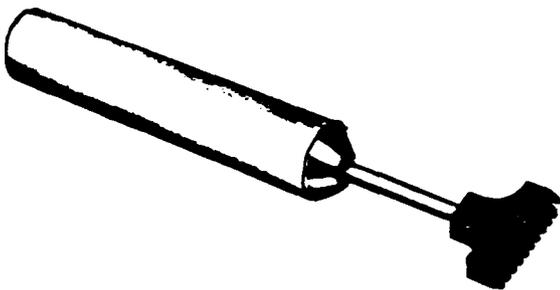
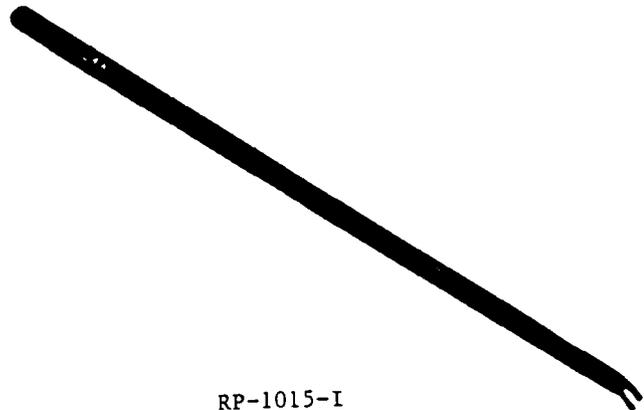


FIG. 13 834B MULTIPAIR IMPACT TOOL



RP-1015-I

FIG. 14 R-3795 (724A) WIRE REMOVING TOOL FOR USE WITH 66, 78 AND 112-TYPE CONNECTING BLOCKS

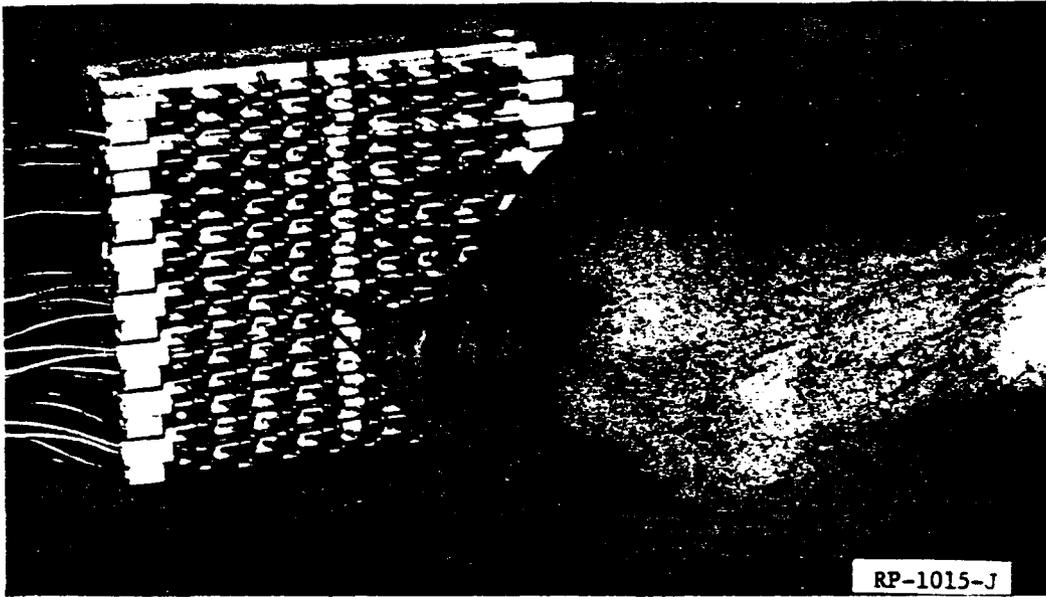


FIG. 15 REMOVAL OF CONNECTED WIRE USING R-3795 TOOL



P-18E827 - SINGLE CLIP
(CONCODE 811-858-273)



P-47L603 - SINGLE CLIP
(CONCODE 824-736-037)



P-18E768 - TWIN CLIP
(CONCODE 811-857-689)

FOR 66C, H TYPE CONN, BLOCKS



P-47L310 - TWIN CLIP
(CONCODE 824-733-109)

FOR 78A, B and C TYPE CONN, BLOCKS

RP-21596C



THREE BEAM (TB) CONNECTOR
(CONCODE 842367823)
FOR 112 & 89TB - TYPE CONN, BLOCKS

FIG. 16 PIECE-PART IDENTIFICATION OF REPLACEMENT TERMINALS

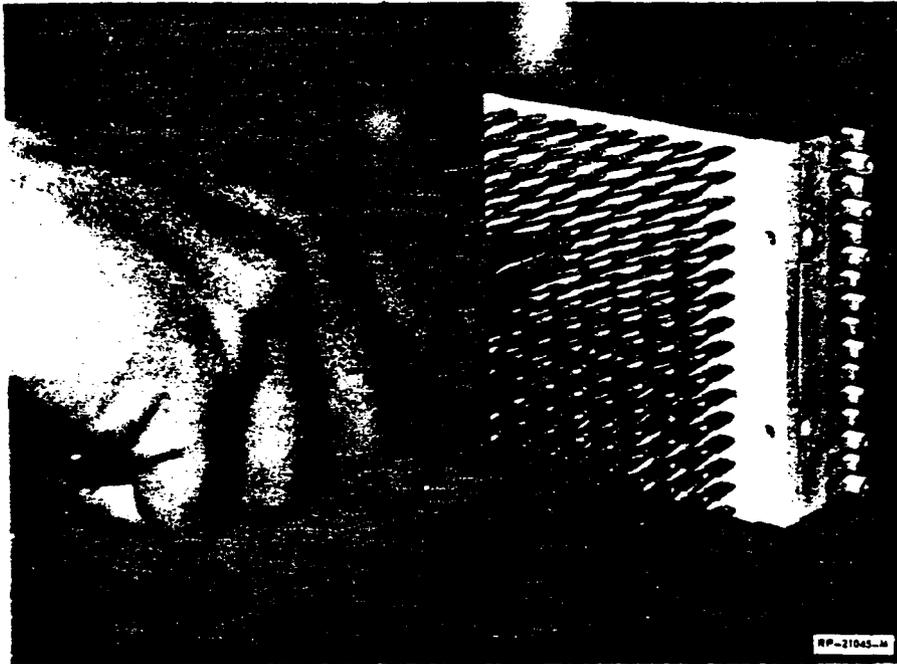
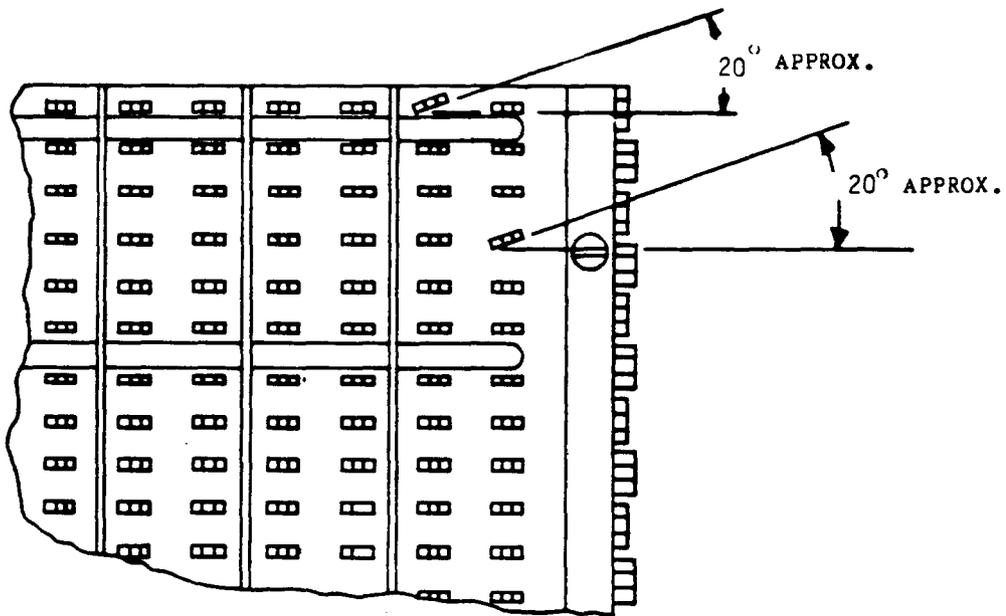


FIG. 17 BREAKING-OFF DEFECTIVE TERMINALS FOR REMOVAL AND REPLACEMENT



WIRE WRAP SIDE OF BLOCK

RP21536F

FIG. 18 TERMINAL SECURED BY TWIST



FIG. 19 PREPARING WIRE ENDS FOR THE 756D TOOL

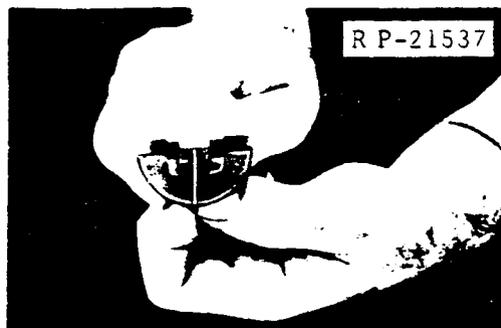
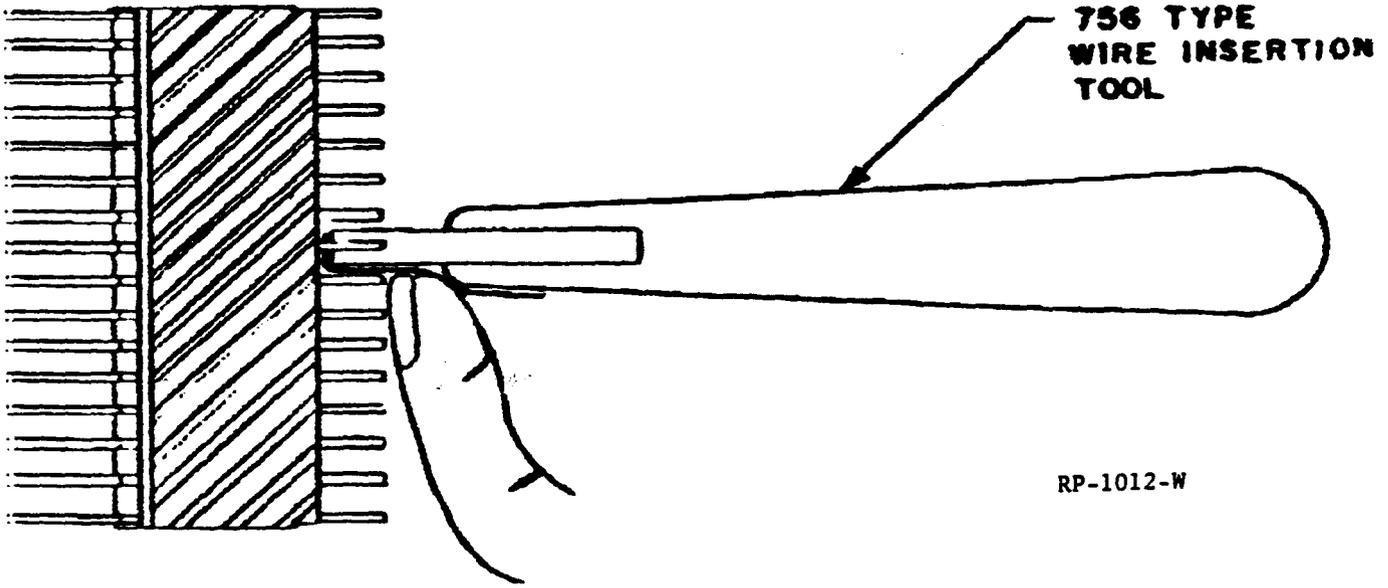


FIG. 20 PREPARATION OF WIRE END FOR INSERTION INTO CONNECTING BLOCK USING A QUICK-CONNECT WIRING TOOL

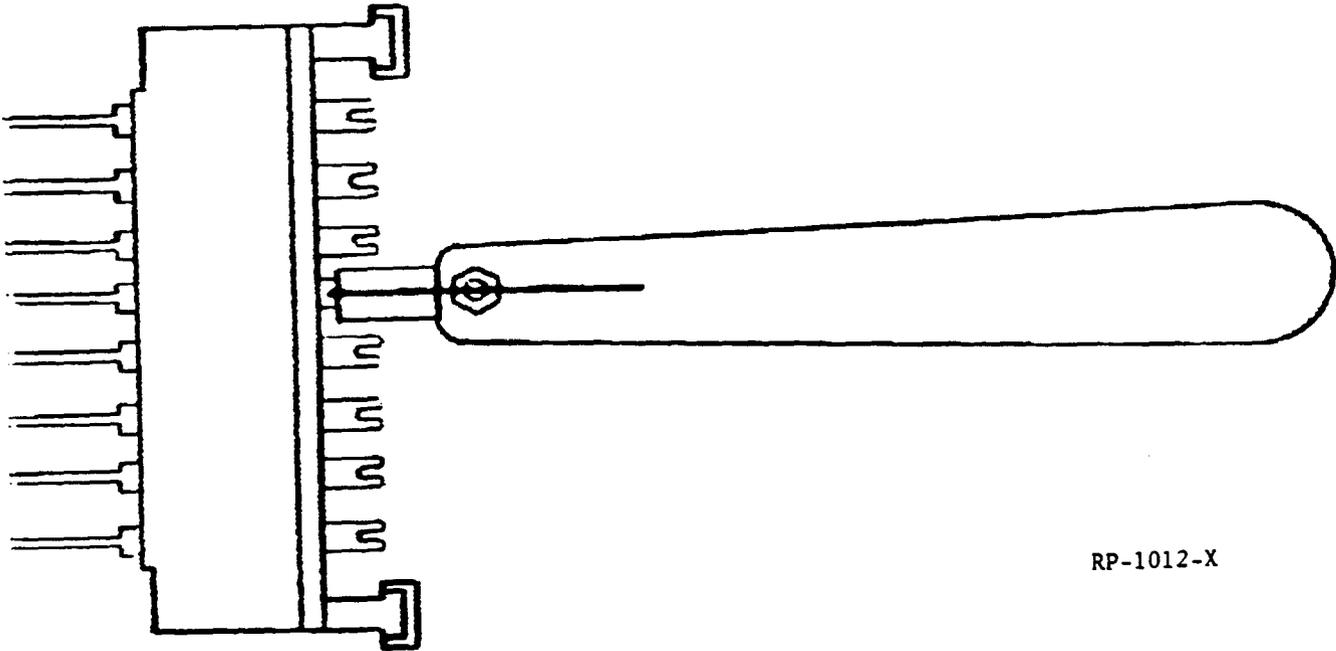


FIG. 21 GRASPING QUICK-CONNECT WIRING TOOL FOR OPERATION (R-3794, 714E (MD) IS ILLUSTRATED BUT APPLIES EQUALLY AS WELL FOR 756B2 and 756D TOOLS



RP-1012-W

FIG. 22 PROPER METHOD OF HOLDING AND INSERTING LEAD



RP-1012-X

FIG. 23 WIRE ALIGNMENT (BOTTOM VIEW)

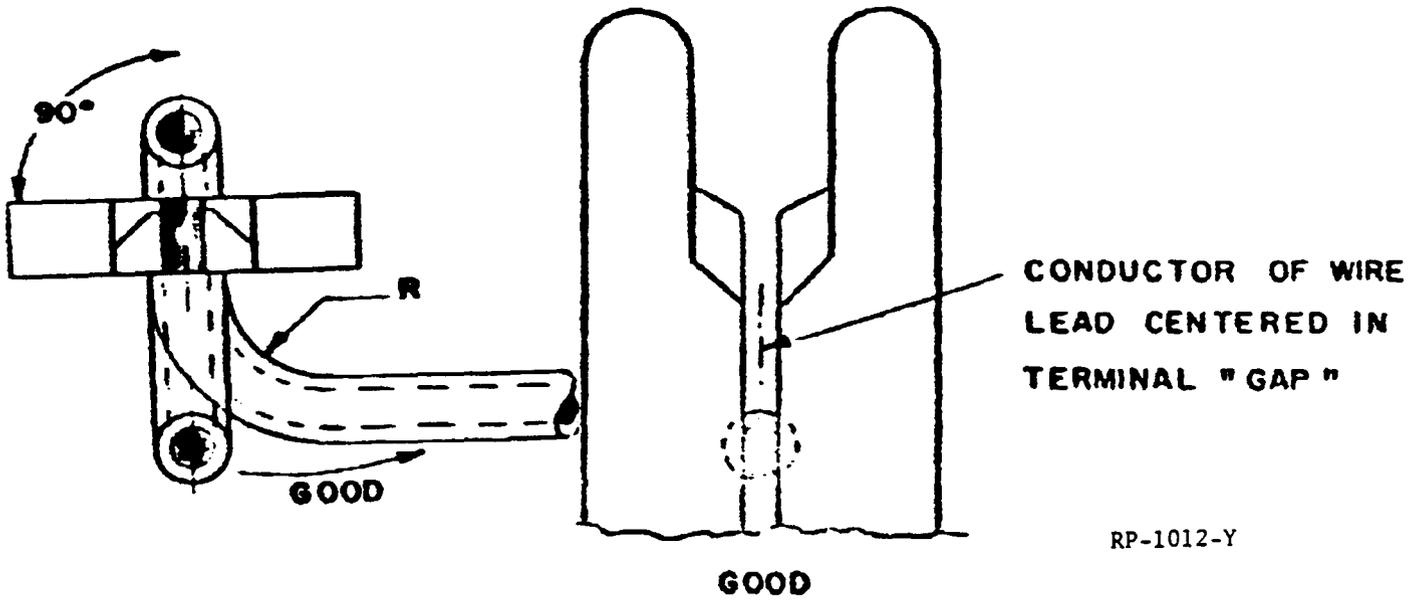


FIG. 24 CONDUCTOR PROPERLY CENTERED IN BEAMS

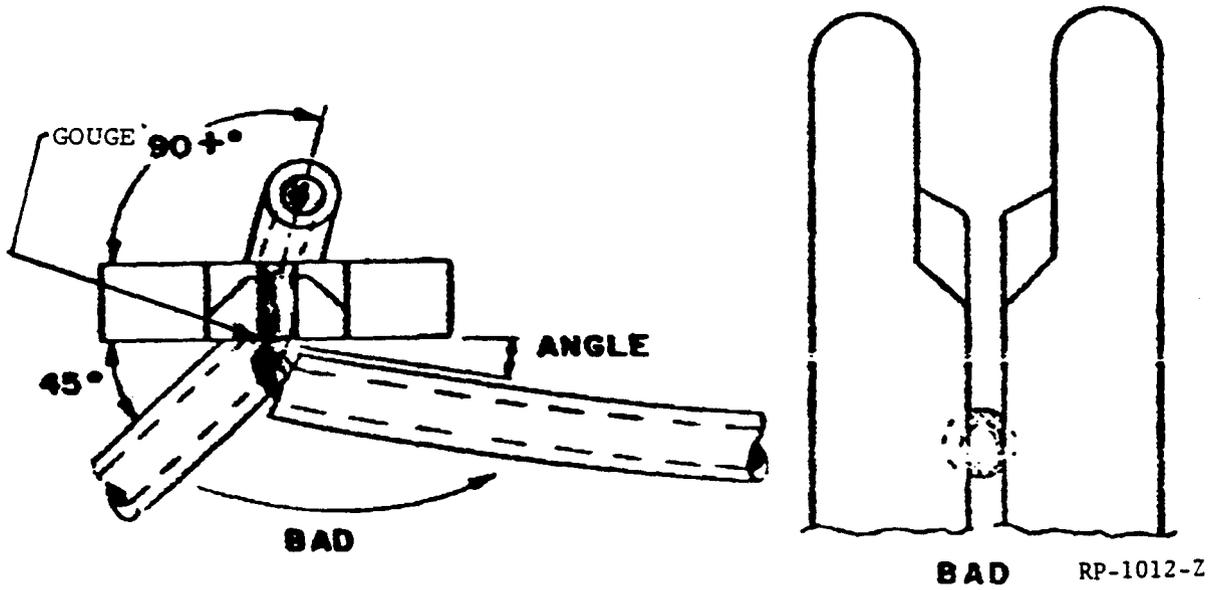


FIG. 25 CONDUCTOR IMPROPERLY CENTERED AND GOUGED