

APPLICATION AND MAINTENANCE
OF
AMP★ CHAMP★ MULTI-INSERTION (MI-1)
HAND TOOLS WITH
BASE PART NUMBER 229378

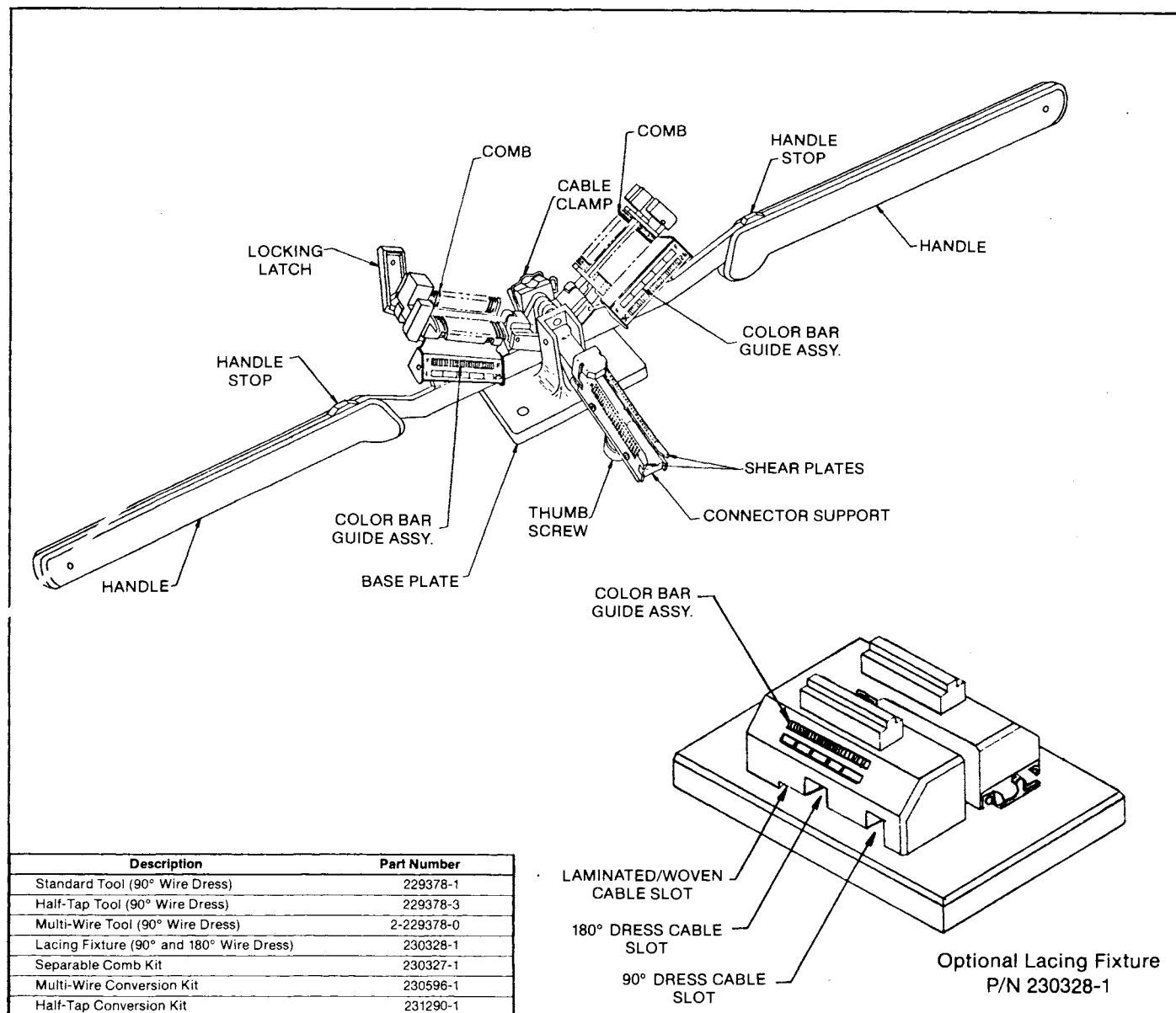


Figure 1

1. INTRODUCTION

The CHAMP MI-1 Hand Tool in Figure 1 is designed to terminate 14-, 24-, 36-, and 50-position CHAMP connectors using the AMP Insulation Displacement Technique. The hand tool permits all contacts to penetrate the wire insulation and engage the conductors simultaneously.

2. DESCRIPTION — UNIVERSAL MI-1

The MI-1 CHAMP Hand Tool (P/N 229378-1) may be operated either of two ways:

1. With the combs in place on the tool, wires may be laced into the combs to produce a 90° cable dress connection.
2. With the combs removed from the tool & positioned on the optional Lacing Fixture, wires may be laced into the combs to produce either 90° or 180° cable dress connections.

This remote lacing feature enables the user to lace wires on one set of combs while another operator terminates a connector utilizing another set of combs in the MI-1 Tool.

Two other versions of the MI-1 are available:

The 229378-3 tool provides a half-tap ("daisy chain") application when more than one connector is to be attached to the same group of wires (conductors are not cut during termination).

The 2-229378-0 tool provides a two-wire insertion application when more than one wire is inserted into one contact slot. (Solid wire only — 24 AWG)

The features of the hand tools, and their functions are as follows:

Base Plate — Supports functional components of the tool, and can be secured to the work bench.

Handles — Retain wire stuffers/inserters and provide insertion force. Stops have been included to prevent over-insertion of wires.

Connector Support — Holds connector in proper position and provides surface (shear plates) for cutting off excess wire.

Thumb Screw — Used to hold connector securely in connector support.

Wire Combs — Used to separate and hold wires that are laced into the tool or laced and predressed on the lacing fixture.

Wire Comb Supports — Contain wire combs, color bar guide assembly, and locking latch.

Cable Clamp — Holds cable in position during lacing procedure, on the tool.

Locking Latch — Holds wire comb supports together during termination of wires.

Inserters — Cuts and simultaneously inserts wires.

Wire Stuffers — Inserts wire between contact legs.

Lacing Fixture — Holds the combs, supports the cable during lacing procedure, and allows the cable to be predressed at 90° or 180°. Color code decals are included for wire lacing visual identification.

3. POSITIONING TOOL FOR USE

Select a sturdy work bench that is a convenient height for the operator. Position the tool on the work bench — then make sure there is sufficient space at the back of the tool to permit handling of the cable bundle, and — make sure the tool handles can open fully. Secure the base plate to the work bench. Make certain the work area is well illuminated, and that the area around the tool is kept clear for operation of the handles.

4. CABLE PREPARATION (Figure 2)

The following procedure has been prepared for standard color coded wires. The same method of operation will apply for nonstandard color coded wires — however, the wire groups MUST be defined in some other way.

1. Remove approximately an 8 in. length of sheathing from end of cable. Do NOT cut insulation of individual wires.

When using short tapered cover, slit cable sheathing back 1 in. — then fold sheathing back over itself before placing cable in tool.

2. Separate wires into color groups (predominately white in one group, predominately red in one group, etc).
3. Wrap a piece of wire around each group to keep the groups separated.

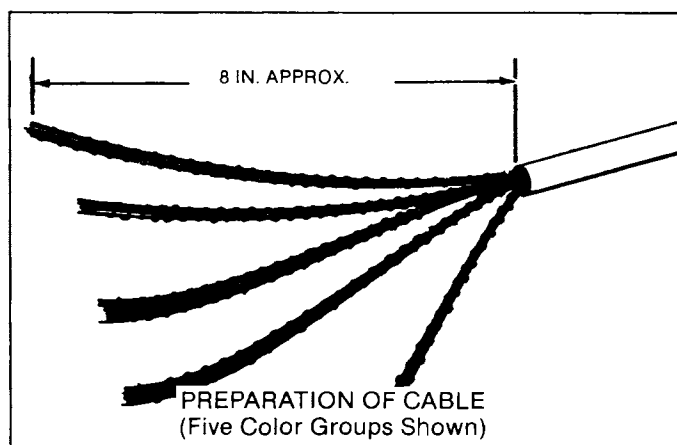


Figure 2

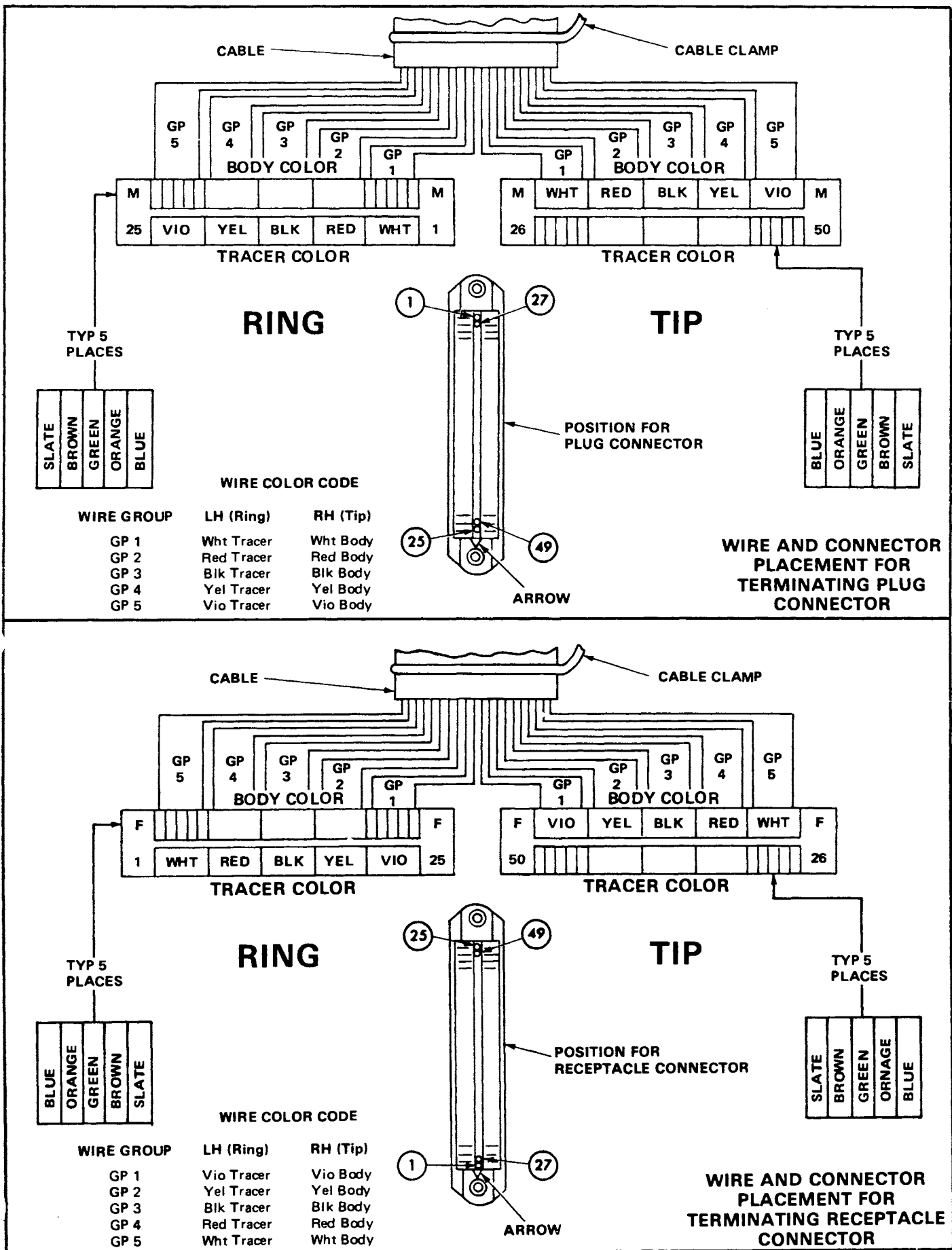


Figure 3

5. TERMINATING PROCEDURE

A. Placing Wires and Connector in Tool (Figure 1 and 3)

1. Open tool handles fully. Push on left side of locking latch until it snaps open, then push on right side to open latch completely.
2. Rotate both wire comb supports outward and move connector support down. The tool is now ready to receive the connector and wires.
3. Loosen thumb screw by rotating it COUNTER-CLOCKWISE several turns.
4. Select the appropriate plug or receptacle connector size for the application. Align connector with FRONT of connector support — make sure arrow on connector faces toward tool operator (see Figure 3) and LOW number positions are to the LEFT. Insert connector into connector support (between shear plates) until bottomed.
5. Turn thumb screw CLOCKWISE until connector is securely held.
6. Verify whether a plug or receptacle connector is being terminated:

a. *If Lacing On Tool* — Check lettering on ends of color bar for compatibility. The letter "M" is for male (plug) connectors and the letter "F" is for female (receptacle) connectors. If necessary, rotate color bar 180° to obtain the applicable lettering.

b. *If Lacing Remotely* — Remove separable combs from tool and place them on lacing fixture.

7. Insert cable.

a. *If Lacing On Tool* — Open cable clamp and insert cable until sheathing extends approximately ½ in. above the base plate. Hold cable in position and close cable clamp (Figure 4).

b. *If Lacing Remotely* — Pivot lacing fixture upward and insert cable into either 90° or 180° cable slot until sheathing is on the same plane as the comb shoulders (see Figure 5).

8. Pull first group of wires forward and remove piece of wire installed in preparing the cable (Step 3 of Paragraph 4). Separate wires by tracer and body color (ring and tip). Place ring wires to the LEFT and tip wires to the RIGHT.

9. Lace wires into combs — When lacing on tool, start towards the center, and when lacing on fixture, start towards the end nearest detent lock on lacing fixture.

Take wire from one side (LEFT or RIGHT) and lace wire through rear comb teeth and into corresponding position in front comb teeth. While keeping wire taut, bend wire under front of comb — and around ends of guide supports. See Figure 5.

10. Take mating wire from opposite side of tool (lacing fixture) and lace it through combs in same manner. Make sure wires are properly laced through the combs — wire color code must correspond with color bar (see Figure 3).

11. Repeat Steps 8, 9 and 10 until half of the wire bundle is laced into the combs.

a. *If Lacing On Tool* — After bending first half of wire bundle around inside of guide supports (toward center of tool), change direction and bend second half of wire bundle around outside of guide supports (toward tool handles).

b. *If Lacing Remotely* — Continue lacing second half of wire bundle and bending wire under comb.

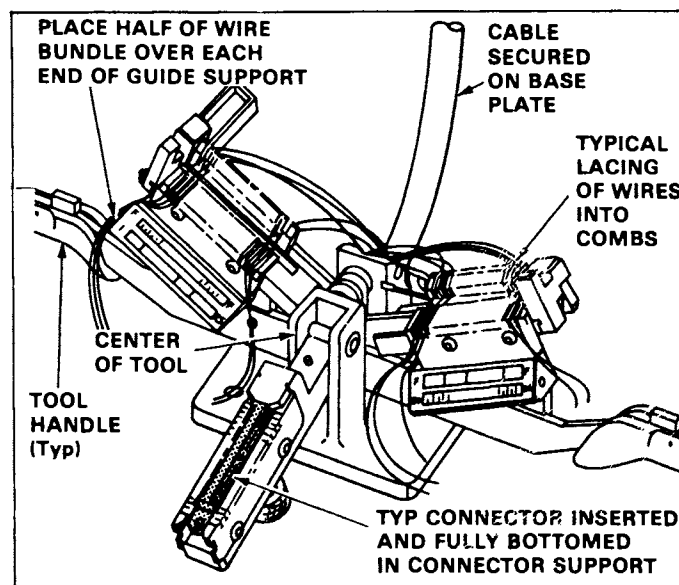


Figure 4

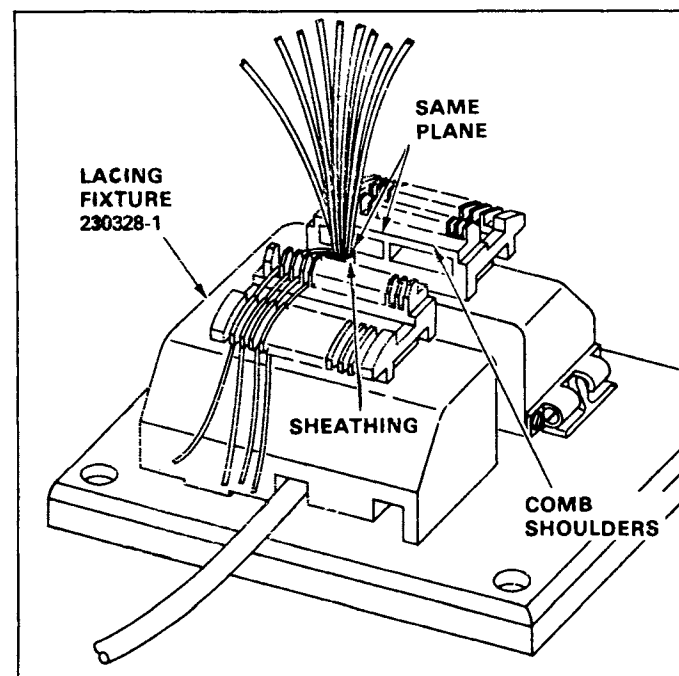
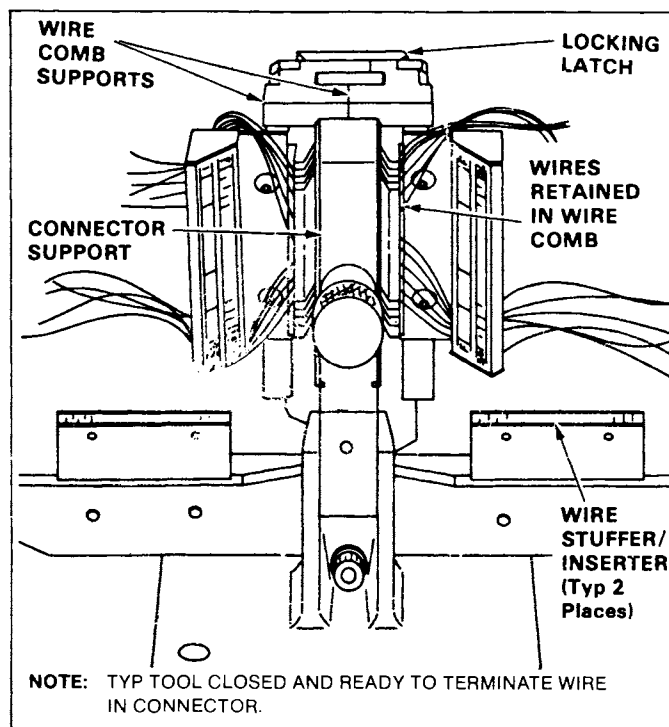


Figure 5

B. Tool Operation (Figure 6)

1. Check to be sure all wires are parallel in combs and that connector is bottomed in connector support.
2. Raise connector support to vertical position.
3. Be careful that the wires remain in the combs.
 - a. *If Lacing On Tool* — Raise one wire comb support to a vertical position and, while holding it in place, raise other wire comb support to a vertical position.
 - b. *If Lacing Remotely* — Carefully remove combs from lacing fixture. Position one comb on wire comb support and snap comb into place. Raise this wire comb support to a vertical position and, while holding it in place, snap second comb onto other wire comb support and raise it to a vertical position.
4. Hook locking latch onto RIGHT wire comb support. Press on LEFT side of locking latch until it is secure.
5. Look into sides of both wire comb supports to check alignment of wires. Each conductor must be aligned with a single contact.
6. Raise tool handles until the stops on the handles butt against each other (these are two-handed tools, and the handle stops must bottom). This shears all wire ends (unless daisy chaining with 229378-3 tool), and fully inserts all wires.
7. Remove sheared wire ends from combs (except 229378-3 tool). Lower the tool handles.
8. Loosen thumb screw by turning it COUNTER-CLOCKWISE.
9. Open locking latch and rotate wire comb supports downward.
10. Open cable clamp (if applicable). Slide terminated connector straight out of connector support.
11. Inspect all terminations as described in Paragraph 6.

**Figure 6****6. INSPECTION OF TERMINATIONS**

Visually inspect the wire terminations in the connector for the following:

1. Make certain wire is inserted evenly so that the insulation is below the "V" shaped lead-in on both the contact slot and the strain relief slot.
2. Check that all wires have been sheared (if applicable) to the proper length (extends at least 50% of the distance between the contact slot and the housing), and no exposed conductor strands are visible.
3. Check that the insulation is NOT cut in any area other than the slot insertion area.
4. Check to be sure the contacts are NOT deformed or crushed.
5. Make certain the conductors have NOT been cut above strain relief slot in the contacts.

If any of the wires are NOT properly terminated, re-insert them using the AMP T-Handle Insertion Tool 229384-1. The Instruction Sheet (IS 7558) for use of the tool is packaged with the tool. Refer to AMP Crimp Inspection Sheet CI 8050-44 as a visual aid for inspection of terminations.

MI-1 CHAMP TOOL MAINTENANCE AND REPAIR

7. DAILY MAINTENANCE

1. Clean the tool with a soft-bristle brush and/or soft, clean cloth. Do NOT use any type of solvent to clean the tool.
2. Lubricate pivot points in center of tool with a few drops of light machine oil. Apply a thin coat of LUBRI-PLATE®, or equivalent, to sides of the insert. Do NOT lubricate excessively.
3. Frequently inspect tool for wear or other damage. If required, replace parts in accordance with the information provided in Paragraph 9, REPLACING WORN OR DAMAGED PARTS.
4. When NOT in use, store the tool in a clean, dry area with a connector in the connector support and the tool handles in the closed position.

8. REPAIR

The parts listed in Figures 7 & 8 are customer replaceable parts. A complete inventory can be stocked and controlled to prevent lost time when replacement of parts is necessary. The tool can also be returned to AMP for evaluation and repair. Send the tool with a written description of the problem to:

AMP Incorporated
3600 Gum Tree Road
Winston-Salem, NC 27107

9. REPLACING WORN OR DAMAGED PARTS

Spare parts for all models of tools are listed in Figure 8. The *Item Number* column has been included to provide a reference throughout the text, it is not to be used when ordering parts. When ordering parts, use the AMP Part Number and Description.

The *Quantity Per Tool* column indicates the number of each item required for each tool. The *Recommended Spares* column indicates quantity of each item required to maintain up to 10 tools for a period of one year under normal circumstances. It is recommended that the customer stock and control these items to insure continuous production capability.

During replacement of parts, use SCREW LOCK† SEALANT (P/N 23419-4), or equivalent, on all screw threads to insure retention.

A. Color Bar Guide Assembly (Figure 7)

1. Note orientation of existing color bar guide assemblies.
2. Spread guide support and remove old color bar guide assembly.
3. From the parts list in Figure 7, select the correct (Item 1 or Item 2) color bar guide assembly.
4. Spread the guide support, then orient and install new color bar guide assembly as noted in Step 1.

B. Cable Clamp (Figure 7)

1. Fully open the tool as indicated in Figure 7.
2. Drive slotted spring pin back far enough to remove the old cable clamp.
3. Position new cable clamp and drive slotted spring pin back into place.

To prevent misalignment, do NOT loosen or remove any screws in the wire comb supports other than those specified in Step 1.

C. Locking Latch (Figure 7)

Install locking latch

1. Using a hex socket wrench key, remove the four screws securing locking latch (Item 9, Figure 7) to BACK of wire comb supports.
2. Position the new locking latch and secure it with the four screws.

D. Wire Combs (Figure 8)

1. While depressing the rear clip, lift the comb from the tool. Position the new comb and snap into place using the rear clip.
2. If misalignment of the wires dictates comb adjustment, proceed as follows: loosen the screws securing the rear clip and raise the wire comb support to the vertical position. While looking into the side of the tool, align the comb with the Shear Plate and tighten the rear clip screws.

E. Shear Plates (Figure 7)

NEVER attempt to reface the shear plates. This will destroy the flatness required for shearing of all wires.

Install shear plates as follows:

1. With tool handles and Wire Comb Supports fully opened, remove the two screws attaching shear plate to connector support.
2. Position new shear plate on connector support and start — but do NOT tighten — the two screws.
3. With connector support open, push down and back on shear plate to seat it on shoulder of connector support. Hold shear plate in position and tighten the two screws.
4. If opposite shear plate is to be replaced, repeat this procedure.

F. Wire Stuffers

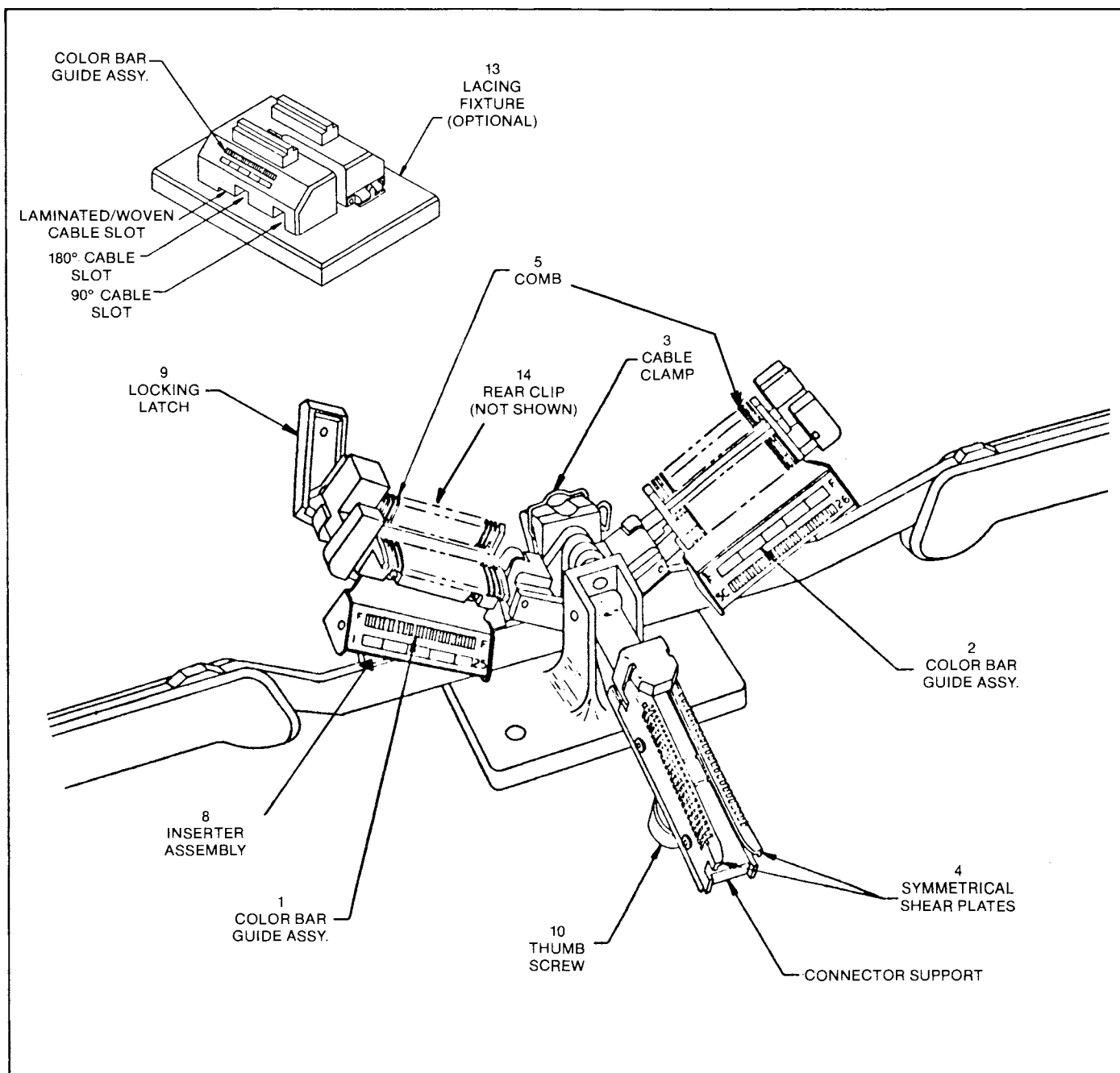
This Procedure applies to both sides of the tool. It is NOT necessary to remove inserters from tool.

1. With tool handles opened and wire comb supports latched in vertical position, support inserter on a flat surface and, using a drift punch, remove the two inserter pins securing the wire stuffer. Refer to Figure 8 for location of pins.
2. Remove wire stuffer from inserter.
3. Position new wire stuffer (Item 6, Figure 7) into inserter and align the holes.
4. Again, support inserter on a solid, flat surface. Then, insert two new inserter pins (Item 7, Figure 7).
5. Unlatch wire comb supports, lower connector support and insert connector into connector support until it bottoms. Tighten thumb screw. Raise connector support and wire comb supports to the vertical position. Secure with locking latch.
6. Operate the respective tool handle several times to assure proper alignment of wire stuffer with contacts. If alignment is incorrect, adjust the inserter as described in Paragraph 9, G.

G. Inserters

This procedure applies to both sides of the tool. Note that it may NOT be necessary to replace both inserters. If the replacement of both is required on a single tool, do NOT remove both at the same time.

1. With tool fully opened remove the two screws and two flat washers used to secure inserter to handle. Remove the inserter.
2. If inserter is being replaced with a new one (Item 11, Figure 7), check wire stuffer for damage. If wire stuffers are NOT damaged, remove them and place them in the new inserters as described in Paragraph 9, F. The same procedure applies if a new wire stuffer (Item 6, Figure 7) must be installed. ALWAYS use new inserter pins (Item 7, Figure 7).
3. Position inserter on handle. Start — but do NOT tighten — the two screws.
4. Insert connector into connector support until it bottoms. Tighten thumb screw. Raise connector support and wire comb supports to the vertical position. Secure with locking latch.
5. Loosen (approximately one turn) the screws that secure the back-up plates.
6. Using caution, raise tool handle until new inserter begins to enter connector. Then, move inserter up or down to align wire stuffer with contacts. When certain that the wire stuffers have aligned with the contacts, closed tool handle fully and tighten screws just enough to hold alignment.
7. If opposite wire inserter is to be replaced, repeat Steps 1, 2, 3, 4, & 6.
8. Secure Inserter Screws and refer to Paragraph on "Tool Adjustment for Proper Wire Cutting".

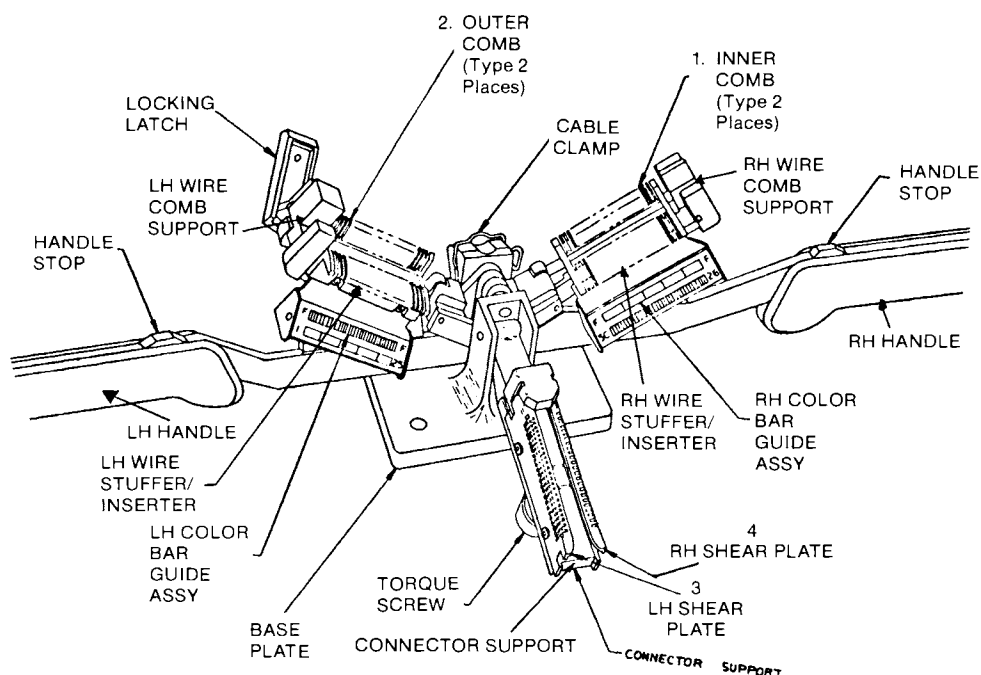


Universal MI-1

ITEM NO.	AMP PART NO.	PARTS LIST	QTY PER TOOL	RECOMMENDED SPARES
		DESCRIPTION		
1	229459-1	GUIDE ASSY, Color Bar (LH)	1	2
2	229460-1	GUIDE ASSY, Color Bar (RH)	1	2
3	229408-1	CLAMP, Cable	1	2
4	231304-1	SHEAR PLATE	2	4
5	230068-1	COMB	2	4
6	229474-1	STUFFER, Wire	2	4
7	229405-1	PIN, Inserter	4	8
8	229694-7	INSERTER ASS'Y (Consists of Items 6, 7 & 11)	2	2
9	27314-1	LATCH, Locking	1	2
10	19599-1	SCREW, Thumb	1	4
11	229475-1	INSERTER	1	2
12	230327-1	KIT, Separable Comb (6 Combs)	1	1
13	230328-1	FIXTURE, Lacing	1	As Req
14	230125-1	CLIP, Rear	2	6

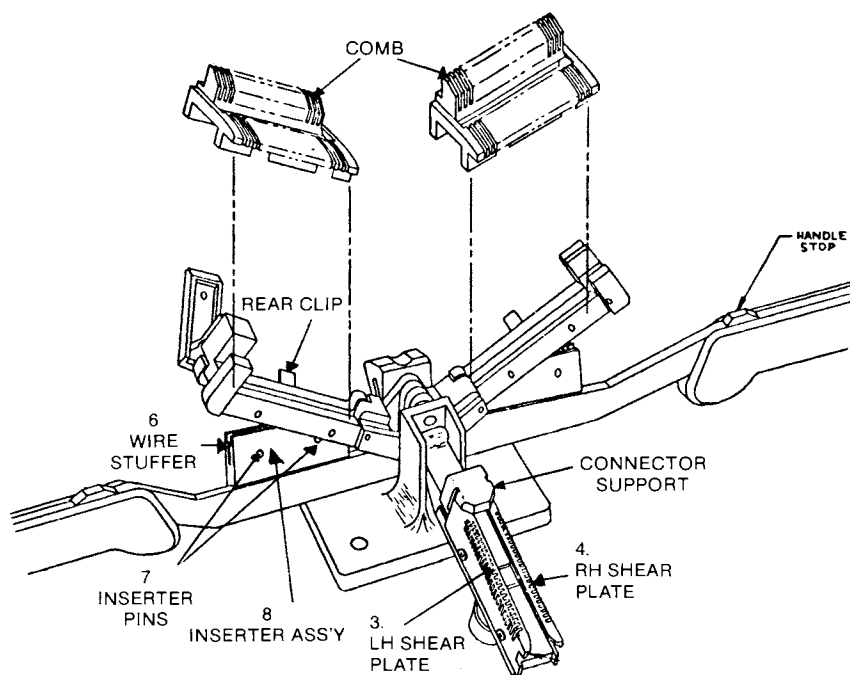
For Replacement Parts Peculiar to Earlier Version MI-1's, Refer to Figure 8.

Figure 7



Fixed Comb MI-1

(Superseded by Universal MI-1)



Separable Comb MI-1

(Superseded by Universal MI-1)

Spare Parts List

ITEM	AMP P/N	PARTS LIST	QTY PER TOOL	RECOMMENDED SPARES
1	229399-1	COMB, Inner (Front)	2	3
2	229406-1	COMB, Outer (Back)	2	3
3*	229397-1	PLATE, Shear (LH)	1	1
4*	229416-1	PLATE, Shear (RH)	1	1

*Replaces item 4 of Figure 7

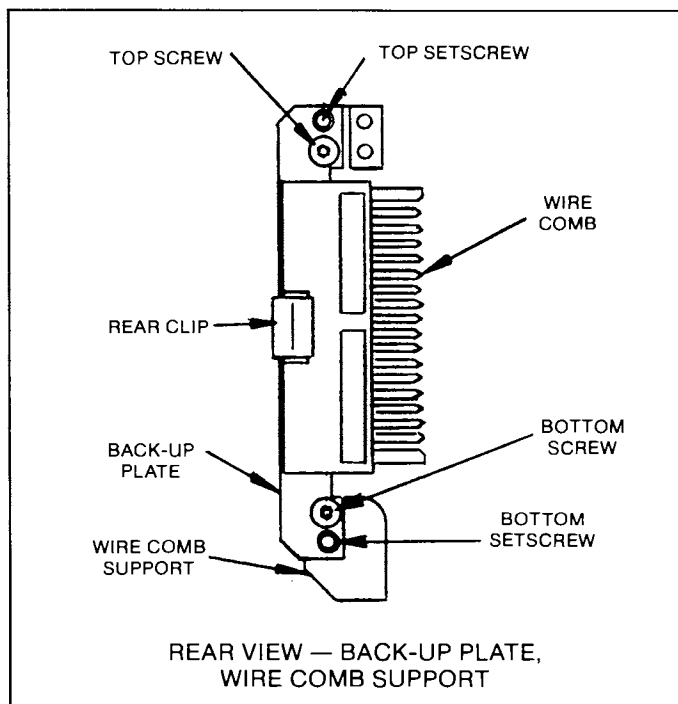
(Note: All other items same as Universal MI-1, Figure 6)

Figure 8

TOOL ADJUSTMENT FOR PROPER WIRE CUTTING

1. Raise connector support and then the wire comb supports to the vertical position. Secure with locking latch.
2. Slowly raise handles — if inserter binds or has excessive drag — STOP. Re-open handles and adjust backup plate. Do NOT force the handles closed.
3. Lower handles. Grip connector support and wire comb support with one hand and release locking latch. Now, loosen TOP screw and setscrew, and BOTTOM screw and setscrew securing backup plate to wire comb support. See Figure 9.
4. Move inserter (handle) in and out of shear plate and, simultaneously, squeeze the backup plate until a slight, even drag is apparent — then hold the backup plate in position and tighten TOP and BOTTOM setscrews until slight outward pressure is detected. Release pressure on the backup plate and secure TOP and BOTTOM screws.
5. Again, check for slight drag on inserter. If drag is NOT even, alternately adjust both the TOP and BOTTOM screws, and setscrews, until proper adjustment is obtained.
6. Repeat this procedure for opposite side if necessary.
7. Terminate several connectors and inspect the terminations.

The tool is ready for use when each termination meets the requirements specified in Paragraph 6, INSPECTION OF TERMINATIONS.

**Figure 9****10. CONVERTING TOOLS**

MI-1 Tools may be converted to perform various functions utilizing the Conversion Kits outlined in the table below.

To Convert To	Order Kit No.
Half-Tap	231290-1
Multi-Wire	230596-1

Figure 10.

Consult instruction sheet COM 3005 included with each conversion kit for detailed instructions.