

**1. INTRODUCTION**

This instruction sheet provides "Instructions" on product application and a "Maintenance and Inspection Procedure" for:

**AMP \* INSULATION PIERCING COPALUM \*  
TERMINAL AND SPLICE CRIMPING TOOLS**

68140-1                      68141-1                      68351-1

These tools are used to crimp:

- COPALUM terminals and splices on No. 20 thru 10 film insulated solid aluminum or copper wire or stranded copper wire.

NOTE: Do not use stranded aluminum wire.

Basic instructions on the use of these tools, wire selection and preparation, etc. are provided in Section 2, "Instructions". Section 3 features a terminal or splice "Crimp Inspection" procedure. Section 4 contains a "Maintenance and Inspection Procedure" which will enable you to establish and maintain a tool certification program.

Crimping tools, see Figure 1, are coated with preservative to prevent rust and corrosion. Wipe this preservative from tool, particularly from crimping surfaces.

**2. INSTRUCTIONS**

**2.1 WIRE SELECTION AND LOADING**

Solid aluminum or copper (or a combination of both) and stranded copper conductors may be crimped in the same wire barrel under the following conditions:  
NOTE: Conductors must always be within CMA limits of wire barrel.

Condition 1 - See Figure 2, Detail A.  
Maximum CMA fill for copper conductor should not exceed 40% of total CMA. Example:  
2 No. 15 solid aluminum (6,400 circular mils) plus 1 No. 14 stranded copper (4,000 circular mils) equals 10,400 circular mils. The 1 No. 14 stranded copper conductor is approximately 40% of total CMA (10,400 circular mils) being crimped.

Condition 2 - See Figure 2, Detail B.  
A maximum of 10 equal size round conductors may be crimped without removing film insulation.

Condition 3 - See Figure 2, Detail C.  
A maximum of 6 equal size square conductors may be crimped without removing film insulation.

Condition 4 - See Figure 2, Detail D.  
4 identical rectangular conductors, where one conductor thickness is equal to or greater than 1/4 of the width of one conductor, may be crimped without removing film insulation.

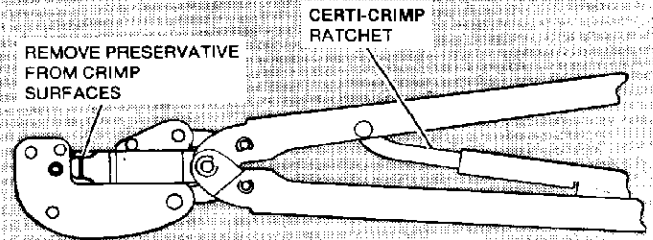


Figure 1

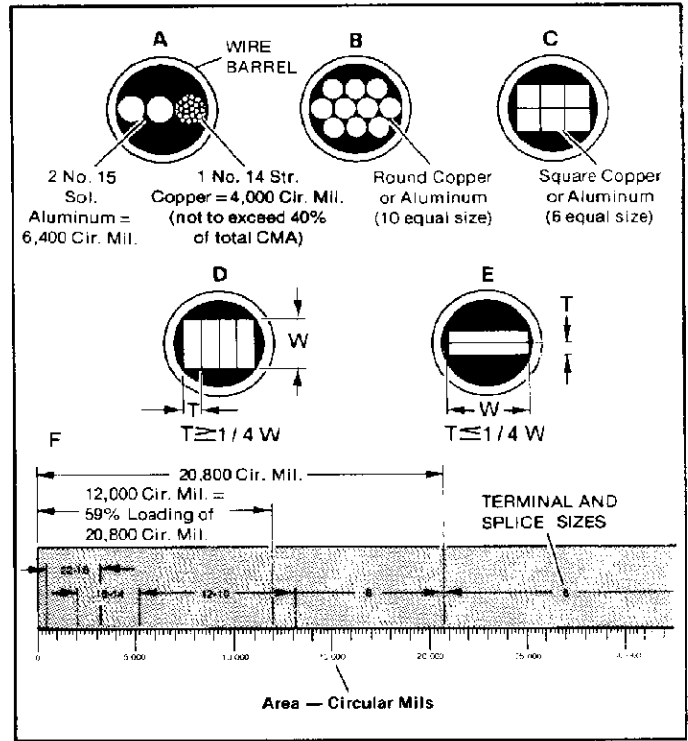


Figure 2

Condition 5 - See Figure 2, Detail E.  
2 identical rectangular conductors, where thickness of one conductor is equal to or less than 1/4 of the width of one conductor, may be crimped without removing film insulation.

Condition 6 - See Figure 2, Detail F.  
In some instances it may not be possible to fit a particular CMA loading into the normally recommended terminal or splice. In these cases, where 2 or more equal round, or a combination of solid aluminum and stranded copper conductors are used, and the total CMA is at least 50% of maximum CMA of the next larger size terminal or splice, the larger size may be used. Example:  
3 No. 14 solid conductors equal about 12,000 circular mils. This falls within

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the CMA range of a 12-10 terminal or splice accepting a maximum CMA of 13,100 circular mils. However, it may not be possible to insert all three conductors into the recommended terminal or splice. It is possible to insert all three conductors into a No. 8 size terminal or splice accepting a CMA range of 13,100 - 20,800 circular mils. The 12,000 circular mils amounts to 59% loading of the maximum CMA for No. 8 size terminals or splices. Therefore, No. 8 size terminals or splices may be used.

Condition 7 - When using a variety of solid conductor sizes, none of the conductors should vary more than one (1) wire gage. (Ideally not more than 1/2 wire gage.)

**2.2 WIRE PREPARATION**

NOTE: Do not use stranded aluminum wire.

(a) Determine correct terminal or splice wire loading by referring to paragraph 2.1, and CMA range listed in Figure 3.

(b) Strip insulated stranded copper wire to dimension indicated in Figure 3. DO NOT NICK OR CUT CONDUCTOR STRANDS.

NOTE: It is not necessary to strip film insulated aluminum or copper wires.

**2.3 CRIMPING PROCEDURE**

(a) Ensure that the wire range stamped on the terminal or splice corresponds with the wire range stamped on the tool head. Wire range and insulation piercing crimp symbol (▲) appear on surface of moving die. See Figure 4A.

(b) Open crimping dies by closing handles until CERTI-CRIMP ★ ratchet releases. See Figure 1. Note that once ratchet is engaged, handles cannot be opened until they are first fully closed.

(c) Place terminal or splice in crimping dies as shown in Figure 4 A, B or C. For best results, position the

butt splice so that the window of splice faces top of tool. See Figure 4B.

- (d) Close handles until terminal or splice is held firmly in place. Do not deform terminal or splice wire barrel.
- (e) Insert wire into terminal or splice wire barrel.
- (f) To complete crimp, close handles until CERTI-CRIMP ratchet releases. Handles can now be opened and crimped item may be removed.
- (g) To crimp other half of butt splice, remove and rotate splice 180° end over end. Reposition uncrimped half in lower jaw as shown in Figure 4B. If splice cannot be rotated, rotate tool. Insert wire and then crimp the splice.
- (h) Refer to section 3 and Figure 5 for crimp inspection.

**3. CRIMP INSPECTION**

Inspect crimped terminals and splices by checking the features described in Figure 5.

Use only the terminals and splices that meet the conditions shown in the "ACCEPT" column.

"REJECT" terminals and splices can be avoided through careful use of instructions in Section 2, and by performing regular tool and die maintenance as instructed in Section 4.

TOOL NO.	WIRE RANGE	CMA RANGE	WIRE STRIP LENGTH (Stranded Copper Wire Only)	
			Min.	Max.
6835-1	20-18	810 TO 2,050	9/32"	11/32"
68140-1	16-14	2,050 TO 5,180		
68141-1	12-10	5,180 TO 13,100	11/32"	13/32"

Figure 3

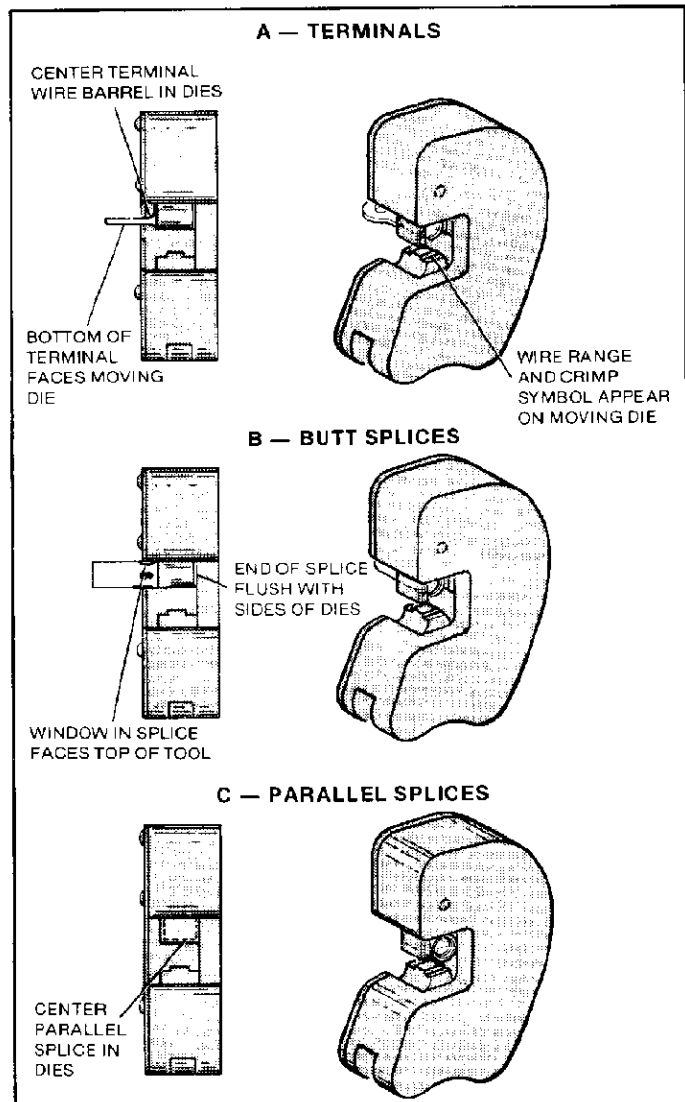


Figure 4

#### 4. MAINTENANCE/INSPECTION PROCEDURE

AMP recommends that a maintenance/inspection program be performed periodically to ensure dependable and uniform terminations. Tools should be inspected at least once a month. Frequency of inspection may be adjusted to suit your requirements through experience. Frequency of inspection is dependent upon:

1. The care, amount of use and handling of the tools.
2. The type and size of the products crimped.
3. The degree of operator skill.
4. The presence of abnormal amounts of dust and dirt.
5. Your own established standards.

All tools are thoroughly inspected before packaging. Since there is a possibility of damage in shipment, new tools should be inspected in accordance with the following instructions when received in your plant. Due to the precision design, *it is important that no parts of these tools be interchanged except those replacement parts listed in Figure 10.*

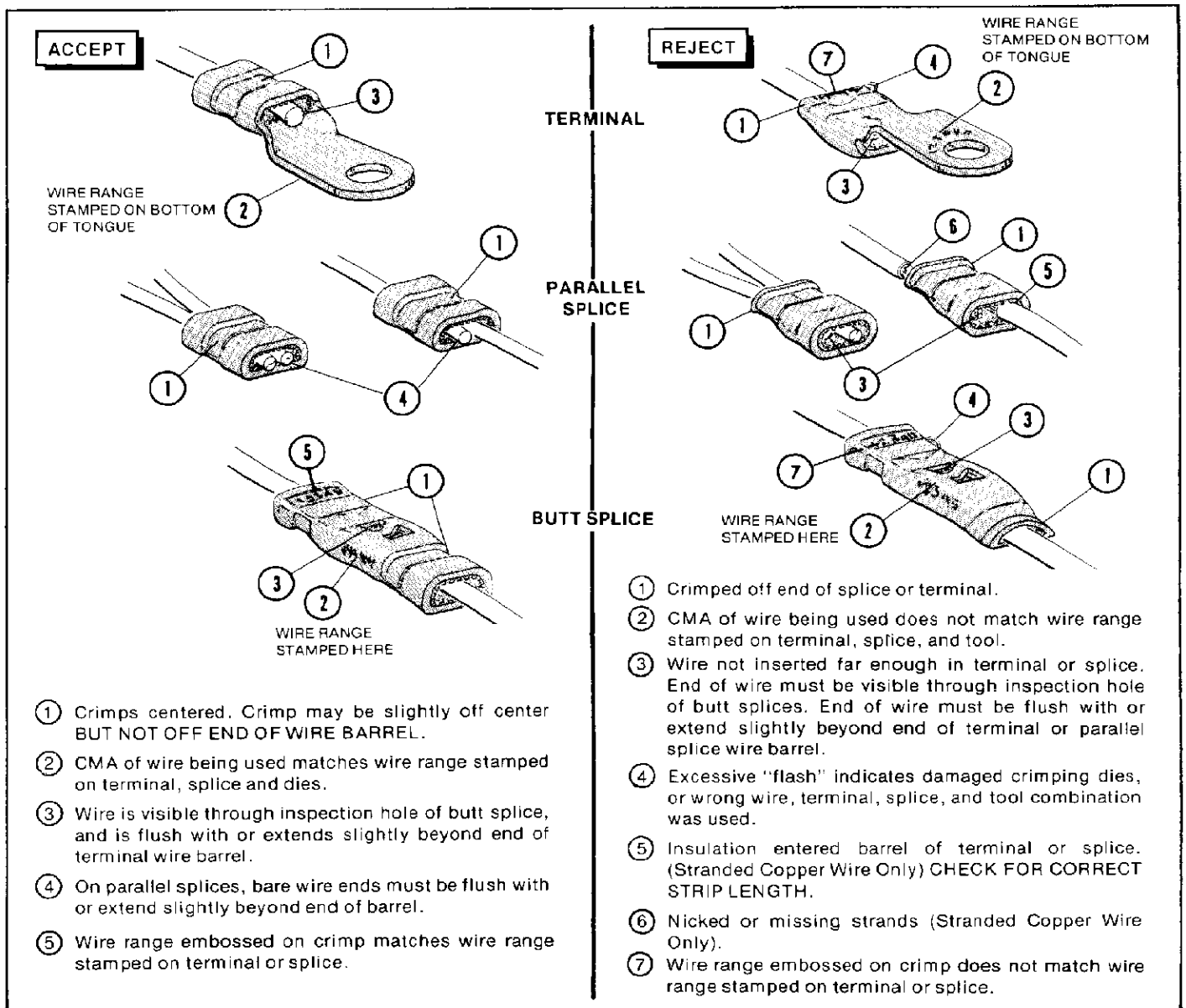
#### 4.1 CLEANING

Do not allow deposits of dirt, grease and foreign matter to accumulate on the die closure surfaces or die bottoming surfaces. These deposits may cause excessive wear, thereby affecting the quality of the crimp. The tool should be immersed (handles partially closed) in degreasing compound to remove accumulated dirt, grease and foreign matter. Remove remaining degreasing compound with a lint free cloth. When degreasing compounds are not available, tool may be wiped clean with a lint free cloth. Relubricate tool, as instructed in paragraph 4.3, before placing it back in service.

#### 4.2 VISUAL INSPECTION

Visually inspect the tool for missing pins or retaining rings. If parts are missing or defective, refer to Figure 10 for customer replaceable parts.

Visually inspect the die closure surfaces for pitted, broken or chipped conditions. Although dies may gage within permissible limits, worn or damaged



die closure surfaces are objectionable and can affect the quality of the crimp. Examples of possible damaged die closure surfaces are shown in Figure 6.

#### 4.3 LUBRICATION

Lubricate all pins, pivot points and bearing surfaces with a good grade S.A.E. No. 20 motor oil as follows:

Tools used in daily production — Lubricate daily

Tools used daily (occasional) — Lubricate weekly

Tools used weekly — Lubricate monthly

Wipe excess oil from tool, particularly from crimping surfaces. Oil transferred from the crimping surfaces onto certain terminations may affect the electrical characteristics of an application.

#### 4.4 DIE CLOSURE INSPECTION

Every tool is inspected for proper die closure before packaging. An inspection should be performed periodically to check the tool die closure for excessive wear.

The die closure inspection is accomplished using GO NO-GO plug gages. AMP neither manufactures nor sells plug gages. A suggested plug gage design and the GO NO-GO dimensions of the plug gage members are listed in Figures 7 and 8. The following procedure is recommended for inspecting the die closures.

- Clean oil or dirt from die closure surfaces, bottoming surfaces, and plug gage members.
- Close handles of tool until crimping dies are bottomed but not under pressure.
- With crimping dies bottomed, inspect the inner crimp closure using the proper plug gage. Hold gage in straight alignment with the die closure and carefully try to insert, without forcing, the GO member. See Figure 9, Detail A. The GO member must pass completely through the inner crimp closure.
- Try to insert the NO-GO member. The NO-GO member may enter partially, but must not pass completely through the inner crimp closure.
- With dies bottomed, inspect the right and left outer crimp closures using the proper plug gage. Try to insert, without forcing, the GO member. See Figure 9, Detail B. The GO member must enter to radius of inner crimp.
- Try to insert the NO-GO member. The NO-GO member may enter partially, but must not enter to radius of inner crimp.
- If both the inner crimp and the outer crimp closures meet the GO NO-GO gage conditions, the dies may be considered dimensionally correct. If you find that the die closures do not conform with the GO NO-GO gage conditions, contact your local AMP field representative.

#### 4.5 CERTI-CRIMP RATCHET INSPECTION

The CERTI-CRIMP ratchet feature should be checked to make certain that the ratchet does not release prematurely allowing dies to open before they have fully bottomed.

To check ratchet feature:

- Thoroughly clean the bottoming surfaces of the dies.
- Make a test crimp using the maximum wire load, i.e., a No. 10 AWG wire in a 12-10 terminal. When this crimp is made, squeeze handles until the ratchet is free, however, **DO NOT RELAX PRESSURE ON TOOL HANDLES.**

- Bottoming is satisfactory if bottoming surfaces of the dies make contact with each other or if the clearance between the bottoming surfaces is .001" or less.
- If the .001" shim stock can be inserted completely between the bottoming surfaces of the dies, the dies are considered as not bottoming. Contact your local AMP field representative.

#### 4.6 REPLACEMENT PARTS

It may be advantageous to stock certain replaceable parts to prevent loss of production time. Figure 10 lists the customer replaceable parts that can be purchased from AMP Incorporated, Harrisburg, Pa. 17105, or a wholly owned subsidiary of AMP Incorporated.

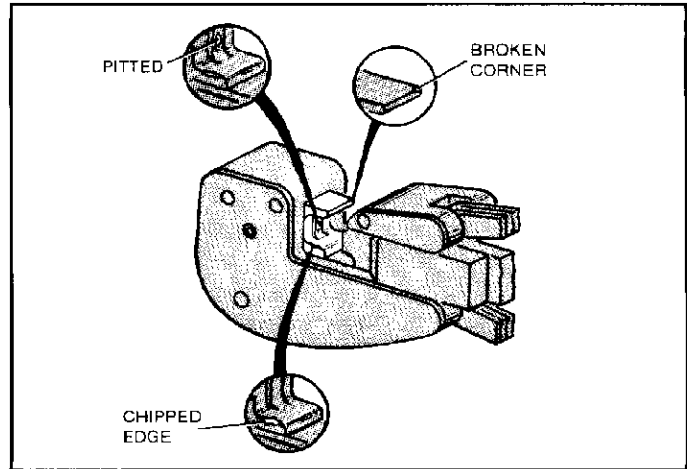


Figure 6

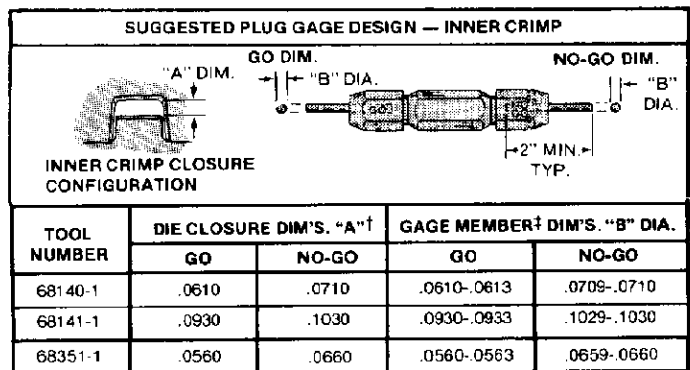
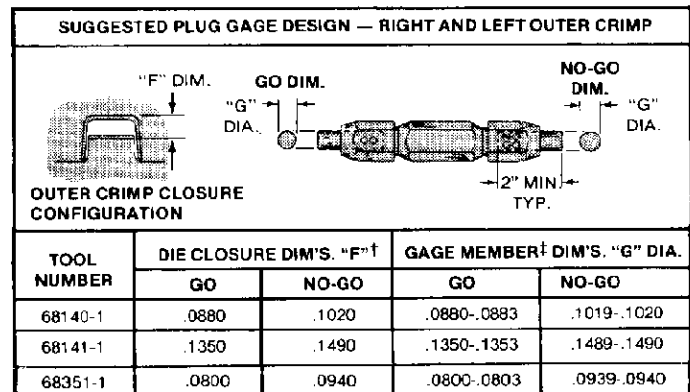


Figure 7



†Die closure dimensions apply when dies are bottomed, but not under pressure.

‡Material — Tool Steel

Figure 8

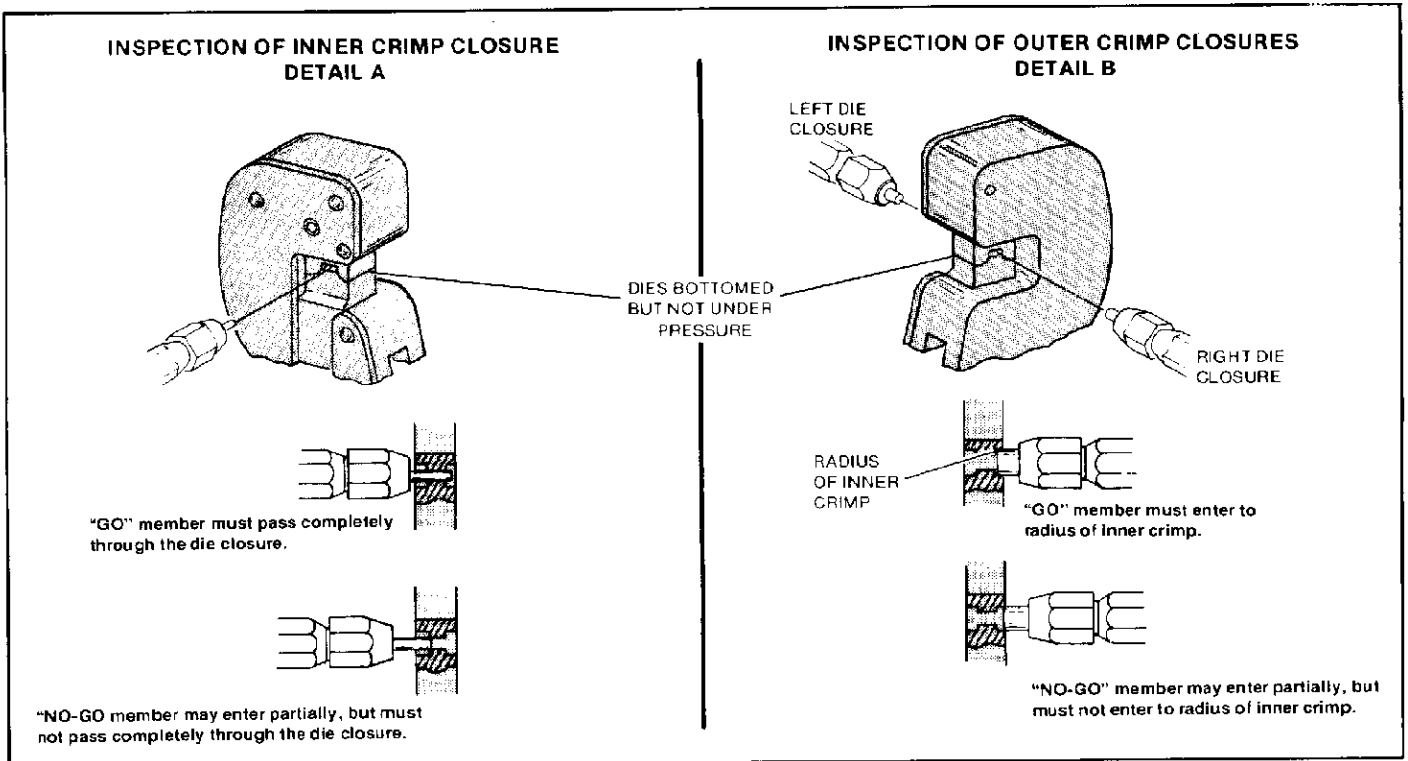
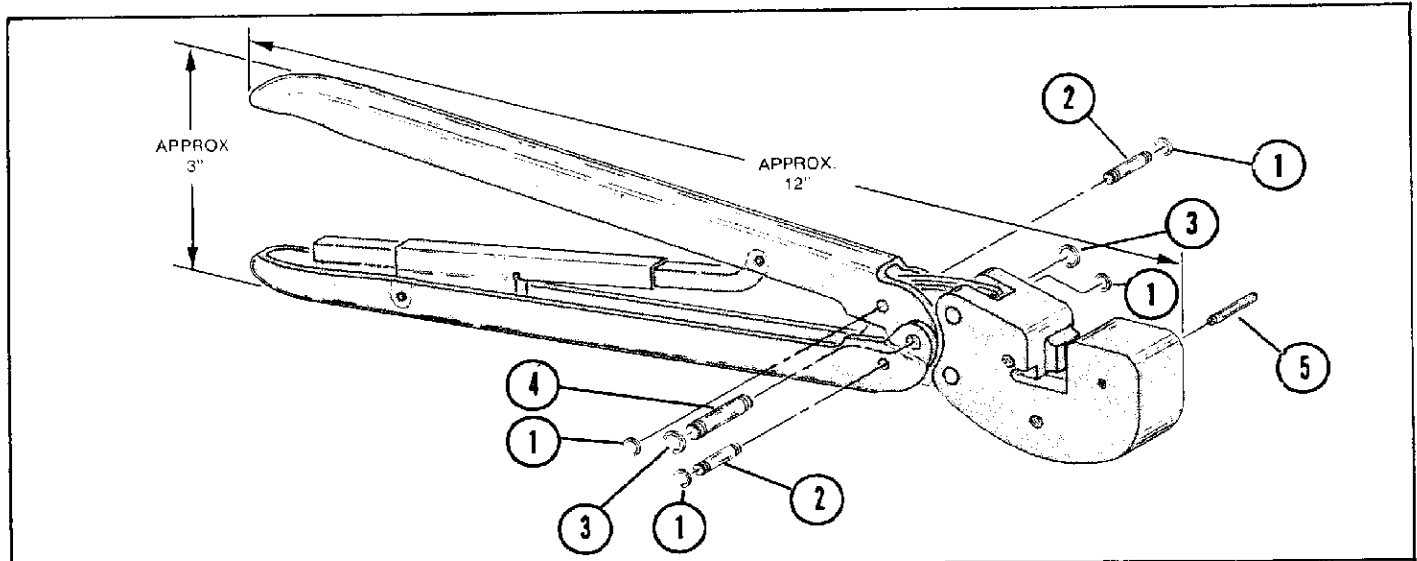


Figure 9



ITEM	DESCRIPTION	QUANTITY	TOOL NUMBERS
			68140-1, 68141-1 and 68351-1
1	RING, RETAINING	4	21045-3
2	PIN, RETAINING	2	300388
3	RING, RETAINING	2	21045-6
4	PIN, RETAINING	1	300389
5	PIN	1	5- 21028-7

Figure 10

REL. DATE	REV. DATE	APPROVALS	
3-12-73	3-2-82	ENG. <i>Dallas Schaefer</i>	PUB. <i>Paul Felty</i>