

**NOTE**



All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of  $\pm 0.13$  [ $\pm .005$ ] and angles have a tolerance of  $\pm 2^\circ$ . Figures and illustrations are for identification only and are not drawn to scale.

### 1. INTRODUCTION

This specification covers requirements for the application of Grounding Clip Terminals with "F" crimp wire barrel feature. This crimp feature provides reliable electrical and mechanical performance. Three different crimp barrel orientations are available as shown in Figure 1. The straight version will accommodate a single wire size range of 18-14 AWG or (2) 18 AWG wires; the flag version will accommodate a single wire size range of 24-14 AWG or (2) 18 AWG wires; and the 90° version will accommodate a 22-18 AWG wire size range. The Grounding Clip Terminal is available in stainless steel.

The design of this terminal virtually eliminates the need for fastening ground lead terminals with screws or bolts. The clip area of the terminal attaches to a variety of painted and bare metal panels ranging in thickness from 0.51 to 1.57 mm [.020 to .062 in.].

When corresponding with TE Connectivity Personnel, use the terminology provided on this specification to help facilitate your inquiry for information. Basic terms and features of components are provided in Figure 1.

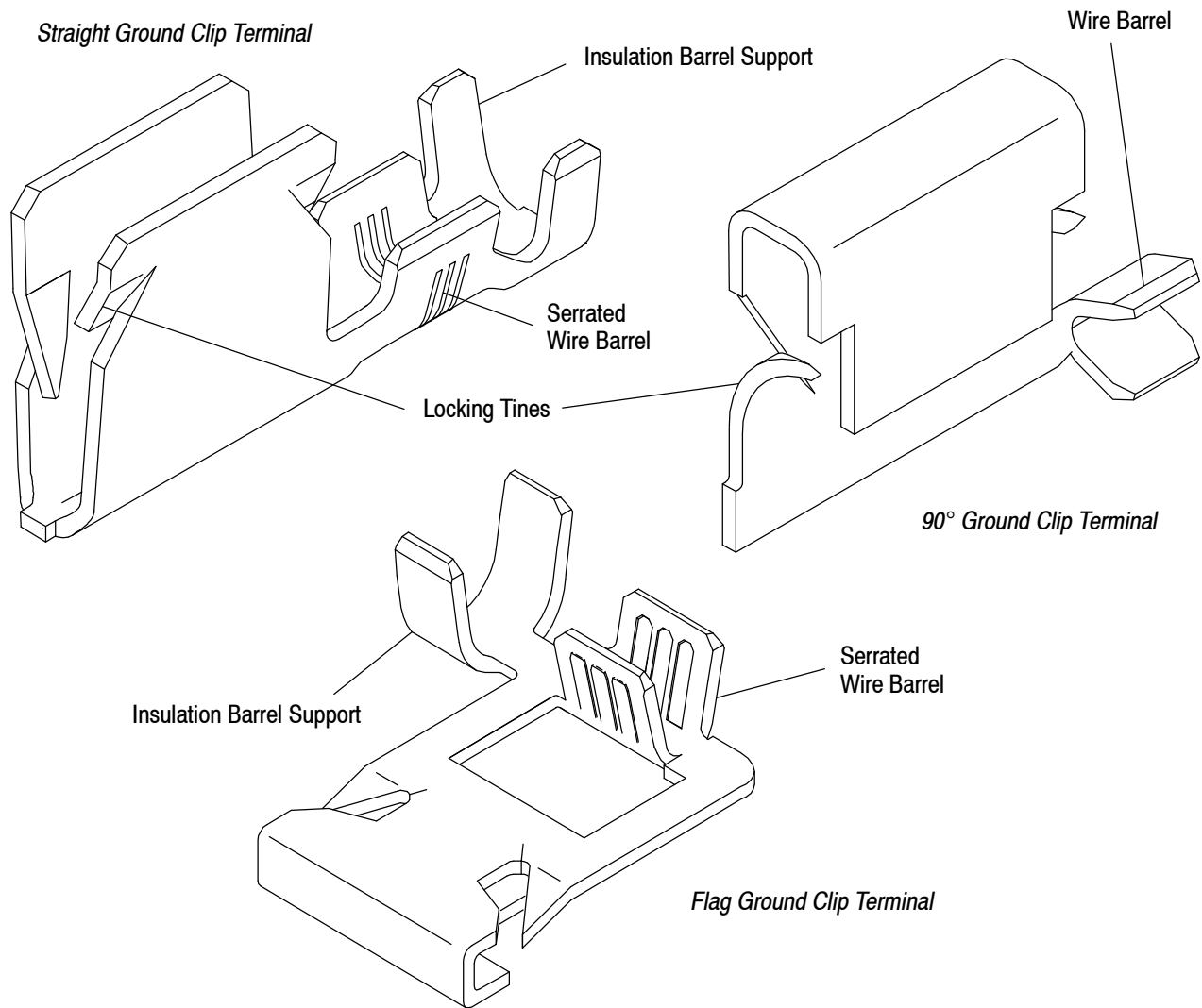


Figure 1

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## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

- Updated document to corporate requirements.

### 2.2. Customer Assistance

Reference Base Part Number 63895 and Product Code 0779 are representative numbers of the Grounding Clip Terminals with “F” crimp feature. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a local TE Representative or, after purchase, by calling the Tooling Assistance Center or Product Information number at the bottom of page 1.

### 2.3. Drawings

Customer Drawings for each product part number are available from the service network. The information contained in the Customer Drawings takes priority if there is a conflict with this specification or with any other technical documentation supplied by TE.

### 2.4. Specifications

These commercial specifications cover related Grounding Clip Terminal requirements:

#### *Underwriters Laboratories Inc. (UL)*

- UL250 - Household Refrigerators and Freezers Standards for Safety
- UL467 - The Standard for Grounding and Bonding Equipment, Seventh Edition
- UL486E - Equipment Wiring Terminals Standards for Safety
- UL560 - Electric Home Laundry Equipment Standards for Safety
- UL858 - Household Electric Ranges Standards for Safety

#### *CSA International*

- CSA C22.2 Number 41-M1987 - Grounding and Bonding Equipment

### 2.5. Instructional Material

The following list includes available instruction sheets (408-series) that provide assembly procedures for operation, maintenance and repair of tooling; and customer manuals (409-series) that provide setup, operation, and maintenance of machines.

<u>Document Number</u>	<u>Document Title</u>
408-3295	Preparing Reel of Contacts for Application Tooling
408-7424	Checking Terminal Crimp Height or Gaging Die Closure
408-8039	Heavy Duty Miniature Quick-Change Applicators (End-Feed Type)
408-8059	General Preventive Maintenance for Applicators
408-9640	Crimp Quality Monitor Applicators for Side-Feed and End-Feed Applications
408-9816	Handling of Reeled Products
409-5128	AMP-O-LECTRIC* Model “K” Terminating Machine 565435-5
409-5842	AMP-O-LECTRIC Model “G” Terminating Machines 354500-[ ]
409-5852	AMPOMATOR* CLS III-G Lead Making Machine 122500-[ ]
409-5866	AMPOMATOR CLS IV Lead-Making Machine 217500-[ ]
409-5878	AMPOMATOR CLS IV+ Lead-making Machine 356500-[ ]
409-10016	Entry Level Terminator (ELT) Machine 1338600-[ ]
409-10027	Stripping Modules 1490500 and 1490502
409-10029	Stripping Modules 1490501 and 1490503

## 3. REQUIREMENTS

### 3.1. Storage

#### **A. Ultraviolet Light**

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the terminal material.

#### **B. Reel Storage**

When using reeled terminals, store coil wound reels horizontally and traverse wound reels vertically.

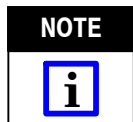
**C. Shelf Life**

The terminals should remain in the shipping containers until ready for use to prevent deformation to the terminal. The terminals should be used on a first in, first out basis to avoid storage contamination that could adversely affect signal transmissions.

**D. Chemical Exposure**

Do not store terminals near any chemicals listed below as they may cause stress corrosion cracking in the terminals.

- |          |            |          |                 |          |                  |
|----------|------------|----------|-----------------|----------|------------------|
| Alkalies | Ammonia    | Citrates | Phosphates      | Citrates | Sulfur Compounds |
| Amines   | Carbonates | Nitrites | Sulfur Nitrites |          | Tartrates        |



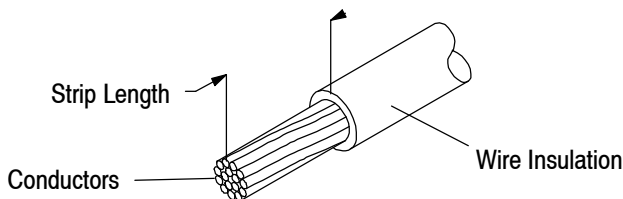
Where these environmental conditions exist, phosphor-bronze terminals are recommended instead of brass if available.

**3.2. Wire Selection and Preparation**

Depending on the style, the Grounding Clip Terminal will accept a wire size range of 24-14 AWG with an insulation diameter of 2.03-3.56 mm [.080-.125 in.]. Two wire applications crimps shall have the insulation diameter limited to a 2.67 mm [.105 in.] maximum diameter.

Proper strip length is necessary to properly insert the wire into the terminal. Reasonable care must be taken not to nick, scrape, or cut any part of the wire during the stripping operation. The wire strip length for end-of-wire termination is shown in Figure 2 and is based on wire barrel length which may be found on the customer drawings.

Note: Not to Scale



TERMINAL STYLE	WIRE SIZE RANGE, AWG	WIRE SIZE	WIRE STRIP LENGTH	WIRE BARREL CRIMP		INSULATION SUPPORT CRIMP WIDTH
				HEIGHT	WIDTH (REF)	
Straight	18-14 or (2) 18	18	4.76 [.188]	1.96-1.85 [.077-.073]	2.79 [.110]	4.47 [.180]
		16		2.16-2.06 [.085-.081]		
		14		2.36-2.26 [.093-.089]		
		(2) 18		2.21-2.11 [.087-.083]		
90°	22-18	22	3.96 [.156]	1.45-1.35 [.057-.053]	2.29 [.090]	---
		20		1.50-1.40 [.059-.055]		
		18		1.60-1.50 [.063-.059]		
Flag	24-20	24	6.22 [.245]	1.04-1.14 [.041-.045]	1.78 [.070]	3.56 [.140]
		22		1.14-1.24 [.045-.049]		
		20		1.19-1.30 [.047-.051]		
	18-14 or (2) 18	18	7.11 [.280]	1.45-1.35 [.057-.053]	2.79 [.110]	4.47 [.180]
		16		1.60-1.50 [.063-.059]		
		14		1.83-1.73 [.072-.068]		
(2) 18	1.68-1.57 [.066-.062]					

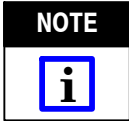
Figure 2

**3.3. Crimped Terminal Requirements**

The terminal shall be located in desired tooling and crimped according to the instructions packaged with that tooling. See Section 5, TOOLING, of this document for details on tooling options. Figure 3 shows a Grounding Clip Terminal as it should appear after crimping.



Wire insulation shall **NOT** be fully cut or broken during the crimping operation, nor shall the insulation be crimped into the terminal wire barrel. Reasonable care should be taken by tooling operators to provide undamaged wire terminations.



Wire stripping tool jaws may leave corrugated indentations on the surface of the wire insulation. This is especially severe with cross-linked polyethylene (high temperature) insulation.

### **A. Wire Barrel Crimp**

The crimp applied to the wire portion of the terminal is the most compressed area and is most critical in ensuring optimum electrical and mechanical performance of the crimped terminal. The terminal wire barrel crimp height must be within the dimension provided in Figure 2.

### **B. Effective Crimp Length**

For optimum crimp effectiveness, the crimp must be within the area shown and must meet the crimp dimensions provided in Figure 3. Effective crimp length shall be defined as that portion of the wire barrel, excluding bellmouth(s), fully formed by the crimping tool. Instructions for adjusting, repairing, and inspecting tools are packaged with the tools. See Section 5, TOOLING.

### **C. Bellmouths**

The front and rear bellmouths shall be as shown and conform to the dimensions given in Figure 3.

### **D. Cutoff Tabs**

The cutoff tab shall be cut to the dimensions shown in Figure 3.

### **E. Burrs**

The cutoff burr shall not exceed the dimensions shown in Figure 3.

### **F. Wire Barrel Flash**

The wire barrel flash shall not exceed the dimensions shown in Figure 3, Section X-X.

### **G. Insulation Barrel Crimp**

The insulation barrel shall grip the insulation firmly without fully cutting into it. Care must be taken to prevent cutting, nicking, or scraping of the insulation. Insulation crimp shall comply to width dimensions provided in Figure 3.

### **H. Wire Location**

The wire conductor and insulation must be visible in the transition area between the wire and insulation barrels as shown in Figure 3.

### **I. Conductor Extension**

The conductor may extend beyond the wire barrel to the maximum shown. No strands may extrude over the height of the conductor crimp as shown in Figure 3.

### **J. Wire Barrel Seam**

The wire barrel seam must be closed with no evidence of loose wire strands visible in the seam as shown in Figure 3.

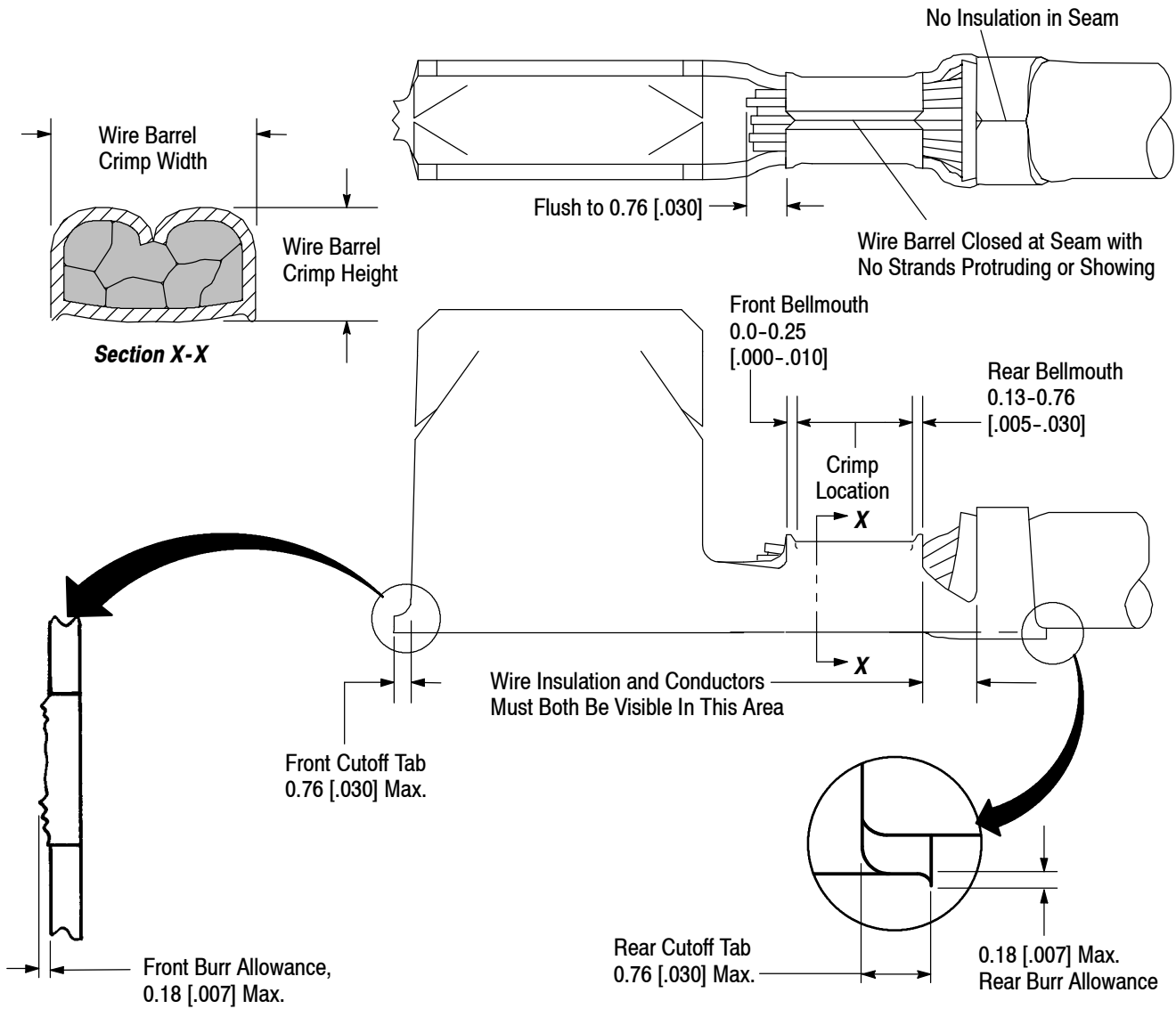


Figure 3

**K. Twist and Roll**

There shall be no twist, roll, deformation or other damage to the mating portion of the crimped terminal that will impair usage of the terminal. See Figure 4.

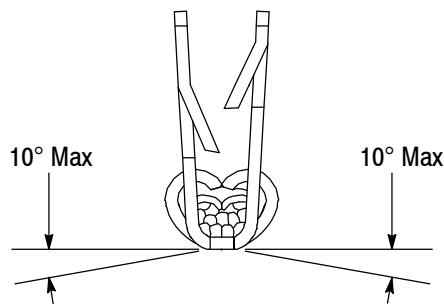


Figure 4

### L. Straightness

The force applied during crimping may cause some bending between the crimped wire barrel and the mating portion of the terminal. Such deformation is acceptable within the limits provided in Figure 5.

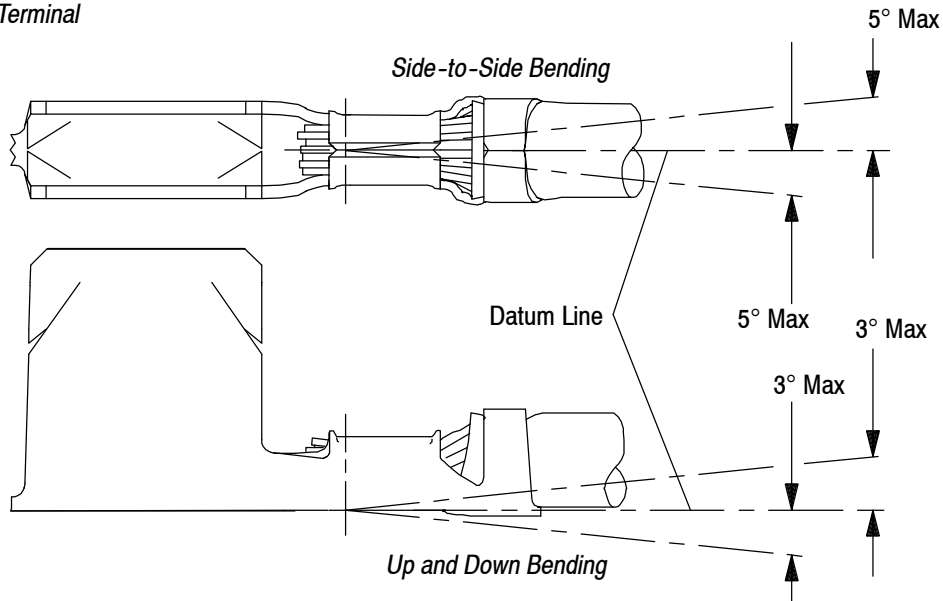
1. The up and down bend of the crimped terminal, including cutoff tab and burr, shall not be bent above or below the datum line more than the amount shown.
2. The side-to-side bend of the terminal may not exceed the limits provided.

**NOTE**



*Periodic inspections must be made to ensure crimped terminal formation is consistent as shown.*

#### Straight or 90° Terminal



#### Flag Terminal

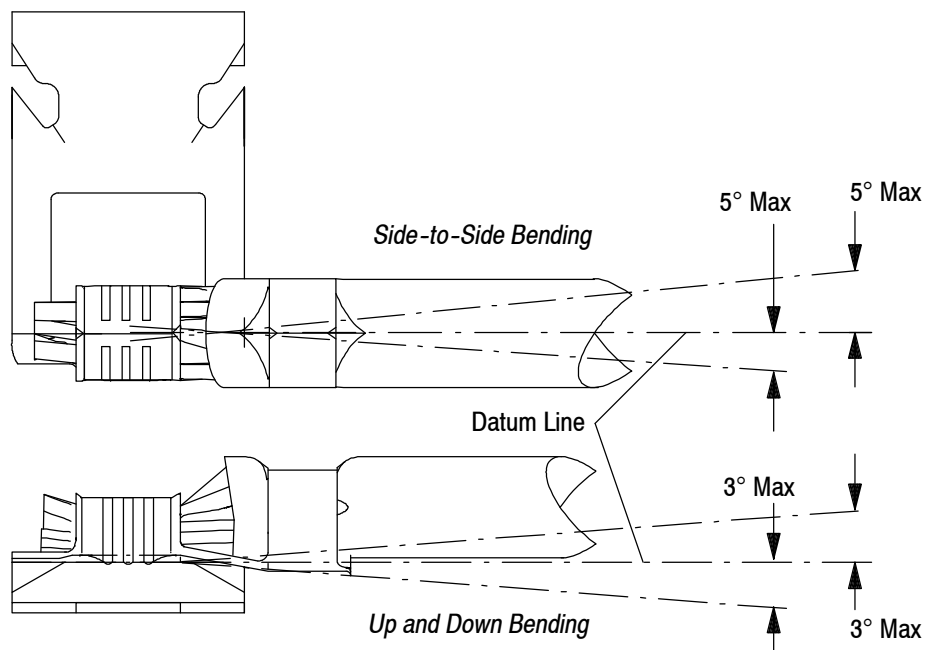
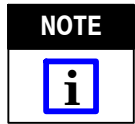


Figure 5

### 3.4. Crimp Pull-Out Test

Crimped Grounding Clip Terminals shall not be separated from their wires when subjected to forces given in the table in Figure 6.



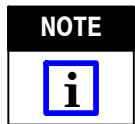
*Adjust tensile testing machine for head travel of 25.4 mm [1 in.] per minute. Directly and gradually apply force for one minute.*

CRIMP PULL-OUT TEST FORCES			
TERMINAL STYLE	WIRE SIZE, AWG	MINIMUM FORCE	
		NEWTONS	[POUNDS]
Straight and Flag	24	22	5
	22	35	8
	20	58	13
	18	90	[20]
	16	133	[30]
	14	222	[50]
	(2) 18	90	[20] Per Single Wire
90°	22	36	[8]
	20	58	[13]
	18	90	[20]

Figure 6

### 3.5. Installation

Apply the Grounding Clip Terminal to a panel by following the steps shown in Figure 7.



*Do not pry Grounding Clip Terminal open during installation.*



*Damaged contacts may not be used. If a damaged contact is evident, it must be cut from the wire and replaced with a new one.*

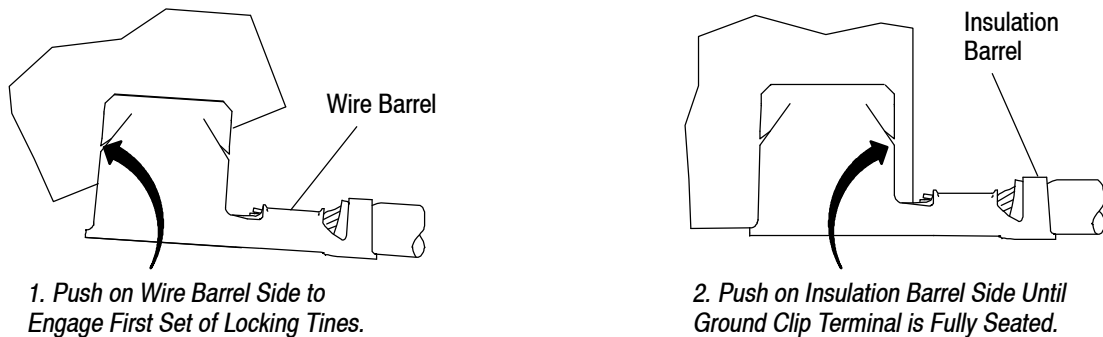


Figure 7

### 4. QUALIFICATION


Grounding Clip Terminals meet Underwriters Laboratories Inc. (UL) Specification UL 467, The Standard for Grounding and Bonding Equipment, Seventh Edition and CSA International Specification CSA 22.2 No. 41-M1987. Grounding Clip Terminals are Recognized in the UL Component Recognition Program, Electrical File No. E69905, Vol. 3, Section 1 and CSA International Component Recognition Program, File No. LR7189-866.

The following Grounding Clip Terminals are Recognized to the preceding UL and CSA International Specification with the following stipulations:

1. Grounding Clip Terminal 63895-1 may be applied to painted or unpainted steel or aluminum panels having a thickness range of 0.51-0.76 mm [.020-.030 in.]. This Grounding Clip Terminal may be terminated using applicators 680290-1 or 680290-2.
2. Grounding Clip Terminal 1217005-1 is terminated using (1) 18 AWG stranded copper wire or (2) 18 AWG stranded copper wires, and may be applied on unpainted steel panels having a nominal thickness of 0.43 mm [.017 in.].
3. Grounding Clip Terminal 1217012-1 is terminated using (1) 16 AWG stranded copper wire applied on unpainted steel panels having a nominal thickness of 1.45 mm [.057 in.]; or (1) 18 AWG stranded copper wire applied to unpainted steel panels having a nominal thickness of 1.19-1.32 mm [.047-.052 in.].


### 5. TOOLING

Figure 8 provides tool part numbers and instructional material related to wire size.

**NOTE**  *TE Tooling Engineers have designed machines for a variety of application requirements. For assistance in setting up prototype and production line equipment, contact TE Tool Engineering through your local TE Representative or call the Tooling Assistance Center number at the bottom of page 1.*

- **Applicator**

Applicators are designed for the full wire size range of strip-fed, precision formed contacts, and provide for high volume, heavy duty, production requirements. The applicators can be used in bench or floor model power units.

**NOTE**  *Each applicator is shipped with a metal identification tag attached. DO NOT remove this tag or disregard the information on it. Also, a packet of associated paperwork is included in each applicator shipment. This information should be read before using the applicator; then it should be stored in a clean, dry area near the applicator for future reference. Some changes may have to be made to the applicators to run in all related power units. Contact the Tooling Assistance Center number located at the bottom of page 1 for specific changes.*

- **Power Units**

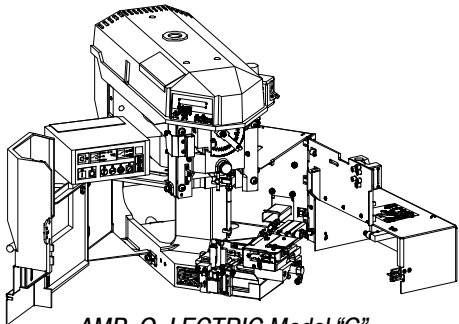
A power unit is an automatic or semi-automatic device used to assist in the application of a product. Power unit includes the power source used to supply the force or power to an applicator.

TERMINAL STYLE	WIRE		APPLICATION TOOLING (DOCUMENT)	
	WIRE SIZE RANGE, AWG	INSULATION DIAMETER	APPLICATOR (408-8039)	POWER UNIT
Straight	18-14 and (2) 18	2.29-3.18 [.090-.125]	680290-1	122500-2, -3 (409-5852)
				217500-1, -2 (409-5866)
				356500-1, -2 (409-5878)
			680290-2	354500-1 (409-5842)
				565435-5 (409-5128)
				1338600-3, -4 (409-10016)
90°	22-18	N/A	567734-1	122500-2, -3 (409-5852)
				217500-1, -2 (409-5866)
				356500-1, -2 (409-5878)
			567734-3	354500-[ ] (409-5842)
				1338600-[ ] (409-10016)
				122500-2, -3 (409-5852)
			680047-1	217500-1, -2 (409-5866)
				356500-1, -2 (409-5878)
				354500-1 (409-5842)
			680047-2	565435-5 (409-5128)
				1338600-3, -4 (409-10016)

Figure 8 (cont'd)

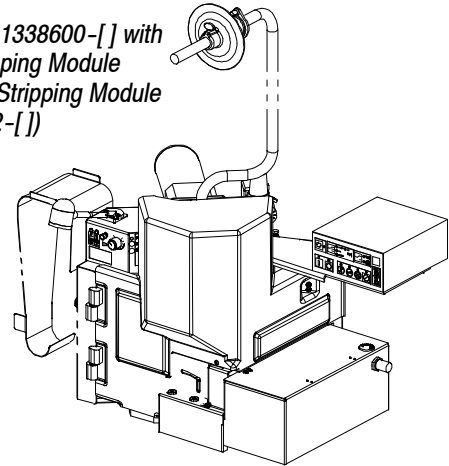


TERMINAL STYLE	WIRE		APPLICATION TOOLING (DOCUMENT)	
	WIRE SIZE RANGE, AWG	INSULATION DIAMETER	APPLICATOR (408-8039)	POWER UNIT
Flag	24-20	3.56 [.140]	1855507-1	122500-1 (409-5852)
			1855507-2	565435-5 (409-5128)
			1855507-3	354500-1 (409-5842)
			1855507-6	122500-1 (409-5852)
	18-14 and (2) 18	2.29 [.090-.135] for Single Wire and 2.67 [.105] Max for Double Wires	1852432-1	122500-2, -3 (409-5852)
				217500-1, -2 (409-5866)
				356500-1, -2 (409-5878)
			1852462-2	565435-5 (409-5128)
				1338600-3, -4 (409-10016)
			1852462-3	354500-1 (409-5842)
				1338600-1, -2 (409-10016)
			1852432-6	122500-2, -3 (409-5852)
217500-1, -2 (409-5866)				
			356500-1, -2 (409-5878)	

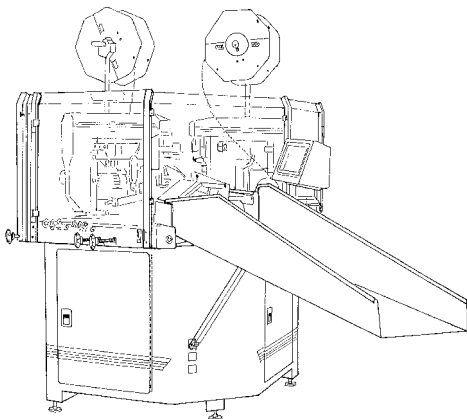
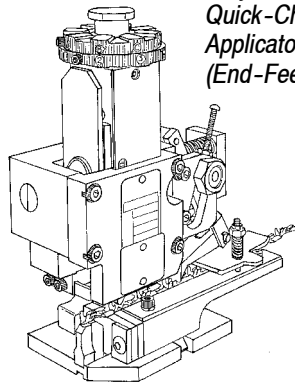


AMP-O-LECTRIC Model "G" Terminating Machine 354500-[] with Optional Stripping Module 1490501-[] (Stripping Module Only 1490503-[])

ELT Machine 1338600-[] with Optional Stripping Module 1490500-[] (Stripping Module Only 1490502-[])



Typical Heavy Duty Miniature Quick-Change Applicator (End-Feed Type)



AMPOMATOR CLS Lead-Making Machines 122500-[]; 217500-[]; 356500-[]

AMP-O-LECTRIC Model "K" Terminating Machine 565435-5

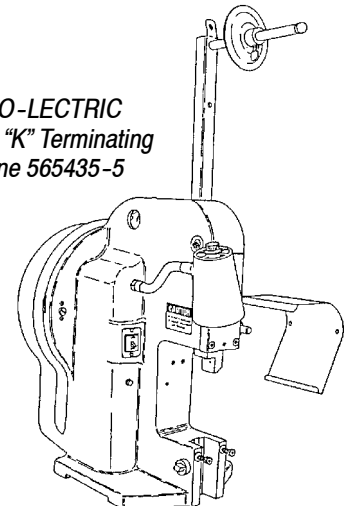
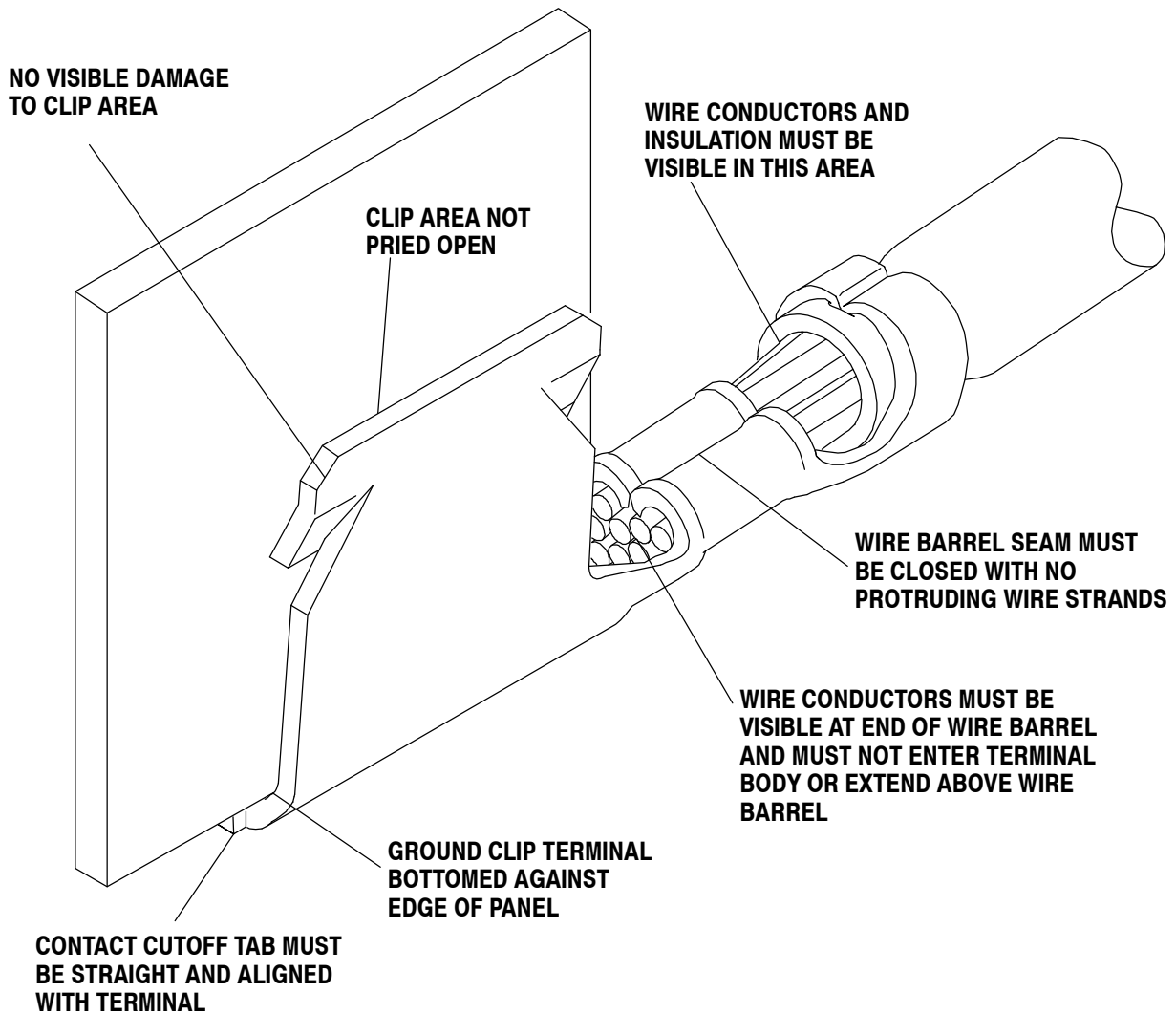


Figure 8 (end)

**6. VISUAL AID**

Figure 9 shows a typical application of a Grounding Clip Terminal. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product.

**NOTE: STRAIGHT GROUNDING CLIP SHOWN, FLAG AND 90° CLIPS HAVE SAME REQUIREMENTS**



**FIGURE 9. VISUAL AID**