

**NOTE**



All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters. Unless otherwise specified, dimensions have a tolerance of  $\pm 0.13$  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 the requirements for application of Category 1 Automotive Plug Connector Assemblies. The plug connector is shipped as one piece, with the terminal position assurance (TPA) lock in the (open) position. These housings are available in a 3-position with a hinged TPA configuration, and 8- through 26-position standard housing. The contact requirements are applicable to automatic machine crimping tools but manual application is available for prototyping and non-production quantities.

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

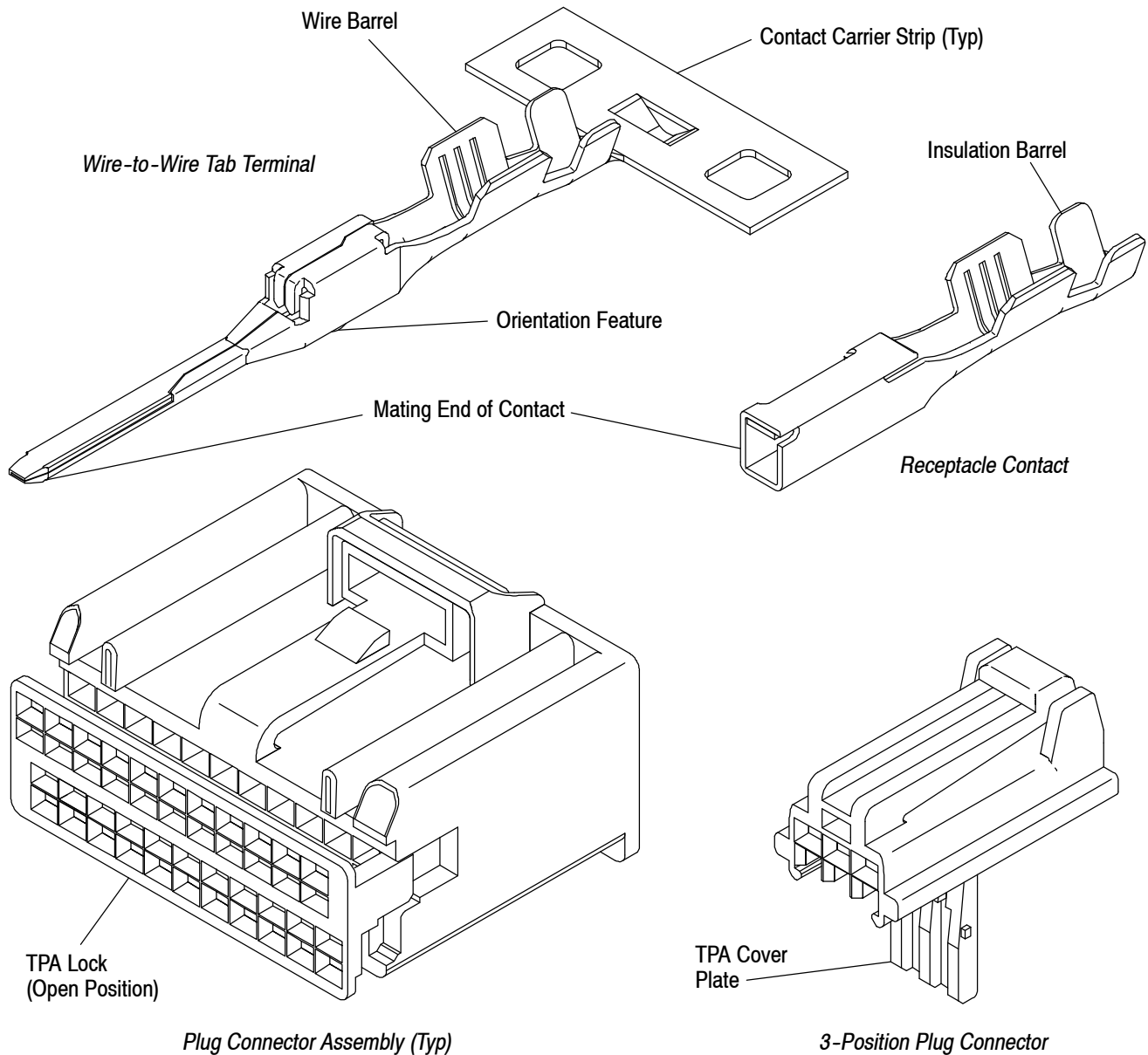


Figure 1

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

This paragraph is reserved for a revision summary of changes and additions made to this specification. The following changes have been made for this revision:

- Updated document to corporate requirements
- New logo and format

### 2.2. Customer Assistance

Reference Part Number 638113 and Product Code A137 are representative numbers of the Category 1 Automotive Plug Connector Assemblies. 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 Tyco Electronics Representative or, after purchase, by calling the Tooling Assistance Center or the Product Information numbers at the bottom of page 1.

### 2.3. Drawings

Customer Drawings for specific products are available from the responsible Tyco Electronics Engineering Department via 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 Tyco Electronics.

### 2.4. Instructional Material

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

<u>Document Number</u>	<u>Document Title</u>
408-3295	Preparing Reel of Contacts for Application Tooling
408-3385	Category 1 Automotive Plug Connector Assembly
408-4206	PRO-CRIMPER* III Hand Tool Assembly 58587-1 with Die Assembly 58587-2
408-4552	Category 1 Automotive, 3-Position, Hinged, Plug Connector Assembly
408-7424	Checking Terminal Crimp Height or Gaging Die Closure
408-8040	Heavy Duty Miniature Quick-Change Applicators (Side-Feed)
408-8053	Miniature (Mini) Quick-Change Applicators
408-8059	General Preventative Maintenance for Applicators
408-9816	Handling of Reeled Products
408-9930	PRO-CRIMPER III Hand Crimping Tool Frame Assembly 354940-1
409-5128	AMP-O-LECTRIC* Model "K" Terminating Machine 565435-[ ]
409-5842	AMP-O-LECTRIC Model "G" Terminating Machine 354500-[ ]
409-5878	AMPOMATOR* CLS IV+ Lead-Making Machines 356500-1, -2
409-10016	Entry Level Terminator (ELT) Machine 1338600-[ ]

## 3. REQUIREMENTS

### 3.1. Storage

#### A. Shelf Life

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

#### B. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the housings and contacts.

#### C. Reeled Splices

When using tape-mounted reeled contacts, care must be taken to prevent stretching, sagging, or other distortion that would prevent smooth feeding of the tape through automatic machine feed mechanisms. Store coil wound reels horizontally and traverse wound reels vertically.

**D. Chemical Exposure**

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

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



Where the above environmental conditions exist, phosphor-bronze contacts are recommended instead of brass if available.

**3.2. Wire Size and Preparation**

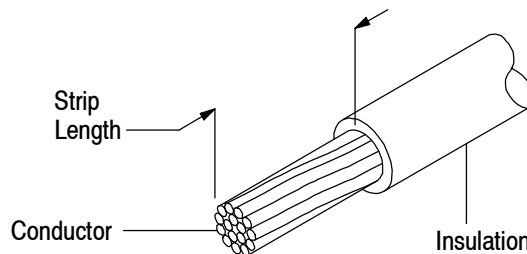
The contacts will accept stranded copper wire sizes 18 through 22 AWG. Proper strip length is necessary to properly insert the wire into the contact. The strip length of the wire is shown in Figure 2.



Reasonable care must be taken not to nick, scrape, or cut any strands during the stripping operation.



The applied crimp dimension (within the functional range of the product) is dependent on the termination tooling being used. Refer to the documentation (applicator logs and instruction sheets) supplied with the termination tooling for the applied crimp height. See Section 5, TOOLING.



CONTACT TYPE	WIRE			WIRE BARREL		INSULATION BARREL MAX (REF)		CRIMP TENSILE●	
	SIZE**		INSUL DIA RANGE	STRIP LENGTH	CRIMP HEIGHT	CRIMP WIDTH +/- 0.05	CRIMP HEIGHT	CRIMP WIDTH	KG (MIN) (3 σ)
	mm <sup>2</sup>	[AWG]							
RECEPT	0.35	---	1.20-1.65	4.80-5.60	0.99-0.89	1.45	1.70■	1.70■	5.50
	---	22	1.20-1.65	4.80-5.60	1.0-0.90				
	0.50	---	1.40-1.85	4.80-5.60	1.09-0.99	1.75	2.00	2.25■	9.00
	---	20	1.40-1.85	4.80-5.60	1.15-1.05				
	0.75	---	1.63-2.10	4.80-5.60	1.22-1.12	1.75	2.00	2.25■	12.00
	---	18	1.63-2.10	4.80-5.60	1.28-1.18				
1.0	---	1.63-2.10	4.80-5.60	1.32-1.22					
TAB	0.50	20	1.40-1.85	4.80-5.80	1.27-1.17	2.03	1.80■	2.25■	13.90
	0.75	18	1.63-2.06	4.80-5.80	1.37-1.27	2.03	1.80■	2.25■	14.20

- Crimp tensile includes insulation grip. Crimp tensile values may vary with wire construction and style. Insulation crimp barrel to be snug against insulation and never exceeding the maximum crimp height and crimp width provided in table.
- For "O" type insulation crimp. Insulation crimp will be snug against insulation, and never exceed the maximum tolerance shown in table.

**NOTE:** Depending on insulation diameter, the PRO-CRIMPER tool may not meet this parameter.

- AWG wire sizes listed are not the mm<sup>2</sup> equivalent.

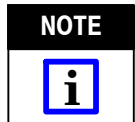
Figure 2

### 3.3. Crimped Contact Requirements

Locate the contact to be crimped in the appropriate tooling according to the instructions packaged with that tooling. Detailed instructions covering the placement of contacts in the tooling and the use of such tooling is packaged with each tool. Terminate the contact according to the directions shipped with the appropriate tooling. See Section 5, TOOLING.



*Wire insulation shall NOT be cut or broken through, to reveal wire conductor core during the crimping operation, nor shall the insulation be crimped into the contact wire barrel. Reasonable care should be taken by tooling operators to provide these conditions or better. Depending on wire size, the PRO-CRIMPER tool may not meet this parameter.*



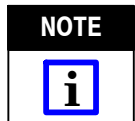
*Periodic inspections must be made to ensure crimped contact formation is consistent as shown in Figure 3.*

#### A. Crimp Height

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

#### B. Crimp Length

For optimum crimp effectiveness, the crimp must be within the area shown 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 Figure 6.



*The effective crimp length is given for tooling design only, and should not be used for inspection criteria.*

#### C. Bellmouths

Front and rear bellmouths shall be evident and conform to the dimensions given in Figure 3.

#### D. Cutoff Tab

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

#### E. Burrs

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

#### F. Wire Barrel Flash

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

#### G. Wire Location

After crimping, the wire conductor and insulation must be visible in the transition area between the wire and insulation barrels.

#### H. Conductor Location

The conductor may extend beyond the wire barrel to the maximum shown in Figure 3.

#### I. Orientation Feature

Orientation feature shall not be deformed.

#### J. Wire Barrel Seam

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

#### K. Insulation Height and Width

The insulation crimp height and crimp width dimensions shall be as referenced in the table in Figure 2.

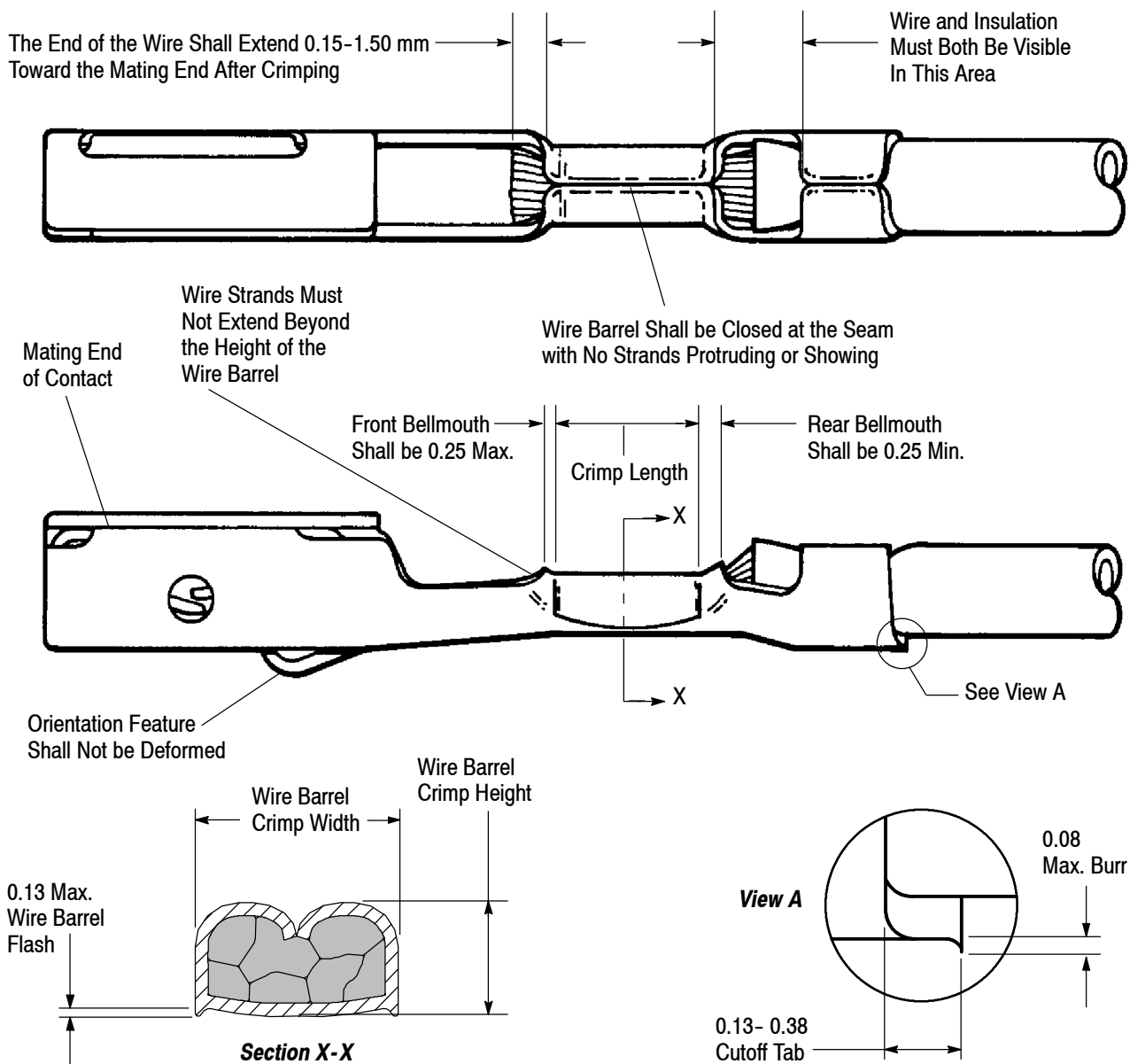


Figure 3

**L. Twist and Roll**

There shall be no twist, roll, deformation, or other damage to the mating portion of the crimped contact that will prevent proper mating.

**M. Straightness**

The force applied during crimping may cause some bending between the crimped wire barrel and the mating portion of the contact. Such deformation is acceptable within the following limits.

1. Up and Down

The crimped contact, including cutoff tab and burr, shall not be bent above or below the datum line more than the amount shown in Figure 4.

2. Side to Side

The side-to-side bending of the contact may not exceed the limits provided in Figure 4.

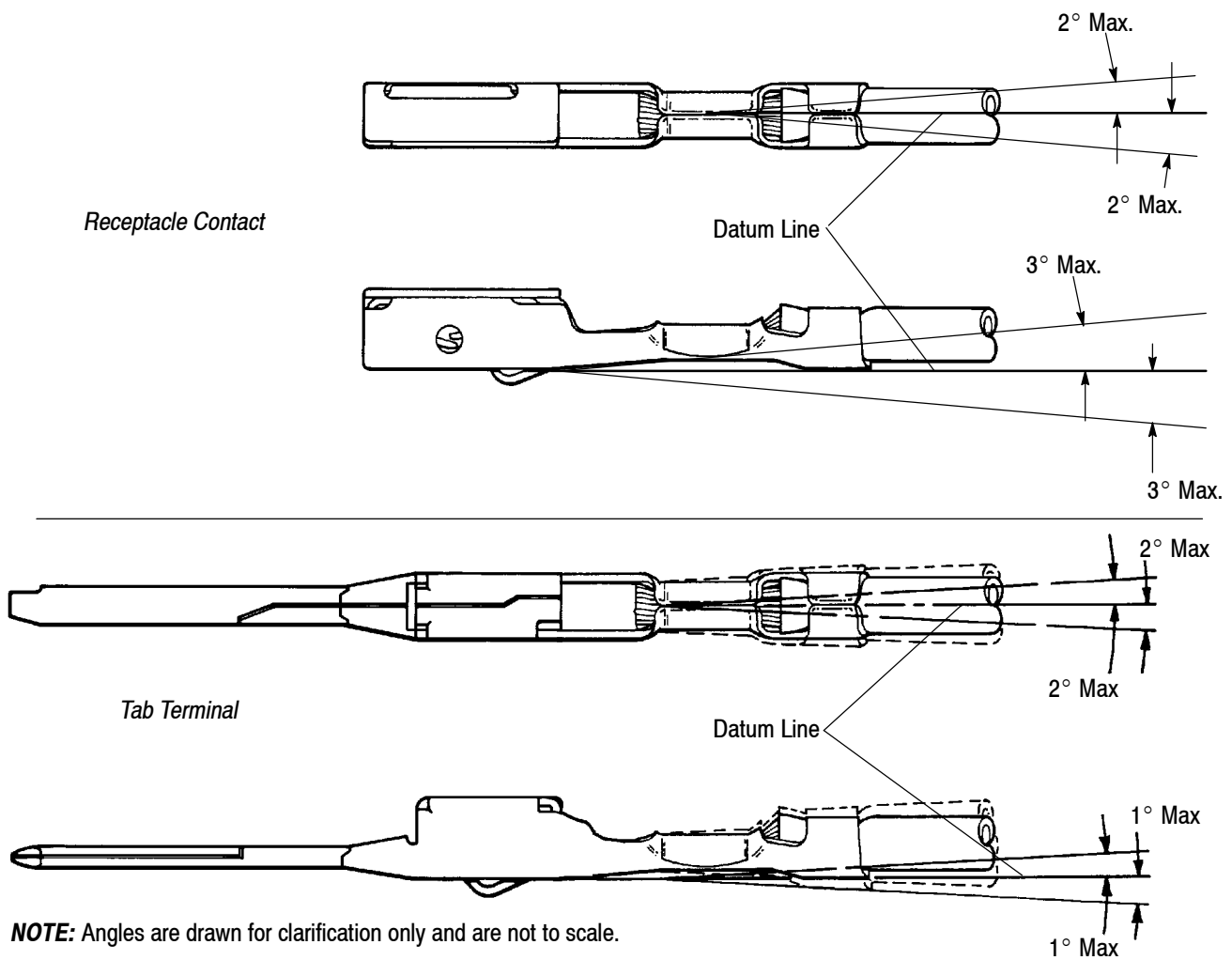


Figure 4

### 3.4. Housings

Category 1 Automotive Plug Housings are available in a 3-position configuration with a hinged TPA, or 8- through 26-position standard housing. They are also available in natural or colored housings. Refer to Instruction Sheet 408-4552 for assembly and disassembly procedures for the 3-position housing; and 408-3385 for assembly and disassembly procedures for the 8- through 26-position connector assemblies. See Figure 5.

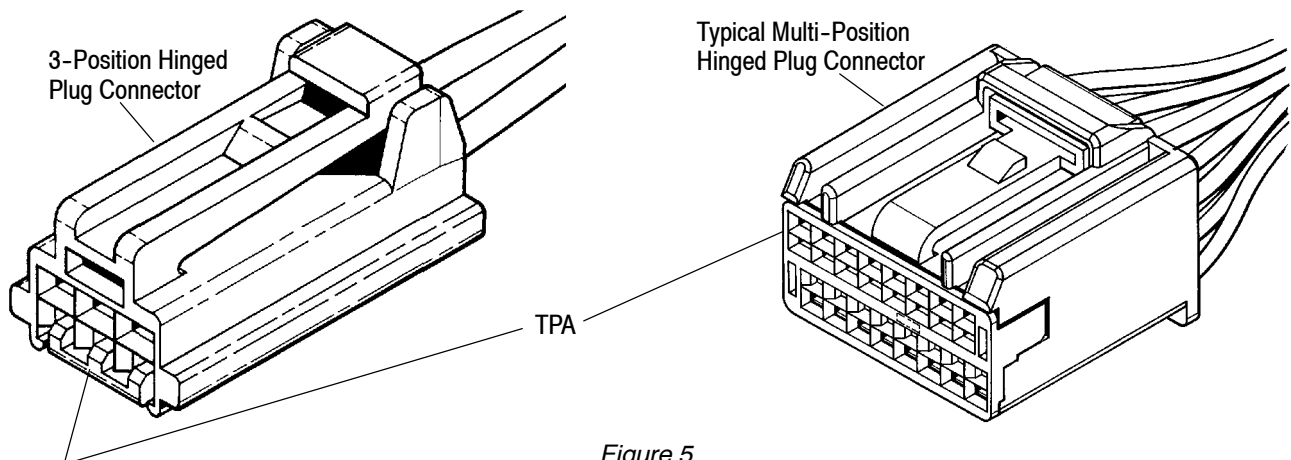
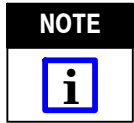


Figure 5

**3.5. Repair/Replacement**

Damaged crimped contacts or housings must be removed, discarded, and replaced with new components. Remove any damaged contacts by referring to the procedures given in Instruction Sheets 408-3385 and 408-4552.



*If a damaged contact is apparent before the contacts are inserted into the housing, cut the wire in back of the contact and reterminate the wire end. If contacts or housing are damaged after insertion, the wire must be cut directly in back of the housing and reterminated with new contacts and housing. See Section 5, TOOLING.*

**4. QUALIFICATION**

Category 1 Automotive Plug Connector Assemblies are not required to be agency approved.

**5. TOOLING**

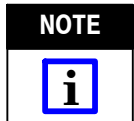
This section provides a selection of tools for various application requirements. They include hand tools for manual application of loose piece contacts, and semi-automatic and automatic machines for power assisted application of strip form contacts. Modified designs and additional tooling concepts may be available to meet other application requirements. For additional information, contact one of the service groups at the bottom of page 1. A listing of tooling recommendations covering the full wire size range is provided in Figure 6.

- **Hand Crimping Tools**

Hand crimping tools that accommodate the full wire size range are designed for prototype and low-volume applications such as repair of damaged contacts.

- **Applicators**

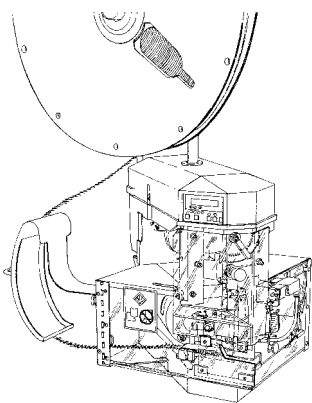
Applicators are designed for the full wire size range of strip-fed, precision formed contacts, and provide for high volume, heavy duty production requirements. The applicators can be used in bench or floor model power units.



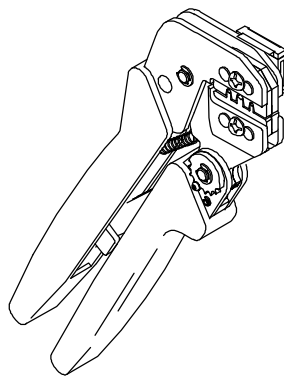
*Each applicator is shipped with a metal identification tag attached. DO NOT remove this tag or disregard the information on it. Also, a packet of associated paperwork is included in each applicator shipment. This information should be read before using the applicator; then it should be stored in a clean, 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 at the bottom of page 1 for specific changes.*

- **Power Units**

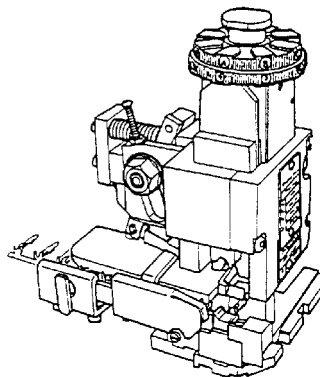
A power unit is an automatic or semi-automatic device used to assist in the application of a product. Power unit includes the power source used to supply the force or power to an applicator.



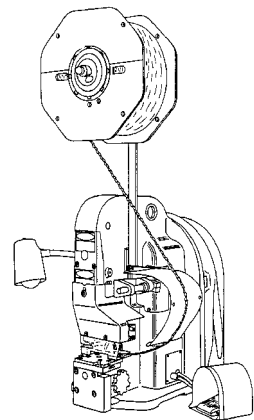
AMP-O-LECTRIC Model "G"  
Terminating Machine 354500-[]



PRO-CRIMPER III  
Hand Tool 58587-1

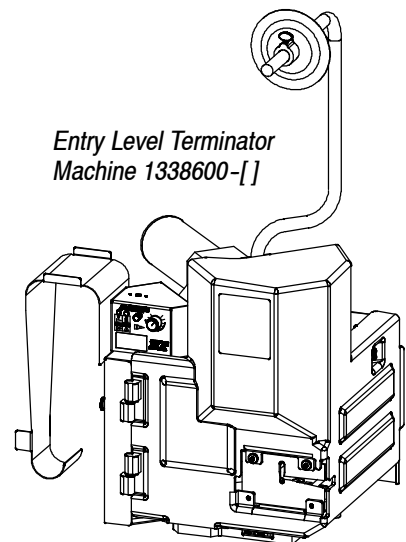
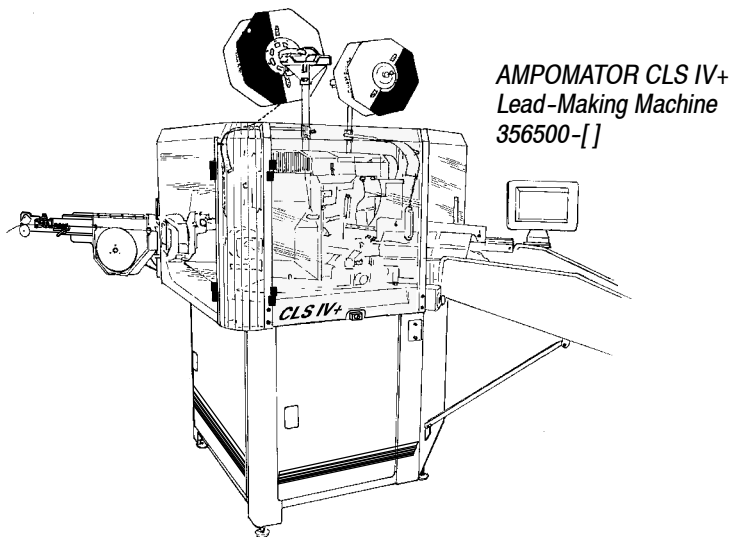


Typical Quick-Change  
Mini-Applicator



AMP-O-LECTRIC Model "K"  
Terminating Unit 565435-[]

Figure 6 (cont'd)



WIRE SIZE		INSULATION DIA RANGE	APPLICATOR (408-8040)	POWER UNITS (DOCUMENT)	HAND TOOL (DOCUMENT)
mm <sup>2</sup>	AWG				
0.35	22	1.20 - 1.65	680125-1	356500-1, -2 (409-5878)	58587-1† (408-4206)
			680125-2	354500-1 (409-5842)	
				565435-5 (409-5128)	
				1338600-[] (409-10016)	
			680125-3	354500-[] (409-5842)	
				1338600-[] (409-10016)	
			680719-2	354500-1 (409-5842)	
				565435-5 (409-5128)	
0.50	20	1.40 - 1.85	680124-1	356500-1, -2 (409-5878)	
			680124-2	354500-1 (409-5842)	
				565435-5 (409-5128)	
				1338600-[] (409-10016)	
			680124-3	354500-[] (409-5842)	
				1338600-[] (409-10016)	
0.75	20-18	1.63 - 2.10	680124-1	356500-1, -2 (409-5878)	
			680124-2	354500-1 (409-5842)	
				565435-5 (409-5128)	
				1338600-[] (409-10016)	
			680124-3	354500-[] (409-5842)	
				1338600-[] (409-10016)	
			680718-1	356500-1, -2 (409-5878)	
			680718-2	354500-1 (409-5842)	
				565435-5 (409-5128)	
			680718-3	354500-[] (409-5842)	
1338688-[] (409-10016)					

†Used with receptacles only.

Figure 6 (end)



6. VISUAL AID

Figure 7 shows a typical application of Category 1 Automotive Plug Connector Assemblies. 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 or tooling.

**NOTE:** RECEPTACLE CONTACT SHOWN, PIN CONTACT HAS SAME REQUIREMENTS. CONTACT MUST BE ROTATED 180° FOR INSERTION INTO CONNECTOR HOUSING.

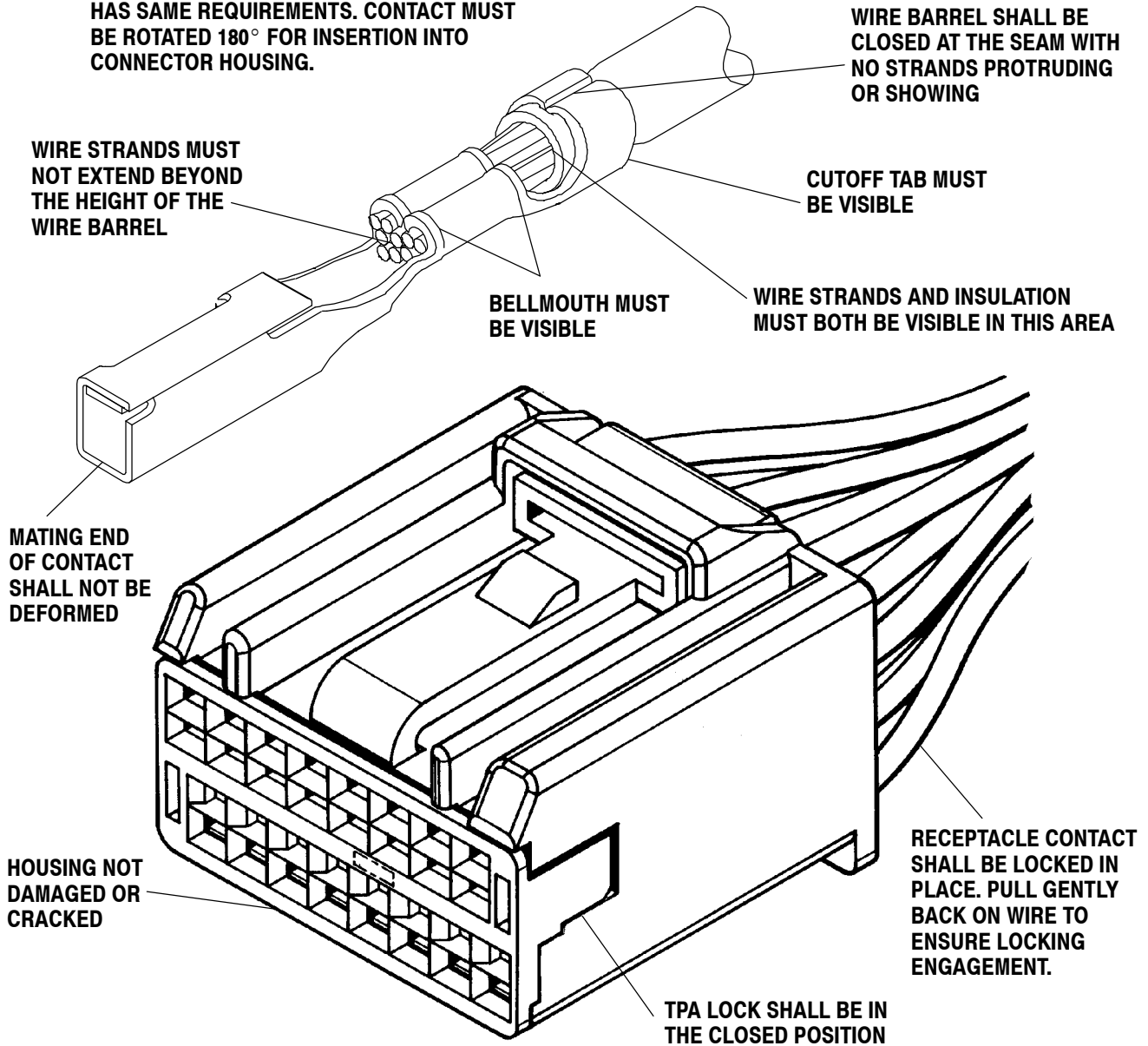


FIGURE 7. VISUAL AID