



**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.

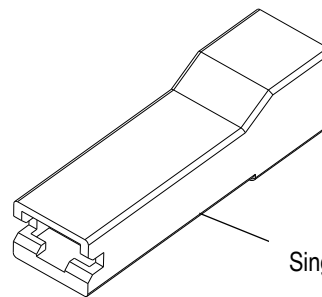
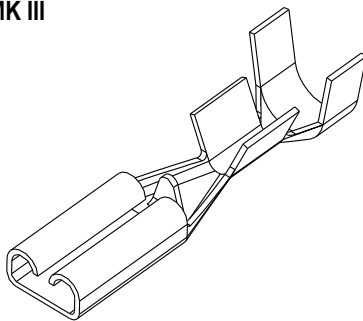
## 1. INTRODUCTION

This specification covers the requirements for the application of Series 110 MK III, Series 187 MK II and MK III, Series 187 MK II High Temp, Series 250 MK II and MK III, RAST 5 & 7, and LIF RAST 5 & 7 Positive Lock Receptacle Connectors. The 110 Series receptacle contacts are designed to accept a wire size range of 22 to 18 AWG, while the 187 Series accepts 24 to 14 AWG, and the 250 Series accepts 22 to 10 AWG.

Single and multiple circuit housings are available for your production requirements. The contacts are designed to be mated with tabs containing holes for greater locking force. These receptacle contacts are terminated by automatic or semi-automatic machines.

When corresponding with TE Connectivity personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

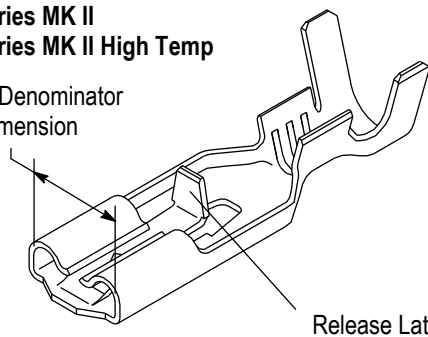
### 110 Series MK III



Single Circuit Housing (Typ)

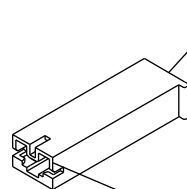
### 187 Series MK II 187 Series MK II High Temp

Series Denominator  
Dimension

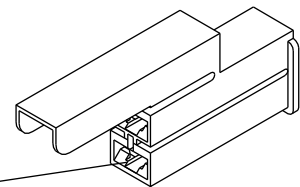


Release Latch

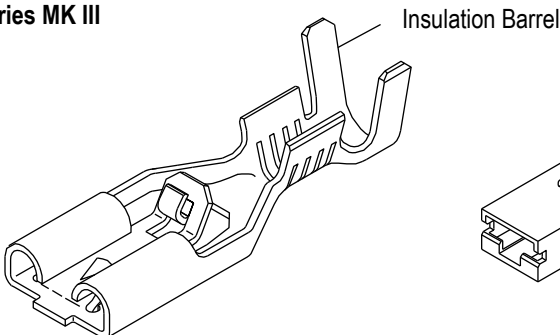
Receptacle Contact  
Insertion End



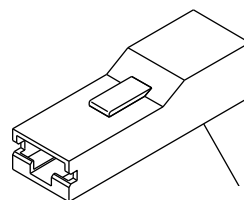
Mating End  
of Housing



### 187 Series MK III

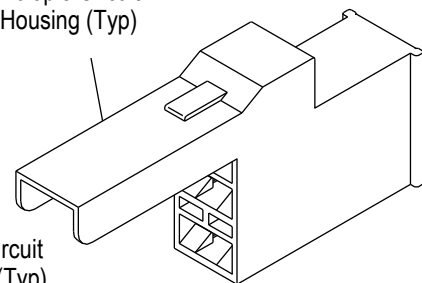


Insulation Barrel



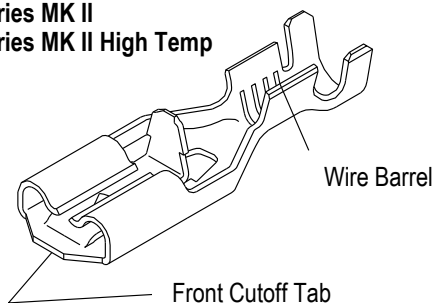
Single Circuit  
Housing (Typ)

Multiple Circuit  
Housing (Typ)

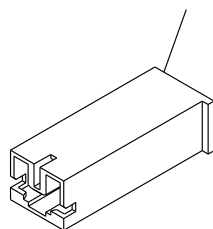


**Figure 1 (continued)**

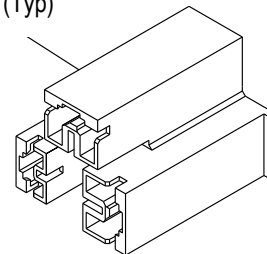
## 250 Series MK II 250 Series MK II High Temp



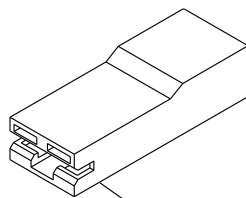
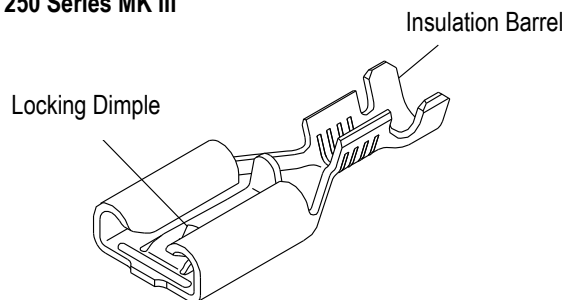
## Single Circuit Housing (Typ)



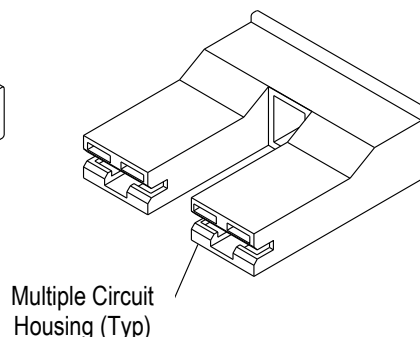
## Multiple Circuit Housing (Typ)



## 250 Series MK III

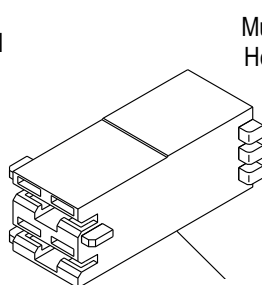
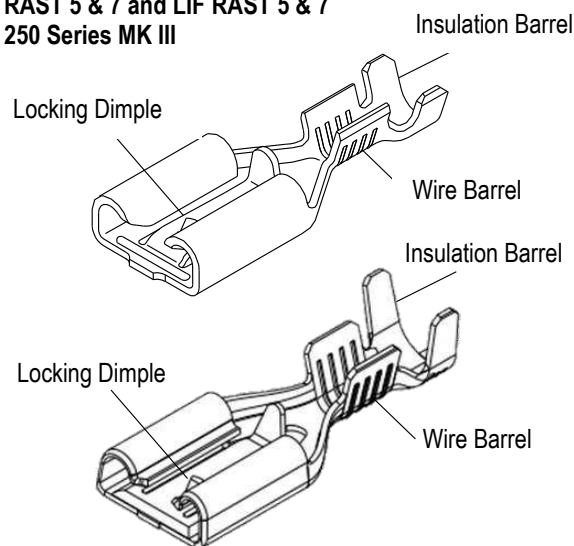


## Single Circuit Housing (Typ)



## Multiple Circuit Housing (Typ)

## RAST 5 & 7 and LIF RAST 5 & 7 250 Series MK III



## Multiple Circuit Housing (Typ)

## Multiple Circuit Housing (Typ)

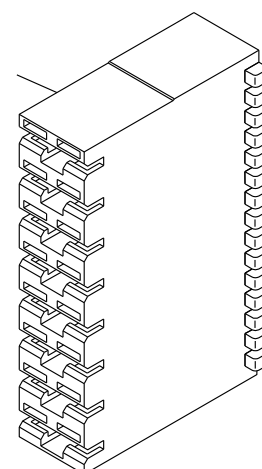


Figure 1 (end)

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

Revisions to this application specification include:

- Updated Figure 1, Figure 2, and Figure 8 with specifications for LIF RAST 5 & 7 MK III terminals.

### 2.2. Customer Assistance

Reference Product Base Part Number 520977 and Product Code 1128 are representative of Series 110, 187, and 250 Positive Lock Receptacle Connectors. Use of these numbers will identify the product line and help you to obtain product and tooling information when visiting [www.te.com](http://www.te.com) or calling the number at the bottom of page 1.

## 2.3. Drawings

Customer drawings for product part numbers are available from [www.te.com](http://www.te.com). Information contained in the customer drawing takes priority.

## 2.4. Instructional Material

The following list includes available instruction sheets (408- and 411-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.

408-3295	Preparing Reel of Contacts for Application Tooling
408-7424	Checking Terminal Crimp Height Gaging Die Closure
408-8039	Heavy Duty Miniature Quick-Change Applicators (End-Feed Type)
408-8053	Conversion Guide for Miniature Quick Change Applicators
408-9640	Crimp Quality Monitor Applicators for Side-Feed and End-Feed Applications
408-9816	Handling of Reeled Products
409-5128	Basic AMP-O-ELECTRIC* Model "K" Terminating Machines, and Accessories
409-5842	AMP-O-ELECTRIC Model "G" Terminating Machine 354500-
409-5878	AMPOMATOR* CLS IV+ Lead-Making Machine 356500-[]
411-5106	Extraction Tool 724659-1, -2, and -5

## 3. REQUIREMENTS

### 3.1. Storage

#### A. Ultraviolet Light

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

#### B. Reel Storage

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

#### C. Shelf Life

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

#### D. Chemical Exposure

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

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



#### NOTE

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

### 3.2. Special Characteristics

Positive Lock Receptacles are designed with reduced mating forces and a flexible locking dimple. This unique locking feature acknowledges proper mating with an audible mechanical "snap" of the dimple into the hole in the mating tab. The locking feature enhances safety and reliability of the connection for isolated and hard-to-reach areas.

### 3.3. Wire Selection

The Series 110, 187, and 250 Positive Lock Contacts will accept wire sizes and insulation diameters listed in Figure 2. Strip lengths, and crimp heights and widths are also listed in Figure 2.

SERIES SIZE	WIRE SIZE, AWG	INSULATION DIAMETER	STRIP LENGTH	WIRE BARREL		INSULATION BARREL CRIMP WIDTH (REF)
				CRIMP HEIGHT ±0.05 [.002]	CRIMP WIDTH (REF)	
110 MK III	22	2.03-3.05 [.080-.120]	3.68-4.44 [.145-.175]	0.99 [.039]	1.57 [.062]	3.56 [.140]
	20			1.09 [.043]		
	18			1.24 [.049]		
187 MK II	24	1.52-2.79 [.060-.110]	4.45-3.68 [.175-.145]	0.89 [.035]	1.78 [.070]	3.56 [.140]
	22			0.97 [.038]		
	20			1.04 [.041]		
	20	2.29-3.30 [.090-.130]	4.45-3.68 [.175-.145]	1.14 [.045]	2.29 [.090]	4.57 [.180]
	18			1.27 [.050]		
	16			1.45 [.057]		
187 MK II High Temp	20	1.65-3.30 [.065-.130]	4.45-3.68 [.175-.145]	1.32 [.052]	2.29 [.090]	3.56 [.150]
	18			1.42 [.056]		
	16			1.60 [.063]		
187 MK III	22	2.29-3.30 [.090-.130]	5.17-4.39 [.203-.173]	1.02 [.044]	2.03 [.080]	3.94 [.155]
	20			1.19 [.047]		
	18			1.32 [.052]		
	18	3.81-5.08 [.150-.200]	5.17-4.39 [.203-.173]	1.3 [.051]	3.05 [.120]	5.59 [.220]
	16			1.42 [.056]		
	14			1.6 [.063]		
	(2) 18	2@2.79 [.110] (maximum)	6.22-5.46 [.245-.215]	1.52 [.060]		
250 MK II	22	1.52-2.79 [.060-.110]	5.17-4.39 [.203-.173]	1.3 [.051]	2.29 [.090]	3.56 [.140]
	20			1.35 [.053]		
	18			1.45 [.057]		
	18	2.29-3.94 [.090-.155]	5.17-4.39 [.203-.173]	1.47 [.058]	2.79 [.110]	4.57 [.180]
	16			1.65 [.065]		
	14			1.88 [.074]		
	12	3.81-5.08 [.150-.200]	6.22-5.46 [.245-.215]	2.21 [.087]	3.94 [.155]	5.59 [.220]
	10			2.64 [.104]		
250 MK II High Temp	22	1.52-2.79 [.060-.110]	5.17-4.39 [.203-.173]	1.37 [.054]	2.29 [.090]	3.56 [.140]
	20			1.45 [.057]		
	18			1.55 [.061]		
	16	2.29-3.94 [.090-.155]	5.17-4.39 [.203-.173]	1.83 [.072]	2.79 [.110]	4.57 [.180]
	14			2.00 [.079]		
	12	3.81-5.08 [.150-.200]	6.22-5.46 [.245-.215]	2.21 [.087]	3.94 [.155]	5.59 [.220]
	10			2.64 [.104]		

Figure 2 (continued)

SERIES SIZE	WIRE SIZE, AWG	INSULATION DIAMETER	STRIP LENGTH	WIRE BARREL		INSULATION BARREL CRIMP WIDTH (REF)
				CRIMP HEIGHT $\pm 0.05$ [.002]	CRIMP WIDTH (REF)	
250 MK III	22	1.52-2.79 [.060-.110]	5.17-4.39 [.203-.173]	1.22 [.048]	2.29 [.090]	3.56 [.140]
	20			1.3 [.051]		
	18			1.4 [.055]		
	(2) 22			1.35 [.053]		
	18	2.29-3.94 [.090-.155]	5.17-4.39 [.203-.173]	1.47 [.058]	2.79 [.110]	4.57 [.180]
	16			1.63 [.064]		
	14			1.85 [.073]		
	16	2@3.05 [.120] (maximum)	5.17-4.39 [.203-.173]	1.5 [.059]	3.56 [.140]	6.1 [.240]
	(2) 18			1.6 [.063]		
	(1) 16 and (1) 18			1.7 [.067]		
	(2) 16			1.78 [.070]		
RAST 5 & 7 MK III  and  LIF RAST 5 & 7 MK III	22	1.52-2.79 [.060-.110]	5.17-4.39 [.203-.173]	1.07 [.042]	2.03 [.080]	3.30 [.130] (F/OVL. Crimp Type)
	20			1.12 [.044]		
	18			1.24 [.049]		
	18	2.29-3.94 [.090-.155]	5.17-4.39 [.203-.173]	1.24 [.049]	2.79 [.110]	4.57 [.180] (F-Crimp Type)
	16			1.37 [.054]		
	14			1.57 [.062]		
	16	2@3.05 [.120] (maximum)	5.17-4.39 [.203-.173]	1.32 [.052]	3.56 [.140]	6.1 [.240] (F-Crimp Type)
	(2) 18			1.42 [.056]		
	(1) 16 and (1) 18			1.52 [.060]		
	(2) 16			1.62 [.064]		

Figure 2 (end)

### 3.4. 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.



#### CAUTION

Wire insulation shall NOT be cut or broken 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 undamaged wire terminations.

#### 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 and must meet the crimp dimensions provided in Figure 2. 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 11.

### 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.

### 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 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. Wire Barrel Seam

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

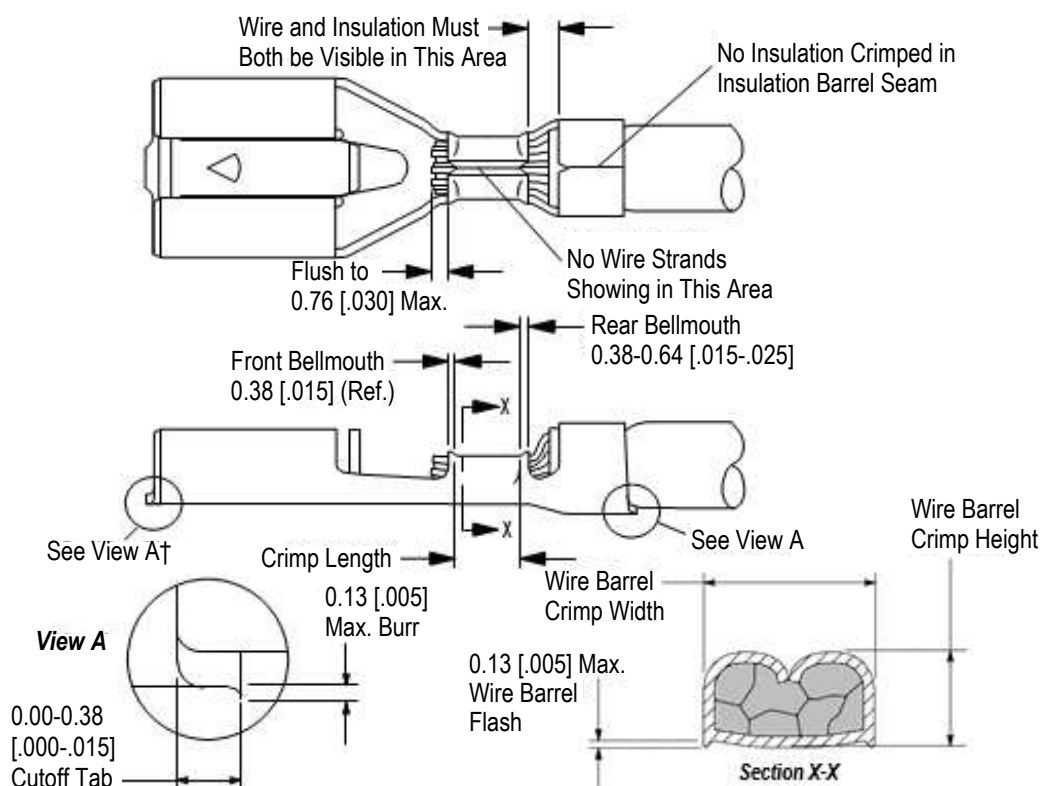


Figure 3

## J. 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. See Figure 4.

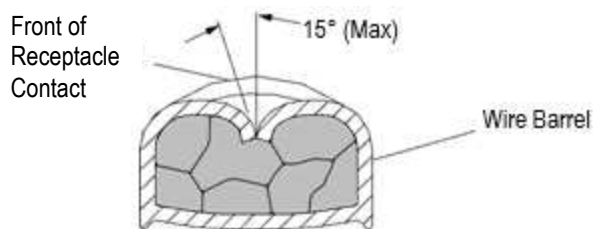


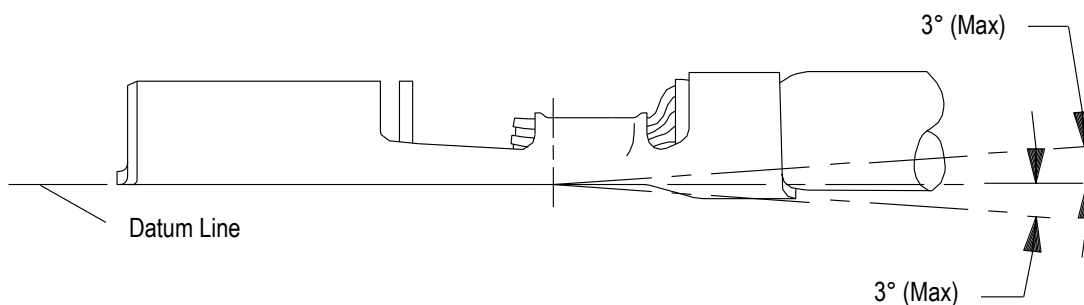
Figure 4

## K. 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 limits provided in Figures 5 and 6.

### 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 5.



### NOTE

Angles are drawn for clarification only and are not to scale.

Figure 5

### 2. Side to Side

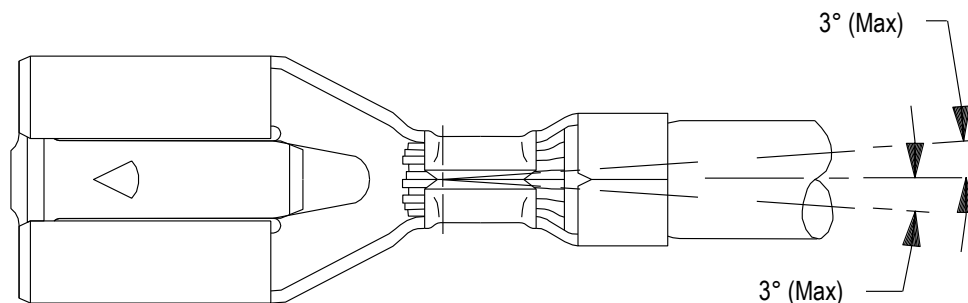
The side-to-side bending of the contact may not exceed the limits provided in Figure 6.



### NOTE

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

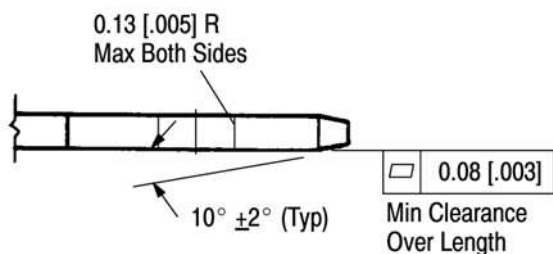
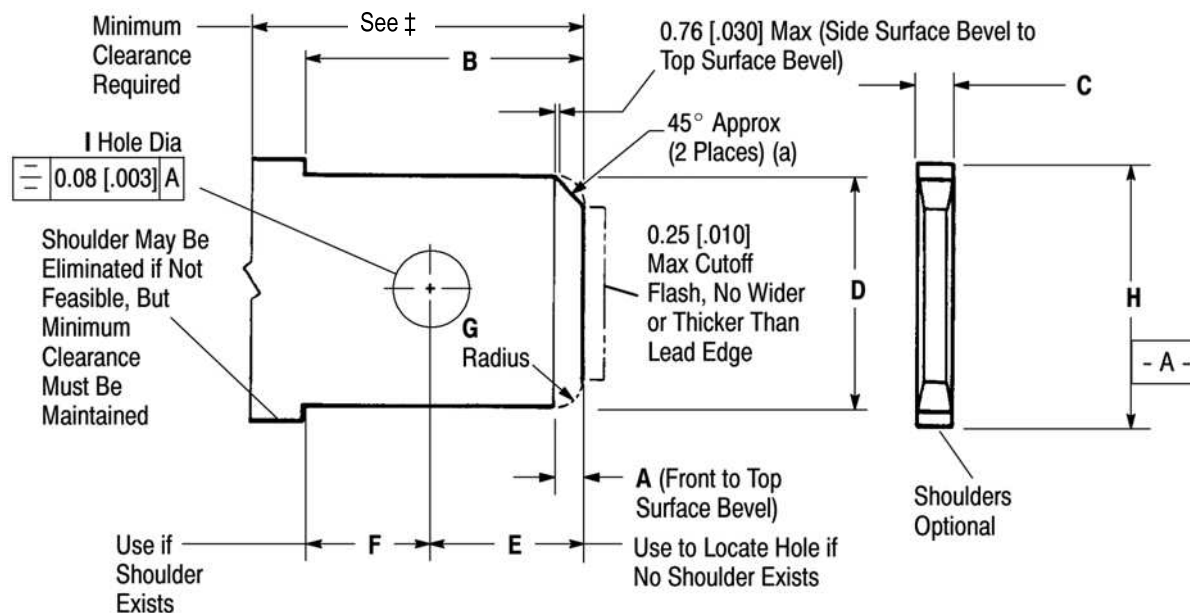



**NOTE**

Angles are drawn for clarification only and are not to scale.

**Figure 6**
**3.5. Mating Tab Dimensions**

Figure 7 shows features and dimensional requirements for tab terminals intended for mating with Series 187 and 250 Positive Lock Receptacle Contacts. The mating portion of the tab and clearance for applicable housings shall be manufactured to the dimensions shown in Figure 7.



Series 110: 8.26 [.325] W/Housing 1969534 MK III

‡ Min Clearance:

Series 187: 7.37 [.290] W/O Insulator, MK II and MK III

8.64 [.340] W/Housing 172074 (MK II) and 521187 (MK III)

Series 250: 9.53 [.375] W/O Insulator, MK II

10.80 [.425] W/Insulator 172076 MK II

11.3 [.445] W/Insulator 520935

9.91 [.390] W/Insulator, MK III and MK III RAST 5

8.51 [.335] W/O Insulator MK III and MK III RAST 5

**Figure 7 (continued)**



TAB SIZE	A± 0.13 [.005]	B± 0.13 [.005]	C± 0.03 [.001]	D± 0.08 [.003]	E± 0.20 [.008]	F± 0.08 [.003]	G± 0.51 [.020]	H (MIN)	I DIA
6.35 x 0.81 [.250 x .032]	1.02 [.040]	7.92 [.312]	0.81 [.032]	6.35 [.250]	4.52 [.178]	3.40 [.134]	1.27 [.050]	8.26 [.325]	165-2.03 [.065-.080]
4.75 x 0.51 [.187 x .020]	1.02 [.040]	6.35 [.250]	0.51 [.020]	4.75 [.187]	3.18 [.125]	3.18 [.125]	1.14 [.045]	5.41 [.213]	1.27-1.52 [.050-.060]
4.75 x 0.81 [.187 x .032]	1.02 [.040]	6.35 [.250]	0.51 [.020]	4.75 [.187]	3.18 [.125]	3.18 [.125]	1.14 [.045]	5.41 [.213]	1.27-1.52 [.050-.060]
2.79 x 0.51 [.110 x .020]	0.51 [.020]	7 [.275]	0.51 [.020]	2.79 [.110]	1.55 [.061]	5.54 [.218]	0.86 [.034]	8.26 [.325]	1.3-1.1 [.051-.043]


**NOTE**

(a) Bevel need not be a straight line if within confines as shown, or a radius of  $G \pm 0.51 [.020]$  may be substituted.


**NOTE**

Dimensional measurements shall not include plating, burrs, or flatness tolerance.

Figure 7 (end)

### 3.6. Mating and Testing


**NOTE**

Testing may be done using a gage as described in Residential Controls – Quick-Connect Terminals, ANSI/NEMA No. DC2 – 1982.

The forces required to mate and unmate a test mating tab and receptacle shall be as specified in Figure 8. Measure the force using a testing device capable of holding the reading. It must also provide accurate alignment with slow and steady mating and unmating of the test tab and receptacle.

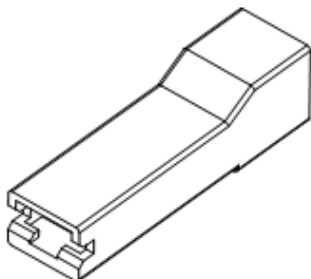
TAB SERIES	FORCE (NEWTONS [LBS])			
	FIRST MATING (MAXIMUM)	FIRST UNMATING (MINIMUM)		SIXTH UNMATING (MINIMUM)
		LOCKED	UNLOCKED	
250	35.6 [8]	66.7 [15]	8.9 [2]	66.7 [15]
187 MK II	31.1 [7]	53.4 [12]	8.9 [2]	53.4 [12]
187 MK II High Temp	31.1 [7]	53.4 [12]	8.9 [2]	53.4 [12]
187 MK III	35.6 [8]	53.4 [12]	8.9 [2]	53.4 [12]
RAST 5 & 7 MK III (Per Circuit)	31.1 [7]	66.7 [15]	8.9 [2]	66.7 [15]
LIF RAST 5 & 7 MK III (Per Circuit)	15 [3.4]	66.7 [15]	8.9 [2]	66.7 [15]
110 MK III	31.1 [7]	53.4 [12]	8.9 [2]	44.5 [10]

Figure 8

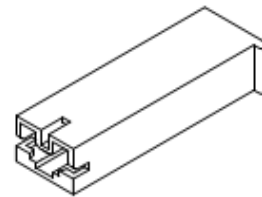
### 3.7. Housings

Series 110, 187, and 250 Positive Lock Housings are available in single or multiple circuitry. These housings provide insulation and protection for the mating tabs and receptacles. See Figure 9.

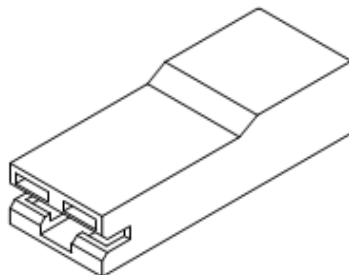
*Single Circuit Series 110 Housing (Typ)*



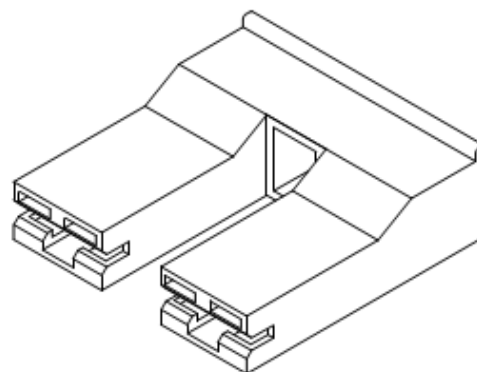
*Single Circuit Series 187 Housing (Typ)*



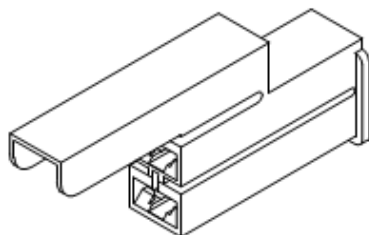
*Single Circuit Series 250 Housing (Typ)*



*Multiple Circuit Series 250 Housing (Typ)*



*Multiple Circuit Series 187 Housing (Typ)*



**Figure 9**

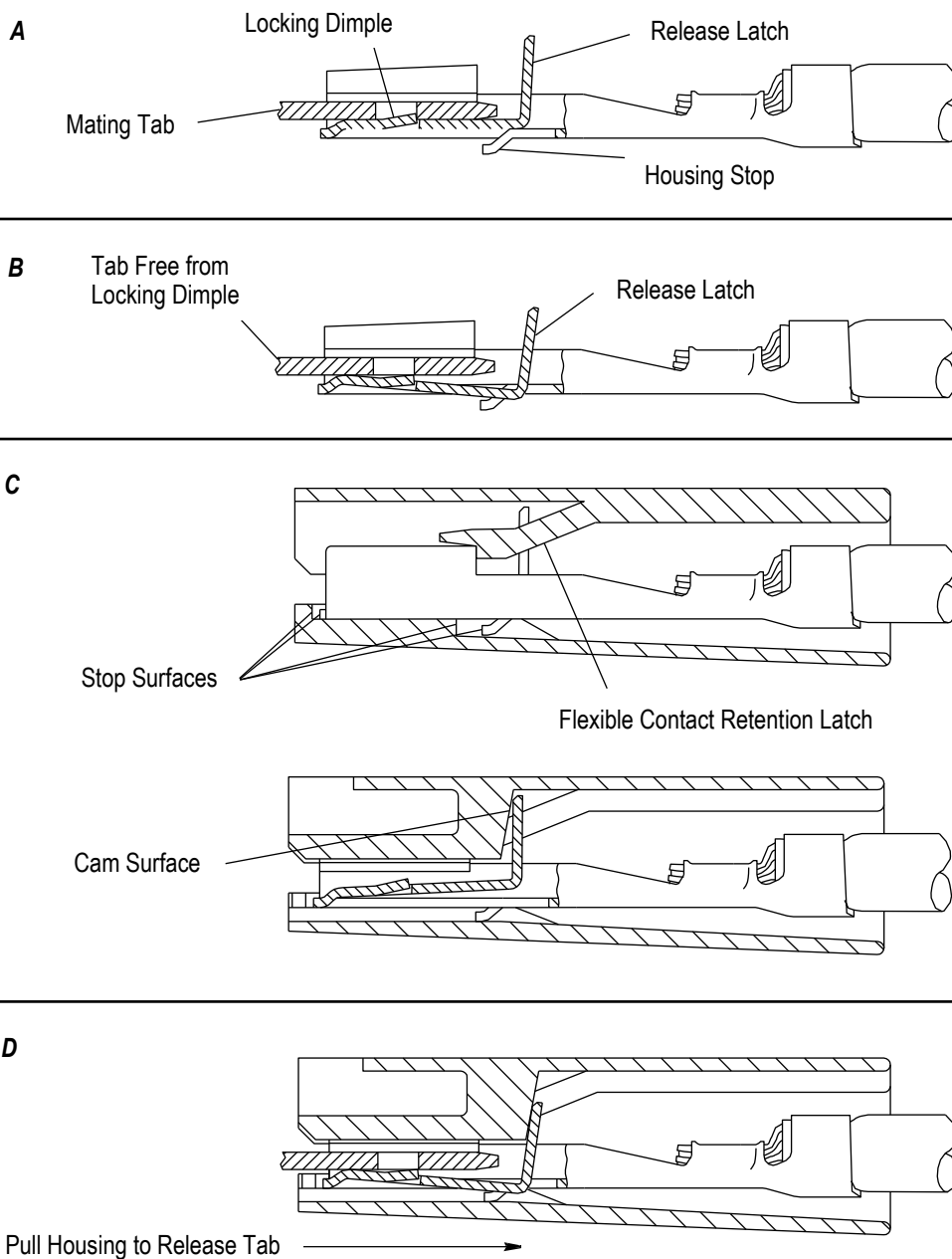
### 3.8. Assembly/Disassembly Procedures

#### A. Assembling Connector

The receptacle contact is inserted into the back of the connector until it bottoms. The contact is held in place by a contact retention latch designed inside the housing to prevent the contact from backing out. See Figure 10C. The contact is designed with a flexible locking dimple which acknowledges proper mating with an audible mechanical “snap” of the dimple into the hole in the mating tab. See Figure 10A.

#### B. Disassembling Connector

To release the lock, the release latch must be depressed. This is accomplished either with a thumb (Figure 10B), or a cam surface (Figure 10C and D), inside the housing. Unless the release latch is depressed either manually or with the optional designated area of the housing, the receptacle cannot be removed without damage force being applied.



**Figure 10**

### 3.9. Repair/Replacement

Damaged crimped contacts or housings must be removed, discarded, and replaced with new components. Remove any damaged contacts with Extraction Tool 724659-[ ] with the information provided in Instruction Sheet 411-5106.



#### **CAUTION**

*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

Series 110, 187, 250, and RAST 5 & 7 Positive Lock Receptacle Connectors are recognized in the Component Program by Underwriters Laboratories Inc. (UL) in File E66717 and E28476; and Certified by CSA International in Report LR7189A. They are also applicable to all performance requirements as listed in UL Specification 310.

#### 5. TOOLING

Figure 11 provides tool part numbers and instructional material related to wire size.

**i NOTE**  
TE Tool 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.

##### A. 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.

**i 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 Product Information number located at the bottom of page 1 for specific changes.

##### B. 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.

**i NOTE**  
The Model "K" AMP-O-LECTRIC Terminating Machine PN 565435-5 has been superseded by the Model "G" Terminating Machine PN 354500-1 (409-5842) for new applications. For existing applications, the Model "K" is still recommended because of the large number of installed machines.

##### C. Extraction Tools

Extraction tools are designed to release the plastic locking lance inside the connector housing without damaging the housing or contacts.

SERIES SIZE	WIRE SIZE, AWG	INSULATION DIAMETER	APPLICATOR (408-8039)	POWER UNIT (DOCUMENT)
110 MK III	26-24	1.78-2.54 [.070-.100]	2150288-1	354500-1 (409-5842)
	24-20	1.52-2.79 [.060-.110]	567110-2	354500-1 (409-5842)
187 MK II	20-16	2.29-3.30 [.090-.130]	567366-2	565435-5 (409-5128)
			567109-1	356500-[ ] (409-5878)
			567109-2	354500-1 (409-5842)
			567748-2, -3	565435-5 (409-5128)
			680141-1	354500-1 (409-5842)
			680141-2	356500-1 (409-5878)
			680141-2	354500-1 (409-5842)
187 MK III	22-18	2.29-3.30 [.090-.130]	680645-1	565435-5 (409-5128)
			680645-2	356500-[ ] (409-5878)
	18-14, (2) 18	3.81-5.08 [.150-.200] or 2@ 2.79 [.110] (maximum)	680652-1	354500-1 (409-5842)
			680652-2	356500-[ ] (409-5878)
			680652-2	354500-1 (409-5842)

Figure 11 (continued)

SERIES SIZE	WIRE SIZE, AWG	INSULATION DIAMETER	APPLICATOR (408- 8039)	POWER UNIT (DOCUMENT)
250 MKII & 250 MK II High Temp	22-18 (20-18 High Temp)	1.52-2.54 [.060-.100]	567064-1	356500-1 (409-5878)
			567064-2	354500-1 (409-5842) 565435-5 (409-5128)
	18-14 (16-14 High Temp)	2.29-3.94 [.090-.155]	567049-1	356500-1 (409-5878)
			567049-2	354500-1 (409-5842) 565435-5 (409-5128)
			567528-1	356500-[ ] (409-5878)
			567528-2	354500-1 (409-5842)
	12-10	3.81-5.08 [.150-.200]	567132-1	356500-[ ] (409-5878)
			567132-2	354500-1 (409-5842) 565435-5 (409-5128)
250 MK III	22-18	1.52-2.54 [.060-.100]	680411-1	356500-1 (409-5878)
			680411-2	354500-1 (409-5842) 565435-5 (409-5128)
			680411-3	354500-[ ] (409-5842)
	18-14	2.29-3.94 [.090-.155]	680161-1	356500-[ ] (409-5878)
			680161-2	354500-1 (409-5842) 565435-5 (409-5128)
			680161-3	354500-[ ] (409-5842)
	(1) 16, (2) 18, (1) 16 and (1) 18, (2) 16	3.05-4.32 [.120-.170] or 2@ 3.05 [.120] (maximum)	680646-1	356500-[ ] (409-5878)
			680646-2	354500-1 (409-5842) 565435-5 (409-5128)
RAST 5 & 7 250 MK III	22-18	1.52-2.79 [.060-.110]	1852165-1	356500-[ ] (409-5878)
			1852165-2	354500-1 (409-5842) 565435-5 (409-5128)
			2150694-2 (OVL)	
	18-14	2.29-3.94 [.090-.155]	680653-1	356500-[ ] (409-5878)
			680653-2	354500-1 (409-5842) 565435-5 (409-5128)
	(1) 16, (2) 18, (1) 16 and (1) 18, (2) 16	3.05-4.32 [.120-.170] or 2@ 3.05 [.120] (maximum)	680654-1	356500-[ ] (409-5878)
			680654-2	354500-1 (409-5842) 565435-5 (409-5128)

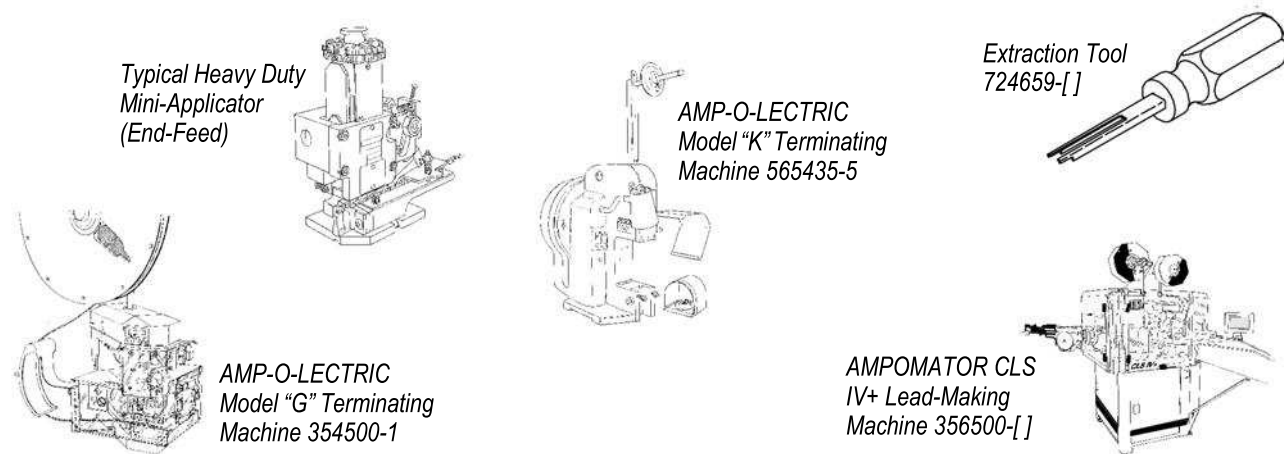
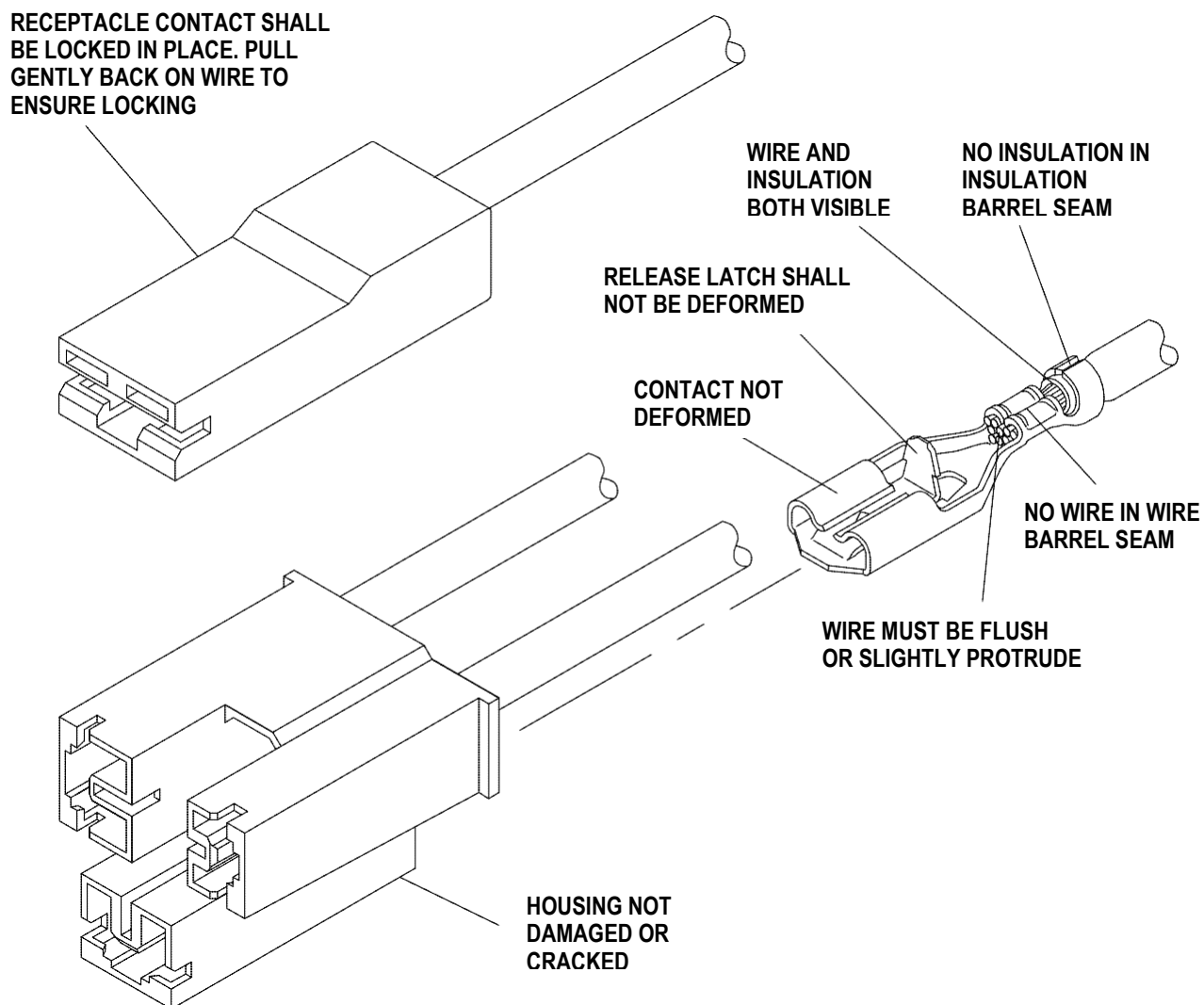


Figure 11 (end)

## 6. VISUAL AID

The illustration below shows a typical application of this product. 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.



**Figure 12.** Visual Aid.