

**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 application of Power Series 120 (single-pole and double-pole) connector assemblies in high-current systems for power supplies, battery chargers, telecommunications, and material handling equipment. The connector assemblies are designed for free-hanging and panel mount applications. Each connector assembly consists of a hermaphroditic housing and one (single-pole) or two (double-pole) closed-barrel contacts. The hermaphroditic design of the housing ensures proper polarity in mating of the connectors. In addition, the housings are color coded to provide visual reference for proper mating. The housing color is also coded for voltage. The contacts are available in sizes 2, 4, 6, and 8 and accept wire sizes (AWG) that correspond to the contact size. Reducing bushings are available for contact size 2 to accommodate small wire sizes to a minimum of size 8 AWG.

The single-pole housing features one contact cavity. This housing is capable of being stacked side-by-side and top-to-bottom using the dovetails. For free-hanging applications, retainer pins are available to hold stacked housings together. The double-pole housing features two contact cavities each marked on top of the housing with a plus (+) to indicate positive polarity and a minus (-) to indicate negative polarity. Each contact is held in the contact cavity by an internal retaining spring. This housing has a molded-in mechanical key at the mating face to prevent inadvertent mating of different colored housings (housings with same position keys will only engage housings of the same color).

When corresponding with 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.

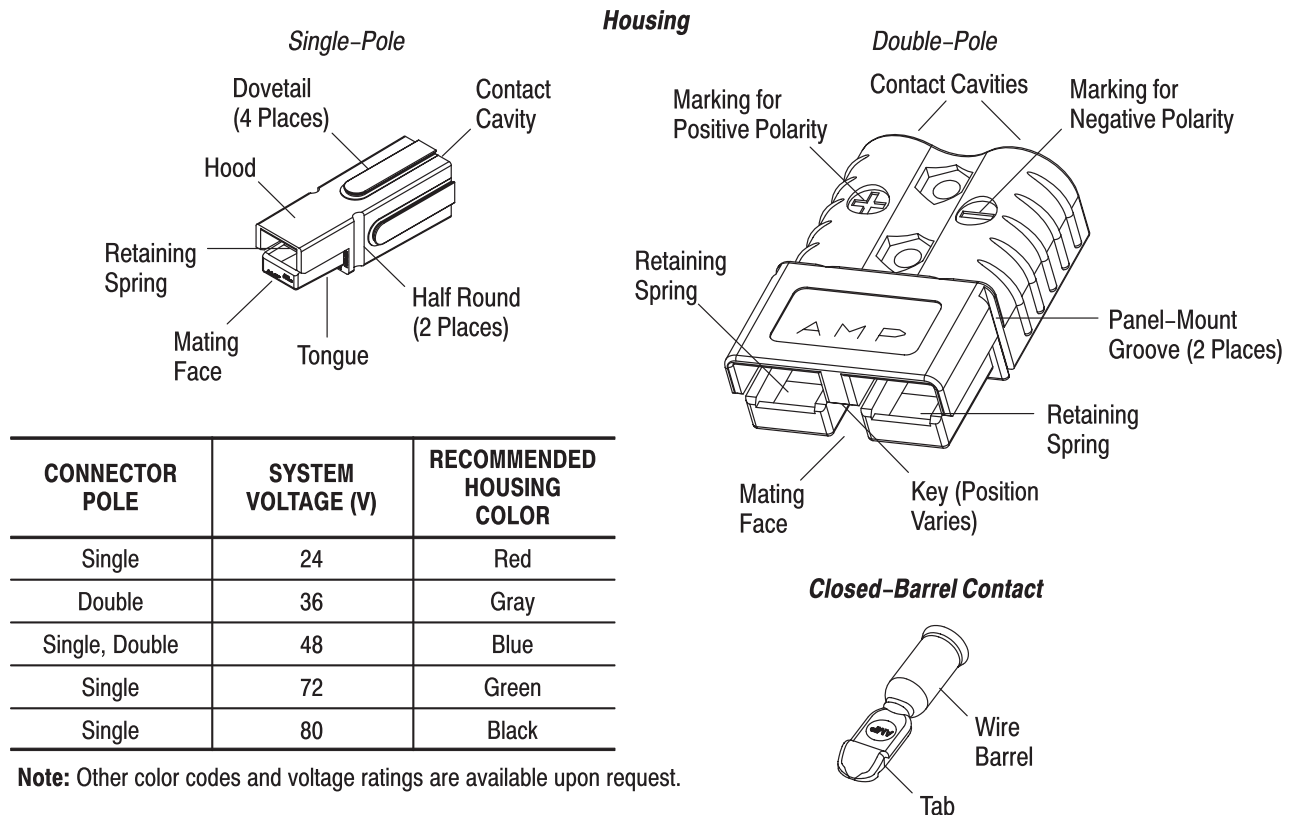


Figure 1 (Cont'd)

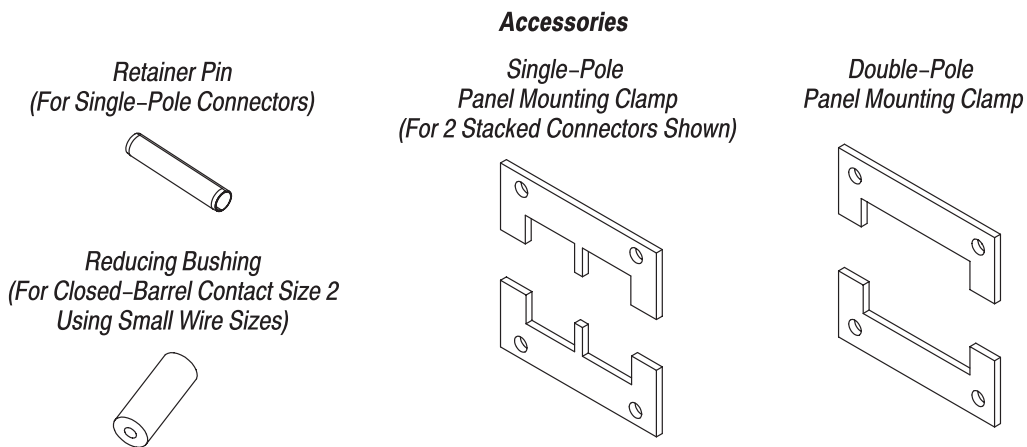


Figure 1 (End)

The contact features a flared wire barrel and round-ended tab. The contacts are available in loose-piece for terminating with manual or pneumatic hand-held tools.

Panel mounting clamps are available to secure the double-pole connector, and 2, 3, or 4 stacked single-pole connectors to a panel. The panel mounting clamp consists of two brackets.

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

- Initial release of application specification

### 2.2. Customer Assistance

Reference Product Base Part Number 1604002 and Product Code H414 are representative of Power Series 120 (single-pole and double-pole) 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 Representative or, after purchase, by calling PRODUCT INFORMATION at the number at the bottom of page 1.

### 2.3. Drawings

Customer Drawings for product part numbers are available from the service network. If there is a conflict between the information contained in the Customer Drawings and this specification or with any other technical documentation supplied, call PRODUCT INFORMATION at the number at the bottom of page 1.

### 2.4. Instructional Material

Instruction Sheets (408-series) provide product assembly instructions or tool setup and operating procedures. Documents available which pertain to this product are:

408-4557	Heavy Duty Cable Cutter Hand Tool 605742-1
408-8540	Crimp Tool 1526955-1
408-9688	Cable Stripper/Slitter Tool 606700-1
408-10248	Power Series 120 (Single-Pole and Double-Pole) Connector Assemblies

### 3. REQUIREMENTS

**IMPORTANT:** Using the exact products and application requirements described in this document will ensure proper application; however, to ensure reliability of performance, it is highly recommended that an independent evaluation be conducted of the chosen product combinations (wire, connector assemblies, and system) *before* final application is approved.

#### 3.1. Special Assembly Considerations and Safety

These connectors **MUST NOT** be used for interrupting current; otherwise, there is risk of electrical shock. In any case, the electrical power supply must **ALWAYS BE DISCONNECTED**, and the connectors must **ALWAYS BE DE-ENERGIZED** (this might include disconnecting the wire from the battery) before mating and unmating or servicing the connectors.

It is highly recommended that these connectors not be used in external power applications where the electrical potential exceeds 42 V. In applications where these connectors are located internal to a device and do not serve as the primary means of connection, high voltages are allowable. It must be determined by the original equipment manufacturer (OEM) whether the connectors meet electrical and safety requirements when used in a specific application.



*In applications where the connectors are used external to a device or as the primary means of disconnecting power supplies or charging equipment, care must be taken to avoid touching exposed electrical contacts as there is risk of electric shock.*

#### 3.2. Limitations

This product is designed to operate in a temperature range of  $-20^{\circ}$  to  $105^{\circ}\text{C}$  [ $-4^{\circ}$  to  $221^{\circ}\text{F}$ ].

#### 3.3. Material

The housing is made of polycarbonate, rated Underwriter Laboratories, Inc. (UL) 94 V-0. The spring(s) (inside the housing) are made of stainless steel. The contact and reducing bushing are made of copper plated with silver. The retainer pin is made of passivated stainless steel. The mounting clamps are made of aluminum.

#### 3.4. Storage

##### A. Ultraviolet Light

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

##### B. Shelf Life

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

##### C. Chemical Exposure

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

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

#### 3.5. Wire Selection and Preparation

The contacts accept stranded (recommended a minimum of 19 strands) copper wire sizes 2 through 8 AWG with a maximum insulation diameter of 15.24 [.60]. Contact size 2 can accept small wire sizes to a minimum of size 8 AWG with the use of a reducing bushing (as described in Paragraph 3.6).



*Wires with less than 19 strands may be too stiff and difficult to work with.*

Tarnished copper wire must be thoroughly cleaned using a stiff wire brush, or other suitable method, that penetrates the entire bundle and cleans every conductor. The wire must be restored to a bright copper finish.

The contact wire barrels are lined with silver plating to assure consistently high conductivity which will be reduced if tarnished wire is used.

The wire must be cut to length. Proper strip length is necessary to properly insert the conductors into the contact. The strip length range of the wire is shown in Figure 2.



Reasonable care must be taken not to nick or scrape any part of the wire during the stripping.

**Recommended Wire Strip Length**

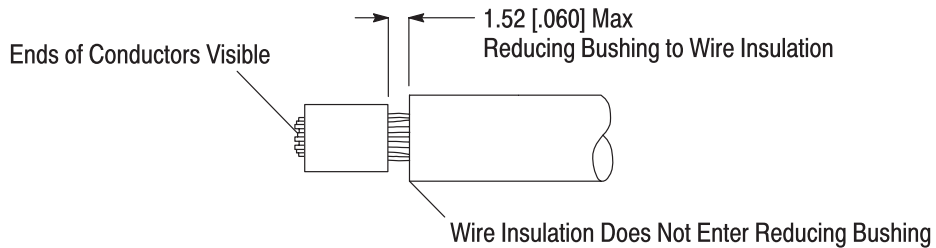


Figure 2

**3.6. Reducing Bushing**

Reducing bushings are available for contact size 2 to accommodate small wires to a minimum of size 8 AWG. The appropriate size reducing bushing must be installed onto the wire *after* stripping the wire and *before* inserting the wire into the contact. Placement of the reducing bushing must meet the requirements shown in Figure 3.

**Placement of Reducing Bushing on Stripped Wire**



**Placement of Reducing Bushing and Wire in Contact**

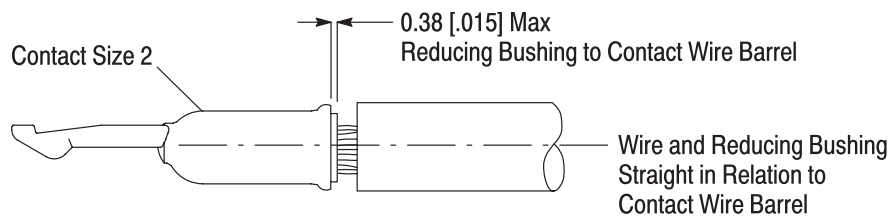


Figure 3

**3.7. Crimp Requirements**

**A. Reducing Bushing**

If used, the reducing bushing must be held firmly inside the contact wire barrel. The reducing bushing must be straight in relation to the wire barrel and must be flush with the end of the wire barrel or protrude no more than the dimension provided in Figure 4.

**B. Tab**

The tab must not be deformed in any way. See Figure 4.

**C. Wire Barrel Crimp**

All wire conductors must be held firmly inside the wire barrel. The crimp applied to the wire barrel is the most compressed area and most critical in ensuring optimum performance of the crimped contact. The crimped area must be symmetrical on both sides of the wire barrel. See Figure 4.



*The developed dual-indent crimp configuration results from using the specific tooling described in Section 5, TOOLING.*

**D. Wire Conductor and Insulation Location**

No wire conductors can be folded back over the wire insulation. The wire insulation must not enter the wire barrel. The wire conductors must be visible between the reducing bushing, if used, or the contact wire barrel and the wire insulation within the dimension given in Figure 4.

The end of the wire must be flush with the end of the wire barrel or extend no more than the dimension given in Figure 4.

**E. Flash**

There shall be no flash or extruded contact insulation visible in the crimped area. See Figure 4.

**Crimp Requirements**

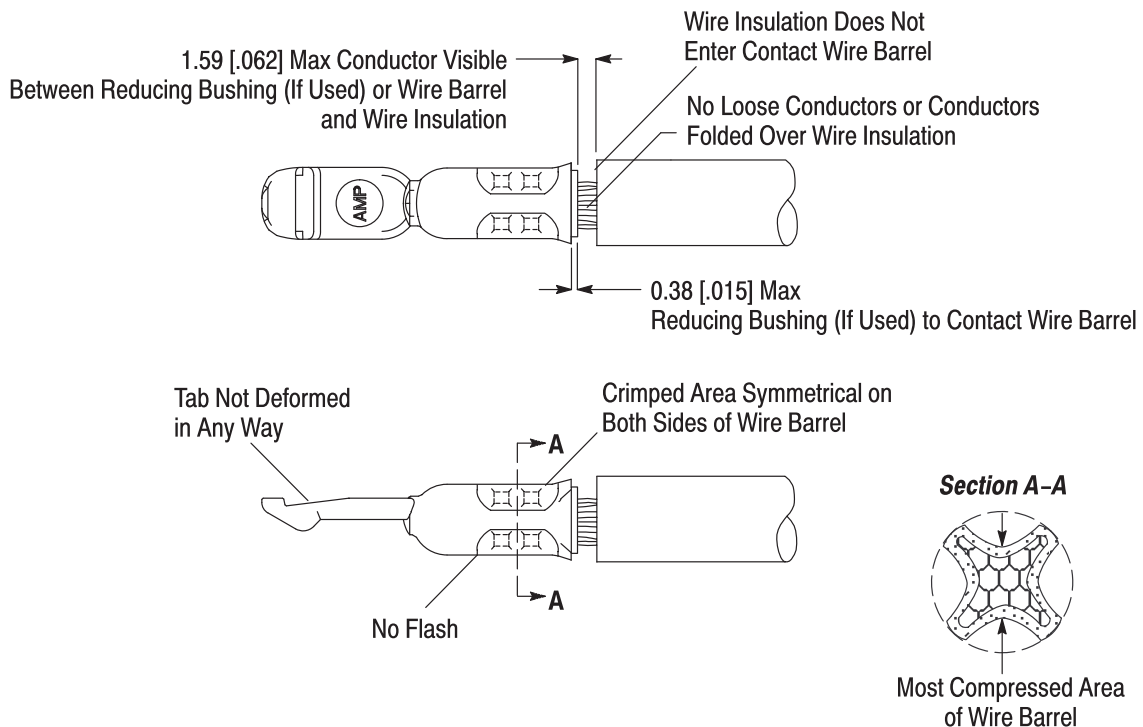


Figure 4

**F. Twist and Roll**

There should be no twist or roll of the wire barrel of the crimped contact that would cause overstress or impair usage. See Figure 5.

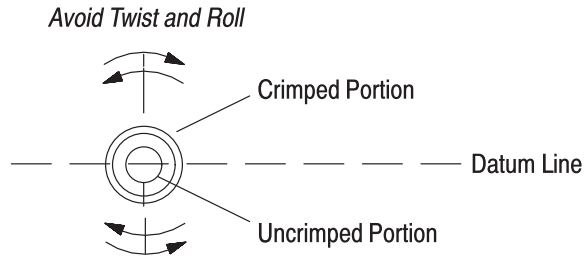


Figure 5

**G. Bend Allowance**

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

1. Up and Down

The crimped portion must not be bent beyond the limits shown in Figure 6.

2. Side-to-Side

The crimped portion must not be bent from one side to the other beyond the limits shown in Figure 6.

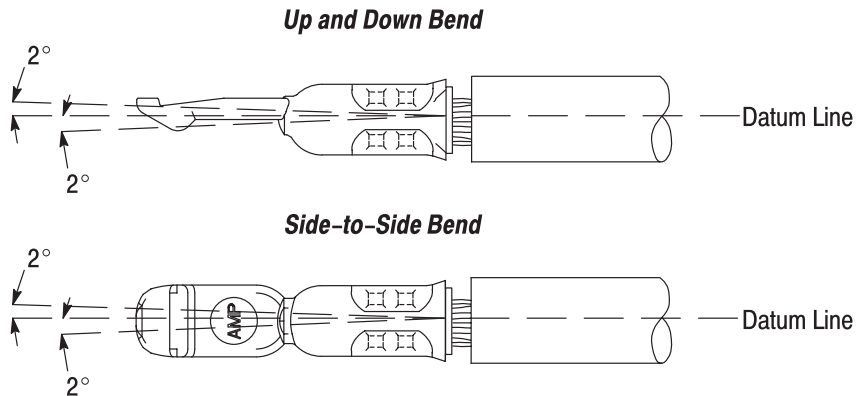


Figure 6

**3.8. Keying**

For the double-pole connectors, assurance of proper mating is provided by a molded-in mechanical key at the mating face of the housing. The position of the key of the mating housings must be compatible. The customer drawing for the specific housing provides the key position.

**NOTE**

*Other key positions are available upon request.*

**3.9. Installing Contact into Housing**

**DANGER**

*The electrical supply **MUST BE DISCONNECTED** and the connectors **MUST BE DE-ENERGIZED** (this might include disconnecting the wire from the battery) before installing the contacts into the housing.*

The contact must be inserted straight into the contact cavity at the wire end of the housing with the bottom of the contact facing the retaining spring of the housing (for single-pole housing, the word "AMP" or TE logo marked on the contact must align with the hood of the housing; for double-pole housing, the word "AMP" or TE logo marked on the contact and on the housing must be facing the same direction).

The contact **MUST NOT** be forced into the housing. When fully seated, the contact must be fully latched onto the retaining spring of the housing.

Each contact must be installed in the housing according to the requirements given in Figure 7.

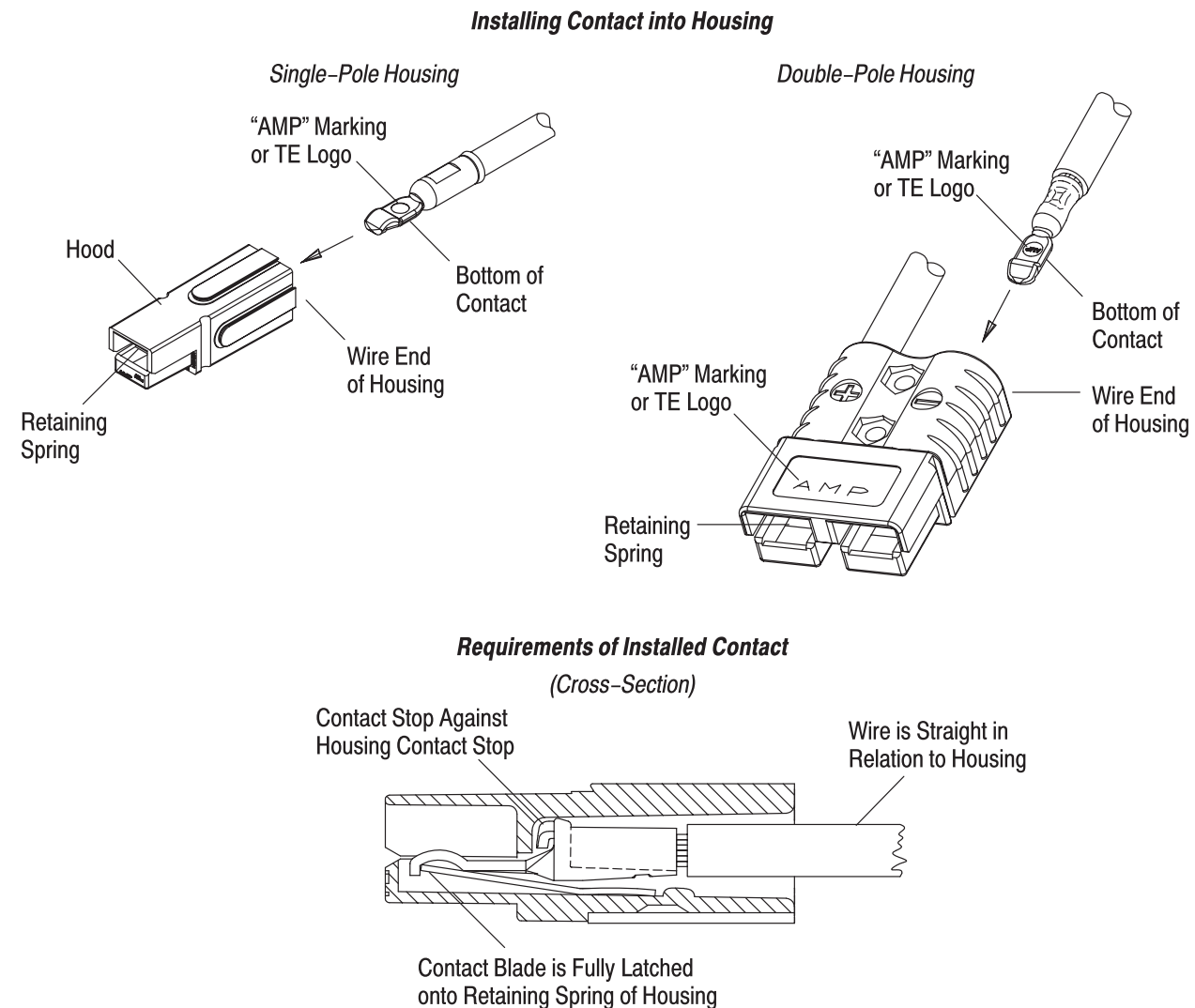


Figure 7

### 3.10. Special Assembly Considerations

- For optimum results, it is recommended intermating housings containing contacts with the same plating (tin to tin or silver to silver).
- DO NOT restrict movement of the contacts that would affect their performance (such as bending unsupported wires).
- DO NOT restrict heat dissipation from the connectors.



**3.11. Stacking Housings and Installing Retainer Pins (Single-Pole Connectors Only)**

The housings must be interlocked using the dovetails. The housings can be stacked in a vertical, horizontal, or block configuration. Refer to Figure 8. A housing must be slid onto another housing from the mating face of the housings until the dovetails are engaged, the ends of the housings are flush, and the half rounds form a hole or, for vertical stacked housings, the half rounds align. See Figure 8, Detail A.

The retainer pin is available in two lengths: 14.22 [.56] (short) and 25.4 [1.0] (long). A retainer pin—using short for horizontal configuration and long for vertical and blocked configurations—should be inserted into the formed hole, or for vertical stacked housings, the aligned half rounds to hold the stacked housings together. When seated, the retainer pin must be flush with the top and bottom of the stacked housings. One retainer pin should be inserted into each formed hole, and for vertical stacked housings, one retainer pin should be inserted into one of the aligned half rounds. See Figure 8, Detail B.



**CAUTION** Commercially available roll pins **MUST NOT** be used. Roll pins could fall out of the housings and cause damage to the system.

Stacked housings can be permanently bonded by applying a small drop of cyanoacrylate glue to the joint between the dovetails.

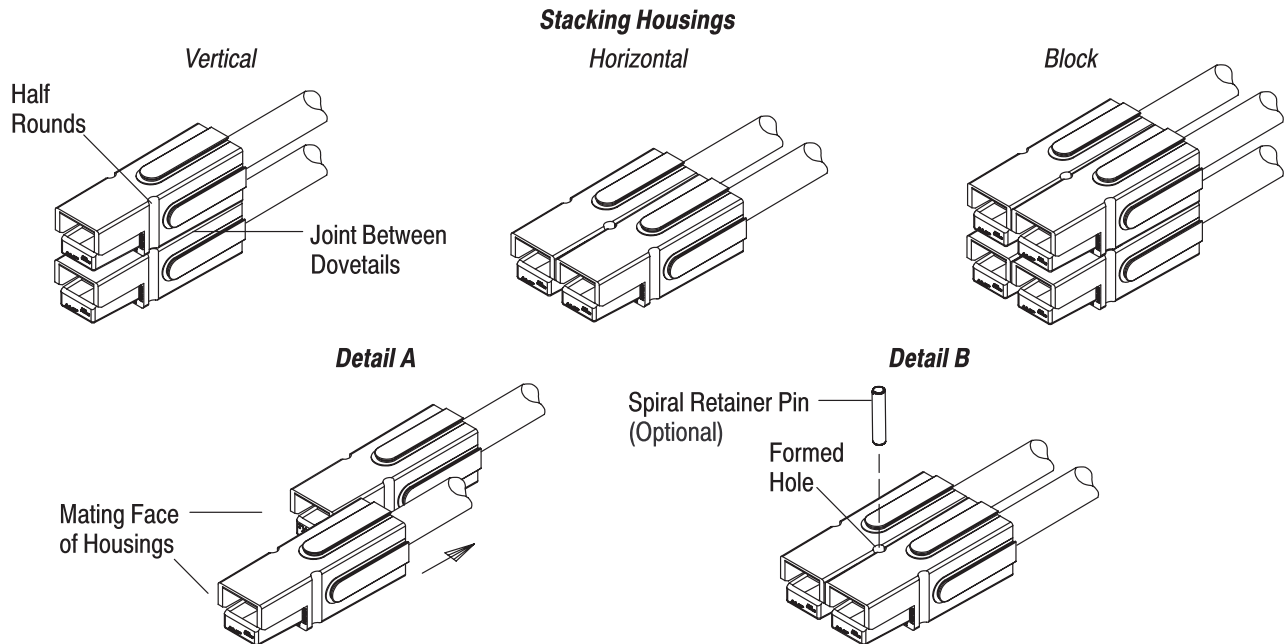


Figure 8

Standard direct current (DC) connectors recommended by the Radio Amateur Civil Emergency Service (RACES) must be stacked as shown in Figure 9. Red (as positive) and black (as negative) are the recommended housing colors.

**Stacking Housings for RACES Standard DC Connectors**

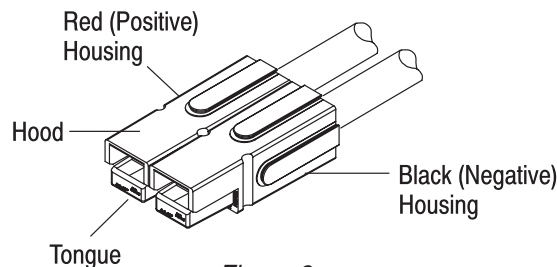


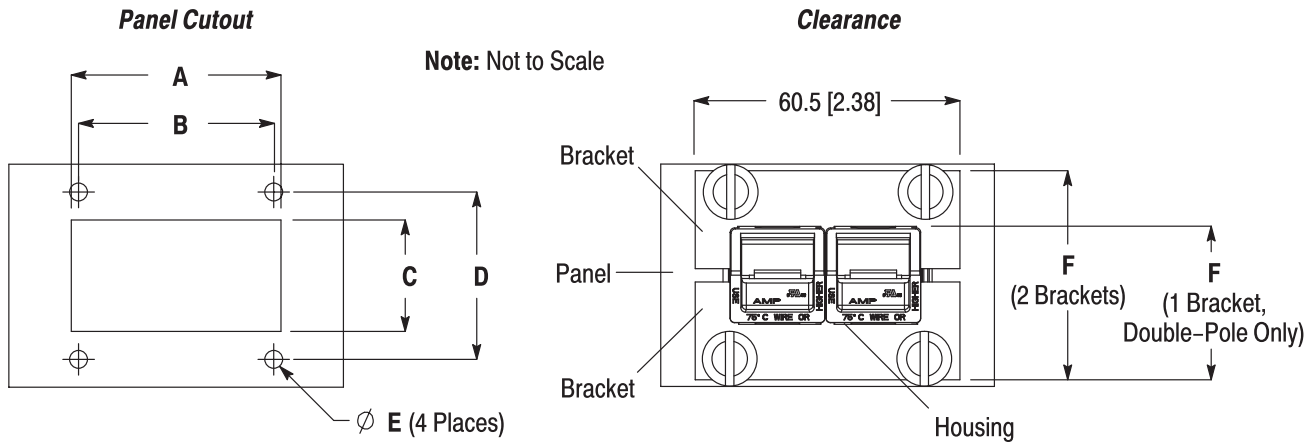
Figure 9



3.12. Panel

A. Cutout

The panel thickness range shall be 0.76 through 3.40 [.030 through .134]. The panel must be cut using the dimensions provided in Figure 10. Dimensions for clearance are also given.



CONNECTOR POLE	USING	DIMENSION					
		A	B	C	D	E	F
Single	2 Housings	47.8 [1.88]	44.50 [1.75]	25.4 [1.00]	60.5 [2.38]	4.06 [.160]	47.80 [1.88]
	3 Housings	70.0 [2.75]	66.50 [2.62]	25.4 [1.00]	38.1 [1.50]		47.80 [1.88]
	4 Housings	47.8 [1.88]	44.50 [1.75]	47.8 [1.88]	38.1 [1.50]		70.10 [2.76]
Double	1 Bracket	46.99 [1.85]	47.75 [1.88]	21.59 [.850]	33.02 [1.30]	4.80 [.190]	30.86 [1.31]
	2 Brackets				—		45.89 [1.81]

Figure 10

B. Mounting

The panel mounting clamp (two brackets—one for on top and one for on bottom of the housing or housings) and commercially-available hardware (four No. 6 pan head screws and nuts) are required to mount the housing or housings onto the panel. The double-pole connector can also be mounted using one bracket and two No. 6 pan head screws and nuts. The length of the screws must be determined by measuring the thickness of the panel, mounting clamp, and nut.

For single-pole connectors, the mounting clamps are designed to be used with horizontal or block stacked housings that do not containing retainer pins. The bracket side arms must be installed along the half rounds and the middle arm must be installed into the formed hole. Refer to Figure 11.

For the double-pole connector, each bracket arm must be installed along the panel mount groove of the housing. Refer to Figure 11.

When installed, the mounting clamp must be flat against the panel and flat against the housing, and the hardware must be secure. When using one bracket with a double-pole connector, the housing must be flat against the panel.

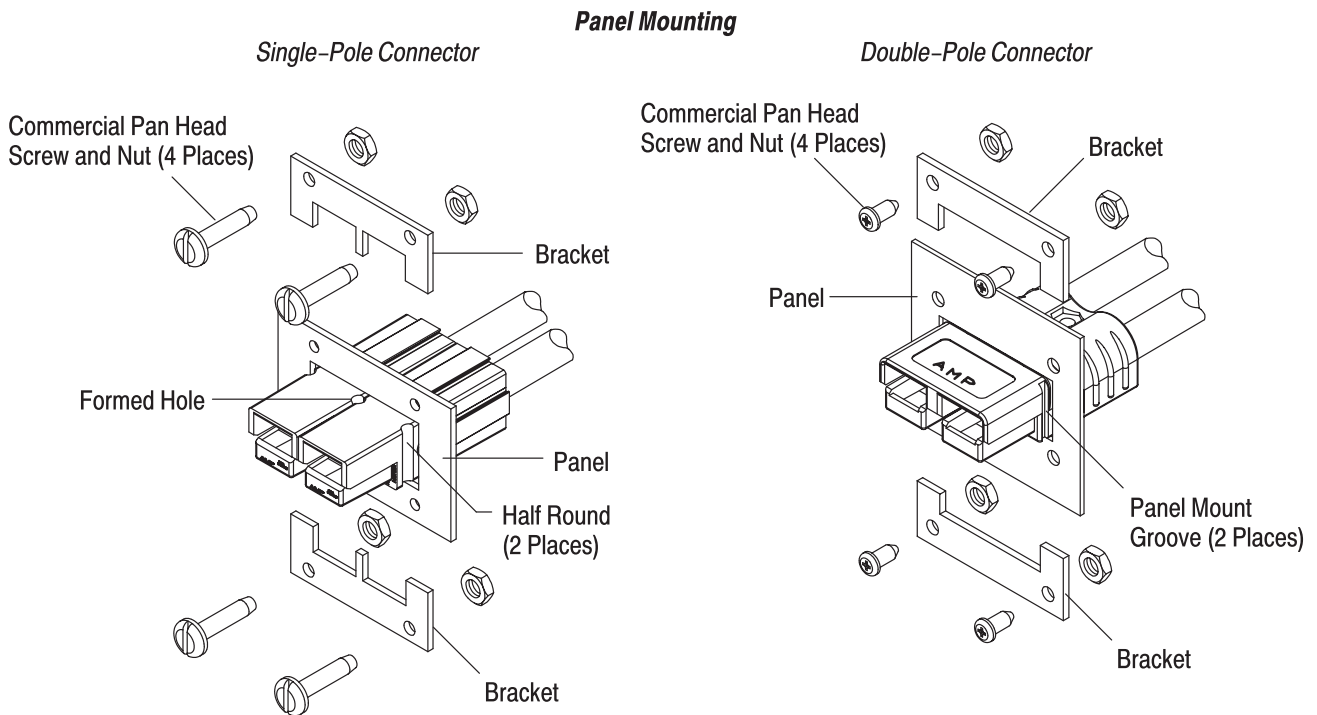


Figure 11

**3.13. Mating and Unmating**



The electrical supply **MUST BE DISCONNECTED** and the connectors **MUST BE DE-ENERGIZED** (this might include disconnecting the wire from the battery) before mating or unmating the connectors.

**A. Single-Pole Connectors**

Housings must be slid together until there is no gap between the hood and the tongue of the housings. See Figure 12.

**B. Double-Pole Connectors**

Housings must be slid together until they appear flush at the point of engagement. See Figure 12.

When unmating connectors, the housings (not the wires) must be grasped and pulled apart. The connectors must NOT be forced to mate or unmate.

**Note:** Free-hanging connectors shown. Requirements apply equally to panel-mounted connectors.

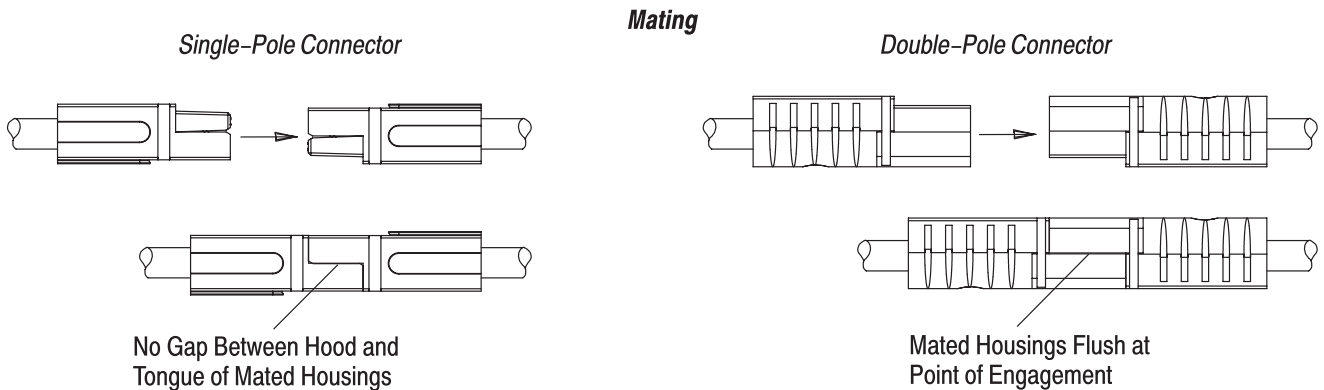


Figure 12

### 3.14. Strain Relief

When bending or forming wire, the bundle must be held at least 6.35 [.250] beyond the back of the housing or frame before bending in any direction. For mated connectors, if the installation is to be subject to bending forces, strain relief should be provided on the wire bundle approximately 25.4 [1.0] from the back of the housing.



*Unsupported wire must not be bent as this may cause strain on the contacts inside the housing.*

### 3.15. Removing Contacts from Housing

The housing retention spring must be depressed away from the underside of the contact to remove the contact from the housing. A contact must be removed from the housing according to the following:



*The electrical supply **MUST BE DISCONNECTED** and the connectors **MUST BE DE-ENERGIZED** (this might include disconnecting the wire from the battery) before removing the contacts from the housing.*



*Section 5 lists available extraction tools used to remove these contacts.*

1. The tip of the tool must be inserted between the sides of contact and the contact cavity at the mating face of the housing.
2. The handle of the tool must be pushed down so that the housing retention spring is depressed away from the underside of the contact. While holding the tool in position, the wire must be pushed down and *gently* pulled back until the contact is free from the housing.

### 3.16. Repair

Components are not repairable. Damaged or defective contacts, housings, or accessories must not be used. The contacts and reducing bushings must not be re-used by removing the wire.

## 4. QUALIFICATION

Power Series 120 (single-pole and double-pole) connector assemblies are Component Recognized by UL under File E28476 and have been Investigated to CSA International Standards by UL.

## 5. TOOLING

Tooling part numbers and instructional material packaged with the tooling are shown in Figure 13.

### 5.1. Cable Cutter Hand Tool

The cable cutter is used to cut the wire to length.

### 5.2. Stripping Tool

The cable stripper/slitter is used to strip insulation from the wire.

### 5.3. Hand Crimping Tool

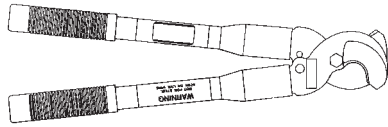
Industry standard tooling for pneumatic application of loose piece contacts is available for the full wire size range. Recommended manufacturer and contact information is Pico Corporation, Camarillo, CA (805) 388-5510 (<http://www.picotools.com>).



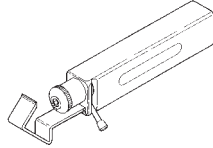
*Consult manufacturer's literature for information on using the tooling.*

**5.4. Extraction Tool**

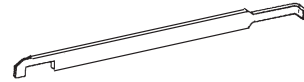
The extraction tool is designed to remove contacts from the housing by releasing the contact locking lance without overstressing the contact. A standard insulated screwdriver with a 1/4-in. blade can also be used to remove the contacts from the housing.



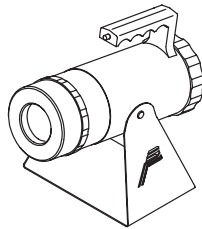
Heavy Duty Cable Cutter Hand Tool  
605742-1 (408-4557)



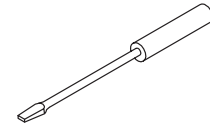
Cable Stripper/Slitter Tool  
606700-1 (408-9688)



Extraction Tool 68265-1  
(No Document)



Pneumatic Power Crimping Tool with Locator and Die  
(Commercially Available from Pico Corporation)  
(See Table)



Standard Insulated Screwdriver  
With 1/4-in. Flat Blade

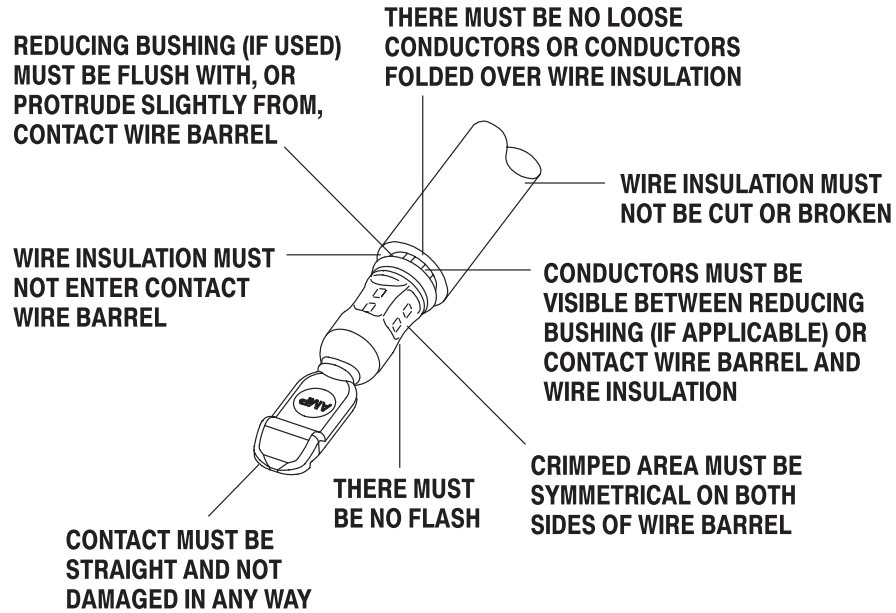
CRIMPING TOOL MODEL SERIES	DIE	DIE CLOSURE DIMENSION●	LOCATOR
400 BHD	414DA-4580	5.08 [.200]	4580-1
500 DEC	7035-1 SPG		7035-1

● Die closure dimension is not crimp height dimension. If die closure is dimensionally correct, crimp height will be correct.

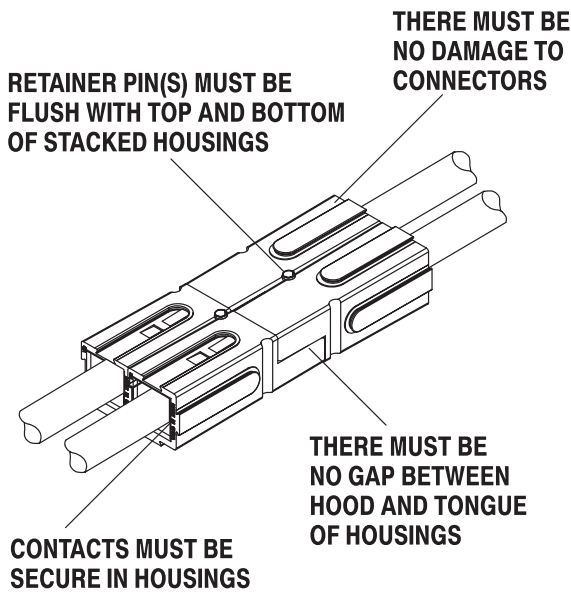
Figure 13

6. VISUAL AID

The illustration below shows a typical application of Power Series 120 (single-pole and double-pole) 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.



FREE-HANGING SINGLE-POLE CONNECTOR



FREE-HANGING DOUBLE-POLE CONNECTOR

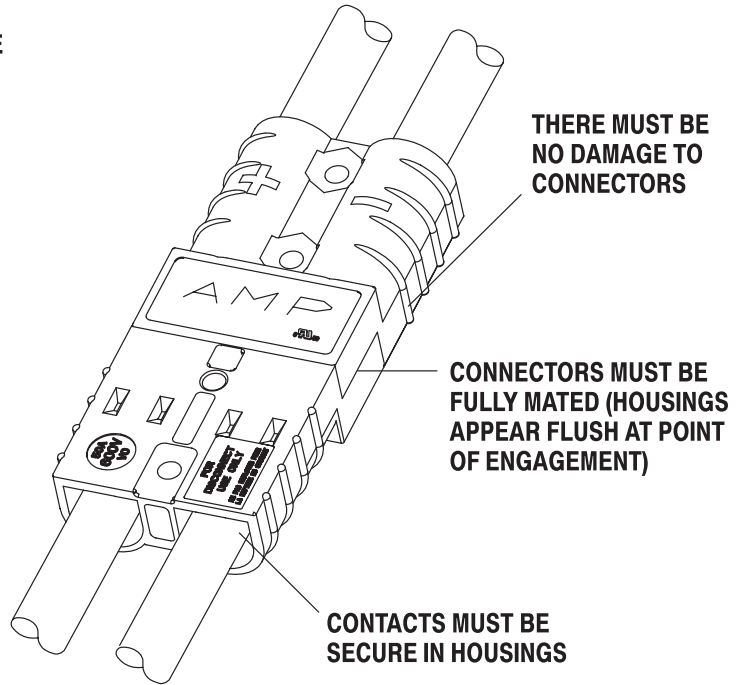
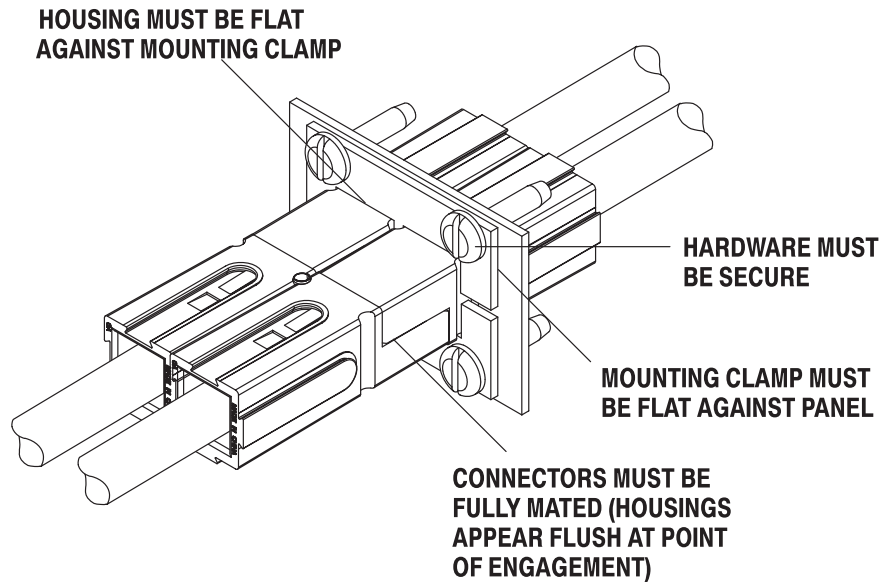


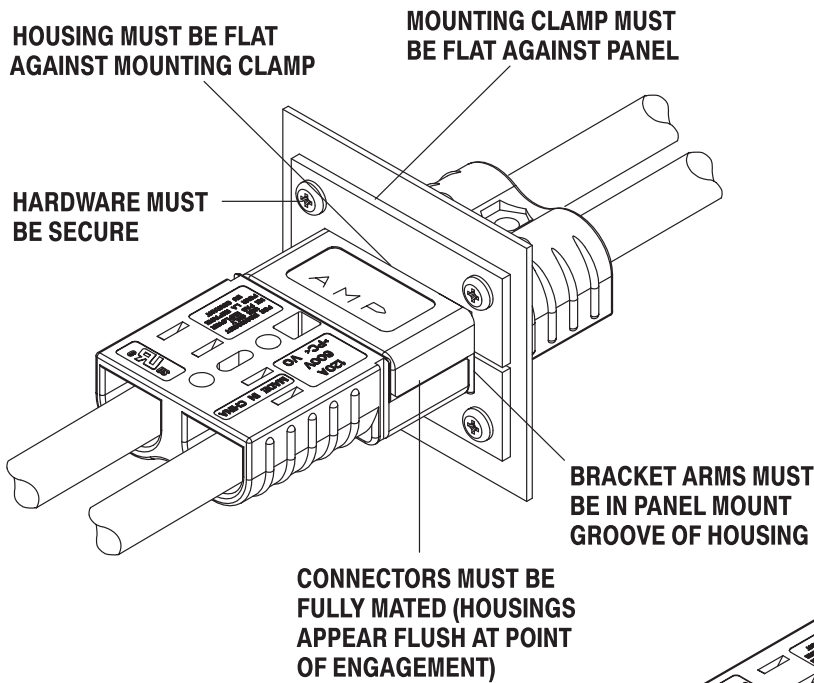
FIGURE 14. VISUAL AID (CONT'D)

**PANEL-MOUNTED SINGLE-POLE CONNECTOR**

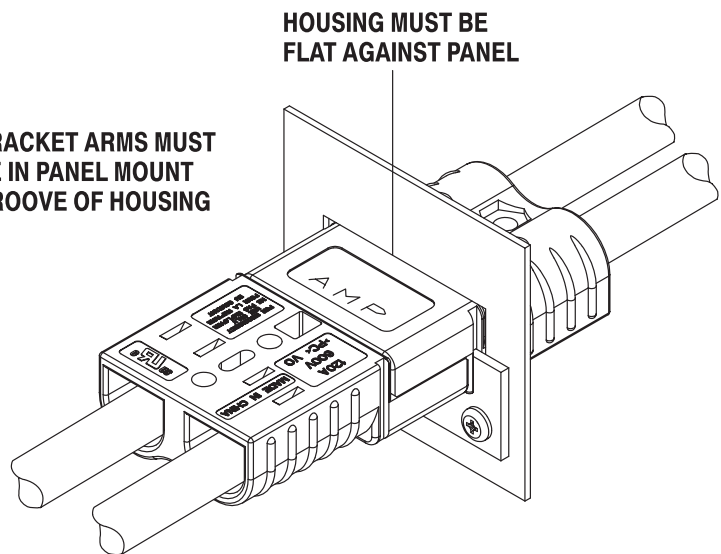


**PANEL-MOUNTED DOUBLE-POLE CONNECTOR**

**DOUBLE BRACKET**



**SINGLE BRACKET**



**FIGURE 14. VISUAL AID (END)**