



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 ± 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 assembly and application of NECTOR M-Line connectors. Connector components, and quantity of each component, are selected for the wire/cable used in the application and is based upon:

- ◆ Number of conductors
- ◆ Cable jacket diameter
- ◆ Conductor size

NECTOR M-Line connectors are available in two housing size variants, based upon cable conductor counts; 3 conductor housing and 5/6/7 conductor housings. The 3 conductor housings are intended for cables having 3 conductors. The 5/6/7 conductor housings are intended for cables having 5 conductor, 6 conductors, or, 7 conductors. The housings for 5 conductors and 6 conductors use a modified 7 conductor housing with specified plug/socket contact locations blocked to form a 5 conductor housing, or 6 conductor housing. Each housing size variant of the NECTOR M-Line connectors is available in two forms: *panel-mount form*, in which the connector installs into a specified opening in a flat panel and is restrained to the panel with a threaded hex nut, and *free-hang form*, in which the connector is not restrained to a mounting surface.



NOTE

NECTOR pin and socket housings are available with a number of “keying” formats that restrict pin/socket connector mating to like keying format connectors. Select pin and socket housings with appropriate keying format option.

Water ingress protection is provided by elastomer seals acting on the cable jacket (free-hang) and at the interface between mated connectors (free-hang, panel-mount). The seal on the cable jacket is provided by “cable clamp” and ring nut components. These components accommodate a range of cable jacket diameters. The seal is activated upon assembly of the connector onto the cable. The seal at the interface of mating connectors is pre-assembled into the socket housing and is not activated until corresponding plug/socket connectors are mated.



NOTE

Connectors in un-mated condition are not water ingress protected at the connector mating interface.

Pin and socket contacts are available in two wire-connection versions: crimp, screw clamp. The crimp version contacts are selected for specific conductor sizes. These contacts require appropriate tooling to crimp the contacts onto conductors. The screw clamp version pin and socket contacts use a clamping screw and accept a range of conductor sizes (14-18 AWG, 2.5-1.5 mm²).



NOTE

Panel-mount NECTOR M connector versions are only available for crimp contacts. Free-hang connector versions can use crimp contacts, or screw clamp contacts.

The NECTOR M 3 position and 5/6/7 position connectors have one contact designated “PE”. This is intended to be a ground contact and is positioned within the connector housings so that the PE contacts in mating pin/socket connectors make connection first upon mating and break connection last upon un-mating. All other contacts make connection simultaneously upon mating and un-mating.

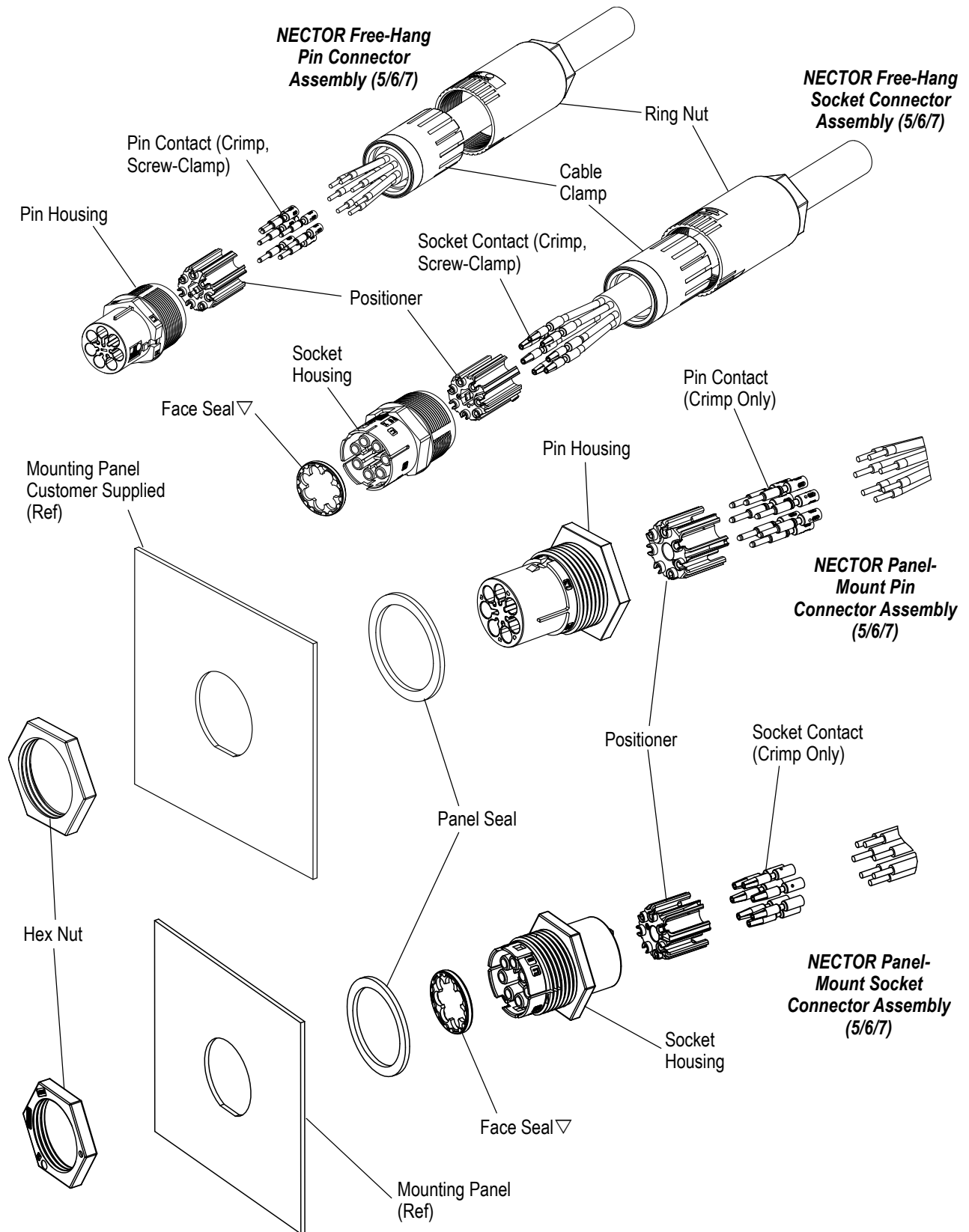
When corresponding with TE Connectivity Personnel, use the terminology provided in this specification to facilitate inquiries for information. Basic terms and features of this product are provided in Figure 1.



NOTE

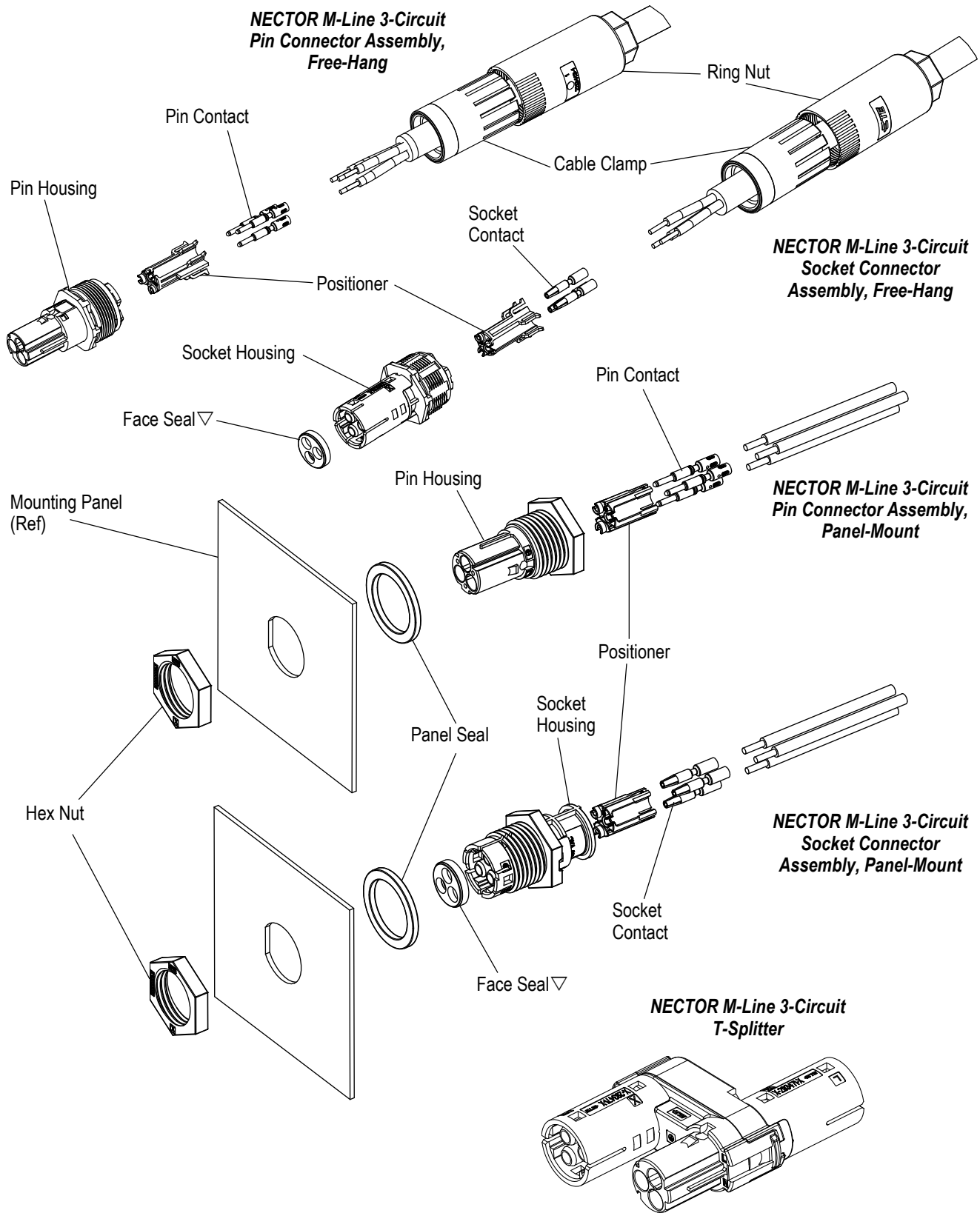
Restrictions for use of NECTOR M-Line connectors is as follows:

- Connectors are intended only for connection and disconnection without electrical load.
- Do not mate NECTOR M-Line connectors with comparable products from different manufacturers since this will result in dangerous compatibilities.
- NECTOR M-Line connectors are not replacements for the prevailing national domestic plug and socket outlet system.



▽Face seal component is shown for reference only. Face seal is pre-assembled to socket housing and not available as separate component.

Figure 1 (cont'd)



▽Face seal component is shown for reference only. Face seal is pre-assembled to socket housing and not available as separate component.

Figure 1 (end)

2. REFERENCE MATERIAL

2.1. Revision Summary

- ◆ Updated document to corporate requirements
- ◆ Added CAUTION to Figure 21

2.2. Customer Assistance

Reference Product Base Part Numbers 2213228, 2213393, and Product Code K680 are representative of NECTOR M-Line connectors. Use of these numbers will identify the product line and help you to obtain product and tooling information. Such information can be obtained through a local TE Representative, by visiting our website at www.te.com, or 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, the information contained in the Customer Drawings takes priority.

2.4. Specifications

Product Specification [108-133014](#) provides product performance and test information.

2.5. Instructional Material

Instruction Sheet [408-7516](#) provides information on Hand Crimping Tool 601967-1, which is used to terminate crimp, screw-machine contacts used in these connectors.

3. REQUIREMENTS

3.1. Safety

Do not stack product shipping containers so high that the containers buckle or deform.

3.2. Storage

A. Ultraviolet Light

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

B. 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.

C. Reel Storage

If using reel contacts, store coil wound reels horizontally and traverse wound reels vertically.

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.

3.3. Material

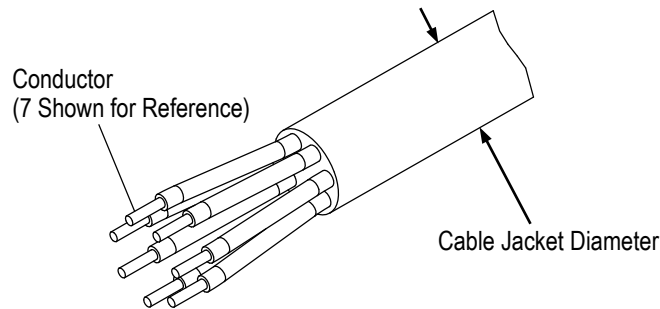
NECTOR M-Line connector components are made of the following materials:

- ◆ Housing components (except as noted below) are made of flame retardant (UL 94 V-0 and UV resistant (UL f1) thermoplastic Polyester, except as noted below
 - “Positioner” component for panel-mounting applications is made of flame retardant (UL 94 V-0) thermoplastic nylon
 - Mating plug/socket interface seal is made of flame retardant (UL HB) Silicone elastomer
 - Cable seal is made of flame retardant (UL HB) thermoplastic elastomer (TPE)
- ◆ Electrical contacts are made of brass and plated with nickel underplate and tin top plate

3.4. Cable Selection and Preparation

Recommended cable is circular construction HO7RN-F or SEOOW having 3, 5, 6, or 7 stranded copper conductors. Reference Figure 2 for conductor gauge size and cable jacket diameter.

NECTOR Cable



STANDARD	CABLE		CONDUCTOR SIZE				
	NO. OF CONDUCTORS	CABLE JACKET DIAMETER	1.5 mm ²	2.5 mm ²	18 AWG	16 AWG	14 AWG
HO7RN-F	3	8-14 mm	X	X	---	---	---
	5	11-17 mm	X	X	---	---	---
	6		X	X	---	---	---
	7		X	X	---	---	---
SEOOW	3	8-14 mm	---	---	X	X	X
	5	11-17 mm	---	---	X	X	X
	6		---	---	X	X	X
	7		---	---	X	X	X

Figure 2

The cable must be prepared according to the illustration and dimensional requirements in Figure 3.



NOTE

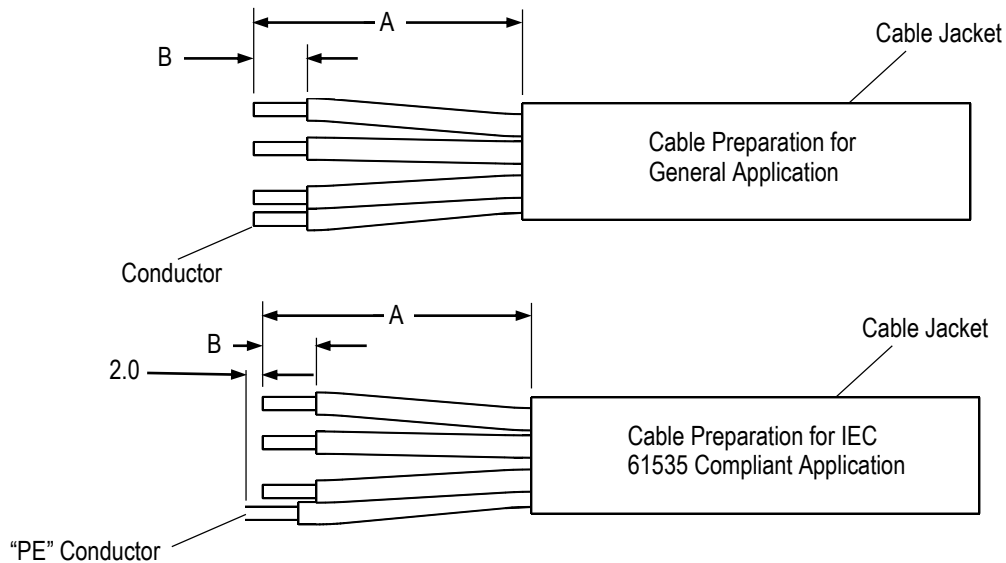
Cable jacket diameter size and strip length must be observed in order to provide reliable ingress protection seal upon connector assembly.



CAUTION

Proper strip lengths of cable jacket and conductors must be observed for the contact type used in the application. When preparing the cable jacket, reasonable care must be taken not to nick or cut the conductors insulation. Care must be taken for the conductors' preparation as follows:

- Do not nick the stranded conductors
- There must not be any remainders of the conductor insulation on the stripped conductors
- Single strands of the conductor should not be cut or pulled during stripping operation
- After removing the conductor insulation, single strands of the conductor should not protrude from the conductor bundle
- If the wire is not to be crimped immediately after preparation then the conductor end should be protected against dirt or strands separating from the conductor bundle (example: partial pull-off of insulation may be used to protect conductor end)



NOTE: For applications compliant with IEC 61535, the “PE” conductor is 2 mm longer than all other conductors. Conductor strip length (B) is the same for all conductors.

CONTACT TYPE	CABLE JACKET STRIP LENGTH (A)	CONDUCTOR STRIP LENGTH (B)
Crimp	30 mm ±0.5	5 mm
Screw Clamp	21 mm ±0.5	6 mm

Figure 3

3.5. NECTOR M-Line Connectors

A. Connectors Form Factor

The NECTOR M-Line Connectors are available in a 3-circuit form factor, and a 7-circuit form factor. In addition, 5-circuit and 6-circuit form factors are available using modified 7-circuit housings having specific circuits blocked. Each connector form factor is available in two variants as follows and shown in Figure 4.

- Panel-Mount Connectors (crimp contacts only)
- Free-Hang Connectors (crimp contacts, screw clamp contacts)

Component sizes vary depending on the selected connector form factor and variant. Reference available component drawings for size dimensions relevant to the connector application.

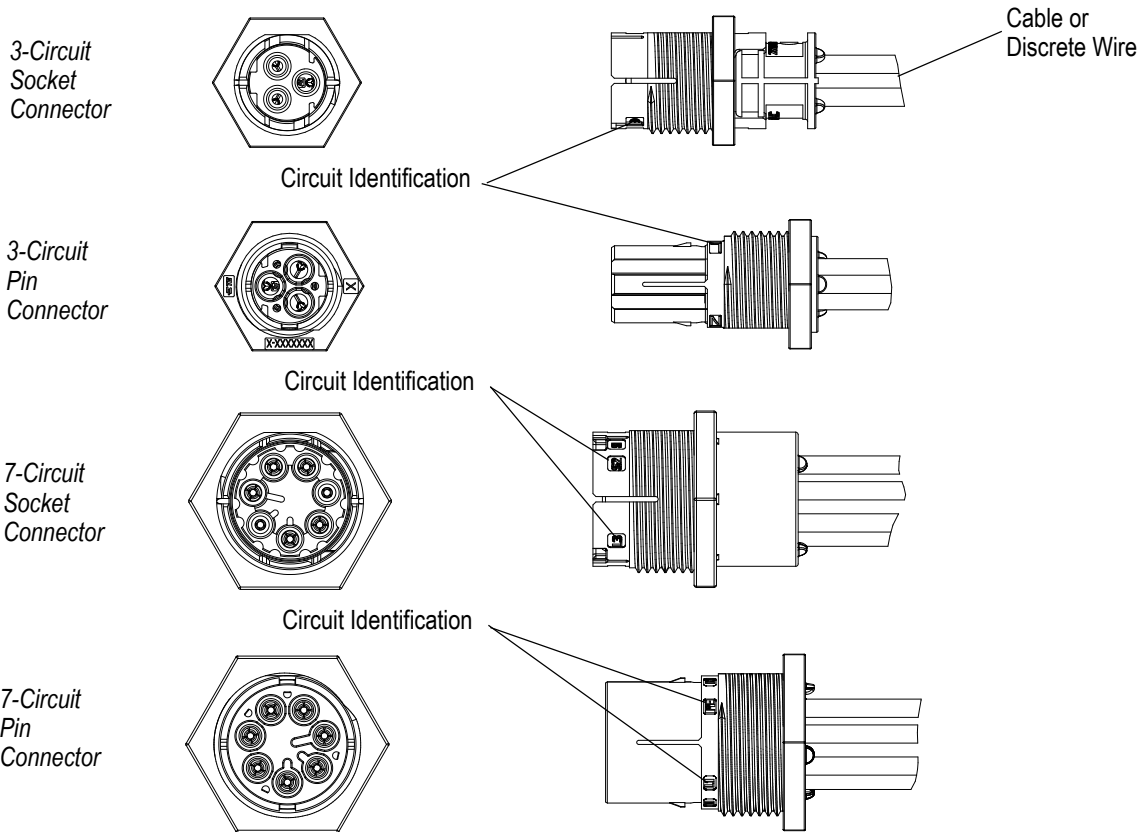
B. Circuits Identification

Molded housings for NECTOR 3-circuit and NECTOR 5/6/7-circuit connectors have alpha-numeric symbols molded on the housings to identify the circuits. NECTOR 3-circuit connectors have symbols; (earth), L, and N. The 5/6/7-circuit connector has symbols; (earth), L1, L2, L3, S1, S2, and N. These symbols are in approximate alignment with the circuit intended for that identification. The “PE” (earth) circuit provides “make first” function when connectors are coupled and “break last” when connectors are separated. Also, the “PE” (earth) circuit provides a convenient alignment reference when assembling connector components.

NECTOR M-Line 3-circuit connectors are intended to have 3 contacts installed into the connector. There are no provisions in the connector design to ensure mating corresponding pin/socket circuits if fewer than 3 contacts are used.

NECTOR M-Line 5/6/7-circuit connectors accommodate up to 7 contacts (circuits) and have provisions to allow 5-contact assemblies and 6-contact assemblies. Separate housing components are available to assemble 5-contact connector, 6-contact connector, or 7-contact connector. Selecting the corresponding housing components ensures mating of corresponding pin/socket circuits.

NECTOR M-Line Panel-Mount Connectors



NECTOR M-Line Free-Hang Connectors

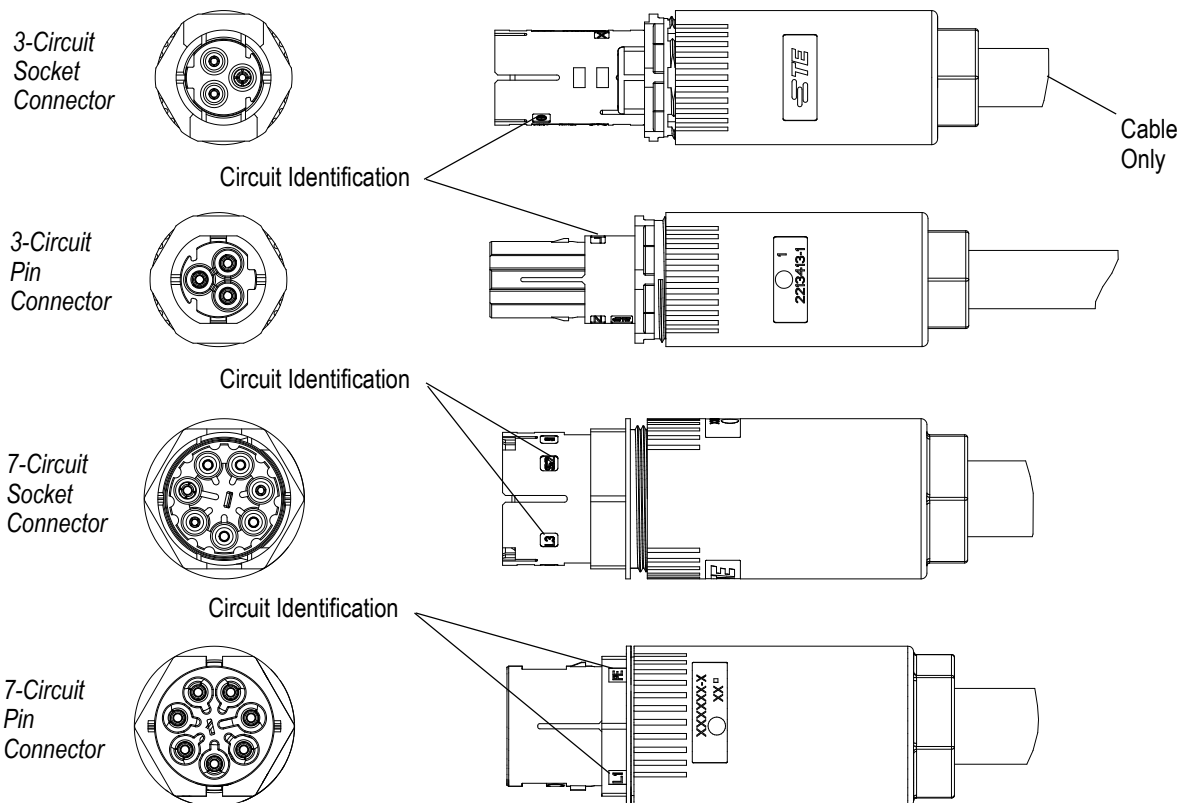


Figure 4



NOTE

When appropriate housing components are used, NECTOR 5/6/7 connectors will only mate to corresponding connectors (pin or socket) having the same contact configurations (example: 5-contact pin connector will only mate to 5-contact socket connector).

To ensure proper mating contacts alignments for the different circuit number connectors (5, 6, or 7), specific contacts positions must be observed, as shown in Figure 5.

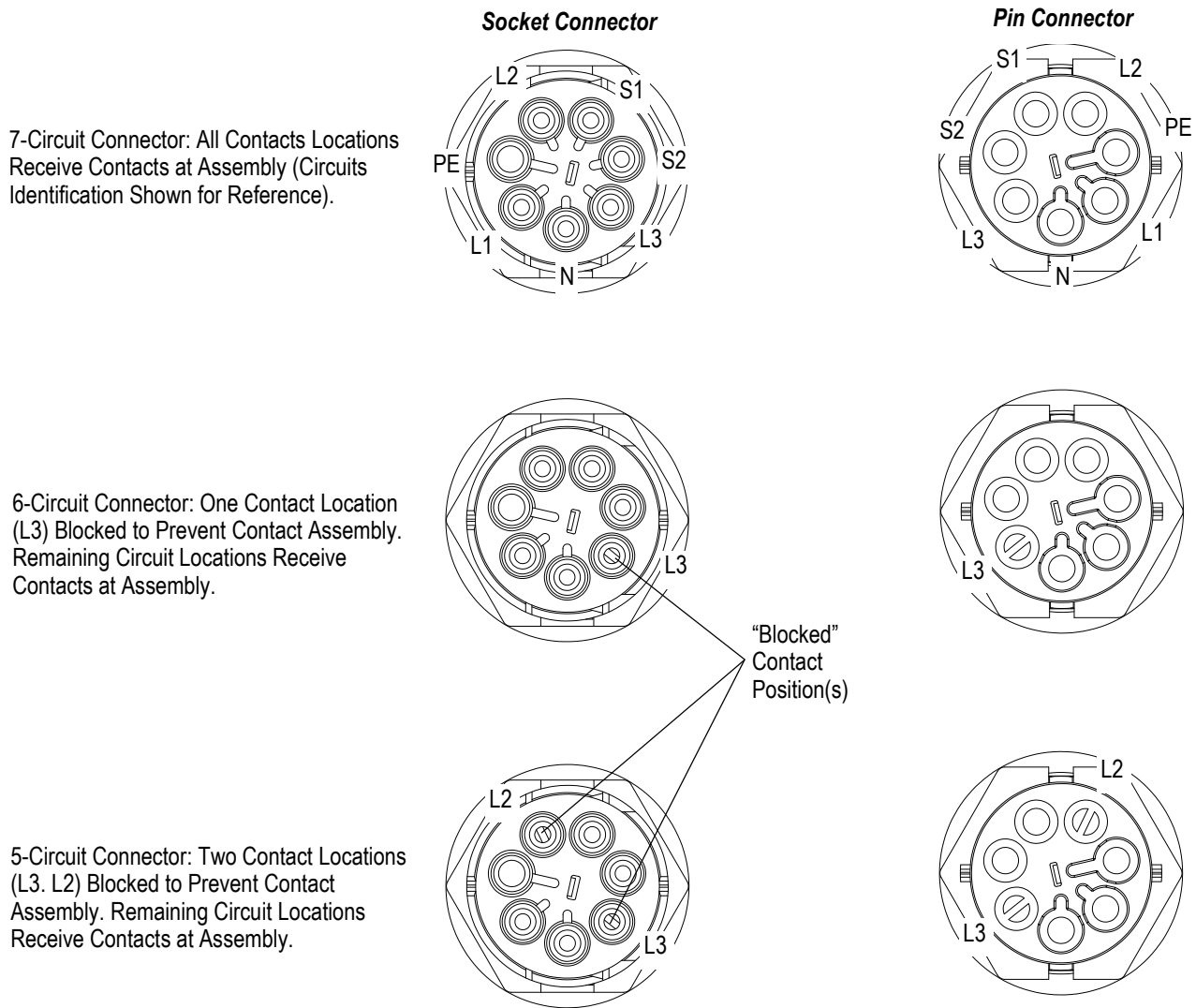


Figure 5

3.6. Connector “Keying” Codes

The mating connector housings have mechanical features (“keying” codes) at the mating interfaces to ensure alignment of corresponding circuits upon pin/socket mating. These features are fixed in the housings and restrict pin/socket connector mating to similarly coded connectors. A number of coding variations are available for each form factor connector, as shown in Figure 6. The “keying” code must be selected when selecting the connector housing form factor and number of circuits.



NOTE

Keying codes must be selected when selecting connector housings. The various keying codes are fixed on the selected housing and can only be changed by selecting different housing components. Mating pin/socket connectors must have the same keying code.

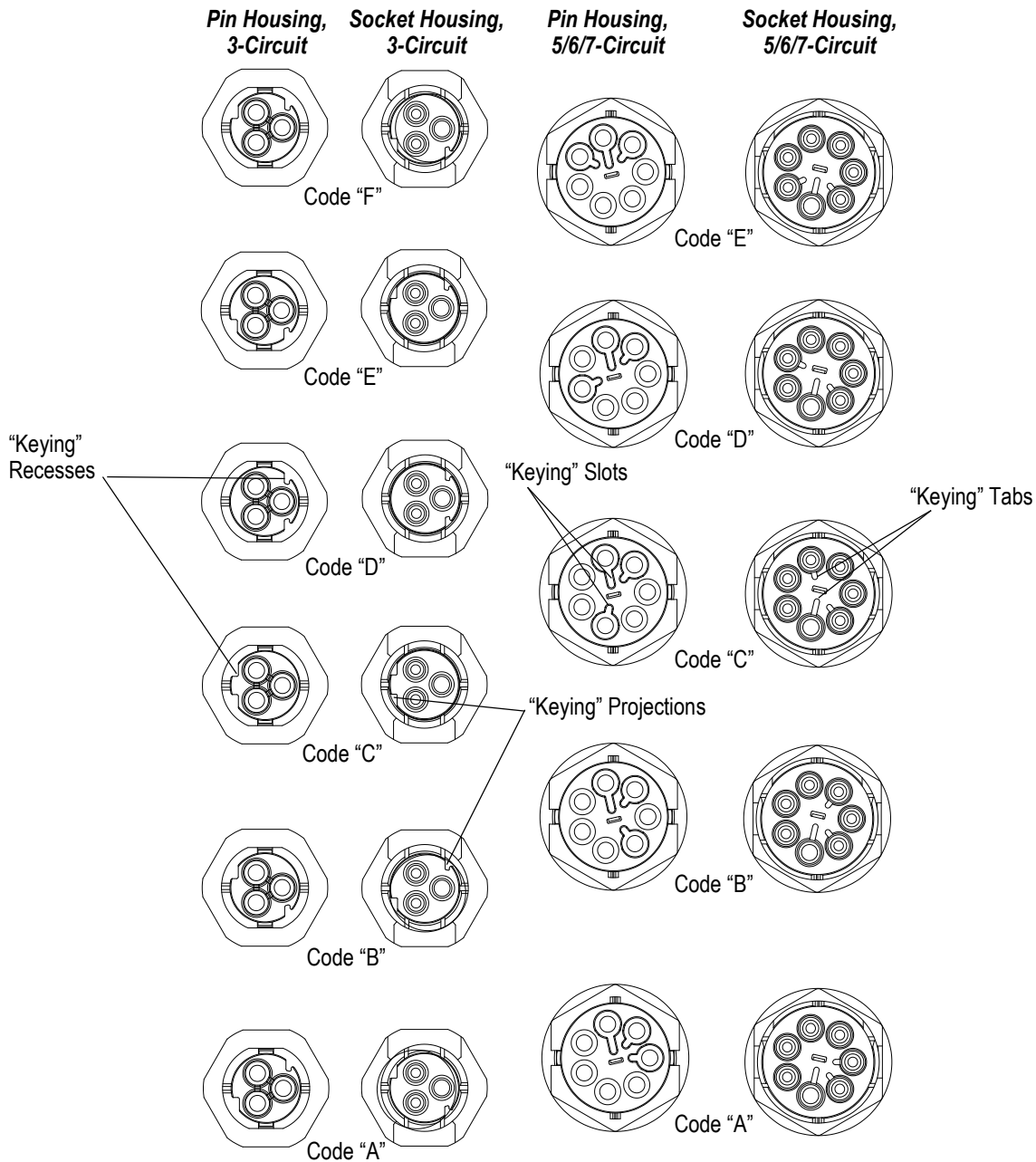


Figure 6

3-circuit form factor connector housings are available in 6 keying code options; A thru F. The keying is accomplished by different sized recesses or projections molded into the front connector housing. The various keying codes are accomplished by changing the combinations of the keying recesses/projections.

7-circuit form factor connector housings are available in 5 keying code options; A thru E. The keying is achieved by different length protruding tabs on socket housings and corresponding slots on pin housings. Three tab/slots are used at two different lengths ("long", "short"). One "long" tab/slot is always located on the "PE" circuit. One "short" tab is always on the "L1" circuit (next to PE circuit). A third slot/tab (short length) is placed on one of the remaining 5 circuits. 5 keying codes are determined by the location of the third tab/slot.

3.7. Crimp Contacts

NECTOR M-Line crimp contacts have a tubular barrel for crimping onto stranded copper conductor. Contacts are provided loose-piece and are available for wire conductor sizes shown in Figure 7. The crimp is a “4/8-indent” style commonly used on tubular crimp barrel contacts. Use hand tool P/N 601967-1 to crimp the contacts to wires. Optional contact positioning tool 2280173-1 attaches to the hand tool for easy positioning of contacts in the crimp tool.

WIRE SIZE	TOOL SELECTOR NO.
1.5 mm ²	6
2.5 mm ²	7
18 AWG	5
16 AWG	6
14 AWG	7

NOTE: Ensure that crimp tool is set according to wire size or corresponding tool selector number (“SEL NO.” on selector dial) as shown in Figure 8.

Figure 7

A. Crimping Procedure

Crimp the contact onto appropriate size stranded conductor according to the following steps:

1. Prepare the wires (cable) as described in Paragraph 3.4; and Figures 2 and 3.
2. Set the crimp tool “SELECTOR” position to the wire size being crimped (or, use tool selector number as given in Figure 7).
3. Insert the mating end of the contact (pin or socket) into the indenter from the front of the crimp tool (as shown in Figure 8). Align the crimp barrel with the four crimp anvils of the tool so that the crimp barrel wire entry protrudes slightly from the indenter to allow wire insertion.
4. Carefully squeeze the tool handles to close the crimp anvils enough to grip the contact crimp barrel and hold it in position to receive the wire.
5. Insert the prepared wire into the contact barrel, taking care not to bend or damage the wire strands.
6. With the contact and wire in place, squeeze the handles until they stop in the fully closed position, crimping the contact barrel to the wire.
7. Release the handles and remove the crimped contact from the crimp tool.

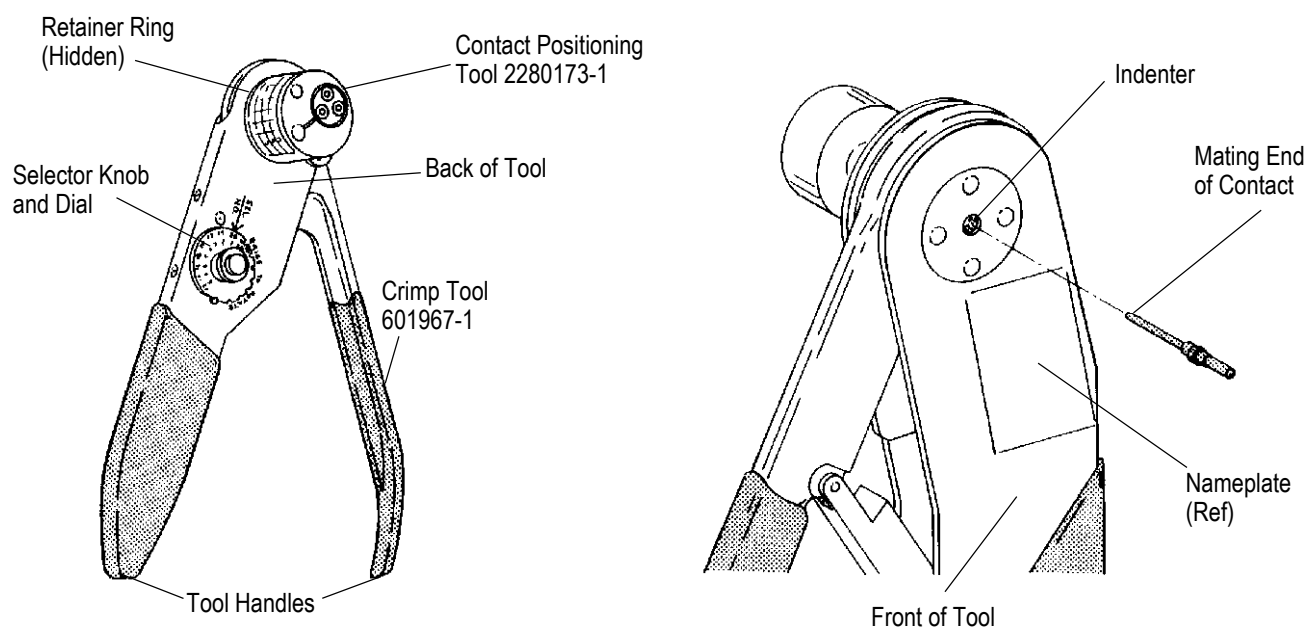


Figure 8

i NOTE
 Consistent contact crimp barrel positioning in the crimp tool is most easily obtained by using optional contact positioning tool 2280173-1.

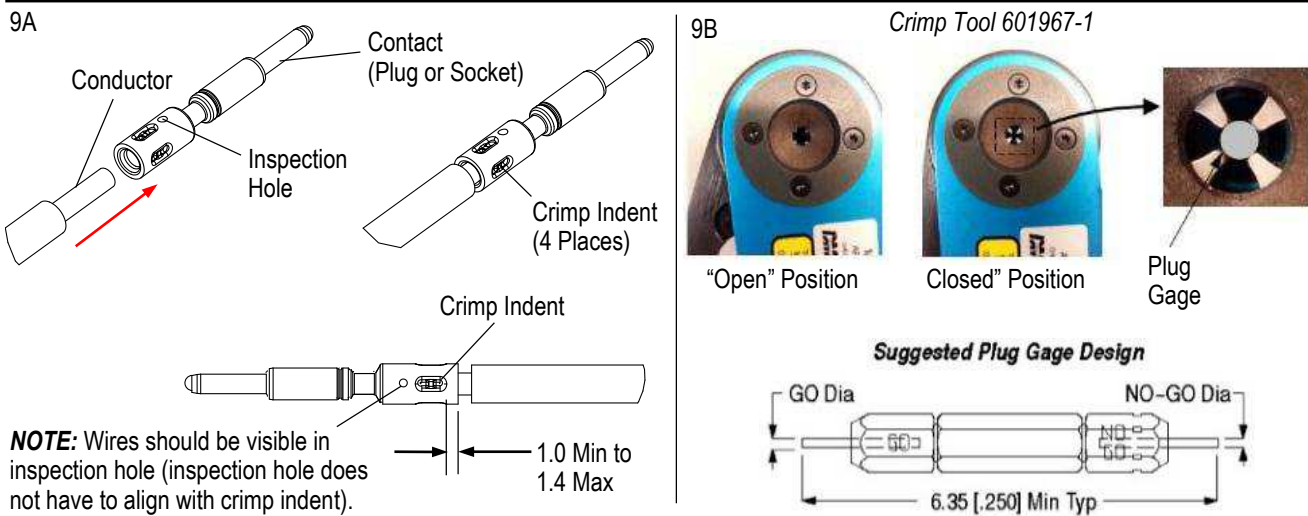
i NOTE
 The hand tool uses a ratchet mechanism in the handles to ensure proper crimping of the contacts. The ratchet mechanism will not release until the tool handles have been fully closed.

The completed crimp is to appear as shown in Figure 9A.

B. Crimp Quality

Crimp quality is determined by proper “SELECTOR” number setting on the crimp tool, and by maintaining required gage calibration of the crimp tool indent anvils. The indent anvils are gaged using a cylindrical “GO/NO GO” plug gage, as shown in Figure 9B. The gaging is done with the hand tool held completely closed. Gaging of the indent anvils should be done before performing any crimps, periodically during use, and, at any time the “SELECTOR” setting is changed.

! CAUTION
 The crimp anvils closed size cannot be adjusted except by tool selector setting. Do not use tool if it does not meet “GO/NO-GO” size for the tool selector setting.



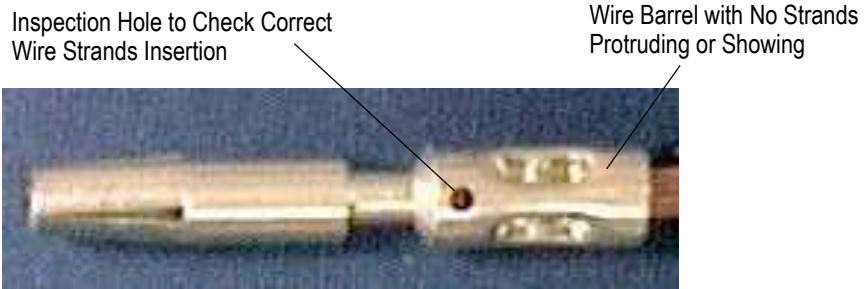
TOOL (MILITARY SPEC)	TOOL SELECTOR SETTING	GAGE ELEMENT DIAMETER ±0.003 [.0001]	
		GO	NO-GO
601967-1 (MIL-C-22520/1-01) and 608668-1	1	0.71 [.028]	0.84 [.033]
	2	0.81 [.032]	0.94 [.037]
	3	0.91 [.036]	1.04 [.041]
	4●	0.99 [.039]●	1.12 [.044]●
	5	1.14 [.045]	1.27 [.050]
	6	1.32 [.052]	1.45 [.057]
	7	1.50 [.059]	1.63 [.064]
	8	1.73 [.068]	1.85 [.073]

●Use for periodic general inspection.

Figure 9

C. Other Requirements

Under no circumstances should the insulation materials be within the wire crimp barrel. All existing wire strands must be enclosed within the wire barrel. Any stranding outside the crimp barrel or broken strands outside the wire crimp are not permissible. See Figure 10.



Socket Shown for Ref Only

Figure 10

D. Wire Pull Out Force

The measuring of the wire pull out forces from the wire crimp is carried out as a supporting manufacturing control. See Figure 11.

WIRE SIZE		CRIMP TENSILE [N] (MINIMUM VALUES)
18 AWG	---	100
16 AWG	---	150
---	1.5 mm ²	200
14 AWG	---	250
---	2.5 mm ²	300

Figure 11

3.8. Screw Clamp Contacts

A. Wire Requirements and Preparation

The NECTOR M-Line screw clamp contacts have a wire barrel sized to accept stranded conductor sizes in the range of 14 AWG (1.8 mm diameter) through 18 AWG (1.2 mm diameter). Reference Figure 2 for recommended cable types. The cables are prepared by removing the cable jacket to distance specified in Figure 3, and individual conductors' insulation is stripped to a length also given in Figure 3.



NOTE

The cable/conductors preparation lengths for screw clamp contacts are different from those requirements for crimp style contacts. Ensure that correct preparation lengths are used for the contacts style (see Figure 3).

B. Screw Clamp Wire Connection

Wire connection to NECTOR M-Line screw clamp contacts is accomplished with a clamping screw that is pre-installed in the contact. The screw has a 1.5 mm hex drive recess.

Insert exposed stranded conductor into contact wire barrel. Ensure the conductor goes past the clamp screw as shown in Figure 12. If the conductor cannot be inserted past the clamp screw, then use 1.5 mm hex drive tool to back the screw 1~2 turns and provide a wider opening for the conductor. A properly prepared conductor has the insulation stripped to the length specified in Figure 3. When the wire is inserted into the contact, the conductor insulation should align with the edge of the wire barrel opening.

With the conductor inserted into the wire barrel, tighten the clamp screw using a 1.5 mm hex drive tool. The tightening torque should be at least 0.25 N-m for sufficient clamping of the conductor.



CAUTION

Do not exceed 0.35 N-m torque on the screw clamp, to avoid damaging the contact or screw.

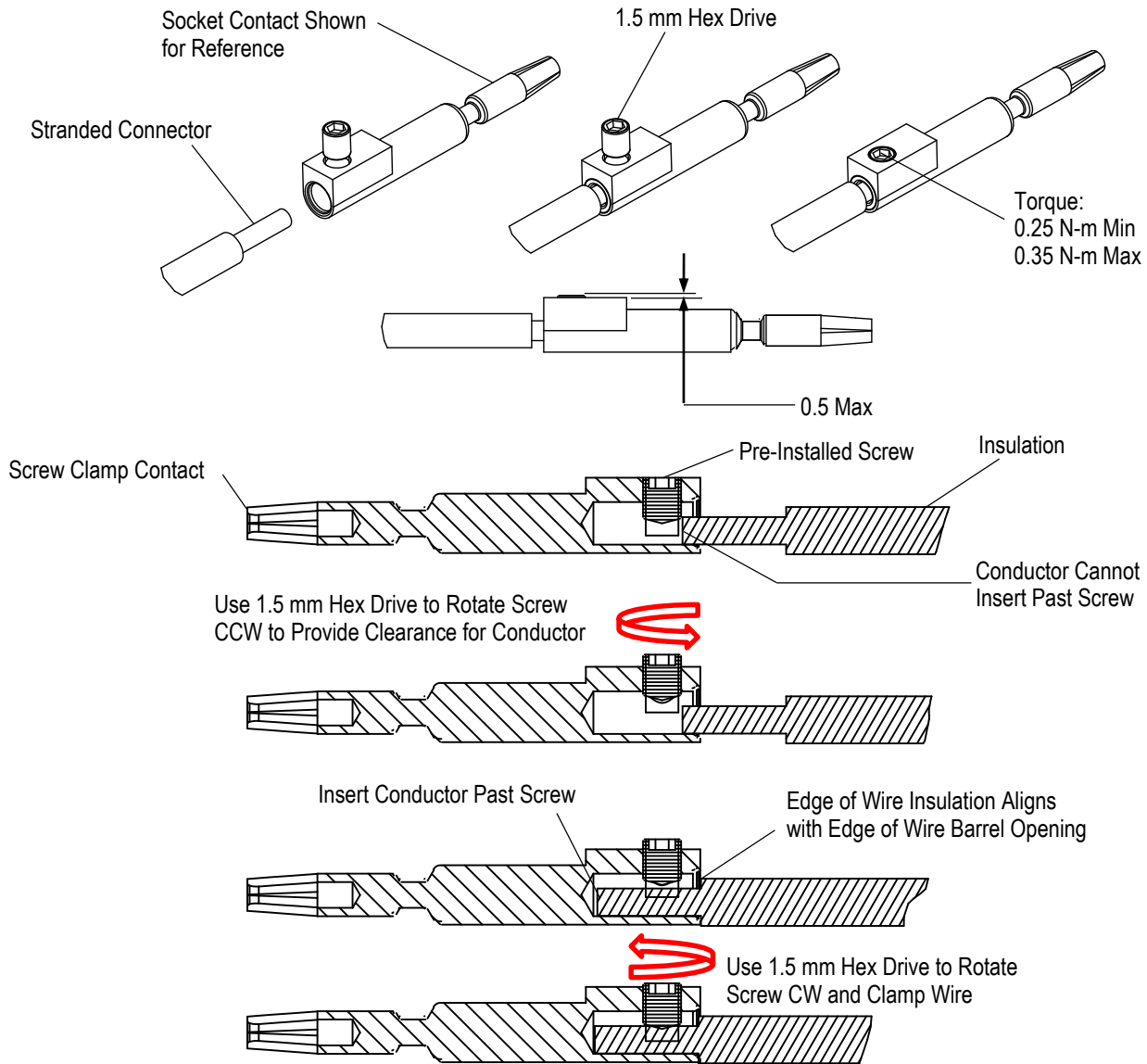


Figure 12

3.9. Connector Assembly

The NECTOR 3 and NECTOR 5/6/7 have 3 connector variants as follows:

- ◆ Panel-Mount Connector (crimp contacts only)
- ◆ Free-Hang Connector, crimp contacts
- ◆ Free-Hang Connector, screw clamp contacts

The assembly procedure is slightly different for each connector variant and is explained in the following paragraphs.



NOTE

To ensure proper mating contacts alignments for the different circuit number connectors (5, 6, or 7), specific contact assembly positions must be observed, as shown in Figures 5 and 14.

A. Contacts Positioner Assembly

NECTOR contacts (pin/socket) must be assembled to the contact “Positioner” component before final assembly into the connector housing. The contacts positioner assembly can be made with discrete wires (panel-mount) or wires contained within a cable (free-hang, panel-mount).


NOTE

Select the appropriate “Positioner” component for Panel-Mount or Free-Hang connector assembly.

Crimp contacts are provided separately from the positioner component and must be crimped onto wires before assembly to the positioner.

Screw clamp contacts are provided pre-assembled to the contact positioner and are intended for wire connections to be made while contacts are assembled to the positioner. However, the screw clamp contacts may be removed from the positioner to facilitate wire connections and then re-assembled to the positioner. The following procedure to assemble contacts to the positioner is specific to crimp contacts, but, is also applicable for screw clamp contacts, if removed from positioner component.


NOTE

Refer to the specific customer drawing for component part numbers, allowable conductor sizes, and contact part numbers for the intended connector assembly. Refer to Paragraph 3.4 for Cable Selection and Preparation; Paragraph 3.7.A for Crimping Procedure; Paragraph 3.7.B for Crimp Quality; and Paragraph 3.8.B for Screw Clamp Wire Connection.

After crimping contacts onto the conductors (discrete/cable) the contacts are assembled to the plastic “positioner” component as shown in Figure 13.

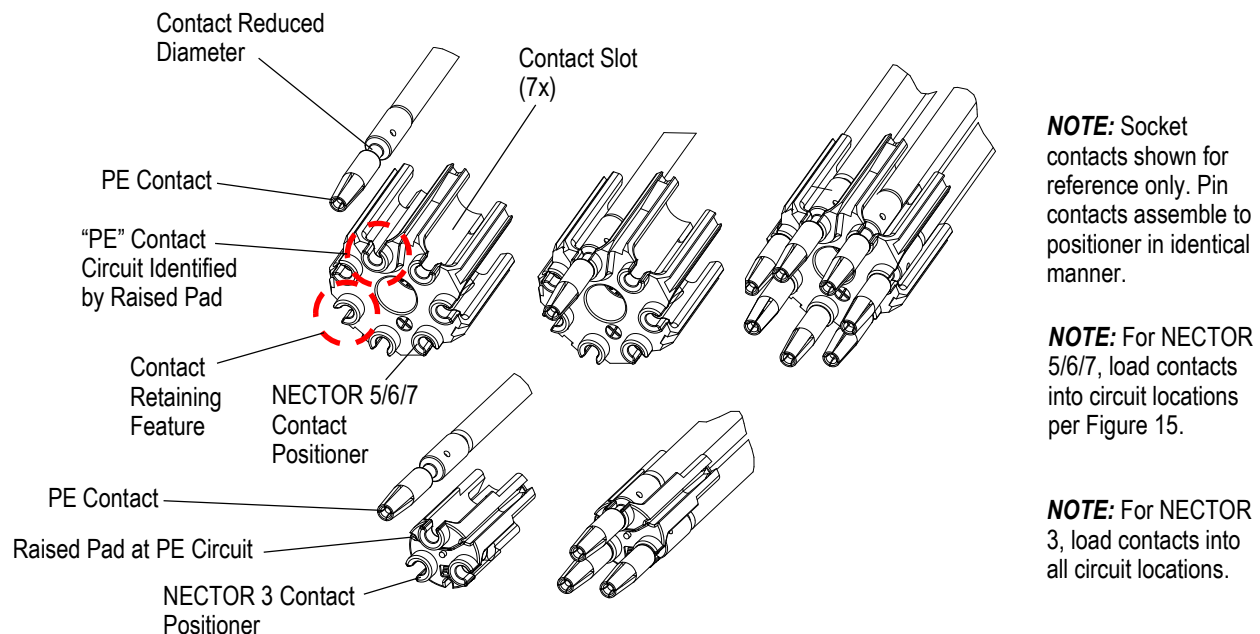


Figure 13

The contacts (pin/socket) are retained in the positioner component by “snap fit” of the contact “reduced diameter” into corresponding retaining features in the positioner. Assemble contacts to the positioner as follows:

1. Start with PE contact and identify corresponding PE “contact slot” on Positioner component (raised pad, Figures 13 & 14).
2. Place the contact crimp barrel in a “contact slot” in the positioner component. Orient the contact so the “reduced diameter” portion aligns with the “contact retaining feature” in the positioner (see Figure 13).
3. With the contact partially assembled to the positioner, apply finger pressure to the reduced diameter area of the contact to “snap” the contact into the positioner retaining feature
4. Repeat this assembly procedure for each Positioner “contact slot” to receive a contact, maintaining corresponding contact/positioner circuit assignments “L”, “S”, and “N” per Figure 14.

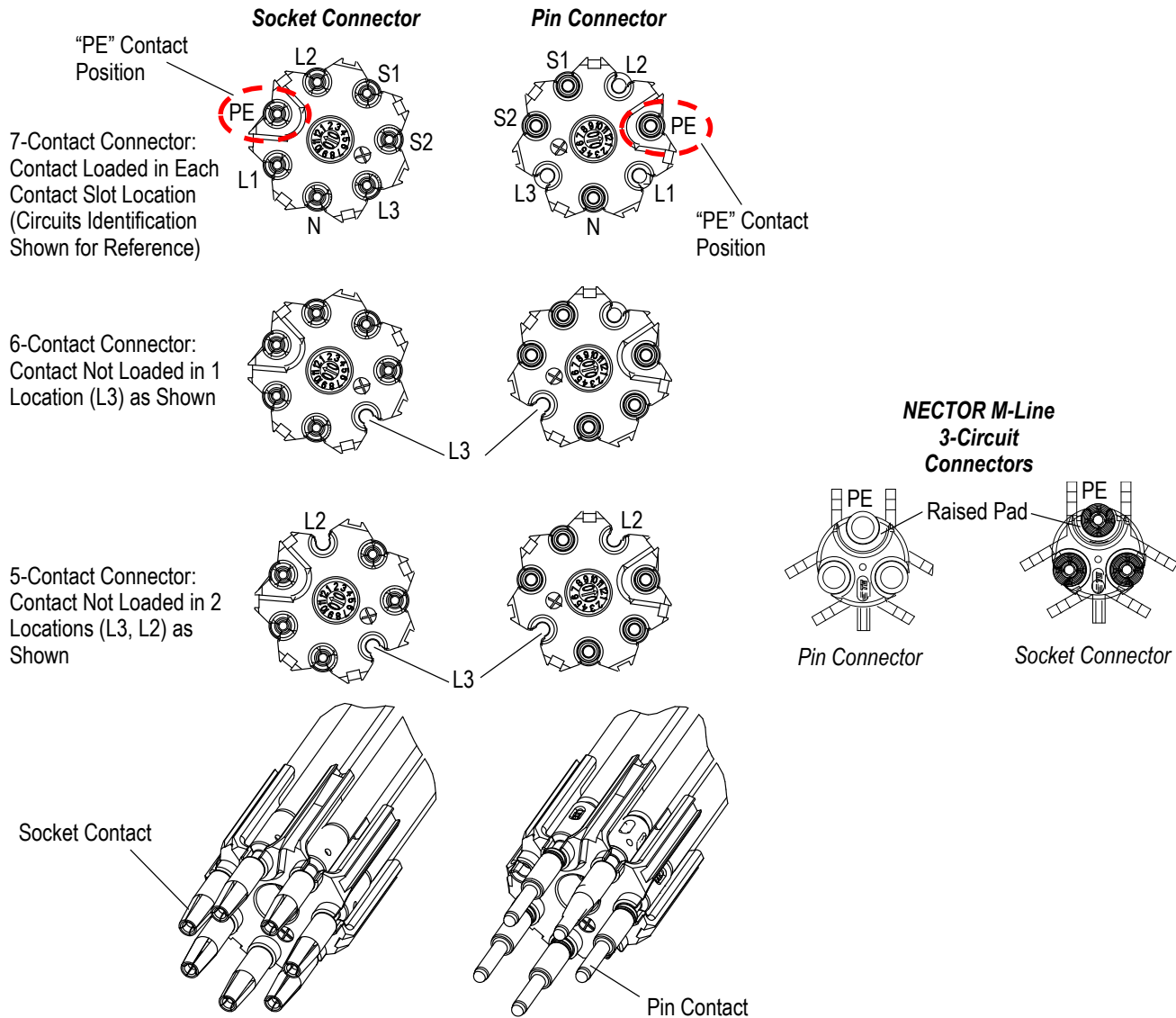


Figure 14

For a 7-contact assembly, load a contact into each contact slot of the positioner. For 5-contact and 6-contact assemblies, load contacts into the positioner contact slot locations as shown in Figure 14.


NOTE

The PE contact slot is identified by a raised pad at the “contact retaining feature” (see Figures 13, 14). The raised pad causes the PE contact to be positioned 1mm ahead of the remaining contacts, and ensures the “make first/ break last” functionality of the PE contact. This PE circuit raised pad feature is on 3-contact positioners and 7-contact positioners.


NOTE

The “contacts positioner assembly” procedure described above is identical for NECTOR M panel-mount connectors and free-hang connectors. However, the positioner component part number will vary depending on the type of connector being assembled. Refer to the specific customer drawing to select correct positioner part number for each type connector assembly.

3.10. Panel-Mount Connector Assembly

Select the appropriate panel-mount housing, positioner, and contacts from the components Customer Drawings.

**NOTE**

NECTOR M-Line panel-mount connectors are only approved for use with crimp-style contacts.

Crimp the contacts onto the wire/cable conductors (see Paragraph 3.7.A) and assemble contacts to the positioner component to form a Contacts Positioner Assembly (See Paragraph 3.9.A) for the intended connector assembly. The housing selection is based upon:

- ◆ Number of circuits (3, 5, 6, or 7)
- ◆ Contact type (Pin or Socket)
- ◆ Polarizing “Code” (A, B, C, D, E, F)

The Contacts Positioner Assembly must have the same number and type (pin/socket) of contact circuits as the selected housing.

The NECTOR M-Line panel-mount connectors are assembled by inserting a contact positioner assembly into the panel-mount housing, as shown in Figure 15 (NECTOR M 3-circuit) and Figure 16 (NECTOR M 5/6/7-circuit).

Assemble the panel-mount connector as follows:

1. Select appropriate connector housing (pin or socket) for the intended connector assembly.
2. Align the PE circuit on the NECTOR front housing with the PE contact of the positioner assembly.

**NOTE**

Reference Figure 14 for identification of PE circuit on NECTOR M 5/6/7-circuit product and NECTOR M 3-circuit product.

3. Insert the contacts positioner assembly into the connector housing, taking care to align the “alignment recesses” with corresponding raised features inside the connector housing.
4. Resistance will be felt as the flex latches on the positioner engage protruding latch features inside the connector housing. Apply pressure to the positioner to fully engage positioner/housing latches. An audible “click” will be heard when the latches fully engage.

**NOTE**

NECTOR M 3-circuit and NECTOR M 5/6/7-circuit panel-mount connectors are not intended to be dis-assembled. Ensure correct components are selected prior to assembly.

Panel-mount connectors are installed into mounting panel as follows (ref Figure 15, applies to NECTOR M 3-circuit and NECTOR M 5/6/7-circuit):

5. Prepare mounting panel with appropriate sized “D” hole (reference Pin Housing or Socket Housing drawing for detailed dimensions).
6. Place mounting panel seal against hex flange of connector housing.
7. Align “flat” surface on connector housing threads with “flat” in mounting panel “D” hole and insert connector into mounting panel.
8. Assemble threaded hex nut onto connector housing threads protruding through panel to complete the installation. Tighten the hex nut to a torque of 1.0 N-m.

NECTOR M 3-Circuits Panel-Mount Assembly

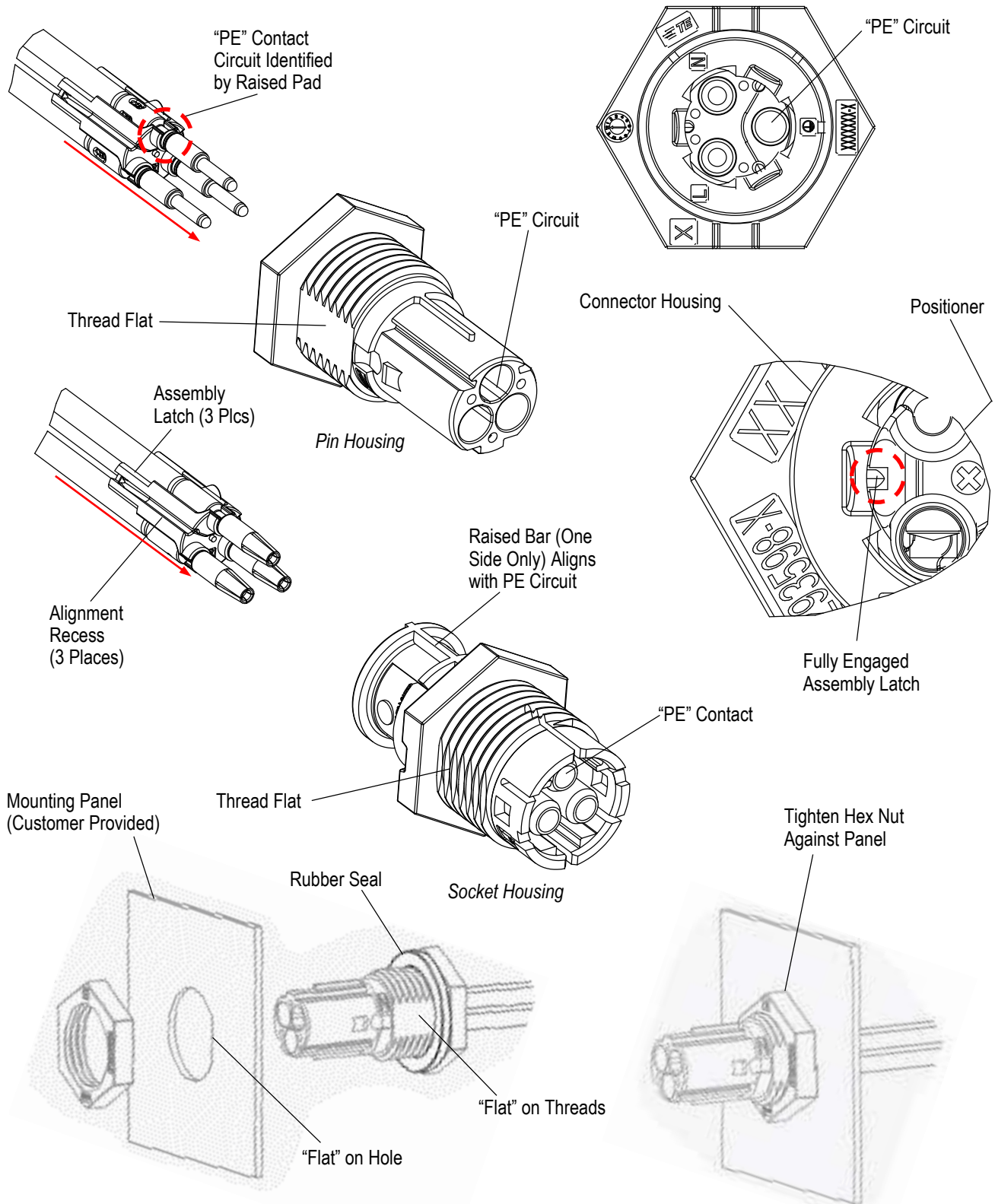


Figure 15

NECTOR M 5/6/7 Circuits Panel-Mount Assembly

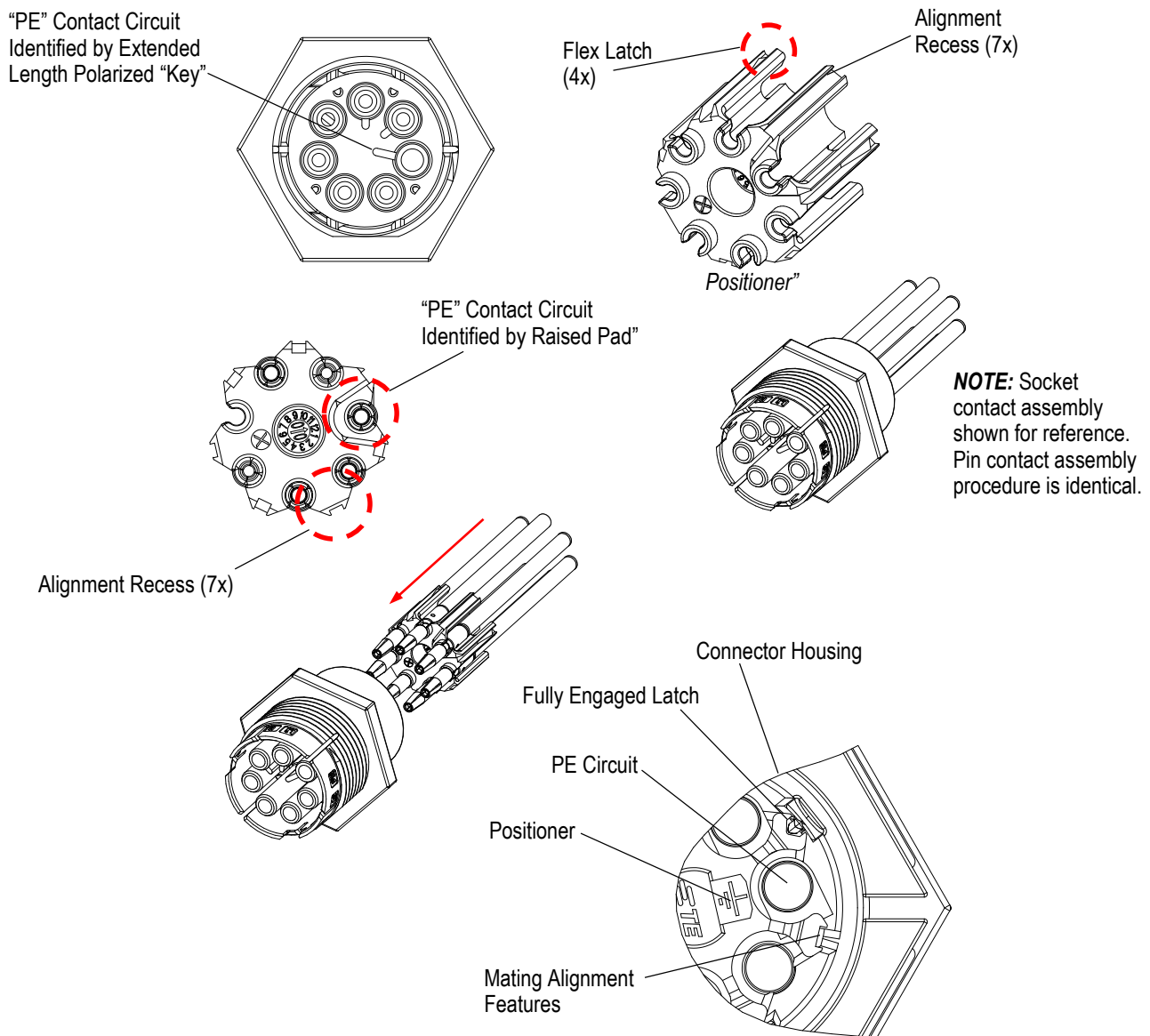


Figure 16

3.11. Free-Hang Connector Assembly; Crimp Contacts

The NECTOR M-Line free-hang connectors are assembled in a similar manner to the panel-mount connectors. However, additional components are used to secure the cable to the connector and to seal the cable interface against water ingress. Also, the connector housing components have different features to identify the PE circuit.



NOTE

NECTOR M-Line free-hang connectors must not be assembled using discrete wires. Recommended cables are specified in Paragraph 3.4 and Figure 2.

The additional components are "ring nut" and "cable clamp assembly". These components are available in two part number versions. Each part number version has a different size cable entry opening to accommodate a range of cable jacket diameters. The ring nut and cable clamp assembly act to retain the cable to the connector housing, and, prevent water ingress at the cable entry and threaded junction of the front connector housing. See Figure 17.


NOTE

Do not mate pin/socket connectors until each connector is fully assembled.

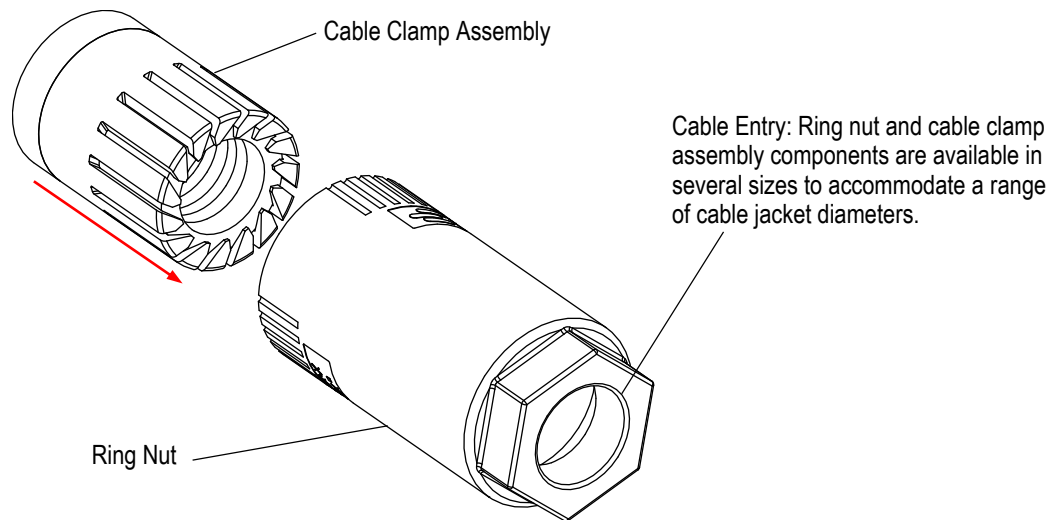


Figure 17

A. NECTOR M-Line 5/6/7 Circuits

NECTOR M-Line 5/6/7 circuits' free-hang connector assembly using crimp contacts is assembled as follows (see Figures 18 and 19):

1. Select appropriate connector housing (pin or socket), positioner, cable clamp, ring nut, and contacts for the intended connector assembly (refer to the components Customer Drawings).
2. Prepare cable per Paragraph 3.4.
3. Crimp contacts to conductors with instructions provided in Paragraph 3.7.A.
4. Place "ring nut" over cable jacket (orient as shown in Figure 18, 19).
5. Place "cable clamp" over cable jacket (orient as shown in Figure 18, 19).
6. Assemble crimped conductors to positioner component to form "contacts positioner assembly" per Paragraph 3.9.A.
7. Align PE circuit on the NECTOR front connector housing with the PE contact of the positioner assembly.
8. Insert the contacts positioner assembly into the connector housing, taking care to align the positioner "alignment recesses" with corresponding features on connector housing.
9. Resistance will be felt as the flex latch on the positioner engages the corresponding protruding latch feature inside the connector housing. Apply pressure to the positioner to fully engage positioner/housing latch. An audible "click" will be heard when the latch fully engages.
10. Move the cable clamp component axially along cable and into position against the connector housing.
11. Move the ring nut component axially along cable to the connector housing. Carefully engage the threaded ring nut with the corresponding thread on the connector housing. Do not force the thread engagement, otherwise the assembly components may "cross thread" and damage the assembly components.
12. When the threads are fully engaged, rotate the ring nut onto the connector housing. The ring nut will apply pressure on the cable clamp components and provide the water ingress seal and cable strain relief. Apply a torque of 3.3-3.5 N-m to the ring nut to complete the assembly.

NECTOR M 5/6/7 Socket Connector Assembly, Free-Hang

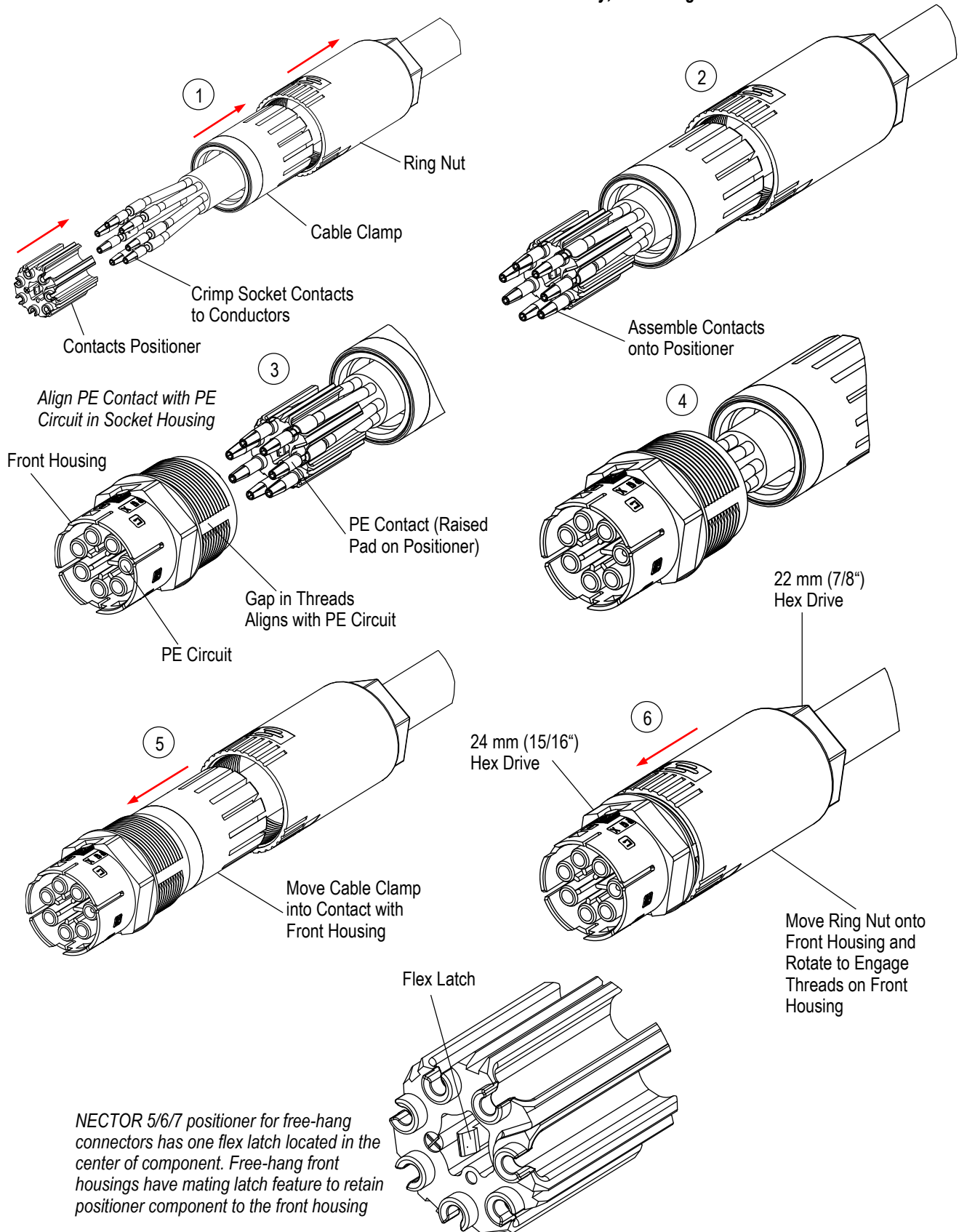


Figure 18

NECTOR M 5/6/7 Pin Connector Assembly, Free-Hang

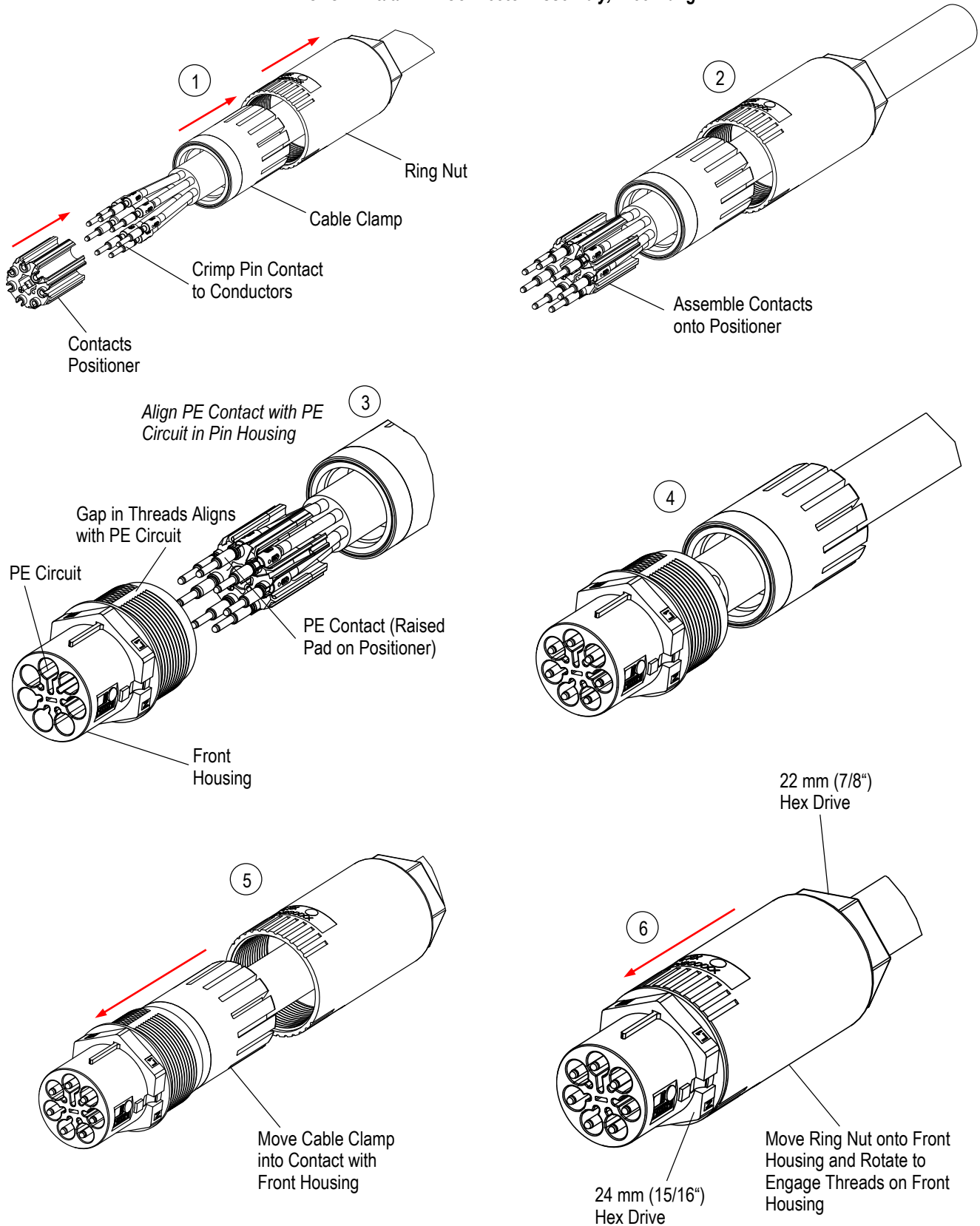


Figure 19

13. The connector assembly may be made “non-reworkable” by applying quick-setting adhesive to threads of connector housing before assembly of “ring nut” component, as shown in Figure 20. Recommended adhesives are:

- Loctite 414 Super Bonder
- Loctite 401 Prism (Loctite 770 Prism primer may be used with Loctite 401 adhesive)

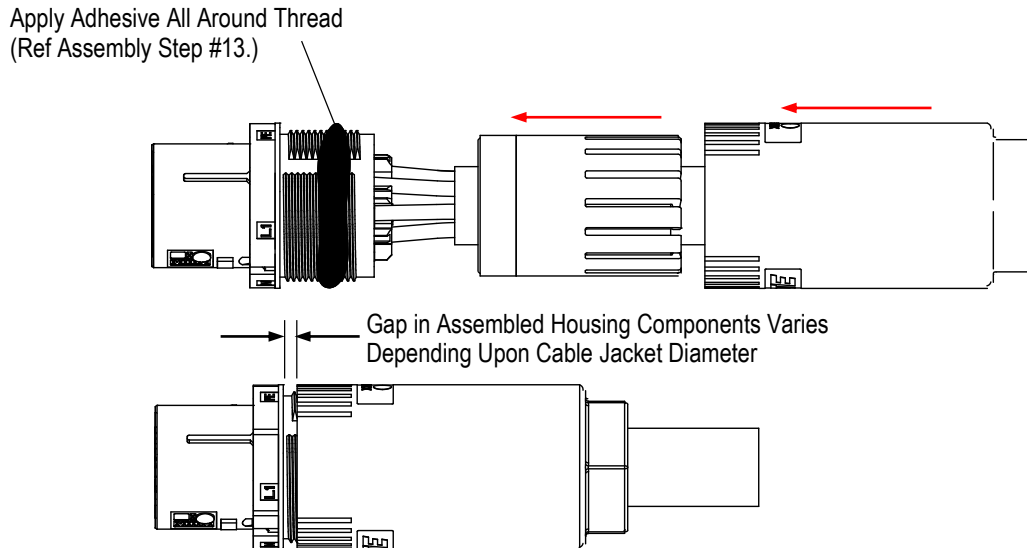


Figure 20

B. NECTOR M-Line 3 Circuits

NECTOR M-Line 3-circuits free-hang connector using crimp contacts is assembled as follows (see Figures 21, 22, 23):

1. Select appropriate connector housing (pin or socket), positioner, cable clamp, ring nut, and contacts for the intended connector assembly (refer to the components Customer Drawings).
2. Prepare cable per Paragraph 3.4.
3. Crimp contacts to conductors with instructions provided in Paragraph 3.7.A.
4. Place “ring nut” over cable jacket. (Orient as shown in Figures 22, 23.)
5. Place “cable clamp” over cable jacket. (Orient as shown in Figures 22, 23.)
6. Assemble crimped conductors to positioner component to form “contacts positioner assembly” per Paragraph 3.9.A.
7. Align PE circuit on the NECTOR front housing with the PE contact of the positioner assembly. The 3-circuit free-hang positioner has a protruding feature in-line with the PE contact for easy identification (see Figure 21).
8. Insert the contacts positioner assembly into the connector housing, taking care to align the positioner protruding “key” (Figure 21) with corresponding slot in connector housing.
9. Resistance will be felt as the flex latches (6 places) on the positioner engage the corresponding latch recess features inside the connector housing. Apply pressure to the positioner to fully engage positioner/housing latches. An audible “click” will be heard when the latches fully engage.
10. Move the cable clamp component axially along the cable and into position against the connector housing.

Loctite and Super Bonder are trademarks.

11. Move the ring nut component axially along the cable to the connector housing. Carefully engage the threaded ring nut with the corresponding thread on the connector housing. Do not force the thread engagement, otherwise the assembly components may “cross thread” and damage the assembly components.

12. When the threads are fully engaged, rotate the ring nut onto the connector housing. The ring nut will apply pressure on the cable clamp components and provide the water ingress seal and cable strain relief. Apply a torque of 1.8-2.0 N-m to the ring nut to complete the assembly.

13. To prevent connector dis-assembly, apply quick-setting adhesive to threads of connector housing before assembly of “ring nut” component, as shown in Figure 20. Recommended adhesives are:

- Loctite 414 Super Bonder
- Loctite 401 Prism (Loctite 770 Prism primer may be used with Loctite 401 adhesive)

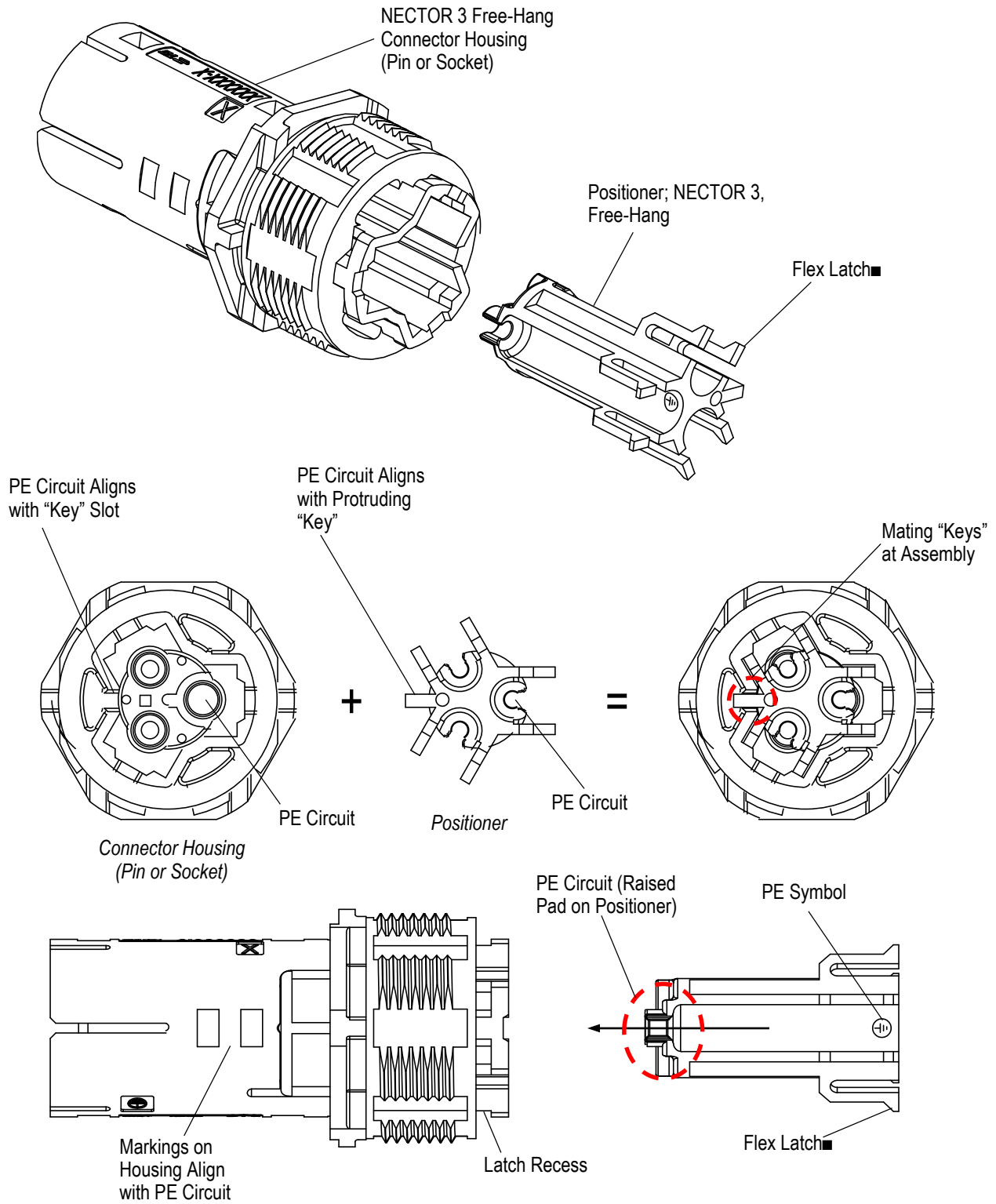
3.12. NECTOR M 7P PCB Header

Assembly procedure for the PN 2307526-X onto a PCB and into the panel is shown below:

1. Align the polarization feature and insert the socket connector PN 2307526-X on the PCB (reference drawing for polarization alignment feature).
2. Prepare mounting panel with appropriate sized hole (reference drawing for PN 2307526-X).
3. Place o-ring in the o-ring groove of the PCB header
4. Place o-ring flange against panel with the socket header sticking through the panel cut-out.
5. Assemble threaded hex nut onto connector housing threads protruding through panel to complete the installation. Tighten the hex nut to a torque of 1.0 N-m.

Loctite and Super Bonder are trademarks.

NECTOR M 3-Circuit, Free-Hang, Positioner/Housing Assembly Features



CAUTION

Do not handle positioner by flex latches when assembling the contacts onto the positioner and when inserting the positioner into the housing.

Figure 21

NECTOR M 3-Circuit Socket Connector Assembly, Free-Hang

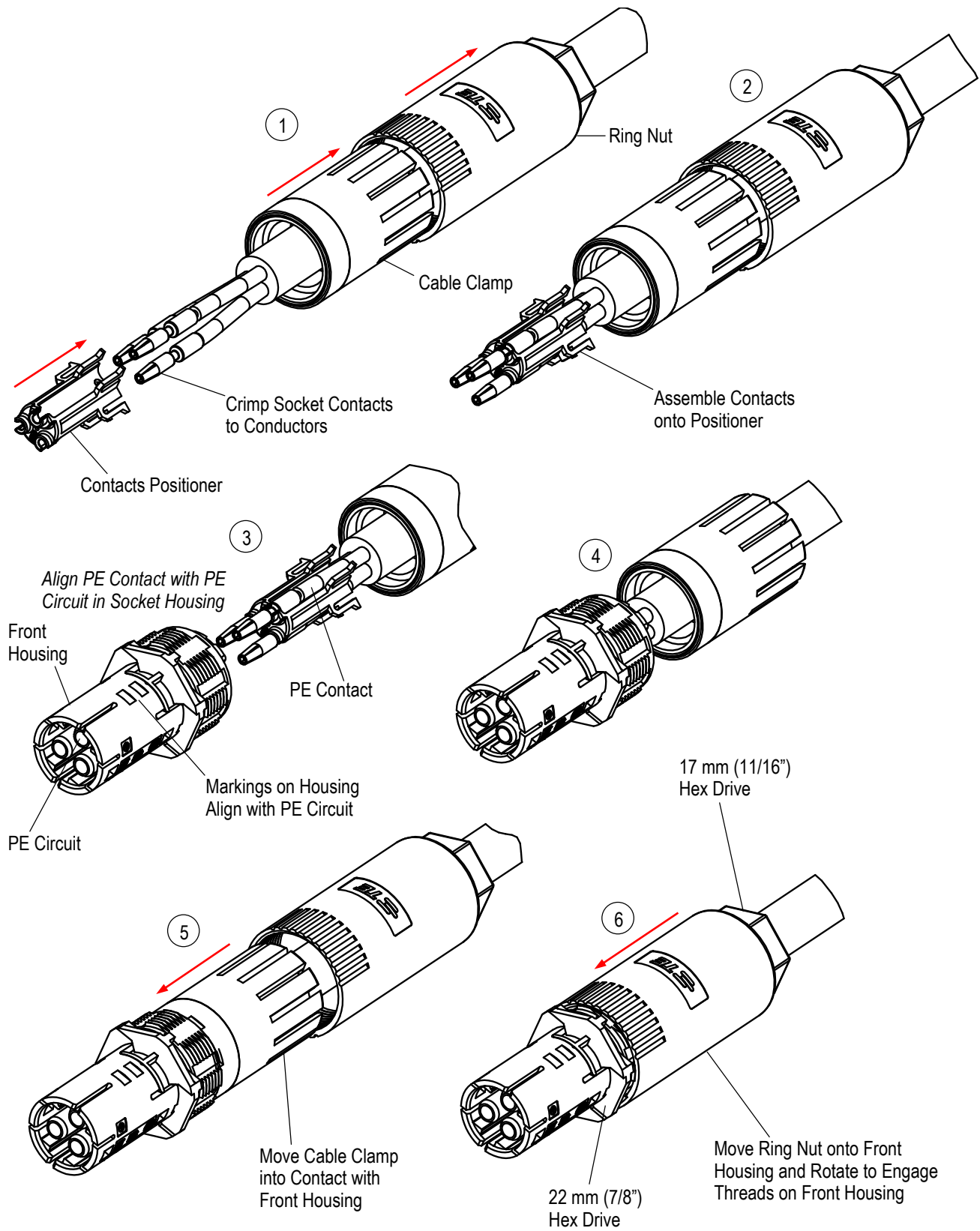


Figure 22

NECTOR M 3-Circuit Pin Connector Assembly, Free-Hang

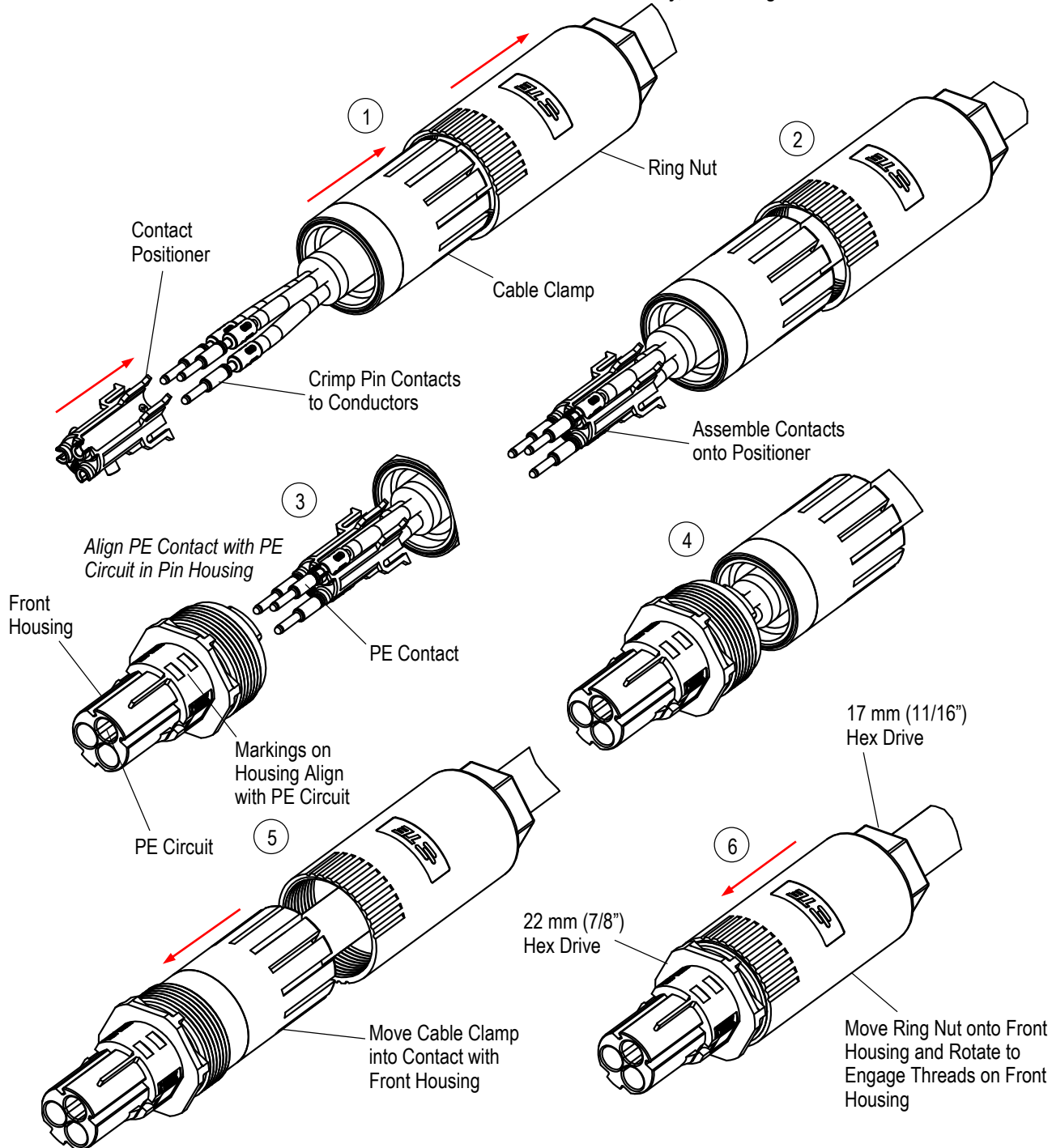


Figure 23

3.13. Screw Clamp Contacts Connector Assembly

NECTOR M-Line connectors are available with screw clamp contacts that do not require a crimping tool (see Paragraph 3.8). These contacts are provided pre-assembled onto a positioner component, as shown in Figure 24.



NOTE

NECTOR M-Line screw clamp contact assemblies are only available for 3-circuit connectors and 5-circuit connectors.

NECTOR M "Screw Clamp" Pin Contact Assembly

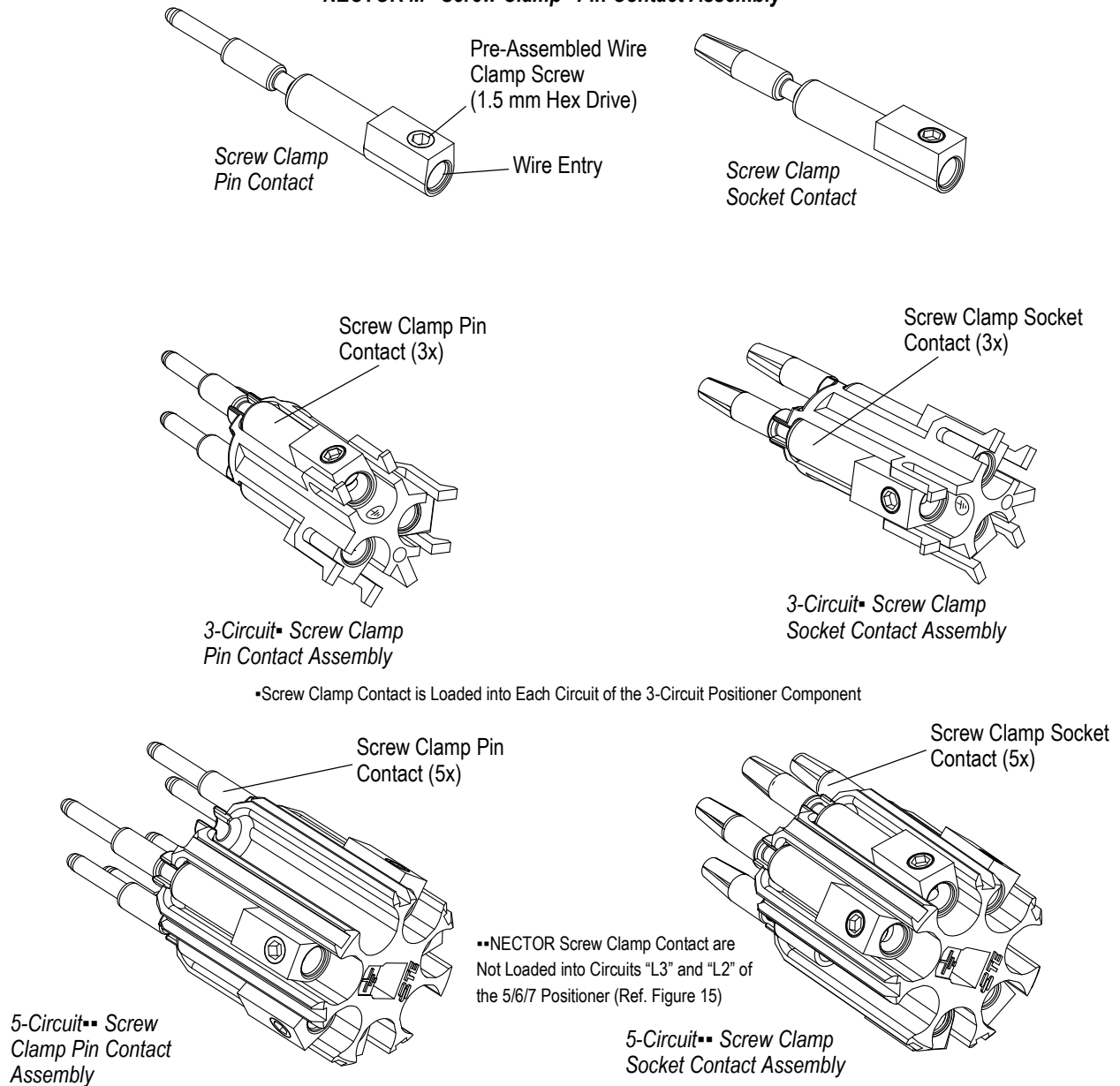


Figure 24

NECTOR M-Line connectors using "screw clamp" contacts are assembled as follows:

1. Select appropriate connector housing (pin or socket), screw clamp contact assembly (pin or socket), cable clamp, and ring nut for the intended connector assembly (see the components Customer Drawings).
2. Prepare cable and conductors per Paragraph 3.4.



NOTE

NECTOR M-Line free-hang connectors using screw clamp contacts are not approved for assembly using discrete wires. Use recommended cables as specified in Paragraph 3.4 and in Figures 2 and 3.

Cable preparation lengths (jacket strip, conductor strip) for connection to screw clamp contacts are different from preparation lengths for crimp contacts. This is indicated in Figure 3.

3. Place "ring nut" over cable jacket. (Orient as shown in Figure 25.)

4. Place “cable clamp” over cable jacket. (Orient as shown in Figure 25.)
5. Maintaining circuit assignments (PE, L, and N per Figure 14), insert stripped conductors into wire barrel of screw clamp contacts (see Paragraph 3.8.B).
6. With conductors fully inserted into each contact wire barrel, use 1.5mm hex drive tool to rotate each clamping screw CW and clamp onto wire conductor. Tighten each screw to a torque value 0.25 N-m (min.) to 0.35 N-m (max.).


NOTE

For ease of wire assembly, the screw clamp contacts may be removed from the positioner component and attached individually onto conductors (see Paragraph 3.8.B). After attaching contacts to wires, re-assemble the contacts onto the positioner component (see Paragraph 3.9.A), maintaining circuit assignments as in Figure 15.

7. After conductors are connected to screw clamp contacts complete final assembly (see Figure 25):
 - For NECTOR M 5-circuit connector assembly reference Paragraph 3.11.A, assembly Steps #7-#12.
 - For NECTOR M 3-circuit connector assembly reference Paragraph 3.11.B, assembly Steps #7-#12.
 - To allow connector “re-work” (IEC 61535), do not apply adhesive as in Step #13 of Section 3.11.

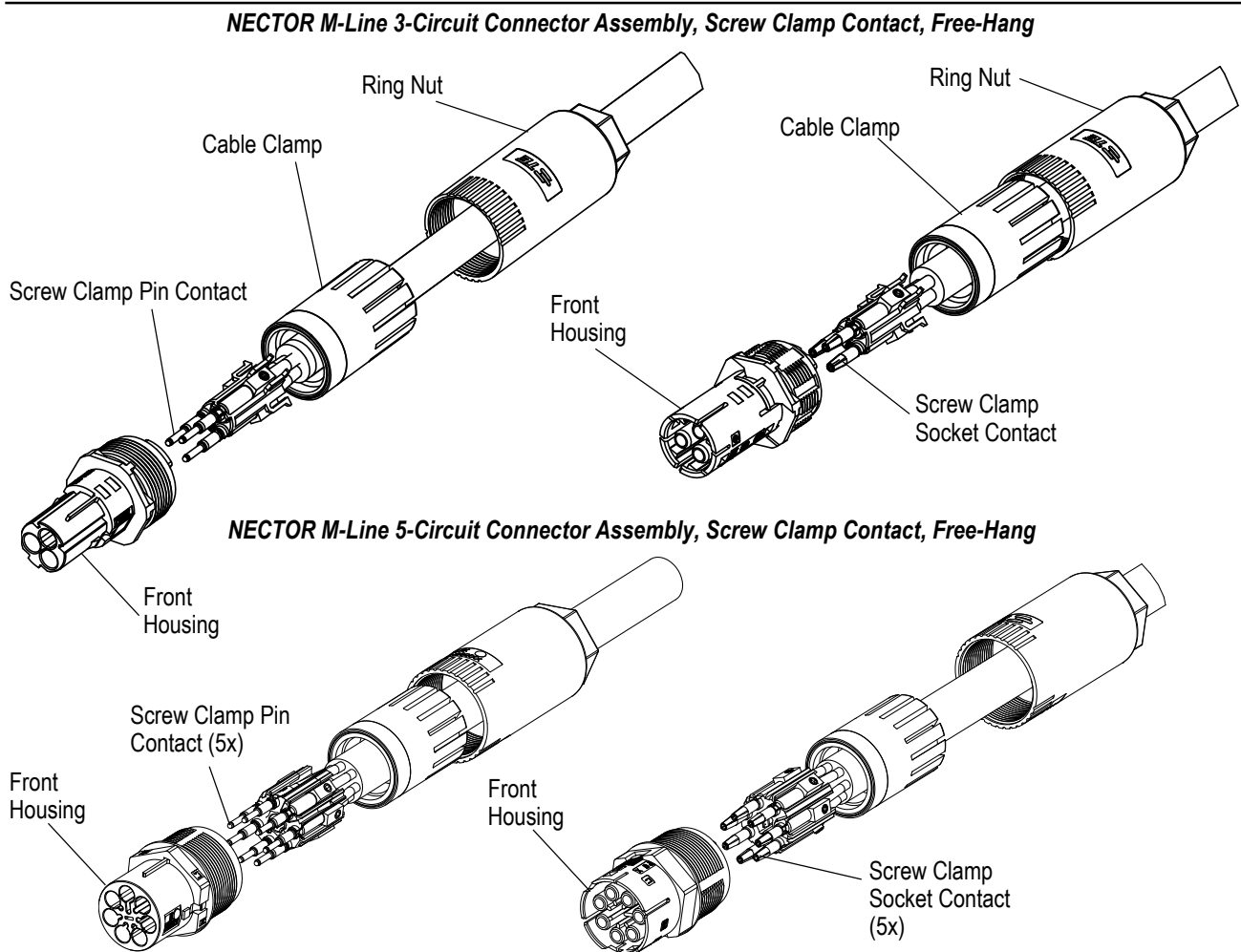


Figure 25

3.14. Pin/Socket Connectors Coupling

NECTOR M-Line pin connectors couple to corresponding socket connectors having the same:

- ◆ form factor (3-circuit, 7-circuit)
- ◆ number of circuits
- ◆ keying code

The pin/socket coupling procedure is the same for 3-circuit connectors and 5/6/7-circuit connectors. It is important to identify the “PE” circuit on each connector before mating, otherwise, the “keying” features will not align and prevent coupling of pin/socket connectors.

“PE” on 3-circuit connectors is identified by marking on one side of the connector housing, as shown in Figure 26. The PE circuit is aligned with these markings.

“PE” on 5/6/7-circuit connectors is identified by the code “keys” on the mating connector faces. There are 3 code keys; 2 at “short” length, 1 at “long” length. PE circuit is the longer length key.

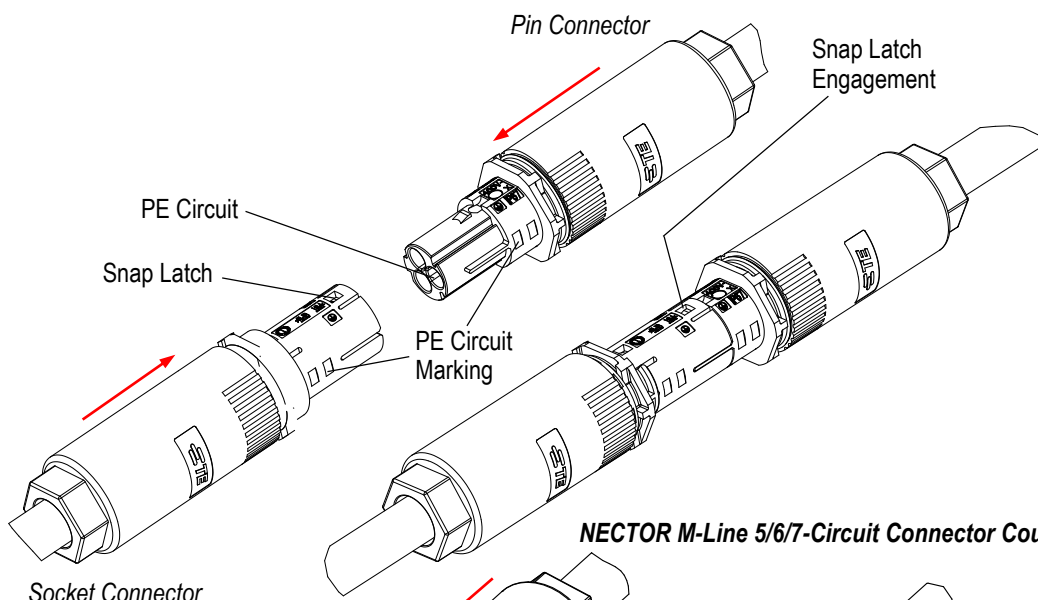
Connectors are coupled as followed (see Figure 26):

1. Identify and align “PE” circuit on the pin and socket connectors.
2. Align the cylindrical pin housing with corresponding cylindrical shell of socket housing.
3. Insert pin housing into socket housing shell and engage snap latches. An audible “click” will be heard when the latches are fully engaged.

**NOTE**

When coupling connectors there will be noticeable increase in the insertion force during latch engagement. This is due to compression of the rubber seal in the socket housing shell. Apply sufficient force to compress the rubber seal and complete latch engagement (see Figure 26).

NECTOR M-Line 3-Circuit Connector Coupling



NECTOR M-Line 5/6/7-Circuit Connector Coupling

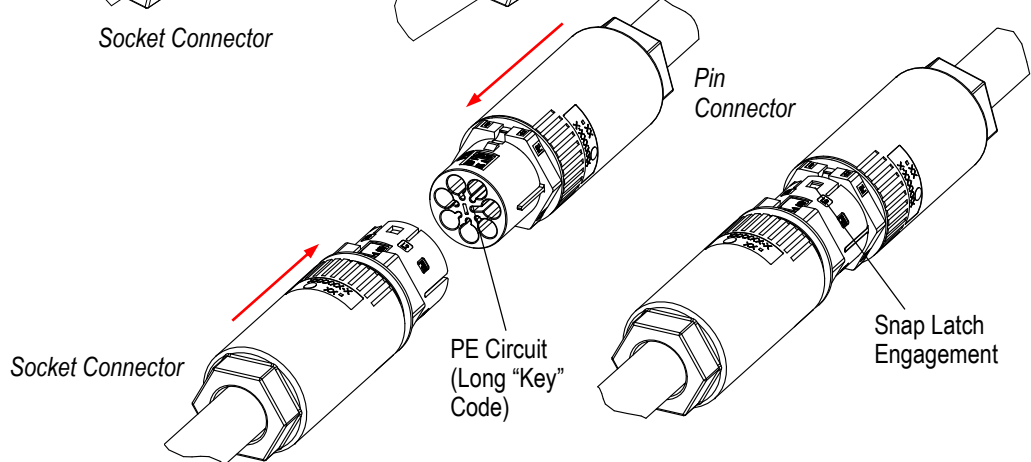


Figure 26 (cont'd)

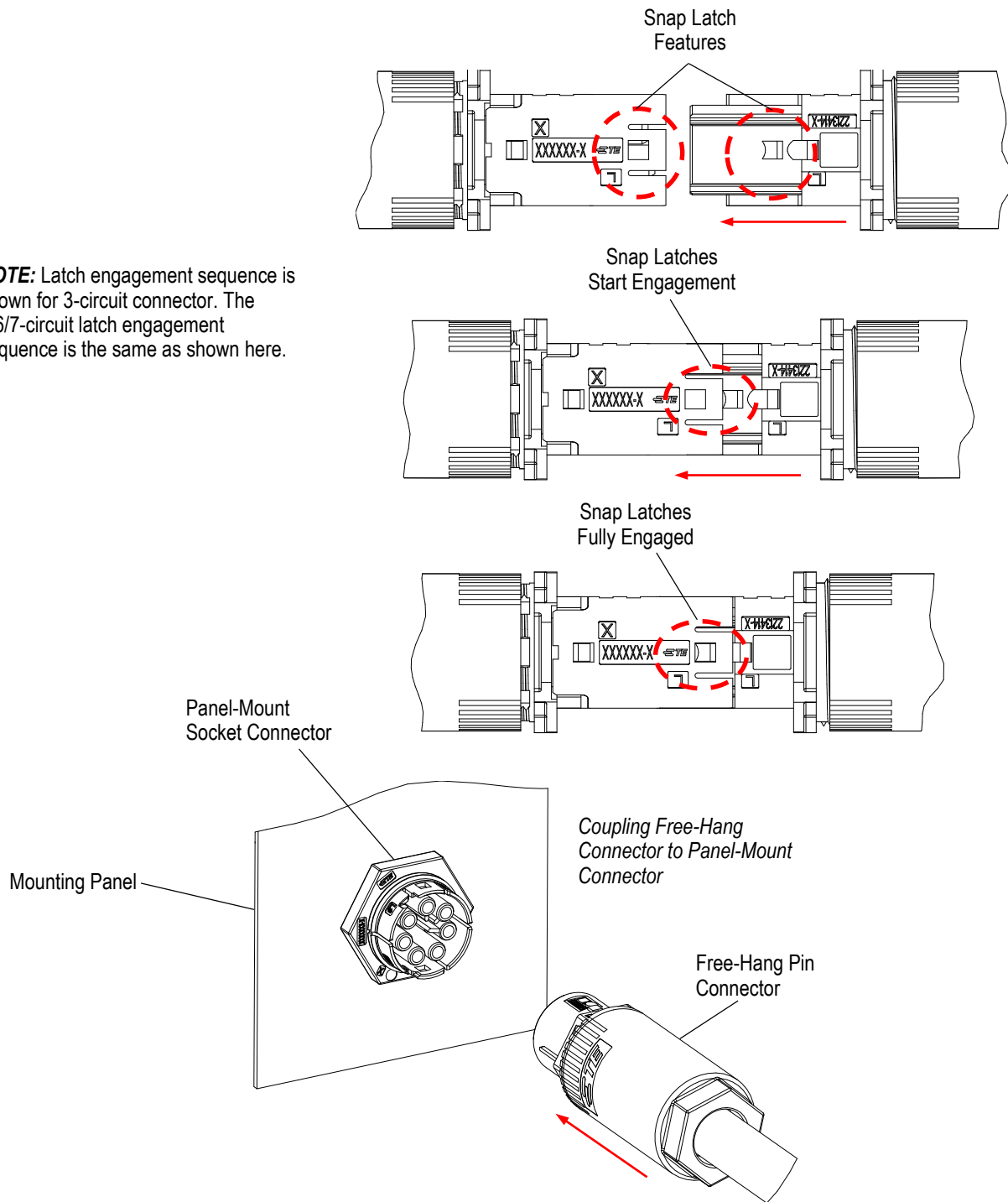


Figure 26 (end)

3.15. De-Coupling Connectors

Coupled connectors are retained in position by two flex latches on the socket housing and corresponding protruding latch features on the pin housing. The latches are located on opposite sides of the pin and socket housings and are designed to prevent unintended/accidental “de-coupling” the connectors.

To “de-couple” connectors the socket housing flex latches must be raised simultaneously so they disengage from the protruding latches on the pin housing. While the flex latches are raised, the coupled connectors can be separated by removing the pin connector housing from the socket connector shell.

A. De-coupling NECTOR 5/6/7-circuit Connectors

The NECTOR 5/6/7-circuit socket housing has recesses adjacent to the flex latches to provide access to the latches for de-coupling. The flex latches must be raised to disengage the protruding latch on pin housing and allow the connectors to separate. This is shown in Figure 27.

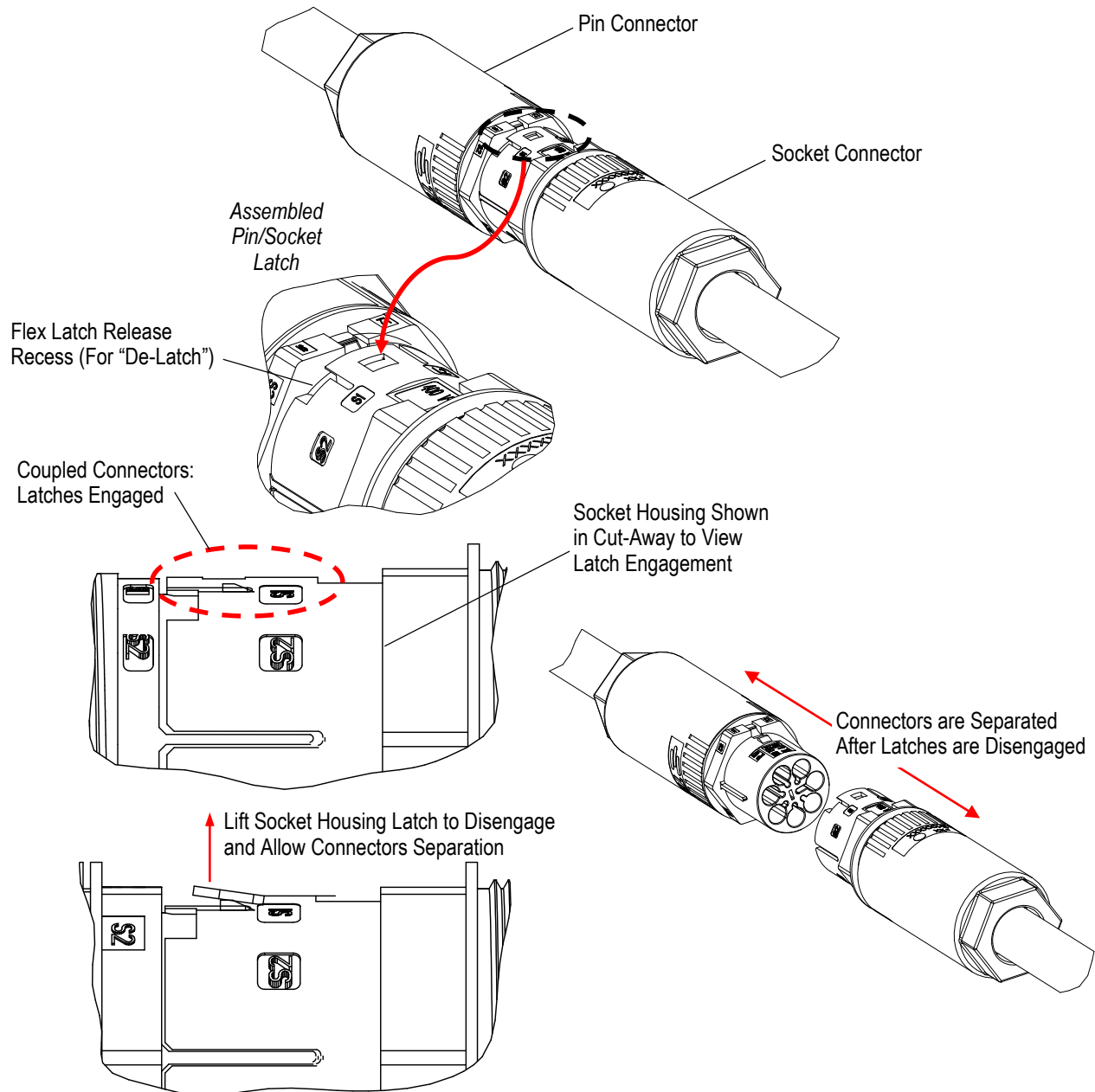


Figure 27

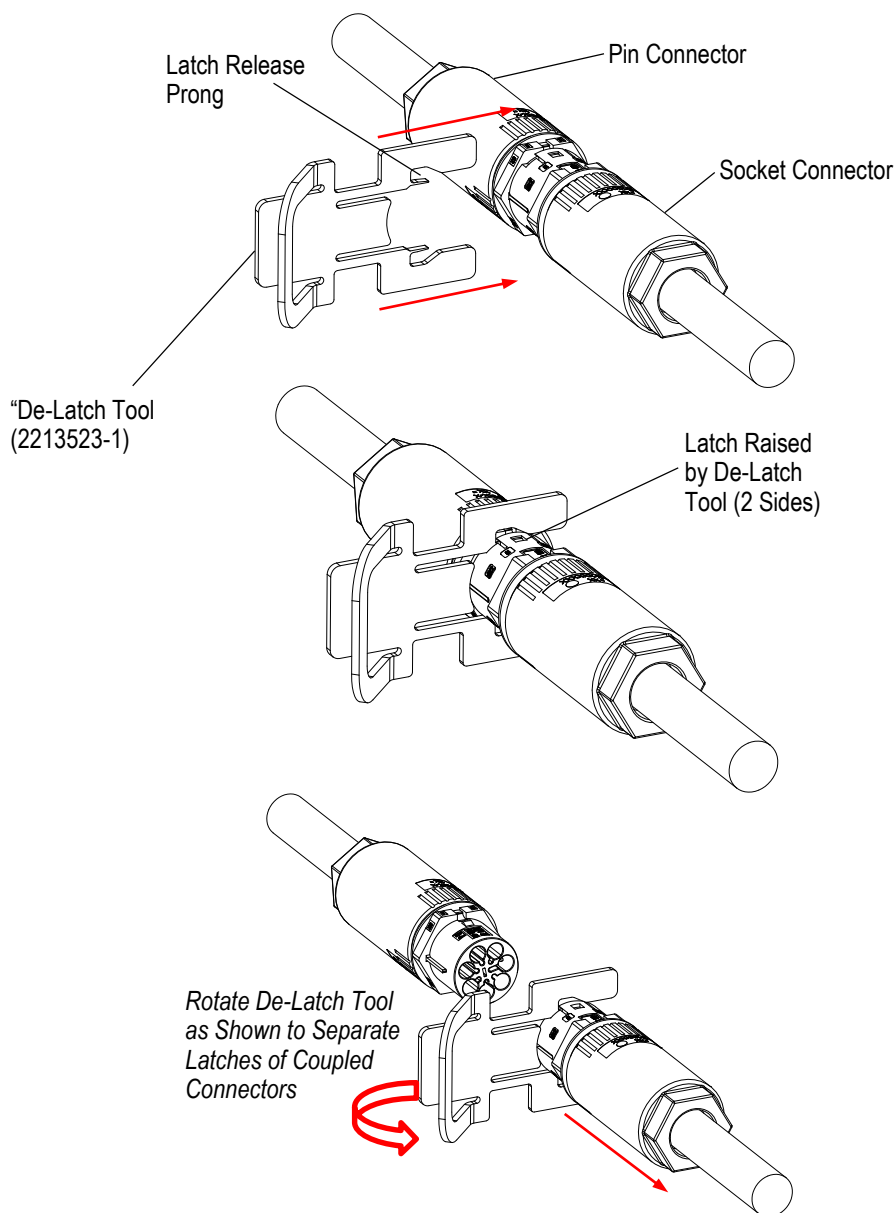
De-latching tool 2213523-1 is available for disengaging housing latches on NECTOR M 5/6/7-circuit connectors. The tool simultaneously raises the socket housing flex latches and allows the connectors to be easily separated.

The procedure for de-coupling NECTOR M 5/6/7-circuit connectors using "de-latch" tool 2213523-1 is as follows (see Figure 28):

1. Locate release recesses adjacent to flex latches on socket housing shell, as shown in Figure 27.

2. Position the de-latch tool perpendicular to connectors' axis as shown in Figure 28.
3. Align the tool release prongs with flex latch release recesses.
4. Carefully insert the tool release prongs into the flex latch release recesses until the tool bottoms out against the socket housing shell. In this position, the release prongs on the tool will have raised the flex latches sufficiently to allow the latches to disengage.
5. With the de-latch tool in place, rotate the tool slightly, as shown in Figure 28, to provide initial separation of the latches. With the latches separated, carefully remove the de-latch tool.
6. After initial separation of the connector latches, and removal of the de-latch tool, fully separate the connectors to complete de-coupling.

Figure 28 depicts using de-latch tool 2213523-1 to de-couple connectors in a "free-hang" installation and in a "panel-mount" installation.



De-Coupling Free-Hang Pin Connector from Free-Hang Socket Connector

Figure 28 (cont'd)

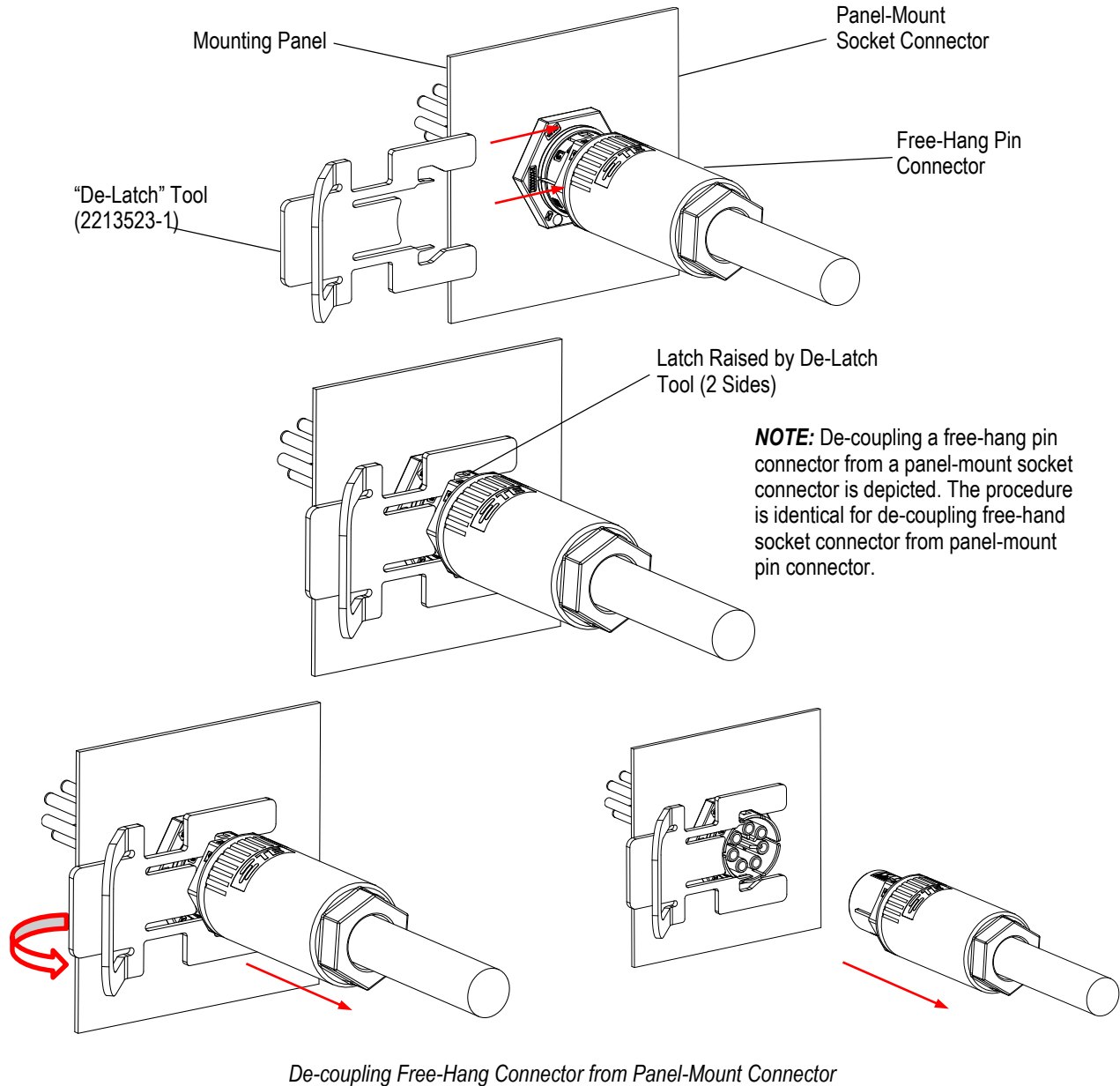


Figure 28 (end)


CAUTION

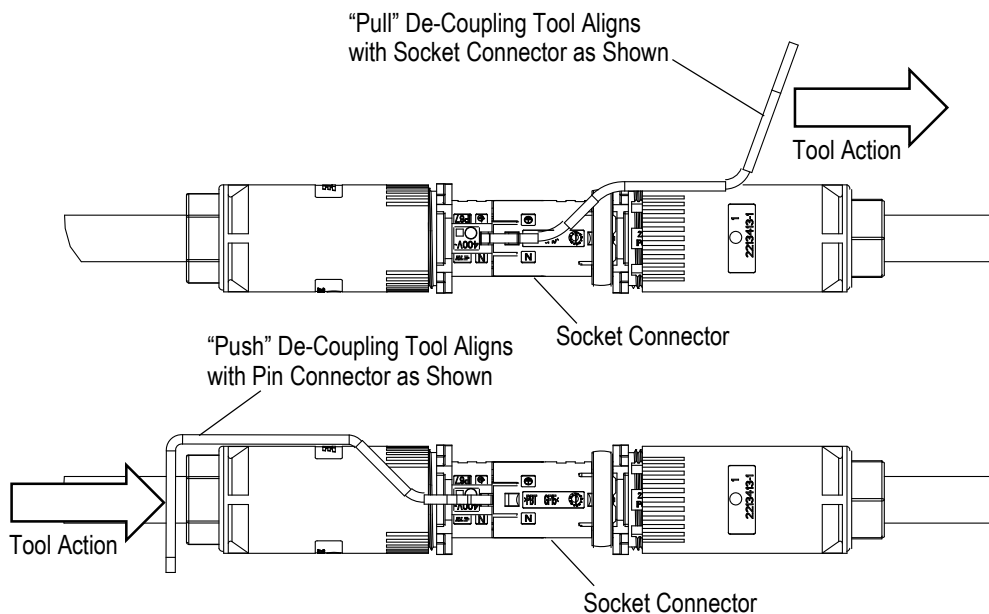
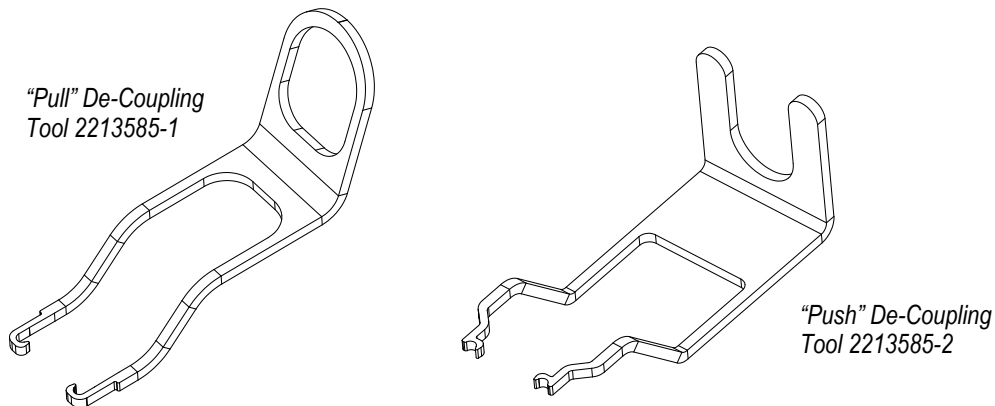
Failure to use a suitable release tool can result in overstress and damage of the connector latches. If this occurs, it will result in reduced performance from the connector sealing system.

B. De-Coupling NECTOR M 3-Circuit Connectors

Two tools are available for de-coupling NECTOR M 3-circuit connectors (Figure 29)

Each of the tools acts upon the socket connector to deflect the flex latch on the socket housing and allow separation of the mated connectors. The tools are characterized by the action required to deflect the flex latches on the socket connector, and are described as “pull” type (2213585-1), and “push” type (2213585-2). When one connector of the installation is panel-mounted, there is limited access to the coupled connectors on the side toward the mounting panel and correct tool selection is determined by the installation of connectors to be de-coupled, as shown in Figure 30.

When a “free-hang” socket connector is mated to a “free-hang” pin connector, then either tool may be used to de-couple the connectors (shown in Figures 29 and 30).



FREE-HANG		PANEL-MOUNT		PULL TOOL 2213585-1	PUSH TOOL 2213585-2
SOCKET	PIN	SOCKET	PIN		
X			X	X	
	X	X			X
X	X			X	X

Figure 29

After selection of the appropriate tool for the connector installation, the connectors de-coupling is accomplished as follows:

1. Orient the de-coupling tool to align with connectors as shown in Figures 29 and 30.
2. Latch hooks at end of de-coupling tool are inserted into latch recesses in pin housing. The recesses are located adjacent to the flex latches. The long arms of the de-coupling tool are flexible and will deflect to allow the latch hooks to install into the latch recesses in the pin housing (Figure 31).
3. Activate the de-coupling tool (push or pull) so that the latch hooks engage the socket housing flex latches and raise the latches.
4. The de-coupling tools provide initial disengagement of the latches maintaining the connectors coupling. After the initial latch disengagement the connectors may be grasped and fully disengaged.

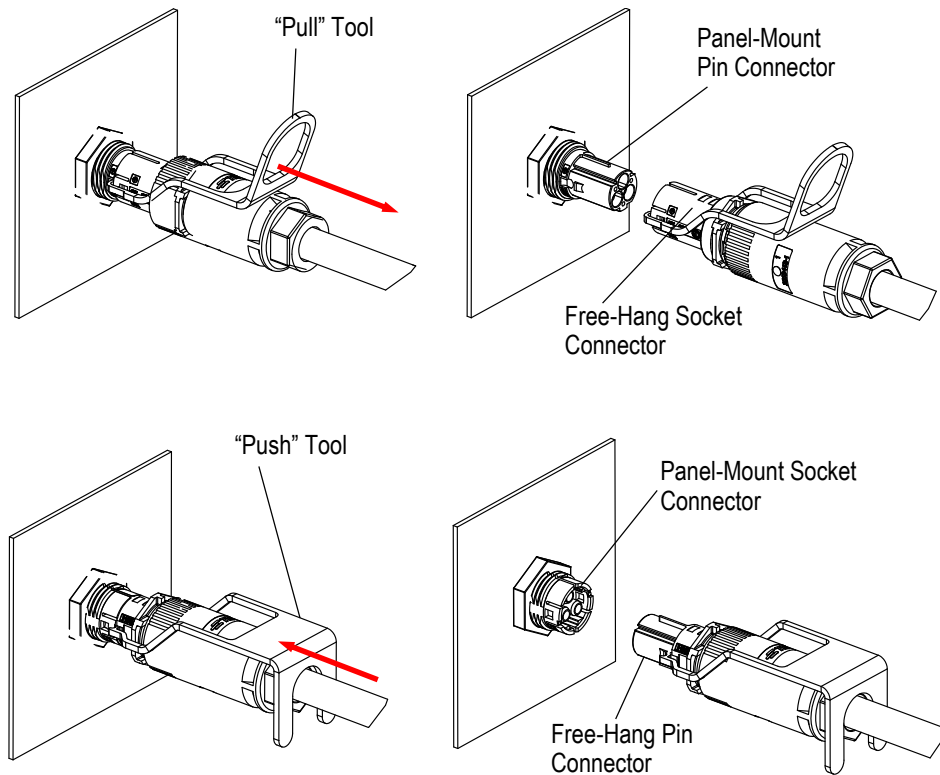


Figure 30

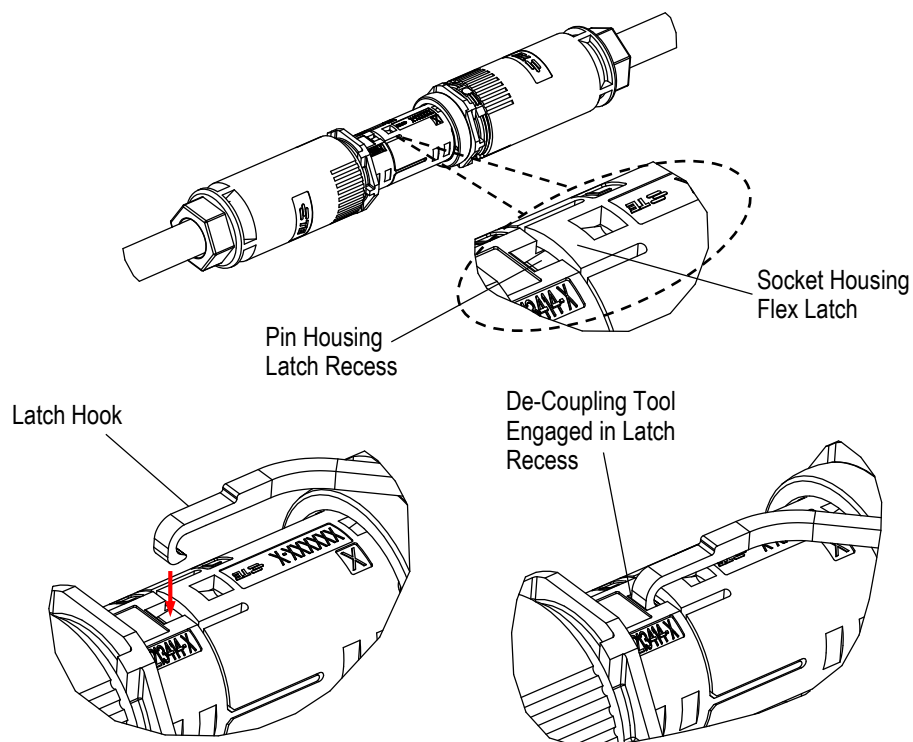


Figure 31

3.16. Connectors Dis-Assembly

“Free-Hang” style connectors assembled using screw-clamp contacts (Ref Paragraph 3.12) are intended for applications that may require connector dis-assembly (NOTE: Panel-Mount connectors are not intended to be dis-assembled.) For this purpose, the connector assembly sequence described in Paragraph 3.12 does not include application of adhesive to prevent connector’s dis-assembly. The following procedure to dis-assemble a connector is the same for pin connectors and socket connectors.

1. De-couple mated connectors.
2. Un-screw ring nut component and move it along cable and away from connector.
3. Carefully release the cable clamp assembly from gripping cable jacket and move it along the cable and away from connector.



CAUTION

Use care not to damage this component so that it may be used again when connector is re-assembled.

For NECTOR M-Line 5/6/7 circuit connectors further dis-assembly is achieved by releasing a latch inside the connector as described in Steps 4 to 6.

4. A rectangular access hole is centrally located in the front mating surface of the connector front housing. This is easily located on pin housing (Figure 32), and is seen inside the cylindrical shroud of the socket housing (Figure 33).

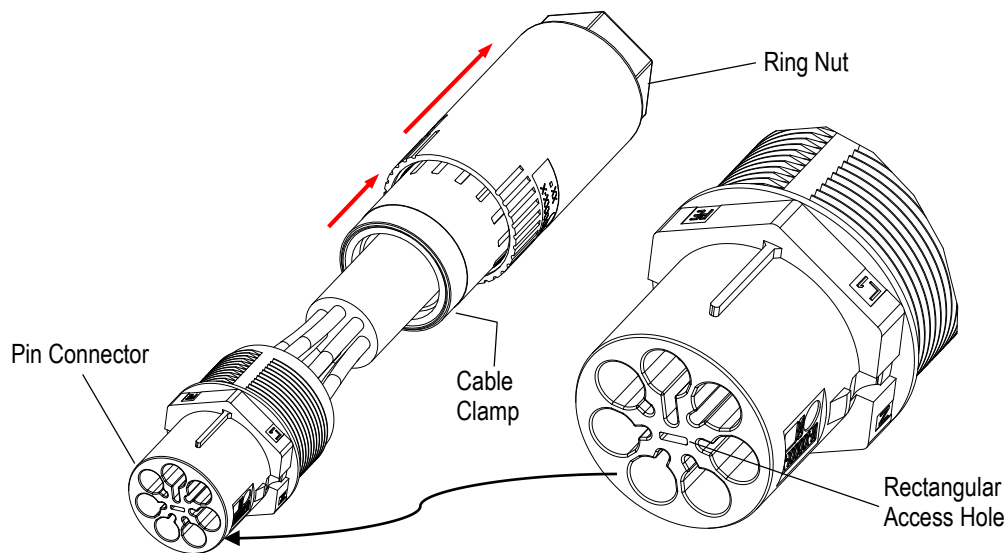


Figure 32

5. Carefully insert the narrow blade of Release Tool (2213589-1) into the access hole from the front of the connector. When inserting the blade an abrupt stopping point will be felt once the blade releases the assembly latch inside the connector housing.

6. Maintain the release tool in place and withdraw the cable assembly from the front connector housing.

For NECTOR M-Line 3 circuit connectors, further dis-assembly is achieved by releasing retaining latches (6 places) located above the threaded portion of front housing. Reference Figure 34, and follow Steps 7 to 10.

7. Place Release Tool (2213590-1) over the front connector housing.
8. Align the release tabs on the tool with corresponding retaining latches on front connector housing.
9. Simultaneously depress the three arms of the tool so that the release tabs enter the retaining latch slots of the connector housing and depress the plastic latches (6 places).

10. Maintain the release tool in place with six latches depressed and withdraw the cable assembly from the front connector housing.

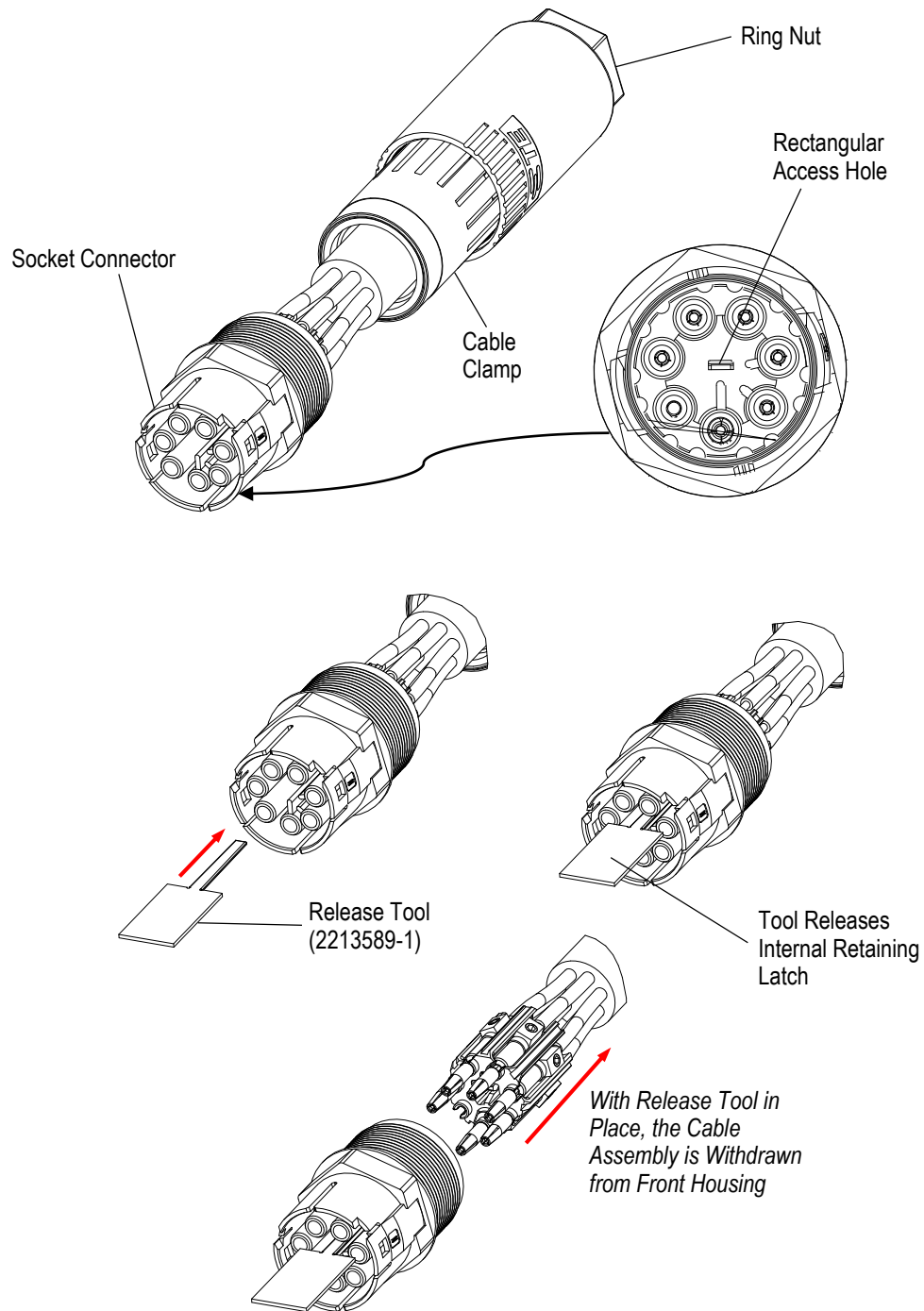


Figure 33

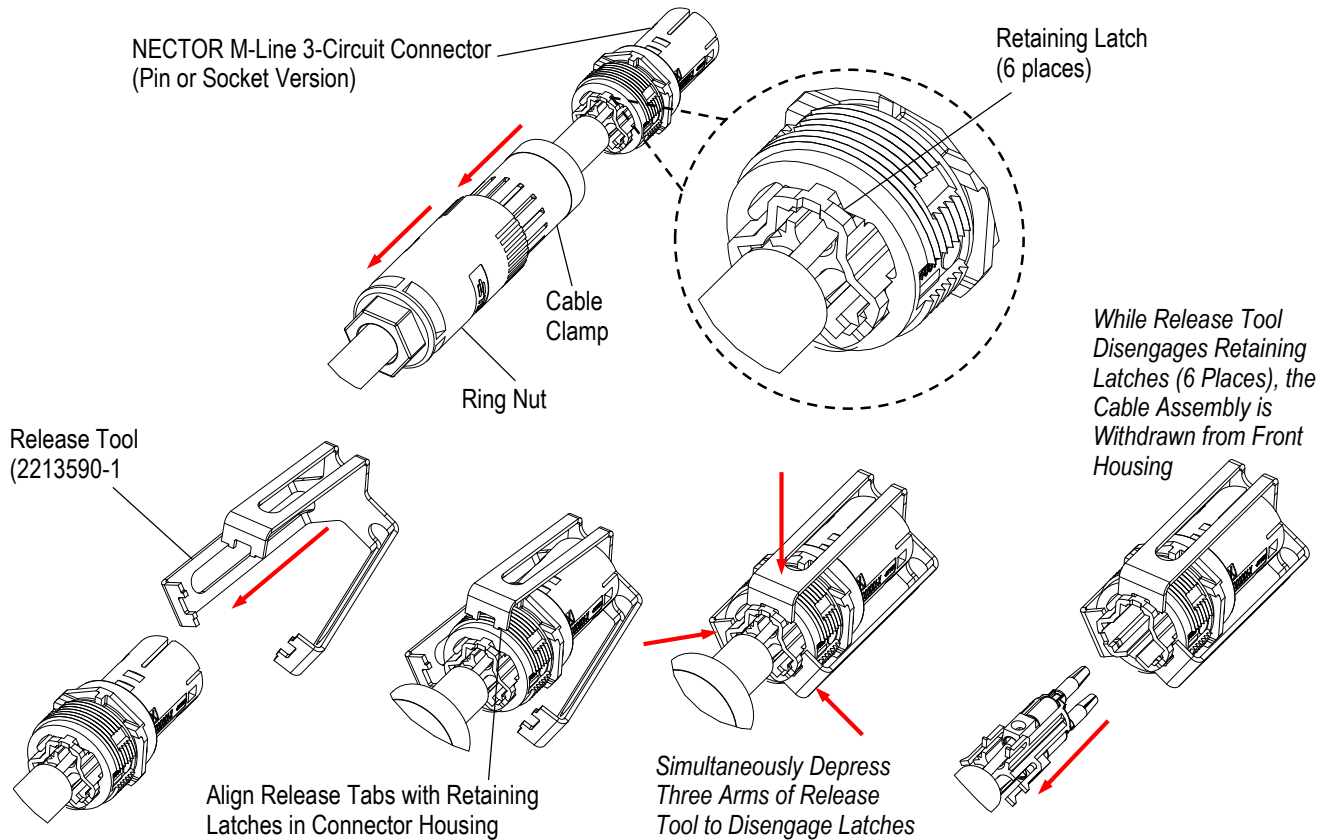


Figure 34

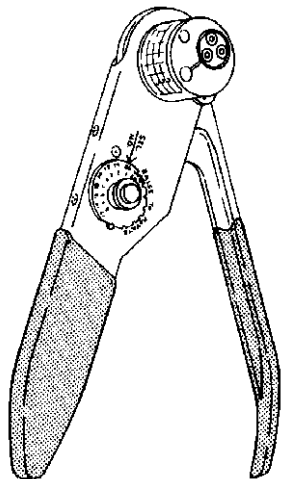
4. QUALIFICATIONS

Sealed NECTOR M-Line connector family is Recognized by Underwriters Laboratories Inc. (UL/CSA International in File E28476.

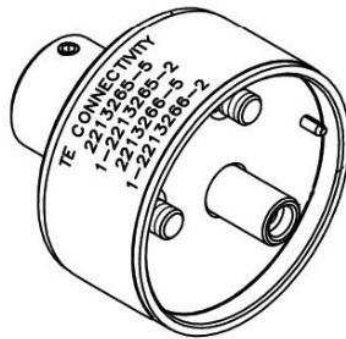
5. TOOLING

The following tooling is needed for termination and application of this product line. See Figure 35.

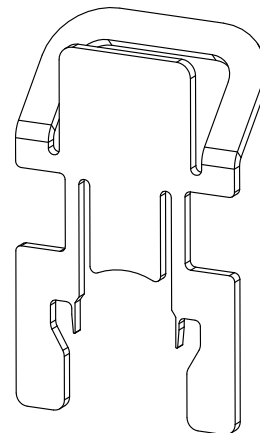
- Crimp Tool 601967-1 (Instruction Sheet 408-7516)
- Positioning Tool 2280173-1
- De-Latching Tool 2213523-1
- Pull De-Coupling Tool 2213585-1
- Push De-Coupling Tool 2213585-2
- Release Tool 2213590-1
- Release Tool 2213589-1



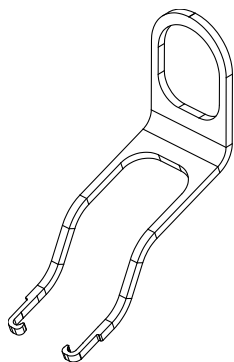
Crimp Tool 601967-1



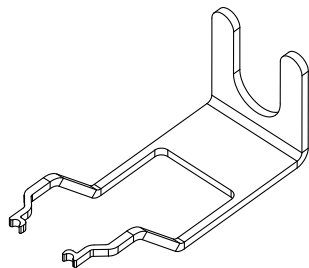
Positioning Tool 2280173-1



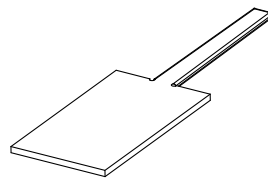
De-Latching Tool 2213523-1



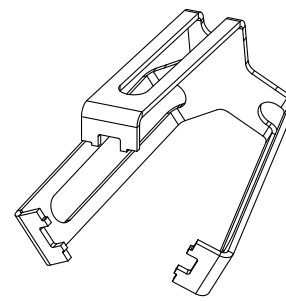
"Pull" De-Coupling Tool 2213585-1



"Push" De-Coupling Tool 2213585-2



Release Tool 2213590-1



Release Tool 2213589-1

Figure 35

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.

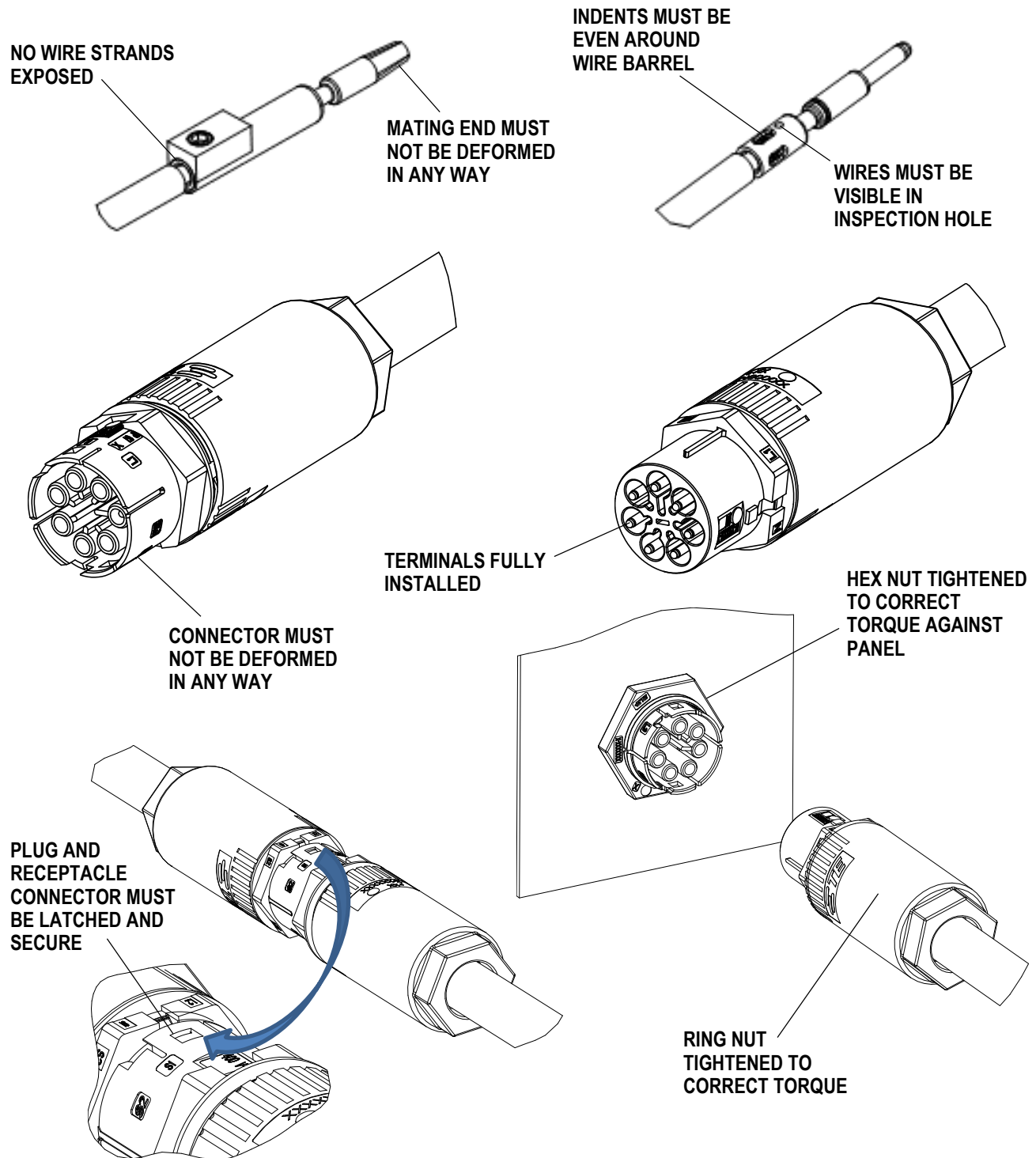


FIGURE 36. VISUAL AID