



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 application of the Industrial Circular Ethernet panel-mount connector system for panel-mount applications in production and manufacturing environments. The connector system consists of a plug connector and a receptacle connector. Each connector is supplied as a kit. The connector kits are available with plastic shell or metal shell and shielded or unshielded. A protective cover is available for each connector to prevent contamination when the connectors are not engaged. The protective cover assembly includes a tether that can be used to attach the cover to the connector.

The plug kit consists of an 8-position Category 5e RJ45 modular plug with crimp-type contacts, load bar, and plug assembly or a 4- or 8-position RJ45 common core assembly with insulation displacement crimp (IDC) contacts. For the plug kit with crimp-type contacts, the load bar is used to hold the cable wires for insertion into the modular plug. The modular plug or common core assembly must be terminated to the cable, then installed into the plug assembly. The locking tab (modular plug) or latch (common core assembly) locates the modular plug or common core assembly in the plug assembly. The cable fitting (plastic shell) or dome nut (metal shell) holds the modular plug or common core assembly in the plug assembly and seals the plug assembly at the cable end. Hand tools and semi-automatic tooling are available for terminating the modular plug. No tooling is required for terminating the common core assembly.

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.

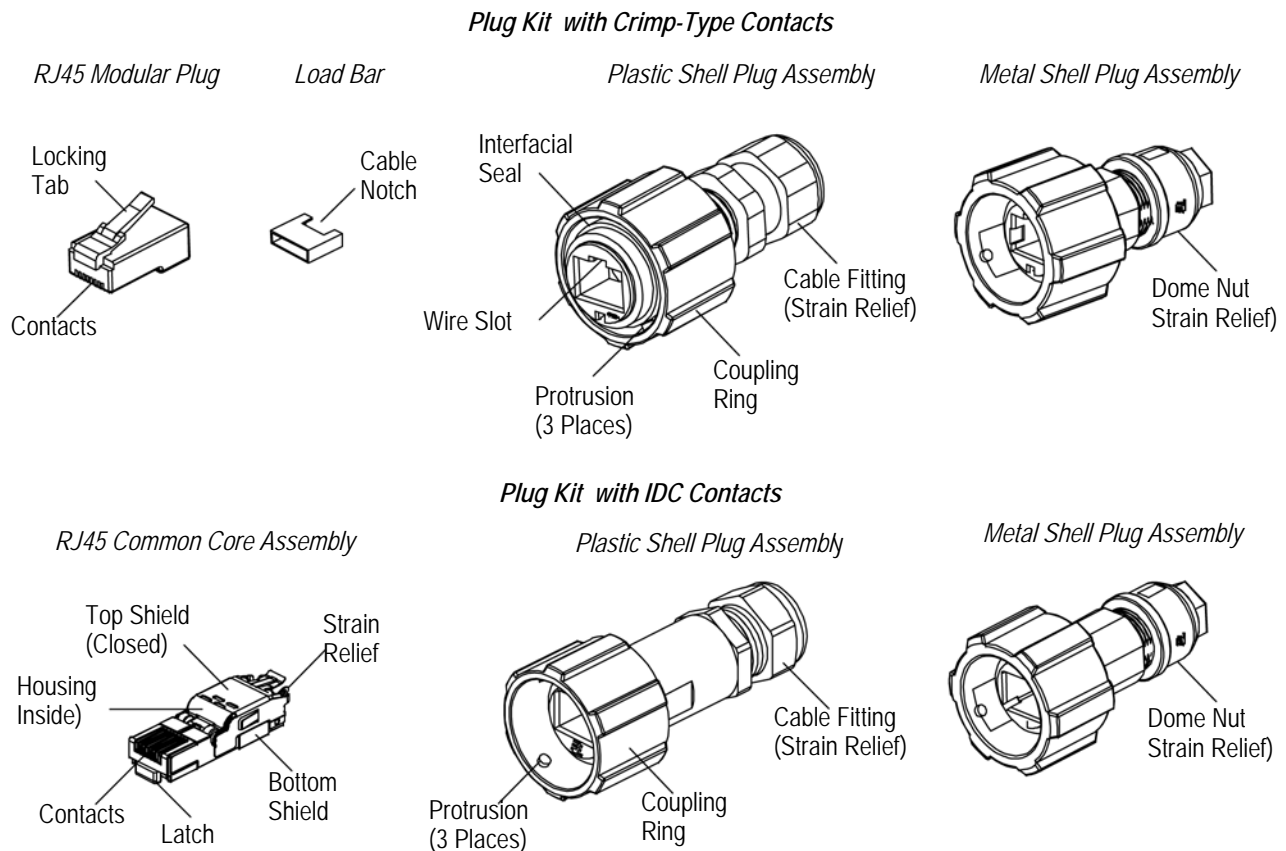


Figure 1 (Cont'd)

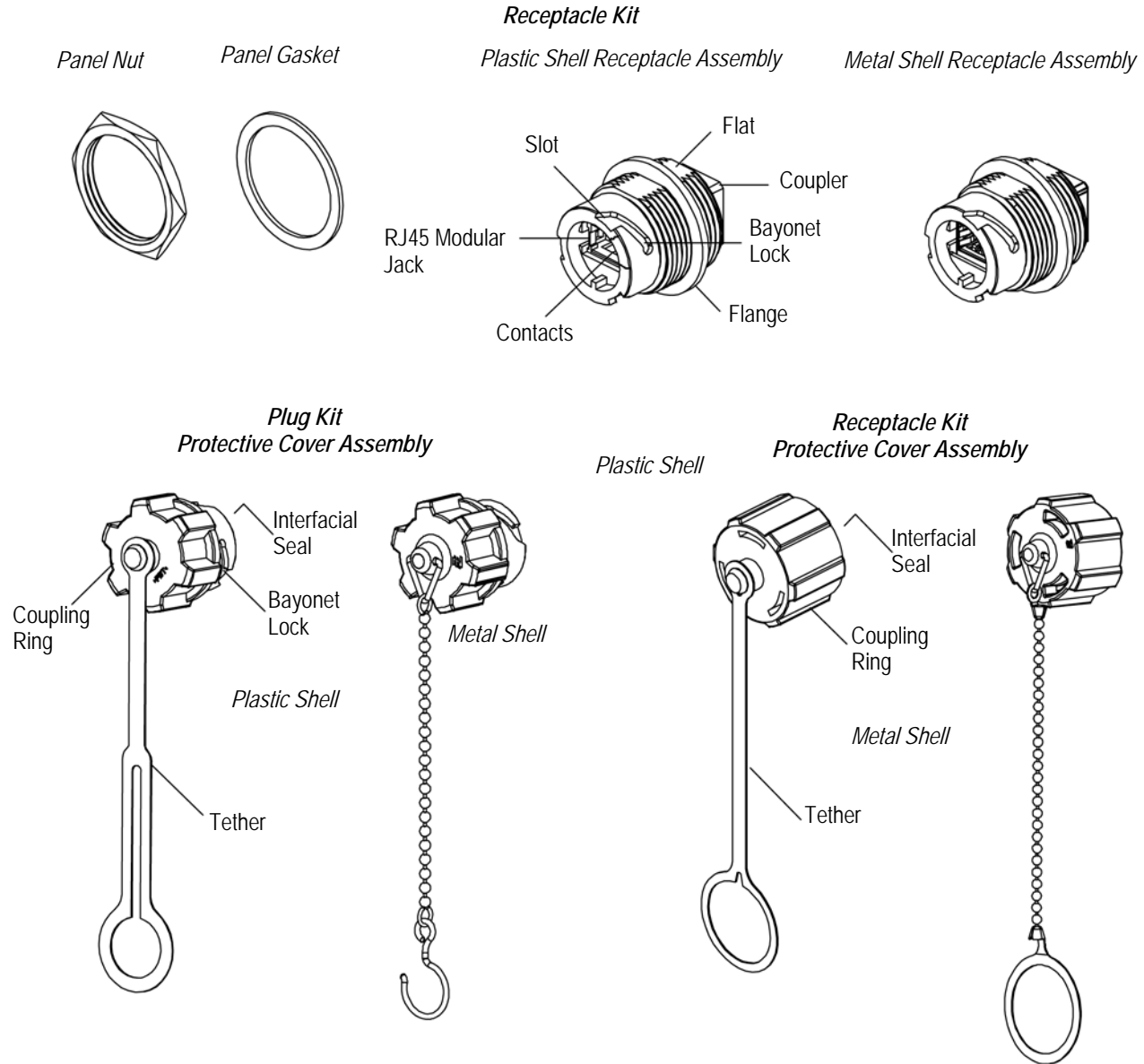


Figure 1 (End)

The receptacle kit consists of a receptacle assembly (which contains an 8-position Category 5e coupler RJ45 modular jack), panel gasket, and panel nut. The receptacle assembly features a flange that allows front- or rear-panel mounting and a flat for indexing the receptacle to the panel. The panel nut is used to mount the receptacle to the panel. The panel gasket seals the receptacle at the panel.

When engaged, the connectors are held together by a locking mechanism (coupling ring and bayonet lock) which prevents accidental disconnection. The engaged connectors are sealed by the interfacial seal of the plug assembly.

2. REFERENCE MATERIAL

2.1. Revision Summary

Since the previous release, the new company logo was applied.

2.2. Customer Assistance

Reference Product Base Part Number 1738607 and Product Code K357 are representative of the Industrial Circular Ethernet panel-mount connector system. 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. Specifications

Design Objective (status at time of publication of this document) 108-2198 provides expected product performance and test information for the Industrial Circular Ethernet panel-mount connector system.

2.5. Standards

Standards and publications developed by the Electronic Industries Alliance/Electronics Components Association (EIA/ECA), International Electrotechnical Commission (IEC), and Telecommunications Industry Association and Electronic Industries Alliance (TIA/EIA) provide industry test and performance requirements. Documents available which pertain to this product are:

- EIA/ECA-364-42, "Impact Test Procedure for Electrical Connectors"
- IEC 60529, "Degrees of Protection Provided By Enclosures," IP Code 67
- TIA/EIA-568, "Commercial Building Telecommunications Cabling Standards"

2.6. Instructional Material

Instruction Sheets (408-series) provide product assembly instructions. Customer Manuals (409-series) provide machine setup and operation procedures. Documents available which pertain to this product are:

- 408-8933 Industrial Circular Ethernet Panel-Mount Connector System
- 408-9743 Terminating Module 1-856196-1
- 408-9767 Modular Plug Hand Tool (Premium Grade) 2-231652-0 and Die Set 1-853400-0
- 408-9919 Modular Plug Single Terminator 354711-8 and Tooling Kit 354714-7
- 409-10010 Modular Plug Dual Terminator 1320840-1

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 component material.

B. Shelf Life

Components should remain in the shipping containers until ready for use. The connectors 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 connectors near any chemical listed below as they may cause stress corrosion cracking in the contacts.

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

3.3. Cable Selection

A. Plug Kit with Crimp-Type Contacts

The modular plug will accept Category 5e, 100-ohm unshielded round cable with the following specifications:

Cable type:	8-conductor
Conductor size and type:	26 AWG solid or 7-strand copper
Conductor diameter:	0.98 [.039] maximum
Cable insulation diameter range:	6.3 through 6.7 [.248 through .264]

B. Plug Kit with IDC Contacts

The common core assembly will accept Category 5e, 100-ohm unshielded round cable with the following specifications:

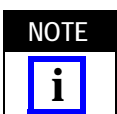
Cable type:	4- or 8-conductor
Conductor size and type:	(4 conductors) 22 AWG solid or 7-strand copper (8 conductors) 26 AWG solid or 7-strand copper
Conductor diameter:	(4 conductors) 0.65 [.020] maximum (8 conductors) 0.42 [.017] maximum
Cable insulation diameter range:	6.3 through 6.7 [.248 through .264]

3.4. Cable Preparation



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

1. The plug assembly must be installed (strain relief end first) onto the cable. See Figure 2, Detail A.
2. Proper strip length is necessary to insert the conductors into the contact slots. The recommended strip length is given in Figure 2, Detail B.



Insulation of individual conductors MUST NOT be cut or removed. This could result in shorted or open terminations.

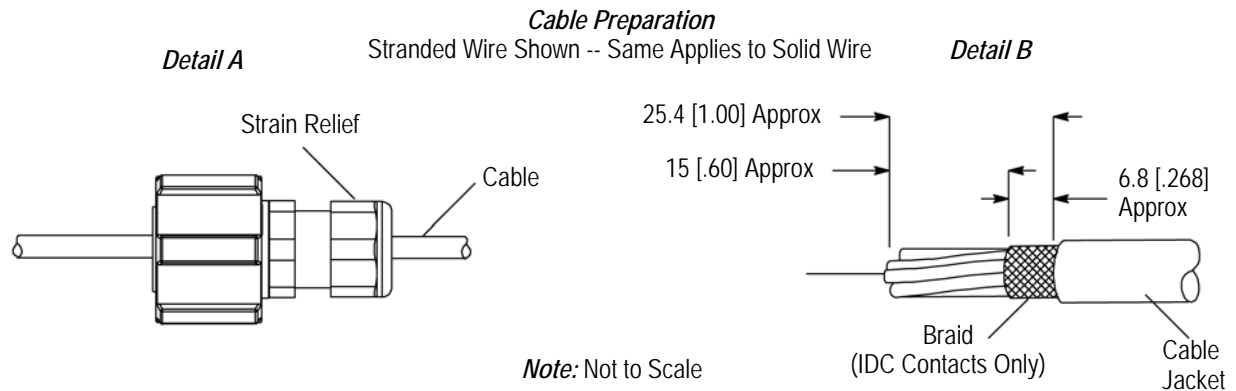


Figure 2

3.5. Conductor Arrangement

1. Conductor pairs must be oriented side-by-side in the order shown in Figure 3, Detail A. The end of the cable jacket must be flattened so that the conductor pairs lay side-by-side.
2. Properly sequenced conductor pairs should extend into the cable jacket to the dimension given in Figure 3, Detail B, creating an oblong shape.
3. The conductor tips must be trimmed evenly to the dimension shown in Figure 3, Detail C. Proper orientation of conductors must be maintained.
4. For crimp-type contacts, the conductor pairs must be untwisted and arranged according to EIA/TIA T568A or T568B (defined in Figure 3, Detail D). IT IS CRITICAL that the the pairs are NOT untwisted inside the cable jacket. When arranging conductor pairs, IT IS IMPORTANT that Conductor 6 be crossed over Conductors 4 and 5 as shown in Figure 3, Detail C.

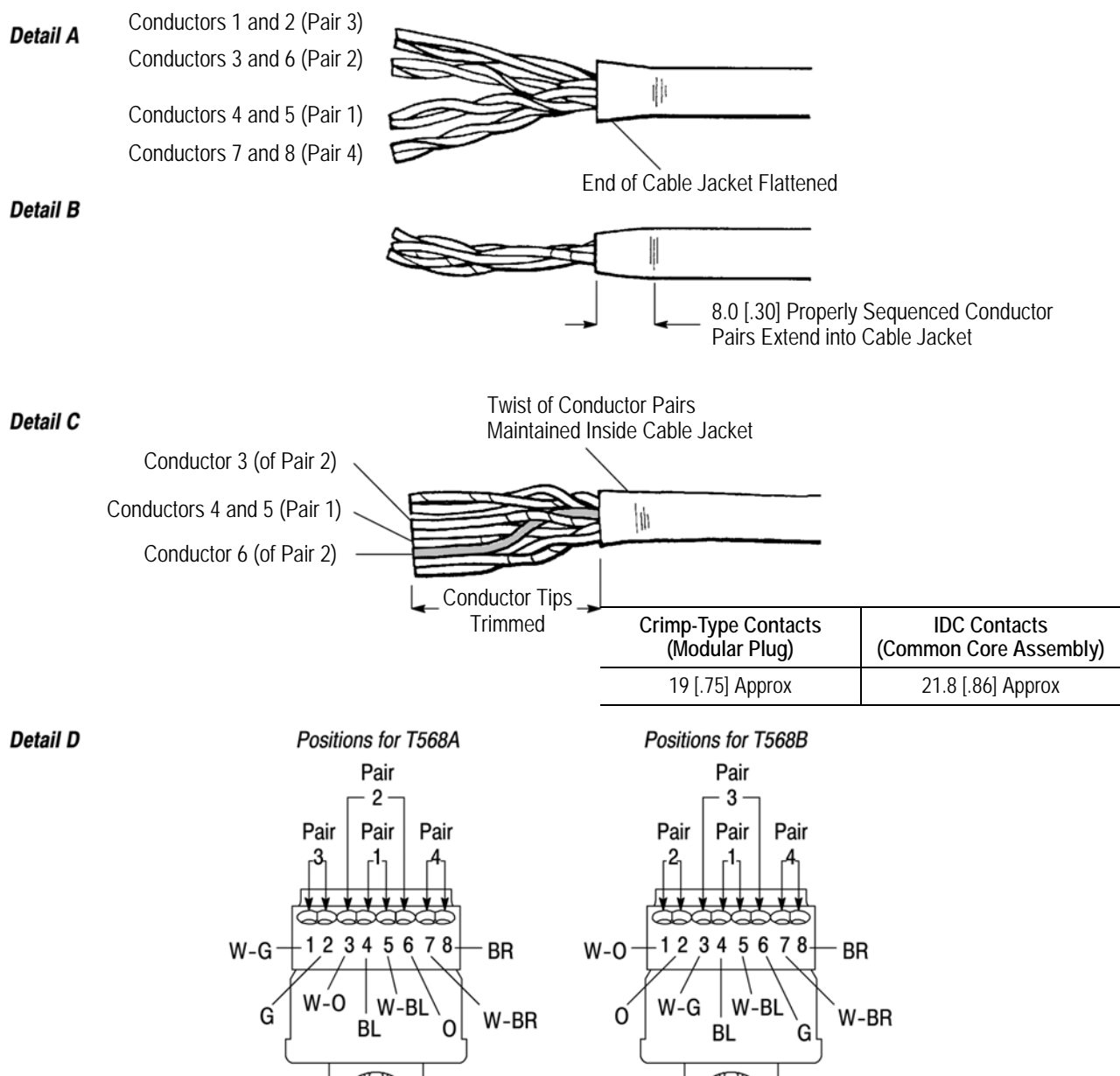
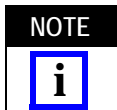


Figure 3 (Cont'd)

CONDUCTOR PAIR	CONDUCTOR PAIR For Electrical Schematic		CONDUCTOR COLOR CODE (Abbreviation)	
	T568A	T568B	OPTION 1	OPTION 2
1	4	4	Blue (BL)•	Red (R)
	5	5	White-Blue (W-BL)	Green (G)
2	3	1	White-Orange (W-O)	Black (BK)
	6	2	Orange (O)	Yellow (Y)
3	1	3	White-Green (W-G)	Blue (BL)
	2	6	Green (G)•	Orange (O)
4	7	7	White-Brown (W-BR)	Brown (BR)
	8	8	Brown (BR)•	Slate (S)

• A white marking is acceptable.

Figure 3 (End)

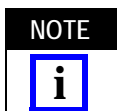


The modular plug (crimp-type contacts) has embossed numbers for contact identification; and the common core assembly (IDC contacts) has a color-coded label for contact identification.

3.6. Termination

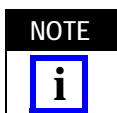
A. Modular Plug (Crimp-Type Contacts)

- 1) The conductors (maintaining arrangement) must be inserted into the load bar (oriented so that the cable notch will align with the contacts) until the cable jacket rests against the cable notch. The conductor twist must not enter the front of the load bar. The conductors must be trimmed evenly and square with the front edge of the load bar to the dimension given in Figure 4, Detail A.
- 2) The conductors must be retracted from the load bar so that the conductors protrude from the end of the load bar to the dimension given in Figure 4, Detail B. The top of the load bar must not be deformed.



If the load bar is deformed, the conductor twist entered the front of the load bar.

- 3) The load bar (oriented so that the cable notch is aligned with the contacts) must be inserted into the modular plug until it butts against the mating feature of the modular plug, and the conductors are bottomed on the wire circuits. The cable jacket must be against the cable notch after the load bar is fully seated. The conductors must not be exposed between the cable jacket and cable notch. The ends of the conductors must be clearly visible through the front of the modular plug. See Figure 4, Detail C.



If the conductors do not bottom on the wire circuits, they must be re-trimmed (after removing the load bar/cable assembly from the modular plug), and re-inserted into the modular plug. If the conductors are too short, the cable must be re-stripped.

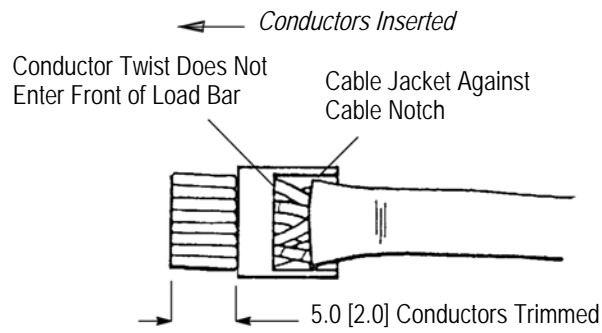
- 4) The modular plug must be terminated to the cable according to the instructions included with the tooling.

B. Common Core Assembly (IDC Contacts)

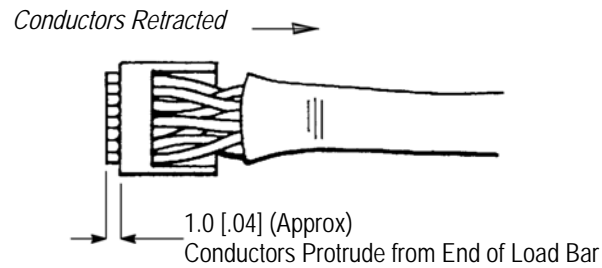
- 1) The top shield of the common core assembly must be opened. The colors of the cable conductors must match the colors on the color-coded label of the common core assembly. Figure 5, Detail A.
- 2) The conductors (maintaining arrangement) must be inserted into the conductor guides until the ends of the conductors butt against the end of the housing. The conductors must not be twisted in the conductor guides. See Figure 5, Detail B.

Termination Requirements -- Modular Jack (Crimp-Type Contacts)

Detail A



Detail B



Detail C

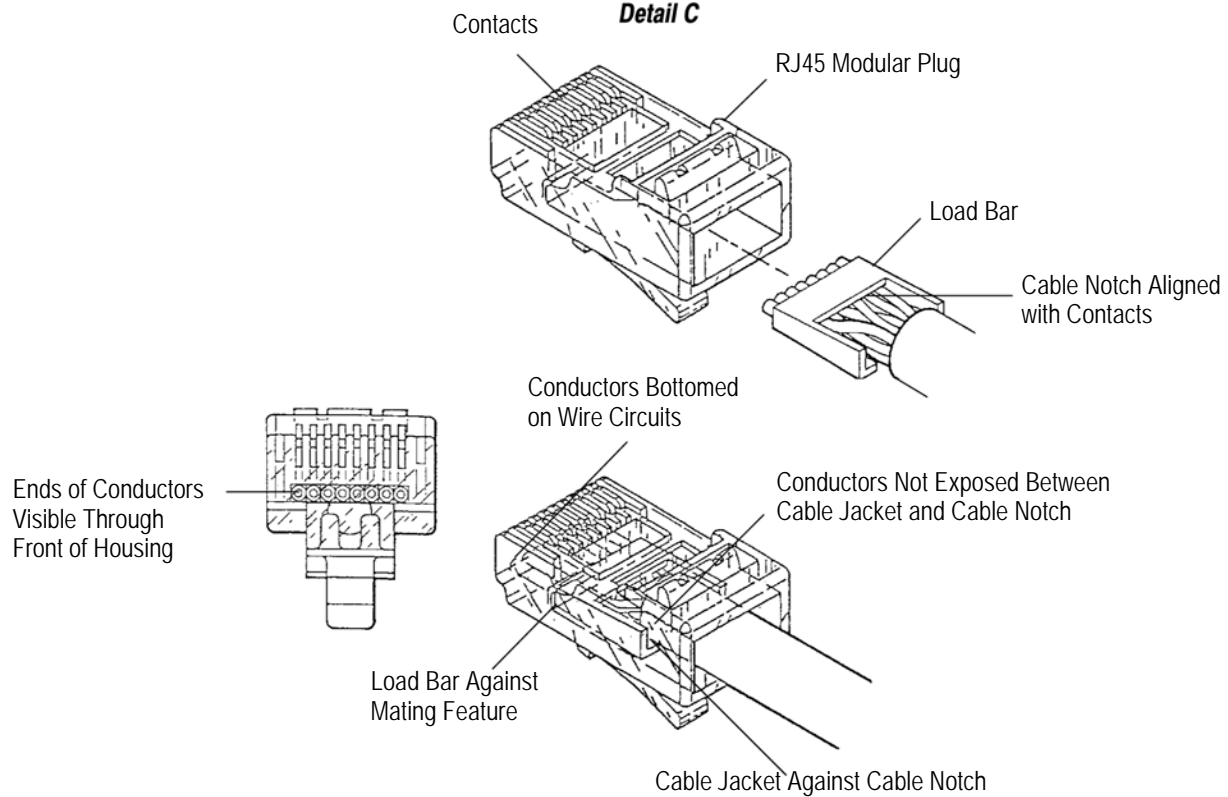


Figure 4

3) The top shield must be closed (there must be an audible "click"). The cable braid must be located in the strain relief. There must be no gap in the seam between the top shield and bottom shield. See Figure 5, Detail C.

Termination Requirements -- Common Core Assembly (IDC Contacts)

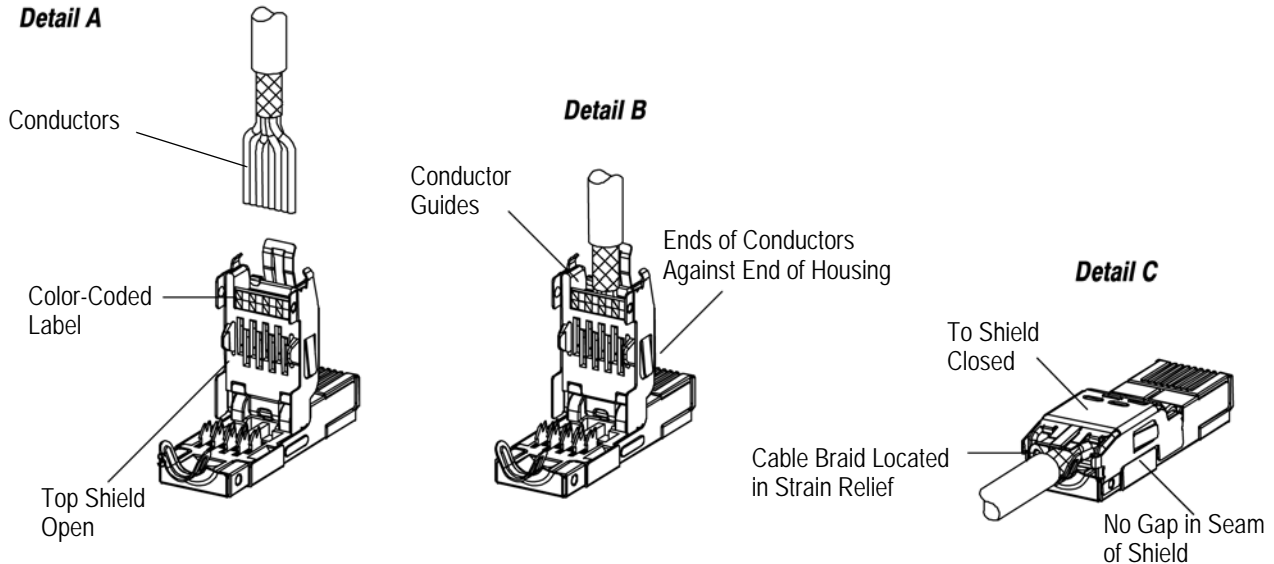


Figure 5

3.7. Inspection

A. Modular Plug (Crimp-Type Contacts)

- 1) The wire insertion depth must be within the dimension given in Figure 6. For optimum transmission performance, the end of the conductors must be bottomed on the wire circuits.
- 2) The crimp height (measured from the top of the contact to the bottom of the modular plug, not including the locking tab) must be within the dimension given in Figure 6. All contacts must be at approximately the same height.

NOTE

The crimp height must be met in order to comply with Federal Communications Commission (FCC) regulations.



- 3) The primary strain relief must be fully engaged with the cable jacket, and the secondary strain relief must be fully engaged with the cable conductors. Both strain reliefs must be fully engaged to isolate the termination area from external forces applied to the cable. It is acceptable for the primary strain relief to cut into the jacket as long as the conductor insulation is not compromised.

NOTE

The primary and secondary strain reliefs can be visually inspected through the side of the modular plug.

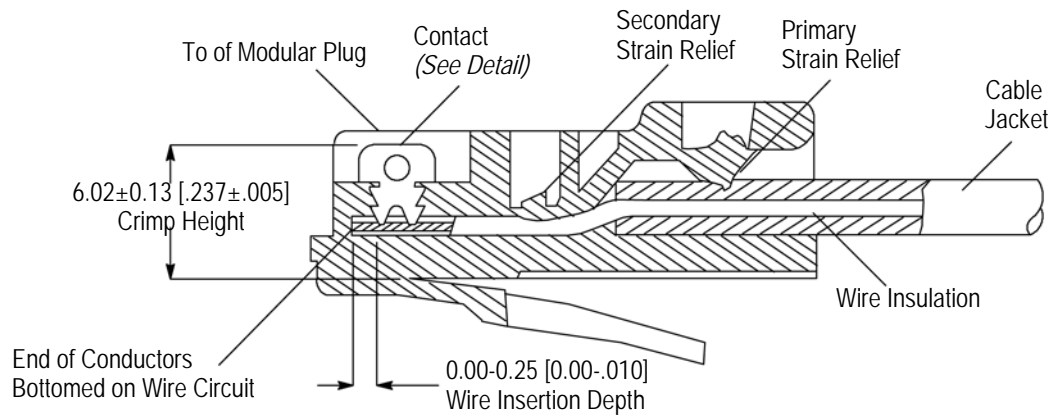


B. Common Core Assembly (IDC Contacts)

- 1) The cable braid must be located in the strain relief (which must not be deformed). Refer to Figure 7.
- 2) The ends of the cable conductors must be against the end of the housing.
- 3) The seam between the top shield and bottom shield must be fully closed.

Cross-Section of Terminated Modular Plug (Crimp-Type Contacts)

Note: Not to Scale



Detail

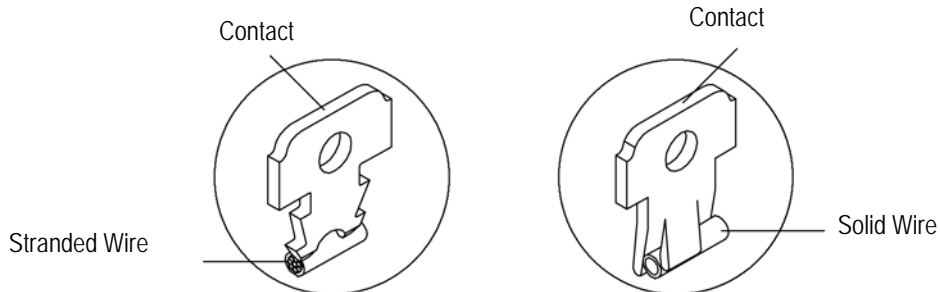


Figure 6

Cross-Section of Terminated Common Core Assembly (IDC Contacts)

Note: Not to Scale

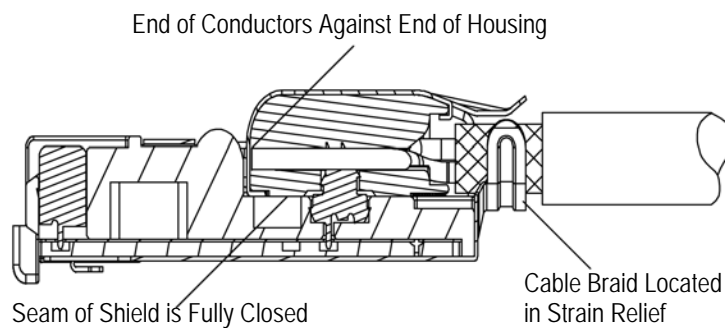


Figure 7

3.8. Assembly

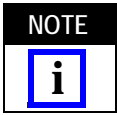
A. Plug Kit

The assembled plug kit must meet the following requirements:

- the locking tab (modular plug) or the latch (common core assembly) is fully engaged with the wide slot at the front of the plug assembly

— the modular plug or common core assembly protrudes from the front of the plug assembly to the dimension given in Figure 8.

— the strain relief is tight to the torque given in Figure 8

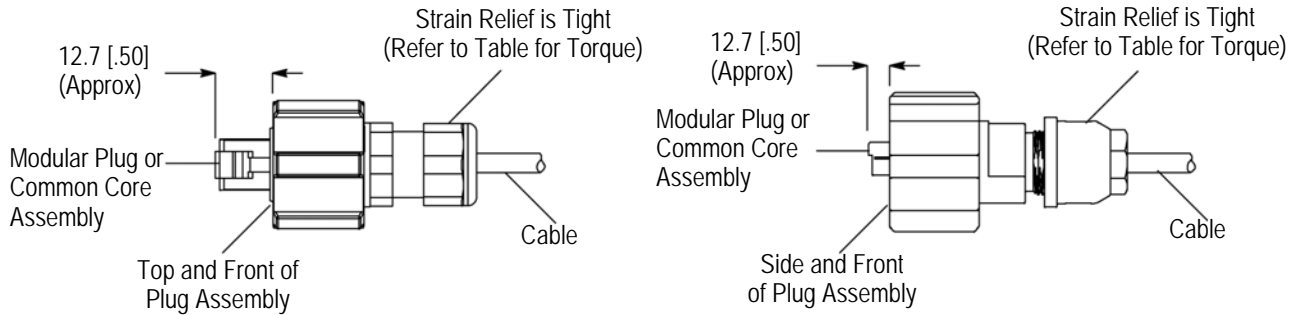


The given torque must be met in order for the strain relief to seal the plug assembly at the cable end as defined in IEC 60529, IP Code 67.

Assembly of Plug Kit

Plastic Shell Plug Assembly

Metal Shell Plug Assembly



STRAIN RELIEF TORQUE RANGE	
PLASTIC SHELL	METAL SHELL
1.7-2.8 n-m [15-25 lbf-in.]	0.9-1.4 N-m [8-12 lbf-in.]

Figure 8

B. Receptacle Kit

The panel gasket must be over the front (end with bayonet lock) for rear panel mount or over the back for front panel mount of the receptacle assembly and against the flange. Refer to Figure 9.

Assembly of Receptacle Kit

Rear Panel Mount

Front Panel Mount

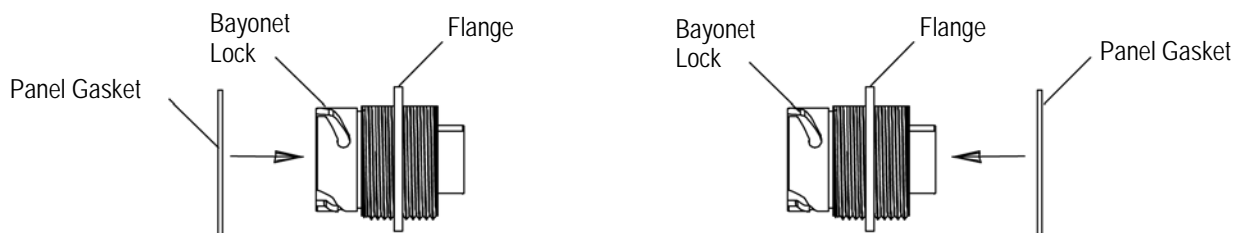


Figure 9

3.9. Panel

A. Indexing

Indexing the receptacle assembly to the panel can be chosen when cutting the panel. There are 4 rotational orientations for mounting the receptacle assembly to the panel: left, right, top, and bottom. The flat of the receptacle assembly fits into the flat edge of the panel. The flat edge also prevents the receptacle assembly from rotating when securing it to the panel.

B. Cutout

The maximum panel thickness shall be 3.18 [.125]. The panel must be cut using the dimensions provided in Figure 10. The flat edge must be located in the desired rotational orientation.

Recommended Panel Cutout

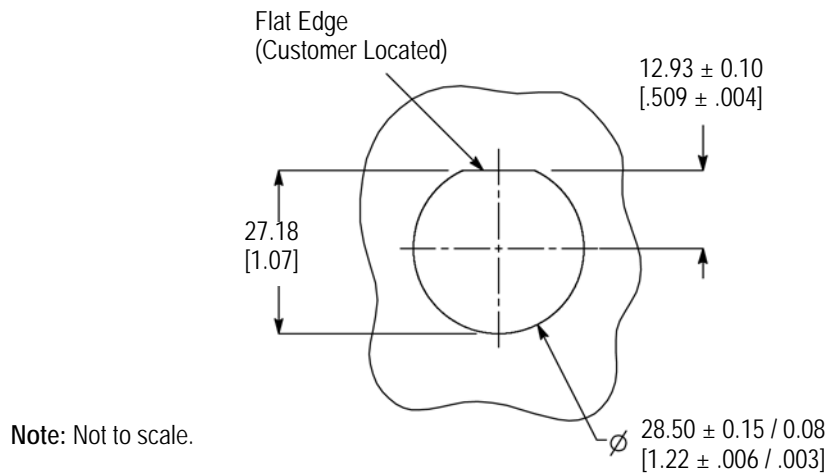
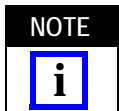


Figure 10

C. Mounting

The receptacle assembly is designed to be front or rear panel mounted. A properly mounted receptacle assembly must have the following requirements (refer to Figure 11):

- the flat of the receptacle assembly must align with the flat edge of the panel
- the panel gasket must be between the receptacle assembly flange and the panel
- the panel gasket must be flat against the panel
- the panel nut must be flat against the panel and tight to the torque given in Figure 11



The given torque must be met in order for the panel gasket to seal the receptacle assembly at the panel as defined in IEC 60529, IP Code 67.

3.10. Protective Cover (Optional)

If used, the protective cover should be attached to the connector by using the tether. For the plug assembly, the loop of the tether must be in the groove at the back (end with the strain relief) of the plug assembly. For the receptacle assembly, the loop of the tether must be in the groove at the front (end with bayonet lock) of the receptacle assembly. Refer to Figure 12.

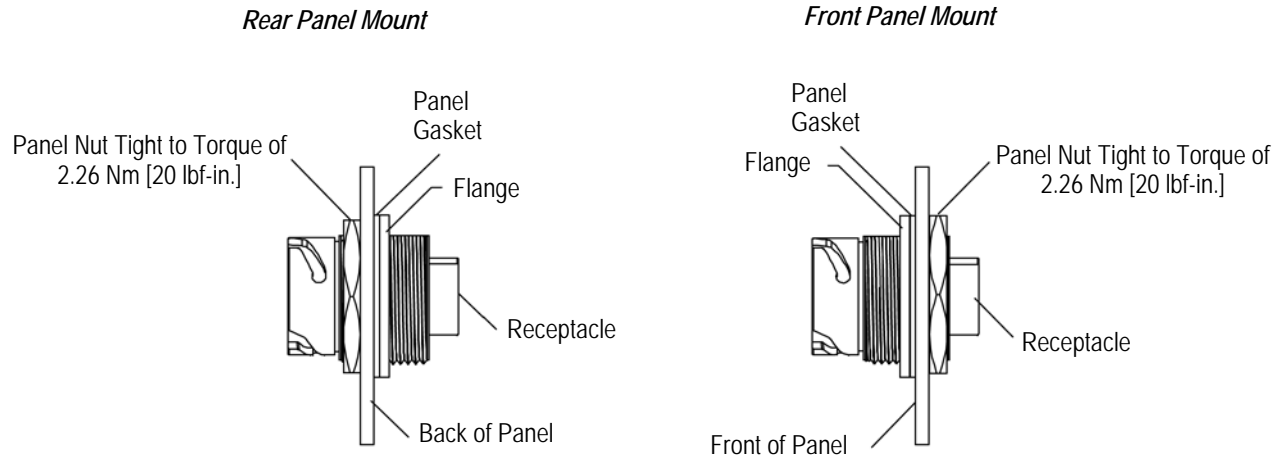


Figure 11

If not mating connectors immediately, the protective cover should be installed onto the mating face of the connector. When installing the protective cover for the plug kit, the slots of the bayonet lock must align with the protrusions (located inside) of the plug assembly; when installing the protective cover for the receptacle kit, the protrusions (located inside) of the cover must align with the slots of the bayonet lock of the receptacle assembly. Then the cover must be rotated until the protrusions "click" onto the bayonet lock.

Protective Cover (Optional) Installation

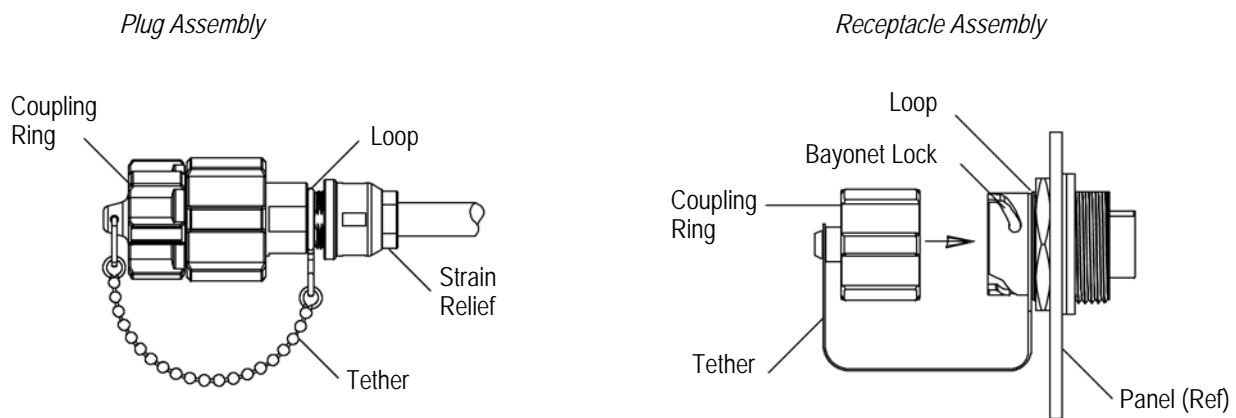


Figure 12

3.11. Connector Engagement

Properly engaged connectors must have the following requirements (see Figure 13):

- the plug assembly and receptacle assembly must be engaged—the locking tab (modular plug) or latch (common core assembly) must be fully seated in the small slot of the modular jack
- the coupling ring of the plug assembly must be engaged with the bayonet lock of the receptacle assembly (during engagement, the protrusions located inside of the coupling ring must "click" onto the bayonet lock)
- the length of the engaged connectors must be within the dimension given in Figure 13

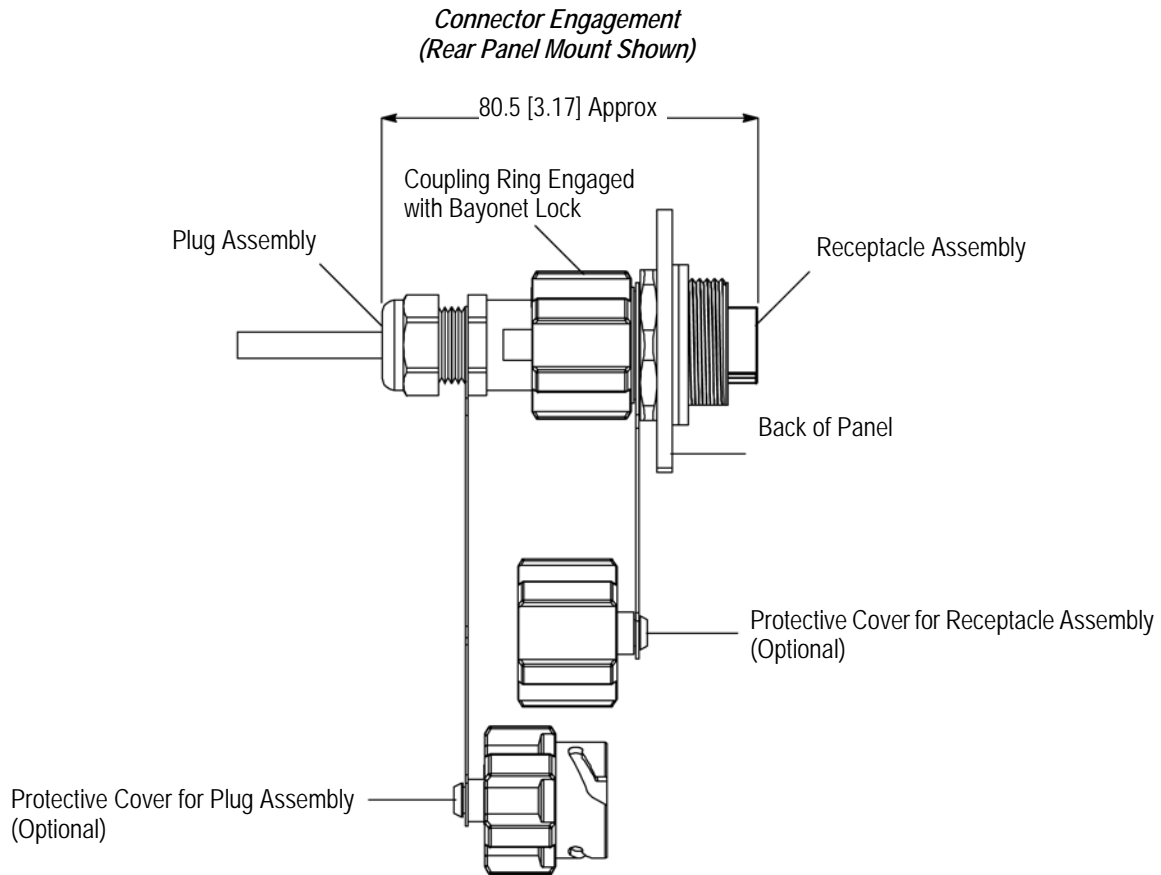


Figure 13

3.12. Repair

These connectors are not repairable. Damaged or defective components **MUST NOT** be used. Plug assemblies **MUST NOT** be re-used by removing the cable.

4. QUALIFICATION

No qualifying support for Industrial Circular Ethernet panel-mount connector system was defined at the time of publication of this document.

The RJ45 modular plug (crimp-type contacts) and RJ45 common core assembly (IDC contacts) are Component Recognized by Underwriters Laboratories Inc. (UL) under File E81956 and Certified by CSA International under File LR 7189A.

5. TOOLING

Tooling part numbers and instructional material packaged with the tooling are given in Figure 14.

No tooling is required for terminating the common core assembly (IDC contacts).

5.1. Torque Tool

A torque tool must be used to tighten the strain relief of the plug assembly and the panel nut of the receptacle assembly. The required torque must be used in order for the connectors to meet the sealing performances defined in IEC 60529, IP Code 67.

5.2. Strip Tool

This strip tool is available to strip the cable jacket for use with the common core assembly (IDC contacts).

5.3. Hand Tool

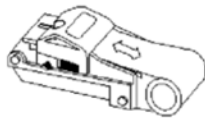
The modular plug hand tool will terminate modular plugs (crimp-type contacts) onto properly stripped stranded or solid cable. The die set is supplied with the tool.

5.4. Single Terminator

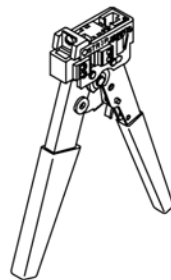
The single terminator will terminate modular plugs (crimp-type contacts) onto properly stripped stranded or solid cable. The terminator is a pneumatically-powered, bench-mounted tool controlled by a foot valve. A tooling kit, specific to this product, must be installed onto the tool. The tooling kit is included with the terminator.

5.5. Dual Terminator

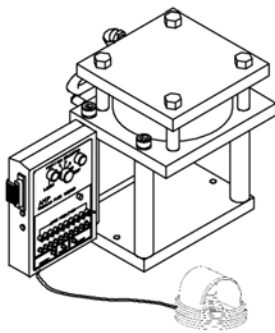
The dual terminator will terminate modular plugs (crimp-type contacts) onto properly stripped stranded or solid cable. The terminator is a pneumatically-powered, bench-mounted machine controlled by a foot valve. A terminating module, specific to this product, must be installed onto the machine. The module must be purchased separately. During termination, the terminator tests the assembly for electrical circuit continuity.



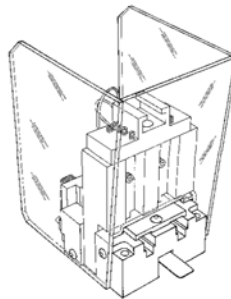
Industrial Ethernet Strip Tool
1981944-1



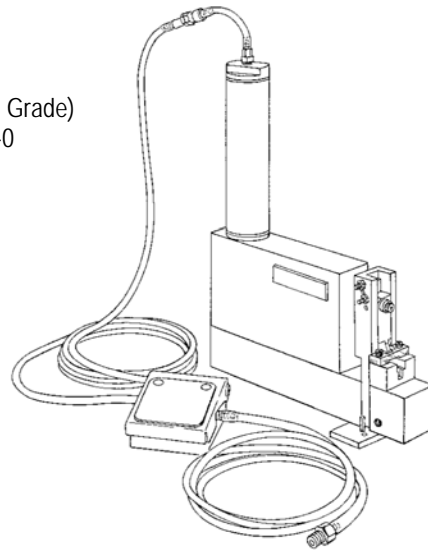
Modular Plug Hand Tool (Premium Grade)
2-231652-0 and Die Set 1-853400-0
(408-9767)



Modular Plug Dual Terminator
1320840-1 (409-10010)



Terminating Module
1-856196-1 (408-9743)

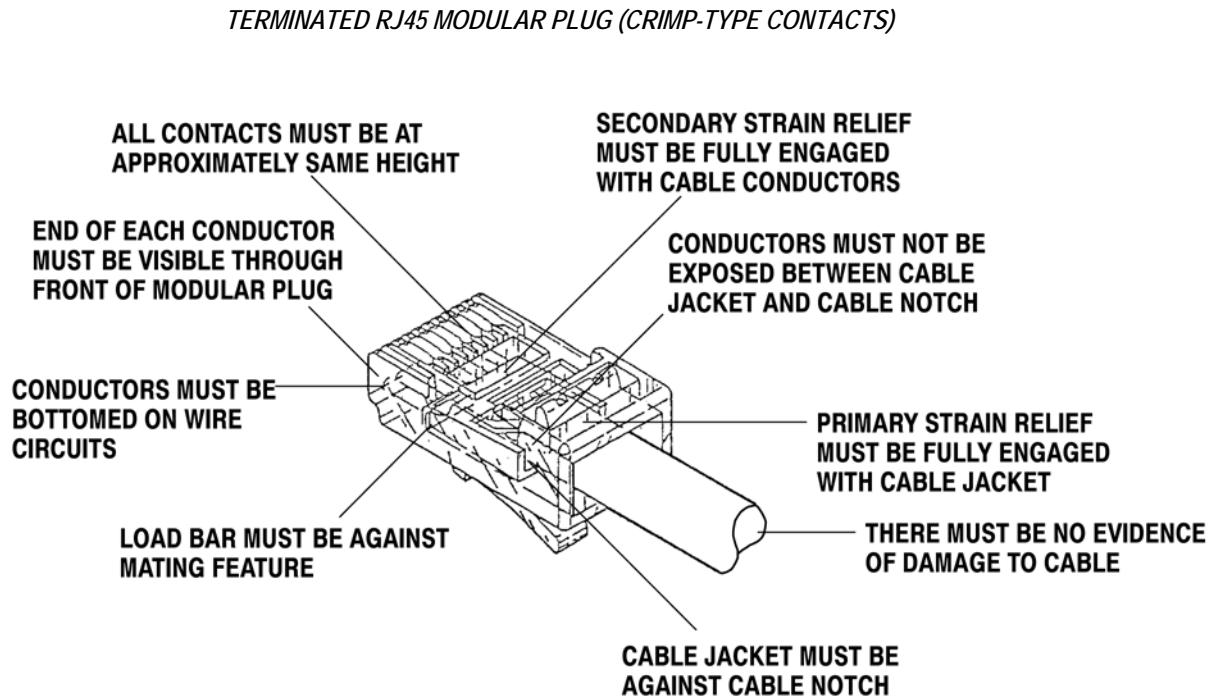


Modular Plug Single Terminator 354711-8
and Tooling Kit 354714-7 (408-9919)

Figure 14

6. VISUAL AID

Figure 15 shows a typical application of the Industrial Circular Ethernet panel-mount connector system. 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.



TERMINATED RJ45 COMMON CORE ASSEMBLY (IDC CONTACTS)

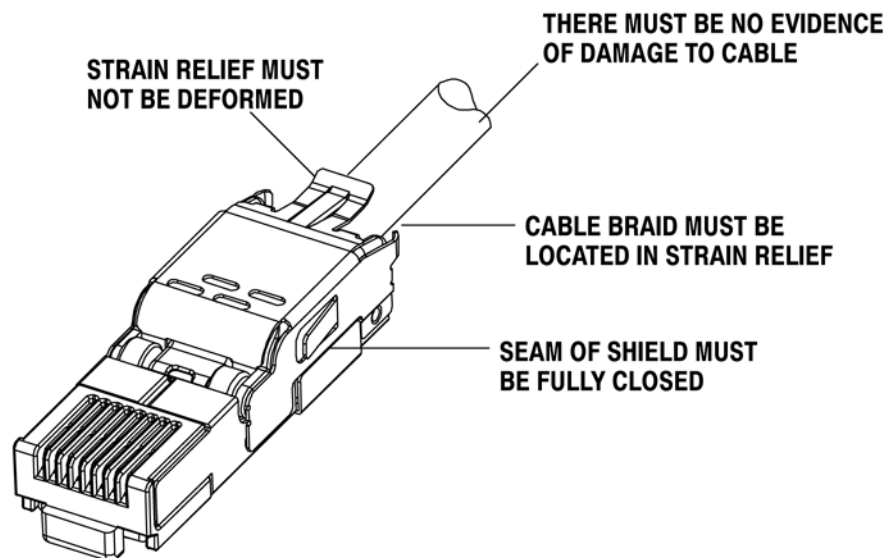
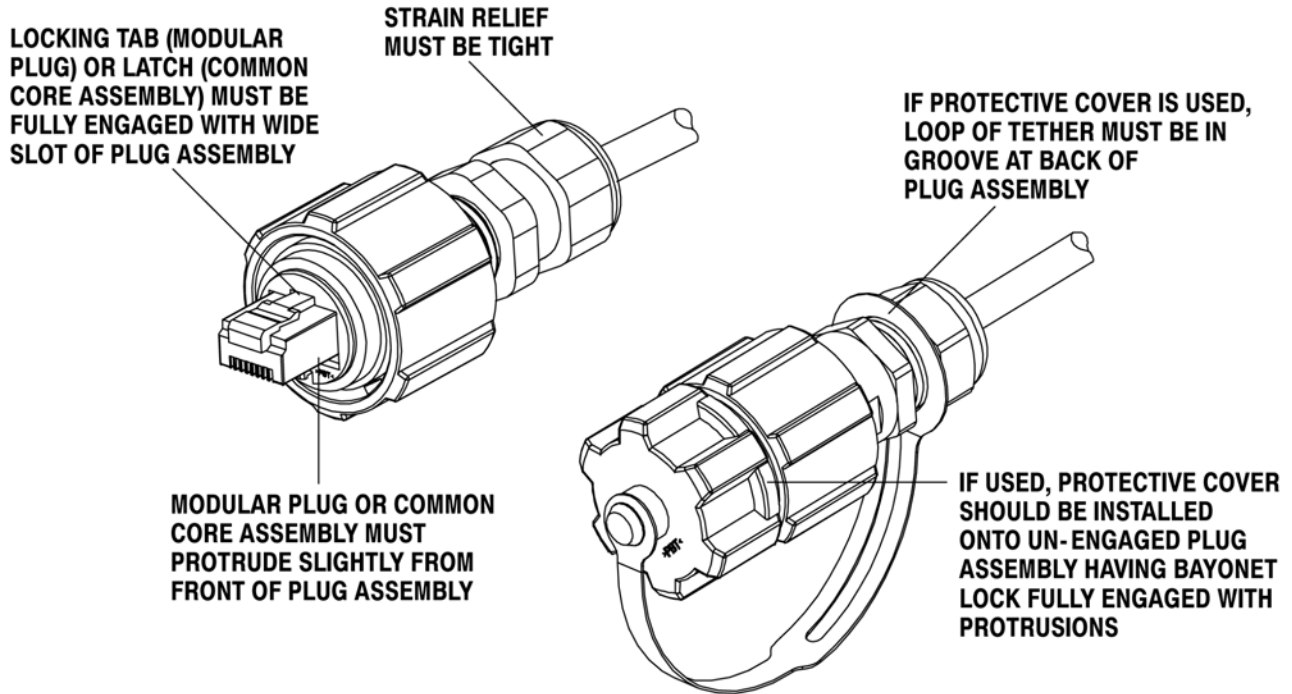


FIGURE 15. VISUAL AID (CONT'D)

ASSEMBLED PLUG KIT



**MOUNTED RECEPTACLE KIT
(REAR PANEL MOUNT SHOWN)**

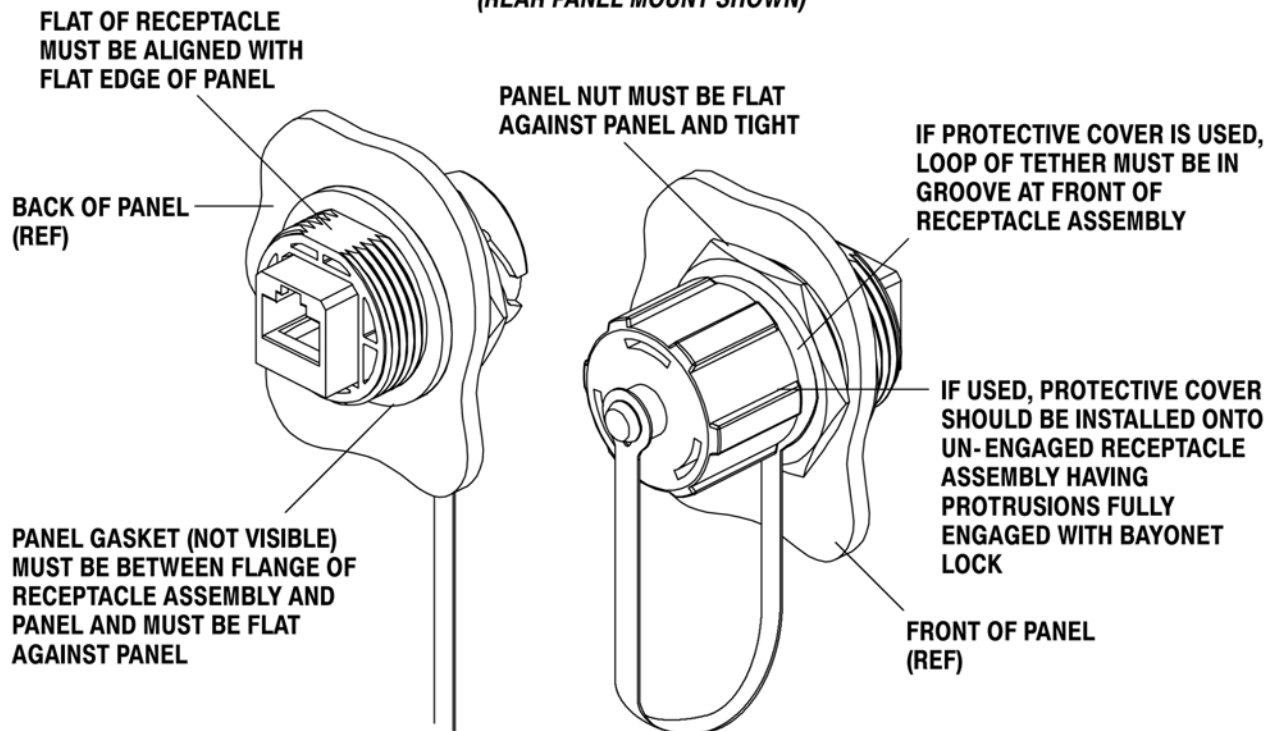


FIGURE 15. VISUAL AID (CONT'D)

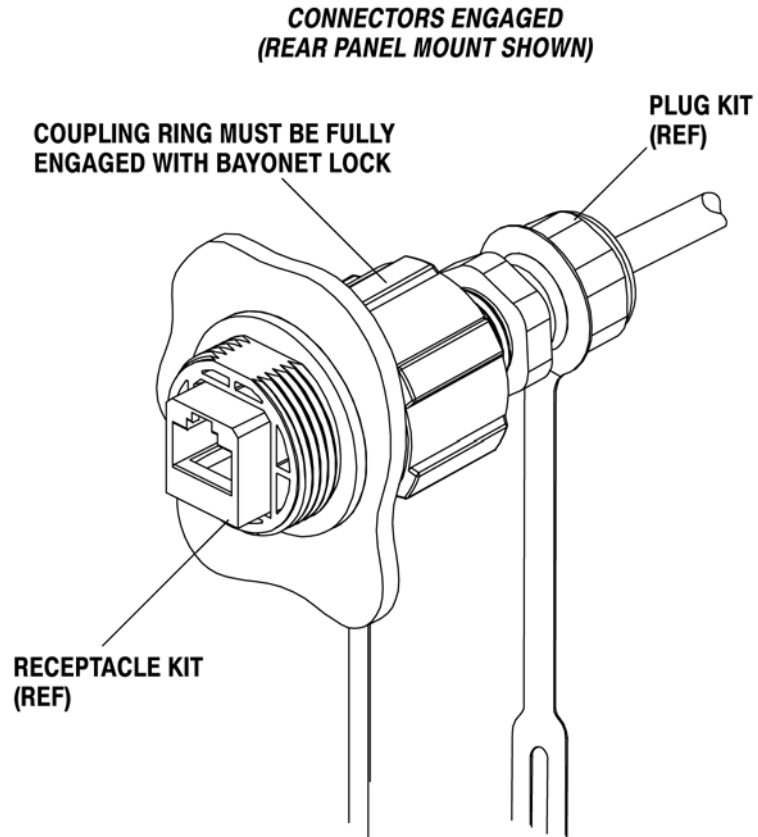


FIGURE 15. VISUAL AID (END)