



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 Industrial Circular Standard USB Panel-Mount Connector System for interconnection between standard serial bus personal computers and interface devices. The connector system consists of a 4-position panel-mount receptacle and mating cable mount overmolded plug. Each connector is supplied as a kit. The kits are available with a plastic or metal shell. The plug kit is available in Series A and Series B; and the receptacle kit is available in Series A to A and Series B to A. The Series A end of the cable connects to the computer, and the Series B end of the cable connects to the peripheral device. The Series A to A receptacle is mounted onto the computer, and the Series B to A receptacle is mounted onto the peripheral.

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.

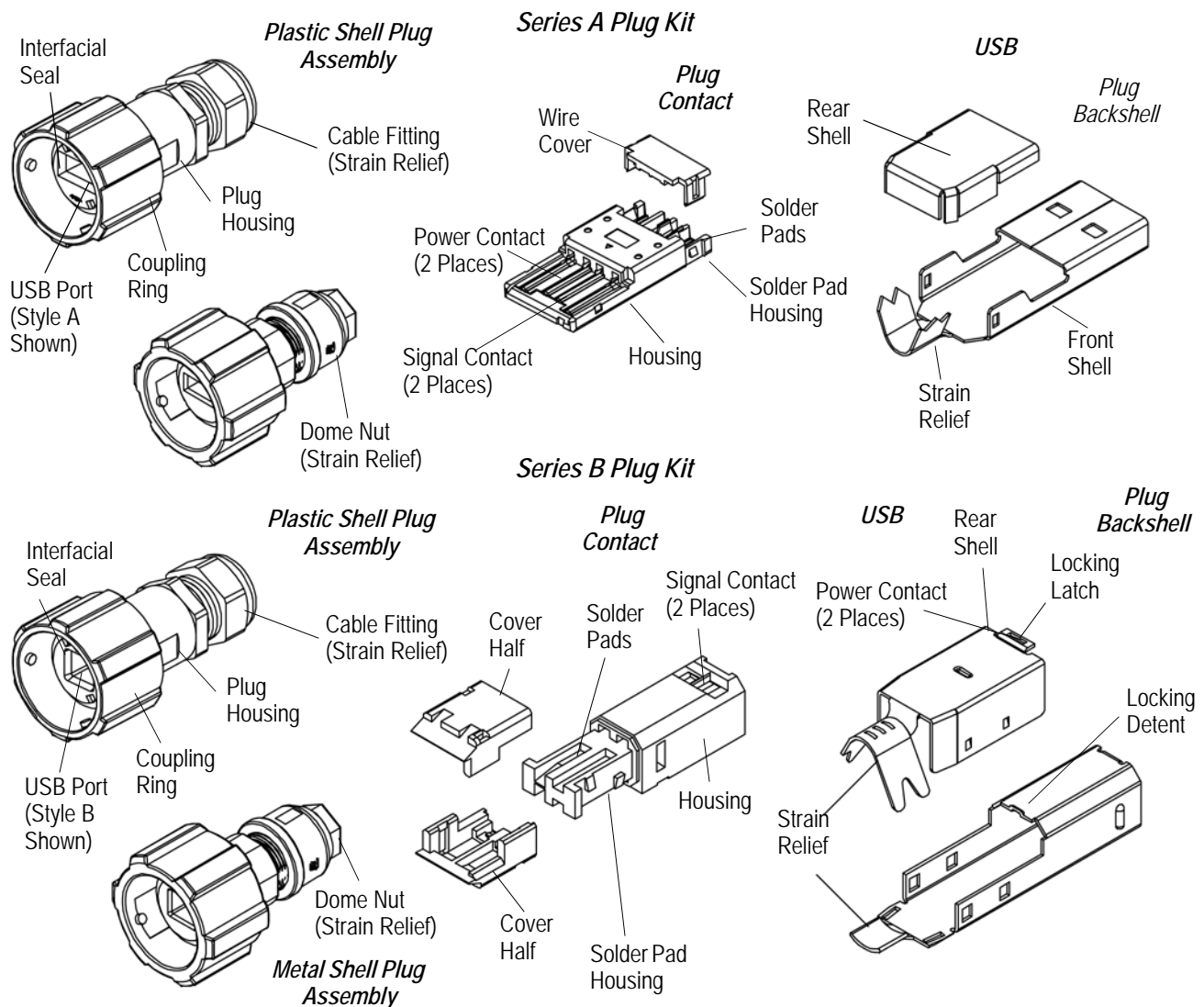


Figure 1 (Cont'd)

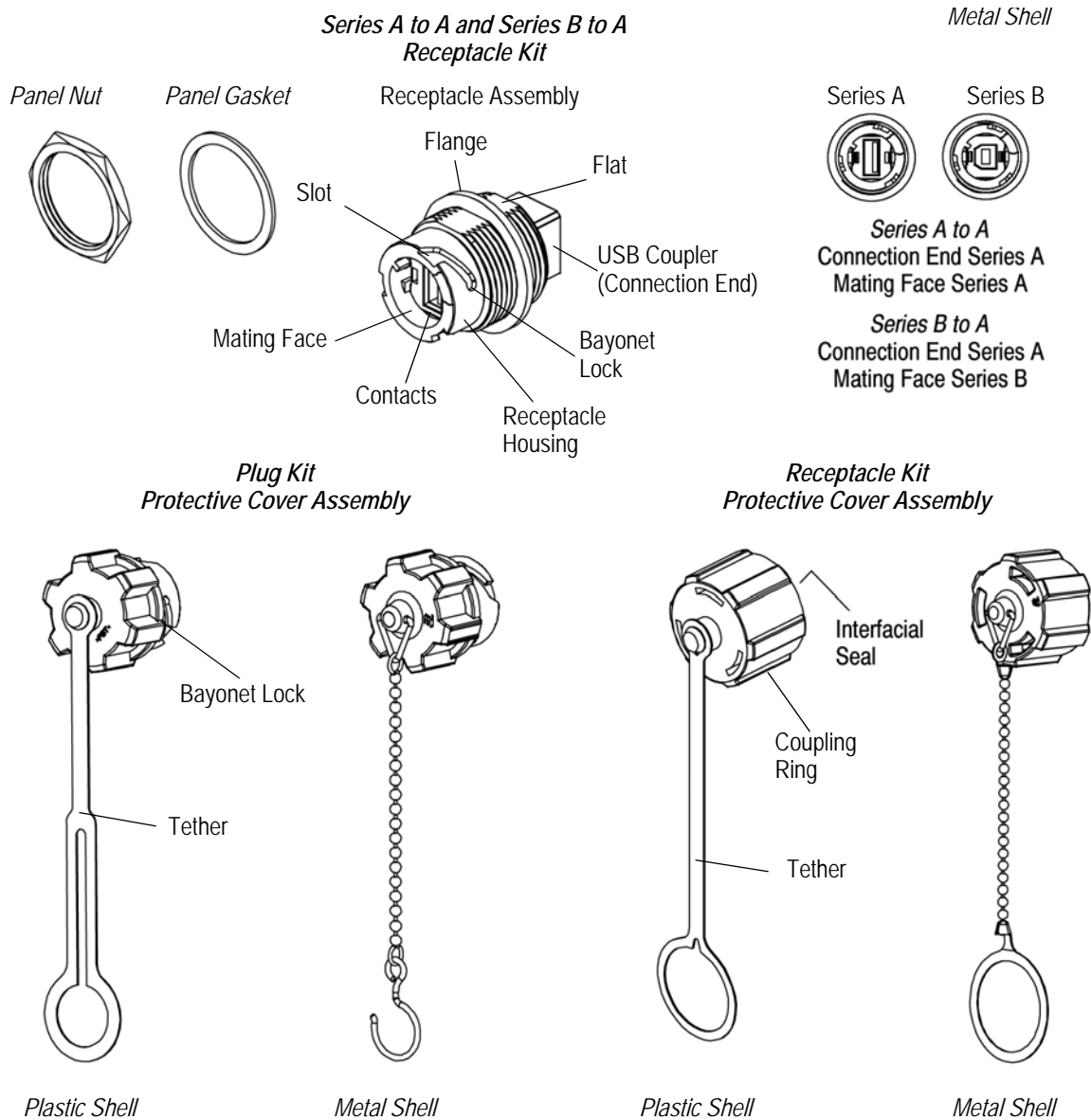


Figure 1 (End)

The plug kit consists of a plug assembly and USB (which consists of a plug contact and stamped and formed backshell). The plug contact of the USB Series A has one set of four adjacent insert molded contacts, and the USB Series B has two sets of two opposing insert molded contacts. The solder pads are numbered for proper wire arrangement. The backshell provides shielding and grounding continuity for electro-magnetic interference (EMI) and electro-magnetic compatibility (EMC). The USB components are designed to be terminated to the wires by soldering and terminated to the cable by crimping. The cable fitting (plastic shell) or dome nut (metal shell) of the plug assembly holds the USB in the plug assembly and seals the USB at the cable end.

The receptacle kit consists of a receptacle assembly (which contains a USB coupler), panel nut, and panel gasket. 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.

A protective cover assembly 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 mating face of the connectors are polarized for proper orientation when mating. When mated, the connectors are held together by a locking mechanism (coupling ring and bayonet lock) which prevents accidental disconnection. The mated connectors are sealed by the interfacial seal of the plug assembly.

2. REFERENCE MATERIAL

2.1. Revision Summary

Since the previous release of this specification, the new company logo has been applied.

2.2. Customer Assistance

Reference Product Base Part Number 1954637 and Product Code K357 are representative of Industrial Circular Standard USB 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 company 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

Product Specification 108-2318 provides product performance and test information.

2.5. Instructional Material

Instruction Sheets (408-series) provide product assembly instructions. Documents available which pertain to this product are:

408-10171 Industrial Circular USB Panel-Mount Connectors

2.6. Standards and Publications

Standards and publications developed by the International Electrotechnical Commission (IEC) and Association of Connecting Electronics Industries (IPC) provide industry test and performance requirements. Documents available which pertain to this product are:

IEC 60529, "Degrees of Protection Provided by Enclosures"

IPC-A-610, "Acceptability of Electronic Assemblies"

3. REQUIREMENTS

3.1. Safety

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

3.2. Limitations

The connectors are designed to operate in a temperature range of 0° to 50°C [32° to 122°F] and for a non-operating temperature range of -20° to 60°C [-4° to 140°F].

3.3. Storage

A. Ultraviolet Light

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

B. Shelf Life

The connectors should remain in the shipping containers until ready for use to prevent deformation to the contacts. 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

3.4. Cable Selection and Preparation

A. Selection

The plug contacts accept 4-conductor solid or stranded individual wire sizes 20-28 (power-signal), 22-28, 24-28, 26-28, or 28-28 AWG with a cable outside insulation diameter range of 4.0 mm [.157 in.] through 6.5 mm [.256 in.] for plastic shell and 4.0 mm [.157 in.] through 5.4 mm [.212 in.] for metal shell. Allowable length of the cable assembly according to wire size is given in Figure 2.

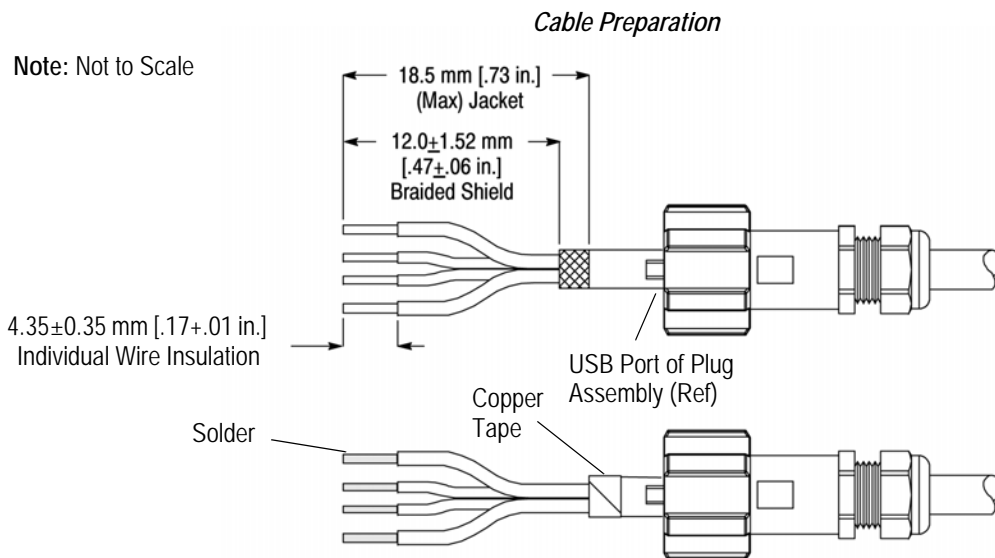
B. Preparation

The plug assembly must be installed (strain relief end first) onto the end of the cable before preparing the cable. Proper strip length is necessary to properly insert the wire into the contact. The strip length of the cable is shown in Figure 2.



Reasonable care must be taken not to nick, scrape, or cut any part of the cable during the stripping operation. Care must also be used when handling the cable during stripping to prevent cracking or breaking of the braided shield, wires, or insulation.

After the braided shield is stripped, it must be rolled back over the jacket and wrapped with copper tape. After the individual wires are stripped, each wire must be pre-tinned with solder.

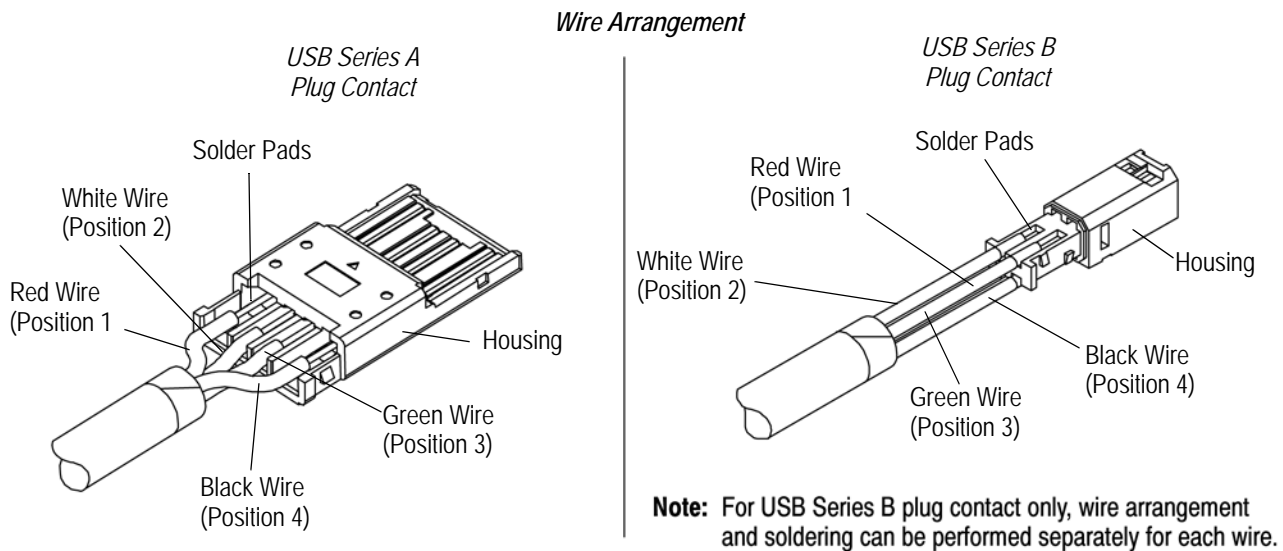


WIRE SIZE (AWG)	MAXIMUM CABLE LENGTH
20-28	5.00 m [16.4 ft]
22-28	3.33 m [10.9 ft]
24-28	2.08 m [6.8 ft]
26-28	1.31 m [4.3 ft]
28-28	0.81 m [2.7 ft]

Figure 2

C. Wire Arrangement

Wires must be arranged according to the wire color and the circuit positions of the plug contact. Refer to Figure 3.



WIRE COLOR (Type)	CIRCUIT POSITION	
	SERIES A	SERIES B
Red (Signal)	1	1
White (Signal)	2	2
Green (Power)	3	3
Black (Power)	4	4

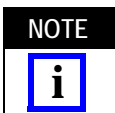
Figure 3

3.5. Soldering

The wires must be soldered onto the solder pads of plug contacts using the following requirements.

A. Flux Selection

The contact solder pads must be fluxed prior to soldering with a mildly active, rosin base flux. Additionally, the flux must be compatible with the wave solder line, manufacturing, health, and safety requirements. Flux that is compatible with these connectors are provided in Figure 4.



Call **PRODUCT INFORMATION** at the number at the bottom of page 1 for consideration of other types of flux.

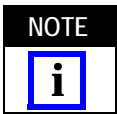
FLUX TYPE	ACTIVITY	RESIDUE	COMMERCIAL DESIGNATION	
			KESTER	ALPHA
RMA	Mild	Noncorrosive	186	611

Kester Flux and Alpha Flux are trademarks.

Figure 4

B. Process

The plug contacts can be soldered using wave, vapor phase (VPR), non-focused infrared reflow (IR), or equivalent soldering technique. Acceptable temperature and exposure time are given in Figure 5. It is recommended using SN60 or SN62 solder.



Manual 402-40 provides information on various flux types and characteristics with the commercial designation and flux removal procedures. A checklist is included in the manual as a guide for information on soldering problems.

SOLDERING PROCESS	TEMPERATURE (Max)	TIME
Wave	260°C [500°F]	5 Seconds
VPR	215°C [500°F]	5 Minutes
IR	230°C [446°F]	5 Minutes

Figure 5

For hand soldering, refer to Manufacturing Process Specification 106-4, "Hand Soldering of Electrical Connections."

C. Cleaning

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. Cleaners must be free of dissolved flux and other contaminants. Common cleaning solvents with times and temperatures that will not affect the plug contacts is specified in Figure 6.

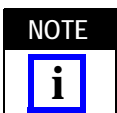
CLEANER		TIME (Minutes)	TEMPERATURE (Maximum)
NAME	TYPE		
ALPHA 2110	Aqueous	1	132°C [270°F]
BIOACT EC-7	Solvent	5	100°C [212°F]
Butyl CARBITOL	Solvent	1	Ambient Room
Isopropyl Alcohol	Solvent	5	100°C [212°F]
KESTER 5778	Aqueous		
KESTER 5779	Aqueous		
LONCOTERGE 520	Aqueous		
LONCOTERGE 530	Aqueous		
Terpene Cleaner	Solvent		

ALPHA, BIOACT, CARBITOL, LONCOTERGE, and KESTER are trademarks of their respective owners.

Figure 6



Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Refer to the manufacturer's Material Safety Data Sheet (MSDS) for characteristics and handling of cleaners. Trichloroethylene and Methylene Chloride is not recommended because of harmful occupational and environmental effects. Both are carcinogenic (cancer-causing).



If you have a particular cleaning solvent that is not listed, contact PRODUCT INFORMATION at the number at the bottom of page 1.

D. Drying

When drying cleaned assemblies, temperature limitations must not be exceeded: -55° to 105°C [-68° to 221°F]. Excessive temperatures may cause degradation.

3.6. Assembling the Plug Kit

A. Plug Contact and Plug Backshell (Figure 7)

USB Series A

The cover of the plug contact must be "snapped" onto the solder pad housing. The latches of the cover must be secured to the tabs of the solder pad housing. There should be no gap between the cover and the housing.

When inserting the plug contact into the front shell, the bottom of the housing must be aligned with the seam of the front shell. The cable jacket must be positioned in the strain relief of the front shell.

The rear shell must be manually "snapped" onto the front shell so that the latches on the sides of the rear shell engage the windows on the sides of the front shell. There should be no gap between the front shell and the rear shell.

When fully assembled, the housing of the plug contact must be bottomed and flush with the mating face of the backshell.

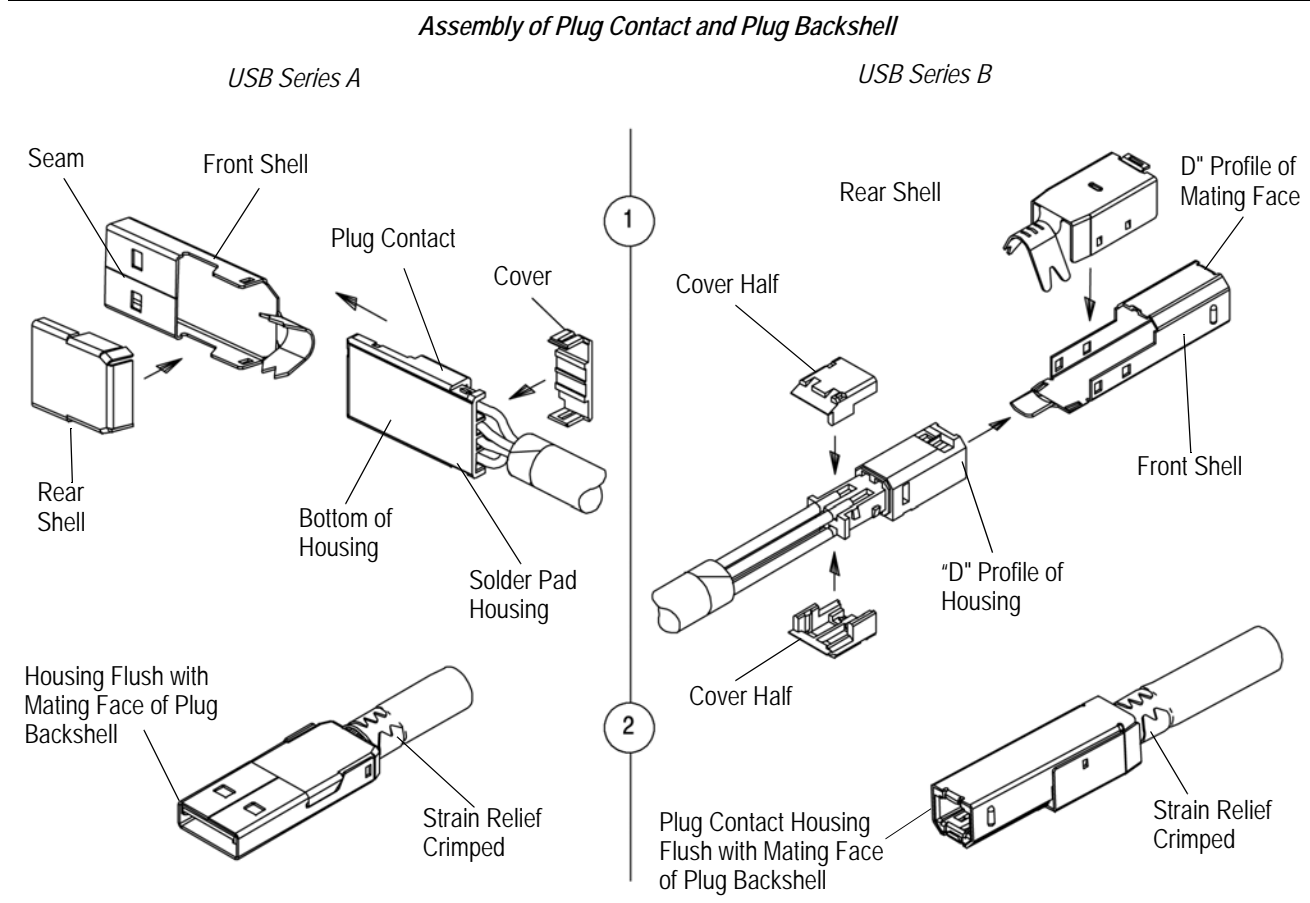


Figure 7

USB Series B

The cover halves of the plug contact must be manually "snapped" together over the solder pad housing. There should be no gap between the covers and the housing.

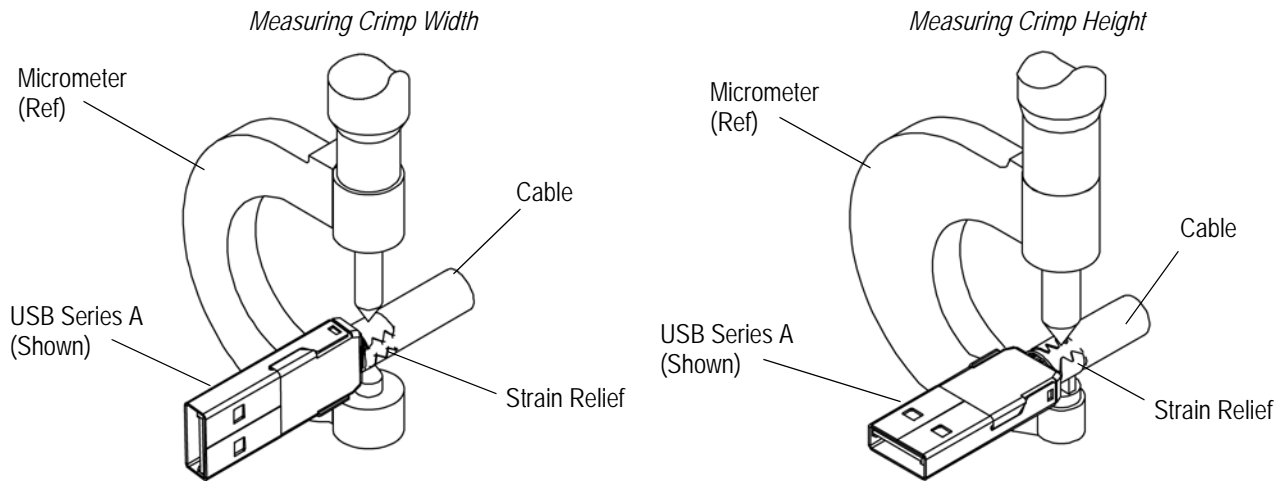
When inserting the plug contact into the plug backshell, the "D" profile of the front of the housing must align with the "D" profile of the mating face of the front shell. The cable jacket must be positioned in the strain relief of the rear shell. The front shell and rear shell of the plug backshell must be manually "snapped" together so that the locking latch of the rear shell engages the locking detent of the front shell. The latches on the sides of the rear shell must engage with the windows of the front shell.

When fully assembled, the housing of the plug contact must be bottomed and flush with the mating face of the plug backshell.

B. Strain Relief

The strain relief must be manually closed, then crimped-capturing the cable braid, copper tape, and cable jacket. The crimp width and crimp height must be checked using a micrometer, vernier, or caliper. The required crimp width and maximum crimp height dimensions are provided in Figure 8.

Inspecting Plug Backshell Strain Relief Crimp



WIRE SIZE (AWG) (Signal-Power)	CABLE INSULATION DIAMETER (mm [in.])	CRIMP (mm [in.])		
		SERIES A (Oval Crimp)		SERIES B (Round Crimp) WIDTH AND HEIGHT ±0.20 [.008]
		WIDTH ±0.20 [.008]	HEIGHT (Max)	
20-28	5.20 [.204]	6.50 [.256]	5.10 [.200]	5.65 [.222]
22-28				
24-28	4.50 [.177]	5.80 [.228]		5.30 [.209]
26-28	4.20 [.165]	5.50 [.217]	5.00 [.197]	
28-28				

Figure 8

C. Installing USB into Plug Assembly

It is recommended that the USB be installed into the plug assembly so that the seam aligns with the logo embossed on the front of the plug housing (located over the USB port).

The assembled plug assembly must meet the following requirements:

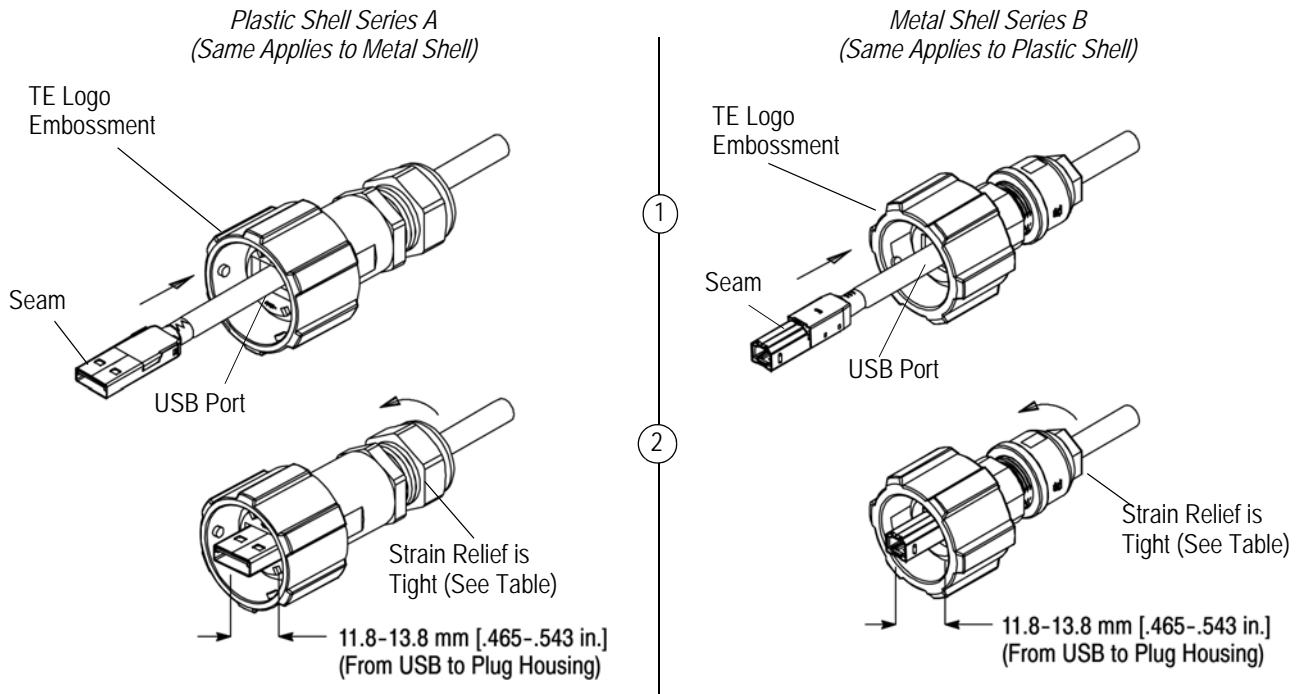
- the USB protrudes from the housing of the plug assembly to the dimension given in Figure 9.
- the strain relief is tight to a torque between the range provided in Figure 9



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

Installing USB into Plug Assembly

NOTE: Not to Scale



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 9

3.7. Panel

A. Indexing

Indexing the receptacle 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 from rotating when securing it to the panel.

B. Thickness

The maximum panel thickness shall be 3.18 mm [.125 in.].

C. Cutout

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

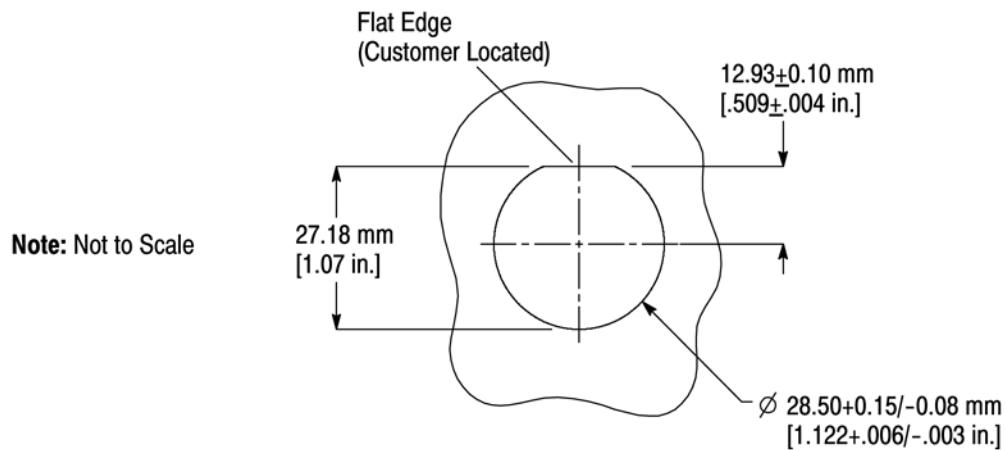


Figure 10

3.8. Mounting the Receptacle Assembly

The receptacle assembly is designed to be front or rear panel mounted. When inserting the receptacle assembly into the panel cutout, the flat must align with the flat edge of the panel. A properly mounted receptacle assembly must have the following requirements (refer to Figure 11):

- the panel gasket must be between the receptacle assembly flange and the panel
- the panel gasket must be flat against the panel
- the flange of the receptacle assembly must be flat against the panel gasket
- the panel nut must be flat against the panel and tight to a torque of between 1.7 and 2.8 N-m [15 and 25 lbf-in.]



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

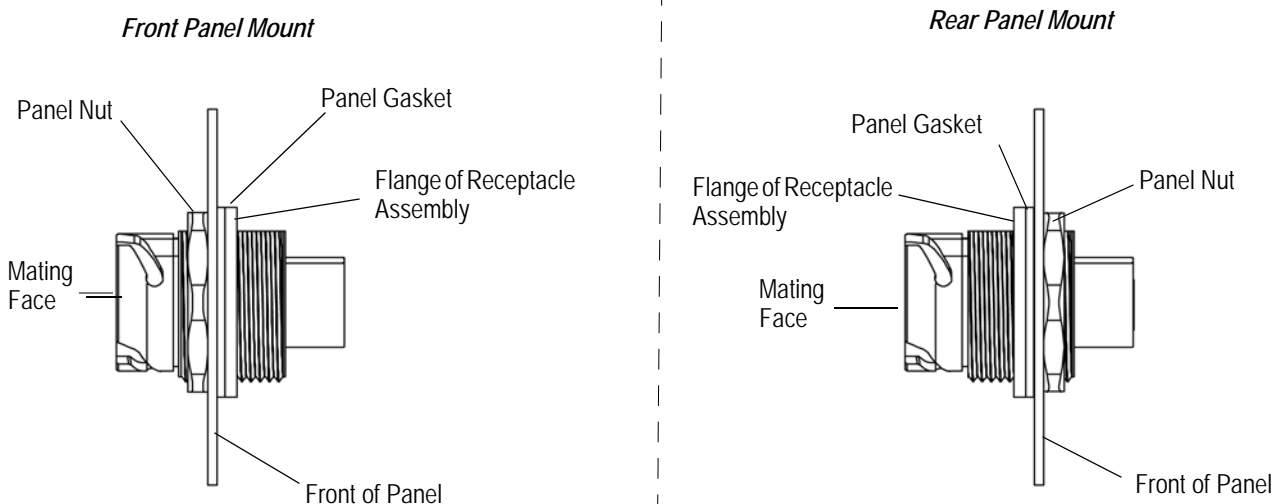


Figure 11

3.9. 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.

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.

3.10. Connector Mating

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

- the plug and receptacle must be engaged (the USB must be fully seated in the slot of the USB coupler)
- 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 mated connectors must be within the dimension given in Figure 13

Protective Cover (Optional) Installation

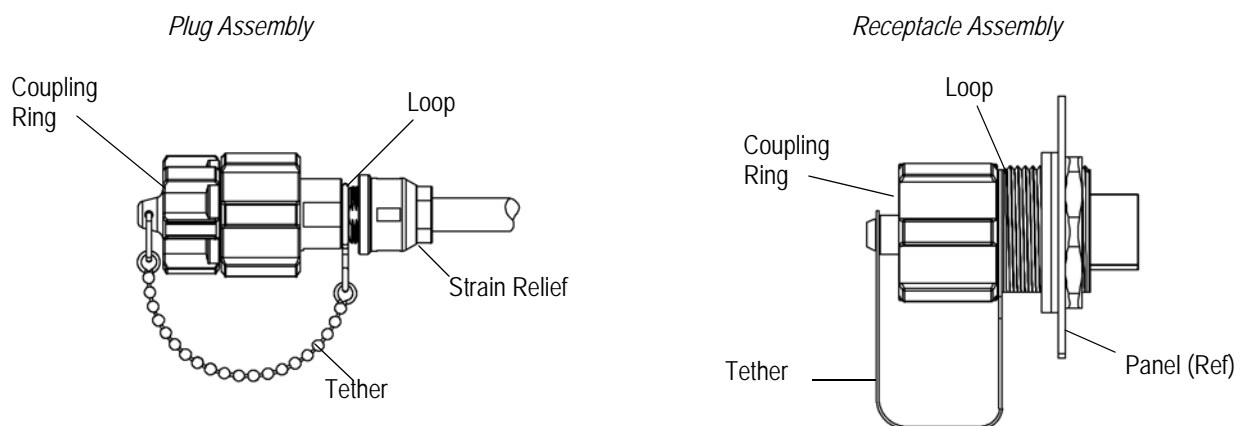


Figure 12

3.11. Electrical Testing

The connector system should be tested for electrical continuity according to local practices.

3.12. Connectivity

The part matrix for this connector system is shown in Figure 14.

3.13. Disassembly

The connectors can be un-mated by rotating the coupling ring of the plug which releases it from the bayonet lock of the receptacle (there should be an audible "click"), then pulled straight away from the receptacle. The receptacle can be removed from the panel by removing the panel nut.

3.14. Replacement and Repair

All components of the connector system are not repairable. Defective or damaged components must be replaced and **MUST NOT** be used.

The panel gasket can be re-used if not worn. Plug contacts **MUST NOT** be re-used by removing the wire. A plug contact **MUST NOT** be removed from the backshell and re-used.

*Connector Mating
(Rear Panel Mount Shown)*

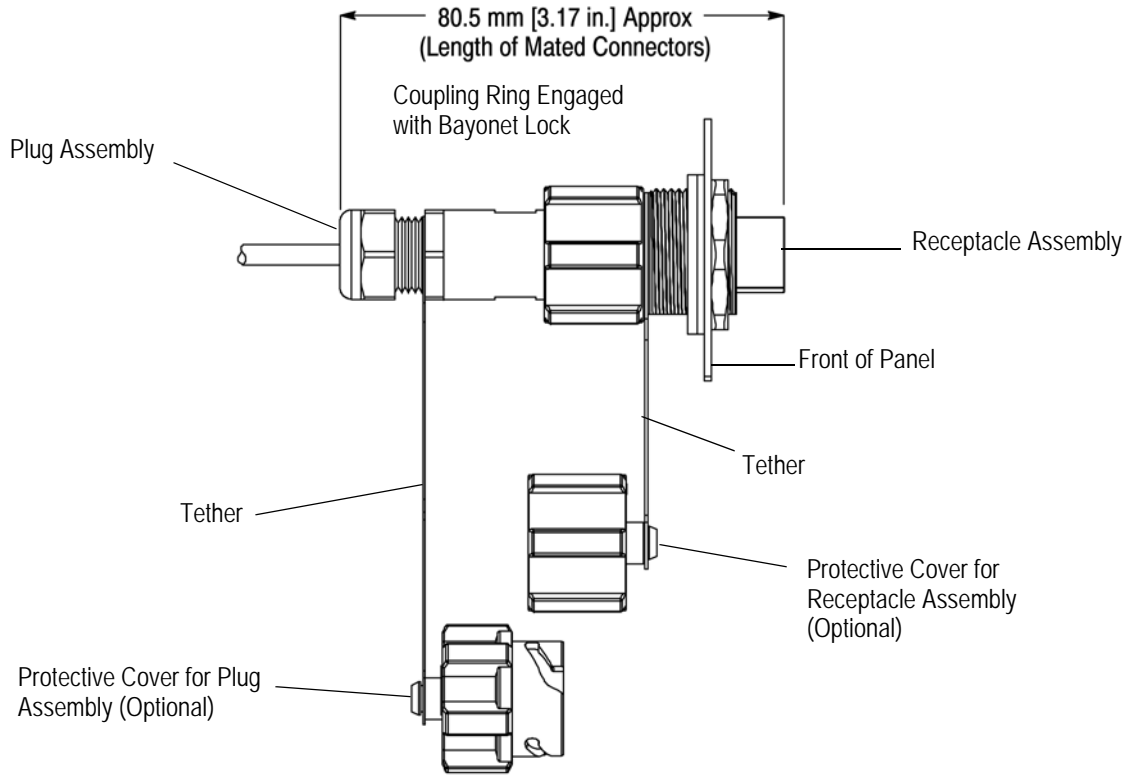


Figure 13

Part Matrix

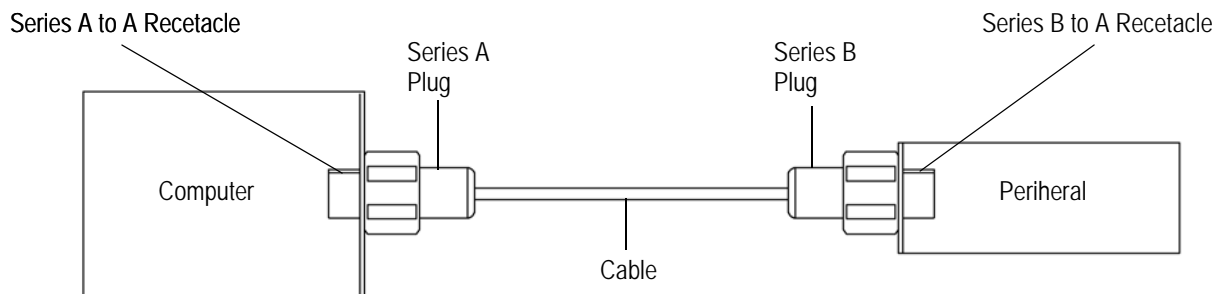


Figure 14

4. QUALIFICATION

The plug contacts and backshells of the Industrial Circular Standard USB Panel-Mount Connector System are Listed by Underwriters Laboratories Inc. (UL) in File E81956 and Certified by CSA International in File LR 7189A.

No qualifying support for the plug assembly or receptacle assembly was defined at the time of publication of this document.

5. TOOLING

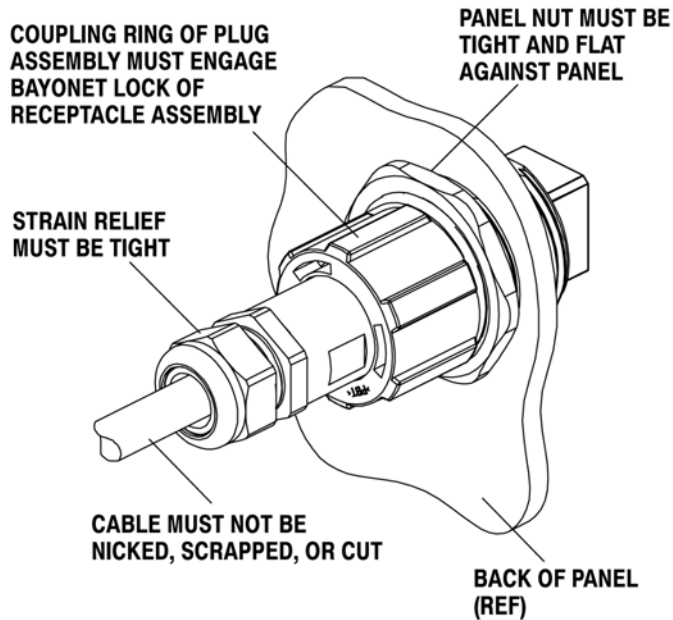
No tooling is available for assembling this connector system. For information on tooling concepts, contact PRODUCT INFORMATION at the number at the bottom of page 1.

6. VISUAL AID

Figure 15 shows a typical application of Industrial Circular Standard USB 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.

NOTE: All Requirements Apply to Both Front-Mounted and Rear-Mounted Connectors

FRONT-MOUNTED CONNECTORS



REAR-MOUNTED CONNECTORS

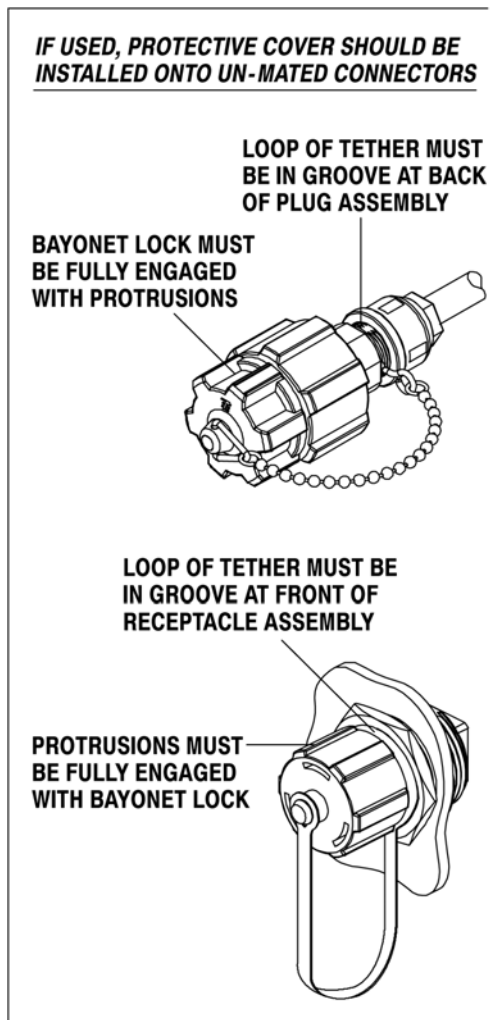
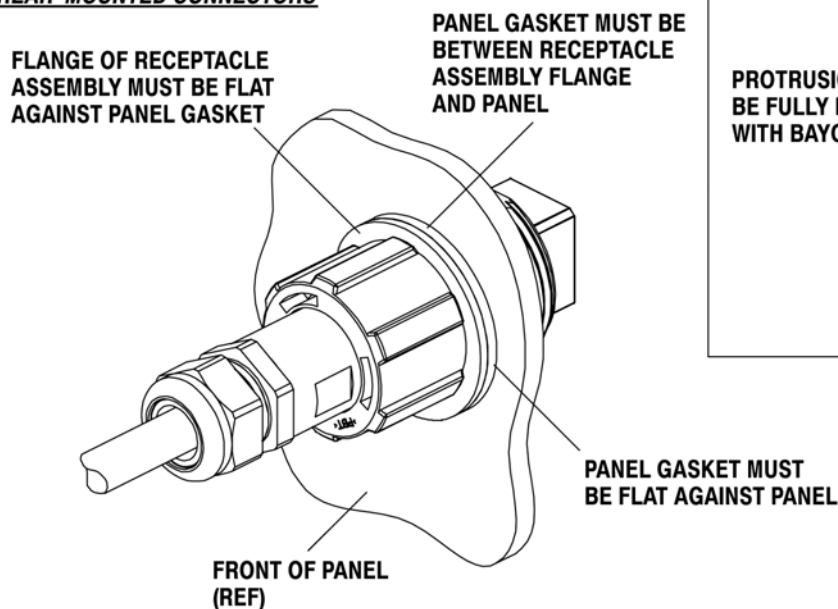


FIGURE 15. VISUAL AID