

Figure 1

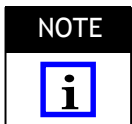
## 1. INTRODUCTION

PRO BEAM Jr. EB Single-Fiber Armored-Cable Plug Connector Kit is designed to be installed onto Ø3.4 mm steel-armored fiber optic cable such as that manufactured by Solifos AG. Read and understand these instructions before assembling the kit.

Cable plug connector kit 1515882-1 can be used, or the combination of Plug Shell Kit 1918948-1, Cable Adapter Kit 1588746-1, a 1-channel EB insert assembly, and a ferrule kit. Select the EB insert and ferrule kit based on the mode and any specific coding pin requirements.



**CAUTION** To avoid poor optical performance or permanent damage to the lens of the EB insert, use **ONLY TE Connectivity ferrule assembly kits**. Other manufacturers' ferrule assemblies **ARE NOT compatible with the EB insert assembly kit**.



**NOTE** All numerical values in this instruction sheet are in metric units. Figures are not drawn to scale.

Reasons for reissue of this instruction sheet are provided in Section 8, REVISION SUMMARY.

## 2. DESCRIPTION

The connector will consist of the components shown in Figure 1.

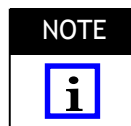
The EB insert assembly is shipped with a white protective label on the end opposite the lens. It is installed immediately after final testing to keep the channel cavities clean. The EB insert is ready for assembly as shipped.

## 3. HANDLING



**DANGER** To avoid personal injury, **NEVER** look into the end of terminated or unterminated optical fibers. Laser radiation is invisible but can damage eye tissue.

- Re-install the protective cap or mate the connector immediately after the cap has been removed to prevent contamination to the EB insert
- Do not touch the lens of the EB insert with your fingers or with any tools



**NOTE** If the lens is touched or otherwise contaminated, clean the lens according to Section 6.

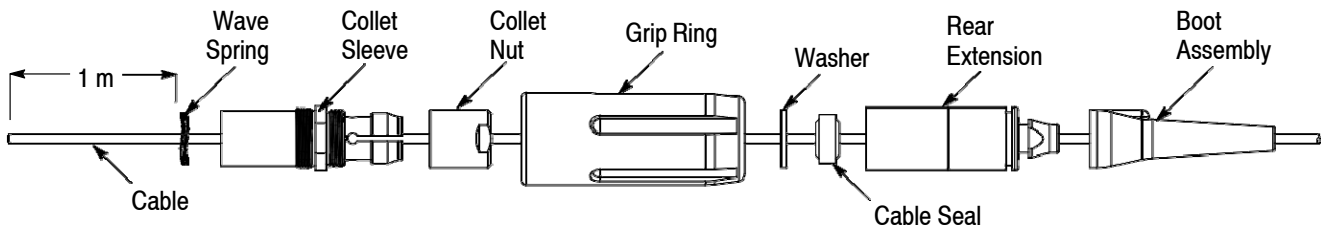


Figure 2

#### 4. TOOLS AND MATERIALS

The following tools and materials are necessary for preparation, assembly, inspection, and maintenance of the connector and cable assembly. Follow the operating instructions packaged with the tools and safety guidelines packaged with the materials.



Items without a part number or supplier are customer supplied.

##### 4.1. Tools

- cable jacket strip tool
- Terry Tool 1/16" tubing cutter
- SDE PEW 12 Hand Tool 91382-1 with Die Set 1673667-1 (408-8795)
- Bench-Mount Assembly Fixture 1918503-3
- micrometer or vernier, dial or digital caliper
- Fiber Stripping Tool 1278947-1 (408-4577)
- Heat Cure Oven Assembly 502134-1 (120 Vac) or -2 (240 Vac) which includes universal heat cure block (408-9460)
- Curing Fixture 1693803-1 (408-8857)
- Sapphire Scribe Tool 504064-1 (408-4293)
- polishing machine (recommended) or Polishing Bushing 503337-1 (for hand polishing)
- Fiber Optic Inspection Microscope (200x) 1754767-1
- Ferrule Insertion Tool 1693820-1
- 2.5-mm hex wrench
- EB Insert Assembly Fixture 1515844-1
- 15-mm open-end wrench
- 10-mm open-end wrench
- heat gun

##### 4.2. Materials

- PTFE etched-OD tubing, size 28 AWG
- LOCTITE Adhesive 496
- LOCTITE Adhesive 480
- lint-free tissue or cloth wipes
- lint-free applicator swabs
- clean, dry air

- isopropyl alcohol (99%) or acetone
- EPO-TEK 353ND-T epoxy
- Epoxy Applicator Kit 501473-3
- DOW CORNING MOLYKOTE 55M Grease
- LOCTITE 243 Medium-Strength Threadlocker

For hand polishing only:

- 5- $\mu$ m Aluminum Oxide Polishing Film 228433-8
- 1mm Rubber Polishing Pad 501858-1 (green)
- 0.3- $\mu$ m Diamond Polishing Film 228433-5
- Final Polishing Film 502748-2

#### 5. ASSEMBLY PROCEDURE

**IMPORTANT:** Assemble the connector kit in a clean environment meeting the requirements of International Organization for Standardization (ISO) 14644-1 (Class 5), "Cleanrooms and Associated Controlled Environments, Part 1." Make sure that all components are free from contamination.

Proceed as follows:

##### 5.1. Prepare the Cable

1. Slide the components shown in Figure 2 onto the cable allowing 1 m at the end of the cable for stripping the cable. Make sure to orient each component as shown.
2. Using the cable jacket strip tool, strip the jacket to the dimension shown in Figure 3, exposing the steel strength members and steel fiber tube. (Heating the jacket first with the heat gun will make the jacket easier to strip.)

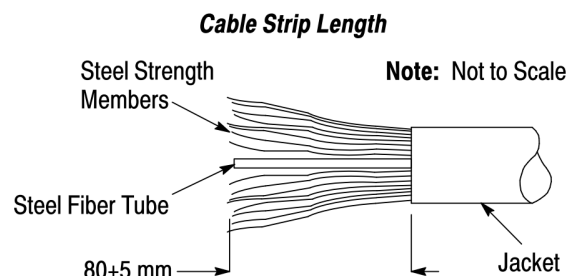


Figure 3

LOCTITE, 243, 480, and 496 are trademarks of Henkel Corporation.

Dow Corning and Molykote are registered trademarks of Dow Corning Corporation

### 5.2. Terminate the Fiber

1. Slide the crimp support (large inside diameter end first) over the cable strength members until it butts against the jacket. See Figure 4, Detail A.

2. Fold the strength members back over the crimp support. See Figure 4, Detail B.

3. Cut a length of  $50 \pm 1$  mm of the PTFE tubing. Make sure that the cut end is free of burrs. Apply 1 or 2 drops of LOCTITE Adhesive 496 to the outside of one end of the tubing, and immediately insert that end into the small diameter end of the fiber sleeve until it bottoms. See Figure 4, Detail C. Allow the adhesive to cure for 30 seconds.

4. Using the tubing cutter, cut the cable fiber tube to the dimension shown in Figure 4, Detail D, exposing the coated fiber. Be careful not to break the coated fiber.

5. Clean the gel from the fiber using an alcohol or acetone-moistened tissue. Be sure to pull straight away in line with the cable to avoid breaking the fiber.

6. Apply 1 drop of LOCTITE Adhesive 480 to the coated fiber at the end of the fiber tube. Refer to Figure 4, Detail D.

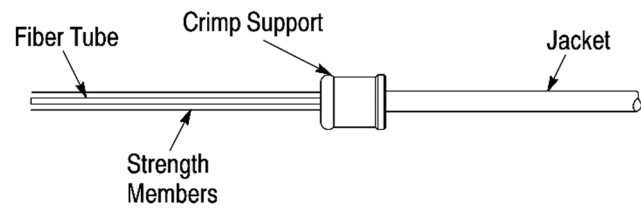
7. Slide the fiber sleeve (with the PTFE tubing) over the coated fiber until the fiber sleeve is against the strength members. See Figure 4, Detail E. Make sure that the adhesive wicks into the tubing. If it does not, slide the fiber sleeve back, and apply another drop of LOCTITE Adhesive 480 to the coated fiber.

8. Slide the crimp sleeve (large diameter end first) over the PTFE tubing and approximately halfway over the crimp support. Trim the strength members flush with edge of the crimp support. See Figure 4, Detail F.

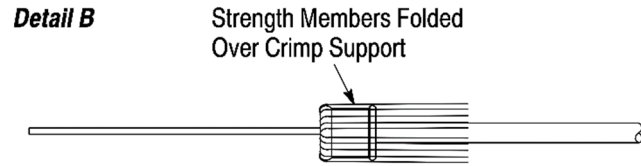
9. Continue sliding the crimp sleeve onto the crimp support until it stops. The crimp sleeve should now be bottomed against the fiber sleeve. See Figure 4, Detail G.

10. Place the crimp sleeve in the 8.6-mm hex nest of the hand tool and crimp the crimp sleeve onto the crimp support. Make sure to position the crimp sleeve in the hex nest so that the crimp will locate within the dimension shown in Figure 4, Detail G.

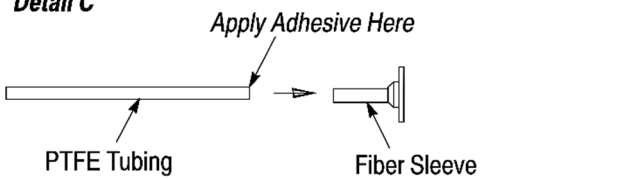
Detail A



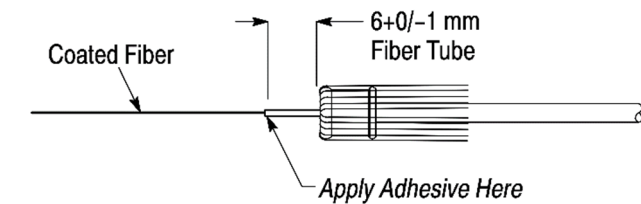
Detail B



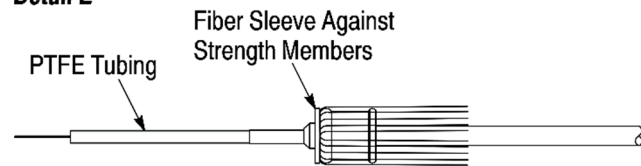
Detail C



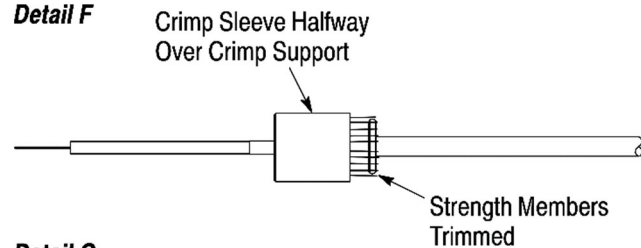
Detail D



Detail E



Detail F



Detail G

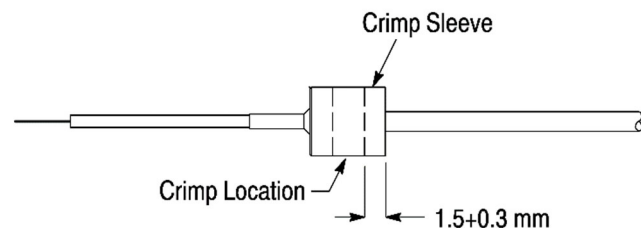


Figure 4

11. Using the micrometer or caliper, measure the crimp sleeve across the flats of the hex crimp to make sure that it conforms to the crimp height and crimp width shown in Figure 5, Detail A. If necessary, crimp again, and re-measure.

12. From the back of the crimp sleeve, inject LOCTITE Adhesive 480 between the crimp sleeve and crimp support, then from the back of the crimp sleeve, inject adhesive between the crimp support and the cable jacket. See Figure 5, Detail B. Remove any excess adhesive from the outside and back edge of the crimp sleeve.

13. Mark the PTFE tubing at the dimension shown in Figure 5, Detail C. Using the fiber stripping tool, cut through the tubing and strip the tubing and coated fiber to the mark, exposing the bare fiber. Using a lint-free tissue or cloth dampened with isopropyl alcohol or acetone, clean the bare fiber.



*Be careful to not break the bare fiber.*

14. Slide the spring over the bare fiber and onto the PTFE tubing. See Figure 5, Detail D.

15. Pre-heat the heat cure oven to 100°C.

16. Prepare the epoxy according to the following:

a. Remove the separating clip from the epoxy package. Mix the two components together thoroughly for 20 to 30 seconds.

b. Install the needle tip on the applicator from the epoxy applicator kit. Make sure it is secure. Remove the plunger.

c. Cut the epoxy packet open and squeeze the epoxy into the back of the applicator. Re-assemble the plunger. Hold the applicator vertically, and slowly push on the plunger until the entrapped air escapes and a bead of epoxy appears at the needle tip.

d. Using a lint free-tissue or cloth dampened with the isopropyl alcohol or acetone, clean the tip of the applicator.

17. Hold the ferrule assembly vertically, and insert the needle tip into the base of the ferrule assembly until it is against the back (end closest to the base) of the ferrule assembly. Refer to Figure 6.

18. While holding the ferrule assembly *firmly* against the needle tip, *slowly* inject the epoxy until a small bead of epoxy (approximately 0.75 mm in diameter) forms at the end face of the ferrule assembly. DO NOT allow the bead to get too large or smear.

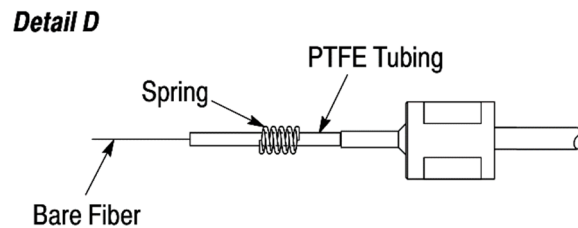
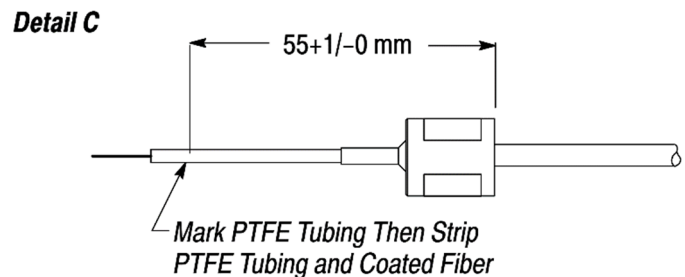
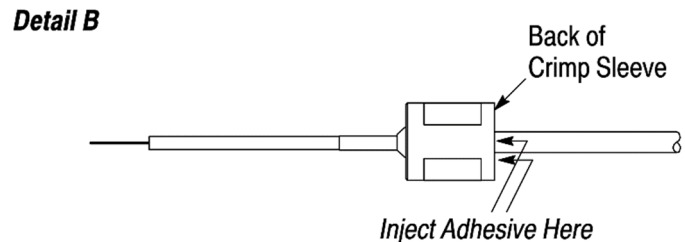
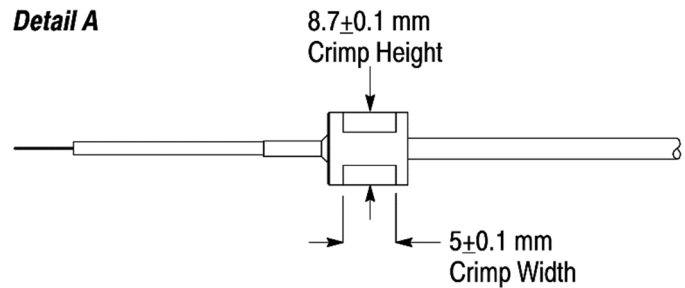


Figure 5

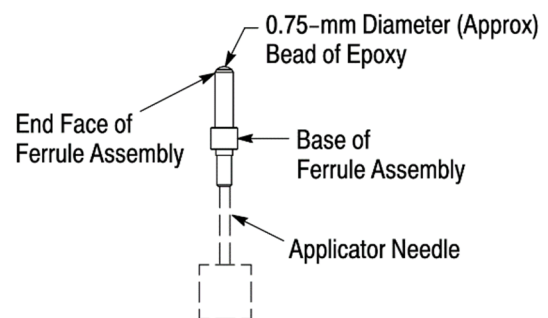


Figure 6

19. Withdraw the needle slightly and inject an additional small amount of epoxy so that the cavity at the base of the ferrule assembly is approximately one-third to one-half full.



To avoid personal injury, remember that epoxy is a hazardous material, and pay particular attention to the following:

- ALWAYS follow manufacturer's safety guidelines.
- ALWAYS wear protective gloves when using epoxy.
- ALWAYS use epoxy in a well-ventilated area.
- AVOID prolonged and frequent contact with skin.
- AVOID inhaling fumes from epoxy.

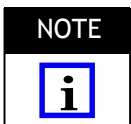
20. Place the crimp sleeve and fiber into the curing fixture according to the instructions for the curing fixture.

21. Carefully insert the fiber into the back of the ferrule assembly (previously prepared with epoxy). Simultaneously slide and rotate the ferrule assembly on the fiber (to prevent any air pockets from being trapped in the epoxy) until it bottoms. Make sure that the bare fiber is protruding from the end face of the ferrule assembly. If it is not, re-strip and re-terminate the fiber.

22. Place the ferrule assembly in the curing fixture according to the instructions included with the curing fixture.

23. Cure the assembly in the heat cure oven for 20 minutes. Remove the assembly from the oven and allow the assembly to cool to room temperature.

24. Measure the assembly to make sure that it conforms to the dimension given in Figure 7. If it does not, re-strip and re-terminate the fiber.



Although the curing fixture is designed to ensure that the required functional length is obtained, it is still important to measure the assembly for this length after curing.

### 5.3. Cleave the Fiber

Firmly support the ferrule assembly and draw the beveled edge of the scribe tool across the fiber as shown in Figure 8. After scoring the fiber, pull the fiber straight away from the ferrule assembly.



Safely dispose of excess fiber.



To avoid damage to the tip of the scribe tool, DO NOT allow the scribe tool to contact the epoxy.

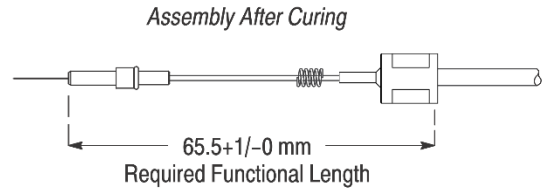
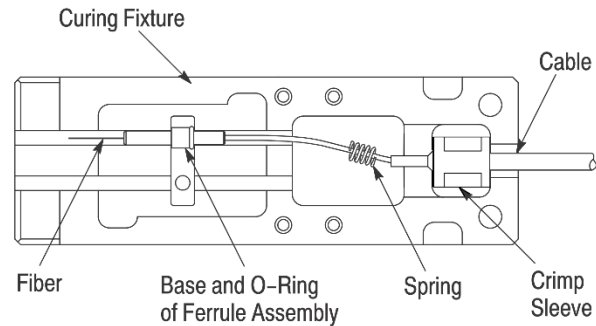


Figure 7

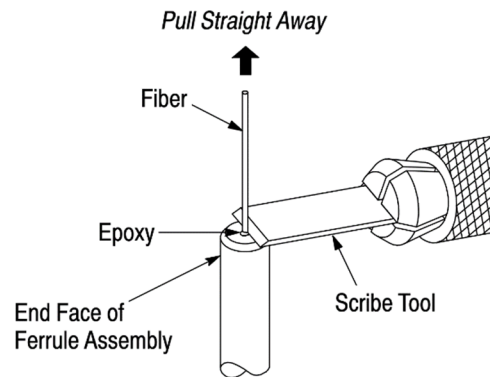


Figure 8

### 5.4. Polish the Fiber

It is recommended polishing the fiber using a polishing machine. Machine polishing will usually produce the best results. Polish the fibers according to the machine manufacturer's instructions. For best performance, as a minimum the polish should be an SPC (super physical contact) end finish for multimode, and a UPC (ultra physical contact) end finish for singlemode.

If machine polishing is not possible, hand polish the fiber according to the following:

1. Using a small piece of the 5- $\mu$ m polishing film, remove the fiber stub to the level of the epoxy.
2. Install the ferrule assembly onto the polishing bushing.
3. Place the green polishing pad on the polishing plate. Place the 5- $\mu$ m polishing film on the green polishing pad.

4. Hold the ferrule assembly and rest the tips of your index finger, middle finger, and thumb on the top of the polishing bushing. Starting with very light pressure, polish the tip of the fiber in a figure-8 pattern. Refer to Figure 9. Polish the fiber until the epoxy turns a very light yellow.

**NOTE** *DO NOT remove all the epoxy. As the epoxy gets lighter, check the tip of the fiber frequently.*

5. Clean the end face of the ferrule assembly and polishing bushing with isopropyl alcohol or acetone and a lint-free tissue.

6. Place the 0.3- $\mu$ m polishing film on the polishing pad. Polish in a figure-8 pattern. Stop polishing as soon as all the epoxy is removed.

7. Again, clean the end face of the ferrule assembly and polishing bushing with isopropyl alcohol or acetone and a lint-free tissue.

8. Place the final polishing film on the polishing pad. Apply several drops of water to an unused area of the film. Move the ferrule assembly in 20-mm circles on the water for 25 seconds.

**NOTE** *One sheet of final polishing film will be enough for polishing 10 to 20 ferrule assemblies.*

9. Remove the ferrule assembly from the polishing bushing. Clean both the end face and the sides of the ferrule assembly with isopropyl alcohol or acetone and a lint-free tissue.

**5.5. Inspect the Ferrule Assembly and Fiber**

**DANGER** *Never inspect or look into the end of a fiber when optical power is applied to the fiber. The infrared light used, although it cannot be seen, can cause injury to the eyes.*

1. Using the fiber optic inspection microscope kit, inspect the ferrule assembly and fiber according to the following criteria (refer to Figure 10):

- Make sure that any epoxy is removed from the ferrule assembly
- Dirt may be mistaken for small pits. If dirt is evident on the ferrule assembly or fiber, clean with isopropyl alcohol or acetone and a lint-free tissue, then dry

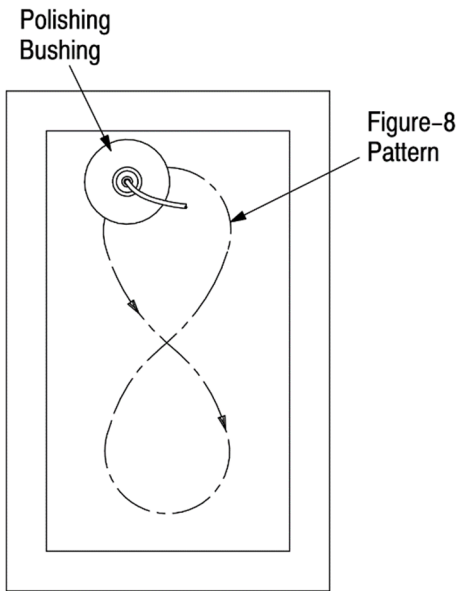


Figure 9

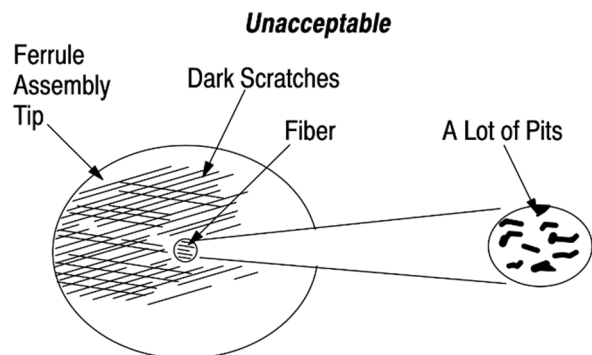
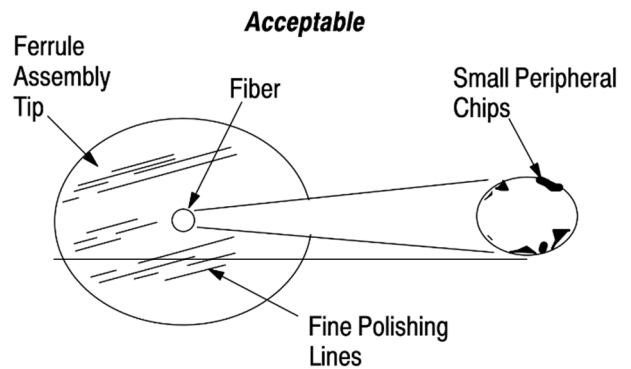


Figure 10

- Fine polishing lines are acceptable
- Small peripheral chips at the outer rim of the fiber are acceptable
- Large chips in the center of the fiber are unacceptable, and the fiber must be re-terminated

2. If necessary, install the dust cover onto ferrule assembly to prevent contamination to the end face.

### 5.6. Complete the Assembly

1. Remove the protective label from the back (end opposite the lens) of the EB insert.
2. Align the ferrule assembly with the channel cavity of the EB insert and insert the ferrule assembly into the channel cavity until the O-ring is against the back surface of the EB insert. See Figure 11, Detail A. To avoid damage to the fiber, DO NOT push on the PTFE tubing to install the ferrule assembly.
3. Slide the spring over the fiber until it is against the O-ring of the ferrule assembly. See Figure 11, Detail B.
4. Using the ferrule insertion tool, **push on the spring** until the ferrule assembly bottoms in the channel cavity. When the ferrule assembly is properly seated, the O-ring will be inside of the cavity, and the spring will protrude slightly from the cavity. See Figure 11, Detail C.

**NOTE** *If necessary, to remove the ferrule assembly from the cavity, firmly grasp the end of the ferrule assembly but not the spring) with the needle-nose pliers and pull out of the cavity.*

**CAUTION** *To avoid damage to the fiber, DO NOT push or pull on the fiber to install or remove the ferrule assembly from the cavity.*

5. Align the index pin hole of the ferrule plate with the index pin at the back of the EB insert and slip the PTFE tubing-covered fiber into the closest slotted hole in the ferrule plate. See Figure 11, Detail D.
6. Hold the ferrule plate against the EB insert, making sure that the index pin enters the index hole. Thread the screw into the screw hole in EB insert. See Figure 11, Detail E. Using the 2.5-mm hex wrench, tighten the screw to a torque between 0.8 and 1.0 N·m. Check to make sure that the ferrule plate is flush with the EB insert.
7. Align the guide pins with the guide pin holes and fit the insert assembly fixture onto the EB insert. Refer to Figure 11, Detail F.

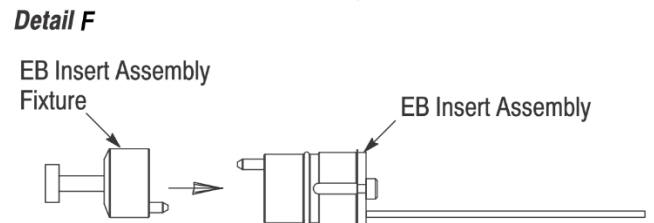
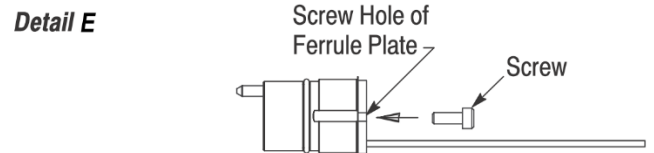
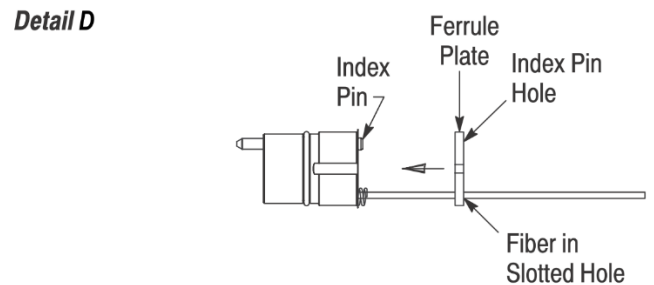
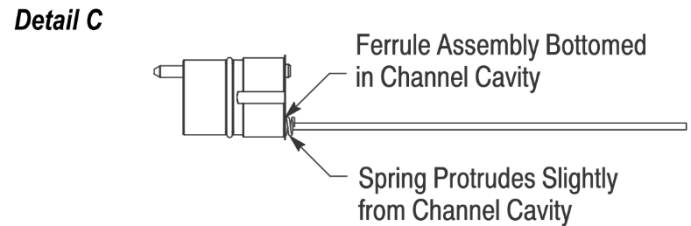
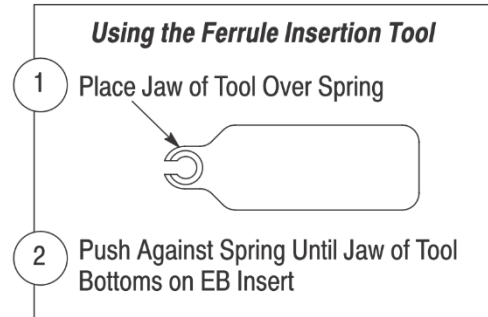
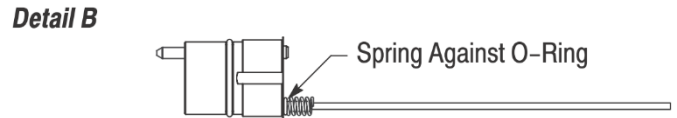
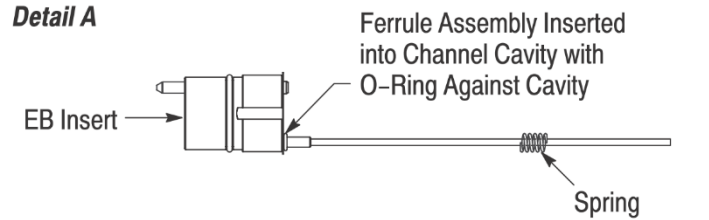


Figure 11

8. Using an applicator swab, apply a *thin film* of the O-ring lubricant (or high-vacuum grease) around the O-ring on the outside of the EB insert and the front seal on the inside of the housing. Remove any excess lubricant. Refer to Figure 12, Detail A.



**CAUTION** To avoid contaminating optical components, DO NOT use heavy deposits of the lubricant.



**NOTE** Using the insert assembly fixture will help guide the EB insert into the housing and minimize the possibility of lubricant contaminating the face of the EB insert.

9. Align the internal key of the housing with the keyway of the EB insert and slide the insert assembly fixture with the EB insert into the housing. See Figure 12, Detail B.

10. Using the 2.5-mm hex wrench, push the EB insert into the housing until it bottoms. (You should feel the key/keyway engagement, then the O-ring compression just before bottoming.)

11. Remove the insert assembly fixture from the housing.

12. Slide the wave spring over the crimp sleeve and into the housing. See Figure 12, Detail C.

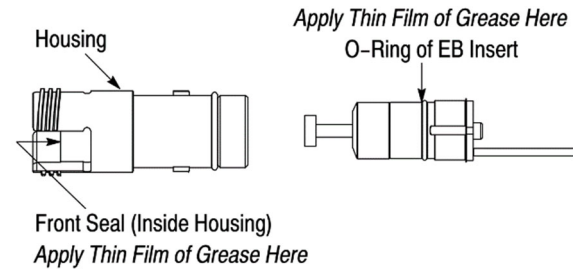
13. Apply 2 to 3 drops of the thread locker to the threads at the front of the collet sleeve. See Figure 12, Detail D.

14. Slide the collet sleeve over the crimp sleeve and into the housing. Thread the collet sleeve onto the housing, BEING VERY CAREFUL NOT to pinch the back end of the collet sleeve, which would cause the cable and fibers to twist. See Figure 12, Detail E.

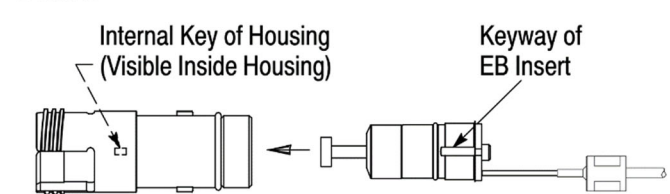
15. Secure the bench-mount assembly fixture to a stable work surface. Fit the end of the connector housing onto the captive housing of the bench-mount assembly fixture. See Figure 12, Detail F.

16. Using the 15-mm open-end wrench, tighten the collet sleeve to a torque between 4 and 5 N·m.

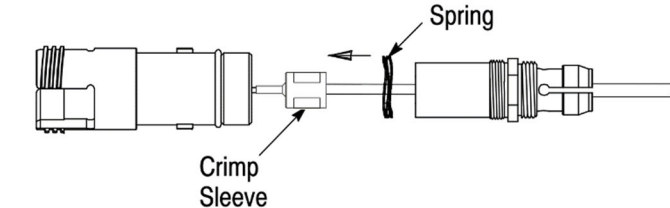
**Detail A**



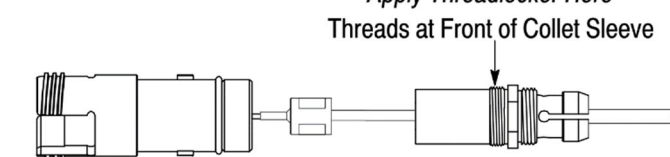
**Detail B**



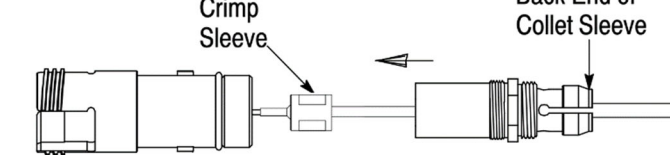
**Detail C**



**Detail D**



**Detail E**



**Detail F**

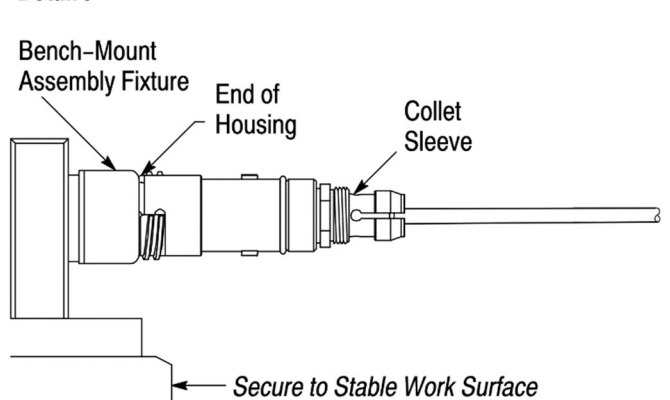
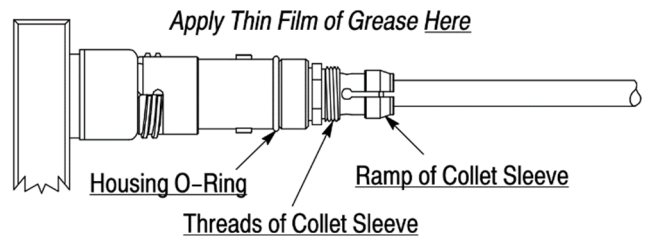


Figure 12



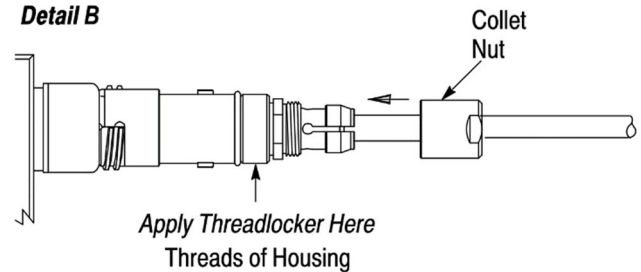
17. Using an applicator swab, apply a thin film of the grease to the housing O-ring, the threads of the collet sleeve, and the four ramps of the collet sleeve. Refer to Figure 13, Detail A.

**Detail A**



18. Slide the collet nut onto the collet sleeve. See Figure 13, Detail B. Using the 15-mm open-end wrench, tighten the collet nut to a torque between 3.6 and 4.0 N·m.

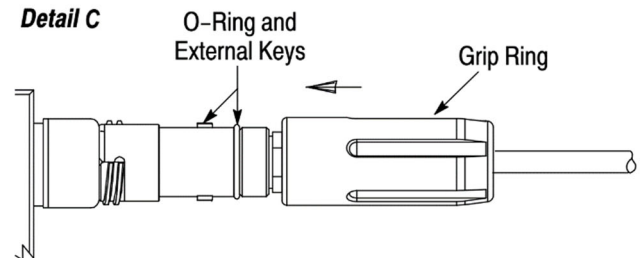
**Detail B**



19. Apply several drops of the LOCTITE 243 threadlocker around the threads of the housing. See Figure 13, Detail B.

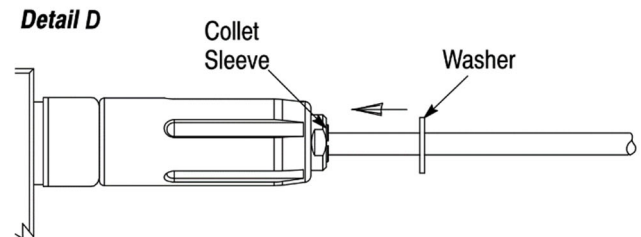
20. Slide the grip ring over the housing, twisting the grip so that it slides over the housing O-ring and the external keys of the housing. See Figure 13, Detail C. Thread, then hand-tighten the grip ring onto the bench-mount assembly fixture.

**Detail C**



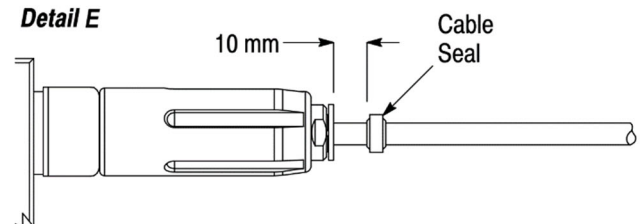
21. Slide the washer against the collet sleeve. See Figure 13, Detail D.

**Detail D**



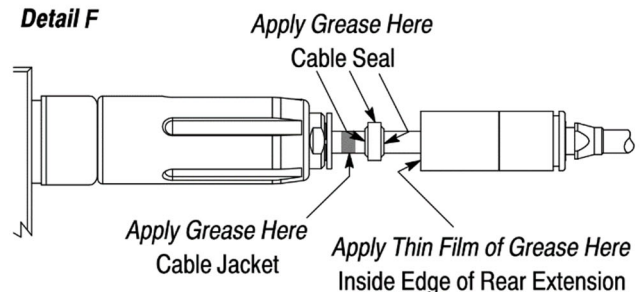
22. Slide the cable seal over the cable until it is approximately 10 mm from the washer. See Figure 13, Detail E.

**Detail E**



23. Apply the grease to the front, back, and outside diameter of the cable seal. Also, apply grease around the cable jacket between the cable seal and the washer. See Figure 13, Detail F.

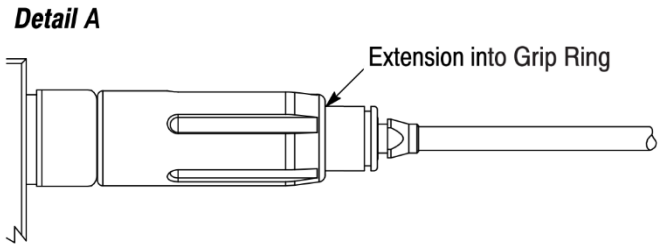
**Detail F**



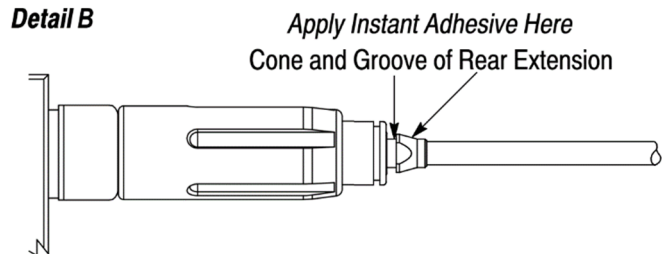
24. Apply a thin film of the grease around the inside edge of the extension, to prevent damage to the housing O-ring during assembly. See Figure 14, Detail F.

Figure 13

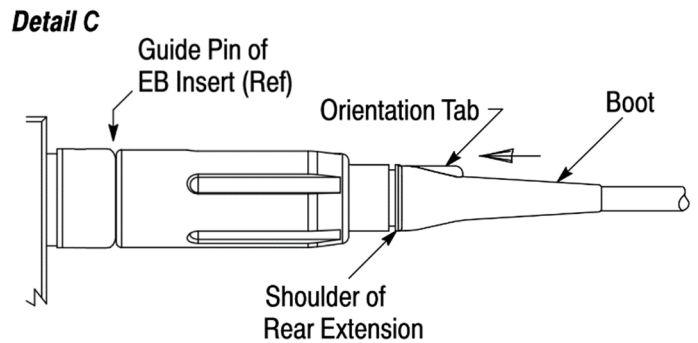
25. Slide the rear extension over the collet nut and into the grip ring. Thread, then hand-tighten the rear extension onto the grip ring. Using the 10-mm open-end wrench, tighten the rear extension to a torque between 6 and 10 N·m. See Figure 14, Detail A.



26. Apply the LOCTITE 480 instant adhesive completely around the cone and in the groove of the extension. See Figure 14, Detail B.



27. Push the boot over the cone of the extension until it is tight against the shoulder of the extension. Immediately rotate the boot so that the orientation tab is aligned with a desired reference point. (Using the guide pin of the EB insert is recommended; facing the bench-mount assembly fixture, the guide pin is positioned at 12 o'clock). See Figure 14, Detail C.



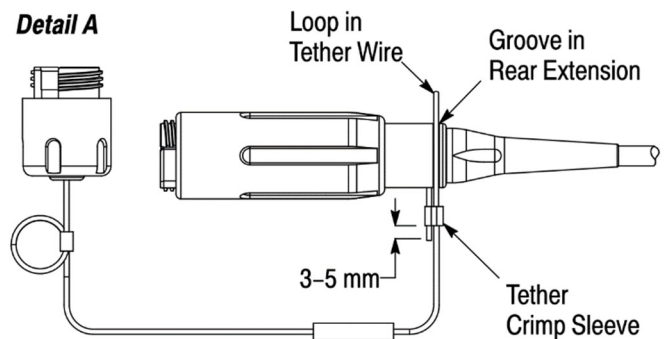
Be sure to use the same reference point to align the boot for subsequent connectors.

28. Unscrew the grip ring and remove the connector from the bench-mount assembly fixture.

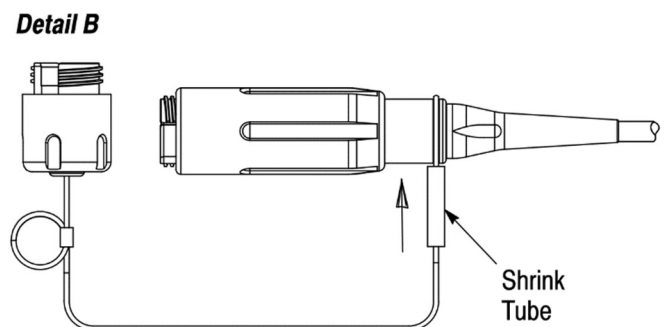
Figure 14

### 5.7. Install the Protective Cap

1. Loop the tether wire of the protective cap around the groove in the extension, and feed the end of the tether wire into the open end of the tether crimp sleeve. Pull approximately 3 to 5 mm of the tether wire through the tether crimp sleeve. See Figure 15, Detail A.



2. Pull the long end of the tether wire to tighten the loop, making sure that the tether crimp sleeve stays in place. Then using the crimping tool and 4-mm hex nest, crimp the tether crimp sleeve onto the tether wire.



3. Slide the shrink tube over the tether crimp sleeve until it extends over the top of the crimp sleeve by 1 to 2 mm. See Figure 15, Detail B.

Figure 15

4. Using the heat gun, apply heat to the shrink tube until it has shrunk and is secure. See Figure 16, Detail A.

5. Thread the protective cap onto the connector housing, and the grip ring onto the protective cap. Finger-tighten the protective cap and the grip ring to each other. See Figure 16.

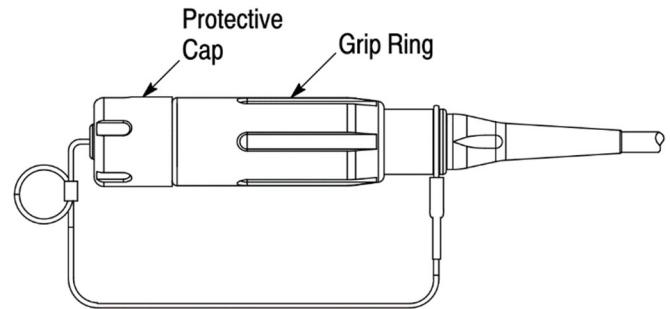


Figure 16

## 6. MAINTENANCE

The EB insert is shipped with a protective label on the back of the EB insert to keep the channel cavities clean. The EB insert is ready for use, however, if the lens becomes contaminated, clean as follows:

1. Moisten an applicator swab with the isopropyl alcohol or acetone.
2. Using a back-and-forth motion, wipe the lens with the applicator swab.
3. Blow clean dry air over the lens until remaining fluid and stray particles are removed.
4. Using the magnifier, inspect the lens to make sure that all contamination is removed.
5. Re-install the protective cap, or mate the connector immediately to prevent contamination to the lens of the EB insert.

## 7. REPLACEMENT AND REPAIR

Kit components are not repairable. DO NOT use any damaged or defective components. DO NOT attempt to re-use the crimp support, crimp sleeve, or ferrule assembly by removing the fiber.

Order replacement parts through your TE Connectivity representative, or call 1-800-522-6752, or use the LIVE CHAT on the [www.te.com](http://www.te.com) website.

## 8. REVISION SUMMARY

Revisions to this instruction sheet include:

- Updated document to current TE Connectivity name and format requirements
- Section 4.1: updated fiber stripping tool and polishing bushing p/n's, added ferrule insertion tool, removed epoxy p/n and replaced with recommended epoxy brand and type, removed epoxy mixer and polishing plate
- Section 5.4: revised singlemode/multimode polish requirements and Steps 1, 2, 3, 6, and 8.
- Section 5.6: Added Step 4 for use of ferrule insertion tool

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