



SUMITOMO RECOMMENDED PROCEDURE

SRP SP-F04-038

FutureFLEX®

INSTALLATION PROCEDURES FOR CABLE ENTRY SEALS

| <u>PARA.</u> | <u>CONTENTS</u> |
|--------------|---|
| 1.0 | General |
| 2.0 | Safety Precautions |
| 3.0 | Reference Documents |
| 4.0 | Equipment / Tools Required |
| 5.0 | Equipment Layout |
| 6.0 | Preparing TDU Enclosure |
| 7.0 | Installing Cable Entry Seals for 2- and 4-Tube Cables |
| 8.0 | Installing Cable Entry Seals for 7- and 19-Tube Cables (except TC19TRX) |
| 9.0 | Installing Cable Entry Seals for TC19TRX Tube Cables |



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1.0 General

1.1 This procedure describes the standard techniques for installing Heat-Shrinkable Cable Entry Seals to FutureFLEX Air-Blown Fiber (ABF) tube cables in indoor applications only.

1.2 Heat-Shrinkable Cable Entry Seals (CESs) provide a simple, easy, and effective means of securing tube cable ends to Tube Distribution Unit (TDU) entry points.

1.2.1 When properly assembled, CESs will provide a liquid-tight, fume-tight seal between the tube cable and the TDU entry point.

1.2.2 However, CESs do not have a strain relief feature such as the wire mesh provided with a typical Kellems Grip. Therefore, CESs are not capable of providing the strain relief required with an ABF tube cable installation. CESs are not to be used where strain relief of the tube cable is necessary and their use is restricted to indoor applications with Plenum- and Riser-rated tube cables only.

2.0 Safety Precautions

2.1 The use of safety equipment (safety glasses, safety shoes, cut-resistant Kevlar gloves) is recommended during this installation procedure.

2.2 Exercise caution when using heat gun to shrink CES boot. Follow manufacturer's recommended operating instructions.

3.0 Reference Documents

3.1 Sumitomo Recommended Procedure, *FutureFLEX Tube Cable Installation Procedures*, SRP SP-F04-008.

3.2 Sumitomo Recommended Procedure, *FutureFLEX Tube Cable Stripping Procedures*, SRP SP-F04-030.

4.0 Equipment / Tools Required

The following equipment, tools, and materials, are required to complete this procedure:

4.1 **See TABLE 1** for Heat-Shrinkable Cable Entry Seal Part Numbers. Recommended Knockout Hole sizes are also provided.

4.2 Tube Cable Cutter (BETL01)

4.3 Utility Knife with Hook Blade

4.4 Spanner wrench or Channel Lock Pliers

4.5 10-inch (or larger) Adjustable Wrenches

4.6 Hammer

4.7 Hole Punch Set for Knockout Holes

4.8 Felt Tip Pen / Marker

4.9 Tape Measure

4.10 Light Duty Heat Gun; McMaster-Carr 32605K44 or equal

5.0 Equipment Layout

5.1 **See Fig. 1 and Fig. 2** for Heat-Shrinkable Cable Entry Seal layout.

TABLE 1
Heat-Shrinkable Cable Entry Seals

| Indoor Tube Cable SEL P/N | | Cable Entry Seal SEL P/N | Recommended Knockout Hole Size (inches) |
|------------------------------|---------|--------------------------------|---|
| TC02TP2 | TC02TRX | DECES3 | 1.500 – 1.625 |
| TC04TP2 | TC04TRX | | |
| TC07TP2 | TC07TRX | | |
| TC19TP2 | TC19TRX | DECES4 | 2.000 – 2.125 |

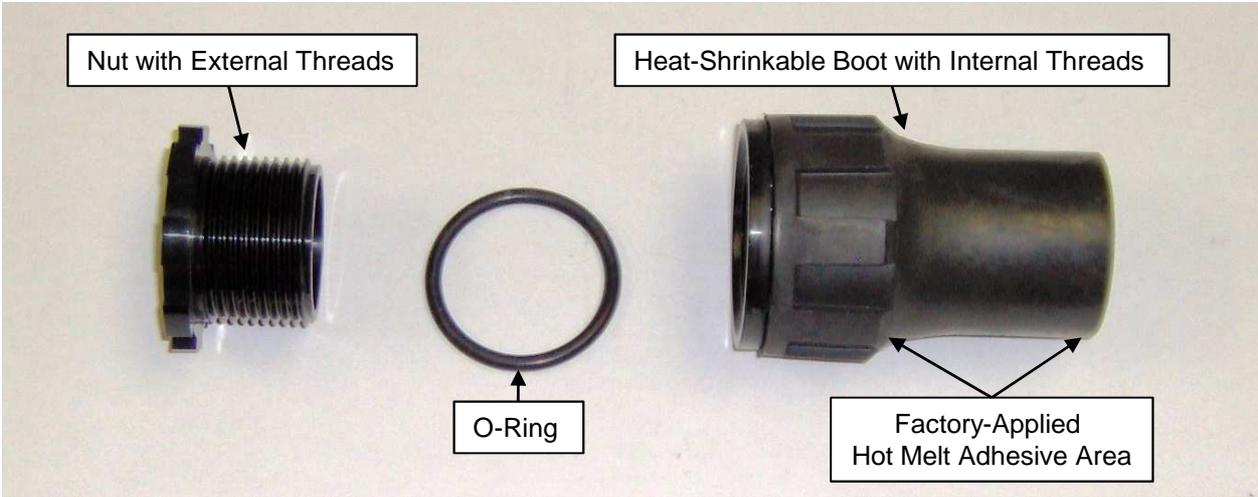


Figure 1
Cable Entry Seal Layout

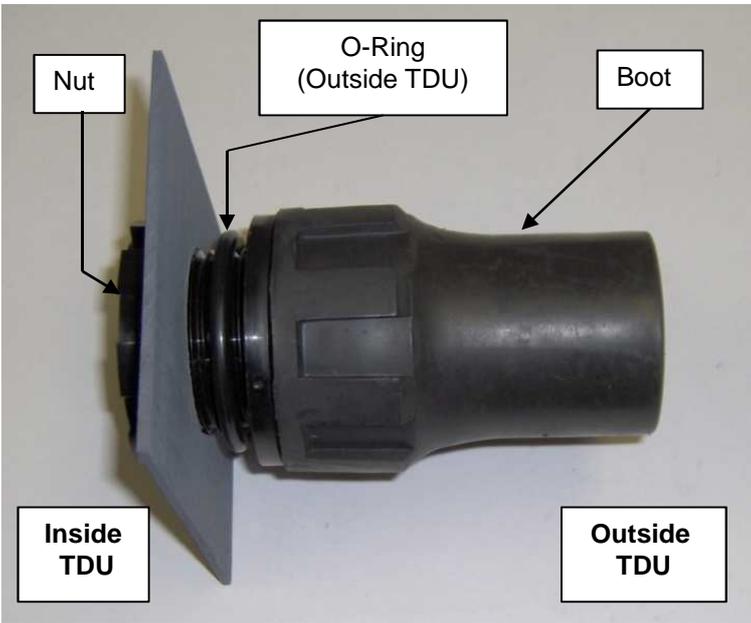


Figure 2
Correct Assembly of a CES is with the O-Ring
Installed on the Outside of the TDU Enclosure

6.0 Preparing TDU Enclosure

6.1 Refer to **TABLE 1** and identify Recommended Knockout Hole size based on the Cable Entry Seal to be used.

6.2 Prepare TDU enclosure by selecting and marking tube cable entry point locations. To best optimize TDU capacity, it is recommended to stagger tube cable entry locations if possible. **See Fig. 3a and Fig. 3b.**

6.3 Use appropriate size hole punch and create opening in TDU.

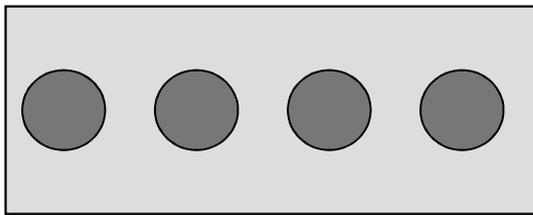


Figure 3a
Inline Tube Cable Entry Locations
Acceptable but Fails to Optimize
TDU Capacity

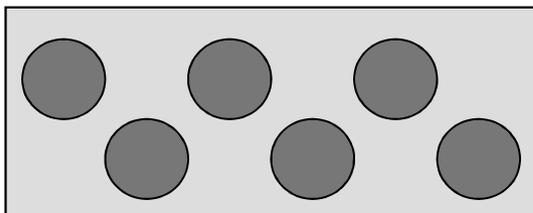


Figure 3b
Staggered Tube Cable Entry Locations
Preferred Method to Optimize
TDU Capacity

7.0 Installing Cable Entry Seals for 2- and 4-Tube Cables

Note: The outside diameters of the TC02TP2, TC04TP2, TC02TRX, and TC04TRX tube cables are small enough to fit through the inside openings of the DECES3-size CES boot and nut.

7.1 After the appropriate size knockout hole is cut into the TDU enclosure, install externally-threaded nut through cable entry hole from inside the TDU.

7.2 Slide O-ring over threads of nut. *Note that O-ring goes on the outside of the TDU enclosure.*

7.3 Install boot onto nut's threads and hand tighten.

7.4 Use a Spanner wrench to finish tightening nut an additional 1/4 – 1/2 turn to properly compress the O-ring. Do not over-tighten..

7.5 With the tube cable external routing to the TDU established and the tube cable cut to its approximate finished length, determine tube cable strip length by measuring the TDU enclosure in the direction the tube cable will be routed through the enclosure. If tube cable will run vertically through the TDU, take the height dimension. If the tube cable will run horizontally through the TDU, take the width dimension.

7.6 Transfer the TDU measurement (taken above) to the tube cable. Measure back from the end of the tube cable and mark the jacket.

7.7 Use Hook Blade Knife to lightly score tube cable jacket at the mark. Pull ripcord and strip jacket away to expose individual tubes.

7.8 Insert tubes / tube cable through CES and make final adjustments to tube cable length and position inside TDU. With 2- and 4-tube cables, position tube cable jacket even with or slightly beyond the nut face. **See Fig. 4.**

7.9 Hold tube cable in place and centered within boot area.

CAUTION: Minimum boot shrink temperature is about 250°F (121°C). Do not touch boot during or immediately after heating process; it will be very hot.

7.10 Use Light Duty Heat Gun to slowly shrink boot around tube cable jacket. Exercise care to not damage / burn the tube cable jacket.

7.11 Continue shrinking boot uniformly until boot conforms to tube cable and hot-melt adhesive is visible at the end of the boot signifying a good seal was made. **See Fig. 6 for reference.**

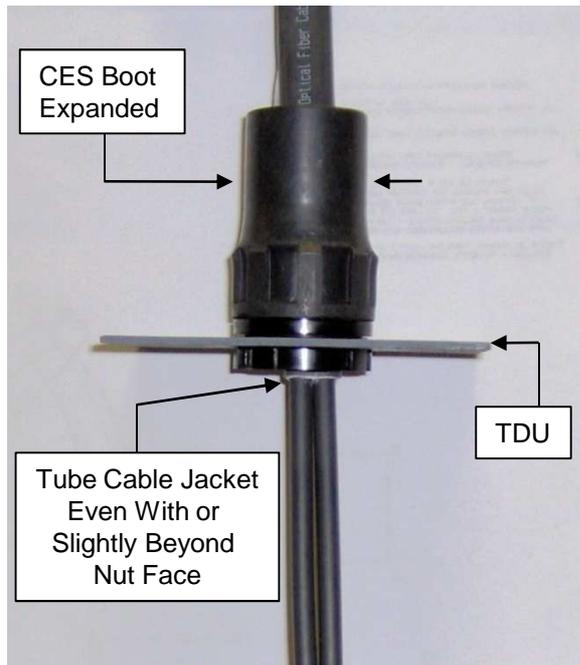


Figure 4
A TC02TP2 Tube Cable Ready
for CES Installation

8.0 Installing Cable Entry Seals for 7- and 19-Tube Cables (except TC19TRX)

Note: The outside diameters of the TC07TP2, TC07TRX, and TC19TP2 tube cables are large enough so that they cannot pass through the boot and / or nut openings. Therefore, slightly different installation techniques are required.

8.1 After the appropriate size knockout hole is cut into the TDU enclosure, install nut through cable entry hole from inside the TDU.

8.2 Slide O-ring over threads of nut. Note that O-ring goes on the outside of the TDU enclosure.

8.3 Install boot onto nut's threads. Only hand-tighten at this time.

8.4 With the tube cable external routing to the TDU established and the tube cable cut to its approximate finished length, determine tube cable strip length by measuring the TDU enclosure in the direction the tube cable will be routed through the enclosure. If tube cable will run vertically through the TDU, take the height dimension. If the tube cable will run horizontally through the TDU, take the width dimension.

8.5 Transfer the TDU measurement (taken above) to the tube cable. Measure back from the end of the tube cable and mark the jacket.

8.6 Use Hook Blade Knife to lightly score tube cable jacket at the mark. Pull ripcord and strip jacket away to expose individual tubes.

8.7 Insert tubes / tube cable into CES until larger diameter tube cable jacket contacts smaller boot / nut opening. *Do not try to force tube cable through these openings. Stop when contact is made.* **See Fig. 5.**

Note: If having difficulties getting the bare tubes of 7- and 19-tube cables through the CES because the tubes have spread apart, disassemble the CES. Slide boot over bare tubes and tube cable. Slide O-ring over bare tubes and tube cable. Insert tubes through cable entry hole. Then, from inside the TDU, slide nut over bare tubes and thread into boot. Hand-tighten nut.

8.8 Use a Spanner wrench to tighten nut an additional 1/4 – 1/2 turn to compress the O-ring. Do not over-tighten.

8.9 Make final adjustments to tube cable length and position inside TDU.

8.10 Hold tube cable in place and centered within boot area.

CAUTION: Minimum boot shrink temperature is about 250°F (121°C). Do not touch boot during or immediately after heating process; it will be very hot.

8.11 Use Light Duty Heat Gun to slowly shrink boot around tube cable jacket. Exercise care to not damage / burn the tube cable jacket.

8.12 Continue shrinking boot uniformly until boot conforms to tube cable and hot-melt adhesive is visible at the end of the boot signifying a good seal was made. See Fig. 6a and Fig. 6b.

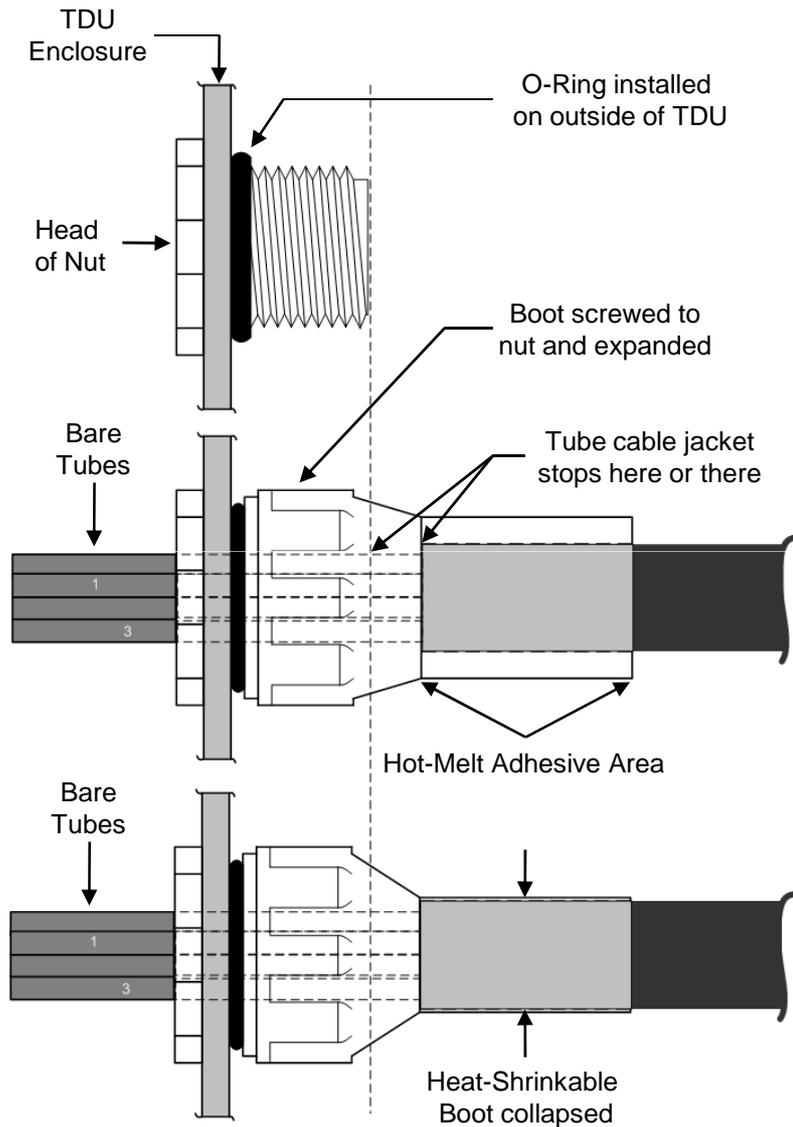


Figure 5
Installation Method for TC07TP2, TC07TRX, and TC19TP2 Tube Cables
(Tube Cable Jackets Stop at Boot Opening or Nut Opening)

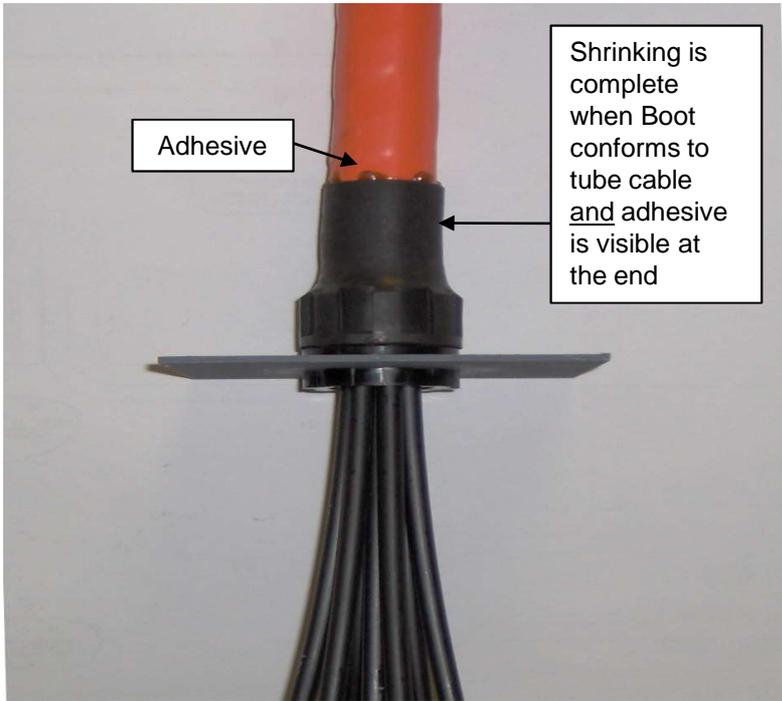


Figure 6a
CES Boot Collapsed on a
TC07TRX Tube Cable

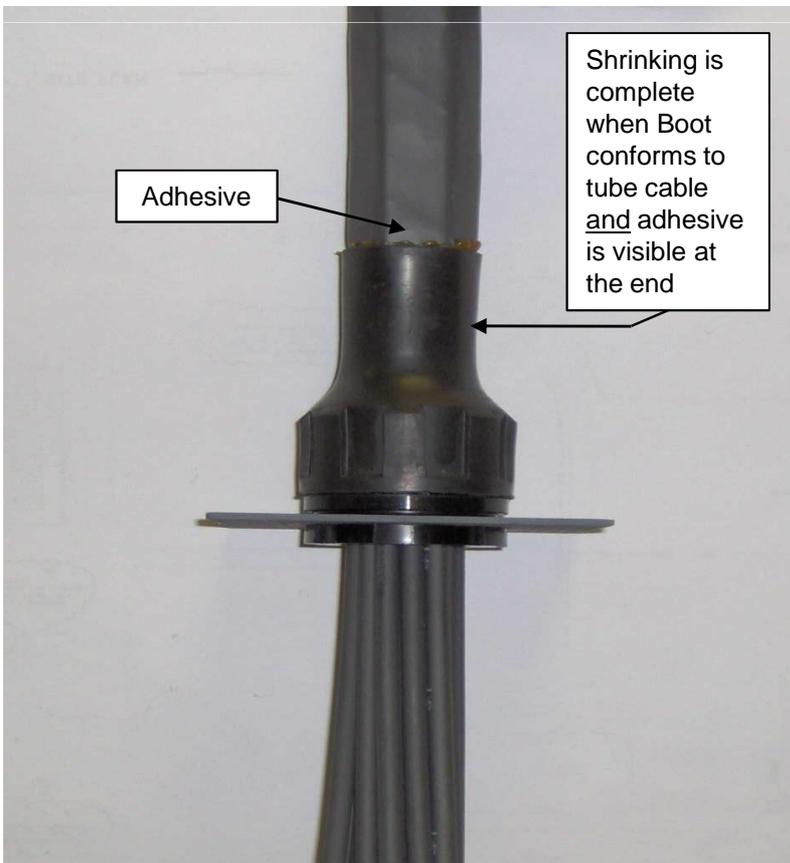


Figure 6b
CES Boot Collapsed on a
TC19TP2 Tube Cable

9.0 Installing Cable Entry Seals for TC19TRX Tube Cables

Note: *Installing a CES on the double-jacketed TC19TRX tube cable presents two (2) other issues. The outside diameter of the TC19TRX's orange outer jacket is large enough so that it cannot pass through the boot's opening. Additionally, the outside diameter of the TC19TRX's black inner jacket is large enough so that it cannot pass through the nut's opening. Therefore, a slightly different installation technique is required.*

9.1 After the appropriate size knockout hole is cut into the TDU enclosure, install externally-threaded nut through cable entry hole from inside the TDU.

9.2 Slide O-ring over threads of nut. *Note that O-ring goes on the outside of the TDU enclosure.*

9.3 Install boot onto nut's threads. Only hand-tighten at this time.

9.4 With the tube cable external routing to the TDU established and the tube cable cut to its approximate finished length, determine tube cable strip length by measuring the TDU enclosure in the direction the tube cable will be routed through the enclosure. If tube cable will run vertically through the TDU, take the height dimension. If the tube cable will run horizontally through the TDU, take the width dimension.

9.5 Transfer the TDU measurement (taken above) to the tube cable and, for the TC19TRX tube cable, add 4 more inches to the above measurement. Mark the orange outer jacket at this point.

9.6 Use Hook Blade Knife to lightly score orange outer jacket at the mark. Pull ripcord and strip away orange outer jacket.

9.7 From the stripped end of the orange outer jacket, measure forward 4 inches on the black inner jacket and mark the black inner jacket.

9.8 Use Hook Blade Knife to lightly score black inner jacket at the mark. Pull ripcord and strip away black inner outer jacket to expose individual tubes.

9.9 Insert tubes / tube cable through CES until the orange outer jacket contacts the end of the boot. *Do not try to force orange outer jacket into or through the boot. Stop when contact is made. See Fig. 7.*

Note: *If having difficulties getting the bare tubes of the 19-tube cable through the CES because the tubes have spread apart, disassemble the CES. Slide boot over bare tubes and tube cable. Slide O-ring over bare tubes and tube cable. Insert tubes through cable entry hole. Then, from inside the TDU, slide nut over bare tubes and thread into boot. Hand-tighten nut.*

9.10 Use a Spanner wrench to tighten nut an additional 1/4 – 1/2 turn to compress the O-ring. Do not over-tighten.

9.11 Make final adjustments to tube cable length and position inside TDU.

9.12 Hold tube cable in place and centered within boot area.

CAUTION: *Minimum boot shrink temperature is about 250°F (121°C). Do not touch boot during or immediately after heating process; it will be very hot.*

9.13 Use Light Duty Heat Gun to slowly shrink boot around tube cable jacket. Exercise care to not damage / burn the tube cable jacket.

9.14 Continue shrinking boot uniformly until boot conforms to tube cable and hot-melt adhesive is visible at the end of the boot signifying a good seal was made. **Refer to Fig. 6a and Fig. 6b.**

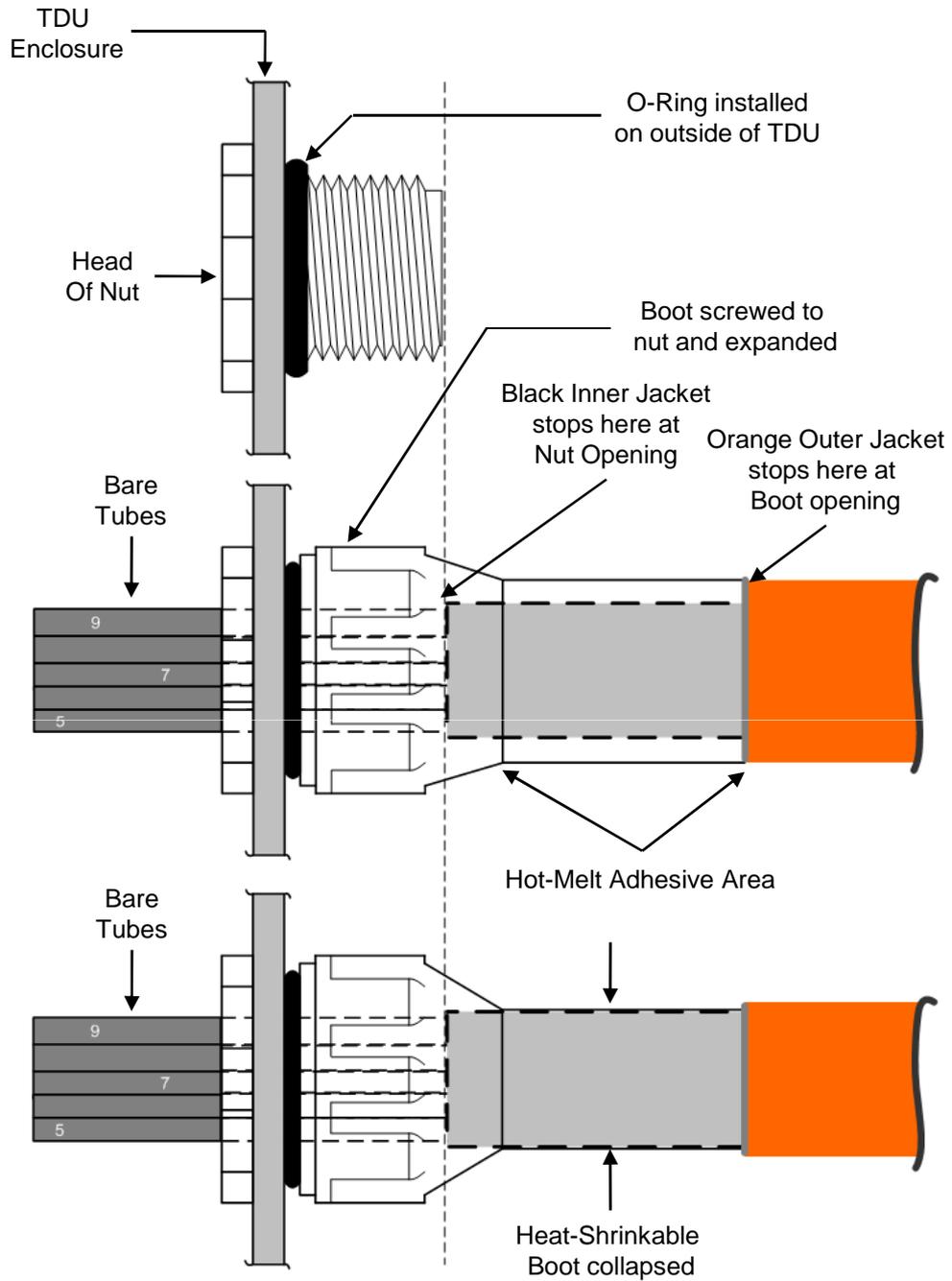


Figure 7
Installation Method for Double-Jacketed TC19TRX Tube Cables
(Outer Jacket Stops at Boot Opening & Inner Jacket Stops at Nut Opening)