Spread Networks Restoration Procedure
Splicing OFS AccuRibbon® DC Toneable Cable in a Tyco FOSC 450D Splice Closure

1. General

1.1 This document describes the cable prep and splicing procedure for OFS AccuRibbon® DC toneable cable using a Tyco FOSC 450D Splice Closure.

1.2 AccuRibbon® DC toneable cable contains two linear dielectric strength members positioned 180° apart in the cable jacket. In addition, two 15 AWG bare copper wires are included in the cable jacket adjacent to the strength members. The copper wires are provided for cable locating purposes.

1.3 The AccuRibbon® DC toneable cable contains 432 fibers in a gel-free central core tube. The nominal cable OD is 0.84 inch. The AccuRibbon® units are comprised of 24-fibers bonded together in a matrix material. The 24-fiber ribbons are split into two 12-fiber sub-units prior to mass fusion splicing.

1.4 The Tyco FOSC 450 D6 fiber optic splice closure uses compressed gel cable seals to environmentally seal the cable splice point. The maximum splice capacity of the FOSC 450 D6 closure is 576 single or 1152 mass fusion splices. The maximum cable diameter should not to exceed 1-inch.

2. Precautions

2.1 The maximum rated cable load (MRCL) for AccuRibbon® DC toneable cable is 600 pounds (2700 N). This is the maximum tensile force that may be applied to the cable during short-term installation conditions. For long term conditions, the maximum recommended cable load is 180 pounds (800 N).

2.2 Cable minimum bend diameters are defined for both dynamic and static conditions. The dynamic condition applies to a cable that may be exposed to the MRCL. The static condition applies to a cable that is exposed only to low tension, e.g., an installed cable that is racked in a handhole or manhole. The maximum recommended cable tension under static conditions is 180 pounds (800 N).

2.3 Cable minimum bend diameters are summarized in Table 1. For static conditions, the minimum recommended bend diameter is 30 × cable outside diameter (OD) or 26 inches. For dynamic conditions, the minimum recommended bend diameter is 40 × OD or 34 inches. The minimum recommended storage-coil diameter is 40 × OD or 34 inches.

Table 1 – Minimum Recommended Bend Diameters and Storage Coil Diameters for 432-Fiber AccuRibbon® DC Toneable Cable

Minimum Bend Diameter		Minimum Storage Coil Diameter
Static Conditions	Dynamic Conditions	
26" (64 cm)	34" (86 cm)	34" (86 cm)

3. Tyco FOSC 450D Splice Kit Components

- Dome and clamp
- Base and o-ring
- Metal slack basket
- Gel end-piece
- Hook and loop fastener straps
- 4 Gel end-piece plugs
- 6 Cable strain relief holders and clips/6 hose clamps
- 6 Small strength member attachment brackets
- 2 Large strength member attachment brackets
- 6 Bond clamps (3” long)
- 2 Braided grounding straps
- 12 Small tie wraps
- 1/4” Nut driver to install hose clamps
- Transportation tubes/spiral wrap
- Ribbon buffer tube storage “sock”
- LBT (loose buffer tube) wrap
- Installation instructions

Other Accessory Kits:
- FOSC ACC D Tray 36, 48 or 72 (Extra tray kits)
- FOSC ACC D/Ribbon - 24
- FOSC 450 Cable Term kit (Replacement cable termination components)
- FOSC ACC D/Basket

4. Closure Entry

4.1 To remove the dome from the closure, release the clamp handle. Apply slight pressure to the side of the handle to disengage the locking tab. Hook the handle on the two posts and pull back until the clamp releases from the closure. Keep the o-ring, clamp, and dome clean and dry. (Figure 1)

IMPORTANT: ***Leave unused components and installation instructions in bag inside closure for future cable terminations. If these parts are lost, you will need to order the above 450 D cable kit to terminate future cables.***

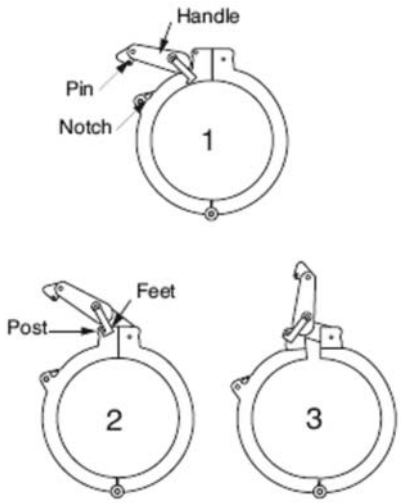

Figure 1 – Release the clamp handle to open the closure.

5. Base Removal

5.1 Loosen the four bolts to remove the metal frame from the FOSC 450 closure base. (Figure 2).

Figure 2 – Remove metal frame from closure base.

5.2 Slide the base (narrow end first) up and out of the way, over all cables that are to be spliced.

6. Cable Preparation

Note: When using the standard tray to store ribbon splices, the ribbons must be routed to the slack basket first. Do not route ribbons directly to the tray unless they will be de-ribbonized for single fiber splicing.

Warning: Do not use a braided or stranded ground wire when installing a ground through a port on the FOSC 450 closures. Tyco Electronics requires that a bonded solid ground wire be used to prevent a leak path and make a proper seal.

6.1 ***Work gloves and safety glasses are recommended for use during the cable prep operation.***

6.2 A cable prep length of 70 to 90 inches is recommended. Mark the cable at the desired prep length.

6.3 Ring-cut the outer jacket at the desired prep length (Figure 3).

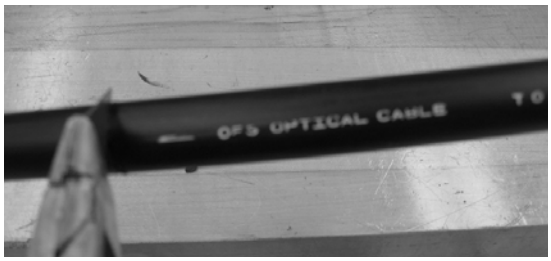

Figure 3 – Ring cut the outer cable jacket.

6.4 Shave about 6 inches of the cable jacket to expose both strength members and ripcords at the end of the cable (Figure 4).

Figure 4 – Expose the strength members and rip cords.

6.5 Grip a ripcord with needle nose pliers and pull it through the outer jacket to the ring cut (Figure 5). Repeat for the second rip cord.

Figure 5 – Pull the ripcords through the outer jacket.

6.6 Flex the two sections of outer jacket at the ring cut to separate and remove from the cable (Figure 6).

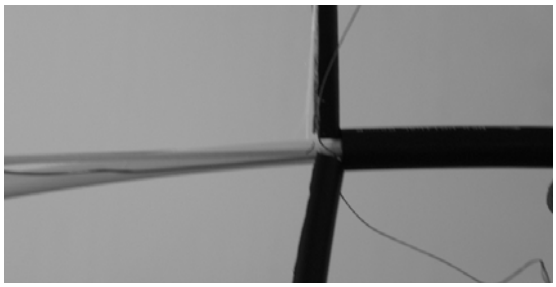

Figure 6 – Remove the outer jacket.

6.7 Cut the ripcords and water blocking tape. Leave a few inches of ripcord if additional jacket may be removed (Figure 7).

Figure 7 – Cut the rip cords and water blocking tape.

7. Cable and Closure Assembly

7.1 Two sizes of strength member attachment brackets and lugs are provided in the closure kit. The larger strength member attachment brackets and lugs are used with 432-fiber AccuRibbon® DC Toneable cable. Bend or cut the middle prong out of the way.

7.2 Cut the two strength members as required for assembly to the strength member attachment bracket. Insert the strength members into the strength member lugs and tighten screws (Figure 8). Trim the copper locate wires as required by local practices.

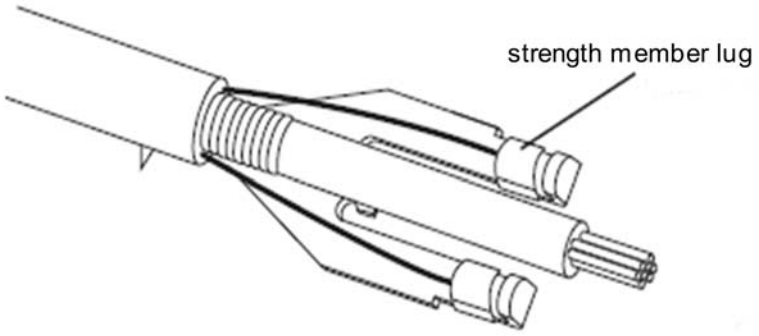

Figure 8 – Install strength member attachment bracket on cable.

7.3 Install the cable attachment bracket on the cable as shown in Figures 9 and 10. Install the hose clamp and tighten the cable attachment bracket. Don't over tighten the clamp to the point that it deforms. Use the 1/4" nut driver supplied in the closure kit to tighten the hose clamp. ***Note that that the required length of the 15 gauge tone wire is left exposed for grounding/toning purposes.***

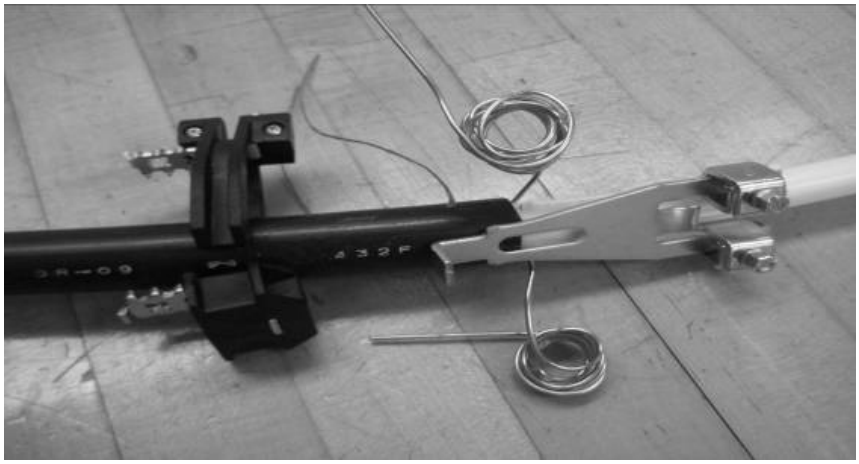

Figure 9 – Install cable attachment bracket.

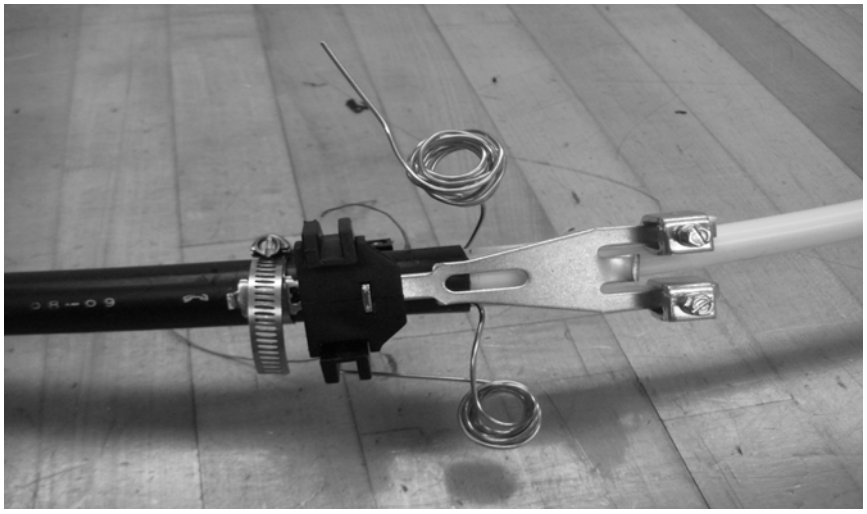

Figure 10 – Install hose clamp on cable attachment bracket.

7.4 Remove all but 9" of the central core tube. Mark the central core tube and use an OFS 1050D tool to ring cut the tube (Figures 11 and 12). Flex the tube at the score mark to separate and remove the core tube (Figure 13). Cut and remove the water blocking tape.

7.5 AccuRibbon DC toneable cable is a totally dry cable and does not contain any cable-gel material. Consequently, no ribbon cleaning procedure is required. At most, the end of the ribbon may need to be wiped with an alcohol soaked towel prior to splicing to remove dust and/or residual water blocking powder.

7.6 Exercise caution when handling the fiber ribbons. Apply uniform pressure along the ribbon surface when cleaning the ribbons. ***Caution: Excessive squeezing pressure and/or excessive twisting may cause ribbon splitting. Handle the ribbons with care!***

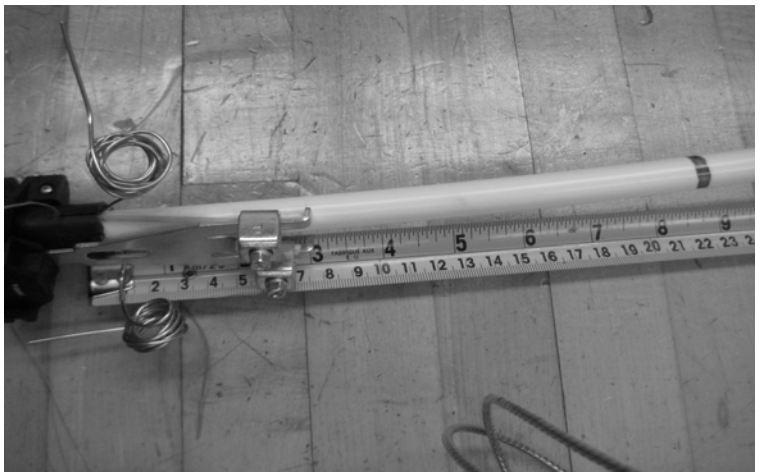

Figure 11 – Mark the core tube.

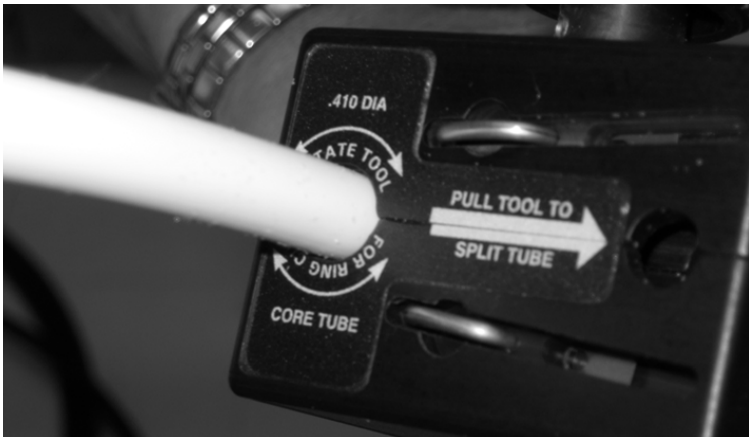

Figure 12 - Ring cut the core tube.

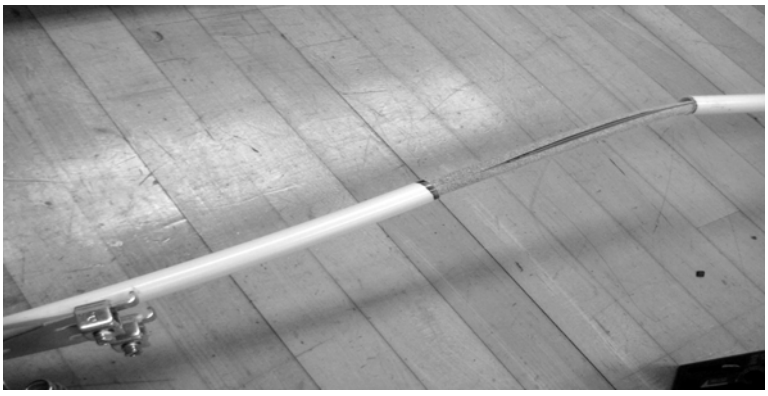

Figure 13 – Remove the core tube.

7.7 Slide the cable attachment bracket and cable into the appropriate slot of the closure until it locks in place (Figure 10). The bottom entry ports should be used for the two cables.

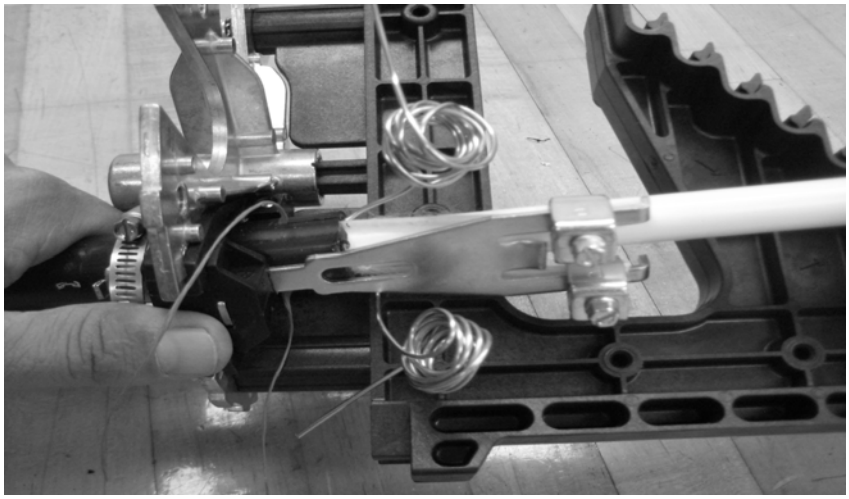

Figure 10 – Insert cable attachment bracket into bottom port of metal frame.

7.8 Fasten the central core tube to the storage basket (Figure 11). ***Use care when positioning the core tube in the storage basket. Excessive bending may kink the core tube.*** Repeat the cable and closure assembly for the 2nd cable (Figure 12).

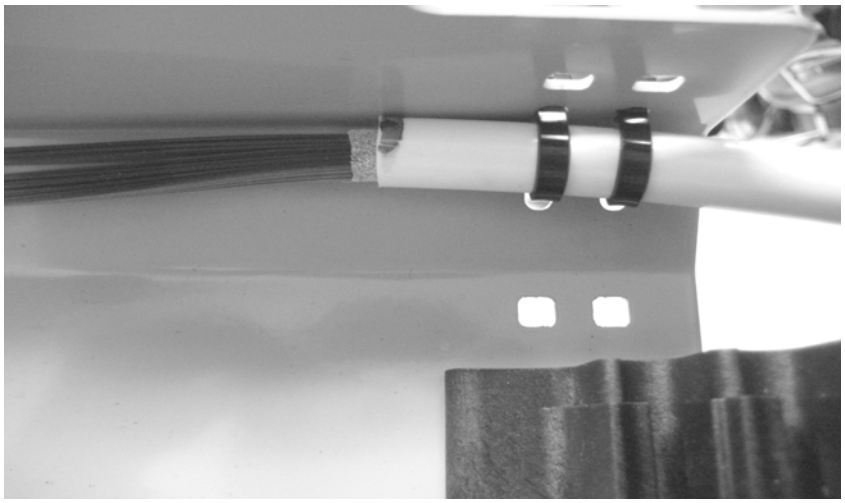

Figure 11 – Fasten the core tube to the storage basket.

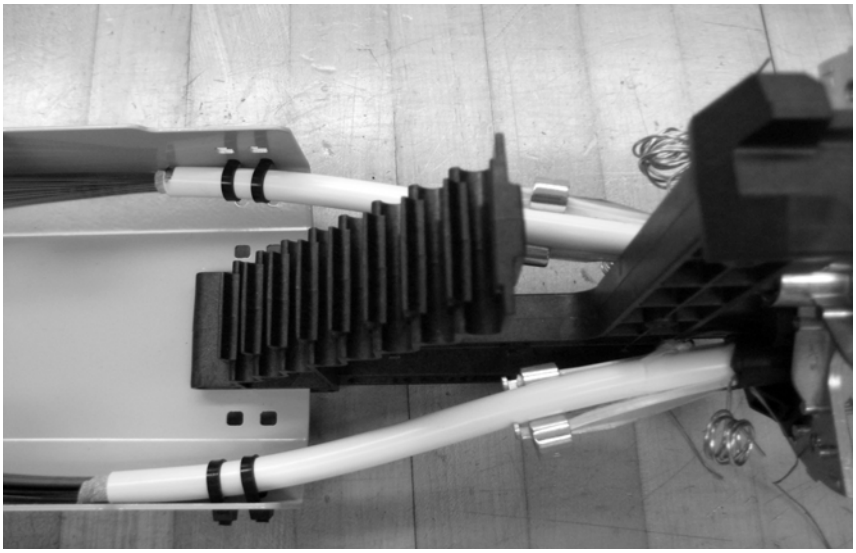

Figure 12 – Both cables assembled in closure.

8. Routing Ribbons to the Tray

8.1 Route the ribbons through the slack storage basket and up to the splice trays using spiral wrap or ribbon transport tubes. ***Note that the inside diameter of the transport tubing must be large enough to accommodate the ribbons without inducing macro-bends in the fibers or ribbons.*** The amount of ribbon stored in the basket will depend on the overall length of cable that is prepped. Typically only 24" to 36" of ribbon is necessary for mass fusion splicing. The remaining ribbon should be stored in the storage basket for future maintenance purposes.

8.2 Each 24-fiber ribbon must be split into two 12-fiber subunits prior to insertion in the transport tubing. The 24-fiber ribbons may be split into subunits as follows.

- Cut the end of the 24-fiber ribbon at a 45° angle.
- Grasp the ribbon between your thumb and forefinger about 3/8-inch (10 mm) from its end. Flare the end of the ribbon by rubbing your index finger across the top of the ribbon. The rubbing action causes the matrix material to flake off the end of the ribbon and leaves a short length of exposed fibers at the end of the ribbon.
- Slightly open the flared end of the ribbon between the aqua (#12) and blue (#13) fibers. The 12-fiber ribbon subunits can now be peeled apart to the required length.
- After separating the ribbon into 12-fiber subunits, cut off the loose fibers from the end of each subunit. This will prevent individual fibers from separating from the subunits.
- Note that each individual 12-fiber subunit is labeled with the fiber type and ribbon number for easy identification.

8.3 Insert the 12-fiber subunits can into the transport tubing (Figure 13) and route to the appropriate splice tray. A maximum of six 12-fiber ribbons can be routed through the 4 mm inside diameter transport tubing. For example, ribbons 1-6, 7-12 and 13-18 should be routed in 3 different transport tubes from the storage basket to tray number 1. ***Avoid sharp twisting and bending of the ribbon during handling and insertion into the transport tubing***. ***Excessive ribbon twisting within the transport tubing may produce micro-bends and lead to increased attenuation.***

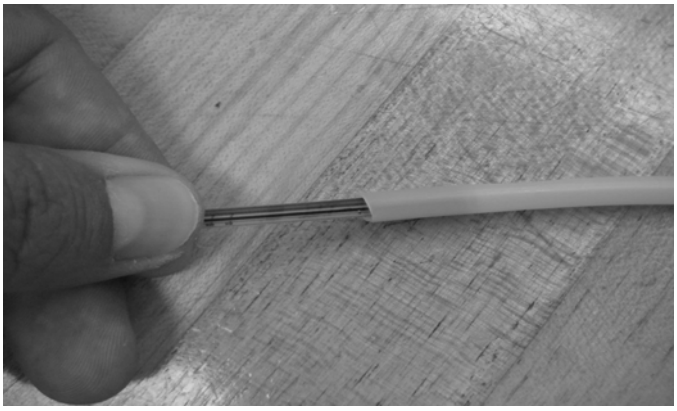

Figure 13 – Insert ribbons into transport tubing.

8.4 The transport tubes should be tied down to the storage basket with tie-wraps prior to routing around the tray holder and into the splice tray (Figure 14). **Repeat this step for all transport tubes.**

Figure 14 – Fasten transport tubes to storage basket.

8.5 The opposite end of the transport tubing should be tie wrapped to the splice tray (Figures 15 and 16). ***Do not over tighten the tie wraps as this may create macro-bends and increased attenuation.*** Repeat for all transport tubes.

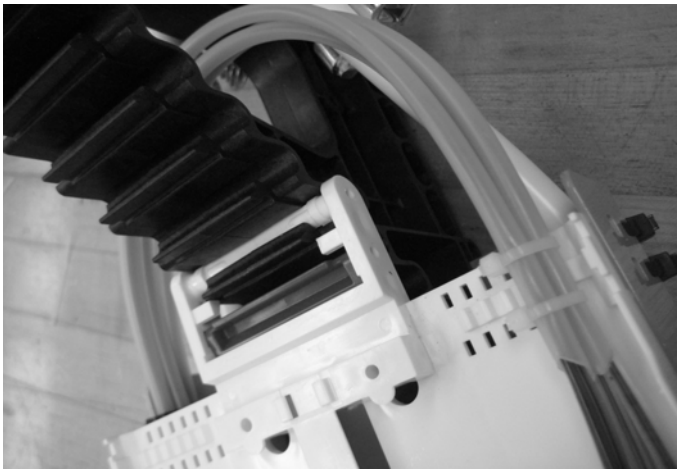

Figure 15 – Fasten transport tubes to splice tray.

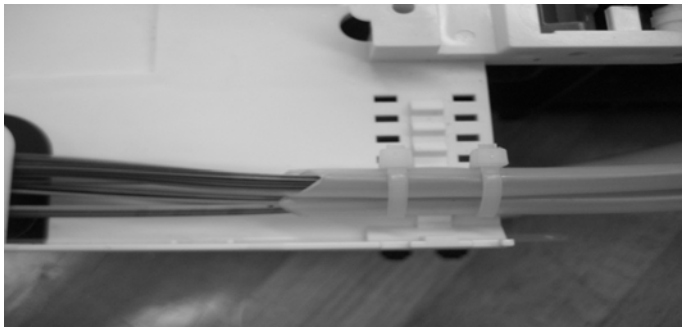

Figure 16 – Fasten transport tubes to splice tray.

8.6 The individual ribbons can now be routed into the appropriate splice holder in the splice tray. Figure 17 shows the recommended routing of the fibers within the splice tray. Note that each transport tube is labeled to identify the ribbon group.

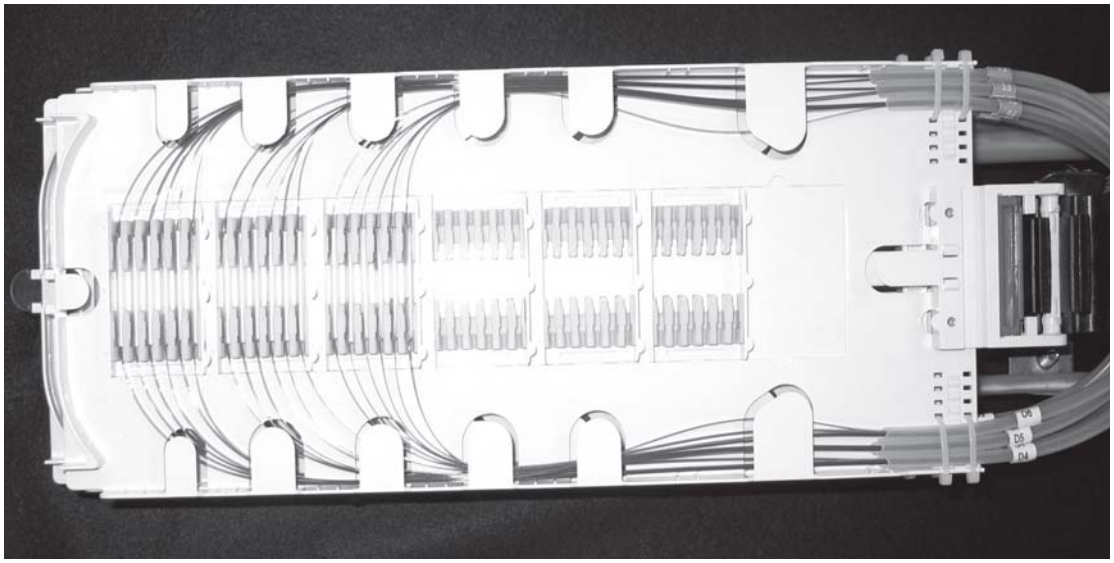

Figure 17 – Route ribbons into splice holders.

Tip: It is helpful to arrange the ribbons in order or organize ribbons prior to inserting them into the transportation tube. This will improve organization on the tray.

9. Gel End-Piece Installation

9.1 First, turn the “tail” of the gel end-piece counter-clockwise until it stops to ensure that the cable openings are in the open position. Squeeze the gel end-piece to open it. (Figure 18)

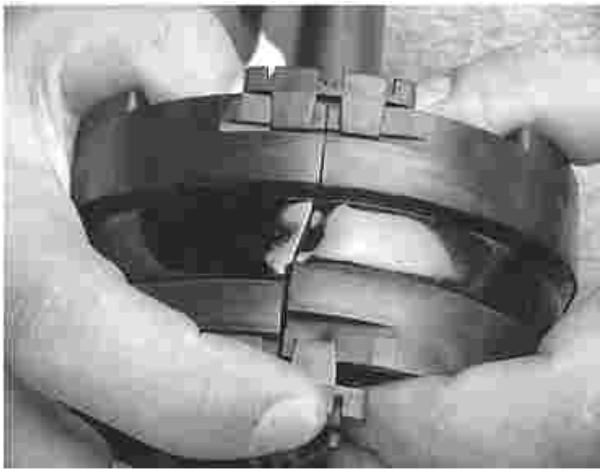

Figure 18 – Squeeze the gel end-piece to open it.

9.2 Position the gel end-piece against the spacer on the metal frame. Position the cables and snap the gel end piece closed. (Figure 19). ***Note: If gel end piece collects dirt, it should be washed off with water only.***

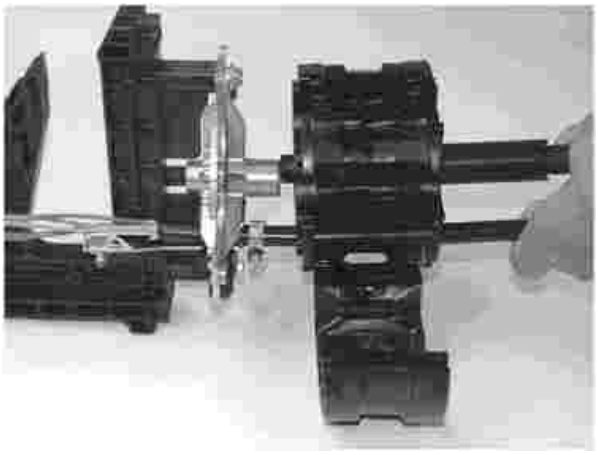

Figure 19 – Install gel end-piece.

9.3 Important: Insert one port plug in each unused port. (Figure 20)

Figure 20 – Insert plugs into unused cable ports.

9.4 Slide the base up and over the gel end-piece. The arrow on the base must be at the top of the closure.

9.5 Inside the base, loosen and turn the four metal clips to secure the base to the metal bracket then tighten the clips securely. Make sure the arrow is on top of the base.

9.6 Pull the gel end-piece “tail” away from the closure to seat the gel end-piece to the end of the base. Turn the “tail” clockwise until it dead ends at the physical stop to seal cables and plugs. (Figure 21)

WARNING: Do not use drill to turn gel end piece tail as this will damage gel end piece.

IMPORTANT: Make sure the rubber seal is in the correct position.

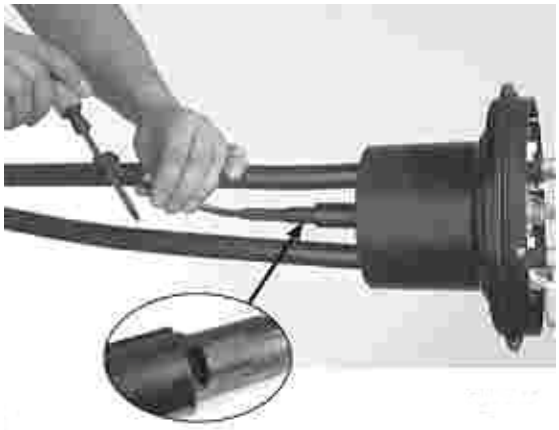

Figure 21

9.7 Place a large tie wrap around all the cables near the end of the tail.

9.8 Once the splicing is complete, wrap hook and loop fastener straps around the splice trays and basket.

9.9 If desiccant is to be used (optional - not supplied) install 150 grams of desiccant on top of the uppermost splice tray. Secure trays and desiccant in place with hook and loop fastener strap.

9.10 Place all unused cable termination hardware in bag in closure to be used for future cable terminations.

9.11 Mount dome onto base, aligning arrow on base with arrow on dome.

9.12 Install clamp around dome/base interface. Position feet of handle in front of the two posts and push down on the handle to pull the two halves of the clamp together. (Figure 22)

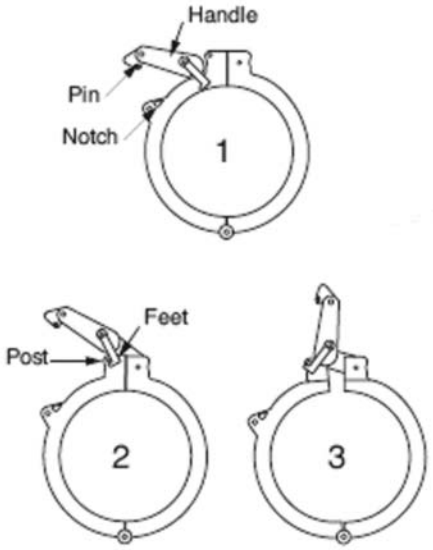

Figure 22 – Install clamp onto closure.

9.13 Continue to push handle down until the small pin on the handle snaps into the triangular hole in the clamp.

9.14 A security lock or tie wrap may be inserted through the round holes in the handle and clamp to lock the closure.

9.15 Flash test the closure to 5 psi. Thoroughly soap seals to check for integrity. After flash testing, bleed all pressure from the closure through the valve.

If you have any questions or need additional information, please contact OFS at 888-FIBER-HELP (888-342-3743).

Appendix

Ribbon Fiber Access Procedure for High Adhesion Matrix

1. Introduction

1.1 This document provides instructions for accessing individual fibers in OFS AccuRibbon® cables in unusual situations where high adhesion is experienced between the fiber coloring and ribbon matrix material. When this occurs, the fiber coating may be damaged when individual fibers are separated from the ribbon. The fiber coating may adhere to the ribbon matrix material or to adjacent fibers. If the fiber coating is damaged, sections of bare fiber can be easily damaged making fiber handling and splicing extremely difficult.

1.2 Not all fibers in the ribbon will necessarily be affected by the high adhesion, and some sections of fiber may separate from the ribbon without difficulty. However, if high adhesion is observed in one fiber, this procedure should be used to separate all fibers in the ribbon.

1.3 No long term fiber reliability problems are expected as a result of the high adhesion or from use of this procedure. As long as the fiber coating is undamaged, the fiber performance and reliability are not diminished.

1.4 During mass fusion splicing, thermal strippers are used to simultaneously remove the ribbon matrix and fiber coating materials. High adhesion is not expected to impact thermal stripping and no special stripping, cleaving, or splicing instructions are required. However, if the cable contains 24-fiber ribbons, the ribbons may be difficult to split into 12-fiber sub-units. In this case, the ribbons may be separated into individual fibers and spliced using single-fiber techniques. Alternatively, the individual fibers can be ribbonized into 12-fiber ribbons using commercially available tools and materials.

2 Fiber Access Procedure

2.1 The fiber-access procedure is similar to the standard ribbon access procedure described in OFS IP-058, *Ribbon Access – Blue Pad Kit*. The primary difference between this procedure and IP-058 is the use of isopropyl alcohol rather than matrix remover gel.

2.2 The following tools and materials are required for fiber access.

Item	Description
1	Isopropyl Alcohol (Reagent Grade, if available)
2	Scotch-Brite[1] Pads
3	pan or other suitable container used to soak ribbons

[1] Scotch-Brite is a trademark of 3M.

2.3 Safety Precautions

- Always wear safety glasses while handling optical fibers.
- Proper ventilation is required when using the alcohol.

2.4 Thoroughly clean the length of AccuRibbon that will be separated into single fibers.

2.5 Fold a Scotch-Brite pad and firmly wipe the length of ribbon to be separated into single fibers (Figure 1). Four or five firm wipes are recommended to loosen the matrix material. Alcohol may be added to the Scotch-Brite pad to help soften the matrix material.

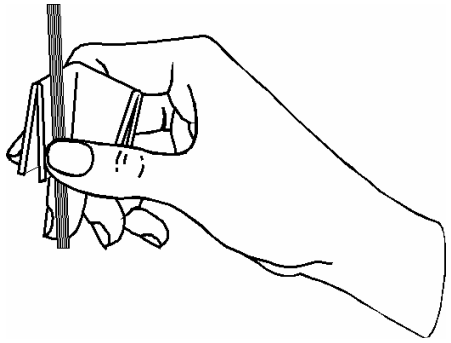

Figure 2 – Firmly wipe the ribbon with a folded Scotch-Brite pad.

2.6 Pour the alcohol into the pan or container that will be used to soak the fiber ribbon. Use enough alcohol to entirely cover the ribbon. Place the fiber-ribbon in the alcohol and soak for 6-8 minutes. If soaking multiple ribbons at the same time, do not soak any ribbon more than 30 minutes in the alcohol.

2.7 Remove the ribbon from the alcohol and notice swelling of the matrix. Fold the Scotch-Brite pad and wipe the ribbon to remove the matrix material. One to three wipes should be sufficient. Reapply alcohol to the Scotch-Brite pad if necessary. Finally, clean the ribbon with a wipe moistened in isopropyl alcohol. Individual fibers should now be accessible. If the matrix material does not completely separate from the fibers, soak the ribbons for an additional 2-3 minutes.

2.8 The individual fibers can now be handled and spliced using standard single-fiber splicing techniques.

If you have any questions or need additional information, please contact the OFS Customer Support Hotline at 888-FIBER-HELP (888-342-3743).