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1.0 General

The 3M 2178 Fiber Optic Splice Case is used in underground, aerial, building entrance, and pedestal applications. The splice case has two cable entrance ports on each end. Port plugs allow the case to be used for butt or inline splices. The rigid nonfilled case provides moisture protection and can be pressurized.

The integral organizer and splicing trays accommodate single-mode and multi-mode fiber optic field splices. Three series of trays are available: The 2116 Splice Tray for fusion splices, the 2118 Splice Tray for mechanical splices, and the 2120 Splice Tray for rotary splices. Splice trays and bonding and grounding hardware are not included in the kits.

The Universal Organizer Adapter allows the 2178 Splice Case to accommodate other splice trays when the 2116, 2118 and 2120 are not used. Splice trays which will work with the Universal Organizer Adapter include 3M 2524 Fibrolok™ Tray and 2524F Fusion Tray, AT&T, UC Series, Siecor, Ditel, Preform and Northern Telecom. One Universal Organizer Adapter is included with the splice case. For further information, see manufacturer’s tray size specifications on page 3.

The 2180 Cable Kit is used when the 2178 Fiber Optic Splice Case is reentered. All materials necessary for cable addition and splice case reassembly are included.

The 2181 Cable Addition Kit increases the cable entrance capacity of the 2178 Fiber Optic Splice Case. One butt adapter is included in each 2181 Kit. A single butt adapter allows the 2178 Splice Case to accommodate four cables in a butt configuration or eight cables total. Double stacking the butt adapter increases the capacity to six cables in a butt configuration or twelve cables total. The 2181B Double Butt Adapter Kit contains the fasteners necessary to assemble the splice case when the butt adapters are double stacked. The 2181 Kit can be installed at initial splicing or at reentry.

2.0 Specifications

- Maximum cable diameter: 1.0” (25 mm)
- Minimum cable diameter: 0.4” (10 mm)
- Maximum cable entry: 4 (2 per end)
  - with 2101: 3 (4 per end)
  - with (2) 2181 & 2181B: 12 (6 per end)
  - with (3) 2181 & 2181B: 16 (8 per end)

3.0 Kit Contents

3.01 2178 Contents

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<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
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<tbody>
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<td>2178 Fiber Optic Splice Case/Cover &amp; Base</td>
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<td>Sealing Washer Tree</td>
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<td>Blue Cable TY</td>
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<td>Sealing Washer Tree</td>
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<tr>
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<td>Blue Cable TY</td>
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<td>Clamp (Hose, .439/1.00)</td>
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<td>Sealing Tape</td>
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<td>Sealing Plugs</td>
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<td>Blue Cable TY</td>
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<td>Clamp (Hose, .439/1.00)</td>
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<td>Key, Hex (Allen Wrench)</td>
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<td>Fillister Head Screws</td>
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<td>Fillister Head Screw, 4.95&quot; (Screw Clamp Retention)</td>
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<td>10</td>
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3.05 2524-FT Splice Tray

<table>
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<td>Tray Base</td>
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<td>Buffer Tube Tubing</td>
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<td>Fusion Splice Holder</td>
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3.06 2185 Core Block Kit

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<tbody>
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<td>4445 Sealant (will core block 4 cables)</td>
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<td>Gloves</td>
<td>1 Pr.</td>
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<td>Foam Tape</td>
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<td>Tongue Depressor</td>
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3.07 Aerial Hanger Bracket

3.08 Additional Material Required:

- 3/4” (19 mm) Vinyl Tape
- 2” (51 mm) Rubber Tape
- Cable Cleaner
- Shield Bond Connectors
- Sheath Scuff Material

3.09 Tools Required:

- 3/8” (9.5 mm) Socket Wrench Set
- 1/2” (12.7 mm) Socket Wrench Set
- 7/16” (11.1 mm) Socket Wrench Set
- 9” Lineman Pliers
- Needle Nose Pliers
- Cable Stripper
- Sheath Knife
- Tape Measure

3.10 Optional Specialized Material Required:

- #6 AWG Ground Braid or equivalent for isolated cable shields.
- AT&T unit splitter kit for unitube fiber optic cable.
- Spiral wrap used to protect express fibers with mid-span splicing and unitube cable.
- 1” (25mm) vinyl tape and #69 Glass tape for sheath isolation for crossply and LXE cable only.
- RC-100 splice support for racking in vaults.
- 1/2” x 2” bolts (2) with washers used with splice support system.
- 1/2” x 2” self-tapping screws (2) with washers for fire retardant backboards.
- Threaded rod (1) 5 1/2” x 1/4” used with Siecor and Ditel trays with full volume and single butt adapter.
- Threaded rod (2) 7” x 1/4” used with Siecor and Ditel trays with full volume and double butt adapter.
- Split bolt for sheath isolation for crossply and LXE.
4.0 **Cable/Splice/Kit Matrix**

4.01 The matrix below shows the number of cables that can be placed into a splice case and the components that would be required to build a new splice.

<table>
<thead>
<tr>
<th># OF CABLES</th>
<th>2178 FIBER OPTIC SPlice CASE</th>
<th>2180 CABLE ADDITION KIT</th>
<th>2181 BUTT ADAPTER KIT</th>
<th>2181B DOUBLE BUTT ADAPTER KIT</th>
</tr>
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<tbody>
<tr>
<td>2</td>
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4.02 The following matrix describes the maximum number of splices that can be made to the maximum number of cables that can be placed in a splice case:

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<th>MAJOR COMPONENTS</th>
<th>BUTT SPLICE</th>
<th>IN-LINE SPLICE</th>
<th># OF CABLES *</th>
<th># OF 24 FIBER TRAYS</th>
<th># OF FIBERS SPLICES</th>
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* See cable/splice/kit matrix in paragraph 4.01 for other components needed to complete the splice.
### Tray Size Specifications:

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<th>Tray Size</th>
<th>Number of Fibrloks per Tray</th>
<th>Standard 3.46&quot; Space Available</th>
<th>Maximum Number of Fibrloks</th>
<th>2178 with a 2181 and No Cable 4.96&quot; Space Available</th>
<th>Maximum Number of Fibrloks</th>
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</tbody>
</table>
SECTION 1: 2178 SPLICE CASE INSTRUCTIONS

5.0 Cable Preparation

**Caution:** When removing cable sheathing, do not cut, kink, or damage underlying layers. If damage occurs, cut back sheath components to adequately inspect and repair.

5.01 Remove 96” (2.43 m) of outer cable sheath (and shield or armor if present). Remove successive sheath layers and wrappings to expose primary tube(s) protecting fibers. Stagger layers as recommended by cable manufacturer or per standard practice.

5.02 Remove all cable grease. Clean all primary tube(s) and dielectric strands with approved cable cleaner. Cover all sharp edges with vinyl tape.

*Note:* Carefully follow health, safety and waste disposal instructions as given on Material Safety Data Sheet or container label for cable cleaner solvent being used.

5.03 Trim any solid filler tubes and discard. Trim central strength members (if present) to 7” (178 mm) from sheath openings.

5.04 Scuff and center 6” (152 mm) of each cable as shown.

5.05 Size and place washers on cable.

5.06 Slide two sealing washers down each cable. Use sealing washers with smallest ID which will slide on the cable.

*Note:* If necessary, sealing washers can be split on washer mark and placed on the cable. Place the cuts off set 180 degrees.

6.0 Mid-Span Splice (Balloon Splice)

6.01 Mark the cable in the center of the stored slack.

6.02 Locate the approximate center of the mid-span opening and remove 18” (450 mm) of outer sheath, shield (if present), inner sheath and Kevlar wraps. Locate the reverse point of the buffer tube(s) oscillations.
6.03 Remove 48" (1.2 m) of cable sheath (and shield, if present) from either side of the reverse point (60" from mid-point for LXE). Remove inner sheath to within 1/2" (13 mm) of the outer sheath ring cut.

**Note:** Removal of 48" (1.2 m) (60" for LXE) of outer cable sheath in both directions is required when the spliced fibers are not dedicated. The fibers to be spliced will be cut in the middle. This will allow 96" (2.4 m) of stored slack available for re-splicing or bi-directional feed.

6.04 Remove all cable grease. Clean all primary tube(s) and dielectric strands with approved cable cleaner. Cover all sharp edges with vinyl tape.

**Note:** Carefully follow health, safety, and waste disposal instructions as given on the Material Safety Data Sheet or container label for cable solvent being used.

6.05 Trim any solid filler tubes and discard. Trim central strength members (if present) to 7" (178 mm) from sheath openings.

6.06 Scuff 6" (152 mm) of each cable.

6.07 The buffer tubes to be spliced will be opened 2" (51 mm) from the cable end at the field side.

6.08 If the cable is a ribbon, unitube, or slotted core, loose tubes from a unit splitter kit will be placed over the fibers to be spliced for protection.

6.09 Ribbon or non-buffer tube design cable will require 1/2" (13 mm) spiral wrap to protect the stored expressed fiber.

6.10 Fibers expressed, or not spliced, will be stored in the base under the central members.
7.0 Bonding for Shielded Cable

*Note: Use caution when installing shield bond connector so underlying layers of cable are not damaged.*

7.01 When splicing any standard, terneplate type, shielded fiber optic cable, install the 4460-D Shield Bond Connector.

7.02 Prepare cable/tab 180 degrees from shield bond connector location and insert base.

*Note: When a non-core wrap fiber optic cable is being used, use caution to not damage buffer tubes when inserting connector base.*

7.03 Install the connector top over the stud and tighten firmly with one of the securing nuts. Place the braid over the connector stud and secure in place with the nut.

7.04 If double sheath, double shield fiber optic cable is being used, both outer shield and inner shield need to be bonded.

Leave 3/4" inner sheath and 3/4" of core wrap exposed and install two shield bond connectors 180 degrees apart per practice. Both shield bond connectors need to be commoned with a bond strap.

7.05 When bonding LXE cable, the two LXE members must be placed in the two slots at the back of base unit after it is installed. Twist LXE members together twice.
7.06 When using steel reinforced crossply, and crossply with ribbon cable, install the 4460-D per practice and twist all reinforcing members together and bring to one side.

8.0 Core Blocking

**Note #1:** This core blocking method is used on fiber cable design as of this practice issue date, except slotted core fiber cable.

**Note #2:** Core blocking of OFNR cable is not necessary.

**Note #3:** If sheath has not been scuffed, do before proceeding.

8.01 Non-Armored Application

8.02 Cut two 3/4” (19 mm) wide by 15” (381 mm) long strips of foam collar tape. Build a foam collar by wrapping at least two layers of foam collar tape around cable sheath 1” (25 mm) from the end of sheath.

8.03 Separate buffer tube(s) and strength members. Build another foam collar by wrapping foam tape between buffer tube(s) and strength members so the distance between collar outer edges is 4” (102 mm). Wrap two more layers of foam tape around outside of buffer tube(s).

8.04 Lay a 4” (102 mm) long piece of E-Z wrap lengthwise on the workstation and position between foam collars. Wrap E-Z wrap edges around foam collars.
8.05 Cut corner of 4445 Sealant bag. Starting at opposite end, force sealant out and fill area between foam collars.

Note: Carefully follow health, safety and disposal instructions as given on Material Safety Data Sheet or product label for 4445 Sealant.

Note: Protective gloves should be worn during sealant dispensing and overwrapping steps.

8.06 Overwrap with at least two additional half-lapped layers of E-Z wrap.

8.07 Secure E-Z wrap by compressing foam collar ends with three half-lapped layers of highly stretched 3/4" (19 mm) vinyl tape.

8.08 Evenly work the 4445 Sealant between buffer tube(s) and strength members.

8.09 Overwrap entire block with one half-lapped layer of highly stretched 3/4" (19 mm) vinyl tape.

8.10 Apply a compression wrap with two half-lapped layers of highly stretched 3/4" (19 mm) DR tape.
8.11 Overwrap with one additional half-lapped layer of vinyl tape.

8.12 Repeat steps 8.02 thru 8.11 until all cables are blocked.

8.13 Secure the cables to the splice case per splice case practice.

8.14 Armored Application

Note: This procedure is the same for LXE, steel re-enforced crossply, crossply ribbon cable, loose buffer tube and steel central member make up fiber optic cable.

8.15 Prepare cable for bonding the armor and strength members.

8.16 Cut stud of the shield bond connector flush with top nut and file sharp edges.

8.17 Cut two 3/4" (19 mm) wide by 15" (381 mm) long strips of foam collar tape. Starting 1" (25 mm) behind shield bond connector build foam collar with the foam collar tape, build collar high enough to accommodate the shield bond connector, bonding straps and nuts.
8.18 Separate buffer tube(s), strength member and bond members. Build another collar between buffer tube(s), strength members and bonding strap so distance between collar outer edges is 5” (127 mm). Wrap two more layers of foam tape around outside of tubes.

8.19 Lay a 5” (127 mm) long piece of E-Z wrap lengthwise on the workstation and position between foam collars. Wrap E-Z wrap edges around foam collars.

8.20 Cut corner of 4445 Sealant bag. Starting at opposite end, force sealant out and fill area between foam collars.

*Note:* Carefully follow health, safety and disposal instructions as given on Material Safety Data Sheet or product label for 4445 Sealant.

*Note:* Protective gloves should be worn during sealant dispensing and overwrapping steps.

8.21 Overwrap with at least two additional half-lapped layers of E-Z wrap.

8.22 Secure E-Z wrap by compressing foam collar ends with three half-lapped highly stretched 3/4” (19 mm) vinyl tape.

8.23 Evenly work sealant between buffer tubes and strength members.
8.24 Overwrap entire block with one half-lapped layer of highly stretched 3/4" (19 mm) vinyl tape.

8.25 Apply a compression wrap with two half-lapped layers of highly stretched 3/4" (19 mm) DR tape.

8.26 Overwrap with one additional half-lapped layer of vinyl tape.

8.27 Follow steps 8.15 thru 8.26 until all cables are blocked.

8.28 Secure the cables to the splice case per the splice case practice.

9.0 Sealing Washer Installation

9.01 Wrap each cable with two wraps of 2" wide DR Tape. Place wraps behind foam tape collar from core block.

9.02 Place the first sealing washer against the DR Tape. Build cable entrance seals by wrapping 1 1/2" (38 mm) sealing tape between washers. Wrap each cable until sealing tape O.D. is flush with the washer O.D. Slide second washer against sealing tape.
9.03 Press cable seals onto cable entrance port(s).

9.04 Attach each cable to splice case by installing and tightening hose clamps over previously wrapped DR Tape on the down brackets. Double sheath cable will have hose clamp tightened over metallic tape previously placed on the cable instead of DR Tape.

9.05 Place cable ties outside of splice case. Install one large green cable tie on the "C.O. Cable" and trim. Install one large blue cable tie on the "Field Cable" and trim.

10.02 Place ground stud protector cap on ground studs.

10.03 If separate external grounding is not required, bond across splice to either ground stud.

10.04 Grounding for Shielded Cable

10.01 Remove ground stud protectors. If bonding to central clamp is not required, remove strap from external ground stud. If separate external grounding is required, bond "C.O. Cable" and "Field Cable" directly to the closest ground stud.
10.04 Ground isolation from the central block using AT&T crossply or LXE cable. This method will provide ground isolation plus strain relief protection.

a. The cables must enter the case in a butt configuration at the external ground stud end.

Note: When terminating OFNR cable, ground isolation is not necessary.

b. The crossply members must be twisted or spirally wound. The two LXE members are twisted together twice.

Note: The double tape method is required to assure ground isolation from the central clamp.

c. The final crossply and LXE member length should extend 3" (76 mm) beyond the central clamp.

d. Starting 3" (76 mm) from the final cut end, wrap two strips 2" (51 mm) long of 1" (25 mm) wide vinyl tape lengthwise around the crossply members. Make sure the tape is overlapped and no metal is exposed. Each LXE member requires only one piece of vinyl tape.

e. Wrap a 2" (51 mm) length of #69 glass cloth backed tape over the vinyl tape. Two pieces of tape are required for crossply cable and one piece for each LXE member.

Note: The double tape method is required to assure ground isolation from the central clamp.
f. The crossply members go under both central retention screws along the outer edge. The LXE members go under both sides of the two screws. Make sure the taped area is under the screws.

g. A split bolt clamp is required to join the crossply members to a number six or equivalent bond strap. Wrap vinyl tape over the bolt connection to protect against sharp edges or pinch points. Attach external ground stud.

11.0 Buffer Tube and Ribbon Cable Preparation

11.01 Unit splitter kits are required on all ribbon, unitube, or slotted core cable. Follow instructions supplied with the unit splitter kits.

11.02 Gather all buffer tubes from “C.O. Cable” and install one small green cable tie approximately 36” (914 mm) from sheath end. Install one small blue cable tie on the “Field Cable” buffer tubes or ribbon cable.  

Note: **Spiral wrap or equivalent must be applied to unitube cable before applying cable tie.**

11.03 Coil buffer tube, ribbon, unitube, or fibers bundles inside splice case base. If using a splice tray that allows fiber entry at all four corners or two corners in the same end, the last 3/4 loop will allow tray movement for splicing away from splice case. Coils should be full splice case base length and width and should be under the cable and central member.

11.04 When using the 2524-FT Fibrlok splice trays, or other trays that allow fiber entry from the same corner, the buffer tubes, ribbon, unitube or slotted core fiber will need to route in the same direction together. This is accomplished by having the fiber from one cable pass in front of the central clamp and follow the route of the other fiber. The 3M Fibrlok splice tray requires a counterclockwise direction. Follow supplied instructions with other splice trays to determine fiber route direction.
11.05 Cut and position central member under central clamp retention screws. If necessary, remove insulation from central member. Using the supplied 7/32” hex key, firmly tighten each retention screw. If Kevlar is used for cable strain relief, wrap the Kevlar fibers twice around one central clamp retention screw and tighten the screw. Cut Kevlar fibers 1/2” (13 mm) from screw.

11.06 The crossply members go under both central clamp retention screws along the outer edge. The LXE members go under both sides of the two screws. Make sure the taped area is under the screws.

11.07 A split bolt clamp is required to join the crossply members to a number six or equivalent bond strap. Wrap vinyl tape over the split bolt connection to protect against sharp edges or pinch points. Attach to external ground stud.

12.0 Universal Organizer Adapter

12.01 The universal organizer adapter is secured onto the studs located on the central clamp. Trays that will fit on the organizer adapter are the 3M Fibrlok Tray, AT&T, UC Series, Ditel, Preform, and Siecor. The bottom tray is secured to the adapter by the adhesive-backed dual-lok pads. Additional trays are added by attaching to the tray below or by using the supplied rod and wing nut.

AT&T Ribbon Cassette (for tray)
PNUC-RR Splice Organizer
AT&T par #103921961
13.0 Splice Trays and Fiber Splicing

13.01 2524-FT (Fusion and Fibrlok)

The Fibrlok 2524 Splice Organizer Tray stores up to 24 Fibrlok splices and/or 24 fusion splices and the respective buffer tubes and fibers. A 4” (102 mm) minimum bend diameter is maintained in each tray. Also, the trays hinge together for individual tray access in a stack.

13.02 Prepare the cables and splice case for splicing.

Danger: Fiber ends and unmated connectors may emit INVISIBLE laser or LED radiation.

Avoid direct eye exposure to the beam. Do not inspect with magnifying instruments. Cap plugs should be kept on all unmated connectors.

Note: The following procedures must be followed prior to installing the 2524 Splice Organizer Tray.

13.03 Prepare the cables to be spliced per the company practice to expose 8 feet (2.4 m) of cable buffer tubes.

Clean the sealant from buffer tube(s) per company practice.

Note: Carefully follow health and safety information given on cleaning solvent container label or Material Safety Data Sheet.

13.04 If the cable is a ribbon, unitube or slotted core, loose tubes from a unit splitter kit will be placed over the fibers to be spliced for protection.

13.05 Secure the cables to the splice case per case practice.

13.06 Lay one complete coil of buffer tube(s) in the splice case in a COUNTERCLOCKWISE direction. Buffer tubes should exit the splice case in the corner where they will enter the splice trays.

13.07 Trim the buffer tubes (without cutting the fibers) to the middle of the splice case. Leave at least 75% of one coil buffer tubing intact.

13.08 Clean the grease from the fiber per company practice.

13.09 Cut the supplied tubing into 12" (305 mm) pieces.
13.10 Slide a segment of tubing over the fibers until it contacts the buffer tube end. No more than twelve 250 µm fibers or four 900 µm fibers should be placed into a tube.

13.11 Slide the segment of tubing over the buffer tube about 1" (25 mm) and secure with two wraps of vinyl tape.

13.12 Mount the universal organizer adapter in the splice case base.

13.13 Cut the Dual-Lok to fit the four flat pads on the tray bottom. Remove protective liner and adhere.

13.14 Center the tray over the adapter and press down to secure.
13.15 To remove cover, unlatch and grasp either corner. Pull straight and rotate simultaneously until both hinges are disengaged.

13.16 Identify fibers to be spliced.

13.17 Lay the buffer tube ends over the channels. If tubes are too long to fit in channels, trim excess off. DO NOT CUT FIBERS.

13.18 Press the buffer tube into the channel to secure. The buffer tube should stop within 1/4" (6 mm) of the channel end.

13.19 Lay at least one complete loop of fiber from the first buffer tube on the tray with the fiber ends crossing the front "CUT HERE" mark.

13.20 Now cut the fiber ends at the mark. Be sure to cut ONLY the fiber ends.

13.21 Remove the cut fibers from the tray, but leave the buffer tube installed.

13.22 Secure the buffer tube, from the second cable, which will now be spliced to those just cut.
13.23 Lay at least 1 1/2 loops of fiber from the first buffer tube of the second cable on the tray with the fiber ends crossing the back "CUT HERE" mark.

13.24 Now cut the fiber ends at the mark. Be sure to cut ONLY the fiber ends.

13.25 Remove the cut fibers from the tray, but leave the buffer tube installed.

13.26 For remaining buffer tubes, repeat steps 13.15 through 13.25.

13.27 Store the first two fibers to be spliced under the tray tabs.

13.28 Remove the minimum length of fiber required to prepare and split the fibers.

13.29 Place the splicing tool in close proximity to the splice tray. Prepare and splice the first pair of fibers.

Note: If fusion splicing method is used, insert the fusion adapter (2524-F packed with 2524-FT) into splice tray.
13.30 Lay the splice on top of the pocket that it will snap into. Place the fibers around the perimeter of the tray under the tray tabs. If 900 micron fiber is being spliced to 250 micron fiber, place the 900 micron fiber into the tray before placing splice in position. This removes torsional load from the 900 micron fiber.

13.31 Prior to placing the splice into the pocket, observe how the splice lays in its relaxed state. Rotate the splice through the smallest possible angle. Snap splice into pocket cap side down.

13.32 For remaining fibers, repeat steps 13.27 through 13.31. Fill pockets in order.

13.33 Install and close tray cover making sure that all fibers are properly stored under the tray tabs.

13.34 Snap tray cover shut.

13.35 Slide the post of the tray being added into the hole in the level arm on the previously installed tray. (Back view shown).
13.36 Now slide the tray laterally (flexing the lever arm outward) enough to allow the post to be inserted into the opposite lever arm hole. (Back view shown).

13.37 Lift the tray being added upwards approximately 1/2" (13 mm). Push in on the front snap of the installed tray and lower new tray down and over the snap.

13.38 For additional trays, repeat steps 13.35 through 13.37.

13.39 If trays are used in an aerial application, a wrap of vinyl tape around entire stack between the front snaps and the cover snaps is recommended. This allows for reinforcement before sealing splice case.

13.40 The label on the top of the tray cover allows for the identification of splices and/or fiber count.

14.0 Splice Preparation

14.01 Open buffer tubes 1" (25 mm) from end of splice case base, exposing 40" (1.02 m) of bare fiber. Protect fibers from damage.  

*Note:* Do not withdraw primary tubes coiled inside splice case base.

14.02 Clean all cable grease from exposed fibers.

15.0 Splice Case Assembly

15.01 Seal splice case walls:

a. Lay sealing cord into channel along both sides of the splice case base. Do not stretch sealing cord.
b. Lay two strips of sealing cord 1 1/2” (38 mm) in length between the cable entrance ports on each end of the splice case base, or one 3” (76 mm) length folded in half to fill the channel.

15.02 Seal plug construction:

   a. Select a plug for each vacant cable entrance port.

   b. Wrap each plug with 1 1/2” (38 mm) sealing tape. Sealing tape O.D. should be flush with plug O.D. **Do not overwrap.**

   c. Press seal plugs into each vacant cable entrance port.

15.03 Set splice case cover directly on top of the splice case base.

15.04 Turn all bolts until they have been threaded several complete turns into the nut inserts or until the cover rests on top of the sealing cord.

15.05 Tighten all bolts in numbered sequence. A torque wrench is not needed. If a torque wrench is used, do not exceed 20 Ft. Lbs. (240 in Lbs.).

**Note:** **Do not use an air drive wrench.**

15.06 After five minutes, retighten all bolts on the splice case.

15.07 Flash test splice case with 10 psi maximum.
16.0 Racking in Building Entrances and Vaults

16.01 Vertical Racking:
   a. Determine height of splice.
   b. Place a 1/2" (13 mm) bolt through racking that extends away from the wall.
   c. The bottom of the 2178 is placed on the bolt so the groove on the base fits around the bolt.
   d. Place a 1/2" (13 mm) bolt through the top groove to align with an opening.
   e. Tighten bolts to prevent movement.

16.02 Horizontal Racking:
   a. Determine height of splice.
   b. Use RC-100 splice support clips.
   c. Insert clips in racking or unistrut.
   d. Insert a standard manhole rack through the brackets.
   e. Use 2" (51 mm) bolts to secure 2178 to installed rack.
   f. Tighten bolts to prevent movement.

   **Note:** Follow instructions provided with packaging of RC-100 clips.

16.03 Fire Retardant Backboard:
   a. Determine height of splice.
   b. Screw two 1/2" x 2" (13 mm x 51 mm) bolts in backboard to secure 2178.
   c. Can be stored vertical or horizontal.
17.0 Splice Case Re-entry

17.01 Loosen the 10 bolts holding splice case halves together. Bolts should be completely unthreaded from nut inserts in splice case base.

17.02 Using these bolts, loosely screw one bolt into each of the four threaded corner inserts in the splice case cover.

17.03 Beginning with any corner, screw in bolt until the splice case halves have been pried apart about 1/4" (6 mm). Repeat with the other bolt on same end of the splice case.

*Note:* Do not pry apart with any tool. The splice case will separate with this procedure.

17.04 Follow same procedure with the bolts on opposite end of the splice case.

17.05 Repeat steps 17.03 and 17.04 until case halves can be easily separated by hand.

*Note:* If splice case is to be reassembled, all sealant must be removed and cable entrance port seals reconstructed.

a. Remove old sealing cord from splice case channels. This is accomplished by pressing a small amount of sealant into the channel and removed with a quick snap. The quick action will remove the old sealant. This is done to the cover and base.

*Note:* Do cleaning immediately after prying the splice case apart.

b. Plug removal - insert the small end of a terminal wrench in the plug opening and pry up. The plug will separate from the splice case. Clean the plug and port area using the method stated above.

c. Cable cleaning - remove the hose clamp from bracket to allow cable to be lifted away from the base. Grab the cable on both sides of the sealing washers and pull up until the cable seal is broken. Be careful not to damage the buffer or fibers that are working. Clean the port area and cable using the method stated above. If the sealing washers are damaged, use new washers.
SECTION 2: 2181 CABLE ADDITION KIT

18.0 Cable Addition Placement, Preparation and Installation (Butt Adapter)

18.01 Cables should be placed in cable entrance ports in a butt configuration for easier storage.

18.02 Cable preparation - (See Section 5.0).

18.03 Stack Central Clamps

Note: Buffer tube retainers may be removed for installation of central clamp and additional trays. Replace buffer tube retainers after clamp and trays are installed.

a. Remove existing tray(s) and set aside. Remove the two fillister head screws holding the central clamp to the splice case base.

b. Place the second level central clamp directly on top of splice case base central clamp and secure the two fillister head screws supplied with the 2181 kit.

18.04 Bonding for Shielded Cable - (See Section 7.0)

18.05 Core Blocking - (See Section 8.0).

18.06 Grounding for Shielded Cable - (See Section 10.0).

18.07 Sealing Washer Installation (See Section 9.0 through 9.05).

19.0 Butt Adapter 1 Installation

19.01 For the single butt adapter splice case, replace all ten 2" (51 mm) bolts inserted in the splice case cover with the ten 3 1/2" (89 mm) bolts supplied with the 2181 kit.
20.0 Splice Case Assembly with One Adapter

20.01 Seal splice case walls:
   a. Lay sealing cord into channel along both sides of the splice case base. Do not stretch sealing cord.
   
   b. Lay two strips of sealing cord 1 1/2" (38 mm) in length between the cable entrance ports on each end of the splice case base, or one 3" (76 mm) length folded in half to fill the channel.

20.02 Seal plug construction:
   a. Select a plug for each vacant cable entrance port.
   b. Wrap each plug three times with 1 1/2" (38 mm) sealing tape. Sealing tape OD should be flush with plug OD. Both ends of tape should be feathered to prevent leak paths. Do not overwrap.
   c. Press seal plugs into each vacant cable entrance port.

20.03 Set butt adapter 1 (flange side down) as is on top of splice case base.

Note: These steps are done to seat cord between splice case and butt adapter.

20.04 Set cover directly over butt adapter 1.
20.05 Tighten all bolts in numbered sequence. A torque wrench is not needed. If a torque wrench is used, do not exceed 20 Ft. Lbs. (240 in Lbs.).

**Note:** Do not use an air drive wrench.

20.06 Follow steps 20.01 through 20.04 to seal butt adapter to cover.

20.07 After five minutes, retighten all bolts on the splice case.

20.08 Flash test splice case with 10 psi maximum.

### 21.0 Cable Addition Placement, Preparation and Installation (Two Adapters)

21.01 For the double butt adapter splice case, replace all ten 2" (51 mm) bolts inserted in the splice case cover with the ten 4.95" (126 mm) bolts supplied with the 2181B kit.

21.02 Cables should be placed in cable entrance port in a butt configuration for easier storage.

21.03 Cable preparation - (See Section 5.0).

21.04 Stack Central Clamps

**Note:** Buffer tube retainers may be removed for installation of central clamp and additional trays. Replace buffer tube retainers after clamp and trays are installed.

a. Remove the splice trays from the central clamp or universal adapter and set aside. If the universal adapter is used, it must be removed from the central clamp. Remove the two fillister head screws holding the central clamp to the splice case base.

b. Place the third level central clamp directly on top of the second level central clamps and secure the two fillister head screws supplied with the 2181B kit.
21.05 Bonding for Shielded Cable - (See Section 7.0)
21.06 Core Blocking - (See Section 8.0).
21.07 Grounding for Shielded Cable - (See Section 10.0).
21.08 Follow instructions in Section 15.0 per adapter installed.

22.0 Butt Adapter 2 Installation

22.01 For the double butt adapter splice case, replace all ten 2" (51 mm) bolts inserted in the cover with the ten 5" (103 mm) bolts supplied with the 2181B kit.

23.0 Splice Case Assembly with Two Adapters

23.01 Seal splice case walls:

a. Lay sealing cord into channel along both sides of the splice case base. Do not stretch sealing cord.

b. Lay two strips of sealing cord 1 1/2" (38 mm) in length between the cable entrance ports on each end of the splice case base, or one 3" (76 mm) length folded in half to fill the channel.

23.02 Seal plug construction:

a. Select a plug for each vacant cable entrance port.

b. Wrap each plug three times with 1 1/2" (38 mm) sealing tape. Sealing tape OD should be flush with plug OD. Both ends of tape should be feathered to prevent leak paths. Do not overwrap.

c. Press seal plugs into each vacant cable entrance port.

Note: Follow Section 20.0 to build splice case base and first butt adapter.

23.03 Set butt adapter 2 (flange side down) directly on top of butt adapter and splice case base.

Note: These steps are done to seat cord between splice case and butt adapter.
23.04 Set cover directly over butt adapter 2.

23.05 Tighten all bolts in numbered sequence. A torque wrench is not needed. If a torque wrench is used, do not exceed 20 Ft. Lbs. (240 in Lbs.).

Note: Do not use an air drive wrench.

23.06 Follow steps 23.01 through 23.04 to seal butt adapter.

23.07 After five minutes, retighten all bolts on the splice case.

23.08 Flash test splice case with 10 psi maximum.

24.0 Splice Case Re-entry with Butt Adapters

24.01 Loosen the 10 bolts holding splice case halves together. Bolts should be completely unthreaded from nut inserts in splice case base.

Note: See label on end of splice case.

24.02 Using these bolts, loosely screw one bolt into each of the four threaded corner inserts in the splice case cover.

24.03 Beginning with any corner, screw in bolt until the splice case cover has been pried from butt adapter about 1/4" (6 mm). Repeat with the other bolt on same end of the splice case.

24.04 Follow same procedure with the bolts on opposite end of the splice case.

24.05 Repeat steps 27.03 and 27.04 until case cover can be easily separated from butt adapter by hand.
24.06 Remove the four corner inserts on exposed side of butt adapter by prying out with a screwdriver.

**Note:** Do not discard corner inserts. Inserts must be replaced in butt adapter before reassembly.

24.07 Loosely screw one bolt into each of the four threaded corner inserts of the butt adapter. The threaded corner inserts are located directly beneath the previously removed corner inserts.

24.08 For the SINGLE BUTT adapter splice case repeat steps 27.03 through 27.05 to separate butt adapter 1 from splice case base.

24.09 For DOUBLE BUTT adapter splice case repeat steps 27.06 through 27.08 to separate butt adapter 2 from butt adapter 1.

**Note:** If splice case is to be reassembled, old sealant must be removed and cable entrance port seals reconstructed.
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