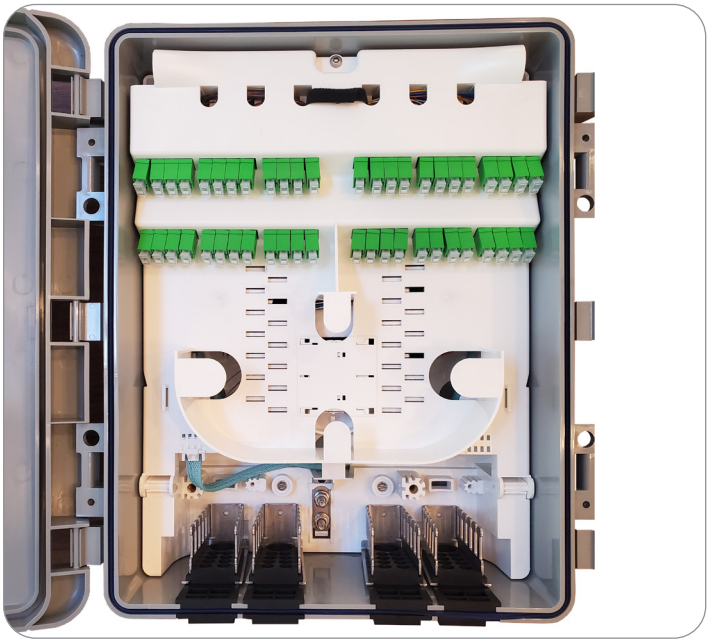
INSTALLATION INSTRUCTIONS

LL-5D Splicing and Distribution Enclosure



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PACKAGE CONTENTS

LightLink LL-5D Enclosure
Cable Attachment Units, as ordered
Splice Trays, as ordered
Foam and Zip Tie Retention Kit
Installation Instructions

REQUIRED TOOLS

216 can wrench
5/32" Hex wrench tamper-proof screwdriver
Tape measure
Zip ties or Velcro® for basket retention
Wire cutter for strength member
Splicer's scissors
Splice equipment and sleeves
Cable entry tools
Cable stripper tool
Cable ring-cutting tool
Cable splicer knife
9" Lineman's pliers
Marker
Utility Knife

ADDITIONAL KITS – OPTIONAL

Table 1

DESCRIPTION	AFL NO.
Velcro, 75 Foot Length Roll – For securing bundles in the slack basket	FC001759
Apex® Cable Bonding Kit (Bonds armored cable sheath to ground) – Alligator clip on one end, eyelet on other end. Pack of 10	AX-KIT-GROUND-10
Bundle Splice Tray Retention Kit – Includes 25 foam grommets for retaining bundles to splice trays	HW000406
Apex Splice Module (18 single fusion triple stacked, 12 mass fusion double stacked, 6 mechanical). Pack of 20	AX-TRAY-MOD-20
Apex Cable Attachment Unit	AX-KIT-CBLSTRN

LL-5D ENCLOSURE DESCRIPTION GUIDE

Reference for different LL-5D box versions referenced throughout the installation instructions as to the version fiber fanout version to splice tray and the type of drop exit ports.

* Based on how the LL-5D is ordered, the box will be a combination of configuration group A and B.

** Color of sheathing on fiber may vary.

*** Splice tray count and fiber routing may vary depending on how the LL-5D was ordered.

Group A

Figure 1 – Conduit Version

Figure 2 – Grommet Version

Group B

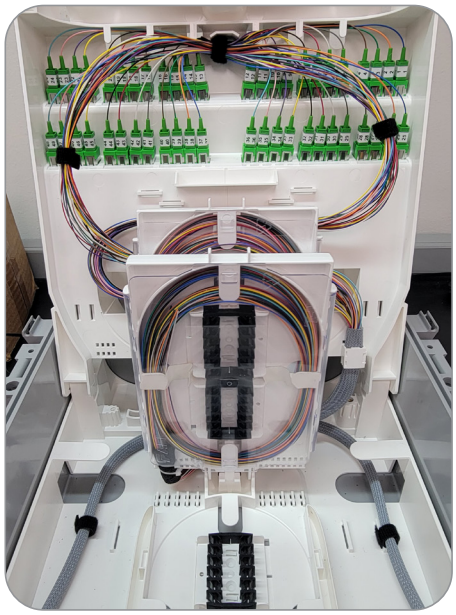


Figure 3 – Tight Buffer Version

Figure 4 – Ribbon Version

ENCLOSURE MOUNTING – WALL

1. Determine the mounting position of the enclosure on the wall or mounting location. (**Figure 5**)
2. Identify the two mounting points found on the top and bottom of the enclosure and mark to be pre-drilled for enclosure placement (**Figure 6**). ****NOTE**** Mounting hole positions are approximately 16 ½ inches apart (**Figure 7**).
3. Drill pilot holes in both previously marked locations (**Figure 8**).
4. Install a screw in each of the mounting holes found on the top and bottom of the box. It is recommended to use #8 2.5" exterior wood screws to prevent pull-out. Using local accepted practices and approved hardware, secure the screws half-way into the wall (**Figures 9 and 10**).
5. Before the screws are completely torqued, a level may be used to ensure that the enclosure is in the desired position (**Figure 11**). Once satisfied with the position, finalize by torquing down the mounting screws.

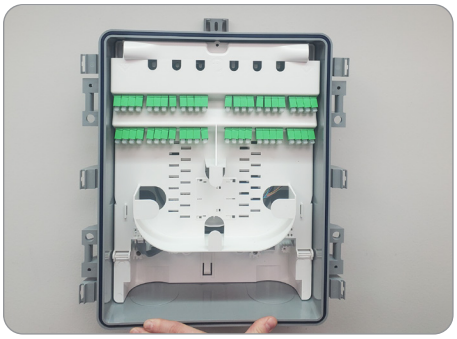


Figure 5

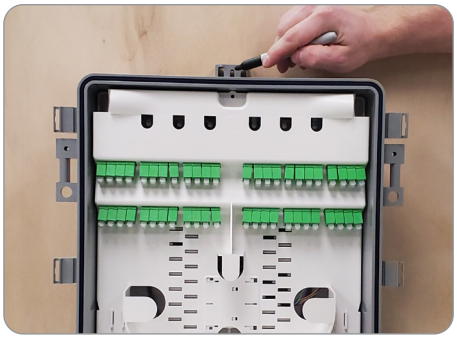


Figure 6

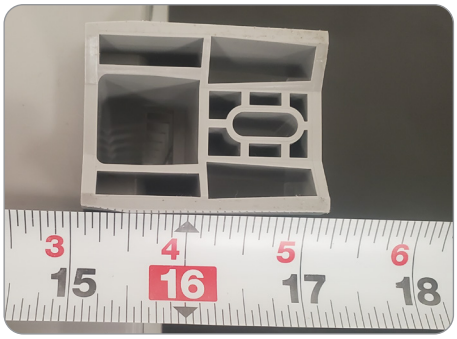


Figure 7

Figure 8

Figure 9

Figure 10

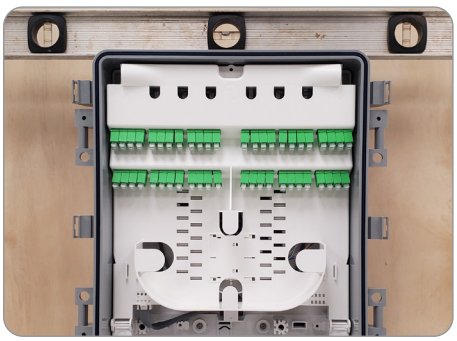


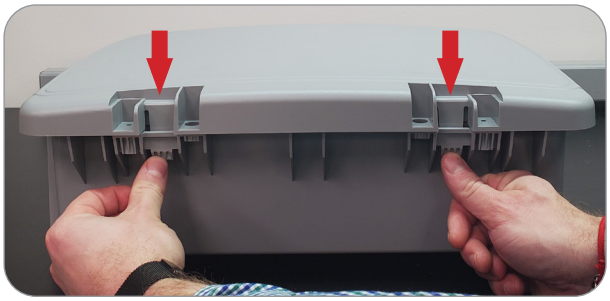
Figure 11

ENCLOSURE PREPARATION – DOOR REMOVAL

1. Using the can wrench tool, unscrew the upper and lower security screws holding the cover closed (**Figures 12 and 13**).
2. Compress both tabs of the enclosure door towards the box, push the lid up and swing the door open (**Figure 14**).
3. Position the enclosure door perpendicular to the box and gently pull away from the hinge to release the door at the three-hinge points. Place the door to the side (**Figures 15 and 16**).

Figure 12

Figure 13



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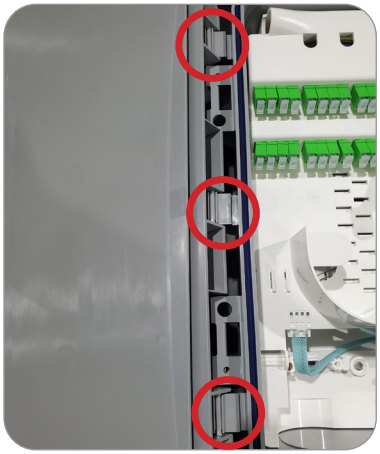


Figure 15

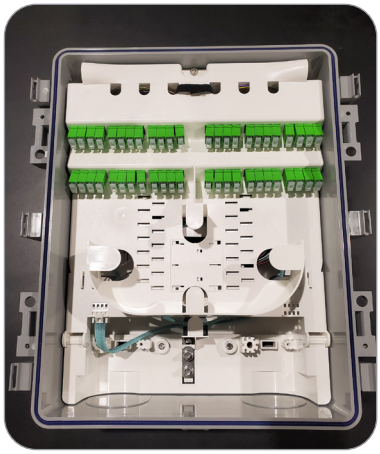


Figure 16

ENCLOSURE PREPARATION – SEAL/GROMMET – GROMMET VERSION

1. Careful not to nick the rubber seal, use a pair of blunted pliers to gently pinch and remove the seal around the outer edge of the box. Place to the side (**Figures 17 and 18**).
2. Remove the grommets, as well as the metal drop cable tie down units by pulling away from the box. Place the items to the side (**Figures 19 and 20**).
3. Using gloves and taking all appropriate safety measures, take one of the grommets and prepare it for cable entry by slitting the input cable port using a utility knife. Slit down the side of the grommet. Use cut-resistant gloves and observe all appropriate safety measures (**Figures 21 and 22**).

Figure 17

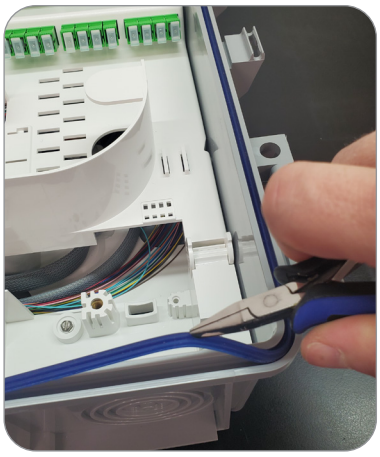


Figure 18

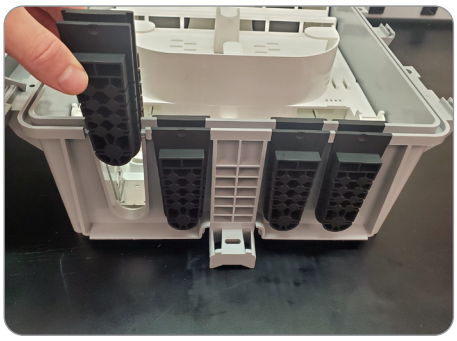


Figure 19

Figure 21

Figure 22

ENCLOSURE PREPARATION – CONDUIT DRILL OUT – CONDUIT VERSION

****NOTE**** Conduit drill-out steps are only necessary if enclosure was not ordered with pre-cut holes or if the top holes need to be cut out.

1. Identify the conduit fitting size to be used and select the appropriate hole saw drill bit. Measure to guarantee the appropriate drill out ring is used for what's needed (**Figures 23 and 24**).
2. Using the drill and appropriate bit from step 1, carefully drill out conduit openings while always observing all safety precautions and PPE requirements with the task (**Figures 25 and 26**). Conduit drill outs exist on both the bottom and top of the box and should be removed based on the project parameters.
3. Ensure all cuttings and debris from drilling holes are removed from the unit before proceeding, to guarantee a clean work environment for future steps.
4. Install conduit fitting by inserting the threaded end through and into the enclosure (**Figure 27**). Place supplied O-ring over the conduit fitting on the inside of the enclosure and secure with threaded retaining locknut (**Figure 28**).
5. Make certain the fittings are centered over the hole to create the best possible seal and tighten by hand. Repeat steps for any other ports or adapter sizes needed (**Figure 29**).

Figure 23

Figure 24

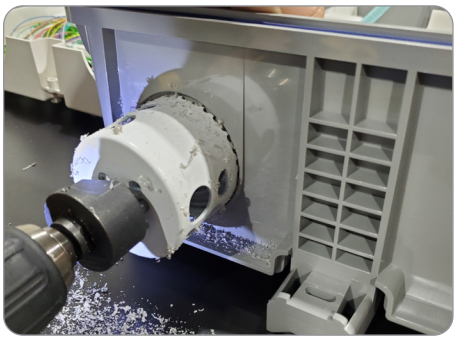
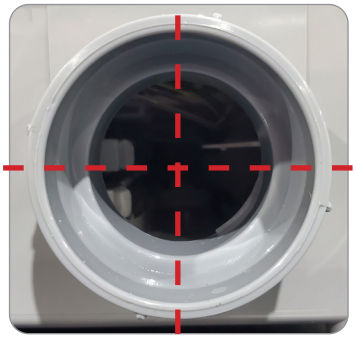


Figure 25

Figure 26



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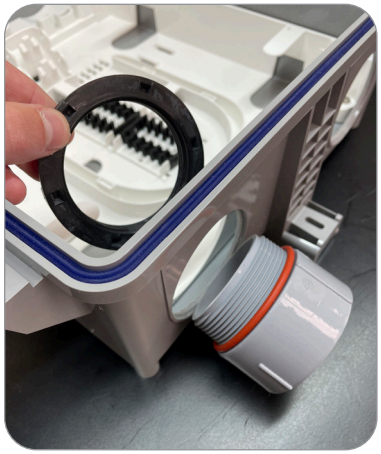

Figure 27

Figure 28

ENCLOSURE PREPARATION – INTERCONNECT TRAY REMOVAL

1. Using a specialized tamper-proof hex wrench, release the security screw holding the interconnect door shut (**Figures 30 and 31**).
2. Lift the hinged door so it sits open freely (**Figure 32**). Remove the Velcro securing the splice trays and set aside. If utilizing the ribbon LL-5D version, using a screwdriver or other flat tool, release the splice trays, one at a time, by releasing them as seen below (**Figure 33**). Set splice trays to the side until needed for splicing.
3. Remove pre-installed Velcro holding the sheathing on the right side of the box and place to the side (**Figures 34 and 35**).

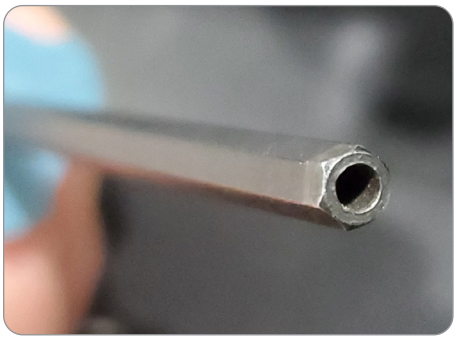

Figure 30

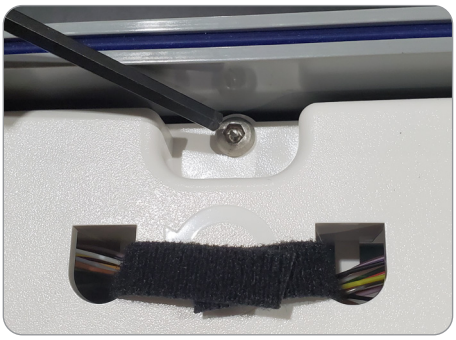

Figure 31

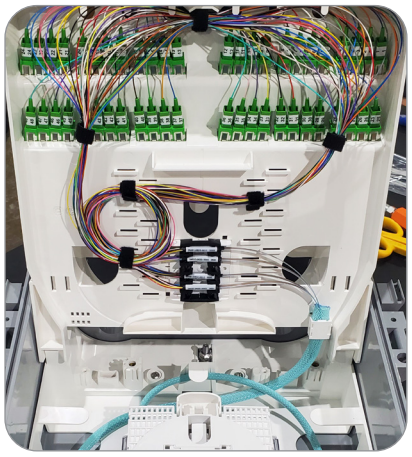

Figure 32

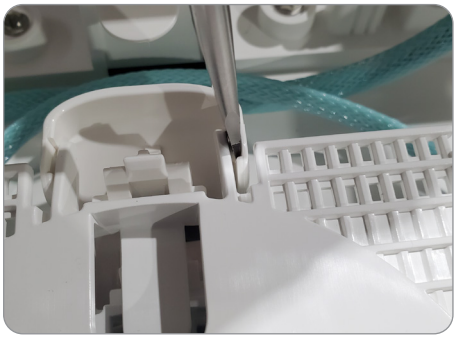

Figure 33

Figure 34

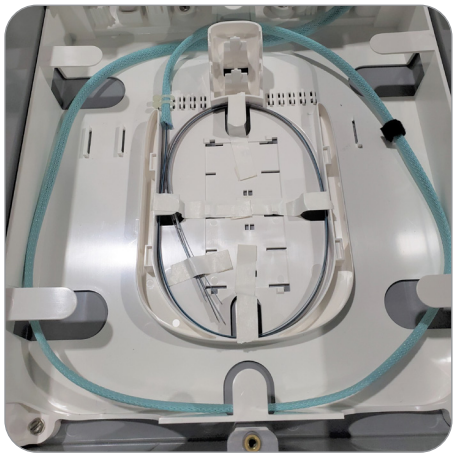

Figure 35

ENCLOSURE PREPARATION – INTERCONNECT TRAY REMOVAL (cont.)

4. Gently pull on the two upper corners interconnect door to release the unit from the hinges (**Figure 36**).
5. Place to the side of the box in a safe area. DO NOT "hang" or leave mesh sheathing under tension, as there is fiber inside (**Figure 37**).

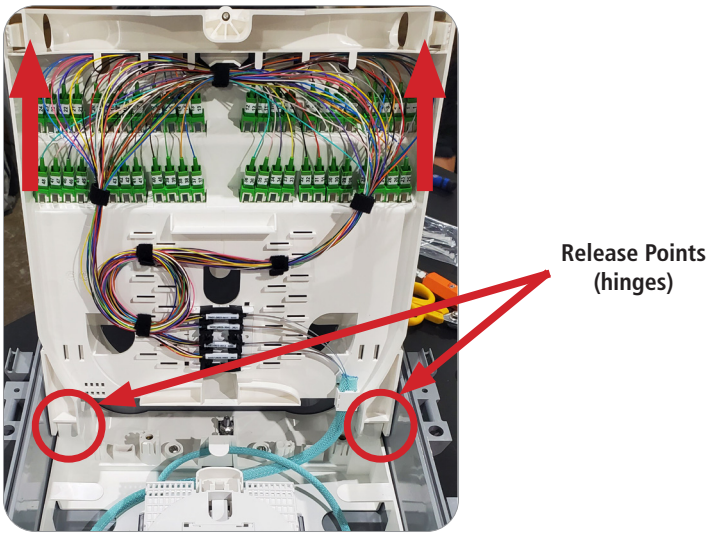

Figure 36

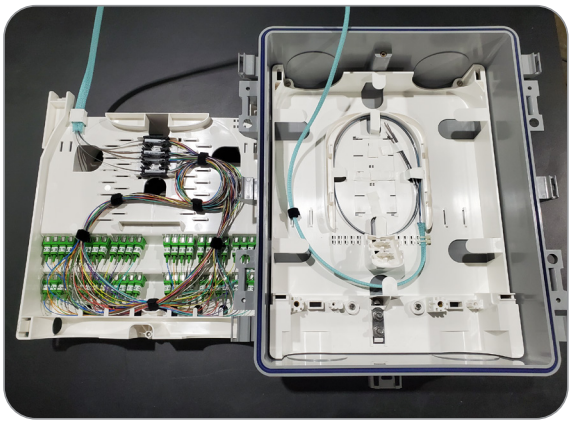

Figure 37

CABLE PREPARATION LENGTH TABLE

Table 2

CABLE/COMPONENT	TYPE OF OPENING	LL-5D
Prep Length		**(in.)**
Wrapping Tube Cable (WTC)/Non Matrix Ribbon	Mid sheath	64-100**
	End cut	54-72**
Flat Matrix Ribbon	Mid sheath	88-90*
	End cut	54-74*
Loose Tube fiber	Mid sheath	64-100**
	End cut	54-72
All cable types	Sheath to tray	36
CSM or strength members (Non SWR®)		2-2 ¼
Storage		
Each additional storage loop in box		36
Each additional Splice tray service loop		18
Definition		
Midsheath	Slack loop in basket, service loop in tray, center cut	
End cut	Slack loop in basket, service loop in tray, to far splice location	
Sheath to tray	Slack loop in basket	

*	Ribbon minimum is slack loop in basket, no slack waterfall splicing in tray
**	Minimum. No service loop in splice tray – maximum allowing for service loop in splice tray

AFL Wrapping Tube Cable (WTC)

- No need to secure strength rods.
- 8-11" of dielectric sheath or water block tape can be brought to basket.

Flat matrix ribbon

- Core tube or ribbon tube should extend from the sheath opening to be secured on the basket.
- Ribbon should be exposed from that point.

Loose tube

- Leave loose tube stranding intact wherever possible in slack loop.

1. Using the length table above, determine the total length needed in the box/splice tray. Measure from the end and mark the cable (**Figure 38**).

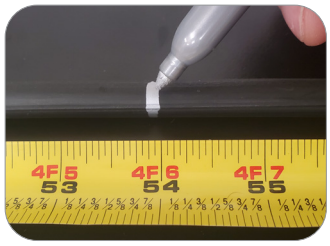

Figure 38

CABLE PREPARATION (cont.)

2. Use accepted local practice to remove the cable sheath where it has been marked in step 1. Remove outer jacket, water blocking tape, ripcords, core binders, as well as aramid yarn (if present) and discard (**Figure 39**). If cable contains a central strength member, cut to 1.75" beyond the cable sheath (**Figure 40**).
3. If grounding is required, install grounding clamp under the sheath. Ensure the grounding clamp contacts the cable armor and secure. Tether the grounding clamp to the grounding terminal of the box (**Figure 41**).

Figure 39

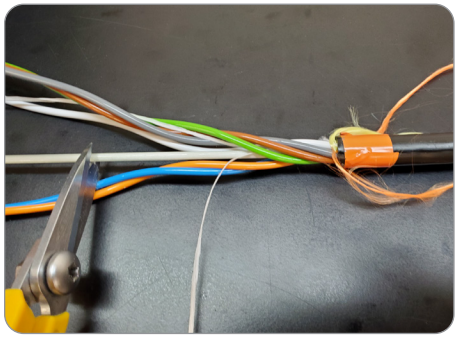

Figure 40

Figure 41

CABLE INSTALLATION

1. Insert the prepared cable through the lower left conduit (**Figure 42**). ****If installing in the grommet version of the LL-5D, omit this step.****
2. Locate the cable attachment unit (CAU) within the unit packaging (**Figure 43**). Attach the cable attachment unit to the cable by tightening the gear nest on the hose clamp (**Figure 44**).

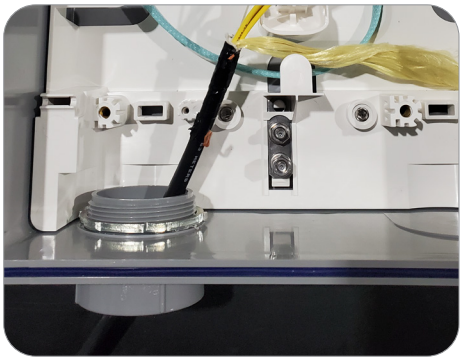

Figure 42

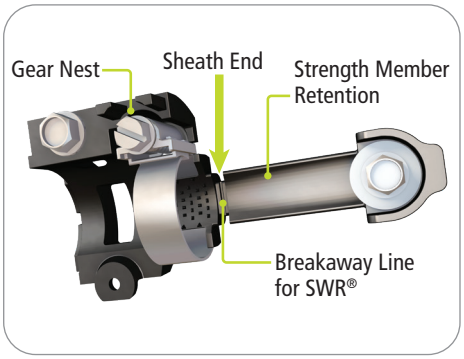

Figure 43

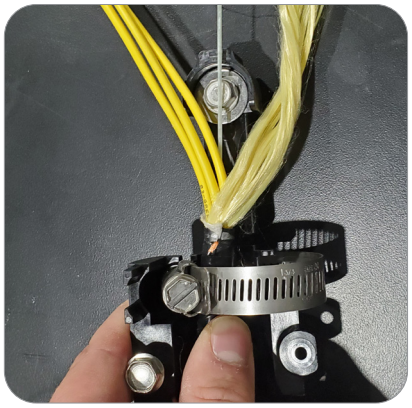

Figure 44

CABLE INSTALLATION (cont.)

3. If cable contains a central strength member and/or aramid yarn, cut to length to secure (**Figure 45**). Once under the strength member retention, secure strength members under retention bolt without trapping or pinching tubes (**Figure 46**).
4. Before fully torquing down the sheath, insert spur bracket between the hose clamp and cable sheath (**Figure 48**). The teeth of the spur bracket should face in the direction of the opened fiber optic cable to provide pull out retention (**Figure 47**).
5. If using the **conduit version** of the LL-5D, place cable attachment unit and secured cable into position, and secure using can wrench tool (**Figures 49 and 50**).

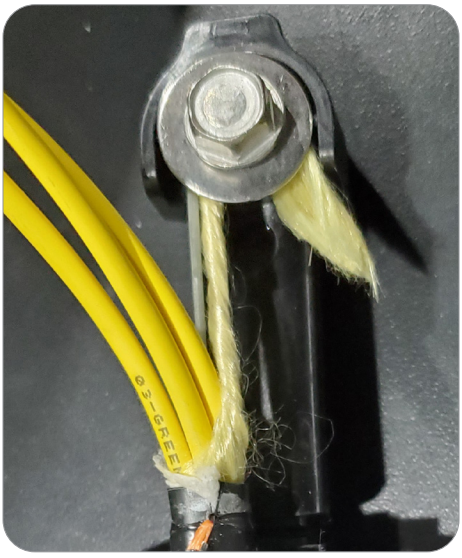

Figure 45

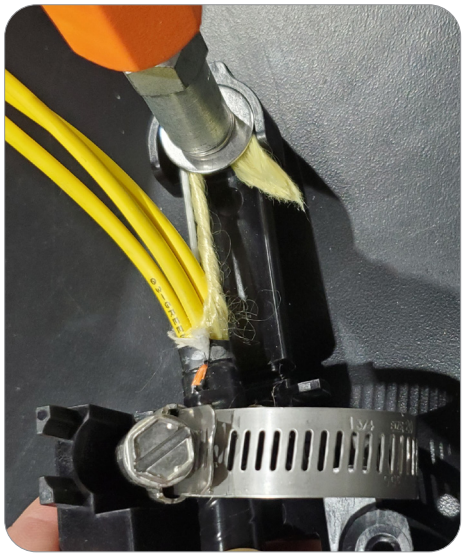

Figure 46

Figure 47

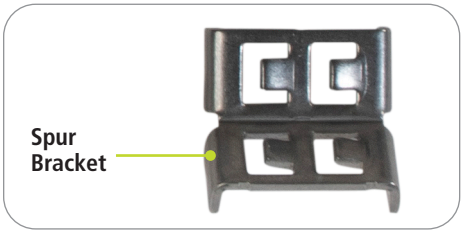

Figure 48

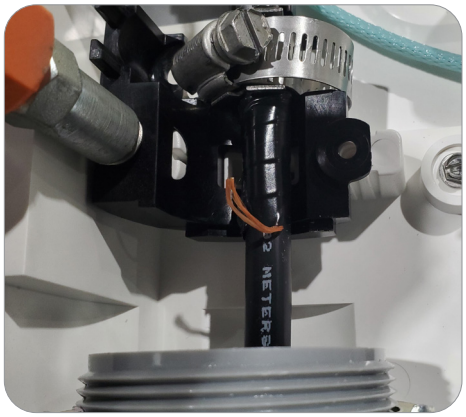

Figure 49

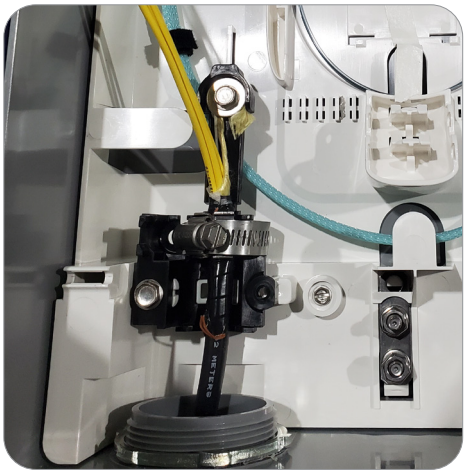

Figure 50

CABLE INSTALLATION (cont.)

6. If using **grommet version** and plan for drop cables to exit the same port as the incoming fiber optic cable, place the metal drop retention inside the box in front of the first grommet port (**Figures 51 and 52**). If this port will NOT be used for drop cables, ignore this step and proceed to step 7.
7. Locate the grommet that was cut in previous steps and insert fiber cable optic cable into cable port (**Figure 53**). Using caution not to kink the cable, slide the grommet into the port (**Figure 54**).
8. Gently pull cable outward until the cable attachment unit is in the installation position (**Figure 55**). Using can wrench tool, secure CAU into the unit (**Figure 56**).

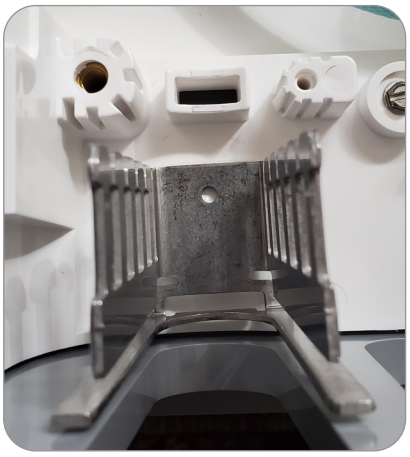

Figure 51

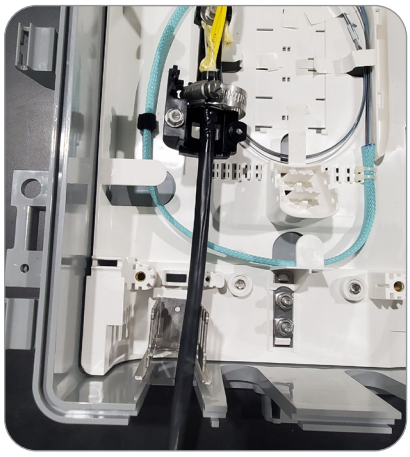

Figure 52

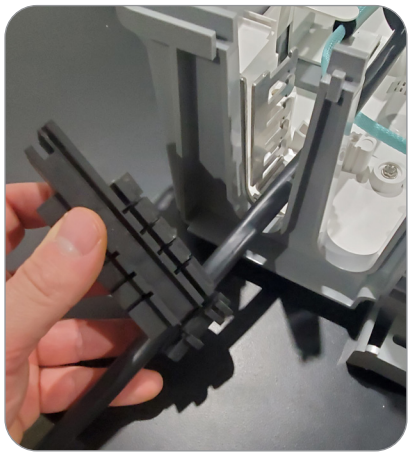

Figure 53

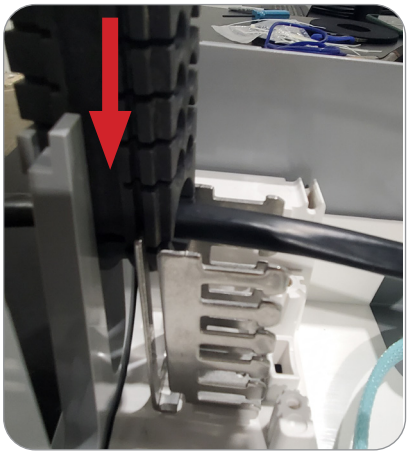

Figure 54

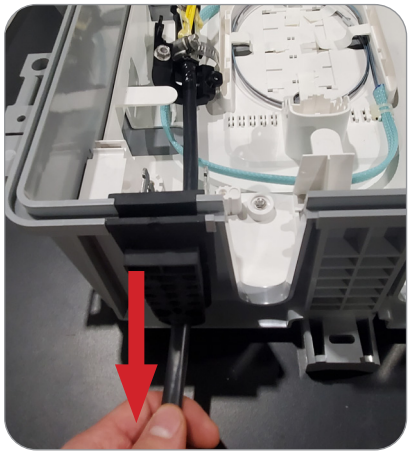

Figure 55

Figure 56

ENCLOSURE PREPARATION – INTERCONNECT TRAY INSTALLATION

1. Route fiber sheathing back into box and use Velcro to reattach (**Figure 57**).
2. Position the interconnect tray over the hinges and using slight force downward, re-attach the interconnect tray (**Figure 58**).
3. Ensure the connectorized pigtails have the proper slack and adjust routing, if needed, to help prevent potential macrobending issues (**Figure 58a**).

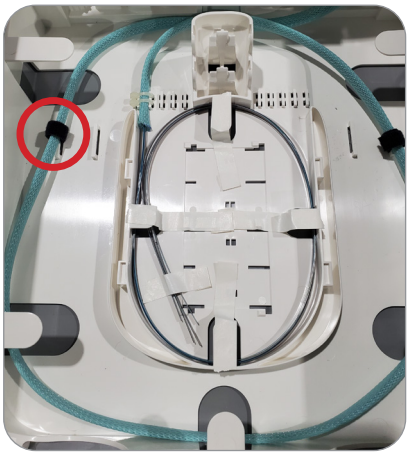

Figure 57

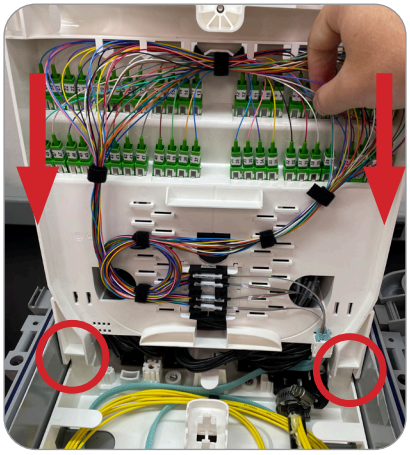

Figure 58

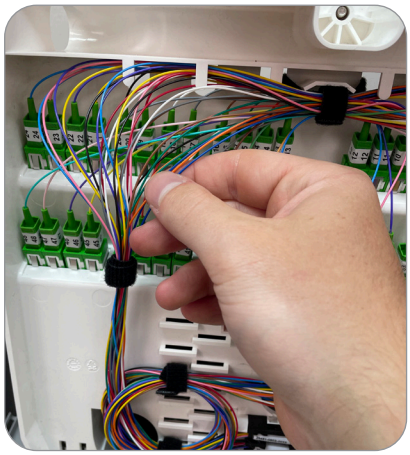

Figure 58a

ENCLOSURE PREPARATION – SPLICE CHIP CONFIGURATIONS

Splice trays can be shipped empty, partially loaded or fully loaded and splice modules are field removable (**Figure 59**).

Each Splice Tray holds up to two splice modules, each splice module has six splice chips. In each splice chip, single fusion splices can be triple stacked, and mass fusion splices can be double stacked (**Table 3**).

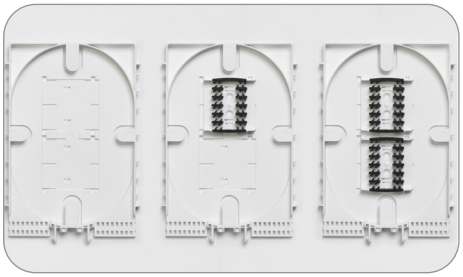

Figure 59

DESCRIPTION	TRAY CAPACITY	
	SINGLE	MASS
X-2S Tray Loaded with One Splice Module	18	72
X-2S Tray Fully Loaded with Two Splice Modules	36	288

Table 3

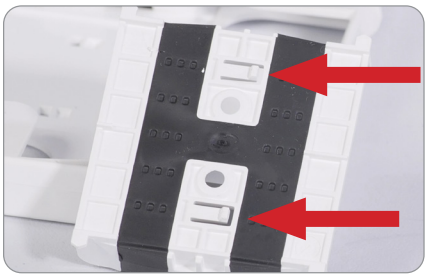

Figure 60

1. To add a splice module to splice tray, simply align the latch tabs (**Figure 60**).
2. Slide to engage (**Figure 61**).
3. To remove a splice module, simply disengage the locking tabs on the back with a pair of shears and slide module to release latch (**Figure 62**).

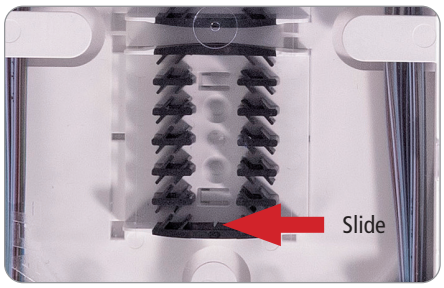

Figure 61

Figure 62

ENCLOSURE PREPARATION – FIBER ROUTING – RIBBON VERSION

1. Route the subunits or buffer tubes around the inside of the box. Ensure they are routed under the Cable Attachment Unit (**Figures 63 and 64**).
2. Route the subunits into the splice tray and mark slightly beyond the wall of the splice tray (**Figures 65 and 66**).
   ****NOTE**** The amount of cable routed in the box and splice tray will depend on the cable length chosen from the Length Table on page 10.
3. Wrap Velcro on the cable at multiple locations to neatly dress the cable slack in the box as desired (**Figure 67**).

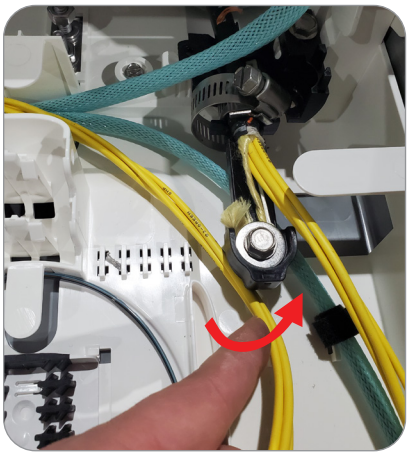

Figure 63

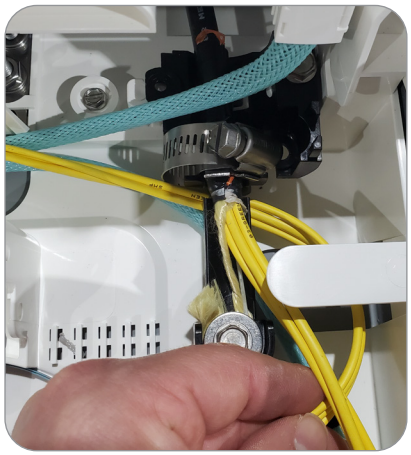

Figure 64

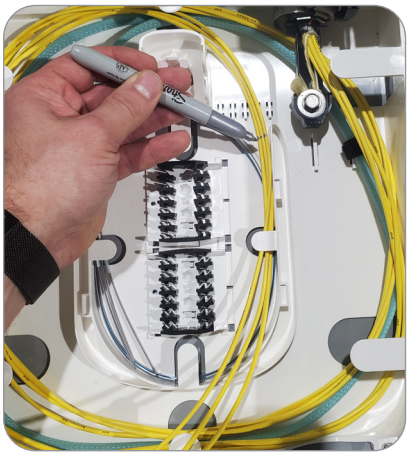

Figure 65

Figure 66

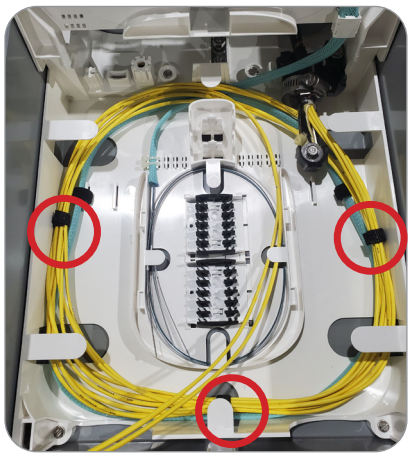

Figure 67

ENCLOSURE PREPARATION – FIBER ROUTING – RIBBON VERSION (cont.)

4. Using an appropriate ringing tool, cut and remove the sub-unit or buffer tube where it was previously marked in step 2 (**Figure 68**). Cut away any aramid yarn or water-blocking material (**Figure 69**).
5. Insert two zip ties under the brackets found at the entrance to the splice tray (**Figure 70**). This will be used to secure the subunits or buffer tubes to the splice tray.
6. Using the AFL Foam Retention Kit included with the splice tray. Cut a piece of foam and wrap around the sub-unit. Secure in groups of two to guarantee all fiber is protected. Cinch zip ties to secure around the foam, securing them firmly into the splice tray entrance. Cut away zip tie tails and discard (**Figures 71 and 72**).

Figure 68

Figure 69

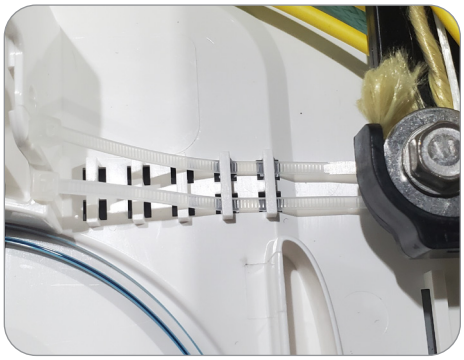

Figure 70

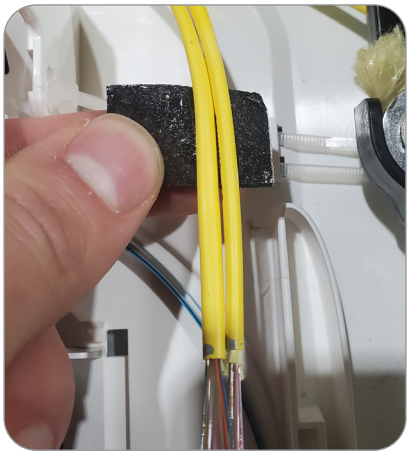

Figure 71

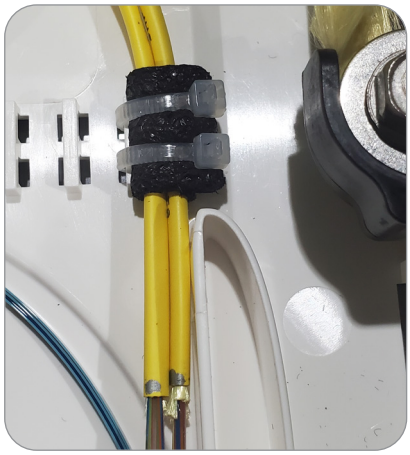

Figure 72

ENCLOSURE PREPARATION – FIBER ROUTING – TIGHT BUFFER VERSION

1. Take the previously prepared cable entering the box and begin routing subunits or buffer tube slack around the inside of the box (**Figure 73**). Ensure these are routed under the Cable Attachment Unit (**Figure 74**).
2. Route the appropriate buffer tubes to the splice tray and mark slightly beyond the wall of the splice tray (Figure 75).

   ****NOTE**** The amount of cable routed in the box and splice tray will depend on the cable length chosen from the Length Table on page 10.
3. Elevate the splice trays so that they sit in the open position and begin by removing the cover off the lower splice tray (**Figure 76**). Uncoil the factory installed fibers in the splice tray and carefully set the tails out of the way (**Figure 77**).
4. Using an appropriate buffer tube ringing tool, cut and remove the buffer tubes where it was previously marked in step 2 (**Figure 78**). Remove any aramid yarn, water-blocking material and gel from the fiber.

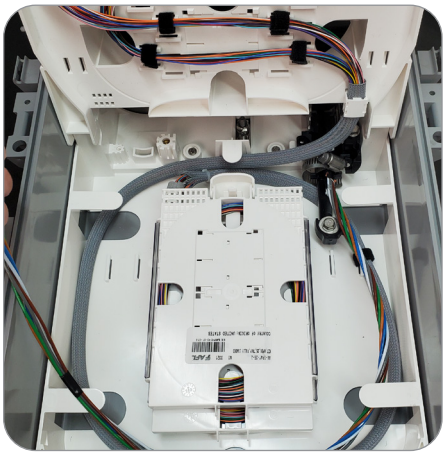

Figure 73

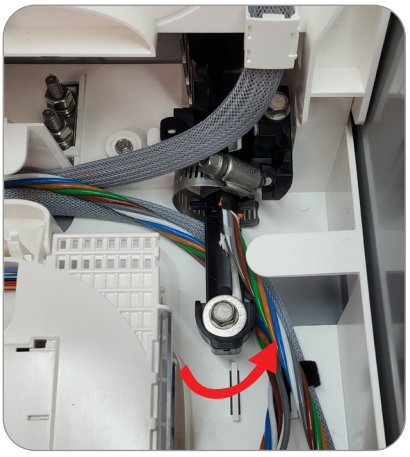

Figure 74

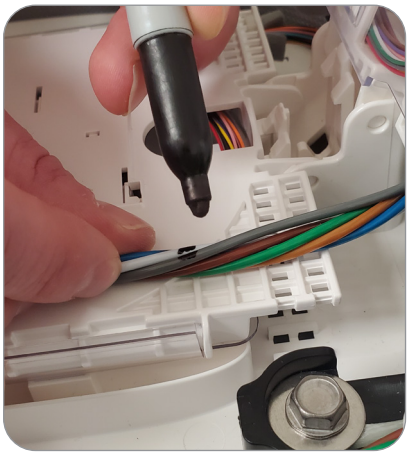

Figure 75

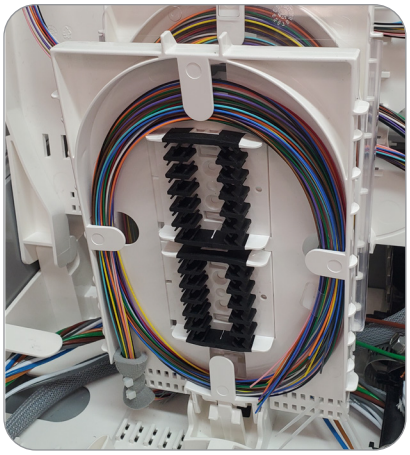

Figure 76

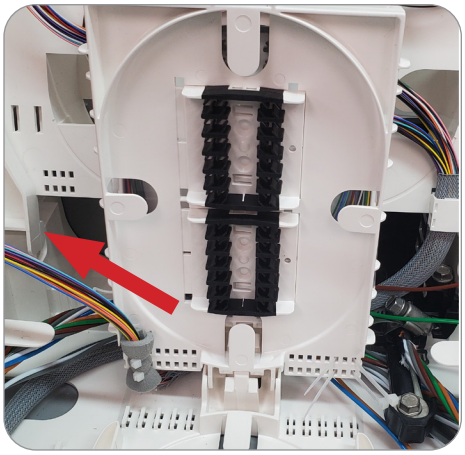

Figure 77

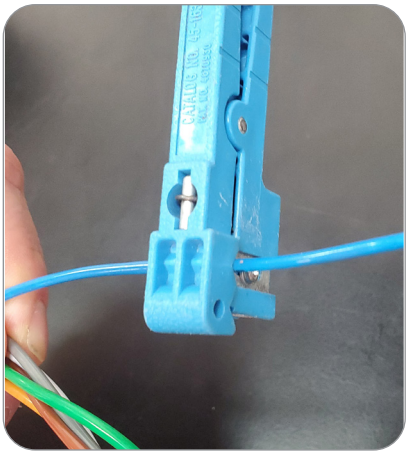

Figure 78

ENCLOSURE PREPARATION – FIBER ROUTING – TIGHT BUFFER VERSION (cont.)

5. Insert two zip ties where the tubes will enter the splice tray (**Figure 79**).
6. Using the AFL Foam Retention Kit included with the splice tray, cut a piece of foam and wrap around the buffer tube(s). Secure in groups of two to guarantee all fiber is protected. Make up zip ties to secure the fiber and foam into the tray. Cut away zip tie tails and discard (**Figures 80 and 81**).
7. Route all fiber back into tray and replace splice tray cover (**Figure 82**). Repeat steps for the second splice tray (**Figure 83**).
8. Put Velcro around the additional buffer tubes at multiple locations to neatly dress the cable slack in the box as desired (**Figures 84 and 85**).

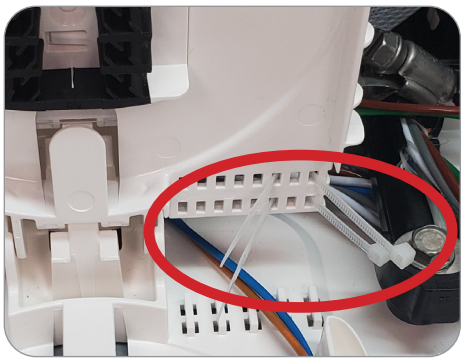

Figure 79

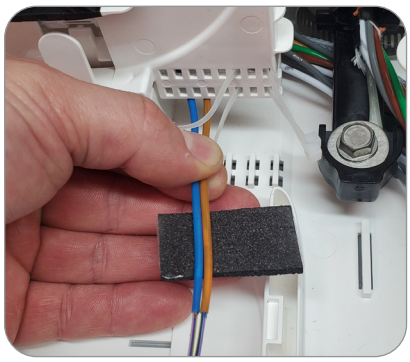

Figure 80

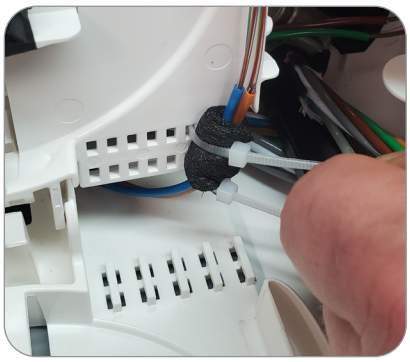

Figure 81

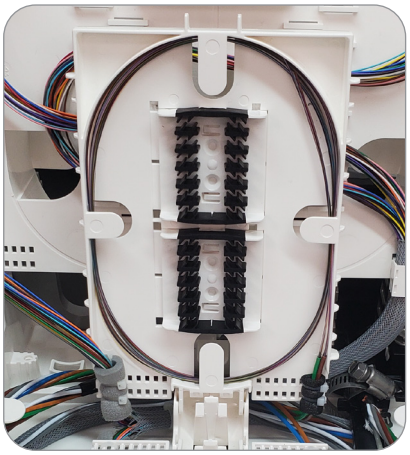

Figure 82

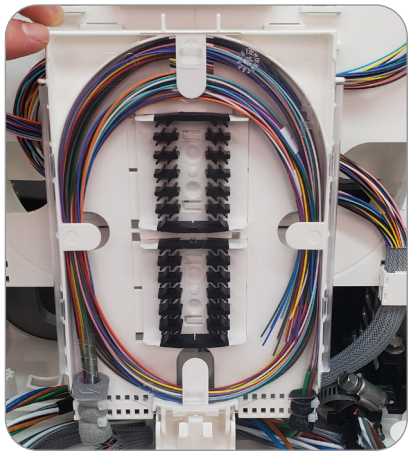

Figure 83

Figure 84

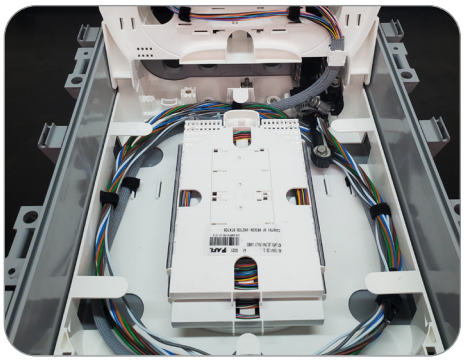

Figure 85

SPLICING

Fiber length and splice location in the splice tray will depend on cable length chosen from the Length Table on page 10.

1. Route fiber in splice tray to determine proper lengths and splice locations (**Figure 86**). Cut any excess fiber that is not desired (**Figure 87**).
2. Remove fiber from tray to prepare for splicing. Keep a record of the fiber groupings to guarantee successful splicing.
3. Following approved splicing procedures, prepare two fiber ends for fusion splice (**Figure 88**). After acceptable splice, route the fiber in the splice tray, securing the splice sleeve into the splice chip (**Figure 89**).

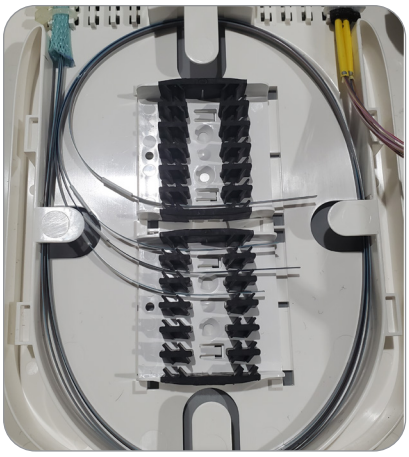

Figure 86

Figure 87

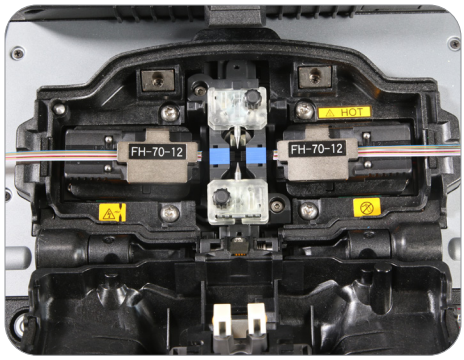

Figure 88

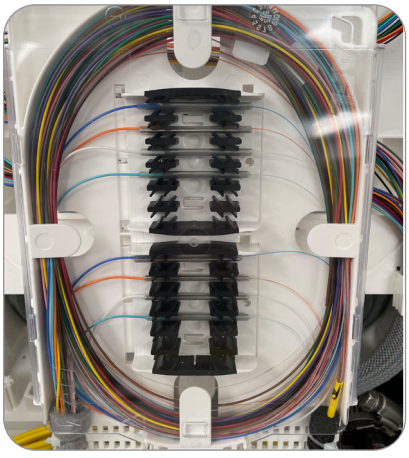

Figure 89

DROP CABLE INSTALLATION – CONDUIT VERSION

****NOTE**** It is recommended to use pre-terminated drop cables for installing the drops on the customer side. If using stubbed drop cable, such as standard flat drop cable, ensure that proper furcation tubing is added to any exposed bare fiber for protection when routed in the box.

1. Prepare drop cables for installation into the box. Before inserting connectors into adapters, use proper cleaning techniques to clean adapters and connectors (**Figures 90 and 91**).
2. Feed drop cables through the lower right conduit hole and route cables appropriately. Use Velcro to manage drop cables (**Figure 92**).
3. Use zip ties at both sides of the box, to secure drop cable groupings (**Figures 93 and 94**).

Figure 90

Figure 91

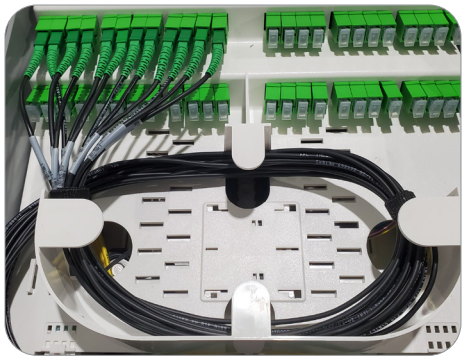

Figure 92

Figure 93

Figure 94

DROP CABLE INSTALLATION – CONDUIT VERSION (cont.)

4. Once box is fully populated with drops, tighten down the safety screw to secure the interconnect tray (**Figure 95**). Re-install LL-5D lid by pressing back into the 3 hinge positions (**Figure 96**). Lid can be installed to open in either direction.

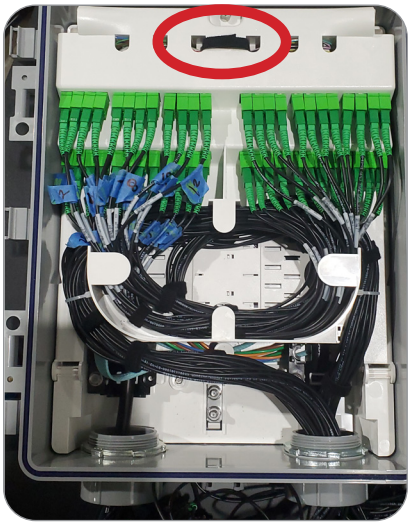

Figure 95

Figure 96

DROP CABLE INSTALLATION – GROMMET VERSION

NOTE It is recommended to use pre-terminated drop cables for installing the drops on the customer side. If using stubbed drop cable, such as standard flat drop cable, ensure that proper furcation tubing is added to any exposed bare fiber for protection when routed in the box.

1. Prepare three additional grommets for drop cable installation by slitting all drop openings along the side (**Figures 97 and 98**). Take all safety precautions when using the sharp tools.
2. Install drop cables into the pre-slit openings in the grommet – two to three round drops per port, or one flat drop per port (**Figure 99**). Once grommet is fully populated, install grommet and metal drop bracket into the box. Begin routing drop cables into the box (**Figure 100**).
3. Before inserting connectors into adapters, use proper cleaning techniques (**Figures 101 and 102**).

Figure 97

Figure 98

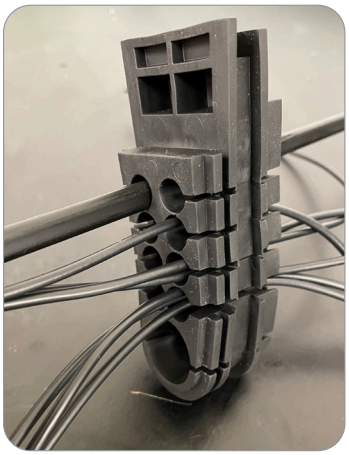

Figure 99

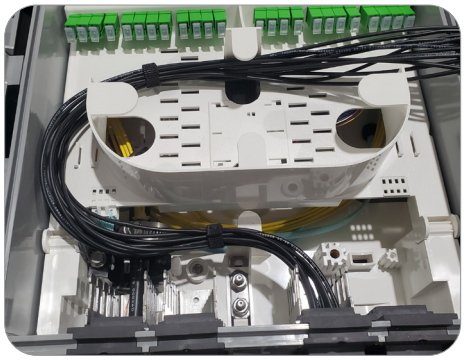

Figure 100

Figure 101

Figure 102

DROP CABLE INSTALLATION – GROMMET VERSION (cont.)

4. Continue to fully populate the rest of the drops, using Velcro to route and organize the drops (**Figures 103 and 104**).
5. Use zip ties at both sides of the box to secure drop cable groupings (**Figures 105 and 106**).

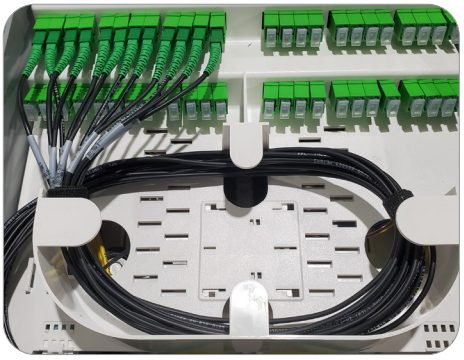

Figure 103

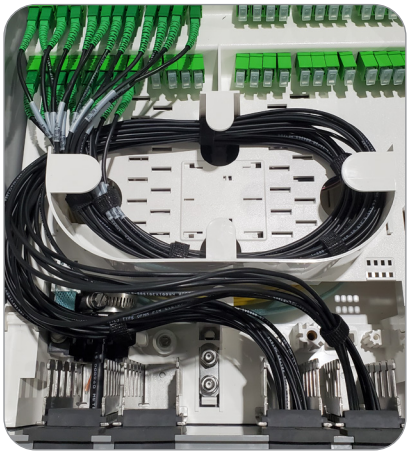

Figure 104

Figure 105

Figure 106

DROP CABLE INSTALLATION – GROMMET VERSION (cont.)

6. Use foam tape to wrap groups of cables and zip tie to the metal bracket to protect against cable pull out (**Figure 107**). If installing a non-terminated flat drop cable, end the sheath at the metal bracket and secure it to the bracket using foam and zip ties (**Figure 107a**).
7. Re-install the rubber seal around the edge of the box (**Figure 108**).
8. Once box is fully populated with drops, tighten the safety screw to secure the interconnect tray (**Figure 109**). Re-install the LL-5D lid by pressing it back into the three hinge positions (**Figure 110**). Lid can be installed to open in either direction.

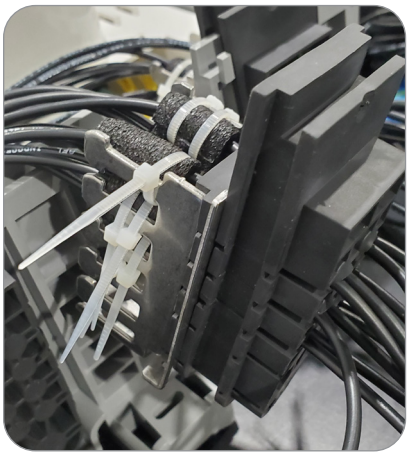

Figure 107

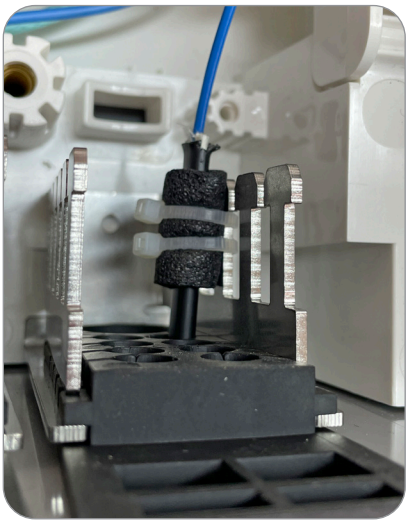

Figure 107a

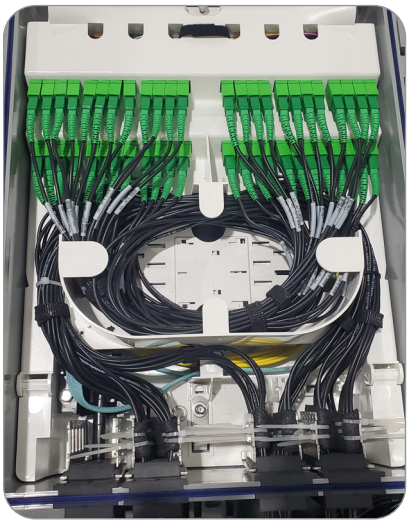

Figure 108

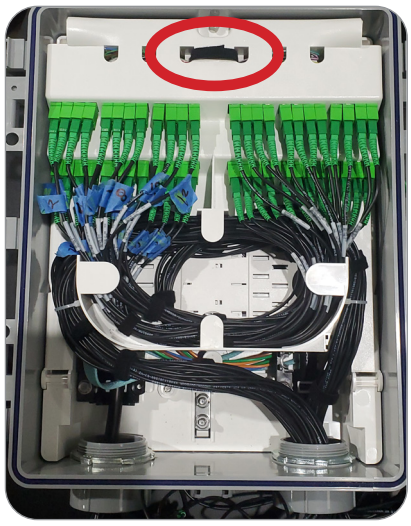

Figure 109

Figure 110

SKIRT KIT INSTALLATION – OPTIONAL

1. Align the holes of the bottom plate to the skirt mounting bracket (**Figure 111**). Join the two with screws to secure and make a single assembly (**Figure 112**).
2. If the enclosure has already been mounted, temporarily remove the bottom mounting screw.
3. Pull the bottom of the enclosure slightly away from the mounting surface (**Figure 113**). Slide the skirt mounting plate under the enclosure and insert the corners of the box into the holes of the mounting plate. Re-install the lower enclosure mounting screw to secure (**Figure 114**).
4. Drill pilot holes in each of the four mounting hole locations (**Figure 115**).

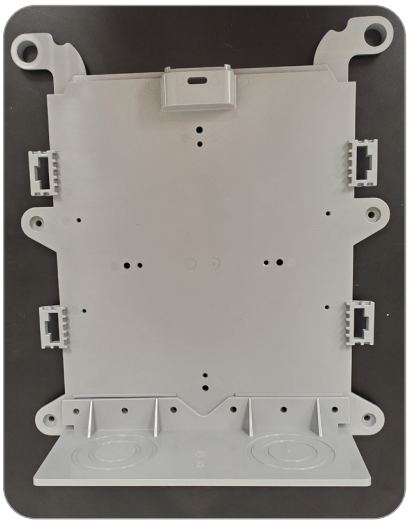

Figure 111

Figure 112

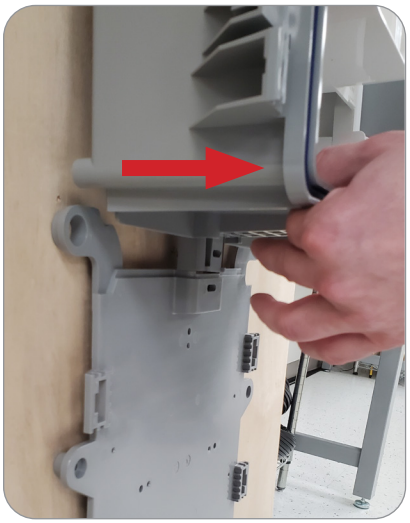

Figure 113

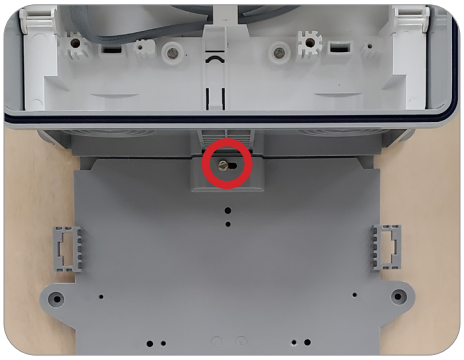

Figure 114

Figure 115

SKIRT KIT INSTALLATION – OPTIONAL (cont.)

5. Position skirt cover over mounting plate and with light force, push tabs into plate, securing the skirt in position (**Figures 116 and 117**).
6. Install four screws into pilot holes to secure the mounting plate (**Figures 118 and 119**).

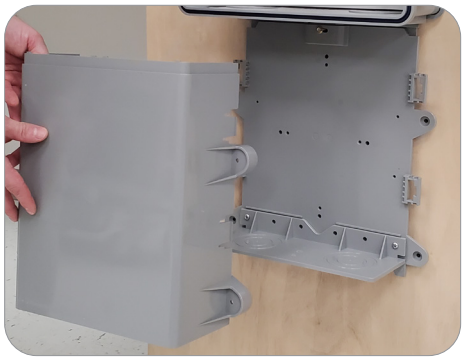

Figure 116

Figure 117

Figure 118

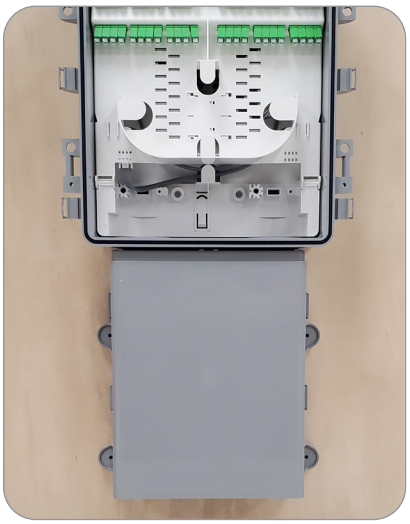

Figure 119