Technical Publication

COMMSCOPE®

Installation Guidelines – HELIAX® Single Mode and Multimode Solutions

Related Support and Learning Opportunities Offered by the CommScope Infrastructure Academy

The insights and expertise contained in this manual represent just one small part of CommScope global learning initiative. Few industries are evolving as quickly as wireless communications. Every technological innovation impacts what happens in the field. Our customers look to the CommScope Infrastructure Academy to make sure their technicians and installers are well trained, well-prepared, and well-educated to take advantage of opportunities as they evolve. To access a course, go to www.commscopetraining.com/coursecatalog.php, course #6107.

Technical Publication

COMMSCOPE®

Section 1: HELIAX® Trunk Cable Hoisting Considerations

- In general this cable will handle similarly to coaxial cable, and similar installation techniques apply. All cables are individually serialized, be sure to write down the cable serial number for future reference.

- The terminated fiber ends (the broken out fibers plus connectors) however are fragile, and these must be protected during the installation process.

- Leave the protective tube and sock around the fiber tails and connectors in place during hoisting and securing the cable. Remove this only just prior to making the final connections to the Junction box.

- DO NOT BEND THE FIBER ENDS (in the furcation tubes) TIGHTER THAN 1.2 in (30 mm) BEND RADIUS ELSE THERE IS A RISK OF BREAKING THE GLASS FIBERS.

- Be sure that the lace up ends and fiber connectors are not damaged by attachment of a hoisting grip or during the hoisting process. Attach a hoisting grip on the jacketed cable no less than 6" below the fiber breakout point. If a hoisting grip is not easily attached, use a simple line attached below the fiber break-out point (i.e. at the cable outer jacket). Prevent the fiber tails (in protective tube) at the cable end from undue movement during hoisting by securing the protective tube (with outer sock) to the hoisting line.

- During hoisting ensure that there is a free path and that the cable, and especially the fiber ends, will not be snagged on tower members or other obstacles.

- Installation temperature range is -40°F to +176°F (-40°C to +80°C)

- Minimum cable bend radii can be found in this document or on-line.

- Maximum cable tensile load can be found in this document or on-line.

- **CommScope Lace-Up Hoisting Grip 19256B-C required for 810/610 installations.**

- **Maximum hanger spacing 3 ft (0.9 m) - 4 ft (1.2 m)**

⚠ **Hybrid Fiber Cables weigh more than traditional coaxial cables. Be sure to follow proper hoisting and attachment procedures.**

Hoisting Recommendations

Fiber Enclosure Box

(D)

(D)
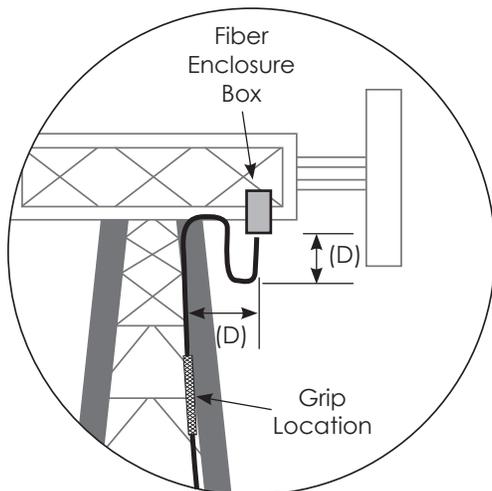
Grip Location

Reminder: Plan grip location by measuring distance (D) from Fiber Enclosure Box to tower support member.

Minimum 5ft (1.5m) leader

Steel cable or rope hoist line

Maximum 200ft (60m) between hoisting grips

Clevis
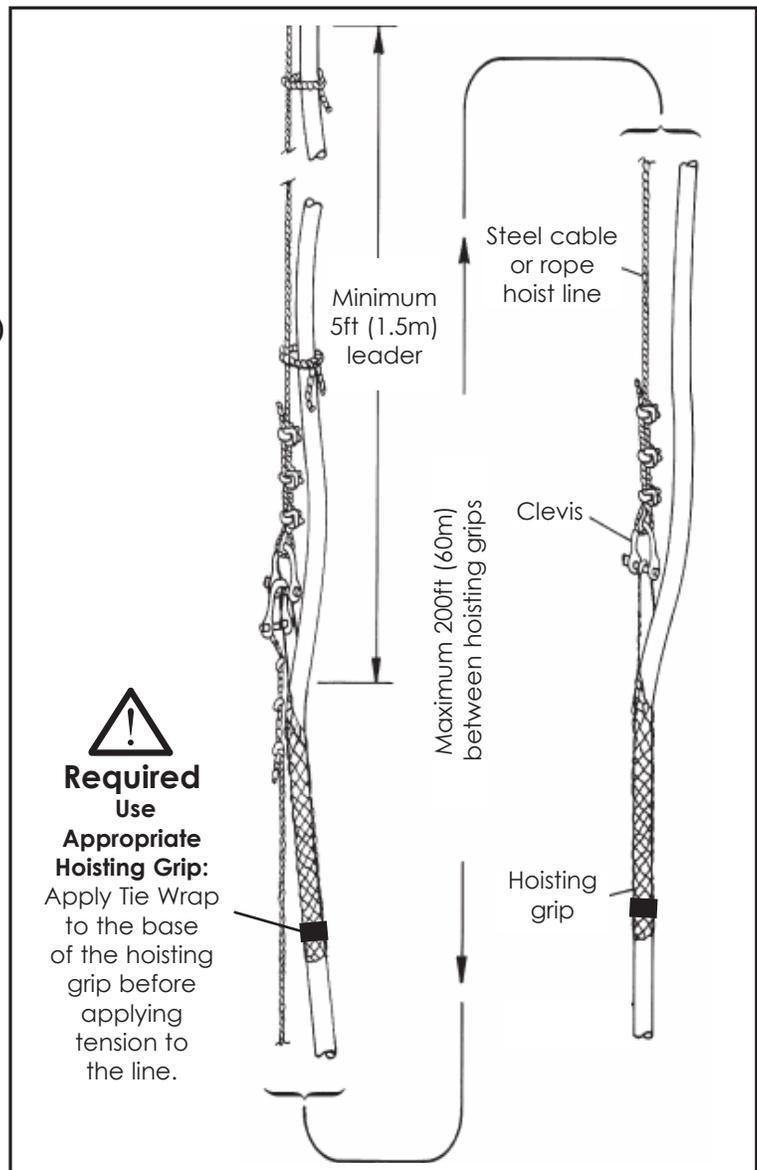
Hoisting grip

⚠ **Required**
Use Appropriate Hoisting Grip:
Apply Tie Wrap to the base of the hoisting grip before applying tension to the line.

COMMSCOPE®

Section 2: General Specifications: Multimode Cables

Cable Type	HFE806M-16MEE-xxxM	HFE810-16M4EE-xxxM	HFE212-4MEB-xxM	HFE212-4MET-xxM
Center Conductor Gauge	6 mm^2	10 AWG	12 AWG	12 AWG
Conductors, quantity	8	8	2	2
Total Fiber Quantity	16	16	4	4
Shielding Type	Corrugated aluminum	Corrugated aluminum	Corrugated aluminum	Corrugated aluminum
Fiber Type	Multimode	Multimode	Multimode	Multimode

Dimensions

Cable Weight	945.0 kg/km	1004.5 kg/km	220.0 kg/km	220.0 kg/km
Diameter Over Jacket	27.8 mm	27.8 mm	13.5 mm	13.5 mm
Breakout Length, Fiber, end 1	850 mm	850 mm	2000 mm	575 mm
Breakout Length, Power, end 1	280 mm	280 mm	2000 mm	250 mm
Breakout Length, Fiber, end 2	850 mm	850 mm	500 mm	500 mm
Breakout Length, Power, end 2	280 mm	280 mm	500 mm	500 mm

Physical Specifications

Minimum Bend Radius, unloaded	276 mm	279 mm	135 mm	135 mm

Single Mode Cables

Cable Type	HFE212-4SEB-xxM	HFE212-4SET-xxM	HFE206M-4SUT-xxM
Center Conductor Gauge	12 AWG	12 AWG	6mm^2
Conductors, quantity	2	2	2
Total Fiber Quantity	4	4	4
Shielding Type	Corrugated aluminum	Corrugated aluminum	Corrugated aluminum
Fiber Type	Single Mode	Single Mode	Single Mode

Dimensions

Cable Weight	220.0 kg/km	220.0 kg/km	355 kg/km
Diameter Over Jacket	13.5 mm	13.5 mm	15.9 mm
Breakout Length, Fiber, end 1	2000 mm	575 mm	420 mm
Breakout Length, Power, end 1	2000 mm	250 mm	420 mm
Breakout Length, Fiber, end 2	500 mm	500 mm	500 mm
Breakout Length, Power, end 2	500 mm	500 mm	500 mm

Physical Specifications

Minimum Bend Radius, unloaded	135 mm	135 mm	135 mm

Power Trunk

Cable Type	PWR-806M-SE	PWR-810M-SE
Conductor Gauge	6mm^2	10mm^2
Conductors, quantity	8	8
Shielding Type	Corrugated aluminum	Corrugated aluminum

Dimensions

Cable Weight	950 kg/km	1185 kg/km
Diameter Over Jacket	25.3 mm	25.3 mm

Physical Specifications

Minimum Bend Radius, unloaded	253 mm	253 mm

Fiber Trunk

Cable Type	FT-16SM-001-xxxM
Total Fiber Quantity	16
Fiber Type	Single Mode

Dimensions

Cable Weight	91.0 kg/km
Diameter Over Jacket	10.28 mm
Breakout Length, Fiber, end 1	850 mm
Breakout Length, Fiber, end 2	2200 mm

Physical Specifications

Minimum Bend Radius, unloaded	135 mm

Section 3: Jumper Assemblies

- In general this cable will handle similarly to a 1/2" coaxial cable.

- The terminated fiber ends however are fragile and must be protected during installation. Leave the packaging around the fiber ends in place until ready to connect the jumper between OVP box and RRU or BBU.

- DO NOT BEND THE FIBER ENDS (in the furcation tubes) TIGHTER THAN 1.2" (30mm) BEND RADIUS ELSE THERE IS A RISK OF BREAKING THE GLASS FIBERS.

- Attach the main cable securely to the structure or equipment using hangers and/or cable ties to prevent strain on connections from movement in wind or snow/ice conditions.

- Ensure the LC fiber connectors are seated firmly in the OVP box, RRU or in BBU equipment.

- Ensure the weatherproof boots for both fiber and power connections and seated firmly in the RRU.

- Heat shrink tube of the jumper should be 1" (25.40mm) inside of the OVP box.

- Installation temperature range is -22F to 158F (-30C to 70C).

- Minimum cable bend radii can be found in this document or on-line.

- Power connector is supplied with the RRU

- Grey power conductor is -48V

- Blue power conductor is 0V (RTN)

- RRU/BBU connectivity per OEM instruction

Technical Publication

COMMSCOPE®

Huawei Radio   **HFE212-4MEB-XX, HFE212-4SEB-XX, HFE212-4M4EB-XX (Bottom Jumper)**

Power Conductors

LC Duplex Connector

END 1 (BBU)   **END 2 (Junction box)**

Identification sheaths
added to END 1
after February 2014
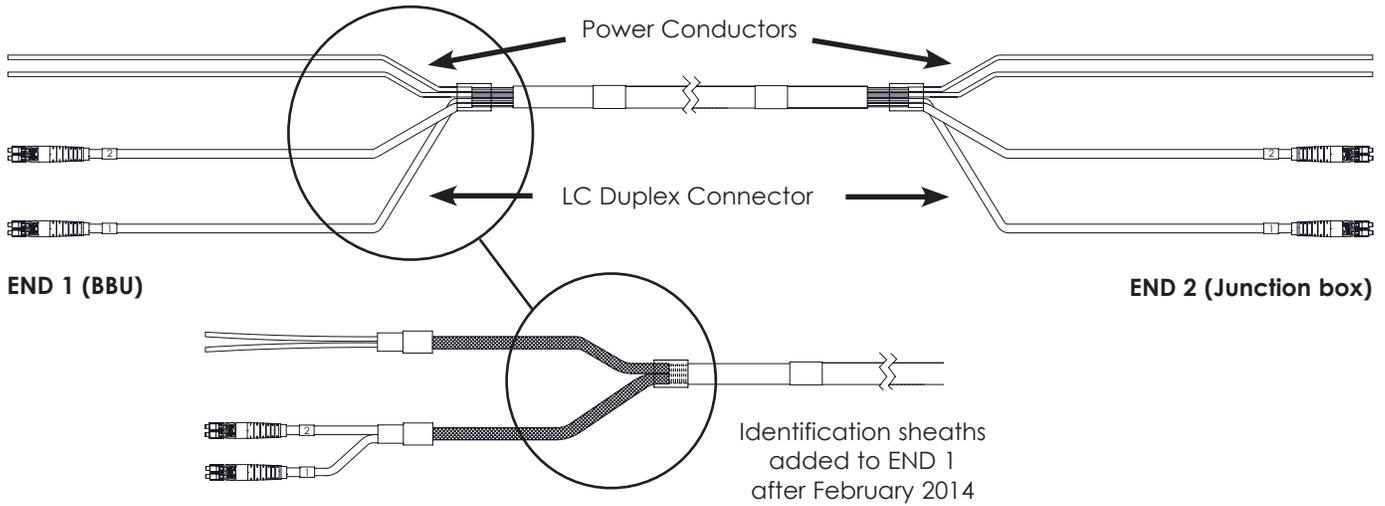
Huawei Radio   **HFE212-4MET-XX, HFE212-4SET-XX, HFE212-4M4ET-XX (Top Jumper)**

Power Cord
(preparation dimensions vary per
RRU verify before prepping)

Power Conductors

LC Duplex Connector

END 1 (RRU)   **END 2 (Junction box)**
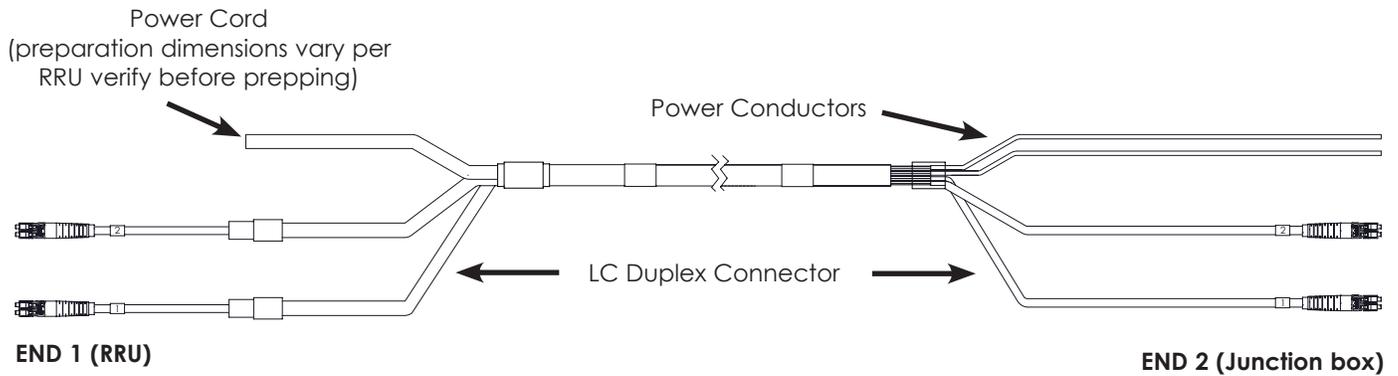
Power cord preparation dimensions
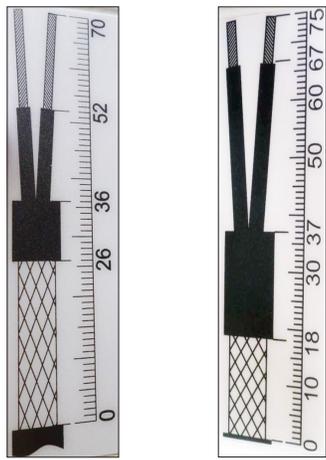
2600 RRU   **800 RRU**

Fiber routing

Max
70 mm

Min
2 mm

Fiber subunit that enters
from the left should
route to the right.

Fiber subunit that
enters from the right
should route to the left.
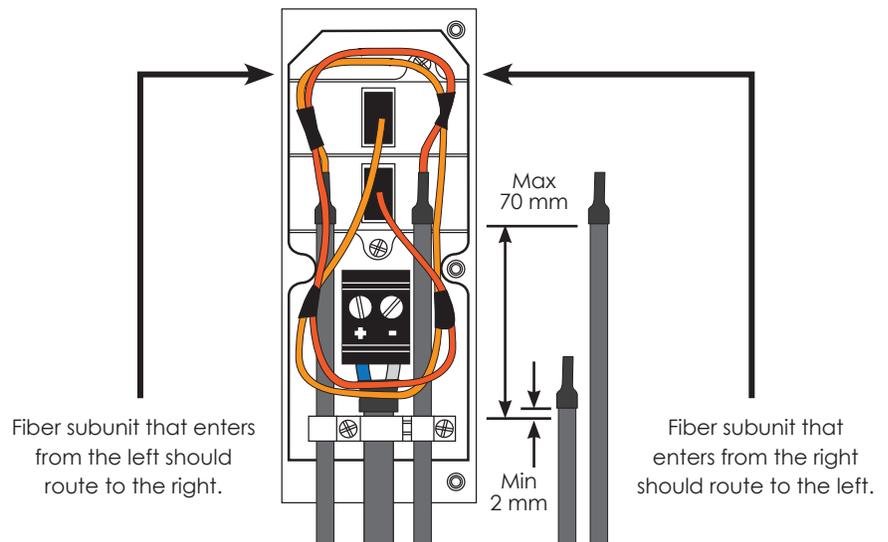
*Velcro is provided with the jumper for cable management within the RRU. Lid will require a little pressure to close.

Section 4: Breakout Procedure

After the trunk cable has been installed and you are ready to make the final connection to the OVP box follow these steps for the removal of fiber protection tube.

1.

Remove electrical tape from the trunk cable and corrugated protection tube. While holding the protection tube straight pull the tube away from cable.

2.

After you have pulled the fiber and power conductors into the OVP box remove electrical tape from the trunk cable and remove clear tube for access to all optical connectors.

Section 5: DLC cleaning and Inspecting

Clean exposed connector ferrule by lightly moistening lint-free wipe with fiber optic cleaning solution (Sticklers MCC-FCC03M BLUE or equivalent), and by applying medium pressure, first wipe against wet area and then onto dry area to clean potential residue from end face. Clean connector ferrule inside adapter by inserting lightly moistened cleaning stick with fiber optic cleaning solution (Sticklers MCC-FCC03M BLUE or equivalent) inside the adapter until contact is made with connector on opposite end. Rotate cleaning stick with medium pressure in one circular motion as it is pulled away from the adapter. Repeat process using dry cleaning stick.

Caution: Signal strength will be affected if end and sides of ferrule are not thoroughly cleaned. Discard cleaning sticks after each use. Do not turn cleaning sticks back and forth pressing against connector end face. This may cause scratches if large contamination is present. Always inspect connector end face for contamination after each cleaning.

Clean Sides of Ferrule

Clean Tip of Ferrule
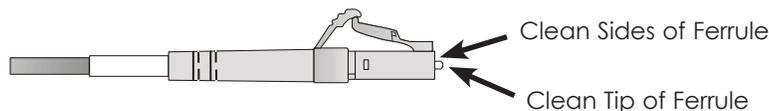
Clean adapter by inserting adapter cleaning stick (or fiber adapter sleeve brush) moistened with fiber optic cleaning solution (Sticklers MCC-FCC03M BLUE or equivalent) inside the adapter and gently pull out with twisting motion. Repeat process with a dry cleaning stick.

Caution: Do not try to clean adapter with a standard pipe cleaner. The sleeve inner diameter of DLC adapters is too small. Do not try to clean the adapter with cleaning stick if a connector is mounted in one side. Discard cleaning sticks after each use.

Adapter Brush

All-in-one cleaner

Device designed for cleaning the ferrule end faces of DLC connectors

Open guide cap, insert DLC connector into guide, push the outer shell to start cleaning the DLC connector interface, a "click" sound indicates end of a cleaning process, repeat, close cap immediately after use.

Caution: Be careful not to slant DLC connector while inserting into the Guide cap. Do not overly exert force during insertion as this may cause damage to both the connector and the cleaner.

DLC Connector   Cap   Guide

Part Number: FCCT - L

Push Cleaner X2
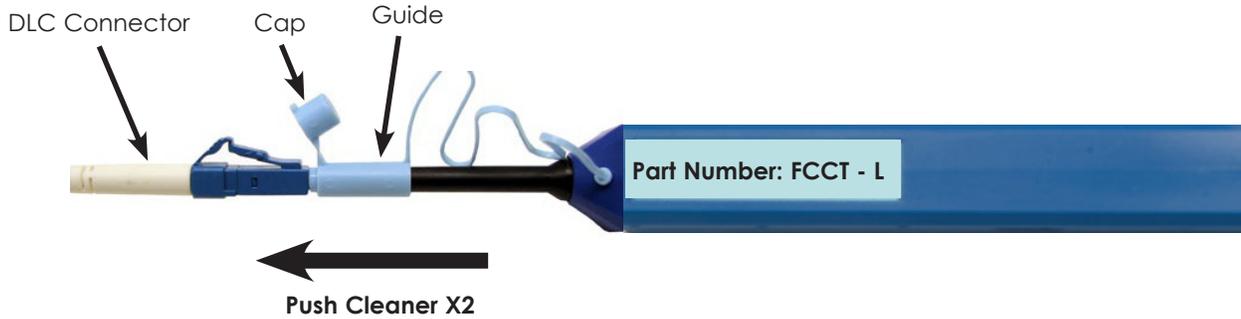
Inspecting

There are 3 basic principles that are critical to achieving an efficient fiber optic connection:

1. Perfect Core Alignment

2. Physical Contact

3. Pristine Connector Interface

Scan to
view video

Today's connector design and production techniques have eliminated most of the challenges to achieving core alignment and physical contact. What remains challenging is maintaining a pristine end-face. As a result, CONTAMINATION is the #1 reason for troubleshooting optical networks.

Implementing the process of cleaning and inspecting before mating can reduce the time spent troubleshooting, optimize signal performance and prevent damage.

Clean → Inspect → Is It Clean?

Clean ← No ← → Yes → Connect
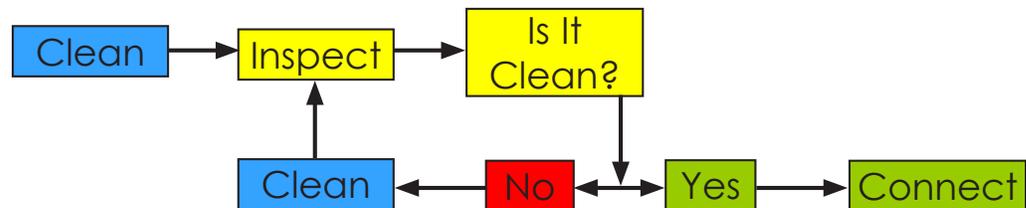
Abrasive particles (i.e. rock dust) can cause permanent damage to the interface. If interface is scratched it cannot be repaired, it would need to be replaced.
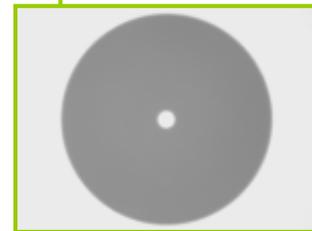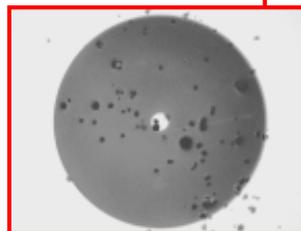
Section 6: Junction Box FE-12106-R11 Wiring

Legend:
- Multimode
- Single Mode
- Power HFE810
- Power HFE806M (same path shown for HFE810)
- Hybrid tail assembly

Option 1: Multimode and Single mode cables
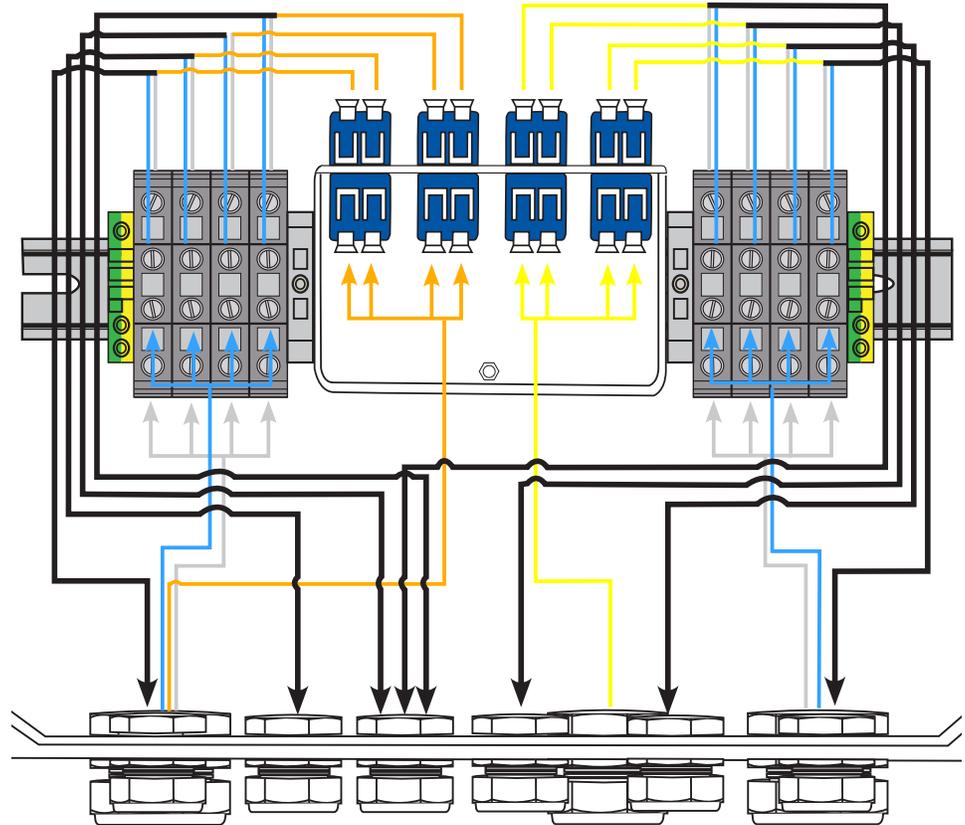
Option 2: Single mode cables

COMMSCOPE®
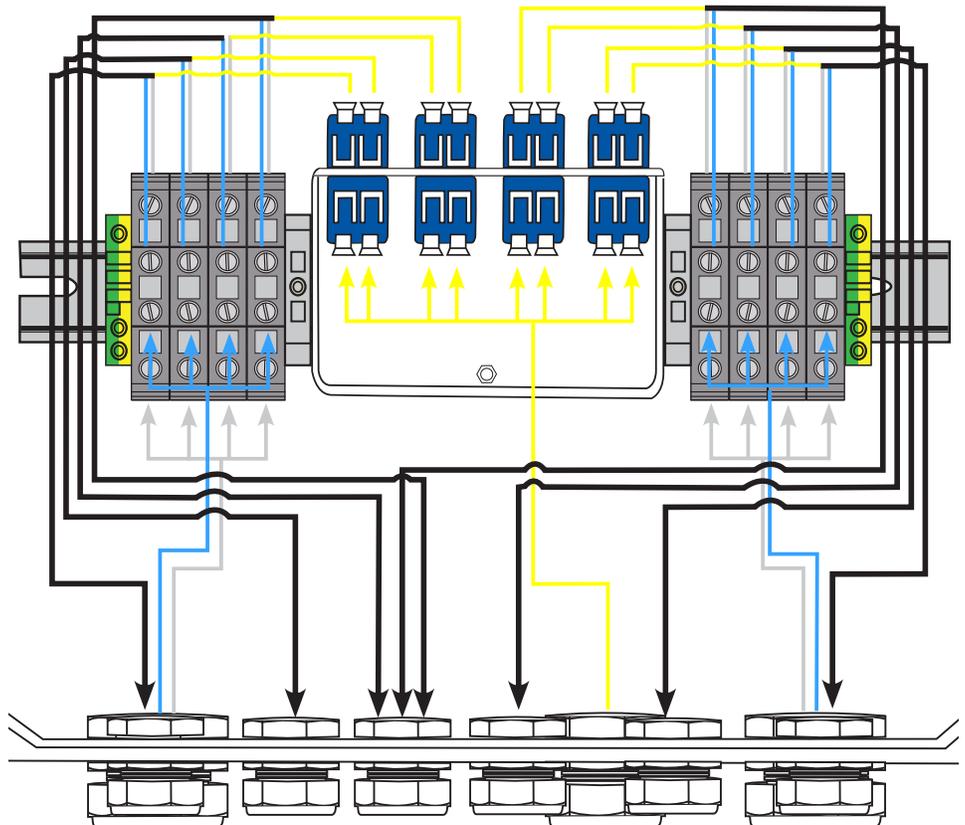
Option 1: Bottom of box and gland placement Multimode/Single mode installation

Multimode

Single mode

Single Mode

Multimode

Fiber
Patch Panel

**Hybrid Jumpers
Out**

**Hybrid Trunk
In**

**Discrete Fiber
Trunk In**

**Discrete Power
Trunk In**
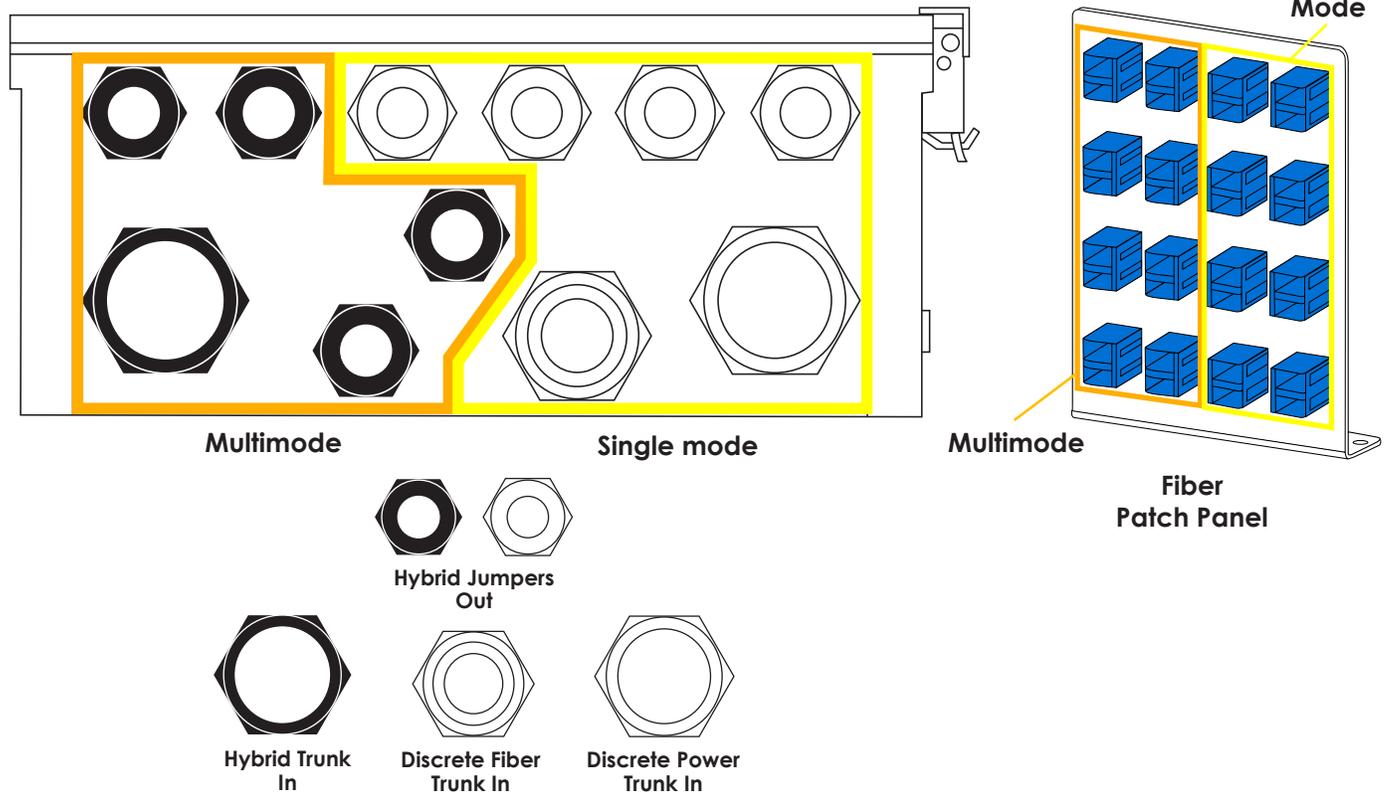
Option 2: Bottom of box and gland placement Single mode installation

Single mode

Single
Mode

Fiber
Patch Panel

**Hybrid Jumpers
Out**

**Discrete Power
Trunk In**

**Discrete Fiber
Trunk In**

**Discrete Power
Trunk In**

COMMSCOPE®
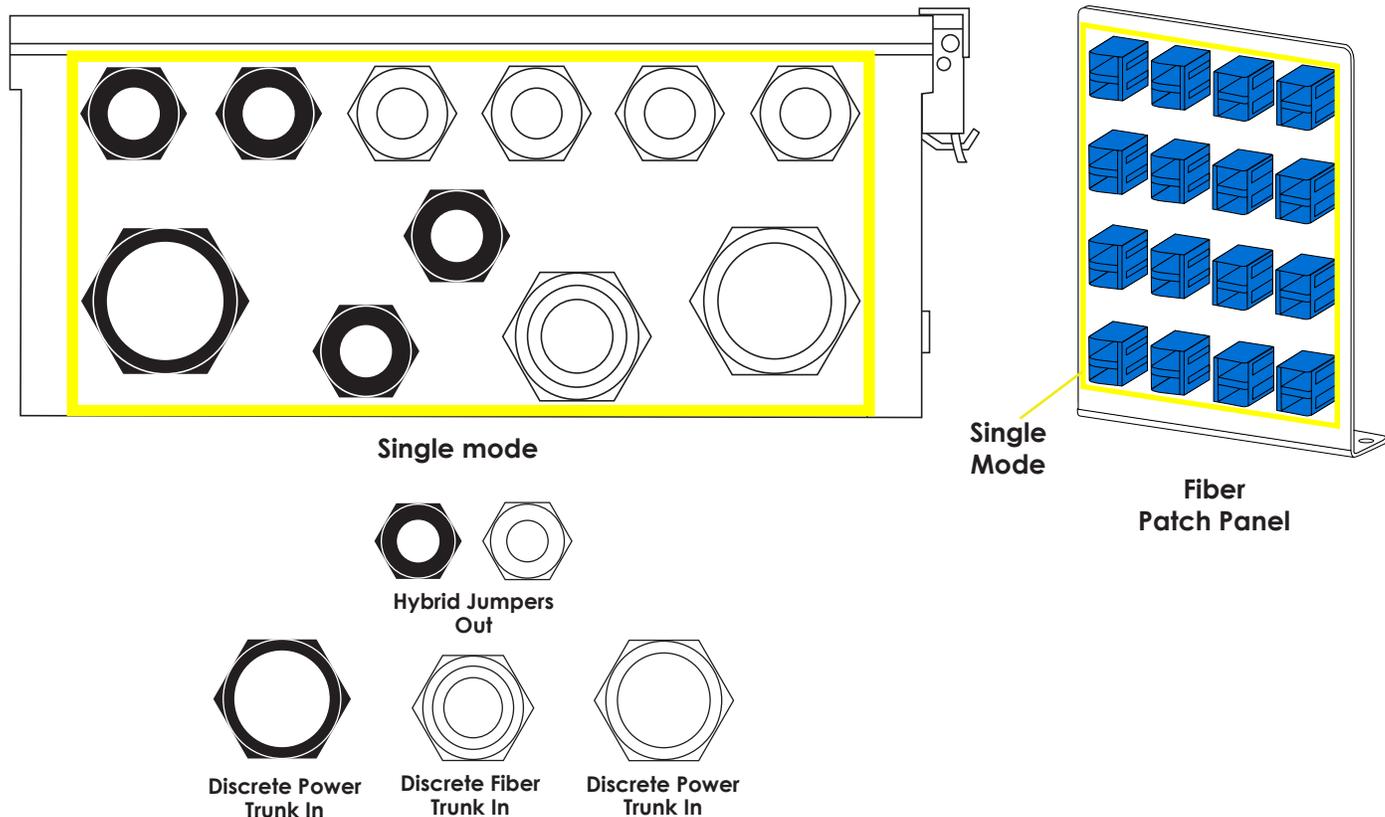
1. Remove the fiber patch panel by pushing up on the bottom and tilting towards yourself, to dis-engage the front locking clips.

2. Install Multimode hybrid trunk cable in the black gland, bottom left corner. Tighten the external gland nut to hold the cable in place.

   If installing Single mode only cable use the bottom left corner black gland for the additinal discrete power trunk. Tighten the external gland nut to hold the cable in place.

   Route the fiber through the cable management clip and place the fiber ends off to the side being sure to not damage them while working on the power conductors. Using the most direct route for cables fit the ferrules into the terminal blocks.

   HFE810 Grey and Blue: Grey on the bottom blue on the top.

   HFE806M White and Blue: White on the bottom blue on the top.

   Tighten the terminal screws
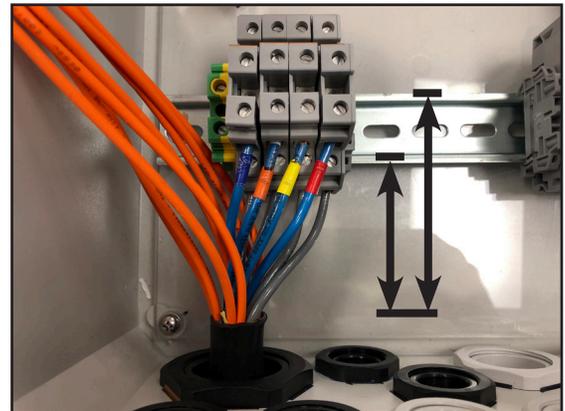
   NOTE: **If a fusion splice transition is used be sure to land them in the top area of the box between cable management clips to minimize the stress placed on the transition area. Place the fiber ends off to the side being sure to not damage them while working on the power conductors until connection to the fiber patch panel in step #7.**

3. Install Multimode or Single mode hybrid jumper cable in the small black gland, bottom left. Tighten the external gland nut to hold the cable in place.

   Place the fiber ends off to the side being sure to not damage them while working on the power conductors. Route the power conductors through the cable management clip. Trim the grey and blue conductors to fit into the terminal blocks. Grey on the bottom blue on the top.

   Tighten the terminal screws

4. Install Multimode or Single mode hybrid jumper cable in the small black gland, center. Tighten the external gland nut to hold the cable in place.

    Place the fiber ends off to the side being sure to not damage them while working on the power conductors. Route the power conductors through the cable management clip. Trim the grey and blue conductors to fit into the terminal blocks. Grey on the bottom blue on the top.

    Tighten the terminal screws

5. Install Multimode or Single mode hybrid jumper cable in the small black gland, top left. Tighten the external gland nut to hold the cable in place.

    Place the fiber ends off to the side being sure to not damage them while working on the power conductors. Route the power conductors through the cable management clip. Trim the grey and blue conductors to fit into the terminal blocks. Grey on the bottom blue on the top.

    Tighten the terminal screws

6. Install Multimode or Single mode hybrid jumper cable in the small black gland, top second from left. Tighten the external gland nut to hold the cable in place.

    Place the fiber ends off to the side being sure to not damage them while working on the power conductors. Route the power conductors through the cable management clip. Trim the grey and blue conductors to fit into the terminal blocks. Grey on the bottom blue on the top.

    Tighten the terminal screws

7. Connect the trunk DLC fiber connectors to the fiber patch panel as shown. Starting from the bottom outside left with #1 and #2 next to it. Next row up will have #3 outside left and #4 next to it. Continue until fully populated.

7	8
5	6
3	4
1	2

Single Mode Ports
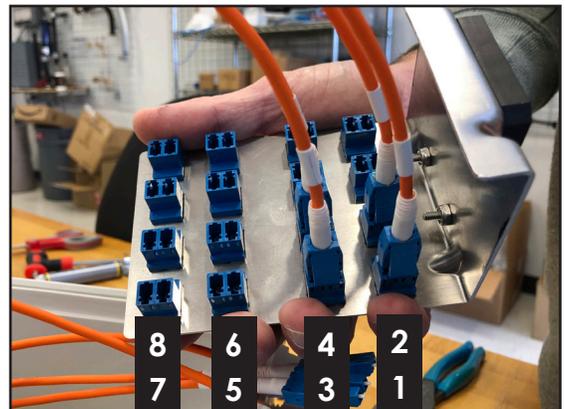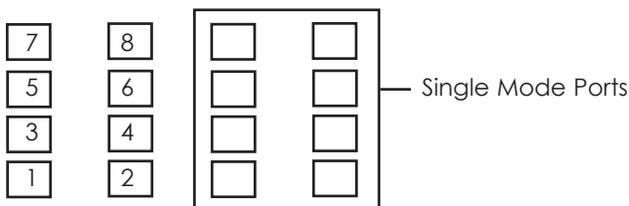
8. On the opposite side connect the jumper DLC fiber connectors to the fiber patch panel as shown. Starting from the bottom outside left with #1 and #2 next to it. Next row up will have the next jumper and also have #1 and #2 designations. Continue until fully populated. Set to the side while installing the single mode cables.

1	2		
1	2		
1	2		
1	2		
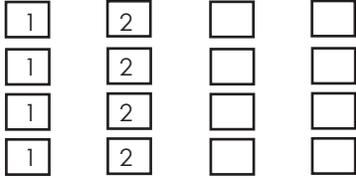
   NOTE: **Temporarily place bracket and fiber on top of the box to continue with wiring.**
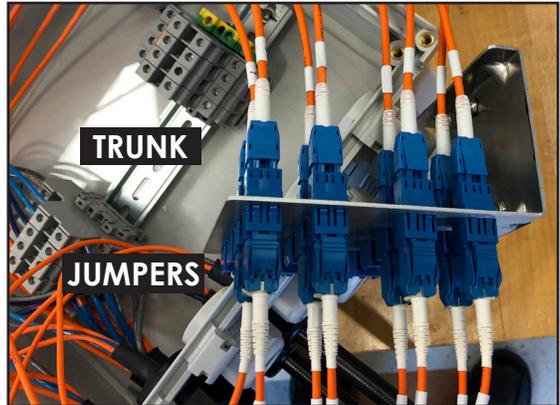
9. Install power trunk cable in the largest white gland on the right side of the box, tighten the external gland nut to hold the cable in place.

   Using the most direct route fit the ferrules into the terminal blocks. White on the bottom blue on the top.

   Tighten the terminal screws

   Single mode only: Repeat with additional discrete power trunk locate in the bottom left corner black gland for the additinal discrete power trunk.

   NOTE: **If a fusion splice transition is used be sure not to trap the fiber under the power connection.**
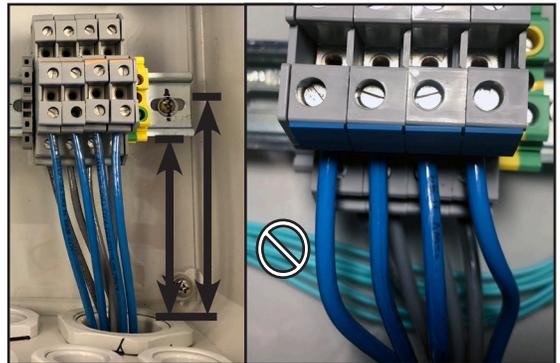
PWR-806M-SE

PWR-810M-SE

10. Install Single mode fiber trunk cable in the medium sized white gland, on the right side of the box, tighten the external gland nut to hold the cable in place.

    Place the fiber ends off to the side being sure to not damage them while working on the hybrid jumpers.

11. Install Single Mode hybrid jumper cable in the small white gland, top left. Tighten the external gland nut to hold the cable in place.

    Place the fiber ends off to the side being sure to not damage them while working on the power conductors. Route the power conductors through the cable management clip. Trim the grey and blue conductors to fit into the terminal blocks. Grey on the bottom blue on the top.

    Tighten the terminal screws

12. Install Single mode hybrid jumper cable in the small white gland, top second from the left. Tighten the external gland nut to hold the cable in place.

   Place the fiber ends off to the side being sure to not damage them while working on the power conductors. Route the power conductors through the cable management clip. Trim the grey and blue conductors to fit into the terminal blocks. Grey on the bottom blue on the top.

   Tighten the terminal screws

13. Install Single mode hybrid jumper cable in the small white gland, top third from the left. Tighten the external gland nut to hold the cable in place.

   Place the fiber ends off to the side being sure to not damage them while working on the power conductors. Route the power conductors through the cable management clip. Trim the grey and blue conductors to fit into the terminal blocks. Grey on the bottom blue on the top.

   Tighten the terminal screws

14. Install Single mode hybrid jumper cable in the small white gland, top fourth from the left. Tighten the external gland nut to hold the cable in place.

   Place the fiber ends off to the side being sure to not damage them while working on the power conductors. Route the power conductors through the cable management clip. Trim the grey and blue conductors to fit into the terminal blocks. Grey on the bottom blue on the top.

   Tighten the terminal screws

15. Picture A: Connect the Single Mode trunk DLC fiber connectors to the fiber patch panel as shown. Starting from the bottom outside left with #1 and #2 next to it. Next row up will have #3 outside left and #4 next to it. Continue until fully populated.

   Picture B: For Single mode only installation

		8	7
		6	5
		4	3
		2	1

Multimode/Single mode

16	15	14	13
12	11	10	9
8	7	6	5
4	3	2	1
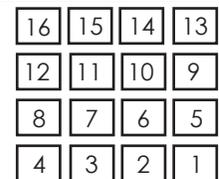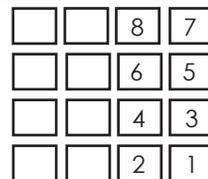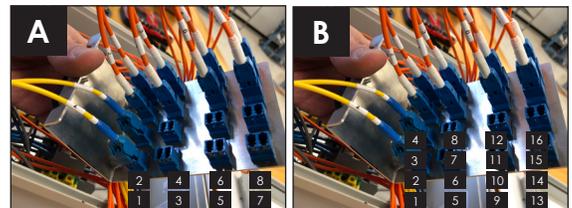
Single mode only

16. On the opposite side connect the jumper DLC fiber connectors to the fiber patch panel as shown. Starting from the bottom outside left with #1 and #2 next to it.
Next row up will have the next jumper and also have #1 and #2 designations. Continue until fully populated.

```
[ ]  [ ]  [2]  [1]
[ ]  [ ]  [2]  [1]
[ ]  [ ]  [2]  [1]
[ ]  [ ]  [2]  [1]
```


Multimode Jumpers

Single Mode Jumpers
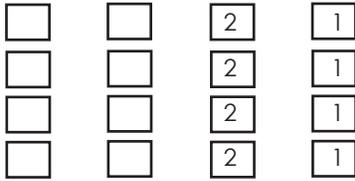
17. Carefully slide fiber patch panel back into its original slot being sure that no furcation tube are trapped between the rail and power terminals.

18. Hook the bottom of the bracket on the rail, push forward while tipping the patch panel away from yourself, lower the patch panel to engage the front locking clips.
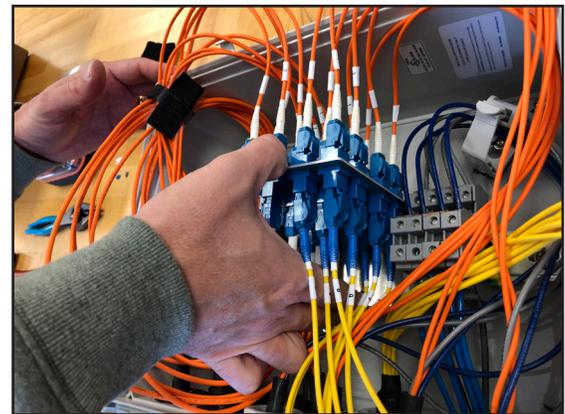
19. Route all remaining loose Single Mode fiber furcation tubes into the cable management clips. Install Velcro cable management to secure all the excess fiber to the sides of the enclosure.

COMMSCOPE®
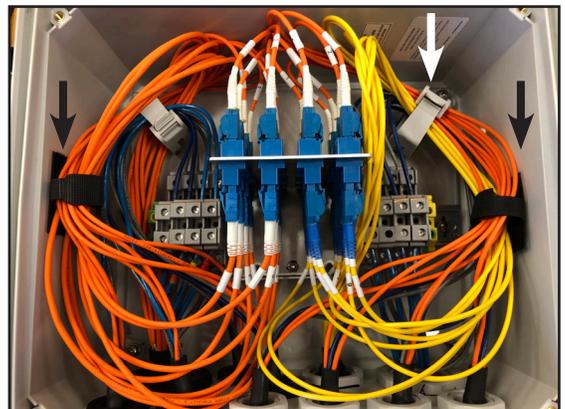
20. To complete the installation be sure to:

• Confirm wiring matches the wiring diagram on the lid or on page #8 of this document

• All fiber furcation tubes are tucked below the surface

• Lid is latched and locking screws installed

• Glands at the bottom of the enclosure are tight
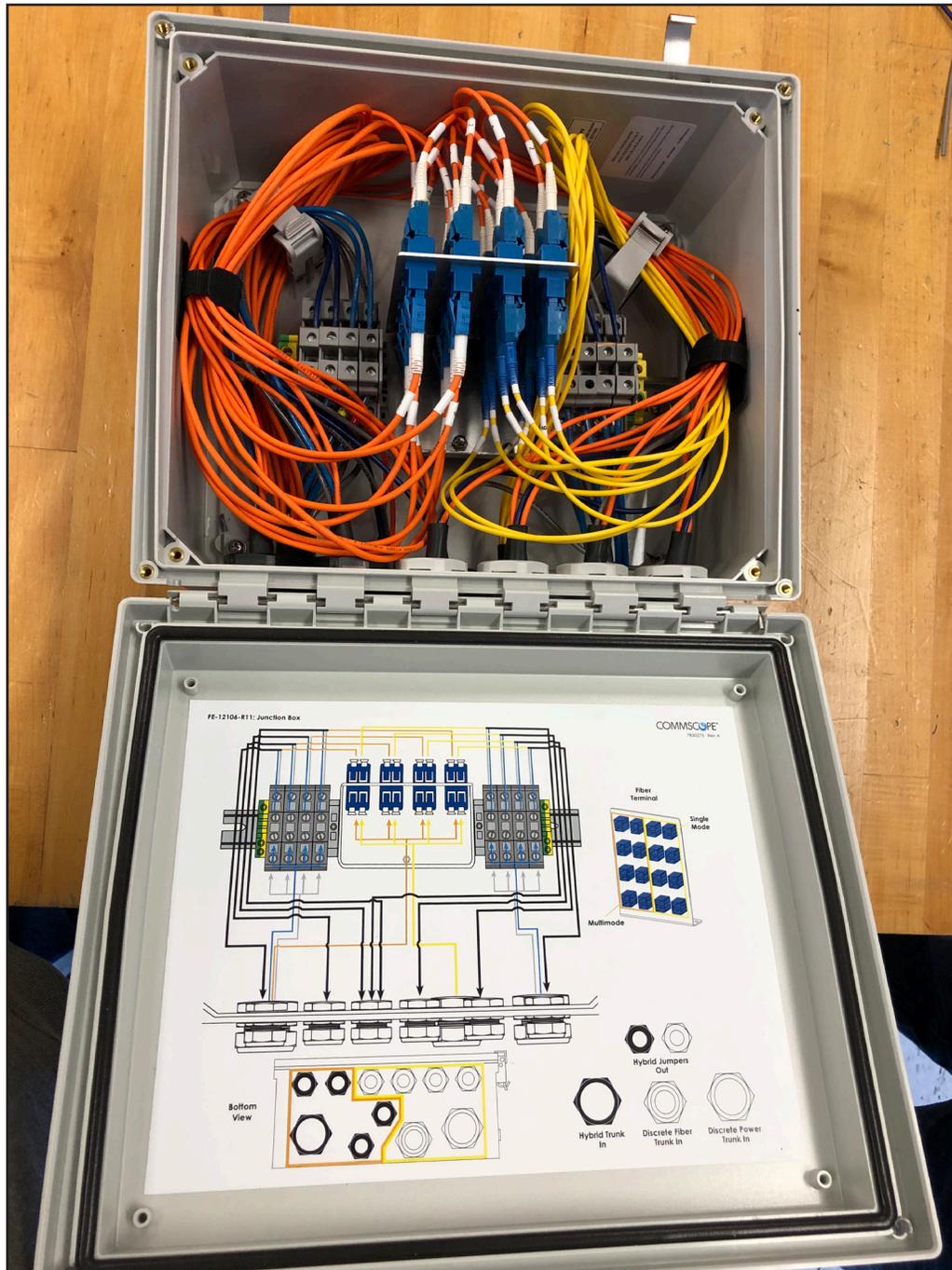
Section 7: Estimating Trunk Length
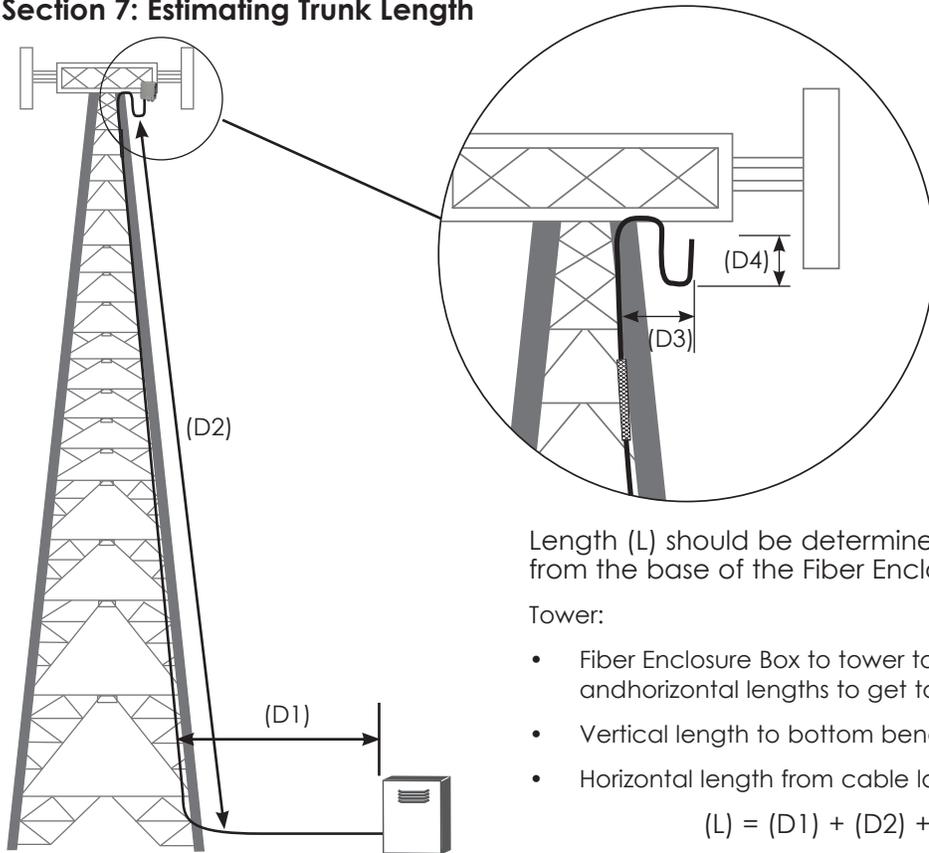
Length (L) should be determined by measuring the trunk cable from the base of the Fiber Enclosure Box to the Cabinet.

Tower:

*   Fiber Enclosure Box to tower taking in account vertical andhorizontal lengths to get to the cable ladder
*   Vertical length to bottom bend towards cabinet
*   Horizontal length from cable ladder to cabinet base

$$(L) = (D1) + (D2) + (D3) + (D4)$$

Section 8: Excess Cable Management (option 1)

Coiled Hybrid Trunk
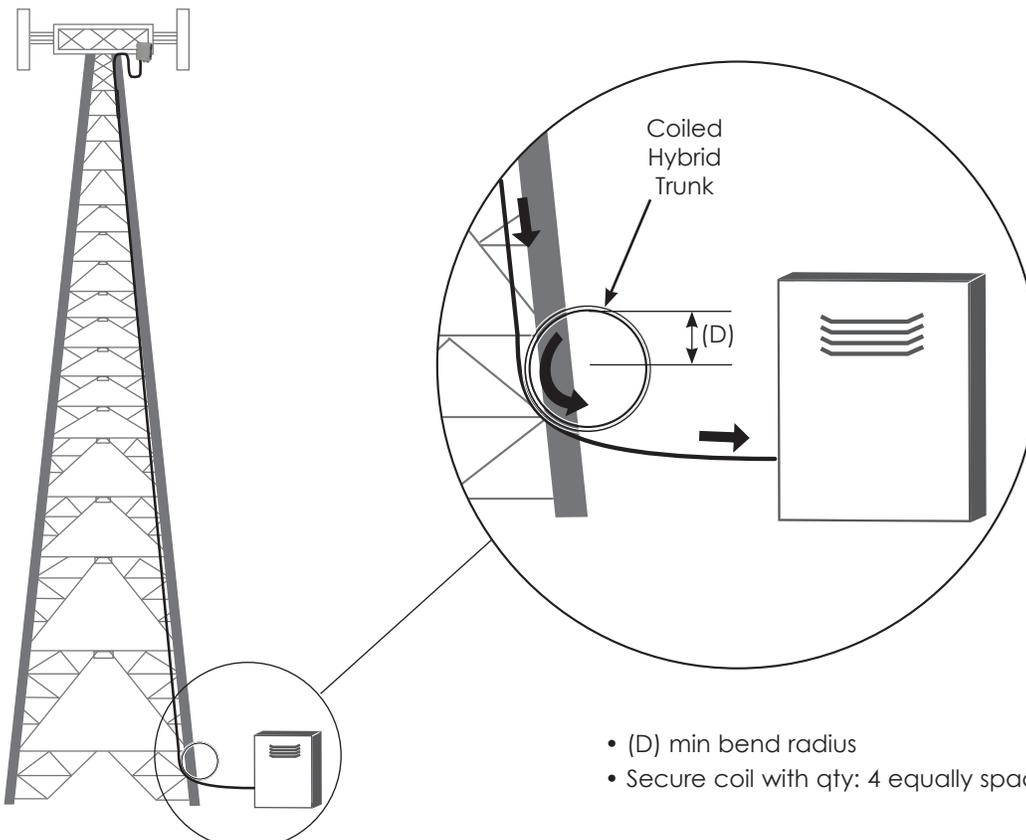
*   (D) min bend radius
*   Secure coil with qty: 4 equally spaced 50 lb UV rated tie wraps

Technical Publication

COMMSCOPE®

Excess Cable Management (option 2)

If length of cable installed needs to be adjusted you can split the cable at the BBU end using the process below and then coiling the excess fiber subunits in a storage box. Fiber management trays are available to manage any excess fiber length in the breakouts at the BBU.

1 Mark cutback length	**2** Notch Armor using flush cutter in-line with Kevlar strings
3 Place Rip Cord in Notches	**4** Pull Rip Cord Parallel to Cable (while supporting breakout)
5 Stop at Length Marker	**6** Separate Armor
7 Cut Armor Using Side Cutter	**8** Remove Water Blocking Tape **NOTE:** Step can be expedited by using a sewing seam ripper that can be purchased at local hobby stores
9 Remove Excess Rip Cord	**10** Apply Electrical Tape to Protect Breakout **NOTE:** Remember to slide identifier labels down the power conductors before trimming the cable to its final length

Cable Splitter tool
Part Number:
FA-RCRT-PD

Excess Fiber
storage Box
Part Number:
FE-14126-E

Seam Ripper

Section 9: Accessories

Hanger

PART NUMBER	DESCRIPTION
SSH-47	Plastic hanger for fiber trunk and jumper, 4 mm – 7 mm; kit of 10
SSH-710	Plastic hanger for fiber trunk and jumper, 7.1 mm – 10 mm; kit of 10
SSH-1014	Plastic hanger for fiber trunk and jumper, 10.1 mm – 14 mm; kit of 10
DHK-78-2-P	Double Hanger Kit for 7/8 in coaxial cable, single stack; includes hardware and angle adapter
SSH-M	SnapStak® Plus Adjustable Hanger for 14mm to 25mm Cable - No Grommets Required
SSH-L	SnapStak® Plus Adjustable Hanger for 25mm to 36mm Cable - No Grommets Required
SSH-XL	SnapStak® Plus Adjustable Hanger for 36mm to 51mm Cable - No Grommets Required
43211A	Butterfly Hanger for hybrid fiber jumpers

1 Hanger required every 1m (3ft)

Mounting Adapters

PART NUMBER	DESCRIPTION
UA-3	For Angles
SA-1U	For Round Members
SA-1C	PIM-free, Composite Snap-in Hanger Adapter
CB-12-50	Cable Banding, Bulk, 1/2 in x 50 ft Reel (uses CB-LH-25 Locking Heads - not incl)
CB-LH-25	Locking Heads for Cable Banding CB-12-50, 25 pcs (uses CB-IT installation tool - not incl)

Section 10: Grounding

Removing Jacketing for Grounding Kit installation

1. Score the jacketing 360º
2. Measure 2 in (51 mm) and repeat
3. Identify where the aluminum shielding overlaps, this will feel like a flat spot in the cable
4. With a knife flat on the cable remove a section of jacketing between score marks
5. Lift edge of jacketing with knife tip
6. Grab lifted edge of jacketing with a pair of pliers and roll on the cable
7. Remove excess adhesive with a piece of emery cloth

Scan to
view video

Technical Publication

COMMSCOPE®

Minimum Grounding Requirements
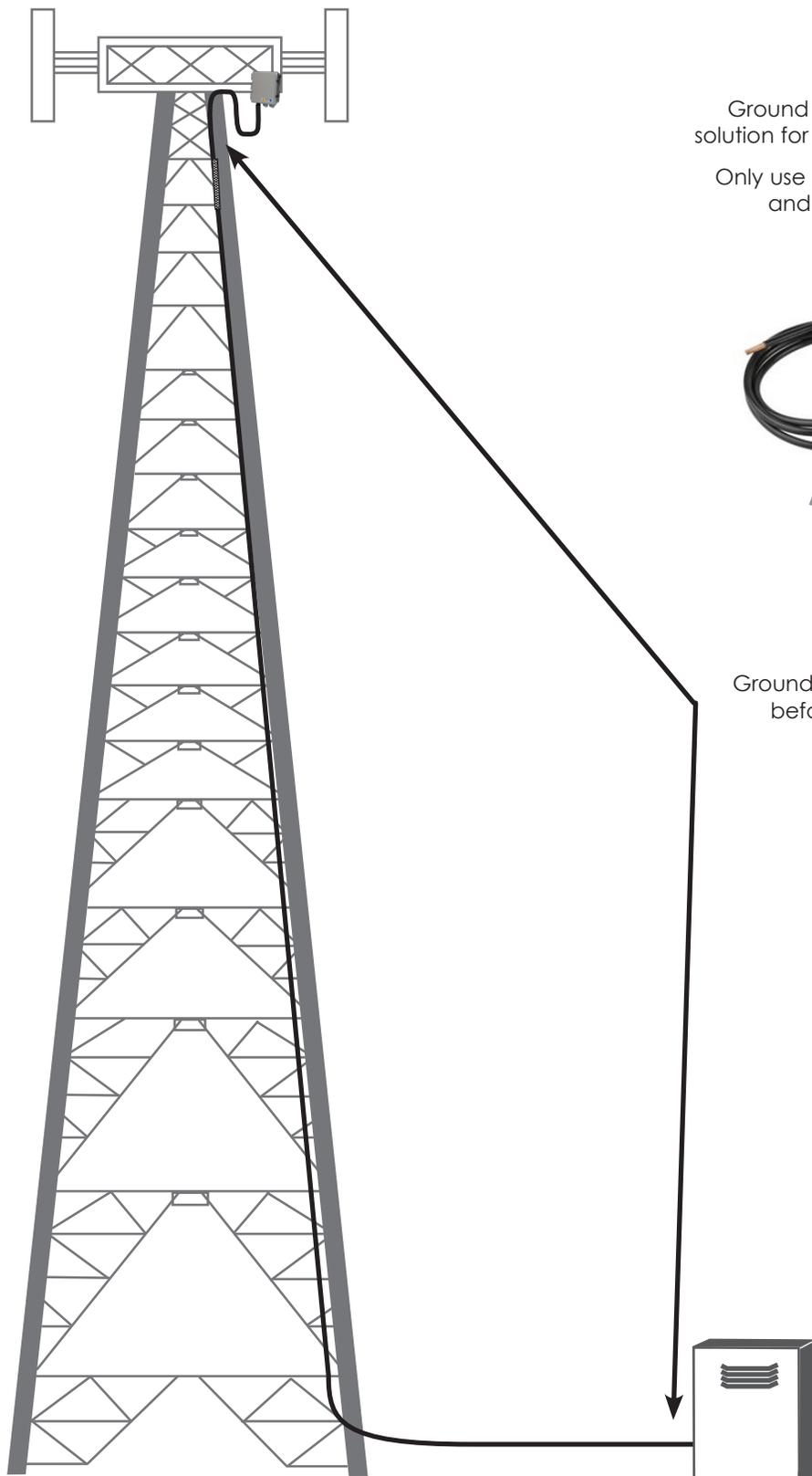
Ground Kit UG12158-15B4-T is a universal solution for all HELIAX® FiberFeed® trunk cables.

Only use Tin Plated grounding kits supplied and approved by CommScope.

Ground kits required at the top and bottom before entering the shelter / cabinet

Section 11: Maintenance Check List

HFE Trunks

☐ Hangers and grommets securely fastened

☐ No damage to cable jacket

☐ Grounding kits securely connected and weatherproofing intact

☐ Labels securely attached

Junction Boxes

☐ Box mounting secure

☐ All electrical terminals secure

☐ All fiber connections seated correctly

☐ All cable entry glands tight and cables secure

☐ Box securely latched closed using both top and bottom latches and tighten lid screws to 0.6 N●m (5 lb-in) so there are no sign of water or dirt ingress

HFE Jumpers

☐ All jumper supports secure

☐ No damage to cable jacket

☐ Grounding kits securely connected and weatherproofing intact where installed

☐ RRU connection cover secure and no signs of water or dirt ingress

☐ RRU DC and fibre connections secure and seated properly

☐ Labels securely attached