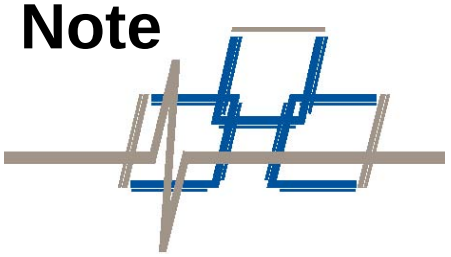
Fiber SenSys
PERIMETER SECURITY

FD525-HALO™ Installation

Application Note



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1. Introduction

This application note will instruct the reader on the proper methods for installing the entire cable assembly for **FD525-HALO™** system deployments including: lead in cable, unified trunk and sensing cable, distribution box and zone enclosures.

Prior to installing the **Alarm Processing Unit** (**APU**) and deploying the sensor cable, the site to be protected must be assessed carefully so that all security needs are met and all potential threats against it are accounted for. Refer to **AN-SM-036 FD500 Series – Site Design and Assessment** for detailed information on how to properly assess a site, and how to design an **FD500** series system.

Ultimately, the method by which the sensor cable is installed and deployed is up to the end user. Fiber SenSys does not mandate one particular installation design over another; however, the general procedure for installing the fiber optic perimeter security system is as follows:

1. **Assess:** Survey the site to be protected and record all information needed for the site design phase

2. **Design:** Create a strategy for protecting the site. This includes planning the level of security, choosing the location of the APUs, provision of electrical power, and planning cable routing

3. **Install:** Proper deployment of the fiber optic sensor and correct installation of the Fiber SenSys system

2. FD525-HALO™ Installation

Tie the insensitive lead-in cable and the sensing cable to the fence using the nylon zip ties. Use the following rules:[1]

1. Tie a three-meter service loop at the locations of the distribution box and the zone enclosures.

2. Only run the fiber horizontally on the fence fabric. When running the fiber vertically, use a fence post (see figure 2-1).

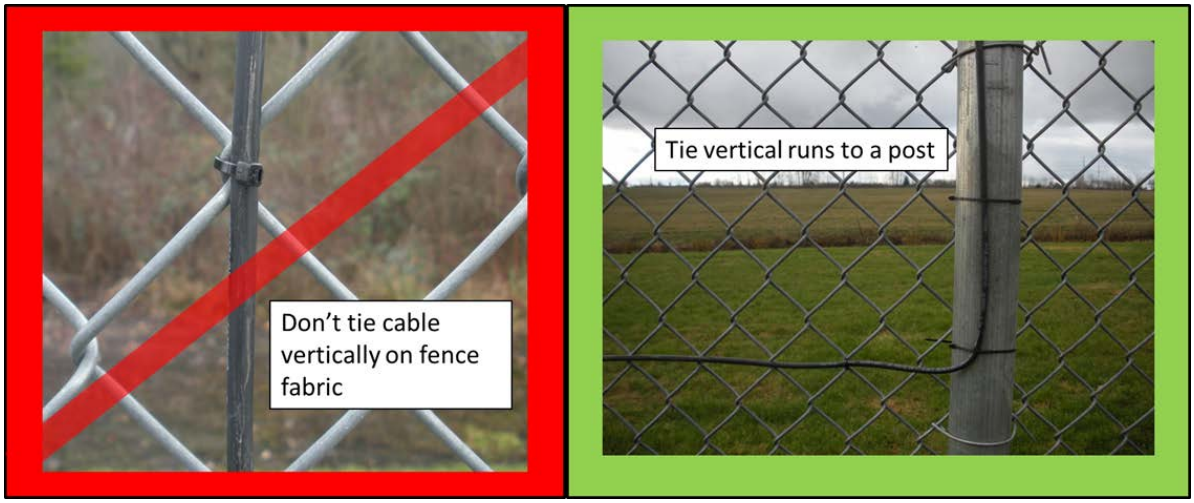


Figure 2-1. Tie vertical runs to a post, do not run the cable vertically on the fence fabric.

3. There must be at least 20 meters of cable between zone enclosures. If it's desirable to have two zone enclosures closer than 20 meters apart (as when putting a single zone on a man gate, or other short/small structure) you must still use at least 20 meters of cable; coil the extra cable and bury it securely so that it cannot inadvertently trigger alarms.

4. Attach the ties every four diamonds, and use enough tension to prevent the cable from sagging (see figure 2-2).

[1] The sensing cable consists of 5 single-mode fibers and one multimode fiber. Sensing, however, is accomplished only with the multimode fiber, so the sensing cable can also be used as the lead-in cable if only the single-mode fibers are used.

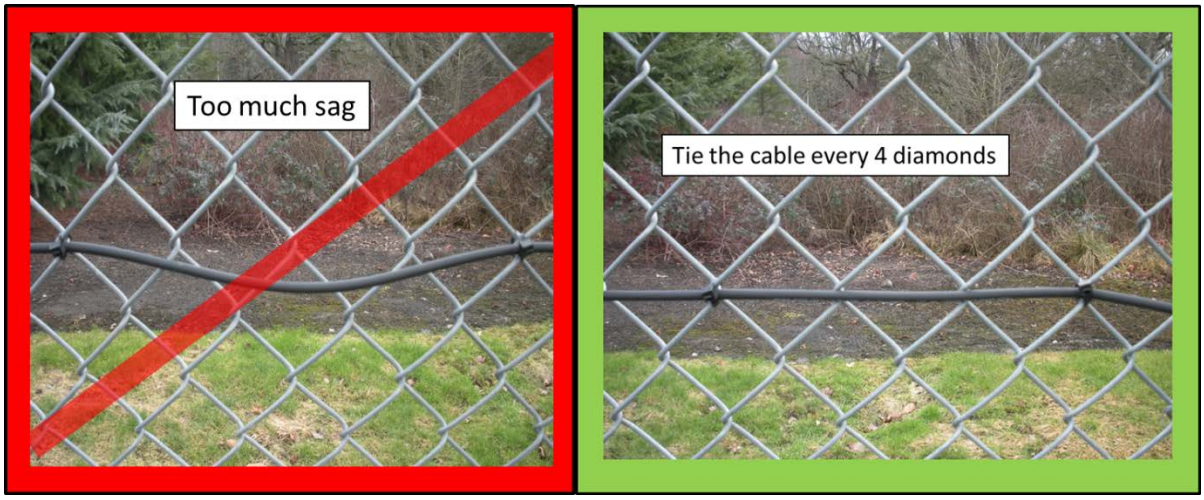


Figure 2-2. Use enough tension and zip ties to avoid sagging in the fiber.

5. When tying the cable, loop the zip tie vertically around the fence fabric – do not loop it diagonally, as this can kink the cable (see figure 2-3). Kinks can cause high optical loss and low signal/sensitivity, which will adversely affect the system's nuisance alarm rate and ability to detect intruders.

Figure 2-3. Loop the zip tie vertically to avoid kinking the cable.

6. Tie the cable at least one diamond away from the fence post to avoid wrapping it too tightly. Wrapping the cable too tightly around the fence post can introduce excess optical loss (see figure 2-4).

Figure 2-4. Do not tie the cable to the fence too closely to the fence posts.

7. Install the cable along the middle of the fence, but on reinforced sections, use a triple pass. When forming the triple pass, make sure to tie the cable to the fence post when running it vertically (see figure 2-5).

Figure 2-5. A single run of cable is sufficient for non-reinforced panels, but three passes of cable may be necessary for reinforced sections.

Install the DB4 Distribution Box

The DB4 distribution box is a standard breakout box with a pre-installed 2-by-4 splitter inside. The DB4 should be mounted to the fence at the beginning of the first zone.

The sensing cable has six fibers inside; five single-mode fibers and one multimode fiber:

Color	Fiber type
Blue	Single mode
Orange	Single mode
Green	Single mode
Brown	Single mode
Slate	Single mode
White	Multimode

Referring to figure 2-6, make the following splices:

- Splice the orange, green, and brown fibers (in any order) to three of the output ports on the splitter (it doesn't matter which three). The slate colored fiber is not used at this point and is designated as either a spare or can be used for auxiliary systems such as cameras.

- Splice the two single-mode fibers in the lead-in cable to the red fiber inputs on tap couplers 1 and 2 (it does not matter which lead-in cable you splice to which tap coupler, they are interchangeable).

- Splice the yellow fiber outputs of tap couplers 1 and 2 to the input and output of the optical attenuator (it does not matter which tap coupler is spliced to input and which to output, they are interchangeable).

- Splice the black fiber outputs of tap couplers 1 and 2 to the two input ports of the 2-by-4 splitter.

- Splice the red fiber input of tap coupler 3 to the remaining output leg of the 2-by-4 splitter.

- Splice the yellow fiber output of tap coupler 3 to the white multimode fiber in the SC6 cable

- Splice the black fiber output of tap coupler 3 to the blue fiber in the SC6 cable

Note: After splicing the DB4 distribution box and closing it, any un-used cable should be tied securely to the fence for use in the event of future repairs.

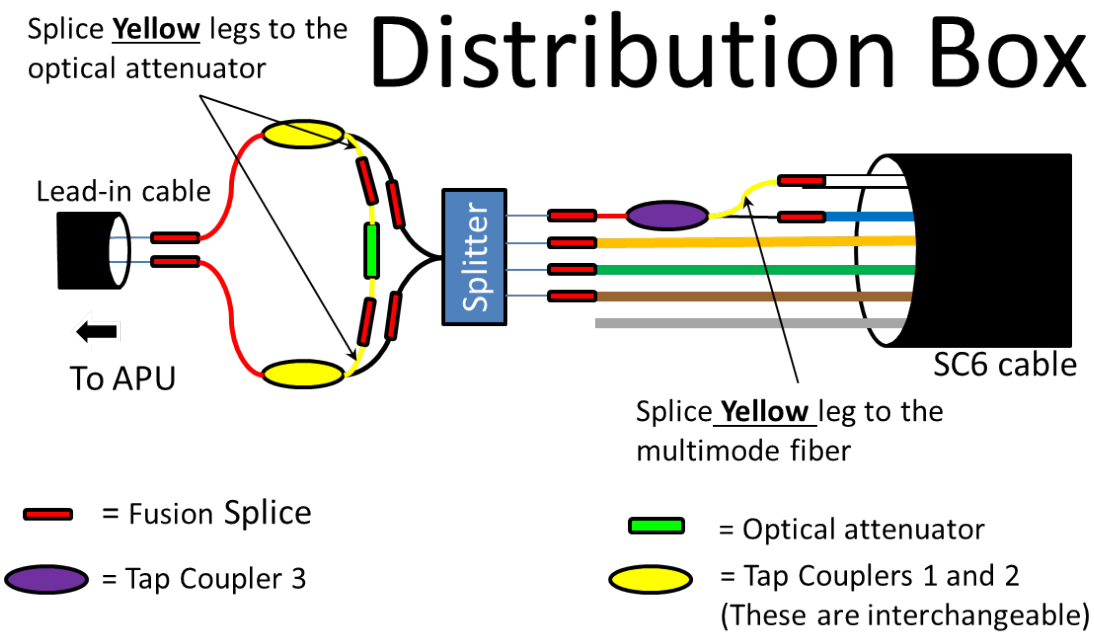


Figure 2-6. Splice diagram for the DB-4 distribution box.

Install the Zone Enclosures & Kits

The zone enclosure kits contain all the necessary materials for constructing the zone terminations inside the breakout boxes. Each zone enclosure kit is unique, though most share many common materials with other zone enclosure kits (see appendix A).

Install zone enclosure 1 at the first breakout box location, zone enclosure 2 at the second breakout box location, zone enclosure 3 at the third breakout box location, etc. Use the service loops to facilitate building the zone enclosures and tie any un-used cable securely to the fence, for use in the event of future repairs. Generally, the process at each zone enclosure is as follows (see figure 2-7);

- Make a mid-point entry into the sensing cable (see appendix B)
- Cut the appropriate single-mode fiber (follow the splicing instructions that come with the zone enclosure kit)

- Splice the RED fiber of the tap coupler (input) to the end of the single-mode fiber that's nearest the APU
- Splice the BLACK fiber of the tap coupler (output) to the other side of the single-mode fiber

- Cut the white multimode fiber
  - Splice the End of Line Terminator to the end of the multimode fiber nearest the APU
  - Splice the other side of the multimode fiber to the YELLOW fiber on the tap coupler (output)

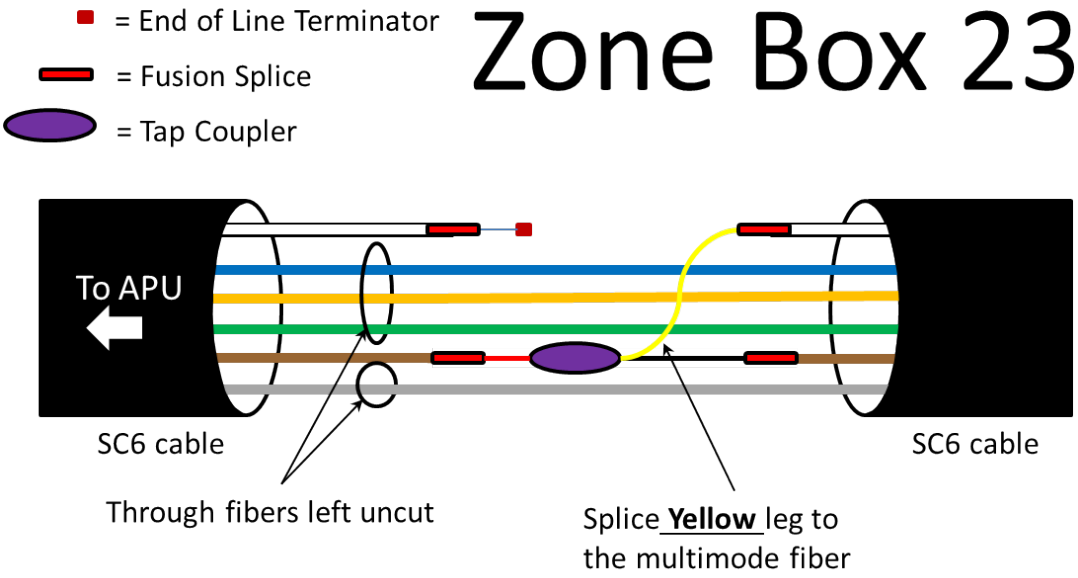


Figure 2-7. An example of the splices in a particular zone enclosure. Each zone enclosure will have a specific splicing instruction card much like this.

In the last zone enclosure only the End of Line Terminator needs to be spliced; the rest of the materials in that zone enclosure are not needed. Also, in the last zone enclosure the sensing cable will enter the zone enclosure, but it will not exit.

Connect the APU and Test the Cable Installation

The cable installation is now complete. It should be checked by connecting the APU to the lead-in cable and tested by configuring the system. The installation is performing adequately if all the zone reflections are above 35%.

Appendix A. Zone Kit Contents

The table below shows the contents of the zone kits. The number of zones ordered will be the number of breakout boxes and zone kits that are received. The first breakout box is also the distribution box. Zone enclosure 1 is at the end of zone 1. Zone enclosure 2 is at the end of zone 2, etc. The distribution box kit is the most complex. This kit contains 3 tap couplers, 12 splices, an optical attenuator and a 2-by-4 splitter. Each zone kit has an end of line terminator and all but four (zones 6, 13, and 20, and 25) have tap couplers. Most have four splices, but the zone kits that have no tap coupler have only two splices, and zone 25 only has one splice.

Each kit comes complete with metal identification tags to clip to the breakout box, and splicing instructions that explain which SM fiber (blue, orange, green, or brown) to use when splicing the tap coupler (the end of line terminator is always spliced to the multimode fiber, as is one leg of the tap coupler).

SM Fiber	Zone Number	Tap Couplers	End of Line Terminators	Splices	Optical Attenuators	2-by-4 Splitter
Blue	Dist. Box	3	0	12	1	1
	1	1	1	4	0	0
	2	1	1	4	0	0
	3	1	1	4	0	0
	4	1	1	4	0	0
	5	1	1	4	0	0
	6	0	1	2	0	0
Orange	7	1	1	4	0	0
	8	1	1	4	0	0
	9	1	1	4	0	0
	10	1	1	4	0	0
	11	1	1	4	0	0
	12	1	1	4	0	0
	13	0	1	2	0	0
Green	14	1	1	4	0	0
	15	1	1	4	0	0
	16	1	1	4	0	0
	17	1	1	4	0	0
	18	1	1	4	0	0
	19	1	1	4	0	0

	20	0	1	2	0	0
Brown	21	1	1	4	0	0
	22	1	1	4	0	0
	23	1	1	4	0	0
	24	1	1	4	0	0
	25	0	1	1	0	0

Appendix B. Mid-Point Entry Procedure for Sensing Cable

Using a process called mid span access, or mid-entry, it is possible to remove specific portions of the cable outer jacket to access only specific target fibers. Unlike a cable end, the mid-span access takes extra care to effectively perform the proper splices without unnecessarily breaking or cutting unused (through) fibers.

The Fiber SenSys recommended tools for performing a mid-entry on Hybrid Sensing Element are:

- Miller brand scissors: model number KS-1
- Ideal brand coax stripper model number: 45-164*
- Needle nose pliers

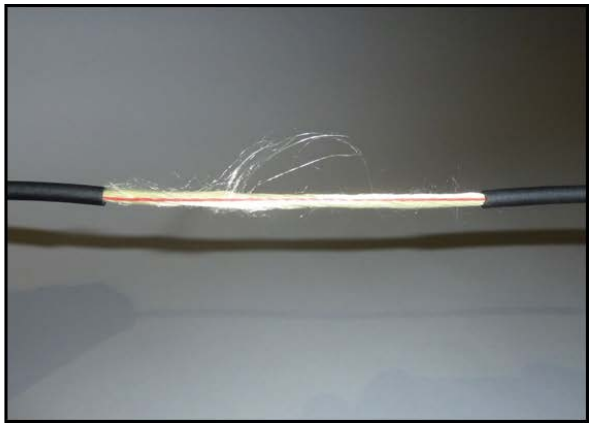
First, mark the section of cable jacket to be removed; the length of cable between the two marks should be 60 inches, in accordance with the manufacturer's recommendations.

There should be 3 meters of coiled cable at each zone enclosure location. Cut enough ties to release approximately 1 meter of cable from the fence in each direction, this should provide adequate free cable to facilitate construction of the zone enclosure.

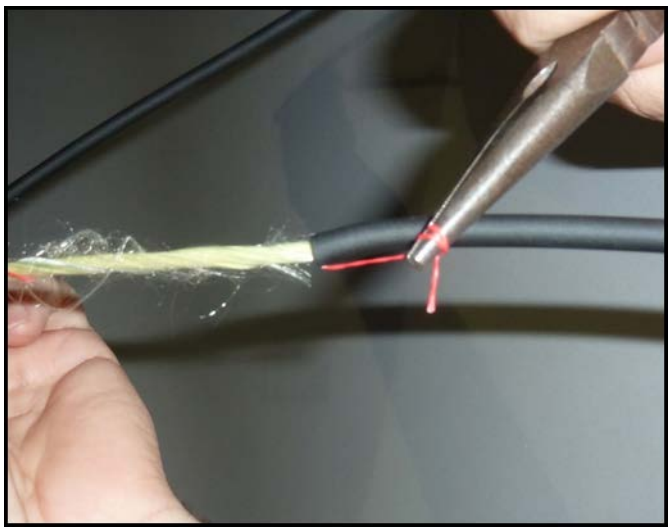
Next, using the tool as shown below, cut a ring at one of the marks followed by another ring cut 6”-8” closer to the other cable marker 60” away. Then perform one final ring cut at the far marker.

Note: It may be necessary to adjust blade height to cut completely through jacket while also avoiding damaged fibers

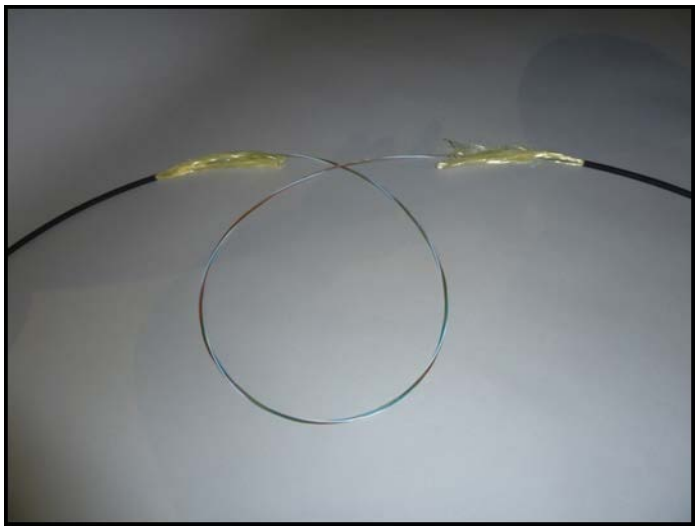
Next, use the tool as shown below, to slit open the jacket lengthwise from the first ring cut to the next closest ring cut (6-8 inches away); remove and discard the opened section of cable jacket.



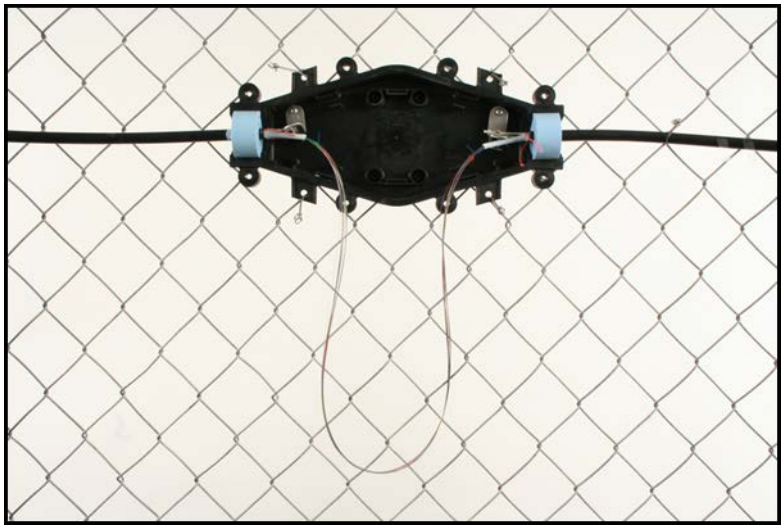
With the jacket removed cut the red rip cord midway between cable jacket ends. Grasp the string that leads to the third ring cut with the needle nose pliers and pull the string in a manner that splits the jacket open to the final ring cut



Remove jacket and all but 6” of aramid yarn from either ring cut. Install opened section of cable in Breakout Box and cut necessary fibers midway between jacket ends.

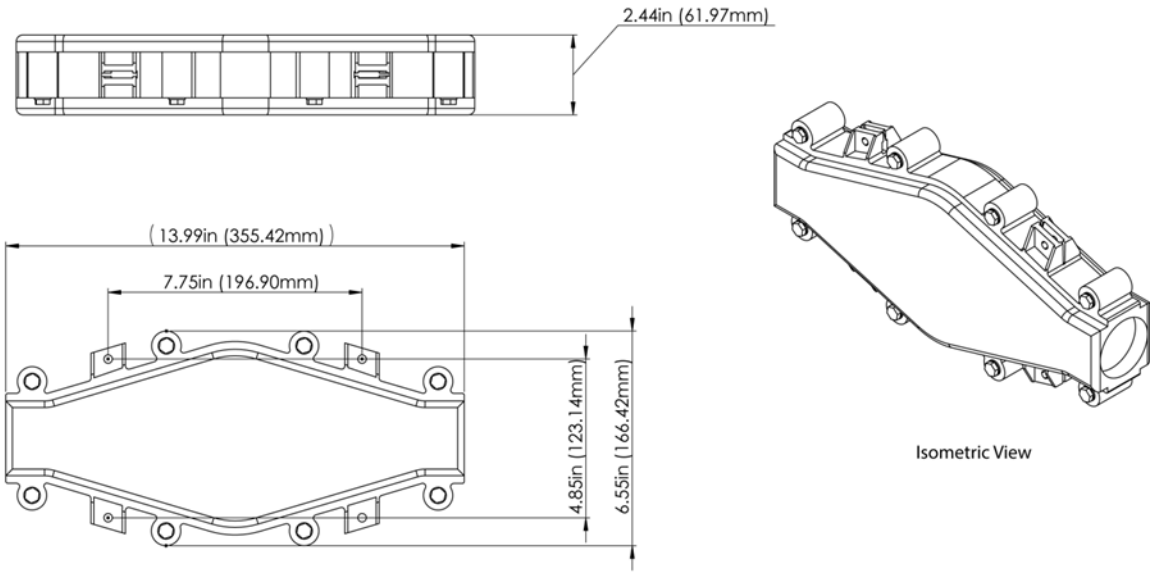


The following illustration shows a Breakout Box installed with 10” of spacing between cable ring cuts as well as 60” of removed cable jacket.



The zone enclosure is now ready for splicing, per the splicing instructions for that particular zone.

Appendix C. Node and Distribution Box Specifications



Node and Distribution Box Specifications	
Exterior Dimensions	Width: 6.55 in (16.64 cm) Length: 14.00 in (35.54 cm) Height: 2.44 in (6.19 cm)
Industry Standards	ISO 9001 / 2000 manufacturing Compliance Modified Telcordia TR-NWT-000251
Operating Temperature	-40 degrees to +70 degrees centigrade (-40° to 158° F.)
Splicing Capacity	Supports up to 48 single-fusion splices.
Weight	3.5 lbs.

Appendix D. Referenced Documents

AN-SM-036 FD500 Series – Site Design and Assessment

Note: If these application notes cannot be found locally in the same directory as this manual under the folder titled: **Application Notes**, then it is possible to download these documents online from the **Fiber Sensys** web page: www.fibersensys.com