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Powered Fiber Cable System

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CommScope Powered Fiber Cable System Template using the MasterFormat Template

The intent of this document is to provide assistance in completing the Construction Specifications Institute (CSI) MasterFormat template for a CommScope telecommunication powered fiber cabling system.

Product part numbers, minimum performance criteria for the components, general design considerations, and installation guidelines are included in this document.

This document provides pertinent information to allow the contractor to bid the labor, supervision, tooling, and miscellaneous mounting hardware and consumables to install a complete Powered Fiber Cable System. It is the responsibility of the contractor to propose any and all items required for a complete system if not identified in this specification.

[Any text appearing in blue and within brackets requires input or a choice in options or features]

SECTION 27 15 00
Data Communications Horizontal Cabling
Powered Fiber Cable System

PART 1 GENERAL

1.01 SUMMARY

A. Introduction

1. Provide a powered cabling solution that combines power and optical fiber communications into one complete system.
2. The cable must combine electrical power conductors and optical fiber into one package to speed up installations and simplify power and communications delivery to devices.

B. Powered Fiber Cable System

1. System must be a complete “rack to device” solution capable of powering and communicating with small cells, Wi-Fi hotspots, HD cameras, and variety of devices requiring optical communications and DC power in one system.
2. The hybrid cable shall allow for “standalone” use for delivering of power and fiber communications for applications where both power and optical fiber communications.
3. When used along with the PoE extender, the powered fiber optic cable shall supply optical fiber communications and PoE+ power for network access and other low voltage DC devices. See Table [1] for 1-Port PoE extender and Table [2] for 2-Port PoE extender.

Input Voltage	Cable Gauge (AWG)	PoE/PoE+	Max Recommended Cable Length (Meters)
<i>Maximum (57V)</i>	12	PoE	3040
<i>Maximum</i>	12	PoE+	1560
<i>Maximum</i>	16	PoE	1190
<i>Maximum</i>	16	PoE+	610
<hr/>			
<i>Nominal (48V)</i>	12	PoE	2150
<i>Nominal</i>	12	PoE+	1100
<i>Nominal</i>	16	PoE	850
<i>Nominal</i>	16	PoE+	430
<hr/>			
<i>Minimum (40.5V)</i>	12	PoE	1530
<i>Minimum</i>	12	PoE+	780
<i>Minimum</i>	16	PoE	600
<i>Minimum</i>	16	PoE+	310

TABLE [1]
1-PORT PoE EXTENDER ELECTRIC TRANSMISSION AND RECOMMENDED CABLE LENGTH DISTANCES

Input Voltage	Cable Gauge (AWG)	Lmax (m) (PoE+/PoE+)	Lmax (m) (PoE/PoE+)	Lmax (m) (PoE/PoE)	Lmax (m) (PoE+)	Lmax (m) (PoE)
<i>Maximum (57V)</i>	12	650	1120	1570	1595	2630
<i>Maximum</i>	16	255	445	620	630	1040
<i>Nominal (48V)</i>	12	460	795	1100	1120	1840
<i>Nominal</i>	16	180	315	435	440	725
<i>Minimum (40.5V)</i>	12	330	555	770	780	1285
<i>Minimum</i>	16	130	220	305	310	510

**TABLE [2]
 2-PORT PoE EXTENDER ELECTRIC TRANSMISSION AND RECOMMENDED CABLE LENGTH DISTANCES**

4. Must be compatible with commercially available NEC Class 2 and/or SELV compliant 48VDC power supply
5. System shall comply with the following standards:
 - a. RoHS (2002/95/EC)
 - b. REACH SVHC, 53 6/20/11
 - c. California Prop 65 for safe drinking water and toxic enforcement act
 - d. Telcordia GR-20-CORE Issue 3 May 2008, EIA/TIA FOTPS
 - e. TIA-568-C
 - f. Deca-BDE free
 - g. Power limited circuit cable UL 13 (CL2R-OF AND CL3R-OF)
 - h. Communication cable per UL 444 (CMR-OF)
 - i. UL 1666 standard for test for flame propagation - Edition 5 - Revision date 2012/06/27
 - j. IEC 60332-1-1, -2, 60332-3-24 Cat. C, 61034 60745-2
 - k. ITU.T K21,
 - l. GR-1089
 - m. IEC 60793-2-50 type B.1.3 and B.6.A&B
 - n. ITU-T G.657.A1 or A2/B2 optical fiber, backwards compatible with G.652.D
 - o. PoE (IEEE 802.3af-2003) and PoE+ (IEEE 802.3at-2009)
 - p. Must comply with Canadian code ICES-003
6. Equipment must comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules
7. Standard system consists of five (5) components:
 - a. Hybrid fiber/copper cabling
 - b. PoE Extender
 - i. 1-port
 - ii. 2-port
 - c. Power and fiber distribution element
 - d. Cable and fiber management
 - e. SFP connector

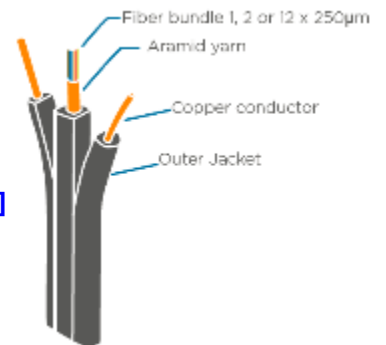
PART 2 PRODUCTS

2.01 OWNER FURNISHED

- A. **[Include information about systems, products, and accessories that are provided by the owner]**
 1. **[DC Power supply, SFP connector, LC connector, LC patch cords and fiber patch panels, outdoor rated Cat 6 patch cord]**
 2. **[For copper based switch: fiber to copper media converters]**

2.02 MANUFACTURED COMPONENTS

- A. Manufacturer List
 1. CommScope
 2. Approved equivalent
- B. System Components
 1. Hybrid fiber/copper cable
 - a. **[12 AWG (2mm) or 16 AWG (1.2mm)]** conductor size
 - b. **[02, 04 or 12]** optical fibers
 - c. **[Singlemode or OM3 Multimode]** fiber type
 - d. **[Outdoor rated polyethylene (PE) or Riser/LSZH indoor/outdoor]** jacket type
 - e. **[1 Km, 2 Km or 4 Km]** cable length
 - f. Compatible with FOSC 450A splice closure
 - g. Cable must meet specifications in Table [1] and Table [2].



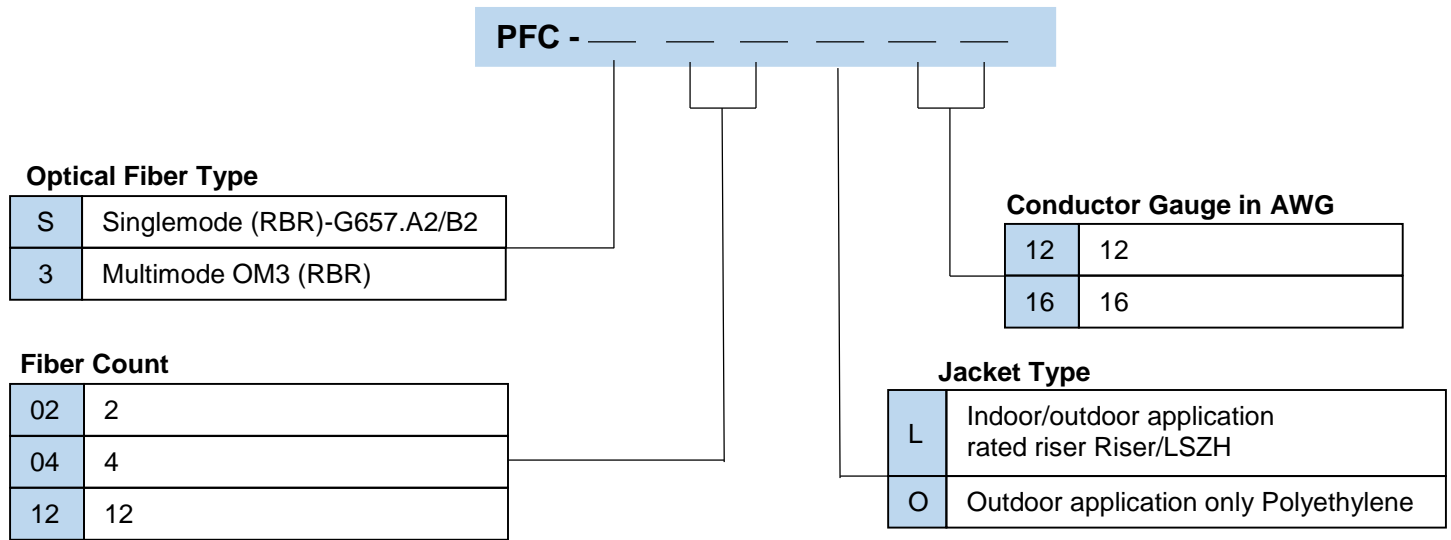
Environmental Characteristics	
Storage Temperature:	-40°C to +70°C
Operating Temperature:	-40°C to +70°C
Installation Temperature:	-10°C to +60°C
Tensile Load	
Short Term:	440 N
Long Term:	132 N
Preferred Axis Bend Radius mm (in.)	
Installed:	30 mm (1.18 in.)
Loaded:	50 mm (1.97 in.)
Impact (N-m)	
EIA/FOTP-25C	4.4 N-m
Crush(N-m)	
EIA/FOTP-41A	2200 N-m
Optical Performance (dB/Km)	
Singlemode Reduce Bend Radius Fiber	0.35/0.25 dB/km (1310/1550 nm)
Multimode OM3	0.35/0.25 dB/km (1310/1550 nm)

**TABLE [1]
 POWERED FIBER CABLE SPECIFICATIONS**

Conductor Size (AWG)	Dimensions (Nominal, mm)		Weight (Nominal)
	Width	Height	
16	10.9	4	70.0 kg/km
12	12	4.5	110.0 kg/km

**TABLE [2]
 POWERED FIBER CABLE DIMENSIONS AND WEIGHT SPECIFICATIONS**

- h. Cable shall be CommScope product part number (see Table [3]) or approved equivalent.



**TABLE [3]
 POWERED FIBER CABLE PART NUMBER CONFIGURATOR**

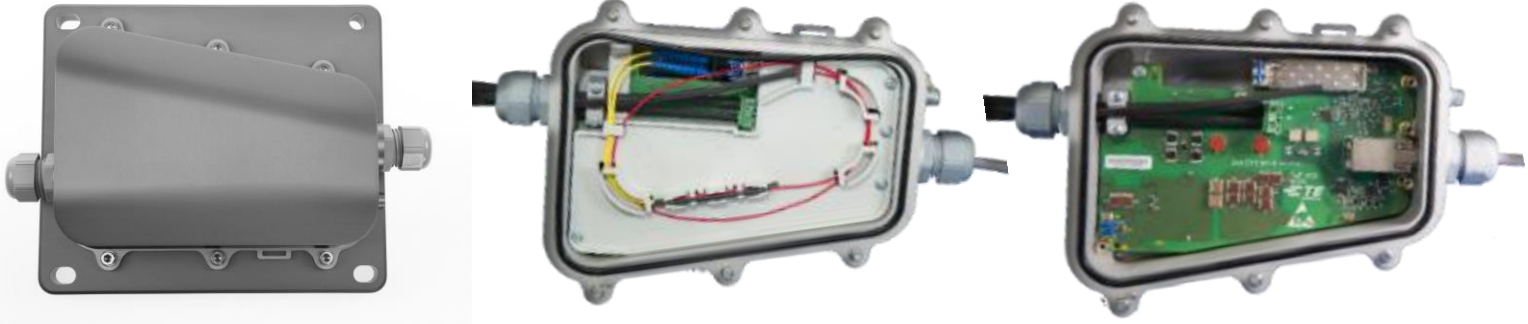
2. PoE Extender
 - a. Provides termination for hybrid cable input and automatically corrects voltage drop over distance
 - b. Optical signal and power in must be converted to RJ45 PoE+ compliant jack(s)
 - c. Shall be available in [1] or [2] port configurations
 - 1) 2-port configuration must allow for two (2) PoE or PoE+ devices to be connected via one hybrid cable
 - 2) 2-port must provide option to share the bandwidth of a single 1 Gb/s SFP or utilize two (2) SFPs for 1 Gb/s per port operation
 - d. Must use outdoor rated patch cord
 - e. Shall be available in pole or wall mount options
 - f. Extender shall have three (3) levels of electrical protection
 - 1) Primary - GDT component rated to 40kA surge protection
 - 2) Secondary - MOV components rated to 4.5kA
 - 3) Tertiary - TVS prevents the voltage from rising above 80-100V
 - g. Termination block shall support a minimum of 200 re-terminations while maintaining a contact resistance of less than one (1) milliohm.
 - h. Environmentally sealed closure rated to IP67
 - i. Must provide electrical power transmission management
 - j. Shall be designed to fit inside brackets capable of holding various types access devices such as wireless access points, or universal mounting brackets
 - k. Must be aesthetically appealing for Wi-Fi access point deployment with the ability to be hidden inside the mounting brackets
 - l. Compatible with Aruba Networks AP-275 Wi-Fi access point (Ruckus, Cisco, security cameras from Axis or Bosch)
 - m. SFP module in the POE extender should match module in existing switch
 - n. Must include sunshade for harsh temperature installation
 - o. PoE extender must meet specifications in Tables [4] and [5].

Item	
Storage Temperature:	-40°C to +70°C
Operating Temperature:	-40°C to +65°C
Installation Temperature:	-5°C to +45°C
<i>65°C assumes 45°C ambient air temperature, plus 20°C sun loading</i>	

TABLE [4]
POE EXTENDER CLIMATIC PERFORMANCE

Item	Dimensions	Weight
PoE Extender 1-port Aruba version	245mm x 159mm x 67mm	1.4 kg
PoE Extender 1-port Universal version	245mm x 173mm x 74mm	2.34 kg
PoE Extender 2-port version	283mm x 225mm x 77mm	3.8 kg

TABLE [5]
POE EXTENDER PHYSICAL DIMENSIONS



1-PORT POE EXTENDER



2-PORT POE EXTENDER

3. Power and Fiber Distribution Element

- a. Must be compatible with GE Critical Power Express Class II shelf or Alpha Chassis part number 0300156-001 and its modules part number 0120028-001
- b. Shall comply with NEC Class II and SELV
- c. Each GE Modules shall accommodate eight (8) cable outputs; each output must be capable of powering a PoE+ (30W) device at a distance of 2.5 Km, each GE chassis shall contain up to four (4) modules total per power supply for a total of 32 cables per power supply;
- d. Each Alpha Modules shall accommodate four (4) cable outputs; each output must be capable of powering a PoE+ (30W) device at a distance of 2.5 Km, each Alpha chassis shall contain up to nine (9) modules total per power supply for a total of 36 cables per power supply.
- e. Capable of extending maximum distance to 1.6 Km for PoE+ (30W output) and 3 Km for PoE (15W output)



POWER SUPPLY

PART 3 EXECUTION

3.03 INSTALLATION

- A. Install all systems in accordance with manufacturer's printed instructions, as well as all [State [Municipality] of [] codes and standards].
- B. The power supply shall be installed in a safe location with access to the fiber optic network into which small cells or other network access devices are desired to be connected, and either 120VAC, 240VAC, or 48V UPS power available.
- C. Parameters to be considered prior to system deployment:
 1. Distance from power supply to the network devices
 2. Maximum power consumption of the network devices
 3. Number of devices to be deployed
 4. Type of cable (jacket, support)
 5. Fiber Management options
- D. For duct installation, the PE-jacketed outdoor-only rated cable is recommended.
 1. When installing in ducts, care should be given to avoid cable twisting.
 2. Standard cable lubricants may be used to assist with the indoor/outdoor cable for duct installation.
 3. If it is not practical to bring a reel of cable to the installation site, then utilize a standard figure 8 procedure to lay the cable out prior to pulling in duct. This helps avoid cable twisting.
- E. The PE-jacketed outdoor cable is rated for direct burial but for long-term reliability is recommended installing below-ground cables in conduit/ducts.
- F. Powered Fiber Cable is not rated for aerial self-support thus cable lashing is recommended.
- G. Use only a typical pair of wire strippers to access the powered fiber cable and, optionally, a wire cutter or snip.
- H. In cases where it becomes necessary to prevent shrink back and enhance coupling the additional buffer tube coupling can be achieved by placing slack or coupling coils at each splice closure or optical tap.
 1. The size of the loop should be based on the unloaded minimum bend radius of the cable.
 2. Laboratories testing and aerial installation test site demonstrate that a total of 5 loops on the input and 5-½ loops on the output adequately enhances the coupling to prevent buffer tube movement and provide proper entry into and out of the tap per Figure 1 below.
- I. For buried conduit/duct installation, the polyethylene PE-jacketed outdoor-only rated cable is recommended.
- J. The LSZH/riser rated indoor/outdoor cable may also be installed in ducts, however, frictional forces are greater for the indoor/outdoor cable and, therefore, achievable distances may be less.
- K. Standard cable lubricants may be used to assist with the indoor/outdoor cable for duct installation.

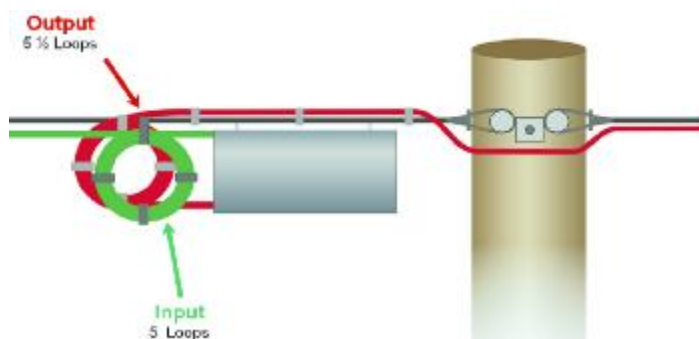
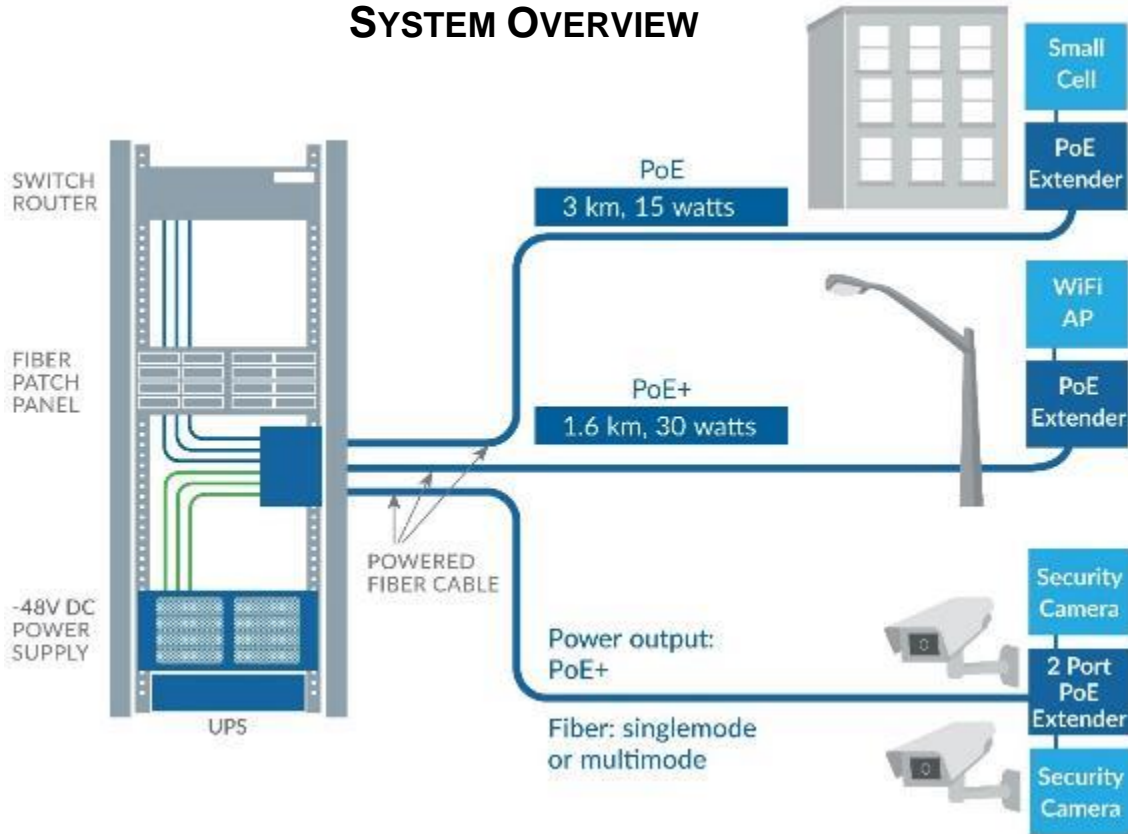
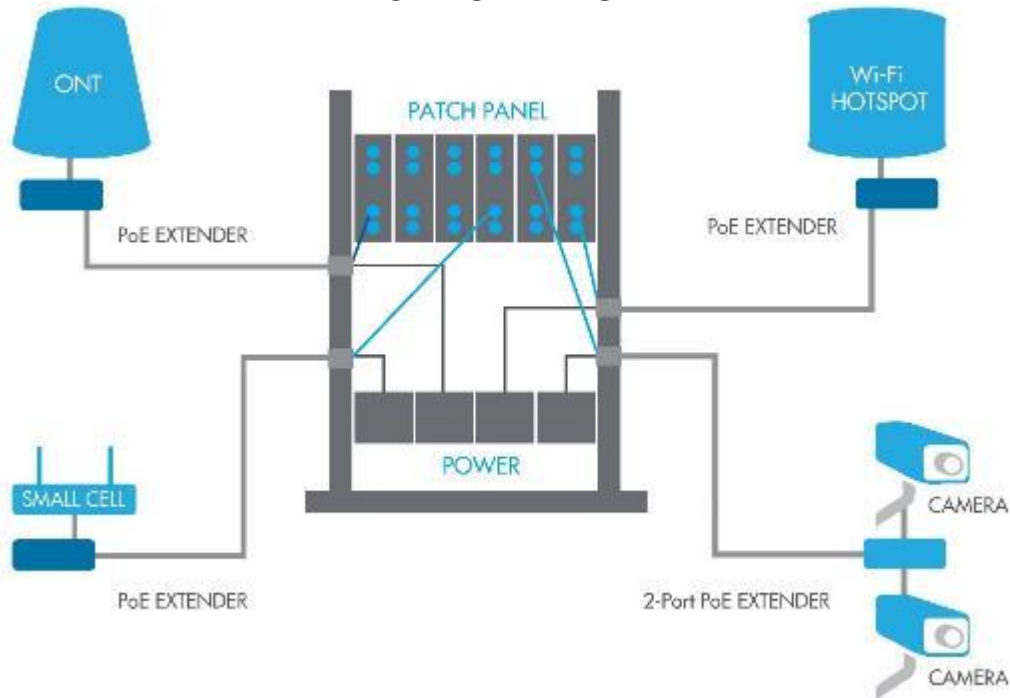


FIGURE 1 – EXAMPLE OF COUPLING COILS

SYSTEM OVERVIEW



APPLICATION DIAGRAM



END OF SECTION



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