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Powered fiber cable system technical overview:

Hybrid optical fiber system for extending
Power over Ethernet (PoE)

This document is intended to describe the purpose and function of the CommScope powered fiber cable system used in conjunction with the PoE extender. It will provide an overview of what options are available and highlight issues to consider for deployment.

Application

Deployment of HD cameras, Wi-Fi access points, optical network terminals, small cells (picocells, femtocells, metrocells, etc.) and other network access devices can be difficult, especially in outdoor environments. Many of these devices accept a Power over Ethernet (PoE) input for power and communications. However, the PoE distance limitation of 100 meters can cause difficulties with network planning. Also, power is not always readily available in the precise locations where device placement is needed to improve 4G LTE and/or 802.11 Wi-Fi coverage for wireless networks, such as on the sides of buildings, lamp posts, etc. In these situations, it is typically necessary to run power to the desired location prior to installing the devices. Also, any concern about who pays for that power and how it is monitored requires wireless network operators to negotiate with local utility companies and building owners. All of this adds time and money to the installation of network access devices.
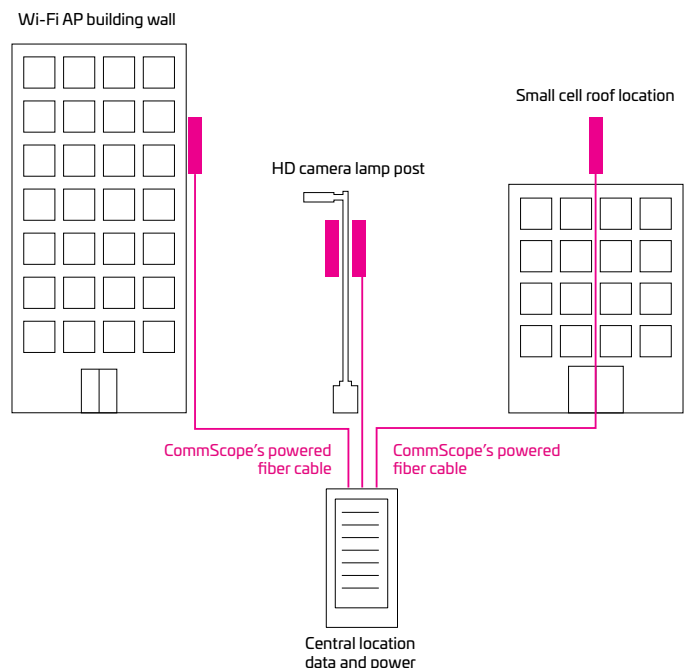
CommScope has developed a solution that combines power and optical fiber communications into one system, eliminating the hassles and extra expense associated with powering typical low-power network devices.

Features

· Hybrid optical fiber and copper cabling with outdoor and indoor/outdoor versions

· Incorporates dc/dc conversion technology to simplify dc line powering calculations

· Primary, secondary, and tertiary electrical protection

· Media converter for delivering PoE and PoE+ capability

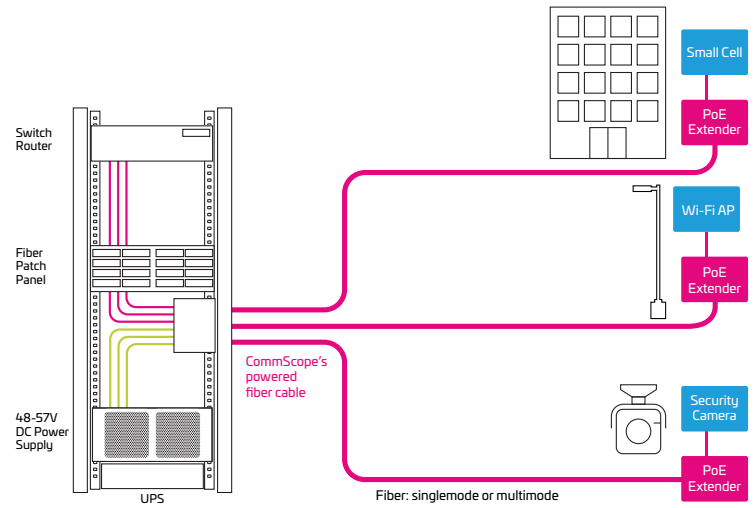· SELV and NEC Class 2 compliant

Applications

· Security cameras

· Wi-Fi access points

· Wireless network small cells

· Optical network terminals

· Digital signage

· Emergency phones

· Additional devices needing PoE signal

Wi-Fi AP building wall

Small cell roof location

HD camera lamp post

CommScope's powered fiber cable

CommScope's powered fiber cable

Central location data and power

System overview

The CommScope powered fiber cable system is a hybrid fiber/copper system that installs like a "long extension cord" and is composed of the following system elements:
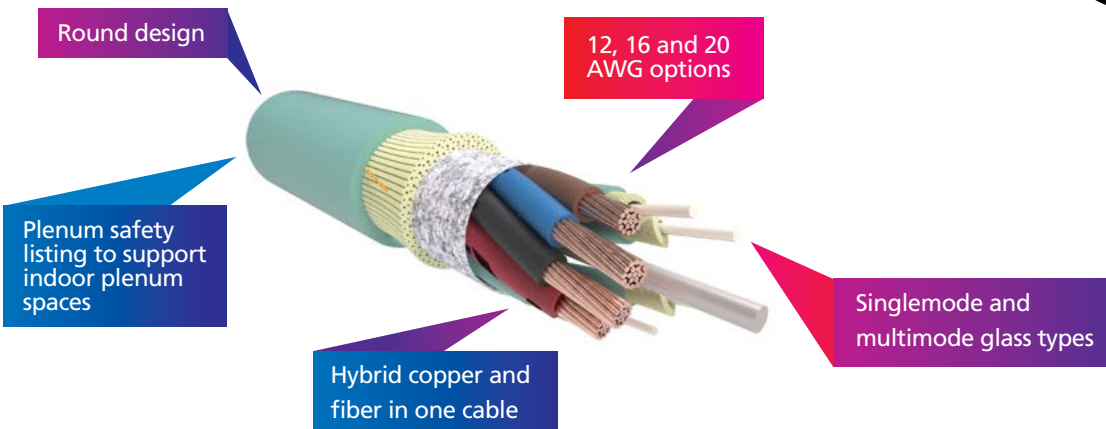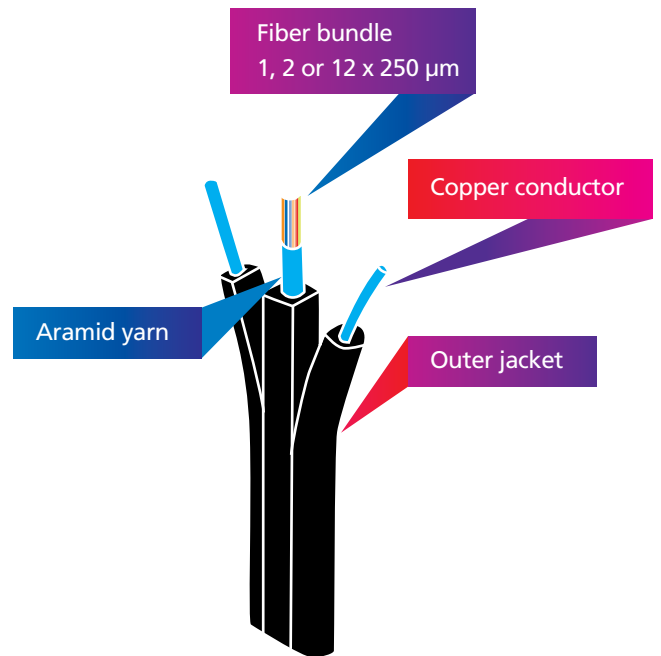
- Hybrid cable
- PoE extender
- Power supply
- Power transmission management

Switch Router

Fiber Patch Panel

48-57V DC Power Supply

UPS

CommScope's powered fiber cable

Fiber: singlemode or multimode

Small Cell

PoE Extender

Wi-Fi AP

PoE Extender

Security Camera

PoE Extender

Hybrid fiber/copper cabling

Hybrid copper and fiber in one cable simplifies installation—saving material, labor costs, space and time.

- 12 AWG, 16 AWG and 20 AWG conductor size options
- From one to 12 optical fibers, G657 A2 singlemode or OM3 and OM4 multimode
- Outdoor-rated polyethylene (PE), indoor/outdoor low smoke zero halogen (LSZH/riser) and plenum rated options
- No special cable access tools needed for flat style cable & uses commonly available flat cable installation hardware

Fiber bundle
1, 2 or 12 x 250 µm

Copper conductor

Aramid yarn

Outer jacket

Round design

Plenum safety listing to support indoor plenum spaces

12, 16 and 20 AWG options

Hybrid copper and fiber in one cable

Singlemode and multimode glass types

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PoE extender

· dc/dc conversion electronics

· Simplifies electrical engineering calculations by converting the received voltage to the correct dc voltage level for PoE output (48 VDC)

· SELV and NEC Class 2 compliant

· IP68 sealing—Enclosures are designed for outdoor installations with protection from moisture and the environment

· Houses electronics, power termination, fiber management, and cable termination

· Unobtrusive installation

· 60W 2-port variant enables 2 PoE or PoE+ devices to be connected via one hybrid cable

· 60W single port variation supports 802.3bt, Class 6 power levels. It can be equipped with SPF+ transceivers, and deliver 5 Gbps Ethernet over the copper port

Surface Mount Box

· Supports structured cabling labeling and administration

· Protects your powered fiber cable and connections

· Provides a clean end point to terminate new indoor plenum powered fiber cables

· Supports multigig Wi-Fi access points

· Supports new and existing powered fiber cables

Power and fiber distribution elements

Power Express power distribution chassis

- · 1 rack unit height, 19-in or 26-in standard rack mount

- · Up to four (4) distribution modules per chassis, each with eight (8) dc output channels

- · Each output capable of providing 100-watt dc power

Slimline Power System rectifier chassis

- · 1 rack unit height, 19-in or 26-in standard rack mount

- · Up to three (3) rectifier modules per chassis, each providing up to 1600-watt dc power

System configuration guidelines

The power supply should 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 120 VAC, 240 VAC, or 48 V UPS power available.

The system has been designed such that there is no need for dc voltage drop calculations and/or system input modifications in order to deliver the correct voltage and power levels to the network device.

Parameters requiring consideration to deploy the system are:

1. The distance from power supply to the network devices - this is important to determine the cable conductor size.

2. The maximum power consumption of the network devices - the PoE standards define power consumption of the powered device (PD) in eight classes, or power levels. In order to determine system performance, it is necessary to understand the actual power consumption of the end point devices.

3. How many devices will be deployed - if multiple devices are going to be deployed at a single location, it may be possible to support the devices with the two port extender, potentially reducing CapEx and network switch port utilization.

4. Installation considerations of the cable - the hybrid cable is available in outside plant, indoor/outdoor LSZH/riser, and indoor plenum configurations. Cable selection will be dependent on the intended installation environment.

5. Fiber management options - CommScope supports a complete portfolio of rack- and wall-mounted splice and patch solutions to connect the powered fiber cable system to your fiber network.

Power supply options

The CommScope recommended power supply is modular, with expansion capability to four modules. Each module can support powering up to eight hybrid cables. If eight or fewer devices are to be deployed initially, then only one module is needed. To power up to 16 devices, add a second module. Three modules are required for up to 24 devices. Four modules are required for up to 32 devices.

Although CommScope has thoroughly evaluated and tested one particular power supply from a major manufacturer, other power supplies from different vendors may be used. Please consult CommScope before utilizing such power supplies, as the voltage output of these may vary—affecting the maximum system distance achievable.

Determine the correct rack width, 19-in or 26-in.

Cable options

To determine the appropriate cable type, three areas need to be addressed.

   a. Installation environment will drive the flame safety and environmental rating requirements of the cable.

   b. Transceiver type will determine the fiber type and fiber count needed in the cable.

   c. The power supply equipment, powered device consumption and distance will drive the selection of wire gauge.

CommScope provides the Powered Fiber Calculator, an online tool, to help determine and validate design choices.

PoE extender

The PoE extender is designed to drastically simplify the electrical calculations normally needed for determining power level versus distance, copper conductor sizes, etc. When the PoE extender is installed with the powered fiber cable, simply follow the maximum rated distances specified in the Powered Fiber Calculator. The dc/dc conversion circuit in the PoE extender automatically compensates for line voltage drop and corrects to proper PoE output.

The PoE extender is designed to accept any standards-compliant small form-factor pluggable transceiver (SFP) for fiber termination. When installing the PoE extender in an unconditioned environment, extended temperature range or industrial temperature range SFPs should be used. The selection of multimode or singlemode transceivers will be driven by customer preference, and drive the fiber type included in the powered fiber cable.

The one-port and two-port PoE extenders include 802.3at-compliant hardened RJ45 ports. CommScope has designed the PoE extender to power/communicate for a standard channel from this port, as specified in the applicable standards. This allows for the PoE extender to be located remotely from the end device and still function properly. This copper link length is fully described in the Powered Fiber Calculator.

CommScope has worked with a variety of companies to ensure proper operation. In addition, CommScope maintains a Powered Fiber Cable System lab to support proof of concept and developmental activities.

Installation considerations

Cable access—outside plant and indoor/outdoor cable

These powered fiber cables are constructed in a three-leg flat design. The copper conductors are positioned on each side of the fiber unit. The cable can be easily separated using only a typical pair of wire strippers and, optionally, a wire cutter or snips.

In the telecom room, the copper and fiber legs are typically separated in the vertical cable management and routed to their respective power supply and fiber enclosure.

At the PoE extender, the cable legs are separated before entering the extender through the weather-tight gland.
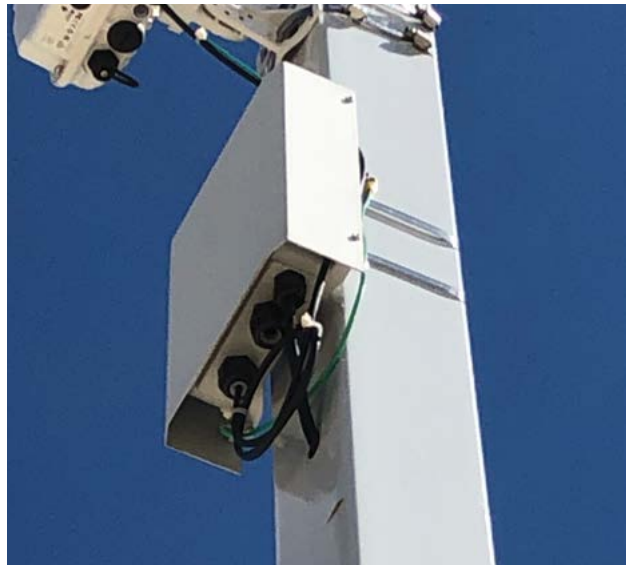
Cable access—indoor cable

These powered fiber cables are constructed in a more traditional round cable design. The copper conductors and fiber units are stranded together under a common outer jacket.

Standard cable access tools are required to separate the jacket and access the internal components.
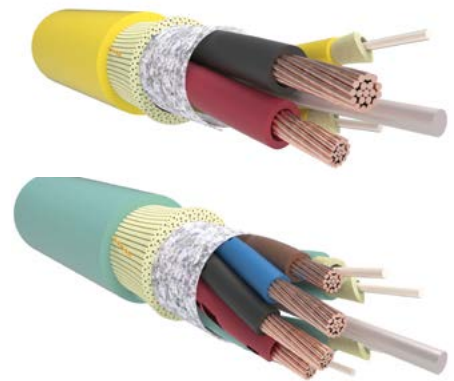
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