YOURx™ Multi-Purpose Terminal (MPT)

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Fiber deployments come in different shapes and sizes and are driven by a variety of motivating factors. Some are most concerned with the least upfront construction costs. Others are more concerned with the total cost of ownership. The conventional hardened fiber optic connector (HFOC) terminal and drop solutions designed for massive fiber deployment projects work well in some situations, but are certainly not the optimal choice for every fiber deployment. Attempts to try and force-fit this single style solution for every type of fiber customer is a simply not wise.

Over the last ten years, Clearfield has been designing flexible fiber termination and distribution systems to fit applications based on the fiber deployment customer's business goals. No two networks are exactly the same. What works well for one customer is not necessarily the best choice for another.

The new YOURx Multi-Purpose Terminal (MPT) from Clearfield elevates the concept of flexibility to a level yet to be experienced in fiber deployment designs. In the same way that the Clearview Cassette can be configured in multiple ways, the new Multi-Purpose Terminal is a uniform outside-plant (OSP) rated housing that efficiently and effectively fulfills virtually any drop fiber termination need. The options for connectors, splicing and optical components permit limitless configurations.

What Makes Up the MPT?

The basic building block of the YOURx MPT includes the base and dome. The current base is configured with eight 14mm FlexPort connector receptacles. See illustration below.
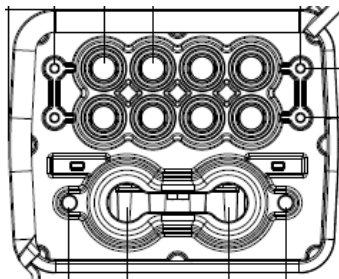
These FlexPorts accept 14mm Microduct, as well as factory-installed FlexPort Connectors – which readily fit Clearfield drop cable and bulk cable solutions with an air-tight, water-tight seal. The base also has a mid-span outside plant (OSP) cable insertion point to bring the OSP cable sheath into the terminal for splicing inside the terminal when needed.

The 14mm ports are large enough to accept two LC connectors through each port. This is beneficial as many new applications, such as 5G small cell radio sites, require two fibers for each radio. Duplex drop cables from the terminal can be connected out to these radios. Another common two-fiber application is business class services — one fiber for transmit and another for receive.

The terminal is sealed by clamping the dome to the base with a simple one piece latching mechanism. Virtually every OSP technician is familiar with this sealing style. The field assembled base and dome design are an important innovation over traditional HFOC-based terminals. Most HFOC-based terminals are factory sealed, making access to interior fiber connectors virtually impossible. Since the MPT has a removable dome, access to the rear of individual connectors for cleaning and maintenance is simplified.

A key element of the MPT is the backplane contained inside the terminal and attached to the base. This backplane has a removable adapter faceplate which is important for ease of cleaning and inspection.

The backplane, with its two-sided design provides a compartment for buffer tube or optical component storage and another for patching (and splicing if desired).

The flexibility to choose from a variety of fiber connector types is an added advantage over traditional HFOC terminals. The MPT adapter plate can be configured to accept either 8-SC, 16-LC or 8-MPO connectors. The MPT also has the ability to mix and match connectors within the same terminal—a valuable feature as well. Some customers may want to have SC terminations for FTTH and LC connectors for fiber-to-the-business or small cells. Some options for the MPO connectors offer unique capabilities.
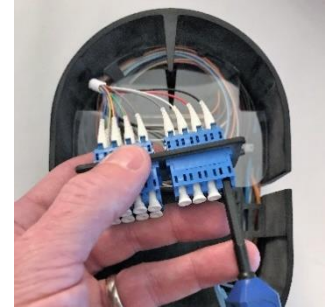
Mounting the MPT in any environment is key design feature. The MPT can be installed on a strand, attached to a pole, attached to a wall or contained within a pedestal. Since it is fully sealed, it can also be placed below grade, in a similar fashion to a splice case.

Terminal Applications

Patch and Splice

One of the most notable features of the MPT, unlike most other fiber terminals available today, is the patch and splice (in-terminal splicing) application. Instead of having a separate splice case and terminal, these two items are combined into one compact housing. For customers that have their own splicing crews, this is a very attractive solution. When placing OSP cable, the provider can simply leave loops of fiber periodically throughout the fiber pathway and come back later and place the MPT terminal at those locations.

Here's how it works. By utilizing the OSP cable entrance area on the base, the cable sheath gets brought into the terminal for splicing. If the technician is not going to be splicing all the fiber inside the terminal (dead end), the tech can remove the outer cable sheath and pass the buffer tubes through the mid-span plate and sealing gel. The terminal will accommodate cables up to a diameter of .70 inches. Operators can mid-span the buffer tube for a certain number of fibers and express the rest to the next location. The large buffer tube storage area can accommodate up to eight feet of buffer tube slack. If ribbon fiber is being used, even higher lengths can be accommodated.

The traditional method of deploying fiber terminals is with a pre-spliced tail installed into the terminal along with an external splice case. These type terminals are referred to as "Patch Only" since splicing is not performed inside the terminal. The blunt end of the tail is pulled back to a central splice point (typically a splice case) where several terminals get spliced to the main distribution fiber. When using this traditional method, the Multi-Purpose Terminal is provided with a stubbed tail in either flat drop or round fiber cables. Whereas most other fiber terminals are only available in a flat drop style cable, the MPT offers the option to use a rodent-resistant, armored tail which can easily be located using the metal shield. Cable stubs for the MPT can be ordered in various lengths from the factory. Since these patch-only types of terminals require an external splice case, most customers elect to opt for the patch and splice version discussed earlier in order to reduce costs.

MPO Connectivity

A recent trend has been to deploy terminals with MPO (Multi-Fiber Push-On) connectors. In this application, the Multi-Purpose Terminal is provided with an MPO receptacle on the terminal and the feeder fiber tail is shipped separately. This allows the feeder fiber tail to be easily deployed off of a reel stand without having the terminal head attached to the reel. Once the feeder tail is pulled back to the splice point, the MPO is easily installed into the terminal to light up the ports inside the terminal.

In many cases, all the fibers in the feeder tail will terminate inside the terminal. For example, an eight-fiber feed tail would have eight corresponding drop fiber ports using either SC or LC connectors inside the terminal.

MPO for Shifted Terminal Network Design

In other cases, the service provider may want to drop a certain number of fibers at a given terminal and express the unused fibers to additional terminals further down in the network. This can easily be accomplished by using what Clearfield calls a "shifted" style of terminal deployment. In a shifted design, an incoming MPO connector will enter the Multi-Purpose Terminal, and inside the terminal, the designated number of fibers get dropped off. The unused fibers are then expressed to the next terminal by using a secondary, outgoing MPO connector. The internal configuration on which fibers will be dropped off and which ones will be expressed through is pre-formed in the factory. This allows for one common cable and for the terminal to be utilized anywhere in the network. An example of one of these applications is shown below.
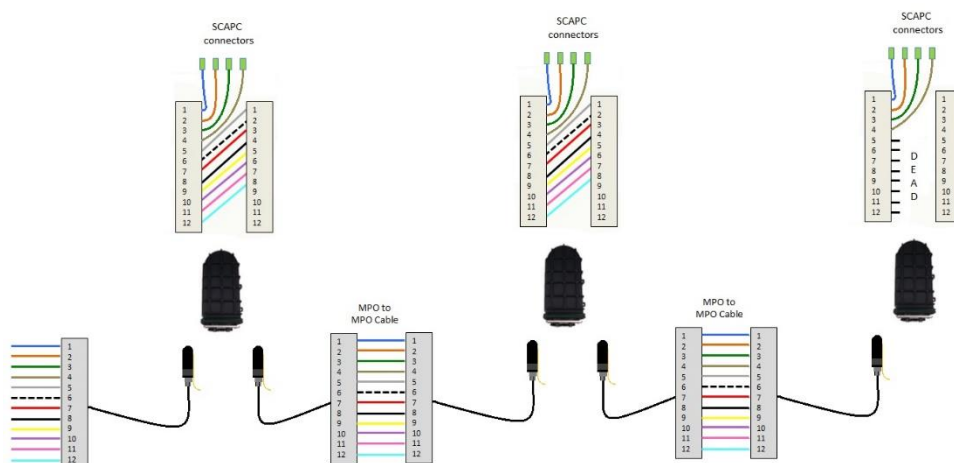
Two key advantages of this system are:

- Only one standard 12-fiber MPO cable is needed between terminals, reducing the number of technicians needed to deploy the terminals.
- MPO cables allow a small microduct between terminals instead of large conduit pipes. If a customer is most interested in reducing splices and labor, this is the optimal design.

MPO for Hub & Spoke Design

As mentioned earlier, the Multi-Purpose Terminal can accommodate up to eight MPO connectors. While this may seem like a lot of MPOs, this is the optimal fit for some applications. One such design is the "Hub and Spoke" concept. In this design, a hub terminal (shown in blue below) has a 96-fiber tail terminated to eight, 12-fiber MPO connectors within the terminal. The 96-fiber terminal tail gets spliced to the main trunk fiber in a FSC Splitter Cabinet. The green terminals shown in the illustration get connected to the master terminal via an MPO–to-MPO cable assembly. *The green terminals ONLY need to be deployed when a customer in that area requests service.* When a technician is dispatched to provide a drop to the customer, just install the remote terminal and run a new MPO-to-MPO assembly back to the hub terminal. Since the Multi-Purpose Terminal accepts pushable fiber and microduct, a *single technician* can push the MPO cable back to the terminal *eliminating* the need for a secondary tech. This type of terminal layout is highly desirable for providers who seek to align their capital investment with subscriber revenue.
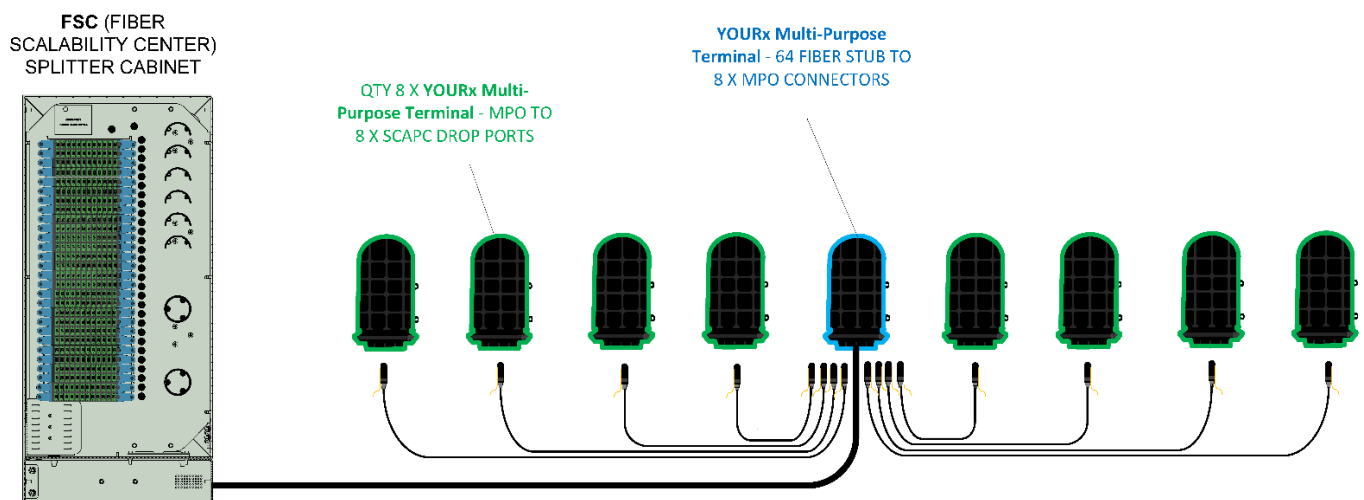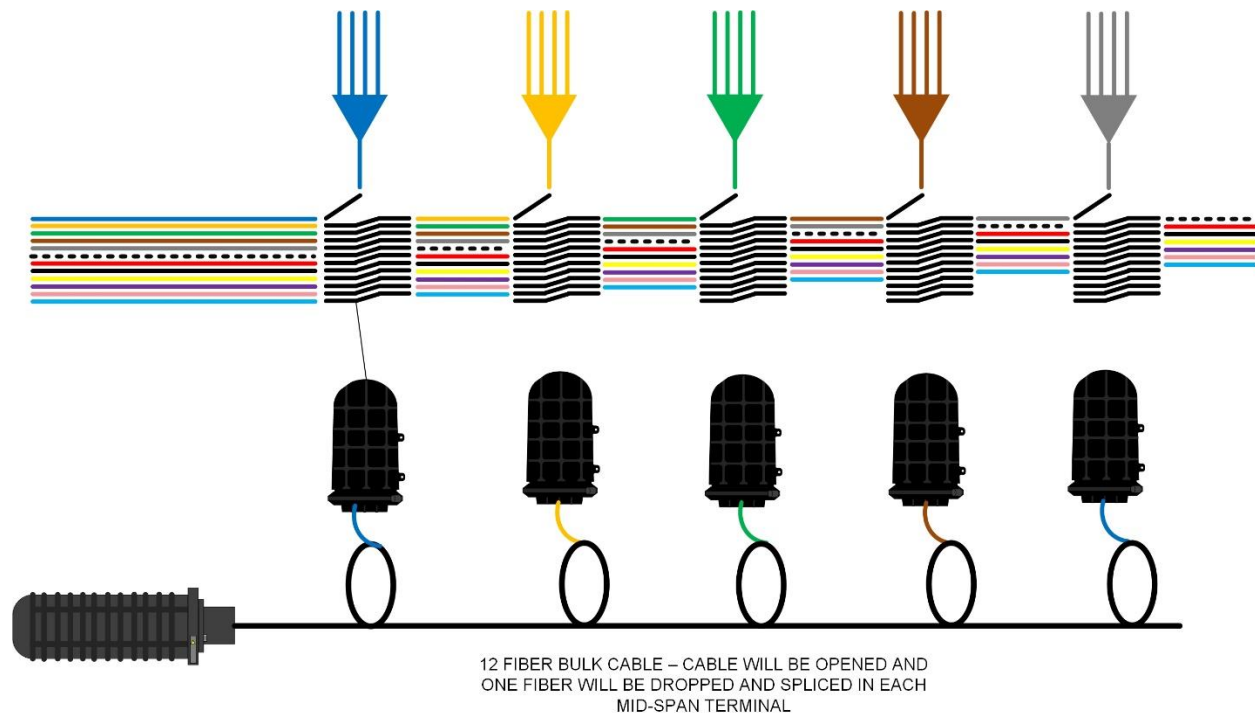

Optical Components

Splitters

The MPT's flexibility can also accommodate those providers who want to deploy a distributed split network. The Multi-Purpose Terminal accommodates optical splitters in the rear chamber. The inputs to these splitters can either be hard spliced or terminated with an LC or SC connector. The MPT can even integrate the shifted MPO design discussed earlier and create a shifted, distributed split design. In this

case, a single fiber gets dropped at each terminal, lighting up a splitter with the rest of the fibers continuing onto the remaining terminals.

12 FIBER BULK CABLE – CABLE WILL BE OPENED AND ONE FIBER WILL BE DROPPED AND SPLICED IN EACH MID-SPAN TERMINAL

WDMs

Customers who are experiencing fiber exhaust and don't want to go to the expense of running additional fiber cables may find the MPT integrated with WDM's an attractive solution. The ability to place hardened WDMs (Wave Division Multiplexers) inside the terminal is a huge benefit because it creates multiple light paths or wavelengths on a single fiber. This is especially important in front haul networks for 5G applications as well as Fiber-to-the-Business (FTTB) for MSOs. As with the optical splitters mentioned earlier, these WDM components can be installed into the rear compartment of the Multi-Purpose Terminal and the common fiber can be spliced or terminated with a connector. At any location in the network, the MPT can provide immediate fiber exhaust relief. Since most WDM FTTB applications require two fibers (one for TX and one for RX), the ability of the MPT to deploy duplex (two-fiber) LC drops is a benefit. A tech installs two LC fibers into the appropriate wavelength ports on the WDM within the terminal and runs a connectorized drop into the business for a full plug-and-play solution—no splicing required.

5G/Small Cell

The next big wave of fiber deployments has commenced. 5G and Small Cells are driving this latest surge in fiber construction. The Fiber Broadband Association estimates that 1,390,816 miles of fiber cable will be required to provide full 5G service to just the top 25 MSAs (Metropolitan Statistical Areas) in the United States[1]. In the previous ten years or so, FTTx was driving much of the fiber construction in the world. Most of these projects used expensive, proprietary HFOC connector solutions when deploying a

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[1] "The Road to 5G Is Paved with Fiber", Fiber Broadband Association, December 2017

plug-and-play network. Many of those deploying broadband networks came to regret committing to this style of connector. Long lead times, high prices and limited functionality were a few reasons these broadband providers developed buyer's remorse.

With small cell and 5G deployments, there is an opportunity to reset and begin again. Having learned many lessons during FTTx, our industry can make better, more informed choices this time around. New products like the YOURx Multi-Purpose Terminal challenges the long-standing view that there is only one way to build a plug-and-play fiber network.

In the past, most FTTx plug-and-play fiber networks were designed for the delivery of a single fiber to a residence. In 5G, many applications require two fibers to each radio. One solution is to keep using expensive HFOC-style connectors in these small cell applications, but place MT/MPO-style ferrules inside the housings instead of single fiber SC-style ferrules. The generic term for these multi-fiber connectors is HMFOC. These MT/MPO connectors allow the two fibers to mate in a single connector housing. While the MT/MPO is a great connector for 12 fibers, it is simply overkill for a 2-fiber interface. Another concern is the HMFOC is more expensive and has a higher loss than single fiber connectors.

A viable alternative to the MPO in two-fiber radio applications is to use two standard LC connectors instead of an MPO-style connector. The new YOURx Multi-Purpose Terminal from Clearfield allows the use of standard LC connectors. The base of the terminal has eight FlexPort fittings that allow standard size LC connectors to easily pass through and into the terminal. Instead of the higher insertion loss (IL) values associated with MPO, the FiberDeep LC connectors from Clearfield provide a maximum IL of 0.2 dB--much less than standard MPO connectors.

Summary

The flexibility of the Multi-Purpose Terminal is something the industry has been seeking for many years. Many terminal solutions are available on the market today. Some are ideal for massive deployments that require only a specific configuration. Others prevent in-terminal splicing and/or optical component (WDM/Splitter) configurations. However, this article demonstrates there is no longer a need to limit network designs to fit into one type of fiber termination equipment. The YOURx MPT from Clearfield allows the network to be designed with flexibility to meet business goals saving labor dollars and consolidating splicing/termination locations for the most economical network design.