



Properly Training Next-Generation Technicians on Next-Generation Products



Properly Training FTTx Technicians on Next-Generation Products



With all the issues and considerations associated with pushing optical fiber and equipment closer to the end user, it's imperative that carriers don't neglect their most important resource – the network technician. Although some responsibilities may differ with each section of the fiber-to-the-premise (FTTP) architecture, there are also some basic procedures that apply from end to end.

It's also important to realize that many technicians have honed their skills amid different types of telecom architectures, such as copper or hybrid fiber-coax (HFC). These technicians have already developed many techniques that are different than in the optical environment where proper cleaning and handling are critical to the operation of the system.

Even new technicians should be reminded that many seemingly tedious and repetitive procedures could impact overall network operations if not performed regularly and correctly. This paper will address a few key issues related to ensuring your technicians understand the “how” and “why” for practicing good techniques and procedures necessary for working in the optical environment of FTTP.

New process and procedures

Many technicians have been around the telecommunication industry for years, acquiring lots of experience that makes them valuable assets to the organization. However, some of these same technicians have no experience with optical fiber. A willingness to add the unique characteristics of working with fiber to their knowledge arsenal is necessary, if not critical. For instance, some techniques that worked well in a copper environment may not necessarily apply to fiber architectures.

We'll look at the central office (CO) of the FTTP first – specifically, the point at which it interfaces with the optical line terminal (OLT). As with much of the FTTP architecture, a key issue in the CO is the cleanliness of connectors. It cannot be overemphasized that any time two connectors are mated, each must be properly cleaned. Any failure to clean any connector invites contamination that can affect performance.

In addition to good cleaning practices, the proper routing and management of patch cords within the CO is also necessary. The fiber distribution frame located in the CO can have as many as 1728 fiber terminations. A fiber distribution frame that enables quick and efficient turn up, testing, and reconfiguration of the network begins with technicians applying sound cable management practices.

Technicians require thorough training on four key aspects of cable management: bend radius protection, proper connector handling, cable routing paths, and physical protection. Teaching technicians to ensure all fiber bends are protected by using the fiber frame management properly, will ensure long-term optical performance and the ability to support future high-speed services.

Physical connector handling inside the fiber distribution frames, such as when removing, cleaning, or replacing a connector, can be difficult in a high-density fiber frame. With limited access, even experienced technicians may be tempted to overlook proper cleaning or handling in the interest of time. For that reason, some frames are designed to allow tool-less access to both front and rear connectors without disturbing adjacent fibers or connectors, enabling easier access and a higher likelihood that technicians will adhere to proper handling and cleaning practices.

Technicians should also ensure proper routing paths are followed within the fiber distribution frame system. The quality of the cable routing paths within the system can be the difference between congested chaos and neatly-routed, easily-accessed patch cords. It's often said that the best teacher in fiber routing techniques is the first technician to route it properly. Conversely, the worst teacher is the first to use improper techniques since subsequent technicians are likely to follow his lead.

Technicians must also be aware of physical safety issues resulting from high-power lasers used in the network. Connectors should never point directly at technicians. Since lasers are infra-red, it's important to take precautions when exposure is possible. Designs that have connector ports pointing side-to-side rather than straight out of the panel, or that utilize some sort of shutter system, can increase eye protection for technicians, regardless of their level of training or awareness.

Technicians in the field

Technicians with responsibilities for the outside plant portions of the network are required to abide by similar practices, standards, and procedures carried over from the CO. Since fiber distribution hubs (FDHs) are designed with components similar to the CO equipment fiber frames, the same cleaning and fiber management practices should be employed. As previously stated, since many technicians have only worked in the OSP and never

in the CO, many common CO practices are new to them, particularly in transitioning from copper to fiber.

Most carriers today are migrating to a connectorized FDH as opposed to straight spliced cabinets. Better loss characteristics achieved by new connector and splitter products have helped achieve acceptable loss budgets while adding the flexibility advantages allowed through a connectorized architecture. In terms of technician skill sets, connectorized inputs are much more cost effective since splice technicians are not required and connections can be made without the need for a splicer.

Additionally, easier test access is enabled at the FDH. For example, a technician can simply unplug the connector at the test point, connect the test equipment, conduct the appropriate test procedure, and then replug the connector back into the original port when finished. Again, it's worth reemphasizing that cleanliness of the connectors remains paramount. ADC always recommends cleaning both connectors on the distribution interface – on the distribution panel and at the splitter output.

Also, proper patch cord routing from the splitter parking lot to the distribution port is important to avoid bend radius loss issues. Although fiber patch cord routing is critical and instructions are clear and concise on ADC products, it's still not uncommon to see cabinets in the field that have been improperly managed.

Figures 1 and 2 show the difference between poor fiber routing and proper fiber routing. It's easy to see which cabinet will enable future technicians to locate and manipulate specific fibers when turning up service or reconfiguring the cabinet. Again, whether it's a case of untrained technicians or simple carelessness, once the first technician gets sloppy and ignores proper procedures, chances are good the next technician will follow that lead.



Figure 1. Poor Fiber Routing



Figure 2. Correct Fiber Routing



Close up shows fibers improperly crossing over one another causing a tangled mess.



Close up of same area shows fibers routed correctly.



Poor Cable Routing



Close up shows fibers improperly crossing over one another causing a tangled mess.



Correct Cable Routing



Close up of same area shows fibers routed correctly.

Even though the first technician in the cabinet may not see proper fiber routing as an important issue since there are only a few customers served by the cabinet, as more customers are added, the proper routing technique takes on greater importance. In fact, training technicians to adhere to proper routing procedures early will make new connections much easier and mitigate the potential for future network problems.

Test equipment familiarity

Finally, technicians require proper training on test equipment. For example, although most technicians receive training on the optical time domain reflectometer (OTDR) and know how to use the machine, they may not be sufficiently educated on evaluating exactly what they are looking at when viewing the trace. There is often a fine line between connecting or operating the equipment and evaluating the data.

For instance, a technician may test from Point A to Point B across half a mile of cable with several splices and connection ports. A normal loss from a particular connection point may lead a less-trained technician to the conclusion that a problem exists at that point in the network. A better trained technician would know exactly where the connection point should be located and realize a certain amount of loss is expected – saving time and effort by preventing an unwarranted truck roll.

Experienced technicians will also make comparisons to the initial testing traces that were documented during the first tests on a particular link. The original test data is typically saved in a data base to enable such comparisons when loss is detected. To the trained technician, these initial test traces are a valuable reference tool for future troubleshooting and maintenance decisions.

Carriers must make it standard procedure to correctly train all their technicians, from the CO to the OSP, in proper craft practices. If every technician employs the same proper technique in connector cleanliness, test procedures, fiber routing/management, record keeping, and overall fiber handling, operational costs can be drastically reduced over the life of the network.



Web Site: www.adc.com

From North America, Call Toll Free: 1-800-366-3891 • Outside of North America: +1-952-938-8080

Fax: +1-952-917-3237 • For a listing of ADC's global sales office locations, please refer to our Web site.

ADC Telecommunications, Inc., P.O. Box 1101, Minneapolis, Minnesota USA 55440-1101

Specifications published here are current as of the date of publication of this document. Because we are continuously improving our products, ADC reserves the right to change specifications without prior notice. At any time, you may verify product specifications by contacting our headquarters office in Minneapolis. ADC Telecommunications, Inc. views its patent portfolio as an important corporate asset and vigorously enforces its patents. Products or features contained herein may be covered by one or more U.S. or foreign patents. An Equal Opportunity Employer

103329AE 9/06 Revision © 2006 ADC Telecommunications, Inc. All Rights Reserved