

Quick-Termination Solutions for Fiber and Copper Cabling

By Vincent Barone and Adam Houston

The need to keep mission-critical enterprise applications running puts pressure on network stakeholders to maintain a robust physical infrastructure within a lean I.T. budget. With thousands of twisted pair and fiber optic links in an average enterprise network, the challenge is how to complete quality installations in the least amount of time and for the lowest installed cost. When it comes to installing these links, everyone from the designer to the installer and end user has an interest in maximizing return on investment.

One area that can have a significant impact on the cost of installation is the decision on which types of copper and fiber connectors to use. Recently numerous cabling vendors have developed quicker and easier solutions for terminating copper and fiber. These connectors and tools simplify the deployment of network services by compressing traditional field termination processes into shorter, more consistent termination steps.

This article addresses several ways that quick-termination solutions can help maximize productivity and maintain network integrity by providing fast, reliable terminations in enterprise applications.

THE BENEFITS OF QUICK-TERMINATION SOLUTIONS

Quick-termination cabling solutions are well-suited for high-volume cabling installations, such as data centers and telecommunications rooms. Several benefits that contribute toward lowest installed cost are common to both fiber and copper quick-termination solutions:

- Dramatically reduced installation times

help maximize installer efficiency and reduce labor costs;

- Consistent terminations increase system reliability and reduce the amount of potential on-site rework;
- Standardized skill sets maximize the efficiency of time spent at one site and keep highly skilled workers on the most sensitive jobs; and,
- Reduced amounts of scrap, packaging, and consumables generate less waste, lower the risk of scrap contaminating sensitive network areas, and contribute to Green enterprise initiatives.

WIRE CAP COPPER JACK MODULES: BEYOND PUNCHDOWN

Both the traditional 110 punchdown method for terminating copper twisted pair cabling and more recent quick-termination methods involve cutting the cable to length, stripping the outer cable jacket, and then laying conductors in their proper orientation. However, the punchdown method involves the additional and time-consuming steps of untwisting each individual pair, re-orienting each of eight individual wires into the proper position, and then punching down and cutting each wire into the termination block before adding the wire cap. In addition, it can be challenging to prevent pair untwist with higher-end copper cable types (i.e., Category 6 and 6A) which rely on tightly twisted pairs to meet TIA/EIA performance specifications.

In contrast, quick-termination techniques combine wire cap jack technology with specialized termination tools. The wire

Figure 1. Example of two-step copper quick-termination sequence using PANDUIT TG Jack Module and Termination Tool



Step 1 (above): All eight conductors are flush cut simultaneously within the wire cap, with scrap wire ends retained for easy disposal.

Step 2 (below): Wire cap and jack module are assembled.



cap maintains both separation of pairs and conductor twist rate integrity during termination to give improved return loss and near end crosstalk (NEXT) performance. The quick-termination of wire cap copper jack modules compresses repetitive punchdown sequences into two consistent steps: simultaneously flush cutting four-pair conductors in one motion, and then assembling the wire cap and jack module together (see Figure 1).

During the first step, the wires are seated and the cap is placed in the ter-

mination tool where all eight conductors are flush cut in one motion. The process of seating the wires in the cap requires less conductor untwist than punchdown termination methods for better overall performance (see Figure 2). The flush-cut eliminates wire stubs that can adversely impact the clean seating of the wire cap in the jack module. This represents an improvement over side-cutter tools that must lay perfectly flush against the cap to work, and helps installers reduce on-site rework by properly and consistently seating conductors and wire cap into the jack.

The second step involves setting the conductors into insulation displacement contacts through the controlled seating of the wire cap into the jack module. The controlled forward motion of the wire cap into the module places less stress on the module than punchdown methods to prevent damage and maintain consistency from one termination to the next. Some installers use channel locks or pliers to complete this step; however, crimping a jack in this manner runs the risk of damaging the jack face and/or distorting the housing due to uneven pressure across the module. The effects of such damage range from affecting link performance and system integrity to being unable to fit patch cords in the jack. Quick-termination tools apply controlled, even pressure during the second step to maintain the integrity of the jack, as well as reduce the cost associated with replacing damaged modules.

The end result is a combination of jack module and termination tool that shortens termination times and meets desired electrical performance requirements.

PRE-POLISHED FIBER CONNECTORS ENABLE NEW LABOR EFFICIENCIES

Traditional pot-and-polish fiber termination methods are often labor intensive. Field polishing of fiber optic connectors requires budgeting for polishing equipment and materials (in the form of consumables such as epoxy and lapping film) and an elevated level of training in assembly and

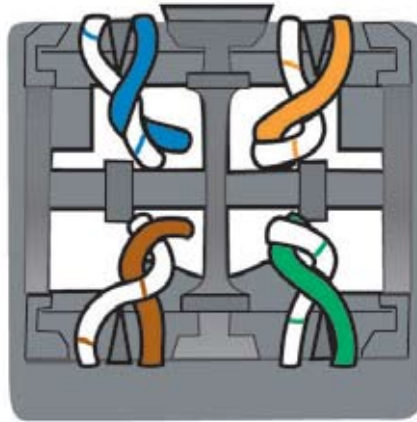


Figure 2. Schematic close-up of copper wire cap after wires have been seated and flush cut.

polishing to assure that endface geometry and finish requirements are met. Even with skilled workers on the job, the rate of link failure due to marginal terminations leads to increased rework and the expense of scrapping good connectors.

Responding to customer demand for faster and more reliable fiber terminations, the industry is moving toward quick-termination solutions that differ radically from traditional field polish methods. The most popular of these is the pre-polished fiber optic connector with a factory-prepared endface. These products are designed to eliminate time-consuming field preparation steps while retaining the desired endface quality and optical requirements to deliver link performance that exceeds stringent TIA/EIA-568-B.3 requirements (insertion loss of <0.75 dB; return loss of >20 dB for multimode fiber and >50 dB

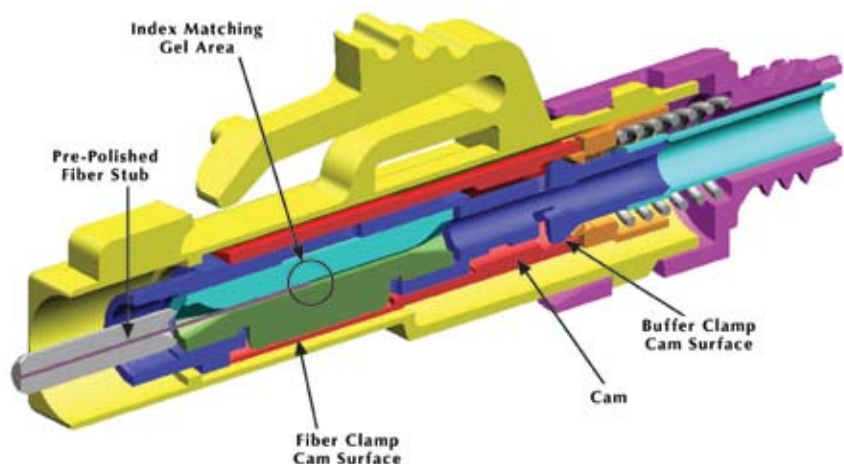
for singlemode fiber). In addition, these requirements must be achieved after a 500 mate/de-mate test with less than 0.2 dB change in insertion loss.

Pre-polished connectors contain a fiber stub that is pre-cleaved and embedded within a cam or crimp tube that contains an optical index matching gel (see Figure 3). During termination the installer strips, cleans, and cleaves the fiber cable, inserts the prepared cable end into the connector tube against the embedded fiber stub, and secures the connector with a mechanical cam or crimp. The factory-polished ferrule endface eliminates the time required for epoxy curing and final polishing, as well as the space and expense needed for benchtop polishing equipment. These connectors enable installers to reduce termination times by more than 50 percent over field-polishing methods to achieve considerable cost savings.

Pre-polished fiber connectors are available in both ceramic and composite ferrule variants, so installers have the flexibility to select the best ferrule material for the application. For example, in any dynamic (i.e. patch field) or mission critical permanent link and patch cord application, the durability of a zirconia ceramic solution is recommended. In a more static interconnect environment, such as behind the wall, at consolidation points, or in telecommunication rooms, a composite solution can be a cost-effective, standards compliant choice.

Advancements in connector design

Figure 3. Cutaway view of pre-polished fiber connector



Quick-Termination Solutions for Fiber and Copper Cabling ■ INSTALLATION

Figure 4. Handheld quick-termination tools terminate LC, SC, and ST pre-polished fiber connectors.



also help installers remedy failed connections to improve yield rates. The tools used to deploy pre-polished fiber connectors are portable, lightweight, and handheld to provide installers the flexibility to maneuver easily in tight spaces. These tools commonly terminate all LC, SC, and ST fiber connectors (see Figure 4), and incorporate

a variety of user-friendly features.

With enterprise networks growing at a rapid rate, it is crucial that stakeholders control installation costs while ensuring desired electrical and optical performance over thousands of links. Quick-termination solutions for copper jacks and fiber connectors result in significant time-savings

over traditional methods to help installers achieve consistent terminations at lowest installed cost.

Wire cap copper jack modules enable installers to replace lengthy punchdown sequences with two-step terminations. For fiber optic links, pre-polished fiber connectors enable field terminations in less than half the time of conventional connectors by eliminating the labor, equipment, and consumables associated with field polishing. Also, the small handheld form factor of quick-termination tools lets installers bring the tool close to the installation, which maximizes flexibility of movement in tight spaces.

For network stakeholders interested in completing high-volume installations with a minimum of re-work, waste, and scrap, quick-termination solutions are a welcome addition to the structured cabling toolbox. ■

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