WHITE PAPER

OPTICAL CABLE CORPORATION

Field Testing of Direct Attach Modified Permanent Links

The dramatic growth of high-bandwidth wireless access points and other IP-enabled devices, such as surveillance cameras and building automation equipment has resulted in the practice of installing direct attach links using field terminable plugs that connect directly to a device.

Currently, installers in the field are utilizing modular plugs that are intended for patch cord construction to terminate Cat5e and Cat6 horizontal cabling. This practice is difficult, time consuming, yields unpredictable performance results and is not recommended by the Telecommunications Industry Association (TIA) 568 standards. Also, these plugs do not accommodate the larger conductors utilized in Cat6A cabling. The increasing data rates of wireless access points and other devices now require a Cat6A cabling link to support 10G Ethernet. The latest IEEE 802.11ac wireless standard supports a theoretical data throughput of 6.9Gbps.

The TIA-568-C.2 communications cabling standard does not currently recognize direct attach links; however due to the growing demand for field installable plugs, industry standards such as TIA-862-A, Building Automation Systems Cabling Standard and BICSI-005D, Electronic Safety and Security (ESS) System Design do recognize the direct attach method of termination.

Two key needs for this market segment are 1) a robust, easy to install field terminable plug and 2) a clearly defined test method to provide installers in the field the capability to accurately measure the true performance of direct attach links to ensure maximum performance.

Figure 1: OCC Field Terminable Plug

OCC has addressed both of these needs with the introduction of a Category 6A field terminable plug (see figure 1) and Cat5e, Cat6 and Cat6A field plug test adapters to be used in modified permanent link and channel field testing.

Traditionally, structured cabling systems are tested in a permanent link or channel configuration as defined by the TIA-568-C.2 standard. The permanent link is comprised of the horizontal cabling and connecting hardware and utilizes a permanent link test adapter at each end of the link under test (see figure 2). The channel is comprised of the horizontal cabling, connecting hardware and patch cords and utilizes a channel adapter at each end of the channel under test (see figure 3). It is important to note that the plug connected directly to the channel adapters are not part of the channel under test and therefore the field tester manufacturers must exclude those plugs from the reported measurement results.

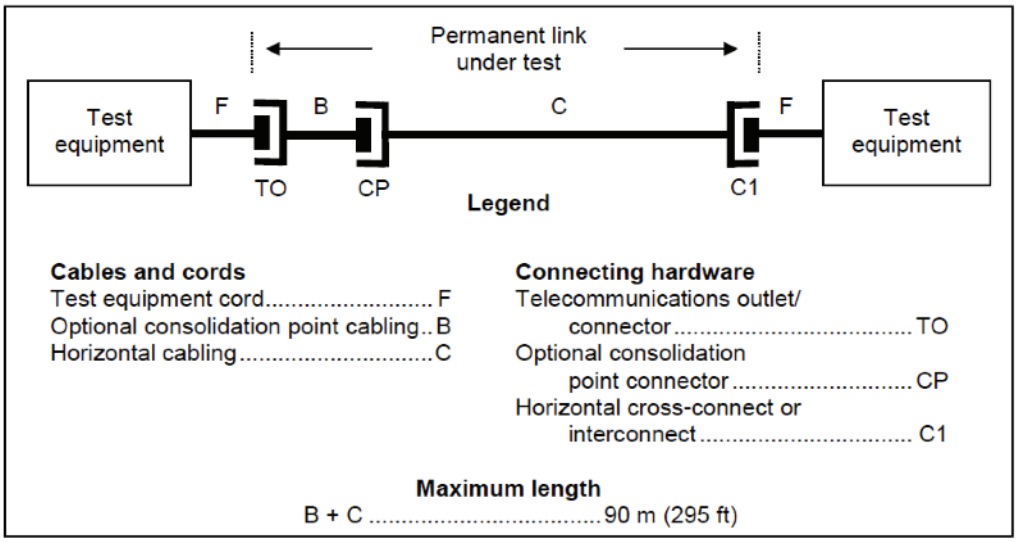

Figure 2: TIA-568-C.2 Permanent Link Configuration

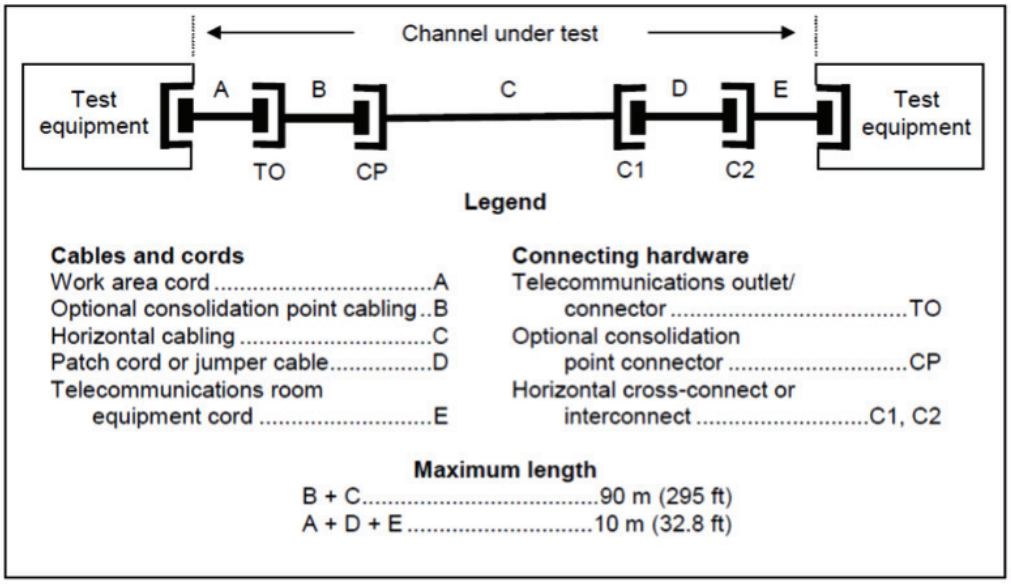

Figure 3: TIA-568-C.2 Channel Configuration

Since the direct attach topology is not recognized by the TIA, a modified permanent link configuration has become the de facto standard in the industry (see figure 4). The modified permanent link utilizes a permanent link adapter at the patch panel (near end) and a channel adapter at the field terminated plug (far end). While this test method has been recommend by vendors and has become common practice among installers in the field, the results may not be representative of actual performance. As noted above, the test instrument excludes the plug connected directly to the channel adapter from the measurement. The test results may pass with good margin even though the plug has been poorly terminated.

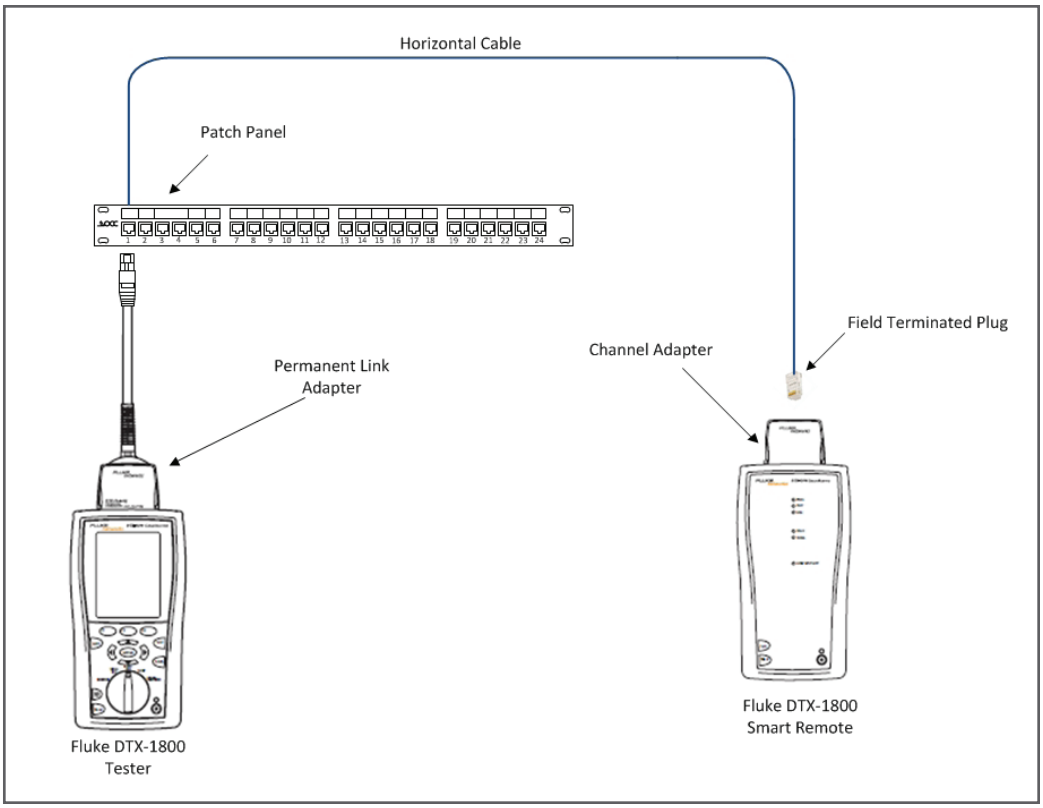

Figure 4: Modified Permanent Link Configuration

Field Testing of Direct Attach Modified Permanent Links

As a result of extensive laboratory testing and evaluation of direct attach test methods; OCC has developed a field plug test adapter that provides installers in the field the capability to accurately measure the true performance of direct attach links. The following explanation describes the current test method and the test configuration using the OCC field plug test adapter. A ten meter Category 6 direct attach link configuration was tested with a Fluke DTX-1800 using the modified permanent link test configuration described above (figure 4). The link consisted of a patch panel at the near end and a poorly terminated plug at the far end. The results show the link passed the Category 6 test requirements with good margin (see figure 5).

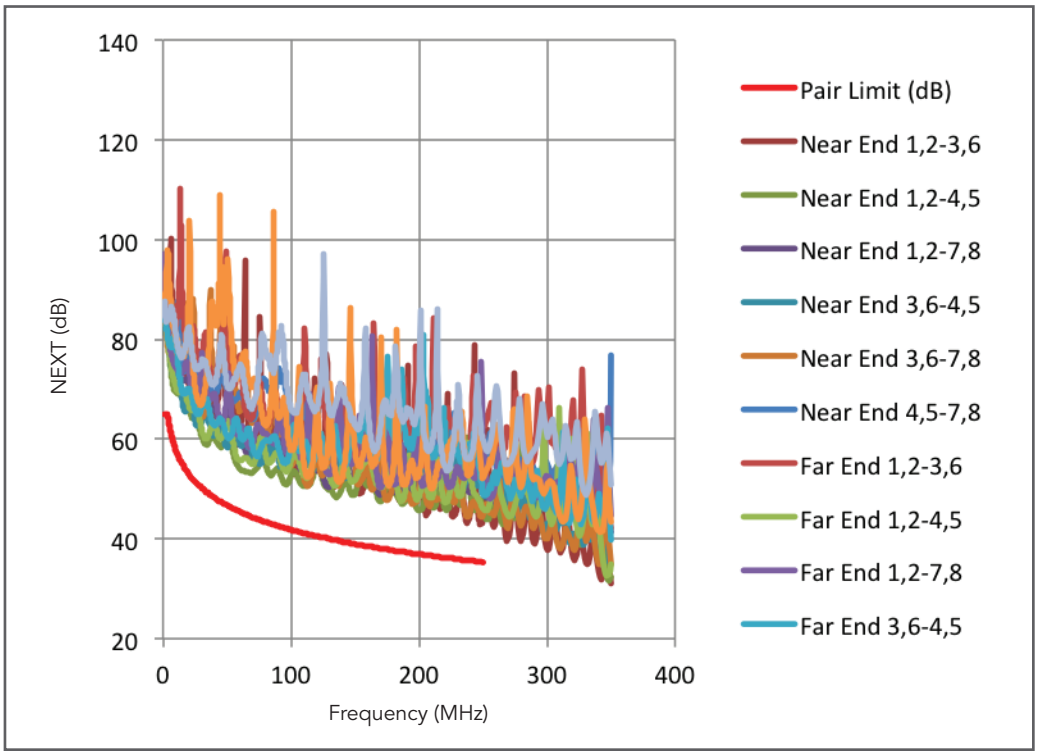

Figure 5: Common Modified Permanent Link Configuration - Poorly terminated plug

The same link was tested using the OCC Field Plug Test Adapter (see figure 6) connected directly to the Fluke smart remote channel adapter. The poorly terminated plug was connected to the jack end of the OCC field plug test adapter (see figure 7). The measured results are clearly much worse and actually fail the Category 6 link test (see figure 8).

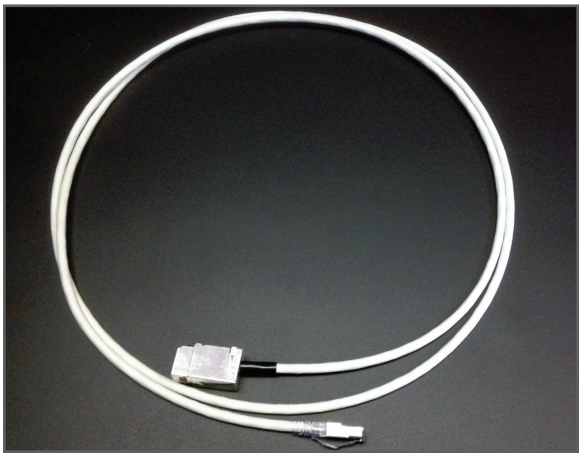

Figure 6: OCC Field Plug Test Adapter

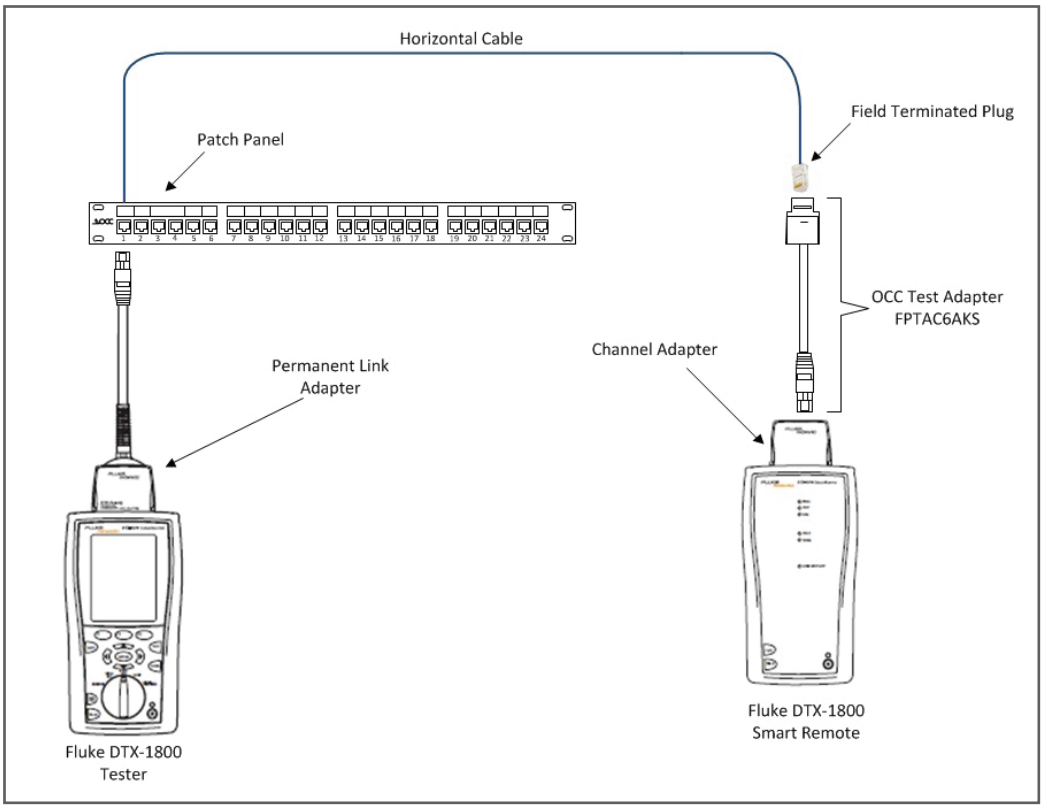

Figure 7: Modified Permanent Link with OCC Field Plug Test Adapter

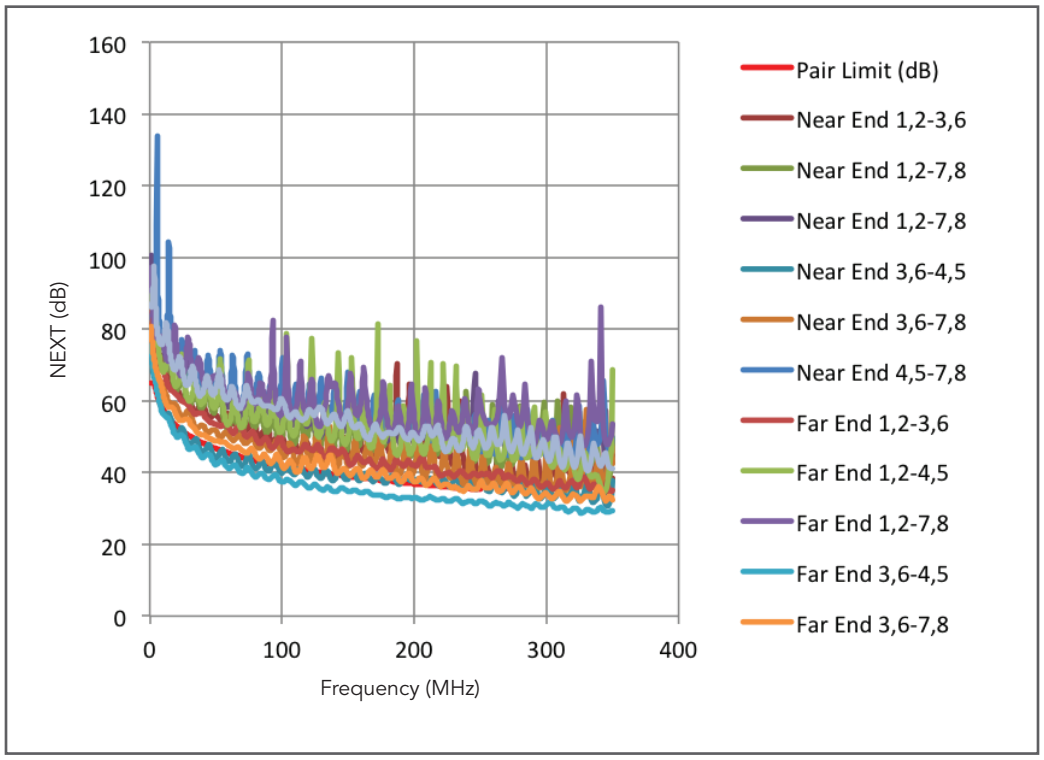

Figure 8: Modified Permanent Link with OCC Field Plug Test Adapter - Poorly terminated plug

In summary, the test results were dramatically different between the two configurations due to the fact that the poorly terminated plug was excluded from the initial link measurement without the field plug test adapter. By utilizing the field plug test adapter, the poorly terminated plug is factored into the measurement and the true performance of the link is recognized. The results show the significant impact the plug has on the overall link performance.

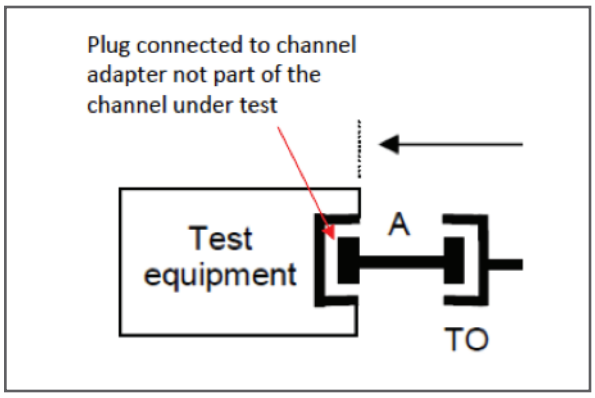

Figure 9: Channel Adapter Plug Configuration

As previously noted, OCC has introduced a field terminable plug that meets Category 6A performance requirements and can be easily terminated by installers in the field. The graph below (see figure 10) shows typical results of a conventional Category 6A 3-connector channel and a similar configuration with the OCC field terminable plug installed at the far end. The OCC plug, tested using the OCC field plug test adapter, exhibits exceptional performance. OCC has expanded the MDIS 25-year System Extended Performance Warranty to include OCC direct attached link/channels using the OCC field terminable plug and certified using the OCC field plug test adapter test method.

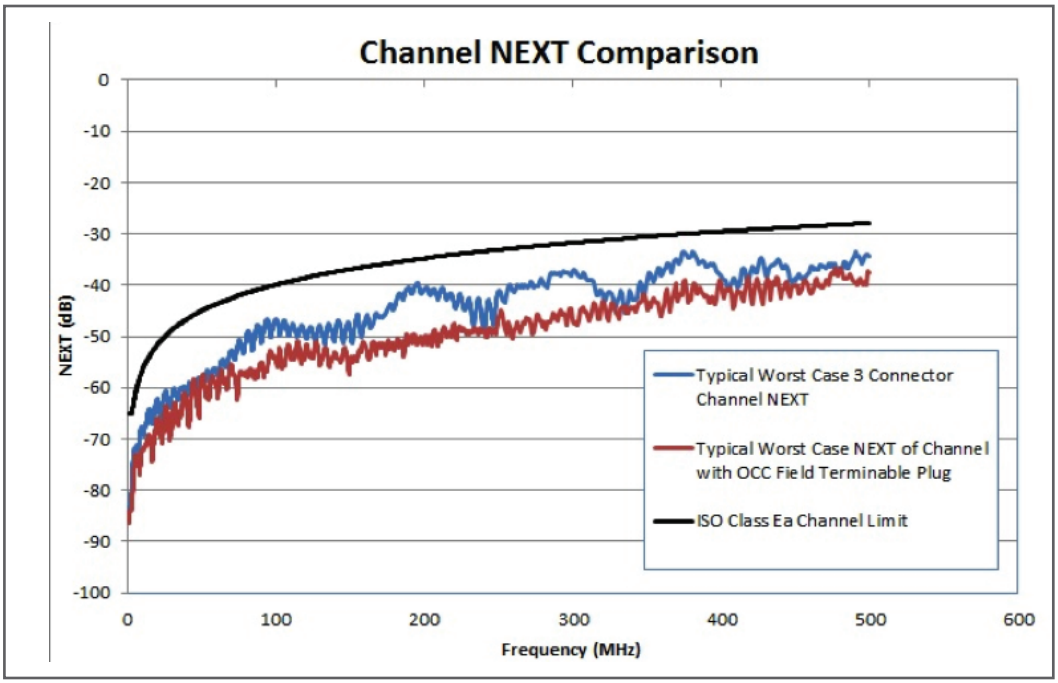

Figure 10: Conventional Cat6A Channel vs. OCC Direct Attach

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