

## Direct Connect Testing Guidelines

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### Introduction

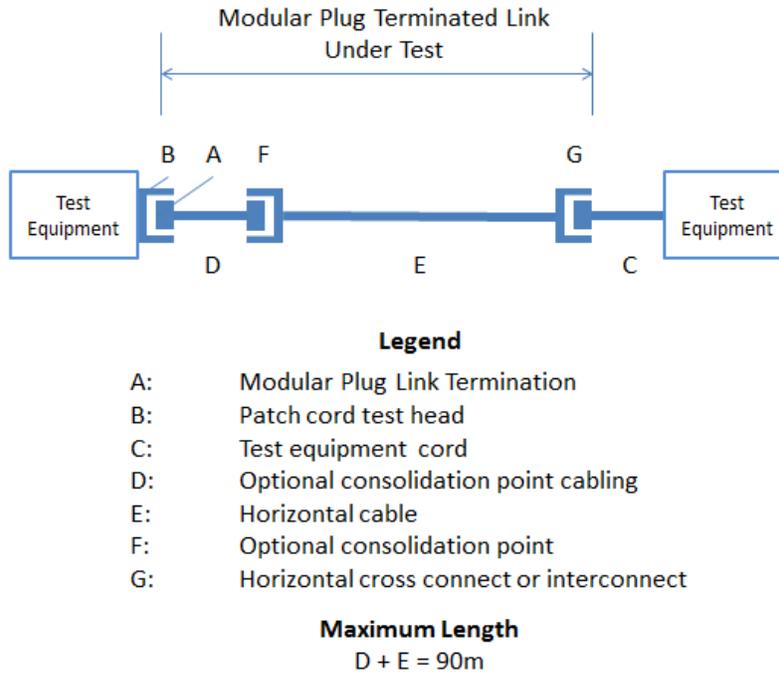
Direct Connect is a viable option for the Digital Building that is being deployed today. Questions surround the proper testing techniques to measure the field installation of Direct Connect since it is not yet fully supported in the standards. This can lead to confusion with consultants, contractors and installers.

Belden presented the problem to TIA and has led the effort to have the direct connect termination method fully supported. While the standards are being developed, Belden will support the testing of Direct Connect in order for installers to obtain system certification and warranties.

### What is Direct Connect?

Direct Connect is Belden's terminology which describes the deployment strategy of terminating the horizontal cabling with a modular plug. This allows the installer to directly connect the cabling into the end device. The benefit of this strategy is that the work area outlet and cord are not needed, thereby reducing the cost of installation as well as maximizing performance and power delivery efficiencies. TIA standards will call this topology "Modular Plug Terminated Link" or MPTL in TIA-568.2-D, which should be available late in 2018. The MPTL is a subset of a cabling channel and is defined as a type of link terminated with a modular plug on one end.

The draft of the normative annex appears in Figure 1. The MPTL will meet permanent link test limits. Its length is limited to 90 m and the topology will consist of a plug on one end and a jack on the other with an optional consolidation point in the middle. What is unique about the MPTL is the ability to include the plug terminated on the end of the horizontal cabling in the field measurement. This is key to supporting the Direct Connect deployment strategy as the modular plug will be terminated in the field.



**Figure 1 - Modular Plug Terminated Link Normative Annex**

Direct Connect is well suited to support the deployment of security cameras, a radio enabled wireless access device, or another device without the need for an additional outlet and patch cord. Cabling can either come out of the plenum space, as in Figure 2. Alternatively, the connection can be made within the plenum space, provided the plug meets UL2043.



**Figure 2 - Direct Connection Outside Plenum Space**

### Requirements for Components Used in Test Equipment

To include the performance of the plug in the field measurement of the Direct Connect, a patch cord test head must be used as shown in Figure 1. This is due to the fact that the jack in the patch cord test head must meet specific performance criteria, referred to as centered performance. A closer look at the mated NEXT requirement is needed to understand the importance.

All plugs have a certain amount of crosstalk so that the interaction between the plug and the compensation on the jack will result in a mated NEXT performance that passes the standard. If a plug has too low or too high crosstalk, the mated performance will fail the requirement as shown in Figure 3. A jack that is centered will result in margin that falls within a certain range for both plug extremes. The requirement for a centered jack is one in which the difference between these margins for the high and low limit-value test plugs shall be less than 2 dB for the pair combination terminated on pins 3,6 4,5 and 4 dB for the pair combinations terminated on pins 1,2-3,6 and 3,6-7,8. This requirement ensures that the measured value is reliable and true.

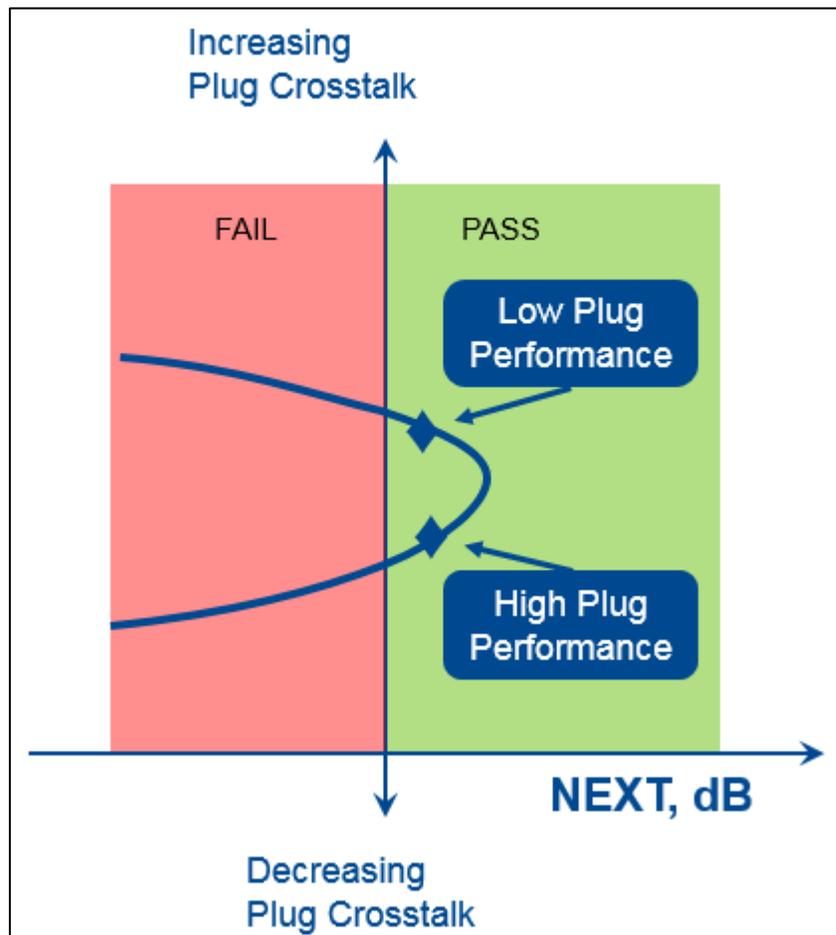
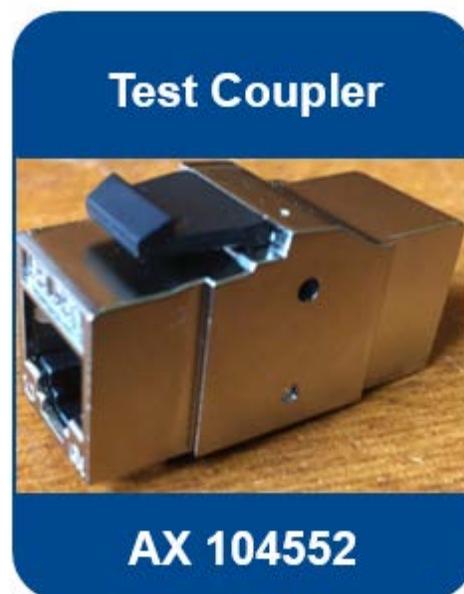


Figure 3 - Jack with Centered Mated NEXT Performance

As an alternative to the use of a patch cord test head, a component with centered performance and low return loss and low mated NEXT can be substituted for the test of Direct Connect. Using two permanent link adapters and a specific test coupler a test in the field can be performed that will meet Belden's requirement for certification in the warranty program.

This test coupler is the AX104552, shown in Figure 4. This coupler has centered performance and meets the requirements of a test connector. With its low return loss and low mated NEXT, this coupler can be included in the test of a Direct Connect with little, if any, impact on overall performance for all categories of cabling.

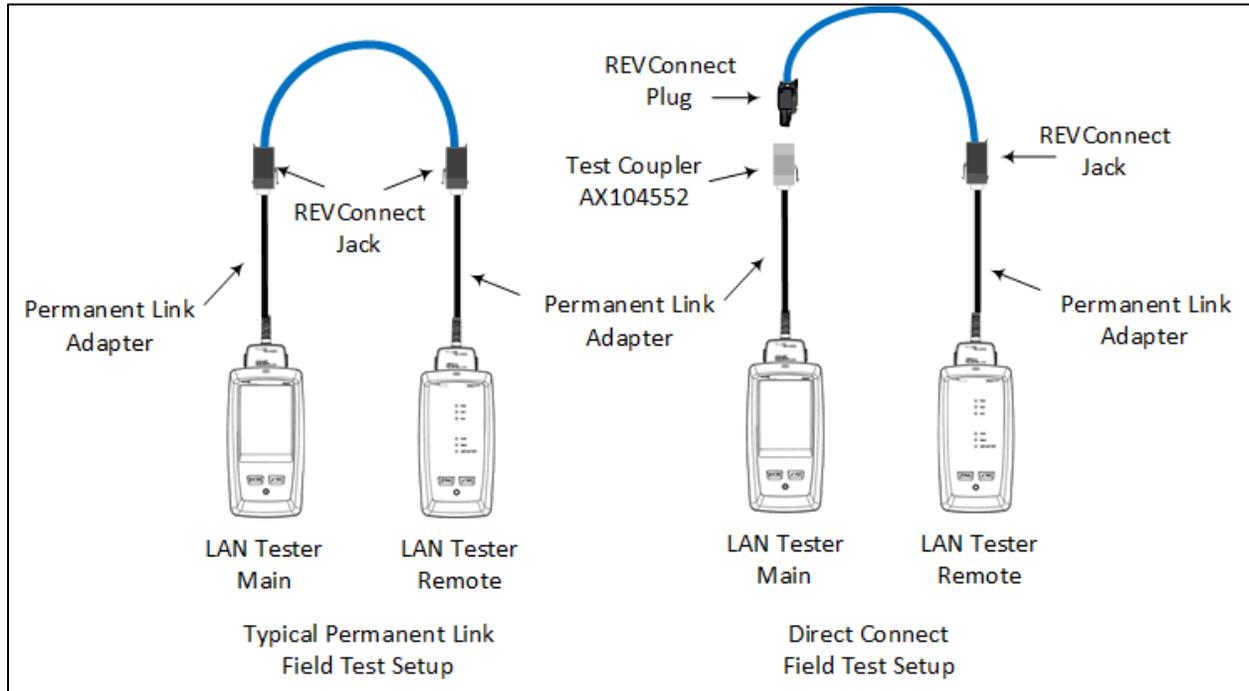


**Figure 4 - Test Coupler Acceptable for Belden Certification of Direct Connect**

### Testing Direct Connect

Testing of direct connect using the AX 104552 test coupler is no different than a typical permanent link test, refer to Figure 5. The permanent link field test setup is shown on the left where a permanent link with two REVConnect Jacks is tested. The main and remote are fitted with permanent link adapters and the installer selects and executes the permanent link test.

Likewise, the Direct Connect uses this same setup with the only difference being the inclusion of the test coupler to connect the REVConnect Plug to the permanent link adapter. The installer selects and executes the same permanent link test as done in the typical permanent link test.



**Figure 5 – Comparison of Permanent Link and Direct Connect Field Test**

## Summary

While the standards are being revised, Belden will support the testing of Direct Connect using the AX104552 coupler to obtain system certification and warranties. Measuring Direct Connect is no different than a typical permanent link field test which is best to understand either by hands on, or by consulting instructional videos.

## Related Links

[Blog: A Way to Simplify Your Infrastructure: Direct-Connect Assembly](#)

[Product Bulletin: Direct Connect with REVConnect](#)

[Blog: Cable Plugs Matter - More Than You Think](#)

[Blog: Breaking News: TIA Recognizes Direct-Connect Termination Method](#)