Nexans

Field-testing procedure of

LANmark-7
and
LANmark-7A

Technical Paper

Nexans Cabling Solutions

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1 Introduction

The purpose of field testing is to validate the installation against both the requirements of the standards and the demands of the Nexans warranty process.
This document serves to describe how to test LANmark-7and LANmark-7A cabling systems and to validate the installation against the international standards ISO/IEC 11801:2002/A1:2008 and CENELEC EN 50173:2002. By doing so, the LANmark-7 or 7A warranty can be achieved.

If testing throws up errors or failures in the results the information gathered should be used to identify the source of the problem so that the installer can rectify and re-test.

To pass testing for the Nexans warranty all Permanent Links and/or Channels in an installation should be tested, and all should pass.

You should agree with the client before starting the contract how to deal with marginal pass results, as they may not be aware that a marginal result may be because of the accuracy and tolerances of the tester.

2 How to proceed ?

2.1 Introduction

This procedure is meant as a support tool for field-testing copper cabling networks. The definitions in the standard ISO/IEC 11801:2002(/A1:2008) are applied into practical recommendations.
After describing some general definitions, the second half of this chapter is especially focused on measuring Class F(A) links.
The procedure is to be followed in case of applying for Nexans Certified System Warranty.

2.2 Permanent link testing vs. Channel testing

In the ISO standards two different ways of testing are described.

A permanent link is the fixed part of the cabling, which is tested after installation, these testresults give information on installation quality. The permanent link extends from the patch panel in the cabinet to the telecommunications outlet at the user side. It excludes work area cords, equipment cords and crossconnections, but does include the optional consolidation point.

A channel represents the complete end-to-end path between the user equipment (PC, phone, video, printer, …) and the active equipment at the cabinet side (switch, hub, PBX, video equipment). The channel includes the work area cord, the equipment cord and the cross-connection.

For LANmark-7/7A channel testing is recommended as the more complete measurement method.

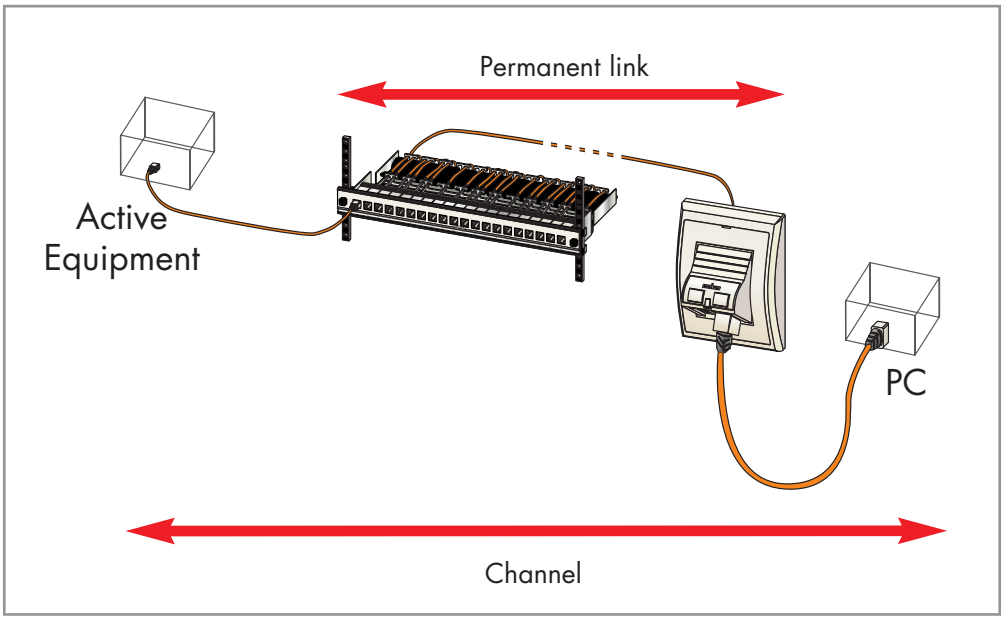

Figure 1: Model of Permanent Link and Channel testing

2.3 Category 7(A) and connecting hardware

Before you go to the test site, please make sure to prepare your tester in accordance to the right standard. In the next paragraphs following issues are covered: 'How the different installation models of Class F and Class FA links can be tested?' and 'Which specific models of test-equipment and test heads can be used.'

2.4 Installation models

2.4.1 2-connector model: Interconnect – TO

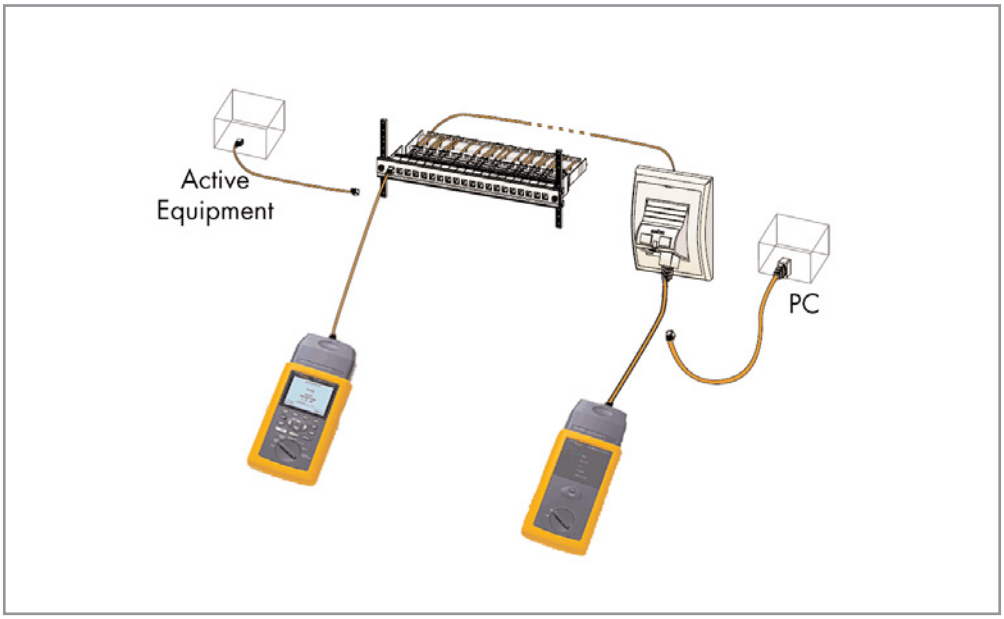

Figure 2.1: Testing a permanent link in a 2 connector model

Figure 2.1 shows the two-connector model as described in the standard. In this installation model both Channel and Permanent Link testing methods can be applied with the available Class F testheads.

2.4.2 3-connector model: Cross connect - TO

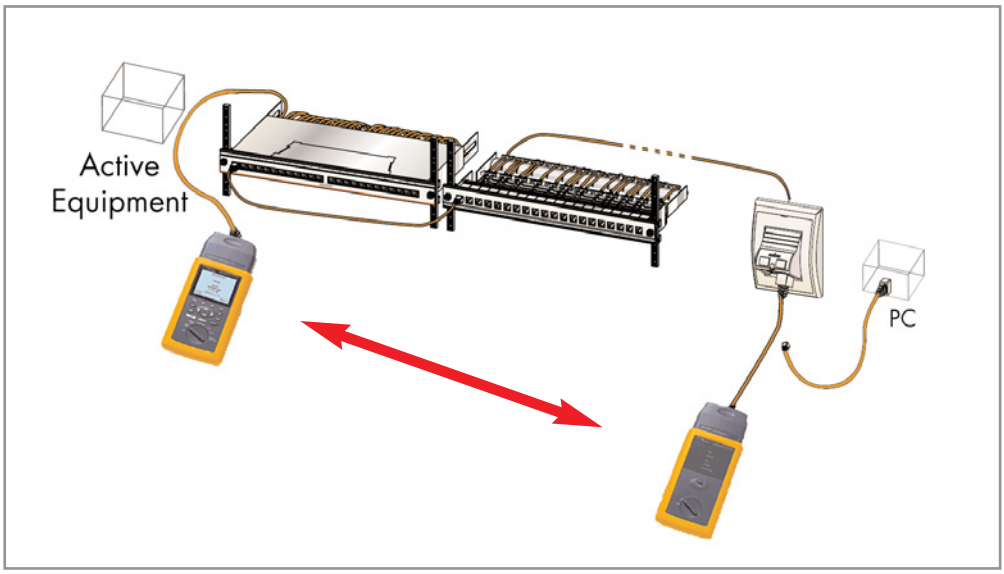

Figure 2.2: Testing at 3 connector Cross connect - TO model

The installation includes a cross connect lead existing of a 'single ended' LANmark-7 or 7A patch cord which must be terminated using a Nexans N420.731 (7) / N420.736 (7A) Snap-in connector to represent the active equipment ports.

If LANmark-7/7A patch cords are used to cross connect the patch panels, testing as a 2-connector test model, described in 2.4.1 and testing the separate Cross connect lead in channel will do to acquire a Nexans Certified Systems Warranty on the complete installation (= 3 connector installation).
Note: An alternative way of testing is to test only as a 2-connector installation ignoring the conditions mentioned in option 1 of this paragraph, see Figure 2.1. *(With these test results only a Certified Systems Warranty on the 2-connector installation can be obtained.)*

2.4.3 3-connector model: Interconnect - CP - TO

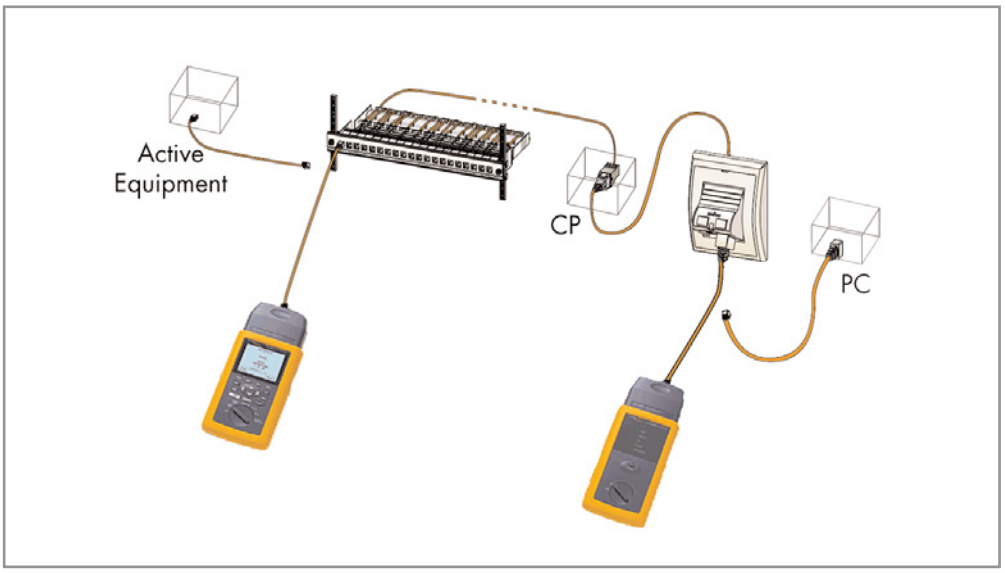

Figure 2.3: Testing at 3 connector Interconnect - CP - TO model

In this model of installation 1 option of testing is possible:

The installation includes a consolidation point lead existing of a 'single ended' LANmark-7 patch cord which must be terminated using a Nexans N420.731 (7) / N420.736 (7A) Snap-in connector connecting the Consolidation Point (CP) to the Terminal Outlet (TO)
Testing in a 3 connector test model as shown in Figure 2.3 is mandatory to acquire a Class F Certified Systems Warranty on the complete installation (= 3 connector installation) under the condition that the correct test heads are in use.

Note: An alternative way of testing is to test as a 2-connector installation from the Interconnect to the Consolidation Point (CP) ignoring the consolidation link mentioned above. (With these test results only a Certified Systems Warranty on the 2 connector installation can be obtained.)

2.4.4 4-connector: Cross connect - CP - TO

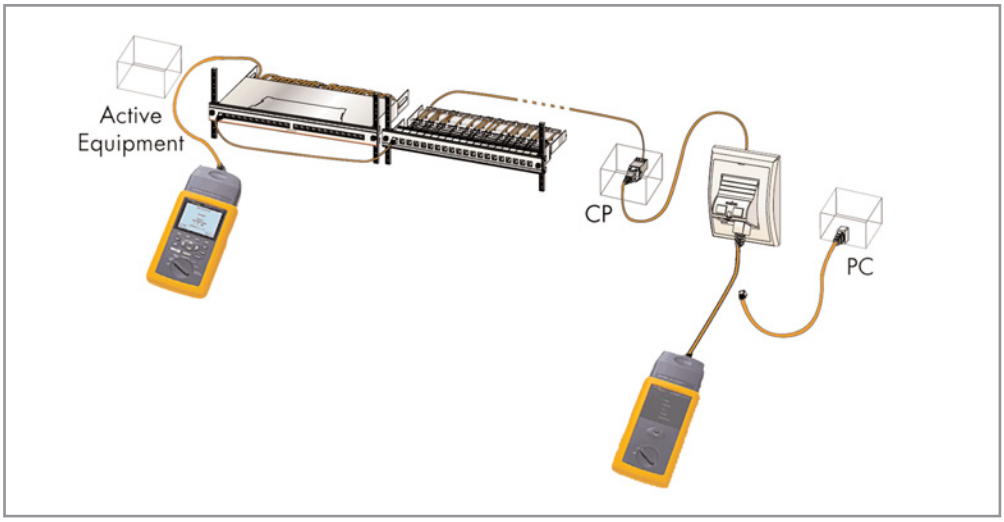

Figure 2.4: Testing at 4 connector Cross connect – CP –TO model

If LANmark-7 or 7A patch cords are used to cross connect the patch panels, testing as a 3-connector test model, described in 2.4.3 and testing the separate cross connect lead in channel will do to acquire a Nexans Certified Systems Warranty on the complete installation (= 4 connector installation). The installation includes a Consolidation point lead existing of a 'single ended' LANmark-7 or 7A patch cord which must be terminated using a Nexans N420.731 (7) / N420.736 (7A) Snap-in connector connecting the Consolidation Point (CP) to the Terminal Outlet (TO). Testing in a 3 connector test model as shown in Figure 2.3 is mandatory to acquire a Class F Certified Systems Warranty on the complete installation (= 4 connector installation) under the condition that the correct test heads and test limits are used.

Note: An alternative way of testing is to test as a 2-connector installation from the Patch Panel to the Consolidation Point (CP) ignoring the conditions mentioned above. (With these test results only a Certified Systems Warranty on the 2 connector installation as described in paragraph 2.4.1 can be obtained.)

2.4.5 Summary

2 connectors	3 connectors	3 connectors	4 connectors
Interconnect TO	Cross connect TO	Interconnect CP - TO	Cross connect CP - TO
PL or CH	PL or CH as 2 connector and Crossconnect CH	PL or CH	PL or CH as 3 connector + CH Crossconect

Class F / FA
PL= Permanent Link Measurement
CH= Channel Measurement

3 What equipment is available to test for compliance?

3.1 Certified Level IV testers

Nexans strongly recommends the use of equipment with baseline accuracy that exceeds ISO/IEC 61935-1/Ed.2 (8-2005) Level IV, as indicated by independent laboratory testing.
Test equipment must be capable of certifying Class F links.
Nexans have endorsed 3 testers and configurations for use in validating the LANmark 7 / Class F and LANmark 7A / Class FA solutions against the Warranty and performance requirements on installations.

At present these are:

1. Agilent Wirescope Pro (Level IV)

2. Fluke DTX 1800 (Level IV)

3. Ideal LANtek-7 (Level IV)

The following testing guidelines are to be adhered to:

- All lines must be installed so that the maximum fixed link distance is 90m.
- All personnel must be competent with the operation of the chosen tester and be familiar with the manufacturers operating manual.

3.2 Care of the Tester and leads

Cabling Field testers are an accurate piece of equipment and as such needs to be looked after. Please follow manufacturer recommendations for the care and maintenance of your tester. Have your tester calibrated at least once a year by the tester manufacturer.

The test leads are susceptible to wear and damage. Please follow manufacturer recommendations for the care and maintenance of your test leads and do not fold or exceed the bend radius of the test cables.

Do not allow the weight of the tester to be supported by the test lead.

Always put your tester on charge the day before a new test job and place both units on charge overnight during the testing phase of the project.

3.3 Test Adapters available for:

1. ***AGILENT*** *Wirescope Pro*

Channel

- N2644A-107 (GG45 CLASS F Channel Smart Probe)
- LANmark-7 GG45 Measurement Cords (N900.979)

Permanent link

- N2644A-106 (Nexans Class F PL Smart Probe)

2. ***FLUKE Networks DTX 1800***

Channel

- DTX-CHA012S GG45 Channel Adapter
- LANmark-7 GG45 Measurement Cords (N900.979)

3. ***IDEAL Industries*** *Lantek 7/7G*

Channel

- Category 7 GG45 Channel Adapter (0012-00-5475X) (LANTEK 7G only!)
- LANmark-7 GG45 Measurement Cords (N900.979)

Permanent link

- GG45 Permanent-Link-Adapter (0012-00-0650 / N900.976)

! Please check regularly our website if you have the latest version of this paper !

Today only 600MHz testing can be supported due to limitations on the testdevices and testadapters available. Nexans is cooperating with all the above mentioned cable tester companies to develop a testsolution up to 1000 MHz for Class FA. Currently testing standards specify testing above 600MHz as informative measurements only.

3.4 Selecting the correct cable type

When setting up your tester you should pay attention to the correct cable selection and the NVP (Nominal Velocity of Propagation) for the cable under test. This setting will determine the length and skew parameters and will therefore affect the results obtained. Some testers set themselves to pre-set or default settings each time they are switched on. You therefore must check this and configure the tester according to the cable data sheet for the product you are testing. Generally for Nexans cabling systems, the values to be used are:

Commercial cable name	NVP
***LAN**mark-7* S/FTP 600MHz	0.80
***LAN**mark-7*A S/FTP 1000 MHz	0.80
***LAN**mark-7*A 1200 S/FTP 1200 MHz	0.80
***LAN**mark-7*A 1500 S/FTP 1500 MHz	0.80

3.5 Before you go to site

For all testers ensure you have the latest version of the tester firmware loaded, the update can be obtained from the manufacturer Internet site along with the latest software and limits database which should also be loaded into the tester. The firmware update and the version of the software database on the tester are important. The firmware from the tester manufacturer provides the tester with the correct parameters to test and how to interact with the test head. The software database holds the test parameters and limits for the standards that you will be comparing the cabling installation against.

You must calibrate the tester local and remote ends to each other before you go to site.
If you are using some testers you will also need to have the test leads calibrated onto the tester units. This will improve the accuracy of the tester.
Make sure you have the latest version of the upload and diagnostic software on your PC on to which you will download the test results from the tester (available on Internet sites of the manufacturers).

Always download each day's worth of test results at the end of the day onto your PC.

Always put your tester on charge the day before it will be needed and afterwards place it on charge overnight during the testing phase of the project.

4 How to calibrate the tester

4.1 Agilent Wirescope Pro

For Class F GG45 testing, Remote Calibration requires the following setup:
- Connect GG45 Channel Adapter on WireScope Pro and Dual remote
- Connect the two devices through a Nexans LANmark-7 measurement patch cord
- Follow the onscreen instructions in Calibration.

4.2 Ideal Industries Lantek 7/7G

Field Calibration using Permanent Link adapters

Step 1

A) Connect the Nexans Calibration Adapter to the Main Handset (Main) and Remote Handset (Remote).
B) Switch on both units.
C) From the **Main** 'ready screen', select **FIELD CALIBRATIO**N. The calibration screen appears.
D) In order to start the **Remote** Field Calibration, select Autotest. This process takes about 15 seconds to complete.
E) From the Field Calibration screen on the **Main**, select **START (F1)** to begin the calibration process. This process takes about 15 seconds to complete.
F) At the completion of the step 1, disconnect the Nexans Calibration Adapter from both **Main** and **Remote**. Go to Step 2

Step 2

A) Connect the Nexans Permanent Link Adapters onto both Main and Remote Handset
B) From the Field Calibration screen on the **Main**, select **START (F1)** to begin the third calibration step. This process takes about 10 seconds to complete.
C) From the **Remote** Field Calibration, select **AUTOTEST** to begin the fourth calibration step. This process takes about 10 seconds to complete.

Step 3

A) Terminate the open end of the Permanent Link adapter with the Nexans Calibration Load Terminator (GG45 connector) on the **Main**. On the Main showing the Field Calibration screen, select **START (F1)**.
B) "Calibration Complete" will be shown on the main when calibration is successful.
C) Terminate the open end of the Permanent Link adapter using the same Nexans Calibration Load Terminator (GG45 connector) as in A on the **Remote**, then select **AUTOTEST**.
D) The Remote unit will briefly show a green PASS LED when calibration is successful.

This Field calibration needs to be performed each time when one or both of the Permanent link adapters are disconnected from the units.

Ideal Industries Website *www.idealindustries.com*

4.3 Fluke Networks DTX-1800

Please refer to the Fluke GG45 Channel Adapter Instruction sheet.

The DTX-CHA012S is a set of two channel adapters for use with a Fluke Networks DTX-1800 CableAnalyzer™ tester. The DTX-CHA012 is a single adapter available as a replacement part. These adapters let you test and certify installed channel links that use GG45 connecting hardware to ensure they meet ISO Class F performance specifications.

The adapter's minimal effect on test results ensures that your results exceed the accuracy and repeatability specifications given in the ISO 11801 standard.

Note
The DTX main and remote testers must have software version 2.4 or later to work with the DTX-CHA012 adapters. Software upgrades are available on the Fluke Networks website.

Setting the Reference for the Class F Test Limit

To use a DTX-1800 CableAnalyzer tester to test and certify a Class F channel link that uses GG45 connecting hardware, you must first set the reference for the Class F test limit. This requires the DTX-REFERENCE module. You must set the reference before initial use of the DTX-CHA012 adapters and should set it again approximately every thirty days, or more often if desired.
Set the reference as follows:

1. Connect the DTX main and remote units together with the DTX-REFERENCE module as shown in Figure 1.
2. Turn the rotary switch **SETUP**; then select **Twisted Pair**.
3. Select **Test Limit**; then select **ISO11801 Channel Class F**. If you do not see this limit on the **Last Used** screen, press F1 **More**, select **ISO**; then select **ISO11801 Channel Class F.**
4. On the **Twisted Pair** screen, select **Cable Type**, select **SSTP** (Class F cabling); then select **Cat 7 SSTP**.
5. On the **Shield Test** screen, select **Enable**.
6. Turn the rotary switch to **SPECIAL FUNCTIONS**; then select Set **Reference**.
7. If a fiber module is installed, select **Link Interface Adapter** on the next screen. The **Set Reference** connection screen shows the main and remote units connected with the permanent link and channel adapters; however, the Class F reference procedure uses the DTX-REFERENCE module as shown in Figure 1.
8. Press Test to set the reference.

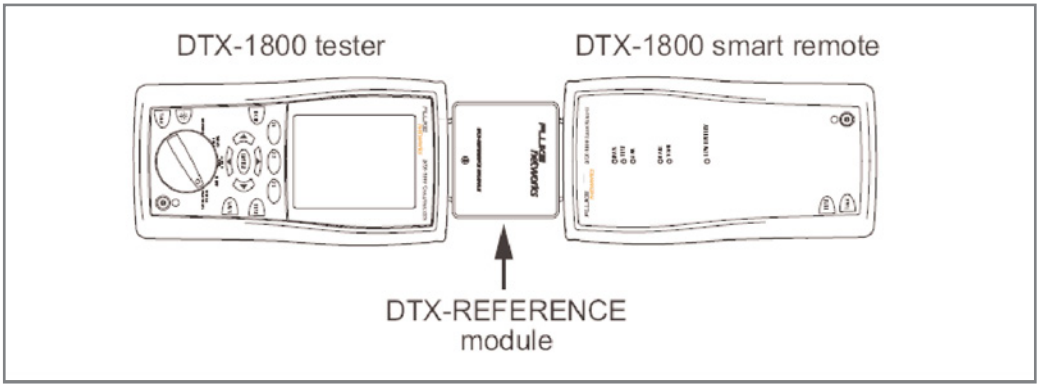

Figure 1. Reference Connections for the Class F Test Limit

Testing a Channel Link

Figure 2 shows typical connections for testing a channel link. Be sure to select the test limit appropriate for the link under test. The test limit defines the test parameters to be measured, the frequency ranges for the tests, and the PASS/FAIL limits. Refer to the tester's users manual or contact Fluke Networks for additional information.
To run a channel test, turn the rotary switch to **AUTO TEST**; then press Test.

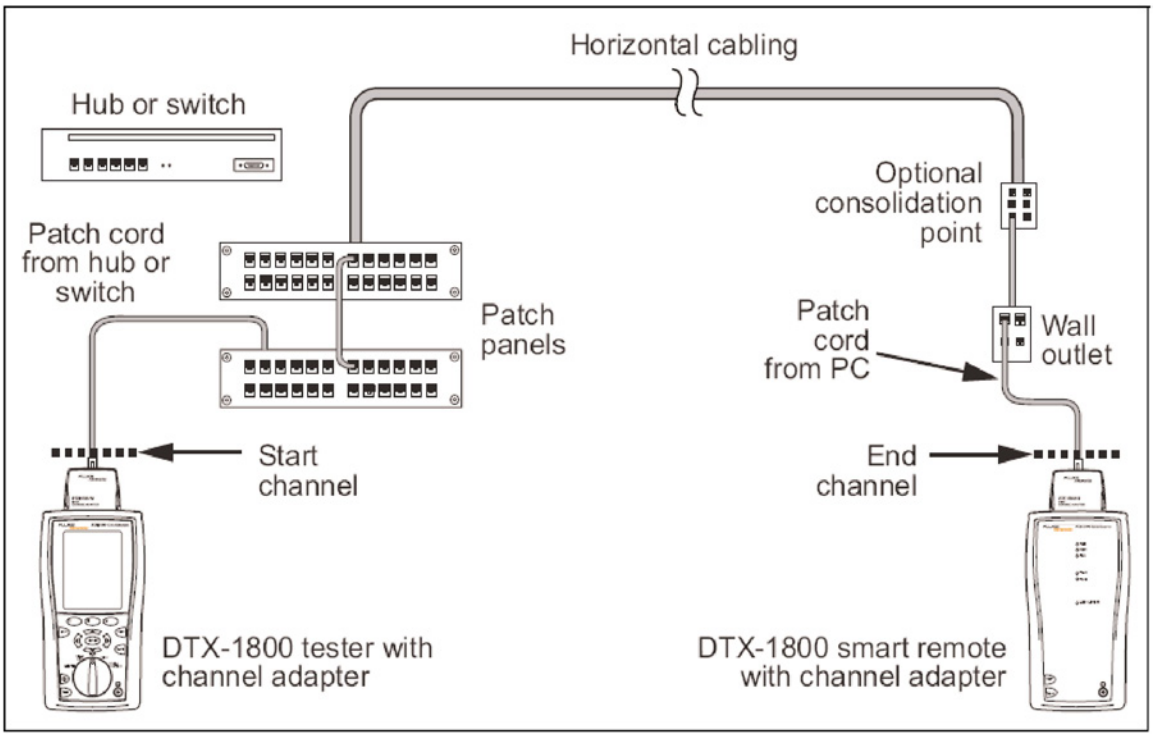

Figure 2. Connecting to a Channel Link

Fluke Networks Website www.flukenetworks.com

4.4 Selecting the correct cable type

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***LAN**mark-7A* 1200 S/FTP 1200 MHz	0.80
***LAN**mark-7A* 1500 S/FTP 1500 MHz	0.80

5. Understanding the test results

5.1 What the test results show

One can only hope that first time of testing a link the results will show a pass with headroom.
However the first thing most testers will show is a wire map failure. As there is an insertion life on tester heads and leads a number of installers make use of a more basic test tool which just checks for wire mapping before running with a full set of tests for Cat 7. This releases the tester for use elsewhere and saves on head wear.
If a failure is detected then make use of the tester diagnostics to locate the problem. Some of the later testers come with analysis software and tools that will locate the problem to a point along the length of the cable or at the termination.
The treatment of marginal asterisked (*) results should be clarified with the client in advance.
Due to the known experience of tester inaccuracies due to test head variations it is our experience that results are usually on the pessimistic side. Nexans will therefore consider a *PASS as acceptable within the warranty.
A *FAIL however should be investigated and is not acceptable.

5.2 What to do with the result – Warranty Certification

When submitting results for the Nexans Warranty, a 'Nexans Warranty application form' for the site has to be filled in and submitted including the original testresults file to **warranty.ncs@nexans.com** .
This warranty application form can be freely downloaded from the Nexans LANsystems website www.nexans.com/LANsystems

- Upload and Save – Which format ?

Fluke DTX-1800: *.flw using Fluke Linkware

Ideal Lantek 7/7G: Backup zip file using LANTEK Reporter

Agilent Wirescope Pro: *.sdf using Scopedata Pro II

It is preferable to save the test results with plots if they are available on your tester as re-certification of graphical test result is only possible when plots are saved.

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