

Design Guidelines

LANmark-6A Cabling System

January 2015
Revision 2.0



This document is intended to provide general guidance on LAN cabling infrastructure design & installation good practices and for compliance to NCS warranty application requirements. It is not meant to serve as the only reference for installation requirements or be a substitute for applicable training requirements.

For further advice or support regarding installation queries please contact the Nexans Cabling Solutions Technical Support department on ncs.swsupport@nexans.com

For more information on products please contact your local Nexans Cabling Solutions Sales office or visit:

www.nexans.com/LANsystems

Table of Contents

1.	Introduction	5
2.	General Guidelines and Standards Compliance	6
3.	Length Considerations for Design and Installation	7
3.1.	Length specifications in ISO/IEC Standards	7
3.2.	Length Specifications for LANmark-6A	8
3.3.	Stranded Cable Length Compensation	9
4.	Detailed Channel Design Guidelines for LANmark-6A	10
4.1.	2 Connector Channel Design Guidelines	10
4.2.	3 Connector Channel using a Cross Connect	12
4.3.	3 Connector Channel using a Consolidation Point	14
4.4.	4 Connector Channel using a Cross Connect and Consolidation Point	16

1. Introduction

The following installation requirements cover the minimum and maximum length configurations for installing a Nexans LANmark-6A structured cabling system using LANmark-6A cable and connectivity.

The LANmark-6A cabling system has been designed not only to meet but exceed the demanding requirements of Augmented Cat 6 and Class EA Standards. The performance headroom of LANmark-6A, which is above the minimum requirements of the International Standards, can be used to build shorter links and channels than those recommended by the Standards.

Both the Standards recommendations and the Nexans specific length restrictions are described in the following chapters.

Please ensure that you have selected the appropriate connector version for the chosen cable solution. NCS offers 2 connector versions depending on the wire thickness within the cable.

For **AWG22 to AWG24**, connectors for solid wire **N420.66A** shall be used.

For the wire size of **AWG 26** (used in LANmark-6 10G DC50 and LANmark-6A Solid Cords) and **all cables with stranded wire** used in patch cords or CC/CP cords, connectors for stranded wire such as **N420.67A** shall be used.

2. General Guidelines and Standards Compliance

All installation designs must follow industry best practice and demonstrate compliance to the relevant sections of ISO/IEC 11801 ed2.2, TIA/EIA 568 C.2 series of documents and shall be tested to TIA/EIA 568-C.2 or ISO/IEC 11801 ed2.2. Furthermore, the General Installation Guidelines from Nexans and especially all detailed product installation instructions must be followed.

General Guidelines are available under http://www.nexans.co.uk/eservice/UK-en_GB/fileLibrary/Download_540209803/UK/files/General%20Installation%20guide%202014_V2.0%20DWI_LR.pdf

Product Installation Sheets are in most cases included with the product. Please check the following link for up-to-date installation instructions for the product you plan to install: <http://www.nexans.co.uk/eservice/Library.nx?topicSelected=13048&parentScope=13025#directory>

In order to apply for installation Warranty Certification as offered by Nexans Cabling Solutions (NCS), verification testing of the installation has to be undertaken in accordance with the 'Field Test Procedure of LANmark-6A Cabling System' document.

<http://www.nexans.co.uk/eservice/Library.nx?topicSelected=13043&parentScope=13025#directory>

To pass testing for the Nexans warranty, all Permanent Links and/or Channels in an installation shall pass in accordance with NCS set-up requirements.

It should be agreed 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. Nexans will consider a *PASS as acceptable within the warranty when specific conditions apply – see table below.

However a *FAIL or FAIL shall be investigated as it is not acceptable.

Warranty Module LANmark-6A	Channel Limits *PASS acceptable if Permanent Link length > 5m and < 15m	Permanent Link Limits *PASS acceptable if length > 5m and < 15m
---	---	---

3. Length Considerations for Design and Installation

3.1 Length specifications in ISO/IEC Standards

The following length requirements for twisted pair cabling are defined within ISO/IEC 11801, EN 50173 and TIA/EIA 568 documents:

Table 1 - Minimum and Maximum Lengths as per Standards

Segment	Minimum length in m	Maximum length in m
FD - CP	15	85
CP – TO	5	-
FD – TO (no CP)	15	90
Work area cord ^a	2	5
Patch cord	2	-
Equipment cord ^b	2	5
All cords	-	10
^a If there is no CP, the minimum length of the work area cord is 1m.		
^b If there is no cross-connect, the minimum length of the equipment cord is 1m.		

Whereas the maximum length is given as a normative requirement, minimum length is an informative requirement and is given to indicate which length limitations were taken into account when the component and link limits for electrical performance have been selected. It is recognized that short links with a high number of connection points at close proximity do generate more internal crosstalk and reflections. Therefore, it is likely that below these minimum length configurations, achieving headroom above the Standard's performance requirements cannot necessarily be achieved. Star pass results at short lengths are therefore likely, if not normal, according to the Standards.

3.2 Length specifications for LANmark-6A

LANmark-6A products exceed the minimum requirements of the ISO Standard for components, so LANmark-6A can provide more link and channel design flexibility and still meet the Standard's performance requirements.

The following minimum and maximum length specifications apply when LANmark-6A products are used.

Table 2 – Length Specifications Overview

Segment	Minimum length in m	Maximum length in m	Maximum length in m using DC 50 cable
2 Connector Channels			
FD – TO (or Panel – Panel)	5	90	50
Work area cord	0.3	5	5
Patch cord	0.3	5	5
3 and more Connector Channels			
FD – CP	5	80.5*	40.5*
CP – TO	3	-	-
Work area cord	0.5	5	5
Patch cord	0.5	-	-
Equipment cord	0.5	5	5
All cords	-	10	10
*calculation based on use of 5m equipment, consolidation and work area cord			

These specifications are valid only if all components within the channel are NCS LANmark-6A products. Especially if Cross Connects and/or Consolidation Points are used, LANmark-6A patch cords series must be used to build the CC and CP links.

3.3 Stranded Cable Length Compensation

Certain channel configurations need more than a total of 10m cords. As the attenuation of flexible stranded cable is higher than solid horizontal cable, the maximum length of the permanent link must be reduced when the total length of flexible cable exceeds 10m. The maximum link length is normally 90m of solid horizontal cable or 50m for the DC50 cable. For every 1m of additional flexible cable (above the 10m already calculated for patch cords) used between the Consolidation Point and the Telecommunications Outlet, the horizontal cable length must be reduced by 1,5 m (see table).

The following table shows the length calculation formulas taking into consideration the length of each portion of the channel:

Table 3 - Horizontal link length equations

Model	Figure	Using DC 50 cable	Class EA channels
Interconnect - TO	12a	$H = 67 - 3 - FX$	$H = 107 - 3 - FX$
Cross connect - TO	12b	$H = 66 - 3 - FX$	$H = 106 - 3 - FX$
Interconnect-CP-TO	12c	$H = 66 - 3 - FX - CY$	$H = 106 - 3 - FX - CY$
Cross connect-CP-TO	12d	$H = 65 - 3 - FX - CY$	$H = 105 - 3 - FX - CY$
<p>H the maximum length of the fixed horizontal cable (m) F combined length of patch cords/jumpers, equipment and work area cords (m) C the length of the CP cable (m) X the ratio of cord cable insertion loss (dB/m) to fixed horizontal cable insertion loss (dB/m): for LANmark-6A use 1.5 Y the ratio of CP cable insertion loss (dB/m) to fixed horizontal cable insertion loss (dB/m) : for LANmark-6A use 1.5 NOTE For operating temperatures above 20°C, H should be reduced by 0.2% per °C for screened cables; 0.4% per °C (20°C to 40°C) and 0.6% per °C (>40°C to 60°C) for unscreened cables.</p>			

4. Detailed Channel Design Guidelines for LANmark-6A

4.1 2 Connector Channel Design Guidelines

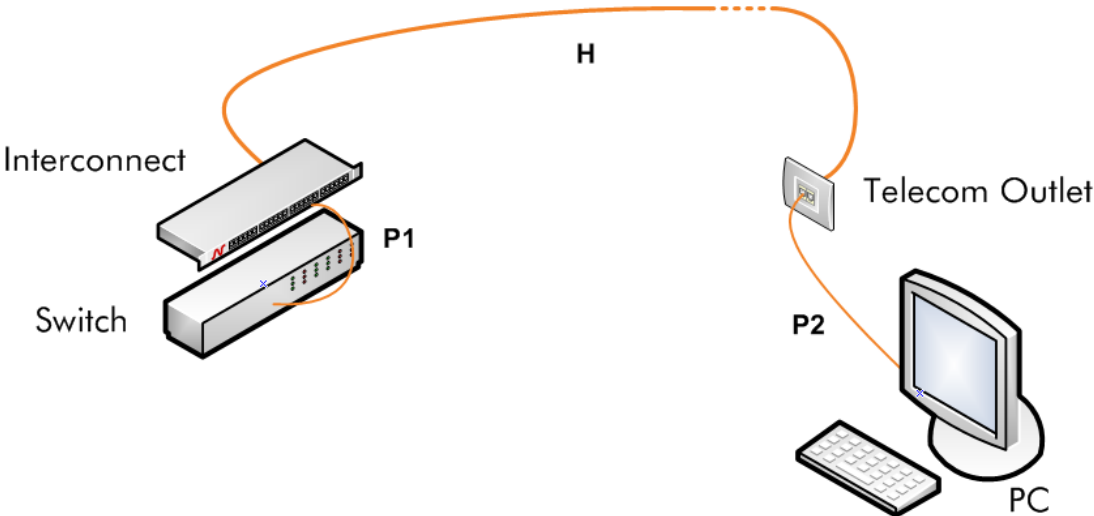


Figure 12a

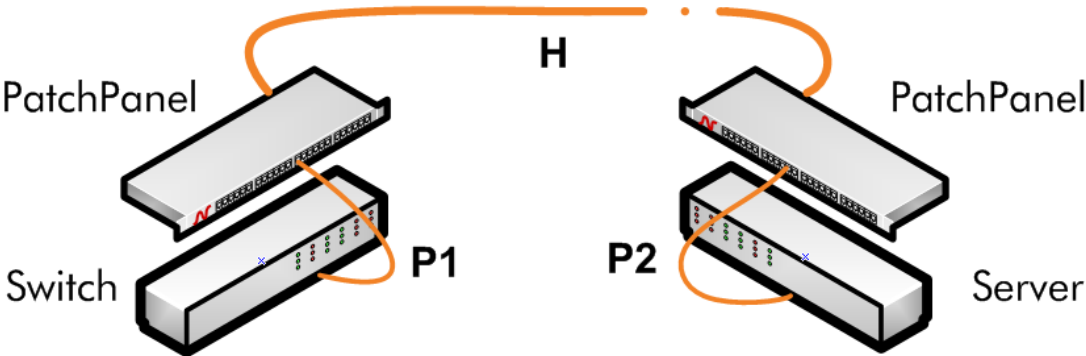
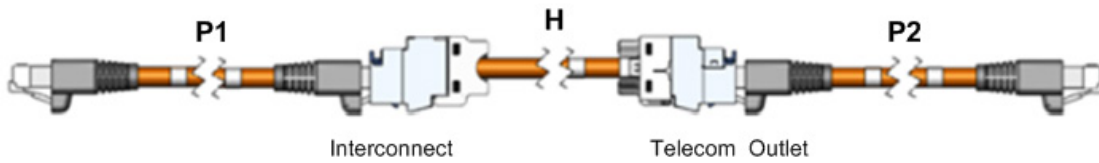


Figure 12a bis

Table 4 - 2 Connector Channel Length Specifications

	Description	Minimum length in m	Maximum length in m	Maximum length in m using DC 50 cable
H	Horizontal Permanent Link	5	90	50
P1-P2	Patch cord	0.3	5	5
H+P1+P2	Total channel length	$5 + 0.3 + 0.3 =$ 5.6	100	$50 + 5 + 5 =$ 60



4.2 3 Connector Channel using a Cross Connect

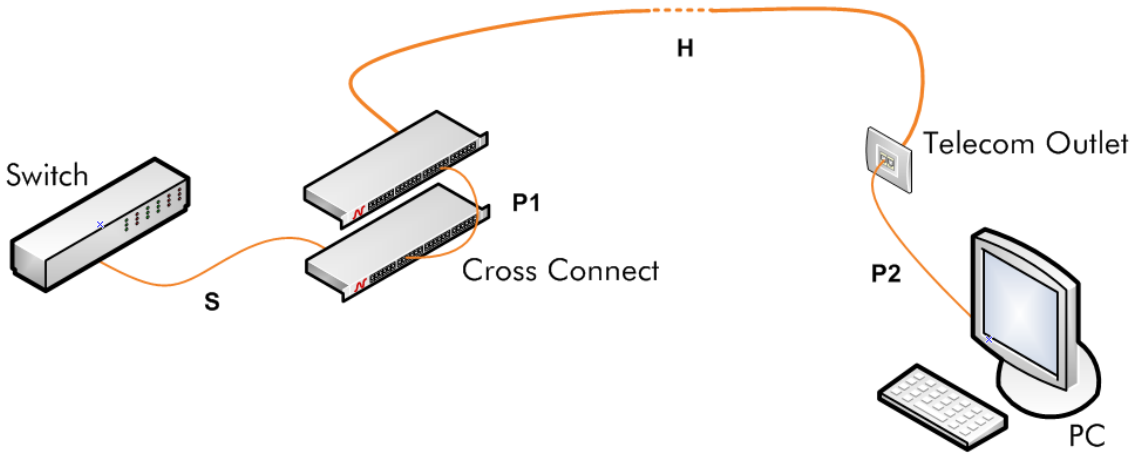
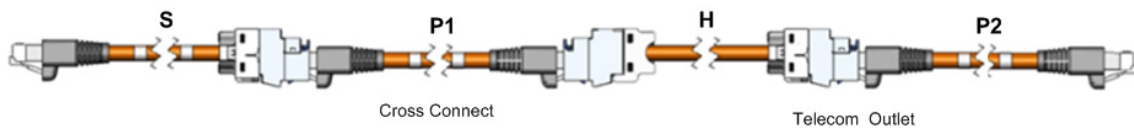


Figure 12b

Table 5 - 3 Connector Channel Length Specifications

	Description	Minimum Length in m	Maximum Length in m	Maximum length in m using DC 50 cable
H	Horizontal Permanent Link	5	H = 106 - 3 - FX	H = 66 - 3 - FX
S	Service Presentation - Cross Connect	3	20	20
P1-P2	Patch cord	0.5	5	5
Examples		Using short and long CC all cables	Using short and long CC with 23AWG cables	Using short and long CC with 26AWG cables
H+S+P1+P2	Length for 3 Connector Channel with Short CC	$5+3+0.5+0.5 = 9\text{m}$	$80.5+5+5+5 = 95.5\text{m}$	$40.5+5+5+5 = 55.5\text{m}$
H+S+P1+P2	Length for 3 Connector Channel with Long CC	$5+20+0.5+0.5 = \mathbf{26m}$	$58+20+5+5 = \mathbf{88m}$	$18+20+5+5 = \mathbf{48m}$



4.3 3 Connector Channel using a Consolidation Point

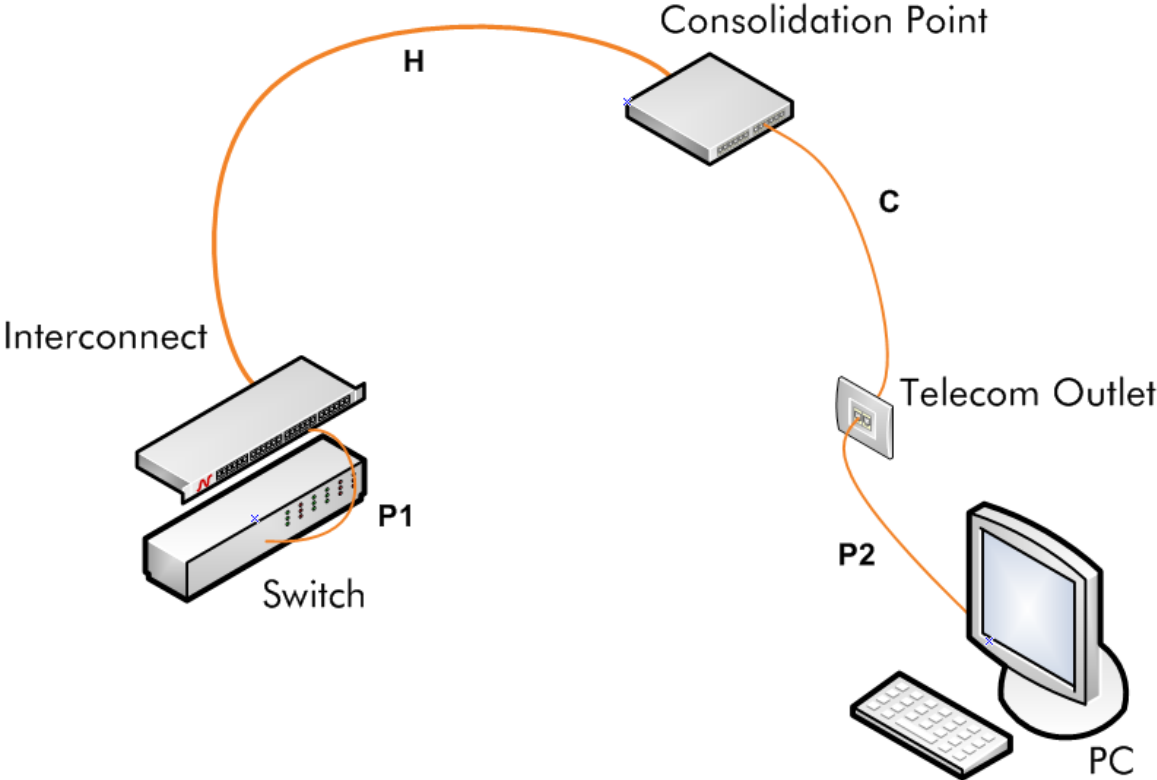
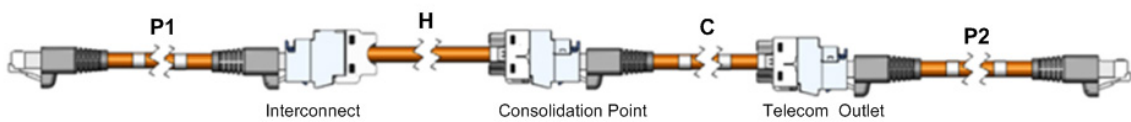


Figure 12c

Table 6 - 3 Connector Channel Length Specifications

	Description	Minimum Length in m	Maximum Length in m	Maximum length in m using DC 50 cable
H	Horizontal Permanent Link	5	H = 106 - 3 - FX - CY	H = 66 - 3 - FX - CY
C	Consolidation Point	3	20	20
P1-P2	Patch cord	0.5	5	5
Examples		Using short and long CP all cables	Using short and long CP with 23 AWG cables	Using short and long CP with 26 AWG cables
H+C+P1+P2	Length for 3 Connector Channel with Short CP	$5+3+0.5+0.5 = 9\text{m}$	$80.5+5+5+5 = 95.5\text{m}$	$40.5+5+5+5 = 55.5\text{m}$
H+C+P1+P2	Length for 3 Connector Channel with Long CP	$5+20+0.5+0.5 = \mathbf{26\text{m}}$	$58+20+5+5 = \mathbf{88\text{m}}$	$18+20+5+5 = \mathbf{48\text{m}}$



4.4 4 Connector Channel using a Cross Connect and Consolidation Point

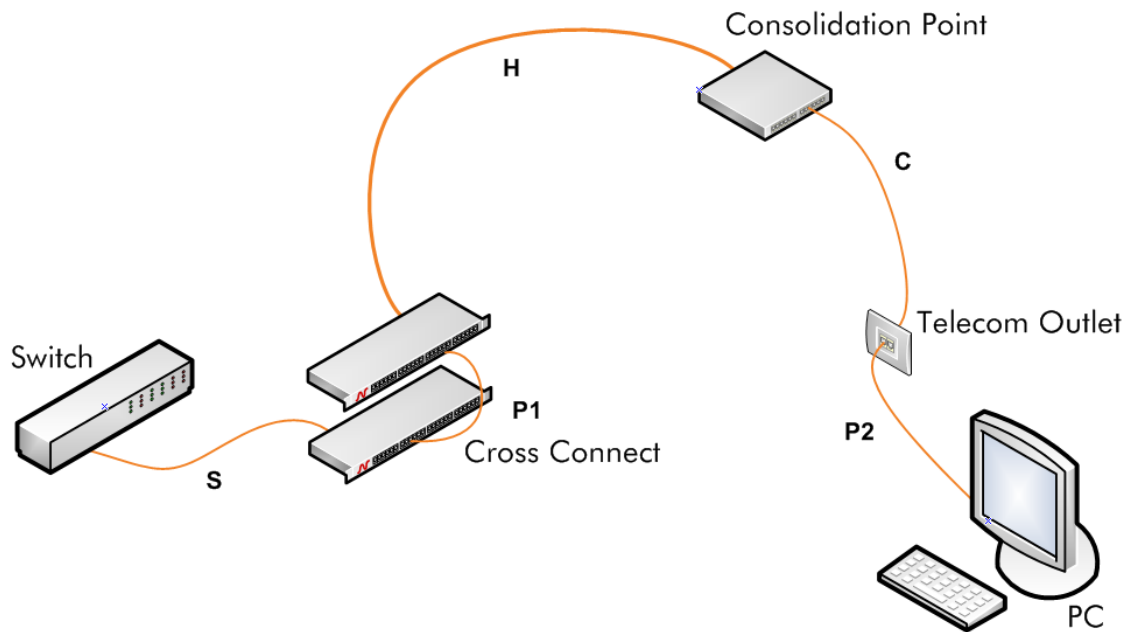
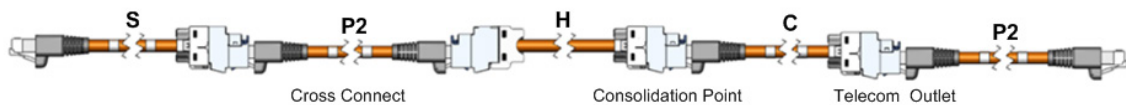


Figure 12d

Table 7 - 4 Connector Channel Length Specifications

	Description	Minimum Length in m	Maximum Length in m	Maximum length in m using DC 50 cable
H	Horizontal Permanent Link	5	H = 105-3-FX-CY	H = 65-3-FX-CY
C	Consolidation Point	3	20	15
S	Service Presentation/ Cross Connect	3	20	10
P1-P2	Patch cord	0.5	5	5
Examples		Using short and long CC+CP all cables	Using short and long CP with 23AWG cables	Using short and long CP with 26AWG cables
H+C+S +P1+P2	Length for 4 Connector Channel with Short CP	$5+3+3+0.5+0.5 = 12\text{m}$	$72+5+5+5+5 = 92\text{m}$	$32+5+5+5+5 = 52\text{m}$
H+C+S +P1+P2	Length for 4 Connector Channel with Long CP	$5+20+20+0.5+0.5 = \mathbf{46\text{m}}$	$27+20+20+5+5 = \mathbf{77\text{m}}$	$9.5+15+10+5+5 = \mathbf{44.5}$





Nexans Cabling Solutions

Alsebergsesteenweg 2, b3 - B-1501 Buizingen - Belgium

Tel: +32 (0)2 363 38 00 - Fax: +32 (0)2 365 09 99

www.nexans.com/LANsystems – info.ncs@nexans.com

Disclaimer

Although care has been taken in the preparation of this document, Nexans cannot be held liable for the accuracy or completeness of this document and reserves the right to change the content of this document at any time without notice