

# Design Guidelines

**LAN**mark-7A GG45

Cabling System

July 2022

Revision 1.2

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 your local Nexans Cabling Solutions representative.

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

<https://datanetworks.nexans.com/>

# 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. Stranded Cable Length Compensation	8
3.3. Permanent Link Length Design Guidelines	9
3.3.1. 2 Connector Link Installation Guidelines	9
3.3.2. 3 Connector Link Installation Guidelines	10
4. Detailed Channel Design Guidelines for LANmark-7A	11
4.1. 2 Connector Channel Design Guidelines	11
4.2. 3 Connector Channel using a Cross Connect	13
4.3. 3 Connector Channel using a Consolidation Point	15
4.4. 4 Connector Channel using a Cross Connect and Consolidation Point	17

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## 1. Introduction

The following installation requirements cover the minimum and maximum length configurations for installing a Nexans LANmark-7A GG45 structured cabling system using LANmark-7A cable and connectivity.

Nexans LANmark-7A is a concept in copper cabling technology supporting frequencies up to 1250MHz meaning 250MHz above the requirements of the standards.

Whilst designed for applications beyond 10G, the GG45 connector supports all applications with RJ45 based legacy equipment, thanks to its backwards compatibility which allows the use of RJ45 patch cords.

When moving to 25G, all that is needed is to replace the RJ45 patch cords with GG45 patch cords\*.

The LANmark-6A cabling system has been designed to meet or exceed the demanding requirements of Class FA Standards.

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

\*Distance limitations for certain applications apply

## 2. General Guidelines and Standards Compliance

All installation designs must follow industry best practice and demonstrate compliance with the relevant parts of ISO/IEC 11801-(1 to 6):2017/COR1:2018 or EN 50173-(1 to 6):2018 standards and shall be tested to ISO/IEC 11801-(1 to 6):2017/COR1:2018.

Furthermore, the General Installation Guidelines from Nexans and especially all detailed product installation instructions must be followed.

Related documents are available from Nexans' Dataneetworks website in various Resources topic webpages

<https://dataneetworks.nexans.com/Resources.html>

Following documents can be found on the website:

- General Installation Guide
- Product Installation Sheets are in most cases included with the product.

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-7A Cabling System'

To pass testing for the Nexans warranty all 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.

System Warranty	Channel Limits	Permanent Link Limits
LANmark-7A	*PASS possible >15m PL length	Not supported

### 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 and EN 50173 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 <sup>a</sup>	2	5
Patch cord	2	-
Equipment cord <sup>b</sup>	2	5
All cords	-	10
<sup>a</sup> If there is no CP, the minimum length of the work area cord is 1m.		
<sup>b</sup> If there is no cross-connect, the minimum length of the equipment cord is 1m.		

(\*) Source: Table 2 of ISO/IEC 11801-2:2017

Whereas the maximum length is given as a normative requirement, minimum length is informative 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. This is valid for all frequencies above 250 MHz and therefore does apply especially for cabling systems up to 1250MHz.

## 3.2. 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. 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 2 - Horizontal link length equations**

Model	Fig.	Class EA/FA channels
Interconnect - TO	12a	$l_h = 105 - l_a \times X$
Cross connect - TO	12b	$l_h = 103 - l_a \times X$
Interconnect- CP - TO	12c	$l_h = 103 - l_a \times X - l_c \times Y$
Cross connect - CP - TO	12d	$l_h = 102 - l_a \times X - l_c \times Y$

$l_h$  - the maximum length of the fixed horizontal cable (m)  
 $l_a$  - combined length of patch cords/jumpers, equipment and work area cords (m)  
 $l_c$  - the length of the CP cable and/or CC equipment cord (m)  
 $X$  - the ratio of cord cable insertion loss (dB/m) to fixed horizontal cable insertion loss (dB/m):  
     for LANmark-6A/7A use **1.5**  
 $Y$  - the ratio of CP cable insertion loss (dB/m) to fixed horizontal cable insertion loss (dB/m):  
     for LANmark-6A/7A use **1.5**

NOTE:  
 For operating temperatures above 20°C,  $l_h$  should be reduced by 0.2% per °C (20°C to 60°C) for screened cables

**Please note:** In the tables shown in the next paragraphs the variables used in the formulas above have been substituted by the following letters.

$$l_h = H$$

$$l_a = F1 \ \& \ F2$$

$$l_c = C1 \ \& \ C2$$

F1= Equipment cord or CC patch cord  
 F2= Work area cord

C1= Service presentation/cross connect  
 C2= Consolidation point cable



### 3.3. Permanent Link Length Design Guidelines

The following length restrictions apply to LANmark-7A products installed from Interconnect (GG45) – TO/EO (GG45). In case Consolidation Points (CP) and/or Cross Connects (CC) are used, LANmark-6A patch cords series have to be used to build the CC links.

#### 3.3.1. 2 Connector Link Installation Guidelines

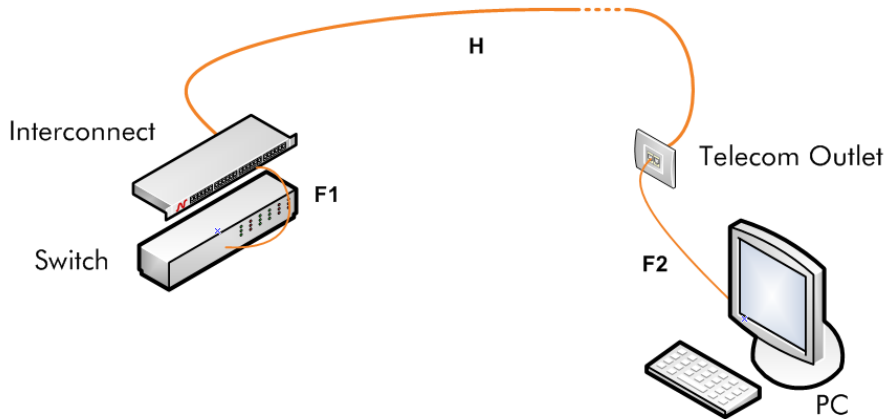


Figure 12a

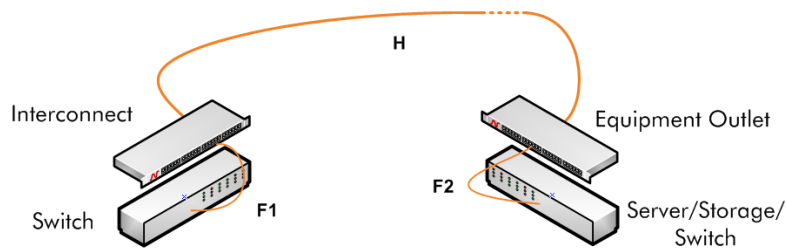
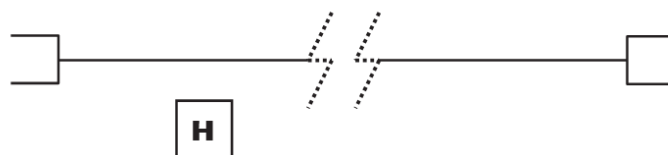


Figure 12a-bis (Data Centre or Backbone)

**Table 3 - 2 Connector Permanent Link Length Specifications**

Segment	Description	Minimum length	Maximum length
H	Horizontal Permanent Link (GG45)	15m	90m



### 3.3.2. 3 Connector Link Installation Guidelines

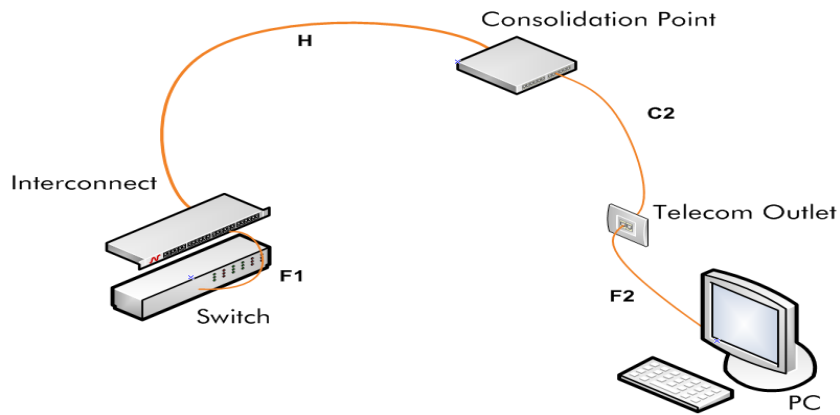


Figure 12c

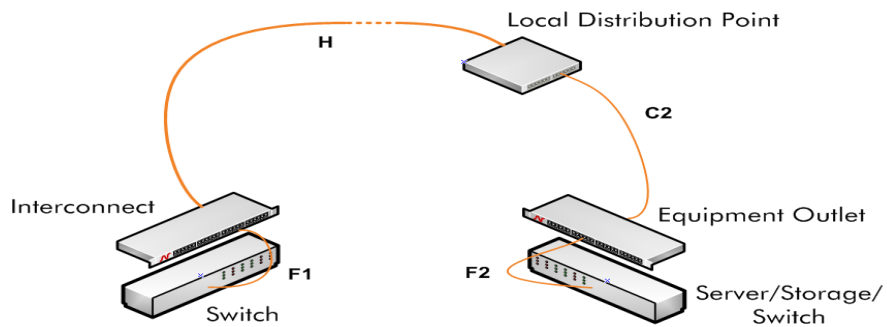
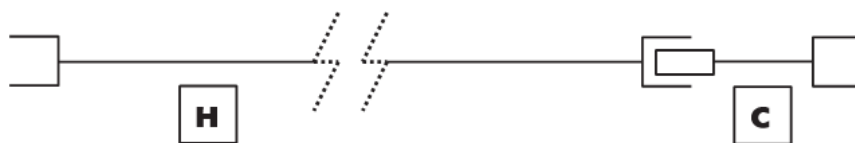


Figure 12c-bis (Data Centre)

**Table 4 - 3 Connector Permanent Link Length Specifications**

Segment	Description	Minimum length	Maximum length
<b>H</b>	Horizontal Permanent Link (GG45)	<b>15m</b>	<b>80.5m</b>
<b>C</b>	Consolidation Point cord (GG45)	<b>5m</b>	20m**
<b>H + C</b>	Total Link length	15 + 5 = <b>20m</b>	80.5 + 5 = <b>87,5m</b>

\*\* Informative maximum length



# 4. Detailed Channel Design Guidelines for LANmark-7A

## 4.1. 2 Connector Channel Design Guidelines

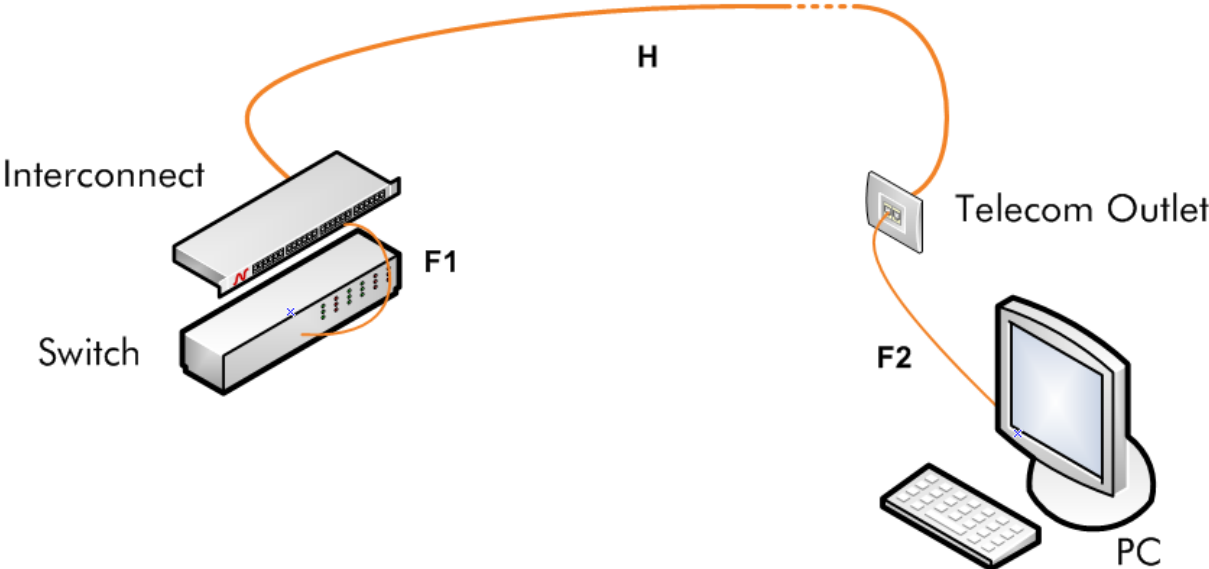


Figure 12a

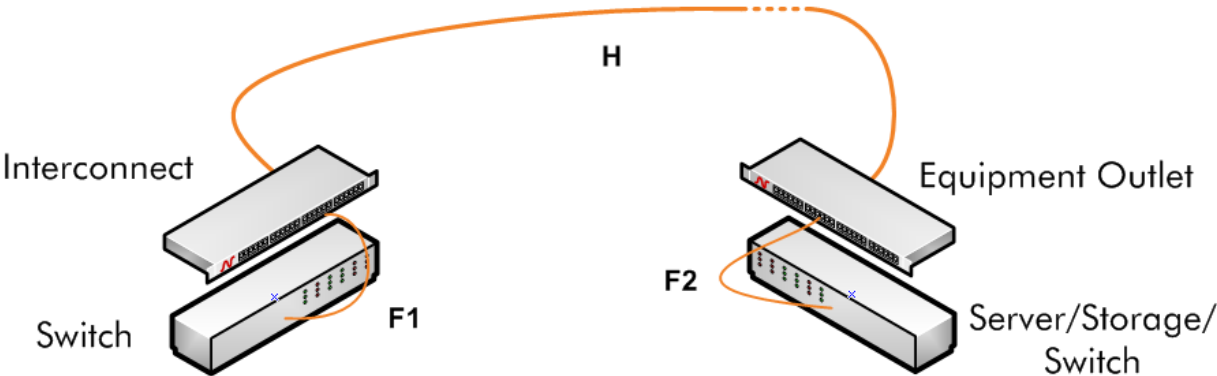
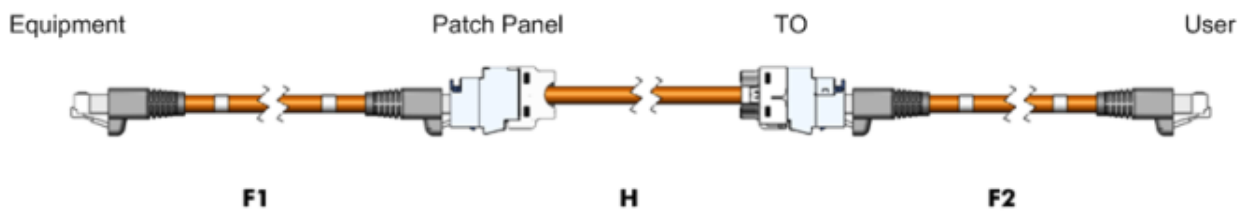


Figure 12a-bis (Data Centre or Backbone)

**Table 5 - 2 Connector Channel Length Specifications**

Segment	Description	Minimum length in m	Maximum length in m
		$H = 105 - (F1+F2) * 1.5$	
H	Horizontal Permanent Link	<b>15</b>	<b>90</b>
F1 & F2	Patch cord	<b>1</b>	<b>5</b>
H+F1+F2	Total channel length	$15 + 1 + 1 = \mathbf{17m}$	$90 + 5 + 5 = \mathbf{100m}$



## 4.2. 3 Connector Channel using a Cross Connect

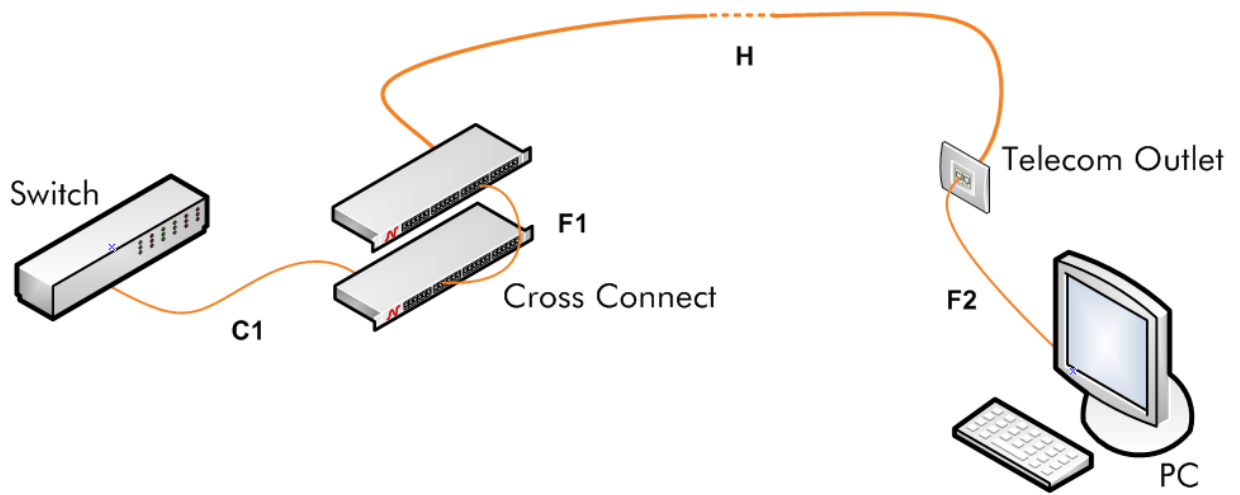


Figure 12b

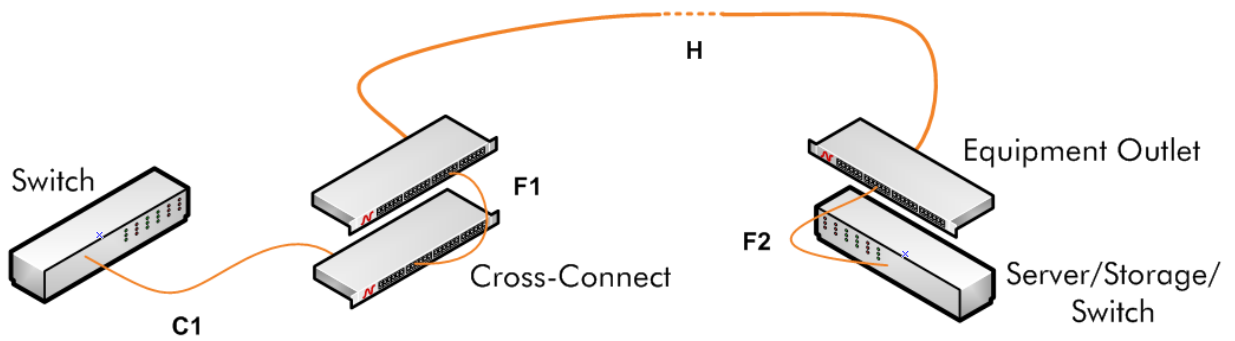
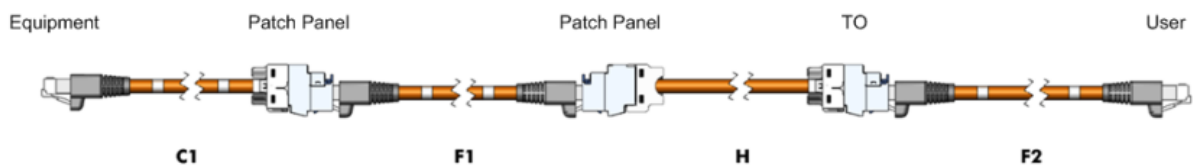


Figure 12b-bis (Data Centre or Backbone)

**Table 6 – 3 Connector Channel Length Specifications**

Segment	Description	Minimum Length in m	Maximum Length in m
		$H = 103 - (F1 + F2 + C1) * 1.5$	
H	Horizontal Permanent Link	<b>15</b>	<b>80.5*</b>
C1	Service Presentation - Cross Connect	<b>5</b>	20**
F1 & F2°	Patch cord	<b>2</b>	<b>5</b>
Examples		<b>Using short and long CC</b>	<b>Using short and long CC</b>
H+C1+F1+F2	Length for 3 Connector Channel with Short CC	$15 + 5 + 2 + 2 = \mathbf{29m}$	$80.5 + 5 + 5 + 5 = \mathbf{95.5m}$
H+C1+F1+F2	Length for 3 Connector Channel with Long CC	$15 + 20^{**} + 2 + 2 = \mathbf{39m}$	$58 + 20^{**} + 5 + 5 = \mathbf{88m}$
<p>° using LANmark-6A screened patch cord(s)                      * Calculation based on 5 m F1&amp;F2 cords to maintain maximum flexibility on choice of patch cord length for user and patch area                      ** Informative maximum length</p>			



### 4.3. 3 Connector Channel using a Consolidation Point

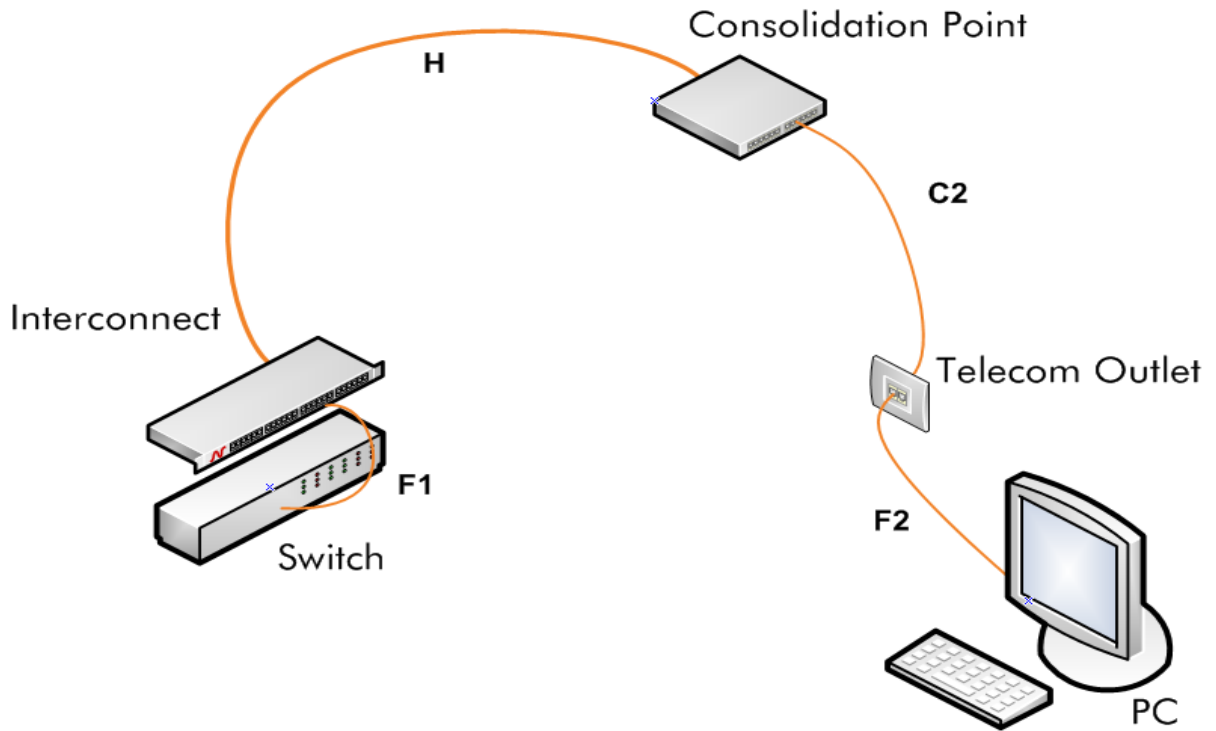


Figure 12c

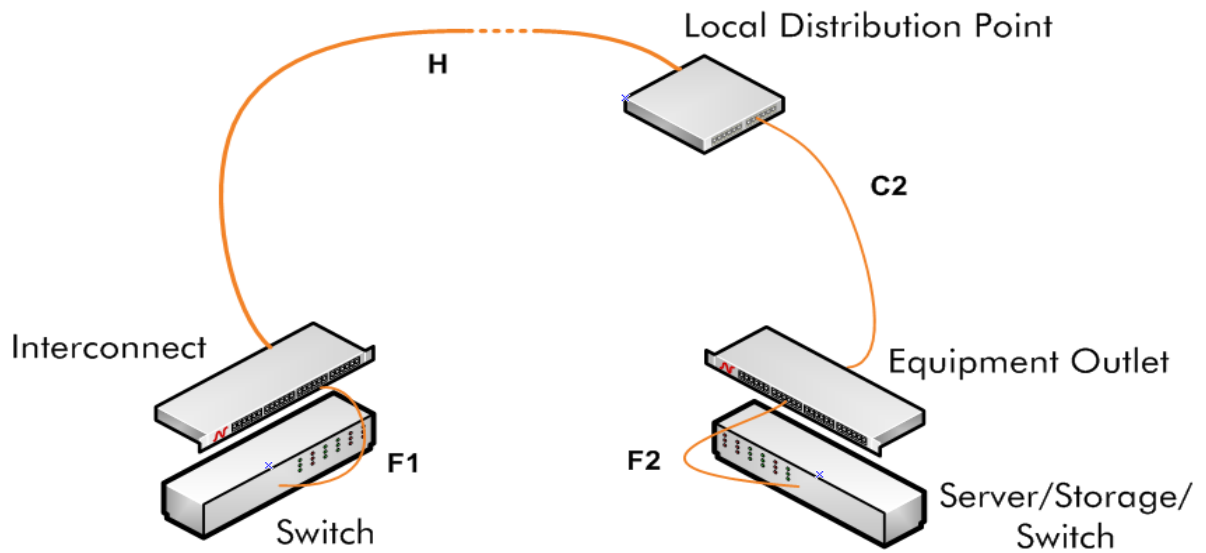
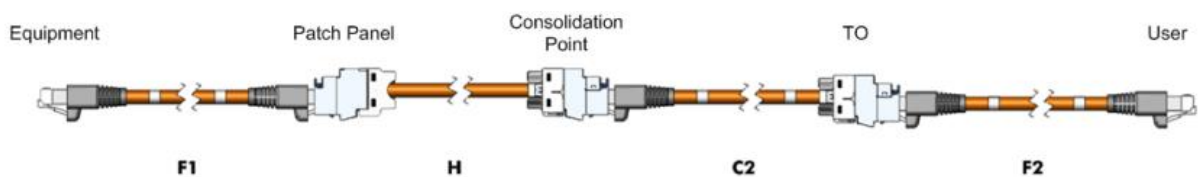


Figure 12c-bis (Data Centre)

**Table 7 – 3 Connector Channel Length Specifications**

Segment	Description	Minimum Length in m	Maximum Length in m
		$H = 103 - (F1 + F2 + C2) * 1.5$	
H	Horizontal Permanent Link	<b>15</b>	<b>80.5*</b>
C2	Consolidation Point cable	<b>5</b>	20**
F1 & F2°	Patch cord	<b>2</b>	<b>5</b>
Examples		Using short and long CP	Using short and long CP
H+C2+F1+F2	Length for 3 Connector Channel with Short CP	$15^* + 5 + 2 + 2 = \mathbf{29m}$	$80.5 + 5 + 5 + 5 = \mathbf{95.5m}$
H+C2+F1+F2	Length for 3 Connector Channel with Long CP	$15 + 20^{**} + 2 + 2 = \mathbf{39m}$	$58+20^{**}+5+5 = \mathbf{88m}$
° using LANmark-6A screened patch cord(s) * Calculation based on 5 m F1&F2 cords to maintain maximum flexibility on choice of patch cord length for user and patch area ** Informative maximum length			





#### 4.4. 4 Connector Channel using a Cross Connect and Consolidation Point

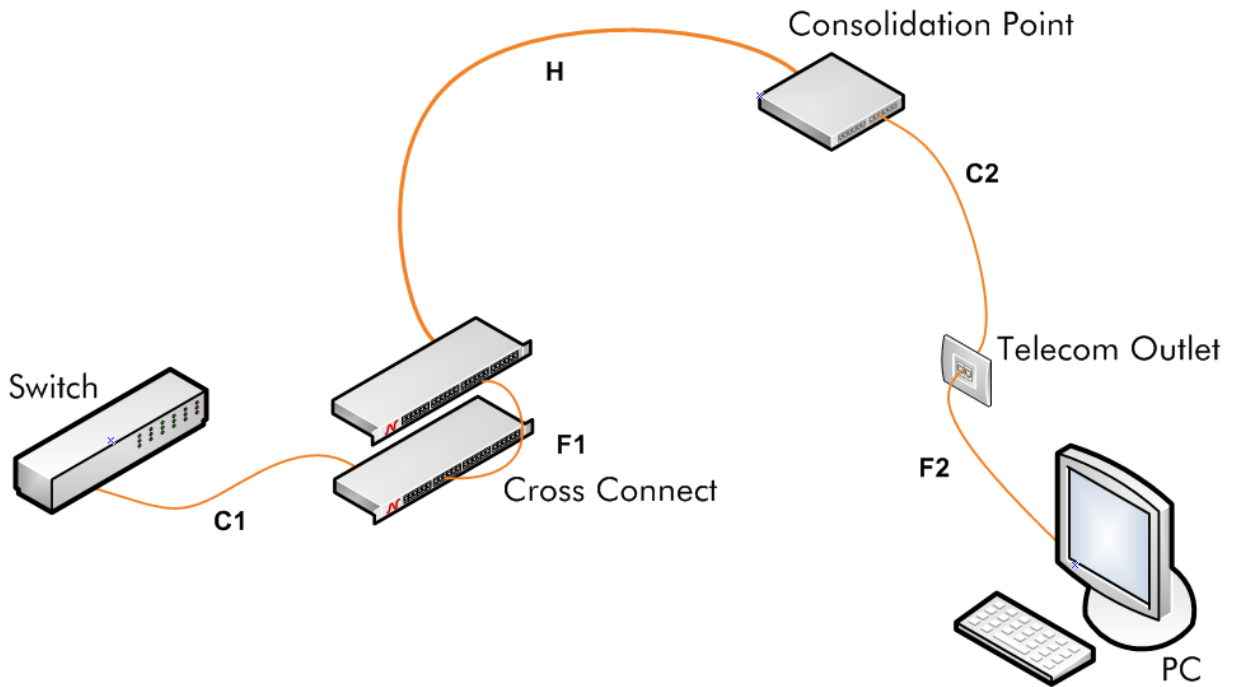


Figure 12d

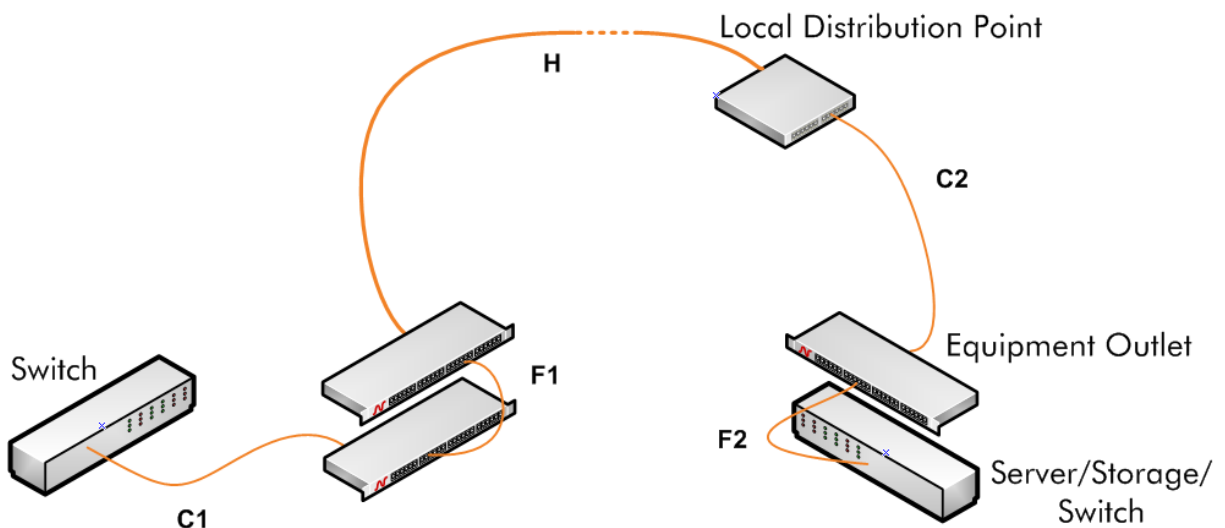
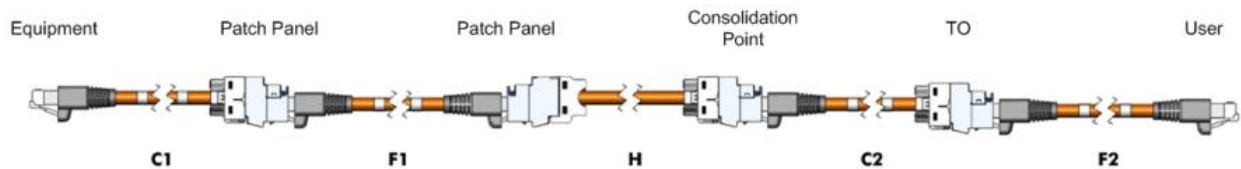


Figure 12d-bis (Data Centre)

**Table 8 – 4 Connector Channel Length Specifications**

Segment	Description	Minimum Length in m	Maximum Length in m
		$H = 102 - (F1 + F2 + C1 + C2) * 1.5$	
H	Horizontal Permanent Link	<b>15</b>	<b>72*</b>
C1°	Service Presentation - Cross Connect	<b>5</b>	20**
C2	Consolidation Point cable	<b>5</b>	20**
F1 & F2	Patch cord	<b>2</b>	<b>5</b>
Examples		<b>Using short and long CC and CP</b>	<b>Using short and long CC and CP</b>
H+C1+C2+F1+F2	Length for 3 Connector Channel with Short CC	$15 + 5 + 5 + 2 + 2 = \mathbf{29m}$	$72 + 5 + 5 + 5 + 5 = \mathbf{92m}$
H+C1+C2+F1+F2	Length for 3 Connector Channel with Long CC	$15 + 20^{**} + 20^{**} + 2 + 2 = \mathbf{59m}$	$27 + 20^{**} + 20^{**} + 5 + 5 = \mathbf{77m}$
° using LANmark-6A screened patch cord(s) * Calculation based on 5 m F1&F2 cords to maintain maximum flexibility on choice of patch cord length for user and patch area ** Informative maximum length			





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