ISO/IEC 11801-4

Edition 1.0 2017-11

INTERNATIONAL STANDARD

Information technology – Generic cabling for customer premises
Part 4: Single-tenant homes

ISO/IEC 11801-4:2017-11(en)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

ISO/IEC 11801-4

Edition 1.0 2017-11

INTERNATIONAL STANDARD

Information technology – Generic cabling for customer premises
Part 4: Single-tenant homes

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 35.200

ISBN 978-2-8322-5035-8

CONTENTS

INFORMATION TECHNOLOGY – GENERIC CABLING FOR CUSTOMER PREMISES

Part 4: Single-tenant homes

FOREWORD

1) ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

2) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees and ISO member bodies.

3) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC National Committees and ISO member bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC, ISO and ISO/IEC publications is accurate, IEC or ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

4) In order to promote international uniformity, IEC National Committees and ISO member bodies undertake to apply IEC, ISO and ISO/IEC publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any ISO, IEC or ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.

5) ISO and IEC do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. ISO or IEC are not responsible for any services carried out by independent certification bodies.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC National Committees or ISO member bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication of, use of, or reliance upon, this ISO/IEC publication or any other IEC, ISO or ISO/IEC publications.

8) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

9) Attention is drawn to the possibility that some of the elements of this ISO/IEC publication may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 11801-4 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This first edition cancels and replaces ISO/IEC 15018:2004 and Amendment 1:2009. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) standard re-structured to contain only those requirements that are specific for generic cabling systems installed in homes;

b) the channel performance Class CCCB and related reference implementations have been deleted and are now addressed as distributed building services in ISO/IEC 11801-6;

c) implementation options now include optical fibre in addition to balanced and coaxial media.

ISO/IEC 11801-4 is to be read in conjunction with ISO/IEC 11801-1.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the ISO/IEC 11801 series, published under the general title *Information technology – Generic cabling for customer premises*, can be found on the IEC website.

The contents of the corrigendum of April 2018 have been included in this copy.

INTRODUCTION

The importance of cabling infrastructure is similar to that of other fundamental utilities such as water and energy supply and interruptions to the services provided over that infrastructure can have a serious impact. A lack of design foresight, the use of inappropriate components, incorrect installation, poor administration or inadequate support can threaten quality of service and have commercial consequence for all types of users.

This document specifies generic cabling within a home.

The home can contain one or more buildings (e.g. farm) or be within a building which contains more than one home (e.g. one home in a multi-tenant building).

The campus or backbone cabling connecting individual homes within multi-tenant premises is specified according to the relevant standard (for instance ISO/IEC 11801-1 or IEC 60728).

Generic cabling for distributed building services in homes is specified in ISO/IEC 11801-6, which addresses all of the above premises and spaces within them.

Figure 1 shows the schematic and contextual relationships between the standards relating to information technology cabling produced by ISO/IEC JTC 1/SC 25, namely the ISO/IEC 11801 series of standards for generic cabling design, standards for the installation, operation and administration of generic cabling and for testing of installed generic cabling.

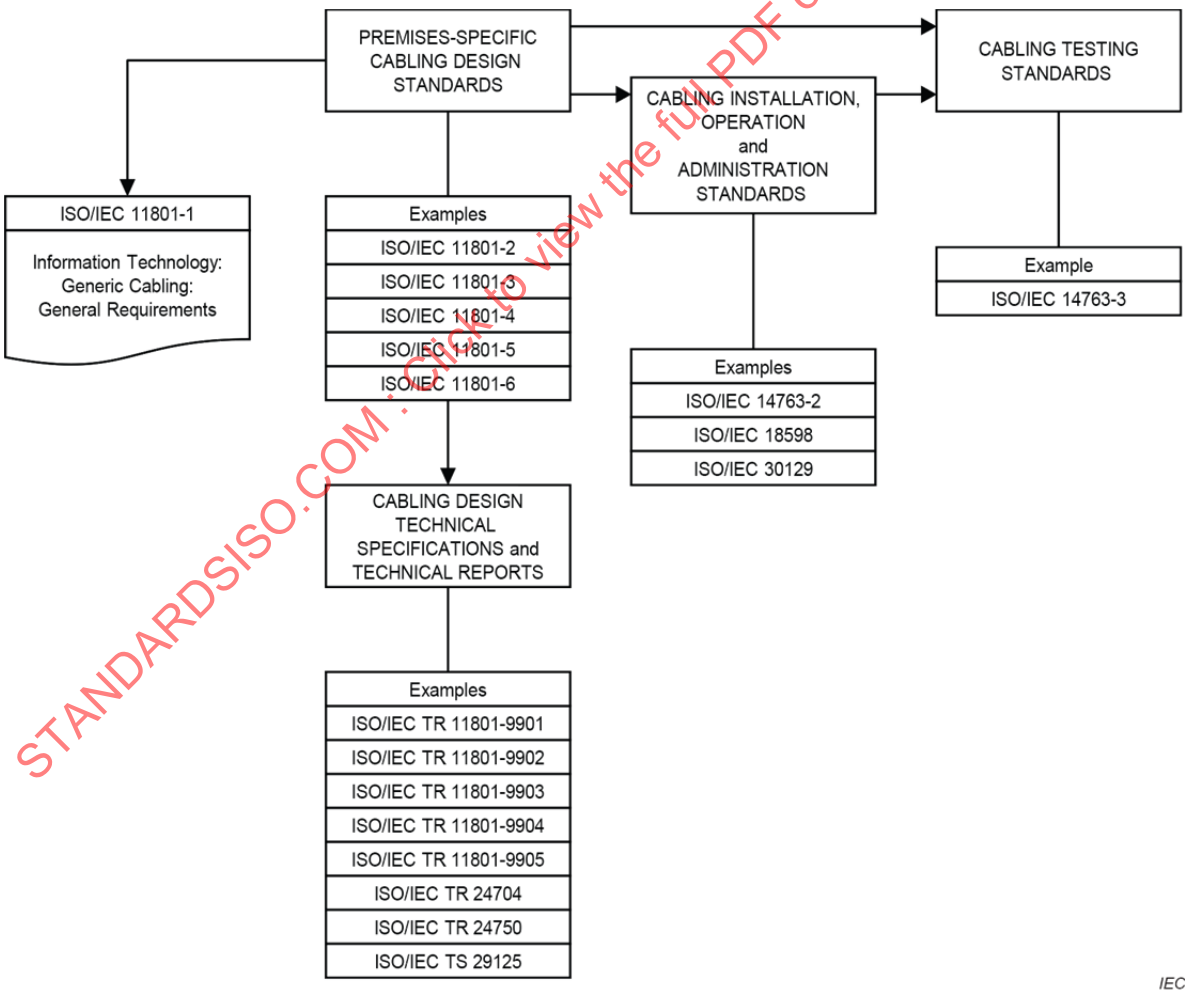


Figure 1 – Relationships between the generic cabling documents produced by ISO/IEC JTC 1/SC 25

The generic cabling specified by this document provides users with

a) an application independent system capable of supporting a wide range of applications in a range of installation and operating environments,

b) a flexible scheme such that modifications are both easy and economical,

c) a multi-vendor supply chain within an open market for cabling components.

In addition, this document provides

d) relevant industry professionals with guidance allowing the accommodation of cabling before specific requirements are known, i.e. in the initial planning either for construction or refurbishment and for further deployment as the requirements of areas are defined,

e) industry and standardization bodies with a cabling system which supports current products and provides a basis for future product development and applications standardization,

f) users, designers and manufacturers of application-specific cabling systems with advice on interfacing to this generic cabling,

g) suppliers of cabling components and installers of cabling with relevant requirements,

h) service providers with a distribution system for their services.

Applications addressed in this document include those developed by the technical committees of IEC (including the subcommittees of ISO/IEC JTC 1) and study groups of ITU-T as used to support the following services:

- information and communications technologies (ICT),
- broadcast and communications technologies (BCT).

This document also applies where cabling is designed to support only one of the services listed above.

Physical layer requirements for the applications listed in Annex E of ISO/IEC 11801-1:2017 have been analysed to determine their compatibility with the cabling performance specified in this document and, together with statistics concerning premises geography from different countries and the models described in Clause 6, have been used to develop the requirements for cabling components and to stipulate their arrangement into cabling systems.

As a result, this document

1) specifies a structure for generic cabling supporting a wide variety of applications including, but not restricted to, the applications in ISO/IEC 11801-1:2017, Annex E,

2) adopts balanced cabling channel and link Classes D, E, E_A, F, F_A and BCT-B specified in ISO/IEC 11801-1,

3) adopts coaxial cabling channel and link Classes BCT-C specified in ISO/IEC 11801-1,

4) adopts optical fibre cabling channel and link requirements specified in ISO/IEC 11801-1,

5) adopts component requirements, specified in ISO/IEC 11801-1, and specifies cabling implementations that ensure performance of permanent links and of channels that meet or exceed the requirements of a specified group (e.g. Class) of applications.

Life expectancy of generic cabling systems can vary depending on environmental conditions, supported applications, aging of materials used in cables, and other factors such as access to pathways (campus pathways are more difficult to access than building pathways). With appropriate choice of components, generic cabling systems meeting the requirements of this document are expected to have a life expectancy of at least ten years.

This document has taken into account requirements specified in application standards listed in ISO/IEC 11801-1:2017, Annex E. It refers to International Standards for components and test methods whenever appropriate International Standards are available.

INFORMATION TECHNOLOGY – GENERIC CABLING FOR CUSTOMER PREMISES

Part 4: Single-tenant homes

1 Scope

This part of ISO/IEC 11801 specifies generic cabling for single-tenant homes. A home can contain one or more buildings or can be within a building that contains more than one home. It covers balanced cabling, optical fibre cabling and coaxial cabling.

This document specifies a generic cabling for two groups of applications:

1) information and communications technologies (ICT),
2) broadcast and communications technologies (BCT).

This document specifies directly or via reference to ISO/IEC 11801-1

a) the structure and minimum configuration for generic cabling within homes,
b) the interfaces at the telecommunications outlet (TO) and broadcast outlet (BO),
c) the performance requirements for cabling links and channels,
d) the implementation requirements and options,
e) the performance requirements for cabling components,
f) the conformance requirements and verification procedures.

Safety and electromagnetic compatibility (EMC) requirements are outside the scope of this document, and are covered by other standards and by regulations. However, information given by this document can be of assistance.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60728 (all parts), *Cable networks for television signals, sound signals and interactive services*

IEC 61754-20 (all parts), *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 20: Type LC connector family*

ISO/IEC 11801-1:2017, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

ISO/IEC 14763-2, *Information technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation*

ISO/IEC 30129, *Information technology – Telecommunications bonding networks for buildings and other structures*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11801-1, ISO/IEC 14763-2 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
application outlet
telecommunications outlet or broadcast outlet

3.1.2
balun
device to provide impedance transformation between balanced and unbalanced components

3.1.3
broadcast outlet
fixed connecting device which provides an interface to the terminal equipment

3.1.4
coverage area
area within a home covered by any application

3.1.5
home
physical structure used as a dwelling place

EXAMPLE A house or an apartment.

Note 1 to entry: This can be an individual building, part of a larger building or more than one building.

3.1.6
home network interface
interface for access to the network for distribution of television signals, sound signals and interactive services inside a single-tenant home

3.1.7
primary home cable
cable that connects a primary home distributor to a telecommunications outlet or broadcast outlet or to a secondary home distributor where present

3.1.8
primary home distributor
distributor from which the primary home cable starts

3.1.9
secondary home cable
cable that connects a secondary home distributor to a telecommunications outlet or broadcast outlet

3.1.10
secondary home distributor
distributor used to provide additional infrastructure flexibility and/or allocate transmission equipment between the primary home distributor and coverage areas (e.g. for homes with multiple floors)

3.2 Abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO/IEC 11801-1 and the following apply.

BO broadcast outlet

ENI external network interface

HNI home network interface

PHD primary home distributor

SHD secondary home distributor

TV television

UHF ultra-high frequency

VHF very high frequency

4 Conformance

For a cabling installation to conform to this document the following applies.

a) The configuration and structure shall conform to the requirements outlined in Clause 5.

b) Channels shall meet the requirements specified in Clause 6 when subjected to environment conditions, local to the channels (see NOTE 2 below), as defined by the applicable environmental Class(es) of Clause 6. This shall be achieved by one of the following:

   1) a channel design and implementation ensuring that the prescribed channel performance of Clause 6 is met;

   2) attachment of appropriate components to a permanent link design meeting the prescribed performance class of Clause 7. Channel performance shall be ensured where a channel is created by adding more than one cord to either end of a link meeting the requirements of Clause 7;

   3) for E_1 environments, using the reference implementations of Clause 8 and compatible cabling components conforming to the requirements of Clauses 9, 10 and 11 based upon a statistical approach of performance modelling.

      NOTE 1 This approach is not applicable to all parameters for Class BCT-B cabling.

c) The interfaces to the cabling at the TO and BO shall conform to the requirements of Clause 10 with respect to mating interfaces and performance when subjected to environment conditions, local to the connecting hardware (see NOTE 2 below), as defined by the applicable environmental Class(es) of Clause 6.

d) Connecting hardware at other places in the cabling structure shall meet the performance requirements specified in Clause 10 when subjected to environment conditions, local to the connecting hardware (see NOTE 2 below), as defined by the applicable environmental Class(es) of Clause 6.

e) The requirements of ISO/IEC 14763-2 and ISO/IEC 30129 shall be met.

This document does not specify which tests and sampling levels should be adopted. Test methods to assess conformance with the channel and link requirements of Clause 6 and Clause 7, respectively, are specified in ISO/IEC 11801-1. The test parameters to be measured, the sampling levels and the treatment of measured results to be applied for particular installation shall be defined in the installation specification and quality plan for that installation prepared in accordance with ISO/IEC 14763-2.

In the absence of the channel, the conformance of the link shall be used to verify conformance with this document.

Specifications marked "ffs" are preliminary specifications, and are not required for conformance to this document.

NOTE 2 The applicable environmental classification of ISO/IEC 11801-1:2017, 6.2.1, local to the cabling or cabling component(s), is that of the environment immediately adjacent to the cabling or cabling component(s).

5 Structure of the generic cabling system

5.1 General

Clause 5 identifies the functional elements of a generic cabling system to support ICT and/or BCT applications, describes how they are connected together to form subsystems and identifies the interfaces at which application-specific components are connected to the generic cabling infrastructure.

The channels specified in Clause 6 do not generally support the simultaneous transmission of multiple applications, of the same or different application Classes, within a cable or at an interface to the generic cabling. The sharing of components by applications can require additional performance requirements and/or supplier instructions to be applied. These requirements are outside the scope of this document.

5.2 Functional elements

The functional elements of generic cabling are as follows:

a) primary home distributor (PHD) – equivalent to distributor 2 in ISO/IEC 11801-1;

b) primary home cable – equivalent to subsystem cable 2 in ISO/IEC 11801-1;

c) secondary home distributor (SHD) – equivalent to distributor 1 in ISO/IEC 11801-1;

d) secondary home cable – equivalent to subsystem cable 1 in ISO/IEC 11801-1;

e) application outlet (TO or BO) – equivalent to TE outlet in ISO/IEC 11801-1.

NOTE The SHD and secondary home cable are optional functional elements.

The type and number of functional elements used depends upon the type of premises and the application group(s) served. It is possible to combine multiple functional elements into a single element.

The functional elements used within a given implementation of a generic cabling system are connected together to form cabling subsystems. The connection of equipment at the application outlets and distributors supports applications.

Equipment is not included within the functional elements. The accommodation of functional elements and the facilities for co-location of equipment and functional elements are discussed in 5.6.

5.3 Cabling subsystems for ICT and BCT

5.3.1 General

Generic cabling schemes to support ICT and/or BCT applications contain a maximum of two cabling subsystems: the primary home cabling subsystem and the secondary home cabling subsystem, as shown in Figure 2.

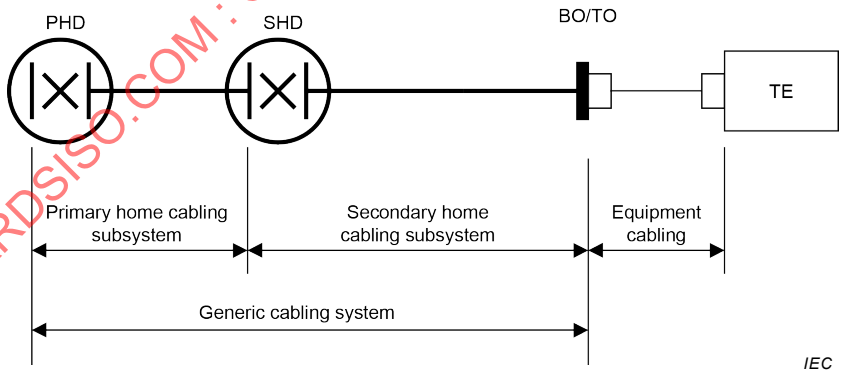


Figure 2 – Structure of the generic cabling system

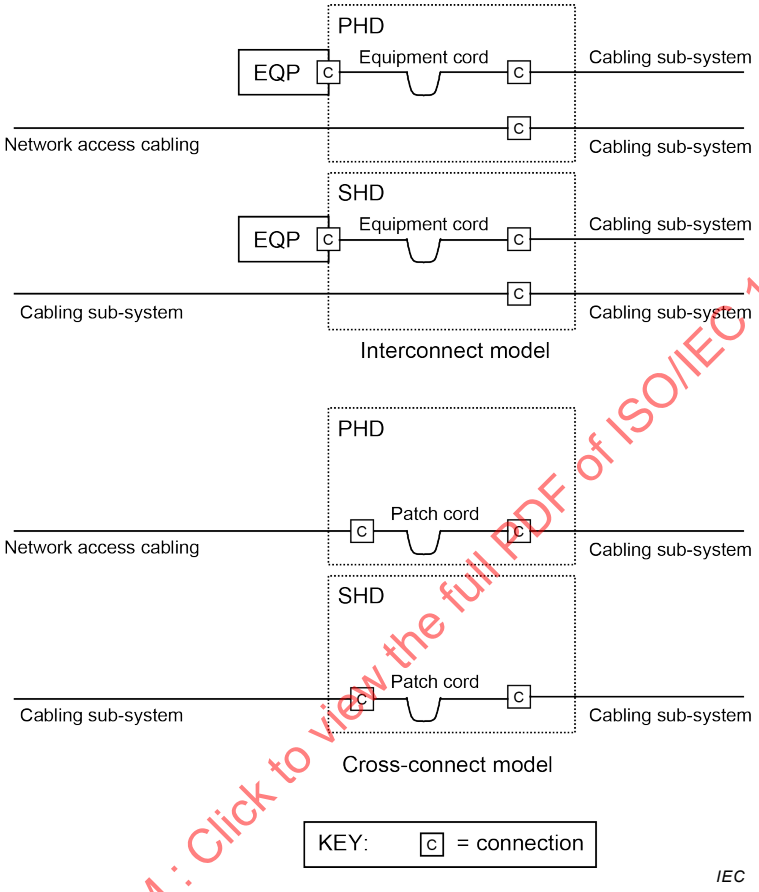
The composition of the subsystems is described in 5.3.2 and 5.3.3. Conformance to this document does not require the presence of a secondary home cabling subsystem.

Distributors and application outlets provide the means for configuring the cabling to support topologies in addition to those implemented by the installed cables.

Passive connections between the primary home cabling subsystem and the network access cabling at the PHD are generally achieved by using cross-connections (see Figure 3).

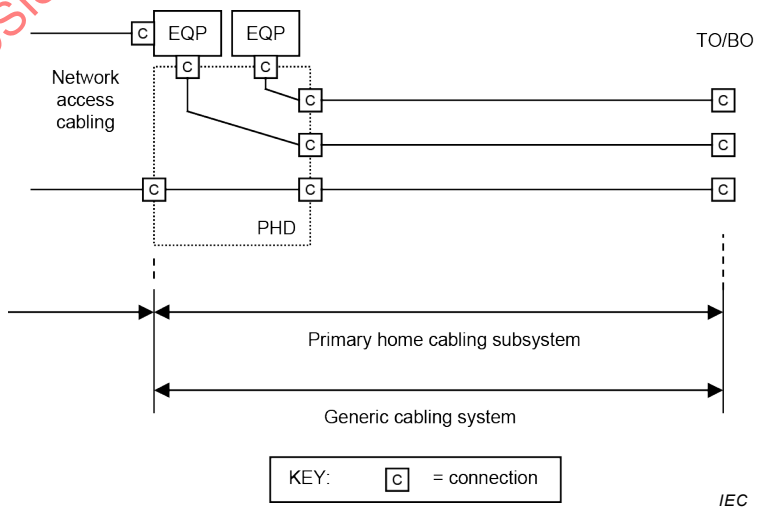
Connection to application-specific equipment at the PHD generally adopts an interconnect approach (see Figure 4). The active equipment can serve the home or can provide an application-specific connection to the network access cabling.

Connections between the cabling subsystems at the SHD are either active, requiring application-specific equipment, or passive using cross-connections by way of either patch cords or jumpers (see Figure 3).



NOTE The dotted elements represent the boundaries of functional elements and not the enclosure that contains the functional elements.

Figure 3 – Interconnect and cross-connect models



NOTE The dotted elements represent the boundaries of functional elements and not the enclosure that contains the functional elements.

Figure 4 – Interconnect and cross-connects at the PHD

5.3.2 Primary home cabling subsystem

The primary home cabling subsystem extends from the PHD to the TO or BO.

When an SHD is used, the primary home cabling subsystem extends from the PHD to the SHD. The subsystem includes

a) the primary home cables,

b) the mechanical termination of the primary home cables at the SHD, TO or BO as appropriate,

c) the mechanical termination of the primary home cables at the PHD including the connecting hardware, e.g. of the interconnect or cross-connect (see Figure 3),

d) any cross-connection to network access cabling at the PHD,

e) TO or BO (where an SHD is not used).

Although equipment cords are used to connect the transmission equipment to the cabling subsystem, they are not considered part of the cabling subsystem because they can be application-specific.

The primary home cabling subsystem does not include the interface to the network access cabling at the PHD.

5.3.3 Secondary home cabling subsystem

The secondary home cabling subsystem extends from an SHD to the TO or BO. The subsystem includes

a) the secondary home cables,

b) the mechanical termination of the secondary home cables at the TO or BO,

c) the mechanical termination of the secondary home cables at the SHD,

d) any cross-connection at the SHD,

e) TO or BO.

Although equipment cords are used to connect the transmission equipment to the cabling subsystem, they are not considered part of the cabling subsystem because they can be application-specific.

5.4 Cabling structure

For generic cabling to support ICT and/or BCT applications, the functional elements of the cabling subsystems are connected to form a hierarchical structure, as shown in Figure 5.

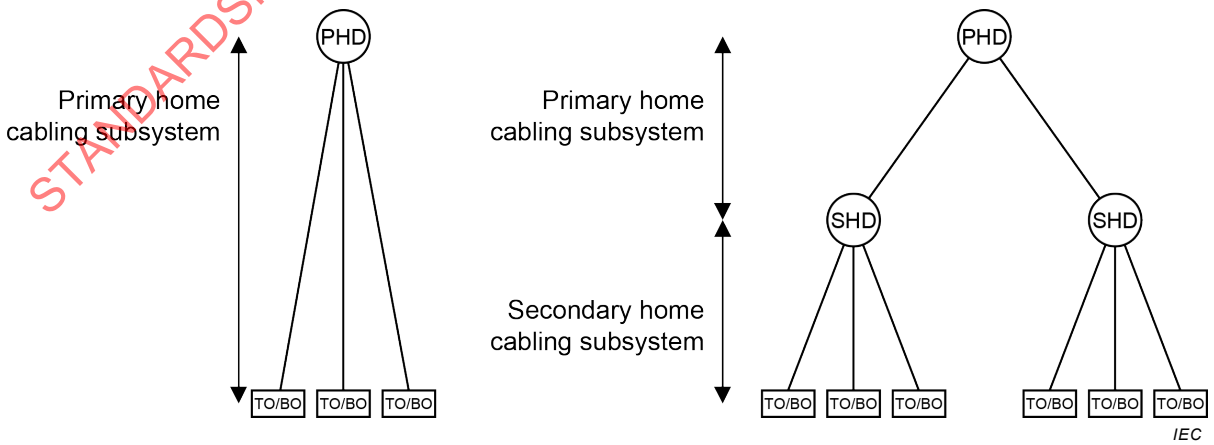


Figure 5 – Hierarchical structure of a generic cabling system in support of ICT and BCT applications

For ICT and BCT applications, the cabling shall have a star topology from the distributors to the application outlet (see Figure 5).

If needed, buses should be created at the PHD or SHD. If cabling is connected to a cabling subsystem to create bus or multi-drop connections, this configuration is outside the scope of this document.

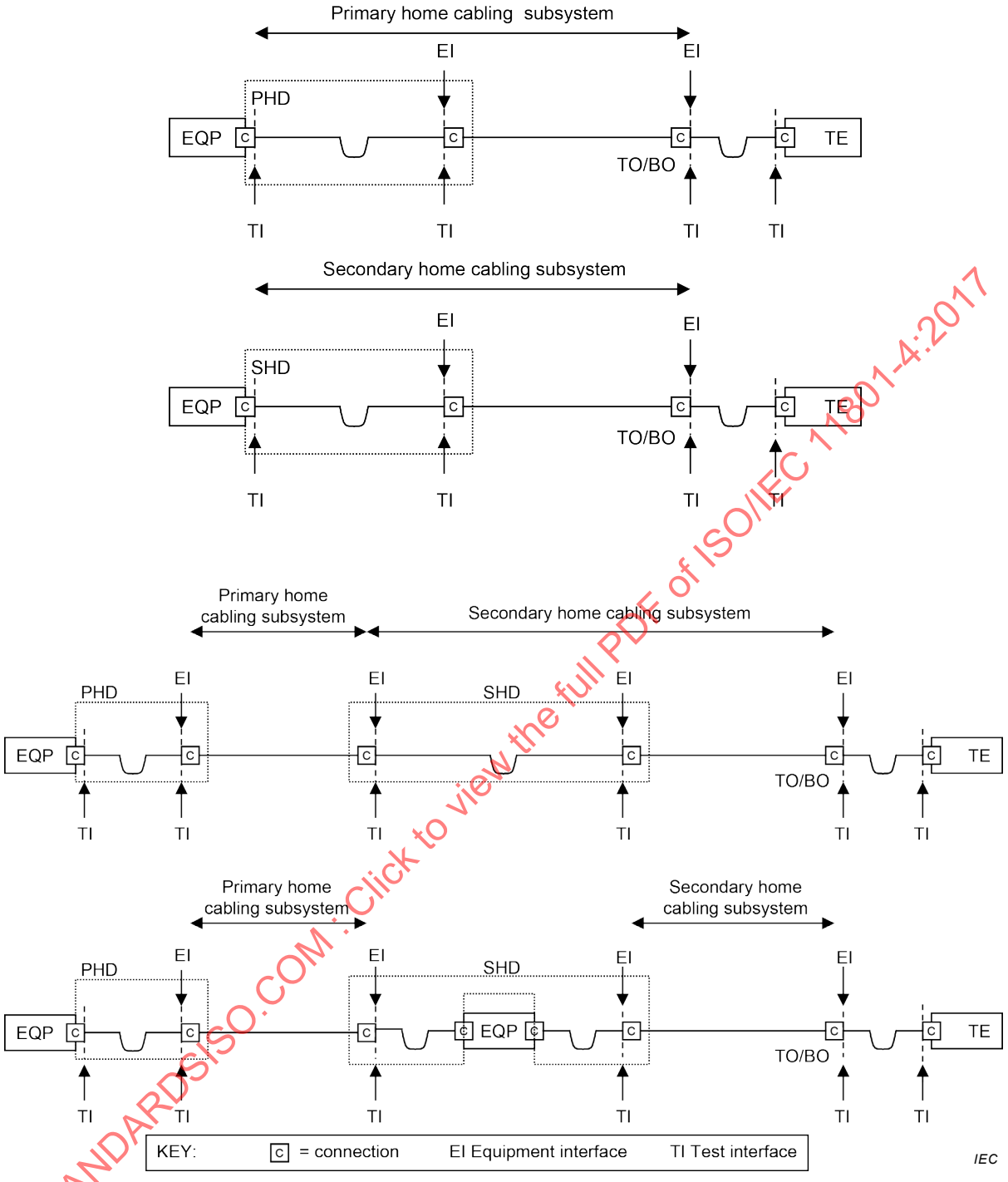
5.5 Interfaces

5.5.1 Equipment interfaces and test interfaces

Equipment interfaces to generic cabling are located at distributors and application outlets. Test interfaces to cabling are located at the ends of each subsystem.

Figure 6 shows the potential equipment interfaces and potential test interfaces within the generic cabling system.

Transmission and terminal equipment are generally connected to the equipment interface using an equipment cord.



NOTE 1 The dotted elements represent the boundaries of functional elements and not the enclosure that contains the functional elements.

NOTE 2 For BCT-C applications (see Clause 6), the test interface is defined according to IEC 61169-1.

Figure 6 – Equipment and test interfaces in support of ICT and BCT applications

5.5.2 Channel and permanent link

5.5.2.1 Channel

For cabling to support ICT and/or BCT applications, the channel consists of the home cabling subsystem(s) together with the equipment cord(s), as shown in Figure 7.

It is important that the cabling channel is designed to meet the required performance for the applications that are to be run. The performance of the channel excludes the connections at the application-specific equipment.

The transmission performance of cabling channels is detailed in Clause 6.

The creation of a channel between two application outlets via a passive cross-connection at the distributors is allowed provided that the relevant channel performance of Clause 6 is met.

The maximum channel lengths for each application group are dependent upon the performance of the cable and connecting hardware used (see Table 1 and Table 2 for maximum channel lengths using the reference implementations of Clause 8).

Where the performance requirements of an application allow, longer channels can be formed by the passive connection of cabling subsystems together with equipment cords where appropriate.

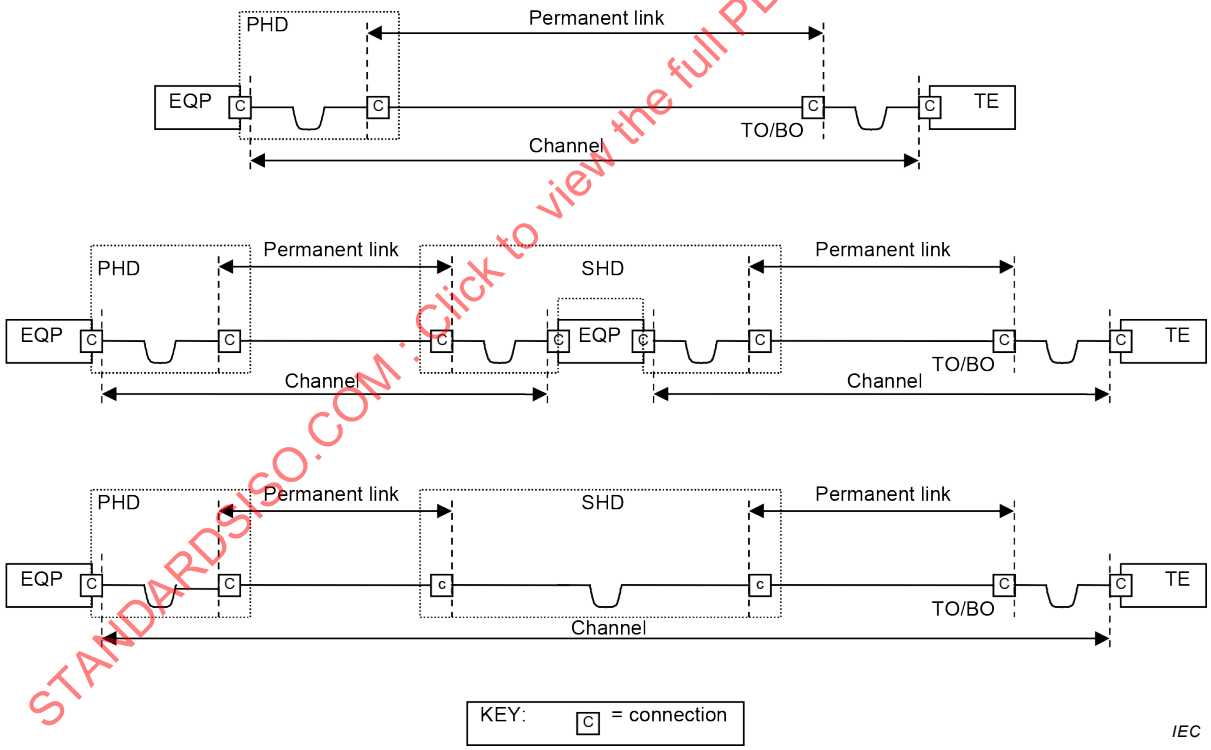
5.5.2.2 Permanent link

If there is no SHD, the permanent link consists of the primary home cable and the termination of that cable at the application outlet and the PHD, as shown in Figure 7.

If there is an SHD, the permanent link consists of the primary or secondary home cable and the termination of that cable at the SHD and the PHD or the application outlet, respectively, as shown in Figure 7.

The permanent link includes the connections at the ends of the installed cabling.

The transmission performance of permanent links is detailed in Clause 7.



NOTE The dotted elements represent the boundaries of functional elements and not the enclosure that contains the functional elements.

Figure 7 – Channels and permanent links within the home

5.5.3 Network access cabling

Network access cabling is presented at the PHD as shown in Figure 8.

In premises containing a single home, the network access cabling provides the connection between the external network interfaces (public or private) and the PHD.

In premises containing multiple homes, the network access cabling can, subject to national or local regulation, also provide the connection between

a) individual homes in the same premises,

b) premises external network interfaces (public or private) and the PHD in each home.

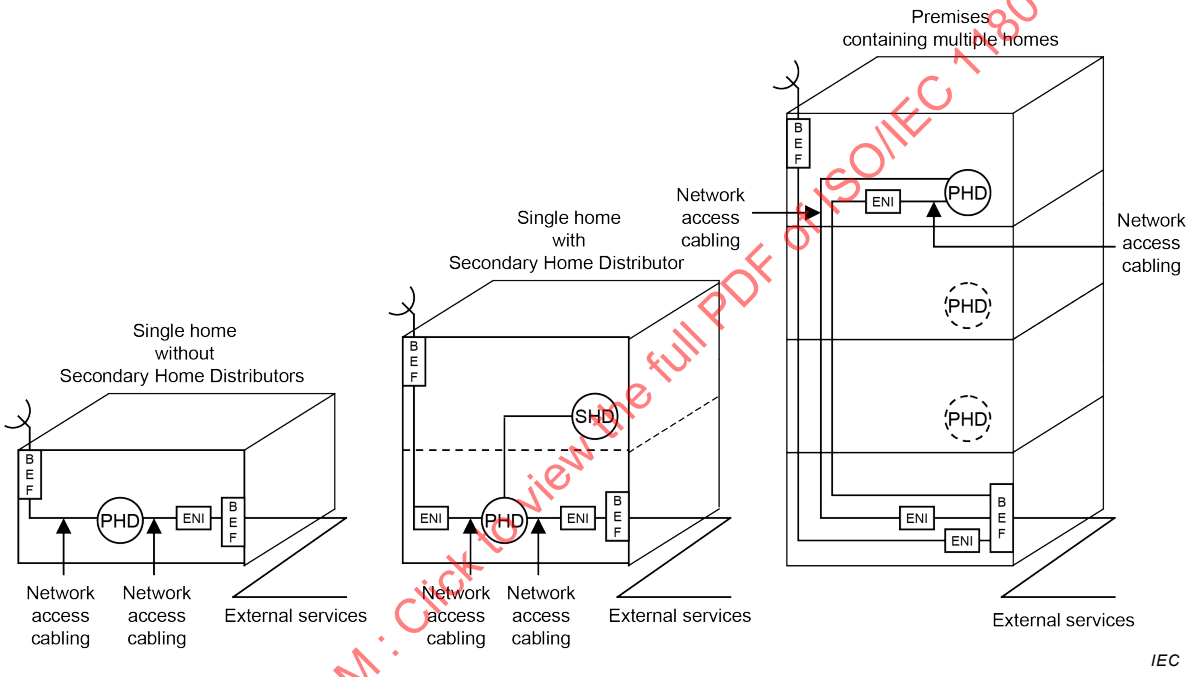
When used to provide a direct connection between the generic cabling system and an external network interface in the home, the performance of the network access cabling should be considered as part of the initial design and implementation of customer applications.

When used to provide a direct connection between the generic cabling system and an external network interface in the same premises (but not within the home served by the home distributor), the network access cabling shall be in accordance with

1) ISO/IEC 11801-1 for ICT applications,

2) IEC 60728 for BCT applications.

The only interfaces to network access cabling within a home shall be those serving that home.



NOTE Some network access cabling uses bus structure.

Figure 8 – Examples of interconnection of home and network access cabling

5.5.4 External network interface

Connections to external networks for the provision of external telecommunications services are made at ENIs. The location of ENIs, if present, and the facilities required may be specified by national, regional, and local regulations. The service provider(s) shall be contacted to locate the ENI(s).

5.6 Accommodation of functional elements

5.6.1 General

Figure 9 illustrates the principle functional elements of generic cabling for a home.

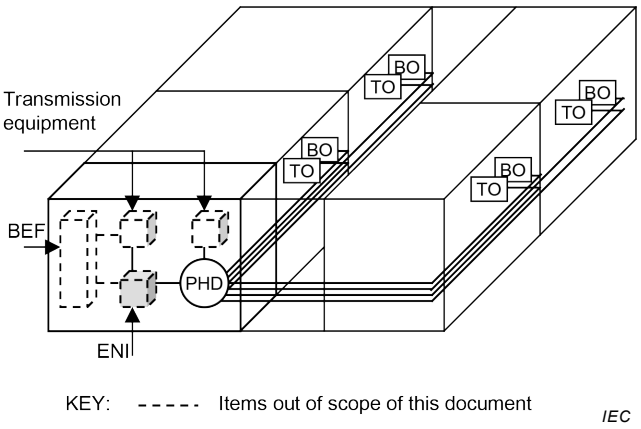


Figure 9 – Overview of a generic cabling for home

Distributors shall be located in designated spaces with adequate access and size to house the cabling, the associated transmission equipment and to enable management of the cabling connections. The space shall be served with mains power supply adequate for transmission equipment.

Requirements and recommendations for spaces are defined in ISO/IEC 14763-2.

Requirements and recommendations for pathways accommodating cables are defined in ISO/IEC 14763-2.

5.6.2 Coverage areas

5.6.2.1 General

The number and distribution of application outlets depends upon the size and function of the coverage area.

The following requirements apply except for rooms that are specifically excluded by local regulations and bathrooms (for which the requirements should be considered as recommendations).

Each room of up to 10 m^2, and each additional area of up to 10m^2 in a larger room, shall be provided with a minimum of one TO for ICT applications and should be provided with a minimum of one BO for BCT applications. For example, a room of 25 m^2 shall have three TOs and should have three BOs.

The TOs and BOs shall be installed in close proximity to single, or groups of, low voltage power supply interfaces. Where multiple TOs or BOs are installed in a room they shall be spaced approximately evenly around the perimeter of the room.

It should be noted that in certain cases an application outlet within a coverage area can be located on the external surface of the building or in a separate building within the premises (see Figure 10).

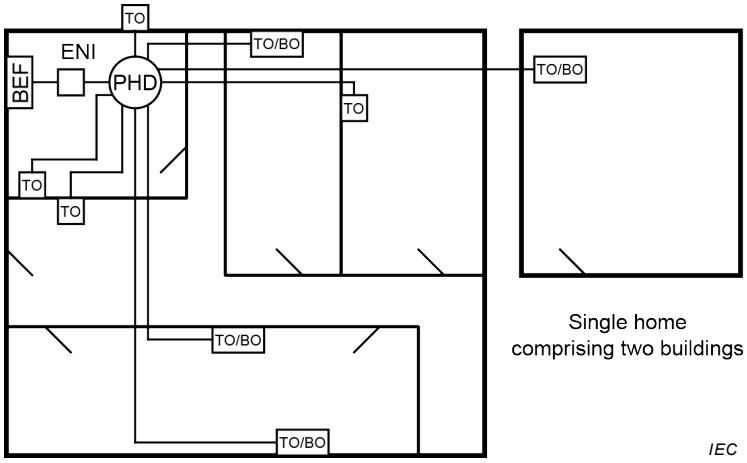


Figure 10 – Interconnection of home cabling subsystems

5.6.2.2 Cable provision

For ICT channels, the primary (or secondary, as appropriate) home cable shall contain four balanced pairs capable of supporting ICT channels in accordance with 6.3.2.1.

For BCT channels, the primary (or secondary, as appropriate) home cable shall be either

a) balanced, containing at least one pair capable of supporting BCT-B channels in accordance with 6.3.2.2, or

b) coaxial, capable of supporting BCT-C channels in accordance with 6.3.3.

Optical fibre cables, additional balanced cables (for ICT and/or BCT applications) or coaxial cables (for BCT applications) should be provided as defined by the

1) number and mix of applications (e.g. satellite feed, multi-cable feed of CATV, in-house generated video),

2) number of application outlets to be served.

5.6.2.3 Cable sharing

It is possible for ICT cables to support multiple ICT applications. In such cases, additional requirements shall be taken into account for balanced cabling. The additional crosstalk requirements are specified in ISO/IEC 11801-1:2017, 9.3.2.5.3.

Four-pair BCT-B cables of 9.2.2 are able to support ICT applications.

The requirements for cables to support both ICT and BCT applications are outside the scope of this document (see 5.1).

5.6.3 Dimensioning and configuring

5.6.3.1 Distributors

Each home shall be served by one PHD. The physical volume of the PHD depends upon the complexity of the infrastructure being served.

The design of distributors should ensure that the lengths of patch cords, jumpers and equipment cords are minimized and administration should ensure that the design lengths are maintained during operation.

Distributors shall be located in such a way that the resulting cable lengths are consistent with the channel performance requirements of Clause 6. For the reference implementations described in Clause 6, the maximum channel lengths in Table 1 shall be observed subject to the following restrictions.

a) Not all applications are supported over the maximum lengths shown in Table 1 and the support of specific applications over installed channels can require a mix of cabling media and types.

b) National, regional, and local regulations or service provider instructions can restrict the maximum channel length between the application outlet and the external network interface.

Table 1 – Maximum channel lengths for reference implementations of ICT/BCT channels

Cabling type				
ICT	**BCT-B**		**BCT-C**	
100 m	-L	11,8 m	-L	34 m
	-M	25 m	-M	73 m
NOTE 1 -L channels allow BCT applications across the frequency range 47 MHz to 862 MHz to be distributed without any compensation, whereas -M channels require compensation across that frequency range of up to 6 dB. NOTE 2 Reference implementations are not intended to restrict the use of shorter lengths.				

5.6.4 Connecting hardware

Connecting hardware shall only provide direct onward attachment for each conductor and shall not provide contact between more than one incoming or outgoing conductor (for example, bridge taps shall not be used).

5.6.5 Application outlets

5.6.5.1 Hierarchy

For cabling supporting ICT applications only, the application outlet is termed the TO. A TO can also be used to support BCT applications where appropriate.

For cabling supporting BCT applications, the application outlet is termed the BO. A BO can also be used to support ICT applications where appropriate.

5.6.5.2 Telecommunications outlet

The TO shall be located in readily accessible locations in the room, depending on the design of the building and subject to the requirements of national and local regulations.

Each TO should be terminated in accordance with 10.2.2.1 using four pairs. Two pairs per TO can be used as an alternative to four pairs. However, four pairs per TO is recommended to support common applications. Care should be taken that the initial pair assignment, and all subsequent changes, are recorded (see ISO/IEC 14763-2 for details of administration requirements). Pair reassignment by means of inserts is allowed.

5.6.5.3 Broadcast outlet

The BO shall be located in readily accessible locations in the room, depending on the design of the building and subject to the requirements of national and local regulations.

Each BO using balanced Category BCT-B cable should be terminated in accordance with 10.2.2.3.

Each BO using coaxial Category BCT-C cable shall be terminated in accordance with 10.3.2.1.

Where balanced cable is used and the BO is intended to also support ICT applications, the number of pairs to be terminated shall take into account the recommendations of 5.6.5.2.

5.6.6 Equipment cords

The performance contribution of the equipment cords, used to connect application-specific equipment to the cabling at distributors and at application outlets, shall be taken into account in the design of the channel. Assumptions have been made concerning the length and the transmission performance of these cords; the assumptions are identified when relevant. The performance contribution of these cords shall be taken into account in the design of

the channel. Subclauses 8.3 and 8.4 provide guidance on cord length for reference implementations of cabling in accordance with Clause 5.

6 Channel performance requirements

6.1 General

Clause 6 specifies the minimum channel performance of generic cabling at and between the connections to active equipment as shown in Figure 7 and comprises only passive sections of cable, connecting hardware, cords and jumpers.

The channel performance is specified as a combination of environmental performance and transmission performance.

The environmental classification of spaces served by generic cabling is described in 6.2.

The minimum requirements for the transmission of performance of cabling channels are specified in 6.3. The required transmission performance shall be met for all environmental performance Classes specified for the channel.

Compatibility between the structures and materials at the interfaces between these components and assemblies shall ensure that the required mechanical, environmental and transmission performance is maintained for the intended life of the cabling.

Where applications listed in ISO/IEC 11801-1:2017, Annex E are to be supported, the performance of the connections at the active equipment are the responsibility of the equipment supplier.

Application support depends on channel performance, which in turn depends on cable length, number of connections and performance of the components within the environments to which the channel is subjected.

Transmission and environmental performance shall be assured by the selection of cabling components suitable for the environmental Class(es) or by the use of pathway systems and installation practices that provide the required protection to the installed cabling.

The transmission performance of balanced cabling is specified in terms of Classes as specified in 6.3.2.

The transmission performance of coaxial cabling is specified in terms of Classes as specified in 6.3.3.

The transmission performance of optical fibre cabling is specified in 6.3.4.

6.2 Environmental performance

See ISO/IEC 11801-1:2017, 6.2.

6.3 Transmission performance

6.3.1 Channel construction

6.3.1.1 ICT channels

ICT cabling channels within the home are provided via balanced or optical fibre cabling. Power feeding, where applicable, is covered in the specification of the channel.

6.3.1.2 BCT channels

BCT channels within the home are provided via balanced or coaxial cabling.

6.3.2 Balanced cabling

6.3.2.1 ICT channel performance

The cabling channels from PHD and SHD to TOs, as shown in Figure 7, shall provide channel performance as required from Classes D or higher as specified in ISO/IEC 11801-1:2017, 5.3.

The cables installed as part of such channels shall provide the transmission characteristics needed to meet the minimum channel performance chosen (Classes D, E_A, E, F and F_A). In addition they shall meet the mechanical characteristics specified in ISO/IEC 11801-1:2017, 6.3.2.

6.3.2.2 BCT channel performance

The cabling channels from PHD and SHD to BOs, as shown in Figure 7, shall provide channel performance of Class BCT-B as specified in ISO/IEC 11801-1:2017, 6.3.

BCT-B-L channels support BCT applications in accordance with the IEC 60728 series across the frequency range 47 MHz to 862 MHz to be distributed without any compensation. BCT-B-M channels require compensation of up to 6 dB. Longer channel lengths require specific system engineering.

6.3.3 Coaxial cabling

The cabling channels from PHD and SHD to BOs, as shown in Figure 7, shall provide channel performance of Class BCT-C as specified in ISO/IEC 11801-1:2017, 6.4.

BCT-C-L channels support BCT applications in accordance with the IEC 60728 series across the frequency range 47 MHz to 862 MHz to be distributed without any compensation. BCT-C-M channels require compensation of up to 6 dB. Longer channel lengths require specific system engineering.

6.3.4 Optical fibre cabling

The selection of optical fibre components shall take into account the applications to be supported, and the required channel lengths, and should take into account any predicted changes to the applications to be supported during the expected life of the cabling.

Cabling shall be designed using the cabled optical fibres referenced in 9.4 to provide channel performance as required to support the relevant applications of ISO/IEC 11801-1:2017, Annex E for the following parameters:

a) channel attenuation;

b) channel length.

Channel performance shall meet the requirements of ISO/IEC 11801-1:2017, 6.5.

7 Link performance requirements

7.1 General

A link comprises only passive sections of cable and connections. Compatibility between the structures and materials at the interfaces between these components shall ensure that the required mechanical, environmental and transmission performance is maintained for the intended life of the cabling.

7.2 Balanced cabling

Link performance shall meet the requirements of ISO/IEC 11801-1:2017, 7.2.

7.3 Coaxial cabling

Link performance shall meet the requirements of ISO/IEC 11801-1:2017, 7.3.

7.4 Optical fibre cabling

Link performance shall meet the requirements of ISO/IEC 11801-1:2017, 7.4.

8 Reference implementations

8.1 General

Clause 8 describes implementations of generic cabling that utilize components referenced in Clauses 9, 10 and 11. These reference implementations meet the requirements of Clause 5

and, when installed in accordance with ISO/IEC 14763-2, comply with the channel transmission performance requirements of Clause 6.

8.2 Channel construction

Figure 11 shows the models used to correlate home cabling dimensions specified in 8.3 and 8.4 with the ICT and BCT channel specifications in Clause 6.

Figure 11 shows the channel configurations from the distributors to the TOs and BOs. The channels shown contain a maximum of four connections.

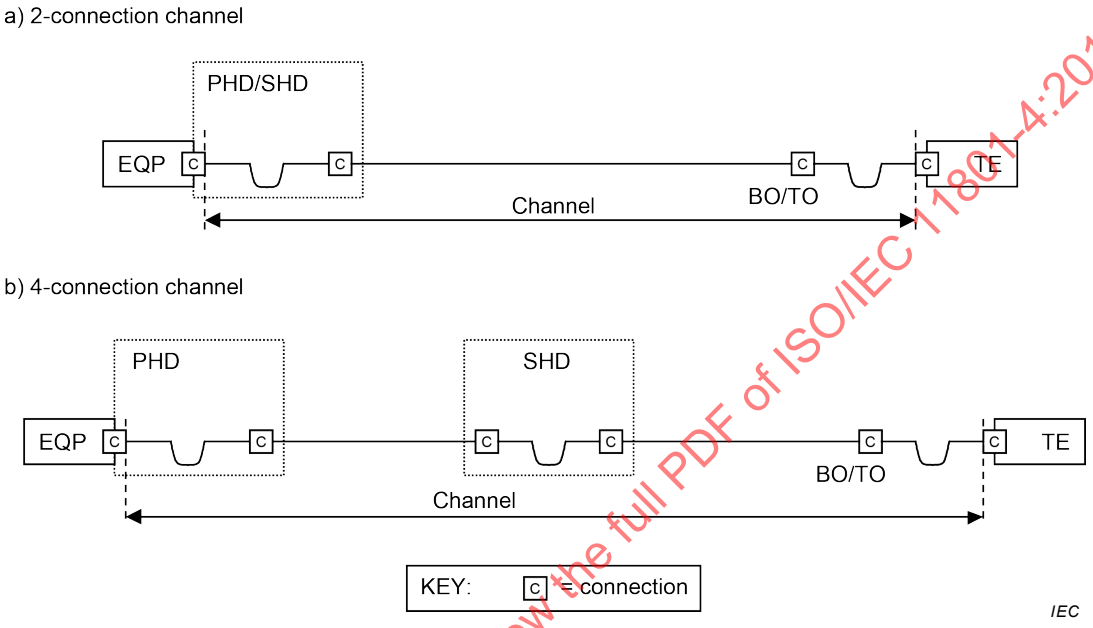


Figure 11 – Reference implementations for ICT and BCT channels (PHD/SHD to TO/BO)

Cabling designs that adopt a direct connection to the equipment at the distributors can be implemented in order to achieve the required transmission performance, but serve to restrict the flexibility of the infrastructure and are non-conformant with the requirements of Clause 5.

8.3 Balanced cabling

8.3.1 General

Balanced components referenced in Clauses 9, 10 and 11 are defined in terms of Category. In the reference implementations of Table 2, the components used in each cabling channel shall have the same nominal impedance in accordance with 9.2.

The balanced cabling reference implementations described in Table 2 contain reductions in channel length where operating temperatures are in excess of 20 °C. In order to maintain specific channel lengths under such conditions (due to the effect of ambient temperature and/or the impact of applications supported by the cabling),

a) cables can be specified with lower insertion loss specifications than those detailed in 8.3.2 and 8.3.3, or

b) appropriate protection can be provided to reduce the operating temperature of the channel.

Cables and connecting hardware of different Categories can be mixed within a channel. However, the resultant cabling performance will be determined by the Category of the lowest performing component.

The generic cabling provides the transmission paths from the PHD to TOs and BOs.

8.3.2 ICT channels

The selection of balanced cabling components will be determined by the Class to be met. Refer to ISO/IEC 11801-1:2017, Annex E for applications supported by cabling Classes.

Using the configurations of Figure 10:

a) Category 5 components provide Class D balanced cabling performance;

b) Category 6 components provide Class E balanced cabling performance;

c) Category 6_A or Category 8.1 components provide Class E_A balanced cabling performance;

d) Category 7 components provide Class F balanced cabling performance;

e) Category 7_A or Category 8.2 components provide Class F_A balanced cabling performance.

The length of the cables used within a channel shall be determined by the equations shown in Table 2.

Table 2 – Link length equations

Model	Figure	Implementation equation		
		Class D	Class E and E_A	Class F and F_A
ICT (2 connections)	11a)	$l_h = 109 - l_a \times X$	$l_h = 104 - l_a \times X$	$l_h = 105 - l_a \times X$
ICT (4 connections)	11b)	$l_h = 105 - l_a \times X$	$l_h = 102 - l_a \times X$	$l_h = 102 - l_a \times X$
		Class BCT-B-L	**Class BCT-B-M**	
BCT-B (2 connections)	11a)	$l_h = 13{,}8 - l_a \times X$	$l_h = 27 - l_a \times X$	
		Class BCT-C-L	**Class BCT-C-M**	
BCT-C (2 connections)	11a)	$l_h = 35 - l_a \times X$	$l_h = 75 - l_a \times X$	

l_h maximum length of the fixed primary and/or secondary home cable(s) (m)

l_a combined length of patch cords, jumpers and equipment cords

X ratio of flexible cable attenuation (dB/m) to fixed cable attenuation (dB/m)
for ICT and BCT-B cable (balanced), 1,5 is used as default value
for BCT-C (coaxial), 1,25 is used as default value.

For operating temperatures above 20 °C, l_h should be reduced by:

1) 0,2 % per °C for balanced screened cables up to 60 °C,
2) 0,4 % per °C for unscreened balanced cables up to 40 °C,
3) 0,6 % per °C for unscreened balanced cables between 40 °C and 60 °C,
4) 0,2 % for coaxial cables.

These are default values and should be used where the actual characteristic of the cable is not known.

Manufacturer's or supplier's information shall be consulted where the intended operating temperature exceeds 60 °C.

If the cable is specified to meet the attenuation requirements of Clause 9 at a "base" temperature above 20 °C then the calculation shall only apply to planned temperatures above the "base" temperature.

8.3.3 BCT channels

Using the configurations of Figure 11a), Category BCT-B components detailed in Clauses 9, 10 and 11 provide Class BCT-B cabling performance.

The length of the cables used within a channel shall be determined by the equations shown in Table 2.

The connection of a BCT-B channel to equipment that has a 75 Ω coaxial connection requires the use of a balun (see Annex A).

8.4 Coaxial cabling

The coaxial cabling reference implementations described in Table 2 contain reductions in channel length where operating temperatures are in excess of 20 °C. In order to maintain specific channel lengths under such conditions (due to the effect of ambient temperature and/or the impact of applications supported by the cabling),

a) cables can be specified with lower insertion loss specifications than those detailed in 8.3.3, or

b) appropriate protection can be provided to reduce the operating temperature of the channel.

Using the configurations of Figure 11a), Category BCT-C components detailed in Clauses 9, 10 and 11 provide Class BCT-C cabling performance.

The length of the cables used within a channel shall be determined by the equations shown in Table 2.

8.5 Optical fibre cabling

8.5.1 General

Optical fibre components are referenced in Clauses 9, 10 and 11. The optical fibres are defined in terms of physical construction (core/cladding diameter) and their transmission performance Category within a cable.

Within the reference implementations of 8.5, the optical fibres used in each cabling channel shall have the same physical construction specification and the cabled optical fibres shall be of the same Category.

When more than one physical construction or cabled optical fibre Category is used in a cabling subsystem the cabling shall be marked to allow each cabling type to be clearly identified.

8.5.2 Component selection

The selection of optical fibre components shall be determined by the channel lengths required and the existing and anticipated applications to be supported. Refer to ISO/IEC 11801-1:2017, Annex E for guidance.

8.5.3 Dimensions

The model of Figure 11 is applicable to optical fibre cabling for home cabling. The channel length is limited by channel length restrictions of the cabled optical fibre Category used, see ISO/IEC 11801-1:2017, Annex E. It should be noted that the connection systems used to terminate fixed optical fibre cabling can contain mated connections and splices (permanent or re-usable) and that cross-connects can comprise re-usable splices.

In order to accommodate increased quantities of mated connections and splices used within a channel, the total length of the channel is typically reduced to accommodate the additional attenuation.

Additional connections may be used if the maximum channel insertion loss (or optical power budget, as applicable) of the application allows (see ISO/IEC 11801-1:2017, Annex E).

9 Cable requirements

9.1 General

Clause 9 defines the minimum requirements for

a) cables installed in the primary home and secondary home cabling subsystems specified in 5.3 and used in the reference implementations of Clause 7,

b) flexible balanced cables to be assembled as cords as specified in Clause 11 and used in the reference implementations of Clause 7,

c) balanced cables or cable elements to be used as jumpers.

9.2 Balanced cables

9.2.1 ICT cabling

Balanced cables shall meet the requirements of ISO/IEC 11801-1:2017, 9.3.1 and 9.3.2.

9.2.2 BCT cabling

Balanced cables shall meet the requirements of ISO/IEC 11801-1:2017, 9.3.1 and 9.3.3.

9.3 Coaxial cables

Coaxial cables shall meet the requirements of ISO/IEC 11801-1:2017, 9.4.

9.4 Optical fibre cables

Cabled optical fibres shall meet the requirements of ISO/IEC 11801-1:2017, 9.5.

10 Connecting hardware requirements

10.1 General requirements

Connecting hardware is installed

a) in a home distributor (PHD or SHD) providing the cross-connections between cabling subsystems and interconnections to application-specific equipment,

b) at the TOs and BOs.

10.2 Connecting hardware for balanced cabling

10.2.1 General requirements

See ISO/IEC 11801-1:2017, 10.1.

10.2.2 Electrical, mechanical and environmental performance

10.2.2.1 ICT cabling connecting hardware at the TO

See ISO/IEC 11801-1:2017, 10.2 and 10.6.

NOTE Some local codes or regulation require a specific connector for a telephone outlet, especially for homes.

Pair rearrangement at the TO should not involve modification of the intermediate cable terminations. If pair rearrangement is used at the TO, the configuration of the outlet terminations shall be clearly identified.

10.2.2.2 ICT cabling connecting hardware at other locations

The following requirements apply to connecting hardware at all other locations than the TO.

See ISO/IEC 11801-1:2017, 10.1.

Connecting hardware of Category 5, 6, 6_A, 7, 7_A, 8.1 and 8.2 shall be in accordance with ISO/IEC 11801-1:2017, 10.2. Other connecting hardware shall at least meet the mechanical and environmental requirements as specified in ISO/IEC 11801-1:2017, B.4.

10.2.2.3 BCT cabling connecting hardware at the BO

See ISO/IEC 11801-1:2017, 10.3 and 10.7.

Pair rearrangement at the BO should not involve modification of the intermediate cable terminations. If pair rearrangement is used at the BO, the configuration of the outlet terminations shall be clearly identified.

10.2.2.4 BCT cabling connecting hardware at other locations

The following requirements apply to connecting hardware at all other locations than the BO.

See ISO/IEC 11801-1:2017, 10.1.

Connecting hardware of Category BCT-B shall be in accordance with ISO/IEC 11801-1:2017, 10.3. Other connecting hardware shall at least meet the mechanical and environmental requirements as specified in ISO/IEC 11801-1:2017, B.4.

10.3 Connecting hardware for coaxial cabling

10.3.1 General requirements

See ISO/IEC 11801-1:2017, 10.1.

10.3.2 Electrical, mechanical and environmental performance

10.3.2.1 Connecting hardware at the BO

See ISO/IEC 11801-1:2017, 10.4 and 10.10.

10.3.2.2 Connecting hardware at other locations

See ISO/IEC 11801-1:2017, 10.4 and 10.10.

10.4 Connecting hardware for optical fibre cabling

10.4.1 General requirements

See ISO/IEC 11801-1:2017, 10.1.

10.4.2 Optical, mechanical and environmental performance

10.4.2.1 Connecting hardware at the TO

The optical fibre cables in the coverage area shall be connected to primary home cabling (or secondary home cabling, if applicable) at the TO with a duplexable LC connector that complies with the IEC 61754-20 series.

10.4.2.2 Connecting hardware at other locations

See ISO/IEC 11801-1:2017, 10.5, 10.11 and 10.12.

11 Cords

11.1 Jumpers

See 9.2.

11.2 Balanced cords

See ISO/IEC 11801-1:2017, 11.1, 11.2 and 11.3.

11.3 Coaxial cords

See ISO/IEC 11801-1:2017, 11.1, 11.2 and 11.4.

11.4 Optical fibre cords

See ISO/IEC 11801-1:2017, 11.1, 11.2 and 11.5.