ISO/IEC TS 11801-9903

Edition 1.0 2021-03

TECHNICAL SPECIFICATION

colour inside

Information technology – Generic cabling systems for customer premises – Part 9903: Matrix modelling of channels and links

ISO/IEC TS 11801-9903:2021-03(en)

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

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
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 It also gives information on projects, replaced and withdrawn publications.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 once a month by email.

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: sales@iec.ch.

IEC online collection - oc.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

ISO/IEC TS 11801-9903

Edition 1.0 2021-03

TECHNICAL SPECIFICATION

colour inside

Information technology – Generic cabling systems for customer premises – Part 9903: Matrix modelling of channels and links

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 35.200

ISBN 978-2-8322-9498-7

CONTENTS

INFORMATION TECHNOLOGY – GENERIC CABLING SYSTEMS FOR CUSTOMER PREMISES –

Part 9903: Matrix modelling of channels and links

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.
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 and ISO National bodies.
3) IEC and ISO documents have the form of recommendations for international use and are accepted by IEC and ISO National bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC and ISO documents is accurate, IEC and 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 and ISO National bodies undertake to apply IEC and ISO documents transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC and ISO document and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC and ISO do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC and ISO marks of conformity. IEC and ISO 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 document.
7) No liability shall attach to IEC and ISO or their directors, employees, servants or agents including individual experts and members of its technical committees and IEC and ISO National 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, use of, or reliance upon, this ISO/IEC document or any other IEC and ISO documents.
8) Attention is drawn to the Normative references cited in this document. Use of the referenced publications is indispensable for the correct application of this document.
9) Attention is drawn to the possibility that some of the elements of this ISO/IEC document may be the subject of patent rights. IEC and ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TS 11801-9903 has been prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology. It is a Technical Specification.

This first edition of ISO/IEC TS 11801-9903 cancels and replaces ISO/IEC TR 11801-9903 published in 2015. This edition constitutes a technical revision.

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

a) the addition of further clarifications of the relations of parameters described in this edition and referenced analogous parameters in IEC TR 62152, e.g. operational attenuation versus operational transfer loss;
b) the introduction and description of the higher order M-parameters 8 × 8 matrix of mixed-mode parameters, which includes the 4 × 4 submatrix of 4-port differential-mode-to-differential-mode (DD) parameters, among three other submatrices of mixed-mode parameters;
c) Annex A, matrix conversion formulas, covers up to 16-port parameters matrices;
d) the expanded Annex B description of example calculations for channel and permanent link, and updated component parameter tables.

The list of all currently available parts of the ISO/IEC 11801 series, under the general title *Information technology – Generic cabling for customer premises*, can be found on the IEC and ISO web sites.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
JTC1-SC25/2959/DTS	JTC1-SC25/2993/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, available at www.iec.ch/members_experts/refdocs.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

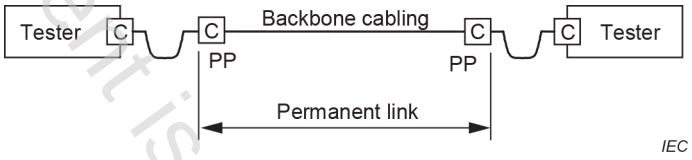
INTRODUCTION

The pass/fail limits for defined channel and permanent link cabling configurations have an implicit impact on the component limits for the cabling components used. The channel configurations and the link configurations are specified in ISO/IEC 11801-1:2017, Clause 6 and Clause 7, respectively.

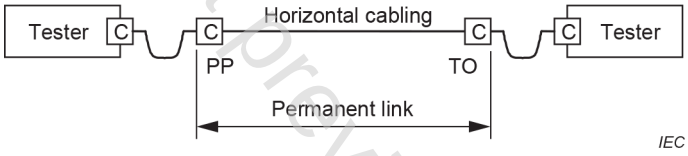
The permanent link configurations, which represent the fixed portion of the cabling, have two possible topologies:

– a connection plus a segment of cable plus a connection (2-connector topology);
– a connection plus a segment of cable plus a connection plus another segment of cable plus another connection (3-connector topology).

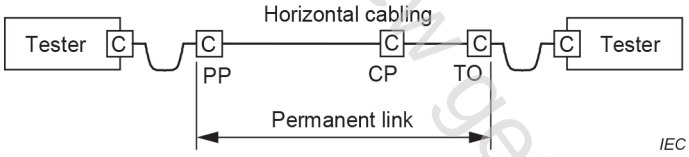
The link configurations of ISO/IEC 11801-1 are shown in Figure 1.



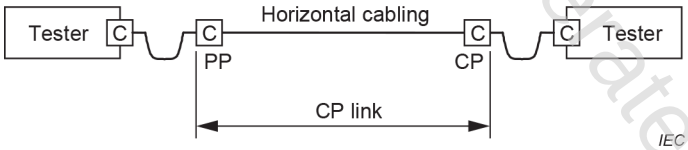
a) Configuration PL1



b) Configuration PL2



c) Configuration PL3



d) Configuration CP1

Figure 1 – Link configurations of ISO/IEC 11801-1

This document includes models and assumptions, which support pass/fail limits for the channel and permanent link test configurations in ISO/IEC 11801-1. These are based on the performance requirements of cable and connecting hardware as specified in IEC standards.

This document provides reasonable assurance that a channel created by adding compliant patch cords to a previously certified permanent link will meet the applicable channel performance limits.

Over the years the frequencies of the classes increased, but the theory for calculating the limits stayed the same. Especially the higher order effects had to be considered and in the end only by doing a Monte Carlo calculation, assuming that not all components would be at the limit at the same time, allowed compliance to be proved.

The model uses two pairs for all calculations. The limits are equal for pairs or pair combinations but in reality measured values could be different. If results are required that need more pairs to be considered, then this calculation can be done based on the results from multiple two-pair calculations with appropriate inputs (worst case). An example of such a calculation is the power sum and average limit lines for four pairs.

Symmetry and additional contributions that result from unbalanced signals and differential-to-common and common-to-differential mode coupling are included in this document by increasing the matrix size.

For details on the naming of transmission parameters, see Clause 3 and Clause C.1.

INFORMATION TECHNOLOGY – GENERIC CABLING SYSTEMS FOR CUSTOMER PREMISES –

Part 9903: Matrix modelling of channels and links

1 Scope

This part of ISO/IEC 11801, which is a Technical Specification, establishes a matrix-model for formulating limits for mixed-mode parameters within and between two pairs of balanced cabling. This is for the purpose of supporting new, improved balanced cabling channel and link specifications.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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 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
attenuation
diminishing of signal strength

Note 1 to entry: Details need to be added to indicate the exact usage.

3.1.2
connection
two mated connectors

EXAMPLE Jack and plug.

3.1.3
image attenuation
wave attenuation
attenuation when a two-port is terminated by its input and output characteristic impedances with no reflections at input and output

Note 1 to entry: The wave attenuation of cables is length scalable.