INTERNATIONAL STANDARD

Specification for the testing of balanced and coaxial information technology cabling –
Part 1: Installed balanced cabling as specified in ISO/IEC 11801 and related standards
CONTENTS

FOREWORD................................................................................................................... 8
INTRODUCTION .................................................................................................................. 10
1 Scope .................................................................................................................................... 11
2 Normative references ....................................................................................................... 12
3 Terms and definitions ....................................................................................................... 13
4 Reference measurement procedures for electrical properties ......................................... 15
  4.1 General .......................................................................................................................... 15
  4.2 Test equipment considerations ..................................................................................... 15
    4.2.1 General ..................................................................................................................... 15
    4.2.2 Network analyzer test requirements ....................................................................... 15
    4.2.3 Termination of conductor pairs ............................................................................... 16
    4.2.4 Reference loads for calibration .............................................................................. 17
    4.2.5 Test configurations .................................................................................................. 17
    4.2.6 Coaxial cables and test leads for network analyzers ............................................ 18
    4.2.7 Balun requirements .................................................................................................. 19
    4.2.8 Network analyzer measurement precautions ....................................................... 20
    4.2.9 Data reporting and accuracy .................................................................................. 21
  4.3 DC loop resistance ....................................................................................................... 21
    4.3.1 Objective .................................................................................................................. 21
    4.3.2 Test method ............................................................................................................ 22
    4.3.3 Test equipment and set-up ..................................................................................... 22
    4.3.4 Procedure ................................................................................................................ 22
    4.3.5 Test report ............................................................................................................... 22
    4.3.6 Uncertainty ............................................................................................................. 23
  4.4 Direct current (d.c.) resistance unbalance ................................................................. 23
    4.4.1 Objective .................................................................................................................. 23
    4.4.2 Test method ............................................................................................................ 23
    4.4.3 Test equipment and set-up ..................................................................................... 23
    4.4.4 Procedure ................................................................................................................ 23
    4.4.5 Test report ............................................................................................................... 24
    4.4.6 Uncertainty ............................................................................................................. 24
  4.5 Insertion loss ............................................................................................................... 24
    4.5.1 Objective .................................................................................................................. 24
    4.5.2 Test method ............................................................................................................ 24
    4.5.3 Test equipment and set-up ..................................................................................... 25
    4.5.4 Procedure ................................................................................................................ 25
    4.5.5 Test report ............................................................................................................... 26
    4.5.6 Temperature correction ........................................................................................... 26
    4.5.7 Uncertainty ............................................................................................................. 26
  4.6 Propagation delay and delay skew .............................................................................. 26
    4.6.1 Objective .................................................................................................................. 26
    4.6.2 Test method ............................................................................................................ 26
    4.6.3 Test equipment and set-up ..................................................................................... 27
    4.6.4 Procedure ................................................................................................................ 27
    4.6.5 Test report ............................................................................................................... 27
    4.6.6 Uncertainty ............................................................................................................. 27
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7</td>
<td>Near-end cross-talk (NEXT) and power sum NEXT</td>
<td>28</td>
</tr>
<tr>
<td>4.7.1</td>
<td>Objective</td>
<td>28</td>
</tr>
<tr>
<td>4.7.2</td>
<td>Test method</td>
<td>28</td>
</tr>
<tr>
<td>4.7.3</td>
<td>Test equipment and set-up</td>
<td>28</td>
</tr>
<tr>
<td>4.7.4</td>
<td>Procedure</td>
<td>28</td>
</tr>
<tr>
<td>4.7.5</td>
<td>Test report</td>
<td>29</td>
</tr>
<tr>
<td>4.7.6</td>
<td>Uncertainty</td>
<td>30</td>
</tr>
<tr>
<td>4.8</td>
<td>Attenuation to crosstalk ratio, near end (ACR-N) and power sum ACR-N</td>
<td>30</td>
</tr>
<tr>
<td>4.8.1</td>
<td>Objective</td>
<td>30</td>
</tr>
<tr>
<td>4.8.2</td>
<td>Test method</td>
<td>30</td>
</tr>
<tr>
<td>4.8.3</td>
<td>Test equipment and set-up</td>
<td>30</td>
</tr>
<tr>
<td>4.8.4</td>
<td>Procedure</td>
<td>30</td>
</tr>
<tr>
<td>4.8.5</td>
<td>Test report</td>
<td>30</td>
</tr>
<tr>
<td>4.8.6</td>
<td>Uncertainty</td>
<td>30</td>
</tr>
<tr>
<td>4.9</td>
<td>Far-end cross-talk (FEXT) and power sum FEXT</td>
<td>31</td>
</tr>
<tr>
<td>4.9.1</td>
<td>Objective</td>
<td>31</td>
</tr>
<tr>
<td>4.9.2</td>
<td>Test method</td>
<td>31</td>
</tr>
<tr>
<td>4.9.3</td>
<td>Test equipment and set-up</td>
<td>31</td>
</tr>
<tr>
<td>4.9.4</td>
<td>Procedure</td>
<td>31</td>
</tr>
<tr>
<td>4.9.5</td>
<td>Test report</td>
<td>32</td>
</tr>
<tr>
<td>4.9.6</td>
<td>Uncertainty of FEXT measurements</td>
<td>32</td>
</tr>
<tr>
<td>4.10</td>
<td>Equal level far end crosstalk (ELFEXT) and attenuation to crosstalk ratio, far end (ACR-F)</td>
<td>32</td>
</tr>
<tr>
<td>4.10.1</td>
<td>Objective</td>
<td>32</td>
</tr>
<tr>
<td>4.10.2</td>
<td>Calculation</td>
<td>33</td>
</tr>
<tr>
<td>4.10.3</td>
<td>Test report</td>
<td>33</td>
</tr>
<tr>
<td>4.10.4</td>
<td>Uncertainty</td>
<td>33</td>
</tr>
<tr>
<td>4.11</td>
<td>Return loss</td>
<td>33</td>
</tr>
<tr>
<td>4.11.1</td>
<td>Objective</td>
<td>33</td>
</tr>
<tr>
<td>4.11.2</td>
<td>Test method</td>
<td>33</td>
</tr>
<tr>
<td>4.11.3</td>
<td>Test equipment and set-up</td>
<td>34</td>
</tr>
<tr>
<td>4.11.4</td>
<td>Procedure</td>
<td>34</td>
</tr>
<tr>
<td>4.11.5</td>
<td>Test report</td>
<td>35</td>
</tr>
<tr>
<td>4.11.6</td>
<td>Uncertainty</td>
<td>35</td>
</tr>
<tr>
<td>4.12</td>
<td>PS alien near end crosstalk (PS ANEXT – Exogenous crosstalk)</td>
<td>35</td>
</tr>
<tr>
<td>4.12.1</td>
<td>Objective</td>
<td>35</td>
</tr>
<tr>
<td>4.12.2</td>
<td>Test method</td>
<td>35</td>
</tr>
<tr>
<td>4.12.3</td>
<td>Test equipment and set-up</td>
<td>35</td>
</tr>
<tr>
<td>4.12.4</td>
<td>Procedure</td>
<td>36</td>
</tr>
<tr>
<td>4.13</td>
<td>PS attenuation to alien crosstalk ratio, far end crosstalk (PS AACR-F – Exogenous crosstalk)</td>
<td>38</td>
</tr>
<tr>
<td>4.13.1</td>
<td>Objective</td>
<td>38</td>
</tr>
<tr>
<td>4.13.2</td>
<td>Test method</td>
<td>38</td>
</tr>
<tr>
<td>4.13.3</td>
<td>Test equipment and set-up</td>
<td>38</td>
</tr>
<tr>
<td>4.13.4</td>
<td>Procedure</td>
<td>40</td>
</tr>
<tr>
<td>4.14</td>
<td>Unbalance attenuation, near end</td>
<td>42</td>
</tr>
<tr>
<td>4.14.1</td>
<td>Objective</td>
<td>42</td>
</tr>
<tr>
<td>4.14.2</td>
<td>Test method</td>
<td>42</td>
</tr>
<tr>
<td>4.14.3</td>
<td>Test equipment and set-up</td>
<td>42</td>
</tr>
</tbody>
</table>
4.14.4 Procedure .......................................................... 43
4.14.5 Test report .......................................................... 45
4.14.6 Uncertainty .......................................................... 46

4.15 Unbalance attenuation, far end ......................................................... 46
4.15.1 Objective .......................................................... 46
4.15.2 Test method .......................................................... 46
4.15.3 Test equipment and set-up ......................................................... 46
4.15.4 Procedure .......................................................... 47
4.15.5 Test report .......................................................... 48
4.15.6 Uncertainty .......................................................... 48

4.16 Coupling attenuation ........................................................................ 48

5 Field test measurement requirements for electrical properties ................. 48
5.1 General ............................................................................... 48
5.2 Cabling configurations tested .......................................................... 49
5.3 Field test parameters ...................................................................... 49
  5.3.1 General ......................................................................... 49
  5.3.2 Inspection of workmanship and connectivity testing ......................... 50
  5.3.3 Propagation delay and delay skew .............................................. 51
  5.3.4 Length ............................................................................ 51
  5.3.5 Insertion loss ..................................................................... 52
  5.3.6 NEXT, power sum NEXT ................................................... 52
  5.3.7 ACR-N and power sum ACR-N ............................................ 53
  5.3.8 ELFEXT, power sum ELFEXT, ACR-F, power sum ACR-F .......... 54
  5.3.9 Return loss ....................................................................... 55
  5.3.10 Direct current (d.c.) loop resistance ......................................... 55

5.4 Power sum alien crosstalk ............................................................... 55
  5.4.1 Objective ......................................................................... 55
  5.4.2 Test method ....................................................................... 56
  5.4.3 Test equipment and set-up ......................................................... 56
  5.4.4 Measuring ANEXT loss ......................................................... 56
  5.4.5 Measuring AFEXT loss .......................................................... 57
  5.4.6 Procedure ....................................................................... 57
  5.4.7 Calculation of PS ANEXT and PS ACR-F from measured data .......... 57
  5.4.8 Selection of test ports .......................................................... 60
  5.4.9 Test report ........................................................................ 62
  5.4.10 Uncertainty of PS alien crosstalk measurements ............................ 62

5.5 Data reporting and accuracy .............................................................. 62
  5.5.1 General ......................................................................... 62
  5.5.2 Detailed results .................................................................... 64
  5.5.3 Summary results .................................................................. 64
  5.5.4 Reporting requirements for power sum alien crosstalk ................... 68
  5.5.5 General ......................................................................... 68
  5.5.6 Consistency checks for field testers .......................................... 68
  5.5.7 Evaluation of consistency tests .................................................. 69
  5.5.8 Administration system applicability ............................................. 69
  5.5.9 Test equipment adapter cords for link testing ............................... 69
  5.5.10 User cords and channel testing .............................................. 69

6 Field tester measurement accuracy requirements ..................................... 69
6.1 General ............................................................................... 69
6.2 Measurement accuracy specifications common to level IIIE, level III, level IIIE, and level IV field testers .......................................................... 73
6.3 Accuracy performance requirements for level IIIE field testers ................... 73
6.4 Accuracy performance requirements for level III field testers ....................... 75
6.5 Accuracy performance requirements for level IIIE field testers ...................... 77
6.6 Accuracy performance requirements for level IV field testers ....................... 79
6.7 Accuracy performance requirements for level IV field testers over 600 MHz ... 81
6.8 Field tester requirements applicable to alien crosstalk measurements ............ 81
6.9 Procedures for determining field tester parameters .................................... 81
  6.9.1 General ......................................................................................... 81
  6.9.2 Output signal balance (OSB) ....................................................... 82
  6.9.3 Common mode rejection (CMR) ................................................... 82
  6.9.4 Residual NEXT ............................................................................ 83
  6.9.5 Dynamic accuracy ....................................................................... 84
  6.9.6 Source/load return loss ............................................................... 85
  6.9.7 Random noise floor ..................................................................... 85
  6.9.8 Residual FEXT ............................................................................. 85
  6.9.9 Directivity .................................................................................... 86
  6.9.10 Tracking ................................................................................... 87
  6.9.11 Source match ............................................................................. 87
  6.9.12 Return loss of remote termination .............................................. 87
  6.9.13 Constant error term of the propagation delay measurement function ... 88
  6.9.14 Error constant term proportional to propagation delay of the propagation delay measurement function ........................................ 88
  6.9.15 Constant error term of the delay skew measurement function .......... 88
  6.9.16 Constant error term of the length measurement function ............... 88
  6.9.17 Error constant proportional to length of the length measurement function .......................................................... 88
  6.9.18 Constant error term of the d.c. resistance measurement function ....... 88
  6.9.19 Error constant term proportional to d.c. resistance of the d.c. resistance measurement function ........................................... 89
  6.9.20 Measurement floor for alien crosstalk testing during field testing ...... 89
  6.9.21 Measurement floor of the test device for the channel test configuration ......................................................................................... 89
6.10 Measurement error models ....................................................................... 90
  6.10.1 General ....................................................................................... 90
  6.10.2 Error model for the insertion loss measurement function .................... 90
  6.10.3 Error model for the NEXT measurement function .......................... 91
  6.10.4 Error model for the power sum NEXT measurement function .......... 91
  6.10.5 Error model for the ACR-N measurement function ........................ 91
  6.10.6 Error model for the power sum ACR-N measurement function ....... 92
  6.10.7 Error model for the ELFEXT or ACR-F measurement function ....... 92
  6.10.8 Error model for the power sum ELFEXT and PS ACR-F measurement functions ..................................................................................... 93
  6.10.9 Error model for the return loss measurement function ..................... 93
  6.10.10 Error model for the propagation delay measurement function .......... 94
  6.10.11 Error model for the delay skew measurement function ................... 95
  6.10.12 Error model for the length measurement function ........................ 95
  6.10.13 Error model for the d.c. loop resistance measurement function ....... 95
6.11 Network analyzer measurement comparisons .......................................... 95
Figure 34 – Sample scatter plot .......................................................................................... 100
Figure A.1 – Source of variability during link testing............................................................ 103

Table 1 – Test balun performance characteristics ................................................................20
Table 2 – Estimated uncertainty of unbalance, near end measurement............................... 46
Table 3 – Estimated uncertainty of unbalance, far end measurement .................................. 48
Table 4 – Summary of reporting requirements for field test equipment ............................... 65
Table 5 – Minimum reporting requirement for PS ANEXT and PS AACR-F ......................... 68
Table 6 – Worst case propagation delay, delay skew, d.c. resistance and length measurement accuracy for level IIE, level III and level IV test instruments ............................................ 70
Table 7 – Worst case insertion loss, NEXT, ACR-N, ELFEXT/ACR-F and return loss measurement accuracy for level IIE test instruments ......................................................... 71
Table 8 – Worst case insertion loss, NEXT, ACR-N, ELFEXT/ACR-F and return loss measurement accuracy for level III test instruments ........................................................... 71
Table 9 – Worst case insertion loss, NEXT, ACR-N, ELFEXT/ACR-F and return loss measurement accuracy for level IIIE test instruments ........................................................... 72
Table 10 – Worst case insertion loss, NEXT, ACR-N, ELFEXT/ACR-F and return loss measurement accuracy for level IV test instruments ........................................................... 72
Table 11 – Propagation delay, delay skew, d.c. resistance and length accuracy performance specifications .................................................................................................................. 73
Table 12 – Level IIE field tester accuracy performance parameters per IEC guidelines .......... 74
Table 13 – Level III field tester accuracy performance parameters per IEC guidelines .......... 76
Table 14 – Level IIIE field tester accuracy performance parameters per IEC guidelines ....... 78
Table 15 – Level IV field tester accuracy performance parameters per IEC guidelines ......... 80
INTERNATIONAL ELECTROTECHNICAL COMMISSION

SPECIFICATION FOR THE TESTING OF BALANCED
AND COAXIAL INFORMATION TECHNOLOGY CABLING –

Part 1: Installed balanced cabling as specified
in ISO/IEC 11801 and related standards

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The objective of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of IEC 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.

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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 IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61935-1 has been prepared by IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories.

This third edition cancels and replaces the second edition published in 2005, and constitutes a technical revision.

This edition differs from the second edition in that it includes test methods for exogenous (alien) crosstalk. It also includes a new annex for uncertainty and variability of field test results.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.
The text of this standard is based on the following documents:

<table>
<thead>
<tr>
<th>FDIS</th>
<th>Report on voting</th>
</tr>
</thead>
<tbody>
<tr>
<td>46/323/FDIS</td>
<td>46/332/RVD</td>
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</tbody>
</table>

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

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

A list of all parts of the IEC 61935 series, under the general title: Specification for the testing of balanced and coaxial information technology cabling, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

The contents of the corrigendum of October 2010 have been included in this copy.
INTRODUCTION

Telecommunication cabling, once specified uniquely by each telecommunications application, has evolved into a generic cabling system. Telecommunications applications now use the ISO/IEC 11801 cabling standard to meet their cabling requirements. Formerly, connectivity tests and visual inspection were deemed sufficient to verify a cabling installation. Now users need more comprehensive testing in order to ensure that the link will support telecommunications applications that are designed to operate on the generic cabling system. This part of IEC 61935 addresses reference laboratory and field test methods and provides a comparison of these methods.

Transmission performance depends on cable characteristics, connecting hardware, patch cords and cross-connect cabling, the total number of connections, and the care with which they are installed and maintained. This standard provides test methods for installed cabling and pre-fabricated cable assemblies. These test methods, where appropriate, are based on those used for components of the cable assembly.

This Part 1 contains the test methods required for installed cabling. Part 2 contains the test methods required for patch cords and work area cables.
1 Scope

This part of IEC 61935 specifies reference measurement procedures for cabling parameters and the requirements for field tester accuracy to measure cabling parameters identified in ISO/IEC 11801. References in this standard to ISO/IEC 11801 mean ISO/IEC 11801 or equivalent cabling standards.

This International Standard applies when the cable assemblies are constructed of cables complying with the IEC 61156 family of standards, and connecting hardware as specified in IEC 60603-7 family of standards or IEC 61076-3-104 and IEC 61076-3-110. In the case where cables and/or connectors do not comply with these standards, then additional tests may be required.

This standard is organized as follows:

- reference laboratory measurement procedures on cabling topologies are specified in Clause 4. In some cases, these procedures may be used in the field;
- descriptions and requirements for measurements in the field are specified in Clause 5;
- performance requirements for field testers and procedures to verify performance are specified in Clause 6.

NOTE 1 This standard does not include tests that are normally performed on the cables and connectors separately. These tests are described in IEC 61156-1 and IEC 60603-7 or IEC 61076-3-104 and IEC 61076-3-110 respectively.

NOTE 2 Wherever possible, cables and connectors used in cable assemblies, even if they are not described in IEC 61156 or IEC 60603-7, IEC 61076-3-104 or IEC 61076-3-110, are tested separately according to the tests given in the relevant generic specification. In this case, most of the environmental and mechanical tests described in this standard may be omitted.

NOTE 3 Users of this standard are advised to consult with applications standards, equipment manufacturers and system integrators to determine the suitability of these requirements for specific networking applications.

This standard relates to performance with respect to 100 Ω cabling. For 120 Ω or 150 Ω cabling, the same principles apply but the measurement system should correspond to the nominal impedance level.

Field tester types include certification, qualification and verification. Certification testing is performed for the rigorous needs of commercial/industrial buildings to this standard. Qualification testing is described in IEC 61935-3. Qualification testing determines whether the cabling will support certain network technologies (e.g., 1000BASE-T, 100BASE-TX, IEEE 1394b). Qualification testers do not have traceable accuracy to national standards and provide confidence that specific applications will work. Verification testers only verify connectivity.

Throughout this document, 4-pair cabling is assumed. The test procedures described in this standard may also be used to evaluate 2-pair balanced cabling. However, 2-pair cabling links that share the same sheath with other links are tested as 4-pair cabling.

1) IEEE 1394b: 2002, High Performance Serial Bus (High Speed Supplement)
2 Normative references

The following referenced documents are indispensable for the application 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 60169-22, Radio-frequency connectors – Part 22: R.F. two-pole bayonet coupled connectors for use with shielded balanced cables having twin inner conductors (Type BNO)


IEC 60603-7, Connectors for electronic equipment – Part 7: Detail specification for 8-way, unshielded, free and fixed connectors

IEC 60603-7, Connectors for electronic equipment – Part 7: Detail specification for 8-way, unshielded, free and fixed connectors

IEC 60603-7, Connectors for electronic equipment – Part 7-4: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz

IEC 60603-7, Connectors for electronic equipment – Part 7-5: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz

IEC 61076-3-104, Connectors for electronic equipment – Product requirements – Part 3-104: Detail specification for 8-way, shielded free and fixed connectors for data transmissions with frequencies up to 1 000 MHz

IEC 61076-3-110, Connectors for electronic equipment – Product requirements – Part 3-110: Rectangular connectors - Detail specification for shielded, free and fixed connectors for data transmission with frequencies up to 1 000 MHz

IEC 61156-1, Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification

IEC 61156-5, Multicore and symmetrical pair/quad cables for digital communications – Part 5: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz-horizontal floor wiring – Sectional specification

IEC 61156-6, Multicore and symmetrical pair/quad cables for digital communications – Part 6: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Work area wiring – Sectional specification

IEC 61156-7, Multicore and symmetrical pair/quad cables for digital communications – Part 7: Symmetrical pair/quad cables with transmission characteristics up to 1 200 MHz – Sectional specification for digital and analog communication cables

IEC 61156-8, Multicore and symmetrical pair/quad cables for digital communications – Part 8: Symmetrical pair/quad cables with transmission characteristics up to 1 200 MHz – Work area wiring – Sectional specification

IEC 61169-16, Radio-frequency connectors – Part 16: Sectional specification – RF coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling – Characteristics impedance 50 ohms (75 ohms) (type N)

ISO/IEC 11801, Information technology – Generic cabling for customer premises


3 Terms and definitions

For the purposes of this document, the following terms and definitions apply, in addition to the definitions included in ISO/IEC 11801.

3.1 cable assembly
combination of cable(s) and connector(s) with specified performance, used as a single unit intended to be a part of a cabling link as defined in ISO/IEC 11801 (or equivalent)

NOTE Examples are: patch cord, work area cable, link.

3.2 certification
measurements of installed cabling specified in ISO/IEC 11801 (e.g., class D, class E, class EA, class F, class FA)

This requires field testers with traceable accuracy to national standards.

3.3 comparative test
test that is performed to check the deviation between the results obtained with the reference test method and those obtained with another test set-up (i.e. field test equipment)

3.4 d.c. resistance
measure of the sum total of the d.c. resistance of the wires of a pair

3.5 delay skew
worst case value of the phase delay difference between any pair in the same cable assembly

3.6 electrical length
equivalent free-space length of the cable assembly

3.7 far-end cross-talk
FEXT
decrease in magnitude of power of a signal that propagates between disturbing and disturbed pairs contained within the same link measured at the far end

NOTE 1 When the power decrease is referenced to the near end of the disturbing pair, the characteristic is named input output crosstalk (IO FEXT).

NOTE 2 When the power decrease is referenced to the far end of the disturbing pair, the characteristic is named equal level far end crosstalk (ELFEXT).

NOTE 3 When the power decrease is referenced to the far end of the disturbed pair, the characteristic is named attenuation-to-crosstalk ratio, far end (ACR-F).

NOTE 4 FEXT is expressed in dB.