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Information technology –
Fibre channel –

Part 115:
Physical interfaces (FC-PI)

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INFORMATION TECHNOLOGY – FIBRE CHANNEL – Part 115: Physical interfaces (FC-PI)

FOREWORD

1) ISO (International Organization for Standardization) and IEC (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) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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

4) 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 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.

5) 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.

6) Attention is drawn to the possibility that some of the elements of this International Standard 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 14165-115 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

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

INTRODUCTION

This International Standard describes the physical interface portions of a high performance serial link that supports the higher Upper Level Protocols (ULPs) associated with HIPPI, IPI, SCSI, IP and others.

Figure 0 shows the relationship of this standard (highlighted rectangle) with other Fibre Channel standards. For the full reference of publication numbers and titles, see bibliography.

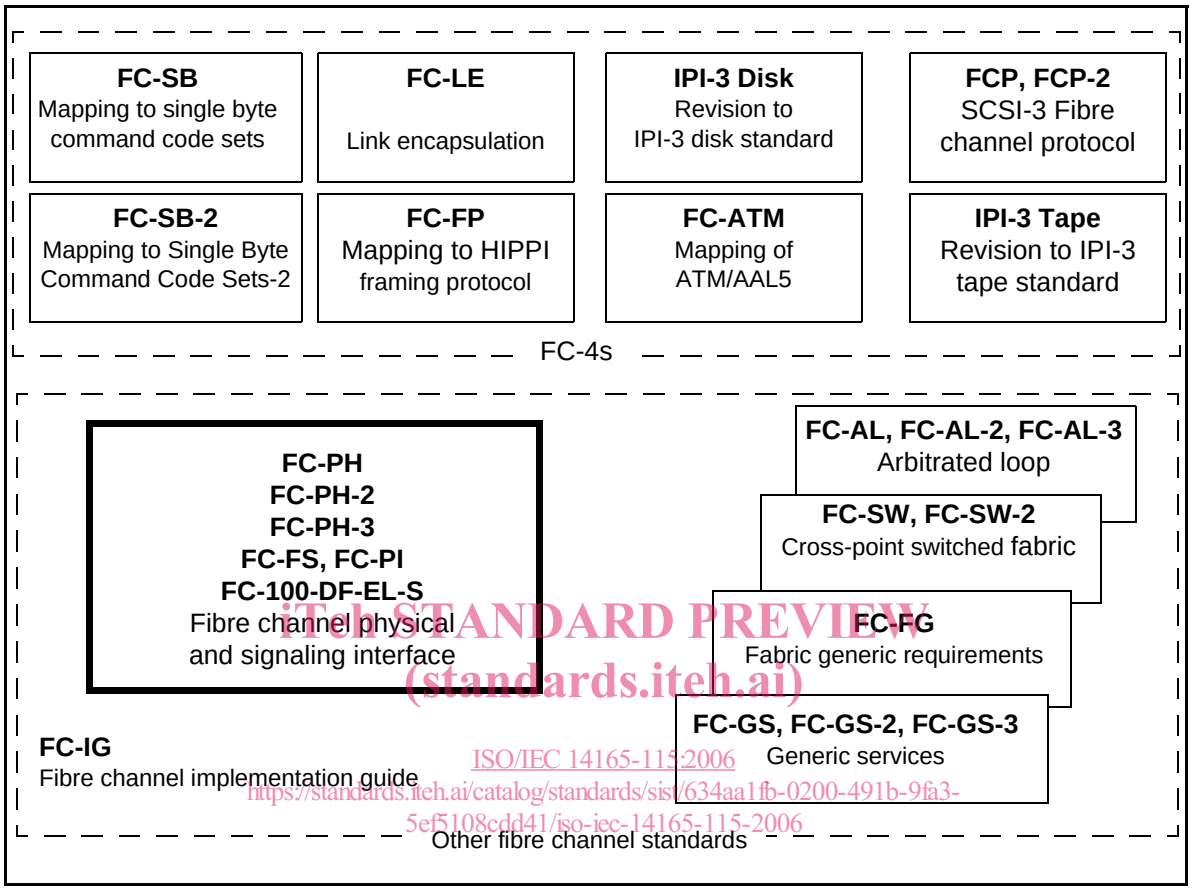

Figure 0 - Document relationship

The information presented in this document is grouped into clauses:

Clause 1 gives a general introduction to the document.

Clause 2 lists the standards which are referenced in the text and which constitute provisions of this document.

Clause 3 describes the basic elements, acronyms, naming conventions and terminology used in this document.

Clause 4 provides an overview of the structure, concepts, configurations and mechanisms used in this document.

Clause 5 describes the physical link, the lowest level, in the Fibre Channel system. It is designed for flexibility and allows the use of several physical interconnect technologies to meet a wide variety of system application requirements.

Clause 6 defines the optical signal characteristics at the interface connector. Each conforming optical FC attachment shall be compatible with this optical interface to allow interoperability within an FC environment.

Fibre Channel links shall not exceed the BER objective (10^{-12}) under any conditions. The parameters specified in this clause support meeting that requirement under all conditions including the minimum input power level.

Clause 7 describes how the optical interface connector aligns the optical transmission fibre mechanically to an optical port on a component such as a receiver or a transmitter.

Clause 8 specifies a single-mode cable plant for the Fibre Channel signaling rates of 1,06 GBd, 2,12 GBd and 4,25 GBd at their rated distance of 10 km.

Clause 9 defines the interfaces of the serial electrical signal at the reference points α and at the inter-operability points β, δ and γ in a TxRx Connection. The existence of a β, δ or γ point is determined by the existence of a connector at that point in a TxRx Connection.

Clause 10 defines the TxRx Connection requirements for a Fibre Channel electrical cable plant and its connectors.

Annex A defines terms, measurement techniques and conditions for testing jitter and wave shapes. It deals with issues specific to Fibre Channel and is not intended to supplant standard test procedures referenced in the specifications.

Annex B describes an example implementation of the electrical SERDES interface to meet the requirements of FC-PI.

Annex C provides information on the use of an alternative multimode cable plant to those described in 6.4.

Annex D extends the optical and electrical interface specifications of clause 6 and clause 9, in the areas of transmitter-off behavior and the (optional) receiver loss-of-signal function. It gives the background, scope and qualitative and quantitative requirements for Tx-off and Rx-LOS in FC physical interfaces.

INFORMATION TECHNOLOGY –

FIBRE CHANNEL –

Part 115: Physical interfaces (FC-PI)

1 Scope

This part of ISO/IEC 14165 describes the physical interface portions of a high performance serial link that supports the higher Upper Level Protocols (ULPs) associated with HIPPI, IPI, SCSI, IP and others.

This International Standard incorporates features described in other international standards (see clause 2 and bibliography).

2 Normative references

2.1 Overview

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.

2.2 International Standards

IEC 60169-8, *Radio-frequency connectors - Part 8: R.F. coaxial connectors with inner diameter of outer conductor 6,5 mm (0,256 in) with Bayonet Lock (Type BNC)*

IEC 60169-15, *Radio-frequency connectors - Part 15: R.F. coaxial connectors with inner diameter of outer conductor 4,13 mm (0,163 in) with screw coupling - Characteristic impedance (Type SMA)*

IEC 60169-17, *Radio-frequency connectors - Part 17: R.F. coaxial connectors with inner diameter of outer conductor 6,5 mm (0,256 in) with screw coupling - Characteristic impedance 50 Ω (Type TNC)*

IEC 60793-1-20, *Optical fibres - Part 1-20: Measurement methods and text procedures - Fibre geometry*

NOTE All fibre geometry methods have been consolidated into IEC 60793-1-20.

IEC 60793-1-41, *Optical fibres - Part 2-41: Measurement methods and test procedures - Bandwidth*

IEC 60793-1-43, *Optical fibres - Part 2-43: Measurement methods and test procedures - Numerical aperture*

IEC 60793-2, *Optical fibres - Part 2: Product specifications - General*

IEC 60793-2-10, *Optical fibres - Part 2-10: Product specifications - Sectional specification for category A1 multimode fibres* (ANSI/TIA/EIA-492AAAA and ANSI/TIA/EIA-492AAAB)

IEC 60793-2-50, *Optical fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres*

IEC 60807-3, *Rectangular connectors for frequencies below 3 MHz - Part 3: Detail specification for a range of connectors with trapezoidal shaped metal shells and round contacts - Removable crimp contact types with closed crimp barrels, rear insertion/rear extraction*

IEC 60825-1, *Safety of laser products - Part 1: Equipment classification, requirements and user's guide*

IEC 61076-3-103, *Connectors for electronic equipment - Part 3-103: Rectangular connectors - Detail specification for single row connectors with non-removable ribbon cable contacts on 1,25 mm pitch used for high speed serial data (HSSDC)*

IEC 61280-1-1, *Fibre optic communication subsystem basic test procedures - Part 1-1: Test procedures for general communication subsystems - Transmitter output optical power measurement for single-mode optical fibre cable*

IEC 61280-1-3, *Fibre optic communication subsystem basic test procedures - Part 1-3: Test procedures for general communication subsystems - Central wavelength and spectral width measurement*

IEC 61280-2-2, *Fibre optic communication subsystem test procedures - Part 2-2: Digital systems - Optical eye pattern, waveform and extinction ratio measurement*

IEC 61280-4-1, *Fibre optic communication subsystem test procedures - Part 4-1: Cable plant and links - Multimode fibre-optic cable plant attenuation measurement*

IEC 61300-2-5, *Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-5: Tests - Torsion/Twist*

IEC 61300-2-17, *Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-17: Tests - Cold*

IEC 61300-3-3, *Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-3: Examinations and measurements - Active monitoring of changes in attenuation and return loss*

IEC 61300-3-6, *Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-6: Examinations and measurements - Return loss*

IEC 61300-3-11, *Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-11: Examinations and measurements - Engagement and separation forces*

IEC 61754-4, *Fibre optic connector interfaces - Part 4: Type SC connector family*

IEC 61754-6, *Fibre optic connector interfaces - Part 6: Type MU connector family*

IEC 61754-18, *Fibre optic connector interfaces - Part 18: Type MT-RJ connector family*

IEC 61754-19, *Fibre optic connector interfaces - Part 19: Type SG connector family*

IEC 61754-20, *Fibre optic connector interfaces - Part 20: Type LC connector family*

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

2.3 Other references

All references in this subclause were correct at the time of approval of this International Standard. The provisions of the referenced specifications, as identified in this subclause, are valid within the context of this International Standard. The reference to a specification within this International Standard does not give it any further status within ISO/IEC; in particular, it does not give the referenced specification the status of an International Standard.

EIA-700-A0AF - [SP-3652] Integral FC Device Connector

SFF-8451, Specification for SCA-2 Unshielded Connections [1]

SFF-8045, 40-pin SCA-2 Connector with Parallel Selection [1]

1. SFF documents are available by FAX access from 408-741-1600 or may be purchased from Global Engineering at 303-792-2181. These documents may become international standards at a later date; they are currently new work proposals.

3 Definitions and conventions

For the purposes of this International Standard, the following definitions, conventions, abbreviations, acronyms and symbols apply.

3.1 Definitions

3.1.1
reference points α_T, α_R
used for establishing signal budgets at the serial input and output pins of the chip containing the SERDES in an FC device or Retimer
α points form the end-points of a TxRx Connection

3.1.2
interoperability points β_T, β_R
used for establishing signal budget at the internal connector nearest the α point, unless the point also satisfies the definition for δ or γ, in which case it shall be either a δ or a γ point

3.1.3
interoperability points δ_T, δ_R
used for establishing signal budget at the internal connector of a removable “Physical Media Dependent” (PMD) element

3.1.4
interoperability points γ_T, γ_R
used for establishing signal budgets at the external enclosure connector

3.1.5
attenuation
transmission medium power or amplitude loss expressed in units of dB

3.1.6
average power
optical power measured using an average-reading power meter when transmitting valid 8B/10B transmission characters

3.1.7
bandwidth
FC-PI context, the corner frequency of a low-pass transmission characteristic, such as the low-pass transmission characteristics of an optical receiver

The modal bandwidth of an optical fibre medium is expressed in units of MHzkm.

3.1.8
baud
unit of signaling speed, expressed as the maximum number of times per second the state of the signal on the transmission line or other medium can change (the dimension of baud is s^{-1})

NOTE With the Fibre Channel transmission scheme, a signal event represents a single transmission bit (adapted from IEEE Std. 610.7-1995).

3.1.9
bit error ratio (BER)
probability of a transmitted bit being erroneously received in a communication system. BER is the number of bits output from a receiver that differ from the transmitted bits, divided by the number of transmitted bits. See baud