

INTERNATIONAL STANDARD

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2000-10

**Information technology –
Fibre Distributed Data Interface (FDDI) –**

**Part 21:
Abstract test suite for FDDI physical layer
protocol conformance testing (PHY ATS)**



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**INFORMATION TECHNOLOGY –
FIBRE DISTRIBUTED DATA INTERFACE (FDDI) –
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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 JTC1. 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) 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 9314-21 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

ISO/IEC 9314 consists of the following parts, under the general title *Information technology – Fibre distributed Data Interface (FDDI)*:

Part 1: Token Ring Physical Layer Protocol (PHY)

Part 2: Token Ring Media Access control (MAC)

Part 3: Physical Layer Medium Dependent (PMD)

Part 4: Single-mode Fibre Physical Layer Medium Dependent (SMF-PMD)

Part 5: Hybrid Ring Control (HRC)

Part 6: Station Management (SMT)

Part 7: Physical Layer Protocol (PHY-2)

Part 8: Media Access Control-2 (MAC-2)

Part 9: Low-cost Fibre Physical Layer Medium Dependent (LCF-PMD)

*Part 13: Conformance Test Protocol Implementation –
Conformance Statement (CT-PICS) Proforma*

Part 20: Abstract Test Suite for FDDI Physical Medium Dependent Conformance Testing (PMD-ATS)¹⁾

Part 21: Abstract Test Suite for FDDI Physical Layer Protocol Conformance Testing

Part 25: Abstract Test Suite for FDDI – Station Management Conformance Testing (SMT-ATS)

Part 26: Media Access Control conformance Testing (MAC-ATS) (under consideration)

¹⁾ To be published.

INTRODUCTION

The Fibre Distributed Data Interface (FDDI) is intended for use in a high performance general purpose multi-station network and is designed for efficient operation with a peak data rate of 100 Mbit/s. It uses a Token Ring Architecture with optical fibre as the transmission medium. FDDI provides for hundreds of stations operating over an extent of tens of kilometres.

FDDI Physical Layer Protocol (PHY) specifies the upper sublayer of the Physical Layer for the FDDI, including the data encode/decode, framing and clocking, as well as the elasticity buffer, smoothing and repeat filter functions. This Abstract Test Suite (ATS) provides a conformance test for FDDI PHY. FDDI PHY, however, does contain several state machines and implements a protocol at the level of FDDI code symbols. The only physical quantity that must be measured in this conformance test is frequency. The PHY ATS cannot use the Tree and Tabular Combined Notation (TTCN) language specified in ISO 7496 and a notation is developed in the PHY ATS for specifying test patterns and expected results in terms of FDDI code symbol strings.

Four other standards in conjunction with this standard provide a complete conformance test of an FDDI station:

- a) An ATS for FDDI Physical Medium Dependent (PMD) that provides a conformance test for FDDI PMD. PMD specifies the optical interface of FDDI stations. PMD is not a protocol standard and this ATS requires the measurement of physical quantities such as optical power, wavelength and signal jitter. The PMD ATS differs from the methodology of higher level protocol conformance tests written using the TTCN, because the TTCN notation does not provide a suitable vehicle for Physical Layer testing, where there is no concept of a protocol data unit and where physical quantities must be measured.
- b) An ATS for FDDI Media Access Control (MAC) that provides a conformance test for FDDI MAC. MAC specifies the lower sublayer of the Data Link Layer for FDDI. It specifies access to the medium, including addressing, data checking and data framing. MAC also specifies the receiver and transmitter state machines. Since MAC is a protocol that deals primarily with complete PDUs, the TTCN language is used to specify MAC protocol tests. Provisions of MAC, however, require high resolution timing that may be difficult to achieve in commercial protocol testers.
- c) An ATS for FDDI Station Management (SMT) that provides a conformance test for FDDI SMT. SMT specifies the local portion of the system management application process for FDDI, including the control required for proper operation of an FDDI station in an FDDI ring. SMT provides services such as connection management, station insertion and removal station initialisation, configuration management and fault recovery, communications protocol for external authority, scheduling policies and the collection of statistics. SMT interacts with PMD, PHY and MAC. Therefore, an ATS for portions of SMT that use MAC PDUs can be specified in TTCN, while other portions require other approaches.
- d) A Protocol Implementation Conformance Statement (PICS) proforma for FDDI that provides a statement of the mandatory and optional requirements of each of the four FDDI base standards. The PICS proforma is used to identify requirements for conformance testing and to specify optional functionality requirements, particularly by workshops for functional standards and profiles.

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1 Scope

This part of ISO/IEC 9314 defines a conformance test of the PHY functions in a path through an FDDI node. Figure 1 is a functional block diagram of an FDDI path. The path contains the necessary functions to repeat (that is decode and retransmit) frames through an FDDI node.

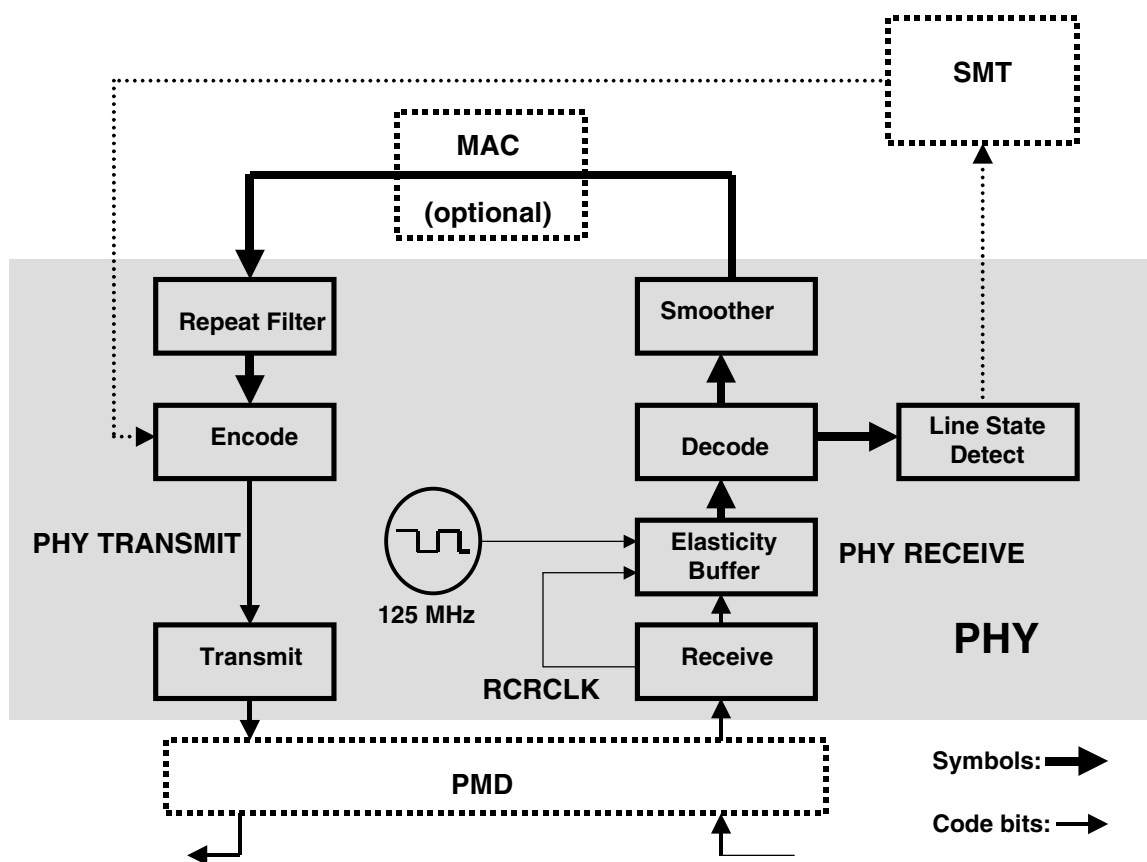


Figure 1 – FDDI Repeat Path and PHY Functions

The PHY Repeat Filter is optional when there is a MAC in the repeat path. If there is no MAC in the repeat path, then the function is implemented in PHY. This test standard makes no assumption about the presence or absence of MAC on the path and is intended to operate with or without a MAC. It tests the repeat filter function wherever it is located. However, the results of some tests may be slightly different if a MAC is present.

2 Conformance

This part of ISO/IEC 9314 defines a conformance test of the PHY functions in a path through an FDDI node.

3 Normative references

The following standards contain provisions which, through reference in the text, constitute provisions of this part of ISO/IEC 9314. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 9314 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 9314-1:1989, *Information processing systems – Fibre Distributed Data Interface (FDDI) – Part 1: Token Ring Physical Layer Protocol (PHY)*

ISO 9314-2:1989, *Information processing systems – Fibre Distributed Data Interface (FDDI) – Part 2: Token Ring Media Access Control (MAC)*

ISO/IEC 9314-3:1990, *Information processing systems – Fibre Distributed Data Interface (FDDI) – Part 3: Physical Layer Medium Dependent (PMD)*

ISO/IEC 9314-6:1998, *Information technology – Fibre Distributed Data Interface (FDDI) – Part 6: Token Ring Station Management (SMT)*

4 Definitions and conventions

For the purposes of this part of ISO/IEC 9314, the definitions given in ISO 9314-1, ISO 9314-2, ISO/IEC 9314-3 and ISO/IEC 9314-6 apply.

The terms SMT, MAC, PHY and PMD, when set in roman type and used without modifiers, refer specifically to the local entities. When set in italic type they refer to the corresponding standard listed in clause 3.

5 Symbols and abbreviated terms

The following acronyms and abbreviations are used in this test specification:

AC	Alternating Current
ALS	Active Line State (PHY)
CMT	Configuration Management (SMT)
DC	Direct Current
FCS	Frame Check Sequence
FDDI	Fiber Distributed Data Interface
HLS	Halt Line State (PHY)
ILS	Idle Line State (PHY)
IUT	Implementation Under Test
MIC	Media Interface Connector (PMD)
MLS	Master Line State (PHY)
NLS	Noise Line State (PHY)
NRZI	Non-Return to Zero Inverted (PHY)
PCM	Physical Connection Management (SMT)
PHY	Physical Layer Protocol (PHY)
PMD	Physical Medium Dependent Layer (PMD)
PTA	PHY Test Apparatus
QLS	Quiet Line State (PHY)
RMT	Ring Management (SMT)
SD	Starting Delimiter (MAC)
SMT	Station Management (SMT)
SR	Symbol Recorder
SSG	Symbol Sequence Generator
TRT	Token Rotation Timer (MAC)

6 Specification breakdown

Table 1 summarizes the requirements of PHY and identifies the specific test suite where requirements are tested. Certain requirements of the PHY standard (primarily the recognition of line states) are indirectly verified in the Station Management (SMT) Physical Configuration Management (PCM) verification test, because their effects are most directly manifest as a result of actions taken by PCM. Every PHY is controlled by an SMT entity, and the test of PCM provides the best test possible of these PHY requirements.

Table 1 – Specification breakdown

Item Name	PICS Item No.	PHY Ref.	Test Reference
Line State Detection and Transmission			
Quiet (Tx/Rx)	PHY 1.1	7.3.1	SMT PCM Test
Master (Tx/Rx)	PHY 1.2	7.3.2	SMT PCM Test
Halt (Tx/Rx)	PHY 1.3	7.3.2	SMT PCM Test
Idle (Tx/Rx)	PHY 1.4	7.3.4	8.4 & SMT PCM Test
Active (Tx/Rx)	PHY 1.5	7.4.5	8.4
Noise (Tx/Rx)	PHY 1.6	7.3.6	SMT PCM Test
Violation symbol / invalid code	PHY 1.7	7.2.4	8.8.4.3
Elasticity Buffer Functions			
Insertion of code bit ones	PHY 2.1	8.2.4	8.5
Deletion of code bit ones	PHY 2.2	8.2.4	8.5
Receive frame with RCRCLK = 125,000 MHz (-0,005 %)	PHY 2.3	8.2.4	8.5
Receive frame with RCRCLK = 125,000 MHz (+0,005 %)	PHY 2.4	8.2.4	8.5
Realignment of JK with ALS	PHY 2.5	8.2.4	not tested
Smoothing Function			
Reclaim fragments of stripped partials	PHY 3.1	8.3	not tested
Reclaim space from other partial frames	PHY 3.2	8.3	not tested
Insert Idles	PHY 3.3	8.3	8.6
Delete Idles	PHY 3.4	8.3	8.6
Repeat Filter Functions			
Symbol following I changed to I until JK	PHY 4.1	8.4	8.8.4.1
Detect Violation symbol (isolated J)	PHY 4.2	8.4	8.8.4.2
SD in ALS	PHY 4.3	8.4	
Replace invalid symbol with HHHH	PHY 4.4	8.4	8.8.4.3
Parameters			
SC_Max (ns)	PHY 5.1	8.5.2	8.7
Lcl-Clk Reew (MHz)	PHY 5.2	8.2.7	7
Phase jitter (deg)	PHY 5.3	8.2.7	not tested
Harmonic content (dB)	PHY 5.4	8.2.7	not tested
Path Latency			
Minimum latency with no MAC in path	PHY 6.1	8.5.1	8.7
Minimum latency with MAC in path	PHY 6.2	8.5.1	8.7