# INTERNATIONAL STANDARD

# ISO/IEC 9314-7

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## Information technology –
## Fibre distributed data interface (FDDI) –
## Part 7:
## Physical Layer Protocol (PHY-2)




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# FOREWORD

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. 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.

International Standard ISO/IEC 9314-7 was prepared by Joint Technical Committee ISO/IEC JTC 1 *Information technology*, Subcommittee SC 25*, Interconnection of information technology equipment.*

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) (1989)*
– *Part 2: Token Ring Media Access Control (MAC) (1989)*
– *Part 3: Physical Layer Medium Dependent (PMD) (1990)*
– *Part 4: Single Mode Fibre Physical Layer Medium Dependent (SMF-PMD)* [1)]
– *Part 5: Hybrid Ring Control (HRC) (1995)*
– *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 Medium Dependent (LCF-PMD) (under consideration)*
– *Part 10: Token Ring Twisted Pair Physical layer Medium Dependent (TP-PMD) (under consideration)*
– *Part 13: Conformance Test Protocol Implementation Conformance Statement Proforma (CT-PICS)*
– *Part 20: Physical Medium Dependent Conformance Testing (PMD-ATS) (under consideration)*
– *Part 21: Physical Layer Protocol Conformance Testing (PHY-ATS) (under consideration)*
– *Part 25: Abstract Test Suite for FDDI – Station Management Conformance Testing (SMT-ATS)*
– *Part 26: Media Access Control Conformance Testing (MAC-ATS) (under consideration)*

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[1)] To be published.

# INTRODUCTION

The Fibre Distributed Data Interface (FDDI), ISO/IEC 9314, is intended for use in a high-performance general purpose multi-node 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 nodes operating over an extent of tens of kilometers.

The Physical Layer Protocol (PHY) specifies the upper sublayer of the Physical Layer for the FDDI. As such, it presents the specifications and services provided for conforming FDDI attachment devices. PHY specifies the data encode and decode, framing, and clocking requirements. PHY also specifies the elasticity buffer, smoothing, and repeat filter functions.

When the set of basic FDDI standards, ISO/IEC 9314, is completed it will include the following standards:

a) A Media Access Control (MAC), which specifies the lower sublayer of the Data Link Layer of ISO/IEC 9314,

b) A Physical Layer Media Dependent (PMD), which specifies the lower sublayer of the Physical Layer of ISO/IEC 9314,

c) A Station Management (SMT), which specifies the local portion of the system management application process of ISO/IEC 9314.

A number of extensions to ISO/IEC 9314 are completed or in process. One extension, ISO/IEC 9314-5, for Hybrid Ring Control (HRC) commonly known as FDDI-II, extends the capability of FDDI to handle isochronous data streams at a multiplicity of data rates. Another extension, ISO/IEC 9314-4, provides for a single-mode optical fibre version of PMD (SMF-PMD) and will permit optical links of up 60 km.

Other extensions, addressing alternate PMDs, provide low-cost attachments for use in concentrator-to-workstation environments.

This part of ISO/IEC 9314 for PHY-2 is an enhancement to the original FDDI standard on PHY (ISO 9314-1). It is referred to as PHY-2 when it is necessary to distinguish it from the original PHY. Changes include those identified in footnotes to ISO 9314-1 as areas that the standards committee intended to change as well as changes that were required for extensions to FDDI, such as FDDI-II. PHY-2 also includes editorial corrections and clarifications.

# INFORMATION TECHNOLOGY — FIBRE DISTRIBUTED DATA INTERFACE (FDDI) —

## Part 7: Physical Layer Protocol (PHY-2)

## 1 Scope

This part of ISO/IEC 9314 specifies the Physical Layer Protocol (PHY), the upper sublayer of the Physical Layer, for Fibre Distributed Data Interface (FDDI).

FDDI provides a high-bandwidth (100 Mbit/s), general-purpose interconnection among information processing systems, subsystems and peripheral equipment, using fibre optics or other transmission media. FDDI can be configured to support a sustained data transfer rate of at least 80 Mbit/s (10 Mbyte/s). FDDI provides connectivity for many nodes distributed over distances of many kilometers in extent. Certain default parameter values for FDDI (e.g. timer settings) are calculated on the basis of up to 1 000 transmission links or up to 200 km total fibre-path length (typically corresponding to 500 nodes and 100 km of dual fibre cable, respectively); however, the FDDI protocols can support much larger networks by increasing these parameter values.

As shown in figure 1, FDDI consists of

a) Physical Layer (PL), which is divided into two sublayers:

   1) A Physical Medium Dependent (PMD), which provides the digital baseband point-to-point communication between nodes in the FDDI network. The PMD provides all services necessary to transport a suitably coded digital bit stream from node to node. The PMD defines and characterizes the fibre-optic drivers and receivers, medium-dependent code requirements, cables, connectors, power budgets, optical bypass provisions, and physical-hardware-related characteristics. It specifies the point of interconnectability for conforming FDDI attachments. The initial PMD standard defines attachment to multi-mode fibre. Alternative PMD sublayer standards are being developed for attachment to other transmission media and for mapping to Synchronous Optical Network (SONET),

   2) A Physical Layer Protocol (PHY), which provides connection between the PMD and the Data Link Layer. PHY establishes clock synchronization with the upstream code-bit data stream and decodes this incoming code-bit stream into an equivalent symbol stream for use by the higher layers. PHY provides encoding and decoding between data and control indicator symbols and code bits, medium conditioning and initializing, the synchronization of incoming and outgoing code-bit clocks, and the delineation of octet boundaries as required for the transmission of information to or from higher layers. Information to be transmitted on the medium is encoded by the PHY using a group transmission code. The definition of PHY is contained in this part of ISO/IEC 9314.

b) A Data Link Layer (DLL), which is divided into two or more sublayers:

   1) An optional Hybrid Ring Control (HRC), which provides multiplexing of packet and circuit switched data on the shared FDDI medium. HRC comprises two internal components, a Hybrid Multiplexer (H-MUX) and an Isochronous MAC (I-MAC). H-MUX maintains a synchronous 125 µs cycle structure and multiplexes the packet and circuit switched data streams, and I-MAC provides access to circuit switched channels,

   2) A Media Access Control (MAC), which provides fair and deterministic access to the medium, address recognition, and generation and verification of frame check sequences. Its primary function is the delivery of packet data, including frame generation, repetition, and removal,

   3) An optional Logical Link Control (LLC), which provides a common protocol for any required packet data adaptation services between MAC and the Network Layer. LLC is not specified by FDDI,

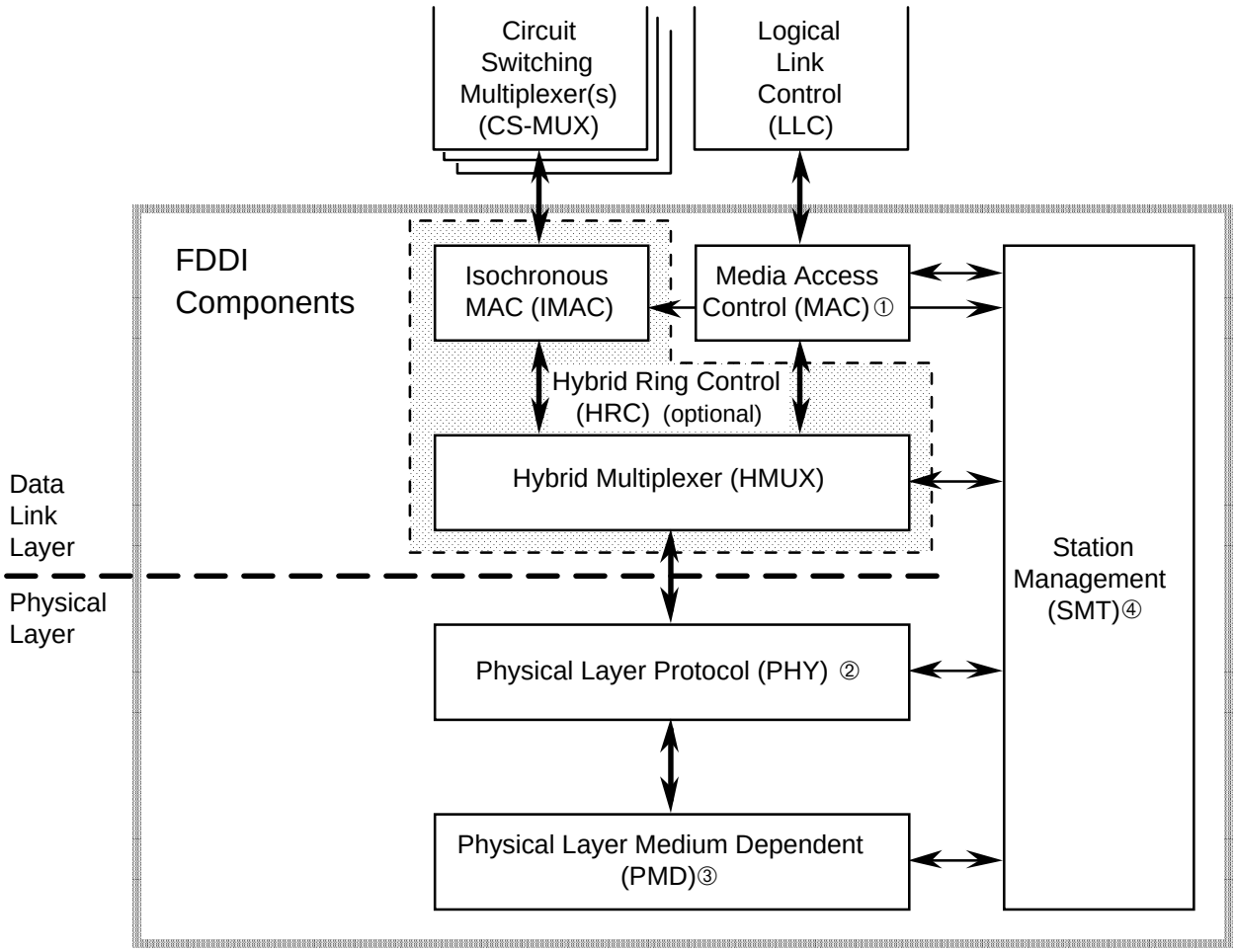
4) An optional Circuit Switching Multiplexer (CS-MUX), which provides a common protocol for any required circuit data adaptation services between I-MAC and the Network Layer. CS-MUX is not specified by FDDI.

c) A Station Management (SMT), which provides the coordination necessary at the node level to manage the processes under way in the various FDDI layers such that a node may work cooperatively on a ring. SMT provides services such as control of configuration management, fault isolation and recovery, and scheduling policies.

The definition of PHY as contained in this part of ISO/IEC 9314 is designed to be as independent as possible from the actual physical medium.

This part of ISO/IEC 9314 is an optional alternative to the original part of ISO/IEC 9314 on PHY (ISO 9314-1) for implementations without an (optional) HRC, and is required for implementations with an HRC. Implementations that conform to this part of ISO/IEC 9314 shall also be interoperable with implementations that conform to ISO 9314-1 if the additional capability of Hybrid mode operation (as defined in this part of ISO/IEC 9314) is not being used. Implementers are encouraged to read ISO 9314-1 in addition to this part of ISO/IEC 9314.

The set of FDDI standards specifies the interfaces, functions and operations necessary to ensure interoperability between conforming FDDI implementations. This part of ISO/IEC 9314 is a functional description. Conforming implementations may employ any design technique that is interoperable.




① MAC-2 with HRC; MAC or MAC-2 otherwise.

② PHY-2 with HRC; PHY or PHY-2 otherwise.

③ PMD, SMF-PMD, TP-PMD or LCF-PMD.

④ SMT-2 with HRC; SMT or SMT-2 otherwise.

**Figure 1 – Structure of FDDI standards**

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 9314. At the time of publication, the editions indicated were valid. All standards are subject to revision, and 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 standards indicated below. 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 9314-4, *Information technology – Fibre Distributed Data Interface (FDDI) – Part 4: Single Mode Fibre Physical Layer Medium Dependent (SMF-PMD)* [1)]

ISO/IEC 9314-5:1995, *Information technology – Fibre Distributed Data Interface (FDDI) – Part 5: Hybrid Ring Control (HRC)*

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

ISO/IEC 9314-8, *Information technology – Fibre Distributed Data Interface (FDDI) – Part 8: Media Access Control (MAC-2)*

ISO/IEC 9314-9:199X, *Fibre Distributed Data Interface (FDDI) – Part 9: Token ring low-cost fibre physical layer medium dependent (LCF-PMD)*

ISO/IEC 9314-10:199X, *Fibre Distributed Data Interface (FDDI) – Part 10: Token ring twisted pair physical layer medium dependent (TP-PMD)*

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[1)] To be published.