

IEEE Standards for Local and Metropolitan Area Networks:

**Supplements to Distributed Queue Dual Bus (DQDB) Access
Method and Physical Layer Specifications**

**Physical Layer Convergence Procedure (PLCP) for
DS1-Based Systems (Clause 12) and**

**Isochronous Service on a Distributed Queue Dual
Bus (DQDB) Subnetwork of a Metropolitan Area
Network (MAN)**

Sponsor

**Technical Committee on Computer Communications
of the
IEEE Computer Society**

802.6c-1993 Approved July 12, 1993
802.6h-1993 Approved September 15, 1993

IEEE Standards Board

Abstract for 802.6c-1993: A Physical Layer Convergence Procedure (PLCP) in which the Distributed Queue Dual Bus (DQDB) Layer is mapped into a public network standard DS1 transmission system is provided. The relationship of DS1 to the PLCP and the DS1 PLCP frame format are covered.

Abstract for 802.6h-1993: Enhancements to the Distributed Queue Dual Bus (DQDB) subnetwork of a MAN standard are defined that support applications requiring periodic, recurring bandwidth. The use of Pre-Arbitrated functions to support a variety of isochronous service rates is addressed, although the use of Queued Arbitrated functions will be standardized at a future date. Procedures for establishing, maintaining, and releasing an isochronous connection are not addressed.

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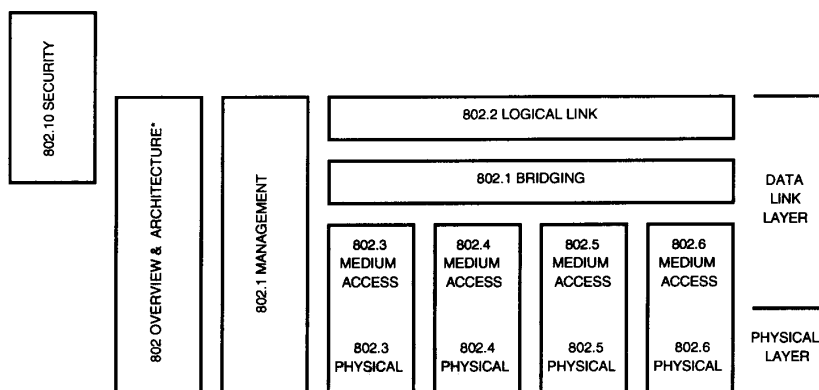
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Introduction

(This introduction is not a part of IEEE Std 802.6c-1993 or IEEE Std 802.6h-1993.)

This standard is part of a family of standards for local and metropolitan area networks. The relationship between the standard and other members of the family is shown below. (The numbers in the figure refer to IEEE standard numbers.)



* Formerly IEEE Std 802.1A.

This family of standards deals with the Physical and Data Link layers as defined by the International Organization for Standardization (ISO) Open Systems Interconnection Basic Reference Model (ISO 7498 : 1984). The access standards define several types of medium access technologies and associated physical media, each appropriate for particular applications or system objectives. Other types are under investigation.

The standards defining these technologies are as follows:

- IEEE Std 802¹: Overview and Architecture. This standard provides an overview to the family of IEEE 802 Standards. This standard forms part of the 802.1 scope of work.
- IEEE Std 802.1B [ISO DIS 15802-2]: LAN/MAN Management. Defines an Open Systems Interconnection (OSI) management-compatible architecture, and service and protocol elements for use in a LAN/MAN environment for performing remote management.
- ISO/IEC 10038 [ANSI/IEEE Std 802.1D]: MAC Bridging. Specifies an architecture and protocol for the interconnection of IEEE 802 LANs below the MAC service boundary.
- IEEE Std 802.1E [ISO DIS 15802-4]: System Load Protocol. Specifies a set of services and protocol for those aspects of management concerned with the loading of systems on IEEE 802 LANs.

¹The 802 Architecture and Overview Specification, originally known as IEEE Std 802.1A, has been renumbered as IEEE Std 802. This has been done to accommodate recognition of the base standard in a family of standards. References to IEEE Std 802.1A should be considered as references to IEEE Std 802.

- ISO 8802-2 [ANSI/IEEE Std 802.2]: Logical Link Control
- ISO/IEC 8802-3 [ANSI/IEEE Std 802.3]: CSMA/CD Access Method and Physical Layer Specifications
- ISO/IEC 8802-4 [ANSI/IEEE Std 802.4]: Token Bus Access Method and Physical Layer Specifications
- ISO/IEC 8802-5 [ANSI/IEEE Std 802.5]: Token Ring Access Method and Physical Layer Specifications
- ISO/IEC 8802-6 [ANSI/IEEE Std 802.6]: Distributed Queue Dual Bus (DQDB) Access Method and Physical Layer Specifications
- IEEE Std 802.10: Interoperable Local Area Network (LAN) Security, *Currently Contains Secure Data Exchange (SDE)*

In addition to the family of standards, the following is a recommended practice for a common technology:

- IEEE Std 802.7: IEEE Recommended Practice for Broadband Local Area Networks

The reader of this standard is urged to become familiar with the complete family of standards.

Conformance test methodology

An additional standards series, identified by the number 1802, has been established to identify the conformance test methodology documents for the 802 family of standards. This makes the correspondence between the various 802 standards and their applicable conformance test requirements readily apparent. Thus the conformance test documents for 802.3 are numbered 1802.3, the conformance test documents for 802.5 will be 1802.5, and so on. Similarly, ISO will use 18802 to number conformance test standards for 8802 standards.

IEEE Std 802.6c-1993 and IEEE Std 802.6h-1993

The two standards included in this volume are supplements to ISO/IEC 8802-6 : 1994 [ANSI/IEEE Std 802.6, 1994 Edition]. When approved by ISO and IEC, they will be incorporated into the base text of the standard and will no longer be available separately.

This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution. Revisions are anticipated within the next few years to clarify existing material, to correct possible errors, and to incorporate new related material. Information on the current revision state of this and other IEEE 802 standards may be obtained from

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IEEE 802 committee working documents are available from

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When IEEE Std 802.6c-1993 and IEEE Std 802.6h-1993 were approved, the IEEE 802.6 Working Group had the following voting membership:

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The final conditions for approval of IEEE Std 802.6c-1993 were met on July 12, 1993. This standard was conditionally approved by the IEEE Standards Board on June 17, 1993, with the following membership:

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IEEE Std 802.6h-1993 was approved by the IEEE Standards Board on September 15, 1993.

Also included are the following nonvoting IEEE Standards Board liaisons:

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IEEE Standards for Local and Metropolitan Area Networks:

Supplements to Distributed Queue Dual Bus (DQDB) Access Method and Physical Layer Specifications

Physical Layer Convergence Procedure (PLCP) for DS1-Based Systems (Clause 12)

Revisions to ISO/IEC 8802-6 : 1994 [ANSI/IEEE Std 802.6, 1994 Edition]

Editing instructions in this document are provided in *bold italics*.

Add the following reference to the list of references in 1.3 in ISO/IEC 8802-6 : 1994:

ANSI T1.408-1990, American National Standard for Telecommunications—ISDN Primary Rate Customer Installation Interfaces, Layer 1 Specification.¹

Add clause 12 to ISO/IEC 8802-6 : 1994 as follows:

12. Physical Layer Convergence Procedure (PLCP) for DS1-based systems

12.1 Overview

This clause provides a convergence procedure in which the DQDB Layer is mapped into a public network standard DS1 transmission system. A DS1 frame is divided into 24 octets preceded by one bit containing the Framing (F) bit, for a total of 193 bits. The 193 bits are transmitted at a rate of 1.544 Mbit/s, which equates to a frame duration of 125 μ s. The DS1 frame provides for an information payload of 24 octets and an information payload rate of 1.536 Mbit/s. The F-bit will be used to frame upon the Extended Superframe (ESF), which consists of 24 consecutive DS1 frames and a frame duration equal to 3 ms. The DS1 information payload (i.e., the 24 octets of each DS1 frame contained within the 24 consecutive DS1 frames) is available every 3 ms time period for use by the DS1 PLCP.

12.1.1 DS1 relationship to PLCP

The framing format used for a DS1-based DQDB subnetwork shall be the ESF format, as specified in ANSI T1.408. The rate, format, electrical characteristics, and other attributes of the unchannelized DS1 signal are defined in ANSI T1.102 and ANSI T1.107.

¹ANSI publications are available from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

DS1 Clear Channel Capability is required for this application. The B8ZS line code, as described in ANSI T1.102, is the preferred method of providing the clear channel capability. The alternative use of ZBTISI, as described in ANSI T1.107, may be used in limited cases (e.g., point-to-point DS1 access). Note that ZBTISI incurs significant delay per station (500 μ s); thus, it may be unacceptable for multistation access.

The DS1 PLCP makes use of the optional status parameter in Ph-DATA indication primitives (see 4.2). Hence, the status parameter is mandatory for the service provided by the DS1 PLCP.

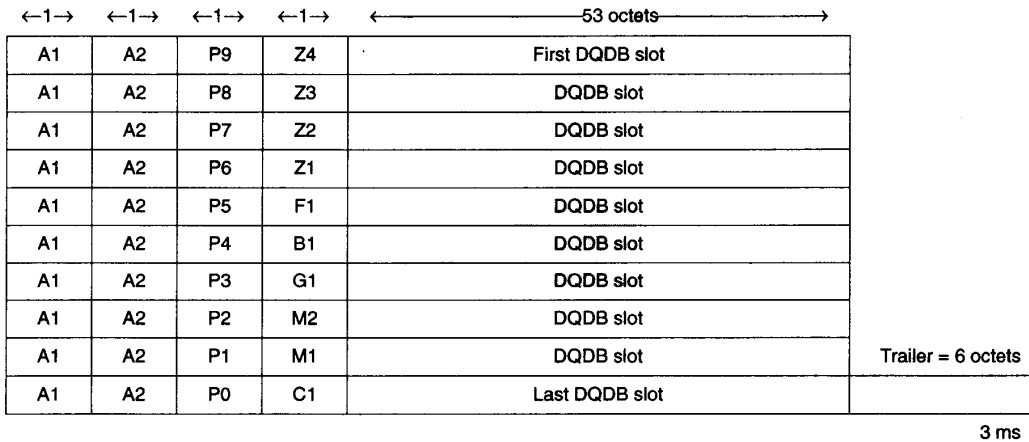
12.2 The PLCP frame format

The DS1 PLCP frame format consists of 10 rows by 57 octets with the last row containing a trailer of 6 octets. The DS1 PLCP frame format has a duration of 3 ms and is transmitted at a rate of 1.536 Mbit/s.

The DS1 PLCP is synchronously mapped into the DS1 information payload at octet boundaries. An octet boundary shall follow each F-bit. There is no predefined relationship between the DS1 frame and the DS1 PLCP frame or the ESF and the DS1 PLCP frame.

The DS1 PLCP delivers DQDB slots every 3 ms to the DQDB Layer. The first three columns of the PLCP frame format are used for framing. The fourth column is used to carry PLCP Path Overhead octets.

The complete frame format structure is shown in figure 12-1. Each row of bits in the DS1 PLCP frame format illustrated in figure 12-1 shall be transmitted in order, left to right, top to bottom.



KEY: A1 = Framing octet (11110110)
A2 = Framing octet (00101000)
P9 – P0 = Path Overhead Identifier octets

PLCP Path Overhead octets:

Z4 – Z1 = Growth octets
F1 = PLCP Path user channel
B1 = BIP-8
G1 = PLCP Path status
M2 – M1 = DQDB Layer Management Information octets
C1 = Cycle/stuff counter

Figure 12-1—The DS1 PLCP frame format

12.3 PLCP field definitions

(Refer to figure 12-1.) See 6.1 for ordering principles of fields. The values of fields are described as bit patterns. The left-most bit of each octet is the most significant.

12.3.1 Framing octets (A1, A2)

The first two columns (A1 and A2) are used to provide slot delineation. The encoding of the A1 and A2 octets is shown in table 12-1.

NOTE—Alternatively, slot delineation can be provided by using the Header Check Sequence (HCS) (see 14.3, 15.3, and 16.3). Since the PLCP for DS1-based systems was originally created by a different standards body than the other PLCPs, this possibility had not been included, although it is also technically feasible in this case.

These codes are of the same pattern that is used in the Synchronous Digital Hierarchy (SDH) CCITT Recommendations G.707, G.708, and G.709. See 13.6 for PLCP framing requirements.

Table 12-1—A1 and A2 codes

A1	A2
11110110	00101000

12.3.2 Path Overhead Identifier (P9–P0)

The third column (P9–P0) identifies the DS1 PLCP Overhead octets contained in the fourth column of figure 12-1. Figure 12-2 shows the format of the Path Overhead Identifier (POI) octet. The reserved bit shall be set to zero (0). The parity bit provides odd parity over this field.

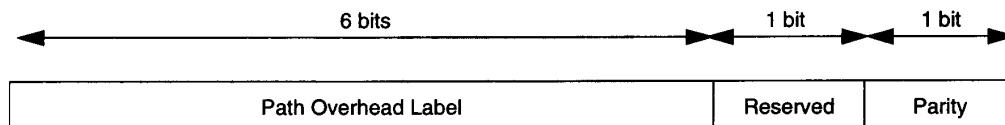


Figure 12-2—POI octet

Table 12-2 defines the codes for P9–P0, which shall be generated by the PLCP at each node. All other codes are invalid. See 13.6 for PLCP framing requirements.

12.3.3 PLCP Path Overhead octets

The PLCP Path is defined between two adjacent peer PLCP entities. The F1, B1, G1, and C1 PLCP Path Overhead octets are related to PLCP operation and are terminated/generated at each PLCP on the subnetwork. The M1 and M2 octets are provided for the transport of DQDB Layer Management Information octets and shall not be processed by the PLCP Sublayer.

Table 12-2—POI codes

P9	001001	0	1
P8	001000	0	0
P7	000111	0	0
P6	000110	0	1
P5	000101	0	1
P4	000100	0	0
P3	000011	0	1
P2	000010	0	0
P1	000001	0	0
P0	000000	0	1

12.3.3.1 PLCP Path user channel (F1)

The F1 octet is the user channel, which is allocated for user communication purposes between adjacent PLCPs. The use of this octet in DQDB subnetworks is under study.² The default code for this octet shall be (00000000).

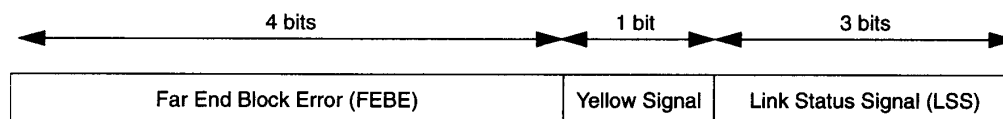
12.3.3.2 Bit Interleaved Parity-8 (B1)

One octet is allocated for PLCP Path error monitoring. This function shall be a Bit Interleaved Parity-8 (BIP-8) code using even parity. The PLCP Path BIP-8 is calculated over the 10×54 octet structure (columns 4–57: 1 PLCP Path Overhead octets and 53 DQDB slot octets per row) of the previous DS1 PLCP frame and inserted in the B1 octet of the current DS1 PLCP frame.

A BIP-8 is an 8-bit code in which the first bit of the BIP-8 code represents even parity calculated over the first bit of each octet in the 10×54 octet structure, the second bit of the BIP-8 represents even parity over the second bit of each octet in the 10×54 octet structure, etc. Therefore, the BIP-8 code provides for 8 separate even parity codes covering the corresponding bit of each octet in the 10×54 octet structure.

12.3.3.3 PLCP Path status (G1)

The G1 octet is allocated to convey the received PLCP status and performance back to the transmitting PLCP. This octet permits the status of the full duplex PLCP Path to be monitored at either PLCP entity. Figure 12-3 depicts the G1 octet.

**Figure 12-3—PLCP Path status (G1)**

²One possible application is for assisting maintenance personnel.