

**INTERNATIONAL  
STANDARD**

**ISO/IEC  
11518-10**

First edition  
2001-03

---

---

**Information technology –  
High-performance parallel interface**

**Part 10:  
6 400 Mbit/s Physical Layer (HIPPI-6400-PH)**



Reference number  
ISO/IEC 11518-10:2001(E)

This is a preview of ISO/IEC 11518-10:2001. [Click here to purchase the full version from the ANSI store.](#)

# INTERNATIONAL STANDARD

# ISO/IEC 11518-10

First edition  
2001-03

---

---

## Information technology – High-performance parallel interface

### Part 10: 6 400 Mbit/s Physical Layer (HIPPI-6400-PH)

© ISO/IEC 2001

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

ISO/IEC Copyright Office • Case postale 56 • CH-1211 Genève 20 • Switzerland

---

---



PRICE CODE

V

*For price, see current catalogue*

## CONTENTS

FOREWORD .....	6
INTRODUCTION .....	7
1 Scope .....	8
2 Normative references .....	8
3 Definitions and conventions .....	9
3.1 Definitions .....	9
3.2 Editorial conventions.....	10
3.3 Acronyms and abbreviations .....	11
4 System overview.....	11
4.1 Overview .....	11
4.2 Links.....	12
4.3 Virtual Channels .....	12
4.4 Micropacket .....	13
4.5 Message .....	14
4.6 FRAME and CLOCK signals.....	15
4.7 Flow control .....	15
4.8 Retransmission .....	15
4.9 Check functions .....	15
4.10 Local electrical interface (optional) .....	15
4.11 Copper cable physical layer (optional) .....	16
5 Service interface.....	16
5.1 Overview .....	16
5.2 Service primitives .....	17
5.3 Sequences of primitives.....	17
5.4 Data transfer service primitives.....	17
5.5 Admin service primitives .....	20
5.6 Control service primitives.....	22
5.7 Status service primitives .....	23
6 Micropacket contents .....	24
6.1 Bit and byte assignments .....	24
6.2 Virtual Channel (VC) selector.....	26
6.3 Micropacket TYPES.....	26
6.4 Sequence number parameters .....	27
6.5 Credit update parameters .....	28
6.6 Check functions .....	28
7 Message structure .....	31
7.1 Overview .....	31
7.2 MAC header.....	31
7.3 LLC/SNAP header.....	32
7.4 Payload .....	32

8	Source specific operations .....	32
8.1	Credit update indications on Source side .....	32
8.2	ACK indications on Source side .....	32
8.3	ACKs and credit updates to remote end .....	33
8.4	Micropacket retransmission .....	33
9	Destination specific operations .....	34
9.1	Link level processing .....	34
9.2	Check for Message protocol errors .....	34
9.3	Generating ACKs .....	36
10	Signal line encoding.....	36
10.1	Signal line bit assignments .....	36
10.2	CLOCK and CLOCK_2 signals .....	36
10.3	FRAME signal.....	39
10.4	Source-side encoding for d.c. balance .....	39
10.5	Destination-side decoding.....	41
11	Skew compensation .....	41
11.1	Training sequences.....	41
11.2	Training sequence errors .....	42
12	Link Reset and Initialization .....	42
12.1	Overview .....	42
12.2	Link Reset .....	43
12.3	Initialize .....	43
12.4	Hold-off timer.....	45
13	Link activity monitoring and shutdown .....	45
13.1	Activity monitoring .....	45
13.2	Link shutdown.....	45
14	Maintenance and control features .....	46
14.1	Timeouts.....	46
14.2	Logged events .....	46
15	Local electrical interface (optional).....	47
15.1	Overview .....	47
15.2	Local electrical interface – Output.....	49
15.3	Local electrical interface – Input .....	49
15.4	Light present signal .....	49
16	Copper cable interface (optional) .....	51
16.1	Overview .....	51
16.2	Copper cable interface – Output .....	51
16.3	Copper cable interface – Input .....	52
16.4	CLOCK_2 .....	53
16.5	Copper cable connectors .....	54
16.6	Copper cable specifications .....	55
	Annex A (informative) Implementation comments .....	61

Figure 1 – System overview .....	12
Figure 2 – HIPPI-6400-PH link showing signal lines .....	13
Figure 3 – Logical micropacket format and naming conventions .....	14
Figure 4 – Message format.....	14
Figure 5 – Reverse direction control information.....	16
Figure 6 – HIPPI-6400-PH service interface .....	17
Figure 7 – Data transfer service primitives .....	18
Figure 8 – Admin service primitives .....	20
Figure 9 – Control service primitives .....	22
Figure 10 – Status service primitives.....	23
Figure 11 – Control bits summary.....	25
Figure 12 – LCRC implementation example.....	30
Figure 13 – ECRC implementation example .....	30
Figure 14 – Header micropacket contents .....	31
Figure 15 – Detailed ULA layout.....	32
Figure 16 – 16-bit system micropacket .....	40
Figure 17 – 8-bit system micropacket.....	41
Figure 18 – 16-bit system training sequence .....	41
Figure 19 – 8-bit system training sequence .....	42
Figure 20 – Initialize and Link Reset sequences.....	44
Figure 21 – Local electrical interface block diagram .....	48
Figure 22 – One signal (of 12 in each direction) of the local electrical interface.....	49
Figure 23 – One signal (of 23 in each direction) of the copper cable interface .....	52
Figure 24 – Destination Receiver equivalent circuit .....	52
Figure 25 – Receiver eye mask (differential) .....	54
Figure 26 – Connecting the overall shield.....	55
Figure 27 – Receptacle pin assignments .....	57
Figure 28 – Receptacle .....	59
Figure 29 – Cable connector .....	60
Figure A.1 – Encode / decode circuit example.....	61
Figure A.2 – Parallel LCRC generator example .....	62
Figure A.3 – Parallel LCRC checker example .....	63
Figure A.4 – Parallel ECRC example.....	64
Table 1 – CRC coverages in a 128-byte Message .....	16
Table 2 – Micropacket contents summary.....	28
Table 3 – Signal line bit assignments in a 16-bit system.....	37
Table 4 – Signal line bit assignments in an 8-bit system.....	38
Table 5 – 4b/5b line coding .....	40
Table 6 – Summary of timeouts .....	46
Table 7 – Summary of logged events.....	47
Table 8 – Local electrical signal timing at Source driver output.....	50

Table 9 – Local electrical interface, Source driver output.....	50
Table 10 – Local electrical interface, Destination receiver input.....	51
Table 11 – Copper cable interface.....	51
Table 12 – Copper cable interface signal timing at Source driver output.....	53
Table 13 – Copper cable interface, Source driver output .....	53
Table 14 – Copper cable interface, Destination receiver input .....	54
Table 15 – Copper cable assembly electrical specifications.....	56
Table 16 – Cable layout .....	58
Table A.1 – Parallel LCRC input bits .....	62
Table A.2 – Parallel ECRC input bits .....	63
Table A.3 – 16-bit LCRC generator equations .....	65
Table A.4 – 64-bit LCRC generator equations .....	66
Table A.5 – 80-bit LCRC checker equations .....	67
Table A.6 – 64-bit ECRC generator / checker equations .....	68

**INFORMATION TECHNOLOGY –  
HIGH-PERFORMANCE PARALLEL INTERFACE –  
Part 10: 6 400 Mbit/s Physical Layer (HIPPI-6400-PH)**

**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 11518-10 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 11518 consists of the following parts, under the general title *Information technology – High-Performance Parallel Interface*:

- *Part 1: Mechanical, electrical, and signalling protocol specification (HIPPI-PH)*
- *Part 2: Framing Protocol (HIPPI-FP)*
- *Part 3: Encapsulation of ISO/IEC 8802-2 (IEEE Std 802.2) Logical Link Control Protocol Data Units (HIPPI-LE)*
- *Part 4: Mapping of HIPPI to IPI device generic command sets (HIPPI-IPI) <sup>1)</sup>*
- *Part 5: Memory Interface (HIPPI-MI) <sup>1)</sup>*
- *Part 6: Physical Switch Control (HIPPI-SC)*
- *Part 8: Mapping to Asynchronous Transfer Mode (HIPPI-ATM)*
- *Part 9: Serial Specification (HIPPI-Serial)*
- *Part 10: 6 400 Mbit/s Physical Layer (HIPPI-6400-PH)*
- *Part 11: 6 400 Mbit/s Physical Switch Control (HIPPI-6400-SC) <sup>1)</sup>*
- *Part 12: 6 400 Mbit/s Optical Specification (HIPPI-6400-OPT) <sup>1)</sup>*

Annex A is for information only.

---

<sup>1)</sup> Under consideration.

## INTRODUCTION

Characteristics of a HIPPI-6400-PH physical-layer interface include:

- user data transfer bandwidth of 6 400 Mbit/s (800 MByte/s);
- a full-duplex link capable of independent full-bandwidth transfers in both directions simultaneously;
- four virtual circuits providing a limited multiplexing capability;
- a fixed-size transfer unit, i.e., a 32-byte micropacket, for hardware efficiency;
- a small transfer unit resulting in low latency for short Messages, and a component for large transfers;
- credit-based flow control that prevents buffer overflow;
- end-to-end, as well as link-to-link, checksums;
- automatic retransmission to correct flawed data providing guaranteed, in-order, reliable, data delivery;
- an a.c. coupled parallel electrical interface for driving parallel copper cable over limited distances;
- a parallel electrical interface for driving a local optical interface for longer distances.

## INFORMATION TECHNOLOGY – HIGH-PERFORMANCE PARALLEL INTERFACE –

### Part 10: 6 400 Mbit/s Physical Layer (HIPPI-6400-PH)

#### 1 Scope

This part of ISO/IEC 11518 specifies a physical-level, point-to-point, full-duplex, link interface for reliable, flow-controlled transmission of user data at 6 400 Mbit/s per direction, across distances of up to 1 km. A parallel copper cable interface for distances of up to 40 m is specified. Connections to a separate longer-distance optical interface are provided. Small fixed-size micropackets provide an efficient, low-latency structure for small transfers, and a component for large transfers.

Specifications are included for:

- automatic retransmission to correct flawed data;
- the format of a small data transfer unit called a micropacket;
- a message structure that includes routing information for network applications;
- end-to-end, as well as link-to-link, checksums;
- the timing requirements of the parallel signals;
- a parallel interface using copper coaxial cable;
- connections to a separate local optical interface;
- a link-level protocol tuned for a maximum distance of 1 km.

#### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 11518. 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 11518 are encouraged to investigate the possibility of applying the most recent edition 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/IEC TR 8802 (all parts), *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements*

ISO/IEC TR 8802-1:1997, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 1: Overview of Local Area Network Standards*

ISO/IEC 8802-2:1998, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 2: Logical link control*

ISO/IEC 15802-3:1998, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Common specifications – Part 3: Media Access Control (MAC) Bridges*