

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) ¹⁾
- Part 5: Memory Interface (HIPPI-MI) ¹⁾
- 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) ¹⁾
- Part 12: 6 400 Mbit/s Optical Specification (HIPPI-6400-OPT) ¹⁾

Annex A is for information only.

¹⁾ 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*