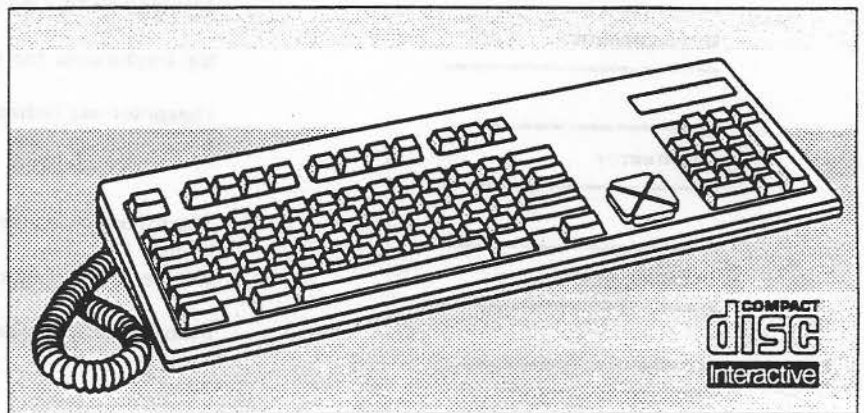# Interactive Media Systems

CD-I

Date:May 1993

Technical Info Keyboards

The purpose for this specification.

Extended CD-I applications will often call for (computer-type) keyboards. Many CD-I users, after all, are already used to them. The CD-I standard (Green Book) is clear about functional requirements, but less definitive regarding compatibility.

Clearly, it is in the interest of all CD-I developers to assure that keyboards from all manufacturers should be both plug compatible and interface compatible with CD-I players in a similar way to pointing devices, except on those special cases where the keyboard is either built in or dedicated to the player system.

This means that there is a need for a de facto standard for keyboards for use with CD-I. Thus, Philips Interactive Media Systems has produced this specification in consultation with other leading player and peripheral manufacturers.

This specification aims at combining the necessary compatibility with flexibility in implementation. It is intended as a guide for all CD-I product manufacturers, who are urged to give it their full support.

The benefits of this specification

For the CD-I player manufacturer, this specification offers the prospect of an installed base of compatible keyboards and simplified sourcing.

The keyboard manufacturer can look forward to an installed base of compatible CD-I players, lower development costs, complete interface specifications and freedom from software interface problems.

For the dealer, there will be fewer stock risks and increased demand.

Consumers can be offered products with good availability, reasonable prices, and a variety of choices.

PHILIPS

Interactive Media Systems

CONTENTS

INTRODUCTION

This specification defines the interface for CD-I keyboards for connection to a general CD-I Pointing Device port. It is intended for keyboards for use in countries for which the CD-I default character set (which conforms to ISO 8859-1) is appropriate.

The interface is specified so that the CD-I player can recognize the device type automatically, thus allowing simple plug-in installation. Device characteristics are dependent on the device type.

NOTE: at least one pionting device should remain connected to the CD-I system.

DEFINITIONS AND GENERIC TERMS

The classification of keyboards used in this specification is that given in Appendix VII.2 of the Green Book, para 2.5.2.

CLASSES OF KEYBOARD

According to Appendix VII.2 of the Green Book, para 2.5.2.2, keyboards may have different formats from small keypads with limited keys to full alphanumeric keyboards. The following table lists the 7 key groups and defines a minimum configuration for a full alphanumeric keyboard needed to meet the CD-IX specification. The key groups used are defined in the DSD (Device Status Descriptor) for each CD-I decoder.

CONNECTOR
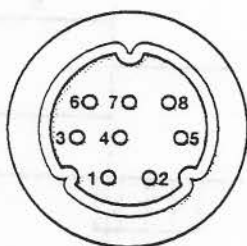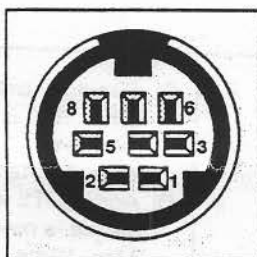
8 pins mini-DIN Hosiden TCP 8500 series 8a type (e.g. TCP 8580-01-010) or compatible plug on the device (male), with mating TCS 7500 series or compatible socket on the CD-I player.

Mini Din 8a pinning

RATINGS

- +5V output from the CD-I player:
  - accuracy +5V±10%
  - supply current: max. 50mA for portable products (stationary players will supply upto 200mA)
- signal levels
  - logical 1(for data) or off (for control):
    $-15V < signal\ level < +0.8V$
  - logical 0 (for data) or on (for control):
    $+2.4V < signal\ level < +15V$
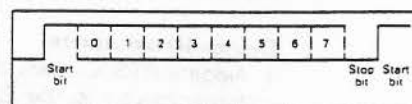(output impedance device max 4.7kΩ)

DATA SIGNALS

Communications should use the RS-232-C interface. For details of this see the EIA RS-232-C standard.
Signalling rate: 1200 baud.
Data format:
- 1 start bit
- 8 data bits (LSB first)
- 1 stop bit
  no parity

Data Format

Signal Name Convention:
For keyboards only two signal lines carry data.
The first is RTS, which is always output from the CD-I player. The second is RXD, which is always input to the CD-I player.
RXD: Carries the data from pointing device to player.
RTS: Used for device identification (see Device Identification).

Signal Flow

Pin	Signal -	Description	In/Out*
1		Reserved	
2	RXD	Received data	Input
3		Reserved for TXD	Output
4		Reserved	
5	GND	Signal ground	
6		Reserved for CTS	Input
7	RTS	Request to send	Output
8	+5V	Power supply for the keyboard	

* Input: an input signal to the CD-I player. Output: an output signal from the CD-I player.

Connector and pinning

Note: Some CD-I players may supply up to 200mA on the +5V power supply line. Input devices requiring over 50mA should have a provision for an external power supply.

Input devices such as keyboards and pointing devices defined use 4 pins out of the possible 8. The remaining pins are reserved for o.a. serial interface port.

CDI PLAYER
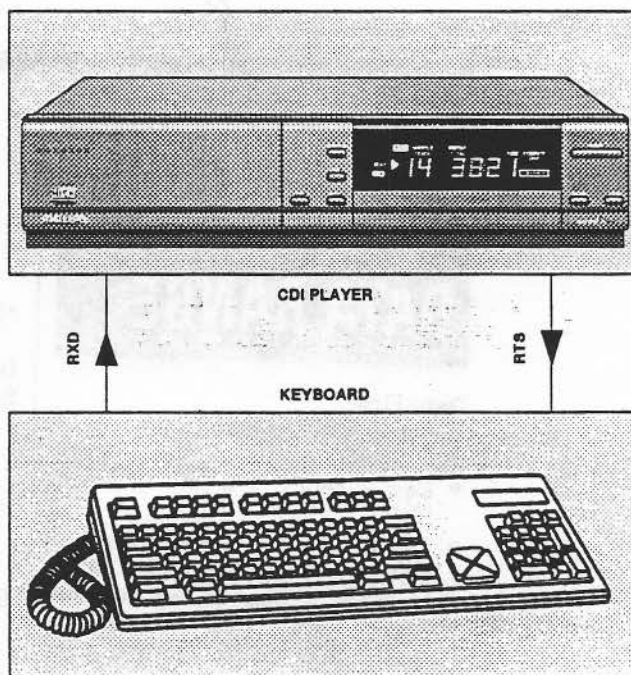
KEYBOARD

DEVICE IDENTIFICATION

Every keyboard should transmit its type identification (ID) byte on request. This allows the CD-I player/system to identify the type or operating mode of the keyboard that is connected to it. This guarantees maximum flexibility and ease of use.

Device ID sequence

1. Negate RTS: Current data transmission to the CD-I player is stopped.
2. Assert RTS.
3. The keyboard sends its 1-byte device ID and clears its buffer.
4. Data transmission to the CD-I player/system can continue. The first byte sent is always the header byte of the device packet. (The Header byte is the first byte of a data packet d7=1)

Keyboard ID sequence:

Keyboard Type/ Mode	d6 - - - d0	ASCII
CD-I:	1001011	'K'
Extended:	1011100	'X'

Timing Chart and Legend
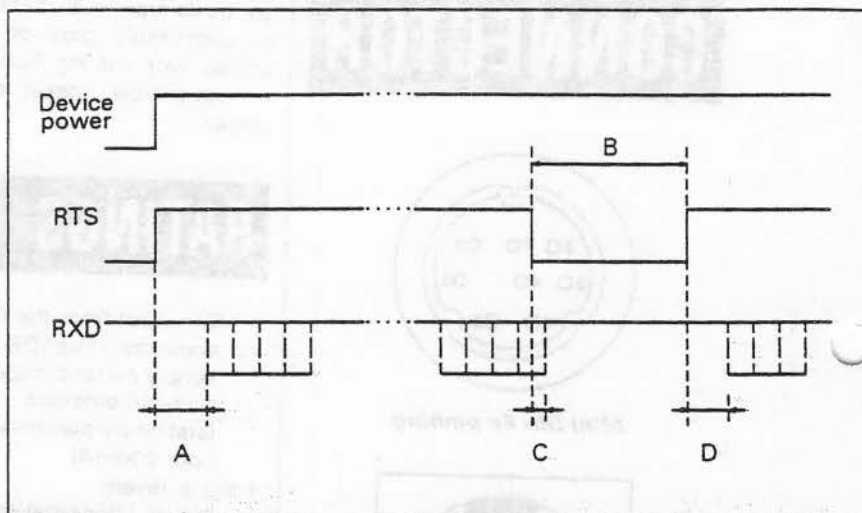
Device ID timing

A: device power-on to ID byte timing
Min. 100ms.
Max. 500ms.

B: negate RTS timing:
Min. 10ms.
Max. irrelevant.

C: Residual data transmission time when RTS is negated:
Min. 0ms.
Max. 1 byte period (8.3ms).

D: Assert RTS to ID byte timing when device is powered:
Max. 10ms.

DATA FLOW DATA FORMAT DATA RANGE

Data Flow

During normal operation (RTS asserted):

- Data is sent to the CD-I player via RXD.
- Every time the keyboard changes state, the new state (last pressed key code or released key code plus special keys status*) is sent in a 2-byte data packet to the CD-I player/system.
- As long as the keyboard status remains unchanged, no data packets are transmitted.
- If one or more of the special keys only are pressed or released, the new special keys status, together with extension bits =01 and key code - $00 is sent in a 2-byte data packet.

- Every time a key is released so that no keys are pressed, special key status = 0000, extension bits = 01 and key code = $00. This data is sent in two bytes with values of $82 and $00 respectively.*

*See Data Format

Data Format

Signaling rate: 1200 baud.

	d7	d6	d5	d4	d3	d2	d1	d0
Byte 0	1	S3	S2	S1	S0	M1	M0	K7
Byte 1	0	K6	K5	K4	K3	K2	K1	K0

S0-S3 Special keys status
S0: Shift key(s) pressed when set
S1: CapsLock pressed when set
S2: Supershift key(s) pressed when set
S3: Control key(s) pressed when set

M0-M1 Extension bits
M1 M0
0 0: Standard Character set (Green Book)
0 1: Character set 1 (if the keycode = $00 then only special keys are pressed
1 0: Character set 2 (Future use)
1 1: Character set 3 (Future use)

K0-K7 Keycode
According to the standard CD-I character set (ISO 8859-1) or an extended character set depending on the value of the extension bits.

Data Range (M&K bits)

$000-$0FF: Standard character set (Green Book)
$100: Keycode if all keys released Keycode for special key(s) status
$101-$1FF: Character set 1
$200-$2FF: Character set 2 (Future use)
$300-$3FF: Character set 3 (Future use)

OPERATIONAL MODE

In "K" mode, the DSD AN and KG fields are filled in so as to inform the application that an alphanumeric keyboard according to Latin alphabet No.1 with all key groups is connected. (AN = LA1; KG = ALL). The keyboard should not transmit data in the range $101-$3FF.

In "X" mode, the DSD AN and KG fields are not filled in. The application is simply informed that a keyboard is connected. The implementation of X-type keyboards is, of course, application-dependent, and may include other functions.
Under this implementation, keyboards may contain other keys that are allowed only in X-mode.

All X-mode keyboards should have a manual swith for the K-mode.
Areset is required to let the system react properly on this mode change.

COUNTRY VERSIONS

The clear advantage of this implementation. is that simple ASCII codes are transmitted via K0 - K7 independant from the keyboard layout for any of the Latin alphabets. Directly compatible keyboards can be produced that take care of the languages for Latin alphabets themselves - and thus only need plugging in.
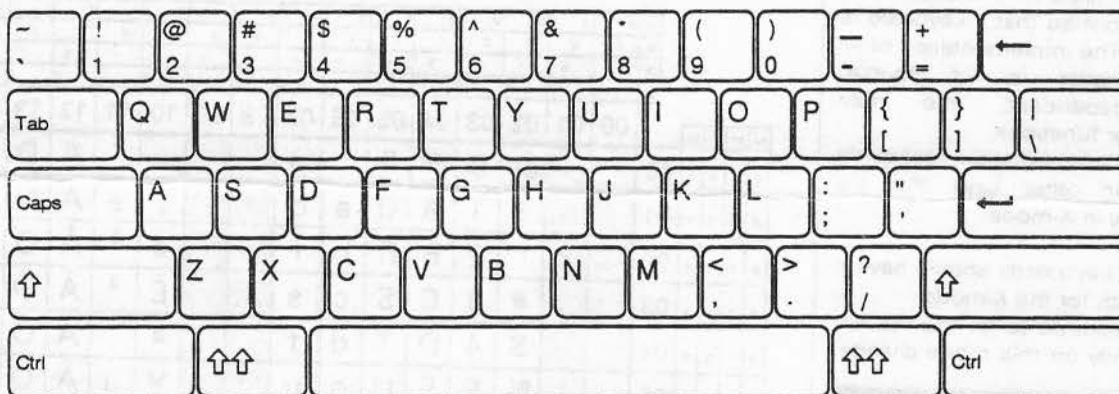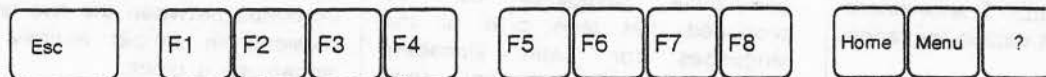
The suggested CD-I keyboards defined in this document are International (US), UK English, French, German and Spanish.

The differences in key layout and keycodes between the five language versions lie almost entirely in the alphanumeric block.
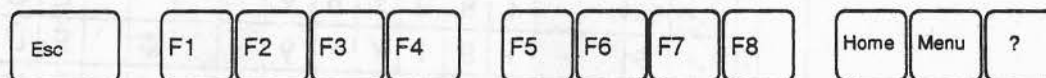
b7		b6		b5		b4		b3	b2	b1	b0	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0	0	0	0	00			SP	0	@	P	`	p			NBSP	°	À	Ð	à	
0	0	0	1	01			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
0	0	1	0	02			"	2	B	R	b	r			¢	²	Â	Ò	â	ò
0	0	1	1	03			#	3	C	S	c	s			£	³	Ã	Ó	ã	ó
0	1	0	0	04			$	4	D	T	d	t			¤	´	Ä	Ô	ä	ô
0	1	0	1	05			%	5	E	U	e	u			¥	µ	Å	Õ	å	õ
0	1	1	0	06			&	6	F	V	f	v			¦	¶	Æ	Ö	æ	ö
0	1	1	1	07			'	7	G	W	g	w			§	·	Ç	×	ç	÷
1	0	0	0	08			(	8	H	X	h	x			¨	¸	È	Ø	è	ø
1	0	0	1	09			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
1	0	1	0	10			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
1	0	1	1	11			+	;	K	[	k	{			«	»	Ë	Û	ë	û
1	1	0	0	12			,	<	L	\	l					¬	¼	Ì	Ü	ì	ü
1	1	0	1	13			-	=	M	]	m	}			SHY	½	Í	Ý	í	ý
1	1	1	0	14			.	>	N	^	n	~			®	¾	Î	Þ	î	þ
1	1	1	1	15			/	?	O	_	o				¯	¿	Ï	ß	ï	Ÿ

CD-I default character set (ISO 8859-1)

BASIC KEYBOARD LAY-OUT

Esc F1 F2 F3 F4   F5 F6 F7 F8   Home Menu ?

~ ` ! 1 @ 2 # 3 $ 4 % 5 ^ 6 & 7 * 8 (9) 0 — - + = ←
Tab Q W E R T Y U I O P { [}] | \
Caps A S D F G H J K L : ; " ' ←
⇧ Z X C V B N M < , > . ? / ⇧
Ctrl ⇧⇧ ⇧⇧ Ctrl

Basic keyboard lay-out
International

Esc F1 F2 F3 F4   F5 F6 F7 F8   Home Menu ?

¬ ` ! 1 " 2 £ 3 $ 4 % 5 ^ 6 & 7 * 8 (9) 0 — - + = ←
Tab Q W E R T Y U I O P { [}] | \
Caps A S D F G H J K L : ; @ ' ←
⇧ Z X C V B N M < , > . ? / ⇧
Ctrl ⇧⇧ ⇧⇧ Ctrl

Basic keyboard lay-out
UK English

KEYBOARD CODING

The code generated by a key can be modified by pressing one of the special keys at the same time. In this way, six code modes can be defined for each key: Normal (Unshift), Shift, Supershift, Shift plus Supershift, Control and Supershift plus Control.

In the **International** keycode diagrams, the six codes allocated to each key appear in the following positions:

| S	S+SS	SS+C
N	SS	C

Where:

N	= normal
S	= shift mode (o)
SS	= supershift mode (oo)
S+SS	= shift plus supershift mode (o+oo)
C	= control mode (Ctrl)
SS+C	= supershift plus control mode (oo+Ctrl)

In addition, the Caps Lock function alters codes in the alphanumeric block, to the shift mode.

1B	1B	1B
1B	1B	1B

88|90|90	89|91|91	8A|92|92	8B|93|93
80|90|98	81|91|99	82|92|9A	83|93|9B

8C|94|94	8D|95|95	8E|96|96	8F|97|97
84|94|9C	85|95|9D	86|96|9E	87|97|9F

1E	1D	1C

7E|FE|80	21|A1|91	40|C0|80	23|A3|93	24|A4|94	25|A5|95	5E|DE|9E	26|A6|97	2A|AA|98	28|A8|99	29|A9|90	5F|DF|9F	2B|AB|9D	0F|0F|FF
60|E0|00	31|B1|11	32|B2|00	33|B3|13	34|B4|14	35|B5|15	36|B6|1E	37|B7|17	38|B8|18	39|B9|19	30|B0|10	2D|AD|1F	3D|BD|1D	7F|0F|7F

19|19|19	51|D1|91	57|D7|97	45|C5|85	52|D2|92	54|D4|94	59|D9|99	55|D5|95	49|C9|89	4F|CF|8F	50|D0|90	7B|FB|8B	7D|FD|8D	7C|FC|8C
09|19|19	71|F1|11	77|F7|17	65|E5|05	72|F2|12	74|F4|14	79|F9|19	75|F5|15	69|E9|09	6F|EF|0F	70|F0|10	5B|DB|1B	5D|DD|1D	5C|DC|1C

00|00|00	41|C1|81	53|D3|93	44|C4|84	46|C6|86	47|C7|87	48|C8|88	4A|CA|8A	4B|CB|8B	4C|CC|8C	3A|BA|9B	22|A2|87	0D|0D|0D
00|00|00	61|E1|01	73|F3|13	64|E4|04	66|E6|06	67|E7|07	68|E8|08	6A|EA|0A	6B|EB|0B	6C|EC|0C	3B|BB|1B	27|A7|07	0D|0D|0D

00|00|00	5A|DA|9A	58|D8|98	43|C3|83	56|D6|96	42|C2|82	4E|CE|8E	4D|CD|8D	3C|BC|8C	3E|BE|8E	3F|BF|AF	00|00|00
00|00|00	7A|FA|1A	78|F8|18	63|E3|03	76|F6|16	62|E2|02	6E|EE|0E	6D|ED|0D	2C|AC|0C	2E|AE|0E	2F|AF|2F	00|00|00

00|00|00	00|00|00	20|A0|A0	00|00|00	00|00|00
00|00|00	00|00|00	20|A0|20	00|00|00	00|00|00

Key code assignment
International
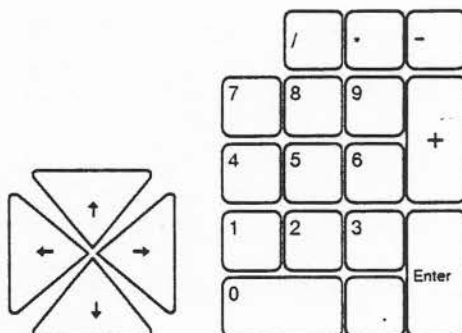
Basic keyboard lay-out
Cursor keys and numerical key pad

S	S+SS	SS+C
N	SS	C

Key code assignment
Cursor keys and numerical key pad

Note 1: For German keyboard the full stop (.) is replaced by a comma (,). The corresponding code is 2C.

Note 2 : The Shaded area where the caps-lock function alters the codes when not used in combination with CRTL or Supershift.

RECOGNITION PROTOCOL

The method of recognition is the same as is specified for pointing devices. The following keyboard and pointing device codes are specified.

Device Type	d7*	d6	d5	d4	d3	d2	d1	d0	ASCII
Relative	1	1	0	0	1	0	1	1	"M"
Maneuvring	1	1	0	1	1	0	0	0	"J"
Absolute	1	1	0	1	0	1	0	0	"T"
Abs. Screen	1	1	0	1	0	0	1	1	"S"
Keyboard	1	1	0	0	1	0	1	1	"K"
Extended keybd	1	1	0	1	1	0	0	0	"X"

4 codes are reserved for implementation in the service and debugging areas at the manufacturer's discretion.

	d7*	d6	d5	d4	d3	d2	d1	d0	ASCII
	0	0	1	0	0	0	0	0	"Space"
	0	0	0	0	0	1	1	0	"ACK"
	0	1	0	0	0	0	1	0	"B"
	0	0	0	0	0	0	0	1	"SOH"

* d7 can be considered as the stop bit depending on the read out mode (7 or 8 bits).

It would be beneficial to arrive at other codes for future use by agreement between the interested parties.

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