

# The PS/2 Keyboard and Mouse Interface

## CSEE W4840

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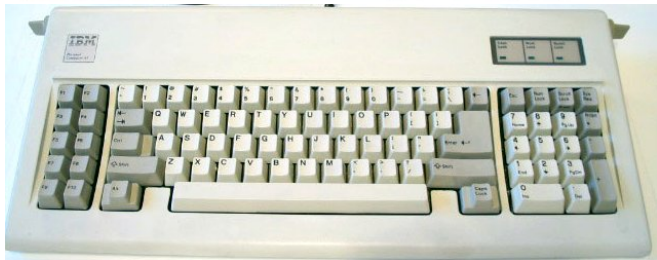
Columbia University

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# The IBM PC/XT and PC/AT Keyboards



c. 1983

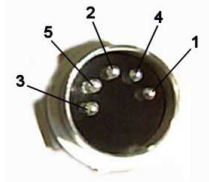


c. 1984

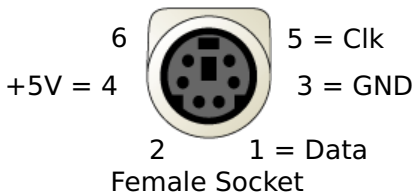
# IBM PC Enhanced (101-key) Keyboard



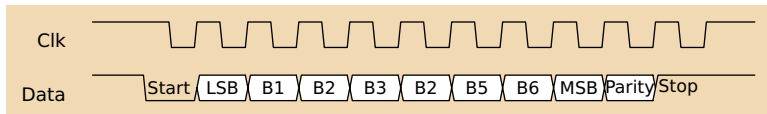
Original keyboard connector: DIN-5



# The PS/2 Mini-DIN 6 Connector



# Synchronous Serial Interface



Like RS-232, but with a clock.

Odd parity, one start, one stop.

Keyboard-to-host shown: keyboard initiates everything.

# Codes (Keyboard to Host)

76	05	06	04	0C	03	0B	83	0A	01	09	78	07	E07C 84	7E	77 E07E								
0E	16	1E	26	25	2E	36	3D	3E	46	45	4E	55	6A	66	E070	E06C	E07D	77	E04A	7C	7B		
0D	15	1D	24	2D	2C	35	3C	43	44	4D	54	5B	5D		E071	E069	E07A	6C	75	7D	79		
58	1C	1B	23	2B	34	33	3B	42	4B	4C	52	5D	5A					6B	73	74	6D		
12	61	1A	22	21	2A	32	31	3A	41	49	4A	51	59			E075		69	72	7A	E05A		
14	11				29									E011		E014	E06B	E072	E074	68	70	71	63

**00/FF** Error or buffer overflow

**F0** Key-up

**FA** Acknowledge

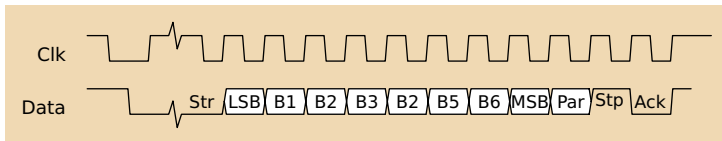
**EE** Echo response

**FE** Resend

**E0** Extended code coming

[http://www.seasip.info/VintagePC/ibm\\_1391406.html](http://www.seasip.info/VintagePC/ibm_1391406.html)

# Communicating to the Keyboard



Host brings Clock low, then Data low to indicate transfer to keyboard, then releases Clock (rises).

Keyboard starts generating clock signals. Host supplies serial data, changing after each falling edge. After stop bit, host releases Data. Keyboard pulls Data low for one more clock signal to indicate it received the byte.

## Commands (Host to Keyboard)

ED LED control

						Caps lock	Num lock	Scroll lock
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EE Echo

Keyboard will respond with EE

F0 Set scan code set

Keyboard will respond with FA and wait for another byte 01–03. 00 leaves scan code unchanged.

F3 Set key repeat rate

Keyboard responds with FA and waits for second byte, indicating repeat rate.

F4 Enable keyboard

Responds with FA, clears buffer, enables scanning.

F5 Disable keyboard

Responds with FA, disables keyboard.

FE Resend

Retransmit the last byte.

FF Reset Keyboard



## PS/2 Mouse Protocol

Host must send 0xF4 (enable data reporting) to make sure three bytes sent every time mouse moves or button clicked:

MSB				LSB			
Y	X	Y	X	1	Middle	Right	Left
Overflow		Sign			Buttons		
X movement							
Y movement							

Movement values are since last transmission: 9-bit two's-complement (signed) numbers.

Many more variants, modes, and other junk.