The PS/2 Keyboard and Mouse Interface
CSEE W4840

Prof. Stephen A. Edwards

Columbia University

Spring 2013
The IBM PC/XT and PC/AT Keyboards

http://www.clickykeyboards.com
IBM PC Enhanced (101-key) Keyboard

Original keyboard connector: DIN-5
The PS/2 Mini-DIN 6 Connector

1 = Data
2 = 
3 = GND
4 = +5V
5 = Clk
6 = 

Female Socket
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)

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.htm
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

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

<table>
<thead>
<tr>
<th>MSB</th>
<th>LSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y Overflow</td>
<td>Y Sign</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>1</td>
<td>Middle Buttons</td>
</tr>
<tr>
<td></td>
<td>Right Buttons</td>
</tr>
<tr>
<td></td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td>X movement</td>
</tr>
<tr>
<td></td>
<td>Y movement</td>
</tr>
</tbody>
</table>

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

Many more variants, modes, and other junk.