The PS/2 Keyboard and Mouse Interface

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Spring 2006

The IBM PC Keyboard

Original keyboard connector: DIN-5

The PS/2 Mini-DIN 6 Connector

Female Socket

VCC = 4

3 = GND

2 = Data

1 = Data

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

Communicating to the Keyboard

Host-generated data

Keyboard-generated clock

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

The IBM PC Keyboard

The PS/2 Keyboard and Mouse Interface
**PS/2 Mouse Protocol**

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</td>
<td>X</td>
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<tr>
<td>Y</td>
<td>X</td>
</tr>
<tr>
<td>1</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Middle</th>
<th>Right</th>
<th>Left</th>
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</thead>
<tbody>
<tr>
<td>Overflow</td>
<td>Sign</td>
<td>Buttons</td>
</tr>
</tbody>
</table>

X movement

Y movement

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

Many more variants, modes, and other junk.

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**Using a PS/2 Port**

Add lines in the `.UCF` file about PS2C and PS2D:

```plaintext```
NET "PS2D" LOC=m15; # Data
NET "PS2C" LOC=m16; # Clock
```

Add these ports in the “add cores” dialog. Make the clock pin a falling-edge-sensitive interrupt.

In the `.MHS` file, this appears as:

```
PORT PS2D = ps2io_GPIO_in, DIR = IN
PORT PS2C = PS2C, DIR = IN,
SIGIN = INTERRUPT,
SENSITIVITY = EDGE_FALLING
```

---

**Using a PS/2 Port**

Using a PS/2 Port

Add lines in the `.UCF` file about PS2C and PS2D:

```plaintext```
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