

# Synchronous Serial

BY DANIEL KOHN  
TECH 4243 – LECTURE 1

1

---

---

---

---

---

---

---

---

## Synchronous Serial

Sends data as a series of pulses to the receiver.

To keep the Sender and Receiver in synch, a 2<sup>nd</sup> signal is sent that is the CLOCK, that says when each bit is ready to be read.

Notes:

- Examples to the side do NOT send the same data ).
- The data is read from the data line when the clock goes high.

Serial Communication

CLOCK DATA

CLOCK DATA

Info Info or next byte

CLOCK DATA

1 1 0 0 1 0 1 0  
0x53 = ASCII 'w'

2

---

---

---

---

---

---

---

---

## Examples where synchronous serial is used

Pin Number	Function
1	Data
2	Reserved
3	Reserved
4	Ground
5	5 volt
6	Clock
7	Reserved

Note: Keyboard data is NOT sent via ASCII code, but has it's own encoding scheme.  
See <http://www.philipstorr.id.au/pcbook/book3/keyboard.htm>

3

---

---

---

---

---

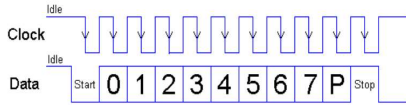
---

---

---

## PS2 Keyboard

The PC/AT keyboard transmits data in a clocked serial format consisting of a start bit, 8 data bits (LSB first), an odd parity bit and a stop bit. The clock signal is only active during data transmit. The generated clock frequency is usually in the range 10 - 30 kHz. Each bit should be read on the falling edge of the clock.



4

---

---

---

---

---

---

---

---

## Encoding

Note: Keyboard data is NOT sent via ASCII code, but has its own encoding scheme.  
<http://www.philipstorr.id.au/pcbook/book3/keyboard.htm>

- It sends multiple values
- Make code (scan code)
  - Break code (0xF0 followed by scan code)

The keyboard handles combinations with control keys as SHIFT, CTRL, ALT, etc. as two separate key presses, i.e., SHIFT-MAKE, 'A'-MAKE, SHIFT-BREAK, 'A'-BREAK. The 'A' scan code ('1CH') is the same for both the shifted and unshifted state. To determine whether the 'A' scan code is interpreted as 'A' or 'a', the PC must keep track of the presence or absence of a prior SHIFT-MAKE.

5

---

---

---

---

---

---

---

---

## Standard Scan Code



6

---

---

---

---

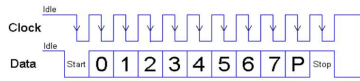
---

---

---

---

## Programming Considerations



Looking at the above...how can we use the clock's falling edge to trigger the capture of the bits of data being sent?

How can we grab ONE BIT and put it in the right order to create an 8-bit integer in the correct order of MSB to LSB (especially when the LSB comes in as the first bit)?

How to we drop start, stop and parity bits (we could also verify the code was received correctly by checking parity, but we will ignore it for the lab)?

How can we easily convert the Scan code to the ascii character?

---

---

---

---

---

---

---

---

---

---

7

## Sources

PS2 Keyboard Interface  
<http://www.philipstorr.id.au/pcbook/book3/keyboard.htm>

---

---

---

---

---

---

---

---

---

---

8