

# I/O - input/output

Certain addresses don't correspond to memory cells

12-bit = 0 → 4095

addr 0 is the current time

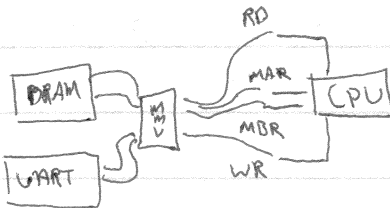
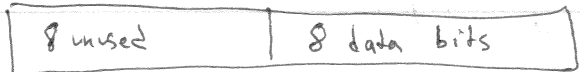
## Actual simulator - UART

universal asynchronous receiver/transmitter

← sends bytes      → sends bytes

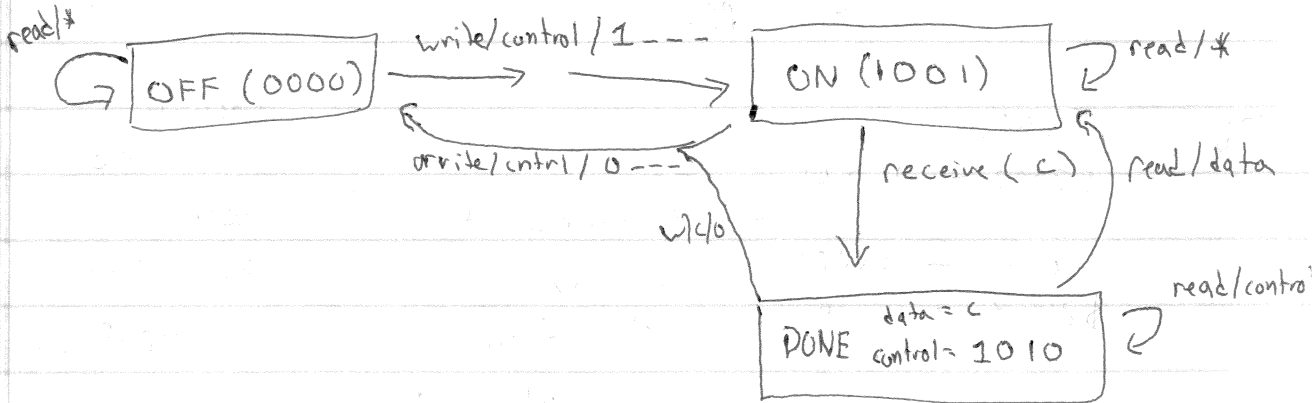
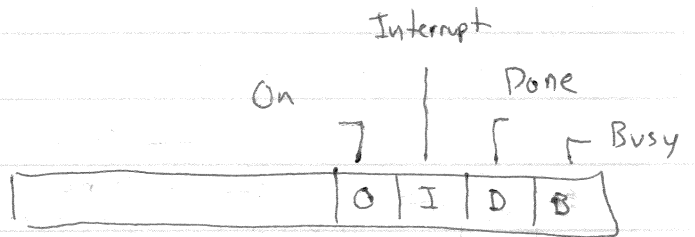
4092

recvr data - 16-bit value -



4093

recvr control



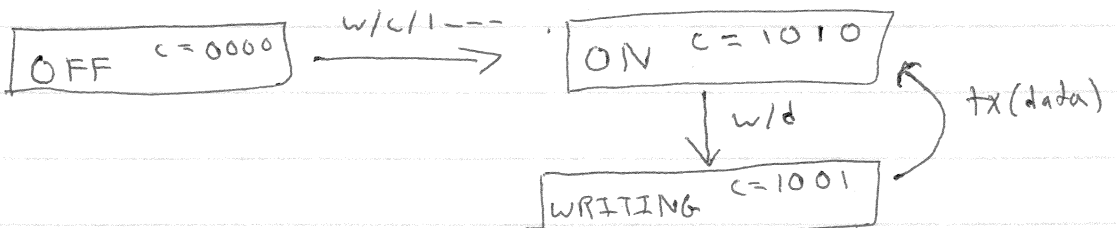
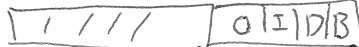
4094

transmit data



4095

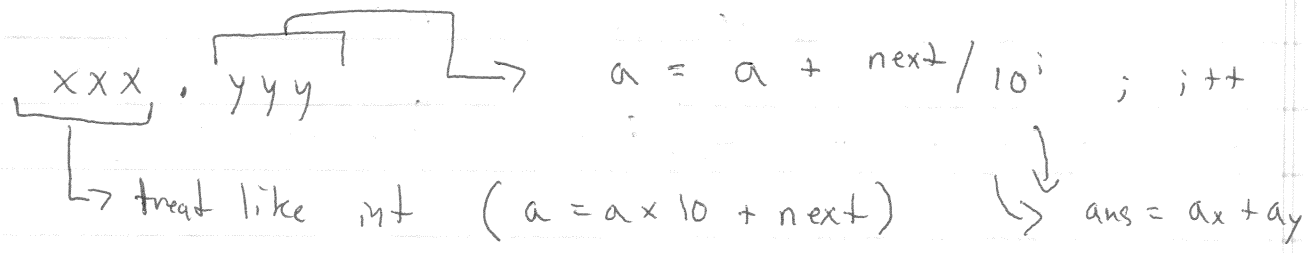
transmit control



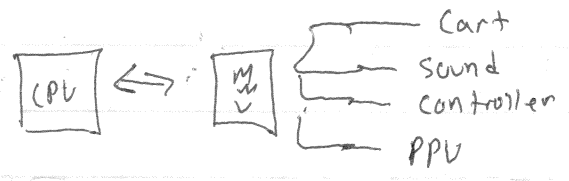
'0' => 48  
'9' => 57

```
int a = 0;
while(
  char n = getch(); {
  a = a * 10 + (n - '0');
}
```

'90' => 57, 48  
- 48 - 48  
-----  
9 0



### NES PPU - Picture Processing Unit



PPU - \$2000  
\$2002 - VSO  
2006 - address  
\$2007 - data



- 1 if sprite 0 overlaps with any other sprite
- 0 o.w.

LOCO 12  
STUD \$2007  
LOCO 8  
STUD \$2007  
PPU[12] = 8