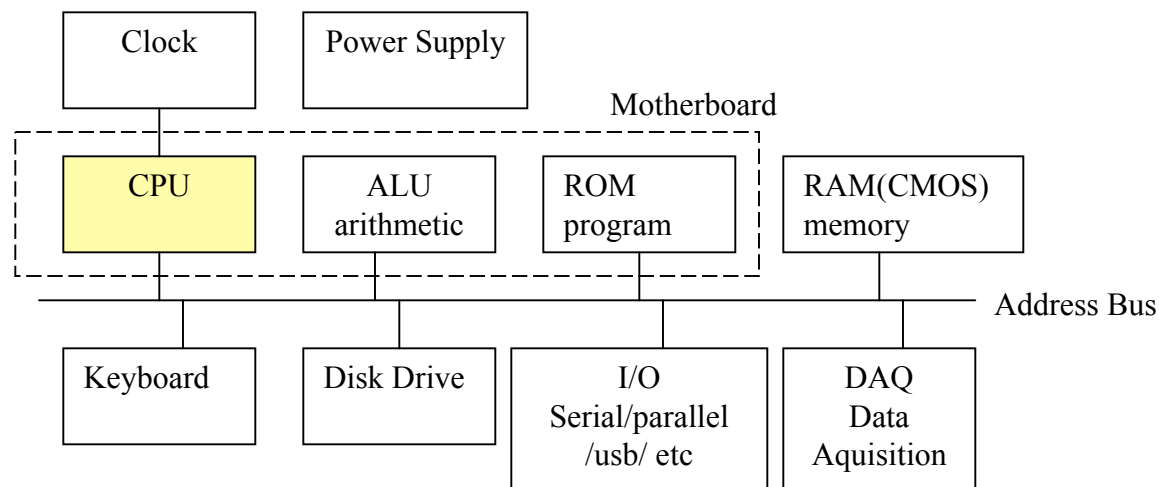


Digital I/O

- The microprocessor performs arithmetic operations, store data, communicates with the outside world, etc.



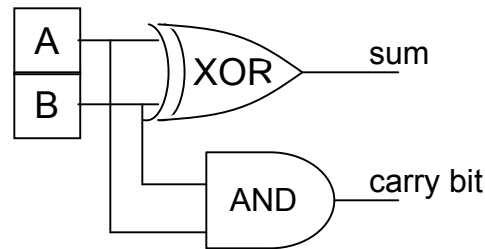
- Three state logic is important in microprocessor design so the many parts can be selectively addressed without affecting the other parts.
- The unused devices on the address bus are placed in disable states and do not respond to address bus signals.

Binary Addition

- Binary addition closely follows the XOR function.

Chapter 13 pg 301

A	B	Carry	Sum
0	0	= 0	0
1	0	= 0	0
0	1	= 0	0
1	1	= 1	0



$$\begin{array}{r}
 63 = \begin{array}{c} 111 \quad 111 \\ 0011 \quad 1111 \end{array} \\
 +5 = + \underline{0000 \quad 0101} \\
 68 \quad \underbrace{0100 \quad 0100}_{68}
 \end{array}$$

Binary Subtraction by Two's Complement

- Binary subtraction is most efficiently accomplished by *Two's Complement Addition*. Chapter 13 pg 304

$$A - B = A \oplus \underbrace{\overline{B} + 1}_{\text{Two's Complement}}$$

$$\begin{array}{r}
 63 = 0011 \quad 1111 \\
 -5 = + \underline{1111 \quad 1011} \leftarrow \overline{0000 \quad 0101} + 1 \\
 58 \quad \underbrace{1 \quad 0011 \quad 1010}_{\substack{\downarrow \\ \text{drop} \quad 58}}
 \end{array}$$