

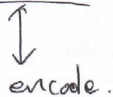
12/4.

ip structure.

CPU: Central processing Unit.

Packed gates.

To decode instructions.



To execute instructions.

Arithmetic, logic calculations.

GND, Vcc Power signal.

CLK Clock signal.

to generate time pulse train



to synchronize the activity within CPU

* High performance of CLK required

A0 ~ A19: 20 lines address bus.

2^{20} addresses can be mapped
(~ 1MB locations).

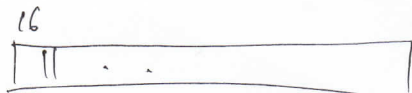
D0 ~ D15: 16 lines of Data Bus

Width of Data Handling = 16 bit.

Control Bus: To issue control command
read, write, Interrupt. ...

ALU = Arithmetic / Logic Unit

PSW: Processed status word. (16 bit width)



CF: Carry Flag

1: if carry happens

$\Rightarrow 2121020 (1 \rightarrow 10 \rightarrow 100 \dots)$

0 if not

ZF: Zero Flag.

1 if previous 'zero' result.

0 if Non zero.

PF: Parity Flag.

1 if result contains even '1'

0 if " odd '1'

IR: Instruction Register.

to hold the current instruction

IR = 03C3 = 'C'

IP: Instruction Pointer

to hold the address of next instruction.

General registers.

to hold address or Results.

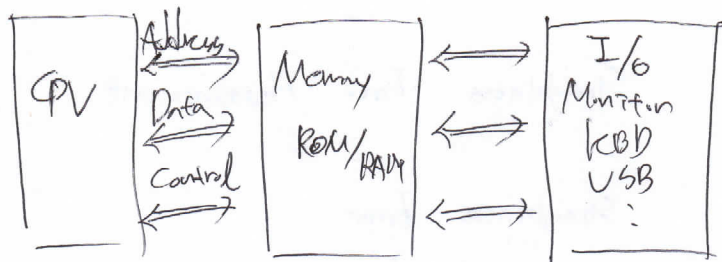
AX = $\begin{array}{|c|c|} \hline AH & AL \\ \hline \end{array}$

BX = $\begin{array}{|c|c|} \hline BH & BL \\ \hline \end{array}$

CX = $\begin{array}{|c|c|} \hline CH & CL \\ \hline \end{array}$

DX = $\begin{array}{|c|c|} \hline DH & DL \\ \hline \end{array}$

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* Memory

to store instructions and data
RAM, ROM.

* I/O. (input/output)

to communicate external world.

Data Formats in μP .

1. Numerical Data.

Unsigned Binary.

$$\begin{aligned} \text{ex) } 45(10) &= 32 + 8 + 4 + 1 \\ &= 00101101(10) \\ &= 2D(H) \end{aligned}$$

signed binary.

$$-N = 2^m - N = \overline{N} + 1$$

$$-45 = \overline{45} + 1$$

$$\overline{45} = 11010010$$

$$\begin{aligned} -45 &= 11010011 \\ &= D3(H) \end{aligned}$$

Fixed Point.

$$.F = .b_1 b_2 b_3 \dots b_n$$

$$= b_1 2^{-1} + b_2 2^{-2} + \dots + b_n 2^{-n}$$

$$\times 2 \quad 0.51375 D = 0.10011 B$$

$$\times 2 \quad 1.0275 \quad 1 MSB$$

$$0.3750 \quad 0$$

LSB.

Floating Point.

$$\text{Number} = (-1)^S \times 2^{E-127} \times 1.F$$

= 32 bit expression of number.

$$313.125 \Rightarrow ?$$

$$313 = 256 + 32 + 16 + 8 + 1$$

$$.125 = \frac{1}{8}$$

$$313.1250 = 100111001.001 B$$

$$= 1.00111001001 \times 2^8$$

$$S = 0$$

$$E - 127 = 8 \therefore E = 135 = 128 + 4 + 2 + 1 = 10000111 B$$

$$\begin{aligned} & \begin{array}{c} 32 \quad 8 \quad 23 \quad 1 \\ \hline 1 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 1 \\ \hline 5 \quad 1 \quad E \quad 1 \end{array} \\ & 41319C9F.000H \\ & = 439C9000H \end{aligned}$$

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2. Non ~~Al~~ Numerical

Ex) 'A' character $\Rightarrow$ ASCII code.
Print thru $\#3BDH$

'A' = $41H = 0100\ 0001\ B$

'b' = $62H = 0100\ 0010\ B$

$00 \sim 1F$: Non printable char.
Control character.

$20 \sim 7F$: printable character

$80 \sim FF$: Extended ASCII code.