1-c

Peripherals and Interfacings:

, Hall এর বই , Tocci এর digital Technique

↳ RAM

addressing mode :

Peripheral : real world এর সাথে connection , input

modem

Interfacing: real world এর সাথে peripheral এর connection

Interrupt

- hardware 8059 → PPI , PIC
- software
- exception handling (1/0 , compile করার সময়ে problem না হলেও runtime error)

ROM → normally write করা যায় না।

তবে → EPROM

↳ Erasable Programable

PROM → Programable

more than one edit possible না।

Flash memory

8284A → timer

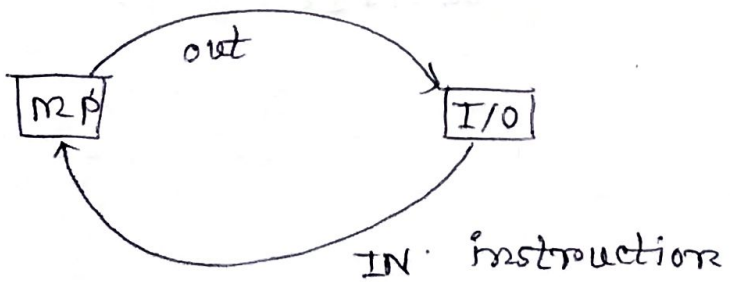
1D

Boey → chapter 11 (input/output)

Basic I/O infacing (data transfer technique)

Accumulator register — AL, AX, EAX (32)

IN, OUT instruction.



variable port address

port address → (DX) / P8

↳ byte form (Fixed port Address)

ROM এ store করে

IN →

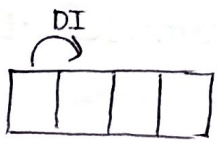
data move

- IN AL, P8
- IN AX, P8 (২টা port থেকে
  - IN AL, DX
  - IN AX, DX
- IN EAX, P8 (4টা consecutive port)
  - IN EAX, DX

address এর

string এর ক্ষেত্রে

INS	INSB
OUTS	OUTSB



DI থাকে

input হবে DI : ES address এ

DI ± 1

INSD (Double word)

DI = DI ± 4

INSW

DI = DI ± 2

OUT P8, AL

OUT P8, AX

OUT P8, EAX

OUT DX, AL

OUT DX, AX

OUT DX, EAX

OUTSB

DS থেকে একটা output হবে।

DS:SI

এক্ষেত্রে SI = SI ± 1

OUTSW

SI = SI ± 2

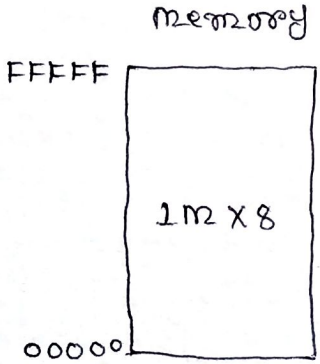
Interfacing Technique: micro p এর সাথে I/O এর interfacing

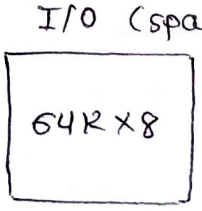
(8086) Isolated I/O interfacing : IN, INS, OUT, OUTS

memory maped » : যেকোনো instruction ব্যবহার করে memory access

8086 support করে না।

Isolated :





M/$\overline{IO}$

$\overline{RD}$

$\overline{WR}$

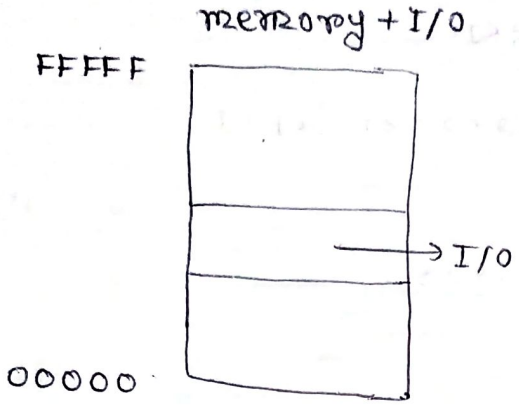
memory, I/O connection

$1M = 2^{20}$ address bus

8 data bit

disadv : extra port use করে।
memory waste হয় না
disadv : যেকোনো instructn use করা যায় না

2) Memory Mapped :



advantage : extra circuit आवश्यक नहीं

disadv : only 4 ही in

Advantage : (isolated से अच्छा)

i) any memory transfer instruction can be used to I/O device.

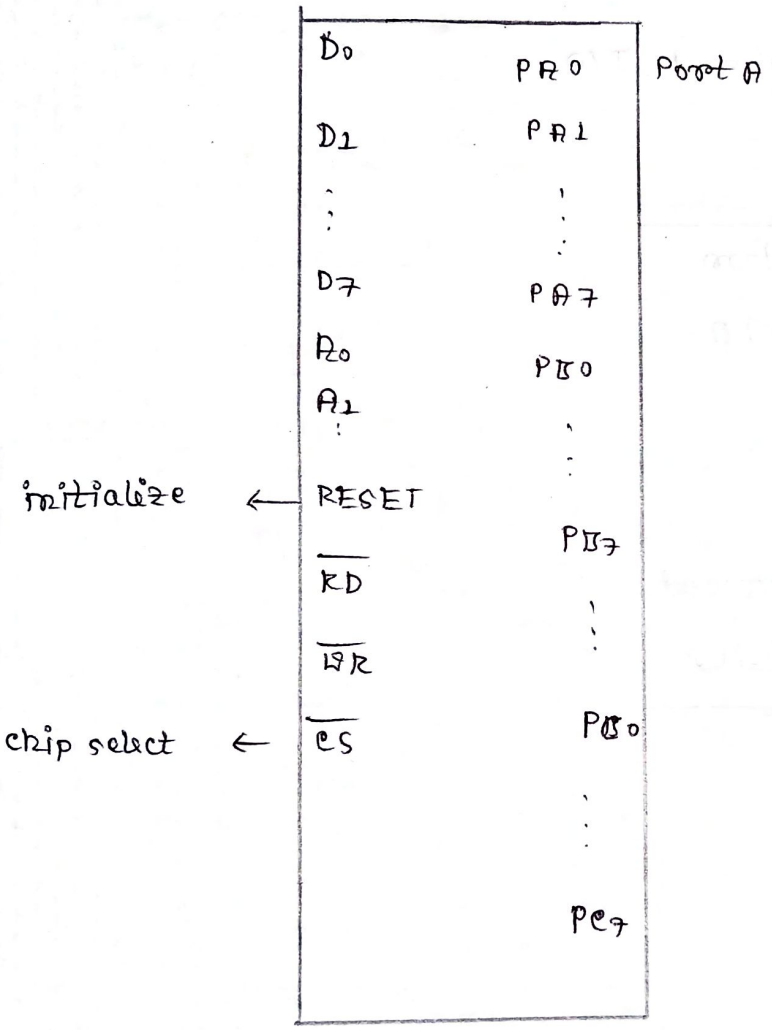
ii) $\overline{IORC}$ and $\overline{IOWC}$ signals have no function in a memory mapped I/O system and may reduce the amount of circuitry required for decoding

Disadvantage :

i) A portion of the memory system is used as the I/O map. This reduces the amount of memory available to applications.

Interfacing device → PPI (Programmable peripheral interface)

82C55 → PA, PB, PC — 8 bit



port → A, B, C

group : A , B

port A
(PA 7 - PA0)
+ port C (PC7 - PC4)
upper half

port B
(PB7 - PB0)
+ port C
(PC3 - PC0)

Mode of operation:

Mode 0 : PPI 0 তে থাকে basic I/O operation

mode 1 : strobed I/O → strobed signal

mode 2 : bidirectional I/O

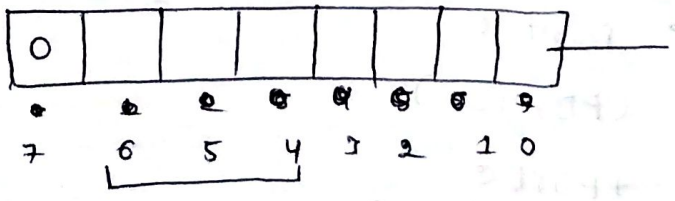
A_1	A_0	Function
0	0	Port A
0	1	B
1	0	C
1	1	command register

command byte A

" B

Programming the 82C55:

command register/byte D



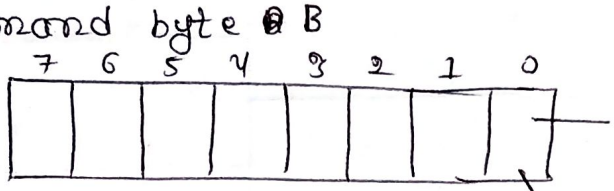
0 হলে byteB

1 হলে byte A

4, 5, 6 → Don't care

3, 2, 1 → command byte কত বোলন bit টা use হবে।

command byte এ B



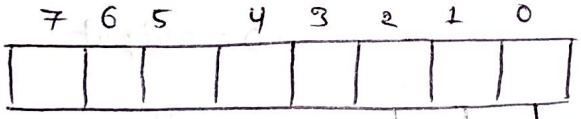
Bit set/reset

1 = set

0 = reset

000 হলে 0 position দিয়ে কাজ করবে।

command byte A



Group B

Port C (PC3 - PC0)

1 → input

0 → output

Port B (PB7 - PB0

1 → input

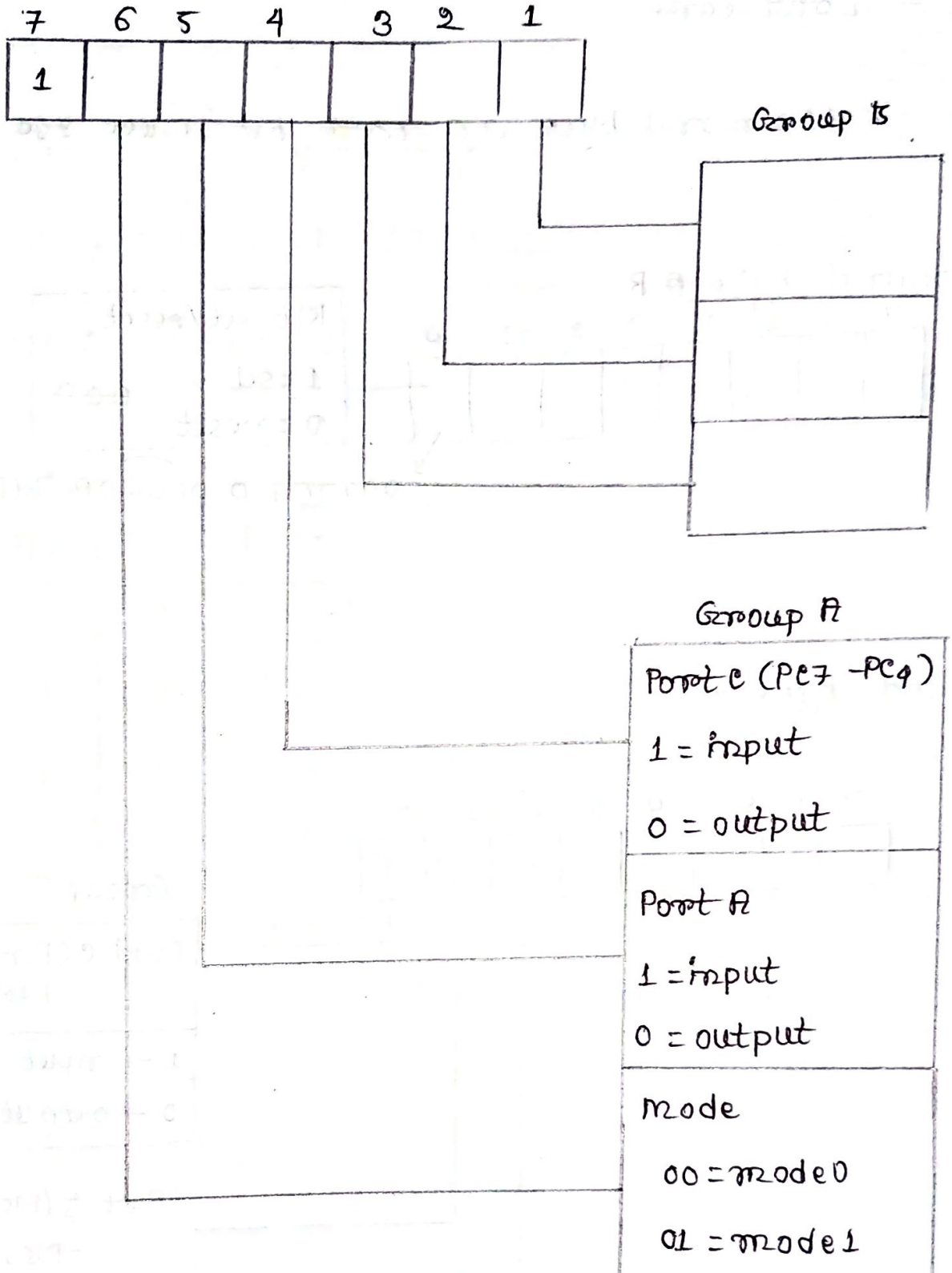
0 → 0

Mode

00 = mode 0

01 = mode 1

command byte A



Mode of operation:

Mode 0:

Mode 1: strobed input / strobed output.

store
Mode 2 %

Strobed Input:

port A } : latching
port B } input device

into microp. যতক্ষণ read করবে না ততক্ষণ store করবে।

port C : control / handshaking

ready কিনা acknowledgement এর মাধ্যমে জানিয়ে দিবে।

. . . . .

used signal :

1. $\overline{STB} \leftarrow 0$ (strobe)

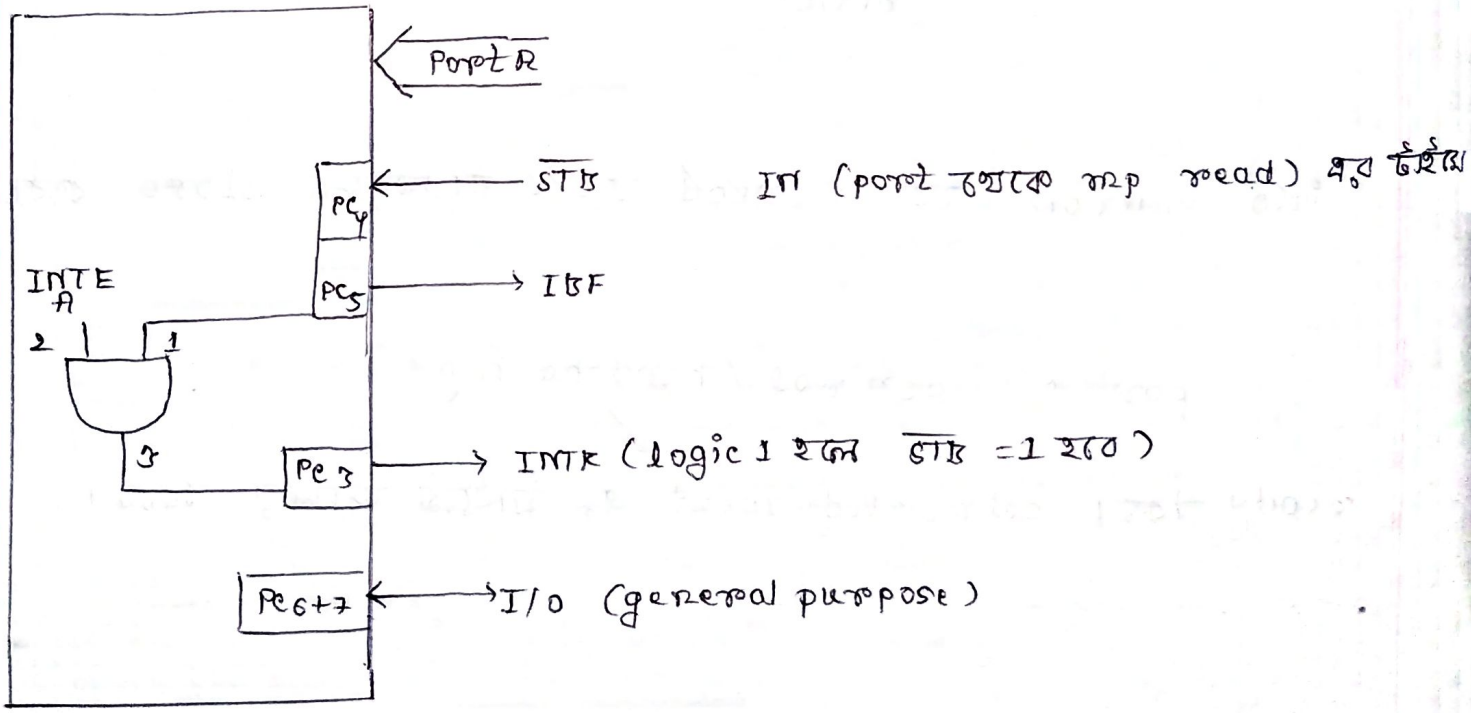
2. IBF (Input buffer full) : full থাকলে read করা possible

3. INTR (Interrupt request) (Int pin এর সাথে)

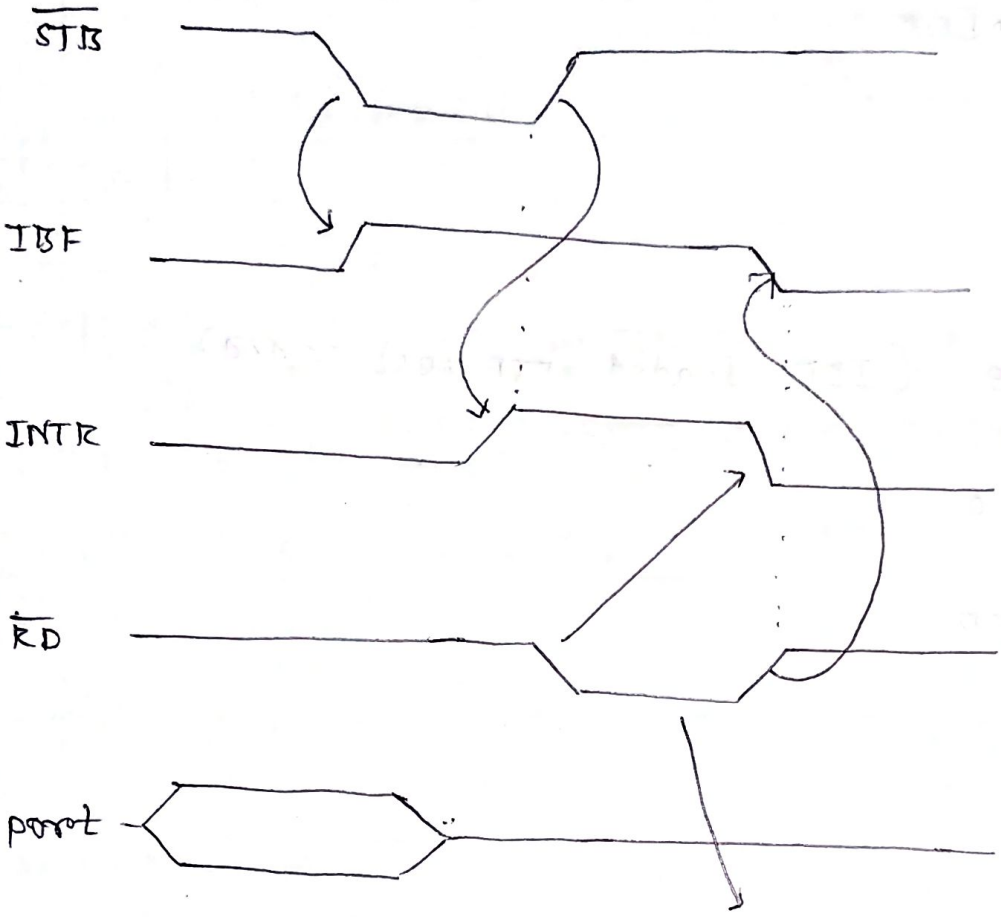
4. INTE (Int Enable) → internal bit

5. PC_7 & PC_6

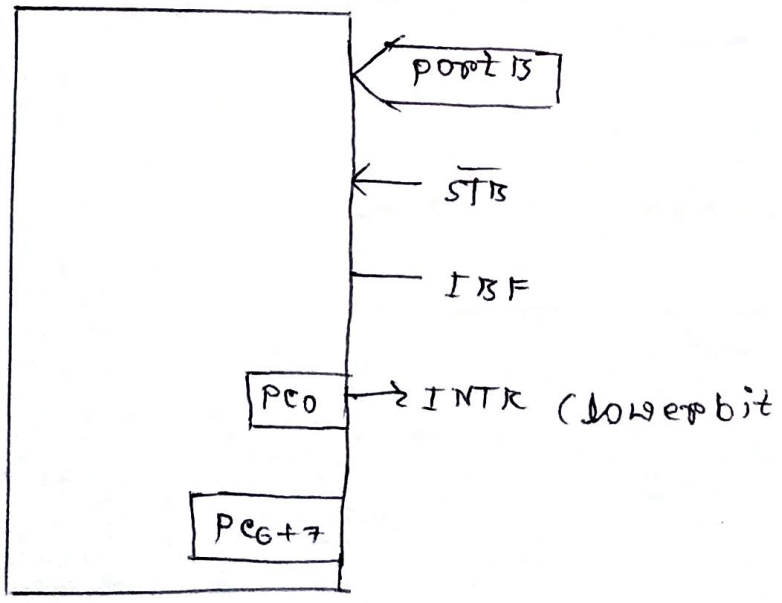
Mode 1 port A :



IN (port থেকে mp read) এর উইথে



Port ছাড়া অন্য name :



strobed input এর example : keyboard যেখানে key

```
READ  PROC  NEAR
' REPEAT
 IN  AL , PORTC
TEST  AL, BITS   (IBF  loaded কিনা test করবে)
 UNTILL !ZERO
IN   AL , PORTA
RET   Port
READ  ENDP
```

3e

Mode 1 strobed output

i) output buffer full

ii)

output → write , যখন কোনো port এ write

$\overline{OBF} = 0$, means port এ data আছে।

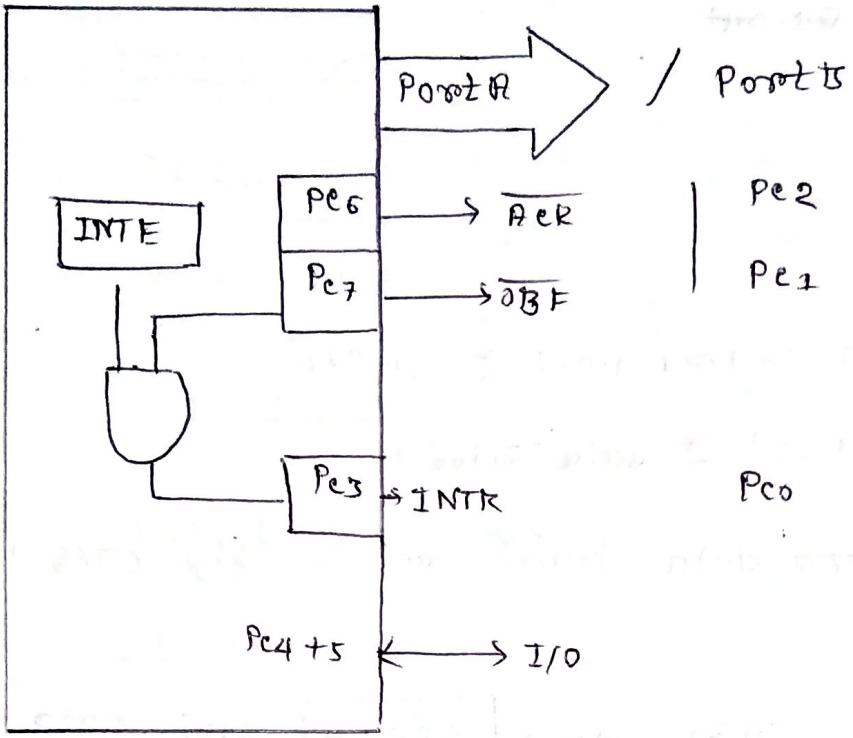
$\overline{ACK} = 0$, port থেকে data input receive হয়ে গেছে।

যখন data port এ যাবে , $\overline{OBF}$, then $\boxed{\overline{ACK} = 0}$ and data are already received.

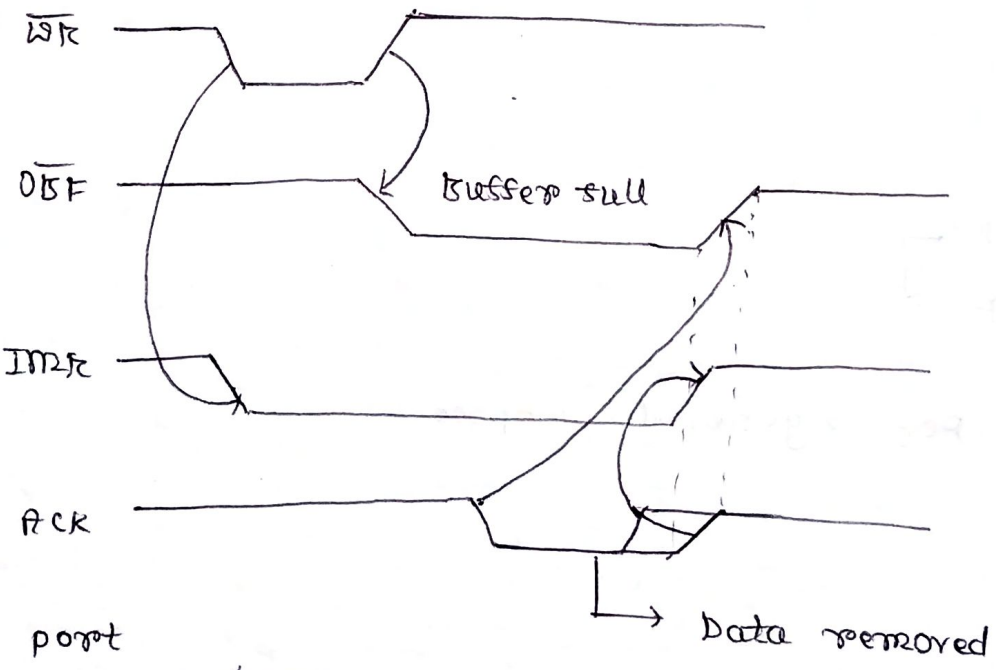
then $\overline{OBF} = 1$ করে দিয়ে যাবে।

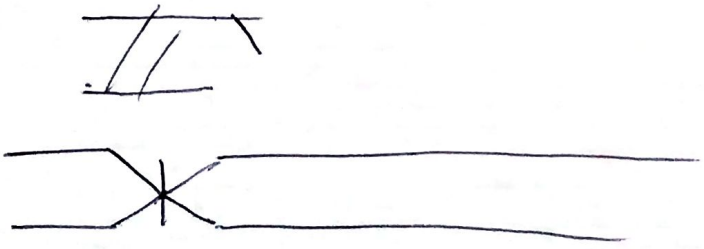
$\overline{OBF}$	OUT
$\overline{ACK}$	INTR]
	INTE]

$PC_4, PC_5 \rightarrow$ general purpose



Timing





Data sent from port

Example :

keyboard এ key press করলে কি ঘটনা ঘটে?

3D

Digital Technique (Tocci)

chapter 11

Interfacing with analog world

digital → discrete, fixed value

0 - 1.5 v = 0

1.6 v - 2v = 1

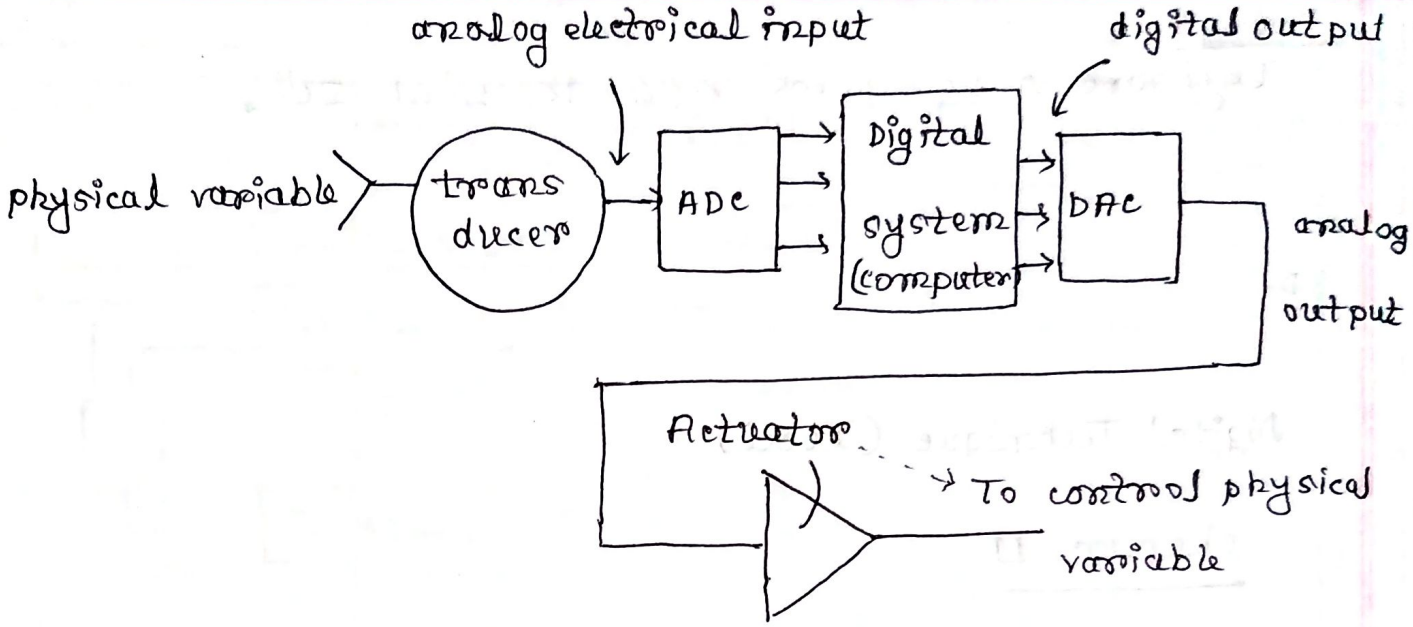
} digital

analog

current, voltage → analog

convert to

digital.



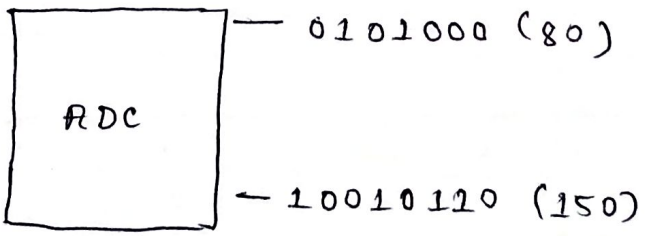
water tank এর পানির flow control

flow নাই

80° — 150° F (p.v) → non electrical

800 - 1500 mV

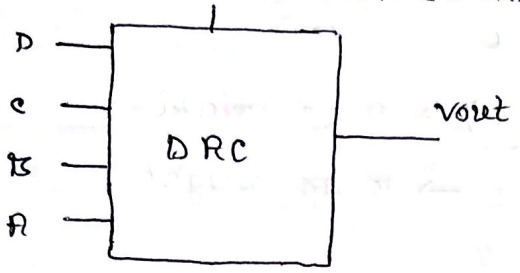
p.v → transducer proportional



Digital to Analog converter : (DAC)

0000 - 1111

V_{REF} = 10v (maximum ধরে নাও)



D	C	B	A	Vout (Analog output)
0	0	0	0	0
0	0	0	1	1
1	1	1	1	15

= K x Digital Input

here, K = 1

$(1100)_2$ = 12

Ex:

5 bit DAC এ 10100_2 → 10 mA

11101_2 → ? 14·5

20

29

20 = K × 10

K = 2

10 = K × 20

K = 0·5 mA

Analog output = K × Digital input

= 0·5 × 29

= 14·5 mA

Input weights

D	C	B	A	Vout
0	0	0	0	0
0	0	0	1	1 → A का weight
0	0	1	0	2 → B का weight
0	0	1	1	3
	1	0	0	4 → C का
				5
				6
				7
1	0	0	0	8 → D का weigh
				16 → E

Vout = 0.2V यदि 00001

Vout
0.2
0.4
0.8
1.6
3.2
6.2

Resolution → 0.2

1111 का जब

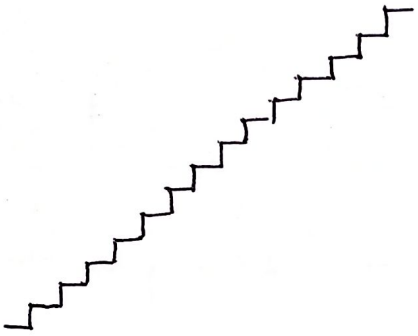
1110 का जब 0.0 कम

step size / resolution (K)

digital signal এর bit change করলে vout এর change একটা

4 bit DAC এর ক্ষেত্রে 1

Figure 11.2



full scale for 4 bit DAC

1111 → 15

2^n সংখ্যক step = 16.

level = $2^n - 1$ = 15

level = 2^n = 16

step = $2^n - 1$ = 15

$$\text{resolution} = K = \frac{\text{Analog full scale}}{(2^n - 1)}$$

$$= \frac{15}{15} = 1$$

example:

Percentage Resolution:

$$\% \text{ resolution} = \frac{\text{step size}}{\text{Full scale}} \times 100\%$$

$$= \frac{1}{15} \times 100\%$$

$$= 6.67\%$$

$$\% \text{ resolution} = \frac{1}{\text{total no of step}} \times 100\%$$

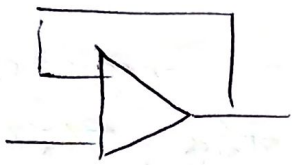
$$= \frac{1}{2^n - 1} \times 100\%$$

$$= \frac{1}{2^4 - 1} \times 100\%$$

$$= \frac{1}{15} \times 100\%$$

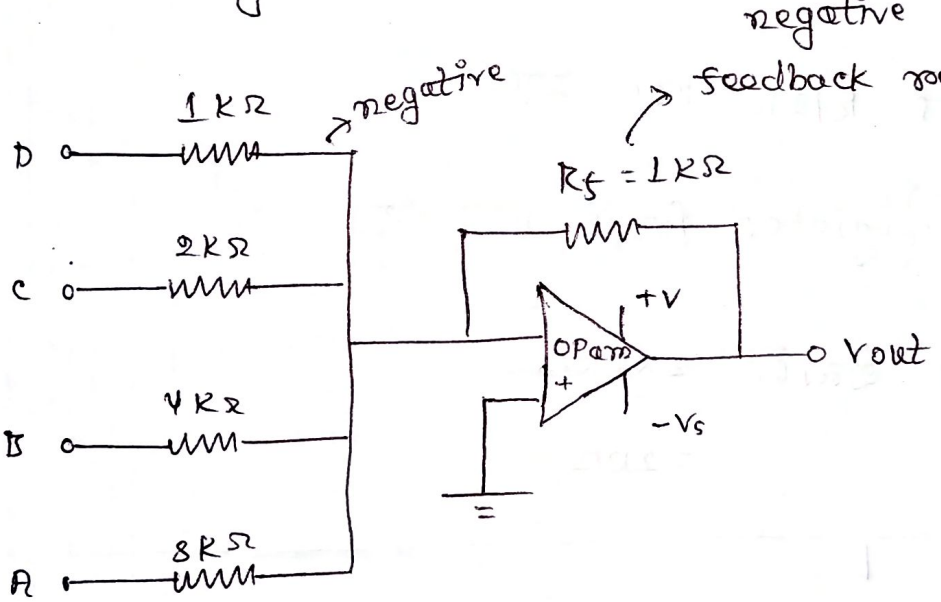
DAC का representation :

DAC circuitry: (4 bit এর DAC)



OPamp

summing amplifier



Digital input ⟶ analog output

0 → 0 volt

1 → 5 volt

$$V_{out} = -\left(\frac{R_f}{R_1}V_D + \frac{R_f}{R_2}V_C + \frac{R_f}{R_3}V_B + \frac{R_f}{R_4}V_A\right)$$

$$= -\left(V_D + \frac{1}{2}V_C + \frac{1}{3}V_B + \frac{1}{4}V_A\right)$$

1010 এর জন্য $= -\left(5 + \frac{1}{2}0 + \frac{1}{3}\times 5 + \frac{1}{4}\times 0\right) = -6.25\ V$

0000 0 V

0001 .625 V

0010 1.250 V

register লাগবে

সমস্যা : 12 bit এর জন্য প্রায় পর্যন্ত যাবে।

bit সংখ্যা বাড়ালে register এর value বাড়তে থাকবে।

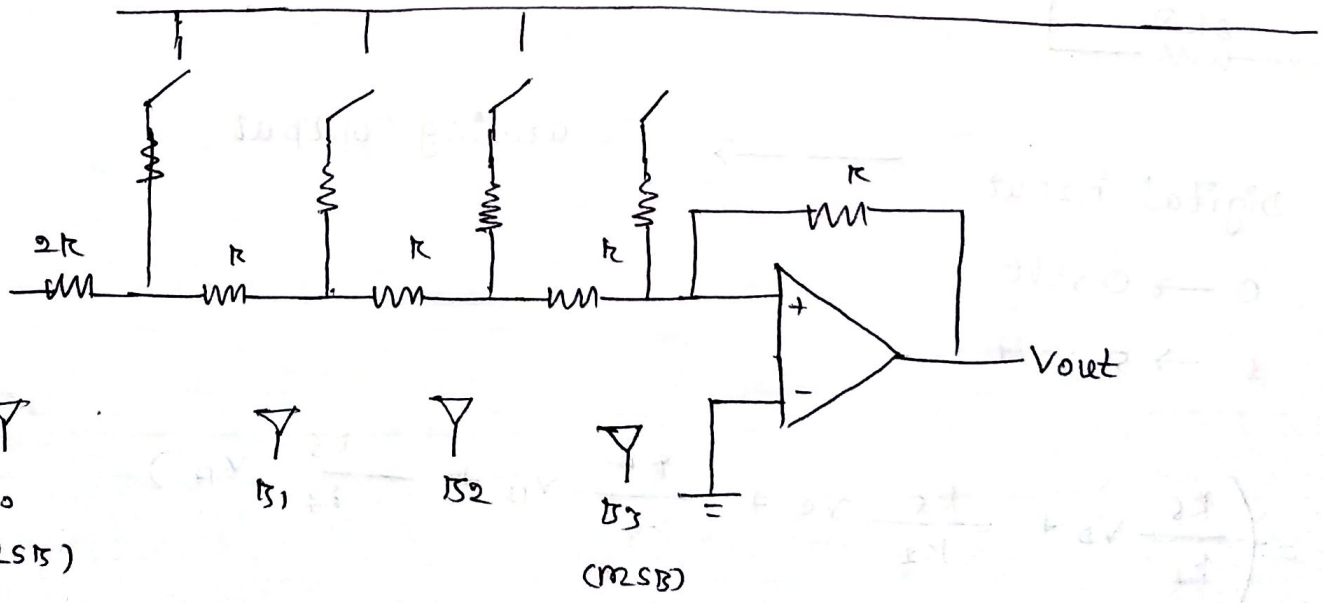
বাজারে এত variation এর register available না।

এটা সমাধানের জন্য R/2R use হয়।

কত দুইটা register দিয়েই DAC ।

একটা 1KΩ হলে অন্যটা 2×1KΩ

= 2KΩ



$$V_{out} = -\frac{V_{REF}}{16} \times B$$

$$= -\frac{10}{16} \times 1$$

V_{REF} বলে কিছু না থাকলে '1'

B_0 B_1 B_2 B_3

(B) → analog

0001 → 1

$B = 0001 = 1$

$$\text{resolution} = -\frac{10}{16} \times 1$$

$$= -0.625\ V$$

~~re~~ full scall output $= -\frac{10}{16} \times 105$

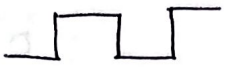
$$= -9.375\ V$$

✓ DAC specification
✓ " Application
] sels study

ET syllabus → Brey এর বই

(Analog to Digital)

clock pulse :

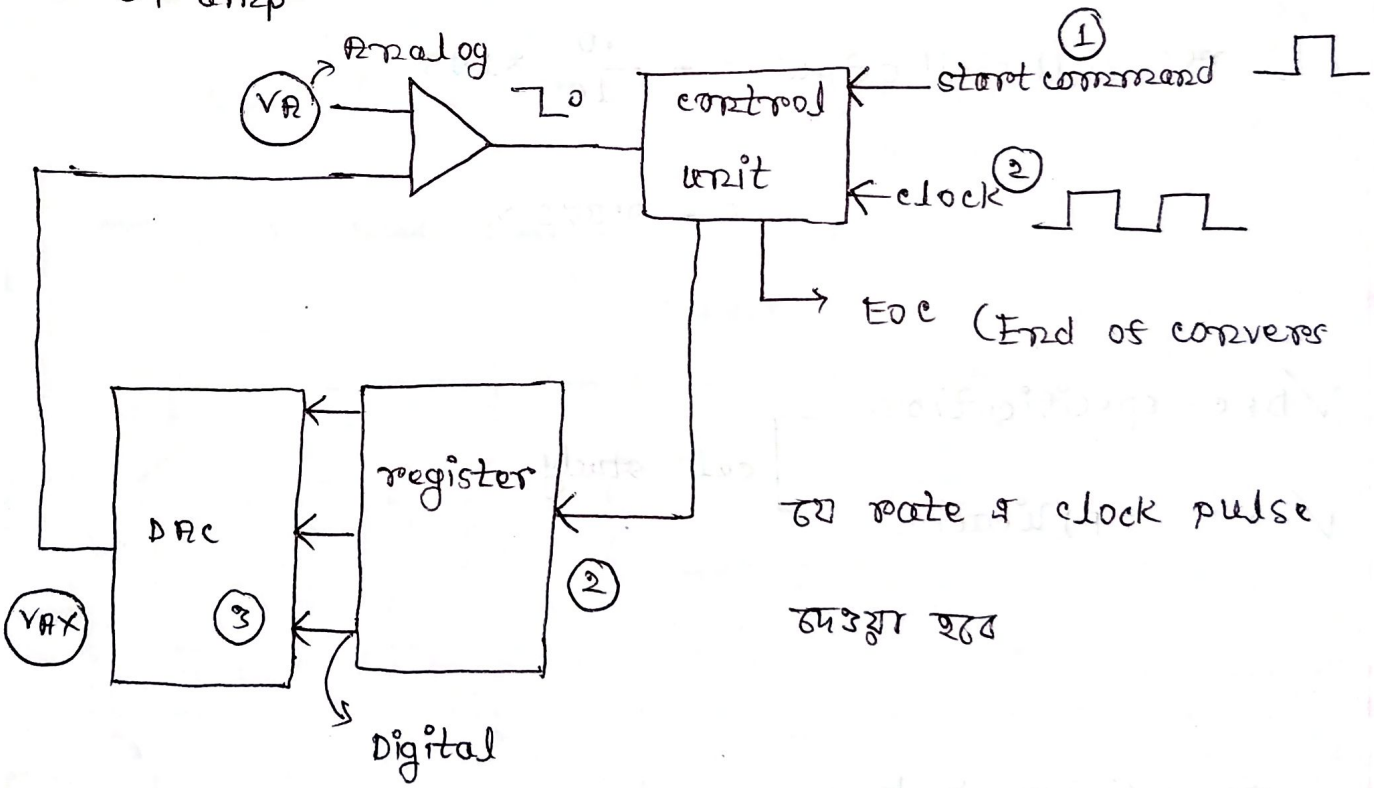


control unit:

register

DAC

OP amp

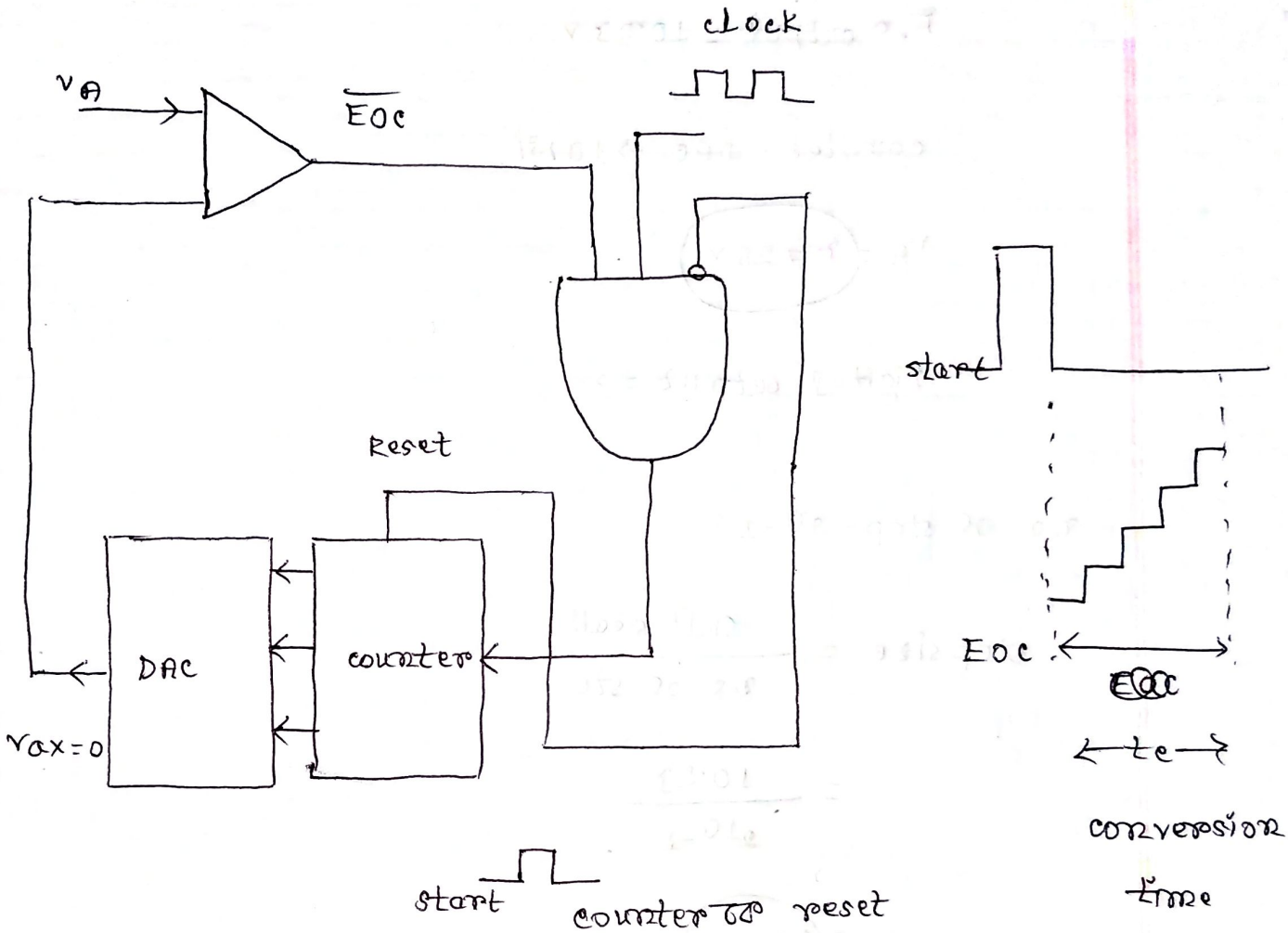


তে rate এ clock pulse

দেওয়া হবে

1. start command
2. clock to register
3. Digital to analog
4. Vax < VA হলে converter চলতে থাকে।
5. Vax > VA হলে low signal পাবে CU, then EOC fire হবে।

Digital RAM ADC:



1. counter initialize
2. $V_{AX} = 0$
3. $V_A > V_{ex}$

   $\overline{EOC}$ = high
4. $V_A < V_{ax}$

* Math

F.S output = 10.23 V

counter, DAC → 10 bit

V_R = 3.728 V

Digital output = ?

no. of step $2^n - 1$

$$\text{step size} = \frac{\text{full scale}}{\text{no of ste}}$$

$$= \frac{10.23}{2^{10} - 1}$$

= 10 mV 1টা step এর মান

VT = 0.1 mV মানে যখনই 10.1 mV হবে তখন EOC

$$\text{step no.} = \frac{3.728}{10\text{ mV}}$$

= 373 steps

0 1 0 1 1 1 0 1 0 1 → 10 bit

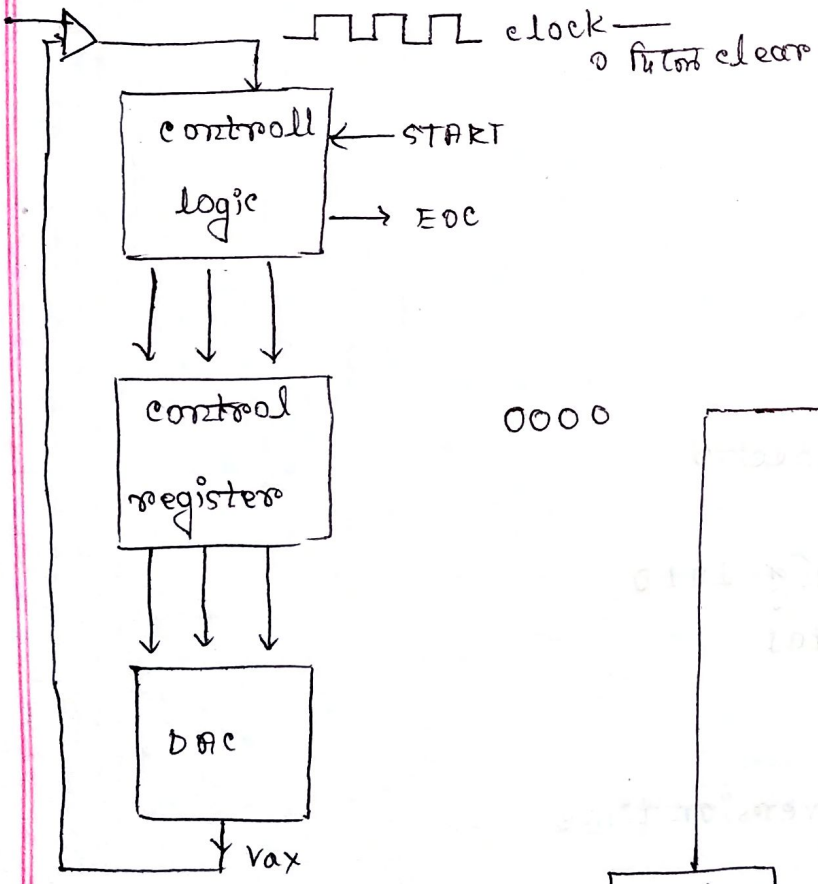
* Digital ramp ADC conversion time

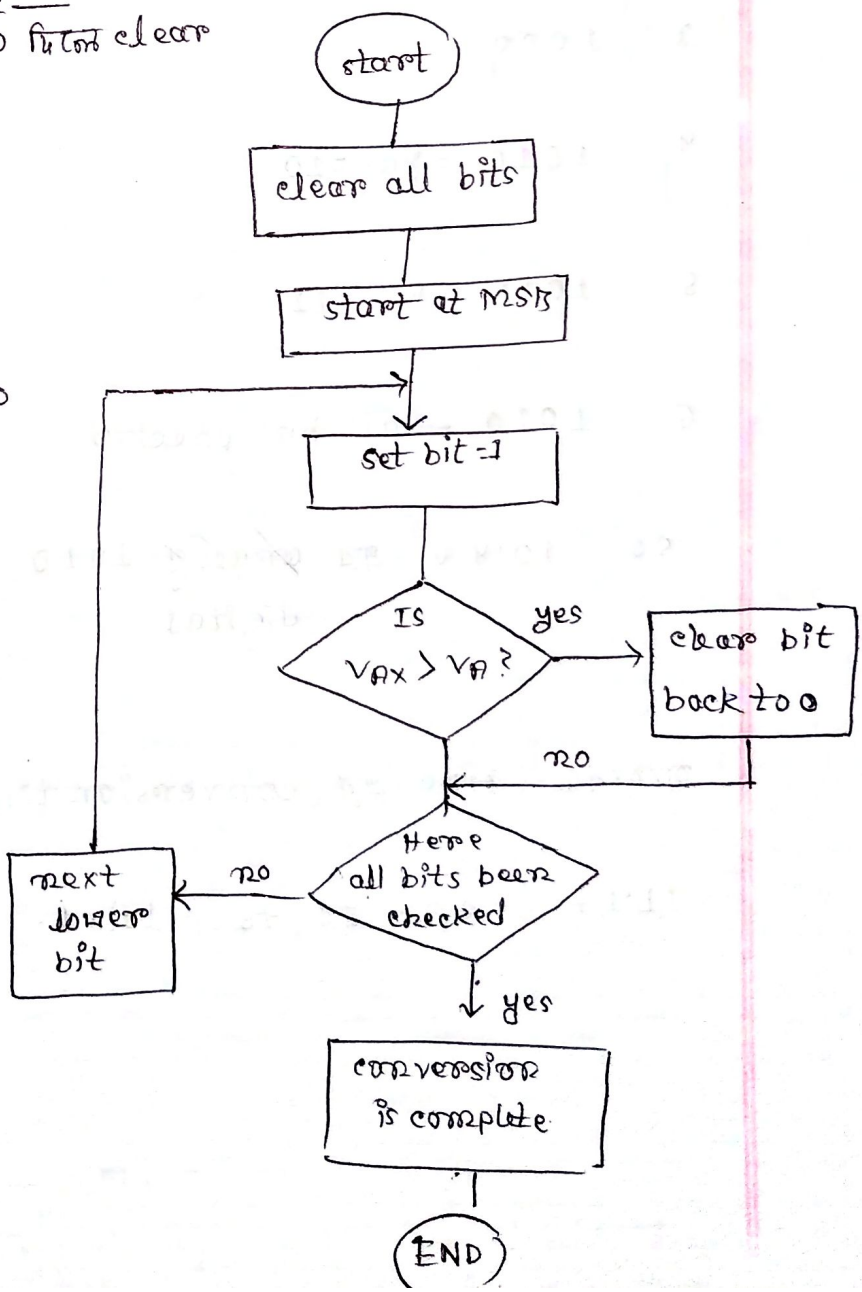
Conversion time $= t_c$

6A

SUCCESSIVE APPROXIMATION ADC

SAC → conversion time कम ।





4 bit SAC

Step size = 1V

V_A = 10.4 V

corresponding digital value:

1 (0000
1000 → 8V = Vax

2 1100 = 12 = Vax

3 1000

4 1010 = Vax = 10

5 1011 = Vax = 11

6 1010 → all bit checked

So 10.4 V এর ~~analog~~ 1010 digital

প্রত্যেকটা ADC এর conversion time.

11.17 SAC এর Tc related.