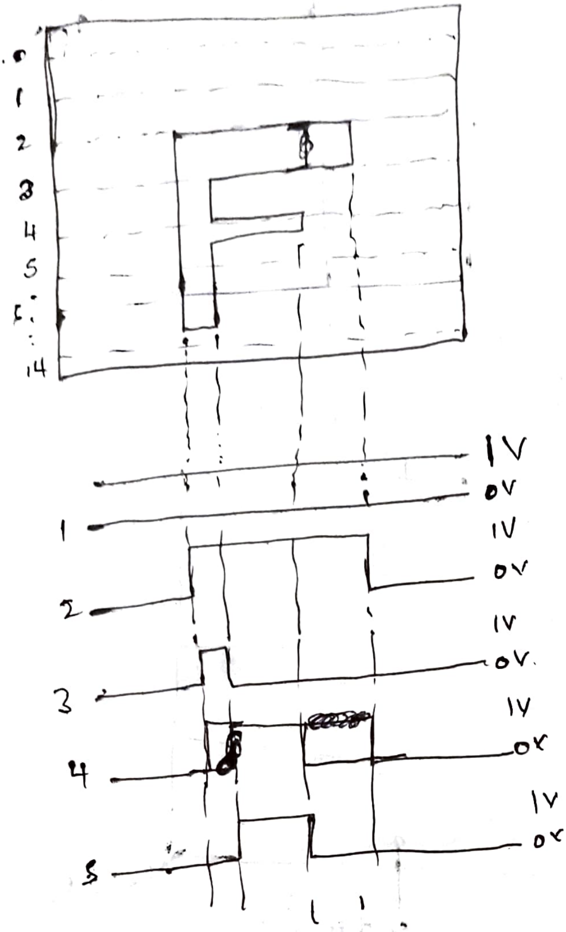
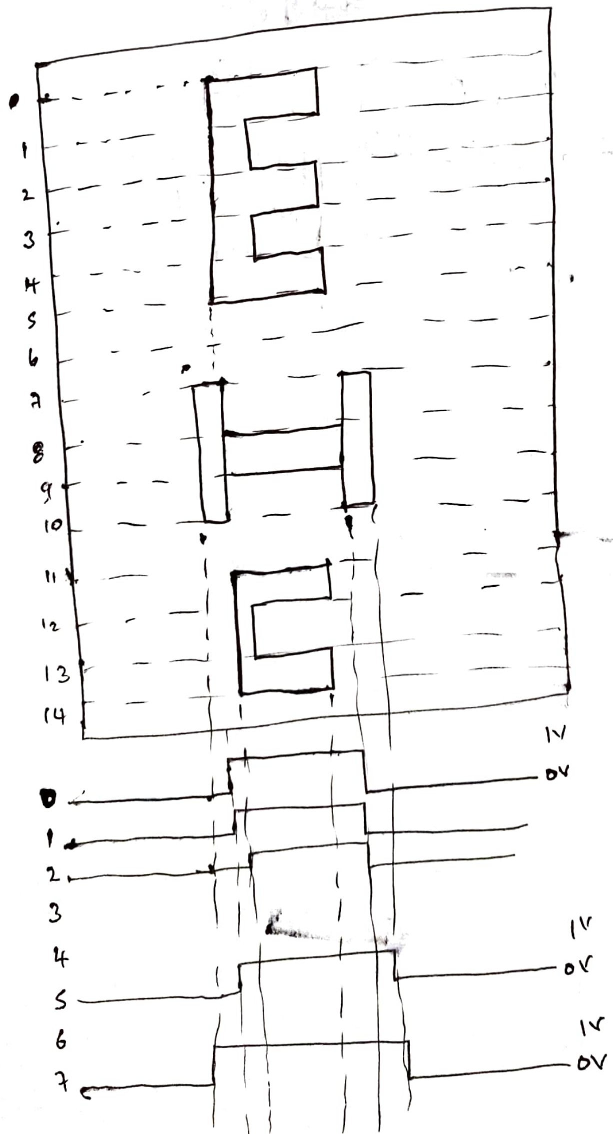

0
1
2
3
4
5
14
1V
0V
1
1V
0V
2
1V
0V
3
1V
0V
4
1V
0V
5


0
1
2
3
4
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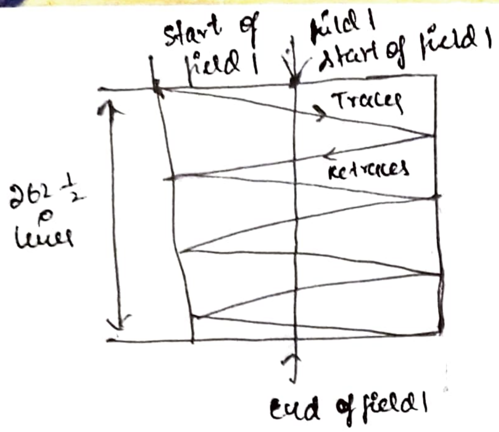
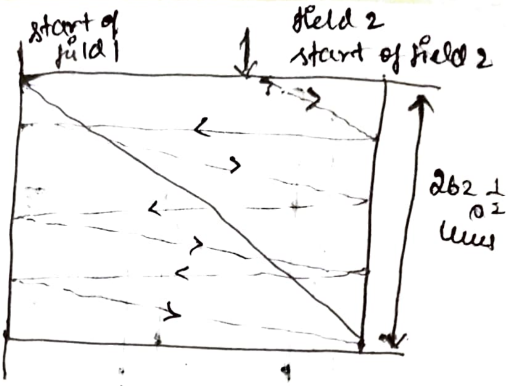
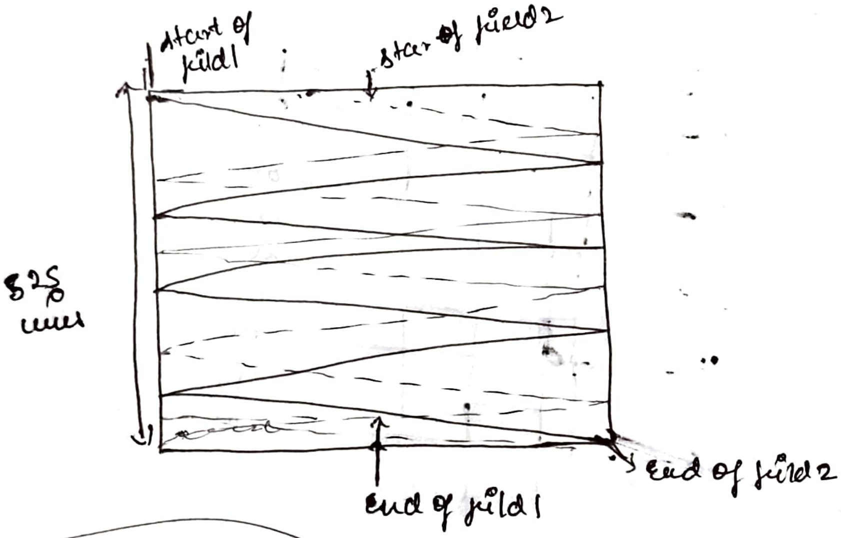
6
7
8
9
10
11
12
13
14
1V
0V
0
1
2
3
4
5
6
7
1V
0V
1V
0V







R G B

0.299 + 0.587 + 0.144

white

Hue

PAL
NTSC

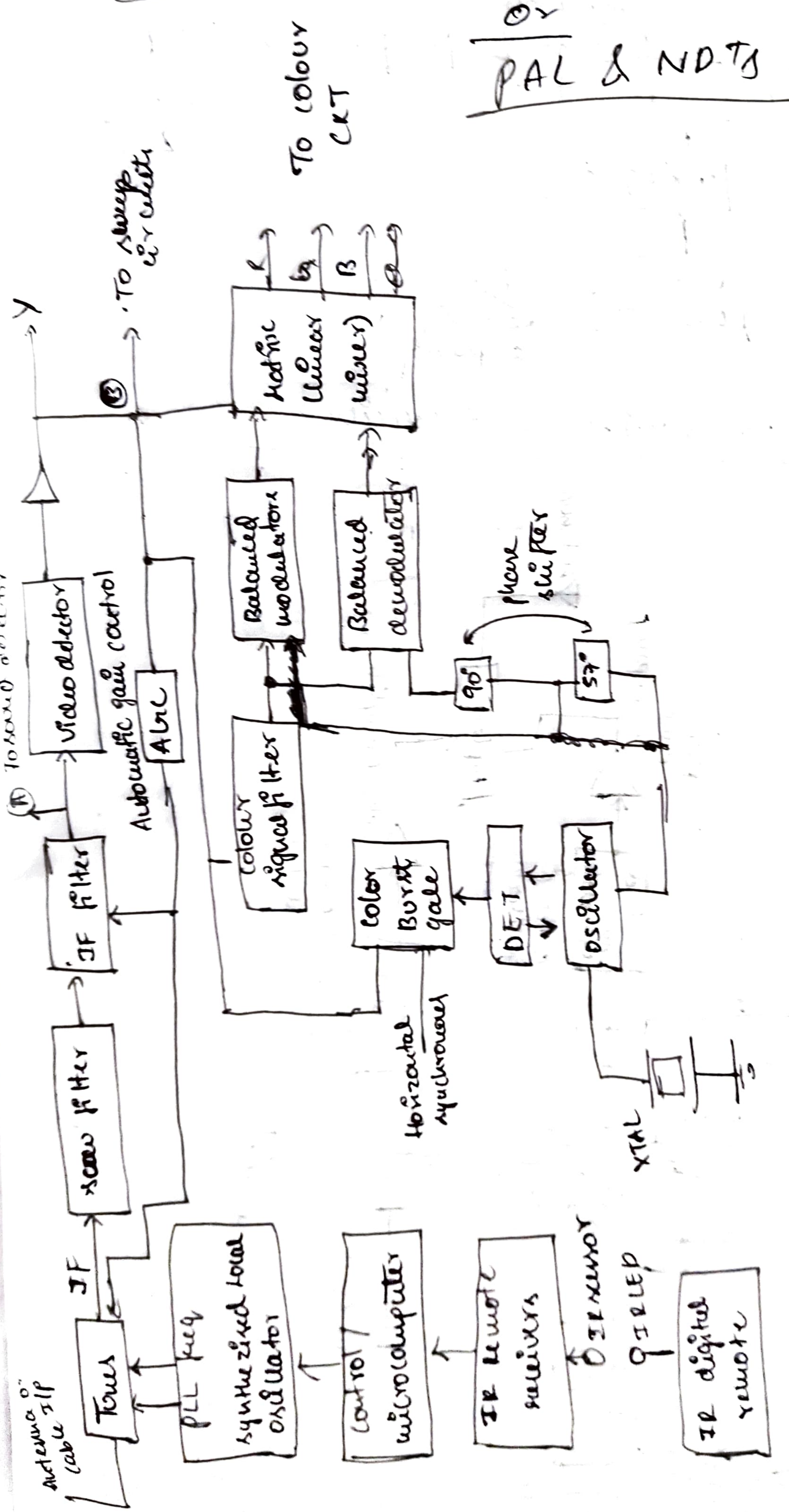
$\boxed{\text{Tones}}$

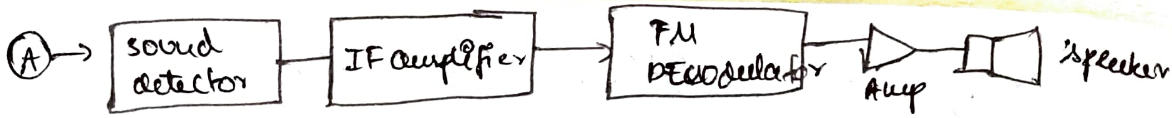
PLL freq

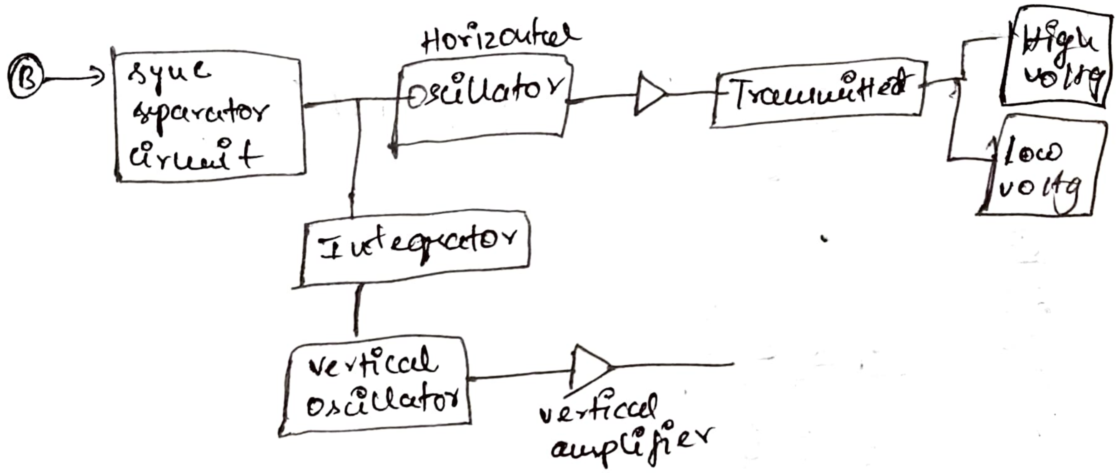
Tv Transmitter and receiver

Or

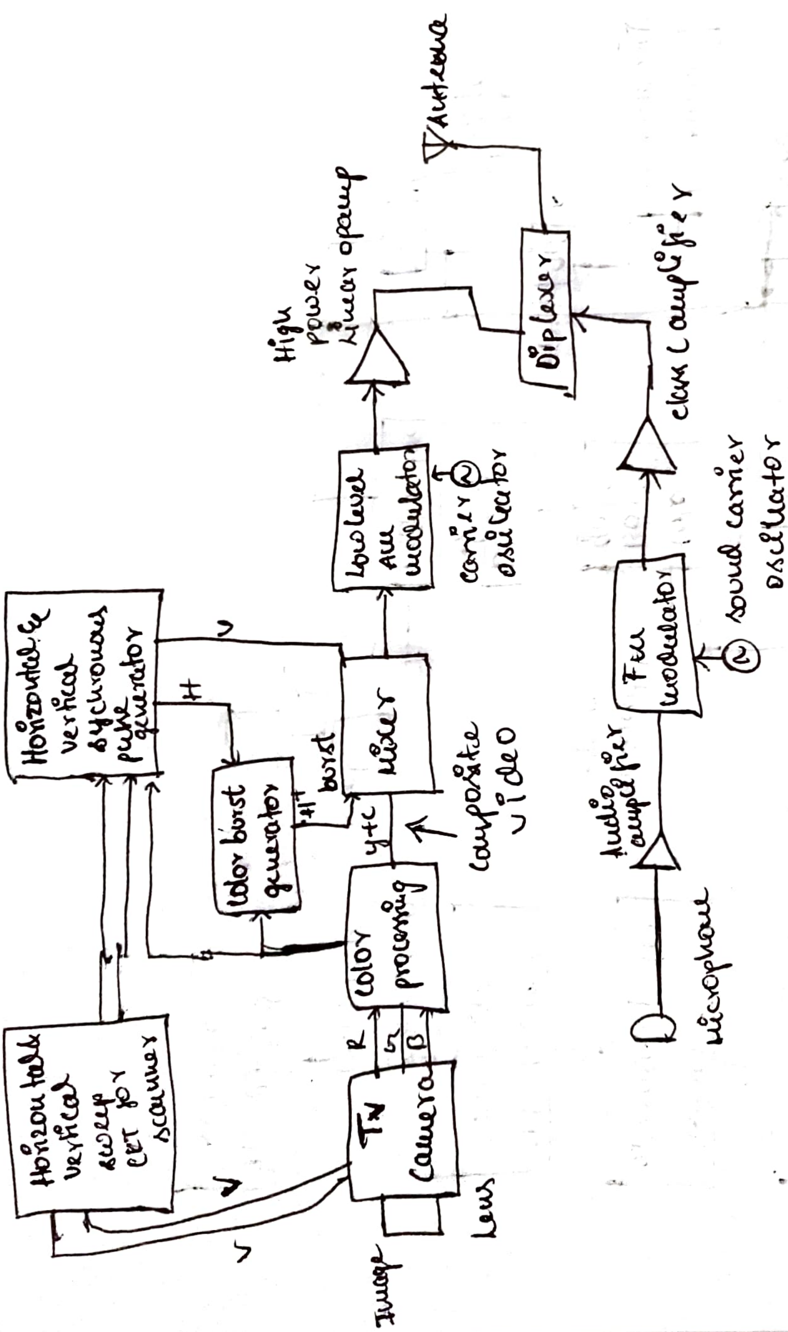
PAL & NDTS





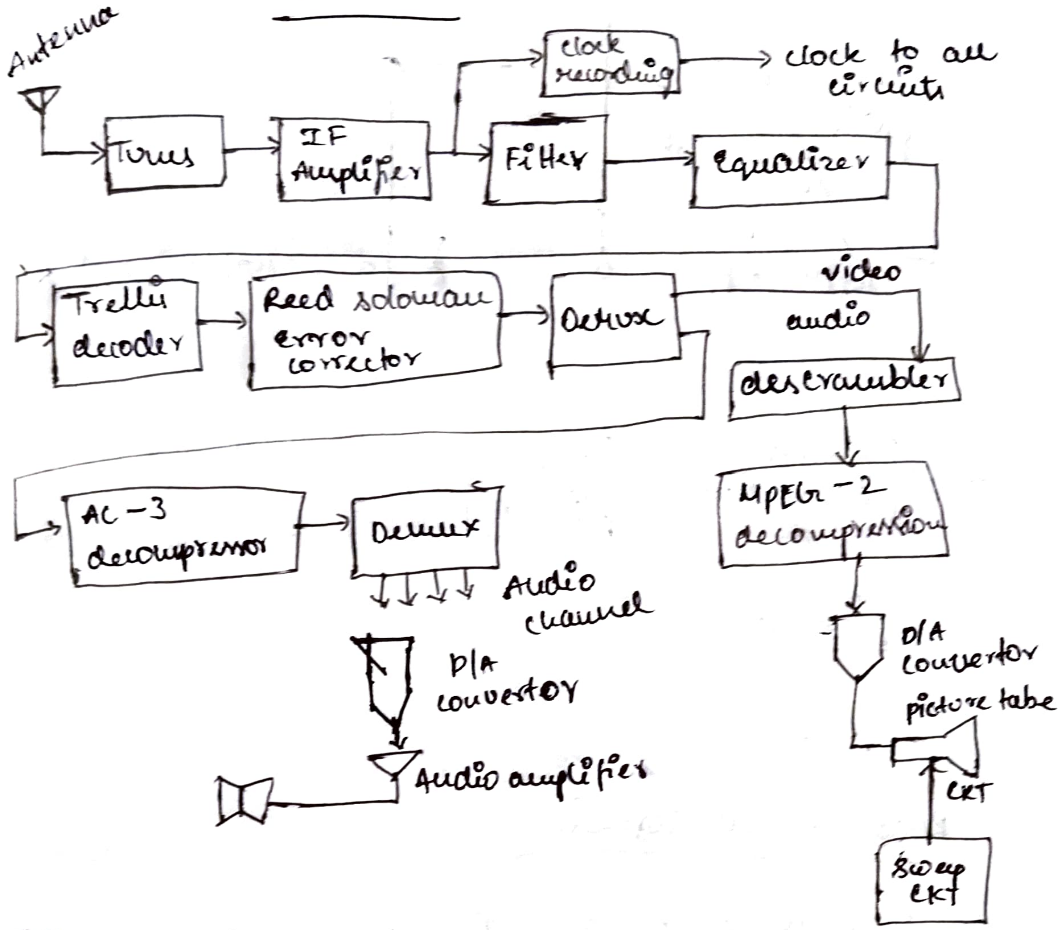


HDTV Transmitter and receiver

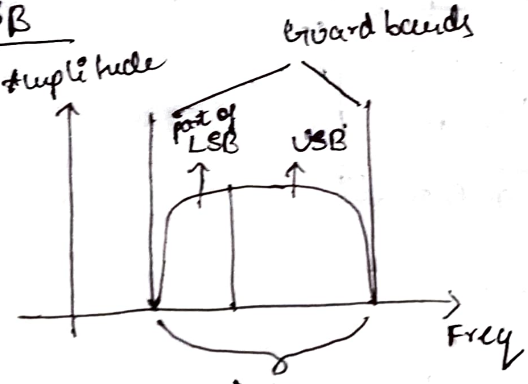


Transmitter

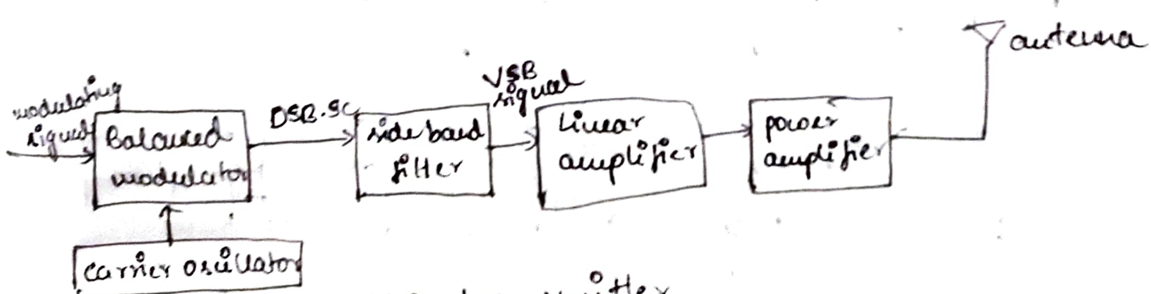
Reciver



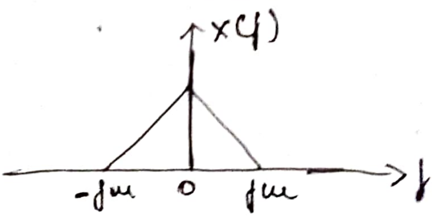
VSB



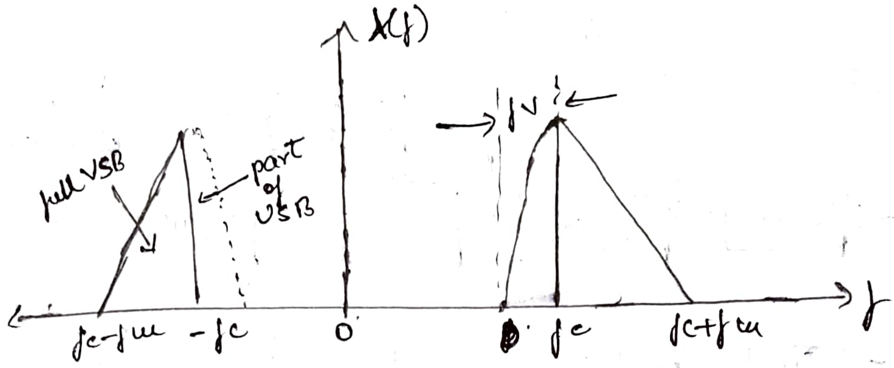
$$B = f_m + f_v$$

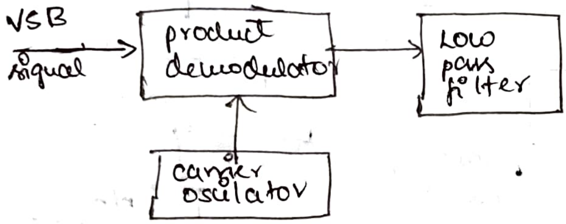


VSB transmitter



spectrum of message signal

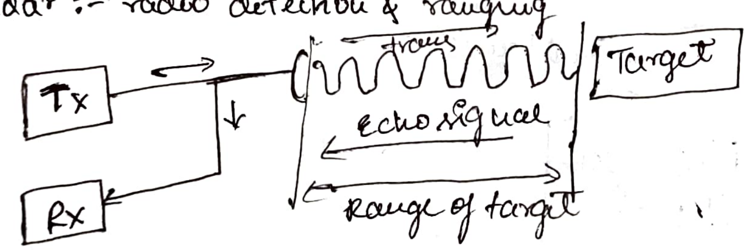




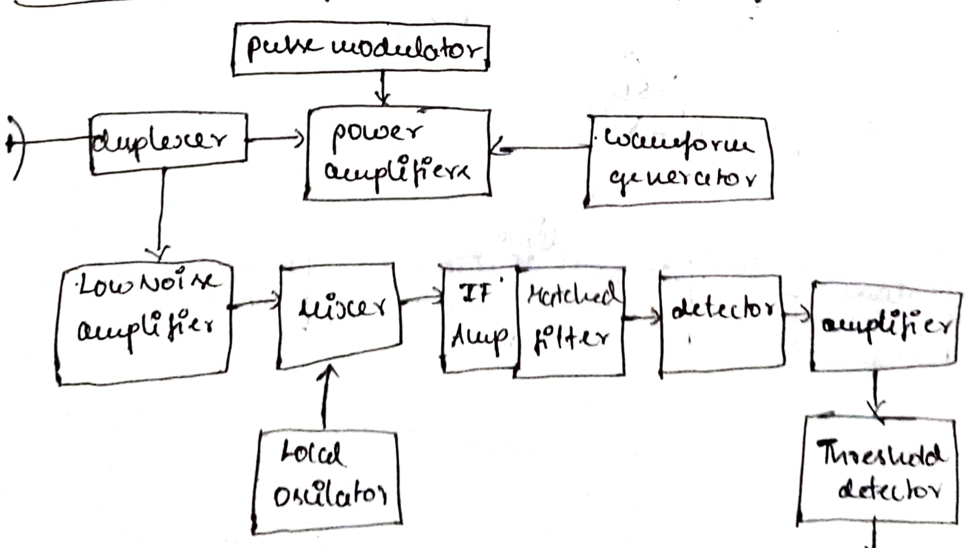
Unit - 4

Radar communication

Radar :- radio detection & ranging



Block diagram of radar



RF to Intermediate Freq

Radar Equation

10 Dec

p_{is} = power density in isotropic
p_t = transmitted power
$4\pi R^2$ = area

$$p_{is} = \frac{p_t}{4\pi R^2} \quad \text{--- (1)}$$

p_{dir} = power density wrt directive antenna

$$p_{dir} = \frac{p_t G}{4\pi r^2} \quad \text{--- (2)}$$

p_{rad} = power radiated

$$p_{rad} = \frac{p_t G}{4\pi r^2} \cdot \frac{\sigma}{4\pi r^2} \quad [\sigma = \text{area of crossection}]$$

$$p_{rad} = \frac{p_t G \sigma A_e}{(4\pi)^2 r^4} \quad [A_e = \text{Effective aperture}] \quad \text{--- (3)}$$

$A_e = \rho . A$ fundamental radar eq

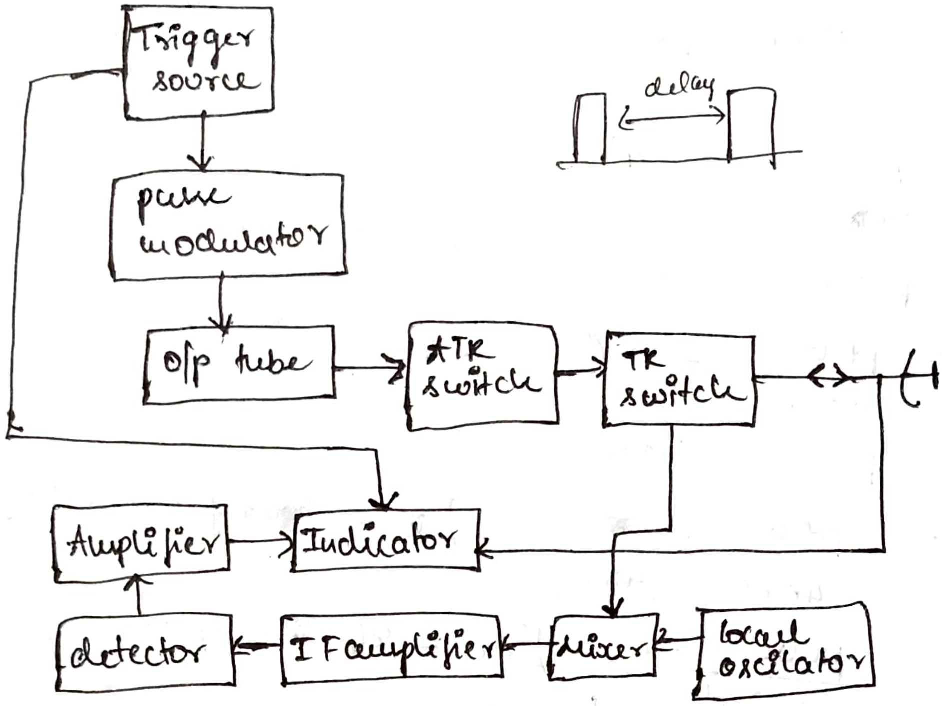
gain & Effective area [Relationship]

$$\cancel{A_e} = \cancel{\frac{p_{rad} (4\pi)^2 r^4}{p_t \sigma G}}$$

$$G = \frac{4\pi A_e}{\lambda^2}$$

$$r^4 = \frac{p_t G \sigma A_e}{(4\pi)^2 p_{rad}} \Rightarrow r = \left(\frac{p_t G \sigma A_e}{(4\pi)^2 p_{rad}}\right)^{\frac{1}{4}}$$

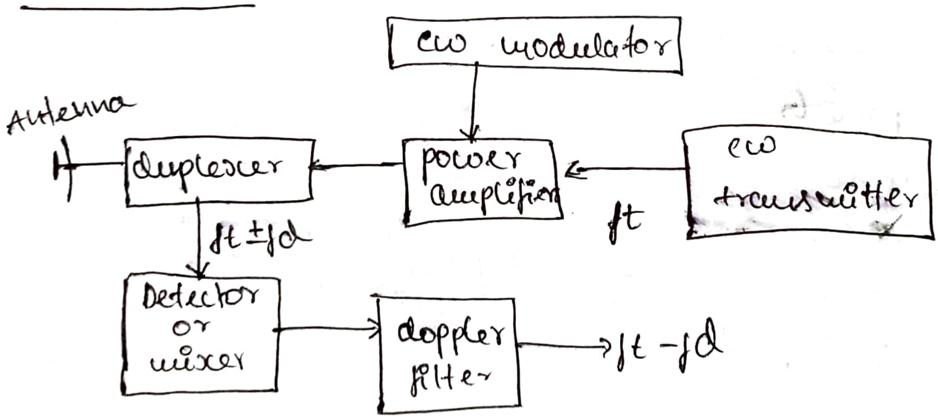
1) pulsed radar :-



ATR - Anti Transmitter & receiver switch

TR - Transmitter receiver switch

CW Radar

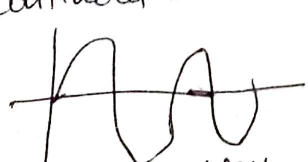


* cw speciality is to measure the moving object velocity
* doppler's effect principle [it works]

ft :- transmitting freq

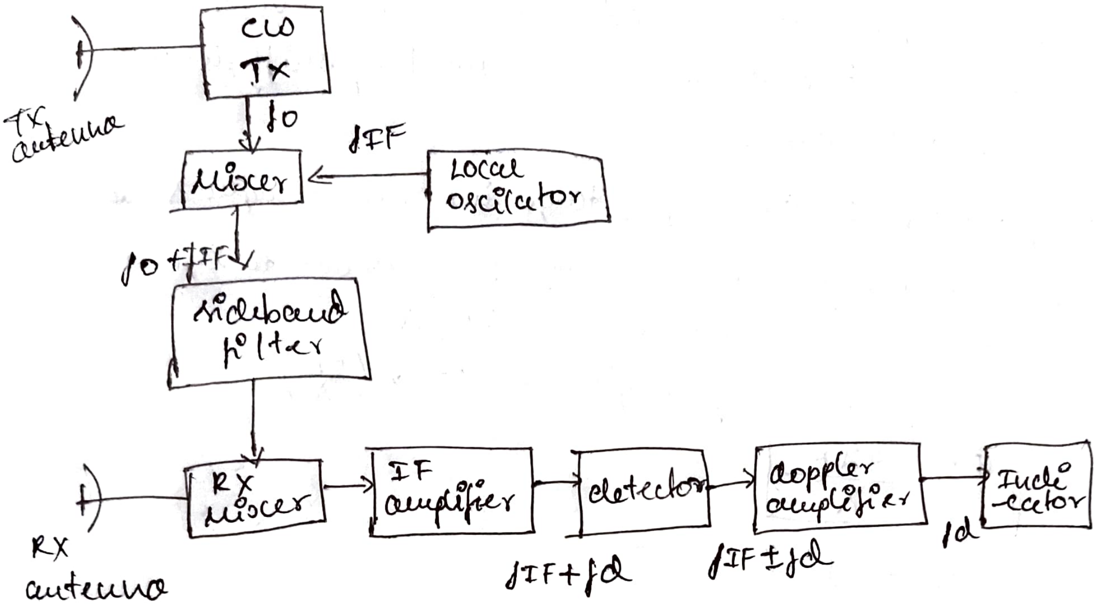
fd :- dopler freq

continous wave = ft - fd [cw]

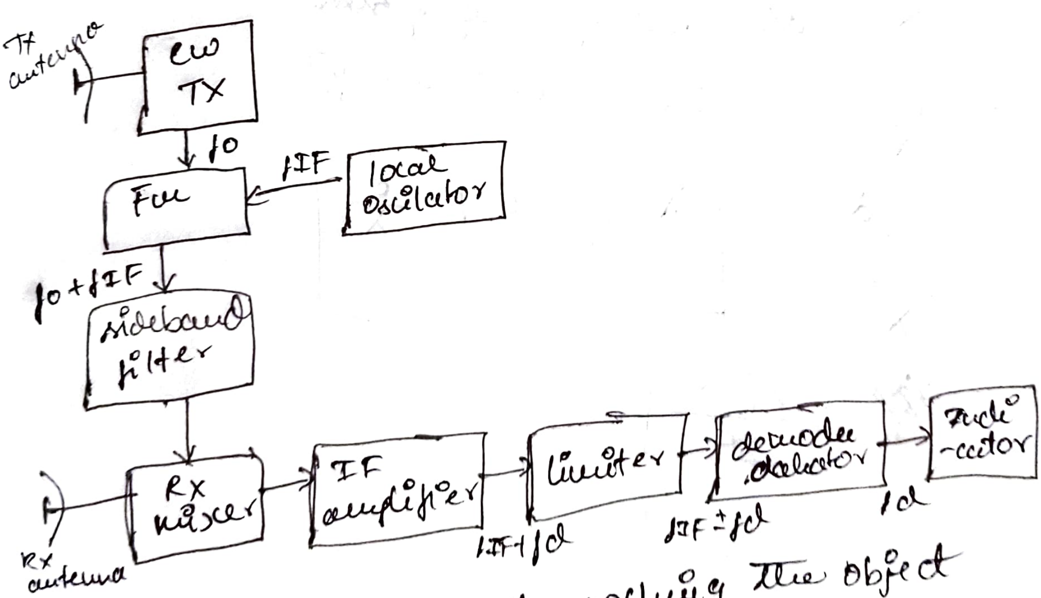


No delay

CW radar with non zero intermediate freq



FM radar



- it also calculates the time of aproching the object

limiter — it acts as a filter

Equation for doppler frequency shift

- doppler freq :- The freq shift can be +ve or -ve if the target is moving towards the radar the freq shift is +ve or else it is negative.
- Range of target :- the range of target is R, wavelength λ ~~and~~
- Total no. of signals in propogation from radar to the target and written is been taken has $2R/\lambda$
- The total phase change is given by $2\pi \times \left(\frac{2R}{\lambda}\right)$

$$\boxed{\phi = \frac{4\pi R}{\lambda}}$$

- In case the target is

$$wd = \frac{d\phi}{dt} \quad \text{rate of change of phase}$$

$$= \frac{4\pi}{\lambda} \frac{dR}{dt} \quad \text{[radial velocity] rate of change of range wrt time}$$

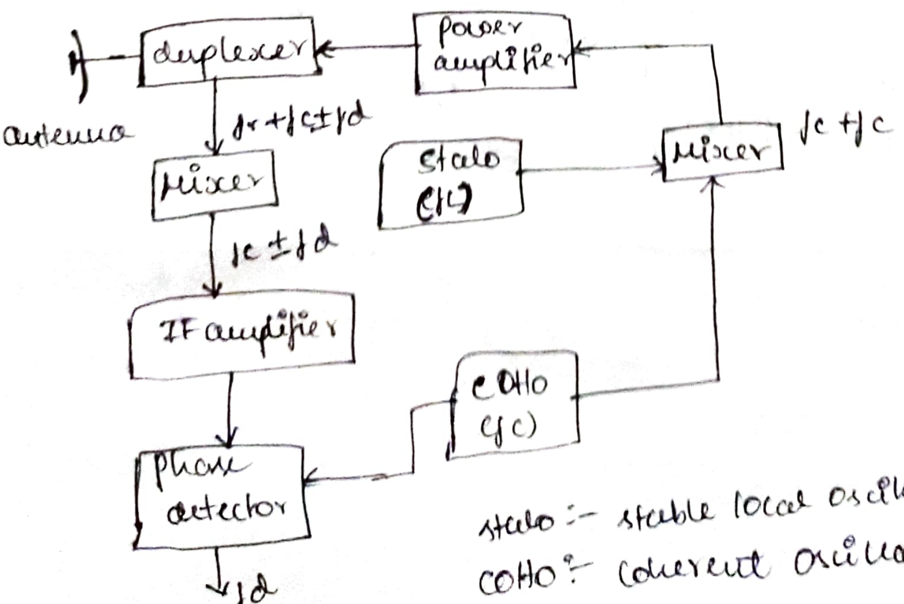
$$= \frac{4\pi}{\lambda} V_r \quad [V_r = \text{radial velocity}]$$

$$wd = 2\pi f d \qquad \left[\lambda = \frac{c}{f} \text{ or } f = \frac{c}{\lambda}\right]$$

$$fd = \frac{2V_r}{\lambda}$$

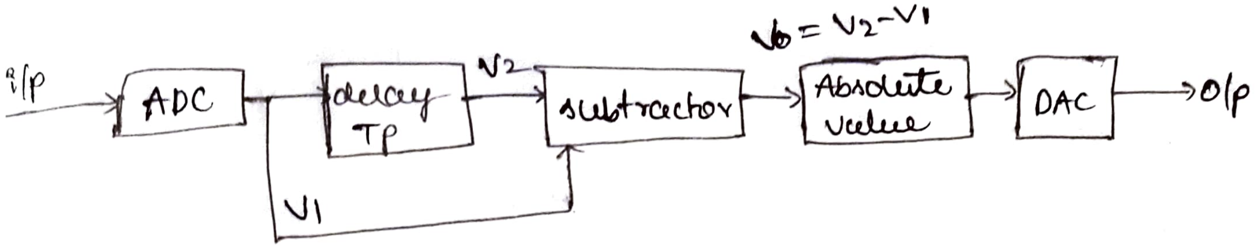
$$\boxed{fd = \frac{2fV_r}{c}}$$

MTI RADAR



stalo :- stable local oscillator
COHO :- coherent oscillator

Delay line canceller



$V_1 = K \sin [2\pi f d t - \phi]$

$V_2 = K \sin [2\pi f d (t - tp) - \phi]$

$V = V_2 - V_1$