

1.

$\begin{matrix} \uparrow \text{and} \\ \text{RADAR} \rightarrow \text{ranging.} \\ \downarrow \downarrow \\ \text{Radio detection} \end{matrix}$

- Radar is an electromagnetic device and regarded to be a powerful electronic eye.
- it is also an electromagnetic sensor.

what is done by radar \rightarrow

it can see the objects in

day or night.

rain or shine

land or air

cloud or clutter

fog or frost

earth or planets

stationary or moving

and good and bad weather.

it can see any hidden object anywhere in the globe except hidden behind good conductors.

Information given by the radar \rightarrow

- position of object
- velocity of object
- dis. of object
- Target recognition.
- size of object
- classification of materials.

Application →

- for military purpose
 - to control guided missiles and weapons.
 - to provide early warning of enemy.
 - To aircraft, ships, submarines and spacecraft for defence purpose.
- for weather forecast.
- for remote sensing
- for airport control.
- precise measurement of dis. for land surveying.
- to detect and measure object under earth.
- to study the nature of stars and planets.
- to measure altitude from earth for aircraft and missiles.

Types of radar →

- speed trap radar
- missile tracking radar
- early warning radar
- Airport control radar
- IFF radar
- weather forecasting radar.
- MTI Radar
- Navy radar etc.

Echo →

is a reflected electromagnetic wave from a target and it is received by a radar receiver. The echo signal power is captured by the effective area of the receiving space antenna.

Duplexer →

it is a microwave switch which connects the transmitter and receiver to the antenna alternatively. it protect receiver from high power output of transmitter. it allow to use of signal for both radar transmission and reception. it blank the receiver during the transmitting period.

Antenna →

Antenna is a source and a sensor of EMW. it convert electromagnetic energy into electrical energy at the receiving side and convert electrical energy into electromagnetic energy at the transmitting side.

Transmitter →

Transmits (generate high power RF energy). it consist of magnetron or cross field amplifier.

(4)

Receiver →

receive signals from antenna, and connects them to display, receiver amplifies return pulses and separates noise and clutter.

Display →

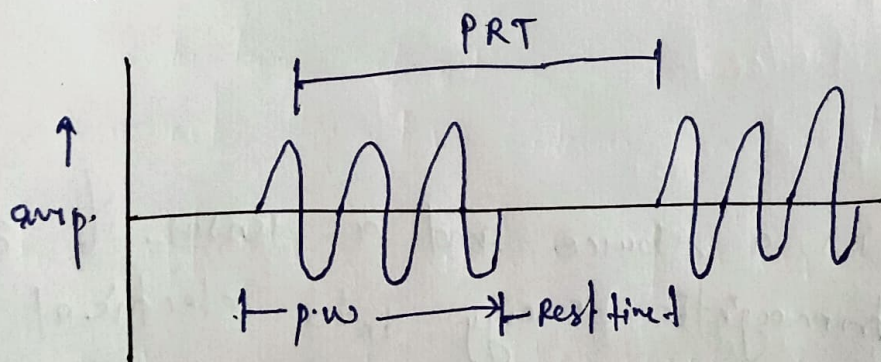
it provides visual presentation of echoes.

Range of radar →

it is dis. of the object from the location of radar

$$R = v_0 \times \frac{\Delta t}{2}$$

v_0 = velocity of em wave
 Δt = time taken by echo from object

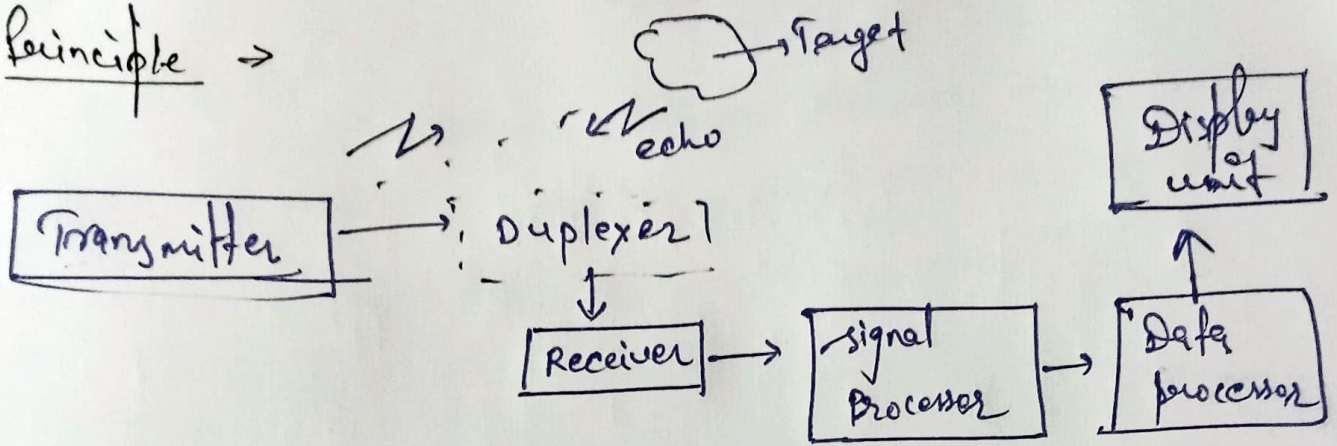
Radar pulseRange resolution →

$$R_s = v_0 \times \frac{PM}{2}, \quad (m)$$

counter
 ECM → measure
 electronic

also known as jamming, it is an electronic device which disrupt radar or communication.

Principle →



Limitation →

- Cannot recognize colour of target.
- Cannot resolve the target at short dis. like human eye.
- Can not see the targets placed behind the conducting sheet
- Can not targets hidden in water at long range.

factor affecting radar operation →

- electromagnetic interferences coming from other transmitters
- signal reflected by natural phenomenon like rain, fog, and cloud.
- the curvature of the earth
- Noise produced within the receiver.

