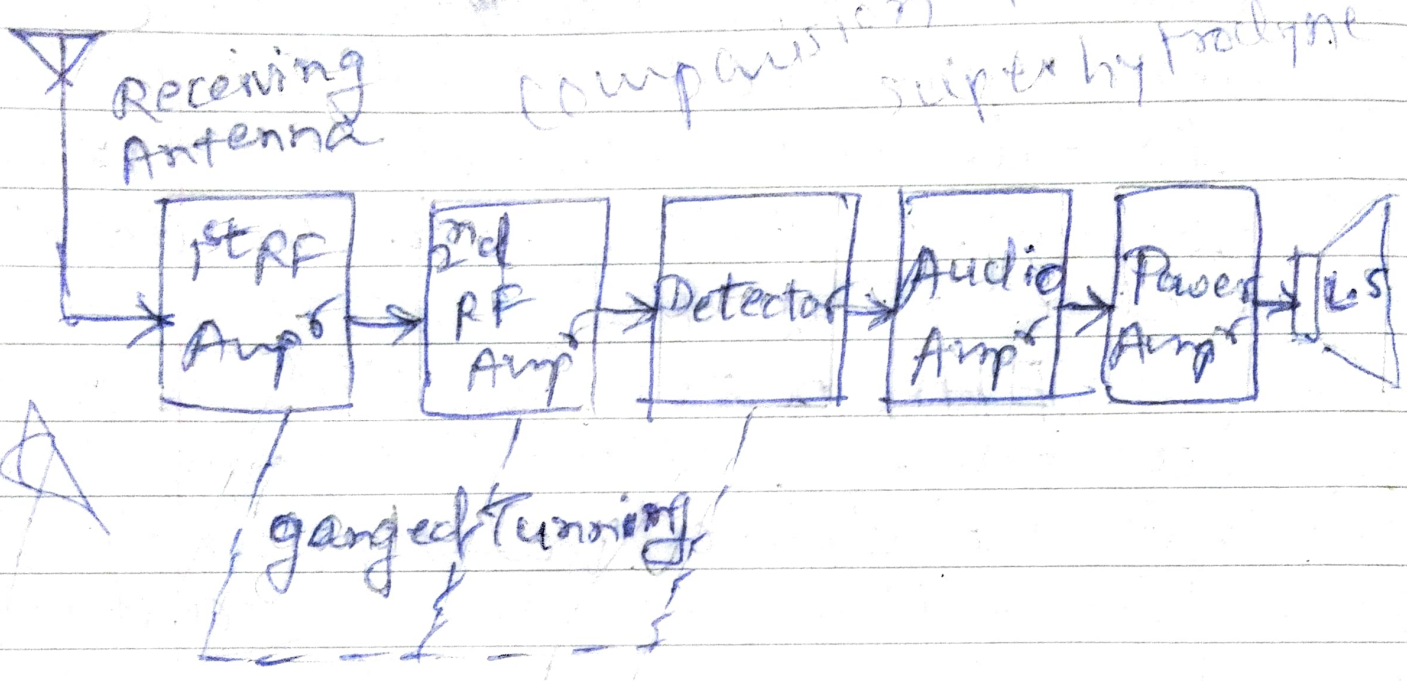
★ Types.

(1) Tuned radio freq. (TRF) receiver.

(2) Superhytrodyne radio receiver.

(1) Tuned radio freq. (TRF) receiver.

Block diagram



comparison TRF with superhytrodyne

(1) RF amp → TRF radio receiver uses two or three stages of RF amp all tuned simultaneously to the desired signal freq. so that this stages provide selection as wellas amplifica to the incoming signal.

(2) Detector → Detector is nothing but the demodula. It recovers the original informa i.e modu.

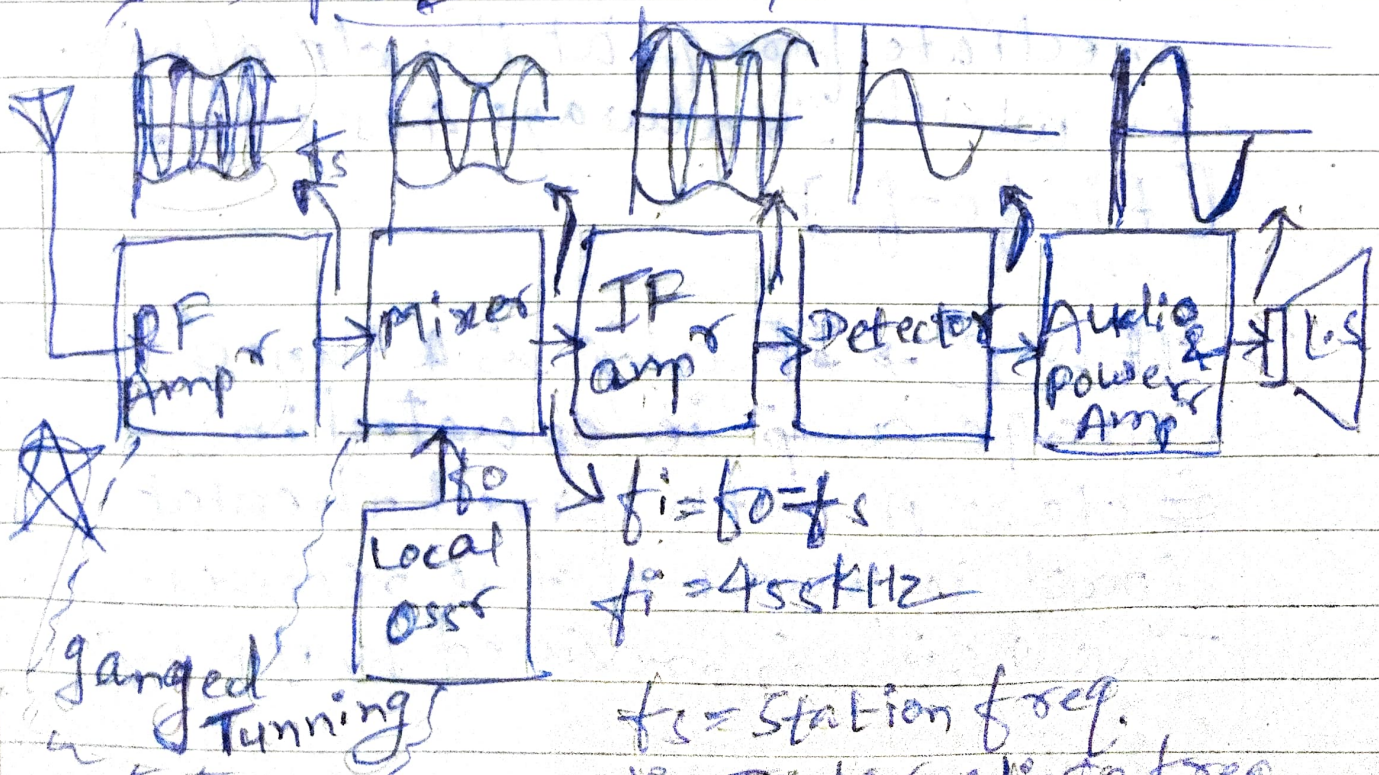
-lating signal from the amplified amplitude modulated signal.

(3) Audio & Power amp^r → The demodu-lated signal (Audio) is amplified by the AF amp^r & power amp^r stages and fed to the loudspeaker & it converts electrical signal into sound signal.

Draw back of TRF radio receiver.

(1) Instability in gain.
(2) Insufficient adjacent freq. rejection
(3) Bandwidth variation

Super heterodyne radio receiver.



Improve Selectivity → Reducing the adjacent channel interference.

(1) RF amp^r → It is tuned voltage amp^r coupled through the antenna to the mixer. It selects the desired signal from the antenna & amplifies them. This stage improves the sensitivity & selectivity of the radio receiver. It also isolates local osc^r circuit from the antenna there by preventing the local osc^r energy.

(2) Mixer & local osc^r (converter stage) → This a converter stage in super-hytrodyne receiver. The RF amp^r, mixer, & the local osc^r are ganged together to produce intermediate freq. at the o/p of mixer which is always difference ($f_i = f_o - f_s$).

(3) IF amp^r → IF amp^r is a tuned voltage amp^r ie. operated in class A with fixed rheostat load in most of the receiver. The gain is provided by IF amp^r.

(4) Detector → The amplified signal is feed to the ~~det~~ detector or demodulator. It recovers the original informa" from the amplitude modulated wave.

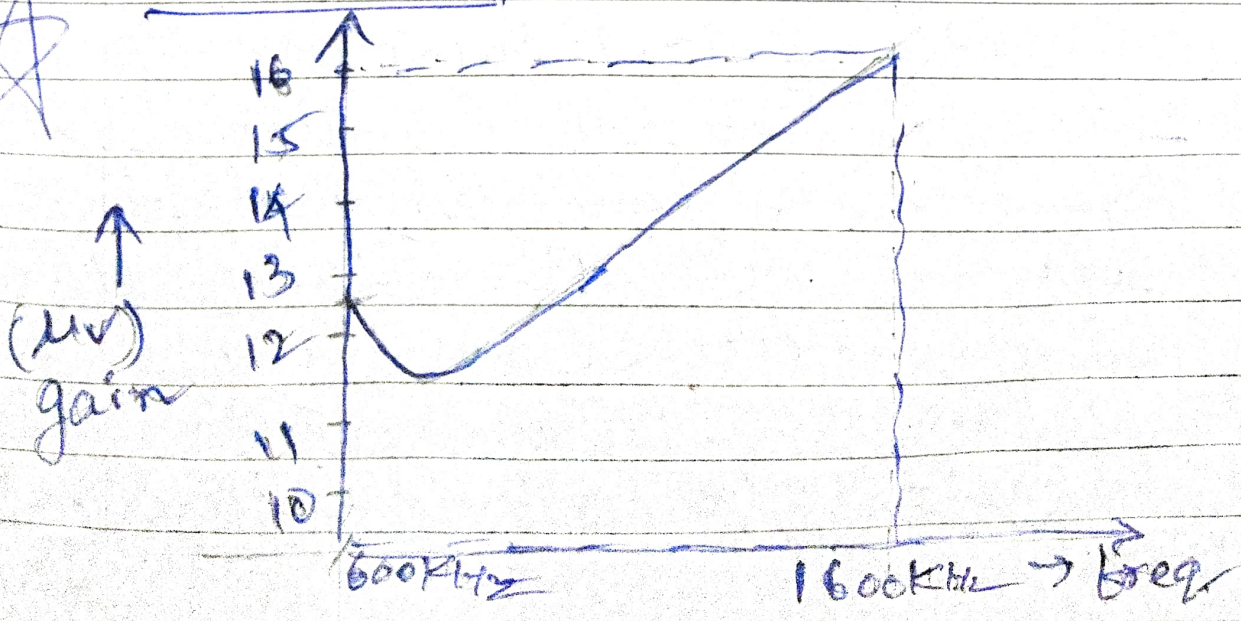
(5). Audio & Power amp".

Audio amp" amplifies the incoming signal & power amp" generates the required power to drive the loud speaker.

(6) Loud speaker → It converts electrical energy in to sound energy.

Parameters of AM radio receiver.

* Sensitivity



Sensitivity of the radio receiver is to amplify the weak signal. Mathematically the sensitivity of radio receiver is defined as a carrier voltage which must be applied to the receiver i/p terminal.

Sensitivity of radio receiver is expressed in microvolts & millivolts or in decibels below one volt.

The sensitivity may be measured at various carrier freq.ies in a given band.

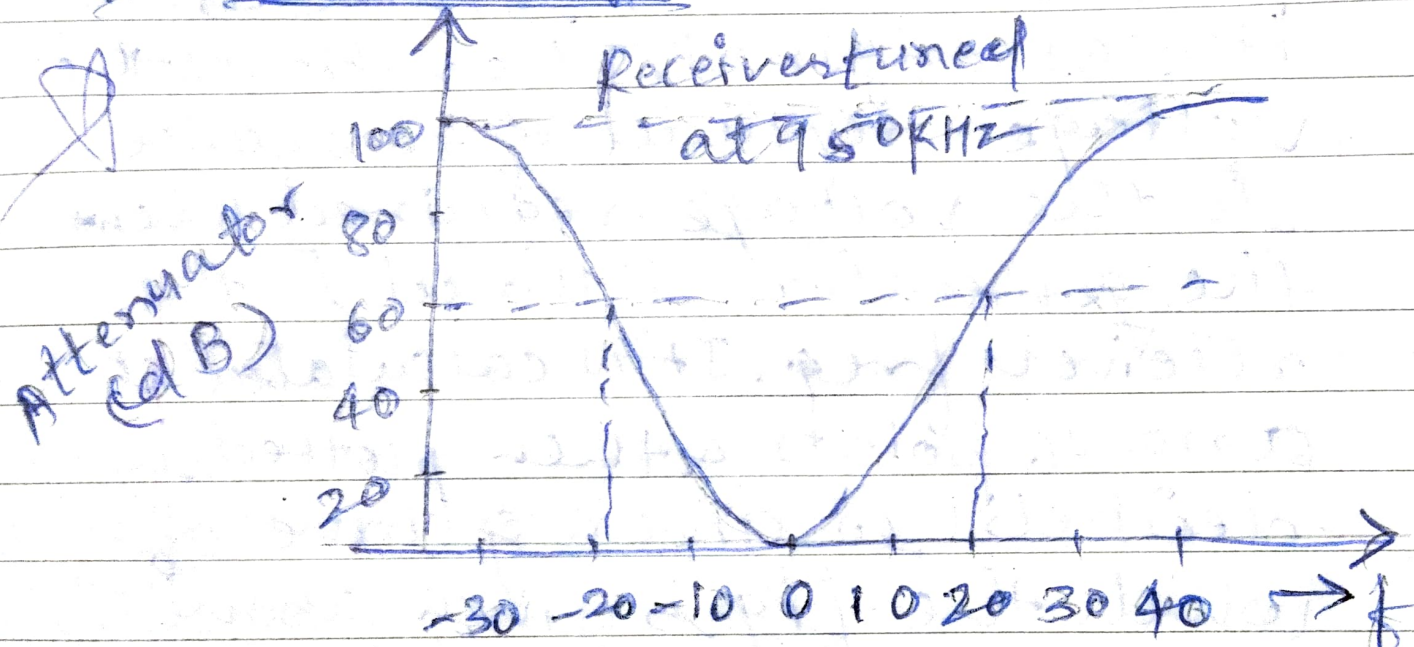
From the graph it is seen that sensitivity varies over the tunning band. At 1600Hz this perticular receiver has a sensitivity of 12.7 Microvolts or -98 decibel volts (below 1volt).

Sometimes sensitivity defination is extended & the manufacturer of this receiver may quote to be 12.7 Microvolts for signal to noise ratio of 20dB in

the dp of the receiver.

The most important factor determining the sensitivity of superheterodyne receiver are the gain of the IF amp^r & that of the RF amp^r

☆ Selectivity



The selectivity of receiver is its ability to reject the unwanted signals. It is expressed as a curve such as the fig. shows.

The attinuation that the receiver offers to the signal at freq.ies near to the one to which it is tuned. Selectivity is measured at the end of the sensitivity test.

with conditions the same as for sensitivity except that Now the freq. of the generator is varied to either side of freq. to which the receiver is tuned. The o/p of the receiver naturally falls, since the i/p freq. is now incorrect. The i/p voltage must be increased until the o/p is same as it was original. The ratio of the voltage required of resonance to the voltage required when the generator is tuned to the receiver freq. It is calculated at a no. of points & then plotted in decibels to give a curve of which the fig is given above.

Looking at the curve we see that, at 20KHz below the receiver tuned freq & the interfering signal would have to be 60db greater than the wanted signal to come out with the same amplitude.

Selectivity varies with the receiver freq if ordinary tuned

$\hat{f}_i = \frac{f_o \cdot f_s}{f_o + f_i}$

$f_{si} = f_s + 2f_i$

ckts are used in the IF section & becomes some what worse when the receiving freq is raised. In general it is determine by the response of the RF section, with the mixer & RF amp^r i/p ckt place a small but a significant part. It should be noted that its selectivity determines adjucent channels rejection of a receiver

4) Image freq. and its rejection.

In a standard broadcast receiver the local osc^r freq. is made higher than the incoming signal freq. For reasons that will become apparent, it is made equal at all times to the signal freq. plus the intermediate freq.

$$f_o = f_s + f_i$$

If the freq. f_{si} manages to reach the mixer such that,

$$f_{si} = f_o + f_i \longrightarrow (1)$$

ie. $f_{si} = f_s + f_i + f_i \quad \because f_o = f_s + f_i$

$$\therefore f_{si} = f_s + 2f_i$$

where, f_{si} = image freq.

Then this freq. will also produces 'fi' when mixed with 'fo'. This IF signal can also be amplified by the IF stage, & will provide interference. The term 'f_{si}' is called as image freq. & is defined as the signal freq. plus twice the intermediate freq. ie. $f_{si} = f_s + 2f_i$.

(A) Image freq. rejection.

To avoid interference due to image freq. signal it is necessary that these signals do not reach the mixer. This can be achieved firstly by using the no. of tuned ckts. bet^n the antenna & mixer & secondly by using there selectivity against image freq. signals.

☆ Choice of Intermediate freq.

The following are the major factors affecting the choice of Intermediate freq. in a particular system.

1) If the IF is too high, poor selectivity & poor adjacent channel rejection.
2) A high value of Intermediate freq. ↑ses Tracking difficulties.
3) As the intermediate freq. lowered image freq. rejection becomes poor.
4) If the IF is very low the freq. stability of local or must be made correspondingly higher because any freq. drift is now larger propotion of the lower IF than the higher IF.
5) IF must not fall within the tuning range of the receiver, or else the instability will occured & hytrodyne whistle will be heard, making it possible to tuned the freq. band