An interfering signal is placed 45 Kc/s from the required signal in each case. If the frequency has been changed down from 5 Mc/s to 500 Kc/s the interference is greatly reduced. The shaded areas show the bandwidth for each transmission band.

The high Q value of the I.F. tuned circuits referred to above also improves their selectivity.

(c) Stability, or freedom from self-oscillation.

The chief cause of oscillations in the amplifying stages of a straight set is stray inductive and capacitive feedback. The amount of feedback increases with frequency so that the lower frequency I.F. amplifiers are less liable to instability. Also fixed tuning enables all the components of an I.F. tuned circuit to be easily screened.

(d) Fidelity, or the ability to reproduce the signal without distortion.

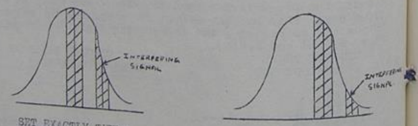
We have seen that the use of a diode detector in a superhet gives better reproduction than any other type of detector, but this is offset by another consideration. Referring to Figs. 2.5(a) and (b) it can be seen that whereas in the 5 Mc/s amplifier all the sidebands are amplified equally, in the 500 Kc/s amplifier there is considerably less amplification of the top and bottom sidebands. This means that the bass is amplified more than the treble and frequency distortion will occur. This trouble is greatly reduced by the use of band- tuning (see below under I.F. amplifiers), but frequency distortion is still there. In general the requirements for good fidelity and good selectivity are in opposition. Many service receivers incorporate a switch to enable one or other to be chosen. In general the fidelity characteristic of a superhet is poorer than that of a straight set.

2.6 Interference in the Superhet

(a) Adjacent Channel Interference

This is the same as poor selectivity. It is interference by transmission on a nearby frequency. A glance at Figs. 2.5(a) and (b) will show that the lower the I.F. the sharper will be the response curve and the less the adjacent channel interference. e.g., for an I.F. of 500 Kc/s the interfering signal (500 + 45 Kc/s) will be 9% off resonance; for an I.F. of 100 Kc/s the interfering signal (100 + 45 Kc/s) will be 45% off resonance and the response to it will be negligible.

Another way of reducing adjacent channel interference is to detune the set slightly as in Fig. 2.6(a) but of course this introduces distortion and should not be done if it can be avoided.



SET EXACTLY TUNED

SET DETUNED TO REDUCE INTERFERENCE

Fig. 2.6(a)

N.B. Adjacent channel inter

(b) Second Channel Interference

Suppose we are receiving a 5 Mc/s signal and the I.F. is 500 Kc/s. This means that the local oscillator must be tuned to 4·5 Mc/s in order to give the correct beat frequency.

Now if there is another station transmitting at 4 Mc/s this will also produce a beat of 500 Kc/s with the local oscillator, which will be amplified in the I.F. stages. The 4 Mc/s signal is said to be in the second channel. The second channel is sometimes called the image frequency.

In general there will not be an interfering station at exactly 4 Mc/s, but there may be one slightly off this which will produce a beat slightly off 500 Kc/s. This will combine in the detector with the original 500 Kc/s I.F. to produce an audible beat note, the characteristic heterodyne whistle. This may be made clearer by Fig. 2.6(b).

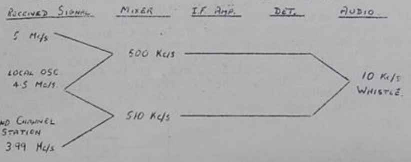
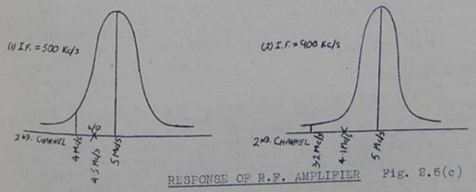


Fig. 2.6(b)

Notice that the whistle can again be reduced by detuning, and that detuning (i.e. alteration of local oscillator frequency) will change the pitch of the whistle.

The value of the R.F. amplifier can now be seen. Its purpose is not to increase the signal strength but to discriminate against unwanted interfering signals. Its effectiveness can be improved by using a high value of I.F. as shown in Fig. 2.6(c)



RESPONSE OF R.F. AMPLIFIER Fig. 2.6(c)