simply 'peaks' certain parts of the receiver for best performance at the chosen frequency. Simply adjust for maximum volume.

Intermediate frequency

All receivers, except *direct conversion* ones, change the frequency of the incoming signal to an *intermediate frequency* (IF) fairly early on. This is because it is easier to amplify and process a signal at a single frequency than over a whole range of frequencies. The intermediate frequency signal is eventually *demodulated* into *audio*.

Modes

There are several different ways of transmitting speech. On the HF bands *Single Sideband* (SSB) is used almost exclusively. There are two sorts of sideband — upper and lower (USB and LSB). On amateur bands below 9MHz it is usual to use LSB, whereas USB is the norm above 9MHz.

AM is rarely used by amateurs now, but it's useful to have it if you want to listen to broadcast stations. FM is very valuable if you envisage listening to the VHF and UHF bands, either on a VHF/UHF receiver or on an HF receiver with a converter.

CW stands for *continuous wave*, a rather inaccurate and old-fashioned term for Morse Code. (How can it be continuous if it's being keyed on and off?) The only difference to the receiver, compared to SSB, is that the *filter* used has a narrower *bandwidth*. The bandwidth is the difference between the lowest and highest frequencies it will let through. Morse consists of a tone of constant frequency that is keyed on and off (whereas speech uses a continuous range of frequencies) so a narrower filter will do.

When you discover how many signals are squashed into the short wave spectrum you will understand how important bandwidth is. You can minimise interference to the station you're trying to listen to by minimising the strength of stations on neighbouring frequencies. In other words you minimise the bandwidth.

Older receivers had switched filters, with bandwidths to suit the mode in use — typically 12kHz for amateur FM, 6kHz for AM, 2.7kHz for SSB and 600Hz for CW.

Modern receivers often have *IF shift* and *IF width* controls which allow continuous variation of the filter's response. **Figure 1** shows the effect of these controls. A typical crystal filter for SSB reception might be, say, 2.7kHz wide, symmetrical about the **intermediate frequency** (IF). Turning down the IF width might reduce this to, say, 1.8kHz. This would spoil the audio quality a bit, but it would certainly cut out 'adjacent-channel' interference.

The IF shift control doesn't affect the bandwidth, but moves the response up and down. It sounds a bit like turning the 'bass' down and the 'treble' up, or vice-versa. Again, this control can be used to get rid of interference on a close (or even overlapping) frequency.

Some rigs, eg. the Trio/Kenwood TS930 transceiver, do not have IF shift and width controls, but separate controls to move each side of the filter's response up and down in frequency.

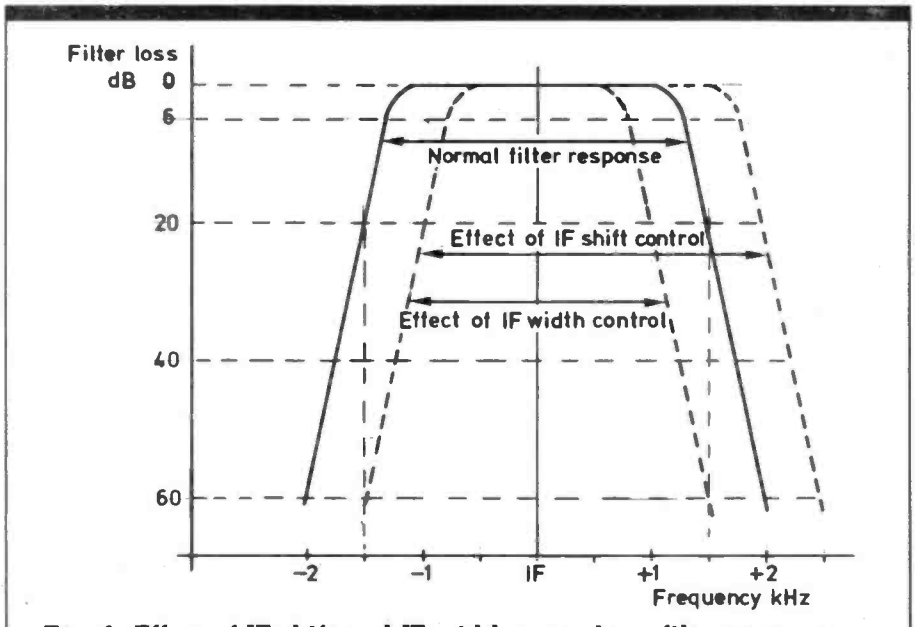

Fig. 1. Effect of IF shift and IF width controls on filter response.

Gain controls

'Gain' means the amount of amplification in the receiver. The various stages inside the set will, among other things, gradually amplify the signal bit by bit until it's strong enough to drive the loudspeaker. However it is important that the signal in each stage is of about the right voltage. If it's too strong, the stage will overload and produce *cross-modulation*. This means that you will hear interference from stations on different frequencies to the one you're tuned to. This can be avoided by reducing the *RF gain*, which controls the amplification of the earliest stages of the receiver. The drop in volume can be offset by turning up the *AF gain*, which controls the amount of gain in the last stages of the receiver. If, however, you turn the RF gain down too low and the AF gain up too high, the signal in most of the receiver's stages will be too low, and it will reward you with hiss.

For SSB reception it is advisable to keep the RF gain set lowish for good audio quality.

Automatic gain control (AGC)

The range of signal strengths on the short wave band varies enormously from one transmission to another, so it's desirable to reduce the receiver's gain automatically on strong signals. This reduces risk of overloading, and prevents you from deafening yourself when a strong signal appears.

A good AGC system has a fast *attack* and slow *decay*. The fast attack means that when a strong signal appears, the AGC will cut the receiver's gain down very fast indeed — typically in a thousandth of a second. The slow decay means that when the strong signal goes, the gain is wound up slowly, so that if the signal reappears after a brief pause (such as the pause between words) the gain is only slighly too high and can be corrected easily.

Many receivers have a fast and slow AGC switch. Slow is normally the best for SSB reception, because