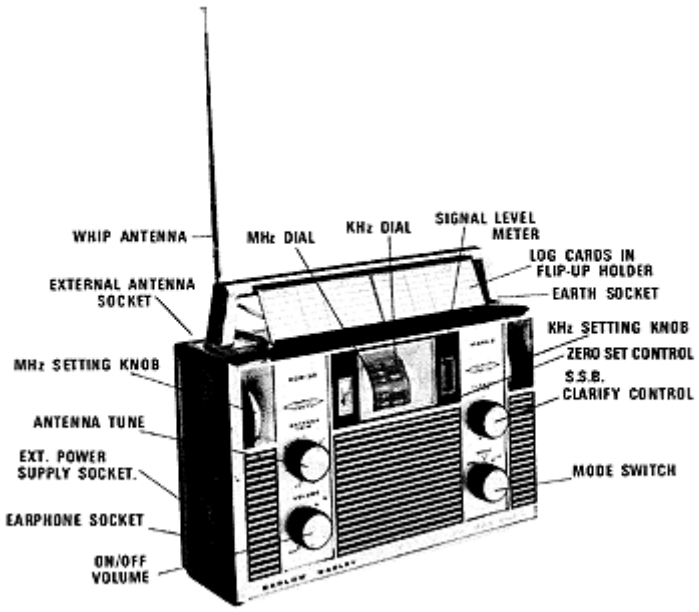
RECEIVER XCR 30,
RECEIVER OPERATING INSTRUCTIONS



General Description:

The XCR-30 is a specialised, high sensitivity portable shortwave receiver, designed to provide precision frequency tuning over the full shortwave spectrum up to 30 MHz, with exceptional frequency stability to both amplitude modulated (AM) and single sideband (SSB) transmissions.

The Circuit:

A multiple heterodyne circuit is incorporated wherein the harmonics of a 1 MHz quartz crystal control the frequency shown on the dials to an accuracy sufficient to locate and identify a station whose frequency is known. The crystal stabilises the received frequency to eliminate tuning drift over long periods of time and to provide stable single side-band pitch. Frequency selection is a composite function of two dials. The whole number of the frequency tin MHz) is displayed on one dial whilst the second dial displays the remaining decimal portion of the frequency.

The Aerial

A separately tuned whip antenna is provided which enables an excellent level of sensitivity for a portable receiver to be obtained, especially at the higher frequencies where signals are usually weak.
It is also effective for medium wave frequencies, since the circuit design allows reception down to 500 kHz. However for indoor use at this frequency, the aerial will not function as efficiently as the ferrite rod type in a conventional medium wave portable.

ZERO SET CONTROL

This is located immediately below the signal strength meter. It provides a means of zero setting the kHz dial to compensate for calibration errors due to temperature and/or humidity variations should this become necessary.

(1) Set mode switch to USB.
(2) Set MHz dial to any whole number.
(3) Set kHz dial to zero.
(4) Adjust zero set control to give "zero beat" in audio. That is, rotate
(5) zero set control until a whistle is heard, then adjust control to reduce the whistle to the lowest possible pitch. Rotation of the control in either direction from this position should increase the pitch of the whistle. "Zero Beat" has been established in this position.

THE ANTENNA TUNE CONTROL

To provide maximum sensitivity from the whip aerial it is desirable to "tune" the antenna separately by means of the control provided. The complete coverage from S00 kHz to 30 MHz is provided by one rotation of this control. It occurs in three segments as marked nominally on this control (.5 to 2MHz; 2 to 6 MHz and 6 to 30 MHz).
These are consecutive but may be regarded as continuous if desired. When searching for a weak station it is necessary that this control be set roughly in the appropriate segment.
Having tuned to a station, the antenna control should be peaked to give maximum signal on the signal strength meter provided. It can, however, be tuned by ear, observing rise in noise level.

TUNING :

Tuning an A.M. Signal:

1. Switch on and set volume
2. Set mode switch to AM ; ignore clarifier or set to centre of scale.
Set MHz dial to whole number of MHz. (e.g. Freq. 15.235, set 15 on
MHz dial).
3. Set antenna tune to appropriate frequency segment, peaking up noise or incidental signals present, if possible.
4. Set kHz dial to required fraction of a MHz or the number of kHz i.e. the figures after the decimal place in the frequency in MHz (e.g. 15.235 MHz set 200 plus three small divisions plus 1/2 a division).
5. If the station is heard, tune in accurately on the kHz dial.
Peak up the antenna tune by ear or on the meter. Peak up the MHz
Dial by ear or on the meter.
6. If the station is not heard, peak up antenna and MHz dial on any noise or other station heard and search one or two divisions either side of required frequency in case of logging error or dial error.

Tuning a Single Side Band Signal:

S.S.B. Signals of interest to the general listener occur mainly on the amateur bands. They will be encountered with the receiver in the AM mode, as described in the procedure for tuning an A.M. signal. To make SSB Signals intelligible it is necessary to:-

1. Switch to the appropriate U.S.B. or L.S.B. mode, transmissions on the 14. 21 and 28 MHz bands are invariably in U.S.B. mode whilst 3.5 and 7 MHz band transmissions are usually in L.S.B. mode.
2. Pitch the sound by means of the kHz dial initially and finally adjust using the S.S.B. clarifier control.
3. Should the signal be lost by the narrowing of the band pass on S.S.S. mode, a slight re-tuning will recover it.

Once clarified a S.S.B. signal can remain correctly pitched for quite long periods on this receiver although transmission stability not uncommonly causes the pitch to wander and requires following on the clarifier control. It often happens that the two or more transmissions on a two way "net" are not always pitched quite the same, and require adjustment of the clarifier control.

Tuning a Continuous Wave or Morse Signal:

Most radio Morse signals are not tone modulated and are heard simply as a succession of 'thumps" rather than the coded tone required, when received in the A.M. mode. This receiver will convert them to a coded tone by using either of the S.S.B. modes and adjusting the tuning and/or clarifier to give a suitable tone. An interfering station may often be rejected by using the alternative mode or pitching the unwanted signal down to a low inaudible frequency.

BATTERIES:

Six "C" size (1.5v) cells. These are fitted into the battery case provided inside the set by turning the two back cover securing screws anti-clockwise until the back cover can be opened. Care must be taken to observe battery polarity as indicated in the battery case.

External Batteries and Phone Jack Sockets:

An external phone socket is provided on the left hand side. The external phones or speaker should be not less than 8 ohms impedance. The jack disconnects the internal speaker automatically. An external power socket is provided alongside the phone socket.
The receiver has an internal voltage regulator and thus a D.C. voltage supply from about 7 to a maximum of 14 volts can be applied. The voltage is regulated to 6.5 volts and at or below this voltage regulation ceases. The receiver will however work quite satisfactorily off a 6 volt supply of good regulation such as an accumulator, and may still be useable down to about 5 volts.
Care must be taken to observe correct polarity.
Centre contacts of plug and socket provided are negative.

External Aerials:

The input circuits of this receiver are adapted to give maximum performance on the whip antenna. When used out of doors an additional aerial, unless specially designed, is unlikely to improve performance. An unduly large aerial may produce overload effects and therefore must be correctly padded and adjusted to give suitable levels of signals and performance.
Indoors, particularly within a ferro-concrete or similar building, an external aerial may be advantageous or essential. This is usually an open elevated wire of some 50 feet in length, connected to the aerial socket provided. This socket is lightly coupled to the input to avoid unduly strong overload interference. If a short external aerial is being used connect it directly to the whip (which should be retracted). The antenna tuning should always be rechecked if a change is made from one aerial arrangement to another.
An earth terminal is provided for use in circumstances where advantageous.

Accessories: (Provided with each set)

1. Earphone plug (grey)
2. External power Supply plug (grey)
3. External aerial plug (red banana plug)
4. World Radio and TV handbook /in which will be found the frequencies of practically ail known transmitting Stations throughout the world and a host of other useful information for the enthusiast).
5. Log cards (5 in flip-up holder on top of set and 10 spares) on which can be logged identities, frequencies, time of day and time of year for instance, of stations which are of particular interest to you. On account of the high setting accuracy of the set, this will enable you to return to a previously heard transmission with the certainty of hearing it if the conditions are suitable.
6. Guarantee card - do not forget to complete fully and send off as indicated.

NOTES FOR THE ENTHUSIAST

1. On AM the selectivity is switched to 6 kHz total (3KHr Audio) which gives optimum separation of stations without loss of intelligibility.
2. When the Mode Switch is switched to SSB. This provides a 3 kHz band-pass,(i.e. half the foregoing) switches the detector circuits for SSB detection, and switches on the B.F.O. (beat frequency oscillator) This oscillator is fixed in frequency on one edge of the band-pass and on switching from L.S.B.
to U.S.B. it is transferred to the other edge of the band-pass.
3. The operation of the SSB clarifier as a fine control on AM has the effect of displacing the main frequency calibration by 1.5 kHz (3 kHz overall). This displacement is insufficient to be readily observed and can be ignored in AM tuning. The control can best be operated, for fine tuning, in conjunction with the hetrodyne note as follows:

Switch temporarily to the U.S.B. (also marked T) position, where a strong whistle or tone will be heard. If this tone is reduced to zero frequency more or less, by means of the kHz dial or the clarifier, the station will be accurately centred. This is so because the USB mode places the B.F.O. at the centre of the AM band-pass, the SSB band-pass being located within one half of the AM Band-pass. The LSB mode Must not be used in this manner as this will place the AM carrier on the edge of the AM band-pass.

4. In practice the MHz dial should be set roughly to indicate the MHz portion of the frequency required. Subsequently it may be adjusted slightly in order to strengthen the reception. It may also be adjusted to eliminate certain types of

interference due to image channel effects. This displacement shifts the images until they cannot be heard, without affecting the main tuning. This is an advantage of a multiple heterodyne design over a conventional heterodyne design where such an image effect cannot be shifted. An image effect is usually heard as a whistle on the required station which varies in pitch as the receiver is tuned. A whistle which does not vary in this way is usually due to other causes such as an adjacent station. Ensure that any interference encountered cannot be eliminated by slight adjustment of this dial.

5. Having tuned the station on the MHz and kHz dial the antenna control should be peaked up to give maximum signal on the signal strength meter which is provided for this purpose. Alternatively this may be done by ear, particularly on a weak station where the optimum antenna tuning is easily heard. A strong station may not change much audibly with antenna tuning, but should nevertheless be peaked up accurately on the meter, otherwise optimum reception will be lost should it weaken or fade deeply. The meter is provided for this purpose although also useful for comparing alternative transmissions etc.
When searching generally over a limited band e.g. an amateur band or particular broadcast band, the aerial tuning may be peaked up on any station in the band, or simply on the noise, and ignored until a station is located for protracted listening, when a final touch up may be made. This procedure is very effective over most of the coverage of the receiver, but at lower frequencies and the medium wave frequencies particularly accurate antenna tuning is usually called for.

Reception of Time Signals and Calibration or adjustment of Dial Scales

Radio time signals from observatories and similar institutes are continuously receivable in most parts of the world. The majority of signals of interest are transmitted on exact multiples of 1 MHz (most often 5 MHz, 10 MHz, 15 MHz and 20 MHz). This receivers internal crystal produces continuous unmodulated signals at each exact multiple of 1 MHz as can be observed by setting the kHz dial to 000 or 1000 on each MHz band) which will beat with the time transmissions. This is strictly a shortcoming of this type of crystal controlled receiver which cannot be completely eliminated without making it unduly expensive for its intended use. However, the time signals, unless they are very weak, can usually be satisfactorily received on these whole number MHz, as the precision of the internal crystal is sufficient to produce only low level inaudible beats with the time transmissions.
This low frequency beat which can often be observed on the signal strength meter serves to check the internal crystal, and internal adjustment in the receiver is provided for setting this crystal accurately. These 1 MHz marks are also useful to check the accuracy of the kHz dial and are perhaps best observed with the aerial down and U.S.B. mode in use to centre the tuning exactly to zero beat.
Adjustment of the extremities of the kHz scale can then be made (by anyone sufficiently skilled) by means of the internal adjustment of the trimmer and inductance of this kHz oscillator, which is the section closest to the scale drum, the 000 being set on the trimmer and the 1000 being adjusted by the inductance, alternatively until the extremities are both in exact agreement. Although it is not intended that such adjustment should be necessary nor undertaken except by a skilled person, it is useful that this can be achieved
in circumstances where no instruments other than the receiver itself are available.

3. Adjustment of B.F.O.

The change in frequency of the B.F.O. from L.S.B. to U.S.B. is set by a trimmer adjustment to about 3 kHz change. The use of accurate instruments to set this is necessary and there is little reason for this to change with time provided it is not disturbed.

The absolute frequency of the B.F.O. may however suffer change with time or abnormal climatic conditions, and this can be accurately set without the use of instruments by adjusting the inductance (lower corner can) until the noise with aerial down, sounds the same in the two modes, indicating the 3 kHz side-step is symmetrically placed on the band edges. Only a small fraction of a turn would normally be required to reset.