A QUICK GUIDE TO BUYING A SHORTWAVE RECEIVER

INTRODUCTION

Once you have discovered the thrill of shortwave listening, you will want to obtain a receiver. Although the choice of whether to buy a new receiver or obtain a used one is entirely your decision, some guidelines would be useful. This article will provide an overview of the different types of receiver available and the associated pro's and con's.

Some may just want to have a receiver they can take with them on business trips or holidays, others may want a sophisticated base station receiver with all the accessories. Luckily, there are receivers available to suit all tastes (and budgets). There are things to be taken into account when deciding to purchase a receiver. The pertinent points are detailed below.

BUYING A RECEIVER - BASICS

When purchasing a receiver, you need to make some decisions about the kind of receiver you wish to purchase. The choice of new and used receivers is bewildering and can be confusing without the right knowledge. Manufacturers do little to help you decide as the adverts tend to give you a list a features and specifications that mean little to the newcomer. So the time has come to buy your receiver, how can you be sure to get the one that best suits your needs?

BUDGET

Firstly, you need to consider your budget and how much you are willing to spend on a receiver. The normal rule of thumb is that the more you spend, the better receiver you will get. This is not always the case, but generally more money = better performance. Will you be buying a new receiver or purchasing a used one? When buying a used receiver, you will get more radio for your money but at the risk of having little or no guarantee. If you are technically minded then this may not be such a worry as you may be able to repair any fault yourself. If, however, you do not wish to attempt a repair there are many shops that will repair a faulty receiver for you, at a price though! Buying new will give you the peace of mind that if anything goes wrong at least it will be covered by the manufacturers warranty (at least for the first year), but of course a new receiver tends to be more expensive than a comparable second hand unit.

WILL IT BE SUITABLE FOR MY NEEDS?

The next thing to consider is what you intend to use the receiver for. Will it be used for general listening?, does it need to be compact enough to fit into a suitcase? Will it be used for listening to radio hams etc.? Do you have room/permission to put up an outside antenna? The answers to these questions will govern how best to spend your hard earned money. Before making a purchase, it is wise to consider if your requirements are likely to change as your interest grows. You may find that after a few months of listening to broadcast stations you begin to wonder what all the other strange noises that are dotted about the bands are. You will probably become frustrated if you are not able to listen to them because your receiver does not receive SSB. If your interest lies in listening to the News from home when you are away on trips, then a more basic receiver would meet your needs.

TYPES OF RECEIVER

There are two basic types of shortwave receiver: the portable that is powered by it's own batteries (or an external power source). These tend to be fairly small, so they can be packed in hand luggage or carried around without problem. The second type is the desktop, or base station receiver. These receivers tend to be larger and designed to operate on a desk and require an external power supply and aerial. Desktop receivers normally have more features and are more expensive to buy. There are a few receivers that don't really fall into either category. The Grundig Satellit range of receivers is an example, although they can run on batteries, have their own antennas and have a carrying handle they are very large and heavy, so are not exactly portable, but they are not really true desktop receivers either.

Although the specifications and features found on receivers varies, a few controls are common to virtually all. With even the most basic of receivers you will find things like a

volume control, tuning control, band selector (for LW, MW, SW and FM) and some form of frequency display (be it analogue or digital). With more advanced and expensive receivers extra features are to be found, such as memory channels, keypad frequency entry, SSB (single side band) facility, signal strength meter, external antenna connections, RF gain, AGC (Automatic Gain Control) etc. Top of the range receivers have built in computer control capability, DSP (digital signal processing) and multi level software menu systems that allow the user to tailor virtually every aspect of the receiver to their liking.
Receivers that feature full frequency coverage and offer a choice of modes are commonly known as 'communications receivers'.

Prices vary enormously, for a basic receiver that covers MW, FM and a selected portion of shortwave you could expect to pay as little as $50/€50 for a new set. A sophisticated communications receiver with all the bells and whistles could command a price tag of $2000/€2000 or more. Most listeners' choice will fall somewhere between the two. Used receiver prices are dependant on whether you choose to purchase from a private seller, or through a dealer. Dealer prices are generally higher, but you do have at least some peace of mind. With a private sale, you really do need to examine the receiver fully and ask to see any repair receipts. Caveat Emptor (Buyer Beware!), is the phrase to remember with private sales.

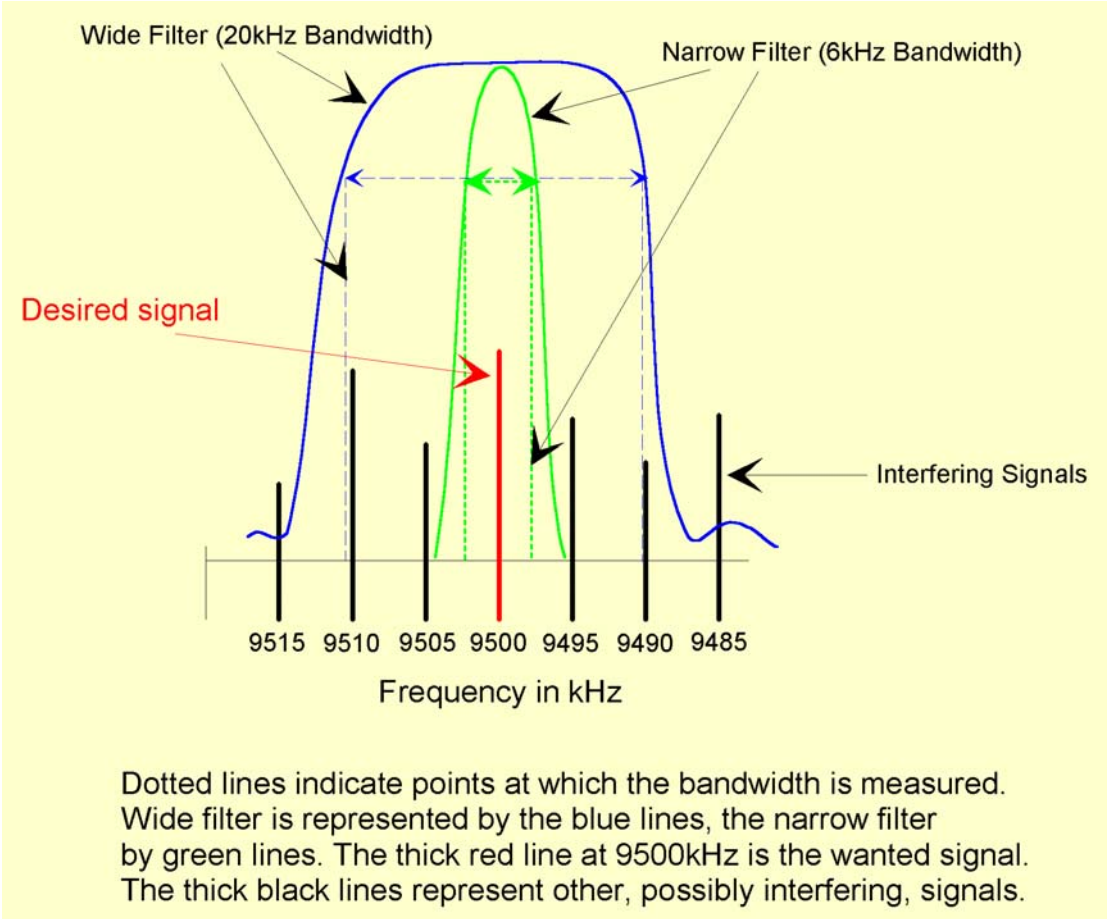
UNDERSTANDING THE ADVERTISEMENTS:

There are a few terms listed in the advertisements that are put there in order to confuse the casual reader into thinking the receiver on offer is better than it actually may be. Although these figures etc. are not outright lies, they can be manipulated to make the reader think the receiver has better performance than a comparison receiver. The way they do this is to use a reference for their figure that gives the impression of better performance, antenna manufacturers are a well known exponent of this kind of advertising. If you know what you are looking at, it can help clear the smoke screen a little.

SPECIFICATIONS - BASICS

SENSITIVITY: This is a measure of how weak a signal the receiver can pick up. Unlike most specifications, a lower figure (if quoted in μV) is better. Sensitivity on it's own does not make a good receiver, but one without adequate sensitivity will appear 'deaf'. As a general rule, the more expensive communications type receivers and higher performance portables have better sensitivity than a cheap portable. There is a reason for this! Cheaper models tend to be susceptible to 'OVERLOADING', which is when a signal becomes too strong for the design of receiver. Overloading causes distortion in the RF stages (the part of the receiver that actually detects, amplifies and sorts out the wanted signal from all the others being picked up). Distortion in the RF stage of a receiver can cause howling from the speaker, hearing two stations at the same time or hearing local stations all over the dial, as well as where they are supposed to be. By reducing the signal level the chances of overloading are greatly reduced. To test the overload theory find a cheap portable, attach about 10 metres of wire to the telescopic antenna and tune around the 41m (7.1MHz) broadcast band after sunset. The results are not pleasant to the ears! This is a particular problem in Europe where there are a large concentration of high powered broadcast stations all crowding into a relatively few frequencies. Signal levels presented to the receiver can be enormous, and even better quality receivers can suffer from the effects of overloading. One control found on the majority of portable receivers is a "local/dx" switch. This control allows the user to switch in circuitry to reduce the signal level presented to the receiver ("local" position) or to allow the full signal to pass through ("dx" position). Some receivers have a similar control called "RF gain", which does the same thing but is normally variable rather than switched. The instruction manual for the receiver will give details of what controls are available and how to use them. If you will be using an external antenna with a portable, it would be wise to begin with the switch in the "local" position, or with the RF gain reduced. This will greatly reduce the possibility of overloading.

SELECTIVITY: This is the ability of a receiver to separate two stations on nearby frequencies. Sensitivity and selectivity go hand in hand as far as overall performance is concerned. Cheaper models do not have the ability to separate strong stations on adjacent channels, so you hear both stations together. More expensive receivers are better able to filter these signals. Filter is the important word here. Most money is spent on the filtering side of a receiver, so if you were looking to cut production costs that is the place to start – put in cheaper filters! The main types of filter found in receivers are ceramic (cheapest), crystal, mechanical and digital (the last two are the most expensive and effective options). Receivers with ceramic filters tend to be at the cheaper end of the pricing spectrum, and offer reasonable performance for the money paid. If you live in an area where lots of very strong signals are likely to be encountered (Europe), you may experience problems with separating stations that are on nearby channels. The channel spacing for shortwave is 5kHz, but the ceramic filter will allow 4 or more of these channels to pass through (it is termed a 'wide' filter and has broad 'skirts'). Crystal filters offer much better rejection of adjacent channels (as it has steep skirts) but you may still hear two stations simultaneously. The very top notch filters Such as mechanical and digital offer excellent adjacent channel rejection and have extremely steep skirts. Digital filtering has earned the nickname of 'brick wall' filtering, because it is though someone has built a wall between adjacent channels, with virtually no unwanted signal creeping into the channel you are listening to. Digital filters are only to be found on the higher end receivers, and are quite unnecessary for the average listener.



This is a graph comparing a wide ceramic filter of the type fitted to cheaper receivers to a narrower crystal type filter, as found on more expensive receivers. The blue line represents the ceramic filter and the green line the crystal filter. If the receiver is tuned to a strong signal on 9500kHz, using the wide ceramic filter, in addition to the signal on 9500kHz, the signals on 9495, 9505, 9510 and even the ones on 9490kHz and 9515kHz will be heard at the same time. Although the signals on 9490kHz and 9515kHz are outside the filter's bandwidth (or passband as it is also known), some of the signal will still get through to cause problems.

Now compare this to a receiver tuned again to 9500kHz, but this time with a better quality filter (shown by the green line).The only signal within the filter passband is the wanted signal on 9500kHz, so no interference from other channels should be expected. As can be seen, the cheaper ceramic filter will be of little use on a congested band, but would suffice on a quiet band where the stations are spread out.
When looking at the specifications of receivers, the filtering is normally quoted as having a bandwidth (or passband), which in simple terms is how many frequencies either side of the desired one a receiver will hear. A filter with a quoted bandwidth of 10kHz means that frequencies 5kHz either side of the centre frequency will pass though. For broadcast radio listening on MW, a filter bandwidth of 9kHz is OK, for general SW listening 6kHz is the best. For crowded bands, 3 to 4kHz will help reduce the interference without reducing audio quality significantly. If your interest lies in ham radio and SSB utilities, you will need to look for 1.8 to 2.4kHz and for Morse code reception 250 to 500Hz. As the filter bandwidth is reduced, audio quality reduces (due to the fact that the lower and higher frequencies contained within speech and music are blocked by the filter). As most of the intelligence in speech occurs between about 1 and 3 kHz, a filter can block frequencies outside of this range without degrading the intelligibility significantly. Using a narrow filter for general SW listening could become tiresome as the received audio may appear muffled, but on a crowded band it may be your only choice, as a wider bandwidth would let through other signals, making it impossible to hear the desired station. Some cheaper receivers appear to offer a selection of filters such as wide (also known as a “music” filter) and narrow (or “News/Speech”), but these filters may not be what they appear! In order to further reduce production costs, some manufacturers use filters on the audio side rather than the RF side, which means that instead of actually reducing the interfering signal, they just reduce the audio bandwidth. Audio filters are reasonably effective and can help combat less severe forms of adjacent channel interference and certainly better than having no filter, but are no match for a crystal filter!

FREQUENCY DISPLAYS

There are two main types of frequency display found on receivers, which are analogue and digital. Cheaper receivers use analogue displays, the familiar tuning dial and pointer arrangement. With smaller receivers this can mean that a lot of stations are squeezed into a small portion of the dial, making it difficult to separate stations and also difficult to be sure exactly what frequency you are tuned to. Larger portables have a much longer scale, making tuning and frequency identification easier. Tuning accuracy with analogue displays can be a problem, especially with older receivers. The more modern approach is to use a digital display, similar to those found in clocks and watches. These displays have several advantages over their analogue counterparts 1) the actual frequency is displayed on the screen, 2) they are more reliable than analogue displays (they contain mechanical parts and drive cords which are difficult to replace); 3) with a digital display, other information can be displayed such as a station name or world time. 4) digital displays are more accurate than analogue ones. With the advances in microprocessor design, falling prices mean that manufacturers of the cheaper receivers are taking advantage of digital displays.

Digital display, showing frequency to nearest kHz, plus other information

Analogue display, with pointer, shows only approximate frequency.

FREQUENCY COVERAGE

Frequency coverage is another area the manufacturers try to save money in. Cheaper models very rarely have coverage of all shortwave broadcast bands, and in some instances miss out important bands altogether. Coverage of the 49m, 31m, 25m, 19m and 13m broadcast bands must be set as a realistic minimum requirement if you are to enjoy your listening. Most major broadcasters use many different frequencies to ensure they reach their intended target audience and your receiver needs to cover all possibilities, otherwise you may miss out. Higher priced receivers offer full coverage from 150kHz (LW) right up to 30MHz, often without gaps. A receiver of this type will allow you to enjoy your hobby to the full.

MODES

Most broadcasters use AM (Amplitude Modulation) on LW, MW and SW. FM (Frequency Modulation) is used by broadcasters in the VHF broadcast band from about 87 to 108MHz. Another mode being used by broadcasters is SSB (Single Side Band). This cannot be resolved on a standard broadcast receiver, if you tune to an SSB signal it would sound very distorted (some call it 'duck talk'). To receive SSB, you need a receiver with a BFO (Beat Frequency Oscillator), which inserts the missing carrier (it is removed by the transmitter to economise on power and bandwidth) and renders the signal intelligible. The quality of an SSB signal is not as great as you would expect to hear from an AM broadcast station but the same signal requires much less power to reach the desired target when SSB is used as the transmission mode. Radio amateurs ('hams') use SSB frequently as do the HF aeronautical, naval and utility services. If you own a receiver with SSB capability, the world really does open up for you. Morse code (CW or Continuous Wave) is another mode you will hear with your SSB receiver, although for best results a narrow bandwidth filter should be used. Morse code is another mode of communication favoured by hams, navy and utility services. CW is even more effective than SSB at getting through on a noisy band, although the ability to read the Morse code being sent is a distinct advantage! Morse code is fairly easy to learn, providing the correct methods are used together with a few weeks of practice. Some of the other signals that can be heard are digital (such as radio teletype – RTTY, Sitor etc.) but these require decoders and usually a PC and so are outside the scope of this article. Some receivers offer enhanced AM reception by way of ECSS (Exalted Carrier Suppressed Sideband). ECSS can make a vast difference to the quality of signal received and is a definite plus if your receiver has this capability. ECSS is a feature normally found on mid to high performance receivers.

ANTENNAS:

The antenna is one of the most important features of any receiver. A good receiver will not perform well if it is connected to a poor antenna, similarly a poor receiver will give better results if it connected to a good antenna. Your receiving capability is only as good as the antenna you use.

Portable receivers have their own in built antennas and these generally give adequate performance. There are normally two types of antenna found on portable receivers, the ferrite bar and the telescopic rod. The ferrite bar antenna is normally hidden inside the receiver and consists of a bar or slab of ferrite (which is an iron ore, powdered and reformed as a slab, rod or bar) with coils wrapped around it. The ferrite bar is used for LW, MW and lower SW (up to about 4MHz). There are many grades of ferrite, which have differing properties and uses. If your receiver uses a ferrite bar for LW, MW and SW, there will probably be two separate antennas, one covering LW and MW, and another covering the lower SW bands (this is due to the grade of ferrite used for MW not being effective at SW and vice versa). Ferrite bar antennas are directional and can be used to peak a signal, or remove an interfering one. To check if your receiver has an internal ferrite bar, remove any other external antenna (and retract the telescopic rod) and tune across the MW band. If you can hear signals, then it is a sure sign of an internal ferrite antenna. The other type of antenna found on portable receivers is the telescopic rod. This type of antenna is used on the VHF (FM) band and also for SW reception. When using the telescopic rod on the VHF band it is necessary to adjust the length, and also swivel the antenna around until the best signal is obtained. When using the

telescopic rod on SW, most receivers will require the antenna to be fully extended and normally work best if vertical. You may find that if you are inside a metal building, better signals are obtained by placing the receiver near to a window or pointing the telescopic rod towards the window. This is because metal buildings (and buildings with reinforced concrete) block the path of radio signals. If you intend to use an external antenna with your portable receiver, it is best to retract the telescopic antenna fully.

LISTENING REGULATIONS:

Before buying a receiver, it is wise to check the regulations in your country with regard to listening. These regulations vary from country to country and can carry a severe penalty if breached. Some countries will not allow certain types of receiver to be used or must have restrictions to the frequency coverage. As a general rule the following types of transmissions can be received legally: Legitimate broadcasters, such as national and international radio stations; Standard Time and Frequency stations and Radio Amateurs (hams). It is probably NOT legal to listen to pirate or unlicensed radio stations and utility stations (such as point to point, aeronautical, naval and military) or telephone links so it would be sensible to avoid these, unless the correct license can be obtained.

Other features that can be found on various receivers are the ability to connect an external antenna. This is important if you are listening to weak stations or are in an area of poor signals. The external antenna can be anything from a random length of wire to a full blown multi element beam type (like a TV antenna but much, much larger). Most portables will show some improvement if a few metres (say 5 to 10m) of wire is clipped to the telescopic antenna, but beware of overloading the receiver as mentioned previously. Features like sockets for headphones or an external speaker are most desirable, some have FM stereo available through the headphone socket. Provision for an external power source is also a priority as running a receiver on batteries alone can prove expensive. Backlighting of the dial or frequency display is useful if using the receiver in poor light.

A selection of recommended receivers:-

UNDER €100

€100-€250

Sony SW100, ICF7600, Sangean/Roberts ATS909

€250-€500

Drake R8

€500-€1000

Icom ICR 75, Ten Tec R340

OVER €1000

NRD535, NRD545, Watkins Johnson, Kneecap and snoring,

Below are listed just some of the receivers available on the used market. Prices and performance vary with age and condition.

USED RECEIVERS:
YAESU FRG7, FRG7000, FRG7700, FRG8800
TRIO/KENWOOD R600, R1000, R2000, R5000
ICOM R70, 71
SONY ICF6800w (orange badge), ICF2001D, ICF7600 (all versions)

GRUNDIG Satellit series, Melody Boy and Yacht Boy series
JRC NRD 515, 525

Listed below are a selection of older valve (tube) or hybrid (valve and transistor) receivers to be found in advertisements. It should be borne in mind that these receivers are often in need of restoration and re-alignment and are not necessarily suitable for every listener. These older receivers can produce extremely good results once restored.

OLDER (VALVED/TUBE) RECEIVERS:
TRIO QR666, 9R59DS, R820
RACAL RA17
EDDYSTONE S640, EC10 etc.
NATIONAL HRO
MURPHY B40
HALLICRAFTERS – Any model
COLLINS – Any model
Software receivers (such as the models offered by Icom, Win Radio and Ten Tec although versatile, do not tend to offer the same level of performance as a dedicated separate receiver

When the time finally comes to purchase your receiver, do some homework and read as many reviews as possible covering the models you are interested in. Draw up a shortlist of receivers and then go to the dealer and try them out. This could be a problem if buying a used receiver but most sellers are willing to let you see the radio working. As much as there is a temptation to buy then and there (especially when in a dealer's shop!), walk away and have a coffee. If the feeling is still as strong after you have finished, then you should buy. This half hour 'cooling off' period will let you think about the pro's and con's of the receivers you have seen without the pressure of a salesperson. If you are in any doubt then I would suggest looking at alternatives. You are liable to spend many hours in front of your receiver so it has to be the right one for you. What suits one does not always suit another!

Once you have purchased a receiver, it is a good idea to thoroughly read the instruction manual. Doing this will introduce all the features of the receiver and will teach you things like how to program memory channels or how to scan between two frequencies. Memory channels are useful for storing your favourite stations, or for storing stations that you would like to return to at a later date. With the complexity of the modern receiver programming memory channels is quite often more difficult than it would first appear, and without the instruction manual can seem quite impossible.