ANTENNA HANDBOOK

Radio Canada International

RECEPTION CONDITIONS IN THE TARGET AREA

When a radio signal finally reaches the target area, it then comes completely under the control of the SWL. The quality of signal picked up will depend completely upon the type of antenna that has been erected, because it should be remembered, that the antenna will make the difference as to whether it is a good or bad signal that is being fed to the receiver. It should always be kept in mind that, good results can be obtained from an inexpensive receiver by erecting a good antenna, and vice versa, a good expensive receiver is not much use without an antenna. Or in other words, the receiver is only as good as the antenna to which it is attached. In the target area the enemy of any incoming signal is noise. It is noise that tends to deteriorate the listening quality of the radio signal. This noise comes from many sources, but there are various ways of combating it. The first type of noise is receiver noise. This depends on the type of receiver being used, that is, its circuit and the components used in that circuit. Therefore, an SWL when buying a receiver should obtain one that gives him a high signal to noise ratio. The second type of noise is radio noise. This noise is made up from man-made noise, QRM, and natural noise, QRN, which in itself is made up from atmospheric and extra-terrestrial sources. The man-made noise is generated from sources such as electrical appliances and apparatus like electric drills, electric saws, car ignition systems, etc. The natural noise is composed of signals generated by electrical storms or radio signals coming in from cosmic sources. These two types of noises are more difficult to overcome. However, by the use of a high-gain, directional type of antenna, it is possible to obtain a stronger radio signal, thereby giving a better signal to noise ratio for feeding into the receiver.

THE WHIP ANTENNA

This type of antenna is the answer to the antenna problem for a great number of listeners who live in apartments or in cities where they do not have enough space to erect any other type of outside antenna, since it is one of the simplest to erect. It can be made either from an automobile antenna, or from a length of small diameter piping. When properly erected it can give very good results. Like any other antenna it should be erected as high as possible and away from any obstructions. Therefore the best place to erect it would be either on the roof, the chimney or on a high pole. This type of antenna is omni-directional which means that it will receive signals equally well from any direction. However, if it is erected on a window sill or along side a building this will of course impair its reception qualities, due to the large mass of the building along side it. The lead-in for this type of antenna can be either a shielded co-axial type or the normal insulated wire. If the listener lives in an area where the noise level is not too high, there can be some advantage in using the normal insulated wire as a lead-in since this, in effect, is similar to increasing the length of the antenna. Figure 3 shows a typical installation of this type of antenna on a pole. Under normal reception conditions the whip antenna will give very good results. However since it is a vertical antenna it is also very responsive to atmospheric and man-made noise.

WHIP ANTENNA

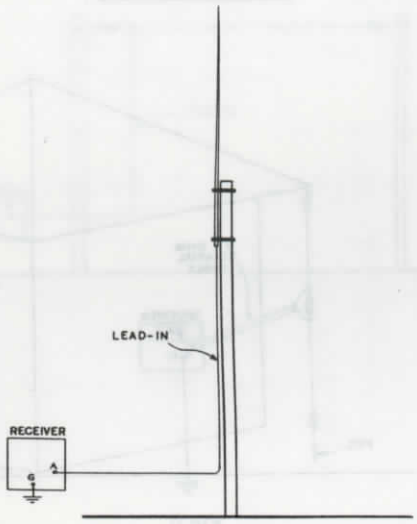

FIG. 3

THE VERTICAL DIPOLE ANTENNA

The vertical dipole is an omni-directional type of antenna and will have its greatest efficiency when cut to a specific length corresponding to a given frequency band. The dimensions of this antenna are exactly the same as those for a horizontal half-wave dipole. However, since it is erected vertically it takes on the omni-directional characteristics. Figure 11 shows a typical installation for this type of antenna. A length of a 75 ohm co-axial cable will make a suitable lead-in for this antenna. Those listeners wishing to obtain reception over a number of frequency bands, should but a vertical dipole for each of the frequency bands they require. This series of vertical dipoles can then be supported from a common support and each of the lead-ins brought into the receiver. In this case a multi-switch should be used between the lead-ins and the antenna connection to the receiver. This will provide a method for the easy selection of the required antenna. It should be remembered the lead-in will have to be taken away from the antenna at right angles, for as great a distance as possible. In this case it will mean therefore that special supports will have to be used. Like other types of vertical antennas, the vertical dipole is more responsive to man-made and atmospheric noise than horizontal types of antennas.

VERTICAL DIPOLE

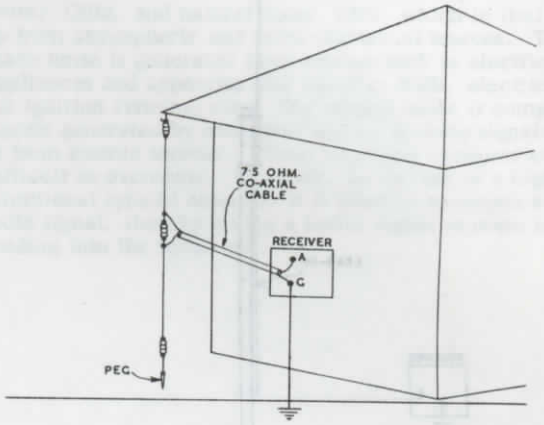

FIG.11

THE INVERTED "L" or MARCONI ANTENNA

This type of antenna is also omni-directional and therefore can be erected to suit the available space. A look at Figure 5 will show why this antenna has got the name of the Inverted "L". The horizontal section should be about 45 to 50 feet long made of stranded copper, if possible, in order to give it strength and be securely supported at either end. The down lead can be of the same type of wire as the antenna, but in this case it is advisable to have it insulated. This will prevent the signal from being shorted to ground should the wire accidently touch the building. Should one, or both ends of the antenna be attached to trees or some other support that is likely to sway in the breeze, it is advisable to have a pulley and counterweight arrangement at the ends. This will prevent the antenna from sagging or tightening too much, and so prevent any likely breakages. The lead-in should be connected to the end of the antenna that is nearest to the receiver, and this will therefore keep it as short as possible.

MARCONI INVERTED "L"

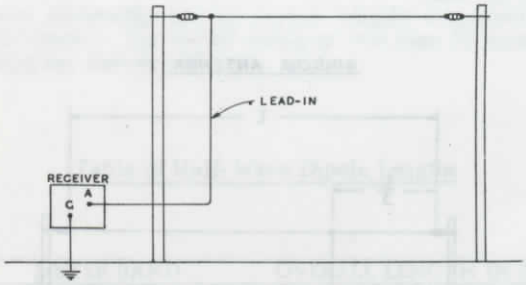

FIG.5

THE WINDOM ANTENNA

This antenna got its name, Windom, after the first experimenter to use and write an article about it. It is a directional type of antenna, and reception is best when the antenna is broadside-on to the incoming signal. The length of the antenna is a half wave length and is cut to the lowest frequency band to which the antenna will be used. The length therefore is determined by the expression;

$$L = \frac{468}{F}$$

where "L" is the required length of the antenna in feet, and "F" is the required frequency in megacycles per second.

It is important that the lead-in be connected at the proper position on the antenna and this should be at 1/3 of the antenna length from one end. Since the down-lead should also be kept as short as possible, it therefore follows that it will be best if the lead-in is connected one third from the end of the antenna that is closest to the receiver. Figure 6 shows a typical installation of this type of antenna. A lead-in can be made from the same type of wire as the antenna but it should be insulated to prevent it from shorting to ground. The antenna should be erected as high as possible and the lead-in should be allowed to drop freely from it, for as great a distance as possible, before any bends are made. A Windom antenna suitable for use from 10 to 80 meters, that is, through all the international shortwave bands would be 126 feet long and have the lead-in connected at 42 feet from one end.

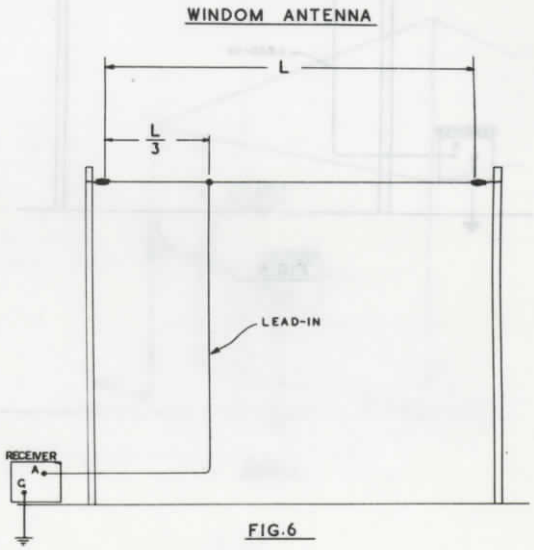

FIG.6

THE HALF-WAVE DIPOLE

This is another directional antenna with the best reception being obtained when the antenna is broadside-on to the incoming signal. It is a centre fed tuned antenna intended for best results over a relatively small band of frequencies. The total length of the antenna is, as its name implies, half the wavelength of the frequency for which it is to be used. However, this half-wave length is divided in the center by an insulator, thus giving two poles, each a quarter of a wave length long. The lead-in for this type of antenna should have an impedence of 75 ohms and can be either of the co-axial or twin lead type. If co-axial lead-in is used then the center conductor should be connected to one half of the antenna at the center insulator and the outer shield should be connected to the other half of the antenna at the other end of the center insulator. If twin lead is used then the conductors should be connected one to each side of the antenna at the center insulator. As with the Windom, the lead-in should be allowed to drop freely at right angles from the antenna for as great a distance as possible, before any bends are made. Then any bends that are necessary should be made as gradually as possible. Since the half-wave dipole is cut for a specific frequency band, it will therefore be necessary to erect a dipole for each band the listener wishes to use. If a series of half-wave dipoles are erected, it will be found convenient to connect all the lead-ins to a multi-switch. This will make it easy to select the antenna to match the band to which the receiver is tuned. Figure 7 shows a typical installation of the half-wave dipole. The following table gives the overall length of the half-wave dipole for the various meter bands.

Since these dimensions are the overall lengths then each dipole will be half of this length. The center insulator will then be placed in the middle dividing the two dipoles.

Table of Half-Wave Dipole Lengths

METER BAND	OVERALL LENGTH IN FEET
13 meters	21 feet
16 "	26 "
19 "	31 "
25 "	41 "
31 "	51 "
41 "	68 "
49 "	81 "
59 "	94 "

HALF WAVE DIPOLE

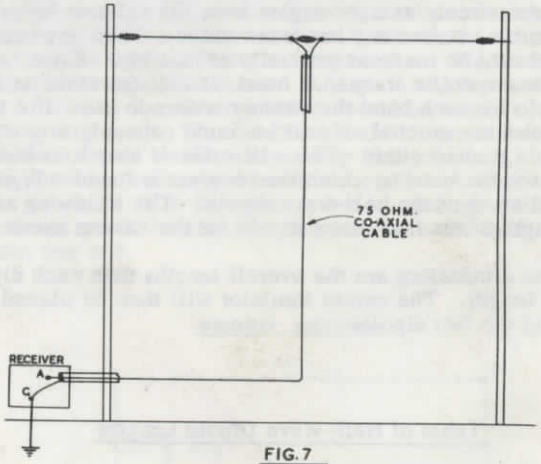

FIG. 7

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