## "Hands on to *RADIO WAVES*"

# Constructing a *Receiver Unit*

**Our indicator of the presence and strength of RADIO WAVES**

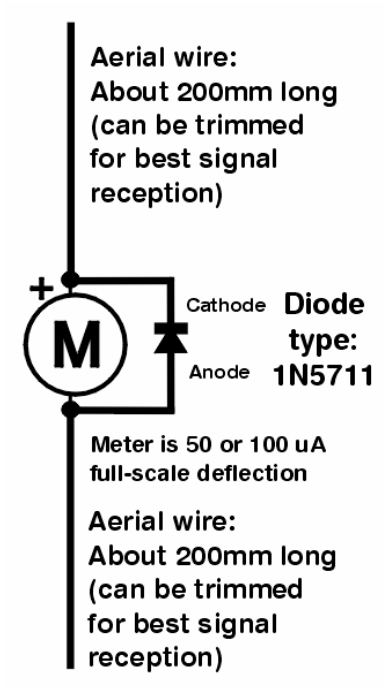

**A device *to detect radio energy* and *to give an indication of field strength* is required. In our experiments we will usually hold it in a vertical position as seen in this photograph.**

**There are just three component parts to this receiver:**

1. An "aerial" (sometimes called an "antenna"). This has an electric current induced in it from the passing radio wave,
2. a "diode" to "rectify" this signal current (to convert it from an alternating current into a direct current to operate a meter. (A diode is an electronic device that will pass a flow of electrons in one direction only), and,
3. a meter to give an indication of the magnitude of the signal current (and hence of the radio-wave field strength).

**It should be noted that this "receiver" unit does not contain any batteries. The energy required to deflect the meter is taken from the wave itself.**

**So before your very eyes you will see a radio transmitter sending energy to a receiver through the space in-between. You won't see the wave, but you'll see its presence, the transfer of energy from the battery at the transmitter to making the needle of the distant meter deflect.**




**You can send commands to the meter by turning the transmitter battery switch on and off. You can "communicate" by using this unseen wave, the basis of "radio communication".**

**A meter rated at 50 or 100 micro-ampere "full-scale-deflection" is suitable. The meter and other parts are available from electronics parts suppliers. Some scraps of wire and the use of some hand-tools are required to complete this unit.**

**The meter is a fragile instrument and care must be taken when handling it. Don't try to test it with a multimeter – and keep batteries away from it. Hold it by its case, and hold this whole assembled receiver by the meter's case.**

**The meter shown in this example is 50 micro-amp d.c. full-scale deflection. It is 80mm x 75mm (approx), a size generally suitable for class-room demonstrations. It has an open and uncluttered scale for good visibility.**

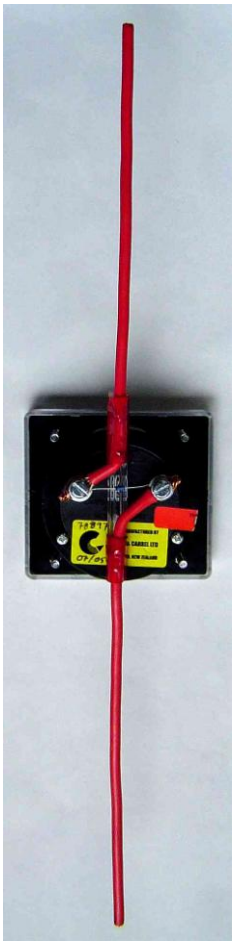
**It is wise to make a label: "*PLEASE HANDLE ME WITH CARE!*" and attach it to the front face of the meter. To find a New Zealand source for this meter, enter "Carrel & Carrel" into Google.**

**Note that the meter has two terminals, positive (marked "+") and negative (marked "-").**

**The stiff copper wire used for the aerial in these photographs is the wire used by electricians when fixed-wiring houses ("6-mil"). Scrap off-cuts can usually be obtained by asking a friendly electrician. The insulation plays no part in our experiments. Bare copper wires could be used, so the colour of the insulation is of no importance, use whatever wire is available. Red is recommended for good visibility in class-room demonstrations.**

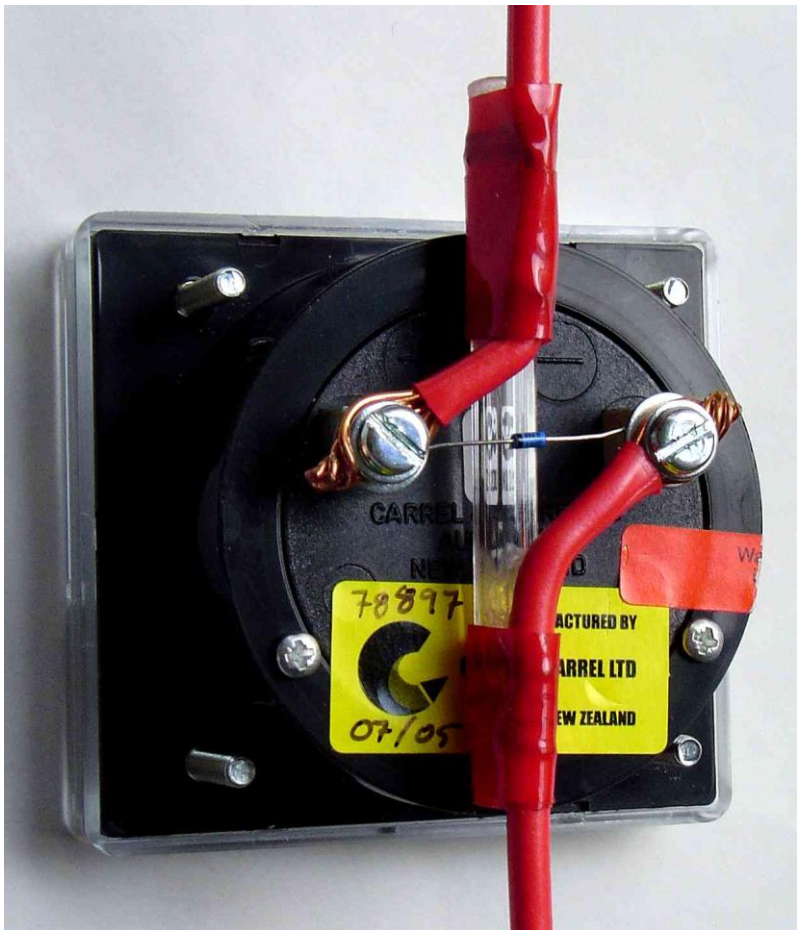
**The 1N5711 is a small-signal Schottky diode. It is the preferred selection from tests with many diodes with different type numbers. It produced the field-strength receiver with the most sensitive characteristics. The datasheet is easily obtained by searching "1N5711" in "Google".**

**The diode has two connecting wires, connected to its two electrodes, "anode" and "cathode". The "cathode" of the type 1N5711 diode is connected to the positive terminal of the meter. The cathode is usually identified by a band marked around the diode. The meter will try to move backwards on its scale if the diode is connected the wrong way around, so test it as soon as your transmitter is working!**



**A piece of plastic tube (the case of a ball-point pen) is used as a stiffener, glued and bound to give support to the aerial elements.**

**This receiver unit can be assembled without the use of solder.**




**You may wish to prune the aerial element lengths of your receiver to seek a more optimal performance – but you will find that the element lengths are not critical! To provide for the added dielectric which surrounds the lower element when it is inserted in the pipe of the support stand, prune the top element to extend to 155mm above the centre-line of the meter terminals and the lower element to extend 150mm below the centre-line of the terminals, i.e. an overall antenna length of 305mm.**

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