

WanderSearch/Wandatrak Equipment

Manual: Regal 1000 and 2000 Models



Wandatrak Kit shown above, the Regal 1000 receiver in the green pouch, charger plus both antennas, Directional Yagi in grey sleeve and vehicle mounted on cylindrical magnetic base.

Introduction

The Wandatrak receiver can be tuned into any one of hundreds of WanderSearch – Wandatrak devices (beacons), and in most cases enables a skilled operator to find any beacon that may be in their area, if they know the beacon's frequency number. This frequency is normally held in a database that links the frequency to the person issued with the beacon.

Beacons

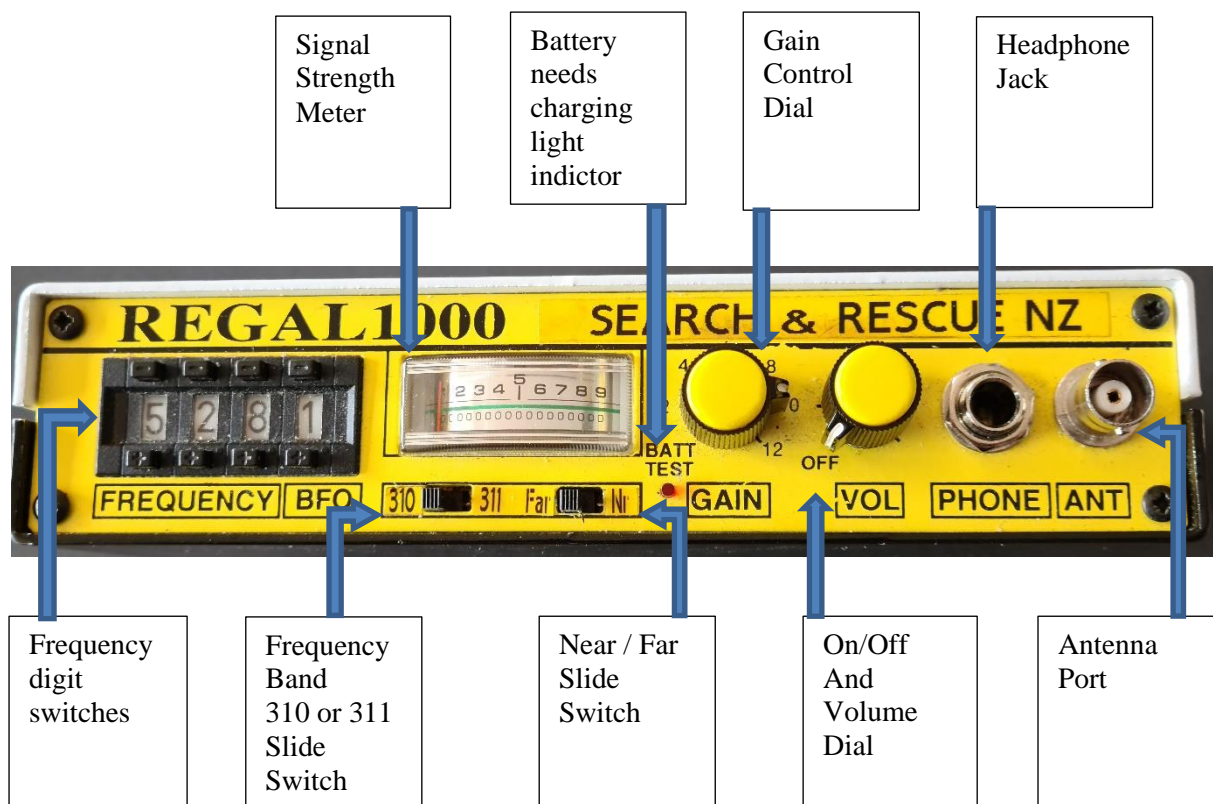


The wrist or key ring type beacons have an internal antenna therefore the signal range is about a third of the range of the pendants where the antennas are a small wire inside the black necklace cord.

Receivers



Regal 1000 and 2000 Controls



This receiver functions differently from most receivers that people are accustomed to using, it has an adjustable sensitivity control called the "Gain control" (left knob). This may seem to do the same job as the volume control, however it actually controls how sensitive or "deaf" the receiver is, and controls how far to the right the meter needle can move in response to the signal being received. A "deaf" receiver is needed when you are close to the beacon and the signal is strong.

The Volume (right hand knob) controls the speaker loudness and does not affect the meter

indication or receiver sensitivity. It is normal for the receiver to hiss or roar loudly when both Gain & Volume controls are increased to maximum.

Always remember to turn the receiver off with the Volume Dial turned to the OFF position when finished with the receiver.

Setting the Frequency

The beacon frequency number will have a format like "310.517 MHz" the 310 is the band and selected by the Frequency 310 or 311 Slide Switch (this is marked "**Band**" on some of the receiver models). The next three digits after the decimal point are set by the first three black frequency digit switches. The last black digit is simply a further reduction in frequency step size, this can be used to adjust the audible pitch of the signal in the receiver speaker.

For example:

310.517 MHz - 310 is the band switch position on front of the receiver

310.517 MHz - 517 is the first three black digits



The last black digit can be set to 0 or the operator may change it to suit their hearing, it is simply a finer step of the previous digits and slightly changes the pitch of the sound made by the receiver's speaker. When trying to hear a weak bleep in a noisy environment, the pitch of the sound can be a very important factor. Some operators will be able to hear a certain pitch better than others, so although the frequency digits are recorded for every beacon, the last two digits may differ slightly with temperature (for analogue beacons), age, and operator hearing preferences (remember to note this frequency).

Signal Strength Meter



The meter on the front of the receiver displays a field strength range of about 30db (decibels) from minimum to maximum. The meter requires careful adjustment of the "**Gain Control**" since the signal can be much less (beacon is far away) or much greater (beacon is close) than the 30db display. So when using the meter to gauge field strength we need to keep the signal level inside the display width of the meter, so the operator can sense if they are closer or farther away from the beacon by the change in meter reading and loudness of the signal from the receiver.

Near / Far Switch

Not all models have this switch, it is useful when searching for a lost beacon in a confined space. The switch should be normally set on Far. When very close to a beacon slide the switch to the Nr (near) position as this attenuates (reduces) the signal strength. The receiver can then be used to search in draws/cupboards etc to locate a lost beacon.

Battery Check

The battery when fully charged will operate for about 40 hours, the small red light will come on when the battery needs to be charged up. The Regal 1000 and 2000 models use a special 12Volt battery pack – the charger is supplied with the receiver and can not now (2020) be replaced. The charging port is located at the rear of the receiver.

The Yagi Antenna

The receiver receives a stronger signal when the Yagi antenna is pointed toward the beacon and a weaker signal when the antenna is pointed away from the beacon.

The difference in strength between pointing the antenna to and away from the beacon is known as the antenna “front to back ratio”. It is about 25db. This ratio is not audibly significant but observing the meter reading on the receiver this ratio becomes more apparent.

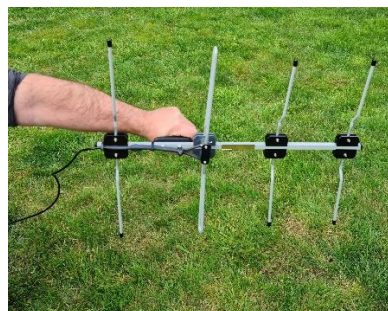
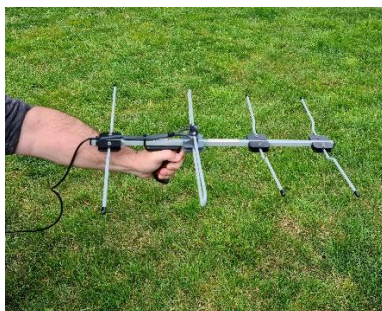


There are a variety of different Yagi antenna in use, some are fixed and some are folding models, they are all specifically designed to optimise detection of radio frequencies in the 310 – 311 MHz range.



Signal Polarity

Signals generally have a defined polarity, horizontal or vertical. The Yagi antenna will give a stronger signal if it is aligned in the same polarity as the incoming signal. The position of the beacon on the person (and if the person is upright or lying down) will alter the beacon's antenna and therefore polarity. Sometimes the polarity can also change across town, so when taking measurements with the Yagi antenna, try orientating the Yagi horizontally then vertically to see which operates best.



Magnetic Base Whip Antenna

The magnetic base whip antenna is useful because it allows the operator to drive and cover a lot of distance quickly.

The whip antenna is placed in the centre of a vehicle's roof and the cable ducted through the top of a slightly open rear door window that is generally not going to be opened by passengers (drivers side rear is the best). The antenna is connected to the Antenna Port on the receiver.



Place Magnetic mount antenna on vehicle roof then feed cable through rear driver's side door window

Approximate Comparative Ranges

A beacon that can be heard at 25 metres on a receiver with no antenna, will be heard when a Yagi or magnetic antenna is fitted at about 30 times the range e.g. $25 \times 30 = 750\text{m}$.
Overlooking the area from a hilltop can multiply this range by a further 10 times or more.

Principle of operation

There are two simple methods used to find a beacon.

- Using a directional antenna (Yagi) to indicate the direction of the strongest signal.
- Using a roof mounted magnetic base whip antenna on a vehicle to drive a criss cross pattern noting the increased/decreased signal strength of the beacon to determine if the operator is getting closer or further away from the beacon.

Searching for a Beacon

Initial experience

One simple exercise that a budding operator can begin with is to try finding a beacon in a room that a colleague has hidden in a closet or draw etc. No antenna is needed to be fitted to the receiver, the operator can start at 20 – 30 metres away with Gain control set to maximum

and volume at a comfortable level as long as the beacon can be heard. The idea is to keep reducing the gain (not the volume) on approach to the beacon also the Near position can be selected if the receiver model has a Near/Far slide. Soon the beacon will be located – remember to return the Near/Far slide to the Far position when finished. Once this technique is mastered on foot, it is a simple matter to translate the same principles in a vehicle with an antenna on a larger scale.

Testing the kit on the Road

Place a beacon that is on in a stationary location (for example hanging in a tree where it is unlikely to be found by any passers-by). Position the vehicle mount magnetic base antenna in the centre of the vehicle roof then connect to the receiver (via the rear door window on the driver's side). Switch the receiver on, select the correct band/ frequency of the beacon, ensure Near/Far slide is in the Far position, and turn up the Gain until the beacon is heard and the volume to a comfortable level. The beacon should be close enough to be heard. Drive away from the beacon and notice that the signal gets weaker, adjust the Gain control to increase the gain so that the beacon can still be heard at the maximum range, this may be something less than a kilometre.

Now drive back noting the increase signal strength and reduce the gain control. It becomes very evident when you pass the beacon as it will suddenly become quiet, this would be one way to quickly find the general location of the beacon.

When the beacon signal strength is very high sometimes the receiver antenna can be completely removed, and the signal found by turning up the Gain. If the beacon can be heard without an external antenna then the beacon must be within about 25 meters and can be found by walking around with the receiver listening for the loudest signal or adjusting the meter level with the Gain control and watching for an increase or decrease as you walk a search grid.

Some operators prefer to plug external earphones into the phone jack on the receiver, Walkman style are fine, but you need to purchase a 6.5/3.5mm phone adapter from an electronics store to take the small plug. On approach to the beacon continue to adjust down the gain control until eventually the beacon is found, even when the beacon is hidden, the experienced operator will know when the beacon has been reached.

The process is a combination of driving a line/road while evaluating the signal strength, returning to the area of road the signal was judged the strongest, and turning into an intersection close to that point and repeating the process at 90 degrees to the previous track. After the process has been followed several times the beacon signal will become very strong and therefore very close. The operator may need to proceed on foot carrying the receiver to approach the beacon.

It is important to maintain maximum gain when the signal is weak and reduced gain when the signal is strong so that the receiver performs correctly and does not overload when the beacon is close. This will help to highlight the diminishing signal when the operator drives past the beacon and increase the operator's sense of where the beacon is.

Using the Yagi Directional Antenna

Experiment by taking the receiver and handheld directional Yagi antenna about half a kilometre from the beacon, since the operator will need two hands free, the receiver should be mounted in the receiver pouch and the strap around the neck supporting the receiver. Use one hand to hold the Yagi antenna pointed toward the beacon and the other hand to operate the receiver controls. Adjust the volume for audio comfort and the gain sufficient to obtain a mid-range meter reading from the signal. Rotate your whole body antenna and receiver slowly through 360 degrees noting the meter level changes, if the meter level exceeds the maximum scale stop and reduce the gain until the level will lie within the meter range in a 360 degree rotation. It should then be evident where the beacon direction is, when this principle is mastered try the same test when another person shifts the beacon to a location that the operators is unaware of. A couple of handheld radios are handy for this type of exercise, but the operator probably needs someone else with them to use the radio.

When searching for beacons with a pulse rate of 2 second intervals or more the meter is continually fluctuating. On the rear panel of the receiver is a switch - the sample and hold switch, if this is moved to the down (on) position the meter position is held so subsequent readings can be identified as stronger or weaker. However, this is a very difficult feature to use correctly and it is not recommended that it is used.



Using the Field Strength Meter

The ear is not as good at sensing a slight increase or decrease in signal as a visual display. However, the Gain control can be a bit touchy to get the gain just right for the meter to display midrange, where a slight increase or decrease can easily be seen. When using the Yagi antenna and noting the meter reading in different positions it can be used to determine a precise rather than a general direction. In most cases an audible signal is good enough.

Useful Hints

It is always easiest to start to find the beacon when you can hear it, if you cannot hear the beacon check the frequency is correctly dialled and set the Gain to maximum, and comfortable Volume level. The options are then to use a high building or drive to a high location, or hill and try listening from that vantage point.

If still no beacon heard, check the equipment by changing frequency to another beacon operating in the area. If a known beacon is heard, this will give the confidence that the receiver, antenna, and cables are all OK.

To increase confidence in the equipment, the installation of a permanent beacon in a high building in a central location allows the receiving equipment to be tested at any time simply by switching to the test beacon frequency and pointing the Yagi directional antenna. Thus, the receiving equipment can be verified at any time eliminating any doubt and confirming that cables and antenna are all in working order. Any faulty equipment can be immediately identified before valuable time is lost.

Acknowledgment:

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