Taking Amateur Radio into the Bush

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As a keen tramper (hiker) and as an amateur looking for a challenge, I couldn't resist the temptation of the Yaesu FT-817 [1] multi-mode, multi-band transceiver. So, after saving my lunch money and scraping some other cash together, I was finally able to buy one of these miniature wonders. However, buying the radio was only the first step. How was I going to go mobile in the bush?

The most obvious problems were the need for a decent dipole for HF, and a reliable power source.

The dipole was fairly easy. My first attempt was thin appliance wire, with a small plastic triangle for the centre of the aerial, and a 6-metre length of RG-58 coax as feedline. I also chose to fit a choke/current balun made from an old ferrite toroid with about 10 turns of the RG-58 wound through it. A number of operators just use the coax direct to the aerial. However, I prefer a purist approach and try to prevent unwanted current on the outside of the coax feedline from disturbing the natural balance of the world.

I also chopped and drilled some plastic material (approx. 30x15 mm) to use as mini insulators. The next step involved a visit to my aerial test range down a quite street, near a park in the industrial part of town. On the weekend there is little activity, and only the occasional passing boy racer or teenager learner driver disturbing the peace.

I used an old 4.5 m fibreglass windsurfing mast as a tree equivalent, and built the dipole starting from the highest frequency (7.1 MHz) and working outwards. I initially cut the wire slightly longer than the length calculated from the old formula of L=142.5/f. As I didn't have any sophisticated aerial test equipment, I quickly scanned frequencies on a low transmit power, to find where the aerial actually resonated (indicated by the lowest reflected power on my trusty SWR meter). The desired length was approximated by folding back a portion of the wire, and then the aerial was rescanned. On average it took about three attempts to get it right.

Once the correct length has been established it was then simply necessary to tie off the end (which was already threaded through the insulator) with a couple of simple knots. A bullet connector was used to connect to the next piece of wire that was already tied on to the other side of the mini insulator (place the sockets on the end closest to the centre of the aerial). The next frequency was 5680 to monitor LandSAR operations and so on into 80 metres and the 3 MHz Mountain Radio frequencies.

I also made up two short lengths of wire with bullet plug connectors fitted (one set at 0.75 m the other at 1.4 m). These add-on's can be plugged in at any insulator and used to fine-tune the aerial to a nearby frequency. For example: when the 0.75 m wire is added to the aerial at the 3.90 MHz insulator the aerial shifts to approximately 3.755 MHz (Branch 65 Sunday net frequency).

Frequency	Final Length (one side)	Comment
7.1	9.62m	AREC/Amateur
5.680	11.88m	LandSAR
3.90	17.37m	AREC/Amateur
3.50	19.00m	Amateur
3.345	20.03m	North Island Mountain Radio
3.261	20.55m	South Island Mountain Radio
3.023	21.36m	LandSAR

So I now had an aerial but what about the power supply?

Possibly a NiCad battery running at about 9.6 Volts (usually for an RC car) would be the optimum solution, as some of those packs can fit into the internal battery area of the radio. However FT-817s are apparently not very tolerant of low voltages and the older sets tend to blow their final transistors if transmitting at below about 8 Volts.

As there would not be much margin for error, I decided to stick with the old reliable Lead-Acid Gel Cell technology until something better can be researched. The battery I finally decided on was a 2.2 AHr gel cell [4] as a compromise between capacity and weight.

Longer trips into the bush also require some form of battery recharge system. I opted to buy a small, but usefully sized, solar panel robustly packaged in a polycarbonate case from Jaycar [2]. Rated at 250 mA output, (actually it requires a blazing tropical midday sun to produce that much current) it would closely match the preferred 1/10 C trickle charge rating of a 2.2 AHr Gel Cell.

However, walking through the shaded bush environment results in a dramatic drop off in solar cell performance, so some form of booster charging system was required. Rather than reinventing the wheel, I bought a small kit [3]. This unit uses an oscillator and capacitor as a charge pump, to boost the output voltage to above 12 Volts, and therefore continues to provide some charge under marginal light conditions.

So now I had the radio, aerial, a solar panel and I had picked an optimum battery size.

I was now fully equipped, but really I still needed some method for checking the aerial for resonance when in the bush. Generally, the aerial as cut is near enough for fixed frequency operations such as the Mountain Radio Service. Amateur operations in the 80-metre band require a bit more flexibility so I hunted around and finally extracted a QRP aerial test bridge circuit from Murray ZL1BPU.

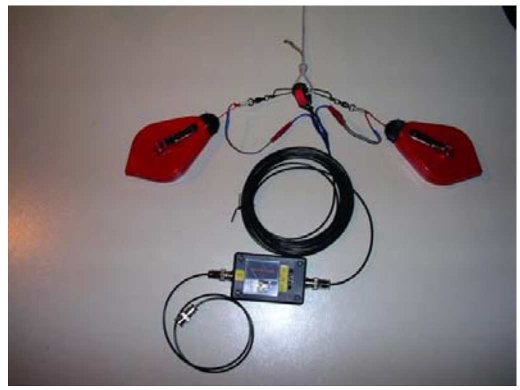
The antenna bridge was very simple to build, and utilised an old VU type meter that cost $1 at a used equipment sale (see last page for details).

From a Central North Island bush hut using the chalk reel aerial system I have worked stations NVIS from Whangarei (400km) to Stewart Island (1200km) mostly on half power of 2.5 Watts.

So, if you are into tramping and want a good all round radio for some fun in the bush I recommend the FT-817, a lightweight aerial, a decent battery and fine weather.

Addendum:

Some time ago Harry ZL1BK had shown me his portable dipole that consisted of thin aircraft wire rolled into chalk line reel holders. I resolved to make one and spent some time hunting down the materials. I obtained some lightweight RG 174 coax and a small toroid for a choke/balun, and found a suitable type of wire in the RS catalogue [4]. The chalk lines can hold the full 30 metres of this 24 AWG wire that has very slippery TFE insulation. The tuning is achieved by rolling out the wire to the correct length. Spot frequencies can be indicated by felt tip marker coded dots on the wire. Once rolled out to the appropriate mark, the line holders are tied off with some Venetian blind cord to the nearest tree. This aerial set up weighs 500 gm versus the first version at 800 gm.



FT-817 + Mic	1120 g	Aerial	500 g	Bridge/Charger	120 g
Battery 2.2 Ahr	1000 g	Solar panel	580 g	**Total weight**	3320 g

(1) Yaesu website: http://www.yaesu.com/ look under “Products”

(2) Solar panel: Jaycar part ZM-9018 http://www.jaycar.co.nz/. A larger flexible marine version would be better if the usage was high (also way more expensive).

(3) Dick Smith: K 3129 Solar Generator Kit (discontinued)

(4) Panasonic or similar 2.2 Ahr Battery: Jaycar part SB-2482

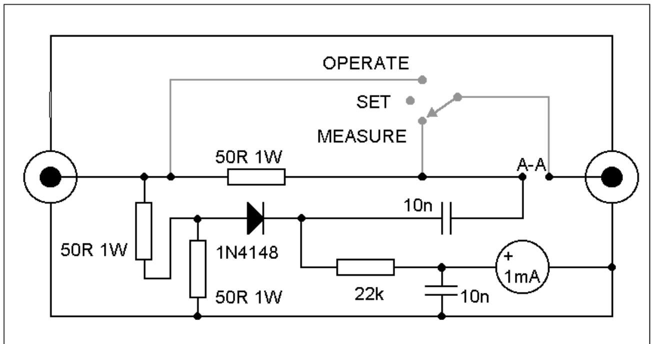
(5) Aerial wire: RS part number 177-0974 Red, 24 AWG (7x0.2), 1.12 mm OD

Complete portable FT 817 tramping (hiking) kit

A simple QRP Antenna Bridge

When going in to the bush with a QRP rig such as the Yaesu FT-817, it pays to be able to adjust your HF dipole to resonance to avoid the protective circuitry sensing a poor SWR and winding back the output power.

The following circuit provided by Murray ZL1BPU has been used to fine-tune the dipole on an FT-817 when operating bush mobile. To achieve optimum operation on HF, you have to either evenly shorten or lengthen both ends of the dipole until the reflected power is at a minimum, i.e. zero reading (null) on the bridge meter.



QRP Antenna Bridge – ZL1BPU

In order to build the simplest version of the bridge, use just a box, meter circuit, the resistors, connectors, and the capacitors. Forget the switch, i.e. everything in grey, and join points A-A. Make one connector male, and the other female. It will work either way around. The 50-Ohm resistors are best made of two 100 Ohm 1W resistors each in parallel. A metal box (even tinplate) is best.

To use the simple version, connect it to the transceiver, and with nothing on the other connector, adjust the transmitter output power for full scale. (Change the 22k resistor if necessary to achieve this conveniently). The transmitter will not be damaged, as it is seeing no worse than 100 Ohms. Very little power is required (the 22k is scaled for about 10W). Then connect the antenna, check the meter and adjust the antenna for a null, without changing anything on the rig. An SWR of 3:1 will be half scale, and anything better will be less. Adjust the antenna for no reading on the meter, but be aware that a short on the output might well look quite good! Once the antenna (or tuner) has been adjusted, disconnect the bridge and reconnect the antenna to the rig without the bridge, since some of the transmitter power is lost in the bridge.

If you use an antenna tuner, this unit should be between the rig and the tuner. Be aware that this bridge gives a null ONLY for 50-Ohm resonant or resistive loads. It would serve no real purpose to use it AFTER an antenna tuner intended for random wire loads.

The more complex version with the switch allows you to leave the bridge in line while transmitting, without causing much loss. The method of operation is similar, except achieved with a switch. If a two-pole switch is available, use the other pole to disconnect the resistors on the left from the line in the OPERATE position. Then you won't be likely to fry the resistors. In the OPERATE position, the meter acts as an RF voltmeter.

For very low power (around 100mW), use a 100uA meter and a 10k resistor, and for intermediate powers, use a larger resistor. For the absolutely lowest weight, build the "simple" version, but omit the meter and associated components. Use a tiny 12V pea lamp as the indicator, and wire it between the output socket and the input resistor junction, i.e. in place of the diode and series capacitor.