

# OZ4VO

## Cliff Dwellers Ham Radio

The biggest problem with setting up a working amateur radio station in a retirement home is the antenna and ground conditions.

My experiences have followed a zigzag course, but now I have a small portable radio amateur set that works on all amateur bands from 160 to 10 meters.

Here are some experiences in a more ordered sequence than the one in which the experiences occurred.

### Transceiver selection

First I researched what small transceivers were available. I chose a YAESU FT-891. Alternatively, it could also be a Kenwood or an Icom.

### Power supply

When I got the transceiver set up the first thing I encountered was a high level of background noise. I investigated where the noise was coming from.

One of the noise sources was the power supply. After many experiments with noise filters, I decided to use a rechargeable battery as a power supply. A usable battery size is 12V / 22 AH.

### Indoor Loop antennas

At an early stage I came up with using a Loop antenna. It is less sensitive to background noise and it is completely independent of a ground connection (ground plane).

Late in the series of experiments, I built four loop antennas that cover all bands from 80 to 10 meters.

### A useful amateur radio station with indoor Loop antennas

The simplest Ham Radio Station is a battery as a power supply, a transceiver, an MFJ-936B Loop Tuner and four homemade Loop antennas.

This configuration can be set up anywhere and will work without problems on the 80, 40, 30, 20, 17, 15, 12 and 10 meter bands.

The receiver sensitivity and the transmitter radiation are very dependent on the actual local conditions.

It is relatively easy to switch between the four loop antennas, but it is desirable to have an antenna system that can switch even more easily between all the HF amateur bands - i.e. the 160, 80, 40, 30, 20, 17, 15, 12 and 10 meter bands.

### Different indoor antennas

The ideal indoor antenna would be a balanced multiband antenna that is independent of an effective ground connection (ground plane). But it takes up a lot space, especially on the 160 and 80 meter bands - even if it is a dipole with extension coils or if it is a folded dipole, e.g. a Cobra antenna.

### Random Wire antenna

Due to limited space, I have to choose a Random Wire Antenna, which is very dependent on an effective ground plane (counter poise).

I started with a wire tuner and with it I tested different antennas, e.g. a rod antenna out of a window, and a wire antenna set up along the shadow strip in the ceiling and an antenna in the attic. They worked reasonably well as receiving antennas, but not well as transmitting antennas.

The first problem was that I did not have a sufficiently effective ground plane on all the amateur bands. I did quite a few experiments with different ground plans, e.g. an artificial ground plane on the floor under a

carpet. Partly I could not tune to a perfect SWR ratio on all bands and partly there was HF in the station's installation.

The antenna tuning was sensitive when touching the equipment and the morse key "burned" my fingers.

### **Artificial Ground**

I became aware of the concept of Artificial Ground - a wire tuned to series resonance with a capacitor. Then the problem with HF in the installation was solved.

Now the antenna can be tuned to an optimal SWR ratio and the ground connection can be tuned to an effective "artificial ground plane".

It turns out in practice that the artificial ground can only be tuned to 160, 80 and 40 meters. At 30, 20, 17, 15, 12 and 10 meters, the antenna is tuned against the radio station's inter-wiring as ground plane. When the random wire antenna is tuned, there is still some HF in the station's installation. That problem was reduced with a copper strip under the inter-wiring.

It is absolutely necessary that all conductors that act as a counter poise (return path) to the antenna are connected to one point - the ground terminal of the antenna tuner.

*See the Cliff Dwellers Ham Radio, Station Wiring diagram.*

The tuning is almost independent of the ground plane under the carpet. This ground plane can be disconnected when an Artificial Ground wire is installed.

With an MFJ-934 Antenna Tuner, a 12 m wire as antenna and a 12 m wire as artificial ground, this antenna system can be tuned to perfect SWR ratio on the amateur bands 80, 40, 30, 20,17, 15, 12 and 10 meters, and with a coil of 48  $\mu$ H in series with the antenna it can also be tuned on the 160 meter band.

### **A useful amateur radio station with indoor Random Wire Antenna and Artificial Ground**

A simple Ham Radio station is a battery as power supply, a transceiver, an MFJ-934 Antenna Tuner, a 12 meter wire as antenna, a 48  $\mu$ H coil and a 12 meter wire as Artificial Ground.

This configuration can be set up anywhere and will work with few – or no – problems on the 160, 80, 40, 30, 20,17, 15, 12 and 10 meter bands.

However, the receiver sensitivity and the transmitter radiation are very dependent on the actual local conditions.

### **Combi-installation**

I have both antenna systems installed so I can easily switch between the Loop Antenna and the Random Wire Antenna and thereby I can cover all the amateur bands 160, 80, 40, 30, 20, 17, 15, 12 and 10 meters.

*See the Cliff Dwellers Ham Radio, Station Wiring diagram.*

The signal strength from the Loop Antenna is from 0 to 3 dB below the signal from the Random Wire Antenna, but the signal to noise ratio is from 8 to 10 dB better on the Loop Antenna, so the Loop Antenna is often the best receiving antenna.

*For more info, read MFJ's user manuals and search "Artificial Ground" online.*

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Station Wiring

