Feature **Article**

Follow Up On 2 GHz Scanning

How To Use Downconverters

Text and photos by Steve Donnell

Last time we covered some of the types of signals that can found above 2 GHz and some of the scanners that cover this upper potion of the spectrum. Another way to receive signals that are above the range of most scanners is by using an RF downconverter which can be found on the Electronic Surplus equipment market in several forms intended for use as Multipoint Distribution System) converters.

Many of these converters use a fairly standard frequency conversion formula; The Local Oscillator is crystal controlled which operates at 2.278 GHz. This results in an "IF"(Intermediate Frequency) output from the converter across the120 to 222 MHz range which corresponds to signals the downconverter receives in the 2.4 to 2.5 GHz range. Some Hams will often change the crystal to one slightly higher in frequency, so that 2.40 GHz comes out at 144 MHz, at the bottom of the2Meter Amateur band.

Another type of 2.4 GHz downconverter that is available directly form the manufacturer is the WinRadio DNC-3500. While this uses a crystal controlled oscillator like those designed for commercial MDS use, the DNC-3500 uses a somewhat higher frequency. Which results in downconverting 2.4 GHz signals so that they show up across the 700 to 800 MHz window. The intent of this so that signals in the 1 GHz to 2.4 GHz range are downconverted to a range/window that is more readily covered by some scanners, so that they can more easily be received.

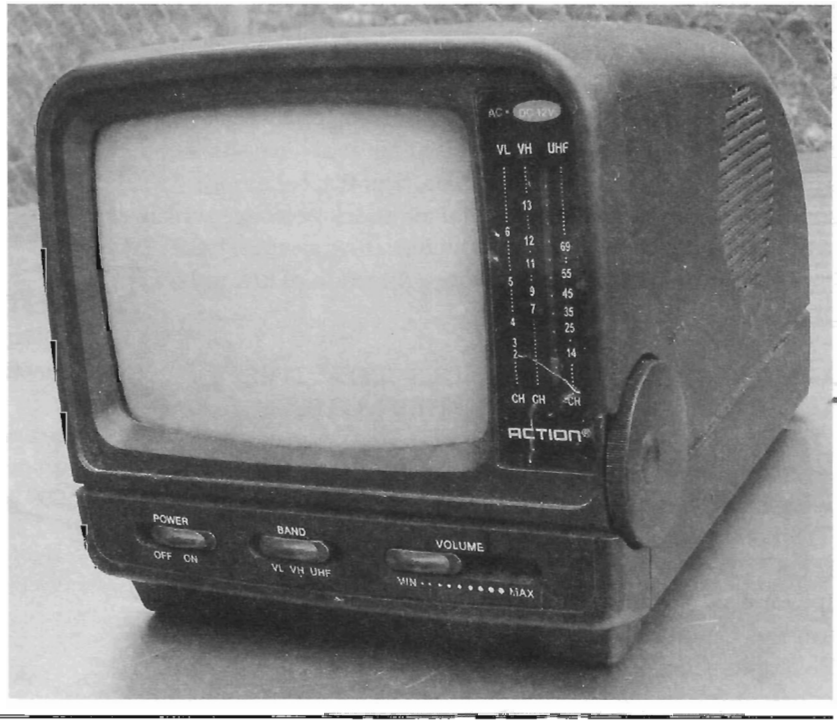
Many long time *Scanning USA* readers may recall that several years ago, I described a mod, whereby 2.4 GHz video signals from various types of wireless cameras, by way of modification of a Radio Shack 2.4 GHz"room to room" receiver. The mod consisted primarily of changes to the tunning control circuit so the receiver could be allowed to cover a continuous range from 2.3GHz to over 2.5GHz. I was previously under the impression that in order to receive(view) most types of video signals found in this region of the spectrum, one needed to use a special receiver that could demodulate FM video signals.

However in a number of experiments recently performed in my lab, and on the road, has revealed that even a regular TV used for viewing Broadcast and Cable TV programs can readily lock onto the image of video from 2.4 GHz signals as well. Even though the video received by "regular"TVs is AM modulated. However by slightly offsetting the tuning of the TV from the frequency of the FM video signal. This is a technique called "slope detection"

. Many years ago, it was used as a means of receiving FM voice signals on shortwave and Military surplus receivers, that only had AM mode available. This was the same means commonly used in the past when monitoring Police and Fire communications on VHF frequencies with the help of a VHF (down)converter so they could be monitored on a typical(AM) car radio.

The only trick that you need to know is where to tune the TV in order to have detect the signal from the 2.4 GHz downconverter. This will depend on the type of converter that you are going to use; if you are using one of those surplus MDS downconverters, which places signals from 2.4 to 2.5 GHz in the range between 120 and 220 MHz. While only the upper portion of this range includes VHF TV Channels 7 to 13, the 120 to 174 MHz frequency range is also often covered on TV's that include an "All Channel" tuner that is intended for use in receiving Cable TV "Mid Band" channels, A - K, or 14 to 24. Typically this is accomplished in a TV design by merely extending the range of the standard "VHF High"range to cover these lower frequencies. It is also good to note that the best type of TV to use for this task is a fairly cheap portable; these often employ very simple means of tuning channels by the means of a simple dial or slider control, and don't make use of predetermined channel presets.

A very good example of this is shown in pic2.This is a



B/W portable TV with a 5 inch screen. Besides it's small size, this type of TV is a good choice for this type of monitoring as it can be operated on 12 volts directly from a vehicle, or on it's own internal battery pack as well. This particular set also includes an "A/V"(external Audio and Video) input connector which permits it to be used as a video monitor as well.

In order to receive video signals in the 2.4 to 2.5 GHz range, all that you need to do is attach the "IF" output of the downconverter to the antenna input of the TV. Then tune around across that range of "extra" channels below where (Broadcast)Channel 7 is shown on the tuning dial. If you are using the Winradio DNC-3500, you need to remember that the "IF"output of it, for reception of signals in the 2.4 to 2.5 GHz range is 700 - 800 MHz. Which works out very nicely, as this range of frequencies directly corresponds to those used by UHF TV channels 52 to 69. Although it should be noted that some of the very newest TV models may not cover this range as TV stations using these channels are moving to lower ones as the 700 MHz band is being transferred for use by Emergency Responders.

Pic1 shows my current 2.4 GHz video monitoring setup which includes a small B/W TV and a surplus MDS downconverter with an integrated antenna. During the time since I first wrote about this type of monitoring over four years ago, a number of the locations where I had first identified as having active 2.4 GHz video signals have gone away. However some newer ones have come along to take their place. At one location where I had found a "door cam", was later revealed, following a Police raid, to be operating as a popular brothel.

Which just goes to show that when you search around, either for audio, or video signals you never know what you may trip over. It is also worth noting that for even far more tame uses for these wireless video cameras, it is best to be discrete when doing this type of monitoring as some folks may not take too kindly to knowing that video images from within their homes(or businesses) can be readily received some distance away out on the street.

Pic 1