

The

Repeater Rag

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Newsletter of THE DENVER RADIO LEAGUE

A CLUB DEVOTED TO
QUALITY AMATEUR RADIO
Published in the metro Denver area, Colorado

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REPEATER LOCATIONS:

146.88Ø Lockheed Martin Company

146.64Ø Centennial Mountain

449.6ØØ Lockheed Martin Company

145.Ø5Ø Digi - Lockheed Martin Company

Repeater Identifier: WAØKBT

*The Denver Radio League is open to all licensed
amateur radio operators. Repeater usage is
limited to properly licensed hams.*

Membership dues and renewals

*~ Please make checks payable to
Denver Radio League or DRL ~*

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For information, contact Chris at:
303-789-4736 or on the 146.88Ø Repeater

NOTICES

DRL MEETING

THURSDAY

NOVEMBER 21, 2002

BEMIS PUBLIC LIBRARY, LITTLETON

7:30 PM

Our guest speaker, John Doran, KVØL,
will do a presentation on

“Microprocessor-based Electronic Clocks”

- *WWVB-DECODING “RADIO CLOCK”*
- *DIGITAL CLOCKS WITH NIXIE® TUBE DISPLAYS*
- *ELECTRONIC CLOCK THAT DRAWS AN
“ANALOGUE” CLOCK FACE ON A ‘SCOPE TUBE
(ELECTROSTATIC CRT)*

The Colorado Council of Amateur Radio Clubs

COLORADO STATEWIDE COORDINATED REPEATERS MAP AND FREQUENCIES LIST

will be available for purchase ... \$2.00 each.

SEE TIM ARMAGOST, WBØTUB
TO GET YOUR COPY.

Printed on Non-smear, waterproof paper!
Data current as of April 2002.



Down with grunge!

Attend the meeting to find out the
whys and WHEREs ...

2003 ARRL Rocky Mountain Division Convention is coming!!

Beautiful Estes Park, Colorado
May 30, 31, and June 1, 2003

Registration forms (It's never to early to register!)
will be available at the meeting ...

SEE TIM ARMAGOST, WBØTUB
TO GET YOUR COPY AND REGISTER TODAY!

Check out the website: www.hamconcolorado.org

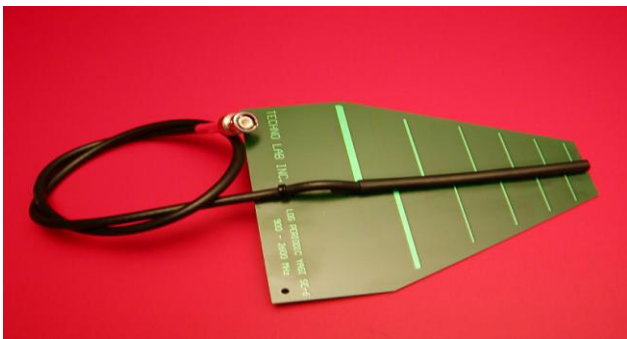
What is this person doing? (Hint: it AIN'T love letters in the sand...)



This is called "War Chalking." This enterprising young gent has just detected an 'open' wireless network in a building, and he is drawing a pictorial of the network, some of its system parameters, the speed of the link, the type of system, and how to access it, using a set of coded symbols (remember the stories about the hobos and the way they would mark certain houses as "a good place to get handouts" or "don't stop here, the dog bites!") called **War Chalk**. Others "in the know" that see and can read these symbols and set up their laptops with the proper parameters can gain free access to the network, any number of unsecured computers on the network and in many cases go surfing on the internet as well.

So far, I have seen no reports of this new generation of mobile Internet gypsies fouling up any corporate networks or trashing servers, but I suppose it's eventually inevitable. In the mean time, it provides a healthier outlet for teen angst than drugs and drinking I guess.

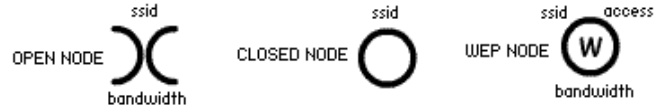
If you want to get in on the fun, you'll need a laptop with a wireless (802.11a) Ethernet card capable of using an external antenna like this:



you drive around town, and when your laptop detects an available network, you use the directional antenna to find your way to the source building, find out everything you can about the network's capabilities, then leave a set of War-Chalk symbols for the next guy who passes by...

This exciting new "hobby" is only a few months old, and already has mutated (Igor, we've created a monster!). The latest rage seems to be roaming around with the laptop and wireless card, plus a GPS (Global Positioning System) unit interfacing with a program such as *DeLorme's Street Atlas* so you can map out multiple sites, and have digital or printable maps available for friends.....

Here are some of the things you might see around the Denver Metroplex if you look closely:



Here's a view from a Bus in Atlanta Georgia:



Someone has found an open node nearby; if you're in the general vicinity, here you go—free access to somebody else's network!

This is a copy of an article I wrote for the company newsletter; it's possible to do this with any 2.4 GHz radio and the proper software. Of **course** there's a *website*:

<http://www.blackbeltjones.com/warchalking/>

Gary, NØERG

Choose Your 2M Frequency Wisely

Written for amateur radio operation in Colorado

Bob Witte, KØNR

22 June 2002

You've just purchased your first 2M FM transceiver and have been chatting with both old and new friends around town on the 2M band. You and your buddies decide to find an out of the way frequency to hang out on. After tuning around, you find a nice, quiet frequency that no one seems to using and start operating there. Nothing to worry about, right? Not so fast, there are a few more things to consider when selecting a frequency on the 2M band. Let's take a look at the key issues.

FCC Rules

The first thing we need to know are the frequencies that the FCC has authorized for our particular license class. For the HF bands, the frequency privileges depend greatly on the license class of the operator. Above 50 MHz, the frequency allocations are the same for Technician licenses and higher. In particular, the 2M band extends from 144 MHz to 148 MHz. The FCC Rules say that any mode (FM, AM, SSB, CW, etc.) can be used on the band from 144.100 M to 148.000 MHz. The FCC has restricted 144.0 to 144.100 MHz to CW operation only.

Band Plans

Knowing the FCC frequency authorizations is a good start but we need to check a bit further. Amateur radio operators use a variety of modulation techniques to carry on communications. Often, these modulation techniques are incompatible since a signal of one type can't be received by a radio set to another modulation type. For example, an SSB signal can't be received on an FM receiver (and vice versa). We need to use our authorized frequencies wisely by sharing the band with other users and avoiding unnecessary interference. Thus, it makes sense to have a band plan that divides the band up into segments for each type of operation.

2M Band Plan

As shown in the table, the 2M amateur band plan supports a wide variety of radio operation. Large portions of the band are dedicated to FM operation, consistent with the popularity of the FM mode. There are portions of the band designated for repeater outputs (which is the frequency that we tune to receive the repeater) and repeater inputs (which is the frequency we transmit on to use the repeater). Notice that these segments are positioned 600 kHz apart consistent with the standard 2M repeater offset. There are also frequencies designated for FM simplex.

On the low end of the band, we see segments for some of the more exotic modes. At the very bottom is the CW portion, which includes Earth-Moon-Earth (EME) operation. EME operators communicate by bouncing their signals off the moon.

2M Band Plan

As approved by the ARRL VHF-UHF Advisory Committee, simplified by KØNR to reflect usage in Colorado.

144.000-144.100 CW	144.100-144.275 Single-sideband (SSB Calling Frequency = 144.200)	144.275-144.300 Propagation Beacons	144.300-144.500 OSCAR (satellite)
144.500-144.900 FM Repeater Inputs	144.900-145.100 Packet Radio	145.100-145.490 FM Repeater Outputs	145.500-145.800 Misc. and experimental modes
145.800-146.000 OSCAR (satellite)	146.010-146.370 FM Repeater Inputs	146.400-146.580 FM Simplex (National Simplex Frequency = 146.52 MHz)	146.610-147.390 FM Repeater Outputs
147.420-147.570 FM Simplex	147.600-147.990 FM Repeater Inputs		

Note: The FM channel spacing in Colorado is 15 kHz (repeaters and simplex).

Further up the band, we see segments for SSB operation and beacon operation. SSB is the preferred voice mode for so-called "weak signal" operators. The mode is more efficient than FM when signals are weak, so it is the way to go when you are trying to push the limits of 2M DX. Beacons are transmitters that are always on, transmitting a short CW message to as a propagation indicator for distant stations. We often think of 2 Meters as a local coverage band but when conditions are right, contacts can be made with stations over a thousand miles away. Of course, conditions are not always right so having a beacon on the other end of the desired communication path lets you know how propagation is in that direction.

Radio amateurs also use 2 meters for OSCAR satellite operation, sending signals to a satellite (uplink) or receiving signals from the satellite (downlink). The OSCAR segments don't specify a particular modulation type since CW, SSB and FM are all used for OSCAR operation. Because of their elevation above the earth, satellites can hear signals from all over the US simultaneously, so they are very susceptible to interference.

Most of this non-FM operation can be easily interfered with by signals from other users. EME signals, for example, are usually quite small since the signal has to make the round trip from the earth to the moon and back. If a local FM operator fires up in the EME portion of the band, an EME signal that can't be heard by an FM receiver can be wiped out by the FM signal. Similarly, an operator chatting across town on 2M could interfere with a satellite hundreds of miles away and not know it. This is particularly a problem with FM receivers, which won't even notice low level CW and SSB signals.

FM Operating

The most common 2M rigs are basic FM mobile or handheld transceivers. These radios usually tune the entire 2M band from 144 MHz to 148 MHz in 5 kHz steps. The band plan indicates the proper range of frequencies for FM operation but there is more to the story. FM operation is "channelized", meaning that specific 2M FM frequencies are identified by the band plan. The use of channels is especially important for repeaters, since they don't easily move around in frequency and are coordinated to minimize interference. The idea is to have all stations use frequencies that are spaced just far enough apart to accommodate the signal without interfering with the adjacent channels.

You might think that the spacing between channels would be 5 kHz, which is the tuning step of most FM radios. This doesn't work because an FM signal occupies a bandwidth that more than 5 kHz wide. Even though we talk about a signal being on a specific frequency, the signal actually spills out on either side of the frequency by about 8 kHz. This means that a typical FM signal is about 16 kHz wide.

(You may recall that amateur 2M FM uses ± 5 kHz frequency deviation. So doesn't this mean the bandwidth is 10 kHz? No, it doesn't work quite that way and the signal is actually wider than 10 kHz. I might be able to show the math behind this but it makes my head hurt. Perhaps in some future article.)

The channel spacing needs to be at least as wide as the bandwidth of the signal, which allows room for each signal without interfering with the adjacent channel. In Colorado, the channel spacing is 15 kHz, which is a bit tight for our 16 kHz-wide signal. In other parts of the country, a 20 kHz spacing has been adopted to provide for more separation between channels. Obviously, you get more channels on the band with 15 kHz spacing than with 20 kHz, but you have to put up with more adjacent channel problems. When using a repeater, you just need to dial in the published repeater frequency and set the transmit offset, either + 600 kHz or - 600 kHz. Most modern 2M radios automatically take care of setting the proper offset (based on the band plan). If you need to set the offset manually, the rule is very simple. If a repeater's output frequency is in the 147 MHz range, it uses a + 600 kHz offset. Otherwise, it requires a - 600 kHz offset.

For simplex operation, the standard simplex frequencies listed in the table below should be used. These simplex frequencies are grouped in the 146 MHz and 147 MHz range as listed in the table below. The National Simplex Frequency (also referred to as the calling frequency) is 146.52 MHz.

2M FM Simplex Frequencies Colorado Band Plan

146 MHz Range	147 MHz Range
146.400, 146.415, 146.430, 146.445, 146.460, 146.475, 146.490, 146.505, 146.520, 146.535, 146.550, 146.565, 146.580, 146.595	147.405, 147.420, 147.435, 147.450, 147.465, 147.480, 147.495, 147.510, 147.525, 147.540, 147.555, 147.570, 147.585

The FCC View on Band Plans

Sometimes I hear radio amateurs say, "Band plans are voluntary so I don't need to pay any attention to them. I can do whatever I want as long as I don't break the FCC rules." Unfortunately, such an attitude does not promote efficient use and sharing of the amateur bands. Imagine the chaos on the ham bands if everyone took this approach. It also may be a violation of FCC rules.

On Oct 18, 2000, in a ruling concerning a repeater operator's failure to conform to the prevailing band plan, FCC Special Counsel for Amateur Radio Enforcement, Riley Hollingsworth commented on the issue. He said "Band plans minimize the necessity for Commission intervention in Amateur operations and the use of Commission resources to resolve amateur interference problems. When such plans are not followed and harmful interference results, we expect very substantial justification to be provided, and we expect that justification to be consistent with Section 97.101."

Section 97.101 is the part of the FCC rules that says (among other things):

In all respects not specifically covered by FCC Rules each amateur station must be operated in accordance with good engineering and good amateur practice.

Each station licensee and each control operator must cooperate in selecting transmitting channels and in making the most effective use of the amateur service frequencies.

The FCC has clearly stated that they expect hams to share the bands by following accepted band plans. More importantly, this is the right thing to do for the benefit of the amateur radio service.

Summary

The fine points of the band plan can be a bit confusing. However, a few simple guidelines can help, especially if you are operating only FM.

FM voice simplex and repeater operation should occur only above 145.100 MHz (and only in the OSCAR sub-band if you are working an FM satellite) When operating through a repeater, make sure you are tuned to the published repeater frequency with the right transmit offset. When operating simplex, use a simplex frequency designated by the band plan.

We've only covered the 2-Meter band in this article. If you are operating on other bands, be sure to check the appropriate band plan before transmitting. Note that this article is written for amateur radio operation in Colorado. Other locations may have different band plans for the 2M band.