



ROUNDTABLE

The Denver Radio Club Newsletter

Since 1917

February 2016

PRESIDENT'S MESSAGE

By Gerry Villhauer – W0GV



Hello DRC Members,

Here we are in February already, I hope this year does not fly by like 2015 did. Looking at the weather, we here in the Denver area are lucky in comparison to the east and south east where they have really gotten hammered. I am sure we will really get ours turn in due time.

If you missed our January meeting you missed a real good one and the largest attendance I believe we have ever had. I know we have had a couple meetings where attendance bumped 70. The January meeting is a record holder with attendance of 82. A big thank you to Dwight Eckert and Glenn Rhoades for their terrific presentation on natural and man-made Electromagnetic Pulses. Their mission is to make the general public aware of the catastrophic damage these pulses can cause and precautions to take; along with getting the public sector to relay their concern to government and industry. I believe they accomplished their mission with our members and guests in attendance.

Our February meeting program promises to be another super interesting presentation. Rob Steenburg (AD0IU) from NOAA, will be telling us about "Solar Winds". He will explain how solar weather affects radio propagation and our ability to communicate and transmit RF energy around the world. NOAA monitors solar activity and gives us a means to react to the many solar events that happen daily. Mark your calendars now for February 17th so you don't miss this exciting program. You can see more details on the program in this issue of the RT.

Another important event date is May 13-15, 2016. That is HamCon Colorado, the ARRL Rocky Mountain Regional Convention being held this year at Keystone, Colorado. If you are a DXer, also mark May 12 for DX University also at Keystone. This promises to be the biggest and best convention yet for our state. You will enjoy several well-known speakers like, Gordon West (WB6NOA), Riley Hollingsworth (K4AHD), Chris Imlay (W3KD) and Rick Roderick (K5UR). You must get your Early Bird Registration in prior to February 12th to be eligible for the Early Bird Drawing and save money on your reservation. There is a link on the HamCon Colorado Webpage for the Convention Registration and Lodging Reservations at the Keystone Lodge. Please see the website at hamconcolorado.org for more details. Rooms at convention rate are going fast; get your reservation in NOW!

Thanks to all of you who recently joined and made the DRC "Your Club". Please stay active on the air, come to meetings, programs and events. Your name and call will be listed in the body of the Round Table.

73 for now,
Gerry (W0GV)
President



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JANUARY MEETING - WHAT'D I MISS?

By Bill, W6OAV

There were 81 attendees for the EMP (Electric Magnetic Pulse) presentation! This shows that hams are concerned about natural EMPs (solar flares) and manmade EMPs (nukes) and their effects on the power grid!

Dwight Eckert and Glenn Rhoades began the presentation with a thought provoking video. The video showed the world's dependence on electricity and the severe impacts on mankind should the power grid fail due to an EMP. Dwight and Glenn followed the video with a PowerPoint presentation titled "EMP is Real Science". The PowerPoint covered many topics some of which were:

- Definition of EMP.
- History of the sun's past solar flares and their effects on the power grid.
- History of the 1962 Johnson Atoll nuke test and its EMP effects around the world.
- The three EMP Time Effects, how they propagate and would affect the power grid.
- Iran and North Korea have openly discussed bringing down the power grid via hacking or EMP.
- How modern society would collapse should the power grid go down.
- Things that need to be done to protect the grid from hacking and EMPs.
- The political politics that are stalling the processes to upgrade and protect the power grid.
- How to prepare one's home in case the power grid does go down.

After the presentation, there were many good questions. Most attendees left realizing how fragile society is with power grid so exposed to hacking, manmade and natural EMPs! More information can be found at <http://www.eiscouncil.org/>



Gerry (W0GV) Introductions



Glen Rhoades



Dwight Eckert

MORSE CODE, THE ORIGINAL DIGITAL MODE

PROVIDED BY FRED, AA0JK

Morse code has always been a reliable means of communication. The simplicity and inexpensive means of CW radio communication has made entry into the hobby very popular over the years. The on-off keying tone has made CW an effective mode of communications.

To the uninitiated it may seem awkward to communicate by spelling out your words with dits and dahs, but to the practiced code operator it isn't even necessary to write down the messages. They can decode the individual letters as well as entire words in their heads as they hear them. Using shorthand and Q-signals to speed things up, some can transmit and receive code at 20-30 + words per minute.



Straight Key

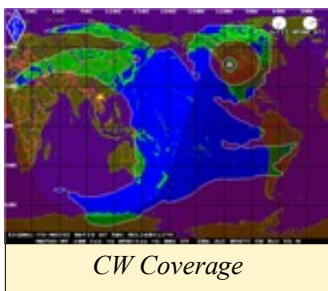


My Favorite Vibroplex

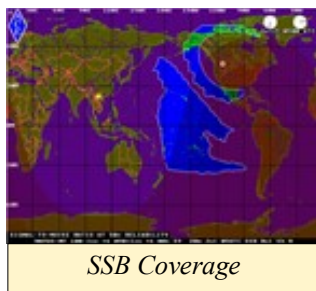
Since CW was dropped as a requirement by the FCC in 2007, this mode of radio communication has taken on a new life. Many thought it would simply disappear, but morse code, now that it's being taken up out of interest instead of being a burdensome requirement, is steadily gaining new fans.

Even now it has a greater range than SSB. The comparison, of the area coverage footprint, a 100-watt SSB signal and the footprint of a 100-watt CW signal shows how much more efficient CW is over SSB.

Note the charts below:



CW Coverage



SSB Coverage

During poor band conditions, QRN, and QRM, your message is more likely to get through than using a voice mode. No need for a computer or some electronic device to decode the message. The best processor is the human ear and brain.

Advantages

Morse code is one of the simplest modes that can be used to make radio communications over long distances, and it doesn't require complicated transmitting or receiving equipment to get on the air. Some of the advantages of CW are its ability to override noise and static and still make itself readable. Then there's its ability to occupy only a fraction of the bandwidth of radio telephony signals, and its universal nature.

Universal

No matter who you are talking to in the world, you can complete a contact on CW. That's because there's a series of internationally recognized Q-signals and shorthand terms that are understood by any ham radio operator in the world.

Bandwidth

Another advantage of CW is the fact that a QSO can take place in a bandwidth of about 300 Hz, compared to 2.5 KHz for SSB, and up to 10 KHz for FM. This means you can fit a lot more QSO's into a given bandwidth, which is especially important on some of the HF bands, where there is sometimes very small portions allocated for CW. In addition, because you are tuning in a signal on a narrow piece of the band, it makes it a lot easier to filter out interference.

Simple and Effective

Although ham radio equipment has become extremely advanced over the years, there isn't much required to make contacts using CW. All you have to do is to generate a carrier and turn it on and off. Because of its cost effectiveness, you'll hear stations on CW that you'll most likely never hear on any other mode.

CW equipment can be easily built by most prospective hams. In fact, an entire group of Amateur Radio enthusiasts specialize in building and using very simple, low powered stations (known as QRP, in ham radio). There are thousands of QRP enthusiasts around the world, who, for only a few tens of dollars, construct and operate their entire station, including antenna, transmitter and accessories.

With a little practice, you too can more readily cover the walls of your shack with Coveted QSL's and award certificates using CW. There is a special sense of pride one feels when having gained the awards using Morse code.

Currently, the most popular use of Morse code is by amateur radio operators. In the professional fields, code identifiers are used on navigational aids. In the field of aviation, VOR and NDB's stations transmit their identifiers in Morse code. (Like your local repeater ID).

(Continued on page 4)

(Continued from page 3)

On a cross-country flight, using VOR stations for radio navigation, I requested that the copilot reset the navigation radio frequency. We had flown beyond the line-of-sight reception of the present setting. As the new frequency was dialed in, it is standard procedure to identify and confirm the new navigation station.

As the new station signal came in over the headsets, I called out to the copilot, station confirmed as OSH VORTAC. He replied, "How did you do that, I don't even have the CDI dialed in yet?" My reply, "I'M A Ham Radio operator, I know Morse code". Not all stations have voice identification, but they do have Morse code identifiers. Today's GPS technology is nice in ideal conditions. But when conditions breakdown, as in a solar weather event as an example, I'll trust a CW identified ground station over GPS any day.

For emergency signaling, morse code can be sent by way of improvised sources that can be easily "keyed" on and off, making morse code one of the most versatile methods of telecommunication in existence.

The fun and gratification one gets from making a CW contact is beyond description. Click on the links below to explore additional information about morse code.

The rhythm of the Code: [YouTube Video](#)

Morse Code Song + Visual Signaling: [YouTube Video](#)

ARRL Practice Files: [Click Here](#)



[Fists CW Club](#)

Straight Key Century Club: [Click Here](#)

[Morse code verses text messaging on Jay Leno!](#)

HAM SITE OF THE MONTH

[Ham Radio Answers](#)

Including Great Videos
on Radio License Classes

ARRL 2016 Rocky Mountain Division Convention

Keystone Conference Center
May 13-15, 2016

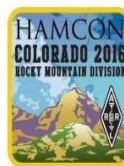
HamCon Colorado 2016

is coming to Keystone Conference Center in Keystone, CO

May 13 - 15, 2016

What a beautiful location to expand your knowledge of radio and meet up with hams from all over the Division and beyond.

Two action packed days of informational forums, nationally recognized speakers, opportunity to get on the air at the W1AW/Ø special event station, vendors galore, VE testing, fun contests and of course the Wouff Hong ceremony.



Register by February 12, 2016

To Receive:

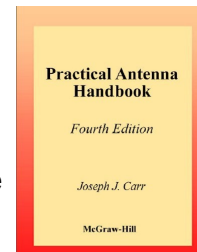
- 1 Free Ticket for Early Bird Prize Drawing
- 1 Free Badge Lanyard
- 1 Free HamCon Commemorative Pin

Register Now At: www.hamconcolorado.org

PRACTICAL ANTENNA HANDBOOK

By Bill, W6OAV

Are you interested in a great FREE 625 page PDF file titled "Practical Antenna Handbook", written by Joseph J. Carr? If so, [Get It Here!](#), or by clicking on the image on the right.



WHAT IF THE WEATHER CHANGES?

If we should experience a turn in the weather on the day of our monthly DRC meeting it may be necessary to cancel the meeting. If this should happen listen for meeting status reports on 145.49 or 448.625 MHz repeaters during the afternoon on the day of the meeting.

WHO'S NEW IN THE DRC?

The DRC is a very active club in the Denver metro area and we'd like to have all of our members listen for these new calls and personally to make them feel welcome. Welcome to our newest members. We have a number of activities throughout the year and we'd like very much for you to participate in serving your community.

Mark Venegas	KE0GXB
Steven Davis	KE0GYP
Bradley Whitlock	KE0GZE
Deborah Forsten	
Jeffrey Geiger	W0AI
Scott Hilton	N0OBA
Toni Hilton	KB0TWK
Terry Smith	
Kurt Fehlhauer	KU0O
Liz Swiech	KE0HCS
Mike Swiech	KE0HCR
Brad Greenwood	K0WET
David Verlinde	WB8AXP

If you have questions please feel free to ask on any of the repeaters or see the contact information on the last page of this publication. Also please join us once a month at the regular club meeting on the 3rd Wednesday at 7:00 p.m. For new hams we have the Elmer session which starts at 6:00 p.m. before the regular meeting.

More information can be found on the Denver Radio Club website at <http://www.w0tx.org>.

TECHNICAL COMMITTEE REPORT

By Bill, W6OAV



The following is an overview of the subjects discussed at the January Technical Committee meeting. The project coordinators' call signs are in red.

AllStar Link Voter System (W0GV)

Goal: Determine the feasibility of establishing an AllStar Link Voter network.

Status: W0GV is working with Skyler, KD0WHB, and Larry, K0LAI, to install and program the main server with Asterisk software. N0ETV has put together the hardware for a remote AllStar Link receiver. Jan, WY0J, will wire up the receiver.

145.49/448.625 Repeater - Controller and Radio Upgrade (AC0UA)

Goal: Replace the S Com 7k with a preprogrammed S Com 7330 and replace the Sytnors with Kenwoods.

Status: The new repeaters are working well. Last week AC0UA reprogrammed the controller to fix several minor ID and timer issues.

DRC/TSA Aurora Site (W0GV)

Goal: Maintain contact with TSA relative to establishing a "communications room" for the DRC.

Status: W0GV will meet ASAP with the new TSA representative. Results of the meeting will be provided to the tech committee.

Noise at Station 4 (WW0LF)

Goal: Locate, document the power line noise source(s) and contact Xcel to correct.

Status: WW0LF is gathering the equipment and will coordinate the tests. In the meantime, the HF side of the gateway is disabled as the gateway is "deaf" due to the extreme HF power line noise level.

Establish a DRC YouTube Channel (KB0A)

Goal: Provide access to various DRC videos.

Status: KB0A has obtained a channel. He will forward log-in info to W6OAV and to others.

Repair the 6 Meter Repeater (W0GV)

Goal: Repair the repeater which went down a week ago.

Status: W0GV will troubleshoot ASAP.

Fusion Repeater Upgrade (KB0A)

Goal: Equip the Fusion repeater with a Wires-X Link unit to connect it to the Wires network.

Status: KB0A has setup a temporary test link at his house. It is node number 11707 on 145.69 MHz.

~ Editor's Note: The Technical Committee meeting is open to members of the DRC. It is held in the Arvada room, starting at 6:00 p.m. on the evening of the DRC monthly meeting.

Ham Tip ~ If you have knowledge of a **GREAT** ham radio related website or just a general tip, let us know and we will share it with the rest of the club membership here in the RoundTable. Send to n0hi@arrl.net.

FEBRUARY MEETING PRESENTATION

By Fred, AA0JK

Rob Steenburgh (AD0IU), a Senior Space Weather Forecaster at NOAA in Boulder Colorado will be our guest speaker. He will give a presentation outlining their work on space weather and how it affects our environment.

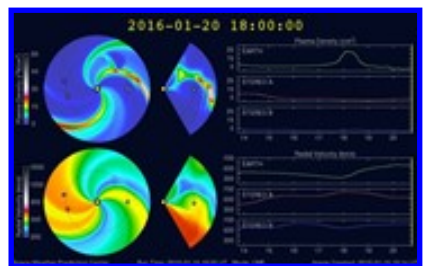
As a space weather scientist at NOAA, he uses a model called ENIL, which provides data for NASA to track space weather. (*Enlil, named for a chief deity written about in Sumerian religion. Lord (of the) Storm, the god of breath, wind, loft and breadth [height and distance]*)

WSA-ENLIL SOLAR WIND PREDICTION

WSA-Enlil is a large-scale, physics-based prediction model of the heliosphere, used by the Space Weather Forecast Office to provide 1-4 day advance warning of [solar wind](#) structures and earth-directed [coronal mass ejections](#) (CMEs) that cause [geomagnetic storms](#). Solar disturbances have long been known to disrupt communications, wreak havoc with geomagnetic systems, and to pose dangers for satellite operations.

The sun causes our space weather. The fiery spinning star constantly jettisons off energetic particles, plasma, solar wind, and CME's into space. NOAA and NASA track these emanations to predict radio blackouts that can knock out GPS and communication satellites. The amateur radio operator well knows how these ejections affect radio propagation.

Join us to welcome Rob as he presents the science of space weather and its effects on our daily lives.



Rob's Biography

I earned my license as a high school freshman in 1980. My call was KA8JBY (Ohio). I was off the air from 1985-2007. Since I've returned, I operate exclusively QRP CW using an HW-8, a Wilderness Sierra, or an ATS-4B. My antenna is a Butternut HF6V-X and occasionally I fire up a home brew 50W amp. On rare occasions I operate a BC-458A I restored with my son Daniel (KD0BMG). I enjoy home brewing equipment, restoring radios and oscilloscopes and learning. I'm an inert member of the Boulder and Longmont amateur radio clubs, BCARES, ARRL, QRPARCI, CWOps, NAQCC, and FPQRP clubs. I was an active Elmer in the Boulder Amateur Radio Club Juniors from 2007-2009.

I've been a meat cutter's apprentice (1981-1983), a volunteer firefighter (1983-1985), a 911 dispatcher (1984-85), an Air Force weather forecaster (1985-2009), and a space weather forecaster (2007-present). I served for 17 months in NASA's Space Radiation Analysis Group at Johnson Space Center (2009-2010) and was the Radiation Mission Manager for STS-130. I was promoted to Space Scientist in 2014, and my duties now involve facilitating Research to Operations (R2O) and Operations to Research (O2R) efforts, accomplishing validation and verification of models and forecast products, designing and implementing training, and engaging in public outreach activities.

**Don't forget to join in Wednesday nights at 7:30p.m. for the
DRC Learning Net on 145.49/448.625 Repeaters!**

W0TX LEARNING NET REPORT

By Fred, AA0JK



Participation numbers are growing. It's great to hear from everyone, and your participation is greatly appreciated by all. As the net grows, the resources we can draw on increases enabling us to better serve the amateur radio community.

Learning Net and Yahoo Learning group topics:

- Packet
- TNC's
- APRS
- Weather stations
- Morse code training software and web-sites
- Upgrading to that next level, General, Extra.
- Public service and what services we as amateur radio operators can provide.
- Antennas for your particular operating location.

All this and more. Great topics from our group. We certainly enjoy everyone's input and participation. Thanks to all.

Just a reminder, our once a month group meeting at the Jefferson county courts building, our time is limited. Questions you may have should be addressed during the hour prior to the main club meeting. The Jefferson county courts personnel need us to be out of the building promptly after the meeting. We would love to stay afterwards to answer question and talk about all topics concerning amateur radio but we need to comply with their wishes. Please let us address your questions during the first hour prior to the main club meeting. If this does not allot enough time, please contact me at elmer@w0tx.org. Also, we monitor 145.490, and 449.350 repeater frequencies and can discuss any topics you may have.

If you are listening and don't yet have your license, you can contact us at the [W0TX web-site](http://www.w0tx.org) , w0tx@w0tx.org or at elmer@w0tx.org.

If we don't have the answer here on the net, we have a lot of experienced hams in the club that can help. Questions can also be submitted on the [YAHOO Learning Net](http://www.w0tx.org) web page. Here you will also find information from past activity that you might find of interest.

Getting that first Technician license? Upgrading to General or Extra? We're here to help. We encourage those who have been Hams for several years to also join us. Your experience and input is welcomed.

What topics would you like to discuss? Join us Wednes-

day nights, 7:30 PM, 145.490 or 448.625.

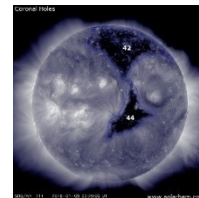
(Note: The third Wednesday of the month is devoted to the DRC club meeting. See the [W0TX web-site](http://www.w0tx.org) for additional information.

SOLAR UPDATE

PROVIDED BY FRED, AA0JK

Week 1

Solar activity was at very low levels with no noteworthy solar flares to report. The visible disk had only two numbered sunspot regions and both were stable. No earth directed coronal mass ejections were observed. A mid latitude coronal hole (44) turning into a geoeffective position. Minor (G1) geomagnetic storming was expected with a solar wind stream expected to reach earth.



Week 2

Despite the influx of new visible sunspots, solar activity remained at very low levels. No Earth directed coronal mass ejections were observed. Trends over this week were just the way we like them, with average daily sunspot numbers and solar flux increasing, and geomagnetic indices lower, compared to the previous seven days. Why do we like these numbers? When solar flux and sunspot numbers are higher, this increases the likelihood that there will be openings on HF. Lower geomagnetic indices suggest lower absorption.

Week 3

Slight uptick in solar activity. Formerly quiet sunspot AR2480 started crackling with C-class solar flares. A magnetic filament in the sun's southern hemisphere exploded. Debris from the blast formed a CME that sideswiped Earth's magnetic field on the 18th the gentle impact did not cause a full-fledged geomagnetic storm as earth passed through the wake of the CME.

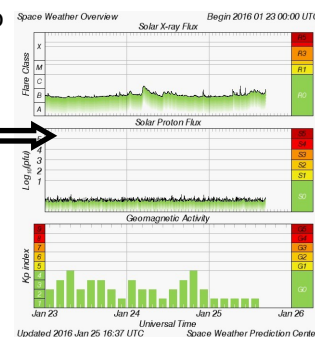
Week 4

Solar activity was expected to be very low with a chance for C-class flares.

Space Weather Overview

Space weather Outlook

No geomagnetic storms, radio blackouts or solar radiation storms are expected through the outlook period.



For the latest first hand solar reports go to space weather prediction center <http://www.swpc.noaa.gov/>.

DON'T WORRY ABOUT HIGH SWR!

By Bill, W6OAV

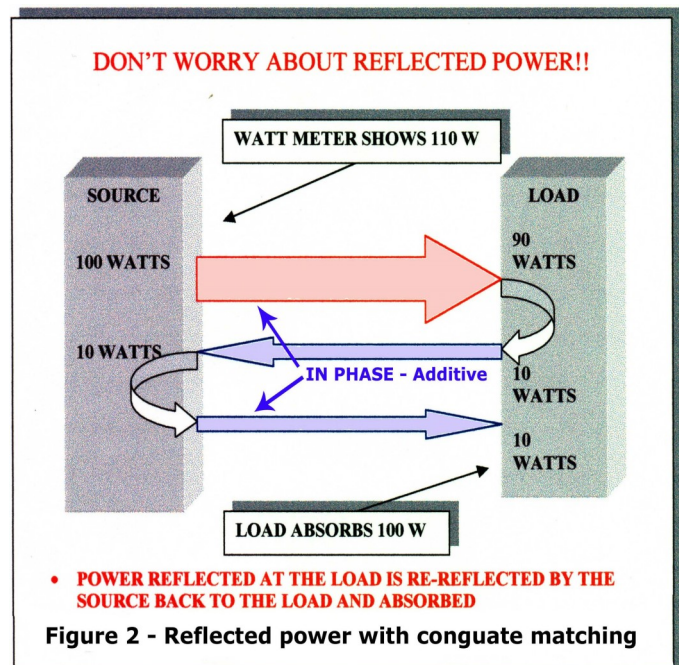
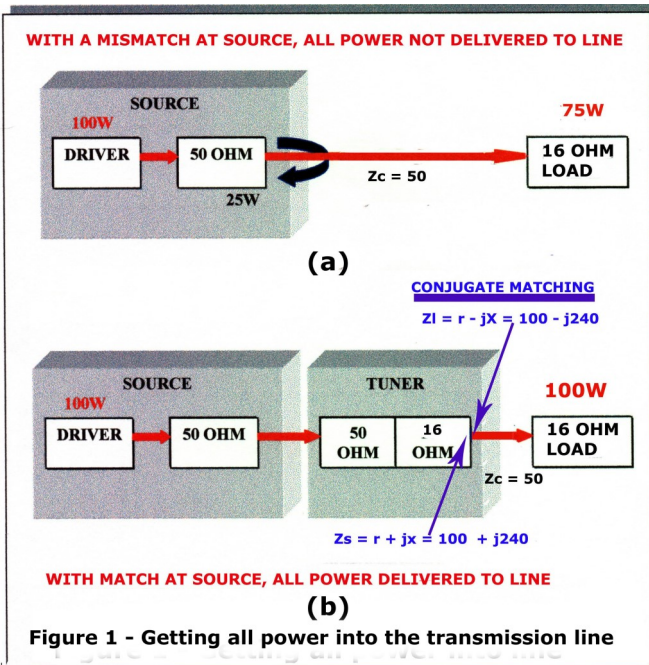
One often hears hams saying that they are concerned that they cannot get their SWR down to 1:1. Actually, if things are done right, an SWR of 3:1, or even higher, isn't a problem. This leads to a lot of possibilities which are discussed in this article:

- Why a properly designed antenna system will radiate the entire transmitter's power with very little loss regardless of the antenna system's SWR.
- How to build a simple dipole that will work on all ham bands and even provide gain on the higher ham bands.

There are two issues for getting all the transmitter power radiated: Getting all the power into the transmission line and then getting the antenna to radiate it.

GETTING ALL POWER INTO A TRANSMISSION LINE HAVING HIGH SWR

Figure 1a shows that all the transmitted power is not delivered to a transmission line when there is a mismatch between the transmitter's output impedance and the transmission line's input impedance.



In this example, 25% of the power is reflected back into the transmitter and heating up the transmitter's final amplifiers. So, how do we get all the power from the transmitter into the transmission line? We use a good tuner. The tuner uses conjugate matching to deliver all the power into the transmission line. Conjugate matching means that if a load has a certain resistance and a certain reactance, the source will have that same resistance and equal but opposite reactance. Figure 1b shows conjugate matching. The transmission line has an input impedance which has an inductive reactance (-j240) and a resistance of 100 ohms. The tuner, when tuned for maximum power transfer to the transmission line, has an equal but opposite capacitive reactance (+j240) and an equal resistance of 100 ohms.

WHAT HAPPENS NOW THAT ALL POWER IS IN THE TRANSMISSION LINE?

The following discussion uses a perfect 0dB loss transmission line. Later, we'll discuss a real world transmission line having some loss.

(Continued on page 9)

(Continued from page 8)

So, now that we have all the transmitter power going into the transmission line, what happens at the mismatch between the transmission line and the antenna? Some of the power is reflected back to the tuner. However, this power is not lost. When the reflected power arrives at the tuner, due to the properties of the tuner's conjugate match, the power is re-reflected in phase with the transmitted power back to the antenna.

Figure 2 shows an example where, due to the mismatch between the transmission line and the antenna, 10% of the power is reflected back at the antenna. However, that power is re-reflected at the tuner in phase with the transmitter power where it is absorbed by the antenna. In other words, **all** power delivered to the transmission line will be absorbed by the antenna, no matter what the SWR. Depending upon the degree of mismatch, there may be another smaller third reflection from the antenna back to the tuner where it is re-reflected in phase with the transmitter power back to the antenna. For those interested in the math and the explanations behind this action, refer to Ref 1 and Ref 2 at the end of this article.

Now, let's discuss the real world with coax loss. In this example, we'll use 100' of RG213 coax to illustrate how the loss of coax affects the amount of power delivered to, and radiated by, an antenna at various SWR values. 100' of RG213 with an SWR of 1:1 has 0.642 dB loss at 28 MHz. (We're using 28 MHz as the coax has more loss at that frequency compared to lower frequencies). Let's look at what happens when this coax is used with an antenna producing an SWR of 3:1.

We'll use Figure 3, a chart that has appeared for many years in QST's antenna books, for this discussion. This chart shows the extra loss of coax with various values of SWR. For example, to determine what happens to power loss when the SWR increases from 1:1 to 3:1, draw a vertical line on the horizontal axis from the 0.642 dB point (RG213 loss @ 28 MHz with an SWR of 1:1) up to the "SWR 3" curve. Then draw a horizontal line from the "SWR 3" curve to the left vertical axis. This shows that the additional loss caused by an SWR of 3:1 is only 0.356 dB. Thus the total loss transmission loss went from 0.624 dB to 0.998 dB. Chart 1 summarizes these results. We'll leave the math to those who want to verify these numbers (Ref 1 and Ref 2).

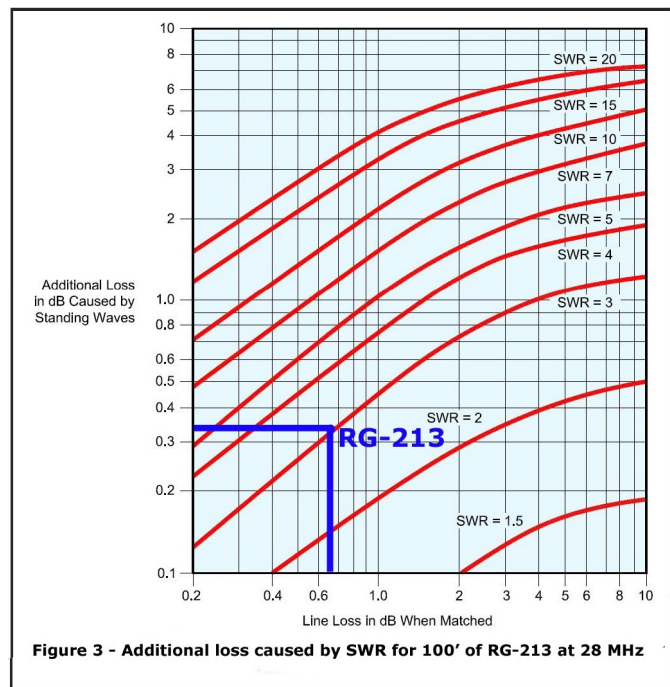


Chart 1 – Comparison of losses of 100' of RG213 @ 28 MHz

	SWR 1:1 LOSS	SWR LOSS	TOTAL LOSS	POWER OUT
POWER INTO RG213 100 W	0.642 dB	0.0 dB	0.642 dB	86.257 w
	SWR 3:1 LOSS	SWR LOSS	TOTAL LOSS	POWER OUT
	0.624 dB	0.356 dB	0.998 dB	79.476 w

There are many good SWR verses extra loss calculators on the Internet. These calculators allow experimenting with different types of feed lines to see what happens as the SWR increases. One calculator is located at: <http://www.arrg.us/pages/Loss-Calc.htm>.

The above discussion illustrates that if a high quality transmission line and a good tuner are used, high SWRs will not cause a noticeable additional transmitted power loss. This does not mean that you should ignore high SWR. You should have a reasonable idea of what SWR is expected. For example, if a dipole cut to resonance has an SWR of 3:1, then there is a problem. A typical dipole in the clear should range between 1.2:1 and 1.8:1 depending upon the dipole's height above ground. Also, use caution when running a fair amount of power with systems having a high SWR. Coax losses results in power being dissipated inside the coax and higher voltages between the

(Continued on page 10)

(Continued from page 9)

shield and the outer shield. This can cause a nasty flash over within the coax.

BUILDING A SIMPLE ALL BAND LOSSLESS DIPOLE

So, based on the above discussion, how do we design an all band dipole that has virtually no extra loss at high values of SWR and no high voltage flash over issues? We use open wire feed line or ladder line.

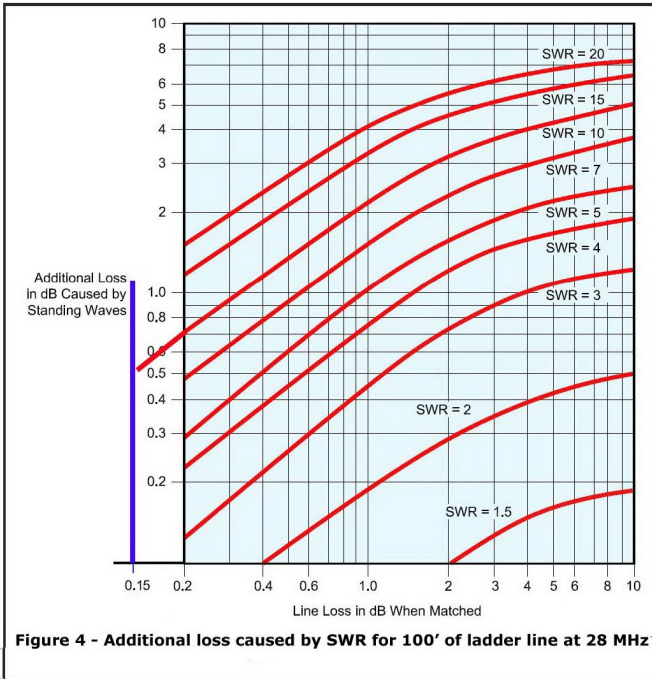


Figure 4 - Additional loss caused by SWR for 100' of ladder line at 28 MHz

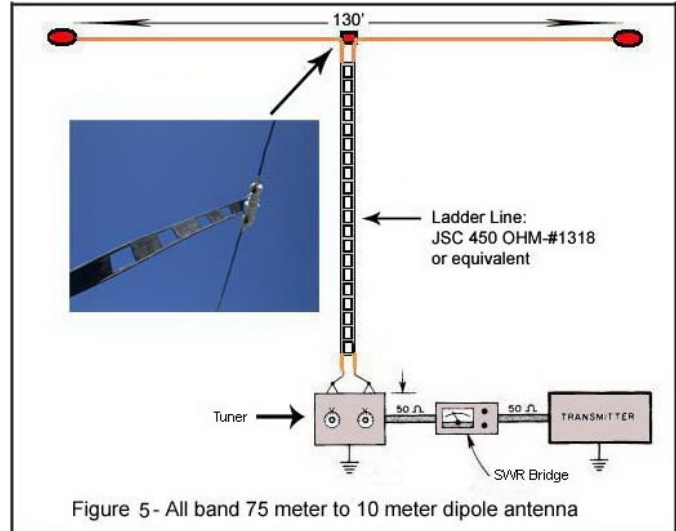


Figure 5 - All band 75 meter to 10 meter dipole antenna

Figure 4 shows the extra loss of ladder line caused by various SWR s. Since the losses are so minimal they are not included in the standard chart! So, we have to extend the horizontal axis left to a 0.15 dB point, the loss of ladder line at 28 MHz. Note that the extra loss with an SWR

of 10:1 is only an extra 0.551 dB! Chart 2 summarizes the losses.

Chart 2 – Comparison of losses of 100' of Ladder Line @ 28 MHz				
POWER INTO OPEN WIRE 100 W	SWR 1:1	SWR	TOTAL LOSS	POWER OUT
	LOSS 0.15 dB	LOSS 0.0 dB	0.15 dB	96.599 w
	SWR 10:1	SWR	TOTAL LOSS	POWER OUT
	LOSS 0.624 dB	LOSS 0.551 dB	0.702 dB	85.079 w

Chart 3 - MHz Verses Gain	
MHz	dBi
3.65	6.87
7.10	7.24
10.14	8.66
14.18	6.56
18.11	7.76
21.25	10.93
24.90	10.65
28.30	10.52

Based on the above discussion, how do we build an all band dipole which has virtually no loss at the lowest band of interest and gain at the upper bands? We build a half wave dipole cut for the lowest band of interest and feed it with open wire or ladder line as shown in Figure 5. For example, EZNEC antenna analysis shows that a 75 meter dipole 45' above ground and fed with ladder line will show the gains listed in Chart 3.

(Note: The gain measurements are at the peak of the horizontal pattern. As the frequency goes up, the horizontal pattern peak goes lower in elevation). The gain results because, as the frequencies increase from 3.65 MHz to 28.3 MHz, the pattern changes from a broad figure 8 to a narrower 4 leaf clover, thus concentration the power in narrower lobes.

Depending upon the height of the antenna and the length of feed line, the tuner might not be able to match the antenna on a particular band.

(Continued on page 11)

(Continued from page 10)

This issue was discussed the April 2014 issue of the *Roundtable*.

SUMMARY

The cardinal rule is that if a high quality transmission line and a good tuner are used, high SWRs will not cause a noticeable transmitted power loss. This rule also allows the ability to use a single efficient dipole on many different bands.

Ref 1: *Reflections II*, Appendix 6, by M. Walter Maxwell

Ref 2: *Antennas Made of Wire*, Volumes 1, 2 & 3, by L.B. Cebik, W2RNL (SK)

VE SESSION REPORT

By Tom, KC2CAG

The Denver Radio Club's VE Team was relatively busy the past year, conducting 7 test sessions serving 99 candidates. A big THANK YOU to all the VE Team members participating in last year's sessions:

KC2CAG - 6 sessions	WZ0S - 4 sessions	AC0VC - 1 session
K0RCW - 4 sessions	W0GV - 3 sessions	N0ETV 1 session
AA0JK - 4 sessions	K0HTX - 3 sessions	WM0P - 1 session
K0MEL - 4 sessions	AD0GX - 2 sessions	NV7R - 1 session
W1ZRV - 4 sessions	KC9PDX - 2 sessions	W0JMC - 1 session
AC0T - 4 sessions	N3PQ - 2 sessions	

(My apologies if I missed anyone, as I don't have copies of the reverse side of the Test Session Reports and some other VE's may have been listed there...)

Let's hope for more work and more new hams this coming year! As a heads up, our VE Team will be testing at HAMCON Colorado 2016 at Keystone Resort this Spring. HAMCON is scheduled for May 13-15, 2016. Hope to see a lot of our VE's there!



The ARRL Rocky Mountain Division Convention

May 13-15, 2016

At the beautiful Keystone Conference Center
in Keystone, Colorado

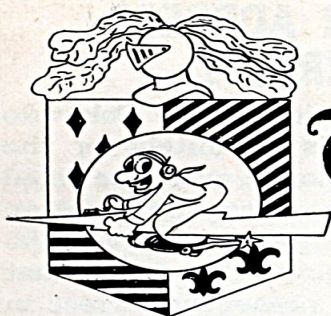
Two action packed days of informational forums, nationally recognized speakers, opportunity to get on the air at the W1AW/Ø special event station, vendors galore, VE testing, fun contests and of course the Wouff Hong ceremony.

Registration Now Open!

REGISTER AT: www.hamconcolorado.org

LOOKING BACK AT THE DRC PROVIDED BY WOODY (W0UI) ROUNDTABLE, OCTOBER 1960

Some nice DRC club history here.



October, 1960

The Round Table

The Denver Radio Club, Inc.

**COTTERELL NAMED
PRESIDENT OF DRC****SMITH TO HEAD
OCT. MEET**

Carl Smith, WØBWJ, the Rocky Mountain division SCM will speak at the DRC meeting at Sabin Hall, October 20. As Carl is well versed on ARRL activities, this promises to be interesting to all, and especially to the traffic handler, the active ham should not miss this one.

Ø—Ø—Ø

A prominent VHF operator takes a serious look at the amateur fraternity and concludes it should be more fraternal in this month's "Letters to the Editor."

(See Page Seven)

Ø—Ø—Ø

**PLANS ANNOUNCED
FOR NEW DIRECTORY**

A new edition of the Colorado Ham Directory has been scheduled for publication by the Denver Radio Club.

One of the first actions by the newly-elected board of directors was approval of a proposal to begin work immediately on a 1961 edition of the popular directory.

The first and only issue of the call book was published in 1959. No funds were available for a publication in 1960, in spite of many requests.

Club members connected with the project promise an outstanding directory of Colorado amateurs, with several unique features. The book will make its appearance early in 1961.

Chic Cotterell, WØSIN, has been elected president of the Denver Radio Club in an exciting race that produced a tie, a runoff election, and a win by two votes.

Interest ran high in the election held at the September club meeting. The two incumbent board members on the list of nominees, Cotterell and Fontaine LaRue, WØRQI, were re-elected on the first ballot, along with two new officers, Russ Hendrickson, KØEPD, and Roy Raney, KØOVQ. (The other two out-going board members, Mike Lyons, WØPG, and Ralph Asbury, WØVDY, declined re-nomination.)

The names of the four newly elected board members were added to the list of four directors whose terms do not expire until next year, and a ballot was taken to name a president. As the ballots were being counted it became apparent that the race was between Cotterell and Raney. And as the last ballot was read, the two candidates were in a dead tie. A runoff election was held amid cheers of partisans, and Chic Cotterell was the victor by two votes. In response to a motion made from the floor, Roy Raney was named vice-president by acclamation.

In later balloting, Larry Moesta, WØJGW, easily won the post of secretary and Russ Hendrickson, KØEPD, was named treasurer.

The complete list of board members can be found in the masthead of **The Round Table**.

This puzzle is provide courtesy of Chris Codella - W2PA. The URL for his website is <http://www.w2pa.com>. The solution for the puzzle is on page 14.

Pins

1	2	3	4		5	6	7	8	9		10	11	12	13
14					15						16			
17					18						19			
20				21						22				
			23						24					
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33			34				35				36			
37						38				39				
40					41				42					
43				44				45				46		
			47				48				49			
50	51	52				53						54	55	56
57					58						59			
60					61						62			
63					64						65			

Across

- 1. Tube connection*
- 5. Close-knit group
- 10. Tube conn.*
- 14. Verdi opera
- 15. Ten-Tec rig
- 16. Ten-Tec rig
- 17. After-bath powder
- 18. Kazakhstan prefix
- 19. Bushel quarter
- 20. With 53 across, describes the * words
- 22. Analyze syntactically
- 23. Window alternative
- 24. ARRL org. pertaining to SS, others
- 25. Beast of burden
- 28. Turner of TV channels
- 29. Platform on a ship's mast (a place for a /MM antenna?)
- 33. Odwalla fruit and ___

- 35. Not brilliant
- 36. Best kind of tower
- 37. New England net
- 38. Transistor conn.*
- 39. Singer Ronstadt
- 40. UA assembly
- 41. Cutter
- 42. Digital mode
- 43. Delta follower
- 45. YLRL non-member
- 46. "___ we having fun yet?"
- 47. Caller for calls
- 48. T8 land
- 50. RG8 ground
- 53. See 20 across
- 57. CW
- 58. Thorny
- 59. 7800 maker

- 60. H.S. tests
- 61. Cycle user
- 62. Put one's foot down?
- 63. Transistor conn.*
- 64. TI land first name
- 65. D.C. group

Down

- 1. Tube or Transistor connection*
- 2. EP coin
- 3. Like some chatter
- 4. S2 capital, old-style
- 5. Swift horse
- 6. Noted traitor
- 7. Device with only a 25 down and 10 across
- 8. Recent UA prefix, especially, e.g. M-V Is.
- 9. W1 dir. from W7
- 10. Just fine
- 11. Part of ARRL (abbr.)
- 12. Ckts. for 42 across use
- 13. Go backpacking
- 21. Ten-Tec amplifier
- 22. Golfer's goal
- 24. Computer port type
- 25. Tube connection*
- 26. Gray line time
- 27. Flower towers
- 29. Tube conn.*
- 30. JA poem
- 31. OOTC member, to an OTC member, probably
- 32. Tube connection*
- 34. Smartest
- 35. Jones' partner
- 38. Plains states NTS org
- 39. KH6 porch

- 41. The only CW most people know
- 42. KH5 land
- 44. CRT successor
- 45. OJ0 reef
- 48. What output power does, in resonance
- 49. Ohms, volts, and others
- 50. Transistor connection*
- 51. Drift
- 52. Prefix with VOX
- 53. Kenwood, once
- 54. Antenna farm unit
- 55. "Crazy" bird
- 56. Tiny parts
- 58. Big G SW org.

FACT OF THE DAY

Human RF Radiation Risks

Radiant RF energy is non-ionizing and is believed to not have cumulatively damaging effects like ionizing radiations such as x-rays have, if radiation doses are small enough to not cause biological cell damage due to heating. The amount of human heating from radiant RF energy is highly dependent upon both field-strength and frequency. A human body absorbs only very small percentages of radiant RF energy below 30 MHz. However, the absorption percentage rises at higher frequencies. About half the energy in a 400 MHz electromagnetic wave passing through a human is absorbed. Between 1 and 3 GHz the RF energy absorption of human flesh is nearly 100 percent (microwave ovens operate at 2.4 GHz, because the same is true for many foods). Human RF radiation absorption decreases above 3 GHz and is down to about 50 percent at 10 GHz, because about half the energy is reflected. ©2005 Martek International All rights reserved.





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THE ROUNDTABLE ARCHIVE

Scan the QR code or go to <http://www.w0tx.org/RoundtableAccessPage.htm>

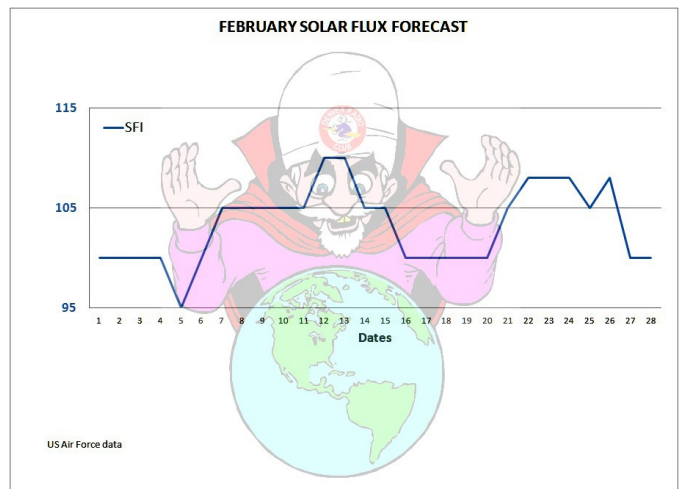
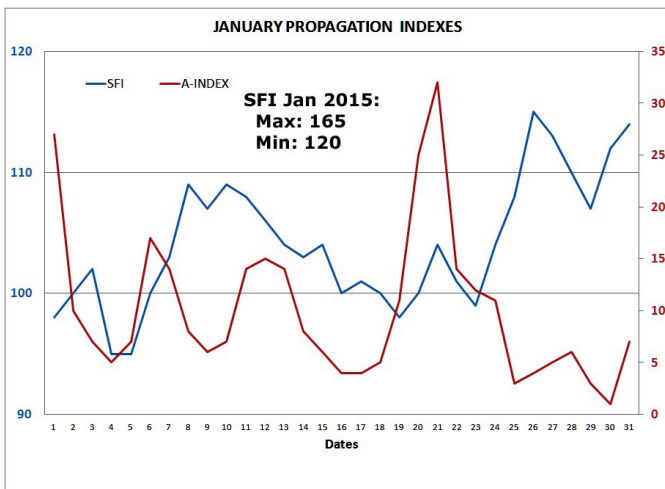


PAST & FUTURE PROPAGATION CONDITIONS

By Bill, W6OAV

The charts below show the Solar Flux and “A” indexes for last month and the forecast for this month’s Solar Flux index.

Refer to the September 2010 *Roundtable* for more complete information on interpreting these charts. Issues of the *Roundtable* are available at <http://www.w0tx.org/RoundtableAccessPage.htm>.



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UPCOMING EVENTS

HAMFESTS & CONVENTIONS

Event	Date	Location	Sponsor Website
The SwapFest	02/07/16	Brighton, CO	Aurora Repeater Assn., Cherry Creek Young ARC, & Rocky Mountain Ham Radio
LARCFest 2016	03/26/16	Longmont, CO	Longmont Amateur Radio Club
Rocky Mountain Division Convention	05/13/16	Keystone, CO	HamCon Colorado

UPCOMING ARRL CONTESTS

[ARRL CONTEST CALENDAR](#)

Contest	Start Date	Start Time	End Date	Stop Time	Notes
School Club Roundup	02/08/2016	1300 UTC	02/12/2016	2359 UTC	
International DX-CW	02/20/2016	0000 UTC	02/21/2016	2359 UTC	
International DX-Phone	03/05/2016	1800 UTC	03/06/2016	2359 UTC	
Rookie Roundup - Phone	04/17/2016	1900 UTC	04/17/2016	0359 UTC	

UPCOMING QSO PARTIES

The following are the Contests not sponsored by the ARRL. Please submit additions for future issues.

State/Province	Start Date	End Date	Sponsor Website	Notes
British Columbia	02/06/2016	02/07/2016	Orca DX and Contest Club	
Vermont	02/06/2016	02/07/2016	Radio Amateurs of Northern Vermont	
Minnesota	02/06/2016	02/06/2016	Minnesota Wireless Association	Based on 2015 date.
New Hampshire	02/13/2016	02/14/2016	Port City Amateur Radio Club	Based on 2015 date.
South Carolina	02/27/2016	02/28/2016	Columbia Amateur Radio Club	Note new date.
North Carolina	02/28/2016	02/29/2016	Raleigh Amateur Radio Society	
Idaho	03/12/2016	03/13/2016	Idaho QSO Party	
Louisiana	03/12/2016	03/13/2016	Louisiana Contest Club	Based on 2015 date.
Wisconsin	03/13/2016	03/14/2016	West Allis Radio Amateur Club	
Oklahoma	03/19/2016	03/20/2016	Oklahoma DX Association	Based on 2015 date.

DRC REPEATERS

BAND	Freq / Shift / PL Tone	Additional Information
6m	53.090MHz (-1MHz) 107.2Hz PL	
Packet	145.05MHz<>14.105MHz	HF port out-of-service due to technical issues.
2m	145.490MHz (-) 100Hz PL	Linked to the 70cm - 448.625MHz machine.
2m	147.330MHz (+) 100Hz PL	Local Area, Members Auto-Patch Does Not TX a PL!
2m	147.330MHz (+) 131.8Hz PL	Test Mode Operation. Send signal reports to Tech Committee.
1.25m	224.380MHz (-) 100Hz PL	
70cm	447.825MHz (-) DCS~073; NB 12.5; +/- 2.5	Saint Anthony's Note: This is a narrow band repeater requiring DCS.
70cm	448.625MHz (-) 100Hz PL	Linked to the 2m - 145.490MHz machine.
70cm	449.350MHz (-) 100Hz PL	Wide area coverage with Echolink Node # 4140.
70cm	449.775 MHz (-) 100Hz PL	Yaesu Fusion Digital / Analog, 100 Hz Tone Required for Analog.
70cm	446.7875MHz (-)	MotoTRBO Repeater Slot 1 – DMR-MARC WW, Slot 2 – Local



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
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FEBRUARY 2016		<i>DRC Net Sunday's at 8:30 p.m. on 145.490 / 448.625 (No PL)</i>				
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2 Groundhog Day 	3 Learning Net 7:30 p.m. 145.490 / 448.625 (No PL)	4	5	6
7	8 ARRL School Club Roundup Begins 1300 UTC 	9	10 Learning Net 7:30 p.m. 145.490 / 448.625 (No PL)	11	12 ARRL School Club Roundup Ends 2359 UTC	13
14 Valentine's Day 	15 President's Day  	16	17 DRC Meeting Elmer 6:00 p.m. General 7:00 p.m.	18	19	20 ARRL International DX - CW Begins 0000 UTC
21 ARRL International DX - CW Ends 2359 UTC	22 	23	24 Learning Net 7:30 p.m. 145.490 / 448.625 (No PL)	25	26	27
28	29					

DRC BOARD OF DIRECTORS

President	W0GV	Gerry Villhauer	303-467-0223	w0gv@hotmail.com
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Board Member	AC0UA	Jason Smallwood	Check Roster	Check Roster
Board Member	KB0A	Bryan Steinberg	303-987-9596	bryan@kb0a.com
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Board Member	K0LAI	Larry Irons	303-763-8112	Check Roster

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Tech. Committee Chair	W6OAV	Bill Rinker	Check Roster	Check Roster
Trustee	WW0LF	Orlen Wolf	303-279-6264	owolf@mines.edu
TSA Coordinator	KA0BBQ	Barry Wilson	Check Roster	ka0bbq@arrl.net
VE Team	KC2CAG	Tom Kocialski	720-284-1911	kc2cag@arrl.net
Web Master	N0LAJ	Bill Hester	Check Roster	Check Roster

~ GET PUBLISHED ~

We welcome and encourage all members to share their experiences and stories so that we can all learn from one another. It can be long or short. If we can't fit it into one newsletter, we can split it across multiple issues. Not a writer? We have volunteers that will listen to your story and put it into an article, and of course you will have the opportunity to review and approve prior to publication. Your contribution to the club is welcomed and appreciated. ~Editor

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DRC members - this is your newsletter. Please email your club or amateur radio related suggestions to the editor. Members are the heart of The Denver Radio Club, so if you have an expertise or an interest in a particular segment of ham radio that you'd like to write about, you may email your submissions to n0hi@arrl.net. The submission deadline is the 20th of the Month. ~ Editor