

The Repeater



The Official Publication of the Twin Cities Repeater Club, Inc.

Mission Statement of the Twin Cities Repeater Club, as Adopted on September 20, 1993

The purpose of the TCRC is to facilitate the local communication needs of its members by owning and operating a state of the art wide area coverage two meter repeater system. The club will further involve itself in secondary activities intended to (1) promote the exchange of ideas and information related to amateur radio, (2) strengthen the fellowship and camaraderie among the members, (3) serve the local amateur radio community, and (4) increase local public safety.

Official Notice of the TCRC Annual Meeting

The final quarterly membership meeting of the Twin Cities Repeater Club (TCRC) for this year is scheduled to occur in Burnsville City Hall, on Tuesday evening, November 23, 2007. You are welcome to arrive around 7:00 PM for set-up and refreshments. We will try to get the meeting underway by about 7:30 PM.

Talk-in will be available on the 147.21 repeater, during an abbreviated version of the TCRC Information Exchange Net that evening.

At this annual meeting, we need to select club officers for the positions of President, Vice-President, Secretary, and Treasurer, so it is very important that we have a quorum of members at the meeting to hold the official elections. We also select the recipient of the Arnie Pung Award for Service in Amateur Radio at this meeting. Please consider who you think is deserving of this honor for 2007.

The current President, Phil (KBØNES) has expressed the desire to be relieved of his duties as President for the 2008 calendar year. The current Vice-President, Mark (KCØITP) has also indicated that he will be unable to serve as an officer next year, now that he has moved his household quite a distance away from the Burnsville area. The current Secretary, Tanna (KCØURO) has indicated her willingness to run for the same position for next year. Likewise, the current Treasurer, Craig (KCØDMF) has indicated his willingness to continue on in this capacity next year. So, please give some thought to who you'd like to see on the Board of Directors next year, but especially in the two top spots. And don't be shy, give some thought as to whether or not *you* might like to run for office. Everyone who has done it for the last 30 years has survived the experience, so give it some serious consideration! You might actually enjoy the experience!

November, 2007
Volume 30, Number 3

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*Please Join Us
For the TCRC
Annual
Membership
Meeting,
with Election of
Club Officers,
and Selection of the
Recipient of the
Arnie Pung Award*

*Burnsville City Hall
7:30 PM
November 27, 2007*

The Repeater is published quarterly by the Twin Cities Repeater Club, Inc. (the TCRC). The TCRC is organized as a nonprofit corporation in the State of Minnesota, with Articles of Incorporation and Bylaws. The club elects officers annually. These officers are simultaneously elected for a two-year term on the Board of Directors. The Repeater Trustee is a permanent member of the Board of Directors. Unlike the other Officers and Board Members, the Trustee may select a proxy to serve in his place at meetings of the Board. Membership in the TCRC is \$25 per year. The TCRC is an official ARRL affiliated society.

TCRC Officers:

President: Phil Lefever, KBØNES
Vice President: Mark Neuman, KCØITP
Secretary: Tanna Morse, KCØURO
Treasurer: Craig Larsen, KCØDMF

Board Members:

All of the above Officers, plus...
Ivan Frantz, WØBU, **Repeater Trustee**
Ivan has currently appointed Mogens Dantoft, OZ9MD, as his proxy for Board Meetings.
Jim Rice, NØOA, **Past Secretary**
Jeff Goodnuff, WØKF
Larry Jenkins, KØLEJ
Artie Johnson, WBØJMG

Technical Committee (a/k/a Tech Team):

Kevin Uhler, NØBEL, **Chair**
Phil Lefever, KBØNES, **Vice Chair**
Doug LaBore, NØBIS
Rich Kenney, WØRFK
Dave Kleindl, NØKP
John Toscano, WØJT
John Phelps, KFØZM
Steve Filek, NØOWL
Kent Peterson, KCØDGY

Field Day Committee:

Mark Neuman, KCØITP, **Chair**
Jim Rice, NØOA, **Vice-Chair**
Kevin Uhler, NØBEL, **Site Setup Manager**
Open, FØOD Station Manager

Information Services Committee:

Kevin Uhler, NØBEL, **Chair and Head Webmaster**
Phil Lefever, KBØNES, **Assistant Webmaster**
John Toscano, WØJT, **Assistant Webmaster**
Jeff Goodnuff, WØKF, **Web Calendar Maintainer**

Membership Committee:

Doug Ayers, NAØVY, **Chair**
Craig Larsen, KCØDMF
Tanna Morse, KCØURO

Newsletter Committee:

John Toscano, WØJT, **Editor**

Net Control Operators:

Chair: Larry Jenkins, KØLEJ
1st Tuesday: Jeff Goodnuff, WØKF
2nd Tuesday: Doug Ayers, NAØVY
3rd Tuesday: **Open**
4th Tuesday: Phil Lefever, KBØNES
5th Tuesday: John Toscano, WØJT
Alternate: Mark Newman, KCØITP

Metro Skywarn Liaison:

Jeff Goodnuff, WØKF

Minnesota Repeater Council Liaison:

Jeff Goodnuff, WØKF

Getting Myself Back Onto HF

Part 3, Creating the New Wire Antenna

by Kevin Uhler, NØBEL

(Editor's Note: In the first two parts of this series, Kevin described how he began the process of getting back onto the HF bands by repairing and re-connecting his existing equipment, and then by preparing for the addition of a new wire antenna. In this third part, he actually designs and builds the new antenna, and tries it out. Part Two of this article appeared in the electronic-only issue of The Repeater, Volume 30 Number 2. You can find that issue on the TCRC web site.)

So I look for wire. I need 45 feet on one leg and 90 feet on the other. I find an old Radio Shack wire antenna... Hmm... the package says 75'. I've always used bare wire in the past, but that old Field Day 80M/40M dipole we've used "forever" is insulated. So I figured I'll just go get some wire. After a trip to Home Depot, and after paying a ridiculous amount of money for a reel of 500' of 14 gauge stranded electrical wire, I was ready to go. It was, of course, raining by this time. Rain always improves an antenna installation, so I continued, undaunted, if a little wet. Now, one end of this dipole has to be anchored to an evergreen tree, as high as I can get it. Using a little twine with a wrench tied to the end of it, and a few tries, I got it up in a decent place. I decided to do something simple and wrap the twine 3/4 of the way around the tree and tie the twine to a stake on the ground. This would let me drop the antenna more easily as I adjusted it. With that done, I went back down to the workbench and prepared the balun with the 100 pF capacitor, and figured out how I would connect it to and support the wires.

I measured out 48 and 96 foot sections (the front face of the garage is 24 feet wide) of wire to start off with. I wasn't going to mess with the 15M piece until after the main part worked. I figured I could prune as needed. I wasn't sure what the insulation would do to the length, although a quick check of the internet showed most people claim the insulation caused you to end up with a dipole shorter than the normal calculation.

It's still raining, so I figured this would be the best antenna yet. I attached the short wire to the balun, and went up the tower, and got it attached. At the same time I decided to remove my 20 year old discone (dummy load) antenna, since this was the coax run I was going to use. It gave me great pleasure to drop that antenna to the ground and watch it go splat. I went up again with the 96' wire and connected that, and then connected the coax, which was, miraculously, exactly the correct length. I then stretched out both ends of the antenna. The short end going to the evergreen tree went up quite nicely and the insulator was about 3 feet from the tree. So far, so good. I went to the long wire. Here, I had difficulty getting the length, missing the satellite dish, missing another tree and attaching to the fence. For the moment, I had about 10 feet of extra wire weaved along the fence. Well it's a wooden fence, and it's insulated wire... lets see what happens.

Ok, to recap... It's raining, I did about 4 free climbs up and down the tower, my antenna is weaved through the fence at one end. Interestingly enough, I feel pretty good, except for a little bit of sweating. My wife is just shaking her head, now having proof, rather than only suspecting that I'm crazy.

Now, I put my newly calibrated antenna analyzer on the coax, and sweep the bands. And I get nothing, nada, bupkis. SWR is infinite everywhere. The impedance however does have some interesting transitions from infinite to zero and back again a few times through the HF bands. Some of the transitions correspond to the predicted resonances that the antenna models showed. My first thought was that I had the wrong coax run. These infinite/low impedance transitions could be showing me that I had an open or shorted coax run. So I re-inventory my coax runs. I only have 4 runs. One run goes to the DX77, one to the old discone dummy load (now the new dipole), one to the Diamond 17' 2m/440 vertical, and one to the satellite antennas. I had identified each run a couple weeks ago. And used the ICOM 820 to verify I had the right antenna for the satellites. I had the right run for the DX77, and the 2m/440 vertical had been attached to my stack of 2m/220/440 radios forever. This was the only run left, so it had to be it, right?

Ok, I'm sure the coax is right. So, let's hack off the ends of the dipole (remember that I had made it 96' instead of 90' and 48' instead of 45') to their proper length. I figured this would also improve the fence wire weave problem. So I did all that, and climbed up the tower once more to make sure that nothing had come apart. It's still raining, a little windy, the temperature is falling, and now, it's getting dark. With all that going for me, this antenna should be nearly perfect! I figured it should be pulling in DX even when the bands were closed!

Back in the house, plug in the analyzer... Same result: infinite SWR everywhere. Not a null to be found. Ok, it must be the coax. Guess where my dummy loads are? Up at the repeater site. So I find an SO-239, solder on one of those 50 ohm resistors I used to check the analyzer, and climbed

up again. It's windier now. Maybe the dummy load will pull in the DX. The analyzer still reads infinite SWR. Ok, it's either a bad coax, or the wrong coax. So I disconnected the coax from the back of the 820, and plugged it into the analyzer. And what do you know? It's all flat, 1:1 SWR everywhere. I guess that'd be the dummy load huh? This coax mixup is a lesson in challenging your assumptions. When I was on the tower earlier in the day, I had seen a coax cable tangled in the old discone. It had an N connector on it, and also had some twisted wire taped to it. It ran up to the top of the tower. It was the UHF satellite antenna feed line, the line that was supposed to be running from the mast to the back end of the satellite antenna and the polarity switch box. Apparently, over the years, the N connector had unscrewed itself. After that, I dismissed the issue as something to fix when I reworked the satellite antennas.

Well, when I identified the coax runs those couple weeks ago, I had used the idea that whatever coax worked best for the 820 would be the satellite antennas. However, what was the case instead was that the 820 liked the discone rather than the satellite antennas, due to the bad shape (and disconnected coax found today), that they were in.

Ok, so now I have the right coax. It's time to make one more run up the tower. It's darker now, and windier, but it stopped raining (damn). Back to the house, analyzer connected (to the right coax), and I actually see SWR nulls! And the nulls are even in the right places! A little bit of study with the meter shows that the antenna works on the very high end of 80M, about the middle of 40M, and the lower end of 20M. So, let's see if the radio likes it. The 736 showed low SWR in the same places the meter did. I didn't check absolute values, but it's in the ballpark.

I did some testing and low power transmitting, and the first thing I noticed was the transmit button seemed to "stick" on 80M. I had to turn off the rig to stop it. I finally figured out that if I removed the USB cable from my USB/sound/serial/radio control box, the transmit sticking would stop. Can you say "RFI"? The TV, right next to the radio, which never exhibited problems on the DX77, had some beat bars on it (lots of beat bars, but all in all low amplitude). Ok, let's try 40M. There is no problem with the transmit button, but more beat bars, and a black and white picture. This TV is connected to the dish receiver via video cables, so the tuner isn't being messed up, the electronics are being overloaded with RF. Hmm, what about 20M? The TV picture was wiped out entirely.

The way the wire antenna is configured, the house (and the second floor, where the radios are), are within 10 or 15 feet of the wires. Both wires go over the house. At this point I'm thinking that the problem is simply antenna-radiated RF, mostly. This is where I left things. It was late enough by now, that I decided to monitor the various geriatric nets on 75 to see how the receiving worked on 80M. I have to report that this worked very well. Noise was S8, which I didn't expect, since it's pretty quiet on the vertical on 40M, with maybe S2 noise with an open band.

I'm happy that the antenna worked as it should have. Again, theory and practice have some intersection. I haven't tried to tweak it yet. I need to move the low SWR frequencies down some on 80M, and up some on 20M. I'll work with the model to figure out which ends to cut (or lengthen). Also, since the satellite antennas are in worse shape than I had thought, and since there are no high orbit satellites up there, I'm going to move the apex of the dipole all the way to the top of the tower, maybe even remove the satellite antennas so I can get the apex a couple of feet higher onto the mast. This should help me get the longer wire clearer of a tree, and help if I have to lengthen that leg. Also, higher means farther from the house roof, and rooms, so maybe the RFI will diminish a bit. Lastly, I think I want to put some cores on the coax feed, since it's probable that the feed is picking up lots of RF from the antenna. Since I'm using a voltage balun for now, there also might be some current on the coax (maybe I'll make up a coax choke for that). In addition, to cut the amount of RF that the feed is getting, I'll probably put some cores on the coax where it comes into the roof. In a week or so, I'll probably be covering the entire house in aluminum foil.... Or maybe not.

Next, I got a pulley and some rope. I also picked up some PL-259 connectors. I made chunk of coax with those PL259's on them, with an 8 turn (10" diameter) coax choke on one end. The goal today is to put the apex of the dipole on the top of the tower, while at the same time being able to lower it for adjustment/repair/upgrade. The choke in the coax was to reduce RF on the outside of the coax. While it wasn't snowing, it was very cold and windy, so I figured this would be good for the antenna.

I got everything ready, loosened the ends of the dipole, and climbed up there. It's been awhile since I've climbed all the way to the top of the tower. My fear of heights got to me about 2 feet from the top, and I had to stop. Of course I'm not using any safety gear. I forgot my gloves, and the at- or below-freezing tower reminded me of that. I managed one more wrung up, and decided that was going to be good enough. I tied the pulley about 1 foot below the very top, and brought down the already-threaded rope down to where the apex was. And of course, while switching hands and grips, I let go of the rope, which went up... then down. Oh well, I had about had it for that trip up anyway. I went back down to the roof, put on the gloves I had left there, and laid down for a while.

After a little recovery and some thought, I started up again with the rope in hand, and gloves on hands. I threaded the rope through, and brought it down to the existing apex. I cut the rope I was using for the existing apex, and let the coax balun and wire drop (about 8 ft) to the roof. I got down onto the roof again, and tied the rope (without dropping it this time), to the coax balun, attached the coax, pulled the thing up to the top, and tied the rope off. I made one more climb (only about 8 ft) to connect the coax from the antenna to the coax going inside the house. I went down and pulled the ends tight again, and did manage to avoid the fence wire weave. The frequencies of low SWR haven't really changed (3.90 MHz, 7.20 MHz, 13.9 MHz). However the SWR on 80M was higher than 2:1. Looking at the meter, it showed a low impedance, less than 25 ohms. This is not really that surprising, since making the apex angle smaller lowers the impedance.

Transmit tests on the three bands worked better than before. There was much less RF in the room. The radio doesn't get stuck in transmit when connected to the computer anymore. Getting the dipole up higher seemed to help, or maybe it was the choke, or both. So now I go back to the model, move the apex up 10 feet, and see what happens. The 80M band modeled almost exactly to observation. The 40M and 20M bands model to the right impedance, but not to the right resonance point. This is probably the result of the insulated wire, which the modeling program knows nothing about. On 80M, the impedance of the model shows about 60 ohms, which, when divided by 4 (by the current balun) is 15 ohms. The meter showed about 25. We're in the ball park. Either the real world antenna is 100 ohms, or the meter isn't accurate on lower impedances. On 40M and 20M, the impedances are close to the 200 ohms seen in the model (175 and 220), so the SWR is low.

On a dipole at resonance, you can move the feed point around. What you get is a change in impedance, but no change in the reactance (which is a function of the resonance). So, with the model, I tried moving the feed point to make it work better on 80M. I was able to move it a little bit to raise the impedance to a usable 150 ohms, but on 40M the impedance went up to a somewhat usable 350 ohms, but on 20M, the impedance went to over 1000. Since the impedance of the feed point is a function of the voltage and current ($E=IR$) at that point, and the voltage and current are 90 degrees out of phase on the standing wave of the resonant half wave wire, different points give you different impedances. However, these voltage/current ratios will be different on different bands, as 80M has 1 half wave, 40M has 2 half waves, and 20M has 3 half waves.

I decided at this point to try the antenna tuner that is built into the radio. The 40M band needed no tuner except for the lower end. The 20M band needed no tuner at all. The 80M worked without the tuner down to about 3.8 MHz. The tuner could take it down to 3.6 MHz. I guess the CW part of 80M won't work without making the antenna longer. I went back to the model to plot the SWR and impedance on the low end of 80M. The SWR increases rapidly as the impedance goes way down on the low end of 80M. At 3.5 MHz, the calculated SWR was 16:1. However, the SWR on the upper end of 80M gradually goes up. I'm thinking that if I lengthen the dipole, the tuner may let me tune both the higher end and the lower end. But this is speculation. Just for the heck of it, I decided to connect that old Dentron tuner. Of course, it worked fine anywhere I chose to tune it on 80M, since the Dentron has a wider tuning range than the internal tuner in the radio.

The next thing I did was to design build my own antenna tuner, but that's another story...

(... to be continued...)



Twin Cities Repeater Club, Inc.
P.O. Box 11534
St. Paul, MN 55111-0534

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Are you a member of Metro Skywarn? ___No ___Yes, spotter ID: _____

Are you a member of ARES? ___No ___Yes

Would you like an autodial speed dial number? ___No ___Yes, to phone # _____

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What is your internet e-mail address, if any? ___None

Would you like an e-mail alias set up, so that mail sent to **yourcallsign@tcrc.org** gets redirected to the e-mail address you listed above? This can be handy on the air! ___No ___Yes

Do you want a copy of the TCRC Handbook? ___No ___Yes (add \$9.50, which includes postage)

Do you want a TCRC binder to hold it? ___No ___Yes (Add \$5.50 to the above)

This is ___New Application ___Renewal ___Other Change ___Callsign update, old call was _____