

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.

TCRC Quarterly Membership Meeting Including Election of Club Officers

Tuesday, November 29, 2005

7:30 PM until ???

The next Quarterly membership meeting of the Twin Cities Repeater Club will be held next Tuesday, November 29th, at the Galaxie Branch of the Dakota County Library. This is in Apple Valley, at 14995 Galaxie Avenue. If you know where the Tuesday evening coffee gatherings are held (Caribou Coffee, 147th and Cedar Avenue, in Apple Valley), you will have no problem finding the library. Just drive East on 147th until you get to Galaxie Avenue, and then turn right (South). Just before you reach County Road 42, you will see the entrance to the library on your right.

As we usually do on the Tuesday evenings of the quarterly membership meeting, we will have an abbreviated version of the TCRC Information Exchange net, from 7:00 PM to about 7:30 PM, so the meeting can get started at that time. You are welcome to show up at the library before 7:30 PM (as early as 6:45 PM is okay), so you can chat with the other folks who have come to the meeting, and enjoy the coffee and cookies that will be provided. We hope to see you there!

This is the most important club meeting of the year, because this is the meeting where we elect club officers for the following year. Please plan to come out that evening to join us!



Field Day 2005 Results are Out!

The Twin Cities Repeater Club placed very well in the scores for this year's Field Day event. In the Dakota Division (Minnesota, North Dakota, and South Dakota) we scored second place with 8,444 points, right behind the Minnesota Wireless Association who scored 8,660 points. We were the leader in our operating class (3A) in the state of Minnesota, and in the division.

In the nationwide view of things, we placed 10th in our operating class, which is quite an achievement. All 63 participants (plus any spectators, visitors who did not operate, etc.) are to be congratulated for a job very well done! And we had an incredible amount of fun while doing it, rather than putting all our efforts into a maximum point total. Please consider joining us next June! We look forward to your participation!

Autumn, 2005
Volume 28, Number 3

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*Please Join Us
for the TCRC
Quarterly
Membership
Meeting and
election of Club
Officers,
Tuesday
Evening,
September 13th,
at the Dakota
County Library
in Apple Valley!*

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: Jim Rice, NØOA
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.
Steve Filek, NØOWL, Past Vice-President
Jeff Goodnuff, WØKF
Larry Jenkins, KØLEJ
Artie Johnson, WBØJMG

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

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Phil Lefever, KBØNES, **Vice Chair**
Doug LaBore, NØBIS
Mike Ferguson, NØDGG
Rich Kenney, WØRFK
John Toscano, WØJT
John Phelps, KFØZM
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John Laxson, KCØPZN

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Kevin Uhlir, NØBEL, **Site Setup Manager**
Monica Filek, KBØUWZ, **FOOD Station Manager**

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Phil Lefever, KBØNES, **Assistant Webmaster**
John Toscano, WØJT, **Assistant Webmaster**
Jeff Goodnuff, WØKF, **Web Calendar Maintainer**

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Tanna Morse, KCØURO

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Net Control Operators:

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Mark Newman, KCØITP, 2nd Tuesday
Steve Shaner, ABØYS, 3rd Tuesday
Phil Lefever, KBØNES, 4th Tuesday
John Toscano, WØJT, 5th Tuesday

Metro Skywarn Liaison:

Jeff Goodnuff, WØKF

Minnesota Repeater Council Liaison:

Jeff Goodnuff, WØKF

160 Meters from the Average Home Station

(or, how to have fun, even with a crappy antenna)

by Phil, KBØNES

Many hams that have been active on HF, even those that are old hands at it, have never made a single contact on 160M. We all look at the antenna design, and seeing that a simple dipole is 260 feet long, we give up before trying. For the past few years, I have been dabbling at contesting, and I decided to give 160 a try. Here is a brief story of my experience.

In 2003, there was a lot of chatter on the email reflector of the Minnesota Wireless Association (a local contest club that encourages activity and competes in most HF contests), about the 160M contest. I decided to take a stab at the "top band" contest.

I had two issues that should have scared me off. First, I had no antenna; second, the contest is all CW and my code skills are marginal at best. The good news on the code issue is that on 160M, most operators slow down a bit, and if I listen to the call a few times I can usually figure it out. Also, the exchange is pretty simple, just the ARRL section and the typical 599 signal report. If I only had an antenna...

I have a ground-mounted vertical for 40/80M in my backyard. There is an available loading coil that will resonate the antenna on 160M but I don't have one, and there was no time to order one before the contest. I do have an old Heathkit legal limit antenna tuner that can match just about anything. I decided to attempt to force the vertical to work on 160M even if it didn't want to. With a good bit of playing with the tuner, I was able to get the transmitter to see a good match. The down side was that the tuner was absorbing about 80% of my transmitter power. Would anyone hear me?

Once the contest started, I tuned the band and could hear a number of stations. I could only see a few of them moving my S-meter, so I knew I didn't have much of an antenna. I copied the call and exchange from one of the stronger stations, then I dumped in my call sign. To my surprise, I heard my call come back to me, so I sent my exchange and waited to hear an acknowledgement. My first 160M QSO was in the log, so I tuned off looking for more. I found that any station that showed any S-meter movement on my end was workable, although many took a few calls. After a number of hours, I finally managed to put a total of 19 QSO's from 9 different ARRL sections in the log. Not great, but better than I had expected to do!

Fast-forward a year, to 2004. I really wanted to do better, but still didn't know what to do for an antenna. As usual, I didn't plan ahead, so I was trying to get something to work a day before the contest. I ended up with a simple end-fed wire antenna thrown over a branch in a tree in the back yard. The total length of the wire is about 150 feet, and the height of the tree limb is only about 25 feet above the ground. I fed the wire from my trusty Heathkit tuner, which I grounded solidly to the copper plumbing in the house. The tuner sits right at the window where the wire exits the house, and a short piece of braid grounds it to the cold water pipe. The antenna tuned up very easily all across the lower part of the band.

At the starting gun, the band was alive with signals. The new antenna worked! I was now hearing layers of stations, not just a few strong ones. I lined up the first station and, bang, he's in the log. It was like shooting fish in a barrel, much more fun than the torture I had endured the previous year. I managed to break my 2003 score in the first 45 minutes, and even though I only operated on and off, I netted a total of 74 contacts from 40 ARRL sections. I even managed to snag a couple of DX stations! I'm hooked now.

This year, the ARRL 160M contest runs the weekend of December 2nd - 4th. I'm looking forward to trying again this year. I encourage those that are active on HF to give it a try. Throw some wire up in a tree and see what you can do. The old adage that any antenna is better than no antenna definitely applies here. It's also a great opportunity to get a little CW experience without a lot of pressure from Mach speed operators. At this point in the solar cycle, 160M is really starting to show some promise too. It's a band that acts unlike all the HF bands we are used to using, so it makes for an interesting experience. Nothing ventured, nothing gained!

73, Phil, KBØNES
[kb0nes \(at\) tcrc.org](mailto:kb0nes@tcrc.org)

Welcome, New Members!

The following folks have recently joined the ranks of the Twin Cities Repeater Club. Please welcome them the next time you hear them on one of our repeaters! The club thanks them for their willingness to participate.

Callsign	Name
KCØBLQ	Jodi A. Menge
KFØEN	Morgan James
KCØTZF	Karl Stoerzinger



Skywarn Update by Jeff, WØKF, Skywarn Liaison

Here it is November, there are tornadoes in Iowa, and we are under a tornado watch with a possibility of Skywarn spotter activation! Have there ever been tornadoes in Minnesota in November? As it turns out, there have been tornadoes in Minnesota in every month of the year except January. So, I guess the "tornado season" never ends!

Speaking of tornado season, the TCRC is scheduled to sponsor two Metro Skywarn Spotter Training Classes again next year. The first will be on the afternoon of Saturday, March 3rd, and the second will be in the morning on Saturday June 10th. Remember, in order to maintain your Metro Skywarn spotter certification, you must re-train every two years.

But first, don't forget about the seventh annual Skywarn Recognition Day Special Event which runs for 24 hours from 6:00 PM Friday, December 2, 2005 to 6:00 PM Saturday, December 3, 2005. Read all about it on page 72 of the December issue of QST, or visit the Web site:
<http://hamradio.noaa.gov>.



Minnesota Repeater Council Report by Jeff, WØKF, MRC liaison

How come there aren't any other repeaters within 120 miles or 20 KHz of 147.210 MHz? It is *not* because of FCC rules! Repeaters have no special privileges over any other frequency users in the eyes of the FCC. And they are subject to all the rules and regulations that we must all follow. There is no provision for "priority" or "assigned" frequencies in the rulebook. Only the non-interference rule that applies to all of us is in effect.

Because of the unique nature of repeater operation, it was recognized early on (in the 1970's) that some sort of self-regulation, in the form of frequency coordination, was needed if complete chaos was to be avoided. Consequently, in each state (or, in some populous areas, only a portion of the state), voluntary organizations were formed to coordinate repeater frequencies and locations, so that we may all have

uninterrupted use of our favorite repeater. In Minnesota the Minnesota Repeater Council (<http://www.mrc.gen.mn.us>) accomplishes this task.

The TCRC is a member in good standing (that means we paid our dues) of the MRC. Each year, by November 1, we submit data to the MRC detailing several parameters associated with each of our four repeaters and five remote sites. These data include such things as exact location (latitude, longitude), ERP (Effective Radiated Power), HAAT (antenna Height Above Average Terrain), and frequency of each transmitter. These data, from all the repeater councils in the USA and Canada are the source for the information contained in the ARRL Repeater Directory, which is published each spring.

The MRC meets twice yearly, and anyone with an interest in repeaters is welcome to attend. If you have any questions or comments about the MRC or about the TCRC's membership in the MRC, do not hesitate to ask. You can reach me at [w0kf \(at\) tcrc.org](mailto:w0kf@tcrc.org) or at 952-927-0201.

TCRC Antenna Building Party by Tanna, KCØURO

Much of amateur radio involves the satisfaction of home brewing your own equipment. So what do you get when you cross enthusiastic antenna-building hams with a knowledgeable "Elmer" willing to share his expertise? An antenna building party!

On Sunday, November 13th, a few of the TCRC members pooled our tools and spent the afternoon building a simple antenna of our choice, while we munched on pizza and socialized. A ham always needs new equipment, and since an antenna is one of the more important pieces in your shack or your emergency radio kit, there's always a good excuse to add one more to your stash. We were able to gather in a warm conference room rather than a chilly garage or basement to work on our project of choice.

A couple of us built simple quarter wave 2 meter dipole antennas. The dipole style antennas we built were geared toward mobility and quick set up, so 25' RG-59 cables with PL-259 connectors were used. After stripping the plastic jacket from the first 20" of cable, a small hole was made in the braid shield, just large enough to allow access to the plastic coated wire in the center of the whole cable. We then commenced separating the delicate braid from the center wire by picking the center wire through the whole in the braid at the newly cut edge of the plastic jacket and pulling the center wire out of the braid shield. It wasn't quite as easy as it sounds! We played tug o' war trying to separate that center wire from the braid that surrounded it! Once that was done we used an antenna analyzer to help us calculate the proper length for the newly separated wire and braid. After these ends were cut to a good length for the 2 meter repeater band, we connected the new antennas to hand held transceivers and tried each antenna out. The antennas worked well.

The second type of antenna crafted was a quarter wave 2 meter ground plane. Simple inexpensive wire clothes hangers were straightened and cut for the ground plane radials and the radiating element. The vertical radiating wire was soldered to the center of an SO-239 connector, then the ground plane radials were bolted onto the four corners of the SO-239 connector. After measuring the antenna with an antenna analyzer, the radiating wire was snipped to the proper length. Voilà! A quick, easy and cheap 2 meter antenna was born!

Some participants decided to march to a different drummer, and build a 70 cm (430 – 450 MHz band) cubical quad antenna. A 14 gauge bare copper wire was bent into a square about 6” on each side. One wire end was cut a bit longer than the other and the square was then soldered onto an RG-59 cable with a PL-259 connector, just as in the dipole antenna discussed above. After measuring the antenna with an antenna analyzer, it was deemed good to go.

After the projects were done, a short, spontaneous lesson in general mathematics and antenna application was given by Jeff Goodnuff, our voluntary “Elmer” for this project.

More antenna building “parties” are planned for the future, about every other month. We won’t always be building simple portable antennas; a lot could be learned and accomplished by assisting our club members with their larger antenna projects. If you have any such projects you would like some assistance with, please contact Tanna Morse, KCØURO or Craig Larsen, KCØDMF, and we’ll set a date for your project!

Why not join us for our next venture? We’ll place a notice on the TCRC website and send an e-mail when the next project is set up!

A special thank you goes to Jeff Goodnuff for serving as our knowledgeable and willing “Elmer”!

73 from Tanna, KCØURO



Craig and Jeff test an antenna using an antenna analyzer.



Dale tests an antenna with an HT and an SWR meter.



Checking the Book.



Discussing a bit of antenna theory.



Placing the quarter-wave ground-plane antenna on its stand.



Jeff analyzes a quarter-wave ground-plane vertical.



It takes three. . .



Tanna and Jeff do a test "in the field"



6 Element "Grab-and-Go" Antenna for 2 Meters (Plumbers Dream 2) By Artie, WBØJMG

An article in QST depicting a "Grab-and-Go" J pole antenna for 2M, using bungee cord in the center for quick assembly, got me thinking about a 2M beam for SSB on 144.200 MHz.

Brainstorm

I envisioned a 2M beam with bungee cords in the elements for quick assembly. (Later, this would have other advantages.) How to do this easily was a question. I decided that using copper water pipe and fittings would make a strong, easily constructed assembly. I bought several lengths of copper water pipe, and a lot of couplings and caps.

The design I found was in an old ARRL handbook showing the element lengths for a 2M, 6 element beam, on an 8 foot boom. This was a maximum gain, narrow bandwidth design. The elements of this design were very close to each other in

length, and can easily be confused. These elements could have been colored, numbered or coded, but assembling them in the dark could waste some valuable time in an emergency deployment. The captive aspect of the bungee antenna would force the elements to be in their proper place.

Because I could not find X fittings, I decided on a boom that was about 2 inches below the plane of the elements. In a balanced antenna, this should be in the zero voltage zone of the beam and have little effect when compared to being in the exact plane of the elements.

La Boom

The boom is 3/4" copper pipe. The ends used a 3/4" to 1/2" elbow fitting, while the middle elements used 3/4" to 1/2" T fittings. Into each of these, a 1 inch piece of 1/2 inch copper pipe was used, along with a 1/2" to 1/2" T, fitting at a right angle to the boom. These were soldered together except for the driven element. The 1/2 inch T was not soldered. A 3/4" to 3/4" T was placed just behind the center, because the driven element has the coax and balun, and would be heavier than the director end of the antenna. The center-most connection was not soldered, so that there could be two 4-foot sections. A small hole was drilled in the center assembly through the T and into the boom that forced the alignment of the two sections after assembly. A V-shaped notch was cut in the pipe, and an alignment pin was inserted and soldered in the T fitting for the boom. This way, the boom sections would align automatically when the bungee cord pulled them together.

Figure 1 shows the "side view" of the antenna. The fittings and boom lengths are not to scale, but they show the general layout of the assembly.

Elementary, my dear Watson

Elements were cut per the formula. The ends were de-burred and smoothed with fine sandpaper, so that they would not cut the bungee cords. To hold the elements together, a set of end caps were made up. A small hole was drilled into the center of each cap. #10 wire was formed into a loop with a tail on it and placed into the end caps so that the tail protruded to outside. These were soldered to the end caps and the ends were trimmed off. This formed a cup with a loop of copper wire on the inside to tie bungee cord to. Figure 2 shows how these end caps were fashioned

We Are Driven

The driven element is a "stand alone", pre-assembled piece. The reason for this is that it keeps the balun, connecting wires, and element all together as one unit. A future variation will require this. This is to be a separate element that fits on the 1/2 inch unsoldered post. Using a 1/2" T, I soldered an SO-239 Teflon socket to the center of the T. A piece of Teflon coax was used to make a half wave balun to match the feed line. The elements were soldered to the T, unlike the reflector and directors. Teflon wire was used to connect the elements to the balun at about 4 or 5 inches out, using stainless steel hose clamps.

Figure 3 shows the driven element and the 4:1 balun. Any impedance of coax can be used for the balun because it is a half wave long. The output wires are placed away from the center of the driven element experimentally until the low SWR point is reached.

Construction and Deconstruction

The boom used a big, strong bungee cord. These cords have a hook on the end, but it is not connected to the end of the bungee. The bungee is looped back and crimped to form a tight loop. Removing the hooks is easy. With two Vise Grip pliers, unwind the spring like end and that will free the end loops. A hole was placed some distance down the boom from the break point and, while the bungee was fished down the boom, a piece of wire was inserted through the hole, through the loop of the bungee and through the opposite hole. The ends of the wire were bent over and cut off, leaving about 1/2 inch exposed on the outside. The other end is tricky. Pull the bungee along the boom until it has what you think is enough force, and mark the spot on the boom and drill a hole through it like the first hole. Pull on the bungee cord until it is well stretched and clamp it down so that the part in the boom is very stretched but the part on the outside is not. Fish the loose end into the other end of the boom and feed a wire again from the hole, through the loop and into the second hole. Bend over the ends and release the clamp on the bungee cord. If this is done right, the two ends of the boom will want to come together tightly.

Stringing the bungee through the elements is easier. First tie off one end of the thin bungee cord on one of the pipe cap loops. Then feed the bungee through the element, the T and through the other element. Feed the end into a loop on the pipe cap on the other side and pull the bungee through it to pre stress it. Tie the bungee cord around the second pipe cap loop and release it. The pipes should all want to pull together. Let them. Keep doing this for the reflector and all of the other directors. Clean the ends with steel wool and spray with WD-40 or another light oil.

To make a mast, use similar techniques to join pieces of copper water pipe together. There are straight unions, etc. for this purpose. Copper pipe to standard N.P.T pipe thread adaptors are available, and can be soldered together. From there, you can adapt to any size pipe.

Assemble the antenna and place it on a mast that is clear of obstruction, and tune it for best SWR. (I found that I had to cut 3/8 inch off of each element end (3/4 inch off of a whole element).

It's In the Bag

Pull the boom apart. Pull out each element and lay it next to the boom. They should all hang together. Lay the driven element next to this bundle. Place them all into a long bag or pipe or just take more bungee cord and lash them all together.

Grab and Go

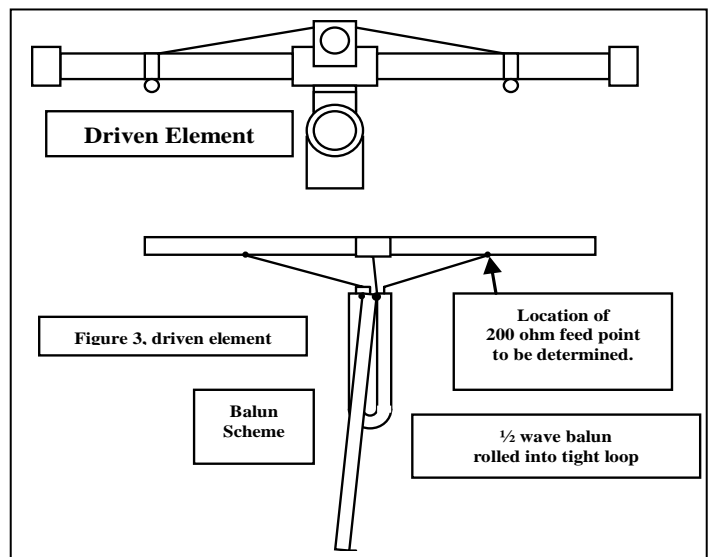
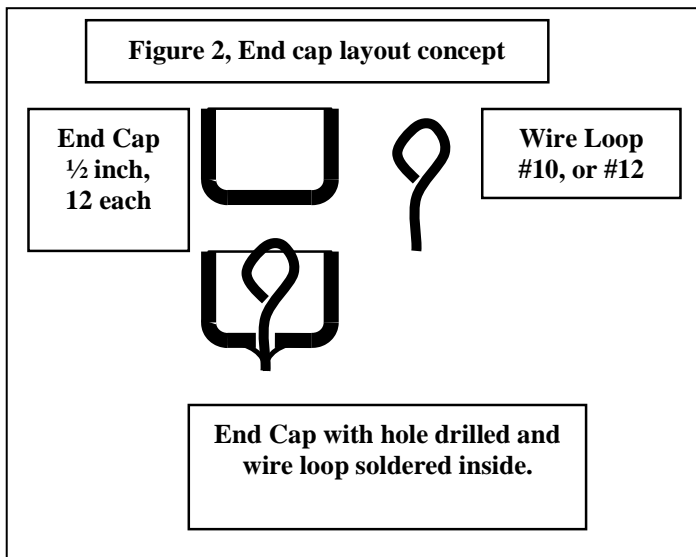
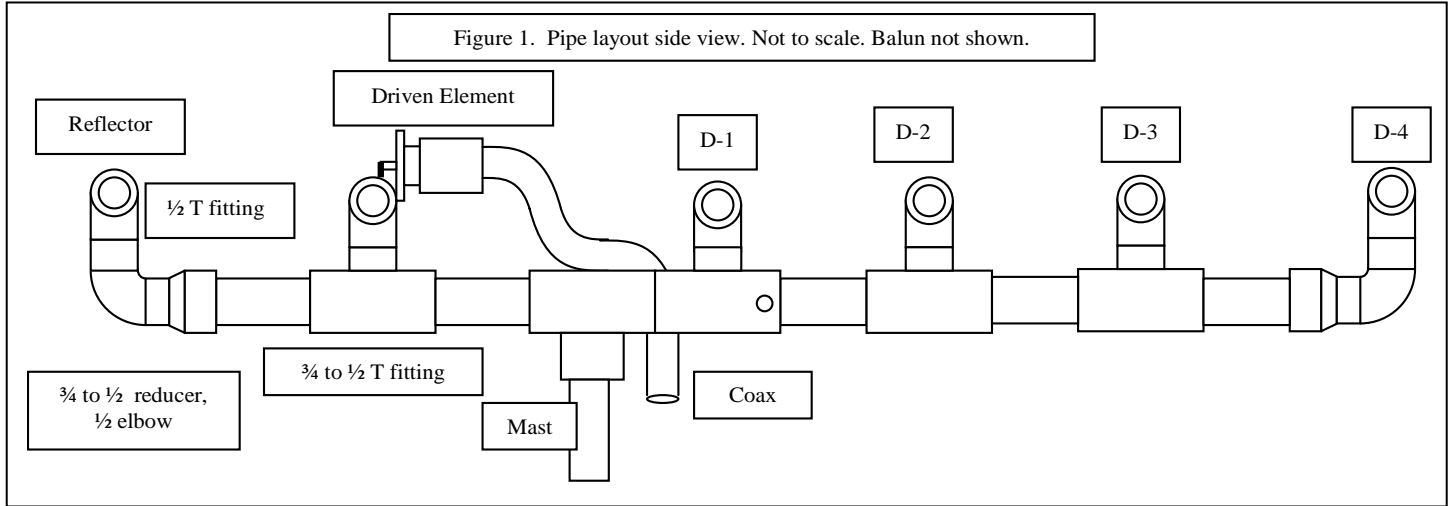
To deploy the antenna, remove it from the bag and / or untie it. Almost like magic, each element wants to go where it is

supposed to, so just help them in, as needed. Connect a coax cable to the driven element and place it over the point it is suppose to be, and pin it in place. Run the coax from the center point along the boom and down the mast. If setup takes more than a minute, including connecting the coax to it, I would be surprised!

This design is not durable, and it cannot withstand a lot of assembly and disassembly. It is not intended to be left up for

long periods of time, as one would do in a home base station. It is not sealed against the weather. It is intended to be used a few times a year during emergency preparedness drills and camping trips and of course, during real emergencies.

Soldering copper water pipe is a skill that every Ham and Home Owner needs. Practice it often.



This space reserved for YOUR article! Send your finished articles, rough drafts, outlines, or even just a topic idea to the newsletter editor, [WØJT at tcrc.org](mailto:WØJT@tcrc.org), and I will do my best to get it into the next issue of **The Repeater**. And, if you get two articles published, your TCRC membership will be extended by one year, free of charge! Not to mention, you get your own 3 months of fame (until the next quarterly issue is published).

Remember, the Twin Cities Repeater Club is an all-volunteer organization, and the more you contribute to the club, the more you (and all the club members) will get out of the club.

73 de WØJT, your newsletter editor



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

**Place
Stamp
Here**

Your Membership Dues Have Expired.
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Fill out this Membership Application Form, and mail it with your check for \$25.00 payable to the Twin Cities Repeater Club, to the mailing address listed above. You can also fill out this form electronically at the web address listed above, and either send us a check, or pay online using the PayPal system.

Name _____ Callsign _____ License Class _____

Address _____ City _____ State _____ Zip _____

Home Phone _____ Work Phone _____ Computer Phone _____

Ok to list your address in club publications? ___ No ___ Yes

Ok to list your phone in club publications? ___ No ___ Yes

Are you available for Emergency Service? ___ No ___ Yes

Are you a member of the ARRL? ___ No ___ Yes

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 # _____

Would you like a club ID badge? ___ No ___ Yes (free to new members, otherwise \$5.00)

What is your internet e-mail adress, 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 _____