
 www.arrl.org		<p align="center">St. Paul Radio Club</p> <p align="center">Ground Wave</p> <p align="center"><i>Dan Meyer, NØKFB, Editor</i> <i>Dale Maroushek, NØPEY, Publisher</i></p>	<p align="center">KØAGF</p> <p align="center">www.stpaulradioclub.org</p> <p align="center">Club Repeaters: 145.310 MHz, 442.450 MHz 114.8 kHz tone PO Box 9375 North St. Paul, MN 55109</p>
---	---	--	--

SPRC Nets: Wednesdays 7:30 PM 28.310 MHz USB; 8:30 PM 145.310 MHz FM 114.8 tone

NEWS AND NOTES FOR NOVEMBER 2022 – Volume 82, Issue 10

NEXT MEETING: FRIDAY November 4, 2022

- 6:00 PM Board Meeting (all are welcome to attend or watch)
- 7:00 PM Refreshments and Socializing
- 7:30 PM Business Meeting Followed by Program

Entrance to CDH for our meeting

Meetings are held at Cretin-Durham Hall High School located at the intersection of Hamline and Randolph in St. Paul. Park in the lot off Hamline near the athletic field.

Enter door 21 at the Ryan Stem Center addition. The meeting room is down the hallway on the right (the Commons). Door 21 will lock at 7:45 so if you arrive after that, please call me to let you in. 612-201-0818 Br. Bob

Program

Our meetings are hybrid meetings. That means there will be an in-person meeting at Cretin-Durham Hall (CDH) and a meeting on Zoom for those unable to attend in person. Zoom meeting information can be found at the end of the newsletter.

The program will be two topics. Jessie Botello, science teacher at Cretin-Derham Hall High School and faculty advisor to the CDH Ham Radio Club, will introduce herself and tell us about her experience this summer at the ARRL Teachers Institute.

Also on the program is Bill Lippert (ACØW), ARRL North Dakota Division Director, who will update us on the current happenings at ARRL.

In memory of Michael Sigelman, 12/17/1938 - 10/20/2022

Michael Roger Sigelman, age 83 of Golden Valley, passed away on Thursday, October 20, 2022. Mike was born and raised in Fergus Falls, MN. The proud Fergus Falls Otter graduated from the University of Minnesota School of Journalism. After graduation, Mike made his professional mark in broadcasting. First, in sales at KDWB and later in management at the iconic WYOO-FM, U100. It was at WYOO where Mike implemented the unique idea to become one of the first radio stations to broadcast live at the Minnesota State Fair. After management stints at radio stations in Pittsburgh and Lafayette, Indiana, Mike returned to Minnesota, became a stockbroker, and re-settled in Golden Valley. Known throughout the country by his amateur radio call letters "K0BUD," Mike was a giant in the Twin City ham radio community. In 2013, he received the national and prestigious American Radio Relay League President's Award. This year, the Maple Grove Radio Club recognized Mike's exceptional amateur radio service to the public and awarded him the group's Public Service Award. A loving husband and father, Mike is survived by his wife, Judith; sons, Sam (Megan), Danny, and Jon; grandsons, Milo and Ari; brother, Paul. Funeral service 10:00 AM, MONDAY, OCTOBER 24th at MINNEAPOLIS JEWISH CEMETERY, 7032 Penn Ave. S., Richfield. The funeral service will also be available via zoom. Email zoom1@hodroffepstein.com for the link. SHIVA 7:00 PM, MONDAY at the Laurie residence, 135 Maryland Ave. S., Golden Valley. "With all the ships at sea, for you and me, 73 K0BUD."

<https://www.hodroffepsteinmemorialchapels.com/obituaries/Michael-Sigelman>

The Prez Sez

So, what have I done lately? Well, we took a two-week vacation to the Northwest corner of the US and for the first time in 45 years, crossed into Canada; Victoria BC to be exact. I was astounded at the cross-border radio traffic that almost sounded like one big radio club. The A's, V's, N's, W's and K's were all first name basis friends.

I heard a member of "The Radio Police" berating a newbie (pet peeve of mine) for making a minor procedural mistake. Before I could hit the PTT, an international crew landed on this old grump, which made my heart glad. Not only was he verbally beaten into submission, but operators on either side of the border explained to the newbie the correct procedure while telling him that the "infraction" was mostly a matter of personal taste. The group then welcomed him in and included him in the round robin discussion that went on for more than an hour. I heard the newbie later, on another repeater, sounding confident and happy.

I thought about the 8 radio operators that I have played Elmer to, over the years, building the hobby one op at a time and how proud I was of them.

The next time someone asks you a basic amateur radio question, answer them with friendly courtesy. You never know how this will affect our hobby.

How we **SHOULD** answer new hams with "obvious" questions



Antenna Measurements by Scott N0AR

Most of us put up an antenna, adjust it if needed and move on. We never think twice about how it's holding up on top of the car or out in the back yard. That is until it has issues and then we are left wondering what changed. There is a better way to keep on top of antenna changes and know if there is an issue that needs addressing. If you already have an antenna analyzer it's a simple task to record the feed line loss and antenna parameters for the usable frequency range of interest. Lacking this a simple SWR bridge and recording the values across the bands of interest works too. Even something as basic as an ohm reading of the antenna from the shack can prove valuable. If before you install the antenna you take the time to make and record measurements of the coax and the antenna it will pay off down the road. The whole idea is that in a few years you can reference that information and determine if there have been any changes and where. It is not uncommon to find a critter has chewed a hole in that nice run of coax and water has been drawn in resulting in a deterioration. It's easy to keep all the information along with drawings of how you configured your reading equipment in a notebook. When you have to remeasure the antenna it's really necessary to recall how things were hooked up and what equipment you used to get those numbers so you can accurately compare changes. A quick sketch of the configuration or maybe a picture is worth it's weight in gold. Could this be inserted in a spreadsheet? Maybe screenshots from that VNA? Something to ponder...

Editor's note: Dawn and I spent a recent afternoon adjusting her 40 meter antenna; my NANO VNA was invaluable in assessing if adjustments made any difference. We chased down a few 'ghost' problems; one problem seemed like there might be a problem with the feedline (... and yes, the PL259 connectors are iffy at best and need to be replaced.), so we installed a temporary known-good feedline which helped a little, but not enough. The biggest issue turned out to be dirty connections in the antenna elements. A secondary issue was tuning was not quite right. Both issues were corrected. It was also interesting to note the frequency where there was the lowest SWR went up about 100khz with the antenna at 50 feet instead of 15 feet. Have fun, be safe and see you on the bands!

Dale's Details by Dale Maroushek NØPEY

As I have tried to lighten my role in activities from SPRC and MARC over the past couple years, the old saying "one step forward, two steps back" keeps coming up. From there, first I say Thank You to those that have taken over some of those things, and secondly beg the membership for more people to step up and grab on to some more of them. I understand life can be busy, but a few hours a month to help the Club should be an easy fit.

We finally have a new and approved Club Brochure, thanks to all the contributors and correctors and President Ralph patiently putting it back together about 12 times. It absolutely, positively has all the latest correct data about the Club, at least until next year...or 60 days, whichever comes first!

Next up is the Club Application. We have reused and updated the current one for many years thanks to Skip K0SJ. We have decided to simplify it, while at the same time examining possible ways to fulfill it online, or even pay dues online with it. Many hurdles to jump over to get there. Now if perhaps someone has some experience in accomplishing a task like this, please step up to the Board.

Ham Fest season appears to be over until our Auction coming up on January 28th, 2023. Donations so far are low this year, but that may change anytime. Preach as I have about our personal responsibility to clear our shacks down so loved ones don't have the burden of getting rid of the mess, the club still gets calls from anywhere for help, and we just don't have that many people willing to do that on at a moment's notice. For those of us in Ramsey County, we again have a free or semi free place to dispose of electronic waste down on the midway. Checkout the separate box.

Halloween has been extra light on kids the last couple years, the Covid residual. But on the way home today, I noticed a couple places already doing the trunk and treat thing with some good lines of kids. I suppose I will have to protect myself and buy a good supply of treats, wait patiently from 5 to 8 next Monday and pass out goodies to kids... while enjoying the beginning of the Holiday Season.

Sorry to say, my home antenna work is very behind a schedule it never had. Maybe that's what it needed to begin with, a schedule! This week I actually thought about doing a total disassembly, repair/rebuild or replace and reassemble. If I was 40 again, and was ok with having my car outside, maybe, but not now. The major time blockers this year were tree cutting and landscaping that took far more time than I expected. It also let me know that my body is far from what it was and health comes first. Watch for further e-mail invitations.

With Veterans Day coming up, and knowing we have many Vets in our club, let's reminisce about those good old days in Basic Combat Training (BCT in the army era 1967). So we had the Draft then, not lottery numbers yet. You could get a deferment if you were in College, but you still were susceptible to your 6 year obligation. If you couldn't find a National Guard or Army Reserve unit that had a open space, you had to choose Enlistment or the Draft. Other poorer categories existed.

To be drafted, your obligation became 2 years active duty, 2 years reserve and 2 years standby...again still obligated to be active for 6 years IF needed. It was considered the cannon fodder future.

Or, you paid a visit to your military recruiter! Probably a wonderful salesperson, but he had to produce, cause of the Police Action in beautiful Southeast Asia...Vietnam. Upon that meeting, you lost, right there. I had a friend that became a recruiter and told our group about it later. Selling igloos to Eskimos was an everyday thing for him. He sat you down with some testing to determine your eligibility for the various avenues that existed then. These test scores directed your butt to where and what it did for you today.

Back then, the Ads said: give us 3 years enlistment and we guarantee a school or location of your choice...with about 30 fine print reservations not mentioned. My intent was to enlist, get training in electronics, serve my 3 years saving all my pay because the Army provided food, clothes and shelter, get out and get a job in the early electronics industry, and marry my sweetheart, etc.

Not a bad deal, but continue. If you scored higher than average you became an unsuspecting candidate for a "better" offer. Son, have you ever heard of the Army Security Agency? (I suppose this is the same for NGS, AFSS or even the marines had something like it, maybe not) No, what is it? I can't tell you much because they deal in Top Secret stuff I can't talk about. But they have the most modern up to date equipment and new technologies. I think I can get you, since your scores where so high. You need to interview with the ASA recruiters in MPLS if you would be interested in enlisting for 4 years active, because it cost more to get you a security clearance and training. Would you like to meet with him?

Eighteen year old kid responses: Of course, what could go wrong!

Dale Maroushek NOPEY

HELP WANTED

Your St. Paul Radio Club is looking for a VE Liaison – someone to coordinate the amateur radio exam sessions.

Currently, our exam year runs September through June with a session on the first Saturday of each month, plus an additional session in conjunction with the MAGIC Repeater Tailgater in July. All sessions are being held at Galilee Lutheran Church in Roseville at 9:30 am.

No experience is necessary, as you will be provided with on-the-job training, for 9 months if you act now. No previous experience is necessary, but merely a willingness to help out the club. The person for this position needs to be 18 years of age or older; and never have had your amateur station or operator licenses suspended or revoked; and hold a valid Amateur Extra class license; and be an accredited ARRL Volunteer Examiner. To become a VE, you merely have to take an open book exam from the ARRL, and you don't need to purchase a manual, as it's all online. You don't even need to be a member of the ARRL to qualify.

*We currently have a large team of experienced VEs who help out with the monthly exams, so anyone volunteering for this position will have plenty of help. The time commitment for this position is about 2 - 3 hours per month plus the exam sessions themselves, which are typically another 2 hours. All paperwork / forms and instruction on their use will also be provided. This is a great opportunity for someone to help out the club with this important position. **Please consider doing this.** Contact Leon, WØCOE, with your willingness to help or with any questions by sending an email to w0coe@arrl.net, or contact any of the club officers. Thank you.*

Editor's Notes – by Dan Meyer, N0KFB

This is my second edition of the Ground Wave; I hope it meets with your approval. I am always in need of content for the Ground wave; if you have any articles to share please send them to dan@meyer-family.net and I will include it in the Ground Wave at the next opportunity. It is helpful if you use your name in the filename of the article to help me keep things organized.

If you are on Facebook, please join our Facebook group! Let us know what you have been doing. Have you made any notable contacts on the air recently? Put up a new antenna? Repaired a radio? Heard something unusual on any band? We would like to hear about it. We have over 150 members there and would enjoy hearing from you!

Ramblings from the VP's Work Bench - Kevin Welna - W5LNA

The best-laid plans of mice and men often go awry:

I'm still not done moving into the new house. I have decided that my tendency is to bite off way more than I can chew and my ability to estimate times to completion are not that great as well....We still have things left to do at the old house.

My CW Ops class is in full swing, and I am improving. But I ain't there yet! I do like the new curriculum and they keep improving it almost on a weekly basis. If you are interested in learning Morse Code, I cannot recommend this class enough! It is the best and easiest way to learn Morse Code and its FREE!

I have started trying to make a few CW contacts.....I have had a few POTA activators come back to me , but My skills at decoding mores code are still not up to snuff. I did however make the classic rookie mistake of sending out my call sign at a speed above my ability to decode. The activators thinking I can receive at 25-30 wpm sent their response accordingly. It took me the better part of a day to realize my mistake. LOL! Lesson learned. This coming weekend I will try again and this time SLOW DOWN my sending!

Speaking of making contacts, I did find a pretty good logging software that seems to be fairly intuitive and has tones of support. It's called N3FJP Amateur Contact Log. It looks to be able to interface with my radio and a number of different Logging sites (LOTW etc.) plus handle contests etc. It not that expensive at \$60. This price includes all current and future software and upgrades for both the General Log and contests. Check them out as they offer quite a selection of options that are all free if you buy the deluxe package for the \$60 one time registration fee. <https://www.n3fjp.com/>

I did rig up my Wolf River Coil Antenna and set it up in the back yard, I can definitely get out on 20 and 40 meters, but 10 meters is still not usable in town. I can not hear the Friendly Net at all!! But ITALY was booming in the other day on 10m ...Go figure....

I am hoping once I get my antennas mounted on the roof my home, reception on 10m will improve. Yep, I still do not have any HF antennas on my roof, but that should be rectified the end of this week if all goes well. Of course currently, I am battling a head cold. So who knows? I just can't win!

I'm still stocking up on electronic components etc, in anticipation of the upcoming cold weather. So far the shack is staying warm enough for me to enjoy being down in the room. My son has also moved into the shack with his 3D resin printer and equipment. It is starting to get a little cramped, but so far there is enough room for the both of us. Since the bench has a soldering station, I am still planning on building the CW Code Messenger outlined in Jack Purdum's book "[Microcontroller Projects for Amateur Radio](#)". If you are interested in building this project, do contact me so we can compare notes and group buy the few components that will be needed for this project. Plus we can learn the circuit board design cad system together. I think this might be a great coffee shop meeting item.

I believe that this should be a wonderful adventure for me and anyone else that wishes to join in!

At this time, then MN-ARTS (Minnesota Amateur Radio Technical Society) is moving more towards having a "Repair-A-Thon" some time in December. Not sure what that means, your best bet will be to contact them and see what they are actually planning. <https://www.mn-arts.org/>

P.S. If you have an alternative project that you wish to build, that would be good too. The idea here is to get off our butts and start building and expand our Ham Radio knowledge and experiences.

Sorry I do not have more to report at this time, but its early into the building season at this point.

I hope to see you all at the next club meeting.

Till then:

May your signals be strong and your antennas have extra gain....73

Kevin Welna VP

W5LNA

Club Wearables

Some folks have been asking about our Club Wearables; Many different items may be ordered at: <https://www.hamthreads.com/> It's the same website with a new owner. Dale spoke with Diane and she assured him they still have our logo in three sizes, hat/chest/back, so you can have it positioned on your favorite item wherever you like. You can shop on line, pick the clothing piece you want, list the logo, name and callsign and pay. Sit back and it comes to your house. If you have questions, give them a call 817.602.1834

Ham Cram by Pete Guldán KDØSQJ

We held our first Ham Cram at CDH. I am happy to report that no student fell asleep during the class even when I was the one presenting the material. Clearly large amounts of caffeine may have been a factor. As a bonus we did get some new hams through the tech test. I want to thank all who were involved. I am also asking how we could make this better for any future sessions. I have received actionable feedback already, and would like your help on how we could communicate with potential future hams. I think compressing the class to Saturday and Sunday and not scheduling during a school break, possibly even between the school's sport seasons could appeal to the CDH students and staff. An advertisement in the newspaper would not be cost effective or necessarily even reach the target market. (do people still read newspapers?) If you have any outside the box ideas please let me know. No I'm not putting stickers outside of any boxes delivered on doorsteps. We did get interest from listing on ARRL's class schedule but I think it's safe to say if someone finds that they are pretty well into it at that point. We could try another session in spring but you folks need to let me know what you think is best. 73. Pete

Below are three of the several presenter in action: Scott N0AR, Evelyn WB0VHF and at the bottom of the page Dan N0KFB.



October Board Meeting Minutes – by Art Thell, NØIWQ

Saint Paul Radio Club Hereinafter referred to as “SPRC” Board Meeting Minutes 10-07-2022

Board members present, (Excused or virtual):

Ralph Bierbaum-(Pres.)-NØAWN	Kevin Welna (V. Pres.)-W5LNA
Art Thell (Secy.)-NØIWQ	George Power- (Treas.)- WØGCP
Br. Bob Walsh-WCØJ	Ben Otto-KEØRFZ (V)
Lou Michaels (Pres.)-WD8NOV	

Also present:

Jay Maher-NJØM	Jeff Iverson-WB9DAN (V)	Dale Maroushek-NØPEY
Pete Guldán-KDØSQJ	John Crabtree-KCØG	Don Kelly-WA6ZMT
Dan Meyer-NØKFB	Members on Zoom: 8.	

6:05 Pres. Ralph B. called the meeting to order.

New SPRC Ground Wave Editor: Dan Meyer, NØKFB

President: Call for added agenda items: _____

Old Business

SPRC Brochure updates: Motion by Art to Accept, 2nd by George. Passed.

Dues/hardship discussion:

Individual or household: \$20 per year. Ralph to craft proposal for Board action in December.

New Club Application form:

Ralph is crafting final version for December Board consideration.

Website (s) issues:

Under review. Contact has been made with George LaValle, WØSBU and Tom Bredemus for resolution of conflicting issues.

Art moved to accept the September Minutes as published in the Ground Wave.
Corrections: "Youngsters under 18". George KØGCP. Seconded by Lou. Approved.
Corrected on the record by Art.

Treasurer's report: George
General Fund: \$7242.54, Education Fund: \$1167.00, Repeater Fund: \$1024.25
Art moved to accept. Seconded by Lou. Approved.

Repeater Report: Dale, "It works".

Membership Report: Dale, Paid members end 2022: 135, Paid members 2023 to date: 45.

New Business:

Question by John Crabtree re: room for January Auction—Room is already scheduled.

Pete Report—Training:
Technician Class weekend "Ham Cram" October 21-23 (MEA Weekend)
ARRL will rebate all but \$5 of the cost for age under 18 years

November meeting program:
Sched 7:40. Presenter Mrs. Jessie Vatel (CDH Staff). Will report on the ARRL Teachers' Institute on Wireless Technology that she attended this summer under the sponsorship of SPRC.

Bill Lippert (ACØW), Dakota Division Director, will present an update on ARRL happenings.

January 2023 meeting:
Br. Bob reported that CDH STEAM Center Director Jeff Winsor will present. Details to follow.

Art moved to adjourn, Seconded by Lou, Approved.

7:05: Adjourn.

October Membership Meeting Minutes – by Art Thell, NØIWQ

**Saint Paul Radio Club
Hereinafter referred to as “SPRC”
Member Meeting Minutes
10-07-2022 7:30 pm**

7:34 Call to order by
President, Ralph Bierbaum

24 Members present plus Zoom.

Program by Dave Ellison, W7UUU. Shack fire program.
Catastrophic shack fire. Cause: faulty surge suppressor. Excellent presentation.
President Ralph noted that members should use caution on which surge suppressors they use.

Treasurer’s Report, George:
General Fund: \$7242.54, Education Fund: \$1167.00, Repeater Fund: \$1024.25

New Ground Wave Editor:
Dan Meyer, N0KFB

Pete Report—Training:
Technician Class weekend “Ham Cram” October 21-23 (MEA Weekend)
Test at Noon on Sunday. VE: Ralph B.
ARRL will rebate all but \$5 of the cost for age under 18 years.

Don Kelly: Need program presenters for 2023.

Circuit Builders: Kevin: No arranged place to work yet. Is working with CDH and others.

New Membership Application: Dale reported it is being worked on—final stages.

Club Breakfast: Third Saturday, October 15 at 9:00.
Place: Denny’s on University Ave. Across from the AxMan.

John C. moved to adjourn. Don K. seconded.

Adjourn: 8:40

Officer Contact Information

President	Bierbaum, Ralph, N0AWN	rwbierbaum@comcast.net	
Vice President	Welna, Kevin W5LNA	kwelna@gmail.com	651-354-5515
Past President	Michaels, Lou WD8NOV	louthephotoguy@gmail.com	612-638-8159
Treasurer	Power, George K0GCP	georgecpower@gmail.com	651-233-3215
Secretary	Thell, Art NØIWQ	thellaj@comcast.net	651-492-0254
Member At-Large	Otto, Ben KEØRFZ	ke0rfz@gmail.com	651-352-9590
Member At-Large	Walsh, Bob WCØJ	brw.fsc@gmail.com	612-201-0818

SPRC Calendar

Fri Nov 4 6PM SPRC Board meeting, Commons Meeting Room,
John R. Albers Center, Cretin-Derham Hall High School. *

Fri Nov 4 7PM Socializing followed by 7:30 PM SPRC Membership meeting.
Commons Meeting Room, John R. Albers Center, Cretin-Derham Hall High
School. See Page 1.

Sat Nov 5 9:30 AM VE testing. Galilee Lutheran Church, 145 N McCarrons Blvd,
Roseville, MN 55113. Reservations required. No walk-ins until further notice.
Contact Leon Dill, WØCOE@arrrl.net or 651-425-0338.

Sat Nov 19 9AM SPRC Breakfast. Denny's, 1664 University Ave, west of Snelling.

Fri Dec 2 6PM SPRC Board meeting, Commons Meeting Room,
John R. Albers Center, Cretin-Derham Hall High School. *

Fri Dec 2 7PM SPRC Membership meeting and Holiday Party. Commons Meeting Room,
John R. Albers Center, Cretin-Derham Hall High School.

Sat Dec 3 9:30 AM VE testing. Galilee Lutheran Church. 145 N McCarrons Blvd,
Roseville, MN 55113. Reservations required. No walk-ins until further notice.
Contact Leon Dill, WØCOE@arrrl.net or 651-425-0338.

Sat Dec 17 9AM SPRC Breakfast. Denny's, 1664 University Ave, west of Snelling.

** Depending on business to be considered, Board Meetings are sometimes held
electronically. Check with a Board member beforehand to confirm a meeting.*

Zoom Meeting Information

Simply click the link below (or copy and paste link into your browser if that doesn't work) or call in from any phone.

If you're not familiar with Zoom and would like to arrange to practice, text Don at 651 276-4838 or email dk@donkelly.biz.

Saint Paul Radio Club is inviting you to a scheduled Zoom meeting.

Topic: SPRC Monthly Meeting

Time: Nov 4, 2022 06:00 PM Central Time (US and Canada)

Nov 4, 2022 06:00 PM

Dec 2, 2022 06:00 PM

Jan 6, 2023 06:00 PM

Feb 3, 2023 06:00 PM

Mar 3, 2023 06:00 PM

Mar 31, 2023 06:00 PM

May 5, 2023 06:00 PM

To Join the Zoom Meeting use this link:

<https://us02web.zoom.us/j/87882794434?pwd=bGdueVVhNmZXVjQrRjFOL2tZMlhmZz09>

or

<https://tinyurl.com/2tyybeuc>

Meeting ID: 878 8279 4434 Passcode: 6512764838

One tap mobile +13092053325,,87882794434#,,,,*6512764838# US

For audio-only, dial +1 312 626 6799 US (Chicago)

To find other dial-in numbers, see: <https://us02web.zoom.us/u/kuWkJhGiz>

Please download and import the following iCalendar (.ics) files to add the meeting to your calendar system:

<https://us02web.zoom.us/meeting/tZMlf-uvpz8uGdAS6lYyFBq9uL1cXxTVtmJ-/ics?>

[icsToken=98tyKuGvpjMoHd2RtBqDRpwEGoqga-3xmClbjad8r0nMOjl1QBKvI84TMYpnJO7E](https://us02web.zoom.us/j/87882794434?pwd=bGdueVVhNmZXVjQrRjFOL2tZMlhmZz09)

For Sale

If you are interested in any of these items please contact Joe Koppi, W0SU at W0SU@arrl.net.

24-inch Copper Shack Grounding Bar

Bought this from KF7P Metalwerks. New, unused, still in original bag. This is made from copper channel stock and is 1-1/4 by 24-inches. Has 6 connection bolts with wing nuts. Am selling because I installed the 36-inch model. Retails for \$47 My price: \$25

Ten-Tec Model 961 Power Supply

115-volt input / output 13.5 VDC @ 20 amps. Has a built-in speaker. Very slight blemish on side but otherwise excellent condition, very clean, almost as new. \$125

Ham M Rotator

Includes the control unit. This is a second unit that I have and do not plan to install it. Has the braking system installed, Very good condition \$400