NVARC
Nashoba Valley Amateur Radio Club

SIGNAL

A club since 1992
Since 1993
Since 1996

de N1NC February 2019 Volume 28 Number 2

This Month's Meeting

Light travels faster than sound.
This is why some people appear bright until you hear them speak.

Not our folks! They're bright—many, many lumens bright. And when you've got lumens, you make lumenade (or SSN, or Short Subjects Night, depending on how far you spell it out).

Because we switched things around to allow Dennis to speak in January, the February meeting will be Members Short Subjects.

Don't forget, this is another of the "your meeting" meetings. Contact a Board member if you intend to present.

NOTICE, NOTICE, NOTICE

As of the February issue of Signal, all distribution will be electronic. If you absolutely need a printed copy, you can actively "opt in" by contacting Ralph, KD1SM. Per discussion at the January Board meeting, because of this late notice there will be no "up-charge" for newsletter mailings at least until the renewal date of your dues.

Last Month's Meeting

We advertised that Dennis Egan, W1UE, would visit in January and tell us about his visit to the most recent WRTC event—and perhaps regale us with a travelogue of his subsequent radio-related travels throughout Europe. That would have been fine; NVARC has WRTC support in its history.

Surprise, surprise, though. Instead of WRTC, Dennis kept us mesmerized with a South Asian travelogue. Following a presentation he made at the Dayton Hamvention a couple of years ago, an Indian ham invited him to speak at the Indian national convention. ("Free; just provide your own transportation and we'll cover the food, lodging, and entertainment.") Dennis embarked on an extensive, multi-country trip and brought back the makings of a fascinating talk about technology, transportation, "civil engineering," culture, and society.

The President's Corner

For the fourth year, we provided support for Girl Scout Thinking Day (TD). This year we supported troops from Tyngsborough and Westford as well as some of the girls from Raymond NH where we started four years ago. We set up stations for Morse Code, phonetics and call signs, on the air HF Radio, world time and greyline demonstration, radio direction finding, and hands on "wireless CW" communication using two Pixie transceivers.

Thanks to all who helped out: Peter N1ZRG, Bruce K1BG, Ralph KD1SM, Jim AB1XX, Jessica WU3C, Greg WY1X, and Lynda N1PBL.

Remember this month's meeting program is Members Short Subjects. Its success depends on your presentation.

We have had much discussion about the cost of publishing and mailing the newsletter. The Treasurer produced an analysis of NVARC finances over the past five years which was discussed at the last Board meeting. The discussion of the issue has resulted in many members choosing to take their newsletter electronically. With only a few members desiring the printed copy the problem is reduced to a level that,

based on the trend of the treasury account, means no increase in dues will be required. Some members had submitted funds in anticipation of either paying the postage or a dues increase. The Treasurer will credit those members in some way toward their membership or make other arrangements.

Thinking ahead, we have been using the same 80 and 40 meter dipoles for many years for Field Day and Thinking Day. The 80 meter antennas are in good condition. At Thinking Day We found there is only one 40 meter antenna and it was broken, possibly when being wrapped up after the last Field Day. We patched it together for TD but we need a couple of 40 meter dipoles built that will be stored in the tower trailer for future use like this year's Field Day.

de Stan KD1LE

Editor's Note

Savin' up my thoughts for next month. Stay tuned.

de Skip, K1NKR

Adapting a 160m Inverted-L Antenna for 630m

Part TWO

By Les Peters, N1SV

(All photos and artwork by the author)

In Part ONE, Les introduced us to the "joy" of adapting an antenna system for use on a new band. Here, he continues—and continues to show evidence that ours is truly "a learning hobby."

Designing & Building an Impedance Transformer

Because the 160m Inverted-L will have an impedance less than 50 ohms a step-down transformer is required. But without knowing exactly what value to step the impedance down to you will need multiple taps on the primary. I happened on this webpage **https://hamsignal.com/blog/the-630m-2200m-antenna-recipe** and about three-quarters of the way down found information on building an impedance transformer using an Amidon FT-240-77 core (**http://www.amidoncorp.com/ft-240-77/**).

Figure 3. Impedance Transformer

The primary is 20 turns of AWG #14 standard copper Romex tapped at every turn starting at the 11th. The secondary is 10 turns using the same type of wire. Based on this construction, Table 1 lists the estimated impedance values that can be properly matched by this transformer. A wire is used to connect the center of the SO-239 to the desired tap.

TAP	Turns_Pri	Imp_Pri	Turns_Sec	Imp_Sec
1	11	50	10	41.3
2	12	50	10	34.7
3	13	50	10	29.6
4	14	50	10	25.5
5	15	50	10	22.2
6	16	50	10	19.5
7	17	50	10	17.3
8	18	50	10	15.4
9	19	50	10	13.9
10	20	50	10	12.5
11	21	50	10	11.3
12	22	50	10	10.3
13	23	50	10	9.5

Table 1. Impedance Transformer Values

A Rubbermaid plastic container was used to house the impedance transformer. One thing I realized after building this was that having a tap only every turn rather than every half or even quarter turn meant limitations in the turns ratio and how well I could match the impedance of the Variometer.

Setup & Adjusting

In order to properly load my 160m antenna I needed to select the proper Variometer outer coil tap, inner coil position, and Impedance transformer primary tap to achieve the lowest SWR at approximately 475.6 KHz (three variables). If you have one of those antenna analyzers that already

covers the 630m band then you're in luck. But if you're like me and have one of those old MFJ-259B ones don't worry you can modify it for 630m and 2200m. Paul N1BUG has a great webpage dedicated to doing this **http://blog.n1bug.com/2016/12/22/adding-630-and-2200-meters-to-the-mfj-259b/**. The DP3T switch I used was from NKK **https://www.nkkswitches.eu/products/Toggles/M/M2044BB1W01/**. Figure 4 shows the required strapping to properly configure the DP3T switch.

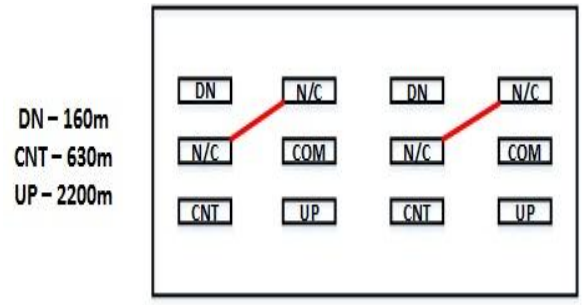


Figure 4. DP3T Switch Strapping

To set everything up I removed the existing coax going to the existing feed of my 160m antenna and connected it to the impedance transformer input (SO-239 connector). I then connected one side of the impedance transformer secondary to the 160m antenna ground and the other side of the secondary to a tap on the Variometer. The other side of the Variometer was connected to the existing 160m antenna wire. Figure-5 shows how everything is connected for 630m use.

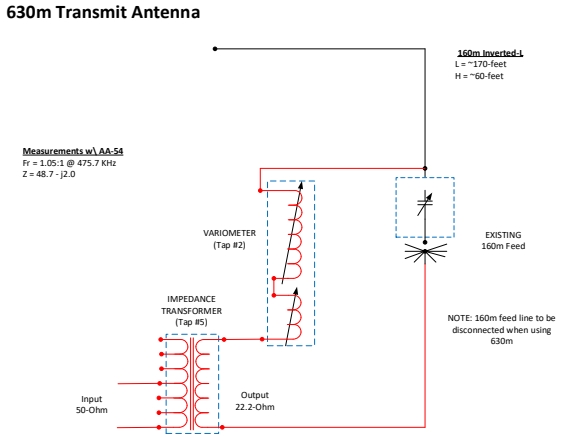


Figure 5. 630m Transmit Antenna System

The procedure I used for making initial adjustments was to start with the lowest tap settings for both the impedance transformer and Variometer and then adjust the Variometer inner coil for minimum SWR at approximately 475.7 KHz. Try different Variometer taps until you find the one that produces the lowest SWR. Then select different impedance taps until again you find the one that produces the lowest SWR with the Variometer. In the end the final setting for my impedance transformer was tap #5 (turn #12) and for my Variometer tap #2 (second lowest inductance value). Figure 6 shows the recorded 630m antenna SWR values using the MFJ-259B. Note that the 2:1 bandwidth is almost 9 KHz.

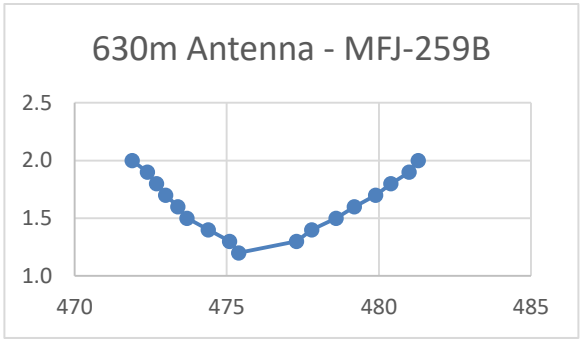


Figure 6. 630m Antenna SWR measurements using modified MFJ-259B

I also used a RigExpert AA-54 antenna analyzer which can operate down to 100 KHz so I was able to check the values obtained using the MFJ-259B against it. The AA-54 is a newer instrument and probably a little more accurate. Figure 7 shows the SWR performance and Figure 8 is the Impedance/Reactance curve. The MFJ and RigExpert analyzers appear to track each other reasonably well.

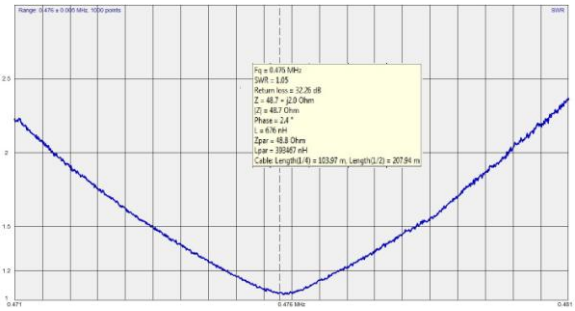


Figure 7. 630m Antenna SWR measurements using RigExpert AA-54

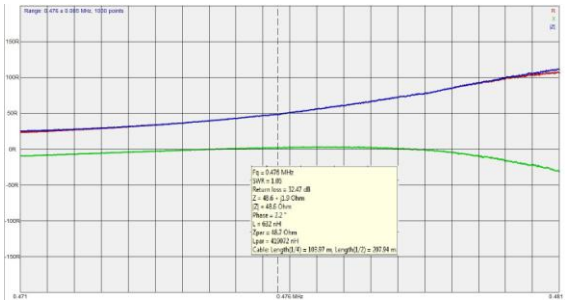


Figure 8. 630m Antenna RXZ measurements using RigExpert AA-54

I purchased a 100w solid state amplifier from K5DNL which included a low pass filter and integrated scopematch. While I was appreciative for the low pass filter, I wasn't initially sure what to do with the scopematch, since I really had no previous knowledge of it. A scopematch is a device that allows one to sample the voltage and current of a signal on a piece of coax and display it on a two channel oscilloscope. KB5NJD has a good explanation of it here **http://njdtechnologies.net/want-a-little-more-info-than-an-swr-meter-alone-can-provide-meet-the-scopematch/**. The scopematch allows you to monitor the match of your antenna system in real time from inside your shack. And for those with remote control of their antenna matching network it allows them to adjust their antenna using the scopematch as real time feedback. So this is basically what the **V** and **I** waveforms viewed on the oscilloscope mean.

- If the **V** and **I** Waveforms are of equal amplitudes and are in phase your antenna system resistive component is at 50 Ω and the reactive component is 0 Ω (in-phase).
- If the **V** waveform is of a greater amplitude then the **I** waveform (regardless of phase relationship) the resistive component is greater than 50 Ω.
- If the **V** waveform amplitude is less than the amplitude of the **I** waveform (regardless of phase relationship) the resistive component is less than 50 Ω.
- If the V waveform leads the I waveform (regardless of the amplitude of either waveform) then the reactive component is inductive (Z = R + j) indicating that inductance needs to be reduced.
- If the I waveform leads the V waveform (regardless of the amplitude of either waveform) then the reactive component is capacitive (Z = R - j) indicating that inductance needs to be increased.

Figure-9 shows the scopematch waveforms for my 630m antenna system transmitting 30w at 475.7 KHz. As you can see the I waveform is leading the **V** waveform slightly indicating the reactive component is slightly capacitive. And the amplitude of the **I** waveform is slightly less than the **V** waveform indicating the resistive portion of the impedance is less than 50 Ω. This seems to correlate with the data from Figure 7 where Z = 48.6-j2.0.

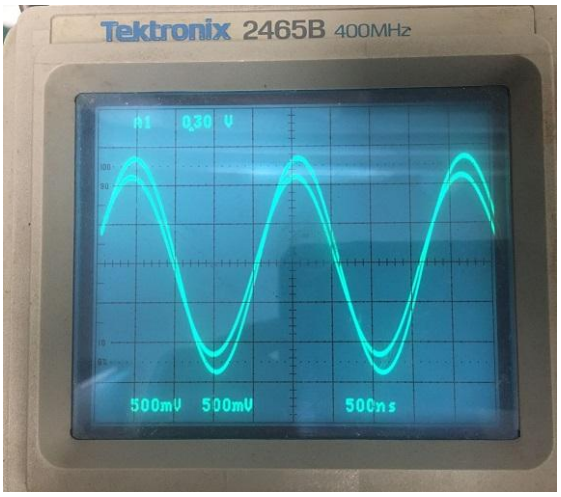


Figure 9. Scopematch waveform of my 630m antenna at 475.7 KHz

Final Thoughts

While I have been happy with the antenna's performance, there are always things that can be improved on. The 630m antenna configuration is not permanent so it requires reconfiguring it manually back and forth between 630m and 160m. This can sometimes be a hassle having to go out in the dark to switch things back and forth so I'll have to give some thought to adding some sort of remote switching.

Also I've found that the antenna system's resonant frequency can change from day to day even without any precipitation by 1-2 KHz so the match must be checked with the antenna analyzer before using it each day and the Variometer adjusted as necessary. When it rains the resonant frequency can change by 5 KHz or more and going out in inclement weather to adjust it is no fun. Others have implemented servo motors to remotely tune their Variometers and I'll also need to look into this more in the future.

And finally, while the impedance transformer I constructed has worked out fairly well the limitation in the turns ratio and therefore how close it can match the antenna's impedance could be improved (currently about 2 Ω). I'd like to look into other designs to improve this going forward including Implementing multiple taps on both the primary and secondary coils to increase the number of turns ratio combinations that are available potentially improving impedance matching down to ± 0.5 Ω.

Les has promised some follow-up comments about our "learning hobby" in subsequent issues of Signal this Winter.

Thinking Day

NVARC has been supporting the Girl Scouts for five years now. It all started with a late-2014 suggestion and request by member Jill KB1SWV. We've set up stations in Raymond NH, Shirley MA, and Tyngsboro MA and supported well more than 160 girls at all levels of the Girl scout program in over two dozen troops.


Cold WX (23degrees and 30+mph winds) didn't slow things down. N1NC was up and running on 20 and 40m in less than an hour.


Lynda,N1PBL, and Girl Scout leader Amee Pozerski complete the set-up so that "science of sound" experiments can commence.


Stan's "Introduction to Morse Code" has always been Thinking Day's single most popular activity.


Bruce and Ralph round out every TDOTA by impressing on the Scouts that there's a "big world out there waiting to be discovered."

The Raymond NH troop that we know so well sent a group of Scouts to join us. These girls are true veterans, most having participated with NVARC in the TDOTA event since its inception here in the US back in 2015.

One significant difference this year was that we didn't participate in the actual International Thinking Day On The Air. This is cookie season here in New England and sales and deliveries would have interfered with the scheduled 16-17 February event. Nevertheless, the local Scouts set up their own Thinking Day and we put them on the air.

This year's NVARC participants were: Stan KD1LE, Peter N1ZRG, Bruce K1BG, Ralph KD1SM, Jim AB1XX, Jessica WU3C, Greg WY1X, Lynda N1PBL, Jill KB1SWV, and Skip K1NKR.

(All photos by K1NKR)

Strays

It may be obvious to some and not so to others, but did you know that reading *Signal* in its electronic copy (*i.e.*, PDF) version permits you to go to and read/display all those references that are identified as bold blue URLs in our articles?

Does this pass the "silly" test? It was one of the questions in a recent QRZ.com daily quiz.

Question: Is transmitting a picture of sheet music against FCC Part 97 rules?

"Correct" Answer: Yes. Explanation: The rules are vague but seem to suggest that the transmission of music, whether in digital, analog, or other forms, is prohibited by Part 97. This rule exists to protect broadcasters from competition.

Folks complain that not enough equipment is built in America. Well, I bought a TV last week and the box said built in antenna!

Qatar OSCAR-100 is geosynchronous and on the air. Unfortunately, its footprint is not over the US. You can monitor it, though. The WebSDR, hosted at Goonhilly Earth Station in Cornwall, enables you to listen to the Qatar OSCAR-100 Narrow band transponder. "Tune" to **https://eshail.batc.org.uk/nb/**

Homebrew Night Follow-up

Remember AB1WQ's 3D-Printed Paddle Project (3DPPP) from Homebrew Night in December? He's planning on offering it to the Scouts during Thinking day On The Air. Here's Jim's report on what's going on. (all photos by AB1WQ)

Here's a note to bring you up to date on what I am prepared to supply for the TDOTA events planned for Feb. 9 and 16.

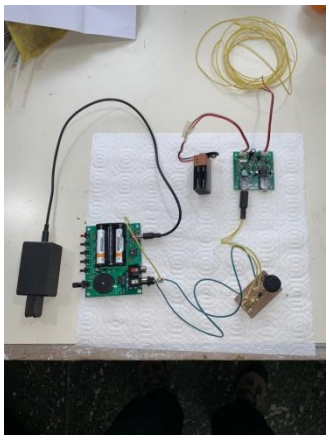
I have refined the 3DPPP to a 17-piece kit as shown in this photo. Each kit will be provided in a Ziploc bag.

All of the paddle's solder joints have been consolidated into a single pre-assembled piece called the "wiring core." It is shown in the lower half of the next photo, below the paddle base. Consequently, the only tools needed to assemble the kit are a Philips screwdriver and needle nose pliers. Working one-on-one, I estimate that one of our NVARVC hams could guide a Scout through the assembly process in 15-30 minutes.

A finished paddle, shown in the following photo, can be connected to a keyer equipped with a small speaker to emit the Morse code sidetone. I can provide two K1EL keyers: the K16-BK model shown in the photo, and a K16-EXT variant which has a smaller piezo transducer which works fine but can be a little challenging to hear in a noisy (*e.g.*, busy cafeteria) environment.

As we considered previously, I will donate the assembled paddles to the Scouts and/or Troops to encourage further effort toward obtaining a Technician license. I am leaving it to you to provide Arduino K3NG keyers to complement these paddles.

LAST BUT NOT LEAST, is a photo which shows a 3DPPP paddle, K1EL keyer, and "Pixie" 40-meter crystal controlled transceiver all working together! (In the photo, the keyer output is driving the Pixie [grounding the Pixie's key input for the duration of each dit or dah], and there is a miniature straight key in parallel to manually drive the Pixie. This is a convenient configuration for setup and testing.)



I have had conversations with several NVARC members about how we might demonstrate the fundamental "magic" of invisible radio wave communication—the hook into our hobby that many of us have felt. Toward that end, I propose that we enhance our Morse code activity with the scouts this year to go beyond the introductory "Spell your name in Morse code" activity to include setting up several Pixie transceivers (7.030 MHz crystal in each) in the TDOTA working space. Each Scout operator, could operate a paddle & keyer or straight key on a multi-way, in-the-room QSO party! A fun activity would be to have Bruce K1BG put the N1NC main station on 7.030 MHz and send him a secret message from one or more of the Pixies and have him tell us what he received!

I have two working Pixie kits that I can bring and plan to assemble two more. I have two spare 7.030 MHz crystals if others have working Pixies with 7.026 xtals. (Note on cost: fully assembled Pixie kits [in clear plastic case, with 'RIT' tuning knob] are available on AliExpress for under $9 each.)

The net result is we could furnish several Scouts with a working, DEMONSTRATION, 40-meter QRP rig to incentivize them to study toward their Technician license and grease the skids toward actually getting them on the air once licensed! (I emphasized the word DEMONSTRATION on the sound advice of Bruce K1BG that the limitations of such a fixed-frequency low-power rig should be made clear to any Scout, Troop leader, or parent who sees it. We don't want to work against ourselves by misleading any youngster into a frustrating experience that turns them off from Amateur Radio as being "too hard.")

73 *de* Jim, AB1WQ

Postscript: Paddle final assembly notes:

Paddle Tension. My latest refinement of the paddle design substitutes a 1/2" x 1" x 1/16" strip of closed-cell packing foam for the ball-point pen spring between the paddles. Instead of hot-gluing the ends of the spring between the paddles, the foam strip can be rolled up and inserted between the paddles. When either paddle is pressed, the foam roll compresses, then pushes the paddle back when it is released. If greater tension is desired, a longer strip can be rolled more tightly and inserted between the paddle arms. For less tension, a shorter strip provides a light touch.

Paddle Travel. The contact screw inserted perpendicular to each paddle arm can be adjusted over a range of about 1/8". This allows the travel (horizontal movement) of each paddle to be independently set from about 1/32" to 1/8", as preferred.

The final "tuning" of paddle tension and travel is done iteratively while temporarily placing the 3D cover piece on the paddle. When desired operation has

been achieved, the four screws are inserted in the base to fasten the cover in place.

From the EMA Section News

UP FRONT NEWS THIS MONTH

The November 2018 issue of CQ Magazine featured an article based on the Nashoba Valley ARC "Ugly Filter Project" of a few years ago. NVARC members designed a set of bandpass filters designed to minimize interference from nearby transmitters such as a Field Day set up. The CQ Magazine article "A Story about Multi-Transmitter Bandpass Filters" appeared in the Ham Notebook Column. The author of the column, Wayne Yoshida, KH6WZ, built a complete set of the "Ugly Filters" which he described as a "project originally devised by Bob Reif, W1XP and Stanley Pozerski, KD1LE, of the Nashoba Valley Amateur Radio Club in Massachusetts in 2005".

We were also mentioned in **https://ema.arrl.org/youth/#Thinking_Day_On_the_Air**

Thanks to K1TW

Solid State Drives and TRIM

I recently upgraded the computer I use for the digital modes to a solid state drive (SSD). I had some questions about the settings in Windows that optimize the drives, particularly since SSD's have a limited life in terms of read and write cycles. SSD's also have limited data retention time when not powered, but this is not a problem for computers that are regularly used.

What I found is that, at least since Windows 8 (maybe 7), the OS has recognized SSD's and treats them differently than spinning disks drives. There are quite a few issues. SSD's don't need to be defragmented like regular disks to improve the read speed as they are random access device—though there are limits to how many file fragments they can deal with. Another issue unlike a magnetic disk, they must erase before they can write to a previously used area. This is complicated because the space is organized as "pages" (of 4-16 kB) and grouped into "blocks" (128-512 pages). While a drive can write to a page, it can only erase a block. That means that in order to reuse a previously "deleted" page it must copy the entire block to memory, erase the block, then write the old plus new pages back to the drive. This is one reason why the write speed is significantly slower than the read process. The OS now "optimizes" these drives rather than the old defragmentation. This is done using a command called TRIM. One function of the TRIM command is to tell the drive which pages in the block are free or deleted so that only pages that need to be saved are copied to memory before the erase. Once the block erase is done the pages in memory are copied back to the drive and any of the erased pages can be used for future writes to the drive without a delay for erasure.

de Stan KD1LE

Treasurer's Report

Income for January was $60 from membership renewals, $5 from PowerPole connector sales, and a $2 donation. Expenses were $120 for the PO Box fee. This left a net expense for the month of $53. We received a $250 donation from the Squannacook River Runners, sponsors of the Groton Road Race. Per our practice, this donation is added to our Community Fund and reserved for other than normal Club expenses.

Current balances:

General fund	$2,723.93
Community fund	$5,311.52

As of 7 February, we have 50 members who are current with their dues and 15 renewals outstanding. Thank you to those of you who hand in your dues before I come to you. Please check your renewal status on the roster circulated at the monthly meeting or ask me.

As noted in the January Signal, those of you who have been receiving mailed hard-copy newsletters must inform me if you wish the Club to continue mailing the paper copy to you. If you tell me nothing then we will not be mailing the Signal to you. This change was directed by the Board in order to save the Club some postage expense.

If you are joining ARRL or renewing your membership please consider me letting me send in the paperwork for you. The Club will buy the stamp and will get a commission from ARRL. ARRL membership checks should be made payable to NVARC. I deduct the Club commission before forwarding your paperwork to Newington. As a Special Service Club, the ARRL expects a majority of Club members to also be ARRL members.

de Ralph KD1SM

Board Meeting Notes

Board meeting 2/7/19

Attending: Stan KD1LE, Jim N8VIM, John KK1X, Ralph KD1SM, Jim AB1WQ, Bruce K1BG.

- Discussion of Ralph's five-year budget analysis
- Shirley TDOTA cancelled. Tyngsboro TDOTA is on.
- Ralph going to purchase another lot of PowerPole connectors.
- Only five members wanted mailed newsletter, reducing club mailing costs.
- Discussion of the sponsorship of a Youth Achievement Award at the Bromfield School in Harvard.

Respectfully submitted,

de John KK1X

Club Services

Saturday Breakfast. Not officially a club function, but a consistent part of club life. A dozen or so members (and some wives who are members, and some wives who are not, and some non-members who aren't wives or husbands) rendezvous at Tiny's in Ayer for Saturday breakfast at 8am on the dot. Somehow, no matter what food is ordered, no matter how fast the service is, no matter what the conversation topics are, we pull out at 9am.

Outgoing QSL Service

Sure we sort incoming cards for the W1 Bureau, but do you remember that we also send Bureau cards out on behalf of members? The big DX contests are October and March. Our card shipments go out late fall and late spring. Save on postage; see Rod WA1TAC.

Calendar

February
9 NVARC's support of a local Thinking Day On The Air (Tyngsboro)
16 Marlboro Flea Market
24 Augusta ME HamFest

March
3 RADIO 50 Antique Flea Market, Nashua NH

April
13 Seacoast Amateur Radio Flea Market (Port City ARC), Portsmouth NH See www.W1WQM.org

May
18 Antique Flea Market, Brookline NH

Upcoming Operating Activities

2019
Canadian NPOTA (all year!)

February
11-15 School Club Roundup
16-17 Thinking Day On The Air (International)
16-17 International DX Contest (CW)

March
2-3 International DX Contest (phone)

Are you a "contest nut?" See http://www.arrl.org/contest-calendar (Contest Corral) for month-by-month listings of both ARRL and non-ARRL contests.

Advertisers

Yes, we can accommodate advertisers.

All this space (and more) could be yours!

Nashoba Valley Amateur Radio Club

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http://www.n1nc.org/

President: Stan Pozerski, KD1LE
Vice President: Jim Hein, N8VIM
Secretary: John Griswold, KK1X
Treasurer: Ralph Swick, KD1SM
Board Members:
Jim Wilber, AB1WQ, 2016-2019
Ed Snapp, N1YFK, 2017-2020
Bruce Blain, K1BG, 2018-2021

Property Master: John Griswold, KK1X
Librarian: Peter Nordberg, N1ZRG
Emergency Coordinator: [open]
N1NC Trustee: Bruce Blain, K1BG

Join NVARC! Annual membership dues are $15; $20 for a family.
Meetings are held on the 3rd Thursday of the month at 7:30 p.m. in the Pepperell Community Center.

Contact us on the N1MNX repeater.
442.900 (+), 100Hz
147.345 (+), 100 Hz
53.890 (–), 100Hz

This newsletter is published monthly. Submissions, corrections and inquiries should be directed to the newsletter editor. Articles and graphics in most PC-compatible formats are OK.
Editor: Skip Youngberg, K1NKR

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