



SIGNAL

A club since 1992



Since 1993



Since 1996

de N1NC

January 2020

Volume 29 Number 1

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Last Month's Meeting

At last month's meeting Paul, W1SEX, presented on Ham radio support for the New England Forrest Rally (NEFR) and the Climb To The Clouds (CTTC) rally races that will take place in Maine and New Hampshire this July and August. These are not casual public service events as Hams provide the only communications ensuring the safety of the event. The remoteness and terrain challenges make this a real test of your communications skill and self-sufficiency. Because of the terrain, both mobile radio VHF power levels and HF NVIS capability are required for some of the stages.

This Month's Meeting

The January meeting is to be Homebrew Night! Please share your latest creations, innovations, and works-in-progress.

7:30pm, January 16, at the Pepperell Community Center.

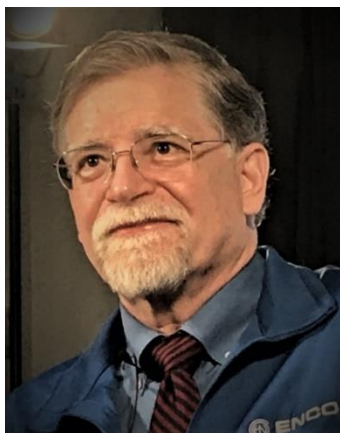
Next Month's Meeting

The February meeting's agenda is up to YOU! It is to be our yearly "Short Subjects Night", wherein members are encouraged to share a short presentation on a subject of interest.

Gene Novacek (SK)

With great sadness and profound respect, we report the death of NVARC member Gene Novacek, WW4EN.

Gene died on 1 January 2020.



In his indomitable fashion, Gene outwitted pancreatic cancer far beyond expectation. Gene had his ups and downs over his many-year long battle, but he always came out on top—always looking forward, not down or back. Most recently he had taken up a study of DXing via repeater linking.

Many club members recognize Gene's enthusiasm during the meetings he was able to attend when he wasn't jet-setting around the world meeting customers of ENCO, the highly successful company that he founded to serve the world's radio/TV broadcast businesses.

Most of us remember his hosting the annual NVARC picnic at "the barn" in Townsend. Always the consummate engineer and ham, Gene designed and built the barn as a Faraday cage complete with solar and geothermal power, heating, and cooling—and better Internet connectivity than most small towns.

A quick search for Gene on the Internet turned up a raft of results, including the following videos of Gene performing at the Piano:

<https://www.youtube.com/watch?v=itM5EPyqlsU>
https://www.youtube.com/watch?v=t_FYXiNap9k

From the President de Stan, KD1LE

We often have to put up VHF antennas in the field for events. Sometimes we can hang them in a tree. Sometimes we put them on a single ten-foot TV type mast that may be leaned on or secured to something. But sometimes there is nothing to hang on or attach to.

This year I plan on participating in an event that has serious requirements for each operator who must be self-sufficient because the operators can be a mile apart over a course of five to twelve miles. They have to set up in a reasonable time, operate during that portion of the event, and be able to tear down and move to another site as much as 26 miles away and repeat several times in a day. They should run a fifty-watt VHF dual receive radio with an antenna ten to 20 feet high. They should run an HF radio on 80 meters SSB with an NVIS dipole. And, they must be able to do this whether they are in the woods or in a field.

With these requirements as a basis I started a project with a couple of goals. Configure a reasonable height telescoping mast kit that can get a vertical antenna up 20-30 feet. Build a tripod arrangement, possibly stabilized by a vehicle supplemented with one or two guy sets, to support the mast once you push it up.

Working the mast issue, I decided that it would be a telescoping fiberglass mast with a maximum collapsed length of six feet for reasonable transport in my new vehicle. This wasn't a problem in the past as my van could take a ten-foot mast inside, but it passed on last summer.

I ruled out the typical four-foot aluminum or fiberglass military type masts because they have to be assembled horizontal and then erected with people on each guy.

For the tripod, I was working with a TV mast tripod which I had on hand. I had been reworking it make it easier to open and fold up. The standard designs are put together with rivets at the pivot points which are stiff. This involved drilling out the rivets at nine places and replacing them with 1/4-20 hardware.

That being completed, I went back to the mast part of the problem. My research found based on the maximum collapsed length I wanted there would be at least six sections progressively smaller. To have a reasonably strong (large enough diameter) top section the bottom mast section was going to be 2-1/2 inches in diameter. That would give me a one-inch or 1-1/4 inch top section.

Back to the tripod: TV mast tripods are designed for smaller masts, typically 1-1/4 inches. Oops. Rather than buying another tripod I decided to modify the one I had been working on to accommodate the larger mast. I had already solved the folding issue and produced a reasonable drive on base. Short metal straps form the area that the mast slips into. I could manufacture new, longer straps, but that would involve a bit of cutting, forming, and drilling. Besides the mounting holes the straps had additional holes for set screws to secure the mast. Since the pivot points were now secured with nuts and bolts instead of rivets, the solution was to add washers at the connecting points to both sides of each leg to spread the straps out about one-half inch. That resulted in an inside spacing that would allow the 2-1/2 inch mast to fit. This is what it looks like from the top:



While some sort of spacers would have been more elegant, the box of washers cost far less than even a few spacers.



Bugs and More Bugs

For years at Field Day (FD) and other events I either operated from my vehicle or in the case of FD wanted to take a few ZZZ's overnight. The choice was to close the windows and be stuffy or hot or open the windows and suffer the bugs. I sometimes thought about some kind of screens and Velcro strips glued to the door frame. But that is a messy set up. What I found are window screens that don't require attachment. They are made of stretchy nylon

material in the form of a pillow case. They slip over an open door and when you close the door they are secured.



The ones I purchased were by TFY but there are several sources on Amazon and they are not expensive. They come in a couple of shapes and sizes. One shape is squarer for back door windows or the shape shown for front door windows or if re-

versed for a back door shaped the other way. They say they are not to be used on the front doors of cars which is probably to conform to visibility laws for cars on the road. For stationary use it shouldn't matter.



Last month I mentioned NVARC members on the Boston Marathon Vol of Fame. The website link is:

<https://www.baa.org/get-involved/volunteer/vol-fame>



CW Practice Phrases

At a recent Tech Morning, Peter, N1ZRG, brought in a CW practice set up and a challenge. Bill, AB1XB, had provided us with some difficult CW phrases to send and we took turns trying to send them without errors at progressively faster speeds:

- She is him es he is she
- Is she he?.
- He is she.
- Shall his be these?
- Did she see his fees?
- This is she.
- N5SHS is his call.
- Is NS5H hers?
- Did she see these?
- He is in these trees.
- His tress are these.
- His tree is here.
- She es he.
- She is 55 es she is his sister.
- Finger Twisters:
 - RADIOTELETYPEWRITER
 - Sphinx of black quartz, judge my vow
 - Pack my box with five dozen liquor jugs

- Dells little feet looked different during summer session classes especially after he fell off the roof in Mississippi and shattered his goofy little glasses.

- Mississippi sissies are sissier than Tennessee sissies

(If I counted right there are 94 dits in the seven words above)

- Musical Word:

- GEGEBEN (German word for "given.")
- BEST BENT WIRE



Elections

Elections are coming up in April. I announced to the Board at the January meeting that I would not seek re-election in April.

-de Stan, KD1LE

The NanoVNA de George, KB1HFT

The "NanoVNA", an inexpensive 2-port VNA, is quite popular in DIY electronics and Amateur Radio circles. NVARC's Monday Tech Morning group is investigating it's use, and it is the subject of the lead article in the January 2020 issue of QEX.

There are several quite active NanoVNA discussion groups on the groups.io website, the main one being: <https://groups.io/g/nanovna-users>, which now has over 3,600 members.

Jessica, WU3C, has done some significant characterization of the performance of a NanoVNA. She reports her findings later in this issue of Signal.

But what is it?

"NanoVNA" refers to a simple design for a two-port vector network analyzer that has evolved over the past several years. It is discussed in detail here:

<http://nanovna.com/>

A pair of Texas Hams, Milt, W8NUE, and Kees, K5BCQ, originally came up with what is now considered the first iteration of the VNA. They once offered it as the "AQRP 8KHz – 440MHz Antenna Analyzer Kit", until their supply of parts ran out.

That design was later modified and enhanced by edy555, a Japanese experimenter, who offered a kit,

in Japanese, for a while until HIS supply of parts ran out. In an attempt thwart the production of inferior clones, edy555 published his PCB layout files and microcontroller code to the public domain.

Unfortunately, as word spread of the usefulness of this inexpensive tool, the cloners took notice. Several (many?) variations of edy555's VNA suddenly became available on the web. Some were good copies, some were shoddy.

Some time later, Gen Hu, a Chinese enthusiast, who goes by the screen name of "Hugen", worked with edy555, to significantly enhance both the NanoVNA's hardware and software. Hugen markets his version, as the "NanoVNA-H", "H" for Hugen, available at: https://www.alibaba.com/product-detail/3-4-version-650mAh-battery-Original_62342877955.html?fullFirstScreen=true

Another Hugen version of the device, the NanoVNA-F, has a larger screen. It is reported that Hugen and edy555 are working on enhancing the product even further.

Again, unfortunately, open-source has its downside for the original artists, as the cloners have stepped right in. It has been said on one of the discussion groups: "The NanoVNA-H, and NanoVNA-F, have an excellent price-to-performance ratio for a piece of hobbyist test equipment. We should support the original developers."

The NanoVNA can be remotely operated via PC applications. One of the most popular of these is "NanoVNASaver", written by Rune, 5Q5R, a Danish Ham.

Finding proper documentation for the NanoVNA can be problematic, as its original Japanese docs have been poorly translated several times. One quite useful, 64-page, doc, by Gunthard, DG8GB, can be found at:

http://www.gunthard-kraus.de/fertig_NanoVNA/English_NanoVNA%20V1.5_final.pdf

While clones of Hugen's NanoVNA can be found on the web at lower prices than Hugen's, the various versions are of varying quality, and their construction is sometimes quite poor.

So, as a dabbler in the electronic arts, I ask myself:

- Do I want to be able to make impedance, VSWR, & return loss measurements of circuit components?
- What is my acceptable margin of measurement error?
- How well do these affordable instruments, meet my needs, and address my curiosity?
- Do I really need another toy? (OF COURSE I DO!)

I now have three of the devices from various vendors, at least one of which is from Hugen. I've not had the cycles to compare them but hope to team up with Jessica to characterize them.

An Interesting QSO de Bruce, K1BG

I'm often asked the question "had any interesting QSOs lately?" As a rag chewer, my standard answer is "all the time". But some QSOs are more interesting than others.

When I'm not traveling, I work from home. I often grab a sandwich and head for the shack, either to answer a CQ or to call CQ, and to engage the other operator in a classic "rag chew". That means that I try to engage the other operator in a conversation.

One of these CQs was recently answered by Ron, KA3J. I gave Ron a 559 signal report, and customarily, my QTH and name. Ron gave me my signal report, his QTH, and name. And then the conversation started.

Ron was operating from Delray Beach, FL. Not just the city – he was actually on the beach!

His rig? A one-watt homebrew transceiver with a whip antenna. Ron was walking on the beach! Turns out that Ron's passion is building these small 20-meter transceivers and operating them close to water: either on Delray Beach or his native Maryland.

Ron has worked over 100 countries and 42 states with this simple setup.

Ron tells the story much better than I can – check it out at <https://www.qrz.com/lookup/KA3J/>

As a side note, operating close to a body of salt water often gives amazing results, particularly when you use a vertically polarized antenna.

With due respect to Forrest Gump - Amateur Radio is like a box of chocolates. If you haven't done it before or in a while, answer or call CQ. It's true – you never know what you're gonna get!



de Bruce, K1BG

The NanoVNA: An Evaluation de Jessica, WU3C

It's cool, OMG its \$40! But how good is it really?



\$39.49
Free Shipping

Get it by Tue, Jan China

Need it faster? In checkout

• New condition
• 60 day returns

*1 NanoVNA (incl host (including 45 Touchstone (snp) Read full description See details

I thought about how to characterize it to determine just that. The thing is, it is a pretty tedious thing to do, and it requires a good deal of measurement care and data. What we are really after is measurement uncertainty.

That is unfortunately much more work than a comparison to a VNA of known and likely superior performance and is especially true if one happens to have a HP8753C with metrology grade cables and calibration kit sitting on your bench...

First off, The Nano VNA I have does not support electronic data transfer. Upgrading it is for another day.

My NanoVNA was tested as supplied: with its male cal standards and female test ports.

That led me to have a difference of a male to male SMA between the measurements that I needed to

remove in the data. Not the best way – room for future improvement.

Next, the Nano VNA is fragile, and unable to take proper SMA connector torque, So I had to only hand-snug things. I tired the torque wrench, and almost ripped the connector off! The power switch did ACTUALLY fall off in use. So, I had to repair it and re-do the cal.

Having only one button, and my brain software being incompatible with slow touch screens, I was frustrated by it enough to not do many parts of this work over to improve some of the issues mentioned here.

The basic idea for measurement comparison here is to generate a passive load circuit that can provide a locus of impedance of varying reflection coefficients over frequency. Ideally, I would measure many points around the chart at each of many frequencies – spanning the instrument capability, however that is more work than a vacation day should contain!

So, as a starting point, I swept a reactively terminated line with a step attenuator in front of it. This gave “loops” of roughly constant VSWR over frequency. This created radial lines of increasing VSWR, each associated with a test frequency.

This really isn't enough to do a good job, but just making this measurement carefully and boiling down the data took many hours – so Good Enough!

Figure 1 shows the termination circuit. I used a step attenuator for the variable attenuator, and an air core inductor along with an air variable capacitor.

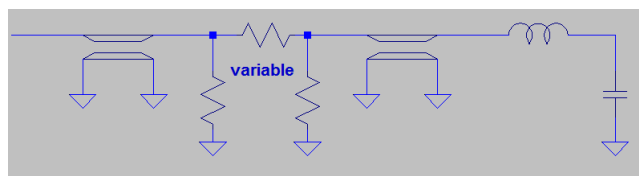


Figure 1: Test termination circuit

Measurement readout was done with the marker, and the data was collected in the format of the Nano VNA (real / L or C) and just in R/I on the HP8753.

Once both the HP8753C and the Nano VNA have this set of measurements, the Nano VNA's data must be converted into polar format, have the adapter phase removed, as it only had female test ports and male cal standards, and interpolate each frequency point to match the HP8753C.

In retrospect I should have just set the 8753 to match each Nano VNA frequency point. Figure 2 shows the

HP8753C measurements in blue “x”, and the Nano VNA in red “o”. Interestingly, the NanoVNA frequency at a point would change from measurement to measurement. I am not sure why.

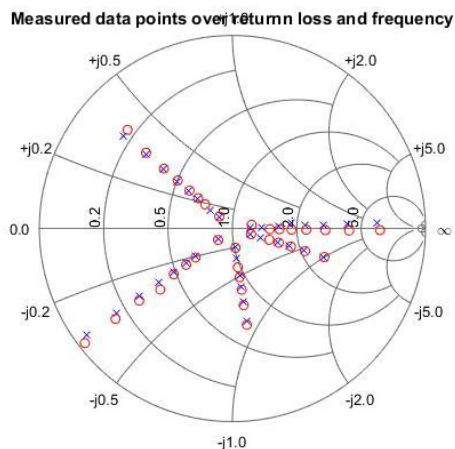


Figure 2: Locus of measured points, 1Mhz is at 3:30 position, increasing clockwise to 50MHz

Generally Speaking, it is satisfyingly close! Realistically it is pretty poor in terms of a commercial VNA, but definitely good enough if one assumes some tweaking will be necessary when constructing a circuit.

There were several anomalies of data points that were way off. I deleted them from the dataset, and this needs further investigation. More disturbing is that there is a pretty large amount of non-uniform error variation over reflection coefficient magnitude and frequency. Some points are close, and some are not. I did not use any parts of the load data that were changing fast with frequency – these were way off (more than 10 degrees.) I think given the tedious nature of the measurement; some automation code is in order for round two.

Looking at the “cherry picked” non-anomalous data differently, I computed the impedance in ohms difference in the magnitude of the measured impedance between the two instruments, which tells an expected story: as the reflection coefficient gets larger, the error grows, and it grows with frequency.

Figures 2 and 3 have series of the step attenuator settings, which is expressed as the approximate return loss of each series. Figure three is the delta in phase of the reflection coefficients. There is a funny “sweet spot” at 20Mhz for 4dB RL and better. I have no explanation for this right now.

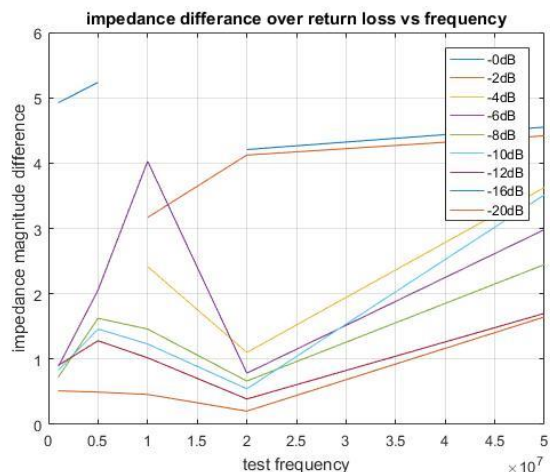


Figure 3

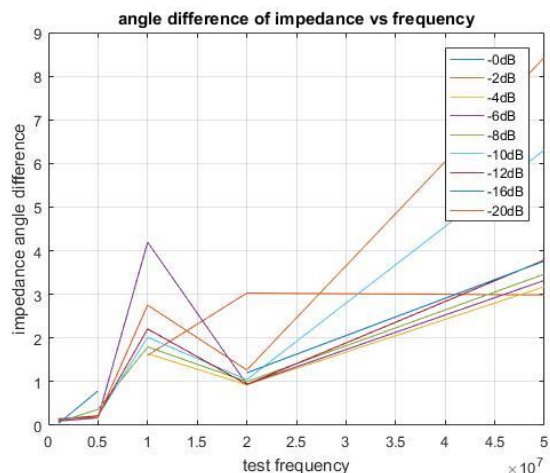


Figure 4: Phase differences in impedance measurements

In summary:

The little guy is really cheap, and I do mean just that. Usability is poor and it's hard to read. It is quite fragile, the battery only lasts a few hours, and it has non-precision connectors. The frequency points would change from sweep to sweep, and the repeatability is questionable.

There were several large errors in the data that I cannot explain right now: but it's possible they were operator error. Further, is it a one path only, and it is not possible to make full 2 port S parameter calibration or measurements.

However, it is pretty darn close for \$40 and plenty good enough to do a variety of jobs in the Ham shack.

When I get around to some automated scripts, I'll take another pass at this and look at computing ac-

tual measurement uncertainty and cover the VHF and UHF portions of its capability.

A Special Thanks to Peter, N1ZRG, for being my able technician and stenographer for this work!

73!

de Jessica, WU3C

Around and About de George, KB1HFT

On January 7th, Bob, W1XP, and I made a pilgrimage to Ham Radio Outlet in Salem, NH, where Bob added to his bookshelf, and I browsed an array of CW keys, paddles, and keyers. Just looking...

We then pushed northward to visit Electronic Surplus Services in Manchester to pick up some wire-by-the-pound. Unhappily, when we arrived, we were greeted by dark windows and a sign on the door stating: "The Store is Closed (for Good)". Bummer!

Subsequently, I called the phone number listed on their (still up) website, and spoke with a woman who related that they have closed the brick & mortar retail store, but will still sell stuff via their eBay store. She also told me that they have sold much of their inventory to Fran, at Electronics Plus in Littleton. YaaY!

Calendar

W1AW Schedule

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	1400		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	1500-1700 1800-2045	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	2100	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2200	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2300	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	0000	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	0100	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	0200	DIGITAL BULLETIN				
6 ⁴⁵ PM	7 ⁴⁵ PM	8 ⁴⁵ PM	9 ⁴⁵ PM	0245	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	0300	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	0400	CODE BULLETIN				

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US time + 4 hours. For the rest of the year, UTC = Eastern US time + 5 hours.

♦ Morse code transmissions: Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675, 50.350, and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13, and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13, and 10 WPM.

Code bulletins are sent at 18 WPM.

All Year

WA1WCC celebrates 100 years of RCA

WA1WCC is commemorating the founding of RCA in a year-long celebration. Watch for WA1WCC/100RCA on the bands during 2019. Participants can request the RCA Special Event Certificate. (Ed: Also, a great shot of the back of Bruce, K1BG's head!)

<https://ema.arri.org/2019/01/19/wcc-ara-celebrates-rca-centennial/>

January

- 15 Augusta Amateur Radio Association Winterfest, Le Club Calumet, 334 West River Road, Augusta, ME. <http://w1tlc.org>
- 16 NVARC Meeting: Homebrew Night. Pepperell Community Center. 7:30pm.
- 18 Whitman ARC Winterfest 2020. 9am-1pm., Knights of Columbus, 1195 Bedford St., Whitman, MA. www.wa1npo.org
- 18 Hungarian DX Contest 1800-2200Z, CW, SSB. 160, 80, 40, 20, 15, 10m. <http://ha-dx.com/en/contest-rules>

February

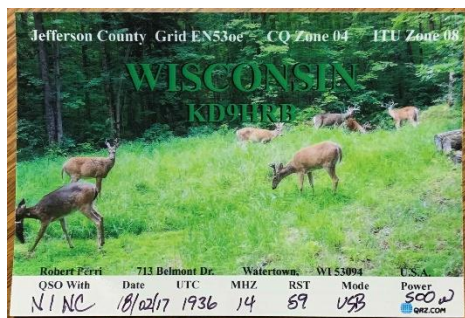
- 1 AGCW Straight Key Party. CW. 80m only. 1600Z-1900Z. <http://www.agcw.org/index.php/en/contests-and-cw-activities/straight-key-party-http>
- 1 FISTS Winter Slow Speed Sprint. 1700Z-2100Z. CW. 80, 40, 20, 15, 10m. <http://fistsna.org/operating.html#sprints>
- 9 Balkan HF Contest. 1300Z-700Z. CW, SSB. 80, 40m. <http://hamyo.ro/balkanhf2019/>
- 15 Russian PSK WW Contest. 1200Z 15FEB – 1159Z16FEB. BPSK31, BPSK63, BPSK125. 160, 80, 40, 20, 15, 10m. <http://www.rdrclub.ru/russian-ww-psk-contest/49-rus-ww-psk-rules>
- 15 Algonquin ARC Fleamarket, Marlboro, MA. <http://n1em.org>
- 17 Run for the Bacon QRP contest. 0200Z-0400Z. CW. 160, 80, 40, 20, 15, 10m. Max 5w. <http://qrptest.com/pigrun/>
- 20 NVARC Meeting: Short Subjects Night. Pepperell Community Center. 7:30pm.

Board Meeting Notes

Attendees:

Stan, KD1LE Ed, N1YFK
John, KK1X Bruce, K1BG,
Ralph, KD1SM Jim, AB1WQ
George, KB1HFT

- NVARC received a QSL card from 2017 Teaching Day:



- January : Homebrew
- February : Short Subjects
- Bruce K1BG will attend the Cabinet Meeting in Springfield on Jan 12
- Bruce has confirmed the general good condition of the TS-450S that belongs to the Club. What do we do with it?
- What's going on with Teaching Day 2020?
- Given Stan's retirement, the Club will need a new contact for the Community Center.

-de John, KK1X

Treasurer's Report

Income for December was \$60 from membership dues and \$1 from ARRL membership renewals. There were no expenses for the month leaving a net income for the month of \$61.

Current balances:

General fund	\$2,754.67
Community fund	\$5,698.25

As of 2January we have 52 members who are current with their dues and 12 renewals outstanding.

Thank you to those of you who mail or hand in your dues before Ralph comes to you. Please check your renewal status on the roster circulated at the monthly meeting or ask Ralph.

Membership dues can now be remitted via PayPal:

- Go to <https://www.paypal.me/nvarc>
- Remove the checkmark in the box "Paying for goods or a service", which instructs PayPal to deduct a fee for their "purchase protection". This adds expense for the Club. If your "shipping address" is displayed then the box is still checked.
- Enter your callsign in the "Add a note" field.

If you are joining ARRL or renewing your membership please consider letting Ralph 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; Ralph deducts 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

Elmering

If you know of a young person who has recently become licensed, or who might be interested in becoming a Ham Radio Operator, and is in need of equipment to set up a station, an NVARC member has the resources to assist.

Through the generous donation of a fellow ham, he can supply the hardware and setup know-how to get a young-un up and on the air. If you know of such a person, please contact Jim, N8VIM at: N8VIM@arrl.net



Wind power generated 47% of Denmark's power usage in 2019.

While the US has the potential for 10.5 GW of on-shore wind power or 37 petawatt-hours (nine times

the current US electricity usage) it only generated 6.9% of electricity from wind.



"I am often asked how radio works. Well, you see, wire telegraphy is like a very long cat. You yank his tail in New York and he meows in Los Angeles. Do you understand this? Now, radio is exactly the same, except that there is no cat."

Attributed to Albert Einstein



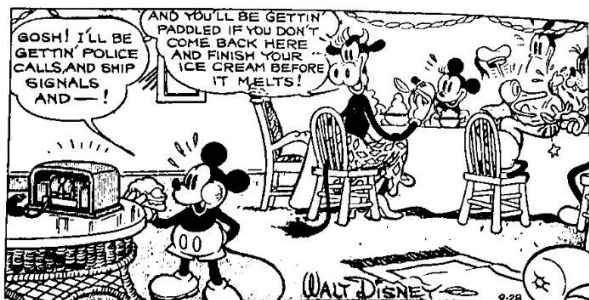
"Signetics" 25120 Write-Only Memory datasheet:

<http://www.repeater-builder.com/humor/pdfs/signetics-wom.pdf>



Umac 606 Phantastatron datasheet:

<http://www.repeater-builder.com/humor/pdfs/umac-606.pdf>



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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

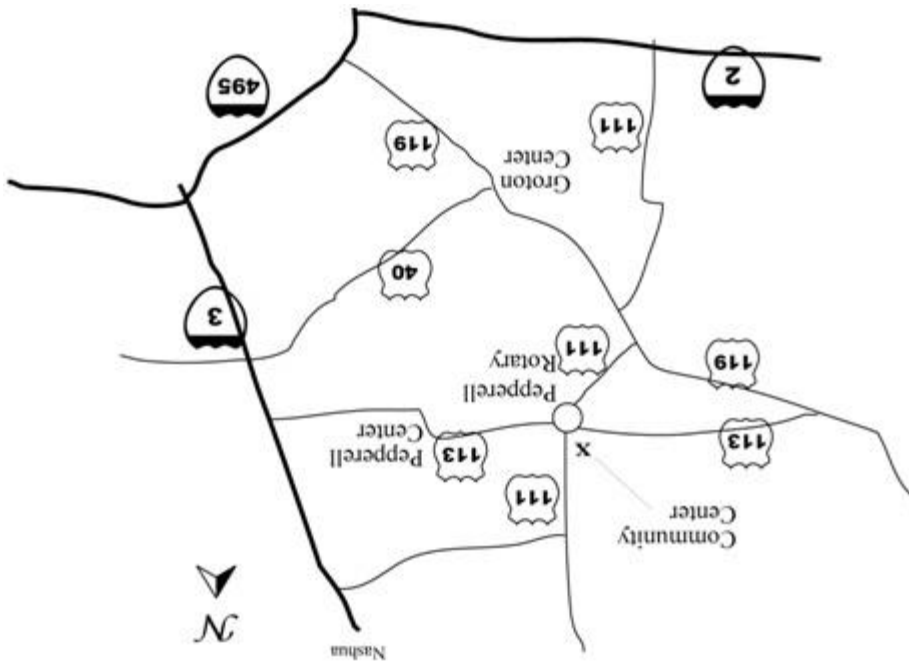
53.890 (-), 100Hz

This newsletter is published monthly. Submissions, corrections and inquiries should be directed to the newsletter editor:

editor@n1nc.org

Articles and graphics in most PC-compatible formats are OK.

Editor: George Kavanagh, KB1HFT



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