NVARC
Nashoba Valley
Amateur Radio Club

SIGNAL

SPECIAL SERVICE CLUB
ARRL

de N1NC

November 2013 Volume 22 Number 11

This Month's Meeting

This months meeting is November 21st at the Pepperell Community Center at 7:30 PM

Last Month's Meeting

Last month was the annual QSL Card Sort. We sorted some 17-18,000 cards in about 1-1/2 hours.

Above Eric KV1J, Ken K1JKR, Bob KB1JZU, Leo K1LK, Russ WR1Y, Ray KB1LRL

Above Stan KD1LE, Ken K1JKR, Peter N1ZRG, and Skip K1NKR

Above Stan KD1LE, Larry W1ESR, Dan KW2T

After the sorting was done we enjoyed pizza

Attendees:
Members
John K1JEB, Ken K1JKR, Dennis K1LGQ, Leo K1LK, Skip K1NKR, Gary K1YTS, George KB1HFT, Ken KB1UVP, Greg & Tom KB1WAQ, Stan KD1LE, Ralph KD1SM, Dan KW2T, Tony KX1G, Les N1SV, Peter N1ZRG, Larry W1ESR, Rod WA1TAC, Russ WR1Y
Visitors
Tom AB1GF, Bill K1NS, Bob KB1JZU, Ray KB1LRL, Andy KB1OIQ, Steve KC1AHU, Eric KV1J, Barry W1HFN

President's Corner

President's Corner
de Skip, K1NKR

I hate to start November this way but let me get serious. I went out to the Syracuse area last month to visit former member Jim Francis, K1PTF. Many of you know that Jim and I go way back. We went from kindergarten to high school graduation together and were both licensed during the winter/spring of eighth

grade. In case you're wondering, Jim's OK. And a pretty OK guy, too.

His being an OK guy is what prompted all this. The father of the people he bought his house from died this past spring and the family approached him for ideas regarding disposition of his ham equipment. This gent was apparently an extreme "type-A" personality. Jim had to assess not just a shack, but an entire basement and the second floor of a barn as well. (Oh, and the place is over an hour away from Jim's home.) Jim offered me two nights' lodging, a little socializing time with him and Colleen, and a visit to the new Antique Wireless Association museum for a "second opinion." I couldn't pass it up.

Overwhelming. OMG, overwhelming! This ham had more than the usual complement of parts and test equipment. But he also had multiple copies of virtually everything Heathkit offered, duplicates of his favorite Icom ham and SWL gear, and a smattering of World War Two stuff. Multiple copies—dozens and dozens and dozens of rigs. Having been in a nursing home for a while, he or the family had let junk pile up on all of it. And the stuff in the barn was treated to a couple of inches of raccoon droppings. It took us two hours to photograph the stuff—not item by item but just overall photographic note-taking of the various piles.

Second opinion: Jim, don't touch this tar baby. Suggest some personalities or organizations who dabble in classic equipment and then make a gracious departure. Connect the family to a network and depart, depart, depart. Brer Rabbit, DON'T touch that tar baby.

It took about seven hours to drive home and I did a lot of thinking. We all love our hobby, but is it fair to just dump everything we've accumulated on the innocent at their time of crisis? There have been articles in QST about the importance of having a will. A will, though, designates who gets what or who disposes of what. But what's what?

I'm not suggesting we get all obsessive-compulsive and start making lists. Lists get out of date very quickly and most of us are expecting to out-survive "quickly." I think it would be even more effective to alert, educate, and inform someone of just what kinds of accumulata (nice word there; I just made it up) make up the most important part of your hobby inventory. Is the size of a rig indicative of its value? Are there family artifacts handed down from some previous generation ham? Does that CK722 you saved all these years belong in the junk bin or a museum? You don't have to get too detailed. Face it, when all is said and done most of what you have is destined for the dumpster. But some stuff is inherently more valuable that other stuff. Non-technical people, particularly non-hams, don't know the difference.

So here we are coming up on the part of the year that's full of dark, quiet evenings. Invite a family member or a close friend over for dinner. Spend a while talking over what's important and what's not. You might just cement a relationship while you're doing it. They may leave with a fuller understanding of your love of the hobby. Most importantly, you'll certainly make life easier for someone someday.

This Month's Program

The Boston Marathon is one of the best known events in the world and local hams are an integral part of it. Steve Schwarm, W3EVE, is "Mr Communicator" for the Marathon and he'll be with us for what promises to be a fascinating and newsworthy talk. No secondary presentation; Steve's got the whole evening.

Strays

The ARRL website notes that this November marks the fiftieth anniversary of the Arecibo radio telescope in Puerto Rico. Heck, that's nothing. I bet there's more than one of our members who has an antenna that's more than fifty years old.

Headquarters and museum of the Antique Wireless Association, Bloomfield NY.
(www.antiquewireless.org)

AWA Museum sign, prominent on NY Route 5&64 (US Route 20).

Part of Armstrong's original FM transmitter.

NVARC Field Day

It was with great hue and cry that the November issue of QST came out this past week, with the long-awaited Field Day results. It's not a contest, but in our 1A category, Nashoba Valley ARC came in fifth in the nation against similarly-equipped clubs. We were operating with emergency power limited to 100W. There were some QRP stations that beat us, but they get a multiplier of 5 instead of our multiplier of two.

There was also a great aerial picture of the Club's Field Day site, credited to Ralph, KD1SM, but unfortunately, they failed to mention that Jim, N8VIM was the pilot of the plane from which Ralph took the photo. That was pretty crucial to the photo. But WE all know.

Thanks again to the large number of people who turned out and made this another successful Field Day operation.

John KK1X - Field Day Chairman 2013

NVARC Club Net

The NVARC Club Net meet's every Monday evening at 8 PM on the 442.900 Pepperell repeater.

Skip K1NKR was NCS October 21st. The net started with the Last Call for SK Erik Stromsted W1ZBT.

Skip asked for some volunteers to run the net.

Discussion included Les' upcoming trip to Bermuda to operate in the CQWW contest.

Participants talked about Winter preparations and antenna work.

The upcoming trip to Haystack for the open house was discussed and arrival time planned.

Stan KD1LE was NCS October 28th

Recent attendees were

Jim N8VIM, Stan KD1LE, Skip K1NKR, Larry W1ESR, Les N1SV.

The End Fed Antenna

Or Almost End Fed Antenna
By W1XP

This is an article on the end fed wire antenna. Or at least antennas feed well off the center. I hope this is a first of a series of articles on this unique class of antennas. There are of course some operational advantages to feeding the antenna at the end. In many cases that is where the radio is or it is a convenient place to attach the feed line. In many cases these antennas are referred to as random wires or random length wires. Random in this case referring to the fact that the wire filled the space available for the wire, and it is not necessarily cut to some fraction or multiple of a wavelength. There are also examples where the wire is cut to a multiple of a wavelength. In these cases the antenna is resonant but the feed point impedance may be much different that that of a center fed half wave antenna. It is this difference of feed point that gives the antenna unique properties. How the antenna is different and how we

might use these differences to our advantage is what will be investigated in these articles. The present discussion is limited to half wave resonant wires at the lowest frequency of operation. A later article may consider both terminated and unterminated long wire antennas.

First some myths about the end fed half wave antenna. It is an opinion held by some that the half wave antenna is a voltage fed antenna and therefore does not need a counterpoise (What ever that is. We will discuss the counterpoise later.) Well the half wave antenna does have some unique properties. If we think of the half wave antenna in free space with a current flowing on it, it is obvious that the current is zero at the ends. The wire ends and so does the current. Measuring the current along the antenna and plotting the magnitude at the measurement points provides a curve that looks like a sine wave. For a half wave antenna it is almost an exact half sine wave. And if we went further and measured the voltage at the same points and plotted them we would get the curves that have been shown in every antenna book for years. That is the current maximum is at the center of the wire and the voltage maximums are at the ends. So this certainly supports the argument that the current required to feed an end fed antenna is zero. After all it is a half wavelength from an open circuit at the other end of the antenna. And impedances repeat every half wave on a feed line. "I read that somewhere". So shouldn't the open circuit repeat itself at the fed end? No!

Let us look at this from the view point that if the antenna is fed at the end that has to be the point of power transfer into the antenna. Or just as possible on receive the point where power flows from the antenna into the feed line and on to the radio. In either case it is **POWER** that has to flow across this boundary. Not voltage. Power is the product of the Voltage (E) and the Current (I) in the DC case. In the case of AC power it is necessary to multiply this by the Cosine of the phase angle between the voltage and the current. This is due to the power factor as it is referred to in the Power industry. In the RF area this is due to the possibility of reactance at the feed point. It is the reactance of the load impedance in either case that causes the phase shift between the voltage (E) and the current (I). But to keep the discussion simple it is obvious that for the product to be any thing other than Zero, neither E nor I can be zero. A Gazillion volts (for our purposes a Gazillion is the largest number you can imagine) times Zero is still **ZERO.** So it is obvious that the current cannot be zero if power, either transmit or receive, is flowing across the boundary. And if it cannot be zero it has to flow either from or into the feed line (transmit or receive). Now Non Zero does not mean it has to be large. It can be quite small if the voltage is quite large. Remember it is the product of the two components E and I that is important.

So as an exercise I modeled a half wave antenna for 20 meters. This antenna was end fed. I ran several different models in free space and over real ground. It was no surprise that the feed impedance of the antenna is a function of how the antenna is fed and what is used for the Counterpoise. In the modeling results I got end feed impedance values from 400 ohms to over 6000 ohms depending on the configuration. I selected 450 ohms as a target. This is a match for a 9 to 1 transformer.

I'll try and explain the function of the counterpoise this way. For the purpose of our discussions here the counterpoise is any structure of wire or wires that serves as the second connection point of the antenna source. Now every antenna has to have **TWO** terminals. Some times this fact is lost. But just like a light bulb, every antenna has to have two terminals. The fact that it is an antenna doesn't change this fact. Current flowing into an antenna has to be matched by current flowing out of a second antenna terminal connected to the exciting source feeding the antenna. This is typically the feed line. In some cases this is quite obvious. The half wave center fed antenna for example. In this case one feed line conductor is connected on one side of the dipole, and the other feed line conductor is connected to the other side of the dipole. Now although the two connections to the two sides of the dipole are obvious enough, the completed circuit is not. But it is a complete circuit just the same. The circuit is completed by the capacity between the two wires of the antenna. The current flowing in this distributed capacitor between the two halves of the dipole completes the circuit. The current flowing in the capacitor is referred to as Displacement Current. This displacement current flows between the two halves of the dipole because they are at a different potential. The voltage difference between the ends of the two wires charges the capacitance between the wires twice per cycle. It is this charging current, referred to above as the displacement current that completes the antenna circuit. Now with some antennas it is not so obvious where the element is that forms the second half of this displacement current capacitor. For example in a ground mounted vertical monopole, it is the ground surrounding the base of the antenna. It is this displacement current flowing in

the high resistance soil that can contribute to the losses in a vertical antenna installation. To reduce this loss radial wires may be added around the antenna base. The radials job is to collect this displacement current and provide a low loss path for the current to flow back to the feed line completing the circuit. Now it is possible to think of our end fed antenna as a vertical for which we must provide a radial field to collect the displacement current. The device that provides this function I will call a counterpoise. It can take many forms and we will only cover a few. But it is absolutely necessary that it exist. If we don't provide the counterpoise it will default to some existing conductive surface. The feed line is the most likely. If it doesn't exist, then the antenna cannot take any power and it will not work. Remember we need both voltage and current to transfer power into or out of the antenna.

It is probably best to understand what is providing the counterpoise function so that we are assured the antenna is operating the way we intend it to work. I know of one end fed antenna that uses a transformer to couple the feed line to the single wire that is a half wave long. There is no obvious counterpoise. In fact the only possible explanation of how this antenna works is that the displacement current is collected on the feed line connected to the matching transformer. So is this bad? Well it may be or not. It depends what you expect the antenna to do. As a casual antenna in a relative noise free environment I think the antenna can perform quite will. But there is RF on the feed line. This means that the feed line is part of the antenna. If the feed line it runs through a noisy area it can pick up the noise that would not be a problem if it wasn't acting as part of the antenna. Also the RF on the feed line can lead to "RF in the shack" problems by getting into the audio or maybe disrupting keying or other ancillary devices. But these problems can usually be handled. A balun somewhere on the feed line can probably choke off the RF well enough. But you may not want to place it right at the feed point.

Now as part of the computer modeling I did with the 20 meter half wave wire, I found I could get reasonable results with as little as two feet of Counterpoise wire at the feed point. Besides a straight horizontal wire I tried various configurations of wires at right angles to the antenna wire. But the simple single wire seemed to work as well as any and is a much simpler antenna to construct. It does change the antenna structure of not one of purely End Fed, but to one of off center fed. I concentrated on this simple approach because it is simple. KISS! After several computer-modeling iterations of increasing the length of the single counterpoise wire antenna, it showed that with a 9 to 1 impedance transformer at the end of the 20 meter half wave and only 5 feet of counterpoise wire on the other side, the SWR was quite reasonable. With the iterations of the counterpoise wire, the length of the half wave wire section was adjusted to maintain resonance. At 30 feet for the half wave section and only 5 feet of wire on the other side of the antenna there was a good match over the whole 20 meter band. The SWR was 1.2 to 1 at the low end and 1.5 to one at the high end. On 10 meters the SWR was 2.7 to 1 at the low end and 2.4 to 1 at 28.5 MHz. The internal tuner in most transceivers can easily nullify this SWR.

This is the interesting difference with end fed half waves. The SWR tends to be reasonable on all harmonics. Since the antenna is always fed at the high impedance point. With a center fed antenna the harmonic frequencies that provide a reasonable match are just the odd harmonics. But in theory the end fed antenna can be used on all higher harmonics. The frequency response of the counterpoise starts to get into the act as the frequency is raised disrupting the harmonic operation. The transformer can start to cause problems also. Such an antenna should also contain a good balun to decouple the feed line.

The radiation pattern of the end fed antenna on 20 meters is pretty much that of a half wave center feed dipole. The current distribution is nearly the same. The fact that the current doesn't go to zero at the fed end changes the pattern a bit. On the harmonic bands the pattern changes a great deal. For example at 10 meters there is now a null where the 20 meter pattern peaks broadside to the wire. There are now four peaks and they are shifted off of the broadside. The pattern also has lots of high elevation angle lobes that are not what one might desire in a 10 meter antenna. But on the air I was able to make contacts on the antenna. I hope to do more with this area in a future article.

I built a 20 meter antenna with 30 feet of #14AWG copper wire on one side of the feed point and five feet on the other. This is a total of 35 feet. The 9 to 1 impedance transformer was one that was developed to match 50 ohm line to 450 ohm window line. The antenna was put up in the back yard and is about 25 feet high. I used it to operate primarily on 20 meters. It was also used on 10 meters and in spite of what might be considered a poor radiation pattern on 10 meters I made QSOs. Many were made only running 5 watts. It seems to perform quite well on both bands, and I worked many European stations on 20 meters again with 5 watts. The transformer uses a small core and is only good for a few hundred watts. I also built an 80 meter version. This antenna used a modified

version of the 9 to 1 transformer to improve the low frequency performance. The wires were scaled from the 20 meter design, but the antenna needed some cut and try to get it to resonate on 80 meters. The antenna is only about 15 feet above ground and it was obvious that more work is needed on the balun with this antenna. I consider this antenna to be a work in progress. Also a full power transformer is needed but I think that is only a case of a suitable core. If anybody is interested in building one of these end fed (really more like off center fed) antennas get in touch with me. I have a limited number of cores for transformers. But if there is enough interest we can order the cores.

In further work I plan to cover radiation patterns and look at the end fed Zepp in detail. There is also the possibility of other versions of the end fed including vertical wires and the WARC bands. Until next time. 73 Bob W1XP

Hanging Antennas

I recently had the need to put a line in a tree to improve the position and height of one leg of my 160 meter dipole. The tree branch was somewhat removed from the best launch point and was some 70 feet high on the tree in question. After several tries with my traditional lead sinker bolo style it was clear I was not going to get there that way. A couple of club members have built air cannons of various designs but no one was around and I wanted my antenna fixed "now". So I did a little research on the Internet and found a variety of designs, kits, and other options. Everything from slingshot/fishing reels to fancy compact tennis ball launchers with over $100 price tags. I ruled out the slingshot as my experience had been the monofilament line tended to get tangled in the branches and the lead weight the slingshot launch was sometimes not heavy enough to pull the line down to the ground. The propane powered cannons seemed a bit risky and uncontrolled but they could hurl the projectile incredible distances.

I decided what I wanted was a simple air launcher using as few purchased parts as possible (translate cheap), simple to build, use, and with a predictable range. The simple and cheap decision meant I skipped the lawn sprinkler valve and fishing reel. I scrapped together the pieces of schedule 40 PVC pipe I needed from the junk pile and for $15 purchased a ball valve and the reducers to transition from the pipe size of the reservoir pipe size to the barrel pipe size. One other stop was to pick up a valve stem at the local auto parts store for $1.25. The device is simply a 3 X 24 pipe for a reservoir connected to a 1-1/4 X 30 inch barrel by a ball valve. The only drilling was a hole in the reservoir to accept the valve stem which is the charge port. I skipped the pressure gauge as my tire pump had its own.

The projectile is a four inch piece of one inch pipe with end caps and an eye bolt in one end to attach a string. The end caps were sanded smooth and made close fit to the barrel size with electrical tape. The projectile was partially filled with small stones to increase its weight to help it pull down the line.

It took about an hour to prepare and put the cannon together using the same care you would if it were your plumbing project. Then I set it aside overnight to let the solvent do its thing.

Overnight I thought about going somewhere for a test range to make some test shots. Everything from here on would be to characterize the launcher and would be established by experimenting. But why bother, the proof would be in the pudding.

The next morning I set up the launcher using my usual light line. The line is distributed on the ground from its home wrapped around a paint can. This is the same method I would use if I were using the lead weight. The line was attached to the projectile which was loaded into the barrel. The tape around the projectile makes the fit just tight enough that it won't just fall down the barrel. So a length of broom handle is used to push it down in place against the ball valve.

One challenge was going to be how to aim the launcher while twisting the ball valve open. The valve is fairly hard to turn. So I attached the launcher to my trailer with bungy cords and aimed it. Then when it came to launching I only had to deal with the ball valve. It makes sense that opening the valve reasonably quickly is important but I have no measured data.

Having no base point I charged the reservoir to 20 PSI and gave the valve a twist. Hurrumph as the projectile left the barrel but it fell about ten feet short of the desired branch but was right on line. At this point, as with each launch, adjustment could be made by increasing/decreasing pressure, adding/removing weight from the projectile, lengthening/shortening the barrel, etc. But the easiest is pressure. So after retrieving the projectile and line I upped the pressure to 25 PSI and launched again. This time the projectile easily sailed over the subject branch trailing the light nylon line.

So while you could build a fancy model the simple cheap one can work. About the only thing I would change is to build a stop into the barrel so the projectile could not fall into the reservoir. If you load the projectile with the ball valve even partially closed it will prevent this. But if the valve were left opened and a string had not been attached to the projectile before it was dropped into the barrel retrieving it might not be possible.

Finally I looked up the pressure ratings for schedule 40 PVC pipe like you would get at Home Depot. I wanted to know what range of pressures might be reasonable or more importantly safe. I was a little surprised that it is rated specifically for water pressure, non-shock, and what one may call room temperature (73 degrees Fahrenheit). For the schedule 40 three inch pipe I used the rating is in excess of 200 PSI. It should be noted that it is not rated for air pressure and has a significant derating for increased temperature. At 100 degrees Fahrenheit the pressure rating is only about 60%. Since compressing air generates heat it could be an issue if you were going to high pressures.

Stan KD1LE

Heard on the Local Repeater

Recently Roger N1OJW was heard on the local two meter repeater. Roger was a club member twenty years ago and was one of the first newsletter editors. Roger currently lives in Westminster and was on the two meter repeater from there.

Stan KD1LE

November Board Meeting Notes

GM3TCW gets another year of honorary membership

Steve Schwarm coming in to talk in November

Dan wants a time slot in November to gauge interest in Tech program

Bob tasked with short article espousing the club benefit of the outgoing QSL program

LBC ongoing

Question of policy regarding use of newsletter and reflector for sale of personal and/or "for-profit" items - Skip to draft a policy for board to shred.

Respectfully,
John KK1X

October Treasurers Report

Income for October was $60 in membership renewals and $10 from PowerPole connector distribution. Expenses were $18.40 for newsletter postage and $67.20 for pizza at the October meeting leaving a net expense for October of $15.60.

Current balances:

General fund	$2,615.42
Community fund	$4,586.41

As of 8 November we have 44 members who are current with their dues and 28 renewals outstanding. Please check your renewal status on the roster circulated at the monthly meeting or ask Ralph.

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 an Special Service Club, the ARRL expects a majority of Club members to also be ARRL members.

Ralph KD1SM

NVARC Outgoing QSL Bureau Service

By W1XP

After the presentation at the September meeting and the QSL sort last month, it was suggested we include an article describing the club outgoing QSL card service. This has been covered with both articles and club presentations in the past, but it is probably time to go over it again.

This club service has been provided to club members for some time. Simply the club pays the US postage to ship the cards to the ARRL outgoing QSL service and pays the bureau charges. At the costs of postage and the fees of the bureau it is a very good deal for the members that take advantage of the service. You don't have to send many cards to get your yearly dues back. But since the club waits till there is a reasonable backlog of cards to ship, the extra delay can be substantial. So if you are anxious to receive a card you may want to either take care of sending the cards to the outgoing bureau or QSL directly to the station.

So how do you use this club provided service? Well to explain this lets first review the operation of the ARRL outgoing bureau. This is a service of the ARRL made available to members only. It receives your cards and sorts them by destination. It then ships these cards along with other cards for the same country, to the "incoming bureau" in that country. This bulk shipment provides a large saving in postage over what postage on each separate card would be. But this also produces further delay. Bureau cards are slow by the very nature of the system. The ARRL bureau does charge a bulk fee based on the weight of the total number of cards submitted. This is to help pay for the packaging and shipping of the cards to the respective countries. Currently this fee is $12 per pound. The club pays this. A pound of cards is a stack about two inches high.

To submit cards for the outgoing bureau the cards must be with in the size the ARRL bureau will accept. This is between 2.75 and 4.25 inches in height, by 4.75 and 6.25 inches in width. The preferred standard size is 3.5 by 5.5 inches. The extra large cards really do make packing up the cards for shipment a bother. So please keep this in mind when you purchase your cards.

Next the cards need to be sorted in alphanumerical order by the prefix of the destination of the card. By destination realize that some stations have managers in other countries. The cards should be sorted by the call of the manager to help the sorter at the ARRL bureau. Now this means start with AA and sort them by prefix to ZZ. Then continue with 1A and on to 9Z. Sort cards into the parent groups. For example M cards should be included in the G group, and R cards should be sorted into the U group. There are two other suggestions for sorting. VE cards should be sorted VE1, VE2, etc. and like wise with VK1, VK2 etc.

Do not submit cards for countries that do not have an incoming bureau. Not all countries have an incoming bureau. Cards will not be delivered to these countries. There is a list of countries that do not have incoming bureaus on the ARRL Outgoing Bureau WEB site. Be sure to check this list for countries that may be in question. Also be aware that some incoming bureaus only handle cards for members of their national radio society. If the station says "QSL direct only" he probably is not a member and the cards may just be discarded or returned via the incoming bureau.

To take advantage of the service you need to provide proof of ARRL membership. There are several ways to do this. One easy way is to just photo copy the latest address label off QST. If you can't easily photocopy the QST label than just copy the information off the QST label onto a piece of paper. A photocopy of your ARRL membership card is also sufficient. Please help me out here and provide this information with every submission of cards. I don't know what they do with cards that don't contain this info. One could believe that it is available to the bureau, but they specify it so I try and comply. Some times I have several packets of cards from a station in one shipment, but they are not necessarily packed together. And I do not resort large packs of cards. I will sometimes sort small packs of cards into larger packs to reduce the sorting at the other end. But generally the packs are just put into a box and shipped along with a check for the fee to Newington.

People always ask, "when do I ship cards?" Generally I ship when "the box" gets full. I save a box about the size of a shoe box and start filling it with cards submitted. When it gets near full I will pack it up and ship it out. Some times it can be six months or more. This is especially true over the summer when the rate of cards seems to be slower due to no club meeting during the summer. You can give me cards at a meeting, or at breakfast. Or make arrangement to drop off cards if you like.

But take advantage of this club service. It's part of the club policy to encourage activity. 73 Bob W1XP

NVARC Haystack Field Trip

In October NVARC members made a trip to MIT Haystack for a tour. First there was a presentation on the various facilities at Haystack. This included a detailed photo essay on the recently completed dome and antenna removal and replacement. A tour of the large domed antenna followed.

Attending the tour were Skip K1NKR, Stan KD1LE, Larry W1ESR, John KK1X, Jim N8VIM, Greg KB1WAQ and son Tom, George KB1HFT, Peter N1ZRG, Dan KW2T, Ben KB3RWM, Tom KB1ZNI.

The highlight of the presentation was a question from a woman in the audience. "Why is everything described in the Metric System?"

The technical highlight of the evening was watching the 37 meter telescope antenna, which weighs 500,000 pounds, slewing. It can slew at up to five degrees per second.

No pictures were allowed inside the radome but they would not have adequately captured its size.

NVARC

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Amateur Radio Club

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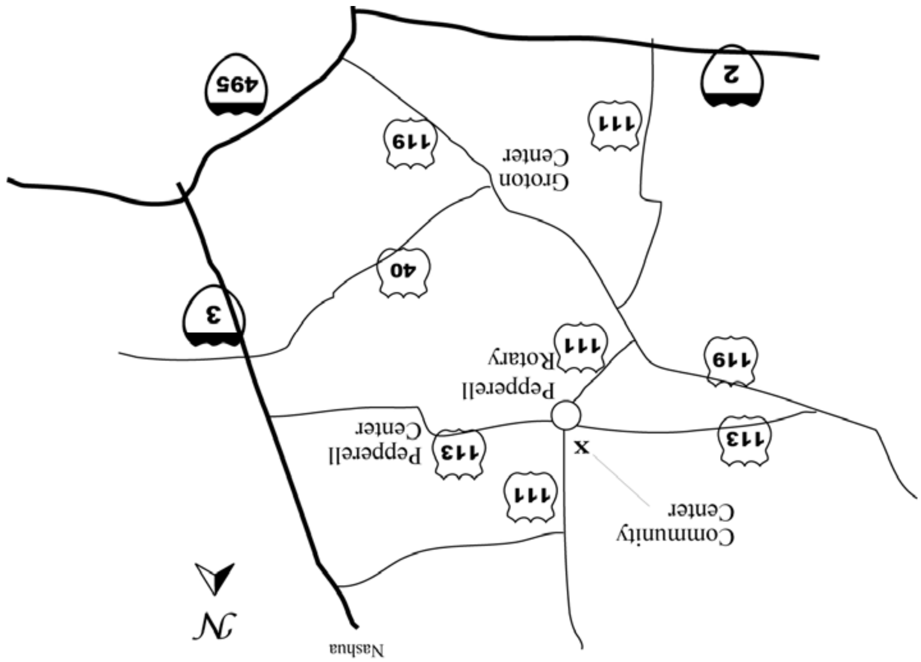
N1NC Trustee: Bruce Blain K1BG
Annual membership dues are $15; $20 for a family
Meetings are held on the 3rd Thursday of the month
7:30 p.m. - Pepperell Community Ctr.
Talk-in 146.490 simplex
442.900 + 100Hz Repeater battery power
147.345 + 100 Hz Repeater
53.890 – 100Hz Repeater battery power
This newsletter is published monthly. Submissions, corrections and inquiries should be directed to the newsletter editor. Articles and graphics in most IBM-PC formats are OK.



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