BARS Billerica Amateur Radio Society

NEWS FOR AND BY BARS MEMBERS

MARCH, 2020

From the President's Desk

from the President of BARS, Andy Wallace, KA1GTT

The password is….BOATANCHORS.

Do you remember the old Password game show? Contestants would be given a word and they had to give clues – remembering not to reveal the word in their excitement – to their partner so they could guess it. Have your ears ever perked up when you heard a ham radio term in an unusual environment? If you are like me, you'll immediately focus on whoever was speaking and see if they reveal they are a ham.

I was carrying my lunch tray to a table one day when I heard someone say, "yeah, and he has boatanchors in every room!" I stopped and said hey, I like boatanchors, don't put them down! Of course I quickly explained I was a ham, and to my surprise, the man talking, AND his brother there, were hams too. Thus began a surprise friendship for us. Not only was I welcomed into their circle of friends, but as a direct result I got on a band I had never operated before (6 meters), a mode I hadn't used much (amplitude modulation), tried a great diner I never heard of before (Stubby's, right near Deerfield NH and Near-Fest https://www.yelp.com/biz/stubbys-diner-candia), and shared so many laughs and stories because of this one word that caught my attention.

So many times I have heard concern when a person active in a net or roundtable is missing, and rejoicing when they come back on days or weeks later and explain their absence. Hamming is an interesting hobby in that we are "doing the same things from separate places."

When I was young there was a nice PBS TV series by James Burke called CONNECTIONS. I watched it and later read the book. Some critics dismiss some of Burke's match-ups about what caused what but like "six degrees of separation" our ham radio hobby makes connections from person to person and group to group. By being on the air and socializing YOU are making an impact on someone else's life. Make it a positive one. Make friends on the air, praise instead of criticize, and assist where you have the skill someone else lacks. Make those connections.

Say the password!

Andy, KA1GTT
President, BARS

Next BARS meeting:
Wednesday March 4th at 7:00 PM
"Bruce Blain as ARRL EMA Affiliated Club Coordinator"

Please welcome back Bruce Blain, K1BG, who is the newly appointed Eastern Massachusetts Affiliated Club Coordinator for the ARRL.

Bruce has been a popular speaker at BARS and other events and is well known for his ability to deep-dive into cause and effect – witness his recent work on the history of Incentive Licensing. As Club Coordinator, it will be very interesting to hear what Bruce plans to do to strengthen the clubs that exist in EMA. We are blessed to have **35 clubs** to choose from here! As you can expect, they all bring unique politics, technical focus, membership

interests, meeting facilities, etc. Bruce has his work cut out for him in herding these cats.

This will be an interesting presentation and I am sure you will have questions for Bruce about the club world surrounding BARS. See you there!

A Message From the Editor

from Marla Wallace, WA1GSF

For most of us, ham radio is one of several hobbies we pursue. For example, I list photography, astronomy, mineral collecting, crystal growing, writing software, constructing electronics, playing guitar, reading, cooking and exploring Hawaii as among my hobbies.

A few of those hobbies intersect with ham radio – years ago, I occasionally used an HT while hiking in Hawaii; some of the electronics I built were pieces of ham gear; and I wrote some software once that let me track OSCAR 8.

What hobbies do you have that you combined with ham radio? Would you like to share your experience in an article for a future issue of the BARS newsletter? I'm sure somebody out there has a unique juxtaposition of ham radio and another hobby. We'd like to hear from you, if so.

Feature Article: With a Little Help for My Friends

By Andy Wallace, KA1GTT

One of the great things about being in BARS is there are many people who have the same (or similar) gear that you do and when something goes wrong, they can help fix it. Tom Walsh, K1TW, approached me wondering if I could help fix his MFJ-945E 1.8-60 MHz mobile antenna tuner. Most of the time, Tom uses this with his QRP (low power, <10W) rig. MFJ rates this tuner at 300W and at $159 it is not a throwaway item when something is amiss. For Tom, he was having trouble using it when the Antenna tuning control was advanced to the 7 range on the dial. This control goes to a variable capacitor inside the box. There are two of them, one for the TRANSMITTER and one for the ANTENNA controls.

Figure 1: Front Panel View of the MFJ Tuner

Our transceivers generally specify a 50 ohm load at the antenna jack. Basic antenna theory gives us many antenna designs which present a perfect 50 ohm load but not many of them will do so on the multiple HF bands we'd enjoy using! An antenna tuner is a way to transform variable loads to the 50 ohm one that the transceiver wants. They can't magically turn a 40m dipole into an 80m one, but they can allow us to make compromises and get on the air. And that's the whole point of hamming, isn't it?

Tom's tuner schematic shows that it is a T network, because it uses two variable capacitors with an inductor in between. The circuit looks like a T. Other tuner circuits might be pi networks because they are configured like the Greek letter **π**.

The MFJ tuner uses identical 208pF variable capacitors. Variable caps have been around since the dawn of radio and are one of the most mechanical of the electronic components. Two metal plates, facing each other, can make a capacitor. Stacking these plates in a large sandwich and connecting them in a certain way builds up the value of capacitance possible. Think of how we shuffle a deck of cards. A variable cap takes these stacks of plates and allows us to vary the value by turning a shaft which meshes and unmeshes the plates. Meshed, they are at the maximum capacitance value. You can see how they got the nickname "bread slicer"! The plates which stay in position are called the stator, and the ones which spin and mesh with the shaft rotation are called the rotor.

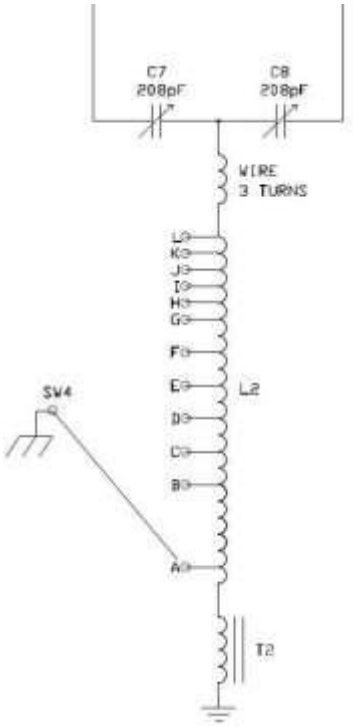


Figure 2: Partial Schematic of the Tuner

Tom went to the trouble of calling MFJ customer service about buying a replacement cap since the tuner was old and long out of warranty. I told him to bring the tuner over because what was

happening could be a simple mechanical fault that could be fixed on the bench.

Generally, you get what you pay for in life. But I have to give it to them, especially after acquiring so many companies, they produce a huge catalog of items for all aspects of ham radio. We as hobbyists should be very happy about that. But in producing such variety there are bound to be levels of care and quality that can be inconsistent. Such is the case with Tom's tuner.

Variable caps can be fragile things. The plates are thin and mishandling can damage them and their performance. From my experience, almost any variable cap can have issues in how the plates mesh. To perform properly, they must be evenly spaced, and this spacing must not change as it is adjusted. Tom's tuner had an issue at the 7 position so I immediately suspected plates were close or touching at that point of rotation. We opened the sheet-metal case for the tuner and I observed that the caps MFJ used did not have a sturdy frame built into the stator. They were the kind where the nut holding the shaft in the front panel is the only securing point. This can be fine, as a cost cutting measure. I inspected the cap and could see that the spacing was uneven, and worse yet, turning the cap toward 7 produced the unmistakeable "Duncan McLeod drawing his sword" zzzzing of metal on metal as stator and rotor blades touched. Most of the interference seemed to be at the rear end of the cap away from the front panel. This would cause a dead short while Tom was trying to adjust the tuner. I bent the few rearward blades back into position and by-eye and by-ear confirmed there was no more interference and the spacing looked even. Buttoned the tuner up and Tom was a happy camper!

…until he went to use it again, at home, and found the same issue around the same place on the dial! Shame on me for not retesting it in the assembled position using my rig. I asked Tom to bring it back again and this time I kept it awhile so I could fix it right.

Those of you who have seen live Tesla coils in action are amazed by the distances sparks can jump when thousands of volts are in play. I was curious about the MFJ capacitor plates – were they spaced far enough apart to use at 300W or even 100W? Old ARRL handbooks talked about this. (I'm still looking for a good reference.) I forgot to measure the distance between plates before giving the tuner back to Tom but visually I think they might have been spaced about the thickness of four sheets of paper, or .015". Web searching reveals formulas that make me conclude that the breakdown voltage in air is 3000V/mm so .015" would break down at 1100V or so. However I also read that at high frequencies, the breakdown voltage drops because of the rapid switching of polarities. (What physicist among BARS can find me a formula for THAT?) Using Ohm's Law, the A/C voltage being produced by Tom's 100W transceiver is equal to SQRT(100W*50 Ohms) or 70.7V RMS. The peak voltage would be 1.414 times that or 100V. Gee, that makes it easy to remember, eh? Wattage number equals peak AC volts! So no way could 100W arc between plates at .015".

However, that is with a perfect SWR. It turns out that higher voltages exist inside the tuner with high SWR. It took much digging but I found a couple of formulas for that which are:

$$E_{max} = \sqrt{P_f * Z_o * SWR}$$

$$E_{peak} = E_{max} * 1.414$$

So calculating the peak voltage at, say, 10:1 SWR inside the tuner: 1.414 x SQRT(100W forward power * 50 Ohms impedance * 10:1 SWR) = 310V. OK, still too low to arc, so it is more likely that the plates were rubbing again. Add to this Tom was using it more at 5W than 100W. Simply putting the sheet-metal clamshell back together may have caused a change in plate alignment because the metal can flex. Back to the bench and I opened up the tuner yet again.

This time I took my suspicions to the connecting wires on the cap. They lead from the rotor and stator terminals to the printed circuit board mounted to the bottom of the case. I saw they had used thick, stiff wire – like 20 gauge solid – to connect the cap.

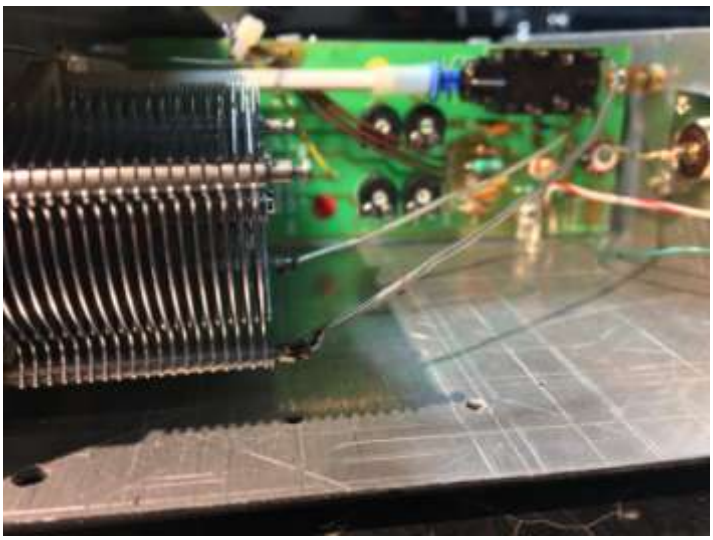


Figure 3: Connections to One of the Variable Capacitors

I could tell right away that the wire was pulling on the capacitor and putting the cover on the case was probably making it worse. My heavy soldering iron had no trouble melting the connection here, and reflowing the joint relieved the stress on the capacitor. Immediately I could see the plates were meshing evenly at all degrees of rotation. Yay!

And on closing up the tuner I put it inline at my own station and used it on several bands. It now worked perfectly! On returning it to Tom it continues to work, and hopefully will

continue to. I was very happy to avoid having Tom waste money on a replacement cap, too.

My guess as to the cause was that MFJ probably soldered the thick wire to the PCB first, then used pliers to form the other end around the capacitor, stressing the assembly. Soldering the cap lead then made the stress permanent.

An engineer once told me that every electrical problem is technically a mechanical problem. When you think about that, it really is true!

Andy
KA1GTT

Feature Article: To Crimp or Not to Crimp?

By Tom Kashuba, KT1TK

Having had to terminate coax with connectors over the past few years, I researched the topic and sought the advice of veteran operators. This is a synopsis of my findings and experience.

Summary:
I found that crimping bests soldering for my coax connector needs. Crimped connections (when properly executed) are stronger and can last longer. They also avoid the pitfalls of overheating the jacket, sheaths and conductors which can melt or short them. Soldering can also embrittle the conductors which fosters breakage or loss in conductivity when the cable is flexed or subject to the large temperature swings of the colder climes.

Details:
I am a recent convert to crimping. With years of light to moderate soldering (not without issues), I approached the subject with some fear and trepidation over the vagaries of cable diameters; types and composition of jackets and sheaths; and the added tools needed. I think it was my realization that the outer conductor braid of newer low loss cables is very sparse and thin, making soldering problematic. So, I bit the bullet and got a crimping kit.

The thickness and density of the outer braid of newer, low loss cables left a lot to be desired. It can be very sparse - unlike older, thicker RG8 cables with braiding that is more dense and solid. Attempts to solder the newer braids can be problematic in that if you gather the sparse braid to solder, you can end up with only a few bristles so there is less solder to adhere to and the strength of the solder lead can be weaker and more fragile.

With the above in mind, I decided to launch my crimping career! I picked one of the several popular kits available. I chose QuickSilver Radio's "Ultimate Crimp Kit" which runs about $129. Similar kits of varying complexity and cost are available from the outlets. I liked the value, quality range of tools in the QSR kit. See QSR link at bottom.

Most crimp kits consist of two tool types: Strippers and crimpers.

Strippers:
These consist of two basic types:

1. A plier-like handle with bladed die at its end (orange cross in photo). You pass the cable through it, then close the jaws and rotate to remove the outer cable layers. The QuickSilver kit includes two of these to handle a wider range of cables. However, the multiple settings of the die can be a bit confusing.

2. A cylindrical body with fixed depth openings. You insert a cable to the fixed depth then rotate the unit to cut and strip the cable. DX Engineering and others sell this type. Its advantage is its simplicity but each unit handles only a few sizes so it more costly as you need several units to cover a full range of cables.

Crimpers:
Most crimpers are of the same style since crimping has been around a long time and the same tool has been refined over the years. They are basically pliers with a jaw that holds a "die" that has multiple cable slots and is usually interchangeable to fit a wide range of cable diameters and connector types. The two halves of the die form a hexagon which allows for better material compression via multiple indention points that maximize contact on each of their 6 flat sides.

I chose QuickSilver's "Ultimate" kit because its crimper came with 2 dies, each with multiple openings. Together they cover all major coax cable sizes as well as Anderson Power Poles.

After some study, experimentation and practice, I found that crimping is as good or better than soldering for the reasons stated herein. Although soldering has that innate hot flowing metal "must be working" feeling, crimping, when properly executed, almost guarantees a solid connection.

Re outdoor use:
I don't subscribe much to the argument that soldering is better for outdoor use. Logic tells me a solder joint can embrittle the connections at low temperatures as much as anything else. To be fair, crimps may also be subject to expansion in very warm temperatures. However, a good crimp greatly compresses the material under it which will also expand somewhat thereby reducing possible separation. I have a few crimped connections outdoors that have lived through 3 years off New England winters, rainstorms, and hot spells. To date, I haven't had any discontinuities or signal degradation as witnessed by no discernible change is SWR. Let us not forget that any properly made connection, be it crimped or soldered, should be completely wrapping and sealed to keep the elements at bay.

Some Crimping Pros:

1. Solderless:
   Well, not quite. Most crimp methods require soldering the center pin which is very easy and not easily prone to failure. It is the avoidance of soldering the problematic and inconsistent outer shield braid of thinner low loss cables that gives crimping an advantage. Not to mention, soldering requires expertise and technique to properly solder the soft braided outer conductor.

2. Contact:
   A good crimp makes a hard and broad contact between the mated pieces that is stronger than a soldered mating because it compresses a large section of the materials. Soldering can make a good connection but only with smaller pieces of the braiding material which can be difficult to gather. The issue is greatest for the thin and sparse braiding of low loss cables.

3. Temperature:
   Crimping does not involve any heating of the sensitive outer braid, so it avoids issues related to melting and embrittling of the materials.

Some Crimping Cons:

1. You need very specific tool sizes to properly crimp a given cable and connector.

2. Requires a little practice, skill and patience to execute a good strip and crimp.

3. As with soldering, it is paramount that you properly dress the cable to carefully and completely expose and dress the outer conductor to maximize the crimped connection's surface area.

4. Not 100% solderless. Common crimping methods only crimp the outer conductor and use soldering for the center pin. I find this is a great trade-off since soldering the center conductor is very easy and effective. It is only the soldering of the outer jacket that is difficult and problematic.

Hope that helps
Tom Kashuba / KT1TK

References:
QuickSilver Radio Crimp Kit:
https://www.qsradio.com/index.html#!/Ultimate-Crimp-Kit%E2%84%A2/p/50841103

DX Engineering Crimp Kits:
https://www.dxengineering.com/search/part-type/coax-and-wire-connector-crimping-tools

Strays

Public Service Event – Help Needed
A request for communications support has been made by the ToughRuck group for their event in Concord, Massachusetts on Sunday, April 19. This route will start in Concord and go into Lexington by way of the Minuteman National Park Trail, also known as the Battle Road Trail. The 1,000 participants will be carrying full military packs and will complete multiple loops to do a total of 26 miles. Public safety radio systems are unable to cover the full route.

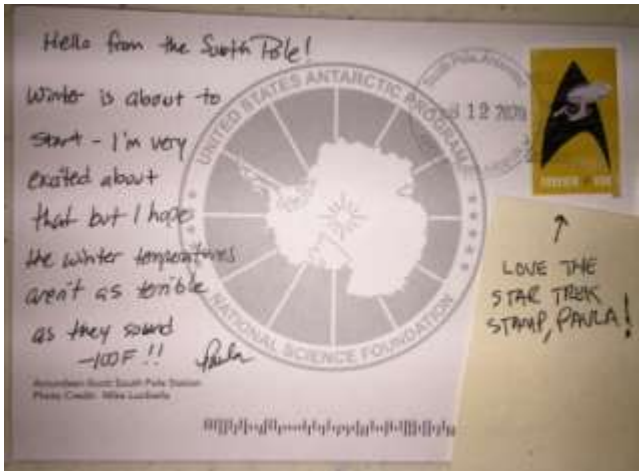
We are looking for operators to be at water and aid stations along the course. The event starts at 7:20AM and runs for nine hours. Two meter repeaters will be used. *Yes, this is the day before the marathon.* Final details are in preparation.

Additional information about this event and a route map can be found at
https://www.toughruck.org

If you are able to assist, please send a message to kc1us@dslextreme.com

Thank You,
Bruce KC1US

I am excited to report BARS got a postcard from Antarctica today. Our past Secretary, Paula Crock, KC1EDA, is at the South Pole performing physics research. As I look at the exposed grass outside due to our abnormal February temperatures, it makes me imagine how she is dealing with the weather down there. Take care, Paula, and we hope you can operate HF from the station someday! -- Andy, KA1GTT



You-Do-It Arduino Day 2020, Needham, March 21

by Phil Temples, K9HI - from the ema.arrl.org website:

https://ema.arrl.org/2020/02/21/you-do-it-arduino-day-2020-needham-march-21/

You-Do-It Electronics is sponsoring Arduino Day 2020 on March 21, 2020 from 11 AM-4 PM at its store at 40 Franklin Street, off Route 128 Exit 19B, in Needham.

"Join us in celebrating Arduino Day a world wide birthday celebration of all things arduino. Here at "You-do-it" Electronics Center we want to bring people together to share their experiences and learn more about the open-source platform. Various exhibitors will share their knowledge and resources of Arduino - what it is and what you can do. We will also have product related specials, raffles and more! If you were ever wondering what this open-platform micro controller is or network with like minded individuals, you don't want to miss this event

"If you have an Arduino project you would like to showcase or are a STEAM related organization interested in being an exhibitor at our event email events@youdoitelectronics.com to reserve a table."

Down Under Special Event Will Use Former Radio Australia Antennas – from Eastern Massachusetts ARRL

Over the March 14 – 15 weekend, members of the Shepparton and District Amateur Radio Club (**SADARC**) in Australia will be on the air as VI3RA (Radio Australia. VI3RA will operate on 40, 30, 20, 17, and 15 meters.

Read the full story at:
https://ema.arrl.org/2020/02/19/down-under-special-event-will-use-former-radio-australia-antennas/

(Australia is on the other side of the International Date Line, so their operation will be March 13-14 for us, starting at 0900 EDT / 1300 UTC. – ed.)

BARS March Suggestions - Get-on-the-air Events

BARS is a "get-on-the-air" (GOTA) club. We encourage members to participate in the varied events on HF and VHF. Here are some popular suggestions for this month:

Date	Event
March 1-2	North Carolina QSO Party
March 7-8	**ARRL Inter. DX Contest, SSB ****
March 14-15	Oklahoma QSO Party
March 14-15	Idaho QSO Party
March 15-16	Wisconsin QSO Party
March 21-22	Virginia QSO party
March 28-29	**CQ WW WPX, SSB Contest ****

**** Top Recommendations for this month**

Details on each contest above and more events can be found every week on the WA7BNM contest calendar at : https://www.contestcalendar.com/weeklycont.php?mode=custom&week=current

Secretary's Reports

from Scott Ginsburg, K1OA, Secretary

BARS General Meeting, 02/04/2020

The general meeting was a presentation by newly-elected ARRL First Vice President, our own Mike Raisbeck, K1TWF. He spoke about goings on at League Headquarters to a packed house.

Mike, K1TWF, Presenting at our February meeting

BARS Board of Directors Meeting, 02/26/2020

Attendees were: Andy KA1GTT, Scott K1OA, Kayla W2IRY, Tom K1TW. No Club decisions needed official vote or recording.

BARS Membership

Our current membership is 102 with the addition of nine new members from the March 13 VE session.

2020 BARS Member Dues

The BARS Board has changed the policy on member dues. A $15 annual BARS membership now runs from January 1 and expires on December 31st. Any renewal or new membership made after September 1 will be valid until December 31 of the next year. Memberships allow us to

- Pay our bills;
- maintain our great web page;
- fund field day;
- and bring the membership a great variety of informative meetings and speakers.

Treasurer's Report

from Bruce Anderson, W1LUS, Treasurer

Reminder 2020 Dues were due starting January first.
So far 43 members have renewed for 2020.

Through mid March we had seven members renew their membership for $105 income. Expenses were $153.16 for the one year renewal of the club web hosting and Domain names renewal. We now have $373.65 in the Bank, $389.50 in our PayPal account for a total of $763.15

BARS Needs You!!!

We are looking for a few good hams to act as net control on the regularly scheduled Wednesday night nets! All it takes is one night a month; if you are interested contact Chris, KC1IUK. Also, the club needs volunteers for light tasks of ~ 1 hour a month. Are you able to pitch in? Contact Andy, KA1GTT

Wednesday Night Net

Join us on the Billerica Repeater for the weekly BARS net (except on 1st Wednesday of Month which is club meeting night)

Repeater info:
147.12 MHz
+600 kHz (normal) offset
Encode CTCSS 103.5 Hz

Club Meetings

First Wednesday of the month at 7:00PM at Chelmsford Bible Church, 128 Gorham St., Chelmsford MA
Park in back and enter by rear door
Chelmsford Bible Church Hall, 128 Gorham St, Rear Door, Chelmsford MA 01824-3220 (map)

VE Sessions

VE sessions are held every month on the 2nd Thursday at 7:00 PM at Chelmsford Bible Church, 128 Gorham St., Chelmsford MA. Park in back and enter by rear door. Chelmsford Bible Church Hall, 128 Gorham St, Rear Door, Chelmsford MA 01824-3220 (map)

At the 2/13/2020 BARS VE exam session 10 people showed up for testing. When the dust settled, there were 5 new Techs, 3 Generals and one Extra. Be sure to say hello if you hear one of them on the air.

The VE's at the session were Team Leader Gary Frascarelli, W1GFF, Antonio Ramos, KB1KDS, Peter Norden, N1ALO, and Frank Byron, K1YK. The next VE session will be on 3/12/2020.

Gary F. W1GFF

Club Breakfast every Saturday

On Saturday mornings around 8:15AM, we also meet weekly for a casual, social breakfast at Stelio's restaurant.
Stelio's Family Restaurant, Billerica, MA (map)

Future Meetings

4/1 Ken Caruso, WO1N, on BARS 2020 Field Day plans, prep, team
5/5 David Kruh, WB2HTO, on repairing vintage tube radios

Subscribe to the BARS Mailing List

To subscribe to the BARS email list, send a blank email to bars-subscribe@w1hh.org
and watch for an automated reply. Note that bars-subscribe is all one word.

Reply to that message from the list server and you are then subscribed.

To post to the list, address your email to bars@w1hh.org

BARS Leadership Team

President:	Andy Wallace, KA1GTT
Vice President:	Kayla Creamer, W2IRY
Treasurer:	Bruce Anderson, W1LUS
Secretary:	Scott Ginsburg, K1OA
Net Coordinator:	Chris Lobdell, KC1IUK
Newsletter Editor:	Marla Wallace, WA1GSF
BoD:	Mike Raisbeck, K1TWF
BoD:	Henry Christle, WA1VAB
Ex Officio:	Tom Walsh, K1TW