



The SPARC

Amateur Radio - Communicating Worldwide for A Century

**Newsletter of the Boston Amateur Radio Club
Serving Hams in the Greater Boston Area**

November 2022 - VOLUME 34, NUMBER 11

www.barc.org - w1bos@arrl.net



Message from the Editor – Doc Kinne, KE1ML / M7RCK

Welcome to the beginning of the cold, folks. Or is it?

As I write this the temperature is 4°C. Yesterday it was 21°C. I guess that's the part of New England weather where they tell you, "if you don't like it, wait five minutes; it'll change!"

This month we have a couple of things that will need your attention, perhaps a bit closer than usual. First of all, take a close look at the BARC General Meeting notice below. The URL link to the Zoom room has changed. If you go to the old link you'll be waiting for a meeting that will never take place.

Second, and most wonderfully, take a careful read of Alan's article "Repairing and Testing a Digital Radio." I may be no judge, but this is one of the best and clearest technical articles I can remember reading in over a year. It was a joy to edit, and I am thrilled it is in *our* newsletter. Thank you so much, Alan!

Happy Thanksgiving, everyone, and remember to break out the sweaters, and/or huddle close to the transmitting radios!



BARC General Meeting – Thursday, November 17, 7:30PM

BARC will be holding a General Meeting on Thursday, November 17, at 7:30 p.m. on the Zoom teleconferencing platform. Rob Steenburgh, AD0IU will be our guest. Rob worked for the NOAA Space Weather Prediction Center and will be discussing Space Weather and how it affects Amateur Radio.

To join the Zoom meeting above go to:

<https://us06web.zoom.us/j/87019436001?pwd=SzhxNUxDMWRmeGJUyTRlZml4UkE2QT09>

Meeting ID: **870 1943 6001** Password: BARC

Repeaters: 145.230 (-) CTCSS 88.5 in/100.0 out

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC

In this Issue of The SPARC

- Repairing and Testing a Digital Radio
- An Update on Artisan's Asylum
- Thom Grosvenor, NV1U, SK

BARC's Online Discussion Group – Joe Harris, N1QD



BARC has an online forum at Groups.io. The group serves as a sounding board for members to post their suggestions and comments, and is intended to foster discussion. The group can also be used to share photographs from club events! Come visit us at: <https://groups.io/g/BostonARC>. You can join, if you're not already there, by sending an email to "BostonARC+subscribe@groups.io."



Repairing and Testing a Digital Radio – Alan Killian, KC1QHV

I'm a member of the "Unofficial QRPGuys Users Group" on Facebook and recently a member posted about having issues receiving FT8 using his QRPGuys Digital XCVR-III and WSJT-X on a Windows 10 PC.

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC

We had several members talk through the WSJT-X settings and nothing seemed to work so he asked if he could send the radio to me and have me take a look at it. Since I have an identical working radio I accepted and a few days later his radio showed up.

I hooked up *my* radio and verified I was receiving properly on 20 meters with both FT-8 and WSPR. This verified my antenna, power supply, audio cable, PC settings and WSJT-X settings were all correct as well as verifying that propagation was suitable *and* there were transmitters out there.

I then hooked the broken radio up to my antenna, power supply and PC and verified that it did not receive any transmissions. The waterfall looked pretty uniform with some noise but nothing resembling FT-8 or WSPR signals. Since FT-8 signals were much more common and stronger at this time I focused on that mode. It's also helpful that the radio powers-up and sets the FT-8 dial frequency automatically. That made one less thing for me to forget to set when testing. It's important to try and keep as much of the setup unchanging when testing and if I had chosen to use the WSPR frequency I would have had to set it each time, and I'm sure I would have forgotten to set it as often as I remembered to set it. I try to make things as easy for myself as possible.

Since this is a radio kit that's assembled by the owner, I first inspected the solder joints and found several that looked not so good. To eliminate the possibility of one of these not being secure, I re-soldered them and got them all nice and secure. One of the SMD ICs with quite fine-pitch leads looked like it had two places where neighboring leads were shorted together with solder blobs, and since both the schematics *and* the Printed Circuit Board layouts are available from the manufacturer, I was able to verify that these shorted pads were normal and were a part of the design, so I didn't have to worry about trying to remove solder shorts on tiny SMD ICs.

This kit has the user build hand wound inductors using enamel-coated wire, and the method they suggest is to use a soldering iron set on *hot* to burn away the enamel on the ends of the wire before soldering them into the PCB. Several inductor ends didn't look fully burned-through, so *carefully*, with the wire still in the PCB, I added extra solder and heat and burned the coating off. This is not a 100% safe thing to do because you can burn the trace right off the board, but this is a pretty good board design with decent sized PCB pads, so I wasn't worried, and I didn't have any issues. It would have been pretty easy to repair a pad or trace even if I had done some damage since the board is not super packed with parts, so I was confident this was safe-enough, and it was. I used the schematics and found the source and destination pads for the inductors and use an Ohm meter set on continuity to verify the inductors were soldered properly. I could have done this before re soldering, but in my experience, you can have a partially-connected wire that will pass the Ohm meter test but is still only partially-connected, so I decided to just get good connections right away.

After that work, I hooked the radio back up and there was no difference in the waterfall and still no signals decoded.

Looking a little closer, I noticed that the 6-digit LED display on the Variable Frequency Oscillator (VFO) used for receive and transmit had one digit that did not light up. I decided to tackle that next.

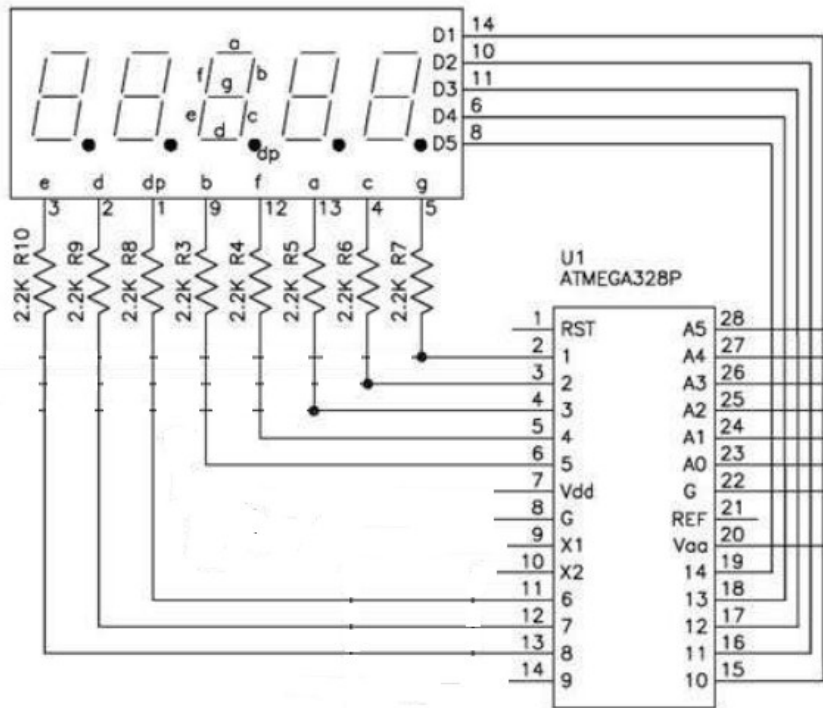
Since the schematics are available, I was able to verify that the seven-segment (plus decimal point) display was hooked up the same way I've seen other displays hooked up: 8 signals one for each segment and 6 signals one for each digit. Since all the segments were lit on at least one of the digits, it was clear all the 8 segment signals were working, and since 5 of the 6 digits were lit up, it also showed that the processor was working properly and the LED was hooked up in the proper orientation. If the problem had been with one of the segments not lighting up on all the digits, I would have checked the solder joints on the eight current-control resistors and then I would have checked the pulses coming from the processor to those resistors and then on to the LED display.

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC



I got out an oscilloscope and verified that each of the 6 digit-drive signals had a pulse on them when I probed at the processor. But one of the signals got lost somewhere between the processor and the LED since I could only detect 5 signals on the LED pins. I could see the whole trace going from the processor socket to the LED and it looked fine as did the solder on both ends. I re-soldered both ends and it didn't solve the problem. This was a bit strange. I guessed there was a crack somewhere in the trace. I scraped through the solder-resist halfway along the trace to get down to bare copper and the signal was there, so I added a jumper wire from that location on the trace up to the LED pad and when it was powered-on all LED digits lit up. So the VFO was working. Or was it? I hadn't verified it was actually producing an output signal at the right voltage and frequency, so that's probably next to test.

Here's a cool thing, this radio is built up as three modules: Receive/Transmit/Power/Connectors PCB; VFO/display PCB and Lowpass Filter PCB. I have a working set of modules so I can take one from the broken radio, plug it in to the working radio and if it still works, that module is verified functional. I plugged in my modules, verified the radio worked as a receiver, removed my VFO, plugged in the bad radio VFO and it still worked, so I checked-off the VFO as *working*.

Next I setup an SDRUno RSP1A in spectrum-analyzer mode connected to my 20 meter EFHW antenna and powered-up the VFO unplugged from the transmitter. The RSP1A is sensitive enough to see the VFO frequency even with no antenna or transmitter, so I calibrated it to 10 MHz and saved the calibration. Check and Check. Good enough, not

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

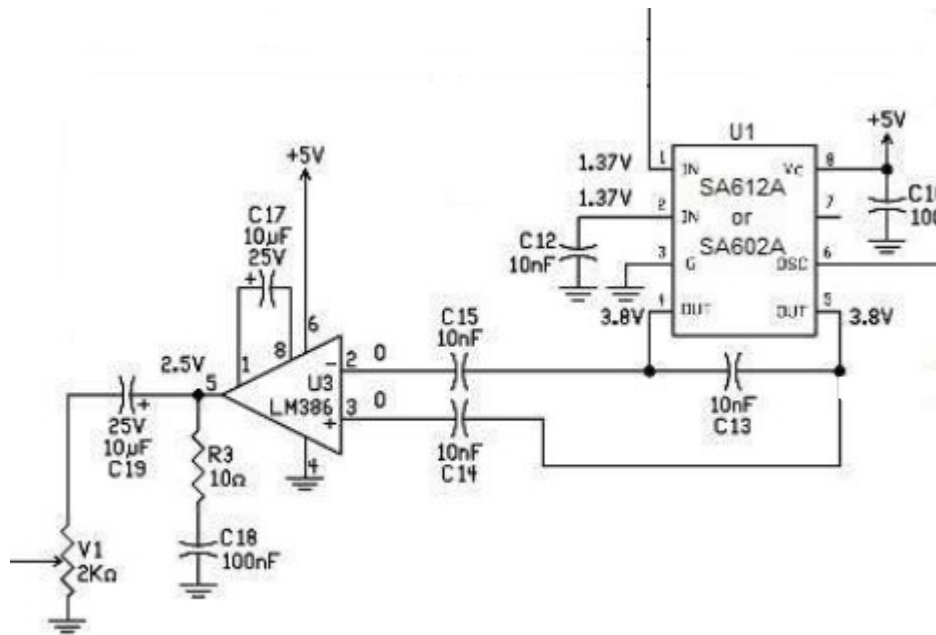
449.175 (-) DMR CC1

The SPARC

super accurate, but good enough. This VFO doesn't have the TCXO option installed so it's going to drift with temperature anyway.

I plugged all the original components back into the working and nonworking radios and did a test again. Bad radio still doesn't receive. That's not really a surprise, since all I did was fix a broken trace on an LED digit signal, which didn't affect the VFO output signal, so there's something else wrong.

I looked into the path from the antenna to the receive IC. It went through the lowpass filter module and a transmit/receive transistor switch and in to the receive IC. To make sure the LPF was not a problem, I temporarily installed my working LPF so the only non-verified parts were on the radio main PCB. The radio was still broken, so I looked at the path of the signal on the baseboard.



I was guessing that since the antenna signal went through two connectors on the LPF board, and that I had installed a working LPF board that the signal was likely getting to pin 1 "IN" on the receive IC. I suppose I could have generated a signal using the other VFO and injected it in to the antenna input, but I don't know how large a signal this should be, presumably very small and I didn't want to wreck the receive IC, so I looked elsewhere. If I had decided to do that, I think I would have just twisted two bits of insulated wire between the transmitting VFO and the receive antenna input and maybe that would have made enough signal to trace using the oscilloscope. I'll have that trick to try next time.

Now, hey, look at that, the schematic has five places I can check voltages on the receive IC, so I checked them and only the +5 Volt voltage matched.

What???

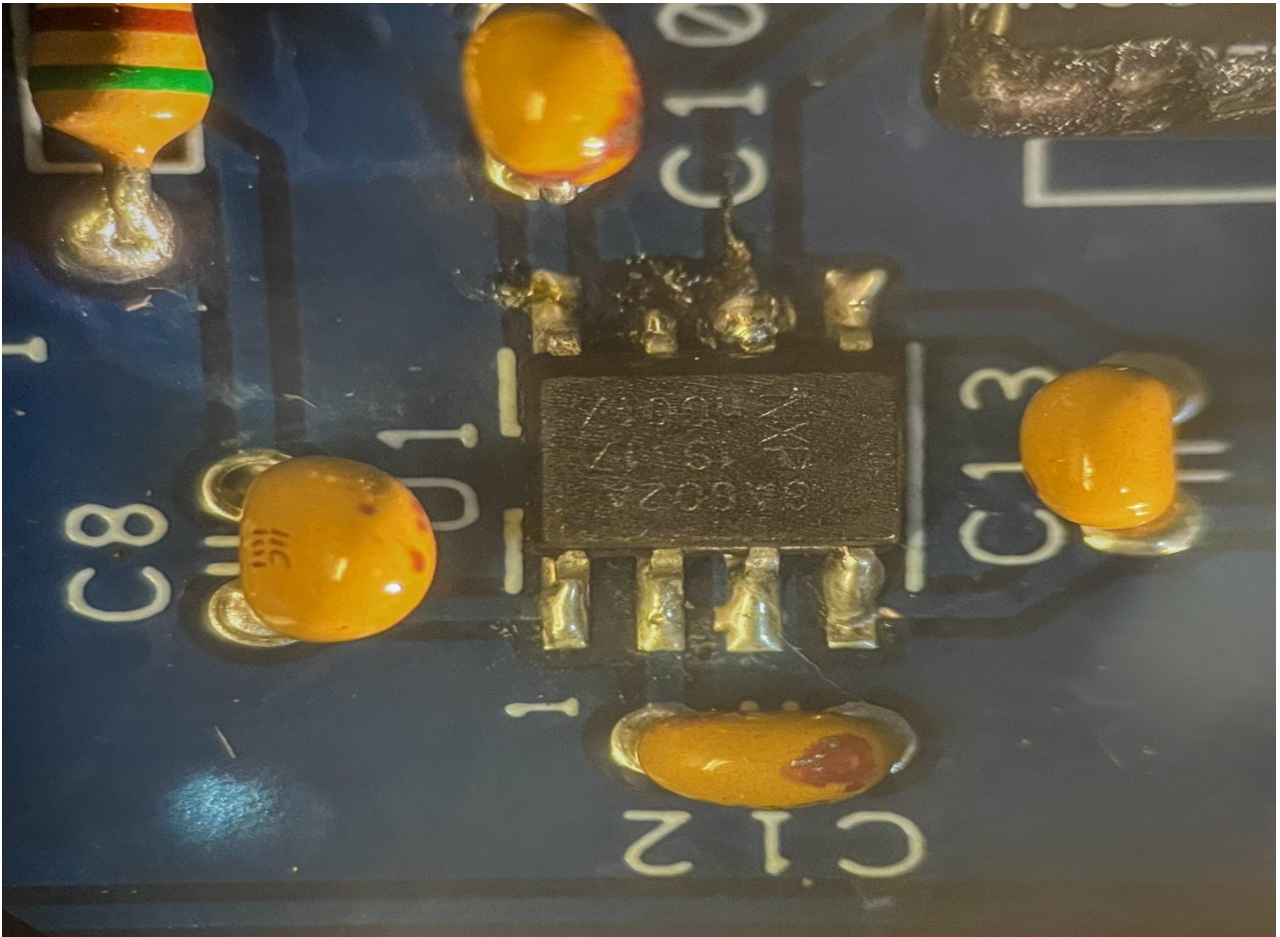
145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC

None of the other voltages were even close. So.... Bad IC? This is a terrifically small IC so I had to dig out the microscope to be able to look at it closer.



Do you see what's wrong? Yeah, that one pin doesn't seem to go to a pad. Let's check that out on the schematic. Looks like pin #3.

Well pin #3 is the Ground pin, so that would explain the lack of proper voltages. How did the pad/trace get damaged? It looks like ground is right nearby so I can probably scrape a bit of solder mask off and bridge it, but... something isn't right. I can SEE the ground pad connected to pin #7, but pin #7 is an unconnected pin. Ummm. Wait a minute, there's a "1" on the silkscreen showing where pin #1 is on the PCB layout, but pin #1 on the package is not there! The part is soldered in rotated 180-degrees off. That would certainly explain the unusual voltages. I can only hope the part wasn't damaged. So I use some tiny solder wick and I got the part off with only a small amount of damage to the PCB. I caused one trace to lift off the PCB, but it didn't break and only lifted off a little bit, so I just solder the IC back in the right orientation. Fingers crossed, I power-up the board again.

And I see signals on the waterfall!!! And WSJT-X is decoding FT-8 signals!!!

I swapped back in the original LPF board and everything was good, so that's that. All fixed.

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC

I tried the 10 meter and 30 Meter LPF boards and could see and decode FT-8 on all bands, so I decided the receiver was working.

I installed to 20 M band LPF, set the dial frequency to the 20M WSPR frequency and did a transmit or two and saw on aprsinfo.com that I had gotten out, so I boxed up the thing and contacted the owner to ship it back.

He said “GREAT! Thank you so much, what was the transmit power? Did you get 4 Watts on all the bands?” Well..... I hadn’t actually tested that, so what the heck, back out of the box it came.

I hooked a Qrp labs 50 Ohm 20 Watt dummy load up with a voltmeter connected to measure approximate power and fired it up. It’s NOT a precise power meter, but it’ll do for this application.

This unit has a “Tune” pad that if grounded, just turns on the transmitter, so it was easy to get a good signal to measure. Jumper from “Tune” to “Gnd” and bango I get a signal transmitted.

I was getting around 2 Volts on the dummy load. Cool. That’s great.

Power is peak voltage squared over 100 for this dummy load, so $2^2 / 100$ is 0.04 watts??? Huh? That’s not a lot.

It turns out that obviously, using WSPR reception as an indication of good transmit power is a dumb thing to do since this mode can pick signals out of darn near nothing, and so I was getting reception reports hundreds of miles away with a transmit power of 40 milliWatts. Nothing unusual for WSPR. It led me to believe the transmitter was working fine when it was not.

So, what’s going on NOW? I swapped in my VFO and it didn’t make a difference, so I swapped it back out.

Oh, here’s a thing, always try to keep the original set of modules together whenever possible when doing experiments. If you keep “re homing” modules back to their original location after every test, you’re less likely to have to chase an issue that’s a combination of two modules. Keep track of what’s where and only test one different module at a time.

I swapped in my 20M LPF and hey, howdy, I got 19.5 Volts on the dummy load. $19.5 * 19.5 / 100$ is 3.8 Watts which is just fine for this radio. So, something with the LPF.

I checked it out, the soldering was fine, but I noticed that the inductors had an extra turn on them, so I took them out, removed a turn and put them back in. That got my up to something like 4 or 5 Volts at the dummy load. So, something else?

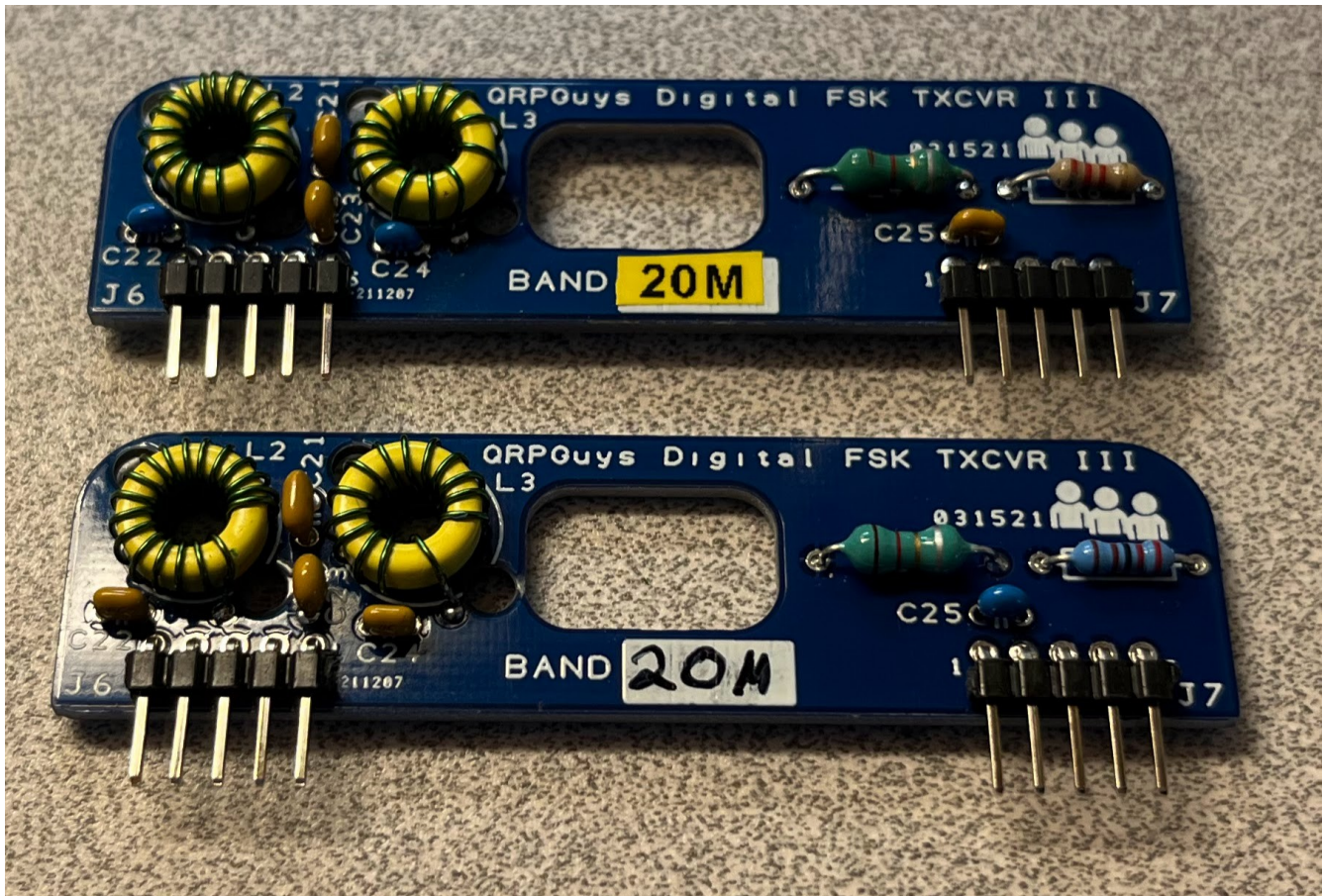
Can you see the difference between these two filters?

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC



No, don't read farther, look at the picture and what do you detect?

Yeah, some of the capacitor colors are different. It turns out the builder didn't really pay attention to the parts list and installed incorrect capacitors which changed the cutoff frequency of the filter to where it was tossing out a lot of the 14 MHz signal on the way out to the antenna.

I pulled them, replaced them and *then* I got close to 16 Volts on the dummy load.

Still strange that I don't get 19 Volts, so I counted ALL the inductors and he had an extra turn on most of them, even one on the main PCB. I removed the incorrectly-wound inductors, corrected the turns-count and soldered them back in.

Correcting all the inductors and capacitors on all the LPF boards and the main board got me close to 19 Volts at the dummy load. It varies depending on which band it's on, but that's expected, so I'm not worried about it.

I hooked it up and did a several hour WSPR session and then I hooked mine up and did a several hour WSPR session and saw similar reception reports for both. Good enough.

That was sufficient for a free repair job I think.

I packed it up and sent it on to Florida.

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC

A week later, he reported that he had nice receive functions, but couldn't get it to transmit, so we did a Zoom call and I walked him through setting up the audio-out part of WSJT-X and he had transmit working.

So, I hope to hear him on the air someday. I'll keep an ear out.

Conclusions: Check all solder joints, especially ones going to enamel-coated inductors; Check the orientation of all ICs; Check the value of all components.

I had a ton of fun debugging this little radio. I know a *lot* more about tiny digital radios now than I did before so it was an excellent learning opportunity for me.

An Update on Artisans Asylum – *Brendan Baldonado, NW1S & Antonio Viva, Executive Director, Artisans Asylum*

I wanted to send a quick update letting you know the status of our timeline for opening Holton. First I want to thank everyone who has helped us get to this point. The many volunteers, staff and members of our community that have supported our opening process thus far. As I shared with the staff this week, we are in the fourth quarter of the game, or the final scene of the performance and this push to December 3rd feels both close and yet very far.

I wish I could share news with you that we have a final date for receiving our Certificate of Occupancy. As of this afternoon, we are waiting for the Boston Fire Department to do a walk through and certify the safety plan for the entire building. This is required of Harvard before we can occupy the building. We have been in touch with the Mayor's office, ISD, GenCon, Harvard as well as our local legislators to assist us. We are working to see if we can expedite this process. In the meantime, we will continue to forge ahead with focus and hard work to get us as ready as possible by the time we welcome friends and the community on Saturday December 3rd.

Please stay tuned for emails asking for help from volunteers to help us get to the finish line. If you have specific questions please reach out to me directly. I will be happy to answer them the best I can. I know I speak for the staff and the board when I say we share in the frustration and disappointment these delays continue to create for our community. I remain hopeful that once we are fully in, the wait will be worth it. I look forward to being able to send you an email saying we are open!

Many thanks for your continued patience and support.

Tom Grosvenor, NV1U, SK – *Forwarded by Joseph Chapman, NV1W*

Tom was a member of BARC before moving to FL in 2017.

Thomas H "Tripp" Grosvenor III passed away in November of 2020 and due to COVID any memorial services were put on hold. We are finally having a Celebration of Life for Tripp on Saturday Nov 19, 2022 at 1pm. The service is being held at First Parish Congregational Church at 12 Beach Street in Saco, Maine, with a reception to follow. We know he had many friends in Massachusetts, Florida, and beyond, so the service will be live

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC

streamed on YouTube at the following link:

<https://youtu.be/dcLzKFYP_TQ>https://youtu.be/dcLzKFYP_TQ

There will be time to share stories of Tripp during the service. If you are unable to attend in person but would like to share a story, please send a video message to <mailto:freddie.connelly@firstparishsaco.org>
freddie.connelly@firstparishsaco.org with the subject line "Tripp Video Message" Please keep videos around or below 2 minutes if possible.

We ask that you please share this information with anyone you know who was friends with Tripp! Thank you and we hope to see you there. Below is his obituary if you would like to learn more about Tripp!

Obituary for Thomas H "Tripp" Grosvenor III

Born in Malden MA on Nov. 8, 1947 to Thomas H Grosvenor Jr & Carolyn (Callahan) Grosvenor. moved to Reading, MA, in 1963. He graduated Reading Memorial High School in 1967 and went on to attend Wentworth Institute. Over the years he also attended Mount Washington College and Alameda University.



He became an electronics technician, managed a Radio Shack, and owned his own electronic repair business in Wakefield, MA in the 80's. He also worked in the Boston School Dept and several other school systems as a computer technician and later he worked as a Polysomnographer at Beth Israel Deaconess Medical Center. He retired 10 years ago.

During the late 1960's and into the 2000's he was very active in community theater playing various lead roles. He is best known for his role of Tevye from "Fiddler on the Roof" whom he portrayed in several local theater companies. He was also involved in several rock bands, most recently was the local band Kalabash.

In 2017 he moved to The Villages in Florida where he really enjoyed his life. He was a member of AARL, the local Villages Ham Radio Club and he became very active in the Long Island CW Club for whom he taught 5 Morse

Code classes every week.

He is predeceased by his parents, his fiancé Christine Liebke, and his cat Turtle. He is survived by his sisters Carol Connelly and her husband Frederic Sr., Pam McPherson and her husband Charles Jr and three nephews and a niece, whom he adored, Frederic Connelly Jr, Charles and Andrew McPherson, and Eva Thurston.

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC

BARC Meeting Calendar for 2022

We are in the process of looking at and garnering physical meeting space hopefully for the Winter onwards, again, depending on developing conditions. Watch this space, and the BARC Website (<https://barc.org>) for up to the minute details.

Unless otherwise noted, all meetings will take place via Zoom.

General Meetings (* Business/General Meetings)

No Meeting in December. Details on Holiday Party to be given at the November Meeting!

VE Sessions:

None Scheduled.

BARC Net Preamble

The control operator for the BARC Net is Joe, W1JF. He rarely misses a net, but when he does any ham can take up the position and run the net. To assist you in opening and closing the net The BARC Net Preamble is printed below. Do not be afraid to step up and take the challenge.

Is there any further business for the repeater before we begin the Boston Amateur Radio Club Net? This is «YOUR CALL». Calling the Boston Amateur Radio Club Net. This is «YOUR CALL», my name is «YOUR NAME» and I am located in «YOUR TOWN». This net meets each Monday evening at 9 pm Eastern Time on the 145.230 Boston repeater, PL 88.5. This net is an informal round table discussion concerning matters of interest to the members of the Boston Amateur Radio Club and the Boston Amateur Radio community in general. When checking into the net, please say, “this is” and drop your carrier to check on doubling. Then give your call sign, name and location. All amateurs are welcome to join the net. Any check-in’s for the Boston Amateur Radio Club Net please call now.

[Compile the list of the check-ins and proceed with the net.]

Is there any further business for the net before I close? Hearing nothing, this is «YOUR CALL» closing tonight’s session of the Boston Amateur Radio Club Net. I would like to thank everyone who participated in the net and those who stood by while I ran the net. The Boston Amateur Radio Club Net will return next Monday evening at 9 pm Eastern Time. This is «YOUR CALL» returning the repeater to general amateur use. 73.

I See the Future

19-21 November	ARRL Nov. Sweepstakes - Phone
10 December	SPARC Article Deadline
2-3 December	ARRL 160m Contest
10-11 December	ARRL 10m Contest
18 December	ARRL Rookie Roundup - CW

▲ Note change from usual date and/or location

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1

The SPARC

Before going to any event over the next few months, please confirm that the event will take place and what the hours are.

As you might expect, there are many more events (public service, hamfests, flea markets, etc.) taking place—some only peripheral to ham radio. For information on these, covering much of the Northeast, the “Ham - Electronic Flea Market” and the “PSLIST” lists tell the story. Of course, if you know of an event that would be of interest to the readers, please let the Editor know.

For an up-to-date calendar of events, including web links, visit <http://www.barc.org/calendar>.

Businesses Can Advertise Here

The SPARC accepts commercial advertisements. BARC encourages monthly promotion of your products and services which would be of interest to hundreds of our members and others interested in the Amateur Radio Service.

The rates for display advertising are:

1 col × 2 in. (business card)	\$15 per issue
1 col × 2 in. (business card)	\$75 per 6 consecutive months
1 col × 2 in. (business card)	\$125 per 12 consecutive months
1 col × 4 in. (½ column)	\$30 per issue
1 col × 9.5 in. (full column)	\$60 per issue

Originals of ads must be presented to the Editor in MS Word or .jpg format to print 1:1. Other composition will be at extra cost. We will be glad to quote other ad sizes and durations. Members are urged to seek prospective advertisers who are appropriate to our readers. For additional information, contact Doc Kinne, KE1ML, at 617.297.2718 or kinnerc@gmail.com.

Two Ways to See Yourself in Print! (well, PDF) – Joe Chapman, NV1W

We are always looking for articles for the newsletter. I have reserved this space for your articles, reviews, tips, how-tos, hints, kinks, photos, schematics, or other ham related information. Photos of you operating or your shack are especially welcome. Send your submissions to the Editor, Doc, KE1ML, at kinnerc@gmail.com. Articles for the September issue must be received by September 6.

Are you a depressed BARC member because you have a treasure you must turn to cash? Cheer up, Bunky! The SPARC will run your (non-business) ad for free. Of course, a 10% donation if you sell it will be cheerfully accepted. Just send your ad to Doc Kinne, KE1ML, kinnerc@gmail.co

The SPARC

BARC Officers and Staff

President: Brendan Baldonado, NW1S
brendan.baldonado@gmail.com

Vice President: Joe Harris, N1QD
n1qd@n1qd.org

Secretary: Joe Chapman, NV1W
nv1w@arrl.net

Treasurer: Jim Clogher, N1ICN,
n1icn@arrl.net

SPARC Newsletter Editor: Doc Kinne, KE1ML / M7RCK
kinnerc@gmail.com

Volunteer Exams:
Jim Clogher, N1ICN, n1icn@arrl.net
Joe Chapman, NV1W nv1w@arrl.net

Public Service Coordinator: Ethan Hansen, KC1OIP

Public Information Officer: Geri Duff, KB1ISG
781.749.7664; geriduff52@juno.com

The Boston Amateur Radio Club is a non-commercial association of persons interested in the Amateur Radio Service. The Club is organized for the promotion of interest in Amateur Radio communication and education, for the establishment of emergency communications in the event of disasters or other emergencies, for the advancement of the radio art and the public welfare, for the representation of the radio amateur in legislative and regulatory matters, and for the maintenance of collegiality and a high standard of conduct.

The Club is open to all persons interested in Amateur Radio without regard to race, color, religion, creed, national origin, gender, disability, or sexual preference. Our General and Business meeting locations are handicap accessible. Other meeting and activity locations may be handicap accessible by arrangement.

The Club is an ARRL-affiliated club, and is a member of the New England Spectrum Management Council (NESMC). The Club is also an associate member of the Courage HandiHams system.

The SPARC is published monthly by the Boston Amateur Radio Club. The design and content are Copyright 2022, all rights reserved. Permission is hereby granted to reprint or distribute by electronic or other means any material herein, provided this publication and the issue date are credited. Such permission is limited to use for non-commercial purposes for the benefit of the Amateur Radio community. Permission for other purposes must be obtained in writing.

The SPARC

Greater Boston Net Directory

Daily 7 pm	MARI (Mass/Rhode Island CW Net) (NTS)	3.565
Daily 8 pm	Eastern Mass 2M Traffic Net (NTS)	145.230 (PL 88.5 in/100.0 out)
Daily 8 pm	Slow Speed CW Net	28.160
M,T,F,S 8:30PM	Massachusetts Rhode Island Slow Net	3598
First Mon 8:30 pm	EMA Section ARES Net	146.610 and all MMRA links
Mon 8 pm	New England DMR Net	DMR New England Talk Group (TG 3181)
Mon 9 pm	BARC Club Net	145.230 (PL 88.5 in/100.0 out)
Sun Mon Wed Fri 10 pm	Heavy Hitters Traffic Net (NTS)	MMRA-linked repeaters: 146.610, 146.670, 146.715, 146.820, and all 222 and 440 repeaters
Mon-Sat Sat, 5 pm	MA RI Phone Net (NTS)	3.978
Tue 8 pm	Sci-Tech Amateur Radio Society (STARS) Net	446.325 (PL 146.2)
Tue 8 pm	MMRA Club Net	146.610 and all MMRA links
Wed 8 pm	Wellesley Amateur Radio Society Net	147.030; 444.600 (PL 88.5)
Wed 9 pm	Waltham Wranglers Swap Net	146.640 (PL 136.5)
Thu 8 pm	Wellesley Amateur Radio Society Net	28.3MHz
Sat 9 am	Northeast SATERN Net	7.265MHz
Sun 9:30 am	Yankee SSB Net	50.275MHz
Sun 8 pm	Algonquin Amateur Radio Club Net	446.675 (PL 88.5)
Sun 8:30 pm	NSRA Net (with Newslines)	145.470 (PL 136.5)
Sun 9 pm	CAARAnet	145.130 (PL 107.2)

145.230 (-) CTCSS 88.5/100.0

Simplex: 147.420

449.175 (-) DMR CC1