



The ORC Newsletter

Official publication of the Ozaukee Radio Club, Inc. Mail all contributions to the editor, Tom Ruhlmann, W9IPR, 465 Beechwood Dr., Cedarburg WI 53012 (phone 262 377-6945). Permission to reprint articles published in any issue is granted provided the author and the Ozaukee Radio Club Newsletter are credited.



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Volume XXXI

February, 2019

Number 2

From the President

de Kevin Steers (K9VIN)



From the Prez,

Happy February. Well, I finally replaced the cheezy rg-58 cabling in my car with high quality RG-8, and, boy, what a difference it made with the noise level for my HF mobiling. I bought a stepped drill bit and a rubber grommet to get the cabling out through my spare-tire bay. When I opened up the trunk and looked in my spare-tire bay, there was already a rubber grommet/plug exactly where I needed it. Apparently the first battery (located in the trunk) that came with the car had a breather tube, and is no longer used.

Apparently, the shield on the new RG-8 is a heck of a lot better than what it replaced!

Now my nagging problem is with noise when accelerating. When I am cruising at any constant speed, all is quiet, but when I put my foot into it, a noise drowns out any receive until the car comes up to speed, and then all is quiet again. Who has a suggestion?

To make everything perfect for my manually-adjustable loading coil from Wolf River Coils, I used my antenna analyzer to adjust the taps for the lowest SWR in the middle of the bands. I could not get the SWR down below Infinity, and then realized the darned hatchback was open and screwing up the antenna big-time. Rookie mistake, I know. Imagine my surprise when I had it all tuned on 20M, 40M, and 80M, according to my analyzer, but when flying down the highway, my FT-450 would NOT tune, no matter what I did. I even went to each end of the band just to be sure it was not just a minor adjustment. NADA. Apparently, when I adjusted the taps, my car was a wee bit too close to the aluminum gutters, etc, on my house.

I am getting so darned smart after troubleshooting all the problems I make for myself. I love this hobby nonetheless.

Cheers and 73,
K9VIN
Kevin

DX'ing & Contesting

De Gary Sutcliffe (W9XT)



Did you survive the nasty weather to end January? How many of you did antenna work during it? It is a known fact that antennas put up in bad weather outperform those done in nice weather. Well, not really but a lot of hams say so.

Skipping the usual format of focusing on the current month, I'm going to focus on a contest that happens next month. That is the Wisconsin QSO Party which is Sunday, March 10. Years ago, Bob, W9LO (SK), was the one who rallied the troops for a big ORC turnout. In more recent years, few members operated and turned in scores for the club. I am as guilty as any, with a conflict that Sunday.

Last year the contest fell on a different day, and I was able to put in a part-time effort. About that time, a discussion with Gary, K9DJT, and Bill, W9MXQ, led to the decision to try to get a big effort out for the 2019 running of the WiQP. I am focusing on it here because it occurs before our March meeting, and the newsletter will probably come out only a couple of days earlier than the contest. I want to give you time to mark it off on the calendar and get ready.

State QSO parties are special because everyone is looking for you. In other contests, you are just another Wisconsin contact, nothing exciting like Wyoming or Vermont. Other stations will be seeking you out. It can be a lot of fun to have several other stations calling you.

WiQP starts at 1800 UTC on Sunday, March 10. That is 1:00 PM CDT. Yes, CDT. It seems kind of early to be talking about Daylight Saving Time, but we switch over earlier Sunday morning. Make sure you change your clocks before going to bed Saturday night. The contest runs for seven hours, ending at 8:00 PM.

There are many categories in WiQP, including single op fixed, multi-op fixed and various mobile categories. I am assuming that most of us will be fixed. Those who have mobile stations might want to hit the road and operate from a number of counties. This is a VHF friendly contest, and you can make contacts using simplex VHF. You can get additional bonus points for operating from multiple counties.

In this short contest, you want to make as many contacts and get as many multipliers as possible. Of course, that is true of any contest, but a large number of potential multipliers and the short period change strategy a bit. For Wisconsin operators, you get a multiplier for working each state county (72 maximum). US states are also multipliers, with 50 maximum. Yes, 50. Don't forget to include WI as a multiplier. Finally, there are the Canadian provinces for another possible 13. Theoretically, you can get 135 multipliers, but top scoring stations usually get a bit over 100.

The modes are phone and CW/digital. Phone contacts are worth 1 point, and CW and digital contacts are worth 2 points. You can work a station once per band on phone and once on CW or digital. You can't contact the same station on CW and digital on the same band. Because of

the point difference, it makes sense to make CW contacts, but not to the exclusion of phone contacts. I don't know how many stations will be on digital modes. FT8 is not set up to give the proper exchange. RTTY may be your best option if you feel more comfortable with digital.

The exchange is your county. A signal report is optional. Other WI stations will send their county. Other US stations will send their state and Canadian stations their province. If you get a DX station calling, just enter DX. There are specific abbreviations for the counties and other multipliers. The West Allis Club, the sponsor, has a page on their web site with the abbreviations. All states and provinces have two letter abbreviations. All WI counties are three letters. Make sure you review them in advance. You don't want to mix up similarly spelled counties like Washington and Washburn, or Waukesha and Waupaca.

On HF, most of your contacts will be on 40 and 80 meters. Skip gets long early, so be sure to try to be on earlier in the day if you can't operate the whole contest. You will want to spend some time on 20 meters to work some of the further-out states for the multipliers.

Many of our out-of-state contacts, especially on phone, will not be in the contest but will work you to help you out. Call CQ something like this: "CQ CQ for the Wisconsin QSO Party, any call will be appreciated, this is W9XT, W9XT for the Wisconsin QSO party." The call is always given phonetically.

When you work someone out of the state and probably not in the contest, thank them and make a big deal if it is a new state. "Wow! Thanks for Utah! That is a new multiplier!" You will have an audience listening, trying to decide if they will give you a call. You want to be friendly and let them hope they will be a hero by giving you a new state. Some will want to rag chew. If they give their name, give yours then politely say other stations are calling and you want to work them before the contest ends.

Some of the state counties are tough. There might not be any on from some of the rarer ones. Or, they might be briefly visited by a mobile station. You can work mobiles again when they move to another county. You can identify them because they will identify themselves as portable. For example, K9DJT might sign K9DJT/WIN from Winnebago country, and later K9DJT/FON from Fond du Lac.

It is useful to keep track of the mobiles and get them in as many counties as possible. The way the rules work, they are encouraged to hit as many counties as possible. If they make 12 QSOs in a county, they get 500 bonus points. So, it makes sense for them to spend as little time as possible there once the first dozen are in the log. Serious mobiles spend a lot of time planning their routes to maximize the number of counties they visit.

One thing works against the fixed stations. The mobile stations often start at further away rare counties and finish up close to home at the end. So, many of the rarer ones will be only activated at the start. Often they will start on 20 meters. That band will be open, and mobile antennas are much more effective there than on 40 or 80. There are plenty of stations in other parts of the country who want to work them for the contest or possibly to pick up some new counties for the award. We will miss many of them for that reason as their signals skip over our heads. Later when 20 gets long or closes they will move down and give us a shot for their remaining counties.

I mentioned that CW contacts are worth twice as much as phone. Even if you are a hotshot CW op who forgot where the microphone is, spend some of the time on SSB, especially 75 meters. There will be some guys who are the only one on from their county, and they will only operate phone. You will miss a lot of county multipliers by only operating CW. You will probably also have better luck getting some states on phone since it is hard to beg on CW.

As a general rule, I try to jump around between bands and modes whenever the rate drops. I don't stay on 20 meters more than about 20 minutes at a time because I want to check the lower bands for mobiles in new counties.

The WiQP is an opportunity for every member to get on and make some contacts. Even if you only have a 2M FM rig, set it on one of the recommended simplex frequencies. Give out a call every once in a while. Work other ORC members. Mobiles might be passing through your area and put out a call. Work them. The full rules are at [HTTP://www.warac.org/wqp/wiqp_rules.htm](http://www.warac.org/wqp/wiqp_rules.htm). The upper right hand corner of the page has links to the multiplier lists and other related info. Can we count on you to make a few QSOs to put the ORC on the WiQP map again?

The big contest for February is the ARRL DX CW contest. This is the second biggest CW DX contest for us. CQWW is bigger, mostly because DX stations can work each other in CQWW. The advantage of the ARRL contest is that the rest of the world will be looking for us, rather than looking for new countries to pad their own DXCC awards. The CW event is February 16-17 (UTC). The Phone weekend is March 2-3, which will be before the next newsletter, so I will cover both here. They start at 0000UTC, on the respective Saturdays, which is 6:00 PM local on Friday night. They last 48 hours.

We will work only DX stations. Hawaii and Alaska count as DX. Canada does not count as DX for this contest, so don't work any VE stations. Send a signal report and our state. Remember, many DX operators may not be real familiar with our states, so on phone I usually say "Five Nine Whiskey Italy." I don't say Whiskey India which is the normal phonetic because sometimes they start thinking I am in Indiana. Of course, on CW you are sending letters anyway, so that is not a problem. DX stations will send a signal report and their power. You can work stations once per band. Each QSO is worth three points, and you multiply it by the total number of band country multipliers you work.

There are many different classes. Single op can go high power, low power, and QRP. Single op does not permit spotting assistance. There is an unlimited single op category, and you can use spotting assistance with the same power categories. You can also operate a single band, but there are no power sub-categories, and spotting assistance is not permitted. Full rules are available at <http://www.arrl.org/arrl-dx>.

The CQWW 160 Meter phone contest is February 22-24. It starts at 2200Z Friday which is 4:00 PM local on Friday afternoon. The CW version was covered last month. The rules are the same for phone, so I won't bother repeating them. Rules at <https://www.cq160.com/rules.htm>

The same weekend also sees the North American QSO Party, RTTY version. It starts at noon on February 23 and runs 12 hours, but you can only operate 10 hours, 100 watts. The phone and CW versions were covered last month, so no point in repeating it here. Rules are at <http://ncjweb.com/NAQP-Rules.pdf>

With the ARRL DX contest this month, you can expect a lot of contest DXpeditions, mostly to the Caribbean. There are a couple of interesting big DXpeditions this month. The most interesting one is to Macao, XX9D. A group of German ops will be there February 11-26. They will be on 160-6 meters, SSB, CW, FT8, and RTTY. This is a tough path for us even in the best of times. They will put a special emphasis on 160-40M for North America. Our best shot will probably be on 40. Long path in the afternoon might be possible. The call is XX9D.

Another group of Germans is heading to Central Kiribati in the Pacific. Look for T31EU February 16- March 5. 160-10M, SSB, CW, RTTY, and some FT8.

Bhutan will be on the air as A5A by a small international group from February 27- March 5. 160-10M, CW, SSB, and FT8. A special focus will be on 160M FT8.

As usual, there are a lot of single op efforts this month. Many of these are on a time available during vacations, work trips, etc. Normally I don't mention too much about them since for the most part you just have to be lucky enough to be on at the right time. One stands out for something different. JI5RPT will be on from Ogasawara as JD1BLY February 15-17. What makes this one different? He will be operating 630 Meter JT9. This is the first DXpedition I am aware of that is including the new band.

Speaking of 630, I have left my 630M WSPR beacon running some more nights. I have been heard as far out as Hawaii so far. I have been off the air the last few days. The thaw changed the antenna tuning a few KHz down. That would not be a big deal on other bands, but here it can move the SWR from about 1.5 to 4:1. I could go out and retune, but I want to see if it comes back when the cold weather returns.

That wraps up February. Don't forget to mark your calendar for March 10 and the WIQP.

EQUIPMENT REPAIR CORNER

ICOM IC-756PROIII Repair Adventure

de Chuck Curran (W9KR)



On January 24th, FEDEX delivered a newly acquired ICOM IC-756PROIII Transceiver. The seller on eBay stated it was 100% functional, and the pictures showed a scratch and dent free radio that would be double boxed on shipping, using the original factory shipping box as the inner container. Sounded and looked good, so I bought it.

Upon its arrival, it proved to be an extremely clean and a well maintained radio. I was very pleased. I took it down to my station and hooked it up for testing. Everything thing seemed to be working, tried as many knobs as I could, notch filter and passband tuning were working fine, and SSB & CW were both working just fine also. Made several contacts, used it to drive my linear to the full 1500 watt output, but that only requires 35 watts input.



ICOM IC 756PROIII Transceiver

I then happened to check my SWR, and noticed I only had about 70 watts output when barefoot. Checked all the bands using my dummy load, seeing power varied from 52 watts on 10 meters to around 70 on 160 meters. I ordered a service manual, but then decided to also look for ICOM service centers. I called ICOM, only to find out they no longer service the 756PROIII, um, not good. I didn't really have the mindset to want to dig into this radio myself, so I then Googled ICOM service, eventually finding www.amateurradioservice.com, located in Tucker, GA. Paul Hansen is the owner, and in reading his website history page, it turned out his specialty area is ICOM radios. He ran the ICOM southeast service center for 10 years. So, I emailed Paul, telling him about the low power output.

Paul emailed back within an hour and listed some suggestions and ideas. His big point was since I was getting power out, the PA board was good. He suggested that I verify what DC voltage I had on the PA board under full power out. I opened up the radio and connected my Fluke

multi-meter to the PA amp board's power studs, which were supposed to show 13.8 VDC under load. Turned on the radio and pressed down the key and got 70 watts output, and showed 10.9 VDC on the power connection to the PA amp circuit board. Paul shared with me that anytime you have less than 12.5 VDC at that test point, you also have low power output. Now Paul seemed very interested. I told him to please keep track of his time and I would pay him at his regular shop rate.

Paul suggested checking the voltage at various points along the ICOM power cord, which ran from my Astron power supply to the back of the ICOM radio. I found that the power cord had a significant voltage drop. Worst voltage drop was from before to after the two fuse holders, one fuse in each of the positive and ground leads. Took that power cable off and took a look, found the fuse connectors were crimped and no solder present. I solder all four connections, cleaned and tightened connections in the six prong plug on the back side of the radio, put the radio back under power, and now DC voltage under load was 12.52 to 12.68 VDC on different bands. All of this was done with the Astron power supply set at 13.8 VDC, and power output was now 88 watts to 97 watts on different bands. Getting Closer!! I still had a voltage drop in the power cable, but I had eliminated about 2.6 VDC of drop.

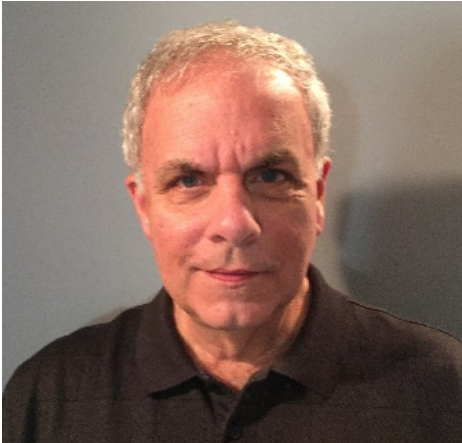
The radio is rated at 13.8 VDC +/- 15%. The high limit works out to 15.87 VDC. I raised the Astron power supply to 14.6 VDC, so the rig wouldn't be so close to that 12.5 VDC threshold for bad transmitter output. The catch is that even after raising the Astron output voltage, I still had only 88 to 97 watts output, when I should have had 105 watts, per the radio's specification sheet.

Digging through the pages in the service manual, I found the adjustments for the drive level setting. It applied to all bands. I changed that, going up just a tweak, and achieved 101 to 111 watts output, again depending on the band measured.

Very happy and grateful to Paul Hansen in Tucker, GA. Asked him again, "What do I owe you?" Paul just ignored my question and simply sent his congratulations!

Vintage Amateur Radio

de Bill Shadid, W9MXQ



Heathkit quite successfully developed and marketed the mostly successful SB-200 Series, the SB-220 Series, the SB-230, and the HA-14 Linear Amplifiers. To this day, ham shacks around the world include these amplifiers – especially the most successful SB-200 and SB-220 models. I wonder: If the last versions of those amplifiers, the SB-201 and SB-221, were built today, would they be successful products? I think they would be. Products like the Ameritron AL-811H and the Ameritron AL-82 show that much of the same circuitry is sellable today.

Not resting on their laurels at the time, however, Heathkit moved onward in their market with effective replacements.

In this installment we will talk about three more Heathkit linear amplifiers. Two are the last Heathkit HF linear amplifier products made in full production. One of those two was perhaps a pretender and not a Heathkit at all. The third model had a production run of only ten units!

When the SB-221 was discontinued in 1983, Heathkit immediately introduced a nearly identical (in circuitry) HL-2200. Like the SB-221, the HL-2200 had a pair of Eimac 3-500z Triodes in its circuitry. It had a tuned input to satisfy 50-ohm impedance exciters and worked on the 80 through 15-meter bands as delivered⁴.



Heathkit HL-2200 80-15 Meter Linear Amplifier

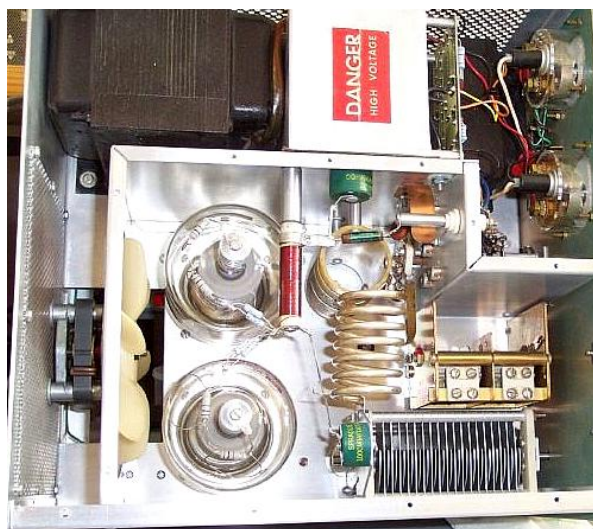
(Heathkit Photo)

Interior views of the SB-221 and HL-2200 were nearly identical. And why not? Heathkit had a worthy competitor in the SB-220 and SB-221. The only reason to repackage the amplifier was to meet styling changes – note more squared corners – and to change the colors to meet new design concepts by the Heathkit HF Transceivers of the day. The HL-2200 looked nice next to the new SS-9000¹ and HW-5400¹, the company moved from green-on-green to more of a brown-tone and bronze color tone.

The HL-2200 had an input power of 2,000 watts PEP on SSB and an input power of 1,000 watts on CW. The radio had an output level of about 1,200 to 1,300 watts on SSB and about 600 watts on CW when set to the CW Mode. When set to SSB Mode, but running CW, with today's maximum legal power, this amplifier, like the SB-220 and SB-221, can put out over 1,200 watts on CW.

Alas, the HL-2200 was not a commercial success. As Chuck Penson, WA7ZZE, relates in his popular book on Heathkit amateur radio history², hams seemed to feel it was a rip-off [presumably of their own SB-220/221].

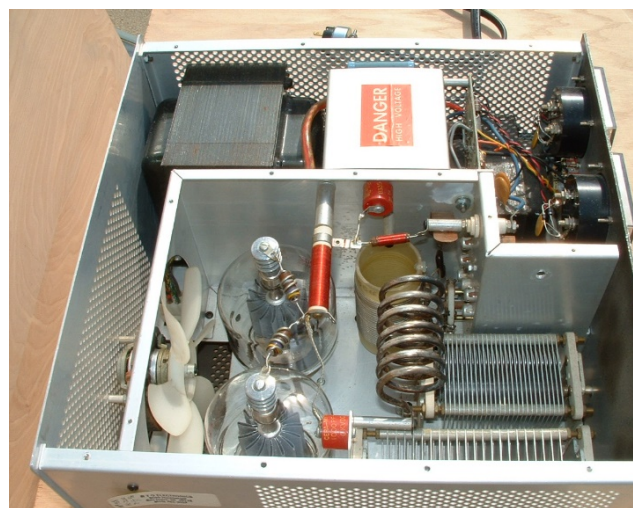
For the sake of the idea that the SB-220/221 and the HL-2200 were nearly identical where it counts, look at these interior pictures:



Heathkit SB-220 Linear Amplifier

Note what appear to be higher quality variable capacitors in the TUNE and LOAD positions of the later HL-2200 Linear Amplifier. (Left picture is of an SB-220.)

(W9MXQ Photo)



Heathkit HL-2200 Linear Amplifier

(Heathkit Photo)

Acceptance by ham operators at the time notwithstanding, if looking for a Heathkit 2,000-watt amplifier from the era (early to mid-1980's) the later HL-2200 would be a good buy. It suffers from less popularity than the SB-220/221 but has the same very good design. That may translate into less money to purchase. While I like the green color scheme of the earlier linear amplifiers, some hams do not. So, the HL-2200 provides good performance with colors more closely matching modern radios. To each his/her own!

Heathkit's last entry in HF Linear Amplifiers was not really a Heathkit at all. At least not in terms of design and in very little in terms of appearance. The SB-1000 Linear Amplifier was a kit version of the by then very popular Ameritron AL-80A Linear Amplifier. Note the return, by Heathkit's marketing, to the long popular "SB" prefix in the model number – with the "1000" no doubt relating to the advertised power output of the single 3-500z Triode tube. The SB-1000 had a lot going for it. For the first time, Heathkit has a linear amplifier designed to not only work on 160 meters but also the new WARC bands at 17 and 12 meters. 12 and 10 meters were not standard with the SB-1000 but could easily be enabled by a licensed amateur operator with components already inside the radio. Instructions were supplied to the user by Heathkit in return for sending in a copy of their amateur radio license.

The HL-2200 front panel added a switch marked AMPLIFIER OUT / IN. The 3-500z tubes in the SB-220/221 and the 572B tubes in the SB-200/201 were essentially “instant on” and required little warmup time. I imagine Heathkit felt the extra switch was unnecessary. I think it was a worthwhile addition – especially with the 3-500z.

The SB-1000 was introduced by Heathkit in 1987, some three years after production of the HL-2200 had stopped. The SB-1000 had a good market life of six years and to this day is relatively common on the used market. With its parts in common with the still popular Ameritron AL-80, AL-80A, and AL-80B, there is little problem with getting replacement parts. MFJ Enterprises, the parent company of Ameritron, openly sells every part of every product it makes. Here is a picture of the Heathkit SB-1000 next to the Ameritron AL-80A:



Ameritron AL-80A Linear Amplifier

(Ameritron Photo)



Heathkit SB-1000 Linear Amplifier

(Heathkit Photo)

So much for the Heathkit that really was not a Heathkit – except to say that while the fact is Heathkit did not design this radio, they did design the concept of making this product a kit. They supplied their time-proven assembly, alignment, and troubleshooting to the successful kit. So, many of the traits of a Heathkit were present. I prefer the Heathkit version of this amplifier as to its appearance. But that is just one man’s opinion!

One more linear amplifier needs to be in this sequence. It came about late in the production of the SB-220 (not the SB-221) that was outlined in last month’s installment. Let’s look at the Heathkit SB-240 – vintage about 1975:



**Heathkit SB-240 HF Linear Amplifier
Brown/Beige/Black Prototype**



**Heathkit SB-240 HF Linear Amplifier
Green/Beige/Black Prototype**

Different Color Schemes were Considered – at the time no radios used what was to become the Brown/Beige/Black colors. Apparently change was in the air!

(KC8IV Photo)

(Heathkit Photo³)

The SB-240 has a footprint essentially the same as the SB-220. Heathkit, like they later did with the HL-2200, essentially repackaged the SB-220 with a different look. The green base-color and design apparently was to match the SB-104/SB-104A¹ Transceiver of the time. The green color of the SB-220 matched the SB-104 series but details of style were different, as you can see. All RF specifications of the SB-240 matched those of the SB-220 – including the presence of 10 meters.

The SB-240, for reasons unknown to us today, did not go into production. It appears that ten of the units were built, according to KC8IV³, former Heathkit employee, in an advertisement to sell his SB-240 prototype many years ago. Three of these amplifiers of the original ten are thought to still exist.

I have one additional note on the SB-240. The green version shown is questionable. I have little data that it existed as a prototype and could be a unit cobbled from a SB-220 panel. But that could as well have been done by Heathkit in making the prototype. Suffice it to say this prototype existed and several still do in perhaps one or two colors.

Between this installment and the one last month, we have covered nine of the eleven HF linear amplifiers made by Heathkit. The next installment will cover two more. In fact, those two were the first two. They were made in a time of big radios – like the Heathkit Apache¹, the Marauder¹ Transmitters and the Mohawk¹ Receiver. Do you remember those boat anchors? All have lived at one time or another at W9MXQ.

Special thanks go to Bob W9DYQ for his proofreading. I appreciate that you read my articles. Remember that I am open to questions and comments at my email address, W9MXQ@TWC.com.

W9MXQ

Notes and References:

¹ Subject of a future article.

² Chuck Penson, WA7ZZE, "Heathkit, A Guide to Amateur Radio Products" Electric Radio Press, © 1995.

³ It is difficult to determine the ownership of this photo. It may well be tied to KC8IV or Heathkit™. At the time the SB-240 was being contemplated, Heathkit was still using the Heathkit Green color scheme.

⁴ Like the SB-201 and SB-221, Heathkit provided a 10-meter add-on kit. Also like its predecessors, buyers of the 10-meter add-on kit for the HL-2200 had to provide proof of their amateur radio license. Unlike some of the other manufacturers, there were parts that needed to be added – not just activated in the existing product – in order to enable 10-meters. These parts are extremely difficult to duplicate today. So, if you purchase an SB-201, SB-221, or HL-2200 and need 10-meters, be sure that it has already been added.

Project of the Month[©]

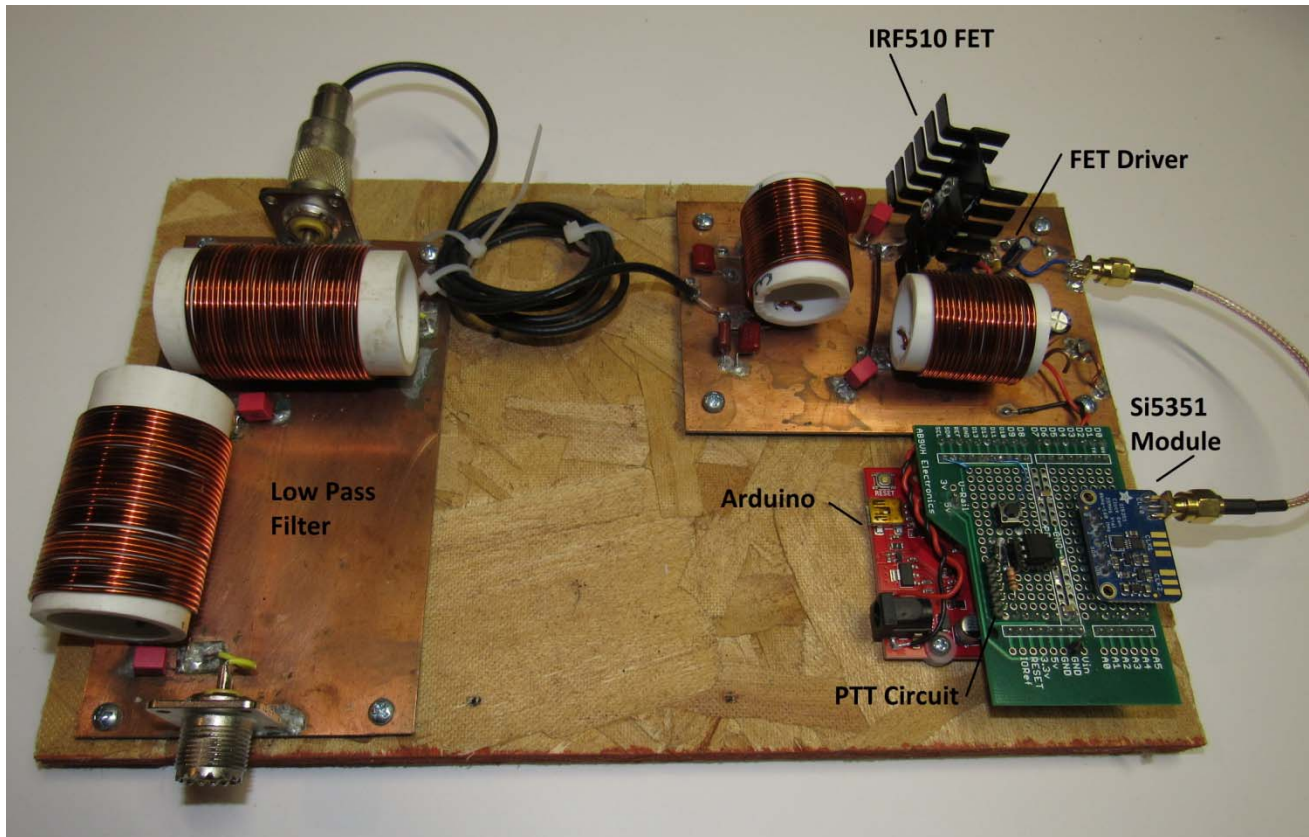
de Gary Drasch, K9DJT



This month's project comes to us via Gary Sutcliffe, W9XT. He mentioned it in his DXing & Contesting column last month while talking about the WSJT-X suite of weak signal modes. In particular, it is the WSPR (pronounced "whisper") mode which he uses with this hardware project.

The project is a low power home-brew 630 meter beacon transmitter. The frequency of 472-479 KHz is below our AM broadcast band! We hams haven't had access to this band since the Spark-Gap days. That changed in 2017 when the FCC released it and opened the doors to us for new experimentation. It has heightened our ability to nourish our roots of this great hobby.

630-Meter Transmitter



The core of this 12-Watt transmitter is an Arduino Uno clone micro-controller board driving an Adafruit Si5351 frequency synthesizer chip/module at a cost of about \$8. It can generate frequencies between 8 KHz and 160 MHz. The chip is a very small surface-mount chip that would be hard to wire by hand, and the module has the oscillator, voltage regulator, I2C level shifters all on one board. It just made sense to use it to save time. The Arduino uses I2C to tell

the Si5351 what frequency to generate. It generates the different frequencies to meet the WSPR protocol. The output of the Si5351 goes to an FET driver that drives the IRF510 general purpose output FET running class D. The FET is meant for switching things like lamps, motors, etc. It is not a linear amplifier. The way it is used in this design is more like a switching power supply than an amplifier. It is basically either on or off. This generates a lot of harmonics that need to be filtered out by the matching network on the FET board and the low pass filter. Most of the similar designs on the internet drove the FET with CMOS logic chips. The key to efficiency and reliability with switched FETs at high frequency is a solid gate drive. I felt the gate drive circuitry on most of the published designs were a bit soft. I bought a tube of the IRF510s figuring I would blow up a lot of them while getting the circuit going. I'm still using the first one! Not bad for a \$1 output final transistor!

From the output, we go to the remaining inductors and capacitors to transform the FET output to 50 ohms and filter out the harmonics. I designed this low pass 5 pole filter with the Elsie filter program. It reduces the harmonics to better than the -43 dBc FCC-required spec.

The Arduino software was found on Github and written by WT7S. I made some changes. The original software only covered the HF bands so I had to make changes to the Si5351 so that it would operate at 475 KHz. The original version used a GPS module to control transmit timing. I changed it to accept an external signal from a PC running WSJT. The PTT circuit uses an optoisolator to level shift the RS-232 RTS line down to 5V. I use a USB serial cable to the PC to control the timing. The WSPR program generates tones and uses the PTT line to control the SSB transmitter. My design ignores the PC generated tones. The RTS just tells the Arduino to transmit.

As of today it has been picked up by over 90 stations in 32 states and 4 DXCC countries. The furthest station to receive it is Hawaii.

Who's next? Share your projects with the club. You may write up your own description of what you did, or call me and explain the project and I'll write it up. Of course, pictures are must. Anything relating to ham radio is welcome. Have you built a kit, home brewed an accessory, reconfigured your operating table, solved an RFI problem, or installed a new or additional antenna? Give me a call at 262-707-4279. I look forward to hearing from you.

73, Gary
W9XT

ARRL Safety Code

de Patrick Volkmann, W9JI

Since our program this month is about safety when making measurements, I thought it would be interesting to take a look at some of the origins of the safety practices that we use today.

In the 1930's, safety was not much of a priority for most hams--other than common sense precautions like "don't touch a live circuit." That started to change with the death of Ross Hull, VK3JU, on September 13, 1938. Hull was a well-known ham who had moved from Australia to work at the ARRL Headquarters in Newington, Connecticut. At the time of his death, Hull was the editor of the Radio Amateur's Handbook and a QST editor. He was known for his many significant technical innovations including pioneering work on VHF propagation and equipment design. He was an early and vocal advocate of safety practices for amateurs. Ironically, his death came about through accidental contact with a 6,000 volt plate supply for an experimental television receiver he was working on.

Within six months of Hull's death, George Grammer, W1DF, wrote an article for QST magazine reflecting on the death of Hull and introduced the ARRL Safety Code. Entitled "Safety Technique in Transmitter Operation and Construction" (QST, March 1939), Grammer laid out seven points for personal safety and eighteen points for safer transmitter designs. The article acknowledges that hams were not likely to adopt the described practices "when, after all, *he's* not going to be guilty of carelessness in handling dangerous voltages."

Typical construction practices of the late 1930's featured an open design with exposed components. Ross Hull was, by the way, an advocate of metal chassis construction and the use of a front panel as part of safer transmitter design. The transmitter shown in Figures 1 and 2 is a reproduction of a design shown in the 1936 edition of the Radio Amateur's Handbook, edited by Hull.

The transmitter is a "Tri-Tet" oscillator and uses a single tube as a 50 watt, crystal controlled transmitter. The plate voltage could run as high as 1000 volts DC. Construction is of the "vertical open-frame type". The Handbook describes the transmitter as suitable for use on 80, 40 and 20 meters. Band changing is done by moving the tap on the coil in both the cathode and plate circuit. The transmitter layout and construction is very similar to the one shown in the 1936 Handbook photos.



Figure 1 - Front view of transmitter

This design uses series feed for the plate circuit. Series feed is characterized by the plate voltage being applied directly to the plate circuit, causing the tank coil and capacitor to be at the B+ voltage. Modern designs use parallel feed, where the B+ is fed through an RF choke to the tube plate and blocked from the tank circuit with a high voltage coupling capacitor.

There are several obvious safety hazards present in this transmitter. The open construction makes it easy to accidentally touch the high voltage circuits. Band-changing requires reaching into the rig and manually changing the tap on the cathode coil. The plate coil tap is changed with a switch relieving the operator from reaching directly into the high voltage circuit. The plate tuning capacitor shaft, along with the frame and plates, are at the B+ potential. I can assure you from personal experience that touching the set screw that holds the tuning knob onto the shaft can result in a nasty shock.



Figure 2 - Rear view of transmitter

The most significant safety issue is that exposed components are at a very high potential due to the use of series fed plate voltage. The Safety Code addresses parallel and series feed, among many other issues. The article says that parallel feed is recommended for circuits in which coils must be changed manually. Series feed should only be used when the antenna is inductively coupled to prevent the high voltage from getting on the antenna (yikes!). Both the Handbook and QST would continue to feature series feed plate designs and breadboard transmitters for beginners until the early 1950's, almost 15 years after the introduction of the Safety Code.

In the June 1953 issue of QST, Don Mix, W1TS, revisited the ARRL Safety Code. Entitled "How to Live Longer" the article amplifies the points of the earlier version of the code with some circuit diagrams and additional text describing safety practices. Mix points out that the requirement to reduce television interference has resulted in the use of shielded enclosures which "has made ham rigs vastly safer to operate and work around". The ARRL subsequently released the ARRL Safety Code as a legal sized poster, publication CD-84, "available to you upon request, by card or radiogram, to the Communications Department".

The poster and the 1953 article are both illustrated with cartoons by Phillip "Gil" Gildersleeves, W1CJD. Gil created more than 1500 illustrations for QST over a 40 year period. You may remember seeing Jeeves cartoons in the *How's DX* column or the *Podunk Hollow Radio Club Field Day* covers on QST. These cartoons added some visual appeal and a bit of humor to an otherwise dry list of safety practices.

Safety practices have certainly changed for the better since 1938. If Ross Hull's 6,000 volt power supply was built anything like the transmitter in the photos, we can see how he might have inadvertently gotten into trouble. In the years following 1953, safety became a much more prominent and important subject in amateur radio literature. Equipment designs changed too, with transmitters moving to parallel feed tank circuits and fully enclosed chassis. Safety information and education is now readily available. The 2019 version of the Radio Amateur's Handbook, for example, has an entire chapter devoted to safety.

A copy of ARRL Safety Code CD-84 (Rev. 7/53) is reproduced here, courtesy of ARRL.

A.R.R.L. SAFETY CODE

SAFETY RULES FOR: THE AMATEUR RADIO OPERATOR

1. KILL ALL POWER CIRCUITS COMPLETELY BEFORE TOUCHING ANYTHING BEHIND THE PANEL OR INSIDE THE CHASSIS OR ENCLOSURE.
2. Never allow anyone else to switch the power on and off for you while you are working on equipment.



3. Don't shoot trouble in a transmitter when tired or sleepy.

Mental or physical fatigue may be accompanied by a certain amount of absentmindedness. Wait until you're fully alert before changing plug-in coils or start working on equipment.

4. Never adjust variable links by hand.

Use special care when checking energized tank circuits with absorption-type wavemeters.

5. Avoid bodily contact with grounded metal (racks, radiators) or damp floors while working on the transmitter.

6. Never wear 'phones while working on gear.

7. Follow the rule of keeping one hand in your pocket.

8. Never pull test arcs from transmitter tank circuits.



9. Instruct members of your household HOW to turn the power off, and HOW to apply artificial respiration.



Instruction sheets on the latest approved method of resuscitation can be obtained from your local Red Cross office.

10. Develop your own safety technique. TAKE TIME TO BE CAREFUL. DEATH IS PERMANENT.

SAFETY RULES FOR EQUIPMENT DESIGN AND CONSTRUCTION

ONE DISCONNECT SWITCH: A single plainly-labeled main switch should be provided to cut off all power from the equipment.

POWER SUPPLIES: All power supplies should be so enclosed or constructed that accidental bodily contact with power circuits is impossible.



All negative plate-supply and positive bias-supply terminals should be connected to the chassis and the chassis connected to a water pipe or other good ground connection.

Every power supply should use a conservatively-rated bleeder resistor. If it is placed on top of the chassis for ventilation, cover it with screening or perforated metal.

When using shielded wire for external power cabling, make sure the shielding is grounded to protect you in case of insulation breakdown.

CD-84 (Rev. 7/53)

-over-

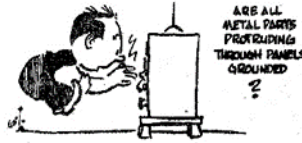
Printed in U.S.A.

Figure 3 - ARRL Safety Code from 1953, Page 1

PANEL CONTROLS AND METERING: Every control shaft extending through the front of the panel should be at ground potential.

The frames of key or metering jacks should be fastened to the grounded panel.

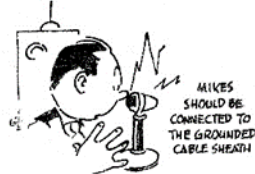
Meters, unless connected in the cathode or centertap, should be recessed to avoid danger of contact with the adjusting screw.



R.F. UNITS: Use parallel feed in all circuits where plug-in coils are used. If using series feed, use coil switching circuits.

All exposed terminals, tube caps, etc., should be protected by insulated coverings.

AUDIO EQUIPMENT:



In addition to the construction rules set forth for power supplies, the following rule should be followed for speech equipment.

The microphone stand and enclosure should always be connected to the microphone-cable shield which, in turn, should be grounded to the chassis.

- . . . -

HANDLE EVERY CIRCUIT WITH CAUTION.
THE LOWLY 115 VOLTS HAS CAUSED MORE ELECTROCUTIONS THAN ANY OTHER.



Figure 4 - ARRL Safety Code from 1953, Page 2

UPCOMING EVENTS

Membership Meeting – February 13, 2019

ORC Monthly Programs

February - Gary Drasch K9DJT – The Safe Use of Digital Multimeters

March - Bill Shadid W9MXQ - An overview of Bill's radio collection as presented on Ham Nation

April – Peter Chow WONG – Assembling a Go-Kit

Volunteers Needed for Monthly Programs

The monthly program is the highlight of the Ozaukee Radio Club meeting. We are fortunate to have a number of very talented people in our club, many of whom have shared their knowledge through a presentation. Share your expertise and experience with the club. Programs can be

on any topic that is ham radio related. Contact Pat Volkmann W9JI at w9ji@arrl.net to discuss your idea for a program.

New “Home-Brew Night” at August meeting

At the January meeting, there was some discussion on the monthly program. A suggestion was made by Peter Chow, W0NG that we try a “Home-Brew Night.” The suggestion met with approval so we are going to give it a try at the August meeting.

This will be a chance to show off something that you have built. It can be anything radio-related. You can bring your project in to show it off or just bring a couple of pictures and talk about it. There is plenty of time until the August meeting, so you can start building something if you don't already have a project on the shelf.

Ozaukee Radio Club

January 9, 2019 Meeting Minutes

de Chuck Curran (W9KR), Acting Secretary for the Meeting



President Kevin Steers (K9VIN) called the meeting to order at 7:31 PM. All present introduced themselves.

Announcements, Show-and-Tell, Bragging Rights:

Bill Shadid, (W9MXQ) related a Drake TR-4 experience he had. It came with a rather rare noise blanker he was happy to get.

Gary Sutcliffe, (W9XT) told the club about a low-frequency low-power transmitter he recently got on the air. His beacon signal has been copied by many stations as far away as Hawaii, and he is pleased with the results.

Gary Drasch, (K9DJT) mentioned he has started a “Project of the Month” posting for the club newsletter. He is hoping that club members will provide him with a short article on any simple project that improved something in their ham station.

Peter Chow, (W0NG) mentioned that a Home-Brew Night might be a good topic for a future meeting, or meetings.

Jeff Whisler, (WV9X) shared with the group that he has received a new vanity call sign, W9KW. Jeff also expressed an interest in putting together a group that is interested in learning more or sharing HT programming methods. Contact Jeff if you are interested.

ELECTIONS:

The following slate of candidates ran for office on January 9, 2019:

President: Kevin Steers (K9VIN)

1st VP: Pat Volkmann (W9JI)

2nd VP: No Candidate

Repeater VP: Tom Trethewey (KC9ONY)

Secretary: Ben Evans (K9UZ)

Treasurer: Robert Eskola (K4WTH)

President Kevin Steers (K9VIN) asked for nominations from the floor three times, with no added nominations being made. The vote was then held and all candidates as listed above were voted into office for 2019.

Late Announcement:

Ken Boston, W9GA made an announcement for the club members. He asked that we remember to consider who would be a good candidate for the various club awards, such as Ham of the Year and Turkey of the Year. Ken is hoping to get suggestions on any of the awards as listed and described in the club by-laws.

Auction:

Pat Volkmann, W9JI ran the January 9th Club Meeting Auction, with Ed Rate, AA9W. The items listed below were up for purchase.

2.4 GHz 13 element beam, SWR Bridge, Kenwood Rapid Charger, Dell docking station, wire ties, 12" copper bus bar, Pyramid Power Supply-13.8 VDC 6 amps, Midland Power/SWR Bridge, Drake TR-72 2-meter Transceiver, Realistic Transceiver, Yaesu Memorizer FT-227R VHF-FM Transceiver, Cobra 200 VHF 220 MHz Transceiver.

Officer Reports:

President: None

1st VP: None

Repeater VP: Tom Trethewey, KC9ONY indicated the 2-meter repeater was working well except for a hum that is being worked on.

Secretary: Pat, W9JI made a motion to accept the minutes, with a second from Todd, N9DRY. Approved by member vote.

Treasurer: Jim Albrinck, K9QLP motioned to accept the treasurer's report, seconded by Jeananne, N9VSV. Approved by member vote.

It was announced that the Fall Swapfest will be on 9/7/2019.

Old Business:

Ken Boston, W9GA provided an update on the Field Day tent, which is being shortened. Tent has still not been completed, but is expected soon. Ken plans to perform a test setup when he picks up the tent. Others will be needed to help with the test setup.

New Business:

None

Adjournment:

Ken, W9GA made the motion to adjourn the meeting, seconded by Tom, KC9ONY. The meeting was adjourned at 8:58 PM.

ORC Meeting Agenda

February 13, 2019

- I. 7:00 – 7:30 PM – Network & Rag Chew
- II. Call to Order & Introductions
- III. Announcements, Bragging Rights, Show & Tell, Upcoming Events, etc.
- IV. Program: Gary, K9DJT - Multimeter Safety
- V. Fellowship Break
- VI. 50/50 Drawing – Kristian Moberg (KC9TFP)
- VII. Auction – Stan Kaplan (WB9RQR)
- VIII. President's Update – Kevin Steers (K9VIN)

- IX. 1st VP Report – Pat Volkmann (W9JR)
- X. Repeater VP Report – Tom Trethewey, (KC9ONY)
- XI. Secretary's Report – Ben Evans (K9UZ)
- XII. Treasurer's Report – Robert Escola (K4WTH)
- XIII. Committee Reports
 - A. Spring Swapfest
 - B. Other
- XIV. OLD BUSINESS
- XV. NEW BUSINESS
- XVI. Adjournment to ?

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The ORC Newsletter

465 Beechwood Drive
Cedarburg WI* 53012

First Class

Next ORC Meeting:

Grafton Multipurpose Senior Center

1665 7th Avenue, Grafton, WI
Wednesday, Feb. 13th, 2019

7:00 PM – Doors Open

7:30 PM – Meeting Begins