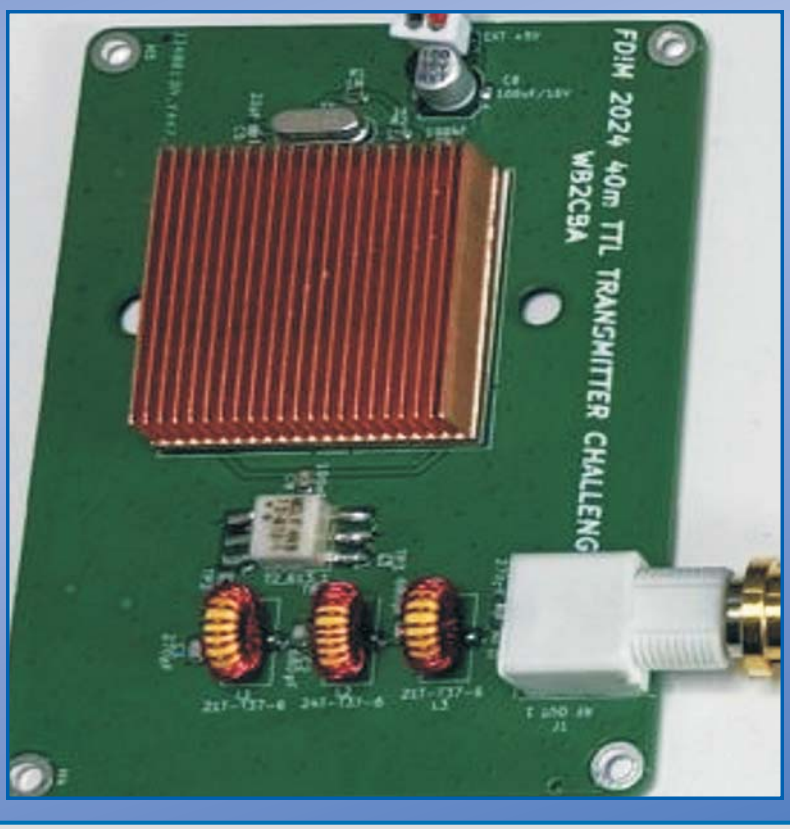
Your Construction and Operating QRP Sourcebook

QRP Quarterly

Volume 65 Number 3
July 2024

Journal of the QRP Amateur Radio Club International

WB2CBA Wins the FDIM 2024 Logic IC XMTR Challenge



- *VE3IPS Reviews the Gabil GRA-7359T Portable Antenna*
- *WB8BEL Improves a Baofeng Microphone*
- *KØNEB Reviews the Revamped NORCAL 40B Transceiver Kit*
- *Turn Down the Power on Your "Big Rig" with W2BX's ALC Adjuster*

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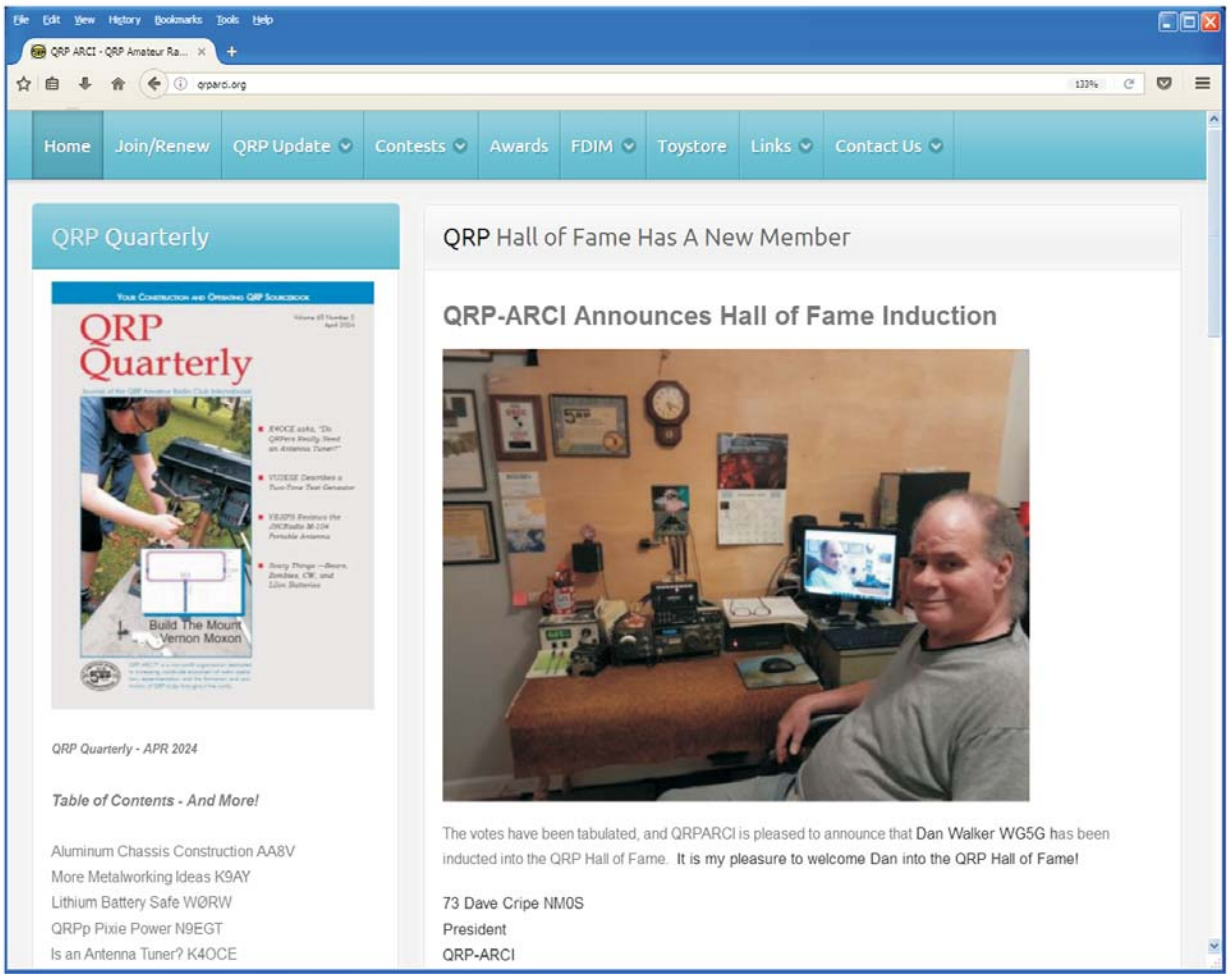

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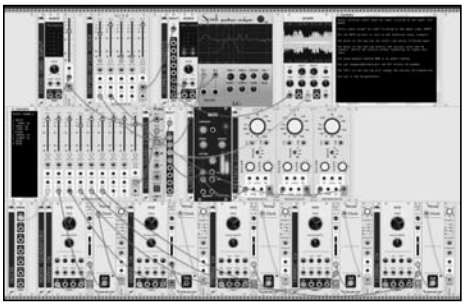

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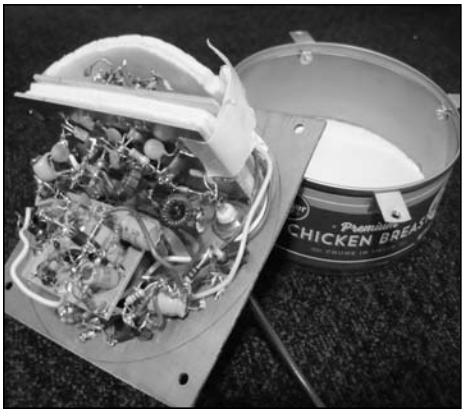

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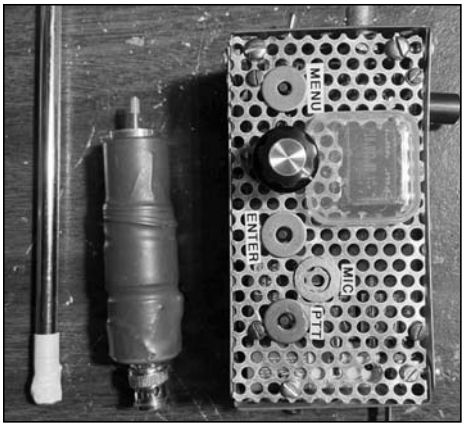

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Which includes maintaining your subscription to *QRP Quarterly*.

See the information on page 40, or at: www.qrparci.org

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QRP ARCI is a club for low power enthusiasts worldwide.

We produce a professional quality magazine (*QRP Quarterly*), organize an annual conference at Dayton (Four Days In May or FDIM), and sponsor various QRP contests and awards.

Our aim is to promote QRP and a variety of related activites. Many of our members enjoy home construction, kit building, antenna experimentation, backpacking and portable operation. Minimalist radios built in small tins are very popular but we also enjoy the very latest high performance radios such as the Elecraft KX3, the new SDR rigs, and great kits like the QCX from QRP Labs, kits from 4 States QRP Group, and the uBitx rigs.

QRP ARCI is an affiliated Club of the American Radio Relay League

Let us know if we can promote your club, group or kit!

AMATEUR RADIO CLUB 1961 5QRP K6JSS A.R.C.I. INTERNATIONAL

From the Editor

Mike Malone—KD5KFX editorqrparci@gmail.com

As I write this, we are beginning what we sportingly call "summer" here in Texas. We have survived field day after "one more time" into the abysmal heat here. I will say that even with the heat—I like it better than storm season. We just had major work done from the latest storm to pound my second story roof. I will be putting my antennas back up soon.

When I first got into QRP, I could tell you about every QRP rig and kit on the market. These days, there is a bevy of them showing up and I am frequently seeing radios I have never heard of. I am looking forward to playing with a few of them or at least reading some reviews on them.

72, Mike, KD5KXF

A Note to Prospective Authors

QRP Quarterly always needs useful, interesting stories and projects. It is the best place to share your ideas, and to learn from other active QRPers!

As you look at each issue, you can see that there is a wide variety of content—SOTA and POTA adventures, reminiscences of the past, reviews of new radios and accessories, and construction projects of all sorts.

Many of you have stories (large or small) that fellow QRP enthusiasts might find interesting. We'd like to present them to the QRP ARCI membership!

To begin, you can just run an idea past the Editor (or one of the Associate Editors) with a quick e-mail. See the staff list on the left. It's even better if you can put together an outline, or maybe a rough draft of your idea for an article. Our staff will help you as much as needed with preparation. We do professional editing, and also clean up drawings and touch up photos. An interesting, readable magazine is our goal.

Thanks in advance from the editors of *QQ*!

From the Desk of the President

David Cripe—NMØS president@qrparci.org

To my QRP Friends:

The QRP Amateur Radio Club International contains thousands of members worldwide, and the particular interests of each of these members is equally wide-ranging. Within the QRP community of amateur radio enthusiasts, there are individuals who experiment with vacuum tubes and vintage gear, as well as the latest SDR rigs and computer-based modes of operation. We have home-brewers and kit builders, collectors and POTA operators, builders of yagis and magloops and EFHWs. Every bit of it is fun, every bit of it just a bit out of the ordinary ham radio experience.

Four Days in May is the annual convention of the QRP ARCI, and is the largest QRP conference in the world. This year our event was one of our finest yet. Within the ballroom at the Fairborn Ohio Holiday Inn, one could have encountered hams who have dabbled in any of the conceivable aspects of the QRP hobby, and others who are actively inventing and designing new ones.

As we look back on FDIM 2024, the leadership of the QRP ARCI wishes to thank all who contributed to enabling this event. The door prize donors, the volunteers, the vendors and club representatives, and all those who traveled from the corners of the world to our conference, all played a part in its success. We owe our success to our members.

Plans are in the works even now for FDIM 2025. It will be our best yet!

73 de NMØS/QRP
Dave Cripe, NMØS
President, QRP ARCI
nm0s@nm0s.com

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QRP ARCI News

QRP Hall of Fame: Daniel Walker, WG5G

To The QRP Amateur Radio Club International (QRP ARCI)
Re: Nomination to Induct Daniel Walker WG5G into the QRP Hall of Fame
Submitted by the Michigan QRP Club, March 4, 2024

The Michigan QRP Club respectfully nominates Daniel Walker WG5G for induction into the QRP Hall of Fame.

The Michigan QRP Club has for the last 45 years steadfastly supported QRP activities throughout the United States and around the World. Our club has enjoyed a close relationship with QRP ARCI, both through joint participation at Four Days in May and the Dayton-Xenia Hamvention, through our common membership rosters, and through notable persons, such as C.F. Rockey W9SCH, who were influential on both our organizations.

Many members of the Michigan QRP Club and readers of our newsletter, *The 5 Watter*, remember well how C.F. Rockey W9SCH raised the technical skill level of QRP hams through articles he regularly published in our newsletter and elsewhere. Those same members also remember how, during that same era, Dan Walker raised our aspirations of what we QRP enthusiasts can achieve, through his monthly column "QRP DX". What Dan was proposing to our readers in those days-that QRP operators can achieve DXCC and Honor Roll-seemed radical then, and to many hams it still does.

Dan was right. It is possible for QRP operators to achieve DXCC and Honor Roll. Indeed, he proved it by being the first ever to earn both awards (see Dan's resume below). That Dan accomplished these feats is noteworthy in its own right; but how his achievements enhance the QRP community is far more important. Consider this. When a new ham first acquires a QRP radio,

Dan, WG5G

he or she is probably thinking, "There is no way I'll work any DX on 5 watts, so why try? I'll just concentrate on making local contacts." In response, the new ham's mentor might pull up Dan Walker's QRZ page and answer, "Are you so sure about that? Look at what this guy did. QRP has no limits."

Why the Michigan QRP Club believes Dan Walker belongs in the QRP Hall of Fame

We recognize that the QRP ARCI Hall of Fame represents a wide range of contributions to the QRP art. The contributions of

each have been different, but the value of the collective whole is undeniable. The members of the QRP Hall of Fame have all enriched the art of QRP. C.F. Rockey W9SCH was a spark plug for both of our organizations. We wouldn't be where we are today without him. Wayne Burdick N6KR contributed his innovative radio designs and many highly effective QRP radios. Joe Taylor K1JT expanded the reach of QRP by giving us control over signals so weak they were considered noise thirty-years ago. One could go on and on, but no doubt everyone in the QRP Hall of Fame has made a meaningful contribution to the art of QRP radio.

Therefore, it is in this context that the Michigan QRP Club urges that Dan Walker WG5G belongs in the Hall of Fame for shining a light on QRP DX and showing the QRP community that anything is possible. Dan showed us all that nowhere in the World is off limits to a QRP radio if you devote your mind and energy to it.

Respectfully submitted,
Gregory Stobbs N8GAS,
Secretary for the Michigan QRP Club

Dan Walker's Resume

QRP DX Successes

Dan WG5G is the first ever to earn DXCC/QRP Honor Roll/MIXED, a QRP record-setting accomplishment which took him 9.5 years (1984 to July 1994). He also earned DXCC Honor Roll/CW in 2016. He has also earned WAS/QRP, WAC/QRP, WAZ/QRP (was the first ever WAZ QRP endorsement, signed by Hugh Cassidy). His CQ DX DXCC/QRPP stands as the highest total ever recorded by *CQ Magazine* (334 all CW). Today Dan's overall DX count is 346, including deleted countries, 337 current mixed, On CW Honor Roll he has 339 including deleted, 331 current. If that were not enough, Dan also won the CQ DX Marathon (QRP category) in years 2012, 2013, 2014, 2015,2016 & 2022.

Other Notable Accomplishments

- QRP DXing Editor for Michigan QRP Club for many years.
- Featured in a podcast about QRP DXING on QSO Today episode #24.
- Currently manages website QRPDX.COM which lists all top QRP DXers in the world. Dan was responsible for resurrecting this site and now handles updates and manages new members.
- Actively posts in the QRP DX forum to inspire others QRP DXers.
- Instrumental in getting a plaque sponsored for the QRP division of the CQ DX Marathon.
- Instrumental in gemng the QRP endorsement for both the WAZ/QRP & 5 Band WAZ/QRP awards.
- Successfully petitioned the ARRL Awards Committee to add a QRP endorsement to new and existing DXCC awards.
- Featured in *QST*, *CQ*, *QRP Quarterly*, *T5W*, *World Radio*, and NM7M Bob Brown's book, *The Little Pistols Guide to HF Propagation*.

Recent Publications:

Michigan *QRP 5 Watter*, "From Worked all States to DXCC Honor Roll On Only 5 Watts — My QRP journey and the antennas that helped me get there," Summer 2023; "DX Tips for the QRP DXer," Fall 2023; "QRP DXing Stories," Winter 2024.

Thanks go out to NN4Q, KR2Q, NDØC, W8QZA, K4OCE, N8GAS, NMØS & AA4GA.

These hams also sent letters to their ARRL section managers to add the QRP endorsement sticker added to our existing or new DXCC certificate, can you please add them to the article.

—Thanks so much, Dan WG5G

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QRP ARCI is an affiliated Club of the American Radio Relay League

FDIM 2024: Another Great Series of Talks

Dan Romanchik—KB6NU cwgeek@kb6nu.com

On Thursday, May 16, I had the good fortune of attending the Four Days in May (FDIM) seminar. This year, nearly 300 people joined me in attending this event.

The talks included:

• "The Construction and Use of a WhoZat" by Jack Purdum, W8TEE.

Jack is a retired professor from Purdue University, a frequent speaker at FDIM, and the designer of many microcontroller-powered ham radio projects, including transceivers and antenna analyzers. This year, he talked about his latest design, the WhoZat. The WhoZat is a portable, battery-powered device that allows an operator to type in a call sign prefix and obtain information about the country associated with the callsign. In return, it tells you the country associated with that prefix, and the azimuthal bearing from your location to that country.

The WhoZat is powered by a Raspberry Pi Pico, and Jack encouraged everyone to consider the Pico for future projects. The Pico, he pointed out, has more computing power and more memory than most Arduinos.

In addition to talking about the WhoZat, Jack was promoting his latest book, *Digital Signal Processing and Sofware Defined Radio*. It's available on Amazon for $45.

• T"op 10 Junkbox Projects" by Hans Summers, GØUPL.

Hans is the genius (?), madman (?), entrepreneur (?) behind QRP Labs. In this talk, he extolled the virtues (as I have done) of a well-stocked junkbox. The project that resonated the most with me is the one-tube transmitter.The reason it resonates with me is that I've been threatening to build one for years myself. Hans actually did it, though. In fact, he made his first QSO with a transmitter he built from an ECL82 tube.

At the end of his talk, Hans gave a little plug for his newest transceiver, the QMX+. The embedded SDR rig covers 160 - 6m, in a slightly bigger form factor than the QMX, for only $125. It's incredible, really.

• "zBitx-A Portable Station for the CW Operator" by Ashar Farhan, VU2ESE of HF Signals.

In this talk, Ashar described his zBitx, a portable CW/FT8 SDR transceiver. This isn't a radio that Ashar is selling (yet!), but it does look like a complete design. And, of course, that design is completely open source, something he ribbed other presenters about. The zBitx is a very small, portable CW/FT8 radio that uses a smart phone for an enhanced user interface.

This radio is powered by a Raspberry Pi, specifically the Raspberry Pi Zero 2 W. This module costs $15 and runs Linux. Ashar says, "If Arduino was a matchbox RC car, the Raspberry Pi is an Airbus A380, both in terms of size and speed. It can run WSJT X, fldigi, and full-stack SDR." The radio also takes advantage of the WiFi capability of the RPi. There's an app that runs on a smart phone that acts as a front panel.

At the end of his talk, instead of flogging a product, Ashar passed out a small PCB assembly called the sBitx Hat. Designed to plug into a Raspberry Pi, it includes an Si5351 clock generator and a 96 kbps, dual-channel audio codec. It looks it will be a fun thing to play with.

• "Adventures of a QRP Evangelist" by Cliff Batson, N4CCB, proprietor of the QRP School YouTube channel.

Cliff gave us a primer on QRP operation and on how to make YouTube videos and encouraged everyone to make their own videos. I'm not so sure about this myself. It seems to me that there is already too many ham radio videos to watch, and if you've ever tried to make your own videos, you know that they're not easy to do.

• "Amplifying Your Adventures, Minimizing Your Power" by Tom Witherspoon, K4SWL.

Tom is a noted YouTuber, and in his presentation, Tom focused on the personal and operating aspects of QRP, not the technical. The conclusion published in the proceedings does a good job of summarizing his talk. It reads, "Since my journey into ham radio began in 1997, I've encountered countless naysayers proclaiming, 'That won't work'or 'Life's too short for QRP.' These discouraging words often came from individuals who lack firsthand experience in the field. Rather than accepting the pessimistic views, I've treated them as a checklist of challenges to overcome. my approach has been simple: get out there, experiment, and fully immerse myself in the moment. It's through this hands-on exploration that I've discovered the true joy and potential of QRP operations."

• "Designing the Elecraft KH1: From Vision to Reality" by Wayne Burdick, N6KR.

Wayne certainly needs no introduction. His talk concentrated on how he made some of the decisions he made in designing the Elecraft KH1 hand-held HF transceiver. The talk provided quite a bit of insight into the design process, but personally, I'm not sold on the KH1. Elecraft can't make them fast enough, though, so I guess that tells you how much I know.

• "The Amazing Thermionic Valve" by Greg Latta, AA8V. Greg is a professor emeritus of electrical engineering from Frostburg State University. He delved into some of the theory of how vacuum tubes work and some of the practical applications.

• "Stealth Operation from Hotel Rooms and Other Unlikely QTHs" by Ross Ballantyne, VK1UN.

Unfortunately, Ross was unable to present, either in person or via Zoom. According to the paper in the *Proceedings*, Ross was part of several peace-keeping missions to remote spots around the world. On these trips, he operated from many hotel rooms and gained quite a bit of experience doing so. For example, he writes that virtually all of his antennas are made from wirewrap wire, which he gets from Ali Express. To couple the wire antenna to the transmitter, he uses a Z-match tuner or a modified Z-match tuner called the FRI match ATU.

It's a shame that Ross wasn't able to address us in person, as he sounds like quite an interesting fellow.

Vendor Night

On Thursday evening, after the talks, I joined W8TEE, GØUPL, and other folks for Vendor Night. It's a great deal for vendors. There's no charge to participate as a vendor, and it's a lot of fun. When I attend FDIM, I always participate.

This year, I sold about $150 worth of books. What was even better was meeting everyone, including those who have used my books to get licensed or to upgrade. For example, Tom, K4SWL, came over and shared his story with me. He said that one year his wife said that she would get her ticket as an anniversary present. He gave her a copy of my study guide, and ten days later, she had her license. How cool is that?

Kudos to QRP ARCI for another successful FDIM. I'm already looking forward to next year. If you'd like to purchase a copy of this year's proceedings, you can email toystore@qrparci.org or directly to the Toy Store manager, n8et@woh.rr.com. ●●

FDIM Highlights

The First Annual Logic-IC Transmitter Power Challenge had 16 entries.

The winner was Barbaros Aseroglu, WB2CBA, with 1.8W. There were two other entries attaining 1.0W for second and third place. (See the article in this issue.)

Major Prizes were won as follows:

The KH-1 station donated by Elecraft was won by Reginald Beardsley, who had presented the seminar on Coherent CW and QRSS.

The IC-705 donated by Icom America was won by Barbaros Aseroglu,WB2CBA

The FT-818 donated by DX Engineering was won by Will Perry WA6LDQ.

The FT-891 donated by DX Engineering was won by David Hostetler W6OQ

The T41 donated by 4SQRP was won by Brent Taylor VY2HF

The Begali Key was won by David Cripe NM0S

Other door prizes were donated by Adam Kimmerly, MFJ, Ham Gadgets, Jeff and Wendy Hetherington, Hamsource, 3rd Planet Solar, 4SQRP, the Iowa QRP Club, and DX Engineering.

Ashhar Farhan donated an xbitx hat board to *everyone* attending the Seminar.

There were 24 entries in the Homebrew Contest. Of these, 14 received at least one vote for Best In Show. The Homebrew contest had the following winners:

Group 100 Station Accessories — Ross Ballantyne VK1UN
Group 200 Transceivers, Receivers — Dan Koelen AI6XG
Group 300 All Scratch Built — James Kretchmar AE7AX
Group 400 Test Equipment Construction Aids — Monty Northrup N5ESE
Group 500 Antennas — Adam Kimmerly K6ARK
Best In Show — James Kretchmar AE7AX

Dan Walker WG5G was inducted into the QRP Hall of Fame

We had 218 advance registrations to the Seminar, and after walk-ins, there were a total of 268 in attendance.

See You Next Year at FDIM 2025!

>> It's Not Too Early to Start Planning for FDIM 2025! <<

- Hamvention® dates: May 16, 17 & 18, 2025
- Location: Green County Fairgrounds, Xenia, OH

- FDIM Seminars: Thursday, May 15, 2025
- FDIM Banquet: Saturday, May 17, 2025
- Other activities: Thursday, Friday, Saturday
- Hotel and program information expected in January 2025

WATCH THE WEBSITE! www.qrparci.org/fdim/

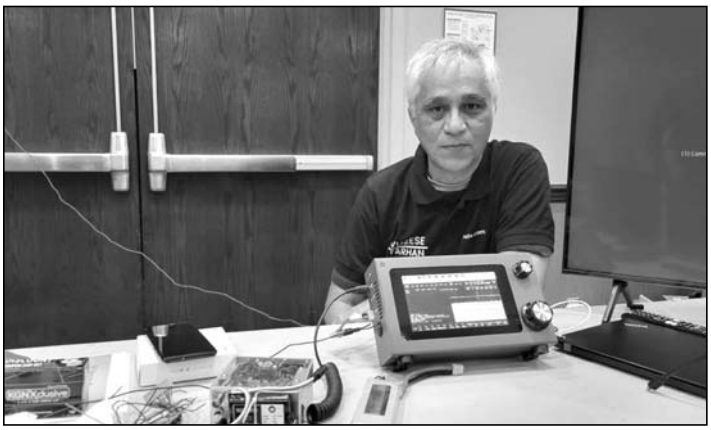
QRP Connections at FDIM Vendor Night

Charlie Brown—NJ7V de.nj7v@gmail.com

Every year, QRP Amateur Radio Club International hosts an event known as "Four Days in May," (FDIM) in conjunction with the Dayton Hamfest. FDIM draws QRP ham radio enthusiasts from around the world. One of the standout features of this event is "Vendor Night," an elbow-to-elbow Thursday night gathering that is more than just a marketplace; YouTubers, old friends, and curious newcomers reconnect or meet up for the first time at this popular event, while learning about the latest QRP innovations.

This year, I think I saw more YouTubers in one place than anywhere else I've been. I counted around 20 individuals from the most popular ham radio YouTube channels in attendance. Many of my friends and acquaintances came to the event to socialize with me and their other friends. The social aspect of Vendor Night is a lot of fun. And while Vendor Night is a popular place to socialize before attending Hamvention, which starts the following morning, the new and interesting products created by ham radio small businesses is the main event.

Hans Summers from QRP Labs, creator of the QCX, QDX, and QMX transceivers, is a regular attraction at Vendor Night. This year he was selling his latest product, the QMX+. The QMX+ is a 160-6m transceiver kit capable of CW and digital modes at 3-5 watts. His table was very popular as people wanted to be one of the first to purchase, build, and operate this new radio. https://www.qrp-labs.com/



Ashar Farhan from HF Signals is also a regular vendor. He introduced the sBitx in his talk at the symposium earlier that day. At the symposium he gave everybody in attendance an sBitx Hat to use in conjunction with a Raspberry Pi for SDR experimentation. At his vendor table you could find all things Bitx including information about his sBitx transceiver:

https://www.hfsignals.com/

Rex Harper from QRPme is another vendor you see at this event almost every year. He sells QRP kits including the famous Tuna Tin II Transmitter and Rockmite Transceiver. He hosts build-a-thons live on YouTube and as in years past, hosted an in-person build-a-thon on Friday afternoon, the day following Vendor Night. I stopped by his table and picked up the "Centro Receive" receiver kit and some "MePads". The MePads are for use in a homebrew radio project I'm working on using Manhattan-style construction. Instead of cutting my own pads these little squares can be glued to copper clad making construction much easier. https://www.qrpme.com/

There was a great mix of returning vendors and new venders this year. In his first year as a vendor, Adam Kimmerly from K6ARK Portable Radio was selling his popular End-Fed Half-Wave antenna kit along with other useful items. I was able to get one of his capacitive-touch key circuits. This little circuit can be used to add capacitive-touch contacts to the enclosure of a portable radio, eliminating the need for an external key. https://k6ark.com/

Newcomer, Joshua Ellis from Tufteln was selling some very popular 3-D printed accessories including an Elecraft KH1 Antenna Angle Adapter which enables the user of the KH1 to hold the radio in hand at an angle and still keep the antenna vertical. His KH1 right angle adapter was also popular, which allows the KH1 operator to lay the radio flat on something like a picnic table and still have the antenna oriented vertically. I don't have a KH1 but still have those items and a few others made by him for when I do purchase one. https://tufteln.com/

Another newcomer, Ara Kourchians from N6ARA Electronics had a few really interesting items for sale, including a MiniSWR meter that you add in-line with your antenna, to give you a rough SWR indicator. This is a convenient piece of gear for those of us with radios that don't have an SWR meter. I have already used this meter in the field for SOTA activations with the Xiegu G-106 and MTR-3b. It worked very well and gave me piece of mind. https://n6ara.com/

A friend of mine, Jonathan Kayne KM4CFT said of the event, "This was my first Hamvention and Four Days in May, and even so I was amazed by the turnout of people and the crowd of folks who love QRP. In a landscape of this usually expensive hobby, it was nice to see a lot of quality radio kits and accessories that were sold at an affordable price. It was also really cool to see people like Joshua (Tufteln), Adam (K6ARK), and Ara (N6ARA) show off innovative ways to use equipment in SOTA and POTA operations!"

The room had quite a diversity of innovative products from these and several more vendors. The Joplin and 4StateQRP clubs were also there, selling products that their club members designed and made including Morse code paddles, antennas, and transceivers. It was nice to see clubs represented at the event alongside the vendors.

WBØIYC was there, too!

Mark Smith with Halibut Electronics, said of the event, "FDIM Vendor Night is a great forum. Since it's such a targeted event, the attendees tend to be technical and deeply interested in the topic. It makes selling my products easier, I don't have to explain it as much. I just describe it once, and the customer usually responds: "Oh! I get it. That's neat!" As a vendor, this also translates to more sales-per-table-visit which is nice. I had lots of great conversations with people I'd never met, and met several people I'd only ever emailed with, or listened to on podcasts, or watched on YouTube. It's a small, but very dense-with-goodness event. I will keep coming back as long as y'all will have me." https://electronics.halibut.com/

The Four Days in May (FDIM) event, held in conjunction with the Dayton Hamfest, continues to be a cornerstone gathering for QRP ham radio enthusiasts. This year's Vendor Night was a testament to the innovative spirit within the QRP community, showcasing a diverse array of products and homebrew projects. The presence of notable vendors alongside the entertaining social atmosphere made the night a truly enjoyable experience.

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See you next year at FDIM 2025!

FDIM 2024 Logic IC Transmitter Challenge

Barbaros (Barb) Asuroglu—WB2CBA wb2cba@gmail.com

A Brief Background History About My Entry Circuit and My Surprise Win!

It all started on early March 2024 with a phone conversation with my friend TA1MHS Muhsin Dogrular. He asked me if I am going to visit Dayton Hamvention this year. I told him that I will visit both FDIM and Hamvention. He suggested that I should look into FDIM 2024 LOGIC IC CHALLENGE!

I didn't pay much attention to that challenge at the beginning. Then I checked the rules and decided to give it a go as already I did most of the leg work past couple of years.

For almost a year I am into QRPp TTL powered digital modes transceiver designs. These transceivers are TTL IC powered sub-500 mW rigs which I use extensively for portable FT8 and FT4 SOTA/POTA/Hiking/Backpacking activities. I am familiar with logic IC transmitters due to these rigs which convinced me to participate in this year's FDIM LOGIC IC challenge. It was now a matter of increasing power of my TTL Transmitter.

In my designs I use an advanced TTL octal buffer, 74ACT244 which is my favorite. With this buffer IC I can get 500 mW on 7 MHz under 5V with my portable rig design.

FDIM 2024 LOGIC IC challenge rule was to use a 7.030 MHz crystal and one LOGIC IC chip 7400/4000 series with as much as passive components you like, such as resistors, capacitors and inductors. The most important rule is, there can only be one active element, the logic IC! After some breadboarding and testing I came up with the basic schematic in Figure 1.

My Logic IC PA HF rig designs are using SI5351 as oscillator. In FDIM Challenge a crystal should be used. This meant I can't use my go-to IC 74ACT244 as it is a non-inverting part. So I switched to 74ACT240 which is the twin sister of 74ACT244 but as an inverting part. See Figure 2.

Why I need inverting logic? To create a crystal oscillator with one gate I need an inverting gate to feedback oscillation signal. So I used one of the eight gates of 74ACT240 as the oscillating gate.

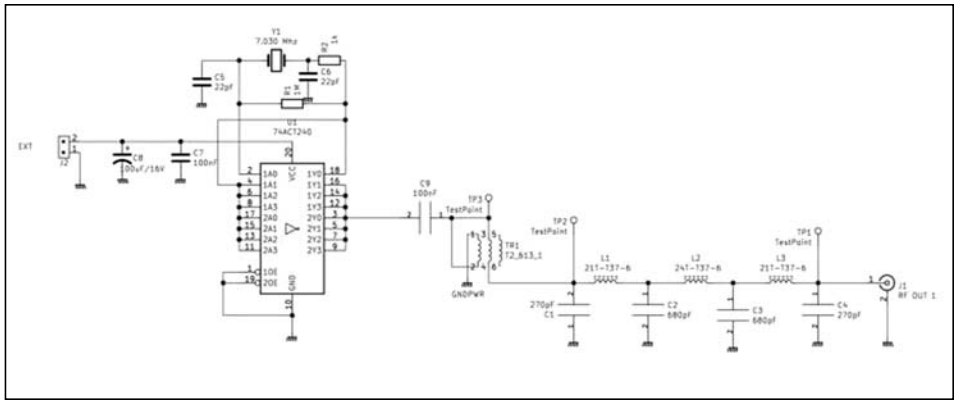
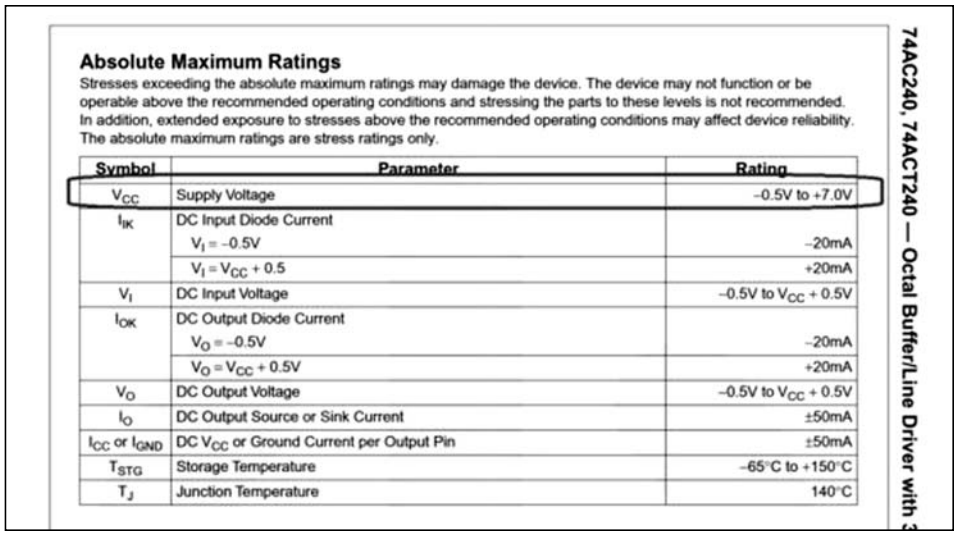


Figure 1—Schematic of the Logic IC transmitter for FDIM.



Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	−0.5V to +7.0V
I_{IK}	DC Input Diode Current	
	$V_I = -0.5V$	−20mA
	$V_I = V_{CC} + 0.5$	+20mA
V_I	DC Input Voltage	−0.5V to V_{CC} + 0.5V
I_{OK}	DC Output Diode Current	
	$V_O = -0.5V$	−20mA
	$V_O = V_{CC} + 0.5V$	+20mA
V_O	DC Output Voltage	−0.5V to V_{CC} + 0.5V
I_O	DC Output Source or Sink Current	±50mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Output Pin	±50mA
T_{STG}	Storage Temperature	−65°C to +150°C
T_J	Junction Temperature	140°C

74AC240, 74ACT240 — Octal Buffer/Line Driver with 3

Figure 2—Data sheet parameters for the 74ACT240 octal buffer IC.

Now as I had a stable 7.030 MHz nice square wave signal coming out of the first inverting buffer gate, I paralleled the rest of the buffers and applied that square wave oscillation to the input of those buffers in parallel.

I also parallel those 7 buffer outputs to increase FAN OUT of the chip to drive a transformer. I still have a square wave and a DC component to it. Adding a 100 nF capacitor at the output of those buffers I have now an AC signal that I can feed into my bifilar transformer to step up my pulse voltage.

While back in March 2020 when we were all quarantined due to COVID 19 I experiment quite deal with standalone WSPR transmitters using TTL chips as PA chips with bifilar transformers boost to output waveform of TTL PA. Under 5 volts with only one 74ACT244 TTL chip I could go up to 300 mW under 5V DC supply with my hand wound FT37-43 bifilar transformers.

I noticed at that time after winding many of these transformers and testing them in my test transmitter circuit I could never get the same same amount of power output of them as a standard. There is always a power difference from one bifilar toroid to the other one no matter how careful and tedious I am winding them.

Back In 2020, this really annoyed me. I needed something that is a standard part bifilar transformer that gives an optimum constant non-varying performance.

After searching online for days for all kinds of ready wound bifilar and trifilar

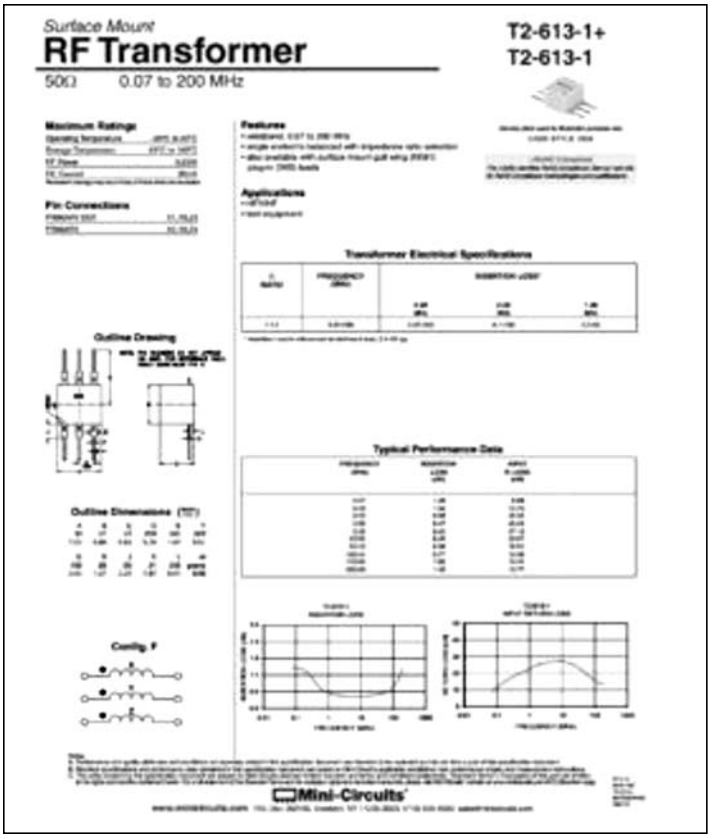


Figure 3—Mini-Circuits transformer data sheet. Although rated ast 250 mW, it handles 2 W easily.

transformers and ordering them and then testing them etc. I settled on one! MINICIRCUITS T2-613-1, seen in Figure 3!

www.minicircuits.com is a New York based RF components company specializing in RF products. The T2-613-1 is 0.07 to 200 MHz trifilar high performance RF transformer with RF power of 250 mW.

When I saw quarter of a watt my first thought was bummer! I wanted to output more than that! I said, "You know what, let me give it a try and see what is the make or break point of this little guy!"

I was surprised to see it works up to 2 watts RF power like a champ! From that moment on I never looked back and this little transformer is my go to solution in all my TTL PA QRPp rigs.

Come back to FDIM 2024 LOGIC IC CHALLENGE entry, this was a no brainer! I used that Mini Circuits transformer again.

Ok now I have my generated and stepped up up 7.030 MHz oscillation though it is nasty jumble of kind of a square wave signal with lots of harmonics. I could have left it like this and take it to FDIM test bench as they will connect a bandpass filter which will filter all harmonics and create a nice sine wave right? Well conscious my conscious said otherwise and I couldn't leave it as it is all over the place signal and entered it to a 7 pole, 7 MHz LPF filter which gave a nice 7 MHz sinewave signal with -58 dBm 2nd harmonic! I lost a bit power which may be a big difference in a power output competition but I was sure at least that I am not generating a jumble of harmonics!

After verifying the schematic, I put together a Manhattan style board to test the circuit. It worked!

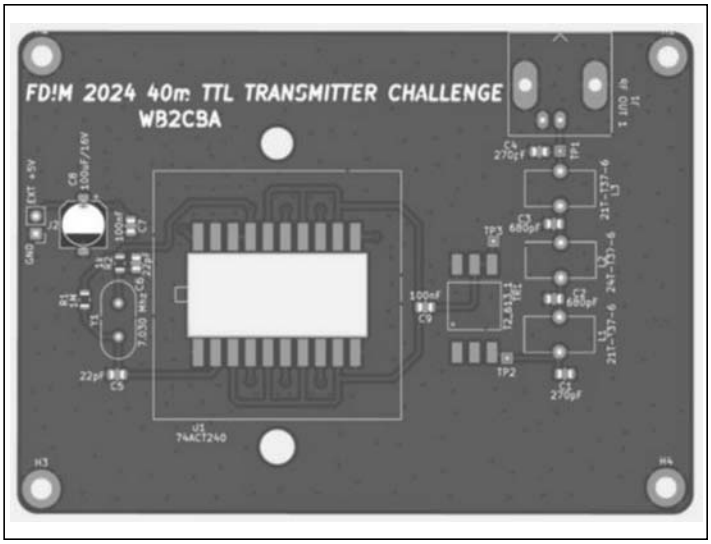


Figure 4—SMD PC board.

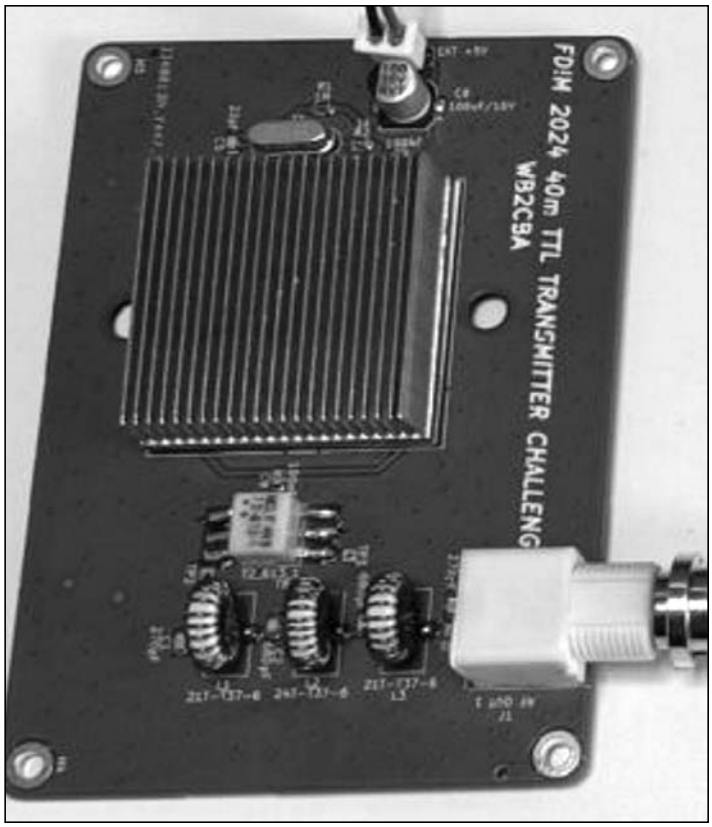


Figure 5—The assembled transmitter.

Now the date was end of March 2024 and I had a working schematic and a crude prototype ready to pack and go for the competition!

Something was nagging me! Timewise I still had 2 months almost and my prototype looked primitive and ready to fall apart! So I decided to design a PCB version of my entry circuit and not any PCB version, a SMD manufactured PCB version!

After designing and sending for checking to www.jlcpcb.com in China, getting back a fabricated PCBs was the next step.

The end result is shown in Figure 4.

This is the DFM Footprint placement analysis layout of my PCB design. And the final product is in Figure 5.

As can be seen on DFM analysis PCB photo (Fig. 4) I spread the pins of 74ACT240 so that I can lower the profile of chip as much as I can. The reason being ease of copper heatsink installation. My other thought was I can sandwich the 74ACT240 chip between identical two heat coppersinks if needed.

I used a PC processor copper heatsink which I got from Amazon for $5.

Tests and Durability Analysis (Pushing limits until smoke!)

After building two PCB prototypes with the new SMD PCB boards I started the fun part! Powering up and pushing it to find the make or break limit!

Look at Figure 2, the 74ACT240 Datasheet on Maximum Permissible Operating Limits.

I continued testing both prototypes with these test conditions and criteria:

• Total test power on run will be 10 minutes under each voltage condition. There will be 30 minute cool down period between each run to dissipate heat and start over with an ambient temperature heatsink every temperature time.

• I will use the same power supply, same 50 ohm dummy load and same RF power meter scope and for all tests.

• I am not going to measure heat dissipation but will have a simple criterion, if the heatsink burns my finger then, it will be considered HOT! I will be using one heatsink initially.

• Efficiency will be calculated by dividing RF power with DC input power times 100 percent.

I let the fun begin and started testing:

• I powered up first within specified nominal condition of +5 Volts. RF power output was 520 mW. No noticeable heat dissipation. Efficiency: 87%

• Then I tried 6 Volts. RF Output = 742 mW. No significant heat dissipation. Efficiency: 82%

• 7 Volts, RF Output = 1021 mW. No significant heat dissipation. Efficiency: 78%. So up to 7V I am still inside 74ACT240 maximum limits boundary and not exceeded.

• 8 Volts, RF Output = 1.38 Watts. Slight heat dissipation. Efficiency: 70%

Now we are on uncharted territory! Anything can happen.

• 9 Volts, RF output = 1.656 Watts. No significant heat dissipation. I can easily hold the heatsink after 10 minutes of run. This is good!

• 10 Volts, RF Output = 1.80 Watts. Still not a significant heat dissipation after 10 minutes. I can still touch the heats comfortably. Efficiency: 49%

• 11 Volts, RF Output = 1.99 Watts. Now something strange happened!

Suddenly heat dissipation increased and efficiency of circuit dropped dramatically. In all above tests efficiency, which is RF power output divided by DC input power was above 50%. In the 11V case efficiency is 30% which means that my circuit was generating 30% useful power and 70% heat, which is not good. Though it didn't fail even after 10 minutes of transmission continues which was a good sign though not reliable for a competition entry.

12 Volts, RF Output = 2.4 watts. Now this was impressive! I broke the 2 watt barrier but with a catch—for only 30 seconds, seeing the infamous smoke which is not enough to win to FDIM logic IC competition as one of the main rule is is to TX for 60 seconds two times in a row. 30 seconds won't cut it.

After these make or break tests I found my sweet spot magical DC Voltage: 10.4 Volts and 1.88 Watts on my RF measuring setup.

How did I come to choose this magic number! Couple of criteria played important role on this:

Efficiency: I limit the efficiency to 43% which is significantly better than 30% of 11V and for a sacrifice of 100 mW over reliability I'll take it.

Heat dissipation after 10 minutes of continues TX was negligible which is a very good sign.

Figures 6 & 7: Here are two photos of my test setup and power measurements under this 10.4 Volts magic number:

I didn't stop testing here. I wanted to have a reliable high power setup so I did the ultimate humane test before packing to FDIM! 24 hours run! Passed with flying colors and ready to compete!

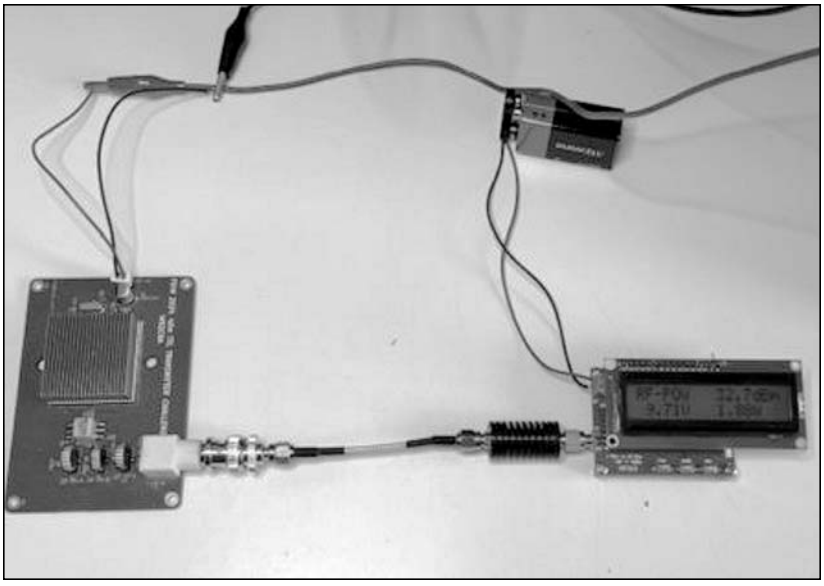


Figure 6—Test setup for the transmitter.

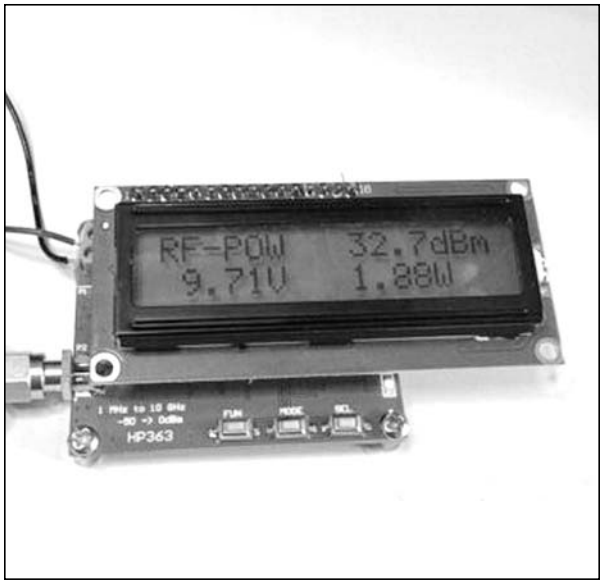


Figure 7—The power output measurement.

Figure 8—Checking in for the competition.

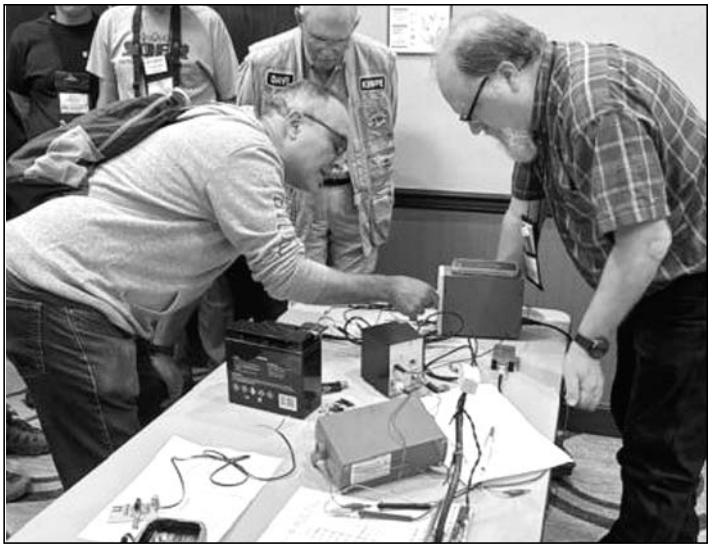


Figure 9—Testing is underway!

FDIM 2024 —
05/17/2024 around 1900 hours:

I arrived to FDIM 2024 venue at Holiday Inn Hotel around 19:00 and I was really nervous. I never attended a challenge before, especially an electronics challenge as this one!

I met David Cripe, NMØS for the first time in person. I exchanged emails with him but no eyeball QSO before this meeting. I like his designs and especially the 4State QRP tuner.

I checked in for Logic IC transmitter challenge and placed my setup on entries display table (Figure 8).

Now there was nothing I can do other than hope for the best and wait my turn to demonstrate!

There were 16 entries in the list and my thought process was no way I can beat 15 hams! I am sure there is a much better design out there. Well at least it will be fun to participate!

In these kinds of challenging events my motto is to wait the end than rather going in first and get over with it. This gives me time to calm down and gather thoughts and confidence. This is exactly what happened and I was one of the last contestants.

Figure 9 is a photo of the Logic IC transmitter in operation.

After two runs of 60 seconds at 1.8 Watts I was relieved at least my board didn't smoke in the middle of these runs. David recorded my output as official 1.8 Watts and I was in great relief though I still wasn't't sure who officially won the challenge. I knew I did better than I expected but I was still unsure.

Hans Summers from QRP LABS was watching my transmitter performance and his comment made me laugh, "Well done Barb, watch yourself, next year I am coming after you!"

FDIM 2024 —
05/18/2024 around 2100 hours!

Saturday, May 18th I attended FDIM Annual Banquet at FDIM 2024 venue at Holiday Inn Hotel near Dayton, Ohio.

It was a great event and great night! I sat on a table with an old friend of mine and Hans Summers from QRPLABS and 6 more hams. We had a great time and a great eyeball QSO. The food served was excellent always.

Around 21:00 hours David Cripe, NMØS took to stage and started to announce the winners of various competitions of FDIM 2024 event.

Figure 10—Here I am receiving my certificate.

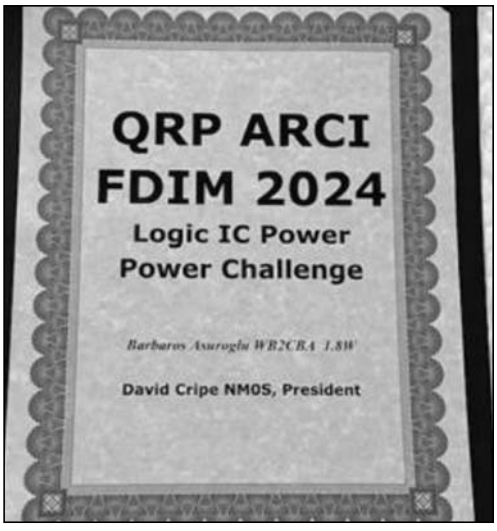


Figure 11—The winner's certificate.

Figure 12—I was awarded a trophy, too!

Figure 13—The Dollar Tree trophy (homebrew, of course)!

When it was time to announce The Logic IC Transmitter Challenge Winner, I was holding my breath!

When he announced my name and call-sign as the winner of FDIM 2024 Logic IC Transmitter Challenge my heart was pounding like crazy! I never expected that moment will be a reality and here I was. I was the winner among 16 participants. All that breadboarding, PCB designing and going one further, getting crazy as my friends called me by designing and getting an SMD PCB for a onetime event and extensive testing! All paid off, it was a relief.

Here are some photos (Figures 10-13) of collecting me my winner certificate and Traditional Dollar Tree Trophy presented by David Cripe, NMØS, and photos of the awards.

I will never forget FDIM 2024 and that night I received my trophy. A small step for humanity but a big step for Barb!

I would like to take this opportunity to thank FDIM 2024 organizers and David Cripe, NMØS for putting together such a fun event. This is the beauty of our hobby called Ham radio!

—Barb, WB2CBA

●●

QRP Frequencies

These are not Calling Frequencies; they are Centers Of Activity—where QRPers are likely to be found

Crystal-controlled transmitters are typically operated near these frequencies, but go ahead and use your VFO to avoid having everyone bunched up in one place!

Contests, SOTA/POTA activations and special events generate more activity, so spread out +/– as needed

Frequencies in italics indicate a preference among Europeans

Digital modes: keep to higher end of usual frequencies

Band	CW	Phone
160m	1810 kHz *1843 kHz*	1910 kHz
80m	3560 kHz	3985 kHz *3690 kHz*
60m		5346.5 kHz (Ch2)
40m	7030 kHz 7122 kHz	*7090 kHz* 7285 kHz
30m	10106 kHz 10116 kHz	
20m	14060 kHz	14285 kHz
17m	18096 kHz	18130 kHz
15m	21060 kHz	*21285 kHz* 21385 kHz
12m	24906 kHz	24950 kHz
10m	28060 kHz	*28365 kHz* 28385 kHz
6m	50096 kHz	50185 kHz
2m	144060 kHz	144285 kHz

Flexible Power for Small Projects

Bryant Julstrom—KCØZNG julstrom@stcloudstate.edu

Small projects like low-voltage bench power supplies, frequency counters, and keyers are often powered by plug-in wall supplies. Here's an idea, that readers may already have thought of, to allow more variety in powering such projects.

When a project's wall supply is a low-voltage transformer, the transformer's output is most often applied to a full-wave bridge rectifier, as illustrated in Figure 1.

We know how these work: AC voltage is applied to points A and B. When the voltage at A is positive, B is negative, current flows through D1 and D2, the voltage at C is positive, and that at D is negative. When the voltage at A is negative and that at B is positive, current flows through D3 and D4, again resulting in a positive voltage at C and negative at D. The resulting output is pulsating DC, so the rectifier is normally followed by an electrolytic filter capacitor.

If a simple DC voltage is applied across points A and B, two of the four diodes conduct, and smooth DC appears across points C and D. This is obvious, and it can help in the following way.

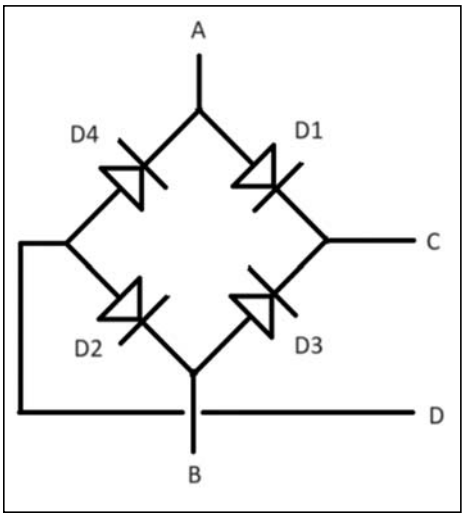


Figure 1—A full-wave bridge rectifier.

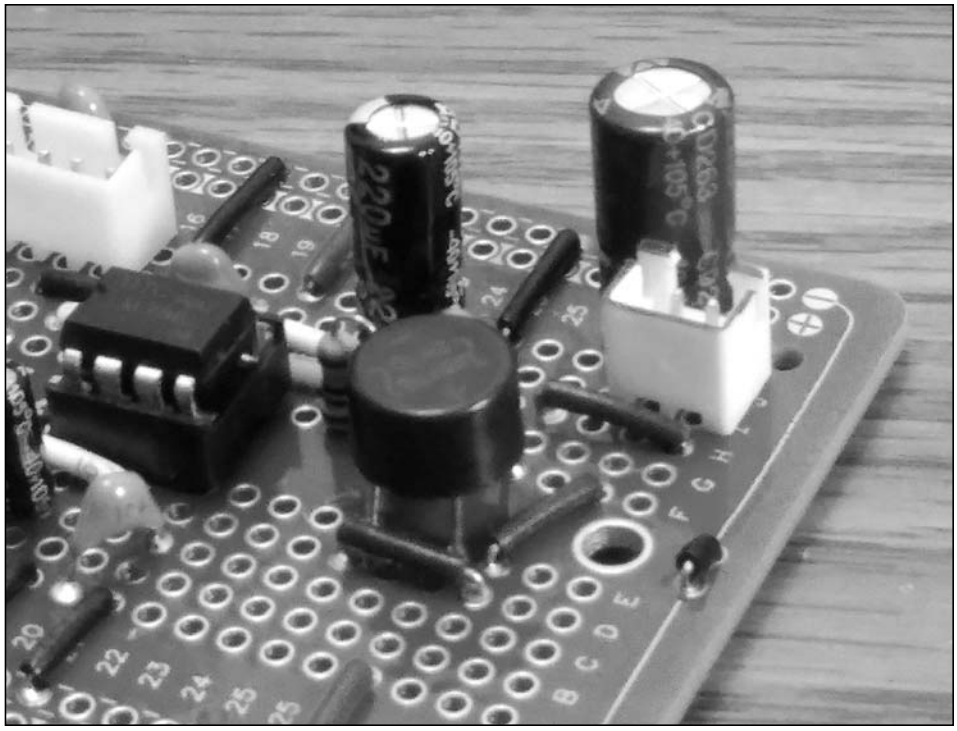


Figure 2—A full-wave bridge in the power input of a small project.

A full-wave bridge across the power input of a project allows it to be powered by any wall supply of the appropriate voltage: either AC or DC, and in the latter case with a connector that is either center + or center –. This allows more options to use among those wall supplies in the box that we all have under the bench, at the cost of one additional component (or four, using individual diodes). Figure 2 shows an example.

Projects that require DC generally include a high-value electrolytic across the supply voltage, so AC input is fine. Also, that voltage will drop slightly through the diodes, but wall supplies come in many voltages.

Two restrictions constrain general usefulness of this observation. First, a project that uses a 60 Hz signal to determine frequency or timing, such as a clock, requires AC power. Second, if a project's power connector has one side grounded, as when a metal enclosure connects to circuit ground, then power must come from a DC supply with a connector of the appropriate polarity.

Otherwise, the inclusion of a full-wave bridge allows more options in powering a project. Now we just have to search for connectors that match.

●●

Do You Have QRP ARCI Operating Awards?

QRP ARCI provides a number of awards, each of which encourages low power enthusiasts to accomplish a wide variety of goals. We invite you to review the various awards and to make a commitment toward earning your own special award. A number of applicants apply for several different awards at the same time, which is fine. We hope you will review your log and determine if you might be eligible for any awards at this time.

Please note that awards are free of charge for active members (maximum of 5 awards per year) — another significant benefit of active membership.

—Preston Buck, NØGLM, QRP ARCI Awards Manager
Email queries to: awards@qrparci.org

Review: Gabil GRA-7359T Portable HF Antenna

John Leonardelli—VE3IPS ve3ips@gmail.com

The Gabil GRA-7350T antenna is a game-changer for portable amateur radio enthusiasts. Its compact physical size combined with the common 3/8-24 stud thread makes it an excellent choice for on-the-go operations.

When I first saw the Gabil antenna come onto the marketplace, I really didn't pay too much attention to it because it looked to me like another compromise antenna that had the M-P (PL-259) type connector. I already had the Comet HFM-350 that uses that connector and I just found it to be somewhat limiting in how I would deploy it. My BNC mount GRA-1899T antenna could also be used with adapters. I don't really like the M-P connector that much, as most of my antenna systems use the standard 3/8-24 connector. I do use them with the Wind Camp RC-1 bracket.

As soon as I saw that they were releasing a version with the 3/8"-24 thread, I knew that I had to have one because now I have the ability to use that with various mounts that I have acquired over the years that I found to give me the most flexibility in the way I need to operate.

The use of the common 3/8-24 stud thread adds immensely to its versatility. This thread size is widely used in the industry, allowing users to easily mount the antenna on various portable setups without the need for additional adapters or modifications. Hip Hip Hooray for Gabriel taking notice to offer this antenna with this thread.

Another strong attraction to this antenna was the fact that it packs down into a small form factor. It could almost fit into a vest pocket. In fact, it does fit into a vest pocket in my Burberry Spy trench coat. The size is as follows: 80m coil 6.5 inches, main loading 11 inches and the telescopic whip is 9.75 inches. It weighs a light 340 grams. I found a perfect carry case as shown in the Photo 1.

Important Advisory: "This antenna is designed to use the car body or the metal handrail as the ground earth when the portable use only. Do not install the antenna fixed and on to the transceiver all the time due to the issues of the prohibited from using for mobile" as per the Gabil instruction sheet. I have deployed the antenna that way using a JAWS clamp made by Workman. However, experimenters found that it can also be used on a camera tripod with appropriate counterpoise wires.

Photo 1—3 Parts to the antenna, plus the JAWS clamp from Workman.

With an upcoming trip to Spain, I also thought this would be ideal for POTA and portable activations. It covers 40 to 6 m plus 80m with the add-on coil. This also

Photo 3—Garage can installation.

Photo 2—Pool shower configuration.

Photo 4—Railing configuration.

allows enhanced shortwave listening and CB radio activity. When I was out and about playing radio, it fit inside my backpack pocket without a worry.

I brought my Icom 705 and my portable CB on this trip to Europe. It turned out this antenna was ideal and also brought it along several bus tours we did. I used RG-316 coax as well to keep things light. I did bring another telescopic antenna system as a backup.

I was right. This antenna packs down pretty small, its light, and it's very efficient. For its small size, it will never out perform a full quarter wave antenna but who can be able to deploy that in a public space without drawing attention or having something that's too heavy. If you are driving to the beach or to the park, then weight isn't an issue, but if you are hiking to the operating location, doing a SOTA summit or just taking the bus into the city park then a small light weight antenna that is efficient and radiates well is what you need.

It uses a slider control that adjusts the Inductance of the coil to match it to the frequency that you plan to operate on. No antenna tuner is required!

It is very simple to use. You just adjust the slider control up or down for maximum noise. And then make small adjustments in order to get the SWR under 1.5 to 1. In many cases, I was able to adjust the antenna to the sweet spot just by listening to and looking at the meter for maximum signal. Of course, I was using this antenna in a portable environment with a JAWS clamp attached to a metal pipe or railing. I did have 16 feet of counterpoise wire that sometimes I used.

I also used it on the CB radio band with a CB portable and for listening to the SW Broadcast bands.

I found the Gabil antenna allowed me to make contacts in various locations and was fast to set up and somewhat stealthy.

The Hotel had a rooftop pool and I used my JAWS clamp to mount it on an outdoor shower (Photo 2). I used it in Gazamel during a tour after having lunch attached to a garbage can. See Photo 3. Another time it was CB radio on a railing (Photo 4).

The next hotel I stayed at in Madrid had its rooftop pool under renovation, and I was able to clamp the antenna to the hotel room window frame. I had it sticking out (I had some Paracord attached to the clamp and the antenna for safety) and I could hear stations but the noise level was S9. This was not a good location. Many city hotels are noise magnets.

Back home, I tried it on the local ONTARS Net on 3755 kHz. A very short antenna on 80m is not going to work DX but it allows great reception and I did try it and work a couple of stations 100 miles away. Next up is to try it with higher power with the Yaesu FT-891 as it supports 100W PEP.

Another great feature was it can be easily used with my other

portable radios that do not have a tuner. The slider does all the tuning.

I had it out in a light rain and windy snowfall and so far no rust and I do wipe it and ensure it's dry before putting it away, but the quality of the materials is very high. The threads are tight and no wobbling. I getting really upset when antennas I buy fall apart after several uses due to poor quality and bad workmanship. Buy once, cry once.

I also have an antenna tripod mount I made that I use with my Manfrotto tripods. This antenna does require a counterpoise in that configuration. I use two 17 ft wires or 4 ten foot wires. Even though it's a mobile antenna it can be used as a portable antenna out in the field with a tripod. Gabil offers a nice once as an accessory. I use them elevated for the longer lengths and the 4 are for use laying on the ground. Elevated is preferred but anything works. I don't spend too much worrying about all of this because all I really want is to deploy the antenna quickly and start making contacts quickly.

My friend is stuck in a HOA community where Fiona is on the lookout for violations but with this antenna he can mount it on the patio table and he can FT8 all he wants. In fact if the HOA police knocks on his door he can quickly collapse the whip, unscrew the base coiled and put it in his pocket as he goes to answer the door... Antenna? What antenna? With the tripod accessory, Brian can set it up in his second floor study. Naturally, SSB needs more signal power and he can use this antenna with his FT-891 at the park.

I plan to put a stud mount on my bicycle rack and use this antenna for operating from my bicycle. Stationary of course. The telescopic whip antenna can be bent if it gets snagged by a tree branch or if handled roughly.

Before I get 1000 messages, the antenna was packed in its heavy duty vinyl bag and went through several airline security checkpoints and several train station security lines with no concerns, issues or baggage inspections.

Overall, the Gabil GRA-7350T antenna is a must-have for any amateur radio operator seeking a compact, reliable, and versatile antenna solution for portable operations. Its combination of compact size, common thread compatibility, and robust performance make it a valuable addition to any radio enthusiast's toolkit.

—73s, John VE3IPS

Information:
https://www.gabilradio.com/gra-7350t

"Amplify" a Baofeng Microphone

Bob Fischer—WB8BEL fischertek@zoominternet.net

I recently purchased a defective Micro-BITX Version 6 transceiver from a ham who said the microphone coming with it had also quit working.

When I powered up the unit, I found the microphone was working properly. All the problems were in the transceiver. After repairing the transceiver, I found that the 20M single sideband output was only 2 to 3 W using the Baofeng microphone that came with the unit. See Figure 1.

I decided to modify that microphone as I had several others in the past. This time I documented the modification because I have seen many complaints about low SSB output using the microphones supplied with some uBITX radios.

Figure 1—The Baofeng microphone syupplied with the Micro-BITX.

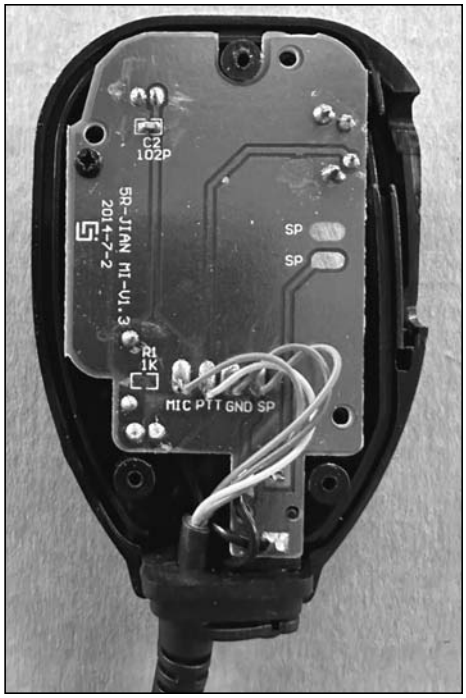


Figure 2—Removing the back cover reveals the PCB inside.

Improving the Microphone

Three screws hold the back of the mic in place. Once the back is off, you will find a printed circuit board secured with one screw. See Figure 2. Remove that screw, turn over the board and you will see the microphone cartridge. Figure 3 shows the original mic cartridge and the much larger PUI Audio AOM-5024L-HD-R high output cartridge we will use to replace it.

When the PCB is lifted, you can also see the plastic well the stock microphone cartridge sits in. It is much larger than the mic but it only has a tiny hole for sound to enter the microphone enclosure. The first thing we're going to do is drill a 3/16 inch diameter hole in the center of the microphone well. This allows much more sound energy to get to the more sensitive mic cartridge we will install. See Figure 4.

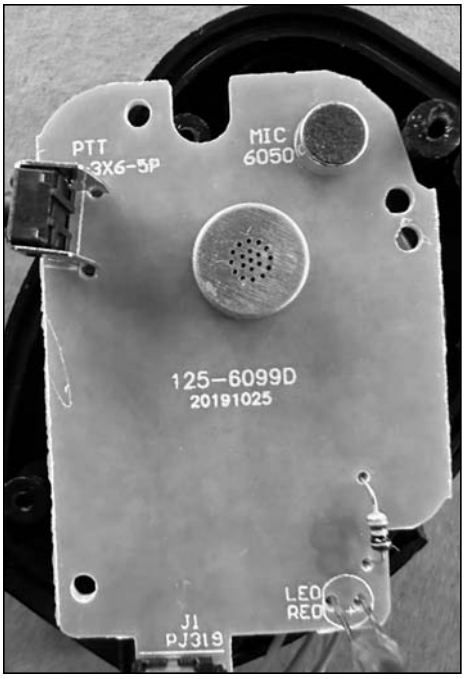


Figure 3—Size comparison of the new mic element.

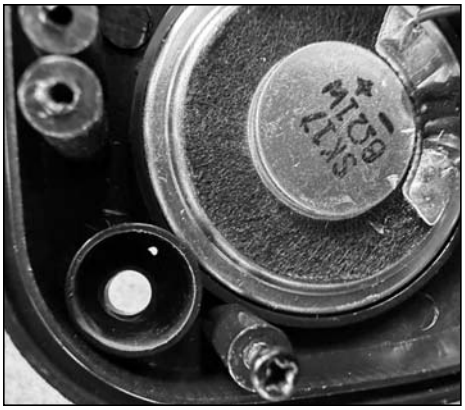


Figure 4—The sound hole is enlarged to 3/16 inch.

Figure 5—Connections inside the modified microphone.

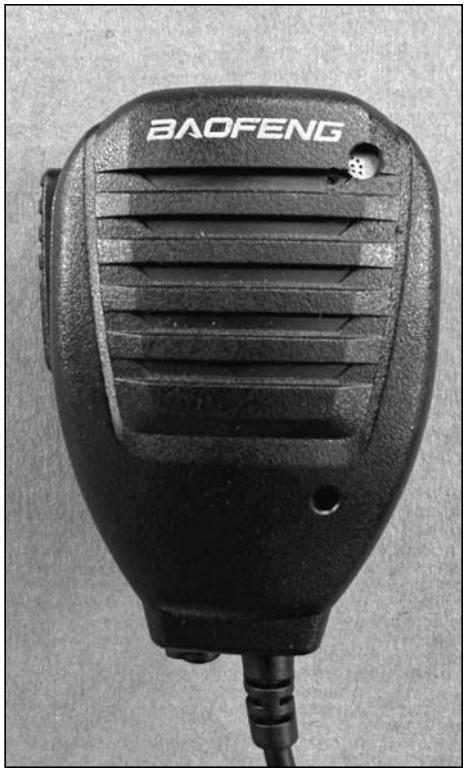


Figure 6—The finished product. Note the enlarged sound hole.

Unsolder the existing microphone cartridge and discard it. Then, solder one end of two small gauge wires (around 3-1/2 inches long) to the pads where the wires from the microphone cord are terminated. Red wire from mic cord needs to connect to (+) pad on the PUI cartridge. The blue wire from the cord connects to the cartridge ground pad. See Figure 5.

When I put this microphone back together, the increased audio output produced 9 to 10W of 20M SSB output from the same radio that had been putting out 2 to 3W with the old cartridge. See Figure 6.

At this writing, the PUI cartridges I have been using are available from Digi-Key Electronics for $3.37 each. They have a 20 Hz-20 kHz frequency response and their sensitivity is -24 dB. The Digi-Key Part Number is 668-1596-ND.

●●

2024 QRP-ARCI Fall QSO Party

Date/Time: 0000Z to 2359Z on 12 October (2nd Saturday UTC)
(8 PM SAT to 7:59 PM SUN EDT)

Mode: HF CW only.

Exchange: Members send RST, State/Province/Country, ARCI member number
Non-Members send RST, State/Province/Country, Power Out

Categories: Entry may be All-Band, Single Band, High Bands (10m-15m-20m) or Low Bands (40m-80m)

How to Participate: Get on any of the HF bands except the WARC bands and hang out near the QRP frequencies. Work stations calling "CQ QRP".

Full information at: http://qrparci.org/contest/fall-qso-party

Software CW Filter

John Clements—KC9ON john@kc9on.com

CW and Music make a great match….

One of my other hobbies, along with amateur radio, is music. I probably have as many music keyboards as I do straight keys. But the last few years I have been pretty dormant playing music. In a recent issue of *MAKE Magazine* I was reading an article for a free piece of software called VCV Rack which emulates a vintage modular synthesizer in software and for me re-opened exploration in music.

A modular synthesizer generates its sound by taking basic building blocks such as oscillators, amplifiers, and, filters then patching various combinations of it all together with cables. The number of sounds you can make is limited to how many modules you have and your imagination. Some famous rock bands have even taken real instruments or their voices and patched into these vintage synthesizer modules for some interesting effects.

Figure 1—A Moog modular synthesizer. (from Wikimedia Commons).

So what does a music synthesizer have to do with CW? There are 2 hints I mentioned in the paragraph above. I realized VCV Rack has several styles of audio filters and it also has the ability to accept audio input from my radio via a sound card. Can I use this virtual music instrument as an audio CW filter with variable frequency and bandwidth? Only one way to find out. The first attempt was to just get audio in, adjust it with a simple filter, then audio out the speakers. The filter initially sounded "choppy" and found changing the block size to 1024 when selecting the audio input gave it a smoother sound. The spectrum analyzer tool shows how well the filter is working. Figure 2 is a screen shot to get started with the spectrum analyzer red trace the input from radio and green trace the filtered audio.

At the time of experimenting the bands were not too crowded with just a single signal and background noise. The next step was to simulate a crowded noisy band. Apparently there must be hams using VCV Rack as there are a couple different modules to create CW signals available to download. So getting carried away I made a filter simulator using 5 CW signals and lots of static band noise (bottom row in Figure 3) then going into a limiter and three filters (2nd row right side). The simulated filter worked so well I was able to pull out a signal -10 dB down from all the other signals and noise. Without the filter I could barely tell the signal was even present. Mixers were used to adjust the various levels as well as bypass the filters.

The current patch as of this writing for the filter was to keep the limiter and 3x filter combination and added sliders to change the bandwidth and frequency of all three filters at the same time (Figure 4). You can probably get away with only one filter module but the extra modules make the skirts of the filter steeper.

VCV Rack, basic instructions, and various modules are available at https://vcvrack.com/. You need to register and there are some paid options but all the downloads and registration used to date are free. The VCV Patches in this article can be downloaded from KC9ON (Links in patches below). You will also need to download modules from the library as noted but patch 5 contains stock modules.

Figure 2—Patch #1: A Simple Filter experiment.

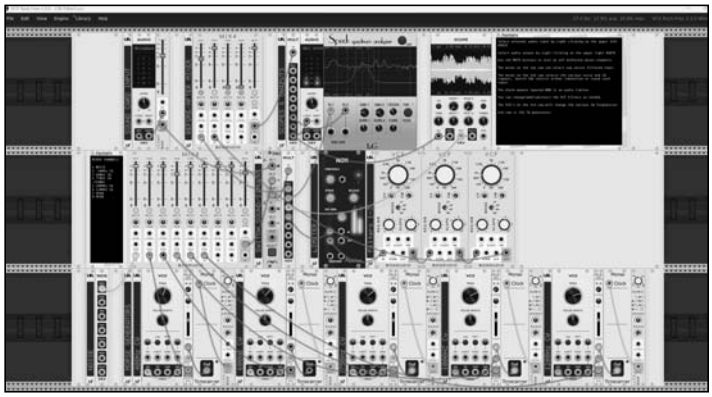


Figure 3—CW Simulator & Filter.

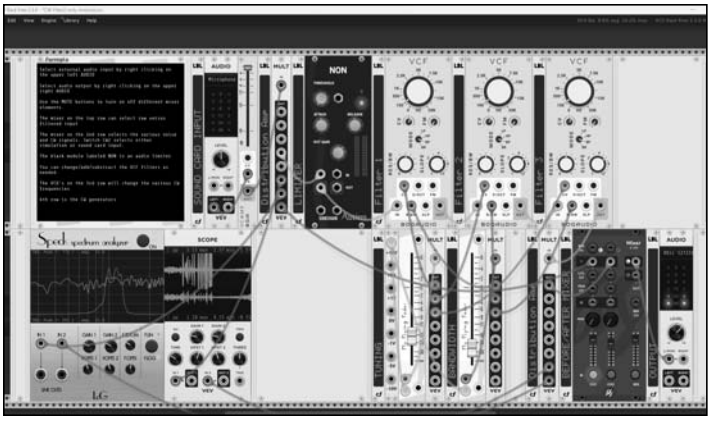


Figure 4—The current version being used.

Figure 5—Patch 1—A Simple Filter.

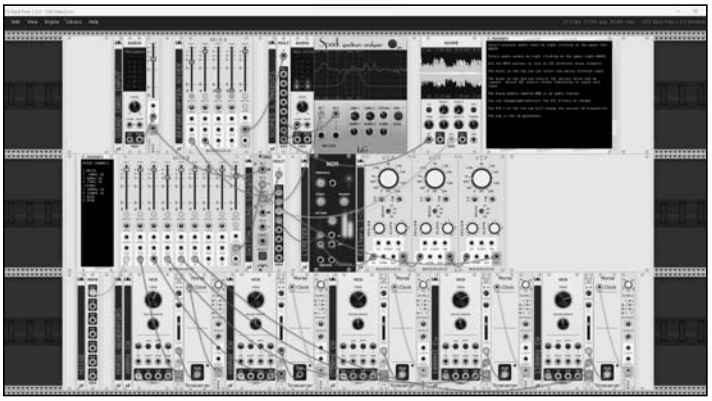


Figure 6—CW Simulator and Filter.

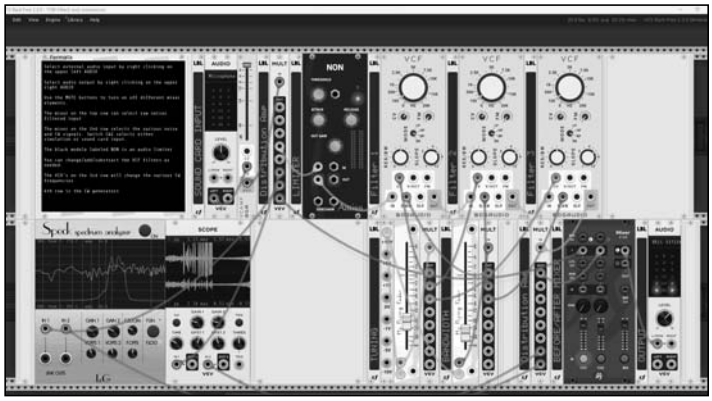


Figure 7—Patch 3—Current Configuration.

Patch Section:

Patch 1—A Simple Filter (Figure 5):

Modules:
- Bogaudio: VCF
- LOGinstruments: Speck
- Stochastic Telegraph: Fermata
- VCV (built-in modules): AUDIO

Patch 2—CW Simulator and Filter (See Figure 6):

Modules:
- Autin: NON
- Bogaudio: VCAMP, MIX4, MIX8, & VCF
- cf: LABEL
- Count Modula: Manual DPDT Switch
- Digital Apothecary: Rue
- LOGinstruments: Speck
- Stochastic Telegraph: Fermata
- Tonecarver: Morse
- VCV (built-in modules): MULT, VCO, NOISE, AUDIO, & Scope

Patch 3—Current configuration (08-10-2023) See Figure 7

Modules:
- Ahornburg: Flying Fader
- Alikins: Reference Voltages
- AS: Mixer 2ch
- Autin: NON
- Bogaudio VCAMP, VCF
- cf: LABEL
- LOGinstruments: Speck
- Stochastic Telegraph: Fermata
- VCV (built-in modules): Audio, MULT, Scope

Patch 4—Improved configuration (08-14-2023). See Figure 8.

A shortcoming with the above patches is the incoming audio is only at 1 Vp-p while the synthesizer operates closer to 10 Vp-p. A

Figure 8—Patch 4—Improved Configuration.

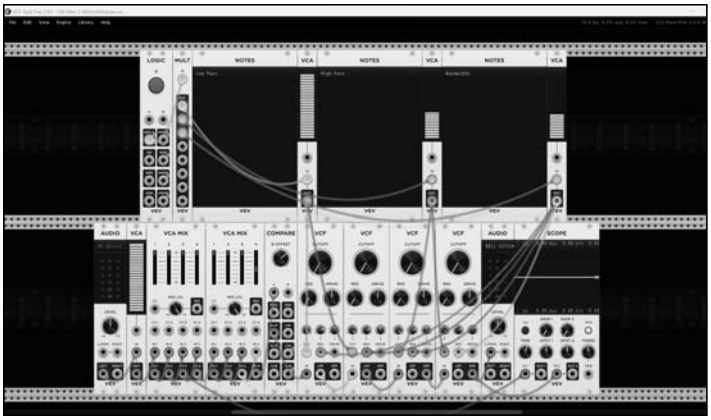


Figure 9—Filter only using the built-in modules.

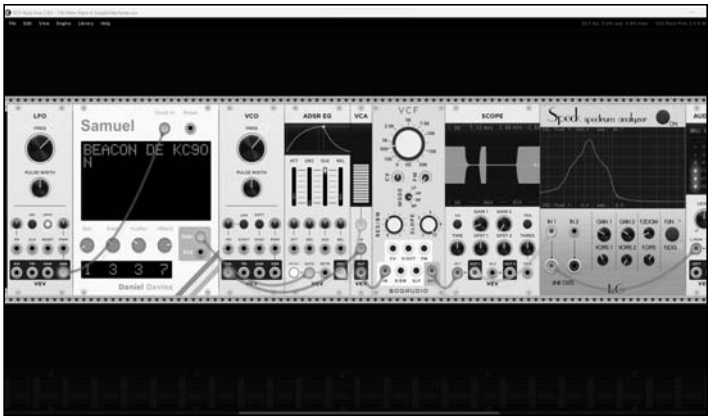


Figure10—Another simple setup to experiment with filters.

multiplier was added to boost the audio to the 10V range.

Modules
- Ahornburg: Flying Fader
- Alikins: Reference Voltages
- AS: Mixer 2ch
- Autin: NON
- Bogaudio: VCAMP, VCF
- cf: LABEL
- Count Modula: Quad Trace Oscilloscope
- kocmoc: MUL
- LOGinstruments: Speck
- Stochastic Telegraph: Fermata
- VCV (built-in modules): Audio, MULT, Scope

Patch 5—Filter using only the built in modules (Figure 9).

However, I'm not impressed with the standard LP/HP stock filter and prefer the BogAudio filter.

Modules:
- VCV (Built-in modules): Audio, VCA, VCA MIX, Compare, VCF, Scope, Logic, Mult, Notes

Patch 6—Another simple setup to experiment with filters (Figure 10).

Modules:
- Bogaudio: VCF
- Daniel Davies: Samuel
- LOGinstruments: Speck
- VCV (built-in modules): LFO, VCO, ADSR, VCA, Scope, Audio

●●

Why Do We Use 468/*f* ???

For decades, antenna references and general-purpose ham radio handbooks have published the following formula to calculate the length of a half-wave dipole:

Length (feet) = 468/*f* (in MHz)

The formula supposedly includes the necessary correction for "end effect", which reduces the physical length compared to a half-wave in free space.

Unfortunately, it is not entirely certain where this number originated — and it is not correct!

A more accurate approximation is: $L = 477/f$ — a better starting point, but remember that the correction factor varies significantly if the antenna is close to ground.

Fortunately, NEC-based antenna modeling programs will calculate lengths with good accuracy. Thus, you can easily confirm the error of 468/*f* and be confident that the antenna you build will require less pruning to put it right on the desired frequency!

NORCAL 40B: A Classic Kit Returns

Joe Eisenberg—KØNEB joe@k0neb.com

This issue marks my first contribution to the QRP ARCI's *QRP Quarterly*. As always, I appreciate your kind comments and words as I bring new kits, techniques and tools to these pages in the future. My goal is to present kits and tools and techniques that cater to all skill levels. This issue is no exception as I present a kit that was a classic QRP kit that played a role in the development of designs for Elecraft's products that followed. The NORCAL 40 CW transceiver kit was developed 30 years ago by Wayne Burdick, N6KR and later updated to the NORCAL 40B by David Cripe, NMØS. This is not a kit I would recommend to a beginning kit builder but definitely one for someone who has assembled more advanced kits involving many types of parts and toroids.

The NORCAL 40 was an innovative kit that offered a high quality CW transceiver with extremely low receive power draw, a big bonus for portable operation. With Parks On The Air and Summits On The Air becoming very popular, the things that made this kit popular in the past are here for the future. This kit incorporates David's technique of using PC board material to form the case which makes the final assembly much easier. All case holes and labeling are already done. The case and board parts are separated by placing the scored line on a table edge and bending it until the parts separate. Once separated, using a piece of sandpaper or an emery board quickly smooths the rough edges left after separation. I keep a supply of emery boards handy for both this step as well as for dealing with the enameled wire on toroids.

Yes, there are 8 toroids to wind. If you prefer, winding them and marking them in advance can make the PC board assembly go easier once you begin mounting parts. The first 5 toroids are single winding type with no taps, etc. The biggest requires 63 turns of #28 wire, so take your time and be careful to wind it correctly. The last three toroids are transformers which also need to be wound exactly as the instructions specify.

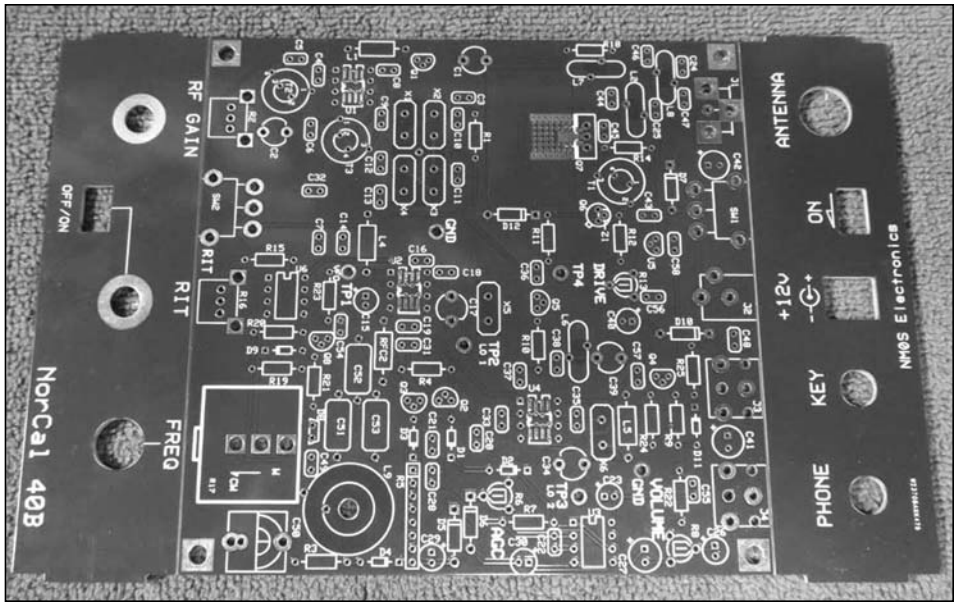


Figure 1—The main PC board with the front and back panels still attached.

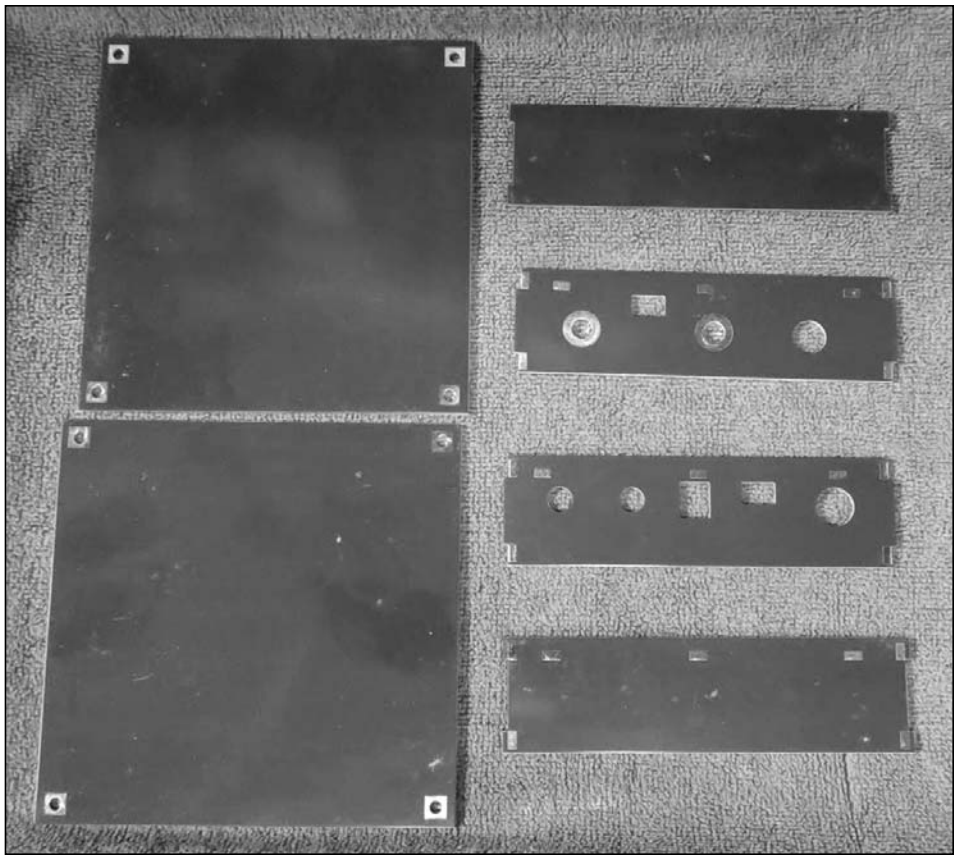


Figure 2—The top and bottom case pieces along with all four side panels.

I found the wire supplied with this kit responds well to the "solder blob" method of removing the insulation and tinning the leads. This method involves turning up the heat on your iron to maximum and creating a teardrop sized blob on the tip and holding it on a lead near the toroid, and as you see it boiling off the insulation and tinning the wire, you gently move the tip away from

Figure 3—The NORCAL 40B parts all sorted and ready to begin assembly.

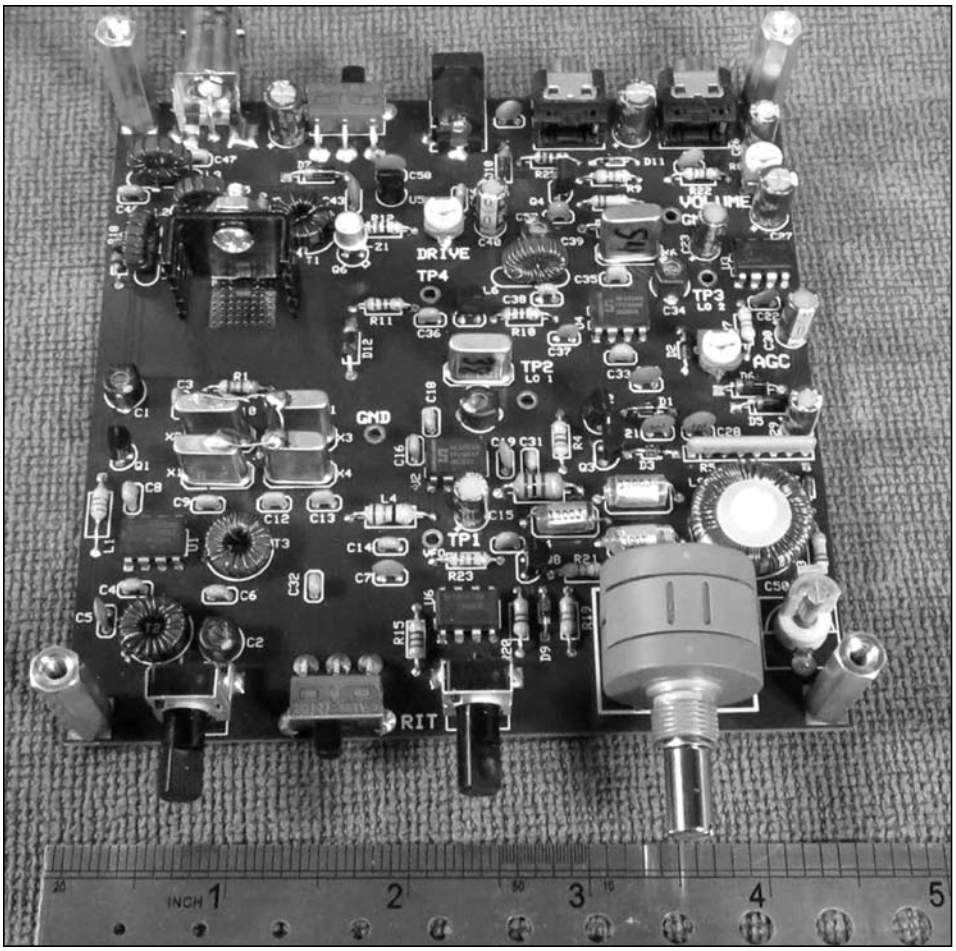


Figure 4—The finished board is ready to mount in the case.

the toroid, creating a stripped and tinned lead. This helps when soldering the toroid to the board by making the solder more easily flow through the hole and make a good connection on both the top and bottom of the board. Toroids always perform best when the connections are both physically and electrically solid.

There are 5 ICs in this kit, all 8-pin DIP type. The places for three of them are also printed with surface mount pads. The reason is that the NE602 mixer ICs, popular with many of our kit radio designs are getting very hard to find in the 8-pin DIP package, and only available in the 8-pin flat SMT package. By cleverly designing the PC board in case the DIP version of the IC become unavailable, the same NE602 mixer IC can be used in SMT form in the same spaces using the pads provided. A 10-turn VFO pot makes for very easy tuning. An RIT is available as well on the front panel.

There are 6 crystals used in the kit, all the same frequency. This makes it easy as you do not need to use specific ones in certain places. Four of the crystals form a crystal filter which gives this kit great selectivity. In addition, the use of a superheterodyne type of receiver greatly reduces the chance of interference from nearby AM broadcast signals. Many kits utilize direct-conversion receivers, which although efficient, they can be vulnerable to strong local AM broadcast signals as well as some shortwave broadcast signals near the band being received.

The alignment steps are relatively easy, although you might find yourself removing a couple of turns from L9, the VFO inductor. This is often needed to bring the VFO up to the desired frequency segment. The steps to do that are in the manual. The good thing is desoldering and removing that toroid is made easier with the larger wire holes provided. It is very easy to heat them up and tug the two wires out and use some solder wick to be sure the holes are clear. It is easy to then remove a number of turns according to the recommendations and only one lead will need to be stripped and tinned again. The VFO frequency center is adjusted with a large trimmer near the L9 toroid.

There are two trimmers that comprise the main receiver front end filtering alignment. They peak rather sharply. I used an oscilloscope to be able to precisely see the changes, although listening to the noise level in the headphones can also be used. There is also a trimmer that adjusts the BFO to peak the audio pitch of the received signal to match the pitch of the filters' peak performance. Another trimmer tunes the transmit drive signal and the drive level is controlled by a pot. There are

test points clearly marked on the board to measure things like the VFO, and I found those points helpful to connect my frequency counter and scope.

The case assembly is simple and involves using tape to tightly secure the outer four panels while making sure they fit squarely and using solder to connect nearby rectangular pads. The top and bottom panels are secured using screws, spacers and standoffs. Using PCB material to form the case is a very low cost and high quality solution that makes for a high quality appearance as well as a strong and shielded case.

It's nice to see a classic kit return to a new generation of QRP operators and kit builders! You can order this kit at:

https://sites.google.com/nm0s.com/home/

—73 de KØNEB

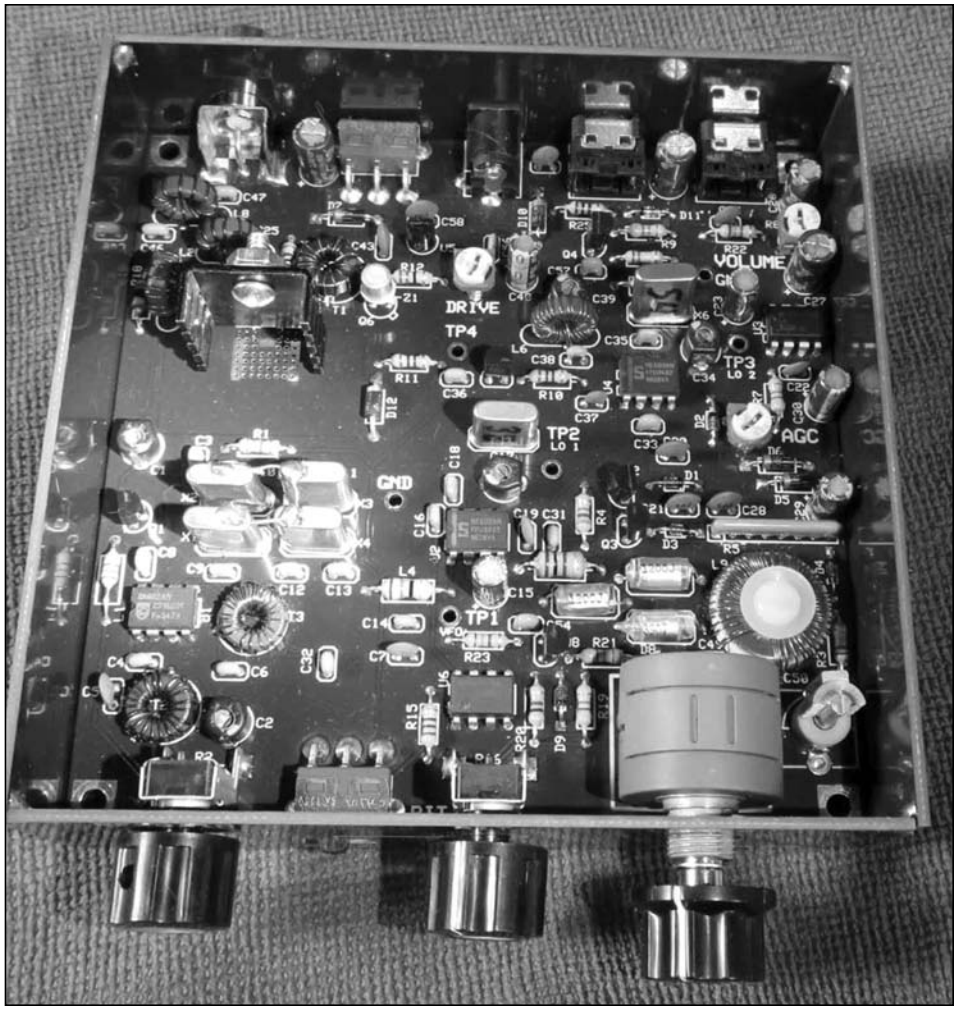


Figure 5—The case is fitted around the main board with the bottom and top removable in case of future modifications or repairs. Notice the solder joining the case side panels together.

Figure 6—A closeup of the NORCAL 40B front panel, Using PCB material makes neat labels.

Figure 7—The real panel includes connections for headphones or speaker, a key, 12 VDC power input and RF

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The CHIXIE

Harold Smith—KE6TI ke6ti.homebrew@gmail.com

Un-minimizing a Minimalist Radio

Many of you are familiar with the "Pixie" family of radios, and the predecessor Micro-80. They are all based on the simple, yet very clever idea of using the final transistor of a crystal-controlled QRP transmitter as the mixer/product detector in a simple direct conversion receiver. The result is about as close to the minimum radio actually useful for communication as has yet been devised.

For this radio I started with the Pixie idea, but added a very stable VFO with keyed transmit offset, and replaced the LM386 usually used for the audio with a discrete version based on a Sziklai pair. I've always found the '386 to be somewhat noisy, and it has lower gain than the discrete version used here.

I built the radio into a can that previously held chicken, so of course it's named CHIXIE.

The VFO might be of interest even to those who aren't interested in Pixie-type radios. It is a Vackar oscillator, voltage tuned by a pair of 1N4002 rectifier diodes. The oscillator and the tuning diodes are fed from a 5V regulator. I used an LP2950-5, though a 78L05 should work. I used the 2950 because, again, I found them to be a bit quieter than the 7805 series.

I used two small caps in series to get the approximately 550 Hz shift when keyed because I didn't have a single, smaller one. One could also use a small variable cap to set the offset precisely. It should be either an air variable of an NP0 ceramic trimmer.

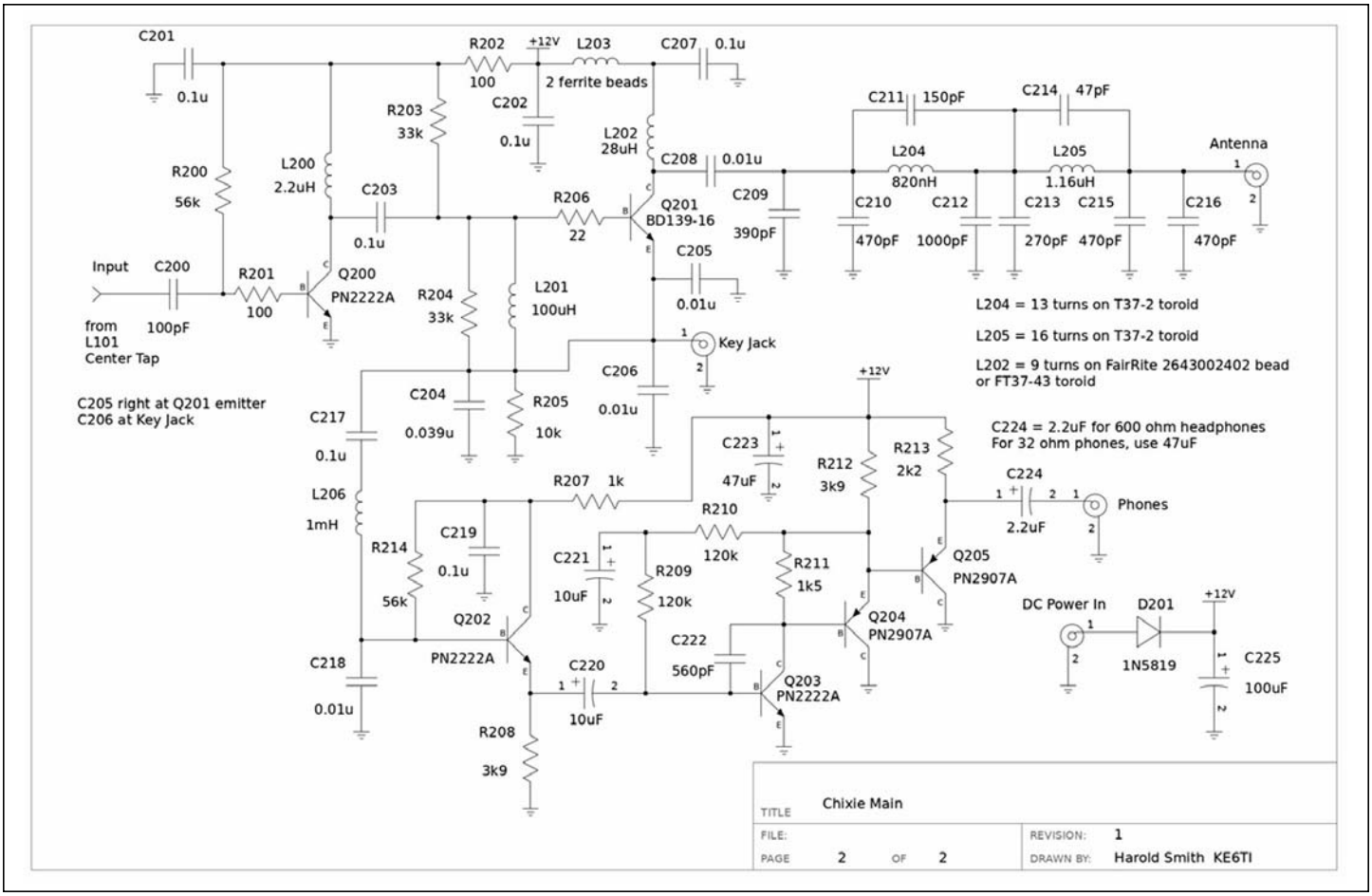
The 10k resistor from the wiper of the 50k TUNE pot to ground is there to linearize the tuning. Without it, the bottom of the tuning range is compressed into the first quarter of the pot's rotation, and the top half of the rotation is the top 15 kHz of range. With the 10k added, the tuning is spread out almost evenly across the pot's rotation.

The combination of NP0 caps and a dash-7 toroid make for a very stable oscillator, and the associated buffer isolates the oscillator from its load so well that shorting the buffer output to ground results in no change at all in oscillator frequency. The VFO as built here is surrounded by styrofoam cut from the trays the grocery store uses to package hamburger and other meat. It is there to help isolate the VFO from external temperature changes.

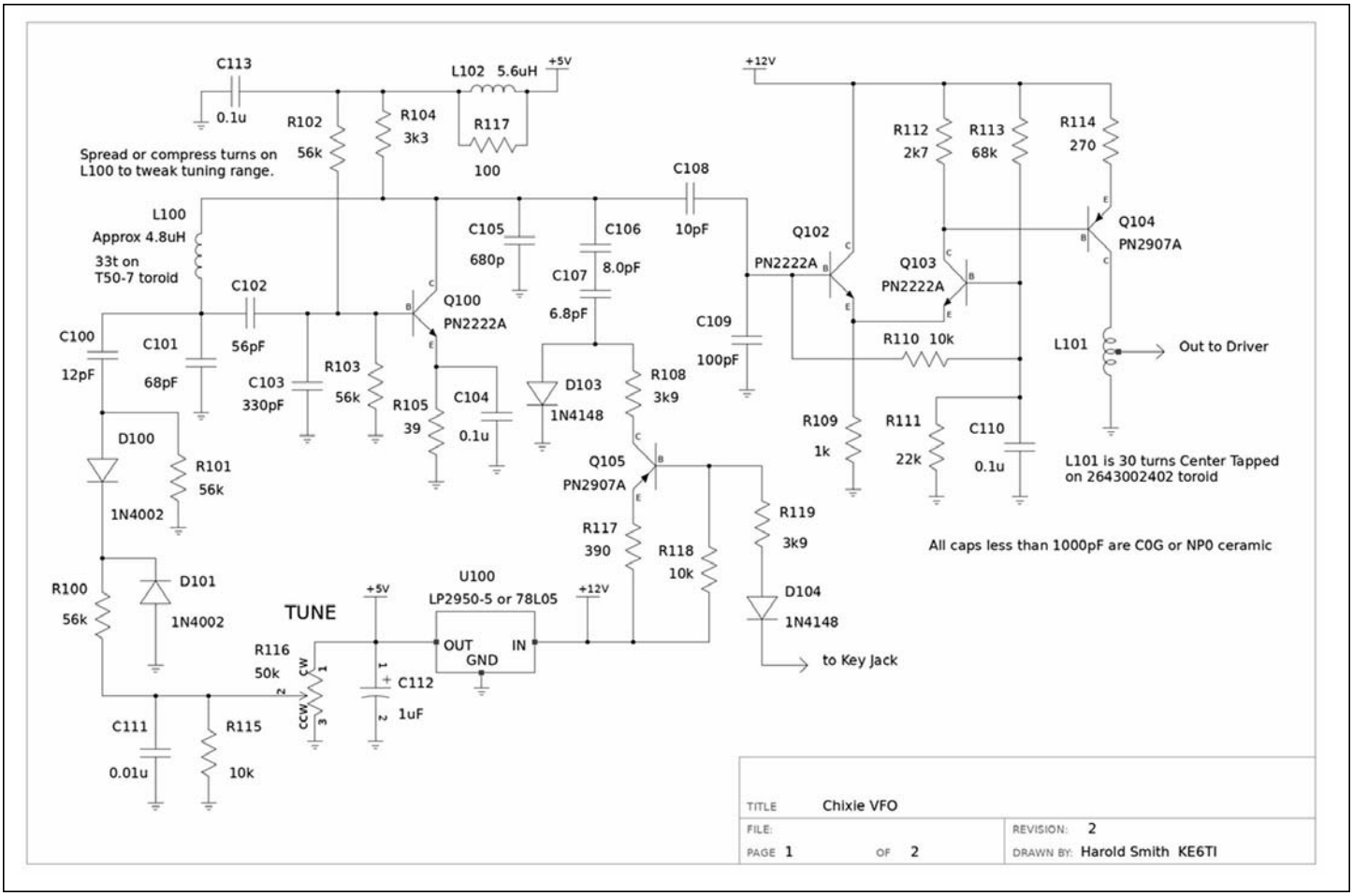
The transmitter will deliver 1 watt running on a 14V supply, and over 900 mW at 13.5V. I would not recommend running on more than 15V.

This is still a Pixie-type radio, and won't ever replace a real radio in most hamshacks. Like the Pixie, and many direct conversion radios, it lacks sidetone. But it was fun to build, and it does work.

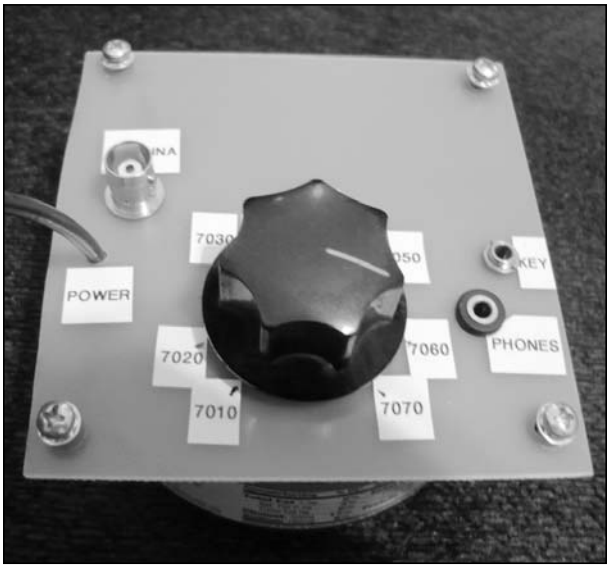
Enjoy!



The CHIXIE main schematic.



The CHIXIE VFO circuit.



The front panel, with tuning potentiometer, wires for power, plus key, phones, and antenna jacks.

The front panel, with tuning pot, wires for power, and key, phones, and antenna jacks.

A Poor Man's KH1

Hiroki Kato—AH6CY hiroki@pacbell.net

A Handheld Multi-band, Multi-mode HF Transceiver

In the fall of 2023 the venerable Elecraft came out with a fabulous handheld HF transceiver called KH1 (Figure 1). It's a dream-come-true sort of a rig if you are a SOTA, POTA or a pedestrian mobile operator. Also, for the frequent traveler like me who likes to operate in the spur of moment anywhere, it is an ideal rig. All you have to do is, just flip on the switch and you are one the air. It is a totally self-contained 5-bander with a telescopic antenna, a keyer paddle, an automatic antenna tuner and a rechargeable battery all built in.

But there is one problem for many of us: the big price tag. By the time you include all options the radio costs north of $1000. Some of the options are not true "options," because without them you cannot operate the rig. You can't imagine operating a portable CW rig without an antenna or a key/paddle. The available options for the KH1 do not include SSB or digital mode capabilities. It is strictly a CW only rig.

I decided to put together my own handheld multi-band, multi-mode transceiver that would cost far less than the KH1. I named my first project XH1. I soon followed it up with XH2 because the XH1 turned out to be not rugged enough for field use and traveling.

What I did was to build a small SDR radio in a hand-held enclosure together with an antenna, a battery and a paddle. There are many all-mode, multi-band small SDR radios with varying quality available from China. I used one called (tr)uSDX* that costs under $100 in kit form from several vendors. This is a perfect radio "guts" to use for rolling your own small portable rig. The (tr)uSDX is sold as a factory assembled package, too, though it only works for low HF bands up to 20m. The ready-to-use assembled version is housed in a 3-D printed case but without a power switch, a built-in battery, a paddle or an antenna.

Figures 2-7 are some photos of my XH1. It is built in a case I put together with old Erector set pieces (courtesy of my grandkids, hi). I call Erector set an old

Figure 2—The first version of my hand-held transceiver, the XH1.

Figure 1—The Elecraft KH1.

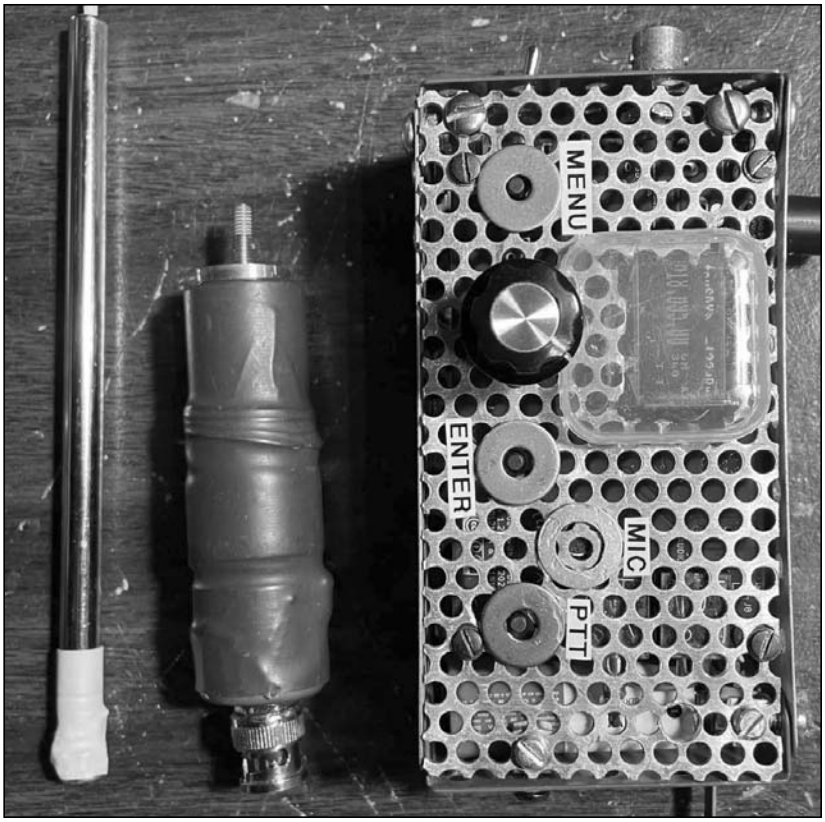


Figure 3—Close up of the XH1 modules.

Figure 4—Here I am holding the radio.

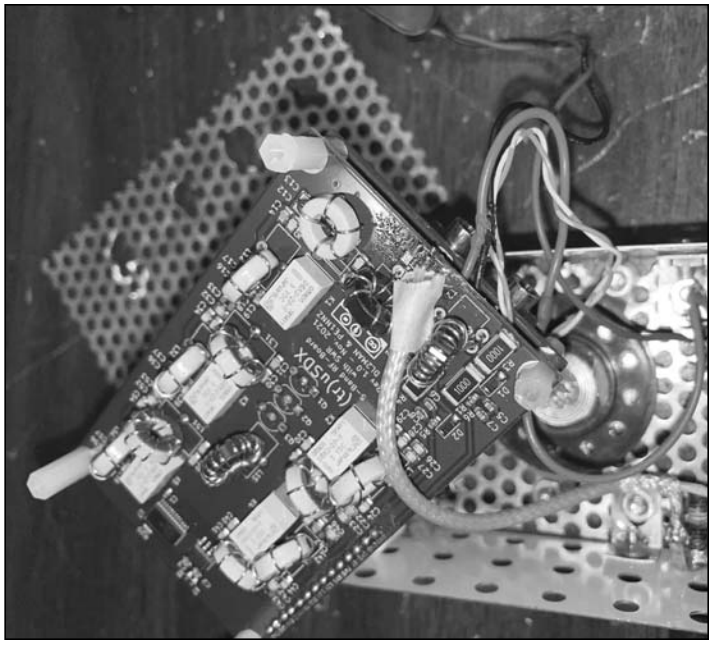


Figure 5—A look at how it's built.

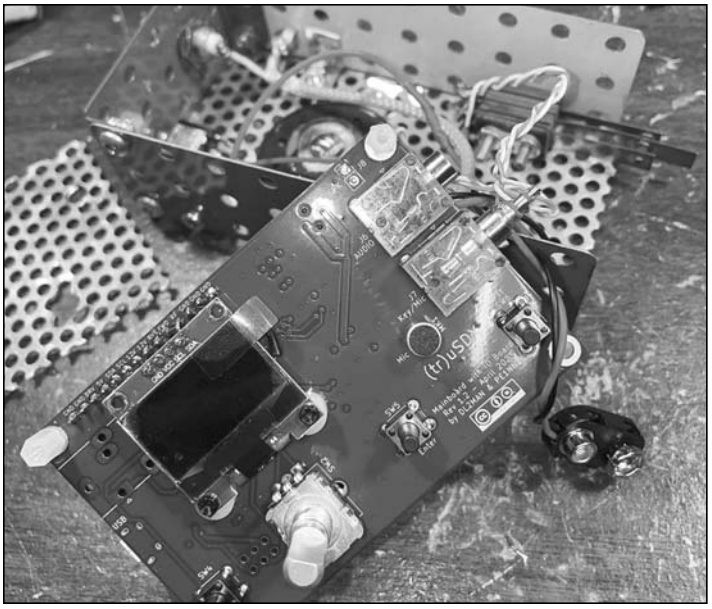


Figure 6—And from the other side of the (tr)uSDX board.

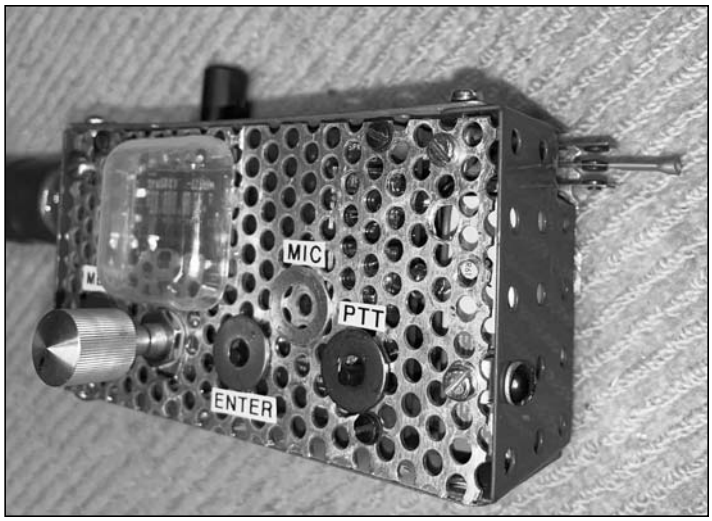


Figure 7—The front of the XH1.

timer's 3D printer, as it is easy to try building any number of enclosre designs. The XH1 contains a built-in paddle made of repurposed old toggle switch parts. These toggle switches are often found in swap meets for a few dollars. I had a bunch of them in my junk box.

The built-in battery is a common household 9V battery. The (tr)uSDX can operate with any voltage from 5V to 15V, although the higher voltage you input, the higher output you get up to about 5 watts. I chose a 9V battery for its small size that will output 2-3 watts depending on the band, but you can plug in 12V external source if higher power is desired.

The antenna is a home-brew base-loaded telescopic vertical terminated with a BNC connector. This is based on Doug Hendrix's, KI6DX, design presented at Pacificon several years ago. (a complete kit is available from QRPGuys.com.)

The XH1's is a pleasing package: very light and easy to operate. The paddle works effortlessly and its physical placement makes it easy to operate. Best of all (for me), the whole XH1 was built with no newly purchased components other than the "guts." Every component came from my junk box. One of the advantages of being an old timer like me is that he/she is likely to have a huge junk box. (In fact, I often feel like I live in a large junk box itself when I am in my shack.)

Well, not everything turned out to be perfect. Though its small form factor and lightness is great, it is a bit too flimsy for a long time, outdoor use. If I accidentally drop it to a hard surface, it is likely not to survive. So I started thinking about ways to build a sturdier version. I happened to remember that I had somewhere in my junk box an old Vietnam War-era handheld VHF FM transmitter whose enclosure I could possibly use as a case for the version 2. The old military radio is called AN/PRT-4A (Figure 8). It is something I picked up many years ago at the annual West Coast

Figure 8—The AN/PRT-4A case that I used for the second version.

Figure 11—High-band antenna.

Military Radio Collectors' meet in San Luis Obispo for something like $20. I had no idea what I would do with it but liked the look of it**.

Figure 9—Close-up view of the final XH2 unit.

Figure 10—The AN/PRT-4A enclosure compared to a factory-assembled (tr)uSDX.

I removed the guts of this VHF transmitter hoping that I could fit the (tr)uSDX inside. It didn't quite fit but after grinding out interior walls and expanding the cavity I managed to squeeze in the new radio. The battery case (at the bottom) is detachable and is big enough to accommodate a switch, batteries (3x CR123A), a terminal for radial wire. Although I could attach a paddle inside like I did for the XH-1, I decided to place it outside (on top the battery case) for ease of operation.

Figure 9 is the result. On the bottom in Figure 10 is a factory-assembled version of the (tr)uSDX for size comparison.

I home-brewed another base-loaded telescopic antenna (Figure 11) specifically for high HF bands (15, 12 and 10m).

You don't have to be poor to build this Poor Man's KH1, but you can have fun building one.

Notes

* The (tr)SDX kit comes in three different 5-band combinations. The Lo-band version comes with 80, 60, 40, 30 and 20m; the Classic-band had 80, 40, 20, 15 and 10m; the Hi-band 20, 17, 15, 12 and 10m. The factory assembled version is available only for the Lo-band. I chose the Hi-band kit.

** I am surprised to find recently that many used AN/PRT-4A radios are still actively traded on eBay.

●●

This article was a presentation prepared for QRP ARCI's Four Days in May 2024

Stealth Operation from Hotel Rooms and Other Unlikely Locations

Ross Ballantyne

VK1UN/VK8UN/EX0AA/6O0O

Firstly, a bit about myself, I was first licensed in 1978, in Australia with the callsign VK3YKX. Since 1992, I've worked in various "holiday" QTHs with the UN and, in each QTH, with the exception of Iraq 1996, I've managed to obtain paper licences in each of these spots. I've held the following overseas licences:

Before the UN:	G6BTE, OZ/VK3YKX VR2/VK3YKX
After commencing with the UN:	XU0UN, ZS1UN, C91UN, 9A9UN, CN2UN, S07UN, 4W6UN, custodian 4U1ET, EX1UN, T61AA, 6O0O and now EX0AA.

I have also done short consultancy missions to Nigeria, Kyrgyzstan and Pakistan. Of course, in all travels to and from permanent missions, home leave, to consultancies and now family trips, I've set up in hotels along the way so I can claim a little bit of experience in this regard!

What can be achieved? (Dayton 2022)

Early in the peace(-keeping missions) I would mostly use voice as a mode of operation until WSJT came along in March 2008 and I started WSPRing with Bob Sutton ZL1RS when he was in Ethiopia as ET3AA. WSPR became my passion, although in Afghanistan I did do quite a bit of 6m and 2m EME, as it is a set and forget mode that is very compatible with my then work situation. You'll note that I am user number 195 on WSPRNet.org as an early WSPR starter.

What do we need for successful operations?

We need suitable atmospheric conditions;
We need to understand propagation time, distance and frequency;
We need a suitable transceiver and power supply;
We need an antenna;
We need to integrate radio, power supply, feed and antenna;
We need a proper operating strategy.

With the exception of the first factor, condx, we can control and optimise all of the factors below that. I am going to cover all that I can that has allowed me to maximise the performance of my station(s) in many varying QTHes.

Licensing

It is important that you establish whether or not the county you are visiting has a reciprocal agreement with the country that issued your Ham Licence and that is entirely on a situation by situation basis. Also, some countries are very touchy about communications equipment being imported without security or customs approval and, in many cases, even transit through the country can be tricky. I can give a number of examples of such concern.

My Australian licences are are noted in the "Advisory Notes applying to licence no:…"

"This licences accords with the requirements of the European Conference of Postal and Telecommunications Administrations (CEPT) Recommendations T/R 61-01." and thus is able be used in countries that note and adhere to this CEPT Recommendation. As I understand it, please correct me if I'm mistaken, US issued licences also accord to CEPT Recommendation T/R 61-01.

Radio

Weight is a primary consideration for travel radio equipment and also battery packs, especially in relation to the carriage of Lithium Ion battery packs in hold baggage, most airline security require Lithium packs to be carried in hand carry-on baggage and often there are limits to the total mAH capacity allowed, so consideration of radio battery packs and phone chargers total capacity need to be kept in mind. Another very important issue is the power consumption drawn on Rx, I have used many different radios, including more recently, the IC 705, good radio, however has a high standby Rx current draw.

Another important consideration is, if you are primarily considering digital mode operation, the method by which the FSK is produced in the radio. One factor that I have found is that QRPLabs direct FSK generation, in the case of Ultimate 3 beacon, QCX, QDX and now QMX is far more "decodable" than SSB or SDR generation of WSPR or other FSK modes. Now this is not a commercial plug for Hans, however, the QDX is tiny, low Rx current consumption and does direct FSK generation. Neither does it look like a radio for customs and airline security bypassing.

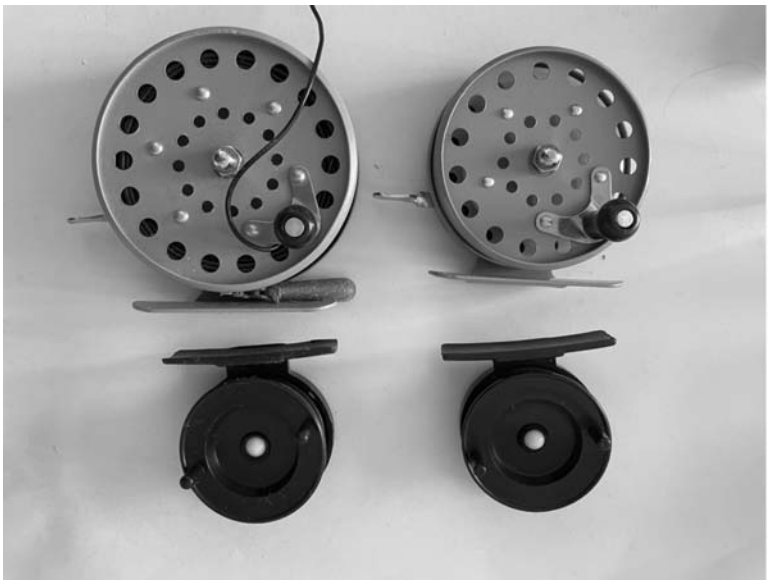
I often use a small LiPol battery pack using two cellphone batteries and a 2S power management board. This achieves two things, light weight and low AC noise into the Rx from AC supplies. Usually you can get 3-5000 mAH cellphone or notepad batteries for next to nothing and are easy to make into an 8.2V peak battery to power the RxTx. At home, I often use a pair of modified 30,000 mAH phone chargers that I have directly connected a 2S board to the cell +ve. Word of warning it is extremely dangerous soldering directly to a lithium battery cell from a short circuit and heat point of view. I usually include a 5A poly switch fuse to (slightly) protect myself.

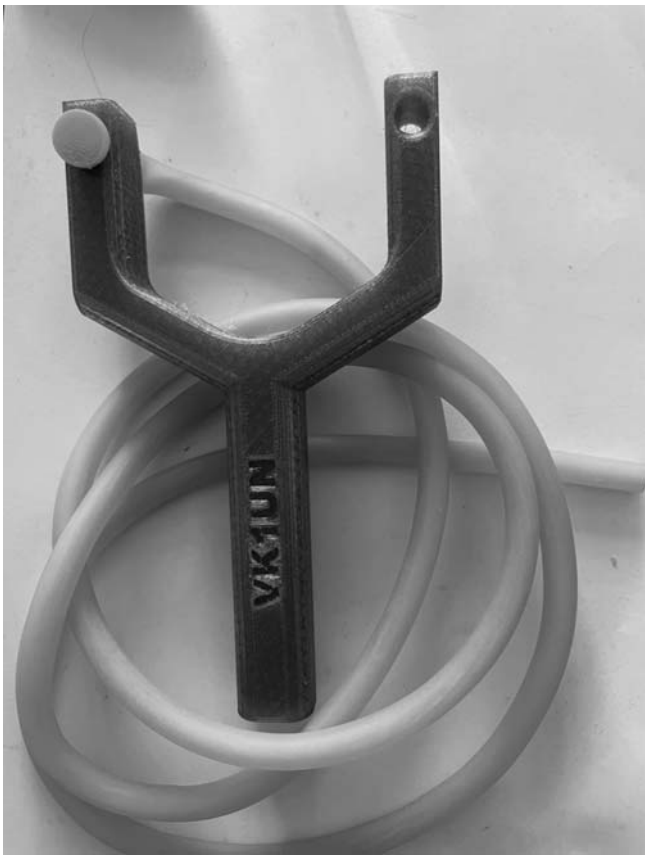
If you are running digital modes a RaspberyPi-400 with a small LED/LCD display is ideal along with either a separate phone charger pack supplying the RasPI or its own RASPI power supply.

Antenna

Virtually all my antennas are usually made from wirewrap wire—solid copper and usually, you can buy a 300m roll from AliExpress or EBay for next to nothing. I do carry about 10-15m on a fishing reel with a lead sinker to hang down as a counterpoise as well, if I have thrown out a long wire. I have a number of small fishing reels that I pre-wind 10-20m of wirewrap wire on and also carry a number of small lead sinkers, to keep the wire taught and hanging vertically from the end of whatever antenna support I use.

First reel is my counterpoise wire and other three are my antenna reels, grey are aluminium bottom two are black plastic that I found the other day in a local fishing shop. Grab a handful of small lead sinkers, 10-30gm are useful weights.





Antenna wire launchers. I do usually carry two carbon fibre collapsible fishing poles of 5-7m in length which are often my main antenna supports. I also take one small spinning reel that will assist in casting an antenna out into a tree if needed, however the slingshot is quite useful for that. Warning carrying slingshots into some countries maybe as considered weapons and might get you into trouble. Carrying a WOODEN slingshot is not allowed into Australia for quarantine reasons, so I have done some 3D printed plastics slingshots and will carry into countries unassembled to avoid such security or quarantine problems.

My bald eagle I got in Bratislava one trip but, being wooden is not suitable for import to VK.

5.4m and 6m poles from local market. Being close to China and having a population keen on fishing has its advantages. Of course, choose a pole that will fit diagonally in your suitcase! (Photo next page)

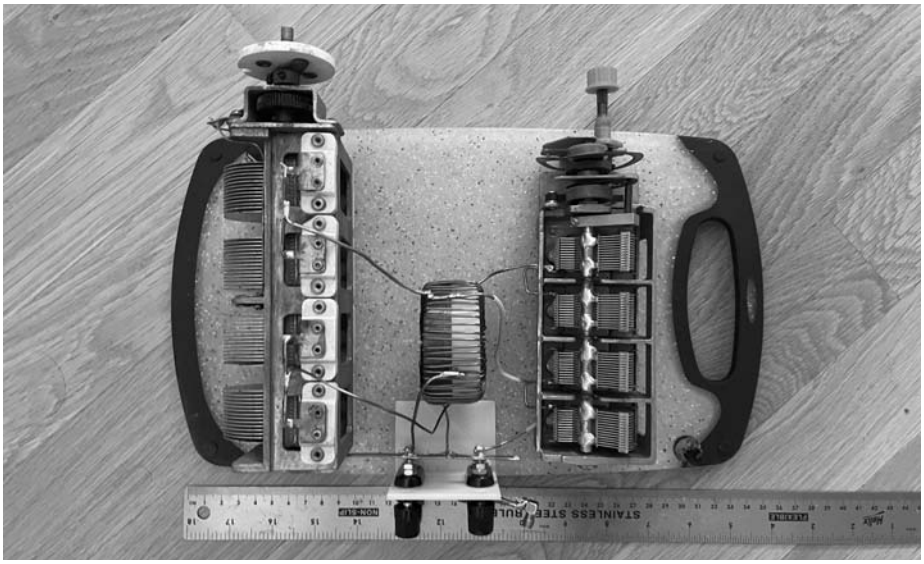
Types of antennas: **get as much wire out as possible!!!**

I will try to sling a wire into a tree, onto another roof or, if neither possible, put a fishing pole out horizontally and hang a vertical wire. If that's not possible then use the fishing pole with 4-5m vertically and hang another 7-10m down like a folded dipole. If all else fails just hang a wire down the building facia making sure it is not hanging in front of windows below!

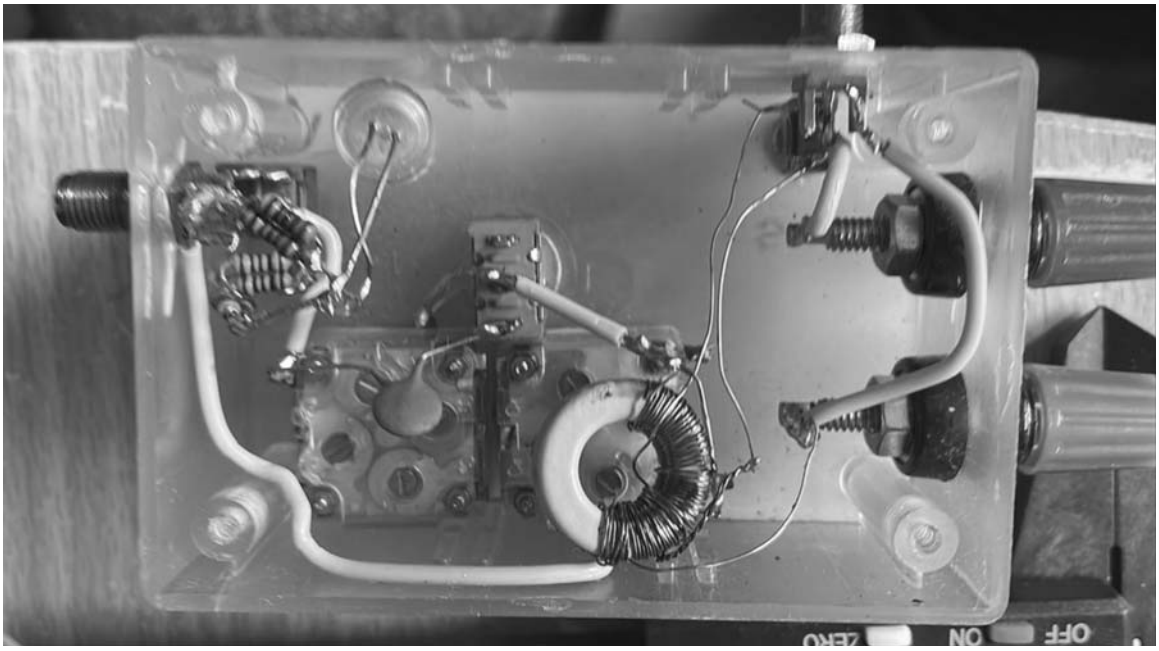
An essential accessory to any fishing pole is a handful of releasable cable ties—I picked these up in Taiwan but you can find on AliExpress and eBay. About 6 at least as they can be chained for longer needs.

Coupling

Now the super critical part: An antenna match that is effective! I have build dozens and dozens of antenna matches time and always a straight LC match is the simplest. However, it is not sim0,to take large roller inductors and set upon window sills in rooms. This is a superb tuner but hardly practical for travel.

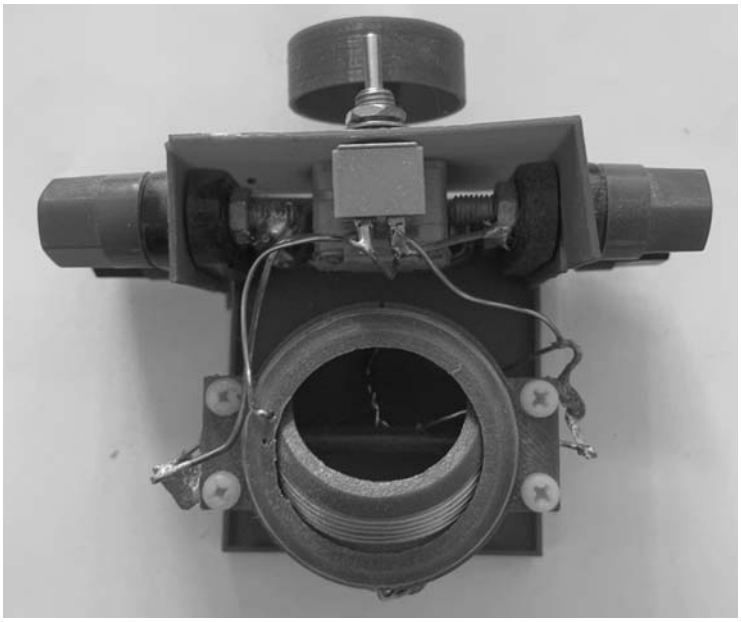


A fair while ago I became quite interested in Z-Matches as a device which had a wide tuning range and I made up many 20-30 or so, using polyvaricon capacitors and small T68-2 or T68-6 toroids, as examples here:



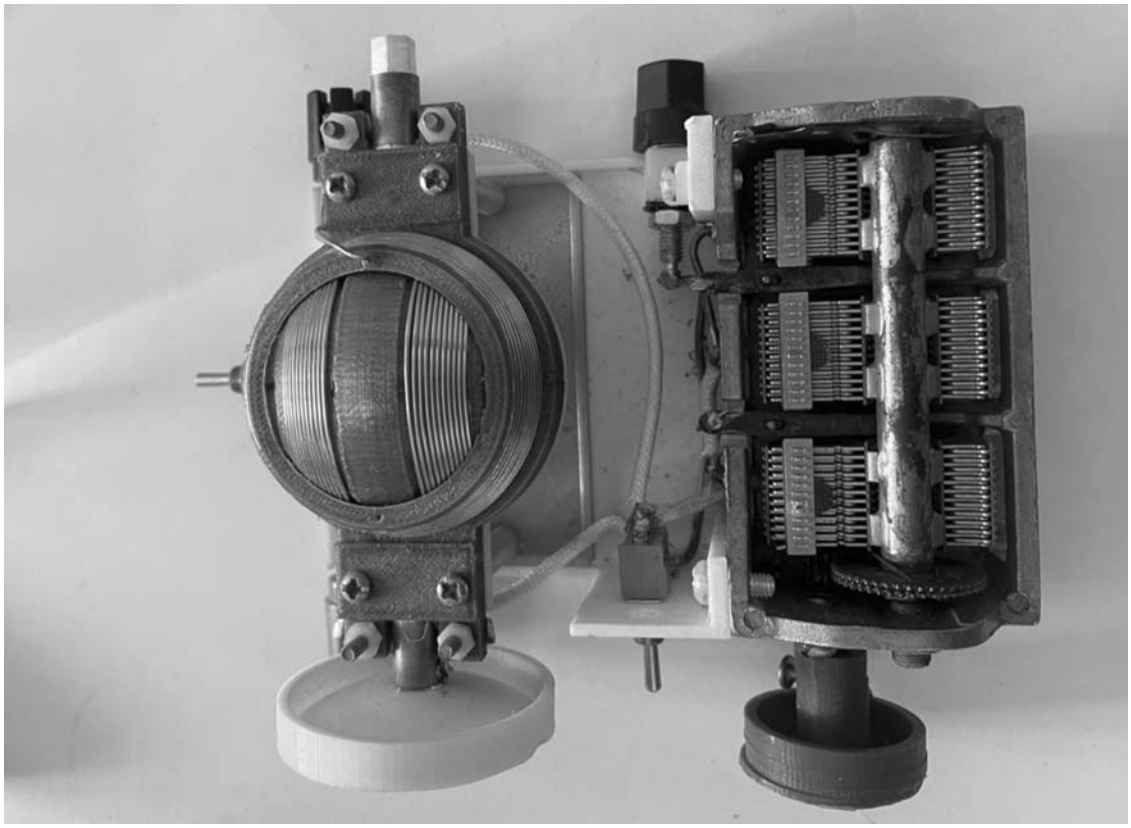
I've made a lot of hotel room contacts with this Z- match.

Until, one day I did a comparison between my best Z-match and a straight LC match made with air wound L and a polyvaricon. I measured the RF volts on the antenna wire for both the Z-match and LC match and found that, at tune, the Z-match only provided half the RF volts on the wire that the LC match did. From then on I only used TXxx-0 toroids or straight air wound inductances. It was t about this point that I became interested in Variometers and made a large number of test unit on cardboard tubes, plastic bottles and even tried to wind one on a ping pong ball.



Since then I have learnt to 3D model and have printed dozens of my own 3D design of variometer from 300 nH to 2 mH!

I have made a number of LC matches that have allowed me to get on even 160m from a hotel room in Istanbul.

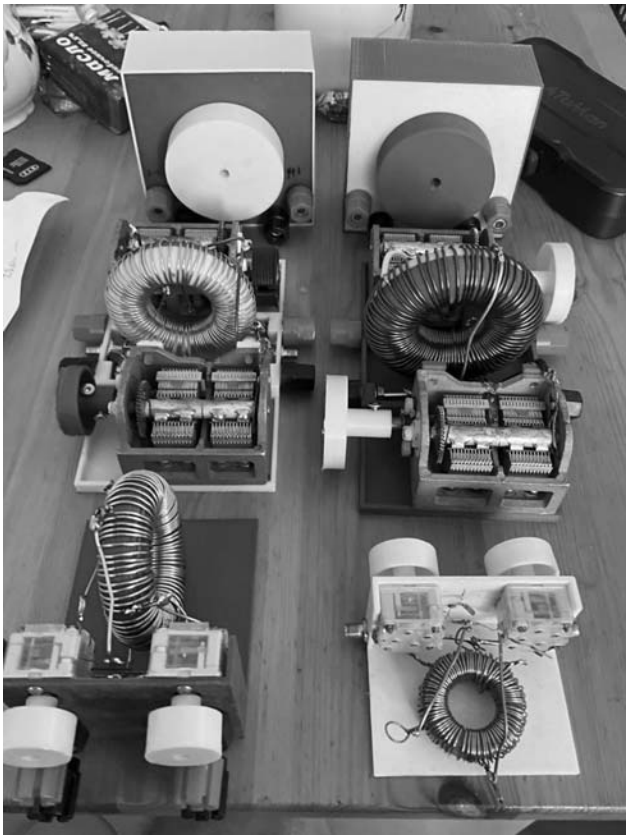


HOWEVER!

I have come across an amateur's antenna pages that changed the whole ballgame!

https://pa0fri.home.xs4all.nl/ATU/FRImatch/FRImatcheng.htm

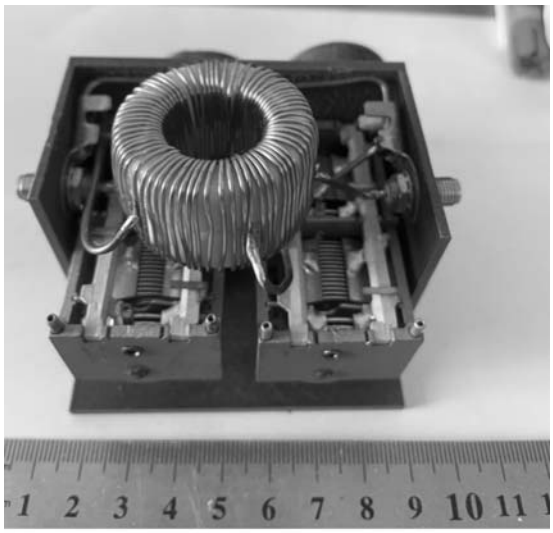
And in that his FRI-match—a modified Z-match has changed everything. The rather large tuner, above, built on a chopping board, is a FRI-match but built with a 3D printed toroid.



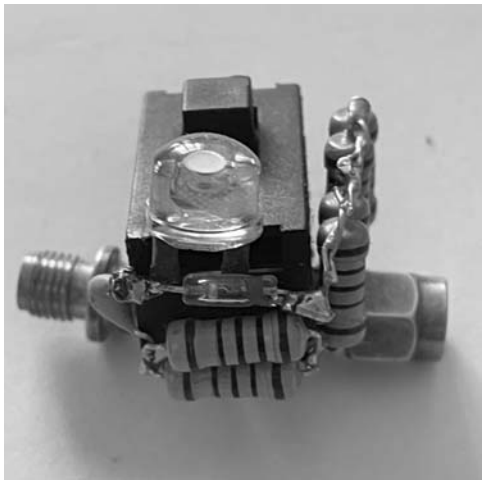
Since I found this page I have made many FRI-matches and have had some outstanding success from many locations,including here in Dayton last year. I print ALL my toroids and cases. Right now I am investigating a variometer wound with pentifilar wire to see if I can make a variable C AND variable L FRI-match.

It is very important to note that FRI-matches are reversible to match low to high Z or high to low Z.

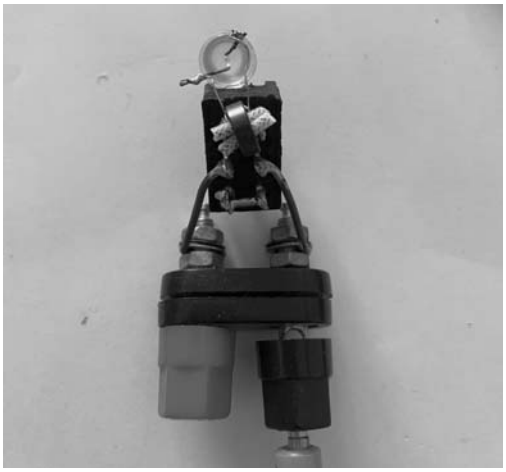
This is my favourite FRI-match



Now another two important accessories are the Wheatstone Bridge LED SWR indicator in which I use metal film resistors 100 ohm (2x) or 200 ohm (4x) these will provide a proper load for the transmitter while tuning.



...and an antenna current indicator only needed to confirm RF current is actually going out on the wire.



I hope this has given some insight into QRP operations in hotels that might assist you in getting going!

One more unlikely QTH—from Somali UNOPS compound 2015:

An ALC Box for Adjustable QRP Power

Glenn Finerman—W2BX fintronicsusa@gmail.com

I understand that dedicated "QRP Transceivers" are all about portability. I do on very rare occasions operate QRP portable with my IC-705 but the majority of my QRP operations are from my home station.

Can your typical non-QRP, 100w transceivers be pressed into use as a QRP and even QRPp transceivers? The answer is "yes they can" if they have an ALC input typically found on transceivers with connections for a linear amplifier. Modern transceivers boast incredible receive performance and features. Most modern 100w transceivers have the ability to reduce power to 5 watts but this setting may or may not produce an actual measured 5 watts output, and what about 1 watt? 100 mW?

This all started recently when I was nearing my goal for the QRP ARCI DX award. I was about 10 countries away from 100, (all with 5 watts and a wire antenna.) when I decided to place an accurate, calibrated QRP wattmeter inline to see what my actual power output was. Up until that point, I had been relying on the 100w transceiver's power setting of "5 watts" output. WRONG! I was actually producing 3 watts into a 50 ohm load!! Not that 3W to 5W makes that much difference, but… you certainly want to squeeze every last milliwatt out when you're operating QRP!, and especially when you're running QRPp!

Another issue I found was when adjusting the power on the radio up from the 5 watt setting in one watt increments. You would expect these settings to match what you see on a wattmeter… nope. Could this have something to do with input voltage to the transceiver? (not 13.8?) who knows...I started looking for a way to continuously adjust output power via the ALC input on the transceiver down to the milliwatt range. I found a couple of simple circuits online, played with values until I came up with the circuit below, built in a small Bud-Box. (Please excuse my hand drawn schematic).

I have a Yaesu FTDX-101D and I've recently acquired the FTDX-10.

These both have incredible receivers. The testing of the ALC box was done on the FTDX-10 which I wanted to use at QRP and QRPp power levels.

After finding out the 10 pin mini-DIN plug on the Amazon cable wouldn't plug into the "linear" jack on the FTDX-10, (I had to modify the metal shell to make it fit) I proceeded to test the box.

This circuit is a basic voltage divider that applies a negative DC voltage to the ALC input of the radio. The more negative ALC voltage applied, the lower the output power. The trimmer sets the maximum voltage limit. Bad things might happen if you try and force 9 volts into the ALC input of the radio so set this up with a voltmeter for a max of about 3 volts out BEFORE plugging it into the radio.

You should be monitoring the ALC output voltage of your box with a voltmeter when doing this. With the radio set to produce 5 watts, connected to a 50 ohm dummy load, CW mode, set the main pot fully counter clockwise, (minimum power out / max ALC voltage) key the transmitter and adjust the trim pot so the maximum amount of voltage out of the box will produce 100 mW out of the radio, read on a calibrated QRP wattmeter or O-scope.

Here is the ALC power control box on top of the FTdx10.

The trimmer sets the max voltage limit and the main pot adjusts the voltage out within that range. With this setup I was able to adjust power from 100 mW to 5 W and anywhere in between.

One look at the schematic might tell you more than my word salad. (hi hi)

My disclaimer…. I've only tried the ALC box on one transceiver, but I have no doubt it will work on many other transceivers with ALC inputs.

Maybe you have an older transceiver you'd like to put into QRP QRPp service or you'd just like to experiment. Either way, good luck, be safe, have fun and keep QRP alive!

—72, Glenn W2BX/QRP

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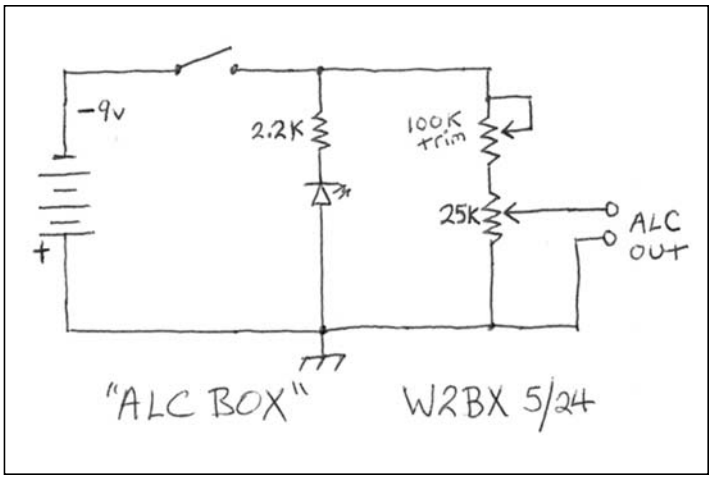

The schematic diagram of the QRP box.

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- Our aim is to promote QRP and a variety of related activites. Many of our members enjoy home construction, kit building, antenna experimentation, backpacking and portable operation. Minimalist radios built in small tins are fun, and very popular, but we also enjoy the very latest high performance radios such as the Elecraft KX3, the new SDR rigs, and great kits like the QCX from QRP Labs, kits from 4 States QRP Group, and the uBitx rigs.
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