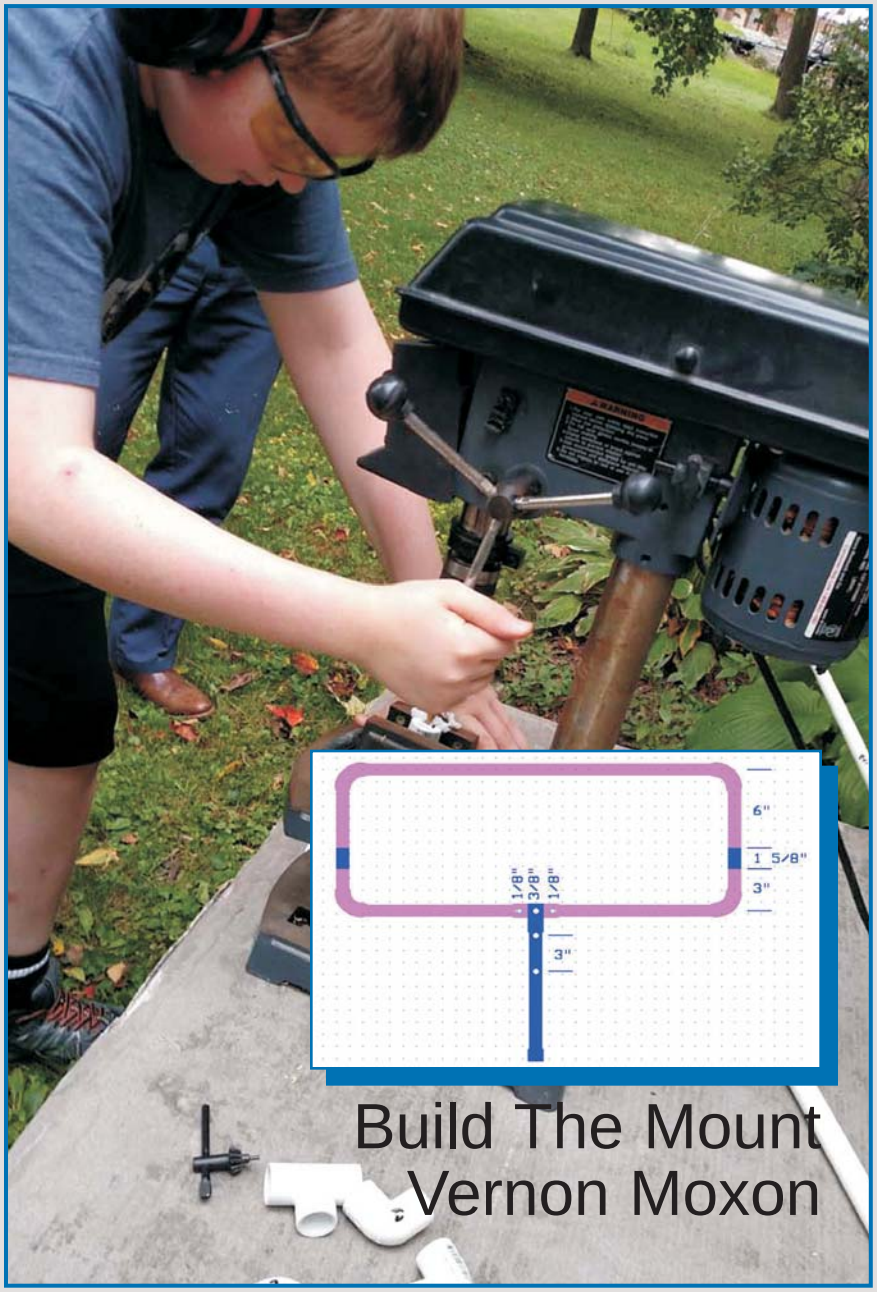
Your Construction and Operating QRP Sourcebook

QRP Quarterly

Volume 65 Number 2
April 2024

Journal of the QRP Amateur Radio Club International

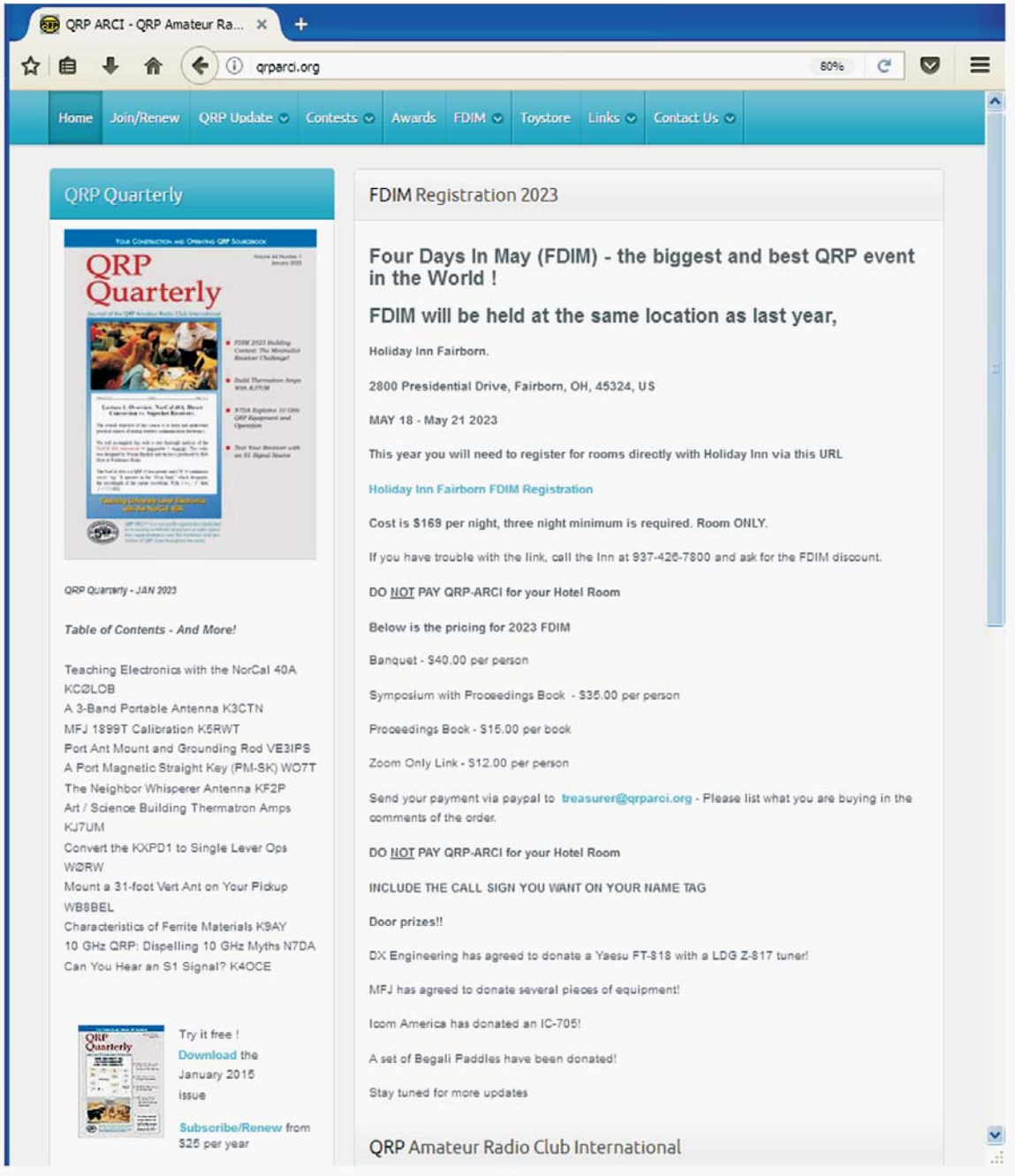


Build The Mount Vernon Moxon

- *K4OCE asks, "Do QRPers Really Need an Antenna Tuner?"*
- *VU2ESE Describes a Two-Tone Test Geneator*
- *VE3IPS Reviews the JNCRadio M-104 Portable Antenna*
- *Scary Things —Bears, Zombies, CW, and LiIon Batteries*

QRP ARCI℠ is a non-profit organization dedicated to increasing worldwide enjoyment of radio operation, experimentation and the formation and promotion of QRP clubs throughout the world.

If you are an active QRPer...



...this should be your favorite web site!

See what's happening in the world of QRP ARCI • Renew your membership
Look up contest rules • Apply for awards • Find links to other QRP resources
Get the latest news about FDIM • Contact club staff and officers • and more!

www.qrparci.org

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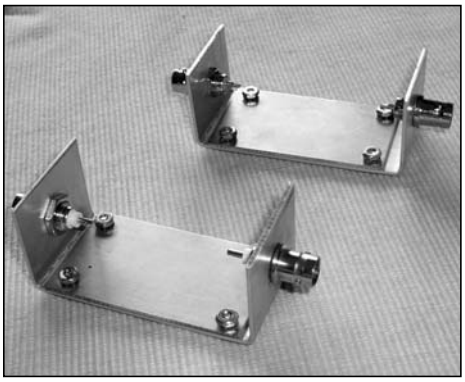

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Technical Articles

The Joy of QRP

The World of QRP ARCI

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

From the Editor

Mike Malone—KD5KFX editorqrparci@gmail.com

Welcome to Spring! I know many QRP aficionados look forward to it every year... FDIM and the Dayton Hamvention, 4States QRP Ozarkcon, and probably some other events on the grass roots scale are favorite springtime events. Spring wakes up my desire to play with portable ham rigs and portable antennas. There is a lot to be said for sitting next to a tree with a SST or a SW+ and hammering out some QSOs or taking a Rockmite camping ... you get the idea. I have a few little rigs that could use some of that kind of love. HW8 patio ops are always good too! The smell of the grill wafting up as you surf around on 15 or 20 meters. Good times. Those small rigs are what attracted me to QRP radio to begin with and as it turns out, they are what I really enjoy playing with now. I could have saved a lot of money if I had figured that out *before* I went through the K2, K3, and numerous other advanced transceivers. Here in Texas there is a saying—"dance with the one that brung ya". Spring leads me back to those small monobanders every time.

Whatever perks you up, I hope you carve out the time to enjoy some of it.

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 only constant in life is change, and this is no less true of QRP ARCI. Last fall we received word from our club Treasurer Will Ravenal that he would be stepping down. Will has served us faithfully for several years, but other circumstances had arisen that required his time and energy. After a search for a replacement for Will, we are pleased to announce that we have selected a new Treasurer, John Kitchens, NS6X. John has served the amateur community for many years and we are fortunate to have a volunteer of his background and skills filling this all-too-important position.

But, one thing in the QRP community that does not change is the fun and excitement that surrounds our annual bash, Four Days In May. It is always a fantastic experience, always the same weekend as the Dayton Hamvention, and held in nearby Fairborn Ohio. If you have never experienced the fun of our annual convention, come check it out. This year we have yet another outstanding list of presenters and topics, where it will be proven again that QRP is where the real innovation is taking place in the world of ham radio. Stick around until Thursday evening, and a number of new kits are slated to be introduced at our Vendor Night. Where else can you actually have an opportunity to meet and talk to the designers of the equipment you acquire? Friday night is Club Night, where you can speak to representatives of QRP clubs from all over the world. Friday night will also be the Homebrew contest, so bring your latest projects to show off, and possibly win prizes! Friday night will also be the first competition of our new design challenge—the Logic IC transmitter Power Challenge! Come out to see what that is about! The Forum will also be livestreamed via Zoom for those who can't make it in person. Admission to the livestream is available through the QRP ARCI website.

As always, FDIM has some of the most generous prize donors of any event. We have donations of some MAJOR door prizes from Four-State QRP, DX Engineering, Icom America, Elecraft, MFJ, 3rd Planet Solar, Hamgadgets, and others! Stick around for prize drawings both Thursday during the Forum, and after the Banquet Saturday evening.

Tickets are required to attend the all-day Forum session on Thursday, but events on Thursday and Friday evening are free to the public. If you attend our annual Awards Banquet, you will get to see the latest inductees into the QRP Hall of Fame! Go to qprarci.org/FDIM to purchase tickets on-line.

It will be another outstanding show! I hope to see everyone there!

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

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QRP ARCI News

Dieter "Diz" Gentzow W8DIZ—SK

QRP Hall of Fame member Dieter "Diz" Gentzow was best known to some as the co-founder of the Flying Pigs QRP Club International. Diz was also the former owner of Kits and Parts—The Toroid King. He is remembered by Brian, KB9BVN (see photo):

Diz was a Co-Founder of the Flying Pigs QRP Club International along with Richard Powell WB6JBM (SK) back in 1999. Diz was elected to the QRP Hall of Fame in 2005. We learned of his passing this evening (March 3), and our deepest and heartfelt condolences go out to his beloved wife Nancy, and their families.

Diz and I attended many FDIM events over the years, and he and some of the Flying Pigs came over from Ohio a few times to help us put on a QRP forum at the Hoosier Hills Hamfest in Bedford Indiana, usually camping at the event. The business that he and Nancy ran, Kits and Parts, probably supplied toroids and mixers, and projects to most of the building public in the Hamosphere. He will be greatly missed. The older I get, the more times I have to say goodbye it seems, and I don't think I will get used to it. I'm glad I got to know Diz. He was a good friend.

—de KB9BVN

Diz W8DIZ and Brian KB9BVN at FDIM 2001, working with Doug DeMaw's (W1FB) original Tuna Tin transmitter from the Ramada Inn. Ed Hare W1RFI had loaned the transmitter to the Flying Pigs QRP Club for the evening. For the receiver Diz contributed one of his famous Multi-Pig Rigs and it worked great.

Upcoming QRP ARCI Contests

2024 QRP-ARCI Hoot Owl Shootout Sprint

Date/Time:
0000Z to 0100Z, 27 May 2024 (8 to 9 p.m. EDT)

Categories:
Entry may be All-Band (AB), Single Band (e.g., SB-160, 80, 40, 20, 15 or 10)

How to Participate:
Get on any of the HF bands except the WARC bands and hang out near the QRP frequencies. Work as many stations calling CQ QRP or CQ TEST as possible, or call CQ QRP or CQ TEST yourself ! You can work a station for credit once on each band. This is a CW only contest.

2024 QRP-ARCI Summer Homebrew Sprint

Date/Time:
2000Z to 2300Z, 14 July 2024 (4 to 7 p.m. EDT)

Categories:
Entry may be All-Band, Single Band, High Bands (10-15-20m) or Low Bands (40-80-160m)

How to Participate:
Get on any of the HF bands except the WARC bands and hang out near the CW QRP frequencies. Work as many stations calling CQ QRP or CQ TEST as possible, or call CQ QRP or CQ TEST yourself! You can work a station for credit once on each band.

Most QRP ARCI contests have bonus points for homebrew equipment and portable operation:

Homebrew is defined as—if you built it, it is homebrew (includes both "from scratch" and kits):

- If operating a HB Transmitter add 2000 points
- If operating a HB Receiver add 3000 points
- If operating a HB Transceiver add 5000 points

If you are operating *portable* using battery power *and* a temporary antenna, add 5000 points to your final score. (You *cannot* be at your shack operating from battery power using your home station antenna to qualify for this bonus.) This bonus is to help level the playing field for contesters who work from the field, versus contest stations with big antennas (like 5 element yagis at 70 ft.).

Be sure to check detailed rules for each contest at:

www.qrparci.org/contest

In particular, make note of the deadline for log submission! Submit your entry online at

www.qrpcontest.com

More 2024 QRP ARCI Contests
(Rules and other details online)

12 October 2024—Fall QSO Party (Second Saturday)
05 December 2024—Top Band Sprint
08 December 2024—Holiday Spirits Sprint

QRP ARCI is a club for low power enthusiasts worldwide.

We produce a professional quality magazine, organize an annual conference at Dayton (Four Days In May, or FDIM), and sponsor 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

Aluminum Chassis Construction

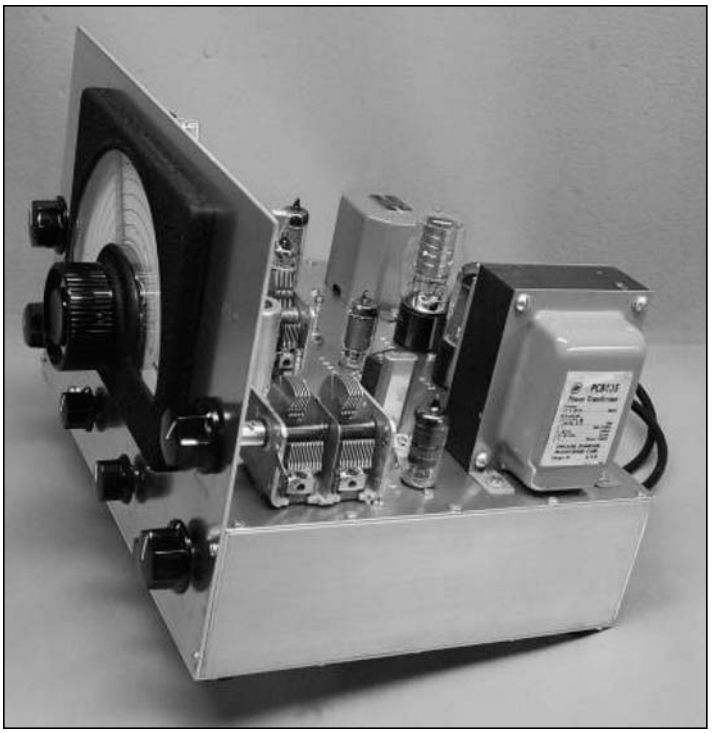
Greg Latta—AA8V glatta@frostburg.edu

For the past year, QQ has published the presentations at FDIM 2023. This is last one—and we hope it will encourage you to see the 2024 seminars in person!

Note that this printed version of AA8V's talk is a collection of photos and brief summaries of the various material choices and construction techniques.

—Editor

An example: 6146 linear amplifier.



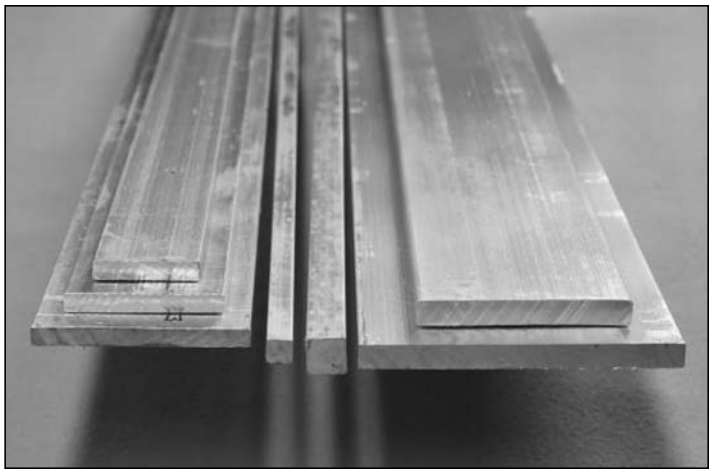
Another example: superheterodyne receiver

Summary Notes for Homebrew Construction

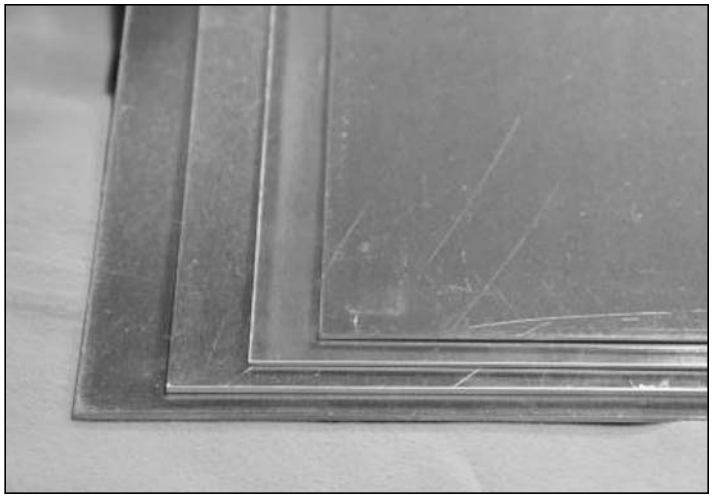
1) Safety:

Eye protection
Hearing protection
Short sleeved shirt — no rolled up sleeves
Keep hair restrained

2) Raw Materials:



Square and rectangular bar stock.



Sheet stock.

3) Fasteners:

4-40 pan head slotted screws
4-40 lockwashers

(These are the most commonly-used screwsd for chassis construction. Other fasteners may be needed for specific projects)

4) Aluminum Alloys:

6061 (hard)
5052-h32 (medium)
3003 (soft—not so good for thin stock)

5) Shapes:

Angle - equal
Angle - unequal
Bar round
Bar square
Bar rectangle
Sheet/plate

6) Thicknesses:

0.040" or 0.050" — for bottom covers
0.0625" (1/16") — very good overall
0.0938" (3/32") — for extra strength

7) Where To Get Raw Materials:

- onlinemetals.com
- mscdirect.com
- mouser.com
- Many other places online
- Prices vary greatly
- Some may be covered with a protective plastic sheet, which is good!

8) Hand Tools:

Standard hacksaw
Single sided hacksaw
(A better choice: bandsaw with metal cutting blade)
Tap 4-40
Tap wrench
#43 drill
#32 or 1/8" drill
Ccenter punch
Vise
Center drill

9) Power Tools:

Electric drill
Sander for drill - 120 grit

Small combination sander.

Better: small 1" belt / 5" disc sander - 120 grit belts/discs
Better: benchtop drill press and drill press vise

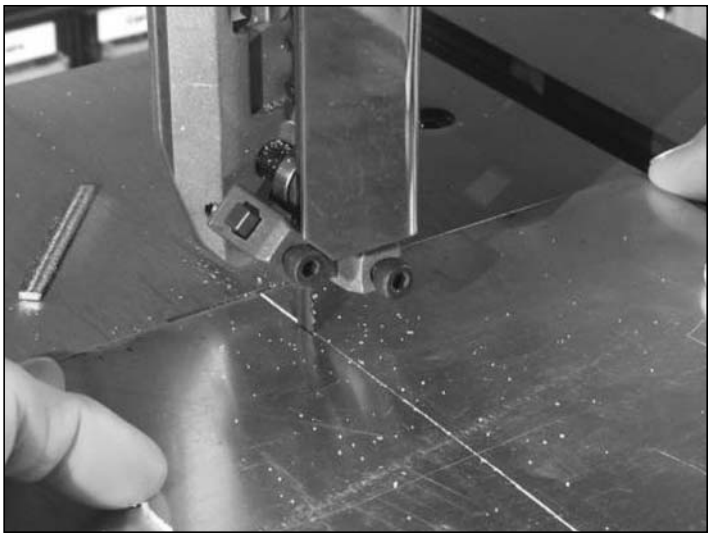
10) Where To Get Tools:

Hardware stores and home centers: Harbor Freight, Lowes, Home Depot, Sears
grizzly.com
grainger.com
mscdirect.com
mcmaster.com
northerntool.com

11) Cutting Techniques:

Use hacksaw to cut rectangular stock
Use single sided hacksaw for sheet stock
Make sure several teeth engage the work
Bandsaw with metal cutting blade can be used to make cutting easier
Leave a little extra to be cleaned up by power sanding

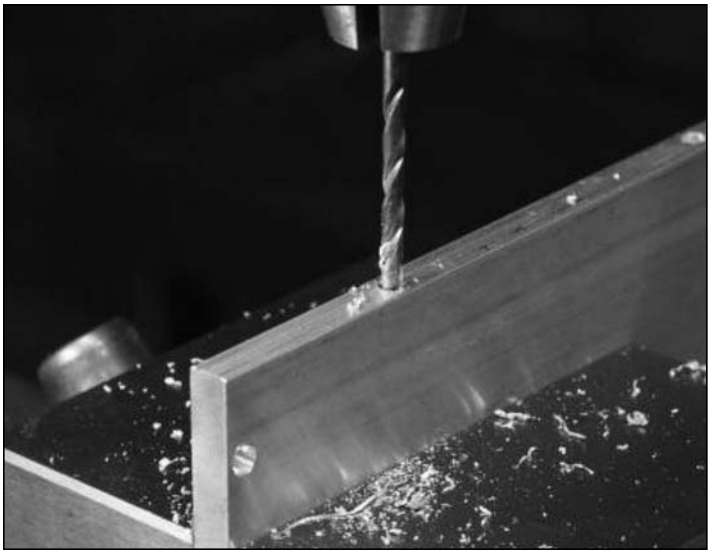
Cutting bar stock with a bandsaw



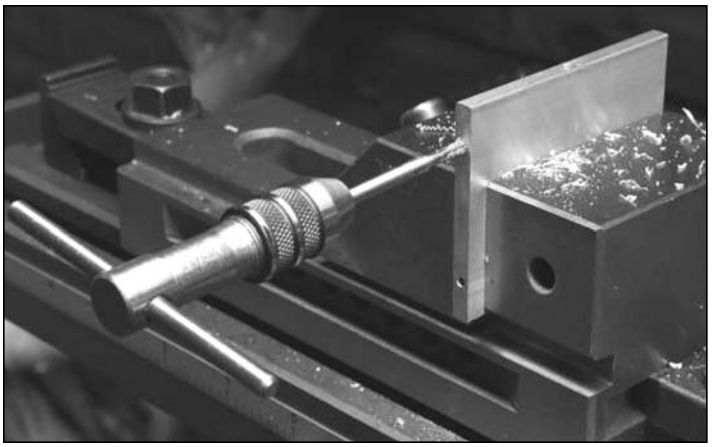
Cutting sheet stock

12) Drilling and Tapping Techniques:

use mating piece to determine location of hole when possible
use center punch or center drill
drill hole with proper sized drill
when tapping, lubricate tap and work back and forth
fully clean out chips
bevel hole with larger sized drill



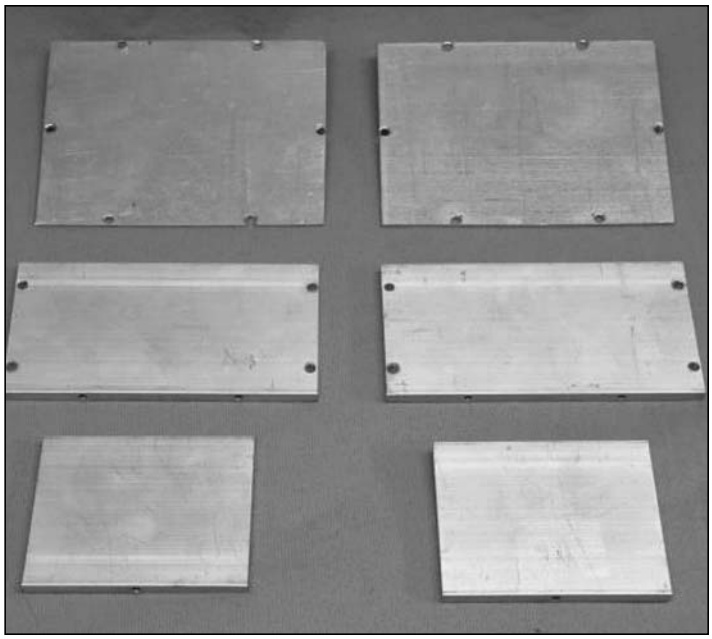
Drilling A Hole



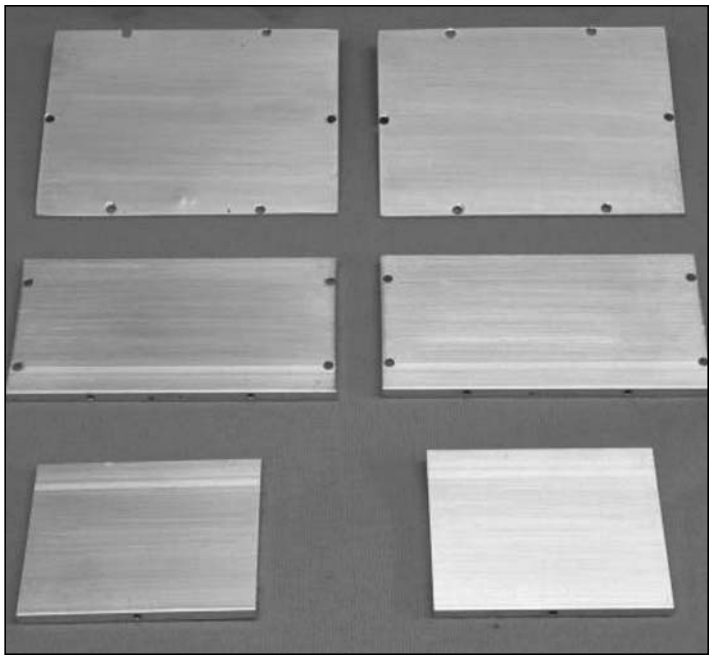
Tapping A Hole

13) Finishing Techniques:

Use sander to clean up edges/ends
For matte finish — rub down with soft scrub cleaner
Can be painted If desired



Unfinished Parts



Finished Parts (not so easy to see in black & white!)

Reminder! FDIM 2024 is coming soon! — May 16-19

www.qrparci.org/fdim

More Metalworking Ideas

Gary Breed—K9AY k9ay@k9ay.com

In the previous article, Greg AA8V provided lots of good information about building chassis and cabinets for your homebrew projects! His article (a 2023 FDIM presentation) prompted me to write up some of things I've learned about cutting, drilling, punching and bending metal for homebrew projects.

I should note that I also have done small-scale production of ham radio gadgets, which helped justify spending a little more on metalworking tools. I hope this gets you thinking about possibilities for upgrading your own shop!

—Gary, K9AY

Materials

By far, most homebrew projects are made from aluminum. It's easy to work with, weatherproof, and looks nice and shiny in the finished product. AA8V gave us a good overview of the types that make sense for us to use.

I get sheet stock where I can find it, which might be a salvage yard, cutoffs from a metals dealer or HVAC company, or even kitchen bakeware found at a thrift store. Flat and angle stock comes mostly from hardware stores and home centers.

Tools for Cutting, Punching and Forming

Tools are the emphasis of this article. My intention is to add to AA8V's list of tools with a few more advanced tools that I have found to be valuable.

Let's start with hole punching tools. The classic hand-held metal punch is the Roper Whitney No. 5 Jr. See Photo 1.

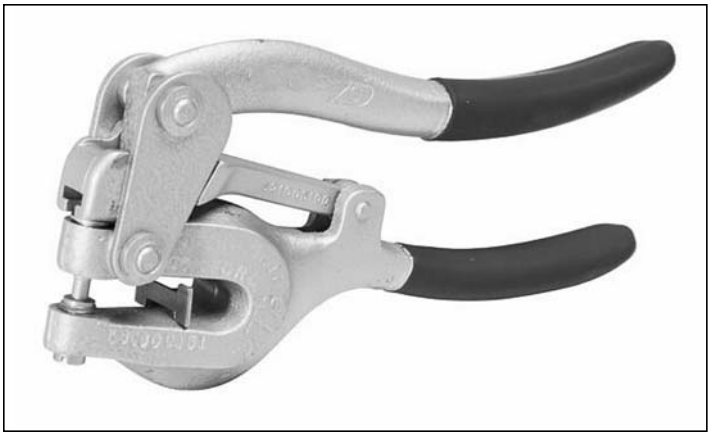


Photo 1—The Roper-Whitney No. 5 Jr. hand punch.

Photo 2—A copy of the Roper-Whitney hand punch. There is no identification of its manufacturer.

Photo 3—Heinrich Company Model 6 hand-operated benchtop punch press.

Other companies have copied this popular tool, including one that I found at a neighborhood garage sale about 1988 (Photo 2). These punches come with dies for round holes from 3/32" to 9/32". 1/8" is used a lot since it's the size of 4-40 hardware, while 1/4" works for many electronic panel components like switches, LED indicators and such.

Roper Whitney and others make a number of metalworking tools, from these small hand-held tools up to industrial-scale production machinery. These may include punch presses, shears, brakes and specialized fabrication tools.

I rarely use my hand punch any more, since expanding my shop with a Heinrich Co. Model 6 benchtop hand-operated punch (Photos 3 and 4). I mounted it on a tool stand, and quickly realized it was a bit awkward to use as I'd hoped. My solution was to fabricate a table with adjustable guides, as you will see later.

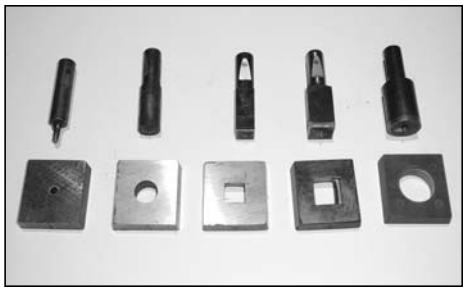


Photo 4—Some of the dies available for the Heinrich press. The company offers round and square dies up to 1/2". I used a grinder to put a flat on a 3/8" die for either a BNC or F connector. And I had a local tool-and-die shop make a 5/8" die for UHF or type N connectors.

The next subject is metal forming tools, primarily the shear and brake. Individual tools are available, such as a foot-operated or power shear that makes straight, clean cuts with sheet metal.

The same goes for a brake, which makes uniform bends in sheet metal. These are of two designs—one type firmly clamps the metal sheet on one side of the bend, while a swinging tray bends the unclamped portion. These tend to be fairly large. I've seen some small bench-top models as well, but. I don't recommend them. They are rarely sturdy enough to avoid flexing during operation.

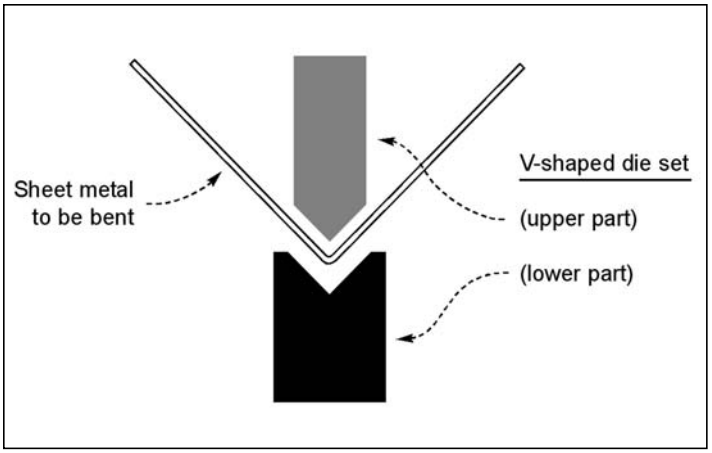


Photo 5—Operation of the V-shaped die style of brake.

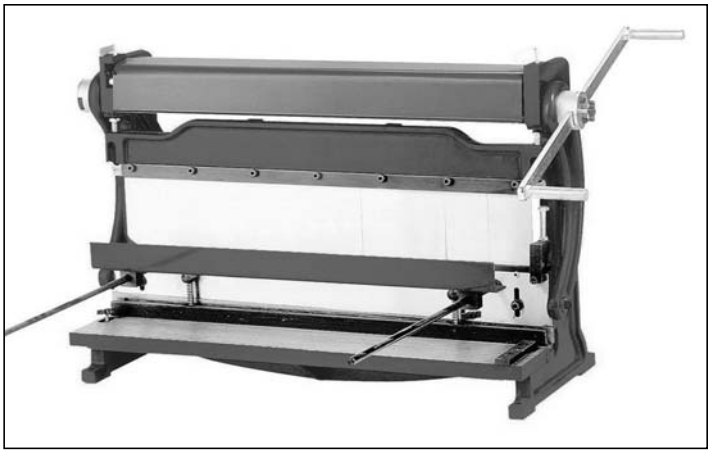


Photo 6—The Harbor Freight 3-in-one shear, brake and roll.

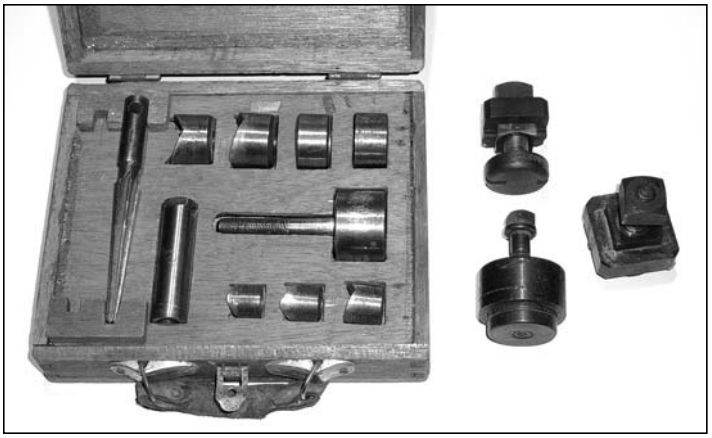


Photo 7—A few other hole punch tools in my collection.

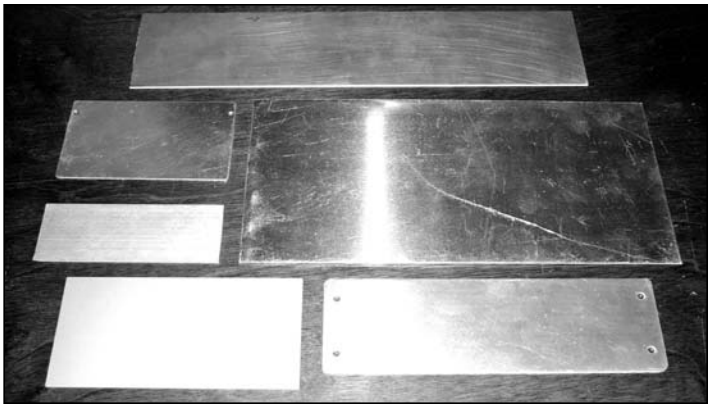


Photo 8—A shear makes it easy to make straight, clean cuts in sheet stock. Most often, I use 0.062 (1/16") stock.

The other type of brake uses a V-shaped set of dies (Photo 5–OK, it's not a photo...) The metal is pressed between the dies and thus becomes bent. This is a good choice for thin sheet metal. The method also works for heavier stock, but requires a lot of pressure—and a big machine to withstand the force.

This "V" style brake is used in a Harbor Freight 3-in-one shear, brake and roll (Photo 6) that I have. It handles 30" wide material and, although heavy, fits on a sturdy workbench. The price is reasonable for a serious homebrewer, who will use it lot if they are an active builder! The brake's upper die has sections of various widths. This allows you to make inside bends, double bends, tabs and flanges. I have had mine since 2001 and use it extensively. Over time, the shear needs occasional adjustment of its back side brace, as well as honing the blade.

Some Others

There are many more metalworking tools available. Photo 7 shows two options for punching large round holes; On the left is a 1960s-vintage punch set that was handed down from my older brother when he went to college. The sizes are appropriate for coax connectors and various vacuum tube sockets. On the right are three Greenlee punches intended for making holes in electrical boxes. If purchased new, these are above most hams' budget, but I was lucky enough to find them in a thrift store for a small fraction of their original price.

Working with These Tools

I have used the shear almost exclusively with 0.050" and 0.062" sheet aluminum. The ability to make clean, square cuts is extremely useful. Parts for panels and chassis are readily cut out from large pieces of sheet stock. See Photo 8. The shear is also ideal for trimming p.c. board material. You can buy large sheets (manufacturers' surplus) and easily cut them to the desired sizes. I have even made strips and pads for Manhattan construction.

Photo 9 shows my Heinrich punch mounted on a tool stand, with a work table. The table and guides let me make evenly-spaced holes and maintain a constant distance from the edge of a panel or chassis. Photo 10 shows examples of holes made with the punch press: round holes for a K9AY Loop control box, and a panel with round holes plus a large rectangular hole for a display module—using square dies, this punch works especially well as a "nibbling tool"!

For this article, I repeated a past project—a prototyping assembly for various circuits, which I have used for filters, preamps, matching transformers and other gadgets. (I needed new ones, anyway!) Photo 11shows the fabrication sequence:

(a) A length of 1-1/2" × 1/16" hardware store aluminum
(b) The strip with holes punched for connectors and p.c.b.
(c) The final assembly with BNC connectors and blank p.c.b, ready for an experimental circuit.

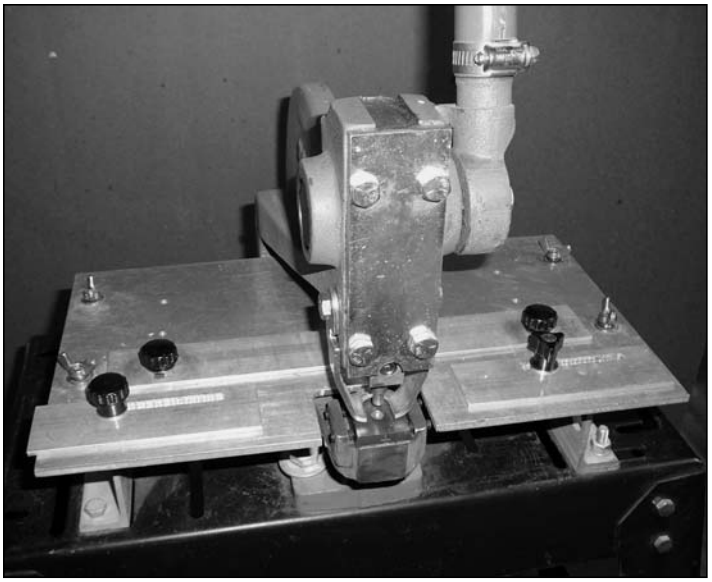


Photo 9—I made a work table with adjustable guides for my Heinrich punch press.

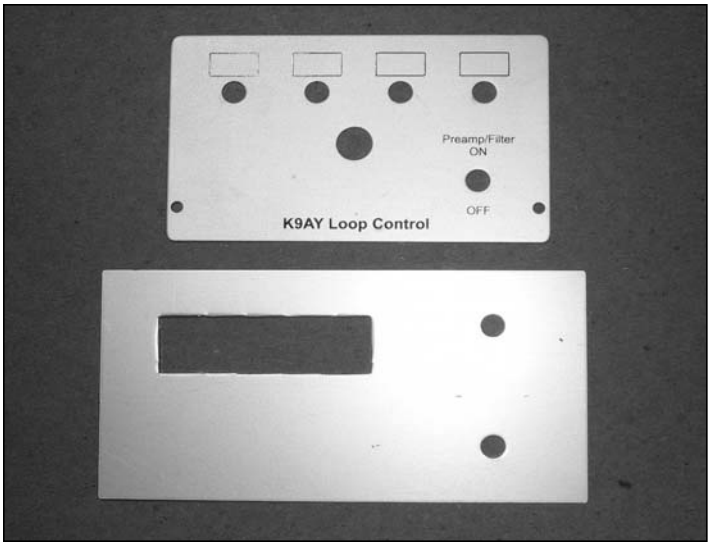
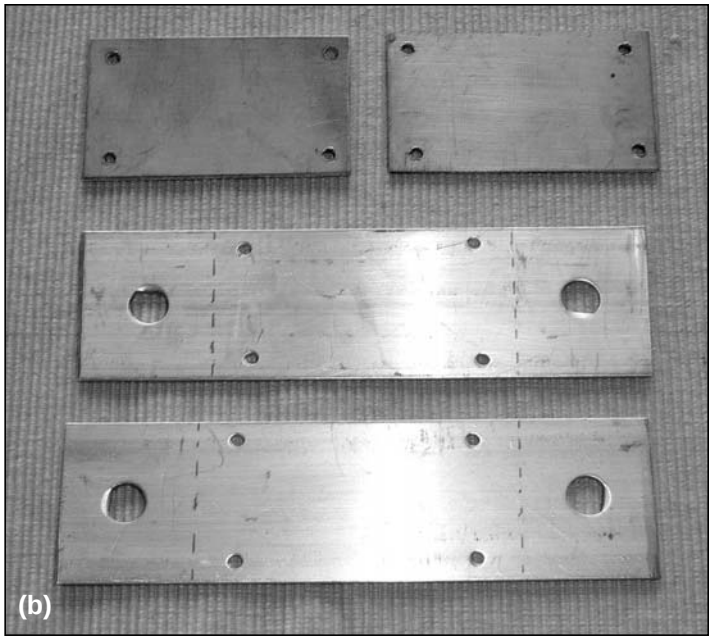


Photo 10—Examples of punched metal pieces: a panel with just round holes, and another panel with a large rectangular hole that was "nibbled" with a square die.



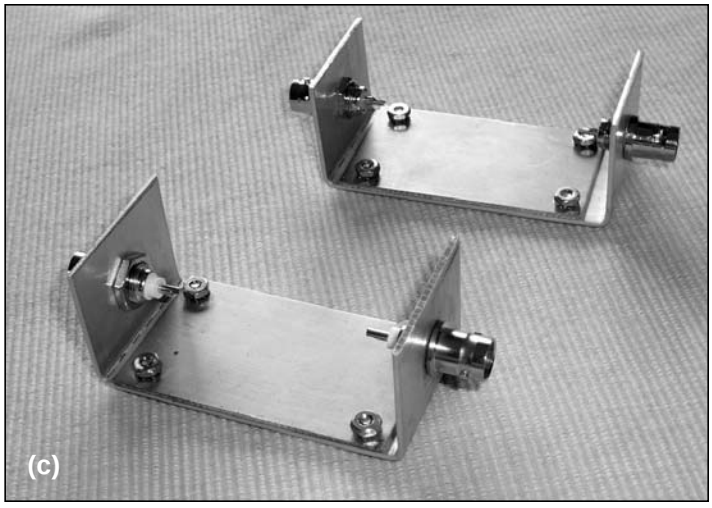


Photo 11—This shows the steps in the fabrication of a metalworking example: (a) blank aluminum piece after cutting with the shear; (b) punched aluminum before bending, with p.c. boards; and (c) the finished assemblies with BNC connectors and prototyping p.c. boards installed.

Summary

I have shown you a number of metalworking tools that are a bit more advanced than common home shop tools. I have found them to be very useful in my own shop—enabling the fabrication of panels, brackets, enclosures, etc. with accuracy and good appearance. Usually saving time, too.

These tools are, for the most part, of moderate cost. If cost is an issue, perhaps this article will raise your awareness of what is available. You just might find something at a bargain price. Then you can upgrade your own shop.

Personally, I put these tools in the same category as better quality test equipment. A good oscilloscope, signal generator, spectrum analyzer or VNA will help make your project perform well—these tools can make them look good, too, with a more "professional" appearance!

Photo credits

Photo 1: Roper Whitney Co.
Photo 3: Heinrich Company
Photo 6: Harbor Freight Tools
All other photos by the author

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The FX-4CR Tranceiver

Jack Purdum—W8TEE jjpurdum@yahoo.com

There's a new kid on the block and he's pretty cool. I'm talking about the FX-4CR transceiver designed by Yu, BG2FX. It should be no surprise that I took interest in the FX-4CR after seeing its feature set and comparing it to Al's (AC8GY) and my T41 SDR transceiver. There are, however, major differences between the two rigs. Here is my review of this interesting new "almost-QRP" transceiver

First Impressions

The first thing you notice is its size; a mere 4.375" × 2.875" × 1.875" as seen in Figure 1. The transceiver is just a little bigger than two decks of playing cards stacked on top of each other. The other surprise is that it covers 80-6M in all modes (SSB, CW, AM {receive only}, FM, and digital with internal sound card) with an output power of 20W SSB, CW, and 5W on FT8, 6M and FM. The FX-4CR is the big brother to the FX-4C which was a 10W transceiver. The FX-4CR doubles the power on SSB and also adds Bluetooth capability.

The next surprise is the display. There is nothing muddy about the 320 × 240, 2" display: its clarity literally jumps off the screen at you. Also, unlike many similar rigs (i.e., the G90) that limit the spectrum width to 25 kHz, the FX-4CR has a 48 kHz wide spectrum/waterfall display... a feature you'll appreciate if you operate contests using the 'hunt-and-pounce" method. Or if you just want to see how much activity is on the band. I also noticed that, if I put a small object behind the rig to tilt it to a viewing angle of about 30°, the ease of viewing was greatly improved. When using the internal speaker, the tilt actually seemed to help the audio quality, too. My guess is that, by the time you read this, someone will have already 3D printed an "angle-viewer" for the rig.

The transceiver arrived in a smallish cardboard box. Inside, however, is an Apache-like case that is literally bomb proof (see Figure 2). The radio fits tightly into a foam cutout. To the left of the cutout is the fused power cord terminated with an XT60 connector and the mic. The slot below the radio holds the USB cable that can be used to link the radio to a laptop or PC for digital work and software updates plus two spare fuses. Other than a battery and antenna, everything is neatly packaged in the case. Indeed, the term "drop ship" takes on a new meaning here as the FX-4CR is safely cradled in the case and I'm sure could take quite a bit of abuse while in its case.

Because I plan to use FX-4CR with a variety of power sources with different connectors, I made a 6" pigtail connector with a female XT60 connector, the external fuse holder, and a male XT60. I then made a long power lead with a female XT60 on one end and the desired connector on the other end. I made a similar power cord for each power source I plan to use. (I use banana plugs for connecting to my home PS and PowerPole connectors for my Bioenno battery.) I did this because the XT60 connectors are a tight fit and I didn't want to stress the connector on the FX-4CR with constant plugging/unplugging. I leave the pigtail permanently plugged in, thus removing any stress on the rig's XT60. It's probably not necessary to do this, but Mr. Murphy seems to be a life-long resident here.

Figure 1—The FX-4CR.

Figure 1—The FX-4CR in its case.

What's Inside

I didn't want to open up my FX.4CR for fear of voiding the warrantee, but Yu was kind enough to tell me that the STM32H750VBT6 processor does the heavy lifting in the radio. This member of the STM32 family is a 32 bit ARM Cortex M7 processor and has 128K of program memory, 82 I/O pins all controlled at a maximum clock rate of 480 MHz. BG2FX also makes the source code for the FXC-4CR available and, by looking at the code, I would guess it's the code was developed with the STM32 Cube programming environment. Just like the T41, the FX-4CR makes extensive use of the ARM library for many of the math and DSP functions.

There is a small Users Manual included with the FX-4CR. The manual is written in excellent English and, while the print size is

small, it's very readable. (My understanding is that Adam Kimmerly, K6ARK and was a speaker at FDIM 2023, and Daniel Nespoulous, F5BUD, helped Yu write the manual.) Table 1 shows the function of each of the buttons on the FX-4CR. All of the buttons have a backlight, which makes them easier to see in dark conditions. (Backlighting automatically turns off after about 10 seconds.) The buttons trigger visual indicators on the display screen, too. For example, pressing the F button presents a list of the bands covered by the FX-4CR on the display screen. Once the band choices are displayed, rotating the Tune encoder allows you to quickly scroll through the band choices. Press the F button a second time activates the currently-selected band. It may sound like a lot of pushing/rotating, but it isn't. It all seems quite natural.

You can also download a copy of the manual from the FX-4CR web site (https://bg2fx.com/). It's a good idea to save a copy of the manual on your system because it contains the full instructions for the process of downloading and installing any firmware updates that might be issued.

The physical construction of the FX_4CR is a black, all-metal case (extruded aluminum?) with tight-fitting panels secured with screws. The two horizontal slits in the front of the case (see Figure 1) give access to the internal speaker. Although the speaker is very small, the audio quality is quite good. There is a headphone jack, too. The buttons feel good and give back a solid feedback when pushed. All external connectors (i.e., power, antenna, key, etc.) are tight and of good quality.

There is an internal mic (the small hole between the AF and Tune controls), but I did not use it. I received good audio reports when using SSB with the included mic. I don't know why, but when I first started using the FX-4CR, I tended to hold the mic too close to my face and mushed up the audio a bit. Moving the mic to a distance of about 8" resulted in excellent audio reports. Despite its diminutive size, the mic performs well. I did not try 6M, as I do not have an antenna for that frequency.

All other connections (e.g., key/paddles, headphones, external speaker, antenna, mic, USB) are on the left and right side panels.

Button/Control	Description
IF ATT	Sets 3 levels of attenuation. Press and hold to set AGC
PWR	Press-Power On. Press and Hold-Power Off. Press and turn VOL encoder to adjust output power
MENU	Press and hold to access menus
FILTER	Press to change filter bandwidth
F	Press for band selection. Press and hold to lock keypad
SSB	Press for SSB mode also LSB/USB set. Press and hold for Noise Reduction toggle
M.V.	Not currently used
A.B.	Switch between VFOs A and B. Press and hold for split
CW	Press for CW. Press and hold to reverse paddles
AM:FM	Press to toggle AM and FM. Press and hold for wideband receive
RIT	Press to toggle RIT ON/OFF (Can be PTT for internal mic)
AF	Rotate to adjust volume. Press and turn to adjust squelch. In SSB mode, adjusts mic gain and DSP. In CW mode, adjusts keyer speed, volume, and sidetone.
TUNE	Turn to adjust frequency. Press to adjust tuning step

Table 1—FX-4CR Button Summary.

Performance

The spectrum display is a little stingy when reporting received signals. What look like just tiny little blips on the spectrum display are almost always very readable signals. Signals that are strong enough to change the spectrum's color display and show up on the waterfall display are almost always S-8 or better signals. The receiver is very sensitive and compares favorably to my other rigs (Flex 6400, T41, QCXs).

CW performance is as expected. The CW filter can be varied between 50 and 800 Hz. For me, the 200 Hz filter seemed like a good choice, but that will vary by user preference. There is no CW decoder in the firmware. I have not examined the firmware to any real extent, but if I get time, I'd like to add the T41's ALP CW decoder, although any decoder might be a welcome addition for someone who's just starting to learn Morse code. 20W of CW power is like shooting-fish-in-a-barrel to me. It seemed that, if I could hear them, I could work them. You can dial back the power if need be. (Some QRP contests don't allow more than 5W on CW.)

When using 20W on SSB, the rig performs very well. Bearing in mind that improving your signal by one S unit relates to a 6 dB change. So, to gain one S unit in the FX-4CR signal strength would require raising the power to 80W. What I'm saying here is that 20W gives a better account of itself on SSB than you might expect from 20W. I use an EFHW antenna which is a saggy 20' off the ground and worked into France a few weeks ago on 20M SSB. Chances are you're not going to break a DX pileup with the FX-4CR, but patience often pays off with a QSO.

Wish List

There are things that some operators are going to want that are missing from the FX-4CR. The biggest one for me is an internal antenna tuner. The Xeigu G90 has a very good builtin antenna tuner and is also capable of 20W output. However, the G90 is larger than the FX-4CR and has a much harder screen to read and the G90 doesn't directly support digital modes. Also, I find the G90 user interface difficult to use.

Some users might complain that the FX-4CR doesn't have an internal battery like some popular rigs do (i.e., the ICOM 705). However, when using the IC-705 with its internal battery, the maximum output is 5W, so tradeoffs are involved. Personally, carrying a Bioenno 10 Ah battery and a 1 lb antenna tuner is pretty easy with the FX-4CR. I'd rather have the small size than the built-in antenna tuner and battery.

I've already mentioned that there is no CW decoder, but for most QRP operators, that's not a big deal. However, for someone just starting out with CW, it is a nice learning tool.

Conclusion

I really like my FX-4CR and that might seem heretical in light of my ties to the T41, but that's not the case. They are different radios designed for different users. Users who do *OTA activations (i.e., SOTA, POTA, IOTA, etc.) are really going to appreciate what the FX-4CR brings to the table with its feature set. On the downside, the radio is not cheap. It sells for $550 directly from the producer. Indeed, at the time of this writing, there are no distributors for the FX-4CR. Therefore, if you see one for sale by anyone else, especially online, be very suspect as it most likely is a knockoff. Also, I had to wait two months to get mine as Yu only does small production runs. However, in my opinion, it was worth the wait! ●●

Adventure Radio at Meadow Creek Campground

Steve Baron—KU9J/4 jnkml4u@att.net

Here's the story of my August 1983 trip to the Panhandle of Idaho near the Canadian Border

After reading an article about one ham's portable Heathkit HW-8 setup in 1983, I was inspired to create my own portable kit and take it on vacation w/ me. They called it Adventure Radio back in the day. I was enamored w/ the idea of a CW-only rig and figured it could only help improve my CW.

I found a used, original-owner Heathkit HW-8 at a hamfest, I already had built a battery-operated Heathkit Frequency Counter, built a 20m dipole out of Radio Shack Speaker Wire, already had a Radio Shack straight key and collected the requisite cables and accessories. After measuring every thing, I then bought a new camera case w/ pick & pluck foam to pack it all in. The kit looked good when completed.

Bought a tent and I already had a sleeping bag. Planned my provisions. Made my airline reservations and scheduled a week's vacation to get far, far away from Chicago.

My plan was to travel up into the Idaho panhandle and camp by myself. Meadow Creek Campground seemed remote enough and it indeed turned out to be a scenic and beautiful campground. Water pump and pit toilet were the amenities.

The time passed quickly and I made my way to Chicago O'Hare Airport to catch my flight to Boise.

A bit of airport trivia—if you ever flew into O'Hare, you probably noticed that your baggage tags had the IATA code "ORD". Did you ever wonder how they came up with ORD from O'Hare? (Hint—they didn't)

We have to go back in time to understand. In 1945 the Chicago city fathers were looking to establish a new airport to meet the anticipated huge increase in commercial passenger aviation. Safety concerns for in-town Midway Airport were a factor, too. (The idea that this would also be a future huge money generator for the city did not escape them, either).

They decided upon a site where Douglas Aircraft Company had built C-54 aircraft during the war, a small airport in the boonies west of the city called Orchard Field. Small problem—it was outside the city limits. As is commonly done, the honorable city fathers simply annexed the land. Problem solved. If you look at a map of the greater Chicago area today, you will notice this O'Hare Airport "island" that is separated from the city proper by many suburbs in between. In 1949, the airport was renamed to honor Navy carrier pilot and Medal of Honor winner "Butch" O'Hare, but still kept the IATA code ORD. But I digress...

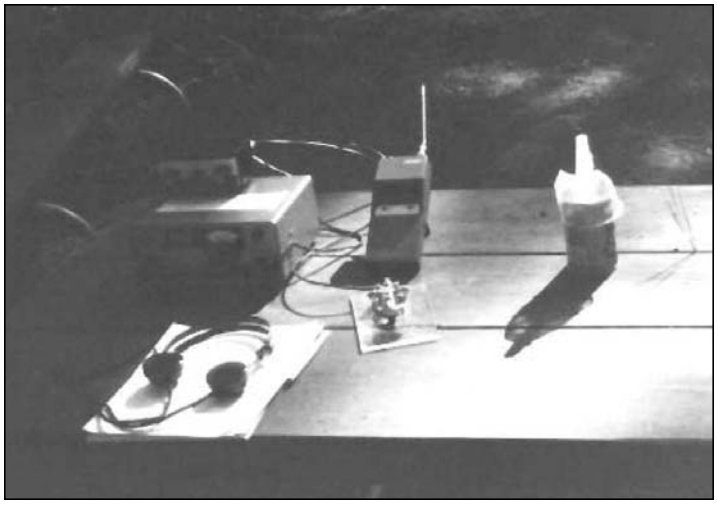
As I waited to go thru that era's version of "security", I couldn't help thinking of investigative reporter Pam Zekman's relatively recent reports of her work as an undercover security screener.

After only about 20 minutes of training on how to operate the machine, she was put on the job at a fluoroscope machine screening passenger luggage as they waited to enter the concourse. When she asked her employer what she was to be looking for, she was simply told to look for anything "suspicious".

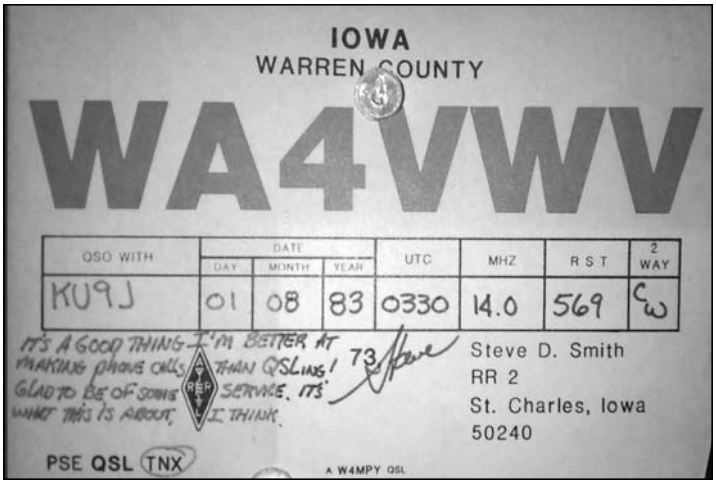
With some apprehension, my turn came to step up to the machine and slide my luggage on to the belt. I then positioned myself so that I could view what was appearing on the screen. Oh. My. Gosh. As my camera case went through, the screen showed several different size metal and plastic boxes w/ knobs, coils of wire, batteries and a couple tools. It looked downright sinister—one could easily imagine this might look like the makings of a bomb.

As I prepared myself to hear them tell me to please step to the side so they could ask me some questions… I was flabbergasted to be waved through. Unbelievable. As I proceeded down the con-

Meadow Creek (ID) Campground.



Heathkit HW-8, Antenna Tuner, Heathkit frequency counter, Radio Shack straight key, headphones, empty Rainier beer can repurposed as candle stick holder. Not pictured is the 20 m dipole made out of Radio Shack speaker wire slung about 15-20 feet up in trees. The rental car's battery provided the power.



QSL card from a fine ham radio gentleman, WA4VWV.

Photo of my MTR-5B inside of a Saunders covered clipboard. Paddles are inside the Altoids case.

course, I realized I was on the wrong concourse.

So, I walked out of the concourse and after about 10 minutes or so finally found the correct concourse. And entered "security" again. Surely, I thought, I will get stopped this time. Again, in spite of the sinisterly suspicious picture presented on the fluoroscope screen, I was once again waved right through.

(Interestingly, when I went through Boise Airport security on my way back one week later—you should've seen the attention I got! Unlike Chicago, they took their security VERY seriously.)

Well, I arrived in Boise, got my rental car and headed up into the panhandle. Arriving at the campground next day, I found a beautiful campsite overlooking a roaring river below. Great place to pitch my tent—at night I fell asleep to the sound of the rushing water. And the celestial canopy of stars over my head—absolutely breathtaking. After my first day, I was the only person at the campground for the rest of my stay. Mother Nature, pure solitude and me. Perfect.

Nearby was a wooden picnic table that supported my radio station, surrounded by pine trees. I strung up the dipole about 15-20 feet and connected my power cables to the battery in the rental car parked close to the picnic table.

Band conditions weren't very good, but I enjoyed listening to the few weak stations I could hear.

The next evening, 1 August, it suddenly dawned on me that it was my mother's birthday. I had completely forgotten about it. I got to thinking… maybe I could get a birthday message into the national traffic network?

Twilight was falling, so I stuck a candle in my improvised candle holder—an empty Rainier beer can—and began tuning around.

Tuning across 20m, I came across a QSO in progress. I heard a VERY LOUD signal. When you heard a signal SO LOUD on the HW-8 that you immediately had to yank the cans away from your ears—you JUST KNEW you could work him.

Patiently waiting for the loud signal to finish his QSO (I couldn't hear the other station he was working), when I heard him sign clear I tapped out my callsign on the straight key. Immediately I heard AS (standby). Apparently, the station he signed w/ was a little long-winded...

So I waited another couple minutes, then heard "KU9J de WA4VWV KN". I now found myself in QSO w/ Steve in St. Charles, Iowa. After I explained my situation, he sent again AS.

The next thing I know, he calls back and tells me he has my mother on the phone… and what would I like to say to her? I was absolutely gobsmacked. Here I was, asking this gentleman ham if he could please get a message into the national traffic system—and instead, he made a long distance phone call!

Through the dits & dahs I communicated my birthday wishes as quickly as possible, not wanting to run up his phone bill (this was 1983, way before cheap long distance cell phone calls).

After we completed the call, I quickly told Steve I would pay him for the call. He just as quickly told me that was not necessary. All I could think was that this was a gentleman ham at his finest.

The band conditions deteriorated the next few days and my vacation soon came to an end. After garnering a lot of attention attempting to go through security at the Boise airport, I was winging my way back to Chicago.

My passion for ham radio hasn't changed over the last 40 years. And I absolutely marvel at how miniaturized the equipment has become. Just compare my current portable station in the photo above to my 1983 camera case station. Unbelievable!

—de KU9J /4

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Consider writing up <u>your</u> QRP adventure story for fellow QRPers to read in *QQ*!

Just do your best to tell the story, then send it to the Editor (or one of the Associate Editors if you prefer). You'll get suggestions and a s much help as necessary to get your article ready for publication.

Of course, we like all sorts of articles! Maybe your antenna is the most important part of the story. Or perhaps the rig and any homebrew accessories. Think about it—your QRP friends will appreciate it!

—72 from the editorial staff of QQ

Lithium Ion Battery Safe

Paul Signorelli—WØRW w0rw1@msn.com

This an article describes how to make your own LiIon Battery Safe storage box. These batteries need special attention!

LiIon battery fires are really getting in the news lately. For example, see: http://tinyurl.com/wkbfztyp

This nearby incident recently caused a fire in a 2 story apartment building. The cause was a LiIon scooter kept in a closet.

I have a little experience, since I have seen a few of these batteries short out during abnormal charging.

They are not known for exploding in the storage condition, but there is a lot of potential energy in them. Backpackers and campers love them because they have twice the energy in half the weight of a NiCad battery.

Most people use them in cordwood stacks and if one explodes in a stack it will take the rest of them with it, one at a time. It is like an ammunition "Cook Off" test. They are like a type "F" Estes Rocket Motors used in model rocketry. You can't extinguish them with your kitchen fire extinguisher. All of your smoke alarms will start going off and your room will quickly fill with smoke. It is not nice!

It is best to never charge a big battery without monitoring the charge and using a LiIon Battery Safety Shutdown system.

It is also a good idea to have a handle on your battery to be able to lift and transport the exploding battery outside as soon as possible.

I built my Storage Box in a 3 foot high cabinet (a common 19 inch rack cabinet). It also has wheels and I keep it outside and 30 feet away from any buildings. The batteries are in metal cases and then placed in Ammo cans. These cans are then stored inside the Safe. It has about (100) 26650 cells in it.

The good news is that a typical LiIon battery has good environmental storage specifications. Mine are rated at -20C to +45C. This means they won't be damaged being passively stored outside. NOTE—These are storage temperatures not charging temperatures.

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The battery safe and its contents.

The battery safe closed and locked. And kept outdoors.

Bear Interrupts DX Operation

Paul Signorelli—WØRW w0rw1@msn.com

Back in 2004...

Last night there was a 20-Meter contest on with lots of strong European stations coming in so I took my Elecraft KX-1 out in the backyard to try for a few.

I was outside walking around just after midnight when I worked Alex, YL2KO, Latvia, on 14,060. This was my first European contact on 20 whilst being peripatetic (pedestrian) mobile. I was hand holding my KX1 and had my eight-foot whip and a drag wire trailing behind me on the grass.

While calling another station, I saw a big black hulk in my driveway. I also heard a raspy sound of claws scratching the cement; I almost dropped the KX-1 as I dashed for the door. While I was trying to figure out how to get inside the door with the 8-foot whip tied to my body, it slammed shut, locking me outside. The big black bear was only 10 feet away. I had to awaken my XYL to let me back into the house. She went to the wrong door not knowing what was happening outside.

Thankfully, the bear was scared away by the clanking noise of my new antenna's capacity hat, a pie pan, and ran the other way back up the driveway . . . whoosh!!!

The adrenaline rush of working Latvia while Pedestrian Mobile QRP is nothing compared to having a bear walk up on you while you are working DX in the dark.

I think I will leave the midnight (zombie) operation for winter time when the bears are hibernating.

Just life in the city!

P.S.—The bear was back in the yard on 9/31/04.

I got the QSL card from YL2KO but He never heard the rest of story.

The local TV crew was out interviewing another lady who had seen the bear and right during the interview the bear came back into her yard. The TV crew got great pictures of the wandering bear.

The local paper, The Gazette, July 21, Metro section, Pages 1 and 8 had a picture of this bear eating a fawn! The article said you could fight the bears off with binoculars… yeah, great!

Chris Ryan used direction finding equipment to find this bear, See *QST* March 2005, p. 43. ●●

It's better to do PM during the daytime!

No bear in the QSL card photo, but it's nearly dark. I'd better stay alert.

The JNCRadio M-104 Portable Antenna

John Leonardelli—VE3IPS VE3IPS@gmail.com

The JNCRadio M-104 Multiband Vest Pocket Portable Antenna

Working 20m with the Icom 705.

I recall about 20 years ago reading about the St Louis Vest Pocket portable antenna in the *QRPp* magazine, I ended up making one as a travel antenna. It proved to me that short antennas do work and they do work when operating QRP. Since then, I have been searching for a commercial Vest Pocket HF multi-band antenna that has a standard antenna connector for portable and mobile operations. I came across the JNCRadio M-104 Multi-Band antenna kit. It consists of a base loaded vertical antenna with band coils for 40, 20, 15, and 10m, a base unit using the PL-259 format connector, a counterpoise ring terminal (for adding your own counterpoise), and a 1.2 m telescopic whip. The power rating of 50 watts PEP is perfect for my field operations.

Chelegance was established a few years ago to address the need for cost-effective portable antennas and relevant amateur radio products, featuring designs from BG8BXM and BD8ABC. I also met Jesse BD7LLY at the Hamvention last year.

The overall construction of the antenna is excellent, and it comes in a compact plastic box measuring 7 × 4.3 × 1.2 inches.

I wanted two things out of this type of antenna: Small and lightweight design and its compatibility with a mobile mount. Perfect for air travel to use in a rental car or out in the field with a suitable mount.

I used this antenna during a business trip to Boston along with a 1/4 wave 2m antenna. It went through security in my carry on without a problem. It weighs 11 ounces so that's not a big deal as I could actually put it in my Vest Pocket, if my carry on exceeded the cabin weight allowance. I was able to use a Diamond K400 mount on the rental car. It worked well when parked, as the antenna is not designed for use while driving. I drove down to the waterfront district of Boston to visit the USS Constitution and the Christopher Columbus Waterfront Park. I was successful in making some contacts from the parking lot.

I now mounted a 2m antenna and pointed the car North to HRO in Salem, NH, on Highway 93 listening to the W1BOS repeater. I stopped at a rest stop along the way. It took me only 30 seconds to swap out the 2-meter whip for the HF antenna. While I could hear many European stations on 20m, I wasn't able to make contacts with 5 watts. I did work a station in Kentucky with a 5x5 signal.

The antenna also works as a field antenna. Wit a small clamp bracket that I made and a counterpoise wire I can use it at the park or on top of a picnic table. HOA friendly sitting on top of patio table.

I tried this with a 3D printed bracket (now replaced with the metal Windcamp version) and adjusted the SWR by shortening the counterpoise wire while utilizing the Icom's built-in SWR meter. I worked N4SMS from Schofield Middle School Radio Club, and I received him at 59 while he had me at 57 on 20m. Not bad for QRP (10 watts) with a compromise antenna. One of the features I appreciate the most about this antenna is its telescopic whip, which can be fully extended and paired with the appropriate coil. It makes the set up easier than adjusting tap points and measuring the whip length.

I also set it up on my Icom 703 backpack for a table top operation. It does need a counterpoise. With the radio antenna tuner, I was even able to use the 15m coil on 17m. I did use some PVC tubing and a Diamond bracket to be used as a mount.

For the counterpoise, I use #26 Silky stranded wire, terminating it on the spade lug. You roll the cable in and out to get best SWR. This wire radiates as well so keep it elevated to minimize ground losses.

I can also use this with a camera tripod for HOA use or where fast deployments are needed like in the RaDaR events. You just need a bracket or modified mount to connect to the tripod head. It's a simple project and you can find cheap tripods at the thrift stores or better yet get a replacement mount for your tripod to modify for ham use.

I have used this antenna a few times during POTA and portable operations mounted on the car or on a tripod. I did find that the mount needed has to be able to bond to the car body. The Diamond K400 will do this via its two screws (do not forget the allen key when travelling). I have tried it on a magnetic mount and some slight adjustment will bring the SWR down to a reasonable level or I can just use a tuner to do some SWR tweaking. Obviously, having extra counterpoise wires will improve the signal levels. I have experimented with mounting this on a bike rack for light weight portable bicycle operations as I prefer a shorter 4 foot antenna versus a longer 8 foot whip. So there you have it, a 4 ft whip for use where longer antennas are not able to be deployed.

Overall, this antenna is a fantastic addi-

Back of rig antenna on the Icom 705.

Table top operations with the Icom 703. Note the custom bracket.

tion to my antenna collection. It can be used easily in portable and mobile configurations, and it has consistently demonstrated excellent radiating performance despite its compact size.

"The JNC MC-750 provides HF communications for the portable operator in a multiband antenna that can fit in a vest pocket." — https://chelegance.github.io/WIKI/ANT/M-104/M-104/

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QRPp Pixie Power

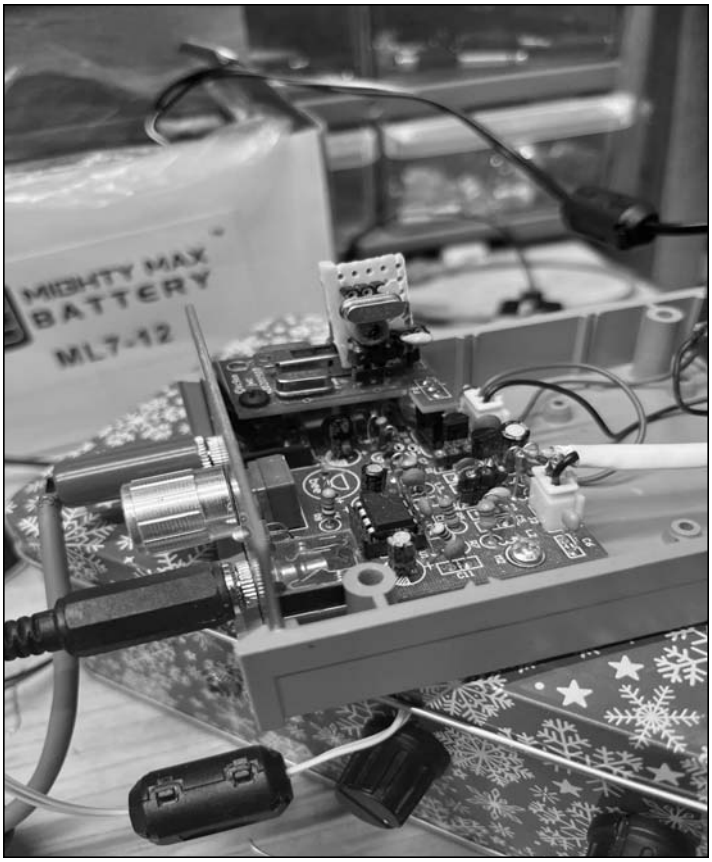
Wayne Steury—N9EGT waynesteury@gmail.com

I have enjoyed QRP and QRPp for many years. I started with a Rockmite on 40 and then 80 meters and enjoyed my QRPP experiences. It takes patience, for sure! My best times have been with my PIXIE. In Indiana, I worked 16 States with my 500 Milliwatt 40 meter Pixie and a Dipole or Loop. The hardest part was the broadband receiver and the noise from sources like my surge protector, etc. Using a battery is important.

However, my best PIXIE has been on 20 meters. KC9ON on his "3rd Planet Solar "' website has information on converting the standard Pixie to 20 meters. I changed the final Inductor to 0.56 mH and the two Capacitors to 220 pF to make the output section. C7 was eliminated and the addition of a 14.060 crystal did it. I changed the final transistor, Q2, to a 2N2222 for best output and use a 12 volt battery. Output is just below 1 watt. My dipole is matched to 1.1 SWR or I use a MFJ QRP tuner if I hear any Broadcast Band station. Anyway, it works in an amazing way! I have made well over 100 initial contacts with 34 States worked here from western Colorado, surrounded by mountains. I often call CQ and monitor with my G90 when the band sounds crowded with my Pixie DC transceiver.

Many times I get a "WOW" from the other end when I tell them my rig. I have worked several stations with a cheap Harbor Freight 9 volt battery. It takes patience and persistence! Reverse Beacon is a great help to see if the Pixie is working! I have a crystal switch on my Pixie and use an audio filter/amp for receive to my speaker.

—73, Wayne, N9EGT



Four Days in May — FDIM 2024!

Fairborn, OH — May 16-19, 2024

Four Days in May will once again be held in conjunction with the Dayton area (Xenia, OH) Hamvention©**.** The location is the Holiday Inn, Fairborn OH. Dates are May 16 through 19, with registration open the evening of May 15. Seminars are held on Thursday, May 16. Thursday evening is Vendor Night, with Homebrew and special contests featured on Friday night.

The Grand Banquet is Saturday evening, May 18. As in the past, there will be many door prizes at the banquet.

For registration, go to: www.qrparci.org/fdim

Club Night, Show & Tell, and Homebrew Competitions

Friday night is a special time for QRP enthusiasts! All events take place in The Ballroom starting at 8.00 pm. People setting up club tables or Homebrew Competition entries can enter earlier.

This is a social event where QRP clubs and groups set up their own tables to publicize their activities and generally have some fun. Tables are free of charge.

.**Four Days In May (FDIM) Speakers**

FDIM seminars are on Thursday May 16, 2024. Speakers presently scheduled include:

Jack Purdum W8TEE—
"The Construction and Use of a WhosZat"

Ashhar Farhan VU2ESE—
"Evolving CW to SDRs: Using sbitx to Bring CW to 21st Century"

Cliff Batson N4CCB—
"Adventures of a QRP Evangelist"

Hans Summers GØUPL—
"Top 10 Junkbox Projects!"

Wayne Burdick N6KR—
"Designing the Elecraft KH1: From Vision to Reality"

Tom Witherspoon K4SWL—
"Amplifying Your Adventures, Minimizing Your Power"

Gregg Latta AA8V—
"The Amazing Thermionic Valve"

Ross Ballantyne VK1UN—
"Stealth Ops from hotel rooms and other unlikely QTHs"

Schedule for FDIM 2024
(All times are Eastern Daylight Time (UTC -4)

Wednesday May 15
Registration from 7:30PM to 9:30PM

Thursday May 16
Registration starts at 7:30AM Outside the Ballroom
Pick up your FDIM badge from the registration table

Thursday May 16
Seminars begin at 9AM and breaking at 10:45AM
Restarting at 11:00AM
Lunch is from Noon to 1:00PM
Restarting at 1:00PM and ending at 5:00PM

7PM to 8PM—Vendor registration and setup - Main Ballroom, no public access
8PM to 10PM—Vendor Night

Friday May 17th
7PM to 8PM—Club Registration and setup in the Main Ballroom, no public access
7PM to 8PM—Show-and-Tell and Homebrew Contest Registration and setup in Ballroom
8PM to 9PM—Homebrew Contest Judging in the Ballroom
8PM to 10PM—Radio Show-and-Tell in the Ballroom
8PM to 10PM—One-IC Transmitter
8PM to 10PM—Club Night in the Ballroom

Saturday May 18th
7PM—Awards Ceremony and Grand Banquet in Ballroom
9PM—Post Banquet Chat Sessions, bring your QSL cards to trade

Sunday May 19th
Hamvention and head back home

Please note that transportation to and from the Hamvention is not provided at the Holiday Inn. Parking and buses are available just a short drive away. Check the Hamvention® web site for park and ride options.

The FDIM 2024 Logic IC Transmitter Power Challenge

It was common in the early days of solid-state QRP to rig up a 7400 TTL chip as a crude QRP transmitter. With a crystal and a handful of parts, it was possible to put a few hundred milliwatts on the air for a couple bucks. While these simple IC-based transmit circuits have fallen out of favor, QRPARCI is revisiting this bit of QRP history with the FDIM2024 LOGIC IC TRANSMITTER POWER CHALLENGE! The challenge is simple: Design and demonstrate a crystal-controlled 40M oscillator/PA to make the highest sustained power for a period of one minute using only a single 4000-series or 7400-series logic IC. This event will take place at 8:00 PM Friday, May 17 during FDIM, and the winner recognized at the QRP ARCI Banquet on Saturday, May 18, 2024.

The rules for the competition are simple, but we have to list every nit-picky detail to test your endurance anyway: The design is to utilize a single 4000 or 7400 series logic IC as the only active circuit element. There are no limits on the number of diodes, inductors, resistors, capacitors, or transformers, but a single IC may be the only active device.

The PA must be crystal controlled within the 40M amateur band. One (or more) section of the IC must be a crystal oscillator to control the frequency of the transmitter and builders are encouraged to use their own crystals, though there will be 7030 kHz HC-49 crystals available at the competition. No external frequency source may be used.

ICs to be used must be of the 4000-series or 7400-series. Different logic families of this type such as 74LSxx, 74HCxx, 54HCTxx etc. may be used.

The circuit must fit inside a 12” × 12” × 12” volume. During the power test, the judges will cover the circuit with a blast shield to protect judges and contestants from flying bits!

All circuit components are to be visible for inspection.

A schematic of the circuit is to be provided with each entry.

A zero-to-24V variable power supply, 40M band-pass filter, dummy load and power meter will be supplied by the judges.

The competition will have two rounds of trials to demonstrate power output of each circuit, with the best performance of each circuit being its final score. During each test, the builder will connect his circuit, set the power supply voltage and then announce to the judges when to begin measurement. During a period of one minute in which the builder may not touch the circuit or power supply, the RF power output at the end of one minute will be taken as the score for that trial. Failure of the circuit in that one minute test period results in a score of ZERO for that round!

The winner is the circuit generating the highest power score during either of his two rounds. If the circuit fails during the first test period, the builder will have five minutes in which to repair it before the second round trials. If your entry sets off the smoke detector in the Holiday Inn, you will be disqualified and may be subjected to rude laughter and finger pointing during the rest of FDIM!

The winner of the FDIM2024 LOGIC IC TRANSMITTER POWER CHALLENGE! will be recognized at the QRP ARCI Banquet Saturday May 18, 2024.

Questions regarding the POWER CHALLENGE may be addressed to David Cripe NMØS, nm0s@nm0s.com

Visiting FDIM for the first time ?
Here’s a guide so you know what to expect

Location

The venue is the Holiday Inn, Fairborn OH. It’s a pleasant and safe area to visit. The hotel has plenty of parking available. Facilities include a restaurant, bar, gym and indoor swimming pool. Ground floor rooms are available for disabled guests. Free WiFi is available throughout the hotel. There are plenty of restaurants within easy walking distance.

Wednesday Evening

Registration opens at 7.30 pm (as you enter the hotel, turn right and walk to the end of the corridor).

There are likely to be two lines—one for pre-registered and another for those who need to pay. Please follow directions from the volunteers. If you pre-registered then your badge will be available for collection and should be laid out on a table in order of Last Name. For those that are not pre-registered, you will need to pay for your tickets and wait while badges are prepared.

Thursday Daytime

Registration (for those who did not register on Wednesday evening) is available starting at 7.30am. You will find the Registration Tables right outside the main entrance to The Ballroom.

The seminars start with an opening address at 8.50am. Attendees sit at a table and are given a set of FDIM Proceedings. Snacks are provided at breaks.

Thursday Evening

At 8.00 pm we hold a Vendor Evening in The Ballroom. Vendors can set up their tables from 7.00 pm. Please wait outside the entrance if you do not have a reserved Vendor Table.

Friday Evening

All events take place in The Ballroom starting at 8.00 pm. People setting up club tables or Homebrew Competition entries can enter earlier.

Everyone attending is highly encouraged to bring a Show & Tell item for display on a table

Saturday Evening—
The Grand Banquet

The banquet is held in The Ballroom with entry at 7.30pm. Dress code is smart casual. No need for penguin suits!

The meal is served buffet style and guests will be invited to attend the buffet by hotel staff.

More information, including registration availability can be found at:
www.qrparci.org/fdim

Is an Antenna Tuner for the QRP Community?

Bob Rosier—K4OCE k4oce.qrp@gmail.com

There are a lot of interesting gadgets showing up on the Internet that could be useful in the QRP world. I recently purchased a Tiny SA Spectrum Analyzer and a Vector Network Antenna Analyzer shown in Figure 1 and 2 respectfully. I plan to do a product analysis of these units in a future issue.

Another item of interest is the ATU-10 Antenna Tuner shown in Figure 3. The unit has a small readout that displays both the output power and SWR. It also displays the capacitance and inductance being used to provide a low SWR match to a transmitter. After running a few tests, I found the power output readings and the SWR readings to be fairly accurate.

Since you are not really tuning the antenna, I prefer calling such a device a "Transmatch" since the TRANSmitter is being MATCHed to whatever is connected to the output of the tuner. The tuner will make automatic adjustments to provide a low SWR to the transmitter, but the antenna itself has not changed; if it was a mismatch, it is *still* a mismatched. I would point out that if you plan to use this unit just as a Power Meter and/or SWR meter, it is still a bargain.

You might be wondering what values of capacitance and inductance are needed to tune a typical antenna. The answer is values in the zero to 9 microhenries (uH) range, and values from zero to 1800 picofarads (pF) capacitance.

This particular unit provides up to 1869 pF in 10 pF steps (10 pF, 22 pF, 47 pF, 100 pF, 220 pF, 470 pF, and 1000 pF.), and up to 8.42 uH in .05 uH steps (.05 uH, 0.1 uH, .22 uH, .45 uH, 1 uH, 2.2 uH, and 4.4 uH).

There are several different configurations for antenna tuners, but this particular unit uses an "L" type. It automatically switches in whatever combination of values needed to provide around a 50 ohms resistive match.

Here is a diagram of this tuner (Figure 4). One thing that is clever about this design is the K2 relay. If the capacitance section is switched to the output, the system will match a high impedance antenna such as an end-fed, and if switched to the input side, it will match a lower impedance antenna like a standard dipole. The software makes all the necessary adjustments based on SWR readings, so all you do is push the TUNE button.

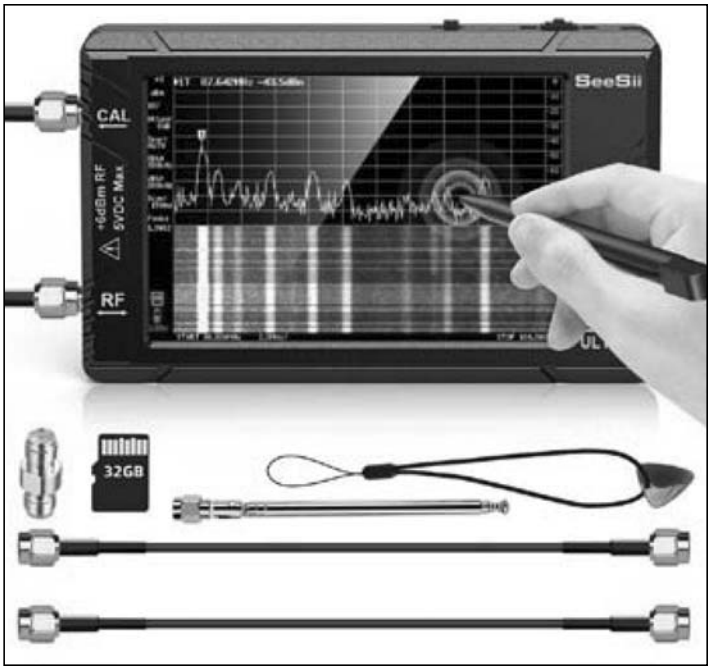


Figure 1—Tiny SA Spectrum Analyzer.

Some hams make the mistake of thinking that even a poor antenna can be made to work well so long as you use an antenna tuner. We all know that maximum power leaving the antenna occurs when the transmitter output impedance, the coax impedance, and antenna impedance are all equal, ideally 50 ohms resistive with little or no capacitance or inductance reactance

Figure 2—Vector Network Analyzer (VNA).

Figure 3—ATU-10 Antenna Tuner.

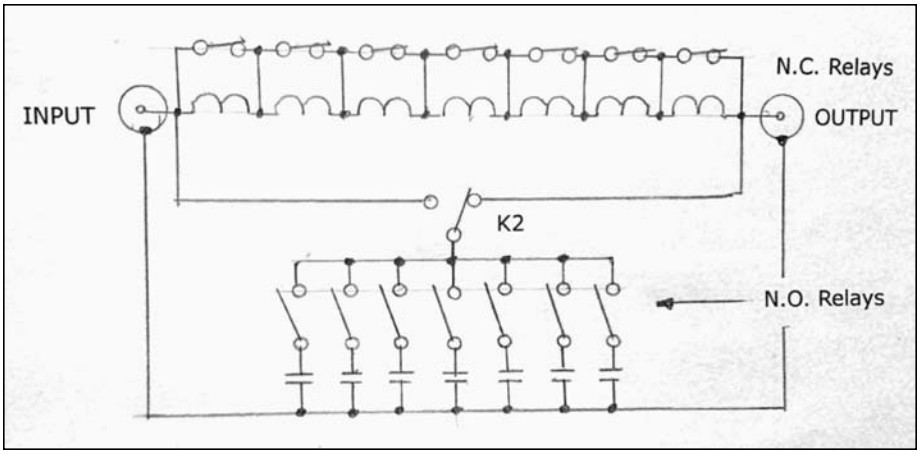


Figure 4—The basic tuner circuit.

components.

Let's use an example of a 20 meter dipole or 20 meter driven element of a beam cut for 14.2 MHz. At this 14.2 MHz resonant point, the current and voltage are in phase, none of the transmitted signal is reflected back, and there are no standing waves. Lowering the frequency to 14.1 MHz would require increasing the antenna length about 3" in order to bring the antenna back into resonance (antenna is too short for 14.1, so it is too capacitive). If we moved up the band to 14.3, it would require decreasing the antenna length by 3" (antenna is too long, it is too inductive) in order to bring it back to resonance. From this example, I hope it is clear that adjusting the length of the antenna is the only way to make the antenna resonant at the desired frequency. The mismatch at 14.1 and 14.3 can not be corrected by an Antenna Tuner. The tuner just takes what load is connected to it's output, and adjust the impedance as best it can to provide a lower SWR to your transmitter. If you were to measure the SWR up at the feed-point of the antenna, it will still be higher at 14.1 and 14.3. Your transmitter is happy with the low SWR it sees, but the antenna portion hasn't changed; the tuner will not fix a flawed antenna, and the tuner has no effect on the SWR between the tuner and the antenna. The reflected signals coming back to the tuner are being dissipated by the tuner thus protecting your transmitter. Is a tuner still useful? I connected a load on the antenna tuner which I measured (with the VNA in Figure 2) to have an SWR of 30:1. The antenna tuner adjusted this test load to 1.4:1 which obviously provided transmitter protection.

To be honest, I never cared much for Antenna Tuners. With QRP, it is important that your antenna be designed and tuned for as perfect a match as possible and just as important to keep the transmission line loss as low as possible. I use a flexible low loss LMR-400 coax cable, and I cut the coax to the minimum length needed to reach the antenna. I also use a high quality PL-259 connectors with gold plated center pin. I measured my beam cable loss to be 0.3 dB at 28 MHz.

You may disagree with my conclusion, but I believe an Antenna Tuner is not for QRPers, but instead was meant for the QRO community. If your antenna mismatch causes a watt or so to be reflected back into your transmitter, it's not going to damage your transmitter. On the other hand, if you are running a kilowatt and reflecting a few hundred watts back to you transmitter, there is a possibility of some damage.

Do you still have trouble understanding the term "Standing Wave"? When I was an Engineer at Bell Labs, I came across an old video (now on YouTube) that shows mechanically the behavior of waves and I highly recommend you watch this video. Here is the URL link. It is worth "cutting & pasting" to your browser and taking a look. You may have to bypass a commercial ad:

https://www.youtube.com/watch?v=DovunOxlY1k

FYI: Most rigs now have a built-in antenna tuner of some sort. Most handle SWR of 3:1 and below. If you are building a new antenna you should use an external SWR meter. Before making any measurements, first connect a 50 ohm dummy load to your rig's antenna terminal and press your auto-tune button. Now connect your new antenna and don't press the auto-tune button again. You can now make accurate measurements of the antenna itself using the external SWR meter.

Most of the early editions of *The Radio Amateur's Handbook* had a very handy antenna chart, as shown in Figure 5. Lets assume you just built a dipole for 80 meters and after measuring SWR you determined that the resonant frequency was 3600 kHz, but let's say you wanted it to resonant at 3900 kHz. The chart shows 3600 kHz = 130 ft and 3900 kHz is 120 ft. The difference is 10 feet, so cutting off 5 feet from each end of the dipole will make it resonant at the desired 3900 kHz. The chart saves a lot of calculations.

Let's take the example in which your antenna has a relatively high SWR of 3:1. You adjust your Transmatch and you get your SWR down to 1.2. But with an SWR of 3:1, only about 3.75 watts of your transmitted 5 watt signal will reach the antenna. (3:1 SWR = 25% of the power reflected back. ●●

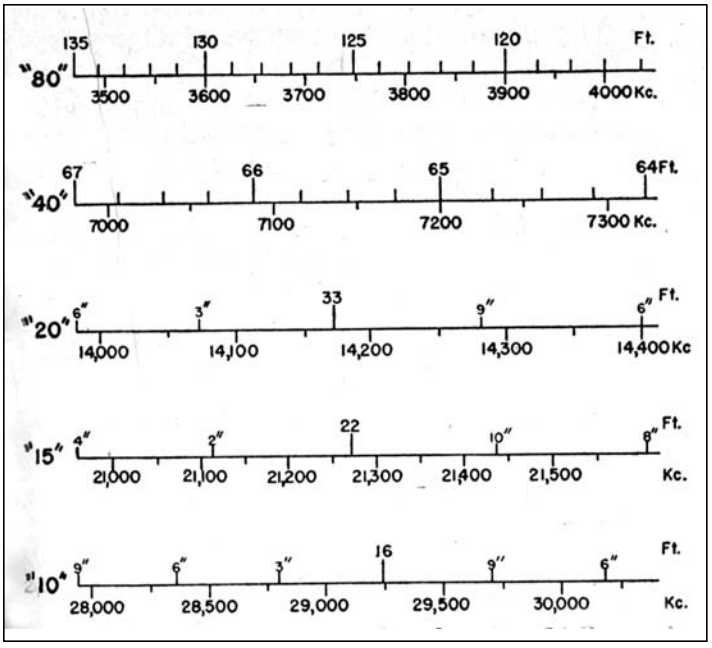


Figure 5—Chart of antenna performance:

The Mount Vernon Moxon

David Cripe—NMØS nm0s@nm0s.com

This article was originally an entry in the ARRL Antenna Contest, in the 6 Meters and Up category. It is the work of Mount Vernon (Iowa) Troop 40 Amateur Radio Club WNØBSA.

Mount Vernon is a small town in eastern Iowa that is home to Boy Scout Troop 40, a small but active group of young, and not-so-young men who have long made their mark on the community with their activities and public service projects. The troop has worked to integrate amateur radio into its activities, with an annual Jamboree-On-The-Air station. With six licensed hams in the troop, we have recently formed our own Amateur Radio Club, with call sign WNØBSA

As our group planned activities for future events, we considered the many different activities the club could participate in. One that really caught our imagination and interest was a transmitter hunt—a good old Fox Hunt! We discussed the basic strategies and techniques, and described the equipment needed: an HT, which each licensed member already owned, and a directional antenna. Thus, the challenge was defined—to devise a directional 2M antenna that could be assembled quickly, safely, and inexpensively by a young person with uncertain skills with tools. It should also be rugged enough to withstand the abuses an energetic young person can inflict.

The Mount Vernon Moxon.

The foxhunter's favorite directional antenna, the "tape measure Yagi" was considered initially, but its construction requiring soldering and the sharp edges resulting from cutting the tape measure made it just a bit too risky and complicated for the younger kids to take on.

After some brainstorming,, a Moxon antenna was selected as the basis for the design. Less well known than a Yagi, a Moxon antenna is actually a two element Yagi with the ends of the elements folded toward each other to form a rectangular profile. Although not as sharply directional as the three element yagi, a Moxon antenna achieves its large front-to-back ratio of gain using only two elements. Additionally, the Moxon has a feedpoint impedance that is already close to 50 ohms, and is far more broadband than the three element Yagi which requires an impedance match for satisfactory VSWR.

The implementation we devised was a simple construction employing everyone's favorite material, PVC pipe, with aluminum foil duct tape for the conductive elements. All the construction can be done with simple hand tools, and no soldering, making it perfect for the younger builder. It is a bit unusual in that it is configured so that the null is in the forward direction of the antenna, making it well suited for direction finding—just aim the antenna toward the null in the signal, and follow in the direction of the antenna!

Our club had an antenna building session, knocking out four Mount Vernon Moxons in assembly-line fashion. Each one worked, and was used for fox hunts during the 2016 Jamboree-On-The-Air.

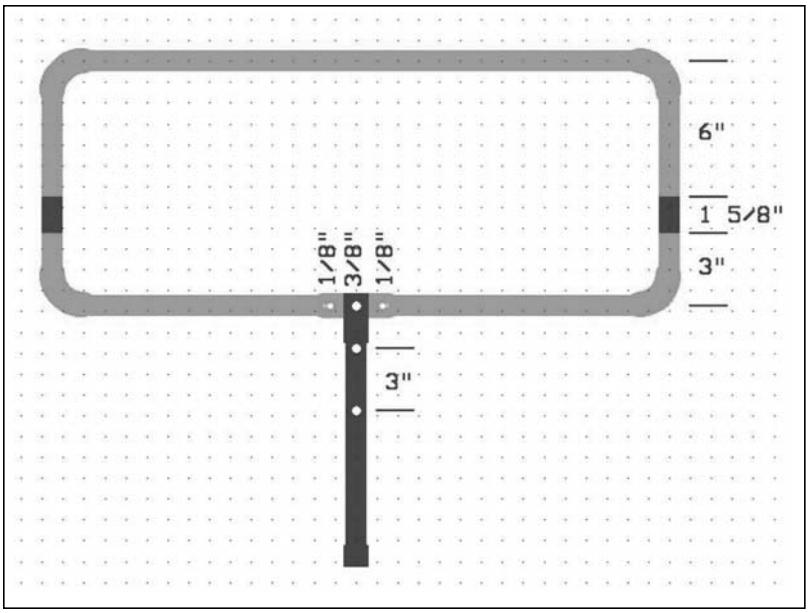


Figure 1—Dimensions of the Mount Vernon Moxon (lighter part is aluminum foil tape).

Detail of the coax connection to the driven element.

Begin by acquiring the following:

Parts List:

Quantity	***Description***
6' (2 m)	1/2" white PVC pipe
4	1/2" PVC elbows
1	1/2" PVC Tee
1	1/2" PVC cap
2	#6-1/2" sheet metal screw
2	20-22 g, #6 crimp ring lugs
1	6' (2 m) 50 ohm BNC cable
12' (4 m)	2" (5 cm) wide aluminum duct tape

Tools

Tape measure
Hand saw
Miter Box
Hobby knife
Hand Drill
1/8" (3 mm) drill bit
3/8" (10 mm) drill bit
Plastic cement

Construction of the antenna is relatively straightforward. First, cut the PVC pipe into sections of the required length:

Quantity	***Length (1/2" PVC pipe)***
2	9-3/4" (24.7 cm)
2	13-1/8" (33.3 cm)
1	27-1/2" (69.9 cm)
1	10" (25.4 cm)

Figure 1 shows dimensions of the finished antenna. Begin with the tee fitting and two 13-1/8" pipe sections. A wide variety of adhesives may be used for assembly, but regular plastic model cement has adequate strength and low toxicity. Apply cement to one end of one of the 13-1/8" tube, and insert it into one side of the tee per the illustration. Push it in with a slight twisting motion until it bottoms out. Repeat with the second 13-1/8" tube on the other side of the tee.

It is important that the PVC frame be assembled straight, so that the elbows are all in-line, and oriented in the correct direction. To do this, we will temporarily insert some of the pipe sections into their connectors to help verify that the joints being glued are straight.

Temporarily insert the 10" section into the tee without gluing it. Take the two 9-3/4" sections, and slip an elbow onto one end of each, without gluing.

Glue the open end of each of these two elbows onto the end of the two 13-1/8" pieces. Quickly, before the glue sets, verify that the 9-3/4" sections are parallel and point in the opposite direction as the 10" piece. If not, use the 9-3/4" pieces as levers to twist the freshly glued elbows until they are straight. Then, remove the 9-3/4" pieces, and temporarily insert them into the two remaining elbows.

Glue these two elbows onto the 27-1/2" long section, again using the 9-3/4" sections to make sure the elbows are correctly oriented.

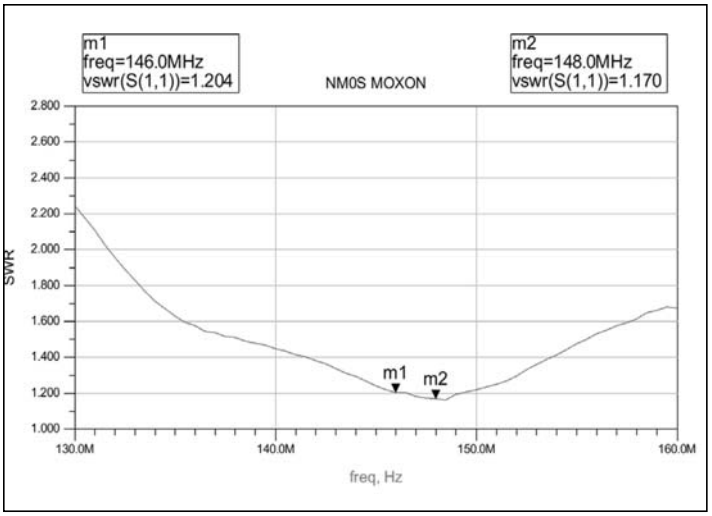


Figure 2— Measured VSWR performance of the Mount Vernon Moxon.

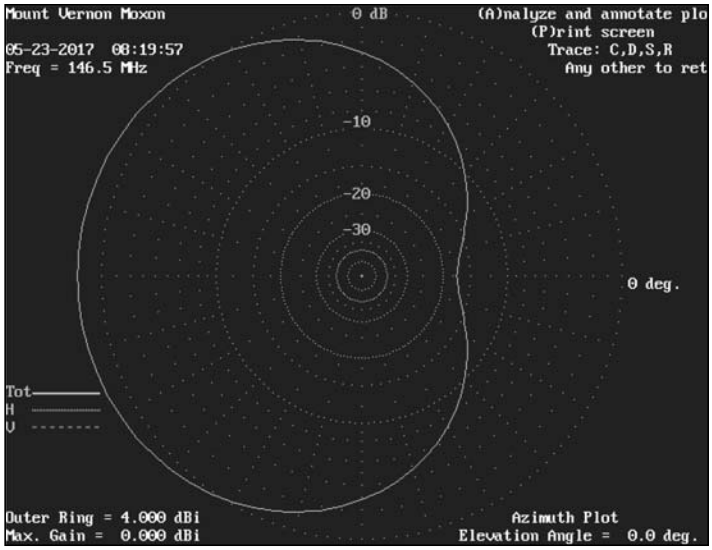


Figure 3—Calculated directive pattern of the antenna.

Next, glue the 9-3/4" pieces into the elbows on the 27-1/2" section. Then, glue the other ends of the 9-3/4" sections into the elbows on the 13-1/8" sections.

Now, we prepare the frame to accept the coax.

Drill a 3/8" hole in the center of the tee as per the diagram.If a drill press is not handy, it can help to drill a 1/8" pilot hole to help keep the larger drill bit from skating while drilling.

Drill a 3/8" hole into the 10" pipe section, 1-1/2" from its end. Drill a second hole 4-1/2" from the same end.

Drill a 3/8" hole in the center of the pipe cap. Glue it onto the 10" section of pipe on the end opposite of where the holes had been drilled.

Next, the pipe frame is to be covered with the aluminum foil tape. Cut four pieces of tape 18-1/2" long. Remove the adhesive backing, and place them on the PVC frame beginning on the outer circumference of the frame, beginning at the tee, about 1/2" from the center. Slowly place the adhesive foil down upon the PVC. It won't be perfectly smooth, especially around the pipe elbows, but smooth out the wrinkles as best as possible. Then take a second piece and apply it to the inner circumference of the frame to cover the inside of the structure. Repeat on the other side of the frame.

Next, mark the aluminum foil where it ends on the side pieces of the frame, 3" from the center of the elbow. Using a hobby knife, score the foil in a circle around the pipe at this point, and peel off the extra foil. Repeat on the other side.

Next, take the remaining foil, and cut two 43" pieces. Beginning at a point 6" from the center of one of the outer elbows, cover the outer side of the PVC frame. Repeat on the inner surface of the PVC frame. Mark the ends of this section of foil 6" in from the midpoint of the far elbows per the diagram. With a hobby knife, score the foil in a circle around the tubing at this point, and peel off the extra foil. You will then be left with sections of bare PVC on both side sections of the frame. Smooth the foil as best as possible.

Next, drill two 1/8" holes through the foil-covered section of the tee per the illustration.

Next, the coaxial connector is to be prepared. Because of the challenge of installing a BNC connector onto coax, a simple expedient is to purchase a premade, 6' BNC cable, and to simply cut off one connector.

Feed the coax through the hole in the pipe cap, then through the hole 4-1/2" from the end of the pipe. Wrap it around the pipe 10 times, and feed it back into the hole nearest the end. Make sure there is about 3" left extending through the end of the pipe. Fish it through the hole in the tee section. Carefully apply adhesive to the end of the pipe, and insert it into the tee.

Strip off 1" of the coax jacket, and separate off the braid, twisting it into a bundle. Crimp on one of the ring lugs. Strip back the foil on the center dielectric, if it has it, and remove about 1/4" of the center dielectric, and then crimp on the remaining lug.

Using the two sheet metal screws, fasten the center conductor and shield crimp lugs down to the 1/8" holes on either side of the center of the tee.

Pull the slack coax back through the hole in the tee, and snug up the coax coil on the handle, pulling the excess through the pipe cap. You are done!

While the Mount Vernon Moxon may be constructed without power tools, when our radio club decided to build several for use in a fox hunt, a chop saw and drill press were employed in assembly line fashion to make short work of the project. Be sure to use eye and ear protection!

Tests of the Mount Vernon Moxon show that it has a decent 1.2:1 VSWR at the band center, and an amazing bandwidth of 17 MHz between 1.5:1 VSWR points. See Figure 2.

The antenna design was analyzed using ELNEC 3.03, an old but useful DOS antenna analysis program. This predicted a forward -to-back ratio of better than 20 dB, with a feedpoint impedance of 62 ohms at 146.52 MHz. See Figure 3.

Empirical field tests of the directionality indicate it has a very well defined null in the forward direction of the loop, and the design has proven itself in numerous fox hunts.

The Mount Vernon Moxon is a simple, durable, effective fox hunt antenna, ideal for young people to build and use. Try it out with your radio scouts!

—73, Dave Cripe, NMØS
Mount Vernon Troop 40
Amateur Radio Club, WNØBSA

The CW Renaissance

Thomas Witherspoon—K4SWL thomas@swling.com

"There's no better time to be a CW operator!"

I sent that message to two people who reached out recently. Both of them purchased CW-only QRP transceivers even though neither of them had started learning CW yet!

For many of us, the allure of ultra-portable radio operation is irresistible. The simplicity and versatility of CW transceivers, coupled with their lightweight and compact design, make them ideal companions for on-the-go radio adventures. Personally, my foray into CW back in 2008 was motivated by the desire to wield the Elecraft KX1, a beacon of portability and performance in its time.

But CW offers even more benefits. Though some of you, dear readers, may already be familiar with them, let's delve into this topic.

But first, my little soapbox…

I'd like to address this upfront: Don't ever let anyone tell you that only "real" hams know CW. I don't believe in that. Whether you operate FT8, enjoy phone conversations, or love building but rarely (if ever) operate, you're a ham. All types of operators are welcome in this dynamic, diverse hobby.

Don't ever let anyone tell you that you have to do it their way. Make ham radio your own! If you have no interest in CW, that's perfectly fine.

Now, where was I? Oh yes, I have news for you...

We're in the midst of a CW Renaissance!

The uptick in CW operators over the last three years has been nothing short of amazing.

Many predicted that when the code requirement was dropped, CW would fade into oblivion. But that hasn't happened. Why would ham radio operators learn CW even though it's no longer required to obtain a ham radio license?

In fact, I would be willing to bet that we currently have more CW operators than we did when that requirement was dropped roughly two decades ago here in the States.

Why are we gravitating back to one of the earliest modes of wireless communications? Let's explore a few reasons on the surface.

CW Packs A QRP Punch

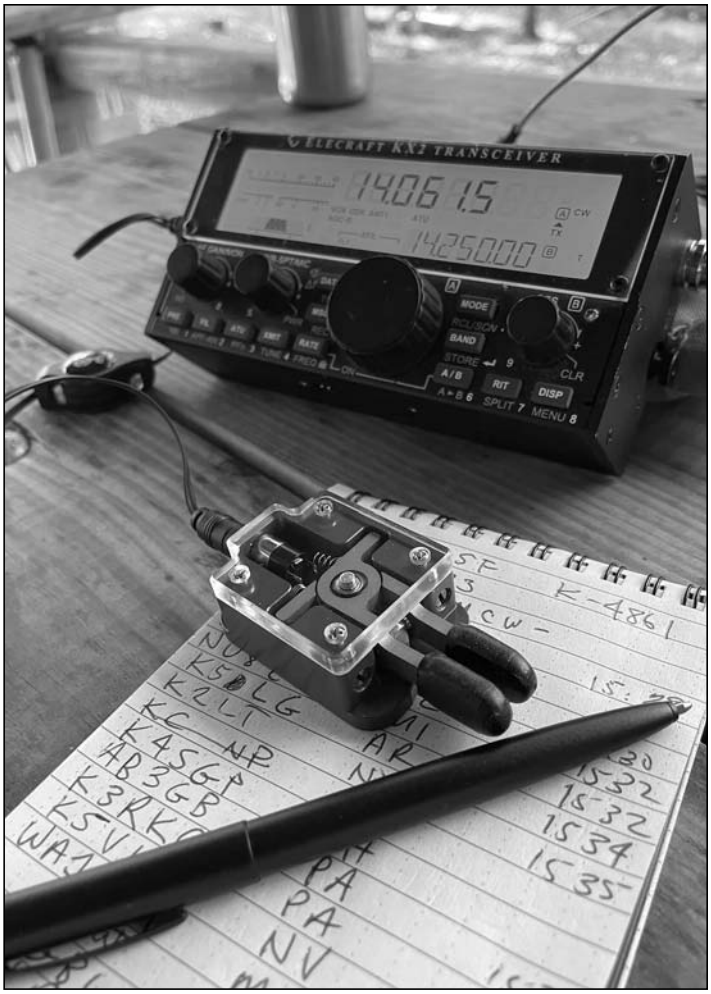
There are a lot of variables in play here, but in my experience, five watts of CW is equivalent to about 75-90 watts in single sideband.

CW is such a simple mode with on/off

The new Elecraft KH1 Elecraft KH1 is ultra-portable, weighing less than one pound.

My MTR-3B, operating in the Rocky Mountains with only a LiIon 9V battery for power.

In June 2023, I operated from Lake Norman, using my Ten Tec R4020 with an EFHW-16 antenna.



Later in June 2023, this operation was done with an Elecraft KX2, and PackTenna antenna.

tones that it punches through the ether better than voice modes, which spread out transmitted energy over a wider bandwidth.

Occasionally, I decide to operate with just 100 mW of power. While this power level may seem absurd to friends who use 100-watt radios, I've never experienced a failed activation using 100 mW. In fact, just looking at my logs from those activations, I would never have guessed I was running QRPp. They have roughly the same propagation footprint as my five-watt activations.

CW Opens the Door to Ultra-Portable Operating

Since CW is such an effective mode at QRP power, and CW transceivers are simpler in design compared to SSB transceivers, there are some amazingly compact, lightweight, and effective field radios available. Many are available as kits for as little as $100 or less!

My entire Venus SW-3B field kit weighs about two pounds (8 ounces of which is the throw weight). My new Elecraft KH1 weighs less than one pound.

In terms of uber-portable gear? You couldn't have picked a better time to become a QRP CW operator!

[*Readers will certainly note that the accompanying photos are all related to portable operating! —Editor*]

CW is Stealthy

I remember activating Rocky Mountain last year. I used my Mountain Topper MTR-3B with earphones and my N6ARA TinyPaddle Jack. Without meaning to, I was so still that a chipmunk walked right up to my chair and sniffed my boot. I was quiet, it startled him when I looked up and smiled at him.

With earphones on, CW makes almost no sound at all, especially if using quiet paddles like mine.

With SSB, even if wearing earphones, you still must speak into a microphone from time to time. When conditions are rough and noisy, without meaning to, many of us shout into the mic, which can actually disturb others around us.

CW-Only Transceivers are Battery-Friendly

Many of my portable CW-only transceivers draw less than 100 mA in receive. Most are below 70 mA, and I even have a couple that are in the sub-20 mA range (I do love my Mountain Toppers!). This means that we can operate for hours using compact, lightweight batteries. The largest battery I use with my QRP transceivers is a 12V 3Ah LiFePO4 battery. With my Mountain Topper MTR-3B, I use a $7 USB-C rechargeable Lithium-Ion 9V cell.

Honestly, it still blows my mind that I

Here I am using the KX2 for a SOTA activation.

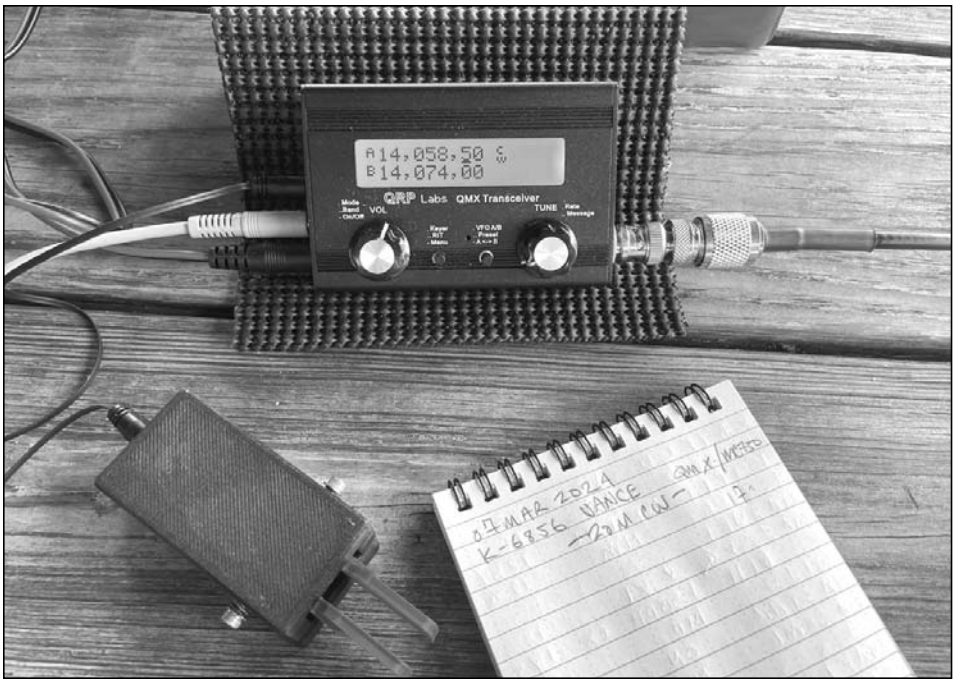
can do two full SOTA activations with my MTR-3B being powered by one 9V battery charge. It's nothing short of battery magic!

CW is More Resilient to QRM/QRN

Because CW is such a narrowband mode, it's a little less susceptible to band noises.

Recently, I activated Gorges State Park here in North Carolina. The park is vast and gorgeous, but it also has high-tension power lines that, somewhere along their length, arc. Had I been activating SSB, the persistent broadband frying noise would have been unbearable. While it was still annoying, with a 500 Hz filter width, operating CW was quite doable with nowhere near the amount of listener fatigue I would have experienced operating phone.

Another example: last year, I activated Pisgah National Forest in the early evening. There were thunderstorms about 800-1200 miles away, and the static crashes were pretty intense. Typically, I run a wide filter even in CW, but on this occasion, I narrowed it down to 350 Hz and the static crashes were much less pronounced. I had no difficulty operating for an hour and logging a load of contacts.



The QRP Labs QMX is another ultra-portable rig I used on a recent outing.

CW is Spectrum-Efficient

Since CW is such a narrow mode, our allocations across the HF bands are much less crowded than they are in, say, the SSB portions of each band. I can operate 500 Hz away from another CW station, and as long as both of us have reasonably effective filters, we won't interfere with each other. This is likely one of the biggest reasons I rarely use my mic these days. It's just so much easier to find a free frequency and hop on the air in the CW portions of the band than it is in SSB.

CW and the Reverse Beacon Network (RBN)

Although I've been a CW operator since around 2008, my speed was slow, and I was accustomed to casual rag chews with friends who could send at a slower pace. The idea of participating in POTA and SOTA activations in CW initially intimidated me—so many callsigns, and the potential for pile-ups? I wasn't sure if I could ever enjoy that.

Boy, was I wrong.

My primary motivation for becoming a CW activator for both programs was the incredible Reverse Beacon Network (RBN). Both the SOTA and POTA networks can scrape callsigns, frequency, and signal reports, then automatically spot an activation (provided it has been scheduled). This revolutionized my activations. I no longer needed an internet connection to self-spot. I could simply hop on the air, call CQ SOTA a couple of times, and boom—I was auto-spotted. This opened up the door to more remote locations that I could activate with confidence. While it's not a flawless system—sometimes the connection to the RBN goes down—the RBN will still find me, ensuring that, at least, my friends can be notified if I'm activating a particularly remote location.

CW is Simple

You could easily argue that digital modes like FT8 share a lot of the advantages of CW, and you'd be correct most of the time—it's effective at low power, it can be stealthy, and it's resilient to noisy band conditions.

That said, digital mode operating

The Elecraft AX1 4 foot vertical is designed for portable operating; shown here with the KX2 transceiver.

Here is my QCX-Mini Field Kit, with everything you need for a portable QRP adventure.

requires some sort of computing device (either separate or built-in to the radio), a keyboard or interface, and often more battery capacity. With CW, the computer is between your ears and requires no battery; although, in truth, mine requires a nice injection of coffee to keep the synapses firing.

Once you've built up your CW skills, they only improve with time and practice. It becomes so second nature I actually find it relaxing.

Two popular portable rigs—the Venus SW-3B and Penntek TR-35 (along with the padded carrying bags that I use).

CW is Good For Your Brain

Learning CW taps into the language centers of our brain. While it's not like learning a completely different language, you will experience some of the same benefits. There are numerous studies out there proving that learning a new language is, as Cambridge University notes, "such an effective brain workout and protects older learners against dementia and other degenerative neurological conditions."

While I'm not sure if anyone has ever researched students of CW, we know that learning and using this mode of communication is healthy for our brains.

So Many Reasons for our CW Renaissance

While all of the advantages of CW mentioned above are significant, there's no doubt in my mind that the increased popularity of park and summit activating has been the turbo-injection responsible for our CW Renaissance. That, coupled with the growth of organizations that help CW

A close-up of the Penntek TR-35.

The Elecraft KX-1 set up for some trailside QRPing!

One more Field Kit—this one with the MTR-4B rig.

operators learn the ropes and become more efficient, along with countless YouTube channels that promote CW in various ways.

When I first embarked on my CW journey in 1997, the most accessible way to learn CW was through tapes and audio courses. Today, you can participate in online classes with dozens of operators at your proficiency level. There are numerous on-the-air activities for CW operators as well. And the friendliness and welcoming nature of the CW community mean that the barrier of entry is quite low.

While taking your first steps in CW may seem intimidating, once you're on the air, you'll find that everyone wants you to succeed and enjoy the mode. Your fellow CW operators want you to succeed—they've all been in your shoes at some point.

So, while activities like POTA, SOTA, WWFF, IOTA, Contesting, DXing, and others may serve as catalysts, it's the community that makes CW such a wonderful, dynamic mode.

CW is a skill worth your investment!

●●

CW in the "Good ol' Days"
Gary Breed—K9AY (originally WN9AYP)

I am an genuine old timer, licensed more than 62 years ago in the fall of 1961. At that time, the Novice license had a term of one year, non-renewable. I was like most Novices, also getting the Technician license to remain a ham if I couldn't upgrade to General by the time a year had passed. Which was the case for me, since I had to make a 120-mile trip to the Chicago FCC office to take the exam. I managed to do that about one month after my Novice expired.

The one-year deadline was a powerful incentive to become proficient on CW! Fortunately, ham radio was quite popular at the time, due to the combination of interest in science with the Space Race, the benefits of the post-WWII economic boom, and an emphasis on Cold War emergency preparedness. The Novice bands were crowded, especially on weekends, so there was plenty of opportunity for code practice. After being active for several months, I recall having ragchews at 18-20 WPM—with a straight key because my paper route income wasn't enough to buy a good quality bug!

Are you a Genuine Radio Collector, Investor Collector (Flipper), Hoarder, Socialite or User?

By Paul Signorelli—WØRW
w0rw1@msn.com

Genuine Collector — One who finds, acquires, and restores equipment and accessories to transport themselves back to a bygone era—a respite from ordinary life. It is a pervasive human trait driven by a desire to create order amidst natural attrition of aging artifacts. A key driver is the association of the equipment with one's youth or career.

Investor Collector (Flipper) — A predator on Genuine Collectors. They only have superficial knowledge or interest of the equipment. They infiltrate collector networks for personal gain. Capitalizing on the altruistic collectors, driving the up the auction prices.

Who would do that?

Hoarder? — There is a narrow dividing line between hoarding and collecting. Both are driven by a compulsion to assemble and accumulate equipment. The collector will continuously improve the quality and diversity of the core collection, but the hoarder only gains satisfaction from acquiring more of the same stuff. In the extreme, it is a mental illness.

Socialite — This ham uses his equipment to develop networks of fellow collectors, give talks at clubs or other meetings, write articles, generate polls, etc.

User — A the term implies, a *user* is more concerned with the operation and frequent use of the equipment—on the air, or in the lab making improvements.

The idea for this subject and a lot of the information came from Richard Dismore, F4WCD/ZS6TF, and is used with his permission. ●●

The Saga of the NorCal Zombie

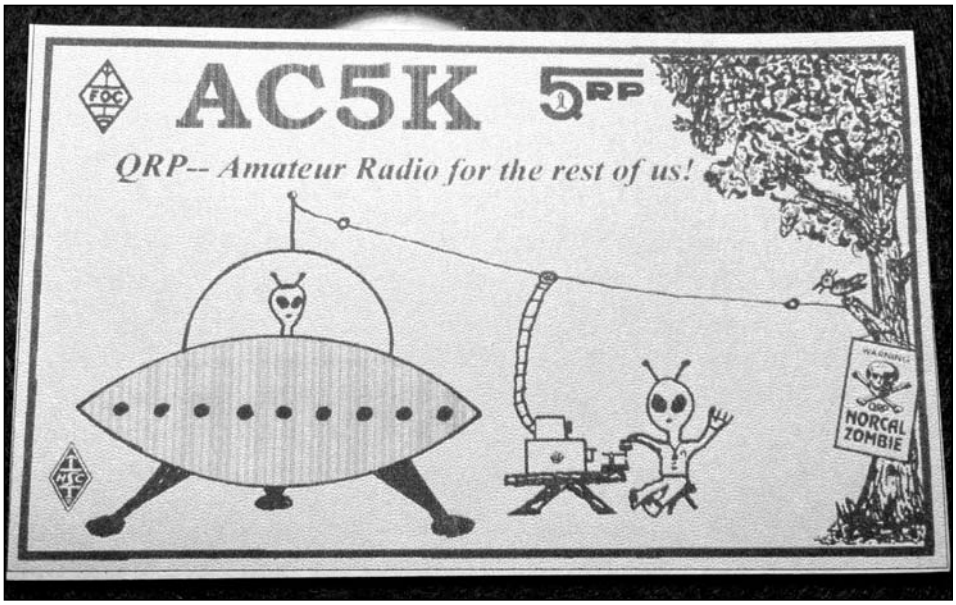
By Wes Spence—AC5K
wesac5k@gmail.com

It has now been many years, but I wonder how many still remember this interesting piece of QRP history?

It all started by someone getting very angry on the QRP Reflector and telling everyone they were "just a bunch of zombies" who do whatever Jim Cates—WA6GER (SK), co-founder of the NorCal QRP Club—told them to do.

Fairly shortly after the big uproar on the QRP Reflector, there was a large hamfest in Texas called Ham Com. That hamfest is gone now, but back then there was a really good presence of QRPers every year. Three separate individuals came up with NorCal Zombie badges and distributed them for free to other QRPers at the hamfest! Even funnier is a red and yellow badge (by NA5N), a mock up of an Area 51 security badge on the reverse side—very useful for scaring people in lunch lines and keeping sales people away!

When I designed my home brewed QRP QSL card, I wanted to emphasize that QRPers were different. I finally decided on the UFO theme and the statement "QRP—Amateur radio for the rest of us". Also, I decided to give a tip of the old hat to the other zombies out there, so I scanned one of the badges and you can see it hanging on the tree under the bird. I have always respected QRPers because they are thinkers and doers. I also hope we will always also remain weird! ●●



A Two-Tone Test Generator

Ashar Farhan—VU2ESE afarhan@gmail.com

A two tone test generator is a very useful, simple circuit that you can build to test your circuits for distortion.

What is it?

The principle is very simple: two crystal oscillators generate two signals that are close to each other. Both the oscillators are well isolated from each other's output and then mixed together in a 6 dB hybrid coupler. The combined output is filtered to remove the harmonics. Figure 1 is the circuit. It has just four transistors in it. You can build one in an evening.

How does it work?

Let's imagine that the two crystals frequencies of your two tone generator (let's call it TTG from now on) are 14 MHz and 14.16 MHz. They are have a difference of 160 kHz between them. If you feed the output of the TTG to an amplifier, you expect just those two frequencies to show up in the output. That only happens in an ideal world..

All real world amplifiers, mixers, even filters show distortion. The distortion will result in spurs (spurious signals) at 13.8 MHz and 14.4 MHz as well.

Mathematically speaking given that the two test signals are f_1 and f_2, the spurs will appear at $2f_1 - f_2$, and $2f_2 - f_1$.

These are called third-order distortions, and they appear near the test signal frequencies. We will deal with the math later. For now, it is enough to say that:

- You inject the two tones, each at -10 dBm into a circuit.
- Measure the output tones. An amplifier will increase the output by it's gain. In a test case, the amplifier output was +7 dBm, the gain was 7 – (-10 dBm) = +17 dB
- Measure the tone to distortion ratio. In this case, the distortion product was at -23 dBm. Which is 30 dB below the tone (+7 dbm – (-23 dBm) => 30 dB)
- The Third Order Output Intercept Point (OIP_3) is output power + half of distortion ratio. In this case, it was +7 dBm + 30dB/2 = +22 dBm.
- The Third Order Input Intercept Point (IIP_3) will be input power + half of the distortion ratio. In this case, it was -10 dBm + 30 dB/2 = +5 dBm

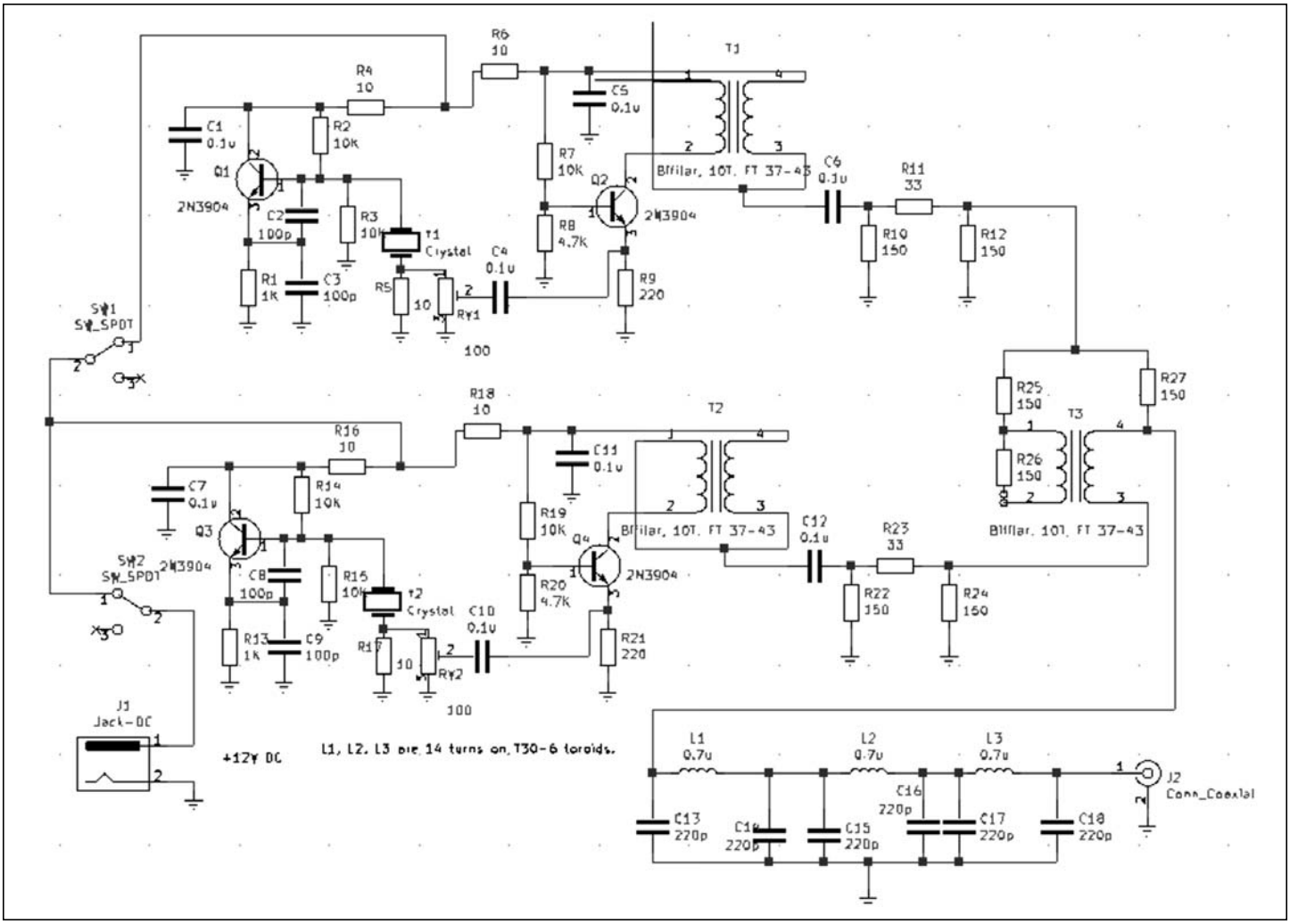


Figure 1—Schematic diagram of the two-tone test generator.

Circuit

Each of the two crystal oscillators is a conventional crystal oscillator. The unusual part is that we take the output from a small (10 ohms) resistor that is between the crystal and the ground. This is a neat trick where we use the crystal as a crystal filter as well. This where the oscillator noise is the lowest. A small value (100 ohms) preset allows you to fix the exact power output at -10 dBm at the BNC jack.

The amplifier that follows is common-base amplifier, that provides very good input-output isolation. This is important as the outputs are mixed further down in the circuit and we don't want one of the outputs leaking back into another oscillator and intermodulating it. We need almost zero intermodulation out of this circuit so that the only intermods you can measure are from the circuit that this TTG will drive.

The 6 dB pads at the output of the amplifiers provide a stable driving impedance to the hybrid coupler. The hybrid coupler is a deceptively simple circuit. It mixes the two oscillator outputs in such a way that there is (theoretically) no reflection from one oscillator output to another. If the hybrid coupler reminds you of a return loss bridge, your guess is correct (Not now, not now).

Any amplifier output has harmonics. These harmonics can interfere with the measurments. You can appreciate that if you remember that the third order intermods are caused by intermodulation of the second harmonic of one tone with another tone's fundamental ($2f_1 - f_2$). Hence, an extensive 3 section Chebyschev low pass filter keeps the harmonics down.

As you can see, the circuit is more elaborate than two simple crystal oscillators with their outputs tied together. Test instruments can never be over-engineered. It is a good idea to throw as much effort and care into them as possible.

Construction

I constructed this in a small tin box that they gave on a flight with nuts in them. (No, not free, you have to buy the nuts). I built it ugly style using some stryoflex (also called polystyrene) capacitors in the LPF The disc ceramics of the plain variety proved quite lossy.

The generator is constructed in a small metal box (the nuts have been eaten).

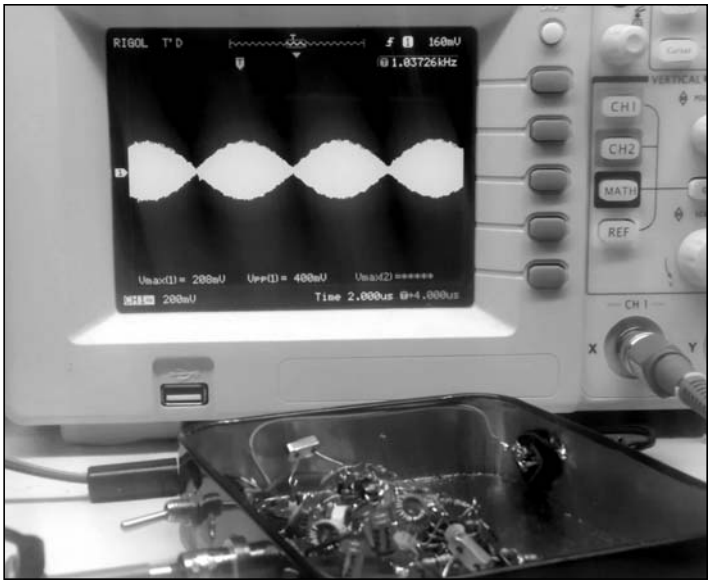
Depending upon the crystals you have, you may have to change the low pass filter values. The *ARRL Handbook* or the *Experimental Methods in RF Design* (Also an ARRL publication) give you the formulae to do it easily.

Calibration

With SW1 switched off, only one oscillator will work. Connect the output to a 50 ohms load and with an oscilloscope probe, adjust the RV1 until the peak to peak RF appears to be 200 mV.

Now, switch on both the oscillators, and ajust the other oscillator until the combined peaks measure 400 mV. Your adjustments are done. See the pictures. Keep the oscilloscope time base to about 1 µsec to get the peaks all bunched together. You can also see the two tones generating a PSK31 like waveform. The peaks are when the amplitudes add up and the nulls are where the amplitudes cancel out.

Output with one tone in operation.



The generator output adjusted for two equal tones.

Doing it without a spectrum analyzer

The two tone generator assumes that you have a way of measuring the two tones seperately, that usually means a spectrum analyzer. But you can use your amateur radio receiver with a step attenuator. Here is how:

- Turn off the AGC. It is a good thing that many homebrew receivers don't have it to begin with!
- Connect the two tone output of the circuit to the receiver through an attenuator. Keep the attenuation to at least 40 dB or you will blow the receiver!
- Tune to the spur. Note the speaker audio level with an oscilloscope.
- Now, tune to the tone. It will be very loud. Keep adding more and more attenuation until the tone is exactly as loud as the spur. Measure the audio level on the oscilloscope. Now, you have the IMD ratio. You can back calculate the OIP_3.

The Mathematics

Given a signal *x* that goes into an amplifier, the output should y such that

$y = ax$ (The ideal case, a is the amplification factor)

Instead, we get,

$$y = ax + bx^2 + cx^3 + dx^4 \ldots.$$

This is not nice. We would ideally like b and c and d etc. to be zero so that just a*x* remains.

Our two tone generator helps in measuring the cx^3. This is the most troublesome distortion because it produces spurs that are close to our signals. The spurs that are further away are filtered by the front-end filters or the transmitting low pass filters. Why is that so?

Let's imagine that the signal consists of two signals actually: a and b. Now, the term cx_3 becomes $c(a + b)^3$.

If you remember your high school math,

$$(a + b)^3 = a^3 + b^3 + 3ab^2 + 3a^2b$$

The last two terms are multiplying the signals like : $3 \cdot a \cdot b \cdot b$ and $3 \cdot a \cdot a \cdot b$

We know that when signals multiply, they generate ouptut frequencies at their the sums and differences.

Multiplying signals $3 \cdot a \cdot b \cdot b$ will generate frequencies $a \pm b \pm c$ which would be:

$a - b - b = a - 2b$	(this is our offending spur)
$a + b - b = a$	(doesn't matter, it is just a)
$a + b + b = a + 2b$	(this spur at 3 times the frequency; it will get filtered out)
$a - b + b = b$	(doesn't matter, it is just b, again)

and multiplication of $3 \cdot a \cdot a \cdot b$ will produce the frequencies at $a \pm a \pm b$ which will be:

$a - a - b = -b$	(just b)
$a - a + b = +b$	(just b, again)
$a + a - b = 2a - b$	(this is the offending spur)
$a + a + b = 2a + b$	(This is three times the frequencies, it will get filtered out)

This is the horrible secret of the third order (because it is the third term) distortion and why we struggle to overcome it. It can never be defeated but it can be controlled.

Pour some more current into the amplifiers, Jake!

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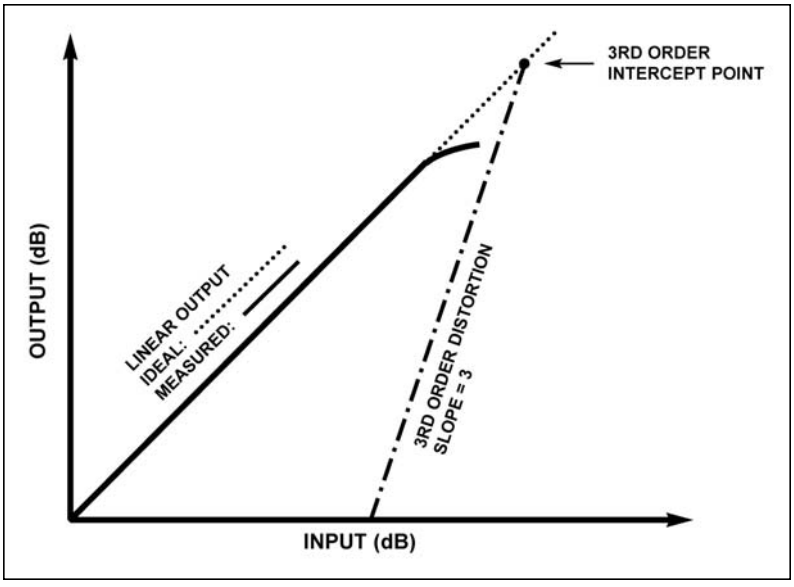

Diagram of 3rd Order distortion behavior and 3rd Order intercept point determination.

Classic QQ: Using Impedance Measurements

Gary Breed—K9AY k9ay@k9ay.com

Here is an article from the summer 2007 issue of QRP Quarterly, one of my "Antennas 101" columns—with a few edits and updates..

—de Gary K9AY

As a follow up to my articles describing an impedance measurement bridge, here is a discussion of how you can use impedance measurements for analysis of an antenna, as well as for determining what type of matching network to use.

Why Make Measurements?

This is not a silly question, since many antennas (such as a simple dipole) will work just fine with a simple check of SWR and a little pruning. The value of impedance measurements is greatest for antennas that do not have a natural impedance near 50 ohms. A few common examples are a dipole used on its odd harmonic frequencies, an off-center fed multiband doublet, quad and yagi feedpoints, horizontal loops, etc. Impedance measurements are also highly valuable for matching mobile antennas and various types of low band antennas.

Knowing the impedance allows you compare the antenna behavior to its modeled characteristics or to the results of other builders. It also gives you the information needed to design a proper circuit (L-C or transmission line) to match the antenna to your 50 ohm rig.

Impedance data can be obtained with a manually-tuned bridge (commercial or homebrew), as well as with an R ±*j*X antenna analyzer.

At the Extremes...

One of the first decisions to make is whether the measured impedance is in a range that allows practical matching.

Very low and very high impedances are difficult, but not impossible, to match. I would consider a 'very low' impedance to be less than 8 ohms resistive, while a 'very high' impedance is more than 600 ohms resistive. I would also consider more than about 500 ohms reactive to be 'very high" impedance, as well.

The reason that these impedances are difficult to match is that component values are either impractical or lossy, such as very large value or very small value capacitors and inductors.

At low impedances, there are higher RF currents, and resistive losses are the main problem. For example, if a matching component has a *Q* such that its loss represents 0.1 ohm, it will have 10 times the loss in a 5 ohm system, compared to a 50 ohm system.

High impedance issues are a bit more complex, since the problem areas are practical component values and increased sensitivity to stray reactances.

For example, 500 ohms capacitive reactance at 1.8 MHz is equivalent to 176 pF; at 30 MHz, it's 10.5 pF. Even if the capacitors have a high *Q* and proper breakdown voltage, the circuit will be sensitive to stray capacitance between components and to ground, since those strays can easily be from several pF to tens of pF.

Conversely, a 500 ohm inductor is 44 µH at 1.8 MHz, which is quite large. Such a coil would require about 70 turns on a 2-inch diameter form. Of course, such a coil can be made, but construction would require large conductors and big winding diameter to obtain a high *Q*. The large physical size would result in even greater capacitance between the coil windings, and to other components and the enclosure.

What are your choices when you find an impedance at the high or low extreme? There are really two practical choices:

1) build a matching network for that impedance, using extra care to minimize losses and/or stray reactances; and

2) make changes to the antenna to obtain a more easily matched impedance.

For example, a Yagi antenna with a very low feedpoint impedance can be efficiently matched with a low-loss 'hairpin' inductor made with aluminum tubing and mounted symmetrically along the boom. Or, the antenna's center-fed configuration can be changed to a gamma or beta match. The driven element can also be made into a folded dipole to raise the feedpoint impedance.

As another example, a half-wave dipole can be used on harmonic frequencies. If it is center fed, the impedances will range from a low impedance to very high impedances at even harmonics. The two common solutions are a wide-range tuner that can handle the range of impedances, or changing to an off-center feed, which is what the G5RV and the various 'windom' designs are based on. You can't get 50 ohms non-reactive on all bands, but you can significantly reduce the range of impedance variation across the bands you are interested in.

Which brings us to the final note on impedance extremes—tuner performance. One popular tuner advertised as covering 160 through 10 meters has a roller inductor with 22 µH maximum inductance and two 500 pF variable capacitors in a Tee configuration. On the 160 meter band, it will provide a match to an resistive impedance below 10 ohms, and can accommodate a few hundred ohms of inductive reactance. However, at 10 ohms resistive, it can only match about 200 ohms of capacitive reactance, with the inductance at maximum and the input capacitor less than 100 pF. Losses might reach 20 percent or more.

So, if you plan to get on 160 meters using your 40 meter dipole with the coax shorted together at the bottom (about 9 –*j*220 ohms, assuming a good radial system), remember that your tuner may not be able to match it, and even if it can, you may lose a dB or two of power before it gets to the antenna.You may decide this is acceptable for occasional operating, but at least you'll understand why it's not an optimum choice.

Typical Matching

As you might expect, impedances that have relatively low VSWR are easiest to match. An impedance that falls within 5:1 SWR is my personal rule-of-thumb. Iimpedances that result in 5:1 VSWR (in a 50 ohm system) include:

10 ±*j*0 ohms
15 ±*j*35
25 ±*j*58
50 ±*j*88
100 ±*j*115
175 ±*j*107
250 ±*j*0

Note that the reactance values are quite moderate. The 'easy matching' range can be usually be extended for reactance. Antennas with reactance values that are much higher may need some pre-matching to get the reactance values into a range handled by a commercial tuner. For example, a short vertical may be 12 ohms resistive, but with several hundred ohms of capacitive reactance. The reactance can be cancelled by using a loading coil with the same magnitude of inductive reactance.

Frequency	Feedpoint	80 ft. 50 ohms	80 ft. 75 ohms
7	171 –*j*20	17 +*j*21	39 +*j*29
14	104 –*j*84	18 –*j*26	32 –*j*24
21	252 –*j*13	63.5 +*j*100	114 +*j*113
28	336 –*j*103	6 +*j*30	15 +*j*7

Table 1—Impedance of a horizontal loop at the feedpoint, and fed with 80 feet of either 50 ohm or 75 ohm coaxial cable.

Horizontal Loop Example

One practical multiband antenna is a horizontal loop with a perimeter that is one wavelength at the lowest frequency. I used an antenna like this a long time ago during my college years, with very good results in a limited space. Table 1 shows the impedance at four ham bands for a square loop that is 36 feet on a side, 40 feet high, and fed near one corner. Three columns list the feedpoint impedance, plus the impedances at the end of 80 feet of 50 ohm, and 80 feet of 75 ohm coax.

With measurements like these, you can see how the antenna behaves, how to use the feedline type and length to get best multiband performance, and see if the impedances can be readily matched using your tuner (if needed).

When fed with 75 ohm coax, the impedance transformation through the coax results in a 2:1 SWR on both 40 and 20 meters, while 15 meters is about 5:1, but with an impedance that will be handled nicely by a tuner. The more extreme transformation on 10 meters will add loss due to the roughly 8:1 SWR on the feedline, but your tuner may match it acceptably. If your interest is primarily in 40 and 15 meters, an adjustment of feedline length can bring the 15 meter impedance down to a value that is 2:1 SWR, but the 20 meter value will increase significantly. You can also improve the 10m SWR and bring its impedance into a better matching range by adjusting feedline length.

Measured impedance values allow you to use the Smith chart or various software tools to calculate what is required for matching. There are many programs available for transmission lines, L-networks, T-networks and Pi-networks.

160 Meter Inverted-L Example

Antennas for 160 meters may be the most common example of impedance matching by hams. For Top Band, hams use shunt-fed towers, inverted-Ls, and of course, connecting together the shield and inner conductor of your 80 or 40 meter dipole, plugging it into a tuner and feeding it against some sort of ground. All of these methods require some type of impedance matching—and making measurement before attempting to match the antenna can both speed the process and help design an efficient matching network.

Let's say you have managed to put a rope into a tree 50 feet off the ground, and can pull a horizontal wire across your lot for about 70 feet to another tree, 40 feet high (Figure 1). Also, you take the time to lay down plenty of radial wires to make sure the antenna gets out well. You take your bridge to the bottom of the antenna and measure the feepdoint impedance as:

1800 kHz: 9.3 –*j*115 ohms
1830 kHz: 9.6 –*j*100 ohms
1860 kHz: 10.0 –*j*88 ohms

Figure 2 shows an L-network that will match the impedance at 1830 kHz. The SWR bandwidth will be narrow—maybe 30 kHz, or a little more, depending on how high an SWR your rig can tolerate. It will require two or three additional taps on the inductor to get a decent match across the whole lower end of the band.

Perhaps you had planned to place your tuner in a weatherproof box at the base of the antenna. An analysis shows that it will probably match OK, but the input capacitor will be 100 pF or less, and the SWR bandwidth for a single setting is narrower

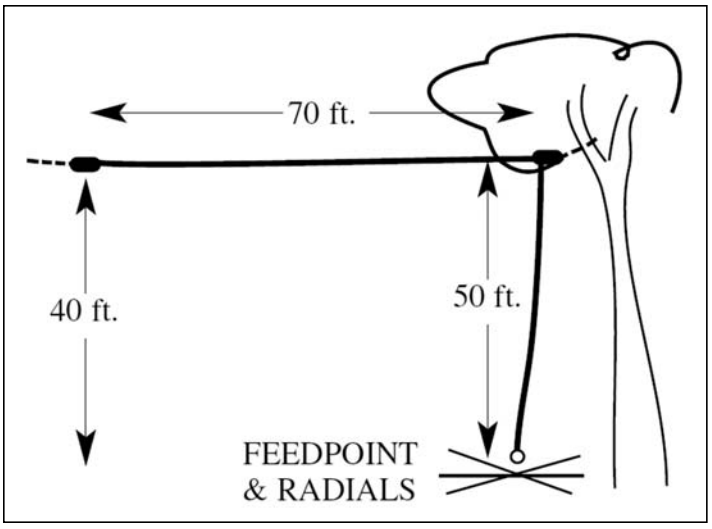

Figure 1—160M inverted-L example (first try).

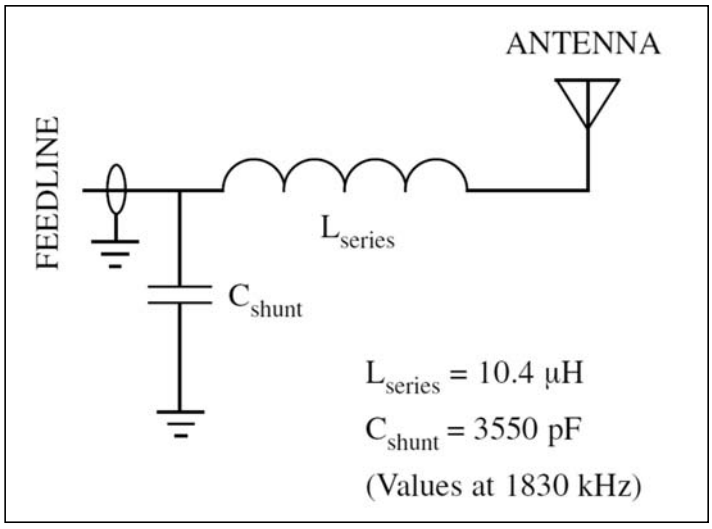

Figure 2—An L-network will match the antenna of Fig 1.

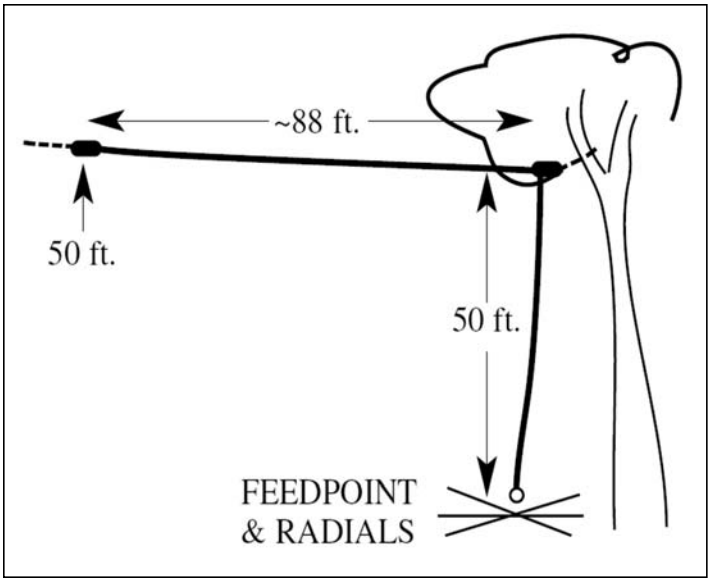

Figure 3—160M inverted-L example (modified for easier matching).

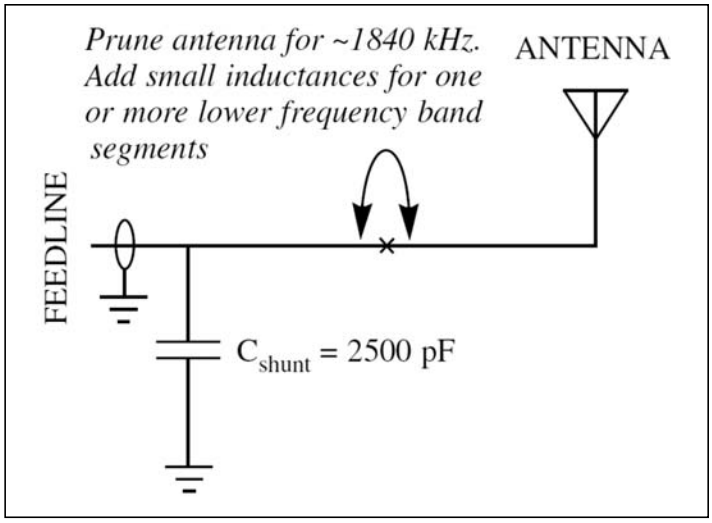

Figure 4—An L-network that incorporates antenna reactance. If initially matched at the highest desired frequency, additional length, or a bit of inductance is all that's needed to cover the rest of the band.

than with the L-network. This antenna will work, but after discussion with fellow hams, you know that the bandwidth should be better.

After another look at your trees and yard, you figure out how to get the far end of the horizontal wire up to 50 feet, and make it 20 feet longer. These changes will increase the resistive part of the impedance and add inductance (+*j*) to the reactance. You measure the new antenna and get these readings:

1800 kHz: 13.6 +*j*19 ohms
1830 kHz: 14.3 +*j*35
1860 kHz: 15.0 +*j*50

As you examine L-network component values you notice that, at 1800 kHz, the series arm becomes *j*0, because the required capacitance of the network exactly equals the inductive reactance of the antenna impedance. You decide to move that "no component" spot to about 1840 kHz, which is done by pruning the horizontal wire by 2-1/2 feet.

Figure 3 shows the final antenna installation, with the one-component matching network in Figure 4. This network shows the rest of your smart thinking—with no component in the series arm, the 2:1 SWR range is from about 1820 to 1865 kHz. You add a small inductance in series with the antenna—actually a 20-inch piece of wire bent into a U-shape—and that range moves downward to about 1800 to 1840 kHz, perfect for the QRP calling frequency of 1810 kHz. A setting in between could add another "sweet spot" zone if you like.

The measurements allowed you determine what changes to make, avoiding the narrow bandwidth that would have resulted from your original installation.

Combining Measurements, Modeling and Matching

These examples can be done with measurements alone, along with design information on matching networks contained in resources such as the *ARRL Antenna Book*, RSGB *Radio Communication Handbook* and others. The amount of 'tweaking' and your confidence in the results can be helped by using EZNEC or one of the other antenna modeling programs. The measurements will show the amount of variation between your actual installation and the idealized conditions of the model. Then you can use the modeling program to explore whether a change in antenna configuration will help simplify matching. If not, then use the matching network resources to help you design the best possible means of matching.

Finally, the knowledge gained by examining your antenna from several different viewpoints is highly educational (and practical). Cut-and-try can make an antenna work, but analysis, design and measurement will make it easier, and help you understand *how* antennas work!

●●

For Your Reading List:

What Isaac Newton is to the physical world, James Clerk Maxwell is to the world of electricity and magnetism—and those who followed (including Einstein) have expanded on his seminal work into modern quantum physics, and beyond. The early 2000s have seen a great deal of interest in the life and work of Maxwell. This interest may simply be renewed appreciation for his remarkable work, or perhaps anticipating his 200th birthday in 2031.

In a local used book store, I recently found a well-written biography of Maxwell and Michael Faraday, whose experimental observations led directly to Maxwell's achievements. If you are interested in the theoretical foundations of radio—or are just a "science nerd"—this book tells an important story! *—de K9AY*

Faraday, Maxwell, and the Electromagnetic Field
by Nancy Forbes and Basil McMahon
Prometheus Books, 2014

Four Days in May — FDIM 2024 !

Fairborn, OH — May 16-19, 2024

Four Days in May will once again be held in conjunction with the Dayton area (Xenia, OH) Hamvention©**.** The location is the Holiday Inn, Fairborn OH. Dates are May 16 through 19, with registration open the evening of May 15. Seminars are held on Thursday, May 16. Thursday evening is Vendor Night, with Homebrew and special contests featured on Friday night.

The Grand Banquet is Saturday evening, May 18. As in the past, there will be many door prizes at the banquet.

Registration will be available sometime in January, so check the club website for updates: www.qrparci.org/fdim

ANNOUNCING — The FDIM 2024 Logic IC Transmitter Power Challenge!

The challenge is simple: Design and demonstrate a crystal-controlled 40M oscillator/PA to make the highest sustained power for a period of one minute using only a single 4000-series or 7400-series logic IC. More detailed information can be found on the club website. This event will take place at 8:00 PM Friday, May 17 during FDIM, and the winner recognized at the QRP ARCI Banquet on Saturday, May 18, 2024.

Four Days In May (FDIM) Speakers

FDIM seminars are on Thursday May 16, 2024. Speakers presently scheduled include:

Jack Purdum	W8TEE
Ashhar Farhan	VU2ESE
Cliff Batson	N4CCB
Hans Summers	GØUPL
Wayne Burdick	N6KR
Tom Witherspoon	K4SWL
Gregg Latta	AA8V
Ross Ballantyne	ZS1UN

Club Night, Show & Tell, and Homebrew Competitions

Friday night is a special time for QRP enthusiasts! All events take place in The Ballroom starting at 8.00 pm. People setting up club tables or Homebrew Competition entries can enter earlier.

This is a social event where QRP clubs and groups set up their own tables to publicize their activities and generally have some fun. Tables are free of charge.

Please note that transportation to the Hamvention is not provided at the Holiday Inn. Parking and buses are available reasonably close—just a short drive.

Visiting FDIM for the first time ?
Here's a guide so you know what to expect

Location

The venue is the Holiday Inn, Fairborn OH. It's a pleasant and safe area to visit. The hotel has plenty of parking available. Facilities include a restaurant, bar, gym and indoor swimming pool. Ground floor rooms are available for disabled guests. Free WiFi is available throughout the hotel. There are plenty of restaurants within easy walking distance.

Wednesday Evening

Registration opens at 7.30 pm (as you enter the hotel, turn right and walk to the end of the corridor).

There are likely to be two lines—one for pre-registered and another for those who need to pay. Please follow directions from the volunteers. If you pre-registered then your badge will be available for collection and should be laid out on a table in order of Last Name. For those that are not pre-registered, you will need to pay for your tickets and wait while badges are prepared.

Thursday Daytime

Registration (for those who did not register on Wednesday evening) is available starting at 7.30am. You will find the Registration Tables right outside the main entrance to The Ballroom.

The seminars start with an opening address at 8.50am. Attendees sit at a table and are given a set of FDIM Proceedings. Snacks are provided at breaks.

Thursday Evening

At 8.00 pm we hold a Vendor Evening in The Ballroom. Vendors can set up their tables from 7.00 pm. Please wait outside the entrance if you do not have a reserved Vendor Table.

Friday Evening

All events take place in The Ballroom starting at 8.00 pm. People setting up club tables or Homebrew Competition entries can enter earlier.

Everyone attending is highly encouraged to bring a Show & Tell item for display on a table

Saturday Evening—
The Grand Banquet

The banquet is held in The Ballroom with entry at 7.30pm. Dress code is smart casual. No need for penguin suits!

The meal is served buffet style and guests will be invited to attend the buffet by hotel staff.

More information, including registration availability can be found at:
www.qrparci.org/fdim

Your membership lasts forever—but your subscription to *QRP Quarterly* does not!

Go to the QRP ARCI web site — http://www.qrparci.org — and click on 'Join/Renew'. The Member Lookup shows your subscription status. You can join or renew on the same page.

QRP ARCI takes membership applications and renewals via credit card—*online*—using the **PayPal** system. *We prefer PayPal for all new and renewal applications—worldwide*!

Go to the club web site's 'Join/Renew' page as instructed above and follow the instructions. Be sure to select the appropriate button for the area of the world you reside in (USA or Rest of the World). If they desire, international members may send payment by check directly to the club Treasurer (see below), but ... ***funds must be drawn on a U.S. bank and be in U.S. dollars.*** Make checks payable to: **QRP ARCI**.

Important! When applying or renewing by mail, please contact the QRP ARCI Treasurer:

John Kitchens—NS6X
PO Box 178
Somis, CA 93066
treasurer@qrparci.org

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To send a check or money order, contact the QRP ARCI Treasurer for instructions: treasurer@qrparci.org

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There are many good reasons for your company to advertise in the official magazine of the QRP Amateur Radio International (QRP ARCI) club—the oldest and strongest ham radio club promoting QRP operating, homebrew construction, and the development of local QRP clubs!

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Your advertising contact is Gary Breed, K9AY — E-mail: gary@aytechnologies.com

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About QRP Amateur Radio Club International — QRP ARCI

- QRP ARCI is a club for low power enthusiasts worldwide.
- We produce a professional quality magazine (*QRP Quarterly*), organize an annual conference in Fairborn, OH that coincides with the famous Hamvention© (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 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.
- QRP-ARCI is an affiliated Club of the American Radio Relay League

www.qrparci.org

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