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QRP Quarterly

Volume 45 Number 2
Spring 2004
$4.95

Journal of the QRP Amateur Radio Club International

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- The Star Antenna for 40 Meters (and Higher)
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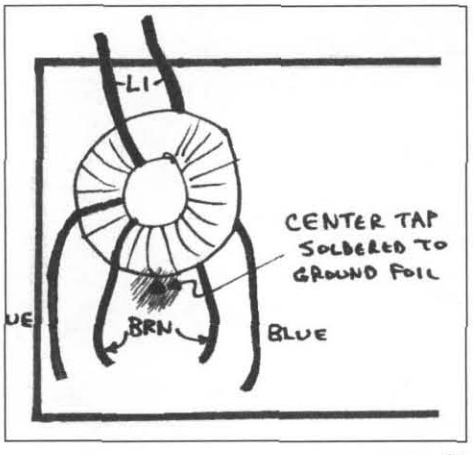

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Technical Articles

The Joy of QRP

The World of QRP ARCI

From the Editor's Desk

Mike Boatright, KO4WX—Editor ko4wx@mindspring.com

In the inimitable words of Monty Python, "I'm not dead yet!" (Monty Python and the Holy Grail, 1975). Rumors of the demise of the QRP-L rippled through the QRP community this winter, although as Mike Czuhajewski, WA8MCQ, reports in this issue's "Idea Exchange," it did find a new home. Mike also gives us an interesting history of the "-L" going back to before 1993.

With the arrival of spring, it is time to get out and spruce up your antenna farm. In this issue, we have several articles related to antennas, including two contributions from L.B. Cebik, W4RNL, an excerpt from Ian Keyser, G3ROO's new book on aerials and two antenna reviews from Rich Arland, K7SZ. Steve Hudson, AA4BW, gives us another installment of Building Day. And finally, since "April showers bring May flowers," we have two articles on the relationship between QRP and emergency communications.

Speaking of Rich, K7SZ, it has been a couple of years since his series of columns, "Profiles in QRP." We are very excited to have him back, with a new series titled "QRP Reflections." Welcome home, Rich!

Also joining the *QRP Quarterly* staff is Ed Tanton, N4XY, who is our new Technical Editor. On behalf of all the staff, I want to extend a sincere "Thank You" to Larry East, W1HUE, who has served in that role for many, many years.

For many years, Danny Gingell, K3TKS, has thanklessly handled all requests for back issues for members and others. I would like to publicly thank him for all the hard work, patience, and time that he has given to keeping the "blocking and tackling" of QRP ARCI going.

The club recently went through a review by the US Postal Service, towards the end of moving us into a better class of postage service. We hope that this results in better delivery of the magazine to our members, and fewer copies "lost in the mail."

We also realized that it makes sense to have fulfillment of all club related items in one place, so from now on, the Toy Store will handle all requests for extra copies of *QQ*—whether it be a missing copy of the current issue or a request for a past one. You can contact the Toy Store through the club website at http://www.qrparci.org.

The greatest thing about amateur radio—and especially about QRP—-is that no matter where I go in the world, I have friends. It has been a while now since I first posted a query on QRP-L about QRPers in London. How was I to know then that I would meet one of the finest amateurs in the hobby, QRP Hall of Famer, Tony Fishpool, G4WIF? Through Tony, I've met gentlemen like Dick, GØBPS, Graham, G3MFJ, and Ian, G3ROO. More than likely, we all would have crossed paths eventually, but like a true friend, Tony always shares his best.

Last fall, Tony and his wonderful wife, Ruth, celebrated their 25th wedding anniversary in the US, spending a weekend with us in Atlanta. My wife, Kathy, KE4NSM, and I traveled to the UK to celebrate our 10th over the holidays and the highlights of our trip included seeing "Peter Pan" in British holiday "Pantomime" ("Oh, no you didn't...Oh, yes we did!") as guests of Tony and Ruth, and spending New Years' with them, the 'ROOs and the Pascoes. Something that I'm sure I'll remember for ever was being the first to congratulate GØBPS on his first day as QRP ARCI President.

The moral of this story is to remember the next time you are ready to send that really juicy flame to the new "-L" to hit "delete" instead—because the one you're about to flame may just be the best friend you've ever had in this hobby—you just haven't met him in person yet.

—72 de Mike, KO4WX

●●

From the President

Dick Pascoe—GØBPS president@qrparci.org

After the snows and gales of winter; welcome to spring! The flowers are poking their heads up and the sun even popped out for a few hours last week. We have a wonderful spring and summer to look forward to. Climbing towers to fix the antennas, draining water from junction boxes and even perhaps putting up the latest all singing/dancing antenna system. I know that I am planning changes at chez Dick.

We have lots to look forward to in the coming months. Plenty of sprints, contests and of course the Hamfest season is well and truly under way.

***QRP Quarterly* Editor KO4WX congratulates GØBPS on his first day as president of QRP ARCI (Jan. 1, 2004)**

FDIM and Dayton:
The *PREMIER US QRP Event*

Dayton is just around the corner and all that goes with that wonderful event. I am sure just by the whispers I have heard that this year will be special again. I know that the team led by Tom Dooley have lots up their sleeves apart from their arms! I have been going since 1989 and then we had a hotel in downtown Dayton and not a pretty one at that!

The lectures on the Thursday are again going to be superb. The usual Extra Special speaker from the UK will be there; who would ever miss a talk by Rev George Dobbs G3RJV? This is the man who persuaded me to take up QRP in 1984 with his comment that "QRPers using a wire antenna squirt their signal weakly in all directions whilst a QRPer with a beam is lucky, he can squirt his RF weakly in just one direction." I have to be there just to check it all out!

Each of the Hamfests that have QRP events attached is special in its own way. Each has an ambience that gives the visitor a buzz and makes them want to come back. Most are just a couple of days of events with a show and tell, some good speakers and a few prizes. These are not to be denigrated as they provide excellent facilities for QRPers and are always attached to a hamfest.

However they all pale into insignificance when compared to Dayton and the Four Days In May. The ONLY event with a whole four days of QRP fun and events to make even the saddest of QRPers grin. As the old adage tells us, forget the rest, come and see the best at FDIM. Check the club web pages for details.

The Hall of Fame voting is almost over as I write this and the new inductees (if any) will receive their plaque(s) at the banquet. This year has been extra special as at least one nominee got a 'now why didn't I think of them?' and the standard, as usual has been very high.

Keep Shouting

QRP-ARCI has not been the best at shouting about how good we are at doing things; we tend to just get on and do it and enjoy what we have done. If you enjoy what we do—shout loud and clear, let the world know after all we ARE the ONLY club with the word *International* in the name.

Keep abreast of club events via the web page and keep information pumping at the webmaster Steve.

Remember the password—QRP is!

Announcements

Four Days in May (FDIM) —

The #1 QRP gathering in the world will once again be held at the Ramada Inn Dayton Mall in Dayton, Ohio. Major FDIM events include:

Thursday, May 13

QRP Symposium—Top speakers, including all-time favorite, Rev. George Dobbs, G3RJV of the G-QRP Club. Registration is $18.00 The symposium schedule follows:

7:15 a.m. Sign-in and coffee
8:00 a.m. Opening address by QRP ARCI President GØBPS
8:15 a.m. Symposium morning technical presentations
11:15 a.m. Morning session remarks
11:25 a.m. Approx. 1-1/2 hours for lunch (on your own)
1:00 p.m. Symposium afternoon technical presentations
4:50 p.m. Symposium closing remarks and door prize drawings
7:00 p.m. Meet the Authors—meet and talk with the symposium speakers, as well as socialize with fellow QRPers. (Open to all at no charge). Continues until approx. 11:00 p.m.

Friday, May 14

During the day, we understand that there is a large hamfest nearby (check out http://www.hamvention.org). QRP ARCI and other organizations and companies of interest to QRPers will have booths in the Hara Arena—stop by and say "Hello!" Perhaps you'll want to acquire some QRP ARCI paraphernalia from the Toy Store!

8:30 p.m. Vendor Social

This evening is set up to allow QRP vendors to display, demonstrate and discuss their products and latest offerings directly with the QRPers who are their target customers.

And, you can talk to the vendors without 28,000 other hams milling around the hamfest grounds! There is no charge for admission to Vendor Night.

Saturday, May 15

After another full day of browsing and buying at the Hamvention, more FDIM activities are planned at the QRP hotel:

7:00 p.m.–9:00 p.m.
QRP ARCI Awards Banquet

The annual QRP ARCI Award Banquet honors QRPers who have made major contributions to QRP and Amateur Radio. The latest inductees to the prestigious QRP Hall of Fame will be announced.

In addition, the winners of the various "build it" contests will be announced, and the the tradition of drawing a large number of excellent door prizes will be continued. Banquet tickets are $25.00.

9:00 p.m.–late night!
Displays and Socializing

Building contest entries and winners will be on display, along with other projects and collections from QRPers at the Radio Show.

There is no charge for this social gathering, and expect to see many familiar faces, names and call signs.

Sunday, May 16

Although there are no official FDIM activities on Sunday, this is a good time to pick up last-minute purchases at the Hamvention, and continue conversations from the night before at the QRP booths in the exhibit halls.

Registration information and hotel room availability are listed on the club web site: www.qrparci.org. By the time you read this, the full FDIM Symposium schedule will also be available online.

Register now! Don't miss a minute of FDIM. And be sure to travel safely! ●●

Correspondence

To the Editor:

First off as a long time member of QRP ARCI let me say what a great job ALL of you guys are doing with the club! I operate nothing but QRP and only PSK 31 at that. I like SSB and CW but PSK is my main interest and has been for years.

I have a question that I have raised several times in the past and the response I have gotten is kind of "duh?" Perhaps you might give me an answer or even actually make this happen. WHY doesn't QRP ARCI have a LIFETIME membership for members such as myself who want it? There are more of us out here that want that than just me. The members who wanted this type membership would never have to worry about the dues every year or every two years, they would be paid one time for life. This would solve a lot of problems for our older members.

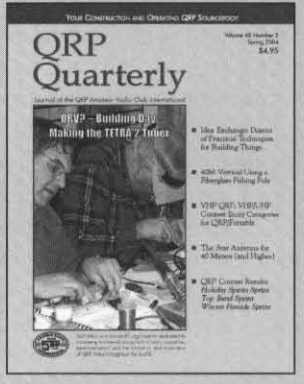
OK, just a thought and besides that it would raise some money for the club! A win-win situation all the way around! Keep up the good work and I would be very interested in hearing your thoughts on this.

Larry Jones WB5KYK/QRP: QRP ARCI #6477, QRP ARCI WAS, WAC, DXCC, 1000 Mile/Watt

Larry, thanks for the great feedback and vote of confidence. I forwarded your note to president Dick Pascoe, GØBPS, and vice president Ken Evans, W4DU, we all agree that it is a great idea, although there are some practical implications that will have to be investigated. A lifetime membership must be carried as a liability on the books for the lifetime of that member. Large organizations such as the ARRL have special investments which can return revenue that would offset this liability.

In addition, consideration would have to be made for the cost of a lifetime membership. The ARRL Life Membership is based on 25 years at the current rate. Say QRP ARCI were to base a lifetime membership on 15 years at the current rate-that would put the cost somewhere in the neighborhood of $300 (which, considering the time-value of money, would be quite a discount). It is not clear if there would be enough interest in a lifetime membership to provide the continuing income necessary to operate QRP ARCI and publish the *QRP Quarterly*.

However, your question has been brought to the attention of the QRP ARCI staff and we promise to continue investigating possible ways that it might be able to be implemented. What do members think of this? *—KO4WX*



On the Cover

Norm Schklar, WA4ZXV, and John Wingard, WB4GLJ, construct Z-match tuners during a club Building Day. Steve Hudson, AA4BW, continues his series on Building Days on Page 32, with "QRV? Building Day—The 'TETRA 2' Z-Match Tuner." No matter what your level of skill or experience, everyone has fun on Building Day!

Do you have great photo of QRP in action? Maybe it can be on the cover of QQ*—contact editor KO4WX.*

***QRP ARCI** is an international club promoting QRP operating, construction and camaraderie among fellow QRPers. One of its primary missions is to encourage the formation and growth of QRP clubs. QRP ARCI has no geographic location and can be described as a club made up of individual QRPers and other QRP clubs. As a worldwide organization for QRPers, QRP ARCI sponsors events such as FDIM and contests, offers operating awards, and maintains the QRP Hall of Fame.* QRP Quarterly *is the official publication of the club. Founded in 1961, QRP ARCI has a long tradition of encouraging amateur radio operators to use low power, build and operate their own equipment, share their knowledge with others, and spread the joy of QRP!*

Idea Exchange

Technical Tidbits for the QRPer

Mike Czuhajewski—WA8MCQ wa8mcq@comcast.net

IN THIS EDITION OF THE IDEA EXCHANGE

D-ing Your BNCs and 5WBPs

Just one more after this to hit the half-century mark! Years ago he told me he could supply me with an endless string of short technical items, and he hasn't failed yet. Here's Joe's Technical Quickie #49, from QRP Hall of Fame member Joe Everhart, N2CX.

I hate sloppy holes. Unfortunately I'm a mediocre machinist so the component and connector mounting holes in my homebrew projects need to be made carefully. In particular, two types of connectors need special attention. They are BNC connectors and 5-way binding posts (5WBPs), both very popular in homebrew projects. I discussed use of the latter in an earlier Quickie (Ref. 1).

The most common chassis mount BNC receptacles mount in a single panel hole. The threaded body of the connector has a diameter of 3/8 inch with a flat on one side. It is intended to mount in a round hole with one flat side as shown in Figure 1. The purpose of the flat side is to prevent the connector from rotating when cable connectors are mated and disconnected. A round hole or a sloppy D-shaped hole obviates this feature. I can state from experience that this usually does not happen in your home QTH where it can be repaired. Instead it happens in the field, breaking the internal rig connections when the connector spins.

Many 5-way binding posts have "flats" to prevent them from rotating. Expensive big ones have a D-shaped body to prevent inadvertent rotation similar to the BNC connector. More common and inexpensive 5-way binding posts have a "double D" threaded mounting shank with a profile as in Figure 2.

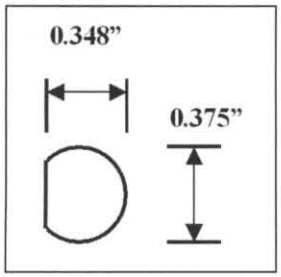


Figure 1—A "D" hole works best for single hole BNC connectors.

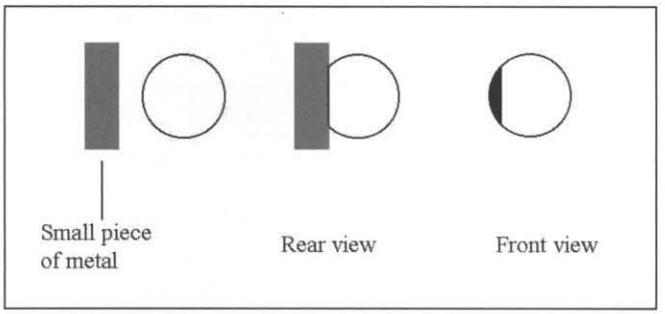


Figure 2—A small piece of metal can be used to cover up part of a round hole, effectively creating a D hole.

Professional machine shops have the ability to punch holes in a chassis to make properly shaped holes. To my knowledge, though, there is no ready source for the average homebrewer to obtain special punches to make other than common size round and square holes. So we have to use either round holes and suffer the problems outlined above or somehow make D-holes in some other way.

Several years back I described a rather brute force method of making specially shaped holes for both types of connectors (Refs. 2 and 3). The scheme was to start by drilling an undersized round hole, then to use a small flat file to form the flat side of the hole and a small rat-tail file to enlarge the round part. This does work, and quite well, if you have skill and patience. Usually I have neither so I wanted yet another way to rub out sloppy holes.

The method came to me while using a drawing program to make specially shaped figures. In particular, I was trying to draw a D-hole. I began with a circle then overlaid one side of the circle with a white-colored rectangle. All that remained visible was the outline of the circle where it was not overlaid. Aha! The same idea could be used with a small rectangular piece metal plate blocking off part of a round hole in a chassis!

Figure 3 shows the process. On the left is the original hole and a small scrap of metal. The center picture shows the metal plate overlaying part of the hole producing the equivalent D-hole on the right. Figure 4 is a side cross-sectional view of a panel with the hole and plate in place. The top surface is the inside of the chassis and the exterior is at the bottom.

So far I've used it only on panels made of copper clad PC board material. The metal used for the rectangle is 0.02" brass that is soldered in place using the BNC connector as a guide for proper placement.

It works surprisingly well for even such an unskilled machinist as myself. Brass stock this size can be easily obtained at hobby shops. I do not recommend any-

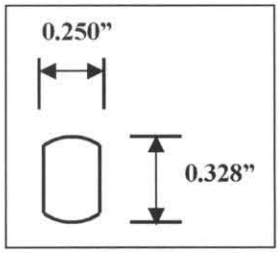


Figure 3—5-way binding posts use a hole with two flat sides.

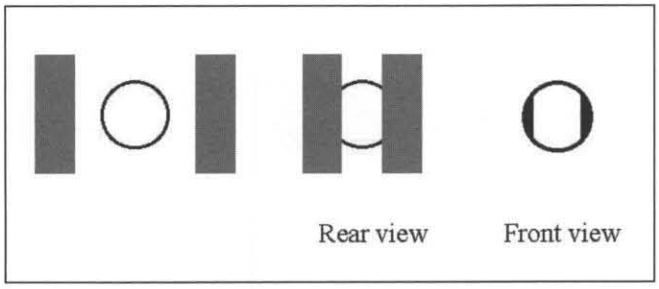


Figure 4—A hole with two flat sides can be made for 5 way binding posts by adding two pieces of metal.

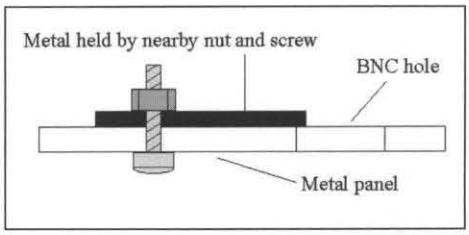


Figure 7—When the metal piece can't be soldered to the panel, it can be held in place using existing nearby hardware, or drilling an extra hole for a screw, nut and lock washer.

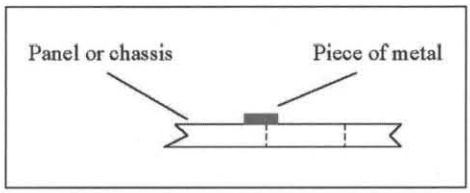


Figure 5—Cross-section view of a hole with one flat side.

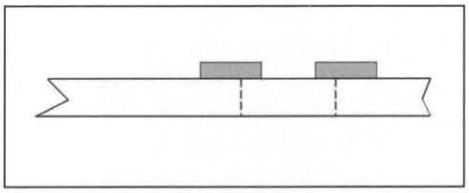


Figure 6—Cross-section view of a hole with two flat sides.

thing smaller or the connector may deform it and rotate undesirably. If you use thicker material you may wish to solder another piece on the other side of the hole from the "D" so that the mounting hardware is not "cocked." [*WA8MCQ note*—With a thin piece of metal on one side, the connector will be slanted slightly in one direction. If the metal is thicker, the slant could start becoming noticeable, so adding a second piece on the other side keeps both sides at the same height.]

Also, for non-solderable panels you could epoxy the metal piece in place, although you will have to insure that part of the connector or mounting hardware is in ohmic contact with the chassis to ensure conductivity.

The same idea works for 5-way binding posts. Types with D-holes use the same method as above while a double-D shape requires two metal plates, one on ether side of the round hole. The corresponding process is illustrated in Figures 5 and 6. With binding posts there is no electrical conductivity needed so it may be simpler to epoxy the plates in place. Naturally, the same method can be used on non-metallic panels.

References:

1. Joe's Quickie #23, "In Praise of Knurled Nuts," Information Exchange column, *QRP Quarterly*, October 1997.

2. "80 Meter Alchemy," by Joe Everhart, N2CX, *NJQRP Homebrewer #4* Fall/Winter 2001.

3. "The NJQRP Squirt," *QST*, Apr. 2001, p. 40 (also available on the ARRL Member's Only web site at http://www.arrl.org/tis/info/pdf/0104040.pdf).

WA8MCQ note 1—Personally, I don't really trust epoxy that much for providing mechanical strength for something like this and wouldn't expect it to hold forever. Another way to do this on a metal panel is to hold the metal piece in place with a nut and screw near the connector (Figure 7). This could be done by drilling an additional hole or using part of the mounting hardware for something nearby.

WA8MCQ note 2—Joe also sent along two photos of his last Quickie, which he didn't have time to make before the deadline. Figures 8 and 9 show the keyer built into an AOL CD mailing tin (described in Quickie #48), along with the notches made in the side of the cover for the connectors.

—de N2CX

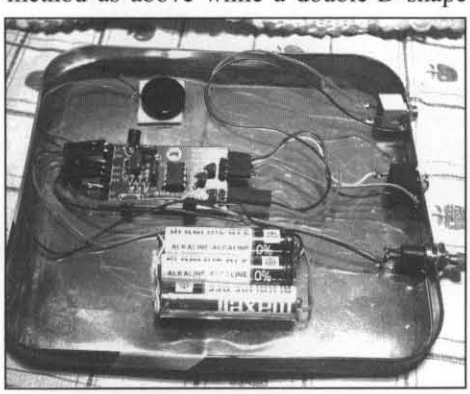


Figure 8--NorCal keyer installed in an AOL CD mailer, as described in Quickie #48.

Figure 9--Cover of the AOL tin with notches cut in the side to accommodate the connectors and switch.

QRP-L Moves from Lehigh.edu to QTH.net

QRP-L@lehigh.edu is no more; it's now QRP-L@qth.net.

Jim Eshleman, N3VXI, is on the IT staff at Lehigh University and has been administering the list since it moved there in 1995. In mid February he announced that he would "pull the plug" on it at the end of the month and recommended that they find a different host. (I won't go into the reasons for that, although I'll be glad to discuss it privately. Those who were active on the list at the time are aware of the situation. It was a mostly thankless job and I was amazed that he lasted as long as he did.)

There was a lot of discussion on the list about where to move it, and the pros and cons of various servers and types of systems. The ultimate home may not be decided for some time, but for the time being it appears to have settled in on qth.net, which was sort of a "hot spare" emergency backup.

In years past, I'd get e-mail every now and then from something posted to QRP-

L@qth.net. My standard response was always that they should be using QRP-L@lehigh.edu instead, which was the "real" QRP-L. The one at qth.net was set up in case anything happened to the list at lehigh.edu, and it was only used when someone stumbled across it by accident and didn't know it was not in use. (At the time, there were some fears that it might have to move from lehigh.edu.)

After Jim's announcement, people migrated to QRP-L@qth.net and it was up and running smoothly before the old one at lehigh.edu was shut down. There are some differences in the way the two systems work, such as sending out several digests per day instead of just one, and the HTML archives only covering one day at a time instead of several. But for the most part it's really not too different from the old one.

To subscribe to the "new" list, go to the qrp-l home at this URL—

http://mailman.qth.net/mailman/listinfo/qrp-l

It has a link to click to look at the archives, and down a bit farther is a place to subscribe to the list.

At the bottom, under QRP-L Subscribers, are two more buttons. The first one, Visit Subscriber List, is for use only by the list administrator. The second button is Edit Options; enter the e-mail address you subscribed with, click, and it takes you to the Configuration page for QRP-L to administer your account. You use this page to unsubscribe, change your password or request that a forgotten password be e-mailed to you. You can also get a list of all qth.net mail lists you're subscribed to, and set various options for your subscription, such as getting the digests instead of direct mails.

QRP-L is the Internet QRP mail reflector started up by Chuck Adams, K7QO (K5FO at the time) in 1993. Originally at think.com, they started looking for a new host when Thinking Machines went into Chapter 11 bankruptcy. It ended up at netcom.com, where it stayed for a while before moving to lehigh.edu. Although netcom.com was generally adequate, it lacked a "daily digest" function and the only way people could get the posts was by direct mail. A number of them left because they couldn't handle all the clutter in their mailbox. (In those days, an astoundingly active day might result in 40 posts. For the last several years, if there were only 40 posts people would start wondering what was wrong with the system!)

Although technically Chuck and Jim were co-owners of the list, Jim considered himself to be the administrator and Chuck the owner. Chuck was the Rulemaker and Jim was Enforcement. At the end of October 1999, Chuck decided it was time to move on and appointed Jim as sole administrator of the list. (It was, after, his system that handled everything.)

Qth.net is hosted by qsl.net, which was started in 1996 by Alan Waller, K3TKJ, of Laurel, DE. You can find some background on it at http://www.qsl.net/aboutqsl.html

Photos of the setup—it looks like it's in his basement!—along with one of K3TKJ himself can be seen at :

http://www.qsl.net/kb9lpj/wallops99/05011999(2).html

For info on qth.net (a subsidiary of qsl.net), try this: http://mailman.qth.net/ From there you can look at a listing of the public mail lists they host. The Elecraft list has been there for a good while, along with a number of lists for small QRP groups, and one for test equipment.

You can look at the archives for any of the lists by going to the home page of the list. You can find that by going to the URL above, find the name of the list in the index and click on it.

Keep in mind that the "new" qrp-l isn't hosted by a major university with deep pockets; it appears to be run by a hobbyist and hobbyists don't normally have steady revenue streams to support their ventures unless they solicit occasional donations. Instead of being handled by the university computer department, funded by students, alumni and government grants, this is a small operation. Keep that in mind when you get an occasional request for money from qsl.net.

I ran into K3TKJ at a hamfest near Baltimore a couple years back, selling some things in the tailgating section. I introduced myself and mentioned that he'd put out an urgent call for donations a few months earlier for some unforeseen problem. I asked if he still needed money and offered to give him some bucks on the spot. He laughed it off; I guess he was doing OK at the moment.

But I sent him a small check a few months ago when one of their regular requests for donations came out. I was hardly a power user of any of their mail lists, but now that qrp-l is there I will be. I, for one, am going to send a little something every year.

Making a Dummy AA Battery

In the July/Summer 2003 issue I ran an item by KØMAX on making dummy AA cells with 1/2-inch copper pipe with end caps soldered on. Here's another way to do it, from Joe Roof, W4JHR.

Wey Walker, K8EAB and I were discussing battery packs for our new Elecraft KX1s. Wey wanted to use 10 AA NiMH batteries, but also wanted to keep the ability to use regular AA alkaline cells if needed. The problem was that 10 AA alkaline cells exceeded the voltage limit of the KX1 (14 volts). Some sort of dummy cell would be needed, to allow the use of 9 AA cells in a 10-cell holder.

I remember reading of someone who made a dummy cell from 1/2-inch soft copper tubing, and soldered some type of end cap on it. A quick trip to the local hardware store came up with no end caps for the soft tubing. Then it dawned on me that a 30-06 rifle shell and a .45 pistol shell were about the same diameter, and because of the chambers, the pistol shell would be expanded to a slightly larger diameter than the rifle shell. Through a little trial and error I cut a fired 30-06 shell to 1.5 inches and drove it into a fired .45 shell until the overall length was 1-15/16 inches. Worked like a champ.

CAUTION: BE SURE TO USE FIRED SHELLS. MAKE SURE THAT THE PRIMER HAS BEEN FIRED.

Start with the 30-06 shell, or any similar shell; .308 Winchester, .270 Winchester etc. Use a tubing cutter to cut it to an overall length of 1.5 inches. Then with steel wool or sandpaper clean the outside of the 30-06 shell and the inside of the .45 shell. This will be a very tight fit and we want a good electrical connection between the two. Using a hammer, drive the 30-06 into the .45 until the overall length is 1-15/16 inch. Finish by polishing with steel wool.

The dummy cell is not as large in diameter as the AA cell, but it seems to work just fine in the plastic battery holders from Thomas Distributing #MS-BH-10-AA (http://thomas-distributing.com/battery-

Figure 10—Left to right: .45 shell, cut down 30-06 shell, completed dummy cell, AA cell. Safety note: be sure the shells have been fired first.

holders.htm) as well as all others I tried it in.

Another word of caution: I would not try to solder the cases together. The fit is extremely tight and when I tried it using a propane torch, the pressure of the air expanding inside the case blew the .45 case off with quite a bit of force. Fortunately it was pointing away from me and flew harmlessly across the basement.

[*WA8MCQ note*—you could probably get away with soldering them if you drilled a hole or two first to let the air escape.]

—de W4JHR

AADE Filter Software Now Free

Neil Heckt of AADE (Almost All Digital Electronics) is well known among QRPers, primarily for his famous L/C Meter IIB. One of his lesser known products is a fine program for designing and evaluating filters. This used to cost about $25 (which I gladly paid several years ago), but he recently announced that he is now giving it away free by way of his web site. (When you get to the download page there is a prominent apology to those who paid for it earlier, a bit of a rarity. But, even at $25 I thought it was a bargain.)

All you have to do is go to http://www.aade.com, scroll down a bit to "Filter Design and Analysis FREE" and click on it. That takes you to a page with some info about it, and a couple of places to click for the actual download. (The program, now at Version 3.0, is for Windows 98 and higher. Be sure to read the notes about XP and 2000, since there are some quirks involved with launching the program, although it will still work.)

The download button for the full version, which is just under 10 MB, is near the top of the page. At the very bottom is a button to download the update if you have a previous version, although that's almost as large as the full download.

The latest version offers several additional features, such as statistical analysis, toroid and airwound inductor design, resistive attenuator design, transformations, and a large HELP system.

(With all due respect, as is the case with most such programs the attenuator design is rather limited and minimal. My all time favorite, which I have never yet seen equaled for versatility, is the attenuator routine in an old 1987 DOS-based freeware program from Teledyne Microelectronics called RFTools. I uploaded it to the QRP-L file archives at lehigh.edu years ago. In addition to giving the precise resistor values it also gives them for 1%, 5% and 10% resistors—you know, those things we use in the real world—along with the actual attenuations as well as actual input and output impedances for all of them. I described it in the Idea Exchange a while back, and can provide a copy, either by e-mail attachment or floppy. The ZIP file is under 200 kB.)

There was always one thing I wasn't too crazy about while he was still selling it—the trial version was free and ran for a specific number of times before it locked up and you had to enter an activation code. To do that, you had to copy a number that appeared on the screen, send him money and that number, and enter the number he'd give you in return. No problem so far. But you'd have to call again for a new code (at no charge) if your hard drive died or if you wanted to trash the computer and transfer the program to a different one. If anything ever happened to him or the company you'd be out of luck.

I did call him again one time when I had a hard drive failure, but for a few years after that I put up with some strange problems on my computer (unrelated to the program). I had tried everything else to fix it and wanted to wipe the hard drive completely and load everything all over again, but I didn't look forward to the hassle of calling him yet another time. And what about the next time I would need to reformat the drive? I am very glad to see the unlock code go.

By the way, the dirty little secret which I never told anyone about was that the program didn't actually lock up after the trial period was over. The screen said that it was locked and told you to pay for an activation code, but it would still happily do the things that I wanted! At least on my system, for whatever reason, it just kept on running. Of course I still sent him the money, which was the only ethical thing to do, and well worth it. (Now that he's released it as freeware the secret can be told!)

If you go to his web site to download the program, take a look at his other products, especially the L/C Meter IIB. It's an excellent little handheld device for measuring a wide range of inductors and capacitors and quite indispensable in homebrewing. I've never regretted buying one, and I doubt if any of the 7000 other buyers have either.

Manufacturer Logos on the Web

Henry Knoll, WAØGOZ, passed along this URL to QRP-L for a fascinating web site that gives a huge number of logos for electronics manufacturers and the names of the companies. If you come across an old part and need some data it helps to know who made it, especially if it's not a common item. The URL is:

http://faq.tweakers.net/cme/iclogos/#N

Since this is graphics intensive it may take a while to load.

Sewing Toroid Windings

As always, a lot of good ideas are rediscovered over the years and deserve to be brought up again to share with the newer folks. Bob Cerreto, WA1FXT, shared this one with QRP-L.

This hint may be a rediscovery. However, we'll share it anyhow. The next time you are shopping with your XYL in the local craft store, look for a package of Tapestry Needles. These are heavy duty, have large eyes and a blunt end, and come in a variety of sizes. I have used them like a sewing needle to run wire through toroid cores. Using these needles I am able to wind toroids faster and more precisely, especially the smaller diameter cores and wire gauges.

These needles are a Godsend for this guy with arthritic hands. And now I can brag about the last rig I sewed together!

—de WA1FXT

Homebrew Single Lever Paddle

Bill Chaikin, KA8VIT, built this item and mentioned it on QRP@qth.net. (That's another QRP mail reflector, but it has seen little activity over the years.) W4QO alerted me to it, and Bill kindly gave his permission to share it.

Here is a homebrew single lever paddle that I put together this past weekend. I got the idea from an article on www.eham.net by Mark Oring, AG4RQ. His original article can be viewed at http://www.eham.net/articles/7114. [*WA8MCQ note*—that one is similar but the base is made from several CDs bolted together. Now there's finally a use for all those AOL CDs you got in the mail! It's well worth the trouble to take a look at his version. Both of their paddles use L brackets from computers as the lever. Those are the metal brackets on the ends of cards that you plug in, and the blank ones that you remove from the computer case when you plug in a card.]

I had seen Mark's article back in December 2003 but had not given it much thought until a ham friend took back his paddles that I had been borrowing for quite a long time. It didn't take too many QSOs after that until I started getting a glass arm 15 minutes into a contact. Having already spent my ham radio budget for the next 20 years on my Kenwood TS-870S, I can't afford to buy a set of Bencher Paddles.

That's when I remembered Mark's article. After looking at it again I went out to the garage to see what kind of scrap I had that I might be able to use. I already knew I had a few of the computer card "L" brackets down in the basement. It doesn't take a lot to put the paddle together. As shown in Figure 11, I used a piece of 5" x 3" x 1/2" pine I had laying around in the garage along with a 6" piece of 3/4" x 3/4" stock, which I glued together to form the base.

Also used were three 1-1/4" 8-32 machine screws and two 1-3/4" 8-32 machine screws. Each screw also had three small washers and associated hex nuts. A couple of short pieces of #18 solid copper hook up wire completed the unit. (See Figure 12 for details of the contact area.)

The biggest cost in this project was the shielded 1/4" stereo phone plug needed to plug the paddle into my TS-870S. That and 6 feet of shielded cable. Both together cost me about $3.95 at Radio Shack.

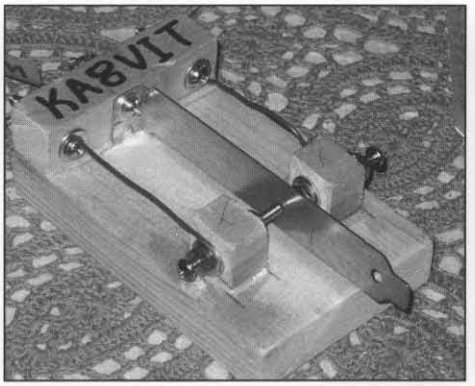


Figure 11—Overall view of the KA8VIT paddles.

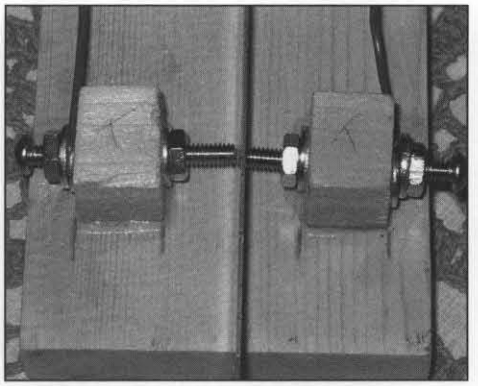


Figure 12—Common machine screws are used for the adjustable contacts.

Adjusting the paddle wasn't hard. I set it so that the contact screws were touching the paddle blade on both sides and then backed off about 3/4 of a turn on each screw, leaving a small gap. I hooked it up to one of my keyers to see if it really worked and to check the action and gap. All seemed OK. I then hooked it up to my rig for the big test.

The biggest surprise came when I tried out my new paddle. Not only did it work, it worked so well that I doubt I will ever buy those Bencher Paddles now! I practiced with my new paddle using the sidetone on my rig for about five minutes and then went on the air. I made 16 contacts with it this weekend and am just tickled pink. One last thing I want to do is to hot glue some medium sized buttons or such to the paddle blade to act as the paddles and insulators.

Many thanks to Mark Oring, AG4RQ for his original idea.

[The online article, which contains some additional pictures, can be viewed at http://www.qsl.net/ka8vit/VITPaddle/index.html.]

—de KA8VIT

Connecting Wire Antennas to Trees

Mike Boice, KW1ND asked QRP-L for ideas on attaching wire antennas to trees:

I'm looking for specific, tried and true methods of using pulleys, springs and/or weights on the ends of wire antennas supported by trees. One end of my antenna (a random wire to start with, but eventually a doublet) will be attached at the house, but the other end will be 50 feet up in an oak.

Obviously, I'd like to keep it in the tree as long as I can, and would like to let the antenna move less than the tree; i.e. let the tree sway without adding too much additional stress on the wire.

I'm already planning on using a marine-grade pulley up in the tree, but am looking for methods of attaching springs or weights to the support line. In the past I've just tied the line off, but in my experience the wire doesn't last too long with that method.

Reply from Leon Heller, G1HSM—A friend of mine uses those elastic things with hooks for securing objects to car roof racks, made from multiple strands of rubber.

Bill Smith, AB6MT, had this to say—I understand the way to attach an antenna to a tree is to use a pulley in the tree, and then attach a series of weights to the end of the support rope to provide enough tension to hold up the antenna. The weights (window counterweights are suggested) are mounted inside a plastic pipe. The pipe is mounted vertical to the ground so the weights can ride freely up and down inside it. If something happens, the weights are contained inside.

From Seab Lyon AA1MY—This is correct. To clarify, the pulley support line is tied off and separate from the antenna support line which is weighted. The antenna can be lowered by either line. This is a weighty affair though, with 15 pounds or more of weight required, which means you can't put the system in the topmost branches. To maximize altitude (and who doesn't?), you may be able to put the support line directly over the topmost branches and achieve a very suitable "natural" strain relief provided by the flexibility of the higher branches. You only have to ensure that the highest crotch the line goes thru is adequate to the task.

If sliding weight is your choice, definitely do not use small diameter pulleys. I use the cheap nylon 4" diameter pulleys from Home Depot, etc. Drill out the "rivet axle" and replace it with a 1/4" x 1.5" shoulder bolt that will last forever. This is particularly handy with loops since you don't have to re-string all the supports when repair/mod is needed. A much improved weight is made from a length of steel pipe filled with rebar [steel reinforcing bars for concrete] and cement, with an eye bolt at the top. Window weights are hard to "series" and chew out the PVC safety tube. In all cases, flare or chamfer the top of the safety tube, or provide a guide so as not to chafe the line with constant motion.

From Steve "Melt Solder" Weber, KD1JV—If you do this, I would suggest making sure that water can't collect inside the pipe. If it does and then freezes, the weight won't slide any more. Disregard this if it never gets cold where you live.

I guess the main concern is to make sure if the line breaks, the weight doesn't fall and hit someone on the head. A simpler alternative method could be to use a fairly short "safety line," attached to the weight and a near-by sturdy tree limb.

Personally, when I've used the "pulley and counter weight" method, I just let the weight dangle a few feet off the ground. But then, in this location I didn't have to worry about kids or passers-by messing with the rope and weights. I can see in some situations where you'd want the weight pretty high up and out of reach or sight.

From WB8RCR, John McDonough—I had good luck using screen door springs on the ends of the antenna. I didn't go to all the trouble of pulleys—just used heavy rope through the branches, on the theory that it would be a while before a heavy synthetic rope degraded enough to matter. Plus, I didn't want to deal with a cherry picker or something like that. My approach is the old fishing weight, pitched with vigor where I want the antenna.

What I found to be the real problem, actually, was the rope—not wear or degradation, but squirrels. My original theory was that nylon would weather best. Well, it might, but the squirrels just loved it. No matter what I put up there, they seemed to think it was good nest material. I finally found that black synthetic rope (I think it was polypropylene, not so sure now) was less appealing to them than light colors. To tell the truth, I didn't like the idea of a dark color because of the weathering, but that doesn't seem to have been a problem.

It's only been up for three or four years now, but that's as long as I've ever been able to keep a wire in the sky. We tend to have pretty violent winds in the winter, and this arrangement manages to ride through them.

Fred Lesnick, VE3FAL had this reply—I too have had my fair share of experience and trouble with wires mounted through tree branches. Nine times out of 10 I use my trusty old fishing rod with a weight to get over that specific branch (being a fly fisherman helps with aim). Once over I will haul up a light rope like butchers twine. Now this twine is very strong and will last some time if you want to leave the antenna for a short period before doing something permanent.

What I found was that the poplar or spruce/pine trees were eating through the ropes, so this year what I did was change all my ropes to clothes line wire. I taped one end to the existing rope, hauled it over, and away we go. It has much more strength, and will last a while longer.

I also use springs at the ends, to give the wire some space to move, rather than being tight all the time. I have dipoles up for 160/40/30 and 20 like this now, and all are holding out just fine.

Alex Krist had these comments—[Alex is a member of a very elite group—he is one of three people I know of whose call is his name. He's KR1ST; the other two are Ken Kopp, KØPP, and KØEHL, Randall Koehl.]

I started out exactly like you did with a random wire and that had one end attached to the house and the other end 50 ft up in an oak tree in the back yard. Later I replaced that antenna with an inverted V fed with homebrew ladder line. This antenna is held up with a pulley and weight system in the center and at both ends. Not the very best, but it seems to hold up just fine during storms. It has only been up for just over a year now, so I can't tell you how well it'll work in the long run. I have documented this project with pictures on my home page: http://www.kr1st.com/hfcoath.htm. [*WA8MCQ note*—the center insulator is a black plastic coat hanger.]

From Tom Sevart, N2UHC—I had a problem with my dipole coming down after flexing in the wind time after time, so I decided to go with a pulley/weight system. My dipole runs from my VHF/UHF antenna mast to a tree in the back yard. At first I just had a pulley at the mast end, but it still didn't provide enough flex. I installed another pulley at the tree end and haven't had any problems.

I launched the support rope over the tree and attached it to the pulley. Then I ran a clothesline wire (plastic coated cable type) through the pulley and attached it to the antenna and weight. I then hoisted it up into the tree. The mast end has the pulley bolted directly to the top of the mast with the weight hanging down next to the mast.

Bruce Muscolino, W6TOY—I have had good success with a system that involves only one "pulley and weight." My antenna is an end fed long wire, only replaced once in the last 7 years.

The antenna runs diagonally across the back yard. The close end has no supports other than the tree that holds it up. The far end goes over a tree limb and down the trunk to a pail. Periodically, before I became handicapped, I would tip the bucket over and drain out the water. I have been continually surprised. Use what you want, they all will work some of the time! It depends on your luck!

From Michael Babineau, VE3WMB—What I have read is that the best thing for the tree is if you can drill a hole and insert an eye-hook rather than tying rope around the trunk. The *ARRL Antenna Book* and/or *Wire Classics* has some good information on this.

In addition to marine pulleys (they don't rust) I have found that rubber truck tie down straps with S hooks on the ends are a reasonable substitute for weights or springs. You can probably find these in an automotive store and they come in lengths from a few inches to a few feet.

I am using three of these right now at the support points for my sloping 30M delta loop and they keep the wire taut while allowing the loop to "float."

Finally, a WA8MCQ comment (not posted online)—When I first put up my 40 meter full size delta loop years ago, I went to a local hardware store and bought steel springs of a few different sizes and strengths. (I didn't know what size would be best, so had to experiment a bit.) When I tied off the two low corners of the delta,

I used free-floating insulators, that is, the wire was free to move through the hole on one end.

Pieces of rope were tied between the other ends of the insulators and one end of the springs, then more rope from the other end of the springs to fixed objects. Just in case the rope on either end of the springs might come loose for whatever reason, I tied another piece of rope as a bypass around the spring. If anything happened to it, the rope would still hold the antenna. (Make sure the bypass rope is long enough that it does not become taut regardless of how much the spring is stretched.)

Stealth Verticals

The subject of stealth verticals is always of interest, since not everyone lives where they are allowed to have antennas. *Paul Mackanos, K2DB, touched off a discussion with this post*—I just installed my 6BTV vertical, ground mounted, no radials, and used it last night on 40 CW; works great. Here is the problem—VISIBILITY. I live in a deed restricted environment, and put it up at night. The only problem is that everyone leaves their outside lights on for security reasons, and that bright shiny aluminum seems to light up like a Christmas tree. In every direction as I walk around, I see lights shining off it. Is the answer as simple as flat black paint, like Rustoleum or something? Will paint detune it?

Mike Gusky, K5UX, had this reply—I've been there before. I used flat black spray paint from Home Depot. Make sure you wipe the antenna down with a good cleaner. I used vinegar, which seems to have some magical property that helps the paint to bond to the aluminum. Make sure the antenna is fully assembled before you apply paint. It's important to have good electrical connections between the aluminum pieces. Both of my antennas came with some special conductive paste that I used between the joints, and I have seen it at Radio Shack. I did this with two verticals and it has worked very well. I did not notice any detuning due to the paint. One of the verticals was elevated above the ground and the other was ground-mounted with radials.

Todd Fonstad, N9NE posted this—I had, for some years, spray-painted my GAP vertical flat black so that it effectively blended into the oaks and hickories along our lot line. Last summer I got back into HF mobile operation after a thirty-year hiatus. I run the Elecraft K2/100 into a magnet-mounted, short-masted Hustler system with the 3 resonator adaptor atop the van roof.

The bright white of the Hustler resonators was visually unattractive, except for locating the vehicle in a large parking lot, so I found a 12 ounce can of spray paint that was perfect for camouflaging the antenna as well as the fifty pound test monofilament line I use to guy the system.

It is Krylon's "Ultra-Flat" (8140 Black), sub-labeled "Camouflage Paint System" and described as "a non-reflective, ultra flat finish to conceal vehicles, decoys and equipment." I don't need an invisible vehicle, but the antenna (three resonators with long stingers) is now very difficult to detect at first glance. I used several thin coats over all surfaces and observed no changes in resonance with the MFJ 259-B antenna analyzer. I'm sure there are other paints that will do the same job.

From Bruce Muscolino, W6TOY—Two solutions come to mind. But first, a question. Is the antenna mounted on your own ground, or is it mounted on "common" ground?

Paint the antenna flat black in any case. Then, if the antenna in mounted on common ground, take the antenna in every time you are not using it. You can make up a coax connector plug for the coax. But if you own the ground you can leave it alone after painting.

I had a friend about 25 years ago in Holland who used a 4BTV in a restricted apartment. He mounted it in a dirt filled flower pot on his balcony. Since the apartment had restrictions, he kept the antenna inside when he was not using it.

I used a HyGain 14AVQ at the same time. My house had no restrictions so I left mine mounted all the time. I used resonant radials on mine, he used none. I did DXCC and WAS in the first year or so, he didn't. If the antenna is mounted on your own property, you should consider burying 15 or 20 radials around the base. They will improve your performance.

Also, you're going to get caught at some point. Operating QRP should eliminate most if not all neighbor interference complaints. You should only have appearance issues. Painting the antenna black should cut down some of the complaints.

Also consider the issue of where it is mounted, on your property or on "common" ground. You have slightly more leeway if it is on your own property. If it is, you may be able to negotiate with the homeowners association to keep the antenna in place some or all of the time. If you are on "common" ground you will be in constant danger of the homeowners association which can tell you to remove the antenna immediately and never put it up again. They have resident protection concerns along with their concerns about "the neighborhood" If it is on your own property you can post it against trespassing.

Templates for Altoids and Whitmans Tins

Terry Fletcher, WAØITP, sent this via e-mail, with attached files containing color scans of his drawings. Since things were differentiated by colored dots that look almost the same when printed in black and white, I added the arrows to make things more obvious.

Figures 13 and 14 are a couple of templates I use for locating holes on Altoids and Whitman's tins. I print them out, and sketch in the positions of the components I have to mount. Usually a little trial and error, or more properly sketch and erase, is required until I get things to fit.

Figure 15 is the working template of NorCal Keyer parts placement. After I determine that the parts will fit, I set the tin on the template and mark the location of the holes I'm using. The vertical location is easy to mark with a scale or even eyeball with a little practice.

This process saves some tedious masking, measuring and marking. It's quick and accurate enough for my purposes. I'd be willing to email copies of the JPG files to interested readers. My address is otm74@rew2000.com. [*WA8MCQ note*—that's the address that his mail came from, although QRZ.com shows him as wa0itp@rev2000.com in mid March 2004. If neither works, I can send copies of the original color scan files myself.]

Inserting ICs into PCBs

Denny Payton, N9JXY, shared an idea from someone else on QRP-L—

Jerry McCarthy, WA2DKG, shared this idea with me a while back, explaining how he installs ICs, and I finally tried it out when I built a "Tenna Dipper"" kit. To me, it's the best idea I've come across in some

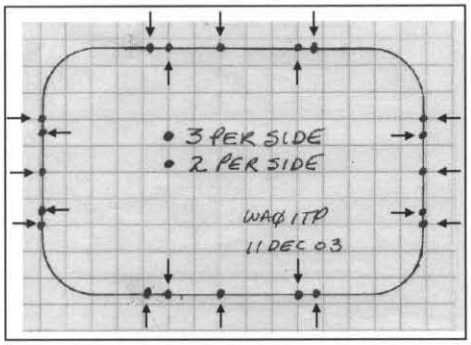


Figure 13—Hole location template for Altoids tin. Locations for 2 or 3 holes per side are indicated by added arrows. (The original uses colored dots.)

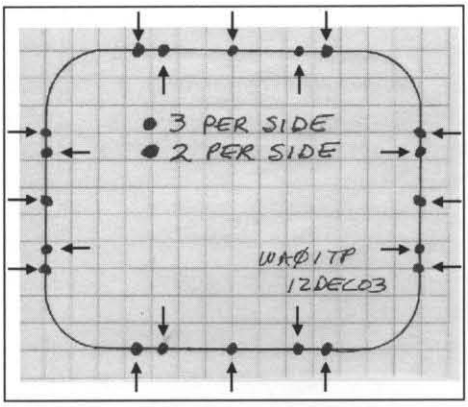


Figure 14--Template for locating holes in a small Whitman's tin.

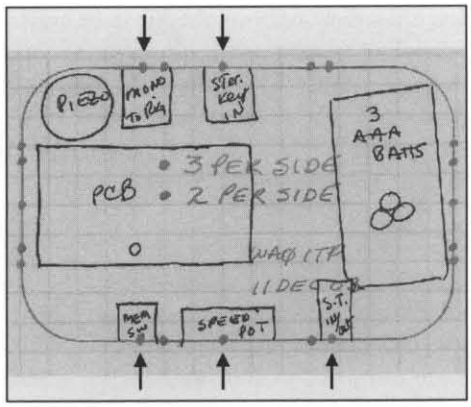


Figure 15--Parts location for putting the NorCal keyer in an Altoids tin.

time! The IC easily snaps in and stays put. I actually was able to snap in the PIC chip and test it, before soldering it. I used my pocket knife since I didn't have a 6" steel ruler like he uses, but tomorrow I plan to buy a small putty knife, then never have to bend IC leads again!

[He included the following e-mail from WA2DKG]:

I am an Elecraft builder, listed on the "builder's list." This is how I handle the pins on ICs. I take the chip as it comes from the factory and insert the pins on one side into the proper holes in the circuit board, with the pins on the other side resting on the board near their holes. The IC is cocked at an angle at this point. I gently hold the IC down with the index finger of one hand, and with the other hand I take a 6 inch steel ruler and place the end against the un-inserted pins.

I press all of them, at the same time, over toward the holes until they line up and drop in from the gentle downward pressure from the other finger. This does several things for you. You don't have to manipulate the pins so you avoid stabbing yourself. It gets all the pins into place quickly and easily, taking only seconds to do. And the pins now have spring tension on them, so when you turn the board over to solder, the IC will not fall out and you will not need to bend any pins over to keep it in place until it is soldered.

—de N9JXY, WA2DKG

Crystal Filters and IF Amplifiers

Rich Johnson (who appears to have no ham call at present) posted this question to QRP-L—

Many times you see designs with a 4 crystal IF filter followed by an IF amp, followed by a single crystal filter. I understand the idea that the crystal after the IF amp is to filter out noise introduced by the amp. However:

1) Would it be better to use a wide roofing type filter after the IF amp, or

2) Split the 4 crystal filter into two 3 crystal filters, one before the amp and one after, or

3) Would a single tuned circuit after the amp be just as good as the single crystal filter?

What do people think of the trade offs between filtering before and after the IF amp?

James "Dr. Megacycle" Duffey (KK6MC/5) had this reply—In general, it is best to have selectivity as early in the receiver as possible. Hence the 4 crystal filter before the IF amplifier is to be preferred over the 3 crystal before and 3 crystal after configuration. And narrow IF filters are to be preferred over wide roofing filters. The more strong signals that that are filtered out before reaching stages with gain, the better the strong signal handling capacity of the receiver.

A single tuned circuit is usually pretty wide at IF frequencies of several MHz and would be much wider than the single crystal filter. The single crystal filter following the IF amp is usually satisfactory to filter out the noise added by the IF amp.

George Baker, W5YR shared this—Rich, you are delving into a fairly complex issue: distribution of gain and selectivity in a multistage receiver. A very good reference on this is Wes Hayward's *Introduction to RF Design*. But the basic concepts are just that: basic.

Reduce the bandwidth and control the signal amplitudes prior to the active stages which have a finite signal-handling capability. That means that any mixer or amplifier can be driven into its non-linear operating range by high enough amplitude signals. So, one must ensure that signal amplitudes are within the linear operating range of the first active device. This is done in two ways:

a) Use filters to reduce the bandwidth of the preceding circuitry feeding the active device to only that required for the desired signal; this keeps unwanted high-amplitude signals from affecting operation.

b) Control signal amplitudes by AGC as needed.

Thus, we commonly see relatively wide filters used ahead of the RF amplifier and/or first or only mixer stage to reduce the likelihood that strong signals can reach the mixer and overdrive it to produce spurious signals (intermodulation distortion, or IMD).

In the early stages of the receiver before the conversion to IF, these filters are commonly called roofing filters. They serve the added purpose of minimizing the response of the receiver to so-called image signals which it is prone to receive as a result of the mixer operation.

Once the signal has been converted to IF, gain must be used to make up for the loss in the mixer. So here again are one or more stages vulnerable to being overdriven and creating distortion products. Their signal levels have to be controlled closely by appropriate AGC circuitry.

It is usual practice to set the operating bandwidth of the receiver by one or more filters operating at the IF. Once sufficient

amplification has been obtained, the signal is applied to the main IF filter. Again, one must be careful not to drive the filter too hard, if it is a conventional crystal filter, since these too have a signal range beyond which they do not perform as desired.

The filter will introduce loss which must be made up for by amplifier stages and again these must have their signal amplitudes controlled to prevent overdriving. Since the signal levels are now rather large compared to those at the mixer input, amplifiers capable of handling large signals must be used.

Any amplifier stage will generate noise in addition to increasing signal level. It is the usual practice to follow the IF amplifier(s) with yet another filter to limit the signal- and the noise-bandwidth of the receiver. Note that the filter does nothing to the noise except limit its power through limiting the bandwidth. It does not "filter out the noise" and leave the signal.

This filter usually is not as complex as the main IF filter nearer the mixer output. That is, it may not have as small a shape factor or be as narrow in bandwidth as the main filter. On the other hand, the filter may indeed have a smaller bandwidth in order to further reduce the operating bandwidth of the receiver. For example, the early IF filter may be a 500 Hz filter followed later by a 250 Hz filter for added CW selectivity.

All these remarks concerning filters apply to conventional receivers with crystal filters. In DSP IF receivers, such as the Icom PRO series or the ORION and other recent radios, the stages preceding the analog/digital converter (ADC) stage are operated and controlled so as to ensure that the ADC cannot be driven into saturation (maximum digital count). No particular effort is made to secure a narrow operating bandwidth in the preceding stages since the DSP filtering will accomplish this much better than any feasible crystal filter(s) can.

This is a very complex topic and I have not done much to reduce the complexity in trying to give you some idea of how to answer your questions. Like most questions in engineering, the answer is "it depends." Many factors bear upon how a receiver is designed, some posed by the user requirements, some by the characteristics of the devices used and some by the laws of Nature.

Finally, for a look at a most elegant receiver design examine the circuitry of the Elecraft K2. Its seemingly oversimplified circuit manages with very few parts and a very simple architecture to provide performance surpassing that of much more complex and expensive radios. You will find there a fairly complex crystal IF filter following the post-mixer amplifier and feeding the IF amplifier which then feeds a very simple crystal filter to the final mixer stage which produces the audio output signal.

Again, Wes Hayward's book and the new one *Experimental Methods in RF Design* are outstanding and I highly recommend their study.

After seeing that last posting, Dr. Megacycle responded with this—

George, you present a very good summary of the function of filters and gain in a receiver.

Some time ago I ran across the expression "Gain at one frequency in a receiver must be accompanied by selectivity at another." I think it was on the GQRP-list, but I am not sure. At any rate it simply states good receiver design philosophy.

I do not share your ideas about the use of AGC to improve the strong handling capabilities of a receiver. Unless, of course that AGC is accompanied by selectivity so that the amplitude of the unwanted strong signals can be reduced and the amplitude of the weak signals preserved. This can only be done by filtering. IF crystal filters remain the easiest way to do this. This function can be done digitally, but I suspect that it is more complex, reduces dynamic range, and may introduce digital processing artifacts.

I still think that the best way to deal with strong signals is to have narrow filtering as soon as possible in a receiver and to operate the receiver at the minimum gain necessary to receive the signals one is interested in.

Long ago, I posted to the list an explanation of filtering and gain in QRP receivers. Perhaps I should dig that up and repost it.

[Someone requested that Dr. Megacycle repost his earlier messages on the subject. He replied by sending along the references where they could be found online along with some comments.]

http://www.kkn.net/archives/html/QRP-L/1996-02/msg00915.html

is a discussion of receivers with multiple conversions and the performance of the ubiquitous NE602-MC1350-NE602 configuration.

http://www.kkn.net/archives/html/QRP-L/1997-11/msg01650.html

is a discussion and a comparison of the performance of direct conversion receivers and superhet receivers.

http://www.kkn.net/archives/html/QRP-L/2003-03/msg01513.html

is a discussion of filtering in receivers.

http://www.kkn.net/archives/html/QRP-L/1997-10/msg00660.html

is a comparison of why we perceive the performance of our simple QRP receivers to be better than our high dollar rigs.

These posts should be taken in context. Some of these are long, longer than they really need to be. Many of these are in response to other QRP-L posts so there are references to posts that set the stage for the above posts.

Also, the technical face of QRP radio, and ham radio in general, has changed since many of these were written. Hence, there are references that may seem odd now.

Having gotten smarter, there are some things in the posts I would change if writing them today, there were some posts that had very good replies, and some posts correcting the mistakes I made. You can find these in the archives as well. But, all in all, these posts are still valid. Many were made prior to the Elecraft K2 being introduced and prior to the modern generation of DSP rigs such as the ORION and PRO2.

By the way, these and all the other posts are available on a great searchable archive:

http://www.kkn.net/archives/html/QRP-L/

One can search the entire archives by keywords. It is quite useful.

[*WA8MCQ note*—when I looked at the archives list I noticed that there is a gap of several months in 1994 for some reason. I also noticed entries for 5 months in 1990 and 1991. QRP-L was not created until

1993; those are probably the result of the date on the sender's computer being set incorrectly. And don't worry about the archives for the "new" QRP-L which is now at qth.net; these archives contain all QRP-L posts regardless of what the host was at the time.]

Coupling a Transmitter to a Counter

This discussion appeared on QRP-L around the end of January.

From Paul Erickson, VA7NT—I was wondering how others couple the output of a transmitter to a frequency counter? I have had occasion to need to verify a transmitter's frequency when the digital readout was suspect. I seem to remember someone using a T connector with the center conductor pin removed in order to prevent blowing the front end of the counter. Also, I guess one could take a couple of turns of wire wrapped around the output coax. Any other suggestions?

From George Baker, W5YR—Use a T-connector. Solder a piece of #12 solid wire about an inch or so long into the center pin of a PL-259. Place a length of plastic tubing or "spaghetti" over the wire to insulate it. Use a scope probe to clip over the insulation and connect to the counter or scope. This pF or two of coupling capacitance is adequate to drive an instrument even at the 5-watt QRP level.

Bob Nielsen, N7XY, had this to say—I installed a BNC connector on the side of the case of my MFJ dummy load with a short length of wire bent 90 degrees just as it comes out of the connector (parallel to the load resistor). There is enough coupling for my counter to trigger, even at 5 watts.

Finally, Dan Tayloe, N7VE sent this reply—You can couple directly to the coax by using a capacitor divider. Use a 5 pF capacitor to the coax, then 220 pF to ground from that 5 pF output. This will form a 40:1 voltage divider. You can pick the output for the counter off the junction of the two caps. Five watts is 22V peak or 44V peak to peak. This will give you about 1Vp-p from the junction, somewhat less than 1 mW.

With the SSS frequency counter, I found I could get a count just by attaching two feet of wire and picking up my transmit signal over the air.

The Transparent Resistor

This one falls in the category of "Oddball Technical Trivia." Most people will probably never see something like this, but if you do, you'll know what it is.

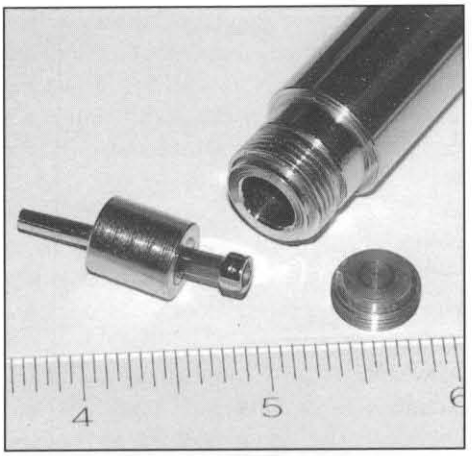


Figure 16—The small transparent cylinder that looks like a small fuse sticking out of the assembly on the left is actually a 52 ohm resistor.

When you examine old electronics items you sometimes come across odd things. Brad Hernlem, KG6IOE, opened up an old 50 ohm terminator with an N connector, and inside found what appeared to be a blue, transparent resistor element. He asked about it on QRP-L and gave a link to some pictures on his web page.

The assembly at the left in Figure 16 is inserted into the rear of the body, and the brass plug holds it in. In the center of the assembly is a small, light blue, transparent cylinder with a metal cap on the end. (Although some of the photos on the web site make it look like there's a thin wire inside it, that's just a quirk of the lighting.) Brad reports that the cylinder does have about 50 ohms between the ends.

Several explanations were offered, but the most likely answer is that it's probably glass coated with a thin film of indium tin oxide. That is both transparent and electrically conductive and it's applications include window defoggers and heated microscope slides. You can find some information on the material at this URL—http://www.cerac.com/pubs/proddata/ito.htm and info on the heated microscope slides (which I had never heard of before) is at http://www.2spi.com/catalog/standards/ITO-coated-slides-resistivities.html.

Visual BASIC for Amateurs

We don't normally think of Microsoft's Excel spreadsheet program as being a useful electronics tool, but it does have a fair amount of computational power available. James Lynes, KE4MIQ, tells how that can be used to do various electronics functions.

While reading an electronics text last year, I thought it might be fun to try and model some of the example circuits on my PC. In the spirit of "when all you have is a hammer, everything looks like a nail," I fired up Microsoft Excel 97 and stumbled right in. Professionally speaking this should be known as "rapid prototyping," but to loyal *QRP Quarterly* readers it's more like the software version of "melt solder."

It didn't take very long to realize that while Excel speaks the language of Accounting fluently, it can't even baby-talk in the language of Electronics. Excel likes to see numbers like .001, 1000, 1E-06, or 1E-12. However, we hams would rather work with quantities such as uF, pF, kohms, mH, MHz, etc. Yes, it was possible to model circuits using scientific notation. But it sure wasn't fun, which after all was my primary goal at the start of this project.

At this point I could have punted and gone back to Solitaire, but I hate being beaten by a Microsoft application, so I pressed on. It became a deep, dark trek into the bowels of Excel where not all "features" are documented in the HELP files.

Under the covers of Excel lies a powerful full function programming environment known as Visual BASIC for Applications (VBA). VBA is the engine under all of the Microsoft Office suite of products. If you've ever written an Excel macro you have programmed in VBA. A macro is just a VBA subroutine.

Another way to access VBA is through a Function call. If youve ever totaled a column of numbers, i.e., =SUM(A1:A9), you've used Excel Function calls. There are hundreds of functions built into Excel, but if you don't find the tool that you need, it's simple to create a user defined function to do the job. Simple macros can be built by recording the keystrokes and mouse clicks that you use to perform a repetitive task. More complex macros and user defined functions are built by entering VBA code via a text editor.

After my initial learning curve, a package of electronics modeling functions began to take shape. Functions are available to convert all of the basic electronic quantities, with their various scale factors,

into scientific notation and back into "ham" for display in worksheet cells. Using these conversion building blocks, a library of over 50 functions has been built to perform calculations such as series and parallel resistance, low, high and bandpass filters, tank circuits, toroid selection, Q values, pop-up resistor and capacitor identification screens, etc.

In practice I maintain the library as a text file (.TXT) and import it into Excel workbooks as needed. Once the workbook is saved the library will remain a part of the Excel file. However, if you update your library, you will need to reimport it into any workbooks that require the new or modified functions.

As you build a model on a worksheet all of the built-in Excel functions as well as all of your custom electronics functions are available for use. I've also found that the Excel Line Graph package can simulate a pretty good transistor characteristic curve with associated load lines.

The electronics functions library is just in it's infancy and there are many more bells and whistles that could still be added. I've built a separate library for complex number calculations that could be used when analyzing AC circuits, one for matrix solutions to simultaneous equations and even an application to do wild card searches against the MS Word dictionary and a custom dictionary that you create for the purpose of solving those tough crossword puzzles!

VBA is a powerful tool that should be available to most hams. It is easy to use and by building small functions that complement each other very complex problems can be attacked. Your only limit is your own imagination.

References:

1. Microsoft Excel 97 Help files
2. Microsoft Excel 97 VBA Help files
3. Bullen, Green, Bovey & Rosenburg, *Excel 2002 VBA Programmers Reference,* Wrox Press Ltd, 2001; ISBN 1-861005-70-9, $39.99 list.

Note: Code is written using the KISS principle and could be optimized further with an accompanying loss of clarity.

—de KE4MIQ

```
Function Freq (Fstr)
' Parse a frequency (Fstr) in the form of
' ##.# Hz, ##.# KHz, ##.# MHz or ##.# GHz into a
' number in the form of ##.#, ##.#E+03, ##.#E+06,
' or ##.#E+09.
' Returns (0) if there is an error in the input string.

    Dim a,b,c,d,e,f
    Freq = 0
    a = Ucase (Right(Fstr,3))
    b = Left (a,1)
    c = (Len (Fstr)
    If (c<3) then exit function
    d = 3
    If (Is Numeric (b)) then d = 2
    e = Left (Fstr, c-d)
    f = Val (e)
    If (a = "KHz") then Freq = f * 1E+03
    If (a = "MHz") then Freq = f * 1E+06
    If (a = "GHz") then Freq = f * 1E+09
End function

Note: Freq (Fstr) has an inverse function Ffreq(Eval) that formats a frequency in
scientific notation into a string for display in a worksheet cell.

Function Xc (CPstr, Fstr)

' Calculates the capacitive reactance in ohms
' of a capacitor (CPstr) at Frequency F(str).
' Returns (0) if there are any errors in the
' input strings.

    Dim Capv, Freqv
    Xc = 0
    Ccpv = Cap (CPstr)
    Freqv = Freq (Fstr)
    If (Capv = 0 or Freqv = 0) then exit function
    Xc = 1/(6.283*Freqv*Capv)
End function
```

Sample code from the Electronic Functions Library Rev 2.1, Copyright 2002, James M. Lynes. Used by permission (permission to use for noncommercial purposes).

Longer Shafts on Potentiometers

Jim Sheldon, WØEB, shared this tip with QRP-L. Sometimes you come across a part which is perfect for a project except that the shaft is too short to put a knob on it. But if it's the type which has a nut to lock the shaft in position you can use more of that shaft; you just have to expose the part covered by the locking grips.

It doesn't just apply to tiny pots, of course, since larger pots and some variable capacitors are also built this way. Several years ago I described this technique in the Idea Exchange as applied to variable capacitors, but this is another of those good ideas which deserves to be brought up every now and then so people remember it. Here's how Jim did it.

I've been looking for some miniature pots that would fit into small places, and had 1/8" shafts. I had trouble finding some, especially a 100k unit to be the speed control for my NorCal keyer. (I robbed the one I had in the NorCal to put in my DSW-II-20 after getting Chuck Olson's DSWK chip).

I was given a couple of the Allen Bradley miniature "locking" potentiometers with short, screwdriver adjustable shafts. These came with the "locking" nut already removed. The threaded mounting sleeve is tapered near the end of the shaft, and is slotted to be crimped down on the shaft by the locking nut. The threaded portion is almost 1/2" long, and longer than really needed to provide mounting through a panel.

I chucked the pot in my drill press with the shaft pointing downward. Then I got

out my flexible shaft tool with a small Dremel type cutoff wheel chucked in it. I spun the pot with the drill press and carefully cut through the mounting shank without going so far as to cut the shaft off. This left me with enough shaft protruding to install a knob and after installing it in the NorCal keyer, it worked. It's amazing what you can come up with when you're broke and desperate for specialized parts.

—de WØEB

QRP Online

As I say every issue, there's been a huge amount of QRP info flying around the Internet for years, and it's still there! Here are some of the online forums for QRPers:

QRP-L, which I call the "QRP Daily," is the online QRP discussion forum started in 1993 by QRP Hall of Fame member Chuck Adams, K7QO (K5FO at the time). It recently moved to a new host, as described earlier in this column. Now that it's more or less settled down at the new home, it continues to run several dozen postings per day on a variety of topics related to QRP.

QRP-F is an alternative QRP forum started by the QRP ARCI in October 1999 to take some of the load off QRP-L. The activity is much lower than on QRP-L, but so is the noise level.

While not specifically a QRP list, the Elecraft reflector is dedicated to owners of those products, most of which are QRP. Even non-owners may find it interesting since they cover a number of homebrew topics.

To check out the online QRP world, go to these URLs:

QRP-L: go to http://mailman.qth.net/mailman/listinfo/qrp-l (note the new address) and you're at the home page where you can sign up, read the archives, etc.

QRP-F: go to http://www.qrparci.org/ and click to enter the site, then click on QRP-F on the menu at the top.

Elecraft: http://mailman.qth.net/mailman/listinfo/Elecraft to subscribe; home page at http://www.elecraft.com/

And while you're online, don't forget to keep an eye on the page of the new American QRP Club, www.amqrp.org.

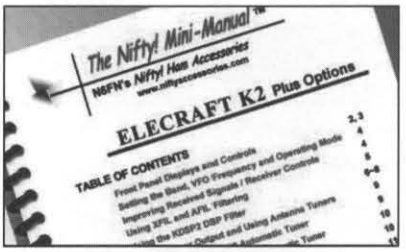
The Fine Print

Do you have something you'd like to share with the readers? You can send it by e-mail, floppy disks or even handwritten notes. And I don't mind hand drawn schematics since I redraw most of them on the computer. (I certainly don't mind if you draw your own like N2CX usually does, but you don't have to.) My job is to edit, rewrite, redraw, etc.; yours is to send in the info to share.

●●

The Nifty! Mini-Manual™ for the "Elecraft K2 Plus Options"

Reviewed by Steve Fletcher, G4GXL webmaster@qrparci.org



The Elecraft K2 Mini-Manual is the latest in a series of reference books for popular amateur transceivers from Nifty! Ham Accessories. The Elecraft K2, like most modern rigs, uses a set of multi-level menus to set up dozens of parameters for operation. Consequently, the book has to pack a lot of information into its 24 pages (7.5" x 5").

Pages 2 and 3 describe all of the front panel displays and controls. The rest of the book is split into short sections that describe a procedure or explain how the K2 options are used. Ten of the K2 options are covered:

KSB2 – SSB Adapter
KNB2 – Noise Blanker
K160RX – 160m adapter & RX Antenna Switch
KIO2 – Auxiliary RS-232 Interface
KAT2 – Automatic Antenna Tuner
KAT100 – High-Power Automatic Antenna Tuner
KAF2 – Analog Audio Filter & Real Time Clock
KDSP2 – DSP Audio Filter & Real Time Clock
KPA100 – 100 Watt Stage & RS-232 Interface
K60XV – 60 Meter Adapter / Transverter I/O

Each section is split into short easy-to-find paragraphs that describe a single function clearly and precisely. For instance, from the section 'Using the CW Memory Keyer':

Using Auto-Repeat

1. Tap **[MSG]** – Hold a digit key **0~8** to select the message buffer. (Auto-repeat starts)
2. To cancel Auto-Repeat, Tap **[MSG]** again, or hit you key or paddle.

The buffer number (e.g. **{B2 }**) followed by **{RPT}** are flashed at the end of each Tx sequence.

Nifty! have produced a manual that is bang up to date. Firmware revisions 2.01 through 2.04 are covered; and the K60XV option had not even been released when I received my copy of the guide!

I found the book very easy to use and appreciated the laminated pages (ideal when operating /Portable). Being spiral bound it stays flat on the bench and does not sneakily close its covers when you are not looking (as do some other manuals). It is ideal for people, like me, who do not use their K2 every day and need some prompting with the more obscure functions. It would also be useful when your K2 is being used for multi-op contests, especially when some operators may not themselves be K2 owners. The author (N6FN) has done a great job describing not only how to use the functions, but in some cases, why a function should be used. Excellent !

The guide costs $22.25 and may be purchased from the publisher online at: http://www.niftyaccessories.com. ●●

A Practical 40M Vertical Aerial

Ian Keyser—G3ROO ian.keyser@btopenworld.com

This spring, Ian Keyser, G3ROO, published the book that he has been threatening to write for many years. His Practical and Tested Aerial Systems *(edited by Tony Fishpool, G4WIF) is a true gem for the radio amateur. Not only does Ian present tried and true aerials, he presents them in a way that only he can. As Rev. George Dobbs puts in the preface to the book, "Enjoy the company of Ian in this book, as I have enjoyed his company on many occasions." Information about obtaining the book can be found on Ian's web site: www.g3roo.org.uk. This article is excerpted from Chapter 4—Practical Vertical Antennas, with Ian's permission. —editor.*

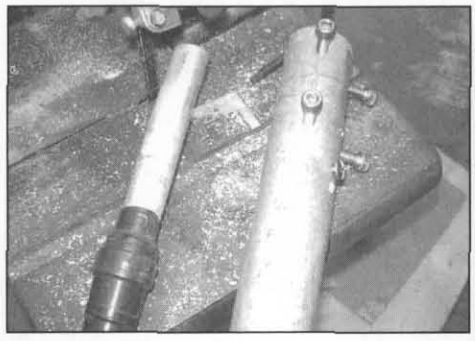


Photo 1—Mounting top pole onto scaffolding pole.

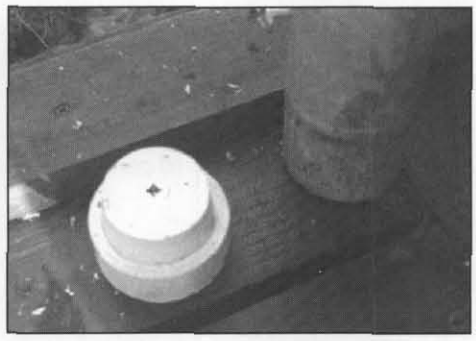


Photo 2. Base insulation and mounting.

The design of my aerials (before I start building hardware) is always checked using a very good, but simple to use, computer program called MMANA. It works extremely well indeed and it has never let me down. It is a freeware program and can be found at www.qsl.net/mmhamsoft/mmana. A little experimentation and you will soon become proficient in adding wires and typing in coordinates. I make a sketch on paper first and then transfer it to the program.

I frequently use Roach fishing poles in my aerial construction, available from SOTA Beams, ECS Ltd., 89 Victoria Road, Macclesfield, Cheshire, SK10 3JA, Tel. 01625-425700 (+44-1625-425700), www.qsl.net/g3cwi/aerial.htm

Simple 'Ground Plane' Antennas

My intention is to make a series of aerials that can be used, either for single bands or several bands and be changed with the minimum of fuss. To this end we will start with a base pole that will be used for all.

No vertical aerial will work without an efficient earth system. This is a priority along with the location of the aerial. Verticals have received very bad press for picking up noise and this is not groundless. Static crashes from lightning strikes tend to be vertically polarised and mains wiring within our houses have vertical components. Noise on wires from appliances will be radiated and received by our aerial systems. The siting of all aerials must be as far away from houses as possible, but, in reality, this is far easier with vertical aerials than with horizontal aerials—as usually dipoles will use the house as a support.

Chose a location preferably equidistant from all houses, a shed down the end of the garden is an ideal situation, but does it have mains wired to it? If it does, check for noise using a transistor radio on the medium wave, (or even better on short wave), and hold it near the cables. Do not forget that it has to be checked with the household appliances running. If a certain appliance is shown to be producing noise add a filter in the supply lead to it. A big problem is oil central heating boilers. The "Buuurp" that you hear on the radio is erroneously put down to the thermostat. It is in fact the ignition circuit. A 5000 volt spark is generated for one or two seconds and if the boiler casing is not too well bolted together this can radiate a terrible racket! If this is traced to be on the wiring from the boiler it can usually be killed using a mains filter salvaged from a washing machine.

I am fortunate that I have a comprehensive workshop, but the "engineering" required for this aerial is very basic and could easily be done with a few hand tools and a garden bench.

The base section is a 17 ft length of alloy scaffold pole. In the top of this four holes are drilled and tapped 8 mm and these are used to hold the top pole in position (Photo 1). Another hole is drilled and tapped 6 mm to enable extensions to be connected at a later date. Another hole is drilled and tapped at the bottom end of the pole for connecting the feeder. This makes the basic building block for our future aerial experiments.

The aerial stands on a small plastic insulator made from plastic padding, although any support will do providing there is reasonable insulation (Photo 2).

In our present aerials the impedance at this point will be low, so the degree of insulation is not critical. My old 100 ft. top band vertical stood on an old fashioned milk bottle filled with sand and cement. The base of the bottle was set in a bucket of sand which in turn was sunk into the soil. The pole is further supported at just over 2 m using a U bolt through one of the 3x2 roof timbers protruding from the roof (Photo 3).

Insulation at this point is achieved by six layers of PVC tape. This method mounting has proven to be strong enough to hold up to anything the weather can throw at us, and we are 400 ft. above sea level only three miles inland from the White Cliffs of Dover. They do not call it "Windy Whitfield" for nothing!

If radials are cut for 20 metres and attached, along with the earth spike, to the braid of a coax feeder and the pole to the inner it will perform as an effective radiator for 20 m.

A 40 Meter Vertical

Having just completed building a K2 transceiver the urge to try it out got me up in the small wee hours and on 40 m. My first CW QSO with 5 watts and a full size quad loop was with an LU (Argentina) and the second with a W2. Reports were 599, but they were contest stations, the saving grace being that I did not get a report of 'RST599, pse rpt name, c/s and RST!'

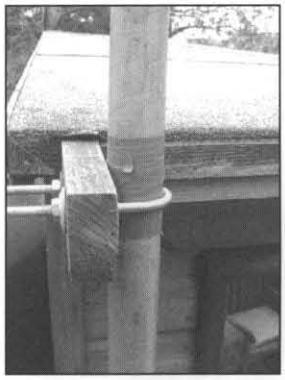


Photo 3. Using roof eave to support the vertical antenna.

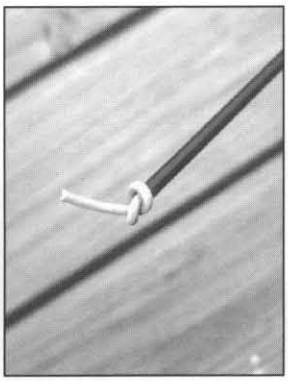


Photo 4. Threading the wire through the hole at the top of the pole.

Photo 5. Connecting wire in the fiberglass pole to the aluminum tube.

The following evening I decided that I would look on 40 CW and see what I could hear in the way of DX. The time was 2130z and I heard a DL working a JA. At the change of over the JA was 559 so after the QSO finished I called and worked him with a report of 549, I was then called by another JA!

The aerial? Well I do have a quad loop hung from an 80 ft. tower, the bottom of which is 12 ft. above ground, but what could I do with a vertical antenna? I decided to put up my portable antenna and rig some decent radials and see what happened. During the following weekends contest I worked a considerable number of stations, local and DX, including JA and W. Being in the contest I could hardly ask them to do a comparison between the loop and the vertical. Of course the Quad will do considerably better than the vertical, but the vertical was perfectly capable of working real DX. The next day I went on 40 SSB and had no problems working all over the country with good reports, although GM reports were well down on the Quad.

Having had so much success with the /P aerial with all its plugs and sockets introducing losses I decided that an experiment with a purpose built vertical was called for. These tests urged me to get on with a project I had been considering for some time, a series of aerials that could be built onto a standard base pole. That was covered in the last chapter, we now continue with making it into a 40 m vertical.

Construction

The top section consists of a 6.7 metre glass fibre Roach pole fishing rod. These poles are available from fishing shops but the only one I have found at 6.7 m was far more expensive. The 5 m versions are available very cheaply but are too short for our application. If you do find them locally make sure it is a glass fibre pole not carbon fibre, as these are conductive, more expensive and unsuitable for some of our future aerial systems.

Preparing the Rod

Extend the rod to its full extent, it is important to do this as it will ensure that any excess plastic padding does not get smeared onto the inner sections and hinder the full extension of the rod later. It also guards against the possibility of doing the following steps and then be unable to insert the top sections!

The cap is unscrewed from the base of the roach pole and a length of aluminium tubing is found that will slide in the end with a few millimetres of clearance. This must be at least 1.5 metres in length, longer if available, as the added length may well be used in later designs for tuning.

Tightly wrap PVC tape around the end of the tube to increase its diameter so that is a friction fit within the tube. Then do the same 150 mm further up the tube, this will make a nice solid coupling when pushed into the rod. Smear the end of the aluminum tube and the inside of the roach pole with plastic padding and force it home so that the second wrap of tape just disappears within the rod. Clean up the excess and, having removed the rubber insert from the end cap, slide it over the tube and screw it up. You will see from the photo that I have also covered the joint with PVC tape. This is not important, but it does add some strength to the pole.

Take a 25 feet length of insulated hook-up wire with an outside diameter of about 2.5 mm. Snip the eye off the top of the glass fibre pole and then, 10 mm at a time, snip down the tube until it is just large enough to take the wire. With the pole "closed," thread the wire through the hole and out of the bottom (Photo 4). Continue threading until there is 5 cm extending and tie a knot in the wire to stop it entering the rod, snip off the excess. Now extend the rod and securely tape over the telescopic joints with several layers of PVC tape to prevent them from "telescoping" when up.

Drill a 6 mm hole in the wall of the aluminum tube just below the end cap and another 2.5 mm hole 20 mm further round the circumference (Photo 5). With a piece of stiff wire with a small hook bent in the end hook the wire from inside the tube and pull it through. Strip the insulation and connect it to the aluminum tube using a self tapping screw in the 2.5 mm hole.

Now mount the top pole into the scaffold pole as shown in Photo 1. Tighten the bolts and ensure that the system is straight, adjust the bolts until it is.

If you can borrow an aerial analyzer it makes life very easy. Connect the base of the aerial to the SO239 inner and the radials and earth spike to the outer and check resonance. Mine was on 7.2 MHz. Bring to resonance by adjusting the length using the joint between the aluminum tube and the scaffold pole.

If an analyzer is not available connect a coax feeder to the aerial and ground system and feed from your transmitter. On low power check the SWR at 7.001 and at 7.099. The VSWR should be higher at 7.001 than 7.099 indicating that resonance is high of the band.... Extend the joint and try again. Continue doing this until resonance is shown by minimum VSWR at 7.050 MHz.

If the SWR is better than 1.5:1 across the band no matching is required. Do not be obsessed by VSWR, providing your transmitter is not complaining and shutting down its output power, the aerial will be working as efficiently as possible.

I have already given sources for the Roach Poles, for alloy scaffold poles go to your yellow pages. One of our locals has just bought one from one of the very well known scaffolding firms for £1 per foot... Plus VAT of course! ●●

Audio Speech Compressor for the FT-817 (and other rigs)

Phil Salas—AD5X ad5x@arrl.net

This audio speech compressor is designed around the Analog Devices SSM2165 device. This IC gives a 40 dB compression range and interfaces nicely with typical electret microphone elements. I decided to build this up because the FT-817 doesn't have any type of speech processing built-in, and any extra "oomph" helps when you are QRP.

The circuit is small enough that it can be built into the microphone. However, I decided to go external until my FT-817 is out of warranty. I've built up a unit using the SMD version of the SSM2165 for this.

I purchased the SSM2165 from Newark Electronics for $4.25. You'll need a PC-mount RJ45 jack and some perf-board. For the cable to connect to the radio, I just bought an RJ45 cable and cut off one end and wired it to the board. The connectors, cable, and other parts were purchased from All Electronics and Hosfelt Electronics. When everything was finished, I covered the entire assembly with heat-shrink tubing to make it a little more rugged.

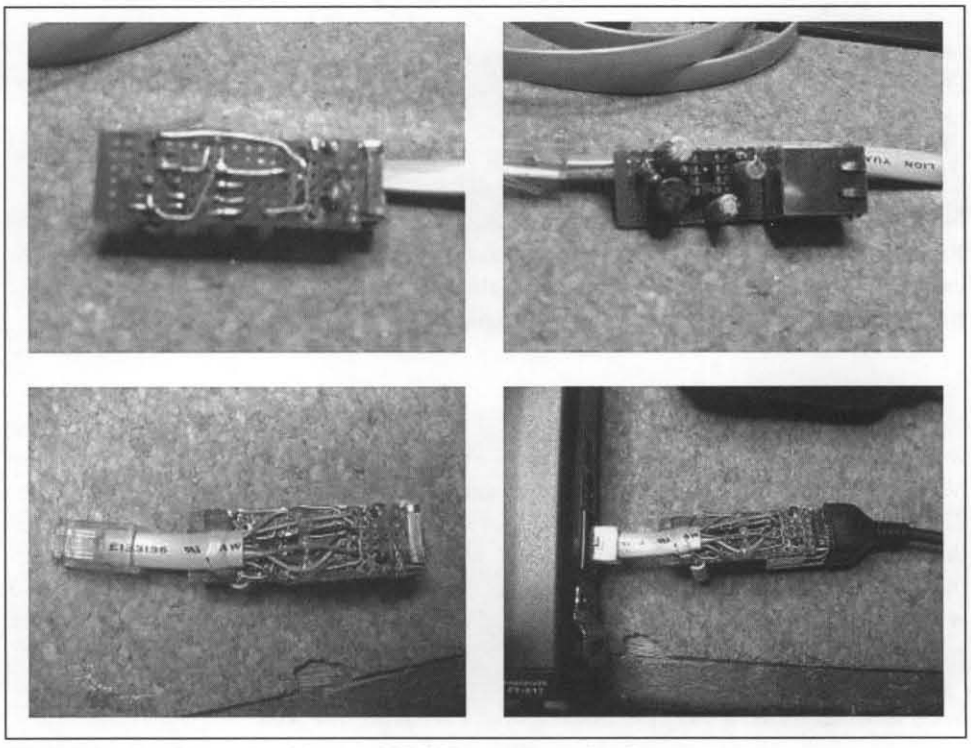


Figure 3—Perf-board wiring and RJ45 connector hookup.

So how does it work? According to my Diamond SX-1000 peak/average power meter, the peaks stay the same (as they should), but the average power increases about 6 dB [that's a lot; one S-unit! —*ed.*]. Most on the air reports say that the compressor makes my signal sound louder, and recommend that I should "leave it in all the time."

While I built this compressor for my FT-817, it should work fine with any rig using an electret microphone element. With the component values shown, the unit has unity gain (output level same as the input level) along with 40 dB compression.

[Note that 50 mA fuses are uncommon, and costly, but may be necessary to protect your warranty. Digikey only has two types in stock, one for $2.29 and the other for $1.30 each. A subminiature "Picofuse" might lend itself to putting the circuit in a microphone, but wait until after the warranty expires! —*editor*] ●●

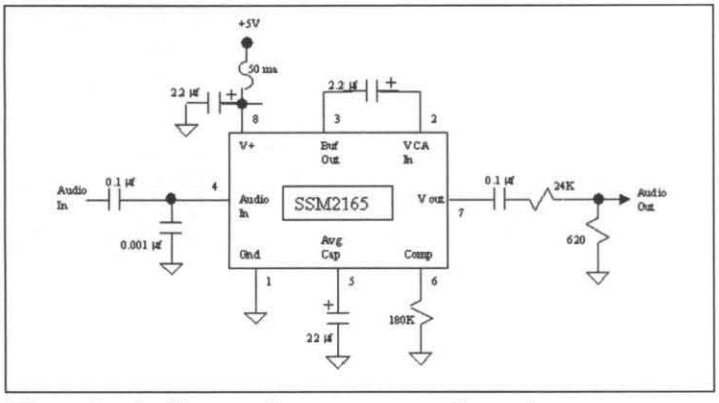


Figure 1—Audio speech compressor schematic.

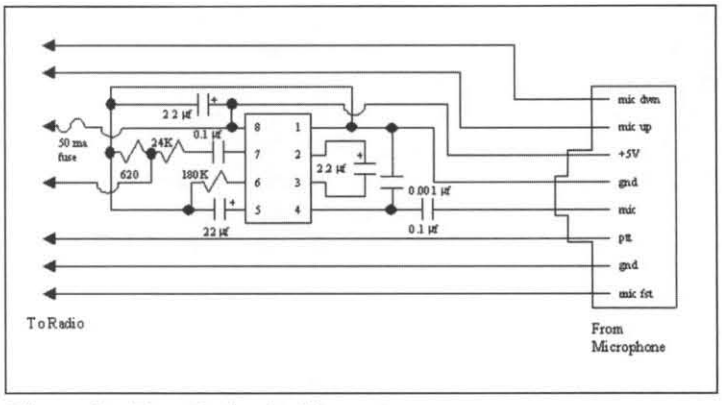


Figure 2—Board physical layout.

Your "interesting little project" is probably worth sharing!
Contact the Editor, Technical Editor or Associate Editor (see the staff list on page 3)

Assembling a EMCOMM/QRP Jump Kit

Rich Arland—K7SZ richard.arland@verizon.net

The Big East Coast Blackout of August 14, 2003 was a red flag to anyone involved with emergency communications. Millions of people across the Northeast, Midwest and Canada were affected in the biggest power outage in the history of the U.S. The much touted cellular infrastructure once again failed. Public Service/EMS repeater systems and trunked radio systems were severely degraded or totally out. This event underscores the need to be involved with emergency communications. If you have not joined a local ARES and/or RACES group yet, please do so. Don't forget to log onto the ARRL website (www.arrl.org) and sign up for the basic emergency communications course. Remember, if you're not properly trained, you are useless in an emergency.

If you want to play the Emergency Communications game you'll need a jump kit. A jump kit is the bag (or bags) you grab when you walk out the door to perform emergency communications (EMCOMM) duties. While I have had some people tell me, point blank, that QRP has no place in EMCOMM, I, and many others, totally disagree. QRPers have top notch operating skills and the size and portability of our gear makes us a valuable EMCOMM asset. While many people think they need at least 100 watts of RF power to maintain communications, QRPers know differently.

Anatomy of a "Jump Kit"

Your jump kit should contain virtually everything you need to enable you to set up and operate a communications station during an emergency. Planning and assembling a jump kit is not easy due to the variables encountered. The following information is provided as a guideline to help you assemble your own jump kit, which, by the way, is never completed! It is a dynamic entity that changes as your emergency communications requirements change.

The ARES guidelines want the emergency communicator to be self sufficient for a minimum of three days. A more realistic goal is 10-14 days. This means that you need to assemble lots of "stuff" besides the obvious radio equipment. This includes several changes of clothing, a toilet kit, spare glasses, any medications you regularly take, depending upon time of year and climate; wet weather and/or cold weather gear along with high energy food items when there is no food available at your site. Don't forget a small tool kit, spare batteries, antennas/feed lines and RF/audio adaptors, log sheets, ARRL message forms, pens/pencils, emergency lighting, maps, compass/GPS unit, whistle, first aid kit, sun block, insect repellent (100% DEET), weather radio and/or scanner. Sometimes you'll need to provide your own tent for shelter along with a sleeping bag. Get the picture? The challenge is to reduce this huge mass of "stuff" to a manageable amount—mobility counts!

K7SZ's emergency communications QRP jump kit.

Your first task is to make lists, separating them into several categories: Radio Gear, Station Accessories, Power, Antennas, Personal Items, First Aid/Meds, and Shelter and Food. List absolutely everything you can think of that you might need during an extended stay in the bush. Once you're done, take a close look at your lists and think about the things you can absolutely do without and then remake your lists. Once you've done this several times you'll hopefully be down to a list of essential items that will allow you to perform your EMCOMM duties at an acceptable level for an extended period in the field. These lists need to be laminated and included in the jump kit since they provide an accurate inventory of all your gear for both pre- and post-deployment.

Which Radio?

The type of RF gear you'll need will be dictated by the requirements of your local ARES/RACES group and the agency(ies) they serve. The majority of my emergency communications revolves around VHF FM voice and packet. Therefore, I need a good VHF rig, some portable gain antennas with the possibility of including a packet TNC, laptop computer, and printer.

HF is nice to have and the pressure is on throughout the Commonwealth of Pennsylvania to have all county Emergency Operations Centers (EOCs) active on HF SSB. Should the individual ARES/RACES member have portable HF SSB capability? Absolutely! It's another method of communications that might prove crucial in an emergency.

My jump kit contains a Yaesu FT-817 (HF plus 6 m, 2 m and 70 cm). It can be argued that 5 watts might be on the light side for reliable communications, which is why I also include a homebrew 40 watt HF amplifier (www.hfpack.com) and a 35 watt V/UHF amplifier (Mirage BD-35). Alternatively, you could opt for the new Yaesu FT-857, which has the same frequency/mode coverage as the FT-817 but provides up to 100 watts output on HF and 6 Meters, 50 watts on 2 m and 20 watts on 70 cm. These power levels are variable, so you can find a balance between reliable communications and available power budget. I also include a V/UHF dual band HT (Radio Shack HT-420) and a 200 channel scanner, just to round out the mix. The photo shows my current jump kit. Spare clothing, food stuffs, meds, etc are carried in a small suitcase that stays in the truck.

It's in the BAG!

You'll need a carrier for your gear. Use what you want with an eye toward mobility. Over the years I have used brief cases, duffle bags, a "Street Bag" from a police supply house, a plastic trunk, a tool box and a soft-sided cooler. Each carrier worked fine at the time but was replaced when my comm requirements changed.

The name of the game is readiness. You have to temper your desire to cover all the bases with the realization that you can't have everything you want during emergencies. Plan your jump kit carefully, get the necessary training and you'll become a valuable EMCOMM asset. ●●

QRP World News

Oleg Borodin—RV3GM master72@lipesk.ru

Hello, dear QRPers! Believe me when I say that I love my QRP World News very much. What can be is more interesting than an opportunity to find out all news in a World—first? What can be is more interesting than talking with QRPers from the many different countries in the World? Truly, it is laborious work, but I love it. And is enjoyable to be the first to learn interesting news and to transmit it to my readers! [Americans call that a "scoop," Oleg! —*ed.*]

Usually, in the late evenings, I turn on my K2 on the international QRP frequency 14060 kHz (so as to not miss interesting QRP stations). Sitting in front of my old Pentium 100 computer, I choose from a great many of the new bits of information, and the most interesting news. And my "QRP Dog" Alpha lays near. So, with that introduction, lets go!

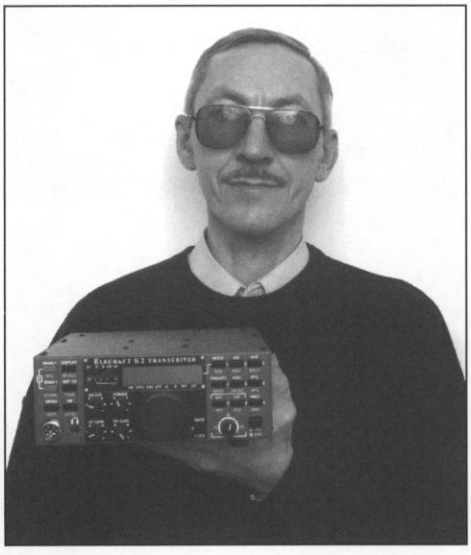


Photo 1—The author, RV3GM with the new RU-QRP Club K2.

World QRP News

Hawaii-QRP Club member Jack, KH6KT operated as VK8IVV/6 in Western Australia until January 28. He bought a Round-the-World airplane ticket. He is now in South Africa for about 2 months. He will try to get on the air from ZS-Land. He next expects to be in Europe, mostly in Germany. The remainder of his trip will include California, Arizona, Fiji, Sydney Australia and finally ending in Perth Australia. Jack's house in Hawaii is up for sale—I don't know Jack's plan on returning to Hawaii. Maybe just to visit?

Ed, AB8DF (MI) had a nice QSO with V73NS (Marshall Island) on the 15 m band. Ed's transceiver was K2 (5 W) and his antenna was a 100 ft dipole at 35 ft. AGL. Nice QSO!

KØEVZ has a nice "doublet." On 15 February, he bagged ZD8R on 15 m, then about an hour later got ZD8A on 20 m. Both contacts were using a K2 at 5 watts into double "Bazooka Inverted Vees" up 27 ft at the apex. Gotta say it—QRP never gets tiring!

Juanjo, EA5CHQ, writes that as of the beginning of the year, the EA-QRP Club has launched a new Web site at http://www.eaqrp.com. It's still in construction and only in Spanish.

Lloyd Lachow, K3ESE, sent me an interesting story: "I enjoy QRP DXing, but I prefer to do it by being on the air and listening, rather than looking at DX spots online. Last night, I left the 40m QRP "watering hole" of 7040 kHz to check the bands before going to sleep. Twenty meters was pretty quiet, but then, there was T32WW, at 599, working ops and calling CQ. I sent my call, and he may have thought, or known, that I was QRP, because I think I heard him say "QRP." So I sent "K3ESE/QRP," and he came right back, giving me a "5NN." I sent "DE K3ESE 5NN MD QRP TU," and he was off, working the next op. Very strong signal here, and a lot of fun. My rig was an Elecraft K1 at 5W, into an EDZ (two 44 ft legs, for a total of 88 ft), up 45 ft and strung N-S, center-fed with 450 ohm ladder line, through a 4:1 balun, tuned by the K1's internal tuner. Recent QRP DX here included Galapagos, HC8N, at 1.5W with my new KX1 and the same antenna." Congrats and thanks, Lloyd!

Mike KL7R wrote: "In talking with another QRPer on the *QRP* ECHOLINK Conference, we thought that it would be a good idea to make a gathering time in the interest of getting the *QRP* Conference up to critical mass. So lets not call it a net but how about a "gathering" at about 0400Z daily. If enough of us meet regularly, the group should become self-sustaining and be really useful to QRPers."

Was sent some info about a new digital mode called, "Domino." It is like MFSK, but uses a narrow bandwidth and very simple SSB equipment can be used with this mode. It is good for beginners. Details and software at http://www.qsl.net/zl1bpu/MFSK/domino/.

Dwayne, KE4RVT/YI, will be in Iraq for 12-18 months and will be operating during downtime from work on 10 to 40 m bands. Will eQSL and standard QSL.

Alberto, LU1DZ, informs me that from the English menu of the GACW Web site (http://gacw.no-ip.org) you can download the graphics, circuits and PCB layouts to build the GACW-40 Receiver and GACW-40 Transmitter. The project will be completed with the GACW-40L, a 15 watts TX amplifier, RX preamp and T/R switch.

Jim Sheldon, WØEB, after modifying his PSK-20 has had his first Hellschreiber QSO. His correspondent was W1AW. Wonderful deal!

News from the Hawaii QRP Club

706 QSO Points x 54 Multipliers = 38,124 Claimed Score. I'm guessing that Max KH6ZM and Dean KH6B operated about 24 hours of the 48-hour ARRL 10 Meter Contest. Most contacts were on CW. Max, however made 39 SSB contacts in about a 2-hour session.

On CW, we netted 35 states and Canadian Provinces plus CX, VR, HL, JA, XE, 3D2, ZL, LU, H7 and 3W. On SSB: 3 states plus LU, JA, VK, TI and FY.

We again used the Hon Cho Wong memorial call sign now belonging to Hilo ARC. Hawaii QRP Club supplied the QRP equipment (Elecraft K2 and TenTec Scout) and operators. Supplying food and antenna installation were: KH6BMM, AH6NK, NH7OD, NH7OH, KH6AFQ, NH6XB, KH6AVF, NH7SY and KH6JRM. We also had a visitor from Bradley, IL, Greg, WR9L.

The 14-element portable Sterba Curtain was at 15m up between a palm tree and extension ladder/mast.

The second antenna was a 5-element

Yagi up 9m on a second extension ladder/mast. Most of the time, the Sterba outperformed the Yagi. Sometimes as much as 4 S-units. Other times, about equal. In some directions, the Yagi was needed. The Yagi has 7.2 dBd gain, and the Sterba Curtain calculated at 12.6 dBd gain.

I think the next time we will build and use two "Portable" Sterba Curtain Arrays installed at right angles to each other.

Oh, yes, the food was excellent!

24-25 January, Dean KH6B and Max KH6ZM again took part in CQ WW 160m CW Contest operated from Laupahoehoe Point Beach Park using a club call KH6GP.

Their antenna was an Inverted-L with metal pavilion roof in the park as a counterpoise-ground, transceiver K2. They had very bad lightning static and a severe electrical storm with wind and rain over Hawaii during the weekend.

Results: 230 contacts, multiplier 42 (34 USA/Canada + 8 countries), claimed score 92,085. It's not bad for 5 watts on 160 m band!

—Dean W. Manley, KH6B

Photo 2—Souvenirs from RU-QRP Club for NoGa-QRP Club.

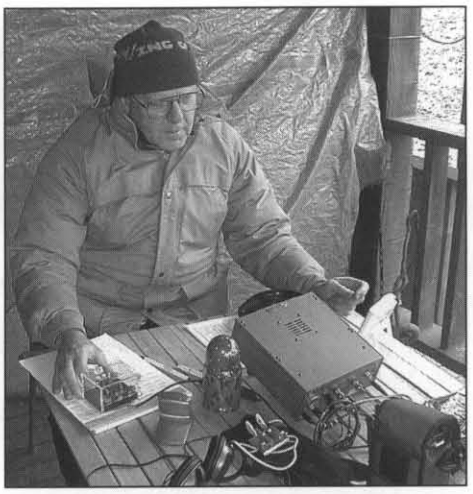


Photo 3—"Matryoshka" help to John "Pickett" AD4S in FYBO-2004.

QRP News From Cuba

Arnie Coro's, CO2KK, design of a viable, modular, easy to build and align transceiver "HURACAN UNO" (which means "HURRICANE ONE" in English), was completed in the late summer of 2003.

The rig draws from the experience of many QRP radio designers around the world...from India to the UK, and from the USA to Australia!

The modular construction project allows the builder to use a step-by-step process when constructing the transceiver, and it also includes two power supply modules, one for AC power line use, and the other one (actually an interphase) for use when running the rig from DC sources like batteries or other external power supplies.

Receiver performance has proven to be excellent, considering that it employs only audio filtering. But the very well designed front end does a great job in providing immunity from strong nearby signals, also aided by a front end resistive RF attenuater.

The HURACAN UNO is a double-sideband transceiver, that puts out about 10 watts PEP, but can be cranked down to 100 milliwatts, as well.

When using it on CW, a clever frequency offset comes into play to obtain the 700 Hz shift required.

The transceiver has a LOW PARTS COUNT, but this is not a "PIXIE" or similar ultra simple radio kit, because it is a much more elaborate direct conversion receiver than just a simple diode mixer.

We have already designed the PC boards and are planning for a KIT to be available in the near future. The little rig is also very easy to build using so called islands or pad (Manhattan-style) construction method.

—Arnie Coro, CO2KK

RU-QRP Club News

As you know, RU-QRP is my home Club, therefore I can't forget to say some words about our news. The mostly important news is we have is a new transceiver K2 in the Club Headquarters in Lipetsk, Russia-see Photo 1. Unfortunately, we have poor antennas now—20 m dipole and LW—we are waiting for spring to make new antennas on the roof [weather in Lipetsk at press time was 0 degrees C and ice —*ed.*]. Since this past February, there is a permanent proxy RU-QRP Club representative in the NOGA-QRP Club, named "Matryoshka" (see Photo 2). He will be present at all NOGA meetings and activities as RU-QRP representative. Our "wooden friend" took part in the FYBO-2004 and was a big help to NOGA members to "non-freezen off" (see Photo 3).

How many QRPers do you know that have an antenna mast 60 meters in height? About as many as in Russia! Look at the Photo 3 and you can see well known Russian QRPer Alexei Rusakov, UA4ARL (#005). He lives in Volgograd city and has operated only QRP/CW since 1988. Recently, he found an old abandoned TV antenna mast in a suburb of Volgograd and made some Inverted Vees on top of the mast (see Photo 4). On weekends, Alexei goes to his antennas to operate QRP. He has worked 223 QRP-DXCC (216 confirmed). On the next photo (Photo 5) Alexei is with his Trohpy for the 1st Place in the Croatian CW Contest 2002 (QRP-entry). By the way, on the photo he is in the Museum Room of his factory, not in an old movie! I searched for interesting scenery to photograph, but this antique scenery is much more interesting than Trophy, HI. Alexei asked me to publish his two QRP tales, which I do with pleasure. Read below.

UA4ARL QRP Adventures

December 1, 2003—I wanted to operate in CQ-WW CW Contest in a "QRP-entry" for a high score, but there were problems with my low band antennas. I had found a good place behind city: a hill, the highest point of my QTH, with a slope to the south of 20 degrees—20 m above Volga river. Ideally for SA, AF, OC directions. There is a 60 m high antenna mast on the hill. I made Inverted Vees, two strands on a common cable. The upper antennas were at 60 m height and lower ones at 30 m height AGL.

Thursday evening, after hanging up antennas I began to listen to the bands. Worked A45XR on 160 m with 589 level and Russian amateurs worked him with lit-

Photo 4—Alexei Rusakov, UA4ARL with his 60 m antenna mast.

Photo 5—Alexei, UA4ARL with 9A-Contest trophy in History Museum

tle noise. I didn't believe that this could be trusted, as that happens rarely on 160. I thought that somebody was checking his antennas before the Contest. Then he works on JA and I receive the Japanese on 559 but all signals are read well.

It rained all day Friday and the propagation worsened. High bands were open, but signals weren't the high intensity like before. In the evening I listened to A45XR on 160 m—he was S-6 but couldn't hear me. The Top Band was up and down.

I began the contest on 160 m. Only 34 QSOs for 1.5 hours, but past ZA, OE, OH nobody could hear me. I turned to 80 m—56 QSOs for 1.5 hours; also it was necessary to transmit twice many times. The rate drops. I go up to 40 m—the same picture. 20 m has opened. Worked KL7, K, UAØ, but felt that reception was weak. It was not so bad on 15 m—33 QSOs in one hour. I look out the window and saw it was raining. The mood comes in conformity with a nature. The propagation is not present.

All the next day, only listened—the air and the ether were in a fog. By evening the conditions began to improve. On 40 m, JA passes +20 dB on S-meter. Signals are too strong! I switch on ATT to listen more comfortably. On 80 m the mass of Japanese are 579 (JA5BJC is 589). I hear about 15 JA stations, but none hear me. Raised my power up to 20 watts—calls are answered, but the higher power doesn't help. Later in the night there are SAs at 579, but there are pile-ups on them. On 160 m, called GU, G, DL...But nobody hears me. I assume that the noise level in Europe is higher. Only P3A and 4X3A replied to my calls.

I decide that there is nothing to catch on 160/80 and raised to 40 m. There is 5X1X on 40 m. At once he answered me, then PXØF. At 0500 UTC I raised to 10 and there was TO4E calling CQ and answered at once. Then began to bag VK, PY, JA. Everybody answered at once. On 15 m 5NØNHD was not interesting to anybody. He answered at once. Listened to him some more minutes—nobody called him. Then there was a long path opening. Argentina returned nicely. Began to try pile-ups. Bagged D4B in twenty minutes. Then, ZD8Z, 5U and a lot of VK, LU, ZL, ZS.

For Sunday my soul was pleasure. The signal of D4B on 10 was sky high and on 160 m he was 589 also! That was a nice holiday!

—72/73! Alexei, UA4ARL/QRP

December, 27, 2003—This weekend I set myself to the task of competing in the Original QRP Contest on 80 m, where QRP-stations meet not so frequently as on the rest of HF. 80 m has too much noise but 3560 kHz especially. As my ears chatter from QRP/VLP on 80 m I go to 160 m to have a rest where the Stew Perry Topband Distance Challenge was going on.

On Saturday evening I called JT1CO on 160 m with 1 watt and he answered at once, what nice antenna he must have! Participated in both contests. On 1832 kHz heard VK3IO (579) and nobody calls him. I called—he does not hear. I try a little higher and lower on frequency—does not react. I thought to check my antenna and raised power to 80 watts. He answers at once! I didn't begin to carry out QSO, because I work in QRP-entry but now I know that the antenna works and not the problem for propagation for QRP.

In the morning on 80 m, worked SP6GB/vlp who had CQing an empty band for an hour. I go to 160 m and there worked RW3AI/QRP. There weren't any new call-signs here. The European stations pass poorly the propagation fades.

I hear ...Y2ZM. I call him and he answers at once and gives a locator. I answer that I'm on QRP. We finish the QSO and I stay on the frequency until I wrote down the QSO in the log. He gives CQ de VY2ZM! His signal is a 579 level on 160 m and he had answered me at once, but I thought I had only operated Lithuania!

—72! Alexei, UA4ARL/QRP

Finally

Goffredo Navacci IØTWA from Rome Italy is visiting the Hawaii QRP Club during thier daily gatherings in Hilo Hawaii. He is the house-guest of Max, KH6ZM, during the month of March. Goffredo has been assigned HI QRP Club number 471. He was also presented a "Micro-80" CW transceiver kit.

The latest information on Jack, KH6KT, is that he is "house-sitting" in Durban, South Africa. There is no word yet that he has a ZS3 license. He plans to be in Germany in the month of April.

As they say in cartoon films, "That's All, Folks!" I'll be very glad to receive your comments about this article and your news, news, news... Thanks for all who helped me and see you later!

—72! de RV3GM
Oleg ("Master-72") V. Borodin

●●

QRP is a worldwide activity! Send international QRP information to Oleg via e-mail at: master72@lipesk.ru.

The QRP Home Companion

Anthony A. Luscre—K8ZT k8zt@arrl.net

Spring Cleaning

As I am writing this in March, here in Ohio, spring is beginning to emerge from the snowy ground. Spring can be a rather ambivalent season for hams.

First, the bad news—good propagation surrounding the equinox is fading, noise on the low bands is increasing, preventing winter's easy QRP QSOs on 160 and 80 meters. The major contests are over. The extra time to operate or build that results from decreased daylight and lack of yard work is rapidly fading (yes, there is at least one advantage to life in Northern climate!). Finally the "honey do" list of outdoor chores is growing fast.

Now, the good news—hamfest season has begun. QRP ARCI's Four Days In May and the accompanying Dayton Hamvention are only weeks away. The weather is much more friendly for QRP field activities. ARRL Field Day planning has begun in earnest, the season for growing antennas and towers has begun and we can finally put away the winter coats, hats and gloves!

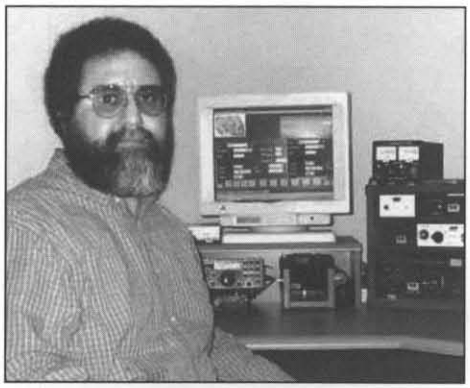
Just like taxes, spring is inevitable; so let's take a look at some things a QRPer can do to take advantage of the season.

Spring Cleaning of the Shack

Start with your operating position. Clear the remnants of snacks, meals and liquid refreshment that have accumulated from extended hours of operating (especially contesting).

Dusting is best accomplished with a combination of soft cloths and small paint brushes (1/2 to 1-1/2 inch are good sizes) and careful use of a small canister vacuum cleaner. You want to be careful not to scratch plastic displays, suck up small connectors or damage painted surfaces.

If you have splashed coffee or sticky soda onto any gear or left dirty fingerprints, a careful use of a mild household cleaner may be necessary. Never spray the cleaner directly onto your equipment-always spray onto a cleaning cloth instead. Direct spraying can cause the cleaner to flow behind dials or monitor bezels. It can get into the spaces between computer keyboard keys, damage paper cones of speakers or reach components or connectors that can be easily oxidized and/or corroded by



liquids. Special care is needed for LCD screens and CRT monitors with non-glare coatings.

Safety Check

Even though they may have been safe when first installed, all electrical devices need to be checked periodically for safety. This idea was driven home when I was dissembling my shack of 12 years and discovered that the rubber insulation of the 110 VAC power cord to my antenna rotor box had dried and crumbled off, leaving sections of parallel copper wires a fraction of an inch from contact with each other. Even scarier, they were close in contact with the metal legs of my operating desk!

I would suggest checking insulation of all power feed cables (both 12 VDC and 110 VAC) and connections to equipment. Make sure there are no "pinch points" or sharp edges on the desk and equipment that can damage wire insulation. Don't forget to check under the desk for damage to multi-outlets and/or surge protectors.

Work Bench and Junk Box

With the hamfest season upon us, it is a good time to clean that workbench. This will allow you to gather up your surplus equipment, built kits and excess components and sell them. Conversely check to see what components or new equipment you need to finish that lingering winter building project, get on a new band or mode and/or just put aside a few spares (I always need more PL-259s and 1/4 inch and mini-plugs).

Tower and Antenna Supports

Start with all ropes and guy lines. Check turnbuckles, clamps, knots and anchors. Check lines for damage or deterioration. Trim tree branches that can interfere with guys. Check bolts, nuts and other hardware of tower base connections. Visually inspect towers and rotors for damage. Use a pair of binoculars for this initial inspection safely from the ground. Whenever you have to climb your tower, take time to do an up close inspection. A thorough inspection should be done at least once every three or four years (this can often be done in conjunction with the next step).

Feed Line, Connectors and Antennas

Coax can be damaged by wind, rain, ice and UV radiation. Connectors can become infiltrated with moisture. Periodic replacement of coax is necessary to prevent losing all of your precious QRP watts before they ever reach the antenna, let alone that station on the other side of the world. Special attention should be paid to weatherproofing all coax connections and pigtails. I recommend a combination of high quality tape, moldable coax sealing compounds, moisture displacement pastes and/or rubber boots.

When checking antennas, pay particular attention to feed points and matches. Antenna traps can be very susceptible to damage by ice if drainage holes become clogged or are incorrectly oriented (insects can aid this clogging with spider webs and wasp nests). A beam antenna's elements can often work themselves loose with the aid of wind, ice and perching birds. Failing to check for loose elements cannot only result in loss of antenna gain, but can also become a very dangerous spear as they fall to earth.

Get Outside, Enjoy the Weather and Operate Portable QRP

Spring is a great time to put together a "field kit" so you can operate portable for an emergency or just for fun. Contrary to the old saying, antennas put up when the weather is not lousy really do work. Use the spring and summer to experiment with and put up some killer antennas, because you know the good-old days of winter operating are just around the corner!

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The Annual Meeting of the Helvetia Telegraphy Club

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By law, all clubs in Switzerland must hold an annual Generalversammlung (business meeting) to review the past year's activities. The meeting for the Helevetia Telegraphy Club was held on Saturday, 6 March, 2004 at the Restaurant Traube in the town of Küttingen, near Aarau in north-central Switzerland.

First, some background. Initially founded in 1951 as the Amateur-Radio-Telegrafie High Speed Club e.V. and reorganized in 1984 to broaden its goals and appeal, the Helvetia Telegraphy Club is run under the auspices of USKA (the Union of Swiss Shortwave Amateurs, their version of the ARRL).

The club's goal is to promote and maintain CW as an operating mode. It does not exist as a club for elite operators but does try to uphold high standards of ham-radio operating in Switzerland. Through the operation of a club station (HB9HC), through practice sessions and courses, they make it possible for hams to learn and perfect their CW skills.

It is common for Swiss clubs to have regular and special meetings at restaurants or similar facilities. Most restaurants here have function rooms of various sizes, which are regularly booked by clubs of all types. The Swiss are "joiners;" it seems that everyone belongs to one or more clubs that address any special interest whether playing cards, playing a favorite sport, practicing their musical skills to prepare for festivals and parades, or in this case ham radio.

As for my day...it began with a half-hour train from my home near Zurich to Aarau, and then a 10-minute bus ride to the village of Küttingen. Although members started congregating at 9 AM for coffee and conversation, I arrived at 10 AM, just before the formal meeting started.

There were 28 members in attendance (out of 134 active members plus 15 "supporters" and two honorary members). At some HTC annual meetings there is a special technical presentation that brings more members, but there was none this year. They tend to get double or triple the attendance at the annual QRP Party in the fall months where there is a formal technical program. This was my third GV, and I'm starting to get to know many of the names and faces, which makes going to the meeting so much more enjoyable.

The officers of the Helvetia Telegraphy Club were re-elected by unanimous vote. From left to right: Secretary, Markus HB9DQJ; Webmaster, Thomas HB9BSH; President, Gerald HB9IRF; EUCW Representative, Robi, HB9DEO; Treasurer, Hans HB9UH.

The business meeting starts with a review of the annual reports as published by the president, secretary, treasurer, and other officers. We reviewed adds/drops from the membership role. The club is pleased that there were 14 new members despite the fact that CW has been dropped as a requirement for obtaining HF privileges in HB9-Land. The president and other officers were unanimously reelected (Fig 1), and the dues were once again set at CHF 30 (roughly $25) per year.

The club reviewed the performance of various members in the major Swiss contests during the past year, noting the large number of HTCers who participate in the CW contests. They also reviewed activities of members who had recently been on DXpeditions and announced upcoming DXpeditions as well as unusual IOTA and lighthouse activations.

An interesting discussion centered around the recent activities of Hans Peter, HB9BXE. On Friday, 27 February, he reached the "Top of Africa"—the summit of Mt Kilimanjaro (5896 m above sea level), where the temperature was roughly –20ºC in a blizzard. Even so, Hans Peter was on the air (21.222 MHz) for approximately 20 minutes with the callsign 5H1BP.

His equipment was an FT-857 at 100W and a Stromsummenantenna wire antenna of the type described by DL1VU. I heard that the total station weight, including batteries, was in the order of 3 kg. It is thought that Hans Peter was the first ham (and perhaps the first radio op in general) to be active on the HF bands from this QTH. Almost all of his roughly 50 QSOs were made with HB9 stations; a manager here in Switzerland took the requests, passed the list on to Hans Peter who ran them mostly with the callsign and signal report. To avoid a pileup and the associated QRM, he gave his call very infrequently. To recover from this stress, Hans Peter then spent a week in Zanzibar where he was QRV on CW, SSB and PSK31 on all HF bands.

Back to the meeting...we next reviewed the major operating and social events of the upcoming year. Chief among them are:

- **H-26 Contest** (aka "The Helvetia Contest," where you try to work all 26 Swiss Kantons, or states), 24/25 April. HB9HC plans to be QRV with a station, likely again at a hut in the hills north of

Zurich.

- **Swiss CW Field Day**, 5/6 June. HB9HC plans to be QRV with a station.
- **National Mountain Day**, 18 July—a very special contest, a Sunday morning sprint on 80m where the QTH must be at least 800m above sea level with a portable station whose total weight cannot exceed 6 kg. This is for individuals only, not clubs, but HTC regularly has more than half the entrants and dominates the top finishers.
- **HTC QRP Sprint**, 11 September

We also reviewed some of the EUCW (European CW Association) activities given that HTC is a member-club of that organization:

- **QRS Week**, 25 April - 1 May
- **Straight Key Day**, 26 June
- **Fraternizing Party**, 20/21 November
- **160m Contest**, 8/9 January 05

Other items that came up in discussion:

- Should HTC have its annual QRP Party as a separate event or instead participate as part of the USKA 75 year celebration taking place at the ham fest in Soffingen, near Basel, on 30/31 October? (motion passed to look at participating in the USKA celebration)
- Should HTC set up a committee to investigate taking over sponsorship and operation of National Mountain Day and thereby offload USKA of this activity? (motion passed).

We heard a report from Markus, HB9DQJ, about HTC setting up CW practice over some of the Swiss club repeaters. The suggestion has not met with overwhelming acceptance, but he will continue to investigate possibilities.

The meeting was then adjourned at 1305, whereupon most members went downstairs to the main restaurant for lunch and a Fachsimpel—defined as an informal exchange of ideas, anecdotes and other information related to a specific specialized activity, in this case, CW and ham radio in general. One criterion for selecting a meeting locale is the quality of the restaurant, and Restaurant Traube does not disappoint.

After finishing a business meeting in a function room on the second floor, the members of HTC enjoy a delicious lunch in the dining room at the Restaurant Traube.

We all had a wonderful lunch; I selected a Wurstsalat, a cold salad where the main ingredient is sliced sausage—delightful! After the meal, people drifted off as their personal commitments required. At about 1600 I was among the last to leave, and I ended up taking the train to Zurich with Robi, HB9DEO and Hans, HB9UH. In fact, I discovered that Robi lives only half a mile from me in the next town. I had intended on trying to catch a ride home with him if he drove, but he was also there with the train. The three of us had a very nice time on the short ride to Zurich, and I continued on the local bus home with Robi.

With him so close, I'm sure we'll have many opportunities to discuss radio and the world in general. For a foreigner, this is one of the major benefits of ham radio clubs—getting to know the locals in a way that would otherwise be extremely difficult.

If I were still living in the US, the HTC Generalversammlung isn't something I'd rush over to attend; it was mostly of a business nature. However, HTC holds a number of contests as outlined above, and I encourage American CW fans to participate (information available at http://www.htc.ch, and if you need help with the German, let me know).

The annual QRP Party is also fun, especially if you speak German, and the annual large Swiss hamfest should be especially fun this year with the special participation of HTC. Reports to follow...Ciao mitenand... ●●

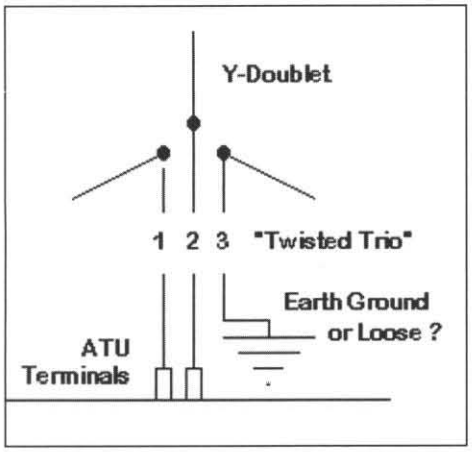


Figure 6. Y-Doublet feedline hook-up.

on it models out (in its perfectly spaced geometry) at about 4 orders of magnitude less current than on the active wires. That is, if the current at the source is 1.0, then the current on the inert wire shows a value of 0.0001 or 1E–4 or less.

The Feeder Question

The original system was designed for use with a twisted trio of feedline wires, in other words, a twisted pair plus one. Figure 6 shows the general hook-up, but without any poor attempt on my part to sketch a braid of 3 wires.

There are several questions about the feasibility of using such a system in modern times. The first quandary is whether we can build such a feeder system.

Modern insulated wire tends to use higher quality (lower loss) insulation than did the wire of yore. I would steer away from line cord, but modern wires use plastics with better RF characteristics, even if the only intend use is carrying DC. Since the system is designed for a low characteristic impedance, but with considerable SWR on the higher bands, I would recommend a heavy gauge wire, perhaps #12 or so. The actual characteristic impedance will depend on the thickness of the wire, the dielectric constant of the insulation material, and how tightly we hold the wires together. Consequently, I can give no exact figures.

Freq. MHz	Gain dBi	TO Angle degrees
3.6	3.35	34
10.125	9.74	26
18.118	9.60	14
24.94	9.85	11

Table 3—Y-Doublet modeled performance: 50 ft. with feeders.

However, you can make up lengths of a proposed feedline and check the impedance in a number of ways with a variety of dummy loads and a low-level signal source. Any one of the current crop of antenna analyzers will give you a fairly accurate reading. Given the relatively high dielectric constant of the insulating material, expect to find a significant velocity factor, something in the 0.6 to 0.7 region.

The next inquiry has to do with the effective inertness of the unused 3rd feeder wire. I re-created the model of the Y-doublet using parallel feedlines. Since twining the leads is not feasible in a physical model, I simply dropped the three leads straight down from the 50 ft. level to 1 ft. above ground. At that point, I connected two of the feeder ends with a 3-segment source wire. Again, all wires used a 1 ft.segment length.

The resulting feedpoint impedances are not accurate to the low-Z feeder system. However, that was not the point of the tests using the feeders with something over 800 ohms as the characteristic impedance. The question was whether the unused antenna and feeder wires would remain inert relative to the active wires.

As one measure, Table 3 shows the effects of the added copper losses of the physically modeled feedlines.

Gain remains virtually unchanged. So, too, do the patterns, and the outlines shown in Figure 3 and Figure 4 remain valid for the reconfigured model.

A second test is to check the current distribution along both the unused antenna wire and the ostensibly inert feeder. I actually performed two tests, one with the unused feeder simply left open and another with the feeder extended 1 foot to touch the ground. The 12-meter current distribution graphic in Figure 7 remains valid for both.

Note that the current line on the unused feeder and antenna wires is flat. The relative current magnitude under either test condition on all of the bands remained less than 1E–4 (.0001) relative to a source current of 1.0.

The modeling test, of course, has limitations relative to an actual twisted trio of wires. In the test, the modeled wires are widely separated and perfectly spaced along the entire 49 ft. feeder run. How well the twisted trio performs may turn out to be as much a careful-construction issue as any other kind of issue.

However, the tests suggest an alternative feed system that just might open up the Y-doublet to use on all of the HF bands. Figure 8 tells the story.

The Y-doublet on the traditional upper ham bands, 40 through 10 meters, can show feedpoint impedances in the thousands of ohms, with considerable reactance. Indeed, shrinking or expanding the basic 80-meter legs may prove useful in reducing the high reactance levels that accompany lengths that are close to even numbers of half-wavelengths. Commonly, we try to select for a doublet a feedline characteristic impedance that is about the geometric

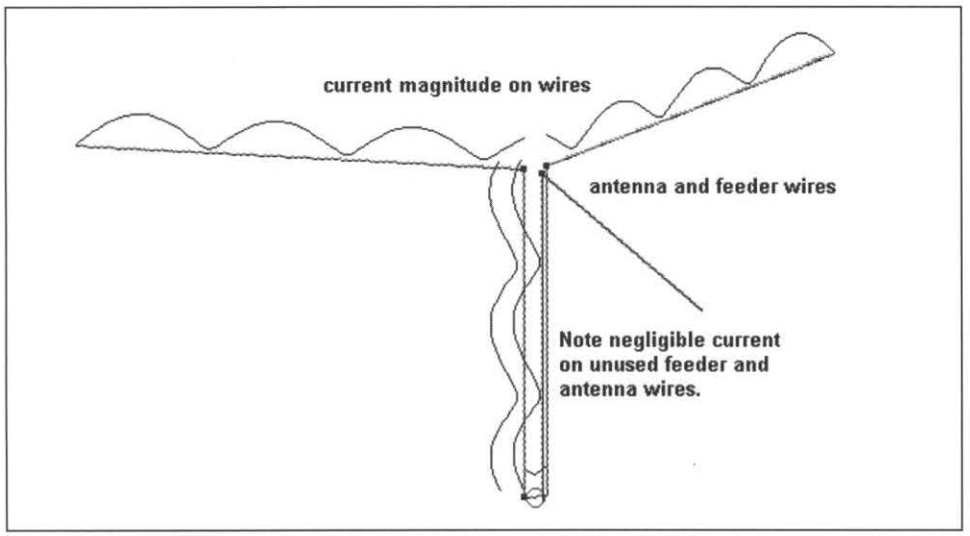


Figure 7—Y-Doublet with 3 feed wires at 24.94 MHz (2 antenna and feed wires are active).

Freq. MHz	Gain dBi	Feed Z R ±jX ohms
3.6	1.70	59 –j 6
10.125	5.16	106 –j 375
18.118	4.62	134 –j 103
24.94	4.92	171 –j 291

Table 1—Y-Doublet modeled performance: free space.

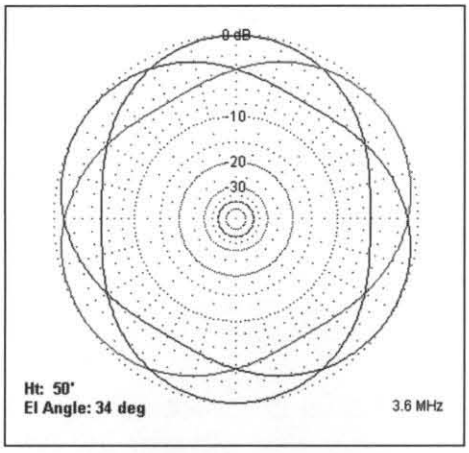


Figure 3—Y-Doublet azimuth patterns at 34 degree elevation angle, with antenna height of 50 ft.

Freq. MHz	Gain dBi	TO Angle degrees	Feed Z R ±jX ohms
3.6	3.43	34*	56 +j 8
10.125	9.98	26	110 –j 424
18.118	9.59	14	135 –j 153
24.94	10.23	11	182 –j 365

*80-meter elevation angle is arbitrary

Table 2—Y-Doublet modeled performance: 50 ft. above average ground

mance on each of the bands above 80 meters. All of the traditional ham bands (40, 20, 15, and 10 meters) yielded very high feedpoint impedances. Since we are working with a low-impedance feedline, I set these bands aside as not especially feasible for use with the system. (We shall review this decision before we are finished.) However, 30, 17, and 12 meters showed feedpoint impedances sufficiently low to potentially allow use of the antenna on these bands using the low-impedance feeder system employed in first half of the 20th century. Table 1 shows the free space performance potential of the array.

The free-space patterns are generally only applicable for a real horizontal antenna over ground if the height is at least 1 wavelength. 80-meter doublets at 270 ft. or more are rare. Therefore, I remodeled the antenna at a 50 ft. height to reflect a more realistic scenario. At that height, the maximum gain of the antenna has an elevation angle that is nearly straight up. So I chose for that band an angle of 34 degrees to reflect typical skip angles. The resulting 3.6 MHz patterns, shown in Figure 3, are a good bit more oval than their free-space counterparts.

On the upper bands, I used the take-off (TO) angle for gathering potential performance data. The antenna promises performance as shown in Table 2, with the leg-length adjusted to 66.5 ft. to bring the array close to resonance at 3.6 MHz. (Wire doublets tend to vary their feedpoint impedances with height in noticeable ways when the doublet is less than 1 wavelength above ground.)

The patterns on the upper bands are not ovals by any means. Figure 4 shows these patterns, but only one pattern per band for clarity. As we increase frequency, we find two especially interesting pattern properties. First, as the legs become longer in terms of wavelengths, the patterns develop growing side "wings." Eventually, by 12 meters, the main lobe has split into two forward lobes. Second, as we increase frequency, the array becomes more directional, with a growing differential between the forward and the rearward gain.

Still, the patterns may be usable for general amateur operations. The question left is why we get reasonably low impedances at 30, 17, and 12 meters. Figure 5 shows part of the reason.

The graphics display the relative current magnitude distribution along the doublet for each of the 4 bands. On 80 meters, we have a somewhat typical dipole current distribution, with the current peak at the feedpoint. On the other bands, we approximate a 3/2, 5/2, and 7/2 wavelength doublet current distribution. Each of these configurations places a current peak at the doublet center, resulting in a relatively low feedpoint impedance.

We should also note that the unused wire shows a flat current line. The current

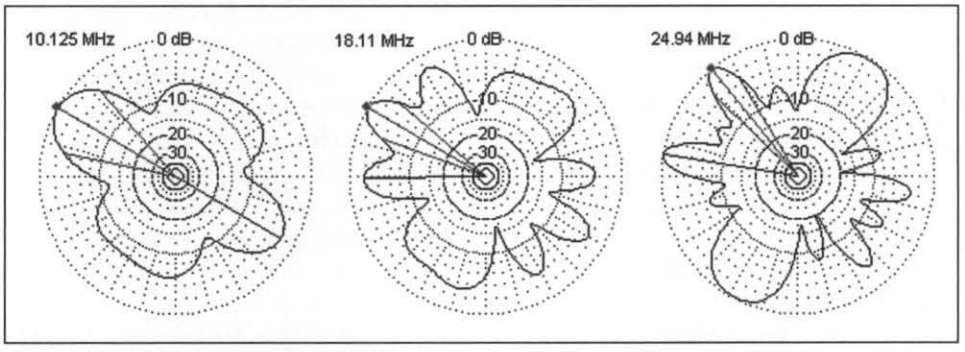


Figure 4—Y-Doublet azimuth patterns: potentially usable upper bands.

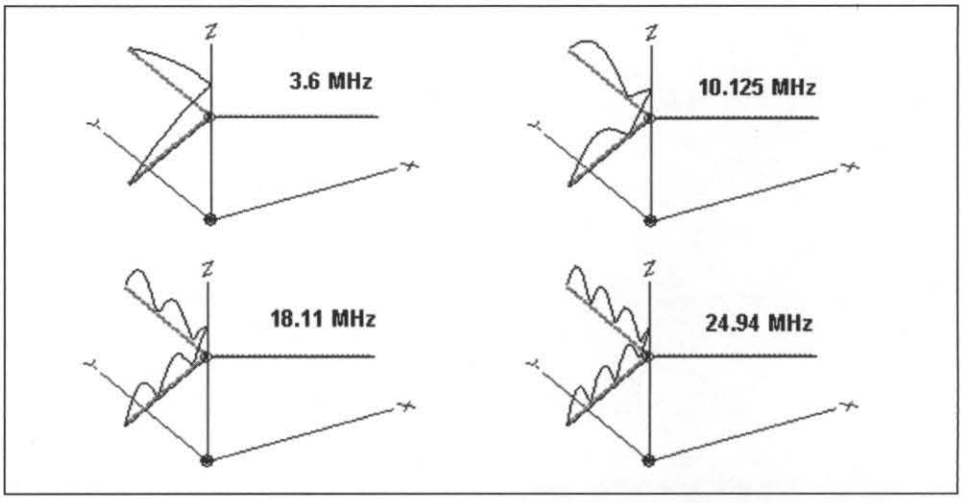
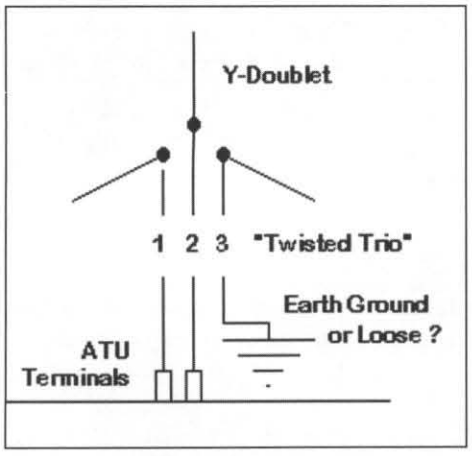


Figure 5—Current distribution along Y-Doublet wires on potentially usable bands.



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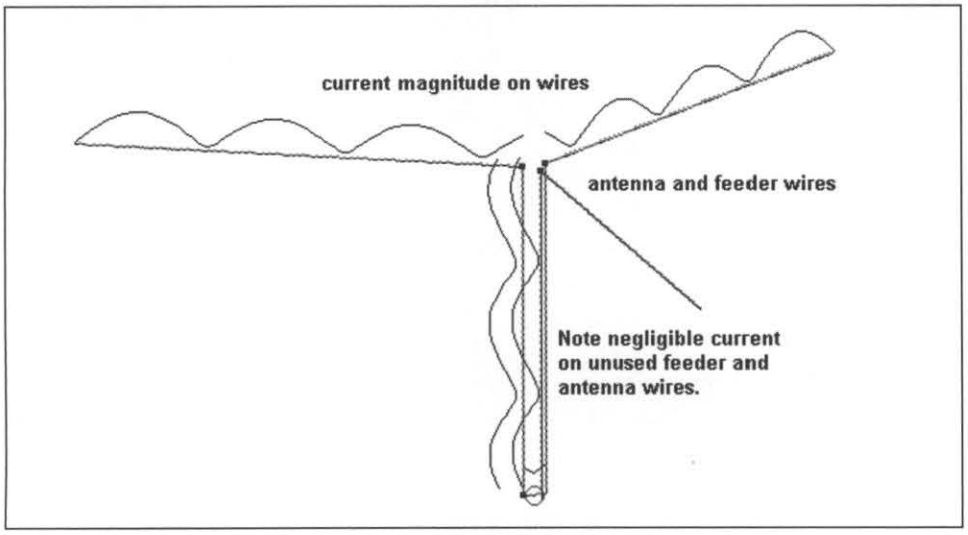

Figure 7—Y-Doublet with 3 feed wires at 24.94 MHz (2 antenna and feed wires are active).

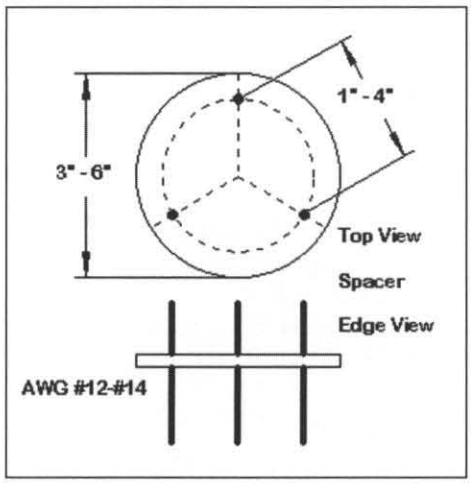

Figure 8—Constructing a 3-wire parallel feedline system for a high Z_0.

mean between the feedpoint impedance extremes that we are likely to encounter. There is a practical limit to this effort, since lines above 600-800 ohms are difficult to produce. Hence, 600-ohm or so open wire becomes typical for such applications.

We can create a trio of pairs by using circular spacers of the type shown in the figure. For HF work, plexiglas or polycarbonate spacers should be satisfactory. We can cut a hole in the center of each to reduce the weight. The holes can actually be slots if we add bridge wires to hold the spacers in place. In essence, we are adapting techniques normally used to create caged elements and applying them to the feedline. Such lines might permit the use of the antenna on all bands with a wide-range antenna tuner and will go a long distance in maintaining something close to the modeled ideal geometry we used in the test cases.

Of course, should you choose to work with a system of this order, you can replace the alligator and crocodile clips of yore with an in-shack switching system to change the orientation of the pattern on all bands.

The resurrected Y-doublet as some potential of still being serviceable today. There are many variables beyond the limits of this initial feasibility check, so success is not assured. However, for some hams who are restricted to backyard wire systems but who wish some directional flexibility, the system may be worth a try.

With the wide spaced feeder system, the system may also be adaptable to 102 ft., 88 ft., 67 ft., and 44 ft. doublet lengths discussed in other notes at my web site (www.cebik.com) and in mountains of other literature. However, as with all horizontal doublets, the rule of thumb that calls for the maximum feasible height remains in play for effective operation.

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Product Announcement: DXtreme Station Log—Multimedia Edition™

Bob Raymond—NE1I
bob.raymond@dxtreme.com

DXtreme Software™ has released a new logging program in its Amateur Radio product line: DXtreme Station Log—Multimedia Edition.

Like other logging programs, DXtreme Station Log lets hams log their contacts and import ADIF files from popular contest programs. But unlike other logging programs, Station Log provides multimedia and advanced functions that can add a new dimension to Amateur Radio logging activities.

Station Log features an embedded Audio facility that lets hams create and maintain an audio archive of their memorable contacts. Station Log also includes an integrated QSL Imaging facility, which lets hams scan the physical QSL cards they receive from regular mail and capture the electronic QSLs they receive from the Internet (including the QSL records from the ARRL's Logbook of the World). Station Log saves both types of QSLs as compatible digital images that hams can view at any time.

These multimedia features let hams listen to previous contacts and view related QSLs whenever they browse their logs … just the thing for reliving the thrill of a pileup chase or the warmth of a memorable conversation.

Station Log integrates with Microsoft® Word to create customized, rich-text-formatted QSL labels for physical QSLs. Station Log also produces ADIF-based electronic QSLs for uploading to Web sites that specialize in the delivery of eQSLs.

To support Logbook of the World, Station Log outputs log entries to ADIF files so you can use the ARRL's TrustedQSL (TQSL) software to digitally sign them. After you sign the log entries, you can upload them to the League's Logbook of the World server.

To help hams track the performance of their stations, Station Log offers a variety of reports. The reports can be filtered by many fields such as date, band, mode, rig, antenna, etc. The reports can also be filtered by output power, which is ideal for QRPers.

Station Log can output the reports to printers as well as to the DXtreme Active Report Viewer. The Active Report Viewer lets hams view and sort reports within Microsoft Internet Explorer. Because the reports are XML/HTML based, hams can upload them to the Web where they or their friends can view them remotely.

DXtreme Station Log includes on-line procedural help as well as context-sensitive What's This? help.

Station Log retails for $79.95 USD in North America and $82.95 USD elsewhere. Prices include shipping and handling charges and lifetime support by Internet e-mail.

For more information, visit www.dxtreme.com.

QRV? Building Day—The 'TETRA 2' Z-Match Tuner

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AA4BW

When it comes to homebrewing, few projects are as fun to build and as useful in the shack as a good antenna (actually, feedline) tuner—and when it comes to tuners, few are as easy to use as the venerable old Z-match design!

The Z-match design has been around just about forever. I remember it from my long-ago Novice class days, when we built them using giant air-wound inductors and huge surplus variable caps. More recently, the Z-match has gotten a new lease on life in a number of well-known tuner projects, and-as the old-timers will tell you—it's a great performer.

The Z-match is designed to feed balanced line with no additional balun required. Recent versions have used a variety of bridge-based tuning aids, with a simple LED as the tuning indicator.

A recent North Georgia QRP Club Building Day project focused on constructing Z-match tuners, utilizing established circuit designs and incorporating a couple of twists in packaging. There's nothing new here in the way of design; in fact, all of the circuitry in this project has been floating around ham radio and the QRP community for quite a while.

But don't write off the Z-match just because it's been around a while. It's one of the easiest-to-use tuners you'll find. Equally important is the fact that it's fun to build, for new homebrewers as well as experienced old-timers. And once you've got it finished, you'll have a piece of homebrew gear that will be a genuinely useful addition to your shack.

What follows is a guide to building a Z-match of your own. Parts of this article are step-by-step instruction; other parts are more along the line of suggestions. Since this is not a kit-based project, and since the physical configuration of some of your chosen parts (the variable caps in particular) may vary, it's impossible to give specific step-by-step instruction in all areas.

But that's also done on purpose, particularly for newcomers to homebrewing, in order to show you that you can tackle a build-from-scratch project and make it work!

You'll even get to do a little math, but only if you want to…

Did You Say Math???

Yes indeed, for you'll find one other thing as you go through this piece too-a little bit of discussion of a couple of technical issues.

Over several years of working with homebrewers, I've found that many builders freeze up when it comes to substituting parts, particularly where toroids are involved. In this project, you'll have a chance to see how a couple of parts substitution issues might be handled. You will even have the opportunity, if you take it, to do a little (gasp!) math!

But don't panic! The math is minimal, and it's purely optional. But I think you'll find it fun!

And Now for the Name!

In keeping with the current trend in QRP projects, the Bureau of Acronyms (BoA) has come up with (insert drum-roll) the TETRA 2 for this one!

The *Tetra 2*—a Tuner for Electronic Transmitters and Radio Antennas Too. Who thinks up these things?

Getting Started

Most of the electronics in this tuner will be built on a small piece of copper-clad board. Start the project by locating a piece of single-sided copper-clad board measuring about 3 by 6 inches. You could also use double-sided board, of course, though you'll only be building on one side of the board. Then thoroughly clean the copper using an abrasive scouring pad, steel wool, or sandpaper. After cleaning be sure to rinse and dry the board.

Pad Placement

The just-prepared board will serve as the ground plane for your tuner. Ground connections will be made by soldering directly to the ground plane; other connections are made "Manhattan-style" by soldering component leads to small pads of PC board material which have been Superglued to the main board.

Take a look at the accompanying pad layout (Figure 1) to see where these pads should be mounted on the board. You'll need a total of six pads. Pads should be about a quarter inch square. There is nothing critical about the pad dimensions, however, and if you're comfortable building on smaller pads by all means feel free to use them.

For this project, the easiest way to make the pads is to cut a strip about a quarter-inch wide from one edge of a piece of PC board material (single or double sided) and then cut the pads from the strip. Don't worry if they're not perfectly square.

After cutting the pads, lightly sand each side of each pad. Slight sanding of the "glue" side helps the pad adhere to the board, while sanding of the "component" side is a great aid in subsequent soldering.

Now, using the layout included here as a template, mark the location of each pad on the board. You may want to photocopy the page, then punch or scribe through the template. Pad position is not critical but should more or less follow that shown.

Once all the pad locations are marked and all the pads are ready for installation, place a suitable dollop (I always wanted to use that word!) of glue at the location of pad 1. Then pick up a pad and press it firmly atop the glue. Apply firm pressure for 15 or 20 seconds—but don't glue your fingers to the board!

Repeat the process for the remaining pads, and your board is ready to go!

R1, R2 and R3

To use the tuner with transmitters which expect a 50-ohm load (and that's just about everything these days), the resistive elements of the bridge (R1, R2 and R3) should be non-inductive resistors with a value of about 50 ohms. You can get this value by using a single 50-ohm resistor or, for greater power handling capability, by paralleling several equal-value resistors of a higher value. I've built versions using both approaches, and both work equally well.

What if you only can find 51 ohm

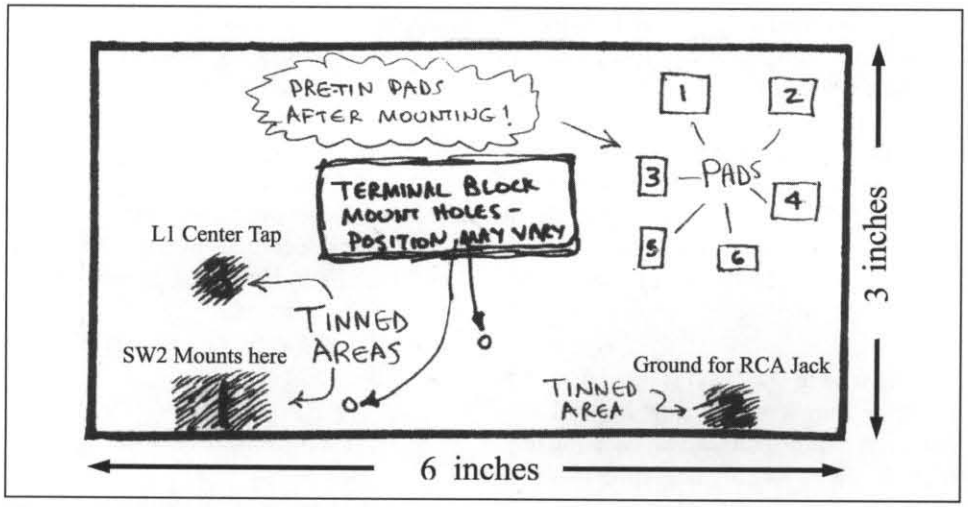


Figure 1—TETRA 2 pad layout.

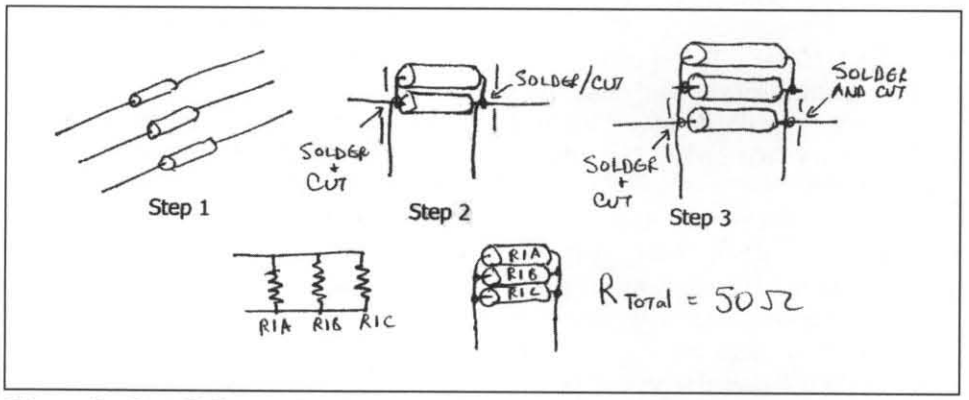


Figure 2—Paralleling resistors.

resistors? In fact, 51-ohmers are fairly easy to find. If you can locate suitable 51 ohm resistors, they'll work fine.

If you have suitable parts, building with individual 50 ohm (or 51 ohm) resistors is easier. The first version of this tuner used 50 ohm, 2-watt carbon composition resistors that I picked up at a surplus store for 10 cents apiece. It works like a champ.

But you'll get equally good results by paralleling a number of equal-value resistors to get the resistance and power handling capability that you need. That's a neat homebrewing trick, particularly for an application like this. How do you do it? Read on!

How to Parallel Resistors

Newcomers to homebrewing are sometimes hesitant to depart from the "official" parts list for a project. But be assured that you can do it—and working with parallel combinations of identical resistors is a great way to get your feet wet and build confidence. The old-timers among us will already know how to do this, but new builders might like to see how it's done.

Let's assume, for example, that your goal is a 50-ohm resistor. You've looked high and low for 50-ohm resistors but can't find any. However, you do have that box of 150-ohm half-watt resistors that you picked up at the last hamfest. Can you use them? You bet! All you've got to do is connect three of 'em in parallel (See Figure 2).

To figure out the value of several identical equal value resistors in parallel, simply divide the value of one of the resistors by the number of resistors in the parallel group. For instance, if you have three 150-ohm half watt resistors in parallel, the resulting resistance will be 150/3 ohms, or 50 ohms.

How about power handling ability? Well, for identical equal value resistors in parallel, the total power handling ability of the bundle is the sum of the power handling ability of each resistor. In other words, for those three half-watters, the total power handling ability of the resulting bundle would the 0.5 plus 0.5 plus 0.5 watts, or 1.5 watts total.

Bottom line? Yes, Virginia, you can parallel three 150 ohm, half-watters to get a 50-ohm, 1.5 watt resistor—just the thing for building the bridge portion of this project! In fact, I used that exact combination in another version of the tuner, and it worked like a champ too!

Are there other combinations of identical-value resistors which you could use? Sure! Four 200-ohm resistors in parallel would do it. So would two 100-ohm resistors. You could even use 20 1000-ohm units in parallel, though it might get a little ungainly when it came time to mount them—and you'd need to be sure that stray inductance didn't mess things up. But it works!

In any case, once assembled, the entire parallel resistor bundle is then treated as a single resistor (R1, R2 or R3) and soldered to the appropriate pads. Alternately, you can dispense with the bundling operation and solder the resistors directly to the pads.

What kind of wattage rating do you need? I'd opt for conservative. For QRP power levels of a couple of watts, each of these resistor units should have a wattage rating of at least one watt. For five-watt power levels, shoot for about 2 watts per resistor unit.

One final note. When building resistor bundles by paralleling resistors like this, it's much easier to work with identical resistors. You could get a 50-ohm resistance by paralleling non-identical resistors, but if you do that the power handling issue (and the math needed to compute the equivalent resistance) becomes a bit more complex. For this application, stick with identical resistors and you'll be fine.

The Toroids

Yes, into almost every project a few toroids must fall. This project calls for two of them.

One of them, designated T1, is a transformer that feeds the bridge circuit. It has two windings—a primary and a secondary—but note (and I'll remind you again) that the primary in this case is the winding with the smaller number of turns. Make a mental note to keep that in mind during assembly so you don't put T1 in backwards.

The other toroid you'll have to wind, designated L1/2/3, is part of the actual Z-

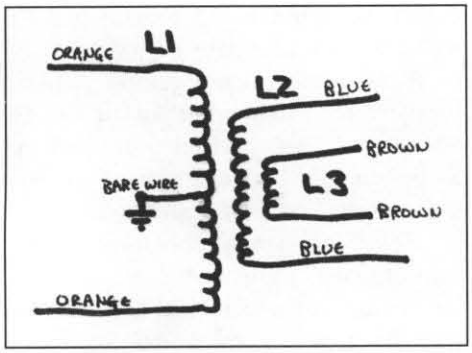


Figure 3—L1/L2/L3 Schematic (note that colors are shown to illustrate the separate windings, use whatever you have available)

match circuitry. It's a little tricky to wind since it has a center-tapped primary (L1) and two secondaries (L2 and L3). But as we move along you'll see just how easy winding even a fairly complex coil like this one can be!

Winding L1/2/3

Start with the hard one-L1/2/3. It has three windings: a center-tapped 18-turn primary (L1), a 12-turn secondary (L2), and another secondary with six turns (L3). Schematically, it looks like Figure 3.

For the NOGA project, this transformer was wound on a T-130-6 toroid core. The "130" refers to the core's diameter in hundredths of an inch—1.3 inches—and the "6" refers to the core material. Type 6 cores are color-coded yellow, so this is a large 1.3-inch diameter yellow-coded core. A core of this size has way more than enough power handling capability for a QRP setup.

The big question: Why did we use an oddball core like a T-130-6? The simple answer: Because that's what was on hand. And truth be told, the T-130 size core is drastic overkill for most QRP applications.

The next question: Could you use a smaller core-say, one like that bread-and-butter T-68-6? Sure!

So how might you go about using a different core? I thought you'd never ask! I can hear the sighs now. "Why didn't he just go with the T-68-6 in the first place?" you're thinking.

Well, I did it on purpose—because now I know you'll sit up and take notice when we talk about how to scale a toroid for a different core. And that's what we're going to do now—work through the operation of scaling this toroid for a smaller T-68-6 core.

When scaling toroids, you've got to consider whether the "new" core will handle the power (not a problem at QRP), whether the windings will physically fit on the new core (not a problem here) and whether the wire size necessary to fit the new core will handle the circuit demands (again, not a problem here). So, in this case, all the hurdles are cleared away. On to scaling!

The scaling operation is just a matter of plugging numbers into formulas. It's not hard, just a little tedious. But knowing how to do it can be a really liberating thing for a homebrewer since it opens up all sorts of core options where toroids are involved. Here's how it's done.

Scaling L1/2/3 for a T-68-6 core

Let's assume that you don't have any T-130-6 cores but really do have a bag of T-68-6 cores on your bench. How do you proceed?

If you're lucky, the designer has included the inductance value of the coil you're scaling. If not, you've got to reverse-engineer things and figure the inductance from the winding data given. I didn't include inductance values here on purpose, but that's only so I could set you up and then show you how it's done!

Now for a bit of reverse engineering. To find the inductance (in microhenries, or uH) of a toroid coil, if you know the core material and the number of turns, the formula works out to be the one shown in Equation A, with L being the inductance in microhenries (uH), N being the number of turns, and A_L (pronounced "A-sub-L") being a number that you simply look up and pull off a chart. A_L is unique for each core size/core material combination.

$$L = (N^2 \times A_L) / 10{,}000 \quad \text{[Equation A]}$$

That formula is derived from the basic formula for finding the number of turns on a given toroid core for a given inductance value is this [Equation B]:

$$\text{Number of turns} = 100 \times \sqrt{\frac{\text{desired inductance (uH)}}{A_L}}$$

Hmmm...I'm starting to sound like a math textbook here...but don't worry. Read on!

To find the mystery inductance, all you have to do is plug some numbers into Equation A and crank up your calculator. The calculation goes like this, starting with the basic formula in Equation A. First, check the number of turns. In this case, L1 has 18 turns specified. So N = 18. Next, look at an *ARRL Handbook* or manufacturer's data sheet to find a table of A_L values. For the T-130-6 core, the value is 96. Now plug in the numbers:

$$L = (18 \times 18 \times 96) / 10{,}000$$
$$= (31{,}034) / 10{,}000$$
$$= 3.11 \text{ microhenries (uH)}$$

That's the value of L1, when wound on the T-130-6 core as specified-3.11 microhenries. That's all there is to it, and the first part of your job is complete.

Similarly, using the same equation, you can figure out the inductance for L2 and L3. For L2, with 12 turns on that T-130-6, it works out to about 1.38 uH. For L3, with 6 turns, it's about 0.35 uH. Note those "abouts" and read that as "not critical" in this application.

Since there's not much critical here, we'll do a little rounding to make the rest of the math easier. Thus, what you want is a toroid with an L1 winding of 3.1 uH (center-tapped), and L2 winding of 1.4 uh, and an L3 winding of 0.4 uH.

Calculating Turns for a T-68-6

How do you figure what you need if you're going to use a T-68-6 core? Just use the other formula-the one that gives you the number of turns.

First look up AL for a T-68-6. You'll find that it's 47. Now plug in numbers, doing L1 first:

$$\text{Number of turns} = 100 \times \sqrt{\frac{3.1 \text{ uH}}{47}}$$

The desired inductance is 3.1 uH, and A_L is 47, and your ever-faithful calculator tells you that 3.1 divided by 47 equals 0.0659574. Then take the square root of 0.0659574, which (with a push of the square root key!) turns out to be 0.2568217.

Finally, to get the number of turns, simply multiply 0.2569217 by 100. The answer turns out to be 25.69217 turns. It takes much more time to describe the cal-

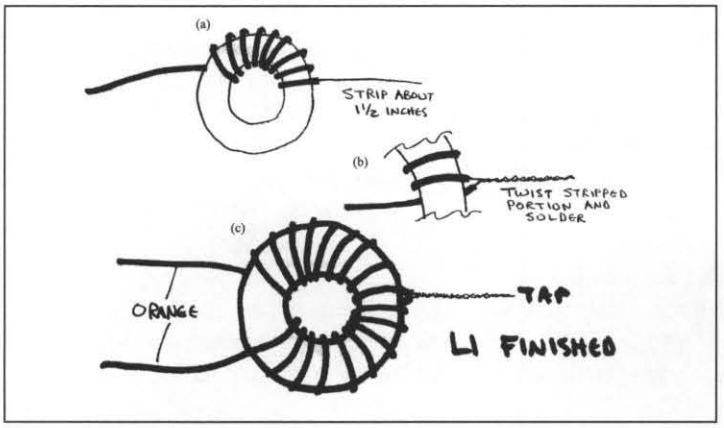


Figure 4—Winding L1.

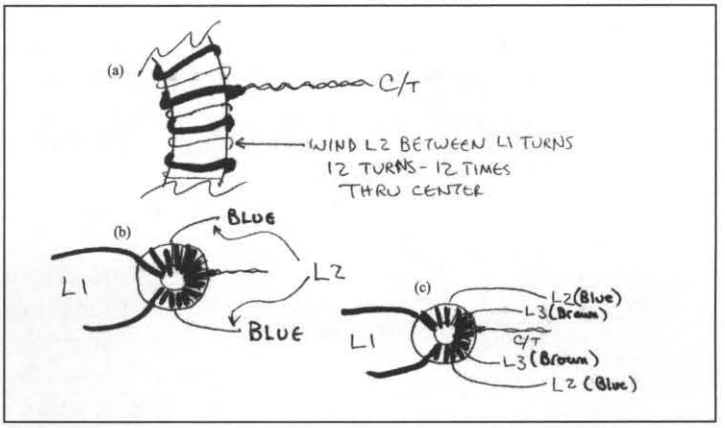


Figure 5—Winding L2/L3.

culation than to actually do it, as you will quickly discover.

How do you realistically handle 25.69217 turns? Well, since it's hard to have a fractional turn on a toroid, we'll just round it up to 26 turns.

As it turns out, 26 turns is a good number for a center-tapped coil-13 on one side of the center tap and 13 on the other. So on our "new" T-68-6 core, L1 will have 26 turns.

If you go through the same exercise for L2 and L3, you'll find that for the T-68-6 core L2 should have 17.25 turns, which you can round up to 18 turns. Similarly, L3 has 9.22 turns, which rounds up to 10 turns.

The bottom line? To use a T-68-6 core in this project, use the following windings:

L1: 26 turns
L2: 18 turns
L3: 10 turns

So there you have it-coil data for two different cores, a T-130-6 or a T-68-6. The larger core will handle more power; the smaller core is more compact and weighs less. For a typical QRP application of a few watts out, either will do just fine.

And if you have a -6 core of some other size on hand, now you know how to convert the winding data. Depending on the frequencies involved, you could even change core materials. In fact, in this application, you could even use a -2 material. The only difference will that you'll use a different A-sub-L value and end up with a different number of turns.

In a nutshell, that's how you can use different cores. And that's something neat for a homebrewer to know!

Winding L1/2/3

Despite all its windings, L1/2/3 is not hard to create. We'll wind it in four steps. First, we'll wind half of the center-tapped primary, then the other half of the primary. Then we'll wind the larger of the two secondaries (L2) and finally the smaller secondary, L3. The procedure is the same whether you use the T-68-6 core or the larger T-130-6 core (or, for that matter, any other core). Note that these particular instructions are for the T-130-6 core. You can certainly feel free to use a T-68-6 core-just remember to adjust the number of turns accordingly based on the turns data that we calculated previously.

How to Wind L1

Start by winding L1, the center-tapped primary (see Figure 4). Locate two pieces of wire, same color, and wind nine turns of wire onto the T-130-6 core. Remember that passing the wire once through the center of the core counts as one turn.

What size wire should you use? Well, I used some anonymous plastic-coated solid hook-up wire. How's that for high-tech specifications! If you're using enameled (magnet) wire, anything from size 18 to size 24 will work fine. It's not critical, so feel free to try whatever you have on hand.

The matter of wire size, incidentally, is another area that often frustrates newcomers to homebrewing, who will sometimes spend a long time looking for the specified wire size. I know that firsthand, because I once put a project on the shelf for weeks looking for some #25 wire! Yes, wire size does matter in some applications. But in applications like this the wire size isn't particularly critical as long as you can get the required number of turns on the coil form without crowding. In other words, if it doesn't fit, then you know the wire's too big. If it does fit, give it a try!

Now back to winding. The next step is to strip about 1.5 inches of insulation from one end of the wire as shown in Figure 4a.

Now strip about 1.5 inches of insulation from one end of the other piece of wire. Then, as shown in this diagram, twist the two bare wire ends together. This will be the center-tap of the coil's main winding. When you're done, it should look like Figure 4b.

Now, using the second piece of wire which you just twisted into place, wind on nine more turns, being sure to wind in the same "sense" as before. Double-check to see that the wire passes through the core nine times on each side of the center tap. When you're satisfied, cut the free ends of the primary winding to a length of about six inches. Then take a deep breath—the hard part of the transformer is done (see Figure 4c)!

Winding L2 and L3

Your Z-match's main transformer has two secondary windings-L2, which has 12 turns, and L3 with 6 turns (again, these are turns counts for the T-130-6 core; if you use the T-68-6 core you'll need to adjust the turns counts accordingly). During operation of your tuner, you will use a switch to select one or other of the secondary windings, allowing you to match a larger range of loads.

For simplicity, you'll wind each of the secondaries half-a-winding at a time, which makes it a bit easier to center the winding over the center tap.

Start with L2. Cut a piece of wire about 15 inches long; use wire of a different

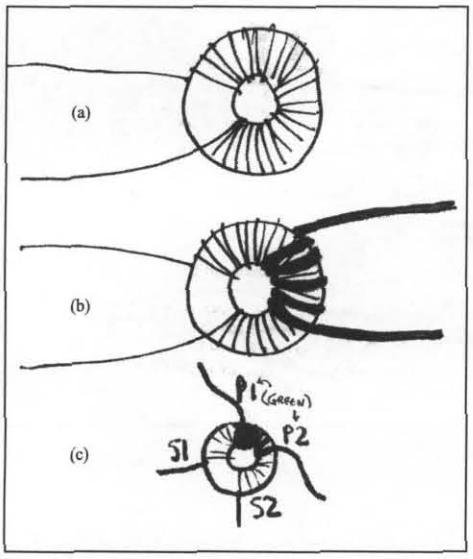


Figure 6—Winding T1.

color than the primary if possible. Then, starting at the center tap (and starting at about the middle of the piece of wire) wind six turns in one direction (moving away from the center tap-see Figure 5a). Be sure to wind in the same "sense" as you wound the primary. Then return to the center tap area and wind six more turns the other side of the center tap (Figure 5b). Cut the leads to about six inches in length.

To wind L3, repeat the process with another (and differently colored) piece of wire. This winding has a total of six turns-three either side of the center tap. Wind it as you did L2.

The finished L1/2/3 assembly will look like Figure 5c.

Now sit back, stretch, and look at what you've accomplished so far. You've prepared a Manhattan-style board, and you've wound a toroid with three windings! Breathe a large sigh of relief, because the hard part is done!

Winding T1

Having completed L1/2/3, you'll find that winding T1is a piece of cake.

T1, the transformer feeding the LED match indicator circuitry, is wound on an FT-50-61 core. The "FT" indicates the type of material. The "50" indicates the diameter (0.5 inches), and the 61 is the type of core material. In the NOGA project, we used this core size and core material because that's what was on hand as the project was being developed. However, there's no reason you couldn't use other core sizes and simply scale the windings as in the L1/2/3 example. Remember, this is homebrewing—don't be afraid to do a little experimenting!

This particular transformer has a five-turn primary and a 23-turn secondary.

Winding the T1 secondary

Generally, when winding a transformer, you want to wind the winding with the most turns first. That's considered to be the "secondary" on this particular toroid. To wind the secondary, cut a piece of enameled wire about 30 inches long. Now wind 23 turns onto the core, remembering that one pass through the center of the core is one turn. Be careful to make sure that turns don't accidentally cross one another but that they lie more or less side by side (see Figure 6a). Wire size? Not critical as long as it fits without crowding. Try 26 or 28.

To wind the primary, cut a 10-inch piece of wire of a contrasting color and wind five turns over the middle portion of the previous winding, as shown in Figure 6b. Be sure to wind in the same sense (direction) as you wound the secondary. Again, one pass through the center counts as one turn.

What about wire size for this winding? I'd just use whatever you have on hand-since it's so few turns, even plastic-insulated hook-up wire will do fine. How's that for open-ended instruction! But you really can use whatever you've got, though using something that's a different color from the previous winding makes it easier to keep track of things later on.

When you're done, T1 will look like Figure 6c. Note the identifiers of each lead coming off the coil; you'll use them in a bit when you start putting things together.

Bridge Parts Placement

Now you're ready to mount the bridge/indicator components on the board. Follow this sequence (use Figure 7 as a placement guide):

___Mount T1, being sure to connect the primary and secondary connections to the proper pads as shown. Be sure to thoroughly remove the insulation from the wire before soldering the leads to the pads.
___Germanium diode, 1N34A. Note the orientation of the banded (cathode) end, which should be toward the back of the board and the RCA connector.
___R4 (1000 ohms)
___R1 (an individual resistor or a resistor bundle with a total of 50 ohms resistance)
___R2 (an individual resistor or a resistor bundle with a total of 50 ohms resistance)
___R3 (an individual resistor or a resistor bundle with a total of 50 ohms resistance)
___C3 (0.1 uF disc)

This bridge, like most of the bridge indicator circuits you see these days, uses an LED as a tuning indicator. For now, we'll simply mount it on the Manhattan board, standing straight up from the board (see Figure 7). But you may eventually want to bring the LED out to the front panel of your finished tuner (as in Figure 8).

To mount the LED on the board, proceed as follows (see Figure 8):

___LED anode lead (long lead) to pad 6
___LED cathode lead (short lead, also indicated by a small "flat" on the LED body) to groundplane

Finally, mount L1/2/3 to the main groundplane board by soldering the center tap to the groundplane more or less in the position shown in Figure 9. The remaining leads from L1/2/3 will be connected later.

___Position L1/2/3 and solder the primary center tap to the groundplane.

Now double-check your work to make sure that you've put all components in the proper places. Pay particular attention to checking that T1 is installed correctly and that the diode and LED are installed correctly.

At this point, your project is coming along well, with the main electronic components mounted on the groundplane board. Now it's time to focus on wrapping it up with installation of the variable caps, switches, and input and output connectors.

The NOGA Version

The NOGA version of this tuner took the decidedly unusual approach of mounting the groundplane board on a piece of wood (yes, wood!), using a piece of clear acrylic for a front panel. It worked out very well, looks really neat, and solves a couple of technical challenges in the bargain.

At this point there are a couple of ways to proceed. One would be to give detailed information on exactly duplicating the

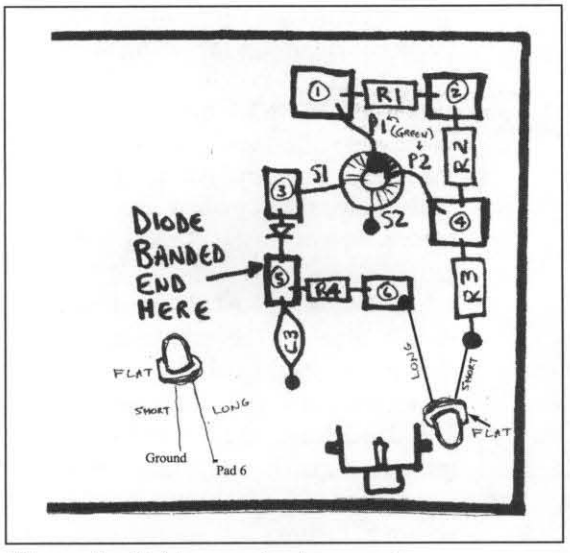


Figure 7—Bridge parts placement.

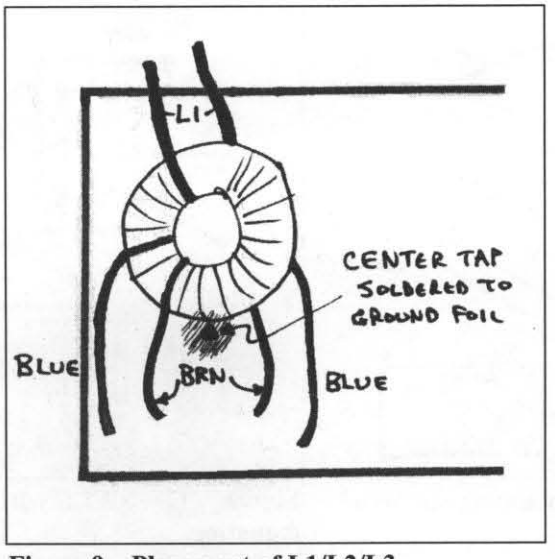


Figure 9—Placement of L1/L2/L3.

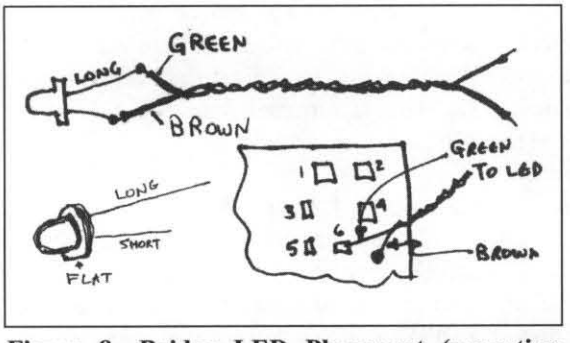


Figure 8—Bridge LED Placement (mounting LED on panel).

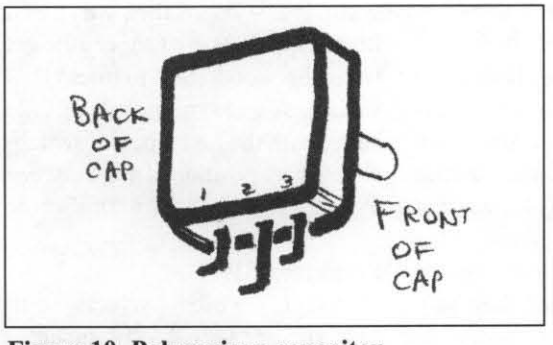


Figure 10. Polyvaricon capacitor.

mounting the variable capacitors. As you can see from the schematic, the variables are insulated from ground in a Z-match design, but most variable capacitor designs have the cap frame electrically connected to the rotor plates. That complicates construction no end, since in this application you can't simply bolt such caps to a grounded chassis or ground plane or panel. They've got to be insulated from ground.

As it turned out, this wasn't a problem with the capacitors used in the NOGA Building Day tuner. We used small "Polyvaricon" variable caps (Figure 10) which mount to a panel via insulated mounting posts, so we could in fact have used a metal panel. Such caps are ideal for Z-match tuner construction, since they eliminate problems with isolating the caps from ground.

So why did we go with the acrylic panel? Well, truth be told, by the time those capacitors had been located, the acrylic panel material had already been acquired and cut to size so it was used anyway. Since it was on hand, the decision was made to use it. And it really does look neat, even though it wasn't necessary with the particular caps we were using.

But it would have been necessary if we'd used variables of more typical design. Remember, most variable caps (including the familiar "receiving" type) have the "rotor" plates (that is, those that rotate when you turn the shaft) electrically connected to the capacitor's metal frame. If we'd used caps of that ilk, then mounting them on the insulated panel (with insulating knobs, of course, since the caps' metal shafts are electrically connected to the rotor plates too) would have solved the isolation problem and worked out fine.

One of these days, we'll take a detailed look at the matter of making panels and cabinets out of acrylic sheeting, but in the meantime here's the short version. The

NOGA panel architecture and final packaging details, but that would be helpful to you only if you had the exact same parts that the NOGA project used.

But since you very probably will not have the same parts on hand, it's better to shift gears here to a more general discussion of how to wrap things up. You'll see how the NOGA version was packaged, and that—along with a look at the schematic—should give you the insights and ideas you need to wrap up your own version of the tuner.

Packaging Considerations

A quick look at some of the considerations that drove the NOGA approach may be helpful.

When deciding how to package a project like this one, whether it's for a group build such as a NOGA Building Day or as a one-time project, experience has shown that things will be most successful if you keep an eye on cost. It's nice to build on a metal chassis or in a fancy "store-bought" cabinet, but such luxuries come at a price! Of course, it's possible to pick up occasional cabinet or chassis deals at hamfests and flea markets, but for a group build the odds of finding enough identical enclosures from such sources are pretty slim. Thus, for group builds, homebrew packaging has repeatedly proven itself as the way to go. It's become my personal favorite for individual projects too.

What makes good homebrew packaging? Cost is a factor, of course; so is availability. It should be something that can be crafted from readily-available materials, ideally from something I can get at the local Home Depot or other bit hardware-and-related-stuff outlet.

It should also require no special or exotic tools. That doesn't mean that you (or I) won't have to do some special fabricating; it just means that such fabricating will be within the realm of what's feasible in an average home workshop.

In the case of packaging this Z-match tuner, the biggest issue was the matter of

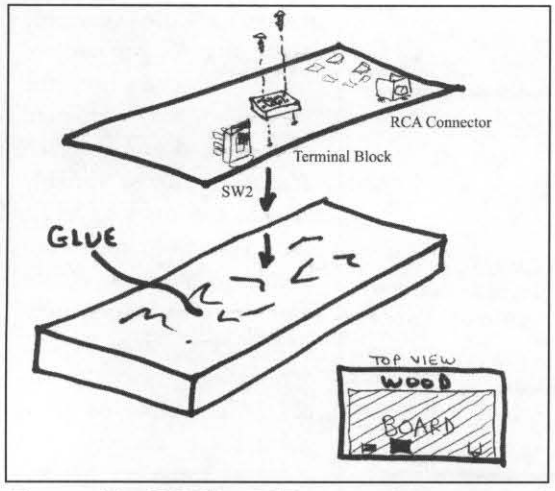


Figure 11—NOGA PCB mounting on wood chassis.

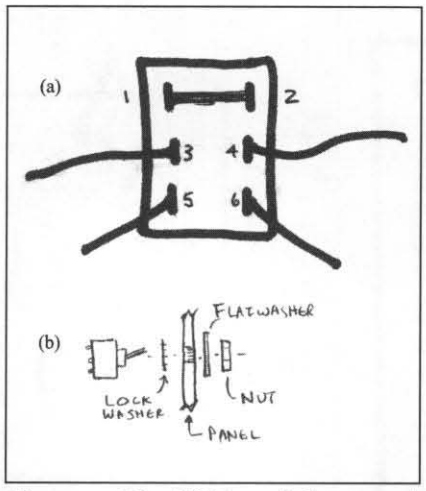


Figure 12—SW1 wiring and mounting.

material is available at many hardware outlets, including the big-box retailers, and they'll usually cut it for you too. If not, you can use a special scoring tool to cut it yourself—ask at the store, and theyll show you how. Drilling it requires some special attention, however; I found it drilled best with very dull bits and light pressure on the drill. I actually think the best results came with very dull bits which melted their way through as much as they cut!

In the NOGA version of the Z-match, the pre-drilled front panel was simply screwed to the front edge of a wood sub-chassis made from 1x4 or 1x6 wood. The groundplane board then was glued, with a liberal application of super glue gel, directly to the wood (See Figure 11). The two variables were mounted on the panel, along with the tune/operate switch (SW-1), which was positioned for easy connection to board pads 1 and 2 with short leads.

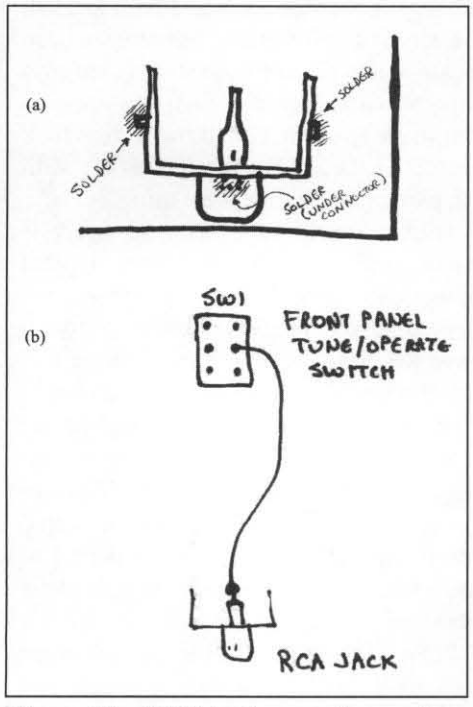


Figure 13—RCA jack mounting and wiring.

Preparing SW-1

SW-1, which selects either the "TUNE" or "OPERATE" mode, is a double-pole, double-throw switch. You can use most any small toggle or slide switch.

Seen from the rear, the switch will probably look like the one shown in Figure 12a. The center pins (3 and 4) are the "arms" of the switch; when you flip the switch, they connect to either pins 1 and 2 or to pins 5 and 6. That allows you direct your transmitter's signal in one of two paths-either through the tuning bridge or directly to the Z-match.

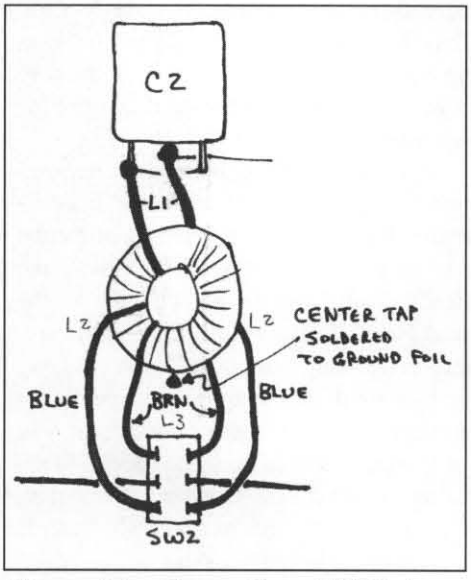


Figure 14—Connecting L2/L3 to SW2.

In the "TUNE" mode, the signal comes into pin 4 and goes out pin 6 to the bridge circuitry. After leaving the bridge circuitry, it goes to pin 5 of the switch, then out to the Z-match itself via pin 3.

In the "OPERATE" position, the switch bypasses the bridge circuit. In that mode, the signal comes into the switch via pin 4, goes from pin 2 to pin 1, and then leaves the switch via pin 3 to go to the Z-match itself. Thus, pins 1 and 2 will need to be connected together, as shown in Figure 12a.

For an input connector, the NOGA version used a stand-up PC-board mount RCA connector. The ground connection is soldered directly to the ground plane (Figure 13a); the center connection goes via wire to terminal 4 of SW-1 (Figure 13b).

Connecting L2 and L3

L2 and L3 are the windings which actually connect your Z-match tuner to your antenna and the outside world. SW-2, a DPDT switch, allows you to select one or the other of these windings. SW-2 should be connected as shown in Figure 14.

In the NOGA version, SW-2 is a plain vanilla slide switch which is mounted directly to the groundplane by soldering one of the switch's mounting wings directly to the copper groundplane foil. The switch is positioned behind L1/2/3 so that L2 and L3 can be connected via short leads.

SW-2's common terminals-terminals 3 and 4-are brought out to a two-connector barrier strip (Figure 15). In the NOGA version, in the interest of neatness, the barrier strip sits on the groundplane and was secured to the wood sub-chassis using screws passing through holes drilled in the groundplane. You could also bring these terminals out to binding posts, should your packaging choice allow, or to almost any other connectors suitable for use with balanced line.

The antenna feedline is connected to the barrier strip.

The Variable Capacitors

The variable caps used in the Z-match should have a maximum value of at least

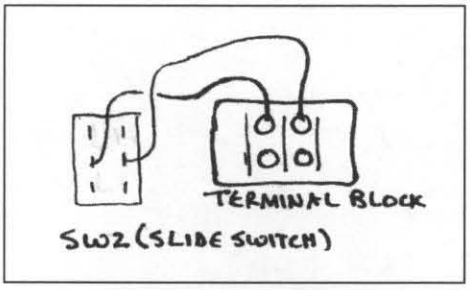


Figure15—Connecting SW2 to the terminal block.

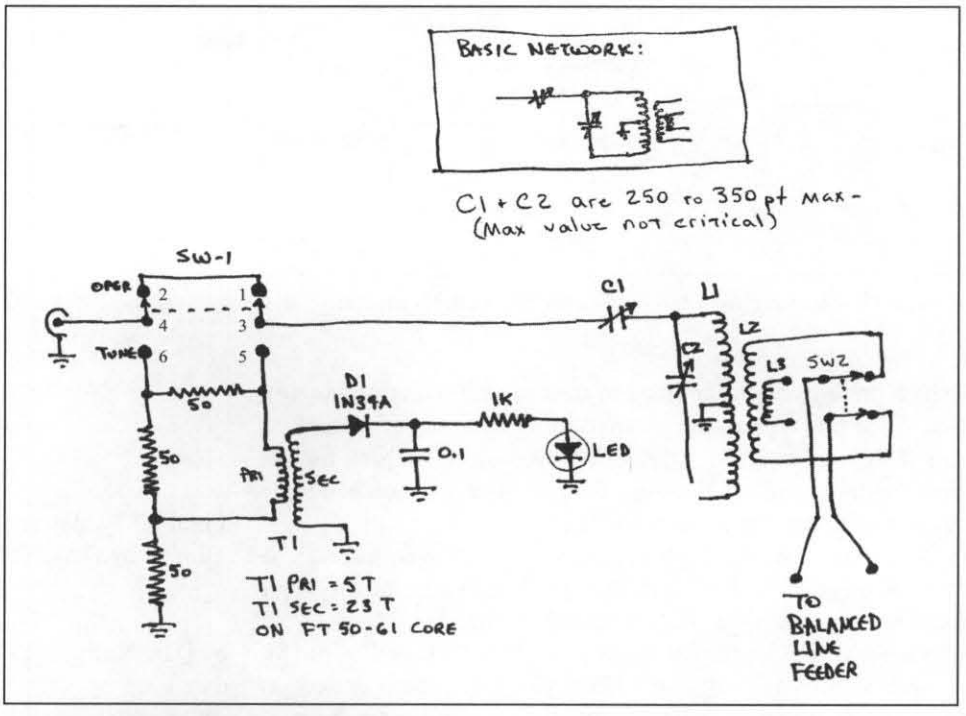


Figure16—TETRA 2 schematic diagram.

200 pF. The polyvaricon units used in the NOGA version include two sections which were connected in parallel to get the most tuning range; you can of course use any cap with a max value in the 200 to 400 range. Small 365 pF receiving type variable caps are ideal and give extended range, though they may pose mounting challenges as noted elsewhere.

In any case, take a look at the schematic (Figure 16) and at the accompanying sketch (Figure 17) to see how C1 and C2 (the air variables) are connected to L1 and to SW-1. Note that terminal 3 of SW-1 goes to one end of C1. The other end of C1 goes to C2 and to one end of L1. The other end of L1 goes to the other end of C2.

Figure 17 shows the completed circuit layout. Note that this shows use of the polyvaricon type variable caps with two capacitor sections in parallel for maximum capacitance and thus the greatest tuning range. The exact configuration of your caps will vary, of course, but the sketch will help you see how to connect them.

Using the TETRA 2

Using the TETRA 2 is a piece of cake. First, connect the feedline to L2 or L3, via whatever connection arrangement you have chosen. Connect your rig to the tuner input jack, and turn on the receiver.

Preset the tuner by flipping SW-1 to the "OPERATE" position. Now, roughly peak the caps on receiver noise. Try both settings of SW-2, which selects either L2 or L3 at the output, to see which works best. If you get a good peak on both, go with L2.

Now flip the switch to "TUNE," key your transmitter with a watt or less of output (it doesn't take much to tune the tuner-in fact, you may be surprised at how little power it takes to get an LED indication). The LED will probably light. Then tweak the two variable caps till the LED goes out. That's it—the tuner is tuned.

To operate, flip the switch back to OPERATE (which bypasses the bridge and runs your rig directly to the tuner) and have fun!

If it doesn't work, first check for proper installation of the LED and T1. Also, check the switch wirings. Those are by far the most common sources of errors. Then make sure that other parts are installed correctly, particularly the variable caps.

Other Tuning Indicator Possibilities

The tuning indicator used in this project is a well-known approach based on a design that's generally credited to N7VE. It utilizes an absorptive bridge design

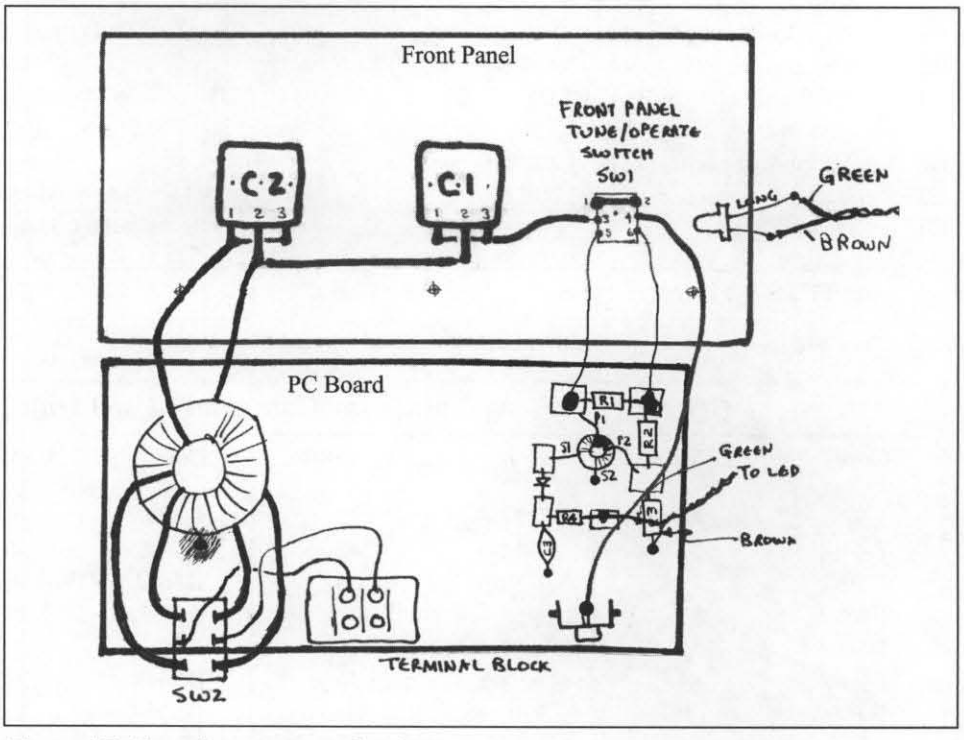


Figure 17. Complete construction layout.

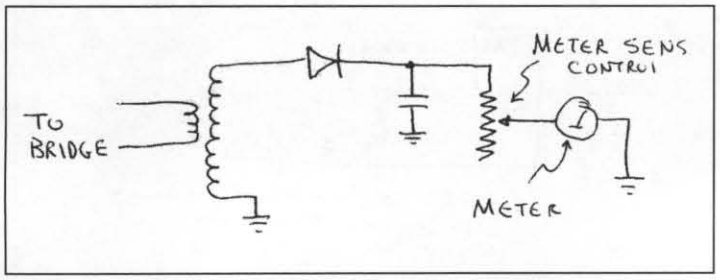


Figure 18—Replacing LED indicator with small meter.

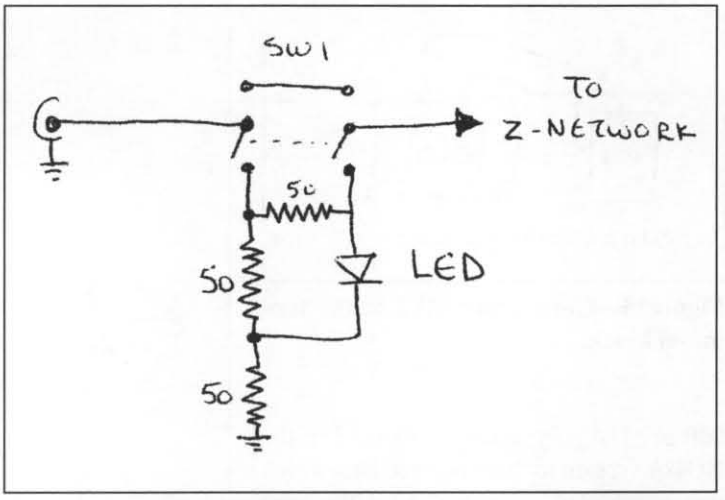


Figure 19—Alternative tuning indicator from "A Pork-Free Tuner" by Dan, N8IE.

(which presents a 50-ohm load to the transmitter during tuning). You'll see this type of circuit used in the Norcal BLT Balanced Line Tuner, among many others. For this project, the parts list has been modified slightly to utilize the parts that were on hand-one of the nice things about homebrewing!

This circuit works exceptionally well. However, there are a number of other tuning indicator possibilities that might be of interest to those who are experimentally inclined.

One is to replace the LED with a small meter (See Figure 18). A meter sensitivity control will allow you adjust meter deflection to get usable readings. In use, simply tune the bridge for the lowest reading on the meter.

A simpler circuit, which I found in the September 2000 issue of *Bacon Bits*, comes from an article entitled "A Pork-Free Tuner" by Dan, N8IE (See Figure 19). The tuning indicator circuitry was drawn up by Diz, W8DIZ. Though not as accurate as the one we're using, it eliminates the toroidal transformer and related components and simply uses an LED.

Don't hesitate to play with such circuits. That's half the fun!

●●

This parts list includes only the electronic components and connectors. Knobs, wire, enclosure, ground plane/Manhattan components and hardware are not listed, as those will likely vary from project to project and will be up to the individual builder.

Electronic Components

R1	Composite, total approx. 50 ohms
R2	Composite, total approx. 50 ohms
R3	Composite, total approx. 50 ohms
R4	1000 ohms (BRN-BLK-RED)
C1	Variable capacitor, at least 200 pF
C2	Variable capacitor, at least 200 pF
C3	0.1 uF disc
D1	1N34A
D2	LED
L1/2/3	Wound on T-130-6 (or T-68-6) toroid core
T1	Wound on FT-50-61 core (see instructions)
SW1	DPDT switch
SW2	DPDT switch
J1	RCA jack, BNC jack, or your favorite coax connector (for input from rig)
TB1	Terminal block (or other output connector suitable for balanced line)

Parts List: TETRA 2 Z-match tuner.

***QQ Tech Note:* A_L Values for Commonly-Used Iron Powder Toroid Cores**

Core	A_L Value	Core	A_L Value	Core	A_L Value	Core	A_L Value
T-37-2	40	T-37-6	30	T-37-7	32	T-37-12	15.0
T-44-2	52	T-44-6	42	T-44-7	46	T-44-12	18.5
T-50-2	49	T-50-6	40	T-50-7	43	T-50-12	18.0
T-68-2	57	T-68-6	47	T-68-7	52	T-68-12	21.0
T-80-2	55	T-80-6	45	T-80-7	50	T-80-12	22.0
T-94-2	84	T-94-6	70	T-94-7	N/A	T-94-12	32.0
T-106-2	135	T-106-6	116	T-106-7	133	T-106-12	N/A
T-130-2	110	T-130-6	96	T-130-7	103	T-130-12	N/A

The Seventh Epiphyte

Dave Barrett—VA7DB va7db@telus.net

This saga is about a rag tag group of friends, and the wonderful experiences they had during many months of laboring over hot soldering irons to ultimately produce their very own set of uniquely home-brewed QRP transceivers—we'll call them Larry, Les, John, Bo, Tommy and Rand. (Not using their last names to protect the innocent). To give you a little history, let me backtrack a couple of years and fill in a few details:

The tale begins in mid-summer of 1999 and takes place in Vancouver, British Columbia in the southern part of western Canada.

Here is the story of this "rag tag group of friends" and their Epiphyte transceivers.

I was spending some time visiting with an old and dear friend in North Vancouver; we had spent the day troubleshooting a particularly troublesome radio that he had on his workbench.

Shortly after stopping for lunch and taking a few moments to drive to the local eatery we found ourselves deep in conversation about our mutually favorite interest—yes, you guessed it—QRP was our chosen topic.

I should tell you at this point that my host and dear friend was none other than Mr. Derry Spittle, VE7QK, designer of the now world famous Epiphyte series of 80-meter single sideband transceivers.

Derry was the president of our local BC QRP club when I met him many years ago, that is until he railroaded me into the position a few years back. It is a task filled with fun and is without doubt one of the highlights of my ham career. I have met many amateur radio operators worldwide over the considerable time I have been around radios and electronics, but without exception all of the QRPers I have encountered have been gentlemen and all seem dedicated to the cause of using the least amount of power to get the message to its intended target.

Derry has spent many years of his life perfecting the Epiphyte with a seemingly unending run of modifications to an already well-proven design; he constantly strives to improve and immediately passes on his latest creations to the amateur community for our collective enjoyment and edification.

Back to the Pesky Transceiver

On this particularly sunny day in Vancouver, as we sat outside enjoying each others' company sipping espressos and tucking in to cheese sandwiches, we discussed a myriad of things ranging from world peace to the demise of the lowly NE602. There was, as always, a good flow of BS from both parties and jokes were being told with great gusto.

Eventually when our bellies were full and our taste buds were satiated the decision was made to head back to his shack and resume fault finding on the old rig.

Upon arrival at the Spittle residence, he had decided to commence a search of the archives for a long lost diagram to assist in our efforts to rid the beast of its ills. Derry set about a trek through countless boxes of papers while I returned to the bench. The schematic was never found, as far as I can remember, but even without it, we set about probing transistor bases with the VOM and clipping on scope probes to various interesting spots in an attempt to locate that elusive signal…

Letting the Smoke Out...
...and Putting It Back In

After many years in the commercial electronic servicing field I have become convinced that once the smoke puffs out from those little cans, there is little that can be done to stuff it back, to heck with all that Electron theory, I'm sure it all comes down to the fact that it is the smoke that amplifies the darned signals and once its escaped, poof, no more amplification!

Anyway I digress, Derry had returned to the room with a surprise—a handful of unetched printed circuit boards, the artwork was in place but that was all. He thrust them into my hand. Taking a puff on his old pipe and between coughing loudly he dryly said,"There, give those to the lads and have them build something."

With that simple comment I experienced a shiver somewhat similar to one you've all likely had from time to time when your life changes usually for the better. For me it was that same feeling as when I was a young fellow and had been introduced to the crystal set for the first time. Yes, the seed had been set for a group construction project at our local ham club that would span almost a year and would involve some of the best evenings of entertainment that any of us could remember in many years.

Anyway, it seemed as if it had just been mere minutes but in fact hours had passed and old Derry had puffed on a couple more pipe loads of his favorite stink weed. Some of the ash had, as always, fallen into the rig. We had drunk a couple more cups of his favorite Orange Pekoe and suddenly as if by magic the sweet sounds of CW were heard emanating from the scratchy old 2-inch speaker hanging miserably by its wires off the edge of his bench.

Aha, success! Hmmm, could some of that pipe smoke have been absorbed back into the recently vacated cans of those MPF102s and had allowed the old electrons to flow once again? I guess we'll never really know for sure, but it was indeed home time, I knew because we were both yawning and the sun was about to sink behind the mountains on the distant

horizon of Vancouver Island.

We said our "73" and off I drove into the cool night, all the time looking down at the boards he had given me sitting on the passengers seat and realizing the very serious responsibility that came with them. I knew that somehow I had to handle the task of disseminating the information and the legacy of all that goes along with something passed on to one by a master of the QRP fraternity. This was to prove a lofty goal.

A Project In Search of Builders

The 30-plus mile journey home went by in a flash, as traffic lights, intersections and speed limits seemed not to matter. my mind was focused upon those seven unetched PCBs and the challenges they represented.

The next few months sped by way too fast with work, family and other projects needing completion. It was spring of 2002 when I eventually found time to devote to the club radios again and by that time ideas were flowing thick and fast.

I first had to enlist a team of lads which wasn't really too hard as they had been operating QRP at Field Day for the last few years on commercial rigs with the power turned down and had come to enjoy the challenge of making fewer contacts but with increased quality to the QSO.

There were seven fellows, most of whom had never so much as touched a soldering iron before and definitely had never etched a circuit board. There was much to learn and much to be taught as we would work together to complete the task at hand.

I was driven by the personal knowledge of that feeling one gets when operating a rig of ones own creation for the first time. I knew they would be very happy with their work when it was all done.

The first thing we discovered was that the block diagram, parts list and schematics didn't match each other! The boards had been created as a trial run for the Epiphyte 3 project, which the NorCal club had funded and so they were subtly different from both the EP1 and EP2s that went before them.

These were indeed "special" little rigs. Although Derry had nicknamed them the EP2.5, they would later be named the EP2-S (S for special).

Derry's computer had over the years suffered a few hiccups resulting, in lost files and hence no proper diagrams, we decided to press on using the old schematics from the EP2 and the parts list that went with it. This was our only real choice, albeit a source of great frustration and much hair pulling in later months, for the designer had indeed made many small changes that to the great unwashed would seem inconsequential but were actually quite important resulting in some very interesting ground loops and other tricky faults.

Etching and Plating the Boards

Well, the evening had finally arrived and the ferric chloride was being prewarmed in its dish. There were nervous giggles at the sight of a heap of rubber surgical gloves awaiting their wearers. The kettle was on the boil ready to top up the chemical heating dish and we were ready to go.

I went first, donning my rubber gloves and gently placing my board into the murky depths of the tray. As it slipped quietly beneath the rust brown of the ferric chloride there was a palpable silence, almost as if breaths were collectively being held in anticipation of the event taking place.

Some fifteen minutes later, after lengthy explanations as to what I was doing and why it had to be done that way, my trusty wristwatch indicated the time was nearing for a peek. We had been agitating the chemical brew for what seemed an eternity but as I lifted the thread I had the board suspended on, we could see it was almost ready. I slipped it beneath the surface one more time and topped up the heating water. A couple of minutes ticked by and another peek revealed it was time to liberate the now completely etched board and then immerse it in fresh clean washing water. Wow, the expressions on those seven faces were priceless! Every emotion from disbelief to utter amazement, there were whispers echoing through the group as they vied for position next in line to perform similar magic on their boards.

As the evening progressed all got their turn and were suitably impressed with their individual efforts, the chemical bath got dirtier and slower to process the boards but regardless they continued on and finally all were done.

With etching completed, it was time now to tin the copper boards. This was yet another hot bath, but luckily far speedier than the first. The boards once immersed quickly take on a beautiful shiny new look as they swirl just under the surface of the clear liquid. After a few minutes in the rinse wash, they were dried and put aside ready for next week and the dreaded high speed drilling.

Some of the lads had never used a high-speed drill press, before and some directions had to first be given so as not to break too many carbide drill bits—any movement sideways and they snap off, generally leaving the carbide tip embedded in the board.

Some of the group took turns at my drill press, while others did the job at home with Dremel™ or similar drills. All were successful, although some holes were almost big enough to drive a bus through! I should mention here that some of those little holes inevitably were missed on one or two boards and that caused considerable hilarity (there will be more on that story later).

Construction and Destruction

The next Friday rolled around and all the boards were prepared, so we started sorting and mounting the components. Of course, resistors, capacitors and other bits and bobs all had different markings and these had to be learned too. Some of the fellows created little cheat sheets and really neat rotating gizmos to assist with remembering and decoding color codes, markings, etc.

I explained the necessity of pulling all the bits down as close to the surface as was possible without damaging the parts. Examples were shown and the lads proceeded to each select a part from the list and, after checking its location on the diagram, it was inserted into the board. The idea was that all parts would be individually checked before soldering, however, some of the group got really keen and soldered all their bits in one foul swoop. Ah yes, I can hear you saying, "Murphy was as always not far away and proceeded to raise his ugly head more than a few times."

Soldering, like etching and drilling, was something that had never been attempted previously by most of the gang and the looks on their faces when I suggested grabbing hold of a hot soldering iron was really something to behold.

Of course, soldering is an art and one not to be taken lightly, so a short seminar was hastily put together and stories were told of instructors remembered from my

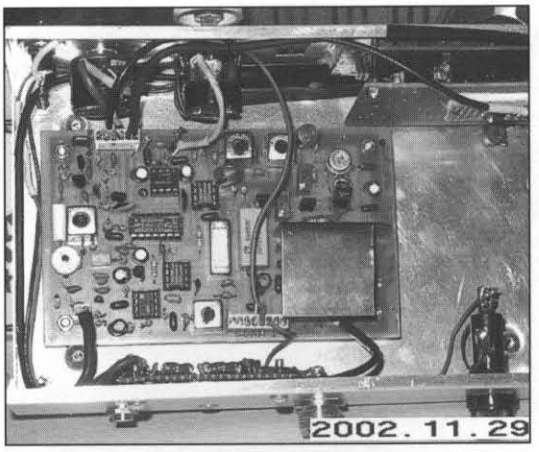
own training back in the early sixties. I was fortunate because soldering had been second nature since the age of 10 or so when my old dad had taught me to handle a gas flame heated copper behemoth that was capable of inflicting great pain on the unwary, if not used correctly. Luckily, these days, we have temperature controlled soldering stations that make the whole process far less hazardous to one's personal well being.

The next few evenings were to be a veritable plethora of hilarious events, one right after the other. The odor of burning sweater sleeves, melting anti-static plastic bags, burnt diagrams and parts lists-to say nothing of the odd burnt finger or toasted and shriveled arm hairs-often accompanied by howls of laughter from the unaffected rest of the group. Molten solder was often dropped on bare legs as shorts were the order of the day on those balmy mid-summer evenings and the inevitable screams of agony were again followed closely by more howls from the others who thought this activity comical to say the very least.

As I mentioned earlier, there were holes missed during the drilling process and most of the lads were by this time far too engrossed in the whole part stuffing and soldering thing to wait another week while we took the board home to drill. So, a Dremel drill was hastily produced from someone's tool box and the thinnest tip quickly found. The poor fellow then proceeded to not only drill the missed hole but then carried on to plunge the tiny drill bit right through the board and halfway through his thumb.

Well as I'm a trained medic/first aid responder, I should have immediately sprung to action and tended his every need, stemming the blood flow and cleansing the wound etc. However, the rest of the group were laughing so hard that it became infectious and I found myself incapacitated by a belly laugh that seemed to go on for ever. We literally rolled on the floor, tears pouring down our faces as this poor fellow (laughing along with us) clutched his drill-damaged digit, it was one of the highlights of the evening and definitely one that none of us will quickly forget.

As soon as we had regained some of our composure and having no real first aid supplies close by, we did what all good technicians do—we bandaged his wound with black electrical tape, holding tightly a pad of folded up paper kitchen towel over this brand new orifice that just been created on the end of his thumb and which had until this time been gushing quite profusely.



Typical interior of one of these beautiful and very personal creations.

Our only concern was for the state of the board—once we had ascertained that no real permanent damage had been done to our friend, the group checked to see if the traces had been damaged by the catastrophe. Luckily the board was repairable. Our friend's thumb, however, took a few weeks more to recover and I'm certain his ego will take even longer.

The only other notable event surrounding those early soldering sessions involved one of our number who mounted all his parts about an inch above the board surface, easily fixed you say? Well, not quite-upon mentioning the need to have all parts mounted as far down as possible, he proceeded to push them down forcibly, having forgotten that he had already soldered them, and of course without first re-flowing the solder. Yes, there were indeed many traces instantly liberated from the rear of the panel. Once again, hilarious howling was the order of the day as we all learned a valuable lesson in component mounting etiquette.

Those were some of the most rewarding evenings I had spent in many years involved with the ham hobby and we often left the club at evenings end with aching heads and stomach muscles caused by the evening's raucous laughter.

Finishing Up

As the weeks progressed and we finished various sections, those areas of the circuit were tested and verified to be working. The audio stages were done first and one remembers the looks of great satisfaction that spread quickly across the lads faces as they heard for the first time beeps, burps and voices coming from their respective rigs.

Most of the parts for the Epiphyte circuit are locally available but a few now have to be special ordered from abroad; the Murata filters came from the UK and the CA3020s came from a fellow in Calgary Canada who happened to have a couple of dozen left in his stock.

The one part that I could not source was the little 60 Hz oscillator that goes in the frequency counter to provide a clocking signal, and this was a problem yet to be solved.

After some searching around I found a great circuit on the Internet on the homepage of IK3OIL, Francesco Morgantini. I hurriedly emailed Francesco to verify he would be OK with us using his circuit in such a club project.

Within hours a reply was returned-he was not only OK with it but offered the source code, as well. Wow, what a gentleman! That is the real ham spirit of sharing one's designs and ideas freely with others! Thanks, Francesco!

I rushed to my workbench to begin construction of the counter to make sure it would do what we needed. Sure enough, at first try it came up with great precision. The software worked well and the little PIC chip was ticking along beautifully. With the addition of a FET in front of the bipolar buffer we had our counter that functioned really nice and steady and drew very little current.

The artwork was copied right off Francesco's web page and I made up Press-N-Peel sheets ready for the lads to iron onto the copper the next week.

As luck would have it, Murphy was close by again and in my haste I had copied the artwork backwards (it was produced for the photographic method). Yes you guessed right we made seven boards all facing the wrong way. Ouch!

Well, not being one to easily accept difficult situations I reasoned that the only component that really cared which way around it faced was the PIC. OK, so we'd simply mount all parts except the 16F84 on the trace side of the board just like surface mount and put the micro controller on the

rear, as luck would have it all was not lost and this method worked just fine albeit looking a tad strange.

The months ticked by and many of the fellows had gone away for their annual holidays so things slowed to a crawl, which actually gave me time to think ahead a bit and at least give the impression of having a plan when actually I was flying by the veritable seat-o'-me-pants.

As suddenly as summer had come upon us it was over and September brought many members back to the club clutching the boxes that contained those semi-completed carcasses.

The next while was spent with the lads working on their individual enclosures. They had chosen to work with pre-built commercial boxes of varying designs and all required some metal bashing and hole cutting for pots, switches, connectors and the LCD. The group was progressing at an uneven rate as some had worked through the summer period and others had been away. We had a situation which was actually to prove an asset rather than a nuisance.

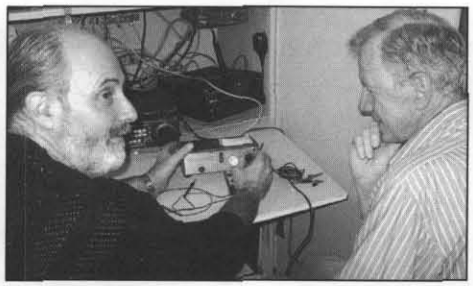
Troubleshooting

It provided time to troubleshoot the rigs one at a time. This was required because as you might remember that the parts list didn't match the schematic or the block diagram. Ah, yes, there were to be some late nights through that period when some resistor and capacitor values would need to be substituted and the odd IC and transistor would need replacing.

But slowly and surely all the problems were found and corrected. The most difficult turned out to be a parasitic oscillation within the driver stage of the transmitter-those CA3020 amplifiers are really neat high gain devices that save many discrete components, but they are intended for audio frequencies and we were using them at RF. Derry had mentioned to me that he had seen the IC used at RF many years before in a similar circuit by a local (Vancouver based) commercial producer and that was enough to convince me of its validity.

I set about researching the original diagram of that old Spillbury and Tindle rig. As luck would have it there was no trace of the information needed, as the company was long since defunct.

After some careful thought and a few moments staring blankly at the data sheet



The author (on the left) doing some final tweaking at the club operating position.

of said device, I reasoned it was a simple bipolar "heave and shove" (push-pull) stage with both emitters going to ground, with copious quantities of RF current in the surrounding stages. It seemed not unlikely that instability was a distinct and probable cause of the VHF parasitic we were witnessing on the old scope.

Following some probing around with a small value capacitors we found one that one was able to kill the oscillation. A hurried phone conversation with Derry ensued. The decision was made to insert a couple of 1 ohm resistors in the emitters of this stage to balance the currents in each device more fully. Wow, what an immediate difference—no more nasty looking signals.

The first rig was now completed and its owner Rand and I worked diligently to tune and test it carefully making sure all was working as per Industry Canada's regulations. The group stood silent as we connected the DC power source that evening at the club, as I made the last adjustment we suddenly heard the clear voice of Drew Watson (VA7DR) one of our local 80 meter net controllers booming from the rigs little speaker, I looked up at Rand and the expression on his face was worth a thousand words, yes indeed all his efforts had paid off, that pile of parts had silently and slowly become a radio. He'd been working hard for so many months and now it was finally receiving a real QSO.

We waited with bated breath while the SSB net rotated through all the areas that it covers it and finally came our turn. Drew called for check-ins from Delta, Ladner or Tsawwassen and Rand keyed the microphone and with an understandably nervous and shaky voice he uttered his call sign and proudly tagged on "slash QRP" to the end. There was a moment of silence as net control listened for other stations checking in and then responded "Got you at five and nine, Rand and thanks for checking in." The entire room erupted in a joyous collective sigh of relief.

At that moment, all knew that the sooner they got their rigs finished off, the sooner that they too would be on the air with those distinctive little radios they had all struggled so hard to build.

The next few Fridays saw everyone working feverishly to complete their projects and the next done was John, followed closely by Les, Bo, Tommy and Larry.

The photo on the first page of this story shows the entire group holding their creations and serves to demonstrate that amateur radio is far more than the sum of its parts as we are proof positive that from a simple project came a lot more.

We have all grown as individuals, while at the same time forging a closer bond within the group, and all have learned much about electronics and each other during this exciting and enjoyable experiment.

Acknowledgements

I would like to formally offer thanks to Mr. Derry Spittle, VE7QK, and Mr. Francesco Morgantini, IK3OIL, for their wonderful designs plus all the lads who allowed me to have so much fun and learn such a great deal. Thanks must also go to my friend Dino Gueorguiev, VE7XDT for his help and technical support throughout this project. Finally, my gratitude goes to the Delta Amateur Radio Society for giving me free reign to run this course in the first place.

Hopefully this tale will inspire other radio club executives who find their membership and attendance slumping for whatever reason, maybe now you will consider organizing such an event. After all building and experimenting are what amateur radio is really about as well as being tremendously educational and an awful lot of fun.

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Editor's note—As this issue of QRP Quarterly *was going to press, we learned that Derry Spittle, VE7QK, had a stroke while talking on his beloved Epiphyte to Bob, VE7XDY, up country a ways. He's basically in good spirits and hopes to come home from the hospital soon. On behalf of the entire* QQ *staff, our thoughts are with Derry and his family as he recovers.*

Working Juicy DX from Alaska

Lynn Hammond—KL7IKV ungava@alaska.net

DXing from Alaska (and high latitudes in general) is more challenging for several reasons, and QRP adds another dimension. High winds and wandering moose limit antennas at my QTH. Nevertheless I was able to put 180 countries in the log at 5 watts in about two years, using mostly a vertical and a dipole. Here is why and a bit of the "how." Perhaps telling of my experiences will suggest techniques and hopefully encourage others to take up the DX chase.

The Northern Latitudes have poor propagation in part because of the proximity of the auroral envelope; when the A and K indices go a bit funny, the envelope expands and hits us first. It is not unusual to see a lot of activity by mid-latitude hams on the web clusters while we have dead bands.

In addition, some DX and even some DXpeditions forget that Alaska may not be at the same beam heading as the USA. DXpeditions tend to rate themselves on number of QSOs, and therefore many (not all!) seem to point their antennas at the population centers and ignore the more rare locations. Or, operators will work the "lower 48" forever, then standby for "Asia and Pacific only" ...and they don't mean Alaska! The last time I looked at a map, Alaska stretched much of the way across the Pacific and nearly reaches Asia in several places. Getting through the East Coast QRM wall can be tough, let alone the California gang. A huge THANK YOU to those who look beyond the crowd!

Finally, the DX is further away. There are about 22 DXCC countries within 4000 miles of Anchorage (one or two hops). On the other hand there are more than 60 countries within the same radius of Eastern USA. Most DXCC entities are located in a "donut" between 4000 and 8000 miles from us—more than two hops away.

Although I had dabbled a bit with QRP in the past, the acquisition of an FT-817 really spurred me to see what that little rig could. I thought it would be tough enough to work all continents, but that happened in just 34 days, with D68C the best DX at about 9000 miles away—beyond the "donut!" So much for assumptions!

When I mentioned to a local friend that I just might shoot for DXCC, he said it had only been done once from Anchorage with 5 watts. That was a real dare, but I hit the mark only 105 days from the day the 817 arrived!

Lynn, KL7IKV, Listening for IOTA Stations in Anchorage, Alaska

I am not a red hot operator; I read every idea I could find and learned along the way, but here is how I learned and applied some of the more common techniques.

• Listen, listen, listen. Everyone says this, but it bears great emphasis. And it wasn't new to me. The best way to beat a pile up is to be there first and that only happens if you are on the prowl and find the DX before they get posted on the cluster. Listen a bit even if you think the bands are dead. As a six meter nut, I am used to listening to a dead band! Sometimes when the magnetic field is disturbed, we will find some DX due south, but nowhere else.

• Assess the pile up—how wide and deep? Where is the DX listening? PWØT was listening "up" and actually seemed to be either up 3 kHz or up 8 to 9 and nowhere in between. The pile up was so thick with JAs that you could almost walk on them, but the crowd followed him up and down. The operator would switch when the pile up got too hot. So I sat 3 kHz up and kept calling there. Sure enough I beat the pile to the switch and got him.

• Remember that many expeditions have a daily pattern of operating frequencies and times, so observe and plan accordingly. I caught K3J on Johnston Island when he was just setting up for the day.

• Patience. Sure, your chances are better near the end of a DXpedition, but even if the pile up is nasty, start watching early on, keep an eye out for a lull and try anyway, but briefly. Come back again the next day and keep at it. If it seems hopeless, just stand by and listen. On the first brief VK9ML expedition to Mellish Reef in 2001, the operator was working a JA pile up for hours, so I just did other things in the shack and listened. All of a sudden, the operator asked "Is anyone else out there?" I grabbed the mike and said, "Alaska." He said "OK, by the alphabet, Alaska please" and I slam-dunked the contact. Now that was a sharp operator down there!

• The first few days of an expedition can present real opportunities. The feeding frenzy can ignore other good catches. If you tune around from time to time, you may find another good one to work. Come back to the big one later and your chances may have improved. When the mob was after K3J looked elsewhere and easily caught ZL7/G3TXF on Chatham Island.

• On the other hand the "look elsewhere" strategy doesn't always work quite as expected. VP6DI (Ducie Island and number 1 most wanted) and XRØX (San Felix) were active at the same time. I thought that VP6DI would create the mother of all pile ups, and it did! Therefore, I planned to focus on XRØX first, but kept an eye on VP6DI. I am glad I did—on about the fourth day, there was a lull in the frenzy, and I was "in the log." The contact with XRØX came almost at the end of that expedition.

• Just because a station is weak, don't assume you cannot work him. You do not know what things sound like at his end, and the propagation might be better in one direction than another. RW1AI/Ant (Vostok Station in Antarctica), R1ANF (South Shetland Islands), and YJØABQ (Vanuatu), for example, were all just above the noise when I worked them.

Conditions are poorer now as the solar cycle wanes, but I keep in practice, chasing what DX I hear and looking for new IOTAs. I leave the rig on 14060 or 21060 when nothing else is there; it would be great to find some of the European QRP gang! If for no other reason, the continued practice helps to build skills and a feel for the bands that just cannot be put into words. Those who fish will catch fish! I like the challenge. ●●

VHF QRP—VHF/UHF Contests

Bob Witte—KØNR konr@arrl.net

Let's Go Hilltopping

As I write this column, there is still snow on the ground here in Colorado, but spring is on the way. Even better, the summer VHF/UHF contest season will soon be upon us. This is an excellent time to try out QRP on the VHF and higher bands. All of the major VHF contests have QRP operating categories, so get out that VHF QRP rig and give it a try.

I prefer to think of VHF contests as "activity weekends" because the word "contest" often makes people think of the fast-paced, chaotic, band-crushing experience of HF contests. VHF contests usually have a much different feel. The problem with the VHF bands is that they are often underutilized. You put out a call on simplex and nobody is there. Dead silence. But on VHF contest weekend, you are sure someone is going to be on the air, so the event tends to increase the level of activity, bringing people out of the woodwork. A VHF contest is much like a friendly reunion of local VHF enthusiasts.

Of course, sometimes a VHF contest can get pretty intense, especially if there is a significant band opening on 6 Meters. Then things start to sound like the HF bands with signals coming in from across the country.

VHF/UHF Contests

The biggest VHF contest of the year in North America is the ARRL June VHF QSO Party. This contest is timed to take advantage of the favorable 6-Meter long distance propagation that usually takes place in June. The allowable frequency bands are 50 MHz and up. While most stations use high power (typically 100 watts or more), there is a QRP category with a 10 watt power limit (called "Single Operator Portable"). In the ARRL contests, the category is defined as a truly portable station using a portable power source (not commercial AC power) and operating from a location other than a permanent station location. Clearly, these rules are intended to encourage radio amateurs to set up temporarily from a local high spot. Note that this is a North American contest as DX stations are only allowed to work US and Canada for contest credit.

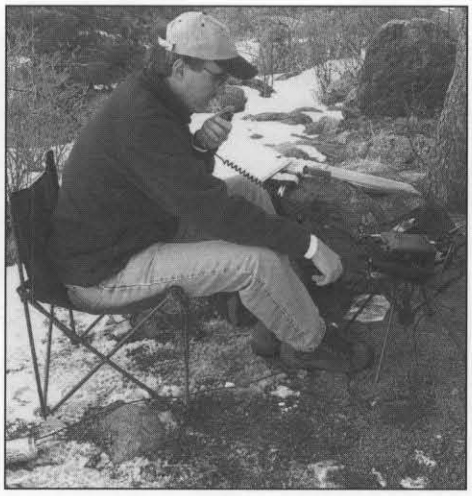

Photo 1—Bob KØNR operating QRP portable during the January ARRL VHF contest.

In July, the CQ Worldwide VHF Contest takes place on the 50 MHz and 144 MHz bands. This contest also tends to benefit from some excellent 6-meter openings. The QRP category is limited to 10 watts output power but unlike the ARRL contests, a QRP station can operate from an established station and use any power source. This contest is an international contest and awards are given on all continents. Last year, this contest experimented with a "hilltopper" category and is establishing this as an official category in the 2004 rules (more about that later).

The ARRL September VHF QSO Party is basically the same format as the June contest, but typically with less favorable 50 MHz propagation. The ARRL UHF Contest is held in August, on frequencies above 222 MHz.

Contest Formats

The contest exchange for these contests is the four-character Maidenhead grid locator, with signal report being optional. Points are awarded for each QSO made during the contest and the QSO points are multiplied by the number of grids worked per band. That is, the number of grids is the multiplier and you receive additional credit for each band that you use to work a particular grid. Generally, the QSOs on higher bands are assigned more points, under the theory that the higher band contacts are more difficult. You can make contacts on recognized FM simplex frequencies but 146.52 MHz is off limits in the ARRL and CQ contests. Refer to the specific rules for each contest for more information.

Hilltopper Category

The CQ Worldwide VHF Contest has added a new QRP category, officially called "Single Operator QRP Portable Limited," but also known as the "Hilltopper" category. To compete in this QRP category, you must operate within a single 6-hour time window. (If you want to operate longer than this, you can enter in the normal QRP Portable category.)

The idea behind this category is to create a competition among portable operators operating from their favorite hilltop for a relatively short period of time. This fits well with "backpack portable" QRP operating, perhaps using the FT-817 or one of the older VHF all-mode portables (FT-290R, IC-202, etc.) If you have been thinking about trying out QRP on VHF, this is a prime opportunity. Unlike the ARRL contests, the CQ WW VHF Contest uses only 2 bands: 50 MHz and 144 MHz. This makes it an especially attractive to backpack portable operators since you don't end up competing with multiband DC-to-light QRP operators (most likely transported by a vehicle).

Getting Started

To get you thinking about equipment and approach to the contest, here's a typical hilltopper scenario:

In the 2004 January ARRL VHF QSO Party, I operated backpacker portable from one of the local mountaintops, in the normal QRP category. Although there was no hilltopper category in that contest, my hike-up approach would work nicely for that category. Even though it was the middle of winter, the weather was relatively mild and I was fairly comfortable until the sun went down. The biggest problem was snow and ice on the trail up the mountain. I plan to repeat this effort in July and fully expect to have warmer weather!

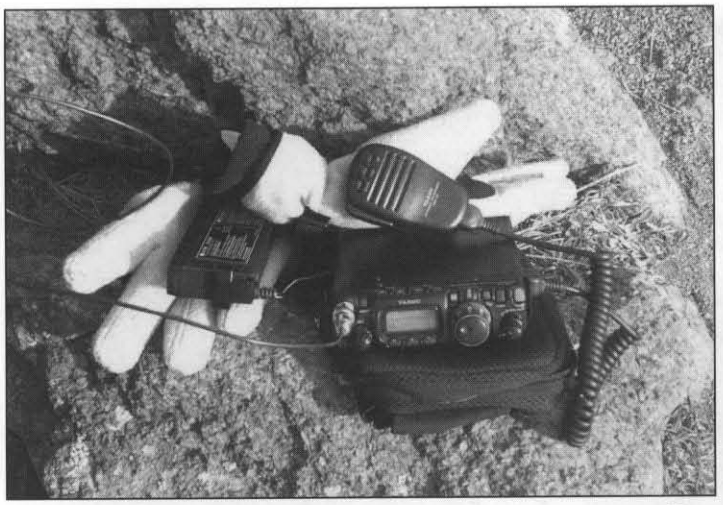

Photo 2—The primary VHF rig for the January contest effort is the Yaesu FT-817.

Photo 3—All the gear fits into a modest size backpack. The antenna and camera tripod are strapped on externally.

Most of the contest activity is on the CW/SSB portion of the bands, so my primary rig was my FT-817 (see Photo 2). I also took along a couple of handheld FM transceivers to monitor some of the common FM simplex frequencies.

Antenna polarization is important on VHF and most of the serious stations use horizontal polarization. For 6 meters, I used a conventional dipole strung between a few trees. Another option is to use a small Yagi antenna, which requires some kind of mast support. For 2 meters, a small Yagi is probably the best choice. In January, I used the 2M/70 cm dual-band Yagi from Arrow antenna mounted on a camera tripod. For the FM handheld radio, I replaced the rubber duck antenna with one of the longer, telescopic antennas with BNC connector. You can also use a Yagi for FM but be sure to orient it for vertical polarization.

Don't forget the essential accessories that you'll need. Bring along headphones for digging out the weak contacts and your choice of key or keyer for CW. Yes, CW comes in really handy when the signals are weak on VHF. You'll need an appropriate length of coax to connect each antenna to the corresponding transceiver. As with any portable operation, a key factor is the power source. Most likely, you'll want to use some kind of rechargeable battery pack, similar to any other QRP operation. If you are using an FT-817, keep in mind that it is a bit power hungry, so plan accordingly. Last, but not least, are the creature comforts such as water, food and clothing. As you can see in Photo 1, I like to take along a lightweight sports chair for a more comfortable operating position. All of my gear fits into a backpack for easy transport (see Photo 3).

Other Alternatives

I've focused on the hilltopper approach using backpack-compatible equipment. However, you may choose to drive to your favorite high spot and operate QRP. With this approach, you can take more stuff: multiple radios, bigger antennas and more substantial power sources. Be sure to check the rules of the specific contest so that you understand the limitations placed on location and power.

This article has focused on the popular VHF contests in North America. I have been looking around the web for VHF contests in other countries and have found information on a few of them. Please let me know what is going on in your corner of the globe with regard to VHF and QRP.

Summary

That's all for this issue. I hope I can work some of you during the summer VHF contests. They really are a lot of fun and a chance to apply QRP thinking to the bands above 50 MHz. Let me know what you doing on VHF and up.

—72 and 73, Bob KØNR

References

1. Information on ARRL contests: http://www.arrl.org/contests/

2. Information on CQ Worldwide VHF Contest: http://www.cq-amateur-radio.com/World%20Wide%20VHF%20Contest.html

3. Arrow Antenna web site: http://www.arrowantenna.com

Contest Calendar

June 12-14—ARRL June VHF QSO Party
July 17-18—CQ WW VHF Contest
August 7-8—ARRL UHF Contest
Sept 11-12—ARRL September VHF QSO Party

VHFQRP Email List

There is a new email list on Yahoo Groups for the purpose of discussion of VHF QRP topics.

To subscribe to the list, go to: http://groups.yahoo.com/group/vhfqrp/ or send an email to vhfqrp-subscribe@yahoogroups.com ●●

UPCOMING QRP ARCI-SPONSORED HF CONTESTS:

April 10 1200Z–April 11 2400Z — Spring QSO Party
May 15 1800Z–2000Z *NEW !!* — NEWCOMER'S RUN
May 30 8 PM–Midnight Local — Hootowl Sprint
June 26 1800Z–June 27 2100Z — Milliwatt Field Day
July 11 2000Z to 2400Z — Summer Homebrew Sprint

Amateur Radio Emergency Communications and QRP

Mike Boatright—KO4WX ko4wx@mindspring.com

Not long ago, I was asked by a friend to come speak to his county amateur radio club—one of the more active clubs in the Atlanta, Georgia area. "Mike, could you put on a short QRP show and tell for GARS on the 8th?" wrote Norm, WA4ZXV. "You could also let us know what's up with your other HAM activities... magazine editor and Emergency services."

Well, I haven't been accused of not having anything to say very often, so a quick, "Um, yeah, I guess I could..." was the response. What surprised me was how related the topics really are!

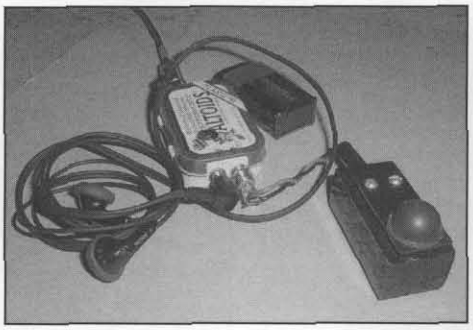

Figure 1—KO4WX's Knightlight SMITE transceiver.

Figure 2—KO4WX's QRP/emergency communications hamshack

What Exactly is This QRP Thing?

We use the term QRP for lots of things, but at the end of the day, it is just an amateur radio Morse code pro-sign for "Shall I reduce power?" if used with a question mark ("QRP?"), or "Please reduce power," if not. Conversely, "QRO?" means "Shall I increase power?" and "QRO" means "Please increase power" (actually, I think that is simply a euphemism for "Please splatter the band...").

In the early days of QRP ARCI, QRP was defined as 100 watts of power or less. Now days, QRP generally means less than 5 watts, unless, of course, you get caught up in that whole 10 watt SSB thing...

The FCC Weighs In

The FCC has a thing or two to say about QRP vs. QRO in its Part 97 rules:

§97.101 General standards.

(a) In all respects not specifically covered by FCC Rules each amateur station must be operated in accordance with good engineering and good amateur practice.

§97.313 Transmitter power standards.

(a) An amateur station must use the minimum transmitter power necessary to carry out the desired communications.

Basically, the FCC has been pretty mum about the amount of power that you use, as long as you don't use more than you are legally allowed, you've made proper RF assessments, etc. But splatter the band and you'll probably get a nice little card from your friendly neighborhood Official Observer... Splatter it with a professional microphone and well; let's just leave that one alone.

I once had a chat with Riley Hollingsworth, K4ZDH, of the FCC. I showed him my Knightlights SMITE transceiver, sort of half expecting him to chastise me for the fact that it only had a single half-wave pi filter on the output. What did Riley say? "Cool!" (It's mounted inside a mini-Altoids tins, you know, the really small ones—see Figure 1.)

A Real-life Story

Let me state unequivocally, that I view one aspect of "good amateur practice" in emergency communications situations as using the appropriate power necessary to establish reliable communications. As a QRPer, I never operate with more than 5 watts—in fact, I prefer to operate with one or two watts whenever I can. However, as an emergency manager, I simply refuse to risk peoples lives, safety and property for the sake of "enjoying" my hobby-hobby is hobby and service is service.

So last winter, I bought a used SB-1000 linear amplifier from my Elmer, Mike Branca, W3IRZ (SK). When necessary, I can run as much as about 700-1000 watts. Some of you may have noticed that I have been obsessed with amplifiers (mostly the 1 to 5 watt kind, but amplifiers, none-the-less) for a while and that is why.

Last spring, It was unusually rainy and stormy in Georgia—what the Chief Meteorologist in Charge at the Atlanta/Peachtree City NWS office called a "statistical leveling." So it was not unusual one night last May when my ARES pager began going off with severe storm warnings all over the state.

As had happened just the night before, the SKYWARN net activated via the statewide linked repeater system. Reports were coming from amateur radio spotters regarding severe thunderstorms and at least one tornado-on-the-ground sighting with lots of RADAR "echoes" in Alabama and Georgia. We fired up our ARES 75M frequency as a backup—just about the time that the nightly SSB net was starting (I love checking into that net sometimes using my Epiphyte and after getting a 59 signal report, being told "you're lying" when I say I'm running 3 watts!).

Power (Watts)	dB 100W	S-units	I (TX)	AH (TX)	I (RX)	AH (Total)	Hours @12 AH	Hours @32.5 AH
400	6	1	66.67	16.67	0.75	17.42	0.69	1.87
100	0	0	16.67	4.17	0.75	4.92	2.44	6.61
25	–6	–1	4.17	1.04	0.75	1.79	6.70	18.14
5	–13	–2	0.83	0.21	0.75	0.96	12.52	33.91
1	–20	–3	0.17	0.04	0.75	0.79	15.16	41.05

Table 1—Power output vs. emergency power supply requirements.

Due to the atmospheric activity, there was an S9 to S9+10 dB noise level on 3975 kHz (our statewide ARES SSB coordinating frequency) with loud static crashes. Knowing that few of the operators on the SSB net operate at less than "barefoot" (100W) and most at a "full gallon" (1500W), I could tell that checking in to the net was going to be difficult, even with my 80M full-wave loop in the trees at 70 feet.

I called the net control, but could not be copied with my 100W signal (what I usually operate with for ARES work), so I raised my power to 300 watts, +5 dB (just under one "S" unit) above 100 watts. The net control could tell I was in there, and could almost copy me, but I was right at the noise level. So I once again raised my power, this time, to about 600 watts, just one half of an "S" unit higher (+8 dB over 100 watts). At that point, we were able to establish reliable communications.

On the VHF SKYWARN net, the net control at the National Weather Service announced a tornado warning for the county where the NWS office was located, and then quickly closed down his station in order to seek shelter. With a tornado headed their way, the Atlanta office closed and transferred the "warning point" to Birmingham, Alabama. That is, suddenly, we had tornado warnings being forecast in Alabama, with spotters on the ground in Georgia (and previous reports of funnel cloud sightings by our spotters). That is when HF came in really handy!

With my power at 600 watts, I was able to establish a link to Birmingham (via VHF-HF liaison station 20m from NWSB-MX) on 3965 to transmit spotter reports from our SKYWARN net to the NWS office in Birmingham.

Folks, that is the proper use of power!

A QRP-only Band!

By some definitions, the new 60 meter band is a QRP-only band. In giving us limited access to 60 meters, the FCC limited output to 50W Effective Radiated Power (ERP). That means that if you had a 3 dBd (dB over a dipole) gain antenna (like my 80M loop is on 5 MHz), you are limited to 25 watts of power, and if you have a 9 dBd gain antenna (I admit that's a big antenna at 5 MHz), you are limited to 6.25 watts of power. In both cases, ERP is 50 watts.

It didn't seem to phase hams, because if you listened on 60 meters shortly after midnight on July 3, 2003, you would agree that it sounded just like Field Day!

Power Output	Signal Strength
1000 watts	S9 + 10 dB
100 watts	S9
25 watts	S8
6.25 watts	S7
1.563 watts	S6
391 milliwatts	S5
98 milliwatts	S4
24 milliwatts	S3
6 milliwatts	S2
1.5 milliwatts	S1

Table 2—Relationship between power output and received signal strength.

Now, the jury is still out on the usefulness of 60 meters to emergency communications, but it does show promise. It appears to have certain propagation characteristics of 40 meters as well as 75/80 meters, and might make a good statewide emergency communications frequency.

But the point is, reliable communications can be established at QRP or close to QRP levels, with the proper planning, knowledge of propagation conditions, operating skill, etc.

Power Output vs. Emergency Power Supply

There is something to be said about operating at QRP levels—it definitely does not drain the batteries or consume near the power that QRO operations do. There may be circumstances when this is very important. Hurricane Isabel left some homes in the mid-Atlantic region without power for over a week, for example. In this kind of situation, battery economy becomes very, very critical.

Take a look at Table 1. If you assume that you have a transmitter that is 50% efficient (not likely, but let's assume it), and your radio draws one amp of receive current, with a 25% duty cycle (which is typical of a Net Control Station), you can see that the benefits of operating QRP are significant. Isn't it interesting that you could operate as net control for over 5 times longer running 5 watts than if you were running 100 watts?

It is important to note, however, that the 5 times longer operation doesn't come for free. Your signal will be 2 "S" units weaker at all other stations on the net's receivers. This may or may not be critical. If everyone is copying you at S9 and you are running 100 watts, then an S7 signal might well be sufficient to establish reliable communications—unless, of course, you have an S8 noise level! (See Table 2.)

Antenna or Amplifier?

Here's a quiz: Say you want to put out a whopping signal on 20 meters and let's say you done some math and determined that to achieve reliable communications, you need to produce a signal that is 6 dB (or more) stronger than the typical 100 watt "barefoot" rig. What is most economical, an amplifier or a bigger antenna?

OK, this is a trick question, because the answer is, "It depends." If you are using a wire antenna, the cost of a tower, beam and rotator can easily exceed the cost of an amplifier. But look further into the matter. Do you need that gain in one direction only? Here in Georgia, much of the country can be covered with a beam pointed northwest. An fixed-direction wire Yagi or Quad antenna might provide the gain you need for just few dollars.

In Summary

One thing absolutely positive benefit that QRP has done for this emergency communications operator is to improve my operating skill. To do well in QRP contests and the like, you really have to learn to listen well, to copy under sub-optimal conditions, and to be patient—all very critical skills to the emergency operator.

It has also encouraged me to improve my technical skills. I never would have put up an 80 meter loop were it not for the help and encouragement of my NOGA QRP buddies. And the construction techniques that I have developed have helped me to greatly improve my station capabilities (see Figure 2).

QRP to-the-field events are excellent training grounds for setting up and operating portable stations for extended periods of time in disaster areas, shelters, etc.

In short, QRP allows you to operate within the spirit of §97.313. However, always remember that it is NOT for making a point when the safety of life or property is at risk. ●●

Mike Boatright, KO4WX, is Georgia ARRL Section Emergency Coordinator.

Confessions of a Radio Junkie

John Sielke—W2AGN w2agn@w2agn.net

"Hi, I'm John, and I'm a radio junkie!"

Much the same as other addicts, the ham radio operator can become, what the wealthy call "an eccentric collector," but what most of the rest of the world would call a "radio junkie." See the accompanying photo that shows what can happen to one like this. The photo only shows 1/3 of the room, which is called, innocently enough, "the shack."

I knew I was in trouble when I found myself laying on the floor, drilling holes to install a shelf in the knee cutout of my desk, to have room to put yet another rig. It was time for a "12 Step Program."

This is what led to the development of the W2AGN "12 Step Program."

The W2AGN 12-Step Program

For those wanting to "kick the radio junkie habit," here is the official 12-step program:

1. REMOVE eBay from your life. Cancel your username. In hard cases, you will need one of those "Parental Control" programs that will not allow you to go to www.ebay.com.
2. Set up Mail Filters. You already have them to filter out other noxious thing such as Spam, W2AGN, "OT," etc. Now you need to eliminate all subjects starting with "FS," "FA," "For Sale,"" "For Trade," "New Kit," etc.
3. Cancel membership in all Email Reflectors dealing with selling, trading, etc. Offensive Lists include "BASWAPLIST," "Heathkits," etc.
4. If you haven't already, get a joint checking account with your XYL.
5. NO PayPal! Cancel your account—NOW!
6. When your *QRP Quarterly*, *QST*, *Homebrewer*, etc., magazines arrive, have your XYL cut out all advertisements, reviews of new rigs, etc. You may read the "Letters to the Editor" and the "Contest Results."
7. Sorry, no more "-cons." That means you have to avoid Atlanticon, Pacificon, Ozarkcon, Lobstercon, etc. Too many temptations. Take the XYL out to a show, instead.
8. Obviously, no more Hamfests. That includes FDIM. Sorry, nobody said "Cold Turkey" would be easy. [*well, attending just the FDIM Symposium would be OK, right? —.ed*]
9. Don't try to be sneaky and check into those "Swap nets" on the repeater or on 75 Meters!
10. Let your XYL see how much you have spent on radios in the last, say, 3 years. This is a last resort and may result in serious pain, but "no pain, no gain."
11. Promise your XYL she can spend a like amount, as in #10 above, on herself. You will not be able to afford another radio.
12. If all else fails, contact your local Power Company, and ask to have BPL installed in your neighborhood.

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QRP Clubhouse

Michael Fletcher—KL7IXI/7 kl7ixi@comcast.net

Merhaba,

I'm writing this column from an internet café on the Aegean coast of Turkey. Unfortunately, I don't have a rig with me to use on this getaway, so am having withdrawal symptoms.

Field Day is on the horizon and clubs are gearing up for the premier test of portable operating gear and antennas.

A local club that usually brings station wagon loads of gear for Field Day is planning a preliminary project where you head out using only what fits into your backpack-radio, antenna, batteries, tent, food, etc. Only a short hiking distance, but in the Pacific North'wet,' outdoors means rain gear or a tent. How about considering a similar Saturday backpack outing away from the breakfast buffet for a change?

When I think of backpack QRP, I think of Wes Hayward, W7ZOI, so I queried him about the project and his recommendations. Wes was kind enough to give me some advice which I'll attempt to do justice to.

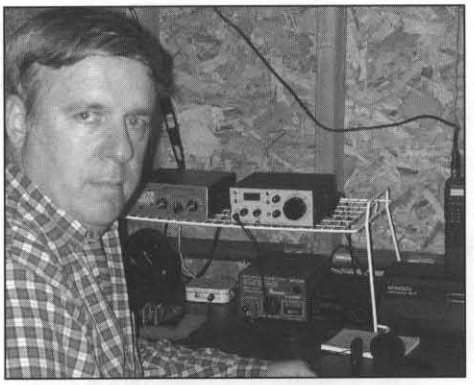
Wes suggested leaving the fancy boxes at home and trying something compact and light, such as a monoband SW-40 or Rock-Mite. The goal here is to get something into the field, no matter how simple it might be. What club doesn't have a SW-40, Rock-Mite, Sierra, or '49er available. The classic "KISS" attitude certainly applies here.

Pick a modest power level, perhaps around 2 watts. Wes likes lower levels to keep the battery weight down, especially when he's scaling some of the Northwest peaks.

"The extra 6 dB in going up to 2 watts output is well worth the trouble for a first outing" Wes said. ""One band is usually enough." Especially for a multi-rig club outing.

Use headphones. Even if you expect to be in a relatively quiet location where you could hear a speaker over the wind, the very concept of dumping CW or SSB out onto the ears of others who might be walking in the area is offensive and unnecessary.

"Pick batteries for the rig on the basis of your expectations," Wes added. "One



battery choice will work for a couple of quick hours of operation, while a totally different choice will be required when planning for a 27 hour Field Day stint."

This is discussed in *Experimental Methods in RF Design* (EMRFD), Chapter 12, and may take some measurements of both your rig and your batteries.

"Antennas are always the greatest difficulty," Wes said. A dipole is always a good starting point, and this usually works well as an inverted V, which means that only one major support is required. Always higher the better, but that's not usually the goal during a weekend "Mini-Pre-Field-Day" outing. There, the goal is to merely make a bunch of contacts, and the close ones are just as much fun as those from the other side of the world. In that case, you can have the dipole amazingly close to the ground.

"I've done well with a 40 meter Inverted V at only 15- or 20-feet with the ends at 6 to 8 feet," Wes said. "This makes some of the 'Crappie' type fishing rods practical, even for lower band Inverted-Vs."

When using dipoles where a feedline is required, Wes uses RG-174 with the lengths down to about 0.4 wavelength (40 ft. on 40 meters) or less to keep the loss within reason. RG-58 is a better choice, but is heavier.

"End fed wire antennas aren't usually used for a club Field Day, but should be seriously considered," Wes said. They require a simple transmatch, and have the major advantage of requiring no feedline, other than perhaps a small piece to connect a rig to a transmatch. It is important that some form of counterpoise be used. This can be a couple of radials that are from 1/8 to 1/4 wavelength long. If you want a "sky warmer" type pattern, run a half wave wire from near the ground up to the rod tip of a crappy pole and back down, with the wire middle at the rod tip. A vertical pattern results if you run a half wave total length wire parallel to the ground for a ways, then bend it with the middle of the wire along the rod, and finally extend the remaining wire horizontally, held out with cord.

"Any of the wire antennas should be at least 10 dB better than the loaded whip type commercial verticals that are currently popular," Wes added. "On the other hand, the little whip antennas have the advantage of being able to be thrown up quickly and easily in about any environment, so they will still get you on the air."

Use the outing to assemble a list that will work the next time, or for Field Day.

"Remember that amateur radio from a rucksack should not (always) be a competition," Wes said. "It will become one for Field Day or other contests sponsored by the many clubs, but in most cases it is a chance to get out and do both hiking and amateur radio, both enjoyable activities enhanced in combination. It's not necessary that you reach a lofty, remote summit to do this. A peaceful grassy ridge may work just as well."

Thanks Wes, and I'll accept it as a challenge to dust off the Rock-Mite I built last year as a club project and see just what the peanut whistle will do with a ZM-2 tuner and zip-cord dipole.

More importantly it will be a change from the usual breakfast and chat that are the usual club fare during the winter.

Listen for me during Field Day.

—72, Mike KL7IXI/7

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Send club news and club-oriented ideas on any subject to Mike, KL7IXI, at kl7ixi@comcast.net

International club news should be sent to World of QRP columnist Oleg, RV3GM, at master72@lipesk.ru

QRP Reflections: Two Excellent Mobile/Portable Antennas

Rich Arland—K7SZ

richard.arland@verizon.net

QRP Quarterly *welcomes Rich, K7SZ, back as a regular columnist. As he said to us, his passion lies with QRP. If you've ever met Rich for an eyeball QSO, chatted, or even exchanged email, you've probably gained a new friend. He is a member of the QRP Hall of Fame, a long time columnist for* QQ *and for* QST, *and has just published his third book. —editor.*

QRP Reflections columnist RIch, K7SZ, enjoys this well-equipped shack.

It's antenna time! I'd like to showcase a couple of antennas that I have had excellent success with when operating mobile and portable QRP.

The Tarheel Model 200 Screwdriver Antenna

First up is the Tarheel Model 200 Screwdriver Antenna from Tarheel Antennas in Fuquay-Verona, North Carolina (www.tarheelantennas.com). I had been researching a multi-band antenna for mobile use on my new truck (yes, it's true...the old Blue Ford F-150 expired recently...thanks to a curse put upon it by Ed Hare, W1RFI, after I labeled his pickup the "Deathmobile"). The screwdriver antenna idea appealed to me since they are relatively simple in design and theory and provided a relatively high "Q" for multi-band HF use. The thought of not having to exit the vehicle each time I needed to change bands by swapping out single-band whips, was a definite plus. Additionally, a screwdriver antenna can be employed as a base or portable station antenna by simply mounting it on a tripod or mast and deploying some counterpoise radials. This is a very workable solution for those QRPers who find themselves hampered by Draconian covenants or zoning restrictions.

Since antennas are the great equalizer when it comes to QRP, the idea of having a physically small, high "Q" antenna that will radiate well will go a long way in leveling the ham radio playing field.

The first thing you have to grasp when dealing with any mobile HF antenna is that they are all physically very short when compared to their full size counterparts. For example, a quarter wavelength vertical whip for 80 meters is about 67 feet long. The typical mobile whip for 80 meters is about 9-12 feet long! Loading coils can provide the proper "electrical" length but these undersize antennas cannot compare with the efficiency and performance of their full size counterparts. This applies to mobile whips as well as the host of short HF whips that have become almost standard equipment for the portable QRP crowd. The bottom line: you can match the feed point impedance of the antenna to the output impedance of the radio, but the efficiency and performance are always going to suffer. A radial counterpoise can definitely help but there is no free lunch.

Photo 1—The Tarheel Model 200 mounted on K7SZ's new truck.

Having used several different types of single band HF whips in the past, I wanted true multi-band performance from my mobile station. My other thought was that it would certainly be nice to have a multi-band, remotely tuned HF antenna that I could use in the field for portable operation. After researching the features of several commercial screwdriver-type mobile antennas, I settled on the Tarheel Model 200. The Model 200 covers 80 through 6 Meters and is undoubtedly the most robust mobile antenna I have ever seen. It is made from high quality fiberglass, Lexan™ and stainless steel parts. The motor unit sits in the lower portion of the mast and drives a piece of threaded rod which, in turn, moves the large diameter tuning coil up and down the middle portion of the mast (see Photo 1). A 72-inch whip is placed atop the coil to complete the antenna. The Model 200 is about as close to indestructible as you can get and still afford the price. The high quality of workmanship and attention to detail in the manufacturing process is evident through out.

Tuning is accomplished by applying a DC control voltage to the screwdriver motor through a DPDT momentary contact toggle switch, wired into the vehicle's 12V power source. The switch box is located in the cab of my pickup with the motor control cabling and coaxial cable routed under the rear seat and through a body grommet in the rear of the cab. From there the wiring travels down the length of the bed to the antenna mount. DC voltage is applied through a 4 wire cable, similar to the type used for trailer wiring. Pushing the toggle on the switch moves the antenna coil up or down to increase or decrease the resonant frequency of the antenna.

By monitoring the SWR it is possible to remotely tune the Tarheel Model 200 antenna anywhere between 80 meters and 6 meters. The only real drawback to this antenna is its size and weight. The Tarheel Model 200 catches a lot of wind at high-

Photo 2—Close-up of the custom welded mounting bracket for the screwdriver antenna.

way speeds. It needs a very robust mount, preferably affixed to the frame of the vehicle. In my case, a welder built my mount, and then bolted and then welded the mount to the rear of the frame of the truck to insure a good ground connection to the vehicle (see Photo 2).

I have had the Tarheel model 200 on my truck since mid-February and I am very pleased with the operational results. My mobile HF rig is an Alinco DX-70T transceiver running between 5 and 100 watts output. On the way to work each morning I check in with "The 22 Crew" on 7.238 MHz and on the return trip I work DX on 20 and 17 Meters. The performance of the Tarheel antenna has been very impressive. The Tarheel antenna outperforms any other mobile whip system I have used in the past. The high "Q" of this antenna coupled with a rugged, well grounded mounting system, and yields a potent signal on HF.

The Tarheel Model 200 is a bit pricey, but well worth the money due to the rugged construction, the high quality of materials used in manufacturer and it outstanding performance under varying band conditions. If you want something smaller than the Model 200, try the "Little Tarheel," a 40-10 meter screwdriver antenna that can be affixed to the vehicle using a heavy duty trunk lip mount.

The Quick Silver Minuteman 20

"Where do you want to work from today" is the motto of the Quicksilver Radio MinuiteMan 20™ portable HF vertical antenna. This portable backpack antenna is unique in that it is made from 3/4 inch schedule 40 PVC pipe. It is lightweight (great for backpacking) and can be assembled in a few minutes. The MinuteMan 20 covers 20 through 10 meters and band changing is fairly quick, once the entire antenna is assembled. The antenna consists of six mast/leg sections, three base sections with "T" fittings attached, one upper assembly with collapsible 6 foot whip and loading coil attached, one lower assembly with coaxial cable connector, counterpoise connector and lower element wire attached, and two counterpoise cables each with two radials and terminals attached. This antenna is ready to assemble and use right out of the box (see Photo 3). Quicksilver Radio included an excellent instruction set (owner's manual) which can get you on the air in minutes.

The MinuteMan 20 is a full 1/4 length antenna for 10, 12 and 15 Meters. For operation on 17 and 20 Meters, a small loading coil is placed in series with the vertical whip section. For 10, 12 and 15 Meters, the lower element wire is connected to the TOP end of the coil and the whip is adjusted for best SWR. For 17 Meters the lower element wire is clipped onto the center of the coil. To tune 20 Meters the lower wire element is clipped to the bottom of the coil. Tuning is accomplished by adjusting the coil taps on 20 and 17 Meters with the whip fully extended.

The MinuiteMan 20 can be ground mounted or used on a picnic table or other elevated surface, thereby elevating the radials above ground to improve the antenna's efficiency. This is a fun antenna and a snap to assemble and use (see Photo 4). It's bulkier than my Ventenna HFp, however, band changing is a lot quicker. There are several portable backpack HF antennas on the market, but for price and ease of use, the Quick Silver Radio MinuiteMan 20 antenna is an outstanding value. Want more info? Go to www.qsradio.com and check out their full product line.

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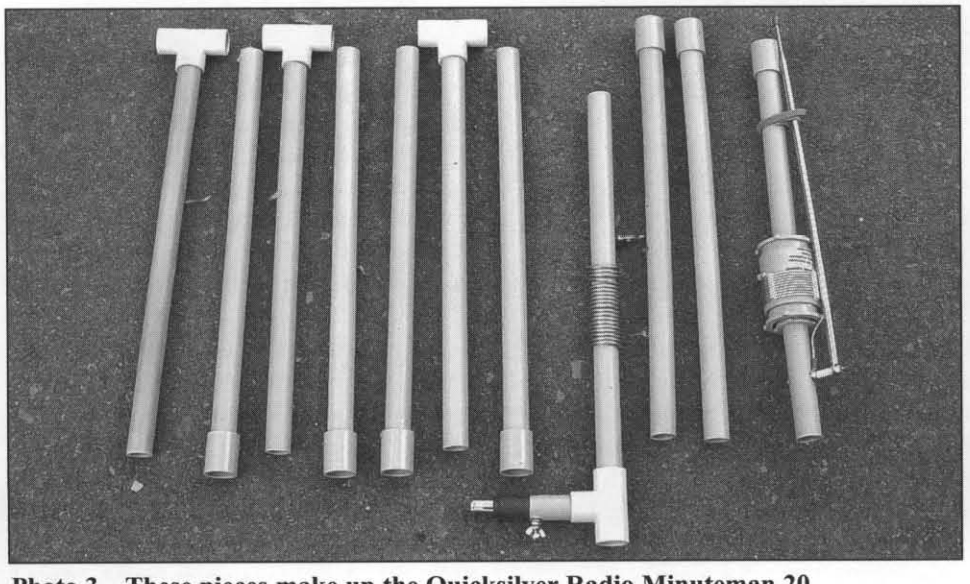

Photo 3—These pieces make up the Quicksilver Radio Minuteman 20.

Photo 4—Yes, it only takes a few minutes to assemble the Minuteman 20.

QRP Contests

Tom Owens—WB5KHC wb5khc@2hams.net

Randy Foltz, K7TQ, has handed me the responsibility of being your contest manager commencing Jan 01, 2004. I want to publicly thank you, Randy, for being ever-present with an answer for all my questions and the problems that I have encountered, for allowing me to copy and freely modify your existing contest web pages, for providing complete spreadsheet data files of all your past contests and all past certificates issued, and for being a good ham friend who continues to provide me the benefit of your knowledge and your years experience. It was my pleasure working for you as your Certificate Manager and I thank you for easing my transition into your position such that there was no interruption to the contest community within QRP ARCI. You are the embodiment of what a "ham" should be! Thank you!

This *QQ* will include information from Randy's last two contests, the Top Band Sprint and the Holiday Spirits Sprint, along with the results from my first contest, the Winter Fireside SSB Sprint. Announcements of the many upcoming contests are also included.

On the contest website, you will notice many changes including the cosmetic changes in appearance, the length of time information is available from a concluded contests, all contest submissions are published not just the e-mail submissions and more information is published about each entry; plus, your winning certificate for each contest will be published.

There are 3 immediate changes that I hope I can get you to embrace:

I have created a single page form in Adobe PDF format to help calculate your score and S/P/C per band for the 6 major bands we use. With this form you KNOW how many S/P/Cs you worked per band and it is easy to jot down the points value for each QSO on each band from your log sheet. When you finish the form it is an easy task to count and add for a total score and feel confident that your score is accurate! In the Winter Fireside SSB Sprint contest, there was an error rate of over 33% in the final scores submitted!

The contest entry form that was an ASCII file has been recreated as an Adobe PDF file. All forms on the ARCI contest site have been converted to PDF format as it is the standard for document exchange via the internet. The newer version of the FREE Adobe Acrobat Reader will allow you to easily resize and print the page centered on your paper regardless of your printer's margin requirements making document exchange very easy. Please don't download the ASCII form and type in your numbers and email it as your entry—you would find some of the forms submitted very difficult and time consuming to decipher especially in the scoring squares!

The online form to submit your score has changed to include additional interesting information like your ARCI membership number, how long you spent working the contest and the number of QSOs you made in the contest. This information is published on the contest website for you to compare how you did with your fellow contesters. Your e-mail address is requested to make it easy to ask a question about your entry but it is not published either on the web or in *QQ*.

There will always be TWO ways to enter an ARCI contest; online and via regular surface mail. If you will be mailing your entry, you will make my job far easier if you include the completed Contest Entry Form, the completed S/P/C Calculator Form and your contest log sheets. From these, I can extract the required information and publish your entry on the contest website plus I will be able to verify your score and math and you will not miss earning a certificate because of a simple oversight during scoring. This is the simplest way for a new contester or someone NOT a computer guru to enter our contests.

If you will be submitting your score via the online form; you will need to print out the Contest Entry Form and the S/P/C Calculator Form to use to calculate your final score. Please either scan and e-mail them as attachments with your log sheets or mail both them and your log sheets to complete your contest entry. The on-line entry form gets your information immediately on the contest results page and eliminates the possibility of a typing error on my part.

If you are don't have Internet access or the ability to print out the entry forms but would like to participate in our contests; please send me an e-mail or a postcard requesting the forms and I will print and mail the Contest Entry Form and the S/P/C Calculator form. Save them in your files and duplicate them for future ARCI contest entries. (These forms are also printed in this issue, following the contest results.)

I promise the ARCI contesting community a complete current calendar of upcoming events, certificates printed in color on attractive stock each different and unique from the past contests, timely and complete contest results as they are submitted, a contest website that is updated many times daily following a contest and in the weeks preceding a contest, easy to understand and print forms, fast and easy on-line contest entry forms, complete spreadsheet information on past ARCI contests stretching back over 5 years and quick response to e-mail questions along with a redrawn "clean" club logo and QRP graphics for your QSL cards or your personal webpage.

UPCOMING CONTESTS

Please mark your calendar for the upcoming contests and see the website at http://www.qrparci.org for complete details and entry instructions

Date of Contest	Event	Certificate	Modes
April 10 1200Z–April 11 2400Z	Spring QSO Party	Winner	CW
May 15 1800Z–2000Z *NEW !!*	NEWCOMER'S RUN	Winner	CW
May 30 8 PM–Midnight Local	Hootowl Sprint	Winner	CW
June 26 1800Z–June 27 2100Z	Milliwatt Field Day	Winner	CW/SSB DIGITAL
July 11 2000Z to 2400Z	Summer Homebrew Sprint	Winner	CW

2003 Top Band Sprint Scores

QTH	Call	QSOs	Score	Pts	SPC	Power	Mode	Time	Rig	Antenna
CO	KIØII	23	6132	73	12	LT5/LT10	Mixed	2.5	Omni	Inv L
GA	WB6BWZ	1	35	5	1	LT5	CW	3	FT817	OCF stealth
ID	K7TQ	15	2730	39	10	LT5	CW	3	K2	Inv L
IL	KF9D	73	49560	236	30	LT5	CW	6	TS930S	Inv L
	K9FO	60	42924	219	28	LT5	CW	5	FT1000MP	Inv L
IN	WT9U	36	15540	111	20	LT5	CW	3	TS930	1/4 wave sloper
	W9CC	7	1218	29	6	LT5	CW	1.5	IC756 ProII	Inv Vee
LA	W5TVW	13	3500	50	10	LT5	CW	3	IC735	135' flattop @ 50'
MD	WB8YYY	17	4697	61	11	LT5	CW	1.25	K2	OCF dipole
MO	KØJPL	37	18760	134	20	LT5	CW	5		
	NØOCT	1	14	1	2	LT5	CW	5	Corsair	Wet noodle
NC	AA4XX	19	5712	68	12	LT5	CW	3.5	Argo V	80 m vert loop
NH	KN1H	25	10948	92	17	LT5	CW	2.5	Omni	300' wire
NJ	W2JEK	9	1764	36	7	LT5	CW	1.5	FT840	1/4 wave marconi
PA	W3TS	24	20250	90	15	LT250	CW	3	HB CW XCVR	1/8 wave wire tee
SC	K3QO	16	7150	65	11	LT1	CW	5.9	Paragon	Inv L
SD	K7RE	51	30051	159	27	LT5	CW	5	K2	45' high top loaded vert
VA	N4ROA	55	30744	183	24	LT5	CW	4	K2	Inv L
	K4ORD	28	14231	107	19	LT5	CW	2	K2	
	K4UK	12	3213	51	9	LT5	CW	1	Omni 6	
WA	WA7LT	7	120	20	6	GT5	CW	1		
WI	N9NE	68	44884	229	28	LT5	CW	6.75	K2	265' doublet @ 50'

In return, I ask only that contest entries be legible, be on the appropriate forms and that if a question arises it be answered within 3 days via e-mail.

If you have a suggestion on how we can attract newcomers to the thrill of QRP contesting, how we can enhance your enjoyment of our current contests or how we can change a contest to reach a broader audience; I'm all ears!

—72, 73 de Tom, WB5KHC #10645

...and now, on to the contest results!

Top Band Sprint
Top Three Finishers

Call	Score	Name
KF9D	49560	Roger E. Scott
N9NE	44884	Todd Fonstad
K9FO	42924	Will Bowser

2003 Top Band Sprint Soapbox

WB8YYY—Fun that I can make contacts with such a modest antenna. My first time keeping a log in an ARCI event. **WB6BWZ**—S8+ steady noise level next to I-75 in downtown Atlanta (Georgia) industrial area. **W9CC**—Only heard a few guys on. This is a fun band. Need more participation. I'll keep trying. **W5TVW**—Activity slacked around 0400Z. Quit and tried at 0900Z with no results. Tried a T32 QRP in the morning but no results. Finally went to 100 watts full power and worked him. **W4BCU**—Second time in contest. Lots of fun. **W3TS**—Late night, weekday sprint before 48 hr contest is not a very good time for me. 24 good operators pulled my 250 mW out of the noise. **W2JEK**—Missed QSO with VE2KN due to QSB. **VE3FAL**—Wish I had more time to play. Next year folks. Ran out of time in the ARRL test with XMAS parties same weekend. **N9NE**—Thanks to QRP ARCI and Randy for sponsoring this warmup to the ARRL test! Conditions were generally good, but QSB and weak signals were gremlins that made the event a real challenge. KØJPL and I agreed to close the bar, er, band at about 0640Z as we concluded we were the only dumbkopfs remaining! **N4ROA**—Only worked 4 hours. Did not read new rules. Much fun. **NØYGY**—Well not a good showing, but it was my first 160M contest and also my first out-of-state QSO using 160M. I heard a few stations in there but could get their attention. I am rather antenna challenged for 160! Maybe next year I'll be better prepared. NØOCT—Here's my stupendous score! Read it and weep, baby! KIØII—Another ARCI winner. Thanks Randy! Big spike of noise right at 1.810 so stayed up the band a bit. Same number of contacts as last year but not as many SPC multis. NØYGY, thanks for the 100 mw to 100 mw contact, even on SSB. Whata hoot! **KF9D**—Thanks for a fun event to warm up for the ARRL 160 contest. Conditions seemed fairly good from here, and my local noise was pretty low for once. Band got a little lonely after midnight, so I pulled the plug. Fun to see what QPR power can do, especially on 160m. **K9FO**—Good conditions, lots of stations. Great results! **K7RE**—Had a great time, with about 5 hours of activity. Amazing how well QRP works on 160M, where QRP is often considered to be any power below 1 kW! Had a fair number of 100W stations call, think that they were impressed with the 5W powers also. **K4UK**—Operated only a short time as Tom and Sue came by to pick up Grandma Elsie. But then we got snow on Friday morning. **K4ORD**—Just getting my feet wet in QRP, since I recently finished my new Elecraft K2 and am enjoying QRP. Looking forward to getting my QRP ARCI number soon. Been thinking of QRP for years but hard to get "big" rig down to accurate QRP power, but K2 works great. **AA4XX**—Top Band was pretty noisy on this end, with most signals just above the noise level. The big surprise was hearing W4BCU at 100 mW with good sigs throughout the contest.

2003 Holiday Spirits Homebrew Sprint

QTH	Call	QSOs	Score	Pts	SPC	Bonus	Power	Bands	Time	Rig	Antenna
AK	AL7FS	6	5630	30	3	5000	LT5	20	1.1	K2	KT34A @ 40'
CA	W6ZH	80	136025	325	51	20000	LT5	40,20,15,10	2.5	K2	KT34XA, yagi
	NK6A	64	91342	287	38	15000	LT5	40,20,15	3.75	K2	C4 @ 40'
	AD6GI	38	42888	166	24	15000	LT5	40,20,15	4	K2	Dipoles
CT	N1EI	20	47645	97	19	20000	LT250	80,40,20,15	4	OHR500	140' doublet @ 50'
FL	N4BP	172	383942	722	73	15000	LT5	40,20,15	4	K2	TH7DXX, 402BA
GA	K4BAI	76	109536	326	48	0	LT5	80,40,20,15	2.75	FT1000MP	TH6DXX, dipoles
	K4PQC	8	12800	40	7	10000	LT1	40,20	0.5	AT Sprint	Indoor ZL special
	KE2WB	16	11958	71	14	5000	LT5	40	1.2	K2	80m dipole
	WB6BWZ	21	11760	84	20	0	LT5	40,20	2.2	FT817	OCF @ 40'
	NG2J	22	11305	95	17	0	LT5	40,20	2.5	IC735	Random wire
IA	WØPWE	86	159240	364	41	10000	LT1	40,20	3.75	20m SST, NN1G xmtr	Open sleeve dipole
ID	K7TQ	88	188420	377	46	15000	LT1		4	K2	C4S @ 50'
IL	N9RY	30	27640	120	21	10000	LT5	20,15	1.75	K2	Inv vee in attic
	N9LTV	21	21592	92	18	10000	LT5	40,20	2.25	K1	Dipole
	N9WW	16	20915	65	13	15000	LT5	40,20,15	2	K1	44' doublet @ 35'
	K9FO	25	20200	95	16	5000	LT1	40	3	MFJ Cub	Vert
IN	K9PX	99	79501	367	29	5000	LT5	40	4	K2	80m loop
	K9NX	40	36544	158	24	10000	LT5	40,20	4	K2	40m inv vee
KS	KCØPMH	18	8505	81	15	0	LT5	40,20	2.5	FT817	132' wire
	WB0SMZ	4	5420	20	3	5000	LT5	20	1	NC20	Butternut Vert
KY	WB4KLI	22	21500	110	15	5000	LT1	20	3.25	Rockmite	TA53M
MD	WB8YYY	53	89155	235	39	25000	LT5	160,80,40,20,15	3	K2	OCF dipole, R5
	KB3WK	51	77720	222	26	20000	LT1	80,40,20,15	4	K2	Yagi, dipole
MI	NA8M	37	33989	149	23	10000	LT5	40,20	2	K2	CF Zepp @ 30'
MN	KEØG	57	70606	234	37	10000	LT5	40,20	3.25	K1	135' OCF @ 30'
MO	NØEVH	27	19278	102	27	0	LT5	20,15	1	FT817	80m loop @ 25'
	KØLWV	30	18018	117	22	0	LT5	40,20,15	2	TS520	40m dipole, 40m loop
NH	W1PID	5	462	22	3	0	LT5	40,20	0.25	FT900	OCF dipole
NJ	W2AGN	58	84367	257	33	25000	LT5	160,80,40,20,15	3.5	Multipig+	KT34
	KD2JC	41	53570	190	29	15000	LT5	40,20,15	3.5	K1, HW-9	40m loop
	W2JEK	5	10770	22	5	10000	LT5	40,20	0.5	OHR500	20m gnd plane, 40m dipole
NY	NY2LJ	6	16008	24	6	15000	LT5	40,20,15	1.5	K1,K2,KX1	TA33m, Vert
OH	W8TM	90	67937	333	27	5000	LT5	40	4	K1	40m inv vee
	W8VE		55960	260	28	5000	LT5	40	3.5	K2	40m rot dipole
	AB8FJ	18	24282	78	17	15000	LT5	80,40,20	3	DSW-II-20, SW-40, SW-80	End fed wire
PA	W3WH	34	25480	140	26	0	LT5	80,40,20,15	2		
	K3HX	20	13295	79	15	5000	LT5	20	4	NC20	Dipole
	WB3AAL	12	9560	57	8	5000	LT1	15	1.5	K2	Beam & Hustler 5BTV
TN	K4BX	68	113088	286	44	25000	LT5	80,40,20,15,10	4	K2	Dipoles
	KW4JS	17	21566	67	14	15000	LT5	40,20,15	2	K2	Vert
TX	W5KDJ	48	122100	204	35	15000	LT250	40,20,15	4	K1	PRO57B, long wire
	W5TA	70	65900	290	30	5000	LT5	20	3.3	Red Hot 20	Vert
VA	K4UK	67	111448	284	46	20000	LT5	80,40,20,15	4	K2	
	KK4R	59	85854	241	42	15000	LT5	40,20,15	3.6	K1, NC40A	130' doublet
	K2EKM	12	24800	48	10	20000	LT1	80,40,20,15	2	Rockmites	Indoor loop
WA	N7RVD	18	23736	78	16	15000	LT5	40,20,15	1	Six HB rigs	Tribander, 80m loop
	W7GB	14	10880	70	12	5000	LT5	20	1	K1	3 el beam
WV	K8KFJ	18	23190	78	15	15000	LT5	40,20,15	2.5	K1	Vertical

Holiday Spirits Homebrew Sprint Top Three Finishers

Call	Score	Name
N4BP	383942	Robert Patten
K7TQ	188420	Randy Foltz
WØPWE	159240	Jerry Hall

Holiday Spirits Homebrew Sprint Soapbox

K9FO—The MFJ Cub is a great little rig. Worked about everyone I could hear. **WB4KLI**—I've worked all states with the Rockmite, but it was rough going against 5 watts. I enjoyed the contest. **K4BX**—I wish more had tried 10, 15, and 80 meters, but it was a blast and I think that's the first time I sat through a whole contest. Thanks for the contacts. **KD2JC**—Enjoyed this one. Nice break from holiday rush. Long live QRP & QRP ARCI. **K9PX**—Thanks, Randy, for your work as contest manager, on this your last contest. **N9LTV**—Had a good time. Worked the last 2 hours and wished I had worked the entire four! **KØLWV**—Good conditions here. **KG6WP**—Used the club station K6BJ yagi for 1-1/2 hours of the contest. Worked 15 m only. **K3HX**—Another fun QRP contest! Poor conditions. **KCØPMH**—These sprints are a real blast. This is becoming my favorite style of contest! **N9RY**—Still amazed at how well 4 W and attic antennas get out. Thanks to all. **NY2LJ**—Nice to work with these rigs, but I'm still not a contestor. I'm a chatter. Tnx! **N1EI**—Bands were noisy with lots of buzzsaws and birdies. Lots of fun anyway! **W1GB**—I just got done wiring this K1. This was a nice "maiden voyage." **W8VE**—Tnx for sponsoring sprint. This is 1st sprint I was in using my K2 XCVR. I like the 4 hour contest. I also worked the ARRL 160 meter contest at night. See you next year. **N7RVD**—So many radios, so little time. With chores and errands, I just didn't have 4 hours free to work the contest. So, to make it interesting, I decided to try to make at least one contact with 6 different homebrew rigs. In order of appearance: Compact W7EL DC – 1 QSO on 40m, 29er – 1 QSO on 20m, 20M SMK-1 – 2 QSOs on 20m, 20M W7EL DC TFR – 3 QSOs on 20m, Elecraft K2 – 10 QSOs on 15m, Classic W7EL DC – 1 QSO on 40m. Of course, they all used different plugs, jacks and cables. It was a mad scramble just like a last minute Field Day setup—in other words, a real blast!! Thank you to everyone for a great contest. **WB8YYY**—Wow this was a lot of fun. Glad to find W2AGN on 160m to give me another band. Yes I should have at least tried 10m for a band sweep. **K8KFJ**—Big games on the NFL schedule sure played havoc with operating time but it was necessary that I have my ARCI fix. HI! Would have liked to have gone to 80m near the end but only have 15-20-30-40 in the K1. It seems I'm always able to work loyal ARCI folks in ARCI events that I don't hear and work elsewhere. :-) Thanks to Randy and others at ARCI who sponsor these operating events making it possible for us to play radio and have fun. **N4BP**—20M closed early as it has been of late. 40M sounded very good for a change. Felt like I was doing well, but then looked at last year's log—I forgot about the obvious, last year 10 & 15 were in much better shape. **W3WH**—I'm not homebrew but I had a lot of fun. **KK4R**—Had a great time trying out my K1. It is a great rig. **AB8FJ**—Had a great time using the DSW-II-20, SW-40 and SW-80. **W6ZH**—10 meters was open, but nobody there (except K4BX!). **WØPWE**—Conditions were pretty good for a change. Thanks for a fun contest. **K4BX**—I wish more had tried 10, 15 and 80 meters! But it was a blast and I think that is the first time I sat through a whole contest. Thanks for the contacts. 72! **W2AGN**—Operated with Multipig+ rig on bench with clipleads. Also 40 feet of my FW loop on the ground. Still was able to make that important 160M QSO. **NA8M**—Good conditions on 20M and lots of activity on 40M. Thanks to all that worked me! **K4PQC**—I was trying to operate the Telephone Pioneer QSO party at the same time. **K4UK**—Not quite as much activity as last year. And 10 Meters was a complete bust, couldn't get even one QSO for the 5,000 bonus points. But, I really do enjoy these Sprints. **WB3AAL**—I had a fun time as usual. 15 Meters dropped out an hour after the start of the contest. **W5KDJ**—Slow contest but had lot of fun. 7 Mhz opened early. **W5TA**—Great sprint! Worked 20m only. Band conditions were excellent. A lot of the QRP signals were 599 some running 1W (sorry guys, you got a 559 anyway from the logging program). The activity sounded like sweepstakes or field day. But, unfortunately, there was a down side to so much activity. It creates a problem when we are squeezed between the FISTs frequency of 14.058 MHz and the digital boys who are always pushing down from 14.065 ever closer to 14.060 MHz. Somehow we have to find a way to spread out below 14.055 MHz (there's a net on 14.055 a lot of the time). And, I hate to say it, but some of our QRP friends need a lesson in contest etiquette. You don't just start CQing on a frequency. First you listen, then you send "QRL?" listen again, and send QRL again before sending CQ. The down side of the contest for me was having stations jump on my CQ frequency and start blasting away with their CQ. There just weren't enough "slots" between 14.059 and 14.064 to accommodate all the participants and it sometimes broke into a rather rowdy slug fest.. If we can't expand up (digital), can we grow down (14.040 to 14.055 MHz)? **NØEVH**—Happy Holidays to All; Cud only play 1st hour, lots of signals on 20 and 15. Great time, thanks for the contest. **K4SV**—Fun contest but need more people involved. Calling CQ to myself. Had fun using my Homebrew rig however. **K2EKM**—Used four VXO-controlled RockMites on 80 (900mw), 40 (900mw), 20 (800mw), 15 (400mw). Antennas: indoor 60 ft. horizontal loop up 6 feet (15, 20), HFp portable vertical (40,80). Was really neat to be able to use Rockmites on all four bands. 80 was nip-and-tuck...kept listening for activity when finally heard signals during the final half-hour. Many thanks to those who demonstrated supreme patience and sharp hearing to pull my pea-sized signal out of the background! **K7TQ**—A great way to end a fun packed radio week. 1st the CQWW, then the Spartan Sprint, followed by the QRP ARCI Top Band Sprint, which lead to the ARRL 160 M Contest, and finally the Holiday Spirits Contest. Now we've got the ARRL 10 M, the Stew Perry, and the RAC Winter contest to look forward to. Whew, I think I'll go to work and recover. Thanks for all the contacts! **NK6A**—It was a perfect day to operate this contest. 15 and 20 were in decent shape. My new logging sofware and rig interface seem to be working and then my keyer decides to stay key down. I had to put the rig in test mode and open up the keyer to remove the battery to get it to

2004 Winter Fireside SSB Sprint

Call	ST	Pwr	Pts	S/P/C	Mult	Bonus	Score	Time	Bands	Rig	Antenna
WDØT	SD	LT5	216	43	7	0	65016	4.00	80.40.20.15.10	TS940S/5w	250' Loop
N9NE	WI	LT10	219	40	7	0	61320	4.00	10,20,40, 80	K2 #1429	265' Doublet, 40M Rot. Dipole, Tribander
K5YC	NM	LT5	139	23	7	0	22379	2.50	40.20.15.10	IC706MkIIG/2W	5 EL Triband @60'
WB4KLI	KY	LT5	110	19	7	0	14630	3.25	20	FT-817	Mosley TA-53 M
N9DI	IL	LT10	78	14	7	5000	12644	2.00	20	FT-817	Buddipole Portable Dipole
N9MDK	IL	LT5	62	11	7	5000	9312	2.00	20, 15	FT817	Iron Horse ATOC, HF Monoband Stick
N3TLQ	PA	LT10	38	10	7	5000	7660	1.00	20	?	Hamstick
KCØPMH	KS	LT5	51	10	7	0	3750	3.33	20.40.80	FT817	102' Doublet
WWØWB	CO	LT5	22	5	10	0	1100	4.25	20	FT301/1.5W	Shakespeare NBS-2010 @ 39'
N7PPF	CA	GT5	21	6	7	0	882	1.00	20.15.10	TS440S	End Fed Wire
NK6A	CA	LT5	25	5	7	0	875	1.50	20.15.10	K2	Force 12 C4
W4DU	GA	LT5	19	5	7	0	665	1.00	20	K2	CL33 @ 50'
W1PID	NH	LT5	20	4	7	0	560	?	20.15	?	?
KØLWV	MO	GT10	32	7	1	0	224	1.00	20	TS-520/100W	Dipole @ 20'
AB8FJ	OH	LT5	10	2	7	0	140	0.50	20	Argonaut II	End Fed Wire

stop. Only mishap of the day. There were some big signals out here in Calif. **WB5KHC**—Jumped in for a couple hours for the fun and to add a few more points to the winner's totals. **AL7FS**—Very tough conditions from Alaska. I thought I had a good contact with NØRC in Colorado but his email says not. Maybe next time. I copied but could not work N4BP. Thank goodness for CA, WA and ID stations or I would be skunked. W6ZH in CA turned his beam my way and came up to 599, that was nice. Thanks everyone. **KEØG**—Thanks to all who dug my signal out of the mud! See you next test. **AD6GI**—Condx had lots of QSB, but still had fun. Tried 10M several times, but had no luck. Maybe next time. **WB6BWZ**—100% S&P: 80 was too noisy. 10 & 15 were zilch. Slow, deep QSB on 40 & 20. K5LG/m, a one-watt mobile (at rest), had an honest 599 in GA when we worked on 40m. Be interesting to know what type of antenna he was using.

Winter Fireside SSB Sprint Soapbox

Great fun once again. It seems every ham (except QRPers) has a net or schedule set for Sunday afternoon on or near the QRP calling frequency (even with a + or - of 10 as suggested). I found people working the contest all over 20 meter SSB. I'm looking forward to the next one. Good luck to all. *—Larry Johnson, WB4KLI*

Winter Fireside SSB Sprint
Top Three Finishers

Call	Score	Name
WDØT	65016	Todd Dravland
N9NE	61320	Todd Fonstad
K5YC	22379	Jim Crawford

Fun contest, pretty good conditions on 15m; 20m was very noisy and difficult until near the end. Was fun to work a lot of the regulars. Thanks for the short by enjoyable contest, and see you again!

—73-72 Todd Dravland, WDØT

I was going to take a couple of hours and jump into the Sprint with my IC-751A set for 5W. But .... I can't find the mike !!! I must've spent 45 minutes looking for the blasted thing! I must have accidentally tossed it last year when I was doing a major basement cleaning. Sheeesh!

—73 de Larry, W2LJ, Vivat Morse!

Was great fun BUT, I gotta get an SSB filter before I do this one again!

—Wayne Dillon, KCØPMH

Good contest for a while. 10 & 15 went out early here. Much QRM on 20 from AM stations. Where were the 6s? Ran 2 watts out this time. *—Jim Crawford, K5YC*

Struggled to get 5 contacts! *—Ken Evans, W4DU, Vice President, QRP ARCI*

My first QRP SSB contest! K5YC had a BIG 2W signal. I didn't hear anyone on the other bands. *—Larry Mergen, KØLWV*

A cold day in northern Illinois for portable operation! Thanks for catching my math error. I was so excited just to be able to make the contacts, while slowly freezing just to be portable, that I rushed to get the results filed. I was surprised at the lengths we hams go just to prove we can operate portable. I enjoyed the challenge.

—Gregory Cise, N9MDK

VERY rough conditions. Lots of stations w/lots of power, very little room for QRP stations. 72 and TNX to all who heard my 1.5 watts. *—Bill Blake, WWØWB*

Great to hear voices of QRPers with whom I've traded CW contacts over the years. Thanks to the west coast 10-10 contest crowd on that band for many Qs. 40 & 80 meters were bears for mini-power operation. Did the "hat trick" with AC4XO, K5YC and KCØPMH. Kudos to QRP ARCI and Tom for making this possible!

—Todd Fonstad, N9NE

I'm sorry my log sheets are a mess, but it's my first contest. Thank you for prodding me to get this in. Even if I come in last; I had a great time.

—Jim Smith, N7PPF

●●

CU in the next QRP ARCI Contest!

QRP ARCI Contest Entry Form

QRP ARCI Contest: _____ **Mode:** _____

Call _____ **QTH** _____ **ARCI#** _____ **Highest Power Used** _____

Multiband/Singleband (circle one)

BAND	QSOs	POINTS	S/P/C
160			
80			
40			
20			
15			
10			
Totals			

Enter Points and S/P/C **PER BAND**. Treat each band separately for S/P/C credit.

Total points and S/P/C's before inserting them into the equation below.

Multiply points, S/P/C's and Power Multiplier then add your Bonus Points, if any.

Mail your form to: Tom Owens, WB5KHC
1916 Addington St
Irving, TX 75062-3505

or e-mail to: **wb5khc@2hams.net**

Total Points X Total S/P/C X Power Multi + Bonus Points = **Final Score**

—— X —— X —— + —— = ——

Total Operating Time _____ Highest Pwr Output Used _____
Transmitter/Transceiver _____
Receiver _____
Antenna(s) _____
Comments _____
_____

Name _____ Call _____
Address _____
City _____ State ____ Zip _____
e-mail _____ (In case of question/comment, please)

S/P/C Calculation Form for QRP ARCI Contests

160 mtrs		80 mtrs		40 mtrs		20 mtrs		15 mtrs		10 mtrs	
S/P/C	Pts.	S/P/C	Pts.	S/P/C	Pts.	S/P/C	Pts.	S/P/C	Pts.	S/P/C	Pts.
AK NB		AK NB		AK NB		AK NB		AK NB		AK NB	
AL NS		AL NS		AL NS		AL NS		AL NS		AL NS	
AR PEI		AR PEI		AR PEI		AR PEI		AR PEI		AR PEI	
AZ QC		AZ QC		AZ QC		AZ QC		AZ QC		AZ QC	
CA ON		CA ON		CA ON		CA ON		CA ON		CA ON	
CO MB		CO MB		CO MB		CO MB		CO MB		CO MB	
CT SK		CT SK		CT SK		CT SK		CT SK		CT SK	
DE AB		DE AB		DE AB		DE AB		DE AB		DE AB	
FL BC		FL BC		FL BC		FL BC		FL BC		FL BC	
GA NF		GA NF		GA NF		GA NF		GA NF		GA NF	
HI LB		HI LB		HI LB		HI LB		HI LB		HI LB	
IA NWT		IA NWT		IA NWT		IA NWT		IA NWT		IA NWT	
ID YT		ID YT		ID YT		ID YT		ID YT		ID YT	
IL NU		IL NU		IL NU		IL NU		IL NU		IL NU	
IN List DX		IN List DX		IN List DX		IN List DX		IN List DX		IN List DX	
KS		KS		KS		KS		KS		KS	
KY		KY		KY		KY		KY		KY	
LA		LA		LA		LA		LA		LA	
MA		MA		MA		MA		MA		MA	
MD		MD		MD		MD		MD		MD	
ME		ME		ME		ME		ME		ME	
MI		MI		MI		MI		MI		MI	
MN		MN		MN		MN		MN		MN	
MO		MO		MO		MO		MO		MO	
MS		MS		MS		MS		MS		MS	
MT		MT		MT		MT		MT		MT	
NC		NC		NC		NC		NC		NC	
ND		ND		ND		ND		ND		ND	
NE		NE		NE		NE		NE		NE	
NH		NH		NH		NH		NH		NH	
NJ		NJ		NJ		NJ		NJ		NJ	
NM		NM		NM		NM		NM		NM	
NV		NV		NV		NV		NV		NV	
NY		NY		NY		NY		NY		NY	
OH		OH		OH		OH		OH		OH	
OK		OK		OK		OK		OK		OK	
OR		OR		OR		OR		OR		OR	
PA		PA		PA		PA		PA		PA	
RI		RI		RI		RI		RI		RI	
SC		SC		SC		SC		SC		SC	
SD		SD		SD		SD		SD		SD	
TN		TN		TN		TN		TN		TN	
TX		TX		TX		TX		TX		TX	
UT		UT		UT		UT		UT		UT	
VA		VA		VA		VA		VA		VA	
VT		VT		VT		VT		VT		VT	
WA		WA		WA		WA		WA		WA	
WI		WI		WI		WI		WI		WI	
WY		WY		WY		WY		WY		WY	
WV		WV		WV		WV		WV		WV	

Created by Tom Owens, WB5KHC

Your Call _____ PointsTot____ X S/P/C Tot____ X PwrMult ____+ BonusPts ____ = Score____

A 40-Meter Star Antenna

L.B Cebik—W4RNL cebik@cebik.com

The horizontally oriented 1-wavelength square loop is a fairly standard low-HF amateur antenna. It lends itself to use with parallel feedline for multi-band application. However, a 1-wavelength loop tends to radiate broadside to the loop. Therefore, the antenna tends to provide better performance on bands above the lowest.

The Standard Square and the 4-Pointed Star Loops

The need for a longer circumference is often at odds with amateurs wwho have only limited space for wire antennas on the lower HF bands. However, one way to increase the circumference of a loop without increasing its footprint is to draw in the 4 sides of the loop toward the center. The result is a 4-pointed star configuration. Figure 1 shows the difference between the standard and star loops, as viewed from above (or below, as the case may be).

Figure 1 also provides us with a key to the main dimensions of the loop and the star. The length of a side for a square horizontally oriented loop is also the length of one side of its footprint. For the 40-meter (7.15 MHz) test case, each side of the loop is about 36.2 ft. long for a near resonant loop. This provides an antenna and a footprint circumference of 144.8 ft. or about 1.05 wavelengths at 7.15 MHz for a near-resonant loop. On the right side of Figure 1 is the star. Here, we must distinguish between the wire length and the footprint. For a near resonant loop, we require a footprint side dimension of about 31.9 ft., which results in a footprint circumference of 127.6 ft. This dimension set is actually smaller than for the square loop. However, as shown in the sketch, each wire is stretched inward toward the center. We cannot make the wire touch at the center, but we can come in rather close. The most radically inset case that I have so far explored positions the apex of each angle formed from the side wires at 1.75 ft. from the antenna center. This yields a distance of about 3.5 ft. between opposing points. The resulting wire length for each side of each point in the star is about 21.35 ft. The total wire circumference thus becomes about 170.8 ft. or close to 1.25 wavelengths.

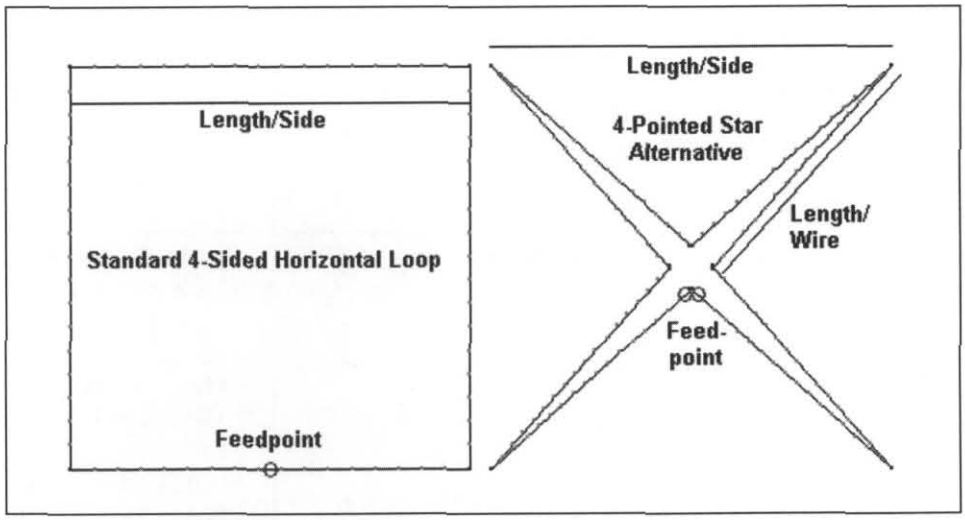

Figure 1—Comparison of a standard 4-sided horizontal loop and a 4-pointed star alternative configuration.

We can compare the potential performance of the two configurations on 40 meters via the following table of modeled results (see Table 1).

Several aspects of the tabular data are significant. First, the 40-meter gain of the two versions of the loop is virtually the same. However, the elevation angle of maximum radiation is considerably lower in the star version. Figure 2 graphically illustrates these matters by showing the two azimuth patterns, each at is respective TO angle, to exactly overlay each other. However, the elevation pattern of the star along the axis of maximum radiation has a noticeably lower angle of maximum radiation (take-off or TO angle).

Second, if operation is contemplated only on 40 meters, then the impedance of the star configuration is suitable for a coaxial cable as the feedline Either 50-ohm or 75-ohm cable will do. For similar operation, the square configuration would require either the use of a parallel feedline or the use of a 4:1 balun with a 50-ohm coaxial cable feedline.

Third, the star configuration is not especially sensitive to just how far toward the array center we push the insets. The distances from center shown may be doubled to see how far apart we may place the inner points of the star. There is considerable room for variation before we lose our advantage over the quare loop in terms of TO angle. However, note that the 3.0 ft. inset has bumped the TO angle upward one notch. As we further move the inner start points away from center, the antenna slowly returns to the characteristics of a simple square loop.

The principle behind the star is an attempt to increase its wire circumference length without increasing its footprint. The 0.2-wavelength increase, while not giving us the almost pure edge-wise radiation of a 2-wavelength loop, does raise the entire wire length in the star loop to 1.25 wavelengths. That much length is sufficient to lower the 40-meter radiation angle by a noticeable amount.

The Square Loop as a Multi-Band Wire Antenna

The square loop allows us to feed the antenna on higher bands, relative to the base-line 40-meter band to which we have cut it. We can summarize the performance with the following tabulated samples for the HF bands.

With exceptions, the patterns generally are strongest in a line through the feedpoint and the corresponding center point of the wire opposite. We may call this the main axis of the antenna. On two bands of high interest, however, the patterns depart from the noted tendency.

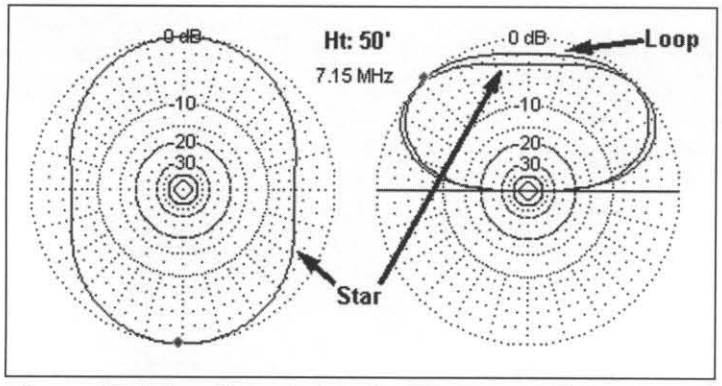

Figure 2—Azimuth and elevations patterns: 40 Meter loop and star.

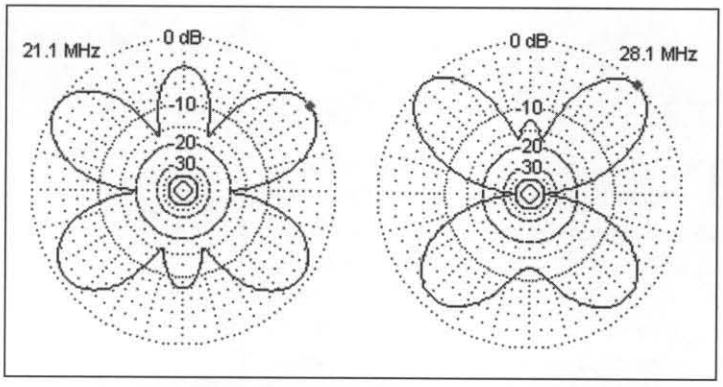

Figure 3—40-Meter standard square horizontal loop: two bands with irregular azimuth patterns.

Antenna Type	Gain dBi	El. Angle Degrees	Feed Z R ±jX ohms
Square:	5.54	47	157.5 –j 6.3
Star: 1.75' insets	5.50	39	65.7 +j 9.0
Star: 2.0' insets	5.50	39	66.8 +j 12.0
Star: 3.0' insets	5.50	40	71.1 –j 0.6

Antenna Height 50 ft. Antenna wire AWG #12 copper. "Insets" refers to the distance of the limit of the star side inset point from the exact center of the array.

Table 1—Square and star loop performance at 7.15 MHz.

Freq. MHz	Gain dBi	TO angle Degrees	Feed Z R ±jX ohms	Pattern Shape
7.15	5.5	47	160 –j 6	Oval
10.125	4.8	32	3060 +j 3140*	Almost square
14.1	8.5	19	275 +j 20	4-leaf clover
18.1	7.2	16	1035 +j 1480*	wobbly oval
21.1	8.7	13	255 +j 55	4 main lobes, 60 degrees off axis
24.95	8.0	11	1230 –j 1380*	6 near-equal lobes
28.1	10.8	10	265 + j 115	4 lobes 45 degrees off axis

Table 2—40-Meter square loop performance (50 ft. height).

Figure 3 shows the azimuth patterns of the square loop on 15 and 10 meters, with the axis presumed to run vertically on the page. The 15-meter pattern forms a sort of butterfly, with small lobes along the antenna axis. However, the strongest lobes are angled to the sides by about 60 degrees. The 10-meter pattern has only 4 notable lobes, each about 45 degrees off axis.

We may also note in passing the starred entries in the feedpoint impedance (Feed Z) column. Each of the non-harmonic bands presents an impedance where the resistance and the reactive components are both above 1000 ohms. Without careful attention to the characteristic impedance and length of the parallel feedline used, the impedance at the antenna tuner terminals may fall outside the range of values that it can match.

Freq. MHz	Gain dBi	TO angle Degrees	Feed Z R ±jX ohms	Pattern Shape
7.15	5.5	39	65 +j 10	Oval
10.125	6.7	26	6820 –j 7650*	Diamond
14.1	9.3	19	540 +j 1850*	4-leaf clover
18.1	6.9	16	925 +j 75	Broad beam: F/B 5.2 dB
21.1	6.2	13	945 –j 1270*	Broad beam: F/B 1.3 dB
24.95	6.8	11	55 +j 340	Broad beam: F/B 2.5 dB
28.1	6.9	10	715 –j 670	Triple forward lobes

Table 3—40-Meter star loop performance (50 ft. height).

The 4-Pointed Star Loop as a Multi-Band Antenna

We may perform the same modeling experiment with the 4-pointed star loop to evaluate its potential as a multi-band antenna for 40-10 meters. The results appear in the following table.

For the entries called "Broad beam," the direction of maximum gain is toward the side of the star containing the feedpoints. If we overlay the outline of the antenna on top of the azimuth patterns in Figure 4, the feedpoint will be above the plot center line across the page.

The patterns show one potential advantage of the star as a multi-band antenna. On all bands, there is a main lobe along the antenna axis through the feedpoint. Hence, the user is always aware of the direction of strongest signal. (30 meters is the one exception, but the main lobe to the reverse of the feedpoint side is only 0.7 dB stronger than on the feedpoint side, a difference that will not be detectable in operation.) Although the beam action—that is, having a front-to-back ratio—is small, the reliability of having the main lobe along the same axis on every band used is a distinct plus.

There are three bands on which the reactance rises above 1000 ohms. However, only on 30 meters are the values for both resistance and reactance so high as to create a very distinct problem for matching the feedline termination to the transceiver 50-ohm system. ...Why?

The distinctness of the square loop and the star loop patterns

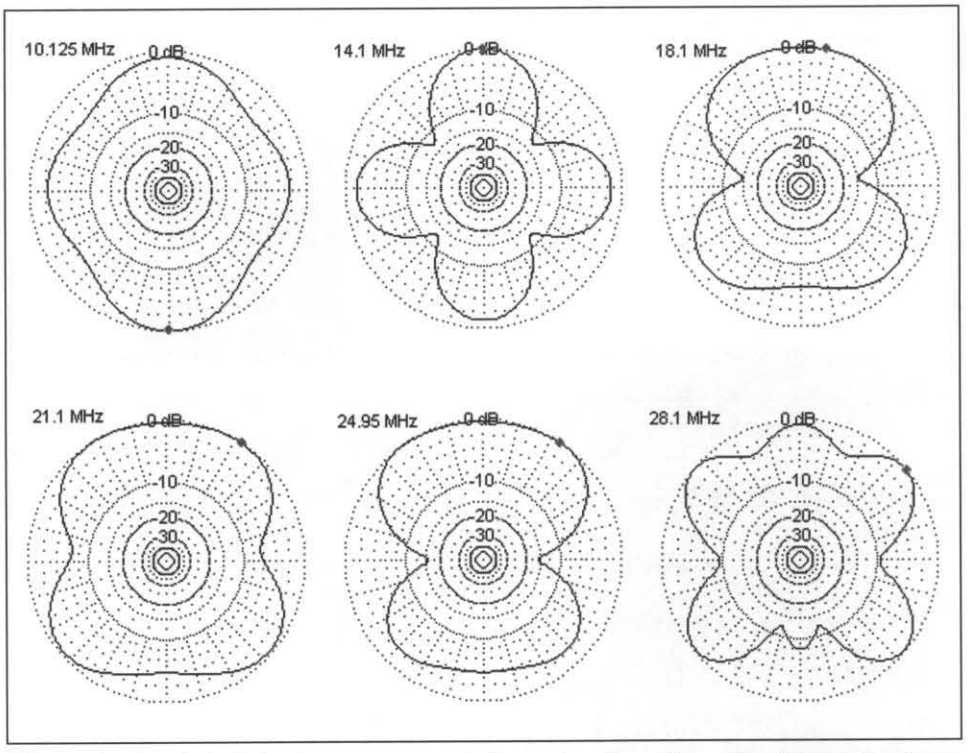

Figure 4—4-pointed star loop: representative azimuth patterns for the bands above 40 meters.

should arouse some curiosity as to the reason for the differences. Figure 5 provides a partial answer.

The upper diagrams compare the relative current magnitude distribution of the two loops on 40 meters. The current on the star remains higher further outward toward the array corners than on the square loop, and this phenomenon plays a role in lowering the elevation angle of maximum radiation (the take-off or TO angle). Otherwise, the gain and pattern shape of the 2 versions of the loop are the same.

The 15-meter case is especially interesting. For the star loop, the current magnitude peaks and valleys appear in close proximity along the outward star-point wires. Hence, the currents (or, more properly, the fields that result) tend to simply add to or subtract from each other—with due place given to the phase of each current magnitude sampled. However, in the square loop, we have current magnitude peaks more linearly separated from each other, with distinct peaks at the four corners of the array. The result is the 6-lobes pattern, with the largest lobes at a considerable angle from the axis of the antenna.

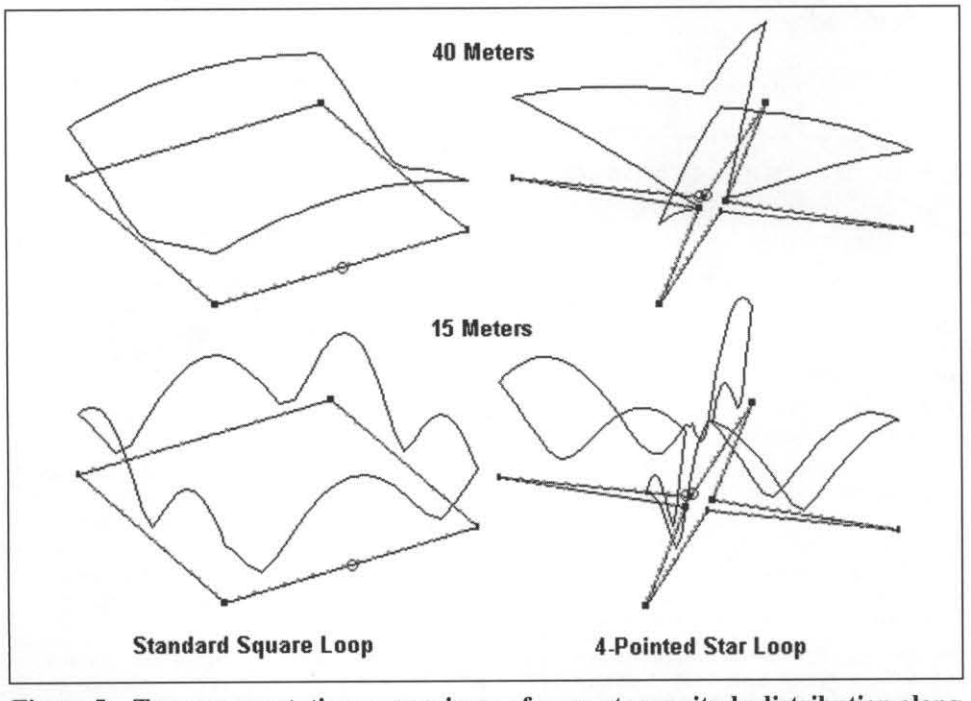

Figure 5—Two representative comparisons of current magnitude distribution along the wires of two types of loops.

These brief notes suggest that for some users of square loops, modification to a star design may be useful. The array dimensions for 40 meters will easily scale to 80 and 160 meters, although most users will have difficulty in scaling the height as well as the wire length. Since we are only approximating resonance on the lowest band of use and presuming parallel feedline to an antenna tuner, fussiness with dimensions seems out of place. Since the wire of the antenna has a small diameter relative to a wave length, any 50-ohm resonance on the lowest band of use is likely to be a very narrow-band phenomenon.

Nonetheless, for the loop-user who wishes a lower TO angle on the lowest band of use and a pattern that has a maximum along the axis of the antenna on every band used, the 4-point star is viable alternative to the standard square loop. The cost is less than 20% more wire, which is likely to be the cheapest part of the antenna anyway. The star loop is not an answer to every loop problem. However, it does show that it pays to explore different wire geometries to see whether they have any potential for use. ●●

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QRP Quarterly (ISSN applied for) is published quarterly in January ("Winter"), April ("Spring"), July ("Summer") and October ("Fall") by Summit Technical Media, LLC, 3 Hawk Drive, Bedford, NH 03110. Periodical postage paid at Manchester, NH and at additional mailing offices.

POSTMASTER: Send address corrections to QRP Quarterly, P.O. Box 10621, Bedford, NH 03110-0621. Subscription information: (603) 472-8261.

Subscription prices (all in U.S. dollars): Domestic one year $18, two years $36; Canada one year $21, two years $42; Elsewhere one year $23, two years $46.

QRP Quarterly is the official publication of the QRP Amateur Radio Club International (QRP ARCI), which is responsible for all editorial content. Editorial submissions should be sent to the Editor, Technical Editor or an Associate Editor. See the staff listing on page 3 of each issue.

This magazine is published under agreement with QRP ARCI by Summit Technical Media, LLC — Business Office: 7 Colby Court, Suite 4-436, Bedford, NH 03110, tel: 603-472-8261, fax: 603-471-0716; Production and Advertising: 6666 Odana Road, #508, Madison, WI 53719, tel: 608-845-3965; fax: 608-845-3976.

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