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QRP Quarterly

Volume 45 Number 1
Winter 2004
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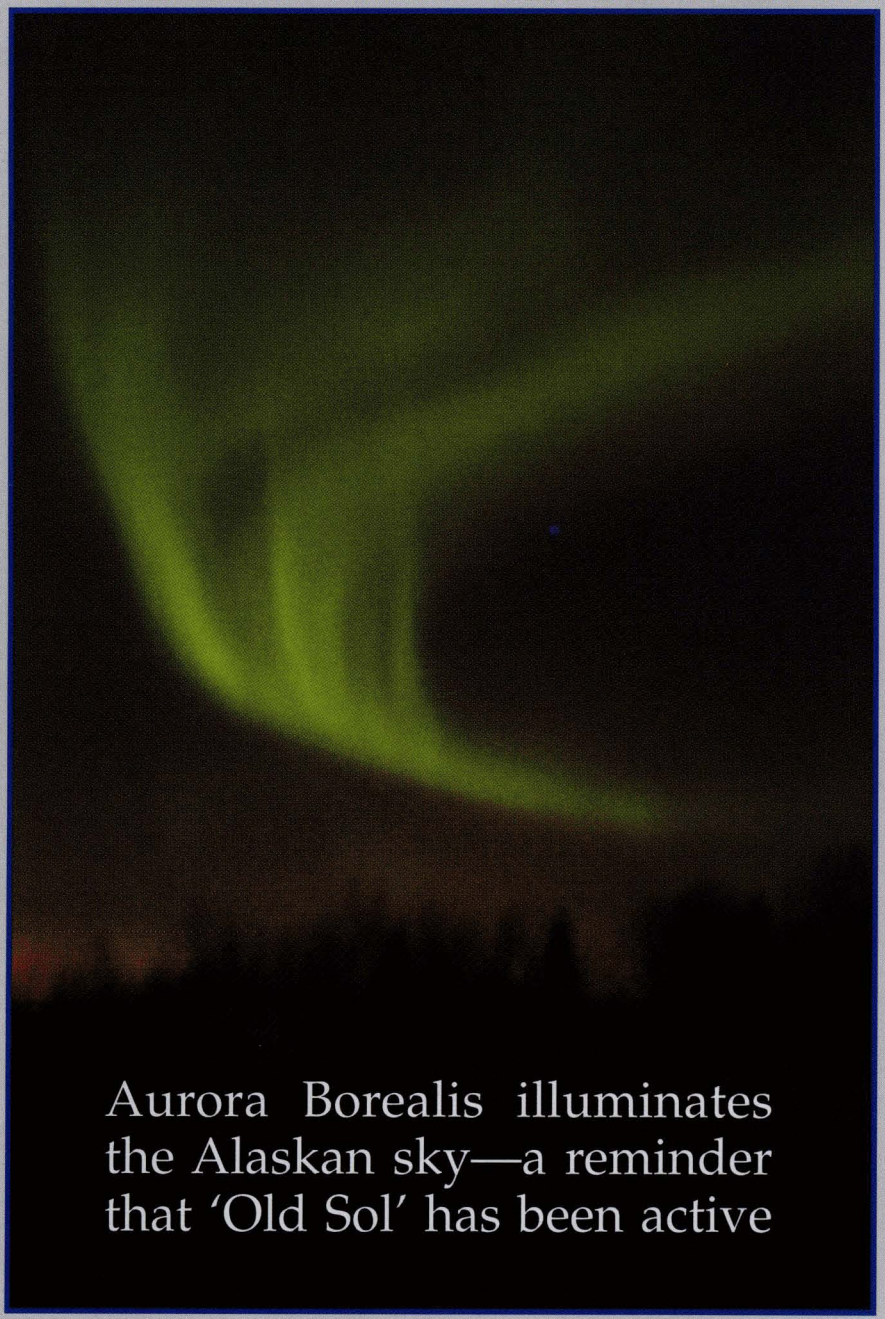
Journal of the QRP Amateur Radio Club International



Aurora Borealis illuminates the Alaskan sky—a reminder that 'Old Sol' has been active

- *QRP Quarterly* Reviews the Elecraft KX1
- The First "Great Alaska Ptarmigan Hunt"
- QRV? 'Recycled Rocks' –or– The Art of Grinding FT-243 Crystals
- GØBPS Reports on the 2003 G-QRP Club Convention
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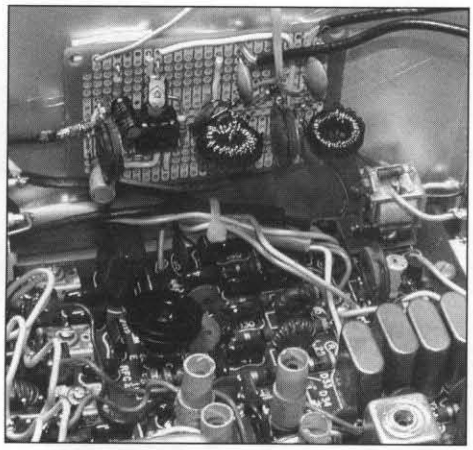

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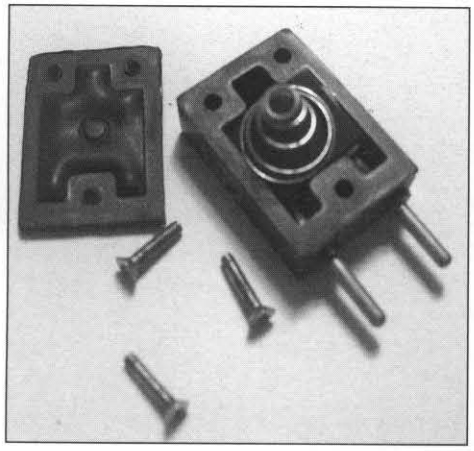

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Technical Articles

The Joy of QRP

The World of QRP ARCI

From the Editor's Desk

Mike Boatright, KO4WX—Editor ko4wx@mindspring.com

In her song, "Se Ilden Lyse" (Fire In Your Heart, Svein Gundersen/Jan Vincents Johannesen), Sissel Kyrkejbo—now known only as "Sissel"—invites the listener to:

Go to the land with the heaven aglow
Go to the home of the troll and the snow
Lead your dream by the hand
To wonderland

The lyrics are about her homeland, Norway. The "heaven aglow," of course, is the Aurora Borealis, which is seen quite often in that magical "North Land."

Although it can appear at just about any time, the Aurora—at least in my mind—is most often associated with cold winter nights in the northern latitudes. The Aurora has been particularly prominent this fall and winter—and has even been seen as far south as Houston, Texas and Atlanta, GA!

Funny how something so beautiful can also lead to signal reports like "UR RST 545" and worldwide radio blackouts.

To me, there is something magical about the Northern Lights—I have only seen them once, when I was in Lillehammer, Norway in 1994.

On my last day in Norway-the day after the Closing Ceremonies of the 1994 Winter Olympic Games, I was driving back to Lillehammer, from Hammer, the site of the Figure Skating, Short Track, Speed Skating and Hockey. As I drove the mountain roads back to our rented house, I was completely awe-struck by the tremendous outpouring of National pride that the Norwegians showed after successfully hosting "the best Winter Olympics ever" (spoken by Juan Antonio Samaranch, IOC President). It seemed like every single home had the National flag proudly displayed—they were proud and deservedly so.

"You've got a fire in your heart" Sissel goes on to sing, about her country. Yes, she's right. They do.

On page 58 of this issue, you will find a very long list of amateur radio operators who all have a fire in their hearts. It is a list of articles and their authors that have appeared in *QRP Quarterly* in the past five years (the list would be a LOT longer if we went back even further, but we simply don't have the room).

Recently, I asked a former columnist if he would be interested in writing again for the magazine. Not only did he say "yes" without blinking an eye, he was genuinely excited about the prospect!

What is truly remarkable about this esteemed crowd of amateurs is that not a single one of them was paid for their articles-and some have written a LOT of articles. The only thing that they receive in return for their efforts is the respect of their peers and the satisfaction of knowing that they have contributed to their hobby.

It has been said that the more that you give away, the more you get in return. Some of these hams must be very rich indeed!

I am also reminded by the personal recent experience of losing my Elmer that "you cannot take it with you" when you move on to the big hamshack in the sky-that the legacy that you leave behind is that which you shared with others while you were here.

These days, it seems that the instant communications afforded by the Internet is rapidly overtaking older forms of sharing information—and in particular, print media. Although many didn't care for his style or his opinions, no one can deny that Wayne Green and his magazine, *73*, had a tremendous impact on the hobby, and particularly on QRP.

We recently received a very nice "obituary" from Jim, "Dr. Megacycle," KK6MC lamenting that *73* had ceased publication. Jim said, "Through this all, Wayne published a QRP column. This was almost always useful, and towards the end,

(contined on page 5)

From the President

Dick Pascoe—GØBPS

president@qrparci.org

Welcome to the wonderful world of QRP once more as we enter a new year with several changes in the top echelons of QRP-ARCI. Firstly, I would like to thank Joe, KK5NA for his work as President over the past two years.

I am delighted to take over the office of President of QRP ARCI, a high honour indeed for anyone but being the first non-American and a Brit at that—Wow! I shall try to do my best for the club and make it a little more international as the title reminds us. Although I live some 3000 miles from the USA; the Internet has shrunk the world to a large extent where I can exchange emails with the Board of Directors and get decisions (almost) by return.

I welcome Ken Evans, W4DU as Vice-President. I have known Ken for many years and we have become friends who also work together very well. I have known Hank, K8DD and Danny, K3TKS for many years too and during the past four years I have also gotten to know the others on the BOD and I can assure members that we have not only a good team, but a great team. This can only be good news for the club.

We are getting a more international flavour as time goes by and I welcome the opportunity to expand it more with our new Web Page manager, Steve Fletcher, G4GXL. Please do check the web pages often and let the webmaster know of any ideas you might have. Other exciting things are also happening with the *QRP Quarterly* under the excellent leadership of Mike, KO4WX, a man of whom I have the highest regard.

The past 12 months have seen some real heavy work by the Officers and the BOD with many difficult decisions being made, remade and eventually agreed upon. Believe me the BOD have earned their rewards this past year. Perhaps a pay rise would be in order—how about 25%?

Other changes in the system are brought about by Ken, I and Jim Larson AL7FS leaving the BOD, and so we welcome three new members of the Board, who will all begin their four-year terms in April, 2004: Bill Kelsey, N8ET; Ed Hare, W1RFI; and Mike Boatright, KO4WX. Please join me in congratulating these fine QRPers who have stepped forward to help set policies and practices for the club.

Finally, Randy, K7TQ, is stepping down as QRP ARCI Contest Chairman, and I am delighted to report that Tom Owens, WB5KHC, our current certificate manager has agreed to take over. He will start with the Spring QSO Party. Thanks Randy for a job well done!

The officers and the BOD of the club do a great job and all for free. Please do show your appreciation when you meet them at Hamfests. Talking of Hamfests, I would love to see more exposure at these and any member can assist on these.

Breaking news: the club will be printing a small booklet about the joys of CW and how to get your speed up. A great read written by Ron "Monte" Starke KU7Y this will be available from the ""Toy Store."

I am planning to be at Dayton again in 2004 and hope to meet many of you. We need your input to keep the club fresh.

You can always contact me via e-mail at president@qrparci.org with your ideas, comments and suggestions.

—TFN de Dick Pascoe GØBPS

Announcements

New Members of the QRP ARCI Board of Directors

In the Fall 2004 issue of the *QRP Quarterly*, Joe Spencer issued a call for nominations for three positions on the Board of Directors that will be vacating in April 2004. Seven nominations were received, and of those, three are willing to serve. Since we have three vacancies, all candidates are running unopposed, and therefore will become members of the Board of Directors in April 2004.

The three new members are highly qualified and well known QRPers:

Bill Kelsey, N8ET—Bill Kelsey is an accomplished QRP operator and writer. He also owns Kanga US, a provider of numerous QRP kits.

Ed Hare, W1RFI—Ed Hare is a well-known QRP author and operator. He is the ARRL Laboratory Manager.

Mike Boatright, KO4WX—Mike Boatright is well known for his articles in the *QRP Quarterly* and other publications. He is the current ARRL SEC for Georgia, and is the *QRP Quarterly* Editor.

Bill Kelsey, N8ET
kanga@bright.net

Bill was first licensed in 1962 as WN2FGA while growing up in upstate New York. His first rig (like W4DU) was a Heathkit AR-3 and a crystal controlled homebrew transmitter. Much of his spare time in those high school days was spent either building or operating CW. Through college, Bill was active at the Cornell University Club Station W2CXM. After college Bill became very active in contesting—an interest he still has today. Along the way he has won the Bermuda Contest while living in the UK, and was part of the winning multi/multi team from VP9AD in the 1991 CQ WW SSB test (yes—he did operate phone!)

After college Bill went to work for Marathon Oil Company and moved to Ohio. His 26 year career at Marathon was spent mostly in Ohio, although the period for 1978 - 83 was spent in the UK. There he found it was much easier to operate QRP than it was to try to fix RFI problems at the many neighbors he had in the closely packed British neighborhood. He also joined the GQRP Club at the time—mainly for the homebrew information that was in SPRAT. As a result of that membership, G3RJV and Co. make the annual trip to Dayton every year passing through the

N8ET QTH in Findlay Ohio. Those annual visits triggered the founding of Kanga US in 1989.

Most of Bill's career at Marathon was spent in Telecommunications. He was active in ENTELEC—the Energy Telecommunications and Electrical Association—and was the president of the organization at the time of his retirement in 2001

Since taking early retirement in 2001, Bill has tried to spend more time with amateur radio, and in particular with Kanga matters. However, he has discovered that there are too many fun things to do when you think you have the time. Bill is active as a goalie on several adult hockey teams and is a private pilot. This year Bill and his wife Tina (N8WQC) bought a sailboat that they keep on Lake Erie. A rig is being installed on the boat, and N8ET/MM has been active. He is also president of the local radio club.

Bill and his wife Tina also have a son (KB8ERZ) and a daughter at Ohio State.

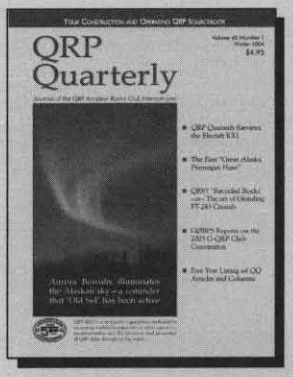
Ed Hare, W1RFI
w1rfi@arrl.org

A good way to describe my interest in QRP is that it has been decreasing for years! Like many QRPers, I started out with 5 watts, then set out to work all states with 250 milliwatts. It took 7 years, but I got the award for that one. My latest has been to see what can be done with 10 milliwatts. So far, it is up to 30 states, all worked in the ARRL CW Sweepstakes!

Enough about me. To me, ARCI will always be the principle organization representing the interests of QRP. It has been around for longer than I have been a QRPer, promoting QRP long before it became the popular operating mode it is today.

With an elected, volunteer Board of Directors, ARCI is best able to represent the diverse interests found in the QRP community and to continue to promote QRP across a wide range of operating activities. I see exciting times ahead for QRP and ARCI, as the synergy between individual QRPers and all the QRP organizations continues to make QRP the fastest-growing facet of Amateur Radio today.

In my role on the ARCI Board of Directors, I will do my best to help ARCI continue to grow and to continue to be an important part of the good things in the works for QRP and Amateur Radio. I consider serving on the QRP ARCI Board of Directors to be an honor and a privilege. It is the high point of an interest in QRP that goes back decades.



On the Cover

The Aurora Borealis curves over the hay flats in Alaska meaning that it is once again time for the winter contesting season. With plenty of record breaking solar activity this fall, it could be an exciting season, even on the downward slope of the sunspot cycle.

In this issue we've got some exciting contest coverage, including tips, results, rules, and lots of soapbox. Especially exciting in this issue is coverage of the "Great Alaska Ptarmigan (GAP) Hunt" by Jim, AL7FS, which begins on Page 48 and Bill, N8ET's story of how he scored over 1 million points in the CQWW running only 5 watts (page 36). The QRP Contests column is on page 52.

Cover photograph by Dave Brown, used with permission.

Mike Boatright, KO4WX
ko4wx@mindspring.com

Mike built his first radio at the age of eight—building a RadioShack shortwave radio kit given to him by his grandparents. For most of his life he has been an avid Shortwave Listener (SWL), and rebuilt many Crosleys and Philcos as a youth.

After graduating from Georgia Tech with a BSICS in 1982, Mike joined the IBM Corporation, in Atlanta, GA, as a systems programmer. He held many staff positions before being assigned to the Atlanta Committee for the Olympic Games in 1992. Today, he works as a digital media consultant with the British Broadcasting Companies Technology division (BBC Technology).

He was first licensed as a Technician Plus in 1991 as KD4BDE. He credits the former ARRL Novice Roundup (where he made 90 contacts on CW using an old SB102 held together with chewing gum and baling wire) for bumping him from five to thirteen words per minute code.

Mike changed to the call, KO4WX, when he upgraded to Advanced and Extra. From July, 1993 to February, 1994, Mike operated from Lillehammer, Norway, as LA/KO4WX. Unfortunately, he lugged his FT-757GXII and Astron power supply to and from Norway—if he had only known about QRP back then!

In 1997, Mike heard a presentation from Jim Stafford, W4QO, on QRP at the Atlanta Hamfest and realized that there were others interested in construction and operating QRP. He soon joined the North Georgia QRP Club, and QRP ARCI not long after (ARCI number 9462).

Although QRP is Mike's passion in amateur radio, Emergency Services is, he feels, his duty. He currently serves as the ARRL Section Emergency Coordinator for the Georgia Section, as well as serving as an ARRL Technical Specialist for the state.

Mike is the former QRV? beginners construction columnist for *QRP Quarterly*. In the Spring of 2003, he became the *QRP Quarterly* editor, and a member of the QRP ARCI management staff.

●●

From the Editor's Desk *(continued)*

often the only interesting thing in the magazine…72 to *73*. We wish you could have remained what you were in the '60s and '70s forever."

Today, the *QRP Quarterly* is strong—in fact, our circulation and QRP ARCI membership rolls continue to grow. But it is only strong because of the columnists, authors, editors and other volunteers who keep it going. As long as they have fires in their hearts, it will remain the premier international QRP journal that it has become.

Are you a writer? A builder? An operator? Got a nifty idea that you could share with others? Got a fire in your heart?

QRP Quarterly might just have a spot for you!

—72 de Mike, KO4WX

Idea Exchange

Technical Tidbits for the QRPer

Mike Czuhajewsi—WA8MCQ wa8mcq@comcast.net

IN THIS EDITION OF THE IDEA EXCHANGE:

Bounty from AOL

Inexorably approaching the half century mark, here is #48 in the endless serious of Quickies from Joe Everhart, N2CX of Brooklawn, NJ—

One of the fads in QRP homebrewing in the last decade has been to build our projects into metal tins of various sizes and shapes. It mostly started with Sucrets and Altoids tins. Since many of our accessories and even QRP rigs have a small component count and simple circuitry this has proven more or less practical. However, the majority of these containers has a height of at least a half inch or so, allowing ordinary components to be used. For the last year or more, AOL has been mailing out their software for special offers in metal tins about 5-1/2 inches square but only a tad over 1/4 inch high inside. This seems to present a more formidable challenge. However, as the project that will be described shows, it's not too tough after all.

The circuit I chose was the recently offered NorCal Keyer. You can find info at: http://www.amqrp.org/kits/NCKeyer/index.html. It consists of a small printed circuit board with only a few components so it's a simple choice for my trial effort. To make it operational you also have to supply a power source, a pushbutton switch and jacks for connecting to a keyer and the key jack of your rig. Batteries are often used for the power source and common 1/8 inch phone plugs are the usual choice for paddle and rig connections. The kit also provides a small piezo element as a keying monitor. The board is laid out to accept pin headers for external connections, although these are not provided.

The first step was to see if the board would fit into the tin. I found that it would if I bent over the capacitors, the keying transistor and the voltage regulator. At first it seemed that the pin headers were a problem, but I found that with care they could be bent over using a pair of needle nose pliers. The pins bend over the edge of the pc board but the mating connectors work just fine in the horizontal position. Figure 1 shows the "straight" and modified headers.

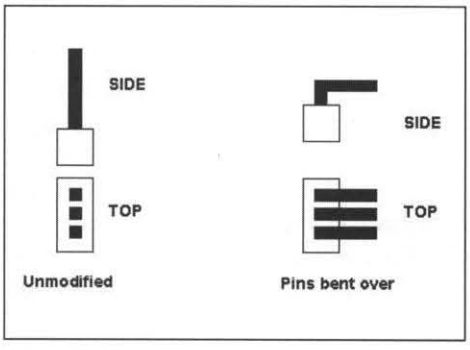


Figure 1—Pin header shortened by bending pins.

These headers are not found at the corner electronics store. I search for them when I go to hamfests or the rare opportunity when I visit the dwindling number of surplus stores on the west coast. I usually buy whatever I can find, whether I have a current need or not, knowing that I will eventually need them.

The piezo element that comes with the kit almost fits with its pins bent over but mine broke when I tried. A better solution is to use a flat one such as the Radio Shack 273-073. It fits quite nicely in the tin with no modification.

Batteries are easy to handle as well. The keyer is intended to work with a 9 - 15 volt source which is reduced to 5 volts on the board by a voltage regulator IC. Others have used 3.3 volt Lithium cells by removing the regulator and jumpering the input and output pins. Being frugal by nature I chose to use less costly batteries. Three AAA cells in series provide 4.5 V with the regulator mod described above. And they are a good fit inside the tin.

Connectors are an issue even when mint tins are the case of choice. They must be small enough to fit inside the case and there is little height to mount them within. As I have found a number of times they must be placed so that the tin's lid can be closed. And, of course the metal tins are very flimsy and take skill to drill out properly. I took a different tack for these thinner tins. Finding jacks that would fit was easy. Common miniature panel-mount jacks and the pushbutton switch fit with no difficulties. And rather than drilling holes in the case, I cut rectangular notches as shown in Figure 2. Tin snips cut the metal easily and the lose ends can be bent over inside the tins. For the most rigid mounting job on the flimsy metal walls, use flat washers inside and out.

Mounting the batteries, the PC board and the piezo element is pretty simple. Twenty some years ago I worked for a manufacturer of two-way radios who often had to add accessory circuits inside their products. There was a wide variety of add-ons and usually very little space. Their solution was to use double-sided adhesive

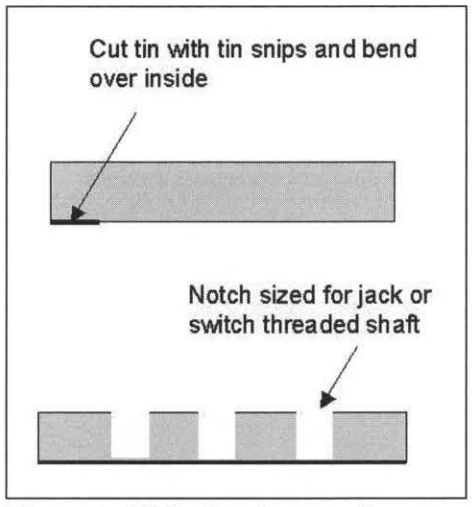


Figure 2—Holes for thru panel components made with tin snips.

foam tape. When questioned about it the chief engineer showed me some phone company gadgets mounted behind our desks. They use high-quality foam tape that would stick to cinder blocks. Ever since then I figured what was good enough for industry was good enough for my ham rigs. So I simply used the stuff commonly used for holding up pictures and sold at the local drug store.

As long as it's used on a clean surface it does just fine. The only time I have had problems was in using it with high impedance circuits. Sometimes the foam will absorb moisture resulting in leakage, so some plastic insulation is needed to keep the foam away from the affected circuits. Fortunately I've had no such problems with this keyer.

I'd really love to show a picture of the finished product but my digital camera went belly-up as I was preparing this Quickie. Luckily Christmas is only a month away. In lieu of the picture a sketch of the layout is shown in Figure 3. The tin is embarrassingly empty!

Guess I'll have to see what kind of small flat transceiver I can find for the next project. The real hooker will probably be the RF output connector—hmmm, those little SMAs and the like are kinda cute…

WA8MCQ comments—And here's a Quickie Bonus. When Joe sent me his graphics the file included some working notes and drawings which contained an additional idea that he did not address in the final version. I took a little part of his drawing and expanded it, as shown in Figure 4.

Instead of the keyer, his working drawing showed some sort of audio amplifier with a '386 chip. To reduce the overall height of a chip sitting on top of the board, he straightened out the leads, cut a hole in the board and dropped the chip into it. The leads are soldered to pads which extend up to the edges. (It could be an etched board or the pads could be isolated by cutting them out with a hobby knife.)

Actually, the caption on his drawing also hinted that the chip could span the space between two boards. I don't know how often anyone would use a technique like that, although there might be a place where that would be appropriate. In that case, though, the two boards would have to be firmly fixed in place so there's no possible movement between them since that could place stress on the IC and possibly damage it.

—DE N2CX

The N2PK Vector Network Analyzer

Remember the HF In-line Return Loss and Power Meter article that the *QRP Quarterly* ran several issues back? It was by Paul Kiciak, N2PK, who is a retired engineer. It was about ten pages long, and went into great detail on the unit. He's outdone himself with his latest project.

In the fall of 2003, someone (W4ZCB?) had a post on the USENET newsgroup rec.radio.amateur.homebrew saying to do a Google search on "n2pk" in a couple of weeks. He said that Paul was preparing to post an article on his web site that would blow everyone away. I missed the announcement when it finally came out but stumbled across the URL for it later. The guy was right—I was blown away.

http://users.adelphia.net/~n2pk/index.html

It's also available on a mirrored site at

http://www.qsl.net/n2pk/

A word of caution—-this type of device is NOT something for the casual homebrewer. But for the advanced experimenter who understands what it is, it's a very useful instrument indeed.

Here's the introduction from his web page—

"This is a homebrew VNA [vector network analyzer] capable of both transmission and reflection measurements from 0.05 to 60 MHz, with about 0.035 Hz frequency resolution and over 110 dB of dynamic range. Its transmission measurement capabilities include gain/loss magnitude, phase, and group delay.

"Its reflection measurement capabilities include complex impedance & admittance, complex reflection coefficient, VSWR, and return loss. Unlike other impedance measuring instruments that infer the sign of the reactance (sometimes incorrectly) from impedance trends with

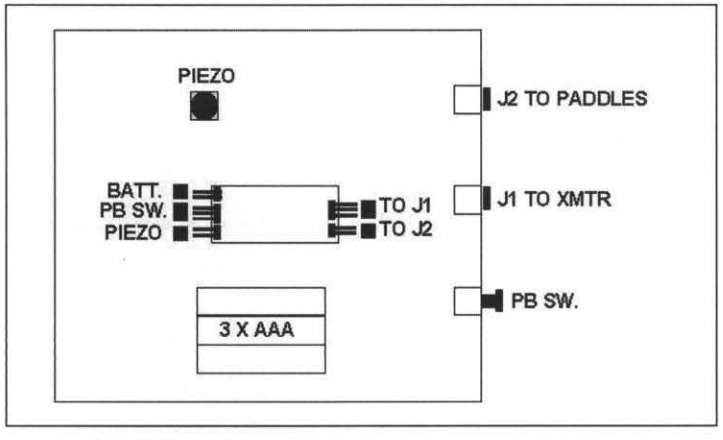


Figure 3—Keyer layout in tin.

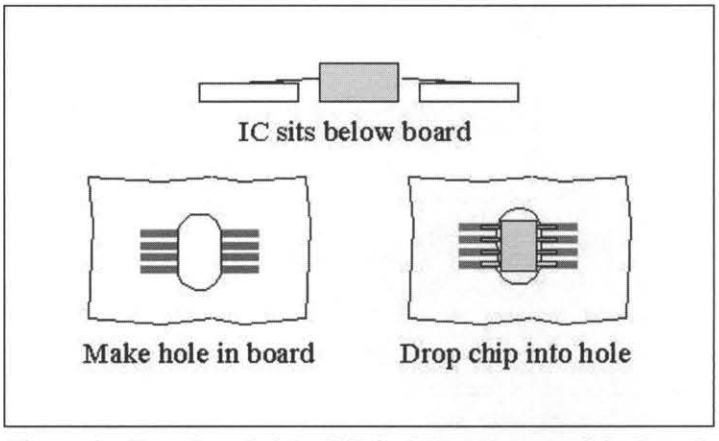


Figure 4—To reduce height, IC sits below the top of the board.

frequency, a VNA is able to make this determination from data at a single frequency. This is a direct result of measuring the phase as well as the magnitude of an RF signal at each test frequency.

"With optional narrowband extensions, this VNA can function through 500 MHz with some degradation in performance. Its custom software operates on DOS and Windows based IBM compatible PCs and communicates with the VNA through a parallel port. It is aimed at the serious experimenter with, at least, a basic understanding of transmission lines."

Further down the page he also says, "This VNA, the majority of which occupies a 2.5" x 3.8" printed circuit board, is neither complicated nor expensive to build. It can be replicated by anyone with moderate skills in surface mount technology." The hardware is relatively simple, and a lot of the power comes from the software he wrote to go along with it.

There are links to plots showing test results obtained with his device and its software. These include Smith Chart plots of his 20M attic dipole, a 20M bandpass filter and 9 MHz crystal filter, gain/phase and passband gain/group delay plots of a 3.758 MHz SSB crystal filter, and gain/phase plot of an 80M bandpass filter.

There are also links to some tabular data, giving comparisons of measurements taken on a simple network with his VNA and an HP 8753C VNA, and data from tests comparing it with a Boonton 250A RX meter. (No, that RX does not mean "receiver"!)

The opening page also shows some sample screen shots. As you scan down further you'll find a spot to click to get the downloads for everything. And there's a lot of it. There's an innocuous line that says, "To read more about its architecture and how to build it, click here." When you do that, you'll find that you've only seen the tip of the iceberg so far.

That takes you to a page that starts out with a block diagram and an overview of the project. There are some pictures of the device as built by him, W4ZCB and W7AAZ, followed by links to download a number of files about it. The meat is in the two PDF files called Part 1 and Part 2, which translate into full-blown articles of 18 and 32 pages respectively.

There's even information on purchasing a printed circuit board for the project, and this one is an adventure in its own right. There is currently no one who provides the board, but he gives the files that you can send off to a PCB maker who does small orders, to have them make one for you. He also suggests the one that he dealt with.

Their minimum order for this size of board is three identical pieces at a cost of $62 total, or a little over $20 each. If you went this route you could always offer the other two boards for sale on QRP-L or perhaps rec.radio.amateur.homebrew and probably find someone interested in both. With a bit of luck, someone may eventually provide a kit of parts for the project, including the board.

It's a very impressive project, and it's obvious that he put a huge amount of time into it. If ever there was anything that screamed out to be in *QEX*, this is it. Unfortunately, the complexity and extreme length may well prevent that. At present, it is only available through the two web sites.

We have several different models of (very expensive) HP vector network analyzers at work, including the HP 8753C and D, so I fully appreciate what they can do. Having even some of that capability at home would be priceless for the serious homebrewer. Even if you have no intention of ever building one, this is still well worth taking a look at.

PS—his web page also has the original version of the return loss/power meter article that he let us use.

Dirty Key Causes Loud Sidetone

Joe Gerry, KH6/W3GW, sent this by e-mail just before the deadline—

Periodically I make the same mistakes fiddling with my QRP rigs. Here's one our readers might enjoy. While getting ready for the recent CQ DX Test, I warmed up my OHR-400 for a little QRP DXing. For a while things went well with the little rig performing flawlessly as usual. But after a while I get a sudden increase in the sidetone volume that leaves my ears ringing! I trace the problem back to the FET that acts as a switch before the audio stages to keep the transmitter signal from being amplified by the audio amplifier stage. I replace the diode and the MPF-102 FET but to no avail. Every time I make a dah with my 35 year old bug the transmitter signal is fed right into my ears.

The bug...? I take the bug out of the keying circuit and key the rig with the tune switch...no problems. Well, to make a long story a little shorter, the bug contacts and the straps on the underside of the base had gotten a little corroded over the years. The resistance on key down was not zero so the gate of the FET did not go to zero volts on transmit. Thus the FET did not switch off during transmit, allowing the transmitter's signal to clobber my ears.

So, if you are like me and use old keys and bugs with solid state gear, clean 'em up periodically to avoid chasing gremlins in the gear that are not really there! I should have figured it out sooner since the dits keyed fine, only the dah contacts had increased resistance.

—de KH6/W3GW

Cleaning Rigs With "MAGIC ERASER"

Ed Tanton, N4XY, posted this to QRP-L—

There was a recent mention of rig-cleaning... and my wife just brought home something pretty good: Mr Clean's "MAGIC ERASER." I had seen ads for this recently, but my imagination conjured up abrasives. Not so. It's a soft foam pad with no chemical odor that I can detect. You wet it, and rub it on stains. She got it for scuff marks on painted chair-rails and sheet-rock walls. It was "magical" on both. Obviously it won't dig out scratches, but otherwise it's amazing.

So I figured when she did a demo I'd try it on some equipment. I had handy a B&W signal generator with a very fine medium green wrinkle paint (original) and a stainless steel 6 or 7 inch frequency dial/knob. The top of the unit had some near-gouges, as well as a 2-inch square stain on top that neither of my 'regular' cleaner favorites (Castrol Super Clean 'Regular' and Castrol Super Clean 'Wheel Cleaner') had touched.

First the stainless, which had black paint in the engraved dial marks and numbers. It worked fine with no residue. It shined up nicely—only a little better, but better. Didn't hurt the paint a bit, not even when vigorously scrubbed. (I figured I could replace black-engraved paint if it did.)

Next a couple of heavy scratches on the top, left, front. It was hard to tell for certain, but either it was down to the primer, or it just didn't work. Didn't make it worse

or anything, but if any better, only marginally.

Then, the stain. Wow. Neither my cleaners, nor straight isopropyl alcohol, had changed what appeared to be a 2-inch square dark stain. This thing lifted it right off. You do rub it... even vigorously... but as I said, it is not abrasive. The paint underneath was somehow not bothered. I have no idea how this worked, but work it did.

Finally, I had an old Curtis Electrodevices Keyer with what I believe is a silk-screen-on-aluminum front panel. It cleaned it well and removed no paint. There were no other marks on the panel—just some paint-deep scratches (which is why I used it to test on.) Your results may vary.

I did NOT test it on clear plastic. I just didn't have one handy in something I didn't care if it messed it up.

I think these pads will do a great job on the exteriors of most equipment. It is water-based, so it should not be used on decals unless they're protected well. I suspect it would take off ordinary dry-transfer-lettering also... but if you put those on, and don't coat it afterwards... well... enough said. You couldn't even use Windex without the coating.

I repeat: your results may vary, so be careful, and test a small area first.

Ed followed up with this later—

A further test in the light of day: I am most pleased of all with the Magic Eraser's performance on my very old Fluke 8020-A handheld DVM. This unit was purchased new in the early 80s, and is 100% plastic. I got brave and used it on all parts of it including the clear dial; it worked perfectly. It actually did a better job here than on the old B&W Signal Generator. No scratches, and no solvent harm.

Then, because Bruce Muscolino (W6TOY) thought of one more thing: conductive residues. I tried the following non-rigorous test: I wiped a 6 inch x 6 inch section of Formica countertop with the damp pad. My Fluke has a 20 megohm "Conductance" scale, and before wiping I tried the dry countertop. Nada. Didn't think there would be anything, but you have to establish a baseline.

After wiping with the damp pad, I put my sharp, beveled probe tips on their sides for maximum contact, and was able to measure approximately 400 k to 800 k ohms. It varied, and was not a solid, always-there kind of measurement. (With just the sharp tips there was no reading at all.) Distance between the tips was reduced from 6 inches to 0.1 inch. A better contact seemed to occur as the tips got closer, but it remained tenuous. I then 'dried' the area with a paper towel. The resistance went up to a very flaky 4 megohms and up. After 15 minutes, even that was gone.

There is no way to assess long-term effects of whatever is in the pad without having a "long-term" go by. A new, dry pad has no conductance I could measure.

I would say the Magic Eraser is great for just about anything we come in contact with, keeping in mind that it IS water-based, and some small amount of water may get into crevices, etc. if you are not careful to keep it to a minimum during use.

—de N4XY

Sheet Metal Nibblers

These are commonly found in many homebrewers toolboxes and can make life a lot easier when making large holes in metal. Former *QRP Quarterly* editor Mike Goins, now with new call K5WMG, asked about them recently on QRP-L—

I'm working mostly with thin aluminum boxes on building projects, and have drilled and filed for many years. I'm looking to make life a little easier with a number of upcoming QRP projects, and am now considering a nibbling tool.

Do they really work well on openings, like for square meters or on round openings without rolling the edges? There has to be some difference in quality of them; who makes a good one?

Current editor Mike Boatright, KO4WX replied—

I use the Radio Shack nibbler a lot. It works really well. It's a bit tough on the wrist, if you have to do a lot of nibbling, but definitely does exactly what you are looking to do. They do wear out, but they are cheap enough that I just replace them when they do.

Next, from Alex Mendelsohn, AI2Q—

I've had an Adel nibbler in my toolbox seemingly forever. Works great. I think they're still in production, although the cutter on mine seems fine even after all these years.

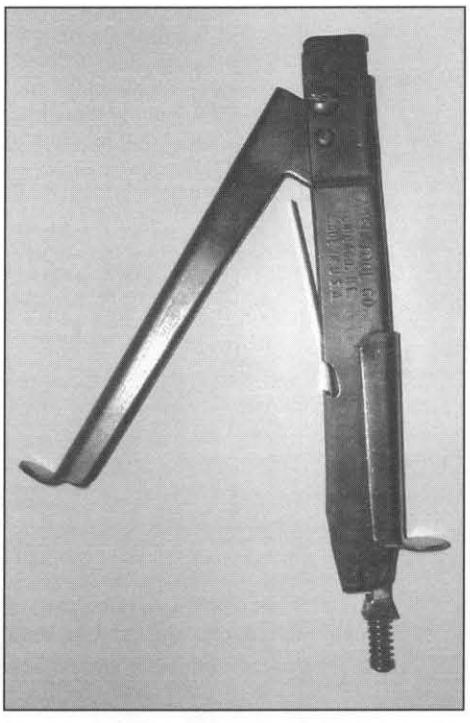


Figure 5—Overall view of the Adel nibbler. Ones made by others have a similar appearance.

I also use it to make Manhattan-style pads from PC stock. It does a good job with that on either single or double sided FR-4 board material.

N1DVJ, Mike Yetsko, had this to say—

There are three types you should consider.

The first is the kind that has 3 "fingers." Two are stationary, and the third moves like a pair of scissors between the two fixed blades. This removes a "sliver" of metal the width of the spacing between the two fixed blades. While not technically what some people call a nibbler, it's a tool to consider. These even come air powered, and are common in auto body shops.

The tools most people mean when they say a "nibbler" is a squeeze tool that has a bit that sticks out the end. The bit is "hooked" and squeezing the handle retracts the bit into the end of the tool. The end is usually a flat piece of carbide or hard steel. The "hook" of the tool grabs a piece of metal and "nibbles" it off as it retracts. It makes a clean cut.

These tools come in two varieties. One is a "wide" cut that is shallow, the other is a narrow cut that is deep. I had one tool that would cut about 1/4" wide but only about 3/32" deep, taking out little rectan-

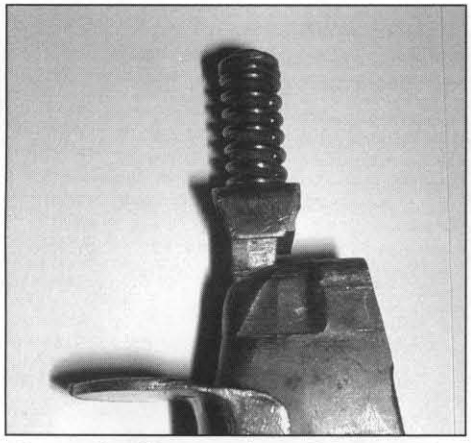


Figure 6—Closeup view of the working end of the nibbler. (The picture in the Internet article I mentioned gives a better view.)

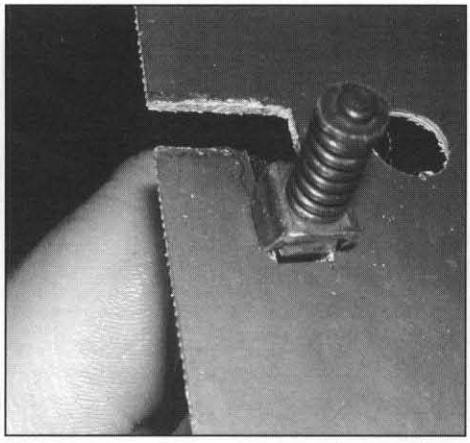


Figure 7—The nibbler in action, halfway through cutting a large rectangular piece out of the edge.

gles. I've also had tools that cut less than 1/8" wide, but just over 3/16" deep. The narrow and deep tool is better at cutting out large areas by going around them and taking out a plate. The wide and shallow tool is better for doing things like widening an opening.

If you only get one tool, get a narrow nibbler, as it can usually fit where the wide ones can't.

By the way, the Radio Shack tool is quite acceptable for the price. Before you invest in a tool with a 3-digit price, I'd get the RS tool and learn how to use it and what it does. You may even find that it does everything you need.

In almost all cases, even the smallest tool will require a start hole at LEAST 1/4" or more. And be aware that openings cut with any nibbler will be coarse. It's amazing how the rough little "steps" you can leave with a nibbler will catch fingers and draw blood! Be prepared to "clean up" your work when you use a nibbler!

WA8MCQ comments—Figures 5 and 6 show the Adel nibbler that I've had at home for the last 31 years. These last "forever" as long as you don't abuse them. I had one at work in my toolbox and it was borrowed by someone who promptly abused it by trying to cut some tough steel that was well beyond it's rated capacity. It broke immediately, but as long as you don't push them beyond the published limits they will last for quite a while.

As far as I know, Adel is the first company to sell this sort of tool, although other make them as well. I still consider the Adel unit to be the gold standard, but the one made by GC is also quite suitable. The latter can be found in the Mouser and DigiKey catalogs. To find someone selling the Adel, your best bet is probably to do an Internet search on "Adel sheet metal nibbler." That will produce a number of places that sell it.

There's a short article on the nibbler on the Internet at http://www.getyourwebsitehere.com/scratchbuilt/articles/tools/tools_nibbler.html

As Mike mentioned, the handheld nibblers do require that you make a starter hole to get the end into the metal, unless making a cut into an existing edge. The Adel is the wide and shallow type that he talked about, and it requires a starter hole of close to half an inch. Of course it doesn't have to be a perfect hole since it's just to get things going. What I often do is drill a couple of overlapping quarter inch holes to make a rough, oblong opening, and then "mangle" the metal one way or another with something until the opening is large enough to get the nibbler in. The mangled metal then gets cut away as the opening is enlarged. Figure 7 shows a large chunk being cut out of the edge of a piece of PCB material. (In this case no starter hole was needed.)

A recent check of some sources on the Internet show the price for the Adel in the range of $16 to $20, with replacement punches going for $10 to $12. The GC nibbler sells for about $12 in the catalogs.

How to Measure Keyed Waveforms

Hams with oscilloscopes sometimes like to look at the output signal, to check for key clicks, etc. Larry Greidinger, WA2DGD, asked for advice on QRP-L—

What is the proper way to look at one's keyed waveform on a scope? I was thinking of using a BNC T connector, with one end on the antenna terminal of the K2, a dummy load on the other end and the tap would go the scope. Should I connect it directly to the scope with a short length of coax or use the scope probe (which is compensated for a nice square wave)?

What is the correct way to trigger the scope? Should it be tied to the keying line or let it auto-trigger on the rigs output? If you should use the key line, what is the easiest way to do it if the rig has a built in keyer?

The first reply was from Mike Boatright, KO4WX—

You need a "ditter." There is one described in EMRFD (Experimental Methods for RF Design). It is actually for testing AGC (it dits a bunch of RF into the front end of the radio), but can be easily adapted to dit a keyer instead. The circuit used by the ARRL Lab is described in the "ARRL Test Procedures Manual" (http://www.arrl.org/members-only/prodrev/testproc.pdf) as a "Keying Generator" on page 133. (You have to be a member of the ARRL to access the members-only part of their web page.)

Next, Steve "Melt Solder" Weber, KD1JV, had this to say—

I just use a keyer, set the speed fairly high and hold the dot paddle closed. You then need to find a place in the rig to trigger the scope when it's keyed. It's easy if you use an external keyer; just trigger on the keyer output.

You need to trigger the scope so you can get a stable display of the output to measure the rise and fall time. It will also show you if there is any delay between the keying and the actual RF output.

If you don't have a convenient place to clip a scope probe to the RF output, use a "T" and a jumper back to the scope.

From Ed Tanton, N4XY—

While you could do a direct scope connection to a dummy load at 5W, I wouldn't do it. Use a 10x probe. That way, any loading effects by the scope input, as well as those of the cable, will be negligible (see note 1 below) for HF measurements. Use a

BNC tee adapter. Tektronix used to have a red plastic pickoff (to connect the probe to the scopes BNC calibrator output connector) that would be VERY handy for this. Connect the probe's ground clip wherever is handy.

The 'regular' AUTO trigger ought to be fine, although if you want to use a delayed sweep you MAY need to help the trigger out some with an EXT TRIGGER input. The easiest way for that is to use a 10x probe connected to the same place. I personally would use the internal auto-trigger (which requires NO connection on its own); but if that was not working out, then use the RF for a trigger.

Lastly, the keyer. You can use a 1x probe for the key line. The trigger probe for that does not have to be another scope probe; it's just easier to use. Any BNC cable with some clips on one end would work (see note 2). But I think the regular Internal Trigger will be fine.

Should you want to use the keying line, I see no reason why the trigger probe could not be connected across the key. There's some voltage present on those terminals, and the change in that voltage (going to ground/zero volts) is what will set off the trigger.

Note 1—Besides the input circuitry's net capacitance, a regular cable has some as well. As you know, RG-58 has a specific capacitance/foot, and that gets added in as well. Keep in mind that whatever capacitance we're talking about gets added in parallel to ground. In the case of RG-58 this figure is 29.6 pF/ft. 10x probes have some capacitance also, but the 10x divider is in the probe, reducing the effects of that capacitance on the test subject.

For RF frequencies, Tektronix made 2 Active FET Probes (one good to 650 MHz and one to, I think, 950 MHz) that placed FET amplifiers in the probe to buffer the input and reduce loading at RF frequencies. 100 pF to ground is bad enough at 7 MHz, but is DROP-DEAD-SERIOUS at 400 MHz. Mostly the active probes are trying to eliminate the effects of the 10x divider capacitance, etc., rather than the cable's characteristics.

Note also that for a keying waveform, you are mostly looking for the high speed, switching-transient garbage on the leading edge of your keying waveform so that 100 pF in a 3 ft cable is more than enough to filter that edge. For a square wave, this tends to round off the corners. And if there are any nasty little ringing transients on that leading edge, this filtering may be just enough to grossly reduce them. That's just what you don't want when you're looking for key clicks, etc.

Note 2—In the case of some kind of RF-feedback problem from high VSWR, or other high power RF related problems, such a 1x pickoff might swamp that RF problem. On the other hand, your feedback problem would then clear up somewhat, cluing you in that it was RF through the key into the TX that was the problem. This is not a typical problem with modern transmitters, much less with QRP.

Amplified Signal Generator as a QRP Rig?

And the short answer is, it's probably not a good idea.

Another interesting online source of technical information is USENET, which most of us know as the "newsgroups." There are several in the rec.radio.amateur area, with rec.radio.amateur.homebrew being arguably the most useful to QRPers. (Another interesting tree to look under is sci.electronics.)

Unlike mail reflectors which have controlled access, such as QRP-L, anyone with a keyboard can make postings on any newsgroup on USENET. As a result things can get a bit wild and wooly at times on some of them. On QRP-L, if someone misbehaves badly they can be banished temporarily or permanently. On USENET, unfortunately, that is not an option so you sometimes have to put up with a certain amount of crap and occasional spam.

Also, since USENET is wide open and spammers can harvest any and all of it for e-mail addresses, a lot of people use "disposable" accounts for making posts, instead of their "real" addresses. That makes it hard at times to tell who actually sent something—or to give credit where it's due.

Paul Van Drunen, KJ4UO, recently tossed this out—

My Wavetek signal generator covers 100 kHz to 512 MHz and puts out about 10 mW. I need a simple circuit to cover HF which will boost this up to 500 mW. I would like to try out the signal generator as a low power CW transmitter.

I have a few CBs around that I could use the RF amp to get me on 10 meters but I am not sure of the drive level. I am not sure if this amp would work below 24 MHz without re-tuning. Does anyone have a simple wideband circuit that could cover 3.5 to 28 MHz?

Bruce Lane, KC7GR, uses this "from:" line on his postings: Dr. Anton Squeegee, SpammersAreVermin@Dev.Null; he had this reply—

This is not something I would recommend. While the theory is that good RF test equipment should have better spectral purity and lack of harmonics than the radio gear it's testing, my experiences with Wavetek along these lines have not been good.

My gut reaction is that "Simple" and "Wideband" do not go together in this context as far as a clean signal is concerned. I suggest examining the *Radio Amateur's Handbook* and *RF Design for the Radio Amateur* (I think that's the title) for design considerations. [He's probably referring to *Solid State Design for the Radio Amateur*, by W7ZOI and the late W1FB.]

I still think that if you want to just do a simple QRP CW transmitter, you'd be better off going with one of the existing designs in one of those two books (or similar such publications).

—Dr. Anton Squeegee, Director, Dutch Surrealist Plumbing Institute (aka Bruce Lane, KC7GR)

Sverre Holm, LA3ZA (a QRP-L regular) had this to say—

I did something similar when I first was licensed in 2001, but I would not recommend it now.

I used my Leader LSG-216 signal generator as a VFO followed by a 1 watt amplifier that I put together myself. It worked and I had several QSOs with it, but after several RST xx8 reports I found that the signal generator had hum modulation and some jitter. I have later learnt that this is almost inherent in a synthesizer which covers a large frequency range. It has very large VCO gain—MHz/volts—change in frequency per change in voltage in order to cover the large frequency range. But this also makes it very sensitive to noise in the control voltage.

As a signal generator, i.e. a tool for aligning circuits and so on, this is not a problem.

This was followed by a comment from someone using the name Ghost Writer (to avoid spammers)—

One must wonder about another possible problem as well. If even a fraction of transmitted RF were to get back into the signal generator, it may upset the balance as well, causing any sort of problem. Much like when RF gets back into a power supply situated close by—creates hum and so on—on the signal. Some signal generators may not have enough shielding to protect from this. Their shielding may very well prevent signals from leaking OUT when testing from it's own source, but not be designed to fight off transmitted RF getting back into it. I'm not saying those things WILL happen, but they are certainly possible. Otherwise, the idea is interesting and I'm sure many others unmentioned have thought of or have actually tried it. I being one.

On another note along these lines, though I didn't see it or hear it, I heard about a ham on 2 meters once who claimed to take a Bearcat scanner—a 250 model I believe—and used it in much the same manner. I'd love to have seen and heard it up close.

—G.W.

Latest Update of VE3ERP HamCalc Available

Back in October, George Murphy, VE3ERP, announced on QRP-L that the latest version of his HamCalc program had been released, HamCalc68.

For those not familiar with it, HamCalc has been around for a number of years and is a collection of a gazillion handy routines for ham and homebrewing use.

To download, go to www.cq-amateur-radio.com. Scroll all the way down the page and hit "click here to download HamCalc." That takes you to a page of instructions that you should save. Next, go to the bottom of that page and click where indicated.

Remember, this has been the official site for HamCalc for some time now. Murph has this note at the bottom of the instruction page: "HamCalc is upgraded frequently. The latest version can be downloaded free from www.cq-amateur-radio.com. HamCalc obtained from any other source is unauthorized, probably outdated and may be corrupted."

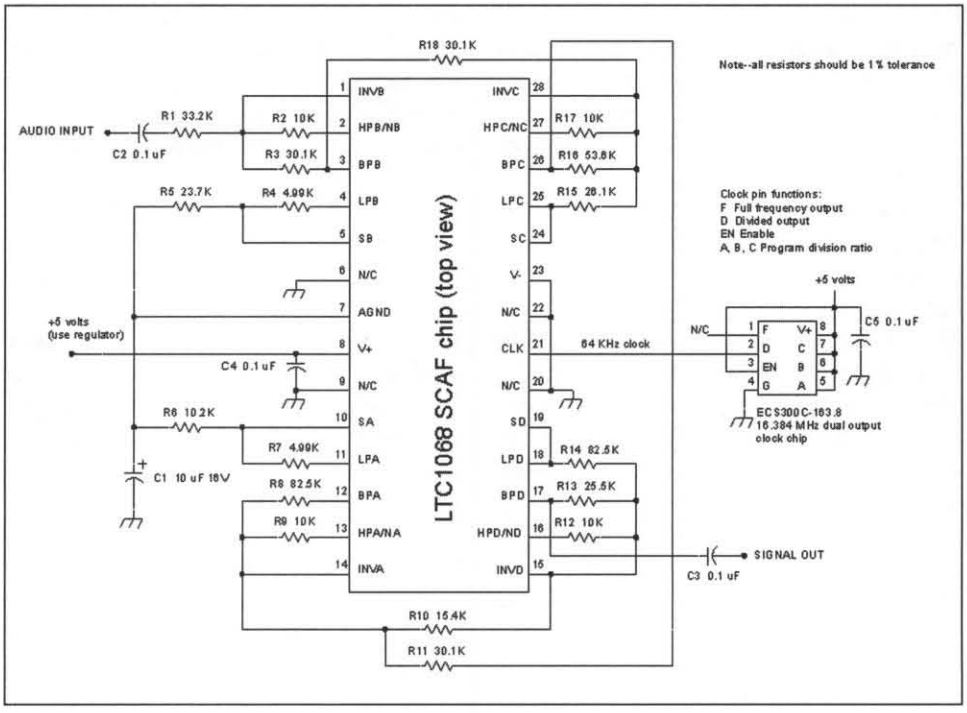


Figure 8—This should have appeared as Figure 20 in the last issue. The original caption for Figure 20 is correct: "The 28 pin version of the KD1JV filter."

Incorrect Schematic in KD1JV SCAF Article

A gremlin crept into the last issue, and the same drawing was used for both figures 19 and 20. They were supposed to show the same circuit with both the 24 and 28 pin versions of the chip, but all that appeared was a double dose of the 24 pin version. Figure 8 is what should have appeared at Figure 20. Thanks to Chuck Carpenter, W5USJ for pointing this out.

Chuck also mentioned that there's some disagreement between the resistor values on the schematic (Figure 19) and the list of values in the text. Both of those were correctly copied from the web page, but I hadn't noticed that they don't agree with each other. I was unable to get clarification from the author in time for this issue, and I don't know which values are correct, but I'd go with the ones on the schematic.

Comments on RF Gain and AGC

James "Dr. Megacycle" Duffey, KK6MC/5, had these comments on QRP-L—

On the lower bands, 40 M and below, most receivers have more sensitivity than they need. On these bands receiver noise performance is dominated by external noise sources, both natural and man-made. On 160 M and 80 M the sensitivity can be too high by a lot, 2 or 3 orders of magnitude in some cases. Dropping the RF gain does nothing to harm the receiver's capability to detect weak signals, but greatly enhances the receiver's capability to cope with strong signals such as local broadcast stations or that kW around the corner.

AGC is a mixed blessing. I think that most receivers, including the Elecraft K-2, sound better with it turned off. With the AGC turned off, strong signals sound strong and weak signals sound weak. Just like Marconi intended. The receiver is more dynamic, has more character, and one can easily tell a weak signal from a strong one. With AGC turned on, that is more difficult.

AGC tends to elevate the noise floor to an artificially high level when the noise is above the AGC threshold as it often is in this modern world.

AGC can often bring out the faults in a receiver. Much higher opposite sideband rejection is required when AGC is used than when it is not. The AGC makes the weak undesired sideband much stronger than it would be without AGC. This can be important with a homebrew receiver. A receiver with a simple filter that has 20 dB opposite sideband rejection can sound good without AGC, but quite poor with it.

My first receiver was a Hammarlund HQ-110A, which required one to turn off the AGC and reduce the RF gain in order not to keep the IF level to the detector at the same level as the BFO injection level. I have kept up that habit to this day.

Along with tuning for replies after I call CQ, signing /5, sending QRL? before I call, using headphones, turning on the rig long before I want to start operating, signing portable (/5) when not in the assigned call area, fearing the FCC monitoring station at Grand Island NE (they sent me a pink slip once), wondering who Ben F. Waple really is, and cringing when I hear SW broadcasters in the 40 M band. All habits acquired 38 years ago as a Novice. So I am prejudiced. Old habits die hard. Sometimes we don't want them to die. AGC is a personal preference; I really don't care for it.

—de Dr. Megacycle, KK6MC/5

Trail Friendly Radios

Backpacking (hitting the trail) with QRP rigs is enjoyed by quite a few QRPers, and the term used for rigs that are well suited for this is "trail friendly radio." A while back, Ron Pfeiffer, N1ZSW, asked a few questions about trail friendly packaging on QRP-L:

Since the cold weather is about to start I thought I might tinker with putting together next springs trail-package. Some immediate questions arose:

1. Are plastic cases better than metal?
2. Is it better to have separate components for battery, radio, tuner, SWR and watt meter or one box with all in it?
3. Is there a list of objects that should be in a toolkit for portable work?
4. Is a hard pouch better than a soft one or a backpack for carrying equipment?

Alan Dujenski, KB7MBI, had this reply—

First, let me direct your attention first to a wealth of info available at the ARS (Adventure Radio Society) website:

http://www.arsqrp.com/

Additionally, take a look at searching ASP SEEK for related topics:

http://qrp.kd4ab.org/cgi-bin/s.cgi

One of the prolific cold weather backpackers is Bruce Prior N7RR in Bellingham, WA and you may want to contact him directly.

Now here is my 2 cents. First you need to decide if you go hiking with radio in the colder and wetter environments 1-2 times or if weekly. Next, what equipment do you have *vs* what you may want to purchase. In some cases carrying something like a Small Wonder radio in a baggy in a vest pocket of a camera or hunting vest may be a solution to keeping it dry and warm.

How much is your present radio affected by cold? Set it on the porch (dry area) overnight and see how it does in the morning. Note—they make chemical heat packs. You could wrap your radio case with a scarf or a designer cover and utilize these chemical packs for keeping the radio snug.

Portability is another issue that is a function of how often you plan to go out, married with ease of operation. The new Elecraft KX1 is not only lightweight but has a complete package so you don't have to carry a keyer and ATU separately. It's almost a plug and play. Not sure how it does in colder weather but I am sure the testers will address that in their write-ups since environment is a key issue in "trail friendly."

[*A review of the KX1 is in this issue of QQ, starting on page 18—ed.*}

There is plastic and there is plastic. Note that there are a variety of plastics available. In some cases rubber type food storage containers might be utilized. The problem with metal is if you were munching down on a peanut butter and jelly sandwich and dripped some on the metal case and tried to lick it off in cold weather...well...need I say more (smile). You can always get a dive shop to sew you a simple cover out of neoprene dive suit material. It is both waterproof and has good insulating properties. They also make these waterproof plastic ammo boxes that are nice for field use but not long hikes.

In some cases wrapping a case in bubble wrap will both protect physically and thermally.

What you do for an occasional outing, and that for weekly expeditions, are sometimes two different things.

Steve "Melt Solder" Weber, KD1JV, has this to say—

The main consideration is how long and how far is the trip?

If it's a short day hike, from a couple to five miles round trip at the most, then you have a lot of leeway. I usually just put all the gear in a cardboard box which fits in the bottom of my day pack, toss in an antenna, wrist rocket, etc, along with lunch, water bottle and a rain jacket and/or other appropriate clothes for the type of weather expected.

If it's a one or two night backpacking trip, then the size, weight and packaging of the equipment becomes more of a concern, but not overly so. An extra 5 pounds of stuff isn't too hard to manage on a weekend trip, so long as it's not too bulky.

For backpacking trips longer than a few days, size, weight and packaging become critical. I've come to the conclusion it's best to leave the radio gear home, as you soon realize you would have rather carried more food than radio gear—or less weight. Though on my last hike through Vermont, I realized a small 2M HT would have been handy to get local weather reports and possibly beg rides into town. An HT would have been a better choice than the HF rig, which I didn't get the chance to use once!

Are plastic cases better than metal? Plastic is generally lighter. A water tight or resistant case for the sensitive gear is always a good idea.

Is it better to have components or all in one box? That's a personal preference and how much work you want to put into it. It's nice to have everything more or less in one place.

Re: 3. Is there a list of objects that should be in a toolkit for portable work?

A small "Leatherman"-like tool should be all you need. If you need to do anything more than simple antenna repairs, you're pretty much SOL anyway [Sure Out of Luck].

Soft/hard/backpack? Definitely a decent day pack for short trips and an appropriate back pack for longer trips. For a walk from the car to a picnic table, anything will work.

Oh, and don't forget, you will generally need something to sit on and something to use as a table when you get to wherever. I carry a piece of insulated pad to sit on; it keeps the old buns dry and warm. I also carry a 1 x 2 foot piece of Masonite to use as a lap table to write on.

John Somerville, VE7CFG had these comments—

Plastic *vs.* metal depends on the temperature. Many plastics have a relatively high glass-transition temperature which depends on the type of plastic as well as the fabrication procedure and the associated quality control. Some plastics will shatter on impact well above freezing.

Metal, on the other hand, will not (usually) get glassy at high temperatures providing any cold bending has not been too severe. Also consider that metal will act as a heat sink, so if you keep it in contact with your body to keep it warm you could end up with frostbite.

Separate boxes or all in one—I would opt for a tuned antenna and keep it simple.

With respect to tools, a small soldering torch may be helpful if it is not too cold and you can get in out of the wind. If it is really cold you are much better off planning for high reliability; often, your ability to use tools depends on how cold you are. Test your gear in a really cold deep freeze; that will unearth any problems very quickly.

I avoid rigs with LCD displays if I expect to encounter temperatures of –20° C or below. Such displays become unreliable or just plain quit. Also, it is too easy to shatter them even if they are covered with a plastic protective cover. I would avoid ten-turn pots, also, for really cold weather.

I have used my SW-20 down to –30° C and I quit before it did.

QRP Dummy Load with Radio Shack Resistors

Chuck Boblenz, AD6GI, built the dummy load shown in Figure 9 using Radio Shack 100 ohm, 1 watt metal film resistors and a surplus aluminum can. Figure 10 shows the schematic. He included a diode detector for measuring power.

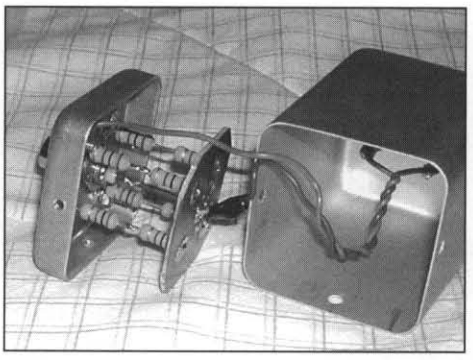


Figure 9--The AD6GI QRP dummy load. (Yes, those metal film resistors are perfectly good for RF, at least through the entire HF region.)

His input connector is a BNC socket, although you could use any other type you wish. It's mounted at the end of the can, as shown in Figure 11, along with a piece of PCB material that serves as a ground connection for the ends of the resistors. (Yes, these metal film resistors are perfectly OK for RF use, at least through the HF region. I checked some on a network analyzer years ago.) The other ends of the resistors are connected to a second piece of PCB material, and a wire runs from that to the center conductor of the BNC.

Although the hot piece of PCB material is rather large, it doesn't add a tremendous amount of capacitance since it's spaced far from ground. You can minimize the capacitance by keeping it as small as possible, or even eliminating it completely and just tie the resistor leads together.

For the detector, one lead of the diode is soldered to the top PCB, and a wire goes from there to the tip jacks on the can. A ground wire, connected to the bottom plate, is twisted with it. The capacitor is mounted directly on the jacks.

Although Chuck didn't provide any ventilation holes, his load should easily be able to take up to the full 5 watt "QRP gallon" intermittently since it's made with 1 watt resistors. (The total dissipation of the resistors is 8 watts, although to get that on a continuous basis some ventilation would have to be provided.)

EBay for the QRPer

I'm sure almost everyone has heard about eBay by now. In case you haven't, it's an online (Internet) auction service where you can find just about anything and everything up for sale. Fortunately, that includes a lot of ham radio and electronics items. (It's been called a 24 hour hamfest by many people.) Unfortunately, for those without an Internet account, it's not accessible; if all you have is an e-mail account you can't use it. But if you do have a full account, it's a good way to pick up things at a good price, at least as long as you're careful.

I've been using it for the better part of a year, and became quite comfortable with it after a few weeks of learning the ropes. To be honest, the vast majority of my dealings have been buying old CDs, although I've purchased some electronics items as well. But the basic principles are all the same. I've never sold anything myself, just bought a lot. I can only talk from the buyers perspective, but it'll still give you a good feel for the whole thing.

The basic idea is that if you have something you'd like to sell, you open up an auction on it (after registering with eBay first, of course, which is free). You open it up for a specified period of time, typically a week or so, and the highest bidder wins. They pay you, you ship the item, and that's

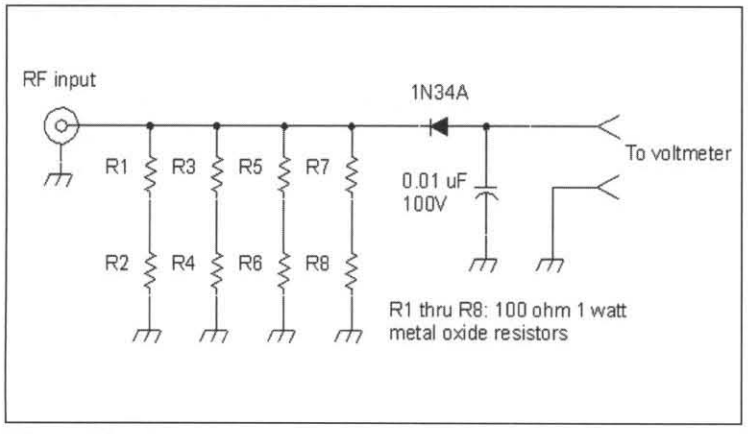


Figure 10—Schematic of the dummy load.

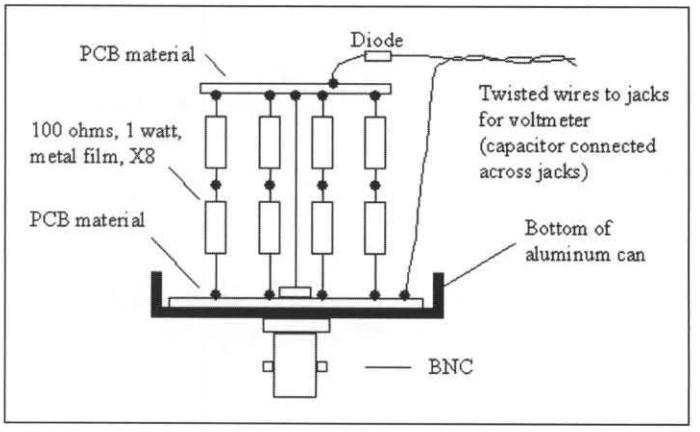


Figure 11—Dummy load construction details.

basically it. It's been around for something like ten years now, and the whole process is pretty mature. (Buying is free, but the sellers pay a fee to eBay.)

How do you know you can trust the person selling the item? Is it what it appears to be, and will they even ship it after you pay? There is potential for getting ripped off, but that can also happen at a hamfest, when you take something home and find that it doesn't work and have no idea how to contact the seller. Or perhaps you have their address but they refuse to work with you. Ebay has about the same potential for fraud as anything else in life. It's probably no better or worse than anything else.

Something that helps a lot is their feedback system. Each registered user who sells or trades has a feedback rating. After you complete a transaction the system encourages you to post feedback on it, positive, negative or neutral. You check one of those 3 boxes, and then you have up to 80 characters to say what you will. It may not sound like a lot, but that's plenty to praise or condemn someone. (Both selling and buying transactions are lumped together; it does not give separate ratings for performance as a buyer and as a seller. It does indicate which end of each transaction you were on, though.)

My current feedback rating (which is all from buying) is 45, with 100% positive. (That means that I pay promptly and with things that don't bounce!) That's a fairly small number, but many people are in the hundreds, thousands, and even well into the tens of thousands. Sellers range from individuals selling off a few things all the way to businesses of various sorts. (Happily, the latter includes electronics surplus houses.)

When viewing an item you see up front what the sellers feedback rating is, both number of transactions and percentage of positives. You can also dig into the details and read the actual comments. Someone with a 100% rating is probably reliable. If someone has hundreds or thousands of transactions it is hardly unusual for the rating to be less than 100%. If it's much less than 98% or 99%, though, I'd look into it a bit. You can quickly get an idea of how reliable the seller is by reading the comments, and also by seeing how long it's been since their last negative. A negative comment doesn't necessarily indicate fraud, and usually doesn't; it could be due to a misunderstanding between the parties, or perhaps just a disgruntled buyer attempting revenge.

If you see something you're interested in, you submit a bid. Be careful when you do this; it's entering into a legally binding contract and if you are the highest bidder you will have to complete the deal. Bid retractions are only possible under limited circumstances, so be sure you really want to buy before bidding.

Be sure to read all of the fine print in the item description to be sure you understand what it is, how many it is, condition, etc. (And always be on the lookout for the ever popular "as is." Although you might be pleasantly surprised, there's also a chance that it has something wrong with it.) If you have any questions, there is a button to click to send a question to the seller by e-mail. It took me a good while to get in the habit of carefully reading everything first. I never got burned because of my inattention, but the potential is there.

If a picture is included, be sure to check it carefully as well. It may not always match the description. I've seen Mini Circuits splitter/combiners called both called "mixers" and "relays" in the description, although the pictures had the part numbers plainly visible and those didn't agree with the words they wrote. Wrong description or wrong picture? Again, ask the seller.

Don't forget that the buyer is usually responsible for paying postage and handling. That amount is usually included somewhere in the item description, although you might have to ask the seller in some cases. The amount varies quite a bit. Some charge minimal amounts and others add to their profits by charging more. But it does take time and effort to pack things, perhaps done by a paid employee, and unless they're an occasional seller who can use an empty box sitting around the house they have to buy containers, padded envelopes, etc.

How much to bid for something and when to stop? You need to know what the item is worth, and try not to get swept up in a bidding frenzy and pay more than you want to. Consider whether you can get the same thing elsewhere for less, and don't forget to figure in the shipping and handling charges. The price may be good, but if it's something you can pick up at the next hamfest for the same amount you might want to wait and get it there and save the shipping charge. And be sure that you're not buying something that you can order from a catalog—where you can place more trust in the vendor—for the same amount. I've even seen things priced higher than a new one would cost. Needless to say, those seldom get any bids.

EBay uses what is called proxy bidding. Let's say the current bid is $10, and a bid of $10.50 or higher is required to beat it. You can offer that amount and then wait a while to see if someone outbids you by a dollar or so, then enter a slightly higher bid and repeat the process a few dozen times. But with proxy bidding, instead of entering the specified minimum bid you can, if you want, enter the maximum amount you are willing to pay. The system will then bid automatically on your behalf whenever someone outbids you, until your limit is reached.

It will only bid enough to beat the high bid by the minimum amount required. But if someone else also entered a much higher limit the system will ping pong between the two, quickly ratcheting the price up to just over the second highest limit. It may appear that the proxy bidding has instantly jacked up the price and made you pay more, but all it did was speed up the process and get to the same end result faster.

When searching for something you have to be careful to spell it correctly, and perhaps try some alternate spellings as well. For instance, most "Mini Circuits" items (mixers, couplers, combiners, etc) are listed just as I spelled it, although it doesn't care about upper/lower case. But it does care about spaces, plurals, etc. You can find still more if you search on "Minicircuits" (all one word) and "Mini Circuit" (singular). And don't forget "MCL", another name they are listed under sometimes (the initials are stamped on some of their products).

Remember, there's a difference between "Pomona box" and "Pomona boxes" and a search for one will not catch the other. I learned a long time ago to enter searches as "mini circuit*" and "Pomona box*" since those will pick up both the singular and plural at the same time. You can pick up extraneous listings, though. For instance, search results from "mini circuit" include a number of offers of "mini circuit breakers."

The same principle applies to things like the Heath "HW-8." It could be listed that way, or it could be listed as "HW8." Be sure to try both. If someone spelled something wrong in the item description, a search won't find it unless you spell it wrong, too, so it never hurts to try it a different way. Don't limit a search by looking for "Heath HW-8" since that won't work unless they included the word "Heath." And that's not the only company that used that model number; I once did a search on "HW-8" and came up with 3 Heathkit QRP rigs and one Hawes wall mounted water cooler!

Sometimes the buyer places a "Buy It Now" amount on an item instead of, or in addition to a minimum bid. An example is $9.99 with a Buy It Now price of $18.00. You can try bidding the minimum, hoping to get the lowest possible price, and taking your chances on being outbid along the way. Or you can just plunk down the higher amount immediately and walk away with it. This is where you have to make a decision on how badly you want something, how great a bargain it is, etc.

I made the mistake a few times of trying to get a stunning bargain by bidding up from the minimum instead of just using Buy It Now and paying more but still getting a very good bargain. I lost out in most cases. Now I sometimes just grab the prize and run; after all, lots of other people will be more than glad to fight you for that stunning bargain and snatch it away from you. It's better to settle for just a very good bargain than to lose out completely.

(PS—once the first bid is placed, the Buy It Now option disappears and it goes into regular bidding. The winning bid could easily end up more than the original Buy It Now price. It does happen. And if you were the highest bidder, you're legally obligated to pay it. That's another reason to carefully consider the Buy It Now option if you really want something.)

There have been several times where I would be the only bidder or the highest of two or three. The auction would go on day after day with no change, and instead of sitting around until the last seconds of the auction to head off a sudden last minute bid from someone, I'd just go about my business. Obviously no one is really that interested in it, and there's no point in staying up until 3 or 4 a.m. when the auction ends (according to the on-screen timer) to protect myself. Unfortunately there are some people who will stay up late to toss in a higher bid in the last few seconds. These things happen, but life goes on.

I later learned a dirty little secret—some enterprising people provide a service, for a small fee, that automates the process for you! Their online system waits until the last few seconds of the auction and then tosses in a slightly higher bid for you. Great for winning the bid at the last minute if the others aren't using it too, but not so good if you're on the losing end. After one particular auction ended and the entire bid history was revealed, I could see where a couple of these automatic bidders fought against each other in the last several seconds.

A lot of the sellers on eBay have regular businesses and list a number of things. When you look at an item description you will sometimes see a button to click to see the sellers other items, and it's often well worth the effort. I frequently look for bargains on Mini Circuits products, and when it's listed by a surplus dealer I often find that looking at their other items for auction can be very interesting and rewarding. I start out looking at a Mini Circuits mixer, perhaps, and end up browsing a long list of surplus electronics and microwave items.

How to pay for an item you win? The seller always indicates what sort of payment they accept. Some possibilities are personal or certified check, money order, PayPal or charge card, and sometimes even well concealed cash (at your own risk). Be sure to read the item description carefully to see what they will or will not accept. (Also be sure to check before bidding to see if they have any restrictions on where they will send items. Many place additional conditions on international shipments.)

And what is PayPal? That's a secure online payment service that has been around for a number of years, and which was recently acquired by eBay. It fits in perfectly with eBay, although it can be used to make electronic payments to anyone for any purpose. The QRP ARCI has had it as an option for subscribing to the *QRP Quarterly* for several years, so you may have heard of it. You can use it to both send and receive money; sending is free, and small fees are involved for the recipient. If you want unrestricted, two way use (sending and receiving), you will have to give them a bank account number; many people set up accounts solely for PayPal use.

I'm still not comfortable with doing that myself, so I can only send money, and only by using the option to have it charged to my MasterCard. That does have a limit on the total cumulative amount that I can send before I am required to register fully and provide an account number, and I can't receive money through it, but since my purchases are small it should last me for some time. I'm still a bit paranoid about the possibility of hackers draining the account, although that could happen to any sort of bank account anywhere. Fraud is hardly limited to the online world, and there are already protections in place everywhere. Many credit cards and banks have mechanisms in place to detect fraud and protect their customers, and both eBay and PayPal have protections of their own. (Information is available online.)

When you buy something and use PayPal, the money is deposited into their account. It comes from your credit card, or your own PayPal account if you have one. If you pay with your credit card through PayPal, you will be told by e-mail what billing name will appear on your statement.

A nice feature of PayPal is that payment appears almost instantly. You don't have to wait on a check or money order to arrive. Since the payment is there immediately and they don't have to wait for anything to clear, that usually translates into your item being shipped sooner.

To get started on eBay, go to www.ebay.com and work from there. Along the way you'll be asked to register, which is free. You assign yourself a user ID—I use my call sign—and also a password. Registration with PayPal also includes the same items.

A word of warning—never give those passwords to anyone, especially if the request comes from what appears to be eBay or PayPal. Scams targeting users are not uncommon. Occasionally, some people receive fancy e-mail in HTML format which gives every appearance of being from eBay or PayPal, asking them to verify their password. It may ask for other information as well, such as social security and drivers license numbers, bank account numbers and PIN codes, etc. They may claim that there was a system crash and they are trying to verify everything as they restore it.

If you examine the mail closely, particularly the incoming headers, you might realize they did not come from either of those organizations. They are scams and you should never respond to them (unless it's to reply with completely bogus information, like I did once!). Neither eBay nor PayPal ever solicits that sort of information by e-mail. They do, however, sometimes send e-mail to remind you that they will never ask for it.

When signing up for eBay you will also have the option to set up your own personalized page for tracking your items, which I highly recommend (also free); it's called "My eBay." It gives a list with several sections showing the items you're currently bidding on, the items you've won recently, the items you lost out on recently, and you can even track the progress on an item you're interested in following but don't want to bid on.

EBay is a lot of fun after you get past the learning curve and start developing your own strategies. The curve isn't too bad since there's a lot of help available online, although it can be hard sometimes to track down the answer you need. They also have a number of user forums where you can ask questions.

You have to take your time and be careful, but you can pick up some good bargains on eBay, or perhaps find an item you've been wanting for a long time.

—de WA8MCQ

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 available:

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 continues to run several dozen postings per day on a variety of topics related to QRP. And as I said in the last issue, if you unsubscribed because of all of the sniping, personal attacks, etc, it's safe to go back. It's a moderated list now and back to what it used to be.

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://qrp.lehigh.edu/lists/qrp-l/ 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.

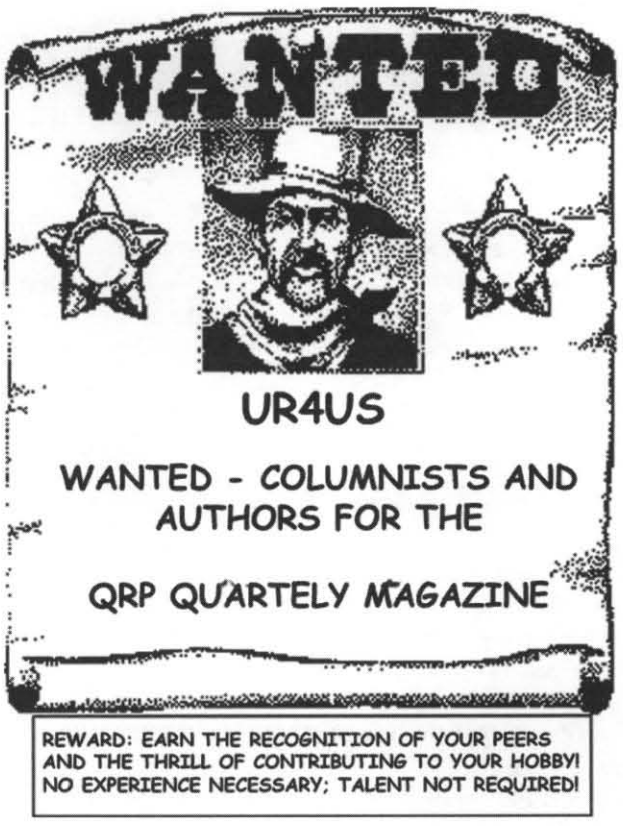
Elecraft: http://mailman.qth.net/mailman/listinfo/Elecraft to subscribe; home page at http://www.elecraft.com/

And while you're on those home pages, don't forget to check out their lists of QRP related links; and at each link that you go to, check THEIR lists as well, since not all sites list all others. In addition to the QRP ARCI site, another excellent place to use as a jumping-off point for checking out QRP related sites is the NorCal home page, run by Jerry Parker WA6OWR, at http://www.fix.net/~jparker/norcal.html. You'll find quite a wealth of QRP info online.

Don't forget to keep an eye on the web 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. My job is to edit, rewrite, redraw, etc; yours is to send in the info to share. ●●



Interested?

Contact the *QQ* Editor, Mike Boatright, KO4WX
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QRP Quarterly Reviews: Elecraft KX1

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It's Saturday, September 6, 2003, 10 a.m. I sit down next to Ken, W4DU just before the start of the monthly NOGA QRP Club meeting. Did he see it? "Did you see, IT?" says Ken. "You mean this?" I said, as I pulled out a print out of the front page of the elecraft.com website. "Yeah!" he says, whipping out the same print out, only on bright, glossy paper!

The subject of the conversation was the much anticipated Elecraft KX1"trail friendly" radio. Many thought it might be called the "K3." What was sure, though, was that although it was purported to only weigh 9 ounces, it would be full of Elecraft magic.

Ken bought his online, shortly after midnight that morning. He got serial number 025. I hesitated, thinking about how I would explain the new radio to my wife, until I realized that it was so small, she'd probably never see it. I ordered mine Monday morning, and got serial number 073. Not a bad serial number for a ham radio, all things considered (and I did tell her about it…).

What is all the excitement about this new little radio? Well, for one thing, it is the newest toy on the market (Rev. George Dobbs, G3RJV, would call it "pelf"). It is also one of the coolest toys on the market. Add to that that it has a fairly decent radio under the covers, and you have all the ingredients for a winner.

The KX1 is intended to be a trail-friendly radio (see Figure 1). For those of us who enjoy combining amateur radio with the great outdoors, there has been much experimenting, testing, trying of this and that, form factors, power curves, low dropout ICs, surface mount parts, well, you name it and somebody has probably tried it in the effort to get anything less than a BC-610 into the backpack, and out on the trail.

Wayne Burdick, N6KR, has a long history of working with trail radios, including his original Wilderness Sierra, the SST and the Elecraft K1. When I asked him about how he came up with this radio, he told me that he had been mulling around several ideas for awhile, including the variable bandwidth filter, the use of latching relays,

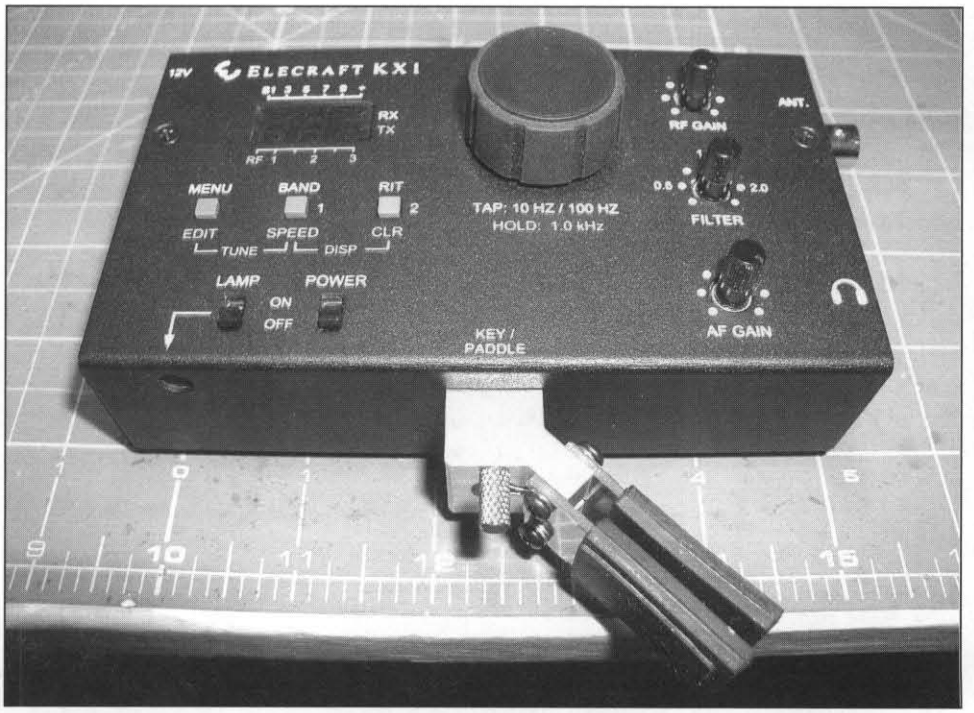

Figure 1—Elecraft K1, S/N 0073.

reuse of circuit components and his tried and true AGC for the NE602 design. He told me that one day last March, he woke up at 5:30 a.m. with the idea for the paddle. From that, everything else congealed and they had a working prototype within a month. (For a really great discussion on the evolution of the KX1, see Wayne's story in the *ARS Sojourner* at www.arsqrp.com/ars/pages/back_issues/2003_text/1203_text/N6KR.html.)

Features

The paddle. Of all the brilliant ideas in this little radio, the paddle is sheer genius (see Figure 2). It's one of those "how come I didn't think of that?" things. For those of us who aren't really good at iambic keying (I'm a paddle slapper, myself, I must admit), it takes some getting used to. But if you concentrate on a light touch (which probably forces you to send better code anyway), you'll be happily using it in no time. The key plugs directly into the radio and uses a thumbscrew to hold it in place. The PIC-processor driven keyer is adjustable from 8-50 WPM, features Iambic modes A and B, has 2 message buffers and auto-repeat.

The basic radio weighs about 9 ounces, although, you'll want to add all the options (30 meter module, antenna tuner, paddle), which along with six AA lithium cells brings it in at a whopping 15 ounces. (The best I could get my fully accessorized K1 down to for the Spartan Sprint was right at two pounds.) But this rig is also only 1.4"(H) x 5.8"(W) x 3.0"(D)—it will fit in your pants pocket! Add a couple of pieces of 20 to 24 foot wire (one for a random wire, the other as a counterpoise) and you are QRV.

A key feature of this radio is its form factor. The radio is laid out flat-that is, all of the radio's controls are on the top of radio, as opposed to on the front panel as are most radios. It is designed to be used while sitting on the floor of a tent, or on the side of a trail, fallen down log, etc., and even has a built-in white LED for night-time operations

One problem with many trail rigs is power output versus current consumption. The KX1 is specified to draw about 32 mA

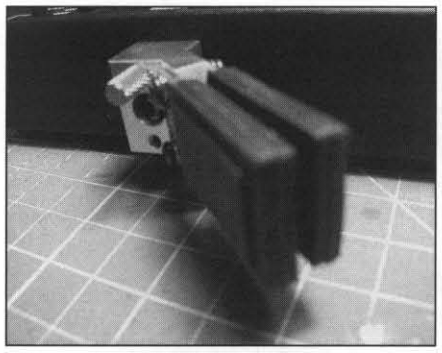

Figure 2—KXPD1 paddle option.

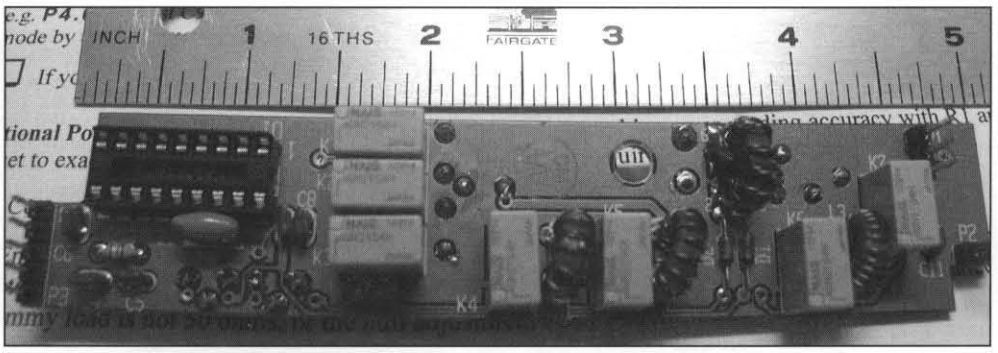

Figure 3—KXAT1 antenna tuner option.

(with headphones) on receive and roughly 300 to 700 mA on transmit (assuming a 10% duty cycle, less than 100 mAh current draw). With six AA batteries (which fit inside the bottom cover), you can expect to get several hours of continuous operation, depending on the output power (adjustable via a small trimmer potentiometer through a hole in the bottom cover, however, Elecraft says that the transmitter performs optimally at the maximum setting).

The rig has several features which help it achieve minimum current draw. These include the use of latching relays for band changes and tuner settings and an "incredibly efficient LED display" that is specifically designed for very-low-current applications. The display also features a display-off timer (variable via a menu setting from 5 to 60 seconds, or always on), and a 100% audio Morse feedback setting, allowing you to use the KX1 without needing the display at all, including access to all menus, all switch functions, and the two VFO frequency modes.

Included in the KX1 design are interesting features intended to reduce the overall parts count while still ensuring reasonably good performance. These include a DDS (Direct Digital Synthesis) VFO, a variable bandwidth crystal IF filter, a differential feed from the product detector to the AF amp (reduces noise and increases overall audio gain), and use of the TC4427 driver chip to drive the two latching relays in the basic circuit.

How many antenna tuners have you built that use less than 25 cubic inches of space? How many have you built with a three-band radio, batteries, and an antenna tuner inside? While not intended to tune a wide range of impedances, the antenna tuner option will work with many basic trail-friendly antenna designs.

The receive circuit is a basic dual-NE602 mixer/product detector superhet design. It features a variable bandwidth crystal IF filter (4.9136 MHz). The bandwidth can be adjusted from approximately 250/300 Hz to 2500 Hz using a potentiometer that varies the reverse bias on the two varicap diodes which serve as the inter-crystal capacitors. While not a pure linear response, it does serve adequately as a simple variable bandwidth IF filter (see lab tests below), and is easily adjustable via a top panel control.

On transmit, the DDS VFO is shifted from the receive mixer LO frequency (11913.6 KHz when the VFO reads 7000.00 KHz) to the displayed VFO frequency. The transmit chain is direct drive, using a J309 buffer for the DDS (the J309 was used instead of the more popular J310 because it has a much lower pinch-off voltage-typically –1 to –3 V-making it more suitable at low voltages as might be encountered running AA batteries in the field), a 2N4124/2N3904 pair of NPN transistors as a driver and the popular 2SC2166 transistor as a final (in class C).

Lab Tests

We intended to put the KX1 through most of the basic laboratory tests, including measuring the minimum discernable signal (MDS), blocking MDS (also known as "blocking dynamic range") and third-order input intercept. The point of these tests were not to compare this radio with others in its class—frankly, there really aren't any others in its class—but rather to give the operator in the field some idea of what kind of performance to expect under normal and abnormal conditions.

However, in order to reduce parts count, N6KR designed the AGC circuit to always be on. Wayne was the first to apply AGC to an NE602/612 (in the SST, then in

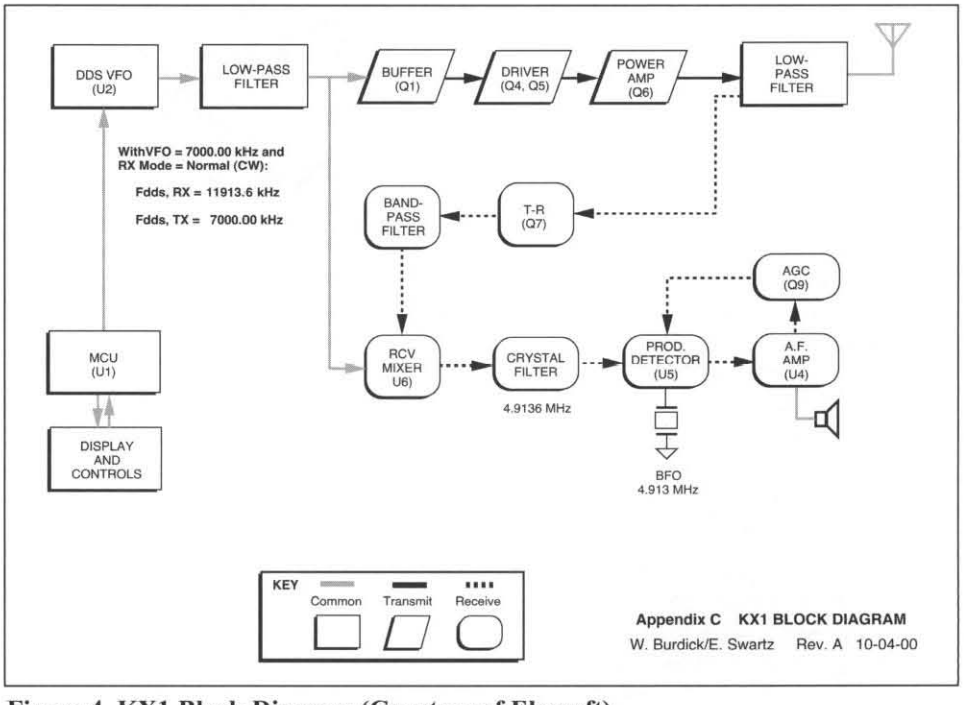

Figure 4. KX1 Block Diagram (Courtesy of Elecraft)

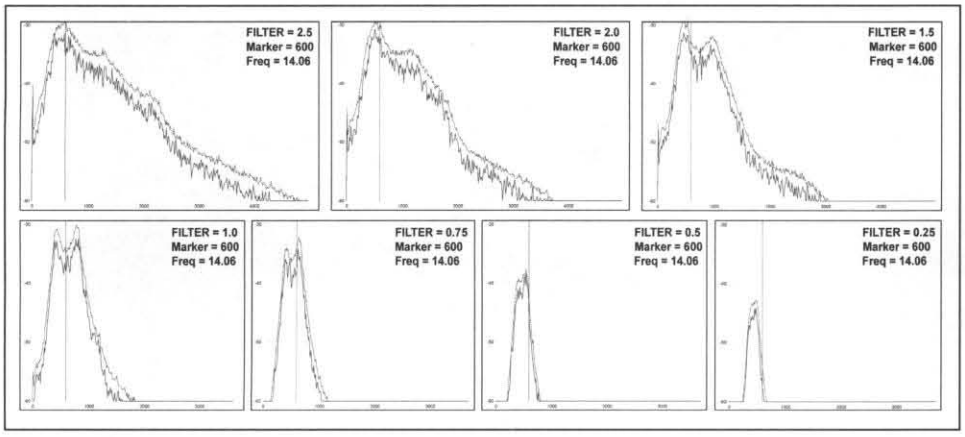

Figure 5—Variable crystal filter bandpass measurements.

the K1 and now the KX1). He describes it like this:

"In general, the gain of Gilbert-cell multiplier can be reduced in this fashion as long as a degradation of IMD is tolerable. Applying the smallest possible amount of bias reduction is a good strategy, and it's important to maintain DC balance by using an RF choke (or transformer) at pins 1 and 2. There's some protection from harmonic distortion due to the preceding crystal filter, and in my tests, I noticed very little distortion in the audio channel even in the presence of near cutoff bias."

In the case of the NE602, an AGC range of something like 70 or 80 dB is possible, depending on individual device balance and the input frequency. In the K1 we applied "delayed" AGC to the RX mixer as well, resulting in a huge AGC range. You could do that in the KX1, too, by adding a resistor and an RF choke, but that's probably overkill since the KX1 has an analog RF GAIN control for the rare times when you might encounter such large signals.

What all this really means is that Wayne made some tradeoffs in performance in order to achieve reduction in complexity and the overall number of parts in the radio. By having the AGC "always on" one really cannot measure blocking MDS, 3IIOP, etc., because the AGC will interfere with the measuring of these parameters. It is possible to disable the AGC, by temporarily grounding the cathode of D4, however, we intended to test the radio unmodified (except for the addition of standard Elecraft options).

So if you are looking to the KX1 to perform like a $3000 contesting rig, it probably will not. We don't even need to make the measurements to say that. However, you probably are not going to lug a $3000 contesting rig along with you to the top of a 14,000 foot mountain, either.

We were, however, able to measure the minimum discernable signal, using the method described by Wes Hayward, W7ZOI, in *Experimental Methods in RF Design* (and similar to the method used in the ARRL Lab). Using this test procedure, we measured the MDS at –125 dBm or 0.13 µV for 3 dB (S+N)/N. This test was performed on 14.060 MHz with the audio filter set at approximately 500 Hz. However, note from Figure 5 (audio filter bandwidth tests) that the 600 Hz offset is four or five dB down from the "sweet spot" at this setting.

Elecraft says that they have measured MDS in excess of –130 dBm on 40 meters. While we restricted our measurements to 20 meters, both radios tested did seem to be more sensitive on 40 meters. Given this and the behavior of the crystal filter, we agree that MDS in excess of –130 dBm is achievable with this radio, depending on the specific filter setting, use of RIT, etc.

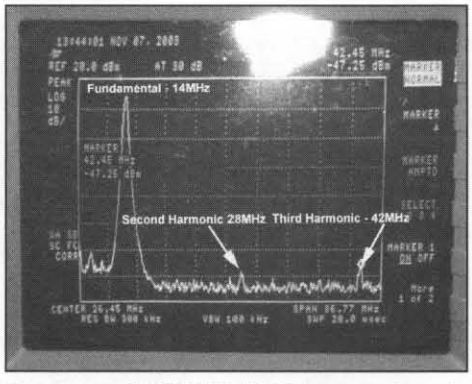

Figure 6—KX1 S/N 0073 harmonic output measurement.

The variable crystal filter is quite ingenious, when you think about it, however, it would be unreasonable to expect it to work perfectly. We tested the filter using an NØSS noise generator followed by a step-attenuator into the RF input of the radio (see Figure 5). The radio was tuned to 14060.00 kHz and the audio output was measured using an IBM Thinkpad T20 using Spectrogram. Since the filter bandwidth is adjusted using an analog potentiometer, the exact bandwidth setting could not be made, but as can be seen in Figure 5, the filter does work fairly well, albeit with some interesting passband shapes. Note that the FILTER setting is subjective and "analog." However, in actual operations, use of the filter should be balanced with use of the RF and AF gain controls to get the clearest possible signals for the band conditions you are operating under.

One troublesome problem we did find was two birdies at 7038.5 kHz and 14066.5 kHz (the 7038.5KHz birdie did not appear in W4DU's radio, S/N 0025). In particular, the 20M birdie was noticeable, even with an antenna attached. We discussed this with Wayne, N6KR, and on two KX1s that he tested, he could not hear the 7038.5 birdie at all, and found the 14066.5 masked by band noise. He suggests that if this is problematic, the operator can switch to LSB receive mode on 20 meters and that birdie will disappear (note that under normal circumstances, Elecraft does not recommend using LSB on 20 meters unless it is necessary, because receive sensitivity is slightly lower; this is due to the high-side injection frequency—14 + 4.9—being a bit past the knee of the curve on the DDS low pass filter). We did observe that this technique did reduce (but did not eliminate) the 20 meter birdie.

These birdies are artifacts of the use of the DDS VFO. Since few QRP stations operate above 14065 kHz (e.g., in the realm of the "digital boys") this birdie may acceptable as a reasonable tradeoff for the benefits realized from the DDS VFO.

As mentioned previously, low current consumption is paramount to portable operations. Using 6 AA Energizer Lithium type L91 (battery voltage at 9.0 V) we measured the receive current (with "ear bud" style headphones, no antenna, volume control set to full volume) at 36 mA. On the same batteries, we measured the

logbook LED current at 13 mA.

Figure 6 shows a spectrum analysis of the harmonic output of KX1 S/N 0073. A 14.060 MHz +34 dBm signal (2.5 watts) was fed into a calibrated 30 dB attenuator resulting in a +14 dBm fundamental signal. The second harmonic (on 28 MHz) is 62 dB down from the fundamental, at –48 dBm. The third harmonic (on 42 MHz) is –62 dB from the fundamental, at –47 dBm. Both are well within the Elecraft specified –40 dB for spurious emissions.

Construction

One of the really great things that Elecraft does for all of its amateur radio kits is to post PDF versions of all "Owner's Manuals" on its website (www.elecraft.com). In anticipation of the arrival of KX1 serial number 073, we downloaded and printed the entire manual—a great help on getting a early start on building the radio.

Like all Elecraft documentation, the KX1 Owner's Manual is extremely well written and easy to follow for the average amateur. Construction is broken down into logical steps allowing for simple testing as you go. We reviewed Revision A, dated October 10, 2003, and as you might expect, we did discover several typographical errors. Wayne was very responsive and had incorporated all of our corrections and suggestions within a day of reporting them.

Construction and testing of the basic radio took us about 10 hours, at a reasonably careful pace. This included approximately one to 1-1/2 hours of sorting and inventorying all parts (highly recommended). The tuner and the 30 meter module took approximately two hours each to construct, install and test.

Building the KX1 will give you a true appreciation for the effort that was put into making this radio tight and compact (see Figure 7). In order to achieve the tight parts density while still using leaded parts (three SMT integrated circuits come preinstalled on the board) careful attention must be payed to installation of most parts. The documentation says, "Follow the instructions carefully about the position of parts. Many parts must be positioned exactly as shown as instructed or the case will not fit. This really is true, especially if you are planning to install the tuner and the 30 meter modules. In some places, parts cannot exceed 5/16 inch, but equal care must also be paid to ensure that you do not damage the parts while trying to get them to sit close to the board."

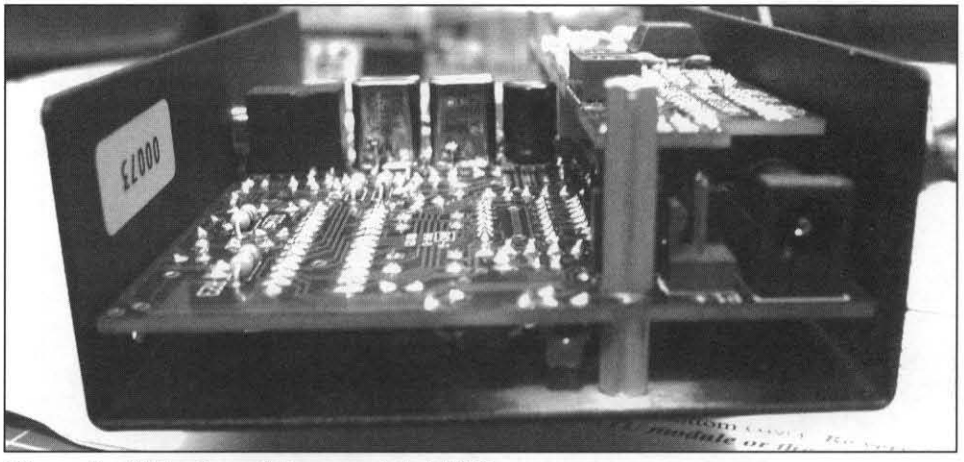

Figure 7—Side view of the completed KX1.

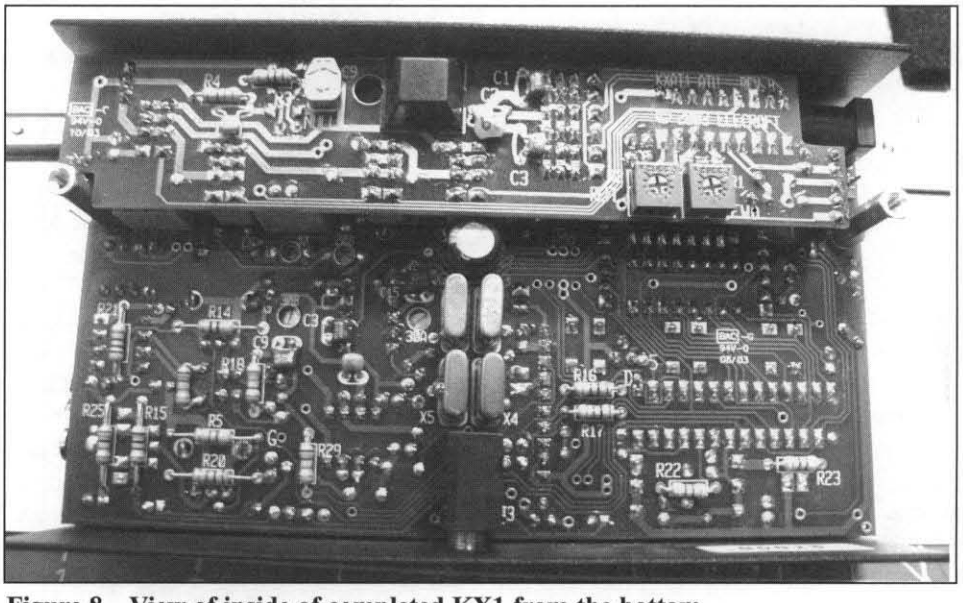

Figure 8—View of inside of completed KX1 from the bottom.

Elecraft also recommends having solder wick and/or a good vacuum desoldering tool. While we believe that you should always have one or both of these on your bench, it is very helpful in this project. Because you are often focusing on making sure that parts fit within the required clearances, it is slightly easier to make a simple parts error and install the wrong part. The documentation is designed to minimize this, but still, it is a good idea to always have solder wick around.

The only test equipment really necessary to construct the KX1 is a good Digital Multimeter (DMM) for voltage checks and confirming resistor values. Elecraft suggests that a DMM with capacitance measurement capability is desirable, but not required. We found the AADE meter (from Almost All Digital Electronics) very helpful (some of the capacitors are quite small!) for confirming capacitor values.

Because of the tight component mounting tolerances, assembling the KX1 requires a bit more care than assembling the K1 or K2. The basic radio is straightforward, however, and if winding toroids is your bane, you will be happy to know that there are only three toroidal inductors and one toroidal transformer in the basic radio, and the same is true for the antenna tuner (and Elecraft does offer a kit of pre-wound toroids for the seriously winding challenged).

The most difficult part of construction of the KX1 is the installation of the 30 meter module. This module is connected to

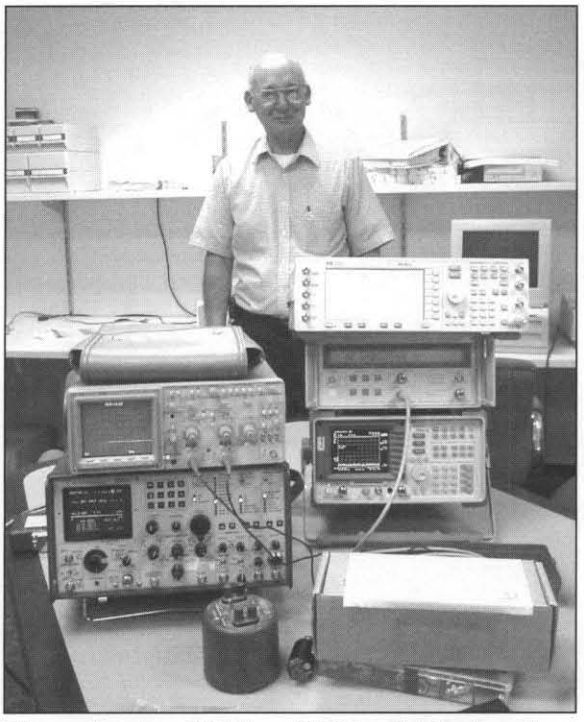

Figure 9— Les Wilding, K4OL, obtained and set up most of the test equipment for this review.

the main board via seven short connecting wires which must carefully routed between the option board and specific holes on the main PCB. Pay very careful attention to this installation-while it is not that hard to do it is a bit challenging and time consuming. Wayne says that he does have some changes to the assembly procedure in mind, and is open to suggestions.

Careful attention must also be paid to installation of the trimmer capacitors. These are actually adjusted during testing and alignment from the other side of the board by passing a small screwdriver through holes in the board. If the trimmers are not installed correctly, it can make alignment difficult and you could damage a part.

We expected the construction of the tuner to be a challenge, but actually it was quite easy and straightforward. Special care must be taken however, to not accidentally touch any of the seven miniature relays on the five square inches of PCB with your soldering iron, as this could damage the part.

The completed KX1, including 30 meter module and antenna tuner is shown in Figure 8 (bottom cover removed). The 30 meter module is not visible, as it actually sits between the PC board and the top cover.

On-the-Air

Never, ever build a new radio and expect to test it the same night as the CQWW Phone! For that matter, don't expect to get stellar results the week the sun throws three of the largest Coronal Mass Ejections (CME) in recorded history at the earth. But then, even the multi-thousand dollar contests rigs aren't going to do very well then either!

On the other hand, the KX1 went head to head with the AT Sprint (ultra-light Class E-final Altoids™ tin radio from Steve Weber, KD1JV) in the November and December, 2003 Spartan Sprints and held its own, taking second and third place in November and second place in December. While the AT Sprint is significantly lighter, the KX1 is clearly the more ruggedized field radio, and is commercially available (the AT Sprint is no longer in production). (One of the authors did sell his AT Sprint after getting his KX1 on the air, though.)

KO4WX operated in the November sprint, taking third place, working 23 stations in 13 SPCs while only running 1 watt. (He did use his 80 meter full-wave loop.) After running for 1.5 hours calling CQ about half the time (you have to have real mojo to call CQ with 1 watt in a contest!), the Energizer Lithium batteries still measured 9.0 volts.

One should not expect the antenna tuner to perform as well as a full-blown antenna tuner—for example, it really cannot tune up KO4WX's 80 meter loop (he uses a ZM-2 to match the loop to the KX1). However, we have found it adequate to tune short (20 to 25 feet) verticals with a counterpoise (also 20 to 25 feet) and doublets about the same size (your results may vary).

The menu navigation is quite straight forward and very intuitive to use. The front panel (or more correctly, top panel) controls are very simple and well thought out.

Conclusions

In conclusion, we found the KX1 to be an excellent balance of compromises in space vs. weight vs. performance. While it is not a "tiny" K2, it is certainly deserving of Elecraft name. It has excellent documentation and while it is a bit of a challenge to construct (you might want to build a K1 first), we know of several QRPers with moderate construction skills who have successfully built the radio.

What sets the KX1 apart from other small radios is that it is a real radio. By that, we mean that in its 24.36 cubic inches, it has lots of features that dramatically affect field usability, including (up to) three-band operation, a real display, real encoder knob, built-in paddle and keyer, antenna tuner, power supply (batteries) and real controls including an easy to use menu system.

The KX1 is fun to build and operate, lives up to its billing and expectations and is truly in a class by itself.

Acknowledgements

We wish to extend special thanks to Les Wilding, K4OL, and Phil Specht, K4QPC, who obtained and set up much of the testing equipment for us. Good professional engineers are getting harder and harder to find these days, and these are definitely two of the good ones! Also, we very much appreciate the open discussion that Wayne Burdick, N6KR, of Elecraft, gave us on several topics related to this radio, including some of the thinking behind his design, and for creating the KX1 radio.

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Modifying the HW8 to Transmit Double Sideband

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About 25 years ago, I worked in the Alaska bush during summers while going to college. I used to be net control for "The Bush Net" on 7250 while there. I would take my HeathKit HW101 and power supply which weighed a ton and was difficult to pack into the small planes which are taxis for the folks that live away from town. I had built an HW8 for fun and thought it might be easier to pack to the bush.

I noticed that with the DC receiver, I could tune in either sideband, and also noticed that it was more difficult to tune in CW as there were two places on the dial where a signal appeared but only one was real. I had been reading a copy of *Solid State Design for the Radio Amateur* at the time. I read comments about DSB rigs and balanced modulators and had an epiphany- I knew at that point that inserting a balanced modulator in the transmit oscillator chain would work to put the HW8 on sideband.

Previously, I had built an audio speech clipping processor using a 741 and some back to back silicon diodes so knew that a 741 would have enough gain to drive the balanced modulator diodes.

There were some schematics in *Solid State Design* for a DSB 50 MHz rig and a number of simple balanced modulator circuits. I figured that I could just drop a balanced modulator between Q5 and Q8. I cut a trace on the circuit board and ran some RG174 in and out of the balanced modulator to the circuit board on either side of the trace cut. I suppose it was a lucky guess but it worked.

To build the balanced modulator, I rewound a couple of the toroids from those stolen from the 15 meter band switch. The first time I built this mod I used silicon diodes and didn't have a carrier balance pot, however, it worked great on the first try! I guess it pays to be Irish.

Carrier suppression seemed pretty good so I listened to my DSB transmit on my HW-101 on either sideband and set the audio level to where it sounded ok and called it done.

At the time I had a 40 meter sloper array around my tower which, incidentally, works very well. The best contact that I ever made on that band ever was with my HW8 DSB to New Zealand from Alaska. 7000 miles/2 watts = 3500 miles per watt. Not bad, considering the HW8 puts out about 2 watts on CW so each sideband is only putting out about 1 watt.

Subtract an S-unit or two for worse signal to noise of sideband vs. CW and that was a pretty cool contact for 40 meters. Hmmm... What would that be if it was CW? 2 S-units = 12 dB = 8x power. 7,000 miles x 8 = 56,000 miles per watt CW equivalent. But I digress...

Anyway, I took the HW8 out to the bush with me the next summer and checked into Anchorage from the Yukon River Delta all summer. I was using a trap vertical stuck in the tundra with 4 radials. The amazing thing that I found was that the net controls could copy me BETTER on sideband than on CW even considering the power drop and increase in signal to noise. That was 25 years ago when the net controls could copy CW pretty well... They seemed to be willing to listen harder to voice than to CW.

I sold that HW8 somewhere along the line. Don't recall where it went. I believe I had ripped the DSB modification out of the HW8 before I sold it.

Nowhere else have I ever seen a similar modification I've often thought it would be cool to recreate it and publish the results sometime. I got another HW8 about 15 years ago and attempted—but failed—to recreate the circuit. Recently, however, I tried again and this time, I was successful. Instead of cutting the circuit board trace, I simply removed C75 and ran RG174 in and out of the holes where C75 used to be. Also, I chose to use germanium diodes instead of silicon this time for the lower cut-on voltage (0.2 volts vs. 0.7 volts).

I tried a couple of simple balanced modulator circuits from *Solid State Design*

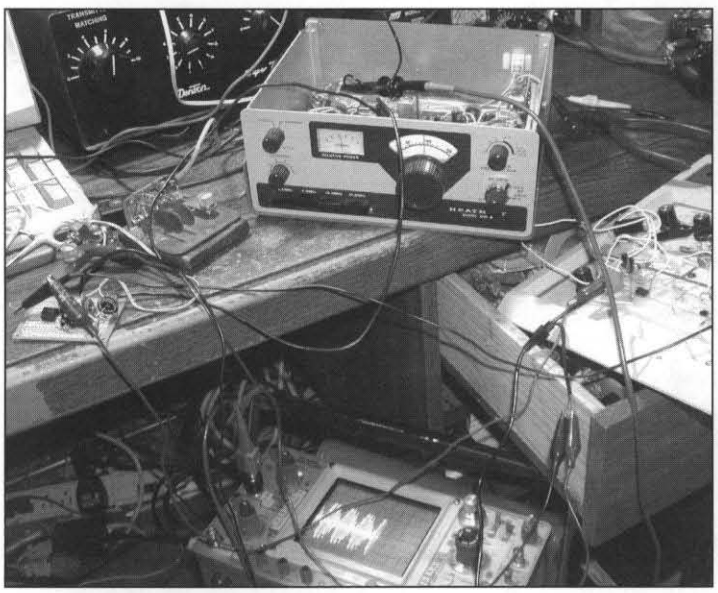

Figure 1—Modification under development; note the modulation waveform on the oscilloscope.

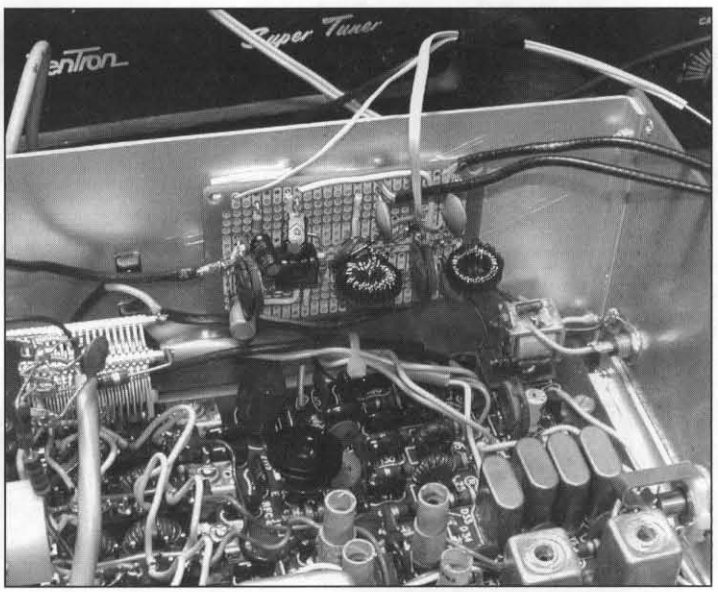

Figure 2—Speech amplifier and balanced modulator installed on inside wall of HW8.

but kept having a problem where I could not get good carrier balance on 80 and 40 meters. I got good carrier balance on 20 and 15. I tore the circuit apart and rebuilt a different type circuit and still had the same problem. I doubled the number of turns on the trifilar balanced transformer and encountered the same problem. Finally, I rewound the audio choke using 40 turns instead of 24 and then the balanced modulator started working well with good carrier balance on 80, 40, 20 and 15 meters.

Using my Heathkit design experimenter, I breadboarded up a speech amplifier and ran the audio from the speech amplifier using clip leads into the balanced modulator. I hooked a scope to my antenna output and adjusted the drive to look like a clean SSB signal without too much flat topping (see Figure 1).

I fired it up on the Bush Net at 7093 and gave a call: "This is KL7R QRP 1 watt double sideband." A fellow in Fairbanks (about 650 miles away) came back to me: "You are S7 here but you are way off frequency."

NL7F also came back and said, "You sound clean on both sidebands and are about 2 kHz off frequency."

The HW8 circuit description (see note 1) says that C55 is switched in and out of circuit on transmit and provides a transmitter offset. It occurred to me that maybe I could just remove C55 and then my transmitter and receiver would no longer be offset. I lifted one leg of C55 and waited for the Bush Net the next day.

I checked in and my transmit frequency was exactly the same as my receive frequency. NL7F said: "You sound clean on both sidebands and are zero beat with the net."

Time to Make it Production...

To make more permanent circuits, I tore apart my Manhattan version of the balanced modulator and the breadboarded speech amplifier and put the, both on pieces of Radio Shack perfboard (see Figure 2). I ran wires to +12V and ground, to the microphone, PTT, key jack, and to a DPDT switch for power and to short past the modulator in CW mode.

I checked into the 40 meter net the next day. Getting routine.

A guy in Seattle on 20 meters (about 900 miles away) gave me a 59 +10 dB. He asked what kind of antenna I was running on my 1 watt DSB rig. I said a Loop Skywire for 80. He said he was running a "4 over 4 over 4 over 4." I said, "I'll take it."

It then occurred to me that I would like to be able to switch back in C55 while in CW mode but I only had the one DPDT switch and still needed to switch the power off to the speech amplifier during CW mode.

I decided to use the relay driver output (which keys on 12 Volts during transmit and is off during receive) to power the 741. I ran wires so that C55 is in circuit when the switch is in CW mode and out of circuit when in DSB mode. The switch also bypasses the balanced modulator when in CW mode. Some double sided foam mounting tape to mount the mod to the side of HW8 and we are done (see Figure 2).

Detailed Modification Instructions

The detailed instructions for the Heathkit HW8 DSB mod can be obtained on the Internet at www.geocities.com/kl7r/hw8/hw8dsbmod.txt.

STOP!! Before you do anything put a 1 amp fuse in your power line. I blew 5 fuses developing this circuit. I was REALLY happy to have fuses go instead of components.

Start by removing the top and bottom covers. The following modifications are made on the main board:

1. Remove C75 (.05 uF), which is located between the emitter of Q6 and the base of Q8. It is also physically located between the group of 4 uncanned tuning coils and the large canned tuning coil (see Figure 3).

2. Insert two lengths of RG172 into the holes where C75 used to be. Find a place to ground the shields. I soldered onto the nearby RG172 shield. The cable from the emitter of Q3 will be CARRIER_IN the cable going to the base of Q8 will be DSB_OUT. Hole to rear of HW8 is CARRIER_IN. Hole to front is DSB_OUT. Refer to HW8 schematic and circuit board.

3. Lift up one leg of C55 (6 pF), located near face plate to the left of the VFO capacitor. This cap is to offset from zero beat in CW mode. We don't want to be offset when doing DSB.

4. Solder a 2 conductor length of ribbon cable to the lifted end of C55 and to

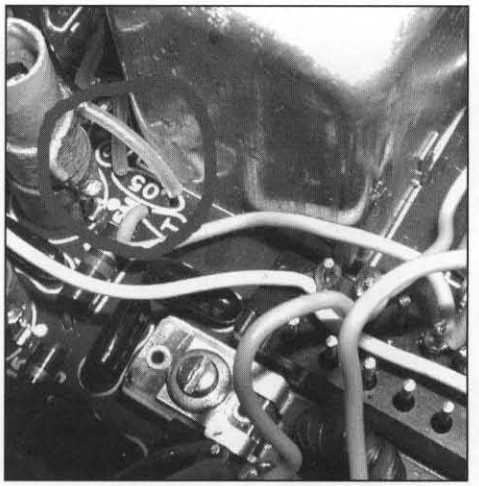

Figure 3—Locating C75 inside the HW8.

the hole that it came out of. This pair of wires called OFFSET_ENABLE will be used to switch C55 in circuit for CW where you need it and out of circuit for DSB where you don't.

That is all the soldering you need to do on the main circuit board so you can put the bottom cover back on.

5. Build the speech amplifier and balanced modulator circuit, shown in Figure 4. A detail of the layout is shown in Figures 5 and 6 (high resolution color photos are located at www.geocities.com/kl7r/hw8/).

6. Attach the CARRIER_IN cable to CARRIER_IN.

7. Attach the DSB_OUT cable to DSB_OUT.

8. Attach the ground wire to the antenna ground lug.

9. Attach the V+ wire to wire connection point "J" (you may need to cut a little bit of shielding back in order to solder to the wire inserted in point "J"). Point "J" is connected to the collector of relay driver Q13 and supplies 12 volts during key down.

10. Drill two holes in back panel and mount a DPDT switch and a 1/8" stereo phone jack.

11. Attach two lengths of two conductor ribbon conductor to the center and upper connections of the DPDT switch.

12. Attach one pair of the ribbon cables in Step 11 to DSB_BYPASS.

13. Attach the other pair of ribbon cables in step 11 to OFFSET_ENABLE.

14. Connect a length of RG174 to the 1/8 jack. (MIC to jack tip; microphone shield to ground.) NOTE: Put a .001 cap

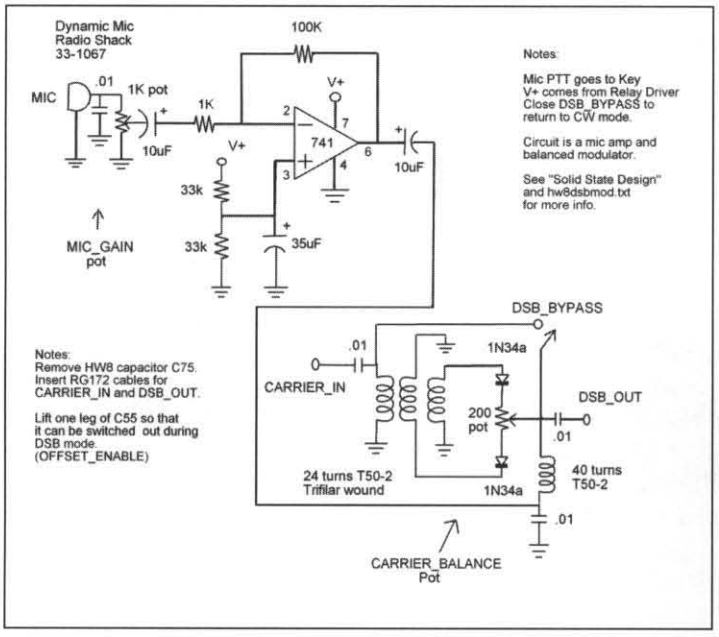

Figure 4—Speech amplifier and balanced modulator schematic.

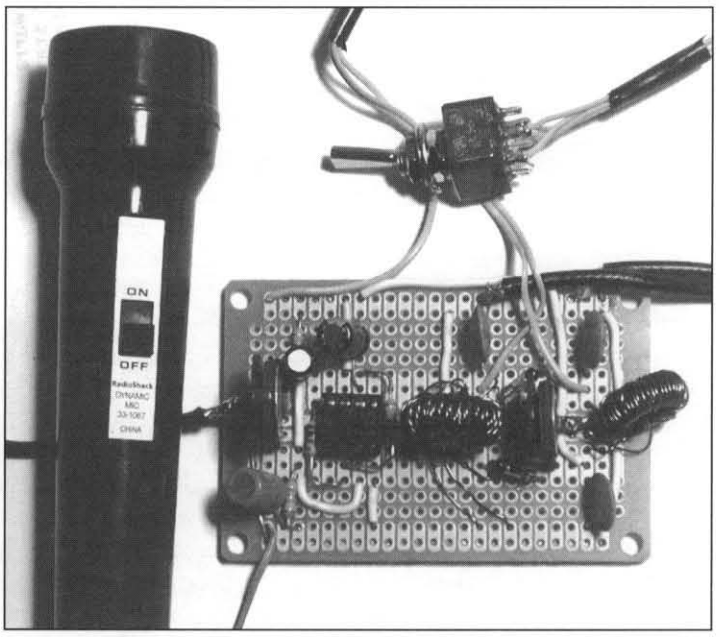

Figure 5. Detail of Circuit Board Layout

from MIC to shield on the jack to shunt any RF on the microphone cable to ground.

15. Connect a length of 2 conductor ribbon cable to the 1/8 jack. (PTT to jack ring. remaining connector to jack ground.)

16. Attach MIC and microphone shield to the DSB circuit

17. Attach PTT and its ground to the key jack on the back panel.

That completes all connections between the HW8 and the DSB board.

Adjustment Procedure

1. Switch the switch to CW.

2. Adjust loading for max. out into dummy load. Note meter reading.

3. Switch the switch to DSB.

4. Key the microphone PTT and adjust CARRIER_NULL pot for minimum.

5. Adjust MIC_GAIN pot on voice peaks for about 50% of maximum CW reading.

That completes the adjustment.

Thoughts Regarding PSK

The only rationale behind doing this is that it is pretty easy to build a CW rig and it is only slightly harder to modify that rig to do DSB. However, it is much harder to build a SSB rig. Homebrewing an SSB rig is beyond many QRP experimenter's ability, so you either have to resort to a commercial kit or a commercial rig.

I imagine as time goes on, more and more hams will be able to do digital modes and less and less hams will be able to do CW (unless they treat CW as a digital mode). As I have modified my Heathkit HW8 to do DSB, I would also like to try to make a BPSK contact with it.

My thoughts regarding QRM are:

1. Since the HW8 is a direct conversion receiver, I would hear any stations on the wrong sideband and so avoid QRM to them.

2. If someone came back to me on either sideband I would be able to answer them if I was using BPSK which doesn't care about polarity.

3. If I use BPSK, my total bandwidth consumed would be 2 x 31 Hz = 62 Hz (if properly adjusted) which is not as wide as many other digital modes. I think I would avoid the wider bandwidth modes.

4. If I kept my audio frequency low (say at or below 1 kHz) then the primary sideband would be at 14071 other sideband would be at 14073 which is still in the "PSK sub-band." If I tuned my VFO to 14069.5 MHz and kept the 1 kHz audio frequency then the primary sideband would be at 14070.5 MHz and the other sideband would be at 14072.5 MHz both of which are well within the PSK sub-band.

I realize the potential for QRM. However, at QRP levels and being able to hear any QRM that might be caused seems to me to mitigate the problem.

Notes

1. I downloaded a copy of the Heathkit HW8 manual and schematics from ftp://bama.sbc.edu/downloads/heath/hw-8/

2. I used #28 wire (green Radio Shack hookup wire) for the toroids.

3. I know that 24 turns was too few on the output choke so went to 40 turns on the output choke. It worked on 20 and 15 but not on 40 and 80 with 24 turns so had to go to 40 turns.

4. I had 12 turns on the transformer and that seemed to work but went to 24 turns which worked well also so I never went back.

5. I spent some time matching the diodes. Silicon diodes should work but I used germanium like 1N34a for lower threshold voltage. I selected a pair with similar forward and reverse resistances and "cut-in" voltages. If you get a really good pair, you might be able to remove the balance pot.

6. When I built this 25 years ago I used silicon diodes and no balance pot. I also cut the circuit board then instead of removing C75.

7. An interesting note: If you switch to DSB and then zero beat a CW station then switch to CW you will be right on him with the correct offset. Likewise, sometimes a CW station will come back to you zero beat—switch to DSB mode on receive to get a proper offset.

●●

A Primer on Relays

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Relays are essentially electrically operated switches. They enable us to switch applications remotely, carry more current than an ordinary switch, or switch more voltage than an ordinary switch can handle. This article will discuss relay types, actions, uses, and connections. Terms such as Single-Pole-Single-Throw, latching, SET & RESET terminals, nominal coil voltage, and others will be explained.

Types of Relays

There are many types of relays, with their physical description and electrical operation closely related to their applications. The methodologies involved in relay actions are best approached from an understanding of the terms usually applied to their various parts, and the relay's intended application. Those important terms include: coil voltage; contact ratings (voltage & current); ultimate breakdown voltage; make time; and break time.

Coil voltage is self-explanatory. The nominal coil voltage for a relay coil is simply that voltage which will best actuate the relay. Coil current is normally given, but not necessarily coil resistance-except sometimes in the case of so-called "sensitive" relays may give only a coil resistance. This just means that the relay's coil requires only a small current to operate-e.g. that most relays not labeled "sensitive" have much lower coil resistances, and require-comparatively-much more current.

An example I recently experimented with is a relay coil with a resistance of 2300 ohms. A high value compared to the usual relay coils which are in the 50 to 200 ohm range. This relay's specifications mainly called it "sensitive," gave the coil resistance, and—buried in the specifications—listed a recommended 1.5 VDC coil voltage. Ohm's Law provides the rest of the numbers.

Contact ratings—Contact ratings vary greatly-always related to the intended applications-usually divided between Signal (with subcategory: RF) and Power. There is a blurred line between which of these relays should be used for what application thanks to new relay architecture and materials design allowing for much greater capabilities than those of a several decades ago. RF relays, on the other hand, are a class unto themselves because their architecture is specifically designed to have a consistent impedance from input lead to output lead.

There has been a quiet revolution in relay contact current capabilities in the past twenty years or so. Gold flashing over silver, palladium, and ruthenium with gold sputtering are just two of the more common improvements. There have also been improvements in insulation, mechanical design, and packaging. Twenty years ago, a relay that could carry several amps at 120 VAC was never smaller than ~4 square inches; but today small-sized relays one half that size-and smaller-are regularly rated to as many as 10 or even 20 amps at 250 VAC.

Current Ratings—There are two current ratings that are important factors in using a relay: switching current and carry current. Most contacts that are at rest can pass about 30% more current than they can carry during a switching operation. One other value often given is a volt-amp (VA) rating. Think of this as the highest (total) power rating at any given moment for the relay's contacts-and even that may be superceded by a listing of a power rating in watts. The former (highest-total-power) meaning peak power and the latter (power rating in watts) meaning average power.

A recent example of this was a dual-coil latching relay: its contacts were rated for a carry current of 3 amps at up to 250 VAC—yet the VA rating was 125 VA. Personally, I'd never put more than about 1/2 that (60W) or RF on that particular relay—and even then, one must always remember not to exceed the carry-current ratings.

Make-Break times—The smaller sized relays—with correspondingly shorter operating distances for the contacts to travel—have brought corresponding improvements in operating speed. This is particularly important for QRP operators, since many of these relays can easily handle full QRP power levels while switching at 35 WPM. The 'size' of a single DIT at 45wpm is ~20 ms while the average make time for these smaller relays is ~2 ms. Break times are usually a single ms or so slower—about 3 ms. Not all relays are this fast, but most of the smaller, newer relays can match these times. One of the primary reasons for the use of vacuum relays in high power amplifiers to achieve CW break-in was not only their vacuum per se, but also because they could switch in under 5 ms and switch high power levels (actually: more carry than switch) at that speed.

Breakdown Voltages—Modern relays also have better breakdown voltage ratings. There are two factors you should be familiar with related to voltages: a) Contact voltage ratings are just that: the voltage that the space between the contacts will consistently stand off (not arc.) b) Coil-to-frame/etc. ratings. This rating is the maximum voltage a relay's component parts will take before arcing to ground/the frame, etc. Normally not a concern, this rating could come into play under a lightning hit, or possibly under a high-impedance, high-VSWR condition-such as might be encountered when using a remote relay to switch something to do with an antenna, for example.

Also important is the role voltage plays in the overall power ratings of the contacts.

Understanding Relay Actions

SPST—The simplest form of relay contact is the SPST (Single Pole/Single Throw) switch. It can be Normally Open (n/o) or the less common Normally Closed (n/c). It is exactly what it's called: either it makes a circuit when switched ON, or it breaks a circuit when switched ON.

For example, if you want to switch both sides of the AC line, you would use a DPST switch or relay. Since you would rather not route AC wiring all over a chassis, you could use an SPST switch to cut ON (and then OFF) the coil of a DPST relay which does the job, and being mounted in the back of the chassis-near the point where the AC line enters (and near the fuse as well) you don't have 120 VAC all over the chassis, where it could induce 60 Hz hum in your circuitry.

So, the simplest relay action is Single-Pole Single-Throw (SPST)—basically ON or OFF.

DPDT—The number of switches operating at once is called POLES. The number

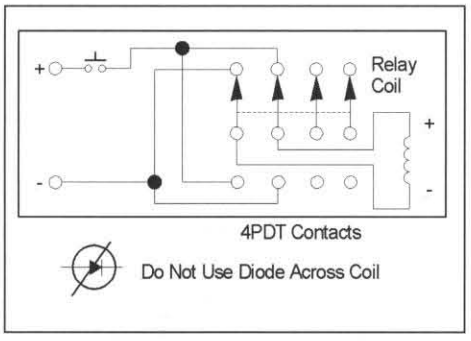

Figure 1—Single-coil latching relay.

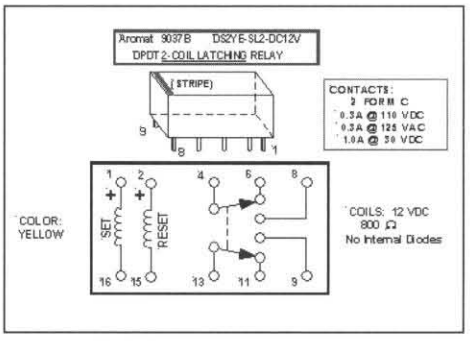

Figure 2—DPDT 2-coil latching relay.

of positions switched to, is called THROWS. So, if you are using a switch or relay to switch both sides of the AC line ON or OFF, you have a Double Pole Single Throw (DPST), Normally Open (n/o) configuration.

Next, suppose you want to switch something between two things instead of just ON or OFF. That relay would be a Single Pole Double Throw (SPDT). Or, the most common switch or relay contact, the Double Pole Double Throw DPDT. The number of poles (things switched at the same time) can equal as many items as you need to change simultaneously. 3PDT, 4PDT, and etc. They are still simply combinations of SPST or SPDT switches.

Latching Relays—Normal relays are activated by applying an appropriate voltage to the coil. They then switch their contacts to their ACTIVE position-returning to their INACTIVE position when that voltage is removed. This means that to remain switched, the relay must draw power continuously. If this condition remains for any length of time (hours not minutes), it is not only wasting power, it may damage the relay—if its coil is not rated for continuous operation-and many are not!

Enter the latching relay. When momentarily activated, the latching relay changes the position of its contact set from position [1] to position [2] and stays there. The "[1]" and the "[2]" are arbitrary labels. The relay manufacturers call them "SET" and "RESET." Just remember that they are just labels, and not verbs!

So, latching relays are very much like simple toggle switches. Rather than one, they have two, stable, no-power positions; e.g. you pulse them, they change, and remain in that position until the next pulse.

Single Coil—There are two kinds of latching relays. The first type has only one coil. To get it to change from the original state, you pulse it with a DC voltage having the reverse polarity (of the previous pulse.) There's nothing mysterious about doing this-you can take a DPDT set of its contacts, and connect use them to reverse the voltage as it is connected to the coil. The other contacts would be used to switch the latching application.

Dual Coil—The second type of latching relay has 2 coils. To cause it to change state, you provide a DC pulse on one of the coils. To change states, you pulse the other coil. There is no state-change on power-up, so if the relay is sitting in state "1" when you decide to change it, and you pulse state 1's coil, nothing happens. So, it is more effective to include an LED state indicator in your switching.

Relay Body Styles

Relay body styles are primarily application-related—though not always. There is tremendous overlapping capabilities amongst the various body, insulation medium, and contact styles. I will describe many of the types you are most likely to encounter, both new, and surplus.

Open Frame—These relays are built just like their name: with an open coil, frame and contact set. In the past, these were used primarily as power relays, perhaps because their contacts frequently need cleaning and burnishing. These also evolved into many plastic-encased (but not encapsulated) power relays used today, including octal socketed plug-in types.

Crystal Can—This is a hermetically sealed, MIL-spec type relay that is most often available with a 28 VDC coil. The contacts are usually 1A, and they are great for RF. The name comes from some resemblance to HC-6 hermetically sealed crystals-even though they frequently have square-and other-shapes that resemble the HC-6 crystal not at all. I'm very fond of them, mostly due to their terrific reliability and their inherent excellent RF capabilities.

Reed Relays—Reed relays are so called because originally they were reed switches with coils around them. They are characterized by fast switching, but are mostly capable of only low power. They may come in all sorts of physical configurations, including some rated as high as 1000V and more. But they are not capable of much current. Since they are magnetically operated, the arm of the reed must be capable of flexing sufficiently to make a contact. This physical limit is the reason for their power limitations, plus the higher mass of a substantial contact.

Reed relays come in many styles, from the simplest (a reed switch inside a coil) to very nice DIP mountings. Keeping in mind their power limitations, they are terrific for RF and keying circuits.

There are higher voltage/current reed switches you can get and make you own 70W reed T/R relay. This reed switch has a 500V rating, and can switch 70W, and carry up to 2.25A! See www.cotorelay.com/html/reed_switch_ri-48.htm. COTO reeds are available from Digikey. Hamlin reeds are also worth consideration.

Coaxial Relays—These relays are nothing magical. They are simply ordinary relays with a package configured to most easily support RF cables. The famous Dow-Key relays probably come first to mind for this category-but do not forget the BNC MIL-surplus styles. They're terrific for QRP applications-usually rated for 50-100W into the microwave range.

Solid State Relays—These relays are mostly just triacs with a DC input control voltage. They make excellent AC line switches (albeit requiring some DC voltage be present to switch them ON) and there are some SSRs that will switch DC-and even some that will switch RF (those are typically similar to ordinary DC-current-biased diode switches.) I have several 14-pin DIP SSRs capable of switching 1A at 120 VAC (although they need a heatsink for the full 1A.) The biggest disadvantage to them is that there is always some leakage current present with SSRs, so poking around a plugged in-but OFF-chassis with an AC SSR requires keeping in mind that 120V is still present.

Power Relays—Finally, as a type, I

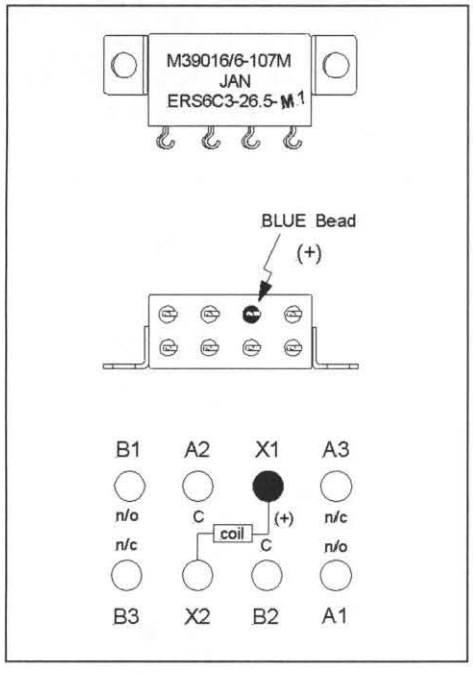

Figure 3—Crystal can relay.

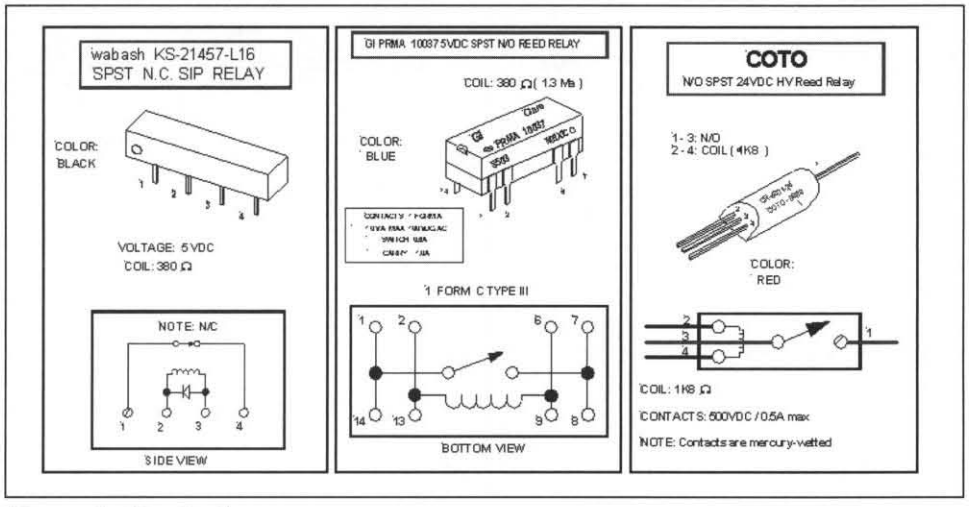

Figure 4—Reed relays.

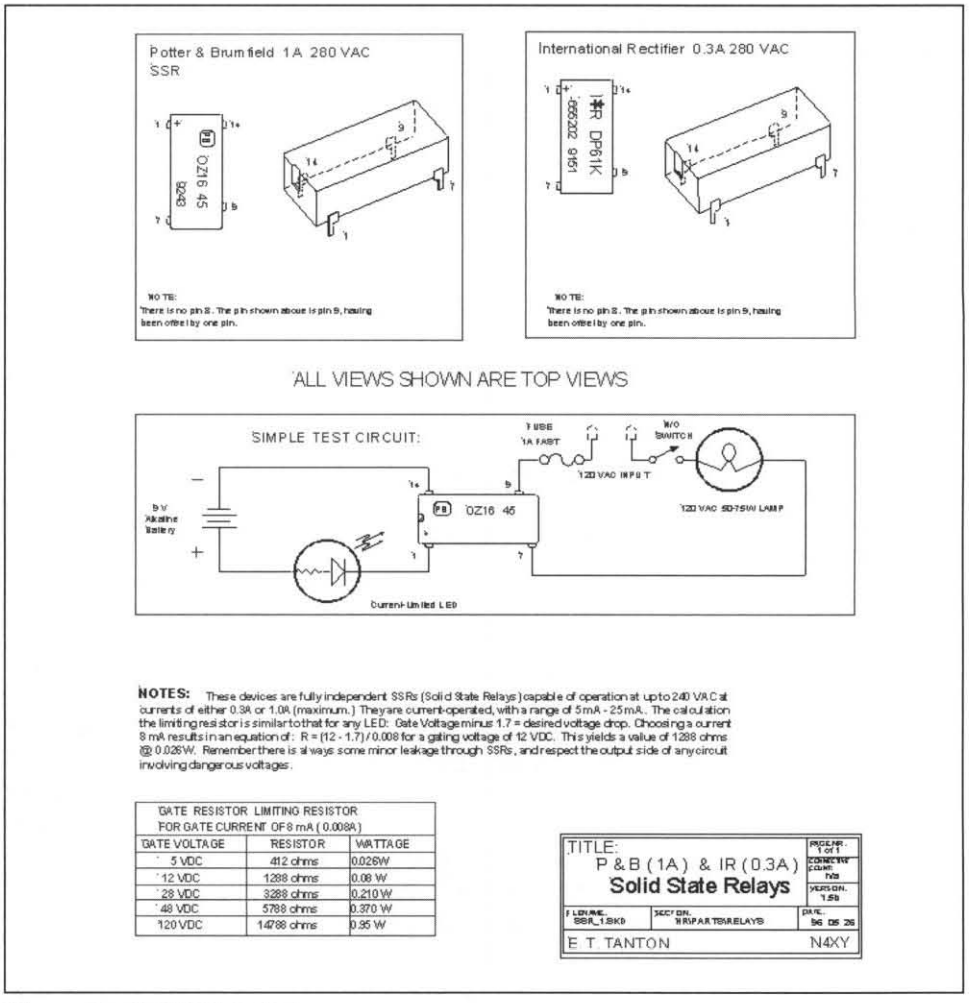

Figure 5—Solid State Relays

don't have a name for all the Power Relays that come in small (1" x [1" or 2"] x 1" typically) plastic cubes. They will do for T/R switches—although they are not as fast as reeds—and excel for power switching.

Final Thoughts

I once built my own reed relay from one of a few heavy duty, gold-plated reed switches I had. I took one and centered it inside a 12V solenoid coil using non-corrosive RTV. Then to test it I set up a high-power HP Squarewave Generator, along with an oscilloscope, a DC source, and a load resistor.

The idea was to switch the DC ON and OFF while watching the 'makes' and 'breaks' until something became flaky. It got past 10 kHz before the leading edge deteriorated significantly due to contact bounce. You could actually see the contact bounce begin! Not too shabby!

Always put a reverse diode across all DC relays except the single-coil-latching type. A 1N4002 is perfect for this application.

Remember most latching relays are intended to be pulsed—so don't hold the OPR SW down too long.

I like relays. I seriously prefer them to their solid state RF T/R switching cohorts. Yes, their contacts are eventually going to wear out, but when used in a properly specified circuit, they frequently last as long as the equipment. Relays offer great isolation, relative immunity to static and nearby lightning. They can be as fast as any keying circuit needs, and are frequently available as new/surplus. Remember that their primary purpose is to enable remote switching, whether it's switches on a front panel with the losses inherent in a non-RF switch (like an ordinary toggle switch), or switching antennas out on your roof. Properly implemented, relays can last as long as the equipment they are installed in. For QRPers, they represent a low cost, low loss, inexpensive solution to most of your switching needs. ●●

The W8DIZ Frequency Reference

Joe Roof—W4JHR w4jhr@arrl.net

It seems like the one piece of test equipment I've always needed is a stable frequency reference, so when Diz, W8DIZ (Dieter Gentzow) announced his new kit I jumped on it.

The kit is inexpensive ($17.00), extremely simple to build, and is even Altoids™ compatible. It uses a 20 MHz TCXO and through all kinds of magic, results in jumper selectable outputs of 2.5, 5 and 10 MHz. Instructions are not included with the kit, but are downloadable at www.kitsandparts.com.

Construction is straightforward. The TCXO is a surface mount part, however it is large and very easy to install, with only 4 pads to solder. The 74HC4040 IC is a little unusual, in that most of the pins need to be cut off and are not soldered through the board. Figure 2 shows one side of the IC and the pins cut off with side cutters. The instructions are very clear, and if you follow them closely you shouldn't have a problem.

Calibration is something else! Diz's instructions say to "Zero beat WWV with the Freq Ref signal by adjusting R5 until the heterodyne is beating at less than 1 Hz per second." I found this was impossible for me. I'm probably tonally challenged, so I ended up using "Spectrogram" and my Ten Tec Jupiter to calibrate the Reference.

WWV transmits 500 and 600 Hz tones alternating on alternating minutes, so I set Spectrogram with vertical markers at 500 and 600 Hz. I connected the Jupiter speaker out to the mic in of my soundcard, set the Jupiter to 10 MHz (USB) with a 1 Hz dial resolution and tuned in WWV until I saw the 600 Hz tone peak on the 600 Hz line. Then I switched mode to LSB and adjusted the tuning slightly, trying to have both USB and LSB peaking at 600 Hz. I got close and then switched to the CW mode and saw that my 600 Hz sidetone beating with the 10 MHz carrier was providing a 600 Hz peak also.

I checked this several times over a period of several minutes to make sure the Jupiter wasn't drifting (it is extremely stable after warm up). Keeping the Jupiter in the CW position I used a coaxial tee in the antenna line to feed the frequency reference signal into the receiver and adjusted R5 for a peak at 600 Hz. Connecting and disconnecting the frequency reference will allow you to compare the peak at 600 Hz in Spectrogram between the reference and WWV.

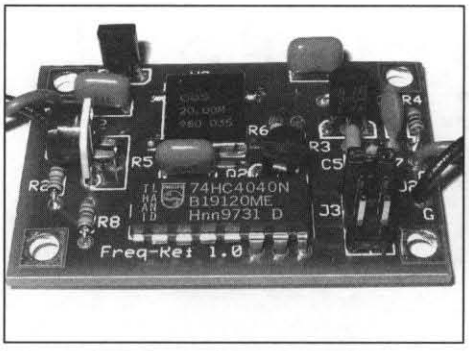

Figure 1—View of completed frequency reference board.

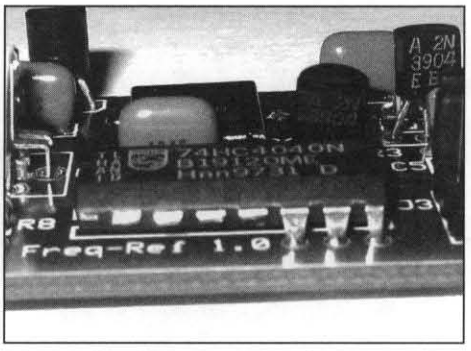

Figure 2—Close-up showing how pins are cut off the IC.

Figure 3 shows my completed Frequency Reference. Although an Altoids tin is cheap and easy, I opted for a plastic case with a built in 9 volt battery compartment. Notice the LED that gives an indication of the power being ON. I've started doing this on most of my small projects. It's cheap, and with my memory and the cost of 9-volt batteries, it saves me a lot of money. Figure 4 has the sketch of the LED circuit.

In summary, this is a very useful, inexpensive accessory that should be considered by all. It makes a great tool to calibrate the frequency counter also available at kitsandparts.com. I've also aligned my K2 and new KX1 using it.

Notes

The W8DIZ Frequency Reference is available at www.kitsandparts.com

Spectrogram is available at http://www.visualizationsoftware.com/gram.html

Editor's note: Calibration against Spectrogram is only as accurate as the clock oscillator driving the digital sampling on your audio card. In most cases, this will be more than adequate for work in the average amateur radio station. For in-depth information on calibration visit the US National Institute of Standards at http://www.nist.gov and the International Telecommunications Union Radio Communications Sector at http://www.itu.int/ITU-R/index.html.

The book *Experimentation and Measurement* written by Dr. W. J. Youden, Applied Mathematics Division, National Bureau of Standards in 1961, first published as a *VISTAS of SCIENCE* book in 1962 is still relevant today. It is available in PDF format on the National Institute of Standards and Technology website.

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Figure 3—Finished frequency reference in a plastic case.

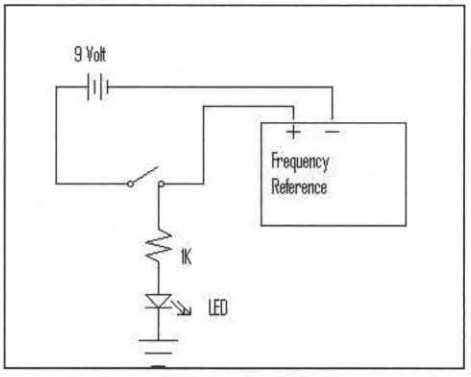


Figure 4—Circuit for adding an LED "ON" indicator.

Report on the G-QRP Club Convention 2003

Dick Pascoe—GØBPS g0bps@gqrp.co.uk

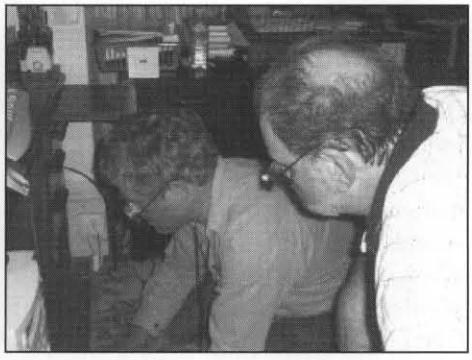
The G-QRP Convention is held each October in Rochdale, Lancashire at the church of the Rev. George Dobbs, G3RJV, founder and leader of the G-QRP Club since its birth in 1974. A quick calculation will show that next year will be the 30th anniversary of the club, and it will also be the 15th convention.

This year the hall was packed even more than usual—numbers were up from previous years and we passed the 400 mark for the very first time. Getting that many people into a small hall is rather difficult, rather like getting a kit into an Altoids tin. Many are encouraged to move out into the church and attend one of the four talks given by the visiting speakers.

The convention is aimed directly at the QRPer and almost all equipment on sale revolves around this part of the hobby. The center area of the hall is kept clear of traders and is used as a seating area for visitors to exchange thoughts and ideas, chat about the latest equipment or the DX station that was worked or got away.

The club uses the opportunity to sell items of interest to members and also renew their membership. Other stands sell kits, components and a large range of junk (sorry, "quality used equipment").

Johnny, SM7UCZ with his wife, Birgita.



Glen, K5FX checking George, W5GFP.

Many International Visitors Attended

This year the increase in numbers was very apparent and could be blamed on the high number of overseas visitors to the convention. Apart from the Canadian and the guy from Holland that turn up most years (like bad pennies), we also had a couple of Danes, three Germans, two Swedes, an American from New Hampshire and also three guys from the Republic of Texas! The most non-UK visitors ever!

This event is nothing like any American events such as Dayton or Pacificon. Yes, there are the lectures and talks, but this event runs around the single hall on a single day with traders around the edge of the hall. Most other QRP events will not attract 400+ visitors either. I cannot explain what it is or why so many come except that an air of excitement abounds. It is not the bits that you can buy or sell, it is the social aspect of the event that attracts so many. One visitor commented that it was because of the social element that so many came determined to enjoy themselves and thus refused to be disappointed or unhappy.

The speakers this year were also varied, including Rob Mannion, G3XFD, who edits the British *Practical Wireless Magazine* and has for many years held court with his readers at the convention. This is an excellent way to find out the latest news from around the UK and tell the editor what we want to see in the next year or so.

Jan Verduyn, GØBBL, and Alan Rowe, MØPUB (what a call!—ed.), talked about their experience in building and operating the Elecraft K2 in front of a packed audience. Response from these gents showed that this is still a very popular rig with several club officers owning one.

George Pierce, W5GFP, gave his ideas on activities in Texas, chasing DX and high altitude balloons. He also showed some video of edge of space flight.

The final session each year is from David Stockton, GM4ZNX, who is the resident expert on electronics and Ham Radio. Ask David a question and he will have the answer and be able to explain it at a level that you can understand. He fields questions from his audience with a panache that is great to watch. He never misses a beat and will have an answer for all questions. I have never seen him stumped by any question, ever!

The new licensing in the UK has opened the doors to many that might not have had opportunity to try Ham Radio and one such youngster came to see what QRP was all about. Jessica, M3JMH, was just seven years old when she gained her M3 call!

Lunch is always available and you have just one choice; locally produced meat pie, mushy peas and pickled cabbage. (This is a local delicacy; for the uninitiated the mushy peas are prepared by boiling peas until they disintegrate into a mushy mess.)

The whole affair in Rochdale has a laid back atmosphere with the feeling that it will almost run itself. The small band of helpers turns up each year (almost always the same faces). Set out the hall, get the food ready and ensure that everything runs smoothly and after everyone has gone, clear the hall ready for the next day's congregation .

I have been to all 14 conventions and thoroughly enjoyed every one. I have met hundreds of hams over the years and love to see them again and again. Several highlights come to mind in past years. This is what it is all about.

Just after the Berlin Wall came down we had a visitor from East Germany. Brought over free of charge by some Dutch hams. He spent most of the day walking up and down looking at the goods I had for sale (I traded as Kanga Products at that time).

I was told that he "lusted" after one of the Morse keys I had on display but he had little, if any money. He later left the con-

Derry, VE7QK advising Peter, G3PDL and Henning, OZ4XF.

George, G3RJV with seven-year old Jessica, M3JMH.

vention with a HUGE grin on his face as I had given him the key. The cost was not important, what was, is that I had a friend for life.

He returned a few years later with a few gifts, all eastern block stuff that he had collected just for me. Other similar stories happen with others visitors, isn't this what our hobby is all about?

The G-QRP Convention is held each year, usually on the second Saturday in October. Next year will be special as it is the 30th anniversary of the club and the 15th convention. Local hotels are available but it is recommended that you book early. Flights from the USA are into Manchester or Liverpool and getting to Rochdale is fairly easy. Further information is available from me at g0bps@gqrp.co.uk.

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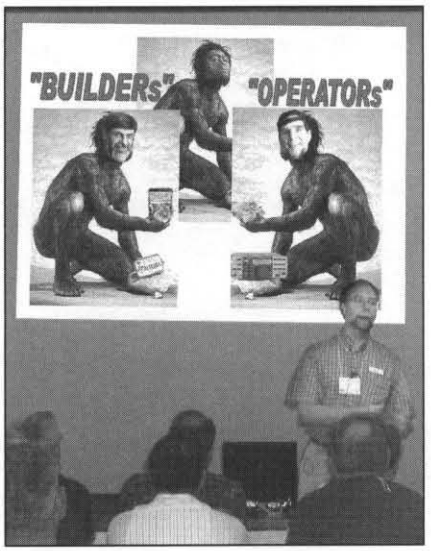
Call for FDIM 2004 Presenters!

Planning is underway for the Four Days in May (FDIM) Symposium in conjunction with the 2004 Dayton Hamvention. This will be our ninth year for this "not to be missed" event. FDIM 2004 will start on Thursday, May 13, 2004. On that day, QRPers will gather in Dayton to hear from some of the best minds in QRP. The symposium is an 8-hour event, which covers the gamut of QRP.



Please consider sharing your talent and experience by giving a presentation and documenting it for the FDIM 2004 Proceedings. Topics are wide open and may include design; construction projects and techniques; antennas and feedlines; operating techniques or experiences. Be creative and define your own topic! All that is required is that you present your topic at the Thursday Symposium and document it for publishing in the *FDIM 2004 Proceedings*.

Time slots are limited, so please submit your idea soon. If interested, please send a short description (one paragraph) of the proposed talk to me prior to January 31, 2004. If you know of someone who might be interested in making a presentation, please forward this call to them.

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VHF QRP

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We Get Letters –or– The VHF Mail Bag

Thanks for the encouragement that I've received along with some great ideas on VHF QRP. Keep those cards and letters coming! In this issue, I'll respond to some of the email messages I've received so far concerning this column. (Interestingly, I've gotten lots of email but no snail mail. I guess times really have changed.)

What is VHF QRP?

I received a few questions about what is and what is not "VHF QRP." I don't see that we need to get into a big debate about a specific definition of VHF QRP, but a few comments are probably in order. Bob, K3WRV, writes:

"From what I've read about VHF propagation, some modes, like meteor scatter and moonbounce require a bit more than 5 watts even with first class gear. I hope your column won't be limited to 5 watts and tropo/sporadic-e propagation."

Typically, modes such as meteor scatter and moonbounce do require significant power levels, usually more than 100 watts. However, there have been some exciting efficiency improvements using digital signal processing for meteor scatter and moonbounce. This lowers the required power level and/or increases the probability of making a meteor scatter contact even when the "rocks" are scarce. But I haven't heard of people using QRP levels yet.

To the extent that these modes are in the 100-watt-plus region, I don't see them as fitting the definition of VHF QRP, appealing to the QRP community or fitting into *QRP Quarterly*. Don't take this wrong—I think these and other amateur radio modes are interesting and worthwhile endeavors, but they don't necessarily all belong in the *QRP Quarterly*.

Bob also writes, "What about including 10M in your definition of VHF? During lulls in the Sun Spot Cycle, it behaves a lot like 6, and given the number of 10M beacons out there running only a few watts, I find it fun."

I agree with Bob on this one. There is nothing magic about the generally accepted "above 50 MHz" threshold for the amateur VHF bands. If this column wanders down to 10 meters on occasion, I don't see a problem. On the other hand, I believe that other parts of *QRP Quarterly* already cover radio operation on 10 meters.

Steve, G4GXL comments on power levels and antenna gain:

"Recently on the AMSAT BB [an AMSAT email discussion list] a poster mentioned that he was using QRP to access the AO-40 satellite. He was using 5 watts on 23 cm to a 2 m dish. In reply someone said that as this constituted 1.5 kW ERP it could not be classed as QRP. ERP is all when working satellites. This poses an interesting question. Is a station running 5 watts to an array of four 17 ele beams on 2M running QRP? His ERP would be similar to a 100 watt station using an HB9CV beam. The problem does not arise on HF where it is highly unlikely that many stations have aerials with more than 5 or 6 dB gain."

The classic definition of QRP is power level and not Effective Radiated Power (ERP). Certainly, the game changes as the frequency increases, allowing for higher gain antennas within some reasonable size constraint. My rule of thumb is that the essence of QRP is small, lightweight, portable radio equipment. If I apply that to VHF, a typical Yagi beam antenna fits that concept. I am thinking of a 2M beam with a boom length of 15 feet or less. If the boom disassembles into several pieces, it can be transported easily in a vehicle or even backpacked into a remote location. A larger antenna system, such as an array of multiple, stacked, long 2-meter Yagis, doesn't quite fit the lightweight or portable category. As the frequency increases, the gain of a portable antenna goes up. In the limit, say at 10 GHz, a very high gain antenna and corresponding high ERP fits my notion of VHF QRP. That's my opinion, what's yours?

Joe K3CHP (and others) commented that he operates on six meters with 5 watts and a Halo antenna. He has 28 states and 11 countries confirmed. Joe says it is amazing what you can do on six meters with 5 watts and a modest antenna when the band is open. Just as 10 meters may look like a VHF band on occasion, 6 meters can sure behave like HF, so it is a natural fit for QRP.

How About the UK?

Wayne, KCØPMH/GØJJQ/G6UIT, says that he is "a displaced UK ham now living in the USA." Wayne writes:

"Thanks to the British magazine *Practical Wireless* sponsoring an annual QRP VHF contest … and encouraging /P operation, VHF QRP has maintained a level of interest in the UK. Considering that the UK would fit into the State of Florida, it was easier to get the QRP VHF operators on the air. I'm not sure how well it would take here in the USA, perhaps the encouragement of the use of 6M instead we could generate a lot more interest in VHF QRP. I know that among the *QQ* readers there is a tremendous 'can do' attitude, so what about an 'activity time' (evening/ weekend/whatever) for VHF QRPers to get onto say 6m and work the ssb/cw end of things?"

A little searching on the web revealed that the Practical Wireless 144 MHz QRP Contest is alive and well (see web URL below). This 7-hour contest is only on 2 meters (SSB, CW and FM), with a power limit of 3W (PEP). While the 2003 results show 79 official entries, the highest scoring station reported 229 QSOs.

I also stumbled upon the "Backpackers Series" of VHF contests sponsored by the Radio Society of Great Britain. These single-band contests are held on 50 MHz and 144 MHz (at different times), lasting 4 hours. The rules encourage or enforce the portable nature of these contests. For example, all equipment must be battery powered and can be charged only from wind or solar power sources during the contest. There are restrictions on antenna structures so that "no significant structure" (in excess of 2" outside diameter) is used. One of the several 144 MHz Backpackers contests runs concurrently with the Practical Wireless 144 MHz QRP Contest. For more information, see the web site listed below.

The QRP and backpacking emphasis in these UK VHF contests have stimulated my thinking on new possibilities for QRP

VHF contests in the US. I'd like to learn more about these contests or perhaps there is someone out there willing to write about their experiences in these events.

And Elsewhere

My experience with VHF in the US Rocky Mountain region is that the activity is quite spread out (with many grid squares having no VHF enthusiasts, maybe even no active radio amateurs). Other areas around the country and around the world are more densely populated, but I think CW/SSB VHF activity is generally sparse. Certainly there are fewer VHF signals per day in most or all areas, compared to HF. Anyway, this leads me to think that any QRP VHF promotion in the US should follow on the heals of existing VHF activity such as the major VHF contests. Fortunately, these contests have a QRP category, so it fits in quite well. However, the scoring method used in these contests greatly rewards making contacts on multiple bands, with the higher bands counting more. This gives a different flavor to the contest than a single-band QRP focus in the UK contests. The exception may be the CQ WW VHF contest since it uses only 6 meters and 2 meters.

Steve, G4GXL, reminded me of the SOTA (Summits On The Air) program that is very active in Europe. SOTA is similar to the Islands on the Air (IOTA) program with the majority of operation on 40M CW and 2M FM/SSB. Steve points out that any operator using a radio up a mountain is likely to be using QRP, so there's another angle on the subject. For more information, see the SOTA web site listed below.

VHF QRP Equipment

Wayne, KCØPMH, also had some comments on the Yaesu FT-290R (Figure 1), calling it "about the most popular VHF 'portable' multimode on the market." Wayne points out there were some shortcomings to the radio, including poor receive sensitivity and the lack of CW break-in keying. A number of modifications and after-market accessories appeared in the ham radio world to improve the radio and Yaesu later introduced an improved "Mark II" version of the rig. I see a number of these radios on the used market (www.ebay.com, in particular) and there are many of them still in use. Perhaps someone out there could contribute a *QRP Quarterly* article focused on this classic VHF rig. (We're all for it!—Ed.)

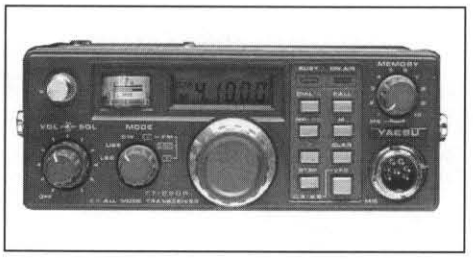


Figure 1—The Yaesu FT-290R is a very popular, 2-meter, all-mode portable transceiver, still available on the used market. (Photo courtesy of www.rig-pix.com)

Another rig that caught my eye is the Ten-Tec Model 526 "6N2" VHF transceiver. This rig puts out 20W SSB, CW and FM on 6 meters and 2 meters. I'd like to hear from people that are using this rig. (A hands-on product review would be great.)

GPS Receivers

A GPS receiver is quite handy for determining your position and grid locator. Zack Lau, W1VT (of ARRL Lab fame), provides us with a good tip:

"I thought you might tell your readers that the only consumer GPS receivers with Grid Squares are Garmins, starting with the 45XL—I still have mine. You need to set the receiver to 'Maidenhead.' "

My two GPS receivers are both from Garmin and they do have the Maidenhead display feature. These GPS receivers display the 6-character version of the grid locator—for 4-character use, just drop the last two characters. Another popular brand is Magellan, so I did some web surfing trying to verify that Magellan doesn't offer the grid locator readout. I could find no indication that any of the Magellan units offer the Maidenhead display, but I found plenty of references to Garmin receivers having the grid display. If you are active in VHF operating, be sure to verify that the GPS you are considering has the grid locator feature.

Calling Frequencies and Band Plans

Chuck W5USJ dropped me a note about some issues with VHF calling frequencies and band plans. Although QRP calling frequencies have been identified for the VHF bands, it is not clear that they are in the right place. We will follow up on this in more detail in a future column.

Homebrew VHF

As you might expect, a number of readers expressed interest in homebrewing VHF QRP gear.

Lee, KG5VU writes: "I would be interested in some homebrew projects for CW or DSB gear on 6M or 2M. *Solid State Design for the Radio Amateur* (published in 1978?) had a few such projects, but it is difficult to come by the parts for such gear. Perhaps some of the readily available QRP transceiver kits could be converted for operation on 6M or 2M."

Bob, K3WRV writes: "While thumbing through some old *CQ* mags from the 60s I found a little 2 transistor 150 mW 2 meter CW transmitter in one of Don Stoner's columns. Stoner was into QRP back then, and even announced the formation of QRP ARCI in one of his columns."

I don't have any VHF homebrew articles in the hopper at this time but would love to have some contributed articles in this area.

Looking Ahead

Thanks to everyone for all of their encouragement and great ideas. Keep those cards and letters (I mean, e-mail) coming. Send me your photos of VHF QRP operating and/or equipment in electronic format and I'll try to get them into the *QRP Quarterly*.

Again, if you want to write a column or just part of a column on a VHF topic you know and love, please let me know.

—Adios, Bob, KØNR

Upcoming VHF QRP Operating Event:

2004 ARRL January VHF Sweepstakes

Date: 1900 UTC January 24 to 0400 UTC January 26

Bands: All bands above 50 MHz

QRP Category: Single Operator Portable (10 W PEP power limit)

Exchange: Call sign and 4-digit grid locator (e.g., DM79)

Complete rules: www.arrl.org/contests/

References

1. Practical Wireless 144 MHz QRP Contest: www.ntay.com/contest

2. Backpackers Series VHF Contests, Radio Society of Great Britain: www.blacksheep.org/vhfcc/rules/03rules/BACKPACK.htm

3. Summits on the Air (SOTA): www.stockportradiosociety.co.uk/sotaweb

The QRP Home Companion

Anthony A. Luscre—K8ZT k8zt@arrl.net

QRP Contesting

I am writing this in the dark November lull between my two favorite contests, the SSB and CW versions of the CQ World Wide DX Contest (www.cqww.com). Why are these my two favorite contests? Well if you remember, in my last column I confessed that DX is my ham radio weakness. If you want to work a lot of DX with QRP in a very short time, nothing beats these two contests. With a little work, a modest QRP station might even work entire DXCC all in one weekend!

Many QRPers love contests and others hate them. If you are in the former group, I don't need to give you reasons to work contests with QRP. But, if you are in the latter group, I have a suggestion for you. Don't think of it as a contest. Instead, think of it as an excellent opportunity to make lots of QRP contacts. You might ask, "Why are contests a great place to make contacts?" Here is my list:

• There are a lot of stations on the air. Just as in a chemical reaction, more molecules in a given space greatly increase reactions; more stations on the air increase the chances of making contacts.

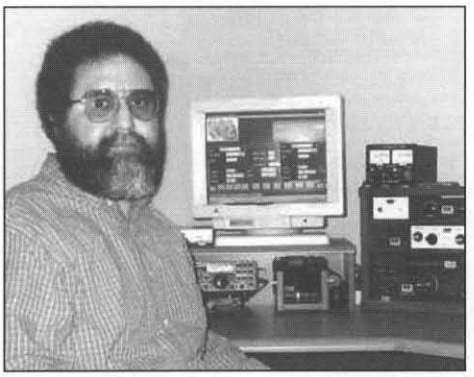
• Many of the stations on the air are well equipped with big antennas, the best equipment money can buy and highly skilled operators... which means all the better to pull our QRP signals out of the mud.

• Serious contesters spend their own money to travel to DX locations (both common and rare) and put them on the air for us to work.

• Serious contesting stations, even rare DX, really want to work you because you are worth points to them!

So, my advice: If you like contests, get on the air and rack up a great score with QRP. If you don't like contests, get on the air, give out your exchange and ignore the other station's exchange. Don't bother keeping score, work only the hours you want and ignore the competition. You will rack up lots of QRP contacts and DX.

The following are a few tips for successful contesting. If you don't care about



your score, you can pick and choose from the following tips. If you are serious about competing, you will want to follow most of my hints and explore other resources for even more tips. (See a list of contesting web resources at the end of this column.)

Know when contests are held. Visit the WA7BNM website (www. hornucopia. com/contestcal/contestcal.html) or the SM3CER website (www.sk3bgse/contest) or read *QST* and *CQ* magazines' contesting columns. (There are still plenty of good contests in the next few months.)

Know the rules for the contest and the exchange, if you don't know the exchange you will not make other contesters very happy.

Use contesting software. (See: http://www.qsl.net/k8zt/logging.html#contesting) Read the documentation and practice using before the contest.

Know operational features of your equipment (especially if you plan to work "split" on 40 phone.)

Timing, Timing, Timing Develop good response timing. Knowing when to respond, pacing, emphasis and calling techniques will increase your chances of success.

Keep current on Propagation conditions to help plan your operating schedule.

Scheduling is your plan for when you are going to work each band and what geographic area you expect to contact. Veteran contesters often spend considerable time scheduling. Although you need to be flexible, due to changes in band conditions, a well-planned schedule can greatly increase your effectiveness and overall score.

Choose your category. Based on your antennas, operating times and style, you may want to choose a single band entry. If you have antennas for all bands and plan on spending days and nights, operating an all band entry may be your choice.

Pick contests that favor your operating style. Choose your favorite: mode, operating times, exchange style, venue-DX, domestic or state. Don't forget the QRP club sponsored contests (see the *QQ* QRP Contests column and AMQRP calendar (www.amqrp.org/contesting/contesting.html).

Set personal goals. It's hard to finish first if you are just starting out in contesting, if you have a minimal station and/or antennas or if you have limited time to operate. Instead choose goals that measure your own progress at your own pace. Goals can even be very specific: working those last few states for WAS on 40 Meters, adding to your DXCC total, working all counties in a specific state (all QRP, of course.)

Persistence and follow-up If you want to score high or even win, you have to "stay in the chair." You have to maximize your time on the air and then submit your log to the sponsor in the proper format by the deadline.

Bonus Hint—if you want to work DX, and don't want to get clobbered for hours by QRO stations, operate during two key times—Thursday and Friday before the contest (when all the DXpeditions are setting up and testing their equipment) and the last few hours of the contest (when most of the stations have already worked each other and you are "fresh meat.")

Contesting Resources

I have collected a number of contesting links on my website (www.qsl.net/k8zt/contesting.html) along with links to two web columns I wrote on contesting (www.qsl.net/k8zt/qrp-com.html#columns).

Try QRP contesting this winter. You might really like it. Hopefully, you will work me so I can get a few more points, QRP of course.

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[*Also be sure to check out Bill, N8ET's exciting QRP effort in the CQWW on Page 36.—Ed.*]

Product Review: Son of Zerobeat

John King—KB3WK johnpking@comcast.net

An interesting thing about amateur radio is that, every so often, someone comes up with a useful station accessory that adds to the performance of a perfectly satisfactory piece of gear.

In this case, Jackson Harbor Press has introduced a low-priced gadget that helps match your frequency to that of the incoming station. For rigs that do not have a means of easily shifting frequency to exactly match the incoming signal, Son of Zerobeat allows faster tuning when coming upon a signal. Most such rigs require that a tone be matched in frequency. If you're "tonally challenged," as I am, Son of Zerobeat really helps. And it only costs about $30, including the outboard parts needed to complete the accessory. Some money can be saved by downloading the instruction manual. Interesting that some company should finally realize that documents could be delivered more cheaply via the Internet.

The kit can be obtained online [1].

Figure 1—Son of Zerobeat connected to K2 transceiver.

Theory of Operation

In this device, the hardware circuit is fairly simple. Like a lot of recent equipment, the majority of the circuit is software housed in a 16F628 PIC microcontroller. The remaining circuitry is essentially an amplifier IC, with an attendant diode detector. Input to the amplifier circuit is taken from the audio output of the tranceiver. The amplifier and detector serve as a gating mechanism for the microcontroller. This gate tells the microcontroller when to count the frequency of the incoming signal.

The software counts the incoming frequency against a register, which stores the frequency produced when an incoming signal is received at the same frequency as the transmit signal. When the frequencies match, the green LED is lit. Unless reprogrammed with an optional switch, the matched frequency is 600 Hz. The switch reprograms the match frequency, in case a lower (or higher) sidetone frequency is preferred. Depending upon the incoming count, a specific LED is lit. The LEDs indicating something other than a perfect match, which are red for large offsets and yellow for small offsets, show these offsets in increments of +/-20 Hz. This results in +/-10Hz accuracy. There is also an LED that shows signal strength and, when the amplifier level in the kit is accurately set, the LED goes on and off with the received signal.

Building the Kit

Building this kit is quite easy and straightforward, as might be expected. Just follow the directions.

The kit requires about two nights to build—one for the board, and one for setting up the enclosure, assuming that you can spend about 2-3 hours per night in this pursuit. Setting up the kit for operation requires only another half-hour, or so. The directions are easy to follow, and there is only one issue that requires explanation. If you have mounted the optional switch for changing the sidetone frequency, you may have to increase the level of that sidetone before the circuit will train as advertised. This is especially true of the K2.

The biggest problem in construction is to find a suitable enclosure, and setting up the off-board components in a manner that facilitates operation. Figure 1 and 2 show one possibility. The method shown allows the front panel to come off without attached wiring. The off-board components are attached to the cabinet back, using a cutout that allows a metal panel to be mounted on the back.

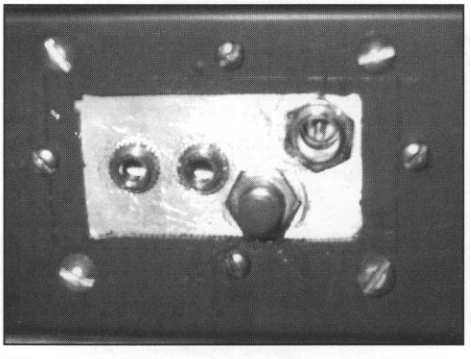

Figure 2. Optional switch to set the zerobeat audio frequency.

How Well Does It Work?

The kit works as advertised, and is easy to use. The circuit is accurate, so long as the signal strength is adequate. For the K2, this implies that at least one signal strength bar is lit. Weak signals below the level of one signal strength bar can still be worked with the K2 receiver, but are too weak for the kit to operate accurately.

Bottom Line: For the $30 cost, the Son of Zerobeat is a good deal, especially for those of us who are "tonally challenged!" It works as advertised, is easy to build, and makes a useful accessory for fast and accurate tuning.

[1] Jackson Harbor Press, RR1, Box 91C, Washington Island, WI 54246-9718, http://jacksonharbor.home.att.net/

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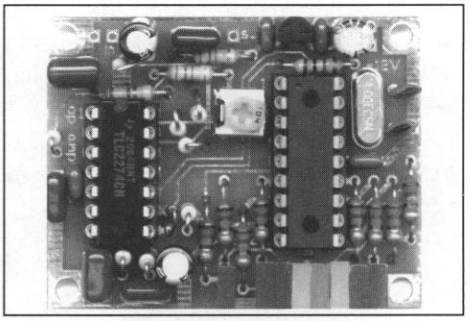

Figure3. Completed Son of Zerobeat PC board (from the Jackson Harbor Press website)

CQ Worldwide CW 2003 — The N8ET Story

Bill Kelsey—N8ET kanga@bright.net

Contesting has always been my first love in amateur radio. It is one of those unexplainable things, understandable only by others who also love to do it. I have made many lifelong friends around the world through contesting. Like the QRP crowd, it is a good bunch of enthusiastic people enjoying a common interest.

I started contesting about 1970 back in upstate NY with a group of friends. We had a station on top of one of the hills near Ithaca, NY, and did fairly well. I continued when we moved to Ohio in 1974, doing fairly well in some single band efforts. From 1978-83 I lived in the UK (G5CMX) and did fairly well over there from a very small garden (yard). The because of zoning restrictions, the tower and antenna would go up Friday evening of a contest weekend and come down Sunday after midnight. I even won the Bermuda contest one year, and got a trip to VP9 to pick up the award. That resulted in many trips back to VP9AD as part of a multi/multi effort that finally won the world in the M/M class in SSB in 1991.

In 1991 we moved to a city lot, so my efforts began to focus on upgrading our local club (Mad River Radio Club) to make it a competitive contest station. Over the past several years we have had two 80' towers with monobanders (10-40) and dipoles which worked fairly well. For the past three years I have entered the CQ WW CW contest in the QRP single op all band category. Last year (2002) is was a real struggle, and it was obvious the antennas were getting old.

The results for 2002 came out around the end of August, and I had again finished in the third spot for the USA and was #10 in the world. At that point I decided to overhaul the antennas, get everything ready before the start of the contest, and see what I could do with a setup that was 100%. I went to work, thinking a couple of trips up the towers to clean up a few connections, and I would be all set.

Here is what actually happened.....

Figure 1—Mad River Radio Club antenna farm, towers 1 and 3.

The Antennas

The old setup was on two 80' towers. We used 3/4" surplus CATV hardline to feed the antennas. The coax runs were on the order of 250', and 150' or so of that was buried. This past winter we had discovered a problem with the 20 meter feedline, so I decided to test all the feedlines for loss and replace any that were not up to spec. The systems had been up for 15 years or more, so it was time for a good check. The Autek Analyzer confirmed that there was a couple of dB loss in all of the feedlines that were in place. That was not too bad if it had been RG-8, but the books says that the loss for that line at 30 MHz should have been measured in tenths of a dB. I now knew I had to replace the feedlines. Fortunately the club still had quite a stock of surplus hardline we had acquired, so "all" I had to do was fabricate connectors and install the new hardline.

While I was checking feedlines, I took the Autek to the top of the towers and checked the antennas. At that point I realized that they would all have to come down for work. Actually—the 10 meter beam was OK—but it was under the 40 meter beam, so it had to come down to get the 40 down!

I began to get a bit discouraged. Everything had to come down, be fixed, and go back up, and the weather was not getting any better as the fall progressed.

About a day after this realization, I got my first break. Club member AA8KJ had an antenna and tribander he was putting up, and he does not like to climb. He found a 90' crane with an operator locally who was willing to set the tower and beam for $60. I volunteered to help out. The crane arrived, set the tower, put up the antenna, and was gone in less than 45 minutes. You had better believe I had that guy's name and phone number before he left the AA8KJ QTH!

With the newfound "tool" available, I re-thought the whole plan. In addition to the surplus CATV hardline, the club and I had quite a stockpile of antennas and towers that were available. With the help of some of the club members (WD8PTB, N8RMT, WS8T, and AD8P, who I call the "N8ET QRP Support Team"!), I expanded the scope of the project and went to work again. A couple of weeks later (including 90 minutes of crane work) the skyline at the club had changed with three new towers now standing waiting for antennas to go up. We had erected 75' of Rohn 25, 70' of Rohn 45, and 40' of old American Tower.

A year ago the club had purchased the estate of one of the members, and it included enough T2X rotors to have one in each tower and have a spare on the ground. My old antennas were available, so I began assembling them. Work began in earnest

getting the antennas off the old towers, overhauling them, and getting them back on top of the towers. We used a tramline to raise and lower the beams from the tops of the towers. We got good enough at it that we took down the 10m, 6m, and 40 meter beams, repaired the 40, and put them all back up in an afternoon. The weather was cooperating.

After all the antennas were back on top of the tower the new hardline was installed. Brackets with conduit hangers were made to support the hardline up the towers. Connectors were installed on the hardline. Some were made using plumbing fittings, and some were made using SO-239s and 3/4" copper pipe. We used both 3/4" and 7/8" hardline. The loss checks on the "new" hardline indicated less than a dB on each run.

With all the towers up and beams in place we had the following setup:

- Pro67B at 75' (10-40 meters) on tower 1, background in Figure 1
- 5 element 10 meter at 70' on tower 2, Figure 2
- 4 element 20 meter at 80' on tower 2, Figure 2
- 5 element 10 meter at 80' on tower 3, foreground in Figure 1
- 5 element 6 meter at 85' on tower 3, foreground in Figure 1
- 2 element 40 meter at 90' on tower 3, foreground in Figure 1
- 4 element 15 meter at 80' on tower 4, Figure 3
- 5 element 20 meter at 90' on tower 4, Figure 3
- Tribander at 40' on tower 5, background in Figure 3
- 18AVQ with 4x40 meter radials at 40' on tower 6

I did use some transmission line matching transformers on some of the feedlines to help get around the 75 to 50 ohm mismatch.

With the aluminum in the air, it was time to work on 80 and 160 antennas. In the middle of all the towers listed above is the club repeater tower. It is a commercial grade 170' tower. A couple of years ago when we had a professional tower climber working at the top, I had a pulley installed just below the repeater antennas at 150'. I put together a dual band inverted-vee for 80 and 160 and hauled it up the tower

Figure 2—Tower 2, 10 and 20 meter beams.

Figure 3—Tower 4, 15 and 20 meter beams.

(Figure 4—you really can't see it at 150' in the photo!). My spirits really fell when my Autek told me I had a 10 to 1 SWR on both 80 and 160, and it seemed to be intermittent between 10 to 1 and even worse! After spending several minutes staring at the antenna (that looked quite small at 150'!) it occurred to me that perhaps it was picking up so much RF at that height that the Autek was giving me false readings. The feedline was connected to a rig and SWR meter, and some real RF was fed to the antenna. That indicated the SWR was right where it should have been! That night I was on 1812 working a lot of you from Maine to Alabama with 5 watts. I even had an internet report from Oklahoma the next morning, so it appeared to be working.

I also installed separate inverted vees at 80' for 80 and 160 on tower 3, and a bobtail for 40 was installed that was broadside to Europe. Tower 4 was gamma matched for 160 (Figure 5), and tower 1 was gamma matched for 80. Radials made up of the old hardline were laid out on the ground beneath each tower. Looking back, I should have added a LOT more wire radials. I had them available, but did not have the time to lay them out.

AD8P installed 4 pennant receive antennas for 160 and 80 meters (Figure 6).

The antenna work was completed (more or less) Wednesday before the contest. The last thing I did Wednesday evening after dark was to check the rotor alignment on tower 2. I found it was about 150 degrees off! Thursday morning (Thanksgiving) the XYL came to the club with me (she sat in the car and watched) in a cold rain while I climbed the tower with a pipe wrench and swung the mast around to the correct direction.

That afternoon before Thanksgiving dinner I went to the club for an hour and connected all the antennas via coax switches to the rigs. Figure 7 shows most of the coax coming into the shack. I was ready.

The Equipment

All the antennas are brought inside the shack and terminated on a patch panel (Figure 8). I planned on running two radios, and wanted all bands available on both radios, so I set up two antenna switches and routed an antenna for each band to each switch. Each switch then went through a Drake MN2700 ATU to each rig. That allowed me to monitor SWR and power easily on either rig to any antenna. I did not need to use the ATU part of the 2700s for any antenna.

The main rig was a new TenTec Orion the club had purchased a month earlier.

Figure 4—Inverted-Vee for 160 and 80 meters, at 150 feet!

Figure 5. Tower 4 and its gamma match for 160.

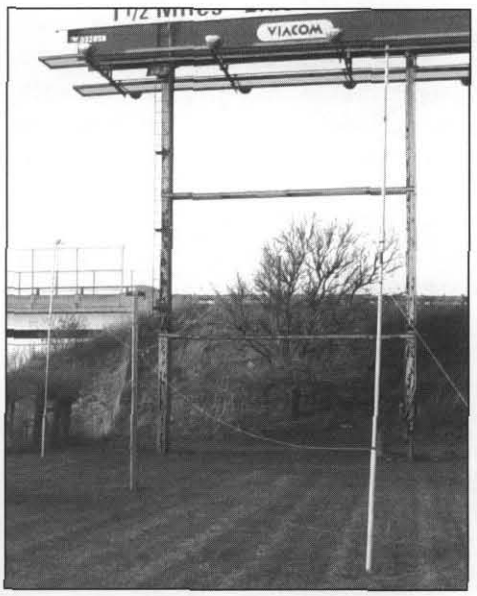

Figure 6—4 pennant receive antennas for 160 and 80 meters were installed by AD8P.

The second rig was a TenTec Omni6+. Both rigs were connected to a PC running TR logging software. Keying for CW for each rig was done by TR.

Figure 9 shows the rigs and the PC ready to go.

A quick comment about the Orion. It is one incredible rig! 40 meters sounded like any other band on a regular day. I was able to hear the weak ones right between all the rock crushing signals that populate 40 in a contest. There were even quiet frequencies. The Orion hears what is actually there—not what is generated inside the radio.

Receive audio switching was set up so I could hear either receiver in both ears, or the right receiver in my right ear and the left receiver in my left ear. I also set up a laptop with GeoClock running so I could see at a glance what parts of the world were in daylight/darkness.

The Contest

I started this contest differently than most other contests—I was actually in the chair in front of the rig at the start of the contest—not fixing something at the last minute! The start of CQ WW is pretty wild-A lot of big signals all trying to find a frequency to run other stations. I started out on 20 meters in the "search and pounce" mode. The first hour was actually pretty slow-only 20 QSOs. Early in the second hour I worked not one but two JT1s in zone 23, a zone I usually don't even hear! I was pleased with the start even though it was slow.

Looking back at my rate sheet after the contest, I see I spent most of the first night on 40 meters. Some time was spent on 80 and 160, and I had a couple of quick listens on 20 where I picked up a few multipliers. About 3 a.m. I took a break to try to sleep, but lay down for less than an hour and never slept, so I went back at it. My rate sheet shows I made QSOs every hour the first night of the test.

At 1217Z (7:17 a.m. local time) I was back on 20 meters working Europe. I went from 20 to 15 to 10 meters, opening up on 10 at 1442Z. I had my best rates the first morning on 10 and 15 with the rate meter holding at 60 QSOs per hour and peaking at 90 per hour once or twice. The rate meter is based on the previous ten minutes-I did not hold those rates for the hour, but my rate sheet does show a 56 and a 55 QSO run on Saturday morning—not too bad for QRP S&P!

I even called CQ a couple of times, and did have people come back to me, but it was quicker to S&P up and down the bands.

At the end of the first day I had 568 QSOs and a multiplier of 350—well ahead of my last years score at that point in time.

The second night I did take some time off—my CW was getting pretty sloppy when I had to use the paddle, and I was having trouble copying CW. Looking back at the log I had an almost 5 hour period when I did not make any QSOs. I recall setting the alarm in TR to wake me after two hours… Things got a bit blurry that second night! I am not quite sure what happened to the other three hours.

The second day was a copy of the first-but a bit slower. The best hour I had was 36 QSOs—quite a bit slower that I would have liked. The high point of the second day was right near the end on 10 meters as the band was closing. Signals were not too strong, and there were not a lot of them—but they were coming in from the Pacific, Antarctica, and northern Europe (Finland) all at the same time. With the high ten meter antennas, I was able to work almost everything I heard on the first call. My multiplier total on 10 meters really went up at that point.

Random Thoughts—and What I Will Do Differently Next Year!

It sure was nice starting a contest with everything ready ahead of time. This is highly recommended!

I spent too much time calling stations in pileups that could not hear me. I should have called about twice and then moved on. With the Bandmap feature in TR, it is very easy to return to a station on a particular frequency later on and drop a call in again.

I need to make better use of the second

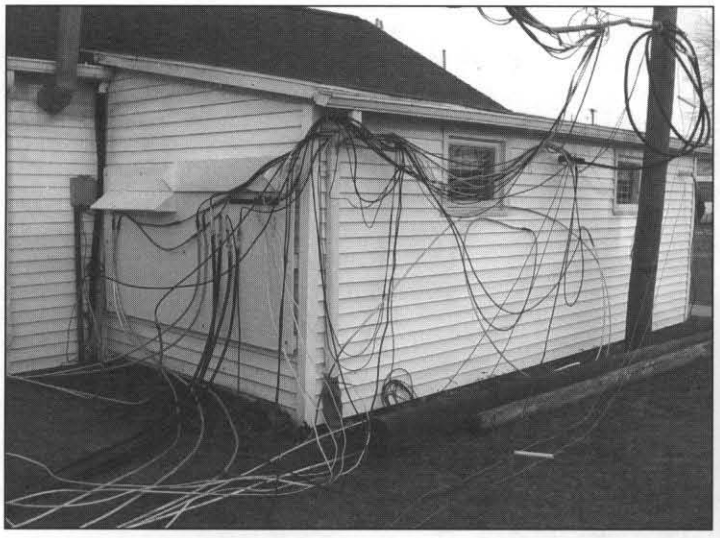

Figure 7. coax coming into the Mad River Radio Club shack

Figure 8. Patch panel and antenna switched inside the shack

radio. It can be calling CQ on one band while I am tuning on another. I tried it a couple of times, but it is a skill I still have to do a lot of work on!

I need to set up my antenna switching so I can get any antenna to either radio. It is nice to be able to have beams pointed in several directions and switch between those directions rather than wait for a rotor come swing around.

I also need some antennas that are lower for a higher angle main lobe during the day when the bands are open. My high antennas are winners when the band is opening or closing, but when the band is really open my takeoff angle is a bit low to have a big signal into the areas of the world that are providing the most QSOs.

I still need to do something about 80 and 160. I had the gamma matched towers up, but I did not get a chance to lay down a LOT of radials. They will be installed by contest time next year!

The beverages will be back up for receive on 80 and 160. Because of time constraints, one of the other club members put up 4 pennant receive antennas. My gut feel is that they did not receive nearly as well as the beverages we used to have at the club.

Look for me again next year in CQ WW CW 2004!

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Figure 9. Mad River Radio Club operating position, ready for the contest to start.

BAND	Raw QSOs	Valid QSOs	Points	Countries	Zones
160CW	5	5	8	2	2
80CW	33	33	73	15	11
40CW	149	149	407	61	20
20CW	222	222	627	89	29
15CW	239	239	683	79	23
10CW	228	228	642	76	25
Totals	876	876	2440	322	110

Final Claimed Score = 1,054,080 points.

N8ET's QRP CQWW CW Contest results, summarized band-by-band.

For QRP ARCI contest announcements and results,
see the "QRP Contests" column on page 52
(and in every issue of *QRP Quarterly*)

QRP Clubhouse

Michael Fletcher—KL7IXI kl7ixi@comcast.net

Reflections on 2003

The Christmas and New Year holiday season brings an excitement of looking forward to what the new year will bring, and a reflection on what occurred during the past 12 months.

2003 was supposed to be a period of declining propagation as the sunspot quickly became history. Instead record solar flares gave us both dead bands as well as great DX even into the 50 MHz band. And it isn't over yet.

We've said goodbye to silent keys who gave much to the hobby and to individual clubs, and welcome to new enthusiasts, including young hams.

New kits have appeared, some with interesting new features, and prices have dropped on several commercial rigs.

New clubs have started and others became inactive. The worldwide QRP activities are more visible due to increased internet presence of clubs and language translation engines.

2003 came charging out of the gate with a full calendar of QRP activities, and I'll humbly attempt to give credit where I know of it and hope to hear of the clubs and events I missed in past columns.

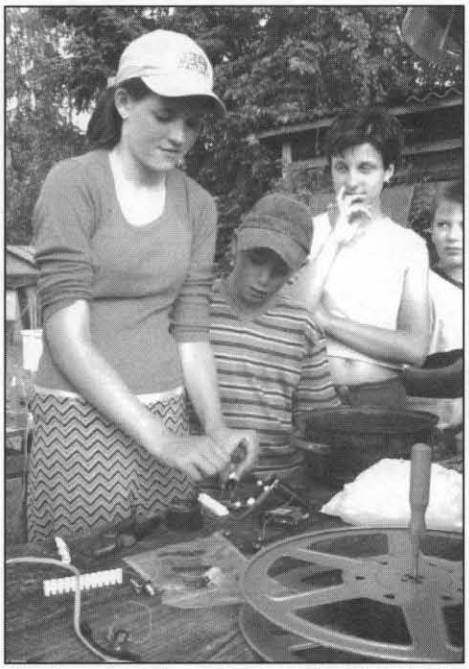
The New Jersey QRP Club started off the year of big events with Atlanticon 2003, Mar. 28 - 29, for a weekend of QRP events and seminars.

The Ft. Smith QRP Club sponsored Arkiecon the following weekend in Ft. Smith, Arkansas with more QRP seminars.

The NorCal QRP Club sponsored their annual "QRP To The Field" in April for six hours of operating fun, with ghost town locations offering multipliers.

Four Days in May. FDIM, in conjuction with the Dayton Hamfest, is a QRP event that draws enthusiasts from around the world and is sponsored by the QRP Amateur Radio Club International with projects sponsored by the Flying Pigs QRP Club, and the North Georgia QRP Club.

Field Day. The premier event for the majority of QRP clubs. Kudos to the Colorado QRP Club for not only being the highest scoring QRP entry, but for besting all entries except for seven QRO entries, 8th overall worldwide out of 2,058 teams with 12,750 points, and first place in the 2A-Battery class. That'll be hard to top. CQC also sponsors the QRP-L Foxhunt website and runs the Colorado Snowshoe Run 40 meter QRP contest each December.



Students and guests at the OK QRP Club Children's QRP Camp try their hand at soldering and CW

The OK QRP Club from the Czech Republic organized the First Children's QRP Camp this past summer, July 7 - 11. Young readers of the *OK QRP INFO* bulletin issued by the club and also readers of the *ABC* journal stayed for five days near Dobris city in the Friends of Pines Sport Club camp base. Under professional guidance they improved their knowledge in theory and in handling of tools and test equipment, and they also built some devices and took part in radio operation on the short wave bands. Twelve children and five adults all together applied themselves to radio engineering and outdoor games. The whole stay was free for the children. (For more information check out the club website at www.qsl.net/ok1dpx/qrpcamp/qrpcamp. htm.)

The Adventure Radio Society conducted two-hour Sprints on the first Monday of each month with scoring in two divisions: The Skinny Division with scores in points-per-pound of station weight, and the Tubby Division with scores in points.

2003 saw the emergence of a new organization, the American QRP Club. A combination of the New Jersey QRP Club, Northern California QRP Club and a new quarterly Homebrewer. The two clubs will continue to operate as local clubs as well.

Lobstercon, 2003, the premier QRP event of the Northeast took place this year July 12-13 in Brunswick, Maine and is an event I want to put on my calendar to attend. Sponsors were the New England QRP Club, Northern Vermont QRP Society, and the American QRP Club.

The Arizona ScQRPions with their annual FYBO event invited all to find cold spots and warm them with RF. The ScQRPions also have a new brass paddle kit available as one of the many kits and projects they've conducted. It is available for $25 and details are at: www.swlink.net/~w5jh/brasspaddle.htm. And of course the club's active QRP turnout at the Ft. Tuthill Hamfest the last full weekend of July was not to be missed.

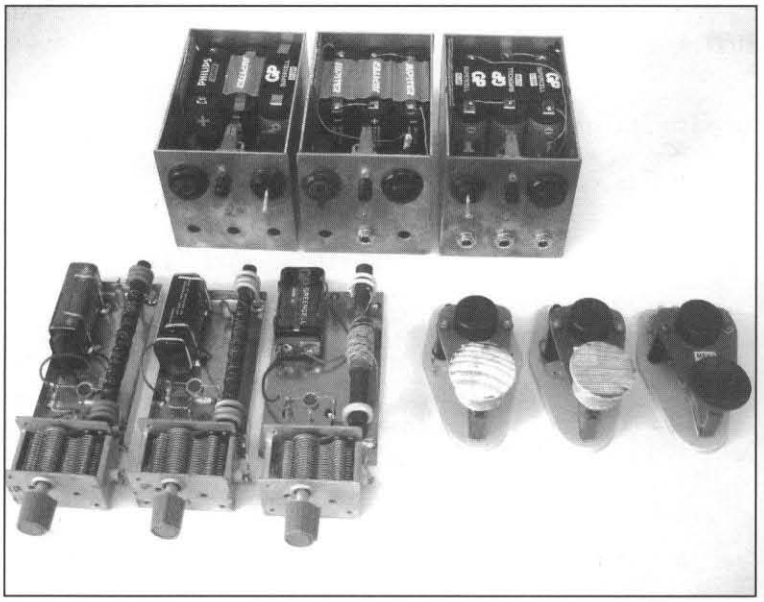
Pacificon, or more specifically, the Pacificon QRP Forum, but there wasn't anything else going on there, was there? The NorCal QRP Club again hosted the annual October event.

November 15, the Alaska QRP Club conducted the Great Alaska Ptarmigan Hunt with 13 Ptarmigans just a few kHz apart. Unfortunately band conditions weren't ideal so lets see some encouragement for them to do it again (yes, Virginia, those Alaskans do pop up out of the snow now and then for a contact).

The Flying Pigs kept their Truffle Hunt going each Tuesday at 0130Z near 7044 kHz. The hunt will continue until March 11.

SKN 2003 (Straight Key Night) begins at 7:00 p.m. EST December 31 and runs for 24 hours through 7:00 p.m. EST January 1 (0000–2400 UTC January 1, 2003). All power levels and fists are invited.

The QRP ARCI Top Band CW and SSB Sprint ran Dec 5 with both CW and phone modes. QRP ARCI and QST will list the results.



QRP Camp attendees assembled battery power supplies and telegraph keys.

During the week several simple transmitters and receivers were put on the air.

Several clubs used Dave Benson's RockMite as a club "burn solder" project, which got several QRO operators interested in joining the fun.

And don't forget the several QRP and slow-speed CW nets that occur weekly. Missed in my column on nets was the Four State QRP Group with a weekly 'Wednesday Warble' on 3580.5 kHz PSK-31 mode. All QRPers are welcome to join the informal roundtable.

Quite a year. Looking back on the events there was little time to get bored or even to build an advanced kit. Just the way I like it — Auld Lang Syne.

A Plea for Some New Year's Resolutions

Several QRP Club websites haven't been updated since 2001, and a few since 1999. Others have broken links. How about a resolution to update information, especially contact information?

Second, I'd love to hear from clubs with news and photographs. Yes, other readers do want to hear about your new kit project, education effort, or perhaps putting a rare state on the map with a QRP To The Field expedition. Let us know.

—Happy Holidays, KL7IXI/7

kl7ixi@comcast.net

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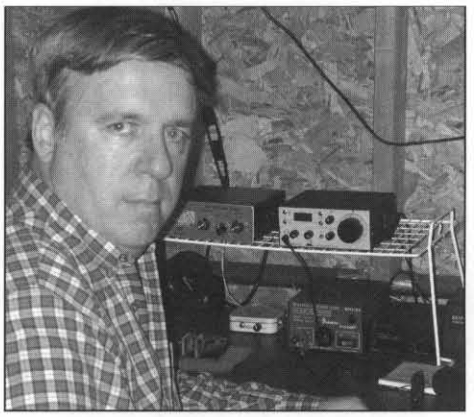


QRP Clubhouse columnist KL7IXI and his QRP-equipped hamshack.

Attention QRP Clubs!

Part of the mission of QRP ARCI is to foster the development of QRP clubs around the world. If your club needs help with membership, projects, organization or any other part of its operation, contact any member of the QRP ARCI Board of Directors. Names and addresses—postal and e-mail—can be found on page 64.

To publicize your club's activities in the "QRP Clubhouse" or the "World of QRP" columns in *QRP Quarterly*, contact the moderators:

QRP Clubhouse: Michael Fletcher—KL7IXI; kl7ixi@comcast.net

World of QRP: Oleg Borodin—RV3GM; master72@lipetsk.ru

The World of QRP

Oleg Borodin—RV3GM master72@lipetsk.ru

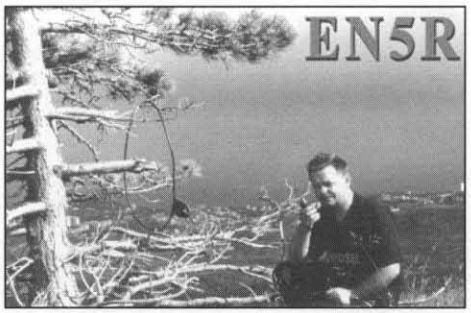
A Salute for the New Year

Dear friends! My QRP-dog Alpha and I wish all *QQ* readers good health, good new ideas, good radio conditions on the QRP frequencies and all the best in the 2004 New Year!

So now, some news from the end of the last year.

It is not surprising that many amateurs go on radio expeditions, not so much to work radio, but to take their holiday in beautiful, natural places. That was the purpose of the QRP expedition of the Ukrainian UR-QRP Club. The club members, led by Victor, US1RCH and well-known radio-traveler Nick, UA3WX, climbed in the Crimean Mountains to the Ai-Petri Plateau. This plateau is located 1300 meters above sea level.

The QRPedition used the callsign, EN5R. Equipment was an old Soviet military radiostation with 5 watts output on the 20M band and a handheld 144 MHz FM transceiver. Only simple wire antennas were used. Apart from interesting QRP contacts, the team got a lot of pleasures from communing with the natural beauty of the place.



Ukrainian UR-QRP Club QRPedition to the Ai-Petri Plateau in the Crimean Mountains.

News from France

Guillaume, F8ARR wrote to say that were not any QRP Clubs in France. But the Union of French Telegraphistes (UFT) talk as often as possible about QRP and QRPp in their publications. Finally, French QRPers are begining to communicate with each other. In the French (and other world-wide) publications there are more and more CW QRP rigs kits than in the past.

Your column moderator, Oleg, RV3GM and his QRP-dog Alpha.

Well known QRPer Roland, F9RP has dedicated his life to QRP and has created several QRP radio projects. Bernard, F6BCU has designed some kits as well.

Guillaume is an information engineer. He has created a special web site for French QRPers named for the QRP-FR group (www.f8arr.org/qrp-fr/) so that French QRPers can talk with each other via a mailing list, to put or get files, schemes, photos. There are 84 members today (membership is free, of course) and it is dedicated to French speaking people-because there are more than enough QRP mailing lists in English! ;-)

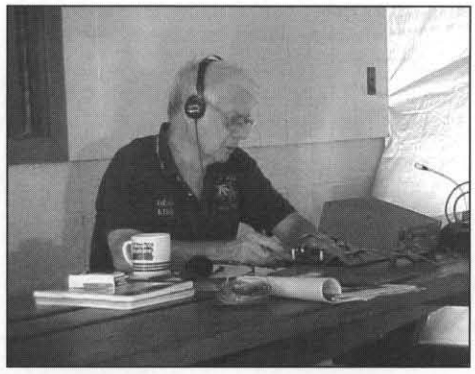
The QRP is not as an traditional spirit in France like in England, for example. Anyway, there are more and more people that are going to be converted there, for sure. Since QRP is more efficient in CW, many young hams begin to learn Morse code so that they can use the cool kits that use only 2N2222s. Guillaume asked me to relay his warmest regards for all *QQ* readers, which I do with great pleasure!

Around the World of QRP

Italian QRPer Franco Bachetti, ISØV-SU, informed me that the Sardinia QRP Club was recently started. The web page is at www.sardiniaqrp.com and is still under construction. This is the first Sardinia QRP Club, and Franco is very proud of it. There is plenty to do and he hopes to have the help from many other QRP clubs around the World. Their motto is: Build, Learn and Teach.

Our colleague, Dean Manley, KH6B from Hilo (Hawaii QRP Club, see Figure 2) informed me about a long trip by Jack, KH6KT, to Darwin, Australia. Jack's itinerary took him through Seoul, Korea, Bangkok, Thailand, and Bali in Indonesia. He should be back in Hawaii in about five months. Jack hopes to be QRPing from Australia as VK8, but unfortunately he is having trouble with local customs to get his equipment and ham license. Hopefully, he will be on the air by the time this reaches you.

Hawaiian QRPers meet every morning meet in a local coffee shop in Hilo. Usually a "high quarter" of the Club shows up! Dean has ordered more than 20 "Micro-80" CW micro-transceivers for organized a local CW-QRP net on 3580 kHz. Always a great pleasure to help our Hawaiian friends!



Dean Manly, KH6B.

A very interesting letter arrived from Tim Ostley, MØCZP, a member of the G-QRP Club. Tim described his PSK31 experiments with simple SSB and DSB QRP transceivers. He wrote, that running PSK31 is straightforward on any SSB/DSB transceiver. Tim has worked PSK31 on three homebrew transceivers: Howes AT160/DXR20 DSB 80M/160M (10W), an Epiphyte 2 SSB 80M transceiver (5W) and a simple homebrew QRPp DSB 80M transceiver (200 mW!). The main issue is one of VFO stability rather than technical complexity. Since PSK31 is such a narrow band, if your VFO drifts

faster than the AFC facility of your PSK31 software, you loose contact. All the homebrew transceivers above use L-C VFOs and provided you let them warm up first all allow PSK31 contacts although he has not tried a QSO which lasts more than about 10-15 minutes.

Both the Howes and the QRPp rigs use a direct conversion receivers with DSB transmitters, and the Epiphyte is a single conversion superhet. Tim used Digipan but other software can also be used. He uses a sophisticated PC-transceiver cable that uses transformers and resistors in the TX/RX lines and an opto-isolator to couple the serial port to the PTT on the rig, but uses a simple link from sound-card to mic/phone jacks of the transceivers. All in all a very nice little setup which has given hours of enjoyment. Tim has some ideas for a 20M transverter for it but not enough time to try them out! In summary, Tim wrote, you do not need sophisticated equipment to enjoy PSK, however the better the equipment the better the results (as with all Amateur Radio).

RU-QRP

To close, some news from my favorite Russian QRP Club. In November we organized the first Club's mini-contest named "Wake-Up! QRP Sprint." Such a strange name comes from the fact that the Sprint time is in the earlier morning, 7:00 to 9:00 a.m. local time. The Sprint consists of 4 rounds, each half an hour, operated only CW on the 40 and 20M bands. More than 30 QRPers have taken part in this sprint and all have had a lot of fun. We have decided to conduct similar QRP-Sprints quarterly on first Saturday of Summer, Autumn, Winter and Spring. We welcome QRPers worldwide!

Beginning in January, all articles in the RU-QRP Club journal *CQ-QRP* will enclosed in the pages of the national Russian Amateur Radio magazine *RADIO* and so the separate subscription for *CQ-QRP* is closed for now.

Finally, there is a World QRP top list on the RW3AA web page at www.qsl.net/rw3aa. If any QRPers have QRP statistics (DXCC countries separated by modes CW, SSB, Digital) you may put your results up on the table (for free!!!). Send a note to Top List Manager, Vyacheslav Lukin, RW3AA (See Figure 3) by e-mail (rw3aa@bk.ru) and he will add your call to the list. As I know, this is the first and only QRP Top List in the World, that I have heard about. Vyacheslav is planning to sponsor a special annual Award named "The 1st Class QRP Operator (also "The 2nd…" and "The 3rd…") of …. Year." He sent me a sample of the award and I think it is beautiful. Vyacheslav also has a "Digital Top List," on his site.

QRP Top List Manager, Vyacheslav Lukin, RW3AA.

That's all, folks! I would be very happy to hear from you regarding things going on in World QRP life. Thanks for all who helped me with this article!

See you in the Spring *QQ* issue and on the QRP frequencies!

—72! Oleg, RV3GM

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A Simple Transceiver Based on the NOGAnaut Transmitter

Oleg V. Borodin—RV3GM master72@lipetsk.ru

Dedicated to all NoGa-QRP and Hawaii-QRP Club members, to Eric and Wayne from Elecraft, to Pickett AD4S, Dean KH6B, Gil NN4CW and other QRPers whose helped us get a K2 transceiver for our Club

I have always liked very simple constructions. They fascinate me with their ease and safety in operation. My theory is, the easier the construction, the safer the construction—this is the well-known fact. It is especially pleasant to have a communication on the equipment, which consists of several elementary details. Thus there is a feeling, that they are magic, HI.

Recently, I received a copy of the *QRP Quarterly* magazine (October, 2000)—many thanks to George Gingell, K3TKS—and found the circuit for the NOGAnaut transmitter designed by Mike, KO4WX (see Figure 1). My first thought was, "That is the simple circuit! It will be necessary to make this transmitter for my collection." As there was no special parts, I was able to

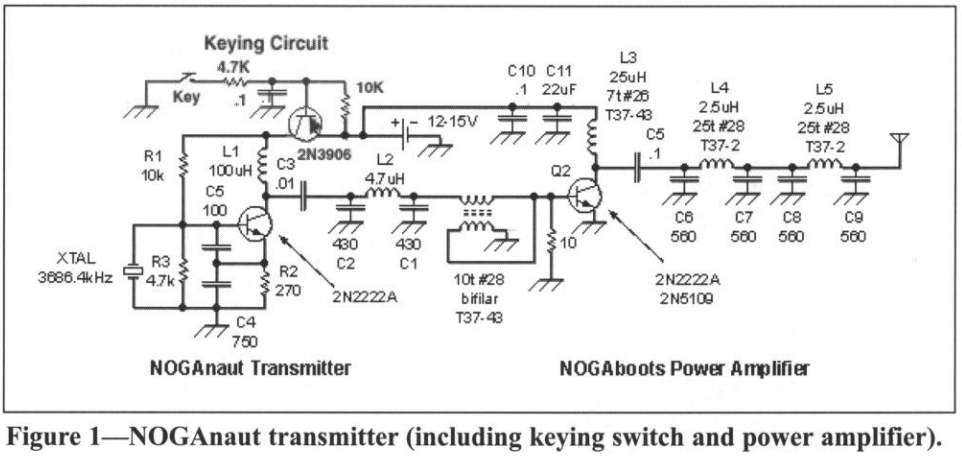

Figure 1—NOGAnaut transmitter (including keying switch and power amplifier).

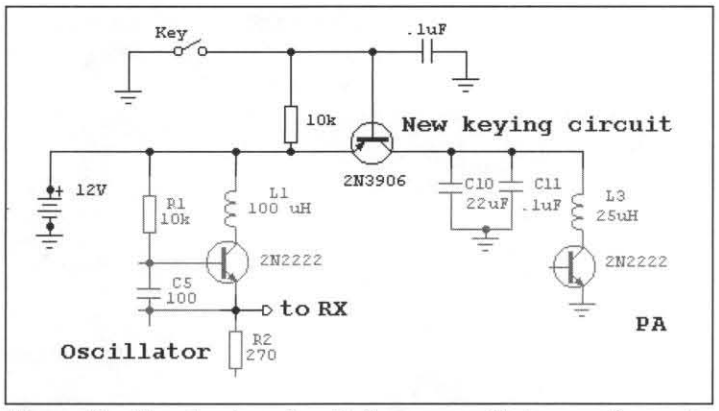

Figure 2—New keying circuit (to run oscillator continuously and key amplifier).

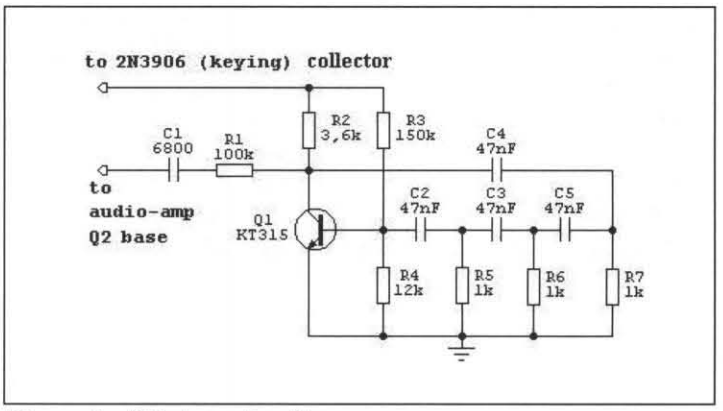

Figure 4—Sidetone circuit.

find all the components in my junk-box.

Not a lot of time was required to make this transmitter on a piece of the PCB by "dead bug" style. I used the 3579 kHz TV crystal in the circuit instead of 3686 kHz as in original rig. First time I turned on the power, my new RIG was on the air! I powered the transmitter using a 13.8V "Wall Wart" PSU and added a 4000 uF x 25 V electrolytic capacitor for the best filtering. The transmitter had 300 mW output using 13.8V.

My next idea was to build a transceiver based on this transmitter. I have never liked to use the separate transmitters and receivers, so although I always think simple is better, I prefer to use a transceiver than a separate transmitter and receiver.

First of all, it was necessary to change the keying circuit because for a transceiver it is necessary, that the oscillator runs constantly both for reception and transmission. Instead of keying the oscillator, I changed the circuit so that the + voltage was connected directly to the oscillator, and keyed the PA transistor with the collector of 2N3906 in the keying circuit (I used a similar Russian PNP transistor, the MP41), see Figure 2.

With the oscillator running continuously, and the PA stage, I was ready to implement a direct conversion circuit for the receiver.

The RF-detector is a simple single-diode mixe. A parallel RC audio-filter is connected to the output of the mixer. Finally, an elementary audio amplifier using a pair of NPN KT315 transistors (you can use 2N2222s or 2N3904s), see Figure 4.

I took the RF for the receiver from the emitter of the oscillator using an 82 pF capacitor to the receiver circuit. Also, I connected a small variable capacitor in series with the crystal to allow tuning the oscillator frequency plus or minus about 1 to 1.5 kHz. I used a SPDT switch for switching the antenna from the receiver to transmitter.

For the side-tone control I built a single-transistor audio-oscillator, and connected it to the base of second audio amplifier transistor (See Figure 4).

My new NOGAnaut transceiver was ready to go to work. For an antenna, I used a piece of wire 42 meters long, stretched between two five-story buildings, without an ATU. Tune up of the the receiver took about a minute-just rotate the core of slug-tuned coil for maximum audio noise level in the earphones. By the way, high impedance headphones—at least 1600 ohms impedance—are necessary.

[Note that you can probably use a 1000:8 impedance transformer available from Radio Shack. Alternatively, many old-style crystal earphones—the kind that used to come with transistor radios—are high impedance and may well work—ed.]

You should be able to build a simple audio amplifier using the well-known LM386 if you want to use the usual 16-32 ohms headphones. If somebody wants to make this update, I would be very interested in knowing your results.

Using this simple radio has been a lot of fun the 80 m band. Some QSOs with nearby Oblasts (Regions) were made without much trouble. I contacted one station 600 km away in the Ukraine (from Moscow—ed.). I think that is very good for QRPp power and the 80 m "trouble" band.

In closing, I would like to wish good luck to all experimenting constructors. Remember, the simplicity is fun!

Good QRPing!

—72 from RV3GM, Oleg

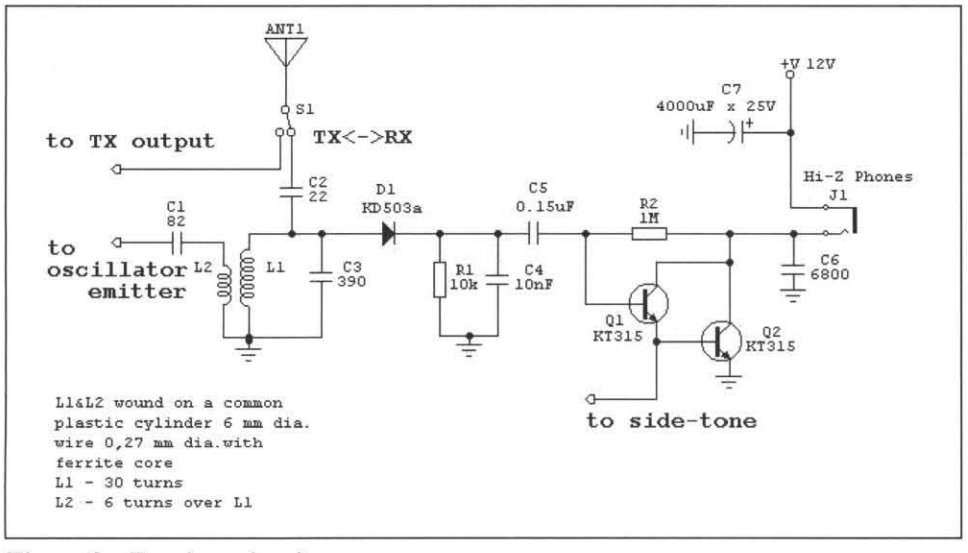

Figure 3—Receiver circuit.

QRV? Reborn Rocks

Steve Hudson—AA4BW sdhudson@reedbusiness.com

Steve, AA4BW

There they were, and I couldn't resist 'em—a half-dozen old FT-243 crystals in a "25 cents each" box on the hamfest fleamarket table. They were in great shape. There was just one problem-they were for 6995 kHz, a wee bit low for 40-meter CW.

Still, the price was right…

Five minutes later they were in my pocket-along with ten others for various frequencies between 6900 and 6995. The seller made me a deal too-all 15 for two bucks. I think he figured he'd unloaded some worthless junk.

But he didn't know my secret. He didn't know I knew how to do the grind!

The grind, in this case, is the fine art of grinding crystals to move them to new frequencies. Back when I got started in the hobby, those trusty FT-243 crystals were ubiquitous. The blocky little crystal holders, each with its bakelite case, screwed-on metal cover and two gleaming pins, were the bread and butter of novice (and other) stations all over the country.

Trouble was, at that time, they cost several dollars apiece-a large chunk of change for a 12-year-old WN4!

But when you're 14, the world is a challenge-and the challenge was to find a way to move out-of-band crystals (which were relatively cheap) to in-band frequencies. Could it be done? You bet it could. All it took was a little grinding—and the techniques used then work just as well today.

The Inside Story

At the heart of any crystal is the "crystal" itself, a tiny wafer of precisely cut quartz that's been mounted in some sort of holder. The physical dimensions of the wafer are the primary determinant of its resonant frequency (that is, the frequency at which it will oscillate), much like the physical dimensions of a chime or bell determine the pitch, or frequency, at which it rings. All other things being equal, a thick wafer of quartz will have a lower resonant frequency than will a thin one.

Hmmm. Shouldn't it be possible, then to raise the frequency of the crystal by removing a little material?

Yes, and that's exactly what you do when you "grind" a crystal. During the grinding process, you literally remove a small amount of material in order to raise that resonant frequency. It's somewhat analogous to trimming a metal chime. The more you trim, the higher the pitch (frequency) of the chime. The same thing works with crystals designed to operate at RF frequencies—if you know how.

Obviously, to grind crystals, you've got to be able to get at the actual piece of crystal itself. For most practical purposes, that eliminates "modern" sealed crystals. Yes, they can be moved—but it's an awful lot of hassle.

However, it's no problem at all with screwed-together surplus FT-243s.

An FT-243 holder (as well as other style holders of similar basic design) may not look as sleek as a modern sealed unit, but there's a lot going on inside those little bakelite case (see Figure 1). Externally, depending on the particular style of holder, the bakelite case will measure an inch or so by an inch or so by some fraction of an inch thick. For an FT-243, for example-one of the more common holder styles seen in hamfests and flea markets—the holder measures about one and an eighth inches high, just over three-quarters of an inch wide, and a bit under a half inch thick.

Typically, one face of the crystal holder is made of metal, which is secured to the bakelite holder with three screws that mate with nuts which fit into shaped recesses in the bakelite body. Some crystals may have paper labels on the metal face plate; in that case, the screws are under the paper.

Opening Things Up

Step one is to get inside your chosen FT-243. First, use a small screwdriver to remove (and save!) the three screws holding the crystal's metal cover in place (see Figure 2). Be careful as you loosen them, especially the last one, for there's a strong spring inside that'll blast everything into never-never land if you're not careful. If that sounds like the voice of experience speaking, rest assured that it is.

Be careful, too, not to lose the three small nuts that fit into keyed holes on the other side. They'll often fall free as you remove the screws, and if you drop them they're devilishly hard to recover. Again, experience speaks!

On very old crystals, the gasket between the cover and the holder may have become stuck to the holder over the years. It may even stay stuck once the screws removed. If it does, gently pry the cover and gasket free and set them aside, being sure to save the rubber gasket.

And as you do, don't forget about that spring!

With the cover off, you'll find a cutout cavity holding the crystal and its associated connectors, all stacked together sandwich-style. At that point you're ready to dig into the heart of things.

With the metal cover, the rubber gasket, and the spring out of the way, the first thing you'll note is a thin square or rectangular metal electrode connected to one of the crystal holder's connecting pins. It's the first layer in the FT-243's interior sand-

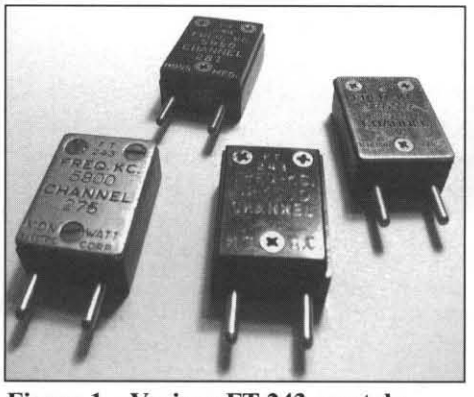

Figure 1—Various FT-243 crystals.

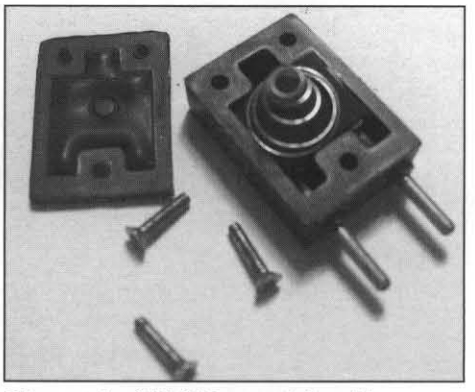

Figure 2—FT-243 crystal with cover removed.

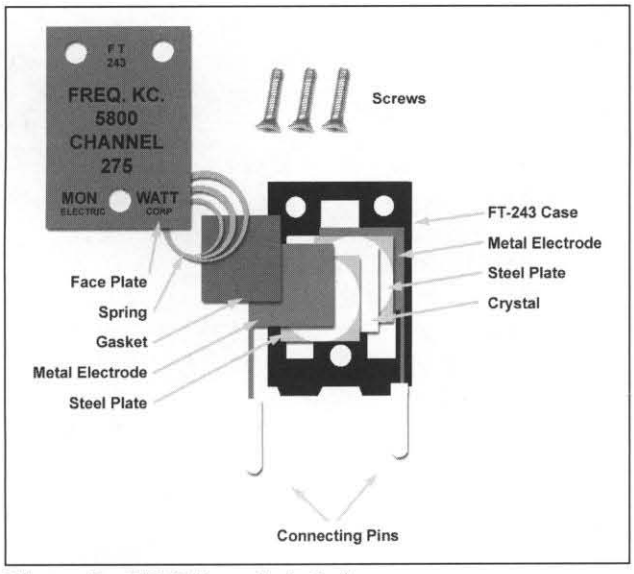

Figure 3—FT-243 exploded view.

wich (see Figure 3).

Below the electrode is a steel plate with slightly offset corners turned inwards (towards the crystal element), followed by the crystal itself, followed by another steel plate with its offset corners turned outwards toward the crystal too, followed by yet another square metal electrode connected to the other pin.

To get to the crystal element, very carefully lift the outer electrode up and remove the two steel plates with the thin quartz wafer between them. Note which side of the plates touches the crystal, since these plates are designed to contact the crystal itself on its corners only and must be reinstalled correctly. Be sure you know how to put it back together correctly!

Now lift off one of the plates, and there it is—the tiny piece of quartz that's been so important to ham radio.

The crystal itself is actually a thin slice that's been carefully cut from a much larger piece of quartz. It's not particularly impressive, looking like nothing so much as a thin square piece of frosted glass. But it''s the heart of things, and that's what you're about to work on.

Congratulations—the hardest part is done.

Doing The Daily Grind

For your first experiments in grinding, pick some oddball crystal on some non-useful frequency. That will let you hone your skills without worrying about messing up a potentially good ham band crystal.

What will you need in the way of grinding equipment?

Not much. The simplest approach is to grind on a piece of plate glass, using a very thin slurry of abrasive compound mixed with water. When I first began grinding crystals, this is the approach I used, and it works just as well now as it did then. Get a piece of plate glass at least a quarter inch thick. It doesn't need to be very large; a six-inch square is plenty. I've found that local glass shops will often provide you with such a piece for cheap or for free.

Next, you'll need a grinding compound. My long-time favorite has been the fine or pre-polish grade of silicon carbide sold in hobby stores for use in rock tumblers. In terms of grit size, look for 600 or 1200 mesh. Both work; the only real difference is that 1200, being finer, grinds a bit more slowly. A one-pound container costs just a few dollars and will last for years.

Before grinding, first check the crystal's frequency using a test oscillator and counter. Then disassemble the crystal (keeping track of the orientation of the steel plates and being careful not to lose the parts) and remove the small quartz wafer. Set it carefully aside.

Next, mix a tiny amount of abrasive with a few drops of water—you want a very thin slurry, not a thick mud—and spread it on a portion of the glass plate.

To do the actual grinding, place the quartz wafer gently on the slurry; then with light fingertip pressure applied with the pad of your index finger to the center of the crystal, move the crystal in a figure-eight pattern three times. Go either clockwise or counterclockwise, but note which direction you're grinding in. Some crystal grinders prefer to use the tips of the index and middle fingers on opposite corners of the crystal; that can work, too, but it's easy to apply uneven pressure and grind the crystal so far out of whack that it will no longer oscillate. I'd suggest the pad-of-the-finger technique to start with.

Next, repeat the figure-eight grinding pattern three additional times but in the opposite direction. Now remove the crystal from the grinding glass, noting which side you were grinding. That's important, as doing all your grinding on one side will help improve the odds of success. Then wash it clean, dry it completely, and replace it in its holder. Reassemble the holder using all three screws, reversing the sequence you used to disassemble it, and check its frequency in the same test set-up you used before.

When you do, you'll find that one of two things has happened.

The hoped-for result is that the crystal has moved upward in frequency by some number of kilohertz. Make a note of the frequency shift; this helps you gauge how much more grinding will be needed to reach the desired frequency. If, for example, three figure eights in each direction yielded a change of 2.5 kHz, you'll need to do approximately three more sets of figure-eights to get a total shift of 10 kHz. Most experienced grinders do in fact use this little-bit-at-a-time approach, sneaking up on their chosen new frequency a few kilohertz at a time, though as you gain confidence you'll be able to tackle greater swings in the course of a single grind.

As you get closer and closer to the desired frequency, you'll want to switch to finer and finer abrasives. For really tiny shifts, you may even want to use a slurry made of water and traditional white Colgate toothpaste—not the gel, but the traditional kind that crunches slightly!

What about that second possible outcome? You may find, upon reassembling the crystal, that oscillation has stopped. There are several possible reasons. It may be something as simple as installing the steel plates backwards (remember, the plates must be installed with the offset corners toward the crystal). It may also be the result of incomplete cleaning of the crystal blank before reassembly.

If you do find a crystal that stops oscillating, the first thing to do is to disassemble it, clean it again, and then reassemble it. Pay particular attention to being sure that the steel plates are correctly installed. This fixes things in a surprising number of cases and is always the first solution to try.

Another possible reason for non-oscillation is that your grinding operation has had (how to put it) an adverse impact on the geometry of the blank. You may have inadvertently ground one end more than

the other, pulling the faces out of parallel. In my experience, this is usually the result of too much finger pressure during grinding, of placing your finger somewhere other than in the center of the quartz wafer, or of not making an equal number of figure-eights in each direction.

Of course, the problem may simply be that you were working on a marginal crystal in the first place, one that was just barely on the edge of functionality. You'll encounter one like that from time to time, though it doesn't happen very often. If you do get a non-oscillating crystal and can't seem to bring it back by any other means, try very lightly beveling the edges of the blank. Sometimes, just a few light strokes on each edge will bring one back to life.

Beyond The Basics

If you find that you're really getting into this crystal grinding thing, you may what to do what I finally did—step up to diamond. Besides ham radio, I also enjoy faceting gemstones, and I eventually discovered that the ultra-fine, ultra-flat diamond laps used to facet sapphires and aquamarine also make dandy tools for grinding FT-243 crystals! With such a lap, all I have to do is dampen the surface, place the crystal on it, and set about my figure-eighting. There is no need to mix an abrasive slurry, since the abrasive (in this case, diamond dust) is permanently embedded in the flat face of the lap.

Where do you get such laps? Well, you can purchase new laps from a lapidary supply house (expensive) or see if you can talk a local lapidary hobbyist out of his old ones (cheap). Look for one in the 1200-grit range; even though it may be too worn for effective gemstone work, it will still have plenty of oompf for the tiny amount of material removal required to grind ham crystals. Besides, finer abrasives force you to proceed more slowly. That can give your success rate a real boost.

Lowering The Frequency?

Grinding allows you to precisely move crystal frequencies upwards by dozens of kilohertz—many dozens, as your technique improves.

Can you lower the frequency of a crystal too?

Well, maybe.

To lower the crystal, you've got to add material to the blank. You can't just glue some additional quartz to the blank and have it work. You can, however, try the following trick if you have a crystal whose frequency you want to lower by a few kilohertz.

To lower a crystal frequency, start with an ordinary pencil. Disassemble the crystal, remove the crystal element, then use the pencil to "draw" on the center of the blank. The thin smear of graphite will add a tiny amount of thickness and mass to the crystal, hopefully lowering the frequency a small amount.

How well does this work? Results, as they say, may vary. Sometimes it works fairly well, allowing you to lower the crystal to a new (and stable) frequency. But other times it works poorly, yielding an unstable crystal or shutting down oscillation altogether. If that happens, simply erase the mark using a soft rubber artist's eraser, wash the crystal, make sure it's still oscillating, and start over.

Some crystal shifters get somewhat better results by trying the same approach but using a permanent marker (I like Sharpie brand markers) or India ink instead of a pencil. Just be sure to keep the mark near the middle of the crystal blank where it won't interfere with the electrical contact between the steel plates and the crystal.

A Hardware VXO?

Since we're talking about shifting crystal frequencies, one other intriguing technique (one that raises frequencies by a little bit) should be noted. As already mentioned, the major determinant of a crystal's frequency is the physical dimensions of the blank of quartz. But that's not the only thing that comes into play. Another factor is the pressure exerted on the blank by the holder. More pressure tends to raise a crystal's frequency, and that suggests an interesting way to potentially vary the frequency of an FT-243 or similar crystal.

What you have to do to make this work is to come up with a way to vary the pressure exerted by that interior spring. How? Try this.

Take apart a crystal, noting where the "pointed" part of the cone-shaped spring contacts the front plate. Now drill a small hole through the front plate at that point. Tap the hole for a suitable screw, but note that some plates are too thin for effective tapping. If you have a crystal with one of those, you may need to drill a large hole and epoxy or solder a suitable nut in place instead. Alternately, get a piece of thicker metal stock and cut and drill a new plate from scratch, using the old one as a template.

The final step is to put a threaded screw of some sort into the drilled-and-tapped hole so that you can vary the spring pressure by running the screw in or out. The resulting creation looks pretty strange, but it works.

What kind of swing can you expect from such an approach? Generally, you won't get very much variation—perhaps a couple of kilohertz, perhaps a little more or a bit less. It's not a technique suited for large swings, but it is useful if you ever need to precisely net a crystal to a particular frequency.

Incidentally, it's best to insulate the screw, if for no other reason than in the interest of safety. Depending on the circuit you use your mechanical VXO in, you may have significant voltage on one or the other of the plates of your crystal. You can accomplish this by mounting an insulated knob on the screw—exactly how you attach I'll leave up to you—or by using a non-conductive screw.

This vary-the-pressure idea has been around for a long time, and over the decades hams have come up with all sorts of ways to implement it. There's even at least one commercial product, the "Tweaky," designed to vary crystal frequency slightly by using this approach.

Add this to your bag of tricks when you set out to play with FT-243 frequencies. You may be surprised at what it will let you do!

What Are You Waiting For?

Whether you're looking for crystals for a homebrew QRP rig or trying to find a few to reactivate one of the crystal-controlled rigs of long ago, the fine art of crystal grinding will put you a jump ahead of the game. By mastering the fine art of crystal grinding, you'll have fun and save money too. And it's a great thing to do on those long evenings when the band is closed or when you just don't feel like turning on the rig.

Meanwhile, look for me on 7038.2-thanks to my 25-cent 6995 kHz crystal and its brand new lease on life!

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The First Great Alaska Ptarmigan Hunt

Jim Larsen—AL7FS JimLarsen2002@alaska.net

Ptarmigan Named

On November 17, 2003 a new Alaska QRP record was set. Eleven Alaska QRP operators were on the air at the same time with the expressed goal of working as many stations as possible no matter how poor the propagation might be. How did this all come about and what happened? This is a report on the first Great Alaska Ptarmigan (GAP) Hunt.

In early August 2003, I began to think in terms of running a one time (at least to start) Alaska Fox Hunt on 20 meters. The plan was to enlist Alaska-based Alaska QRP Club members (like many clubs, there are members of the Alaska QRP Club who are not Alaska-based) to operate for a given 2 hour period with from one to five or more Foxes spread from .050 to .065. We would use the same exchange format as the Spartan Sprint of RST, S/P/C, and power out.

I had some ideas for awards for the top couple of contestants. At some point it was suggested that it might be better for Alaska to use something other than Fox Hunt. Suggestions were received such as Polar Bear Hunt, Kodiak Bear Hunt, Alaska Fox, Grizzly Hunt, and so on. Eventually this question was presented at the Alaska QRP Club monthly meeting and after a short discussion we all agreed to call ourselves Ptarmigan…Great Alaska Ptarmigan (GAP) to be exact. Thus the GAP operators of Alaska were born.

Ptarmigan Sought

A date was selected for the GAP Hunt and the call went out for Ptarmigan. I had been hoping to get at least six GAP for this hunt and in very short order I had 14 QRP operators lined up and ready to go. This meant one Ptarmigan every 3 kHz from 14.026 to 14.064. We literally were going to be hidden in amongst the brush known as all the other CW operators on the band.

The Great Alaska Ptarmigan who actually operated are listed on this page.

Ptarmigan Hunted

Sunday afternoon of the Ptarmigan Hunt arrived and it was time to get on the air. The excitement of the hunt must have addled my brain as I spent the first 2-3 minutes transmitting into the coax on the back of my Elecraft K2. I had forgotten to switch the beam from the Kenwood over to the K2. Having fixed that problem, I began calling CQ GAP. I could tell right away this was going to be a tough two hours and unfortunately not enough attention had been paid to the 27 day sun cycle. We ended up with a high A and K index that day and with aurora. (SFI=121 A=31 K=4 Au=9)

White-tailed Ptarmigan (Lagopus leucurus). Photo by Rob Bennetts, Greater Yellowstone Network; used with permission.

Call	Name	QTH
KL7R	Mike	Juneau
AL7FS	Jim	Anchorage
KL7IKV	Lynn	Anchorage
KL7CC	Jim	Anchorage
KL7GN	Gordon	Anchorage
WL7CDC	Doug	Anchorage
KL7PB	Rich	Sterling
KLØWN	John	Kodiak
AL7N	Ed	Fairbanks
KY7J	Ken	Emmonak—on the Bearing Sea
AL1G	Corliss	Anchorage

Great Alaska Ptarmigan who participated in the first GAP Hunt.

In spite of the propagation, 113 QSOs were made during the two hours by the eleven Great Alaska Ptarmigan. There were 13 states/provinces contacted including CA, WA, NM, AK, TX, AZ, OR, ID, HI, OK, GA, LA and BC. The high honors for the Ptarmigan went to KL7CC, Jim Wiley, who made 18 QSOs. WL7CDC, Doug Stowers had 15 QSOs. AL1G had 13 while AL7FS, KL7GN, KL7PB and KLØWN all had 12 QSOs.

The Ptarmigan Hunters that could hear us did well. KG6WP, K7TQ, W6AZ and N1SB all worked 8 to 10 GAP stations. That is amazing given the band conditions.

Here are a few comments from some of the Ptarmigan.

Corliss Kimmel, AL1G

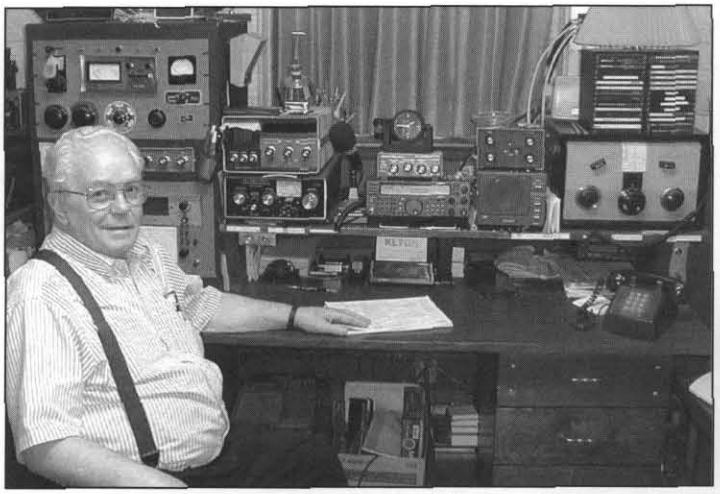
I was heavy into the Sweepstakes contest on 15m, not paying attention to the time. Frank came over and said, "uh, when are you supposed to be starting the Ptarmigan thing?" I looked the time and it was after 3pm...eeeeeeek!!!

So I quickly made the switch to 14035 and started to transmit, but the paddles weren't working. Hmmm… took me a couple seconds to realize the mode was still set to SSB :-)

I didn't get any answers at first, so I decided to hunt down the other Ptarmigans. I would go get one, and then go back to CQing. None of the out-of-state stations I worked was tough copy, all were weak but very readable. There was a phantom KØ station that would fade in, send the call 3 or 4 times and then fade out every time I acknowledged the call. There was one station calling who obviously was not part of the GAP hunt, as he gave me only a signal report. I asked for the state, he sent that. But after I asked for his power level, he had gone. I logged him anyway as it was a valid Q.

I couldn't hear all of the Ptarmigans, but worked all the ones I heard. I really wanted to work Kodiak, as I lived there for 8 years and wanted to have a Q with my old hometown. Maybe next time!

After the GAP was done, I went back to



The search for Ptarmigan netted well known QRP contester, Gordon Nightingale, KL7GN

Alaska Ptarmigan, Corliss Kimmel, AL1G managed 13 QSOs.

the maelstrom of the last hour of Sweepstakes.

I enjoyed being part of the Ptarmigan Hunt and would certainly do it again. Thanks!

—Corliss, AL1G

John Pfeifer, KLØWN

My biggest challenge was getting back on the air before the GAP Hunt began. My fancy, automatic antenna tuner blew up a few days earlier and I was without a tuner for my one-and-only antenna, a 44-foot doublet hanging 50-feet up between a two spruce trees.

I found a used Johnson Matchbox for a reasonable price on Ebay and—fortunately—had the winning bid. It arrived in the mail Friday, just a couple of days before the Hunt. I spent most of Sunday morning hooking it up, but, when time came to try it out, I couldn't get a good match on 20 meters. I think my open-wire feeder just happens to be an unlucky length for that band and is presenting an unmatchable impedance.

As a last resort, I dug out my trusty Emtech ZM-2-which can tune up the proverbial wet noodle-and voila, it brought the SWR down to 1.1-to-1. All this happened at 2330z—just 30 minutes before the Hunt ...whew!

I originally hoped to use my Elecraft K1 for the Hunt, but with all the time I spent futzing around with my antenna, I didn't have a chance to replace the crystal that had failed on the 20 meter filter board. Fortunately, I was able to reduce power on my Ten-Ten Omni V.9 to 4.5 watts, as measured on my OHR WM-2 wattmeter. Actually, the Omni proved to be an excellent QRP rig. The extra receive sensitivity really helped pull out those weak signals.

The last time I did anything vaguely like the GAP Hunt was last summer's Flight of the Bumble Bees. Propagation was even worse then, and I only had one contact. So, being a Bee didn't do much to prepare me for being a Ptarmigan. I was very worried that propagation would be too good and I'd find myself on the receiving end of a pile-up. Fortunately, things got off to a slow start, and I had a chance to get used to the routine.

The first station to call was KH6HE in Hawaii. After that, several stations in the Pacific Northwest and California pounced.

The Great Alaska Ptarmigan Hunt Results/Logs

Call	Name	QTH	QSOs
KL7CC	Jim	Anchorage	18
WL7CDC	Doug	Anchorage	15
AL1G	Corliss	Anchorage	13
AL7FS	Jim	Anchorage	12
KL7GN	Gordon	Anchorage	12
KL7PB	Rich	Sterling	12
KL0WN	John	Kodiak	12
KL7R	Mike	Juneau	7
KL7IKV	Lynn	Anchorage	6
AL7N	Ed	Fairbanks	6

Stations worked:

KL7CC—K2ZY, KH6HE, AL1G, K7SBK, W6AZ, N1SB, K7TQ, KH7T, K7ILN, KG6WP, VE7HHH, KQ5U, KL7V/5, K7JOS, K5DIZ, KD7GTI, AD6HJ, K7OZN

WL7CDC—K7TQ, KG6WP, N1SB, W7ILW, W6AZ, KL7GN, K7SBK, K2ZU, W5YR, KG6CSE, AL1G, VE7HHH, KD7GTI, K7ROS, KD7GIM

AL1G—KL7GN, KL7CC, KL7IKV, W6AZ, N1SB, KG6ST, K7TQ, K7SBK, AL7FS, KG6WP, VE7HHH, W7ILW, WL7CDC

AL7FS—N1SB, W6AZ, K7TQ, KG6WP, W7ILW, AL1G, KK7SB, W4FOA, VE7HHH, K7OZN, KD7GIM, KD7GTI

KL7GN—KG6WP, W7ILW, K7TQ, N1SB, AL1G, W6AZ, KQ5U, K7SBK, WL7CDC, KL7IKV, KD7GTI, VE7HHH

KL7PB—N7MOB, K6TQ, K7SBK, WA5TCZ, KG6WP, N1SB, K5JPH, W5USJ, W6AZ, KA7CKS, KL7TQ, K2ZU

KLØWN—KH6HE, N1SB, K7SBK, K7TW, W6AZ, K2ZU, W7ILW, KG6WP, W4FOA, KL7V/5, KQ5U, KD7GTI

KL7R—KH6HE, KL7IYD, KH7T, K7TQ, W3JGG/7, KQ5U, K7POS

KL7IKV—AL1G, KG6WP, N1SB, KH6HE, KL7GN, KD7GTI

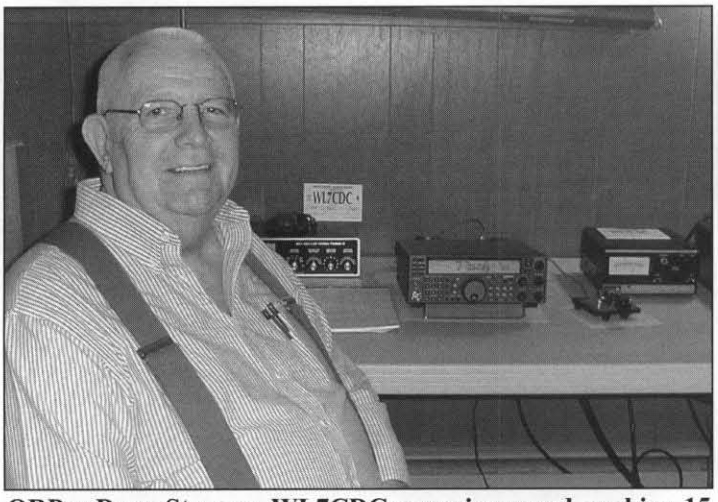
AL7N—N1SB, K7TQ, K2ZU, KD7GTI, KG6WP, W6AZ

KY7J—Was there 2 hours, nothing heard

AL7OK—Called out of town on business

KL7Z—Was ill, did not operate

KLØXK—Last minute conflict



QRPer Doug Stowers, WL7CDC came in second, making 15 QSOs.

Jim Wiley, KL7CC, President of the South Central Radio Club of Anchorage netted top honors, working 18 stations. (Yes, he was QRP!)

Although propagation was, as expected, quite poor, there were a couple of brief openings. W4FOA, way down in Georgia, blasted through with a 559 signal about two-thirds of the way through. Right before Ptarmigan season closed, at 0152z, there was another brief burp in the ionosphere and two more southern stations came into view: KL7V/5 in Oklahoma and KQ5U in Texas.

Even on the downward slope of the solar cycle, 5 watts into a dipole can still provide some excitement. All it takes is a little patience on both the transmitting and receiving end. I hope the Great Alaskan Ptarmigan hunt becomes a regular QRP event. It's a great way to encourage more contacts between Alaskan QRPers and the "Lower-49" states.

—John Pfeifer, KLØWN

The Ptarmigan's Future

The first Great Alaska Ptarmigan Hunt is history. We all had a good time and want to do this again. Our plan calls for watching the A index for the quietest time and trying to guess what dates will be best allowing for the 27 days cycles of the sun. The Ptarmigan of Alaska hope you will all try to listen for us when next we have another Great Alaska Ptarmigan Hunt.

—Jim Larsen, AL7FS

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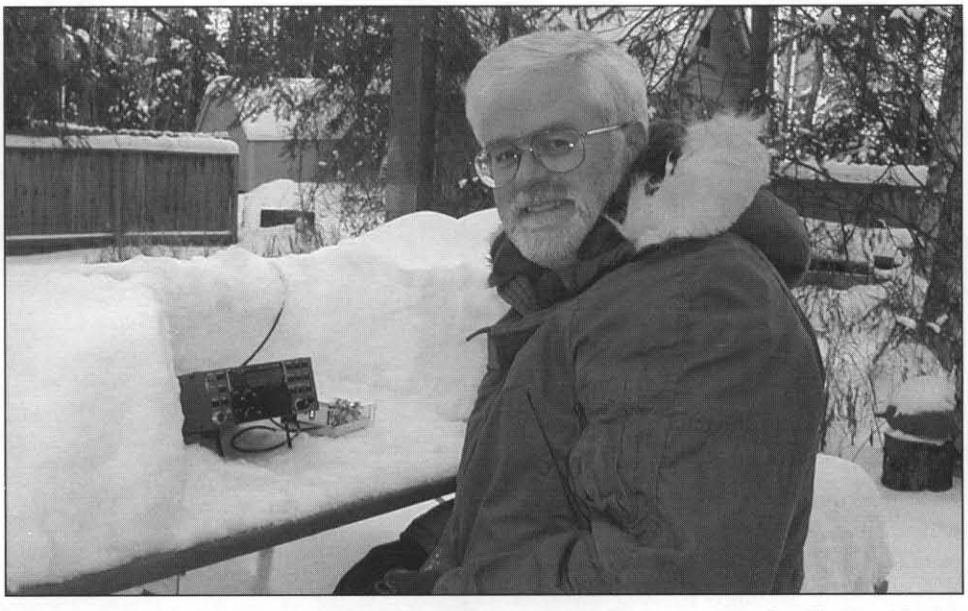


The author, Jim Larsen, AL7FS, getting ready for next year's Great Alaska Ptarmigan (GAP) Hunt. Watch for an announcement of the 2004 date.

DON'T MISS AN ISSUE OF *QRP QUARTERLY*!

Although your membership in QRP ARCI does a lot more than just give you a subscription to *QRP Quarterly*, we understand that it is probably the most important part to you. Check your subscription online at the club web site — www.qrparci.org — or on the mailing label for this issue. If it's due for renewal, don't wait for our reminder — do it today! Full subscription and renewal information is provided on page 64.

Welcome to QRP ARCI!

QRP Amateur Radio Club International, an organization begun in the early '60s, has grown to over 11,000 members. The club is truly international in nature, with members all over the world. Club members like to build and/or operate small, low powered rigs. Most of our members are not against high power and as a group we have never advocated the elimination of amplifiers or high powered contacts. We simply enjoy operating at low power levels—lower than we were used to operating. Why? Because it's FUN!

We have found that there is a real thrill associated with low power contacts. Because low power rigs are relatively easy to build, we have also found that an even greater thrill results from operating a rig that we have built ourselves. Accordingly, there are a lot of technical folks in the club who enjoy talking about new ways to build small transceivers, receivers and transmitters. Finding parts and sharing sources with others is a way of enjoying QRP as well. In fact, most all of our members get very excited about helping others who may be new to building or operating QRP. We answer some questions here and more on our FAQ page (www.qrparci.org/arcifaq.htm).

Why join our club? Here are some of the benefits of being a member of QRP ARCI:

1. **The *QRP Quarterly***—This journal is published each quarter in an 8 1/2 x 11 format and is usually 60-70 pages in length. It is packed with technical content but also has something for everyone from rank beginner to seasoned veteran. If you would like to see some of what we've published in past issues of QQ, take a look at the Tables of Contents of Past Issues (www.qsl.net/wd8rif/qq_arci.htm) or to o see a list of 1995-1999 QQ articles in title order - click here (www.qrparci.org/qrptitle.html) or a list of QQ issues in author order- click here (www.qrparci.org/qrpauth.html).

2. **QRP Awards program**—Numerous awards are offered by the club. By the way, these are available for non-members as well as members. The most popular is the 1000 miles per watt. Simply take your output power and divide by the miles between the two stations. If it is greater than 1000, you WIN! For more info on this and other awards, simple check out our Awards Page (www.qrparci.org/arciawds.html).

3. **QRP Contests**—Again, you do not have to be a member to enter out contests. If you are a member, you send your club number. If not, send your power output instead. The standard exchange of the RST and State/Province/Country precedes this information. The contests are very informal and you won't find much in the way of "hogging" frequencies and that sort of thing. They may be thought of as a way to test out your rigs and antennas with other QRPers. Don't own a QRP rig? Well, simply turn your power down on your "big" transceiver as much as you can and have a go at it. Check out our Contest Page (personal.palouse.net/rfoltz/arci/arcitst.htm).

4. **Local club support**—We try to help local/regional clubs with their programs by promotion and assistance. We also try to have our officers and board members at as many hamfests per year as possible. We bring along or send out a box of materials and promo items for use at hamfests as well. Is there a club in your area? Check out our Club Page (www.qrparci.org/arciclub.htm).

5. **Dayton Four Days In May**—The club sponsors a huge event each year in conjunction with the Dayton Hamvention. We actually add a full day of seminars before the hamfest and we have a whole program of activities each evening of the hamfest. You'll find almost a QRP Hamfest at the Ramada Inn motel at the south end of Dayton, where we take over most of the facility. Check out our FDIM page (qrparci.org/fdim64.html).

6. **QRP Forum**—A place to ask questions, trade ideas, seek information, make friends—in short, have fun! Check it out (www.e-discounter.net/qrparci/).

There are many more reasons to join. Take a tour of our web site at www.qrparci.org. Thank you for your membership (or your interest if this is a borrowed copy of *QRP Quarterly*) — "try QRP, you'll like it!"

THE THRILL IS BACK!

New and renewal membership information is included in every issue of QQ. *It can be found on page 64 of this issue.*

QRP Contests

Randy Foltz—K7TQ rfoltz@turbonet.com

Greetings QRP contesters! The hottest QRP ARCI contesting news is that Tom Owens, WB5KHC, will be taking over as the Contest Manager effective January 2004. Tom has been the Certificate Manager since May 2003. When Tom accepted his position there was a backlog of five contests needing certificates issued immediately. Within two weeks, all delayed certificates were in the mail and Tom was waiting on the next contest results. He will now apply his skills to contest management for ARCI. I am confident that he will continue to do a fine job.

On a personal note, I took over from AB7TT, Joe, in October 1999 just in time for that year's Fall QSO Party. I've enjoyed the time since then working for you QRP contest operators. Now it is time for a new person. I'll still be in the contests and hope to be a regular in the top 10.

In this issue of QRP Contests you will find the results of the Fall QSO Party. There are also announcements for the Winter Fireside SSB Sprint and the Spring QSO Party.

Mark Your Calendars

Winter Fireside SSB Sprint
February 8, 2004

Spring QSO Party
April 10 and 11, 2004

Hoot Owl Sprint
May 30, 2004

2003 Fall QSO Party

The Fall QSO Party for 2003 was held October 18 and 19. As happened last year, we shared 40 M with the JARTS RTTY contest. Just in case this wasn't enough of a challenge, we didn't get much cooperation from the sun. A solar flare put the hurt on propagation for much of Saturday and into Sunday. I think we have relief from the RTTY contest for 2004 as there are five weekends in October.

Places 1 and 2 were captured by N4BP and K7RE, respectively. It just wouldn't be a QRP ARCI contest without Bob handing out many contacts. 401 for this contest. All of the top 10 finishers were familiar QRP calls. Noteworthy were 7th place KØZK in Maine who operated the entire time from his van at the edge of a salt water marsh and 9th place AA4XX who used a mighty 50 mW from his home in North Carolina.

I highlighted this in 2001, last year in 2002, and will again this year. K9PX operated the entire contest on 40 M in 2001, 2002, and 2003. Each year in around 11 hours of operation, Jim has scored 200,000 to 350,000 points. In 2003 his 10-1/2 hours of operation on 40 M only was good for 225,792 points. For the third consecutive year, Jim, you are an inspiration. A tip of the contest manager's hat to you!

As long as we are talking about 40 M, I will mention WA1GWH, Garry, in New York. He operated 40 M only at 250 mW with a SW40+ into an 85 foot wire at 15 feet. The 8-1/2 hour effort resulted in 45 QSOs and 55,800 points. Like Jim, Garry took what he was dealt and operated. FB!!

QRP ARCI Fall QSO Party
Top Ten

1.	N4BP	2,151,600
2.	K7RE	1,144,830
3.	N9NE	760,200
4.	W2AGN	665,280
5.	W4FMS	590,520
6.	WA7LNW	524,251
7.	KØZK	517,230
8.	AA1MY	509,404
9.	AA4XX	464,200
10.	K8CV	458,528

Category Winners

<250 mW	W5KDJ	339,390
40 m	K9PX	225,792
20 m	WA4DOU	126,175

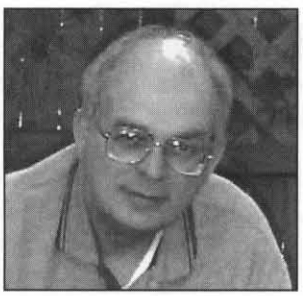
Soapbox

AA1MY—Operated outside in tent under my antennas in 'iffy' wx just above freezing in evenings. Lots of breaks to warm up, chow, chat with visitors. Solar dynamics really apparent on sigs/activity. **AA4XX**—As always, I was mightily impressed with the listening skills displayed by fellow contesters. I was astounded when WØETT pulled my 50 mW out of the 40 M RTTY QRM late Saturday night. **KØEWS**—Had fun in the short time I ran this weekend. Bands didn't seem all that great from here, but managed a few contacts. **KØLWV**—Great contest, low noise here, wonder who was sending dashes like a beacon on 20 M? **K2EKM**—Enjoyed the QSO Party with my VXO-contolled Rock-Mites even though conditions made it a real challenge. Particularly rewarding to work several stations including K7RE in SD on 15 with my new 15 meter R-M. **K3CHP**—Bands were playing tricks. Propagation on its way down. **K4BYF**—Lots of fun. Good ops. **K4UK**—I would have missed all of it if I hadn't heard AA1MY calling "CQ TEST"—He told me the QRP-ARCI Fall Party was on. **K5HQV**—Conditions were generally pretty poor here in MS. Very noisy and high levels of QSB. This was the case on all bands. 40 and 80 were really summer-like with noise. Had good time as always. **K5IC**—First semi-serious entry. I was surprised by the amount of activity. **W5USJ**—Not a whole lot of time to operate this year with family events and chores. But a fun event once again from QRP ARCI even if the bands did die for a while. **K6LG**—The very best band for QRP is 30M. I see no reason why the "band plan" should not allow QRP contests. I tuned the band during the last part of the contest and found exactly one signal on the whole band. **K7RE**—Condx sure began very poorly, but got a bit better as the event wore on. Only put in 20.0 hours, as there just didn't seem enough folks to work on Saturday evening. **K8KFJ**—A home project kept me off the air most of the weekend. **K9FO**—Conditions very good on 20 m. Lots of big QRP signals. See you in the 160 M sprint. **KD9B**—AF4LQ was my first QSO and completely threw me when he asked for my name and city. It was nice to meet someone interested in more than

just the Exchange. **KG4LDY**—RTTY QRM bad Saturday night. Solar flare blacked out bands for me late Sunday morning. **KH6B**—Operated 1/2-mile from rim of Kilauea Volcano at Hawaii Volcanoes National Park. Elevation 4000 ft, temperature 51° F. **KK4R**—Activity seemed low to me, but the guys with the big antennas were working stations I couldn't hear. The friendliest contact was with KØZK who was chillin' at the beach. **KO1U**—Only attic dipoles. Best moments: working same stations on 3 bands. Thanks to all. See you next year QRP. **KO4WX**—Not much activity until Sunday afternoon, then came alive! Amazing what you can do with under 1W just after a radio storm! Most interesting Q was with VE3VA who was at 1W. **KW3F**—Great fun, wish I could have operated more hours. RTTY on 40 is brutal! N0EVH—Many complained of poor conditions, but I thought they were ok. 15 opened well and I heard a beacon from XE1 on 10 meters, but no one showed up on ten. **NØTK**—Ran my newly built K2 and attic dipoles. **NØUR**—Surprised how well my low 80 foot wire worked. Was able to spend more time on than I thought I would, while visiting my daughter in St. Louis, MO. **N2JNZ**—Lousy condx on 40 meters but kept plugging!!!!! **N3IUT**—As usual, a fun contest. Heard lots of familiar signals. **N4BP**—Had planned to again use K1TO's antennas (which included 2/2 on 40M at 165 & 80 ft), but came down with a bad cold and needed to stay at home. Still did decent on 40M which I attribute to the DSP in my K2. **N4ROA**—Thanks for the fun. Wish I could have stayed longer. **N5GM**—I have been inactive for several years, and I was happy to reactivate my old 3 digit number, and glad to work a few other original members. Very happy to see all the new members carrying on the QRP spirit. **N7FG**—I enjoyed working QRP-to-QRP; some good strong stations. **NE5DL**—WX in TX 75F and sunny both

Who is our new Contest Manager you might ask?

Tom Owens—WB5KHC wb5khc@2hams.net



Tom, WB5KHC

For those of you who have not worked me on the bands and been subjected to hearing about my big dogs…

I was first licensed in Oklahoma in 1973, as WN5KHC. I operated CW from under the trees in Pecan Grove using simple dipole antennas with a Drake 2NT and 2C. I didn't work any DX but I worked many good CW operators stateside, some of whom I have had the pleasure of reencountering 30 years later! I discovered that I had a gift for CW and fell in love with the mode.

Before my Novice expired I braved the trip to the FCC Field Office in Oklahoma City where I examined and passed the exam for General Class privileges. I still remember carrying my Heathkit keyer to the session where I was asked, "Please send me some code, son."

Years later, my occupation took me traveling over 13 states and we didn't have the wonderful QRP rigs of today. I remember trying to lug about a Tempo One and the AC power supply and the Heathkit Keyer and the antennas and etc… You get the idea. If and when it was finally setup you were just too tired to operate. Frustration was in there somewhere, also. After some few attempts, I went QRT and sold my rigs.

Many things changed in my life while I was off the air. Some for the better, like the departure of my first wife. Many health and career changes occurred also but things finally settled down. Plus I found that one special person in my life and married her before someone else found her.

About four years ago while sitting around with my best friend and wife, Sue, I made the comment that I was bored and was thinking about a hobby. She wanted to know what hobby I was thinking of. I explained ham radio and the fun I used to enjoy and was again considering.

We discovered that Heathkit no longer existed; there was only ONE ham store in the entire Dallas-Ft. Worth metroplex and many other things had changed over the years. But, there were some fantastic rigs and antennas available nowadays! Boy, were they different than what I remembered. We purchased an ICOM 746 and a Gap Titan DX vertical from Texas Towers in Plano, Texas and our fun began!

We discovered QRP, the FISTS CW Club and portable radios like the FT817 and the IC706MIIG. A whole new world had opened while I had been inactive and it captivated both me and my wife. Shortly after getting "reactivated," I went to a local VE session and passed the Extra Class exam and Sue followed me with her Tech then within a year her General and just a few months later, her Extra! Sue is AD5JS but she works only SSB, usually on 10 meters or chasing special event stations. The CW bug never bit her.

I am a "casual contester" and will work a few hours of each contest for fun. I stand in awe of folks like Bob, Jim and Brian.

My website is at 2hams.net and my email is wb5khc@2hams.net. The contest information for 2004 is already published and I invite constructive comments of what could be added or changed to enhance your enjoyment of our contests.

My enjoyment comes from being a details oriented person, getting a great deal of satisfaction from manipulating data/numbers and making my computer generate something from the maelstrom. Contest certificates have been the most recent result.

I will enjoy working with and for the avid contesters among our membership and would encourage more members to take a try at one of our contests and see if they find new rewards in a different part of our wonderful hobby. You don't have to win the contest or even be in the top 3 places to have fun and enjoy yourself!

If you hear me on the air; ask me about Bubba. He is our 165 pound St. Bernard who thinks he can send code by bumping my elbow while I'm on the air. He may surprise me and pass his ticket someday…

—72, Tom, WB5KHC

Fall QSO Party 2003

QTH	Call	Score	Pts	SPC	Power	Bands	Time	Rig	Antenna
AZ	N7FG	18760	134	20	LT5	20	5	IC751	60' end-fed wire @ 20'
CA	K6LG	14875	125	17	LT5		1.5	Mark V	Tribander, dipoles
CO	WØNTA	172368	456	54	LT5		8	K2, IC706MKII	Loop
	NØTK	114163	347	47	LT5	80,40,20,15,10		K2	Attic dipoles
DE	K3CHP	169302	417	58	LT5	80,40,20,15,10	22	FT817	HF6V
FL	N4BP	2151600	1630	132	LT1	160,80,40,20,15,10	21.75	K2	TH7, 402BA, dipoles
	K4BYF	90650	370	35	LT5	40,20,15	13	K2	Yagi, 80 m loop
GA	KE2WB	431032	716	86	LT5	80,40,20,15,10	14	K2	80 m half wave dipole
	K4BAI	368550	675	78	LT5	80,40,20,15	9	FT1000MP	TH6DXX, zepp, dipole
	KO4WX	47520	176	27	LT1	40,20,15	2.3	K2	
	WB6BWZ	2646	42	9	LT5	20,15	0.7	FT817	Reel dipole, 44' end fed
HI	KH6B	3654	87	6	LT5	160,80,40,20,15,10	12	K2	Vert loop
	W6ORS	210	30	1	LT5	160,80,40,20,15,10	1	DX70T	Bazooka
IA	W0PFR	50176	224	32	LT5		14	Argo V	Inside mini loop
IL	K9FO	167762	521	46	LT5	40,20,15	10	FT1000MP	40 m vert, triband rot dipole @ 35'
IN	K9PX	225792	768	42	LT5	40	10.5	K2	80 m loop
	K9UT	23450	134	25	LT5	40,20	2.5	K2	Sloper
KS	WB0SMZ	7280	80	13	LT5	20		NC20	Vert
KY	KD9B	7056	72	14	LT5	80,40,20	6	IC706	G5RV @ 25'
LA	N5IB	13433	101	19	LT5	40,20,15	3	K2	40 m horiz loop
MA	K1GDH	42840	170	36	LT5	80,40,20,15	10	HW9	G5RV, TA33jr
	KO1U	12690	270	47	GT5	40,20,15	10	DX70TH	Attic dipoles
	WB1HGA	8736	96	13	LT5	40	12	Scout	Carolina windom
ME	KØZK	517230	821	90	LT5	80,40,20,15,10		K2	Vert @ salt water edge
	AA1MY	509404	791	92	LT5		12	IC706	Crossed 88' + 172' EDZ @ 55'
MI	W4FMS	590520	888	95	LT5		12.25	K2	Dipoles, inv vees, R5
	K8CV	458528	736	89	LT5	80,40,20,15			
	KT8K	54502	229	34	LT5	40,20,15	7.75	Argo 509	20,15,10 m trap dipole, HF9V
MN	WØUFO	215040	480	64	LT5	40,20,15,10	8.5	K2	TA33, 40 m inv vee
MO	NØ0UR	336672	668	72	LT5	80,40,20,15	11	K2	Limp wire
	NØEVH	135660	380	51	LT5	80,40,20,15	16	FT817	80 m loop @ 20'
	KØLWV	69069	253	39	LT5	40,20,15	4	TS520	20 m vert array, 40 m loop
	KB0KM	27664	152	26	LT5	80,40,20,15	2	Argosy	G5RV, 3 el tribander
MS	K5HQV	426349	791	77	LT5	80,40,20,15,10	18.5	FT1000MP	140' dipole, 10 m rotary dipole
MT	KL7FDQ	137270	370	53	LT5	80,40,20,15,10	19.5	FT817	Dipole
NC	AA4XX	464200	422	55	LT55	80,40,20,15	21	Sierra	Delta loops, stacked dipoles
	WA4DOU	126175	515	35	LT5	20	9	FT897	2 el yagi @ 53'
	AE4EC	23023	143	23	LT5	80,40,20,15	8	K2	Inv vee, 560' horiz loop
NH	W1PID	11760	112	15	LT5	80,40,20,15	4	FT900	Windom OCF dipole
NJ	W2AGN	665280	864	77	LT1	80,40,20,15	19	K2	KT34, 300' horiz loop

days so operated on the patio next to the pool. Mostly K1 and K2 at the end at 5W. 66 ft end fed for 20/15 and new PAC-12 for 40. **NG7Z**—Only able to operate on Saturday. Lousy condx on 20 meters. Solar storm made it seem like no one was on the band. It improved near sunset. 40 meters was a mess due to the RTTY contest. I gave up. Very disappointing contest this year. Nuts. **VE2DEQ**—Got me prepared better for this year's contest compared to last year. Band conditions were not the best but good. Overall, enjoyed the contest and look forward for the next one. **VE3FAL**—Wish I had more time to play, but was a very busy weekend, and 15 meters was sounding good eh! **WØNTA**—I really enjoyed this contest even though conditions were not the best. Operated from home on Saturday afternoon and evening using a K2 and a large loop on the roof of the house. **WØPFR**—Band conditions were not good on Saturday and the RTTY signals did'nt help much. But it still was a good contest. **WØUFO**—Busy day here but managed to operate some and had fun. Nice to hear a lot of friends. **W2AGN**—In spite of poor conditions, seemed like no trouble being heard with <1W. In fact, got a lot of 599 reports! **W3BBO**—Another fun ARCI event. Thanks to all for the contacts and thanks to Randy for the effort to put on these events. **W3DP**—Heavy QRN crashes Saturday and RTTY QRM Saturday night. Solar disturbance Sunday killed activity. The usual QRO QRM also. With all the free space it's frustrating some ops have to interfere around 7040. Had fun anyway! **W4FMS**—Condx not great here in MI on 10/15m. I'm hoping for better antennas next year. CU on 160 this winter. Tnx for the Qs. **W5KDJ**—ARCI threw a

QTH	Call	Score	Pts	SPC	Power	Bands	Time	Rig	Antenna
	W2JEK	73472	256	41	LT5	80,40,20,15	6	FT840	15,40 dipole, 20 gnd plane, 80 edf
	N2CQ	59598	258	33	LT5	40,20,15	6		
NM	WA7LNW	524251	823	91	LT5	80,40,20,15	9.3	K2	67' zepp @ 30', 600' beverage
	K5IC	129690	393	33	LT1		16	K1	4 el yagi @ 35'
NV	AE7I	7980	76	15	LT5	20,15	2	K2	60' end fed wire @ 25'
NY	WA1GWH	55800	186	20	LT250	40	8.5	SW40+	85' wire @ 15'
	N2JNZ	7553	83	13	LT5	40			
OH	K8RL	95284	332	41	LT5	40,20	11	K1	40 m & 20 m attic dipoles
	AB8FJ	31668	156	29	LT5	80,40,20,15		Argo II	End fed wire
ON	VE3WZ	76545	243	45	LT5	40,20,15,10			
	VE3IGJ	8610	82	15	LT5	20	2		
	VE3FAL	1470	35	6	LT5		1	FT817	Dipole
OR	N7OU	375592	706	76	LT5	40,20,15,10	8	K2	Sterba curtains, dipole
PA	W3BBO	453600	810	80	LT5	80,40,20,15,10	10.75	K2	MA5B, HF2V
	KW3F	157050	349	45	LT1	40,20,15	7.6	K1	Windom
	WB3AAL	132300	245	36	LT250	40,20,15	5	K2	Beam, HB vert
	W3DP	62727	309	29	LT5	40,20	6.75	TS570D, K1	G5RV @ 25'
	AA3GM	61901	239	37	LT5	160,80,40,20,15	5	Argo II	R6000, 40-80-160 sloper
	N3IUT	49434	214	33	LT5	40,10,15	11	K2	9 el yagi, vert
	WA2DUV	8820	84	15	LT5	40,20,15	4		located under mobile home
QU	VE2DEQ	121303	403	43	LT5	80,40,20		Scout	CF Zepp
SC	KØFRP	328986	746	63	LT5	40,20			
SD	K7RE	1144830	1231	93	LT1	80,40,20,15,10		K2	
	KØEWS	14630	110	19	LT5	80,40,20,15	6.5	IC718	88' doublet
TX	W5KDJ	339390	419	54	LT250	40,20,15	9.3	K1, Sierra	Long wire
	NE5DL	203742	539	54	LT5	40,20,15			
	N5GM	59885	295	29	LT5	20	13	FT920	Hamstick on car
	W5TA	38948	214	26	LT5	80,40,20	3	TS-430S	Vert, dipoles
	W5USJ	38577	167	33	LT5	40,20,15,10	4.5	FT847	HF9V
VA	WR4I	89817	273	47	LT5	80,40,20,15	7.8	Argo V	G5RV
	N4ROA	89397	297	43	LT5	80,40	4.5	K2	450' loop
	K4UK	68593	239	41	LT5	80,40,20,15		K2	
	KK4R	66612	244	39	LT5	80,40,20,15	3.5	TS940	Doublet
	K2EKM	39690	147	27	LT1	40,20,15	5	Rock Mites	Portable vert
	KG4LDY	5628	67	12	LT5	80,40,20,15	1.3	TT Jupiter	Horiz loop
WA	K7TQ	79268	298	38	LT5	40,20	3	K2	TH7DX
	N7RVD	47040	210	32	LT5	80,40,20,15			
	NG7Z	16380	117	20	LT5	40,20	8	K1	Sigma dipole
WI	N9NE	760200	1086	100	LT5	80,40,20,15,10	12.75	K2	Tribander @ 60', 88' doublet
WV	K8KFJ	29106	154	27	LT5	80,40,20	7	K1, IC706G	Vert, dipoles

party but no one came? It was fun just very slow. See you'all on the ZOMBIE & FOX. **W5TA**—Was hoping to make plenty of Qs on 40 m, but found horrendous QRM from RTTY stations working the JARTs contest. Suggest that next year we try a different weekend. **W7DRA**—I took out my 6L6 driver and put in a 6K6, to reduce my output to about 4.5 watts. I know this has been a bad weekend for solar effects, but did not hear anyone on 160, 80, 40 or 20 working the contest. **WA1GWH**—Great contest and my favorite of the year. Too bad about the JART RTTY test. On 40 m I wonder if the mW multipliers are big enough? **WA2DUV**—Hope I can be a bit more active. I felt old having such a low member number! **WA4DOU**—Lots of fun as always; conditions were off, best DX was KH6. No Europeans worked. Without the power of QRO stations, isn't it amazing how fast good signals can fall in the "soup"? **WA7LNW**—Operated from Edgewood, New Mexico, my work QTH. Another enjoyable QRP event! **WB1HGA** —Erratic band conditions. 1st entry since 80s. Forgot how much fun this is. Wait until next time! **WB3AAL**—I had a lot of fun running less than 250 mW during the contest. I did not have a lot of time to operate due to I was re-roofing my QTH this weekend before the cold wx arrives. My homebrew vertical worked great on 40 meters even in the RTTY QRM. **WB6BWZ**—Operated QRP portable from St. Simons Inn by the Lighthouse on St. Simons Island, GA, while attending the Amateur Radio Lighthouse Society (ARLHS), second annual convention. **WR4I**—Nice meeting old QRP friends again!

●●

Contest Announcements

2004 Winter Fireside SSB Sprint

Date/Time:
February 8, 2004, 2000Z to 2400Z
SSB, HF only

Exchange:
Member—RS, State/Province/Country, ARCI member number
Non-member—RS, State/Province/Country, Power Out

QSO Points:
Member = 5 points; Non-member, Different Continent = 4 points; Non-member, Same Continent = 2 points

Multiplier:
SPC (State/Province/Country) total for all bands. The same station may be worked on multiple bands for QSO points and SPC credit.

Power Multiplier (PEP):
Note the higher SSB power limits compared to CW!
Over 10 W = x1
2 W - 10 W = x7
500 mW - 2 W = x10
100 - 500 mW = x15
<100 mW = x20
(Note the higher multiplier!)

Suggested Frequencies:

80M	3865 kHz
40M	7285 kHz
20M	14285 kHz
15M	21385 kHz
10M	28385 kHz

Score:
Points (total for all bands) x SPCs (total for all bands) x Power Multiplier. Entry may be All-band, Single-, High-, or Low-band. Entry includes a copy of logs and summary sheet. Include legible name, call, address, and ARCI number, if any. Entry must be received within 30 days of contest date. Highest power used will determine the power multiplier.

The final decision on all matters concerning the contest rests with the contest manager. Entries are welcome via e-mail to wb5khc@2hams.net or by snail mail to

Tom Owens, WB5KHC
QRP ARCI Contest Manager
1916 Addington St.
Irving, TX 75062-3505

After the contest use the Online Reporting Form by visiting http://www.2hams.net/ARCI/form.htm. Note that you must still submit logs by either e-mail or snail mail. Check the web page for updates after the contest to see what others have said and claimed as their scores.

2004 Spring QSO Party

Date/Time:
April 10, 2004, 1200Z – April 11, 2004, 2400Z. You may work a maximum of 24 hours of the 36 hour period.
HF CW only

Exchange:
Member — RST, State/Province/Country, ARCI member number
Non-member — RST, State/Province/Country, Power Out

QSO Points:
Member = 5 points; Non-member, Different Continent = 4 points; Non-member, Same Continent = 2 points

Multiplier:
SPC (State/Province/Country) total for all bands. The same station may be worked on multiple bands for QSO points and SPC credit.

Power Multiplier: *(Note: higher multiplier!)*
Over 5 W = x1
>1 W - 5 W = x7
>250 mW - 1 W = x10
>50 mW - 250 mW = x15
<50 mW = x20

Suggested Frequencies:

160M	1810 kHz
80M	3560 kHz
40M	7040 kHz

How to Operate the Contest:

Winter Fireside SSB Sprint

How to participate: Get on any of the HF bands except the WARC bands and hang out near the QRP SSB frequencies of 3865, 7285, 14285, 21385, and 28385 kHz. Work as many stations calling CQ QRP or CQ TEST as possible, or call CQ QRP or CQ TEST yourself. You can work a station for credit again on a different band.

What to send: Give a signal report and your state (for Americans), province (for Canadians), or country (for everyone else), and QRP ARCI member number if you have one, or your power if you don't have one.

Best reason to participate: You can pickup needed states for 2x QRP WAS in one afternoon.

Relative challenge: Easy for all. (Short duration, good numbers of participants, QRP only contest).

How to Operate the Contest:

Spring QSO Party

How to participate: Get on any of the HF bands except the WARC bands and hang out near the QRP frequencies of 3560, 7040, 14060, 21060, and 28060 kHz. Work as many stations calling CQ QRP or CQ TST as possible, or call CQ QRP or CQ TST yourself. You can work a station for credit again if on a different band.

What to send: Give a signal report and your state (for Americans), province (for Canadians), or country (for everyone else), and QRP ARCI member number if you have one, or your power if you don't have one.

Best reason to participate: This contest and the Fall QSO Party have the greatest QRP participation of all QRP contests!

Relative challenge: Easy to Moderate. (Slow CW speeds, long duration, large numbers of participants, QRP only contest).

20M	14060 kHz
15M	21060 kHz
10M	28060 kHz

Score:

Points (total for all bands) x SPCs (total for all bands) x Power Multiplier.

Categories:

Entry may be All-band, Single, High, or Low-band.

Teams:

You may enter as a team with any number of operators as long as no more than 5 transmitters are on the air concurrently. Entrants compete individually as well as on the team. Teams need not be in the same location. Team captains must send a list of members to the Contest Manager before the contest.

Entry includes a copy of logs and summary sheet. Include legible name, call, address, and ARCI number, if any. Entry must be received within 30 days of contest date. Highest power used will determine the power multiplier. The final decision on all matters concerning the contest rests with the contest manager. Entries welcome via e-mail to wb5khc@2hams.net or by snail mail to:

Tom Owens, WB5KHC
QRP ARCI Contest Manager
1916 Addington St.
Irving, TX 75062-3505

After the contest use the Online Reporting Form by visiting http://www.2hams.net/ARCI/form.htm. Note that you must still submit your logs by either e-mail or snail mail if you use the Online Reporting Form. Check the web page after the contest to see what others have said and claimed as their scores.

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QRP Hall of Fame Nominations

Members will recall that this is the time of year for the call for nominations for election to the QRP-ARCI "QRP Hall of Fame." You can submit nominations by mail or Internet, and they must include the following information:

- Name & Call of person nominated
- Name & Call of person making the nomination.

Include a full description of why you think your nominee should be in the QRP Hall of Fame. Remember, we may not know this person and you must convince us that he or she is worthy. Things such as "John Doe is a great guy and always helps out at the club" are not sufficient. Be specific in your recommendation, explaining exactly why your person should be in the HOF.

"The voting body consists of the QRP ARCI Board of Directors, President, and Vice President. Those who were inducted into the QRP Hall of Fame in the last two rounds will also be given the option to vote. Nominations may be submitted by anyone, whether a member of the QRP ARCI or not. Similarly, membership is not required for someone to receive the honor, since this is an award to recognize those who have made great contributions to the QRP community, not just to the QRP ARCI."

If no nominations are received or the nominee(s) receive(s) less than the required vote there will not be an induction at Dayton for 2004. The BOD is adamant that there is no requirement to have an induction.

Please forward your nominations to BOTH President QRP (president@qrparci.org) AND to the Vice President (vicepresident@qrparci.org). Nominations in writing should be sent direct to Ken Evans, W4DU and Dick Pascoe, GØBPS. Addresses are inside the back page.

The closing date for nominations is March 1, 2004. When a nomination is received, a confirmation e-mail or letter will be sent to the person making the nomination. If you nominate someone and do not receive a confirmation, we did not receive it. You must receive a confirmation to insure your nominee will be considered.

Members QRP ARCI Hall of Fame

(as of November 2003)

Chuck Adams, K5FO (1998)
Brice Anderson, W9PNE (1996)
Rich Arland, K7SZ (2002)
Dave Benson, NN1G (1999)
Michael Bryce WB8VGE (2000)
Wayne Burdick, N6KR (1998)
George Burt, GM3OXX (1996)
Jim Cates, WA6GER (1998)
L. B. Cebik, W4RNL (1999)
Arnold (Arnie) Coro, CO2KK (2003)
Mike Czuhajewski, WA8MCQ (1997)
Tom Davis, K8IF (1996)
Doug DeMaw, W1FB (1992) (silent key)
Rev. George Dobbs, G3RJV (1992)
Joe Everhart, N2CX (2000)
Graham Firth, G3MFJ (2003)
Tony Fishpool, G4WIF (2003)
Paul Harden, NA5N (1999)
Wes Hayward, W7ZOI (1996)
Doug Hendricks, KI6DS (1997)
George Heron N2APB (2001)
Jim Kortge, K8IQY (2002)
Roy Llewellyn, W7EL (1992)
Rick Littlefield, K1BQT (1996)
Dick Pascoe, GØBPS (1997)
Randy Rand, AA2U (1992)
C. F. Rockey, W9SCH (1996)
Gus Taylor, G8PG (1998)
Adrian Weiss, WØRSP (1996)
Peter Zenker, DL2FI (2001)

Five Years of *QRP Quarterly* Articles and Columns

Fall 2003

Idea Exchange by Mike Czuhajewski, WA8MCQ
- Comments on Reversing FET Leads, W7ZOI
- The "Good Enough Oscillator", N2CX
- Noisy Epson Program Oscillators Revisited, AA7U, WS4S
- Epson Programmable Oscillators: a Brief Test Report, KØLR
- Handles for the HW-8
- A Simple Passive Audio Filter, AA3SJ
- The HW-8 RFCI Problem, WA8MCQ
- A Single Chip SCAF, KD1JV
- Building the AADE L/C Meter, WA8MCQ
- Labels for Black Enclosures, W5USJ
- The Mouse Keyer, KB1JQX
- Mobile CW through the Car Radio, N8ET, N2APB, WBØPOQ
- QRP Online

The Electroluminescent Receiver, A Year Later by David White, WN5Y
QRV? A Building Day Transmitter by Steve Hudson, AA4BW
One Ugly Pig by Ken Evans, W4DU
Just Tall, That's All, Some Principles of Portable Antennas to Strive for by L.B. Cebik, W4RNL
The Spartan Sprint Special 40M Transceiver by Steve Kavanagh, VE3SMA
A Two-Antenna Switch for Open-Wire Line by Ed Tanton, N4XY
The QRP Home Companion by Anthony Luscre, K8ZT
International QRP Day 2003 by Dick Pascoe, GØBPS
QRP World News by Oleg Borodin, RV3GM
VHF QRP by Bob White, KØNR
QRP Contests by Randy Foltz, K7TQ
- Hoot Owl Sprint
- Milliwatt Field Day
- Summer Homebrew Sprint
- K7TQ's Extra Helpings

From the Editor's Desk by Mike Boatright, KO4WX
From the President by Joe Spencer, KK5NA

Summer 2003

Idea Exchange by Mike Czuhajewski, WA8MCQ
- Quickie Bargraph Meter, N2CX
- HW-8 VFO Tuning Capacitors are available, WB5OFD
- HW-8 Handbook Second Edition Now Available
- Some Interesting Rock Mites
- More Audio for the Rock Mites, N9JXY, NC9H
- Using SCAFs, N7VE, N4XY, KD1JV, KK6MC/5, K2ZN
- Faux AA Cells, KØMAX
- The Milliwatt is Still Available on CD
- HAMCALC Available on CQ Web Site
- Free Attenuator Calculation Program, WA8MCQ
- Online S Parameter Tutorials, WA8MCQ
- The Tiniest Altoids Rig Yet, KO4WX
- QRP Online

Review: The GHD GD107WS High Tech Bug by Dick Arnold, AF8X
Peak Power Modification for the WM-2 by Ingo Meyer, DK3RED
Making Waves: A QRP Celebration of Spectrum Analysis by John Cumming, VE3JC
Test Topics and More by Joe Everhart, N2CX
- "Loading" Effects in Measurements
- Output Amplifier for a QuickieLab
- Headphone Evaluator

A Dual-Band Version of the Rock-Mite by Monty Northrup, N5ESE
QRV? by Mike Boatright, KO4WX
- Absolute Power Corrupts Absolutely—But You Need Electricity

Salvaging Roller Inductors for the Differential-T Tuner by Mike Branca, W3IRZ
The QRP Home Companion by Anthony Luscre, K8ZT
Four Days in May, 2003 by Dick Pascoe, GØBPS
QRP Clubhouse by Mike Fletcher, KL7IXI/7
Slow Speed CW Nets
Does QRP Apply to VHF? by Bob Witte, KØNR
Building Day! by Steve Hudson, AA4BW
Book Review: QRP Basics by Tony Fishpool, G4WIF
QRP Contests by Randy Foltz
- Winter Fireside SSB Sprint
- 2003 Spring QSO Party

More FDIM Photos, photos by AA9YH, WD0FPY, KO4WX
From the Editor's Desk by Mike Boatright, KO4WX
From the President by Joe Spencer, KK5NA

Spring 2003

Idea Exchange by Mike Czuhaewski, WA8MCQ
- It's Safe to Go Back to QRP-L
- New RF Book from Hayward & Friends, WA8MCQ
- DDS and the QuickieLab, N2CX
- Manhattan Construction on a Scrap PCB, N2ZHS
- Defective PCB Causes Problems, W2AGN
- Using Plastic Spacers from Ammo Boxes, N2ZHS
- Portable Dipole Antenna Observations, W8FNN
- Defective Electrolytic Caps in Supply Chain, WA8MCQ
- K2 On-Frequency Receiver Overload Mod, N6KR
- VFO with LTC1799 Chip Doesn't Pan Out, WA8MCQ
- High Voltage Safety, K5KVH, W5YR, W3IRZ
- Changing HW-8 T/R Frequency Offset, WA8MCQ
- Toroid Calculator Program from W8DIZ, WA8MCQ
- Micro Moments #4
- Use a BASIC Stamp to send GPS
- Positioning in Morse Code, N2APB
- QRP Online

A Compressed Air Powered Antenna Launcher by Alan Biocca, WB6ZQZ
My New 40 Meter Antenna by Joel Denison, KE1LA
A Differential-T Antenna Tuner by Mike Branca, W3IRZ
The Nursing Home Loop by Dick Arnold, AF8X
Digital QRP Homebrewing by George Heron, N2APB
- The Digital QRP Breadboard... Part 7, "Hello DDS and GPS"
- Spotlight on...The NKØE "PIC Weather Station" Part 4: Wind Speed

QRV? "I can't give you more power, Captain,she's gonna blow" by Mike Boatright, KO4WX
Test Topics and More Q Measurement Methods by Joe Everhart, N2CX
A 20 Meter Transciever by Tom Duncan, KG4CUY
Modifying the Heathkit HM-102 for QRP by Donald Sanders, W4BWS
QRP Contests by Randy Foltx, K7TQ
- Running of the Bulls
- Fall QSO Party
- Top Band Sprint
- Holiday Spirits Sprint

A Field Day Checklist by Gary Breed, K9AY
From the Editor's Desk by Mike Boatright, KO4WX
From the President by Joe Spencer, KK5NA
Peaux Displaced Cajun Lad in Maine by Joel Denison, KE1LA
A Photo Tour of FDIM 2001 & 2002
dBm-Volts-Watts Power Conversion Chart
Book Reviews by Tony Fishpool, G4WIF
- RSGB Technical Topics Scrapbooks (Volumes 1, 2, & 3)
- Antenna Topics

January 2003

Idea Exchange by Mike Czuhajewski, WA8MCQ
- VXO-Mate, N2CX
- Some Rules on VFO Stability, VE3DNL
- Some Interesting Web Sites
- MFJ493 Keyer Mods, N4IM
- Fixes for Dirty Signal on NC-20
- Varicap VFOs can be Stable, AD6A
- Protecting Buried Coaxial Cable
- Homemade Sheet Metal Brake, KD1JV
- Broadband Noise Source, G1HSM
- Jackson Brothers Product are Back
- Dual Color LED in an SWR Indicator, KD4BTH
- Dimple Washer Makes Spinner Knob, K5KVH
- Altoid Tins and an Elecraft Tool, W4LJD

Computer Speakers for the Ham Shack, W5USJ
Cutting PCB Material Like Glass, N3AAZ
Micro Moments #3: DDS Daughterboard Useful for Many projects, N2APB
QRP Online
74HC4053 Mixer Circuit and Receiver by Steve Weber, KD1JV
More Mods for the Index Labs QRP-Plus by Larry East, W1HUE
Digital QRP Homebrewing by George Heron, N2APB
The Digital QRP Breadboard, Frequently Asked Questions
Spotlight on...The NKØE "PIC Weather Station" Part 3: Temperature and Humidity
Solar Power for Amateur Radio Operations by John Zaruba, Jr., AA2BN
"Altoobs" Two-Tube 40 Meter CW Transmitter by Monty Northrup, N5FC
Test Topics and More by Joe Everhart, N2CX
New Life for the Johnson Matchbox by John Meade, W2XS
Funky—A Key Using Pressure Sensors by Ingo Meyer, DK3RED
QRV? A Picture is Worth a Thousand Words by Mike Boatright, KO4WX
Change Frequency with Crystal Penning by Hans Summers, GØUPL
A Vertical Doublet for 30-10 Meters by L.B. Cebik, W4RNL
A Better TTC for 40 Meters by Mike Boatright, KO4WX
Smoother Tuning for the HW-8 Transceiver by Bill Coleman, N4ES
A Short Vertical Dipole by Brice Anderson, W9PNE
A New Contester by Max Moon, KØMAX
RSGB NFD — June 1-2, 2002 by Dave Sergeant, G3YMC
State QSO Parties and QRP by Bob Reisenwever, W3BBO and Jim Gooch, NA3V
QRP Contests by Randy Foltz, K7TQ
End of Summer PSK-31 Sprint
Review: Buddipole Antenna System by Harry Edwards, W6DXO
Across the Editor's Desk by Mike Goins, WB5YJX
From the President by Joe Spencer, KK5NA
Ramblings of a Displaced Cajun Lad in Maine by Joel Denison, KE1LA
Milliwatting by Jim Hale, KJ5TF
Interview: Joe Spencer, President of QRP ARCI
SK Night—The Real Meaning by Carl Herbert, AA2JZ

October 2002

Idea Exchange by Mike Czuhajewski, WA8MCQ
A Digital Voltmeter with with Audible "Display", N2CX
Ignore Colore Codes on IF Cans, NA5N
MFJ Manuals Available on the Web, DK3RED
MFJ-259B Info on the Web, DK3RED
Heathkit Schematics Online, WA7MCQ
Good Info on the Elecraft Mail Reflector, WA8MCQ
I/O Expander Adds Useful Functions in Small Projects, N2APB
Amplifier for 40m Milliwatt Rigs, N4UY
Decoupling Capacitor Rules of Thumb, AD6A
Duct Tape as Insulation, K3WRV
AM/SSB Reception on DSW Rigs, N4QA
Another HW-8 Toroid Success Story, AA3J, WA8MCQ
Frequency Alignment of TenTec 13xx Rigs, WB8WTU
Microminiature QRP Crystals and FT-817 Filters, WA8MCQ
QRP Online
An HF In-line Return Loss and Power Meters by Paul Kiciak, N2PK
The Tuna Twin Too by Mike Boatright, KO4WX
Improved AGC Performance for the for the Sierra Transciever by Larry Wilson, KFØN
Digital QRP Homebrewing by George Heron, N2APB
Digital QRP Breadboard "Baseboard and Enclosure"
Spotlight on...The PIC Weather Station Project, Part 2: Communications
The Electroluminescent Reciever by David White, WN5Y
The QuickieLab by George Heron, N2APB
QRV? The Ubiquitous Cathode Ray Tube by Mike Boatright, KO4WX
Test Topics and More by Joe Everhart, N2CX
The Micro-80 Transciever by Oleg V. Borodin, RV3GM
QRP, QSOs, and QSLs—The Joys of the Rookie QRPer by Rev. Fred Hembree, N4SSD
QRP Contests by Randy Foltz, K7TQ
2002 Milliwatt Field Day
2002 Summer Homebrew Sprint
Review: Palm Radio Mini Paddle and Code Cube by Richard Arnold, AF8X
Review: Outbacker Joey Antenna System by David Gilson, KD3EM
Across the Editor's Desk by Mike Goins, WB5YJX
From the President by Joe Spencer, KK5NA
Ramblings of a Displaced Cajun Lad in Maine by Joel Denison, KE1LA
QRP Clubhouse by Mike Fletcher, KL7IXI/7
An Interview with James "Dr. Megacycle" Duffey, KK6MC/5

July 2002

Idea Exchange by Mike Czuhajewski, WA8MCQ
Cheapskates Portable Power, N2CX
Testimonial for the WA8MCQ BNC Repair Tool
NE602 Not Gone for Good, Part 2, NA5N
KD1JV Frequency Counter Mod, N5FC
Overtone Operation with the NE602/612, W3IRZ
Improved Signal Isolation for MFJ Coax Switch, AE4GX
Micro Moments #1: An Intelligent Controller for your Rig, N2APB
Homebrewed Open-Wire Feedline, W2SH
Source of Ceramic Spreaders, KK6MC
Open Wire and Spreaders A Cynics View, KK6MC
To PCB Paddles, KD1JV
More on Diode Detector Response, WA8MCQ
QRP On-line
20-Meter End-Fed 1/2-Wave Antenna, Tuner, and SWR Indicator by Louis Hlousek, W7DZN
Digital QRP Homebrewing by George Heron, N2APB
The PIC-Based APRS Weather Station
Digital QRP Breadboard
First Application: SWR Measurement
Test Topics and More... #12 by Joe Everhart, N2CX
Convert Your Power Meter to Read CW and PEP by Ian Keyser, G3ROO
Variable Power Supply Regulator/Current Limiter by Steve Weber, KD1JV
QRV? "Seeing" Radio Signals by Mike Boatright, KO4WX
QRP is! (Confessions of a QRO Op Gone QRP) by Ed Muns, WØYK
Milliwatting: 30M QRSS Beacon Activity by Jim Hale, KJ5TF
2002 FYBO Results by Bob Hightower, NK7M
QRP Contests, by Randy Foltz K7TQ
Winter Fireside Sprint 2002
2002 Spring QSO Party
Kazo Kontesting by Michael Sealfon, WA2OCG
Review: LogiKit CMOS-4 Keyer Kit by Tom Hammond, NØSS
Review: Let's Talk About Contest Logging Programs by Randy Foltz, K7TQ
Across the Editor's Desk by Mike Goins, WB5YJX
From the President by Joe Spencer, KK5NA
QRP Clubhouse by Mike Fletcher, KL7IXI/7
Ramblings of a Displaced Cajun Lad in Maine by Joel Denison, KE1LA
IMHO--Homebrew is Alive and Well by Jerry Hall, W0PWE
Interview: Steve "Melt Solder" Weber, KD1JV
Arkiecon Report by Mike Goins, WB5YJX
Member Profile: RV3GM/QRP by Oleg V. Borodin, RV3GM
Ramblings of a Peaux Cajun Lad at FDIM by Joel Denison, KE1LA
NoGa Donates K2 to Science Museum by Pickett Cummins, AD4S

April 2002

Idea Exchange by Mike Czuhajewski, WA8MCQ
New E-mail Address for WA8MCQ
Getting Lower (Frequency) Performance From Your SSS, Joe Everhart, N2CX
A Real Ham Radio-Arnold Olean, KØZK
The Multi-Mode PSK-20-Jim Hale, KJ5TF
RF Activated Sidetone Oscillator, Steve Weber, KD1JV
The NE602 is Not Gone for Good
Some Interesting Technical Info on the Web
Unbalancing an NE602 Modulator for Tuning Up
Design for a 13.5 MHz Crystal Filter, Mike Brainard, ex-WA5KEX
How to Find Old QRP-L Traffic
Good Source of SMT Parts, Monty Northrup, N5FC
Grinding Aluminum and Brass: Don't!
Schottky RF Diode Info and Sources, WA8MCQ
1N5819 Not Recommended for Diode Detector, WA8MCQ
QRP Online
Some Techniques for Building a QRP Field Vertical by L.B. Cebik, W4RNL
Digital QRP Homebrewing by George Heron, N2APB
The "Badger"
DDS VFO for the Digital QRP Breadboard
QRV? Putting Together a Good Bench by Mike Boatwright, KO4WX
Test Topics and More...#11 by Joe Everhart, N2CX

QRP Contests by Randy Foltz, K7TQ
Holiday Spirits Sprint 2001
Top Band Sprint 2001
Milliwatting Without a Beam Antenna by Jim Hale, KJ5TF
Product Review: Elecraft K1 Transceiver by Bruce Prior, N7RR
Counterpoint, W7DZN
Addendum, N6KR and WA6HHQ
From the Editor's Desk by Mike Goins, WB5KYX
From the President by Joe Spencer, KK5NA
Ramblings of a Peaux Displaced Cajun Lad in Maine by Joel Denison, KE1LA
Clubhouse Corner by Mike Fletcher, KL7IXI/7
150 QRPers Enjoy Atlanticon by George Heron, N2APB

January 2002

Idea Exchange by Mike Czuhajewski, WA8MCCQ
Quickie #40: Vertical Base Connector, N2CX
Losses in 50 vs. 75 Ohm Coax, KK6MC
Inexpensive Source of 40m QRP Crystals
Calibrated Dial for a 3-Turn Pot, VE3TMH/VA3HN/VE3HIE
Cheap (Free) Batteries, W2EB, KB9OCE, WA8MCQ
Good Contact Cleaners, N8YG, W6TOY, WA8MCQ
Japanese Transistor Coding System, KD7DMH
The NJQRP "Islander" Pad Cutter, WA8MCQ
More Variable Capacitor Sources
An RF Probe in a Small Phone Jack, KA8MAV
Intermittent Alligator Clip Leads, WA8MCQ
Soldering Fume Hazards, Lead Safety, KD4BTH
Noninductive Resistors Not Always for Dummy Loads, WA8MCQ
QRP Online
Test Topics and More #10 by Joe Everhart, N2CX
Laptops for the Field and the Hamshack by Preston Douglas, WJ2V
Digital QRP Homebrewing by George Heron, N2APB
The FT-817-Paddle Combo by Dick Arnold, AF8X
"TOAST" — QRP Transceiver of the Near Future? by Petr Prause, OK1DPX
Freddy's Fabulous Frequency Finder by Bill Currie, VK3AWC
QRV? Dah-di-dah-dit Dah-dah-di-dah by Mike Boatwright, KO4WX
Thoughts on Soldering Technique by Danny Gingell, K3TKS
Floyd Smithberg—NQ7X, Contester of the Quarter by Randy Foltz, K7TQ
Adventures in Milliwatting--QRPp International by Jim Hale, KJ5TF
QRP Contests by Randy Foltz, K7TQ
Review—The KFL1-4 Four-Band Module for the Elecraft K1 by T.J. "Skip" Arey, N2EI
Base Current, by Pres. Jim Stafford, W4QO
Who Comes Here? by incoming ARCI Pres. Joe Spencer, KK5NA
Ramblings of a Peaux Displaced Cajun Lad in Maine, by Joel Denison, KE1LA
QRP Clubhouse—The Winter Doldrums by Mike Fletcher, KL7IXI/7
IMHO—Ten Things I've Learned from QRP by Gary Breed, K9AY

October 2001

Idea Exchange by Mike Czuhajewski, WA8MCCQ
Altoids Tins Construction Ideas, N2CX
The Missing HW-8 Figures from Last Issue, WA8MCQ
A Simple BNC Dummy Load, K4JPN
Operating CW with the PSK-80 Warbler, N4QA
Threaded Spacers Hold Covers on PCB Box, N5FC
Experimental Air Core Inductor from a Lifesaver, N9JXY
VXO Using Switched Capacitors, N4UY
New 365 PF Variables Still Available, WA8MCQ
Measuring Capacitance of Manhattan Pads, N9JZY
Stronger Connections to TV Twinlead, KB7MBI
Tool for Fixing Smashed BNCs, WA8MCQ
QRPer N3CDR a Silent Key
QRP Online
Using Spectrogram To Measure the Filter Response of a High Frequency Receiver by John Grebenkemper, KI6WX
Test Topics and More...#9 by Joe Everhart, N2CX
Wide-Band 40 and 80-Meter Dipoles by Dave Leeson, W6NL
End-Fed Half-Wave Antenna for 20-Meters by John Harper, AE5X
QRP Field logging in the 21st Century, Part II by David Ek, ABØGO
Digital QRP Homebrewing by George Heron, N2APB
QRV? Finishing Your Cub-40 by Mike Boatright, KO4WX
Pomona Box Projects by Brian Kassel, K7RE
Raising Hell with QRP, Part II by Murray Greeman, ZL1BPU
QRP on Safari by Harry Edwards, W6DXO
160-Meter MPW Record Challenge by Dan Wolfe, N4ROA
The Summer of My (QRP) DXCC by Harry Edwards, W6DXO
The Thrill of the Hunt — Intra-Club Competitions by Jim Worthington, AD4J
Cam Castillo, HP1AC — Contest Operator of the Quarter by Randy Foltz, K7TQ
QRPxpeditions to XE-Land by Richard Clem, WØIS
My Second V31GX QRPxpedition by Sam Billingsly, AE4GX
Adventures in Milliwatting by Jim Hale, KJ5TF
Contest Solitaire by Jim Gooch, NA3V
Two Days in Alabama (TDIA) by John (Pickett) Cummins, Jr., AD4S
Bicycle Mobile II by Dick Arnold, K8RJA
QRP Contests by Randy Foltz, K7TQ
Keylite Kit Review, a Memory Keyer with a Difference by Gary O'Neal, N3GO
Elecraft Introduces 4-Band Module for K1 by Wayne, N6KR & Eric, WA6HHQ
Collins Mechanical Filters for the FT-817 by Greg Buchwald, K9QI
Editor's Spot by Craig W. Behrens, NM4T
Base Current by Jim Stafford, W4QO, QRP ARCI Pres.
Ramblings of a Peaux Displaced Cajun Lad in Maine by Joel Denison, KE1LA
QRP Clubhouse by Michael Fletcher, KL7IXI/7
IMHO—QRP DXCC by Ed Hare, W1RFI

July 2001

Idea Exchange by Mike Czuhajewski, WA8MCCQ
Enclosure for the Microvolt Signal Source, N2CX
RX Blocking and IMD Dynamic Range, KC1SX
Scrap Tribander Becomes A Vertical, N4BP
Umbrella in Table Replaced by Antenna Mast, N7CQR
Mixing Wire Colors in Portable Antennas, AE5X
Finishing Aluminum... the Easy Way, W9OCP
Solder Wick Holder Becomes Solder Holder, W1XH
A Personal Relationship with the DS9SQ Mast, K8BBM
A Fishing Pole Vertical, KØEVX
FT-243 Crystal Holder as Twin Lead Connector, W4LJD
Comparison of Autek and MFJ Antenna Analyzers, K5KVH
Old Telephones Provide Anntenna Wire, WØCH
Fiberglass Mast is Passive Antenna Erection Tool, GØUKB
The Complete HW-8 Output Coil Set, WA8MCQ
QRP Online
Test Oscillators by Mike Branca, W3IRZ
Super Cub wth Ladybug Paddle by Larry Woodworth, W0HXS
N5FC's QRP Transmitting In-Line Attenuator by Monty Northrup, N5FC
SMK-1 and 49er 20-Meter Modifications by Brian Wingert, N7RVD
One Half Wavelength Inverted-L Multiband Antenna by L.B. Cebik, W4RNL
QRP Field Contest Logging in the 21st Century by Dave Elk, ABØGO
Decibels Count More in QRP by Warren U. Amfahr, WØWL
Test Topics... And More by Joe Everhart, N2CX
Antenna Transmission Lines, Tuners, Myths, Mysteries, and Qualifiers by Don Wilhelm, W3FPR
QRV? Building Your Cub-40 by Mike Boatright, KO4WX
DXCC Milliwatt Trophy: Margaret Williams, K14W
New Frequency Announcer Kit by Dan Tayloe, N7VE
Raising Hell with QRP by Murray Greenman, ZL1BPU
Bicycle Mobile by Dick Arnold, K8RJA
Adventures in Milliwatting QRPTTF from an Arkansas Island by Jim Hale, KJ5TF
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2001 QRP Hall of Fame Inductees by Mike Czuhajewski, WA8MCQ
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A Versatile Remote Control Antenna Tuner by John Cumming, VE3JC
Some Comments on Powering the FT-817 by Barry Johnson, W4WB
A Switchbox for Soundcard Digital Modes by Don Wilhelm, W3FPR
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PCB Fix for the NJ QRP SOP Receiver Kit, N2APB
Cure for AGC Pumping in the MFJ Cub, W1HUE/7
The Right Tuning Knob for the K2, KØZK
Useful Internet QRP Sites Worth Checking
A Useful Tool-Super Long, Flexible Screwdriver, GM6JAG
Polarity Reversal Switch for Paddles, KU7Y
Modifying the DSW Rigs to Receive SSB, N7RR
Repairing Cotton Covered Headset Cords, K3TKS
Instruments for Measuring Various Power Levels, VE3DNL
Handy Test Accessories for the Workbench, WA8MCQ
QSY Box by Mike Branca, W3IRZ
QRV? Putting the MRX on 80 Meters by Mike Boatright, KO4WX
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Universal Notch and Bandpass Filter by Randy Hargenrader, WJ4P
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Appalachian Trail Part 2 by Ken Newman, N2CQ
C6A/WA3WSJ with Tuna Tin-2 by John Harper, AE5X
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Revisiting the Resonant Feed-line Dipole by Mike Boatright, KO4WX
Bypassing Your Automatic Antenna Tuner by Grant Bingeman, KM5KG
NoGa Twin Tube 80 Transmitter by Mike Branca, W3IRZ
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High Dynamic Range Power Meter and Antenna Tuner Aid by Steven Weber, KD1JV
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Sneak Preview: Elecraft's K1 QRP Dual-Bander by Conrad Weiss, NN6CW
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July 2000

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- Cheaper replacement for 2N3553
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- Some antenna comments
- Rehash and update on the Boonton 260A
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Transistor PA RF Output Power vs. Load Impedance by Grant Bingeman, KM5KG
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Mutterings of a Displaced Cajun by Joel Denison, KE1LA
Ultimate Backpacking Rig? by Bill Jones, KD7S
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Review—Some Mods for the Norcal-20 Transceiver by Larry East, W1HUE
Review—Small Wonder Labs DSW-20 Transceiver by Russ Carpenter, AA7QU
Review—Ten-Tec Powermite Transceiver by John Marranca, Jr., KB2HSH
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- "Special Fellow" by Ron Stark, KU7Y
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- Journals for those in the Trades, WA8MCQ
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NJ QRP Fireball SOP Receiver by George Heron, N2ABP
Verticals Without Vertigo by L.B. Cebik, W4RNL
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- Reprinted Schematics from July, WA8MCQ
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Verticals Without Vertigo, Part 2 by L.B. Cebik, W4RNL
An RX Noise Bridge, Part 2 by Rich Dailey, KA8OKH
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The NOGAPIG-North Georgia Power Indicator/Guard
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Correction: QRP Plus Modifications, Part 1 by Larry East, W1HUE
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News Release—ARRL Hosts QRP ARCI by Bruce Muscolino, W6TOY/3
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Call for Board of Director Nominations by Mike Czuhajewski, WA8MCQ
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Another Portable Vertical Antenna by John Cumming, VE3JC
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Verticals Without Vertigo, Part 1 by L. B. Cebik, W4RNL
An All-Band CW/SSB QRP Transceiver Update by Frank Nance, W6MN
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The Tuna Tin 2 Lives! by Bruce Muscolino, W6TOY/3

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An All-Band CW/SSB QRP Transceiver by Frank Nance, W6MN
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Low Noise RF Amplifier by Todd Gale, VE7BPO
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A Simple Satellite Mobile QRP Station for the Beginner
by Douglas Quagliana, KA2UPW
Apollo Beep for SSB Transceivers by Arjen Raateland, OH2ZAZ
Build a Step-UP DC-DC Converter! by Larry East, W1HUE
An RX Noise Bridge—Part 1 by Rich Daily, KA8OKH
A (Dubious) De-Soldering Primer by Wayne Burdick, N6KR
QRP Transceivers for Less than $10 by Jim Larsen, AL7FS
QRP—Getting Started by Jim Larsen, AL7FS
QRPing the RAC Contests by Jim Gooch, NA3V
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Review—The K2 Logger Program for ARCI Contests by Bruce Milne, WB2QAP
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Better Sideband Rejection for the Argo 509, KN1H
AC Voltmeters and Waveforms, VE3DNL
QRP-L, The "QRP Daily"
Build a $15 Computer Control Interface for Your Scanner by John Montalbano, KA2PYJ
"Add-On Kit" for the Rainbow Tuner by Joe Everhart, N2CX
The QRP Cannon—A Resonant Speaker for CW by George "Danny" Gingell, K3TKS
Component Alternatives for Homebrew Design and Construction by Gary Breed, K9AY
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Audio Power—from the Acoustic Side by Dennis Blanchard, K1YPP
A Dozen Ways to See and Love Your Feedlines by L.B. Cebik, W4RNL
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Yet Another DDS VFO—"The 9850 DDS VFO" by George Heron, N2APB
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Hamfest Portable Station Jim Nestor, WK8G
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QRP Clubhouse by Bob Gobrick, NØEB
Announcing: Atlanticon QRP Forum by New Jersey QRP Club
QRP-ARCI Quality Recognition Program by Steve Pituch, W2MY
From the Membership Chairperson by Dave Johnson, WA4NID

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