QRP Quarterly

Journal of the QRP Amateur Radio Club, International

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35 Years Old

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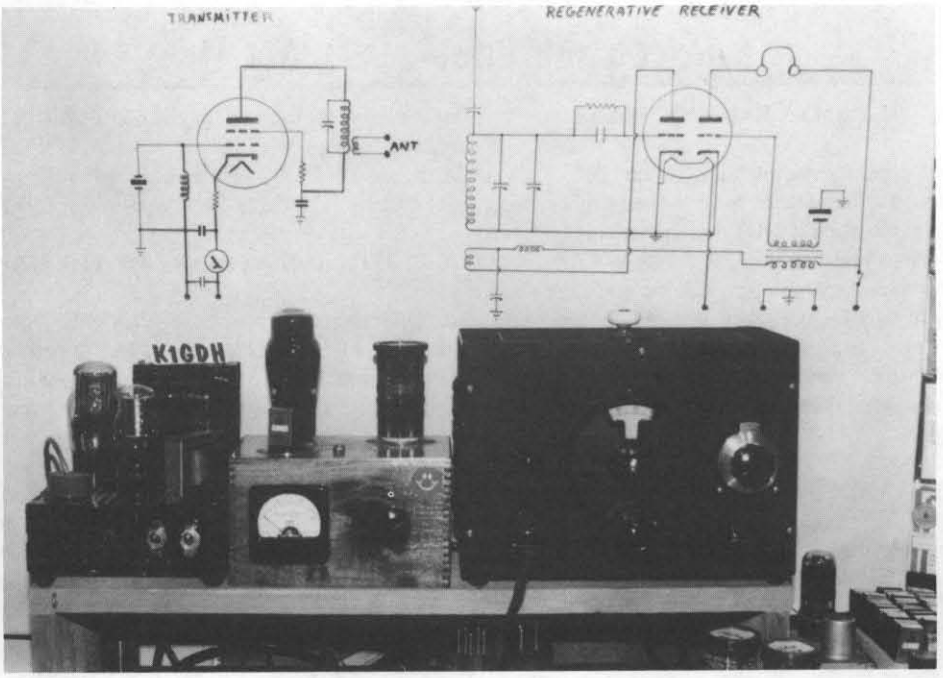

Edward J. Jarmolowicz, K1GDH, sent in this picture of his first class station! Built in 1995 and running 5 watts, Ed already has over 120 QSO's with it. The RX is a one tube regen using a 6C8 and the TX is a 6L6 xtal osc. Great job Ed!

The QRP ARCI is a non-profit organization dedicated to increasing world-wide enjoyment of QRP operation and experimentation, and to the formation and promotion of local and regional QRP Clubs throughout the world.

NOTES FROM THE PRESIDENT

BUCK SWITZER, N8CQA

My column from last quarter certainly generated a considerable response!! Many of you e-mailed Ron, KU7Y and he dutifully forwarded those responses. In addition, I've received several QSL cards and letters. The response was overwhelmingly in favor of maintaining Morse Code as a requirement for licensure. I will be asking the Board of Directors to approve a proclamation supporting continuation of the code requirement for amateur licensing, both world wide and in the US. I am waiting for two other groups to agree on the wording of such a proclamation. These recommendations are to be sent to the ARRL with the assurance that we speak for XXXX number of hams and that we would like to see them (ARRL) stick to their resolution of 01/94, supporting code proficiency. For those that asked, yes I am a member of ARRL and have been for many years, I use their services and have been active in the Volunteer Exam system since it's inception. My ARRL "bashing" was done to get a response from the members of QRP-ARCI and to send a message I felt needed to be sent. Enough said.

On a brighter issue, DAYTON is coming!!!! You will find announcements for the FDIM activity in this issue of the Quarterly, that group is planning another "knock your socks off" presentation to kick off the '97 Dayton experience. We are looking at some "Candy Store" goodies for the QRP-ARCI booth and hope to generate some needed income. Please help out by signing up to work at the booth, we need help on all three days. Please give us an hour or two. Sign up during FDIM or contact me directly.

The Board and officers have been hashing over the numbers as far as the Quarterly costs, with the hope of reducing our recently increased dues structure, particularly the DX members. I had hoped we would be done by this time, but it has been a more difficult job than I expected, with several surprises along the way. More to come on this issue.

Best wishes for the Holidays from myself, the Board of Directors, Officers and Quarterly Staff. Hope to hear all of you in the Holiday Sprints (12/01/96)! **72/73 Buck, N8CQA**

NOTES FROM THE VEEP

Mike Czuhajewski, WB8MCQ

1997 QRP HALL OF FAME DEADLINE NEARS

Just a reminder that the deadline for nominations for the QRP Hall of Fame is the end of January. Further details were in the October issue, along with a list of people you should NOT nominate, the 11 hams already in the QRP HoF. Send your nominations to me, WA8MCQ, by e-mail or snail mail; a couple of paragraphs will be sufficient, and include good, solid rationale why the person is deserving of the honor. Only QRP ARCI members can submit nominations, although membership is not required to be nominated or inducted. (Be sure to include your membership number.) Inductees, if any, will be announced at some QRP event at Dayton.

"THE MILLIWATT" NOW ON CD-ROM

Details can be found elsewhere in this issue, but the good news is that anyone with CD ROM capability on their computer can now read the entire press run of The Milliwatt: National Journal of QRPp. I did several small scale runs of photocopy reprints in recent years, the last one 2 or 3 years back in conjunction with Bill Kelsey, N8ET, but those are time consuming. I may eventually do it again, but in the meantime for those who don't mind an electronic version instead of paper, here's your chance. Thanks to Tom Arvo, WA8DXD for his efforts!

35TH ANNIVERSARY OF THE QRP QUARTERLY

The QRP Quarterly is now 35 years old! Does anyone have any really old and moldy back issues they'd like to part with, at least temporarily? The club would like to assemble a complete library of the Quarterly, but anything before 1985 is almost impossible to come across. If anyone has anything from 1984 or earlier, please let Chuck Adams, K5FO, know about it. We'd love to have them, either originals or photocopies, and the QRP ARCI will reimburse reasonable expenses for postage and copying as necessary. (Be sure to talk with us first before sending anything, to avoid unnecessary duplication and expense.) And while we're at it, if anyone has any copies of "QRP/8", the small QRP journal I was publishing circa 1968-1970 before W0RSP came on board and turned it into The Milliwatt: National Journal of QRPp, I would dearly love to have some copies! –DE WA8MCQ, The Veep

MEMBERSHIP NOTES

Michael Bryce, WB8VGE

Since I've taken over as membership person, you may have notice some changes on your mailing label. Here's what I've been doing to help get your copy of The Quarterly to you on time.

Incorrect addresses

I've received quite a stack of letters from the membership telling me their address is incorrect. In fact, there is nothing wrong with the data, but the format of the labels cut the names of some cites in half. For example:

Colorado Springs
Little Bent Spring

came out on the label as:

Colorado Spr
Little Ben

This problem should be fixed by now. I gave the computer more room to place the city on the label. There's a lot of information to be placed on a very small label.

Zip +4

Save your stamps and hate mail. At this time, we do not send out enough copies to use the ZIP +4 sorting. In fact, we can't even apply for the prefix sort. We just barely make the State sort in some locations. Therefore, we can not use the ZIP +4.

To make matters even more complex, as of July 1, 1996 the US

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Opeing Balance	$9,792.45
Income All Sources	$7,797.27
Expenses:	$7,307.44 (Detail below)
Closing Balance:	$10,282.00 (Detail below)
(*)	
Admin	$42.75
Printing	$6330.00
Public Relations	$122.41
Legal	$10.00
(**)	
Closing Balance:	
Checking	$1710.30
Savings	$8572.00

July issue cost $3338. October cost $2882.

Oct 96 we mailed 1401 Domestic
and 129 DX
for a total of: 1530 active members.

Corrections

Last month I misspelled an authors name, both in the table of contents, page 3 and at the start of his fine article on page 30! My appoligies to Philip Karras, KE3FL, for any inconvience this might have caused.

FROM THE EDITOR

Monte "Ron" Stark, KU7Y

The days are cooling down and the nights are starting to get a bit cold. Lows into the upper 20s. Furnace running. Winter bills beginning to show up!

One short tower up, about 30' is all and it's just planted in the hole with no cement yet! But something had to be done. There was a fellow down there in **Texas** who needed some competition during the November ARRL SS. This wound up being a bet while we were at **Pacificon 96**. (More on this later. Be sure to look at all the pictures on page # 36). Dinner for the winner. I would tell you about the tons of antennas he was using and I would tell you all about the tall towers those antennas were held up with, but it might make you sick!

Then came Sweepstakes. I fired up the new computer software, by **TR Log**, doubled checked the power output of the TS 930 and away I went. I even worked that station down there in Texas. He was ahead of me by almost 100 QSOs! Then, much later, we stopped to chat for a minute and shucks, he was still almost 100 ahead! I wound up with 342 QSOs and 72 sections. Only missed WY for all states.

The Texan? Oh, he had 400 and something! Beat me! But he did tell me to take my wife out and by her that dinner and we will be doing just that tonight! **Carol** said to say thanks **Chuck**! (And don't tell **Chuck**, but I'd much rather have a nice candle light dinner with **Carol** anyway!)

To **code** or **not to code**, that was the question asked last issue. There have been many letters and e-mails received by us here at the Quarterly. Keep the pressure up. Send letters and e-mails to everyone that you can think of! So far the responses have been running about ten to one in favor of keeping the code and for the **QRP ARCI** to take a stand. As **Buck** said in his notes, plans are under way to do that.

Other ARCI matters.

During the year and a half that I have had the privilege of being the Editor of the **QRP ARCI Quarterly**, I have had a lot of fun, met a lot of very nice people and have learned to appreciate all the work each and every one on the **Quarterly** staff does. These people are the real reason the **Quarterly** continues to improve.

However, there are also those things that tend to get a fellow all worked up now and then! The **QRP ARCI** has a set of by-laws that the Board of Directors approved at their annual meeting in Dayton last May.

Among the provisions in the by-laws are those that tell me to publish the financial reports and to publish the summary of the board of directors meeting each May. There are also reports called for. I have copied a little of the by-laws here to help you understand my frustration:

(c.) SECRETARY/TREASURER:

The Secretary/Treasurer shall be the keeper of the Official Club Seal. The Secretary/Treasurer will reply to all correspondence of a general nature and shall maintain Club records. He or she will receive and tabulate all ballots of votes authorized by the Club except as directed otherwise by the President. ***The Secretary/Treasurer shall submit a quarterly report to the Board of Directors outlining the activities of the office for the preceding three months. This will include membership and fiscal status and pertinent information that will serve to keep the Board of Directors informed of QRP-ARCI progress. The Secretary/Treasurer shall submit a summary of the annual Board of Directors meeting proceedings to the President for inclusion in The QRP Quarterly***

(e.) EDITOR:

The Editor shall be responsible for the management, production and distribution of the QRP Quarterly. The Editor shall appoint The QRP Quarterly Staff and inform the Board of Directors of such. ***He or she shall furnish the Secretary/Treasurer with a quarterly report of cash received and disbursed for advertising ads, production and distribution costs associated with the QRP Quarterly.*** The Editor shall assist with the coordination of Publicity Officer, Net Manager and Contest Manager programs as required.

(i.) MEMBERSHIP MANAGER:

The Membership Manager will receive and process applications for new and renewed membership. He or she will issue the Certificate of Membership and assign the applicant an official membership number. ***He or she will furnish the Secretary/Treasurer a quarterly report of active and new memberships and cash received from such.*** The Membership Manager shall be appointed by the President

ARTICLE VI: Removal of Club Officers.

(a.) Any Officer of the Club may be removed from office for just cause, by a 2/3 majority of the ballots received from the Board of Directors for this vote.

Here is my dilemma. Should we do as the by-laws say or should we ignore them, as has been done in the past, and continue along, not really knowing where we stand from one quarter to the next? Some think we should ignore them and others think we should do as the by-laws say. I feel that we should follow the rules. If the rules are bad, then the BoD should change them. If they are good, they should enforce them. Simple!

I tend to simplify things like this. When you agree to wear a hat for any organization, you are also agreeing to do the very best you can. If you either can't or don't want to do to the job to the best of your ability, then you should be willing to step down and help someone else do it! Conditions and rules both change. As rules become something you can't live with, it's time for a change. The same can be said for the time we have to do volunteer jobs. When our full time jobs put more demands on our time, we often must change our free time commitments.

But the bottom line is that I should not have to beg for the reports that I am required to publish in the **Quarterly**. And if begging is right, then how long should I have to beg? 6 months? A year? More? And when a report does show up, how complete should it be? Should you be able to add the numbers and get the same totals? Why should reports be sent to someone we rarely hear from?

During the yearly meeting, the BoD unanimously approved helping pay for my trip to the meeting in 1997. While I do think this is a very nice offer and would like to thank the BoD, I'm not sure that the membership knows that these things are done. And until we get a much better idea of how we stand financially, I don't think it right to spend money that way. The amount we are talking about is $500-$600 or 38 cents per member of your yearly dues. But first, we need to be sure that we have the money in the bank to print all the issue of the **Quarterly** that we have sold! Only then can we think about spending money on anything else!

In order to know where we stand, we need timely and accurate reports. And we need to be running on a budget! I have made a motion to the BoD that a budget be set up. With any luck, in the next issue we can show off our budget! (Yes, I am an optimist!)

And if there is anyone out there that would like to be the Editor, please step up! My job keeps growing and by free time is becoming less and less. I will give all the help I can. I had never done anything like this before and didn't really didn't have any trouble. There is a fantastic staff here to help you along.

Now it's your turn. Lets hear what you think. Write, e-mail or call your BoD members. Send letters to me or anyone else on the back page. Our goal is to make this whole club what you want. Give us our orders!

de Ron, KU7Y

(Continued from page 2)

Postal Service changed the way bulk mail is to be sorted, labeled and boxed . Now, to get the best rate, even for us, I had to add an extra line to the label. This line is for the bar coded ZIP code.

We still mail out third rate bulk, and it's possible for your friend down the road to get his copy three weeks before you. Also, if you have moved, the third rate bulk mail will not follow you to your new QTH. We have added a line of text to the back of each Quarterly. It basically states if you move, and the postal service does by chance forward your mail, you will be charged for the required first class postage.

Membership numbers

If you are a long lost member returning to the ranks, and send me $17 with a note saying "NEW", guess what? You'll get a new QRP ARCI number. If you can't remember your old number, I need your call. If you have changed call signs, I need all of the old ones. I can sometimes find one of your old calls from the 9000+ member data base. If I can't find your old call or your old QRP number, then I will issue a new number for you.

Problems with your membership

Every once in a while, I do screw up. And, when I do, it's a doosy! If you have a question about your membership, I need to know your QRP ARCI number. It's important you have that number. It's the first thing the computer asks for when finding an address. That number will never change, but calls do, address do and so on. I had a change of address sent to me with only the name and new address. No call, no ARCI number, not even the old address. Do you have any idea how many Martins are in the data base? (156!)

If you have a question about your membership, **send it to me, NOT to Buck, NOT to Myron, NOT to Stew and NOT to the guys on the QRP-L net.** I'm the only guy that can help, the others may pass on the information and in doing so, sometimes get things out of wack.

If you send your hate mail to anyone other than me, you just wasted a stamp! No one can fix or update your membership records but me. Calling **Myron** and complaining about a missed issue will not get your copy. That's my job I don't get paid for.

If you contact me via email, and don't get a reponse, send it to me again. Sometimes the internet just does not work the way it is suppose to. My Email address is : **73357.222@compuserve.com**. I check this almost every day.

I'm proud to say I have the worst handwriting in the free world. But, to speed up your requests, write it so I can read it. Watch those "v" and "u" letters in your call. For the DX members, if you have a rubber stamp, or sticky label with your address, use it. Either stamp or place the label on a clear spot in your letter. It will become your shipping label. Also, be sure you mention what country you're in. DX to me is anything outside of Ohio. Kent means nothing to me. Where's Laudercast? 5U4s are in my junk box.

Renewals

In order for Monte to get The Quarterly out on time, we need to have the copy at the printers no less than three weeks ahead of the due date. This means I must have the mailing labels printed and in the hands of the printers at least two weeks before the due date.

This is very important to you.

If you renew after the mail label run, you will miss the next issue! **You must send in your renewal at least one month before the next issue!**

So, if your membership expires with the April 96 issue, and you wait until June 20 to send in your renewal guess what? You'll miss the July issue!

Also, when you renew your membership, but miss the current issue, I change the renewal to start on the next issue you receive. For example. Your membership expires with the April 96 issue. You missed the July issue. You will receive the October issue. Your membership will then run from October 96 to October 97.

Where's my cancelled check?

Don't panic if you don't get your canceled check back as soon as you think. It's not unusual for me to hold the checks for a month or two until I have a huge stack of them. I then make arrangements with our secatary/treasurer for a meeting. We meet in a seedy part of Canton and exchange plain manilla envelopes full of checks. So, by the time **Myron** gets your check, two or three months may pass. Don't panic!

Renewal Notices:

Chuck Adams, K5FO, has agreed to send out renewal notices. He will use both U.S. Mail and E-Mail.

Just a couple of days after the first batch of E-Mailed notices were sent, here is what **Chuck** had to say;

"I have gotten back over 20 emails from the group last week saying that the check *was/is/gonnabe* in the mail this week. So it looks like this technique saved everyone some time, energy, and money".

"Until further notice I plan on doing this each quarter as I have the computer resources to keep this up".

Thanks **Chuck, Ron, KU7Y**

Goodies...

I've had several (ok, lots) of requests for a member directory. The G-QRP club prints one with the call, G-QRP number, and first name. I'am asking, "Do you guys want a membership directory?" Since the club gives out awards based on working members, a directory listing QRP ARCI members WITH their QRP numbers gets a bit touchy-feely. I will need input from the membership before I go to the board about a directory.

Back issues

I do not have a listing of all back issues. I can tell you I have all of 1996, all of 1995 and all 1994 EXCEPT for October 94. Back issues are $4 each.

And just for DX members

I've said in the past not to send cash. I understand in some countries, it cost more to convert your money in to a postal money order than the dues. So, here is how to send cash.

First, place nothing on the envelope to indicate the letter has any value. Don't put call signs on it, yours or mine. Don't mentions "QRP DUES" or any other wording to that effect. You want the letter to look like one going to mom back home.

Wrap the money up so you can't see it in the envelope. Carbon paper is great for this. Light weight and impossible to see through. Avoid sending the letter registered as this will also draw attention.

It take about 10 hours PER WEEK to just keep my head above the waters. Throw in a week of 12 hour days at the steel mill and things begin to pile up. So, that's what I've been up to. Trying like mad to get your copy of The Quarterly out to each and everyone of you.

Mike, WB8VGE

Incoming Mail

Compiled by Larry East, W1HUE

Ron received many letters and emails in response for his request for input on the question of retaining a CW requirement for HF privileges (October 1996, page 47). The vast majority were strongly in favor of retaining at least a 5 WPM CW requirement. A few felt that "the writing is on the wall" and that codeless HF licenses are inevitable. Most also stated that the ARCI should take a stand in favor of keeping the CW requirement. The following are a few examples of the thoughts expressed by our readers. Sorry, but we don't have the space to print all the letters!.

Ron,

There is no good reason to delete the S25.5 International Morse requirement from the international regulations. I vehemently oppose dropping the Morse requirement for access to he HF bands. QRP-ARCI should join with AM International, FISTS, and the QCWA to oppose efforts by ORACLE, RAC (Canada), NZART (New Zealand) and elements within the ARRL to remove the International Morse requirement and furthermore preserve existing Morse qualification requirements for access to frequencies below 30 MHz.

73, Tony Stalls, K4KYO

Monte Stark, Editor:

In response to your questions in the October [1996] issue:

Should the CW requirement for HF be dropped? Yes.

Should the ARCI take a stand? No.

The issue is too divisive, and our involvement would not change the outcome in any case, so it would be stirring up passion for nothing. Our stance should be pro-CW from an operating perspective, not from a regulatory one. We need to encourage CW operation, and encourage those hams trying to learn and use CW. Our message should always be positive, not a negative one with scare tactics, etc. We want to present CW as a wonderful mode that can be learned and used with great pleasure, just as RTTY, ATV and the other modes.

The fight will come when and if they try to squeeze the frequencies allocated to CW ... lets save our fight for that which I believe all the club members will be on the same side.

73, Mark KQ0I

Dear Ron,

Regarding your question in the October [1996] QRP Quarterly about keeping the CW requirement ... YES! I am a fairly new ham (four years), and a recent upgrade to General (six months), but I feed he CW requirement is essential to keeping ham radio the great hobby it is. I've found the most satisfying QSOs I've made have been on CW. Nobody has ever called me a lid on CW because of my spelling. 14.313 MHz should be enough reason to keep he requirement. Imagine what the HF bands would be like if any Joe could call ICOM and buy a super station and go on the air with minimal knowledge. We've enough "broadcasters" in the AM and FM bands now.

Thanks for your time. The Quarterly is great and continuing to get better.

John Schneblt, N8TDH

Dear Ron,

I am OPPOSED to deleting the CW requirements for amateur radio. Obviously, CW is a simple and inexpensive form of communications that breaks down language barriers (at least through the "Q" signals). It is still a popular mode as can be seen by the growing popularity of the QRP groups made up of individuals who primarily operate CW. CW is tied directly to the history of amateur radio. Lots of folks say that history has no place in today's and tomorrow's communications environment. Well, for some reason, everyone must take years of history in primary and secondary school so maybe history is important! I submit that learning CW, even at the 20 WPM rate, takes less work than the effort required in even a single semester of required high school history.

Many folks say that we're using CW as a filter to limit entrance into the ham ranks. I don't look at CW as a filter, but more as the only thing left that requires a learning commitment. Lets face it, all you need to do today is purchase a Radio Shack license manual and read over only the right answers. You don't even really need to read the questions! If you can recognize an answer on the exam, it is probably right! Even the CW exam is very easy. You get two tries at copying the calls and you know that there is a high probability that one of the calls will have a slant bar ("/") in it. If you copy one out of every three letters, you can figure out if the rig is Kenwood, Yaesu, ICOM, or Heathkit. You know approximately when the name and QTH come in, as well as the RST. As a VE, I've seen lots of passes when I couldn't read the copy!

Some people say that we should just make the theory tougher to compensate for not learning the code. That will never happen. Our entire society is based on making things easier! Finally, if Morse code is no longer required, no one will learn it and it will completely die out. How many people go off and learn Latin for the fun of it? Keep the code!

Thanks and 73,
Phil Salas - AD5X
Richardson, TX

Unless specifically requested that it not be published, any letter, note, etc. received by the editors and staff of the QRP Quarterly that is of general interest to our readers will be published when space is available. We reserve the right to edit all published correspondence as we find necessary. Opinions expressed are those of the authors' and do not necessarily reflect those of The Quarterly editors or the ARCI Board of Directors.

MILLIWATTING: 10db BELOW QRP

Bob White, WO3B

Milliwatt Contesting

I hope everyone is enjoying the current contest period. I for one have been having a ball. This is the time of year when on any given weekend you know you will have an abundance of contest quality stations who are more then happy to give an extra listen for our peanut whistles. Granted you might have trouble finding anyone who wants to ragchew, but it all counts for WAS. Besides you can always slide over to one of the WARC bands after closing some of the holes in your WAS QRPp log, to brag about your exploits.

It's the guy on the receiving end that does all the work.

I have always heard that the real achiever in a 1000 mi/W contact is the listen station. Common theory has it that if not for the guy with the big buck receiver on the receiving end, the contact would have never taken place. A good case in point for this theory is my recent contact with **Ron, N8VAR**. Ron's QTH in Dayton, Ohio is 408 miles from my QTH. and at 250mw from a 40 9er feed with 9V we managed 1632 mi/W. Now I had no problem hearing Ron's big signal on my unmodified 40 9er because he was running 5db more power then I was, but how did he hear me on his unmodified 40 9er? I guess it was because his was powered by 12V, or perhaps it was because the two 40 9ers had set besides each other during the Dayton building contest and developed some sort of ESP. You don't always have to rely on a "big buck" receiver, (though it does help), you would be surprised what you can do with a little help from nature and some good operating skills. Don't ever count on any help from Murphy though. Two days after the contact, Ron found out that half of his antenna had been laying on the roof during the time we worked.

ARRL Sweepstakes

Well I wimped out again this year and ran CWSS at five watts, but **Steve, N2MNN** passed on a report of his QRPp CWSS exploits:

Its nice to see postings about SS experiences where the QRP operator had fun despite the QRO environment, or they learned something new. Operating in a QRO contest is very good experience for the QRPer, and can be quite enjoyable if the right attitude is taken. I decided this year not to go for the pin but to supplement my milliWatt-states count which was at about 30 before the contest. I promised myself that I would only contact states I didn't have yet. Delaware is tough to get even from neighboring New Jersey, and that was my initial goal - just to get a DE. I started Saturday morning on 80m and listened to every "3" call. After about an hour I finally got my DE. I switched to 40m and got an SC; not rare but it had eluded me to date. I always try 15m before going to 20m; its just less crowded. WOW! I thought it was the top of the sunspot cycle. Got an NM, WA, MT, AZ, and an ID. Then I went back to 40m which is usually good for me out to the Mississippi river. I felt that I was still on 15m! I got MT again, KY, SD, MS, OK, and UT. Many CAs were heard both on 15m and 40m. Best contact was QRP to QRP with **K7MM in WA**. I wound up with 12 new states! My score? Who cares! I met my goal and now I've got some QSLing to do. Power output was .95 W at a blazing 14 WPM.

There were no reports of Milliwatting for the Phone SS. Any brave souls want to try that next year?

ARCI QSO Party

There was a great turnout for this years ARCI QSO Party. If you could not make any milliwatting contacts during this event, you had better think about putting up a new antenna during the next blizzard.

Here are the reports I received on milliwatting during the ARCI QSO party.

WO3B

I put in five hours of operating time for the contest, operating low band only at 200mw. I had 47 contacts in 29 SPC's (12 SPC's on 80 meters and 17 SPC's on 40 meters). Antenna used was the 571' loop feed with 450 ladderline through an MFJ tuner. Logging program was WO3B's QRP log for the Psion S3a. States worked were: 80 meters IN, NY, NC (2), TN, NJ(2), MD(3), OH, PA(4), VA(2), WV, MA(2), and MI. 40 meters GA(4), IL, SC, ME, IN, OH(2), NC(4), VA(2), RI, MI PA, NJ, NY(2), CT, MO, CO, and Puerto Rico

KI0G

I only made two Q's, both to AZ during the contest. I did not spend very much time on the air. I did however put on a JOTA display and demo for a group of Cub Scouts. They were very impressed by the 40 9er in the Altoids tin, that thing is a real attention getter on matter where. Bob with a QTH in Glenwood Springs, CO, was using a stock 40 9er into a G5RV at 200mW.

N9ZZ

I worked the contest and found it to be a great experience. I don't usually get into contests, just do my qrping and qrpping at random, but this year thought would give it a try and had a ball. I didn't set the world on fire, but with 200mW I though I did fair.

Bob was operating from Mountain Home, AK. His power out was 200mw (Ten Tec Argonaut 515 at 2W with 10db attenuation) and antenna's used were a GAP vertical, MFJ 36" loop and a 450' wire loop. Bob operated for approximately 4 hours total on 80, 40 and 20 meters. States worked were CO, GA, TX, OH, GA, LA, MN, NH, CA, AZ, NC, and TX.

K3TKS

Danny was using a QRP Plus (original model), at 900 mW into an 80 meter horizontal loop at 45 feet. In 11.5 hours of contesting Danny put together a very respectful log of 52 QSO/20 SPC's on 80 and 43 QSO/25 SPC's on 40. Danny as Captain of the Maryland Milliwatts team entry was expected to score big, but the team anchor turned out to be **Paul, AA4XX.**

AA4XX

Paul, running a Sierra at 250mW into a 80meter Windom up at 60 feet pulled in 146 QSO's in 60 SPC's during his 19.4 hours of contesting. Let's see 146 QSO's x 60 SPC's x 15 = 576,000 points! Danny, I don't think you and I are pulling our share of the load anymore.

Paul noted that almost every station he called with his 250mW came back on the first try. Paul also wrote: "Working the contest milliwatt style was a heck of a lot of fun. Luckily, I had gotten all my domestic chores done, and I had not done any radioing for several weeks prior, so Sue was very understanding. I sure hope some more guys will consider the mW categories in future tests. That's pure QRP, ain't it?"

WD0AKZ

When asked about his Milliwatting experiences **George** replied; Thanks for the offer **Bob**, but my "experiences" are probably no different then every one else who worked in the milli-watt range.... Total Amazement!

Not too many years ago I had the Tower/Yagi/Kw combination that many of us have and with this "Ideal" setup I found I was getting frustrated when I couldn't work someone I thought I should be able to. Now I'm at the other end of the scale. With the 40 9er I worked 5 states with less than 200mw into a Inverted-V at 27ft, and 3 of those 5 were at less than 100mw's..... that's more than 40db down from where I was with the KW setup, incredible. Now I figure it's kinda like fishin... I really don't expect to catch anything so when/if I do it's a real Hoot!! Put the fun back into Hamming.

I attended a seminar on QRP at a local HamFest this weekend. When it was over I told the instructor that after using the 49er at <200mw's I thought his use of 5 watts was a bit excessive. :-)

So now the 49er is up on the display shelf, and I'm back to my trusty old Kenwood TS-440s. Only this time, the CW drive is backed down and the PWR output is at a booming 900mw. Yes I know, that too could be call a bit excessive by some, but what the hey, it's SS this weekend and I need all the horsepower I can to work them big guys.

So I'm afraid I don't really have any interesting experiences for you to write about, just found a home with QRPp and hope to stay.

40 9er Contest

This is an event we will be seeing again. Many thanks to **Bob, AE4IC** for putting it together. The following soapbox from **Randy WJ4P** will give you a good idea of how things went.

Monday night was mildly successful but signals were down as propagation to my end of the world was poor. Also, getting into the swing of things and trying to remember the exchange was a challenge. It was good to hear some familiar calls and to finally work a 40-9er on the air. **KJ5TF, Jim**, was all over and working (it seemed) everything I could hear and then some. He sure gets around with that 'lil radio! He proved to be my nemesis - He out scored me - **Jim**, watch out next time!!

Tuesday night was the best with very good prop and strong sigs. I worked about twice as many stations but only ONE 40-9er, **Jim KJ5TF**! (wouldn't you know! hi!)

Wednesday and Thursday nights turned out like Monday with low prop and weak sigs. Friday night the propagation was so good I had SSB splatter and digital sigs wiping out just about every station I heard. Just worked a few stations. A disappointing finish to a fun contest but I still had fun.

One thing I noticed... almost all stations that called me did it nearly zero-beat probably betting that I was an unmodified 40-9er. I as able to tune off zero-beat and still hold them. That was a smart strategy considering this contest.

Thanks to everyone for being patient. This ain't your fathers contest radio...

JPs NIA-12 Audio Spectrum Display Software

The Audio Spectrum Display Software for the NIA-12 that I have been writing about is not available. Contact JPS for more information.

Till next time.... **--QRPp--**

NorCal to the field! April, 1997

In April of this year, there will be some QRP sounds coming from the Nevada desert, near a place called **"AREA 51"**. Seen here is the **ET Hwy**. The site will be just straight down the road, up into the hills.

The operators will be **Doug Hendricks, KI6DS, Paul Harder, NA5N, Bob Follett, AB7ST,** and yours truly, **Ron Stark, KU7Y**. If anyone else wants to join us, you are more than welcome. Just be sure your insurance is paid up and that your lawyer knows where you are going! We will be checking in with the folks at the store in **Rachel, NV**, shown in the picture. If nothing is heard from us, you will know where to start the search.

Remember, **"AREA 51"** does not exist! (**Doug** said he will provide the special, picture QSL cards). Well, he hasn't said it yet, but he will soon after he reads this! Thanks **Doug!**

de Ron, KU7Y

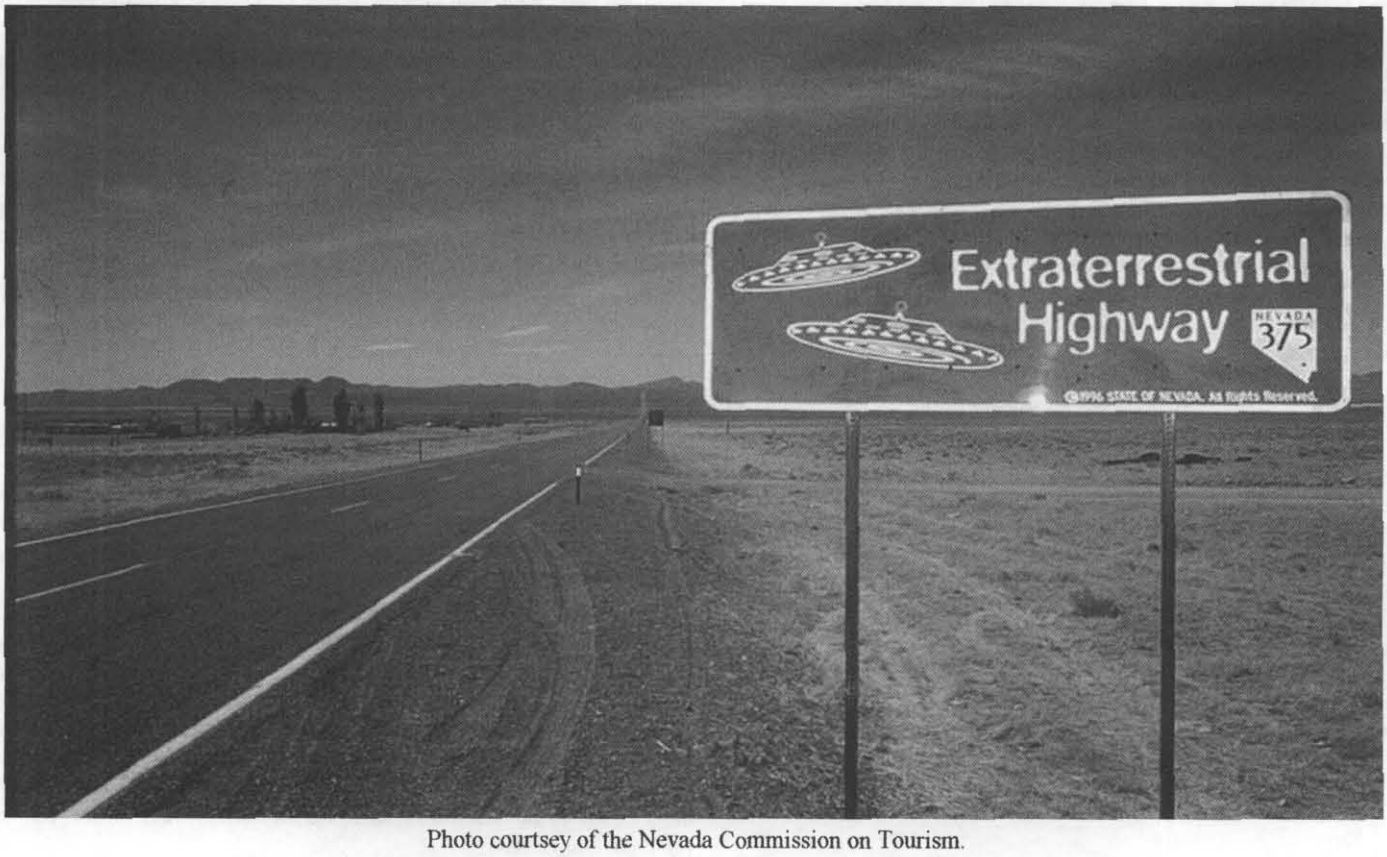


Photo courtsey of the Nevada Commission on Tourism.
Check out their website at: www.travelnevada.com or email them at: ncot@travelnevada.com

QRP WISDOM FROM UNCLE BRUCE

QRP, Really!

Bruce Muscolino, W6TOY
P.O. Box 9333,
Silver Springs, MD 20916
w6tjoy@qrols.com

DX Made Easy

Yes indeed! Gather around my friends and I'll show you how you can work DXCC running 1 milliwatt and using a perfectly cooked 12 inch long strand of spaghetti for an antenna! Sound too good to be true? Of course it is!

Who among us has not called, and called, and called, even the most common DX stations and been studiously ignored? I'm here to help you find the light. By the time the next edition of this column comes along I expect I'll have heard from a number of you, telling me what a wonderful time you've been having working DX.

Some introductions

I'm going to pretty much cut to the chase here. Those of you who have read my earlier scribblings know I'm a bit of a curmudgeon (you can substitute "old grump") about many things that go on in our corner of the hobby. You know I am strongly results oriented, and believe in the KISS ("keep It Simple Stupid") principle. You also know I am strongly in favor of learning to solve problems on your own, because that's the only way you actually learn anything. Please take my earlier advice: relax, I'm still the same old results oriented grouch you've come to know and love.

DX -- What's DX?

What a question! What's DX? Anyone knows it's working the guy with the chirpy, AC sounding signal you can barely hear above the noise with the full power of your Superwhizbang10000 receiver working and your 28 element 40 meter beam pointed at him! Not entirely...

Yours truly can remember when working the next town was DX, and it wasn't all that long ago. It involved a modern, for the time, transceiver (TS520) and QRO power (100 w). What was the problem? Antenna -- I lived in a California "stucco box" apartment and was trying to use an indoor antenna. (I got it to work later, and actually worked a few DX stations, but that's another story) DX does not necessarily imply great physical distances. It does not imply stations in exotic, remote locations.

How CAN I Work DX?

Another excellent question. This is the basic question. The answer is simple, be where the DX is when the DX is there, and be among the FIRST to call him. It's so darned easy, but for those of you who aren't sure yet, let's take the answer apart bit by bit.

Be where the DX is.

Before we go any further, get a bottle of black paint and a brush, go out to your shack and paint over the dial markings around the QRP calling frequencies. In fact, for best success paint out all the dial markings above 25 KHZ above the bottom band edge. DX stations don't come to you -- you go to them.

This is not intended to be a shot at the non-Extra class licensees among us. But, take the advice of 40 plus years of experience -- DX hangs out at the bottom end of the band. I don't know why. Between 1978 and 1981 I had the unbelievable good fortune to live, work, and ham, in Europe. I was PA3AIC. I was DX to a lot of folks and I worked a lot of DX, and I'd bet that 90 percent of the rare ones (that is non-Europeans) were worked in the bottom 25 KHZ of the band. Why? I don't know, it's just that way.

Does this mean there's no DX until I upgrade? No!. Remember what I said before, DX doesn't imply exotic. There are, actually a pretty large number of DX stations who do operate above the 25 KHZ barrier. Anyone can work them, even Novices, but they may have to work harder and upgrading couldn't hurt, but if you're already on the air and active, upgrading should be pretty easy.

So, having resolved the "Where's the DX" question, let's turn our attention to the "When DX?" question. Here's where you and the DX station share a lot in common. Putting Dxpeditions and contest operations aside for the moment, the average DX operator has the same problems you have -- a job, a family, and other activities that compete for his time. So, when is he on? About the same time you're on, only translated by the time zone difference.

Learn the time zone difference between your QTH and the QTH of the DX station you're trying to work. As an example, suppose you live out in the "Great Heartland", and you want to work Europe. You're in the Central Standard Time (CST) zone. Europe starts at the Greenwich Mean Time zone, Greenwich being, generally, speaking, on the Western edge of Europe (yes, I know it's in England). The difference between CST and GMT (also called UTC) is, as I write this, 6 hours. This difference will change between winter and summer, and also locally, depending whether you or the DX station observe Daylight Saving Time. However, if you use 6 hours in the winter and 5 hours in the summer you'll be close enough; just learn the difference. Also, remember that Europe has time zones too, and that Central European Time (1 hour later than GMT) covers many of the more "common" DX countries, going east, at least through Germany. I'm not going to do your homework for you -- go to your local library and look it up!

The point here is that if you're going to try to work Europeans, you ought to look for them between 7:00 AM and 3:00 PM Saturdays and Sundays, if you work for a living like I do!. These times translate to about 1:00 PM to 9:00 PM for the DX station. Of course that isn't the whole answer...

Where the DX is, Part Two

Knowing that we should be looking for that German station between 7:00 AM and 3:00 PM will not help us much if we're looking on 80 or 40 meters. Those bands just aren't open to Europe (or much of anywhere else) at those times. They are special conditions, and I'll talk about them in another column. Start on 20 meters, and as the sunspot cycle begins to gather steam, look on 15 and 10, and the WARC bands. And learn something about the bands, and propagation. I don't know about where you live, but where I live 20 meters isn't often open at 7 in the morning. And, while I have absolutely nothing to back this up, to me the bands open going East in the morning and slowly shift to West as the day goes on. Go to the library and do some reading, it'll pay off, and you won't have spend 40 years learning it through experience.

Be there first

This is as important as any other consideration, especially if you're QRP. QRP is a state of output power, not a state of mind. If you approach operating with a QRO attitude, that is, anyone can hear me -- you'll do lots better. Regardless of how much power you're running, you'll have a better chance when few other stations are calling the DX station. To be there first you have to be looking all the time. When I first turn on my radio I immediately check the bottom 10 KHZ or so of the band (depending on the band and the time of day) for DX stations. I will periodically sweep this range the whole time I'm on. More times than not I have found DX stations there just getting on the air and I have worked them.

Dxing is like hunting. You don't hunt rabbits down by the pond unless you're the President and you're in Georgia. The cornfields hold more rabbits per square foot than the pond. You also don't go hunting in the middle of the night (there's a name for those guys) -- daytime works better. Notice the similarities -- be where they are, when they are. Does it matter if you use a .410 or a 12 gauge? Not if you're a competent shot. In later columns I'll talk about operating skills. For now practice being there at the right time and being first.

Some practical stuff

I moved from a condo to a house in early September. It's early November as I'm writing this. In the two months I've lived here I've been on the air a total of 25 separate times. Three of those operating sessions went to non-DX contests -- the Pennsylvania QSO party, the ARCI Fall QSO Contest, and Sweepstakes. in the other 22 periods I worked at least 17 DX stations, running from the common to the unusual. What were they? On 80 meters, Puerto Rico; on 40 meters, Canada, France, MALTA, and the Caribbean; and on 20 and 30 meters, Europe and the Caribbean. Great DX? Not especially, but MALTA on 40 meters was pretty special. Not real shabby.

What equipment was I using? My faithful TS-130V running between 5 or 10 watts into a 100 foot longwire up at about 25 feet. When did I work these stations? Looking at the log, between about 0000 and 0300 UTC (that's between 2200 and 0100 EDST. Was I there first? Most of the time I remember I was there among the first. How did I find them? Tuning around. Did I call CQDX? NO, not now, not often! Can you do it? Of course. Is it hard? NO! I firmly expect to receive lots of mail telling me how you've done.

A Place to Start

A good place to get your feet wet Dxing is in DX contests. There is a big one coming in February -- the ARRL DX contest. GET IN IT. The exchanges are simple, pretty much serial number and signal report. You can get the details from QST or the League. You can bet you'll be 599 everywhere, even if they have to ask you for a repeat, and you can also be sure the DX stations will "have their ears on". It's a bit hectic, but you'll work some DX and have some fun.

More

I want to use reader input in this column. For this to be a useful forum it is necessary to share your experiences with your fellow QRPers. WRITE ME with your successes, your failures, and your questions. I promise to answer all mail, either personally or in this column.

Until next time -- WORK A DX STATION TODAY! **Bruce -- W6TOY/3**

Still QRP, Really! (c)

CALL FOR ELECTIONS

The terms of the current President and Vice President of the QRP ARCI expire in April 1997. Anyone wishing to be considered for either position may send a brief nominating letter to **Mike Czuhajewski, WB8MCQ**. The terms run for two years, and are voted on by the Board of Directors.

Although having an e-mail account is not a "condition of employment", it is very important that these two people have one. Currently, all Board members, officers, Quarterly staff, etc, have them and it vastly speeds up the communication process. We do not currently require that anyone in a position of power have an account, but anyone who does not have one, and must rely on "snail mail", will be operating at a severe disadvantage, both with regard to speed of communication and not being able to see the discussions on various topics. (There are sometimes dozens of messages per week.) Sorry, the **QRP ARCI** cannot pay for your account!

If interested in running for President or Vice President, please submit your own nomination to **Mike Czuhajewski, WB8MCQ**, by 31 March 1997, preferably by e-mail. *(And if you do not receive a confirmatory e-mail or letter in a short time, please assume that it was not received and send a follow-up. If we did not acknowledge your nomination, we didn't get it.)*

Several positions on the Board of Directors will be up for grabs next year. Although we aren't taking nominations for those yet, some of you might want to think about running.

73 and Queue Our Pea DE WA8MCQ wa8mcq@abs.net

Another view of that great looking rig on the front cover!

QRP CLUBHOUSE

Bob Gobrick, VO1DRB / WA6ERB

I just finished reading a thought provoking editorial by ARRL's **Dave Summer, K1ZZ** in the November, 1996 **QST**. **K1ZZ** talks about the Amateur Radio community and the many "neighborhoods" in that world-wide community. To quote a few lines "In a healthy community, the inhabitants know one another. Anonymity is the enemy of community.." ; "**Pride** ..... The proud record of service performed by radio amateurs stretches across four generations, and we desperately want to continue even as the telecommunications world changes so rapidly around us." **Dave's** editorial struck a cord with me as I contemplated writing this QRP Clubhouse column.

We as QRP advocates know about community and neighborhoods. As amateur radio operators designing, building and operating our own low power equipment there is that undeniable pride in being able to communicate with hams around the world with that little rig. How can we share this enthusiasm with others? One answer is right in our neighborhood - the regional QRP Club. In this issue I will introduce four new regional QRP Clubs that were formed in the last few months. I'm sure by next issue there will be more. What's causing this phenomenal growth of regional QRP Clubs? Well maybe folks just simply want to share their ham radio QRP experience with others and in turn they want to learn what others have done.

Each day on the **QRP-L** internet mail list we read about QRP adventures: The **NorCal QRP** club gets together for hamburgers and homebrew. The **Arizona ScQRPions** meet to lay out a strategy for assuring that the "home" club will win the upcoming "**Freeze Your Bxxx Off" (FYBO) Winter QRP Field Day** event, the **New England QRP Club** is looking for lighthouses to operate QRP from, **QRP Fox** hunts run wild throughout the QRP hunting season, the **Colorado QRP** club is up there "peak grabbing" with the best of the **Adventure Radio Society** light weight sawed off toothbrush and keyer gang. What's missing is the "eyeball" QSO - meeting face-to-face with folks you may have only exchanged email with. Regional QRP Clubs offer this personal touch and that is why they are growing. By all means, if you have the opportunity in your neighborhood to start or participate in a QRP club then just do it. You won't regret it. And of course you'll meet the nicest people there (we already knew that).

And finally before I start my **QRP Clubhouse** coverage I would like to put in a plug for an event that I wish every QRP Club member could attend - the **"Four Days in May"** QRP Symposium to be held May 15, **1997 at the Dayton Hamvention**. This year a special Saturday evening social is planned just for regional QRP Clubs. On the agenda will be QRP club tutorials on starting a QRP Club, what to do at meetings, how to start a QRP newsletter, what QRP operating events can a club participate in. If you would like to help organize some of these activities then please drop me a note at my email or mail address at the back of this issue. Hope to see you all there.

The regional QRP Clubs have been a buzz the last few months with all kinds of doings. Here's a sampling:

NEW QRP CLUB ALERT - Minnesota QRP Society.

The Minnesota QRP Society held it's inaugural meeting on Saturday, November 2, 1996 at the Edina Community Library (Minneapolis/St. Paul area). I personally was happy to see **Clayton Cadmus KA0GKC** enthusiasm in getting this club formed because by the time you read this column the Minneapolis-St. Paul area will be my new home (what will I do with all those ham calls...) **Clayton** reports that there was a good showing of 11 QRPers for this first meeting, **David Donaldson WB7DRU** volunteered to be club secretary and all had a great time. As is the usual QRP Club style, the meeting adjourned to the library parking lot where **Larry KB0R** worked his **QRP+** to the frenzy of the weekend SS contest. First Club event planned by the **MNQRP Gang** - what else, but an all-out Multi Op effort for the upcoming February 22, 1997 **"Freeze Your Bxxx Off"** Winter QRP Field Day - Minnesotans know how to have fun! Want to join in on the fun - contact **Clayton at (612) 926-8886 or email cla@spacestar.net**

Colorado QRP Club is Loud

The last two issues of the **Colorado QRP Club** bi-monthly newsletter **"The Low Down"** featured an informative tutorial on the popular "qrp ready" audio amplifier chips - the LM 380 and LM 386. I can tell that these super design notes must be a "leader" for **Paul Harden NA5N** next update of **"The Electronic Data Book for Homebrewers and QRPers"**. **Gabe Sellers, KG0NR** follows with a nice review of Paul's original TEDBFHAQ. Great reading. The CQC gang take QRP contesting seriously and the word is on the street that the CQC may be the QRP Club to beat in the upcoming "FYBO" Winter QRP FD. The Low Down covers many adventures of CQCers heading for "high altitude (or is that attitude)" contest training. **Joe Everhart N2CX,** the prolific QRP Club newsletter author shows a simple design for a VXO Crystal Checker. **Brad Mugleston KB0ROL** reviews the **Autek Research RF Analyst RF-1, Al Dawkins K0FRP** has a nice tutorial on "Building a Functional Station", **Dick Schneider, AB0CD** covers the **Adventure Radio Society** method of scoring using the QSO's PER POUND method and **John Gubbins, N0VSE** reports on "Satellite QRP Or How TO Beat Lousy Band Conditions". Lots of good stuff in "The Low Down". Membership information from **Rich High W0HEP, CQC, PO Box 371883, Denver, CO 80237-1883 or CQC@aol.com**

NEW QRP CLUB ALERT - Ohio QRP Club

Lake breaking news from **Steve Bornstein K8IDN** - the bug has bit! Steve reports that a breakfast meeting is scheduled for November 23, 1996 in the Columbus, Ohio area to form the new **Ohio QRP Club.** For those interested, Bruce has gathered some great articles from the **Michigan QRP** gang: **Chuck Adams K5FO** reviews the new **WBL V2L Iambic** helping get Ohio officially on the QRP map (I always work tons of Ohio QRPers during QRP contests) drop **Steve a line at 475 East**

NorCal QRP Club Hosts 1st Annual West Coast QRP Symposium

From reports that I have received the Pacificon Pacific Division Convention was a "side-show" to the first annual **NorCal QRP Club West Coast QRP Symposium.** Great job by a great bunch of QRPers.

The December 1996 issue of **QRPp** will have coverage of this super event. We don't know how much more the QRPp guys can do - the October issue of the QRPp was so jammed with articles that it would take all of the convention weekend to read it!

North Broadway, Columbus OH 43214, phone (614) 263-5819 or email saborns@aol.com

New England QRP Club "72" Newsletter Par Excellence

Every issue of the quarterly "72" newsletter, editor **Dennis Marandos, K1LGQ** sprinkles a little motto throughout the pages. It goes like this - **"The New England QRP Club** - THE EXCITEMENT IS BUILDING". **Dennis** ain't kidding (**Dennis** is a professional technical writer so he will ignore the slang) The latest issue of 72 is jammed packed with technical articles - the best I've seen. "72" starts off with super designer **Dave Benson NN1G**'s description of the new White Mountain SSB Transceiver. Lots of neat design ideas in this "must read" article. Next **Steve Weber KD1JV** unveils a design for the DDVFO, a Direct Digital VFO circuit that will probable be seen in many future multiband qrp designs. **Ernie Gregoire AA1IK** mods up a new Jade Products Battery Controller for solar and base power use. **Bob Gobrick** (that guy with all the callsigns) reviews in an article titled "Going Digital - QRP Style" the Radio Adventures Company DigitalDial for use with the Oak Hills Research rigs and the Wilderness Radio KC-2 - the fabulous **N6KR** keyer-counter-meter-kitchen sink accessory for the Sierra and any rig you can dream of. **Joe Everhart N2CX** does another splendid tutorial on a simple antenna design called "The PVC Gusher II" (where does Joe get those NJ names?). And there's more - a lot more but you need to join NEQRP to read it all. Membership to **William McNally AE1D, 7 Blueberry Rd, Windham, NH 03087 or email Bill Studley AA1OC@concentric.net**

NEW QRP CLUB ALERT - VIVA LIQRP Club

"Viva" was **Jeff Casey WB5GWB**'s way of saying that a Long Island (New York, that is) QRP Club will be formed on December 7, 1996 at an undisclosed Suffolk county restaurant. Word is that **Nick KF2PH** will be running his 40-9er "Fox Hunt" style from the restaurant. Also **Preston WJ2V** may have his new Small Wonders Lab 80 meter SSB White Mountain fired up for a "talk-in". Jeff is struggling with questions that I'm sure all new QRP Clubs face. What should you do for the first meeting and what has to be done at the first meeting to assure folks return (raffling off a new Small Wonder Labs White Mountain SSB rig)? Jeff would like your help and if you are in the Long Island and NYC area why not plan to join the LIQRP LIQRPers. **Jeff can be reached at 19 Bruce Pl., East Setauket, NY 11733. Telephone (516) 689-0084 or email at WB5GWB@sprynet.com**

Arizona ScQRPions - Expert Winter QRP Operating Tips

Yes you heard it right - the **Arizona ScQRPions** will be sponsoring the first ever **"Freeze Your Bxxx Off"** Winter QRP Field Day on February 22, 1997 (see rules elsewhere in this issue of QQ). Sure all the Snowbirds go to Arizona for the winter. But the ScQRPions promised that they will "level" the playing field by heading for the Northern Arizona subzero high country - righttttt! In preparation for FYBO the gang will be posting **"Dave's** (**Dave AF5U** that is) Ten Best Winter Safety Tips" - drop them a note for some "fresh" winter operating ideas. In other late breaking news, ScQRPion member **Dan Taylor KK7BD** has a winter construction project in the works that the Club may kit up if there is enough demand (I hear through the wormhole that this kit WILL be in demand since it can be used during the dark hours of a snow blizzard to see if your tent antenna hasn't blown away). Encourage them on gang. Founder **Dave Little, AF5U** says a "stinging" QRP newsletter may be in the works soon. For membership information contact **Joe Gervais KC7NEV at email address vole@primenet.com**

Michigan QRP Club "The Five-Watter" has a New Look

The **Michigan QRP Club "The Five-Watter"** quarterly newsletter has a new editor - **Bruce Pea K8JRO**. And with a new editor comes a very new looking TFW - jazzy desktop publishing in the **QRPp, SPRAT** format. Paddle (a beauty), **Art Searle WU2K** reviews the South African Lima Electronics Mini-Straight Key, **Bob Kellogg AE4IC** on Easy Portable Antenna, and another nice antenna tutorial by **C.F. "Rock" Rocky W9SCH** on "A Few Thoughts on Small, Single-Turn Antennas". Good luck Bruce with the "new" TFW. Membership info via **Lowell Cordin W8IQB (new call) at MIQRP, 654 Georgia, Marysville, MI 48080 or email KD8FR@aol.com**

NoGaQRP Meeting Announcement

The "Peach State" gang are planning their February winter meeting and once again it will be held at the Atlanta Morrison's cafeteria on North Druid Hills Road. **Ed Tanton, N4XY** reports that the NoGaQRP gang had a great October meeting with 14 folks in attendance and lots of QRP stories swapped. Ed hopes to get some pictures of the meeting on his Website soon (email n4xy@avana.net). For membership contact **Jim Stafford, W4QO, 11395 West Rd, Roswell, GA 30075-2122. Telephone (770) 993-9500 or email w4qo@america.net**

NorthWest QRP Club Still Wired

In milliseconds I received the October 1996 issue of the **NorthWest QRP Club "NWQ Newsletter" - Electronic version.** I will admit, getting the NWQ electronically removes the stress of wondering if your postal carrier is a "QRPer" and likes to borrow YOUR surface mailed issue to browse through (doesn't happen!). Editor/President **Bill Todd N7MFB** once again gathers a number of fine articles for this issue. **Stuart Rohreback K5KVH** starts off with a great article on "Ground System - Fact & Fancy" Stuart dispels a lot of ground myths and his article digs to the bottom of the issue. **DX News Editor, H. Ward Silver N0AX** follows with a nice article "Ain't No Meters Like 40-Meters" exploring the secrets of many a QRPer's favorite band. **Brian High KV9X** does a little QRP Mountain Topping (NW Style) with his NW8020 and lives to tell about it. The E-Mail subscription is only $3 and subscriptions can be had from **Bill Todd N7MFB at NW QRP Club, PO Box 354, Bay Center, WA 98527 or via email n7mfb@juno.com**

NEW QRP CLUB ALERT - Alaskan QRP Club

Watch out FYBO Winter QRP FD contestants - we have some "real" QRP pros from the North coming on line. The **NorthWest QRP** Club's newsletter reported the formation of the **Alaskan QRP Club** by **Bruce Hopkins, KL7JAF**. Sure enough, I checked the nice **AKQRP** home page and there it was. Bruce is off to a nice start and he hopes to have an Electronic AKQRP newsletter on-line in January 1997 (I wonder where he got that idea). For membership (free) contact **Bruce at bhopkins@polarnet.com**

NorCal QRP Club Hosts 1st Annual West Coast QRP Symposium

From reports that I have received the Pacificon Pacific Division Convention was a "side-show" to the first annual **NorCal QRP Club West Coast QRP Symposium.** Great job by a great bunch of QRPers. The December 1996 issue of QRPp will have coverage of this super event. We don't know how much more the QRPp guys can do - the October issue of the QRPp was so jammed with articles that it would take all of the convention weekend to read it. Just to touch on a few articles - **Wayne Burdick N6KR** leads off with the unbelievable KC2 keyer-counter-meter-kitchen sink accessory - you got to get one. Then a few articles from the G-QRP Club SPRAT newsletter on a Homebrew Spectrum Wavemeter and the "TCF" Sideband/CW Transceiver for 40 meters. **Bill Jones KD7S** shows off his "Collins" quality packaging of the NorCal 40-9er Club transceiver kit and **Jeff Anderson WA6AHL** follows up with packaging a rig in a 9 volt battery case - unbelievable.. Next comes a great new column by **Paul Harden NA5N** on QRP Hints & Kinks (great graphics) and an article by Paul on Understanding Receiver Specifications. And last, but not least, is an article on the rave of the QRP community - the St. Louis Vertical by **Dave Gauding, NF0R.**

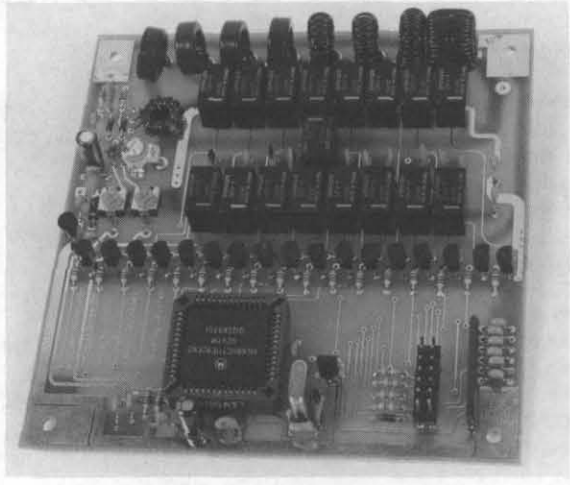
Wishing everyone a Happy Holiday and hope everyone gets some nice QRP goodies in their Christmas stocking (QRP rigs are small). Start planning for the 1997 "Four Days In May" QRP Symposium and I'll see you all next issue. **73/72 Bob VO1DRB/WA6ERB** - "QRP CLUBHOUSE" - What's the secret password? - **"QRP".**

Review: The LDG Electronics Automatic QRP Antenna Tuner

Don Shipman, W3RDF 403 11th Ave. North North Myrtle Beach, SC 29582 email: DLShips@aol.com

If you're like me, you can't wait to open the radio magazines to see what new circuits lie beneath the covers. I can recall the adrenaline rush when I discovered the article by Dwayne Kincaid, WD8OYG, in the January 1996 QST, describing the AT-11 Automatic Antenna Tuner. Although other "hot" projects kept me from ordering the parts, the thought of an automatic tuner lingered in the back of my mind. A magazine advertisement for the AT-11 prompted an e-mail message to Dwayne to see if he had any plans to build a QRP version. I was delighted to learn that he was finishing the design and expected to begin shipping kits in November, 1996. I quickly placed an order and Dwayne agreed to send a prototype to help get my fever under control!

The QRP AT-11 is available as a "board only" kit that can be built into a rig or put into a cabinet (supplied by the builder) for "stand alone" operation. It is a full featured automatic or semi-automatic antenna tuner designed for HF (1.8 to 30 MHz) transmitters having an output in the range 0.1 to 10 Watts. It uses a switched "L" configuration with 256 capacitor, 256 inductor and Hi/Lo-Z settings to provide over 131,000 tuning combinations. The "L" network works with just about any coax fed antenna (dipole, vertical, beam, etc.). It's small size (4.4in. x 4.3in. x 0.6in.) and weight (4.2 oz) make it perfect for installing in existing QRP transmitters. The inductance range of 0 to 20 µH and capacitance range of 0 to 2700 pF will tune most 6 to 800 Ohm loads. Tuning time is 0.1 to 3 seconds (1.5 second average). Power requirements are 11 to 14 VDC at 10 to 190 mA (75 mA average).



Completed Automatic QRP Antenna Tuner circuit board (photo courtesy LDG Electronics).

You can operate the tuner in either automatic or semi automatic mode. In automatic mode it will seek a 1.5:1 match anytime the SWR is above 3:1. In the semi-automatic mode the tuner will only seek a match when the tune input line is grounded. Both modes require at least 0.1 W of RF power to be present. Up and down inputs are provided for fine tuning the inductors and capacitors and can be used in either mode.

There are four outputs for "optional" LEDs (not supplied with the kit) to provide an indication of SWR and status. For example, green can be used to indicate SWR of less than 1.5; Green/Yellow for 1.5-2.0; Yellow for 2.0-2.5; Yellow/Red for 2.5-3.0 and Red to indicate more than 3.0. The fourth LED will light when the tuner is trying to find a match.

Construction and alignment should take only a few hours and can be done with the usual tools including a VOM. There's an easy-to-follow manual and you don't need a frequency counter or a scope to build this kit. Parts are installed in order of height, from shortest to tallest. Alignment is accomplished with the power off and with some RF (5 to 10 watts) flowing through the tuner into a 50 Ohm load. Only one capacitor and two resistors require adjustment.

Operating the tuner is very easy. When the tuner is in the "semi" mode, the micro-processor will go to sleep after it finds a match. This reduces power consumption by about 20 mA. If it is set to operate in the "automatic" mode it won't go to sleep; it stays awake to monitor for an SWR above 3:1. In either mode you can put the processor to sleep by pressing the two fine tuning "down" buttons. You wake it by pressing the "tune" button. When the processor is awake, the clock signal is quite strong at 3643 kHz and "birdies" can be heard at other frequencies so it's nice to be able to put it to sleep.

I'm one who loves to see an SWR needle sound asleep at the bottom of the scale. An SWR of 3:1, although acceptable in some instances, has a negative psychological effect on me. 1.5:1 is very respectable, but it's nice to know I can fine tune it for closer to 1:1.

I tested the tuner using an HW-9 transmitter running 1 Watt on the QRP (CW) calling frequency in each band. I placed a Heath QRP Watt meter (HM-9) on top of the tuner to monitor power and SWR. I tested the tuner in both "automatic" and "semi-automatic" modes. I used four different antennas for the tests:

- A 40 meter 1/4 wave ground mounted vertical, fed with 1/2 wavelength of 50 Ohm coax.
- A 30 meter 1/4 wave ground mounted vertical, fed with 1/2 wavelength of 50 Ohm coax.
- A 20 meter half-square, fed with a full wavelength of 50 Ohm coax.
- A random wire of around 180 feet using ground as the return (center of coax fitting to antenna and outside of coax fitting to station ground).

An Autek RF-1 Analyst was used to make impedance readings of each antenna on all bands, 80 through 10, including the WARC bands. The impedance ranged from a low of 4 Ohms at 3560 kHz on the 20 meter half square to a high of 341 Ohms at 7040 kHz on that same antenna. All other measurements fell between these limits.

In all cases the tuner was able to find a match with an SWR of less than 3:1 in less than 3 seconds. In most cases the tuner found a match with an SWR of 1.5:1 or better in less than the stated average of 1.5 seconds. The matches requiring the greatest time and resulting in the highest initial SWR occurred while trying to load the 20 meter half-square on the 80 meter band (the 4 ohm Z load) and the 40 meter vertical on 20 and 80 meters. With the up/down buttons I was able to fine tune the 20 meter half-square to 1.3:1 on 80. I got the 40 meter vertical down to 1.8:1 on 80 and to 1.1:1 on 40. I was especially pleased with the way it tuned the random wire. Tuning was quick and the matches were good.

The tuner exceeded my expectations. I took it to our QRP society meeting and everyone was amazed at how fast it found a match as we switched from band to band. It does a great job. I recommend one for any QRP mobile or home station. However, it may be a little bulky and eat too much power for the back packer with tiny batteries. The quality and capability are well worth the price of $100 plus $6.00 shipping in the US. For those interested in obtaining a copy of the microprocessor source code, it can be down-loaded from the ARRL BBS.

LDG Electronics can be contacted at 1445 Parran Road, St. Leonard, MD 20685, Phone 410-586-2177. If you are on the Internet and have "World Wide Web" capability, check out their WEB site at http://www.radix.net/~ldg. (E-mail can be sent to ldg@radix.net)

Members' News

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QRP 'News'-makers in 1996

With the start of the new year, it's Members' News' traditional time to reflect on 1996 and to thank those who made this column happen.

KI6SN
. . .Richard Fisher

In such busy times it's no small task to find a few spare moments and muster enough energy to sit down, compose something for publication, and send it to the Members' News columnist. Yet you do it. Year in and out.

Here are the operators who shared the good news and challenges of their QRP experience with Members' News readers during 1996:

Paul Goemans, WA9PWP; Mike Kopacki, KF2EW; Danny Gingell, K3TKS; Paul Taylor, WB2GIN; Bob Hartley, K2QJ, Eric J. Bowser, KB3BFQ; Rob Neece, N4JEO; Larry Mergen, N0IZZ, John Walder-Davis, G0KCA; Bruce Milne, WB2QAP; Hans Tscharner, HB9XY; Bob Lisenfeld, WB0POQ; J. Frank Brumbaugh, KB4ZGC; John H. Shannon, K3WWP; Warren Gregoire, AB6XM; Brian Howard, KA9SZX; Tom Chisnell, W6XF; Pablo Luis Robles, WP4JXD; Marv Holmes, W0YHE; Jim Cates, WA6GER; Richard Smith, N7CTJ; Jo Milkuckis, K3CHP; Frank Van Derpoel, K6UIZ; Doug Hendricks, KI6DS; Bob Hartley, K2QJ; Bob Seymour, W0LK; Mike Czuhajewski, WA8MCQ; Russ Sutton, W3MY; Ralph Irons, AA6UL/4; and Ace Collins, K6VV.

For their cards, letters, pieces of e-mail; photographs et al, thank you so very much.

And since taking on duties as Members' News editor several years ago, I've had the happy duty of dispensing "Goodie Giveaway" items to randomly-drawn contributors. Most of these prizes have been graciously donated over the years. For 1996, the gifts came compliments of: **Doug Hendricks, KI6DS; Don Dorn, KJ5MG; Dick McIntyre, K4BNI; and J. Frank Brumbaugh, KB4ZGC.** Many thanks to them, as well.

Here's an open invitation to every QRP ARCI member to drop a note or photograph to Members' News in 1997. There's a lot of good work going on in QRP construction and operation. Sharing the news with others is part of what makes QRP such a fabulous part of amateur radio. The addresses at the head of this column are the pathways to telling your story.

A sincere "72" to all who have contributed in 1996, and here's hoping to hear from you all this year.

— R. E. F.

Doing a lot of QRP with a little (space)

Lou Moxey, N3CZB, writes from Doylestown, Pa., that he has put together "what might be called a compact low power shack in a studio apartment, complete with indoor antennae.

A tidy QRP layout put together by Lou Moxey, N3CZB, of Doylestown, Pa., proves that low power operation is possible even from a third-floor studio apartment using primarily indoor antennae.

"Except for the keys, all equipment is on a wood rack behind the desk — which can be cleared for desk work.

"At desk level are the QRP rigs for 10, 20, and 30 meters. The 30-meter rig at the bottom center was completed recently from a Small Wonder Labs GM-30 kit. On the first shelf is the QRO rig — a Century / 21 having 30 watts output.

"At the top are the antennae switching phono plugs and jacks, a dummy antenna and power supply for the QRP rigs.

"Part of one loop antenna is visible at the left side of the photograph. A 30-meter dipole of No. 30 wire is invisible, but the center insulator may be seen at the upper right of the picture. It is only used for QRP. The 30-watt output of the Century / 21 will melt the wire!

"A temporary outdoor antenna is a half-sloper, with counterpoise inside under the furniture. It is cut for 30 meters, but works on 20 and 40 with a tuner.

"This is all on the third floor of an eight-story steel and masonry retirement community building. Management will not permit a permanent outdoor antenna, because it would interfere with the window cleaners, who work from a chair suspended from roof mounted supports."

A good time at the QRP 'Party'

Cam Hartford, N6GA, writes from Claremont, Calif., that he had an eventful day operating from 7,000 feet in California's San Gabriel Mountains during QRP ARCI's Fall QSO Party:

"Got up to Table Mountain (north of Los Angeles) at 6:55 a.m. Sunday. I knew something was odd because as I drove up the hill, the temperature gauge on the car went down!

"According to . . . the camp host, it was 28 degrees! Try threading nylon monofilament into lead weights when your fingers don't bend! On an impulse, I snatched my bike gloves as I left the house, and it sure helped to have at least part of my hands covered. What a shock. I thought it might be cool, but this was scary.

"It took an hour to get the antenna up. Five shots with the slingshot, three lost weights, and finally I was in business. Had to splice a couple pieces of 300 ohm line so the lead-in would make it to the picnic table. Got the radio set up and operated an hour or so, but by that time the heat I had generated by putting up the antenna was gone and the wind chill factor was dropping down, so I had to retreat to the car. Much easier operating from the table.

"A real pain in the car, what with Sierra, tuner, keyer, paddle, battery, wattmeter and laptop, and no real good place to put any of them. I took the Sierra sans KC-2, so had to use CMOS keyer and Kent paddles.

"The campground was very empty except for the Zuni Loop, which was filled with Boy Scouts. I retreated to one of the upper loops and had an equally fine view to the Northeast.

"Wow! What a treat. Good conditions prevailed, and I could pretty much work 'em on the first call. Did 63 QSOs in about 5.5 hours, almost all on 20 meters. Tried 15 and 40, but not much going on there. Not as fast a rate as Field Day, but felt good for a QRP test at 1 watt. I'd have loved to have the Six Shooter up. My first 20-meter QSO was with KH6CP/1, so I knew it was going to work.

"I connected the TFR (newly completed Trail Friendly Radio) to the Hamstick so I could listen to the contest on the way home. As I was driving out of the campground, I heard someone working **(Wes Hayward) W7ZOI.** I called him and snagged him. Got a 339, but considering the power and the lousy mobile antenna, it was an amazing feat."

Great balls of QRP 'Fire'

Michael Griggs, N5FOS, writes that "the simple Fire-Ball transmitter was my first attempt at serious QRP work. I built one of these during the popularity time in which the rig got famed. My Fire-Ball number is 143 of this unique 'sub club' effort.

"On Friday September 13, 1996 at 04:43 p.m., Dallas local time, I had a rather interesting QSO. On the frequency 14.060, I managed to work the station YS1Z from El Salvador. The operator's name was Randy. We talked for about fifteen minutes.

"I have not received his QSL card as of yet. The output power of my Fire-Ball was 50 milliwatts. My antenna was a homemade dipole located inside my attic.

"In any event, it sure was fun.

"I like this little pocket rig so well that I had a small TTL oscillator custom made per every band. This was a tad bit expensive to do, but it has been very well worth it."

By the numbers: How low can you go?

Jack Hotchkiss, W7CNL, writes from Boise, Idaho, that he gets quite a few remarks when he mentions his QRP ARCI membership number: 271.

"My membership certificate is not dated but I believe it was issued in 1962. At age 58 I don't really feel like an old timer, but I've had the same call for over 40 years, so I guess I 'are' one.

"I picked up a Century 22 in January and an Argosy in August and I've been 99 percent QRP 5 watts — mostly monitoring 14.060 and really enjoying myself. QRPers are a classy group and seem to really appreciate a two-way QRP QSO as I get a high percentage of fast QSLs, many taking the time to write a friendly note.

"I had the good fortune of getting to know (QRP Quarterly) managing editor **Ron Stark, KU7Y,** here in Boise before he moved to Nevada. It was surprising what he was able to do with the equipment he had," Jack wrote, adding jokingly, "Now that he is building a real antenna farm, I'm sure he will become a QRP DX hog. I sure hope he will QRX one in a while and let the rest of us work some DX."

Keeping in QRP contact

Part of the fun and fascination of QRP comes in hearing of the experiences, challenges and success of others. And telling your story is part of that natural process.

Why not drop a card, letter, photograph or e-mail to Members' News? Sending off a few lines takes only a few minutes. Putting it in the mail or on the wire is painless, and the camaraderie it invokes in the QRP community is a substantial payback.

Here are the only mailing addresses you need:

Richard Fisher, KI6SN
Quarterly Members' News
1940 Wetherly St.
Riverside, CA 92506

(e-mail: KI6SN@aol.com)

Goodie Giveaway

How's this for optimism: This quarter's Goodie Giveaway prize is a copy of **K3CHP's DX QSL Guide,** contributed by the author and QRP ARCI member **Joe Mikuckis, K3CHP,** of Riverdale, MD. History tells us that the propagation doldrums aren't going to last forever — even though it might seem that way at the moment.

Truth be known, however, it won't be long before the bands are hopping and DX is pounding in like the good ol' days. And that's when K3CHP's DX QSL Guide will come in handy. This 100+ page booklet gives the QSLing QRPer "a set of standard sentences, written in various languages, to be selected and copied in QSL-related correspondence, and thereby produce an impressive QSL return." Twelve standard sentences are offered in a lots of languages ranging from Afrikaans to Zulu.

Sincere thanks to Joe for his contribution. Three copies have been provided, so they'll appear also in Giveaways to come.

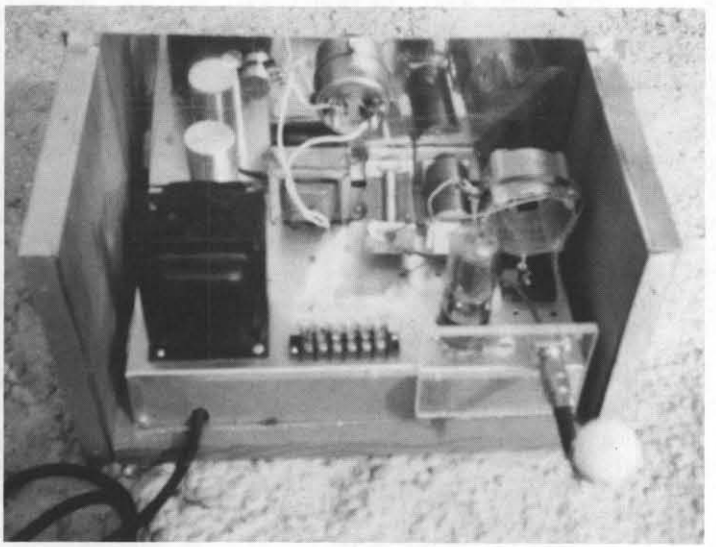
This quarter's winner is: **Lou Moxey, N3CZB,** of Doylestown, Pa. His contribution — as well as the others appearing here — are much appreciated.

To be in the running for next quarter's Giveaway, simply drop a card, letter, photograph or e-mail to the address at the head of this column. Your name and call go into a hat for the random drawing. The hat is emptied each quarter, so your chances for success are pretty darned good.

Members' News Gallery

Dick Swanson, N5JWL, writes from San Antonio, Tex., that he's having fun running QRP mobile. "The rig is a QRP Plus, MFJ 901B antenna tuner, SWR/ power meter and very small keyer. The antenna is a Hustler (20 meters) with mag mount. I built a cabinet for all the equipment. Even holds a log book and extra antenna tuner and 12-volt gel cell."

Edwin Keck, KI5IE, of San Antonio, Tex., gets some extra antenna height for his QRP operations by piloting an ultralight aircraft frequently when he gets on the air. He has also built an all-band transmitter, which is better suited to operation on terra firma. "It runs a 6L6 in the final and is crystal controlled with a built-in power supply."



Some Notes on Antenna Bandwidth

L. B. Cebik, W4RNL, QRPARCI #2572, 1434 High Mesa Drive, Knoxville, Tennessee 37938-4443 cebik@utk.edu

For most of us, the antenna's bandwidth is the number of Hz for which the antenna will exhibit a less than 2:1 SWR. We usually measure bandwidth at the transmitter output, and hence put a large pile of variables on top of the basic idea of SWR bandwidth. So let's begin again and see how the concept actually works.

An antenna--for example, a resonant half-wavelength dipole operated on its fundamental frequency--has a natural feedpoint impedance. For a lossless wire dipole in free space, that figure is just about 72 ohms. In fact, NEC-2 models of just such an antenna using wire diameters from #30 to over 2.5" show less than 1 ohm variation in the 72-ohm feedpoint impedance.

Relative to that impedance, a 2:1 SWR will occur as the feedpoint impedance (off resonance, a complex of resistance and reactance) reaches or 144 ohms at points higher or lower than resonance. The number of Hz (of kHZ or MHz) between those frequencies is the 2:1 SWR bandwidth of the antenna. The bandwidth will vary with the diameter of the antenna element in a regular but nonlinear manner.

2:1 SWR bandwidth is approximately (but again, nonlinearly) proportional to frequency. For a given wire size, a resonant dipole at 28 MHz will have (about) twice the bandwidth of a resonant dipole at 14 MHz.

Table 1 Selected 2:1 SWR Bandwidths for Wire Antennas

Frequency	3.5 MHz	7 MHz	14 MHz	28 MHz
Wire Size (diameter)		2:1 SWR Bandwidth in MHz		
#28 AWG (0.013")	0.17	0.35	0.73	1.63
#12 AWG (0.081")	0.19	0.40	0.86	1.91
#4 AWG (0.204")	0.22	0.46	0.98	2.18
(1")	0.30	0.63	1.35	3.06

To help you gain a reasonable expectation of the 2:1 SWR bandwidth of resonant half-wavelength dipoles, I am attaching a small BASIC utility program that will produce bandwidth tables for any HF frequency for wires from #30 (0.01" diameter) to 2.5" diameter. It is roughly calibrated to NEC- 2 models for lossless wire resonant dipoles in free space and to 72 ohms. The algorithms are generally accurate to about 5%, with some matrix-center variations reaching about 10%. The figures are roughly applicable also to resonant quarter-wavelength vertical antennas.

Table 1 sumarizes a few data points for thin, medium, and thick antenna elements on 80, 40, 20, and 10 meters. The increase of bandwidth with frequency for a given wire size is evident. Notice also that it takes nearly a 100:1 wire size increse to double the bandwidth of the antenna on any given frequency.

The degree of error in the program is of no concern, since real antennas and antenna systems will introduce larger variations that no table can account for in advance. Hence, the program is only for getting some reasonable expectations, not for predicting bandwidth wit precision. The bandwidth you actually measure will vary with the following variables:

1. Antenna type: Low impedance antenna types will generally (but not always) have wider bandwidths than high impedance antennas.

2. *Antenna material: Copper and aluminum* have losses that affect antenna bandwidth, especially with small diameter wires (less than #20).

3. Antenna environment: Placing an antenna some height above ground less than about 2 wavelengths will alter both the natural feedpoint impedance and the bandwidth at that impedance. Ground clutter in the near field of the antenna will affect both in ways that are for practical purposes unpredictable.

4. Feedline mismatch: Feeding a 72-ohm antenna with our common 50-ohm coax starts us out at 1.4:1 SWR, hence decreasing the 2:1 SWR bandwidth. The reduction of SWR bandwidth is a function of a complex curve that begins with a shallow decrease, narrows to the inverse of the SWR at the 1.4 SWR point and then decreases rapidly toward zero as the basic mismatch SWR grows to 2. Hence, for the case of the dipole fed with 50-ohm coax, we should expect *about 70% of the program's* estimated bandwidth. (This fact explains is why some claim a slightly wider band width for inverted Vee configurations: being closer to 50 ohm natural feedpoint impedance, Vees introduce less bandwidth narrowing due to the slight mismatch).

5. Feedline losses: Even well-matched transmitter-feedline-antenna systems introduce some losses in the feedline. The effect of these losses is to reduce the SWR at the transmitter end of the line, thus giving a wider 2:1 SWR bandwidth. This wider bandwidth is usable, so long as we understand and evaluate the acceptability of the power losses involved.

6. Antenna shortening and loading: Although antenna loading for the sake of shortening reduces the feedpoint impedance, it introduces components that raise antenna Q and narrow the bandwidth. As a rule of thumb, bandwidth is reduced by the percentage of shortening of the antenna. For example, a 33' vertical on 80 meters is about half size, and its bandwidth is about 70 kHz for most common loading schemes--just about half the bandwidth of a full size quarter-wave vertical.

Understanding these bandwidth-altering factors along with the basic output of the program can give us reasonable expectations for antenna bandwidth for the various bands. If our antenna system is more than about 20% off the mark, then we begin to search for possible problems.

Remember that these notes do not apply to antennas fed with parallel feedline and an ATU: those we always tune for 1:1 SWR and maximum power output to the line and antenna.

Finally, if you do not like typing BASIC programs or converting them to C, a version of the program will appear in VE3ERP's HAMCALC collection, available in the Lehigh.edu archives or directly from Murph. Address: **Mr. George Murphy, VE3ERP;** 77 McKenzie Street; Orillia, Ontario; L3V 6A6 Canada.

Program Listing

```
10 ' BW.BAS
20 CLS:SCREEN 0: COLOR 2,,4:CLS
30ER$=STRING$(70,32):BW$="###.###":WIRE$="#.###":S$=
STRING$(10,32): T$=STRING$(6, 32)
40 ' Estimates 2:1 SWR bandwidth of halfwavelength dipoles for
a range of common wire and tubing sizes. Algorithm is based on
NEC models of lossless wire dipoles in free space and is based on
a feedpoint
50 ' impedance of 72 ohms. Program does not account for
material losses, feedline losses, mismatches, or the antenna
environment. Accuracy averages 5%.
60 PRINT "  Estimated 2:1 SWR bandwidth of half-wavelength
dipoles at any HF frequency"
70 LOCATE 2,25:PRINT "by L. B. Cebik, W4RNL"
80 LOCATE 3,15:INPUT "Enter any frequency from 3 - 30 MHz:
",F 90 IF F>30 OR F<3 THEN LOCATE 3,5: PRINT ER$:GOTO
80
100 PRINT "Wire size","Wire dia.","Bandwidth";S$;"Wire
dia.";T$;"Bandwidth"::PRINT " AWG ","inches","  MHz ";S$;"
inches",T$;"  MHz  "
110 FOR J=30 TO 2 STEP -2
120 AWG$=MKS$(J):N=J:AWG=J
130 K#=(.46/.005)^(1/39):WIRE=.46/K#^(N+3):DIA=WIRE
140 DIA2=DIA-((.4343*LOG(30/F))*(DIA/(2*(2.56/DIA))))
150 BWBASE=(.0469+(((F/3)-1)*(.0116/9)))*F
160 BW=((SQR(DIA2))+.9)*BWBASE
170 PRINT AWG,:PRINT USING WIRE$;WIRE,:PRINT"
",:PRINT USING BW$;BW
180 NEXT
190 FOR J=.375 TO 2.5 STEP .125
200 DIA=J
210 DIA2=DIA-((.4343*LOG(30/F))*(DIA/(2*(2.56/DIA))))
220 BWBASE=(.0469+(((F/3)-1)*(.0116/9)))*F
230 BW=((SQR(DIA2))+.9)*BWBASE
240 K=(J*8)+3:LOCATE K,50
250 PRINT USING WIRE$;J,:PRINT S$;:PRINT USING
BW$;BW
260 NEXT
270 LOCATE 23,5:PRINT "Another <F>requency or <Q>uit"
280 A$=INKEY$
290 IF A$="f" OR A$="F" THEN 10 ELSE IF A$="q" OR
A$="Q" THEN 300 ELSE 280
300 END
```

THE QRP WORKBENCH

By Bruce O. Williams, WA6IVC, MXM Industries, Rt 1 Box 156C, Smithville, TX 78957

PART I. THE WORKBENCH AND TEST EQUIPMENT

QRP operators ARE different from other Amateur Radio Operators. Their interests are not different from the rest of the ham community, but they lean toward simplicity of operation coupled with a desire to build and test their own equipment. Commercial ham equipment is extremely complicated, both from a construction and technical standpoint. As a result, prices for commercial Amateur Radio equipment have become, for most of us, prohibitive. QRP operation offers the experienced and the inexperienced operator the opportunity to not only acquire reasonably priced equipment, butto take an active part in the design, construction and testing of it.

The interest in QRP operation over the past ten years has created a new set of requirements. Equipment must now be simple, and the technical requirements for QRP operation demand the highest performance for the most cost effective design and construction. QRP operation is, by definition, weak-signal work. As such, receivers must be highly sensitive, extremely selective, and devoid of most features such as noise blankers, memories, dual VFOs, digital processing, etc., that drive up the cost of commercial equipment, but do not necessarily make a radio more useful for the ultimate purpose, COMMUNICATIONS!

This series will talk about some of the things that I have found needed for home construction and testing of simple QRP equipment. We will discuss the QRP experimenter's workbench, tools and test equipment, troubleshooting and repair of simple transmitters and receivers--the kind that are provided in kit form, or are designed by the experimenter for his own use. I'll try to make it interesting, also. If you have specific questions that you'd like to see covered, write to me at the above address, and I'll try to answer them.

First in a series!

Lets all give a big welcome to **Bruce Williams, WA6IVC**.

Have you ever wondered what tools and equipment you would need to build that kit you have been looking at? What will it take to get it going once it's built?

This is the place for you. **Bruce** will be covering all that and more in the coming months.

de **Ron, KU7Y**

Costs

A word about costs. Amateur Radio is a hobby--it should be fun. One sure way to take the fun out is to find out you can't afford what you need or want. I estimate that to properly set up a workbench, with minimum tools and test equipment, will cost in the neighborhood of $500. This is not a one-time, start-up investment, like a set of golf clubs, but can represent the investment over several months, or even years. Of course, like any hobby, you can spend as much as you want. Where possible, I'll note typical costs for each item I describe.

Choice of Workplace

Choosing a working space for your experimenting is a real

challenge. Primarily, choose a work area that can be DEDICATED to your messing around. It need not be large, but it should be provided with sufficient climate control so that you can "go to the shack" any time you wish. This means that the location can be in a small room in the house, or in the garage or attic, or in a separate building. A door, to keep out rug- rats is more than a nicety--it's a necessity! It is important that the work station need not be dismantled or stored away when not in use.

1. You want your workbench to be accessible when needed, and having to set everything up each time you want to work on something just means that you won't do it! A small table or desk in an isolated room or corner of the house is ideal. It needn't be especially attractive--in fact, during periods of rest and non-use, it probably will look like a rat's nest. My shack is in a separate building, air-conditioned and heated, and about 15 minutes after I clean it up (every couple of months or so), it looks like it did before all that mop and broom work. (There's nothing like a clean shack to suggest some new, necessary messing around.) It is MY shack, though, and I can do what I want in it. My XYL doesn't understand all this, but she accepts it! A word about XYLs--make sure she understands this is SACRED ground, or if she can't understand that, get a LOCK with only one key!

Suggestions for the Workbench

1. No carpeting! Clipped component leads, if they fall on carpet (and they will) get into the weave of the carpet and are next to impossible to remove. I scrapped about 25 yards of indoor-outdoor because of this! The XYL thought carpeting would make my shack a real attraction for any visitors. Try bare feet on a clip-loaded carpet!

2. Think carefully about component storage! Small, multidrawer storage cabinets, available at about $6.00, solved this problem for me.

3. Shelving for storage is great, but it can be expensive! Look at some of the 6-foot high bookshelves available at about $30 at various department stores (limited assembly required).

4. Keep the most-used tools on the bench! There's nothing worse than trying to find something you need in drawers or boxes. You don't need any more frustration than you came to the shack with!

5. Have a central power control point. A 115-volt, switched power strip will save lots of time and energy. ALWAYS TURN OFF ANY TEST EQUIPMENT WHEN YOU LEAVE THE SHACK! Soldering irons are great fire starters if left on.

6. Consider your age and eyesight--provide lighting sources WHERE you need them. My old eyes require lots of light, and some (lots) help from magnifying eyeglasses. Swing-arm INCANDESCENT lamps are the solution--don't use Neon lighting if you expect to hear anything on your radio!

Tools and Test Equipment

This list of tools and test equipment should only serve to provide you with a wish list. Starting in the next installment, I'll talk about each listed item in detail. Inventory your existing equipment against the following list, and earmark the items you already have and are satisfied with. Make another list of the items you absolutely need, and a third list of the items that you'd like to have, subject to fund availability.

Tools

1. Soldering iron or station with iron-plated or iron tip. Maximum rating should be about 25 watts.

2. Long-nose pliers, diagonal cutters and wire-strippers. These should have relatively small jaws to allow working in tight spaces.

3. Phillips and straight-blade screwdrivers. Again, include some small ones, but be sure that the shanks are at least 4" to 5" long.

4. *Metal-working tools suitable for use with aluminum.* Include a set of small jeweler's files, a tapered reamer, and a 6-in. metal scale.

Test Equipment

1. Volt-ohm-meter. Remember that we are experimenting--we don't need equipment with laboratory precision. We're not as interested in the exact voltage, but WHETHER THERE IS ANY!
2. Frequency measuring equipment. A frequency counter is fine, but a general coverage receiver is much more useful!

3. The ultimate test unit is the Oscilloscope. I could not get through a day without my 15-MHz unit. It allows me to measure both AC and DC voltages, estimate frequencies, determine quality of the signal, and perform time-dependent measurements.

4. Various items, such as grid-dippers, signal generators, capacitance and inductance meters are nice to have, but not absolutely needed.

Next time we'll define several options in tools and test equipment. In anticipation, locate your copy of catalogs from the following companies, or order them from the addresses given. Although most items can be purchased locally, many people live in areas not served by the local outlets. Catalog prices also give you an idea of what to expect in the way of local prices. Remember that buying from one of these mail-order houses entails minimum buy requirements ($25 in most cases) and the cost of shipping and handling. It is always preferable to buy your items locally, if possible.

Mouser Electronics
958 North Main Streett
Mansfield, TX 76063-4827
Phone: (817) 483-4422
E-mail to sales @ mouser.com

Marlin P. Jones & Assoc. Inc.
P. O. Box 12685
Lake Park, FL 33403-0685
Phone: 800-652-6733
FAX 800-432-9937

Digi-Key Corporaation
701 Brooks Ave. South
Thief River Falls, MN 56701-0677
Phone: 800-344-4539
FAX 218-681-3380
HTTP://WWW.digikey.com

IDEA EXCHANGE

Technical tidbits for the QRPer

Mike Czuhajewski WA8MCQ 7945 Citadel Drive, Severn, MD 21144 wa8mcq@abs.net WA8MCQ@KA3RFE.MD

IN THIS EDTION OF THE IDEA EXCHANGE:

TOOL FOR SLOTTED NUTS ON PHONE JACKS

In a recent posting to QRP-L, **Chuck Adams, K5FO** (adams@chuck.dallas.sgi.com) complained about the mounting nuts on miniature phone jacks. You know the ones--round, sometimes knurled, with little slots on either side of the center hole (Figure 1A). You can use a pair of tiny wire cutters as a spanner wrench, with one tip in each slot, or a small screwdriver to push on one of the slots, but these are cumbersome and there's a good chance of slipping and damaging a panel or hurting yourself. He wanted to know if there's a better nut to use on them, preferably a hex nut.

Mike Ardai, N1IST (n1ist@netcom.com) and **Zack Lau, KH6CP/1** (zlau@arrl.org) replied that Mouser has tools for exactly this purpose, in two sizes for both the 3.5 and 2.5 mm jacks. They've had them for several years now; here's a repeat of my item in the October 1992 Idea Exchange--

"What QRPer or homebrewer hasn't mounted a miniature phone jack and cursed the little round, knurled nuts that come with most of them? About all you can do is try gripping them with a pair of long nose pliers, or maybe stuff the tips of a tiny pair of scissors or tiny long nose pliers into the two slots, but nothing really works well. Good ol' Mouser just came to the rescue. In a recent catalog they introduced a pair of knurled nut drivers made specifically for them. They come in two sizes, for both the miniature (3.5 mm) and subminiature (2.5 mm) jacks, which take 6 mm and 4 mm nuts, respectively.

"These resemble normal nut drivers, but the ends have two little studs that stick out and engage the slots on the nuts, and the center has a small shaft that fits into the jack itself for positioning. Price is about $7 for either one; these fall into the category of "specialty items that cost way too much and which you'd only use once in a lifetime but which you can't live without once you have them." (Look in the index under Tools, Knurled Nut.)"

Mike says the Mouser part numbers are 382-0004 for the 4 mm nuts that fit 2.5 mm jacks, and 382-0006 for 6mm nuts (3.5 mm jacks).

Here's a cheaper method, a tool you can make at home from an old, beat up screwdriver. **Claton Cadmus, KA0GKC** (CLATON.CADMUS@hamlink.mn.org) passed this on: "Take an old screwdriver that is as wide as the whole knurled nut. Carefully file the end flat and narrow down the blade thickness so it's a good fit to the slots in the nut. Then, with a small square file, make a notch centered in the blade that just fits the phone jack stub. It might take 20 minutes to make the tool, and it works great." (Figure 1B, C, D.)

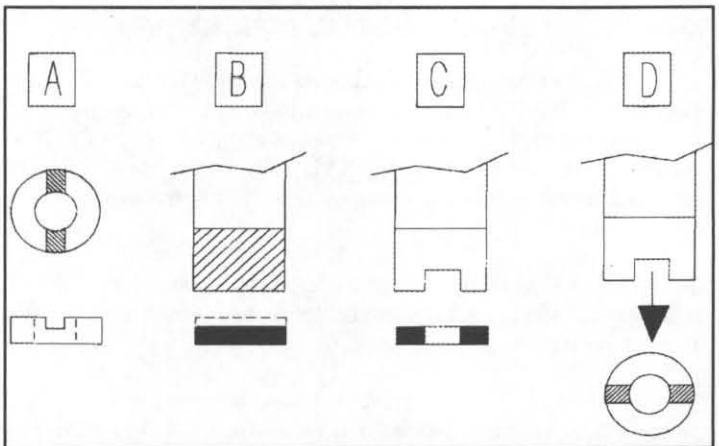


Figure 1—Knurled nut tool (KA0GKC idea)

Paul Harden, NA5N (pharden@aoc.nrao.edu) also pointed out that this tool can be used in a VCR for some of the adjustments.

ALTOIDS BOX SUBSTITUTE

From **Dick McIntyre, K4BNI** *of Basye, VA, regarding the current craze of building rigs in tiny boxes*--Fans of Sucrets and Altoids cans may wish to check out another can labeled "Jacksons of Picadilly". These cans, which contain various English tea imports, are 3" square and 4" high with a topside lid. They should make a good container for rigs or other small projects. If not available in major food outlets, check health or specialty food stores. As a bonus, the tea is very good!

--DE K4BNI

ANTENNA TENSIONER

From **Joe Everhart, N2C***X of Brooklawn, NJ, here's Joes Quickie #20, along with the KeyCAD drawing he provided*-- The human animal is a tool maker. He uses his brain and his hands to

fabricate devices that make his life easier. And I'm no exception. My old scout leader Pops Wilhelm is probably turning over in his grave, but I have to admit that knots are something that always escape me. Bowlines and half hitches and all that stuff vanish from memory seconds after somebody give a lesson. So, when it comes to securing wire antennas, a favorite obsession, I need help!

While camping, I ran across a very clever device used to adjust tension on the lines that secured a tent to its stakes. It didn't require any fancy knotsmanship or talent, just a little care in its use. Recently, when putting up a temporary QRP Afield Antenna, I happened to remember the clever little device so I'd like to share it with my fellow QRPers.

The tensioner is really quite simple. You can see in Figure 2A that it's nothing more than a flat rectangular piece of material with two holes drilled in it. The line to be adjusted passes through the hole at end A several times. A loop of line is then passed around the tent

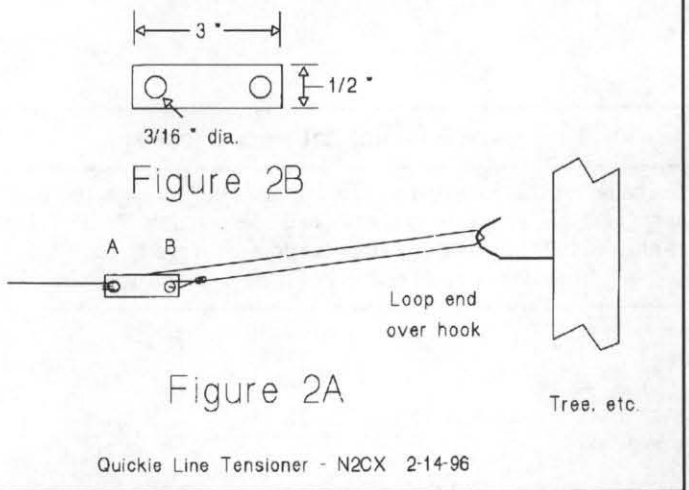


Figure 2—Antenna line tensioner (N2CX idea)

peg or tree or whatever stationary support is used and then tied off in the hole at end B. When the line is pulled tight, the friction of the tight loops trough the A hole prevent the line from slipping. To adjust the tightness of the line, simply remove tension from the loops and pull the tensioner away from the support. Believe it or not it really works!

You can build these gems very easily from scrap material. Figure 2B shows some sample dimensions. These are by no means sacred, just something I measured from some tensioners I built. The material can be almost anything that has some strength and stiffness with the dimensions shown. I've used .040 to .060 aluminum scraps, .062 glass epoxy circuit board and some plexiglas that was about .125 thick. Be careful of sharp edges with metal or the glass epoxy board that can cut the guy lines.

In a pinch to replace some on tents, I made some from parts of a plastic clothespin. The clothespin was the two-part kind with a spring clip. On disassembly, this yields two sort of flat rectangular pieces of plastic. Using a penknife, I bored holes in either end and voila! - instant tensioner.

While these are handy for temporary antennas, they will eventually loosen up, particularly in windy weather. For permanent antennas you gotta use the right knots!

--DE N2CX

QRP-PLUS MICROPHONICS

Frank Brumbaugh, W4LJD (ex KB4ZGC) *of Salinas, PR once mentioned that his QRP-Plus transceiver was somewhat microphonic, and I told him that every one of the 3 or 4 I'd seen had the same problem. He later responded with this*--If your QRP Plus is microphonic when it is bumped, open it up and tighten the four screws holding the top PC board to the stack. It will be a good idea to check these screws occasionally if you move it around much, especially if you use it mobile. There's no guarantee it will help all of them, but it worked for me."

--DE W4LJD (ex KB4ZGC)

KEYCAD FOR DOS NOW ON CD-ROM

I've been using KeyCAD for my drawings in the Quarterly for over 2 years now. I'm still grateful to Doug Hendricks, KI6DS, for turning me onto this inexpensive but useful drawing program. Several others on QRP-L have been using it as well, and I've sent many of them copies of my electronics symbols library (which is considerably better than the one that comes with the program). There were both DOS and Windows versions available, although the two use different file structures so drawings (and libraries) are not directly transportable between the two. Back then, DOS went for about $20 and Windows for $30 and they were widely available at places like Office Depot, Circuit City, Best Buy, etc.

I hadn't seen the DOS version lately, and was afraid that it had disappeared from the market. However, Larry Wise, KA5T (lewise@admin.inetport.com) reported that he found what he thought was the DOS version of KEYCAD. "It is in one of those $12.98 CD-ROMs from KEYSOFT (Softkey). It's called CAD CREATIONS on the label, but when you get down into the program both the directory and the program are named KEYCAD, so I'm hoping it's the same." He sent me a directory of all the files, and it is exactly the same as the DOS disk I bought a few years ago, including .exe, help files, libraries and sample drawings. I looked in a local Staples office supply store and sure enough, I found the CD-ROM; Larry says he got his at Sears, and that he saw displays for Softkey at KMart, Walmart, and Office Max.

Larry says that the CD-ROM also comes with a minimal documentation file. "They say, in the 10 page writeup that you can print out, that the help is pretty basic and that a 'more detailed' manual is available for $12.95 plus shipping and handling." That makes the total cost for program and manual about $26, which is still quite reasonable. (The DOS disk that I bought did include the manual; while it is better than the on-disk documentation, it still leaves a bit to be desired.) If anyone has the DOS version, I'll be glad to send them a copy of my electronic symbols library on disk or it can be found via Internet ftp in the QRP-L area of lehigh.edu. Do an anonymous ftp to ftp.lehigh.edu, then change directories to pub, listserv, qrp-l, tools. (Remember, it is not compatible with the Windows version.)

GEL CELL CHARGING & MONITORING

From "The QRPer Formerly Known as KB4ZGC", **Frank Brumbaugh, W4LJD** ***of Salinas, PR***--After a gel cell battery, normally floated across a 13.8VDC supply, has been used for a while--such as during the 5 day power outage caused here by Hurricane Hortense--putting it back across a 13.8V supply will cause much higher than 0.1C charging current to be drawn, which is not good for the battery. Figure 3 is a partial circuit to be added to the existing station power supply which allows current to a heavily discharged battery to be controlled and monitored.

Not shown are bypass capacitors on the 317T regulator, nor values for the suppressed zero, expanded scale voltmeter circuit (R1 and D1) and some other components. S1 is a 2 pole, 3 position rotary

and S2 is an SPDT, center-off toggle switch.

It is not "idiot proof" as shown. S1 should be in the CHG position before S2 is switched to CHG so charge current can be monitored on the meter. R2 controls the charge current to the gel cell. I am assuming that others are also "meter freaks" like I am and like to monitor as many parameters as possible, so the main shunt, meter, and current and voltage switching are already built into the power supply.

The use of a 317T 3-terminal regulator (heat sinked, of course) allows up to one ampere of charge current, which is a charge rate of 0.1C for a 10 ampere-hour battery, more than sufficient for the smaller batteries most often used to power QRP stations. Full detailed

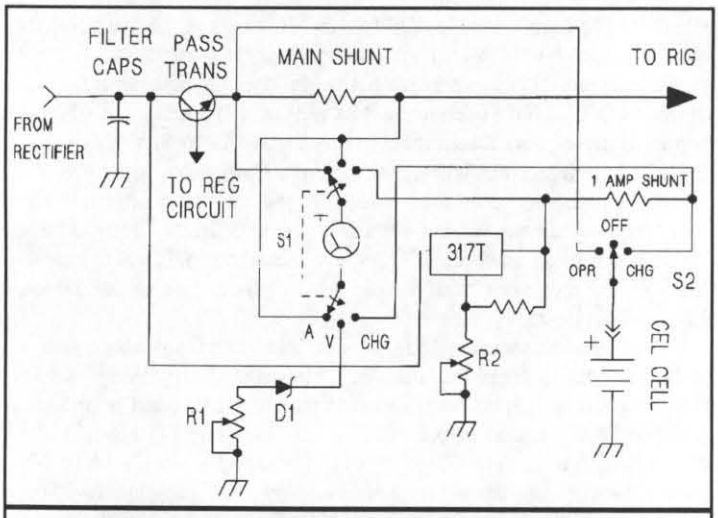


Figure 3—Gel cell charger/monitor (W4LJD)

instructions for suppressed zero, expanded scale voltmeters, and easy construction of shunts using enameled copper wire, is included in my article "Use Those Surplus Meters" in 73 Amateur Radio Today, January 1992, page 42.

The meter monitors output current and voltages from the AC supply in the first two positions of S1, and charging current at the third position when S2 is at CHG.

When the supply is OFF and S2 is at OPR, the battery powers the rig and S1 allows monitoring its terminal voltage and the current drawn by the rig. S2 is normally at its center OFF position. However, to float charge it, with the supply on, switch both S1 and S2 to CHG and set R2 for 100 or 200 mA of trickle charge current, then set S1 as desired to monitor DC voltage or current.

This design is the "simple version" for adding to an existing supply. If I were starting from scratch I might have tried to do everything with more poles and contacts on S1, but maybe not--I prefer the simple approach. R2 should be adjustable from the panel. A mark should be made at the knob position which results in 13.8 VDC at the CHG terminal of S2 with S2 off and the power supply ON. This obviates the need to check trickle current when floating the battery. It will take care of itself if the R2 knob is set at this point and S2 set to CHG.

--DE W4LJD

A USEFUL TOOL--DIAL CALIPERS

From me, WA8MCQ--Here is a useful item for the homebrewer which not everyone may be aware of. Dial calipers are handy for measuring dimensions of parts, holes and cavities, checking to see if a part will fit the space available, seeing how much you have to shave/cut/file off something to make it fit, etc. They are much more useful than a ruler, with much greater resolution and precision, easily reading to within 0.001".

Figure 4 shows a set of dial calipers in the closed position, and Fig. 5 shows it opened a bit. As the jaws are spread apart, the dial pointer rotates; you read the opening of the jaws from two places and add them, somewhat like a micrometer--the nearest tenth of an inch comes from a scale printed on the body, and the dial shows the next two digits, giving resolution to 0.001", or one mil. Figure 5 shows an example of 1.734". Although I didn't show them due to

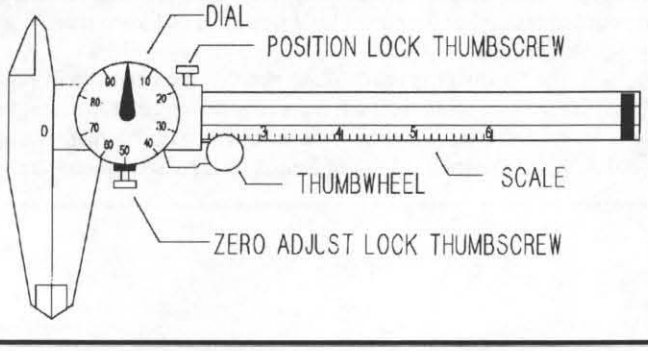


Figure 4—Dial calipers (closed)

limitations of the drawing and printing process, there are 100 marks around the dial, giving direct readout to the nearest mil. You don't have to interpolate between 30 and 40 as the drawing suggests.

Dimensions A, B and C in Figure 5 are all identical. The

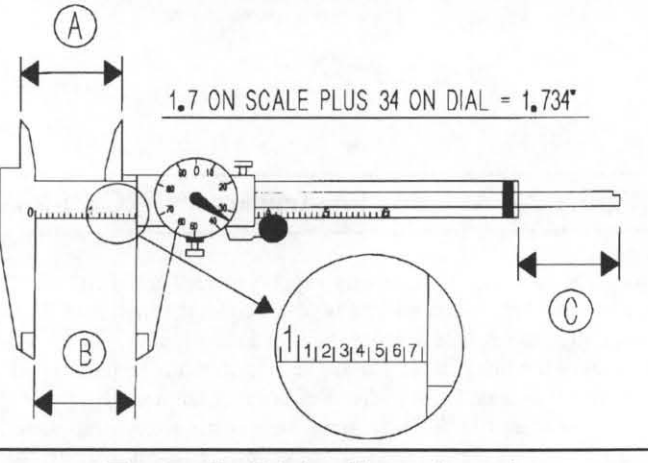


Figure 5—Dial calipers (open)

jaws at B are used to measure outer dimensions, such as thickness, length, etc. Inner dimensions, such as hole diameters and slot openings, are measured at A, and C is used for depth measurement. Figure 6 shows the latter in more detail; extend the center beam from the body (A), insert the end into the hole or cavity and push down on the body (B) until the end is flush with the surface (C).

Back to Figure 4, there is a locking thumbscrew for setting the 0 point. The jaws are closed tightly (after first cleaning them carefully to insure that no small particles will give erroneous readings), and if the pointer isn't quite at 0 the entire dial assembly is rotated slightly after loosening the thumbscrew, aligning the 0 mark with the pointer. (Don't forget to tighten it again!) The thumbwheel is used to open and close the jaws with one hand. If you want to lock the calipers open at a certain setting for some purpose, tighten the thumbscrew to the right of the dial.

Electronic versions are also available, with LCD displays. They often have a few other bells and whistles, such as holding

a measurement display, doing delta measurements, and switching between inches and millimeters, and are more expensive. Dial calipers can be had in either inch or metric versions, but many digital ones are switchable between the two.

Calipers of both types are typically available in 4" and 6" sizes with longer, more expensive ones for those who really need them. At work we have a digital unit which will measure up to 18". The dial unit shown here covers 0.100" in one revolution, although some models cover 0.200" (and are not quite as easy to read).

Who makes them? Some names are Brown & Sharpe, Mitutoyo, Craftsman, Starrett, as well as "house brands" and "no name" imports. Prices vary all over the spectrum, depending on how much importance you attach to the name, what size you want, quality, features, etc. At home I have a 6" Mitutoyo, which is a well known Japanese maker of machine shop items, which I got for $60 (on sale) from MSC, a large industrial supply house in New York, though you can buy less expensive units. If you're looking for a set, check with your favorite industrial supply dealer or catalog (something that most QRPers probably don't deal with!), and you'll find quite a variety.

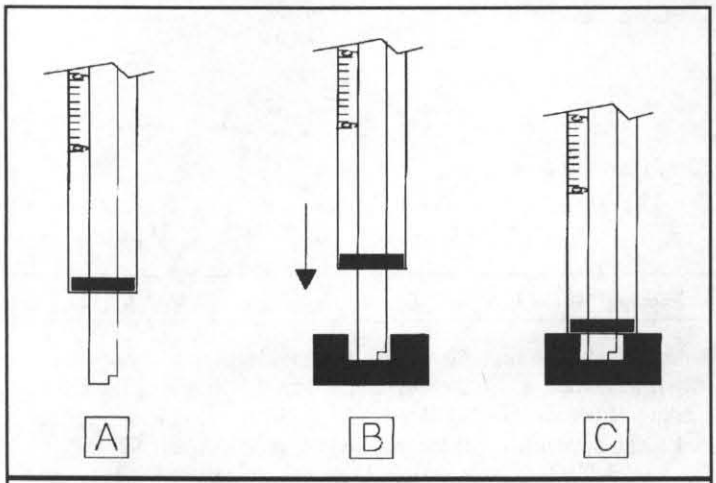


Figure 6—Depth measurement

You might want to contact MSC and ask for a sale flyer to get an idea of what's available; the ones I've seen usually have some dial calipers on sale. You might also want to ask for their catalog, though it's a bit large--the 1996/97 catalog is over 3500 pages (no typo--that's thirty five hundred!) and weighs several pounds. (MSC Industrial Supply Co., 151 Sunnyside Blvd, Plainview, NY 11803-9915, or 1-800-645-7270. They will only send them to street addresses, not to P. O. boxes.)

How much can you expect to pay for what I would consider the "basic" dial calipers, a 6" unit? You can pay in the vicinity of $30 or so, well over $100 and everything in between, again depending on the name, quality, size, features, etc. And how about those no-name imports? Would you trust a $20 set of dial calipers made in China? I can't make any guarantees, just an observation--at work I've seen just such a thing have daily use for the last 4 years and it's still going strong, although they cost more than $20 now.

I've found dial calipers to be indispensable both at home and on the job. If your homebrewing includes a fair amount of mechanical work, such as cutting, drilling, making things fit, etc, a set of dial calipers can be a really handy tool to have.

--DE WA8MCQ

DUAL USE CONNECTORS

There have been some intriguing multiple uses of connectors in QRP rigs of late in **QRPp**, journal of the NorCal QRP Club. Sometimes when you build something you have plenty of room to spare and weight is not a consideration, and you can use a separate connector for everything. There are other applications when you need to minimize space or weight, and making connectors do double duty is helpful; people who like to build very tiny rigs can benefit from these tips, as can those who make rigs for serious backpacking or bicycling.

First, from the June 1996 issue, **Ori Mizrahi, AC6AN,** reports on an idea he credits to **Jeff Furman, KD6MNP** (both are QRP-L regulars). His item was one of a number of modification articles for the 40-9er transceiver (or 49er, as some call it). Says Ori, "I put the 49er in a box and had to worry about the inconvenience of disconnecting the [9 volt transistor radio] battery. I talked with Jeff and he he was "surprised" I don't use what he considers a natural power switch.

"This is taking advantage of a stereo 1/8" phone socket and the fact that a mono plug shorts the middle contact to the ground (not

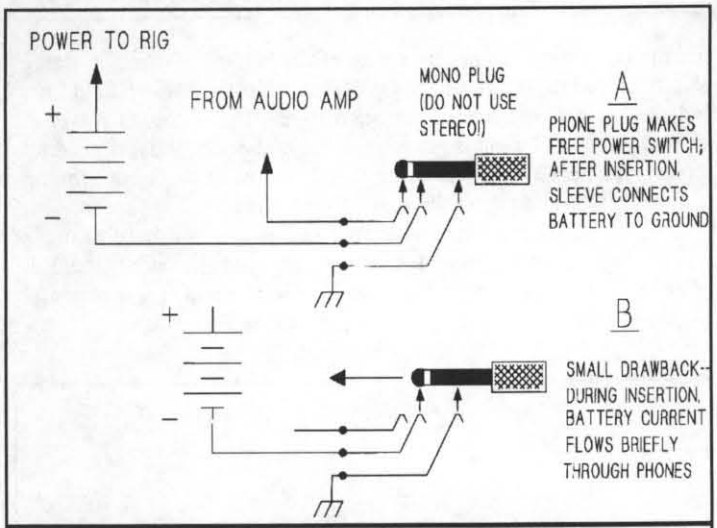


Figure 7—Free power switch (A); KD6MNP

to the tip). Wire the earphone socket in the following manner, as shown in Figure 7A:

—Tip--audio out

—Middle (ring)--battery negative side

—Ground--PCB ground

"Jeff also warned to plug in the earphones BEFORE they're in your ears. I would appreciate it if someone lets me know what happens otherwise!" **--DE AC6AN**

Figure 7A shows this method. Note that the internal battery supply does not go to ground directly, but is switched to ground by the mono plug inserted into the stereo socket. As for Jeffs warning, here's what happens: as shown in Figure 7B, as the plug is inserted, the tip first contacts the ring contact of the socket, and a DC path is completed to ground through the earphones. The amount of current inrush is determined by the size of the various capacitors that may happen to be connected from the power line to ground, and is limited by the resistance of the headphones and its cable. I can't guarantee that this method will always be safe--some damage to the headphones could result due to the initial current surge, but it will be only a brief surge as long as you push the plug in quickly.

Figure 8 shows a possible alternate method that I came up with. In this case mono phones are used (or stereo wired as mono, with both sections in parallel) but with a stereo plug on the end. The phones are connected to the ring and sleeve, while the tip is also connected to the sleeve. Inside the rig, the audio line is connected to the ring contact

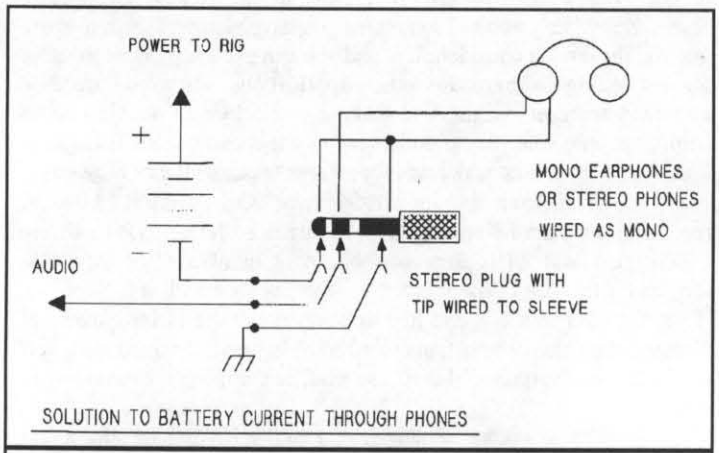


Figure 8—Alternate "free switch" (WA8MCQ)

and the tip goes to the negative side of the battery. When the stereo plug is shoved in, the grounded tip first contacts the audio output line, and nothing bad can happen by shorting the line since no power is applied yet. As the plug is pushed the rest of the way, the grounded tip contacts the negative battery contact, and current flows through the tip to ground. The audio goes through the ring contact to the phones.

A slight drawback of my method is that you have to use a specific set of headphones with the rig, with a specially wired plug. But regardless of which circuit you use, you've eliminated the expense, weight and volume of a switch. **--DE WA8MCQ**

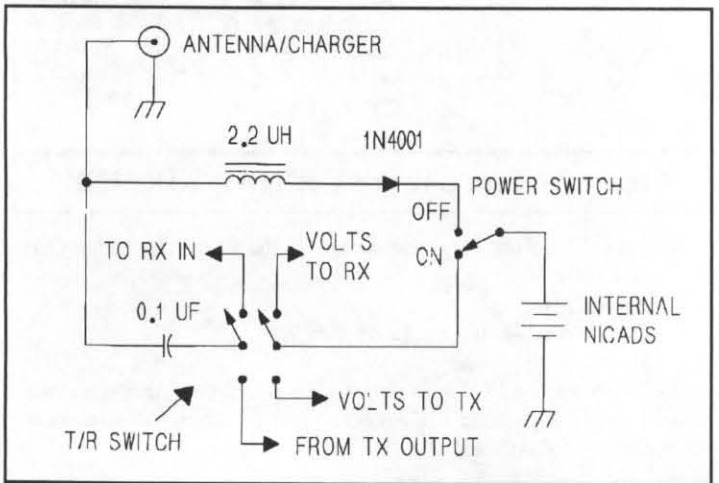


Figure 9—Charging via antenna jack (VE7CVJ)

Next, in the same issue of QRPp **Peter Talbot, VE7CVJ** describes his own little rig in "Wilderness Wireless at its Best: A Story of Adventure on the High Seas". It's a very simple, small CW rig designed for small size and weight for serious wilderness use. Power comes from an internal ni-cad pack of 4 AA cells, and when it is not in use he charges the battery from a small solar panel. How does he get the charging current into it without adding a connector? He makes the antenna connector do double duty--it either puts out RF or takes in milliamps.

Figure 9 shows how he does it. When the rig needs charging, power comes in the antenna connector, is blocked from the T/R switch by a capacitor, and flows through a small coil and a diode, through the power switch (in the OFF position) and into the battery. When operating, the battery is disconnected from the charging line and powers the rig. Since a little bit of RF could leak through the capacitance of the switch, the 2.2 uH coil adds a bit of reactive inductance to offer some resistance to it.

Says Peter, "With the power switch in the OFF position, the antenna jack becomes the input for charging the battery. An inductor and diode in series isolate the power switch from the RF signal and prevents accidental shorting of the battery. The 50 mA solar panel I carry plugs directly into the antenna jack, or I can use my constant current minimal loss charger for direct connection to any power source from 6 to 24 volts. This is how I charge equipment while traveling by car."

(In his rig, the right side of the T/R switch connects power to either the TX or RX lines. That's just a function of his rig design and has nothing to do with the charging circuit.)

Next, in the September 1996 issue of QRPp, **Jeff Anderson, WA6AHL**, describes his tiny rig built into a 9 volt transistor radio

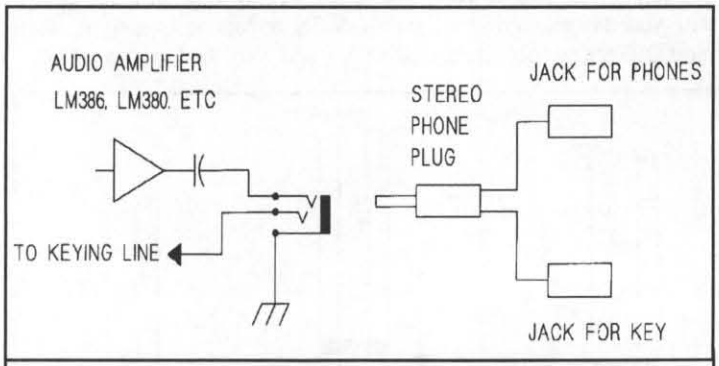


Figure 10—One jack for key and audio (WA6AHL)

battery case. (The circuit is similar, but not identical, to the 40-9er.) I saw it at Dayton and it's really cute! The 4 builders of the DB-25 rigs-in-pill-bottles (QRP Quarterly, April 1990) welcome him to their ranks with open arms! (That's me, WG3R, WA5JAY and N2GAR.)

Jeffs Unique Connector Application is to use a stereo phone jack for both audio and transmitter keying, saving the space of an extra connector on the rig itself where volume is really critical. Both signals go out on a single plug, and are split up once they're in the outside world. In effect he remotely locates the phones and key sockets.. That's something the DB-25 crew agreed on long ago as being quite legal, sporting and kosher, since it's hardly unknown for mobile VHF FM rigs to run cables outside to the actual DC power, RF and microphone connectors to save space on the rig itself. If the Big Boys can do it, so can we! Jeffs circuit is shown in Figure 10. He plugs a Y adapter into the jack on the rig, and the two legs of the Y have regular connectors for the phones and key.

If you'd like to see pictures of Jeffs little rig and you have an Internet Web browser, go to Steve Hidegs site, qrp.cc.nd.edu. Click on QRP-L Resource Page, member pictures, Dayton 1996, various incarnations of the 40-9er, then look for the word "EXTREME" and callsign WA6AHL.

Finally, when **KD6MNP** responded with permission to use his item here, Jeff included an additional tip, shown in Figure 11 on the next page--

"Use a stereo connector, shell (sleeve in telephone parlance) floating, ring grounded, and tip hot to allow either a stereo headset to operate with left and right in series, or a mono earphone to work without shorting out a driver or needing any extra circuitry. It's easy to isolate the chassis mount (threaded barrel) type of connector by using two homemade mylar washers with close fitting holes, and a spacer ring made from a piece of tubing skinned off of a piece of hookup wire, that's stuffed into the slightly oversize clearance hole in the chassis. No need to find a professional quality shoulder washer for isolation.

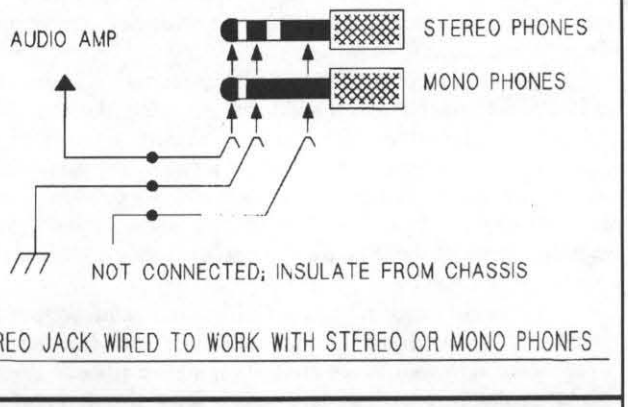


Figure 11—Jack for stereo/mono phones (KD6MNP)

Even if it shorts out, it just causes one side of the stereo to quit, so no smoke. Some of the PC board mount jacks are all plastic outside, so isolation is not an issue."

—DE KD6MNP

PROLONGING LIFE OF SOLDERING IRON TIPS

In a QRP-L posting about soldering irons, **Frank, G3YCC**, said to get at least one spare tip when you get an iron, and that he went through about 3 tips a year. **WB9KZY** replied that he used to have the same problem until he switched to an iron plated tip instead of a bare copper one. The problem with bare copper tips is that they corrode fairly fast and have to be dressed frequently with a file; iron plated tips may cost more, but will last longer.

Monte Stark, KU7Y, *had this to say*--"I used to have this problem also until I switched to an iron plated tip. One other little tip to remember, learned from working in a factory where electronics devices were made--wipe the tip on a damp sponge, apply some solder, solder the joint and put the iron back into the holder WITHOUT cleaning the solder from the tip. Clean the tip on the sponge BEFORE but NOT after making the joint. When you are done for the day, "put your iron to bed" by wiping the tip on the sponge and then melting a lot of solder on it before it cools off. This thick coating of solder stops the air from contacting the tip and slows down the process of "tip rot"! It seems to work; I bought my irons about 9 years ago and still use the same tip! Here at work the tip lasted about 5 years before I changed it! I don't use them everyday but would guess I have them on here at work about 10 hours a week."

Finally, a comment from me, **WA8MCQ**; I can say this safely because only one other person at work reads the QRP Quarterly and I don't think he'll blow my cover and get me in trouble! One of the other technicians once told me that you can walk up to a bench, pull the soldering iron out of the holder and tell whether an engineer or technician is working there. If it's an engineer, the soldering iron will be devoid of solder. If a technician, it will be fully loaded.

CURES FOR WALKING PADDLES

Another discussion on QRP-L dealt with some cures for keyer paddles walking all over the desk or table top while sending.

From **Phil Sikes, KJ7NS** (psikes@whidbey.net)--Take just a small spot of Coax Seal tape and place it on at least one foot of the key. I have used this on bugs as well as Vibroplex, Brown Bros. and Nye Viking paddles and it seems to work on all of them. The Coax Seal will also come right off when no longer needed.

Steve Miller, kg7pv@teleport.com--I just use a big mouse pad. The paddle will not slip or move in any way and it makes a nice soft surface for my hand.

Monte Stark, ku7y@sage.dri.edu--I use a small piece of that shelf liner that is sold to keep glass cups and such from sliding around. It works well and there's nothing to clean up if you want to move the key.

Dan Keen, KN6TM (70731.722@CompuServe.COM)--I have adhesive-backed "loop" strips affixed to the desktop, and the mouse pad placed over the strips, with nothing attached to the paddles. By "loop" strip I mean one of the two strips from a "hook and loop" Velcro [tm] kit available at any drug/discount store. The "hook" strips are not needed.

From **Bob Gobrick, VO1DRB** (rgobrick@nfld.com)--If you want to go first class, get one of those new, expensive 3M (tm) Precise Mousing Surface pads. It's a paper thin pad with tiny, microscopic grooves that keep your key clean and working well. And it even doubles as a mouse pad when you are not on the air with your key!

THE FD4 ANTENNA

Fred Bonavita, W5QJM *of San Antonio, TX, provided this to both the QRP Quarterly and the New England QRP Club journal, 72, where it already appeared. (The drawing is used with permission of G3RJV.)*--The FD4 antenna has cropped up twice recently in the QRP press, but on neither occasion was there an explanation of this little known skywire. The mentions were in the Member News column in SPRAT #85 and the QRP Quarterly (January 1996). And QST for February 1996 carried an article about the FD3 antenna, "Four Bands, Off Center", written by G0FAH. This time there was a drawing but no mention of the FD4.

I have not tried either antenna, but I wanted to find out more about the FD4, since it was receiving rave reviews from the QRP

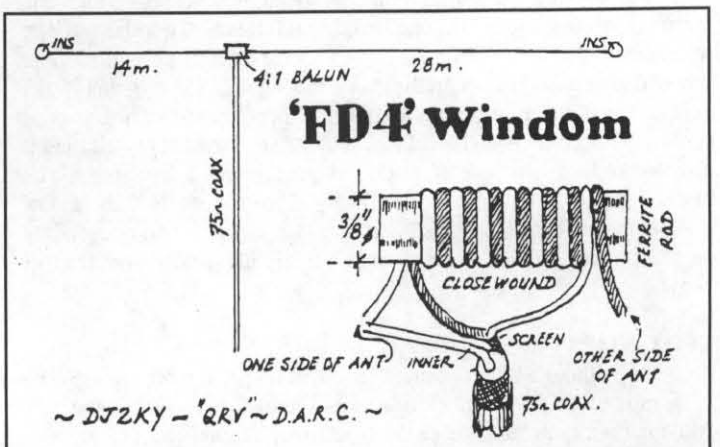


Figure 12—The FD4 antenna (via W5QJM)

crowd in Europe. I managed to track down the FD4 in the GQRP Club Antenna Handbook from which the drawing in Figure 12 comes. It is a variation of the old Windom, an off-center fed antenna still fairly popular in one form or another today.

Unlike most Windoms, the FD4 calls for 75 ohm coax, a line not often used in the US, and it is fed via a 1:4 balun. A 1:6 balun is used for a 50 ohm feedline. Both match the feed point impedance of 300 ohms. Users say the only band on which the FD4 will not play is 15 meters, but it will function on 160 and 6 meters.

Unfortunately, the balun is described only as six turns of black and gray wire (no gauge given) on a "piece of scrap" ferrite rod, no material or length given. Not a bunch of help. Articles on winding baluns are readily available in most antenna books and handbooks, and

Palomar and Amidon sell baluns ready-wound or in kits.

The FD3 appears to be an abbreviated version of the FD4 (69 feet vs 135 feet respectively). The FD3 also is fed with 300 or 450 ohm ladder line. With a 1:1 balun, it performs on 40, 20 and 10 meters. It works on 15 meters with a 1:4 balun, but band switching involves balun switching, too. The author of the QST article is wrong when he says 300 ohm ladder line isn't commonplace in the US. Try Davis RF, Radio Works, or the Wireman.

The GQRP Club Antenna Handbook is a must for any well stocked QRP library. It's available from Bill Kelsey, N8ET of Kanga US, 3521 Spring Lake Drive, Findlay, OH 45840, and from the GQRP Club in the UK.

[Additional notes from WA8MCQ: In the original article by GM3MXN in the GQRP Club Antenna Handbook, the antenna is attributed to the German DARC magazine "QRV" of December 1971, and DJ2KT. GM3MXN says, "As far as the WARC bands are concerned, 10 MHz is a poor match but 18 and 24 MHz are acceptable. I have used an ATU on 21 and 10 MHz with good reports. If QRO is put into a mismatched balun, it will heat up, so stick with QRP. A 4:1 balun is easy to make from scrap ferrite rod. Refer to G6XN's article on page 57 of RADCOM, December 1989." RADCOM is an abbreviation of Radio Communication, the RSGB equivalent of QST.]

ANOTHER METER TESTING HINT

In the January 1992 issue of the Quarterly I had an item about testing meters on the run at hamfests. Somehow one of the non-QRP members of my ham club saw the article and had a suggestion of his own. This idea comes from **Craig Rockenbach, WA3TID**. If you're thinking of buying a really sensitive meter, such as 50 microamperes, you can use your wristwatch to test it if it has a metal watchband. Hold one terminal of the meter in one hand, and touch the other to the watchband. The two dissimilar metals create a bit of galvanic action, and will give a slight kick on the meter if it's good. He says this works best in the summer, when there's a bit of perspiration to insure good contact between the watchband and your wrist. I tried it myself, and it also worked with a pair of pliers, a quarter and a key ring. The dissimilar metal junction is the key. The current is only a few microamperes, but plainly visible if you look closely. (And depending on the polarity of the meter, it may go slightly below 0 instead of above.)

EPOXY TIPS

Although I don't normally use it at home, at work we use a lot of 5 minute epoxy for sticking various things together in the lab. Although not quite as good as the type which requires an overnight or longer cure, the convenience is hard to beat. It's good for lots of things in building and prototyping, but does have a slight drawback--if you need a fairly thick coat, you have to build it up in several layers because it's relatively runny. However, I recently stumbled across a 5 minute epoxy gel made by Devcon, which is probably widely available in places like Hechingers and Home Depot. It doesn't slump down nearly as much as regular 5 minute epoxy, making it easy to build up a rather large lump in one setting. You can also use it on vertical surfaces, or even upside down.

Like many epoxies, it comes in a twin syringe; push out what you need, mix the two parts and use quickly. Like all 5 minute epoxies, you only have a couple of minutes to apply it before it gets too stiff to use. You can handle the item safely after "a while"; it's usually safe after 15 to 30 minutes, although you should wait overnight or longer for a full strength cure. A nice thing about 5 minute epoxy is that it's relatively wimpy compared to the regular type--you can remove it with comparative ease. Just hit it with a soldering iron and it softens quickly, and can be chipped away. Warning--it does have a rather "interesting and unique" smell when heated, and you should use adequate ventilation to be safe.

Finally, there are also two part epoxy putties available which are loaded with steel fibers for additional strength and could have some applications in homebrewing. These are in putty form; break off the amount you need, knead with your hands for a few minutes until warm, soft and well mixed, and press into place and shape. Don't forget that you're massaging "bare epoxy" with your hands; try not to touch anything else while you're doing it, especially your eyes, and be sure to wash your hands well when done.

I've only used it once, but if you buy some be sure to look around a bit. I saw several different styles in a local Hechingers Home Project store in the adhesives area, all at similar prices. I wandered over to the plumbing section a bit later and found that they also had one type over there, under the name Oatey or Oakey, for sealing leaks. It was the same type of product, but the price per ounce was significantly cheaper than those in the adhesives section. (Whatever you get, be sure to use it fairly soon; don't do like I did and let it sit around for several months and dry out! It became quite brittle and impossible to massage and mix, and I had to go buy another one!)

FRANKLIN VFO ON A HEADER

From **Frank Brumbaugh, W4LJD** *of Salinas, PR*--I've reduced my Franklin oscillator with buffer (Idea Exchange for April 1996) to a plug-in VFO on a 14 pin header. Frequency is determined solely by the external parallel tank. The two ground pins should be connected together on the header so the VFO will have a single ground connection. The circuit could be encapsulated to exclude moisture, dust or accidental shorts, but if you use a silicone rubber RTV don't use one that contains acetic acid (Idea Exchange for January 1996). The 1K resistor in the Q3 source lead may need to be smaller; make sure it works before encapsulating it.

Assign your own pin number orientation. You can put pin 1 at whichever corner you wish, and the view shown can be either a top or bottom view; the choice is yours. There is no reason a larger header

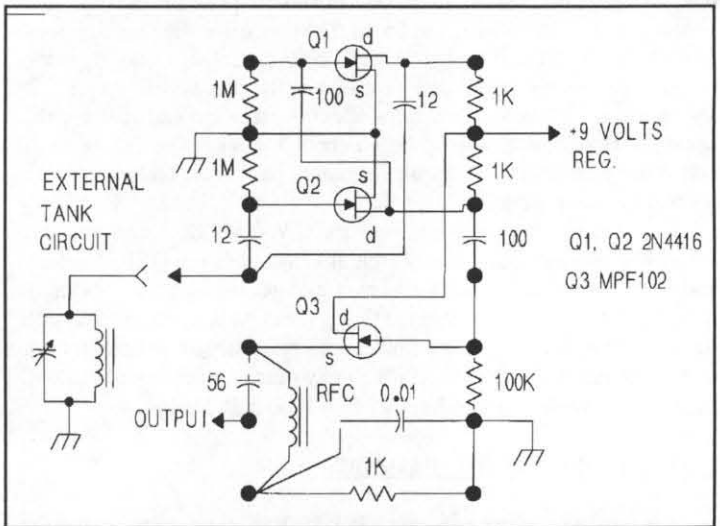


Figure 13—VFO on 14 pin header (W4LJD)

couldn't be used. The soldering must be done with very small diameter solder and a needle point soldering iron tip, working slowly and with great care. Mount and solder all parts, leaving the transistors for last. If you don't have 2N4416's, MPF102's can be used. The oscillator/ buffer should be followed by a 2N2222 or 2N4401 amplifier operating

at a nominal 12 volts. A 78L09 regulator is preferred over a zener diode for the VFO power, for greatest stability. The two 12 pF caps specified can be anything from 10 to 15 pF, but don't go any larger.

I recently discovered that the Franklin Oscillator was mentioned in QST in 1979. SP8YA told me he had built and used a vacuum tube version a number of years ago and said it was even more stable than the series tuned Clapp, which in those days was considered the best. A Clapp I built in the early 1950's using a 6AN5 tube with a coil on a 1 inch diameter ceramic standoff insulator, and heavily doped, was as stable as my surplus crystals. It was mounted in a small aluminum box with the hot tube outside to reduce temperature effects.

—DE W4LJD (ex KB4ZGC)

AN SPC ANTENNA TUNER

From **Ernie Young, K3ZQI** *of Pittsburgh, PA*--I enjoy QRP operation while camping or vacationing with my family. Often I've found that the dipoles I have taken are either for the wrong band or, for lack of appropriately spaced trees, can not easily be erected. At the home QTH I prefer to use a forty meter dipole fed with open wire and have often wished that I had a similar antenna for multi-band use in the field. The home station antenna system includes a tuner of the SPC variety as described in the ARRL Handbook. I purchased the tuner when I operated QRO. While it will handle well over one kilowatt, it is quite large and therefore not very portable. I have been able to achieve a good match to almost any load, having loaded long wires, open wire and coaxial fed antennas of many varieties with the SPC

Turns required for Lx	
Band	T-50-6
40	16
30	12
20	9
15	6
10	2

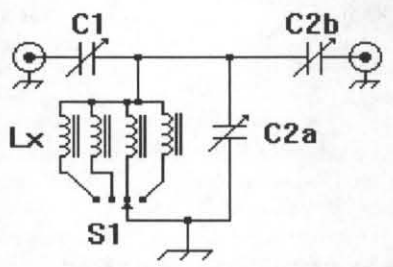


Figure 14—SPC tuner (K3ZQI drawing)

tuner. Now that I operate QRP it has continued to serve my needs.

Two years ago I began to construct a tuner for use in the field. My hope was that no matter what the situation, I'd at least be able to load some length of wire and get on the air. I constructed a variety of tuners, none of which lived up to my expectations. Then one afternoon while listening to a dead twenty meter band, I had the thought that if only I could build a tuner like the one in the shack I would be satisfied. That tuner employs two variable capacitors, a variable inductor and a balun for balanced fed antennas. The capacitors were no problem, after several years of attempting to built the ultimate tuner I have a large collection of variable capacitors. The variable inductor did present a problem though; they are typically large and expensive requiring an equally expensive counter dial.

I did notice, however, that all of the charts I had created over the years had very close to the same number in the INDUCTANCE column per band. This column had remained nearly the same whether loading an open wire or coaxial fed or random wire antenna. This eventually lead to the idea that I could replace the inductance provided by that costly variable inductor with fixed inductance providing the approximate required value. After some calculations and trial I have developed what I hope will be a tuner which will provide the performance I get at home.

Since I do not frequent the one-sixty or eighty meter bands, the following information is for the bands I have interest in. While I do enjoy the seventeen and twelve meter bands, I do not currently have a QRP rig capable of operation there. Inductance for those bands should be somewhere between the twenty and fifteen, and fifteen and ten meter band toroids respectively. One should, with a little experimentation, be able to construct a tuner using this method for all HF bands. Additionally, I used the toroids noted here based solely on availability (i.e. they were in my junk box). I suppose that similar results could be achieved by tapping an air coil. The following schematic is for parts reference only, the tuner itself is described in detail in the ARRL Handbook.

For C1 I used a small single section capacitor of approximately 250 pF. C2 is a dual section broadcast type capacitor of approximately 350 pF per section. Similar capacitors are available from Ocean State Electronics or Dan's Small Parts. All toroids are wound with number twenty enameled wire. Initially, I was soldering the toroids into the circuit as required, but now my breadboard model includes a single pole multi-position switch, S1, to band switch the tuner. To feed open wire antennas I constructed a 4:1 balun using 15 turns of number twenty wire bifilar-wound on a T200-6 core. I also tried a 1:1 balun, and both achieved the desired result.

With this tuner I've been able to load random lengths of wire, my station antenna and in one case a ten foot length of ladder line. Tuning is similar to that of a tuner with a variable inductor, except that it is only necessary to switch-select the correct band inductance. I haven't included vernier dials, also an expensive item, suggested for use with the SPC tuner. While tuning loads ranging from 25 ohms to 1500 ohms I haven't had trouble achieving a match with direct drive to the capacitors. I suspect that this may be due, in part, to the lower circuit Q.

I have also noticed that attempting to make initial tuner adjustments using received signal strength is less successful, again probably circuit Q. For this reason, I suggest a resistive QRP bridge as described in the July 1986 QST article The SWR Twins - QRP and QRO. Fortunately, this article has been reprinted in the ARRL book QRP Classics. With this type of SWR bridge your transmitter will have a good load while you fiddle with the tuner and at the same time you'll be minimizing the QRM.

I haven't performed extensive testing with this tuner, not having access to the necessary test equipment. However, on the air testing over the last month and one-half have netted enough QSOs for me to be satisfied that at least a good portion of the RF is making it to the antenna. If you've been looking for a portable QRP tuner that will provide a match to just about anything, you should give this variation of the SPC tuner a try.

--DE K3ZQI

QRP-L, THE "QRP DAILY"

To subscribe to the free Internet QRP forum, send e-mail to **listserv@lehigh.edu** and leave the subject blank unless your system requires something. In the text, put

subscribe QRP-L <your name> <your call>

Save the automatic "welcome" message you'll get and read it thoroughly. (And pay special attention to the part about enabling the Daily Digest function, which will still give you all the traffic but as a single, huge daily e-mail message instead of several dozen individual messages PER DAY cluttering up your mailbox; I couldn't live without it! The digest also includes a handy index at the top.)

THE FINE PRINT: I just got Microsoft Publisher 97, which supports 9 point type; previous software I had access to only did even sizes. The column in this issue is in slightly larger print than last time, which was 8 point. I received almost no complaints at all about that, but I'm sure lots of folks grumbled in private. I'll be sticking with the slightly larger one now. As for the length of the column, that one's up to you! Keep those ideas and tips coming to Severn, and if you sent me something which hasn't appeared after a couple of issues, please remind me about it.

—qrp—

Review: White Mountain SSB Kit

Preston Douglas, WJ2V 216 Harborview North Lawrence, NY email: pdouglas12@aol.com

Dave Benson, owner of the famed NN1G call and Small Wonder Labs (SWL), has just introduced a great new kit. This time he has produced an innovative, state of the art single sideband transceiver. The kit comes in 20M and 75M versions and consists of a circuit board and all on-board parts. Off-board parts (two pots and various connectors) are not included. There is an optional enclosure kit with pre-punched custom case, silk screened labels, connectors, pots, knobs and parts to add to the circuit board to provide an audible frequency readout. Electronic indication of the operating frequency is practically a necessity because the tuning control included with the case option is a 100K ten-turn pot. While I suppose you could struggle with a turns counter as a tuning indicator, that would be cumbersome. The frequency readout included with the case option reports the operating frequency in Morse code at the touch of a front panel button. *[Morse code in a SSB only rig? Long live CW! – W1HUE]* However, I decided to go with a Wilderness Radio KC2 multifunction digital (visual) frequency readout and my own case. I have discovered that I can do very nice front panels for my home-brew rigs with my color printer and computer. I also picked up some nice 100K ten-turn pots at Dayton. Thus, I can only report on the board kit, as I did not get the case kit.

White Mountain SSB Transceiver with optional case. (Photo courtsey Small Wonder Labs.)

The quality of the parts included in the kit is excellent. The board is masked, screened, two-sided with plated through holes. This is the standard we have come to expect from the leading kit makers. The instructions and construction were the usual clear, clean work you can expect from Small Wonder Labs. There are a good number of toroid coils to wind. Some of them are bifilar, and two are even trifilar. Do I hear groans from the peanut gallery? No need; Dave supplies special tricolor wire making it dead-easy to wind the coils and get the wires in the right holes. Truly easy and foolproof. And the bifilars use similar special two color, two wire stock. Best system I have seen. Incidentally, I still use a sharp, fresh #11 blade to scrape my coil wire ends. All it takes is a little care.

This is the first single sideband radio I have ever built. I did build a double sideband radio with a DC receiver several years ago, but that technology was way inferior to the current state of the art. You need a good (calibrated) HF rig and a multimeter to get this radio working, but *that's all. No oscilloscope, frequency counter or signal generator re-*quired. SWL provides the parts to make a handy RF sniffer (it connects to your digital voltmeter), which you get to keep as a useful piece of test equipment. A dummy load is required, but surely you have one, don't you?

My rig puts out about 8 Watts PEP, I think. SSB isn't as easy to measure as CW! The ten-turn tuning pot covers most of the voice band on 75M. Subjectively, tuning a voice in is slightly touchy, but it is just as touchy on my Yaesu FT757. Actually, I was surprised at how clean the audio sounds, and how easy the tuning really is. Speaker volume is more than adequate. *I will* have to go with a bigger speaker than the usual two-incher I use with those tiny and tinny CW rigs I have been building! A little fidelity is required for good voice reproduction, I notice. The filtering uses separate but identical four pole crystal ladders, and thanks to the TUF-1 balanced mixers, there is no balance adjustment needed – a real plus. My only technical gripe is with the AGC, which samples its voltage after the volume control. *I would* prefer AGC pickup to precede the volume control stage. For one thing, there is no good place to pick up an S-meter voltage with this system.

The manual calls for a speaker-mic of the modern two plug type compatible with a Yaesu or ICOM (not Kenwood) handy-talkie. Listed in the manual as suggested mics are the following: Yaesu MH12A2B, MFJ 284 and Radio Shack 19-310. I bought the latter as I don't have a speaker mic to fit the bill.

Bang-for-the-buck department. The board kit costs about $100. You get a real SSB superhet radio, less mic of course, for that price. This is genuinely a high value kit, where value is defined as quality/price. I very much recommend it. As usual, I paid retail for my kit. I am friends with most or all of the small business QRP kit makers, but I call 'em as I see 'em. This one has no real competition out there, and there has been a need for a good SSB kit. SWL is going to sell a lot of *these!*

You can contact Small Wonder Labs at 80 East Robbins Ave., Newington, CT 06111 or email to bensondj@aol.com

1997 Dayton Building Contest

by Doug Hendricks, KI6DS
862 Frank Ave.
Dos Palos, CA 93620
ki6ds@telis.org

The NorCal QRP Club sponsored the first annual Dayton Building Contest in 1996. We selected 2 projects, the 49er 40 Meter Transceiver designed by Wayne Burdick, N6KR, and the Pipsqueak Regenerative Receiver designed by Paul Harden, NA5N. To add a little spice to the contest and generate some technical articles, we decided to have a design contest to go along with the building contest, with the winning designs published in QQ and QRPp. The winning designers will be awarded a plaque from NorCal and the winning design kitted. This year, we had two great winners, the "38 Special", a 30M transceiver designed by Ori Mizrahi-Shalom, AC6AN, and the "Rainbow Tuner", designed by Joe Everhart, N2CX.

NorCal will kit the "38 Special" and the New Jersey QRP Club will kit the "Rainbow Tuner". We found that NorCal did not have the time to kit both kits, and the New Jersey QRP Club graciously stepped forward to help us out. QRPers are the winners in the design contest, because there are now two great $25 kits out there to build.

The point of the design contest was to provide kits for the Dayton 97 Building contest, which is again sponsored by NorCal QRP Club. There will be 3 prizes in each category, with the judges decision final. The rules are simple. The project must work, and mods are allowed. You may build from the kits available, or you may homebrew your own. Chuck Adams, K5FO is the head judge, and he will select two additional judges the night of the contest. Judging will be held at the ARCI Hospitality Room at 8:00 on Saturday night of Dayton.

I would like to thank all of the designers for their efforts and time that they have put in to providing the rest of us with great projects to build. Good luck builders, and we will all get to see the winners in Dayton. 72, Doug, KI6DS

The "38 Special", A 30 Meter Superhet Transceiver

by Ori Mizrahi-Shalom, AC6AN
2841 Burdick Way
San Jose, CA 95148
e-mail: ori@juno.com

What radio??

1) is a superhet with only two NE602s
2) has no discrete transistors
3) sells for $25

Can't guess? The answer is the "38 Special". The "38 Special" is an exercise in minimization. We feel that it is "special" because of the following:

*It works on the under-utilized 30M band
*Runs of f a 8V supply (due to limitations of some components)
*Special in its architecture
*Excellent price/performance ratio
*Last, but certainly not least, the fact that it offers a great platform for another year of hacking...

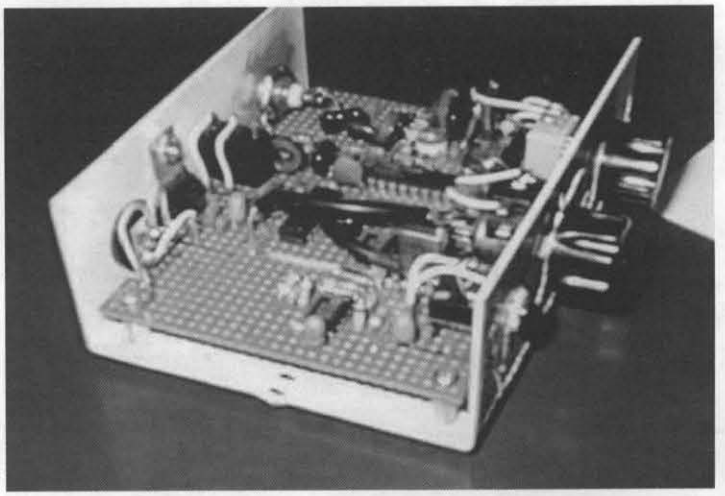
The "38 Special" is the result of an effort which started with hacking the 40-9er transceiver. A novelty radio, the direct-conversion 40-9er was quite limited, especially for weak signal work. The "38 Special" rectifies most of these problems and even adds a few nice features. It came to life due to the design contest challenge and the never ending enthusiasm and encouragement by Doug, KI6DS, who also came up with the great name.

GENERAL DESCRIPTION

The "38 Special" is a superhet transceiver for the 30M band. The first thing you'll notice looking at the schematics is the lack of discrete transistors. I have been playing with this concept for some time and the 38 Special was the right vehicle. The transmit section relies on a TTL buffer. I extended this concept to utilize the same TTL chip for other tasks. Although it's an NE602-based superhet transceiver, the "38 Special" incorporates only two NE602s. I reuse the product-detector as the transmit mixer by channeling different signals to that chip on receive and transmit. Also, the traditional LM380/386 is gone in favor of a more versatile dual op-amp circuit for the audio section.

RECEIVER FRONT-END

The receiver front-end starts with a back-to-back diode switch. The



"38 Special" Prototype built by Dave Fifield

"38 Special" utilizes 1N4007 diodes for the switch. This diode has a PIN structure and provides low insertion loss, although it suffers from poor zero bias isolation and does not offer a strong IMD performance like an RF-rated PIN diode. (1) It is superior to the 1N914 or similar diodes in this type of design. Next is a toroidal impedance transformer with a 10.1 MHz tuned circuit at its output, providing additional front-end selectivity to that offered by the transmit output network. Provisions were made to include a 10 KOhm pot for RF-GAIN control. The 10.1 MHz RF signal is fed to the input of the NE602 receive mixer, where it is mixed with the 22.1 MHz VXO to generate the 12.0 MHz IF frequency.

THE VXO

The superhet circuit enabled me to use standard crystals and avoid the high price of custom ham-band crystals. Many crystal combinations work

for most HF bands. I chose a high frequency first crystal to achieve a high frequency swing. [2] This required a relatively high IF in the simple receiver. The NE602 Collpits oscillator required a high DC bias for a large swing, provided by a 3.9 KOhm resistor at pin 7. Although well below the value recommended, this resistor provides for stable operation of the NE602. "Rubbering" the crystal with a varicap allows relocating the tuning pot away from the oscillator, if desired. A 1N4000-family diode works here nicely as a varicap. [3]

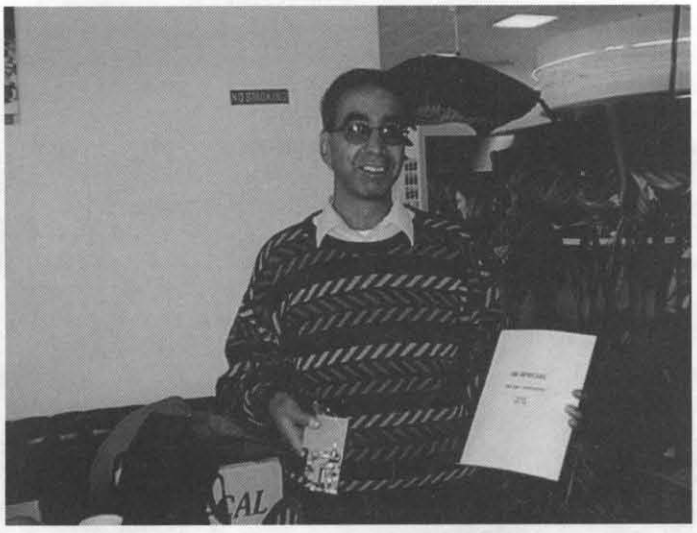
A little assist from a molded inductor yields a tuning range of 25 KHz. A little hint here for the experimenters, do not replace this inductor with a toroid. The low Q helps to increase the pulling range. The VXO signal is mixed inside the NE602 with the received signal to produce an IF output of 12.0 MHz, which is the difference between the VXO and the RF frequency. During transmit, a 22.1 MHz signal is taken from the Collpits oscillator and injected into the input of the transmit mixer.

IF FILTER

The IF filter is implemented with a single crystal. It is a few KHz wide, due to budget constraints. Provisions for a better IF filter are included in the board layout. The main selectivity is achieved at the audio stage and the wide IF filter greatly simplifies the alignment of the receiver. The wide IF filter provides very little "wrong" sideband attenuation. Due to this, the "38 Special" in the stock form cannot be classified as a single-signal receiver. It will take a much sharper IF filter to achieve that. Although you will hear the same signal twice, the sharp audio filter totally eliminates the "off" signal.

PRODUCT DETECTOR

In the cost cutting tradition I left out the "traditional" third NE602 for



Ori Mizrahi-Shalom, the designer of the "38 Special"

the transmit mixing. Instead, the 38 SPECIAL reuses the product-detector for the same function. On receive, an oscillator (IF frequency) is mixed with the IF signal and it results in a low-level audio signal. On transmit, a signal from the VXO is mixed with the IF frequency oscillator in the second NE602. The selection of the input signal to the second NE602 is done by means of a 4066 analog multiplexer. Other than the switching of signals with the 4066, the receiver is similar in concept to most NE602-based superhet rigs.

RECEIVE OFFSET

Sharing the product-detector and transmit mixer required a "trick" to achieve a receive offset. The 38 SPECIAL "pulls" the IF frequency oscillator about 500 Hz up on receive with a 100 pF capacitor in series with the 12.0 MHz oscillator crystal. During transmit, this capacitor is shunted to ground with a parallel forward-conducting diode, so the crystal oscillates right on its fundamental frequency, resulting in a zero-beat transmit signal. The down-conversion at the first mixer and this oscillator pulling up on receive combine to yield the "right" receive sideband at a lower frequency. So, although the IF filter allows either sideband through, it is easy to identify the "right" one. This is not an issue when you call a CQ. The answering station is on the right frequency, if it zero-beats with your transmit signal.

AUDIO AMP/FILTER

The audio is filtered and amplified by an NE5532A dual op-amp, instead of the "traditional" LM380 or LM386 chips. [4] The 5532 requires more external components, but it gives a higher gain, and more important, the circuit also forms a sharp band-pass filter. From that point of view, the "38 Special" is superior to most NE602-based radios. This amp delivers about 60 dB of gain while driving a walkman-style headphones. The filter offers a 50 Hz -6 dB bandwidth and about 400 Hz at -30 dB. This circuit uses a dozen more components than an LM386. But they are probably the most cost-effective components in the whole radio!

TRANSMIT CHAIN

As mentioned before, the product-detector doubles as a transmit mixer. The signal on the output is filtered by a tuned circuit, and the 10.1 MHz output of 100 mV is used to drive the two-stage transmit amplifier. A few examples in the literature describe the use of TTL chips (and other logic devices) for a low-power transmitter. [5]

The most interesting article on the subject was written by Len Smith and appeared in QST. Len used an octal inverting buffer with eight individual active devices, but really utilized only five of them. This circuit gave me the idea of using the leftover devices for sidetone generation and other tasks.

One of the inverters is biased as a high gain linear amplifier. The 100 mV at its input comes out as a few volts on swing at the output. The single inverter is strong enough to drive the final circuit, which is made of four parallel inverters. Depending on the output matching, this circuit can deliver well over half a watt of output power. I chose to leave it at 400 mW for the sake of cool and safe operation of the final. The board supports additional circuitry (not supplied with the kit) for a higher output of up to 5W.

THE OUTPUT NETWORK

The use of only 8V supply required very low impedance for the final to give any appreciable output power. The matching is easily done by an L-C-L-C type network. [6]

SIDETONE

Two inverters combine in a simple oscillator circuit, as described in the ARRL handbook. The oscillator is clamped to ground during receive but is free-running during key-down. The output is attenuated by means of a large series resistor. There was no need to filter the square waveform, as the audio bandpass circuit does that anyway.

ADDITIONAL LOGIC

One inverter of the octal buffer chip forms the receive/transmit logic. It inverts the logic state of the "key" line, so when key is down, this signal is at full Vcc and when key is open, this signal is at 0V. The availability of the T and R signals simplifies the implementation of the T/R circuitry.

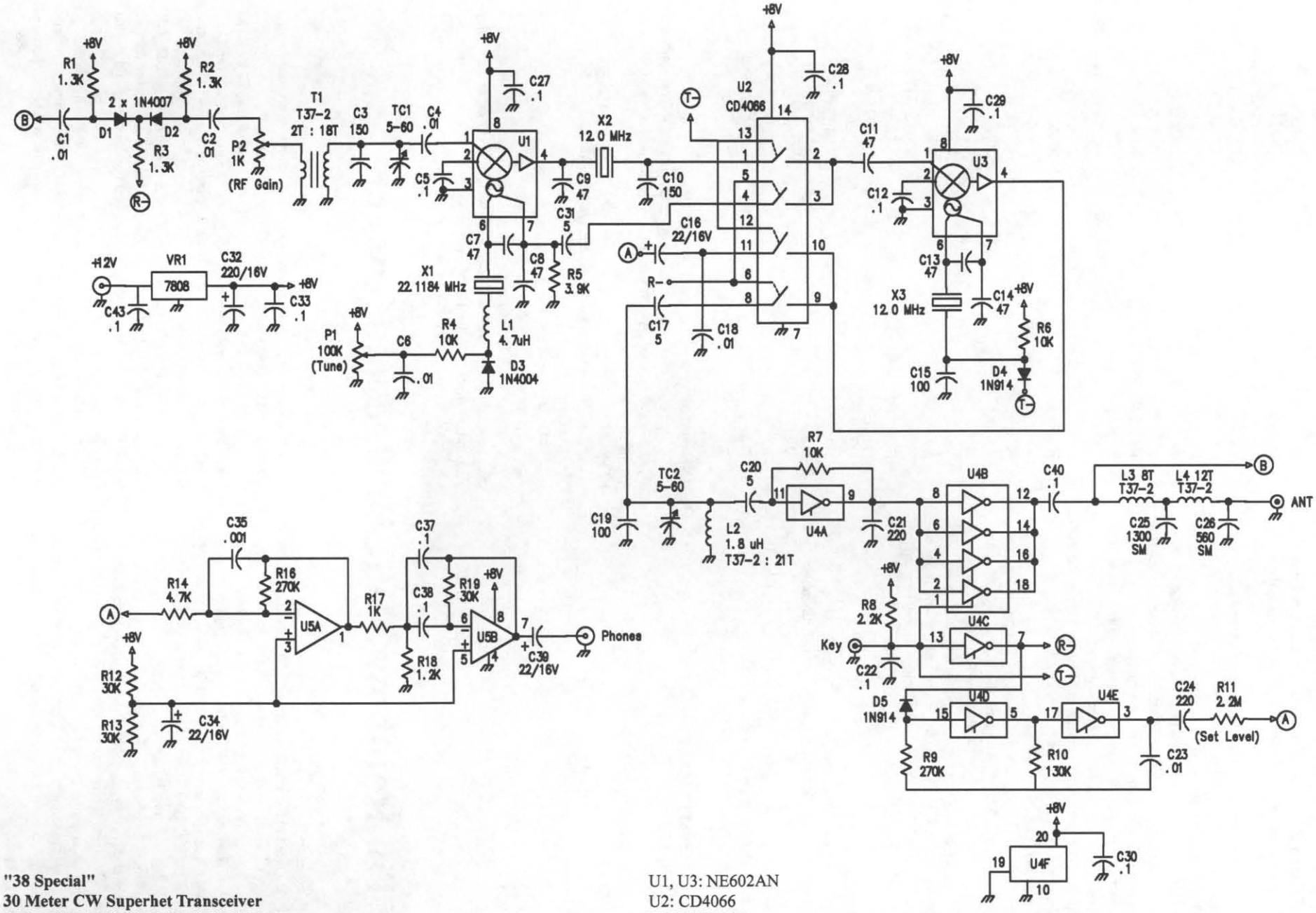
ALIGNMENT

The "38 Special" was designed with a novice builder in mind. There are only two alignment steps, although more parameters could be tweaked by the experienced builder. The receiver alignment consists of peaking the front-end trimcap for the highest receive audio.

The transmitter alignment is a bit more tricky. The radio transmits 10.1 MHz signal, when it has a 12.0 MHz IF signal in the output of the transmit mixer. This requires care when tuning the transmit filter trimcap. One way of doing that is by listening to your signal on another receiver. Tune close to your center frequency and look for the adjustment that results in an output with the least close-in spurs. The two alignment steps do not require any test equipment, although having such equipment can improve the alignment.

THE NEXT STEP

The final design reflects cost-cutting and other changes to simplify the alignment and kitting of the design. It is a superhet with offset and



"38 Special"
30 Meter CW Superhet Transceiver
designed by Ori Mizrahi-Shalom, AC6AN
Winner of the 1997 Dayton Building Contest Design Contest
Rev. 1.0, Nov. 1, 1996

U1, U3: NE602AN
U2: CD4066
U4: 74HC240
U5: NE5532
Decimal Caps are in uF, All others in pF

sidetone at a 40-9er price! As such, it has limitations, of course. I look at it as a product and a development platform. There will be many that will assemble the basic unit and have lots of fun with it in the stock form. But there will be those who want to do things their way. This radio was designed for both.

I will not continue its development. I leave that to the hackers and tinkerers out there. The "38 Special" was designed to continue the tradition that started with the 40-9er - mods by the dozen. There are many possibilities. In fact, some mods are being developed as we speak. I certainly encourage people to do just that. All I ask is that you share with the QRP community and let us all know of your adventures...

For those that build it stock or custom, plain or modified, hot or low key - have fun. I can't wait to see the entries for Dayton and Pacificon next year. I also hope to get more activity on the 30M band. Maybe we will finally know what the propagation properties really are on 30...

ACKNOWLEDGEMENTS

Again, many thanks to Doug Hendricks for the encouragement. Special thanks to Dave Fifield, KQ6FR, who built the second prototype and beat me to the first QSO - 549 on 200 mW from San Jose to Spokane! Dave is a master builder, both of circuits and enclosures. He came up with many additions and suggestions that made this radio nicer and more robust. Special thanks to the XYL, who became a "radio-widow" during the last month...

NOTES:

(1) QST, Dec 1994 pp. 25-27.
(2) A similar concept is used in the Mizuho MX7S radio.
(3) See Jim Pepper's Deluxe QRP station, although not for rubbering a crystal.
(4) One designed by NN1G uses the 5532A for an audio amp but the filter seems to be not as sharp (that radio has a sharp IF filter)
(5) QRPp Mar. 1994 p. 58 and W1FB's Design Notebook p. 156.
(6) Solid State Design p. 53.

"38 SPECIAL" Parts List

C1,C2,C4,C6,C18,C23,	0.01 uF
C3,C10	150pF
C5,C12,C22,C27,C28,C29,C30,C33	.1uF
C37,C38,C40,C43	
C35	0.001uF
C7,C8,C9,C11,C13,C14	47pF
C15,C19	100pF
C16,C34,C39	22uF/16V Elect.
C17,C20,C31	5pF
C21,C24	220 pF
C25	1300pF SM 5%
C26	560pF SM 5%
C32	220uF/16V Elect.
D1,D2	1N4007
D3	1N4004
D4,D5	1N914
L1	4.7 uH (molded)
L2	T37-2,21T
L3	T37-2, 8T
L4	T37-2,12T
P1	100K pot*.
P2	1K pot.*
R1,R2,R3,R14	1.3K
R4,R6,R7	10K
R5	3.9K
R8	2.2K
R9,R16	270K
R10	130K
R11	2.2 MEG
R12,R13,R19	30K
R14	4.7K
R18	1.2K
R17	1K
T1	T37-2; 2TP:S18T
TC1,TC2	5-60 pF trimcap
U1,U3	NE602AN
U2	CD4066
U4	74HC240
U5	NE5532A
VR1	7808CT
X1	22.1184 MHz Xtal
X2,X3	12.0 MHz Xtal (matched)

*Off board component, not in kit

All caps are disk ceramic unless otherwise noted. All caps are in pF unless otherwise noted. All caps are 10% tolerance unless otherwise noted. All resistors are 1/4W, 10%.

KITS

Parts Kits for the "38 Special" are available from:

Jim Cates
3241 Eastwood Rd.
Sacramento, CA 95821

Cost for the kit is $25 for the pcboard, board mounted parts, and instruction manual. Kit does not include connectors, controls, or case. Shipping and handling is $3 for US addresses, $5 for outside of US addresses. US funds only. Make checks or money orders out to Jim Cates, NOT NorCal.

Mint Tin Rainbow SWR Bridge and Tuner

by Joe Everhart, N2CX
work: jeverhart@cayman.vf.mmc.co
home: n2cx@voicenet.com

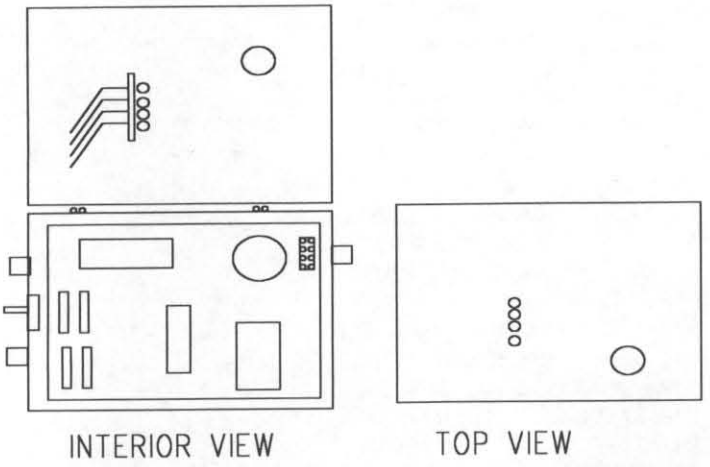
The circuit described in the article really doesn't tune rainbows, but it does use a rainbow of sorts. It embodies the Spartan design philosphy exemplified by the 40-9er Transceiver. It combines a very basic antenna tuner with a simple-to-use accurate SWR meter. Intended to fit in the same type tin as the 40-9er, it can be built for under $25.00. As will be described below, the heart of the Rainbow Tuner is a user-friendly SWR indicator that can be used by itself in other homebrew projects.

The antenna tuning function is performed by L1 and C7 in Figure 1. In the configuration shown, they are connected as a parallel tuned resonant circuit with a tapped output. It is intended for use with a half wave end fed wire. The high impedance presented by the half wave wire is transformed to 50 ohms by taps on the toroidal coil. A compression mica trimmer is used to tune out any reactance presented by the antenna and inductor taps are selectable to give a close match to 50 ohm feedline. More detail will be given later about antenna length selection and tuneup.

A novel SWR bridge was written up in the June 1995 QST by K1KP. It used the familiar toroid type SWR bridge and replaced a meter with LEDs. It had no means of displaying actual SWR, merely a relative indication via brilliance of the its LEDs.

The Rainbow SWR indicator uses a bridge circuit more suited to QRP operation and a self-adjusting LED indicator that is slightly more complex than K1KP's but provides both relative indications for tuning and an exact final SWR reading.

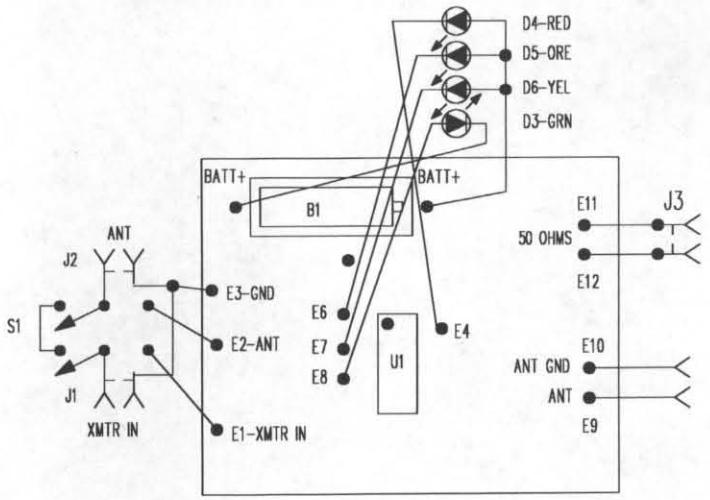
The SWR bridge in Figure 1 consists of resistors R1, R2 and R3. R1 and R2 form a voltage divider with exactly half the input voltage present at their middle. This is rectified by D1 to produce a dc voltage proportional



to forward RF power. The other half of the bridge is comprised of R3 and the output load, either an antenna or the tuner circuit, whichever is connected. When the load is 50 ohms, the voltage at the junction of R3 and the load is the same as at the R1/R2 junction. This corresponds to a 1:1 SWR and the voltage difference across the bridge arms is zero. When the load is not 50 ohms the difference voltage is proportional to the SWR. D2 rectifies the difference voltage to provide the reflected voltage.

Using resistors for the SWR bridge provides a real advantage when the Rainbow tuner is used with simple QRP rigs. Most SWR indicators pass their output SWR right on through to the rig driving them. Transmitters like the one used in the 40-9er and others misbehave with high SWR loads. At best, they become unstable and may oscillate generating off-frequency spurious signals. At worst, a high SWR load may destroy the final transistor. The absorptive bridge in the Rainbow tuner limits SWR that the transmitter sees to 2:1 maximum.

Most SWR indicators require the operator to adjust a meter or other indicator for full scale reading on forward power and then switch to a reverse power reading. The Rainbow tuner eliminates this complication. It uses the fact that in an SWR bridge, the reflected voltage is a fixed fraction of the forward voltage. For example with a 3:1 SWR, no matter what power level is used, the reflected voltage is *always* half the forward voltage. In Figure 1, the forward sample is connected to a voltage divider RX through RZ. The resistors are chosen to set a fraction of the forward voltage at comparator U1 inputs to correspond to 5:1, 3:1, 2:1 and 1.5:1. The other comparator inputs are fed directly by the reflected voltage. LEDS at the outputs of the comparators indicate SWR by lighting in response to the compared forward and reflected voltages.



The LEDs form the rainbow display. As shown in Table I, only the green LED is on only for SWR less than 1.5:1, both the green and yellow LEDs light with SWR between 1.5:1 and 2:1 and so on. Two levels of intensity are provided on the red LED for the highest SWR because I ran out of colors for cheap LEDs! No voltage regulator is needed by the comparator since it relies only on the resistive divider for accuracy.

Table I:Rainbow Display Interpretation

SWR	RED	ORG	YEL	GRN
> 5:1	O+	O	O	O
> 3:1	O	O	O	O
> 2:1	X	O	O	O
> 1.5:1	X	X	O	O
< 1.5:1	X	X	X	O

Note: O means LED is ON, O+ is higher intensity for RED LED. X means LED is OFF.

The SWR indicator is switched in or out of the circuit by S1. It is not connected at all times for two reasons. First, the tuner has a 6 dB loss even with a good match to the antenna. And secondly, power is required for the LEDs when the indicator is being used.

The tuner SWR indicator senses RF and turns itself on with less than 150 mW of RF. Q1 is a special MOSFET with a very low turn on voltage. I've measured a number of them and all have turned on with less than 1.5 volts.

The recommended battery, B1 has a rated milliampere hour capacity of only 33 mAH and the indicators draws about 10 to 50 mA, depending on how many are lighted. So battery life is prolonged by using the indicator only when needed. Longer life can be obtained with a 9-volt alkaline battery, but it won't fit into a a mint tin along with the tuner circuit board.

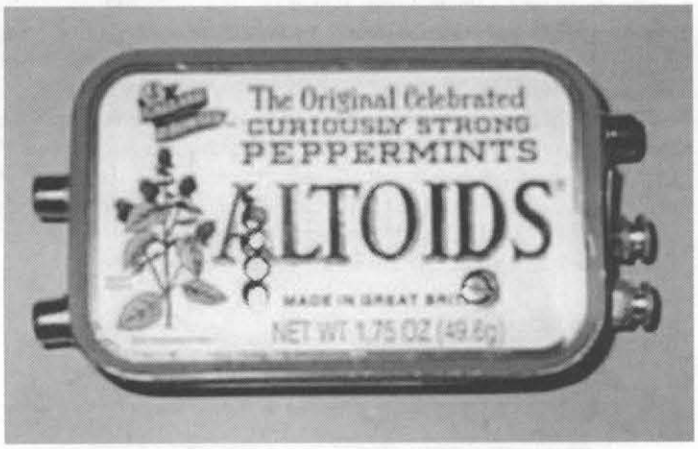
The tuner is sized to fit in a British mint tin with room for the SWR bridge selection switch and some small connectors - I used RCA phono jacks for their small size. The bridge has its own in and out jacks which can be connected to the tuner section with a short coax jumper. This way the tuner and SWR bridge can be used separately. If you want, you can use a small switch to go between the bridge and tuner sections and eliminate the extra connector and coax lead.

Figure 2 is a sketch of the tuner as installed in the tin. The printed circuit board fits into the tin and is insulated from the metal box by a piece of cardboard beneath it. The battery is installed in a holder for a type N cell. Access to the tuner variable capacitor is via a hole punched in the lid. 6-32 screws and knurled nuts are used for antenna wire and counterpoise conections. Shoulder washers insulate the "hot" antenna wire hardware.

The display LEDs are plugged into a SIP (single inline socket) strip cut down to 8 pins. The LED leads are bent at right angles so that the socket can be glued inside the mint tin lid and the LEDs are visible through holes in the tin lid. A short piece of ribbon cable is soldered to the SIP socket and run to the printed circuit connections. I prefer to use pins in pc boards to connect extrnal wires so pins like the Vector T-44 types are soldered to the pc board and wires soldered to them to go off-board.

Operation is very simple. To use just the SWR bridge, attach the rig and antenna cables to the proper connectors and set the switch to the "in-line" position. As soon as you transmit, the circuit will turn itself on and you can read the SWR using the LEDs. When the RF disappears the tuner shuts off dc power. Set the switch to "bypass".

The antenna tuner is intended for a half-wave end-fed wire. An antenna of this type presents an impedance of 1000 to 10000 ohms or so. To check out the tuner and learn how it works, connect a non-inductive resistor in that range across the antenna and ground terminals and a coaxial jumper



from the tuner phono jack to the SWR bridge ANTENNA jack. Use a 40 meter rig with an ouput of 150 mW to 1 watt to feed the RIG jack. Set the tuner tap jumper between between the LOW Z taps.

Set the switch to the IN-LINE postition and keyup the transmitter while monitoring the LEDS. Adjust the tuner variable capacitor with a non-metallic tuning tool for lowest SWR. If it isn't below 1.5:1, try the next highest tap and repeat the tuning. You should be able to find a tap and tuning setting which lights only the green LED.

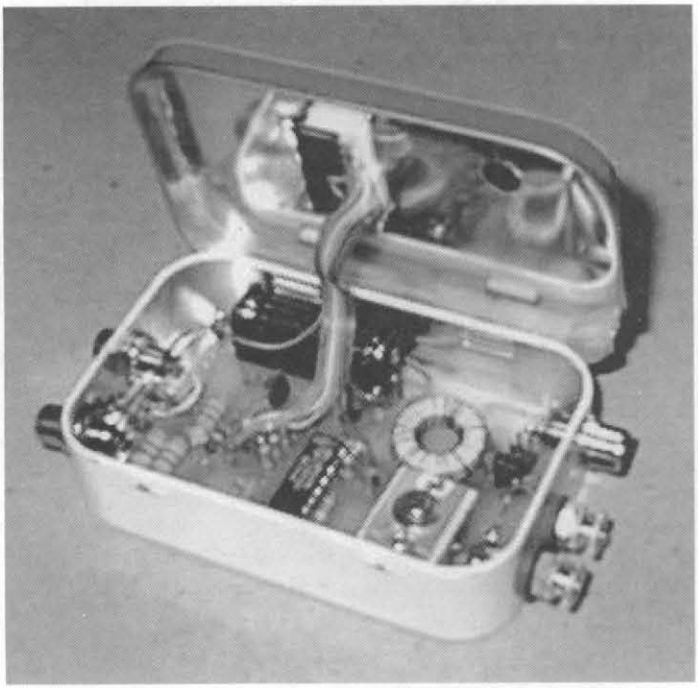
Tuning with an antenna is done the same way. Use a single wire about 67 feet long and at least one 33 foot counterpoise. Try to get the antenna wire at least 15 to 20 feet off the ground. Key up your transmitter and tune as you did with the resistor. Due to the tuner's limited adjustment range you may find it necessary to trim the antenna slightly to get minimum SWR. It is recommended that once you have found a wire length that tunes up well, always use that wire and counterpoise.

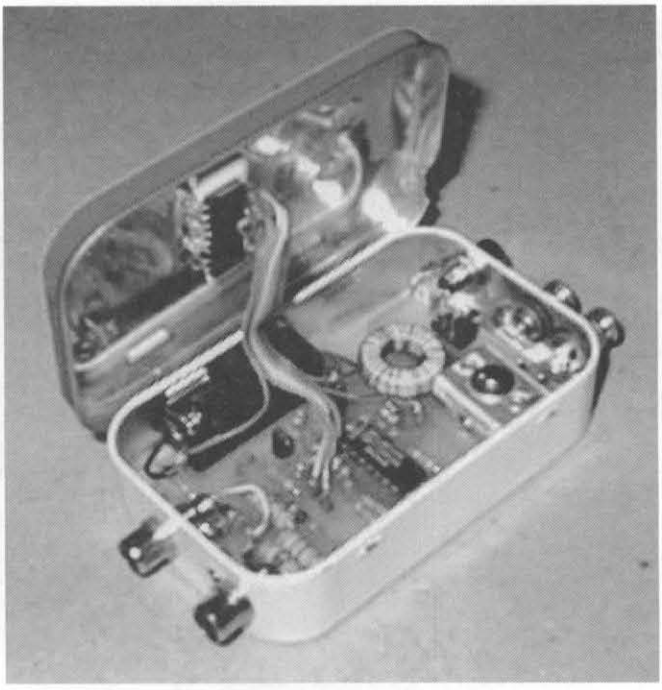
Parts List

B1	12V lighter battery, RS
B2	"N" battery holder, RS
C1,C2,C5,C6	.05 uF mono cap, DK
C3, C4	1000 pF mono cap, DK
C7	150pF mica trimmer, DSP
D1, D2	1N34, RS
D3	Green 3 mm LED, DK
D4	Red 3 mm LED, DK
D5	Orange 3 mm LED, DK
D6	Yellow 3 mm LED, DK
L1	T68-2, DSP
Q1	VN10KM,DSP
Q2	2N3906 Various
R1, R2, R3	51ohm 5%,1/2W, DK
R4, R5	10K,1%, 1/4 W, DK
R6	56.2K, 1%, 1/4 W, DK
R7, R8	34K, 1%, 1/4 W, DK
R9	26.1K, 1%, 1/4 W, DK
R10	40.2K, 1%, 1/4 W, DK
R11	10K, 5%, 1/4 W, DK
R12	15K, 5%, 1/4 W, DK
R13, R16, R17	1K, 5%, 1/4 W, DK
R14, R15,	2K, 5%, 1/4 W, DK
S1	Mini toggle switch, RS
U1	LM339, DK or RS
15	T-44 pins, DK
3	RCA jacks, DK
40"	28 ga. magnet wire
3"	ribbon cable
1	4 pos X 2 0.1 spaced terminal block
1	8 pos SIP socket, RS
Misc. hardware	

The parts shown are for maximum accuracy and performance. However some substitutions can be made with more avaialable components. Resistors R1, R2 and R3 directly affect bridge accuracy and power rating. 47 ohm 5% values can be used with only a slight effect on accuracy (the prototype used them!). The 1/2 watt values shown will be adequate for intermittent use with transmitter power up to 2 watts. Smaller wattage resistors will burn up at that power level. Of course 1 watt values will handle up to 4 watts and 2 watters theoretically can handle 8 watts. Prolonged transmit periods will cause excess component heating.

1% resistors are shown for R6 through R10 and R18 in the comparator circuit. 5% values close to these can be substitued but will result in degraded SWR accuracy. Besides, the Digikey resistors are cheap - only 54 cents for 5 of them.





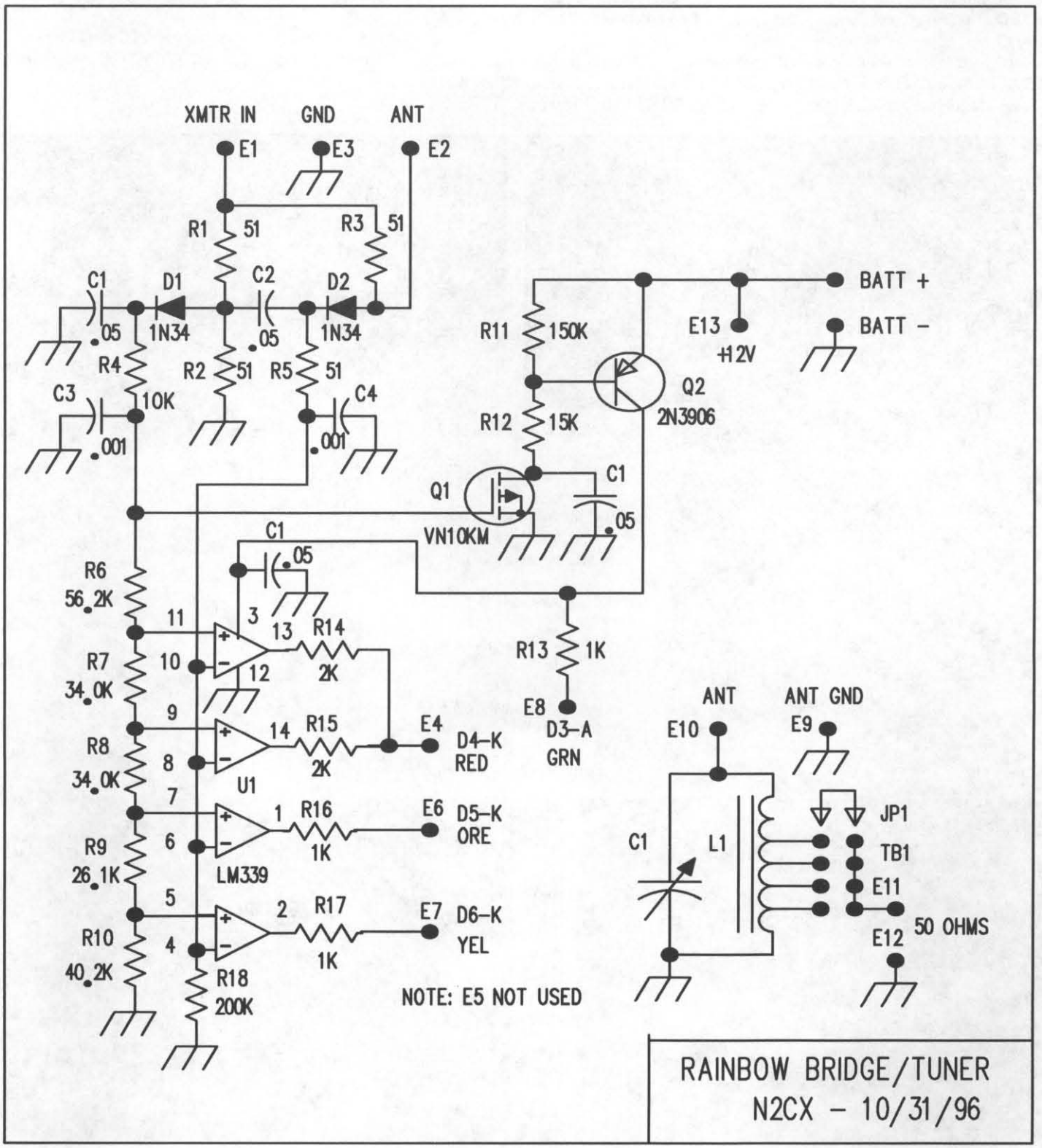
Q1, the MOSFET power switch is specially chosen to have a very low turn on voltage. I measured a sample of 8 devices and none of them took more than 1.5 volts dc gate voltage to turn on. In-circuit checks showed that none of them needed more than 150 mW of rf to activate the circuit. If you try a replacement, test it to be sure that it turns on at the power level you will use.

72/73, Joe Everhart, N2CX

Parts Kits for the Rainbow Tuner are available from the New Jersey QRP Club. The cost of the kit is $25, and includes the pcboard, board mounted parts, LEDs, sockets, but does not include the case or connectors. To order the kit send $25 plus $3 shipping and handling for US addresses, $5 shipping and handling for non-US addresses. Make check or money order out to James Bennett, not NJ QRP Club. US Funds only. Send order to:

James Bennett, KA5DVS
309 Morrison Ave.
Hightstown, NJ
08520

Please allow 6 weeks shipping and handling time. Please refer all queries to James Bennett, KA5DVS at the address above.



Pacificon, 1996

de Ron, KU7Y

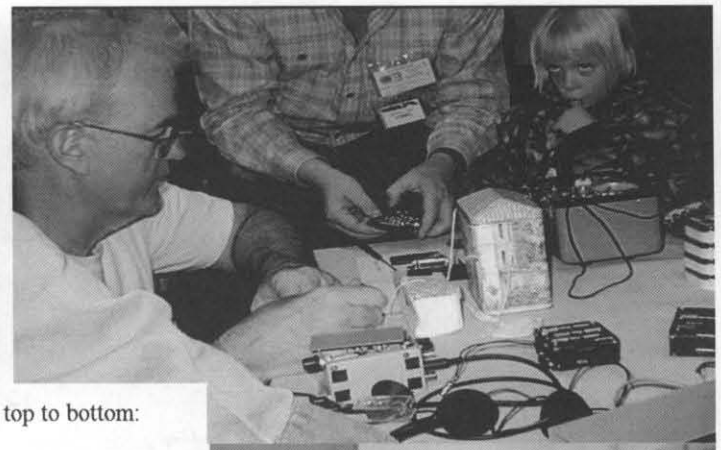
Wow! **Doug Hendricks, KI6DS,** and **Jim Caates, WA6GER,** of **NorCal** fame, really did put on a show. All during the event, everyone was wondering why the QRPers were having so much fun! All the forums were standing room only.

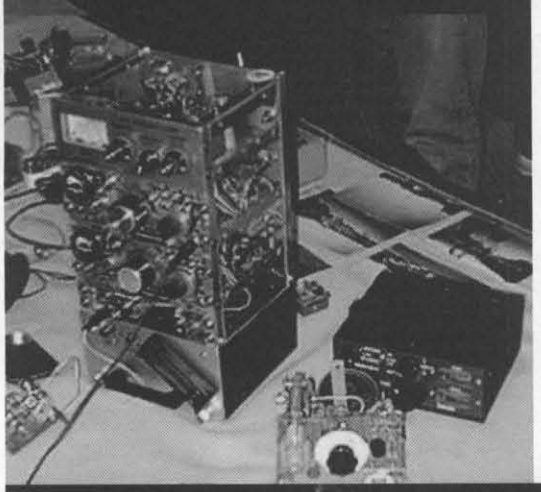
I was lucky enough to have my room furnished by the **NorCal** club and on top of that I shared it with the one and only **Chuck Adams, K5FO**. That was a real pleasure, not counting the contest bet! (That's OK **Chuck**, next year, same time, same place, different winner!).

Listen to this list of speakers: **Chuck Adams, K5FO, Ed Burke, KI7KW, Stan Goldstein, N6XU, (ex N6ULU), Paul Harden, NA5N, Doug Hendricks, KI6DS, Derry Spittle, VE7QK, Eric Swartz, WA6HHQ** and **Bob Tellefson, N6WG**.

There was standing room only for the QRP talks. What a great time we all had. Everyone was running around asking why there were so many QRPers there and why we were all laughing and smiling! The QRP table by **Wilderness Radio** had a big, big crowd around it every time I went by! Even the QRO types had to stop and see what all the excitement was!

Enough of my chatter. Here are some pictures of the big event. All photo credits go to **NorCal, Jerry Parker, WA6OWR** and **Dennis Utley, K7JLF**.





Clockwise, top to bottom:

K5FO, WA6HHQ and N6XU.

K5FO judging under close scrutiny.

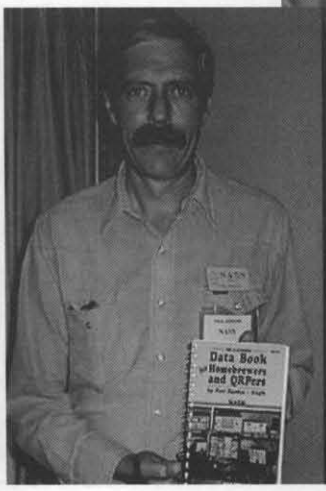
KF6ML's transceiver in a stapler!

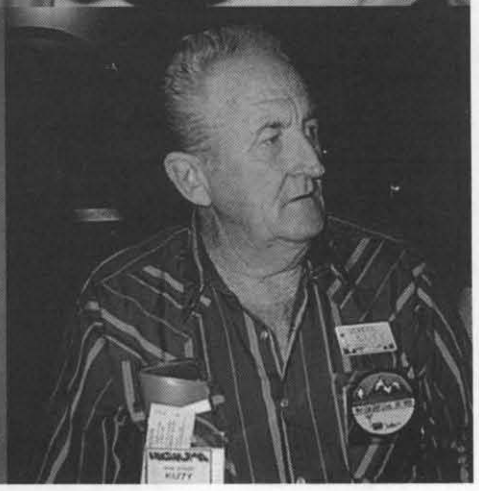
Yours truly, KU7Y.

NA5N and his book.

All the winners in the building contest. Doug was last. Chuck said later that he felt pressured!

Collection of rigs by NA5N.





Modifications and Enhancements for the QRP PLUS Transceiver (Part 1 – Receiver Modifications)

Larry East, W1HUE **1355 S. Rimline Drive** **Idaho Falls, ID 83401**

Introduction

The Index Laboratories' QRP PLUS offers a lot of features in a small package. It has a continuous coverage receiver (1.6MHz to 30MHz) and a 5W (nominal) transmitter that covers all amateur bands from 160M through 10M. It is one of only a few commercially available QRP transceivers and has become very popular since its introduction. This is indeed a nice little rig, but not without a few faults – some technical and some more in the realm of personal preferences [1, 2] [1]. The QRP PLUS is an evolving product as Index strives for continued product improvement. A "new improved" version of the rig is now being produced that has several major changes over the "original" model. Owners of the original model were offered the opportunity to have their rigs upgraded for about one-half the price of the new model. I had one of the original models to which I had already made several modifications when the new model was introduced. After comparing my modified rig with a new model [3], I decided not to take advantage of the upgrade offer.

> *Many of the modifications that I will describe are applicable to both the new and original models, and some are model specific.* ***From this point on, I will refer to the original model as the "QRP+" and the new model (including "upgraded" units) as the "QRP++".*** *This is common practice among owners, but it is not an "official" Index Labs designation. "QRP PLUS" will refer to either model.*

I have divided this article into two parts because of the large amount of material covered. This first installment will describe modifications that apply primarily to the receiver. The second installment (scheduled to appear in the next of **The QRP Quarterly**) will concentrate on transmitter modifications. Some of the modifications that I will describe have been adapted from the work of others and I will try to give proper credit in those cases. If I fail to give credit where it is due, please let me know and I will try to make amends.

Some Preliminaries

Index has made several "firmware" upgrades for the QRP+ available as new EPROMs for the very nominal charge of $6.00 plus return of the old EPROM. The most recent version of which I am aware is designated "Rev 4C". (Note that this is model specific – the QRP++ may well use a different EPROM.) The Rev 4C EPROM contains several programming changes that affect the internal keyer and the switched capacitance audio filter (SCAF). If you do not have this latest version, you should contact Index for an upgrade. How do you tell if you have this version or not? Simple: If you did not upgrade, you don't have it! If you obtained your rig used and don't know its history, a couple of simple tests will determine whether or not you have the latest EPROM: If the internal keyer speed changes in increments of 5 WPM, you don't have it. If the keyer speed changes in increments of 1 WPM but an external keyer cannot be followed above about 27 WPM, then you still don't have it (you probably have Rev 03).

The small size of the rig can be rather intimidating the first time you remove the cover. However, if you have some building experience, a good soldering iron with a small tip and a little patience, you should be able to successfully perform the modifications that I will describe. A desoldering tool and/or good quality desoldering braid is also a necessity. I find that a desoldering tool is useful for removing the "surface solder" but that desoldering braid is a necessity when removing parts from double sided boards with plated-through holes. A magnifying lamp and/or a magnifying glass will also come in handy.

The following modifications will be described in this installment:

- Better reverse voltage protection.
- Receiver input mixer protection (RF board).
- Reducing receiver spurs (LO and RF boards).
- Reducing "AGC Thump" on strong signals (AF board).
- Improved rejection of strong adjacent signals when using narrow SCAF settings (AF board).
- Making the sidetone level (relatively) independent of AF gain control setting (AF board).
- Elimination of sidetone thumps and clicks (AF board).
- LED indicator for RIT/SPLIT active (front panel).
- RF gain control.
- Light for Power/SWR meter (front panel).

Two things that you should do right off the bat: Install some type of connector on the speaker cable, and install flat washers over the hold-down holes on the top PC board (the RF board). The primary reason for installing a speaker cable connector is to avoid having to replace the speaker when you eventually knock the cover off the bench and rip the wires out of the speaker! I drilled the rivets holding the small terminal strip to the speaker frame and mounted a small right-angle aluminum bracket in place of the terminal strip. I secured the bracket to the speaker frame with a sheet metal screw and epoxy, and mounted a mini phone jack in a hole in the bracket. The two wires from the speaker voice coil were then unsoldered from the terminal strip and soldered to the jack. I installed a mini phone plug on the cable connecting the speaker to the front panel phone jack. One of the speaker cable wires is grounded, so make sure that it connects to the grounded side of the jack if you go this route. An in-line jack and plug arrangement will also work; just make sure that they don't hang down too far and touch something on the RF board!

The purpose of the flat washers is to prevent the lock washers under the board hold-down bolts from destroying the ground plane around the holes on the top board. The plating gets pretty chewed-up after several removal-reinstall cycles. I soldered zinc plated brass washers directly to the plating around the holes so that I don't have to mess with putting them in place every time I remount the boards. I retained the lock washers under the mounting bolt heads – they now contact the flat washers soldered to the ground plane rather than the ground-plane plating.

Here are a few things to keep in mind when working on your QRP PLUS:

- When reassembling the rig, be very careful to line up the flat cable connectors and make sure they are properly seated. In particular, if the connector at the front of the RF board is seated so that the top row of pins is inserted into the bottom row of holes in the connector, Q15 on the AF board will be smoked when the rig is keyed! (Speaking from experience here...)
- Don't forget to tighten the hold-down bolts after reassembling the board stack. The boards are grounded via the hold down bolts and

[1] References are listed at the end of the article.

failure to tighten them can result in all sorts of strange problems due to poor grounding.

- If the AF board (the one with the 3V lithium battery on it) is removed (or the jumper cables to the AF board disconnected), be sure to hold down the MEM button while applying power to the rig after reassembly. This resets the microprocessor and restores factory default parameters for VFO memories, etc.
- Don't forget to replace the foam rubber pads above and below the LO board; these help to reduce microphonics. (Using larger pads can result in a somewhat greater reduction in microphonics – just make sure you use non-conductive foam!)

Improved Reverse Polarity Protection

This, of course, is not specific to the receiver, but it is an easy change to make and a good place to start. You should make this modification even if you make no others. You might be inclined to say: "Hay, I'm not stupid enough to connect a power supply up with the wrong polarity!" However, I know of at least one case in which damage occurred to a QRP+ when the owner attempted to inset the power connector with the power applied and accidentally touched the ground ring of the plug to the center pin of the power jack.

The rig does have reverse polarity protection of sorts; a reverse-biased diode is connected from the +12V power buss to ground (on the XMTR board). The idea is that a reversed polarity power connection will result in the diode conducting heavily enough to blow the fuse. There is a slight problem with this scheme, however – the diode (a 1N4005) is rated at 1A and the fuse is rated at 3A! There is a good likelihood that the diode will open before the fuse blows thereby removing any reverse polarity protection.

To provide "sure fire" reverse polarity protection, I replaced the wire between the power connector and fuse holder with a 1N5822 3A Schottky barrier diode. (Actually, I used an SK9935 because it was available locally.) Any leakage (it should be very small) through the series diode under reversed polarity conditions will be shunted to ground by the 1N4005. The small voltage drop across a Schottky diode – I measured 0.28V across the SK9935 while transmitting at 5W output – will not affect transmitter or receiver performance.

Receiver Input Mixer Protection

This is where my "QRP+ modification binge" began. Within the first three months that I owned the rig, the receiver input mixer had to be replaced twice. The second time I returned the rig for in-warranty repair, I received a phone call from Index saying that I must have a static discharge problem or possibly a problem with RF from a nearby transmitter. I decided I had better try to find out what was happening.

After posting a query on the Internet, I learned that several other QRP+ owners had experienced similar problems; one owner lost the mixer in the middle of a QSO during a wind storm. A look at the QRP+ schematic revealed that there is pretty much a straight shot from the antenna connector to the mixer input. There is some resistance to ground (in the transmit ALC/power meter circuit), but apparently fast voltage spikes from static build-up on the antenna were getting to the mixer anyway. Checking the schematics for my FT-301 and TenTec 509, I noticed that they had protection diodes at the receiver input; the QRP+ has no such input protection. Ah ha! Installing some protection diodes at the input of the mixer might solve the problem!

I installed four 1N4148 diodes in series-parallel at the output of the receiver input high-pass filter, as shown in Figure 1. I used four diodes rather than two in order to reduce any effect on the receiver IMD. However, the QRP+ IMD immunity is not all that great to start with, so using two diodes (in reverse-polarity parallel) would probably have no adverse effect.

Caution: *Do <u>not</u> use PIN or defused junction rectifier diodes; use small signal Si switching diodes only!*

I originally put the diodes before the HP filter [4] but later decided that the series impedance of the filter's capacitors would be helpful in limiting the current through the diodes. The diodes are mounted on the bottom of the RF board, between one solder pad for C49 (the end connecting to the relay) and the ground pad for C46. The diodes will certainty not protect the mixer from a very large discharge induced by a near-by lighting strike, but they should provide protection from moderate static discharges. To be completely sure, you should disconnect the QRP+ from the antenna when it is not in use!

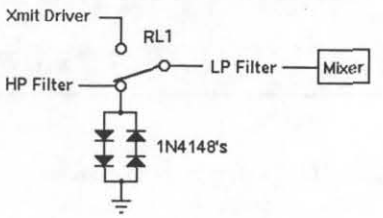


Figure 1. Mixer protection diodes.

Early production runs of the QRP++ had the mixer protected by an MOV device installed at the same location that I used for the protection diodes in my QRP+. In a fairly recent model that I tested, the MOV was missing. I have been told that Index decided that the mixer that they are now using in the QRP++ is more robust than an MOV and are no longer installing MOVs. However, if I owned a QRP++, I believe that I would install protection diodes just to be on the safe side.

Reducing Receiver Spurs and the "W1AW Problem"

I noted several receiver "spurs" in my QRP+ on almost every amateur band, particular 80 meters. Many were too weak to register on the S-meter, but could be distinctly heard with the antenna disconnected. The loudest spurs – registering S-1 or greater – were at 3570.8, 3845.6, 7142.2, 14286.5 and 21161.4 kHz. A spur near 10.0 MHz was strong enough to make WWV difficult to copy at times. These spurs appear to be present in all QRP+ receivers, but the intensities vary somewhat from rig to rig (perhaps due to LO cable positioning – see below). Very few spurs were noted on the QRP++ that I tested [3], and the ones that were present were very weak.

The intensities of these spurs can be greatly reduced (some eliminated entirely) by four simple changes. ***Note:*** *The following applies to a non-upgraded QRP+ only!*

1. On the LO board (the second one in the stack), unsolder the braid of the LO cable (that's the one that goes to the connector on the rear of the RF board near the SBL-1 mixer) from the LO board. Re-solder the braid to the ground lead of L5; the grounding point is located at the right side of L5 (as seen from the front of the board) and just in front of Q12. You should place a small piece of insulation (stripped from a piece of wire or some heat shrink tubing) over the braid so that it does not accidentally short to the resistor lead just to the rear of L5.
2. Route the cable directly toward the rear of the LO board, <u>away</u> from U10, U11 and the bunch of resistors at the rear of the board. Also keep it from passing directly over U4
3. On the RF board (the top one in the stack), solder a piece of wire (or braid) between the bottom of the LO connector barrel and the case of the SBL-1 mixer. (Strangely enough, the mixer case is <u>not</u> grounded.
4. Replace the LO and RF boards and insert the hold-down bolts. You will note that the LO cable is now an inch or so too long – shorten it so that it is neatly dressed (but don't make it too short). I shortened it at the connector end, but you might prefer to shorten it at the LO board end after determining precisely how much cable to remove.

Fire up the rig (hopefully there will be no smoke) and you should note a dramatic ruction in the strength of the spurs. (Oh yes – you should note the strength of the strongest spurs in your rig before making this change so you can make a before/after comparison.)

Changing the grounding point of the LO cable as noted above also helps (but does not cure) the "W1AW problem". This problem manifests itself by strong signals in the vicinity of 3.58 MHz (W1AW bulletins are transmitted on 3.5815 MHz) being heard over a large portion of the 80M band. According to Index, the problem is caused by a harmonic of the microprocessor 10.24 MHz clock leaking into the LO signal. For the past year they have been using a 10.66 MHz clock which moves the sensitive frequency below the 80M band. Anyone experiencing the "W1AW problem" can contact Index for a replacement 10.66 MHz clock crystal.

Reducing "AGC Thump" on Strong Signals

There is a noticeable "AGC thump" that can be very annoying on strong signals (both CW and SSB) in the QRP+. The cause of the "thump" is the delay through the switched capacitor audio filter (SCAF) which is inside the AGC loop. The AGC detector is on the output of the filter, and by the time it detects a strong signal and feeds a control voltage back to the IF amplifier, additional components of the strong signal are still making their way through the filter and eventually appear at the output causing the "thump". (This is a rather oversimplified explanation, but hopefully you get the picture.) No amount of diddling with AGC time constants will cure the problem; the only real cure is to go to a dual AGC system or put the gain control element (currently the IF amplifier) after the SCAF. These are major design changes not to be undertaken lightly.

However, there is something that can be done to reduce the effect: limit the signal to a few dB above the AGC threshold until the AGC has time to react to a strong signal. Index has taken this approach in the QRP++ by using a pair of Shottky diodes in the IF to act as signal limiters[2] (D2 and D3 at the output of U4 on the RF board). I tried a similar approach by limiting the audio level into the SCAF. This took care of the thump, but produced a new problem: Strong signals outside the SCAF passband but within the IF passband would activate the limiter causing a sever reduction in the level of the desired signal. I call this an "inverse thump" for lack of a better term. The same problem exists with the IF limiter in the QRP++; it makes no difference whether the limiting occurs at RF or AF. That is the reason for the recommendation to open up the SCAF passband when near-by interference is present (sort of defeats the purpose of a narrow filter...).

The solution that I finally settled on was to place a limiter at the output of the SCAF as shown in Figure 2. This does not completely eliminate the problem, but it reduces the effect from ear splitting "thumps" on very strong signals to just slightly annoying "clicks". When listening to a very strong signal, the best solution is still to switch in the 20 dB input attenuator.

I located the limiter before the second SCAF IC's output buffer amplifier to take advantage of the LP filter present in the buffer amplifier circuit. Five parts need to be added – a 4.7K and a 100K resistor, a 4.7uF capacitor and two diodes – and one existing resistor (R40) replaced. The mod can be made without removing the AF board, but the RF board must be removed. The 4.7K resistor can be inserted by lifting the end of R40 (33K) nearest U4 and soldering one end of the 4.7K resistor into the pad from which the end of R40 was removed. Remove the other end of R40 and insert one end of the 27K resistor into that pad. The 4.7K and 27K resistors can then be soldered together "in the air" – just make sure they don't stick up far enough to touch the shield between the RF and AF boards when it is installed. (Also make sure the wires don't stick through the board far enough to touch the shield below!) The cap can then be soldered to the resistor junction, and the diodes and 100K resistor from the other end of the cap to ground. A convenient grounding point is the ground pad for C20 (it's the end nearest U4).

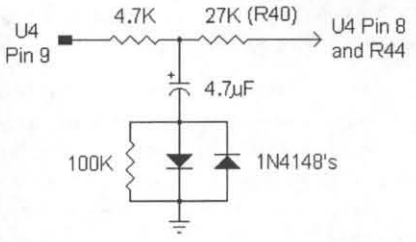


Figure 2. Limiter added to output of U4

An added bonus of this modification is that it also acts as a noise limiter. It will not eliminate noise, but it will keep those static crashes from busting your ear drums!

QRP++ Notes

This modification will probably not help the QRP++. As noted above, these rigs are equipped with an IF limiter. Although that approach introduces a new problem when using narrow SCAF bandwidths when strong adjacent channel interference is present, it has the advantage that less audio distortion is introduced (there is noticeable distortion on the peaks of strong SSB signals using my circuit). I do not recommend that the diodes at the output of U4 be removed since they are also used during transmit and are the basis for the "speech processing" feature of the QRP++. Should you want try this mod with a QRP++, there are some minor differences between the QRP+ and QRP++ that must be taken into consideration:

1. The 33K resistor on pin 9 of U4 is labeled R45 rather than R40.
2. You will have to look for a different grounding point for the diodes and 100K resistor.
3 You should consider increasing C28 to 680pF (or even 1000pF) to provide better filtering of the high frequency distortion produced by the limiter.

Improved Rejection of Strong Adjacent Signals at Narrow SCAF Bandwidths

One of the design compromises in the QRP PLUS is the way selectivity is obtained. The crystal IF filter is basically a sideband filter and the SCAF is used as the final bandwidth determining element. Since the AGC detector is after the SCAF, strong signals that are within the IF filter passband but outside the SCAF passband will be amplified at full IF gain and can cause overloading of the SCAF [3]. This results in various annoying artifacts when trying to copy a weak CW signal and one or more strong signals are close by. Narrowing the SCAF passband does not help, and can even make the situation worse.

The SCAF is implemented using two special ICs, U3 which is a high pass switched capacitance filter and U4 which is a low pass switched capacitance filter. The QRP PLUS SCAF implementation is very similar to one described in **QST** several years ago [5]. The SCAF ICs contain operational amplifiers that can be used as input/output buffers. These buffers are configured as single pole analog LP filters to eliminate high frequencies outside of the final passband from getting into the SCAF and causing "aliasing" (spurious output response). Ideally, these LP filters should have cutoff frequencies slightly higher than the SCAF upper passband cutoff and a flat response within the SCAF passband. However, this is not possible with simple 1-pole filters, and another design compromise comes into play. The 3 dB rolloff frequencies of these filters are above the highest SCAF passband cutoff, but they produce significant attenuation at lower frequencies. In fact, the high frequency audio response in the QRP+ is determined by these analog filters at the wider SCAF settings. In the QRP++, the LP filter rolloff frequencies have been increased by a factor of about four

[2] A number of QRP++ units were shipped with an incorrect resistor value (R33) on the AF board that resulted in the limiter not being effective. (Apparently the QRP++ I tested had this defect.) Index will correct the problem, or you can do it yourself.

[3] The IF limiter in the QRP++ eliminates SCAF input overloading but introduces a new adjacent channel strong signal problem. (See discussion above.)

to improve the high frequency audio response, but they are consequently less effective in attenuating unwanted signals at narrow SCAF bandwidths.

If the analog LP filters before the LP SCAF could be made to have a lower cutoff frequency when the SCAF bandwidth is made narrower, then strong audio signals above the SCAF cutoff frequency would be less likely to overload the SCAF. The modification shown in Figure 3 accomplishes this using diodes to switch additional capacitors into the LP filters. The switching action is controlled by one of the control signals used to set the SCAF HP cutoff (the signal at pin 1 of U3). This results in the capacitors being switched in at SCAF bandwidths of 1.4 kHz or less (1.0 kHz or less if a Rev 03 or earlier EPROM is in use).[4]

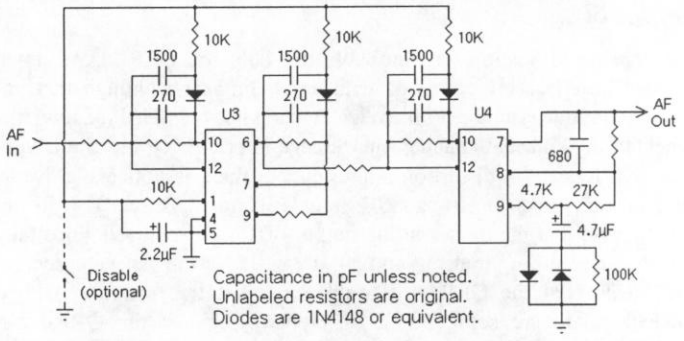


Figure 3. Partial schematic of SCAF showing modified buffer amplifiers and the output limiter. (The limiter is also shown in Figure 2.)

The original feedback capacitors in all four analog LP filters of the QRP+ should be changed to improve the high frequency response at the wider SCAF settings. In particular, C6, C16 and C18 should be changed to 270pF. I used a value of 680pF for C21 in order to reduce the high frequency distortion introduced by the audio limiter (described above). If you don't mind a little faster rolloff above 1.8 kHz or so, you can leave C21 at 1000pF. The 1500pF capacitors that are switched into the first three LP filters add substantial attenuation of signals above the narrower SCAF passbands. This greatly reduces the detrimental effects of strong adjacent channel signals on the SCAF response. The capacitors used in the analog filter feedback loops should be good quality, preferably NPO or C0G types.

I mounted the extra caps, resistors and diodes above the board "spider web" style. The junction of the four 10K resistors (I used 1/8W) and the 2.2µF cap (I used a small molded tantalum) is located over the top of U3 Connections to U3 pins 1 and 5 are soldered directly to the IC pins. I mounted a miniature slide switch along the right edge of the board so that I could disable the capacitor switching to facilitate before/after testing, but this is purely optional. A piece of #30 wire-wrap wire snaked along the PC board connects to the switch.

This modification reduces bleed-through and overloading effects in my QRP+ at SCAF bandwidth settings below 1kHz. However, very strong signals within 1.5 kHz or so of the desired signal can still cause problems. The worst problems are from strong signals below the desired signal on 160M though 40M and above the desired signal on the higher bands and within 1.5kHz of the desired signal. About the only way to help this situation – short of adding a narrow IF filter – is to switch in the 20dB input attenuator. (Or add an RF gain control.)

While you have the AF board on your bench, change the coupling capacitor from the SCAF output to the AGC detector (C24 in the QRP+) to 0.47µF in order to improve the AGC low frequency response. Since nothing below about 250Hz gets through the SCAF, there is no need to make this cap any larger than 0.47µF.

Note for SSB operators

You may well decide to forego this modification if your primary mode of operation is SSB. But if you do a lot of CW operating (particularly contests), you should give it serious consideration. If your primarily operating mode is SSB and you have a non-upgraded QRP+, you should at least consider changing C6, C16 and C18 to 270pF (330pF would also work) to improve the high frequency audio response. If you add the audio limiter (and you really should), C21 should not be reduced below about 600 pF.

QRP++ Note

This modification will have less effect on adjacent channel interference due to the presence of the IF limiter. If you decide to try it, you should note that components are label differently; in particular, the LP analog filter capacitors are C23, C24, C25 and C28. Their values are already 270pF, so it is only necessary to change C28 to 680pF.

Sidetone Output Independent of Audio Gain Setting

Maybe I have been "conditioned" by all the other rigs that I have ever owned, but I really expect the CW sidetone level to be essentially independent of the audio gain setting. Not so with the QRP PLUS! The first thing that I did after installing the mixer protection diodes described above was to see what could be done to correct this situation. I came up with the following fairly easy fix:

1. Remove the resistor that goes from the wiper of the sidetone level control to the top of the audio gain control. In the QRP+, this is a 10K resistor, R22, located near the sidetone pot (R21) and the microphone jack at the rear of the AF board. In the QRP++, it is a 4.7K resistor but not labeled on the schematic (maybe R2?).
2. Tack-solder one end of a 100K resistor (47K might be better for the QRP++) to the solder pad of the 1K resistor that connects to pin 2 of the LM386 audio amplifier IC (R52 in the QRP+, R58 in the QRP++).
3. Solder one end of a piece of #30 insulated wire (wire-wrap wire, available from Radio Shack) to the solder pad of the resistor removed in step 1 that connects to the wiper of the sidetone pot. Snake the wire along the PC board and connect the other end to the 100K (47K) resistor installed in step 2.

That's all there is to it! The side tone level will still be influenced slightly by the audio gain setting, but not nearly as much as before. I decided that the slight interaction still remaining is OK since I tend to run the audio gain much higher when using the speaker than when using headphones. If I now set the sidetone level so that it is just right when using headphones, it is also about right when using the speaker.

Removing Sidetone Clicks and Thumps

There is a low frequency "thump" when keying the rig that is quite noticeable (and annoying) when wearing headphones. The source of the "thump" is inadequate bypassing of pin 7 of the LM386 audio amplifier. The purpose of the bypass cap on this pin is to isolate the high gain input stage of the LM386 from the power supply. When the rig is keyed, the +12V buss "sags" slightly as the result of the transmitter drawing current. This "sag" produces a transient that results in the audible thump, the amplitude of which depends to some extent on the "stiffness" of the power supply. The problem can be easily fixed by replacing the original 0.1µF bypass cap (C35 in both the QRP+ and QRP++) with a molded tantalum in the range 4.7µF to 10µF having a voltage rating of at least 25V. The positive lead goes to pin 7.

There is also a slight key-up click in the QRP+ that is audible when wearing headphones. This problem is not present in the QRP++. The click is due to a voltage transient induced on C29 when U8 is

[4] This modification has been tested on a QRP+ with both Rev 03 and Rev 4C EPROMs. It has not been tested on a QRP++, but I assume that the SCAF cutoff frequency characteristics are the same as a QRP+ with a Rev 4C EPROM. If not, then a control pin on one of the SCAF IC's must be found that is "high" (about 7.8V) for all low bandwidth settings below some cutoff in the range 0.8 to 1.4 kHz and "low" (0V) at all filter settings above the cutoff.

turned on. The cure is fairly simple [6], but it does require a trace on the PC board to be cut: Insert a 0.47µF capacitor (any value in the range 0.2 – 1.0µF is OK) between R44 and pin 11 of U8, and a 100K resistor from pin 11 of U8 to ground. You can do this as follows **(QRP+ only)**:

1. Find the PC trace that goes from R44 (near U4) to U8; it passes under C24 and makes a right-angle bend in front of Q6. With a sharp knife, cut a gap in the trace just below the bend. Scrape the protective coating from the trace on each side of the cut, tin the exposed trace, and solder the leads of the capacitor to the trace.
2. The trace makes two right-angle bends between C26 and C45, just above U8. Scrape the coating from the short section of trace between these bends and tin it. Solder one lead of the 100K resistor to this point and the other lead to the ground pad for C8 (located just in front of the mic jack).

LED Indicator for RIT/SPLIT Active

More than once I have wondered why a station did not come back to my call only to discover that the RIT was ON and I was calling off-frequency! I therefore decided to add an LED to indicate when the XCVE/RIT/SPLIT switch was not in the XCVE position. The circuit that I used to accomplish this is shown in Figure 4.

I constructed the circuit on a 0.5 in. x 0.5 in. piece of "perf board" with the resistors mounted upright and the 1µF bypass capacitor hanging below the board. The board is mounted "spider web" style behind the front panel PC board. It must be mounted very close to the front panel PC board so that it does not interfere with removal of the "stacked" PC boards. Input to the circuit is taken from the bottom post of the XCVE/RIT/SPLIT switch. When the switch is in the XCVE position, +5V is fed to the circuit which switches the LED off. When it is in either the RIT or SPLIT position, the LED will be turned on. In addition to the input from the switch, the circuit requires +5V which can be obtained from the back of the front panel PC board at the lower C3 solder pad. The ground connection can be made to the other C3 solder pad, or to the ground plane of the PC board. I used a 3mm "Super Bright" LED mounted in a clear plastic holder. I drilled a hole for the LED holder below the "RIT" and just to the right of "SPLIT" lettering on the front panel.

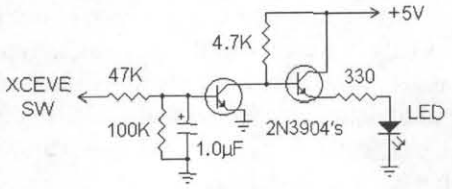


Figure 4. RIT/SPLIT ON indicator circuit.

RF Gain Control

Being able to control the RF gain would be useful, particularly in the QRP++ with its high IF gain and IF limiter, in reducing adjacent channel interference effects. (My personal opinion is that a variable input attenuator would be the best solution.) Index Labs has provided many QRP++ owners with a simple RF gain control circuit. The circuit, shown in Figure 5, adds a variable DC bias to the AGC line to control the IF amplifier gain.. The circuit connects to pin 4 of U7 (U8 in the QRP+) on the AF board. +V is +10V (+12V in the QRP+) I bread-boarded the circuit in my QRP+ but decided against adding it as a permanent feature. For one thing, there is no place to put the RF gain control except on the rear panel or possibly the top cover.

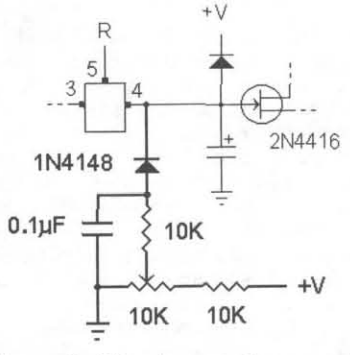


Figure 5. RF gain control suggested by Index Labs. Added components are shown in bold.

Light for Power/SWR meter

I found it difficult to read the meter even under good lighting conditions, so I mounted a small "high intensity" green LED behind the meter face. The meter in my rig has an access space behind the face which is translucent, allowing the light to easily shine through. The LED is held in place with a dab of RTV. I believe that several different meter styles have been used in different production runs of the rig, so you may have to devise a different mounting scheme for a light. Since you have to almost completely disassemble the rig to gain access to the meter, you may well decide this is not worth the effort. On the other hand, the LED sure makes the meter easier to read and acts as a convenient power-ON indicator.

To get to the meter, you can remove all four of the boards in the vertical stack. Alternatively, you can leave the XMTR board in place and remove the display board to gain access to the meter. The meter can then be removed by removing the two "L" shaped brackets holding it in place. Once you have access to the meter, you can determine how best to mount a lamp. I highly recommend an LED (green gives a nice friendly glow). The high intensity type will produce plenty of light at a current of 10mA or less. Power for the light can be obtained from the ON/OFF switch, and a convenient grounding point is the ground lug on the bottom of the case. Use an appropriate series resistor for the LED (I used 1.2K) covered with a piece of heat-shrink tubing.

I tried various schemes to illuminate the liquid crystal frequency display, but nothing short of a small lamp directly in front of it was very effective. The display is actually fairly easy to read in all but very poor lighting, so I decided that it wasn't worth worrying about.

Wrap-up

That's it for my QRP+ receiver mods. The next installment will describe mods for the transmitter. Several mods to improve transmitter spectral purity will be covered, including new output filters for 30M through 10M. So make sure you have plenty of desoldering braid on hand and that your ARCI membership dues are paid so that you won't miss the next issue of **The QRP Quarterly**! By the way – you might want to make sure to have about three T50-10 toroid cores on hand.

My thanks to the many folks with whom I have swapped information on the QRP+ via the Internet, particularly those who tested and provided feedback on some of mods that I have described here.

References

[1] David Feldman, WB0GAZ, "The Index Labs QRP Plus – First Impressions," **The QRP Quarterly**, Volume XXXIII, No. 2 (April 1995), page 8.

[2] Rick Lundquest, KX4V, "Index Laboratories New QRP Plus Transceiver," **QST**, Volume 80, No. 9 (Sept. 1996), page 68.

[3] Larry East, W1HUE, "Comparison between the 'old' and 'new' QRP-Plus Transceivers," **The QRP Quarterly**, Volume XXXIV, No. 3 (July 1996), page 20.

[4] "Idea Exchange," **The QRP Quarterly**, Volume XXXIV, No. 1 (January 1996), page 34.

[5] Rich Arndt, WB4TLM and Joe Fikes, KB4KVE, "SuperSCAF and son – A Pair of Switched Capacitor Audio Filters," **QST**, April 1986, page 13.

[6] This modification was originally posted on the Internet by Norbert Heyder, DL8BDF and is reproduced here with his permission.

CONTESTS

Cam Hartford, N6GA

Each new contest seems to bring new members and new contesters into our fold. The Fall QSO Party was no exception. I think there were more entries than ever before which were accompanied by the comment "My first contest!" or "My first QRP contest." To help the newer participants and refresh the memories of some of the more seasoned contesters, I am offering a list of the most common scoring errors.

1) **S/P/Cs**. By far the most errors are made here. In ARCI contests, S/P/Cs are counted BY BAND. This means if you work Colorado on 20, 40 and 80 meters, you have ***Three*** S/P/Cs. Check the results of the Fall contest later in this issue. Ever wonder how somebody could work 119 S/P/Cs?

2) **S/P/Cs Again**. S/P/C stands for State, Province *or* Country. A QSO can count for only one. For a US station, a QSO with VE6GK counts as one province, not as a province and a country.

3) **Power Multiplier**. Most people get this one right, but please note that for each contest, you can only have one Power Multiplier. It is based on the highest power you run during the contest. Example: If you use your QRP+ on 20 meters at 5 watts and your Forty-9er on 40 meters at .25 watts, your Power Multiplier for the entire contest is X7 (for 1 to 5 watts out.) To maximize your score, choose similar power levels for all bands.

4) **Adding up your score**. On our Summary sheet, there are boxes for QSO Points and S/P/Cs for each band. Add these down the columns before multiplying them. If you multiply the numbers for each band together before adding them, you will have a lower score. Trust me on this. (If you don't trust me, try it both ways.)

5) **Bonus Points**. Homebrew bonus points apply to Homebrew contests only. They don't apply to the QSO Parties, and haven't for a few years. Read the Rules! Please!
We also dropped the Power Source multipliers long ago. Batteries and solar panels are cheap and readily available now, and really have nothing to do with contesting.

6) **Summary Sheet.** I do not require the use of a Summary sheet with each entry, but I should. Please use one. If you had a clue how hard it was or how much time it took to hunt around for the information on a contest summary scrawled on a bar napkin, you would take pity on the poor Contest Manager. Especially in a contest with 150 entries. The summary sheet reminds you to include all necessary information, and it presents the information in a format that is easily used (by you and me). You can get the Summary sheet by sending an SASE to me, or from the ARCI Web Page (http://www.duke.edu/~djohnson/arci.html). We occasionally print one here in the Quarterly on a space-available basis.

Thanks and hope to see you in the next one -
de N6GA.

WINTER FIRESIDE SSB SPRINT

Date/Time:
January 12, 1997; 12 Noon to 8:00 PM, Local Time. Operate a maximum of 4 hours of the 8 hour period. Mark on and off times in log.

Exchange:
Member - RST, State/Province/Country, ARCI 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.
S/P/Cs may be worked on more than one band for credit.

Bonus Points:
Points awarded for using Homebrew equipment,apply for each band on which Homebrew equipment was used:
+2,000 HB Transmitter used
+3,000 HB Receiver used
+5,000 HB Transceiver used

Homebrew Definition: If you built it, it is considered Homebrew.

Power Multiplier: (Power Output)
0 - 250 MW (0- 500 MW PEP SSB) = X 15;
250 MW - 1 Watt (500 MW - 2 W PEP SSB) = X 10;
1 W - 5 W (2 - 10 Watts PEP SSB) = X 7;
Over 5 W (Over 10 Watts PEP SSB) = X 1.

Suggested Frequencies:

GENERAL

160 Meters	1830 KHz	15 Meters	21385 KHz
80 Meters	3865 KHz	10 Meters	28385 KHz
40 Meters	7285 KHz	6 Meters	50128 KHz
20 Meter	14285 KHz		

Score:
Points (total for all bands) X SPCs (total for all bands) X Power Multiplier + Bonus Points.

Entry may be an All-Band, Single Band, Hi-Band (20M, 15M, 10M and 6M) or Lo-Band (160M, 80M and 40M). Certificates to the top three scores, to the top score in each Single-band, Lo-band and Hi-band class, and to the top score in each SPC. The contest manager reserves the right to recognize special significant entries with a certificate award.

Entry includes a copy of the logs and a separate summary sheet. Include duplicate check sheets with entries of 100 QSOs or more. Indicate total time-on-the-air, and include a legible name, call, QRP ARCI Number (if any) and address.

All entries must be received within 30 days of the contest date. Late entries will be counted as check logs. Members and non-members indicate their output power for each band. The highest power used will determine the power multiplier. Output power is considered as 1/2 of input power.

Include a description of homebrew equipment, commercial equipment, and antennas used with each entry. Homebrew bonus points may not be claimed if a description is not included with the entry.

Send an SASE for a summary and sample log sheets. Include an SASE with your entry for a copy of the results. Results will be published in the next available issue of the QRP ARCI Quarterly.

The final decision on all matters concerning the contests rests with the contest manager.

Entries are welcome via E-Mail to CamQRP@cyberg8t.com, or by mail to:

Cam Hartford, N6GA
1959 Bridgeport Ave.
Claremont, CA 91711

CALL	SCORE	POINTS		SPC	POWER	BANDS		TIME	RIG	ANTENNA
KG2DP	1008	18	8		10PEP	40M	1.5	QRP+		DELTA LOOP
KT4QV	224	8	4		10PEP	20M	1	ALINCO DX-70T		DIPOLE @ 25'
VE2PIJ	2	2	1		70w	6M	4	?	?	

QRP ARCI CONTEST SUMMARY SHEET

QRP ARCI CONTEST_____ MODE_____

CALL_____ S/P/C(QTH)_____ QRP # / POWER_____ ENTRY: MULTIBAND_____ LOW-BAND ___

SINGLE BAND____ HIGH-BAND____

BAND	POINTS	S/P/C
160		
80		
40		
20		
15		
10		
6		
Totals		

Enter Points and S/P/C PER BAND. Treat each band separately for S/P/C credit.

Total points and S/P/Cs before inserting them in the equation below.

Multiply points, S/P/Cs and Power Multiplier, then add Bonus Points, if any.

Send Entry to: Cam Hartford N6GA
QRP ARCI Contest Manager
1959 Bridgeport Ave.
Claremont, CA 91711

or e-mail to CamQRP@cyberg8t.com

Total Points	X	Total S/P/C	X	Power Mult	+	Bonus Points	=	Final Score
_____	X	_____	X	_____	+	_____	=	_____

TOTAL OPERATING TIME _____ DUPLICATE SHEETS INCLUDED? _____

TRANSMITTER/TRANSCEIVER _____ POWER OUTPUT _____

RECEIVER _____

ANTENNA(S)_____

TIME TO CHECK THE ADDRESS LABEL

Please remember to check the address label to see if you need to renew your membership in the QRP ARCI.

DON'T MISS A SINGLE ISSUE OF THE QUARTERLY

Don't wait for us to send you a reminder, we just might not!

1996 QRP ARCI FALL QSO PARTY

Wherein the Sunspots make a brief but promising return, and W9PNE runs up a total of 288k points running 20 MW !

CALL	SCORE	POINTS	S/P/Cs	POWER	BANDS	TIME	RIG	ANTENNA
ALBERTA								
VE6BIR	38,430	183	30	3	A-2	3	ARGO 509	YAGI, TRAP DIPOLE
VE6ZAA	7,154	73	14	4	A-2	2.5	IC-725	GAP VERTICAL
ALASKA								
KL7GN	3,150	50	9	4	20M	2	IC-735	YAGI @ 60'
ALABAMA								
AB4QL	70,620	214	33	0.9	A-3	6	ARGO 515	80M LOOP
K4KJP	61,236	243	36	5	A-3	6	QRP+,ARGO 515,SPRINT	540'HORIZ LOOP,SLOPER,DISCONE
AE4JM	5,628	67	12	2	40M	1.5	NORCAL 40A	80M DIPOLE @ 11'
W4DGH	3,520	56	9	4	20M	2.5	QRP+	YAGI
ARKANSAS								
KJ5TF	24,080	172	20	1.3	40M	10	FORTY-9ER	HALF SQUARE
N9ZZ	9,180	51	12	0.2	A-3	4	ARGO 515	VERTICAL, 36" LOOP, 450' WIRE
ARIZONA								
W5VBO	173,964	436	57	5	A-3	17.5	QRP+	YAGI, LOOP, PHASED VERTICALS
N7JXS	106,428	362	42	4.5	A-2	14	FT-757GX	TH6DXX, VERT
W7BXZ	30,464	136	32	4	20M	7.5	TEN TEC SCOUT	20M DIPOLE
AA7QY	11,760	112	15	3	A-2	5	HW-9R-7	VERTICAL
BRITISH CO LUMBIA								
VE7CA	153,216	456	48	3	A-2	?	HB TCVR	HB LOG PERIODIC, INV VEE
VE7BLU	21,252	132	23	4	20M	12	HW9 YAGI @ 40'	
CALIFORNIA								
N6GA	108,400	271	40	0.9	A-3	6	NORCAL SIERRA	40M DIPOLE @ 35'
K6QWH	105,336	342	44	5	A-2	10	ARGO 509	VERTICAL
W1HIJ	7,918	214	37	10	A-2	10	TS140S	20M & 40M DIPOLES
WD6FDD	2,016	48	6	5	40M	?	?	?
COLORADO								
KØFRP	649,508	1091	84	5	A-4	11	TS-850	PH LOOPS 80, 2 EL 40, 4 EL 20
KØFX	572,964	1077	76	4	A-3	13	TS-930	YAGI, SLOPER, DIPOLE
KF7MD	389,400	590	66	0.9	A-4	11	TS-680	YAGI, VEEBEAM,DELTA LOOP, INV VEE
WØØQ	154,000	400	55	4	A-3	8.5	FT-1000	QUAD, VERTICAL
NØIBT	61,985	235	35	5	A-3	14	TS-870	DIPOLE
NØTBM	31,465	145	31	5	A-3	4	TS-450S	G5RV @ 30'
KGØPP	1,736	31	8	3	20M	0.5	QRP+	HF6V VERT
CONNECTICUT								
KH6CP	737,583	1133	93	4.7	A-4	24	HW-9	YAGI, VERT,330'LOOP, 66' DIPOLE
KA1OX	64,008	254	36	5	A-3	16.5	TS-850, CENTURY 21	YAGI @ 28', EXT ZEPP @ 75'
N1RCG	28,728	152	27	3	A-3	8	FT-890	DIPOLE,DELTA LOOP, INV.L
FLORIDA								
K3PBY	45,458	191	34	5	A-2	5	HB TCVRS	CF 90' ZEPP
KT4QV	8,288	74	16	5	20M	4	ALINCO DX-70T	CF ZEPP
WB2QAP	945	27	5	5	A-2	1	FT-840	MFJ VERTICAL
GEORGIA								
AE4CA	529,200	840	90	5	A-5	18	FT-840	80M LOOP, VERTICAL
KN4QV	225,792	504	64	5	A-3	5	IC-738	YAGI, DIPOLES
N4OLN	113,600	355	32	0.5	L-2	?	?	?
WD4DSS	76,636	322	34	4.5	20M	13.5	TEN-TEC OMNI D	80M LOOP
KE2WB	13,440	84	16	0.9	A-3	2	HW-9	131' DIPOLE @ 40'
HAWAII								
WB6FZH	4,032	36	16	5	A-2	6	TEN TEC CENTURY 21	VERTICAL, ON EDGE OF KANEOHE BAY
IOWA								
KFØN	137,550	393	50	5	A-2	7	HB TRANSCEIVER	41' VERTICAL
KQØI	3,402	54	9	5	A-2	1	TEN TEC DELTA LOW	DIPOLE
IDAHO								
W7CNL	160,524	468	49	3	20M	14	ARGOSY II YAGI	@ 45'
KF7ET	8,730	92	10	0.9	40M	11	QRP+	INVERTED VEE
ILLINOIS								
N9HH	316,470	685	66	5	A-4	18	IC706	50' OF DOWNSPOUT AND RAIN GUTTER
W9PNE	288,750	350	55	20MW	A-3	14	ARGO 515	MOD FOR MW YAGI @ 52',HALF SLOPERS
KB9IUA	23,562	153	22	5	40M	7	CENTURY 22	DIPOLE @ 20'
W9CUN	5,313	69	11	4	40M	2.5	OMNI-D	GAP CHALLENGER VERT

Check page # 10

If you have any interest in helping out the QRP ARCI in ANY way, now it the time to let us know. Send your letter or email to Mike now. Don't delay.
If you see a position listed on the back cover that you would like to fill, write today!
And don't forget that the job of Managing Editor is open also. See page # 47.

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The Last Word

The QRP Quarterly invites readers to submit original technical and feature articles as a service to their fellow QRP enthusiasts. Although The QRP Quarterly cannot pay for submissions accepted for publication, it will acknowledge, with thanks, authorship of all published articles.

Due to space limitations, articles should be concise. Where appropriate, they should be illustrated with publishable photos and/or drawings.

Full articles should go to the appropriate volunteer editor for review, with a copy to the Managing Editor. Information for columns should be sent directly to the column editor. See the back cover for addresses. Submit technical and feature articles with a printed copy and a copy on disk (if possible). ASCII text is preferred. Photos and drawings should be camera-ready or .tif format. Other formats can be used with prior approval.

Technical and feature articles should be original and not be under consideration by any other publication at the time of submission to the QRP Quarterly or while the QRP Quarterly is reviewing the article. If you contemplate simultaneous submission to another publication, please explain the situation in a cover letter.

Material for possible use in the QRP Quarterly should be sent to only one of the editorial volunteers, not to several at the same time. The QRP Quarterly editors and columnists will transmit the submission to others on the staff if they believe it better fits another category.

The QRP Quarterly will occasionally consider reprinting articles previously published elsewhere if the information is especially useful to members of QRP ARCI. In all such cases, the QRP Quarterly will obtain permission to reprint from both the author and the original publication and acknowledge the source of the material.

The QRP Quarterly will occasionally print information first appearing on QRP-L after obtaining the permission of the author and ascertaining that the information is not scheduled to appear in another publication.

Copyright of materials published in the QRP Quarterly remains with the author. Although the author retains the right to reuse the material, the QRP Quarterly requests that reprints of the material in other publications acknowledge first publication in the QRP Quarterly. de **Ron, KU7Y**

(With thanks to **L.B. Cebik** for all his help)

So, you wanna be an Editor, eh?

We are taking applications for the position of Managing Editor. You must have internet access, including both email and ftp as a minimum. If you have ever worked on a club news letter or school paper, you already have the basic skills needed for the job. All the hard work is done by all the other editors listed on the back cover. You just paste things together and send the whole thing to the printer. If you are interested, please let me know. de Ron, KU7Y

New Member / Renewal Application Form

Full Name:_____ **Call**_____ **QRP ARCI #** _____

Mailing Address _____

City _____ **State / Country** _____ **Zip Code** _____

New Address? **New Call?** **(List old call)** _____ **New Membership or Renewal?** _____

USA	CANADA	DX
New Member, $17. Renewal, $15	New Member, $20. Renewal, $18	New Member, $27. Renewal, $25

Mail compleated application to either:

Check or Money Order in U.S. Funds
Make checks payable to: "QRP-ARCI"

Mike Bryce, WB8VGE
QRP ARCI Membership
P.O.Box 508
Massillon, OH 44648-0508
For a Club Information Pack, send $2 to the above address.

We hope to announce another DX agent in the April, 1997 issue of the Quarterly.

In the meantime, please send all funds, in US dollars, to Mike Bryce as listed to the left.

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