QRP Quarterly

Journal of the QRP Amateur Radio Club, International

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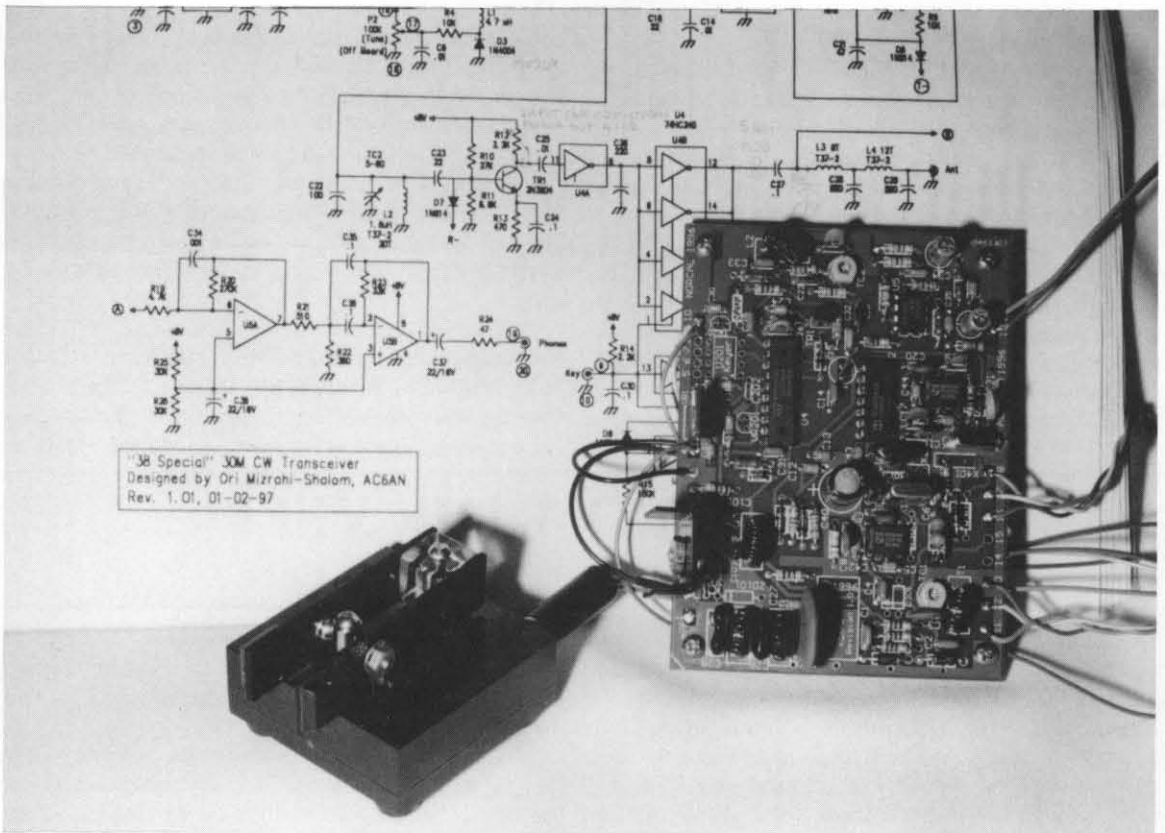


The winner of the cover picture contest this quarter is *Dick Smith, N7CTJ.*
This is his "NorCal 38 Special" during the debugging stage.
NorCal has shipped over 1,000 of these kits already!
Send in your picture for the cover contest. You just may be the next person to win a membership or renewal to the QRP ARCI.

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

By the time you read this column, I will have sent the following recommendations to the **ARRL** via **Dave Sumner, K1ZZ** and **Rodney Stafford, KB6ZV:**

"Whereas proficiency in Morse code has been an international requirement for many decades, and Morse code is the international language that fosters communications between peoples with differing languages, and knowledge of the Morse code has, for decades, proven to be of positive value to the amateur service worldwide; therefore, we request that the ARRL:

1. Strongly reaffirm it's continued support for a demonstrated proficiency in the International Morse Code as part of the license requirement for all amateur operation below 30 MHz.

2. Declare it's desire that demonstrated proficiency in the International Morse Code should remain in the ITU rules as a requirement for all amateurs operating below 30 MHz.

3. Instruct all ARRL representatives to continue to insist, before all national and international bodies that there be no modification of the present Morse code proficiency requirements for operation below 30 MHz."

This wording has basically been agreed upon by several like minded organizations and similar statements are being sent to the ARRL, what impact these recommendations will have I can't predict, but at least they will know where we stand. On a similar subject, please pay close attention to the upcoming proposal for restructuring of both band plans and amateur licensing that is scheduled to be presented in the 03/97 QST

This issue contains the FDIM announcement that I told you was in the 01/97 issue. Our apologies to those hard working folks for losing their first announcement. Other plans for Dayton '97 are in the works and I hope to visit with as many members as possible.

The Board of Directors has voted to reduce the DX dues (outside N. America) to $20.00/year from the $25.00 /year established in July '96. This reduction was made with the realization that a subsidy may soon result with these members dues, but the $25.00/year was excessive when compared to other QRP Club journals costs. The DX members were heard and appropriate action was taken. In another issue relative to DX members, their issues have been going by "surface" (read slow-boat). It was our intent to surface mail only the July '96 issue, but the word to go back to air mail never got to the mailing house. To atone for the resultant overcharge to these members, we will be adding one additional quarter to the DX members subscriptions. You have my promise that this issue will be sent via air mail.

Additionally, the Board of Directors voted (same motion) to make the $2.00 additional charge (pays for the membership certificate) optional. This makes the new and renewal rates the same. If you desire a membership certificate, you can include an additional $2.00 to receive one.

In other ARCI news, **Bruce Muscolino, W6TOY/3**, has agreed to become the club's Publicity Officer, effective 01/01/97. This takes some pressure off **Mike Bryce, WB8VGE** who has been wearing several hats for many years. Thanks for all your efforts Mike! We do appreciate them. Hope to see all of you at Dayton '97 and FDIM. **72/73 Buck, N8CQA**

NOTES FROM THE VEEP

Mike Czuhajewski, WA8MCQ

Dayton is fast approaching and, as always, it's a big event for QRPers. There are lots of things going on at the "QRP Hotel" most evenings, and during the day you can "shop 'til you drop" in the flea market area. It's a tired old cliche, but mostly true--"If you can't find it for sale at Dayton, it doesn't exist!" And don't forget to go inside the arena and stop by the tables of the various QRP clubs and meet some well known QRPers. (There will be plenty of those at the QRP Hotel, too.) I've been there three times already, and it's something you really should do at least once in your life.

Who are the new President and Veep of the QRP ARCI? Sorry, can't tell you yet; not all precincts have reported their results, and we still have to count the absentee ballots. Well, actually that's not true; the voting is done by the Board of Directors, and may be done via e-mail this year. The cutoff for getting names on the ballot is the end of March, well after the deadline for this issue of the QRP Quarterly, but the results will be put out on QRP-L and at Dayton. And if anyone is interested in running for a spot on the Board of Directors, three terms expire next year. We'll have a call for volunteers to throw their hats in the ring later this year.

The QRP Hall of Fame results for this year will be announced at the QRP banquet at Dayton. There weren't quite as many nominees as last year, but still a good handful. And if there is someone you think is deserving of the honor, start writing up a good nominating letter for them. Later this year we'll call for nominations again.

The sunspots have nowhere to go but up! If you haven't tried any milliwatting yet, you might want to start thinking about it. If running a few watts gets to be boring and unexciting after a while and you need a new challenge, try cranking the power way down. And don't forget to write to WO3B and tell him of your accomplishments so he can include it in our milliwatting column. **DE WA8MCQ, The Veep**

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!

Table of contentS

FROM THE EDITOR

Monte "Ron" Stark, KU7Y

Here it is, time for another Quarterly. Winter is still here. Just a little spit of snow today. In two days they say it will be over 60F! Weeds and some of the bulbs are starting to grow already.

Just before Christmas, on the 21st of December, we had over three feet of snow! What a nice sight that made on Christmas day. Sunny and warm. Was like living in the picture on a Christmas card. By New Years, the snow was gone, the ground saturated and then it warmed up. I'm sure you all heard about the flooding in the Reno and Carson City areas. We were very lucky here. No real damage, just ruts in the driveways where the water ran through. Still waiting for the ground to dry a bit before digging the holes for the other tower.

How many of you managed to work **VK0IR, Heard Island**? If you didn't follow the activity on the WEB or on the reflector, you really missed out on a one of a kind operation. **John Devoldere, ON4UN,** was one of the pilot stations and worked a good 16 hours a day to keep everyone in the world informed of the situation on the island. A lot of QRP contacts were made! (No, I didn't get them with QRP, I did it with a full 100 watts.) Here are some of the numbers from that operation: **80,673 total QSOs!** That's a new overall record for any DX-pedition. **Congratulations to the whole crew!** What did it take to get that many QSOs? **17 OF THE BEST OPERATORS IN THE WORLD**, over **34 tons** of equipment, **30 antennas**, **6 generators** and that's just part of it! Go to their **WWW** and check it out. **http://www.ccnet.com/~cordell/HI/** or try **http://www.aurumtel.com/hnews.html**.

HEARD ISLAND
It was the greatest show of HiTech Amateur Radio the world has ever seen.

What does this have to do with QRP? A few things come to mind. One is that if you want to "work em' all" with QRP, you need these operations! Another is that this operation set the standard for major **DX-peditions**. These operators stuck with a station until they got the call right. They didn't just say "sri, try later"! My hat is off to them. One more point is that even though this was one of the most needed countries and the pile-ups were big, (or maybe I should say bigger than big), many QRP stations made it! Don't give up. Have faith in your ability to get the contact.

But, (you knew this was coming, didn't you?), what was wrong with the whole picture? Certainly nothing wrong with the **DXpedition**. It was the greatest show of HiTech Amateur Radio the world has ever seen. What bothers me is that is just seemed too easy. Watch the WEB, the Internet reflector or packet spots. Turn your dial to the right numbers, listen to see where they are working. Tweak the filters a bit to get rid of the jammers, lid and cops. Then, when the signals peak, drop your call where you think they will be listing and bingo, another new one! I came away with the feeling that if it wasn't for all the jammers, lids and cops, there wouldn't have been much challenge left! No more "one ringers" at 2 am, no more sleepless nights spent listing for a faint signal in all the noise. Just watch the info and set your dial. Something just isn't right.

Maybe the trouble is that we have a low tech award program that finds itself in a high tech world. When the **DXCC** program started, did anyone think that so many people would work 100 plus countries in just one weekend? Or did they think that you should have to work hard to get it? Even at **QRP** power levels, with a little help from the sunspots, 100 countries in a single contest is a snap.

Then there is the option of going to someone else's station and working new countries using your call. Just because you can't or don't want to have what it takes to work DX from your own station! Should it count if I go to the east coast and use a major contest/DX station to work the stations to the east and come out to a major west coast contest/DX station to work the stations to the west? How far do we have to go before we have all the awards watered down to the point that they are not worth having? What was the intent of the **DXCC** program? If we were to really know what the originators were thinking, we might be able to find a cure! If all they wanted to do was to create some activity from all over the world, then it's fine as it is. But if, on the other hand, the award was conceived to really mean something, then I think we might have a problem. Just saying that the awards only mean something to the person that got it is the easy way out!

QRPers tend to do things the hard way and might tend to think that the QRO operators don't think the same way. But you might be in for a little surprise. Read what was sent as a reply on the Internet reflector when one, (of many), complained that they couldn't work **VK0IR** for some reason, (not of their doing of course!):

The complaint was abut not being able to work them with 100 watts with a tri bander yagi and wire antennas. All bands were usable to the letter writer. The excuse that was used was that he had only a general class license and he could not get down where the **DX** was! Others asked for schedules because they couldn't make a contact for, (insert any reason you can think of!).

Read the following reply. This is from someone who knows **DX** well. While he is not a QRPer, he does share many of the ideals that we believe in.

"Please forgive me if I sound like some old grump--I do not mean to offend you--but I personally think the general class issue as you have stated it puts the cart before the horse.

The question in **DX**ing, as it is in many other spheres of activity, is whether to bring oneself **UP** to the next performance level, or to expect the world to bring itself **DOWN** to one's own level. I think the answer is obvious--if it requires an Extra Class license to be a serious **CW DX**er, and one wants to be a serious **CW DX**er, one should take up the challenge, study and practice, and achieve the higher level. It's not impossible--people do it at all ages--and it is a worthwhile thing to do.

It is admirable that the **HI** group wants to work as many generals as possible. It is not reasonable to expect the **HI** group to radically alter the game plan to do so." **Garry Shapiro, NI6T**
Editor, The DXer newsletter of the Northern California DX Club

Very well said Garry. Those attitudes are right there with with the "speed limits needed in CW contests because I can't copy that fast" ideas. In life outside Amateur Radio, you must first have the skills needed for the job to be done. If you want a degree, you must complete the course first! You don't get the degree and then go get the last 15 units whenever you feel like it! If you want to "work em' all", you should get your extra class license. If you want to be in the top ten listing of one of the major CW contests, you need to get your speed up! I wonder how many top ten finishers in the **CQWW, ARRL DX, WPX** or the ever popular **ARRL SS** contests held their speed to 25 wpm?

I have been using **TR Log** every since the **ARRL SS CW** contest back in November. It now includes the **ARCI** contest format! If you have never used a good contest program, you should try it! There are other good logging programs out there, but **TR Log** is the only one I have tried. Sure makes tracking all the **Fox's** easy. And in the contest emulation mode, it's some of the best code practice you can have!

I hope to meet many of you at **Dayton** this year. I will be at the **FDIM** event, the **QRP Banquet** and of course at the **QRP ARCI Booth**. Be sure to stop by and say HI. **de Ron, KU7Y**

Error Correction

From the Round Robin Review '96 article

Page 28, October, 1996

Ron Stark, KU7Y, Editor

Bruce Williams, WA6IVC, notified me of some errors in the review of his **MXM Simple Transceiver.**

I would like to apologize to Bruce for allowing this inaccurate description to be published. This should have been caught during the review of the article and I take full responsibility for the error.

Following is a correct description, by **Bruce Williams,** of how his circuit works. Following that, there is an acknowledgment by the author.

There has also been some discussions of reviews in general. Some feel that they need to be totally objective, with no impressions from the reviewer. Others feel that reviews are more subjective than objective because the reviewer is talking mostly about how the radio "feels" to him or her.

I agree with the second position, that reviews are more subjective and reflect how the author "got along with" the radio. What one person likes another might dislike. Otherwise, one radio would fill the bill for all of us! The more we read the same author, the more we understand what his feelings mean to us.

Circuit descriptions, sizes, specifications and other "facts" are objective and need to be accurate. When errors do get past us, we will gladly run a correction.

Impressions are just that. I doubt that I would waste much space with arguments over who likes/dislikes which features and etc.!

But that's enough of my babbling, lets get on with the correction.
de Ron, KU7Y

My design is a double-conversion type. There are no other similar designs offered at the present time. However, my design differs from even the commercial double-conversion items in that it includes two filters--one in each IF. No mention was made of the second, ceramic filter in the 455 kHz IF.

The MXM is not furnished with a "Painted Cabinet".

The Simple Transceiver is designed for speaker volume--not headphones! The LM38ON8 that I use is rated at 0.6W.

Double-conversion receivers have three mixers: the VFO, which converts the RF to the first IF, the second mixer which converts the first IF to the second IF, and the product detector, which can be considered the third mixer and which converts the 455 kHz second IF to audio.

The unit is designed to permit variation of the BFO frequency over a range of 5000 Hz on each side of zero beat. It is impossible to move the VFO through a range of 1500 kHz. In any event, this control affects only the receiver--**it is impossible to inadvertently be transmitting 1500 kHz away from an incoming signal.**

The purpose of the control is to allow the selection of either sideband--this is not a fixed, 700 Hz offset. With this variable feature, you can move to the opposite sideband to eliminate QRM near the desired signal, or change the pitch for easier listening.

Until recently I had only a dot-matrix printer and an old 386 machine available for manuals. This has changed, now, and I have a commercial word-processor with an inkjet printer. I am in the process of redoing all of my data.

The PC board is 3-1/2 by 4-1/2 inches in size--it is rectangular, not square.

There is a reason I use 7 mm transformers--other designers use the 10 mm types. I have found that the repeatability of the 7mm transformer types are better, and that there is a better core mix. In any event, the 7 mm transformers are no harder to install than the 10 mm types.

Bruce O. Williams, WA6IVC
MXM Industries, Rt 1 Box 156C, Smithville, TX 78957
(512) 237-3906

Hi Gang,

It was pointed out to me that I was in error when I wrote **(Oct. QQ "Round Robin Review '96)** that the **MXM Transceiver** BFO control could put the rig on the wrong sideband. The is a BFO, it can't cause wrong side errors, and it is an effective system. I apologize for this error.
Preston WJ2V

QRP ARCI World Wide Web Site!

Everyone is invited to visit and contribute to the improvement of the **QRP ARCI Web** site. This currently has information on **QRP ARCI**, its contests, the Quarterly, nets, awards, and more! There is a radiolinks page which contains links to many other web sites of interest to QRPers and other radio amateurs. I would like to receive information and ideas for the improvement of these web pages. I can't guarantee that I can follow everyone's ideas or include all text that is sent to me, but I will try to incorporate improvements as time permits. Have a look by pointing your browser to the following URL and following the links!

http://RTPnet.org:80/~qrp/

Have fun! **Dave, WA4NID**

QRP ARCI ANNOUNCES NEW AD RATES

$80.00 per page, $40.00 per half page and $20.00 per quarter page per issue. There is a new Company Ad Rate. Four ads, any size, one in each issue of the Quarterly, prepaid for a year, will include a membership or renewal. (4 quarter page ads, to run one each quarter, and membership is $80 and etc.)

All ads must be related to QRP. This can be equipment, parts, keyers, paddles, batteries and anything else that is of interest to the QRP community.

We would like to make this "**The Place**" to locate the sources for all the hard to find items that are always needed! For full details contact:

Byron Johnson, WA8LCZ at: Byron8lcz@aol.com
or at: 27426 Winslow Ave, Warren, MI 48092-4004

MILLIWATTING: 10db BELOW QRP

Bob White, WO3B

MILLIWATTING:How I got started and why I do it.

By now I am sure that most of you have read or at least heard about the "Why QRP?" correspondence which was printed in the March 1997 publication of QST. This is not an attempt to rebuttal said correspondence, but more a testimonial of why I dabble in the art of low power communications.

My QRP experiences started on 27 Oct 91 when I had a QSO with **Jerry, W0CLR**. Jerry, who was in Belton, MO, was running QRP and 579 at my station in MD, while I was running 100 watts with the same 579 signal in MO. Jerry convinced me that he would still be able to copy quite well even if I were to lower my power some, so down it came. Going down in steps, I hit the stops on the rig at .5 watts, and I was still a very respectful 559. What a kick. This reminded me of my high school days in the mid 60's when I, then **WA2YYO** and my buddy, **John, WA2WHZ** used to talk across town on the output of our VFO's. I remember thinking at the time that surely no one else could hear us, but was proven wrong when I received a "pink card" QSL from Frank Charlie Charlie who had some objection to the signal quality of my Heathkit VFO output. I had forgotten those days. That was when John, and I spend much of our free time trying to design a 40 meter rig we could use to communicate to each other during study hall. If only we had access to the NE602 back then!

After the contact with **W0CLR** I spent much of my time at or below 5 watts. I even broke the 1 watt barrier on occasion. But then I met Mike in February of 1994. You know **Mike, WA8MCQ**. By the time I hooked up with Mike at one of the **Maryland Milliwatter Show n Tells** at the local candy store, I had managed to work 850 QRP contacts with 40 of them in the under 1 watt range. Heck, I was even down to the last two or three QSL cards from WAS QRP. I was quite proud that Mike had heard of me and I remember his words. "So you are **Bob, WO3B**, I have heard that you are into QRP, but have you ever tried milliwatting?" Mike had an immediate strike. He proceeded to reel me in with a hand full of parts and a schematic for a simple dummyload/power measurement device and a challenge to try and check into the NEN the next weekend with less then 50 mw. Well I got into the NEN at 449 with 11mw, boy does **Greg, WA1JXR** have good ears, but Mike got in with 6mw! That was it for me, hook, line and sinker.

Why do I do it? It is fun, it makes me try to maintain an efficient station, it makes me a better operator, (I know about fills and repeats), it is a challenge, and did I say it was fun? Does it make it hard on the other end? I am sure it does at times, but I have never refrained from increasing power when the other end remarked that the going was getting rough. I try my best to keep people from having to work for a QSO. I do little things, like putting an attenuator inline on the receive side to approximate what my signal would sound like on the other end before I answer a CQ. Of course if I am the one calling CQ, then it was the other stations choice to answer me, so my signal must not be too objectionable.

I also like to look for other low power stations as it helps increase my operations skills and forces me learn to use some of the signal processing toys that I have hanging off the TS940s that I normal use. Heck, it forces me to learn to use some of the features on the 940 that I would normally have no need for in the non-contest environment. I sure don't want to have to learn about functions in the middle of the **ARRL CWSS!**

The big buck rig is nice and does help "pull them in", but it was certainly the efficient antenna I have cultivated over the last five years of QRPing that helped me QSO with a 49er that was operating from Dayton, OH, because I doubt that it was the receiver in the little buck 49er that I was using on my end that was doing all the work!

Bottom line is that you should enjoy what you are doing or it is time to move onto something else. **-- QRPp --**

IS FEAR OF A MICROPHONE KEEPING YOU FROM BECOMING AN AMATEUR RADIO OPERATOR?

Fred Bonavita, W5QJM, P.O. Box 2764, San Antonio, Texas 78299-2764.

Thousands of people are missing the joys of being a license Amateur Radio operator because they fear talking into a microphone.

They suffer the heartbreak of acute MIKE FRIGHT!

Mental blocks about using a microphone to communicate are far more widespread than many admit. Would-be amateurs worry they will become outcasts in the hobby because the resort to **cw** to work other stations -- especially when voice communications utterly fail.

Some have been known to beat their heads against the wall or to cry themselves to sleep at night because they cannot readily grab and gab with a microphone.

Many have quietly asked whether there is microphone-free ticket available: **A NO-VOICE LICENSE.**

Do not despair! Help is at hand.

Though a special program designed and offered by a **recovering cw operator** , mike fright can be a thing of the past in your life.

In just **30 short days**, you can be right in there with the best of today's crop of Amateur Radio operators, saying such well-known things as: **"What's your personal?" "10-4, good buddy." "QSL that." "Five, nine plus 20 dog biscuits." "Seventy-thirds."** And ever-popular, **"I haven't used cw since I took my test, and I don't intend to. I don't know why they keep that requirement."** And many more catchy phrases that quickly and firmly identify you as a voice operator -- things you never uttered on **CW**.

Now -- for just $29.95 (plus $3 s/h) -- we will send you a special video tape -- more than two hours of simple, easy-to-understand instructions on how to use a microphone, whether it's a hand mike, a desk mike or a state-of-the-art console mike on a goose neck hanging over your transceiver just like you in the radio magazines' cover photos of the Big Guns in action! You'll see and hear real hams talking on the air to other real hams! Practice in the privacy of your own home. Say things along with them; feel the difference almost instantly!

Or for $19.95 ($3 s/h), you can get an audio cassette and player with a special speaker for under your pillow so you can hypnotize yourself while sleeping. Imagine waking every morning with a whole new vocabulary of on-the-air phases you learned subliminally in your sleep. No one will ever suspect you once had a potentially terminal case of mike fright! They will think you've always been like that.

This is a limited-time offer. Only orders postmarked and received on **April 1** will be accepted. Kits will be sent in a plain, brown envelope so nosy neighbors won't know.

Send your order today to **Fred Bonavita, W5QJM**, P.O. Box 2764, San Antonio, Texas 78299-2764.

Hurry, and you, too, can become a **real** ham radio operator in a matter of days! **See ya on the flip side.....**

Review: "The Milliwatt"—Electronic Edition

Mike Czuhajewski, WA8MCQ **7945 Citadel Drive** **Severn, MD 21144**

A fine bit of history is the pioneering QRP journal published by Ade Weiss, W0RSP, at the University of South Dakota starting in 1970. Called "The Milliwatt" and subtitled "National Journal of QRPp," its 33 bimonthly issues between February 1970 and June 1975 were an excellent early source of QRP operating news, hints and tips, construction and technical articles. (Remember, this was well before the conversion of the QRP ARCI into a "true QRP" club circa 1978, at a time when the QRP Quarterly almost completely ignored topics relating to the modern "definition" of QRP as 5 Watts and below. The Milliwatt was literally the only game in town!)

I was the cofounder of The Milliwatt, since I was already publishing its precursor, a small newsletter for QRP ARCI members in the 8th call district. Titled "QRP/8," it contained a section called the QRP Corner, devoted to what we now consider QRP, at the 5 Watt level and below. When Ade saw a copy of it he went through the roof—he wasn't crazy, he wasn't alone, there were others out there playing around with a handful of Watts just like him! He came on board, convinced me to convert it over to a 100% QRP journal—something that simply did not exist at the time—and the rest is history. I left after four issues to join the Air Force, and he kept it up by himself. Even while I was still on the staff Ade did all of the hard work, on the publishing end. The drive and vision that produced The Milliwatt were all his, as was all of the hard work; I simply played a seminal role.

People find issues of The Milliwatt on rare occasions at hamfests, but they are generally hard to come by. Several years ago, I somehow talked K7YHA, Rich Arland, into parting with his complete collection in exchange for an unbuilt QRP kit, and I made several runs of photocopy reprints, so now there are over a hundred extra copies in the hands of QRPers. But now, through the efforts of Tom Arvo, WA8DXD, there's also an electronic version of The Milliwatt, scanned into a computer and put onto a CD ROM. Anyone with the capability of reading one on their computer, either PC/Windows or MAC, can now browse the pages of The Milliwatt.

First, a word of warning—this was scanned graphically, from the original copies, not by inputting ASCII text into a word processor, so the quality of the text and graphics is not up to computer generated, laser printed quality. It's no better than the originals, which were done well before the advent of modern technology. It's not a matter of being unable to find the original computer files—they never existed in the first place! Word processing in those days was a typewriter and eraser (making Ades work all the more amazing).

The CD ROM contains a copy of the Adobe® Acrobat reader which is required to read the.pdf files (in the Adobe "portable document format"). Tom puts both PC/Windows and Mac versions of the reader on the CD, so no one is left out. Under the CD directory, they are in folders "acromac" and "acrowin". Select the appropriate version and load according to instructions. The Milliwatt files themselves are in "miliwatt", and Tom added a fourth folder called "qrpxtras" with a variety of miscellaneous files and programs. (In case anyone is wondering about inclusion of the Acrobat reader — if you want to write your own .pdf files you have to spend serious money for the full software, but when you pass your .pdf files to others—such as this CD ROM—you are allowed to include a free copy of the reader software. Details are in the Acrobat files.)

Under the "miliwatt" directory are files from "mw-01.pdf" through "mw-33.pdf", one per issue. If you turn on the "all file types" option when viewing the directory you'll also see a pair of text files, one at the beginning and the other at the end. At the top of the list is "history.txt", a copy of a posting I made to QRP-L once, giving some history of The Milliwatt and QRP ARCI. At the end of the list is "readme.txt", which should really be at the top; it's Toms introductory remarks.

It didn't take too long to figure out a good way to view the pages. You can play around with the tool bars, help windows, etc., to take full advantage of the software, but here are some quick and dirty methods to get you started. There are several "view" options. If you select "fit page" it shows an entire page of The Milliwatt all on the screen at once, but it's impossible to read. The option is only good for doing a quick overview. You get better results with "actual size", quite readable, but with that or any other options you'll have to use arrow keys, scroll bars, etc. to see all of the page—only a portion appears on the screen at one time. "Fit width" is even larger and better, "fit visible" gives the largest type of all, but "full screen" takes you back to a shrunken version (along with hiding all toolbars, menus, etc.).

To scroll up and down, you can use the vertical scroll bar at the right of the page. I don't know how a Mac works, but on my PC the page up and page down keys move by a portion of a page, while the up and down arrows take you to the top of the next or previous page. Finally, to move within a page, select the "hand" from the tools menu. It displays a little hand that clenches when you click on the left mouse button, to "grab" the document on the screen, and then you move the mouse forward or backward to make the hand push the document up or down on the screen. At the end of the page you must use the arrow or scroll bar to jump to the top of the next page.

After a while I realized that I could turn on a toolbar on the display, and that really helped a lot. It has tool icons for changing the size as well as forward/reverse buttons (like a tape recorder) to skip around from page to page. It also has two buttons to jump directly to the first or last page.

If you have a laser printer, you can make a hard copy of anything you want. Although the physical size of The Milliwatt is the same as SPRAT and NorCal's QRPp, Tom arranged things so that each page fills the entire sheet when printed — regardless of what size it is on the screen — and is quite easy to read. There is one "gotcha" to watch out for, though; when prompted for a page number or range of pages to print, don't forget that the front cover and inside cover are not included in the printed page count! Everything is off by 2; for instance, to print the page with "8" at the top, you have to tell the software to print page 10 since there are two additional, unnumbered pages in the document.

In The Nutshell On The Bottom Line: The Milliwatt is excellent QRP history, fascinating reading, and much of it is still quite interesting today. You'll also be surprised at some of the familiar call signs you'll see there. The Milliwatt is great reading for anyone interested in QRP, and having it available on CD ROM makes it much more widely available—and takes the pressure off me to do another photocopy reprint run!

The Milliwatt CD ROM is available from The Milliwatt CD, Box 2550, Goldenrod, FL 32733-2550. Current price is $24.95 in US funds, check or money order, post paid (first class) to North America; DX is $3 extra for air mail.

QRP CLUBHOUSE

Bob Gobrick, N0EB, (ex VO1DRB, VE2DRB, WA6ERB)

Spring is an exciting time of year for QRP Clubs. After surviving the first annual February **"Freeze Your Bxxx Off" Winter QRP Field Day** sponsored by the **Snowbirds of the Arizona ScQRPions** and the concurrently run **Colorado QRP Club Winter QSO Party,** many "seasoned" QRP club member's thoughts turn to "milder" forms of outdoor field events such as those sponsored by the **Northern California** and **New England QRP Clubs**. From time-to-time the **QRP CLUBHOUSE** will be posting a number of spring, summer and autumn QRP mini-field events sponsored by regional QRP clubs. If you have a QRP event that you would like to post please drop me a line at the address on the back cover. **Photos of your QRP club events are also gladly welcomed here at the QRP CLUBHOUSE.**

Spring is also a time to field test those numerous winter QRP projects that we've spent the winter working on while we were fending off the snow, floods and the cold. Two super hot kits that debuted this past winter were the two prize winners of the **Northern California QRP Club annual Dayton Building Contest**: The **NorCal 38 Special** (NC38S), a wonderful neat design of a minimum part (but not minimum quality) 30 meter cw transceiver designed by **Ori Mizrahi-Shalom, AC6AN** and a super compact (Altoid candy tin size) "to-the-field" QRP antenna tuner and SWR indicator named the **Rainbow Tuner**. The Rainbow designed was submitted by that prolific QRP writing elmer **Joe Everhart N2CX.** The "deal" that was made was that in order to be a winner the designs had to be made available in kit form to QRPers at large. In that spirit, the NorCal QRP Club stepped forward and "kitted" the NC38S and the New Jersey QRP Club graciously volunteered to kit Joe's Rainbow Tuner. These two kits were featured in the January 1997 issue of the QRP Quarterly.

And finally Spring bursts into full bloom with the premier QRP event of the year - the **"Four Days In May" QRP Symposium.** For those newcomers to QRP, **"Four Days In May"** is the four days that coincide with the annual three day **Dayton Hamvention**. **FDIM 97** opens this year on **Thursday May 15** (day before Hamvention opens) and begins with a jam packed day of QRP presentations by some of the most renowned QRPers in the field. Last year this international event was sold out with over 100 attendees. Thursday evening continues with the **QRP ARCI hospitality suite** where QRPers get to meet face-to-face with the **Internet QRP-L foxes and elmers**. Friday evening brings the prize laden **QRP ARCI Annual Banquet and the FDIM QRP Vendor Social**, where you have the thrill of seeing the latest QRP goodies from our vendor community. Saturday evening brings the **NorCal and QRP-L annual Dayton Building Contest** where the best-of-the-best kit renditions of the winning designs are judged. This year we are also hoping that a **Regional and International QRP Club** night can be arranged for Saturday night. **FDIM is looking for some volunteers to handle this event**. Sunday, which in QRP terms runs from midnight Saturday to the wee hours of Sunday morning is the grand finale (Texas QRPers seem to be able to chat longer and stay up later than the California brethren). An event not to be missed. Details can be found elsewhere in this issue of the **QRP Quarterly**. Also the FDIM committee thanks the numerous regional and international QRP Club newsletters for the coverage offered this event.

Portsmouth Island QRP Expedition: April 4-6, 1997

Paul Stroud AA4XX of the KnightLife's QRP Group announces a "major" QRP ham expedition to the rare Portsmouth Island, located in the North Carolina coastline Hatteras Group of islands. **Andrew K4HQ, John WB4OFT, Frank N4EKB, Steve AA1BK, Bob AE4IC, Dave WA4NID, Tripp N4NTO and Paul AA4XX** will be on CW and SSB on all bands from Friday night (April 4) to Sunday morning (April 6). Since Portsmouth Island is only accessible by boat the KnightLife QRP gang will be staging a real action packed expedition shore landing (the liquid refreshments will be the first thing unloaded). A vanity call is being applied for and to keep abreast of the event check out the KnightLife website at http://www.ipass.net/~aa4xx/ocral.htm

New England QRP Club Survives Winter.

Once again the latest issue (Jan. 97) of the New England QRP Club newsletter "72" arrived jam packed with some great technical and club activity articles. The opening article was written by **Bob Stolzle AC5AM**, the 1996 winner of the prestigious New England QRP Club QRP AFIELD event. Bob topped the field of entries with his 1 watt 20 and 40 meter rigs tied to his "diversity" antenna system of simple field erected full wave resonant loops and dipoles for both bands. What was noteworthy about all of this is that Bob is a "born-again" ham who just got into QRP and contesting this past year. Congratulations to Bob and the New England QRP Club for a great event.

The 72 newsletter continues on with some nice technical articles *by* **Tom N1OOQ** on Type 77 ferrite cores for the W7EL Directional Wattmeter, the Revival of an NE3040 Transceiver (that all time favorite New England QRP Club design by *Dave Benson NN1G*) by **Walter WA4KAC,** Dry Transfer Lettering by **Cam KT3A**, Lessons I've Learned From My Longwires by **Mill AA1PB**, The Real Meaning of QRP by **Ernie AA1IK**, WinSmith, an Automated Smith Chart Program review by **John WB4OFT**, The New Improved QRP PLUS by **Joel WA5CVM**, A Tiny 1 Watt RF Amplifier by **Steve KD1JV,** The Frosted Antenna by **Joel WA5CVM** (could this be Joel's answer to a QRP version of a Robert Frost poem??) and the Gusher III Antenna Kit review by **Jim W1FMR.** And there are a lot more articles embedded in 72. Once again, editor-in-chief, **Dennis Marandos K1LGQ** has put together a great issue of this great newsletter. Membership info via **William McNally - AE1D, 7 Blueberry Rd, Windham, NH 03087 (mvwkm@mvvgse.lucent.com)**

CQC Signs Free-Agent "L. B." W4RNL

The Colorado QRP Club bi-monthly newsletter "The Low Down" proudly announces the "signing" of **L. B. Cebik, W4RNL** as a regular columnist on antennas. Many know L. B. as the Internet QRP-L elmer on antenna matters, but many may not know that L. B. is a prolific writer of antenna articles for QST and CQ's Communications Quarterly to name just a few of the magazines that he is published in. L. B. debuts his column "Antenna From the Ground Up" with the an article on Fantastic Feedlines (Nov. 1996 issue) and then moves on to The Incredible Inedible Dipole (Jan 97 issue). Knowing LB's style of writing this column will be of interest to old and new (figuratively) QRPers alike.

L. B. joins an elite group of QRP writers that editor **Rich High W0HEP** has skillfully "signed" for the Low Down newsletter fans. **Paul Harden NA5N** and his now famous series of "Tech Topics From NA5N" continues his discussion on the LM386 Cookbook - that ever-so-popular audio amplifier chip used in many of our QRP rigs; **Marshall Emm AA0XI** does a wonderful review on the Emtech NW30 Transceiver Kit and some Radio Shack Amplified Speaker Mods; Building a Functional Station by that great QRP contester **Al, K0RFP,** Bicycling Through Switzerland by **Steve HB9/N0BF** and Electronic Trouble Shooting Techniques by **Gabe KG0NR** are but a few of the technical articles in the last few issues of the Low Down. CQC members **Mark, WU0L, Russ AA7QU,** *and* **Jim, KG0PP** also do a great job covering up-and-coming QRP contests and events. Membership info:

CQC, PO Box 371883, Denver, CO 80237-1883

New Jersey QRP Club Winter Social

NJQRP Reporter **Joe N2CX** passed on the happenings of the January 97 NJQRP Social. Hosted by **Bill W2DP** and his wife Jane the gang consisting of **Vince WA2ECP, David N2SMH, Joe N2CX, James KA5DVS/2, Rich WB2RAR, Tony W2GUM, Pat KA2GSL, Ken N2CQ, Herb K2HPV, Jim K3QIO, Dean N2TNN, Bob N2EAA, Howard K3HW,Paul KC2AHB, George KG2DR and Marty NR3Z** (wow what a gang). Besides everyone bringing high energy (calorie) goodies to ward off the winter weather many QRP goodies were passed around. The new Rainbow Bridge/Tuners prototypes by **W2DP** and **KA5DVS** along with the new NorCal QRP kit NC38S were displayed. **KG2DR** showed off a 30 meter rig with a bargain basement AM synthesized radio as part of the design, and **W2GUM** demonstrated a clever and inexpensive base mount for the NEQRP 20-30 portable PVC mast (another **N2CX** design). All we need now is some write-ups on those neat designs. The business then turned to the 300 plus Rainbow Bridge/Tuner kits that the New Jersey QRP Club was going to package up for the QRP community. A great effort and we are all looking forward to these great little kits. For NJQRP info: **Joe Everhart N2CX jeverhart@cayman.vf.mmc.com**

The Five-Watter New Look

Editor **Bruce Pea, N9WKE** and the Michigan QRP Club members continue the new look of the quarterly newsletter The Five-Watter. An important announcement was that Club President **Lowell Corbin W8IQB** is stepping down after 8 years of Michigan QRP service. I met Lowell years ago when I was just a QRP newbie and it's elmers like Lowell that make the QRP fraternity the great group that it is. If you see Lowell at the Four Days In May Symposium this year don't hesitate to go up and say hello - by the way you can't miss Lowell with his QRP badge studded vest and hat.

The December issue of the Five-Watter covers **Hank K8DD/C6A** QRP Bahamian travel report (I'm writing this while I peer at the 0 degree F temperature on my Minnesota outdoor thermometer), The Spark, another true-to-life born again QRP tale by **Walt N1CJB**, Resonant Speakers for CW by **Gary AB7MY** and the DX column by **Bob W9NIP**. Membership information from: Membership Chairperson; Michigan QRP Club; 654 Georgia; Marysville, MI 48040.

NorCal QRP Strikes Gold One More Time

There is no stopping the success of striking gold by the Northern California QRP Club. Can it be that the legend of the California "Motherload" was really all about QRP kits and not that yellow shiny stuff. Just one short year after **Doug Hendricks KI6DS and Jim Cates WA6GER**, along with a team of NorCal members put out the very successful **Wayne Burdick N6KR** designed 49er 40 meter cw transceiver kit, they turn around and start panning for more of those QRP nuggets. This year, rather than blasting for those gold nuggets, they enticed the QRP community with a contest for the best QRP designs, with the winners getting their designs "kitted" by volunteer regional QRP clubs. So what discoveries did they make?

A double motherload find! Out of the California surface rock pops a beautiful elegant (and simple) gem of a design for a performance based 30 meter transceiver by **Ori Mizrahi-Shalom, AC6AN**. And at the same time across the nation in the New Jersey wetlands a rainbow appears pointing to another pot of gold - an Altoids candy tin sized antenna tuner and SWR meter by **Joe Everhart N2CX**. It is dubbed the Rainbow Tuner. Two winning designs and two winning kits for the QRP community. NorCal and the New Jersey QRP Club will graciously be kitting these designs. See the Jan. 97 issue of the QRP Quarterly and the latest issue of the NorCal QRPp for details.

Don't miss Saturday night at the 1997 "Four Days In May" QRP festivities when NorCal QRP and the Internet QRP-L Clubs will have *Chuck Adams K5FO* judging the best constructed versions of these two winning kits. Grand Prize will NOT be an Alpha Linear. For NorCal QRP membership info: **Doug Hendricks KI6DS; 862 Frank Ave; Dos Palos, CA 93620.**

G-QRP Winter Wonderland

The G-QRP Club is the most prestigious (and largest) of the International QRP Clubs. What one has to marvel at is the work that editor **Rev. George Dobbs G3RJV** and the many, many G-QRP Club members do to put out this quality SPRAT quarterly newsletter. Reviewing the Winter 1996/1997 issue of SPRAT makes you realize how valuable this QRP newsletter is to the QRP community and why editors like **Doug Hendricks KI6DS** of the Northern California QRP Club openly admit that they want their newsletter to match the grandeur of SPRAT. The first half of this 44 page edition is crammed with QRP circuits, designs, modifications, reviews, etc. The second half is equally crammed with the "regular" columnist: **Gus G8PG** with "Antennas - Anecdotes - Awards", **Gerald G3MCK** with "Communications and Contests", **John G8SEQ** "VHF Manger's Report", **Steve G4RAW** "Novice News" and the anchor column "Members' News" by **Chris G4BUE**. It will take ALL winter to get through the QRP material that is packed into SPRAT. For membership info in North America contact **Mike Kilgore KG5F, 10000 Walnut St. #2062, Dallas TX 75243.**

Hambrew QRT

I received my last issue of the magazine Hambrew - For Amateur Radio Designers and Builders. Founding publisher **George Grazio WF0K** has labored to make this commercial venture succeed and has been exploring for over a year a replacement publisher - but to no avail. I'll miss Hambrew and the service it gave to the QRP community. But it is a tough commercial market. Some say that the rise of numerous first class regional QRP Club newsletters have eroded the sales of commercial ventures like Hambrew. There may be some truth to that but in the same breath it could be said that the regional QRP newsletters also increase the number of potential customers for a commercial publication. I suspect that the dismiss of Hambrew was purely a commercial issue that was not effected by the QRP regional newsletters.

I raise this issue because we as members of non-profit QRP clubs with our non-profit QRP newsletters need to be considerate of our fragile hobby market. There is a finite number of amateur radio operators, with a finite number of that sector being QRP operators and even a more finite sector wanting or able to afford multiple QRP publications. As an insider to the workings of the **QRP Amateur Radio Club, International** doings (I was elected to the Board of Directors this past year) one of the biggest struggles the Board dealt with was how to get this **QRP Quarterly** newsletter to you, the members, in the most cost effective way. It is not an easy job and even less easy when some members lose sight that this is a organization with unpaid volunteer members. It's tough enough for a publication to make it in the commercial world, as can be seen from the folding of Hambrew and other class publications like the Digital Journal and it is even tougher to succeed at the hobby publication level.

We in the QRP community need to contribute if we expect our hobby to succeed - there has to be a pay-back for the years of elmering that we received - we need to become elmers. That elmering may come in the form of supporting your local and regional QRP clubs by writing articles, helping out those hard working QRP editors, volunteering for field events or just being an ACTIVE QRP member. Volunteering doesn't come easy but the rewards are great. Just pick one area where you can contribute and just "do it". Have some fun! Then when you look around you'll see that others are also having fun.

My column will be a little short (?) this issue due to my latest (?) mid-life changes. In the period of a few short months, my wife and I moved from our Montreal (**VE2DRB**) house and Newfoundland (**VO1DRB**) apartment to our new home in Stillwater, Minnesota (Lake Wobegon country). Along the way I relinquished by **WA6ERB** call and

I'm a "new vanity type of guy" with **N0EB** as my identifier. And finally I've taken on a new assignment with my employer, Chevron Oil and you'll find me living (and working) every other month in Kazakstan (**UH7/N0EB**) with my off months "playing" QRP radio in Minnesota. I can't understand why our QQ editor **Ron Stark, KU7Y** gets so excited about my column being late. So, hope to see you all at the 1997 "Four Days In May" QRP Symposium this year. Mail your club news and photos to: **Bob Gobrick N0EB (PO Box 249, Lake Elmo, MN 55042; email 70466.1405@compuserve.com AND (send concurrently) rgob@tco.infonet.com** *Cheers 73/72* **Bob N0EB**. *QRP CLUBHOUSE*

What's the secret password? - "QRP"

QRP WISDOM FROM UNCLE BRUCE

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

Heard Island

So, did you heard Heard Island? Did you work them? Running QRP? I didn't, I didn't hear them and I didn't work them, QRP or QRO. In my own defense I'll throw in that I was sick with the "mother of all flu's" while they were on, and the few times I did listen, I really couldn't stand the noise the crowd. But, everybody seems to agree they were really good operators; incredibly patient and courteous.

DX-peditions like this give all of us an opportunity to add a rare one to our collection. The Heard Island operators worked long and hard *to give everybody a chance at that elusive QSL card on every band.* I wish the same were true of some of the operators I heard calling them. Guys, having been on the other end of DX QSOs a number of times can tell you that calling them while they are working someone else will probably only get you shoved to the back of their list. You're making their work harder, they're trying to copy someone and you're there, on top of the station they're trying to copy! They have to ask for repeats, and that takes time, and ruins others chances. Do you really believe for a minute that he won't remember your call?

Contests

Contests are another great way to add new wallpaper to your shack. Since we last talked there have been some interesting contests; I hope you got in one or two of them. There was the CQ WorldWide, back around Thanksgiving, the Dutch PACC just a week ago, and the ARRL DX Contest this past weekend, plus a bunch of state QSO parties.

Contest Operations

Another way for you to get new wallpaper, and easier that working your way through the contest QRM. Major contests often result in special "contest stations". These are a bit like DX-peditions put on during contests. The major difference is they don't necessarily go to real exotic locations. *Typically, one or more guys will convince their wives* that a vacation in the Caribbean or the Azores, or somewhere like that would be a great idea. Then, while the wives sit on the beach and get brown, or go shopping, the guys sit in the room and play radio! Some of these are long established operations, returning to the same spot every year. And, some of them go to their locations one or two weeks ahead of time to make sure everything works. If you watch the bands in the few weeks ahead of a major contest these stations are yours for the asking WITHOUT the pileups!

CQ WorldWide

Egad, what a mess. I worked at this one for six or 7 hours running 5 watts and had something like 15 QSOs to show for my frustration. Every one I worked was in Central and South America, and each one brought back memories of the last tooth I had pulled! This is one where I did a lot better during the week or two preceding it.

PACC

Many of you know that I spent the years from 1978 through 1981 living and working in The Netherlands. A truly wonderful experience that I'd repeat in a hot heartbeat (hint, hint). The PACC contest was my contest while I lived there and I've diligently tried to work it ever since. *This year was no different -- I started on 15 meters and moved slowly* down to 80 meters. I made 20 QSOs. I started with my TS130V running 5 watts and after pulling the second tooth I cranked up the Icom 730 and went out to play at 100 watts. Did it help? You betcha!

Could I have made those QSOs running 5 watts? Maybe, but I'm not sure about the 80 and 40 meter QSOs, and maybe even the 20 meter ones. Am I ashamed of myself for going QRO? Hell no -- the object of this hobby is to communicate with others -- and I was running the minimum power necessary to do that. I might add that this was my first excursion into QRO operation since 1983, so I don't feel too bad about it. BUT, I warn you, I'll probably do it again!

ARRL DX Contest

To paraphrase the song, "What a difference a week makes!" For last week's PACC contest I had to result to running 100 watts to work a few stations in my "adopted" country. This weekend I started the ARRL DX Contest (CW) at 5 watts on 80 meters and stuck with it. The result -- 98 QSOs distributed across 80, 40, 20, and 15. The QSOs were distributed this way:

80 meters -- 26 QSOs -- 19 countries
40 meters -- 27 QSOs -- 20 countries
20 meters -- 29 QSOs -- 17 countries
15 meters -- 16 QSOs -- 11 countries

Not too bad for a distinctly part-time effort. Best DX was probably ZD8DEZ on Ascension Island, and it came with an interesting surprise -- when he came back he first sent "Hi Bruce", and then his exchange. To my knowledge I've never met him, so he either has one heck of an on-line database, maybe a callbook CD-ROM, or maybe (hope, hope) he reads my columns!

I only heard two QRP stations, one DX and one US sending /QRP. I don't' know if that helps or not -- I tend to think it just makes it a little harder for the DX station to figure out who you are! But, from the QRP *list postings I gather that some of you got on during this contest and were* pleasantly surprised at what your QRP rigs could do. Isn't that what I've been telling you all along? QRP is a state of mind -- it really doesn't have much to do with how much RF actually dribbles off your antenna. Of course, as one of our famous members says, contests are good because 'the best operators in the world are on, and the best stations in the world are being used". He's absolutely right, I was there!

The State QSO Parties

Late in 1995 I suggested that a way to easily do Worked All States (WAS) was to religiously get in the state QSO parties. Every state has one, sometimes several on the same weekend. They're pretty easy to find, and like all "contests" the other operator really has "his ears on". I know I missed some already this year, but one Saturday afternoon while tuning across the 40 meter band I came across a station calling "CQ VT". He came right back to a short call and, although I didn't need Vermont, he's in my log and could have been in yours.

Wallpaper

QSL cards -- I don't know about you, but collecting QSL cards has always been one of the most enjoyable aspects of this hobby. I still have all the cards I received from my early days as K8BAL, and some short-*wave listener cards from before then. They're precious to me!*

Two questions come to mind about QSL cards: how to get them,

and what to do with them after you've gotten them. Lets start with how to get them. "A QSL is the final courtesy of a QSO", it is said. Many hams send a QSL for every contact they make, even if they've worked the station before. I admit, I used to do this, but, since I moved back to Maryland I've slipped some. I've made an effort since moving into the house, but as I write this I'm about 350 cards behind. At a minimum, you ought to return a card for any one you receive.

You do have QSL cards, don't you? The magazines are full of classified ads from printers who will do a good job for not a whole lot of money. Once in a while you'll find them at hamfests -- my current card was bought from a W4MPY at Dayton last year. I thought I got a really good deal too, I bought 1000 cards and got 100 free "eyeball" cards. An "eyeball" card is a miniature QSL card the size of a business card. You give them to guys you meet face to face. They're really useful for sticking under windshield wipers of cars with call letter license plates, you come across in parking lots.

Sending QSLs -- You fill in the details of the QSO (date, time, frequency, etc.), write the guy's address on the back, and drop it in a mail box, first putting a 20 cent stamp on it. Should you put the card in an envelope? Maybe, if it's going overseas, and you're including something with the card, like an International Reply Coupon (IRC). An IRC can be exchanged for one postage in any country; they cost $1.05 at your Post Office.

Addresses -- Where to get the address? Traditionally hams have used "the callbook" to get address information for both US and DX stations. The callbook can be bought at your local radio store and by mail from a number of companies. These days, in the information age, there are computerized alternatives -- CD-ROM based callbooks. And, if you're "connected" to the internet, there are several sites where you can download address information. See the list at the end of this column for more information.

Mail -- QSL bureaus are an alternative methods of QSL card delivery that avoids the high cost of postage. QSL bureaus have been used to deliver DX cards for longer than I've been a ham, and maybe, longer than I've been around. Here's how they work. Generally, the national radio club in a country establishes a QSL bureau to send and receive cards for its member. Cards are exchanged between bureaus in both directions. To economize, bureaus make extensive use of surface and bulk mail rates. This is one reasons why cards sent "via the buro" take a long time to arrive -- the bureaus wait until they have a number of cards going to any one country before mailing by slow boat! Sometimes the service is free to club members, and sometimes there is a small fee for handling each card.

Incoming cards are distributed either by a network of member clubs or by surface mail within the country. When I lived in Holland I was able to pick and send up my QSL cards at the local affiliated club I belonged to. Here in the United States we use a slightly different system. The ARRL operates our national QSL bureau. Because we're such a large country they have set up one QSL bureau for each call district. The addresses of these bureaus are published in QST every month and are also available via the ARRL web site. To receive incoming cards you need to send your district bureau one or more self-addressed stamped envelopes. When they have enough cards to they put them in the envelope and mail it. The incoming bureau depends on your envelopes -- if you don't have any there they will -- gasp -- throw away your cards after a while! Some bureaus also sell envelopes and stamps.

In the United States, you need to belong to the ARRL -- the fee is a copy of your QST mailing label. To send DX cards "via the buro" you fill them out and write the callsign of the receiving station in big, printed letters on the back of the card. Then you sort the cards alphabetically by prefix, bundle them with a rubber band, and mail them to ARRL Headquarters with a copy of your QST mailing label. They forward them to the other bureaus in the world.

OK, you say, that's just fine and dandy for DX cards, but most of my QSOs are in the country. Get a better antenna, run some power, NOT. There have been several attempts to establish a bureau for "in country" cards. Most have failed, but hope springs eternal. For a while I've been hearing about something called the "USA QSL BUREAU" on the internet. Recently I got a letter from them, I figured it was advertising, but when I opened it I found a QSL card from a contact I made in last year's Pennsylvania State QSO Party! Fortunately they included a flyer describing their services. They charge a nickel a card for both US and DX cards and promise to distribute ALL cards they receive. You don't need to be a member of anything, but you do have to have at least one self addressed stamped envelope on file with them. Prepare your outgoing cards as you would for any bureau (presorted, etc.) and send them off with the money to the address shown at the end of this column. I have a feeling they're going to get the 250 or so cards I'm behind one of these days soon!

Other uses for wallpaper -- So, you say, you've worked all states, or 100 countries, or all 5 hams in East Podunk. Prove it! One great way to prove it is by applying for awards. Probably every radio club in the world offers some sort of award. But, once you get past the common ones sponsored by major organizations and magazines, how do you find out about the smaller ones, like the East Podunk Radio Club's award? Try K1BV's DX Award Directory. I worked K1BV in the Fall ARCI contest, and along with his QSL card he sent me a flyer about his book. This puppy is a full grown dog! It's 250 pages, darned near an inch thick, and printed double-sided in 8 point type. I didn't believe there were that many different awards offered. I work toward operating awards all the time, and I'm proud of the ones I have, and this directory is a pure gold. You can get your own copy directly from Ted for only $20.00. His address is at the end of this column.

Sources

ARRL:
The American Radio Relay League
225 Main Street
Newington, CT 06411
web site: <www.arrl.org>

The Callbook
Radio Amateur Callbook, Inc.,
PO Box 2013
Lakewood, NJ 08701

HamCall CD-ROM
Buckmaster
6196 Jefferson Highway
Mineral, VA 23117

W4MPY QSLs
QSLs by W4MPY
682 Mt. Pleasant Rd.
Monetta, SC 29105

K1BV Awards Directory
Ted Melinosky K1BV
65 Glebe Road
Spofford, NH 03462-4411

USA QSL BUREAU
PO Box 814
Brewer, ME 04412-0814
email: <usburo@aol.com> or <aa1mf@aol.com>
web site: <http://members.aol.com/usburo/index.htm

Editors Note:

The list of vendors on this page is far from complete. There are many others whose products and services are comparable to those listed.

Check the advertisements in the major magazines to see even more choices.

de Ron, KU7Y

Bruce, W6TOY/3 Still QRP, Really! (c)

A Tunable Preselector for the QRP+

by Norbert Heyder DL8BDF (Norbert.Heyder@erno.de)

(Editors note: This article was originally posted to the QRP-L mailing list on the Internet in Sept. 1996. The author was kind enough to grant QRP Quarterly permission to reprint a version of his original posting.)

I would like to describe an external passive LC preselector, (tunable from 5 MHz to 30 MHz), to be used to overcome the low receiver intercept point of my QRP+.

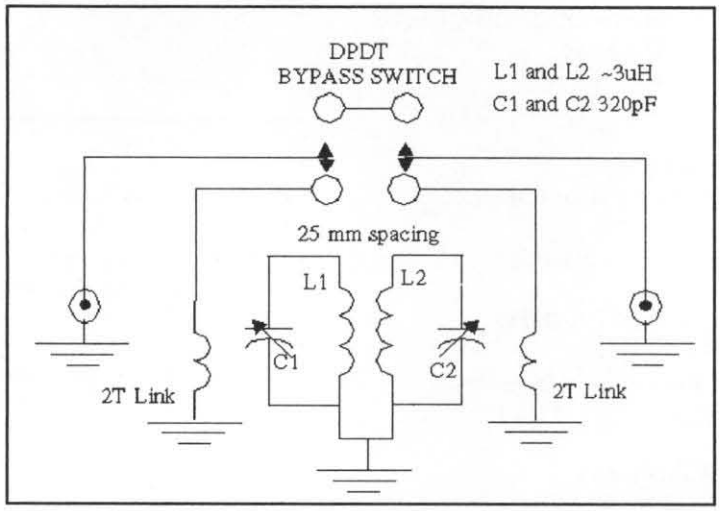
If you look into the QRP+ schematics you will find no receiver front-end bandpass filtering at all. All signals that the antenna feeds to the receiver hit the first mixer. This results in noticeable receiver noise and pseudo-broadcast signals with 5 kHz spacing on 40, 30 and 20 meters due to intermodulation distortion during the early evening hours when the received signal strengths reach their maximum. After putting the simple preselector that I shall describe inbetween the receiver and the antenna I felt that I had a new receiver.

This preselector also provides a great improvement for my Japanese receiver front-ends. It's a sure thing that any preselector design would be an improvement for a rig missing a front-end bandpass filter.

An Overview:

-Nothing really new or exotic, very easy to build but the results are great.
-The preselector uses only 4 basic passive components by putting two tunable parallel resonant circuits in cascade.
-The tricky thing: Because the two resonant circuits are coupled only inductively, (instead of capacitively), the coupling factor between the resonant circuits is constant over a wide frequency range.

Circuit Description:



As seen in the schematic, the incoming signal is inductively coupled via a 2 turn link to the cold end of the first tank circuit. The second tank circuit, (identical to the first), is inductively coupled to the first tank. The two resonant tanks are synchronously tuned to the same frequency. The output of the preselector is taken with a two turn link near the cold end of the second tank. A switch may be used to switch the preselector out of the circuit if desired.

The preselector functions as a very narrow-band filter, passing only those frequencies that you have tuned with the variable capacitors. This preselector has a much narrower bandwidth than the ordinary and sometimes insufficient fixed bandpass filters to be found in common factory built rigs.

Parts List:

* 2 identical coils, (about 3 microHenries inductance), wound on a 12mm coil form, (with adjustable core). Length of coil: 25mm. Windings: 26 turns close spaced. Coupling Link: 2 turns at cold end of the main winding . Wire: 4mm dia. insulated magnet wire.
* 2 variable capacitors, 320 pF each. I used one with two rotor/stator packets mounted on the same shaft. It looks similar to the ones you might find in an ordinary AM radio but it isn't. The AM radios use different capacitance's in each section for tuning different frequencies, (the front end and the LO). We need both sections to have the same capacitance. Of course you can use two separate variable capacitors, but this complicates the use of the preselector. Using less capacity restricts the preselectors range on the low end. If you use a smaller capacitor, compensate by adding a few more turns to the inductors.
* An optional switch, (DPDT), to bypass the filter and bridge the input connectors together.
* A metal case with 2 BNC or other coax connectors to connect to the antenna and receiver.

Wiring:

I mounted the two coils vertically, (at right angles to the chassis), with a spacing of 25 mm between the coils. Arrange the circuit so that leads going to the tuning capacitor are as short and direct as possible. The loose coupling results in a very narrow bandwidth with a loss of only 5 dB.

I put everything (coils and capacitors) on a piece of copper clad circuit board. If you use coils with appreciably different sizes from those suggested you will need to experimentally determine what the best spacing between the coils is.

Connect the "cold" end of all the coils to ground. The circuit is symmetric. The in and out connections may be interchanged without a problem.

Fine Tuning:

The goal is to make the two LC circuits tune to the same frequency to achieve the narrowest bandwidth.

Put the preselector between your transceiver and antenna. **(Don't transmit through the preselector)!**

1. Find a 'constant signal' at the low end of the preselectors range.
2. Tune the preselector carefully for a maximum s-meter reading.
3. Now adjust the cores slightly on both coils repetitively to maximize the signal.
4. Repeat steps 2 and 3 several times.

If you cannot reach the 'one and only one' resonance condition, (that is you have a double humped response), this is a sign that the two coils are too close together and are either critically or over-coupled. This results in excess bandwidth. We want very loose coupling to provide the narrowest passband. Increase the spacing between the coils to reduce the coupling if necessary.

QRP+ Modifications (not absolutely necessary):

The preselector is absolutely passive. As such it has no TX/RX switching relays inside. Therefore I connected it to the receiver front-end just between the QRP+ RX/TX antenna switch relay and the receiver input. An ideal point is the most upper RF board with its receiver input coax connector placed at one edge at the rear.

I snipped the QRP+ receiver input line before it reaches the RF board, (brown teflon coax cable with coax plug at upper left). Connect the two snipped ends to 2 additional coax connectors which are installed at the rear of the QRP+ case. (Back side view: upper right). Yes, for that you have to drill two holes into the nice magic cube at the upper right rear side! Be careful! These two connectors are to be connected to the preselector via short coax cables. Good luck with your new receiver front-end!! **72 de Norbert, DL8BDF QRP-L #204**

Incomming Mail

Compiled by Monte "Ron" Stark, KU7Y

Hi Ron!

Just wanted to say the the January 1997 QQ is absolutely the best ever! It's quite a benchmark for you and ARCI. Congratulations and thanks for all the hard work. Gonna' take me quite a few days to absorb all this but it'll be fun all the way.

Best regards, de Dave, NF0R nf0r@slacc.com

Thanks for the kind words Dave! ed

Ron,

Firstly, let me complement you on your fine work as editor of the QRP Quarterly. I am the newsletter editor of the Hit and Bounce CW traffic net (Net dates back to 1938), and I can certainly appreciate your work not only as a consumer but also as someone who monthly has to deal with some of the same issue as do you.

I do have one question in the latest issue (No. 1, XXXV). In "Notes from the President," Buck said, "You will find announcements for the FDIM activity in this issue of the Quarterly..." I could find no such "announcement." Did I overlook it? The closest thing I found to the FDIM was the article "1997 Dayton Building Contest." Not much information there. I must admit, I haven't read the Quarterly from cover to cover yet, so maybe it's tucked away somewhere. To whom should I address my questions? Is there info on a web site? I'm not on the QRP-L--just too much 'traffic' there for me.

Thanks in advance for your help. C. M. Shearer (Sam), WB5ZJN

Hi Sam. You are one of many with sharp eyes! I managed to let the FDIM announcement fall on the floor somehow! But it's in this issue. ed

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Monte -

My QQ arrived today also - looks good! 73 - Bill - N8ET

Kanga US kanga@mail.bright.net http://qrp.cc.nd.edu/kanga/

Thanks Bill, but I must pass any credit to the rest of the staff! ed

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I just received my Jan. QQ, and went to check the results from the Fall QSO Party. What did I find? Scores from the states through Illinois, and nothing more.

Is this the kind of service we are going to get for an extra 5 dollars per year. If I wasn't such a strong believer in, and supporter of QRP, I would say cancel my membership. I won't do that, but I want everyone responsible for this to know that I am very disgusted. More money should mean better performance.

Please get your act together, and find out how this happened so it can be avoided in the future.

Also, please return to the table format for the scores. They are too hard to read scattered out like they are on page 44. Come visit K3WWP's Ham Radio Activities at: http://www.geocities.com/CapeCanaveral/3852

73, John, K3WWP

Hi John, Thanks for taking the time to write. I did manage to lost a number of pages of Contest results during the file transfer process! And I take full responsibility for the error. The full report is in this issue. However, I do take issue with the statement that more money should mean better service. None of us are being paid for our services. The increase in price was only to offset increases in our costs. Things like postage, printing and etc. I think our "act" is together and we always try our best to avoid mistakes. ed

Ron,

Received my quarterly today - OUTSTANDING. I enjoyed your column and thought I would pass on my thoughts about by-laws.

I see the BoD as the governing body of the club. The Editor and others are to volunteer their time under the rules/guidelines/by-laws that are set up by the board. If they can not or will not do that, then they should re-evaluate their decision to volunteer. As the Editor, you shouldn't have to beg for required reports - they should be provided as set up by the board.

Sounds rather simple, and I think it is! If we have 1500 plus members at $15.00 per year, there is $22,500.00. Quite a sum and some accountability is required if only to protect the individuals handling the money. BTW, the funding of your trip is fine with me. Any support staff or BoD travel should be funded as long as we have the funds in the club. A free or partially funded trip to Dayton is reasonable and helps for continuity on the Quarterly Team.

I could go on, but I think I've made my point. I'm also forwarding a copy of this to W4QO as he is the Director in my division. Please feel free to share my comments as you see fit. Again, thanks for a great issue and for doing so well for us the past 18 months.

72, Ken Evans, W4DU QRP ARCI # 696

Thank you very much for your views Ken. From the input I have received, I think this letter sums it up very well. ed

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Gang -

I have my fully modified QRP Plus ready for Monday's Maryland venture into QRP WAS. Thanks to Dr. Larry East's mods in the January issue of QRP Quarterly. I finished the last one - the concentric gain control & the meter lighting this week. So on with the festivities!

Have fun! 72 & 73 John, N3REY Always QRP!

John, just look in this issue to see even more mods for the QRP Plus! ed

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Ron,

Actually, I have meant to call you for a while. Some months ago, you sent out a request for feedback regarding QRP-ARCI. I got your number from QRZ (I think), and meant to call to give my $0.02.

Bottom-line: you guys are doing a bang-up job! Sam, kd4bth

Thanks Sam, I needed that! And my thanks to the whole crew that make the Quarterly possible. Without them, there would be no Quarterly! ed

Unless specifically requested that it not be published, any letter, note, etc. received, via any means, 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.

Members' News

Richard Fisher, KI6SN
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QRP opportunity knocks

Is it possible that it's almost time for Dayton again? Four Days in May, the QRP hospitality suite, QRP ARCI banquet, and all the other trappings of a great weekend in Ohio are just around the corner.

KI6SN
. . .Richard Fisher

This is also a time to put our QRP ARCI house in order. Tie together loose ends, redouble efforts to builder a stronger foundation for this organization, and to better solidify a vision for QRP ARCI's future.

This is also a time for those of us in the rank-and-file to give QRP ARCI leadership our ideas for making a good organization even better.

The names and address of the board and top leadership appear in every issue of QRP Quarterly. Let your feelings be known. The strength of QRP ARCI has always been in its members — as demonstrated in Members' News every quarter. On the eve of "big doings" in Dayton, the time has never been better for sharing your vision with others.

— R. E. F.

New twists on a '38 Special'

Bill Jones, KD7S, writes from Sanger, CA., that his version of the NorCal QRP Club 30-meter QRP transceiver kit called the "38 Special" is unique in several respects.

"To begin with, the cabinet is completely homebrew and made from small pieces of three-sixteenth-inch ABS plastic sheet. It measures approximately four and seven-eighths inches wide by two and five-eighths inches high by four and one-half inches deep. A portion of the top cover is hinged to allow instant access to the interior without having to remove any screws. The enclosure is polished to ebony shine.

"I replaced P2, the 100 K tuning pot, with a 10K, 10-turn control from my junkbox. Because I have a strong need to know what frequency I'm on, I designed a special electronic dial. I call it the E-Dial.

"The E-Dial consists of three LM3914 bar graph display drivers (configured as a dot-mode display) which, in turn, drive three 10-segment LED bar graph displays staked end-to-end.

"The LEDs are placed behind a molded black plastic bezel with a clear plastic window. Sandwiched between the displays and the plastic window is a computer generated calibration scale along with some other graphics. The E-Dial id driven by the voltage on the wiper contact on P2. It is not only functional but also lots of fun to watch the lighted LED zip up and down the scale as the rig is tuned.

"I incorporated the IRF510 power amplifier modification — plus other enhancements as outlined by **Mike Gipe, K1MG,** on QRP-L — as well as the TiCK keyer chip right from the beginning.

"My '38 Special' has been up and running . . . and I have logged dozens of domestic stations as well as New Zealand, Japan, Panama, Brazil and Cuba."

Hard work and some ingenious design have come together in the KD7S version of the "38 Special" transceiver built by Bill Jones.

QRP that glows in the dark

Mike Herr, WA6ARA, writes from Ridgecrest, CA, that he's been having a ball with a QRP station that looks like it's right out of the 1960s.

"It really does bring back memories, both good and bad, and makes you appreciate the rigs we do have today.

"The transmitter is a crystal controlled one-tube 3A4 job putting out about 1 watt. The power supply is in a wooden card box and is made up of 9-volt batteries keyed with a relay and two 'D' cells for the filaments.

"I take the output and pump it through a low pass filter, and then use 'Armstrong' T/R (transmit/receive switching).

"A dedicated straight key is used with no sidetone, although I have cranked the Argonaut on and listened to the output (as a sidetone).

"The receiver is a Heathkit GR-81. This is a regen from the '60s that Heath sold. I bought this one after picking prunes for a summer. It was the second radio I ever built — the first one being a one-tube regen from a Boy Scout merit badge book.

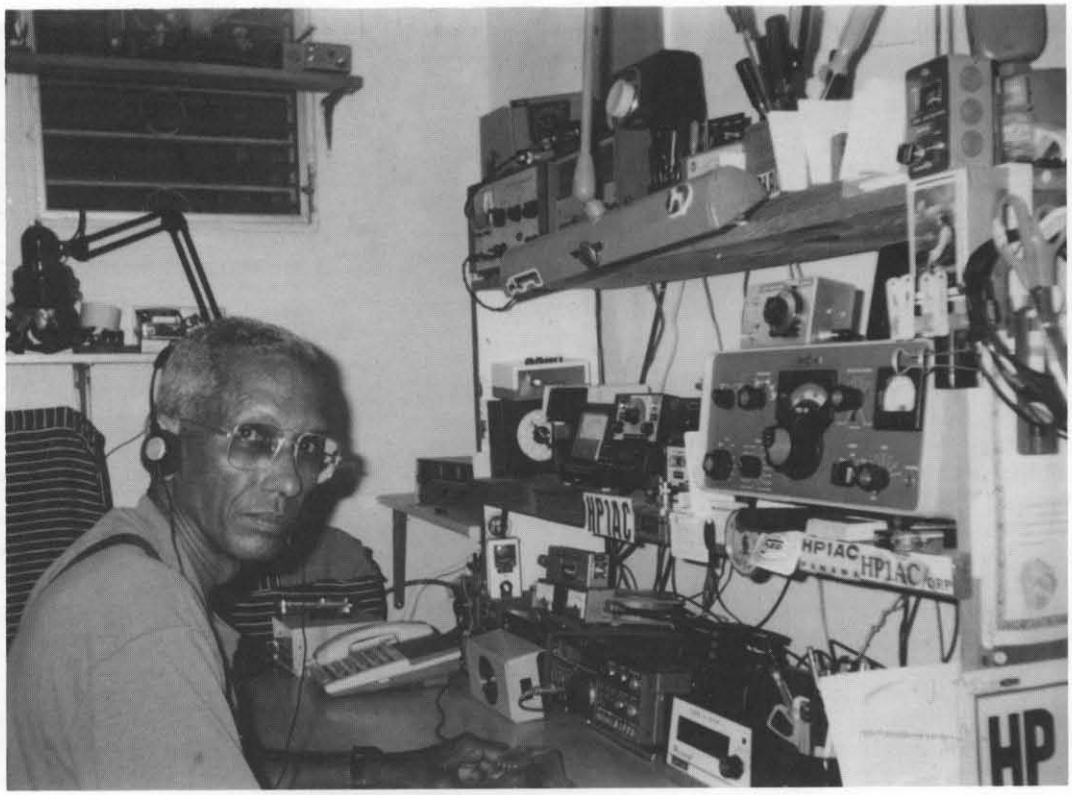
"Anyway, I always thought of using it as a receiver for my novice station, but when I got the ticket I couldn't resist the lure of the Hallicrafers SX-100 of my father's sitting there.

"So, after 30+ years I finally built the little transmitter I wanted and coupled it with the receiver and have been having a ball.

"I have found a couple of problems, though. First, one must remember to turn off the filaments! It turns out the 3A4 is a good choice for a QRP transmitter as the filament current draw is low and tolerable.

"On the receive side it all works great until the wind blows. The regenerative detector couples heavily with the antenna. As (the antenna) starts to move, the frequency and amount of regeneration starts to change. And, yes, it does blow here (in the high desert of California). Copy becomes almost impossible.

"I am building up a low gain RF preamplifier for the receiver. That should decouple the regenerative detector and do away with the swinging antenna problem."

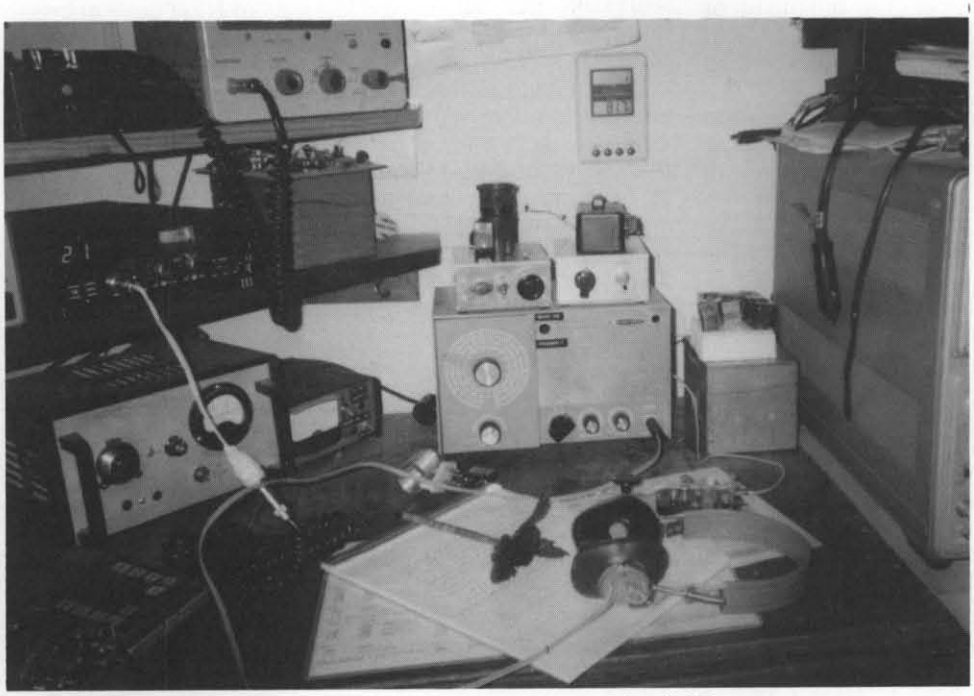


Camilo A. Castillo, HP1AC, sits at the operating position of his QRP shack in Panama. He enjoys homebrewing, contesting and DXing, with 135 countries worked and 113 confirmed.

QRP: HP1-Panama style

Camilo A. Castillo, HP1AC, writes from Panama City, Panama that he "started QRP on 40 meters many years ago with a one-bottle (tube) transmitter by W5LET I had built from an article in the March 1967 issue of *Electronics Illustrated*. It was a crystal-controlled 6AQ5 with about 10 watts input. Later on I built the 'Little Joe' single-transistor, crystal-controlled (rig) that appeared in QST magazine. Pumping out a couple of watts, I worked even through Europe.

"In May 1992 I got myself a kit from A&A Engineering



An all tube QRP station takes center stage on the operating table at WA6ARA, the station of Mike Herr, Ridgecrest, CA. Sitting atop an old Heathkit cabinet are a single 3A4 1-watt transmitter with plug-in coil, left, and a GR-81 regenerative receiver, right, manufactured by Heathkit. To the far right and below, beside the oscilloscope, is the station's power supply — 9-volt and 'D' cell batteries in a wooden card box.

and put to work the K9AY 20 meter transceiver. In April 1993 I was finishing my Radio Kit K1BQT 15 meter transceiver and doing lots of DX.

"I built a QRP wattmeter from W1FB's handbook and put my regular Kenwood TS-430S (into use) to do some QRP.

"I have some other gadgets I like to build from magazine projects for my QRP activities — tuners, field strength meters, T/R switches, battery chargers, keyers, etc. I also do some RS-10 mode A CW-only satellite operation.

"Actually, I have 135 (countries) worked and 113 confirmed and enjoy working all QRP contests. (During) the Big Guns WW contests I also operate QRP CW and have obtained some awards. I'd like to take the opportunity to thank all the QRP family that has been following my health problems over the last year (open heart surgery with four bypasses) . . ."

It was 'party' time running just 20 milliwatts

Brice Anderson, W9PNE, reports from Lancaster, IL, that that QRP ARCI 1996 Fall QSO Party was a most interesting and rewarding milliwatting experience — to the tune of 288,750 points.

"I almost didn't participate," Anderson says. "The bands sounded so poor, and WWV was predicting a continuation of the minor geomagnetic storms. But, I set up for 20 milliwatts and gave it a try. I got answers better than I had expected, so I continued.

"In my best hour, Sunday afternoon, I had 16 QSOs. Several hours produced on 3 QSOs per hour. The average was 6 QSOs per hour. You have to be dedicated to work low mW in contests. I had six incomplete QSOs, but later completed three of these.

"My biggest thrills were in working **HP1AC** and **KL7GN** . . . Three stations tail-ended my previous QSOs, proving that 20 mW is enough power to get out.

"I am 78 years old, but I still enjoy contests without an computer help. I just can't lose much sleep or sit too long at the rig.

"My Argonaut 515, with the audio filter/notch and crystal calibrator units, is mounted in a wooden box that I built. The front door hinges down and makes a smooth writing surface when used on a park picnic table, etc.

"The slots I cut in the back to store cables, and the tilt of the Argonaut greatly enhances the audio output. The sound literally booms out at you above ambient noise. I even take my hearing aids out when I operate.

"Fading was very deep. Signals often were S1 for a while before they would increase. When they got up to S3 or more, I could work them. Almost all stations that were S7 to S9 could be raised.

"I worked 32 states, 4 Canadian provinces and 3 DX countries. I called VE1, 2 and several European stations without success.

I was unable to raise **YS1ZRB** on 14.060 or **WB6FZH / KH6** on 14.060.5, however, raising **HP1AC, KP3S** and **N4BP/VP9** was satisfying."

KB1FK awarded G2NJ Trophy

Al Libby, KB1FK, writes from Newington, NH, that he has been awarded the coveted **G2NJ Trophy** from the QRP Club of Great Britain "in recognition of your long-time work in promoting international friendship via QRP amateur radio, and in particular you outstanding work in contacting European operators and, in many cases, backing up your QSOs by mail contacts."

The award letter is signed by **Gus Taylor, G8PG.**

"I cannot tell you how proud and happy I am to be award (the trophy) by the committee," Libby says. "To be selected is one of the highlights of my ham career along with G-QRP Master No. 57, and membership in the German Telegraph Club."

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)

The Goodie Giveaway

Perhaps it would be hyperbole to say that the **NE602** double balanced mixer chip has been at the forefront of a building revolution in QRP in the last eight or nine years. But there's no denying that this little chip has made a huge impact on homebrewing in general, and in low power operations in particular.

From its emergence onto the scene in 1988 as the heart and soul of the famed "Neophyte" direct conversion receiver, this little chip has found uses in literally hundreds of designs that have enriched and beautified the QRP builders' landscape.

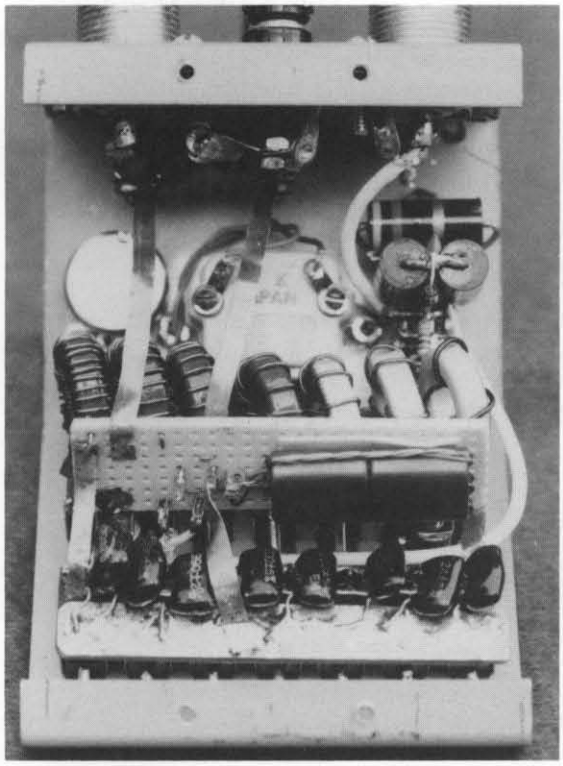
Given it's history as a major player in the low power world, this quarter's goodie is a pair of NE602s — primed and ready for use in everything from simple DC receivers to highly sophisticated superhet transceivers. And for his contribution to MN, our winner is **Pete Hoover, W6ZH,** of San Marino, CA. A tip of the ol' QRP beret to this fine builder and operator, and a sincere "72" for taking the time and effort to tell — through photographs, no less — the story of his marvelous antenna tuner.

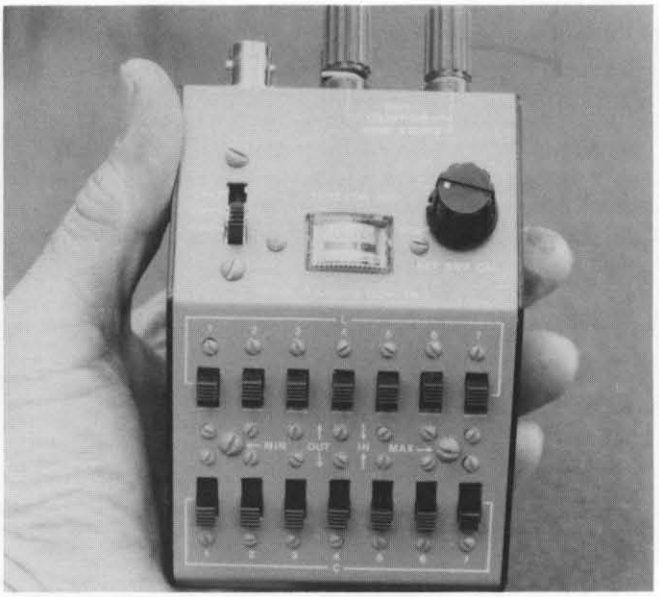
Pete's name was chosen by random drawing to be the recipient of this quarter's Goodie Giveaway. And next quarter will be no different. Everyone submitting an item to MN is in the running. The hat is emptied every quarter, so your chances begin anew.

Let's hope to hear from you soon.

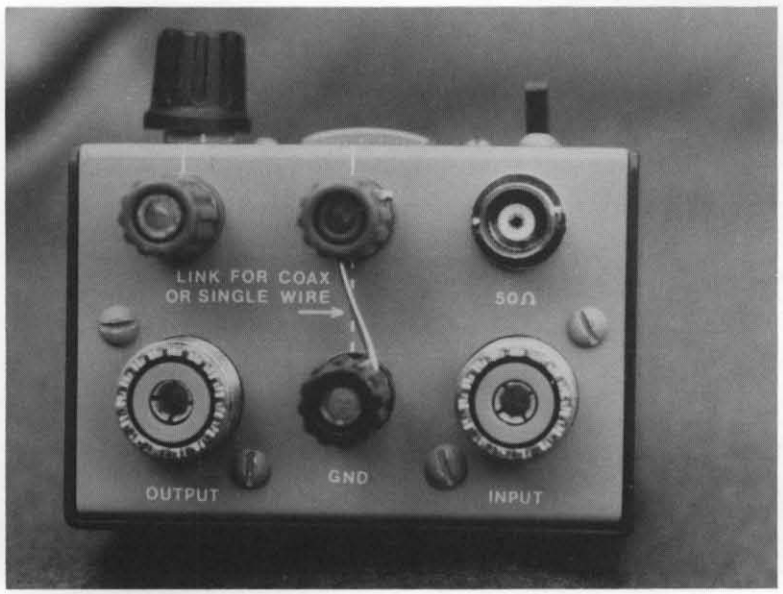
Items for the Members' News column should be sent to Richard Fisher, KI6SN, 1940 Wetherly St., Riverside, CA 92506. Photographs — either black and white or color — are welcomed. Please include a self addressed, stamped envelope if you would like pictures returned. Submissions by e-mail (KI6SN@aol.com) are welcomed. To clarify intent, please state that your e-mail text "is offered for publication in QRP Quarterly."

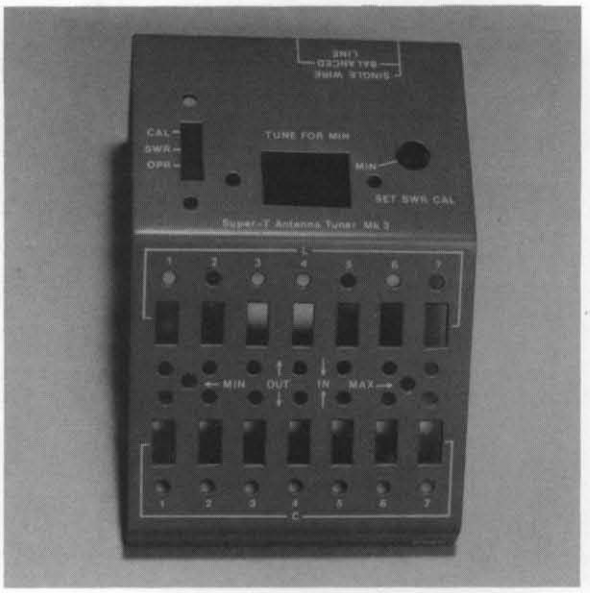
Members' News Gallery





Longtime QRPer and homebrewer Pete Hoover, W6ZH, of San Marino, CA, did some remarkable chassis work and design in his version of the Super-T antenna tuning unit. Each of the holes for multiple slide switches and SWR meter were painstakingly filed by hand. A superb job of chassis lettering gives the unit a polished, professional look. Nine toroids are employed in the matching network. An absorptive SWR bridge gives the operator a read-out of matching conditions.





Wire Yagis for 30 and 40 Meters

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

The quest for better wire antennas for the lower HF bands often overlooks the Yagi. We envision the Yagi as an expensive tubular beast that crumbles easily, needs a tall tower and a large rotator, and belongs only to the rich and famous. Actually, we can build a 2-element wire Yagi with no more wire then is needed for a 1 loop: just two half-wavelength copper wires properly spaced. And the whole thing will pretty closely match that extra length of coax hiding in the closet.

Figure 1 illustrates the general outlines of a 2-element Yagi consisting of a driven element and a reflector. The reflector is parasitical because it is not directly fed power. Rather, because of its length and distance from the driven element, the current on the wire is of a magnitude and phase to augment the radiation in the forward direction and to diminish it to the rear. Because the two elements are electrically interlocked, the elevation angle of maximum radiation tends to be lower than for a single wire antenna, such as a center-fed dipole.

For 40 and 30 meters, typical #14 copper wire dimensions are the following:

Dimension	**40**	**30**
El. #1 (Driven Element)	66'	46.6'
El #2 (Reflector)	70'	49.4'
Spacing	20'	14.1'

With these dimensions, the feedpoint impedance will be close to 50 , and the 2:1 SWR bandwidth should cover most of the band. (Wire antennas will have somewhat narrower SWR bandwidths than antennas made from fatter tubing.).

One of the advantages of a wire Yagi is that it requires no more wire than a full-wave loop. Unlike vertically-oriented loops, both wires of the Yagi are at the maximum height available. Therefore, standard wire antenna construction can be used throughout. The 2-element Yagi is thus a very useful step on the road to even more complex antennas in the future.

Figure 2 and **Figure 3** show the anticipated azimuth patterns of wire Yagis at antenna heights of ¼ and ½ , respectively. In each case, although some of the side rejection of an ideal beam is diminished, the antenna retains useful gain and front-to-back ratio. At ¼ up, the gain is about 8.3 dBi with a front-to-back ratio of about 8.5 dB. At ½ up, the gain climbs to about 105 dBi with about 10.5 dB front-to-back ratio. A quarter wavelength is about 35' at 40 meters and 25' at 30 meters; while a half wavelength would be twice those heights.

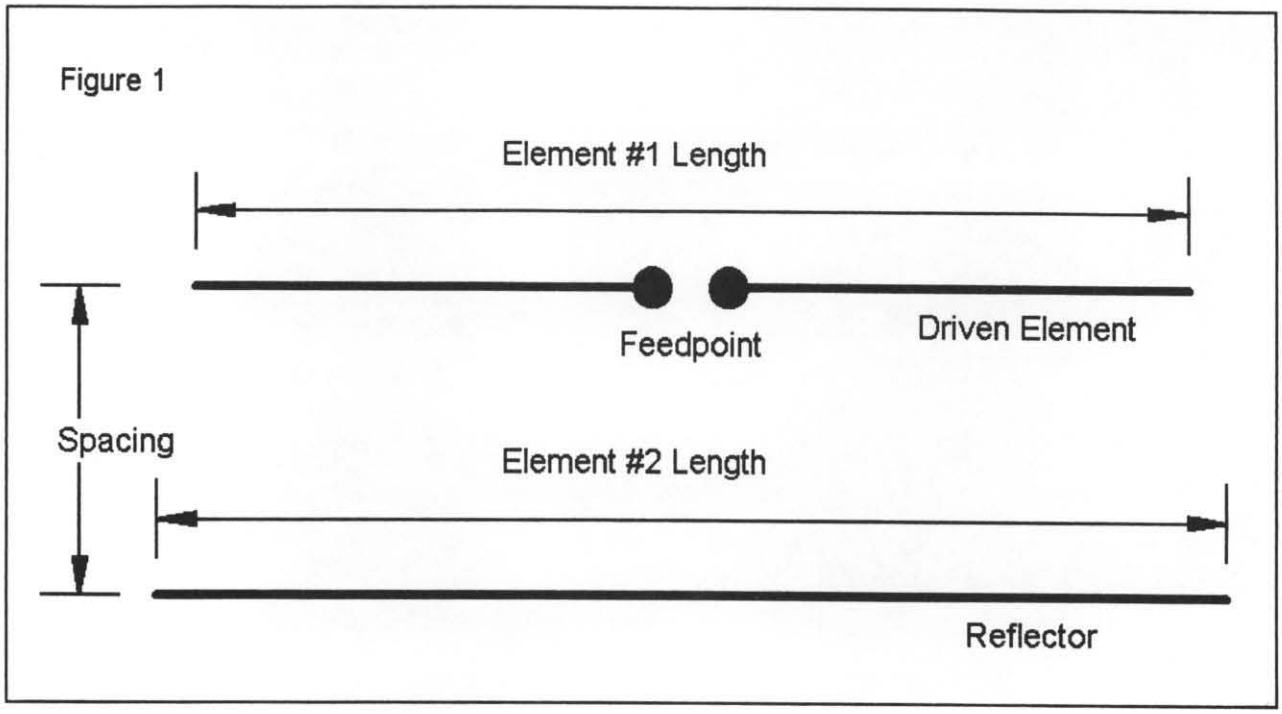
In addition, the elevation angle of maximum radiation is lower than a dipole at the same height. **Figure 4** compares the elevation patterns of a dipole and a wire Yagi at ½ up. The Yagi not only displaces radiation in one direction compared to the dipole; it also has about 3 dB gain over the dipole at critical DX elevation angles of 10 to 20 . DX performance should equal or exceed some of the low angle phased loops and half-squares while still permitting good contacts with nearer stations.

Who might profit from a fixed-position wire Yagi? Any operators who have a broad area toward which they would like to radiate and from which they would like to receive. This might mean someone on the borders of a country trying to work across the country. It might also mean someone wanting to work DX with too much QRM to the rear of the DX direction.

These designs have been optimized for ease of matching. Removing remnant reactance from the feedpoint should be a matter of adjusting the driven element length, an operation that will not significantly affect overall antenna performance. Although slightly more gain or front-to-back ratio can be tweaked from the design, the difference would be unlikely to make an operational difference and only make the whole array harder to match.

For less than the cost of a rotator alone, you can install 4 of these antennas, one to each of the four corners of the earth. (Supports are the builder's responsibility.) There is no one perfect antenna for every application. The wire Yagi is no exception. However, it just might fit into your antenna needs. Remember also that you need not feed the driven element with coax. With parallel feedline, you can also operate the driven element as an all-band wire for 40 meters and up. The reflector may cause a bit of distortion to normal single-wire patterns, but not enough to make the antenna a poor performer on the upper bands.

Figure 1



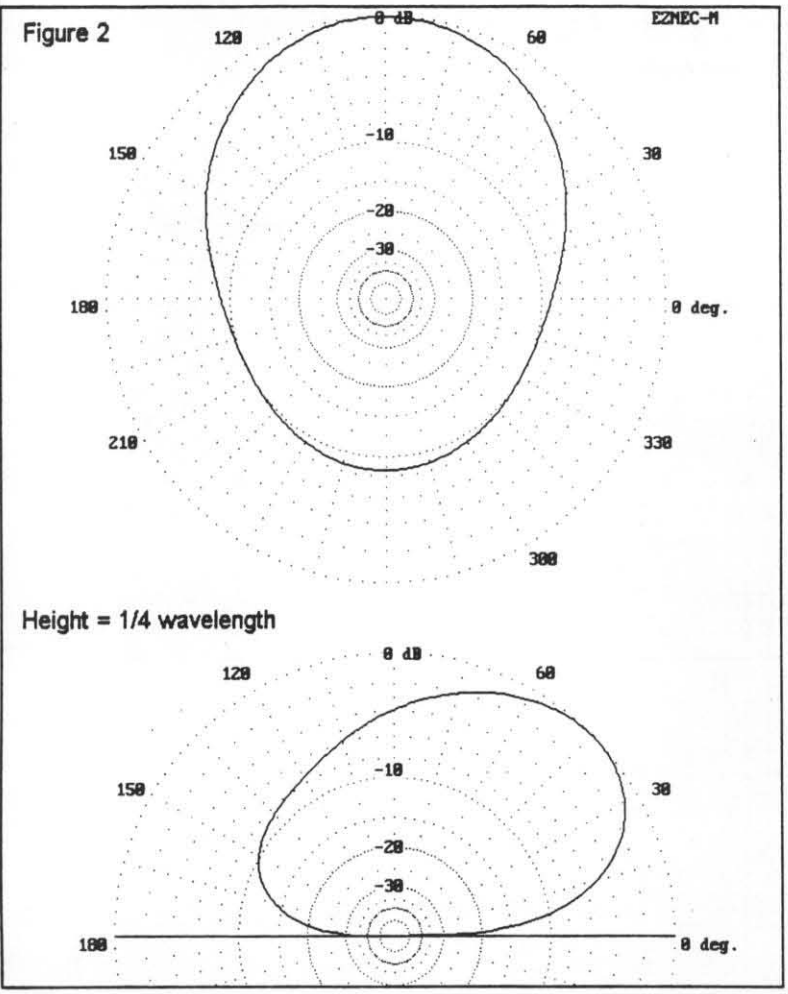


Figure 2
EZNEC-M
0 dB
120
60
150
30
-10
-20
-30
180
0 deg.
210
330
300
Height = 1/4 wavelength
0 dB
120
60
150
30
-10
-20
-30
180
0 deg.

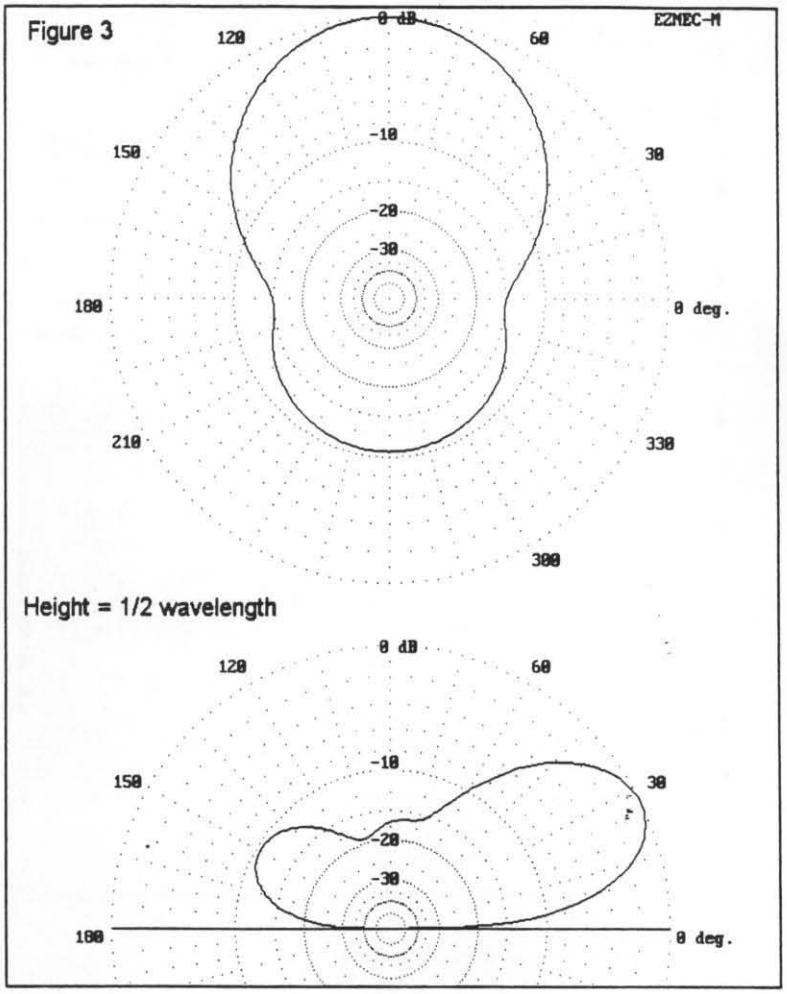


Figure 3
EZNEC-M
0 dB
120
60
150
30
-10
-20
-30
180
0 deg.
210
330
300
Height = 1/2 wavelength
0 dB
120
60
150
30
-10
-20
-30
180
0 deg.

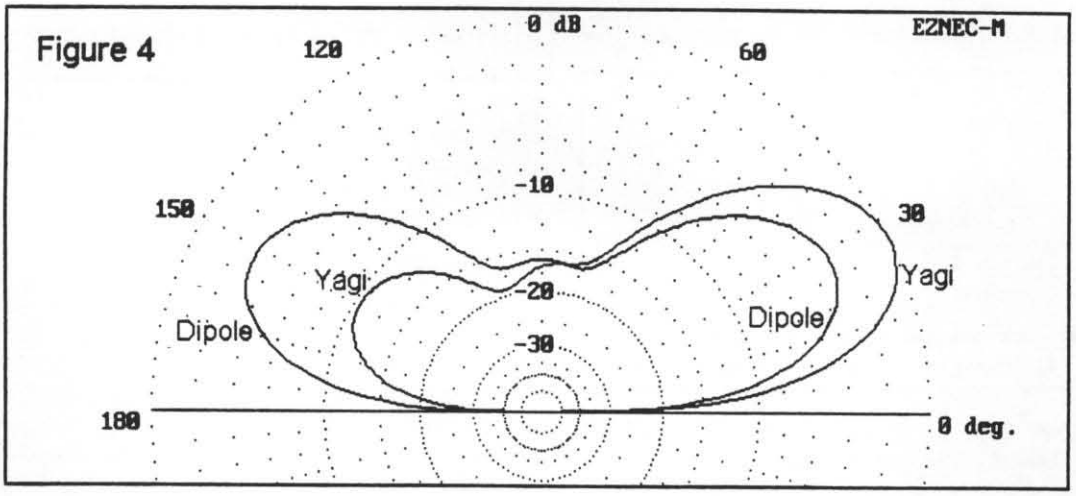


Figure 4
EZNEC-M
0 dB
120
60
150
30
-10
-20
-30
180
0 deg.
Yagi
Dipole
Yagi
Dipole

IDEA EXCHANGE

Technical tidbits for the QRPer

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

IN THIS EDITION OF THE IDEA EXCHANGE:

PC DOTS FOR RF BREADBOARDING

*From **Joe Everhart, N2CX** of Brooklawn, NJ, here's Joes Quickie #21, along with the KeyCAD drawings he provided-*

Anybody who does much homebrewing has their favorite methods of breadboarding. I use a variety of them myself, including Vector (tm) board, "ugly style" and Ball O' Components. My favorite bears some similarity to the W7ZOI "ugly style" though I learned it from a ham buddy 20+ years ago. I call it PC dots construction.

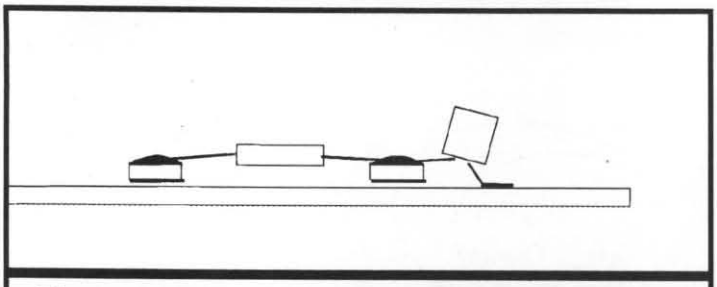


Figure 1—PC DOTS and component mounting

Like ugly style, it uses a piece of copper clad printed circuit board as a ground plane and mounting base. The continuous ground plane makes it ideal for RF circuits, where good grounding and short lead lengths are important. But where ugly style uses high value resistors soldered upright on the base plate for tie points, PC dots uses small round pieces of copper clad PC board for component attachment.

The dots are simply PC board material punched out of scrap material. I use a hand punch with a 1/4 inch die to fabricate the dots. They are punched out copper side up so that the convex "dome" is upward and the concave side is downward. The tool is a simple hand punch available by mail order for less than $30.00 from Harbor Freight Their part number is 35510-OBHA and you can reach them by phone at 1- 800-423-2567. (I have no connection with this company other than being a satisfied customer.) By the way, the punch is also quite handy for punching out round holes in metal chassis for permanent homebrew projects and ideal for making clean holes in the thin metal of the popular Altoids (tm) mint tins.

The pads are secured to the ground plane by putting a dot of cyanoacrylate "super glue" on the plane and pressing the dot in place. When the glue sets, the dot is held firmly where you want it. Of course the copper surface should be free from oxidation and any surface contaminants for the glue to hold and for good solderability. If you ever want to remove a dot, simply use a screwdriver and smack it sideways. Super glue has great tensile strength but very little shear strength.

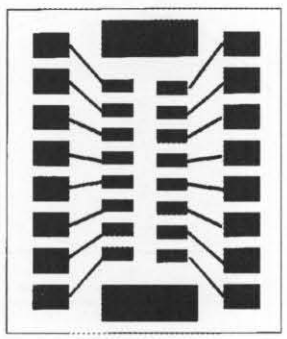


Figure 2—Integrated circuit (DIP) mount

Components are simply soldered to the dots, which serve as junction points. Ground connections are made by soldering right to the copper ground plane. A side view of component connection and grounding is shown in Figure 1. The technique is very good for discrete components, although somewhat awkward for integrated circuits. For DIP IC's, I use an etched pattern on a separate scrap of PC board material like the one in Figure 2. The extra board is held onto the ground place by soldering wires on the copper areas at the ends, then soldering those wires onto the ground plane.

Making up a breadboard with dots is very fast! You just start with a schematic diagram and lay out the dots and components as you go along. You might say it is free-style breadboarding. An example of this is illustrated in Figure 4, which is a dots layout for the circuit of Figure 3. You can easily see the one-to-one correspondence between the figures. The circuit shown is a handy RF buffer amplifier used in many W7ZOI projects. For component values, refer to the ARRL

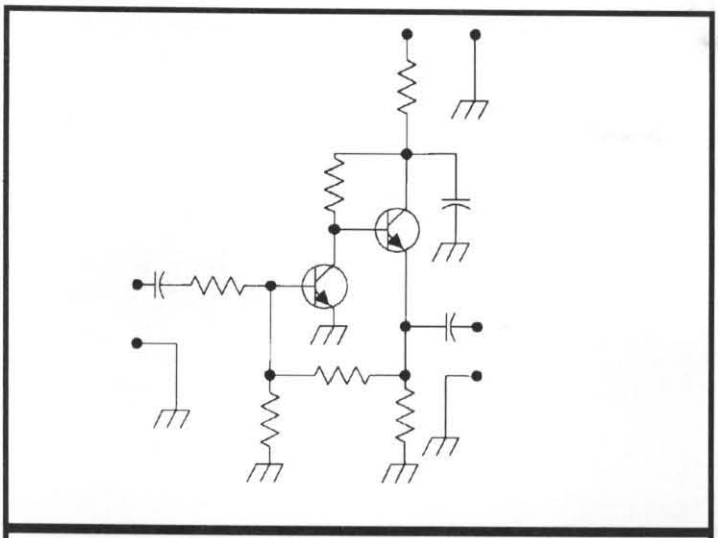


Figure 3—circuit schematic

publication "Solid State Design for the Radio Amateur" by Wes Hayward and Doug DeMaw.

The ability to place components just where you want them and to get very short connections to a solid ground plane make the dots method very good for RF circuits. Instability caused by long lead lengths and poor grounding are happily absent. The dots do have a

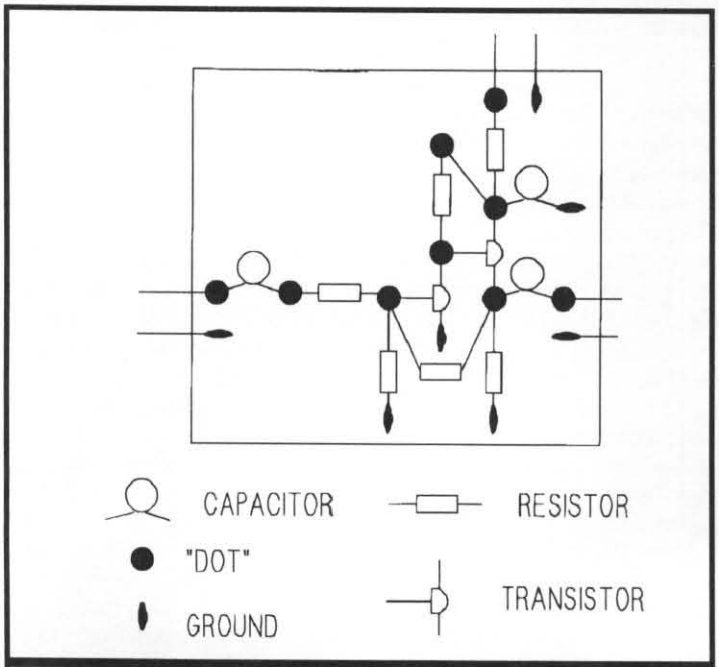


Figure 4—"DOTS" breadboard

stray capacitance of several picofarads to ground, but it should have little effect at HF and VHF. The very first circuit I breadboarded this way was a low noise JFET cascode pre-amp for 150 MHz. Since then I've built dozens of amplifiers, mixers, crystal oscillators and even a few QRP transmitters using dots.

Using dots lets you make fast breadboards for RF circuits or anything with discrete components that needs a good ground plane and a flexible means of laying out a circuit.

--DE N2CX

SIMPLE RF POWER MEASUREMENT

*From **Bob Gipe, WA3NSR** of White Hall, MD, a repeat of one of the classic QRP tools for simple power measurement, the dummy load with diode detector*—The WA8MCQ item in the April 1996 Idea Exchange, "Measuring Power with a Scope", reminded me of the way I measure QRP power levels since I don't have a scope which covers the ham frequencies. I use an RF peak detector as shown in Figure 5.

R1 is three 150 ohm, two watt resistors in parallel, providing a load of 50 ohms at 6 watts dissipation. R2 in conjunction with C2

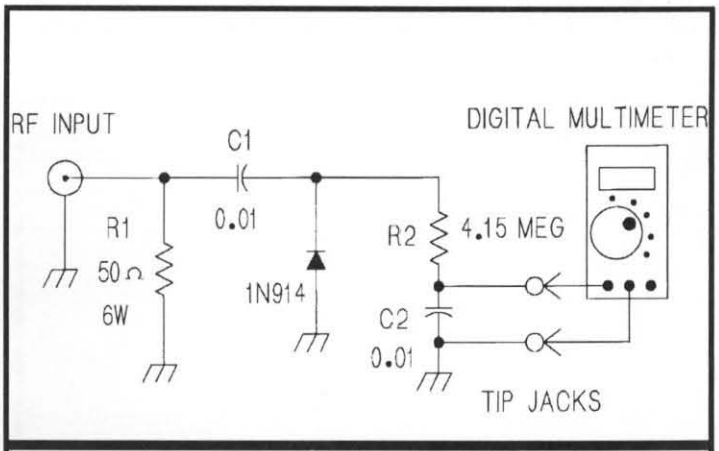


Figure 5—Power measurement

forms a low pass filter which keeps RF out of the digital multimeter. It consists of four 1 megohm resistors in series, carefully selected from a handful to add up to the required 4.15 megs. In conjunction with the 10 megohm input of the digital meter, R2 forms a voltage divider which scales the DC output from the peak detector by a factor of 0.707. Thus the DC output indicated by the meter represents the RMS value of the RF voltage across R1. The power output is thus the square of the meter reading, divided by 50.

This circuit is the same one I used years ago with my old vacuum tube voltmeter. Since the VTVM had an input impedance of 11 megohms, all I had to do to modernize the circuit was to change the value of R2 a bit to be compatible with the slightly lower impedance of the newer digital meter.

—DE WA3NSR

20 dB COUPLER FOR TESTING

In the Idea Exchange last October, Joe Everhart, N2CX, presented a 30 dB power attenuator for use in transmitter testing. The idea is to take a signal sample at a reduced power level, to prevent frying a spectrum analyzer or other test device. At work we're allowed to use anything for personal projects, but woe be unto him that cooketh the input! Fry it while doing something for the company and it might be forgiven, but do it on your own time, on your own project, and guess who pays for the repair! I've been using this device for several years and it works great. It's only 20 dB of attenuation, or 1/100th the power, so I usually follow it with an in-line attenuator just to be safe; I like to have plenty of margin.

Although it acts like one, this isn't exactly an attenuator, at least not in the way we usually think of one. The basic idea comes straight out of the ARRL book Solid State Design for the Radio Amateur, by Hayward and DeMaw. It's a current transformer in series with the signal line. The transmitter is fed into a 50 ohm dummy load, which you should already have anyhow, and a small portion of the signal is coupled out, in this case at a level 20 dB lower than the transmitter power. The advantage of this method is that you don't need to buy any big resistors, which are required for Joes power attenuator; all you need is a ferrite toroid and some connectors.

The core is an FT37-43 or FT50-43; either size is suitable. Performance should be adequate throughout the HF region (details are

provided later). In a perfect world the output from the sample connector, terminated by a 50 ohm load—such as the input of a spectrum analyzer—would be 20 dB down from the transmitter power. In the real world it will vary a bit. By the way, if you want to go for 30 dB, you'd have to make that 31 turns instead of ten.

What type of material to use? I recommended type 43, with the size being a function of the power level you intend to use. In SSD they said FT25-43 but that might be pushing your luck at QRP transmitting levels. I haven't done any power handling tests with a core of that physical size in this application, but an FT37 size should be perfectly

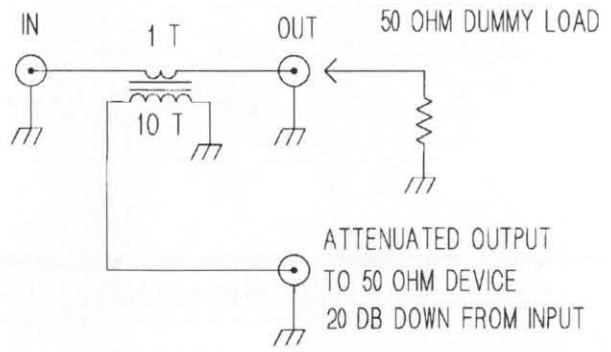


Figure 6—20 dB coupler

safe at all QRP levels and probably higher, and certainly an FT50 is overkill.

How important is it to use type 43, which has an initial permeability of 850? Can you use something higher, like type 77, or lower like type 61? Or maybe a powdered iron? It all depends on what sort of frequency response you want to have. If you want something

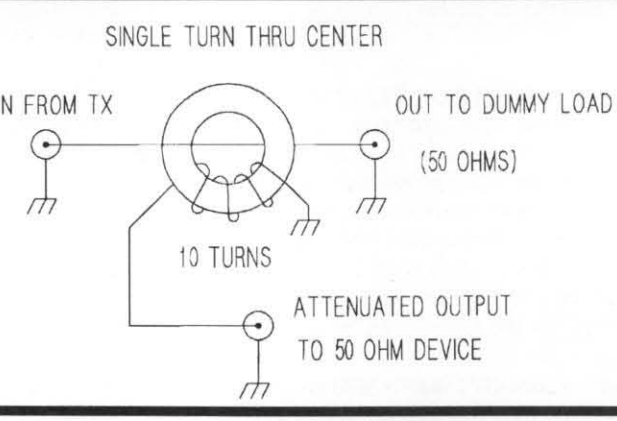


Figure 7—construction of coupler

good from 160M, across the entire HF range and up to 6 meters, type 43 is pretty good, 77 is better, and anything lower starts falling on its face on the low end. You can get away with 61 material if you're not interested in going as low as 160 meters, or type 67 (permeability of 40) if you only go down as low as 40 meters. And a powdered iron? Forget it!

Here are the results of some tests I did with couplers similar to this several years ago on an HP 8753C network analyzer.

		Freq in MHz						
		1.8	3.5	7	14	21	28	50
Coupler	Core type							
A	43	20.5	20.4	20.3	20.26	20.25	20.24	20.2
B	43	20.6	20.43	20.3	20.23	20.18	20.13	19.84
C	77	20.28	20.29	20.26	20.29	20.33	20.33	20.39
D	61	21.0	20.38	20.18	20.21	20.2	20.21	20.11
E	67	26.0	22.3	20.77	20.55	20.44	20.39	20.16
F	(SEI)	20.05	20.1	20.11	20.14	20.14	20.14	19.95
G	2	44	34.5	26.1	22.5	21.4	21.0	20.4
H	0	75	58	45	35	30	28	24
I	43	29.9	29.86	29.8	29.8	29.8	29.8	29.6

Coupler A: FT50-43, ui 850, 10 turns
Coupler B: FT37-43, 10 turns
Coupler C: FT37-77, ui 2000, 10 turns

Coupler D: FT50-61, ui 125, 10 turns
Coupler E: FT50A-67, ui 40, 10 turns
Coupler F: Yellow ferrite from Kanga, made in UK by SEI, type supplied with Stockton wattmeter kit, permeability unknown but at least equal to type 43 material; 10 turns

Coupler G: T50-2 powdered iron, ui 10, 10 turns
Coupler H: T50-0 (phenolic), ui 1, 10 turns
Coupler I: FT50-43, ui 850, 31 turns

The key to good performance on the low end is having enough inductance, which is directly related to the core material used. Couplers A and B are both made from type 43 material, with permeability (ui) of 850, and they give reasonably flat performance from 160M through 6M. Coupler C uses type 77, with ui of 2000, and also performs well. With Coupler D, type 61 is used, ui 125, and the response starts falling off a bit at 160M, though it's still good through HF. (The extended data set, not presented here, shows that it indeed is starting to fall off down at 1.8 MHz, getting rapidly worse below that.)

Coupler E is a bit of an oddball in a couple of ways. First, the size is FT50A, which is essentially a thicker version of an FT50. It is type 67 material, ui of 40, not a type we normally see in homebrew use. The reason I included it is that I have a fair stock of these from my days as the HW-8 Doctor, when I repaired several HW-8s with bad ferrites in the output networks for 80 and 40 meters. This core is one of the two used for 80M.

(Side note—the HW-8 uses ferrites in the output networks on both 80 and 40 meters. These cores can—and sometimes do—go bad, resulting in a loss of output power that cannot be repaired by tuning up the rig. The cure is to replace the cores. I had this published in the QRP Quarterly, SPRAT and QST Hints & Kinks. My original Quarterly article, along with a lot of additional information on bad cores, can be found in the ftp area of lehigh.edu; look under pub, listserv, qrp-l, articles, and the file name is hw8cores.)

Coupler E, with its relatively low permeability, starts falling off rapidly below 7 MHz and is not suitable for use across the entire HF range.

To really prove the importance of having sufficient inductance to get good performance on the low end, a type 2 powdered iron, ui of 10, is shown as Coupler G. From the chart you can see that it's performance is quite poor across HF. Finally, for the ultimate test, Coupler H uses a type 0 core, with permeability of 1. Although usually listed together with powdered iron cores, this material is actually phenolic and has the same permeability as a block of wood. Type 0 has

no magnetic personality of its own and serves solely as a convenient form on which to wind coils. While the type 2 material is merely horrible, type 0 is spectacularly poor.

Finally, for those who prefer to make a coupler with 30 dB attenuation instead of 20, Coupler I is 31 turns on an FT50-43 core. Response from 160 through 6M is similar to the 20 dB version with 10 turns. The same advice holds true for 30 dB couplers as with 20 dB: use a core with permeability of at least 850 for best results, although type 61 with ui of 125 is also reasonably good.

Coupler F has unknown permeability, but appears to be somewhat similar to the type 77 we're familiar with. This core was loaned to me by K3TKS, and came from his Stockton wattmeter kit from Kanga, and is made by SEI in the UK. The core is similar to an FT50 size, and is painted yellow. (Remember what I've been preaching for years: color codes on toroids are utterly meaningless unless you positively know who put that color on there and what their color codes are. There is NO standardization of toroid colors between manufacturers, as I pointed out in both the QRP Quarterly and in QSTs Technical Correspondence section several years ago.)

One final point about this coupler: this is NOT a directional coupler! There is no mechanism for it to differentiate between forward and reverse current flow, so you can apply the power to either terminal as long as the other terminal has a dummy load, and the resulting output will be the same.

—DE WA8MCQ

SIDETONE FOR 40-9ER AND PIXIE 2

Adapted from the September 1996 issue of QRPp, here's another mod for the popular 40-9er, from ***Jeff Furman KD6MNP.***

I have added sidetone to the 49er. A similar method may work for the PIXIE 2 also. The LM380 audio amplifier in the unmodified 49er has an unused input, which can be used to boost the amplifier's gain by using controlled positive feedback. I used this input to make a classical Wien bridge oscillator circuit for sidetone. The "sinusoidal" waveform produced by a linear type oscillator sounds better than the harsh, raspy square waves or pulses generated by typical multivibrators or unijunction oscillators.

Barkhausen showed the condition for oscillation is that the net gain around the loop must have magnitude of one and zero phase shift at the frequency of oscillation and different magnitude and/or phase shift at all other frequencies. Our LM380 unused input is non

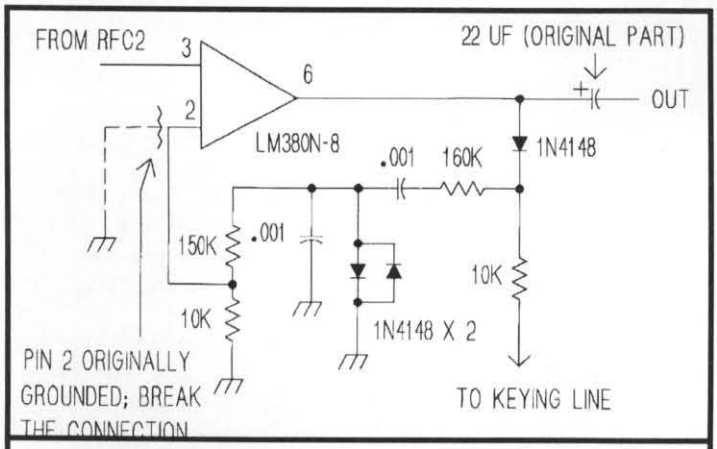


Figure 8—Sidetone for 40-9er

inverting; this means the phase shift from input to output is zero degrees. The gain magnitude of the amplifier is about 50. The Wien feedback network as used here has zero degrees phase shift at only one frequency, and its gain magnitude is a maximum of 1/3 at that frequency. These two elements combined into a loop give the required phase shift, but the gain is too great for oscillation. What is needed is an attenuator of about 3/50 to give the required unity magnitude. This is easily added as a tap, forming a voltage divider, in the resistor of the shunt branch of the Wien network. This is the basic idea for the oscillator.

The oscillator must be keyed along with the transmitter. A garden variety switching diode is used as a switch: when forward biased its resistance is relatively low, compared to the rest of the circuit it controls. When reverse biased, its high resistance disconnects the two parts of the circuit. The LM380 output pin is quiescent at half of the supply voltage, so if the keying line in the key up condition has a higher voltage than this, the diode will be reverse biased and the feedback loop will be broken. Next, key down pulls current through the diode, which enables the feedback and allows oscillation to start. The back to back diodes are intended to limit the amplitude of oscillation. It is a feeble attempt to provide oscillator AGC, common in linear oscillators. As the amplitude increases, the diodes start to conduct, and thus change the attenuation through the feedback network away from the Barkhausen condition.

Here is the mod in words:

1. At the output of the LM380 (pin 6), connect the anode of an ordinary switching diode such as 1N914, 1N4148, etc. A rectifier such as 1N4001 may work, but I haven't tried it.
2. Connect a 10k resistor (value not critical) between the cathode of this diode and the keying line.
3. At the junction of the diode and the 10k resistor, connect one end of a 160k ohm resistor.
4. At the free end of the resistor, connect a 0.001uF (or 1 nF) capacitor. I recommend any film type as opposed to any ceramic type.
5. Connect a second capacitor of the same value and type between the free end of the first capacitor and ground.
6. At the junction of the two capacitors, connect one end of a 150k ohm resistor.
7. At the free end of the resistor, connect a 10k ohm resistor to ground.
8. Connect two more switching diodes back to back ie. anode of each one connected to the cathode of the other, and connect this pair between ground and the junction of the two capacitors and the 150k ohm resistor.
9. On the printed circuit board, cut the trace that grounds the unused input pin on the LM380 (pin 2) and connect this input to the junction of the 150k ohm and 10k ohm resistors.

These are all standard 5% values; the 10K resistor in step 2 is a nominal value but the remaining resistors and capacitors determine the oscillation frequency and the attenuation, so departures from resistor and capacitor ratios will cause problems. The key here is the capacitors have the same value and the single series resistor equals the sum of the voltage divider resistors. Notice that 10k/(150k + 10k) = 1/16 = 3/48 (almost 3/50). The error toward slightly less attenuation than estimated helps the oscillator start up and stabilize before the "dit" is done. Thus, the 10k ohm resistor added in step 7 may need to be different depending on variables: standard values are 8.2k, 9.1k, 10k, 11k, 12k, 13k, etc; I used 5.1k with a 10k, one turn trimmer in series. The correct value allows oscillation to build up over the extremes of supply voltage and temperature, but not exceed the limits of the AGC. You can notice the raspy, blaring quality of the note when it's too much, and a slow, droopy startup with barely sufficient gain.

The sidetone frequency is about 1 kHz. Doubling the resistors (or the capacitors) halves the frequency, so, as an example, for about 700 Hz, the 160k ohm resistor becomes 220k ohms, the 150k ohm

resistor becomes 200k ohms, and the 10k ohm resistor in step 7 becomes about 13k ohms.

PIXIE 2 modification: three major differences are:

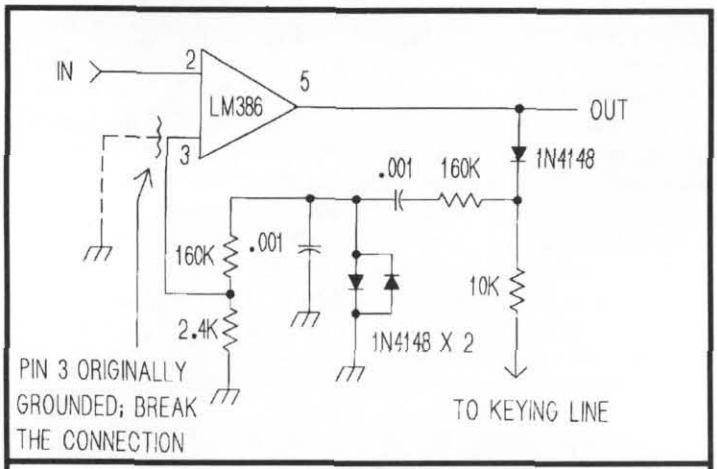


Figure 9—Sidetone for PIXIE 2 (also requires changes to PIXIE circuit, not shown here)

1. the pin numbers are different on the LM386 than the LM380 (LM386 output is pin 5; LM386 noninverting input is pin 3).

2. The LM386 gain is about 200 instead of the LM380's 50. Just changing the voltage divider attenuation from 3/50 to about 3/200 should do it, so, for 1 kHz, the 150k ohm resistor becomes 160k ohms, and the 10k ohm resistor in step 7 looks like about 2400 ohms.

3. The PIXIE 2 shuts down the LM386 during transmit; this needs to be changed by disconnecting the anode of the PIXIEs D1 from the junction of R5, C10, and pin 6 of the LM386, and connecting it to its own 1k ohm resistor to +9v. and another 10 uF cap. This accounts for the bias current through D1 during receive, if D1 has some effect in receive. If it happens that D1 is not necessary, then a resistor from the keying line to +9V (guessing here, perhaps 1k to 10k ohms) could replace D1. I have a PIXIE 2 that uses a homemade discrete audio amp without D1, so I need to investigate its function further. I invite comments on the functioning of the PIXIE 2 in receive to clarify this.

Experimenter's License and author's caveat: Since I haven't tried this PIXIE 2 modification, this is more speculative. As before, the value of the 2.4k ohm resistor may need tweaking. Exact science, huh?

—DE KD6MNP

COMMENTS ON THE S&S ENGINEERING TAC-1

Adapted from his QRP-L posting, here are some comments and observations from ***Gary Surrency, AB7MY*** *(gsurrenc@ix.netcom.com)—*

First off, diode D7, a 1N4001 is in series in the power lead as a polarity protection device, and is underrated for the 1.25 amps of transmit current draw. It gets HOT! I replaced mine with a 3 amp device and it runs a lot cooler. I'm probably going to put a 3 amp Schottky power diode in there, such as a 1N5822 to lessen the forward voltage drop. If running from a battery, this should help when the voltage starts to drop. An alternative would be to use a jumper there, or a resistor fuse, and put the polarity protection in the power lead where there should be a fuse anyway.

Second, this is the second S&S kit I've had (the other is an ARK30) that had a low voltage zener at D23, a 1N4733A. Both of the originals were only around 4.7V on my DVM. I got some new ones from the local Radio Shack that were much better at 5.15V (Motorola devices). I think the product detector works a little better now.

I'm getting around 6 watts out into a 50 ohm dummy load, which is great, but not "true QRP" and it seems like a little much for the small heat sink on Q7. I installed Molex pin sockets for Q6 and Q3 to allow me to select devices for optimizing the output. The 2N3906's I had seemed to be a little soft for Q3, resulting in too much voltage drop to the transmitter chain. Q4 and Q5 didn't seem as critical to the drive. With the Molex sockets, you could use a "hotter" pair at Q3 and Q6 when battery operated, or the "weaker" pair if running off a good 13.8v AC supply. The "softer" transistors will still give 4-5 watts, and may be a better idea for longevity.

I looked at several 2N3906s before finding one that didn't have so much drop when ON during transmit. A 2N4403 or 2N2907 had much less ON resistance and gave better keying/output power. A couple of the 2N3906's I had on hand were nearly as good, so I think they vary a lot in ON resistance. Finally found one that gave me 11.03 volts at Q3's collector. I can get as much as 9-10 watts out by using a 2N4403 at Q3 and a 2N222 (good) or MPS2222A (better) at Q6, but decided that was TOO much and not really true QRP, so I chickened out and settled for a good 2N3906 at Q3 and a good 2N3904 at Q6 for a solid 5-6 watts. The power is there if you want it, but Q7 might expire prematurely from all that drive. I could get 9-10 watts with the right combination. It needs a bigger heat sink.

I had to add one turn to L4 to get the MAIN LOOP VCO going. It has 13 turns now, neatly grouped into three groups of 4 turns when seen from the top. The wire passes thru 13 times but it only looks like 12 full turns.

The LM7809s on this kit and the ARK30 were a little wimpy in output voltage, so I replaced them all with JRC 7809A's and got a nice 9.15v to 9.20v. The originals were Korean KIA 7809Ps with 8.95v to 8.99v. This can make all the difference in the world when trimming C45 to get 36.4000 MHz at TP2. My low 9 volt supply couldn't bring D8, a MV209 varicap, low enough in frequency with the RIT centered. A second MV209 was no help either, and I tried several other 16.0000 crystals I had to no avail. The original crystal is a "watch" type in a miniature cylinder case.

I even checked the 1k resistors R30 and R39 to see if they were "unbalanced", but the most improvement came from boosting the 9 volt supply with a new 7809a. Your crystal may pull low enough with C45, but if it doesn't, here's where to look. A couple of tenths of a volt improvement from 9.00 to 9.20 did the trick. Otherwise, it's not possible to calibrate the VCO to frequency correctly.

The LM78L05s seem to be better when it comes to rated 5V readings; I didn't change any. A 100 uF 10v electrolytic fits better at C14 and is adequately rated. The original 16v part supplied was a tight squeeze. Funny thing is, the parts list specifies a 10v part but a 16v cap was supplied. Check the junk box if you can find one.

I used "hot carrier diodes" for D15-D18, the double-balanced mixer in the front-end, instead of the supplied 1N4148s. The 1N5711s I had were much better matched in forward drop, and have less junction capacitance and less voltage drop. This should improve the mixer performance.

Spend some time adjusting T5, T6 and T7 because there's a lot to be gained here for best bandpass characteristics and LO drive. Small movements in the windings position made large differences when you get it close. I used the tuning knob between 7.000 and 7.200 to evenly set the bandpass. It's only 1 click up or down to move to band edges.

I didn't get much improvement when adjusting the receiver bandpass transformers, T12-T13, so mine were either spot-on or way off. But the sensitivity seems quite good compared to my commercial HF big rig. Your mileage may vary.

Some general observations:

The keyer works really well, and the digital display of

frequency and speed is great. It even defaults at power-up to 7.040 MHz and 12 wpm, which is only a few clicks of the tuning knob away from 20-25 wpm where I usually operate. The digital display of both parameters is nice for repeatability. The weight is even digitally adjustable from the tuning knob when placed in the "keyer" mode by the rear panel push button. This is integrated into the PIC microcontroller and is cheaper to buy with the kit than later, since it replaces the standard processor. Get it.

BNC antenna connector! No relay! Nice audio filter which seems better than the ARK30 and no 10 kHz whine at low headphone levels like the ARK30. Dick of S&S put a 4.7 uF capacitor from pin 7 of the LM386 to ground. I put a 10 uF tantalum in my ARK30 to cure it. It just fits under the PCB.

I had no BCI images at my QTH in the evening. IMD is good. Beautiful case, cabinet, packaging, as in all S & S products. The PCB is really a pretty effort, with no jumpers or kludges but it's a little tight in places and requires careful assembly. Take your time building and enjoy. It's not a kit for first time builders. The silk screening is clear and the mask is nicely done. There's no wiring except for a ribbon cable assembly to the front panel. It's a clean layout. You won't want to put the cabinet on for a while so you can admire the workmanship.

The keyed waveform is well shaped, and the signal has a nice "ring" with no clicks when monitored on my big rig. NO DRIFT! None; it's synthesized. It has jacks for both paddles and straight key! It works well with my homebrew keyboard and Bencher paddles both attached.

Gripes: No external speaker output jack, but my amplified speakers can go in the earphone jack. There is a 100 ohm resistor in series there, but the LM386 can adequately drive a speaker directly, and there is a PCB take-off point near the rear panel for a speaker but no jack. I couldn't bring myself to drill another spare hole in the rear panel yet . One has to be drilled for the keyer push button PB1, and there are two other spots labeled PB2 and PB3, but they might have options installed later so I decided not to drill.

Summary:

At the price, it's a good value and very high quality. If you consider the competition, adding all that's necessary to equal this rig, it's a good buy. You won't be disappointed.

Standard disclaimer: I am not affiliated with S & S in any way, and received nothing for this review. *[The same goes for me and the QRP Quarterly! —WA8MCQ]*

—DE AB7MY

BYPASS RELAY FOR MFJ 971 TUNER

*From "The QRPer Formerly Known As KB4ZGC", **Frank Brumbaugh, W4LJD** of Salinas, PR, a tip on adding a bypass relay to a tuner lacking a switch for the purpose*—This is for the MFJ 971 antenna tuner that is touted for use with their QRP rigs, but applicable to others as well. I wanted to use just the double needle meter circuitry with my own low pass antenna tuner without the T-circuit in the 971 getting into the act. Since the meter lamp uses 12V anyhow, I epoxied in a 12V DPDT DIP relay (982 ohm coil, which is polarized, and 1 ampere contacts) to do the job with an SPST toggle switch to control it. See Figure 10.

There's plenty of room to epoxy the relay inside and with a little wire cutting, rerouting and soldering, the double needle meter can be used with an external tuner at a maximum of 6, 30 or 300 watts RF. The internal jumpers (6W only) and/or the pushbutton switch on the rear deck determines the maximum RF power the meter can be used to monitor. If used for over 50 watts, the relay should have higher current contacts, of course.

—DE W4LJD

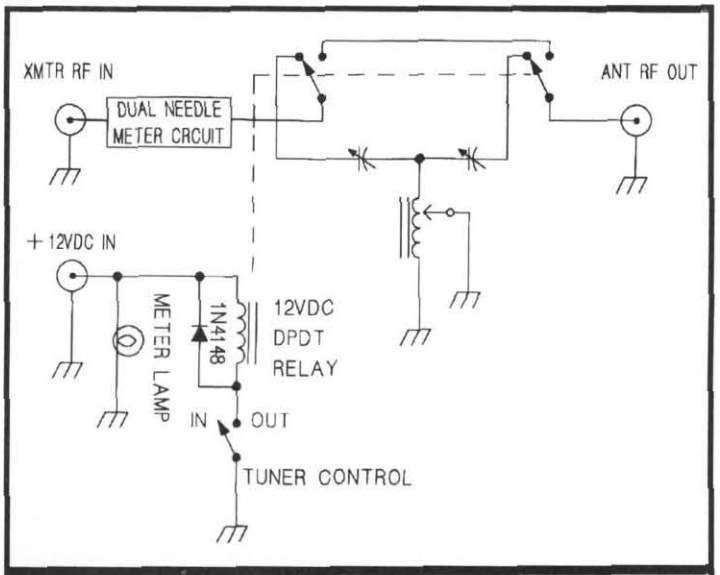


Figure 10—Bypass relay for tuner

PCB PARTS PLACEMENT ERROR: NN1G RIG

***Henry Smith, W4INQ** of Gulf Shores, AL reports an error in the parts placement diagram for the NN1G rig in the 1995 ARRL Handbook*—The rig looked good so I ordered the info kit from ARRL and the boards from FAR Circuits and found that both are in error. The orientation of Q2 is wrong and should be facing the other way, as shown in Figure 11, which is from the ARRL info pack. This might save someone a headache. After more than 50 years as a ham I don't need this kind of troubleshooting experience :-)

—DE W4INQ

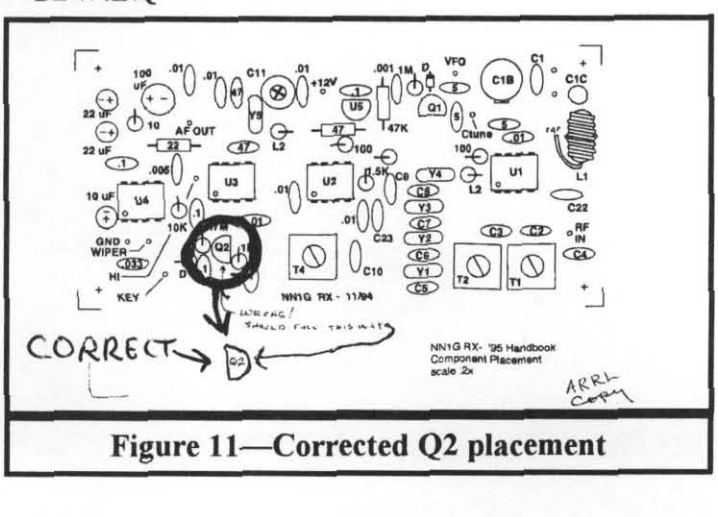


Figure 11—Corrected Q2 placement

HW-9 BANDSPREAD MOD UPDATE FOR 30M

Dick McIntyre, K4BNI of Basye, VA has an update on one of the mods that was in the KF0N article in the January 1990 QRP Quarterly, on pages 8-10 (which was the same issue in which I took over the Idea Exchange from Mike Michael, W3TS). One of the mods Larry Wilson presented there was reducing the VFO coverage from 275 kHz to 150 kHz by inserting a 33 pF capacitor in series with the main tuning capacitor, to give a slower tuning rate, and recalibrating the dial.

Dick performed the mod and ended up with only 0-100 kHz; it gave an even better tuning rate, but he quickly discovered that 30 meters was now out of range since it STARTS at 100 kHz above the

bottom. When the VFO originally went from 0-250 kHz, it wasn't a problem. After replacing the heterodyne oscillator crystal for 30M with one for 24.930 MHz, from Peterson Radio, 30M fell within the first 50 kHz of the dial. (The original value of Y103 is 24.830 MHz.)

STEREO-MONO HEADPHONE JACK
STANDARD POWER PLUG
PARTS CONTAINERS

Mike Stein, WB9NOO *of Fort Wayne, IN passes these three along*—**Stereo-mono headphone jack:** A trick I have used for years is to wire 100 or 150 ohm resistors in series with both the left and right channel pins on a stereo headphone jack. The amplifier then doesn't care if it sees a left channel headphone from a stereo plug or a short to ground from a mono plug since either is in series with the resistor. A check of a commercial radio schematic shows this has been done for years to pad down the volume to the phones, making adjustment of the volume control unnecessary when switching from speakers to phones.(See Figure 12.)

Standard power plug: I have used a 4 pin Cinch-Jones connector as a standard power plug on all my equipment. I tied pins 1

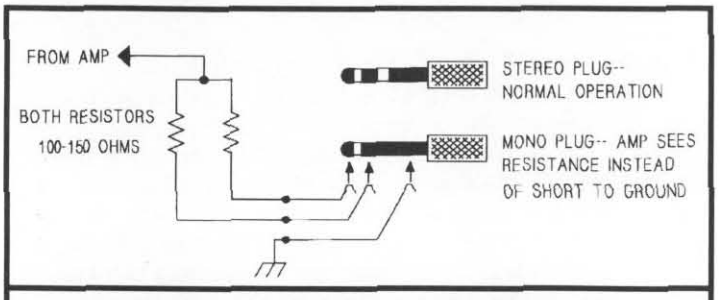


Figure 12—Stereo-mono headphone jack

and 3 for ground, and 2 & 4 to positive. These connectors are cheap, reusable, have a strain relief, are easy to solder, and will handle 20 amperes. I even mounted 8 of them in a long rectangular box, making my own outlet strip. I have a battery backup, so if the power quits my radios don't. Whether mobile or base, all equipment is interchangeable.

Parts containers: While coffee cans worked to store large parts, I needed something for smaller items. My local pharmacist was happy to sell me 400 pill bottles for about 7 cents each. I had my choice of childproof or non-childproof lids. *[You can't take a chance on your toddlers thinking T68-2 cores are lifesavers! —WA8MCQ]*

—DE WB9NOO

EXTRA WIDE RANGE VXO

From QRP-L, here's an intriguing wide range VXO passed along by one of the QRPers in Japan, ***Makoto Minowa, 7N3WVM,*** *minowa@icepp.s.u-tokyo.ac.jp, plus some comments on it from* ***Tom Randolph, N1OOQ*** *. (My thanks to W1HUE for alerting me to this, since I don't always get a chance to read the QRP-L Daily Digests and miss some things.) The basic circuit I chose to illustrate it is one that N2CX submitted a while back; the technique from JA-land is the addition of a second crystal. The complete circuit as shown has not been tested but "should" work..*

Since it seems that the wide range oscillator called "Super VXO" is not well known to people out there, I would like to introduce it to you; it is commonly used among Japanese homebrewers.

The Super VXO, shown in Figure 13, uses two crystals of the identical nominal frequency in parallel instead of a single crystal like a conventional VXO. *[His original posting contained only an ASCII art drawing of the variable cap, coil and two crystals, with a line leading off to the base of a transistor oscillator, not shown. The circuit shown here is a composite of an N2CX VXO with the dual crystal modification. This particular circuit has not actually been built by anyone that I know of, and is intended to illustrate the basic principle. It "should" work! —WA8MCQ]* Nothing else is special. It can pull considerably more in frequency than a conventional VXO, such as about 40 kHz for a pair of 10.15 MHz crystals , and 90 kHz for 13 MHz units, according to my experience.

The Super VXO is said to have been invented and named by JA0AS (Mr. Shimizu) and JH1FCZ (Mr. Ohkubo) many years ago. (Sorry that the spellings of their names might not be correct.) The story of their invention of the Super VXO is reported in a book (written in Japanese) entitled "Textbook for Homebrewing of Electronic Circuits" (my translation; the original is in Japanese), written by JH1FCZ.

The followings are some of my experimental results.

(1) Two 10.15 MHz Crystals in parallel + 15 uH inductor + 20 pF poly-variable cap covered the range of 10.10 - 10.14 MHz. I built a 30m direct conversion QRP XCVR with it. Frequency is very stable. The transistor used in my version is 2SC1815, a common general purpose small signal device with fT of 80 MHz.

I tried it with some different type of inductors of the same value, but it did not oscillate with a small-sized axial lead type inductor. Inductors with larger physical size seem to work better. Maybe Q of the inductor is the issue. Those who want to experiment may need to try it with as many types of inductors as possible. Varying the bias current of the transistor may also help in case it does not oscillate.

The frequency range can be made still wider with larger inductance values, 22 uH for example, but the frequency stability gets worse rapidly with increasing inductance. Anyway, we need not go

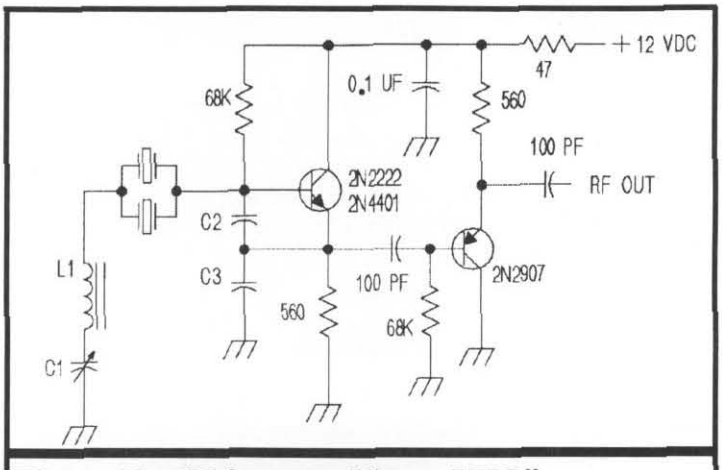


Figure 13—Wide range "Super VXO"
Note—this circuit is a composite design used to illustrate the principle and has not actually been built and tested as shown. (For 10.1 MHz, use 220 pF for C2 and C3.)

lower than 10.10 MHz !

(2) Two 13 MHz Crystals in parallel + VXO-50 coil (see below) + 30 pF air variable cap gave the range 12.91 - 13.00 MHz. Again, the transistor used was a 2SC1815.

The VXO-50 coil is designed specially for the Super VXO and sold by the FCZ-lab, a company founded by JH1FCZ (they sell many kits and special parts for hams). This coil is slug tunable with a core having a small temperature coefficient. The inductance ranges between

7 and 11 uH. [Any similar coil can be used.]

This Super VXO is used in my 6M QRP SSB superhet XCVR. The VXO frequency is multiplied by 3 and used with an IF of 11.2735 MHz to cover the range of 50.00 - 50.27 MHz (270 kHz !). The frequency is acceptably stable but not so stable as the above example of 10.15 MHz. A change in voice pitch is observable during a long QSO.

A crystal with a frequency below 10 MHz is hard to pull by more than 50 kHz even with this method if you need a stable frequency. The lower the frequency, the narrower the range. Therefore, for lower bands, you need to choose an appropriate IF to cover the wide range with a Super VXO of higher frequency. I am now trying to build a 40m CW XCVR with IF = 4.5 MHz and Super VXO of 11.54 MHz to cover 7.00 - 7.04 MHz.

A 3rd overtone crystal can be used at its fundamental frequency.

The frequency range can be made wider with a larger inductance value, but the frequency stability gets worse rapidly with increasing inductance. JH1FCZ recommends in his book that one should keep the frequency range within 0.5% of the nominal frequency to maintain the stability, such as 50 kHz for 10 MHz.

You might want to use a surplus square-canned slug-tunable coil of an appropriate inductance for Super VXO, but the frequency stability depends on the temperature coefficient of the core material used. Commonly used core materials seem to have large temperature coefficients. I have no experience with Super VXO with an iron powder toroidal core inductance, but proper choice of the core material is again the key in frequency stability.

Some further comments on the VXO from QRP-L, from Tom Randolph, N1OOQ, randolph@asic.enet.dec.com--

Well folks, 7N3WVM was absolutely not kidding about this technique. I slapped one together on a piece of square-cut-pads copper clad board. Keep a couple of those around, very handy for this sort of thing.

The circuit was a basic bipolar transistor Colpitts oscillator *[of which Figure 13 is an example]*.

I used 10.0 MHz crystals, as that's what I had around. Unfortunately, my junk box crystal supply doesn't have more than 2 of any one type, so I couldn't test what happens with 3 or more!

With L of 1.2 uH (20T on a T37-6 core): 1 crystal gave 10005-10011 kHz, a 6 kHz range. Two crystals gave 10008-10015, a range of 7 kHz.

12 uH (scrap inductor pulled from an old TV set)	1 crystal	10000-10010 kHz (10 kHz)
	2 crystals	10001-10014 kHz (13 kHz)
22 uH (another TV set job)	1 crystal	9991-10009 kHz (18 kHz)
	2 crystals	9970-10013 kHz (43 kHz)

There's a sort of threshold of inductance which you have to get above before you see the dramatic effect.

Drift: The 22 uH circuit had noticeable drift compared to the BFO on my general-coverage short wave RX. Very slow and long, not at all bad compared to some LC VFOs I've built. I'll guess 20-30 Hz per minute. The 12 uH circuit had virtually no drift over about 10 minutes. The 1.2 uH circuit also had long, slow drift. These comparisons were made maybe 30 seconds after removing the soldering iron. Blowing on the circuits caused a small frequency change, maybe 20-40 Hz, so they're certainly not immune from temperature effects.

In a follow-up posting on QRP-L, 7N3WVM passed this along--

JH1FCZ phoned me and told that JA0AS passed away on November 10, 1996. Mr. Shimizu founded the JARL QRP Club in 1956 and was the first president. An article on experimental results of the Super VXO first appeared (in Japanese) in the August 1980 issue (Number 64) of "Fancy Crazy Zippy", a homebrew and QRP related magazine published periodically by JH1FCZ.. After 16 years, this technique is now commonly used among Japanese homebrewers. JA0AS would be pleased if it would be used by many other hams around the world.

SIERRA 17M BIRDIE CURED

***Wayne Burdick, N6KR**, posted some information to QRP-L about the NorCal Sierra transceiver. The original title of the post was "VFO harmonics, birdies, and varactor diodes".*

On some Sierras, from both NorCal and Wilderness Radio, you can hear a birdie (spurious signal) when the receiver is tuned to 18.073 MHz (using the 17m module). It is usually very weak, but the long leads required to connect the VFO to a KC1 or KC2 keyer/counter module can make it much louder. While this birdie rarely caused me any trouble, I decided to look into it

THE CAUSE: What I found was that the birdie was originating from the 6th harmonic of the VFO! (It doesn't take much energy in harmonics to cause a birdie, given the very small signals the receiver is capable of hearing.) With a long wire lead (antenna!) connected to the VFO, this harmonic gets past the VFOs lowpass filter and goes straight into the receive mixer.

Here's how the birdie is created. At an operating frequency of 18.073 MHz, the premix signal frequency is 18.073 + 4.915 = 22.988 MHz. This premix signal is in turn the result of mixing a 26.000 MHz crystal oscillator signal with the VFO, which must be set for about 3.012 MHz. The 6th harmonic of the VFO is now at the same frequency you're tuned to: about 18.073 MHz. (Since it's an upper harmonic of the VFO, it "tunes faster" than normal signals--a dead giveaway.)

But why did I have any significant energy in this high-order harmonic? As it turns out, when I designed the VFO I connected the RIT varactor diode (D8) to the highest amplitude point in the VFO circuit: the junction of L7 and C52/C53/C54. As I discovered, the AC voltage at this point is 15 to 20V p-p, much higher than you'd like to see across a varactor diode at any DC bias level.

I happened to be reading about varactor diode frequency multipliers and realized that this was where the 6th harmonic energy was coming from -- not to mention 5th, 4th, etc! Varactor diodes introduce harmonic distortion of the waveform since their capacitance varies with the AC waveform as well as the DC bias.

THE CURE: Killing the birdie was actually quite simple: I had to move the varactor diode to a different point in the circuit where the AC voltage was much lower. In this case, all I had to do was cut the trace from the anode of D8 to L7, then reconnect the anode to the other side of L7, i.e. the junction of L7 and C56. The AC voltage at this point is much lower -- about one third that on the other side of L7. (The impedance is much lower here.)

I had to make two other changes, since the varactor was now connected at a point where its capacitance had less of an impact on the total capacitance in the VFO circuit. First, I changed R33 (R19 on the NorCal Sierra) to 10K instead of 47k. This brought the RIT range back up to about 3 kHz. Next, I had to add an additional 22 pF across C53 to get the VFO back to the correct frequency range. Any kind of small capacitor will do; I used an NPO ceramic.

This modification will likely be made permanent in the next revision of the Sierra. Chances are it will improve both receive and transmit spectral purity, although I haven't put a spectrum analyzer to it yet.

If you have a different rig that includes an RIT circuit, you might want to measure the voltage on the varactor to make sure that this isn't a potential problem. Be sure to use a high impedance scope probe or RF probe so you don't load down the L-C circuit too much.

--DE N6KR

SMOKE-PROOFING NEW RIGS

Stephen Smith, WB6TNL *passed this tip to QRP-L (and thanks to K3TKS to pointing it out to me)*-- I have noticed a couple of posts from builders who've fried things when powering up their newly completed or modified "38 Special" transceivers. There is a simple way to prevent letting the smoke out upon initial application of power should there be a serious problem in your radio. This is not an original idea, but I thought that it would be a good time to bring it up again.

Before you apply power to your kit for the first time, purchase a 12-14 Volt incandescent lamp that's rated for 50 milliamps or so. The Radio Shack P/N 272-1092 is my pick for the 38S because it is rated at 60 mA and has wire leads that you can connect to with clip leads (but be careful handling these lamps as they're somewhat fragile).

Connect the lamp in series with the positive lead from your power source. If it illuminates at full brilliance when you turn on the rig, STOP! You have a problem with your kit--there is a short somewhere, but more than likely you'll not have fried the radio since the lamp limits the current. Proceed with troubleshooting and correct the problem. If the lamp lights dimly (1/2 brilliance or so) you should be ready to connect the power directly (lamp removed) and proceed with tune-up. Note: If you try to transmit with the lamp in series, it WILL light at full brilliance and your rig will not transmit. You must remove the lamp for transmitter testing.

To help you differentiate between full and half brilliance, connect one lamp to your 13.8 V supply. That will light at full brilliance. Now connect two in series across the same supply. Each of those will be lit at 1/2 brilliance. The 38S draws around 30 milliamps key up, when not receiving a signal, which equates to about 1/2 brilliance on a lamp rated for 60 milliamps.

Television repair people use this trick all the time (although they use a 110 V light bulb in series with the AC line), especially on sets that have just had a shorted horizontal output transistor replaced. It keeps the same thing from happening again if there are additional defective components.

—DE WB6TNL

POTTED ANTENNA CENTER INSULATORS

A condensed version of this idea from **Wes Spence, AC5K** *of Lumberton, TX originally appeared in the April 1994 Idea Exchange. He recently sent in this expanded version, along with some photos which were taken by his wife, KA5PXK*—Many years ago when I was just starting out in amateur radio I could not afford lot of equipment. I learned to improvise, and one of the improvisations—a center insulator for wire antennas—turned out to be much more than a "make do"; it's the best I have ever used or seen. The advantages:

1. It is poured into a mold of your choosing, so it can be as large or small as needed.
2. It has good resistance against ultraviolet (UV) light.
3. It is a good insulator.
4. A means of attaching a rope, such as an eye bolt, can be molded into it.
5. It is absolutely waterproof if done correctly.
6. The insulator will stick to coax, wire (insulated or bare), hardware, or just about anything else, so it can be used for many different types of antennas.

The "magic ingredient" to this system is polyester resin. It is sold in the US in quart containers along with a small tube of hardener. It is sold as the resin to use when working with fiberglass on boats and such.

As the photos show, the insulator is quite simple to make. It is best to start with new wire and feedline. This is to be sure that there are not contaminants on the wires that could keep the resin from sticking to them.

For a mold, I use clean, empty cups from "Jell-O" pudding or similar products. Styrofoam cups will NOT work. If you use the wrong type of plastic, it will melt when the resin is poured in, so build this outside to avoid the mess.

I make small holes in the cup for wires, coax, eye bolts, etc, and force them through for a tight, leakproof seal.

The most important thing to do is to be sure you mix the resin

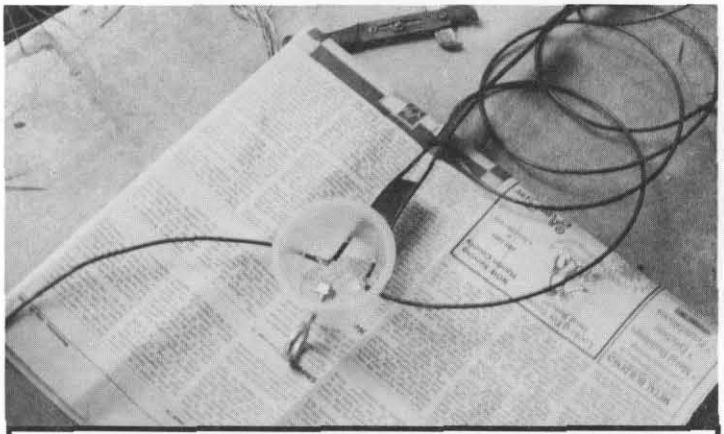


Photo 1—Antenna wire, ladder line and eye bolt in empty plastic cup

and hardener in a separate cup. Otherwise, bubbles and poor adhesion to the wires is likely. If you mix it well in a separate cup, it will turn out like the example in the photo.

In an hour or so the insulator should be cured and hard. You may or may not be able to get the mold off, but it really doesn't matter.

Photo 2—Pour resin into the mold; be sure to mix resin and hardener in a separate cup

If you cut it off with a knife, be sure not to cut the wires or coax insulation, or water may still be able to get in.

Larger antennas such as 80 meter dipoles will require slightly larger molds so there is enough area to hold the wire inside the insulator. Small pieces of fiberglass may be added to the mold before

pouring in the resin if it is perceived that more strength is needed. As in all antenna work, the key is to experiment.

I don't know how long these insulators will last, but I have had

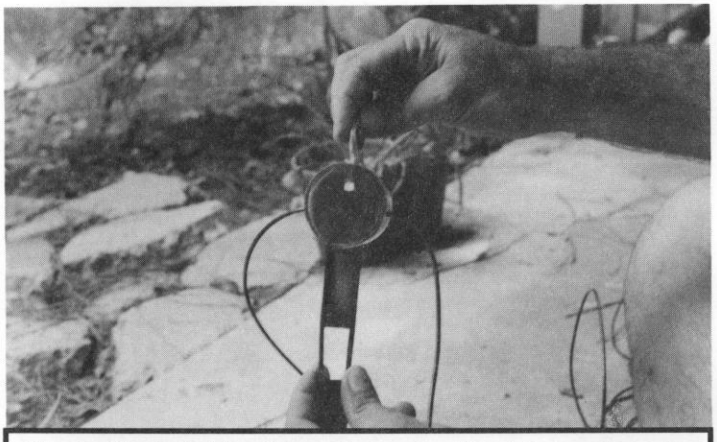


Photo 3—Finished insulator molded into place in center of antenna

them up for years and the wire will probably rot off and break before the insulators!

—DE AC5K

SIMPLE ANTENNA TUNER TUNER

Frank Brumbaugh, W4LJD (nee KB4ZGC), sent in this simple device to aid in setting your antenna tuner—This gadget uses a signal generator as a signal source and will do some of the work that a commercial antenna SWR analyzer does. It indicates antenna resonance, and can be used to pre-adjust a tuner to reflect 50 ohms back to the transceiver.

A frequency counter or receiver should be used to set the generator accurately. The meter can be calibrated for SWR if desired, by plugging in resistors of known value to the tuner connector, although it's not really necessary. The important thing about SWR and tuners is getting it as low as possible; knowing the exact value isn't critical.

I suppose it would be possible to use a grid dip oscillator in

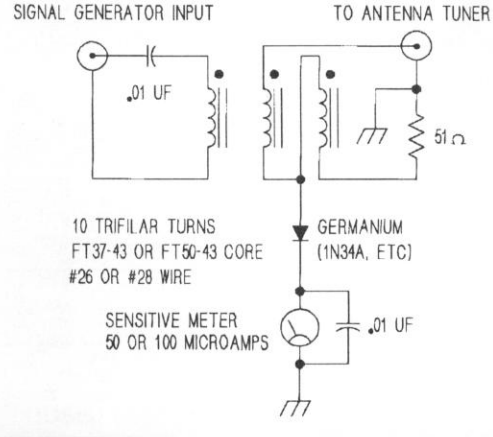


Figure 14—Simple antenna tuner tuner

place of the signal generator, link coupled to a coil plugged into the input. Or a simple band switched Franklin oscillator followed by an amplifier would work well as a signal source. The output of a grid dip oscillator may be too low to give a good meter indication, though.

The diode should be a germanium type such as 1N34A or equivalent, for greatest sensitivity. The meter must be a sensitive one, on the order of 50 or 100 microamps, although you may get acceptable results with less sensitive units. The dots on the leads of the coils show phasing; be sure to connect the correct wires for proper performance.

To use, set the generator to the operating frequency. Observe the indication on the meter. Adjust the tuner for minimum. If the output of the signal generator is too high for the meter and can't be lowered, you can put a potentiometer in series with the meter for a sensitivity adjustment.

—DE W4LJD

QRP-L, THE "QRP DAILY"

To subscribe to the free Internet QRP forum, started up several years ago by Chuck Adams, K5FO, 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 so you can decide which postings look interesting and skip the ones on topics you don't care for.

And just how much traffic is there? I remember when I was amazed and overjoyed to see 40 postings per day, but that was a couple of years back. Now I heave a sigh of relief when there are ONLY 40! I analyzed a 30 day period starting with 8 December 1996. The daily average was 75 messages, ranging from 38 to 123 (a record that has since been broken). That comes out to an average of 58 pages per day in Microsoft Word, with an average file size of 112 KB. The subscriber list has grown steadily over the years, and is now over 1500.

DID YOUR INPUT FALL THROUGH THE CRACKS?

They say that to err is human but to really mess up requires a computer. Still, I sometimes do pretty good on my own. Things get kind of hectic and messy in my computer/radio room, and some things may very well have been lost in the shuffle over the years. If you sent me an input for the column and it hasn't appeared for a few issues, please let me know about it. (Note: this does not apply to Frank Brumbaugh, who has a huge backlog!) I don't hold onto things until I get enough of a certain category to do a specialty column; I try to pretty much run them as they come in, though it may sometimes take a couple of issues for them to appear.

If you sent something and it's been a really long time, let me know about it and I'll see if I can find it. And if your item has already appeared in print and you haven't received an authors check from me, don't hold your breath. As soon as I start getting paid for this I'll think about giving the writers a cut!

THE FINE PRINT

Hand drawn schematics or computer generated, floppy disk word processor and ASCII text or handwritten in pencil, we don't care. Write up your ideas and send them to Severn, by e-mail or snail mail and we'll run them. And tape a note to the front of your rig or computer to remind you to watch for it, and be sure to get on my case if it doesn't show up after a few issues!

—qrp—

Making the QRP Plus LCD Display Backlit and a Selectable Attenuator

by John McClun N3REY 5399 Briar Oak Ct., Ellicott City, MD 21043 <mcclun@clark.net>

I purchased my QRP+, serial number 1272, about a year and a half ago. I came to the conclusion that this was a very nice rig, especially for an all band QRP rig. It had short comings but over all I enjoyed it. I was so enthralled with this rig that I went totally QRP; I sold my QRO rig, an Icom 730. I had taken the plunge; I now only had home built QRP kit transceivers and the Plus. After 30 years as an electronics technician, I felt that I could handle anything the QRP + could throw at me. But the chirping of both the received and transmitted signals was too much for my limited QRP + knowledge. So I packed it up and sent it back to Index Labs.

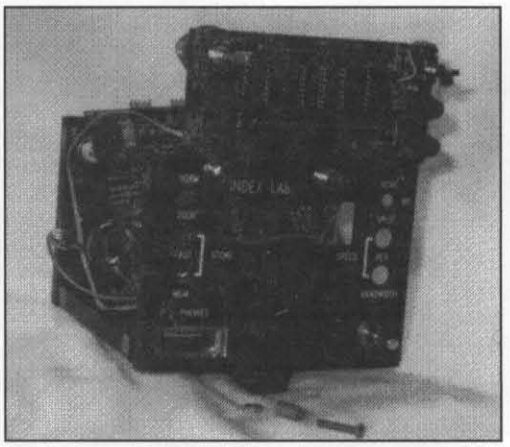
They were very thorough, performed a quick repair and I had my unit back in about three weeks. This got me thinking about the innards and what I really knew about the Plus's operation. Many others on the QRP-L list were talking about problems they had, some similar to mine and other's were very different. I read every review of the unit and went over the schematics with a fine tooth comb. Many questions passed back and forth from me to **Larry East** and **Norbert Heyder**. Each listing of a problem on the QRP-L list got my full attention and I tried to "troubleshoot" their problem on the schematics. In order to use the schematics I made my first mod to the QRP Plus. I enlarged the schematics to make them more readable. I also color coded each section (i.e., Bidirectional Amp - blue, Audio amp- red, CPU - green, etc.). This expanded my understanding of the rig's functions and brought me to the point of wanting to start modifying my rig. **Larry East, W1HUE**, and **Norbert Heyder, DL8BDF**, had several postings of mods they had done and the improvements it made. I soon made my first actual modification.

[figure1]

Since the Plus has no tune mode, the first mod I made was a front panel switch to key the unit for tuning with five watts. As you can see from Figure 1, I have gone WAY beyond that first mod. That first mod is the upper left switch to the left of the word "Index." Since then I have performed every mod that has been published on QRP-L list, I think, and more. I believe I have the most modified QRP + known. In the original QRP + the only attenuation was a switch allowing 0db or 20db attenuation. Others have changed this to 10db or 25db, whatever suited their fancy, by changing the resistor values. I decided to replace this with a selectable attenuator switch. I felt the signal should be attenuated before the filter inputs.

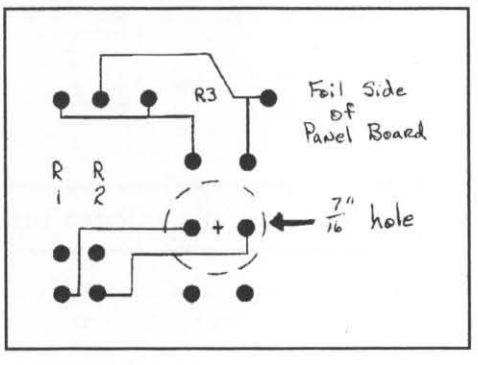
With this mod the switch will allow the attenuator to be increased from 0db to 3db, 6db, 9db, 18db and 27db, or any set of attenuations the builder chooses (See Table 1). After the AF/RF pot modification, this was the second most adventuresome mod I have undertaken. In that mod I took out the audio control and replaced it with a concentric AF/RF gain pot. This required using a smaller tuning knob, an on-off switch in the front panel and an indicator led above the switch. With the addition of the RIT LED, an LED in the meter and a backlit LCD display mod I am publishing here, my rig really lights up!

Let's get started with the variable attenuator. In order to put the attenuator switch in the front panel you must remove the circuit board behind the front panel that carries the switches, tuning control and LED read out. The shaft of the new rotary switch will pass through the hole left by the toggle switch presently used to switch in the 20db resistors. Positioning is very critical. Also, the switch will just clear the J5 jack on the AF board and the edge of the board. Please double check everything before you start. You will have to form the switch's connections to clear the plug and the board.

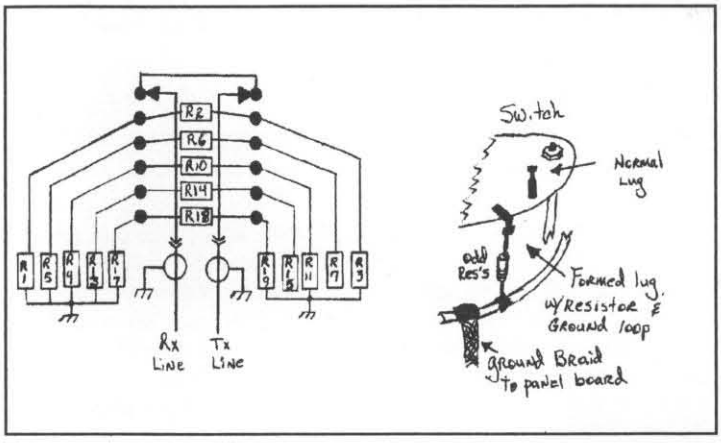


[figure 2]

Unsolder the switch from the front panel board and remove the resistors R1, R2 and R3. Disconnect the Rx and Tx RG-174 coax wires from the board. They will attach to the new switch. Return the board to the chassis in its normal location. Through the hole left by the attenuator switch mark the panel board with a crayon to show the exact location of the hole to be drilled. Place a 7/16" hole in this exact position. See figure 2. I stress, double check the position. Note in figure 3 the copper foil lands and the new connections to be made via additional wires you will run. When installing the new switch, the switch chassis must be isolated from the copper lands of the panel board. This is done with a thin nylon washer or some electrical tape. The switch is mounted to the board with the nut and the nylon washer through the hole you drilled. Prepare the switch according to figure 4. A loop of about 7" of 14 gauge wire forms the ground side of the odd numbered resistors. The prongs of the switch must be bent very gently so they clear the J5 connector. The switch is a six position, two gang unit I got from Jameco in their switch grab bag, part number 18235($6.95). The unit should measure 1.5" across and .75" thick with a shaft 2" long. **Jameco part number 101573 WILL NOT WORK!** Any switch that is near the same physical size should work, like Digikey numbers CKC7004-ND or EG1954-ND. I would have Digikey fax me the physical description on the switch I was ordering so that I could measure the space to make sure it would fit, if I went with theirs. But again I stress - check and double check the positioning and size.



[figure 3]



[figure 4]

Following the lay out in figure 4 solder the even numbered resistors from the appropriate contact on gang A' across the switch to gang B'. Then solder one end of the corresponding odd numbered resistor to each contact. Form this resistor back over the edge of the switch toward the front. Once all the odd numbered resistors are in place then place the loop of wire around the switch and solder the loose ends of the odd numbered resistors to the loop. Solder a short piece of braid from the loop to the ground on the panel board. Ohm the switch contacts at each selection. It should read the appropriate value. Also ohm from each contact to ground for proper resistive value. This all sounds more complicated than it is. The total switch construction took 15 minutes to do.

Because there is no physical support on this side of the board now that we have removed the attenuator switch and its mounting nut, an additional hole is drilled just to the left of the word "FAST." A 4-40 or 6-32 screw with a couple of nuts or spacer is used to hold the panel board in correct position. Double check the location of the new support by returning the board to the final location, mark the needed hole's position on the board with a pen or pencil. Now drill this hole, Reinstall the board and use the screw to mount the board to the front panel. The rotary switch shaft should come out the original switch's mounting hole. If there is any drag, the hole can be enlarged a little with a file. The shaft is cut to length, about .5 " beyond the front face. Add a knob to the shaft. The "old" attenuator markings are painted over with some black paint and new markings made from white transfers if you wish. If the clearance to J5 causes the switch to "short" out to the connector, the front plate of the Plus maybe bent forward 1/16" to allow extra room. No change in appearance results.

While the front panel board is out of the unit you might like to try the final mod, back lighting the LCD display. The LCD display must be pried VERY gently from the socket on the front panel. Keep this display as you may want to use it again someday. Now the driver chips underneath are visible. The end chips are in sockets and only to help "support" the LCD according to Index Labs. Remove the IC's in these two sockets, unsolder and remove the sockets. Discard the sockets. Return the chips to the board solder them in place. Now all the IC's should be at the same level. If you wish a brighter display, very gently peel the silver tape off the back of new LCD display. If you prefere a more subdued display back ground leave this tape on. Remove the plastic scratch cover from the front. Prepare the LED back light by soldering a 3" piece of 20 gauge red wire to the A pad. Solder a 3" piece of black wire to the K connector. Place the LED squarely on the back of the LCD, centering both vertically and horizontally. Dab some super glue to the junction of the LED front and LCD back surfaces on both ends of the display. Let this set for a few minutes. Now before putting the new LCD display back on the front panel board fold C3 back toward the IC's. This will allow the LED to clear. Put the display unit back in place. The red wire will be soldered to the top of C1 through a 55-Ohm resistor and the black wire to the bottom of C1 near the bottom middle of the panel board. The 50 ohms will give a very dim green back light. If you wish a very bright display try a 25-ohm resistor, or even a 25-ohm pot in series with a 25-ohm resistor for a variable brightness display. Replace the panel board in the Plus, return all boards to the stack and turn on the unit. Check the display for proper function and backlighting. If the display is too dim or too bright change the value of the resistor. Check the attenuator for proper function by tuning in a very strong local station. Turn the switch turn toward the maximum attenuation and listen for the station to become weaker in the phones or speaker. Check that each step works, if not find the short or open and correct.

Well there you have it. Two of my mods that along with the AF/RF - power on switch mod, have really made the QRP + the rig I wanted. If you feel as **Larry East** and I do that the attenuation of the signal should be done before the filter inputs, then this attenuation mod is for you. If you want the display to look more like a big rig, with a lighted display, do the back lighting mod. I have available a "HeathKit" style check list for these mods. If you would like a copy send an E-mail to <mcclun@clark.net>. And remember - Always QRP! **John N3REY**.

Part numbers :

LCD Display	153-1010-ND	Digikey	$11.30
LED Back light	153-1027-ND	Digikey	$11.20
Knob	10204-ND	Digikey	$3.62
Switch	CKC7004-ND Or EG1954-ND	Digikey	About $5.00

Table 1

Attenuation Step Wanted	Even resistor Value	Odd Resistor Value
1 db	6 ohms	910 ohms
2 db	12 ohms	470 ohms
3 db	18 ohms	300 ohms
5 db	33 ohms	200 ohms
6 db	36 ohms	150 ohms
9 db	54 ohms	105 ohms
10 db	75 ohms	100 ohms
15 db	130 ohms	78 ohms
18 db	220 ohms	70 ohms
20 db	270 ohms	68 ohms

Modifications and Enhancements for the QRP PLUS Transceiver (Part 2 – Transmitter Modifications)

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

Introduction

This is the second of a two-part series describing modifications that I have made to my Index Laboratories QRP PLUS transceiver. Part 1 appeared in the January 1997 issue of **The QRP Quarterly** and dealt with modifications that are primarily receiver related. In this second part, I will describe modifications that I have made to improve the transmitter performance. Many of the modifications are specific to the "original" version of the transceiver, but some are also applicable to the "new improved" version that became available in the spring of 1996. From this point on, I will use **"QRP+"** when referring specifically to the original model and **"QRP++"** when referring to the new model (including old models that have been updated by the factory). I will use "QRP PLUS" in non model specific references.

The following modifications are described in this article:

- Modifications to reduce QRP+ transmitter spurs.
- New output filters for 30M and above.
- Some mods that may be required when upgrading the QRP+ to the REV 4C EPROM
- Improved PTT- and key-line noise immunity.
- New final amplifier for improved SSB performance.

I will also give some advice on final amplifier bias adjustment for those not wishing to modify the final amplifier.

Some Preliminaries

I presented several things in Part 1 that should be kept in mind when working on a QRP PLUS. I also gave information on obtaining the latest firmware upgrade from the factory. If you do not have a copy of that article, I will be glad to provide one if you send me a business size SASE. One item is worth repeating, however: If you remove the AF board (the one with the 3V memory backup battery), make sure to hold down the MEM button when you apply power to the rig after reassembly (if you forget, just do it the next time you apply power).

Please keep in mind the need for carefully soldering and cleanliness when working on these rather compact boards. It's very easy to bridge a couple of traces with solder or a piece of a component lead. Also check for and remove the metal shavings that tend to accumulate around the board mounting holes from wear and tear produced by removing and replacing the boards.

Some additional observations that I have made regarding receiver microphonics might be of interest. I stated in Part 1 that the microphonics could be reduced by using larger foam rubber pads above and below the LO board. Now I'm not so sure that really helps much. It appears that keeping the board hold-down bolts good and tight is the critical factor in keeping microphonics under control. In fact, I inadvertently left the foam pads out one time that I reassembled my rig, and the microphonics appeared to be less than with the pads installed!

Reducing Transmitter Spurs

Since the QRP PLUS has a "full coverage" receiver, it is difficult to incorporate band-pass filters (particularly in such a small radio) in the design to insure the elimination of unwanted transmitter output signals (spurious signals or simply "spurs"). Spurs can arise from higher order mixing products between the local oscillator and its harmonics and other signals present and their harmonics. Such mixing products can be accentuated or even produced by any nonlinearity in the transmitter amplifying chain.

The QRP-PLUS uses relatively high local oscillator frequencies and a 50MHz IF in an attempt to keep any spurs above the carrier frequency so that they can be removed by simple low pass filters. However, there are a few spurs that occur below the carrier frequency when operating on 14Mhz and above, and a few very close to the operating frequency, particularly on 12M. The majority of these spurs are more than 30dB below the carrier level and therefore are of no great concern.[1] However, the QRP+ is plagued with some spurs several MHz below the carrier that are not much more than 20dB down when operating on 15M and 10M. The presence of these spurs also causes the transmitter output to appear rather "ragged" when viewed on an oscilloscope. I was able to make some spectrum measurements on one QRP++ and those spurs were at least 30dB down. The improvement in the QRP++ is evidently due to an improved IF amplifier design and/or a different mixer. Both models of the QRP PLUS are plagued by close-in spurs on 12M that may be less than 30dB down. More on this later.

Some relatively simple modifications can be made to the QRP+ to reduce the below-the-carrier spurs. All of these mods are made to the RF board which is the top one in the stack.

Note: The spur reduction modifications described below are specific to the QRP+.

The first and most complex mod makes the transmitter IF amplifier stage that follows the crystal filter resonant at 50MHz. One would think that this should be unnecessary, but apparently some lower frequencies are being passed by the overtone crystals in the filter. This modification has been posted on the Internet several times and I'm not sure who originally came up with the idea, but it wasn't me. To perform this mod, proceed as follows:

1. Replace the 18µH choke labeled L11 (just to the right of the input mixer when viewing the board from the front) with a small inductor having a value of 50nH (0.05µH). The easiest way to make such an inductor is to parallel two small 100nH molded chokes.[2]
2. Unsolder the ends of C41 and C42 that are soldered to a common pad. Insert one lead of a small (preferably NPO with 5% tolerance) 330pF monolithic ceramic capacitor into one of the solder pads from which you just removed one end of C41 or C42 and solder it into place. Form a junction "spider web" style of the other lead from the 330pF cap and the free ends of C41 and C42; solder.
3. Solder a small (NPO, 5%) 470pF monolithic ceramic capacitor between either pin 3 or pin 4 of U3 (the mixer) and ground on the bottom of the board.

When this mod is completed, the resulting circuit should be as shown in Figure 1. The replacement for L11 must be pretty close to 50nH; otherwise transmitter power will suffer. If it is really far off the mark, you will get no output at all! I first attempted to use a small toroid (T16-10) with a few turns but I had trouble getting it to resonate at exactly 50MHz. I then tried two 100nH chokes in parallel and that worked just fine. I suspect that the chokes have a lower Q than the toroid and produce a broader resonant peak.

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[1] The FCC requires spurious emissions from Amateur Radio transmitters operating below 30MHz to be at least 30dB below the carrier level for output powers of 5 Watts or less and at least 40dB below the carrier level at higher power levels. However, licensing authorities in some countries require spurious emissions to be at least 40dB below the carrier level regardless of output power.

[2] Suitable chokes are available from Mouser Electronics (stock number 542-9230-94), DigiKey (part number M7801-ND) and other mail order suppliers.

I found that this modification produced a significant reduction in most of the spurs, but there were still a couple within 30 dB of the carrier level when operating on 15M and 10M. In addition, the 20M, 15M and 10M transmitter output still appeared a bit "ragged" on my 'scope. One very simple change to the low pass filter following the mixer solved the problem: I added a 20pF capacitor across L7 (on the bottom of the board). The cap forms a parallel resonant circuit with L7 at approximately 50MHz, sharply reducing IF feedthrough. It also sharpens the high frequency roll-off of the LP filter resulting in greater attenuation for all frequencies above about 30 MHz. After this simple change, the transmitter output looked much better on the 'scope and all spurs (except the ones unique to 12M) were at least 35dB down. Before adding the capacitor across L7, you should check the transmitter output at the high end of 10M, say 29MHz, relative to the output at 28MHz. If the output at 29MHz is reduced significantly (more than 0.25W or so) after adding 20pF across L7, try a smaller cap (but not less than 10pF).

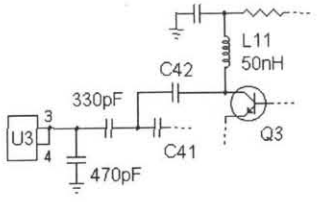

Figure 1. *Modified IF filter buffer amplifier.*

Adding one more capacitor—56pF from the junction of L4 and C17 (the output of Q10) to ground—finally brought all the below-the-carrier spurs down to at least the 40 dBc level; some spurs originally seen are no longer measurable. Adding this capacitor also made the 20M and above output from Q10 look much better on the 'scope. The exact size of this cap is not especially critical; anything from 47pF to 100pF seems to do the job. However, values above about 68pF resulted in less transmitter output above 20M, so I settled on a value of 56pF.

The 12M Problem

As noted above, 12M has a special problem: Higher order mixing products result in spurs very close to the carrier frequency. These spurs are related to the carrier frequency, F_0, the 50MHz *IF* and *LO* (local oscillator) frequencies as follows:

$$F_0 \pm N \times (2 \times IF - (LO + F_0))$$

where N is a positive integer (1, 2, 3, ...). This can be rearranged to better show the mixing products between the carrier injection (*IF*) and local oscillator (*LO*) frequencies:

$$(3N - 1) \times IF - (2N - 1) \times LO$$

and

$$(2N + 1) \times LO - (3N + 1) \times IF$$

For example, at a carrier frequency of 24.9 MHz, mixing products cause spurs at ±200 kHz, ±400 kHz, etc. from the carrier frequency, decreasing in amplitude with increasing values of N. In my unmodified QRP+, the "first order" ($N = 1$) mixing products were rather strong; only 28dB down from a 5W carrier frequency of 24.90MHz and 22dB down at 24.95MHz. Reducing the output power to 2W reduced these spurs to 40 dBc and 32 dBc respectively. These spurs were somewhat lower on the one QRP++ that I have tested, but still not below the 30 dBc level when operating in the top 40 kHz or so of the band at a power output of 5W.

What can be done to reduce these spurs? Well, I tried everything I could think of without any noticeable improvement — until I replaced the final amplifier as described later. A good part of the problem appears to be caused by the non-linear operation of the stock IRF510 MOSFET final amplifier at output powers greater than 2 or 3 Watts. With the new final amplifier, the 12M spurs are at least 30 dBc at 5W output except at the very top edge of the band where they are about 28 dBc — still not entirely 'legal' but a good 15 dB improvement.

If you don't do the final amplifier modification described later, you can take the following steps to keep the 12M spurs down to a reasonable level: 1) Make sure that the bias on the final amplifier is properly adjusted (discussed later). 2) Keep the output power no higher than 3W. 3) Avoid operating in the top 40kHz or so of the band.

Improved Output Filters

The QRP PLUS (both the "+" and "++" versions) uses individual five-pole "elliptic" low pass filters[3] in the transmitter output on 160M, 80M and 40M. Above 40M, five-pole Chebyshev filters are used, and a single filter is used for two adjacent bands. That is, one filter is used for 30M and 20M, another one for 17M and 15M, and a third for 12M and 10M. It is interesting that elliptic filters are used on the lowest three bands but not on the higher bands where the sharper high frequency roll-off of such filters are really needed. The second harmonic output on 160M through 40M is at least 50dB below the carrier level, whereas it ranges from slightly more than 30 dBc for 30M to about 50 dBc for 20M and 10M. Higher harmonics are at least 50 dBc on all bands.

Changing the three high-band filters to elliptic filter designs[4] reduced the second harmonic levels to at least 45dBc. I also obtained greater output power with the new filters, ranging from an increase of almost 3W on 30M to about 0.5W on 10M. Figure 2 shows a schematic of a five-pole elliptic filter. The component values for each filter are given in Table 1.

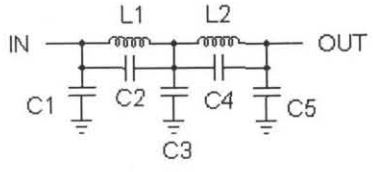

Figure 2. *Five-pole elliptic low pass filter.*

Table 1. New high-band LP filter component values (see Figure 2).

Component	30/20M	17/15M	12/10M
L1	610 nH 11T on T50-6	400 nH 9T on T50-6	320 nH 10T on T50-10
L2	380 nH 9T on T50-6	320 nH 10T on T50-10	220 nH 8T on T50-10
C1	150 pF	82 pF	62 pF
C2	47 pF	20 pF	15 pF
C3	270 pF	180 pF	(120 + 20) pF
C4	(150 + 10) pF	68 pF	47 pF
C5	82 pF	56 pF	39 pF

I used 300V silver mica capacitors in the new filters, but good quality NPO (or C0G) ceramic caps rated for at least 100V should work just as well. The capacitors across the coils must be mounted on the bottom (trace side) of the PC board. I also mounted the smaller of the two paralleled capacitors used in the 30/20M and 12/10M filters on the bottom of the board. (Two capacitance values shown in Table 1 separated by a "+" indicates that two capacitors are to be used in parallel.)

I used number 22 enameled wire to wind the inductors; you can simply remove the required number of turns from the original coils where T50-6 cores are used. Remember that each time a wire passes through the center hole of a toroid it counts as one turn. I found that T50-10 cores[5] were better to use for the lower inductance value. The fewer turns required using the original T50-6 cores made them too sensitive to tightness and spacing of the windings. Note that L1 for the 17/15M filter and L2 for the 30/20M filter have the same number of

[3] A description of various filter types and their advantages and disadvantages can be found in any recent addition of The ARRL Handbook.

[4] The filters were designed with the aid of an MS-DOS program called "FilDes" written by Bob Lombardi, WB4EHS. "Fine tuning" was performed with the aid of a spectrum analyzer and tracking generator.

[5] The toroidal cores can be obtained directly from Amadon Associates (Tel: 714-850-4660) or various dealers.

turns but slightly different inductance values; the turns on the 17/15M coil are more closely spaced than the 30/20M coil. It would be a good idea to measure the inductance values of the finished coils, if you have some way of doing that.

The values of the input capacitors for the three low-band filters can be reduced slightly to improve the response flatness of these filters at the high end of their passbands. I changed the input cap for the 80M filter (C6 on the "XMTR" board schematic) from 820pF to 750pF and the 40M filter input cap (C11) from 390pF to 360pF. The 160M input filter cap should be about 1400pF; the 1500pF value is certainly close enough. These changes result in less attenuation imposed by the output filters at the high ends of 75M and 40M without making any measurable differences in their harmonic attenuation.

"Before" and "after" comparisons of the second and third harmonic intensities at 5W output are shown in Table 2. The harmonic intensities were determined using a borrowed IFR-1500 spectrum analyzer that had a dynamic range of about 60dB at the 5W level. The only band that did not show an improvement was 20M, which was the only high-band for which the second harmonic was less than 50dBc with the

Table 2. Harmonic levels obtained with original and modified filters.

Carrier Freq., F_0 (MHz)	Harmonic Content – dB Below Carrier			
	Original Output Filters		New Output Filters	
	2 x F_0	3 x F_0	2 x F_0	3 x F_0
1.820	50	>60	50	>60
3.560	55	>60	55	>60
7.040	52	>60	52	>60
10.116	34	53	49	>60
14.060	52	>60	52	>60
18.070	40	~60	50	>60
21.060	37	~60	45	~60
24.900	36	54	52	>60
28.060	48	58	52	58

stock filter. The biggest improvements were for 30M and 12M; the new filters provide a 15dB or so reduction in the second harmonics on these bands. Your results may vary somewhat due to normal component value tolerances.

You might well ask: "Is it worth the effort to replace these filters?" The answer to that depends on whether or not you need — either from a legal or personal preference standpoint — to keep harmonic levels at least 40dB down. If you can live with >30dB, then don't bother. On the other hand, it really isn't that much effort to change them.

Fixes for REV 4C EPROM Induced Problems [6]

The Rev 4C EPROM for the QRP+ contains firmware code changes that eliminate the "forced spacing" characteristic of the internal keyer which many users (myself included) found rather annoying. The Rev 4C keyer firmware changes also allow an external keyer to be used at speeds up to about 40 wpm whereas the Rev 03 and earlier EPROMs would not allow external keying above 25 to 30 wpm. The bandpass characteristics of the SCAF at bandwidth settings of 1.0 kHz and below are also changed by this EPROM to better center the passband around the 800 Hz CW offset frequency. These changes essentially make the keying and SCAF filter passbands the same as the QRP++.

A disappointing side-effect of the Rev 4C code is that keying is very mushy when in normal XCEVE mode; the rise time of the transmitter output envelope is almost 10ms! When the front panel mode switch is in the RIT or SPLIT position, the keyed output risetime is about 2ms — the same as with the Rev 03 code — resulting in much better sounding keying. "What's going on here," you may well ask (as did I). To answer that requires a little explanation of the keying sequence in the rig. When the rig is keyed, +12V is immediately applied to the transmitter driver stages and the antenna is switched from the receive to the transmit RF chain. However, the actual keying signal (a voltage applied to the balanced modulator to unbalance it and let RF pass) is delayed slightly — about 5ms in XCEVE and about 25 ms if RIT or SPLIT is turned on. This delay was much longer with previous firmware versions, resulting in the limited external keying speed. The 5ms delay when in XCEVE does not allow the bias on the first driver transistor to reach its final operating point resulting in the slow rise of the output RF envelope. Does this mean that one must leave the mode switch in RIT or SPLIT to get decent keying? Not if you are willing to make a simple modification to the RF board: simply decrease the size of C54 by a factor of ten — from 4.7µF to 0.47µF (use a dipped tantalum cap). This change will result in a 2ms risetime when in XCEVE as well as RIT and SPLIT modes. The RF board is the top one in the stack, and C54 is located in the rear left-hand quadrant of the board (when viewed from the front of the rig).

Another keying related problem can also occur with the Rev 4C EPROM: an RIT or SPLIT receive/transmit offset of more than 3 to 5 kHz (depending on the band) can result in a noticeable "chirp" on the keyed signal. The chirp became very pronounced in my rig at offsets of 10kHz or more. With the Rev 03 EPROM installed, I could not detect any noticeable chip below a receive/transmit offset of 15 to 20 kHz (depending on the band). The Rev 4C EPROM provides less delay between key-down and transmitter output in order to accommodate faster external keying (see above), but this reduced delay does not give the PLL sufficient time to stabilize the VCO frequency. I have seen complaints from others about chirp with this EPROM even with no RIT offset, so the PLL settling time may vary somewhat from rig to rig.

However, the chirp can be cured — at least for receive/transmit offsets that are not too great — by replacing a couple of caps on the LO board. Changing C43 and C44 from 4.7µF (original values) to 2.2 µF in my rig resulted in no detectable chirp for receive/transmit offsets up to at least 20 kHz. This is good enough for "DX split" operation, which is typically no more than 10 kHz on CW. Some care is in order when fiddling with these cap values; reducing the values too much can result in the PLL becoming unstable. I did not try to determine the smallest values that can be safely used since 2.2µF seemed to do the trick. C43 and C44 are located near the LO board's right-hand rear edge (when viewed from the front of the rig).

Better PTT- and Key-Line Noise Immunity

The microprocessor in the QRP+ can be "locked up" by rapidly opening and closing the push-to-talk switch on the microphone, or by a "bouncy" PTT switch. As far as I know, this problem does not occur in the QRP++ due to changes in the PTT circuitry. Several suggestions have been posted to the Internet QRP discussion group on ways to reduce this problem, including installing a bypass capacitor across the PTT switch and an isolation diode in the PTT line. I did both and found a considerable improvement. A really bad PTT switch can still cause problems, however. I also installed an isolation diode in series with the straight key input just in case any "funny stuff" might happen to be introduced by an external keyer. These modifications are depicted in Figure 3. I added the bypass caps directly from the J4 and J6 jack connections to ground on the bottom of the "AF" PC board. Rather than try to explain which jack connections should be bypassed, I suggest that you use a "naked" plug and Ohm meter and trace the connections yourself; that way I won't get blamed if you do it wrong!

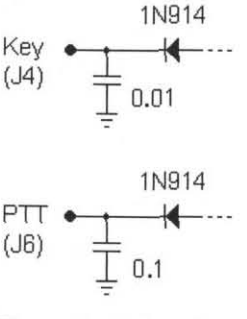

Figure 3. *Key and PTT line noise immunity mods.*

It is necessary to cut a couple of traces on the PC board in order to install the isolation diodes. I installed the diode in the key line by cutting the trace from the key jack (use an Ohm meter to make sure you have the right one) that passes just to the right of the back-up battery

[6] See Part 1 for information on EPROM updates for the QRP+.

(as viewed from the front of the board). I cut the trace just to the left of R8 and "tack-soldered" the diode to the trace on each side of the cut. Use a sharp "hobby knife" or razor blade to cut the trace. Be careful; there's not much room for mistakes here! A convenient point to install the diode in the PTT line is between C45 and R17. Again, use an Ohm meter to make sure you have the right trace.

Final Amplifier — Problems, Comments and a Replacement

The IRF510 "HEXFET®" that is used in the QRP PLUS final amplifier was designed for use in voltage switching applications rather than as an RF amplifier. However, this type of power FET works quite well as a class C or D RF amplifiers at HF frequencies. (Power FETs designed especially for RF work can be used well into the VHF range, but they are rather expensive.) However, it appears that the IRF510 does not function well as a linear amplifier when its drain voltage is less than 20V or so. I discovered this when I attempted to modify the ALC circuit to obtain more SSB power. When I ran some "two-tone" tests and viewed the SSB output on an oscilloscope, I discovered that "flattopping" occurred at output power levels greater than about 3W. This was on 75M; flattopping occurred at about 1.5W on 10M! Looking at the output of the driver (isolated from the final and terminated in 50 Ohms) showed no indications of flattopping at a level sufficient to produce an output from the final in excess of 7W on CW. This indicated that the limited linear operating range was due to a problem in the final amplifier. My initial tests were made with a supply voltage of 13.2V. Increasing the voltage to 14V improved the situation somewhat: Flattopping then did not occur until just under 4W output on 75M.

I then decided to check the final amplifier bias and, in the process, discovered an error (two, actually) in my manual. The instructions for setting the transmitter output stage bias states that minimum current will occur with the bias control set fully counter clockwise; in fact, minimum current occurs with the control fully *clockwise*. It goes on to state that the bias control should be adjusted to produce an increase in transmitter idling current of 60mA. This is also incorrect: an increase of at least 400mA is required to achieve decent linear operation from the final. The first error has been corrected in later versions of the manual. The second error has been almost corrected: The instructions now say to set the total idling current to 600mA, whereas I found that a value of at least 850mA is required (at a supply voltage of 13.2V) for linear operation. Setting the bias as instructed in my manual (for an increase of 60mA) resulted in severe "cross-over" distortion in SSB mode. (It also resulted in stronger 12M spurs, by the way.) If you set the final bias following the incorrect manual instructions, by all means reset it!

My observations concerning the limited linear operating range and the high idling current required were confirmed by Internet conversations with Peter Zenker, DL2FI, of the Berlin QRP Club. Peter stated that current measurements made on several "factory fresh" rigs showed transmitter idling currents in the range 800mA to 1200mA. He also confirmed that no more than about 3W of undistorted SSB power can be obtained when operating from "12V power sources" (which typically deliver between 13V and 13.5V). He also stated that some members of the Berlin club were using 24V to power the IRF510 final amplifier and obtaining "perfect SSB at 5W or more output."

Note: Power sources delivering more than 15V <u>should not</u> be used to power the entire rig. Doing so will exceed the maximum voltage ratings on some components!

Required Mod: Bias Voltage Regulator

Before leaving the subject of final amplifier bias, there is something that you should check in your rig if you have one of the early models: Make sure that a 78L05 is used to supply a regulated bias voltage for the IRF510. Early production models used a simple voltage divider from the +12V bus, and that arrangement is still shown in the schematic in the manual. Look at the RF board just in front of the bias control; there should be what looks like a transistor in the spot marked "R14". This is a 78L05 voltage regulator. If there is a resistor there instead, you should definitely make the following modification:[7]

1. Remove all of the PC boards, including the RF board. You must remove the mounting screw holding the IRF510 to the case to remove the board. Don't lose the silicon rubber insulator!
2. Remove R14 and drill a small hole through the board approximately in the center of the silk screened outline of R14.
3. Install a 78L05 voltage regulator in place of R14. The output lead goes in the R14 mounting hole nearest the bias adjustment pot. The ground (center) lead goes through the new hole in the board; solder it to the ground plane on the bottom of the board. The input lead goes in the other R14 mounting hole. The flat surface of the 78L05 should be facing toward the center of the board.
4. A capacitor in the range 0.2µF to 2µF should be soldered from the output of the 78L05 to ground on the bottom of the board. Use a small ceramic or dipped tantalum cap; make sure that it does not touch the case when the board in installed.
5. Reassemble the whole thing, making sure that the insulating pad is under the IRF510.[8] Set the bias control to its full *clockwise* position. Power up the rig and adjust the final bias so that the transmitter idling current *with no RF output* is about 900mA. (See the discussion above concerning bias adjustment.)

A Better Output MOSFET

After discovering the linearity problem with the IRF510, I decided to see if I could find a replacement device that would work better at 12V. An Internet inquiry brought responses from Dana Myers, K6JQ, and Jim Kortge, K8IQY, suggesting that I try a Motorola MTP3055E "TMOS ®" power FET. Both had good experience using this device as a tuned RF amplifier, but neither had tried using one as a broad band amplifier. Dana, in true ham tradition, even offered to send me a couple to experiment with! The MTP3055E has the same physical configuration and pin-outs as the IRF510 so it was an easy matter to simply replace the original final and see what happened. Not only did it work, but some quick measurements indicated that it could produce an undistorted SSB output of at least 5 Watts and at a lower idling current than required by the IRF510! However, the power consumption for a given output power was greater than with the IRF510, particularly on 10M. In addition, the output power dropped rather severely above 20M; I could get in excess of 10W out on 160M and 80M but barely 5W on 10M. After some discussions with Dana, I replaced the stock 4:1 impedance ratio output transformer with one having a 16:1 impedance ratio. What a difference that made: I could get almost 10W out on 10M!

I won't bore you with the details of all the experimenting that I did; I'll just give you my final results. The revised final amplifier circuit shown in Figure 4 is capable of producing a 6W to 7W undistorted SSB output into 50 Ohms on all bands from 160M through 10M when operated from a supply voltage of 13.2V. Linearity remains good at 5W on the lower bands and 4W on 10M even when operated from 12.0V. Ah, sweet smell of success! (Much better than the smell of fried capacitors, by the way...)

The new output transformer that I finally settled on is wound on an Amidon 61-202 binocular (two hole) core and has a two turn primary and five turn secondary. This gives an impedance ratio of about 12:1. The large ratio is required to "swamp" the very high dynamic output capacitance of the MTP3055E — according to Dana, this is about 2.5 times the "static" output capacitance of 300pF, or approximately 750pF! I used #22 enameled wire for the primary and #26 for the sec-

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[7] If you are really squeamish about working on your QRP+, Index Labs. will install the voltage regulator mod for a nominal charge.

[8] If you lose or mess up the insulating pad, a standard TO-220 mica pad and heat sink compound (both available from Radio Shack) can be used. If you strip the threads on the plastic mounting bolt, you should be able to find a replacement at any good hardware store (ask for a 6-32 nylon machine screw).

ondary, although #24 could be used for both (anything larger won't allow enough turns through the core).

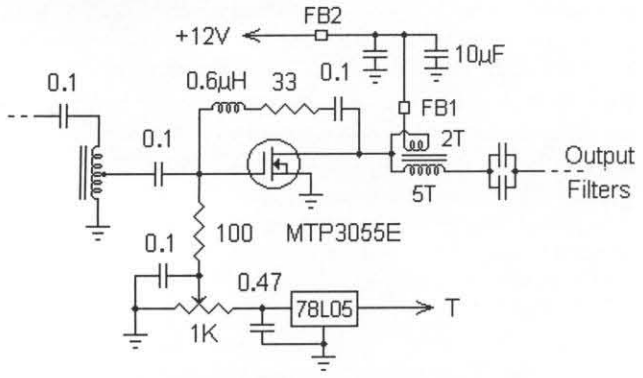


Figure 4. *Modified transmitter output amplifier.*

To make the new output transformer, start with a five inch length of #22 (or #24) wire and a 12 inch length of #26 (or #24). Align one end of each of the two wires and twist them together to produce between four and six twists per inch. I suggest doing this by hand with the aligned ends of the wires clamped in a vice. Place the twisted end of the wires through one hole of the core, allowing it to extend about 3/4 inch from the other end. Then feed the other (long) end of the wires through the other whole. This constitutes one turn. Feed the long end of the wires through the two holes again; you have now completed the two turn primary and two turns of the secondary. Untwist the wires that extend from the core; you should now have four wires extending from the same end of the core, two from each hole. Pass the long wire (the #26 wire) through each hole of the core three more times to complete the secondary. You should again have four wires extending from one end of the core, two from each hole. Trim the ends of the wires to about 3/4 inch, remove the enamel and tin them. Twist one of the primary wires together with the opposite secondary wire; that is, the secondary wire sticking out of the opposite hole. These twisted leads will connect to the MTP3055E gate when the transformer is installed.

The gate to source feedback network consisting of 600nH in series with 33 Ohms flattens the response of the amplifier (the 0.1uF capacitor is used for DC blocking and has little effect above 80M). For a given setting of the CW drive control, the power output of my rig (the QRP+ has no ALC in CW mode) with the new final remains constant within a factor of two from 1.8MHz to 29.7MHz. Without the feedback network, output power dropped by a factor of about six over this range (the output from the original IRF510 final dropped by about a factor of four). I have no theoretical basis for the L, C and R values used in the feedback network; I simply experimented until I got something that seemed to work! The feedback network is undoubtedly not optimum, but the performance is certainly acceptable. Besides, there are other factors in additional to the final amplifier that affect changes in power output with frequency. I made the 600nH inductor by winding 12 turns of #26 wire on an Amadon T30-2 core. Wire size is not critical; anything from #28 to #24 can be used. The core type is also not critical; 13 turns on a T30-6 core should also work.

FB1 and FB2 are RF chokes made from Amadon FB101-64 ferrite beads. FB1 slips over the "cold" output transformer lead; its function is to "de-Q" the output transformer for better stability. FB2 consists of a piece of #24 wire passed twice through a bead and was "tack soldered" across a gap cut in the 12V bus between C28 (the 10uF molded tantalum capacitor) and Q8 (the driver transistor). Its function is to provide additional isolation between the driver stage and the final.

Now that we have the preliminaries taken care of, I'll outline the steps to follow if you feel up to making this modification. Please note, however, that I have only performed this mod on one rig — my QRP+. My results are hopefully reproducible, and the new final should work just fine with a QRP++. Unless Mr. Murphy decides to intervene, of course! The parts that you will need to modify the final are as follows:

1 MTP3055E power FET (available from Newark Electronics).
1 Amadon 61-202 binocular core.
1 Amadon T30-2 (or T30-6) toroid core.
2 Amadon FB101-64 ferrite beads.
2 100 Ohm 1/4W composition resistors.
1 33 Ohm 1/4W (*don't* use 1/8W) composition resistor.
1 2.7K 1/4 composition resistor.
1 1.5K 1/4 composition resistor (QRP+ only).
1 0.1µF monolithic capacitor (small 50V type).
1 0.47µF monolithic or dipped tantalum capacitor.
Some #22 and #26 (or #24) enameled wire, solder, etc.

Don't worry about not seeing a 2.7K, 1.5K or second 100 Ohm resistor in Figure 4; their use will be described later. The 0.47µF capacitor will be used to bypass the output of the 78L05 bias voltage regulator; these things can oscillate if their output is not bypassed and I just don't trust them! The capacitor size is not critical; anything in the range 0.2µF to 2µF can be used; just make sure it is small enough to fit under the PC board.

Now for the step by step instructions:

1. Remove all of the PC boards from the case. Don't forget to remove the nylon bolt holding the IRF510 to the case.
2. Remove the following parts from the RF board (the one to which the IRF510 is attached): The IRF510 FET, the output transformer (L17) and R7 unless it happens to have a value of 100 Ohms or less. (It's probably 1K, but early models may have used 47 Ohms which is OK to leave in.)
3. Cut a small gap in the trace carrying +12V to the final. Make the cut in front (toward Q8) of the right-angle bend near C28. Tack solder a choke made by passing a piece of #24 (or #26) wire twice through a ferrite bead across the gap.
4. If you removed R7, install a 100 Ohm resistor in its place.
5. Install a bypass capacitor from the output of the 78L05 voltage regulator (the end connecting to R18) to ground. Mount the capacitor on the bottom of the PC board and make sure it will not touch the bottom of the case when the board is installed.
6. Install the new output transformer (see winding instructions above) in place of L17. There is not enough clearance for the transformer to stand upright, so bend its leads so that it's slightly above C25, C26 and C27 and parallel to the PC board. Slip a ferrite bead over the "cold end" of the primary; this is the wire that connects to the trace carrying +12V. Make sure that the twisted leads go into the center hole (the trace from which connects to the output FET). When you have the transformer properly positioned, solder its leads in place.
7. The new output FET should be installed next. Bend the leads in the same manner as the leads on the original FET. The easiest way to make sure it is positioned correctly is to inset its leads into the mounting holes and then put the board back into position using two short screws to hold it temporarily in place. The FET can then be positioned over its mounting hole and soldered into place. Trim the excess leads after soldering.
8. Remove the board and install the feedback network as follows: Solder one lead of a 0.1µF capacitor to the drain (center lead) of the FET so that the capacitor is sticking up perpendicular to the board. Solder one lead from the 600nH inductor (see winding instructions above) to the non-grounded end of C30 so that the core is parallel and slightly above the PC board. Solder the 33 Ohm resistor between the other inductor lead and the capacitor.
9. Replace R16 (located toward the front of the board) with a 2.7K resistor. This lowers the sensitivity of the ALC circuit to allow a full 5W peak SSB output.

Note: If you have a QRP+ and have installed a resistor from pin 2 of U2 on the AF board to ground in an attempt to get more SSB power, remove it! I have seen this suggested as a way of decreasing the ALC sensitivity, but this actually overrides ALC control.

10. Replace R17 (original value 1K) with a 100 Ohm resistor. This reduces the ALC response time.
11. Set the FET bias control (R18) to its *full clockwise* position.
12. You can now reinstall the RF board. Be sure to place the silicone rubber insulator under the new FET. See a previous footnote concerning replacements for the insulator and/or nylon mounting bolt.
13. **QRP+ Only:** Before reinstalling the AF board, check the size of C12 which is located to the right of U2 and between Q3 and Q4 (near the battery). If it is not 0.01µF, replace it with a 0.01µF cap (it's shown on the schematic as 10µF).
14. **QRP+ Only:** Change R2 on the AF board to 1.5K. This resistor is located along the left of the board to the left of Q1 (near the battery). This change prevents the CW drive control from "over driving" the new final.
15. Finish replacing the boards. Make sure all the connectors are properly seated and that the hold-down bolts are tight.
16. Connect an Ammeter capable of measuring at least 1.5A in series with the power supply. Some folks connect a meter across the fuse holder and remove the fuse; I don't recommend doing this unless the power supply (or meter) is fused at 3A or less!
17. Apply power while holding down the MEM button to reset the microprocessor. The display should come on and the Ammeter should show a current of less than 150mA. (And there should be no smoke!)
18. Turn the CW drive control (power control on the QRP++) to the minimum power position. Connect a Wattmeter and dummy load to the transmitter output.
19. Key the transmitter; the Ammeter should show between 450mA and 500mA and the Wattmeter should show very little (if any) output power. Slowly turn the FET bias control counter clockwise until the Ammeter reading has increased by approximately 200mA. The MTF3055E is capable of passing in excess of 10A, so make this adjustment slowly and carefully!
20. Increase the drive (power) control while keying the rig; you should be able to get at least 8W out on 160M through 30M and at least 5W on 10M from a QRP+. You should be able to get at least 5W out on all bands from a QRP++; perhaps as much as 10W on some bands if the ALC will allow it to go that high.

If everything looks OK, hook up a microphone and check the SSB output with a peak reading Wattmeter or oscilloscope. You should get a good 5W peak output with no "flattopping" or other distortion. If steady tones are fed into the microphone input of a QRP+ (and possibly a QRP++), the ALC will limit the output to between 3W and 4W. However, voice modulation should easily produce a peak output of 5W or more. If you think that the output is a little low on a QRP+, increase the size of R16 on the RF board to 3.3K. (As noted above, shunting the control input of U2 on the AF board to ground with a resistor is *not* the proper way to control SSB power output!) You should be able to set the peak SSB output power on a QRP++ to 5W or more using the power control. If not, you may have to experiment with different values of R20 on the AF board and/or R16 on the RF board.

The final test is to make some on-the-air SSB contacts, preferably with someone you have talked to before so you can get a before and after comparison. When I ran some tests with a local ham after completing this mod, he told me that I had the best sounding QRP PLUS that he had ever heard!

I believe that this mod is worth doing even if you don't do much SSB operating. The MTP3055E is a much more rugged device than the IRF510 and therefore more likely to survive such abuses as extremely high SWR (like a shorted antenna lead!). The greater linear operating range also results in a significant reduction of those pesky 12M spurs that I discussed above. The lower transmitter idling current is also something to consider if you do much portable operating, although this really makes little difference when operating CW. The cost of this mode is surprisingly low; the price for a MTP3055E in the Newark catalog is $1.05 — about the same as an IRF510! (But then there's that blasted $25 order minimum.)

Wrap-up

I have used up more that my allotted share of space, I'm afraid. I hope I have presented some information that you have found useful, or at least given you some ideas of things to try — perhaps not only to improve your QRP PLUS but something that you can apply to some of your other projects as well.

You may well wonder why someone would buy a new rig and then spend countless hours trying to make improvements to it. Well, I guess I have gotten a bit carried away with all these modifications and enhancements, but I have found it to be a great learning experience. I have learned how SCAF's work, how to design low pass filters, some things about broadband FET power amplifiers, and on and on. And I've certainly honed my trouble shooting skills when things I tried didn't work the way I expected! Am I finished trying new things with my QRP+? Probably not; lets see now, I wonder what it would take to make a variable passband IF filter? How about a good IF notch filter? And that AGC system still leaves some things to be desired. Hmmm.... But what about all those unbuilt (and partially built) kits stashed under my work bench? Ah, so many projects and so little time!

Acknowledgments

My thanks to all with whom I have discussed — in person, over the air and via the Internet — various aspects of the QRP PLUS and modifications that I and others have done. Particular thanks go to Peter Zenker, DL2FI, and Dana Myers, K6JQ. I am also indebted to Niel Skousen, WA7SSA, for the use of his spectrum analyzer. Last but not least: Thank you, Index Laboratories, for designing this nice little rig!

Appendix

MTP3055E Reference Data

(From Motorola Technical Data Sheet)

Maximum Drain-Source Voltage:	60V
Maximum Drain-Gate Voltage:	60V
Maximum Gate-Source Voltage:	±20V
Maximum Drain Current:	12A
Maximum Power Dissipation:	40W (at 25 °C)
Gate Threshold Voltage:	2V min, 4.5V max
Forward Transconductance:	4 mhos minimum
Input Capacitance:	500 pF max
Output Capacitance:	300 pF max
Reverse Transfer Capacitance:	100 pF max
Turn-On Delay Time:	20ns max
Rise Time:	60ns max
Turn Off Delay Time:	65ns max
Fall Time:	65ns max

Results of the Adventure Radio Society's "TFR Challenge"

Richard Fisher, KI6SN **1940 Wetherly St.** **Riverside, CA 92506**

The Adventure Radio Society's "TFR Challenge" spurred five designers to take a run at packaging radios specifically for use in rugged and, at times, awkward field conditions. The results of their work are nothing short of remarkable—both individually and collectively. We are honored here to present a preliminary report on their innovations, and to name winners in a random drawing for an Oak Hills Research "Explorer II" transceiver, a QRP Club of New England "NE 30-40" transceiver, a Wilderness Radio "KC-1" displayless frequency counter/memory keyer, and two Radio Shack audio Power Amplifier Module kits.

The challenge, first announced in August on QRP-L (QRP Internet E-Mail Reflector), asked builders to consider repackaging an existing transceiver in a way that will make it excellent for use on the trail or to design a radio from the ground up using trail-friendly technology and packaging. Challengers had until Nov. 15, to submit their operational designs. In posing the challenge, ARS asked: "Is it necessary that ALL controls and connections—headphone, key, power and antenna jacks—be on (a) horizontal plane? Experiment and let us know. What about waterproofing and dust covers? Should the radio float? Are sharp corners a problem? Can antenna tuning units, keys, keyers, batteries, speakers and other accessories be practically packaged with a transceiver to form a 'complete station' lightweight TFR design? You decide."

Decide, they did. Following is a brief description of each of the designs. Color photographs and the complete text of the papers accompanying each of these works will be posted soon on the ARS web site: http://members.aol.com/adradio/index.html

Bill Jones, KD7S, of Sanger, CA:

Using a scratch-built New England 40-40 transceiver as a foundation, Bill designed a TFR unit mounted between brackets allowing it to rotate to the line of sight of the user—no matter what that angle might be. Whether the operator is sitting at a picnic table, laying flat on the ground or straddling a log, the front panel of the "TFR-40," as Bill calls it, can be easily positioned for the operator's ease. The removable brackets—on either side of the rig's enclosure—"elevate the radio sufficiently to allow it to swivel through a 90-degree arc. All controls are sufficiently recessed to protect them from damage during transport and operation." Bill's homebrew enclosure and support brackets are made from three-sixteenths inch ABS plastic "which results in a very strong case." A large, recessed front panel dial (fronting a 6:1 reduction drive) features a backplane made from a piece of glow-in-the-dark plastic. "A two or three second blast from a flashlight will yield 15-20 minutes of dial illumination in a darkened tent or inside a sleeping bag." A built-in storage compartment houses the brackets and there are snap-on covers for the front and rear panels. "Being a Spartan rig doesn't necessarily mean it is totally devoid of convenience features," Bill writes. "For example, it has built-in battery reverse polarity protection. The transceiver can be operated from a variety of power supply options, including a voltage regulated solar panel." While Bill's TFR-40 hasn't been to the mountains yet, he did use it "at home to compete in the (ARS) October Spartan Sprint. Instead of sitting on the operating desk, I placed the rig on a small plastic table at about knee height. The enclosure was angled so I could see and adjust the controls easily. At the same time, the battery connections, key line and antenna lead were securely connected to the back of the cabinet well out of the way."

Peter Simpson, KA1AXY, Southborough, MA:

Peter built a modified Forty-9er transceiver into an Ethernet transceiver enclosure. He replaced the original box's front and rear panels with pieces of sheet aluminum. "It weighs maybe a pound, has rounded edges and slips neatly into my pack." The circuit is principally the stock design, however some modifications featured in posts on QRP-L were incorporated. The VXO tuning capacitor, C6, was mounted at right angles to the circuit board, "using the ground etch that runs around the periphery of the board as a tie point for the rotor connection, and tying the stator to the lying lead of RFC6. This gave the cap a solid mounting, and allowed me to extend the shaft with a piece of hobby brass rod. The Forty-9er PCB is attached with four small bolts to a larger piece of copperclad PCB material cut to the size of the former inhabitant of the (Ethernet transceiver) enclosure. I call this the 'carrier' board. The whole assembly slides into the slots in the enclosure and two screws hold it together." Peter says the battery seems to last a long time, "so it shouldn't be necessary to disassemble the unit in the field, but I used slotted screws just in case. There's enough room in the case to tape a spare screw inside, should one get dropped."

Cam Hartford, N6GA, Claremont, CA:

Cam writes that for a year he had been formulating a rig to put in a box he'd found at a swap meet. "I was having trouble finding a way to mount all the controls on the front panel and all the connectors on the back, in traditional table-radio fashion. The TFR concept gave me the freedom—and the idea—to mount the controls wherever I pleased. Suddenly the parts fit, and the idea became a radio. Inside is everything one needs to get on the air, minus headphones and antenna. The transceiver is an NE 40-40 interfaced with a KC-1 to give frequency read out and keyer functions. A single-band, modified Z-match (antenna tuner) from the portfolio of Charlie Lofgren, W6JJZ, along with an absorptive bridge SWR circuit (built inside) provide matching to any random trailside antenna. For power, a 10 pack of AA batteries is included. To key the rig, a set of Galbraith paddles mount (into a specially made slide-in boot) on the top of the box. Because of the size and shape of the box (and) the mounting location of the paddles, the box provides a place to rest your hand while keying. While sitting on the ground, a log, a canoe seat or the seat of a car, you can set the rig on your lap and be very comfortable as you operate." Cam positioned the main tuning control (a 10- turn pot), the RF gain control and the KC-1 control on the top surface of the box, close to the keyer paddles. The tuner controls, "which don't need to be accessed as often," are mounted on the back panel "out of the way of operations." The radio can rest comfortably in the operator's lap while on the air. Cam reports using his all-inclusive unit during parts of QRP ARCI's 1996 Fall QSO Party with success. "This is going to be a fun radio to pack around."

Mike Michael, W3TS, Halifax, PA:

"I wanted the smallest case possible," wrote Mike, in describing the packaging of his TFR NE 40-40 transceiver. "I also wanted to have a package that would lie flat in front of me on the operating table, or picnic table, or on the ground or on my lap. I took a BUD CU-2105B 5x4x3-inch MINI BOX and cut it down to three-quarters of an inch high. This is not much larger than a cassette storage case. I am right-handed, so I put the tuning pot on the lower right hand corner of the top half and the RF attenuator control on the lower left corner of the top half. I put the power, antenna, and key input connectors on the upper right side of the top (and) a stereo earphone connector on the right side of (the top of) the case. There are no other controls on the sides or back of the enclosure." He rounded off the sharp corners of the box with a file. Mike's keyer is separate and self contained, has its own 9-volt battery and simple paddle. It is "as light as possible to reduce the carrying weight, so I have to hold it down to keep it in place during use. This seemed like a good tradeoff instead of carrying a lot of dead weight. This also works if your are lying on your stomach in a small tent trying to stay dry and operating at the same time." Mike says he didn't water-

proof his TFR radio: "If it gets wet, I just slide the back off and shake out the water and lay it in the sun to dry."

Bob Edwards, W4ED (formerly AE4CA), Stone Mountain, GA:

Bob offers what he describes as "a common sense approach to an operating laptop surface for use on the trail. It is useful for operators sitting on a chair, camp stool, sitting on the ground, or sprawled out prone on a blanket." His design incorporates an inexpensive 9x12-inch plastic covered folding portfolio, an 18-inch long, half-inch aluminum spar and two 1-inch "C" clamps. The spar's edges are de-burred and rounded. "Field assembly is a simple matter of opening the portfolio, then placing the aluminum spar just under the far edge." The "C" clamps are used to tighten the spar to the portfolio, making a rigid operating surface. The operator's key or keyer paddle can be affixed to the operating surface under one of the "C" clamps, regardless of whether the operator is right- or left-handed. The rig is positioned opposite the key or keyer paddles. While 1-inch "C" clamps were used in his design, Bob says smaller clamps would certainly suffice. "One side benefit is having two 'C' clamps on the trail—you never know!" Bob wrote, adding: "the portfolio is a natural place to store log sheets and a pencil." Bob's technical paper also includes data on a dual-band wire vertical for 20 and 40 meters "designed to be carried in a backpack with quick set-up and take down by one person." (Complete details on this antenna will be featured on the ARS web site.)

As promised, a random drawing was held as ARS' way of saying thank-you to designers taking on the "TFR Challenge." Here are the results:

- Bill Jones, KD7S: QRP Club of New England "NE 30-40" 30-meter transceiver kit.
- Bob Edwards, W4ED: Wilderness Radio "KC-1" displayless frequency counter and memory keyer kit.
- Mike Michael, W3TS: Radio Shack audio Power Amplifier Module kit.
- Cam Hartford, N6GA: Oak Hills Research "Explorer II" 40-meter QRP transceiver kit.
- Peter Simpson, KA1AXY: Radio Shack audio Power Amplifier Module kit.

Each of these radio amateurs' design papers and photographs are being forwarded to an ARS review committee consisting of Russ Carpenter, AA7QU; Wayne Burdick, N6KR; and Mike Herr, WA6ARA. Certificates of merit recognizing particularly notable innovation will be awarded and announced on QRP-L following their review.

On behalf of the Adventure Radio Society, sincere thanks to these designers for their fabulous innovation, for the tremendous time and effort they expended in research and development, and for sharing their wonderful, clever and useful ideas with the QRP community.

If you're interested in becoming a member of the Adventure Radio Society, please contact me at: KI6SN@aol.com.

Richard Fisher, KI6SN
ARS No. 3

Product News

New products, addresses, vendors and other items of interest to QRPers.

This is the place to look to see what has been going on during the past quarter. New addresses, phone numbers, products. Your input is necessary for this to continue. If you use a product that you think others might like, let us know.

This will not be advertisements, but announcements. They must be short and to the point. The object is to keep the members up to date on what is available to the QRP community.

SOFTWARE

There are many software programs out there! I will mention the two that I use.

For contesting and FOXing, I use **TR Log**. This is a top notch contesting program that requires some learning but it's well worth the effort. Duping is done during the contest, saving the embarrassment of having the other station tell you "sri qso b4"! It has **ARCI** contest format built in! Nice code practice mode also. For more information, contact **GEO Distributing, 913 Ramona St. Austin, TX 78704. (512) 416-7010** or via the Internet at: **tree@contesting.com or geoiii@bga.com**

For general logging and awards tracking I am just starting to use **WJ2O**. This will not only track awards but is also very good to use for general QSOing. It will print the labels for your QSL cards and you can also have it interface with many of the address databases. Then you can have all the address labels done for you at the push of a button! Some learning also required but again, well worth it. For more information, call **1-800-944-WJ2O (9526). WJ2O Software, P.O.Box 16, McConnellsville, NY 13401**. Or on the Internet at: **wj2o@aol.com**
WEB: http://www.webprint.com/WJ2O

BOOKS

Paul Harden, NA5N, informed the QRP-L list of 2 new sources for his wonderful book, **"Electronic Data Book for Homebrewers and QRPers"**. They are: **Quicksilver Printing, P.O. Box 757, Socorro, New Mexico 87801.** And **H-B Electronics, 43 Rector Street, East Greenwich, Rhode Island 02818-3312.** E-mail via: **hbelectronis@businesson.com.** (Note electroniS not electroniC). **WEB is: http://www.businesson.com/hamparts**.

NEW RIGS

Wayne Burdick, N6KR, has just announced that his newest design, the **SST**, is now available! If this is like **Waynes** other designs, it should be great! For more info, contact **Wilderness Radio, P.O. Box 734, Los Altos, CA 94023-0734** or call **Bob Dyer** at **(415) 494-3806**, 9AM to 6PM Pacific time, M-F. Or E-mail **Wayne** at: **svecbrdk@well.com**.

There you have it. If you like it we'll keep it. If not, we'll let it drop. The best way to show your support is to send in your news. This will always be on a space available basis.

de **Ron, KU7Y**

"Four Days In May ©" QRP Symposium
The Amateur Radio QRP Event of 1997

QRP Amateur Radio Club, International (QRP-ARCI) proudly announces the second annual **"Four Days In May ©" QRP Symposium** to be held on Thursday, May 15 1997 - the first day of four festive days of **1997 Dayton Hamvention ©** QRP activities. Mark your calendar for this extra bonus day and register early for this not-to-be-missed QRP event of the year.

Amateur radio QRP presentations, workshops and demonstrations will be the focus of the full day Thursday activities to be held at the **Days Inn Dayton South (513-847-8422)**. Last year, this sold-out event was a "standing room only" crowd of 100 enthusiastic pre-registered attendees. For 1997, the **FDIM QRP Symposium** will be moved to the hotel's larger ballroom facility so make your reservations early before it's sold out again. **FDIM QRP Symposium** attendees will start their day with a wake-up coffee social and then plunge into a morning of multimedia QRP presentations by renowned QRP authors and designers. At midday, attendees are treated to a catered lunch and QRP door prizes. Then it is back to an afternoon of more exciting QRP technical presentations. Culminating this first day, will be an evening of guest QRP tutorials sponsored by regional QRP clubs. **The 1997 "Four Days In May" QRP Symposium will be the talk of the 1997 Dayton Hamvention ©.**

The **"Four Days in May" QRP extravaganza** continues with the annual **Friday night QRP-ARCI Awards Banquet** honoring QRP dignitaries for their service to the amateur radio community. Following the Awards Banquet, a special evening has been set aside for the **FDIM QRP Vendor Social** where prizes will be drawn. Saturday will also be special this year with an evening for QRPers to meet the many regional North American and International QRP Clubs - bring your banners! QRP Club awards will be presented to those who submit their "pride and joy" QRP construction projects for judging.

"Four Days In May ©" QRP Symposium:
Frequently Asked Questions:

- QRP SYMPOSIUM PRESENTERS - Please submit your QRP technical manuscripts to **FDIM Technical Paper Chairperson Bruce Muscolino W6TOY/3 at PO Box 9333, Silver Spring, MD 20916-9333** or Email: **w6toy@erols.com** Presenter's papers will be bound in the 1997 FDIM QRP Symposium Proceedings. All attendees receive the Proceedings.

- FDIM QRP SYMPOSIUM REGISTRATION FEE - Registration for the Thursday, May 15, 1997 FDIM QRP Symposium will be $30 if prepaid by May 1, 1997 and $35 after that date or at the door. "At the door" registration may be limited if, once again, we sell out. Please register early to guarantee a seat. Registration will cover a full day of QRP Symposium activities, which include the QRP technical presentations, the **1997 FDIM QRP Symposium Proceedings**, the scrumptious **QRP luncheon** , those famous "special" **Symposium bag stuffers** and finally an **endless QRO coffee pot.**

Please send your $30 registration fee (US check, money order, international money order) made out to **"BOB FOLLETT" by May 1, 1997** to: **Bob Follett AB7ST, FDIM Registration Chairperson at 2861 Estates Dr, Park City, UT 84060** or **E-mail: bfollett@ditell.com**

- QRP-ARCI AWARDS BANQUET - This not-to-be-missed **Friday May 16, 1997** event is once again being hosted by **FDIM Banquet Chairperson - Pete Meier WK8S**. Please send your $15 banquet ticket fee (US check, money order, international money order) made out to **"PETE MEIER"** by May 1, 1997 to: **Pete Meier WK8S at 4181 Rural, Waterford, MI 48329** or **Email: pmeier@tir.com**

- FDIM QRP VENDOR SOCIAL - A tradition was started at FDIM 1996 - a special evening was established to officially introduce our **QRP Vendors from around the world.** All are invited to attend this wonderful Friday, May 16, 1997 evening social. **Preston Douglas, WJ2V** will once again be our gracious host. **QRP Vendors,** for registration information, please contact **Preston Douglas WJ2V, QRP Vendor Evening Chairperson, at 216 Harbor View N, Lawrence, NY 11559** or via **Email: Pdouglas12@aol.com**

On behalf of the FDIM team we invite you all to join us for the **QRP Event of 1997** - the **"Four Days In May ©" QRP Symposium at the 1997 Dayton Hamvention.** See you all there.

Bob Gobrick N0EB, FDIM Publicity Chairperson
(email 70466.1405@compuserve.com)

QRP Net Information

Compiled by George "Danny" Gingell, K3TKS

1997 ARCI QRP Net Schedule

Net	Frequency	NCS (Alt. NCS)	Day	Time [1]
TCN [2]	14060	W5LXS (K2LGJ)	Sunday	2300 UTC
SEN [3]	7030 3535	K3TKS (AA1OC)	Wednesday [4]	0100 UTC 0130 UTC
GSN	3560	N9ZZ	Thursday [4]	0200 UTC
GLN	3560	W1CFI (WA1JXR)	Thursday [4]	0200 UTC
NEN	7040-41	K3TKS (KC1DI)	Saturday	1300 UTC
WSN-80	3558	WA6ARA (KI6SN)	Thursday [4]	0300 UTC
WSN-40	7040	W6SIY (several)	Saturday	1700 UTC

Notes:

1. Adjust UTC times to one hour earlier when local time switches to daylight savings time unless otherwise noted.
2. TCN remains at 2300 UTC Sunday the year around except on major contest weekends, then it will meet one hour later.
3. If conditions on 7030 kHz are poor, QSY to 3535 kHz at 0130 UTC (0030 UTC Spring/Summer). Please note that 3535 kHz is the Michigan QRP Club net frequency at 0200 UTC (see " Other QRP Nets " listing).
4. Note that in North America, net meets on the evening of the day before local time.

Other QRP Nets

Net	Frequency	NCS (Alt. NCS)	Day	Time [1]
BC (SSB)	3729	- - -	Daily	0300 UTC
MI-QRP	3535	K8JRO	Wed. [2]	0200 UTC
NE-QRP	3855	WA1JXR	Monday	2100 EST
NEIQS	3560	- - -	Friday [2]	0200 UTC
OK-QRP	7060 (3560)	- - -	Sunday	1330 UTC
NW-QRP	10123	N7MFB	Tuesday [2]	0200 UTC
NW-QRP	7035	- - -	Saturday	0730 PST
N.C.QRP	3710	WA4NID (AA4SX)	Sunday	2200 EST
VE-QRP	14060	VE6BLY	Sunday	1800 UTC

Notes:

1. Adjust UTC times to one hour earlier when local time switches to daylight savings time.
2. Note that in North America, net meets on the evening of the day before local time.

Please tell your friends about the QRP Nets -- they might decide to join after seeing how friendly we can be!

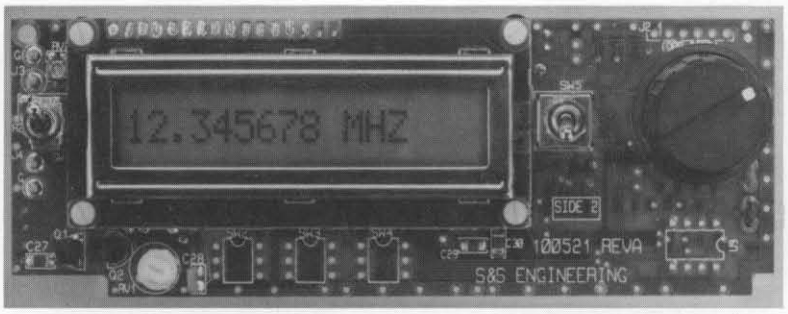
***NOTICE**: If an NCS does not appear for an ARCI net within ten minutes of scheduled net time, anyone can step in and take control. Just remember to send me a net report. No report, no credit!*

Review: S & S Engineering's DVFO (Digital VFO)

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

S & S Engineering now offers a precision Digital VFO to provide builders and experimenters with an interesting and innovative choice for local oscillators or for general purpose frequency sources. This compact (5.25in. X 1.9in. X 1in.) direct signal (synthesized) VFO provides continuous tuning from 1 Hz (!) to 16 MHz using the latest DDS and micro-controller technology. Although its tuning range is specified as "1 Hz to 16 MHz", the unit actually tunes to 25 MHz but its main output is limited to 16 MHz by a low pass filter. A "supertwist" liquid crystal display forms easy to read letters and numbers. The DVFO can be programmed to display one frequency while outputting a different frequency. The display frequency can be made to increase as the output frequency decreases or, visa versa. It uses a shaft encoder for detented tuning, enabling quick frequency changes in steps ranging from 1 Hz to 10 MHz. It produces a signal of 0.6 V (peak to peak) and has an output impedance of 50 Ohms. Spurious outputs are rated at -60 dB typical, -50 dB minimum. It requires an external power supply delivering 7 to 14 VDC at 175 mA.

There are two outputs, one labeled J1 and the other J2. The DVFO output, J1, supplies a signal from 1 Hz to 16 MHz. It's protected from short circuits and incorporates a 16 MHz low pass filter. J2 is 180 degrees out of phase with J1 and has no filtering. Output up to 25 MHz is available from J2 but mixing products or other spurious signals above 16 MHz may be present.



DVFO with a tuning knob installed (photo courtesy S & S Engineering)

The DVFO is available as a kit or completely assembled; I was brave and purchased the kit. Having built several S & S Engineering kits, it was no surprise to see high quality components and a superb job of parts identification and packaging. Each group of components comes in separate clearly marked packages. Since this is a board level kit with many possible uses, no case or tuning knob is supplied. It's up to the builder to supply these items appropriate for the intended application. I found a suitable box at Radio Shack for about $3

This kit offers a great challenge to those wanting to advance their soldering and kit building skills. About 60% of the components are surface mounts. All resistors and most of the capacitors are about the size of a grain of rice. S & S provides an extra resistor and an extra capacitor of each value, just in case one gets away. I was happy for this since one of the little rascals jumped off the board and hid in my carpet, only to surface after the "extra" was firmly in place. Two of the IC's are about the size of large ants, each with 14 tiny feet. The documentation includes adequate instructions on how to work with surface mount components and recommends the use of a "grounded tip mini iron". I was able to sharpen the tip on my 25 Watt iron, ground it to my scope, and with care and patience avoided bridges and over heating. Also, I wouldn't attempt working with surface mounts without magnifying glasses.

It's a two-board kit with the builder assembling the main board while the second board, containing only the display, comes pre-assembled. The main board arrives with the 44 pin (AD7008) DDS chip already soldered in-place. (Whew!) Following the parts list and aided by an enlarged silk-screen drawing, the builder installs the remaining components. The surface mount resistors are installed first, followed by the capacitors. Values are not shown on the capacitors so each value is packaged separately and you're instructed to work with only one value at a time. After installing the remaining parts (IC sockets, mono caps, tantalums, xtals, ceramics, switches and toroids, etc.) and washing the board with alcohol, you're set to couple the display to the main board. The boards are attached with nylon hardware and connected with "clipped" component leads at 16 points. Assembly is completed by soldering a ribbon cable to the main board and plugging in the shaft encoder. The whole job takes only a few hours, depending upon your experience and skill.

Alignment is quite easy. There's only one board mounted pot and it may or may not need adjustment. Simply connect a frequency counter to the J1 output and turn and on the power. I used a 12V battery as a power supply. The counter and the DVFO should both display "10.000000 MHz". If this is the case, alignment is complete; otherwise you can probably match the DVFO with the counter by adjusting the board mounted pot. (Caution: The DVFO may be more accurate than your frequency counter!)

Operation is simple too. Pressing the tuning control causes a cursor to appear under the right-most digit of the display. Rotating the control to the left moves the cursor to the left. After placing the cursor under the digit you want to change, press the control again and the cursor disappears. Then, by turning the control, the selected digit increases or decreases. For example, if you move the cursor to the left of the decimal you will change the frequency in 1 MHz steps with each click of the shaft encoder. In addition to the power switch and the tuning control (shaft encoder), there are two little push button switches beneath the display. Pressing the left button enters the "Push Button Select Mode". Pressing the right button exits this mode. While in the select mode, you can choose the frequency to be displayed and the frequency you would like at the output jack. You can further program for the output frequency to advance as the dial frequency decreases or visa versa. There's a switch to the right of the display (not currently used) which helps to hold the unit to a face plate.

Be aware that all the settings are volatile and disappear when the power is removed. This is no problem if the unit is used as a design or bench tool but it could be a problem if the unit is used in a radio. Unless the VFO is to start at 10 MHz with the display reading 10 MHz, you will have to set the frequencies each time the power is applied. I understand that by the time this article is published S & S will offer the option (at a very affordable price) of non-volatile memory to store 10 dial and 10 VFO frequency schemes. Wow!.

Possible uses of the DVFO are limited only by your imagination. With the versatility of display and output selections and the outstanding stability, it's an excellent foundation for the rig of your dreams. It's also a great bench tool for audio and RF work. You can toss away those old dinosaurs that take up so much precious bench space. It's perfect for verifying the design of IF and audio filters. So far I've tested my hearing and found the dead spots in each ear. I'm now searching for the frequency to annoy roaches in my shack and mosquitoes around my picnic table.

S & S Engineering sells the DVFO as a kit for about $140 and as an assembled unit for about $190 (plus shipping and handling). They can be reached at 14102 Brown Road in Smithsburg, Maryland. Phone (301) 416-0661. In addition to the future option of a "non volatile memory" for frequencies and offsets, we can also expect to see a "precision digital memory keyer". It won't be long before we begin to see some exciting radios built around this little beauty

Additional Comments from Mike Czuhajewski, WA8MCQ

I received an assembled DVFO from Dick at S & S Engineering for "technical evaluation" and loved it. About all I can add to Don's comments is that I checked it on some Really Expensive Test Equipment at work and found that it met or exceeded the claimed specs for spectral purity and output level across the specified range.

As Don mentioned, it has provision for adjusting the output frequency a bit. The master oscillator is one of those computer clock oscillator modules, at 50 MHz, and Dick added a potentiometer to vary its supply voltage slightly. I was always under the impression that these things are pretty much rock solid with respect to supply voltage, and proved it to myself once with a 28 MHz oscillator, but the shift on the 50 MHz oscillator module with varying supply voltage is enough to make a change of a few tens of Hz at a VFO output frequency of 10 MHz (as specified in the S & S alignment procedures).

As noted above, the DVFO makes a handy audio oscillator as well as a general purpose RF signal generator - a versatile addition to the workbench if you can resist building it into a QRP rig! One observation I made the first time I it with a receiver beside it, listening to it: The 1 Hz frequency step has great potential for a little tomfoolery if you use it as a VFO in a rig. Set it for 1 Hz steps, then while you work someone you can slowly crank the dial, giving the effect of apparent drift, and then try to convince the other guy that you know your rig is rock solid and the problem must be on his end!

In The Nutshell On The Bottom Line: Although not having a nonvolatile memory available (at least not at the time of writing) is a drawback in some applications, overall this is a really neat device, and long overdue. Dick and Kathy have another winner!

[Since this review was written, S & S has announced an upgraded DVFO with 10 nonvolatile offsets and a "software calibration" scheme. The price of the new DVFO is $159.95 in kit form or $209.95 fully assembled. Original model DVFOs can be upgraded for $32.95. Contact S & S Engineering for full details. —W1HUE]

Review: "QRP Power"

Mike Czuhajewski, WA8MCQ 7945 Citadel Drive Severn, MD 21144

QRP Power, Compiled by Joel Kleinman, N1BKE and Zack Lau, KH6CP/1; ARRL Publication No.5617, ARRL, Newington, CT., 1996.

This is the latest QRP book from the League. It is mostly a collection of reprints from QST and QEX of recent years, although there is one previously unpublished article (more on that later). If you've been in QRP for years and years, you may not be interested; if you're fairly new and don't have huge stacks of QST and QEX, it may well be mostly new to you. In any case, it's a lot of great material.

The pages are not numbered sequentially but I counted 178 pages of "meat" in six chapters. (Curiously, although the pages are numbered within chapters (1-1, 2-1, etc.), the table of contents does not give page numbers. The first thing I did was make up my own index.)

The first chapter, "How Low can You Go?", is the three-part series on QRP from QST by Rich Arland, K7YHA. The second chapter is "Construction Practices," and starts off with the four-part series "Build it Yourself" from QST by Bruce Hale, KB1MW. A pair of Zack Lau articles from QEX fills out the chapter.

Transceivers and transmitters are the focus of Chapter 3. Contents include three QST articles by Rick Campbell, KK7B, some HW-9 modifications from QEX by ND3P (reprinted a few years back in the QRP Quarterly), the Oner-in-a-film-box rig from WA3ULH, and one of my Zack Lau favorites, his 15 page QEX article "Birth of a 7 MHz Transceiver."

The NN1G single board superhet QRP transceiver (which began life as the New England QRP Club's NE-4040 and NE-3040 kits) leads off the chapter, followed by the much-touted original, unpublished article: "Revisiting the 40-40", 20 pages of upgrades and comments on the NN1G rig by Mitchell Lee, KB6FPW and Dennis Monticelli, AE6C. Overflowing with pictures and graphics, it contains a lot of good ideas and even presents an alternate method of winding cores: "Secret Toroid Knowledge Revealed." (Sorry, I won't spill the beans; you have to buy the book if you want to learn this tip!) I wondered why the book didn't include the two modifications developed by NN1G himself; RIT and the addition of an inexpensive 50 ohm MMIC amplifier to tame the transmitter. But Dave Benson reminded me that he had never submitted those to the League; they appeared only in the New England QRP Clubs journal, "72".

Receivers are covered in chapter 4, starting out with a glowbug (hollow state) 40 meter regenerative unit from Dave Newkirk, WJ1Z. That's followed by the receiver addition to the "Ugly Weekender" transmitter by KA7EXM, Roger Hayward, and two more KK7B articles on high performance direct conversion receivers.

Chapter 5 is on "Accessories/Components." It includes "Substituting Parts" (KH6CP/1), the "Weekend Digibrain DDS VFO" (WB0VNE), "SWR Indicator" (K1KP), two articles on crystal filter design (W7ZOI and N6NWP), a tutorial on double tuned circuits from W7ZOI (an article I found quite useful when it first appeared in QST), as well as Wes' recent treatise on measuring and compensating VFO drift. Finishing it off is a portable hamshack for campers by Bill Jones, KD7S. (Bill's 40-9er transceiver was the winner of the Dayton Building Contest and appears in the September 1996 issue of QRPp.)

Chapter 6 is a brief list of periodicals of interest to QRP enthusiasts compiled by L. B. Cebik, W4RNL; this first appeared on the Internet QRP-L reflector. Most of these will be familiar to seasoned QRPers; things such as the QRP Quarterly, QRPp, SPRAT, LowDown, The Five Watter, 72, etc.

There were a few articles that I would have liked to see included in the book, but it turns out most of them were already covered in the ARRL's earlier QRP Classics so I can't complain. (Most were in the first printing and one was added in the second.) However, the KA7EXM/W7ZOI "Ugly Weekender" transmitter appears in neither, though the receiver update is in chapter 4. I would also have liked to see the "Safari-4" by Wayne Burdick, N6KR, a multi-part QEX article of several years ago. Its absence may be due to the reluctance of the author himself; when I approached him about reprinting it in the QRP Quarterly a while back, he was hesitant since it was, so to speak, "yesterdays design and technology" (my phrase), and he had gone to newer and better methods. I still recommend reading the QEX series if you can find it.

In The Nutshell On The Bottom Line: The book is subtitled "The Best Recent QRP Articles from QST, QEX and the ARRL Handbook," and I think that it more than lives up to the claim. Even seasoned QRPers who've already seen everything in print will find it quite handy to have it all in one place for easy reference, and there's the added bonus of the 20 new pages on the NN1G rig. QRP Newbies who don't have a 200 pound stack of old QSTs and QEXs around the house will definitely love it. It deserves a place on the shelf in any well-stocked QRP library. A $12 well spent, in my opinion.

CONTESTS

Cam Hartford, N6GA

Results: Fall QSO Party (We Try Again)
Results: Holiday Spirits Homebrew Sprint
Announcing: Spring QSO Party
Announcing: The Hootowl Sprint

UPCOMING EVENTS

QRP ARCI Spring QSO Party	April 12-13
NorCal QRP To The Field	April 26
QRP ARCI Hootowl Sprint	May 26
Field Day	June 28
MI-QRP Club 4th of July CW Sprint	July 4
QRP ARCI Summer Homebrew Sprint	July 13

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 !

Following shortly after a period of no sunspots (as in "zero" observed sunspots) the QRPers gathered together, and with the incredible might of their collected signals, warmed the ionosphere sufficiently to provide a weekend of pretty darned good contesting. Lots of contesters were out there, as evidenced by the non-stop and at times frenzied activity, and also by the 166 logs submitted.

One good measure of operating conditions are the scores, particularly the average scores of the Top Ten stations. In the Spring '96 QSO Party, the Top Ten averaged 467K points, while in this contest the average was a blistering 729K! Not quite twice, but a really substantial improvement.

Team competition was also quite lively, with four teams making the effort and diving into the fray. Congratulations to the Texas Yahoos, who surged to the top of the heap. Team listings are at the end of this report.

Brice Anderson, W9PNE, deserves special mention. Brice has been very active in recent years in the Milliwatting arena, and in this contest showed off the skills he has honed - running 20 MW (Yes, that's 20 Milliwatts) he racked up a score of 288,750 points. For some pespective, that's more than 10 dB down from a stock Forty-9er! Quite some doing, Brice, and quite a boost to the diehard Milliwatters amongst us.

Honorable mention also goes to another pair of die-hards, WB3GCK and N9HH. Call them the Downspout Duo. WB3GCK operated for 4 hours into his rainspout for a total of 10K points, and N9HH resonated his "50' of downspout and gutter" to the tune of 316K points! Amazing! Who but QRPers?

Thanks also to those distant ops who lent some DX fun to the crowd - N4BP/VP9, KP3S, YS1ZRB, and as many have said, what would a contest be without working HP1AC. And please don't forget to give a listen for WB6FZH/KH6, who is straining to hear our stateside signal from the shore of Kaneohe Bay.

Soapbox: EVEN IN DEEP SOUTH IT WAS TOO COLD TO LEAVE SLEEPING BAG TO TRY LOOP ON 160M - K4KJP; AGE -16 YRS OLD. MYFIRST QRP CONTEST, I HAD A LOT OF FUN - AE4JM; I HAD A BLAST WITH MY NORCAL 49ER. IT'S HOPPED UP WITH 1.26 WATTS AND AUDIO MOD - KJ4TF; SURPRISING THAT 200 MW GOT OUT AT ALL - N9ZZ; NEED MORE SPOTS FROM THE SUNSPOT GODS - W5VBO; NOT ENOUGH OPERATING TIME, EVERYONE WAS HAVING ME DO SOMETHING ELSE - VE6ZAA; 1ST CONTEST IN 20 YEARS - GREAT TIME - W1HIJ; FISHING, PLAYING WITH DAUGHTER, FISHING, CAMPING, FISHING... - WD6FDD; GOOD PARTICIPATION, GOOD TO HEAR SO MANY STATIONS - KØFRP; MY NEW QTH ALLOWS REAL ANTENNAS AGAIN! - KF7MD; HAD SO FEW 'CONTACTS, DIDN'T BOTHER PUTTING THEM IN THE COMPUTER - KGØPP; MY HIGHLIGHT WAS WORKING WY,SD AND ND IN SAME CONTEST - KA1OX; HEARD KP3S CALLING FOR SEVERAL HOURS ON 15M. WHERE WAS EVERYONE ELSE? - N1RCG; GOT OLD CALL BACK DAY AFTER THE TEST - KT4QV;SWAPPED A "72" FOR A "KEEP WARM" WHEN I SIGNED WITH GLENN, AE0Q - AE4CA; IF SOME SIGNALS WERE ANY WEAKER, E.S.P. WOULD HAVE BEEN NEW MODE OF CONVERSATION - WB6FZH/KH6; LOTS OF FUN FOR MY FIRST TRY...WILL CERTAINLY DO BETTER NEXT TIME - KQOI; MY

BIGGEST THRILLS WERE IN WORKING HP1AC AND KL7GN (USING 20 MW!!) - W9PNE; MY FIRST QRP CONTEST; I'M SOLD - LOTS OF FUN - KB9IUA; NEW FAMILY RESPONSIBILITIES CHANGED MY OPERATING HABITS WBØSMZ; VERY DEPRESSING WHEN YOU ONLY WORK ONE STATION WITH A LOWER MEMBER # THAN MINE - WA3EOP; FIRST ARCI CONTEST FROM MY NEW HOUSE - W6TOY/3; ALL 3 RIGS NEEDED THE OHR SCAF FILTER! - N8CQA; GREAT TO HEAR LOTS OF NEW NUMBERS AND SOME VERY LOW NUMBERS - WAØRPI; MY 1ST CONTEST WITH A TOOTHACHE! BUT CONDX ON 20M RELIEFVED THE PAIN - KØLWV; WHAT THE HECK WAS THIS? (QSS) { W1MK-ESE FOR "MASS" - ed} - NØOCT; GREAT CONTEST. WAS THRILLED WHEN MY CQ WAS ANSWERED BY A CZ(OK) STATION WITH AN ARCI #! - AE4IC; I SPENT 1 HOUR TRYING TO GET MY ONLY CA (WA6YEE) IT TOOK ME A FEW CONTESTS TO SEE THE VALUE OF THE x15 MULTIPLIER - AA4XX; BEST I COULD DO BETWEEN REFINISHING LIVING ROOM FLOOR AND HIGH QRN LEVEL - AE4EC; THRILL HAVING OK1DZD CALL ME WITH 970 MW - VO1DRB; ANY GEOGRAPHICAL HANDICAPS? (PAUL -FIRST GEOGRAPHICAL HANDICAP GOES TO SOCAL! - ed.) - AA1MI; THE PIXIE @ 200MW WAS A CHALLENGE TO THOSE 6 STATIONS ANSWERING MY CQ - W1FMR; TOO MANY CHORES - NO1E; INCREDIBLE AMOUNT OF ACTIVITY ON SATURDAY ALL DAY. SHOULD HAVE STARTED RIGHT OUT OF THE CHUTE - N2CQ; HAD LOTS OF FUN BETWEEN CLEANING GUTTERS IN POURING RAIN AND VACCUMING WATER OUT OF MY SHACK. MISSED HP1AC FOR THE FIRST TIME IN YEARS - KB2JE; MY FIRST CW CONTEST AND I HAD A BLAST. I CAN'T WAIT FOR THE NEXT ONE. - N2TNN; HAD COMPANY VISITING ALL WEEKEND. I WAS A BETTER HOST TO MY BVROTHER-IN-LAW THAN I INTENDED TO BE - K2HPV; STORM CAUSED POWER OUTAGE SATURDAY NIGHT, USED BATTERY POWER - W2JEK; RAINED ALL WEEKEND, OPERATED FROM MY COUCH - NOW THAT'S COMFORT! - K2UD; MY FIRST CONTEST! - KB2OUA; MOST FUN EVER IN A QRP ARCI TEST - NZ8J; MY FIRST QRP CONTEST, GREAT FUN BUT MANY HONEY DOS - NEØC; - WA3PAK; IT'S AMAZING WHAT A QUARTER WATT CAN DO - AA7KF; STANDARD OF OPERATING WAS THE BEST I'VE SEEN IN A QRP CONTEST. VERY FEW ENDLESS CQS... - K3WWP; THIS WAS MY FIRST ARCI CONTEST. REALLY ENJOYED IT - W3DP; GOOD WEEKEND SLOT - NO PA QSO PARTY! - W3TS; SIGNALS WERE WEAK, BUT THE NOISE CAME THROUGH WITH GREAT FIDELITY! - N3IUT; HATS OFF TO ALL THE GREAT OPERATORS WHOSE SKILL AND PATIENCE MAKES THIS A FUN CONTEST - NE3I; BETTER ANTENNA, WORSE SCORE! - N3CZB; 50 MPH WINDS, VERY HEAVY RAIN, POWER OUTAGES MADE IT INTERESTING - WA1OFT; CONDX ON 40 WERE GREAT. GOT CALLED INTO WORK SEVERAL TIMES... - WA2UAX; I'VE OPERATED MANY QRP CONTESTS - THIS IS MY FIRST ENTRY - WOW, SURPRISED MYSELF! - K3NVI; I USED TWO RADIOS TO GET READY FOR SS. LOOKING FOR MULTS ON THE SECOND RIG REALLY PAID OFF. - W5NN (KB5YVT); THIS STUFF IS ADDICTING. I'M GLAD THERE IS A 24 HR LIMIT ON IT - K5ZTY; FUN-FUN-FUN IN TEST AND LOCAL HAMFEST - N4ROA; HEARD ONLY YS1ZRB ON A5 METERS, BUT NO CONTACT - K3SS; HAVEN'T PARTICIPATED IN A CONTEST SINCE 1974. REALLY ENJOYED MYSELF - WA4CHQ; JUST MOVEED, NO GOOD ANTENNAS UP YET, BUT ENJOYED THE CONTEST ANYWAY - WA9PWP; CAMPED AT 8200'; WIND, COLD, SNOW, ONLY GOT ONE ANTENNA UP, BUT FUN CONTEST! - AEØQ; HAD LOTSA FUN. NOW IN MEXICO, WILL BE XE1/K8ZAA - YS1ZRB.

QTH	CALL	SCORE	PTS	S/P/Cs	PWR	BANDS	TIME	RIG	ANTENNA
AB	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
AK	KL7GN	3,150	50	9	4	20M	2	IC-735	YAGI @ 60'
AL	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
AR	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
AZ	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-9	R-7 VERTICAL
BC	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'
CA	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	?	?	?
CO	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
	WOØQ	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
CT	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
FL	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
GA	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'

QTH	CALL	SCORE	PTS	S/P/Cs	PWR	BANDS	TIME	RIG	ANTENNA
HI	WB6FZH	4,032	36	16	5	A-2	6	TEN TEC CENTURY 21	VERTICAL, ON EDGE OF KANEOHE BAY
IA	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
ID	W7CNL	160,524	468	49	3	20M	14	ARGOSY II	YAGI @ 45'
	KF7ET	8,730	92	10	0.9	40M	11	QRP+	INVERTED VEE
IL	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
IN	WD9CTB	433,490	647	67	0.9	A-3	14	ARGO 509	LOOP, INV VEE, VERTICAL
	WB9PXR	304,325	925	41	5	40M	14	TAC-1	40M VERT, 80M LOOP
	N9DD	59,400	198	30	0.95	L-2	6	TS-520	HORIZONTAL LOOP
	K8LEN	26,980	142	19	1	40M	1	624 TCVR	DIPOLE
KS	WBØSMZ	1,736	31	8	4	80M	1	TS-140S	DIPOLE
KY	KE4LIA	45,668	233	28	2.5	40M	?	OHR EXPLORER II	?
	KR4KL	43,904	196	32	5	A-3	4	QRP+	VERTICAL, DIPOLE
	W9FHA	32,319	171	27	5	A-2	4	TEN TEC SCOUT	HUSTLER WHIP ON CAR
	AE4VQ	1,920	32	6	1	20M	1	QRP+	TUNED WIRE
LA	AC5AM	319,140	591	54	0.95	L-2	20	ARGO 515	80M SLOPER, 40M DELTA LOOP
	W5TVW	110,950	317	50	4	A-3	?	HW-9	END-FED WIRE, VERTICAL
MA	AA1MR	17,640	98	12	0.1	40M	10	HB XMTR, IC735 RCVR	160M ZEPP @ 35'
MAN	VE4AKI	40,180	205	28	4.5	A-3	5	TEN TEC SCOUT	SLOPING DIPOLE, VERTICAL
MD	W3ERU	235,956	636	53	4	L-2	16	TS-850	40M VERT LOOP, G5RV
	K3TKS	185,400	412	45	0.9	L-2	11.5	QRP+	80 HORIZ LOOP
	WO3B	89,175	205	29	0.2	L-2	5	TS-940S	571' HORIZONTAL LOOP
	WA3EOP	41,132	226	26	4	A-3	4	?	DIPOLES
	W6TOY/3	30,940	221	20	5	80M	4	TS-130V	100' LONG WIRE
	WA8MCQ	1,848	33	8	4	40M	1	TS-430S	40M DELTA LOOP
ME	KC1DI	324,576	828	56	4	L-3	15	TEN TEC SCOUT	G5RV,A60 INV. L, 40M LOOP
MI	W9NIP	164,780	428	55	5	A-3	8	QRP+	20M YAGI, HF2V VERTICAL
	N8CQA	111,475	325	49	2	A-3	10	EXPLORER, NC40A, SW	?
	WB8APR	103,320	360	41	5	A-2	11	?	?
	WA8RXI	95,718	318	43	5	A-2	11	SPRINT, EXPLORER	YAGI, DIPOLE
	K8CV	88,837	343	37	2	L-2	6	SIERRA	DIPOLE
	WB8NYV	52,440	228	23	1	40M	5	SW-40	DIPOLE @ 45'
MN	WAØRPI	659,680	992	95	5	A-5	17	IC-735	DELTA LOOPS, 40M DIPOLE
MO	KQ4VH	223,325	709	45	5	40M	24	IC-728	32' VERTICAL
	K0LWV	145,908	386	54	5	A-3	15	TS-520	LONGWIRE V
	WØGWT	118,800	220	36	0.25	A-3	18	IC-735	YAGI, VERTICAL, RANDOM WIRE
	KCØM	47,600	200	34	5	L-2	4.5	?	?
	NØOCT	15,770	83	19	1	A-3	1	ARGO 509	40M DIPOLE
NC	AE4IC	626,080	1040	86	5	A-4	15	NW20, NW40, NW80,	400' HORIZONTAL LOOP
	AA4XX	576,000	640	60	0.25	A-3	19.4	SIERRA	80M WINDOM @ 60'
	AE4EC	55,440	240	33	4	A-3	12	ARGOSY	CAROLINA WINDOM
	AD4ZE	35,119	173	29	3	A-4	5.5	IC-706	LONG WIRE
ND	WEØQ	70,756	266	38	3	A-2	4	HW-8	VERTICAL
NFD	VO1DRB	65,205	345	27	5	20M	12	OHR 400	MFJ LOOP
NH	AA1MI	150,822	399	54	5	A-4	15.5	FT-990, QRP+	R7 VERT, 80M DIPOLE
	W1FMR	19,110	130	21	2.4	A-2	4	GM-20, PIXIE	RANDOM WIRE
	NO1E	2,632	47	8	2	40M	2	NORCAL 40	DIPOLE
NJ	N2CQ	617,050	1025	86	5	A-4	16.5	TS-850S	TRI-BANDER, ZEPP
	KB2JE	243,908	562	62	4	A-3	12	QRP+	G5RV
	K2JT	152,516	419	52	5	A-4	?	TS-130V, TENTEC OMNI-D	LONG WIRE
	N2TNN	98,196	334	42	4.5	A-4	15	QRP+	GAP VERTICAL
	N2YVF	63,525	363	25	5	40M	8	ARK 4	DIPOLE
	K2HPV	33,040	236	20	2	40M	6	IC-735	GAP TITAN VERTICAL
	KE2XA	13,650	135	15	2	40M	8.5	NORCAL 40A	G5RV @ 10'
	W2JEK	10,948	92	17	2	A-3	2.5	ARGO 505	20M GP, 40M DIPOLE, 80M END FED
	N2MNN	6,160	56	11	0.95	40M	1.5	SIERRA	40M VERT LOOP
	KB2WI	5,775	75	11	5	L-2	?	ARGO 515	350' LONG WIRE @ 75'
	N2SMH	5,740	82	10	2	40M	3	?	?

QTH	CALL	SCORE	PTS	S/P/Cs	PWR	BANDS	TIME	RIG	ANTENNA
NM	K5AM	424,004	797	76	5	A-4	8	HB TCVR	YAGI, LOOP K5AM - EX KN5S
	AB5OU	46,368	207	32	5	A-2	4	TS-140S	GAP TITAN, ASSYMMETRIC ZEPP
NY	K2LGJ	390,600	630	62	0.9	A-3	12	TS-870	DIPOLE, VERTICAL
	K2UD	86,681	427	29	5	40M	18	ARGO 515	40M END-FED MARCONI
	W2QYA	72,020	277	26	0.9	A-3	14	HW-8	LONGWIRE
	KB2TEO	67,592	284	34	5	A-2	6	IC-728	R-5 VERTICAL, BENT DIPOLE
	W2PTF	10,556	116	13	4	160M	8	TEN TEC OMNI VI	260' DIPOLE @ 25'
	WJ2V	10,192	112	13	2.5	80M	3.5	NORCAL SIERRA	130' DOUBLET
	KB2OUA	1,680	24	10	4	A-3	8.5	ARGOSY	40M LONG WIRE @ 15'
OH	NZ8J	730,442	1122	93	4	A-5	16	IC-735	YAGI, ZEPP
	W8MVN	455,896	1163	56	4	40M	19	HB TCVR	DELTA LOOPS @ 60'
	WA8HQO	72,891	267	39	5	A-4	?	ARGO II	INV VEE, RANDOM WIRE
	KB8GAE	49,476	228	31	5	A-3	3	K9AY, TS440	80M ZEPP & VERT
	NEØC	46,886	197	34	4	A-4	10.5	TS-130V	GAP TITAN & CHALLENGER
	WA3PAK	25,872	154	24	5	A-2	9	IC-735	20M DIPOLE @ 25'
	KF8EE	19,418	146	19	5	80M	6	ARGO II	80' END-FED WIRE @15'
OK	KJ5MG	188,384	464	58	5	A-2	19	HB XCVRS	DIPOLE
	K5UP	102,564	396	37	5	40M	14	HB IRF510, FRG100	78' WIRE @ 25'
ONT	VA3SB	54,150	285	19	0.95	40M	7.5	ARGOSY II	INVERTED VEE
OR	AA7KF	588,060	594	66	0.25	A-3	15	TS-940	DELTA LOOPS @ 85'
	WX7R	46,438	214	31	4	A-3	5	IC-735	LOOP, VEE BEAM
	W7LNG	31,618	162	27	5	A-3	4	TS-850	YAGI, GROUND PLANE
PA	K3WWP	462,434	986	67	5	A-6	17.5	HB 6Y6 FINAL, R-71A RX	RANDOM WIRE, DIPOLES
	W3DP	147,693	541	39	4	L-2	10	TEN TEC CENTURY 22	G5RV @ 25'
	W3TS	135,660	266	34	0.25	A-3	3	HB TRANSCEIVER	YAGI @ 52', INV VEE @ 60'
	N3IUT	95,760	304	45	5	A-4	19	SCOUT 555	YAGI, VERTICAL
	NE3I	76,685	313	35	5	A-2	4	TS-440	ATTIC DIPOLES
	W3DQU	67,620	345	28	4	40M	12.5	MFJ 9040	DIPOLE @ 25'
	WA3SRE	66,660	303	22	0.95	80M	14	ARGO 515	LONG WIRE
	WA3YON	43,848	261	24	5	L-2	5	TAC-1,QRP CLASSIC	80M HORIZ LOOP, VERTICAL
	K3NVI	37,611	199	27	5	A-3	9	TS-120V	14AVQ, INV VEE
	AA3GM	34,104	174	28	5	A-4	6	ARGO 556	160 & 80M DIPOLES, 40 & 20
	N3LAZ	25,200	280	20	1.5	20M	12	HB VXO, HB RCVR	G5RV @ 50'
	KW3U	13,580	97	20	5	A-3	2	IC-725	R-5 VERT, LONG WIRE
	WB3GCK	10,304	92	16	3	A-2	4	CENTURY 22	RAINSPOUT
	N3CZB	3,339	53	9	4	20M	6	MFJ 9020	30M HALF SLOPER
PAN	HP1AC	71,253	261	39	5	A-3	7	TS-430, K9AY	YAGI, LONG WIRE
PR	KP3S	839,664	1071	112	5	A-4	18.5	ARGO II	YAGI W/ 40 METER KIT
QUE	VE2BLX	11,340	90	18	3	40M	14	HW-7	LONG WIRE
RI	WA1OFT	175,357	611	41	5	L-2	16	HW-9	80M CF ZEPP
	WA1YLN	48,608	224	31	5	A-3	6.5	ARGO 515	SHORTY G5RV
SC	WA2UAX	62,720	280	32	5	40M	6.5	ARGOSY II	G5RV
	KS4DU	8,099	89	13	5	A-2	2	IC-706	FAN DIPOLE
TX	W5NN	1,002,932	1204	119	5	A-6	17.5	FT-1000, HW-8	BEAMS, LOOPS, ETC.
	K5ZTY	828,604	1172	101	5	A-5	23.5	OHR 400, TS-830S	YAGI & G5RV
	WA1YIA	566,475	975	83	5	A-5	18	FT-767	40M LOOP, VERTICAL
	AB5WB	105,154	406	37	4	A-2	?	FT-757	ROTATING DIPOLE, INV VEE @ 30'
	WA5DWX	55,146	202	39	5	A-4	?	?	?
	KD5KP	47,936	214	32	5	A-2	11	TEN TEC SCOUT	260' CF ZEPP
	WB5FKC	15,190	155	14	5	40M	?	TEN TEC DELTA	INV VEE @ 30'
	AA5TB	2,058	42	7	3	20M	1.25	MFJ-9020	2.5 FT DIAMETER LOOP @ 4'
	KBØPJE	1,232	22	8	5	A-3	?	?	?
	WB9LAU	1,190	34	5	3	40M	1	OHR EXPLORER II	INV VEE @ 30'
UT	WAØYSE	10,976	98	16	4	20M	6	MFJ-9020	INV VEE, WINDOM
VA	N4ROA	591,766	983	86	5	A-3	16.5	QRP+, TEN TEC OMNI C	2 EL QUAD, 160M INVERTED "L"
	K3SS	126,224	392	46	5	A-3	12	FT-757GX	DIPOLE @ 35'
	WA4CHQ	103,240	356	29	0.75	40M	19	HB VXO, HB RCVR	30 FT WIRE ALMOST VERTICAL
	AE4EW	97,944	318	44	5	A-3	12	TS-130	G5RV, YAGI
	W4OEL	2,772	44	9	4	20M	1	TS-130V	YAGI @ 28'
VP9	N4BP/VP9	612,955	1055	83	5	H-2	14.3	?	?
WA	KL7NS	28,826	142	29	4	A-3	14	CORSAIR II, CLASSIC, FT-900	QUAD, VERTICAL, DIPOLE
WI	W9CBE	54,236	298	26	5	A-3	6	ARGOSY	G5RV
	WA9PWP	51,660	205	36	5	A-3	4	ARGOSY II	END-FED RANDOM WIRE
	KB9W	2,898	46	9	4	40M	1	HW-8	DIPOLE
	W9OVZ	1,911	39	7	5	20M	6	MFJ9020	DIPOLE @ 14'
WV	WF8X	399,399	741	77	5	A-4	12.5	TS-120V, TS-430S	G5RV
WY	AE0Q	506,345	851	85	5	A-4	22.5	TS-450S	80M VERT IN TREES
YS	YS1ZRB	8,636	193	36	5	H-3	10	QRP+	MFJ LOOP

FALL QSO PARTY

TOP	TEN	SINGLE BAND		
W5NN	1,002,932	160M	W2PTF	10,556
KP3S	839,664	80M	WA3SRE	66,660
K5ZTY	828,604	40M	W8MVN	455,896
KH6CP	737,583	20M	W7CNL	160,524
NZ8J	730,442			
WAØRPI	659,680	LOW BAND	KC1DI	324,576
KØFRP	641,508			
AE4IC	626,080	HIGH BAND	N4BP/VP9	612,955
N2CQ	617,050			
N4BP	612,955			

TEAM COMPETITION

Texas Yahoos	K5ZTY, WA1YIA, W5NN, WA5DWX	2,453,157
New Jersey QRPeanuts #2	KB2JE, K2HPV, KB2TEO, N2CQ	961,590
Maryland Milliwatts	K3TKS, WO3B, AA4XX, W6TOY/3, WA8MCQ	883,363
No-Name Western Group	AEØQ, NØTBM	537,810

1996 HOLIDAY SPIRITS HOMEBREW SPRINT

This contest just seems to keep on growing. Last year we had 77 participants, this year there were 86. There was a time a few years ago when a full-blown QSO Party drew barely 100 entries. I attribute the growth of these Homebrew Sprints to the accelerated pace of QRP building. I count 70 homebrew rigs among those used by the entrants in this contest. Keep on building, keep on operating, and keep on contesting!

TOP THREE

Q	T	H
C	O	

Soapbox: Propagation to Alaska was bad...Could not break through the QRM (I assume you all haveQRM down there - I don't) - AL7FS; Let's all pray for more sunspots - VE4AKI; Heard many more than I worked. Great fun - N7GS; Got 1.5 hours in before XYL dragged me out Xmas shopping - NQ7X; Spent the first hour finding a cold solder joint... - W9FHA; This was my first contest. Had a great time, esp. when I worked CO, IA and LA - AA8RJ; Lots of fun, gentlemen ops - K8LEN; The SW-40 was up to the challenge and I worked almost everyone I could hear - N2VPK; Best ever 49er session I've had! - KIØG; Boy Oh Boy, condx sure stunk back here - W6TOY/3; Can't get xyl's OK to use neighbor's tree for inverted vee. Oh well. - KE2XA; Attic dipole terrible for QRP, as usual. - AEØQ; Lots of QRM from local Christmas lights - KT3A; Wind broke the feed off my dipole, so had to use the loop. Could hear many stations but they didn't hear me! - W6JHQ; Lots of noise but as usual QRPers are real gentlemen and hams. great time. - KF7ET; Well to start with, last Friday I had surgery on my left hand... - K6QWH; First time I've used the HW-9 in about 3 years! - W1HUE; Lost an hour when nc-40 decided it didn't like milliwatting! - W1FMR; Two hours of unmitigated QRP fun! - AD4ZE; Almost worked Mike, W3TS on 15, but not quite enough signal - W6ZH; Couldn't resist giving the new call its first contest workout - N7RI; 15M seemed to be open but not many stations on - AC5AM; First contest with new call, worked fine - NØUR; NØUR was posing as Jim, WAØRPI - N4ROA; Are there any QRPers in ND? - K5ZTY; Used 2 HB tcvrs on two bands to try CQing and Hunting... - W3TS; Wind/rain/QRN = Fun - WA1OFT; I was amazed at the responses to my 200 MW! - K4BNI;I don't claim high score but I have fun! - WA6ARA.

QTH	CALL	SCORE	PTS	S/P/C	PWR	BANDS	TIME	RIG	ANTENNA
AK	AL7FS	1,134	27	6	5	20	?	TS-440S	KT34 @ 40'
AR	W0LK	59,742	209	34	4	A-2	3	QHR CLASSIC	80M DELTA LOOP
AR	KJ5TF	28,716	154	22	2	20M	3.5	GM-20	HALF SQUARE
AZ	NQ7X	11,461	71	13	5	20M	1.5	QHR CLASSIC	3 EL YAGI
AZ	W7BXZ	9,044	76	17	5	20M	3	TEN TEC SCOUT	20M DIPOLE
CA	W6ZH	72,820	236	35	3	A-3	2.75	SIERRA	KT-34XA, 40M 2-EL @ 60'
CA	K6QWH	47,250	225	30	3	A-2	4	ARGO 509	?
CA	KI6SN	9,970	71	7	0.9	40M	1	NORCAL 40	G5RV
CA	WA6AR/	5,840	30	4	1.5	40M	1	NORCAL 40	CF ZEPP
CA	AB6SO	5,630	30	3	1.8	40M	1	NORCAL 40	40M FOLDED DIPOLE ON ROOF

QTH	CALL	SCORE	PTS	S/P/C	PWR	BANDS	TIME	RIG	ANTENNA
CO	K0FRP	285,772	588	67	5	A-3	4	OHR CLASSIC, TS-850	4 EL 15 & 20, 2 EL 40
CO	N0IBT	20,636	134	22	5	A-2	4	TS-870	DIPOLE
CO	KI0G	9,590	51	6	0.2	40M	4	FORTY 9ER	G5RV
CO	AE0Q	6,888	82	12	5	40M	4	ARGO 556	ATTIC DIPOLE
CT	N1RCG	23,150	50	9	2	A-4	2.5	NORCAL 40A, SIERRA	80M INV L, 40M LOOP, 20M DIPOLE
CT	NN1G	20,192	91	16	2	A-2	2.5	GM-20, SW-40	RANDOM WIRE
FL	W3DHN	805	23	5	5	A-2	2	TS-440	HF6V VERTICAL
GA	AA4PC	107,900	343	30	1	40M	4	SW-40	2 EL YAGI @48'
GA	K4GT	1,470	35	6	5	20M	2	TS-930	80M LOOP
IA	KF0N	41,288	216	24	3	40M	3	HB RX, HB TX	?
ID	W1HUE	30,587	173	17	4	A-2	3.5	HW-9	GAP VERT, INV VEE, 470'LONG WI
ID	WB5QM	13,430	49	10	2	A-2	4	SIERRA	GAP TITAN
ID	KF7ET	3,840	64	6	0.8	40M	3	QRP+	INVERTED VEE @ 35'
IL	N9MDK	28,700	164	25	5	A-2	3.5	QRP+	R-5, G5RV
IL	N9RWY	25,720	148	20	5	20M	3.75	624 TCVR	MOSLEY PRO67C
IN	WB9PXR	87,208	367	32	5	40M	4	TAC-1	80M LOOP, 40M DIPOLE
IN	KC9UR	25,733	63	13	2	A-4	4	SIERRA	VERTICAL ARRAY, HORIZONTAL L
IN	W9FHA	16,368	116	14	5	40M	3	OHR CLASSIC	ZEPP
IN	K8LEN	14,620	74	13	1	40M	0.5	624 TCVR	DIPOLE
KY	AE4VQ	238	17	2	1	20M	1	QRP+	TUNED WIRE
LA	AC5AM	160,320	334	48	1	A-4	4	ARGO 509	LOOPS, DIPOLES
MA	K1DGH	62,485	119	21	0.3	A-5	4	HW-9	TA-33JR, G5RV
MA	W1DDW	2,896	32	4	5	80M	2	HARTLEY 1 TUBE, 1928	?
MA	VE4AKI	16,100	115	20	5	20M	2.75	SCOUT 555	SLOPER, ROTARY DIPOLE, VERTIC
MD	W6TOY/	7,646	42	9	3	40M	1.3	TAC-1	100' LONG WIRE
ME	KC1DI	756	27	4	4	80M	0.5	TEN-TEC SCOUT	G5RV
MI	K8CV	18,753	141	19	5	A-3	2	?	?
MI	WA8RXI	12,007	77	13	2	20M	4	OHR EXPLORER II	3 EL YAGI
MN	N0UR	140,350	401	50	5	A-4	3.7	IC-735	LOOP,DIPOLE,INVERTED VEE
MN	W3FAF	113,520	258	44	0.8	A-4	4	TS-130V	TRIBANDER @ 33', 160M DIPOLE
MN	WA0IAD	17,290	130	19	5	A-3	3.5	TS-520	ZEPP
MO	K0LWV	23,856	142	24	5	A-2	3	TS-520	40M EXTENDED DOUBLE ZEPP
MT	N7GS	13,624	88	14	1.5	20M	3.5	NN1G	3 EL MOSELY @ 50'
NC	AC4QX	25,111	169	17	5	40M	3.5	ARK-4	G5RV
NC	AD4ZE	13,986	111	18	5	A-2	2	TS-450	80M DIPOLE
NH	W1FMR	23,350	89	15	1	A-2	3	GM-20, NORCAL 40	LONG WIRE
NH	NO1E	5,560	20	4	1.5	40M	1	NORCAL 40	ZEPP
NJ	N2CQ	36,486	173	26	3	L-2	2.7	EXPLORER II, TS-850	ZEPP
NJ	N2CQ	36,486	173	26	5	L-2	2.7	EXPLORER II, TS-850	ZEPP
NJ	W2JEK	20,460	65	12	2.3	A-3	2	HW-8, OHR-40, NN1G	40 DIPOLE, 20 GP, 80 HERTZ
NJ	N2YVF	18,104	117	16	4	40M	2.5	ARK-4	DIPOLE
NJ	KE2XA	7,240	40	8	2	40M	4	NORCAL 40A	G5RV @ 10'
NM	K5AM	85,170	245	38	5	A-4	4	HB 11-BAND TCVR	YAGI, LOOP @ 20'
NY	N2VPK	9,860	54	9	1	40M	1.1	SW-40	40M VERTICAL
NY	WB2KK	6,270	61	7	1	80M	2.5	RAMSEY QRP 80	80M INVERTED VEE
OH	AA8RJ	16,310	87	13	0.5	40M	4	NN1G	SLOPING CAROLINA WINDOM
OH	KF8EE	15,400	54	10	1	L-2	3	SW-80	80' END FED WIRE @ 15'
OH	K8UCL	11,813	37	7	2	A-2	3.5	HW-8	ATTIC DIPOLES
OH	WD8RIF	5,159	67	11	5	40M	1.3	IC-735	135' DIPOLE @ 30'
OK	KJ5MG	43,023	143	23	5	A-4	3	HB TCVR EACH BAND	DIPOLE
OK	AB5UA	11,552	78	12	3	40M	3	EXPLORER II	BUTTERNUT VERTICAL
OR	AA7QU	79,120	256	27	1	A-2	4	SIERRA	YAGI, BISQUARE, INV VEE
PA	W3TS	125,320	209	32	0.3	A-5	3	HB TCVR, 80-40, 40-40	160M TEE, 80&40 INV VEES, YAGIS
PA	K3WWP	62,416	234	32	5	A-5	3.5	HB 6Y6 FINAL	RANDOM WIRE, DIPOLES
PA	N3RN	43,096	197	24	5	L-2	3	TAC-1, OHR CLASSIC	80M HORIZ LOOP, 40M DIPOLE
PA	WA3SRE	15,080	116	13	1	80M	4	ARGO 515	40M LOOP AS LONG WIRE
PA	N3LAZ	9,312	56	11	1.5	20M	3	HB VCO, PROGRESSIVE	G5RV
PA	W3DP	8,330	85	14	4	40M	2	CENTURY 22	G5RV
PA	KT3A	5,945	27	5	2	40M	1.7	NORCAL 40	ATTIC LOOP
PA	N3CZB	420	20	3	4	20M	2	MFJ-9020	INDOOR LOOP

QTF	CALL	SCORE	PTS	S/P/C	POWER	BANDS	TIME	RIG	ANTENNA	
AK	AL7FS	1,134	27	6	5	20	?	TS-440S	KT34@40'	Propagation
AR	W0LK	59,742	209	34	4	A-2	3	OHR CLASSIC	80M DELTA LOOP	
AR	KJ5TF	28,716	154	22	2	20M	3.5	GM-20	HALF SQUARE	
AZ	NQ7X	11,461	71	13	5	20M	1.5	OHR CLASSIC	3 EL YAGI	Got 1.5 hours
AZ	W7BXZ	9,044	76	17	5	20M	3	TEN TEC SCOUT	20M DIPOLE	
CA	W6ZH	72,820	236	35	3	A-3	2.75	SIERRA	KT-34XA, 40M2-EL@60'	Almost work
CA	K6QWH	47,250	225	30	3	A-2	4	ARGO 509	?	Well to start
CA	KI6SN	9,970	71	7	0.9	40M	1	NORCAL 40	G5RV	
CA	WA6AR	5,840	30	4	1.5	40M	1	NORCAL 40	CF ZEPP	I don't claim
CA	AB6SO	5,630	30	3	1.75	40M	1	NORCAL 40	40M FOLDED DIPOLE ON ROOF	
CA	W6EMD	5,525	25	3	5	40M	1	NORCAL 40	DELTA LOOP	

SPRING QSO PARTY

Date/Time:
April 12,1997, 1200Z through April 13, 2400Z. Work a maximum of 24 hours of the 36 hour period. CW only.
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.
Power Multiplier:
0 - 250 MW = X 15; 250 MW - 1 Watt = X 10
1 W - 5 W = X 7; Over 5 W = X 1.
Suggested Frequencies:

	GENERAL	NOVICE
160 Meters	1810 KHz	
80 Meters	3560 KHz	3710 KHz
40 Meters	7040 KHz	7110 KHz
20 Meter	14060 KHz	
15 Meters	21060 KHz	21110 KHz
10 Meters	28060 KHz	28110 KHz
6 Meters	50060 KHz	

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

Team Competition: Competition between teams consisting of 2 to 5 members will be a separate category apart from individual entries. Team members will be listed as individuals and the team score will be the total of the members' scores. The team captain must send a list of team members to the contest manager postmarked at least one day prior to the QSO Party.

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 10 scores, to the top score in each Single-band, Lo-band and Hi-band class, and to the top score in each class 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.

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 maters 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

HOOTOWL SPRINT

Date/Time: May25, 1997; 8:00 PM to 12:00 PM **Local Time**
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. The same station may be worked on more than one band for QSO points and SPC credit.
Power Multiplier:
0 - 250 MW = X 15; 250 MW - 1 Watt = X 10
1 W - 5 W = X 7; Over 5 W = X 1.
Suggested Frequencies:

	GENERAL	NOVICE
160 Meters	1810 KHz	
80 Meters	3560 KHz	3710 KHz
40 Meters	7040 KHz	7110 KHz
20 Meter	14060 KHz	
15 Meters	21060 KHz	21110 KHz
10 Meters	28060 KHz	28110 KHz
6 Meters	50060 KHz	

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

Entry may be All-Band, Single-, High-Band or Low-Band. Entry includes copy of logs and summary sheet. Indicate total time on the air. Include legible name, call, address and ARCI Number, if any. Entry must be received within 30 days of contest date. Highest power used will determine the power multiplier. Send an SASE for sample log and summary sheets. Include as SASE with your entry for a copy of the results

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

QRP ARCI AWARDS

Quarterly Awards Column by
Chuck Adams, K5FO

In this issue, I hope to complete the one thousand mile per watt awards and the worked all states awards in one fell swoop. Of course, ahead of time I have no idea just how much space the editor has, so I will limit this column to one page and whatever pages of the awards that Ron can add.

I apologize in advance for the amount of white space for the Worked All States summary, but there are a large number of vertical fields. All the data is interesting and all the data is presented here to allow everyone to check for their awards over the years and to let me know if you see any glaring errors. I will correct them and periodically I will read through the files (and there are a lot of files now) and double check. Data after a period of time does have a way of migrating it seems.

The columns for the worked all states award are the number, the call at the time the award was issued, the date of the award in the form of year—month—date as a single number for computer sorting, the number of states for the initial issue and columns for updates of 30, 40, and 50 states, the power level, mode of operation, frequency if single band award and a column for endorsements. We don't do endorsements for all combinations that the human mind can conceive.

Of the 380, 17 were done with two–way QRP, 58 were single band, and 185 were CW only with 40 for SSB only. N5DUQ has five WAS awards for five bands, thus the distinction of being the only such person to do so at this time.

In the paperwork that I have there was a change in the WAS program starting with the issue to Mike WA8MCQ for which there is no documentation. Before that time there were a number of WAS awards outstanding. If you have one dated before December 1969 I would like to get a photocopy for my records and any additional information that you may have. It is one of the historical pieces that I am trying to get by getting all Quarterly issues before 1984.

As a result of putting all the awards records on the computer I have been able to come up with some interesting statistics on the data that we do have. I will attempt to in the first issue of each year to give an up todate account of the one thousand mile per watt stats.

Here is a breakdown on the number of contacts by band and modes for the CW and SSB up to the end of 1996:

BAND	CW	SSB	AM
160M	9	3	0
80M	39	5	2
40M	226	11	1
30M	22	0	0
20M	357	58	3
17M	5	3	0
15M	388	80	0
12M	3	3	0
10M	130	106	27

Next month the WAC and DXCC awards and then back to just monthly updates.

dit dit de K5FO

NR	DATE	TO	POWER	WITH	POWER	MI	MI/WATT	BND	MDE	QSO DATE	
1437	940321	K6DWO	QRO	WJ7H	0.2	520	2,603	7	CW	940223	
1438	940325	WA9PWP	5	C91J	5	8,994	1,799	28	SSB	930327	2xQRP
1439	940325	AD4KS	0.5	N3ILC	QRO	844	1,688	7	CW	940221	
1440	940408	N3CLU	5	ZS4AE	QRO	7,800	1,560	21	SSB	940408	
1441	940426	KO4VO	3	SP3XP	QRO	5,035	1,678	14	CW	940426	
1442	940501	AA8HV	3.1	G3IAR	QRO	3,810	1,229	10	CW	930505	
1443	940514	KD8JN	0.01	CT4RL	5	3,719	371,900	28	CW	920926	2xQRP
1444	940601	IK2LEY	2.8	JJ3YBB	QRO	5,865	2,130	7	CW	940108	
1445	940620	N7RVD	2	ZL1MH	QRO	7,239	3,619	14	CW	930731	
1446	940620	N7RVD	2	JA7SSB	QRO	4,778	2,389	14	CW	920427	
1447	940625	WW9H	0.05	AA7UT	QRO	1,607	32,140	14	CW	950614	
1448	940625	WA5OJI	0.455	WA4VQD	QRO	630	1,380	7	CW	94----	
1449	940701	KF8FY	0.9	JJ3YBB	QRO	6,560	7,289	21	CW	930410	
1450	940801	HL9BK	2	KP2J	QRO	8,493	4,246	14	CW	920328	
1451	940801	HL9BK	1	LU8DZJ	QRO	7,432	7,432	21	CW	920218	
1452	940802	W5RYV	0.7	N4JQ	QRO	1,024	1,463	14	CW	940618	
1453	940802	W5RYV	0.5	WA0EDN/7	QRO	914	1,828	14	CW	940629	
1454	940803	DL6FBQ	0.5	WB3GOC	QRO	4,239	8,478	21	CW	931018	
1455	940808	G0IFK	39.9uW	K1RM	5	3,217	80,465,232	21	CW	910519	2xQRP
1456	940809	KU7Y	0.25	N7CZF	QRO	375	1,500	14	CW	830829	
1457	940825	J3/G0STR	2	ZD8M	QRO	3,541	1,270	14	CW	940110	
1458	940825	J3/G0STR	2	9G1SD	QRO	4,059	2,029	14	SSB	940110	
1459	940825	J3/G0STR	2	G3TMA	QRO	4,380	2,190	14	CW	940110	
1460	940825	J3/G0STR	2	DJ1FH	QRO	4,705	2,352	14	CW	940110	
1461	940825	J3/G0STR	2	ON4ANT	QRO	4,536	2,218	14	CW	940108	
1462	940905	WB9OMC	5	7P8EB	QRO	8,758	1,752	28	SSB	921213	
1463	940925	G0UTB	2	NY3C	QRO	3,582	1,791	14	SSB	940908	
1464	Not Issued/Not Paid For										
1465	941017	N0OCT	4	LU6VCD	QRO	5,452	1,363	21	CW	940201	
1466	941021	VK4FV	4	XE1/KC5APT	QRO	7,926	1,982	14	CW	940404	
1467	941021	VK4FV	4	NK5BEG	QRO	8,740	2,185	14	CW	940404	
1468	941021	VK4FV	4	FE5VV	QRO	10,584	2,646	14	CW	940828	
1469	941027	N4JEO	0.25	KB5TYW	QRO	722	2,888	14	CW	940925	
1470	941028	OE6BMG	1	VO1LT	QRO	3,006	3,006	14	CW	930827	
1471	941101	N2JNZ	0.25	KE4OFN	QRO	493	1,972	7	CW	940210	
1472	941101	N2JNZ	0.25	KA1UQT	QRO	333	1,332	7	CW	941002	
1473	941124	KK6QS	4	BV7WB	QRO	6,488	1,612	14	CW	930707	
1474	941124	KK6QS	4	DL1DQP	QRO	5,581	1,395	14	CW	930823	
1475	941124	KK6QS	5	EA8LZ	QRO	5,896	1,179	21	CW	940219	
1476	941124	KK6QS	5	ZL2GH	QRO	6,543	1,309	21	CW	940202	
1477	941124	KK6QS	4	CE2LZR	QRO	5,918	1,479	14	CW	930813	
1478	941125	JR6XXI	2	N6AW	QRO	6,451	3,225	24	SSB	920208	
1479	950125	N7TAU	2	JA2FJP	QRO	4,935	2,467	18	SSB	941121	
1480	950130	KJ5YF	1	TI5NW	QRP	1,500	1,500	14	CW	941203	
1481	950205	AA4XX	221uW	KA3WTF	5	452	1,909,502	7	CW	951226	
1482	950205	KA3WTF	5	AA4XX	221uW	452	1,909,502	7	CW	951226	
1483	950224	K9IQP	5	VK6HQ	QRO	10,944	2,189	10	CW	950208	
1484	950227	G0DTQ	4	VK2PP	QRO	10,848	2,712	14	CW	950227	
1485	950718	WB4JJJ	2.5	OK1XJ	400	4,318	1,727	7	CW	950605	
1486	950606	WA9JNO	1	WP4CTD	QRO			28	SSB	941217	
1487	950606	WA9JNO	1	VE7WW	QRO			21	SSB	941219	
1488	950818	KA6SGT	2	7M1KEN	2.5	5,130	2,565	14	CW	930404	
1489	950911	KT3A	0.95	K5FO	0.95	1,222	1,286	10	CW	950808	
1490	951020	KO4AJ	0.7	PY7FNE	4	4,700	6,714	10	CW	930419	
1491	951027	KC1DI	80MW	K3JA	QRO	317	3,962	7	CW	951013	
1492	951101	AB6DG	2	AL7QC	QRO	2,344	1,172	7	CW	950830	
1493	951101	AL7QC	QRO	AB6DG	2	2,344	1,172	7	CW	950830	
1494	951109	KF6MP	1.5	ZL1MH	QRO	6,360	4,240	7	CW	940930	
1495	951115	KE4OOW	1.25	I2YSB	QRO	4,505	3,604	10	CW	950823	
1496	951115	I2YSB	QRO	KE4OOW	1.25	4,505	3,604	10	CW	950823	
1497	951130	W9MSE	5	VK9NS	QRO	8,162	1,632	18	CW	940818	
1498	951208	KN1H	0.25	W3TS	0.25	315	1,260	1.8	CW	951203	
1499	951208	W3TS	0.25	KN1H	0.25	315	1,260	1.8	CW	951203	

NR	DATE	TO	POWER	WITH	POWER	MI	MI/WATT	BND	MDE	QSO DATE
1500	951209	WB8MWR	4	VK3BYE	QRO	9,895	2,473	14	CW	930320
1501	951215	K9BXG	5	S79MX	QRO	8,996	1,799	14	CW	911023
1502	951215	VE3uWL	5	ZL1ATW	4	8,710	1,742	14	CW	950820
1503	951218	JA1TCV	.5MW	7M3VQJ	3	4.8	9,600	432	FM	951125
1504	951218	7M3VQJ	3	JA1TCV	.5MW	4.8	9,600	432	FM	951125
1505	951218	WA9MPY	1.29	N6DHP	100	1,708	1,324	14	CW	810308
1506	951220	AB5TV	0.9	AH6AQ	QRO	3,875	4,305	21	CW	951203
1507	951220	VA3JFF	1	KB5HRS	QRO	1,591	1,591	21	CW	951105
1508	960112	GW0KZW	3	K5LP	QRO	4,500	1,500	21	CW	950219
1509	950212	KF9UJ	5	VK2KM	QRO	11,089	2,217	14	RTTY	951119
1510	960212	KB3APN	2	EA5CAQ	QRO	3,952	1,976	14	SSB	940313
1511	960317	WB5QMP	2	KN4QV	5	2,024	1,012	7	CW	960226
1512	960416	WB4ZKA	1.5	AE4IC	3	1,823	1,215	7	CW	960111
1513	960416	WB4ZKA	1.5	N3KFL	5	1,823	1,215	7	CW	960111
1514	960416	AE4IC	3	WB4ZKA	1.5	1,823	1,215	7	CW	960111
1515	960416	N3KFL	5	WB4ZKA	1.5	1,823	1,215	7	CW	960111
1516	960420	WB4ZKA	1.5	N1QQV	5	2,211	1,474	7	CW	960315
1517	960420	N1QQV	5	WB4ZKA	1.5	2,211	1,474	7	CW	960315
1518	960420	WB4ZKA	1	KC1FB	5	2,170	2,170	7	CW	960315
1519	960420	KC1FB	5	WB4ZKA	1	2,170	2,170	7	CW	960315
1520	960421	AC6LS/KH6	2	W1CW	QRO	4,635	2,317	7	CW	950907
1521	960421	KS4XS	1	AA7KF	5	2,013	2,013	14	CW	951203
1522	960421	AA7KF	5	KS4XS	1	2,013	2,013	14	CW	951203
1523	960421	KG2DP	0.9	DL2BWG	QRO	4,075	4,528	7	CW	960309
1524	960421	DL2BWG	QRO	KG2DP	0.9	4,075	4,528	7	CW	960309
1525	960421	KA3OHV	5	JJ1CRL	250	6,751	1,350	21	CW	921121
1526	960421	KA3OHV	5	LU8ABN	QRO	5,249	1,059	21	CW	921121
1527	960421	KA3OHV	5	LU4FFG	QRO	5,057	1,011	21	CW	921121
1528	960421	KA3OHV	5	LW2DFM	QRO	5,340	1,068	21	CW	921121
1529	960509	DK6NC	4	VK3MR	QRO	11,021	2,755	7	CW	960318
1530	960524	N2JNZ	50MW	AA3LM	100	330	6,660	7	CW	960316
1531	960527	N9UKX	1.2	P40MR	100	2,346	1,955	18	SSB	960314
1532	960527	P40MR	100	N9UKX	1.2	2,346	1,955	18	SSB	960314
1533	960621	WB4ZKA	1.5	WO3B	5	2,005	1,336	7	CW	960315
1534	960621	WO3B	5	WB4ZKA	1.5	2,005	1,336	7	CW	960315
1535	960707	KK5RO	2	NL7SA	QRO	2,890	1,445	7	CW	960405
1536	960801	KE6IZK	1.5	N2DCP	100	2,040	1,360	21	CW	960127
1537	960812	WX7M	5	JF3EIU	5	5,300	1,060	28	SSB	930212
1538	960910	PA3ASC	1	JA5NSR	100	5,718	5,718	21	CW	810502
1539	960916	HB9US	5	ZL2AGY	100	11,620	2,324	10	CW	950805
1540	961025	K8IDN	0.2	N2GEK	100	504	2,520	7	CW	960519
1541	961025	KE4JFS	0.5	N2QAC	1	700	1,400	50	SSB	960713
1542	961025	KG2DP	5	VK6APZ	QRO	11,411	2,282	7	SSB	960721
1543	961025	K5HT	3.5	S92SS	100	6,866	1,962	18	CW	960401
1544	961025	K5HT	0.2	WR3O	100	505	2,545	7	CW	960804
1545	961026	WA3NSR	0.235	KE4LIA	2.5	496	2,110	7	CW	960818
1546	961108	AA0SM	0.25	N9DD	1.5	354	1,416	7	CW	960921
1547	961112	JA2BCQ	0.6	KC6CNV	100	5,416	9,348	7	CW	960505
1548	961112	KB2TEO	2	DJ5GG	100	3,975	1,987	14	CW	961001
1549	961112	DJ5GG	100	KB2TEO	2	3,975	1,987	14	CW	961001
1550	961201	W1VT	155uW	WB1FKF	QRO	37	238,700	5760	SSB	960622
1551	961205	JI3GYF	3	DL3OI	100	5,600	1,800	21	SSB	941016
1552	961207	AC4ZO	0.7	EA8QJ	100	3,715	5,307	14	CW	961201
1553	961215	JS1KLS	2.5	JR2IBC	0.005	64	8,003	50	AM	960810
1554	961215	G0TLE	0.5	IK4MEC	0.5	857	1,714	14	CW	961017

END OF 1996

WAS NR	CALL	DATE	STATES	30	40	50	POWER	MODE	FREQ	ENDORSEMENTS
1	WA8MCQ	691209	46							
2	W4UM	691209	50							
3	K6EIL/2	700311	20							
4	WA6ABP	700521	30							
5	WB4GOR	700621	20							
6	WA8DDI	701130	50							
7	WA4QXC	710111	40							
8	W7BBX/4	710111	20							
9	WA9HYX	710306	40							
10	W6JXH	710308	30							
11	W5TVW	710424	20							
12	W5TVW	710424	20							
13	K6AAW	710528	20							
14	W6IEU	710709	45							
15	WA1CYT/4	710826	20							
16	WA5ZBN	710909	20							
17	W0NTW	711108	20							
18	K8BHG	720719	50							
19	WB4MKB	720719	20							
20	WA6DKD	721030	45							
21	K2VIV	721030	20							
22	WA6KGB	721221	40			820801		SSB		
23	W2GSZ	730131	30							
24	K4FPF/0	730209	20							
25	W4KFB	730327	40							
26	WA8KNE/6	730420	20							
27	WA6DKD	730519	20						14	
28	WA6DKD	730519	20						21	
29	K6GKU	730618	50							
30	WA2FIQ/1	730618	20							
31	WB4TNB	731027	30							
32	WA6KGB	731112	26						14	
33	WA6KGB	731112	27						21	
34	WA6KGB	731112	35						7	
35	K4FPF/0	731112	50							
36	WN2TLQ	740330	35							
37	WA1OFP	740429	50							
38	WB0CGJ	740604	33							
39	WB9HPV	740810	20							
40	WN8PJR	741113	20							
41	W8ILC	741122	20							
42	WA8KNE/6	741114	40							
43	WB8SFZ	741215	50							
44	W7DJU	741222	50							
45	WB4BUL	750211	45							
46	WB9HPV	750220	30						7	
47	WB9HPV	750220	20						14	
48	WB2TEN	750316	20							
49	WA0AGN	750504	30							
50	WA4BUJ	750606	40							
51	WA2RHA	750825	30							
52	WA5DGI	760123	30							
53	WA2JOC	760823	50							
54	WB5QYH	761108	40							
55	K6GKU	761115	50							
56	KYGKU	761206	50						14	
57	W8ILC	770207	50							
58	WB4ZOJ	770216	20							
59	WA4IAR	770605	20							
60	WB8YUU	770822	20							
61	2A3ZXK	770822	20							
62	WA2ZWH	771023	50							
63	K3NS	771028	20							
65	K6GKU	771102	50						7	
66	WB2RVF	771212	20							
67	WB8BHU	771228	20			820130				
68	K6GKU	780106	50						28	
69	G6BUE	780124	20			810401		CW		
70	WB0RSW	780202	40							
71	WD9APY	780204	20							

The Last Word

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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.

Material cannot be returned unless accompanied by sufficient postage.

The act of mailing a manuscript constitutes the author's certification of originality of material.

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The opinions of the authors

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

de **Ron, KU7Y**

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