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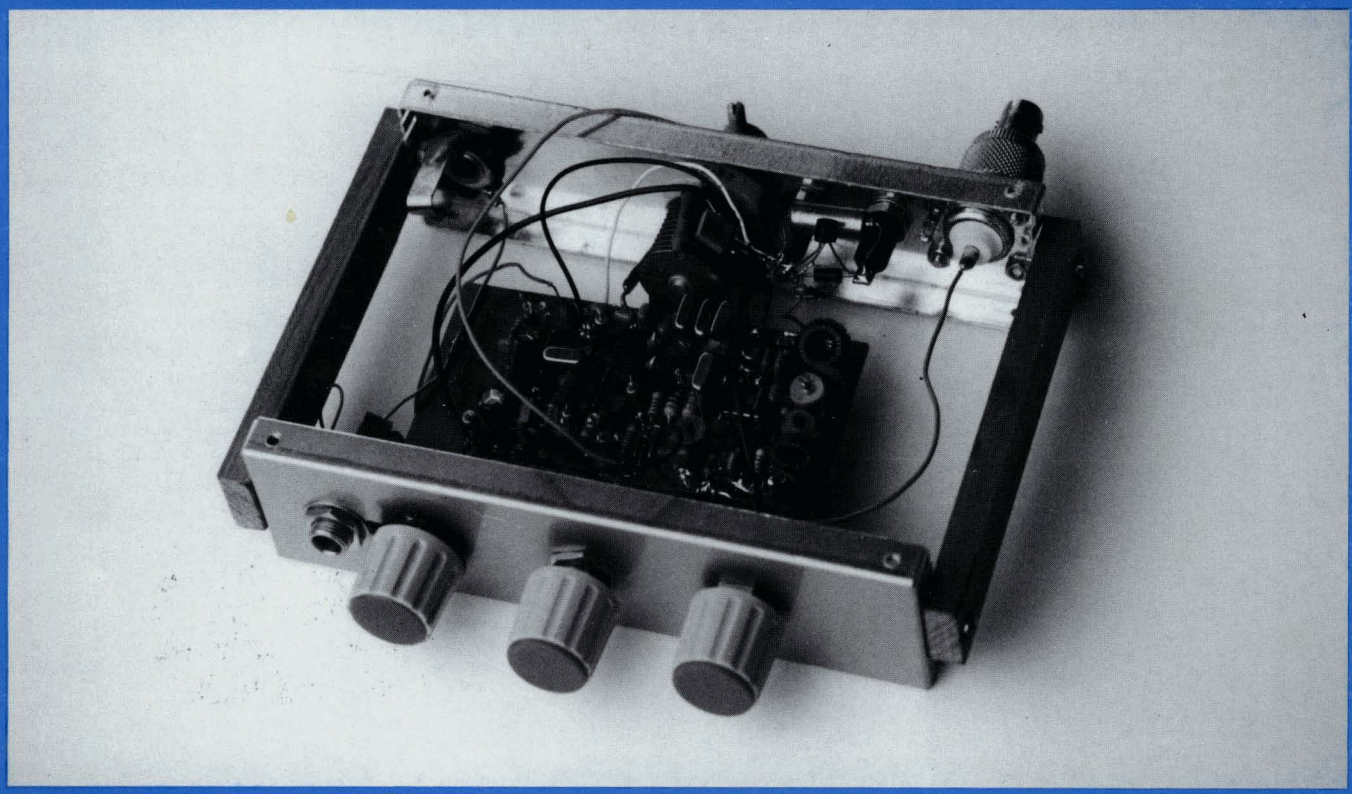

The cover photo contest winner this issue is Guido Giannini, HB9BQB. Here is Guido's answer to the problem of what to do with that new rig while you test it before you put it in the final enclosure. He uses an old rig case and now has room to work, with no worry about shorting it out on wire trimmings and etc. Plenty of room for test leads too!

You too can win a one year membership or renewal to the QRP ARCI.
Just send your entry photo for the cover picture contest to the editor at the address on the back cover.

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.

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73 TO W1FB

By now everyone has probably heard of the passing of Doug DeMaw, W1FB, in late September. Most QRPers have heard of him, but for the benefit of those who haven't, or to whom he's little more than a name on a book you might have, here's the deal--while not specifically a QRPer, Doug was one of the most prolific technical writers in ham radio, leaning heavily toward homebrewing and experimenting. He served on the ARRL staff from 1965 until retirement in 1983 and had a large influence in the technical department, which he managed, and was also the Senior Technical Editor for many years.

The December 1997 issue of QST said that he wrote "hundreds" of articles for QST and other publications, and that's literal, not hype! In my review of one of his books in the April 1992 issue of the QRP Quarterly, I mentioned that I had checked a 12 year stack of old QSTs to see how many articles had his name on them. Out of those 144 issues alone, he had written 159 articles! And after departure from Newington, he continued to write for QST, CQ and Monitoring Times.

Although not everything he wrote was of direct interest to QRPers, a great deal of it was. He wrote about simple transmitters, receivers, test equipment and station accessories. Many a QRPer has benefited from something or other that Doug wrote over the years. When I got back into ham radio in 1986 after a long absence I was fortunate to have access to all the old QSTs, and I spent a considerable amount of time reading and studying his many projects.

Doug wrote many books of interest to QRPers. These include Solid State Design for the Radio Amateur, which has become the de facto QRPers technical Bible, co-authored with W7ZOI; W1FB's QRP Notebook (two editions); W1FB's Design Notebook; W1FB's Antenna Notebook; The ARRL Electronics Data Book; and Ferromagnetic Core Design & Application Handbook (originally published by Prentice Hall and now reprinted by MFJ).

After his retirement to Michigan, Doug started Oak Hills Research, which he sold several years ago. (He was also elected as country commissioner, and on his death the local flags were flown at half mast for a week.) Doug had a number of interesting non-ham hobbies as well; one of those was dressing up in buckskins and shooting muzzle loading guns. (My thanks to W7AAZ for putting me in touch with W4ZCB, a friend of the DeMaw family who obtained a picture of Doug from W1CER, Jean DeMaw, his widow.)

Doug DeMaw was inducted into the QRP Hall of Fame when it was started up in 1992. Being on the Board of Directors at the time, I was one of the voters and when presented with his name my answer was an immediate and emphatic "Absolutely!" Voting for him was a no-brainer! I know of no one who has made a more lasting impression on homebrewing and QRP than the late, great W1FB and he will be missed. As WB5HQO said in the announcement in QST, "The world of ham radio has lost one of its giants." --qrp--

LAST CALL FOR QRP HALL OF FAME

As announced in the October issue, we are now accepting nominations for the QRP Hall of Fame for 1998. The deadline is the end of January. If you would like to nominate someone, please send me your nomination letter, and include a paragraph or two about them, giving justification and rationale why they deserve to be inducted into the QRP Hall of Fame. The October issue had a list of those who are already in the HoF and do not need to be nominated again. Nominations can be made by QRP ARCI members only, since this is a club award, but people need not be a member to be nominated or inducted. You can send it by e-mail or USPS, but if you don't get an acknowledgement back from me in a few days, please assume that I never got it and try again. I don't want to see anyone lose out on a chance to be inducted because someones nomination letter was never received! (My addresses can be found elsewhere in this issue.)

NORCAL/DAYTON BUILDING CONTEST

Wayne Burdick, N6KR, has come up with a very interesting theme for this years Dayton building contest, sponsored by the NorCal QRP Club. The idea is to build a transceiver using no active devices other than 2N2222 transistors--and no more than 22 of them! Details can be found in the Idea Exchange in this issue, but if you're on QRP-L you've known about this for quite some time. By the way, I checked the rules carefully and there is no requirement that the 2N2222's have leads, so mine will be surface mount.

If you aren't already a member and subscriber, you owe it to yourself to join NorCal and subscribe to their excellent quarterly, QRPp. It's currently $15 per year, first class to US/Canadian addresses ($20 per year for air mail to DX), and completely stuffed with good QRP info! To join, write to Jim Cates, WA6GER, 3241 Eastwood Rd, Sacramento CA 95821. They request that checks be made out to Jim Cates, not to NorCal.

"THE JOY OF QRP" IS BACK IN PRINT!

To keep the Presidents Notes from becoming too commercial, info on this was placed elsewhere in this issue as a new product announcement; but I did have to mention that it's back! This is just about THE number one QRP book classic; it's been out of print for years but is now available again. If you have any questions, ask the old timers if it's any good! **--qrp--**

FROM THE EDITOR
Monte "Ron" Stark, KU7Y

Here it is, time to write again. We have had our first snows in the mountains and even had a light dusting here in the valley once. That can only mean one thing. Winter is here. Time to really get all the outside projects into high gear. The first reports from using the new antenna are "GREAT". It also has me playing around with QRPp. Worked **Alan, KB7MBI** with 35 mW the other night and even worked a JA8 with 70 mW. However, having a nice antenna on a tower does have another side. When the wind blows, you worry! A few days ago we had a wind come through here that had gusts a little over 70 mph. Watching the antenna was interesting. There was no bouncing around like I have seen my trapped antennas do in the winds. This **Force 12** just bends. No shaking or bouncing at all, at least not yet.

The part that looked bad was the antenna moving around about 10 degrees and banging against the rotor! It didn't take much of that to break the old rotor. But it was 11 years old and a bit too small for this antenna. I was just hopping that it would last until summer. Ordered the new rotor out of Texas and had to pay for some hurry up shipping to get it here before Thanksgiving. Without going into too much detail let me just say that Rohn 25G gets very crowded with three, five gallon buckets and a tool bag hanging from it! Every time you need to move you have to change how you have the safety belt. It's either under this, through that or caught behind something else!

About the time I got the old rotor out, the wind started blowing. I got the rotors changed, beam aligned and all the wire splicing done. By the time I got back on the ground my feet, legs, arms and hands were cramping and I was shivering so badly I could hardly talk. You sure do pay for antennas in more ways than one! Then it was inside to warm up and hook up the new rotor control. Plugged in the power cord, hit the switch and bingo- it worked right the first time. Later I listened to some of the bands to see what was going on with the contest (CQWW CW). The antenna was still working fine. All that free turning for a few days didn't seem to hurt the feed lines at all. Then it was time to get back to visiting with the family.

While my son was helping me with the tower work, my son-in-law was doing the framing in the little apartment. All I need to do now is buy (Not more stuff?) a counter top to put on the nice frames he made. One is for the reloading equipment and the other is for the radio "stuff". The radio position is ten feet long and will be about thirty-two inches wide. There should be more than enough room for a single operating position with two radios and the computer.

Paul Harden, NA5N made it out for a visit on the way to PacCom. We had a super time and he even got to look over my playpen here at work. Then we went over the hill to the big event. Look for the article by **Joe Gervais, AB7TT** elsewhere. Super event! **Chuck *Adams*, K5FO** and I did a little show and tell on how to operate in the ARRL Sweepstakes CW contest. Be sure to ask **Chuck** about mode "A" keyers. **Chuck** and I also mentioned our little side bet for this contest. The looser has to buy the winner dinner. Last year I lost and **Chuck** told me to take my wife out instead of him. This year, I told him to take his wife out instead of me! Yes, I managed to get the bragging rights for this year. It was my 86K to his 80K. We are all even at one to one. Next year it's gonna get ruff. (I plan to have more antennas up but don't tell **Chuck**.)

Good to see the high bands coming to life. For those of you who haven't seen ten and fifteen meters when they are "open", get ready for a wild ride. After the kids/grandkids left for Idaho, I worked a few stations in the CQWW. It's been a long time since I heard that many stations on those two bands.

I want to congratulate all those QRPers who had fun in the ARRL Sweepstakes contest. On the Internet mail list, QRP-L I noticed that there were no negative comments about the contest this year. Last year there were those who even thought there should be speed limits in CW contests. This year people were talking about how much better they were doing and that there were very few stations they couldn't copy. It might taken a few tries listing to the exchanges being sent but they were getting it all down OK! Some even recorded the exchanges of the faster stations and played the tape back at a slower speed to make sure they copied everything right. Every time I read one of these posts, I feel good. It tells me that there is a good future for amateur radio.

Have you ever read the **National Contest Journal**? This is published by the **ARRL** and has always been thought of as only for the hard core, super duper contesters. The new editor, **Dennis, K7BV** is trying to change that. I have agreed to do a column about the little contests we have. I call it "Contesting for Fun". What I want to show the world is that contesting is not just big super station games, but that there are a lot of smaller contests that are just plain fun! I mention it here only because it is promoting QRP. I will be looking for all the stories about QRP contesting I can get. It is another place to show the world and the ARRL that there are a lot of QRPers out here and that we like lots of different things!

I'm running about 3 days late getting this edition put together. If all goes well, this issue will arrive in a new color cover. Let me know what you think of it!

All the best to you and yours this holiday season and throughout the entire year. de Ron, KU7Y

NEW ASSISTANT EDITOR JOINS THE STAFF

I want to welcome our new assistant editor to the team. It is none other than that famous **AZ ScQRPion, Joe Gervais, AB7TT**. Joe has already been helping me with input to the **NCJ** and it was easy to con..... ops, I mean it was just natural for me to ask him to come on board here.

He told me he could read and write. I said to stop right there because that was more than enough skills to qualify as an editor!

When I asked Joe what he wanted me to say about him, he said "Ron says that after I finish my share of the QQ work, he'll even let me whitewash his fence for him - cool!" What Joe may not realize is that we have at least a half a mile of board fence that sure could use a nice whitewashing!

Joe's job, along with the fence painting and tower climbing, is to learn my job. Should anything ever happen to me, I would like to see the Quarterly continue without any major upsets. He had done a fine job of editing the article about RFI and will be doing more and more as time goes by.

Please give Joe a big welcome. His addresses are listed on the back page with the rest of us worker bees. Thank Joe! de Ron, KU7Y

The NorCal 2222 Design Contest

Wayne Burdick, N6KR

Introduction

The object of this contest is to build a ham-band transceiver using only one kind of active device, the venerable 2N2222 NPN transistor. NPN transistors can function at all stages of a radio--oscillators, RF or AF amplifiers, mixers, switching and timing circuits--and you get to use up to twenty-two of them!

Specifically encouraged is out-right theft of existing circuits to build the transceiver. In fact, you don't necessarily have to design a thing; if you want, just glue together existing circuits. But do it with style!

This contest will appeal to those who are all thumbs, since the finished rigs will NOT be judged by appearance or construction technique, just by what they do and how well they do it. The winner will have the honor of having his or her design named the official "NorCal 2222 Transceiver"! There will of course be tangible prizes, too, and there's always the possibility that the winning design might become a NorCal kit.

Rules

1. The 2N2222 is the cockroach of NPN transistors: no matter what happens to us or to the planet, you'll still be able to find them in huge quantities. Your task is to use these ubiquitous parts to design a radio for a post-apocalyptic world; a radio that could be built in any country, no matter how remote it may be from Silicon Valley.

2. You may use up to twenty-two (22) 2N2222-family transistors, including the 2N2222, 2N2222A, PN2222, PN2222A, exact NTE equivalent, etc. You can use as many other electronic and mechanical components as you like (including diodes), as well as any kind of packaging. But DO NOT use ICs, other transistor types, or mixers such as the Tuf-1 or SBL-1 etc.

3. Feel free to incorporate parts of published circuits into your design. Cite all references used, and try not to "borrow" more than 25% of your design from any single article. Also let us know which circuits you designed from scratch, or modified, and explain what you learned or observed in the integration process.

4. The transceiver may operate on any ham band(s) and any legal mode(s), but must meet FCC regulations.

5. For each design you submit, please provide the following:

A. Working prototype of the design

B. Complete, readable schematic on one 8.5" x 11" page

C. One-page, typed description of the design, including operating instructions

D. Results from your own bench tests

Judging

Entries will be judged strictly by how creatively the designer applied the 2N2222 in his or her design. Entries will be NOT be judged by appearance, construction techniques, finish detail, etc., nor on how many 2N2222's were actually used. (For example, the judges will not be impressed by the use of a 2N2222's base-emitter junction as a simple switching diode.)

In general, performance of the radio will be inferred from the schematics and from the test results you supply. However, those rigs that are deemed safe to operate may also be tested on the air using real antennas. (If the judges have a lot of fun with your radio, it can't hurt your chances. If they fry their power supply and get dirty faces from exploding electrolytics, it *will* hurt your chances. Since you never know who might be judging--we certainly don't--try to make your radio foolproof!)

Entries will be judged at 8:00 PM Saturday night at Dayton 1998 at the Day's Inn Dayton South in the QRP Hospitality room.

Have fun! 72, Wayne

This contest is sponsored by NorCal QRP Club and the decision of the judges chosen by NorCal is final.

1998 QRP to the Field Contest
BORDER OPERATIONS

Doug Hendricks, KI6DS/M0BIV

The theme for the 1998 QRP to the Field Contest is "Border Operations".

The Jalopeno Pepper Gang thought this one up at Fort Tuthill. The idea is that we want to encourage everyone to operate from a state border, or even where 3 or 4 states come together. (Of course there is only one place in the US that has 4 states that come together, and that is the 4 corners area. There will be a 4 Corners Special Operation for the contest sponsored by the Arizona and New Mexico QRPers.)

In order to have the qso qualify for ARRL WAS consideration, reports will have to be sent from each state of operation. If you work a station on the Kansas/Nebraska border, the station would send you a report from each state, i.e. 579 KS, 579 NE. You would get credit for 2 states and 2 qso's, he gets credit for your 1 state, but gets to count it as 2 qso's. Should be a lot of fun. Start the planning now, the date is Saturday, April 28th and the time is 1600 to 2400 Zulu.

Also, we have a new contest manager for this year's contest, Joe Gervais, AB7TT. Joe has agreed to take over from Bob Farnworth, WU7F who has decided to step down. Bob did a great job getting this contest off the ground, and I would like to thank him for his efforts. Hope to see you in the next one, Bob. Joe will be posting an official contest announcement with rules, etc. soon on the list and with all the journals and magazines. 72, Doug

Incoming Mail

Compiled by Monte "Ron" Stark, KU7Y

Hi All,

Although we only corresponded, I was sadened to learn of the death of Bruce Williams, WA6IVC, of MXM Industries and contributor to now defunct Hambrew Magazine. I have one of his early Simple SuperRX receivers mounted in an old LaFayette VFO case to conceal the fact that I even listen to 40M, but when I pulled the reviews of his later products, the transceivers, I noted a recurring theme.

"A fun project during assembly," said Doug DeMaw, (CQ, June 1995, p 27); "Easy to build" echoed 73, (Nov. 1994 p. 32) and Radie Fun, a magazine aimed at Novices, called the RX I have "Easy to Build" too (Nov. 1991). Those are not adjectives one hears about later projects aimed at beginners. "Requires considerable experience," and "over 10 torodials" are what we here now. The back-packing progenitors of ham radio microscrospy have taken us up to the door of surface mount now, I thought as we drove home from church Sunday and saw a rare sight: a 1960 Ford Falcon, green of course.

This may have been the famous Sunday Driver out in a 30+ year compact, but the Falcon taught a lesson back when and now. Introduced just one year after Cadillac tail fins reached their apogee, the Falcon was for a while the symbol of common sense, but within a decade they had V8s and padded roofs, so maybe that is the way of commercial technology. Maybe a simple product just cannot long endure. There is sitll K6LMN, Roger in California, who offers much the same as Bruce did and some of Kanga's offerings, (certinally not the Hands stuff) are OK for the beginner or someone without a hair shirt, but we discourage those things.

Build a DC receiver like Ten-Tec's masterful 1056? It is a good idea, but we tell folks "DCs are no good," and NN1Gs great quote: "You can build a transceiver for just about as much trouble as a DC RX." Maybe that is so, but can a newcomer get one going, assuming they can borrow a comparison microscope to place the parts? How many of these things ever go back packing anyway? Maybe one for every 5 or 6 abandoned boards? Hamfest types know they will often find a DX-20 or a Knight TX that was never finished, and can we assume our first timers are better than the children of the duty driven 1950s?

But maybe it does not matter. We have decided by degrees to make ourselves the haven of short call Extras. The move to output power was such a step as is how we blythly advoctate milliwatting for Novices, forgetting that Ade Weiss came to us after owning a Globe Champion. It is just like the old Navy saying: "I'm aboard Mister, pull up the ladder." Michael, AB5L

Hi Michael, Your letter is good food for thought. Thanks, ed.

Hi Ron,

Excellent issue, keep up good work. Glad you got tower up. Want to express appreciation for W6TOY's article including comment about QRP is religion or not. I appreciate my minimalist operators, but, as hobby, don't need to be just like them. I do mostly CW, lots QRP, but occasionally keep love affair active with boat anchors, run'em stock. Don't apologize for your beam/tower. Enjoy, enjoy, anyway, tnx again, for good job, Dave K8BBM #6354

Thanks Dave, With the crew I have, editing the Quarterly is easy! ed.

Hi Cam

Every time I make out a contest report, even my small one, I can"t help but appreciate the magnitude of the job that you and the rest of the volunteer officers of ARCI are doing for we, the rank and file. A sincere THANK YOU! and 72 Bill, K3AS

Hi Bill, Thanks for the kind words. But it's all the members that really make everything happen. Without you there would be no QRP ARCI to need a Quarterly. I thank you for your support! ed.

Hi Ron,

Just a short note to say how much I enjoy the Quarterly. I was speaking with Bruce, W6TOY the other day and mentioned the only thing as good as sex for a 50 year old like me is the day I get the Quarterly! Thanks again for your dedication, Craig Sterling, AA3MD

Hi Craig, Hmmmmm, I ani't gonna say anything! ed.

Hi Ron,

I just read about the death of Bruce Williams, WA6IVC, from MXM Industries. Many of you know Bruce's articles in Hambrew journal, and some of you enjoy many of his kits. But I keep a letter he sent me with a very special message. I quote: "... I spent a number of years playing pelota (we call it Jai Alai) in the Fronton in Tijuana, Mexico. This was many years ago. The professional pelotaris refused to speak English with us, so we had to learn spanish and a smattering of Basque. It's all gone now, after 50 years."

I can tell you that's an amazing coincidence. No one in his right mind would think of someone called Bruce Williams, living in Texas, and selling QRP kits to be a 'professional Jai Alai player". Not me! This is a small world..

Anyway, Bruce jauna, agur eta goian bego Jon, ea2sn

(P.S. The Basque words, which at some time Bruce knew, means: "Sir, good bye and be in heaven")

Later on I got an e-mail from Bruce, W6TOY, who wrote me that Bruce was his best friend on Earth and enlightened me on more of Bruce's career. Aside from been a professional Jai Alai player, he spent some time as a commercial fisherman, professional debt collector, and General Manager of Swan Radio circa 1963, as well as product review editor for QST and, later on, QST's advertising manager. Lot's of different things for a really fascinating man. Dr. Jon Iza

Unless specifically requested that it not be published, any letter, note, etc. received via any means, by the editors and or 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.

Hi All, Got something you would like to say? Something you would like us to do? Articles you want to see? Remember, this is your magazine. Let me know what you want. E-Mail to; ku7y@sage.dri.edu And thanks for all your support. ed.

QRP Really!

QRP WISDOM FROM UNCLE BRUCE

Bruce Muscolino, W6TOY
P.O. Box 9333,
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We are all diminished

Humanity, it is said, is diminished by the loss of even one of its members. QRP is no different, except that we are a smaller community. We have lost one of our best and are in proximity of loosing another. Doug DeMaw is dead; long live Doug, through his works and deeds. Bruce Williams is also gone, God bless you Bruce, thanks for all the fun.

Doug DeMaw.

Who among us, in fact who in amateur radio has not heard of Doug DeMaw, W1FB. Throughout his life Doug was an avid ham and went to great length to communicate his enthusiasm for the hobby. Employed for many years at The America Radio Relay League, Doug continued to pass along his knowledge, experience, and enthusiasm to us all. Doug, all by himself, was responsible for starting an entire generation of QRP enthusiasts with his Tuna Tin 2 and helping it grow with subsequent projects he brought us through the pages of QST.

I met Doug only once, in Dayton, in 1991 or 1992. The QRP ARCI had the top floor (or two) of the old Belton hotel downtown. They had a hospitality suite that was full of people and equipment, and a few vendors. Doug came with some of his books to sell (real treasures), and, I think, one of his projects from QST to show off. Bruce Williams introduced us. Bruce was the last QST editor to handle Doug's work. Doug was most gracious and listened without boredom as I recounted the list of his projects I'd built and enjoyed. I'll miss him, we'll miss him.

By the way, one of Doug's projects came to visit Mike Czuhajewski, WA8MCQ, and me at a hamfest in Timmonium, Maryland, a few years ago. Ed Hare, W7TVI, the League's laboratory head, and TVI guru, waa coming down to give a lecture, and in keeping with the Maryland Milliwatt policy of entertaining visiting QRPers, I invited him to have dinner the night he arrived; Mike came along. At dinner we had a small "show and tell", something Maryland Milliwatts excel at, and Ed surprised us by saying he'd brought something too. He dug into his pocket and pulled out THE ORIGINAL TUNA TIN 2. Of course, after marveling at it we asked where he got it. He told us it had apparently been stolen, or misplaced from the ARRL's museum display during some renovation, and he found it in a dollar box under a table at a local hamfest. He bought it thinking it was a well done copy, until he compared it carefully to the QST article. He had it, number 1! Sure won't forget seeing that radio!

Bruce Williams

Bruce Williams is one of those behind the scenes people in ham radio. Bruce was licensed in the late 50s or early 60s as WA6IVC. His career spanned both amateur radio and aerospace electronics. I met Bruce when he foolishly hired me as a technical writer at Lear-Siegler Astronics Division in Santa Monica. Lear manufactures automatic flight control systems for commercial and military aircraft. Bruce was the head of Publications at the time.

Bruce was also an avid ham. He'd been actively involved in the ham radio industry almost from the moment his license dropped through the mail slot in the door. Bruce came into the industry through a technical manual he wrote for Fauss Gonset for what became, I think, the SBE-33. He was Herb Johnson's first General Manager at Swan, in the early days of SSB. Then he left his childhood behind and went into the aerospace industry.

QRP, Really

At the end of a very successful career in aerospace publications and product support Bruce moved to Connecticut, starting as QST's Product Review Editor and progressing upward to Advertising Manager. He left the League in 1990 to move to Texas, where he founded MXM Industries, one of our many QRP equipment manufacturers. His line of QRP transceivers employing double conversion receivers remains unique within our corner of the hobby.

I called Bruce the day after I came back from Dayton this year to see how he was doing. The day after I wrote this Bruce passed away. As I write this he is in an extended care hospice near Austin, Texas, with what will probably be terminal cancer. I'll miss Bruce for the many memories he gave me in ham radio and for being almost a second father to me in the aerospace business.

There is Joy in Mudville

No the mighty men have not won the world series. They had one more chance this afternoon — they lost. But for QRPers, the "Joy of QRP", written by one of QRPs founding fathers, Adrian Weiss, is once again in publication and available. The "Joy of QRP" is one of two classic books about QRP written by Adrian Weiss.; the other is the "History of QRP". Both books are available from Adrian directly. See the address info at the end of this column.

The Joy of QRP is the author's attempt to guide the newcomer to QRP and to help the established practitioner achieve more enjoyment from QRP. It covers a wide range of topics from how to successfully operate QRP through equipment selection, operating activities, awards and clubs, and touches on the colorful history of QRP. First published in 1984, Adrian has revised it to account for the intervening years. This edition includes a lot of information about current QRP activities and clubs. It also includes enough of the original work to remind one who watched as an occasional participant, of the flavor of the QRPs early days. True to the burgeoning information age, some of Ade's information has already gone out of date. Don't let those items put you off. BUY THIS BOOK. Put it on the shelf next to the ARRL Handbook and Solid State Design for the Radio Amateur as a book worthy of your time to read and study. You'll learn where we came from, and what your forefathers had to do to walk that 10 miles every year to Field Day, in the snow. uphill both ways!

It's a great book. I bought two copies, one as a gift. The other one will be under my pillow for a while. Oh, yes, the alarm is on. Now, back to your regularly scheduled entertainment.

Contesting and DX

The summer's over. I know this officially because the Autumnal equinox was greeted here in Maryland with ice on the car windshield. Amazing how that one simple event can remind you of all the other really nice places you've lived!

This time of year marks several must do contests for your scribe; the Pennsylvania State QSO Party, the QRP ARCI Fall QSO Party and the ARRLs Sweep-a-stakes (so called probably for the stakes driven through vampires hearts on the companion holiday, Halloween). I've been getting in the Pennsylvania QSO Party for the past 4 years, ever since they showed up on the same weekend as a contest I was running for HAMBREW! That first year I made 50 QSOs with a badly hearing impaired NE4040 (it had an almost open circuit in the receive chain). I was using my infamous stealth tree warmer back then and I was surprised at my success. This year they added a "sweet" to the pot -- work 100 stations any get a coffee mug. Of course I had to have the mug, so 103 QSOs later it is on order. Let me point out that I worked only on 80 and 40, and the majority of my QSOs were on 80. I also

worked 47 of the 67 Pennsylvania counties.

The Fall QSO Party

I'd probably have gotten in this anyway, since I like the ARCI contests, but Danny Gingell, K3TKS, went and made me a part of the Maryland Milliwatts team (what's a milliwatt anyway, I thought this was supposed to be QRP). I was only on for about 5 hours, due to family commitments (I live with my 87 year old mother and an 85 year old aunt). Again 80 meters provided most of my QSOs (50%) and 17 SPCs. 40, 20, and 15 contributed the rest. Good contest -- mediocre score (26,600).

Sweep-a-stakes

A private confession. Sweepstakes was the one contest I studiously avoided through the years. Why? Simply enough the exchange seemed to be a bit overdone! But two years ago Bob White, WO3B (another one of those milliwatters), told me I could win a pin if I made 200 QSOs. Last fall it was 206 and a pin on CW. This year it will be more (I hope) and another CW pin. I just can't stay away from those little goodies. I sure hope this doesn't become a defacto standard for contests -- I'll have to give up this column and probably work, just to go out to get them!

DX

I see more reports of guys working REAL good DX on the QRP List. I think that's great, but I still see some undercurrents of "how lucky" he was to work him. It ain't luck dammit, it's operating skill. Maybe your operating skills are like the newly formed flower bud, but if you feed them and nurture them they'll grow like the flower. You';; get lots better and the DX won't be able to hide from you any more. Go forth and work a DX station a week for the next month, and then move it up to one or more each time you're on the air. It can be done. It will be done. Just do it!

Radios

There's been some traffic lately about VHF QRP rigs. Some want kits and such like to support this "new" activity. It ain't new. It's been around for many years. I've told you about the first radio club meeting I attended in Holland, haven't I? A Dutch ham I worked with took my name and passed it on to the local group. I was contacted and invited to the next meeting, being held coincidentally, that very evening. They drove, I rode. Almost all Dutch radio clubs are part of their national organization, the VERON. The Leiden section me in an ooooold church in the center of town. God and Mr, Heineken help anyone who tried to get there unaided the first time. The area abounds with canals that threaten to swallow the unwary.

Anyway, I was accompanied by two Dutch hams from my town. One of the was a the chief operator of PA0AA, the Dutch W1AW, cunningly housed in a paint factory about 1 kilometer from my house. The other held a Dutch Class B license, somewhat like our original Technician Class license. After the meeting proper there was an intermission. A very enlightened intermission from where I stood because they sold beer along with coffee and cookies! Intermission also marked the distribution of QSL cards from the regional QSL bureau person. My friend with the Class B license came back and sat down with about a 1 inch stack (2.5 cm) of QSLs. I looked over his shoulder as he flipped through cards from all over Europe, from the Scandinavian Countries to Eastern Europe and the USSR. "Pretty nice work," I said to him, "20 meters, or what?" "Two meters and 70 cm!" said he.

My mouth is still drops open when I think about that, but, never one to sit around and let the good stuff go by, I bought a two meter beam the next time I was at my local ham store and put the FT221 I'd brought over from America to work. The beam was only 4 elements, and mounted in the attic of my house, but I had many satisfying contacts with England, and Germany, and a few other close by countries as well. Later I replaced the little 4 element beam with a proper 17 element beam with a rotator, mounted on my chimney, "All the better to hear the grass grow in Germany" said my friend at the ham store as I walked out the door! Oh yes, and it was, too! Sadly I had to take it down when I found I was causing TVI to a neighbor THREE blocks away who was trying to watch German TV. It seems the front to back ratio of his 4 fed in phase, stacked TV yagis, was not up to the ERP of my 10 watt FT221 and beam! The sacrifices we make in the name of international relations.

There are lots of really nice multi-mode rigs out there for reasonable prices. I don't remember why but I sold the FT221 to someone and replaced it with an IC211, one of ICOMs first "base" station multi-modes. It runs 10 watts out (it can be controlled) FM, SSB, and CW. I've had it now for about 15 years and I think the world of it. Similarly, the FT221 and Kenwood's TS700 are still out there for reasonable prices. Or, you could build an MCW adapter for your HT, and do simplex CW. It does not take much to work around your local area. In January of 1994 I made 15 or 20 contacts in the ARRL VHF contest on 2 meters with the IC211 and an indoor, twinlead, J-Pole. Best DX was probably 100 miles or so simplex, CW, between home and southern Pennsylvania. Gotta do that one again. The upshot of this whole paragraph is if you're going to try something new, VHF operation or 160 meters, or whatever, try it with something you know already works. You'll reduce your frustration and increase your enjoyment, and if you don't like it you'lll find out without an investment of time or money.

Parting shots

Whilst many of you are setting your sights on 6 and 2 meters, I'm looking the other way. When I first got my license 160 meters was used much like 6 and 2 are these days. It was the band for local ragchewing, and it was the band where the local emergency net met. I've had a long distance love affair with the band for many years, and I'm going to toss my hat in the ring once again this winter. Look for progress reports on QRP-L and something at next year's QRP Technical Conference being held at a Dayton Hamvention near you.

Oh yes, once more into the breach, etc. I'm going to mess up most of March and April again this year with another QRP Technical Conference. This time it will be a more or less solo show, so the scope may be reduced a bit, but as before, if you can make it, you'll be satisfied beyond belief. Want to be a part of this exciting program? You can write a paper and come present it to a large number of your enthusiastic fellow QRPers. I'm looking at a couple of themes that previous attendees have said they'd like to see. I want papers about operating in foreign countries or from motels, hotels, and whatever, on the road. They don't have to be long, 8 to 10 pages works just fine, including illustrations, but they must be COMPLETE. I want the blow by blow coverage of how you got your reciprocal license (if you did) and what you had to do to get on the air from wherever you were. I want results and I want lessons learned. Check out Pete Hoover's excellent article in the October 1997 QQ for some ideas.

I'm also looking for a new technology theme. This can be new designs or new horizons. My 160 meter stuff is one example. I'd welcome some 6 and/or 2 meter rigs. I'll make a deal with you, too. If you do present a design for a new piece of QRP equipment, I'll let you "sell" the kits/boards/info packs, during the conference. You'll have to consummate the actual deal in your room of from a Hamvention space, but you can do some tasteful advertising during the conference.

I'm always open to antenna papers. Loops are a hot topic, both for receiving and for transmitting. Tried to lasso new contacts lately? Tell us how you did it and how it worked.

That's enough for now. I've overstayed my welcome in your mind. Give Ade's book a read and think about the coming conference. Say a prayer for Doug, and Bruce, and the many others we don't hear about until it's too late. Ade's book can be had by sending $23.00 for one, or $40 for two copies to:

Adrian Weiss, 26 North Dakota Street Vermillion, SD 57069

Tell 'em where you got it.

QRP CLUBHOUSE

Bob Gobrick, N0EB, (VO1DRB & UN7N0EB)

Happy winter holidays from the **QRP Clubhouse**. Wintertime is a wonderful time to assemble those QRP kits that have been back-logged all summer long. There is no greater joy then to be hunched over a printed circuit board populating and soldering in those resistors, capacitors, 2N2222s, etc. with a warm crackling fire burning in the basement firebox and a nice cup of cocoa at hand. Why even the winding of the toroids might bring memories of fly tying for the spring fishing season. Winter time also brings better band propagation to encourage operating into the wee hours of the evening (by candle light and batteries for the QRP purists). The **QRP-L** fox hunts and the many new regional QRP club nets that are sprouting up help cure the dreaded wintertime "cabin fever". Winter is truly the season for QRP ham radio.

Another cure for wintertime "cabin fever" is for your regional QRP club to host some get togethers where members can share some of their kit building experiences and operating techniques. A number of the clubs that will be reported in this issue have also put together club projects for their members to participate in. Similar to the **New England QRP Club** Color Burst transmitter that was popular a number of years ago, the **New Jersey QRP Club** is looking at a "group build" of the Pixie II with the intent of starting a weekly " NJ QRP Pixie Net". The **Knightlite QRP** gang have taken their club project a step further by designing a SMP (Surface Mounted Pixie II) based on the W1FB mods. These are all great projects and a wonderful inspiration for other regional QRP clubs to do the same. As an aside, I want to mention this columnist's sorrow at hearing of **Doug DeMaw's W1FB** passing. Doug has always been one of my ham radio "Elmers" and I feel there is a no better way to recognize his "greatness" to our hobby then to incorporate some of his many wonderful QRP designs into our projects. Let us make sure that QRPers will never forget Doug's many wonderful contributions to the hobby .

So what news do we have from the regional QRP clubs for the winter of 1997/1998? Oh by the way - my apologies to the QRP gang from Down Under - Australia. The QRP Clubhouse has just started a newsletter exchange with the QRP Quarterly and the **CW Operators' QRP Club** "Lo-Key" from Australia - for you southern hemisphere folks just hold on to this column for 6 months so we don't "spoil" your summer - hi.

NJ-QRP CLUBS' NON-STOP WINTER PROGRAM

George Heron N2APB was kind enough to send the QRP Clubhouse a report on some of the great events that the NJ-QRP club will be doing this winter. Here is his report:

"We've had lots of excitement and happenings this fall here in Jersey: the Rainbow Tuner kit's still hot, our website is a great surf, contesting and construction continue to be our strong focus, and we've just signed on our 100th member! And even bigger news is that by the time you read this we will have co-hosted with the **Long Island (NY) QRP Club** our first operating event: The Doghouse Operation Sprint!

Our website (the Online Journal at http://www.njqrp.org) is looking great with tons of good material input from our members. A Member Profiles section has been added containing bio's and pictures of a growing number of our group. The Member Projects section chronicles the development of a number of our in-progress projects - from paddles to DDS VFOs. And a new section was recently added, hosted by our contest manager **Ken Newman N2CQ**, to keep the monthly contests and events in focus for us all ... Ken now has a collection and review of available contest loggers. Major updates are posted at the beginning of each month, so if you haven't seen us lately you're in for a very pleasant
surprise!

Our **Rainbow Tuner kit** is still selling like gangbusters after **Dave Ingram's K4TWJ** review in the November issue of CQ Magazine. This **N2CX** design keeps on ticking! Along with the great feedback, reviews, and online app notes, we now have the super enclosure offer from **Doug Hauff KE6RIE**: a bullet-proof, black anodized case with etched-in lettering. A great match for the 38s enclosure we've already seen from Doug! All these positive indicators have convinced us to buy parts for yet another round of kits this winter, so keep your eyes peeled for the Rainbow Users Group newsletter and get ready to spread the word.

We have a couple of club projects on the table that will probably be of interest to the QRP community in general. Our "**MicroBeacon**" is featured in its own section on the website and is being treated as a participative group design and construction project over time, to be chronicled in a series of articles describing the concept, design, implement, test and usage phases often experienced in industry product development. The second project is a group purchase and kitting of the **Pixie-II** for club members and the corresponding hosting of our NJQRP weekly net meeting with the Pixies! Lots of interest - lots of participation.

NJ-QRP member news this quarter: **Joe Everhart N2CX** has been tied to extraordinary travel duty for the "salt mine"; **James Bennett KA5DVS** and wife Cathy have successfully relocated to CA; **Dave Maliniak N2SMH** made it to several NorCal meetings; **Kevin Glynn N2TO** has been driving the local Pixie-II interest and kitting; and I **(N2APB)** was able to make it as an east coast representative to Pacificon in October, meeting many of the fine faces behind the callsigns encountered throughout the year.

Be sure to stop by our NJQRP Online Journal website for your monthly dose of construction and operating events. If you don't have web surfing capabilities, drop an e-mail to embot@njqrp.org and put LIST in the body of the message to receive a list of files you can have automatically sent to you via e-mail."

Thanks George and for those interested in the NJ-QRP Club drop him a line at George Heron N2APB (g.heron@dialogic.com) .

KNIGHTLITES GET "Small"

Bob Kellogg AE4IC dropped a note about the doings of the Knightlite QRP gang (Club call **WQ4RP**) down in the North Carolina - Virginia - South Carolina area. This non-organized group of QRPers have only one requirement for membership - One must say "I am a Knightlite" and you're in. The club uses the internet to communicate and they have their own email reflector to encourage discussion (a number of other clubs like the MN-QRP, CO-QRP and NJ-QRP club are making use of email methods to communicate club information and as Bob points out this may be the hobby club organization format of the future).

In addition to activities like field day, the popular Knightlite Roundtable Net (meets each Sunday night at 9:30PM EST on 3686.4 KHz), monthly QRPizza meetings in Raleigh, NC and a QRP expedition to Portsmouth Island the gang has started to put together some club kit projects. One project that will certainly raise some interest is their new **SMP** or Surface Mounted Pixie II transceiver. The SMP has a board size of 1.7" X .875" and the 80 meter design is based on the late **W1FB**'s modifications. It will be a fairly simple, inexpensive, small parts count SM project. Also they may offer a companion board that accommodates the TICK or K1EL keyer. They expect to have the rig ready for the 1998 winter building season. For more information about the Knightlites contact Bob Kellogg AE4IC at ae4ic@nr.infi.net

Late Breaking VA QRP news - A new QRP Club has just

emerged in the Chesapeake, Virginia area called the **Tidewater QRP Club**. **Rick McNelley KE4IZH, Frank Matthews KC4FKX, Bob KE4QOK, Greg KF9OV, Chuck KD3SQ** and **Will K4EGW** met at Fuddruckers and all had a great QRP time. As Frank says in his QRP-L post "This was a most enjoyable get together and a real pleasure. I encourage others to join us as well as start other groups throughout the country. All it takes is a few to get it started and it will grow." Contact Frank at fmathews@norfolk.infi.net for info

TEXAS QRP CLUBS

It's probably not fair to group all of the regional QRP clubs of Texas under one header but you have to admit - Texas is a BIG state and they do support more QRP clubs then any other state (well I did notice that the SCQS - Southern California QRP Society is gathering steam (geothermal) in California to show the CA flag, along with that other small CA QRP club - Northern California QRP Club - hi).

- Austin QRP Club

Glen Reid K5HGB, in the beautiful hill country of SOUTH TEXAS noted that the club meets the second Saturday of every month at 10 AM somewhere in Austin (as Glen states - this is to stay ahead of the Sheriff - hi). The club has a growing email listing of 25 members. Since there are no officers in the club members may appoint themselves to any club position they choose. With that, a newsletter may emerge in the future with **John Andrews N5INZ** being the designated volunteer and **Ed Popp K5BOT** was involunteered as the keeper of the money (something to do with a "reputation").

In usual Texas style the October meeting was hosted by **Stuart Rohre K5KVH** at the Applied Research Lab and folks like **John N5IZN** came in from San Antonio and **Ed N5EM** wandered in from Houston (only someone who has driven across Texas can appreciate how far these guys come to attend a QRP get-together). There was talk of a club QRP project with 10 or 6 meters and cw or phone being bantered around. **Rick KD5ABM** (rick@kirchhof.com) volunteered to start a "QRP Resource" list for the club looking for folks to share their expertise, test equipment, skills, etc. with others. And finally, in the ritual of a true "QRP" society **Larry Wise KA5T** was recognized as "The Grand Poobah Trouble Shooter, Par Excellence" (don't ask!). For more information on this growing club contact **Glen Reid K5HGB** at 1305 Carlotta Lane, Austin TX 78733-1532 or k5hgb@flash.net

- NorTex QRP Club

Chuck Adams K5FO, the famous QRP-L Webmeister, posted an invitation to all to attend the NorTex QRP club meetings that are held on the first Saturday of the month at Silicon Graphics in the Dallas/Fort Worth area. In the spirit of the winter QRP building season, NorTex QRP will sponsor the First Annual Hamcom HB XCVR Building Contest that will be judged at the June 6, 1998 Hamcom. The event, which will be organized by **Joe Spencer KK5NA** and **Doc Drake W5TB**, will showcase some of the best handicrafts of the QRPers from the south central US region. For more information on the North Texas club contact Chuck Adams K5FO at adams@sgi.com or his home page http://reality.sgi.com/adams/index.html

Late Breaking TX QRP NEWS: No sooner had the ink dried on my proof copy of this column then I heard from **Ed Manuel N5EM** that yet another new TX QRP club has formed in the Houston TX area - the club is yet unnamed but the **Houston QRP Club** sure sounds like it will be popular. It is fashioned after the Austin (TX) QRP Club - no coincidence since Ed magically showed up at the last Austin QRP Club meeting. More info from Ed at n5em@amsat.org

SCQS - A SOUTHERN CALIFORNIA QRP SOCIETY THAT'S A ZUNI!

There was some earth shattering news on the QRP-L about the new call **WQ6RP** for the Southern California QRP Society. The report came from **Paul Carreiro N6EV** but I was unable to reach him at his given email address of carreiro@barepower.net (any have new info). Paul reported that the **Zuni Loop Expeditionary Force** has secured the vanity call of **K6ZNI** with **Cam N6GA** as trustee. I can see this will cause the shakes to the many other QRP contesting clubs for the upcoming 1998 contesting season.

Paul also reported that most of the Zuni crowd are members of the Southern California QRP Society (SCQS) with such notables as **Cam N6GA, Richard KI6SN, Fred K6MDJ, John W6SU, Charlie W6JJZ, Sam KF6ML, Tony K6EK and Paul N6EV** as trustee. Right now the SCQS is a fairly informal group that get together after each TRW and Pomona Swap meet. But with this much talent we should expect to see some quaking things come out of SCQS this winter.

AR QRP CLUB DOUBLES MEMBERSHIP OVERNIGHT

If you recall in the October 1997 QRP Clubhouse column it was noted that the Arkansas QRP gang hoped to reach a club membership of 100 members by year end 1997. Well during the month of October 1997 **Jim Hale KJ5TF** reported that the membership went from 62 to 126 in a few days. Talk about marketing! How did they do it? Easy - membership is free if you register by email and that membership to the AR QRP clubs includes a membership number, welcome letter AND the free AR QRP email newsletter.

And to make sure you stay in touch as a AR QRP member the club hosts two Club Nets - one on Monday at 7:30 PM Central Standard Time on 3.560 Mhz and the other on Tuesday at 7:30 PM CST on 7.042 +/- QRM.

Contact Jim at kj5tf@mctc.com for more information about this fast growing QRP club.

QRP SOCIETY OF CENTRAL PENNSYLVANIA

The last two issues of the QRP Society of Central Pennsylvania newsletter "QRP Gazette" were received here at the QRP Clubhouse as part of the QRP newsletter exchange program and the Ben Franklin style gazette is really growing in size - 6 pages double sided. Kudos to club Elmers **John Jaminet W3HMS, Bob Wicks W3HAH** and **Cam Bailey KT3A** for these great newsletter and club activities. So what's new in PA land (I have to let you all know that I was born in Pennsylvania and returned to University there so I have some fond memories of this area - plus my folks still live in the Poconos).

Jerry Buckwalter AA3HB and **Bob Wicks W3HAH** announced in the QRP Gazette the availability of printed circuit boards for the Club Project SWR bridge that appears in the W1FB QRP Notebook page 49. Please contact Bob at BobWicks@aol.com for availability and cost.

A new contest is in the works for the 1998 QRP Contesting season. **The First Annual QRP TACtical Contest** is based on TAC scoring or Telephone Area Code. Tentative plans for this QRP Society of Central Pennsylvania contest is for a short outdoor sprint event scheduled for June 6, 1998. For more information conTACt **Cam KT3A** (kt3a@juno.com) TAContest chair.

There's a lot more to report but not enough room here at the QRP Clubhouse. Of interest that I hope to report next time on is a series of articles by **John W3HMS** on "The W3HMS 20 meter Home Brew Superhet Project" - a step by step article on homebrewing that starts off by Specifying what is to be built stage by stage. This should be interesting reading. For more info on joining ($5) the QRP Society of Central Pennsylvania and receiving their great QRP Gazette drop a line to **Robert A. Wicks W3HAH** at 20 Brenely Lane, Mount Holly Springs, PA 17065 or email bobwicks@aol.com

MICHIGAN QRP CLUB NEWSLETTER "THE FIVE WATTER" BACK IN STYLE

The latest issue of the Michigan QRP Club newsletter "The Five Watter" is back in business under the new tutelage of editor **Tom Arvo WA8DXD**. President **Tim Petter K8NWD** and past President **Lowell Corbin W8IQB** report that the Michigan QRP club is in full swing with lot's of 1998 club activities. The September issue of the Five-Watter sets the tone with a nice technical article by **Dr. T. C. Choy VK3CCA** on the DB 80, an 80 meter SSB/CW QRP Transmitter. **Bob Williams W9NIP** follows with his QRP-DX report and venerable contributor

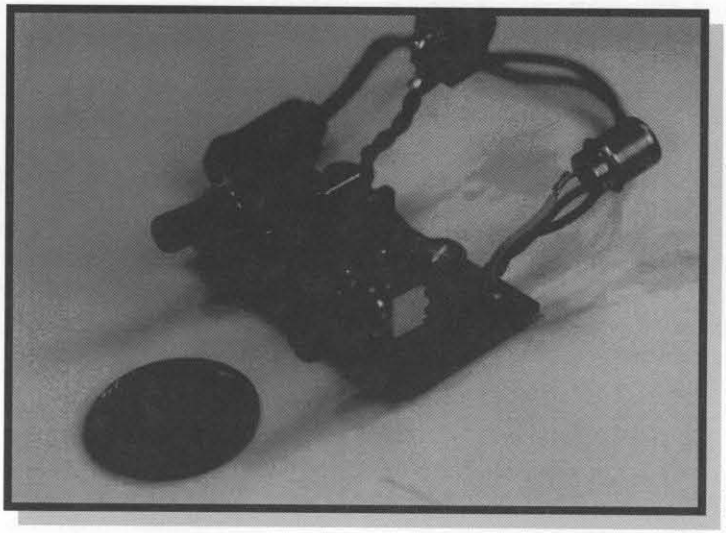
C.F. "Rock" Rockey W9SCH has an article on "The Joy of Bricolage" a very interesting comparison of how to design a QRP project - Engineering style or Bricoleur style.

To find out what the heck Rocky is talking about contact **Buck Switzer N8CQA** at 654 Georgia, Marysville, MI 48040 or n8cqa@tir.com

COLORADO QRP CLUB - THE LOW DOWN OVERLOAD

There is so many great articles and activities coming out of the Colorado QRP Club newsletter " The Low Down" that's it's hard to keep up. In the September and November 1997 bi-monthly issues there are some great articles by **Paul Harden NA5N** on Decimals and Power, **L.B. Cebik W4RNL** antenna classic articles on the "But My Yard's Too Small - or a 102' Center-Fed Multi-Band Dipole" and "My ATU is No Darn Good - or How to Make Your Tuner Work on Every Band"; review of the Emtech ZM-1 Z match Tuner by **Marshall Emm N1FN**; Homebrewing the Sierra by **Nick Hulbet KG5N**; Ten Tips for the First Time Builder by **Rob Capon W3DX**, review of the Emtech NW40 and OHR Classic 100 by **Dayl Larsen KB0OPT**, Grounding Basics by **Al Dawkins K0FRP**, Walking Stick Tri-bander by **Jane Wodening AA0ZR** and much more with articles by **Dick Schneider AB0CD**, **Brad Mugleson KB0ROL**. One Great QRP newsletter.

For more info on the CQC drop a note to president **Rich High W0HEP** at CQC, POB 371883, Denver, CO 80237-1883 or w0hep@aol.com



COLUMBUS (OH) QRP CLUB WINTER MEETINGS

Just a reminder to the folks in the Columbus Ohio area that the CQrp Club meets the first Saturday of the month at 10:30 at Universal Radio in Reynoldsburg, OH with lunch following at the Ponderosa. **Steve Bornstein K8IDN** reports in the monthly CQrp Club newsletter reviews on the new NorCal Paddle Kit, K1MG Digital Clock/Counter Kit and more good building info. CQrp also still has on hand one of the best candidates for a nice club kit project - the MRX-40 Mini Receiver pictured above. The $18 MRX-40 comes with all parts on a nice 1" X 2" printed circuit board. For more info contact Steve Bornstein K8IDN, 475 East North Broadway, Columbus, OH 43214 or k8idn@amsat.org

NORCAL QRP (PACIFICON) QRP SEMINARS A MAJOR SUCCESS

Doug Hendricks KI6DS and the NorCal QRP gang have once again made Pacificon synonymous with QRP with an all out, day long parade of QRP events. A nice touch was added by **Jerry Parker WA6OWR**, who covered the NorCal QRP Symposium with live Internet website reporting. I found it great to check in from my job in Kazakstan to "see" the happenings - amazing stuff. All will be covered in the up and coming Winter 1997 issue of the QRPp newsletter. Pacificon was the introduction of the latest NorCal QRP Club kit and what was a surprise to all - the first non-electrical club project - a mechanical iambic paddle designed by **Wayne Smith K8FF**. Another smash hit for the winter building season by the Doug and **Jim Cates WA6GER** team. Also abuzz is the next NorCal QRP Building contest challenge - the NorCal 2222 Design Contest based on only using 2N2222 transistors for the active components of a CW transceiver. The contest was inspired by NorCal member **Wayne Burdick N6KR**. Finally, the Fall 1997 edition of QRPp arrived here at the QRP Clubhouse with a grape colored cover dedicated as the Amanda Wines Memorial Cover - a nice issue to bring into the sitting room with a nice glass of that grape colored liquid to go with the romantic fire (why does my wife not understand..) For info on the NorCal QRP club drop **Doug Hendricks KI6DS** a line at 862 Frank Ave, Dos Palos, CA 93620 or ki6ds@telis.org

NWQ NEWSLETTER ARRIVES RIGHT ON TIME

The October 1997 of the NorthWest QRP Club "NWQ" newsletter arrived just minutes at the QRP Clubhouse after it hit the streets. How does publisher **Bill Todd N7MFB** do it? Well it's the magic of the Internet since the NWQ is truly an email QRP newsletter. The 20 some pages printed out cover a wide variety of topics including a fictional story of "Jeremy Finished His Radio" by **Bud Larson W7LNG**; Some notes on Lower HF Wire Beams by Mr. Antenna - **L. B. Cebik W4RNL**; DX News by **Ward Silver N0AX**, and more. For information on receiving the electronic NWQ write **Bill Todd N7MFB** at PO Box 354, Bay Center, WA 98527 or email bill@techline.com

WELCOME CW OPERATORS' QRP CLUB OF AUSTRALIA

The QRP Clubhouse would like to welcome to this issue **Don Callow VK5AIL**, the editor of "Lo-Key", the quarterly journal of the **CW Operators' QRP Club**, President **Barry Samuel VK5BLS** and the rest of the QRP Gang Down Under. The QRP Clubhouse will be exchanging newsletters and hopefully we shall be seeing some future technical articles appearing in the QRP Quarterly compliments of the CW Operators' QRP Club. The Lo-Key is sized similar to the G-QRP Clubs' SPRAT and the NorCal QRP Clubs' QRPp and it has a good smattering of QRP technical articles that are of interest to all. Of interest in the September 1997 issue of the Lo-Key was an article **by Leon Williams VK2DOB** on a 80 meter QRP CW Transceiver design that uses a direct conversion receiver with an audio phase shifter to eliminate the opposite sideband - very interesting. If you are interested in joining the CW Operators' QRP Club and receiving the Lo-Key then contact **Kevin Zletz VK5AKZ**, 41 Tobruk Ave, St. Marys SA 5042, AUSTRALIA.

MINNESOTA QRP SOCIETY

The Minnesota QRP Society marked it's first year in operation with the "**First Annual Statewide Minnesota QRP Society Meeting**" held in conjunction with Hamfest Minnesota. This could be the start of another Pacificon and Dayton QRP event! **Larry Gaalaas KB0R** was the host speaker for this years event. 1998 will bring some new activities to the MN QRP Society with the possible publishing of a club newsletter to supplement the club's Website and member email reflector. Stay tuned and be prepared for a "real" Minnesota QRP winter assault of the SQRPions "Freeze Your B... Off" QRP operating event. For information on the club contact President **Claton Cadmus KA0GKC** at cla@spacestar.net

That's it for this issue. Please mail your club news and photos (jpeg would be great) to: **Bob Gobrick N0EB**, PO Box 249, Lake Elmo, MN 55042-0249 or email me at rgob@tengizchevroil.com AND rgobrick@worldnet.att.net (please send to both email addresses). Also drop the QRP Clubhouse a note if you would like to exchange QRP Club newsletters. Cheers 73/72 Bob N0EB, QRP CLUBHOUSE.

What's the secret password? - "QRP"

Don't Be Phased By Phasing

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

Many antenna builders cringe at the mention of a certain word: phasing. Unless you are using a simple antenna, like a resonant 1/2 wavelength wire (commonly called a dipole), your antenna consists of phased elements. If it is a Yagi, it is phased. If it is a 135' doublet used on 10 meters, it is phased. If it is a 4-element system of collinear extended double Zepps spaced 5/8 wavelengths vertically with all elements fed, it is phased. (I have modeled this little system for about 22 dBi forward gain and a beam width of under 17 degrees--or better than most flashlights in directivity.)

What Phasing Is: So I guess it may be useful to understand a little better what phasing is all about. Any time we have more than a half-wavelength of wire, we have phasing. (More than a quarter wavelength with verticals.) Phasing is simply a readout of the current on a designated secondary part of the antenna or antenna system relative to the designated primary part. We are not interested in those currents for their own sake, but for what they do to the resulting radiation pattern of the antenna. What they do is a function of the current magnitudes, the current phases, the length of the primary and secondary parts, and their separation.

Geometric and Electronic Phasing Control: If we understand phasing well enough, we can not only see what the interaction of these 4 phasing factors yields, but we can also control the radiation pattern by juggling the factors. Consider a 2-element Yagi: a driven element and a reflector. Just the relative lengths of elements and their spacing determines the current magnitude and phase on the reflector relative to the driven element. There are good combinations and bad combinations--those with more gain and/or front-to-back ratio and those with less. But we quickly learn that with two elements, there is a limit to both gain and front-to-back ratio.

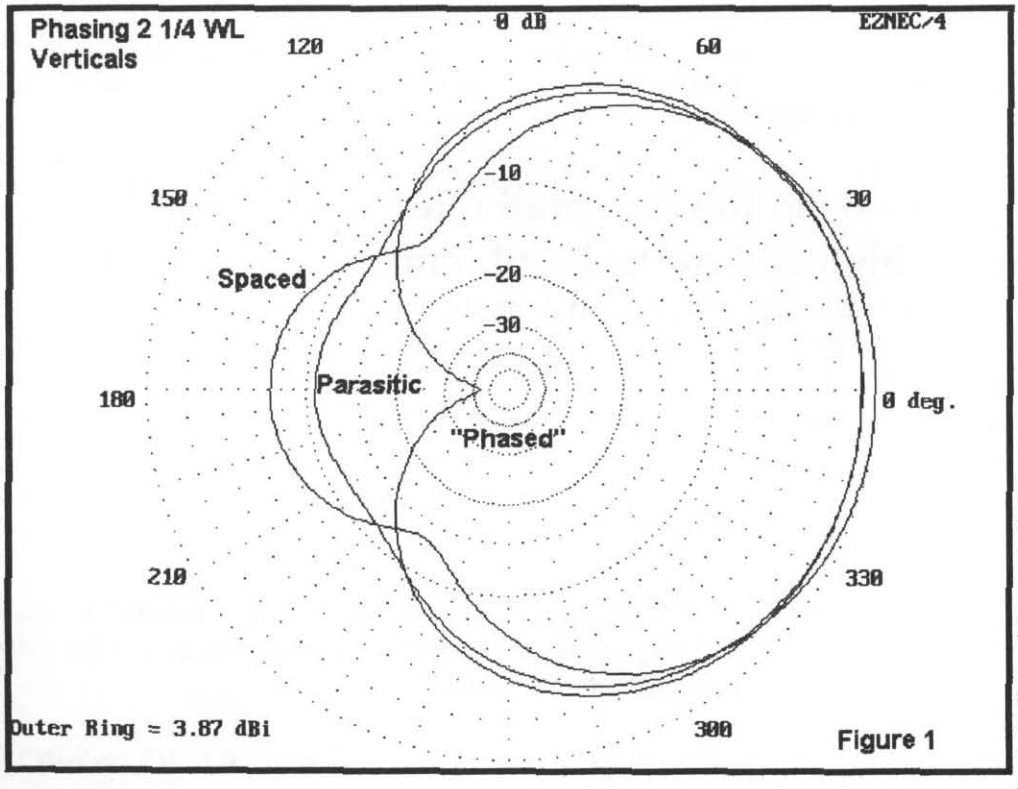


Figure 1

Suppose we could control the current magnitude and phase on the rear element. One thing we discover is that we cannot squeeze out much more significant gain, but we can improve the front-to-back ratio--at least for a small frequency range. Hence, the ZL Special, a 2-element phased array, using a precisely calculated set of element lengths, spacings, and an equally precisely calculated length of transmission line between them. The current splits at the feedpoint, part going to the forward element, and part being transformed along the phasing line so that at the rear element it has the magnitude and phase to maximize front-to-back ratio at the target frequency.

Let's see that again, this time with 1/4 wavelength verticals. Let's set two of them exactly 1/4 wavelength apart. First, we shall make both antenna elements the same length and feed only one. That yields the "spaced" pattern in Figure 1. It is a nice pattern, but we can improve the front-to-back ratio. First, we shall increase the rear (reflector) element length and shorten the driven element back to resonance so that they have about a 4% length difference. The performance peaks out on the curve called "parasitic" in Figure 1. In short, altering geometry can do only so much to establish the conditions for maximum front-to-back ratio.

The curve marked "phased" is the pattern of two elements of the same length 1/4 wavelength apart when both are fed in a certain way. The forward element has a current of 1 and a phase angle of zero, the rear element has a current of 1.03 and phase angle of 96 degrees. What the pattern shows is over 42 dB of front-to-back ratio.

The patterns also show other important things. First, the maximum gain set-up differs from the maximum front-to-back set-up. The "spaced" array of two identical elements with only one fed yields the most gain. Both attempts to improve front-to-back ratio show less gain. Second, we always have to evaluate whether the gain or the front-to-back ratio will do us the most good for our operating needs.

More Elements: To improve gain, we shall need more elements, that is, more 1/2 wavelength sections for antenna. Yagis with 3 or more elements alter the relative current phase and magnitude by the proper spacing and sizing of directors in addition to a reflector. We can also create collinear arrays, that is, antennas with the elements end-to-end. The patterns will add or subtract according to their placement. Think of an extended double Zepp (a 1 1/4 wavelength wire, centerfed) as two half-wavelength wires separated by a quarter wavelength. This spacing lets the dipole patterns add up and narrow for more gain and a narrower beamwidth. The center section establishes the pattern of current distribution along the wire to permit the addition.

Phasing Methods: There are only a few basic methods of altering the current magnitude and phasing of the secondary antenna parts.

1. Element length and spacing: We have seen with both the

Yagi and vertical examples how element length and spacing alter current distribution. If we need or want a distribution that geometry will not give us, then we must use other means.

2. Transmission lines as phasing transformers: Every transmission line is a transformer of voltage, current, and impedance along its length. For antenna work (and contrary to what we think about when considering the feedline to the shack), it is the current phase and magnitude that is most important. How this transformation occurs is a function of the characteristic impedance of the feedline (and its velocity factor). The ZL Special transformation is a very precise thing if one wants more than mediocre results. Not just any line will do, nor will just any length of line (relative to the antenna element lengths and spacing) do. For certain simple cases, like phasing 2 verticals 90 degrees, lengths of line can do the job, but those cases are somewhat limited.

Many collinear arrays make use of phasing lines between element ends. Most are simple cases of reversing the end-to-end phasing. The 1/2 wavelength wire that runs between the two drooping ends of a half-square antenna is such a line. It does not radiate (much), but presents the "far end" vertical with the same magnitude of current as the fed end, but 180 degrees out of phase. The vertical patterns then add to give the peanut-shaped pattern useful to low band DXers. More complex arrays may need precise electrical lengths of phasing lines to effect a specific change of current phase to an adjacent wire, as in collinear EDZs.

3. Brute force: For precisely tuned phased arrays, nothing beats L-networks (along with PIs and Tees) for establishing the exact phase change needed to make an array work. Every such network changes the phase of the entire voltage-current magnitude set relative to the input (although the voltage and current retain their initial phasing relative to each other). Hence, we can achieve any desired relative current settings. If we then use multiples of a half wavelength of transmission line from the network to the element, we can set each element where we want to set it. Sounds simple, doesn't it.

In some ways it is, but. . .let's not forget that the network also creates an impedance transformation. When we take these matters into account, the calculations can get a little more complex. We have to make certain that the element gets the correct current level and phase under a matched condition. Phasing 3, 4, and more wire systems is an exercise for someone who loves his calculator.

Vertical Phasing: So far we have been thinking in 2-dimensional terms. Now lets add a third--the vertical. We can stack antennas vertically for more gain. The principle is to place the two patterns in a proper phase relationship so that the forward patterns add--a vertical version of collinear pattern adding. The principle works with almost any type of antenna. Vertically spaced EDZs are common. Most vertically spaced arrays feed each antenna in phase--that is, each driven element has the same current magnitude and phase.

Roger Cox of Hy Gain has shown that the proper spacing for maximum gain increases for a pair of Yagis increases as the gain of the original Yagis increases. While 5/8 wavelength spacing works well for 3-element Yagis of good gain, we need a lot more space between 5- or 6-element Yagis to get the maximum gain possible from the pair. To make matters a bit hairier, the front-to-back maxima do not occur in the same spacing places as gain maxima.

Space is too small to make this a how-to manual. We would need a book for that, and handbooks already abound. However, if we have convinced you that phasing is everything in antenna work, then you may not be phased by all the references to phasing in what you read about antennas. Phasing can never be phased out of antenna work.

Members' News

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QRP reflections: 'Twas a great '97

As we do at the beginning of each new year of Members' News, January's column takes a moment to reflect upon the contributions from last year — recognizing those who took the time and effort to make this column happen.

KI6SN
Richard Fisher

Here are the QRPers who shared their stories and photos with us all during 1997:

Lou Moxey, N3CZB; Cam Hartford, N6GA; Michael Griggs, N5FOS; Jack Hotchkiss, W7CNL; Dick Swanson, N5JWL; Edwin Keck KI5IE; Bill Jones, KD7S; Mike Herr, WA6ARA; Camilo A. Castillo, HP1AC; Brice Anderson, W9PNE; Al Libby, KB1FK; Joe Mikuckis, K3CHP; Lorraine Aubert, AC6XK; Frank Brumbaugh, W4LJD; Larry Mergen, K0LWV; Eric McFadden, WD8RIF; Doug Hendricks, KI6DS.

A tip of the ol' QRP hat to them all, and sincere thanks for their fine prose and photography.

The invitation, by the way, is always open to each "QRP Quarterly" reader to follow the lead of Moxey, Hartford, Griggs, et al, and send a letter, postcard, photograph or e-mail to MN for publication in a coming issue.

Here's hoping your name and callsign are included in next January's accounting of Members' News contributors in 1998. A "72" comes your way in advance.

— R. E. F.

QRP fun with the 'Sea Elf'

Neil Tanner, WA4CHQ, writes from Gwynn, VA, that he "had a great time (last year) operating the QRP ARCI Fall QSO Party from my sailboat 'Sea Elf.'

"The temperature was around 50-degrees and it rained the whole time — a great time to find leaks on your boat.

"I used my homebrew 40-meter transceiver — about ¾-watt — with the boat's batteries. My antenna was a wire hauled up to the top of the mast.

"The boat was at a mooring so she moved constantly with the wind and with the tide. I think next year I'll try a quad on the top of the mast. It would rotate naturally!

"I've been building QRP stuff since 1995, most of them taken from plans from various publications. Building from scratch is fun!"

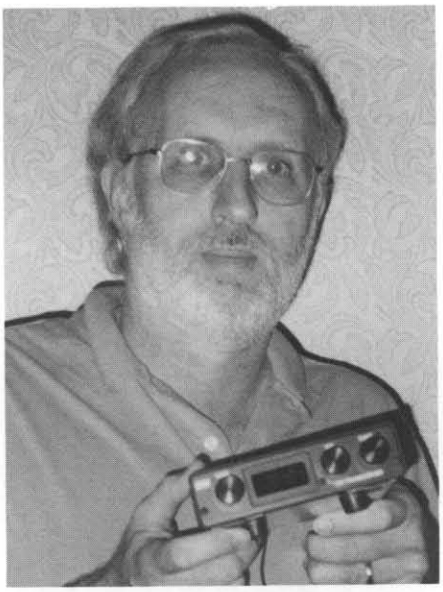
New QRP recruit

Frank Brumbaugh, W4LJD, writes from Salians, Puerto Rico, that "my on-the-air friend **Lew Steczkowski, SP8YA,** is a brand new QRPer.

"I converted him, sent him an Emtech 30-meter kit and an MFJ-9420X and CW adapter. I have to recruit new QRPers long distance.

"I know of only one General class here and he is QRO — big beam and all. Seems that most of the rest are code-free Techs with handhelds.

"Had a very few QSOs on 30-meters with my QRP++ — lousy propagation. My GM-30 is back in Connecticut undergoing analysis for a possible hidden intermittent in the receiver."



Dave Benson, NN1G, holds a prototype of Small Wonders Labs' new transceiver kit at the 1997 West Coast QRP Symposium in Concord, CA.

Adventurous QRPers enjoy the 'Party'

Eric McFadden, WD8RIF, in an e-mail dispatch from Ohio, writes that "three members of the SE Ohio Radio Adventure Team participated in the 1997 QRP ARCI Fall QSO Party from Highland Park in Athens, OH on Sunday of this 36-hour event. The participants were **Mike Hansgen, AA8EB; Drew McDaniel, W8MHV/9M2MC;** and (myself).

"This participation was mostly an excuse to get the rigs outside and have fun before winter's arrival, so we only operated about five hours of the permitted 24 hours.

"The gear: Mike brought his Ten Tec Scout and lots of coax. Drew brought his ICOM IC-706; MFJ 20m CW transceiver; homebrew 15m CW rig, antenna tuner, and SWR bridge; and an Island Keyer.

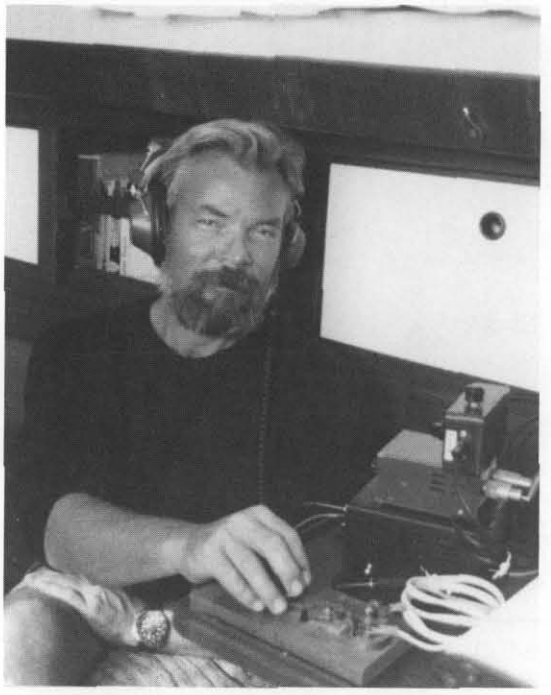
"I brought a QRP Station in a Bag and a 20m full-wave delta loop. In addition, a 25Ah and a 10Ah battery for the Scout and IC-706.

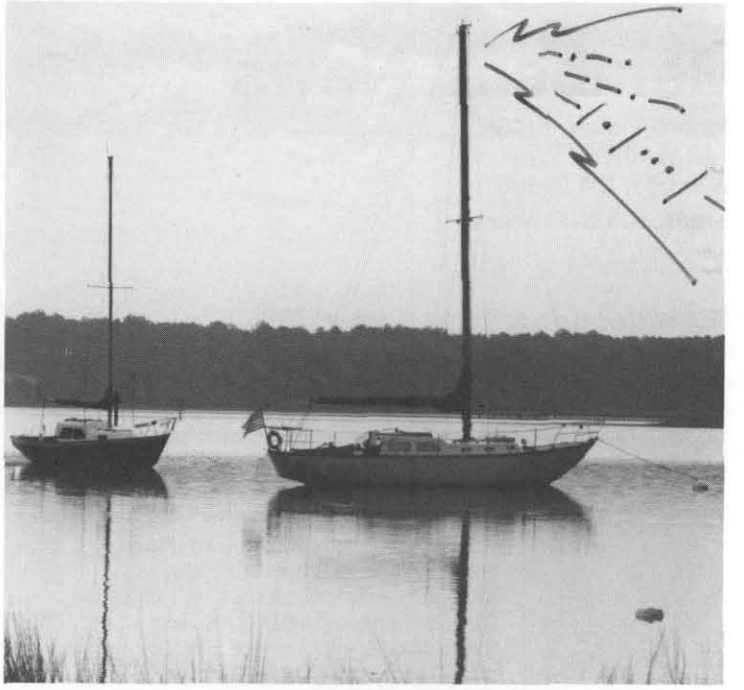
"Mike and I arrived about 11 a.m., and successfully suspended the 20 meter delta loop and a 40 meter dipole (part of my 'QRP Station in a Bag') before Drew arrived about noon.

"Drew's IC-706 was set up first, and this was the first time Mike and I had had a chance to operate this rig, and both were impressed. It is tiny, and combined with the 4.5 pound switching supply Drew has — but didn't bring to this event — would be a wonderful travel radio. The receiver is excellent, and the menu system, while initially somewhat daunting, proved to be no real problem. Drew does have the 500 Hz narrow CW filter installed in this rig. Operations with this rig took place at 5 watts, of course.

"After a bit of time with the '706, operations switched to the Scout. This was the first time Drew and I were able to operate a Scout. The receive audio was wonderful, and the legendary TenTec QSK was a joy.

"I was pleasantly surprised by the very mechanical feel of the PTO tuning. The Jones filter worked very well. The





Neil Tanner, WA4CHQ, of Gwynn, VA, pounds brass at his 1997 QRP ARCI Fall QSO Party operating position aboard his sailboat "Sea Elf." His rig is a ¾-watt scratch-built homebrew transceiver connected to a wire hoisted to the top of the vessel's mast. The lightning bolts and CW emanating from the mast-supported antenna are indicative of the fine signal Tanner produced in the contest.

receiver was very sensitive. The Scout is fractionally larger than the ICOM, but also is small enough to travel well. Operations with this rig also took place at 5 watts.

"Just for comparison's sake, my QRP Plus was set up. While pleasantly familiar to me, it was much less sensitive than either the IC-706 or the Scout. The SCAF does allow a much narrower (audio) filter than either of the others have. Set up next to the sleek, tiny '706, the QRP Plus looked large and chunky — but the QRP Plus can survive on a much smaller battery than either the '706 or the Scout can.

THE OPERATIONS: "Except for a stint when Mike used my callsign, each operator used his own callsign. Twenty-meters was hard going and it was hard to keep a frequency. On the other hand, forty-meters was wide open and full of stations. Each of the operators was able to run the frequency, and several times small pileups developed."

OPERATOR, NUMBER OF QSOS: "Mike, (using WD8RIF), 17; Mike, (using AA8EB), 17; Drew, 18; Eric, 17."

Phoenix + CW = Nevada (in Missouri, that is)

CW Crystals, a longtime provider of quartz crystals to QRP homebrewers, has been purchased by Phoenix Crystals in Nevada, MO. Equipment and stock has been moved to the new location, and Phoenix has also changed its name to CW Crystals, which was a condition of the sale.

The new company says it will be able to provide vintage crystals for frequencies from 160- through 2 meters.

CW Crystals' new address is: CW Crystals, 1714 North Ash Street, Nevada, MO 64772.

Anatomy of a successful QRP workshop

Bruce Rattray, VE5RC, writes from Saskatchewan, Canada, about his experiences in co-conducting a QRP workshop at the Saskatchewan Provincial Hamfest recently:

"Earl Murphy, VE5WF, and myself gave a QRP Workshop for two hours during the hamfest. We prepared the workshop room by drawing a schematic of the 2N2222 transmitter which was to be constructed by those in attendance, placing 12 piles of old newspapers (we had put together enough components for 12 transmitters) on the tables so as to protect the surfaces from being marred during construction, laid in power extension cords and placed the tools necessary for this project at each of the 12 tables, placed a bag on the presenter's table which held various components of the presentation.

"I also had 2 copies of my script and Earl had a third copy, (Murphy is always present! . . . hmmm, Earl's last name is Murphy . . . hmmmmm), the handouts were placed in position to be picked up at the end of the workshop.

"I began the workshop with silence, just looking at the audience. When the general chit chat died down and I knew I had their attention, I used an idea I saw on the QRP-L and held up two balls and very seriously intoned "You gotta have a lot of these to do QRP!" There was a brief pause and then everyone laughed out loud! The ice was broken and I began by going through some of the common Q codes — QRM, QRN, QTH — which naturally led to QRO and QRP.

"Throughout the presentation I peppered it with one-liners: 'You know you're a QRPer when the electrical com-

pany has a power failure and you don't notice because you're in the middle of a great QRP QSO!' — and then held up 2 signs. One sign said 'GROAN!' and the other sign said 'APPLAUSE!' The audience chose which sign by either groaning or applauding. This had the effect of making the workshop interactive and it worked very well. The people in attendance had a great time with this.

"I showed a big tube as QRO and then a transistor as QRP; a very large capacitor as QRO, a small capacitor as QRP; a large power supply as QRO, a battery as QRP; etc. At this point I gave a short description of how I got into QRP and included more 'one liners.'

"I addressed the question of 'Why run QRP?' During this I drew an S meter on the whiteboard and showed the differences in received signal levels from 100 watts down to 0.39 watts.

"Then I gave a short history of QRP showing higher power levels were not needed to communicate over great distances. I included here a report from the Reuter's News Agency about NASA pulling the plug on Pioneer 10 whose last message back to Earth was a billionth of a trillionth of a watt in strength . . .

"I then introduced the audience to the Internet QRP-L group and showed how this is the 'glue' that helps to hold everyone together and that QRP is the fastest growing part of amateur radio today. I described some of the various QRP clubs on the North American continent and other parts of the world. Here, I gave a plug for the QRP get-together at the Dayton Hamfest. I talked about the various QRP projects that are a great part of the fun; Rainbow tuners, the 38 Special, etc. I showed how QRP is being done everywhere and told them about the QRP Field Day event.

"Fox hunting was next and I'm thinking that there just might be a few more VEs in this event this year.

"I talked about homebrewing and kits, describing some of the kits that are available as well as parts that are available, where one can get them. I included brochures from two or three companies who were kind enough to send them to me for the workshop, showing the very reasonable prices and telling how this puts the fun back into the hobby for many. There was also a brief mention of VK0IR and how Heard Island was worked with QRP and that QRP is going to really take off as Cycle 23 starts opening up 15- and 10-meters.

"I then introduced Earl, VE5WF, who did a show and tell using his Small Wonders Lab GM-20 meter CW transceiver, his 2N2222 transmitter as well as showing some construction techniques.

Earl showed a Ramsey transmitter and receiver brought to the show and tell by **Bill, VE5EE.** I did the same using the Small Wonders Lab 30-meter CW transceiver, the TiCK keyer, the SWL 20 meter SSB transceiver and the Oak Hills Research WM-2 wattmeter. **Grant Hannon, VE7PTW,** really sparkled the show and tell with his two 80-meter SSB scratch-built transceivers which included frequency readouts. I tried to think of how I could 'borrow' these rigs for a 'very long' time but was unable to do it.

"I did, however, use a towel to wipe up my droolings as I observed Grant's fine rigs. This QRP Group from British Columbia is doing some fantastic work out there and I know I would dearly love to see a kit or two come out of their efforts.

"Prior to the workshop Earl and I worked hard to gather the parts for 12 QRP 40/80 meter transmitters which provided the hands-on part of the presentation. Earl and his son manufactured 12 beautiful heavy gauge aluminum chassis for the transmitters. **Larry, VE5TP,** picked up some of the parts from the Dayton flea market. Earl also picked up some 80-meter crystals from someone on the QRP-L group. Without these crystals things would have been more complicated. Earl then took front and center and did a great job of guiding everyone through the building of the transmitters. As it turned out we would have needed a little more time (or get me to shut up sooner!) and I'm sure we would have had signals on the air.

"As the 2 hours came to an end, we drew for the three 38S transceiver kits (we purchased 2 kits from the NorCal group and one kit from Phil Rutledge, K1HS, in Amherst, NH) and three new QRP enthusiasts went away happy with a rig to build and hopefully we'll hear them on 30 meters this winter.

"The handout included the 2N2222 article and schematic, list of QRP clubs and URLs, list of QRP nets, list of QRP frequencies, information about Oak Hill Research, Embedded Research (they couldn't believe the size of the TiCK keyer), HB Electronics, Dan's Small Parts, the NorCal Home Page, the Alaska QRP Home Page and some which I have forgotten — but this gives you the idea.

"If Earl and I ever give the presentation again sometime, all the ground work has been done and I m sure we can do an even better job next time.

"As of the writing of this report, Earl just heard from one of the people who took the 2N2222 transmitter home and it has been completed and is on the air. So now it's time to finish the TiCK and build my SWL 20 meter SSB QRP transceiver."

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:

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Quarterly Members' News
1940 Wetherly Way
Riverside, CA 92506

(e-mail: KI6SN@aol.com)

QRP DX on 30 meters

Joe Gervais, AB7TT, of Phoenix, AZ, asks: "Is this the greatest hobby in the world or what?" During a recent stint on 30-meters, he was feeling great about just having snagged Estonia, got back on the band "and worked **9Y4/PA3EWP,** then had a nice ragchew with **KC4UB** in Florida. Turns out the poor guy lost his logs in the last big hurricane and is starting over on 30 meter Worked All States. One Arizona QSL is headed his way, special delivery.

"I tuned around a bit and heard **JE7RIT** calling CQ in the clear. Had a nice short chat with him, then decided to call it a night. Well, our youngest harmonic had other plans, so while she had a midnight snack, I got back on the air and tuned around a bit.

"Lo and behold, there was **JR7HAN/QRP** calling CQ! I make it a habit never to pass up a call with /QRP on the end, not to mention one across the Pacific. Mike was running 2 watts on his QRP+ to a dipole, vs. 5 watts on my QRP+ to a vertical. We had a very nice 2xQRP 2xQRP+ ragchew. Fun! I was as happy as a termite in a lumber mill. Then it got better!

"Right after we signed, **ZL1MH** called me! Another Mike. And my first New Zealand / 19th DXCC country — zippy! He was running 100 watts to a loop. Very classy fellow, Mike is.

He congratulated me on my QRP sig and offered to QSL. I thanked him profusely and said I owe him a beer. Think I'll send a 1,000 miles/watt award his way too. Once we signed, the first Mike (JR7HAN/QRP) called the second Mike (ZL1MH) and I listened to them chat for a bit. What a great fellow! As soon as the Mikes signed, a small pileup pounded ZL1MH, mostly JAs it sounded like. Maybe they were all QRP.

"Mere mortals were never meant to have this much fun! No wonder 30 meters is my favorite band."

A QRPer's friend: The CQ

Pierre Thomson, KA2QPG, writes that on a recent Saturday "I found myself (on short notice) in the Catskill Mountains of southeastern New York. In my backpack was the trusty HW-8, complete with a sealed battery pack, key, phones, and enough wire for the antenna of my choice.

"I took the pack to the top of Indian Head Mountain, 3,500 feet elevation. Finding a secluded spot with trees (not tall but usable), I whacked off a 20 meter dipole and threw the ends over two trees for about 15 feet of height. Then I settled down to try the band.

"Lots of signals! Also some broadcast overload which forced me to run the RF gain below max. Anyhow, I picked out the loudest CQ, somewhere around 14.030, and replied. No hear. Found another loud CQ around 14.015. Same. Tried 14.060 but the digital sigs had spread down through there. Answered a few more CQs with no responses.

"Finally I found a sizable empty spot around 14.050 and put out a 3x3 CQ. Bingo, immediate response from N0COS. We exchanged 599 both ways to Kirkwood, MO. A leisurely 20-minute QSO ensued.

"Just goes to show: don't rule out calling CQ. Especially if you're in a favorable location!"

Pierre added that "most of all, it was fun! . . . When I got back to civilization, my sore feet reminded me that I had hiked 8 miles for one QSO. But I felt it was more than worth it!"

New QRP net from Arkansas

Jim Hale, KJ5TF, of Kingston, AR, has announced formation of CW QRP net Tuesday evenings at 2330Z on, or near 7.042 MHz. The group, which first met in September, meets each Tuesday and encourages all QRP operators to check in. **Bob Schill, N9ZZ,** of Mountain Home, was net control station (NCS) on the net's inaugural evening. During the kick-off session, Hale was mobile near Fayetteville, AR, with a Small Wonders Lab SWL-40 transceiver at 2.5 watts and a Forty-9er transceiver at 1.2 watts.

In addition to himself, **Bob Stolzle, AC5AM,** of Natchitoches, LA, reported that there were six QNI during the kick-off session: **Bob Edwards, W4ED,** Stone Mountain, GA; **Joe Gerry, W3GW,** Covington, LA; **Jeff Johnson, KB0ZSM,** Hollister, MO; **Sandy Blaize, W5TVW,** Metairie, LA (using a 6T9 tube crystal controlled transmitter); **Hank Kohl, K8DD,** of Port Huron, MI operating the Michigan QRP Club's **WQ8RP**; and **Dick Kapalczynski, N5JI,** Murphy, TX.

One QRPer's 'Mystery Dipole' high wire act

Cam Hartford, N6GA, of Claremont, CA, had some excitement during the September '97 QRP Afield contest. Here's his report:

"I thought a trip to the Zuni Loop (high in the San Gabriel Mountains north of Los Angeles) was in order for September's QRP Afield. From up there (7,300 feet elevation) I could rip off a few Q's and keep my eye on the borders for Arizonian infiltrators. As it turned out, I encountered darn few of either.

"The bands were rather pathetic from this end of the country. Best contact of the day was **AL7FS,** who was right off the end of the antenna. Not sure how he heard my 950 mW. They must grow big ears up there.

"Biggest surprise of the day was when the antenna, a dipole strung at 50 feet between two trees, decided to lower itself about 20 feet, then raise itself mysteriously to its original height . . .

"I had left the operating table to get some water, and when I returned I realized that the antenna had slipped to about half its original height. As I was gawking about, trying to figure out which end had come loose, it slowly started to raise itself back up to its original height.

"Must be the Spirit of the Great Zuni in the Sky, trying to tell me my angle of radiation needed adjustment.

"The far end of the antenna was in a tree whose base was down the hill a bit, out of view from where I sat. It turned out that a couple of hikers had come across the yellow spool of cord which held up the end of my dipole.

"From where they were, they couldn't see me or the antenna. They thought someone had gotten a kite stuck in the tree or something like that, and wouldn't this make a really neat spool of kite string? So they untied it from the tree, whereupon the antenna slipped and drooped about 20 feet. Deciding that they would retrieve as much of the stuff out of the tree as they could, they started winding it back onto the spool. Back up went the antenna!

"Surprised the whooey out of them when I came yelping over the hill towards them.

"After about an hour, when there wasn't much but dupes on 20 meters, I dropped the dipole on purpose to add the bottom half to it, making it into a Lazy H. Signal strength and Q rate both improved, but still things were fairly slow.

"Vital stats:

"CALL USED: **KF6NKR** (the new call for the Zuni Loop Mountain Expeditionary Force, while awaiting **K7ZNI** through the vanity call program. I had to use this one just once before trashing it. Once was enough!)

"RIG: Norcal Sierra, much modified, 950mW out.

"ANTENNA: Mystery dipole, morphed into a Lazy H.

"OPERATING TIME: 3½ hours.

"RECOVERY TIME FOR PULSE TO RETURN TO

NORMAL: About 12 minutes (plus one 807).

"OPERATION: 34 QSOs, 19 SPCs, 8X multiplier, final score: 5,168 points.

"Thanks to the QRP Club of New England for yet another fun Afield event.

QRP mobile adventures and success

Scott Rosenfeld, NF3I, near Washington, D.C., is proof positive that QRPing and mobiling are far from being mutually exclusive activities.

"At 1145Z this morning, on the way into work, I got on 30 meters as propagation's been good lately.

"Bingo! **VK2AWD** is calling CQ on 10.111, but he's kind of weak and with all this noise and traffic (Interstate 95, rush hour, north of DC) . . .

"So I reply at a power level of 3 watts, and I get a 539! Turns out he's Dave, in Syndey, VK-Land, running 100 watts to a vertical (and I've got a shortened vertical on the car).

"Good QSO, lots of noise from the overhead high-tension wires at times and lots of RFI from certain other vehicles as they drive by.

"So now I can say I've done it:

W3-to-VK2, QRP mobile, on 30 meters, vertical-to-vertical!

"The CQ almanac lists Washington, DC to Canberra as 9,900 miles; Sydney is about 150 miles NE of Canberra, and I'm 10 miles north of DC, for a distance of about 9,750 miles. Now I *really* feel like I can apply for the 1000 mile/watt award without guilt!"

Notes from the fall 'Party'

JP Keon, AB4PP, sends e-mail from Raleigh, N.C., about his work in the 1997 QRP ARCI Fall QSO Party. "I just wanted to let everyone know that my second experience was awesome."

"I got in there with **Paul Stroud, AA4XX,** and **Derek Brown, WF4I,** and operated the whole time we could stay on the air. We were also graced with the presence of several others: **Dave Johnson, WA4NID,** who finally showed up after his car died on the way to the site; **Todd Ellis, N2XL,** and **Lynn Williams, W4WDN.**

" We set up in the rain (drizzle) and worked the contest in the monsoons. We stayed up mostly all night and kept pushing the water off the top of the 12x12 shelter we used over a picnic table to operate from. The picnic table also served as the eating table and cooking table so we could stay out of the weather.

"We really should have operated MM because at times we were almost under water."

"Since this was my first experience at a real contest operation with that much power (250mW) I was impressed to work mostly all the stations I called and there were only a few who I contacted that told me DUPE or B4 that we tried to work over and over. I learned the real meaning of the word frustration when I made contact with someone a second time after waiting for him to answer me and then tell me again B4 and we still did not have him in the log for that band.

"We did however, manage to cook on my smoker and on the grill when the rains would let up long enough and we cooked up some very tasty spare ribs, and some wonderful chicken. And we even smoked some Kielbasa and then in the morning the chef (me) cooked up eggs, bacon, toast, and fresh coffee for all.

"We dismantled the camp early since we all had other things to do on Sunday, and I think it was more due to the fact that we were waterlogged.

"We probably took on about 10 inches of rain in that period there at the site.

"We did manage to get up several nice antennas including the Carolina Beam that worked well for 80 and 40 meters, even though we aimed it the wrong way. And it still performed very well.

"The best part of the whole operation was during the early morning hours when we got on 80 meters and worked everyone we could hear in the contest part of the band and I intentionally drifted a little and made some 30 and 45 minute QSO's with some other folks (QRO) and even got one of them to change his power down to 5 watts and he was probably another convert to QRP after that. He could not believe that we actually were running only 250mW. But we finally did recognize that fact when he heard the other contest stations.

"There was only one station this time who questioned my '250 watts' when I told him I was QRP, and then when I told him the 'number' was 'one quarter of a watt,' and not 250 watts. He was amazed too.

"When Paul and I did the last QRP to the Field we did have a 'KE4' who told me I was QRM'ing his QSO with my 950 watts, and then when I advised him I had sent 950mW he was never heard from again. I will not mention his call because I think he suffered enough embarrassment when he finally read the words correctly. I just love people who can actually read the CW they hear on the bands. I guess I am just spoiled.

"We were even queried about having a nine element beam up real high since our signal sounded so good to one operator.

"We got lots of praises from some other ops who said they heard us real well (which was evident from the reports we were getting).

"I am sorry to say, fellows, that you are now stuck with me in the QRP ranks. I have even got plans to sell my new TL-922A Linear and the six extra 3-500Z's so that I can get a new Sierra and other little things in the near future. But all that will take time.

"I now have to figure out how to get my Carolina Beam back up in the air in the back yard.

"We really did enjoy it and I am sure that Derek is like me and addicted to QRP. In fact when he gets done building 'my' Sierra he will begin work on his.

"Again thanks to all, I enjoyed it and will definitely be in there for the next one."

Goodie Giveaway

Joe Mikuckis, K3CHP, of Riverdale, MD, is author of **"K3CHP's DX QSL Guide,"** a 100+ page booklet of "standard sentences, written in various languages to be selected and copied on QSL-related correspondence, and thereby produce an impressive QSL return." He generously donated copies to be given out in the "Goodie Giveaway," and the third, and final booklet is being sent to this quarter's winner: **Neil Tanner, WA4CHQ,** of Gwynn, VA, whose QRP maritime mobile story and pictures appear in MN this month.

We're emptying the hat for next quarter's giveaway, and here's hoping you share your stories and photos with Quarterly readers, and get into the drawing at the same time.

SOLAR PHENOMENON OF THE ACTIVE SUN

Part 1

by Paul Harden, NA5N

OUR SUN has intrigued man for centuries. It is this glowing orb sustaining life on Earth with daily regularity and endless perfection. Well, almost. Galileo was the first to observe the sun, the motions of the planets and the cycles of sunspots, causing him to declare the planets revolve around the sun and it's blemished surface makes it less than perfect. (And we all know how much trouble that got the poor fellow into). Since then, the sun has been studied with every advance in technology, and yet, very little is actually known about the true physics of the solar phenomenon. It is indeed a burning orb with temperatures in the millions of degrees celsius, far beyond what conventional physics can currently explain. In the past several centuries, it has been learned the sun goes through an 11-year cycle of sunspot activity, which in this century, has been correlated to cycles in the solar energy released. We now call it the solar cycle, ranging from the "quiet sun" to the "active sun." Since World War I, it has been noted by scientists, radio amateurs, and shortwave listeners alike that communications on earth are affected by these swings in solar activity

Not much has been written about our sun in recent years because we are at the bottom of the solar cycle, and frankly, it's behavior over the past 3-4 years has been boring. However, we are entering a period of the active sun that will last several years, taking us from the current minimum to the solar maximum. During these next few years, as the old timers will tell you, communications on the HF bands take on a whole new character. Most notable are dependable communication paths on the higher frequencies, lower absorption of signals in our ionosphere, and higher reflectivity causing longer skip distances. All of these factors improves communications on the ham bands to an amazing degree -- including low power QRP operations. Of course the active sun brings bad news for hams along with the good, for along with improved propagation and band conditions, comes unexpected solar disturbances that can cause elevated static levels of the nuisance variety -- to complete communications blackouts on HF. It is the purpose of this two part article to explain this phenomenon known as the "active sun." In this first part, we'll explore some of the mechanisms and popular models of solar disturbances and the solar storms they produce, while in Part II, we'll explore the earthly effects. **QRPers** who take an interest in the behavior of the active sun will learn to exploit the coming trends for very successful DX operations. It is for these QRPers that this article is intended. And while most articles on this subject describe the general effects, none describe the actual physics of a solar storm, which hopefully most of you will find interesting.

Hams are not the only people looking forward to the active sun. This coming solar maximum will be studied like none other before, due to the many advances in technology since the last solar cycle. Scientists now have brand new instruments to study the sun from earth based observatories to new satellites in orbit, dedicated to solar research. The theories of solar physics and solar disturbances will be drastically revised over the next few years. Some of the information presented in this article is the result of recent observations and modeling from the Culgoora Solar Radio Heliograph (now deactivated), the VLA and VLBA radio telescopes, the SOHO solar satellite, and other facilities, previously unpublished in a general interest article.

Fig. 1 - Skylab photo of a massive flare (or CME)

A TYPICAL SOLAR DISTURBANCE

The photo below (**Fig. 1**) is a dramatic example of a giant solar flare, and representative of disturbances about to occur. Scientists call this type of event a **Coronal Mass Ejection** or a CME. The massive size of this event reveals several important characteristics of a solar disturbance, even when occuring on a smaller scale. First, the loop appears to be solar material that is leap-frogging, or jumping, from one place to another. This is exactly right. In this case, material was ejected from the sun at the northern location to an area near the equator, a distance of about 300,000 miles! Several Earths would fit inside the loop. Secondly, the loop appears to be half of a toroidal pattern, that is, a magnetic loop. This is also exactly right. Solar disturbances produce huge magnetic disturbances as well, forming loops of magnetic field lines originating at the disturbance and terminating elsewhere on the solar surface. The photo shows solar mass traveling along the magnetic field lines, painting the magnetic shape of the disturbance. A tremendous amount of mass is being ejected from the sun, including electrons and protons that will eventually reach the Earth (ouch!) if we are in it's eventual path.

There are a host of other activities occuring that are not seen in the visual image that are observable only with radio telescopes or satellites ... such as the energetic release of electrons that will strike the earth shortly after the onset of the disturbance. Nor the shock wave of electrons and protons that will bombard the Earth in a couple of days, that can cause long periods of geomagnetic storming.

For hams and QRPers, a solar disturbance is a significant event, as it delivers a one-two punch to the Earth effecting communications ... a bursting static solar storm at the onset of the disturbance, followed by up to several days of geomagnetic storming on Earth.

THE PHYSICAL SUN AND EARTH.

Let's review our sun and Earth for a sense of the sizes, distances and terms often associated with such discussions.

The Sun is a fairly small star by astronomical standards, yet it is huge by our gauges of measure . It has a diameter of 870,000 miles (1,400,000 km), or about 110 times larger than the Earth. The bright surface we see (the visable disk) is called the **photosphere** and is quite cool, a mere 6000^{0}K, compared to the millions of degrees K deep in the interior. The solar atmosphere consists of both the **chromosphere** (the lower atmosphere) and the **corona** (upper atmosphere), extending outwards to about 600,000 miles (1,000,000 km). The electrons blowing away from the corona is what forms the **solar wind**, that extends well beyond the orbit of Pluto. (The boundry of the solar wind is called the **heliosphere** and how far it extends from the sun is not known. Electron density measurements from the *Voyager* spacecrafts are still functional and being monitored by NASA/JPL. It is hoped that the boundry of the sun's influence will be detected in the next couple of years ... the last role to be completed by these historic spacecrafts).

The sun also rotates, just like the Earth, with a solar rotation being

about 28 days. Thus, a location on the surface of the sun (such as a disturbance or sunspot group) will face the Earth for about 14 days, then gone for 14 days, where it could re-emerge and cause problems all over again. During an active sun, the solar flux goes through a 27-day oscillation, linked to the sun's rotation.

The Earth is about 7,900 miles (12,700 km) in diameter and located about 93 million miles (150 x 10^6 km) from the sun. This sun-earth distance is called an **Astronomical Unit** or 1 A.U. The Earth is 8 light minutes from the sun (8m 20s, to be exact).

The Radio Sun. If the sun radiated as a thermal source only, the received flux density (radio brightness) would vary directly with frequency according to **Plank's black body radiation law**. The higher the frequency, the more power received. Optical observations of the sun at different wavelengths does follow the black body spectrum. However, radio energy from the sun does not ... indicating radio energy is being generated by another process other than heat. **Fig. 2** shows the radio energy during a quiet and disturbed sun, and what the calculated **black body** radiation should be.

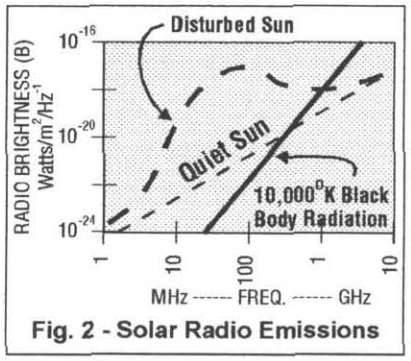


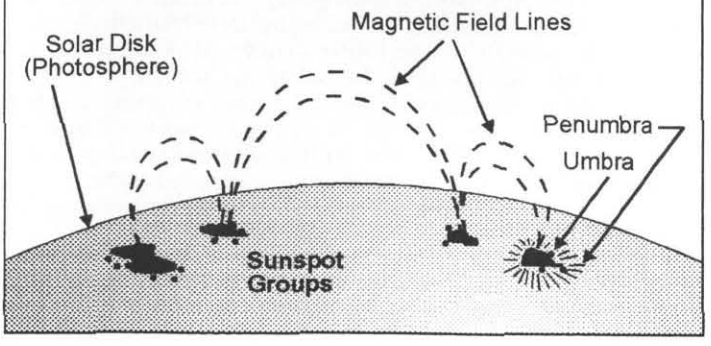
Fig. 2 - Solar Radio Emissions

Deep in the core of the sun is a massive thermo-nuclear reactor, generating very short wavelength energy (gamma and X-rays). As this energy works its way to the surface of the sun, the wavelength gets elongated, or stretched, into the lower or radio wavelengths, becoming the background radio emission from the sun called the **solar flux**. Solar flux is low during a quiet sun, and elevated during an active sun. Also, solar flares, sunspots, CME's and other phenomenon will cause fluctuations in the solar flux.

Sunspots are the most commonly known solar phenomenon. They are dark blemishes on the solar surface of mass that is cooler than the photosphere. Sunspots can be a single feature, many features, or an area made of dozens or hundreds of individual spots. The dark region is called the **umbra** and the filamentary structure called the **penumbra**. Sunspot groups are highly magnetized, with strong local field lines amongst a group, and sometimes connecting groups, as shown in **Fig. 3**. There are few sunspots during the quiet sun (<20), while the active sun can sport over 200 at a time. During the active sun with many sunspot groups, the intertangling of all these magnetic field lines can get complicated, causing all sorts of interactions with the sun's magnetic field, generating wideband noise, bursts, and the like. It is believed that this web of magnetic fields during an active sun, in part, attributes to the higher solar flux.

Solar astronomers watch sunspot groups carefully, as it is from these areas that solar flares can occur. Heightened sunspot activity should also alert the QRPer that an impending solar storm is possible.

FIG. 3 - General Composition of Sunspots



Before we model a typical solar disturbance, let's look at the evolution of a solar storm as received on Earth. Likely, many QRPers have experienced the following scenario (or soon will!), not realizing you were "witnessing" the onset of a solar storm.

EVOLUTION OF A SOLAR STORM

It's saturday afternoon, 20M is quiet and the DX is good. Suddenly, sharp bursts of static nearly swamps the QSO in progress, followed by a sudden increase in the overall noise level. Then it tapers off. But wait, here it comes again, bursts and static crashes, and what sounds likes ocean waves smacking on the beach. You push the Noise Blanker button ... nothing. (Does that NB thing ever do anything?). You, and thousands of other hams, just became victims of a solar storm.

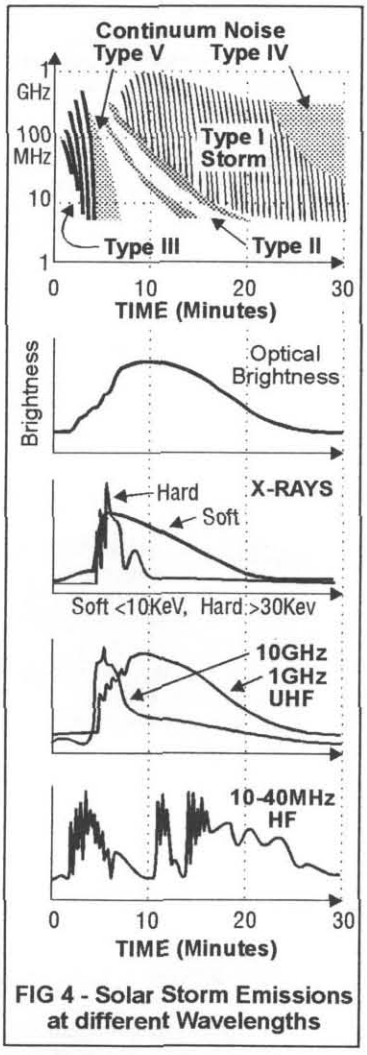


FIG 4 - Solar Storm Emissions at different Wavelengths

Fig. 4 is a sequence of diagrams showing the spectrum of a typical solar disturbance *as received on earth,* at different wavelengths, from visable light down to HF, for the first 30 minutes. The radio storm types, such as Type II or III bursts, will be discussed later.

The first indication of a solar storm is the arrival of very short duration (Type III) bursts from ~8 to 600 MHz and lasting only 2-3 minutes. Often, these bursts arrive before the flare or disturbance is seen visually, as shown in the second *Optical Brightness* chart. Type III bursts are the first to arrive because these are energetic **relativistic electrons,** meaning they are traveling at nearly the speed of light. These bursts drift downward in frequency very fast, about 20MHz per second. The streaks on the top chart for Type III indicate numerous bursts, several seconds apart, drifting downward in frequency. However, if you were parked on a discrete frequency, it would sound like a static burst, repeated every few seconds for 2-3 minutes in duration. This would be followed by an overall increase in the noise level, caused by the **continuum noise** (Type V) that follows. Continuum means the energy is present over a wide frequency range simultaneously. Then for several minutes, there is a lull in the action before the Type II bursts arrive. This is also sharp static bursting that drifts downward in frequency, caused by electrons traveling about one-half the speed of light, and thus takes an additional eight minutes or so to reach the Earth, followed by many minutes of Type I storm bursts and an overall increase in the noise level due to Type IV continuum noise. A fairly large solar disturbance can cause storming to persist far beyond the 30 minutes shown in Fig. 4.

There is little distinction between the different storm types to the untrained ear ... they all sound like a symphony of static crashes. But don't forget ... this is just the first attack. The slower electrons, those traveling far less than the speed of light, will reach the Earth in about two days time to trigger electromagnetic storming in our own ionosphere and magnetic field. This second punch is usually more severe, as it can last for days and disrupt HF communications.

THE PHYSICS OF A SOLAR DISTURBANCE

Scientists do not know what triggers a solar storm, but they are constantly revising the models of what happens once it starts as new instruments and observational data becomes available. The physics involved in a solar disturbance are actually quite fascinating; hopefully you'll find the following interesting.

First, let's consider a typical explosion. Say you are to witness a nuclear explosion from some safe vantage point. At the moment of detonation, there is a bright flash, a sudden release of electro-magnetic energy, then a rising mushroom cloud, followed sometime later by the shock wave, and later still, the sound of the explosion. These are the results of different types of energy, travelling at different speeds. The flash of the explosion and the electro-magnetic energy travels at or near the speed of light. The shockwave travels at supersonic speeds (faster than the speed of sound), while the thunder of the explosion travels at the speed of sound. The heat of the explosion carries gas, debris and other matter upward, also at sonic or supersonic speeds.

And such is the case with a solar disturbance, which begins as an "explosion" on the sun's surface, releasing different forms of energy and mass, traveling at different speeds. Scientists refer to these speeds as either **relativistic** or **sonic/supersonic** velocities. Electrons, electro-magnetic radiation, radio emissions, and of course light travel at **relativistic velocities**, which is generally defined as the speed of light to one-half the speed of light. (95,000 to 186,000 miles/sec., or 150,000 to 300,000 Km/sec.). **Sonic** speeds are relatively slow velocities, much like the speed of sound (in space), or in the hundreds of km/sec., while **supersonic** velocities extend upwards to about 150,000 km/sec., or about one-half the speed of light. The shock wave from the explosion of a solar flare, and the mass ejected from it, travels at supersonic velocities.

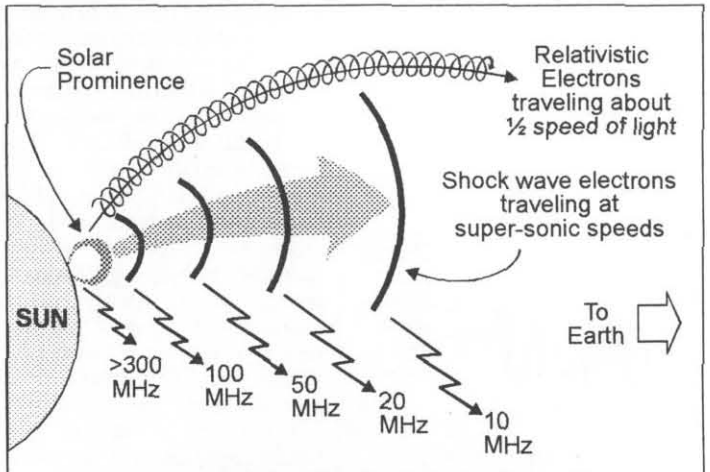


FIG. 4 - Basic Emission Model of a Solar Storm

Fig. 4 depicts the basic actions of a solar disturbance. It begins by a sudden release of mass from the solar surface, much like a growing bubble that suddenly bursts explosively. This burst produces a **shock wave** that carries the hot burning gas cloud and highly concentrated electrons higher and higher into the solar atmosphere. When it becomes visable, it is called a **solar prominence**. Sometimes this may be a single "jet" of mass leaving the sun, while other times the mass is contained within the magnetic field lines forming a "ring," such as shown in the Fig. 1 photo. Regardless of whether or not the ejected mass is allowed to escape or contained, the shock wave will continue to rise above the solar surface and propagates outward to eventually reach the Earth, and in fact, far beyond. Very strong **magnetic field lines** develop around the disturbance, and energetic electrons are produced. A very strong disturbance can produce gamma and x-rays. These energetic electrons start out traveling at the speed of light, but some are trapped by the sun's magnetic field, only to return to the solar surface, while others are allowed to escape to propagate across the solar system at relativistic speeds. The difference is whether the electrons get trapped by what is referred to as closed or open field lines. A **closed field line** is one that leaves and returns to the solar surface, making a toroidal field line. Electrons traveling along a closed field line return to the sun. **Open field lines** are those that extend very far from the sun and for practical purposes do not return (even though all magnetic field lines eventually do return). Electrons traveling along an open field line do not return to the sun. They travel in one direction only -- outward from the sun. (See Fig. 5). Of importance is that as we travel around the sun, the Earth travels through the sun's **open field lines**. Thus, as energetic electrons escape the sun by traveling along open field lines, it is some of these electrons that will strike the earth at relativistic speeds.

Electrons trapped by a magnetic field will revolve around a field line in a circular motion. The energetic electrons released by a solar disturbance will also be attracted to the magnetic field lines, which try to capture the electrons into encircling the field. However, instead of revolving around the field lines stationary (as free electrons do), they will travel along the field lines in a spiraling motion due to the very fast forward motion of these relativistic electrons. This spiraling motion slows down the relative velocity to about one-half the speed of light. Still, these spiraling relativistic electrons, traveling along open field lines, will be the first to strike the Earth in 8 to 16 minutes following the onsert of the disturbance. It is these electrons that cause the first disturbances on Earth, called **Type III bursts**. A new solar storm has just been born.

As these first relativistic electrons strike the Earth, the shock wave and the ejected mass from the disturbance are rising above the sun at **super-sonic velocities** (~50,000 km/sec) creating strong radio emissions across the entire radio spectrum. However, at this point in time, only the very high frequencies are escaping the sun to propagate towards Earth. As one can imagine, the electron density of the sun's lower atmosphere is very dense. On Earth, air is more dense at sea level, and it gets less dense the higher you go above sea level. The same is true on the sun. At the surface, the density of the atmosphere at the solar surface is very dense. For comparison, the electron density (Ne) on Earth is about 10^{10} to 10^{13} per cubic meter, while the surface of the sun is about $10^{16}/m^3$. For radio energy to escape an atmosphere (whether the sun or Earth), the wavelength must be small enough so that the collisions with the electrons do not cause total absorption or reflection. Thus, lower frequencies, with long wavelengths, can not escape until the electron density becomes fairly low, while high electron density will allow only short wavelength energy to pass. The lowest frequency that penetrates a given electron density is called the **plasma frequency** (or *critical* frequency). This is a very important concept. On the sun, this determines what frequencies are emitted towards Earth from different solar heigths. On the Earth, it determines what frequencies will travel into space, and what frequencies will be reflected back to Earth. Sound familiar? Hams call this the **Maximum Usable Frequency (MUF)**. At any given time, the electron density of our ionosphere is such that radio energy above the MUF (shorter wavelengths) will pass through to space, while below the MUF (lower wavelengths) will be reflected back to Earth (and/or absorbed). In terms of the **plasma frequency (Fp)** , for a given electron density, all frequencies above the Fp will pass through, while frequencies below the Fp will not. The relationship of the plasma frequency (Fp) to the electron density (Ne) is approximated by:

$$Fp = 9\sqrt{Ne} \qquad \text{which for the Earth is,} \quad Fp = 9\sqrt{10^{12}} = 9 \text{ MHz}$$

This is universal throughout our galaxy. For example, professionals and amateurs alike (including the author) monitored the radio emissions from Jupiter when the various fragments of the SL-9 comet penetrated it's atmosphere in July 1994. By noting the times and the lowest frequencies that emissions were detected during the impacts, the plasma frequencies were determined, which were then used to calculate how deep into the Jovian atmosphere the fragments traveled. Interestingly, this amateur data showed the fragments exploded rather shallow, contrary to the professional thinking at the time. It has since been determined the impacts were indeed quite shallow.

The plasma frequencies are roughly depicted in **Fig. 4**. **Fig. 5** shows how the plasma frequency is related to the distance from the sun.

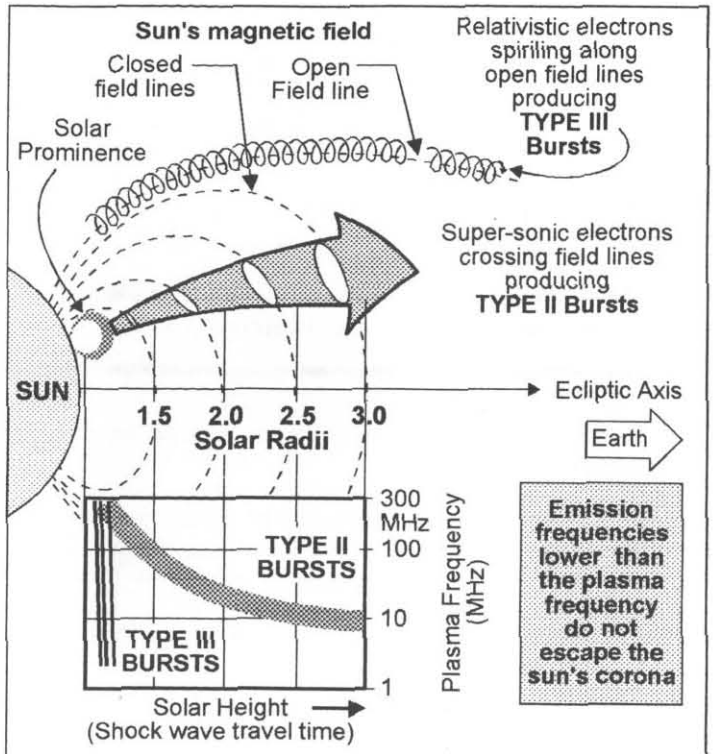


FIG. 5 - Mechanisms for TYPE II and III Bursts (Referenced to the solar magnetic field)

By observing the time a certain plasma frequency is reached, astronomers can determine precisely the speed of the shock wave, how high above the solar surface it has travelled, and how far it will travel. If the Earth lies in this trajectory, this wavefront will ionize our ionosphere and cause geomagnetic storming when it hits about two days later. Various organizations issue alerts and predictions as to the severity of this impending geomagnetic storm. It is from "listening" for the plasma frequencies and determining the speed and trajectory of the shock wave that these predictions are made. This seemingly complicated solar physics of determining plasma frequencies and wavefront velocities can actually be performed by amateurs monitoring a solar storm at two or three different frequencies. Just use Fig. 5.

As this shock wave travels away from the sun, it passes through the sun's magnetic field lines, as shown in **Fig. 5**, producing radio emissions, which if above the plasma frequency for that heigth, will be emitted towards earth at relativistic speeds. When received on Earth about 10 minutes later, they will be the second wave of static bursts, the **Type II bursts** shown in Fig. 4. While the Type III bursts drift downward in frequency about 20MHz/sec., the Type II's are slower at about 2 MHz/sec. To the QRPer, the Type III bursts will be quick, loud bursts of static, while the Type II's sound like "swishes" of static, or like waves crashing on a beach.

The previous actions, shown in Fig. 5, describes the relativistic electrons and the shock wave as it interacts with the **sun's magnetic field**. As stated earlier, a solar disturbance also produces it's own magnetic field, and this shock wave must therefore travel through the field lines of the disturbance as well as that of the sun's. This is depicted in **Fig. 6**. Behind the shock wave is the rising gas cloud, which expands and rises to about two solar radii, where the electron density of the gas cloud equals the electron density of the chromosphere. At this point, about 30 minutes following the CME, the gas cloud becomes stationary, continues to produce radio energy for hours to days, and the emission changes from linear to circular polarization. While this means little to the ham being bombarded with this radio noise, the change in polarization does tell astronomers when the gas expansion stops, and measurements of electron density, heigth, etc. can be made. The radio emissions from this mechanism is continuum in nature, and called a **Type IV Continuum Storm.** It is heard over the frequency range of 18-400 MHz simultaneously as elevated background noise. Furthermore, as the shock wave continues on, it travels through the field lines of the disturbance, producing sharp, bursty emissions called **Type I bursts**. The exact mechanism behind Type IV and Type I emissions is not well understood, but one current model is the Type I bursts are electrons trapped in the high coronal loops -- that is, the closed field lines of the disturbance just before they become open field lines. If this occurs high above the solar surface, then the plasma frequency will be low, perhaps low enough to extend into the HF spectrum. These trapped electrons will radiate energy at the plasma frequency and higher, and is called **plasma radiation**. Type I bursts have also been detected in the magnetic fields between sunspot groups (see Fig. 3) without anyother signs of a solar disturbance, although usually with plasma frequencies above 100MHz.

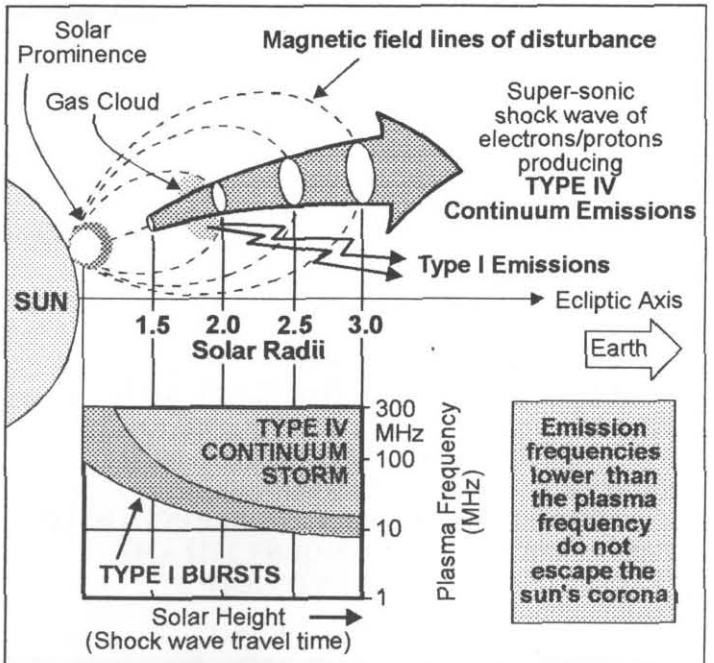


FIG. 6 - Mechanisms for TYPE I and TYPE IV Storms (Referenced to magnetic field of Disturbance)

All illustrations by the author

Summary.

A solar disturbance is a complicated sequence of events, and interactions between many processes, not all of which are well understood. It is a fascinating science in itself. To the QRPer, the active sun will bring days of excellent global propagation, days of severe HF disruptions, and episodes of violent solar activity. It is important to understand a solar disturbance is a two-bladed sword ... a "solar storm" at the onset of the disturbance, and another one (a geomagnetic storm) two to three days later that in itself can last days. This later phenomenon will be discussed in Part 2 of this article, along with how to interpret solar forecast information from WWV or internet sources.

A Personal Note ...

I have worked at the National Radio Astronomy Observatory on the VLA and VLBA radio telescopes for over 20 years. During this time, I have worked with many astronomers, including solar astronomers, who are always fun to work with and make excellent "Elmers." I wish to specifically thank Dr. Tim Bastian, our staff solar scientist, who always has the time to explain the concepts such as presented in this article.

-- 72, Paul NA5N (pharden@nrao.edu)

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IDEA EXCHANGE

Technical tidbits for the QRPer

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IN THIS EDITION OF THE IDEA EXCHANGE:

THE NORCAL 2222 DAYTON DESIGN CONTEST

__Wayne Burdick, N6KR__ came up with another interesting building project to be done for Dayton next year, and QRP-L has been abuzz with lots of discussion on it

Here's the announcement as originally posted to QRP-L and now seen on the __NorCal web page__. (If you haven't already been there, be sure to take a look; __Jerry Parker, WA6OWR__, has done an excellent job with it. The URL is __www.fix.net/norcal.html__.)

NORCAL'S 2222 Building Contest
Conceived by Wayne Burdick, N6KR
Sponsored by the NorCal QRP Club

Introduction:

The object of this contest is to build a ham-band transceiver using only one kind of active device, the venerable 2N2222 NPN transistor. NPN transistors can function at all stages of a radio--oscillators, RF or AF amplifiers, mixers, switching and timing circuits--and you get to use up to twenty-two of them!

Specifically encouraged is out-right theft of existing circuits to build the transceiver. In fact, you don't necessarily have to design a thing; if you want, just glue together existing circuits. But do it with style!

This contest will appeal to those who are all thumbs, since the finished rigs will NOT be judged by appearance or construction technique, just by what they do and how well they do it. The winner will have the honor of having his or her design named the official "NorCal 2222 Transceiver"! There will of course be tangible prizes, too, and there's always the possibility that the winning design might become a NorCal kit.

Rules:

1. The 2N2222 is the cockroach of NPN transistors: no matter what happens to us or to the planet, you'll still be able to find them in huge quantities. Your task is to use these ubiquitous parts to design a radio for a post-apocalyptic world; a radio that could be built in any country, no matter how remote it may be from Silicon Valley.

2. You may use up to twenty-two (22) 2N2222-family transistors, including the 2N2222, 2N2222A, PN2222, PN2222A, exact NTE equivalent, etc. *[Or even the MMBT2222 for the brave of heart and strong of eye! That's what I'm using! --WA8MCQ]* You can use as many other electronic and mechanical components as you like (including diodes), as well as any kind of packaging. But DO NOT use ICs, other transistor types, or mixers such as the TUF-1 or SBL-1 etc.

3. Feel free to incorporate parts of published circuits into your design. Cite all references used, and try not to "borrow" more than 25% of your design from any single article. Also let us know which circuits you designed from scratch, or modified, and explain what you learned or observed in the integration process.

4. The transceiver may operate on any ham band(s) and any legal mode(s), but must meet FCC regulations.

5. For each design you submit, please provide the following:

   A. Working prototype of the design
   B. Complete, readable schematic on one 8.5" x 11" page
   C. One-page, typed description of the design, including operating instructions
   D. Results from your own bench tests

Judging: Entries will be judged strictly by how creatively the designer applied the 2N2222 in his or her design. Entries will be NOT be judged by appearance, construction techniques, finish detail, etc., nor on how many 2N2222's were actually used. (For example, the judges will not be impressed by the use of a 2N2222's base-emitter junction as a simple switching diode.)

In general, performance of the radio will be inferred from the schematics and from the test results you supply. However, those rigs that are deemed safe to operate may also be tested on the air using real antennas. (If the judges have a lot of fun with your radio, it can't hurt your chances. If they fry their power supply and get dirty faces from exploding electrolytics, it WILL hurt your chances. Since you never know who might be judging--we certainly don't--try to make your radio foolproof!)

Entries will be judged at 8:00 PM Saturday night at Dayton 1998 at the Day's Inn Dayton South in the QRP Hospitality room. Have fun! 72, Wayne

This contest is sponsored by NorCal QRP Club and the decision of the judges chosen by NorCal is final. 72, Doug, KI6DS/M0BIV

[Also from the web page---]

Wayne followed his original posting with the following clarification today. Here is a copy of that message also. Boy, it's nice to see so many responses to this back-to-basics challenge. Many good ideas. Presumably everyone's counting 2222's, trying to get to sleep at night.

1. Why not allow PNP transistors? My intent here was to be a purist, I admit it! I thought it might be fun to focus attention on what can be done with nothing but NPN transistors. The goal is NOT to facilitate optimal design, which would certainly require PNPs, FETs, etc.

If you're worried about making a PNP-less and transformer-less audio output stage, consider that you can get quite a bit of power into 8 ohms with three or four 2222's in parallel, operating class A, with a beefy resistor in series with the collectors. On the other hand, if all you're driving is 32-ohm ear-buds, one 2222 operating class A will be more than adequate.

2. Why not allow integrated mixers (SBL-1, etc.) ? That violates the spirit of rule #1: "...a radio that could be built in any country, no matter how remote it may be from Silicon Valley...." I'm thinking that, on the moon, for example, you might not be able to find an SBL-1. But you sure could find some silicon diodes and roll your own mixer!

3. Why not allow 3-terminal regulators? That's an IC. Sorry. You can do a very good job with either a zener diode alone OR a zener diode with an NPN transistor as a buffer/follower if you need a lot of current. If you want to get really fancy, use an additional 2222 to provide temperature compensation....'nuff said.

4. How much RF power can you get out of a 2N2222? Hint: use the metal can for the PA stages! (The plastic PN2222 is much wimpier.) You can get a watt out of a 2N2222 for a while, more than a while with a really good heat sink, at least at low frequencies (like 3.5 MHz). Put them in parallel or push-pull, perhaps with individual emitter resistors, to get more power. On the other hand, no one said this had to be a 5W rig! How about a 500mW hand-held DSB rig for 15 meters? OK, no more hints. Good luck! Wayne

A DIFFERENT APPROACH TO WIDE RANGE VXO DESIGN

From ***Don Compton, K4FS*** *of Orlando, FL*--Various VXO circuits for shifting the frequency of a quartz crystal oscillator have been published over the yeas and their use has become quite popular in home built QRP gear. Basically, an inductor is connected in series with the crystal to lower the oscillator frequency and its effective inductance varied, usually by means of a series connected variable capacitor, to permit adjustment of the oscillator frequency.

The main focus of many VXO articles and technical notes has been on the selection of the series inductor to produce wide frequency shifts, but the use of other components seems to have been overlooked. The amount of crystal pulling is determined by the inductor plus stray circuit capacitances. Stray capacity in parallel with the inductor limited the frequency shift, but the capacity between the point where the inductor connects to one terminal of the crystal and ground extends the low frequency shift range. If a small capacitor is connected between this point and ground, the inductance of the coil can be reduced and the frequency shift actually increased.

For convenience we will refer to this added capacitance as the shunt capacitor. A simple Colpitts circuit test oscillator, shown in Figure 1, was used to measure the frequency shift which can be obtained with 5 assorted crystals when different value shunt capacitors were used (C1).

Note that adding the shunt capacitor to the circuit has very little effect on the high frequency limit of the tuning range, but produces a significant change on the low frequency side. It is important to remember that the further a crystal is pulled from its marked frequency, the greater the need of good electrical, thermal and mechanical stability of the VXO components since they play a larger role in the overall frequency determining process.

It is therefore recommended that C1 be a high quality, stable unit. I am using a small NPO temperature coefficient 2 to 10 pF

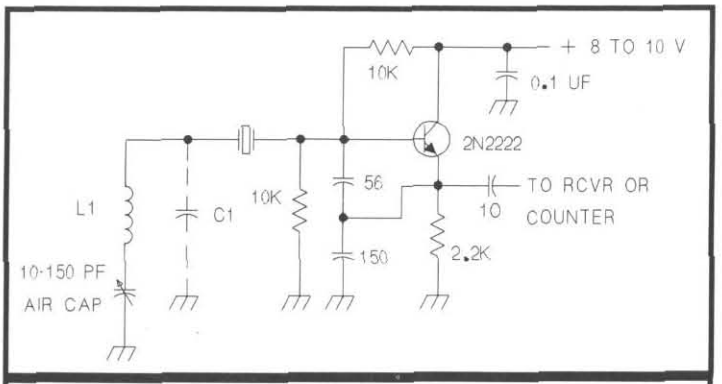


Figure 1—Small added cap (C1) increases VXO tuning range

ceramic trimmer in a VXO as it allows the low frequency shift limit to be adjusted. Short term frequency stability has been acceptable with shifts of 4000 ppm or less, provided the oscillator is protected from abrupt temperature changes.

The inductors used in the test setup are axial lead type, epoxy coated miniature choke coils stocked by Mouser (stock number 424-22-###). An inductor for VXO use should have as high a self resonant frequency as possible, indicating that it has low stray and inter-winding capacitance. Fortunately some coil manufacturers list the self resonant frequency (SRF) of their product and suitable inductors can be selected by checking catalogs. Many experimenters use two or more coils in series to minimize the overall distributed capacitance and obtain wide frequency shifts; starting out with low C helps even more. Low stray capacitance coils can be home-built by using very small diameter wire and spaced turns.

The crystals were chosen to demonstrate what can be achieved in or near the 40, 30 and 20 meter bands. The 12 and 22 MHz crystals are used in a heterodyne exciter for 30 meters. Pulling the 12 MHz crystal to a lower frequency with an inductor, series trimmer capacitor and shunt capacitor allows coverage of the upper half of the band. A small relay shorts the shunt capacitor to retune the oscillator to 12.000 MHz and enable tuning the lower portion of the band.

The same crystal/inductor pairs were also tested using the oscillator section of an NE602 mixer/oscillator IC. Slightly different values of C1 produced essentially the same frequency shift ranges as the 2N2222 test oscillator.

The shunt capacitor can also be used to experimentally determine a suitable value of series inductance for use with a specific crystal. Connecting 4 or 5 pF into the circuit should produce a substantial frequency shift, but a small change of only a few kHz indicates that the inductance can be increased. If 1 or 2 pF connected as the shunt capacitor results in a drastic frequency change, the inductance should be reduced.

Refer to the test results in Table 1 to get an idea of approximate inductance values to start with. I find that a VXO with a modest amount of inductance and 6 to 8 pF as the shunt capacitor has better stability than when the same crystal is used with a larger inductor and no shunt capacitor, although the frequency shift range may be essentially the same.

Anyone planning to use a shunt capacitor in a VXO circuit

should experiment with a test oscillator to aid in selecting the proper components. Experimenters wishing to try a shunt capacitor in existing equipment should first try very small capacitors (1 or 2 pF) to determine if the series inductor is already critically high in value as the increased frequency spread may be unstable. A "gimmick" capacitor consisting of two short lengths of insulated wire twisted together could be used for test purposes, but should be replaced with a stable fixed or variable capacitor.

7050 kHz, in HC-6 holder; L1 is 10&18 uH in series	0 pF 7045- 7050 5 kHz	4 pF 7042- 7050 8 kHz	6 pF 7039- 7050 11 kHz	8 pF 7032- 7050 18 kHz	10 pF 7017- 7050 33 kHz
10100 kHz, in HC-6 holder; L1 is 4.7&10 uH in series	0 pF 10092- 10103 11 kHz	2 pF 10089- 10103 14 kHz	4 pF 10085- 10103 18 kHz	6 pF 10074- 10103 29 kHz	7 pF 10063- 10103 40 kHz
12000 kHz, in HC-49 holder; L1 is 10 uH	0 pF 11988- 12000 12 kHz	4 pF 11982- 12000 18 kHz	6 pF 11977- 12000 23 kHz	8 pF 11967- 12000 33 kHz	10 pF 11942- 11999 57 kHz
14318 kHz, in HC-49 holder; L1 is 10 uH	0 pF 14304- 14320 16 kHz	2 pF 14296- 14320 24 kHz	3 pF 14288- 14320 32 kHz	4 pF 14279- 14320 41 kHz	5 pF 14255- 14319 64 kHz
22118 kHz, in HC-49 holder; L1 is 2.2 uH	0 pF 22091- 22113 22 kHz	2 pF 22083- 22113 30 kHz	4 pF 22071- 22113 42 kHz	5 pF 22061- 22113 52 kHz	6 pF 22042- 22112 70 kHz

Table 1—Frequency shifts observed on several crystals with various values at C1. Each cell shows value of C1, lower and upper frequency limits (in kHz), and total

—DE K4FS

PAINT FOR HEATHKITS

The subject of paint for Heathkit rigs came up on QRP-L back in September, and here are two sources worth looking into.

From **Paul Goemans, WA9PWP**-- Since there is so much interest in the "hot-water" QRP rigs, and an occasional request for paint, I am passing along some info I have on a local ham who has matching paint for Heath and other brands of "boatanchor" rigs. Rob also sells parts like knobs, plugs, belts, dial scales, etc. Yes, he has paint for the Heath "lunchbox" rigs as well!

R & R Designs
Rob Hummel WA9ZTY
202 Midvale Dr.
Marshall, WI 53559
1-608-255-0400
rhummel@aol.com for catalog , updates, and orders

From **Brad Mitchell, WB8YGG**--Rustoleum makes a paint that looks perfect. It's their American Accents, Heritage Color Teal 7929. I'm a purist at heart; if you don't need to paint it, don't! But if it's absolutely necessary, this color looks great; it's probably the best you will ever do with an off the shelf color.

RECHARGEABLE BATTERIES AND HAMFESTS

On QRP-L a while back, **Scott Bauer, W3CV** (ke3nv@erols.com) mentioned that some gel cells he bought at hamfests appeared to be defective—they gave only 12 volts or less after charging—and cautioned others to be careful when buying used gel cells. A few of the replies—

From **Scott Rosenfeld, NF3I** (ham@w3eax.umd.edu)--"I've bought dozens of batteries from hamfests and gotten maybe ONE dud of all of them. LESSON: BRING A VOLTMETER! If it's not over 12 VDC, reject it. It's not foolproof, but it has seemed to work for me."

From **David Maliniak , N2SMH** (dmaliniak@penton.com): "I guess I've been pretty lucky. I've bought several gel cells at hamfests and haven't gotten a bad one yet. In each case I was fully aware that I was buying burglar-alarm pulls. I didn't happen to have a multimeter with me, yet I'd get these puppies home and they'd always be sitting at 13 V or so. I hook them up to the A&A Smart Charger and they'd top off close to 14 V.

"My best deal was this past June. I came away with two 7-AH Yuasa cells for $1 each; both are in great shape and are mainstays of the station here. Whenever you hear me I'm running off a gel cell, so I like to look for them at hamfests. I know that my luck won't hold out forever, but it's been a good ride so far. The best way to protect yourself is to bring a little multimeter to the hamfests."

From **Rick Robinson, KF4AR**, rerobins@unccvm.uncc.edu: "After getting burned on a supposedly new 30 AH Yuasa gel cell, I've started carrying a digital multimeter and a 10 ohm 10W resistor in my hamfest backpack. I eliminate the ones that are less than 12.5 VDC with no load and I don't buy any gel cells that read less than 12 VDC loaded down. This may not keep me from getting ripped off again, but so far so good. The fellows that squawk about me testing before I buy are probably the ones not to do business with anyway.

"Another nice item to carry is a digital LRC meter for identifying values of variable caps and unknown inductors. The one that I have measures pF to uF and uH to mH."

A follow-up from W3CV reported a happy ending to the story; the batteries he was complaining about were not bad after all. He had merely been using the wrong type of charger on them. **Rich Bachmann, N3SLR**, gave him a lot of help and education on charging gel cells, and they are now fine. Rich has agreed to write an article on the subject, which will appear somewhere in the QRP Quarterly in the future.

MORE BOUNTY: RECYCLED CASES

*From **Joe Everhart, N2CX** of Brooklawn, NJ, Joes Quickie #24*— Several "Quickies" ago I talked about using parts from discarded batteries, a bounty from discarded material. There's lots more that can be recycled by the avid homebrewer in the form of "sunset technology." That is once state-of-the-art electronic stuff that has been superseded by newer fancier, and better-performing gadgets.

Not surprisingly, much of this older equipment shows up at hamfests. I suppose that the packrat in all of us keeps us from throwing away older goodies that are no longer in their prime. And optimism leads us to try to sell them at hamfests. But if they don't sell early, prices drop precipitously and at the end of the day we may even leave them behind so you don't have to drag them back home. Of course that's other people. We QRPers never do that, do we?

A rich source of material these days is old computer related equipment. I won't go into the electronic circuit aspects. Instead I want to recommend recycling some of the cases that the stuff comes in! As a bonus, you can also recycle components from the innards.

Now I wouldn't pay a lot for this stuff, because it just ain't worth it. Since it is of little use for its original purpose, it usually costs only a buck or so. And late in the hamfest day, it might be only a quarter or half dollar. At a recent 'fest, James Bennett, KA5DVS, found a vendor with a half dozen or so old A/B switches and bought

the whole lot for a special package price. He was kind enough to share several with me! Of course that was while he lived in New Jersey. Since his defection to Silicon Valley I now have to fend for myself.

The kind of stuff to look for is accessories to computers, such as A/B switches, old external modems and various interface items. They are housed in simple metal or plastic "clamshell" type cases of the style shown in Figure 2. There are a number of styles and sizes, but the kind I find most useful have top and bottom pieces with slots in their ends that hold separate front and rear panels in place. That means that you can open the case up and remove the case parts by simply pulling the panels and inner components out of the grooves. Then you can make up your panels to fit in the same grooves. There are metal cases, too, but they are usually made of steel and don't have easily removable end panels.

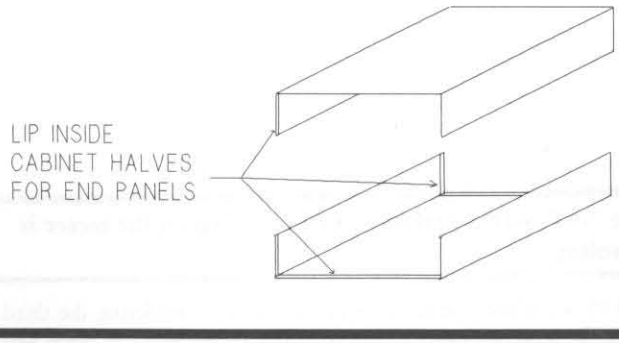


Figure 2—Clamshell type plastic case (N2CX drawing)

Replacement panels can be aluminum if that's what you prefer, but I'm partial to double sided copper-clad glass epoxy printed circuit board material. It is pretty darned easy to cut to size with good tin snips and can be machined with simple hand tools almost as easily as aluminum sheet stock. One down side is that it is fairly abrasive to cutting tools and drills so they need replacement or sharpening more frequently than when used with metal sheets. The outer surfaces can be left copper clad and painted or stripped of copper to have a "natural" finish. Colors for commonly available PC board material are tan, blue or green.

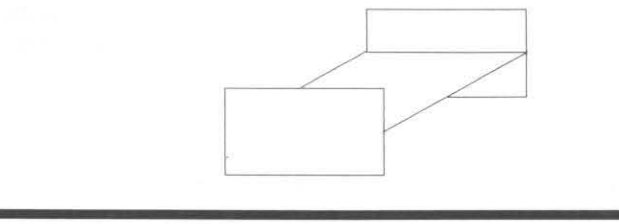


Figure 3—"H" shaped combo end panels and center support (N2CX drawing)

My favorite structure for the panels includes an inner horizontal piece attached to the panels to make an "H" as shown in Figure 3. This connects the two panels together and provides a convenient mounting surface for PC boards or electronic components and assemblies inside the case. Using PC board material lets you connect the inner piece by simply soldering it to the end panels. You can even use the copper surface for ugly style construction so that you don't even need PC boards. Of course the plastic case provides no electrical shielding so you may have to make up some internal shields. You might consider making them out of PC board stock as well and simply solder them in place.

So keep your eye out for the bargains when you see a sign that says "50 cents for anything in this box" at your local hamfest. You can walk away with a snazzy cabinet for your homebrew project for under a buck instead of paying five or ten bucks for a new one.

—DE N2CX

QSL'ING TIP

***Joe Mikuckis, K3CHP** of Riverdale, MD has this hint that might help improve your QSL return rate*—How many times have you sent your QSL with SASE to a fellow QRPer without getting a response? The reason may be a sloppy log. Especially during contests, when information is shuffled among immediate copy, dupe sheets, submission sheets and permanent station log, signal reports can be lost in the process. I found that it is very helpful to include MY received signal report as well on the QSLs by simply stating "tnx for my XXX report..." Also, don't forget to use "2-way QRP QSO or "X#XXX/QRP" when applicable.

DE K3CHP

SCREW-ON DUMMY LOAD/DETECTOR

*This one comes from **Frank Brumbaugh, W4LJD**, retired in Salinas, PR. He sent it simultaneously to the Idea Exchange and to QRPp, journal of the NorCal QRP Club. It appeared first in their fall issue due to the earlier publication schedule, and their version is better since he sent them pictures! (I also like the hand drawn figures in the QRPp version, which were probably done by Paul Harden, NA5N; he does a lot of the artwork for QRPp and it's quite good.)*

If you also have the QRPp version of this item, please disregard the formula for calculating power in the text on page 13 and also shown in Figure 2 on page 15; there was an error in the formula he gave both of us. As soon as I received his article I wrote to him about it but I couldn't notify Doug since I didn't know QRPp was also using it until I received my Fall issue. On page 13 it starts out correctly by stating that the power is calculated by multiplying the peak voltage (which the meter shows when using this device) by 0.707 to get RMS, squaring that and then dividing the result by the resistance—50, in this case. But for some reason he then said to take the square root of that quantity, which gives an incorrect result. The same error is in the formula on page 15 in QRPp, where a radical (square root sign) is shown. To get correct results, do not take the square root. (The text on page 16 gives an example of 22.36 volts being shown on the meter at the 5 watt level; those are correct figures.) Figure 7 here has the correct formula; use the one in the center.

I built this dummy load and RF detector to plug into the antenna connector of QRP rigs to provide a 50 ohm, 12 watt load and deliver the DC equivalent of peak RF voltage to be measured by any DC voltmeter and converted into watts. (See Figure 4.)

Prior to about 1982, pennies were solid copper; ever since, they've been made of zinc with a very thin copper plating. Take 2 solid copper pennies or disks cut from PCB material and drill a central hole and six small holes around the perimeter to hold the 300 ohm, 2 watt metal oxide resistors as shown in Figure 5. *[From what I've been told by others, this is not illegal; my understanding is that what IS illegal is defacing a coin AND trying to fraudulently use it. —WA8MCQ]*

Hot and ground insulated wires are soldered to each penny as shown, fed into a PL-259 and soldered on. Since the barrel must be assembled onto the plug body before soldering the wires onto the dummy load, the proper sequence is to first solder the wires onto the plug body, install the barrel with the ends of the wires sticking out, and then solder the wires onto the pennies. There will be play between the grounded penny and the end of the PL-259, so epoxy the penny to the

top end of the plug..

The detector (see Figure 6) is simply a series germanium diode with anode to the center pin of another PL-259, with the cathode bypassed with a 0.01 uF disk capacitor to the shell. Wires lead from the PL-259 from the junction of the diode and capacitor (positive) and soldered to one of the holes in the shell (negative), with plugs to match an external meter. After testing that the diode wasn't destroyed by the heat of soldering, use epoxy or hot glue to secure the wires where they egress from the plug.

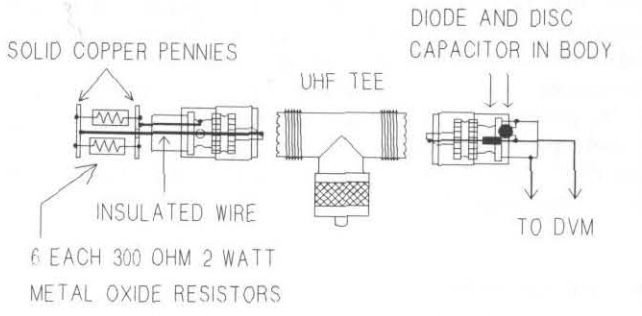


Figure 4—Dummy load and diode detector are built into PL-259's, plugged into a UHF tee, which then plugs onto the output connector of a QRP rig.

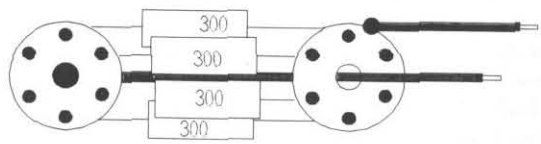


Figure 5—Detail of resistors between pennies (the resistor leads are shown longer than necessary for clarity; if you make one of these, keep them as short as possible).

Connect the dummy load and detector assemblies to the female ends of a UHF tee connector and screw the tee onto the antenna connector of the QRP rig. Connect the leads from the detector to a digital multimeter (preferred) or any DC voltmeter. Close the key to place the rig in transmit mode and note the meter indication (which corresponds to peak RF output voltage); compute the power from the middle equation in Figure 7.

I read somewhere that metal oxide resistors were totally noninductive. I don't recall when or where, but I considered the source authoritative. *[I've also seen that said from time to time, so I did a test of a dummy load made from two 100 ohm metal oxide resistors from Radio Shack in parallel mounted on a BNC socket. The HP 8753C network analyzer at work showed that it made a good load even at 2 meters. This was mentioned in the Idea Exchange in October, buried in the left column of page 33. --WA8MCQ]*

Soldering resistors to solid copper pennies is best accomplished by soldering one lead, skipping the next, soldering the third, skipping the next, etc until all six resistors are soldered in place with the pennies snugged up against the bodies of the resistors. The pennies become hotter than the gates of Hades, so be careful not to be burned! Caution--the penny furthest from the PL-259 is the hot end of the dummy load, so don't let it get grounded by touching something.

—DE W4LJD

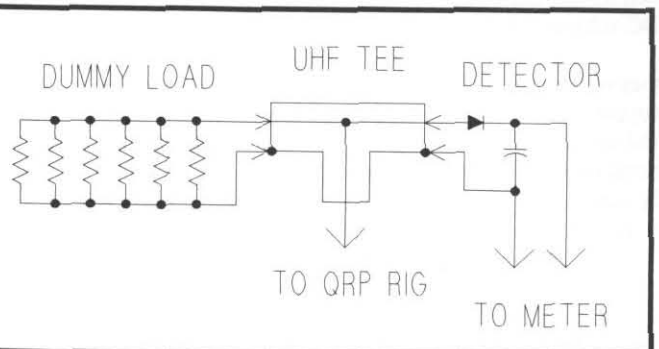


Figure 6—schematic. The diode is germanium, such as 1N34, 1N50, 1N270, etc.

$$Pwatts = \frac{Erms^2}{R} \qquad Erms = Epeak \times 0.707$$

$$Pwatts = \frac{(Epeak \times 0.707)^2}{R}$$

$$Pwatts = \frac{(22.36 \times 0.707)^2}{50} = 4.998 \text{ watts}$$

Figure 7—Power calculation. (The reading on the meter is peak voltage.)

DUAL "VFO" FOR VARACTOR TUNED RIGS

Here's an interesting little idea from **Claton Cadmus, KA0GKC** (cla@spacestar.net) taken from QRP-L. Sometimes it might be handy to have dual VFOs on your QRP transceiver, one for transmit and another for receive (good for working someone listening farther away from his own frequency than your RIT can handle, for example), or perhaps one for both TX/RX and a second one so you could monitor a particular frequency from time to time. The "big rigs" have had this for years, in their A/B/split functions. They don't really have two VFOs of course, just two different memory registers in the frequency control system.

He says, "Most of the simple QRP rigs these days are tuned by Varactor diodes (left side of Figure 8). To add a second "VFO" only requires a second pot and a SPDT switch (right side of Figure 8). You could even get fancy and power each pot from the receive and transmit

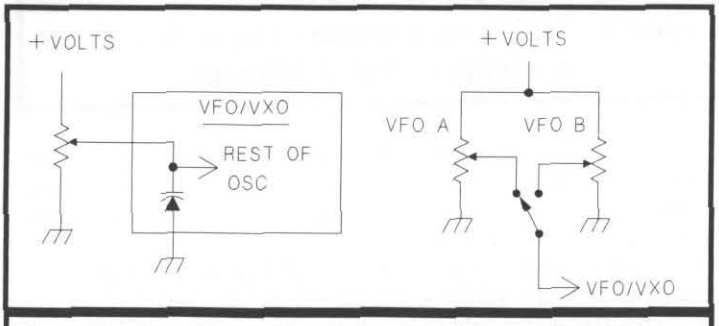


Figure 8—Standard voltage tuned VFO or VXO (left) can be controlled with two switched pots (right) to effectively give two different VFOs.

V+ lines (Figure 9). Use a small external case and a 1/8" stereo phone plug and bang, an external VFO!"

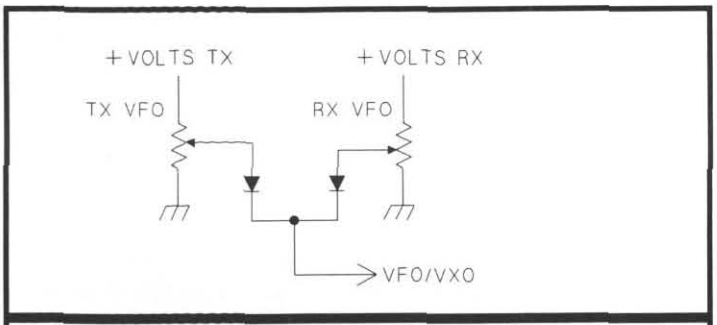


Figure 9—Pots fed from TX and RX voltage sources to give separate transmit and receive VFOs. Use diodes (such as 1N4148, 1N914, etc) for isolation between pots.

EXPOSING MORE SHAFT ON AIR VARIABLE CAPS FROM HB ELECTRONICS

From me, **WA8MCQ**—Bob Berlyn, N1PWU, started up a little place called HB Electronics a while back, and he has a variety of parts for homebrewing. You can visit his web page to see his offerings at **http://users.ids.net/~hb_elec/** (this is a new URL; he moved recently). When he first started up he sent e-mail to some people with an initial offering, and I couldn't resist the air variable caps he had. They were described as panel mount, screwdriver adjustable. I certainly don't need more variable caps, but I couldn't resist the price of a dollar each. They turned out to be the type shown in Figure 10. He also sells the exact same thing but with a shaft that will take a knob, for $4.

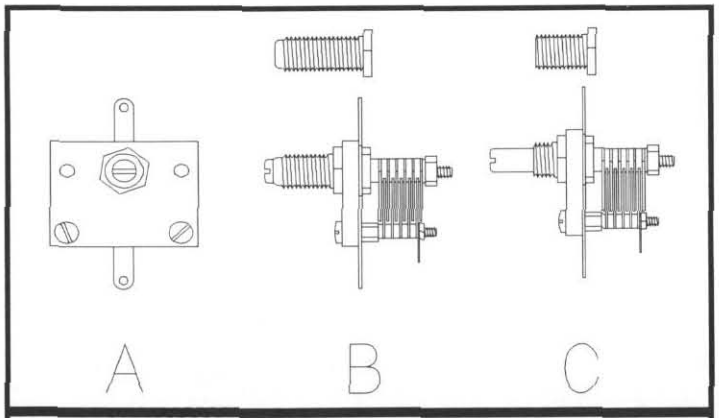


Figure 10—Disassembling and cutting down bushing on screwdriver adjustable Cambion variable capacitor exposes enough shaft to use a knob. B is the original length, C is cut down

Fortunately, the threaded bushing on these $1 caps is relatively long and can be cut down to expose enough shaft to use a knob. The caps are made by Cambion and can be completely disassembled with a screwdriver and pair of pliers; no welds, rivets, etc. I took one apart, carefully laid all of the pieces out in a line for ease of reassembly, and cut off some of the bushing with a hack saw.

If you'd rather not take them apart (which is quite easy), you could also cut off some bushing with the cap intact, but you have to be careful so you don't nick the shaft. Hold the end of the bushing and make a shallow cut with the hack saw, carefully cutting until you break through the inside of the bushing and try not to nick the shaft too much. Rotate a bit and repeat until the entire circumference of the bushing is cut and it can be pulled off.

Don't cut off too much of the bushing. You have to leave enough thread for the nut which holds it to the ceramic frame, but don't forget to leave a little more thread to accommodate a panel and the nut and washer to hold it onto the panel. But if you cut too much like I did the first time (Figure 11A) and can't use the second nut you can still

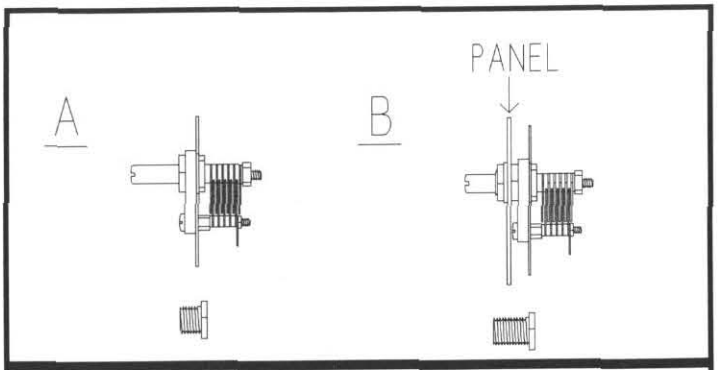


Figure 11—Bushing too short at A (my first attempt!), but plenty of room for knob; must mount to panel with screws through frame. Long enough at B to mount to panel with second nut but less room for knob.

mount the frame to the panel with screws and nuts. Be careful that they don't short out to the plates, and don't forget to space it away from the panel a bit so the heads of the stator screws don't short out.

—DE WA8MCQ

BNC/UHF ADAPTER

From me, **WA8MCQ**—BNC connectors are popular and convenient, and I use them everywhere in my station. Unfortunately there are some things that come with UHF sockets (SO-239's), and it's usually simpler to use a UHF/BNC adapter than replace the SO-239 with a BNC socket. Fortunately I have a goodly number of the adapters, and you can usually find them at hamfests at reasonable prices. But if you need one quickly or don't want to shell out the money, you can make your own easily from a single hole chassis mount BNC socket and a PL-259 plug. This idea is hardly a new one and has been around for years, but I'll give credit to the last place that I saw it, which motivated me to give it a try. It was in SPRAT #84, Autumn 1995, from the GQRP Club, by PA3BHK, Robert van Zaal.

Figure 12 shows the basics. Solder a piece of heavy wire to the center pin of the BNC socket as shown at A and insert it into the PL-259. (The nut and washers from the BNC are not used.) Cut off the

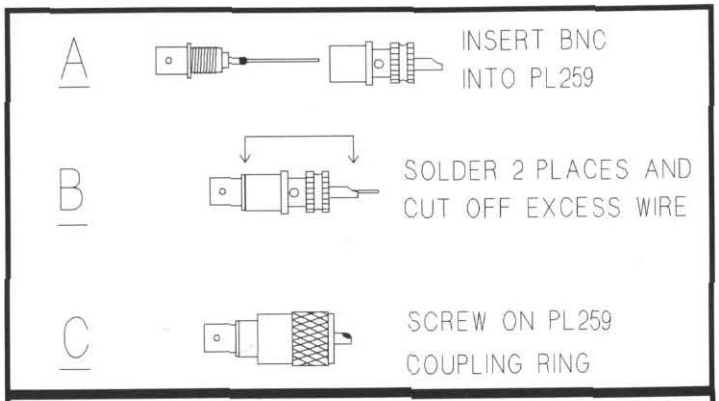


Figure 12—BNC single-hole-mount socket soldered into PL-259 plug makes a BNC/UHF adapter.

excess wire sticking out the end of the center pin of the PL-259, solder it in place and solder the BNC socket to the shell (B). Screw on the coupling ring (C) and you have the finished adapter.

Now for the fine points. First, a rather hefty soldering iron is recommended for soldering the BNC to the shell, since it's a fair mass of metal. Try to get a fair amount of solder in there, since it will be the only thing holding them together. Both the socket and inside of the plug are threaded; if the diameters were closely matched it would be possible to jam the different threads together; you wouldn't care about stripping them out or messing them up and making it hard to remove, and in fact that would be a benefit. Unfortunately, the diameter of the threads on the BNC socket is a little too small to do that. I experimented with placing some solder wick (braid) and wire in the hole to flesh it out a bit and give the BNC threads something to bite into, but results were pretty poor so I stuck with just the solder. If you use enough, it should last for quite some time.

Be careful when you heat up the shell to solder the BNC in place. I really poured on the coals and got it good and hot, so hot that I later discovered that the solder in the center pin of the PL-259 had melted! I just had to add a bit of extra solder to fill it up to the end and none had flowed inside and shorted out to the shell. I was lucky that the wire had remained in place, since the solder on the center pin of the BNC had also melted. If it had come out it I would have had to remove the BNC from the shell and start all over.

Finally, don't forget to let everything cool thoroughly before screwing on the shell. The assembly is rather large and will take a while to cool down, so burns are a possibility.

—DE WA8MCQ

JIG TO HOLD SMD'S WHILE SOLDERING

There is a certain amount of interest in using surface mount devices (SMDs) in homebrewing, and here's a little tool you can make to help with the soldering. This appeared in SPRAT 87, Summer 1996, and was submitted by **John Beech, G8SEQ**. He says it is a simplified design based on a jig from Blue Rose Electronics, a company which operated in the UK several years ago and specialized in SMD for the homebrewer. (They have been closed for a while.)

As shown in Figure 13, all you need is a piece of wood for the base, a clothes pin, a small wood block to support it (screw or glue it down) and a nail with a blunt point. Some 5 minute epoxy is also required. (SPRAT articles, like this one, frequently call for Araldite, which I believe is a brand name of 5 minute epoxy. My favorite here in the Colonies is by Devcon and comes in a two-chamber syringe.) Drill a hole in the end of the pin which is slightly smaller than the nail so it will be a tight fit. Before putting the nail in place, enlarge the hole in the lower part of the pin jaw; it must be oversize to allow the nail to move freely. Leave a little bit of the nail sticking out of the hole on top, and put some 5 minute epoxy around the top to help hold it in place. Attach an extension lever to the other end, made of any convenient material, to give better control when opening and closing.

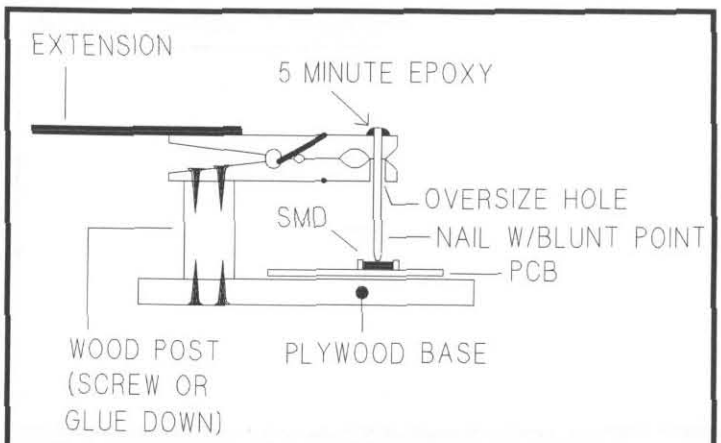


Figure 13—Holding surface mount devices while soldering.

John says, "No dimensions are given as none are critical, with the proviso that the length of the nail and the height of the block should be adjusted to give a firm but not excessive pressure to hold the component in place. If the point of the nail just touches the base board when the clothes pin is fully closed, it should be about right. The point of the nail should be dressed with a fine file or emery to remove any burs."

THE WA8MCQ SURFACE MOUNT 2222 AMP

It was suggested that people could get more power from their NorCal 2222 rigs if they used several 2N2222's in parallel. It was also said that the plastic packaged 2222's are wimpier than the metal versions. I'm going to build a 2222 myself but using surface mount devices as much as possible, and the Motorola RF Device data book shows that the SMD 2222's have significantly lower power dissipation than the leaded variety. Figure 14 is the power amp and output filter that I've breadboarded and tested. For the moment I'm driving it with a synthesized function generator at work, but should have the oscillator and buffer added by the time this issue is out. The circuit of 4 transistors in parallel is pretty much generic, and has been in print many times, by the late W1FB and others.

My choice of component values was limited somewhat by parts availability, although I have a fair stock of SMD items. The emitter resistors are usually 1.8 ohms but I had to use a pair of 3.3 ohms in parallel at each transistor. The filter was designed around my relatively limited capacitor values, but turned out quite well since I used a network analyzer to optimize it. Power output, with a 12V supply, was as high as 2.25 watts, though it ran very hot and I'll hold it to one watt in the final version. By the way, the second harmonic was a very healthy 45 dB below the fundamental, as shown on the HP

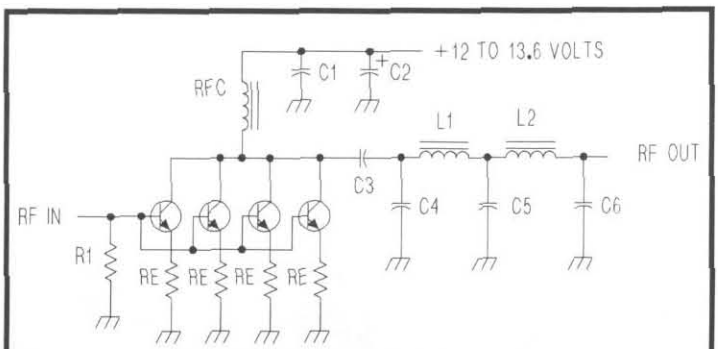


Figure 14—WA8MCQ SMD 2222 power amp.

Parts list (all items are surface mount except for 2 toroids):
C1, C3—0.1 uF ceramic C2—4.7 uF/20V tantalum
C4, C6—560 pF ceramic
C5—800 pF (240 and 560 in parallel)
L1, L2—20 turns #32 on T25-2
R1—51
RE—use 1.8 ohms; I used two 3.3 ohms in parallel due to parts availability
RFC 6.8 uH, 0.9 ohms DC resistance
Transistors—MMBT2222ALT1
Power output: over 2 1/4 watts observed but will be held down to 1 watt in final form due to lack of heatsinking

spectrum analyzer. That's where it comes in handy having the network analyzer available at work to fine tune the filter. Unfortunately the HP 8753C, even on the surplus market, is a bit rich for home use—it's a choice between buying one of those and making several years of mortgage payments!

Sorry, don't expect any kits or PCB layouts to be available for my 2222 transceiver! This will not be something easily duplicated at home. There are two different ways of doing SMD design. One is "let's build something with SMDs to get familiar with it but use a foot square PCB with lots of open space" and the other approach is "jam everything together so tight you really DO need a stereo microscope to do the assembly and examine for shorts." Guess which category this one falls in! I forgot to mention that my transceiver must be built with a footprint of about 1.25" X 1.5" and limited to a hair over 1/4" height. It will be built into one of those little tin boxes that 5 cartridge fuses come in (which is a volume of just under 1/2 cubic inch). This is Phase II of the DB-25 Challenge that WG3R came up with in 1989. Phase I resulted in rigs built into 3/4 cubic inch pill bottles and we had 2 transmitters and 2 transceivers. (I usually have one or the other of the XCVRs with me at major hamfests and Dayton to show off, built by WA5JAY and WG3R (non-QRPers); both have internal VFOs, though my latest rig will not.)

And after all this big talk, don't be surprised if I don't show up at Dayton with the rig; I have a huge pile of unfinished projects and this just might end up the same way!

INTERPRETING MARKINGS ON SMDS

While on the subject of surface mount devices, what about the markings? Someone wondered aloud about that on QRP-L several months ago, and here are two replies on how to read the ones that are marked. (Unfortunately, some SMDs are not marked, especially the relatively new 0402 size. That's not a problem for me because I avoid that size whenever possible, even at work where we have all the proper tools and microscopes to handle them. If you think SMDs are too small, wait until you see the 0402's!)

From **Laura Halliday, VE7LDH** (ve7ldh@direct.ca--"Resistors are marked with significant digits plus multiplier; for example, 472 is 4700 ohms, or 4K7. [*Smaller values use the letter R to indicate a decimal point, such as 3R3 for 3.3 ohms. --WA8MCQ]*

"ICs have their full part number if it will fit, otherwise they contain an abbreviated code (e.g. M2401 = MRFIC2401). Other active devices, including transistors, diodes, etc, have codes set by their manufacturers, which you can find in data sheets and manuals. Examples include 5D for MMBD914 (SMD equivalent of 1N914) and 1P = MMBT2222 (equivalent of 2N2222).

"Motorola has a small-signal device selection guide (check their web site) that documents the markings (among other things) of pretty well all the discrete transistors and diodes of interest to hams."

Mark Tyler, K5GQ (k5gq@juno.com) submitted this--Surface-mount capacitors are marked with a two-character code consisting of a letter indicating the significant digits and the number indicating the multiplier. Examples--A4 is 10,000 pF (0.01 uF); N1 is 33 pF. The code is found in the '96 and '97 ARRL Handbook. For those of you that do not have a handbook here it is, in Table 2.

A	1.0	M	3.0	Y	8.2
B	1.1	N	3.3	Z	9.1
C	1.2	P	3.6	a	2.5
D	1.3	Q	3.9	b	3.5
E	1.5	R	4.3	d	4.0
F	1.6	S	4.7	e	4.5
G	1.8	T	5.1	f	5.0
H	2.0	U	5.6	m	6.0
J	2.2	V	6.2	n	7.0
K	2.4	W	6.8	t	8.0
L	2.7	X	7.5	y	9.0

Table 2—Markings on surface mount capacitors. The letter gives the significant digits, and the number following the letter is the multiplier. Examples—N1 is 33 pF (3.3 X 10), U2 is 560 pF (5.6 X 100), S3 is 4700 pF (4.7 X 1000).

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>

That's your real name and real call, not your e-mail address—it gets that from the headers. The name and call are for the benefit of people who look at the subscriber list; unlike some mail reflectors, the one at lehigh.edu also gives names (or whatever you type in) in addition to e-mail address—which can be quite cryptic in some cases.

Save the automatic "welcome" message you'll get after your subscription (free) is processed 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.

Now that it's fall (as this written) and the FOX hunt is in full swing again, the number of daily postings is back up from the summer lull, and often running in the high double digits of messages. (The FOX hunt is an HF on-the-air activity and is a little different than the typical 2-meter fox hunt. In the QRP-L FOX activity, one or more designated people are the "fox" each week and are on the air at a particular time and frequency. The object is to work as many of them as possible in the several months the activity is underway.)

By the way, those of you using juno.com with its infamous file size limit of about 60K who want to get the daily digest don't need to worry. Just send e-mail to Jim Eshleman, N3VXI who administers QRP-L and he'll fix you up with an alternative that splits the daily digest into two smaller chunks that juno.com can handle. (His address is LUJCE@lehigh.edu.)

THE FINE PRINT

Starting in the next issue, we'll have a 3 part series of HW-9 mods by Gary Surrency, AB7MY, taken from QRP-L. I have to hold off on this one until Doug runs it in QRPp first; he got to Gary before I did, so he gets first publication rights!

Do YOU have something you'd like to have in the Idea Exchange? We still don't pay but you do get the fame and glory of appearing on the pages of the QRP Quarterly! As always, don't sweat it if you don't have the time to send in a polished item, or can only do hand drawn figures, or can't send it via e-mail or floppy disk. Just get the idea to Severn and I'll take it from there!

—qrp—

Be sure to check your address label to see if this is your last issue! Renewals go to Ken Evans, W4DU; inquiries about your subscription go to Dave Johnson, WA4NID.

Pacificon '97 Report

by Joe Gervais, AB7TT vole@primenet.com

The QRP gathering at Pacificon '97 has come and gone, and *wow* what a show it was! For those who may be unfamiliar with it, Pacificon is the annual convention of the ARRL Pacific Division, held in Concord, CA (near San Francisco), and QRP forums have been part of it from the start. This year, through the efforts of the NorCal QRP club and guest speakers from across the country, the QRP forum grew to a full day of six QRP sessions as well as a QRP Open House complete with demonstrations and a building contest. To add to the adventure, Jerry Parker (WA6OWR) was taking digital photos of the events and quickly putting them on the NorCal website so those who couldn't make it could still enjoy the show.

In addition to the forums, some of your favorite QRP vendors (Small Wonder Labs, Embedded Research, Wilderness Radio, and others) had booths set up in the Exhibit Hall alongside the larger commercial outfits, and a swap meet outside the building provided good scavenging for bargain hunters.

The QRP fun got off to an early start on Friday afternoon, when Bill Jones (KD7S) gave a talk on designing and building small-diameter transmitting loops. To prove it was more than just talk, Bill brought along a beautifully-crafted copper loop he'd built. Very nice to see how much you can really do with a compact antenna, particularly for apartment and condo dwellers who can't get alot of wire out in the open.

The rest of the day was free for dropping in on other forums, browsing the latest toys being offered, and waiting for fellow QRPers to arrive. The weather was warmer than usual, perfect for shorts and t-shirts. Speaking of t-shirts, by the time 5PM rolled around, the lobby was quickly filling with QRPers (who were easy to spot since many of them were wearing bright gold NorCal club shirts). It was great to start meeting the faces behind the callsigns. You'd look across the room and see dozens of strangers, until you started reading the nametags and realizing that what you were really seeing were all your old friends from email, HF, contests, QRP journals, and kit building. Folks had flown in or driven from all across North America to join in the fun.

By around 6PM Friday night, enough hungry QRPers were milling around the lobby to start a migration across the street to "restaurant row", led by NorCal's Doug Hendricks (KI6DS). With all the NorCal t-shirts, it looked like a mass migration of garibaldi (the brightly colored CA state fish) which made it easy to find your friends. After a few misses (we were having a bit of a time finding a table for 35) the hungry herd of QRPers stumbled across Tony Roma's, where the manager happily opened up the banquet room for us.

The dinner that followed was full of good food and lots of fun as old friends got reacquainted, "eyeball" QSOs were had for the first time, and the latest stories of projects, operating, and badgers were shared. Think we'd just about closed the place down by the time we started heading back to the hotel.

Things got off to an early start Saturday morning. The swap meet started at 6AM, giving folks a few hours to browse, haggle, and find some breakfast before the QRP sessions got underway. The first forum of the day was a talk on iambic keyers, including a little history and lots of info on the TiCK keyer, by Gary N2JGU & Brad WB8YGG of Embedded Research. The room was filled to capacity and then some, with about 130 people crowding in. Gary and Brad kept the crowd entertained as they traced the evolution of these little critters all the way up to the current surface mount version of the TiCK-2.

Next up was Dave Benson (NN1G), of Small Wonder Labs. Dave gave an in-depth talk on 16-bit PiC devices, and a bit of info on his latest project - a DDS HF xcvr kit, with digital display. Based on his recent successes with the Green Mountain CW and the White Mountain SSB xcvr kits, this new project promises to be a good one! For some odd reason, Dave's talk left me with a strong recollection of sliced bread....

The final forum presentation before lunch was how to align and tweak your QRP rigs, presented by Paul Harden (NA5N). Paul did a great job of taking the mystery out of how to squeeze the best performance from your homebuilt rigs. Made me want to go out to the swapmeet and look for an oscilloscope to play with on the long drive home. Need to get my 40m Fox hunting rig a full checkup to keep up with the rest of Hounds.

Right before Paul's talk, Doug (KI6DS) announced that the much-anticipated "secret kit", the NorCal paddles, would be up for sale at the NorCal booth during lunch. You could see and feel the fidgety anticipation building in the crowd. Looked like a bunch of kids on Christmas morning. You knew Paul's talk had to be good because everyone stayed and learned instead of following their basic instinct to stampede for a place in line.

The lunch break came and the herd made an orderly migration to the NorCal booth. Well, some more orderly than others. The line was long, but the company was good. Jim Cates (WA6GER) was busily handing out the padded envelopes containing the paddles. I believe the initial run of 200 paddles sold out that afternoon. With good reason too - they have a very nice feel to them, the brass looks sharp, the solid (steel) base keeps it from "walking", they're compact, and for $30 are a bargain.

Paddles in hand, folks wandered off to browse the Exhibit Hall, find a portable HF station to work the ARCI Fall QSO Party with, or get some lunch. One of the great things about Pacificon is that you can walk to over a dozen restaurants, just a block or two away from the convention. Lots to choose from, a nice change of pace from the typical vendor food you get stuck with at most events.

With full stomachs and kits in hand, the QRP herd was all smiles as they assembled into the Marconi Room again, this time to hear Wayne Burdick (N6KR) and Eric Swartz (WA6HHQ) talk about the design and construction of multiband QRP rigs. Wayne is the designer of the excellent Sierra QRP multiband xcvr, so folks were very interested when they heard that Wayne and Eric are forming a new company (EleCraft) and designing a new all-band, fully modular HF xcvr kit. Should cause quite a stir when it hits the streets! (Note: Wayne still plans to support current and future projects sold by Wilderness Radio.)

Next up was Dave Gauding (NF0R) discussing something near and dear to many QRPers - portable and stealth antennas. Dave had some great examples of his handiwork to show, and many came up after his talk to see the examples firsthand. Excellent material for the ham forced into clandestine operations (of whom there are far too many these days) by the shadow of restrictive CC&Rs.

Dave's talk was a natural lead-in for the next topic, QRP Portable Operating, presented by Roy Lewallen (W7EL). Roy gave an entertaining slide presentation of some of his portable field operations and, despite his best efforts, accidentally showed photos of the sun shining brightly in the Oregon mountains and everyone having fun. His fellow Oregonians will doubtlessly pummel him severely for letting the secret out.

With the QRP Forum finished for the day, folks scattered to the winds to get some dinner before the QRP Open House that evening. Several hours later, QRPers were streaming into the DeForest Room where the Open House was ready to go. Attendees were treated to tables

full of projects on display for the NorCal Pacificon Kit Contest. The diversity and quality was impressive - xcvrs, antenna tuners, power supplies, paddles made of finest hardwood and even (yes) Legos (those plastic snap-together build-anything-with-em toys) - quite an assortment! And all of it crafted with careful precision and attention to detail. Made you feel humble (and inspired) to see what others around you could do with a soldering iron and a bag of components.

Once everyone had a chance to chat and enjoy the displays, Mike Gipe (K1MG) gave a demonstration of surface mount soldering techniques. Should definitely come in handy as SMT kits (keyers and rigs) are becoming available to QRP builders. Hint: Don't sneeze while placing the components. Mike made it look easy and more than a few folks walked over to buy the SMT version of the TiCK-2 from the Embedded Research folks.

Next up was a demonstration of high-speed contest operating techniques by Ron (KU7Y) and Chuck (K5FO). To add a little spice to the event, someone had slipped Chuck (an Iambic Mode B fan) a keyer that was operating in Mode A. Needless to say, the demonstration took on a whole new light. After they were done amusing the crowd, Chuck called Jim Cates and Doug Hendricks to the center of the room and announced a closely-held surprise. Jim and Doug had been named co-recipients of the ARRL Pacific Division's Ham of the Year award. The formal announcement was to be made the following morning, but since many of us had to leave town early the next day, Chuck wanted everyone to know. Congratulations Doug!

The rest of the evening was spent chatting with fellow QRPers, talking about new projects and operations, swapping tales of QRP DX and the QRP-L Fox Hunt, early plans for Field Day, baseball scores, holiday plans, life in general. Time went by quickly, and before we knew it the hotel staff were clearing us out of the conference room so they could prepare for tomorrow's events. Some QRPers called it a night and turned in, others headed back to their rooms to play with the latest toys they'd picked up into the wee hours of the morning.

Sunday AM arrived too soon, and it was time to start heading home. Even so, plans were already being made to come back next year. Something that fun just can't be passed up! If you can possibly make it, put Pacificon '98 on your calendars. This one's a keeper.

The following are just some of the QRPers who were present (in no particular order, and please don't be offended if I left you out - I've got an 8-bit memory in a 64-bit world...Great crowd!

Doug Hendricks (KI6DS), Jim Cates (WA6GER), Chuck Adams (K5FO), Ron Stark (KU7Y), Dave Benson (NN1G), Bob Hightower (KI7MN), Bertie Hightower (N7XJW), Richard Fisher (KI6SN), Cam Hartford (N6GA), Bill Jones (KD7S), Darrell Jones (KA6PRW), Mike Connor (NQ7K), Brian Kassel (W5VBO), Grant Taylor (K7GT), Randy Foltz (AB7TK), Ed Loranger (WE6W), Mike Gipe (K1MG), Bob Tellefsen (N6WG), Derry Spittle (VE7QK), Paul Harden (NA5N), Roy Lewallen (W7EL), Jerry Parker (WA6OWR), Dave Yarnes (W7AQK), George Heron (N2APB), Wayne Burdick (N6KR), Eric Swartz (WA6HHQ), Dave Gauding (NF0R), Gary Diana (N2JGU), Brad Mitchell (WB8YGG), Debra Blanke (KG6UI), Kit Blanke (WA6PWW), Bob Cortez (KF6CXC), Ron Moeller (K8BPN), John Dundas (WA1DKH), Vernon Wright (W6MMA), Ori Mizrahi-Shalom (AC6AN), Dave Meacham (W6EMD), Joe Gervais (AB7TT), Sam Imai (KF6ML), Denis Englander (KO6GF), Doug Faunt (N6TQS), and many more.

That's it! Sure look forward to seeing all of you out there next year. I can promise you won't be disappointed.

Joe, AB7TT

A STRONG FOUNDATION

by Bob Cutter, KI0G bcutter@teal.csn.net

We all know a tripod is the most stable foundation and for me those three legs, ham radio wise, are, homebrew, QSO and QSL.

Some time ago I decided to collect QSL cards for all the first contacts with a new kit or homebrew transceiver. In my years of QRP building I have avoided canned first contacts with another ham down the block primarily because I never had a ham down the block. It often took longer but the thrill of that first contact was much sweeter if the contact was random and had a bit of distance with it.

Photo 1. is my earliest working QRP homebrew transceiver. There were others but they failed the "working" test. The circuit is the TWO-FER on 20M and developed in part by Chris Hethorn, KM8X. I have incorporated an "electronic hand key", the two PC board finger contacts on the top, from the ARRL publication QRP Classics. I was late in asking for the 1989 QSL card and Al Salazar, N7LWJ had this to say; "*** gave me the opportunity to dig through my old log books Hi, sure enuf there u were on ur 'home brew QRP rig @ 2 w.' ".

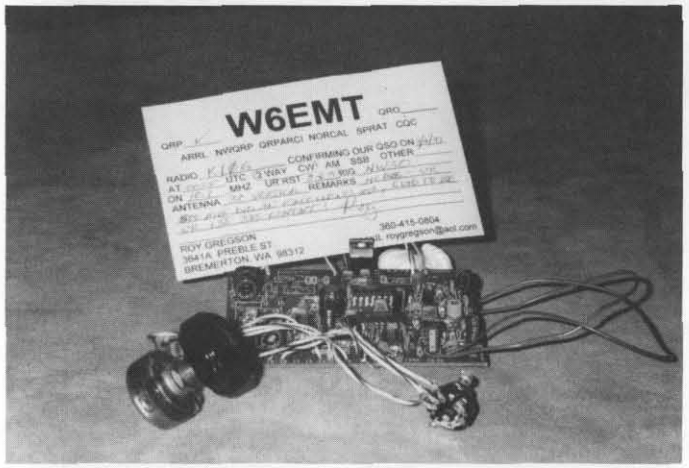


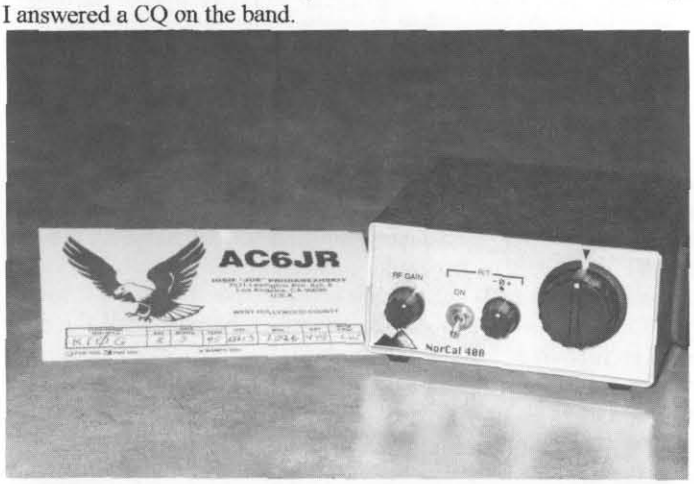
Photo 2. is obviously a work in progress. The 38 Special is the 30M design of AC6AN, Ori Mizrahi-Shalom and was kited by the Northern California QRP Club[1] (NorCal). The 38 Special was intended as an experimental platform and the design contemplates a keyer, 5W power boost and filter modifications outside the bare kit. My first QSO at about 500mw was with W6EMT, Roy Gregson and the rig was even more haywired than in the photo! Roy also designs and markets a fine line of QRP kits under the name of EMTECH[2] and from my experience he believes in getting on the air and trying his own product.

Photo 3. is of another NorCal project, the 49'er built into an Altoids mint box and includes the 9v. battery for power. The 49'er is no longer available from NorCal but you will find them on 40M around the QRP calling frequency of 7040 KHz. I worked 10 other stations during a brief sprint type contest with the rig at about 250mw out. WB6TMY, Warren Reese was my first QSO and he appended the suffix,"/IMD" for International Marconi Day while using widely separated transmitter and receiver locations reminiscent of commercial marine station KPH.

Photo 4. is of the SST designed by Wayne Burdick, N6KR and available from Wilderness Radio[3]. My SST is on 20M and also has the KC1 keyer/CW frequency read out and the BuzzNot noise blanker installed. Both the KC1 and the BuzzNot are available from Wilderness Radio. This radio replaces the TWO-FER shown in Photo 1. as my primary travel/backpack radio. The power is about the same at 2w. but the lower power consumption of 25ma on receive makes it much more battery friendly. I am sure I will make as many or more DX contacts on this new rig as I did with the TWO-FER which has been a great companion all over North America. I plan to continue to run the rig from the same 8-AA battery pack I used for the TWO-FER. The first QSO with Dick Beym, NB6R was a bit ragged as I had wired the paddle contacts backwards on the keyer and had to reverse them in my head. As in all QRP QSO's the operator on the other end, in this case Dick, deserves the credit for digging us out.

Photo 5. (next page) is another Wildeness Radio Kit, the 40A on 40M. This kit has received a lot of use the past two plus years since I have shifted my primary QRP band from 20M down to 40M with the

decrease in the sunspots. The first QSO with Iosif "Joe" Prodanezhskiy, AC6JR was on the very evening I finished the final assembly of the rig and just got it into the case. I had not even measured the output yet which I later determined to be just over 2w. As with all these examples I answered a CQ on the band.



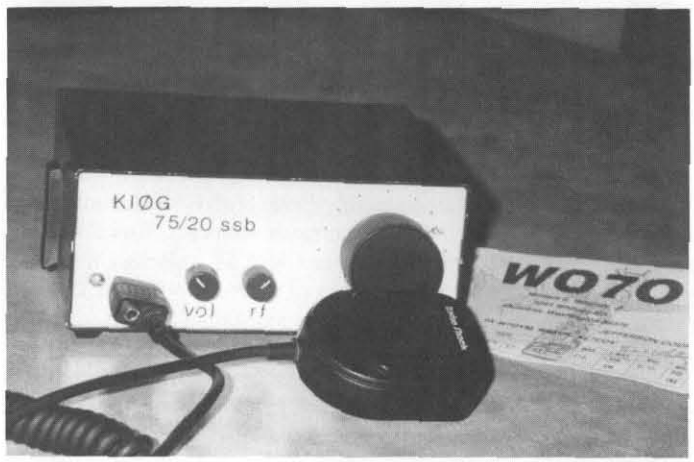


Photo 6. is my first experience with SSB QRP kits. The Cascade is a design by John Liebenrood, K7RO that covers 20M and 75M with interchangeable plug-in modules. The kit is no longer available from NorCal. However the White Mountain single band SSB kits from Small Wonder Labs[4] appears to be a suitable substitute. My QSO with WO7O, Bill Whitney, was not my first with the Cascade but it was the first on 20M. I have since used the Cascade in the ARRL Sweepstakes SSB contest twice and I am amazed with its performance in a crowded contest environment. SSB QRP is an area that deserves more consideration and among the leaders in that regard are Derry Spittle, VE7QK, Bruce Gellatly, VE7ZM, Joe Stipek, VE7TX and the BC QRP Club. I have used the Cascade to check into their informal net on 3760 KHz which meets nightly at 10:00 PM local. Not a bad haul from Colorado.

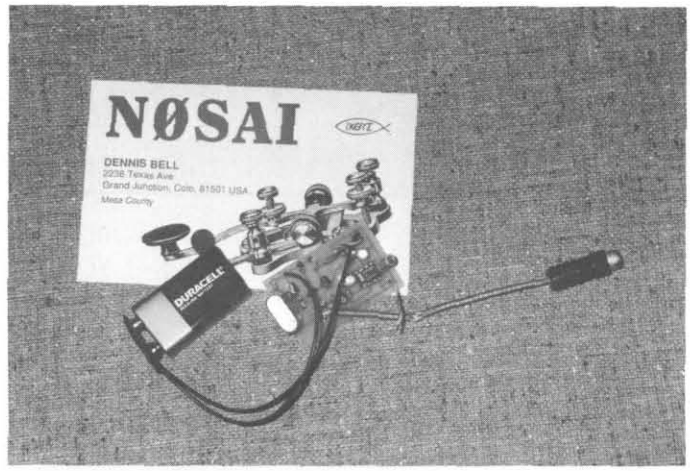


Photo 7. is the latest success. Our local club, Ski Country ARC, decided to use the Pixie2 as a group project for the 97-98 winter season. I ordered a group of kits[5] and the pictured one is the proto type and the QSO with Dennis, N0SAI was while the unit was still on the bench and wired up with clip leads. I obtained both color burst crystals and 5.0MHz crystals for the kits. WWV at 5.0MHz makes a good test to see if the receiver is working and adds another feature to the already great little unit.

As in all QRP operation, the real thanks go to the ears on the other end and those hams willing to keep alive the wonderful tradition of QSL cards. Thanks! Bob Cutter, KI0G bcutter@teal.csn.net

[1] NorCal QRP Club
c/o Jim Cates
3241 Eastwood Rd.
Sacramento, CA 95821

[2] EMTECH
3641 A Preble St.
Bremerton, WA 98312

[3] Wilderness Radio
P.O. Box 734
Los Altos, CA 94023-0734
(415)494-3806

[4] Dave Benson, NN1G
Small Wonder Labs
80 East Robbins Ave
Newington, CT 06111

[5] H.S.C. Electronics Supply
3500 Ryder St.
Santa Clara, CA 95051

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Review: L/C Meter IIB Kit from AADE

Larry East, W1HUE 1355 S. Rimline Dr. Idaho Falls, ID 83401 email: w1hue@amsat.org

In my opinion, the "L/C Meter IIB" from ***Almost All Digital Electronics***[1] (AADE) ranks right up there with a good VOM and frequency counter as a required piece of test equipment for the serious builder. It is available as a kit or completely assembled and tested. The price of the kit is approximately $90 plus shipping.

This handy little gadget has the following published specifications:

Range:

Inductance: 0.001µH to at least 100mH
Capacitance: 0.01pF to at least 1.0µF (non-polarized only)
Automatic ranging

Accuracy:

1% of reading typical for values greater than 1.0pF and 0.1µH
Self calibrating at power-on

Display:

16 character LCD
Four digit resolution
Direct display in engineering units – µH, mH, pF, µF, etc.

Sampling Rate:

Approximately five samples per second.

The L/C meter is housed in a plastic case approximately 3.5 in. wide × 5.75 in. high × 1.25 in. thick. A 9V battery compartment is located in the rear of the case. Components to be measured are attached to binding posts on the front of the case. Controls consist of four push-button switches along the right edge of the case labeled PWR, Lx, Cx and ZERO. The first three are locking, the third is momentary. The Lx switch is depressed to measure inductance and the Cx switch to measure capacitance (if both are depressed, "SWITCH ERROR" will appear on the display). If the ZERO switch is depressed while either the Lx or Cx switch is on, the unit compensates for stray capacitance or inductance. If neither the Lx nor Cx switches are on, repeatedly depressing the ZERO switch cycles the unit through several possible display modes. Two of the modes display the difference between a reference component (L or C) and other unknown components – very handy for matching capacitors and inductors for use in filters, etc.

Now a quick overview of what makes the L/C Meter tick. The unit contains a novel oscillator circuit using an analog voltage comparitor that is capable of operating with a very wide range of L and C values. A microcontroller is used as a frequency counter and to compute L and C values from the shift in oscillator frequency when an "unknown" component is present. When power is first applied, a small relay switches an accurately known capacitor into the oscillator circuit; this establishes a reference to which all measured values are compared. The theory behind this type of L/C meter was described by Bill Carver, K6OLG (now W7AAZ), in the Winter 1993 issue of ***Communications Quarterly***.

I purchased the L/C Meter IIB kit directly from AADE, but it is also available from several kit and parts suppliers. The kit arrived with all parts present and accounted for and a ten page instruction manual. About three pages of the manual are dedicated to the circuit description, one page to assembly (plus another three pages for parts list, schematic, board lay-out and mechanical assembly) and about one-half page to trouble shooting. A few more pages attached to the back the manual describe some other AADE products. The circuit board contains few parts and the instructions are certainly adequate for anyone with some previous building experience. "Expert" builders should *not* bypass the instructions; doing so will very likely result in a couple of "got-cha's"!

Assembly went very quickly and no problems were encountered. I installed a 9V battery (not included in the kit), pressed the power switch and: Bingo! The thing came to life! (I really get a feeling of satisfaction when something I build works the first time!) The only complaint that I have – and a minor one at that – is that the LCD board is held in place only by the header connecting it to the main PC board. This results in the LCD board being able to move around a bit, but the top of the case keeps it from becoming disconnected from the main board so it really shouldn't be a problem. Nevertheless, I decided to install a plastic support between the lower right-hand side of the LCD board and the main board.

Included in the kit was a piece of wire about a foot and a half long with clip leads on each end. The instructions gave no indication as to its purpose, so I decided to make a couple of short test leads from it. I cut three inches from each end and soldered spade lugs to the bare wire ends for mounting under the binding posts. Sure handier than having to mount the leads of components to be measured under the binding posts. This added a little stray capacity (and inductance), but that is not a problem thanks to the "ZERO" switch.

"How about measurement accuracy," you are probably wondering. I don't have access to an accurate impedance bridge, so I'm not able to verify the claimed 1% or better measurement accuracy. However, I did make measurements on several capacitors with 5% tolerance and a few with 3% tolerance; the measured values of all but two (out of 18) were within the claimed tolerance. Not an indisputable verification of accuracy to be sure, but close enough for amateur work.

One thing that I noticed was a definite zero reading sensitivity to placement of the instrument on the bench or in the hand. This is not a problem except when measuring very small L or C values since the reading changed by no more than 0.5pF. However, I decided to perform a little experiment and painted the inside of the case with conductive paint[2]. This reduced the sensitivity in the zero reading to less than 0.1pF. It's probably not worth the effort, but if you do decide to apply conductive paint to the inside of the case, be very careful *not* to let it come in contact with the "hot" binding post.

The manual suggests turning on power and waiting about five minutes before making measurements to reduce the effect of oscillator drift. However, long-term drift is not really a problem since the meter can be zeroed before making measurements on small L or C values. Out of curiosity, I decided to see just how much the zero reading would drift over time. After leaving the unit turned off for a couple of hours, I turned it on, set it to measure capacitance and zeroed the reading. After about 10 minutes, the zero reading was -0.2pF. After twenty minutes, the zero reading was -0.3pF and changed less than 0.1pF over the next 30 minutes. A similar experiment with the meter set to measure inductance indicated a drift of about 0.01uH over a two hour period. From these results, I would say that the stability is quite acceptable.

Do I find this gadget useful? You bet! I recommend it as a valuable addition to the serious homebrewer's workbench. You can have a ball measuring all those unmarked inductors in your junk box! For some suggestions on other uses, see the article by Bill Carver, W7AAZ, elsewhere in this issue. Although its accuracy is not as high as can be achieved with a good impedance bridge, it is probably better than the DVM L/C "add-ons" one sees advertised.

[1] Almost All Digital Electronics, 1412 Elm St. S.E., Auburn, WA 98092. Phone: 253-351-9316. FAX: 253-931-1940. Email: neil@aade.com.

[2] The paint I used was a high resistivity black spray paint manufactured by ***GC Electronics*** and labeled "EMI-RFI SHIELD."

Measuring Capacitors and Inductors

Bill Carver, W7AAZ, 690 Mahard Drive, Twin Falls, ID 83301 <bcarver@magiclink.com>

Without the ablility to measure L and C you are working with one hand tied behind your back; there is no substitute for having reasonably accurate component values. "The LC Tester", was published in the Winter 1993 issue of Communications Quarterly. That issue is no longer available so here is a description of that instrument which will measure 0-2000 picofarads and 0-50 microhenries with about 1% accuracy, and adds some applications for it.

THEORY

The resonant frequency of a high Q tuned circuit is equal to 1/6.2832*sqrt(L_oC_o). The LC Tester uses that tuned circuit in a Hartley oscillator so that we can measure its frequency, f_b ("before"), with a frequency counter. When we add a known capacitor, C_{cal}, in parallel with C_o the oscillator frequency will go down to f_a ("after"). With these two measured frequencies and known C_{cal}, and you can calculate L_o and C_o as:

$$C_o = (C_{cal} * f_a^2) / (f_b^2 - f_a^2)$$

$$L_o = 1 / (39.4784 * f_b^2 * C_o)$$

If the oscillator is ruggedly built like a transmitter VFO, and the tank uses silvered mica or polystyrene capacitors and a toroid wound on -2, 6 or -7 powdered iron, the C_o and L_o will be stable so only periodic calibration is required.

CAPACITORS

Calibration and capacitor measurements are always made with a jumper of #20 wire between the **L** and **C** terminals. To measure an unknown capacitor value we again measure the "before" oscillator frequency without anything connected then connect the unknown capacitor in parallel with L_oC_o (between the **C** and **GND** terminals) and measure the "after" oscillator frequency. The unknown capacitor is:

$$C = C_o * (f_b^2 - f_a^2) / f_a^2$$

The same thing, but easier to do on a calculator:

$$C = C_o * [(f_b/f_a)^2 - 1]$$

for example, if your C_o is 1029 pF and you measure 1004.279 KHz for f_b, then connect a 10 pF capacitor to the oscillator and measure 999.127 KHz for f_a. The exact capacitor value is:

$$C = 1029 \text{ pF} * [(1.0051565)^2 - 1] = 1029 \text{ pF} * .0103396 = 10.64 \text{ pF}$$

INDUCTORS

The "before" frequency, f_b, is measured with a wire jumper between the **L** and **C** terminals, then that jumper is removed and the unknown inductor placed between the same terminals. Putting an inductor in series with L_o will cause the frequency to go down to f_a, the "after" frequency. We can calculate the value of the inductor. In the "easiest for a calculator" format:

$$L = L_o * [(f_b/f_a)^2 - 1]$$

What we have done with an oscillator and frequency counter is transfer the accuracy of a marked capacitor to get the same accuracy in an inductance. The key idea in the home-brew instrument is to KNOW what the value of C_{cal} is. While access to a very accurate bridge is ideal, I've found dipped mica swapmeet capacitors marked with 1% and 0.5% accuracy and have never found a defective one. It is prudent to collect as many accurate capacitors as you can and compare the computed value of C_o and L_o for each one. They should produce L_o and C_o clustered around some average value according to their marked accuracy; a damaged or mismarked capacitor will produces bizarre values that stand out from the rest.

The original Communications Quarterly article listed a Pascal program that would do a variety of calculations to match components and find specific values. Any PC will run it just fine. On the bench I find it's not difficult to calculate values with my -hp-42S hand calculator.

CONSTRUCTION

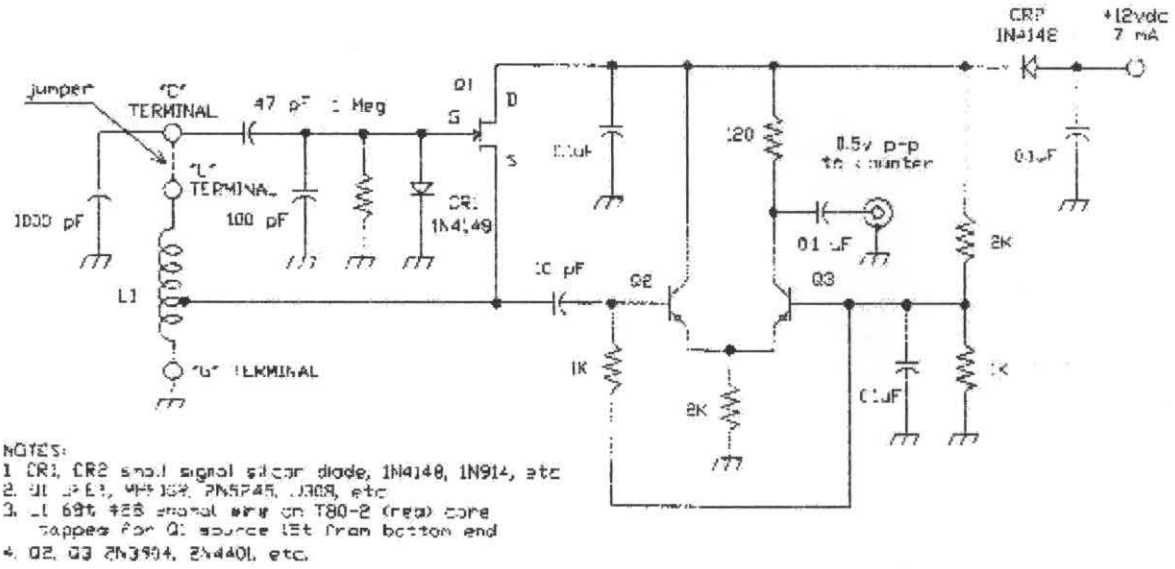
The goal is an oscillator with good short-term stability and 500 millivolts output, enough to drive a benchtop counter through a short piece of coax.

Figure 1 is the LC Tester schematic. The oscillator used a 2N5245 JFET but this is not critical. Other FETs such as J308 can be used as long as the I_{dss} is in the 5-20 mA region. All parts came from my junkbox and are not terribly critical.

Figure 2 shows oscillator wiring, point-to-point on a piece of copperclad board with a 1/2" x 2" strip of copper remaining in the middle for the circuit ground. The T80-2 core was clamped to the board with a long nylon screw and fibreglass washer and the board is mounted on the back of three binding posts spaced 3/4" on a 4"x4"x2" aluminum box, Bud CR-442. A rigid metal box reduces hand capacitance, eliminates drafts and helps the short term frequency stability of the oscillator.

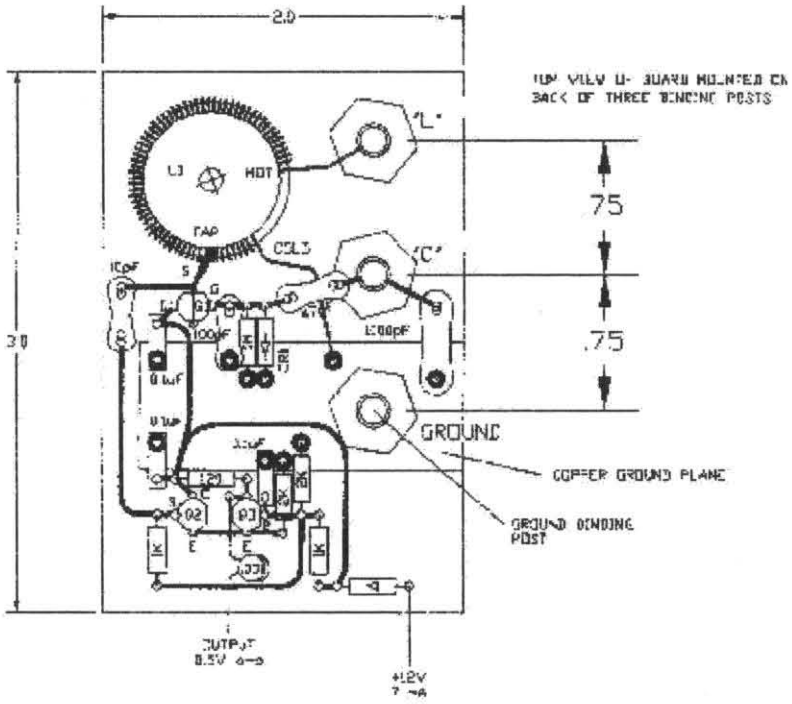
LC TESTER

FIGURE 1 : SCHEMATIC



NOTES:
1. CR1, CR2 small signal silicon diode, 1N4148, 1N914, etc
2. Q1 J-FET, MPF102, 2N5245, J308, etc
3. L1 69t #28 enamel wire on T80-2 (red) core tapped for Q1 source 15t from bottom end
4. Q2, Q3 2N3904, 2N4401, etc.

FIGURE 2 : PART LAYOUT



W7AAZ - 5/13/97

bunch of swapmeet capacitors. Better check them, one more thing you don't have to worry about.

3. When you need a 64.9 pF capacitor you can sort through a small handful of 33 pF and most likely find a pair in parallel that add up to the 64.9 pF you need (twenty 33 pF capacitors makes 100 different combinations near 66 pF). This is a eye-opening experience the first time you do it, and a powerful assistance to precision homebrewing!

4. Choosing the number of turns, and placement of the "link" winding on an antenna coil has always been black magic. Personally I'm sure this ***must*** be where the term "cut and try" first started! With computer-aided design you can model how a coil will work without cutting up wire and ruining coils. This is really computer-aided cut and try, but it slightly more intellectual and perhaps more of a learning process.

   Computer modelling transformers with PSPICE, for example, requires you to specify the inductance of the two windings (let's call them L_1 and L_2) and the mutual inductance between them which I'll call L_{12}. With the LC Tester we can measure L_1, L_2, and L_{12} as follows:

a. Measure L_1 like any single coil. Just make sure that L_2 isn't shorted or connected to anything.
b. Measure L_2, making sure L_1 isn't connected or shorted.
c. Connect the wires of L_1 and L_2 in series and measure the inductance. It doesn't matter right now which way you phase the two coils.
d. Reverse *either* the two L_1 leads or the two L_2 leads (NOT BOTH). Measure the inductance again

   In steps c and d one of those two readings will be larger than the other. The larger reading is $L_1 + L_2 + 2*L_{12}$. The smaller one is $L_1 + L_2 - 2* L_{12}$. The difference between them is $4*L_{12}$. For example if you have the following measurements:

   coil L_1 = 4.1 uH
   link L_2 = 0.18 uH
   bigger = 4.88 uH
   smaller = 3.68 uH

   Then $4 * L_{12}$ = 1.2 uH so L_{12} = 0.3 uH

   The "coupling coefficient", a number between zero and 1, can be calculated from L_1, L_2 and L_{12}:

$$K = \frac{L_{12}}{\sqrt{L_1 * L_2}} = \frac{0.30}{0.859} = 0.35$$

   Complicated? Sorta. Wierd? Maybe a little. Useful? Yes! It takes time and effort, and this kind of theory might not really appeal to you. On the other hand, it can be a useful thing to have in your bag of tricks when black magic seems to have a hold on something you are trying to build.

5. Going beyond duplicating someone else's design, you'll find that LC filters are easily done as "paper designs" on a computer. Programs can be shareware, Wes Hayward's software in the back of ***Introduction to RF Design***, the ARRL's *Radio Designer*, AADE's filter program, or your own Basic programs implementing formulae out of the Handbook. After you have a paper design, consult Amidon's *Tech Data* flier (or better yet their *Iron-Powder and Ferrite Coil Forms* booklet) to ensure that the inductance values can have good Q so they make sense for the frequency involved. You can be confident that when you have the indicated values of L and C the filter will work. It gets tricky, but I've built multipole bandpass filters at 40 MHz.

6. High performance crystal filters can also be computed with Wes Hayward's software. After measuring the crystal parameters and computing the filter the coupling capacitors can be accurately selected with the LC Tester. For best accuracy the coupling capacitor values need to be corrected for the capacitance of each crystal lead to the case. Tie the two crystal leads together and measure the capacitance between them and the case like any other capacitor. This is *two* wire-case capacitances in parallel, so divide the LC Tester reading by two to get the capacitance from each wire to the grounded case.

   When a filter's coupling capacitor-to-ground has two crystals connected to it, subtract two wire-case capacitances. At the end of the filter where there's only one crystal connected subtract just one.

7. Ferrites aren't color coded, but using the LC Meter I'm able to return breadboard parts to my stock of cores, confident they are going back into the right drawer.

   .Short the tester's terminals with a piece of straight, stiff bare wire. Zero the inductance value and compare the inductance with the following table of *approximate* inductances. There will be variation in ferrites, inaccuracies from only using one turn, and inaccuracy depending on the position of wire in a large core. Recheck the ZERO often because one turn produces a very small inductance. The large difference between materials means you shouldn't have a problem getting your cores sorted.

   Being portable, the AADE box is perfect to put in your pocket or purse when you shop for parts at surplus stores or swapmeets. The inductance will not be affected by existing windings *if they are not shorted or loaded*. You can slip a wire through even a wound core and get a reasonably accurate reading without removing any wires from the core

   You will find -61 baluns from CATV surplus, and lots of power ferrite cores. The ferrites we commonly use (72, 43, 61, 67, 68) are *not* the only materials in existence, but in general the permeabilities are similar for similar frequency capabilities.

Inductance in microhenries for one turn through the core. →

FERRITE MATERIAL	67 or 63	61	43	77
PERMEABILITY	40	125	850	2000
FT-23	0.004	0.025	0.16	0.18
FT-37	0.03	0.06		0.41
FT-50	0.044	0.075	0.33	0.5
.14"d x.125"l (small) FB-101 bead			0.4	1.1
.3"d x .3"l (large) FB-801 bead		0.45	1.38	4.7
wire through one hole of balun cores				
BN61-202		0.31		
BN61-302		0.19		
BN43-202			2.1	

LOSSLESS FEEDBACK AMPLIFIERS

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In the design of communication receivers, the design goals of low noise figure (NF) and high intermodulation immunity, usually expressed in terms of third-order intercept point (IP_3), are most important when designing the first few stages. Here, the bandwidth is usually greatest in order to accomodate the reception of a wide range of signals, which also allows adjacent strong signals to enter. Also, any noise generated in addition to the antenna and terrestrial noise will degrade the receiver's signal-to-noise ratio (S/N), and together with the IP_3 will determine the overall dynamic range of the receiver. Strong signals, even those far removed from the frequency of interest, can interact with each other and produce spurious signals, the result of intermodulation, or can generate harmonics. Those of you who have purchased inexpensive receivers for shortwave listening have undoubtedly experienced these effects.

Amongst the various amplifiers at our disposal is one very worthy candidate that can accomplish both design goals simultaneously without the need for exotic (read expensive) components or extensive tuning procedures. This is the lossless feedback, or Norton, amplifier, shown in Figure 1 in it's simplest form. Here, the active device Q1, a bipolar junction transistor, is operating in a common-base configuration. Current flowing through the input winding of the feedback transformer T1 to the emitter of Q1 creates an almost identical current (allowing for the alpha factor) at the collector, which then flows through the tapped output winding of T1 to the load R_L. By way of magnetic coupling, the current flowing through the output winding, and the voltage across the load, creates a back-EMF in the input winding, thereby giving the amplifier it's input impedance. The sole drawback to the Norton amplifier thus becomes obvious: The load impedance is reflected back to the input, and there is little or no isolation. This, however, is not a serious matter, and the benefits of high dynamic range far outweigh the inconvenience of having to provide a good wide-band termination.

One item I should mention here is the point at which I have placed the emitter biasing resistor R1. Some designers prefer to place this resistor at the input end, rather than the emitter end, of the input winding. And most invariably choose to place a decoupling choke in serieswith it. I have found, by having made many of these and measuring the IP_3, that this component works best where I have shown it. This may be that the resistor provides a means of discharging the emitter/base junction when the input signal is swinging negatively. Placing a choke in series can reduce the IP_3 by as much as 6dB!

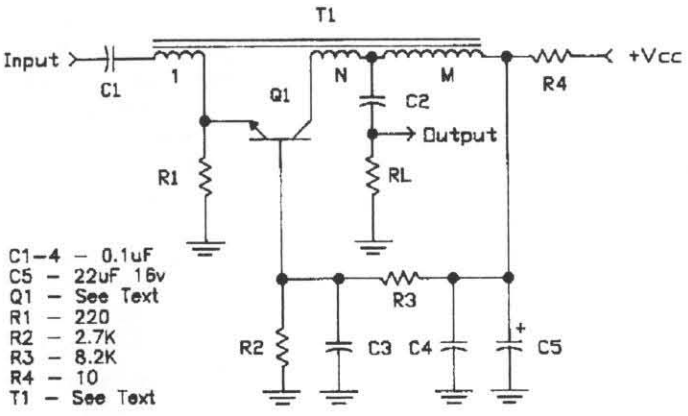

Figure 1 - Lossless Feedback Amplifier

According to the literature, the noise figure of the Norton amplifier is easily achieved by biasing Q1 at the collector current (I_C) and collector-emitter voltage (V_{CE}) that the manufacturer recommends for best noise figure. Except for the presence of the emitter biasing resistor R1, there are no additional sources of noise in the imbedding topology, assuming that the supply is properly bypassed and the collector current does not create a magnetization flux in the transformer core sufficient to create Barkhausen noise.

There are some fairly simple mathematical relationships that describe the relationship of the transformer windings to gain and impedances. First, the power gain is determined by:

$$G = M + N + 1 \qquad (1)$$

and the input impedance R_I is:

$$R_I = R_S = R_L \times (M + N + 1)/(M^2) \qquad (2)$$

where R_S is the source impedance and R_L is the load impedance. If the source and load impedances are equal (the usual case), then the transformer output turns are related by:

$$N = M^2 - M - 1 \qquad (3)$$

which, if we substitute (1) into (3), we find:

$$G = M^2 \qquad (4)$$

One additional relationship is the collector load impedance, which is:

$$Z_C = (M + N) \times R_L \qquad (5)$$

Note that since the collector sees a load impedance higher than the load, the voltage swing that it sees is also going to be greater than that delivered to the load. This is an important consideration when determining the gain of a particular stage, as the collector voltage swing will cause the stage to saturate earlier than one where the collector sees the load directly. For instance, for a 6dB amplifier (a power gain of 4), the transfomer turns are M = 2 and N = 1, and the voltage swing at the collector is 1.5 times that delivered to the load. For a 9.5dB amplifier (M = 3, N = 5), the collector voltage is 2.67 times the load voltage, indicating that the dynamic range decreases rapidly as the designed gain increases.

Selecting the Transistor

Of course, no amplifier topology is going to make a lousy transistor produce good linearity, even with tightly coupled feedback networks such as this. We must always begin with a device which produces good linear amplification on it's own, particularly when we are trying to meet rigid performance specifications. For nstance, the ever-popular 2N2222, the subject of an annual NORCAL contest, is a mediocre choice even when compared to it's PNP counterpart, the 2N2907A. The 2N4401-04 series are good linear devices, and also exhibit good noise qualities. Even more so, the Philips BFR92A and the NEC NE68133 are excellent choices for linearity, noise, and transition frequency (f_t). Their availability has kept them from finding wide application in amateur work, although some NEC devices are now available from Mouser.

My favourite, for now, is the BC549/A/B/C, preferably the "B" version as it's h_{fe} is in a desireable range. This device, and it's nearby cousins, shows good linearity characteristics when tested with a curve tracer, and with a NF of less than 1.5dB at and an f_t of greater than 100 MHz, this makes an excellent device for HF receivers. And, it has PNP complements that are equally usable for receiver front-ends if you happen to be into push-pull complementary pairs for linearization. Also, it's readily available from Mouser and Newark at a reasonable price, and I recently bought a large quantity from Baggy Bob at an even more reasonable price.

Making the Transformer

No, you're not going to be able to go out and buy this. Like a lot of other magnetic devices in RF design, such as toroidal inductors, you'll have to buy the cores and some wire, make a pot of coffee, and sit down in front of the Luxo magnifier lamp (if you're over 40) and go to work.

Two balun (or binocular) cores come to mind: The Fair-Rite 2843-002-402 (of which I have a large jar full), and the Micrometals BLN 1728-8, which is more readily available for amateur work. Both of these cores will allow you to make amplifiers up to 50MHz, and the smaller sizes will take you into the VHF and UHF regions.

Figure 2 shows a generalized feedback transformer with the input winding leads to the left and the output winding leads to the right. This configuration is physically convenient, more so than if all of the leads exited the core on the same side. The M and N windings are wound through the core individually, and the output termination is provided by twisting the two appropriate leads together and soldering.

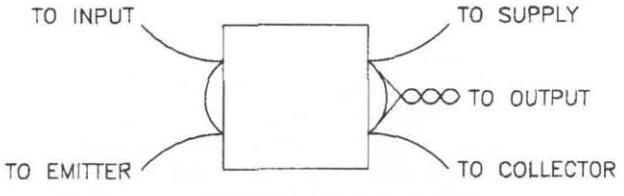

Figure 2 - Feedback Transformer (General)

The 6dB amplifier presents a unique case where the output winding has a 1:2 ratio, mentioned earlier. Here, it is very convenient to make the output side by twisting three pieces of wire together (a trifilar winding), and then winding this through the core for the same number of turns as the input winding. This creates a second connection on the output side, which simply hangs in mid-air. The reason for doing this is that it gives us a tighter coupling between the M and N sections of the output side, giving slightly better performance. A quadrifilar winding, adding the input winding to the twisted putput wires, improves things further, but not so much that you'll notice it. Besides, I can only buy three colours of magnet wire.

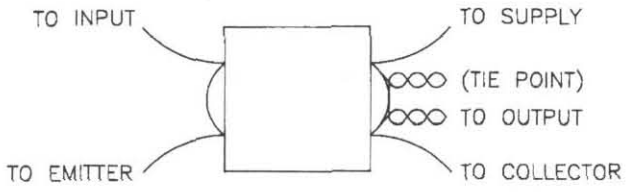

Figure 3 - Feedback Transformer (6dB Amplifier)

Design Examples

As an example or two, a pair of 6dB amplifiers using the schematic of Figure 1 have been assembled and tested. The transformer T1 was made with the Fair-Rite balun core mentioned earlier, and using 34 AWG magnet wire (single polyurethane nylon) the windings were made with 4 turns on the input and four turns of trifilar wire on the output, the connections made as shown in Figure 3. A surface mount version was made using an NEC NE68133 transistor and 10 volts V_{CC}. This resulted in an I_C of 8.5mA and V_{CE} of 8.6V. A two-tone test was then made at 10MHz. With +7dBm output on both signals (+10dBm total output power), the IP_3 was +39dBm, or just under 10 watts. A through-hole version was made with a BC549B and 12 volts V_{CC}, and the same test shows an IP_3 of +32.5dBm, just under 2 watts. Not bad for less than 100mW of dissipated power.

Just imagine what this would do to a 2N2222 front end.

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The QRP Website Cookbook

by George Heron, N2APB

Get your QRP Club Website up on the Internet quickly and easily!

I've been on the Internet now for a number of years, surfing around primarily for technical issues relating to work and software development in general. Although always impressed with the fabulous company websites and personal home pages that I've encountered, I've never delved into how it's actually done ... just too many other things to do with my spare time, like building QRP equipment for the shack or just plain operating!

But this all changed early this year when the current webmaster of our QRP club had to relinquish his duties and we needed someone to step in to continue this effort. So it was time to crack the books and hop on the information superhighway in a big way, and I found that it wasn't hard to do.

OVERVIEW

This is a basic "cookbook" of techniques that any reasonably PC-literate individual can follow to design and install a website on the Internet. I'll provide some background reasoning for having a website, and I'll explain the inexpensive and no-frills approach that worked for me, including the tools and programs used to edit content and access the host server. And then I'll overview the ongoing maintenance I expect to provide for this beastie once all the bugs are shaken out.

I've also put together a sample website to use as a template for your starting point and provided some description of the HTML code to help understand how to modify it to meet your own needs. All the code and files comprising the sample website are available for download from my site, including a line-by-line description of the code.

And finally, I need to say that I am not an expert! There most definitely are better ways to get the end results I describe, but this is the way I found most doable ... maybe you will too!

FEARS & TREPIDATION

I had all the concerns that many of you probably have with regard to getting in over your head in this new Internet technology: new terms and abbreviations, unknown/complex/expensive software tools, expensive Internet connection, and yet another reason for your spouse to ask "why are you spending so much time down in the basement workroom?!$#@.

Well, although there are indeed a few ongoing commitment aspects to this adventure, I have really good news to report: it's not that expensive, hard, time consuming, complex or support-intensive ... and it's actually fun in the process!!

WHY CREATE A QRP WEBSITE?

Communication, communication and then more communication is the lifeblood of any organization - the more its members know what's happening, the better the group survives and grows. As a prototypical example of this communication, I'll describe a little of the strategy and tactics we had in mind during the construction of our NJ-QRP Club website (http://www.njqrp.org).

Basically we wanted to produce an "online journal" of QRP-related information, activities, happenings, membership, projects, technical studies, etc. Our journal needed to be organized a little like a magazine with a set of regular sections, as well as having "feature" sections prominently displayed and accessible.

There are just tons of sections and material you can provide: membership services, events, contests, features, club info, meeting agendas and minutes, website information, equipment reviews, links to other cool sites, downloadable software, "for sale", and member projects. And this is only a smattering of material that can be used for your club website!

This paper was presented at the Four Days In May symposium put on by Bruce Muscolino, W6TOY/3 on May 15th, 1997. This is a somewhat shortened version for publication here in the QRP ARCI Quarterly. Contact Bruce Muscolino, W6TOY/3 for information on getting all the papers from that event in a three ring binder. ed.

FEARS & TREPIDATION

I had all the concerns that many of you probably have with regard to getting in over your head in this new Internet technology: new terms and abbreviations, unknown/complex/expensive software tools, expensive Internet connection, and yet another reason for your spouse to ask "why are you spending so much time down in the basement workroom?!$#@.

EDITORS ARE WE, ONE AND ALL!

I need to mention at this point that updating this information and keeping it current and fresh is A LOT OF WORK!!!! Realizing this, it was our goal to spread the original contribution and editorial work around to as many of the membership as possible. Once we get settled into the final format, color schemes, et al, I'll be setting up access rights for specific "section owners" to be able to regularly upload new material and content to their section without too much interaction by me.

A COOBOOK OF STEPS TO MAKE YOUR FIRST WEBSITE

STEP 1 - Get on the Internet!

You will need to connect to a server which is already on the Internet, which is owned and maintained by an Internet service provider (ISP) who rents out connection time to people wanting e-mail and surfing privileges. And we connect to the ISPs via modems from our home computers.

There are many ISPs offering basic, low cost connections with e-mail service and unlimited connect time ... typically for a monthly charge in the $10 to $20 range, depending on the size, support and accessibility of the services. ISPs often advertise on the radio and newspaper, or they can be found in the yellow pages of your phone book - check out "Internet." Also try word of mouth references for a local ISP.

STEP 2 - Get Some Basic Tools

The first "tool" you're going to need is a browser - a software program run on your PC, Macintosh, SunStation, etc., which talks to the servers on the Internet. The most common browsers these days are Netscape Navigator and Microsoft's Internet Explorer (IE). The good news is that these are both free and have grown very powerful and feature-rich in recent years.

The only other tool you'll need for basic usage is a text editor, such as WordPad, NotePad or MS Write. And of course you can also use a full-blown word processor (such as MS Word) if you have it.

Ultimately, you'll be editing the HTML text files that describe the content of your web pages.

STEP 3 - Create a "Local" Home Page

A convenient aspect of creating a website is that you can develop the necessary files on your local computer first and get it working there before transferring them up to the host server at your ISP site.

A website is a collection of text files containing "HTML" codes which provide the formatting, colors, text, graphics and general appearance displayed for your website.

The default starting point for your home page is a file named index.htm, which contains links (pointers) to all the other HTML files in the collection of sub-pages comprising your website.

The best way to start writing software program is to use another one as a sample template. The HTML files for a very basic website are available for download from my website (http://www.waterw.com/~n2apb), and I'll use them later in describing a simple home page.

Once the files are created with a text editor (or downloaded to your system), you can modify any of the displayed text, displayed graphics or sequencing of information based on your own particular design goals. Refer to Appendix A for a detailed explanation and walk-through of all the codes present in these HTML files.

STEP 4 - Getting a Home Page on your ISP's Server

Now that you have your new website working on your local machine, it's time to graduate and put it all up on the ISP's server so it can be accessed by everyone on the Internet.

But unfortunately it will be necessary for you to purchase the next level of service from your ISP - in my case, they call it premier service. This will provide you with a "home page" website capability and some disk storage space on the server for your HTML files, graphics and image files. The price for this home page capability is usually in the $5 to $10 range, on top of the basic rate you paid for the original connection.

STEP 5 - Transfer Local Pages to Server Site

When you purchase the personal website services from your ISP, you will be sent specific information on how to transfer files from your local computer to his Internet server. Once this is accomplished you will essentially be online!

The process of sending files between two computers over a network or comm link is called FTP. I use a popular shareware program called WS_FTP95_Pro by Ipswitch Software (http://www.ipswitch.com), which presents a very helpful user interface showing files on both computers.

The idea is simple: transfer the HTML and image files from your local computer to your ISP's server on the Internet. After you establish a connection with your ISP, you will need to identify the source files on your system and the destination directory location on your ISP's server, then transfer the files! At that point, Voila! ... your newly-created website will be accessible by the millions of Internet users around the world!

STEP 6 - Updating, Expanding and Improving your Club Site

The hardest part of your adventure is over ... and now the most exciting and rewarding part begins. Everyone will be telling your how great it looks, and the updating process is a piece of cake.

Suppose someone's e-mail address changes and you need to update the membership roster page. All you need to do is double-click on the roster.htm file on your local system which launches your browser and displays the roster page. Again, this is on your local computer -- you don't even need to be connected to your Internet service provider at this point. Then select "View ... Source" in order to bring up your NotePad text editor to display the HTML code for that page, make the appropriate changes in the e-mail address and then save the HTML file. You can then "Refresh" your browser display and view the updates you just made. The final step is to actually transfer the updated HTML file onto your ISP's Internet server by again by following the FTP procedure in step 5 above. Once the updated file is in place, all people visiting your site will see the member's new e-mail address. Pretty simple!

YOUR STARTING POINT: A SAMPLE WEBSITE

If you download the software from my website, you'll see several text files representing a home page (index.htm) and a couple of linked pages (project.htm and members.htm) which together comprise a sample website.

This is an example of a very simple website wherein I used some graphics, sound, links and images in order to illustrate what can be done. It doesn't generally show good page design practice, but gives a great head start in creating your own club's website from an sample "menu" of items.

We don't have room for a full discussion of HTML code, but I have a document on my website that does. So, in addition to the actual files and graphics comprising the Sample Website, you'll find a document describing a line-by-line description of the HTML code used to generate the web pages. From this descriptive narrative, you should be able to add and modify any of it to produce your own version of a web page in no time at all.

SOME ADVANCED TOOLS

Although this paper describes how to create a website using the least amount of effort and power (truly a QRP website!), you will undoubtedly want some more power and capabilities at your fingertips within short order.

I recommend a very powerful suite of relatively inexpensive tools for your next level of webmastering: Microsoft FrontPage 97. This is a $149 web creation tool which contains a WYSIWYG HTML editor (you no longer need to worry about which tag to use or its syntax, as you actually see the formatted results on the screen), and a web creation wizard that walks you through a variety of the options required in setting up a website.

FrontPage also includes Image Composer, which is a powerful sprite-based[JP1] image construction environment for creating controls, buttons, and anything else displayed on the screen.

Among all the books available for website instruction, I ended up getting Laura Lemay's Web Workshop (ISBN 1-57521-223-4) as it had a comprehensive and practical referencing of FrontPage features and usage, as well as a CD-ROM with a good sample/tutorial of building web pages.

SUMMARY

Bringing a QRP club website online from a ground-zero base of Internet experience has been an exciting and rewarding endeavor. In this paper I showed how to use a very basic set of tools to put some original content on the Internet for your colleagues and club membership. And I gave some glimpses as to the usefulness and value you could provide by creating a variety of ham-related functions within a website.

The directions for you to go to from here are limited only by your available time and desire to experiment. The Internet authoring and publication field is expanding in an explosive manner - new tools, concepts, and languages are becoming available on almost a daily basis. And you can take advantage of all this for your ham radio club today ... try it, you'll like it! Let me know what your URL is when you get it going!

N2APB

Software developer and manager for over 20 years in the northeast, working at Kodak Research Labs, Edsun Labs and currently with Dialogic working on "computer telephony" products. A consummate homebrewer -- rf, digital, microcontrollers, and totally enthralled with QRP. Built some kits, repaired a long-dormant HW-8, got an HW-100 working QRP, and design interest is now on Coherent CW. Currently lives in Sparta, New Jersey with wife Debbie and five year old Elizabeth, who's constantly helping to rearrange the radio shack! E-mail: g.heron@dialogic.com.

Dealing with Computer-Generated RFI/EMI

by Daniel Wee (9V1ZV), 9V1ZV@amsat.org

1.0 *Introduction*

One of the most frustrating problems about using computers with radios, whether it be for controlling purposes or for decoding, is the amount of RFI generated by these machines. Most of the time the RFI generated is enough to render certain bands useless, and on other bands it may drown out any weak signals and distort or interfere with signals you are trying to copy. This is totally unacceptable for working with digital modes and even for CW. Thus one of the most frequently asked questions is how this RFI may be reduced or eliminated. The bad news is that there is no way that I know of to completely remove the computer generated RFI in most situations. The good news is that there are definite steps we can take to reduce the RFI to very acceptable levels and in some cases, it will almost disappear altogether. This document is a compilation of suggestions from various persons and some of the things I have tried with my own system when dealing with this problem. Many of the documents I have seen relate to situations involving spurious emissions (RFI) and how to avoid generating them.

I suppose most people would have already tried the basic steps to improve signal conditions by having the receiver and antenna as far removed as possible, physically and electrically, from the RFI source (computers and monitors in our case) but I am also aware that sometimes there are limitations and constraints as to how much distance can be had. One may have also tried changing the orientation of the computer, monitor, receiver, antennas and feeds to see if things get better. Having done all that, what else can be done? This was the predicament I faced.

The standard disclaimer applies and I will not be responsible for any accidents although I have tried my best to present the following information in the best integrity.

2.0 RFI Sources

Before we actually begin tackling the problem, it might be helpful to know something about why computers generate RFI and how it gets into the receiver. The two major components of the computer are the main CPU and the monitor (for simplicity sake). The computer runs at a certain clock rate as determined by an internal oscillator. Most of the time the rates are something like 4.77 MHz, 8 MHz, 12 MHz, 16 MHz, 20 MHz, 25 MHz, 33 MHz, 40 MHz, 50 MHz, 66 MHz and 80 MHz. This is not the only clock involved, there is also another oscillator on the video generator card and sometimes a few oscillators, plus those on other cards. As you can see, these clocks are all oscillating in the HF and L-VHF regions, which may interfere with signals we would like to receive. To make things worse, these clocks are usually sub-divided into a number of other frequencies within the computer. Since the computer is a digital system, the characteristic waveform of these signals are square-waves, and square-waves tend to generate many harmonics. The video card also generates RFI because the data-pixel-rate is often high enough to fall into the HF regions. All these are reasons why computers and monitors can be so troublesome when it comes to generating RFI. This is often made worse by computers with cheap plastic casings which do not adequately shield the system. Many people have the opinion that monitors are one of the main RFI sources and this may well be the case. I have also noticed that the PC keyboard also generates a considerable amount of RFI despite its innocent look. This is because it contains a microprocessor on board which runs off a clock in the 3 MHz range. This problem is compounded by the way the keyboard PCB runs, which acts like a pretty good loop antenna type radiator and produces harmonics that can be heard in the 2nd and 3rd harmonic range. The monitor probably has an on-board crystal at about 14.316 MHz so you will find a strong carrier there too.

The first thing we want to do is to determine how much RFI is being generated by the CPU and the monitor. It may be that the CPU is not radiating at all but the monitor is the culprit, or vice versa. This can be done by switching off the monitor and leaving the CPU on just to see how much RFI is getting into the radio. The following is a suggested procedure:

1) Do a quick sweep across the bands to find out where the RFI is the strongest. This is helpful because if we can reduce the RFI here, there should normally be a corresponding decrease of RFI everywhere else (but not necessarily so).

[Editor's Note: Several hams, including Stephen Lee (AB7HI) and Andy Fox (KK7HV) have pointed out that "hot-plugging" some connectors can damage your system. In particular, hot-plugging mini-DIN keyboard connectors and P/S 2 mice was said to be a potential cause of motherboard damage. Hot-plugging is when connectors are removed or reattached to the PC while the power is on.]

2) Disconnect the mouse, serial cables and printer cables, keyboard, video cable, and video power cord. If you can, run the receiver on batteries for this part. Now turn on the computer and see if the RFI is decreased by any appreciable amount.

3) Now connect the keyboard (with the CPU on), then the mouse, the serial cable, the parallel cable, the video cable, and monitor power cable (don't turn on yet). As you reconnect these, note the increase of RFI, if any. You should now have some idea as to which is the main contributor of RFI. If you should have the good fortune that none of these result in any appreciable increase of RFI then you're in luck.

4) Turn on the monitor and note the increase in RFI. Run both text and graphics modes to see if the RFI is affected.

5) Reconnect the radio to the power supply and again note the RFI increase, if any.

6) Disconnect the radio from any antenna, whether external and internal, and see if the RFI goes away. Note that on some radios when you unplug the external antenna connection, the internal antenna is automatically activated. To prevent this, plug a dummy plug into the antenna socket.

By now you should have a pretty good idea of which components are contributing to RFI. Keep these notes while we move on to another point, RFI paths.

Earl Morse (KZ8E) suggest this for pin-pointing RFI source:

In the event that this does not work, you will need to look for cabinet radiation from the monitor and computer. Make a loop from some RG-58 coax by stripping back the shield a few inches and making a couple of turns about an 1-2 inches in diameter. Solder the center lead to where you stripped back the shield. Plug this loop into your receiver and use it to probe the computer setup. A faulty computer cabinet can be easily shielded with fingerstock, braid, or other conductive materials. Shielding a monitor cabinet is a lot more difficult and could cause safety problems (high voltage) or overheating.

If you find the above method too troublesome, just get ahold of a battery-operated portable AM/SW receiver with an internal ferrite rod antenna and start moving around, rotating the radio as you go. Often you can pinpoint the major RFI sources just by following the radio to the place where the strongest hum is found. Of course the radio should be tuned to a section of the spectrum where the RFI can already be heard somewhat. Do this with the radio near the suspected equipment and

fine-adjust from there. This will also give you an idea of what kind of RFI is present and on what frequency it is focused.

3.0 RFI paths

RFI gets into the receiver from the source through a number of paths. This can be through the power supply, through the "earth" point of the power supply, through direct radio emission, even through "shielding" which is not properly designed or used. There are a number of ways to deal with these situations. If in (6) above, your radio is still picking up RFI with no antenna connected, then the shielding in your receiver is poor. If in (5) above, the RFI increases as you reconnect the radio to the main power supply or adaptor, then RFI is coming in through the power supply. If your radio is connected directly or indirectly to the computer through the serial port or some other interface, that too could be a path for RFI. You will know if this is a problem as you go through step (3) above. If the RFI increases appreciably as you reconnect the external antenna, then the RFI may be coming from direct emission or being picked up from the antenna feed.

Remember that in many cases RFI is coming in from more than one path, so it is important to check out all possibilities. On the other hand if one path is the overwhelming problem, you may want to deal only with that. Other basic measures are to keep cables and connections as short as possible. This will help prevent these connections from becoming radiating elements for the RFI from the equipment. If possible, have your radio equipment connected to a different power circuit but watch the earth so that no dangerous voltage- potentials are formed.

4.0 Killing RFI

As you can probably see, RFI is a combination of problems and not just one problem. It can be classified into 3 categories:

a) Shielding problems. b) Filtering problems. c) Design problems

These are not definitive categories but are used for simplicity. In many cases, poor shielding is a prime suspect. So we will deal with this first. Now to get on with the real action.

4.1 Shielding problems

When we talk about shielding, there are 4 things to consider: The radio itself, the monitor, the CPU and the antenna/feed combination. Poor shielding can be an inherent problem in some designs but can also be due to dirty connectors and old parts. Go through the equipment to make sure that all the connection points are secure, particularly the connections to the antenna shielding, radio power supply, CPU casing, and cabling. Make sure that the wires are not old and that all the connections are clean, no oxides on surfaces. The presence of oxides makes for poor conduction and in some cases it results in rectification of signals which can then lead to a host of other problems.

If the problem is in the design, such as poor shielding in a radio as determined by step (6) in section 2.0 on RFI sources, or poor monitor or CPU shielding, then we need to provide an adequate shield. This can normally be done using tin/aluminum foil or conductive spray. The basic idea is that we must line the casing of the inadequately shielded equipment with a barrier to RFI. This must be done carefully since the shielding is conductive, making it possible to accidentally short circuit something and fry your radio or other device you are trying to shield. The spray is probably the easiest to use but also quite expensive. My feeling is that metal foil probably provides better shielding but is harder to apply. The conductive spray or paint has a lower conductivity but spreads more evenly and gets into difficult to reach locations more readily. What you need to do is to carefully remove the plastic casing of the radio or monitor, paying attention to cabling and electrical contacts. Remember that opening the case will almost certainly invalidate the warranty on the equipment. Clean the insides of the case thoroughly and make sure that it is dry and free of dust or grease before applying the spray. You may need to apply several coatings to get better shielding. Make sure that at some point in the casing, the applied shielding comes into contact with ground. Remember that in monitors, the chassis are not always connected to ground so check this out first. For the shielding to be effective, you need to provide as complete a "wrap" as possible but remember not to spray switches or anything that might cause a short circuit. Also, avoid blocking up ventilation holes. You may at this point wonder about the screen itself. Well in most color monitors, the mask inside the monitor acts as a shield of sorts. Wait for the coat of paint or spray to dry before replacing the cover. Try to ensure good grounding for the shield and avoid scratching off the paint. If arcing should occur, use some insulating tape over the area. The kind of spray that I use is known as EMI-LAC or EMV-LACK (by Cramolin) and is of German origin. There are many other makes and most should work okay. In the event that you cannot find either paint, spray or suitable foil, conductive tape will do also. Remember, the conductive screening must NOT touch the components. Pay attention as there is always a shock hazard when messing with monitors. Don't do this yourself unless you know exactly what you are doing! Stay alive.

Gary Coffman (KE4ZV) has this advice about shielding:

If the monitor is the culprit, there are conductive sprays you can use on the inside of the plastic cabinet to reduce the hash. GC Electronics makes one that works well. You have to strip the monitor and spray the cabinet. Usually you want to spray inside for appearance sake. When you put it back together, watch that the HV section has adequate clearance with the now conductive case. If it doesn't, glue some fish paper in the proper spots to prevent arc-overs. Unless the monitor is a "hot chassis" design, bond the conductive coating to the chassis, and bring a bond wire out from the chassis to station ground. If the monitor is color, the shadow mask in the tube will form an adequate shield, but if it's mono, then you may need to put fine copper screening over the face of the tube. Spray paint it flat black and it'll double as an anti-reflection screen.

If the cable is radiating, first make sure you're using a shielded cable, then use some snap-on ferrite chokes on the cable. These chokes are good things to put on *every* external cable.

If the PC is the culprit, scrape paint so that the case halves can bond properly, and add extra screws so that every seam has a screw at least every two inches of it's length. That's what it takes to get a good Faraday cage. Any openings in the case should be covered with copper screen wire. The floppy drive opening is a problem because you need access. The best way to handle this is to shield the entire drive bay from the inside and accept the hash when the drive is in use. Bring a bond wire from the case to station ground.

Of course it always helps to have the radio's antenna as far from the PC as possible, and brought back to the radio via a well shielded coax. The radio chassis should be bonded to the station ground. If you're using a HT (so sorry) then you may have to locate the radio and TNC far from the PC via a long RS232 cable. Note that the TNC can also be a source of noise. In some cases it's better to leave the TNC next to the computer and remote locate the radio with long audio and control cabling. The TNC should be treated the same way as the PC. Sand off the paint and add bonding screws. If it's plastic cased, either use the conductive spray, or put it in a metal box.

If you are using the spray, make sure to apply an even layer and you may want to repeat the process a few times to get a better screen. Do not waste excessive spray on one spot but make sure that the coat does not have "thin" spots. The same method can be applied to the CPU casing or to the keyboard casing. The effectiveness of such a method on the keyboard is debatable however, seeing that it is difficult to build a proper Faraday's cage around the offending circuitry. Care must also be taken, given the tight enclosure of most keyboards.

Shielding of cables is also important. Try to make sure that the video cable has a good shield/screen. The same applies to serial and parallel cables and, of course, the antenna feed should be well shielded.

For antenna feeds, avoid TV 75 ohm coaxes as these normally do not provide sufficient screening. Try RG-58-C/U (which I think has better screening that RG-58-A/U) or some other high-screening type cables like RG-8 and the like. Well screened antenna feeds go a long way to remove RFI. I have been told that the equipment should all be connected to a firm ground via heavy gauge wire or braid. This is probably true and if you can, why not. Where cables terminate, use good and appropriate connectors such as PL-259 or something similar. In all cases, provide the screening with a good ground. A well screened antenna feed may eliminate up to 80% of the RFI in some cases, or more. If you are listening on VHF and UHF however, the length of the feed may need to be weighed against signal losses in the feed itself. Feeds such as the 9913 have lower losses but are quite expensive. Use them if you can however. Personally I still find the RG-58 to be the easiest to work with.

Sometimes in some CPU units, there may be some parts which are difficult to shield, such as the disk-drive. This is not too serious since the drive is not operating most of the time, but if you elect to try to screen that also, remember that the screen must all be well connected electrically. The same goes for the rest of the computer casing. If you can, use one with a proper metal casing on all sides. What we want is a Faraday Cage, so see that the whole case is well grounded. Scrape off some paint at the screws so that there can be good electrical contact everywhere.

Other exposed connectors and splitters (which are not recommendable) can also be letting in RFI so you may want to check out their screening as well.

4.2 Filtering problems

This represents the next major path for RFI. In some poor designs, RFI is not properly filtered out of the computer or monitor power supply and it thus leaks out into the mains, and from there into the radio power supply and finally into the RF section (or AF sometimes) of the receiver. This type of problem can normally be improved by using a line filter for the equipment's power supply. Make sure that the line filter is rated for the power the cable is meant to carry or it may burn up. There is a kind of line filter which is essentially built as a socket, which you can use in place of the one on the power supply. I am not sure how much improvement this kind of filter affords but if you elect to do this, do it with care! Other than using line filters, you can also use ferrite beads and toroids on most any lines. Experiment around with a bunch of these things. You could also put a bunch of ferrite beads on the antenna feed line and this will act as a kind of balun as well as preventing RFI from traveling on the screening. There are many types of ferrite RF chokes, clip on types and ready made types, which can be used. The ARRL Handbook has a description of some of these devices. I have built myself a 4:1 balun (BAL-anced to UN-balanced) for my coax fed dipole and now I get much less computer RFI and other noise from my antenna system due to the impedance matching and improved power transfer characteristics. Better selectivity is also a benefit of a good antenna system. Line filters and RFCs can do wonders so experiment with them at various strategic locations such as power supplies, some audio lines etc.

Other than that, RFI often comes through other data lines and control lines in parallel and serial ports as well as video ports. Besides using ferrite beads on these, you may want to connect small value capacitors between the lines to ground. For parallel and serial lines, use 0.01 uF capacitors (multilayer, MKT if possible, others may work well too), and for video ports, connect 100 pF capacitors from the RGB, H-Sync and V-Sync to ground. These may have some other effects on the lines so experiment with slightly higher or lower capacitor values.

If you are receiving on certain bands only, a bandpass, highpass or lowpass filter may help if used on the receiver front-end. This, however, will not be effective for reducing in-band noise. A notch filter can be used on the antenna feed to notch out certain strong emissions such as the 14.316 MHz crystal oscillator on the video card or on the baud-rate generator. Note that all kinds of filters (barring active ones) incur losses to some degree and if your signal lands too near the unwanted emission then you cannot use the Notch since the wanted signal may also get filtered out. A high-Q notch is often preferred in this case.

Concerning the use of clip-on filters (such as those sold by RS), Steve Byan has this to say:

The "clip-on choke" is a split ferrite bead in a plastic case, sold for RFI suppression from personal computers. The two halves of the bead fit around the cable; the plastic case has a hinge and a latch to hold the two halves together. You could get the same effect by slipping a ferrite bead onto the coax before attaching the connector.

This idea is similar to the ferrite bead baluns used in amateur radio. The idea is to increase the impedance to RF current flow on the outside of the coax shield - this ideally prevents the coax from becoming part of the antenna.

I'm skeptical that one or a only a few of these Radio Shack beads would have much effect when placed on the coax lead-in. I think it would take quite a few beads to get enough inductance to help.

It might be better to use the beads on the offending appliances. I'd recommend John Doty's method of grounding the coax shield at the antenna, and running the coax buried or along the surface of the ground. I think this will minimize pickup of local noise sources more effectively than a few ferrite beads at the receiver.

Power line decoupling and filtering is essential for optimum performance. The standard power supply of most PC's is a switching power-supply. Such systems, while power efficient, tend to generate spikes and unwanted harmonics due to the switching effect. Needless to say, if not handled properly, these spikes will get into the mains and from there into your radio. This is usually not severe because the design usually takes this into consideration already. What is more worrying is the CPU clock leaking into the mains through the power supply. Once again, the line filter is the way out.

Often, when only the audio from the receiver is required to go into the computer, you might want to consider some way of isolating the signal from direction connection to the computer. One simple way is by the use of 1:1 audio transformers. Personally I have found a slight improvement here but not to my satisfaction. I also tried connecting the audio from the receiver to an adapted FM microphone and having another FM radio pick up the audio which goes into the computer. This seems a lot of hassle but may be a last resort or for people who really want distance between the radio and the computer. Other forms of isolation can be implemented using IR or optics. These will provide excellent isolation as far as the audio line is concerned and there should no RFI worries from that path.

4.3 Design problems

RFI problems are sometimes compounded by poor antenna or receiver design. Antenna impedance mismatch, for example, can make things worse than they need to be. As such, use of baluns and transmatches may help. Although the coax antenna feed is supposed to keep out RFI, a mismatched antenna and feed may result in the coax screening itself picking up RFI. So if you are using coax feed into a balanced dipole, try using a balun at the feed point. Balun designs are really simple to build and can be found in the ARRL handbook also. The impedance matching of the antenna to the feed can also be handled by the balun. Baluns, being what they are, normally incur some signal loss but in a good balun this is insignificant compared to losses in the feed itself. Besides, loss of signal strength is often made up for by improved S/N ratio. I have not confirmed this but some out of band RFI can be reduced by the use of antenna tuners which provide better selectivity. Such tuners can easily be made from any number of designs found in amateur circles because commercial ones tend to be rather expensive and come with SWR meters and other fancy things that the RX-only

SWL does not need. In my case, a coax feeding into an off-center-fed-dipole, the balun did wonders to the S/N ratio and I actually see a signal strength improvement. This does not mean that the balun improves gain but the selectivity it provides may prevent the receiver AGC from kicking in and drowning out the weaker station, thus resulting in a higher apparent signal strength.

Kok Chen (AA6TY) has this to say about unmatched antenna systems:

And finally, just as connecting coax to a balanced antenna will cause the feedline to radiate, the reciprocal also happens. If you feed a balanced receiving antenna with an unbalanced line like coax, the outside of your coax will pick up noise and send it to the antenna input of the receiver. Place a balun between the coax and the antenna itself.

Decoupling in some digital equipment is not properly done and can lead to RFI being insufficiently suppressed. This can be remedied by placing 0.1 uF capacitors along all points in the power supply of the equipment between supply and ground. This may sound silly to some because it may seem easier to use one big capacitor, but while the electrical properties at DC may be similar, the distributed capacitance has a different effect on RF. You want to ensure that your power supplies are properly decoupled and no unwanted oscillations are taking place in the regulators.

The directivity properties of the antenna can also help improve signal conditions under RFI. The loop antenna, for example, can be positioned so that it nulls out at the RFI source. I haven't tried this myself. In theory it should work but I cannot comment on the actual performance you can get out of this. Similarly the dipole also exhibits certain directive properties which can be taken advantage of to reduce RFI.

The use of antenna tuners and pre-selectors may help reduce out of band noise and may provide a clearer signal, especially if a high-Q tuner is used in the front-end. If an active antenna is used, it is probably more advisable to have that antenna mounted at the mast/feed-point. This is so that only the signal gets amplified and not the RFI from the computer. This is especially so when we are talking about broadband RF pre-amps which are more susceptible to noise. I now have an MFJ-1020-A active antenna pre-amp which also contains a pre-selector section and it works well for me, removing a considerable amount of out-of-band signals, but at the same time the noise floor is also raised. Judicious use of such a system can help improve reception on many signals, especially of the continuous carrier types such as RTTY and FAX or SSTV.

If you are constructing your own interface equipment, try as best as possible to build it into some kind of shielded casing, or a metal box. This may help reduce some RFI input to the radio.

5.0 Other measures

Besides the above, if one is using the computer for receiving CW/RTTY or other digital signals, a good IF or AF filter will help in removing unwanted noise. The advantages of the different filter types are detailed in the ARRL Handbook. For those who are more well off, a DSP adaptive filter can be of added convenience, aside from all the other SC (Switched Capacitor) filters, Notch filters, etc. Again, I do not have the privilege to speak from experience. Bandpass filters are quite easy to construct and you may want to experiment with certain designs before investing in the real thing.

For those who are thinking of a new computer, I hear that notebooks have very low RFI emission and may be very suitable for radio use.

In case you are like me and don't live near the ground floor, you may want to use a balanced antenna system which does not require a ground, or you may want to get one of MFJ's Artificial Ground devices. Here is an excerpt from Scott N3FI to me about this:

I picked up this thing called the MFJ Artificial Ground, which consists of (I think parallel) an LC circuit and a counterpoise wire. This allows you to "tune" the reactance out of the counterpoise wire so that it "seems" like an earth ground to the shack. No more zaps on your microphone! Don't know if necessary on RCV only, though. Wouldn't imagine so. Just remember that electrical outlet ground is ground at 60 Hz, but NOT in the MHz. Your whole wiring system will act as an antenna!

As far as the wiring of the feed goes, remember to keep the feed from running parallel with mains wiring and try to avoid fluorescent lamps if possible. Some of these old lamps have faulty chokes which tend to generate some noise. Most modern buildings should be okay, but older places tend to have this problem. While on the subject of wiring, remember that it may not always be your computer/monitor which is generating the RFI. Especially now that more and more people are staying in apartments or terrace houses, your neighbour's computer system may also be a source of noise. One way to go about this is to have a nice talk with your neighbour or use some kind of grounded metal sheet or grid at the walls. In concrete buildings, there are steel bars in the walls and so this may not be absolutely necessary.

6.0 Conclusion and Credits

RFI has been a most perplexing problem and will continue to be so as long as manufacturers of computers do not think if it as a problem. I welcome contributions and other suggestions so that we can advance our fight against RFI. Please direct all suggestions to: daniel@pandora.lugs.org.sg

I would also like to thank persons who have offered their advice and experience in RFI problems. Tks.

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Earl Morse KZ8E e.morse@zds.com
Scott R. NF3I ham@wam.umd.edu
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Tom Bruhns K7ITM tomb@lsid.hp.com
Andrew Moore dmoore@viper.cis.upenn.edu
Steve Byan steve@hicomb.hi.com
and others whose names I may have lost...

The ARRL Handbook offers plenty of helpful information concerning baluns, transmatches, filters and chokes. This will be helpful for those who want to find out more about antenna and transmission line theory. Information can also be obtained from the ARRL e-mail server. Simply send email containing nothing but the word "HELP" to info@arrl.org to get started. The server contains some more information on RFI and related problems.

Have fun, down with QRM and RFI. A final word of caution, be sure to know what you are doing or you may fry your equipment in the process, or fry yourself (which will arguably solve all your RFI problems!). In case of doubt, get an Elmer or someone experienced with electronics to help you out, or to walk you through the steps.

I just got off the fone with G3RJV, and it is now official. I will be handling the GQRP accounts here in the US.
Renewal and updates can come to me at:

Bill Kelsey - N8ET
3521 Spring Lake Dr.
Findlay, OH 45840
kanga@bright.net

419-423-4604 - machine will probably answer!

E-mail is the best way to get in touch with me.
I have a copy of the North American membership database so I should be able to answer inquiries on membership status.

Annual membership is $14. Checks can be made out to GQRP Club.

Review: Ten-Tec Model 1330 QRP Transceiver Kit

Dennis B. Dolle, NX5W **5790 Fort Wright Oval** **Fairchild AFB, WA 99011**

I've noted a definite increase in the number of really fine QRP transceiver kits offered to the amateur radio community over the course of the past few years. A few of them have found their way into my shack, and I have been very pleased with the quality and performance of the offerings I've sampled. Recently I assembled a Ten-Tec Model 1330 30-meter QRP transceiver kit, and this kit ranks right up there with the best.

In the fall of 1996, Ten-Tec[1] introduced the 13xx-series QRP transceiver kits. They are available in several flavors: The model 1380 for 80 meters, 1340 for 40 meters, 1330 for 30 meters, and 1320 for 20 meters. All the kits sport identical specifications and basic design. I strongly suspect that all models use the same circuit board with different VFO, filter, etc. component values for the different bands.

Ten-Tec's specifications for the 13xx-series kits are as follows:

GENERAL

Frequency Coverage: Any 50 kHz segment of the CW subband.

Frequency Control: Varactor tuned oscillator with potentiometer control. Temperature compensated LC components stabilize the VFO.

Power Requirements: 12-14 VDC, 35 mA receive (no signal), 80 mA receive (S-9 signal), 800 mA transmit.

Construction: Black texture painted clamshell-type steel top and bottom, aluminum panel/chassis, subpanel and heatsink.

Board-mounted Components: 216 including four ICs, 19 transistors, 13 diodes.

Front Panel Controls: Frequency, RIT, volume, DC on-off.

Connectors: Front panel – 1/4 in. stereo phone jack; rear panel – SO-239 for antenna, RCA jacks for key, DC-input and accessory DC output.

Dimensions: HWD 2.75 in. × 6 in. × 6 in.

Weight: 2.25 lb. (1.02 kg).

TRANSMITTER

RF Output: Three Watts typical, no adjustment.

T/R Switching: Solid state, full break-in.

CW Offset and Sidetone: adjustable 400-1000 Hz sidetone automatically tracks offset frequency. sidetone has internal level adjustment.

RECEIVER

Type: Single conversion superhet, JFET mixer.

Sensitivity: 0.25 μV typical for 10 dB S/N.

Selectivity: Four-pole crystal ladder filter (1 KHz nominal bandwidth).

RIT (receive incremental tuning): ± 1.5 KHz.

AGC: audio derived.

IF Frequency: 14.31818 MHz.

Audio: 300 mW into 4 Ohms, built-in 3-in. speaker.

The kit comes well packed with parts sorted by type in small plastic bags. The circuit board is first rate and as good as any I've seen from other quality outfits; it is silk-screened, solder masked and has plated-through holes. *[Ten-Tec changed to the plated-through board some time after production began. The board supplied with early production kits was of poorer quality and caused complaints from many builders. –W1HUE]* All parts are also of excellent quality. The kit comes with case, speaker, knobs, potentiometers, and jacks. – everything (except solder) that you need to make a working transceiver. At only $95.00 plus $6.00 shipping in the US, the completeness of the kit makes this radio one of the best deals I've seen in the world of QRP merchandising.

The manual is spiral bound and contains 28 reference pages and 46 pages of assembly instructions. There are foldout pages showing the circuit board component side with X-ray view in red, mechanical assembly and circuit diagrams of some assembly phases. There is also an insert with full schematic and parts placement by assembly phases to reduce the amount of flipping back and forth in the manual during assembly. Overall, the manual is well written with only a few minor errors that appear to have crept in during revisions. For example, in one place the manual refers the builder to a page that does not contain the referenced information requiring a little search to access the data.

The kit contains over 300 parts so there is a fair amount of assembly to be done. The output transistor was the only part missing from my kit, but a call to Ten-Tec on Monday morning had the part to me in eastern Washington by Friday. Parts density on the circuit board is fairly high so the builder must exercise some care in soldering. The board is of such good quality that soldering is not too difficult, but I did get a few solder bridges that I luckily caught when I made them. My Weller WTCP soldering iron with a 700 degree PTA tip worked just fine. I did the assembly with Radio Shack 0.031 in. diameter rosin core solder. I took my time and assembled the kit over the course of a week. I'd call this about a five evening kit, but your results may vary.

The manual walks the builder through assembly in eight phases; keying circuit, VFO, transmit mixer and 10.1 MHz bandpass filter, receiver IF stages, receiver BFO and audio amplifier, receiver AGC and op-amp audio filter, transmit driver/amplifier/output filter, and final assembly and alignment. I found this a little different than my normal assembly style, but I didn't find any problem in building in stages. The advantage of Ten-Tec's building method is that progress tests are provided at the end of each major stage. If things go haywire, the amount of troubleshooting is limited to just the last stage built. In my case, every stage worked as advertised through complete assembly and the rig fired up perfectly when the last stage was finished.

This radio can be built with a minimum of test equipment. In fact, I think it could be built with only a VOM, a dummy load, and another transceiver with accurate frequency display. I did find a frequency counter to be very convenient in setting the RIT and VFO coverage, but the manual outlines alternate methods.

My 1330 covers 10.099 through 10.176 MHz, more than the 50 kHz specified. The receiver is very sensitive and the rig is stable; I've noted no drift and operators on the receiving end of the first QSOs with the rig have commented on the 1330's stability. The sidetone is clean and listening through another receiver and on-air reports verify that the transmitter does a good job. The rig includes RIT, but no adjustable audio filter. My rig puts out about 5 Watts at 13.8 volts DC, but that is not a precise measurement (taken from my QRO Wattmeter). Output power is not adjustable. My only real complaint is the choice of the RCA jacks for DC power. I see this arrangement as somewhat hazardous as opens the possibility of an accidental short. I prefer barrel connectors for this job and will do the mod later.

Am I happy? You bet! I've had may enjoyable contacts with this little rig and I had fun building it. I recommend this kit for anyone who can do a halfway decent job with a soldering iron.

[1] T-Kit, a division of TEN-TEC Inc., 1185 DollyParton Pkwy, Sevierville, TN 83862. Phone 423-453-7172.

Computer Control for Your Homebrew Rig

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Introduction

When I was first introduced to computer control and logging on my ICOM IC-725, I simply fell in love with the concept. The fact is, I have always found manual logging to be rather disruptive. This is especially the case since I am usually the DX working a pile-up. I ended up writing logging software for use with my IC-725 and it had quite a number of bells and whistles thrown in. For example, it sported a TNC window, automatic keyer, support for DX-spotting and retrieving, auto QSY, auto distance and heading computation, ASCII gray scale map; in fact, just about everything I could think of and wanted at my finger tips.

In a short time I grew quite dependent on that logger of mine. The best part is that I could keep adding as many features as I wanted and I could customize it anyway I liked. It was multitasking too so it let me do quite a number of things at the same time. All was fine until I had to give up the IC-725 and was left with my homebrew QRP rigs. The rigs worked fine actually, but the logging part did not. It was then that I started dreaming of actually having a homebrew rig that communicated with the computer the same way the IC-725 did.

Since I had written the logging software, I was by then quite familiar with the protocol used by ICOM, known as the C-IV protocol. At that time however, I was quite daunted by the prospect of building a circuit that could do the job and still fit into the ARK-20 which was already very crammed. In the months to come however, I embarked on a microcontroller keyer, a very small one, which I did manage to fit into the ARK-20.[1] This was great because it meant that the basic brains were in place. The keyer utilized an 87C51 MPU that included a TTL level serial port, just like the ICOM standard.

First Attempt

With the MPU hardware in place, I was left with no excuse not to try the project. I started coding in assembly language and it was not very long before I had some basic communication between the ARK and the computer going, indicating that the interface actually worked. I was still on the learning curve, however, and was discovering many things and making many mistakes along the way. I did iron out the major bugs eventually and even got the protocol going quite well.

The real trick was to get the MPU to read the thumbwheel setting of the ARK-20 without disrupting the performance. The fact that the ARK-20 was a synthesized rig made this very easy to do. However, it did mean that I had to use a 16-wire cable from the bottom board reading the BCD output of the thumbwheels back to the MPU board. I will tell you that it is not fun soldering so many wires in a cramped space. Fortunately however, I had given some thought to the layout when I designed the keyer so I avoided some potentially hairy problems with the mounting.

Unfortunately for me, things weren't that simple. Connecting the BCD output to the MPU input imposed a load on some of the pins and this messed up the functioning of the thumbwheel. I eventually traced down the problem and had to add some additional pull-down resistors to compensate for the effects of the loading by the MPU port.

The ARK 20 was completely dismantled and my room was in a mess. Reference books lay open everywhere and the soldering iron was on for hours. I did not get very much sleep at all! Eventually, I did get the software working the way I wanted it, and the hardware was beginning to look good. I had a hole drilled at the back of the ARK-20 to put a 3.5 mm mono socket there for the serial port. ICOM has the TX and RX pins tied together so we save a line there, requiring only two instead of three.

Putting it all together

Finally when I was satisfied with the whole thing, I decided to put everything back together. Boy, was the space tight, now with the MPU board, the screening, the 16-way cables, etc. After some juggling with the wires, I managed to get the case back together. I was especially careful to add decoupling capacitors where necessary so as to avoid QRM from the MPU which was running at 11.0592 MHz. Surprisingly, when all was done, the rig looked little different than when in its original configuration. The only addition was the 3.5mm socket at the back which sat unobtrusively below the antenna port.

Fortunately for me, most of the work in such a project is done in the microprocessor. This is especially so with the 87C51 which had enough ports for me to directly read the BCD output without having to resort to any additional multiplexing circuitry. The fact that the serial port is built in is also another boon. When you think of it, all the hardware that this additional feature entailed, were the 16-way ribbon cable, some resistors and the socket.

The Moment of Truth

Okay, so now I connected up the interface cable, fired up the logging software and then the rig. Nothing ... Nada ... no indication of a C-IV compatible rig on-line. Huh ... I must have forgotten something! After some checking I realized that I had not changed my logging software to recognize the new protocol identification number I had assigned to the ARK. A short recompile and this was soon fixed.

Upon firing up the software now, it automatically detects the ARK-20. When I turn off the ARK, the software detects that too. The thumbwheel checks out correctly and it looks like the project is a success. Wow! I actually have a homebrew rig with C-IV support. I'm not sure, but I may have become the first one to do this!

Conclusion

So, now I am back into my lazy operating mode — I turn on the radio and work stations, type in the callsign and RST. Then move along, happily, just the way it's supposed to be!

I should say that projects similar to this can be kept reasonably simple if *a lot* of thought is given to how you want to do it before hitting the soldering iron. MPU software proficiency is of course a necessity for such projects but it can be learned quickly for people with programming background. One also has to decide on the protocol to use; whether to use a custom protocol, which might simplify coding and interfacing at the expense of compatibility, or to use a commercial standard but working at correct implementation of the protocol. For such as this, the proper reference material for the selected protocol is usually a must.

For all the trouble it took, I must say I like the results very much. Yep, that I do! I'll be glad to furnish more information to anyone who wants it. The 87C51 source code is easily modified for other machines and the C source code for my logger is also available (it also supports a number of other ICOM radios).

[1] The keyer is described beginning on page 14 of the December 1996 Journal of the NorCal QRP Club, ***QRPp***.

Comments on the NN1G 40-40 QRP Transceiver

Edward B. Beach, K4MKX **5112 Williamsburg Blvd.** **Arlington VA, 22207**

As soon as I read the excellent article by Dave Benson, NN1G, in the November 1994 issue of ***QST***[1] describing his "40-40" QRP transceiver, I ordered the kit of parts for the 40 meter version. For a long time I have wanted to experiment with the Cohn crystal lattice filter, but lacked the equipment and desire to hand select crystals for a five- or six-pole filter. Here was a chance to build a known working version, although I had my doubts about the effectiveness of a two-pole filter.

The parts and manual arrived in a 9×12 envelope, and were given a thorough going over at once. Nothing was missing, and assembly went very smoothly. Excellent written instructions mirror those in the original ***QST*** article.

Since I do not yet have my Extra ticket, I decided to set the lowest frequency to 7.025 MHz. On startup, the lowest frequency was 6.9 MHz, so one turn was removed from the VCO coil, L1. This raised the lowest frequency to about 7.065 MHz, so I started squeezing turns on L1 until I could get it back down to 7.025 MHz. Despite all my efforts, the lowest I could get was 7.026 MHz. A variable inductor might help here, but this is close enough for amateur work. With the lowest frequency set, I found the tuning range to be from 7.026 MHz to about 7.060 MHz. I would like a bit more range, but this is fine for now.

Trying out the receiver showed good single signal reception, adequate sensitivity, and an extremely nonlinear tuning rate. Not much happens between 7.026 and 7.030 MHz, then everything is squeezed between 7.030 and 7.060. Needless to say, tuning in a CW signal is just a bit touchy with the 270 degree tuning pot. After a few minutes experimenting with a spreadsheet program to calculate the effects of various combinations of parallel resistors, I came up with the modification shown in Figure 1. The 1K resistor is a fine-tune control that is most effective toward the low and mid settings of the tuning, while the 10K resistor produces a much more linear tuning rate. Of course a multi-turn control is the ideal solution, but this simple modification will suffice for now.

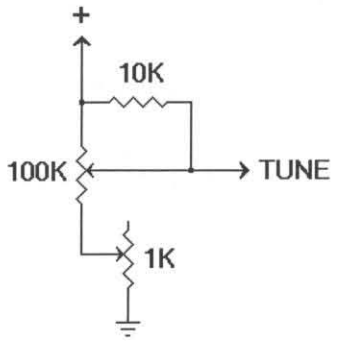


Figure 1. Modified frequency control.

The next thing I needed to address was the extremely high noise level present in the receiver. As designed, the two audio amplifiers run wide open, so I thought the noise must be coming from the product detector, U3. However, removing U3 from its socket had no effect on the noise level. Well, U4A must be the culprit then. Unfortunately, grounding pin 1 of U4A with a 10µF electrolytic did not reduce the noise either. This indicated that the noise was mostly in the final audio (filter) stage!

Thinking maybe I had a bad IC, I substituted a 1458 (I had no spare NE5532). I still had a very high noise level, high enough to drive me up the wall if I tried to use the receiver! I then took the bull by the horns and experimented with some shunt capacitors to ground at the junction of the 22K and 510K resistors. The final configuration which suits me fine is a 0.01µF capacitor and 15K series combination. Perhaps not all amplifiers exhibit this noisy characteristic, but this brute-force low-pass filter works for mine.

Before I buttoned the rig up in its shielded enclosure, I did quite a bit of listening to see just how well the receiver performed. What I discovered was that with strong signals, the RF gain (attenuator) control still allowed signals to get through. There was perhaps five inches of wire going to and from the gain control in my setup. I changed the wire connections to miniature coaxial cable. Even with this change, and after re-peaking C1, strong (not necessarily close by) signals still came through the receiver! Stations a few miles away really blew my ears off, so I decided to see if perhaps there might be a better way to control the input signal level.

I decided that injecting or withdrawing some bias from the first mixer stage might do the trick, so I tried the change shown in Figure 2. This works quite well, and requires only a 1K resistor and a 0.01µF capacitor. I did change the gain control from 5K to 100K as this gives a bit more range. You can now use a direct coaxial cable connection from the transmitter to the receiver input. Don't forget to peak C1 after making this change.

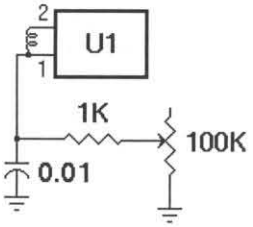


Figure 2. RF gain control.

If you want even more gain control, you can make the connections shown in Figure 3. At low settings of the control, the gain of the product detector is also reduced which helps on very strong signals. The electrolytic capacitor is needed to keep potentiometer noise (audio) from going through to the audio amplifier stage.

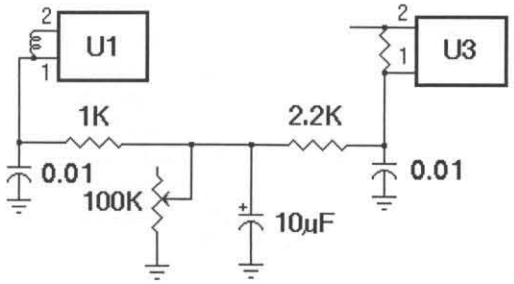


Figure 3. Improved RF gain control.

The last thing tackled was frequency spotting and the transmit sidetone. I thought it would be nice to touch a button to turn on just U5 so I could hear the transmit frequency without going on the air. This way I could tune to the exact frequency of the station being received. This worked quite nicely (you'll see the change in a minute) but there was a slight problem. On transmit, the receiver stays wide open, and the audio switch (Q1) turns off. Unfortunately, the large RF signal blasts through U1, the filter, and U3 producing lots of audio. This happens even with just U5 switched on for spotting, and gives a really bad signal when the full transmitter is on, even with Q1 doing its job. I reasoned that if the receive mixer, U1, was turned off during transmit (and spotting), only U3 would be subject to the strong RF from the transmitter. Just so, this is the case and works quite well. Figure 4 shows the changes made here. When the NPN transistor (2N3904 or equivalent) conducts, it grounds the unused output of U1 which upsets the balanced mixer and cuts it off entirely. Unfortunately, with the reduced product detector output we need to "leak" a bit more signal

[1] Dave Benson, NN1G, "A Single-Board Superhet QRP Transceiver for 40 or 30 Meters," ***QST***, November 1994, p. 37. A reprint of the article can be found in the ARRL publication ***QRP Power*** (page 3-1).

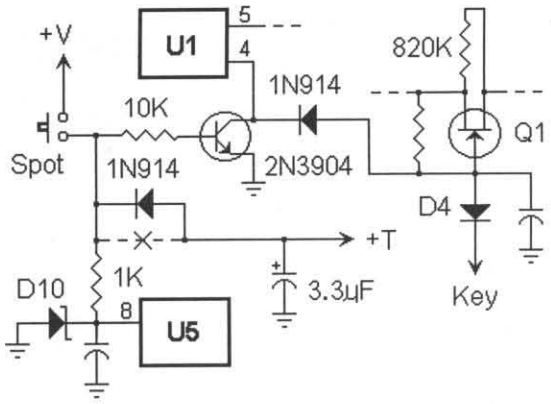


Figure 4. Modifications to add spotting switch.

around Q1. I found that shunting the (original) 4.7M resistor with 1M (resulting in 820K) worked for me, but you may want to experiment a bit. It is very easy to insert the blocking diode on the production circuit board if you followed the recommended parts installation. The 1K resistor going to the Zener diode at U5 is mounted vertically. Unsolder the long resistor lead and install the diode in the vacated resistor hole (anode toward board). Connect the diode and resistor leads together to go to the push-button switch and 10K resistor.

The very last modification made to the transceiver was to install a 1A rectifier diode in series with the positive power supply lead. Dave cautions more than once about not reversing the power supply, so this extra part eliminates the possibility entirely and has no effect on performance. *[To reduce the voltage drop, a Shottky diode can be used –W1HUE].* I installed the diode vertically on the circuit board at the main power input lead.

For an enclosure for the transceiver, I used a PC board front panel and a vegetable can shield. The panel is about 3 - 1/8 in. square, the can is 3 in. in diameter and just long enough to accommodate the circuit board. I made six small "L" brackets out of strips of tin can. Be sure to drill the mounting holes before cutting the strips from the can. All controls fit quite nicely in the enclosure as I used a PC-mount trimmer for the fine tune control.

[If you own or are thinking about building a 40-40, be sure and read the excellent article on 40-40 modifications starting on page 3-6 of the ARRL publication **QRP Power** *–W1HUE]*

Comments from Dave Benson, NN1G

Ted's fix for the tuning rate involving a parallel fixed resistor is a good one. It's worth noting that pot characteristics can differ significantly. The pots available from that well known corner electronics store have a significant "over-travel", or dead spot, at the counterclockwise end of their range, and the resistor fix won't help in this case.

I'm not sure I concur with Ted's assessment of an extremely high noise level – many builders have remarked on just the opposite! Each of the two audio stages run at approximately 30 dB gain, as opposed to "wide open". The suggested fix looks like it adds some additional high-frequency rolloff to the audio final stage, but it undoubtedly affects the receiver's AF passband response. Another way to achieve noise reduction is to add a 10µF electrolytic cap between the 10 Ohm AF output resistor and ground to form a low-pass filter.

From the Membership Chairperson

Dave Johnson, WA4NID

***** IMPORTANT *** ALL members please read! *****

1. Funds for subscribing or renewing should ONLY be sent to the Treasurer, Ken Evans (address on the page with application, or back cover). Any other matters pertaining to your membership (address changes, inquiries, etc.) should be sent to me (info on back cover).

2. New or renewal applications must be RECEIVED at least by the first of the month PRIOR to the next issue month to insure receipt. Because forms with the data are forwarded by Ken to me, you should NOT WAIT to renew! For example, if you want to receive the July issue, and your subscription ended after the April issue, please don't wait until the middle of June to send the funds. Please RENEW EARLY and make sure I have your correct address on record! At this time, renewals are accepted for one and two year terms.

3. If you don't have one of the sharp-looking QRP ARCI Membership Certificates, you may obtain one by sending $2 and your request to the Treasurer. New members now receive a certificate at no extra charge, as announced last fall.

4. The early batches of QRP ARCI Membership Certificates I sent out last summer lacked the gold seal embossed with the club logo. This is a standard part of certificates shipping now, but if yours is missing the seal and you want one, just send an SASE to me with a request.

5. A Family Membership category is now established for those living at the same address as a regular member, and not wishing to receive their own copy of the QRP Quarterly. There is a $2 initial fee for this type of membership (send to the Treasurer). Members of this category receive a Memebrship Certificate and a Member Number. This will allow young QRPers to get involved in club activities as a regular member, without the added expense of a subscription.

6. The membership database now accomodates the ZIP-PLUS-FOUR for USA addresses, so please supply this info. Also I am entering other data for tracking old calls, packet radio and email addresses, and home and work telephone numbers (the latter NOT for general distribution, but to help in contacting you if needed).

7. We are tracking QRP Quarterly subscription extensions for the Cover Photo winners, extensions for advertisers (contact Byron Johnson for info on that program), and exchange subscriptions for other groups we are exchanging publications with. The latter allows us to share with other QRP organizations (contact Bob Gobrick or myself for more info). If you notice any problems or mistakes in these categories, or have any questions, please let me know.

8. I have been fixing problems discovered with a few people's membership records. I work to provide quality service for all members, but sometimes there are problems caused by the post office, mistakes made in data entry, or properties of the database I inherited. I ask all members to PLEASE INFORM ME of any problems with your membership or subscription so that I can work to fix them. Please also be tolerant and understand that problems can be caused by many factors, and know that I (and all on the Board) want to provide good service to YOU.

9. I try to keep the QRP ARCI World Wide Web site current, but don't have the time to do a lot of preparation of materials myself. Instead, I depend on others to submit material. If you have news or info to share, please send it to me. I am interested especially in tracking news of upcoming contests which may be of interest to QRPers, and have included such info sent from several people already. Please contribute to the material on the web site, to help all of our members and all QRPers. And check out the site from time to time for updates. The address is http://rtpnet.org/~qrp/

10. Last but not least, **HAVE FUN!** Dave, WA4NID

Development of a Portable Antenna System

Pete Hoover, W6ZH 1520 Circle Drive San Marino, CA 91108 e-mail: w6zh@ix.netcom.com

In 1988 I took a six week trip through Australia and New Zealand taking a 20 meter CW QRP rig (see page 82, March 1988 **73**). During that trip I used a wire dipole fed with RG-58U as the antenna "system". While the dipole worked well and was light and compact for packing, it did have drawbacks; it could be time-consuming to put up, it needed lots of supplies (kite string, old tennis balls for "throwing" weights, etc.), at least one support, and a 50 foot length of feed-line was frequently required. Putting up the dipole frequently drew a crowd with comments like "why are you throwing that ball up in a tree?", or "H'mmm, think that Yank has gone daft!" Or more seriously: "Just what do you think you are doing?", etc. As a result, the dipole wasn't what you might call a "stealth" antenna!

On the flight home I thought about replacement antennas. It was obvious that most of the dipole's shortcomings could be overcome by some form of a whip, providing it was long enough to be effective, could be made compact for packing, and had some quick and easy method of mounting. After some paper design work and a raid on the junk box, by early 1989 the "antenna system" described here was developed.

Some preliminary words of caution: This specific system is based on the use of an AN-191 packset antenna I found in my junk box. This antenna has a become scarce item, but can occasionally be found at swap-meets. Incidentally, you may find a packset antenna with interior connecting cable so badly frayed that it won't fit together – buy it! You will be replacing the cable anyway.

When extended, the AN-191 packset antenna is 12 feet long, and collapsed it is an 18 in. bundle of eight tapered steel tubing segments weighing 11 oz. The antenna segments are fitted one into the next very much like a fishing rod. A thin flexible steel cable goes through the center of the segments from the tip to the base segment where a compression spring puts the cable in tension and keeps the segments rigidly connected. The base section is terminated in a standard 3/8×24 threaded stud that fits into the usual mobile antenna mount.

In its standard form the antenna resonates at about 20 MHz. To make it resonate at 14 MHz requires some form of inductive loading that does not compromise the whip's collapsibility – in other words, a loading coil that can be easily removed. I decided not to use a base loading coil for several reasons: Previous experience with mobile antennas showed that center loading resulted in a higher feed impedance and radiated a better signal, all things being equal; and, home construction of a base coil that would support the rest of the antenna could be a real challenge. So, a loading coil would have to be developed that would fit between a couple of the antenna segments.

The first step in adapting the antenna to its new job was to replace the steel cable with a suitable length of 75 lb. test braided Dacron kite line. It requires ingenuity to thread the Dacron through the tubing – hint: Start from the bottom! The non-conducting Dacron line is needed so that the loading coil can be inserted between sections and not be shorted out by the steel cable.

Calculations showed that the amount of inductance needed to resonate the antenna at 14.050 MHz would not be large and that the feed impedance of the loaded antenna would have an SWR of about 2:1 when fed with 50 ohm coax. It turned out that the antenna could, indeed, be fed directly with 50 ohm coax on 20 meters with an acceptable SWR, but the use of the antenna on any other band requires the use of an antenna tuning unit.

The loading coil "holder" was fabricated from a 2 in. length of 3/4 in. diameter styrene rod that was drilled to hold connecting ferrules and slit to pass the inner cable. The ferrules were originally made of aluminum because of ease of construction but corrosion between the brass fastening screws and the aluminum eventually caused an intermittent connection. After a year or so the aluminum units were replaced by brass ferrules, courtesy of Brad, KB6H. The diameter of the ferrules was matched to the end of segment four and the start of segment five of the antenna - the location of the loading coil in the finished antenna.

An Amidon T-86-6 toroid was used because it was on hand; there might be a more technically suitable component, but it has served well. I started with about 24 turns of #22 wire on the toroid, and removed turns until the assembled antenna (complete with counterpoise – see below) resonated at about 14.050 MHz. The resulting toroid, protected from the weather with a coating of styrene coil dope, is fastened to the support plastic rod with a brass 6-32 screw through a piece of cork, and threaded into the plastic. The brass screws that are used to hold the brass end-pieces in place continue through the plastic and are the terminals for the toroid winding – see Photo 1.

When finished, the antenna's original olive drab exterior was

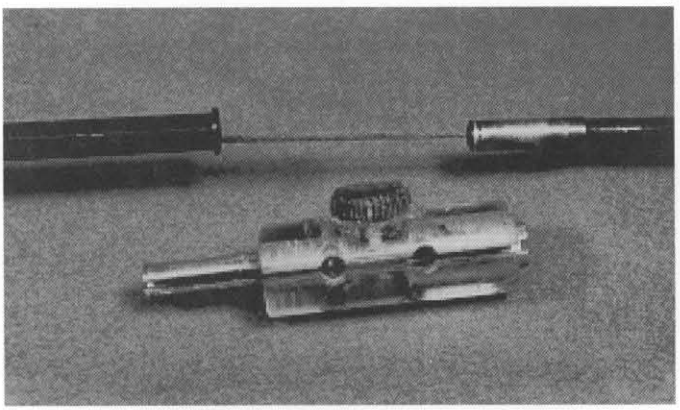


Photo 1. Loading coil fixture.

covered by a coat of flat black paint, making the installed antenna almost impossible to see during the day time and it is really a "stealth" antenna at night. Now, for the mounting bits and pieces.

As previously mentioned, the base section of the antenna is terminated in a 3/8×24 threaded stud that will fit into the usual mobile antenna mount. As part of the all-purpose mount, I built a fixture using a Radio Shack "Feedthrough/Adapter" (RS #21-961) that has a female 3/8×24 on one end and a PL-259 female coax connector on the other end, with a 5/8 in. diameter threaded section in the middle. I used a piece of 1×1×1 in. (3/16 in. thick) aluminum angle, drilled with a 5/8 in. hole to take the "Adapter" on one leg of the angle and a 1/4 in. hole drilled in the center of the other leg of the angle. I made two more pieces of angle just like the first, only with a 1/4 in. hole in each leg instead of one larger/one smaller.

I drilled a 1/4 in. hole 1/2 in. from one end of a 8 × 1 1/2 × 3/8 in. aluminum bar found in the junk box. Using 1/4 in. NF 1 in. bolts, washers, and nuts, the three pieces of aluminum angle were connected together, and the end piece was attached to the flat bar - see Photos 2 and 3. In its assembled form, the system provides for three-axis positioning of the antenna for best performance regardless of the orientation of the surface to which the flat bar is clamped.

If there is a "secret weapon" in this antenna system, it is the vise-grip type clamp that is adjustable over an eight inch range. I bought that from Leichtung Workshops (telephone 1-800-654-7817). In their catalog it is called a "Locking 'L' Clamp" (#74716). I drilled out the rivets holding the long bar to the top "vise-grip" jaw and made a two-

prong replacement so that the unit could be disassembled and packed – see Photo 2. The "prong" is tied to the "vise-grip" part with a length of heavy Dacron cord to prevent loss. When assembled, this clamp will work on window frames, auto bumpers, fence posts – anything that the clamp system can get around. Photo 3 shows the antenna and clamp system fastened to an overhead beam without an attached feed line. Care should be taken when using this vise-grip system as it can exert a very substantial amount of force, and could make a very unseemly dent in almost any mounting surface.

Photo 2. The Portable Antenna System.

The system also includes a pair of sixteen foot pieces of #14 insulated stranded wire for use as a counterpoise (shown coiled up in Photo 2). One end of each wire is terminated in an alligator clip which "bites" onto the angle bracket holding the antenna. These wires can be arranged in practically any configuration that is out of the way of the operator. I try to spread them out on both sides of the antenna base – along a balcony railing or along the baseboard of the room if there is no balcony. It seems that in all cases, two counterpoise wires are needed to get a suitably low SWR. Not shown in the photos is a recent addition: A short segment of coax threaded through suitable toroids to form a current choke. The choke is inserted between the feed-line and the base of the antenna. This removes any trace of RF on the outside of the coax and is really necessary if the antenna is being used with an antenna tuner on frequencies other than 20 meters.

Also not shown is another piece of 75 lb. Dacron line about ten feet long used as a safety device: One end is tied securely around the antenna itself just above the large base fitting. The other end is tied to some strong structure inside the room; a radiator or table leg for example. Its purpose is to keep the antenna from falling should some part of the mounting system fail; I added this when I had visions of the thing dropping ten floors and spearing the Prime Minister of Enigma just as he stepped out of his stretched Yugo limo! Another important item is shown in Photo 2; a four foot length of the ubiquitous Dacron cord fastened around the shaft of each of the two 1/2 in. open end/box wrenches used to tighten the nuts 'n bolts of the mounting system. There is a loop tied in the middle of this cord that goes over my left hand so that when I'm reaching out of a window to adjust the "system" and one of the wrenches slips out of my grasp it, too, doesn't fall and create problems.

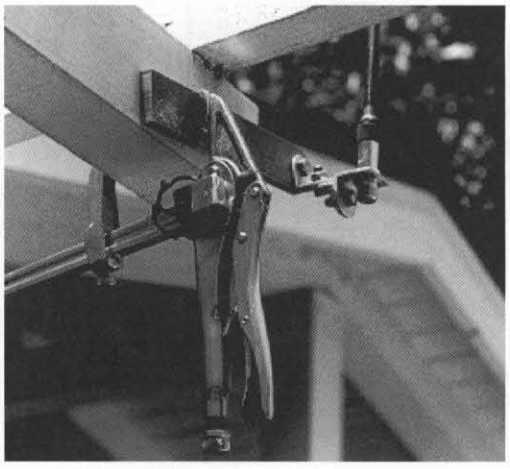


Photo 3. The clamping system in action.

In addition to the vise-grip unit, I also carry along two 3-in."C" clamps. Sometimes, these are all that are needed. "C" clamps are easier and quicker to use if the support and the "system" bar can be fitted between the jaws of the clamp. However, the "C" clamps cannot exert the same degree of clamping effort as the vise-grips. But, if you can't find the vise-grip unit, go with the "C" clamps, but don't forget the safety line!

In use I find that I can set up the complete radio installation in about 15 minutes. First step is to set up the antenna. I find that it takes me about five minutes if I can use "C" clamps but the vise-grip approach may double this, depending upon the difficulty of the situation. If the vise-grip clamp is going to be used, it and the flat bar are adjusted and installed first. Then the three angle pieces on the bar are adjusted and tightened. Then the whip is set up in the room, the loading coil is inserted and one end of the safety line is attached to the whip the other end to whatever is chosen as an anchor. Only then is the antenna extended out the window (or whatever) and screwed into the base fitting. Granted this is a bit awkward but the whip is light enough so that it is much easier to accomplish than it might sound. The counterpoise wires are added, followed by the current choke and the feedline. I found that a 15 ft. length of RG-8X works well. In most cases sticking the whip horizontally out the window works well, but experimentation in the name of the game.

This antenna system was christened in late 1989 on a two month trip through Sweden, Finland, Norway, Svalbard, and Iceland. I operated from ten different locations in six different DXCC countries and the antenna system worked like a champ. Granted, an exotic call like OH0//W6ZH or JW/W6ZH adds (at least) 17.23 dB to the signal and 20 meter propagation at the time was good, but using this simple 12 foot center loaded whip and QRP-level power I had over 450 CW QSO's. Since that journey, the antenna system has been used many times in locations both on land and aboard ship, and most recently on a three week trip to Hawaii, Guam, Saipan, and American Samoa. Never once in all that time have I ever found a situation where I couldn't set up the antenna system when I wanted to. In short, the system works as desired.

Now, what if you can't find an AN-191 packset antenna? There are several approaches that could be followed in developing a probable antenna system:

1. The PRC-74 antenna could be used: this is an interesting item that must be the more modern version of the AN-191 unit. It is seven segment whip used with some portable military radio. In its collapsed form it is 18 in. long; when extended it is 9 ft. 4 in, and weighs about 16 oz. Eighteen inches from the base is a multi-tapped coil that supposedly resonates the antenna from 3.5 to 18 MHz. The one unit I have was manufactured by Hughes Aircraft and carries the part number P/N 1550159-100 US. *No, I don't want to sell mine and no, I don't know where you can get one*! Oops — I didn't mean to shout! Look in the **Fair Sales** or **Nebraska Surplus Sales** catalogs.
2. **Force 12** advertises a full-length 20 meter vertical that collapses to 24 inches. I have not seen this unit, but a call to them should get the information. (for brochure, call 1-408-720-9073);
3. At one time, **B & W** sold a "window" antenna: This was a six foot collapsible antenna with a changeable base loading coil that resonates the antenna from 160 to 6 meters, or so it was claimed. The windowsill clamping system used some form of a

"C" clamp, as I remember. This antenna may still be available but I haven't seen an advertisement for it in some time.

4. There is a good possibility that collapsible tent poles, using shock cord could be pressed into service. I have not looked into this, but there was a 'thread' about it recently on the Internet QRP-L Reflector.
5. There has been considerable discussion in recent QRP magazines and on the QRP-L Internet Reflector about the St. Louis Vertical and its modifications . The QRP-L archives might be checked for information.
6. Also consider making a helically-wound antenna, using a fiberglass fishing rod as a mandrel. The winding wire would have to be securely soldered to each ferrule. This approach might yield an interesting approach to an all-band antenna with different plug-in sections for different bands
7. Finally, there is a possibility that a unit could be built using various sizes of aluminum tubing and/or carbon-fiber or fiberglass tubing. For a source of the latter try a good kite store, for example: **Into the Wind** in Boulder, Colorado. A phone-call (1-800-541-0314) requesting their latest catalog would be a starting point.

Other considerations: The mounting system as described will take conventional mobile antennas. However, it might be necessary to beef-up the design to handle the additional weight. The "Outbacker" series of all-band mobile antennas are definitely worth considering. However, most mobile antennas I've seen do not collapse to much less than four feet.

That's it; maybe this will give you some ideas for portable antenna that you can use with your QRP rig on a trip – if only to the nearest city park. Oh, and I still carry the wire dipole with me – just in case!

SPICE for QRPers
Part 1

Chuck Adams, K5FO

Somewhere else in this issue of the Quarterly, Ron will have most likely have an announcement of the Dayton Building Contest sponsored by the NorCal QRP Club. This contest announced on the QRP-L mailing list by Wayne Burdick, N6KR, has spawned a flurry of building and schematic investigation for circuits that do not use integrated circuits. This article and any followups that people are interested in is in response to the use of software to aid in selection of circuits and checking designs.

First let me emphasize that software circuit simulation does not in any way replace original design work. It is a tool whose main purpose is to verify design work and possibly avoid problems before the individual sits down to build the circuit. It can be used to check component values and simulate the circuit before actually building it. I will in a step by step method illustrate both the software command language, some circuits, and what the program yields for these circuits. For more detail one has to go to the literature and read the entire book by several authors and experiment with the program. I'll list sources as I go along.

SPICE is one of those fancy acronyms that stands for Simulation Program with Integrated Circuit Emphasis and was developed in the University environment at the University of California at Berkeley. It is a public domain program since it was developed with taxpayer monies and it is available from several locations on the Internet. It is also available for moderate costs from several commercial sources with enhancements and support software to do graphics and it does run on a PC computer. But it is a large program and requires a 386 or higher with a math coprocessor and relatively large memory but fortunately most PC owners fall within this catagory at this time.

SPICE can be used to study component variations and the effects on a circuit. It can also be used to study thermal effects, noise levels, distortion, and both DC and AC characteristics of circuits. It is probably the most used program in the design of ICs, both analog and digital, in the world today. It is cheaper and much faster to develop circuits in software than to build them for very large scale integrated circuits.

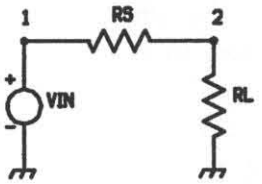
SPICE takes its data in as plain text ASCII files called a netlist. This data is used to specify devices both passive and active, voltage sources, current sources as well as some commands to SPICE itself to determine the type of analysis and the output. We'll introduce all these as we go along.

I will assume that you have some knowledge of Ohm's Law, and some basic electronics otherwise you need to grab the ARRL Handbook and start reading and use SPICE to test stuff as we go along. I'll use some basic examples for starters and expand rather rapidly. We don't have too much time or space as it is.

Let me start with just the basics for resistors, inductors, capacitors, and voltage sources. First draw up the circuit you want to analyze. Assign numbers to all the connecting points and most importantly assign

the number 0 to ground. This is a requirement for SPICE and will get you into a lot of trouble if you don't. Also we'll see later that all points need a DC point to ground for proper analysis and we can do this with very very large resistor values. These numbered points we will call *nodes* and we will create the input file to SPICE called the *netlist* from this schematic along with some command lines. Every netlist must have a title as the first line of the file.

So let me start with the following circuit with just a DC voltage source VIN and two resistors RS and RL each with a value of 50 ohms.



Let's see if SPICE understands and we understand Ohm's Law. Here is the input file to SPICE for a 12V source and the two resistors of 50 ohms each. The `.END` line is used to terminate input to the program and start it processing the data if we do not have any errors.

```
*CIRCUIT NUMBER 1 BY K5FO
*
VIN 1 0 12.00VOLTS
RS  1 2 500HMS
RL  2 0 500HMS
.END
```

The format for DC voltage sources is a name beginning with a V followed by the positive node number to which the positive terminal of the voltage source is connected, the negative node number for the negative terminal, and then the value of the voltage. You can enter the data without the VOLTS but do not leave a space between the zero and the V if you show volts. Resistors names begin with an R, the two node points, and a value and the word ohms optionally following the value with no spaces. There are some scaling factors, F for femto, P for pico, U for micro, M for milli, K for kilo, MEG for mega, G for giga, and T for tera. Thus you could have 12.00UVOLTS for 12 microvolts, 12.00MVOLTS for 12 millivolts, or even 12.00MEGAVOLTS and run the same ciruit, which I recommend. Don't ask me how you handle the last case.

Now if you put the above example in a file, say `circuit1.cir` and use this file as input to SPICE, you will get output showing that the voltage at node 1 is 12V, voltage at node 2 is 6V, the current is 120mA, and that the total power for the circuit is 1.44W. Not bad. Now if you want to see what happens for other voltages you can change the value(s) and rerun for each case. This would get tiresome and prone to errors. Fortunately SPICE comes to our aid with what is called a DC sweep command. There are actually four DC sweep function types.

The format for the input line for a DC linear sweep is

```
.DC <v-src> <strt> <fin> <incr>
```

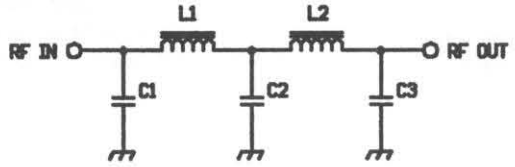
where v-src is the DC source voltage to vary, strt the starting voltage value, fin the final voltage, and incr the amount to increment by for each calculation and for the circuit we have been studying so far we would use the file

```
*CIRCUIT NUMBER 2 BY K5FO
VIN 1 0 12.00VOLTS DC 1
RS  1 2 500HMS
RL  2 0 500HMS
.DC VIN 0.25V 12.00V 0.25V
.PRINT DC V(1) V(2)
.PLOT DC V(1) V(2)
.END
```

to do a series of calculations. I have added a `.PRINT` statement to print the results and

a .PLOT to create a graphical output just to show the linear behaviour of a resistor.

Of course SPICE is very good at doing AC voltages and currents also. As an example let us look at the 5-element Chebyshev Low-pass Filter often used between the PA of the transmitter and the antenna. The function of this filter is to pass sinusoidal frequencies up to a cutoff point and then provide appreciable attenuation for harmonics of higher frequencies. Here is the schematic for this filter.



This filter is typically designed for 50 ohm impedance for both the input and output. So in order to correctly model this we need an AC voltage with an impendance of 50 ohms and a load of 50 ohms on the output. The circuit, in netlist form for doing this simulation, is as follows with values taken from the ARRL Handbook for a frequency cutoff of 7.33MHz. I'll just show the file that you need to analyze this filter.

```
AC ANALYSIS OF CHEBY FILTER
*
*   FIVE ELEMENT CHEBY FILTER
*

VIN 9    0    AC 1
R9  9    1    50
C1  1    0    390PF
L1  1    2    1.48UH
C2  2    0    750PF
L2  2    3    1.48UH
C3  3    0    390PF
R1  3    0    50
.PRINT AC VDB(1) VDB(3)
.AC LIN 51 1MEG 21MEG
.END
```

If you run this through SPICE you will probably be extremely shocked to see that below 7.5MHz the attenuation is -6.0dB. Well, the maximum transfer occurs when the input impedance and the output impedance matches and the efficiency is only 50 per cent.

Now having the format and the above data to study Chebyshev filters you need to take out schematics of every rig you have and run them through this program to study their characteristics. Also take your ARRL Handbook and run through some of the 5-element Chebyshev filter values and double check to see that you understand how they function and what their characteristics are. I have done this for a lot of the filters in the magazines and in rigs that I have built. You will be surprised to find some errors in the books or misprints. It may help you someday to have a great rig instead of winding up with an average rig.

As for books to consider learning more about SPICE and what it can be used for I recommend the book by L.H. Fenical called "PSpice A Tutorial". It has some excellent examples and a number of circuits that you can model and build to test your results.

I know that I am going to get some snail mail from those that do not have access to the Internet and can not ftp software from various sites. So, if you would like a copy of a SPICE program that will run on a 386 or higher, then send me a brand new 3.5 inch floppy HD disk (I will not accept a recycled disk due to wear and tear already that I will have on the disk drive and to prevent virus attacks of any type) and a disk mailer already stamped and labeled. All this to save me time and energy, please.

You may find some variations between versions of SPICE but in general they are fairly compatable and the data files should be fairly portable. Thanks and enjoy.

Amateur Radio in the 1930's

(I Was QRP and Didn't Know It!)

Brice Anderson, W9PNE **PO Box 14** **Lancaster, IL 62855**

Brice's remembrances of his early experiences in Amateur Radio should trigger a few fond memories in the rest of you old timers out there. As for you "youngsters" who complain about having to wind toroids, how would you like to have to wind your own power transformers? Although most of the events described go back considerably before the existence of the ARCI, I thought that this would be a fitting article for The QRP Quarterly's 35th anniversary issue. I hope you enjoy it as much as I did. -- W1HUE.

I am one of the few remaining old-time hams who got started in the 1930's or earlier. Al of us had unique experiences back then. I thought I should record some while I can still remember them; I hope your find them interesting.

My father, W9KX, was on of the earliest licensed hams. He had operated a spark transmitter on 200 meters before amateurs were even licensed. When I was a child, by bedroom was adjacent to his radio room. I was often lulled to sleep by the music of code. It was only natural that I became interested in ham radio while quite young. When I was 12 years old, I took the lengthy written test and the ten words per minute code test. My license arrived right after my thirteenth birthday.

In those days, hams had to build all of their equipment. Those were the depression years, so everybody had to scrounge for parts and tubes. The usual receiver was a regenerative detector with one or two stages of audio. The 01-A tube was standard, and my dad's rig used two 01-A's in parallel. I got old tubes from radio service shops, wire from old transformers, variable condensers from old radios, etc. I wound my power transformer and filter chokes, and even made some mica condensers (we call them capacitors now). I built my two 201-A tube regenerative detector with one audio stage receiver before I got my license. At first, I used by dad's rig but soon built my own. My first QSO with it was with a VE3. I later built a 160 meter oscillator using either a 112-A or a 371-A tube, which ran three Watts input.

There were twenty or more hams in my small home town and we had an active radio club. The most common subjects of discussion were how to achieve smooth control of regeneration and get a stable signal without too much AC modulation. My father solved the AC note problem by building a 600 Volt storage battery. I helped him gather 300 uniform size pickle jars from junk piles. He poured molten lead into sand molds to make the plates, mounting two plates in each glass jar. Then he mixed the sulfuric acid electrolyte and filled the jars, forming the storage cells, which he connected together to complete the battery. A series-parallel arrangement was used for charging the battery. W9KX was known for his distinctive, pure DC signal.

I wanted to operate on 20 and 40 meters. The Hartley oscillator did not work well on 20, so I used my dad's pet circuit, a split-Hartley. I used a husky 45 tube; with 250 Volts on the plate and 30 mA plate current, I got about 3 Watts out of my oscillator-transmitter and filled many log books with QSO's. On 10 meters I could work the world and often was the DX station's first W9. The rig was stable and had a "beautiful" T7 note without chirp. (A T7 note was not only legal but considered good in those days.) The AC ripple was due to having only two 1 TF paper capacitors in the power supply filter.

When I first got on 10 meters, I found the signal unstable and rough. I saw that the RF had blistered the bakelite tub base between the plate pin and the other pins. Removing the tube from its base, I sawed deep notches between the pins which solved the problem. Later, the same thing happened with the bakelite tube socket, so I replaced it with a low-loss ceramic socket.

In my senior year in high school, I built a rig described in QST using a 59 tube electron-coupled oscillator, a 46 tube buffer/doubler and two 45 tubes in parallel in the final. I built the rig in a small chest to take to college. I made a powerful power supply and could load the two 45's to 85 Watts input. I could lift out the receiver and get on the air in about one minute. The station was secure with the lid locked.

During my college days, I kept weekly schedules with my dad on 80 meter CW. We always had lots to talk about and we sent as fast as we could, up to 35 WPM. The local hams in each town used our transmissions for code practice. We got tired of the eaves dropping, so my dad suggested that we use the American Morse code, the railroad code. My dad had been a railroad telegrapher in the early 1900's. I had to learn American Morse, but soon we were up to speed. This stopped the "reading of the mail" until someone found another old railroad telegrapher who could copy us. When we found out about it, we alternated words in American Morse with words in International Morse. This was gibberish to all the listeners and they soon gave up!

I always loved CW but developed a "glass arm" from fast sending with a straight key. My dad came to the rescue with a "side-swiper" that he made from a hacksaw blade, some relay contacts and a "sad-iron" for a base. I was able to send even faster with this and used if from about 1934 to about 1950. I then went to a Vibroplex bug for about ten years and finally to a keyer, which I still use.

There were enough experiences over the years to fill a book, but that is not my purpose here. I have been asked if I would like to go back to the 30's again. Frankly, yes! However, I would hate to give up the stability, convenience and selectivity of the modern transceiver. But operating was pure fun in those days. Everybody was a gentleman, the bands were uncrowded, and there were no pile-ups on DX.

After returning home from the Army Air Corps following WW2, I built a 600 Watt input rig based on a 4-250A tube KW amplifier described in QST. I eventually tired of high power. There was no challenge since you could work anyone you called. In 1970 I sold all of my high-power equipment and went totally QRP. I used home-built transmitters and a Drake R4B receiver until I purchased an Argonaut 505. Later I traded it for a 515, which I still use today.

For a few years, my father, my younger son and I were a three-generation family of radio hams. My son, K9DCF, received his license in 1956 when he was eleven. He often took a turn at the key during the weekly schedules with my dad -- grandson to grandpa. This pleased my father very much.

I keep a weekly schedule with my son in New Mexico and our QSO's are often QRM'ed by stations starting QSO's on top of us. To help even up the situation, I bought an IC-720A. This helped greatly, but we were still being clobbered. I decided to buy a linear, which took care of things. When needed, I use the linear for our schedules and for 160 meter SSB. But I operate QRP whenever I can and I really enjoy QRP contests. I am looking forward to much QRP operation as the increase in sun spots comes around.

CONTESTS

Cam Hartford, N6GA

Results: Summer Daze SSB Sprint
Results: NE QRP Afield
Announcing: The New Winter Fireside SSB Sprint
Announcing: The New N/T+ Sprint

New SSB Contest Format

If you take a look at the results of the Summer Daze SSB Sprint, you will come to the same same conclusion I have - it's time for a change! Participation has dwindled so that there were only three entries this year. What's going on here?

I think that the change I made in the rules a couple years ago helped at the time, but in the long run it has proven to be a bust. I lengthened the contest hours to allow more evening time for the new crop of 75 Meter SSB ops. Unfortunately, that change also spread what few SSB participants we have even farther apart from each other.

Now they are not only on different bands, but they are there at different times. Lonely voices in the wilderness.

Here is my remedy. The upcoming Winter Fireside SSB Sprint will be two contests in one. The first half will be a High-Band sprint, from 1900 to 2100 UTC. By limiting the time and the bands, I hope to get all of the SSBers together at the same place and the same time. It should be quite a bit livelier than in the recent past. I expect that most of the action will be on 20 meters, since that is where the Cascade and WM-20 boys and girls will be hanging out. If 15 ond/or 10 meters come to life, so much the better.

Later in the evening, after a well-deserved rest to catch our collective breaths, we'll have a Low-Band sprint from 7 to 9 PM, Local time. Again, I suspect that most of the action will be on 75 Meters, but 40 could provide some surprises. Since most of the action on these bands will be within a more local radius, we don't need to have everybody in the country on at the same time. Hence the local time zone format.

I've also changed the exchange format to include the operator's name, which should make the proceedings a little friendlier.

We'll try this format for a few contests to see what transpires. My guess is the great mass of Sidebanders lurking in our midst will break out of the closet and saturate the airwaves with their QRP voices.

See you there!

New Novice/Tech+ Sprint

We are fortunate to have a growing number of Novice and Tech+ licensees in the QRP ranks. I was one of those curmudgeons who believed that a Novice should begin life at a higher power level to gain some operating skills before throttling back to QRP levels. I thought new operators would be more susceptible to an early death from frustration if they dove right into the QRP fray.

Happily, I was wrong. The Novice/Tech+ Fox hunts have been drawing ever bigger crowds, showing at least in part that QRP operating is very good for improving one's skills, even if one is new to the sport.

For those of you not familiar with the Fox Hunt concept, it is a contest brought to our ranks by Chuck Adams, K5FO. On any given evening, the individual who is the designated fox is set loose on the 40 meter band for a two-hour time period. Everyone else chases the fox. When conditions are good, being the Fox is like being rare DX, a pileup on your hide for the whole time period. When conditions are poor, it is a good exersize in pulling out the weak ones. By popular demand the Fox hunt has been extended to the N/T+ band segment, where its popularity has grown.

In the spirit of the Fox hunt, we are presenting a new sprint to take place on the N/T+ band segments on March 15. Think of it as a four-hour, multi-band Fox hunt where all of the N/T+ class licensees are Foxes, and all of the General and above types are the hunters. Points are given regardless of who works whom, but the playing field is tilted in favor those who make the most contacts with the N/T+ stations.

I firmly believe that those of us in the higher license classes have an obligation to assist the newer members of our society. One way to do that is getting on the N/T+ band segments and giving them an opportunity to participate in some contesting with experienced operators. (Us.)

Many thanks to Joel Malman, WA1QVM, for the idea for this sprint. Hopefully it will become a regular event for all QRP ops. Check out the complete rules later in this column.

See you there!

1997 QRP AFIELD

I was saddened to hear of the passing of "72", the Journal of the New England QRP Club. The NE QRP Club was a pioneer in sponsoring the "Afield" type QRP contest, of which there are now several on the calendar. These outdoor contests provide contesters and builders new opportunities to get out and use their portable gear, in addition tothe traditional Field Day. The response to the Afield contests has been amazing, so much so that it prompted us to add Portable classifications to the ARCI events. Following are the results of the 1997 QRP Afield.

Call	Name	Score	Qs	Mults	Class	Location
K5ZTY	Bill Steinroth & Bill Denton	17,272	127	34	Hfield	Woods, NZ Ranch, Bedis, TX
WA7LNW	Jack Reed	11,136	87	32	Hfield	Brian Head Peak, UT
WQ0RP	MN QRP Soc	10,292	83	31	Hfield	Oak Park, MN
WB4ZKA	Mike Pulley	9,504	54	22	Lfield	Copper Basin Camp, AZ
N1FN	Marshall Emm	8,200	82	25	Hfield	Daniels Park, CO
W5FN	Tim Aherns	6,880	43	20	Lfield	nr Driftwood, TX VFD
AE4IC	Bob Kellogg	5,616	39	18	Lfield	Falls Lake Rec Area, NC
KF6NKR	Cam Hartford	5,168	34	19	Lfield	Table Mtn Campgrnd, CA
N4BP	Bob Patten	5,400	150	36	Hperm	Home, Plantation, FL
AB7TK	Randy Foltz	4,080	60	17	Hfield	Moscow, ID

N7CEE	Bruce Grubbs	3,240	27	15	Lfield	near Flagstaff, AZ
W5VBO	Brain Kassel	3,312	46	18	Hfield	White Tanks SP, AZ
AA5TB	Steve Yates	3,120	26	15	Lfield	Backyard, Fort Worth, TX
W9SUL	Dave Cary	3,036	33	23	Hfield	Backyard, Rochester, MN
WD8RIF	SE Ohio RAT	2,808	39	18	Hfield	Highland Park, Athens, OH
AL7FS	Jim Larsen	2,100	75	28	Hperm	Home, Anchorage, AK
WB8TPM	Ed Clark	1,872	18	13	Lfield	Echo Twp., MI
K5OI	Tim Pettibone	1750	29	15	Hfield	NMSU parking lot
AA0SM	AnthonyDrumm	1680	28	15	Hfield	Camp nr Spring Valley, MN
WB3AAL	Ron Polityka	1440	15	12	Lfield	Locust Lake SP, PA
N2TO	Kevin Glynn	1,400	25	14	Hfield	Ft. Hamilton, Brooklyn, NY
N2CQ	Ken Newman	1,300	25	13	Hfield	Backyard, Woodbury, NJ
AB5UA	Clifton Sikes	1,260	30	21	Lperm	Earlsboro, OK
WB3GCK	Craig LaBarge	1,248	15	12	Lfield	French Creek SP, PA
NR3E	David Kreinberg	1,200	50	24	Hperm	Lewisville, TX
AA0ZR	Jane Woodening	896	28	8	Hfield	Nederland, CO
W1XH	Al Bates	832	13	8	Lfield	Heart Pond, MA
VE3ELA	Ken La Rose	832	16	13	Hfield	Wye Heritage Marina, ONT
K5RAC	Rad. C&C Cb	832	16	13	Hfield	Red Kane Park, TX
N2SMH	DavidMaliniak	560	14	10	Hfield	In-laws QTH, Lebanon, NJ
N4JS/MM	John Sielke	560	10	7	Lfield	Maurice River, NJ
N2VPK	Mark Adams	446	26	16	Hperm	Clarence, NY
W1FN	Twin State RC	396	11	9	Hfield	Thetford, VT
W3MWY	G.W. Morgan	384	12	8	Hfield	Baltimore, MD
K0LWV	Larry Mergen	350	5	14	Hperm	Raymore, MO
NI0A	John Perrone	280	10	7	Hfield	Island Lake, MN
N0IBT	David Perry	280	20	14	Hperm	Boulder, CO
AE0Q	Glenn Pladsen	240	20	12	Hperm	Lakewood, CO
KE5TC	Royce Rainwater	224	8	7	Hfield	Keota, OK
WA4AAK	Evan McDade	165	15	11	Hperm	Huntsville, AL
WA6FUH	Ward Hill	120	10	3	Hfield	Roseville, CA
WA9PWP	Paul Goemans	120	12	10	Hperm	Stoughton, WI
N4UY		108	12	9	Hperm	
N2BRT	Adam Kanis	20	5	4	Hperm	Wellman, IA

QRP Afield Soapbox:

Location gave me great views of 3 states and 4 national parks. Except for rain, sleet, snow and 50 mph winds, it was a real blast! - WA7LNW; Got several new states 2XQRP--Fun event. Would like to see first name added to next year's event. - W9SUL; Fun. Camped out with Boy Scout troop--first time they've shown much interest in ham radio. AA0SM; WX very cool and windy with scattered showers. Most signals not strong. - VE3ELA; Bands were spotty, but a very enjoyable day. - AE4IC; Perfect WX, had to ground the kite and use G5RV. Nobody else showed up, so had to do it solo. N0UR (for MN QRP Society); Only able to work two hours--20M was hopping and 40M wasn't. K5OI; Worked 10 more Qs and 2 more mults than last year which makes us successful in our book. Worked a JA7 who was incredulous at our 0.95W. Also worked AK. - WB4ZKA; My first QRP contest--enjoyed it immensely. Hightlight was working QRPpp station WB3AAL (9mw). - WA4AAK; This year's motto was: Quality, not quantity. Highlight was working AL7FS. - N2SMH; Raining and cold--stayed home this year. - AE0Q; It was a real struggle this year for some reason. My worst showing to date! Murphy was on hand for the setup and I had some equipment problems to deal with. - WB3GCK; Lot of fun! Thanks. Good to hear the milliwatt stations. - NR3E; Had a ball, but got cold in the tent at dusk--fall came early in MI! - WB8TPM; Not much air time, but was fun! Thanks for the contest! - KE5TC; Could only operate for 45 minutes, but had fun--seemed to be lots of activity! - WA9PWP; Didn't get my 20M rig finished for portable operation, so decided to try milliwatting from home. Had a blast! Highlight was working EA4DBS @ 900mW! - AB5UA; Had a great time! Lots of sweating putting up the dipole--was about 96 degrees and 80% humidity--but was close enough to the VFD refrigerator to make it OK! - W5FN; I worked 3 contests at the same time: QRP plus AF and WA QSO parties. Kept me busy! - K0LWV; Temp at operator position got up to 102 degrees--a little warm, even for Phoenix. Enjoyed contest immensly. - W5VBO.

1997 SUMMER DAZE SSB SPRINT

Whither goeth all the Sidebanders? Conditions were terrible, not very many participated, and even fewer sent in logs. Al, KØFRP, cranked out 29 Qs, half of which were with QRO types. But there were at least 15 other QRPers out there - only 3 sent in logs. In the words of N1TGZ, "Dismal QRN, Late start, gave up." Ralph, N7RI, broke into a conversation between two W3 land stations, got good signal reports from both on his new Centennial tcvr kit, and in the process got the other two to reduce power and try QRP SSB for themselves. Attaboy, Ralph!

Clearly it is time to revamp our SSB contests. Participation got a boost a few years back when the 75 Meter gang from VE7 land joined in fray, but that involvement has come and gone. I've decided to change the times and places - see the announcement later in this column.

STATE	*CALL*	*SCORE*	*POINTS*	*SPC*	*POWER*	*BANDS*	*TIME*	*RIG*	*ANTENNA*
CO	KØFRP	14,014	91	22	5	20M	1.5	TS-850	YAGI @ 82' E, @35' W
VA	N7RI	5,056	4	2	4	80M	.5	CENTENNIAL	DIPOLE @ 40'
FL	N1TGZ	1,232	22	8	5	40M	1	TS-530S	DELTA LOOP

UPCOMING EVENTS

Michigan CW Contest	January 3-4
Winter Fireside SSB Sprint	January 11
Az SQRPions FYBO	February 7
Colorado Winter Contest	February 22
ARCI Novice/Tech+ Sprint	March 15
ARCI Spring QSO Party	April 11-12

Contest Info on the Web

If you have access to the World Wide Web, there are several sources for contest information worth looking into. QRP ARCI maintains a web page at http://RTPnet.org/~qrp/ where Webmeister Dave Johnson, WA4NID keeps a calendar of QRP sponsored events.

John Shannon, K3WWP, maintains an extensive calendar on his web page at www.geocities.com/CapeCanaveral/3852/. John lists a wide variety of contests, including both QRP-sponsored and mainline events. He annotates them as to their interest to QRPers, so you can quickly determine if an upcoming event, such as a state QSO party, has a QRP class.

Bob, KI7MN, also has a contest calendar on his web page, http://www.dancris.com/~ki7mn/. He lists both QRP- and non-QRP contests which might be of interest to QRPers.

Fall QSO Party Preliminary Scores

Fall QSO Party logs were still rolling in as this issue of the Quarterly went to press. Here is a preliminary listing of the claimed Top Ten:

N4BP	2,505,559	K7SZ	707,553
AA7KF	1,896,048	NK9G	651,882
N9AW	815,850	WA9PWP	563,220
NØUR	807,030	W3KC	512,589
AD4ZE	720,720	N1QY	499,359

WINTER FIRESIDE SSB SPRINT

Date/Time:
January 11, 1998; Hi Bands - 1900 to 2100 UTC;
Lo Bands - 7 PM to 9 PM Local Time.
Exchange: RS, State/Province/Country, Name
QSO Points: All QSOs are worth one QSO point
Multiplier: SPC (State/Province/Country) total for all bands.
S/P/Cs may be worked on more than one band for credit.
Bonus Points: Points awarded for using Homebrew equipment,apply for each band on which Homebrew equipment was used:
+2,000 HB Transmitter used
+3,000 HB Receiver used
+5,000 HB Transceiver used
Homebrew Definition: If you built it, it is considered Homebrew.
Power Multiplier: (Power Output)
< 250 mW (< 500 mW PEP SSB) = X 15; 250 mW - 1 Watt (500 mW - 2 W PEP SSB) = X 10; 1 W - 5 W (2 - 10 Watts PEP SSB) = X 7; Over 5 W (Over 10 Watts PEP SSB) = X 1.
Suggested Frequencies:

	GENERAL		
160 Meters	1860 KHz	15 Meters	21385 KHz
80 Meters	3865 KHz	10 Meters	28385 KHz
40 Meters	7285 KHz	6 Meters	50128 KHz
20 Meter	14285 KHz		

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

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

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

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

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

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

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

Entries are welcome via E-Mail to CamQRP@cyberg8t.com, or by mail to:
Cam Hartford, N6GA
1959 Bridgeport Ave.
Claremont, CA 91711

NOVICE/TECH+ SPRINT

Date/Time:

March 15, 1997; 2000 - 2400 Z
Exchange: RST, State/Province/Country, Name

QSO Points:

N/T+ to N/T+ = 25 Points
N/T+ to Non N/T+ = 10 Points
Non-N/T+ to Non N/T+ = 5 Points

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:

80 Meters	3710 KHz
40 Meters	7110 KHz
15 Meters	21110 KHz
10 Meters	28110 KHz

Score:

Points (total for all bands) X Power Multiplier

Entry may be Single-Band or Multi-Band. Certificate to the overall winner. Certificates to the top three finishers in both Novice/Tech+ and Non-Novice/Tech+ categories. Certificates to top three places in each Single-Band and Multi-Band class. 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, and address.

All entries must be received within 30 days of the contest date. Late entries will be counted as check logs. 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.

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

QRP Amateru Radio Club International Operating Awards Program

Chuck Adams, K5FO

The objective of the QRP ARCI Operating Awards Program is to demonstrate that "power is no substitute for skill". It encourages full enjoyment of Ham Radio while running the minimum power necessary to complete a QSO and thereby reducing QRM on our crowded bands. QRP is defined by the club as 5 watts output CW and 10 watts PEP output SSB. The following awards are available to any Amateur. Requirements are set forth below.

QRP-25 This award is issued to any Amateur for working 25 members of QRP ARCI while those members were running QRP. Endorsements are offered for 50, 100 and every 100 thereafter. To apply send list of members worked. List should be in numerical order.

WAC-QRP This award is issued to any Amateur for confirming QSOs with stations in all six continents while running QRP.

WAS-QRP This award is issued to any Amateur for confirming QSOs with stations in at least 20 of the 50 states of the USA while running QRP. Endorsement seals are issued at 30, 40 and 50 states confirmed.

DXCC-QRP This award is issued to any Amateur for confirmed QSOs with 100 ARRL countries while running QRP.

1000-MILE-PER-WATT (KM/W) This award is issued to any Amateur transmitting from, or receiving the transmission of, a QRP station such that the Great Circle Bearing distance between the two stations, divided by the QRP stations power output equals or exceeds 1000 Miles-per-Watt. Additional certificates can be earned with different modes and bands.

NOTES

1) The fee for all awards is $2.00 US or 10 IRCs. Subsequent Endorsement Seals are $1.00 or 5 IRCs. Make checks or money orders payable to QRP ARCI.

2) GCR List (General Certificate Rule): QRP ARCI will accept as satisfactory proof of confirmed QSOs and that the QSLs are on hand as claimed by the applicant if the list is signed by: (a) a radio club official, OR (b) two amateur radio operators, general class or higher, OR (c) notary public, OR (d) CPA. If you must send show proof, first send photocopies of QSLs. QRP ARCI is not responsible for lost or damaged QSLs.

3) QRP ARCI member numbers are not published. The Awards Program will accept as satisfactory proof for any of the club awards a QSO with a club member giving their membership number and power output in the log data. If the QRP number and power are not given a QSL is required for confirmation. See Note 2 above.

4) Endorsement seals are available for a) One Band, b) One Mode, c) Natural Power, d) Novice and e) Two-way QRP if log data so indicates.

Send Applications to:

QRP ARCI AWARDS CHAIRMAN
Chuck Adams K5FO
Box 181150
Dallas, TX 75218-8150

1,000 MILE/WATT AWARD APPLICATION

AWARD NR: _____

BAND ____ MHZ NR: ____

MODE _____ NR: ____

AWARD DATE: _____

K5FO BOOKKEEPING AREA

DATE: _____

CALL: _____

BAND: _____ MHZ

MODE: CW SSB FM OTHER:_____

PAYMENT: NONE CASH MO CHECK IRCS_____ AMOUNT:_____ US DOLLARS

DATE OF QSO: _____

FIRST STATION CALL: _____ PWR: _____

QTH: _____

LAT: _____ LONG: _____

QRP STATION CALL: _____ PWR: _____

QTH: _____

LAT: _____ LONG: _____

POWER LEVEL: _____ WATTS MILES: _____ MILES

MILES PER WATT: _____ MILES/WATT

CERTIFICATE TO: _____

_____

_____

_____

MAILING LABEL APPRECIATED

QRP ARCI WAS AWARD FORM

Name _____ Call _____

Address _____

Band _____ MODE cw ssb mixed Max-Power_____W

Certificate Number if Endorsement _____

States Worked (circle one) 20 30 40 50

ST	CALL	ARCI#	DATE	ST	CALL	ARCI#	DATE
AL				MT			
AK				NE			
AZ				NV			
AR				NH			
CA				NJ			
CO				NM			
CT				NY			
DE				NC			
FL				ND			
GA				OH			
HI				OK			
ID				OR			
IL				PA			
IN				RI			
IA				SC			
KS				SD			
KY				TN			
LA				TX			
ME				UT			
MD				VT			
MA				VA			
MI				WA			
MN				WV			
MS				WI			
MO				WY			

Note: Show ARCI# if you worked member of QRP ARCI and number exchanged. DC will count as MD.

QRP Net Information

Compiled by George "Danny" Gingell, K3TKS

1998 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	7040	W6SIY (several)	Saturday	1700 UTC

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	W7DFO (N7MFB)	Tuesday [2]	0200 UTC
NW-QRP	3710	N7MFB	Tuesday [2]	0230 UTC
NW-QRP	7035	N7NFB	Saturday	0730 PST
NC-QRP	3686	KQ4RP (club call)	Sunday	2130 EST
VE-QRP	14060	VE6BLY	Sunday	1800 UTC

WOW, Dayton is only FIVE MONTHS AWAY!!! Can you believe it?

DAYTON QRP BANQUET 1998!
FOOD, FUN, and PRIZES!
Friday, May 15, 1998 - Mark it on your calendar NOW!
Days Inn, Dayton South, Miamisburg, Ohio
7:00 p.m.

Buffet food - three main courses, two salads, two veggies, and dessert.

Featured Keynote Speaker - the one, the only
W0RSP, Ade Weiss, author of THE JOY OF QRP

Door prizes galore
(if you want to donate, let me know - I'm also doing some serious solicitation - I hate to do it, but it HAS to be done).

"Scott Rosenfeld [NF3I]" <ham@w3eax.umd.edu>

The Last Word

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

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

Full articles should go to any of the volunteer editors for review. 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.

Accepting advertisements for publication in the Quarterly does not constitute endorsement of either the product or the advertiser.

Material cannot be returned unless accompanied by sufficient postage.

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

de **Ron, KU7Y**

New Member / Renewal Application Form

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

Mailing Address _____

City _____ **State / Country** _____ **Zip+4 Code** _____

New Address? **(List ALL old calls)** _____ **New Membership or Renewal?** _____

Packet Radio Address _____ **E-Mail Address** _____

Home Phone Number ( ) _____ **Work Phone Number ( )** _____

USA $15	CANADA $18	DX $20

Change of Address, and membership status questions go to:
Dave Johnson, WA4NID 2522 Alpine Rd, Durham, NC 27707

Mail completed application to either:

Check or Money Order in U.S. Funds

Make checks payable to: "QRP-ARCI"
All applications MUST BE RECEIVED at least 30 days prior to the cover date to receive that issue.

Send to:
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848 Valbrook Court
Lilburn, GA 30047

For a Club Information Pack, write to:
Bruce Muscolino, W6TOY
P. O. Box 9333
Silver Spring, MD 20916

DX Membership Contact:

(for all non NA members)
Checks for 13.50 UK pounds ONLY.
We can accept Visa / Mastercard @ 14 UK pounds.
Make checks payable to: "GQRP" (ONLY)

Send to:

Dick Pascoe, G0BPS
Seaview House, Crete Road East
Folkestone. Kent CT18 7EG UK

Tel/Fax 44(0)1303 891106 from 0930 to 1900 GMT ONLY
If in doubt, ring Dick, but ONLY for Membership.

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