QRP Quarterly

Journal of the QRP Amateur Radio Club, International

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Photo courtesy of Steve Hidig.

Two Famous QRPers chat about antennas at the QRP ARCI Hospitality Suite, Dayton, 1995
Roy Lewallen, W7EL and Ernie Helton, W8MVN.
(When Ernie models antennas, he doesn't need a computer!)

The QRP ARCI is committed to encouraging the voluntary use of the least power output possible so that amateurs all over the world may more equally enjoy amateur radio.

From the President:

Buck, N8CQA

After 5 months in this position, I am still amazed at how much remains to be done and how long it takes to do anything. **Rev. Dobbs** has the right idea. We (BOD)have further modified the club Bylaws to include the proper election information/processes. We are currently voting on standards for the **QRP Hall of Fame Award,** to give consistency and fairness to these awards. Hopefully, the standards will appear in this issue of the QQ.

This issue is the first for **Ron Stark, KU7Y.** I'm very appreciative of his picking up the reins and running with them. Those of you who edit newsletters for any QRP group, please contact Ron with your address. Ron is re-activating the complimentary newsletter exchange for QRP-ARCI and will add you to his mailing list for a copy of your newsletter. Please contact him ASAP.

To **Paula Franke, WB9TBU,** my heartfelt **thanks for her years of dedicated service.** I know I speak for all of us in wishing her all the best in her new endeavors. Perhaps now she can get on the air!

I am pleased to see the Club banners being requested for regional/local functions. If you are planning to include QRP-ARCI in your swap/convention, (please do!), contact your area representative (see back cover) for a banner and contact me for some Candy Store goodies (cups, pins, shirts). I will send you a small quantity. Call Early!

Seen on QRP-L **"Dayton '96, it's not too early to plan!"**. Be aware that the **banquet will be held on Friday evening in '96. Dayton will be May 17, 18 & 19, 1996.** Several groups are planning activities for Thursday evening, more info to come. There is now a Dayton-List available to keep QRP-L free from the Dayton hoorah this year **(email to "listserv@lehigh.edu" in the text put "subscribe to dayton-l (your name) (your call))"**.

Hope to work you in the Fall Contests/Sprints.

72/73 **Buck, N8CQA**

NOTES FROM THE VEEP

Mike.Czuhajewski@bbs.abs.net

The QRP ARCI banners are here! Take a look at the cover f the July issue--you can borrow one of these to help promote RP at hamfests and conventions in your area. (I am caretaker of the "East Coast loaner".) Many people do that already, but having an official banner will attract more people to your display and give a large boost to those efforts.

I heard that when someone showed one of the banners at a West Coast function recently, someone said it was the first time the QRP ARCI had done anything out West. True or not? It reminds me of an item in QST long ago where someone complained that the ARRL didn't support them in their tower suit, their TVI problem, their technical problem, etc. The League just sent over some local ham who was a lawyer, some local technical expert, etc. The point was that the League is people all across the country, not just a staff in Newington.

Just like the League, the QRP ARCI depends on local talent, local representatives everywhere to represent it. Neither organization retains a fleet of vehicles with the motors idling, ready to dispatch their staff to anywhere in the country at a moments notice. We don't normally send official QRP ARCI teams to hamfests or conventions, but frequently people in the local areas just take it on themselves to do something. (Most likely there have always been people promoting the QRP ARCI everywhere, but without a banner they are less likely to be noticed and remembered.)

For the last several years I have been taking a fistful of QRP Quarterlies to each of the 4 to 8 hamfests I attend each year, passing them out to interested people. I have also been taking a stack of them to Maryland Radio Center in Laurel, MD each quarter for over a year for sale, where they sit beside QST, CQ, etc on the rack. Not only do they silently promote QRP, but we even make a bit of money in the process!

I've been giving a few Quarterlies to **Dick, KA3ZOW of S&S Engineering** for over a year, to give away at the hamfests where he sells his wares; several QRP rigs and kits sitting on the table beside sample copies of the Quarterly make a great recruiting tool! (I recently made arrangements for him to automatically receive a shipment direct from the printer every quarter.) **Rich, K7YHA**, just told me that his stack of copies has run out and is getting more, and he and I are not the only ones giving them out at ham gatherings. And who tells all of us to do these things? No one; we just do it. And if anyone else wants to promote QRP (and the QRP ARCI) in their area, just go ahead and do it--opportunity is knocking!

--WA8MCQ

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EDITORIAL

From the new Managing Editor, Monte "Ron" Stark, KU7Y

Here is my first attempt at putting the Quarterly together. This issue has been a real learning experience. The most important thing I can say is that with so many good people getting all the work done for me, how can I miss?

One more thank you to **Paula Franke, WB9TBU.** I am really learning to appreciate just how much work she put into the **QRP ARCI** and the **Quarterly**. I wish her the best in all her new endeavors and hope that we can all work her on the bands.

In this issue there is one nomination and one recommendation being asked for. **Mike Czuhajewski, WA8MCQ**, explains all about the **Hall of Fame** and why you should think about nominating someone who you feel deserves that award. The recommendations we are asking for is to fill the temporary positions on the **Board of Directors**.

The By-Laws call for the President to appoint a nominating committee. The committee will nominate candidates for the BoD. (ARTICLE IV: (b.)).The committee will review all recommendations sent in by **active** ARCI members. I would suggest that you include with your recommendation a letter explaining why you think this person should be on the BoD. The names of those on the nomination committee are not available as we go to press but will be included in the January, 1996, issue.

This is your chance to have some input on the direction your club is heading. If you know someone who would make a good director, **send in your recommendation now**.

Due to the lead time needed to get all the information out to the members, the terms of the temporary BoD members has been extended until the elections are complete.

To nominate, recommend, vote or serve on the Board of Directors you **must** be an **active** member of the **QRP ARCI** with all dues paid. If your membership has expired, get the check in the mail to **Mike Bryce, WB8VGE, now!** See the inside, back cover for a membership renewal form.

Recommendations will be accepted until November 10, 1995. All recommendations **must** go to the President, **Buck Switzer, N8CQA**. Any recommendations received after November 10, 1995 will not be used.

The ballots will be in the January, 1996 issue of the **QUARTERLY** and the winners will be announced in the April, 1996 issue of the **QUARTERLY**.

Please write and let us know how we are doing. This is your club and the **QUARTERLY** is your journal. Without your input we have no way of knowing what you want or how we are doing.

Look for the article, **WATTS ARE FOR WIMPS**, (new column?), on milliwatting in this issue. Let **Bob White, WO3B**, know what you think. Got any other ideas? Let us know.

Another issue is on the burner. How do you feel about advertisements in the **QUARTERLY**? Revenue from them could help us keep the costs to you down and maybe even upgrade the **QUARTERLY** somewhat. But would we have to worry about a 'less than kind review' becoming an advertising issue? Good arguments can be made on both sides of that question. I want to know how you feel.

Please use the contest reporting form found in this issue when reporting to **Cam, N6GA**. He said his eyes are getting weak from reading all those results sent in on Red Eye stained bar napkins! Notice all the nice forms to help **Chuck, K5FO**, save his eyes. Copy and use these forms freely. Many thanks to both.

Remember folks, the entire **QRP ARCI** and its' journal, the **QRP Quarterly**, is just a labor of love. No one is getting paid! All the time we spend working on these activities is time that we can't be doing all the "Honey Do's". Hmmmmm, gee, I feel better already! Till next time,

72 **Ron, KU7Y** **ku7y@sage.dri.edu**

TIME TO CHECK THE ADDRESS LABELS

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

REMEMBER: THERE IS NO OTHER WARNING

CALL FOR NOMINATIONS FOR THE QRP ARCI HALL OF FAME, 1996

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The QRP Hall of Fame is an honor bestowed by the QRP ARCI for outstanding accomplishments with QRP and/or on behalf of the QRP community. The first four inductees were announced at Dayton in 1992: **Doug DeMaw, W1FB; Rev. George Dobbs, G3RJV; Roy Lewallen, W7EL; and Randy Rand, AA2U.**

Although we'd prefer that this be an annual event, for some reason there was no activity in 1993 or 1994. We tried to get it moving again for 1995; we called for nominations and received several, but things didn't work out. One mistake was planning on doing the voting at the official Board/Officers meeting at Dayton--there simply was not enough time, especially since the meeting was scheduled immediately before the QRP Banquet. (Anyone who has been to Dayton knows that we really need a full week for the QRP activities!)

There was also substantial turbulence in the "power structure" of the QRP ARCI during the year, with lots of people coming and going. That was definitely a contributing factor since there were many administrative details of the HoF process to be worked out and approved, and that takes lots of time, especially with a "mail order club". We wanted to push ahead with the 1995 voting, even though it would be several months late, but other problems popped up and we had to accept the inevitable--the Hall of Fame has skipped another year. Our apologies to all, especially those who submitted nominations.

QRP ARCI President N8CQA asked me if I would honcho the HoF, and I accepted the task. Those of you with Navy experience can call me *CINCFAME. If things fall through the* cracks again, at least you'll have a specific person to take the blame!

SEND NOMINATIONS NOW

Nominations are now being accepted from QRP ARCI members for the 1996 inductions into the QRP Hall of Fame. If you wish to submit someone for this honor, please send a nominating letter or e-mail to me; my postal and e-mail addresses appear above. Deadline for receipt is the last day of January, 1996. Voting will take place after that, with results to be announced publicly at Dayton. (If you made a submission for 1995, you must send another; I was unable to obtain those nominations.)

Although anyone can be elected to the HoF whether or not they are a member of the QRP ARCI, nominations will only be accepted from members. Please include your membership number with your nomination for verification.

The first four inductees to the QRP Hall of Fame were announced at Dayton in 1992

Doug DeMaw, W1FB

Rev. George Dobbs, G3RJV

Roy Lewallen, W7EL

Randy Rand, AA2U

While they may be as simple as "I nominate Joe Blow for the QRP Hall of Fame", their chances will be much improved if you include one or two brief paragraphs with specific reasons why you believe they are worthy of the honor. One of the Directors recently told me, "I would go into it with the attitude that no one is worthy, but I'll read the letters of nomination to see if I am wrong. And I'm sure that I will be proven wrong." Be sure *to include some specific facts and* details to support the nomination; you may feel that Joe Blow deserves it, but you have to convince us!

What is required for induction into the QRP Hall of Fame? There are no hard and fast rules, nor specific "squares to fill." The award is to be based on one or more of the following: technical or writing accomplishments, operating accomplishments (contesting, award achievement, net operations, etc), service to the organization, significant QRP promotion activity, other significant activity and/or accomplishments. (There is no requirement that nominees be *members of the QRP ARCI.)*

There are no numerical quotas for the Hall of Fame; there is no limit on how many can be inducted each year, but there is also nothing that says we must admit anyone at all. It's up to you; if you know of someone who has made outstanding contributions to QRP in some way and feel they deserve the honor, write it up and send it in!

--qrp--

HOW THE QRP ARCI BECAME A QRP CLUB

By Adrian Weiss, W0RSP

Reprinted from the May 1983 issue of CQ Magazine, with permission. (From the W0RSP QRP column, originally "K8IF Steps Down".)

*Editorial Two-Cents Worth: People joining the **QRP ARCI** today think that it was always a flea-power club, but that's not the case, even though the **QRP Quarterly** is well past it's 30th anniversary. The club was founded in 1961 by the late **K6JSS** with the goal of reducing QRM on the bands by voluntarily reducing power input to a lower level, selected as 100 watts input. (The amateur world used input rather than output power until relatively recently.) While that was a noble and worthwhile purpose, and everyone involved with the Club back then had the best of intentions and motives, there were many who heard the term "QRP" and signed up, only to drift off when they learned that it wasn't a flea-power club.*

*Having joined in 1967, I was only too well aware of the purpose of the Club in those days. I was one of the very small minority who ran QRP as we know it today, 5 watts and under. Unfortunately, I went QRT when I joined USAF in 1970, not becoming active in ham radio for another 16 years, so I missed all the fun Ade describes here. When I became active again in 1986 I was overjoyed to find that the "QRP Club" had turned into a real QRP club. Here, then, is some historical perspective for our newer members, reprinted from the days when Ade had a QRP column in CQ magazine. **--WA8MCQ***

About eight years ago, I met **Tom Davis, K8IF**, on the old Milliwatt 80 meter QRP Net. I was struck by his dedication to QRP even then. He'd be the first guy to QNI with his little signal from the east coast, at that time signing **WB2TEN**, and he'd be the last guy hanging around after the net session, so we ended up having long ragchews about QRP afterwards. After The Milliwatt [see sidebar] ceased publication and its nets were discontinued, Tom jumped into the gap, scheduling and NCSing nets on 80 and 40 meters, and then on 20. He hung in there alone for about two years, sometimes the only one who showed up, and it was a rough, lonely struggle for quite a while until a few other QRP devotees took over some of the NCS duties and QNI's began increasing. I don't know exactly how it happened, because my complimentary copy of the QRP Quarterly stopped coming for a while and by the time I began receiving it again, Tom had been elected President of the QRP ARCI club. I hadn't heard from him for quite a while, but I have ever since, and we've become good buddies. Those are fond memories of early experiences that we shared.

This note is about Tom's critical role as a leader on the US QRP scene. He provided the vision and drive and diplomacy necessary for switching the QRP ARCI onto a real QRP track. When Tom took over, the QRP ARCI defined QRP as 100 watts input, required prospective members to sign a "pledge" that they would never exceed 100 watts input, and made all club awards, except two, for operating at the 100 watt level. *[Those two were the 1000 Miles Per Watt award and the WAS/QRPp for working at least 20 states with 5 watts or less. I personally proposed and created the latter award while I was on the QRP ARCI Board of Directors in the late 1960's, while the "KMW" had already been around for a few years. --WA8MCQ]* The clubs leadership essentially saw real QRP--5 watts output and below--as irrelevant to club policy and direction. I don't want to sound critical of the old leadership because those guys were dedicated and expended a great deal of effort in keeping the QRP ARCI alive in a world of QRO amplifiers. However, they lacked the vision and flexibility for change, and eventually most of us real QRP types would become disenchanted with a 100 watt organization calling itself a QRP club and refusing to recognize reality--that QRP had long since come to mean under 5 watt output operation around the world.

I was always impressed with Tom's positive attitude. I'd "read the writing on the wall" back in 1969 and started The Milliwatt because of frustration with the club's old-guard stance. Not so with Tom. He looked at it differently. He'd say, "Well, it's the US QRP club and the only one we've got, so why not turn it around to represent the real QRPers interests." I'd always respond negatively about the old-guard Board of Directors and the futility of trying, but he didn't agree. He went to work, figuring that most of the club's active members were 5 watt output types and that the Board should represent their interests. He was right, of course, but it took years of hard work to produce the desired results.

The process was complex, but Tom handled it very diplomatically and within established channels. He beat the bushes for new Board candidates and had them write up "position papers" for the newsletter prior to Board elections, and he urged members to vote. The complexion of the Board slowly began to change.

Tom opened the question of "100 watts input vs 5 watts output" in an editorial, and a heated discussion followed in several newsletters. Of course, I fueled the fires just a wee bit with a broadside attack on the 100 watts input dinosaur. Tom felt the time was right, and he took a straw-poll of the membership via the newsletter to see what the membership wanted. The poll produced overwhelming support for the 5 watt output direction. Of course, the board dismissed the poll as invalid and non-binding, but Tom had the Board where he wanted it--faced with such results, the Board logically could not refuse to submit to a real binding vote. And it turned out as expected--overwhelmingly in favor of the 5 watt output definition of QRP for club purposes. The Constitution had to be changed, and Tom very diplomatically dealt with the Board, insisting on the new 5 watt guideline and letting them have the remaining 100 watt guidelines.

There were still other barriers: club awards for 100 watt achievement, club contests with 100 watt categories competing with 5 watt and under types for certificates, and worst of all, the "pledge". The "pledge" had turned away many prospective and current members after they got to thinking about it. In some cases, this problem wasn't a "who needs 'em" type. When notables such as **Wes Hayward, W7ZOI**, and **Doug DeMaw, W1FB**, were turned off by the outdated "pledge", the club lost two individuals who, I believe, have been solely responsible for attention to QRP from the ARRL! A QRP club can't afford to be at odds with two guys who have done so much for QRP in the US!

Tom hung in there and eventually, after about four years of effort, removed all traces of the club's 100 watt input vintage. By 1981, the QRP ARCI was a genuine 5 watt output QRP organization from top to bottom. Frankly, I didn't think Tom could pull it off. But he did, and his contribution to QRP in this country is inestimable and far-reaching. I'm sure that in five years or so new QRPers will join the QRP ARCI, overjoyed to find an organization in existence which represents their particular interest in amateur radio, and they'll assume that it was always that way. I want to make certain that some older QRP operator who has read this tribute will set them straight and tell them, "You have **K8IF** to thank for that because it wasn't always that way."

Unfortunately, Tom couldn't enjoy being President of the organization that he worked so hard to bring into existence. An increase in workload cut deeply into his time. Then, too, Tom had been seeing a Pennsylvania lady (that's where I'm from) whom he'd met years earlier during his wild life as a rock musician on the road, and when several of us had dinner with him at Dayton in 1981, we sensed that something serious was in the air, although Tom didn't exactly admit it. Well, he finally married her after much cogitation and trepidation and is happy that he did. So, being married and setting up a home takes a lot of time, too, and I'm pleased that Tom is excited by it all. I know he missed the action and phone calls and decisions associated with his stint as president of the QRP ARCI, but he's done his share for QRP. I'm sure we all will miss him, but we all wish him well with a "thank you".

--qrp--

The Milliwatt, National Journal of QRPp

I was already publishing "**QRP/8**", an 8th call district QRP ARCI newsletter which contained a section devoted to true QRP. Ade found out about it and quickly convinced me that we should devote it entirely to true QRP, since there was a very definite demand for that; indeed, the majority of subscribers at that point were from outside the 8th district and were getting it solely for the QRP content. At his suggestion we changed the name and format, calling it **The Milliwatt**, subtitled "**The National Journal of QRPp**" (his names), and Ade began publishing it at the University of South Dakota.

I remained on the editorial staff for 4 issues, at which time I ran off to join the Air Force, an attractive alternative to being drafted into the Army while Viet Nam was still hot. (Some of my articles continued to appear in later issues.) Ade continued to publish The Milliwatt until the middle of 1975. Although he credits me in both his QRP books with giving him his start in QRP publishing, he did virtually all the work for the vast majority of its life. (In these days when it seems like there's a computer/word processor and laser printer in virtually every house in the country, you have to really admire the fact that Ade put out a bimonthly publication of 16 and more pages for 5 and a half years using just a typewriter.)

To this day the Milliwatt remains legendary as a pioneering QRP publication, and has many excellent technical articles which have withstood the test of time. It contained a good deal of QRP operating reports and philosophy which simply was not available elsewhere. Those 33 issues contain a number of names and calls which are still active in QRP today. (By the way, since 1992 I have reprinted the entire run of The Milliwatt 3 times, the last time in conjunction with **Bill Kelsey, N8ET**, and may do another batch some day. Keep an eye on the Quarterly for an announcement.) **--WA8MCQ**

A QRP TRANSMITTER FROM THE COMPUTER

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There was some discussion on the Internet QRP mailing list (Note 1) about the use of computer crystal oscillator cans as QRP transmitters. The idea itself is not new, having been the subject of a set of articles in the November 1990 issue of 73 magazine (the Fireball transmitter), and they make handy little ready-made QRP rigs with a handful of milliwatts on several ham bands. They aren't powerhouses, putting out something on the order of 20 milliwatts and much less, but they're great for experimenting with really serious QRP. (And the world miles per watt record of 2.133 billion was set with one of these! See Note 2.)

Chuck Adams, K5FO, commented that they generate square waves and will require a lot of filtering on the output and should not be connected directly to an antenna. I made a 10 meter rig from one of them several years ago and I did use a filter, but after seeing his comment I decided to do some experiments and see how dirty their outputs are.

These inexpensive and widely available oscillators cover a variety of frequencies, some of which are in ham bands. These include 1.843, 3.579, 3.686, 14.318, 28.322, 28.636, and 29.491 MHz. (There is nothing that says you can't run CW in the phone bands, as long as you have the correct license class. Not great for calling CQ, but OK for prearranged QRP experiments.) Don't count on all of them putting out square waves, at least not the ones for the higher frequencies! Those are closer to sine waves, or at least appear to be, but all have lots of harmonics and need a lot of filtering before you put them on the air.

POWER AND PURITY

You might be lucky to get 10 milliwatts out of one of them by the time you connect a filter and antenna, so how strong can the harmonics be? Is it even worth worrying about? I'm not touching that one with a ten foot Czech! I'm not about to suggest that QRPers violate the FCC rules for spectral purity, even at such a low level; if I did, and someone got caught, the FCC would be here in a heartbeat! (The main office in Washington, DC is a half hour away by car, and the nearest monitoring station is about 7 miles away by air.)

I checked oscillator cans at 4.096 and 11 MHz, and they put out fairly respectable square waves, at least when loaded only by a high impedance scope probe. (I looked at the output of the 4.096 MHz oscillator on a spectrum analyzer, and it was a terrible thing to behold! Massive quantities of spikes going waaaaaay up the spectrum, each one a harmonic.) Cans for 32 and 48 MHz, as well as 28.636 MHz, appeared to put out something much closer to sine waves, albeit rather ragged ones, full of harmonic energy--again, this being unloaded except for high Z scope probes.

I suspect the higher frequency cans are worse than they appear, due to metrology limitations. In all cases, the $2000+ scopes and probes were rated to at least 100 MHz, but that's not enough to get a good look at a 32 to 48 MHz signal. QRPer Denton Bramwell, K7OWJ, had an article on oscilloscopes in the April 1990 issue of Ham Radio magazine. He recommended using a bandwidth 5 to 7 times greater than the signal being examined, or almost 500 MHz in the case of the 48 MHz oscillator. He also pointed out that probes should have a significantly higher rating than the oscilloscope, saying that a 50 MHz probe on a 50 MHz scope translates into only 35 MHz at the tip!

While the ones at the higher frequencies may not APPEAR to put out square waves, they DO contain a lot of harmonics and filtering is still necessary. In fact, that's exactly what I did with my own rig using one of the cans--I put a pi low pass filter on the output to clean it up. The can put out fairly low power to begin with, and by the time it passed through the low pass filter it was serious QRP, on the order of 3 or 4 milliwatts, although that was precisely what I wanted--I needed a micro-power transmitter for some real QRP experiments with a local ham, and I put a great deal of attenuation on the output. Even three milliwatts was far too much power for what we wanted to do!

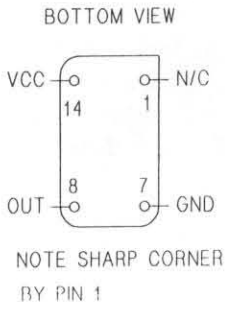
HOW TO CONNECT THEM

Oscillator cans for the Fireball QRP transmitters started out using 28.322, but they eventually had some custom built for the 10M CW QRP freq of 28.060 and sold them in a little kit. The Fireball didn't use filters--they connected the oscillators directly to the antenna (which is obviously not a great idea after you've looked at one on a spectrum analyzer).

They connected them differently from the "standard" configuration of taking the output between pin 8 and ground (Figure 1). They ran them from a battery, with a CW key in the negative lead to the ground pin, but it was not connected to an external ground, though--the battery and oscillator ground were left floating. (Figure 2)

The output pin (8) went to the shield of the coax (external ground), and a 1K pot went from there up to pin 14, the power pin. The hot side of the coax went to the wiper

of the pot, for a power control. Maximum power results when the wiper is set to the pin 14 end, not the "output" pin end. Unorthodox, but it works. The Fireball article said they did it that way to get maximum power output. It didn't do anything to clean up the waveform (I checked), but does give more power. (Figure 2 is simplified a bit. The actual circuit included a T/R relay.)



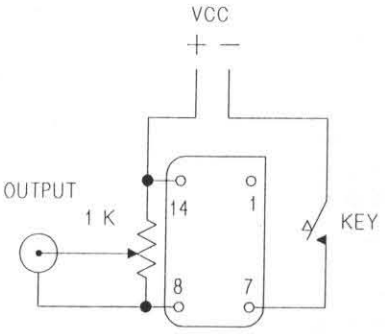


FIGURE 1 **FIGURE 2**

Speaking of power, don't expect a great deal. The output voltage of these cans is relatively high when lightly loaded, but a 50 ohm filter or antenna system will load them down quite a bit. I measured the output of a 28.636 Mhz can with no load except the 10X scope probe and it was something like 5.4 volts peak to peak, with about 5.4 volts applied to the can. When I connected a 1K resistor from the output to ground, it dropped by a full volt. After running it through the low pass filter (with a modest amount of measured loss) and into a 50 ohm load, the output was down to 1.3V peak to peak, 0.65V peak, about 0.46 VRMS, for a booming 4.2 milliwatts!

VXO--NOT!

By the way, forget about VXO'ing these cans--the suckers do NOT move! You have no access to the internal circuitry, so you can't affect the frequency. I even tried lowering the supply voltage to see if it would move a bit; I forget how low it went before it ceased oscillation completely, but the frequency shift was barely perceptible by ear. If you still like the "neighborhood", you could build a VXO; inexpensive crystals are also available for all these frequencies.

AVAILABILITY

The latest Digi-Key catalog (Note 3) has a variety of oscillator cans, some as low as $3.25 and $3.30 in single quantity. Not all frequencies are available in every series so you might have to look around a bit, but all the frequencies mentioned above are in the catalog. The Epson SG-531 series has all 7. This series is in an "8 pin" DIP package, though it actually only has 4 pins. It also has what appears to be an "output enable" pin, which presumably must be tied high to enable the output.

SPECTRUM ANALYZER FUN

I checked my little rig on an HP model 8592A spectrum analyzer; I disconnected the filter and ran the oscillator output (28.636 MHz) directly into the 50 ohm input of the spectrum analyzer (through a 500 pF capacitor). As expected, the odd-order harmonics were stronger than the even ones, and it was pretty grim--while the second was down a respectable (and legal) 38 dB, the 3rd was only down 11 dB from the fundamental. The 5th was down by 17, 7th was 22 dB down, the 9th was 27 down, and it finally crossed the line into "FCC legal" at the 11th (!) harmonic, at 31.8 dB below the fundamental. That's about 315 MHz, by the way. Additional harmonics were visible before they petered out into the noise level--the 18th harmonic was the last one seen!

BETTER WITH THE FILTER

Next, I connected my 5 element low pass filter back up, and ran the output into the spectrum analyzer--things looked much better. The third harmonic was down by 35 dB, 5th was 43, 7th was 45, and the 9th harmonic was the last one visible before it petered out into the noise. I would have expected the harmonics to be much weaker, but the filter had relatively poor performance. Examination of the filter on an HP 8753C network analyzer showed that the response suffered a bit after the first few harmonics, had a lot of peaks and valleys, and the ultimate attenuation was only about 40 dB. This was probably due mostly to the construction method, which did not provide for proper separation of input and output.

SPECTRUM PICTURES

To get some idea of what you can expect with one for 160 or 80 meters I tested the 4.096 MHz can again, which is in the same region. Now this one was fun! The unloaded output was a good, respectable square wave with some ringing, with rise and fall times on the order of 3 or 4 nanoseconds--we'd expect some nasty harmonics, and I wasn't disappointed!

A perfect square wave consists of a fundamental and odd order harmonics, with no even harmonics, but we won't see that in the real world. Sure enough, this one had plenty of even harmonics, although they were weaker than the adjacent odds; the second was about 26 dB below the fundamental, but the third was only down by 10 dB. Succeeding odd harmonics slowly decreased in amplitude, and they finally dropped to the FCC-legal value of 30 dB below the carrier at the 17th harmonic! I saw harmonics approaching 500 MHz before they finally disappeared into the noise level. (That's well past the 100th harmonic.)

Figure 3 is a spectrum analyzer scan of 1 to 100 MHz, using the 4.096 MHz can. This is the unfiltered output, loaded by the 50 ohm input of an HP 3589A spectrum analyzer. Note that while the second harmonic is down a respectable 37 dB, the third is only down by 10 dB, falling far short of the FCC requirement. (That states that for powers under 5 watts, all spurious and harmonic energy must be at least 30 dB below the carrier. For powers over 5 watts, the figure is 40 dB.)

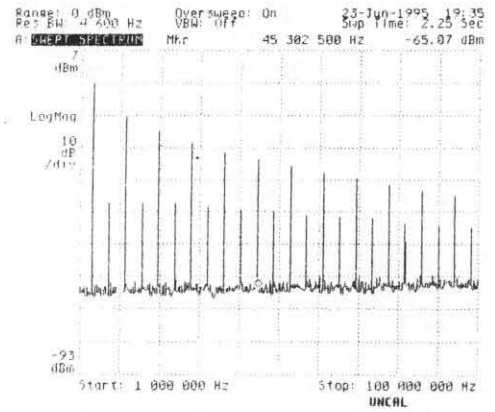


FIGURE 3

MAKING A FILTER FOR IT

I looked at the charts of normalized filters in my 1991 ARRL handbook and calculated the component values for a 5 element Chebyshev pi low pass filter with cutoff frequency of 4.3 MHz and pass band ripple of 0.1 dB--this should give a second harmonic attenuation of over 30 dB. I used my Boonton 260A Q meter to carefully match capacitors and prune toroid coils to come as close as possible to the calculated values. The results are in Figure 4, which is the output of the 4.096 MHz can after being filtered.

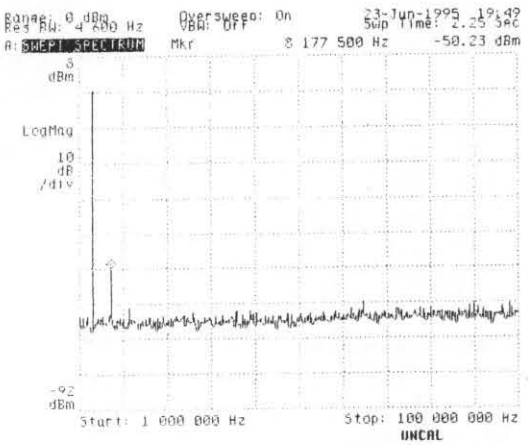


FIGURE 4

The improvement is dramatic, and now the signal meets the FCC specs by a considerable margin (50 dB below the carrier). With proper filter design and component selection you should be easily able to make one of these cans "street legal". You will get better performance with a 7 element filter, but even 5 elements will be entirely adequate. Use a capacitive input design--that's the one in Figure 5, with two coils and three capacitors--and a Chebyshev response.

You don't need to use the normalized filter charts, either; those give nonstandard capacitor values, requiring you to mix and match. Use the tables which give standard capacitor values, and select one with an appropriate cutoff frequency, somewhat above your frequency range. You will find several that are suitable; best harmonic attenuation will result from selecting the one with the highest passband ripple (as long as it doesn't much exceed 0.1 dB) or highest SWR. Results will be similar to the normalized filter. (More detailed info on filters is beyond the scope of this article, but will be covered in a future issue of the QRP Quarterly.)

The bottom line is that if you use one of these computer oscillator cans, regardless of frequency and whether the output is a square wave or approaches a sine wave, you will need to filter the output. Figure 5 shows the complete rig.

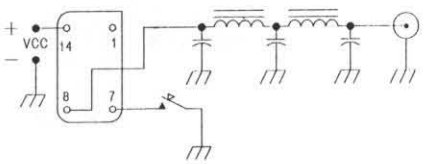


FIGURE 5

IN THE NUTSHELL ON THE BOTTOM LINE

These oscillator cans make neat little QRP rigs for serious QRP work, approaching the single digit milliwatts, and are available for a few frequencies on 160, 80, 20 and 10 meters. Widely available and inexpensive, they are very simple to hook up, very stable, but do require filtering on the output, especially on the lower frequencies, which have more of a square wave than the 10M version.

NOTES:

Note 1. To subscribe to the QRP mail reflector, send e-mail to listserv@lehigh.edu. In the text, say "SUBSCRIBE QRP-L [full name] [call sign]". Use your real name, not your e-mail address; it gets that from the header. For example, "SUBSCRIBE QRP-L Mike Czuhajewski WA8MCQ". After your request is processed you will automatically receive a welcoming message. Among other things, it gives instructions on how to receive the daily digest, which bundles all the days traffic into a single e-mail message.

Note 2. See "New World Miles-Per-Watt Record With The Fireball: 2.133 Billion", by Bill Brown, WB8ELK in the "Try Something New" column in the March 1992 issue of Radio Fun magazine (published by Wayne Green, W2NSD/1), reprinted by permission in the April 1993 issue of the QRP Quarterly.

Note 3. You can request a Digi-Key catalog by calling 1-800-DIGI-KEY (1-800-344-4539). They currently pay shipping and insurance charges to the US and Canada when check or money order accompanies the order; there is no minimum order, although there is an additional $5 service charge for orders under $25.

QRP BOOK REVIEW

LOW POWER COMMUNICATIONS, VOLUME III: QRP HARDWARE

By Rich Arland, K7YHA

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

Here's number three in the series, and another good one! Rich is the main author, as in Volume I, and writes on the hardware aspects of QRP--some of the kits and commercial QRP gear, accessories, antennas, etc. He also has a pair of articles written by "outsiders" on starting up local QRP clubs. The book is dedicated to AA4XX and KA3WTF, who set a new world miles-per-watt record for 40 meters in December, 1994, at 1.9 million MPW, a feat also described in his article in the September 1995 QST.

The chapter titles are Commercial QRP Transceivers; QRP Transceiver Kits; QRP Accessories; Other Accessories; Antenna Adventures; Buying and Trading Used Equipment; Organizing and Running a QRP Club; and Zen and The Art of QRP.

INTRODUCTION

In the introduction, Rich says this book actually started life as a chapter in Volume II, but after he hit 30 pages of text on rigs and accessories he realized Volume II was getting too large. The publisher liked the idea of a third volume, and gave their OK. As Rich says, "This book is an attempt to bring together some loose ends which were not covered in the previous two volumes. It examines new and used commercially manufactured equipment and kits applicable to the QRP communicator, along with a selection of useful accessories....Some readers may find my remarks highly biased. They are. I have used a box car full of QRP equipment in my amateur radio career and have developed some rather strong opinions...."

Rich started in QRP about the same time that I did, a few eons ago, but instead of taking a 16 year breather due to USAF service like I did, he took his rigs with him wherever he was assigned. He's used pretty much everything that's been in the QRP equipment world over the years, so he certainly has the credibility.

THE CHAPTERS

In Chapter 1, Rich gives the low-down on various commercial QRP rigs over the years. He starts out with the latest, the Index Labs QRP-Plus, followed by the TS-130V, the MFJ-9020, a variety of TenTecs, and a couple of Yaesus. He gives a lot of background on the various rigs, speaking from experience.

QRP transceiver kits are covered in Chapter 2, starting with the Heath HW-series, the K9AY rig from A&A Engineering, and the Tejas Backpacker II. S&S Engineering is well represented, with info on their ARK-40, ARK-4, and their newest TAC-1. The latter is a radical departure from their push button tuning, using a rotary knob instead, while still retaining the 100 Hz synthesized steps. Rich closes out the chapter with several pages devoted to "The NorCal-40 & NN1G 40-40 Phenomenon". These two little rigs have really taken the QRP world by storm in recent years, offering excellent superhet performance with relative simplicity.

Chapter 3 covers a few accessories of interest to QRPers. Rich covers one in each of the following categories--RF analyzer (Autek), keyer (CMOS Super), straight key (Bencher), coaxial switches (Alpha Delta), programmable counter/frequency display (S&S Engineering PC-1), power meter (Stockton from Kanga), and gel cell charger (Tejas RF Technologies). The next chapter covers some other types of accessories--portable lighting units, books, and software for contests, antennas and propagation.

WORTH THE PRICE TO ME

In Chapter 5, Rich dares to tackle a subject which is rather sensitive, at least on the QRP-L Internet QRP forum--"real QRPers don't use gain antennas". Titled "Antenna Adventures", I found these 12+ pages worth the price of admission by themselves. Although it's not exactly QRP, strictly speaking, he goes into excruciating detail, step by step, blow by blow, on the erection of his tower and beam. I think this is the first time I've read something on the subject so interesting, practical and "down in the dirt"; he points out all the little things that can go wrong and all those little details you don't normally anticipate. (And all that work and detail makes me glad I stick with wire antennas!)

"Buying and Trading Used Equipment" is the title of Chapter 6. It's short, but a good guide on the subject.

LET'S FORM A CLUB!

More good info worth the price of admission is found in Chapter 7, Organizing and Running a QRP Club. It consists of

articles written by KI6DS, Doug Hendricks of the NorCal group, and W1FMR, Jim Fitton of the QRP Club of New England. These are two hugely successful groups that started in recent years, quickly expanding outside their original areas, with excellent newsletters. These folks have done it and done it well, and tell all about it. And another article that should be added to the book if there is ever a second printing is one by KI6DS which was posted on the QRP-L mail reflector after the book went to press. In it, he gives a good rundown on putting out QRP kits as a club, pointing out some of the reasons why NorCal was so successful at it and why others might not have so much luck.

By the way, I do have to point out that the Maryland Milliwatts have been using a phrase for years that Doug uses on page 84; he describes one of their local meetings as a "QRP Show and Tell". Not that I'm demanding royalties or anything, but just wanted to remind everyone that we first used the term as early as the April 1989 issue of the QRP Quarterly, and many times after that. Just trying to protect our copyright :-) (And the use of the "emoticon" at the end of that sentence proves that I've been spending far too much time on the Internet instead of on the air! For the uninitiated, emoticons are characters formed from punctuation symbols and are used to attach emotions to printed text, which is otherwise rather sterile and could be misinterpreted. They are the equivalent of watching someones face and listening to the tone with which they say something. For instance, this one is a "smiley face". Just look at them sideways!)

NOT JUST CW AND SSB

Rich closes out with Chapter 8, Zen and the Art of QRP, where he goes into a little philosophy. Among other things, he warns us against two exclusionary practices which sometimes scare off would-be QRPers. Although speaking against these will be heresy and high treason to some, he does have good points. "While homebrewing gear does constitute a part of QRP, it is just a part, it's not the essence. The only reason that I did not include any construction projects in any of my books was so I could focus on the true essence of QRP, which is operating. While it is exemplary and highly desirable for the QRPer to experience the thrill of building and using homebrew equipment, it is not necessary to do so in order to become a True QRPer and enjoy the hobby.

"Nor is it necessary for the QRPer to embrace CW as the only mode of communications....During the last two years as QRP editor for Worldradio magazine [since taken over by KI6SN], I tried hard to get my readers to try other modes of operation....Letters arrived from long time QRPers stating that they had never tried any of the digital modes (RTTY, HF packet, AMTOR, etc) or satellite communications until they read my column and now they are hooked! Wonderful! If we are not diverse in our hobby we are doomed to extinction...." Or, as Rich said in the intro to Vol II, "QRP is no longer 'just CW and SSB done with low-power transmitters'. It is, in fact, full-blown amateur radio done at power levels below five watts output. All modes are open to the QRPer...."

ERRORS

Since I got my copy as a freebie but later sent Rich a check for it I don't have to point out all the nitpicking mistakes to maintain my credibility! Besides, after writing reviews for several years it's not fun anymore to write them all down. But just to keep my form up, here goes--

As usual, a few small ones crept in, but nothing really worth mentioning. Some are names, addresses, etc which have changed over time, which is inevitable; for example, the late W5HKA is listed as US liaison for the GQRP club, and the old host location for the Internet QRP forum (QRP-L) is given--it changed after the book was on the streets. Not much that can be done about things like that except have the publisher print up errata sheets to stuff in the books on the shelf, which in turn become outdated themselves in short order! One of the more interesting errors is Rich (or the typesetter) getting my callsign wrong on page 36, but spelling my name correctly--it's usually the other way around!

IN THE NUTSHELL ON THE BOTTOM LINE

Another good QRP book by Rich. His purpose in all 3 was to avoid the homebrewing and technical areas, which are heavily represented in the QRP press, and concentrate on the other side for a change. As usual, he does it well--the voice of long QRP experience speaks again, with lots of good, practical info on the hardware side of our sub-hobby.

AVAILABILITY

All three K7YHA QRP books are available from the author. The following info was pulled off the QRP-L Internet mail reflector in late August: Vol I, Basic QRP and Vol III, QRP Hardware are $13.50 each including book rate postage. Vol II, Advanced QRP Operating, is $17.00 including book rate postage. All three volumes: $40 plus $4 priority mail anywhere in the US.

Checks/Money Orders (in US funds, ONLY) to:
Rich Arland
PO Box 1782
Shavertown, PA 18708

All three Arland QRP books should also be available from the publisher, Tiare Publications, P O Box 493, Lake Geneva, WI 53147. (The prices above only apply to orders direct from the author; list prices are higher and do not include shipping.)

--qrp--

How Far is it?
or
Great Circle Distance calculations via the Internet

by Chuck Adams, K5FO
adams@chuck.dallas.sgi.com

For a long time, people have known that the world is round. Not exactly spherical, but close enough. I did a posting over one year ago to rec.amateur.misc in response to someone else's posting about accounting for the non-spherical geometry and I assure you that it isn't worth going the "extra mile". :-)

Anyway, back on track.

Let's see how you go about getting distance. I posted previously info about the geographical server, **GEO@T5L.ADP.WISC.EDU**, and sending message to same with name of town followed by state in subject line. **Nothing in the body of the message**. Later, and it is pretty quick, you will get back a message with something like the following (and I use Dallas, TX and San Carlos, CA as examples here).

For Dallas I get:

City: Dallas
County: 48085 Collin
State/Province: TX Texas
Nation: US United States
Feature: 45 Populated place
Postal Code(s): 75200

City: Dallas
County: 48113 Dallas
State/Province: TX Texas
Nation: US United States
Remark: county seat
Feature: 45 Populated place
Lat/Long: 32 47 00 N 96 48 00 W
Population (1980): 904078
Elevation: 463

(Editors Note: Some Zip Codes have been removed for clarity)

Postal Code(s): 75201 75202 ..... 75209 75210
Postal Code(s): 75212 75214 ..... 75221 75222
Postal Code(s): 75224 75225 ..... 75232 75233
Postal Code(s): 75235 75236 ..... 75243 75244
Postal Code(s): 75246 75247 ..... 75258 75260
Postal Code(s): 75262 75263 ..... 75284 75285
Postal Code(s): 75287 75295 ..... 75346 75350
Postal Code(s): 75354 75355 ..... 75371 75373
Postal Code(s): 75376 75378 ..... 75389 75390
Postal Code(s): 75392 75393 75396 75397 75398

and for San Carlos I get:

City: San Carlos
County: 06081 San Mateo
State/Province: CA California
Nation: US United States
Feature: 45 Populated place
Lat/Long: 37 29 47 N 122 15 27 W
Postal Code(s): 94070

City: San Carlos
County: 06081 San Mateo
State/Province: CA California
Nation: US United States
Feature: 45 Populated place
Lat/Long: 37 30 26 N 122 15 34 W
Elevation: 76
Postal Code(s): 94070

I'm interested in the Lat/Long data, so I need to convert it to a form of dd.mmNdd.mmW and this is true of everything in the USofA. For DX, you have to find some other source of data. The format will become obvious later in this posting. dd is degrees and mm is minutes. You can add the seconds into the minutes by dividing the seconds by 60 and adding.

For Dallas we get one Lat/Long and this converts into 32.4700N96.4800W. For San Carlos we get two Lat/Long and I assume that one is for the geographical center and the other for the courthouse, but I'll do both to illustrate a point: 37.2978N122.1512W and 37.3043N122.1557W, showing that the difference is only past the second decimal place in the minutes (watch it gang, I'm right here, 'cuz the decimal point above separates degrees from minutes). OK, now we have both points on the globe that we need.

For the newbies to spherical geometry: if you look at the typical map, you'll see that **N6KR, Wayne Burdick**, who's QTH I used above and I are pretty close to being at the same Latitude. It looks like his heading is about 270 degrees, i.e. due West of me, but BZZZZTTT, wrong answer due to the spherical geometry involved. No big deal, as in no way am I going out to rotate the 80M long wire to get it exact.

NOTE: You can do the extra places in mm position of the format. So, when I divide 47 by 60 and get 0.78, I just append this to the 29 and get 2978 after the decimal point, thus the 37.2978N.

There is a program called gc.c which I have put on **FTP.LEHIGH.EDU** under **pub/listserv/qrp-l/tools**. This program was written by **S.R. Sampson, N5OWK**, in November 1989 and I added a mod to output miles and km, since the

original program only output the distance in nautical miles. The instructions are in the heading of the program, which obviously is written in C.

You can run the program remotely, thanks to Jim Eshleman for setting this up, by sending email to **LISTSERV@LEHIGH.EDU** with first line of body of message

RUN QRP-L X gc 32.4700N96.4800W 37.2978N122.1512W
and you will get back

Output from stdout:

Bearing is 290 Degrees for 1276 Nautical Miles = 1469 Miles = 2364 Km

and for
RUN QRP-L X gc 32.4700N96.4800W 37.3043N122.1557W
we get

Bearing is 290 Degrees for 1277 Nautical Miles = 1469 Miles = 2364 Km

and you can see that the small difference in Lat/Long doesn't effect the result all that much.

For the newbies to spherical geometry: if you look at the typical map, you'll see that **N6KR**, **Wayne Burdick**, who's QTH I used above and I are pretty close to being at the same Latitude. It looks like his heading is about 270 degrees, i.e. due West of me, but BZZZZTTT, wrong answer due to the spherical geometry involved. No big deal, as in no way am I going out to rotate the 80M long wire to get it exact. :-) :-)

I worked N6KR with 950 milliWatts, thus my Miles/Watt rating is 1,469Mi/0.95W = 1,546 Miles/Watt. This was for a NorCal 40a to NorCal 40a contact posted previously. Just to stop the discussion before it starts: 1. we don't account for the number of hops and the additional distance the signal really really traveled in 3D space and 2. we don't do long path.

Note: you don't have to do the commands to listserv in upper case. Also, please use the correct address and don't post requests to this list. :-) It does make a difference whether something goes to listserv or qrp-l. But you knew that.

OK, for the programming "staff" of qrp-l. You wanna automate the following, **1**. Send email to callsign server and get back FCC info **2**. Take FCC QTH and send email to geo and get lat/long **3**. Convert lat/long to proper format **4**. Do same for senders call **5**. Return results with both calls and the distances.

Piece of cake, I'm sure. :-)

YET ANOTHER SIMPLE MARKER GENERATOR

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Marker generators, also known as crystal calibrators, are a handy tool to have around a workbench. Use a marker to check band edges, calibrate a dial, or as an impromptu signal generator. A generator is a good beginner's project. The components are inexpensive and the digital signals are perhaps more forgiving than analog RF.

My introduction to marker generator design was the generator in the 1993 _ARRL Handbook_. The design you see here is an improved version of the _Handbook_ generator. The new version uses fewer chips and lower power consumption.

The generator signal flow starts with an 4 MHz crystal oscillator. The oscillator design shown, which comes verbatim from the _Handbook_, will work fine. To miniaturize, replace the 7400 and its support components with a 4 MHz microprocessor oscillator can. Either one will work well. I do not know which will be more accurate in the long run.

The 4 MHz signal clocks a 74LS93 4-bit binary counter. The divide-by-4, -8, and -16 outputs from the counter go to switch S1B, to allow the user to select a marker spacing. Since these signals are still 10 times the frequency needed, the wiper of S1B is connected to a 74LS90 counter. The 74LS90 is configured as a bi-quinary frequency divider, generating a square wave at one-tenth its input frequency.

An 18 pF capacitor couples the 74LS90 output to a BNC jack, making the marker generator ready to go to work. The value of the output coupling capacitor is not very critical. The _Handbook_ used 20 pF. I used 18 pF because that was what I found in my junk box.

The 5V power supply uses the 78L05 and has no tricks. One section of S1 serves as the power switch. The 10 uF tantalum decoupling capacitors are overkill, but they were in my junk box. I threw in liberal power-supply decoupling at each chip. C2, C3, and C4 do the job, each situated as near as possible to its chip's power supply pins. This much decoupling is overkill. So simple a circuit would probably operate acceptably with only one of these capacitors.

Construction is not critical. I used wire wrap construction, a common technique for digital circuits. Point-to-point wiring or a PC board would work just as well. It's always wise to keep the signal lines short.

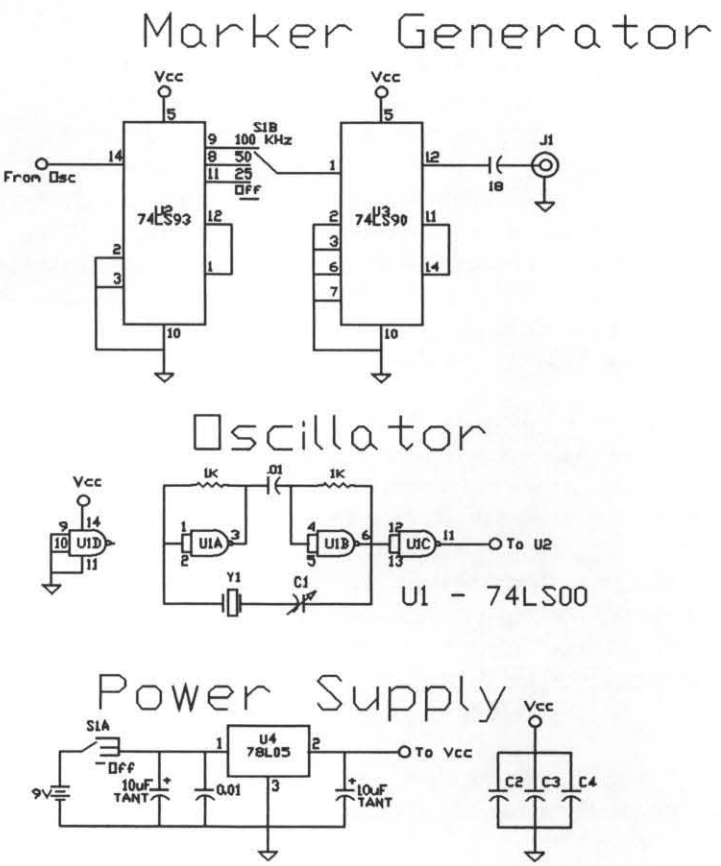
Tuning the oscillator is simple. The best way is probably to connect a frequency counter at the generator output and adjust C1 until the frequency is right. I used a receiver with digital readout for rough adjustment, then zero-beat the generator against WWV.

I've checked the generator's harmonics to 28 MHz. It might be usable into the VHF range. I don't have the equipment to check its stability. Odd harmonics are much stronger than even harmonics, but not so much as to be a problem. I haven't managed to get it to use up a battery yet, so I can only say that batteries last for many hours of use!

A further improvement would be to switch to 74HC logic for lower power consumption. Using an oscillator can would reduce size, but might sacrifice accuracy. A calibrator with both might be a good match for a tiny, portable, battery-powered rig.

Parts list for Marker Generator

U1	74LS00
U2	74LS93
U3	74LS90
U4	78L05
R1, R2	1K
C1, C5, C7	0.01 uF
C2	5-60 pF variable
C3	20 pF
C4, C6	10 uF tantalum
C8, C9, C10	0.1 uF
Y1	4 MHz crystal
S1	2 pole, 4 position rotary switch
BAT	9V battery
	or any 8V-12V power supply



ANTENNA MASTS FOR THE QRPer

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San Antonio, Texas 78428

Having seen the many ways that QRPers improvise with equipment and operating techniques, I thought I'd take the opportunity to pass on some of the ideas I've put to use with antenna masts. Having operated from three continents with some degree of success, I've formed some opinions on what works and what doesn't. While my discussion is limited to particular mast designs, I hope this article will stimulate more ideas on the subject.

My experience has led me to believe that a double zepp antenna in an inverted V fashion is probably the simplest, and most effective antenna to put up. The real advantage of this antenna is that you only need one mast and the antenna itself can help serve to guy the mast. It is this antenna design that I will focus on in this article.

The ideal mast for any antenna would be strong, lightweight, electrically transparent, aesthetically pleasing, and inexpensive. When considering materials, one should consider not only the strength of the material, but also the wind load. Obviously a six-inch diameter metal mast will be very strong, but it will also require some pretty hefty guy wires, or it will have to be set in several cubic yards of concrete to withstand even light winds. On the other hand, thin wall conduit that is a half inch in diameter will have little windload, but is likely to buckle if you try to hang anything heavy from it.

What materials, then, will make a good mast? My experience has been that standard one and a half inch diameter TV mast material is good to about thirty feet with minimal guying. I've used a telescoping mast using thin wall conduit, with the bottom section one inch in diameter tapering to one half inch at the top section, up to thirty to support a pair of lightweight inverted V's (at right angles to each other) that were fed with RG-58. By attaching the coax to the mast at regular intervals using cable ties, I decreased the stress on the mast and the system survived several 60 mph windstorms.

My search for greater feedline efficiency led me to replace my coax with open feeders. This also created a new set of problems. since a metal mast can affect the feedline, I had to find a way to keep the feedline away from the mast. I've found that inexpensive shelf brackets work great to space the feedline away from the mast, and if you place a pulley between the top and bottom brackets, you can quickly and easily raise your antenna. Unfortunately, this additional plumbing increases the wind load on the mast, and can also stress the mast and cause it to bow.

After further examining the situation, I felt that I could decrease the windload and the potential for bowing (while also improving the appearance) if I could somehow put the feedline inside of the mast. I found two ways to do this without adversely affecting the proper operation of the feedline -- either use a shielded balanced feedline inside a metal mast, or use a non-metallic mast with normal open feeders inside the mast.

I first tried using a shielded twinlead, but it seemed to be quite lossy. I considered using two runs of coax as a balanced feed system, but felt it would be bulky, heavy and hard to work with. That seemed to leave me with one alternative.

When looking at possible non-metallic materials to use, PVC pipe seemed to be a potential solution, but it just was not strong enough to support its own weight at heights above about 20 feet. I remembered reading that the strongest material for its weight was not aluminum or steel, but wood. This inspired me to also experiment with wooden masts.

I tried putting together a 30 foot mast using four pieces of 1 inch by 2 inch furring strips. with guys at the half way point, it proved to be as strong and stable as my 30 feet of steel TV mast, while being considerably lighter. I could attach my feedline against the mast with little concern for losses. with a coat of all-weather varnish, the mast had the potential to last for some time.

The only difficulty with the wooden mast was that it looked somewhat unkempt. I didn't want to attach the feedline up against the wood because it might trap moisture and cause losses. As a result, my feedline dangled next to the mast and blew around and twisted about the mast. My thoughts again went back to the PVC pipe. If I could strengthen it by putting a wooden reinforcement inside of it, it would have the strength of wood, while concealing my feedline inside!

I found three 3 meter sections and one 2 meter section of black, flanged PVC at a local hardware store at a total cost of less than $20.00. The diameter was about two and a half inches,and one by two furring strips fit inside snugly. I spliced 32 feet of furring strips together using screws and my glue gun. I glued the PVC sections together using PVC glue. I laid the feedline along the furring strip, put a few cable ties on it to hold it in place, and then slid the whole thing inside the PVC tubing.

I put a PVC cap on top of the mast, and made two holes for the dipole wires to stick out of. (See Figure 1) It has worked well, looks good, and only requires one set of guy wires at the 20 foot level. One of the hidden advantages is that the tuner setting change very little with changes in weather, since a good portion of my feedline now stays dry.

Incidentally, I've had very good success using nonmetallic plastic-coated nylon clothesline as guy ropes. Being nonmetallic, this material doesn't affect the operation of the feedline or the antenna, and also won't shrink or stretch like regular nylon rope will.

A few words of caution are in order. First of all, the furring strips used should be free of knots and imperfections, as that will ensure maximum strength. Secondly, some types of PVC may not stand up well in weather, so it may be necessary to put a coat of clear Krylon or something similar on the pipe to retard the weathering process.

The next step in the evolution of the perfect mast? when I get back to the states, I plan to experiment with an "ultralight" thin-wall PVC mast. I'd like to try to embed the feedline inside the mast and strengthen the whole thing by filling the hollow mast with liquid Styrofoam and letting it harden. I think that a very strong 40 foot mast could be built utilizing this technique. If you have any thoughts on this subject, I'd be anxious to hear from you. In the meantime, good luck and good QRPing!□

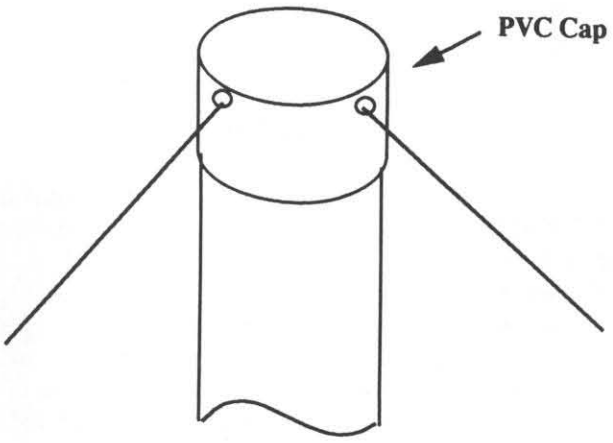

Figure 1

A HANDY HUNTING TOOL

Dave Peterson KD9IG
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(Not all QRPers spend all of their time chasing DX. Here is a QRP project to help you in a hidden transmitter hunt contest. The concept of the offset mixer was published in QST of November 1992 by PA0ZR and republished in the 1995 ARRL Handbook. The design published below is Dave's original. The original PA0ZR design didn't use a double balanced mixer and as a result it would "re-radiate" the received signal if strong enough offset by the crystal frequency. This design should reduce that effect by about 20 dB. -WB6TPU)

Hunting a transmitter is particularly difficult as one gets so close to the transmitter that signal is strong enough to saturate the receiver, even with no antenna on the radio. Over the years, I have tried various metal boxes and other shielding techniques which proved cumbersome and inconvenient.

Here is a technique which has proven extremely useful in close-in hunts: A simple offset mixer (the idea is not mine but this implementation is,) eliminates the need for fancy shielded boxes and attenuators, yet allows hunting right up to the transmitter.

Theory of Operation:

Generate a signal at few MHz (4 MHz in this case) to drive a mixer. By varying the local oscillator (LO) injection level to the mixer over a very wide range (here almost 90 dB) one can vary the level of the mixture products over an equally wide range. By tuning the receiver off of the transmitter frequency by the offset, the receiver is almost completely immune to any signal coming directly from the transmitter and only hears what is coming out of the mixer. At maximum injection, the conversion loss through the mixer is only about 6 dB so the unit can be used almost from the start of the hunt. As one approaches the transmitter, the mixer LO injection can be decreased to keep the signal strength at the receiver within a reasonable range. A standard directional antenna can be used even for the last few feet.

Advantages:

1) It is much easier to attenuate the few MHz used as the LO than a VHF or UHF signal. Tests have shown this unit can reduce the received signal to squelch level even just a few steps away from a 5 watt transmitter.

2) Additional reduction of the received signal can be achieved by tuning off of the transmitter frequency by multiples of the offset oscillator frequency.

3) No special modification of the receiver is required. No cumbersome shielding boxes are needed.

4) The unit is compact and easily portable.

Disadvantages:

1) One needs a receiver which can be tuned a few MHz away from the hunt frequency. (This does not seem to be a big

problem with synthesized radios.)

2) There is no rejection of the mixer image products so one must carefully pick the offset direction to avoid confusion from other radio services.

Construction:

The unit I built consists of a 4 MHz computer crystal, a CMOS 4049 hex inverting buffer powered by a 9 volt battery (and an on/off switch), a 5 kOhm pot with a nice knob, a DPDT switch wired as a 50 Ohm 30 dB Pi pad, a Mini-Circuits mixer and two BNC connectors all in a small box The crystal and a section of the inverter are wired as an oscillator. Each end of the crystal has a 20 pF cap to ground. The output of the inverter (call it U1a) has a 1.2 kOhm resistor to one end of the crystal. The other end of the crystal connects to the input of that inverter gate (U1a). There is also a 10 MegOhm resistor connected from the output to the input of that gate (U1a). The output of U1a is connected to the input of another section of the inverter (U1b) which buffers the oscillator. The output of U1b is coupled through a capacitor (0.22 uF or so) to one end of the 5 K pot. The other end of the pot is grounded and the wiper goes to the common on one side of the DPDT switch. The switch is wired so in one position the signal is connected straight through, in the other position it connects to a Pi pad consisting of 51 Ohm resistors to ground with a 1.6 kOhm resistor in the series leg. The common on the other side of the switch then goes to the LO input of the mixer which has a 51 Ohm termination resistor to ground. BNCs are connected to the RF and IF ports of the mixer.

Operation:

Connect the coax from your directional hunting antenna to one BNC on the mixer unit. Connect your receiver to the other BNC. Turn on the mixer unit and adjust the pot and switch for maximum LO injection. Tune the receiver to the hunt frequency plus or minus the crystal offset frequency. For example, if the fox is on 146.52 MHz and you are using a standard 4 MHz crystal in the mixer unit, you should tune to 150.52 MHz or 142.52 MHz. As you approach the transmitter simply turn down the LO injection on the mixer box to keep the signal level in a reasonable range. Happy Hunting!

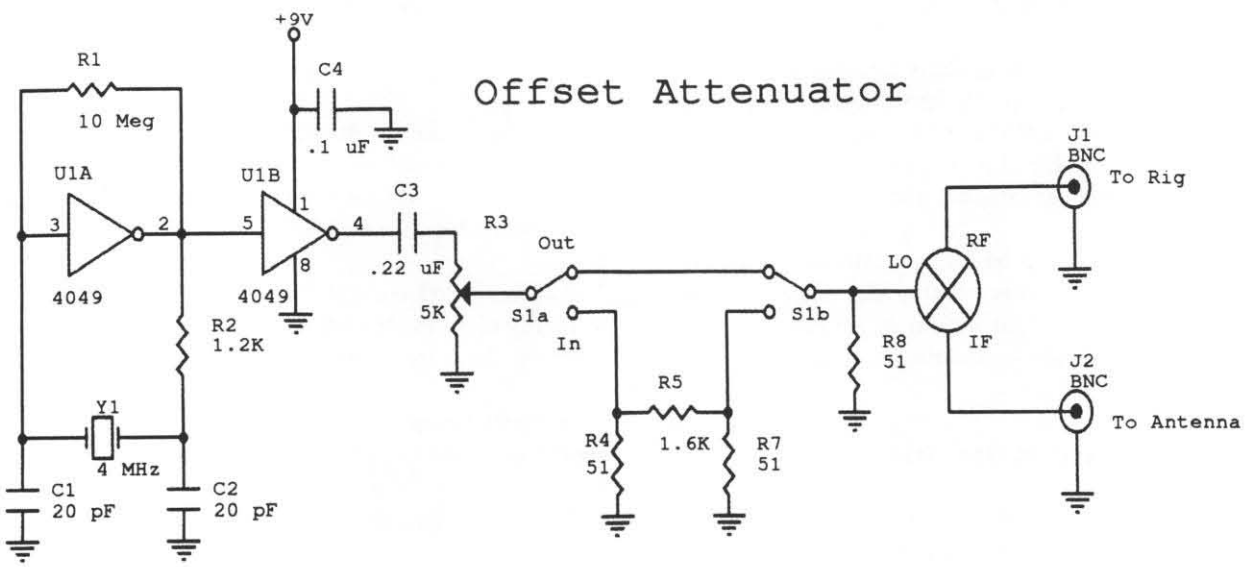
Comments:

I have used my mixer unit with great success on both VHF and UHF. By selecting the proper mixer, one should be able to use this unit over a wide range of frequencies, from HF to UHF and beyond. The selection of the crystal frequency is up to you. Just remember, you will need to offset the receiver by that amount so it might be easiest to pick a frequency which is a multiple of 1 MHz. One could use a color-burst crystal but I can't subtract 3.579545 MHz from 146.520 MHz without taking my eyes off of the road.

I hope you will find the offset mixer a valuable tool in your fox-hunting kit.

73,
Dave Peterson, KD9IG

My apologies for not being able to remember the source of this idea, but whomever it is, Thanks!



QRP WISDOM FROM UNCLE BRUCE

QRP, REALLY!

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ANSWERING YOUR OWN QUESTIONS

Way back when I started writing these epistles I did a piece on answering your own questions. I also did a piece on putting together your own resource library. But lately, small birds have been hanging around, whispering in my ears that some of you didn't get the message. Answering your own questions is the best way to learn about this wonderful hobby we share. No one can answer your questions like you. I know, you thought it was my job, didn't you? Or maybe it was someone else's job, right? Anybody but yours.

Not so, my friend, not so. You're the only one who knows when your question has been answered. I can't read your mind, and neither can anyone else. Only you --sounds like a good song title -- can say when the question has been answered and if you understand the answer.

There was a good reason why I gave you that list of recommended references -- many years ago, back in the days when electrons were made from stone, I was a college student. My professors were very smart men -- they knew I'd never remember all the formulas, laws, and other stuff they were trying to stuff into an already crowded head. So they taught me a methodology for answering questions, and pointed me at the library for the reference books I'd need. Smart, huh? Hey, it worked. Like it says in the "good book", they didn't hand me a fish, they taught me how to fish.

What I want to do is pass that skill along to you. A few columns back I think I said I'd help you learn to fish. If I didn't say that, I'm sorry, because I meant to. So, go and get your fishing pole and we'll get started.

QUESTIONS

Let's look at a question I recently saw on the Internet. A gentleman posted a note that the three band QRP transceiver in the Handbook looked just like what he wanted. But, instead of building it for 18, 21, and 24 MHz, he wanted to put on the lower bands. The Handbook implied that it should be pretty easy to put the thing on the lower bands -- his question was "How do I do that?"

Seem like a reasonable question? Yes and no. A quick look at the Handbook showed the fellow hadn't really understood the construction article, because if he had, he'd have discovered the rig used a direct direct conversion receiver and a single VFO that controlled both the transmit and receive frequencies. Changing the rig's operating frequency is as simple as changing the VFO tank circuit, the receiver input circuit, and the transmitter output filter. So, you say, maybe he doesn't know that much about how the rig works. My point exactly! What's he going to do after he's built it AND it doesn't work? All the Internet postings in the world won't help.

OK, I've blabbed it all over the place, and I apologize to the gentleman in question if he is reading this. Ordinarily I don't name names or point fingers, but it is such a perfect example of one area where improvement is needed that I couldn't resist using it.

We QRPers are blessed to have some of the finest technical talent in the RF world in our camp. Look at the legends in our "QRP designers hall of fame" -- Dave Benson, Gary Breed, Wayne Burdick, Doug DeMaw, Wes Hayward, Zack Lau, Rick Littlefield, Bruce Williams, Dick Witzke, Dick Szakonyi. Any one of these guys could have invented radio by themselves -- any one of them could be the next Art Collins. But, just because they share our love of QRP we shouldn't expect them to answer our every trivial design question. If you're going to visit the oracle it is only polite to not abuse the privilege.

AN EXAMPLE

Phew, got that part off my chest. Now let's look at how to really ask for help. Using our example problem, what could our prospective builder have done? First he could have carefully read the article and worked out for himself how the rig worked. Yes, I know, there all those lines and other dumb looking things on the page, and how's a fella to get through all that? Well, every radio I've ever worked with shared one feature in common with its brethren -- SIGNAL FLOW. In general, the signal enters the radio at the antenna, wanders through the receiver, passing through mixers and amplifiers and detectors until the receiver tires of the fun and spits it up at the speaker or headphones.

All of the major design types have well defined signal flows -- in the superhet it's RF amp to first mixer to IF amp to second mixer (detector) to audio. In a DC receiver it's RF amp (if any) to mixer (detector) to audio. It's not difficult to classify the circuit as a particular type. CW transmitters all share pretty much the same signal flow --oscillator to buffer to final to antenna. Phone type transmitters are somewhat different, but still are easily classified.

Having decided for himself the radio in question uses direct conversion technology, our prospective builder could then turn to the appropriate section of the Handbook and read up on how DC receivers work. One of the first things he'll learn is that the VFO operates at the receive frequency, or pretty close. From there it is not a major leap of faith to go

back to the construction article to see how the designer (one of my hall of famers, by the way) handled the frequency determination. Now, what's involved in moving this little devil from 21 MHz to 7 MHz? Calculating values for the coils and capacitors in the receiver front end, the VFO tank, and the output filter. And, if our prospective builder had spent enough time just looking through the Handbook he'd have found designs (or design examples) already in there with the necessary values (or, at least starting values) already calculated for him!

But what if he doesn't own a Handbook? Well he should, but I'll admit the $30.00 purchase price will also buy a lot of the parts for his new radio, so I'll just say his local phone book will tell him where the nearest public library is located. If they don't have a copy of the Radio Amateur's Handbook, they surely can borrow one from a larger library.

All right, that out of the way, let's take a moment and see what doing some basic research has done for our prospective builder. First, it will give him a reasonable understanding of how his rig works at a system level. He knows what frequencies to expect and where; he knows what each transistor, integrated circuit, and coil and capacitor combination performs. Warm fuzzy feelings aside, so what? So, what if it doesn't work the first time he applies power -- he'll know enough to at least enough to start troubleshooting. He may not have the best test bench in the world, but he can at least describe the symptoms of his problem more explicitly than some failure tags we used to get on failed items for repair from the airlines, "Inoperative". Also, if he does have questions to ask of one of our oracles of our hobby he'll also be far more able to understand the answers.

Now I know I just shot a couple of pages talking about something that none of you do. I know you're all at least as technically competent as any of our resident gurus, aren't you? So, when can I expect to see your latest design in these pages? Do us all a favor, buy one or two basic books, and read them. Learn to ask intelligent questions, ignore the folklore, and perhaps we will see your latest here one day.

A CHEAP 3 DB (or... "to work weak signals or not to work weak signals")

One of the more or less raging controversies in QRP these days is whether you should only work the strong stations, or try to work the the weak ones too. I admit to recommending that beginners start out with with the strong signals first so they'll gain confidence in themselves and their stations more rapidly. But, what about the weak ones -- at just what point should you stop trying to work them?

An admission -- my usual operating technique in contests is to tune from one end of the band to the other working the strongest signals I hear. I then repeat the process with the next weaker tier of signals. I continue doing this until I've worked everyone that can hear me. Then I go party until the last hour or so of the contest when I return to the radio and repeat the process all over to catch anyone who was impolite enough to be on some other band while I was looking. It's worked for me for many years. But again, what about the beginner?

The reason my technique works so well for me is I have developed a sort of second sense of just how weak a signal I can reliably expect to work. How did I do that? It wasn't substance abuse, it was a lot of operating time. It was a lot of stations called, and called, and called, and... well, you get the idea.

You all know I'm a proponent of putting up the best antenna your circumstances permit. I will probably always believe that a better antenna is the best improvement you can make to your station (well, maybe, except for the linear under the desk). But once you've refined your antenna as much as you're allowed, or can afford, then what?

A new receiver? Good plan; that'll let you hear those weak ones better. But it'll also bring along a whole new bunch of weak ones. After you've improved your station as much as you can, there is only one place you can look for more help -- between your ears! Yep, that old "embedded computer" -- the one between your ears.

BIOLOGICAL SIGNAL PROCESSING

That little signal processor in your head will outperform any reasonable combination of receiver sensitivity, filtering, and digital signal processing. It's how the old-time telegraphers were able to send and receive messages while eating lunch AND reading the paper! But you've got to train it to help you.

How do you train it? PRACTICE. Make as many QSOs as you can. Get in contests, where you have to fight to hear and understand the other guy's signal. Make the little bugger work for its supper. You'll be surprised at how quickly you gain operating proficiency. One Saturday afternoon in 1978 I entered my first serious contest. I was just going to see if I could determine the scope of my new station's performance. But I kept on entering contests regularly, two and three each month, for the next three years. Had I become more proficient? You bet. I couldn't read the newspaper while I was operating, but I got the calls and the exchanges in the log on the first go around, even if they were RST 239. OK, everyone knows a contest is good for at least a 6 DB improvement in your signal, but if you work at it, your improved operating skills may mean as much as 3 DB the rest of the time!

ENOUGH

Enough for now. I would sincerely like to see some of you make some progress on answering your own questions. I think QRP offers the most promise of any area in amateur radio today to bring fun and excitement back to our hobby. You're lucky to be part of this fascinating hobby and even luckier to be on its only cutting edge. You owe the hobby something in return, and learning to answer your own questions is one of the first steps!

To all of you who sent me congratulations on my recent QST article, thank you.

--QRP--

The RST Standard of Reporting

by L. B. Cebik, W4RNL
QRP ARCI #2572

The RST (Readability-Strength-Tone) system of reporting with which we are all familiar (or are we?) goes back to 1934. The S-meter name was derived from the S in RST. Before (and for some time after) that, receiver meters were sometimes called R-meters (and sometimes just "signal" meters) and terminated at either 5 or 9. The difference in the 2 scales results directly from the change brought about in the standard RST report system between 1934 and 1936. These vacuum-tube voltmeters were used as much to align the receiver as to determine the strength of incoming signals.

Most S-meters were and are still a derivative function of AGC (called AVC by many in those days) and thus cannot exactly parallel the RST system. Few S-meter circuits are able to meet the proposed standard of S9=50 microvolts, with each S-unit equaling a 6 dB reduction from that level. The more signal processing we insert before the detection of a voltage roughly corresponding to signal strength, the more troubles we encounter with the accuracy of the system. Moreover, receiver gain distribution tends to vary from band to band (which is why QST product reviews rate sensitivity on various bands). Hence, the standard proposed in the early 1940s was never adopted by manufacturers, even though S-meters are given printed scales as if the system were universal.

Between S1 and S9, a well-calibrated meter can provide a reasonable indication of signal strength that parallels the original RST system. In contrast, S9+40 is a sort of meaningless extra in conversation relative to the system. It is extraneous precision for the term "extremely strong signals" on an electronic system (the receiver) that has been shown time and time again to be quite imprecise. Hence, S9+40 is almost the SSB equivalent of Dave's World talk--and of a world where the thing rules the operator rather than the operator ruling the thing (the meter).

"In contrast, S9+40 is a sort of meaningless extra in conversation relative to the system. It is extraneous precision for the term "extremely strong signals" on an electronic system (the receiver) that has been shown time and time again to be quite imprecise. Hence, S9+40 is almost the SSB equivalent of Dave's World talk--and of a world where the thing rules the operator rather than the operator ruling the thing (the meter)."

The only way for the meter to be precisely in tune with the RST reporting system at the low end is to have S1 as the left needle rest marking. Then, you give S1 if you can hear the non-needle mover and give nothing if you cannot hear him. If S1 equals a certain number of microvolts of signal strength, the needle does not move until there is that number +1 (or +.001, etc.). Everything else that is lower is still S1. Or it is silence, since a person cannot give a report to a station he does not hear (nets and contests not included). This means of meter calibration would make the meter again partially track the RST standard.

If we turn the question around and require that the reporting system parallel the action of meters, then we need a new standard by which to report. The RST system of reporting is a standard and was developed to be a standard. It is not and was never intended to be a large collection of individual interpretations and inventions. Rather, it is a standard agreed upon and promulgated to everyone for standard use, in essence, an ITU standard paralleling all those used in physics and electronics that have been agreed upon by recognized bodies representative of all users.

Until a new standard exists, the current standard places the RST system ahead of meter readings and "S" runs from 1 to 9. Those who insist upon putting their own revisions into practice--however widespread--only create confusion--like inventing a new set of meanings for voltage, current, and resistance such that E=2IR: quite possible, but confusing to casual readers.

The following notes may form some historical background to my comments concerning RST as a standard.

In the 1930 ARRL Handbook, there is no mention of RST. Rather, the standard log page shows reference to QSA (Strength of signals on a scale of 1 to 5) and tone, given as a set of remarks (pp. 195-96). An alternative to the word "tone" was QRI? ("Is my tone bad?" as if the expected reply would be "yes.") Q-signals were the universal means of conveying complex questions and information quickly in early radio, augmented by the Phillips code, Navy signals, and a few other sources.

The 1936 ARRL Handbook (the next in my collection) reports (p. 323) that the basic version of the modern (?) RST system was proposed in 1934 by W2BSR. The original system used a 559 scale to preserve the QSA range. "T" was very detailed, since the achievement of a "Purest d.c. note" was a function of many factors, including poor or nonexistent power supply filtration and what was then known as musical modulation and whistle.

"Some time later," W2BSR made a second proposal to expand the strength scale to 1 to 9 to accommodate finer gradations of perceived signal strength. (This step must have occurred either late in 1934 or early in 1935, since the copyright date of the '36 Handbook is October, 1935.) In 1936, an RST

followed by "X" for the appearance of crystal control (for frequency stability) already existed, but no mention of "K" for key clicks is given. The 1947 Handbook adds "C" for chirp (p. 466), while retaining the 1936 meaning for the T-numbers. By 1952 the "K" appears, but the RST system has become such a standard part of amateur operations, that the editors moved the chart to the "Miscellaneous Data" chapter without any accompanying textual comment (p. 547).

To receive a report in 1936, one sent "RST?" or "QRK?" ("Are you receiving me well?") RST was an evolving standard and reports were not yet sent by everyone as part of the first exchange. The '36 Handbook refers to the RST system as "the present standard recommended for your use" (p. 323).

Between 1936 and 1995, the meanings of the 5 R-numbers and the 9 S-numbers has not changed. Sometime between 1970 and 1978 (the space between Handbooks in my collection), the T-numbers took on their current meanings. The T-scale was altered in wording to reflect changing problems in achieving pure CW. In the 30s, T represented what the ham constructor had achieved. In modern times, it largely indicates a malfunction of some stage in a transmitter. T-6 now means "Filtered tone, definite trace of ripple modulation." Between 1934 and the early 70s, it was interpreted as "Modulated note, slight trace of whistle." See the accompanying table for further details on "T" and a reminder of the meanings of the rest of the numbers.

Does the RST standard system of reporting need change? Perhaps "R" is not to be changed, since it represents a measure of readability to the receiving operator. Is "S" a strict measure (a standardized meter reading), a relative measure (based on how signals sound compared to each other on a given occasion with given band conditions), or a subjective measure (of how the receiving operator feels about the incoming signal)? What can "S" be as a standard for the next century? Does "T" need revision, omission, or mention only when the note is other than purest d.c.? Perhaps QRP operators are in the best position to contribute to a revised standard applicable to them or to everyone since they work at power levels where the report is most meaningful.

If good QRP practice does require a new standard for RST, then let there be a deliberative body representative of all the QRP organizations, and let this body study the problem, receive input from all interested operators, consider all the aspects of the problem, and develop a new standard. Further, let all QRP organizations making studies, issuing awards, and publishing operating accomplishments formally adopt the new standard and insist that all data input to them be in accord with the new standard. At that time, deviant input must be rejected or revised to meet the new standard.

Until then, the de facto standard is that which appears in handbooks and which takes precedence over meters. Until we go through the process of creating a better standard, we can either report in accord with the standard to the best of our operating skill or we can be deviant (or "cool"). If the latter, we owe it to other QRP operators to let them know which we are doing so that operator may discount our report. If the former, then we are committed to applying our best efforts and skills to master the art of reporting uniformly with others also committed to the standard. The uniformity cannot be perfect, but it can be reliable.

"R" reports may improve as we better master the art of copying CW (or SSB). Recognizing CW signal faults may require much practice in this day and age when almost all rigs produce clean CW. Strength reporting may be the most controversial part of the process. If the RST system is the standard, then using meters is an aid to reporting signal strength, but it is not as the standard itself. Should anyone report my signal as S0, I shall stop transmitting, since that is--by the standard--evidence of non-contact, and except for CQ and QST (no, not the magazines), non-contact transmissions except for brief tests and known beacons are not regulatorily approved. If someone gives me an S9+anything, then that is only a cue to reduce power. Only the S9 goes in the logbook/disk.

" If good QRP practice does require a new standard for RST, then let there be a deliberative body representative of all the QRP organizations, and let this body study the problem, receive input from all interested operators, consider all the aspects of the problem, and develop a new standard."

Of course, virtually all BIG contest reports and dx pile-up reports are meaningless. But that fact does not say that QRP operators must adopt the meaningless. They can still adhere to the operative standard for maximum information transferral until such time as a better standard is adopted--if there is one.

Anyone care to lead the effort to form an international body to study the question and develop a new standard for the 21st century?

Whatever may transpire, I recommend that we always keep the other operator in mind as we use the present RST system for the transferral of the most precise information permitted by the standard. We can always add notes in our own logs for impressions of the band conditions, etc. But as the 1936 Handbook notes, the RST system is a complete and efficient report in its own right to the other operator.

Table. 1. The RST system in 1936 and in 1995.

R: Same in '36 and '95

1 Unreadable
2 Barely readable, occasional words distinguishab
3 Readable with considerably difficulty
4 Readable with practically no difficulty
5 Perfectly readable

S: Same in '36 and '95

1 Faint signals, barely perceptible
2 Very weak signals
3 Weak signals
4 Fair signals
5 Fairly good signals
6 Good signals
7 moderately strong signals
8 Strong signals
9 Extremely strong signals

T: 1936

1 Extremely rough hissing note
2 Very rough a.c. note, no trace of musicality, broad
3 Rough, low-pitched a.c. note, slightly musical
4 Rather rough a.c. note; moderately musical
5 Musically modulated note
6 Modulated note, slight trace of whistle
7 Near d.c. note, smooth ripple
8 Good d.c. note, just a trace of ripple
9 Purest d.c. note

T: 1995

1 Sixty-cycle ac or less,very rough and broad
2 Very rough ac, very harsh
3 Rough ac tone, rectified but not filtered
4 Rough note, some trace of filtering
5 Filtered rectified ac, but strongly ripple modulated
6 Filtered tone, definitetrace of ripple modulation
7 Near pure tone, trace of ripple modulation
8 Near perfect tone, slight trace of modulation
9 Perfect tone, no trace ofripple or modulation of anykind

QRP ARCI History, Purpose and Policies:

The QRP ARCI was founded in 1961 by the late Harry Blomquist, K6JSS, with the aim of reducing QRM on the air, by members voluntarily limiting their power to 100 watts or less at all times. Due to increasing interest in true low power operation, and through the leadership of then-president Tom Davis, K8IF, the Club voted in the late 1970's to redefine its purpose in that direction, and adopted the generally accepted definition of QRP as 5 watts output CW and 10 watts PEP SSB.

The voluntary 100 watt power limit was later abolished; members may run any legal amount of power necessary at any time, for any purpose, although the 5 watt limit should be observed when claiming to be operating QRP. Club awards and activities are geared to the 5 watt and under level. The QRP ARCI does not advocate the reduction of the legal power limits of amateurs in any country, and serves only to provide a forum for those who enjoy the thrills and challenges of building and operating with low power equipment. The QRP ARCI is a member of the World QRP Federation and maintains ties with various other QRP organizations.

The QRP ARCI publishes the QRP Quarterly in January, April, July and October. All contributions are welcome and should be directed to the appropriate editor or columnist. (No payment is made for material published. Unless expressly requested, manuscripts, drawings, pictures and diskettes will not be returned.) Except for those items with a copyright indication, material may be reprinted elsewhere if proper credit is given to the author and the QRP Quarterly. The products, projects, features and fantasies described are intended solely for the enjoyment of our readers. No testing has been done unless explicitly stated, and no warranties are intended nor implied. The QRP ARCI and QRP Quarterly in no way warrant any commercial or private offers herein unless expressly stated.

To promote on the air QRP operation, the QRP ARCI promotes the use of designated QRP calling frequencies, regular QRP nets, and a program of QRP operating awards and contests. Information on these is found in the QRP Quarterly from time to time. Detailed information on the awards program is available from the Awards Chairman. To join the QRP ARCI or renew your subscription to the QRP Quarterly, see the form inside the back cover.

QRP SOCIETY of GREAT BRITAIN

Was this the first of the QRP clubs?

Here is a chance for the real sleuths among us to delve into the past and see what is there.

or

Did the Egyptians really use small candles for QRP signaling?

Hi Gang,

Whilst chatting to **Wayne Burdick** at Dayton I explained that we had in the UK a QRP club just after WWll. He suggested I write it up for the net.

In 1949 a group of amateurs decided to start a QRP club and called it the **QRP Society of Great Britain.** It was founded "To widen interest in the low power field of amateur radio transmission by creating a bond between QRP enthusiasts wherever they may live"

The Hon Secretary at that time was a **Mr. John Whitehead** of Walton on Thames. Membership at that time for full membership was 10 shillings which equates by today's standard to 50 pence or about 75 cents per year!

It may be of interest to see that "The agreed maximum power to be used for any QSO shall be 5 watts input to the final stage" It is strange to see that the *overseas* members could use up to four times this power and were permitted a maximum of 20 watts.

The *overseas* members dealing with membership included... Canada **VE7BS,** AUSTRALIA **VK7EJ**, N RHODESIA **VQ2W**, HOLLAND **PA0XE,** DENMARK **OZ5U**, SWEDEN **Mr. Larson**, USA **W2QHH & W2EQS**. More? Y/n

There was a TRF section, a Student section , a Model Control section and an affiliated clubs section.

Various contests were held including the "200" contest in two parts, The first to provide proof of working 200 British counties with 50 of each on the bands 1.8Mc, 3.5Mc and 7Mc with a power level of not more than two watts. Part 2 covered a year from 1/1 until 31/12 and a cup donated by **GC2CNC** (it would now be **GJ2CNC**) was given to the highest score obtained in similar lines. The C - Z contest was an annual fight for SWLs on all HF bands.

The TOP BAND Panel was an SWL contest for the highest number of countries heard on top band.

There were also 144Mc contests with "a maximum of 3 watts HT"

I have a couple of newsletters dated 1954 giving most of the above information and showing the officers to be ... More? Y/n

President **E Banks GC2CNC**

PAST PRESIDENT; **A MILNE G2MI** (also president of the RSGB)

Press & Publicity **V Brand G3JNB** (currently advertising manager of RadCom).

A mobile rally was held in 1954 to promote the hobby and it may be surprising to see an ATV stand along with the usual club stands. I have a lot of information on this show including the stand layout used, some newspaper cuttings and a pile of QSL cards of those attending.

All of this information is available to any seriously interested person but it is ONLY available at my home. I will not part with it!

As an aside, the widow of the late secretary has many other newsletters and the publicity officer **Victor Brand** is well known to me. It was through him that I got all this information. I also understand that this remaining information will come to me at a later date.

Finally, this club ceased to exist sometime in the mid 1950's I have yet been unable to find out exactly when.

So..... Was this the oldest QRP club known? or do you know differently. More? Y/n

TTFN de Dick

****

Dick G0BPS / G0ROO / 9H3JX Kanga Products
Email to Dick@kanga.demon.co.uk
Packet msgs to me via GB7RMS
or even write a letter to me via snail mail
isn't this "communications hobby" wonderful!

****

MILLIWATTING: QRP FOR QRPERS

WATTS ARE FOR WIMPS!

Michael A. Czuhajewski WA8MCQ
7945 Citadel Drive
Severn, MD 21144

AN ARTICLE, AND MAYBE A COLUMN

Authors intro--During a round of e-mails about QRP, WA8LCZ mentioned that the QRP ARCI doesn't seem to place much emphasis on REAL QRP operation, under one watt. He's quite right; there isn't much about the sport of milliwatting in the QRP Quarterly, and I think it's time to try to change that.

Back in the Bad Old 100 Watt Days of the QRP ARCI, all of the club awards (except the 1000 Miles Per Watt) were oriented toward 100 watt or less operation, even though they had QRP in their names. I struck my blow for real QRP in those days; I was on the board of directors in the late 60's, one of a relatively small number of true QRPers in the QRP ARCI at the time; I proposed an award for working States with five watts or less, starting out at twenty. It was quickly accepted, and I hastily wrote up the rules, designed the certificate, etc. It was known as WAS/QRPp, in contrast to the Clubs WAS/QRP award for doing it with 100 watts.

Perhaps it's now time to strike another blow for QRP, by trying to stir up some interest in even lower power--QRP by QRP standards, or milliwatting. Just like those interested in "true QRP" in the Bad Old 100W Days of the club, milliwatters are out there but seldom heard from. I'd like to try to change that. This is an article I wrote about the subject a while back. I'd like to make it the first installment of a column, if there is enough interest in milliwatting (which we'll define as anything under one full watt). Shortly before publication I asked WO3B if he'd like to do the column and he agreed to give it a try. His address is at the end of this article; let him know what you're doing with milliwatts, and he'll print it in this column-to-be. Do you have any hints about operating in the milliwatts, thoughts about philosophy, how to get down there, technical tidbits, anything at all? Let him hear from you, and we just might make this an occasional or regular column. And if Bob gets tired of doing it, I'll take over; we have the columnists lined up, and now it's up to you!

--WA8MCQ

Good old Sol has wound down and now, in 1995, his complexion is pretty well cleared up--is it too late to write about this? Probably not. While the sunspots are on the way down and we're almost at the bottom, and it's getting harder to accomplish some of the "QRP miracles" of a few years ago, the sport of "milliwatting" is still alive and well. (And those sunspots will be back--here's something to look forward to!)

While QRP has long been accepted as running 5 watts or less, to some it's 5 watts, period. Some people throttle their rigs down, down, down to the magic 5 watt limit, work a few states, then crank it back up to a hundred watts and brag about their QRP expertise. There's nothing at all wrong with that, of course; we're always glad when someone tries QRP, and especially when they tell others about it. But for true, died in the wool QRPers five watts looms as a menacing plateau which is to be viewed only from a distance, with loathing and apprehension--who needs all that power? (Just to be safe, when I use "high power" I hold it to 4 watts to give a safety margin.)

Although the QRP "legal limit" is 5 watts, many folks run less than that. There are a lot of rigs out there, homebrew and kits, which run just a watt or two. That may be a bit more difficult and challenging than running the Full Five, but even at the one watt level there may come a time when it all becomes a bit boring and routine. That's when it's time to crack the barrier, forsake the watts and dip into the milliwatts!

QRP FOR QRPERS

The subject of milliwatting (which is "QRP for QRPers") has been covered over the years by some of the QRP giants such as G4BUE (3 articles in SPRAT) and W0RSP (in one of his columns in CQ) but deserves more attention. There's a lot of fun down there for even the most jaded QRPer, and perhaps especially for them. Are you one of the QRP converts who came from the 100 watt arena and was amazed and astounded that a mere 5 watts could do so well? After a while it may get to be a bit too easy--go into the milliwatts and you'll probably have the same excitement all over again.

In the late eighties, while I was a QRPer but before I started serious milliwatting, I heard an HC2 calling CQ on 20M. I cranked the power control on my TS-430S all the way down, gave a call, and almost fell out of the chair when he came back! I didn't know how much power it was, but the external wattmeter wasn't moving--and it was on the 20 watt scale! There is nothing to compare with the thrill of the first time DX comes back to you with the wattmeter stuck at zero!

GETTING DOWN TO THE MILLIWATTS

How to get there? Lots of rigs, both commercial and kit/homebrew, have power controls which let you throttle them back. Crank the carrier control down and my TS-430S will go to a quarter watt or lower depending on the band and how long the rig has been turned on. (I later found out I was running about 30 mW when I worked the HC2.) The TS-440S acts the same way, and the newer Kenwoods (like the TS-450S and TS-850S) are even better--they have two front panel controls

which set power and you can go down easily into the single digit milliwatts with them.

To check into the Saturday morning QRP net on 7040 KHz with milliwatts, I turn on my TS-430S about a half hour early. From a fresh start it puts out about 160 milliwatts, and as it warms up that drops to the vicinity of 40 mW. But that's usually too much for me, so I add attenuators to the output; I have a few 6 dB units which I insert in the antenna line. The effect on receive signals isn't serious, and each 6 dB cuts my power by 4 times.

MEASURING THE MILLIWATTS

How to measure power down that low? You'll need a good QRP wattmeter, such as the fabled Welz RP-120 or perhaps the Oak Hills Research WM-1 (which is a cross between the W7EL wattmeter in the February 1990 issue of QST and the GM4ZNX (Stockton) wattmeter from SPRAT). I built the W7EL from scratch and it's nice, but for regular use I prefer an alternate method--using a diode detector on a 50 ohm dummy load. I switch my rig to the load, read the peak voltage off my digital voltmeter, square it with a calculator and mentally divide by 100 to get watts. (That's simpler than converting to RMS, squaring that and dividing by 50. Due to the math, which involves squaring 0.707, if the load is exactly 50 ohms the peak voltage can be squared and then divided by 100. But if you use a regular RF probe on a dummy load, it most likely contains an internal resistor to form a divider with the input resistance of a DVM and scale the readings down to RMS. In that case you square the voltage and divide by 50.)

I prefer to measure the power at a relatively high level, such as 40 mW or above, where accuracy is better, and then add the attenuators. They give precise, repeatable reductions. You can buy some at hamfests (not always a bargain), or make your own from scratch. The recent W1FB books, as well as Solid State Design for the Radio Amateur, have details. I'd recommend a couple of 3 dB (1/2 power) and perhaps one for 6 dB (1/4 power); that gives a good range to start with. You can get by with garden variety resistors of 5% tolerance; it may not be come out to exactly 3.0 dB but that's OK--the important thing is to know the exact value so you can figure your power. (My article in the October 1994 QRP Quarterly dealt with calibration of attenuators with DC and a voltmeter.)

WHAT CAN MILLIWATTS DO?

So, what can you do with milliwatts? The QRP Quarterly once announced that Brice Anderson, W9PNE, had completed WAS with 50 milliwatts and already had thirty-something with 25 mW--and that was several years ago. Randy Rand, AA2U, has DXCC with 100 milliwatts. During the height of the sunspots I worked into Europe quite a few times on 20, 15 and 10 meters with 65 milliwatts and under--and that's with just a 40 meter loop antenna feed with coax (lots of feedline loss).

Then there was the 1990 ARRL Ten Meter contest where I made 20 contacts with an average power of 32 mW, and the highest was a blistering 52 mW. I worked the entire West Coast plus Yugoslavia. The average Miles Per Watt figure was about 61K and the Yugoslavian was 143K. (During routine operation, figures of 40K and over became routine and commonplace.) A week after the contest I checked into the Saturday morning QRP net on 7040 KHz with WA1JXR while running 1.23 milliwatts, for 284K MPW. I don't usually run that low for the net, but I've checked in a few dozen times with him at under 100 mW, and over a dozen at 10 mW or less. The next day I did some experiments with a ham exactly a half mile away, going as low as 69 nanowatts--that's 0.069 microwatts! (That is the subject of an upcoming QRP Quarterly article.)

WHO WAS THAT MASKED QRPER, ANYHOW?

During one DX contest in 1990 I heard J6DX, a multi-operator effort by some Americans. I called but all he said was "WA8? QRP"; I repeated my call twice, and he came back with "Hi Mike, how much power are you running"!!! I never did find out who the operator was, but he certainly heard my 45 mW.

MILLIWATT FEVER!

Sometimes it got to be an obsession when the bands were really hot and the Milliwatt Miracles kept on coming. During some of those DX contests I worked European after European on 10 meters with under 50 mW; sure, I'd have to call only the strongest signals to have any hope of being heard. There were LOTS of wasted calls, but many of them did hear me and it was great! There were many times when I'd call someone a couple times, get no answer, and I honestly could not force myself to crank up the power to even 100 mW to make the contact; it was almost a sickness--Milliwatt Fever! (I swear on my copy of The Joy of QRP that it's true.) I'd sometimes go for days on end with the power control on zero.

Of course, all this will be more difficult when the sunspots drop, but that doesn't mean the good times are over; even during the Dark Years there will be occasional good times. If you turn on the rig and the bands are stinko, pour on the coals and run whole watts; but if signals are way up there, try the milliwatts. (You don't have to go bananas at first; start out with something easy like 1/2 or 1/4 watt to get your feet wet.) You could be pleasantly surprised. And you don't have to work DX, either--just working a few states away with a handful of milliwatts can be quite a thrill.

When QRP at the 5 watt level, or even 1 or 2 watts gets boring and routine, remember--Watts are for Wimps!

MILLIWATTING INPUTS FOR NEXT TIME

Send your milliwatting news, views, comments, etc to:

Bob White WO3B
8293 Shilling Road
Pasadena, MD 21122

--qrp--

Members' News

Richard Fisher, KI6SN
1940 Wetherly St.
Riverside, CA 92506
(e-mail: KI6SN@aol.com)

Getting psyched for the 'Party'

If you've never participated in a QRP contest sponsored by QRP ARCI, there's a golden opportunity this month. Scheduled for the weekend of Oct. 14-15, the Fall QSO Party has a grand tradition of being one of the QRPer's annual contest highlights. A look back through contest scoring summaries back up the assertion that this is easily one of the most popular contests of the year.

KI6SN
. . .Richard Fisher

Even with marginal band conditions, you're likely to hear lots of stations taking part. And if you're "shopping" to increase QRP Worked All States totals, for example, you'll not have much better an opportunity in the remainder of 1995.

Furthermore, the Fall QSO Party is a great place to renew old friendships, and to make new ones. It's a competition all our own.

Through the tireless effort of QRP ARCI contest manager **Cam Hartford, N6GA,** the club's contest program is firmly on track. Contest results are quickly compiled and published. And handsome certificates await the QRP operator who comes out a winner in any of a number of categories.

So you're not a contest hound? Give the Fall QSO Party a try. I suspect you won't be disappointed.

— R. E. F.

Hooked on OHR's Classic

Newfoundland's **Bob Gobrick, VO1DRB/WA6ERB,** was "right on" with his article (QRP Quarterly, April 1995) about the Oak Hills two-band Classic transceiver, according to **John Small, W9FHA,** of Evansville, Ind. "My search for the 'ideal rig' was like his and then OHR announced the Classic," John writes.

"I was, and am, hooked on it. I also have the (Oak Hills Research) Sprint, and when the 40 meter QRM was more than I could bear with the (direct conversion) receiver, I converted it to 30 meters.

"Am currently building a (portable station) box like the **KD7S** set-up," by **Bill Jones** of Sanger, Calif., and featured in January 1995 Members' News. "Will incorporate an LED SWR bridge in the Classic, homebrew antenna tuner, battery and charger. Should be ready for Field Day.

QRP, on the road . . . again

Bob Edwards, AE4CA, of Stone Mountain, Ga., and **Bob Hanrahan, KR4ZD,** of Powder Springs, Ga., presented a program on QRP HF at the June employee radio club meeting of Lockheed Georgia.

They had a variety of rigs on display ranging from KR4ZD's QRP Plus to AE4CA's NN1G 80m kit. "The QRP Plus was shown with several neat accesories and was powered by a 10 watt solar panel," Edwards wrote in an e-mail dispatch. "KR4ZD described this high end QRP solar based system."

AE4CA had his Techsonic Milliwatter transmitter kit, and "it was good for a 449 RST from **VK6-land** using only 3 watts on 30 meter. There were some disbelievers amongst the mostly 2-meter FM audience, that 3 watts could even make the long haul, but a QSL from **VK6WT** cinched it."

The two Bobs made an attempt to describe the QRP mindset, "if such is possible using strictly the English language — as well as, kit building, QRP contesting, and QRP clubs. QRP mindset was described like, you might hear a couple hot QRP contesters break action and QSO for a while, letting points fall where they may. Or, 'I can talk to most of the states and that's good enough for me.' Or, 'QRP can mean 5 watt CW output or it can mean use the least possible power to get the job done, take your pick.' "

"Examples of impressive membership certificates from QRP ARCI and Colorado QRP Club were shown. Also, newsletters from QRP clubs were displayed and they stirred some interest."

AE4CA had a few special QSLs, each with its own story. One was from a 14-year-old extra class and another from an 89-year-old Navy veteran licensed in 1932.

Another special QSL was "from a friend, Andre, at **VY9CCS,** Quebec. "If you hear him, go out of your way to have a nice chat then exchange QSLs. This QSL is worth framing.

"Since the June club meeting was also the Field Day planning meeting, the QRP presentations were brief. Never-the-less, the QRP point was made and well taken. We could tell, by questions afterwards and followup requests for stuff like QRP internet addresses and kit sources, that the HF QRP bug is still alive and contagious."

A bear of a QRP Field Day

Bill Jones, KD7S, sends an e-mail dispatch from Sanger, Calif.:

"The 1995 KD7S Field Day site was situated 6,500 feet above sea level in Kings Canyon National Park in the central California Sierra mountains. Besides being ideal for QRP operators, it is a natural habitat for various type of wildlife. Frequent visitors to my camp were deer, golden mantel chipmunks, ravens and a plethora of insects.

"I had chosen to take the Monday following Field Day off work to clean up and recover from the weekend. My wife, Merleigh, was scheduled to pick me up around 9:30 a.m. on Monday and take me home.

"However, on her way up the winding mountain roads the clutch in our old car disintegrated into a thousand pieces. She had the car towed back home and then telephoned the park rangers at Kings Canyon to let me know what had happened.

"Around noon a lady ranger named Scottie delivered the bad (?) news that I would have to spend another night in the mountains. She also advised me to keep my ice chest well secured and out of sight as there had been several recent bear sightings in the area.

"No sooner had the words left her mouth than a large black bear came galloping through my campsite and about 15 feet from where we were standing. Not far behind were three heavily armed rangers huffing and puffing their way up the steep terrain in hot pursuit.

"Scottie said she was going to join the chase in her pickup truck and asked if I preferred to stay in camp or ride along with her?

"I chose the later and within a few minutes our

The homebrew QRP shack of Dain B. Lones, KC6WCK, includes a three-band digital readout receiver, a 5-watt DSSC transmitter with both phone and CW outputs, a cross-needle power/SWR meter, a transmatch, a direct digital synthesizer with programmable switches for each button and a T/R switch.

impromptu bear posse managed to herd the bruin away from the camping area.

Scottie decided to move me to another campground just in case the bear decided to make a return trip. Although I never saw the bear again, I didn't sleep very well Monday night.

So, what was my final Field Day score?

KD7S - 0
BRU1N - 1

A QRP 'Sprint' through the Summer

Cameron Bailey, KT3A, sends e-mail from Mount Wolf, Pa., that he was "pleased to work the Summer Homebrew Sprint.

"I had the house to myself and my quiet understanding wife. (All four children away!) So, I decided to work from the house instead of the field for once.

"Now that I have a computer, I could use my new logging program, 'Logger' from WB2QAP. I never used a computer logging program before, so this was a first for me.

"I tried shooting the 4 ounce lead sinker through the neighbor's trees (they were not home) and decided that I did not want to explain how I broke their window.

"Why do your neighbors always have the better trees? I ended up using my good ole, tried and true 'Hamstick.'

"Set up the NorCal-40 and found the power jack was intermittent. Good thing I was not in the field this time!

"After getting the iron out and fixing the rig I was set. Forty meters was full of activity. Not too much slack time.

"I did not hear anyone from 1-land. That was strange. I did manage to work everyone I heard, (except for) one station in Georgia who could not pull me out.

"I had fun, not being on the air in quite a while. The (logging) program was fine. Just remember to enter a callsign and the correct time!

"I managed 14 contacts in nine states, only working three hours."

The joys of building from scratch

Dain B. Lones, KC6WZK, writes from Palos Verdes Estates, Calif., that he is "75 years old and built my first transmitter in 1937 — a one-tube 201A — along with a two-tube shortwave receiver.

"Subsequently I left the hobby for 50 years. In the past 10 years, and after retirement, I have become a committed hardware-hacker.

"Along with many pieces of test equipment, I have built (a) 10 meter station . . . Each item was built from scratch — no kits."

Dain says the gear includes a three-band 3.5 to 30 MHz digital readout receiver, a 5-watt DSSC transmitter with both phone and CW outputs, a cross-needle power/SWR meter, a transmatch, a direct digital synthesizer with programmable switches for each button and a T/R switch.

"I have provided myself a world of learning building this stuff and can highly recommend to your readers to give it a try."

One QRPer's story

John H. Shannon, K3WWP, writes from Kittanning, Pa., that he has "been a ham since 1963, and I joined (QRP ARCI) in 1967 or 1968. I spent most of my hamming time in the '60s chasing counties. **WA8EOH** (David Maurer) and I started the CW County Hunters Net which I then managed for a year or two. Today's net on 14.056 MHz is a direct descendant of our net. Because of school, work and other

interests, I was mostly inactive from 1970 through 1992 except the early '80s.

"In 1993 a friend of mine wanted to know all about amateur radio, and getting on the air was the easiest way to show him. We built a little 2-watt transmitter from parts I had around the house. A couple of months later we increased the output to 5 watts, and I have kept it at that level.

"The transmitter uses mostly tubes (with some solid state devices for keying, switching, etc.) with a 6Y6 as a final amplifier. I operate all nine HF bands, CW only. I use a homebrew transmatch, a homebrew CMOS Super Keyer II, and a homebrew paddle.

"My friend (Mark Mulholland of Drexel Hill, Pa.) is now **KA3BFQ,** and is very much a QRP operator. In just over seven months in the CW novice bands he only needs a few states for Worked All States, and has worked several DX countries. He will soon be joining (QRP ARCI) — or may have already by this time.

"I don't have the best location for QRP (or amateur radio in general). My QTH is along the Allegheny River with hills to the east and west and I live on a small town lot surrounded by houses and businesses. My antennas are an end fed random wire (used for 160, 80, 40, 30 and 15) about 100 feet in length and 30 feet high at the apex (up in the attic where most of the antenna resides); a ground-mounted vertical dipole cut for 20 meters that I also use on 17 and 12 meters; and a sloping dipole for 10 meters.

"In two years with the setup described, I have over 5,000 QSOs in 110+ countries, all 50 states, all continents including Antarctica, and all Canadian provinces/territories. I have worked over 300 band countries, nearly 900 prefixes, and over 650 DX contacts. While most of the DX contacts are the quick 'RST and 73'-type of contacts, I have had some nice ragchews with some DX stations in Europe and Africa who were interested in my setup.

"I enter just about every possible contest (if it is on CW). If the contest has a QRP entry class, I thank the sponsors for looking out for the QRP operator. If there is no QRP entry class, I mention that to the sponsor and urge them to adopt one. I think the QRP ARCI should contact all contest sponsors urging them to have a QRP entry class. Input from a large organization like the QRP ARCI should have much more effect than a small voice like mine.

"I have had some success in contests over the past couple of years with QRP. I have won a few state QSO parties for Pennsylvania, and had a 10th place finish nationwide in last fall's QRP ARCI contest. In the April 1995 QRP Quarterly, I see I was tops in the country in the December Homebrew Sprint QRP Contest in the all-bands division.

"I have several goals in ham radio such as 5BDXCC, working as many counties as I can, using only resident hams (no mobiles or portables), and 9 band Worked All States. I think that 5BDXCC is possible, but I don't think I can ever make the DXCC Honor Roll with my setup. I have just passed the halfway mark — 1,540 — in counties confirmed. Right now I am working hardest on the 2XCW QRP WAS on all 9 HF bands. Of the 450 band-states, I am around the 300 confirmed mark now. I only started working on some bands this year — 160, 12, 10 — and I was not on in time for the 160 and 10 meter contests, so my states on those three bands are low. I have all states on 20 meters, need Alaska to finish 80 and 30 meters, need Nevada to finish 40 meters.

"For years I believed that QRP and s simple antenna would not work on 160 meters, so I never operated there until this year. I proved myself wrong, and have had a ball there. I missed the peak of the season, but still had fun. I have had many enjoyable ragchews, and have gathered 18 states so far, including Colorado. I can't wait till next fall/winter to really give it a good try, especially in the CQ and ARRL contests.

"Everyone has a tip or two to pass along. I think that one good way to be successful on the bands with QRP is to have a good fist. The closest you can come to sending perfectly formed CW, the more success you will have. It is much easier to copy perfect CW from a weak signal than sloppy CW from a QRO station.

"Also strive for perfection in the quality of your signal. Eliminate all chirp, drift, hum, etc. One thing overlooked is signal purity. Get a good scope and examine your signal. The RF waveform entering your antenna should be a perfect sine wave. If it is not, then not all of your signal is being radiated where you want it to be. If you are transmitting on 7.040 MHz, some of your signal will be radiating on 14.080 and/or 3.520 MHz, etc. Adjust the drive to the various stages of your transmitter until you get that pure sine wave.

"Also pay attention to your keying waveform. I think it is easier to copy a hard keying waveform that is just short of the point where it produces clicks. Too soft a waveform just doesn't cut it. Also, hard keying seems to punch through QRM and/or QRN much better.

"One other thing. I personally don't sign '/QRP' except in the QRP contests. I enjoy working someone, and then telling them I am QRP. I think you get more honest reports that way. Also I like to compete directly against the big signal guys without saying I am QRP. Signing '/QRP' is abused a lot, anyway. I hear QRO stations doing that just to try to break a pileup, so I just don't do it.

"Above all, give QRP a try. It is a lot of fun, and to my way of thinking, the only way to do amateur radio. Don't be discouraged when you read of the exploits of some QRPers. Keep in mind that they may be running much more ERP than you — 5 watts into a 13-dB gain antenna such as a huge multi-element quad or yagi on a tall tower, yields around 100 watts of effective radiated power.

"Those of us who use simple antennas should realize that the QRPers with big antenna farms are not in our league, and we shouldn't feel bad when they work DX so easily or

Keeping in QRP contact

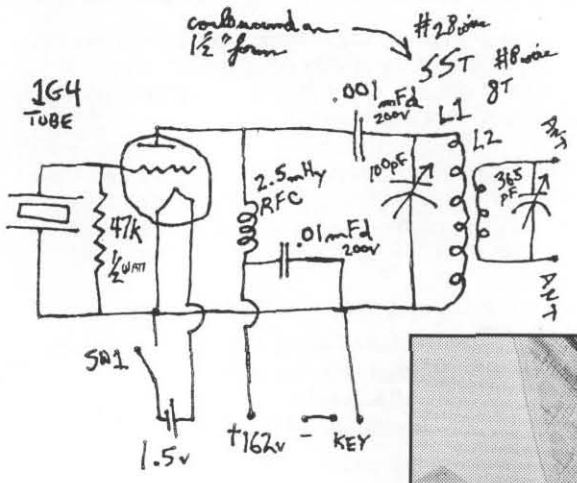
Part of the fun and fascination of QRP comes in hearing of the experiences, challenges and success of others. And telling your story is part of that natural process.

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

Here are the only mailing addresses you need:

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

(e-mail: KI6SN@aol.com)



". . . Thanks for holding this lowkey, short (QRP ARCI Summer Homebrew Sprint). It is just right for beginners."

Randy Haus, KB2PLW, Trumansburg, N.Y.

Eighteen 9-volt batteries in series provide 162-volts for the plate the 1G4 tube QRP rig built by Randy Haus, KB2PLW, and successfully used to rack up more than 2,000 points in the Summer Homebrew Sprint. Above is Randy's rough sketch of the schematic, for anyone caring to duplicate the rig.

run up such big scores in contests.

"Remember, they are essentially using much more power. Take into account when considering your accomplishments vs. those of others, and continue to do the best you can with your 5 watts ERP — pure QRP?

"Incidentally, thanks to the QRP ARCI for publishing station setups in the contest results in the QRP Quarterly. Now I know how some stations do it.

"I find it tremendously rewarding doing the things I am doing with my 5 watts and simple wire antennas from not the best QTH."

Tubular QRP in the 'Homebrew Sprint'

"I have done just a little QRP operation over the last three years," writes **Randy Haus, KB2PLW,** from Trumansburg, N.Y. "But the Summer QRP Homebrew Sprint was my first contest."

Randy used a homebrew transmitter. "It's a 1G4 (tube) crystal oscillator with 162-volts on the plate — one watt output. For coils I use B&W 'baby' inductors — otherwise coils were wound on a 1½-inch forms."

The 'Goodie Giveaway'

Is there a more popular field effect transistor than the MPF 102 for use in QRP projects? For years it has shown up in circuits repeatedly.

This quarter's Goodie Giveaway is **a dozen MPF 102s** primed and ready to be found permanent homes around the QRP shack.

And whose shack will that be? **John H. Shannon's, K3WWP,** of Kittanning, Pa., whose name popped out of the hat for the October Giveaway. He gets a tip of the QRP hat and a sincere "72" for his contribution to Members' News — along with his dozen FETs.

You, too, can get in line for next quarter's Goodie. Everyone who submits a card, letter, photograph or e-mail is automatically in the running.

The addresses listed regularly with MN are all you need.

Here's hoping to hear from you soon.

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

QRP Net Information

Warning: QRP Nets are known to be Addictive!

1995 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 (N1QYZ)	Wednesday [4]	0100 UTC 0130 UTC
GSN	3560	W5TTE	Thursday [4]	0200 UTC
GLN	3560	NN1G (WA1JXR)	Thursday [4]	0200 UTC
NEN	7040	WA1JXR (K3TKS)	Saturday	1300 UTC
WSN-80	3560	WA6ARA (W6RCP & KI6SN)	Thursday [4]	0300 UTC
WSN-40	7039	W6JHQ (several)	Saturday	1700 UTC

Notes:

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

I would like to thank all of you who have been active on the QRP nets for helping to make 1994 such a great success. I would like to extend my personal special vote of thanks to all of the great NCS's and ANCS's who have been ever faithful to the cause in spite of terrible band conditions and other pitfalls. We have even bigger things in store for you this coming year. There is a plan in the works to have another Special QRP QNI Contest in 1996. It will even include prizes! We are also working very hard on the update to the net records so that we can give out those long awaited QRP Net QNI Awards.

Other QRP Nets

Net	Frequency	NCS	Day	Time [1]
BC (SSB)	3729	---	Every Evening	0300 UTC
MI-QRP	3535	K8JRO	Wednesday [2]	0200 UTC
NE-QRP (SSB)	3855	WA1JXR	Monday	2100 EST
NEIQS	3560	---	Friday [2]	0200 UTC
OK-QRP	7060 (3560)	---	Sunday	1330 UTC
NW-QRP	10123	N7MFB	Tuesday [2]	0200 UTC
NW-QRP	7035	---	Saturday	0730 PST
TCSN (SSB/CW)	28322 (7285)	KA9JKK	Saturday	1900 UTC
VE-QRP	14060	VE6BLY	Sunday	1800 UTC

Notes:

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

Permission is granted to freely copy and distribute this schedule.

!!! HELP WANTED !!!

We are looking for some good people to help with NCS (Net Control Station) duty. We have some great NCS's on the nets now, but they really need your help to fill in when they can't make it. Any QRPer is authorized to take over as NCS on any of the ARCI nets. If you don't hear the regular NCS by ten minutes after the scheduled time, just grab the bull by the horns and GO FOR IT! Then drop me a note or card reporting net activity. Yes, even if you are the only one who shows up for the net.

QRP ARCI NETWORK MANAGER -- Danny Gingell, K3TKS

Phone: (301) 572-6789
Packet: K3TKS @ WB3V.MD.NOAM.USA

What Amateur Radio Means to Real Hams

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1030 Bussigny, Switzerland

[The following article originally appeared in French in the Swiss USKA (their ARRL equivalent) journal Oldman for October 1994 on page 22. It was translated to English by John Jaminet, W3HMS, because he felt that it expresses the true essence of our great hobby and wanted to share it with other hams. The article is reprinted here by permission of the author. -- W1HUE]

Serge Perret, HB9PS, died on 9 August 1994 in Spain. He had two daughters, Sophie and Mireille, and three boys: Jean-Yves, Edouard and me -- but there was no infidelity there by my mother. No, Serge was my radio amateur dad. First of all, it was he who taught me the Morse Code. Each week I returned to his shack in the basement of his home at Pully. I would sit in his shack trying very hard to understand what he was sending with his automatic key, which was one of the first for that epoch. He had an old RCA AR-88 receiver and a transmitter that he rescued from an old ship and restored to a perfect state of repair (200 watts from two parallel 813's).

I passed my first license exam in CW and theory at Lausanne in 1964 when I was 19 years old; thank you, Serge. Then it was with him that I made my first QSO on 144 MHz. A little bit before the exam, I had built an AM transmitter typical of the era with a QQE-32-12 in the final and crystal controlled with an 8 MHz crystal of the famous FT-243 series surplus from W.W.II. I was surprised by how fast the license arrived thus I did not have the time to get an 8 MHz crystal. So, it was Serge who loaned me one and with him I made my first QSO -- after arranging it by telephone just to make sure. Again thank you, Serge.

Later on, it was thanks to him that I worked my first American station on 40M CW using one of the famous W.W.II Command Sets, which used a VFO with less than perfect stability and two 807's in parallel in the final. A dynamotor encapsulated in insulating material and a box to reduce the noise furnished the high voltage. To avoid being seriously disturbed by the noise, I put the dynamotor, which resembled a motor, on the balcony. Now it was the neighbors who were bothered by the change in the motor's whine each time I hit the key. This made it possible for the neighbors to follow the QSO by the medium of the keyed whine! Again, I had Serge to thank for the loan of the transmitter. For reception, I had modified a standard broadcast receiver by adding a tuning capacitor to the IF stage to cause it to oscillate and produce a CW beat note identical to a normal BFO beat note.

Some years later, Serge was the Vice President of the Radio Amateurs of Vaudois (a Swiss canton/state), called at that time "The USKA Section of Lausanne." It was Serge who proposed me for the President and then pushed me into office at the time of the annual meeting of the group. There were present some young hams full of energy, project ideas, and enthusiasm that disturbed just a little the traditional calmness and austere environment of this assembly; sorry Jean-Claude (HB9UG) and thank you again, Serge.

Later, it was Serge by who propelled me without transition into another world. In the space of three days, I made the decision, got the necessary vacation time, bought clothes for a hot climate and rode on an airplane for the first time. The destination was Jeddah, Saudi Arabia where I arrived at midnight with a winter coat under my arm in a torrid heat wave. The Customs Officer wrote something on it in chalk (probably his expression of satisfaction that I arrived)! I departed with the CCIR to reinstall their radio communications network in the north of Yemen, a country then at war. I was 23 years old. Thanks to Simone for encouraging me to go (the date of our wedding was set for just three months later) and thanks again to Serge for this unforgettable experience. Life separated us then, for me marriage, children, the job, building projects and for him the marriage, children, the job, and that terrible sickness, cancer.

We liked to see each other at Bussigny or at Ampuria-Brava where he lived for some years. He lived a life and a half in his home and with his twin 80 foot towers, a magnificent vestige of the time when boats were made of wood and not plastic purchased after much scrimping and savings.

We made a pilgrimage in his boat to Cadaques, the extraordinary village of Salvador Dali. We repaired his Drake TR7 transceiver with which we ragchewed in CW, we went to see Boris parachute jump at Ampuria, and we made plans for skin-diving and Maritime Mobile expeditions. Yet, four years ago, the doctors gave him just a few months to live. Thanks to a great poker hand, in which he had the secret, the only doctor in the world capable of doing the operation successfully did it.

There was a sort of irony in all his bravery: he didn't die of cancer but from a series of falls on his boat. On the day of his death, by chance I found myself 50 km from Serge's house trying to telephone him to tell him that I would help him defend himself from pirates on the high seas!

Serge was important in my life and the lives of radio amateurs in general since he was a member of the central committee of the USKA and also the officer responsible for relations with the IARU; he was active for a very long-time and he was a most honorable member. Life is made such that some chaps, for which we sometimes ignore the other aspects of their life, are always there at the most pivotal moments of the other person's life. Serge I found several times in this situation for me. His determination and his force in life remain always an example. When he maliciously tapped the knot of the rope hanging from the ceiling on his boat, he wanted to say: "It is me; I am the captain of this boat!" And he remained the captain until his death, with all his qualities and all his faults. I salute my friend, I liked him so well... and Serge, if you meet Him, try to intervene to see that we are left with some open frequencies for peaceful ATV.

Improving SSB Performance of the Ten-Tec Argonaut 509

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Introduction

Ten-Tec originally rated their Argonaut 509 at 2W output, 80 through 10 meters. However, most 509's will produce more than 5W in CW mode on 80 through 15 meters, but less than 5W PEP when running SSB. On 10M, one typically gets about 4W CW and less than 3W SSB PEP output. An article in **SPRAT** (1)[1] a few years ago suggested replacing the final transistors with MRF476's as a way of increasing SSB power output. (That mod requires some surgery on the amplifier board that is pretty much irreversible.) The stock final transistors (2) should be capable of doing better on SSB, however, so I decided to see what could be done to increase their SSB output.

When I feed a two-tone signal into the microphone input and looked at the transmitter output on an oscilloscope, the cause of the low output became immediately apparent: limited range of linear operation of the final (and possibly driver) amplifier. Most of the problem appears to be caused by insufficient "stiffness" of the final amplifier bias voltage. The bias is derived from the transmit control signal (shown as "T" on the schematic) through a 470 Ohm resistor and limited by a 1N4002 diode. When the final amplifier power output reaches about 2.5W, the bias voltage begins to drop and the amplifier no longer operates in a linear mode resulting in output limiting. I tried reducing the value of the bias resistor; that helped slightly, but the "T" voltage varied with audio peaks due to the added current drain. I decided that a better solution would be to derive the bias from the +12V supply buss and use the "T" control voltage to turn it on and off.

The bias circuit modification described below resulted in an additional 1.5 to two Watts of SSB output from my 509, depending on the band of operation. My rig will now produce an easy 5-plus Watts of peak SSB output on 75 through 20 meters, about 5W on 15M and nearly 4W on 10M with no noticeable distortion. (Power output was measured using an Oak Hills WM-1 QRP Wattmeter with the PEP modification described on page 8 of the January 1995 QRP Quarterly.) This translates to a rather modest 2 dB power gain, but the audio quality is definitely improved. Besides, every little bit helps when you're running QRP!

The bias modification should also help the 505 and 515 models, since their amplifier bias circuits are essentially the same as the 509. However, the 515 uses higher gain final transistors (MRF476's) and is probably capable of sufficient SSB output without this modification.

The Argonaut series of QRP rigs do not have any type of speech processing which also detracts from their SSB performance. T-Kit, the new subsidiary of Ten-Tec that supplies amateur radio related kits (3), has come to the rescue with a small speech processor "mini kit," model 1551. At $9.00, this has got to be one of the best bargains around! The kit consists of a 1.75 in. square PC board and a "bag of parts"; no cabinet or connectors are included. Assembly instructions are not "step-by-step," but they are certainly adequate for anyone with moderate building experience. The processor is intended to be placed between the microphone and a transceiver's microphone input, and should be useable with just about any SSB rig that does not have audio processing.

I installed one of these kits in my Argonaut 509 as described below and am very pleased with the results. It does an excellent job of controlling the peak modulation level and raising the average "talk power". On-the-air reports range from "signal strength about the same but your audio sounds louder with the processor on" to "your signal went up about one S-unit when you turned the processor on" -- and that's with no increase in peak output power!

Final Amplifier Bias Modification

The new final amplifier bias circuit is shown in Figure 1. The bias transistor is tuned on by the transmit control signal, but the bias current is obtained from the +12V supply rather than the control signal. Output from the emitter of the bias transistor is connected to the junction of RFC1 and RFC2 on the 509 Power Amplifier board (the connection point would be the center tap of T2 in the 505). Final amplifier idle current is set to about 10 mA by the 2K pot. The two diodes in series at the base of the bias transistor compensate for the base-emitter voltage drops of the bias and final amplifier transistors, and the 100 uF bypass capacitor reduces the effect of audio peaks on the bias voltage. The diodes are also used for temperature compensation of the transistor base-emitter voltages. D2 is a 1N914 (or 1N4148) and is in thermal contact with the bias transistor, a 2N2222A. I determined experimentally that the junction voltages as a function of temperature of these two components track very closely. D1 is the original 1N4002 bias diode. I remounted it on the heat sink between the amplifier transistors, but that is probably an over-kill since the heat sink remains essentially at room temperature even at full (7 to 8W) amplifier output.

[1] See "Notes and References" section.

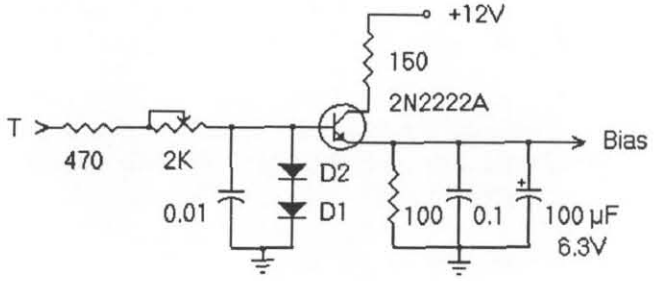

Figure 1. New final amplifier bias circuit.

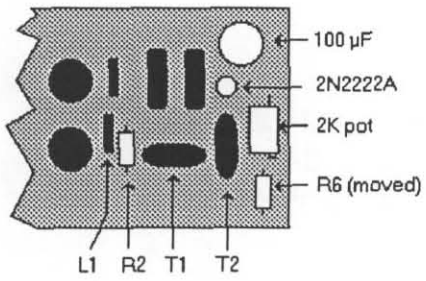

Figure 2. Approximate layout of new bias circuit components on the final amplifier board. The board connector (not shown) would be at the bottom of the figure.

Important note: Do not increase the size of the bypass capacitors shown in Fig. 1; doing so can result in poor CW keying characteristics! (Modifications to improve keying characteristics are described in a recent **QRPp** article (4).)

I was able to mount the components for the new bias circuit on the Power Amplifier board of my 509 by performing some rather minor (and reversible) surgery. The new component layout is approximately as shown in Figure 2. I have not installed this modification in a 505 or 515; with those rigs, you are on your own!

To make this modification to a 509, proceed as follows:

1. Obtain the parts for the circuit shown in Figure 1; a metal case 2N2222A should be used for the bias transistor. The 1N4002 diode already on the Power Amplifier board can be used in this circuit. You will also need a 27 Ohm 1/8 Watt resistor to replace R6 on the Power Amplifier board.

2. Remove the screw holding the Power Amplifier heat sink to the chassis and carefully remove the Power Amplifier board (the heat sink is attached to the amplifier transistors via mounting cups).

3. Remove the nuts holding the transistor mounting cups to the aluminum heat sink and remove the heat sink. You do NOT need to remove the mounting cups from the transistors.

4. Remove R1 (soldered to the back of the board), R6 and D1; try not to break D1 so that it can be reused. R1 and R6 will not be reused. Also remove the end of R2 from the board that connects to D1, RFC1 and RFC2; you will need to solder a short jumper from this end of the resistor to the bias control pot (see below).

5. Solder the anode end of a 1N914 (or 1N4148) diode to the base lead of a 2N2222A transistor so that the diode is parallel to the transistor case with its cathode lead sticking up above the transistor. Apply a little heat sink compound between the diode and transistor case, then use a small piece of heat-shrink tubing to keep the diode and transistor in thermal contact. (A bit ugly, but it works!)

6. Do a "test layout" of the parts for the new bias circuit on the board to see where they will best fit. I drilled holes to mount the 100 uF cap in the upper corner of the board, as shown in Figure 2. I glued a small multi-turn 2K pot "dead bug" style along the edge of the board. A single turn pot is OK; just make sure you can get to it when the board is re-mounted. I drilled a hole for the 2N2222A emitter, but wired the base and collector above the board.

7. Drill the necessary mounting holes, including new mounting holes for the 1/8 Watt replacement for R6 (27 Ohms) as shown in Figure 2.

8. Find a place to remount D1 (the 1N4002 diode) near the final transistors. I mounted it on the heat sink between the transistors using a small metal clamp, some heat sink compound and heat-shrink tubing to insulate the leads. It could just as well be placed in close contact with one of the transistors "spider web" style. In any event, connect its cathode to the ground foil on the board, not to the heat sink.

9. Carefully check your work, set the bias adjustment pot to mid-range, and reinstall the heat sink and the board.

10. Disconnect the +12V lead that runs from the Power Amplifier board connector to the power input connector and insert a milliamp meter.

11. Make sure the Mode switch is not in the Lock position and turn the Drive control to minimum (full CCW). Set the Band switch to 80 or 40 meters.

12. Connect a 50 Ohm dummy load to the antenna output; also a Wattmeter if you have one.

13. Connect the rig to a 12V power supply and turn it on. The milliamp meter should not show any reading at this point; if it does, something is wrong (immediately turn the rig off and check for smoke)!

14. If all appears to be in order, turn the Mode control to Lock and adjust the bias pot for a current reading of 17 to 18 mA

WITH THE DRIVE CONTROL AT MINIMUM. The bias transistor draws about 7 mA, and we want the amplifier idle current to be about 10 mA.

15. Slowly increase the Drive control until the finals are drawing about 800 mA; this should correspond to around 5W output, depending on the power supply voltage.

16. Turn the Drive control back to its minimum position; the current reading should quickly drop to somewhere between 40 and 60 mA, and then slowly drop back to around 20 mA as the finals cool off.

That's it; connect a microphone and give it a try! If you have a peak reading Wattmeter (5), check the SSB PEP output power on the various bands. You should be able to get at least 5 Watts PEP out on 40 meters with the Drive control no higher than about the 50 to 60% position when speaking at a normal level. This is if you are using a high impedance crystal mic; maybe the 70% position if you are using a low impedance mic. Note that an AVERAGE reading power meter will read considerably less than 5 Watts.

If you cannot get adequate output when using a low impedance microphone, check the value of the microphone input coupling capacitor on the SSB Generator board (C19 in the 509); if it is less than 0.1 uF, replace it with a 0.1 to 0.2 uF capacitor.

Adding a T-Kit Speech Processor

In the process of building and checking out the T-Kit model 1551 speech processor, I discovered two errors: Capacitors C9 and C10 should have their polarities reversed from what is shown in the schematic and the markings on the PC board (6). Wired as shown in the 1551 schematic, the leakage of C9 (due to its reversed polarity) results in reduced bias on the positive input of U2B, the output op-amp. This does not appear to affect the operation of U2B since the bias remains well above the peak AC signal level. However, the reversed polarity could well lead to premature failure of C9. C10 is on the output of U2B, so its positive end should be connected to U2B -- assuming that the device to which the processor output is connected is at (or close to) ground potential. It would be even better to use an unpolarized capacitor for C10 so that one does not have to worry about what DC potential, if any, might be present at the processor output. I replaced the electrolytic capacitor supplied for use as C10 with a 1.0 uF monolithic non-polarized capacitor, but a 0.1 uF ceramic capacitor should work just as well.

I installed the speech processor board inside my 509 above the front half of the control board using two 2-centimeter long metal stand-offs obtained from Radio Shack (that's right -- they're metric!). I mounted the stand-offs by drilling two holes along the left edge of the control board: one between the "S-meter zero" and "RIT zero" pots and the other next to the receive antenna relay (later 509 models use a transistor switching circuit and there is more room to mount the stand-off). The speech processor board was then mounted on top of the stand-offs using two of the pre-drilled mounting holes in the board. Caution: if the processor board is mounted too close to the back of the control board, it will interfere with the speaker mounted under the top cover of the 509. I had to replace the pot supplied for R19 (the "Processor Adjustment" control) with a small 10K trim-pot due to lack of space inside the 509. I obtained the microphone signal for the processor input from the feed-through under the SSB Generator board, and fed the output of the processor to the SSB Generator board connector pin originally wired to the feed-through. I mounted a small DPDT switch on the 509 front panel just below and to the right of the Drive Control, wired as shown on page 10 of the 1551 manual. (Actually, the switch is mounted to the "sub-panel" and protrudes through a hole in the front panel.) I used shielded signal cable (RG-174 mini-coax) between the connectors under the SSB Generator board, the switch and the processor board.

I have not experienced any problems with RF pickup in the speech processor, although I did take the extra precaution of adding some RF bypass capacitors on the processor board (0.001 uF at the negative inputs of U2A and U1B and the output of U2B, 0.1 uF in parallel with C11 and C14).

I did, however, experience two minor problems in using the speech processor with my 509:

- The high gain of the processor makes output adjustment via R22 rather difficult; the proper output level is obtained with the control in the bottom 5% or so of its range.

- Using the switching arrangement shown on page 10 of the 1551 manual results in reduced microphone output when the processor is switched out. This is due to the loading effect of R12 in conjunction with a 6.8K resistor in series with the microphone. (I found it most convenient to obtain the microphone signal at the connector under the SSB Generator board -- after the 6.8K resistor -- rather than at the microphone jack.)

I solved these problems by making two minor modifications to the speech processor:

1. I added a 10K resistor between pins 6-7 of U2B and the junction of C10 and R11 to act as an output attenuator. I did this by cutting the trace on the bottom of the board and soldering the resistor across the resulting gap in the trace.

2. I changed the value of R12 from 10K to 100K and added a 220K resistor from the processor output to ground. This reduced the microphone loading to an acceptable level; adequate output should still be obtainable with the transmitter Drive control no higher than 60 to 70%.

The speech processor has two controls: The "Processor Adjustment," R19 and an output level control, R22. These should be adjusted as follows (using a dummy load, of course!):

1. Set R19 on the processor board almost full CW -- about the 75 or 80% position -- and set R22 at its minimum (full CCW) position.

2. With the processor switched out of the circuit, set the transmitter Drive control just below the point where maximum PEP power output occurs when speaking into the microphone. Make this adjustment while repeating a one-syllable word such as "pop" or "two" into the microphone.

3. Turn the processor on and increase R22 until you get the same PEP output power obtained without the processor. Make several comparisons with the processor on and off. It takes a few seconds for the processor gain to stabilize after power is applied, so take this into account when switching the processor on.

If you have an oscilloscope, use it to monitor the rig's output and compare the output waveform with and without the processor in the circuit. You may find that you need to "diddle" the settings of R19 and R22 for best results with a particular microphone. The object is to maintain the same PEAK output power with the processor on and off, but increase the AVERAGE power when the processor is on. The gain compression characteristics of the processor will compensate for voice level variations resulting in a more constant average power output.

Other Items Affecting SSB Performance

There are a variety of malfunctions that can degrade Argonaut SSB performance. A common problem seems to be detectable frequency changes with modulation, or "FMing". Two possible causes are: 1) Bad 8V regulator on the Control Board, and 2) Bad bypass capacitor(s) on the SSB Generator Board.

The 8V regulator supplies voltage to the VFO, RIT, microphone amplifier and carrier balance circuits. Its output should actually be slightly greater than 8V. 505's and early 509's use a discrete regular circuit, consisting of two transistors and a zenier diode, that produces an output of about 8.4V. This circuit is not too likely to fail; however, later versions of the 509 use an IC (LM723) that is prone to failure. If your rig uses an IC regulator and its output is less than 8V, replace it (LM723's are available from Radio Shack for about $1). It's a good idea to check the regulator IC output even if you haven't had reports of FMing.

If you have the FMing problem and the 8V regulator appears to be OK, try replacing C11 and C20 (509 part numbers) on the SSB Generator Board. C11 is the bypass capacitor on the +8V line to the microphone amplifier, and C20 is the bypass capacitor for the carrier balance control. It's a good idea to replace C11 with the largest value capacitor that will fit into the space on the board; say 220 uF or 300 uF.

Two adjustments that can effect SSB performance are: 1) Carrier Balance and 2) TX Mixer Balance. The Carrier Balance control is on the SSB Generator Board and should be adjusted for minimum output when the transmitter is in SSB mode and the Drive control is turned all the way down. The best output indicator is an oscilloscope connected to the transmitter output, but a voltmeter with an RF probe can also be used. The adjustment procedure is described in the Argonaut manual.

The manual is rather vague on how to adjust the TX Mixer Balance control located on the TX-RX Mixer Board. I have found that the following procedure works well with my 509; it should also work for 505's and 515's:

1. Set the band switch to 20M.

2. Turn the Drive control to minimum (full CCW).

3. Put a 'scope or RF voltmeter probe on the XMTR OUT pin of the TX-RX Mixer Board (not the transmitter output!).

4. Set the Mode control to Lock.

5. Adjust the balance control on the TX-RX Mixer Board for minimum mixer output as indicated by the 'scope or RF voltmeter. (This control is labeled as R9 in the 505, R7 in the 509 and R13 in the 515.)

Now that your trusty old Argonaut is all tweaked for maximum SSB performance, put it on the air and enjoy!

Notes and References

1. B. C. Weaver, WU2J, "Argonaut 509 Modifications," SPRAT No. 72 (August 1992), p. 14.

2. If your final transistors need replacement, Ten-Tec recommends using 2N3924's. I tested a pair of 2SC799's (similar to MRF237's) in my 509 and they produced about the same output power as the original finals. Both types are direct "drop-in" replacements.

3. T-Kit, 1185 Dolly Parton Parkway, Sevierville, TN 37862; phone (615) 453-7172.

4. L. V. East, W1HUE, "Cleaner Keying for the Ten-Tec 509," QRPp Vol. III No. 2 (June 1995), p. 56. Copies can be obtained by sending an SASE to the author.

5. You can also use a calibrated oscilloscope. Peak envelope power equals peak-to-peak RF voltage squared divided by the load resistance times 8, so 45V peak-to-peak across 50 Ohms would correspond to about 5 Watts.

6. T-Kit has been notified of these errors and they may have been corrected on later runs.

IDEA EXCHANGE

Technical Tidbits for the QRPer

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IN THIS EDTION OF THE IDEA EXCHANGE:

ANOTHER LOOK AT "INTRO TO RF DESIGN"

*From **Denton Bramwell, K7OWJ** of St. Joseph, MI (not too far from the ancestral WA8MCQ home)*--"Introduction to Radio Frequency Design" by Wes Hayward, W7ZOI, has just been reprinted by the ARRL, and if you're any kind of electronics tinkerer, you'll value the book.

The author, Wes Hayward, is a physicist turned electronics maestro. With his physics background, he tends to approach problems differently than those who started out directly in electronics, and he tends to ask (and answer) questions that do not seem to occur to other workers in the field. This work seems to be a compilation of the things he had to learn to move from electron mechanics to electronics, and, as such, is an excellent guide to anyone with a technical background who needs to know about the principles of good electronics design.

The software that comes with the book is more than worth the price of the book. Again, the software seems to be the tools Wes needed in his day to day work. I'll admit to having gotten so fascinated with the software that I've spent more time with that than with the book itself.

Want to do a crystal filter design? There's a program included that lets you design and fully characterize serious crystal filters. It will set up biasing for bipolar and JFET amplifier stages, design lowpass, highpass, and bandpass filters, impedance matching networks, and much, much more. I've run a couple of crystal filters, and have been able to make really fine CW filters that work just like they're 'sposed to. More recently, I whipped out a bandpass filter to follow the transmit mixer stage in a little QRP superhet transceiver I'm working on; it works very well indeed. Some of these designs I could have done by hand, with considerable patience. Others, I doubt I could have duplicated without a daunting amount of research.

One of my favorite software features is one that allows the user to "build" a network, and then adjust values of the components while watching the effects of change on the screen. It is the next best thing to having a spectrum analyzer and tracking generator.

The book is not for those without a technical background, though. Although the math presented does use calculus and differential equations to develop some of the ideas, the narrative is sufficiently clear for those who want to understand the concepts without spending a lot of time with the equations. The main topics covered are transistor models, filters, transmission lines, two port networks, practical amplifiers and mixers, oscillators and synthesizers, and receivers.

--DE K7OWJ

INEXPENSIVE 100 KHZ CRYSTALS FOR CALIBRATORS

*From our Features Editor, **Larry East, W1HUE** of Idaho Falls, ID--*

The 100 kHz crystals that used to be common in receiver calibration and marker oscillators have become rather expensive and hard to find. I expect that this is due in large part to the fact that the stable frequency synthesizers and accurate digital frequency displays used in modern communications equipment have made marker oscillators unnecessary. However, some of us are still using and/or building less sophisticated equipment and consequently find marker oscillators useful. It seems to be common practice now to use inexpensive computer clock

crystals in the range 1 - 4 MHz and frequency divider IC's to produce a 100 kHz (or even 25 kHz) marker oscillator. Although the resulting circuit is a little complex, the required IC's are compact and inexpensive.

However, I recently found another solution: miniature quartz "tuning fork" resonators like those used in digital watches are available from some mail order suppliers (DigiKey, for example) with a frequency of 100 kHz for about $1.50. These things are really small; about the size of a 1/8 Watt resistor! However, they cannot handle more than one microwatt (that's 10 to the negative 6 power!) of drive, so they can't be used in many conventional oscillator circuits. These little crystals are also not as temperature stable as "normal" quartz crystals, but their stability is quite adequate for a 100 kHz marker oscillator.

I purchased several of these little "jewels" to experiment with and found that they worked very well in an oscillator circuit using an FET high frequency operational amplifier. The circuit, based on one in the 1987 ARRL Handbook, is shown in the figure. I tried TL082, LF353 and LF412 dual op-amps in the circuit and they all worked. However, the LF412's that I tried produced a somewhat less symmetrical output waveform than the other op-amps, resulting in a more even distribution of even and odd harmonics. Any reasonably well regulated supply voltage in the range 6 - 12 V can be used; the current drain was less than 5 mA at 9 V for the op-amps I tested.

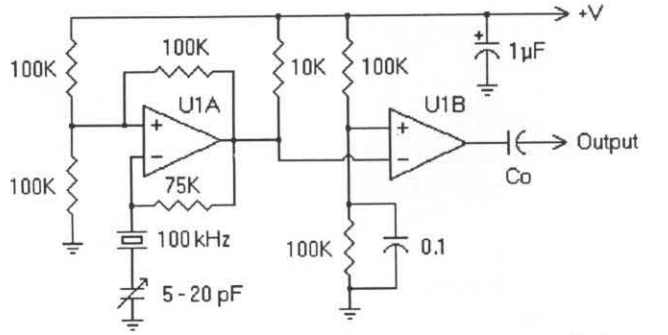

FIGURE 1

The size of the feedback resistor between the output of U1A and its inverting input is somewhat critical; too small and oscillation will be very sluggish in starting when power is applied, too large and oscillation may occur on an overtone frequency. I found that 75K was about optimum in my circuit layout, but 68K and 82K worked satisfactorily. The oscillator frequency can be adjusted over several Hz with the trimmer capacitor shown in Figure 1. [Drawing done by W1HUE in .PCX format. --WA8MCQ]

The output of U1B can be fed to a receiver antenna input through a small coupling capacitor (Co in the diagram). I found that 2 - 3 pF provided an adequate signal level into a Yaesu FRG-7 receiver, but 20 pF was required to produce an S-9+ signal (from 80 through 10 meters) in my Ten-Tec 509. I assume that this difference is due to the low input impedance of the Ten-Tec receiver, rather than lower sensitivity!

These little crystals are available from DigiKey in a number of frequencies from 20 kHz to 60 MHz, including most of the common computer clock frequencies. I have been told that the ones in the MHz range are "slab" type resonators, rather than tuning forks. They will also handle up to 2 milliwatts of drive power. I wonder who will be the first to try them in a narrow band-pass filter? You could probably build a complete filter smaller than a standard HC-6/HC-33 crystal!

--DE W1HUE

RUBBERIZING A COMMON CB RIG CRYSTAL

Via e-mail from ***Joe Everhart, N2CX*** *of Brooklawn, NJ (jeverhart@cayman.vf.mmc.com), it's Joes Quickie #15--*

One day on the Internet, Jeff Herman, NH6IL suggested using a very common crystal as a cheap way to get on 30 meters. Just as 3.579 MHz crystals are cheap and available for 80 meters, a common crystal freq found in "recycled" older CB rigs is 10.140 MHz. Unfortunately, though, that frequency is very heavily used by hf packeteers. In the spirit of cooperation, it's a good idea to avoid that area and use a lower portion of the band for QRP cw.

Experience with a circuit popularized by Ha-Jo Brandt, DJ1ZB, in SPRAT #70 (and reprinted in QQ), convinced me that the crystal could be "pulled" quite a bit on 30. Ha-Jo and others report a range of up to 30 kHz or so on 80 meters. In fact, in another issue of SPRAT, W6EMT used the same techniques with a 5.068 MHz crystal and a doubler to cover in excess of 30 Khz on the 30 meter band.

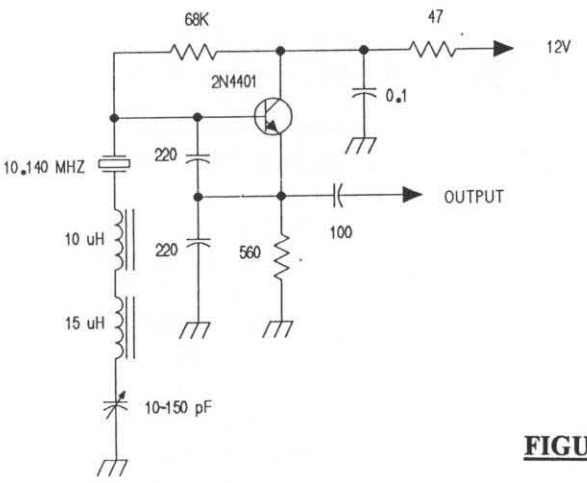

FIGURE 2

And, in a recent QRP Club of New England contest, I entered a VXO (variable crystal oscillator) with a tuning range of about 13 KHz. The circuit is shown in Figure 2. It's really an ordinary "crystal Colpitts" with only a slight variation. Note the multiple chokes in series with the crystal and tuning capacitor. Using a few small-valued chokes in series lets you put a large inductance in series so that you can get a large tuning range. Stray capacitance inherent in

chokes spoils the inductance of a large choke. Breaking the inductance up into several small-valued ones bypasses this effect. The results I give here are strictly empirical - that is, I just fooled around with different values until I got the best results. The following table shows results with different chokes in series:

No Choke	82 uH	82+75 uH	82+75+82 uH	
3.5801	3.5793	3.5786	3.5773	MHz @ Min C
3.5782	3.5764	3.5735	3.5638	MHz @ Max C
1.88	2.91	5.06	13.5	KHz Range

This is not nearly as far as Ha-Jo says he can tune, but it's not too shabby either! Perhaps with a wider selection of chokes, I could do better. With a 10.140 MHz crystal, feedback capacitors C1 and C2 had to be decreased to 220 pf each. This may not be an optimum value, but it worked fairly well. As expected, the choke values had to be smaller at 30 meters, but the tuning range increased substantially. Frequency resolution in the following table is poorer because my counter was acting up above 10 MHz; instead, I used a digitally synthesized receiver and rounded to the nearest kHz. Results were:

No choke	10 uH	10+10 uH	10+15 uH	
10.146	10.144	10.140	10.138	MHz Min C
10.140	10.134	10.123	10.109	MHz Max C
6	10	17	29	KHz Range

With more inductance the oscillator tuned below 10 MHz at the low end, but was VERY unstable, probably because it was no longer under control of the crystal. However with any of the above values, tuning was smooth, although compressed at the high frequency end. Keying was clean and drift was less than 100 Hz over a several minute period at any point in the tuning range.

I knew that the CB radio crystal was "sloppy", that is,it was easily pulled, probably due to its low Q. To demonstrate pulling range with a higher quality crystal, I repeated the experiment with a 10.105 MHz commercial quality crystal from Jan Crystals.

No choke	10 uH	10+10 uH	10+15 uH	
10.107	10.106	10.105	10.102	MHz Min C
10.105	10.099	10.089	10.051**	Max C
2	7	16	51 **	kHz Range

** Oscillator very unstable at low freq end

It is obvious that this crystal is harder to pull, although it still has a fairly wide usable tuning range of 16 kHz. Although not shown, it's probably a good idea to use an emitter follower buffer to minimize loading by succeeding stages. With the values shown above, I was able to pull one of the 10.140 MHz crystals over a stable range of 10.109 to 10.138 MHz. I can GUARANTEE that other crystals will have a different tuning range, even if they came from the same manufacturing run!

This examination of "pulling" crystal oscillators is hardly exhaustive nor is it very rigorous. I have much more data and expect to use it in a more comprehensive VXO article in conjunction with another technique that promises more tuning range and much better tuning linearity. The idea I wanted to show here was that simple experimenting can give wide range tuning with crystal oscillators and that common colorburst crystals are usable on 80 meters (witness the recent Colorburst Sprint) and that an easily scrounged CB radio crystal is very usable on 30 meters.

--DE N2CX

MODIFY SCOUT/ARGO 556 MODULE FOR WWV

*From frequent contributor **J. Frank Brumbaugh, KB4ZGC** of Salinas, PR, comes a modification to allow reception of WWV at 15 MHz*--This mod is not for everyone, since it involves sacrificing 80 meter operation, but some may be interested. I happened to get my hands on an old 80M module at no charge, and because I never work that band, and my homebrew low pass antenna tuner (October 1991 issue of 73, page 46) was designed for 40 thru 10, I can't use it for 80--hence this mod.

The signal conversion of these rigs is: Signal = IF + crystal + VFO, or IF + VFO -crystal, depending on the band module. The 80M module contains a 7.444 MHz crystal and band pass filter for 80 meters, and the difference frequency is selected: 3.5 = 7.444 + 2.2 - 6.144. However, by eliminating the band pass filter, replacing it with the circuit below, and substituting a crystal between 6.156 and 6.656 MHz, WWV can be tuned at either the low or high end, respectively, of the tuning range.

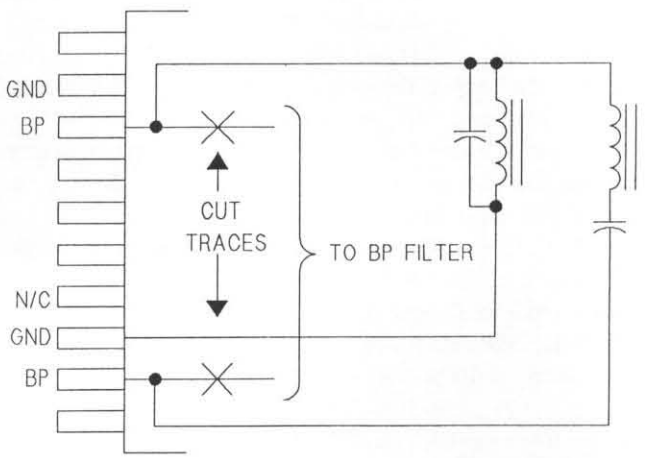

FIGURE 3

Cut foils at the places marked X in Figure 3. Drill small holes where connections are shown. Parts must be placed on the component side between the coil cans so they cannot interfere with the filter can on the other PC board. Be sure to put the module back together properly when done. Two screws hold both PC boards--remove these and the guts drop right out.

Both inductors are 2.35 microhenries and the capacitors are 50 pF. If a crystal of 6.2 MHz is chosen, the tuning range will be 14.844 to 15.344, which includes a large portion of the 19 meter shortwave broadcast band. A 6.156 MHz crystal will produce a tuning range of 15.000 to 15.500 MHz.

A surplus 6.553600 MHz microprocessor crystal is available for $5.00 from JAN crystals, but they have a $20 minimum order, plus shipping. A special order crystal in the range specified above, at 50 ppm, costs $11.00 from JAN. I have not been able to find a suitable surplus crystal at the usual $1.00-1.25 price in any of my catalogs.

Because there is some QRP operation on 80, perhaps not too many hams would want to use this mod. Still, it does allow tuning WWV, which is handy not only for time but also for propagation reports at 18 minutes past every hour. Any other module could also be modified for WWV, on 15 MHz as shown, or 10 MHz with changes as required for this frequency. (The unmodified 30 meter module will hit 10 MHz at the low end of the tuning range, so if you have that module there is no need to sacrifice another to get WWV.) The fact that this module can be set up with the proper crystal to tune most or all of the 19 meter SW broadcast band is a plus.

--DE KB4ZGC

HOLDER FOR SCOUT/ARGO 556 MODULES

Whether you modify any of your modules or not, you need a handy way of storing them. Here's the answer from long-time QRPer ***Fred Bonavita, W5QJM*** *of San Antonio, TX*--I needed a convenient, safe way to take several (but not all) of the band modules for my Argo 556 on a recent vacation trip. I didn't like the idea of packing individual modules in the oversized briefcase I used to take my rig, power supply, tuner, keyer and other station components. I worried about damaging the finger connector strips on the module bottoms, or, to a lesser degree, the plastic ejector strip on the tops.

While shopping for containers to pack food in my cooler for the trip, I spotted one that appeared to have been made more for modules than munchies. Since it cost less than $1, I bought it. My hunch was correct; it holds 4 modules with no problems. I lined the bottom with two layers of bubble wrap for more protection for the connectors, since stored modules are stood on end. Shutting the lid holds everything gently but firmly in place. The container is firm but has some "give" to it.

This particular one is made by Tucker Housewares, item #0583-1. It has a 3 cup (750 mL) capacity. It is tapered slightly but wide enough at the top so the modules fit with no problems. I found mine at a Container Store, but supermarkets may yield similar ones by other manufacturers. Take at least one module to test the fit.

With 4 modules in the container and one in the rig, I have more than enough band capacity for portable operating. I keep my modules in the container back at the shack, too.

--DE W5QJM

THE "COPPER-TOP" ANTENNA

From ***C. F. Rockey, W9SCH*** *of Albany, WI*--If you please, may I suggest another simple but effective antenna to go alongside of W1HUEs "sky plane"? (Idea Exchange, April 1995 QRP Quarterly.) Although old enough to have been used on Noahs ark, it is a true "golden oldie" which should not be forgotten. For the form used and enjoyed at W9SCH, the details appear in Figure 4:

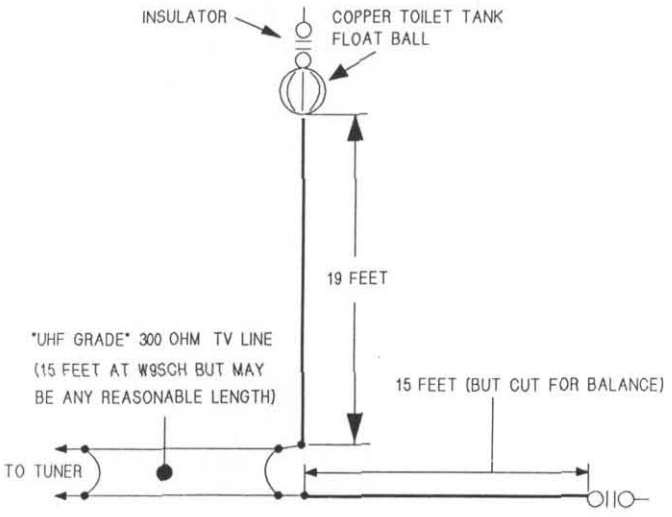

FIGURE 4

This antenna works well on 28, 21, 14 and 10.1 MHz; possibly on the other WARC bands, too, but I have no gear for them.

At W9SCH, the vertical wire runs up along a corner of my frame cottage, while the horizontal wire runs just above

the foundation, at two feet above ground. (If the presence of the float ball offends your cyberspace esthetics, omit it. But then you should make the vertical wire 2 1/2 feet longer, 'cause that's what the silly ball is "worth", electrically. But the ball does add some top capacitance, increasing the radiation effectiveness of the vertical wire.)

Purists will pout because only one "radial" counterpoise wire is used. But I say to you--try, and see for yourself! This antenna is non-critical, generally, as to the wire lengths but one point is important: the two wires must be in balance, electrically. You may easily determine that this condition exists by temporarily connecting one miniature Christmas tree bulb in series with each feedline wire at the tuner.

Tune it up, with low power on 14 MHz, and trim the horizontal wire until both bulbs burn at equal brilliance. Then remove the bulbs and connect directly to the tuner. (This is vital! If the system is not thus balanced, various weird problems will ensue. So, balance it and forget the problems.)

This antenna was set up at W9SCH in 1991 and has been used with pleasure since then. During the good propagation years, all continents were worked with five watts, and four with one watt. Since then, during the current radio "hard times", kilo-mile domestic contacts are made consistently with one watt, and quite often with 100 milliwatts. To me, this is the acid test of an effective antenna--one having the observable low angle radiation property of a good vertical radiator. Check it out and see--its cost is negligible.

--DE W9SCH

QUICK, EASY AND SUPER AUDIO FILTERS

*More from **Denton Bramwell, K7OWJ** of St. Joseph, MI*--Interested in audio filters? If so, let me tell you: the game has changed! New parts are available from MAXIM that make it possible to build filters out of one chip that were possible only with a number of op amps and their associated phase shifting components.

For a portable receiver, it's hard to beat the MAX297. For a 750 Hz low pass filter, Figure 5 is the circuit:

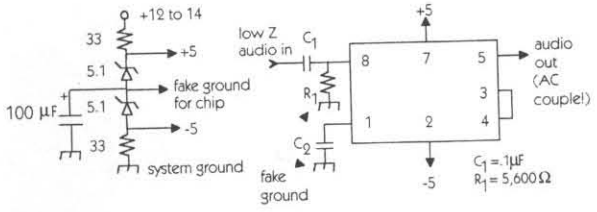

FIGURE 5

R1 and C1 form a simple high pass network that attenuates signals below 284 Hz. This forms the lower cutoff frequency of the filter. C2 sets the upper cutoff, and brother, does it cut. With a corner frequency of 750 Hz, attenuation is 80 dB by 1125 Hz. That's a steep slope!

These are some possible values of C2, and the associated upper cutoff frequency.

C2, pF	Cutoff Frequency, Hz
1,000	667
940 (2x470)	709
820	813
247	2,700

This chip is NOT built to run on voltages above about 10. In fact, 12 or +/- 6 is the absolute maximum. The zeners shown in the circuit guarantee compatibility with 12-14 volt systems.

The chip generates an internal clock, which controls the corner frequency (clock set by C2). Up to 5 millivolts of clock can appear in the output, where it can cause mischief in some circuits. In most cases, however, the clock, which is 50X the corner frequency, simply disappears in the normal rolloff of the audio amplifiers that follow the filter. If you want to suppress the clock feedthrough, the chip does have an uncommitted op amp (pins 3 and 4) that allows you to build one stage of RC low-passing to clean up the clock.

As shown here, you can AC couple the output, and use the system ground as your audio return. Bypasses of 0.1 uF or larger from pin 2 and pin 7 to the fake chip ground are a good idea, but may not always be necessary, since the zeners are fairly low impedance all by themselves.

My article in the July 1995 issue of QST had a slightly more complex filter with a hard cutoff at 300 Hz and a continuously variable upper cutoff frequency, for phone, CW and other modes.

Other chips in the family that are worth noting are the MAX294, which is steeper yet, but with an ultimate rejection of only 60 dB, and the MAX295 which has a gentler slope, but an ultimate rejection of about 110 dB. All of these filter chips are in the $6 to $7 price range, and are available from Digi-Key (1-800-DIGIKEY).

--DE K7OWJ

TESTING VHF TV BALUN CORES

*There was some discussion on the Internet QRP forum (QRP-L@lehigh.edu) recently about using ferrite binocular balun cores from old TVs and VCRs, and whether the material was suitable for HF use. N0OCT had something to say about it (VCR FERRITE BINOCULAR CORES AS POWER SPLITTERS in the July Idea Exchange), and here's what **Joe Everhart, N2CX,** said on-line--*

I want to beat the drum some more for a favorite technique of mine. You can measure the baluns and assure yourself that they will work! To do this, you simply measure the impedance of the windings in question, either directly or indirectly. I won't go into the internal mechanics of the baluns, as that has been done both here and in several excellent publications by Jerry Sevick, Wes Hayward, Doug DeMaw and lots of others. A pretty good idea of a balun's worth for QRP amateur radio applications can be

gotten by just measuring it as an inductor. Figure 6 shows the balun wound as an impedance transformer:

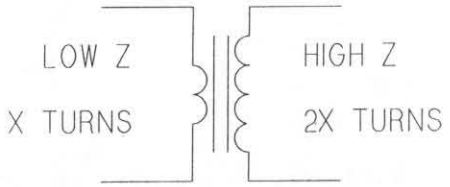

FIGURE 6

A crude rule of thumb is that the impedance of a winding must be at least 4 times the impedance it will see at the lowest operating frequency (I like ten times). In this case, a TV balun is to be checked out for use at hf. In TV use (at VHF) the "LO Z" side would see 75 ohms and the "HI Z" side would match 300 ohms. The ratio of impedances is set by turns ratios inside the device. The operating impedance level is really set by the characteristic impedance of the windings but can often be ignored. So potentially the unmodified balun can be used to transform 50 ohms to 200 ohms. You can get some idea of the usability by measuring the impedance of the windings as inductors.

For various reasons, the LO Z side is probably easiest to measure. Using an inductance measuring device you can check the inductance at the operating frequency, then calculate the impedance using the familiar formula:

Z = XL = 2 * PI * F * L

A more direct way is to measure the impedance directly at the operating frequency using an impedance bridge or another device such as the Autek RF-1 ANALYST, or an MFJ SWR analyzer with "RF resistance" capability. Just be sure that the impedance is at least 4 times the impedance level of your circuit at the LOWEST operating frequency. Only one winding must be checked. If it is OK, the transformer's turns ratio will probably ensure that the other winding is adequate.

If you are adventurous (and I hope you are), you can use the balun core to wind your own. Just check the impedance of one of the windings as described above to be sure that the balun will work. Purists will no doubt say that this method is not exact. They're right, but it should get you in the ball park for most low power usage over a few ham bands.

--DE N2CX

ARTIFICIAL TURF AND THE CWF-2 AUDIO FILTER

*From **Jim Smith, N0OCT** of the St. Louis QRP group (JIMN0OCT@AOL.COM), some info on the venerable CWF-2 audio filter by MFJ, which still shows up at hamfests now and then, or which could be easily duplicated at home; this article was also submitted to the St. Louis QRP Societys "Peanut Whistle"--*

I did some recent work on the CWF-2 audio filter kit. While an excellent filter, it is noisier than I would like for extended listening, perhaps due in part to the single supply design. While op amps were originally designed for dual polarity supply (+15 and -15 Vdc, for example), many circuits employ a virtual ground in order to accommodate a single polarity supply (+12 Vdc).

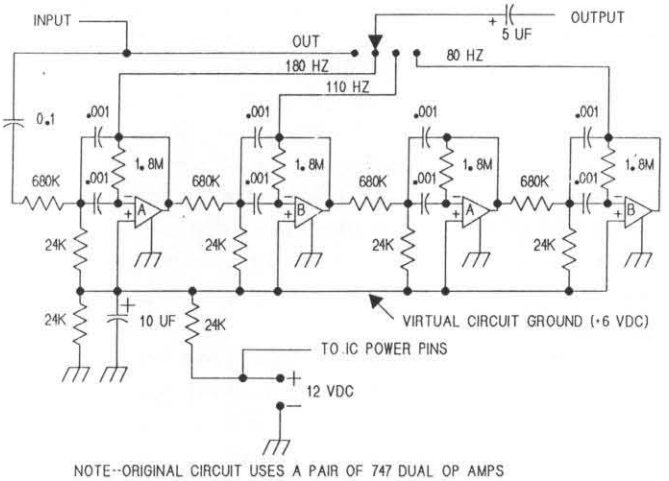

FIGURE 7

The implementation used in the CWF-2 is quite common: use two high value resistors as a voltage divider to provide the virtual ground. This "ground" is at +6 Vdc potential, and all leads that would normally be connected to circuit ground are connected to it. The negative supply leads are then connected to actual circuit ground. Thus, the op amps in the CWF-2 and other circuits like this operate between 0-12 Vdc, centered on +6 Vdc (virtual ground). Any AC signals that are processed by the filter can only fluctuate 6 V (absolute) above or below "ground".

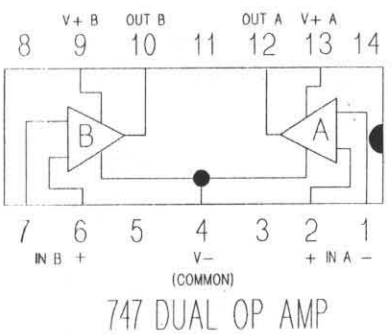

FIGURE 7A

After some discussions with Chuck, AA0HW, and Matt, N0XEU, two shortcomings of the unipolar supply became apparent. The first is that it may not take much audio signal to the filter before it starts clipping or distorting the signal. Second, the perceived "signal to noise" ratio (S+N/N) may be rather low since the AC signal only fluctuates +/- 6 Vdc maximum with respect to virtual ground at the output. If the filter were driven with a bipolar supply (+12 and -12 Vdc,

for example), might not the filter be able to handle higher signal levels and improve the S+N/N ratio?

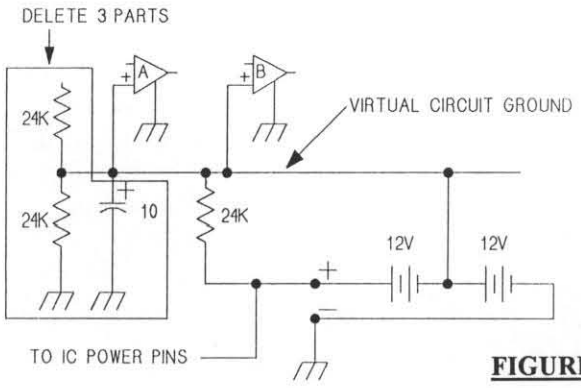

FIGURE 8

To modify the circuit for bipolar operation, I used the virtual ground line (originally at +6 Vdc) as circuit ground for both supplies (in this case, 12 V batteries) and the original circuit ground as the negative (-12 Vdc) supply, as shown in Figure 8. One must disconnect the grounded electrolytic or tantalum cap in the middle of the circuit board, as well as the two 24 k ohm resistors on the far right side of the board (viewing from the component side, pin 1 end of the IC's pointing away from you).

How did it work? It sounded better and it seemed to have higher Q to me, but these are very subjective evaluations. It also had higher gain compared to the single supply version. I haven't had a chance to put a 'scope on it, but I'm going to try to use this in my Argonaut 509. It does have its drawbacks--it has a higher tendency towards ringing, and requires the bipolar supply. The ringing only occurs at high signal levels and can be cured by inserting the filter into low signal level locations in the audio chain and placing low noise audio amplification after it. I'm working on a fix for the dual polarity supply.

(The "artificial turf" relates to the virtual ground in the original CWF-2. I know--bad joke.)

Later comments--

I built one of these puppies up from the original circuit board. With hand matched 1% resistors and good poly caps, this filter is dynamite. Again, it overloads easily, so care must be taken to insert it into a low level audio section of a receiver.

When I tried to improve upon it by wiring it for +/- 12V operation it was narrower, a little bit quieter, and could handle a higher signal load before distorting. However, I don't think these advantages outweigh the complexity involved to change to +/- 12V (like building a voltage doubler or using two batteries).

There are also quieter op amps now available (NE5532, TL071CP, etc), but I haven't tried one of these. The stock product is very quiet if care is taken to use well matched components. There may even be some improvement realized by building this from a single quad op-amp rather than two duals.

--DE N0OCT

QUIET AUDIO AMPLIFIERS

More from ***J. Frank Brumbaugh, KB4ZGC***--I've heard and read lots of hams griping that their audio output chips are noisy. Here are two of my circuits which are noise free at full gain, with no audio input. They should eliminate the noise problems I've been hearing about.

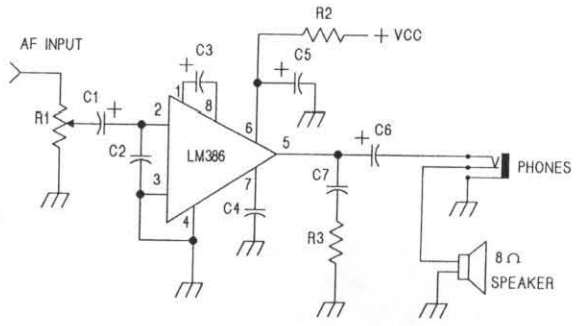

FIGURE 9

	IC Type	Power out
R1 10K audio taper pot		
R2 22 ohms 1/4 w		
R3 10 ohms 1/4 w	LM386	100 mw
C1 1 to 3.3 UF electrolytic	LM386N	100 mw
C2 330 to 470 PF ceramic disc	LM386N-1	100 mw
C3 10 UF electrolytic	LM386N-2	250 mw
C4 0.01 UF disc	LM386N-3	500 mw
C5, C6 220 to 470 UF electrolytic	LM386N-4	750 mw
C7 0.1 UF disc		

In Figure 9, C5 and C6 must be no smaller than 220 UF, with 470 UF preferred, and must be mounted right at pins 5 and 6, as closely as possible. C2 may not be needed, but without it the chip may pick up a local AM broadcast station.

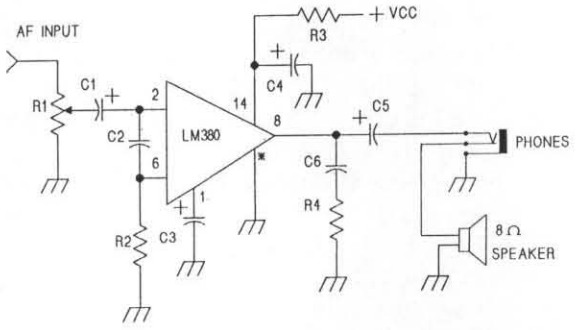

FIGURE 10

*Ground pins 3, 4, 5, 7, 10, 11, 12

R1 10K audio taper pot	C1 1 to 3.3 UF electrolytic
R2 470K 1/4 w	C2 330 to 470 PF disc
R3 22 ohms 1/4 w	C3 4.7 UF electrolytic
R4 16 ohms 1/4 w	C4, C5 470 UF electrolytic
	C6 0.1 UF disc

Figure 10 is my favorite AF amp, with 2 watts output and current drain of about 15 mA with no input. C3, C4 and

C5 must be mounted directly at the pins, as closely as possible. All 7 grounded pins should have short, direct connections to ground. Gluing a heat sink on the LM380 is a good idea, as well as using one on the LM386N-2, -3 and -4.

These circuits should eliminate the noise problems I've been hearing about.

--DE KB4ZGC

PROGRAMMABLE ATTENUATORS

*From me, **WA8MCQ**--* Step attenuators are always good things to have for experimenting, and even for operating, if you're feeling adventuresome. (Don't forget, "watts are for wimps!", and milliwatting can be a fascinating mixture of great thrills and utter frustration....and a lot of the latter, with the sunspots where they are now!) I've found some good values at hamfests, but people usually want a lot more than I'm willing to pay. There are still some occasional good deals out there, though, if you're willing to do a bit of extra work and accept some slight inconvenience.

When someone says "step attenuator" you usually think of a cylindrical unit with a knob, or a long, rectangular one with lots of switches on it. There is one other type, the programmable attenuator, which you don't see as often, and are sometimes sold for less than the "normal" type. These might not look like attenuators at first glance, and certainly don't have knobs or switches. They aren't as convenient for our use, but still work perfectly well.

A programmable attenuator is one in which the value of attenuation is controlled by applying DC voltages rather than by manipulating switches or knobs. Examples of use would include computer controlled test systems, or perhaps a piece of equipment where front panel control of attenuation is needed but due to the construction the attenuator itself must be located some distance away.

They might have a single multi-pin connector, or perhaps a set of feedthrough lugs. The one I have is a model 50DA25, made by Alan Industries. It is a 50 ohm unit with BNC connectors, steps of 1, 2, 4, 8 and 10 dB, all individually selectable by applying a voltage to the appropriate pins. The innards consist of the usual resistors, plus five tiny relays that look like SBL-1 mixers. (In the old days, we used to say that SBL-1 mixers looked like relays!)

The coils are nominally 26 volts DC, but work quite well with 12 volts. (That's a little tip to keep in mind when you are looking at anything with 26 volt relays--they often work with lower voltages.) One way of using it would be to add a few switches and a power supply as shown in Figure 11, which also gives a rough idea of what this particular attenuator looks like (other units may be different). The Alan unit has polarity marked on the terminals, due to the diodes connected internally across the relay coils. You'd need a little chassis or box to hold everything, along with a cable to go to a power supply, but if the price of the attenuator is good it could be worth the trouble.

--DE WA8MCQ

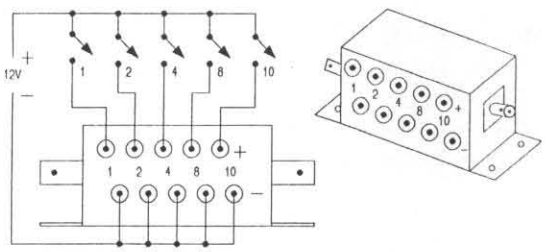

FIGURE 11

INTERNET QRP FORUM

To subscribe to the QRP discussion group mail reflector, send e-mail to

listserv@lehigh.edu

and in the text say

SUBSCRIBE QRP-L [your name] [your call]

For example,

SUBSCRIBE QRP-L Mike Czuhajewski WA8MCQ

That's your name, not your e-mail address, which it gets from the incoming header. If all went well, you will shortly receive a welcoming message with info on the forum, along with 20 to 40 e-mail messages a day. (A daily digest is also available, which bundles an entire days traffic into a single, very long e-mail message.)

THE FINE PRINT See any significant errors in anything in the Idea Exchange? If so, be sure to let me or the author know about it and we'll work it out. And if you send something for the Idea Exchange, let me know if you don't get an acknowledgement in, say, 3 weeks or so. I'd hate to see anything get lost in the mail, but I've been getting lazy lately and you might need to rattle my cage. Do your part to keep the Idea Exchange big--keep those tidbits (via e-mail, on disk or even handwritten) coming to Severn!

--qrp--

QRP ARCI AWARDS

Quarterly Awards Column written by Chuck Adams, K5FO

I know that many could not help but notice the lack of printing on awards during the last year and after reading this column, hopefully you will understand and bear with the delays.

I picked up the job as Awards Manager from **Bob Gaye, K2LGJ**, who did an excellent job of handling a tremendous burden of paperwork. I hope that I can follow in such giant footsteps.

During the process of transfer of the paperwork a very close call was encountered when United Parcel Service left the boxes that Bob had sent to me exposed to the elements during a tremendous Texas sized rainstorm. Fortunately, nothing critical was lost due to water damage, but it did make me realize how important the duplication of the data was. I then took on the personal task of entering **ALL** the awards data into the computer little realizing what was involved in the process. I figure over **500 hours of total time** was required over a period of more than a year to do this. You will see why later in this broadcast.

The awards program for the ARCI has been in place for almost **30 years.** During that time a tremendous amount of data was accumulated by many awards managers. All the work until now was accomplished without the aid of a computer. Many of you who think that 300MB or more of disk space is and has been a common thing need to go back a look at what was available about 10 years ago and the prices at that time.

First lets look at the awards in place a year ago. Of course, all of these assume the radio amateur is running 5 watts or less and some awards may have endorsements for the specific power level used. When applying for an award make sure to specify if ALL contacts were made at a lower level.

QRP-25 for working 25 or more QRP ARCI members.

WAC for working all six continents.

WAS for working 20 or more states in the United States of America.

DXCC for working 100 or more countries.

One Thousand Miles--per--Watt for a QSO where the distance between the two stations divided by the lowest power used by either station is greater than 1,000 miles/watt. Historically this award has been using the measurement of miles for the distance and no time in the near future do I see us changing this although the kilometer is used throughout the rest of the world as a standard measure of distance.

QRP-NET (QNI-25) for 25 check-ins into the QRP ARCI nets.

See the page with the application forms in this issue to get all the details when applying for an award of your choice.

There have been **over three thousand awards given out** over the years. This is a tremendous amount of data. In fact, the entered data consisted of more than two hundred thousand characters. About one-third of this I might have been able to get by without, but I needed it to catch errors in the data. I leave it as an exercise for the reader to figure out how long this would take at various typing speeds.

Some applications were delayed due to a number of reasons and for that I apologize, but a small perturbation now will clear up a lot of delays and get the numbers correct. If you have been awarded a certificate and when the numbers are published and they do not agree, please let me know in a postcard, but I respectfully request that you do not ask for another certificate unless you just gotta have the right numbers and are willing to post the additional expense to do so. There is no free ride.

I have the data cross-referenced by mode, band, and mode-per-band. The statistics are very interesting and will be detailed next month. This month's main purpose was to get rid of some of my paperwork and get the applicant to fill in as many blanks as possible. If you have any difficulty with the forms, don't worry. Fill in everything that you can except what is inside the double box, that area is reserved for me. I'll do the rest. **Photocopy QSL** cards, do not send them to me. QSL cards are too valuable to you and a photocopy is satisfactory.

I have all the cities in the US on-line with long/Lat. data. This database alone takes up 51 different files and has more than 125,480 lines and almost ten megabytes of disk storage. I use this data to calculate great circle bearings and distances for the KM/W awards. International data I have to look up in an Atlas, which was very difficult to find one that I was willing to pay for that had the long/Lat. for each city. Modern Atlas's do not contain that data anymore. Guess noone else needs it. So if you can get this info, please do so.

For **DXCC, WAC, and WAS**, get all the cards together and have another amateur witness them and check them for accuracy. We are not in the policing business.

Tell all your friends that have let their subscriptions lapse that they need to immediately get back on board. For the first time in history, **ALL of the data is going into print** over the next few issues and it will not be reprinted for years to come.

Thanks for your support and keep those cards and letters coming. Also note the new address, Box 181150, Dallas, TX 75218-8150.

dit dit **Chuck Adams (K5FO CP-60) adams@sgi.com**

CONTESTS

Cam Hartford, N6GA
QRP ARCI Contest Manager
1959 Bridgeport Ave., Claremont, CA 91711

This past June we had twenty participants in the Milliwatt Field Day competition. That is to say, twenty groups or individuals braved the elements to go up against all comers for the MW Field Day plaques and trophy. They survived the usual onslaught of Mother Nature's finest - Heat, Rain, Thundestorms, Mosquitoes, Other Campers, and the Occasional Bear. Congratulations are in order for the winners:

One or Two Ops, Less than One Watt	KN1H
One or Two Ops, Less than Five Watts	NN9K
Club Category	AA4XX

All groups were hotly contested, especially the Club class which saw 4 groups packed closely at the top of the list. Battle plans are most likely already being reviewed and revised for next year. Be sure to join in on the fun!

1994 MILLIWATT FIELD DAY

GROUP NAME	CALL	SCORE	CW Qs	PHONE Qs	No. OPS	RIG(S)	ANTENNA
ONE OR TWO OPS, LESS THAN 1 WATT							
	KN1H	4643	299	21	1	ARGOSY	140' DIPOLE
WYOMING VLY QRP CMDOS	K7YHA	2025	135	Ø	2	NORCAL 40	DELTA LOOP
	K4JO	110	11	Ø	1	HB TCVR	SUPERLOOP
ONE OR TWO OPS, 5 WATTS							
	NN9K	7920	528	Ø	2	IC-735	DIPOLES, YAGI
	WAØRPI	7230	468	28	1	IC-735	G5RV, 500' LONGWIRE
HIGH KNOB HOOTERS	N4ROA	5385	351	16	2	?	?
	KK7C	4890	326	Ø	1	ARGO 509	HALF SQUARE
	K3SS	4830	269	106	2	IC-737	INV VEE, SLOPER
	W9NJP	4665	311	Ø	1		SLOPING CF ZEPP
	WØYHE	3330	222	Ø	1	TEN TEC ARGOSY	130' INV VEE
	AE4CA	2040	136	Ø	1	FT-840	92' CF ZEPP
	KO6KA	1380	87	10	1	ARGO 509	40, 20 DIPOLES, 15 LOOP
	AA9NA	608	Ø	81	1	ARGO II	CAROLINA WINDOM
CLUB STATIONS							
OCRA	AA4XX	13163	692	371	19	MANY	MANY
MERIDEN ARC	W1NRG	12698	797	99	38	TS-450, TS-790, -690	VEE-BEAM, G5RVS
ZUNI LOOP MEF	N6GA	12330	615	414	13	MANY	MANY
DURHAM REGION QRP CLUB	VE3DQR	12308	767	107	18	?	?
BERRY'S MT ARC	W3TS	6225	297	236	5	HB TCVR, TS-130V	2-135' DIPOLES
GUANO REEF BASH. PERV.	N4BP	5708	333	95	3	TS-130V,FT-690	R5,40M PARAFOIL VERT
ATHENS CTY ARA	W8MHV	3728	226	45	6	ARGO 515	DIPOLES

HOOTOWL 95

STATE	CALL	SCORE	POINTS	SPC	POWER	BANDS	TIME	RIG	ANTENNA
20 METER STATIONS									
KS	WBØSMZ	945	27	5	5	20M	2	TS-140	TRIBANDER
40 METER STATIONS									
VA	N4ROA	23,380	167	20	5	40M	3	OMNI C	DIPOLE
CA	W6ZH	9,828	108	13	5	40M	2.5	ARGO II	2 EL YAGI @ 60'
MI	K8NWD	9,345	89	15	3	40M	3	ARGO 509, 515	80M DBL EXT ZEPP
AZ	WO7T	8,127	129	9	5	40M	3	QRP +	GAP VERT
CA	KD7S	7,553	83	13	4	40M	4	IC-728	HF6V
AR	N5SAN	5,964	71	12	4.5	40M	2.5	FT-747	650' DIPOLE
NC	AA4XX	5,850	39	10	0.25	40M	3	OHR CLASSIC	3 EL WIRE BEAM, INV VEE
CA	W6SIY	3,690	41	6	0.25	40M	2	TUNA TIN II, NEOPHYTE	DIPOLE@ 18'
AL	KE4AGT	3,087	49	9	5	40M	2		DIPOLE
PA	W3PNL	3,024	48	9	4	40M	4	ARK-40	INVERTED VEE
MO	NØOCT	2,646	42	9	4	40M	?	ARGO 509	SLOPING DIPOLE
CA	N6KM	2,394	57	6	5	40M	1.5	QRP +	R-7 VERT, DIPOLE
MD	WA4KAC	2,240	32	7	0.9	40M	2	NORCAL 40A	ATTIC LOOP
CA	K6MDJ	1,848	44	6	3	40M	1.5	NORCAL 40	80M VERT LOOP
NJ	N2CX	420	20	3	4	40M	0.5	ARGO 509, MFJ 9040	DIPOLE
VA	K3SS	315	15	3	2	40M	2	MOD TECHSONIC MILLIWATTER	G5RV
MD	WA8MCQ	252	12	3	4	40M	0.25	TS-430	DELTA LOOP
PA	N3CZB	35	5	1	4	40M	1	TT CENTURY 21	36" LOOP INDOORS
ALL-BAND STATIONS									
TN	KC4IIS	58,072	244	34	5	A-2	3.5	OMNI V	2 EL QUAD, 1000' LOOP
OK	W7BD	26,754	147	26	4	A-2	4	T-T DELTA	TRAP VEE
AB	VE6GK	19,908	158	18	5	A-2	3	?	?
TX	KB5YVT	14,231	107	19	5	A-2	2	??	??
CO	WOØQ	13,442	113	17	5	A-2	2	FT-1000	QUAD, HF6 VERT
GA	AE4CA	11,781	99	17	5	A-2	4	FT-840	80M LOOP, 40M DIPOLE
CA	KO6KA	7,770	74	15	3	A-2	4	ARGO 509	DIPOLES
VA	N4JEO	6,762	69	14	5	A-3	2	IC 735	DBL EXT ZEPP
AZ	KB7BEJ	5,915	65	13	5	A-2	2	SCOUT 555	5BTV
MD	WO3B	3,360	32	7	0.2	A-2	2	QRP +	160M LOOP
CT	NM1J	1,344	32	6	2.5	A-2	2	NC40, ARGO 515	VERTICAL LOOP, YAGI
NJ	W2JEK	1,260	30	6	4	A-2	2	ARGO 505, LCK	GP, DIPOLE, 160 MARCONI
TX	K5ZTY	1,250	25	5	2	A-2	2	HW-8	140' DIPOLE
NY	KD2IX	800	20	4	0.9	A-2	2	IC-725	210' DIPOLE
LOW-BAND STATIONS									
PA	W3TS	7,800	52	10	0.25	L-3	1	HB TCVR	INV VEE, 160M TEE
NJ	N2MNN	1,911	39	7	5	L-2	3.5	TS-850	40M VERT LOOP
NY	K2LGJ	1,620	27	6	0.9	L-2	2.5	NN1G, HW-9	26' ELEVATED VERT
WI	WW9H	1,100	22	5	1	L-2	2.5	ARGO II	YAGI, DIPOLE

The Hootowl is on the comeback! After a few years in the doldrums, it seems to have caught the fancy of QRP contesters again. It helps if the Contest Manager remembers to get the contest announcement into the QQ, but he is learning, albeit slowly. The top three scores were as follows:

KC4IIS	58,072
W7BD	26,072
N4ROA	23,380

Propagation kept operators in the lower frequency bands, as evidenced by the lack of a Hi-Band entry. One intrepid soul, Ray WBØSMZ, gets the certificate for being the best (only) op to try a 20 Meter only contest. Hard work these days. Soapbox: Checked all the other bands, but no signals, therefore, this is a single band entry - W6ZH; Contest kept me awake while I waited to open the irrigation gate for the yard - WO7T; QRM was brutal -N5SAN; I especially like 4-hour contests. Unfortunately, my final fried after 2.5 hours - KE4AGT; The static was skull splitting here - NØOCT; While Doug was working on his floor, my wife had higher aspirations - ceiling tile - N2CX; Too much noise, not enough receiver - K5ZTY; Nearly gave up, it took 47 minutes to make the first QSO - AE4CA; Although "watts are for wimps", near-summertime QRN requires wimpy behavior - WA8MCQ; When 40 went out, so did I - KB7BEJ; It all came back to me. I am a family-man, not a radio-man. - N4JEO

Summer Homebrew 95

STATE	CALL	SCORE	QSOs	POINTS	SPC	POWER	BANDS	TIME	RIG	ANTENNA
*****	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********
20 METER STATIONS										
PA	KM3D	41,340	41	158	23	0.9	20M	4	NN1G	4 EL YAGI
TX	W5HNS	13,804	28	116	17	4	20M	4	TS-930	CAROLINA WINDOM
AB	VE6GK	12,040	17	64	11	0.95	20M	1	NORCAL SIERRA	YAGI
OR	N7ICK	9,660	25	92	15	5	20M	3	QRP +	DIPOLE
KS	WBØSMZ	4,107	11	43	7	4	20M	2	HB TX	TRIBANDER
G4	G4MQC	2,016	9	36	8	3	20M	3	PRM 4031	INV VEE
PA	N3CZB	896	7	32	4	4	20M	3	MFJ 9020	2 TURN INDOOR LOOP
40 METER STATIONS										
NJ	N2MNN	19,504	41	148	14	3.7	40M	3.5	OHR 40 SPIRIT	40M VERT LOOP
MD	WA4KAC	15,340	23	94	11	0.95	40M	3	NORCAL 40A	98' ATTIC LOOP
NC	AC4QX	14,114	24	93	14	5	40M	2.5	ARK 4	G5RV
TN	N4AOX	14,016	22	92	14	4	40M	3	ARK 4	INV VEE
PA	W3PNL	12,280	25	104	10	5	40M	4	ARK 40	INV VEE
PA	KT3A	8,591	12	57	9	2	40M	3	NORCAL 40	HAMSTICK ON ROOF
GA	AE4CA	7,340	9	39	6	1	40M	4	NN1G	LOOP, DIPOLE
CA	W6SIY	5,330	4	11	2	0.25	40M	2	TUNA TIN II, NEOPHYTE	DIPOLE @ 18'
IN	N9DAW	1,666	8	30	4	5	40M	1.5	MFJ 9040	G5RV
80 METER STATIONS										
PA	WA3YON	7,436	17	58	6	5	80M	2	S&S TAC-1	CF ZEPP
NY	KB2PLW	2,231	4	11	3	1	80M	1	HB 1G4 OSCILLATOR	?
ALL-BAND STATIONS										
VA	N4ROA	66,495	58	251	35	5	A-3	4	OHR 40, OMNI C	A4S YAGI, DIPOLE
GA	KE2WB	44,860	41	166	30	5	A-2	3	HW-9, HB TCVR	G5RV
NJ	KB2JE	42,924	51	219	28	5	A-3	4	QRP +	G5RV
OH	N8UOO	42,784	41	191	32	5	A-3	?	TS-930	DIPOLES, LOOP
PA	W3TS	36,630	23	103	14	0.25	A-3	1	HB TCVR	INV VEES, YAGI
TX	K5ZTY	26,930	15	63	11	1	A-4	3	HW-8 MODIFIED OFTEN	140' DIPOLE
CA	W6ZH	24,212	23	94	14	1.3	A-3	2.5	NORCAL SIERRA	KT34XA, 40M YAGI
MO	NFØR	23,520	24	140	24	5	A-3	3.5	ARGO 509	ATTIC ZEPP
NJ	W2JEK	22,464	10	44	8	2	A-4	1	HW-8, NN1G, OHR40	GP, DIPOLE, END-FED HERTZ
VT	N6GA	21,570	19	89	13	0.9	A-2	1.5	NORCAL SIERRA	90' CF ZEPP
MN	WAØRPI	19,112	24	96	21	3	A-2	2.5	HW-9	LOOP
NFD	VO1DRB	15,708	25	102	22	5	A-2	4	ARGOSY	MFJ LOOP, LONG WIRE
AR	WØLK	15,591	21	89	17	5	A-2	3.5	UGLY WKENDER, TS-140	80M DELTA LOOP
PA	AA3GM	14,700	23	100	21	5	A-4	4	ARGO 556	DIPOLES
PA	K3WWP	14,060	14	58	10	5	A-5	1	HB 6Y6 TX	VRS WIRE ANTENNAS
HI-BAND STATIONS										
PAN	HP1AC	25,400	25	110	20	5	H-2	4	K9AY, K1BQT	TA 33 JR
PA	K7YHA	17,346	26	118	21	5	H-2	1.5	ARGO 509	TH7DX, 80M ZEPP
MO	NØIZZ	4,620	15	60	11	5	H-2	3	TS-520	RHOMBIC @ 15'

The bands seemed to be in a better frame of mind for the Summer Homebrew Sprint. Scores were up, as well as participation. There were three Hi-Band entries and seven 20 Meter entries, both of which signal an increase in propagation on the higher frequencies. Let the sunspots roll! Top three were -

N4ROA	66,495
KE2WB	44,860
KB2JE	42,924

Yours truly thought a personal examination of operating conditions on the East Coast was in order. Good grief, there are so many more ops over there, I'm thinking of instituting a geographic multiplier for the poor struggling stations on or near the Left Coast. What say? Soapbox: JUST WAITING FOR THE SOLAR TURN-AROUND - N3CZB; ANY BONUS POINTS FOR OPERATING CONTEST MGR WHILE N6GA/1 IN VERMONT? - VO2DRB (*YES - NEGATIVE 5000*); JUST PASSED EXTRA THIS AM - CONTEST A GOOD WAY TO CELEBRATE - N8UOO;GO AHEAD AND LAUGH AT MY 15 QS BUT THEY WERE HARD FOUGHT AND WON THRU THE QRN AND I'M PROUD OF EVERY ONE OF THEM - K5ZTY; I SHOULD HAVE READ THE RULES FIRST. AN 80 OR 15M QSO WOULD HAVE REALLY HELPED MY SCORE - KE2WB; HAD LOTS OF QRM & QRN AS WELL AS NOISE AND STATIC - N4ROA; 80M WAS LONELY - BUT ONLY BAND I HAD HB RIG FOR - WA3YON; IN QSO WITH KE6GXD FOR 13 MINUTES, COULDN'T GET HIM TO REPORT HIS POWER! - W6SIY; CAN I COUNT MY 509 AS HB IF I RECENTLY REPLACE DIAL LITES & CORD? - K7YHA.

HOLIDAY SPIRITS HOMEBREW SPRINT

Date/Time:
December 3, 1995; 2000 - 2400 Z
Exchange:
Member - RST, State/Province/Country, ARCI Number
Non-Member - RST, State/Province/Country, Power Out
QSO Points:
Member = 5 Points: Non-Member, Same Continent = 2 Points
Non-Member, Different Continent = 4 Points
Multiplier:
SPC (State/Province/Country) total for all bands.
The same station may be worked on more than one band for QSO points and SPC credit.
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:
0 - 250 MW = X 15; 250 MW - 1 Watt = X 10; 1 W - 5 W = X 7; Over 5 W = X 1.
Suggested Frequencies:

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

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

Entry may be 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 class in each SPC. The contest manager reserves the right to recognize special significant entries with a certificate award.

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

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

Include a description of homebrew equipment, commercial equipment, and antennas used with each entry. 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 maters concerning the contests rests with the contest manager.

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

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

WINTER FIRESIDE SSB SPRINT

Date/Time:
January 21, 1996 12 Noon to 8:00 PM, Local Time
Operate any 4 of the 8 hour period. Mark on & off times.
Exchange:
Member - RS, State/Province/Country, ARCI Number
Non-Member - RS, State/Province/Country, Power Out
QSO Points:
Member = 5 Points Non-Member, Same Continent = 2 Points
Non-Member, Different Continent = 4 Points
Multiplier:
SPC (State/Province/Country) total for all bands.
The same station may be worked on more than one band for QSO point and SPC credit.
Power Multiplier: (Power Output)
0 - 250 MW (0 - 500 MW PEP SSB) = X 15;
250 MW - 1 Watt (500 MW - 2 Watts PEP SSB) = X 10;
1 W - 5 W (2 - 10 Watts PEP SSB) = X 7;
Over 5 W (Over 10 W PEP SSB) = X 1.
Bonus Points: (Apply for each band)

+2000 HB Transmitter Used
+3000 HB Receiver Used
+5000 HB Transceiver Used

Homebrew Definition: If you made it, it's homebrew.
Suggested Frequencies:

160 Meters	1810 KHz	15 Meters	21060 KHz
80 Meters	3865 KHz	10 Meters	28060 KHz
40 Meters	7285 KHz	6 Meter	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 class in each SPC. The contest manager reserves the right to recognize special significant entries with a certificate award.

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

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

Include a description of homebrew equipment, commercial equipment, and antennas used with each entry. 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.

Send entries via E-Mail to CamQRP@aol.com, or by mail to:

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

QRP ARCI CONTEST SUMMARY SHEET

QRP ARCI CONTEST_____; MODE_____

CALL_____; S-P-C_____; QRP NR / POWER_____; ENTRY: MULTI-BAND_____

: SINGLE-BAND_____

	BAND	POINTS	S-P-C
___	160		
___	80		
___	40		
___	20		
___	15		
___	10		
___	6		
___			
___			
	TOTALS		

1. Enter all data above and indicate entry class and band.
2. Enter all points and S-P-C by band.
3. Add total points and S-P-C.
4. Multiply points, S-P-C, power multiplier and bonus multiplier (power source) and add bonus points for final score.
5. Send entries to:

Cam Hartford N6GA
QRP ARCI Contest Manager
1959 Bridgeport Ave.
Claremont, CA 91711

SCORING:

TOTAL POINTS		TOTAL S-P-C		POWER MULT		BONUS MULT	+	BONUS POINTS	=	FINAL SCORE
_____	X	_____	X	___	X	___	+	_____	=	

TOTAL OPERATING TIME_____; DUPLICATE SHEETS INCLUDED_____

TRANSMITTER/XCVR:_____; OUTPUT:_____

RECEIVER:_____; POWER SOURCE:_____

ANTENNA(S):_____

COMMENTS:_____

_____

NAME:_____; CALL:_____

ADDRESS:_____

CITY:_____; STATE:_____; ZIP:_____

QRP Amateur Radio Club International
Operating Awards Program

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 20 or more 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.

QRP-NET (QNI-25) This award is issued to those members completing 25 check-ins into any individual QRP ARCI net. Subsequent 25 QNIs in another net will earn an endorsement seal. Net managers send a list of those qualifying to the Nets Manager at the end of the month. Awards are issued FREE to those qualifying by the Awards Chairman as information is received from the Nets Manager.

NOTES 1) The fee for all awards, except QRP NET (QNI-25), is $2.00 US or 10 IRCs. Subsequent Endorsement Seals are $1.00 or 5 IRCs. Make checks or money orders (preferred) payable to QRP ARCI. Cash accepted, but not recommended through the mail.

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 QSLs, please include postage for their return. Neither QRP ARCI or the Awards Chairperson are 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 NR: _____
MODE NR: _____
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: _____

AWARDED TO CALL: _____ PWR: _____

QTH: _____

LAT: _____ LONG: _____

POWER LEVEL: _____ WATTS MILES: _____ MILES

MILES PER WATT: _____ MILES/WATT

CERTIFICATE TO: _____

_____

_____

_____

___ WAC AWARD APPLICATION ___ WAS AWARD APPLICATION ___ DXCC AWARD APPLICATION

___ WAC AWARD ENDORSEMENT ___ WAS AWARD ENDORSEMENT ___ DXCC AWARD ENDORSEMENT

CALL: _____

BAND: _____ MHZ MIXED

MODE: CW SSB FM RTTY MIXED

AWARD NR: _____

DATE: _____

PAYMENT: CASH MO CHECK IRCS_____ AMOUNT: _____ US DOLLARS

MAX POWER LEVEL: _____ WATTS

STATES: 20 30 40 50

COUNTRIES: 100 _____

ENDORSEMENT: YES NO

_____

CERTIFICATE TO: _____

_____

_____

_____

QRP ARCI CONTEST LOG

CONTEST_____ **DATE**_____ **PAGE** _____

CALL_____ **SPC**_____ **QRP NR**_____ **POWER**_____**W** **BAND**_____ **MODE**____

	DATE	TIME UTC	CALL	RST RCV	SPC	QRP NR POWER	RST SNT	POINTS	MULT
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

Totals _____ _____

QRP ARCI CONTEST LOG

CONTEST_____ **DATE**_____ **PAGE** _____

CALL_____ **SPC**_____ **QRP NR**_____ **POWER**_____**W** **BAND**_____ **MODE**____

	DATE	TIME UTC	CALL	RST RCV	SPC	QRP NR POWER	RST SNT	POINTS	MULT
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									

Totals _____ _____

QRP ARCI CONTEST LOG

CONTEST_____ **DATE**_____ **PAGE** _____

CALL_____ **SPC**_____ **QRP NR**_____ **POWER**_____**W** **BAND**_____ **MODE**____

	DATE	TIME UTC	CALL	RST RCV	SPC	QRP NR POWER	RST SNT	POINTS	MULT
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									

Totals _____ _____

QRP ARCI CONTEST LOG

CONTEST_____ **DATE**_____ **PAGE** _____

CALL_____ **SPC**_____ **QRP NR**_____ **POWER**_____**W** **BAND**_____ **MODE**____

	DATE	TIME UTC	CALL	RST RCV	SPC	QRP NR POWER	RST SNT	POINTS	MULT
76									
77									
78									
79									
80									
81									
82									
83									
84									
85									
86									
87									
88									
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93									
94									
95									
96									
97									
98									
99									
00									

Totals _____ _____

REGIONAL CLUB ANNOUNCEMENTS

News from regional QRP clubs that is of interest to a larger audience

Send announcements to: ku7y@sage.dri.edu
or use the snail mail address from the back cover.

NorthWest QRP Club

The **NorthWest QRP Club** announces that the **NW QRP BBS** has changed the phone number and hours of operation of its land line BBS. Here's the new information:

The new phone number is: (360) 875-5744
Time of Operation: 9PM to 8AM Pacific Time

Ron - Bill N7MFB

North Georgia QRP Club (NOGA).

We have a list of terested people and have not yet had our first meeting. **Jim, W4QO,** and myself are planning to have the first get together in the August/September time frame, (due to Feild Day & vacations). Right now, there appears to be 20 people who are interested. We would be glad to give a report for the Quarterly. What is the deadline and what format?

Ken - KJ4XR ARCI #696 evans.ken@bwi.bls.com

SECOND ANNUAL QRP-L FOX HUNT ACTIVITY

I'm looking for two or three more foxes west of a vertical line between western border of **WI** and **LA**.

We really need someone in **ND,SD,MT,WY** area and the states of **AZ,NV,** and **ID**. *(Editors note: I have volunteered for NV. - ku7y-)*

At the present time I have 14 stations east of the Mississippi River and 9 to the west of same. I account this to the population density of the USofA.

This is the last call for foxii. Activity to begin week of Oct 1 and last until the end of March. The operating times will be determined by the foxes and the foxes only, as they are the main contributors of their valuable time. All foxes must be a member of this list. *(qrp-l on the internet, -ku7y-)*

I have 500 certificates, so there will be a certificate for everyone on the list who participates. Two prizes consisting of the new **NN1G** rigs and whatever else I can get contributed.

If you have applied, don't email me. I have you on the list.

dit dit, **Chuck Adams (K5FO CP-60)** adams@sgi.com

Austin Summerfest QRP Forum:

Building on the fine introduction to **QRP forum** presented at Dallas Ham Com this year by **Chuck Adams, K5FO**; a plan was formed to expand the Austin Forum into various topics of QRP interest, and into more technical detail. First of all, organizers called for the help of experienced QRPers **Fred Bonavita W5QJM**, **Bruce Williams of MXM Industries kits, (WA6IVC)**; **Ed Manuel, N5EM**, and **Chuck Adams, K5FO**. Forum co-ordinator was **Stuart Rohre, K5KVH**. He provided a four poster introductory exhibit in the halls outside the Forum to attract new faces, and the forum speakers provided a fast two hours with Fred leading off.

Bruce Williams explained what QRP manufacturers face in bringing affordable designs, kits and service back-up to the QRP users after showing the Forum how QRP had come from the days of the (then small) Drake tube receiver to the present shirt pocket MXM receiver. Then, Chuck Adams talked about his founding of the **QRP-L reflector** list on Internet, and the promotion of more activities on the air by that means, such as the winter Fox Hunts on HF, the 30M Propagation study under way in the Summer, and discussions on kits such as the **Nor Cal and Wilderness Radio NC-40A**, and the products of **Small Wonders Labs, Dave Benson, NN1G,** among others. The forum was wrapped up by Ed Manuel speaking about maintaining balance among the many facets of QRP, and the results to date of a study of the use of Vee beams for QRP Field Day operations over the period of a sunspot cycle. Using an optimum antennas setup, successful operations were sustained and expanded over a series of Field Days, by employing up to three Vee beams to cover the continental operations areas of the ARRL Field Day.

On exhibit in the Forum was more QRP literature and equipment than some hams had ever seen, including the classic **Weiss QRP book,** also **Transistor Radio Handbook by Les Earnshaw ZL1AAX and Don Stoner W6TNS**, (from the 60's),and all the **ARRL books on QRP**. Examples of all the QRP magazines: **SPRAT, QRP QUARTERLY, QRPp, Hambrew**, etc. were on display as were QRP Awards Certificates. Rigs included the **MXM's**, the **QRP+**, the **Ten Tec Scout/Argo, Wilderness NC-40A, SWL-30,** and numerous home brew projects, including a paperback sized transceiver with key from Ed Manuel, suitable for use in a sleeping bag!

This forum has already generated some building projects and QRP kit orders, and much interest in future QRP activities. In Austin, we are looking forward to an even longer QRP Forum at the new Houston ham convention in November at the Humble Convention Center.----

Stuart Rohre, K5KVH

QRP Group Trashes Hospitality Suite at Dayton

Michael A. Czuhajewski, WA8MCQ
7945 Citadel Drive
Severn, MD 21144

Fortunately, this headline never appeared in the Dayton Daily News, although it could have. The following true story was told to me in the late 80's by a well-known QRPer who shall remain anonymous. I was told never to repeat this story publicly, but quite a few years have passed since the incident and the statute of limitations has probably expired by now.

It was the morning after the usual big pizza party in the hospitality suite on the 11th floor of the QRP Hotel in downtown Dayton (which seemed to change its name every two years whether it needed it or not). Our hero decided to look in on the room to see how bad a mess was left for the cleaning crew, and he was horrified. There was trash everywhere, cigarette butts overflowing the ash trays, "billllyuns and billllyuns" of beer bottles and cans, dead pizza carcasses ground into the carpet, pizza toppings splattered on the walls, etc. He just knew that the hotel management would bar the QRP ARCI from the hotel for all eternity, and perhaps even initiate legal action, if word of this devastation got out

As he stood in the door wondering where he could find a couple of QRPer's to help him with an emergency clean-up, to his horror he saw a member of the cleaning crew coming toward him with all her tools in tow. He ran to meet her, and whipped out a twenty dollar bill. "Look," he said, "before you go inside the hospitality suite I want to apologize for the mess in there. I'm in a position of some power in the organization that used it, and I really don't know what to say. They've never done anything like this before, and I'm deeply ashamed of what happened to it. We'd really like to keep on coming here in the future, and maybe you'll accept this little gratuity in return for not telling the hotel management about it."

She took the money, walked up to the room, stuck her head inside, and said, "Honey, this ain't nothin'--you should'a seen this place after the Shriners convention got done with it!"

[*Our apologies to all Shriners! -- W1HUE*]

Problems, Questions, Comments?

Who To Contact—*PLEASE include an SASE of an appropriate size if you expect a response.*

- **Subscriptions, dues, membership problems:** Mike Bryce, WB8VGE; 2225 Mayflower, N.W.; Massilon, Ohio 44647
- **Technical articles:** Ray Anderson, WB6TPU, 3440 Gross Road, Santa Cruz, CA 95062
- **Feature articles:** Larry East, W1HUE, 1355 S. Rimline Dr., Idaho Falls, ID 83401
- **Idea Exchange:** Mike Czuhajewski, WA8MCQ, 7945 Citadel Drive, Severn, Maryland 21144
- **QRP Contests:** Cam Hartford, N6GA; 1959 Bridgeport Ave.; Claremont, California 91711
- **Member News:** Richard Fisher, KI6SN, 1940 Wetherly St. Riverside, CA 92506
- **Nets:** Danny Gingell, K3TKS; 3052 Fairland Road; Silver Spring, Maryland 20904
- **Awards:** Chuck Adams, K5FO; 830 Waite Drive; Copper Canyon, Texas 75067
- **Club Operations:** Les Shattuck, WN2V, 7878 Mill Creek Road, Surfside Beach, SC 29575
- **Club Information packets** (include $2): Mike Bryce, WB8VGE; 2225 Mayflower, N.W.; Massilon, Ohio 44647

New Member/Renewal Data Sheet

Full Name_____ Call_____ QRP #_____

Mailing Address_____

City_____State/Country_____ Post Code_____

❑ New Address? ❑ New Call?

USA

❑ New Member, $12 (DX: $14)
❑ Renewal, $10 (DX: $12)
Amount enclosed in U.S. funds____
Check or MO in U.S. funds
payable to "QRP-ARCI".
Do not send cash.
Mail to: Mike Bryce, WB8VGE
2225 Mayflower, NW
Massilon, OH 44647

DX

❑ New Member, £7
❑ Renewal, £6
Check or MO in British pounds
payable to "G-QRP"
Mail to: Dick Pascoe, GØBPS
Seaview House
Crete Road East
Folkestone, Kent CT18 7EG
England

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