Protective Cover

QRP Quarterly

Journal of the QRP Amateur Radio Club, International

July-October 1986 Volume XXIV Number 3

In this issue . . .

Build the "Two-Fer"
A High Performance DC Receiver
The 1985 Milliwatt Achievements
. . . plus much more

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Board-of-Directors Election

The April '86 issue of the *Quarterly* requested nominations for new members of the Board of Directors to replace four members whose terms expire on December 31st. Of the incumbents, two are seeking re-election.

Danny Gingell is our current Nets Manager in addition to being a member of the B.O.D. Danny has been a member since Oct. of '79 and has been very active in the QRP net activities. He served as NCS for both the SEN and NEN prior to being elected to Nets Manager. Danny has been employed by A.T.&T. as a systems technician on computer telephone systems. Look for his photograph and article in the April '86 issue of the *Quarterly*.

Bill Harding joined the QRP ARCI in July of '80. He has been a member of the B.O.D. for three years and a club officer for the last five years. Bill was Awards Manager for two years and is serving a second term in his current position of secretary/treasurer. Bill, first licensed in 1954, is a 50 year old industrial engineer working in electronics manufacturing.

Terry Young, K4KJP, and Fred Turpin, K4MDJ, have been nominted to replace Ed Lappi, WD4LOO and Bill Welsh, W6DDB, who have not sought re-election.

Terry has been licensed since 1956 and has been an active QRP ARCI member since May '74. He is employed as an Electronic Field Engineer. Terry holds several Thousand-Mile-Per-Watt certificates for operation in the UHF and microwave bands and would like to see operating activities expanded to include a Million-Miles-Per-Watt certificate and recognition for two-way solar power. He also suggests operating activities for 'homebrew only' operators and a special 'QRP only' field day for members. Terry states that enthusiasm and comraderie in our group is reason enough to seek a position of leadership in defining our club's goals in the coming months.

Fred Turpin is currently doing a great job as our Awards manger. He is a long time member of the QRP ARCI, (QRP number in the 2000's!), and has been extremely helpful during the past year with ideas and suggestions for improvement of the QRP ARCI. Please dig out your April '86 *Quarterly* to see his picture and excellent article.

Please complete the ballot below and mail it before December 1st to:

Bill Harding, Sec./Treas.
10923 Carter's Oak Way
Burke, VA 22015

VOTE!

Clip and Mail

Bill Harding, Secy./Treas.
10923 Carter's Oak Way
Burke, VA 22015

B.O.D. candidates for three year terms:		FOR	AGAINST
Danny Gingell	K3TKS	☐	☐
Bill Harding	K4AHK	☐	☐
Terry Young	K4KJP	☐	☐
Fred Turpin	K6MDJ	☐	☐

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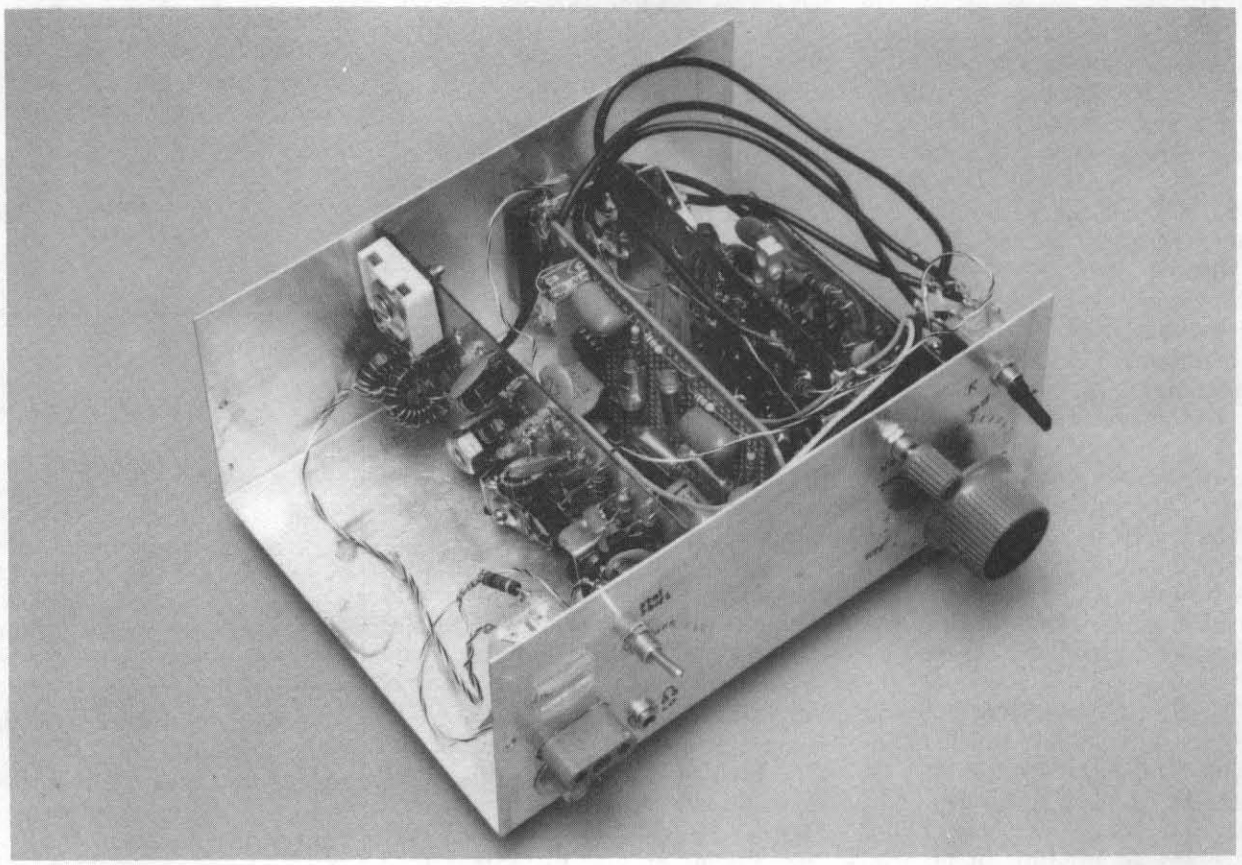


QRP Transceiver with high performance receiver by Denton Bramwell, K7OWJ. From left to right boards are transmitter and side tone, audio filter, detector/passive filter, main audio amplifier, VFO and buffer.

QRP ARCI News

President's Message

by Les Shattuck, President

On April 26, the club had its annual meeting. The meeting was opened by President Les Shattuck and was attended by the following officers and board members: Vice President Jim Fitton; Awards Mgr. Fred Turpin; Net Mgr. Danny Gingell; Publicity Mgr. Joe Sullivan; Quarterly Editor Jim Stevens as well as BOD members Michael Bryce, John Collins, Chris Page and Red Reynolds.

The order of business was

1. Dues. Discussion was brought up that our dues should be increased to reflect the rising cost of the *Quarterly* and Club operations in general. President Les Shattuck mentioned the possiblity of allowing advertisements by QRP related manufacturers in the *Quarterly* to offset costs. After much discussion President Les Shattuck appointed a committee (KK7C and K2RS) to research the possibilities of advertising. It was decided by the members present to request the Board to approve a dues increase effective January, 1987. If passed the new rates will be:

a. New member US & DX $8.00
b. Renewal US & DX $7.00

All members of the Board are urged to respond with Yea, Nea or comments to the president on this matter.

2. Hot Water Handbook. Fred Bonavita has given the club all rights to his *Hot Water Handbook*. *Quarterly* consulting editor, Michael Bryce volunteered to take over the publication of a second edition and the membership present agreed to same.

All Members of the Board should send written comments to the president concerning this matter.

3. Thirty Meters. A discussion of the 30 meter band was brought up by Vice President Jim Fitton who would like to promote QRP activity on this exceptionally useful band. The low cost of 10.11 MHz crystals suggests that frequency. G-QRPers are using 10.016 and others are using 10.120. All are encouraged to call and listen in these regions. An official rendezvous frequency wil be selected later.

4. Awards. After a lengthy discussion with Gene Smith our contest mgr., I have come to the conclusion the Triple Crown Award, as it stands now, is not obtainable by many club members. Certainly those members with large contest style stations would be able to win each year. Furthermore, contesting is only one way to participate in the advancement of QRP. I propose that in the future, the club's Triple Crown be awarded on the basis of contributions and participation in three key areas of QRP activity:

a. Contests
b. Technical
c. Net Participation

I have appointed a committee to study this and report to me by Sept. 1st. The committee members are KN1H, K2RS and W3TS.

Members and members of the board are urged to send comments to both committee members and the president as soon as possible.

It was proposed by Net Mgr., K3TKS, that we drop all fees for the Net Awards. He also proposed the creation of a QNI/100 award for 100 check-ins and an honor roll for the top QNI of the year. A committee (K3TKS and K6MDJ) has been formed to review the proposal and will report to the board and president by September, 1986.

Members and members of the board are urged to respond to the president regarding net participation awards.

Awards Mgr. Fred Turpin, K6MDJ, awarded special hats and T-shirts to Ade Weiss, W0RSP; Chris Page, G4BUE; Jim Fitton, W1FMR and Les Shattuck, WB2IPX for contributions to QRP. Each was also awarded a certificate.

5. Lieu of Annual Meeting. It is my observation that the Dayton Hamfest is the best place to have our official annual meeting and I hereby propose that each year we have an annual meeting at the Dayton Hamfest. Vice President Jim Fitton is appointed to examine Article 4 of the by-laws and present the board with a revised text for approval.

6. Request for comments. I invite any club member with comments on the above topics to write me with your input.

73,
Les Shattuck
WB2IPX

Editor's Word

Thanks to all who have written with support or impatience. I have been swamped by working two jobs and having both editing and publishing chores, with the result that all stood still 'til Bill Brooks, KE5OG stepped forward to turn copy into a magazine. We heartily welcome him to the staff, for without him we could not continue to produce the quality and size of publications we have at present.

Thanks also to the numerous contributors to this issue. QRP is truly "Witts in place of Watts" to span the globe. I invite you all to write about what you are doing, testing and learning.

73,
Jim
KK7C

Technical Articles Wanted

Send technical articles to the general editor via modem or by mail typed double-spaced. To save editing and retyping, please use the abbreviations on the mailing cover of January '86 *Quarterly*. Include a complete list of parts and values. To reduce errors draw circuit diagrams well enough that they can be reproduced as is. Double check them before mailing. Include photos. Editorial volunteers can't test projects.

The QRP ARCI is a non-profit organization dedicated to increasing world-wide enjoyment of QRP operation and experimentation. QRP, as defined by the club, is 5 watts output CW, and 10 watts output PEP.

Contents

Build the "Two-fer"

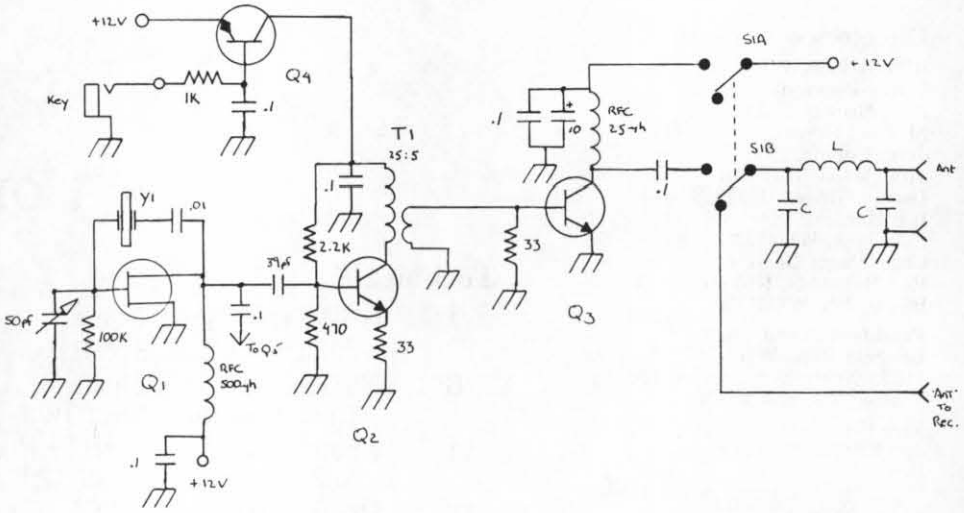
A Homebrew two cubic inch TX/RX Project Sponsored by the QRP-ARCI

by John T. Collins, KN1H [1]

At the QRP ARCI club meeting at Dayton, two related themes occupied a good deal of our discussion. The first was the tremendous interest in miniature QRP rigs like GM3OXX's one cubic-inch masterpiece affectionately called the 'Oner.' The second idea was to organize operating events promoting the use of homemade equipment. I was asked to consult with Mike Michael, W3TS, and others and design a small, easily built transmitter to be described in the October *Quarterly*. Gene Smith, KA5NLY, was asked to organize an on-the-air event promoting homebrew equipment. Enthusiasm ran high. Before we left, we had plenty of ideas to work with, and another group was already organizing to produce 'Two-fer' kits for the club to market at Dayton next year.

While the kit will take a bit longer to get together, the design team is ready to show what has come of our efforts. I wish to thank those that joined Mike and me in our summer on-the-air design sessions and provided comments during the process. The project went together nicely and tested out well with ugly construction. We invite all you budding homebrewers to give the 'Two-fer' a try. We'll look for your new signal on the air, and as we receive comments or come up with modifications or accessories, you can expect to hear more from us.

The Two-fer TX. The 'Two-fer' is a VXO-controlled broad-band transmitter with companion direct-conversion receiver. The project gets its name from two of its features. First, it contains not just one element of a true ham station but two, the transmitter and the receiver. Second, the entire project will almost fit into a two-cubic-inch space, using dense three-dimensional construction. The transmitter is easily capable of 1.5W out on 80-15M using fundamental mode crystals. Crystal type is non-critical – every one of my junk box crystals worked fine.



"Club Project" Transmitter de KN1H

9-1-86

Q1: MPF 102, 2N4416, 2N5486 etc.
Q2: 2N2222, 2N3909 etc.
Q3: 2N3137, 2N3866, 2N3553 etc.
Q4: 2N3906, any general purpose PNP

The advantage of the Pierce oscillator, besides its obvious simplicity, is its lack of parallel capacitance. This means that the variable cap on the gate will change the oscillator frequency from about 4 Khz on 80m to 15 Khz on 20 and 15m. The range will of course vary with individual crystals. Output from the oscillator is dependant on crystal activity and the 39 pF coupling cap was chosen to limit transmitter output to 1.5W using my most active 80M crystal. As designed, power output is 1.2W on 40m, 1.1W on 20m and 650mW on 15m.

The values of the 2 RFCs are not especially critical. For the oscillator choke I tried several values from 100uH to 1mH and all worked satisfactory. Thirty six turns on an FT-37-43 core works fine if you wish to roll your own. For the PA choke, fill an FT-37-61 with #24 wire (that's about 24 turns) and it's about right (25uH).

The driver and the final circuits are almost straight out of *Solid State Design for the Radio Amateur,* so the credit goes to Wes Hayward for that part. I added the DPDT toggle switch to make sure the final is never keyed without an antenna connected.

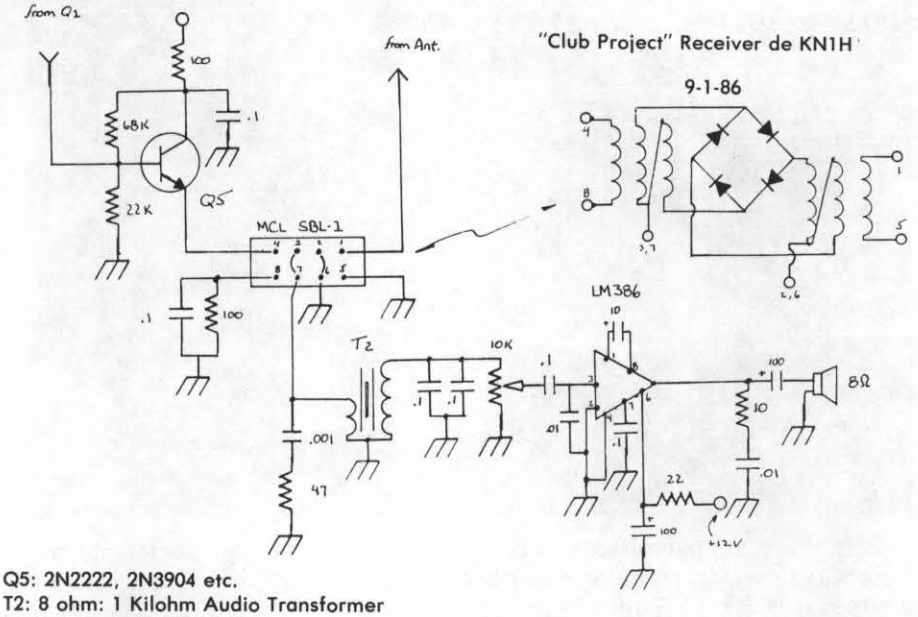
Apart from the crystal, the only tuned circuit required is the low pass output filter. If you wish to have a rig which can be changed easily from band to band, you may simply make up a miniature plug-in filter for each band you wish to operate, and keep them with your crystals. We have not included the details on the filters, since you can find that information from several sources.

While the transmitter is a bit more complex than an 0X0 or 'Oner,' we think there are a couple of distinct advantages of this design and we will comment on them in the course of the next few issues of the *Quarterly* if you like. One should be mentioned right now, however, and that is that the oscillator can be with a VFO/Buffer if desired with no changes to the driver, final or keying circuit. Secondly, the simple receiver circuit can be added with no changes to the transmitter at all. And this brings us to the second part of the 'Two-fer' design, the receiver.

The Two-Fer RX. The 'Two-fer' receiver is really a further refine-

See "Two Fer" . . . . . next page

[1] RR 2, Box 427, Cornish N.H. 03745



Q5: 2N2222, 2N3904 etc.
T2: 8 ohm: 1 Kilohm Audio Transformer
(Radio Shack # 273-1380)

ment of one I have been building for several years now. It's really simple, can be built in a couple of hours, and works better than any other DC receiver I have ever used.

Oscillator energy is coupled to Q5, an emitter follower that provides +7 dBm to the mixer without loading the oscillator very much due to its high input impedance. The circuit is borrowed from the HW-8, which uses two of them.

The output of the SBL-1 DBM is first terminated at RF by the series cap/resistor to ground, then the audio is applied to T2 which is a Radio Shack 1k:8 ohm transformer. It steps up the audio voltage about 11 times and fairly well matches the 50 ohm impedance of the DBM to the 10K pot (volume control). The two .1uF caps across the secondary resonate it at 720 Hz giving about a 500 Hz bandwidth response and a nice clean wave-form.

The LM 386 has a voltage gain of 20 and will drive 8 ohm headphones or even a speaker – a very unusual combination for a single stage. I've included a diagram of what is inside the SBL-1 DBM as they may be hard to get for some of you. To make your own, a couple of trifilar-wound transformers (10 turns on FT-37-61 cores) and four matched 1N914 diodes will work, although not quite so well as the manufactured unit.

Construction Hints. A few hints may be of help to the builder: Be careful not to overdrive a 2N3866 or other UHF transistor in the PA. They will give about 5W out for a few seconds and then open up. The reasons are the very high gain, especially at 80M, and the very close tolerances in the transistor – the very qualities that make them so good at UHF. The 2N3553 is probably the most reliable choice for a PA as it will also survive pretty outrageous SWR for those who like to tune-up for hours on end.

The small encapsulated chokes are fine for the oscillator, but I strongly recommend something heavier for the PA. Radio Shack chokes are fine as they'll pass an Amp, and they are available at 25 uH.

If a Mini-Circuits SRA-1 is used in place of an SBL-1 be careful: Pin one on the SRA-1 is connected to the case (ground) so the connections to pins one and five should be reversed from what is shown in the circuit. Don't inadvertently wire the SRA-1 backwards since Q5 depends on DC flowing through the winding between pins eight and four. Unlike the SRA-1, the SBL-1 may be used in either direction.

A QRP Hamvention

by Les Shattuck, WB2IPX

The Dayton Hamvention 1986 was more exciting than 1985. With 20 rooms, we set up our headquarters on the 11th floor of the Belton Inn in downtown Dayton. The group began arriving on Thursday and found Vice-president Jim Fitton had the hospitality suite open and running. Later, we found a little restaurant serving pasta and seafood sauce where we swapped photos and talked QRP. Back at the center we stayed up till midnight talking antennas. Brice Anderson, W9PNE brought his waist-high 30 to 10 meter micro loop antenna, sequel to last Field Day's experiments. Inspired by his stories of far away QSOs with it, we couldn't resist firing up John Collins' new back pack rig to try it out on the spot.

Our main booth was in the convention center and Leo, KC5EV, and Jim, KK7C, set up our fleamarket spot. We had banners, sign up sheets and membership information at both locations.

Thirty-five of us walked eight blocks for the QRP banquet. We enjoyed a wonderful meal and exercised the QRPers' greatest skill – communicating with each other in spite of thundering QRM, this time from a very QRO live band.

Afterwards at the hospitality suite, we continued our antenna program, hearing Bob, W6SQK and Fred, K6MDJ.

Dave Cornell, WB2UXI, and Joe Sullivan, WA1WLU, captured most of the group on film during the dinner or other events.

Saturday morning we pushed hard for memberships and it paid off. Both the booth and the fleamarket attracted many new members.

Around 4 p.m. we had our official QRP ARCI meeting, (See report elsewhere).

Saturday was the open house at our hospitality suite, where we greeted QRPers and DXers from the four corners of the world. Over 40 people attended. Four door prizes, including commemorative QRP mugs and an ARRL Handbook

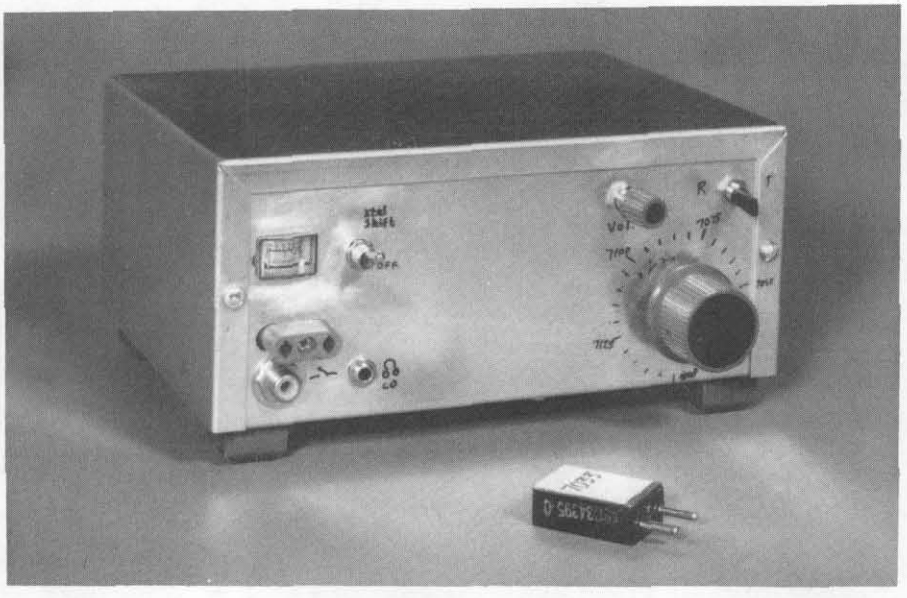
See Hamvention . . . . . next page

Experimenter's Corner

Toward a High Performance DC Receiver

by Denton Bramwell, K7OWJ

A year or so ago, I started building a compact 40 m transceiver, partly for the fun of it and partly because my work kept me from most of my familiar pursuits, and I needed something familiar to do. This article is a chronicle of the development process and a discussion of what worked well and what didn't work so well in the receiver portion of the project. The end result of my project was a 40 meter transceiver, in a 3"x5"x7" box. The next step was to build a 30 meter version, using what I had learned on the first project. That device is still in process, but the receiver is already in the box and it works very nicely. The transmitter is nearly there.



K7OWJ's compact 40 meter transceiver using the high performance direct conversion receiver described in the article. The entire unit is housed in a 3 x 5 x 7 inch box.

The instrumentation I used includes a 10 MHz oscilloscope, a well shielded surplus URM-250 signal generator, and a simple mW meter. The main reference consulted was *Solid State Design for the Radio Amateur,* which in my opinion, is an absolute "must have" for the serious QRPer. Those of you who are familiar with that work will quickly see that it inspired most of my circuits. I would like to thank Wes Hayward, who has contributed much to what I understand about radio.

If you try to duplicate my unit, you probably won't need any instruments except the mW meter, and a well calibrated receiver to set dial calibration.

My design criteria were:

1) Sensitivity limited by atmospheric noise.

2) Two tone (not single tone!) dynamic range approaching 100 dB.

3) 200-300 Hz selectivity, with steep skirts.

4) Enough stability that signals did not drift out of my passband.

5) Cheap, cheap, cheap.

As I went along, I added:

6) Immunity to AM detection. Sorry folks, but I don't like my CW with a dash of foreign broadcast on the side.

By the way, I opted for a crystal controlled companion transmitter, because I wanted some sort of guarantee of stability while operating under inclement conditions. I put an inductive frequency shifter on the XO, which gives me two frequencies per crystal. That, plus a couple dozen old crystals ($.50 each, by good fortune), get me around quite well.

My early efforts at building receivers and transmitters used perf-board and point to point wiring. While I still use perf-board for my audio filters, this approach often gave non-reproduceable results, and I now discourage it. For high gain audio amps, RF mixers, oscillators, etc., I use double sided board with the component side unetched (ground plane), and the other side etched, with countersunk holes through the ground plane to permit component leads to pass through. For VFOs, I use single sided board only. This gives much more satisfactory results. A bottle of Radio Shack

See Receiver . . . . . next page

Hamvention . . .

were passed out to lucky winners

The QRP Forum began at 9 a.m. with Michael Bryce, WB8VGE, speaking on solar power operation. I reported on the direction the club is headed, then Chris Page, G4BUE, told the story of the G-QRP Club. Finally, Ade Weiss, W0RSP fielded questions from the more than 100 present for the three-hour session.

Danny Gingell, K3TKS, then set up the booth and signed up a large number of newcomers. In all, we welcomed 55 new members and 20 renewals.

With more than 30,000 hams in attendance, Dayton Hamvention is the spot for QRP gatherings. Plan for next year when we'll put on an even bigger program and have a bigger booth and display.

Among the QRPers that stopped by our booths was Steve Roberts, who was preparing for a second cross-continental expedition on his space age natural powered reclining bicycle. Last year he covered 10,000 miles, using solar panels and an HW-8 for hamming. The panels had also powered a portable computer with which he made his living while traveling. At the fleamarket, Steve was searching for new gear for a second generation steed. The new version will have 20 watts of solar panels instead of the original five. There will be four computers instead of one. Packet mode will join straight key QRP, 2-meter FM, CB and HF scanner aboard his incredible 225 lb. bike. Keep an ear open for Steve on the QRP frequencies.

Receiver . . .

etch, a Sharpie pen, a spray can of clear lacquer, a ¼" drill or counter sink and a plastic container to etch in are about all that is required. I don't bother with the "press on" circuit board stuff.

homebrew unit keeps receiving. That performance is a direct result of my choice of mixers. (See Figure 2). Interestingly, my homebrew receiver also performs noticeably better than the '301 in the presence of pulse type noise.

My designing and testing did not start with this solution. Instead, my first attempt used a singly balanced four diode mixer, feeding into about 100 dB of audio gain. It worked, but had four problems:

1) I could hear only about .4 microvolts RMS, and that is not enough sensitivity.

2) A 200 microvolt AM signal anywhere in the passband of the input filter was detected (a very common problem in direct conversion receivers).

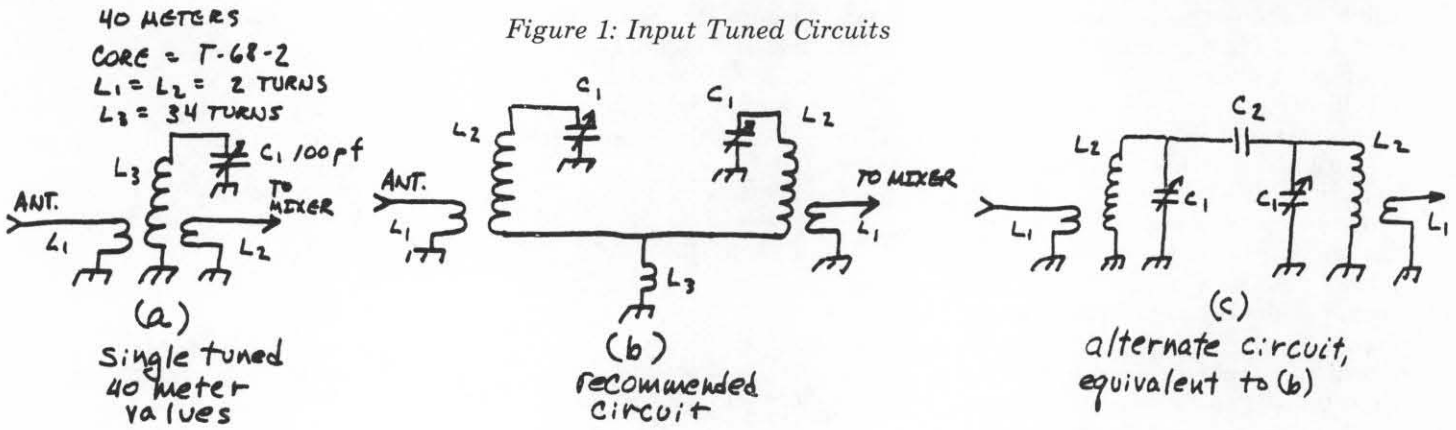
3) A strong CW signal tens of kilohertz from the VFO would be detected and drive the audio amplifier into clipping, distorting the signal of interest.

4) The receiver was very microphonic.

Most of the rest of the project centered around solving these problems.

According the the literature I have, insertion loss of four-diode singly balanced mixers and doubly balanced mixers is about the same. Hence, both should give the same minimum discernable signal. In two separate experiments, I found the doubly balanced mixer to be better. Shifting to the circuit in Figure 2 improved sensitivity to the point that I could hear .2 to .3 microvolts. I have no idea why this should be so. Later circuit improvements brought sensitivity to the point that I could hear .1 microvolt.

Figure 1: Input Tuned Circuits



BAND	L2	L1	L3	C1 NOM.	C2 NOM
30	19 turns, T-50-6	2 turns on L2	3 turns, T-50-2	171 pf	5.4 pf
40	22 turns, T-50-6	3 turns on L2	4 turns, T-50-2	262 pf	10.5 pf

INPUT FILTER DATA

Input Circuit. My first 40 meter receiver used a single tuned circuit in the input. This gave fair discrimination against unwanted responses (mostly 3F and 5F – good balance takes care of 2F and 4F) and you may find that to be satisfactory. But I got better results with a double tuned circuit, and kept that design for the more recent 30 meter receiver. The original 40 meter version is shown in Figure 1a, with the recommended circuits at 1b and 1c.

In the single tuned version, as you decrease the number of turns on the input and output links, discrimination against unwanted responses improves, but loss of wanted signals also increases. I very scientifically peeled off input/output turns until I noticed a drop in sensitivity, then I restored the last turn I had removed. The double tuned circuits were more formally designed.

Mixer. The next stage is the mixer, and a number of good possibilities exist. I wanted superior dynamic range, so I finally opted for a diode ring. The result is that when the Russian "woodpecker" drives my FT-301S into blocking, my

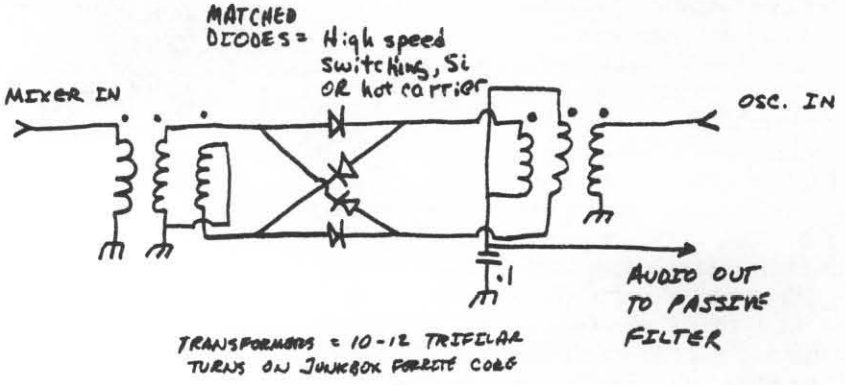


Figure 2: Mixer

See Receiver . . . . . next page

Receiver . . .

Eliminating AM Detection. The AM detection problem was fairly tough for me. My breakthrough came when I fed a 1000 microvolt, 50% modulated, AM signal (400 Hz modulation) into the input and watched the detected signal with the scope at the output. One would expect a 400 Hz sine wave with nice, symmetric noise extending above and below. Not so! My 400 Hz sine wave was there alright, but the noise appeared like icicles, hanging down from it. Clearly, something very non-linear was going on! I was getting mixing in the audio amp.

Two solutions were found: The first, a doubly balanced mixer, helped keep RF out of the audio stage. The second, a passive audio filter, did the same thing in addition to its more obivious function. The two solutions are not additive, since either one alone gets you almost as much as both together. But both stayed in my final design, for other reasons to be discussed later. With the present circuit, a 2000 uV AM signal produces a just-perceptible audio output, and I find that to be satisfactory.

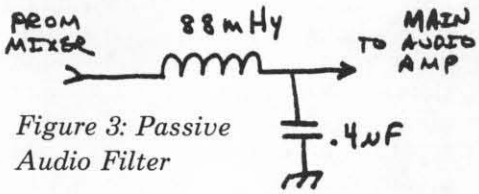
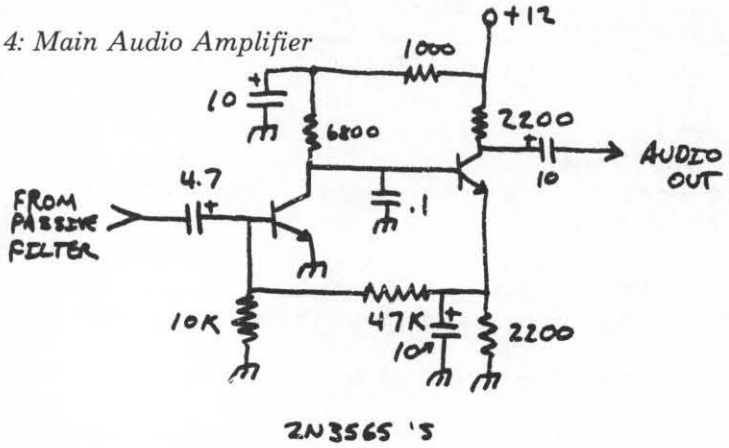


Figure 3: Passive Audio Filter

Passive Audio Filtering. The passive audio filter seen in Figure 3 does a couple of other things that make it very worthwhile. (By the way, I made it out of three 5/8" diameter 30 mH inductors in series and paper and mylar capacitors in parallel). For one thing, it greatly increases the efficiency of power transfer from the mixer to the audio amplifier, which reduced the need for gain in that stage, thus reducing mixing and microphonics. Second, it discriminates against high frequency beat notes. Once, I used hi-fi phones on this thing, with no selectivity. A 15 kHz beat note must be heard to be fully appreciated! With no selectivity, strong signals 50-100 kHz away can "fold up" your audio amp. But with the passive filter in the circuit I can snuggle in close to a strong signal with no adverse effect.

Audio Amplifier. The main audio amplifier (Figure 4) is quite ordinary, except that it has much less gain than most direct conversion receiver audio amps. This occurs partly because the passive audio filter steps up the voltage coming out of the detector, and partly because the later active audio filter provides a good share of the gain. One lesson that I learned early on is that you do have to use 2N3565's in the audio amplifier. Anything else will add significantly to the receiver noise.

Figure 4: Main Audio Amplifier



Active Audio Filtering. Some people think I'm a little "nuts" on the subject of active audio filters. I tend to use one "follower" stage to deliver a signal with practically zero source impedance, with four or five stages of two pole active filters. Since most people quit with a couple of stages, why do I use so many?

This design of filter has unity gain at DC, rising to a peak at the design frequency or a little below for low Q. Then it rolls off above the peak. Gain at the peak is approximately equal to Q, so three stages with a Q of three would give a voltage gain of 27 at the peak, a gain of 1 below the peak, and the roll-off would be −36 dB at 2X the peak.

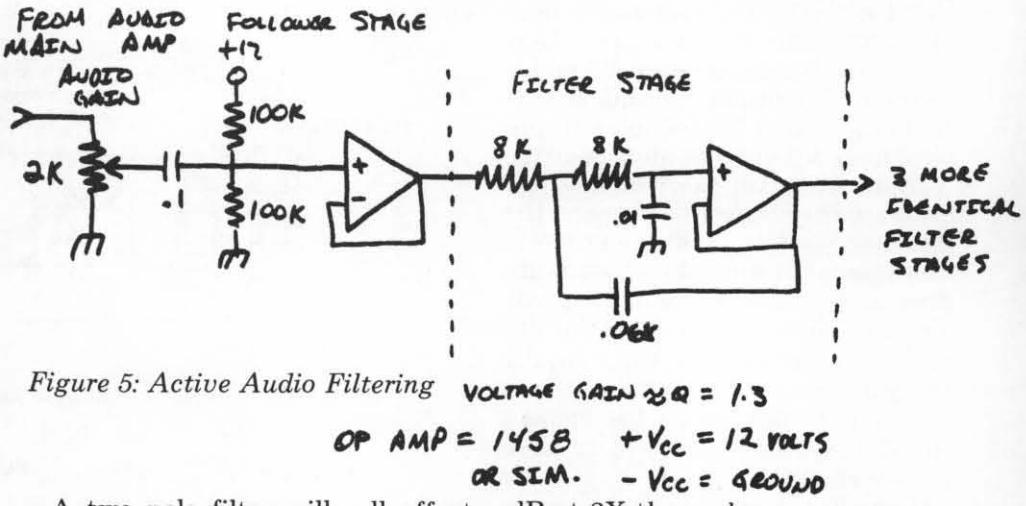


Figure 5: Active Audio Filtering

A two pole filter will roll off at about 12dB per octave. Five stages of low Q audio filtering will give 60 dB of attenuation at 2X the peak frequency, and that makes a receiver very nice to listen to. With low Q, the filters do not ring and keying does not sound blurred. As a matter of personal preference, I set my audio peak at 750 Hz or so. Figure 5 gives details of the audio filter design.

The low pass rather than the band-pass configuration does two things: 1) Above the peak frequency, the low pass design rolls off faster than a band pass design and 2) the low pass design leaves some signals below the peak, so you can hear yourself tune through zero beat. This is very handy in a direct conversion unit.

Some designers will cut corners by cascading just a couple of high Q stages. This gives lots of gain, and a bandwidth spec that looks good on

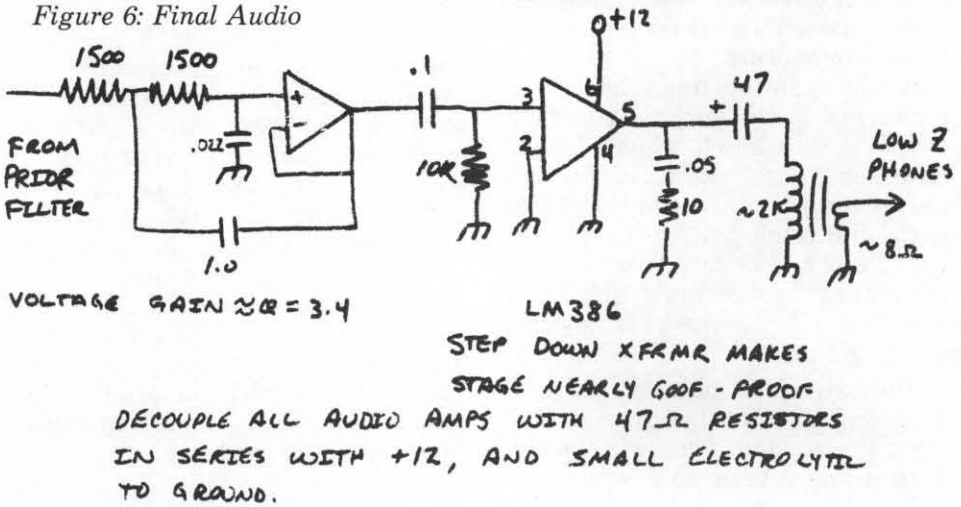
See Receiver . . . . . next page

paper, but the true test is in the sound. With high-Q the shape factor and ultimate rejection suffer and the filter will ring, blurring high speed dots.

The audio filtering chain shown here is the one I used in the 30 meter version. It is a little less narrow than the 40 meter version, but still has excellent roll-off on the high side. The whole chain has a gain of 20dB at 700-750 Hz. I'm quite pleased with its performance.

Incidentally, I have had excellent luck with low Q filters for SSB. I start out with one stage of high pass filtering to remove the lows under 300 Hz, then I add in two or three low pass stages to cut off at 3000 Hz. The result is easy to copy SSB.

Figure 6: Final Audio

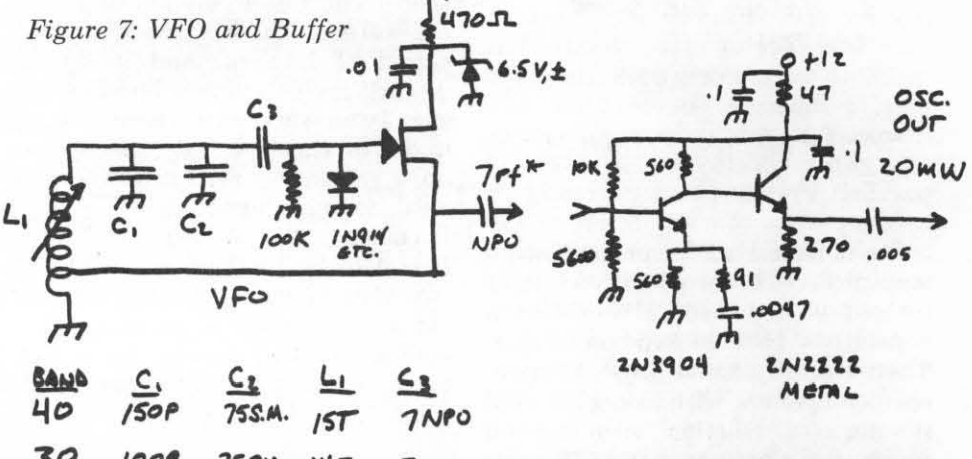


Final Audio. The final audio stage (LM386) brings the audio up to listening level. Although the chip is designed to work into low impedance loads, I found a slight tendency toward instability, and I also found that I didn't need all the gain of the '386. The step down transformer fixed both problems. In retrospect, I'd have to say that more economical designs are available, but once I had this in place and working well, I wasn't about to take it out.

If I were starting over, I'd probably just use five identical filter stages, with 1 k ohm resistors and 1 nF and .047 nF capacitors. That gives more gain in the filter stage, and a final audio amplifier probably would not be needed. One could simply capacitively couple to 2K phones or to a 2K/8 transformer. with low Z phones. If you do opt for 2K phones, I suggest you put a 100 ohm resistor in series with the output. It will tend to save your final audio amp if someone tried to use low phones.

The VFO. Numerous VFO's are available in the literature. To my surprise, the oscillator configuration made a big difference in receiver sensitivity. By most accounts the noise floor on "any old" oscillator should be such that it does not degrade the sensitivity of a direct conversion receiver. But I've built two of my orignal type oscillators, which both gave the same results. Two oscillators of the configuration I now use (Fig. 7) were also consistant with each other, and both let me hear down to .1uV. This was an unexpected result and I suggest that other expimenters take it into account.

Figure 7: VFO and Buffer



The oscillator I recommend is shown in Figure 7. In addition to low noise, it has the added virtue of being fairly easy to stabilize, and a high degree of stability is needed for the degree of selectivity I chose. Also, this VFO does not require a variable capacitor. A buffer stage is used to bring the oscillator up to + dBm.

Tuning the VFO. The inductor is wound on a 3/8" ceramic form, and the last few turns on the "top"end of the coil are spaced out from each other a bit. Capacitance is added so the LC circuit is resonant at the wanted frequency when the slug is just into the coil. In my case, the spacing of the turns happily also gave me a linear frequency scale. There is no need for trimmer capacitors in this arrangement. The mechanical arrangement I devised for tuning is shown in Figure 8.

Since the input port of a diode ring mixer looks like about 50 ohms, I used the 50 ohm mW meter to set oscillator output. Just connect the meter in place of the mixer and read output. How did I adjust the output? Aw heck fellas, I put a small NPO capacitor as the coupling between the VFO and buffer. Initially output was about 250 mW, so using diagonal cutters I chopped away pieces of the capacitor until output was 20 mW. Living in Nevada, as I did at the time, I could just leave it at that. But in a more humid climate like Michigan's, you have to reseal the capacitor with a high Q sealant like Q-dope (available at Radio Shack). Don't use nail polish, it isn't high-Q enough.

See Receiver . . . . . next page

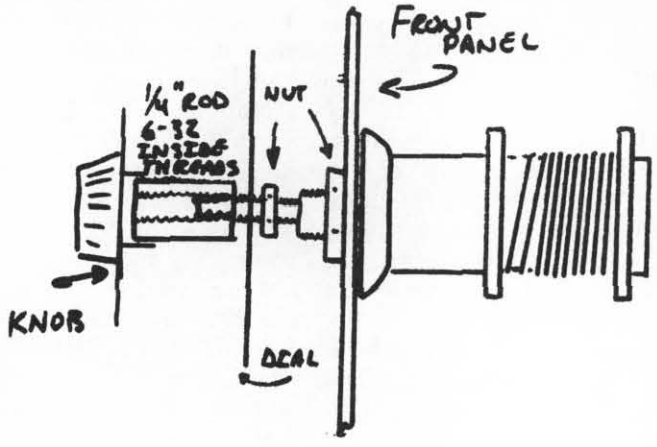


Figure 8: VFO Tuning Coil Detail

Stabilizing the VFO. Before testing a combination for drift, I suggest you pop the whole assembly in the oven and bring it up to about 200 F. This will not harm the FET. Turn the oven off, and let it cool to room temperature. This relieves stresses in the VFO and will greatly improve stability.

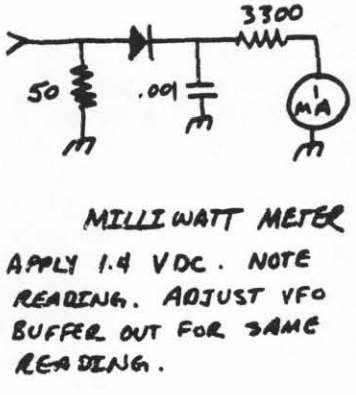


Figure 9: Milliwatt Output Meter

Stabilizing a VFO can turn into a long project. I started with a mix of polystyrene and silver mica capacitors that looked promising. Then I used a small brush to daub each component with alcohol to cool it and see whether each had a positive or negative drift coefficient. To my surprise, the FET had one of the larger coefficients. I substituted several until I found one with a low drift.

The final system test was performed with the aid of the deep freeze. I juggled the mix of capacitors until I found a combination that gave me less than 1 kHz drift between the deep freeze and room temperature.

While conducting these experiments I was surprised to hear the VFO shift 50 Hz when I turned on a bench light right over it. The phenomenon was traced to the glass encapsulated diode at the gate of the FET, which was sensitive to light. Once that was properly shaded, I was able to bring the VFO down to my target drift.

The Satisaction of it All. I'm pretty proud of what I've learned and what I've created. Tuning is smooth, with a linear scale that wraps 150 kHz of 40 meters around 360 degrees. The dynamic range is such that I can put millivolts of RF on the antenna 20 kHz away from a signal of interest, and it doesn't disturb my listening a bit. The sensitivity is such that on a January night in rural Nevada, headphone noise increases noticeably when the antenna is connected.

Those that "roll their own" know how it feels. To the rest, I can only say that there is nothing like the thrill of reaching out into the sky to contact another human being hundreds of miles away, using only the tools you've built yourself.

Denton Bramwell recently joined HeathKit as a Product Line Manager. His new address is 3139 Royalton Heights Road, St. Joseph, MI 49085. His son, Ben, also a QRP enthusiast, is KA7YBV.

Information for Writers

The Quarterly welcomes articles on all aspects of low power communications – equipment construction and modification, antenna experimentation, and operating practice, as well as reports of experiences, presentations on QRP for local clubs, announcements and letters.

Photos of your station, and projects are especially desired. Black and white photos are preferred where possible.

Send contributions to the consulting editors or to the general editor via modem or by mail typed double spaced. Editors will select and edit material to space limitations.

Press dates are March 5, May 15, September 1 and November 1. Material received less than four weeks before press date is difficult to include. Remember your editors are volunteers like yourself who must squeeze this work into busy family and work lives and still get on the air from time to time.

Please include name, call, address and telephone number on all correspondence and material. Enclose s.a.s.e. if you wish material to be returned or when requesting reply from officers or authors.

Subscription Renewal

Subscription renewal is $5 ($6 for DX) for four issues. The renewal date appears on the mailing label following the QRP membership number, i.e. 4174-3/86, means that member number 4174's subscription will expire with the 3rd (July) *Quarterly* in 1986. Renewals and new member applications must be received by the 1st of the month prior to the next publication to receive that issue, otherwise service will not begin until publication of the following issue.

FROM WB8VGE/QRP

MICHAEL BRYCE
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MASSILLON,OHIO 44646

Photovoltaic systems behave in an extraordinary and useful way: They react to light by transforming part of it into electricity. In the past I have explained how that is done. But this time around, I will tell how it is done in the real world.

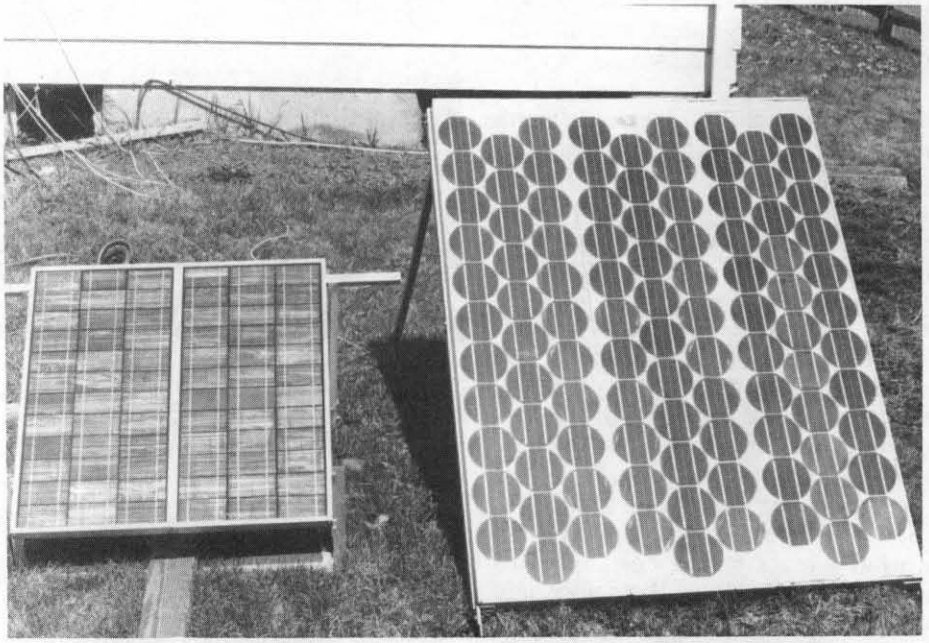
The sun is a run-of-the-mill star. It has been burning for more than four billion years, and it will burn at least that long into the future before erupting into a giant red star, engulfing the earth in the process.

Some stars generate enormous amounts of X-rays; others mostly generate radio signals. Our sun, while producing these and other energies, releases 95% of its output energy as light. Some of this light cannot be seen by humans.

The sun is responsible for nearly all the energy available on earth. There are a few exceptions. Light is energy. Wear a pair of shorts and sit on a black car seat. That solar energy will become a very realisitic fact very soon.

The physical phenomenon responsible for converting light to electricity, the photovoltaic effect, is quite complex. Reams of paper have been consumed in explaining the physics used.

The first steps in solar power is the purchase of the panels or modules. In the past, there were quite a few companies making PV. That number has dropped off to leave only a hand full. This makes for a buyer's market. But buyer beware! There is a lot of junk out there. The first thing to check out in the purchase of panels is the wattage rating. Get the highest you can afford. But watch how the panels are tested. This is very much like the gain measurements on antennas. It all depends on the reference point. In solar panels, the amount of light and the TEMPERATURE of the



panels determine the wattage level. Check these out very carefully.

In the past, all 12 volt panels had 36 series connected cells. The first generation panels were more efficient and therefore had only 33 cells. These panels are rated at 35 watts. Well, sometime back, the second generation panels came out. They went back to 36 cells. The difference? Higher wattage. My old 35 watt panels open circuit voltage is about 19 volts. That loads down to roughly 15 volts. The newer panels have open circuit voltages in excess of 22 volts. They will load down to about 18 volts. As you can see, the newer panel will charge up the storage batteries better and faster than a panel only a few years old. So when purchasing panels, keep an eye out on the panel voltage, both open and loaded voltages. Try and get the highest you can afford.

Speaking of prices, they sure have come down since I started playing with the sun's power. I had paid $500 for the first panel. I can now get that same one (if there are any left) for about $200. Some second rated panels, cosmetic rejects, can be purchased for less than seven dollars per watt. New first quality panels go for about 10 dollars per watt. This will of course vary with company to company, however, this is a good rule-of-thumb to follow. Keep an eye out on the surplus market. When paying for surplus, remember that the panels may be "one of a kind" and may be out of stock if you would like more. It is ok to mix and match panels of different manufacturers, just keep the wattage and panel voltages the same. In other words, don't put on line panels rated at 20 volts open circuit with panels rated at 14 volts open circuit. That will lower the total output of all the panels in your system.

PV arrays are useful energy producers only when the sun is shining on them and thus are unproductive a good deal of the time. The use of bat-

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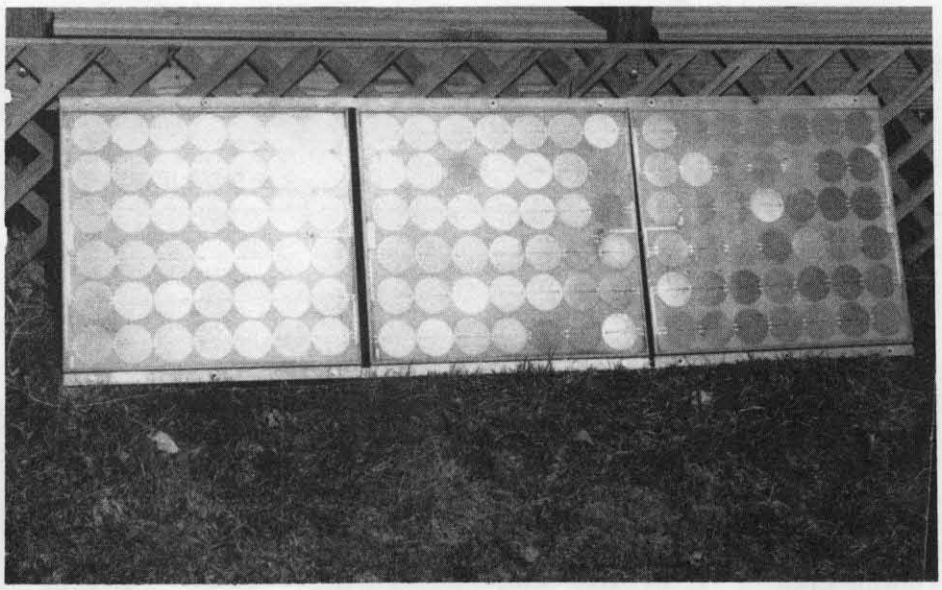
SOLAR POWERED



teries to store electric power is without a doubt the most common method to date. (For the record, batteries don't "store" electricity, they convert it into a chemical reaction. This chemical reaction is reversed when the battery is driving a load). For years I have been saying to only use a "deep cycle" battery, well I still stand behind that statement. Don't use a car battery. They just will not handle the use and will have a short life. Any good battery dealer will be able to help you find what you need. There are several different types of names for the deep cycle batteries. Some people call them "trolling," "RV," and "electric vehicle" batteries. The golf cart battery is ideal. Exide make a dandy, the EV-4. While reams of paper have been used on solar panels, very little has been used for batteries. Batteries, however, represent more than mere storage capacity. They can serve as a power conditioner. By being part of the circuit into which electricity from the PV supply flows, the batteries keep the electrical load more nearly constant. Of course, the batteries must be protected from being overcharged by a highly productive array, and the array must be protected from the batteries at night. The size of storage and the amount of solar power must be carefully chosen. Too much PV power and too little battery storage will shorten battery life and cause lack of system efficiency. Likewise, too much storage and too little PV power may lead to undercharged batteries.

In the real world, the question on "charge controlling" is often asked. The answer is both "yes" and "no." If the system is large, both in PV power and storage, then by all means yes. If on the other hand, the system is small with only one 105 amp-hour battery being charged with 35 watts of PV then the anwser is no. The last system needs only include a blocking diode to prevent discharging at night. For a good rule-of-thumb, one can charge up to 20% of the total amount of battery storage without need for charge controlling. (That is about six amps for a 105 amp-hour battery).

Choosing the optimum system is not simply that of choosing the best equipment; it is a matter of choosing the equipment that is best for the system. Developing a PV system for your use involves deciding on the power needs of the loads, and the times during which the loads are applied. It also involves establishing the conditions of sunlight (angle, intensity, etc.,) and the weather in which the PV system will be operative.

For the novice in PV power, the recipe for success: purchase one Arco "Genesis" panel, rated at five watts at 20 volts. Mix in one Gel-Cell battery with a five amp-hour rating. Slowly blend in one HW-8, o.k. to substitute one HW-9, and then wave in front of some Zuni-Loopers. The results will be instant fun. Do give it a try, but one warning – running solar panels can be habit forming.

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Specs Newsletters

Sellers of Photovoltaic Panels and Systems

Solar Powered Emergency Communications Systems Inc.
P.O. Box 155
Montrose, CA 91020
catalog with $3
(very good)

Henry Radio
2050 S. Bundy Drive
Los Angeles, CA 90025

Mobile Solar Energy Corporation
16 Hickory Drive
Waltham, Mass. 02254

Energy Sciences Inc.
16730 Oakmont Avenue
Gaithersburg, MD 20877
(surplus panels)

Tropico Solar Systems
P.O. Box 417
Big Pine Key, Fla 33043
(surplus and new panels)

There are more dealers who I don't have the current address for. If you know of more, lets start up a listing

Membership

The initial QRP ARCI membership fee of $6 ($7 for DX) covers lifetime membership plus the first four issues of *The Quarterly.* The membership and renewal form is on the mailing cover.

Propagation & DX

conducted by Bob Brown, NM7M
504 Channel View DR., Anacortes, WA 98221

Picture this, if you will: young Joe QRP has just returned from the fleamarket on the outskirts of Wichita, KS, with an HW-8 under his arm. He walks into his shack, brushes aside his rock-bound homebrew rig and installs the HW-8 in the center of his operating desk, ready to start a new career, perhaps even DX'ing.

A new career it is. Having plugged in the battery, key and antenna, Joe punches the 14 MHz button. Before you know it, he is copying an FD1 whose QTH is Paris. With anxious trembling, he makes the slow 3x3 call. As the sound of the sidetone fades, Joe holds his breath and listens for the answer.

Will he come back to Joe or won't he? That's the question. And as they say, "it all depends."

On what?

First of all, it's not so hard to find that Paris is 7576 km from Joe's shack. But since Joe's antenna is not up that high, most of his RF is not going to skim along the tree tops, but what reaches Paris must take off at seven degrees from the horizon to make the trip in only three hops.

Then the next question—will the band be open for Joe? He can find the answer if he'd look at the curves in his September *QST* which show the Maximum Usable Frequency (MUF) from the Midwest to western Europe. A quick glance at *QST* shows that 20 meters should be open if Joe is operating between 17 and 21 UTC, barring any magnetic disturbance.

Now we get to some more questions: just how do we know the F-layer will be so obliging? And how much damage will be done to Joe's signal along the way? Let's take the first question and see what is involved in preparing a MUF plot. That's another way of asking what does one do to come up with a MUF program on a computer. In all honesty, it's easy to say but a bit harder to do.

Experience shows that we should break up the path into hops and examine whether the ionosphere will return Joe's signal to earth at the first and last hop. Thus one needs to know the critical F-layer frequency at the mid-point of both first and last hops as well as the angle that Joe's RF makes with the F-layer.

The angle is just a matter of geometry but the critical frequency at a point depends on the amount of solar radiation at that point as well as the sunspot number. If one does this with a propagation program, the computer calculates the highest frequency which is returned at each of the mid-points and then the MUF for the path is taken as the lowest of the two frequencies. If Joe's operating frequency is below the MUF, he can expect at least a chance of making the contact with the FD1.

I should add that Joe QRP is a student at the local community college, taking courses in computer science. But being in haste with his new toy, he wonders whether he should take time to run the MINIMUF program (from the December '82 *QST*) to see whether the band is open.

Does Joe know of the new program *MICROMUF 2+* published in Radio Netherlands *Shortwave Software* (Aug. '85)? It's a bit longer, requiring about 9k RAM, but gives better agreement with the NPAA results in *QST*. If Joe is interested he can write to Radio Nederland Wereldomroep, P.O. Box 222, 1200 JG Hilversum, Holland and get a copy of *MICROMUF 2+*. But if he's impatient to know whether he should answer that FD1, I could send him a copy of my listing in TRS-80 Model 4 BASIC. That might help.

Okay, having run the program we know that the band is open from Wichita to Paris, at least during part of the day. The next question is how much of Joe's QRP is left when it gets to Paris? Put another way, what will happen to his RF on its way over that path? If you talk about his signal strength in watts per square meter, it drops off largely because of what is termed signal spreading or path loss. That's the same as the inverse-square law which affects illumination by a point light source, but different by the fact the RF is returned by the ion osphere rather than continuing along in straight lines. If you work it out, Joe's loss in signal strength due to path loss is a staggering 127 DB, just for openers. And that's a fixed loss, nothing we can do about it.

But there's another loss too, the loss on surface reflection along the path. Since this is a 3-hop connection, we have to look where the two bounces take place and the kind of surfaces involved. Joe's azimuthal DX map shows that the first reflection is in Quebec Province, off good Canadian dirt, while the second one is off saltwater out in the Atlantic. Assuming that Joe has a horizontally polarized antenna, the losses for reflections at seven degrees amount to 3.5dB for the Canadian dirt and 1 dB for the sea water.

Now we come to the final losses along the path from Wichita to Paris, involving absorption everytime Joe's RF passes through the D-region of the ionosphere, first as it leaves Wichita, then twice over Canada, twice over the Atlantic and finally as it reaches Paris. The loss mechanism in the D-region involves collision between the free electrons set in motion by Joe's RF and atoms and molecules at the 60-90 km altitude; in effect, Joe loses RF energy by heating the D-region, albeit feebly.

The actual amount of absorption depends on the level of solar activity as well as the solar zenith angle where the RF passes through the D-region. Since we said the opening from Wichita to Paris was between 17 and 21 UTC, let's stake 19 UTC as an operating time to illustrate what's involved. At that moment the D-region over Kansas is in full sunlight and 13 dB absorption takes place when Joe's RF makes one pass out of the D-region. At the Canadian relection point, Joe's RF goes in and out of the D-region with a total of 19 dB loss. On the Atlantic, where the sun is even lower in the sky, there's only nine dB absorption and finally, when his RF arrives at Paris, the D-region is in darkenss and there is

See Propagation . . . . . next page

no futher loss. Adding it all up, the total loss from Wichita to Paris amounts to about 173 dB; of that number, only the D-region losses vary with the time of day or solar activity.

To find the losses on reflection and in the D-region one has to do some real calculating, not just something on the back of an envelope. Of the two, the reflection loss is perhaps the most interesting as it varies greatly according to the polarization of the RF from the transmitting antenna and the radiation angle of the RF, with horizontal polarization winning hands down! And that's why the True Blue Super dedicated DX'ers all have horizontally polarized Yagis or Quads; vertical arrays are okay if you're at sea or find yourself cramped for space but when it comes to DX'ing, it's horizontal polarization all the way!

At this point, we're back to talking about antennas and that's just where we should be as their patterns are the next thing we have to consider. We have to add in the gains of both transmitting and receiving antennas to get a final figure for the signal strength at the receiver of that FD1.

Most likely Joe's low antenna has its maximum gain at a higher angle than the seven degrees needed to make it to France. And what does that FD1 have for an antenna? Further, Joe's not even sure of the receiver at the other end—or the local noise that his signal has to surmount to make the QSO.

You thought a QRP'ers life was simple! That's the case only if he doesn't think about what he's doing.

So having taken Joe's RF all the way to Paris, we'll have to look further to see how he made out. While we wait to find out whether the FD1 heard him, you may want your computer to start warming up for these questions. If so, send me an S.A.S.E. and I'll get you started with some of the programs.

In The Other Guy's Shoes

Everyone has a "sphere of interaction," usually within his/her own city or town. But amateur radio enlarges our horizons, making us think of distant countries and continents all the time. Thus, we have a good idea of where various countries are located, whether near or far, and even a notion, albeit changing with the seasons, when one can make a contact with them. But what about the other guys? Do you know something of their habits, be they simple like rising in the morning and going to bed at night or more complex like operating on the bands? As for sleeping habits, all you need is a map with time zones on it and you can work out the rest. But operating habits is another matter! However, we can get a handle on that one too, thanks to our propagation programs.

So as an exercise, I used one of my programs to see what the JA's would be up to in June and, as they say, I'll share it with you. Thus, I chose six different DX QTH's and worked out the MUF diagram for them; then, using 14mHz as an operating frequency, I found the times, both local time (LT) and UTC, when the bands where open. These are listed below but in looking at them, bear in mind that the MUF's and the openings are more uncertain for the longer paths, particularly after four hops or paths in excess of 10,000 km. But they do show all the proper trends and will give an idea of what the JA's have to face in June.

The DX QTH's are listed going to the East from Tokyo; for the West Coast I used San Franciso and Washingon, D.C. for the East Coast. The rest should be obvious:

All in all, that should give you an idea of how a day in a JA DXer's life goes. For me, the interesting thing was the distance from Japan to South America. Being that great, it explains why the JA's and South Americans have such an affinity for each other and struggle so hard for QSO's; that's real DX for them as it involves a great circle path of 167 degrees or almost half the way around the world! Sitting in the middle as we do and working both Japan and South America with comparative ease, even with QRP, one doesn't appreciate the magnitude of their struggle.

In The Other Guy's Shoes

QTH	DX	HOPS	UTC	LT
West Coast	8,267 km	3	21-01	06-10
East Coast	10,931 km	4	21-05	06-14
Rio de Janeiro	18,532 km	6	22-04	07-13
Frankfurt	8,886 km	3	07-12	16-21
Nairobi	11,267	4	04-14	13-23
Melbourne	8,190 km	3	23-08	08-17

Milliwatt Achievement Certificates—1985

by Ade Weiss, W0RSP

The selection of recipients for the 1985 MILLIWATT ACHIEVEMENT CERTIFICATES was hampered by a late arrival of the *QRP Quarterly* and by the problem created by low participation in the 1985 Spring QSO Party. The Rules note that "Certificates will be awarded to any milliwatters scoring in the top five place in the Spring and Fall QSO Parties, **assuming that activity remains at roughly the same level as in past years.**" The Spring s.s.b. event produced only 21 entries, roughly 30% of the typical. Hence, a difficult decision was reached with respect to awards: only the top milliwatter will receive a certificate for the Spring QSO Party. The Fall QSO Party produced an adequate number of entries, and four milliwatters scored in the top five places. With 10 entries in the Field Day One Watt Class, second place entrant W9PNE qualified for a certificate, but his award signifies greater merit than the second place showing. Brice's 225 QSO's include 38 at the 100 milliwatt level! Hence, while

See Milliwatt . . . . . next page

there were no qualifiers for the Special Category (60 QSO's at 100 milliwatts), W9PNE certainly would have done it. His 38 QSO's should tempt other milliwatters to take a shot at the Special Category, which awaits its first winner.

In assessing the effect of the MILLIWATT CERTIFICATE award during the first two years. I am gratified at the results. Milliwatters have moved to the front of the class! In 1984, milliwatters took the first three places in both Spring and Fall QSO Parties, and fourth and fifth places. In 1985, they took the first three, and fifth places in the Fall Party. Beyond that, it seems that milliwatt entries have risen. Of 58 entries in the 1985 Fall party, 12 were in the milliwatt class, or roughly 21%, slightly up from 1984 (19%). The FD One-Watt and Five-Watt Classes show a total of 27 entries with milliwatters in four of the top five places. The X8 power multiplier provides an edge for milliwatters, but when FD results are ranked only on the basis of total QSO's, milliwatters still put in a respectable showing in positions 3,6,7,8 of the top 10 entrants in the two classes. In other words, the power multiplier helps, but doesn't eliminate the need for an impressive raw QSO's total.

Qualifying Events/Rules: (1) Spring and Fall QSO Parties, milliwatters scoring in top five places; (2) Field Day, One-Watt Class, second place if 6-12 entries, second-third if 13 (or more) entries; (3) 60 QSO's at 100 milliwatts r.f. output in any of the three qualifying events. A certificate may be awarded to the top milliwatt entry in an event such as the Hootowl Sprint if participation and performance warrants it.

QRP Field Day Trophy Winners

Five Watt Class

1970	K4OCE	220	1470
1971	WA6ABP	137	1175
1972	W7DRA	55	5652
1973	WA5WYO*	79	1098
1974	W0IYP	439	2748
1975	WB8OSM	220	1470
1976	K6TG	128	918
1977	N2AA	389	2790
1978	WA4IAR	442	2804
1979	WD5BKO	287	1872
1980	K1JX*	741	9042
1981	N4BP	999	6144
1982	N5EM	259	1704
1983	WA0VBW	435	2760
1984	N4BP	1046	6426
1985	W0KEA	486	3066

*One-watt entries adjusted to X8 power multiplier.

Milliwatt Class

1981	K5WNH/0	239	3018
1982	----	----	----
1983	N0BYC	241	3042
1984	W8ILC	425	5250
1985	KN1H	373	4626

QRP Field Day 1985

Station	CW	SSB	Total QSOs	Total	
*KN1H	264	109	373	4626	
W9PNE	225	0	225	2850	
NJ7M	215	0	215	2730	
KK7C/WB7BIV	190	3	193	2466	
W1XH	139	1	140	1830	
KR2V	70	22	92	1254	
NS6X	70	0	70	840	
KV7X	31	0	31	522	
KA9HAO/7	17	3	20	390	
WB2IPX(100mw)	14	0	14	318	
Five Watt Stations					
*W0KEA/KA0KRW	417	69	486	3066	
W0UY/K0WRY	151	229	380	2430	
N2RI	269	84	353	2268	
N9DHX	0	305	305	1830	
VE3HIE	184	0	184	1254	
WD5BRR	149	0	149	1044	
W6YVK	0	149	149	894	
WD9AEU	110	26	136	816	
NU4B	103	0	103	768	
N0BQW	0	76	76	606	
KT1H	29	61	90	540	
NM7M	60	0	60	510	
WD9EGW	64	0	64	384	
KA2KMU	35	0	35	360	
KH6CP	17	16	33	348	
KA5QAP	21	0	21	276	
KA0FDL	0	30	30	180	
Club Stations					
K9NG	461	42	503	6186	#
*W3TS	491	285	776	4806	
W2LZ	667	0	667	4152	
W6SK0	411	178	589	3684	
NC9O	58	189	247	3114	#
W0VM	427		427	2712	
KA4LKH	23	274	297	1932	
K5IS/N5AE	138	70	208	1398	

*Award Winners

#One-Watt club stations

QRP Field Day Club Standings

Top 20 Club Scores 1979-85

	Call	Year	QSO's	Score
1.	N4BP	'82	1170	7170
2.	K9NG*	'85	503	6186
3.	K8BX	'81	854	5274
4.	K9NG*	'84	418	5166
5.	W3TS	'85	776	4806
6.	N6UU	'84	731	4536
7.	K8IF	'79	732	4488
8.	N2RI	'83	699	4344
9.	N5AF	'82	685	4260
10.	K8IF	'82	684	4254
11.	W2LZ	'85	667	4152
12.	KN9W	'83	643	4008
13.	W2LZ	'83	637	3972
14.	AC2U	'81	627	3912
15.	N2RI	'82	625	3900
16.	W3TS	'84	597	3732
17.	W6SKQ	'85	589	3684
18.	WB9JVX	'82	584	3654
19.	K8IF	'84	568	3558
20.	N2RI	'81	555	3480

*One-watt club entry

See Milliwatt . . . . . next page

Milliwatt . . .

1985 MILLIWATT ACHIEVEMENT CERTIFICATE WINNERS

N4BP	Bob Patten	Spring Party, 1st place Fall Party, 1st Place
W3TS	Mike Michael	Fall Party, 2nd place
WB5KFC	Chris Brakhage	Fall Party, 3rd place
KV7X	Jay Sturdivant	Fall Party, 5th place
W9PNE	Brice Anderson	FD One-Watt Class, 2nd place

Clandestine antenna installed at rented cabin.

Extracting Energy from the Atmosphere

Dynamite results from a clandestine antenna
by Jim Fitton, W1FMR

Last year, an unfortunate set of circumstances forced me to move from home into a condominium shared by a fellow worker. How to get back on the air?

That perpetual problem of antenna erection soon began to rise it's ugly head. The handicaps of condo living, antenna prohibition, poor location (the bottom of a big hill), and the dead of winter tended to put a chill on all enthusiam. After missing the QRP nets and my buddies WB2IPX and K3TKS, I decided to try my darnest to make the best of a bad situation.

PUTTING IT UP

Fortunately, outside my second story bedroom window and about 20 feet away, stood an old oak tree. The situation seemed perfect for a hidden 40 meter delta loop that I had been experimenting with at my old location, an antenna that had spectacular performance.

On a calm day, a well aimed slingshot sent a sinker weight trailing light nylon fishing line up, over and down the other side of the tree. The fishline was followed by some waxed lacing twine, and in turn 146 feet of insulated 18 guage stranded wire (flea market special). The shape of the wire followed the outline of the tree and looked somewhat like a triangle replete with bulges, humps and droops. Both ends were brought through the window where the stripping, measuring and cutting could be done in the privacy of my own bedroom.

TUNING

First, the resonant frequency of the loop must be found. This is most easily measured using a grid dip oscillator (GDO), but an RF noise bridge or SWR meter and matching transformer could be used also. To measure the resonant frequency of a loop, strip the ends and twist them together, or clip them together with a small clip lead about six inches long. Next wrap a few turns of the antenna wire or (clip lead) around the coil of the GDO. As the GDO is tuned through the resonant frequency of the antenna, a drop (or dip) in current will be seen. Check the frequency of this dip by listening on your ham receiver.

If you tune your receiver to the same frequency as the GDO it will be heard quite loudly.

If the frequency measured is too low, cut a few inches off the end of the loop and try again. If the frequency is too high, (unlikely) add a few inches. The loop will in all likelyhood at 146 feet, be too long. As we all know, it is far easier to remove than it is to add on wire. The formula for determining the resonant frequency length of a loop is 1004 divided by the desired frequency in megahertz. for instance 1004/7.500 mHz = 142.4 feet.

I must warn you, that the resonant frequency changes from winter to summer. Sap running through the trees and leaves, all form part of the antenna system, and about 18 inches will have to be lopped off the antenna during the summer. Keep

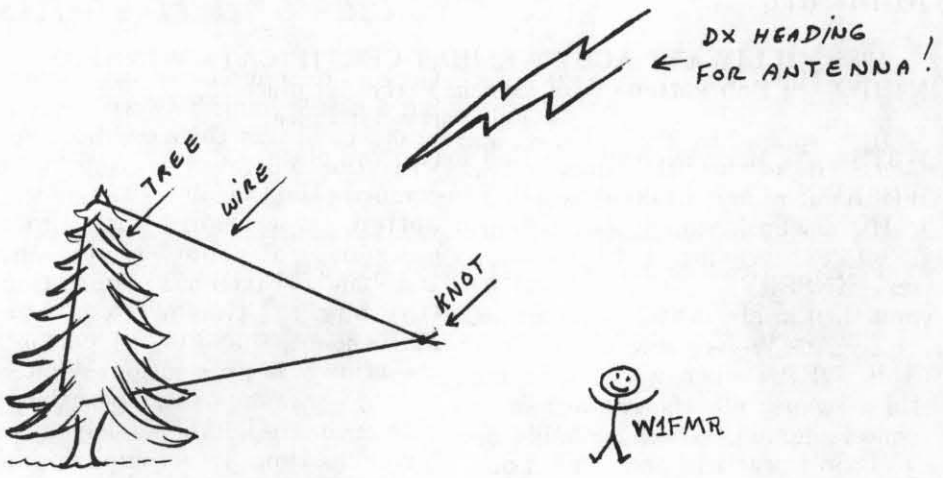
See Energy . . . . . next page

[1] Jim Fitton, W1FMR, Box 58, Ward Hill, Mass. 01830.
[2] A.W. Gaunt provided the drawing of the cabin.

that grid dipper handy! Also during a hard rain, the resonance point changes but not much, because the frequency response of a full wave loop is quite broad. This is the price one has to pay for a dynamite clandestine signal.

The antenna described uses no insulators, is quickly erected and becomes almost invisible.

During a year and a half of rather serious operating, there have been no complaints or comments about the wire. Had anyone asked, they would have been told that it was an experiment to attract wild birds wintering in the area or an invention to extract energy from the atmosphere. I would then invite them to my room to experience a mild shock during the next thunderstorm.



THE W1FMR 40 METER DELTA LOOP

CHARACTERIZING THE ANTENNA

The resonant loop as it stands will be a potent performer. Depending on the shape, it will have either horizontal or vertical polarization, or a combination of both. A horizontally polarized loop has about +2db gain over an ideal dipole, and if your loop turns out to be vertically polarized, it will give the same results as an excellent vertical antenna (and requires no radials).

Radiation intensity will tend to be in a direction perpendicular to the plane of the loop. Try to imagine what the shape of a huge bubble would look like, if the loop were momentarily dipped into a tub of soapy water on a breezy day. Of course another main lobe of radiation would also exist in the opposite direction.

CARE AND FEEDING

Having the ends of the loop avialable inside your window has many advantages. Experiments can be performed very easily. For instance, a couple of 33 foot wires run around your room will act as a counterpoise when connected to the ground terminal on your tuner. The loop can then be operated as a long wire on 80 meters (open or closed loop) by simply clipping on a short length of coax to your tuner. In a recent contest using five watts of power on 40 meters, 41 foreign stations including the Fiji Islands (twice) and Asiatic Russia were worked using the closed loop in this manner.

If your tuner has a balanced input, you can tune all bands from 40 through 10 meters by connecting a short length of 300 ohm TV line from the ends of the loop to the balanced input of the tunner. If your loop is not located near the house, a length of TV type twinlead or other form of balanced line (after resonance is found, of course) could be used to get to your window. You should notice no difference in performance using this arrangement.

The impedance of the loop is the usual 100 or so ohms at the fundamental frequency (40 meters) and not much different for 20, 15 and 10 meters. I have found a neat little matching transformer that works like a charm and provides a good match on all bands from 40 through 10 meters. When the matching transformer is connected to the ends of the loop and a piece of coaxial cable is connected to your QRP rig, 40, 20, 15 and 10 meters can be bandswitched (without using a tuner). From what I can determine, the transformer has a small amount of reactance that balances out the antenna reactance on all harmonically related bands and gives a very low SWR if the loop is trimmed correctly.

Last spring during the ARCI QRP contest I came in fifth place overall using this loop and transformer arrangement. Two loops were set up at angles of 90 degrees to each other so that all directions were covered. All stations having a higher score were using beams, and had the solar and milliwatt bonus advantage.

A total of five loop antennas have been constructed at different locations using this matching transformer and all had similiar performance.

At one location, the transformer was put into a small plastic box (Radio Shack) with holes for the loop and coaxial cable sealed with silicon rubber (or liquid latex). The antenna matching system was outside for almost two years and performed beautifully in all kinds of weather.

The drawing accompanying this article shows how the antenna was put up at a rented camp in the mountains.

Teflon coated wire works very well and even tall pine trees were used successfully as supports. If there is some slack on the antenna wire, a string can be tied at a far corner and then run to a supple branch to provide tension. A motorcycle type bonji cord may be used as a tensioner or shock absorber also. The antenna whips around a bit in the wind and sometimes becomes tangled in the branches. This does not seem to affect performance, but if this bothers you, pull it down and put up another. It is practically free.

Because the loop operates so easily on all harmonic frequencies a low pass filter should be used for harmonic supression.

I am able to acquire the matching tansformer for a reasonable cost at quantity. They are wound on toroidal core with stripped and tinn-

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Experiences of a High-Rise QRPer

by Hans Schroeder, AE9G

In response to the request for some "High-Rise QRP"–ideas, allow me to put in my two-cents worth.

History/background: I was dormant (expired) for about 10 years (ex–KN8PRV, K8PRV, W9IKK) and then in about 1977 I happened to see Ade Weiss's column in *CQ*. This "QRP," which was new to me then, seemed like the answer: small space, simple gear and probably no TVI. So I practiced code and in due time got a ticket again. As may be apparent from this, I am not very experienced as an operator; I am just having fun with my "embellished" HW-8.

Portable Operation: One facet which should not be ignored altogether is portable operation (a la Field Day). For this I have collected pieces of 1" and 7/8" aluminum tubing, dowels and hose clamps for joining them - with or without electrical connection - steel ships and also a 15 foot three-piece bamboo fishing pole. Together with some string and stakes for guying, this allows me to assemble verticals (also vertical dipoles) from heights up to over 30 ft. In addition there is a cross-piece which allows me to mount a horizontal dipole for 15m. Transmission line is 75 ohm twinlead. Whenever I find something useful I add that to my "bag of tricks."

My first contact after I got a license again was in Medford, Oregon, (responding to my CQ) using a dipole hung between the two branches of this U-shaped building, with the "operator" sitting on a campstool on the falt roof (sundeck); battery operation, with good sunspots at that time, and 15m-band. Fixed-base operation: Obviously, to be weather-independent, that kind of portable operation is not a solution. What is needed is a more or less permanent antenna on the building, likely of the "invisible" type. To accomplish this:

1. Study the building. Find a convenient way to get from the inside to the outside, such as drainage holes in aluminum window frames, enlarging an existing crack, gap, etc. Study the construction of the building in detail. Make detailed sketches. They are useful for "seeing" the building, and also later for making plans. The more one looks, the more nooks and crannies, bumps and protrusions one finds. Is the roof accessible? Is there a cooperative tenant who lives a few floors above or below? It is likely that no antennas are allowed. Even if the landlord is friendly, it is probably better not to put him/her on the spot by asking for special permission. Just go ahead, but be careful, professional and don't cause any problems. (You want the antenna to remain invisible, right?)

2. Raw materials. Enameled wire, #24 to #27 is suitable for the antenna; nylon fishing line for "fishing," also as end-insulator, guying or anchoring; rope-caulk (a substance which might be considered a heavy-duty putty, and which is used in our area for sealing cracks at windows during winter) for attaching the wire to the wall, under a window still, or even for making an anchor; other useful items: twine, masking tape and duct tape.

3. Techniques. Study nautical knots - paticularly useful is figure-eight knot, bowline and fisherman's bend. The three-piece bamboo fishing pole mentioned above has been worth its weight in gold. It is extended with special hooks, loops, etc., as the moment requires, made of #14 house-wire taped to the end.

To fish a wire from one place to another, it may be possible to fish it directly (with the fishing pole-cum-hook), or it is possible to drop a nylon line to ground level (with a little weight - using rope-caulk), then also hanging an extension on the antenna, also to ground level, then tie the two together and haul away.

It is possible to anchor the antenna either with some good quality tape to a metal surface (plus a piece of nylon line as end-insulator) or to use a wad of rope-caulk. In that case it is useful to knead it together with some cotton string or twine, so that the nylon line does not cut through the putty, but is supported by the string inside the mass. Squeeze the rope-caulk anchor into a crevice or corner such that the weight of the antenna does not pull it away from the attachment. It is also possible to put a slip-knot loose around a protruding decorative brick, in which case a dab of the universal rope-caulk provides a bit of securing against slippage.

Some experiences: An antenna such as this is of necessity in the "non-permanent" category, but then, aren't all antennas more or less "non-permanent?" In any case, upon restringing it, one finds better ways of where to hang it, how to hang it and how to do the job more smoothly and efficiently.

When working on a flat roof, remember that your center of gravity is near the navel. It is better to lie flat on the roof and get your shirt dirty, than to crouch at the edge looking over the side. Remember that an accident effectively spoils the invisibility of your antenna.

It seems best to let the wire hug the building, and use preferably vertical runs. Free-hanging wire, even of small gauge, is surprisingly visible silhoutted against the sky and becomes even more visible with an accumulation of fog droplets or wet snow. Horizontal runs can be a problem even close to the building, as I found out last winter, when I discovered fishing lines and wire encased in over one-half inch of ice after a warm snowstorm followed by a cold spell. Answer: cut and rehang in the spring. If the antenna is below the roof line and hugs the building

See High . . . . . **next page**

Energy . . .

ed leads. If you would like to try this matching system send $4 for a transformer and instruction sheet.

While much literature exists on full wave loop antennas (called Quad Antennas in the *ARRL Antenna Handbook)*, **the hardest thing is to get started.** This article will show how easy it is. I suggest first buying the wire. Next figure out a way to measure 146 feet. Then get it up and over a tree (or run it around horizontally if you like). Measure at the ends for resonance. Provide a matching device such as a transformer, transmatch or matching stub. **Jump right in and try it.**

The Venerable Zepp

by C.F. Rockey, W9SCH

Here is the diagram of the real "zepp" antenna, hanging from the gondola, or cabin, of a zeppelin airship (Luftschiff, in German). It was taken from the 1915 edition of the *Textbook of Wireless Telegraphy*, by Dr. J. Zenneck, a famous authority on the subject in those days.

For those whose German may be rusty, the text tells us (very loosely translated) that this antenna hangs beneath the gondola of the ship but is not grounded to it.

96. Ungeerdete Antennen für Luftschiffe[151]).

a. Für Luftschiffe, bei denen jede Form der Erdung ausgeschlossen ist, sind unter anderen folgende Antennenformen versucht worden:

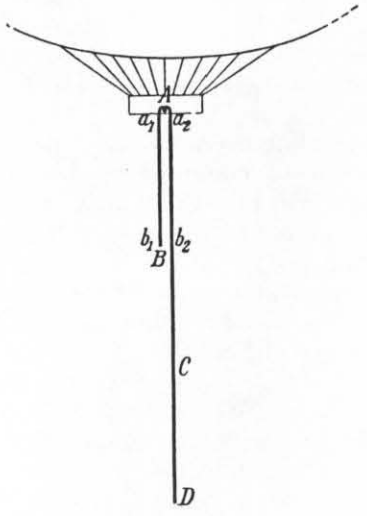

Fig. 204.

1. Die Antenne, ein aus der Gondel heraushängender Draht, als Gegengewicht die Gondel mit ihren Metallteilen (Motoren), davon isoliert der Ballon.

2. Ebenso, aber als Gegengewicht sowohl die Gondel, als auch das damit verbundene Metallgerippe des Ballons (Zeppelinluftschiff) oder eine leitende Hülle des Ballons.

3. Die Antenne besteht aus einer Art Lecherschen Systems mit zwei ungleich langen Drähten*) (Fig. 204) (H. Beggerow): der eine Draht (a_1 b_1) wird z. B. = 1/4 Wellenlänge der Schwingungen, der andere a_2 D = 3/4 Wellenlängen gemacht. Die Schwingungen werden bei A in der Gondel erregt, bei A und C sind Spannungsknoten (vgl. **72 c** 2 und **24 a**). Für die Strahlung kommt nur der Teil

*) Die durch isolierende Stücke in demselben Abstand voneinander gehalten werden.

Zenneck, Drahtlose Telegraphie. 3. unveränderte Auflage. 13

Depending upon the Lecher-Wire principle, one wire, A2 D1 is 3/4 wavelength long, the other wire is 1/4 wavelength long. The oscillations are generated at points A1 and A2, at a voltage-null of the system. The waves are radiated by the portion of the wire B2 CD, 1/2 wavelength long and 1/4 wavelength away from the ship itself.

Apparently the main purpose of this arrangement was to keep strong radiated fields away from the metal work around the hydrogen-filled gas bag. The effect of induced sparks jumping around in there could be disastrous (non-flammable helium was not available in those days)! Indeed, we hear that at least one hydrogen-filled airship had been destroyed in that way, by explosion.

The text credits a gentleman named H. Beggerow with the invention of this antenna - probably even before 1915. This would make this one of the earliest of practical antennas, preceded only by the Hertzian Dipole and the grounded "Marconi" types. With a number of modifications, the "zepp" is still effectively used by radio amateurs (including W9SCH), but for its radiation efficiency rather than its anti-sparking property.

There must be something good about an antenna that's been in use at least 71 years.

73,
C.F. Rockey, W9SCH
Box 171, Albany, Wis. 53502

High . . .

there should be no lightning problem. In any case, though, use good common sense, both electrically and mechanically - and, as mentioned above, don't forget your own safety.

It was a surprise to me to discover how often some work is done on a building - it seems that nothing ever gets done, UNTIL one has a clandestine antenna hanging on it. There is work on the roof, painting, repairing rainleaks along the walls, tuckpointing, replacement of windowsills and all sorts of other likely and unlikely things. Try to remain out of the way of any likely building maintenance work and/or be able to remove the antenna, or part of it, or let it hang loose - put a piece of nylon line on it, so you can easily haul it back in when the crisis is over.

Performance: Directivity seems impossible to predict. My wire is at the northwest corner of a large building, about 80 ft. up. QTH is near Lake Michigan. It would seem that my signal would be mostly to the north or west. Not so. Of course, as expected there have been contacts in Alberta, Oregon, California, etc., but also Texas, Florida (good-ole N4BP), Georgia, and up the coast to New Brunswick, using bands 40, 20 and 15m, all with the HW-8, plus an MFJ-901 "Versatuner," and an MFJ-202 noise bridge to help.

Summary: To Larry Harmon, N7NX, whose question inspired this summary and to anyone else who is in this situation, I say, "Don't let a high-rise keep you down!"

QRP Notebook

by Jack Russell, K2RS

QRPers should run, not walk, to their local ham radio emporium, or drop an order into the corner mailbox for a copy of W1FB's *QRP Notebook*. This latest book by the former technical director of *QST* (Doug is a long-time QRPer and the winner of the Dayton Hamvention 1986 Technical Achievement Award) is a bountiful source of basic

See Notebook . . . . . next page

design information on solid-state TX's and RX's, as well as transceivers, station accessories, construction and design tips and operating advice.

The *QRP Notebook* is divided into six chapters and includes appendices and an index. The chapters cover The Essentials of Receiving, The World of QRP Transmitters, QRP Accessory Gear, QRP Transceiving, the QRP Workshop and QRP Operating.

The technical chapters which constitute the bulk of the book are presented in DeMaw's tried-and-true "building block" approach, as he has done on other ARRL publications and his more advanced engineering texts, *Practical RF Communications Data*[2] and *Practical RF Design Manual*[3]. The "building block" technique makes what can be complex circuitry wonderfully simple, taking the would-be designer stage-by-stage through a RX or TX, showing various circuit alternatives for each stage and explaining the advantages or disadvantages of each.

Circuits for complete TX's, RX's, transceivers and trans-receivers are presented. In describing each one, the author builds on his foundation of circuit information by referring the reader to the previously discussed circuitry. In this way, the elementary circuit-stage "building blocks" come together in a final, working design. It's hard to conceive of a simpler, more effective way to present such information, while tying the basic info together with functional equipment.

W1FB proves once again that good things come in small packages. Although *QRP Notebook* is only 77 pages long, a tremendous amount of information is presented between its covers. In the chapter on RX's DeMaw covers direct-conversion and superheterodyne designs, along with stage-by-stage circuit descriptions and complete circuit diagrams. The TX chapter covers oscillators (both VXO's and VFO's), amplifiers, curing instability problems, harmonic filtering and break-in circuitry. The accessory chapter includes power supplies, antenna matching devices (matchboxes), SWR meters, crystal calibrators, RIT and more. A separate chapter presents a 40 meter transceiver and The Gutless Wonder Trans-Receiver (great name, eh).

Throughout the book W1FB makes reference to *Solid State Design for the Radio Amateur,* a softcover ARRL publication that he co-authored with Wes Hayward. W7ZOI. *Solid State Design* (affectionately known as *SSD* to many homebrewers) is considered by many of us to be the QRP technical "Bible," but there is some question about its availability at this time. Although it is not currently listed as an available title for the ARRL, in talking with W1FB prior to the Dayton Hamvention, he indicated that the League planned a small press run of *SSD.* Doug feels that it might be time to do a second revised edition of *SSD,* but the League needs to see some indication from the buying public that there's a market for it. He suggested that amateurs interested in seeing a second edition of *SSD* should write to the ARRL and make their feelings known.

I give Doug DeMaw an A+ for *QRP Notebook.* My criticism does not concern the content as much as the package. There are no photos in the notebook and the text is obviously computer generated, as it was with the outrageously overpriced, poorly produced *The AARL Antenna Compendium.* Unfortunately, this production style makes for a very bland package. As DeMaw explains in his introduction, he chose the simple approach to keep the cover price reasonable. It's too bad the editors at the League don't have more pride in their publications, because Doug's excellent manuscript deserves better presentation than it was given. As a magazine editor, I know that the additional cost of a more stylish layout would not have been exhorbitant.

Despite this minor criticism, *QRP Notebook* is an essential technical sourcebook for the low power enthusiast and the perfect complement to *Solid State Design.*

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[1] 487 Highland Court, Carlisle, PA 17013.

[2] a Howard Sams publication now out of print.

[3] a Prentice-Hall college division book.

QRP DX Chasing

by Keith Clark, W6SIY

I am writing this article to encourage some of you to try QRP DX'ing. If you read on, you will at least become aware of what is possible - you may even get hooked on it as I did. I will give you some background on my intital false beliefs about DX'ing, my operating experience and some hints to get you started. As of July 1986, I have been chasing DX actively on QRP for a year and a half. I have worked 118 DXCC countries and 91 are confirmed with QSL's so far. This has been done with *QRP power* (four watts output), *near the bottom of the sunspot cycle,* and with *poor antennas* on a city lot. If I can do it, you can too. I am letting my secrets out now, as I expect to have my QRP DXCC application out by the time you read this.

I didn't do any DXing for my first 24 years as a licensed amateur. I missed two entire solar cycles, all the time thinking my limited equipment and skill wouldn't be successful. Oh, I had other excuses. I moved several times and had periods of inactivity going to school, working and raising a family. I never even got close to a QRO Worked All States during that time, so how could I expect to get a signal out of the country? When I moved to California, I totally gave up on any idea of DXing - where would I find DX stations who still needed a QSO with a W6?

All my DX misconceptions have been overcome in the last four years. After a license upgrade to Extra, I treated myself to my first modern radio equipment, a used Ten-Tec Delta. A QRO WAS achieved in a few monhts as I learned SSB operating techniques and kept working on my code speed. Then I began a few attempts at working DX. It's funny, but I don't remember hearing much DX while I was chasing

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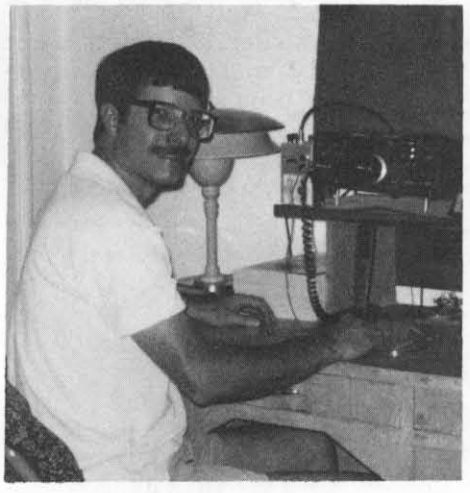
1609 Ewing Circle, Ridgecrest, CA 93555.

See DX . . . . . next page



states. In the next two years, I achieved a QRO DXCC plus many countries to spare. I was having a ball - my most exciting operating ever! My antennas during these efforts were a 40/20 meter lopsided inverted vee dipole 18 feet at its highest point, and an HQ-1 Miniquad at 24 feet. These are the same antennas in use today.

My QRO DXing efforts and fun were tapering off in late 1984. I seldom heard new countries, and the sunspot cycle was heading toward the bottom. Even though I'd made one QRP QSO into Europe the previous spring, I still thought QRP DXing was only for those with big monoband antennas on 100' towers, and of course during the sunspot peak. However in February 1985, I decided to try QRP in the CW ARRL DX Contest, just to see if I could make a couple of contacts. I figured it would keep me busy while I watched for new QRO countries, and I could always continue it when sunspots came up again. Well, I worked 21 DXCC countries during the two-day contest, using four watts output! I was hooked on QRP DX!

QRP DXing *is* possible, even with my poor antennas and at the bottom of the sunspot cycle. It was only the belief that I couldn't do it which kept me from trying earlier.

A surprise to most new DXers is the strength of signals from extreme ranges. These levels occur at peak conditions and the locations of best signal propagation are continually changing with daily, monthly, yearly and 11 year average cycles. The cycles are also continually varying in a random manner. I have heard S9 signals from nearly all corners of the globe at one time or another. It was a shock to realize that European signals could be S9 when the east coast was S2 or lower. This seems be in conflict with the usual multi-hop theory of ionospheric propagation. Another little-mentioned fact is that HF propagation is *very* spotty. You might hear two signals from Finland on 20 meters, and no other signals from Europe. The next night, conditions might be perfect to Argentina or New Zealand with no European signals to speak of. Some of the DX write-ups would lead you to believe that the whole world will come in practically every day!

Because propagation is so variable and spotty, the best advice for finding DX is to LISTEN, LISTEN, LISTEN. The study of propagation is fascinating, and I try to learn everything I can about it. However, *all the theory and computer programs available are no substitute for listening to the bands.* As a QRP DXer, you want to be on the air listening when conditions peak to a new country you need, and someone is there on the band.

Dxing could easily turn into a full time pursuit. However, most of us have other commitments on our time and must squeeze in ham activities when possible. For most efficient use of operating time, the best DX chasing is available during the major DX contests. You don't have to enter the contest; you can just use it to work new countries. The DX stations are happy for each contact they get, and you'll hear them calling "CQ TEST" by the hour. Just time your calls when their signals are strong and few or other stations are calling them. Many of you who participate in the QRP contests and field day already have honed your contest operating skills and operation in DX contests will be a natural transition.

Many groups go on DXpeditions for the major contests, and this is a good chance to pick up less active locations. Contest fans go all-out with very big antennas and will have no trouble hearing your QRP signal when conditions are right. They are often on the air a few days before and after the contest. Since the contest runs 48 hours straight, and stations world-wide are on the air continuously on all bands, it is an excellent time to study propagation. All activity is speeded up during the contests, so you don't waste a lot of time waiting for QSO's to end so that you can try calling the DX station.

For my DXing, I much prefer CW over SSB, and have made an effort to build up my code speed to pick out call signs. QSK CW is very helpful for timing calls when the frequency is clear. On SSB, use multi-syllable phonetics or try different ones. I generally have better luck with the Santiago Italy Yokohama than with Sierra India Yankee. The highest license class you can get will give you more band coverage and thus more chances for contacts.

All my QRP DXing has been done without benefit of Lists, DX Nets, two meter DX alert nets or by calling first on high power. My RIT only covers +/−1 khz, so DXing can be done without an external vfo. Ability to change bands rapidly without retuning is helpful. I have tried to hone my operating skills for correctly placing my transmit frequency and timing my calls. Every technique possible should be tried to gain an advantage in making contacts.

I keep up on the latest DX information by listening to the W1AW DX Bulletin every Friday UTC, and the W6TI DX Bulletin on Monday (UTC)at 0200 UTC on 14002 khz (Sunday evening here). Printed bulletins are also available from various DX associations. *The Complete DX'er* by W9KNI is an excellent book, and for QSL information, I rely on the W6GO/K6HHD LIST of QSL managers.

Finally, all the recommendations to put up an antenna as big and high as possible should be followed. They all help. However, keep in mind my experience. DXCC on QRP is possible with an antenna barely above the roof, even near the bottom of the sunspot cycle. As we enter the next cycle, DXing on low power will get easier and easier as 15 and 10 meters have widespread openings. Now is the time to get started and test your DXing skills through the whole cycle. Good luck and DX!

QRP DX Beacons on 20 Meters

by Bert Matthies, DL2HCB

Nineteen year old Bert Matthies has been licensed since May 1984, having started three years earlier as a SWL. Presently midway of a three year technical apprenticeship with German Telephone, his ham radio interests are low power CW DXing and contesting. Off the air he chooses country and western QRM.

Have you ever noticed CW signals on 14.100 MHz? Twenty-four hours a day, seven days a week, you can tune your receiver to that frequency to hear QRP transmissions from the 10 stations of the NCDXF beacon net. In just 10 minutes, you can form a good picture of QRP DX propagation possibilities from the QTH to key areas of the world.

Beacon stations are located in . . . and are identical. Each consists of . . . driving a simple groundplane antenna. Because power levels and antennas are so similar to what an average QRPer could put on the air, the beacons give a very useful impression of where your signal will be readable at any moment.

Of utmost importance to the QRPer is the decreasing output power of each beacon, from 100w to 0.1w in 10dB steps. The transmitting sequence of the net is shown below. Same sequence is repeated every 10 minutes, but it may vary as more beacons are added to the net.

Now lets take a closer look to the text transmitted by each beacon.
100w QST de(W6WX/B) beacon
100w ._____ nine second dash
100w .._____ nine second dash
10w ..._____ nine second dash
1w ...._____nine second dash
100w SK (W6WX/B)

The transmission time is ± 58 seconds at a code speed of 20wpm. Because the stations are crystal controlled on 14.1 Mhz (listen on 14.099.4 due to the CW offset), they provide an accurate band-in frequency marker and also a fine time standard. The first "Q" of each "QST" begins within a fraction of a second of the assigned time. The net might help you in improving your station/knowledge when:

–comparing antennas and receivers during the same nine second dash.

Time	Call Sign	Location
00.00	4U1UN/B	United Nations, NY
00.01	W6WX/B	Stanford Univ., CA
00.02	KH6O/B	Honolulu Com. College, HI
00.03	JA2IGY/B	Mt. Asama, Japan
00.04	4X6TU/B	Tel Aviv Univ., Isreal
00.05	OH2B	Helsinki Univ., Finland
00.06	CT3B	ARRM, Madeira
00.07	ZS6DN/B	Transvaal, So. Africa,
00.08	LU4AA/B	Argentina
	HK4LR	Medellin, Colombia

–checking DX versus short-range characteristics of different antennas.

–trying your own propagation investigation.

Last of all, the Observation Coordinator Al Lotze, W6RZ is sending QSL's to beacon monitors reporting their observations and thoughts to him. Regular observations are appreciated.

Osterfeldweg 30, 2100 Hamburg 90, West Germany

Free QSL Bureau Established

by W.C. Wellborn, K4CLA

We were saddened that USQS is no more.

However, someone must carry on. Therefore effective immediately, KIQS will offer the incoming QSL service. We have notified *Worldradio, CQ, 73, QSQS, Ham Radio* and many others.

Our service is called K.I.Q.S.–pronounced KICKS–which stands for K4CLA Incoming QSL Service.

A copy of our operating rules is printed below. We ask that you and others spread the word that KIQS is in place to process incoming QSLs destined to USA hams. Thanks very much.

We appreciate what USQS did. KIQS now asks your support.

KIQS Operating Rules

1. DX Stations may send QSLs to USA homes via K4CLA.
2. US station may send QSLs to other USA hams via K4CLA.
3. Pre-sort QSLs numerically, then aphabetically by suffix.
4. QSLs dispatched within 90 days if postage on file.
5. QSLs dispatched within 180 days when USA hams must be notified that postage is needed.
6. Notices will be sent as routine traffic via ham radio.
7. Message example: "Send greenstamps for QSL postage. signed KIQS/K4CLA, 562 Oak Dr., Lexington, SC 29072-9059.
8. One greenstamp is exchanged for four stamped envelopes of appropriate size, each bearing one ounce of postage.
9. We do not accept SASEs from USA hams as too often they are too small and/or have incorrect postage or damage the QSLs.
10. If QSLs cause overweight envelopes, excess is postage due.
11. KIQS dispatches: January, April, July, October.
12. USA hams may send any number of green stamps at any time.
13. Send QSLs, green stamps, correspondence, comments and criticism to: KIQS-K4CLA, 562 Oak Dr., Lexington, SC 29072.

Activity and Awards

conducted by Fred Turpin, K6MDJ
Box 145, Cedarpines Park, CA 92322

Life is returning to normal after Datyon. Bills and responsibilities are coming back into perspective and the adrenalin flow has slowed down. I actually slept six hours straight the other night. I wish I could have spent another week to really get acquainted with all the QRPers that were there. Now meeting you on the air takes on added dimension.

The QRP Hospitality Suite was always full. Some were checking out the homebrew gear or talking QRP, while others were on the air, loading up everything in sight, including each other. One always knew where Field Day was being discusssed by all the chest pounding and crowing.

Each of you would have been pleased with the candid, open manner of your elected and appointed officials addressing issues in your behalf. On every issue, membership opinion, as expressed in the poll published in the April *Quarterly,* prevailed. The Board of Directors lacked one vote of a quorum, so issues raised must be voted on through the mail before results are available.

Also with us were the Michigan QRP Club President Jerry Trotten, K8IRO and Editor Tom Root, WB8UUJ. From farther away we had Chris Page, G4BUE, G-QRP *Sprat* editor and member of our BOD. Adrian Weiss, W0RSP, author of *The Joy of QRP* and columnist for *CQ* came this year by plane rather than motorcycle.

Special awards recognizing long hours of uncompensated service to QRP were issued to Les Shattuck, WB2IPX and Jim Fitton W1FMR, for their Dayton efforts; to Adrian Weiss, W0RSP and Chris Page G4BUE for contributions to the QRP movement, and to Jim Stevens, KK7C for his countless editorial hours.

The club gave them monogramed hats and T-shirts marked, "In Appreciation QRP ARCI, Dayton -'86."

At the direction of the president, I issued a special certificate of appreciation to Danny Gingell, K3KS, our Nets Manager, for single handedly signing up 25% of all new memberships at Dayton. Nice going, Dan!

Norm Wagner, K9EIJ

Jim Fitton, W1FMR did a deluxe job of putting together the details of Dayton, going out on a limb for 20 rooms and running up a phone bill worthy of Ma Bell to coordiante it all. This world is made up of "givers" and "takers" and Jim is a giving person of the highest order. Many others join me in saying, "Thank you Jim, for one of the times of my life!"

AWARDS

Congratulations to all the award winners in this quarter. You're in good company, alongside all the other achievers since 1983. You asked that we publish this information so look for it as a regular part of this forum.

Norm Wagner, K9EIJ, is the closest thing to a grand slam QRP award winner I can find on our books. This quarter Norm applied for and received WAC-QRP, DXCC/-QRP, WAS/QRP-30, QRP-25 and KM/W awards. He only missed the QNI-25! I first ran into Norm in the '84 Hootowl Sprint, which marked his return to amateur radio after a five year layoff. Reactivated by fellow QRP ARCI member Norm Wald, KD9NJ (ex KA9PNN), Norm took the challenge to beat the socks off his mentor. Some say their competition is the hottest thing since the Chicago fire, with Norm #2 holding 40 countries confirmed QRP and just two QSL's short of the full WAS/QRP.

At first glance I thought Norm's Argo 515, TA33 at 55' and Butternut 80/40 vertical at 60 ft. told it all, but it turns out that he did most of it with an HW-8 15m ground plane and 40m dipole.

Norm's attitude was so positive I knew there must be a positive force behind him; so I included a special certificate of appreciation to his family for being "super supportive in his pursuit of happiness." The super note that came back from Donna, his XYL-to-be, will keep me cooking for weeks. Thank you both!

Brad Hutton, KJ1H, up in Bow, N.H., just received DXCC/QRP trophy No. 69. Just goes to show what an ex-navy radio-man, with five watts and a 70' tri-bander can do on shore leave! Brad's station consists of HW7, 8 and 9 plus and Argosy with tribander on a 70 ft. tower and trapped inverted V for 80/40m. "Now I'm attacking DXCC with less than one watt," writes Brad.

Club propagation soothsayer, Bob

See Activity . . . . . next page

Activity . . .

Brown, NM7M, gives us some good advice in his DX and propagation forum. Someone once said, "it ain't braggin' if you can deliver." Well, Bob just earned DXCC-QRP #73, and did it all in a three year span at the bottom of the solar cycle. His first 75 countries were worked with verticals and dipoles. The tougher ones came after his new two element quad went to work on Europe in early '85.

Several QSO parties ago, Sue, KA6SOC, of Richmond, Ca., was bonked on the head by her old man's hammer when it fell off a ladder she was holding. Ever since then Sue has been on fire. (My XYL suggested I submit to a similar adjustment). Sue is the receiving secretary for YLRL active with the west coast Red Cross diaster group. Well guys, let me pop your macho bubble. On Easter Day, Sue earned WAC-QRP in less than 24 hours:

5W1CW	0003 UTC
EL2CN	0240 UTC
OH3EF	1645 UTC
PP2WV	2127 UTC
JP1BJR	2225 UTC
W5LYM	2347 UTC

Sort of takes the edge off the Iceland QRP QSO I was going to tell you about.

ACTIVITIES

Speaking of the YLs, QRPer Mary Lou Brown, NM7N, is back home in Anacortes, Washington after an eight week mini-RV trip with Fred, her dog, visiting family and YLRL buddies along the way. Mary Lou, vice president of YLRL, stopped in Dayton for the Hamvention. She livened up sign-ups at the club table and visited the club flea market booth before heading west. Using her mobile Argosy and Hustler whip, Mary Lou was one of the highest scorers in last year's Washington QSO party.

Those of you looking for Alaska, make note of Bill Slabonik's new call, KZ3I/KL7. WA3PTT/KL7 has been retired. Bill usually provides that tough state for us on the nets during the QSO parties with his HW-9 and wire antenna farm.

The Spring QSO Party was a big success with good conditions in many regions and the best activity level in a long time. I set out to put up a killer antenna the day before, but ran into overtime so I stayed with the phased 40m delta loops that have replaced the QNI special. After sundown the loops came out winners. In three one hour sittings, with fair openings to the east, I was able to work everyone I heard. This big gun is everything I expected it to be even with the dense trees that gave me trouble with the QNI yagi. I'll tell about it in the *Quarterly* if I tire of using it . . .

Bob Spidell, W6SKQ, rounded up a few of us one evening last April to meet and break bread with our friend from Alaska, John Trent, KL7DG, here to visit his old alma mater in Pomona. Unfortunately, John missed a hop and and we never connected. All was not lost though as several of us had never met and we used the time to solidify our FD-86 plans. On hand were Tom Brown, W6IHQ, Cam Harford, N6GA, Bob and myself. Catch you next time John.

Super thanks to our previous Awards Manager, Leo Dulaney, KC5EV, for his gift to the club of a TRS-80 computer. Intially, I'll use it to compute the 100 miles per watt award which will save me a lot of time. The gift is sorely needed and genuinely appreciated Leo, thank you. Hm, we might also run some of Bob Brown's prop and anatenna programs too . . .

All is not well in my in-basket. One of the strongest messages delivered in the opinion polls was that fully 80% of you wanted to see more member news in the *Quarterly* and 60% of you indicated you would contribute. Since the *Quarterly* circulation is near the 1000 mark and 20% of those responded to the questionaire, one could expect my mail box to run over with something like 75 to 100 action packed stories and photos, right? Wrong! I've heard from only a few of you and mostly about awards.

Maybe everyone expects or hopes the other guy or girl will take care of it, apparently discounting their own activities as mundane and dull. Who are the silent supporters who annually pay dues, yet are absent in contests, nets and forums? Some have been around for years, their identity hidden in the mute secrecy of the mailing list. I would really like to know. One does not survive in QRP this deep into the solar cycle without having found some keys, and I for one would love to tell your story.

I spent the first Sunday of the month, catching up on my paper work and monitoring the club frequencies, with frequent calls of my own. Not a single QRP station was heard. Granted, conditions were the pits, but it was still depressing to hear no one.

One can hardly pick up a Radio magazine without reading about it, apathy is everywhere, our society, our hobby and even QRP, while at the same time on the other side of the pond, for example, our G-QRP counter parts are alive with enthusiasm. How come? I'm sure the answer is complex, but I think I know a contributing factor.

The vast majority of American amateurs buy their equipment, while the majority of European amateurs build their own and builders enjoy an energy that comes from creative involvement. Educators have long held that the more senses and emotions they appeal to, the higher the quality of learning. Similarly, homebrew construction fulfills man's creative need, it bolsters the ego and builds self esteem and that's energy, which translates into enthusiasm and that into involvement. Simply put, they're having more fun than we are. They're energized by the hobby, not drained. Take it from someone who knows, "appliance radio," devoid of any creative stimulation, is the quickest ticket in town to "ham radio burn-out," sometimes confused with apathy.

Don't get me wrong, I'm not suggesting we trash all our store bought gear, not at all. My Argosy stays, until such time that I build something better and if that never happens, that's o.k. too. The important thing is that we all keep our hands in building and cash in on the obvious and not so obvious benefits.

There was some welcome talk along these lines at Dayton about a club sponsored homebrew project with some interesting twists along the way. The idea sort of spun off from an awards change currently being studied. Basically, as I recall, two or three of the clubs finest would collectively design and tailor

See Activity . . . . . next page

Activity . . .

a new homebrew project for the club, names like John Collins, KN1H, Mike Michael, W3TS and Michael Bryce, WB8UGE were suggested. The project would be published in the *Quarterly* in an open number of installments. We, the members would build them, with craftmanship etc., being awarded points. Finally there would be a shake-down sprint or contest, with the cumulative winner or winners along with their rigs and a nice prize making front page *Quarterly* news.

Sounds like a winner to me. I'd like to see something modularized and expandable and covered in three or four quarterly installments. Having the PC boards made up commercially might be an added incentive for some, with points taken, of course! It was just in the talking stages at Dayton, but could easily grow over night if enthusiastically received. Send me your suggestions and comments and I'll pass them along as the project develops.

Next month we'll get back on track and talk about the "new look" of our WAS award. By then, all of you will have written and I'll have a ton of material for the column and for the first time I'll be able to meet the editor's due date. So don't let me down . . .

73,
Fred

For Sale

The Quarterly will begin with this issue to accept short "classified" ads from its members who desire to sell equipment and other items of interest. They will be printed on a space-available basis.

Send information to publisher, labeled "*QRP Quarterly* classified."

For sale: HW8 w/ps - not used since Heath aligned it. HM9 QRP wattmeter, MFJ 941C Tuner in Ctn. Call Waterbury WB5TOE, ARCI 5271, 817/754-0043.

QRP ARCI Awards Summary

Call	Date	Cert.	Basic End. Notes	Power	Mode	Band
DXCC						
WB21PX	11-13-83	65C			MIX	MIX
AA2U	11-13-83	66C			MIX	MIX
W6SKQ	11-13-83	67C			MIX	MIX
WAIYLN	12-04-83	68C			SSB	MIX
WD9FSA	07-31-84	69C			SSB	10M
WA9FWO	12-28-84	69C			CW	MIX
EA2SN	12-15-86	70C			SSB	MIX
WAC						
WD9FSA	11-13-83	443C			SSB	10M
W6YMH	12-04-83	444C			SSB	15M
K7YHA	02-25-84	445C			SSB	MIX
JA7AS	02-25-84	446C			CW	MIX
K4KJP	05-15-84	447C			CW	10M
WA9RWO	05-15-84	448C			CW	MIX
VE3JFH	05-31-84	449C			CW	10M
KX5L	08-07-84	450C			MIX	MIX
N7DGZ	10-28-84	451C			CW	20M
N9DHZ	10-28-84	452C			SSB	MIX
EA2SN	02-15-86	453C			SSB	20M
WAS						
W6YMH	11-13-83	216C	50 States	2.0	SSB	MIX
AAZU	11-13-83	217C	50 States	3.5	MIX	MIX
WD9SFS	11-13-83	218C	50 States	5.0	SSB	10M
KW9N	02-25-84	220C	50 States	5.0	CW	MIX
KO9V	02-25-84	221C	30 States	2.0	MIX	MIP
N7DGZ	05-15-84	222C	50 States	5.0	CW	MIX
KA9PMP	05-15-84	223C	50 States	5.0	CW	MIX
WA9FWO	05-15-84	224C	50 States	5.0	CW	MIX
KAZRWL	07-24-84	225C	50 States	2.0	CW	MIX
W3TS	07-31-84	226C	50 States 2/WQRP	2.0	CW	MIX
KNIH	08-02-84	227C	50 States	1.0	CW	MIX
KNIH	08-02-84	228C	30 States 2/WQRP	CW	MIX	
WD9EGW	10-28-84	229C	50 States	2.5	CW	MIX
NIBXC	10-04-85	230C	50 States	5.0	CW	MIX
KBIMW	10-04-85	231C	50 States	2.0	CW	40M
KAOHIB	10-04-85	232C	50 States	5.0	MIX	MIX
WBIDCC	10-04-85	233C	50 States	5.0	CW	MIX
KAZKGP	01-31-86	234C	50 States	5.0	MIX	MIX
KH6CP	01-31-86	235C	30 " 2/W under 1w	1.0	CW	MIX
EA2SN	02-15-86	236C	50 States	2.0	SSB	MIX
			QRP-25			
AI2T	11-26-83	232C	25 Members			
W6YMH	11-26-83	303	"100" SEAL			
WAIYLN	12-04-83	304	"100" SEAL			
WB2IPX	01-03-84	305	"100" SEAL			
WA8MLV	02-05-84	958	25 Members			
N7DGZ	02-22-84	959	25 " "50"SEAL #514			
WD6DMY	05-31-84	960	25 " "50"SEAL]#515			
WB8VGE	7-31-84	103	"200"	Seal		
W3TS	7-31-84	961	25 Members, "50"	Seal	#516	
KNIH	8-2-84	962	25 Members			
KNIH	8-2-84	517	"50" SEAL #517	Seal	#306	
KX5L	8-7-84	963	25 Members			
WIXH	10-28-84	964	25 Members			
KE8P	10-28-84	307	"100" SEAL			
WB5FKC	10-28-84	308	"100" SEAL			
KA9NZI	10-03-85	965	25 Members			
NIBXC	10-03-85	966	25 Members, "50"	SEAL	#519	
KA6SOC	10-03-85	967	25 Members			
N7DHA	10-03-85	518	50 Members			
KH6CP	1-31-86	968	25 Members, "100"	SEAL	#309	
KDSVD	1-31-86	969	25 Members			

See Awards . . . . . next page

Contesting

conducted by Gene Smith, KA5NLY
P.O. Box 55010, Little Rock, ARK 72225

QRP-ARCI 1986 Spring Contest Results

ALABAMA					
KA4LKH	Barry	68,640	3/176/26/10/1	515	Mixed
ALASKA					
*KL7XA	Rick	26,703	3/129/23/6/1.5	Argosy	Mixed
KL7GN	Gordon	23,932	1/193/31/4/1	Cent. 21	Beam
KZ3I/KL7	Bill	7,140	1/105/17/4/1	TR7A	Beam
ARIZONA					
*WB7APW	Jack	212,364	4/347/51/8/1.5	Cent. 22	Mixed
N7CEE	Bruce	143,664	3/292/41/8/1.5	509	Zepp
KA9HAO	Randy	20,440	3/73/14/10/2	515	G5RV
N7FU	Scott	12,0962	96/14444/6/1.5	YAESU757	Hustler
NN7A	Art	7,888	1/116/17/4/1	?	?
NO7D	Karen	6,750	2/75/10/6/1.5	YAESU757	Dipole
CALIFORNIA					
*W6JHQ	Tom	112,224	3/334/42/4/2	Argosy	Beam
W6RCP	Jim	51,504	3/232/37/4/1.5	515	Vert.
N6GA	Cam	31,740	3/115/23/8/1.5	HW-9	?
W6SIY	Keith	30,228	3/229/33/4/1	TTdelta	Mixed
N7FEG/6	Maurice	20,160	2/84/20/8/1.5	515	Mixed
W6SKQ/6	Robert	12,096	2/96/14/6/1.5	Argo?	Endfedlw
KL7DG/6	John	3,456	1/36/8/8/1.5	509	Dipole
WF6D	William	840	2/21/5/8/1	HW-8	?
COLORADO					
KR8U	Tim	108,540	2/201/27/10/2	HW-9	Vert.

See Spring . . . . . **next page**

Awards . . .

QNI Awards

W6JHQ	11-26-83	21	SWN-40	Cert
WB2IPX	10-25-83	22	Sen-40, Nen-40	Certs
WB2IPX	5-24-84	23	TCN-20	SEAL
WIFMR	7-24-84	23	SEN-40	CERT
WIFMR	3-9-85	23	TCN-20	SEAL
WD6DMY	8-2-84	24	SWN-40	CERT
N7DGZ	8-7-84	25	SWN-40	CERT
N7DGZ	8-7-84	25	TCN-20	SEAL
N7DEZ	8-7-84	25	NWN-40	SEAL
N6DHA	10-28-84	26	TCN-20	CERT
KV7X	10-28-84	27	SWN-40	CERT
KV7X	10-28-84	27	TCN-20	SEAL
K6MDJ	1-31-86	28	SWN-40	CERT

K/M Per Watt Awards

Space will not allow detailed recognition of all K/M per watt recipiants since certificate #856 in 1983. This information will be published in the future.

Congratulations to the following:

WB2IPX, AI2T, WA3GYW, N5CNH, KC5EV, JA3PAV, JL1GDE, JJ10SG, N9EEP, KW9N, WA3NXA, JA1CKE, N4BP, N4ELM, DE1BMH, KO7V, VK5AGX, K7YHA, ZL2NCC, JA7AS, VK4ZSH, WA9FWO, W1XH, NODSE, KH6-JOI, K2JJ, KA2KMV, VK2ERJ, JA9MJR, JA4CITL, AI2T, KYKJP, KW9N, KF4JV, JH7BDS, WD6DMY, JA7IFI, GM4-JJ6, JA4REP, VE3JFH, W3TS, KA3LPW, VK4ZSH, KB1MW, N6GTI, KX5L, K9EIJ, KZ9H, W6SIY, AAZU, JR3ELR, W6JHQ, NW6V, WB3ALL, KH6CP, K5NT, KS5R, JP1SYV, SH6KZI, SE1PMZ, WoDBZ, JA6GCG, G4VGA, EA2SN, FR3EZH, NOETQ, WA1MBK and DL2HCB.

The Oceania QRP Contest

Dates: 0000 UTC Saturday, November 15, 1986 to 2400 UTC Sunday November 16, 1986. Participants may operate a maximum of 48 hours.

Mode: CW only

Call: CQ QRP

Bands: 1.8 MHz to 28 MHz. (not WARC)

Sections: QRP Single Op/Single Band, Multi Band/Single Op, QRP Multi OP/Single Band, M Band/Multi Op, QRO Single Op/Single Band, Single Op/Multi Band, SWL Multi Band, Single Band

Period: Full Period - 48 hours. Half period - any 24 consecutive hours within the 48 hour period.

Exchange: RST plus serial no. starting from 001 up to 999.

Power: QRP output - maximum of five watts. QRO output - over five watts

Scoring: QRP stations

up to one watt . . . . . 6 points
1 to 2 watts . . . . . 5 points
2 to 3 watts . . . . . 4 points
3 to 4 watts . . . . . 3 points
4 to 5 watts . . . . . 2 points

QRO Stations

Over 5 watts . . . . . 1 point - QRO to QRP only.

SWL Stations:

Each QRO station logged in test . . . . . 1 point

Each QRP station logged in test . . . . . 3 points

Valid Log: Must contain a minimum of 10 entries to qualify for entry to test.

Multipliers: Every contact in a different ITU Zone counts as a multiplier on each band.

Bonus Score: Field stations multiply your grand total score by two.

Conditions: Contestants may work each other once per band in each 24 hour period. All entrants, please use separate log sheet for each band. Each logged QSO to show date, time, GMT, station worked, RST exchange, multiplier, power output, points claimed, grand total. The grand total score is deriv-

See Oceana . . . . . **next page**

Spring . . .

CONN.					
*KA5GIS/1	Carol	11,466	1/98/13/6/1.5	?	?
W1IKB	John	7,236	1/201/18/2/1	ICOM740	Dipole
FLORIDA					
*K4KJP	Terry	180,432	3/358/42/6/2	Omni/509	Mixed
W4FRL	Leo	65,360	2/380/43/4/1	HW-8	Vert.
N4BP	Bob	53,200	1/380/35/2/2	TS-130V	Beam.
GEORGIA					
WD4DSS	Frank	39,360	2/205/24/8/1	Omni	Dipole
HAWAII					
*KH6CP	Zack	15,840	4/88/15/6/2	515	Mixed
KH6IJS	Howell	12,825	3/95/15/6/1.5	HW8	Vert.
IDAHO					
*KU7Y	Monte	200,475	3/405/55/6/1.5	?	?
NJ7M	Chuck	83,520	3/261/40/8/1	HB/Argosy	Zepp
ILLINOIS					
(9)*W9OA	George	272,160	3/540/63/8/1	Argosy	Mixed
K9EIJ	Norman	106,240	3/332/40/8/1	515	Mixed
NF9X	Carl	81,400	2/275/37/8/1	509	Inv Vee
KA9BDK	Jim	61,008	1/328/31/6/1	509	Inv Vee
K5VOL	Red	5,400	1/60/9/10/1	Homebrew	L.Wire
INDIANA					
*KA9OKH	Stephen	226,432	4/488/58/8/1	Corsair II	Mixed
N9DNX	Russell	34,730	2/151/23/10/1	&	?
K9VCM	Roland	26,740	3/543/52/2/1	&	?
MARYLAND					
*K3TKS	George	42,336	3/189/28/8/1	509	Mixed
WA3GYW	Fran	10,304	3/92/14/8/1	HW-8	?
MASS.					
*W1FMR	Jim	224,730	5/454/55/6/1.5	Argosy	Delta Lp.
K1CGJ	John	48,152	5/436/52/2/1	Argo	Mixed
N1BXC	Steve	25,704	4/126/17/8/1.5	HW-8	Zepp
KZ1L	Andy	14,442	3/166/29/2/1.5	?	G5RV
WB1HGA	Ron	13,860	3/165/21/4/1	Cent. 21	Mixed
MICHIGAN					
(4)*N8CQA	Buck	356,824	5/611/73/8/1	TR-4	Mixed
K8DD	Hank	188,784	5/342/46/8/1.5	515	Mixed
W8VSK	Joe	21,168	2/196/27/4/1	Homebrew	Beams
AC8W	Stanley	14,250	3/93/15/10/1	HW-8	Mixed
MINNESOTA					
*WBOBJP	Paul	21,120	1/220/24/4/1	?	?
KD8UI	Devel	2,190	1/73/10/2/1.5	?	?
MISSOURI					
KA8KKV	Elliott	1,040	1/26/5/8/1	505	L. Wire
MISSISSIPPI					
(7)NF5Y	Herb	303,855	2/431/47/10/1.5	HW-9	Mixed
NEW HAMP.					
(6)KN1H	John	340,200	5/378/45/10/2	Argosy	Dipole
NEW JERSEY					
*K2JT	Joseph	145,020	3/370/49/8/1	515	Zepp
KD2JC	Joseph	43,680	3/182/30/8/1	HW-8	Mixed
W2AXZ	Charles	36,360	3/202/30/6/1	?	Mixed
W2JEK	Don	40	1/5/1/8/1	HW-8	GP
NEW MEX.					
(10)*W5TTE	Ed	260,480	3/352/37/10/2	HW-7	Mixed
W5SUV	Glenn	490	2/35/7/2/1	ICOM745	Dipole

See Spring . . . . . next page

Oceana . . .

ed from the total points from all bands X total multipliers from all bands X bonus score.

Entries: All entries must have summary sheet showing calculation of grand total score, name and QTH, call sign and signature. Include usual contest declaration.

Certificates:

QRP Single Op. Single band highest score 24/48 hr -

QRP Single Op. Multi band highest score 24/48 hr -

QRP Multi Op. Single band highest score 24/48 hr -

QRP Multi Op. Multi band highest score 24/48 -

QRO Single Op. Single band highest score 24/48 hr -

QRO Single Op. Multi band highest score 24/48 hr -

SWL Single band Multi band highest score 24/48 hr -

Deadline: Entries to be addressed to: Contest Manager, Len O'Donnell, 33 Lucas Street, Richmond, S.A. 5033, Australia, no later than December 29, 1986.

Contest sponsored by CW Operators QRP Club

W3TS Homebrew Spring Contest Win

D.A. 'Mike' Michael, W3TS, running 900 milliwatts on the 10 through 160 meters and using all homebrew gear, won the 1986 QRP-ARCI spring contest well ahead of the rest of the pack. By operating on six bands, Mike picked up the extra QSO points and s/p/c multipliers needed to insure his win against any challengers and bring the first place certificate home to Lykens, PA.

Meanwhile, Darrell, WB6OJV, out in Washington, scored 437,450 to take second place in a closely fought battle with Michael, WB8VGE, who scored 417,240 points to earn third place overall from Ohio.

The fourth through eighth place finishers were clustered together between 305,000 and 357,000 points while another fairly close battle in

See Homebrew . . . . . next page

Spring . . .

NEW YORK					
*WA2VEZ	Al	83,148	4/338/41/6/1	509	Mixed
WB2IPX	Les	78,120	3/252/31/10/1	509	Dipole
N2ARP	Art	41,370	2/197/21/10/1	?	?
W2QYA	Merl	19,500	3/100/13/10/1.5	HW-7	L. Wire
N CAROLINA					
(8)*AA4CO	Joe	305,235	4/399/51/10/1.5	515	Mixed
W4FHI	Reagan	53,856	3/374/48/2/1.5	Argosy	Mixed
OHIO					
(3)*WB8VGE	Michael	417,240	4/366/57/10/2	Homebrew	Mixed
WB8ZWW	Wayne	30,360	fl½230/33/4/1	Triton III	Inv. Vee
NN8B	Don	2,940	1/49/10/6/1	Argosy	Vert.
OREGON					
*N7EZG	Joe	3,312	1/46/8/6/1.5	TS-130	Dipole
W7LNG	Bud	3,094	2/91/17/2/1	HB/Mixed	Mixed
PENNS.					
(1)*W3TS	D.A.	694,180	6/569/61/10/2	Homebrew	Mixed
WA3SLN	Mike	8,154	3/43/22/6/1.5	HW-8	Mixed
S. DAKOTA					
W0RSP	Ade	85,680	2/252/34/10/1	?	?
TENNESSEE					
KV4B	Kick	94,464	2/246/32/8/1.5	Argosy	Mixed
TEXAS					
(5)*W5LXS	Roger	351,900	2/391/45/10/2	515	Mixed
WB5FKC	Chris	225,420	4/289/39/10/2	Delta	Inv. Vee
W5QJM	Fred	15,444	2/143/27/4/1	515	Mixed
WB4CSK	Mark	9,774	2/181/27/2/1	TS-940S	Dipole
K5IS	Jerome	8,520	2/71/15/8/1	?	?
N5AE	Dick	5,022	1/62/9/6/1.5	Homebrew	?
WC5A	Billy	1,584	1/44/9/4/1	FT757GX	Vert.
?	John	660	1/22/5/6/1	HW-8	Vert.
VIRGINIA					
*K7YHA	Rich	237,600	5/360/44/10/1.5	TS-130V	Mixed
K4JM	Tom	53,170	3/197/27/10/1	TS-520	Mixed
W4FOA	Tony	25,974	4/333/39/2/1	515	Mixed
W4XD	Joseph	16,432	3/316/26/2/1	Argosy	Dipole
KA5NLY/4	Gene	15,180	3/92/11/10/1.5	509	Dipole
N7FMB	Rod	5,106	5/111/23/2/1	TS-430S	Mixed
WASHINGTON					
(2)*WB7OJV	Buck	437,450	4/673/65/10/1	HW-8	Mixed
NM7M	Bob	145,200	3/660/55/2/2	Corsair	Mixed
WB7SNH	Dennis	22,272	2/116/16/8/1.5	HW-8	Mixed
W VIRGINIA					
KA8VTF	Keith	10,332	2/123/14/5/1	?	?
ALBERTA					
VE6BMX	Barry	26,400	2/120/22/10/1	?	?
BRIT. COL.					
VE7EKS	Peter	1,092	3/26/7/6/1	HW-8	Mixed
NEW BRUNS.					
VE1BF	John	78,120	4/310/42/6/1	HW-8	?
ONTARIO					
VE3EFC	Bill	4,224	2/88/12/4/1	HW-8	?
HONDURAS					
KD5VD/HR5	Glenn	26,352	5/183/36/2/2	Atlas 210X	Mixed
N. ZEALAND					
ZL1BXW	E.J.		3/45/8/4/1	?	?

CHECK LOGS
KU6F, KH6JOI, WD5Q
102 Logs Received: 32 States, 4 VE Provinces, 1 DX

See Spring . . . . . next page

Homebrew . . .

the high 200 K range rounded out the top ten.

Eight of the top ten were milliwatters, which again shows the value of pursuing that multiplier.

(1) 694,180	W3TS	PA	(M)
(2) 437,430	WB7OJV	WA	(M)
(3) 417,240	WB8VGE	OH	(M)
(4) 356,824	N8CQA	MI	
(5) 351,900	W5LXS	TX	(M)
(6) 340,200	KN1H	NH	(M)
(7) 308,855	NF5Y	MS	(M)
(8) 305,235	AA4CO	NC	(M)
(9) 272,160	W9DA	IL	
(10) 260,480	W5TTE	NM	(M)

*Note: Milliwatt stations are designated by (M)

Do you Homebrew?

Many of us are interested in rigs and accessories that we can build for ourselves or use as projects for newcomers to the world of low power. *The Quarterly* wants both long and short articles on homebrew construction, design and technique.

Finding QRPers

The QRP ARCI sponsors an informal QSO party the first Sunday of each month at the following times and frequencies. Join in to get acquainted with other QRPers.

First Sunday Schedule†

UTC	CW	SSB	NOVICE
14-16	14,060	14,285	
16-17	21,060	21,385	21.110
17-18	28.060	28.885	28.110
18-19	7.040*	7,285	7.110
19-20	14.060	14.285	
20-21	21.060	21.385	21.110
21-22	28.060	28.885	28.110
22-23	7.040*	7.110	
23-00	14.060**	14.285	
00-01	7.040*	7.285	7.110
01-03	3.560	3.985	3.710

†Try CW on the hour and SSB and novice frequencies on the half hour.
*Some other countries use 7.030.
**Transcontinental QRP Net – Join Us!

Spring . . .

Altogether, there were 99 entries plus three check-logs for the spring CW contest. Many noted that conditions were for the most part pretty good. The sun spot cycle seems to be on the upswing from the 1985 level -a comparision with the last four CW contest follows:

Spring 1986	(CW)	102 logs
Fall 1985	(SSB)	58 logs
Fall 1984	(SSB)	74 logs
Spring 1984	(CW)	111 logs
Fall 1983	(SSB)	85 logs

Rigs: (85 logs reported rig type)

Argonaut	23	TS-130V	3
HW-7/8/9	20	IC-740/745	2
Argosy	10	TR-4/7	2
Homebrew	7	Corsair	2
Omni	4	Triton	1
Century 21/22	3	Other QRO	5
FT-757	3		

Antenna: (79 Logs reported antenna type)

*Mixed	39	Zepp	4
Dipole(s)	11	Inv. Vee	3
Vertical	7	G5RV	2
Beam	5	Loop	2
Long Wire	5	Whip	1

*Mixed generally consisted of some sort of beam for 10/15/20 meters and a wire antenna (L. Wire, dipole, Vee, etc.) for 40/80/160.

Output Power:			
1-2 watts	25	4-5 watts	15
Milliwatters	23	3-4 watts	14
2-3 watts	22		
Power Source:			
AC Mains	55		
Battery	30		
Natural	14		
Top Ten Finishers:			
Rig: HW-7/8/9	3	Ant: Mixed	9
Argonaut	2	Dipoles	1
Argosy	2	Power Out	
Homebrew	2	Milliwatt	8
TR-4	1	1-2 Watts	2

Power Source: Natural 5, Mains 3, Battery 2

QRP Nets

QRP ARCI sponsors transcontinental and regional nets throughout the week, and invites all Amateurs to participate, regardless of affiliation. Special QNI Certificates recognize frequent check-ins.

The QRP nets include the Transcontinental Net (TCN), the Southeast Net (SEN), the Great Lakes Net (GLN), the Gulf States Net (GSN), the Northeast Net (NEN), and the Western States Net (WSN). Nets are listed by UTC day and hour in the table below.

QRP Net Schedule

Net	QRG	NCS	Day/Hr	UTC
TCN*	14.060	W5LXS	Sun	2300
SEN**	7.030	K3TKS	†Wed	0001
GSN	3.560		†Thur	0200
GLN	3.560	W3TS	†Thur	0200
WSN	3.558	NM7M W6RCP	†Sat	0200
NEN	7.040	W1FMR	Sat	1200
WSN	7.040	NM7M W6RCP	Sat	1600

*On weekends of major contests will meet one hour later.

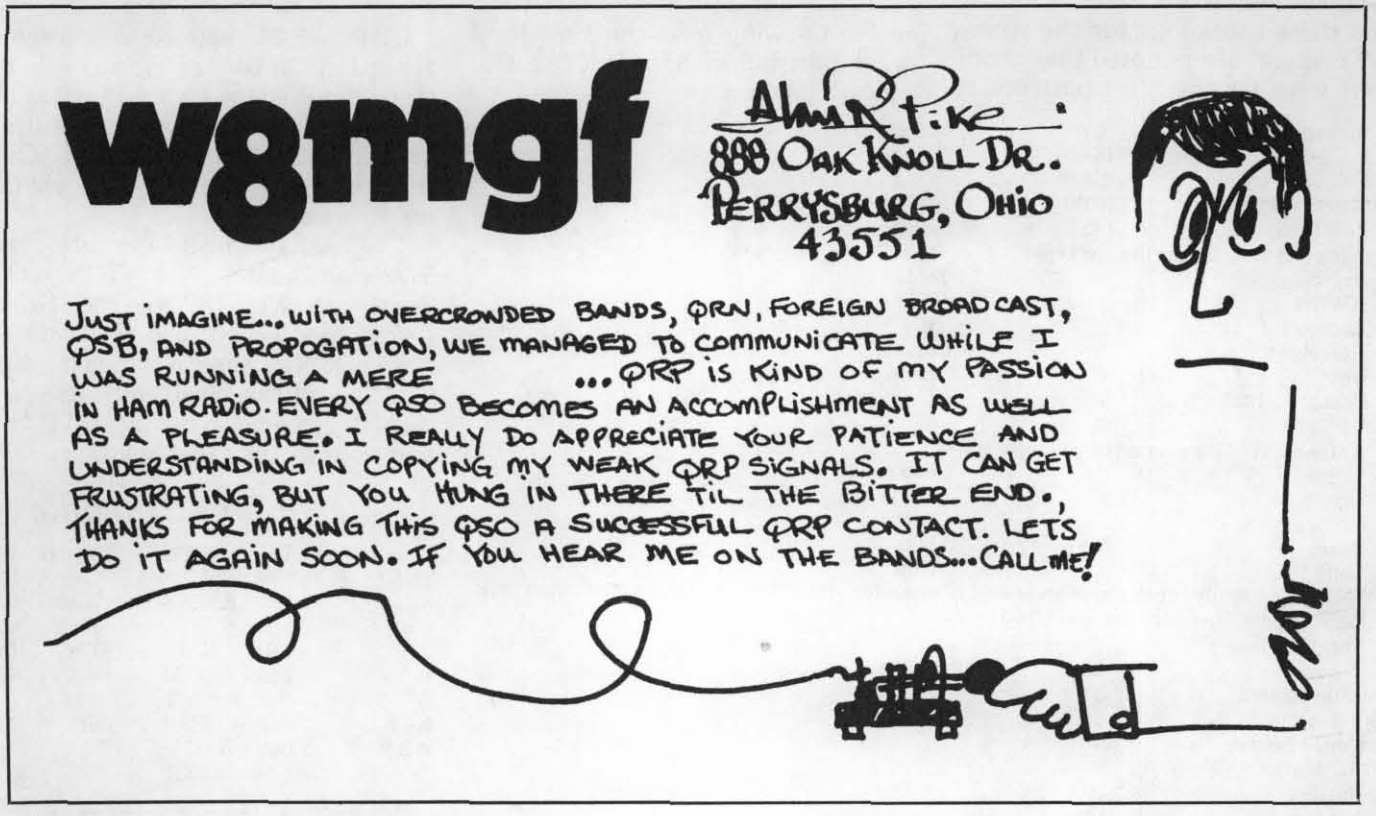
**If conditions on 7030 kHz are poor, QSY to 3535 kHz at 0031 UTC.

†Evening of day before of W/VE.

1986 Hootowl Sprint

SPC	Call	Score	Name	Bands	SPC's	Output	Rig	Antenna
Power								
Alaska	KZ3I/LK7	3,780	Bill	2	9	0.9	HW9	Beam/Sloper
Arkansas	KA5NLY	432	Gene	1	3	0.9	*HW8	Long Wire
California	K6MDJ	16,800	Fred	2	14	1.0	*HW8	Delta Lp /Skel.Con.
	W6SIY	2,288	Keith	2	11	3.9	TT Delta	Mini Quad/Dipole
	WF6D	546	Bill	3	7	5.0	Icom 735	Skelton Cone
Florida	K4KJP	27,816	Terry	2	19	2.5	•Argo 509	Beam/Dipole
Idaho	NJ7M	43,920	Chuck	3	30	1.9	Argo 509	Zepp
Illinois	K0EIJ	6,656	Norman	3	13	2.0	Argo 515	Beam/Vertical
	K5VOL	405	Red	1	3	0.5	Homebrew	Long Wire
Mass.	KA1GDG	20	Brad	1	1	4.0	Drake 2C	Dipole
Minnesota	NB0O	13,650	Curby	3	15	0.8	?	?
Mississippi	NF5Y	43,125	Herb	3	23	0.9	*Argo 515	Beam/Loops
N Hamp.	KN1H	5,920	John	3	8	0.9	•Argosy	Zepp
New Jersey	W2JEK	960	Donald	1	4	1.9	*HW8	Ground Plane
New Mexico	W5TTE	35,440	Ed	2	22	0.8	•HW7	Delta Loop
New York	W2PFS	40,304	Harold	1	22	2.0	Argo 509	?
N Dakota	WD0BDA	47,616	Kirk	3	32	3.8	•Yaesu Ft-301	Beam/Lp./Vert.
	W0HSC	10	Jerome	1	1	5.0	Argo 509	Dipole
Ohio	WB8ZWW	10,944	Wayne	3	19	2.8	Triton IV	Zepp
	NN8B	6,144	Don	3	12	1.9	Argosy	Beam/G5RV
	N8GJR	3,760	James	3	10	1.0	SB-104A	Lp/Phased Vertical
Oklahoma	WD5GLO	10,400	Lou	4	20	2.0	Argo 509	Inv. Vee
Penns.	W3TS	33,800	Mike	6	13	0.9	•Homebrew	Duke's mixture
Texas	W5LXS	172,800	Roger	3	45	0.5	•Argo 515	Beam/Inv. Vee
	WB5FKC	45,408	Chris	3	22	4.0	•Homebrew	Inv. Vee/G5RV
Utah	KK7C	29,120	Jim	3	16	0.9	•Argo 509	G5RV
Virginia	W4XD	160	Joseph	3	4	5.0	HW8/Argosy	?
Washington	NM7N	28,800	Mary Lou	2	24	3.5	•Argosy II	Quad/Dipole

*Battery
•Solar/Battery



Alan Pike, W8MGF, tells the world about QRP with every QSL card he sends. *The Quarterly* congratulates Alan for his exemplary and distinctive way of delivering the message.

QRP ARCI Membership Application/Renewal/Change Form

Please use this form to join, renew your subscription or report change of call or address.

Send to the Secretary/Treasurer: William K. Harding, K4AHK 10923 Carters Oak Way, Burke, Virginia 22015

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[ ] Change of Address
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Name: _____ Address: _____

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