QRP Quarterly

Journal of the QRP Amateur Radio Club, International
October 1987 Volume XXV Number 4

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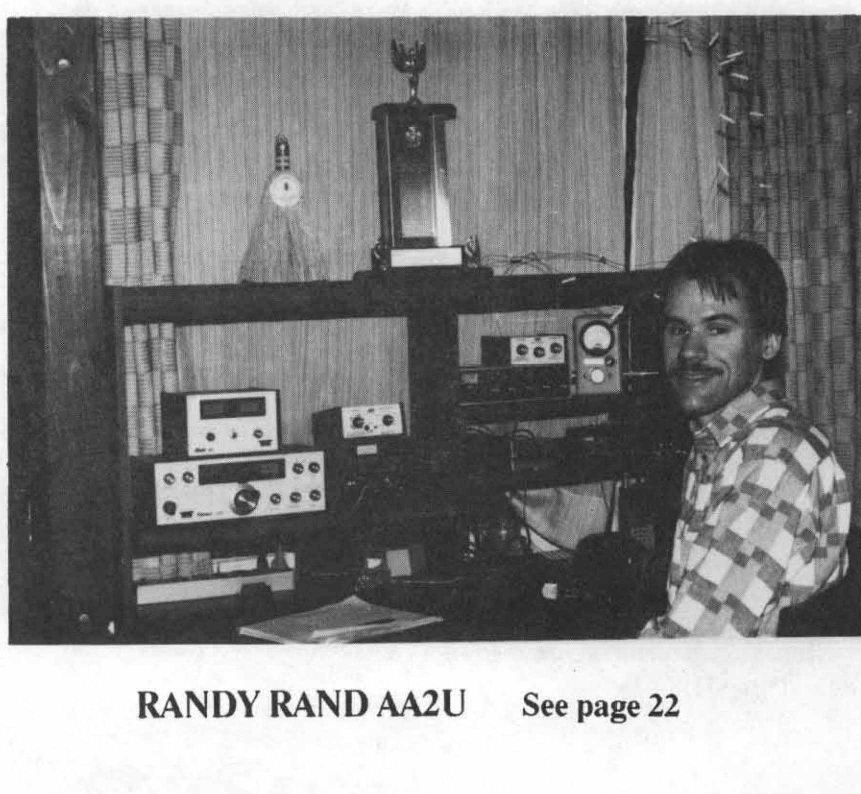

RANDY RAND AA2U **See page 22**

QRP ARCI NEWS

Editor's Word

Thanks to all those who have contributed the ideas that have made my task a rewarding and stimulating one. That QRP is a game of wits in place of watts has been continually evident.

The QUARTERLY is your opportunity to share and exchange. Its quality is the reflection of your interest and your contributions.

I have particularly appreciated the support of the QRP ARCI officers and of Fred Bonavita W5QJM, who preceded me in this post. Bob Brown NM7M, Mike Michael W3TS, and Brice Anderson W9PNE, have provided technical support and Fred Turpin K6MDJ has given me much needed inspiration while infusing warmth and energy to the whole project.

Paula Franke WB9TBU has come on board with this issue to provide the typsetting and paste-up master for plate making. Paula and her team are making a major contribution to the quality of our magazine by assuming so capably a task few could undertake successfully and even fewer could properly appreciate.

I extend a welcome to the new editor, and will use my increased free time to contribute to the QUARTERLY, as well as to get on the air a bit more often, and to resume projects that I have kept on hold for two years.

73, Jim Stevens KK7C

The Quarterly will 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 the editor, labeled "QRP Quarterly classified".

Information for Writers

The Quarterly welcomes articles on all aspects of low power communications: equipment construction and modification, antenna experimentation, operating practice and reports of

Is There An Argonaut In Our Future?

Jim Jones K9PNG has been doing quite a bit of legwork tracking down rumors of possible future production of the Argonaut. Here is his report:

Having obtained the address of KW Ten-Tec Ltd. in England, I wrote them asking if they had any plans for resuming production of the Argonaut or, if that was not in the works, would they consider the production of the individual modules.

Mr. Rowley Shears G8KW said that Ten-Tec had not sold him the Argonaut line and that they had him research the U.K. market to determine if a further production run would be justified. It was his opinion that the response did not bode well for that. This was primarily an economic consideration. I think the G-QRP Club had already discovered this. He gave me the name of Mr. Sidney Kitrell at Ten-Tec and suggested that I give him a call.

I spoke with Sid Kitrell W0LYM and a summation of his answers and comments follows:

1. Ten-Tec feels very kindly disposed toward the QRP groups in view of their unflagging support of the company's products.

2. Yes, they would consider a further production run of the Argonaut 515 if they had commitments for 200 units.

3. The projected price would be in the $500 range.

4. No, they had not considered selling modules, but if there were enough interest, perhaps they would.

5. They could not realistically design "universal" type modules that would lend themselves to optimizing and/or parts substitution.

6. Would the QRP groups favor a maximum 5 watt output or one with greater flexibility? (NOTE: It seems that inconversations with individual QRP operators, they complained to him that they are never sure the OTHER operators are really only running the 1 watt or 5 watts they claim).

7. Their 8 pole Crystal Filter is "equal to the best (of the Japanese units) and better than the rest." When told of Fred Bonavita's recent Quarterly article describing his adaptation of these filters to the Argonaut 515, Sid said he had not ben aware of that. He also said he didn't know of the KVG line of crystal filters.

8. When asked, I told him any plan should include provisions for ading an optimal SSB module. While I don't use phone that much, it seems to me that this was one of the features that set the Argonaut apart from other commercially built QRP equipment and, better yet, it works. Sid's comment was that this option would be comparatively expensive.

9. I reminded him that Ten-Tec originally supplied modules and that they were highly regarded by users much more knowledgeable than I.

10. The subject of transverters for 160 and WARC bands was discussed and, again, any serious consideration on their part would be determined by user interest.

Subscription Renewal

Subscription renewal is $10 ($12 for DX) for four issues. The renewal date appears on the mailing label following the QRP membership number, i.e. 4174-3/87 means that members number 4174's subscription will expire with the 3rd (July) Quarterly in 1987. Renewals and new member applications must be received by the first of the month prior to the next publication to receive that issue, otherwise service will not begin until the publication of the following issue.

Membership

The initial QRP ARCI membership fee of $11 ($13 for DX) covers lifetime membership plus the first four issues of The Quarterly. The membership and renewal form is inside the back cover. Additional membership forms are available, for an SASE, from Membership Chairman Bill Harding K4AHK, 10923 Carters Oak Way, Burke, Virginia 22015.

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.

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Making The HW-7 Into A Radio

by John T. Collins, KN1H

RR 2 BOX 427
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My HW-7 was found at a hamfest several years ago. It was terribly dirty but carried a $15 price tag. So, with a warning from it's owner that it didn't receive "too well", I carried it home and plugged it in. Well, the original owner was at least partly right, it didn't receive at all...or transmit either!

I pulled out the PNP transistors that were in the oscillator section and replaced them with the FETs which belong there, and in a few days had a working HW-7. The transmitterr worked pretty well and on receive I could listen to the VOA, the BBC and our local AM station all at once on 40 meters. I could also listen to 20 meter CW stations on 15 meters. That is if they were stronger than the ever-present common-mode hum.

This HW-7 was looking less like a bargain all the time; but by now, with $15 and several days invested, I was determined to make a radio out of this thing.

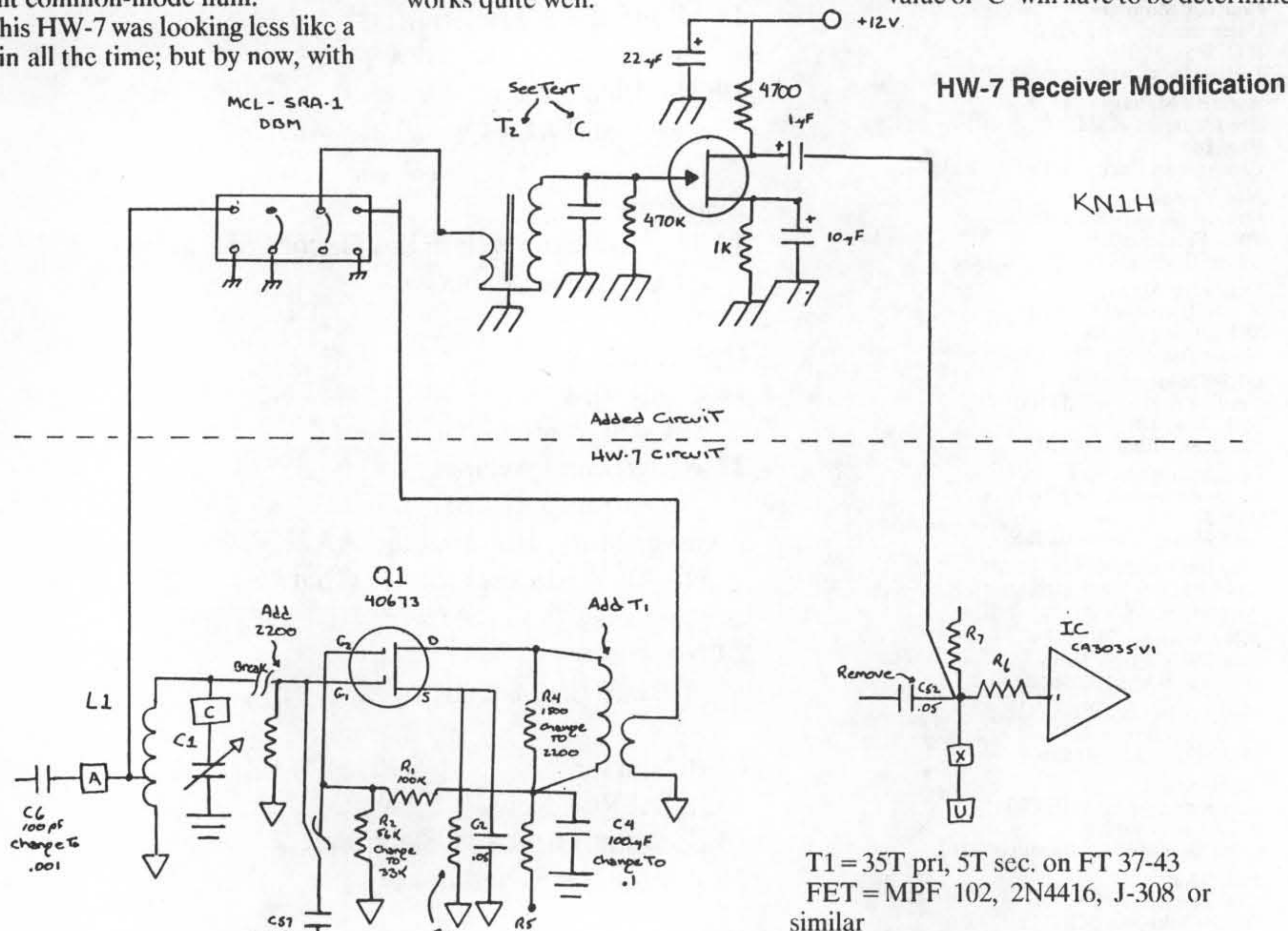
First, the 40673 Product Detector had to go. The square-law characteristics of the dual-gate MOSFET make it a wonderful detector of any AM signal that appears at its input. The passive double-balanced mixer I put in its place has no such tendencies (due to its balance); but suffers from conversion loss, the requirement for a high level of LO injection, and a low impedance output.

The LO requirement was met by simply reconfiguring the 40673 as a broadband amplifier to boost the LO level into the DBM. T1 is a broadband transformer with 35 turns on the primary and 5 turns on the secondary wound on a FT37-43 toroid. This delivers about +5 dbm into the 50 ohm impedance of the DBM...a little less than the optimum +7 dbm; but it works quite well.

The conversion loss and low output impedance problem are both handled by a neat trick first published by PA0SE (note 1). The audio output of the DBM is fed directly into a miniature audio transformer with a high turns ratio, which feeds a FET amplifier. The transformer performs several functions all at once. First it provides a low impedance for the DBM to see, and then it steps the audio voltage up to a high level which improves the FET noise characteristic. The transformer I used is an 8 ohm- 15Kohm unit found in the junk box. It has a 44:1 turns ratio (turns ratio [2] = Impedance ratio), and works well; but an even higher ratio might work better.

Capacitor "C" across the secondary was chosen to resonate the winding at 750 Hz. This cleans up the waveform and gives a 3db bandwidth of about 1Khz. A free audio filter! The value of "C" will have to be determined

HW-7 Receiver Modification



T1 = 35T pri, 5T sec. on FT 37-43
FET = MPF 102, 2N4416, J-308 or similar
T2 = Audio Transformer

HW-7 ...

experimentally as the secondary inductance of your transformer will undoubtedly be different from mine. My "C" turned out to be .015 uf.

Almost any FET will yield good results in this circuit, but some will be better than others of the same type number. One particular J-308 I had gave about 10db more gain than its nearest competitor, so it was used here.

These modifications completely cured the AM break-through and common-mode hum problems, even when using an AC power supply. The problem with 20M stations breaking through on 15M was helped (but not totally eliminated) by feeding RF to the DBM from the tap on the preselector coil (L1) rather than from the top of L1. With this arrangement, preselector tuning is much sharper and there is probably a closer match to the input impedance of the DBM. Also, C6 (100pf) was changed to .001 uf which resulted in a 6db signal increase on 40M, but no change on 20M and 15M.

The "added" portions of this modification were assembled, ugly fashion, on a piece of double-sided PCB which was then bolted to the side wall of the HW-7 chassis. RF and LO interconnections were made with RG-174 mini coax. +12 volts is supplied from the ON-OFF switch.

Changes to the 40673 circuit can be implemented by first removing C3, C4, C5, C7, C9, L14 and C52; then changing R2 (56K) to 33K; R3 (470) to 100; and R4 (1.5K) to 2.2K. T1 can be installed on top of the circuit board by soldering the primary across R4 (2.2K), and drilling a small hole in the ground foil nearby for the "cold" end of the secondary. The 2.2K resistor between G1 of the 40673 and ground will also require two new holes, as will the new connection to L1. The foil connection between L1 and G1 will have to be broken at any convenient point. This can be accomplished easily with a pen knife or other implement.

Finally, remove C57 (1.5) and install a 22pf capacitor with long leads between the hole near the collector of Q4 and the G1 end of the "new" 2.2K resistor.

I have found this modification to be extremely worthwhile; the HW-7 is now a thoroughly useable QRP rig with a pleasant sounding receiver. Not bad for a $15 radio! With the hamfest season approaching, let me suggest you keep an eye out for an HW- 7. When you have made the modifications described, it may become your favorite portable rig.

NOTES: 1. Dick Rollema, PA0SE, Second Thoughts on the Direct Conversion Receiver; ham radio, November 1977, pp 44-55. This article is highly recommended to anyone interested in DC receivers.

Notes on Designing Filters & Matching Sections

by Denton Bramwell K7OWJ
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For me, part of the fun of homebrewing is finding out how things work, and expanding my repertoire of circuit design skills. Bit at a time, I'm finding things that work for me, and expanding my skills at making things that work right.

While working on the 30 and 40 meter receivers in the July- October '86 QRP Quarterly, I had to do quite a bit of work with LC filters. It didn't take long for me to start looking for an alternative to my hand calculator. I started writing BASIC programs and, in the course of time, compiled them into a program I call "ELSIE". If you're into designing your own filters and matching sections, you might find that the program will save you a lot of time. In addition to this program (or the "ARRL Data Book", "Solid State Design for the Radio Amateur", and a good calculator), you will also need a copy of the Amidon data sheet and catalog if you use toroids as I do.

Transmitters and receivers often demand very different approaches. For example, the final output circuit of a transmitter may require negligible loss, so that energy is not dissipated in a matching circuit. The input section of a receiver might well dissipate half the incoming signal in order to meet its design objectives! You can imagine how well such a circuit would function in the output of a kilowatt amplifier. But I digress...

The case of a double tuned circuit is interesting, because it illustrates how circuit components, losses, and bandwidth can be traded back and forth. Before diving in, let me explain that a tuned circuit with nothing attached will have an UNloaded Q, and that when we attach the tuned circuit to the rest of the circuit, the Q will change (usually significantly) and become the LOADED Q. The ratio of these two numbers will be the main determining factor in circuit losses: if we let unloaded Q get too close to loaded Q, losses will be high. Let me further explain that, in most cases, the inductor losses will determine the unloaded Q, so if we have good data on our inductors,we know what the unloaded Q of the tuned circuit will be. Now let's look at a few examples:

For a double tuned circuit, we begin by choosing our inductors. Say, for example, we have T-37-10 cores with 12 turns. The Amidon data sheet lets us estimate that the unloaded Q we can obtain is about 135. Let's also assume that we have chosen our bandwidth to be just 200 kHz, from 7000 to 7200 kHz. So far, we have made some very poor choices, but we will be fixing that soon.

Don't get me wrong: the T-37-10 is a fine core. We're just trying to use it inappropriately. An unloaded Q of 135 is nothing to write home about, and we got this low Q by trying to run the core at the wrong frequency.

We made a second mistake by choosing a 200 kHz (-3dB points) bandwidth. This is quite narrow and demands a high loaded Q. In fact,

Notes on Designing Filters and Matching Sections

continued from page 5

ELSIE will tell us that in choosing such a narrow bandwidth, we have also chosen a loaded Q of 50. 135/50 is not a big enough ratio to give us low losses.

For the double tuned circuit parameters in ELSIE, a good approximation of the loss in dB is given by:

$$1 - .0671 + .0823 \frac{Q\ \text{unloaded}}{Q\ \text{loaded}}$$

and we can calculate that our in-band losses will be 6.2 dB. Hardly acceptable! Fortunately, we have ways to remedy the situation.

One avenue of attack is to improve our unloaded Q. We can do this by switching to a T-68-10 core with 15 turns. According to Amidon, this will give us an unloaded Q of about 220. Our formula now predicts that we will lose only 3.4 dB, and that is a very significant improvement.

The second avenue of attack is to reduce our loaded Q. This is the same as saying we will broaden our filter (move the -3 dB points farther apart). OK, let's move our -3 dB points out to 6950 and 7250 kHz. ELSIE (or our handbooks and calculator) now tells us that our loaded Q drops to 33.5. Plugging back into our formula, our losses in the passband drop to a very acceptable 2.1 dB.

Of course, this second improvement is not totally free. We have also reduced our ability to discriminate against out of band signals, but it is quite an acceptable compromise.

The same priniples apply in transmitter output circuits. As an interesting case in point: I once owned a "store bought" SSB transceiver from a respected company. Like most commercial rigs, this one ran 200 watts in, and had a spec of 120 watts out. After a long time of running this transceiver, I acquired a real wattmeter and found, to my chagrin, that the output was only 70 watts on 80 meters, even though the input was 200 watts. The design error was that, in order to save space, the manufacturer used a loaded Q of 20 in the final pi net. This led to very high losses and an exceedingly hot pi net coil. A redesign to a Q of 10 brought the efficiency up at once.

In transistor finals, a Q of 3 or 4 is often the design choice. It is not unusual to see double pi sections with a Q of 1 used.

As sort of a footnote, there is one factor that is sometimes missed in tuning up transistor finals with low Q matching sections: Maximum output and minimum collector/drain current do not occur at the same settings. When I first built the 40 meter transmitter to go with my little receiver, I adjusted for maximum output and got 4 watts. Unfortunately, my input power was over 10 watts. A re-adjustment for minimum collector current brought the efficiency up sharply, but left me with only 2.5 watts. I finally settled for a compromise setting that left me with 3.5 watts out, an overal transmitter efficiency of a little over 50% and a cool final.

With a little care, anyone can design good matching sections. In some cases, you'll find your homemade design surpassing commercial designs that have been widely accepted. And isn't that a big part of the hobby? Getting excellent results doesn't usually depend on elaborate instrumentation or a PhD in occult science. It frequently depends on paying careful attention to the very most fundamental issues.

(You can get a PC compatible copy of the BASIC ELSIE program by sending a blank DS/DD 5-1/4" floppy disk and mailer with return postage to Paula Frank WB9TBU, PO Box 873, Beecher, IL 60401. ELSIE will perform the following calculations: toroid inductor calculation, link with suckout, L section, pi section, low pass T network, controlled Q type L section, LCC type T networks, double tuned circuits, T attentuators, pi attentuators.)

A Universal Crystal Oscillator

by Paul Levesque KB1MJ
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The Colpitts crystal oscillator circuit has enjoyed popularity with homebrewers since it is simple and reliable. A review of construction articles will, however, indicate a wide range of component values with little explanation of the reasons behind the selections. Since I have been a victim of cranky Colpitts circuits, I surveyed the literature and discovered an excellent reference on this subject*. Implementing the Author's recommendations resulted in a circuit which functions well over a 5 to 1 frequency range with a variety of AT cut crystals.

The first parameter to consider is the impedance which the circuit places across the crystal. In our typical circuit this is the parallel combination of R1, R2 and the input impedance of the transistor. A minimum impedance is required for dependable oscillation and this value is a function of frequency.

FREQUENCY MHZ	2	5	10	20
IMPEDANCE Z(min)	15K	4.7K	3.3K	2.2K

I have observed crystals jump from fundamental to third harmonic when too low a value of shunt impedance was provided for oscillation at the fundamental mode! Since a required Z has an inverse relationship with frequency, the needs for shunt impedance at the third harmonic were satisfied when impedance needs for oscillation at the fundamental frequency were not.

Capacitor C1 is non-critical in value and a good choice for most applications is 47 pf. Optimum performance will result if the time constant R3*C2 follows this approximate relationship:

R3*C2 = 0.5/f where R is in ohms, C is in micro-farads and f is in MHz.

Since the ratio of C1/C2 is non-critical, a value of 150 pf will satisfy a

Grinding Surplus Crystals

by Jim Fitton W1FMR
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War Surplus Crystals are Still Around!

At the 1986 Dayton Hamvention QRP Forum, Chris Page G4BUE demonstrated the tiny "ONER" crystal controlled transmitter kit, designed by GM3OXX. Chris brought a number of these, hoping to promote home construction among his QRP friends in this country.

My kit was assembled at the airport terminal while awaiting the flight home, and all that remained was to solder the connections and hook up a crystal to try it out.

A look in the junk box at home turned up some surplus military FT-243 type crystals, which can still be found at radio flea markets for 25 to 50 cents each. Unfortunately, none of mine were resonant on the QRP frequencies used for nets and contests.

You may remember these crystals from the old Novice days, when everyone had to be crystal controlled and the QRM was unbelievable. In fact, I had to alternate nights of operating with my friend across town who had the same crystals, until we found out how to grind them to different frequencies.

This technique still works, and I was able to grind quite a few in just an hour or so.

Here is the technique used: first accumulate the following supplies.

* **Abrasive powder, such as household Comet cleanser, baking soda, etc.**
* **A sheet of glass (I used a framed picture of my ex-wife, and required less abrasive powder).**
* **Cup of tap water.**
* **Q-tips.**
* **Crystal Oscillator test circuit.**
* **Frequency counter or ham receiver.**

A simple circuit should be built to test the crystal for operation prior to grinding. A circuit that has worked well for me is shown in fig. 1 and comes from the ARRL publication "Solid State Design for the Radio Amateur".

I like to lay the crystal down flat on the table, connected to the test circuit by a couple of short alligator clip-leads. this allows me to take the cover off of the crystal while it is still connected to the circuit, and permits quick testing of the quartz crystal element.

First, determine where the crystal oscillates by connecting it to the test circuit while listening for the best note on your receiver or measuring it with a frequency counter.

If the frequency is too low, you are in luck because grinding the crystal raises the frequency.

Wash your hands to rid them of excess oils. Remove the three screws that hold the case together and then remove the cover and spring assembly. Next, gingerly bend the thin copper plate out of the way and slide the thicker metal plate out and place on the table. Do this in such a way that you will be able to replace it EXACTLY as it was removed. Then, out comes the Quartz blank (looks like frosted glass). This blank is what you have to grind.

Next, take a pane of glass, lay it flat on the table and pour about half a teaspoon of abrasive powder onto the glass. Add a little water to make an abrasive soup and mix well. Then, drop the quartz blank into the soup and press down with your finger.

Using a circular figure-eight grinding motion, make about 5 circles while feeling and hearing the grinding process going on. Remove the quartz from the soup and wash with tap water. (Alcohol works great also!)

Pat with a clean tissue and then air dry using an electric fan. Place the parts back into the crystal case (except for screws), and hold the cover in place with your finger. This allows you to check the frequency without screwing the case together.

Measure the frequency and repeat the grinding operation until you arrive at the desired frequency. Some crystals seem to grind easier than others, so be careful to measure often.

If you overshoot the mark, and the frequency is too high, it can be lowered slightly by drawing a few lines through the center of the crystal blank with a soft lead pencil. Be sure to rinse the quartz blank well and measure as before. CAUTION: While this lowers the frequency a few kilohertz, too much lead will kill the crystal. I don't know how to remedy this, but remember it from the past.

One thing to note, FT-243 crystals do not work well in the "ONER" circuit unless the trimmer capacitor CT1 (in series with the crystals) is omitted.

This is really fun to do, and it will prepare you for the homebrew sprints that are coming up.

Crystal Oscillator ...

wide range of frequencies and allow the time constant to be adjusted via changes in R3. In this way, lower frequencies will enjoy larger values of R3 and increased input Z to the transistor. Higher frequencies will have lower values for R3, increasing transistor transconductance and providing increased ability to drive circuit capacitance.

Excellent performance has been obtained from the circuit below. A broad variety of microprocessor crystals -- 3 MHz to 18 MHz -- have been tried and found to provide an output of approximately 4.5 volts peak to peak, good waveforms and reasonable use of RC delay in the keyed + Vcc supply.

It follows that the conventional methods for shifting frequency (L and C in series with the crystal) can be used to provide VXO performance.

Next time you are homebrewing a QRP crystal controlled transmitter, give this circuit a try.

* MATTHYS, ROBERT J. "CRYSTAL OSCILLATOR CIRCUITS", New York, John Wiley & Sons, 1983.

PROPAGATION AND DX

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"Now you see it, now you don't!" That's the pitch a magician uses when he practices his sleight of hand on us. When it comes to the magic of the ionosphere, maybe the phrase should be "Now you hear it, now you don't!" I'm sure there isn't a QRP'er alive who'd take issue with that. My own experience has been on 15M where signals could drop out without warning. But there are also tales like that about gray line propagation. I can brush aside the problems on 15M with a glib phrase like "ionospheric instabilities"; the stories about gray line propagation are something else, so let's take a look at what is really going on here.

First, I'm sure you know the so-called "gray line" is really the line that divides the region on the earth in daylight from the region in darkness, the nighttime side. This has an astronomical name, the terminator, and it moves across the surface of the earth in the course of a day. In addition to its motion in longitude each day, the terminator also moves in latitude, but more slowly, as the seasons change. This is due to the fact that the earth's axis is tilted with respect to the plane of its orbit around the sun by some 23.4 degrees. Thus, the sub-solar point moves in latitude, reaching as far north as 23.4 degrees in summer, as far south as -23.4 degrees in winter and right on the earth's equator at the equinoxes. The gray line moves north and south too but its shape is a bit complicated; we'll get to it shortly.

Now all of that is just simple solar astronomy and while you may not have a command of all the numbers and calculations for the times of sunrise or sunset along the gray line, you can get that information without spending too much money. For example, all you have to do is visit your nearby Federal bookstore to purchase a Nautical Almanac for the current year. It costs about $12 and is put out by the U.S.Naval Observatory. There's enough data and information in there to keep you occupied for quite a while, particularly if you're interested in amateur astronomy or gray line propagation in amateur radio.

Okay, now you can find out the times when the sun rises and sets at your QTH; but how about elsewhere? If you know some astronomy, have an atlas and a computer, you can work out those times for any location on the face of the earth. The problem is that you'd be busy running that computer all the time. Isn't there an easier way, say a graphic aid? Well, if you knew where the gray line was located, you could find those times for the entire world! So, how do we get a graphical representation of the gray line? Well, let's not try to do this sort of thing for each minute or hour of the day; let's just get a representative picture of the gray line for one day of the month and use that to get a feeling for the magnitudes involved. Now I have news for you, somebody beat us to that idea. You can buy a "DX-EDGE" from the folks at Xantek in New York City. They have a slide-rule type device which gives you the gray line for the middle of each month. It fits in a slide containing a double map of the world and you just move the slide from right to left to see how the gray line progresses across the earth's surface during a day. That's neat and it gives you the shape of the gray line too.

Now, what does the gray line have to do with propagation? Well, being a region that divides the areas in daylight from those in darkness, it shows us where we can expect that terrible ionospheric demon, D-region absorption, to change in our favor. That's right, if we could propagate a signal along the gray line, just inside the dark side of dawn or dusk, we could get our signals through with a minimum of ionospheric absorption. Now that's a great idea for DX'ers and they've been using it for quite a while. But it's a bit more complicated than you'd think by just moving that slide along the DX Edge, searching for absorption free DX openings. Part of that has to do with the changes in the shape of the gray line with seasons and the other part is due to the fact that you have to vary the antenna headings to take advantage of the gray line in DX'ing. Both points warrant more work on your part, using the DX Edge. But the folks at Xantek have not been lax, they've added a graphical aid on the beam heading problem. So let's take a closer look at the DX Edge and see what we can learn from it.

First, mark your QTH on the world map. In my case it was easy since I live in the Puget Sound area, which was easily discernable on the map. In your case, you have to use a pin-hole to mark your QTH. Next we must select a slide to illustrate how the gray line moves along. Take the December slide (winter solstice); that's a good one since it illustrates one extreme in the course a year. Moving the slide along, I find there's a gray line path in the NW-SE direction from my QTH at about 0100 UTC and at 1600 UTC there's a NE-SW path. The 0100 UTC path heads off to the Orient (BY and beyond) and toward the South Pacific (CE0X & CE0Z) while the one at 1600 UTC heads toward Europe (EI and beyond) and toward the Western Pacific, between the Cook Islands (ZK1) and Samoa (5W1). Okay, that suggests I might do well to point my beam in those directions and try to work DX around 0100 and 1600 UTC. But what are "those directions"? I could use the Xantek Great Circle Slide that goes with the DX Edge to find the answer, or perhaps use another aid, the azimuthal equidistant map from N5KR to do the job. Either way I could get my RF going in the desired direction. But what about those openings? Actually, they're quite different and warrant some discussion as they tell us more about propagation.

The two gray lines to the SE and SW directions are simpler than those in the NE and NW directions. Thus, they involve sunset or sunrise at both ends of the gray line and in sweeping from East to West would give a minimum D-Region absorption around dusk or dawn. The northerly paths, on the other hand, are more complicated, as sunrise is at one end of the gray line and sunset at the other. To illustrate, take the path from my QTH to Ireland at 1600 UTC with sunrise here in the Northwest and sunset over Ireland. That time would give a minimum of D-region absorption, but before or after 1600 UTC, parts of the D-region along the path are illuminated. On that basis, we'd expect the signals from Ireland to peak up right when we have the gray line connection but be weaker before and after that time. A similiar argument would apply to the path toward the Orient at 0100 UTC.

If we use the slide for June (summer solstice), the idea is the same but the roles and times of the gray line connections change as the sun is now above the equator. If we wanted to explore the gray lines for other months of the year, all we have to do is take out the appropiate slides and move them across the DX-Edge. Now if one wanted to do that sort of thing, but with more precision than the graphical device offers, then a computer program can be of help. And guess what? There's a "GRAYLINE" program available in the book "Computer Programs for Amateur Radio" by Wayne Overbeck (N6NB) and James Steffen (KC6A). Hayden Book Company publishes it and it's advertised in all the ham magazines. With a computer you can type in their program, or buy their disk to get it up and running the easy way.

The program is able to do several things: calculate sunrise and sunset times at any location on earth and sort through all answers and match up DX locations having the same sunrise/sunset times as you have at your QTH. About all you have to know is your latitude and west longitude in degrees and minutes and the date of interest; the computer does the rest. First it calculates sunrise/sunset in UTC and then searches an extensive file, "LAT-LONG", which contains geographic coordinates of all the important calls and QTH's in ham radio. So the program calculates all the times and sorts those that closely match your local sunrise/sunset times. And what's more, you can pick the spread between their time and yours, up to a maximum of 45 minutes.

Although this program does a FB job, be sure to bring along a cup of coffee or snack since it takes about 15 minutes to run the entire data base, do all the calculations and sort out the results. But it's worth the wait since all QTH's are identified along the gray line through your QTH. Having made a choice of what you're going after, you can use your DX-Heading program to just how far you're trying to go with QRP and in which direction you should point the beam. So with that it should be just a matter of "GL OM, FB QRP DX"!

Or is it? I didn't tell you there's a flaw in what I've told you up to this point. That's right, but you knew it all along. We haven't paid the slightest attention to solar activity and how it affects our RF. This means we must go beyond the geometrical arguments we've made so far. Otherwise, any use of the gray line idea in DX'ing would be just an act of faith, hope or ignorance, depending upon the frequency we use and the solar activity at the time.

To show you what I mean, let's take ignorance, that's easy. No matter how FB a gray line might appear on paper, if a band like 10 or 15 meters is never open due to a low sunspot number, it's a waste of time to listen there around sunrise or sunset and look for DX signals. But faith is another matter; this usually involves some previous success and an expectation that it will happen again. Those circumstances are often found on the lower bands like 80M, even in times of low solar activity. Then, there is still enough ionization in the F-region from current solar activity to support propagation and DX can come through, just as advertised.

Finally, we have hope; that's the tough one. Usually it means propagation numbers like the solar flux or MUF's from a computer program are a bit low to really expect that propagation would be supported. If we're lucky, several possibilities exist; either the 24-hour average for the solar flux used in the calculations is too crude (not giving enough importance to the statistical variations in the solar flux), or the sun has actually pulled a fast one when we weren't looking and increased the F-layer ionization. Also there's the possibility that the propagation mode might change to something other than the usual F-hops along a great circle path. Those are the circumstances that'll bring the DX through, to your joy and surprise.

Let me give you an example. In December of '86,I was QRP'ing on 20M late one afternoon around 0000 UTC. 20M starts to close about that time, the JA's slowly disappearing due to band conditions and they're going to work, and the BV's and BY's show up briefly, probably due to their work habits as well as propagation along the gray line. So, a little before 0100 UTC on December 7th, I got lucky, starting right at the head of the line of the pile-up on BY1OH. Having finished that QSO, I gave a final spin of the dial before going down to dinner. And then I heard him, VQ9QM on Diego Garcia! He was weak with a good-size pile-up on him. Now he was only the second VQ9 I've ever heard and knowing he was more than twice the distance of the BY, I swallowed my pride, put my QRP'ers conscience "on hold" and raised the output of my Corsair to 85 watts. Got him on the third call, getting a mighty RST 339 from 16,000km away.

The kilowatt "Big Shots" and the barefoot "Little Pistols" have a phrase, "work 'em first and worry later" (WFWL). That has to do with the legitimacy of a particular QSO, whether it's good old "Slim" again or the real thing. In my case, it was work him first, feel guilty afterward and then try to see how I ever worked him in the first place. And there was the surprise! When I put my best propagation program in the computer, the MUF at the time was just over 10Mhz; however, there was enough flux for an opening to Diego Garcia around 1900 UTC, just when I heard my first VQ9 on that other occasion.

So what happened? To be honest, I really don't know. A check with the DX-Edge showed that it was pretty close to a gray line path between here and the Chagos Islands during that QSO. So maybe my MUF program predicted too low a MUF at that time of day, maybe there was a flukey mode in effect at that time or else there was some change in the F-Layer ionization that wasn't reflected in solar flux data used in my calculations. It certainly didn't hurt to be on the band when the time was ripe for a gray line connection. I doubt that I could have raised him with my mighty 5 watts, but I'll give

A DSB/CW Transmitter for 80 Meters

by Drew Diamond VK3XU
Lot 2. Gatters Road
Wonga Park. Victoria 3115
Australia

Reprinted from *Amateur Radio,* March 1985.

Like to try your hand at building a little double sideband/CW transmitter? A DSB signal is easy to generate, and is a permitted mode on all bands. The only difference between DSB and SSB is that both sidebands are transmitted for the DSB signal. By ensuring that the audio is shaped or tailored before it is applied to the balanced modulator, tuning at the receiving end is easy, and an ordinary SSB receiver will resolve it. in addition, the listener has the choice of LSB or USB.

This transmitter was empirically designed using locally available parts. Output power is sufficient to drive previously described linear amplifiers.

Carrier suppression: At least 35 dB.

Frequency Stablity: Less than 50 Hz/5 min from cold.

Power Supply: Nominally +12V at 300 mA.

Performance: Frequency Range: 3.5 to 3.7 MHz. Modes: DSB or CW. Output Power: 1 W PEP DSB, 1W rms CW. Spectral Purity: All harmonics at least -50 dBc.

Propagation & DX ...

it a try the next time I hear a VQ9. If I make it, it'll be because I got there first to start the pile-up.

If I may summarize, let me say I do believe in gray line propagation; it's real and can help you with DX'ing. But just the geometrical side of the gray line is not the whole story. You need enough solar activity so it or its fluctuations have a chance to affect the ionosphere and get DX signals through. Other exotic propagation modes are possible too. So be there for DX, sunrise or sunset, but do a bit of thinking about it first. Remember, it's not only the early QRP'er that gets the good DX, it's the one who knows what he/she is doing. Okay? GL & FB QRP DX

Block Diagram Description: The VFO generates the output frequency, which is adjustable from 3.5 to about 3.7 MHz. This frequency is applied to the RF input port of the balanced modulator. Amplified audio energy from the microphone is applied to the AF input port differentially. For DSB operation;, the balanced modulator operates in the balanced mode and produces a DSB signal at the output port. This signal is then raised to about the 1W PEP level by a two-stage broadband amplifier. A lowpass filter is provided toattenuate any harmonics of the RF output signal.

For CW operation, the balanced modulator is deliberately unbalanced to supply a carrier. Keying is obtained by interrupting the +12V supply to the first stage of the output amplifier. The AF amplifier +12V supply is removed during CW operation to prevent spurious microphonic noises from being applied to the carrier.

Circuit Description: A Colpitts VFO at Q1 produces the chosen frequency between 3.5 and 3.7 MHz and is buffered by Q2 and Q3.

The balanced modulator consists of a CA3028 differential amplifier IC. The speech signal from the microphone is amplified and shaped at U1. High and low audio frequencies are rolled off in this stage to provide a telephony type signal with a minimum of redundant frequencies. This is done so that the DSB signal occupies a minimum of spectrum. The response of the microphone amplifier is determined mainly by C13 (lows) and C14 (highs). T1 applied a differential (or push-pull) signal to the differential input of the balanced modulator at U2.

"Carrier" frequency from the VFO is applied to the balanced modulator in common-mode at pin 2. Precise carrier nullis obtained with a bifilar tuned circuit at L3, C24, C25, which is tuned to the middle of the band (3.6 MHz for VK's).

The single-ended broadband amplifier at Q4 has about 20 dB gain, and the signal level is raised by this amount before it is applied to the push-pull broadband linear amplifier at Q5 Q6. This output amplifier is very stable and tolerant of poorly matched loads. The amplified signal is passed through a low pass filter to attentuate any harmonics.

For CW operation, the microphone amplifier is switched off, and the balanced modulator is unbalanced by adjusting R20 to allow some carrier to leak through to the B-B amplifier. This potentiometer is also used to adjust the drive level for the CW mode, so the R20 has a dual function.

Keying is implemented by interrupting the 12 V supply to Q4 in a shaped manner by Q7. The rise and fall time for keying is largely determined by the value of C40. The value shown, 0.2uF, gives hard crisp keying. A larger value, e.g. 0.39uF, would give softer keying.

Construction: Case size depends upon whether an internal or external power supply is required. The prototype uses an external supply and is housed in a factory made case measuring 204mm W x 65mm H x 130mm D. The cover must have some holes in the top and sides to allow ventilation of Q5 and Q6.

The photo shows how th boards should be arranged inside. It is important that the VFO is kept separated fromt heoutput amplifier to prevent leak-through ot feedback problems.

The placement os an internal supply is not critical but it must be remembered that the power transformer should be located as remotely as practical from the toroidal inductors and particularly the audio transformer, T1. Protection diode D6 is only required is an external supply is employed.

All components except those for the keying circuit are accomodated upon the copper side of homemade printed wiring boards. The keying circuit components and D6 C42 may be installed upon a 7-lug tag strip. Diode D5 may be soldered to the tags of S1.

To ensure VFO stability, it is necessary that styroseal (poly) and NPO capacitors are used where specified. Of course, silver-mica capacitors may be used if they are available. the same applies to those in the low-pass filter (ordinarily disc ceramic capacitors are rather lossy and change their value greatly with temperature and should therefore be avoided in these applications).

The PWB's may be mounted upon stand-offs. Ideally, the VFO should be enclosed in its own little box; but the construction of such a box may be difficult for some and the cost of die-cast boxes has become rather expensive. The photo shows the compromise reached. The PWB for the VFO has four 25mm high walls around it as a shield. These are made of double-sided material. Any other conducting sheet material, such as tinplate, will do. Three holes are required in the walls: one to allow connection to C1, one to admit the coaxial cable carrying the VFO signal, and nother to accomodate the +12V VFO supply feedthrough capacitor, C12. VFO inductor L1 should be painted with shellac or dipped in Estapol to ensure mechanical rigidity of the windings.

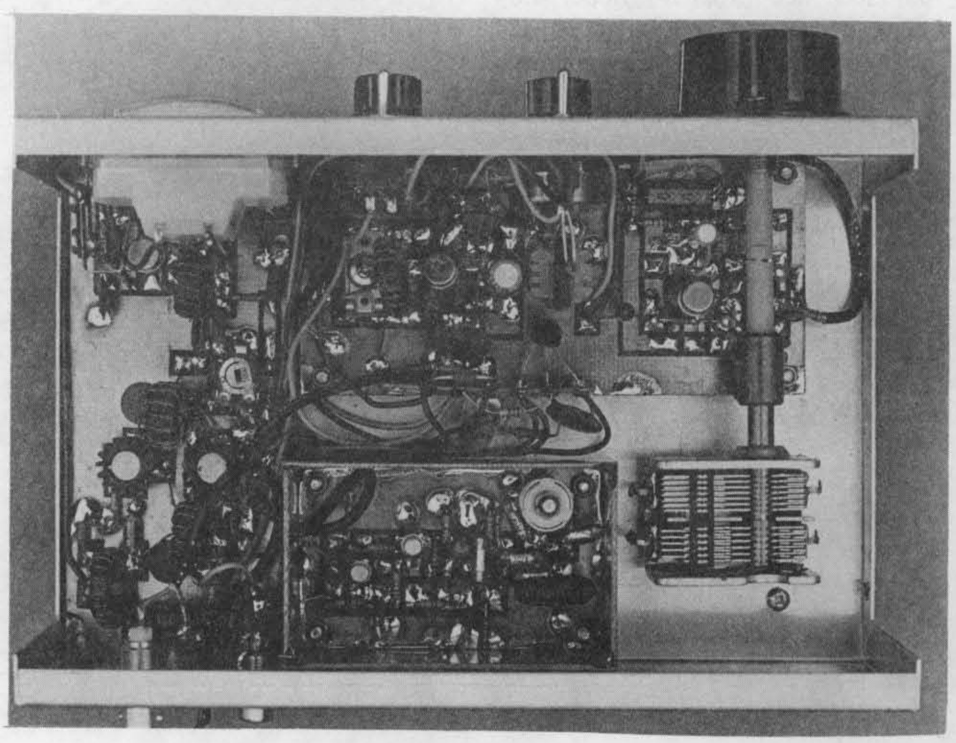
Broadband transformers T3 and T4 are made as follows: Take three 300mm lengths of 24 B&S enameled wire. Lay them paralell to each other, twist them together at one end and fix that end in a vise. Draw a cloththrough the wires to remove any wrinkles, then twist the other ends together and fix the group into the chuck of a hand drill. Whilst keeping the wires taut, turn the drill until there are about three twists per cm. Give the drill a pull to set the twists, then remove the group. Carefully thread them through the specified core until there are about 11 loops. It is esential that the end of one winding is connected to the start of another winding to form the center tap (ct). respective windings may be identified with a multimeter set to ohms. Connections should be double checked before the transformers are soldered into circuit. T2 and L3 are made in a similar way, but with two wires. Once again, it is essential that the end of one winding is connected to the start of the other winding. The start of a winding is represented schematically with a dot. L3 is a bifilar wound inductor to provide a balanced load to the output of U2. If Amidon cores are used for T2-T4, they should first be coated with some kind of enamel such as Estapol or shellac to prevent losses due to scratching of the wire enamel. Neosid cores require no treatment. Choke L2 is available ready made from several sources.

The choice of a dial drive for the VFO capacitor must be left to the individual constructor. Indeed, it is possible to get by without a reduction drive, and accurate netting is not difficult. If a drive is used, it should be connected to the capacitor shaft via a flexible coupler. As these also have become difficult to obtain, a short length of plastic number 3 (6.5mm) knitting needle will do the job. Four slots may be cut at right angles with a hacksaw to give some flexibility.

Adjustment: All tests and adjustments must be carried out with a dummy load connected to the output. THis could consist of 2 x 100 ohm 1 W Phillips cracked carbon or metal-film resistors connected in paralell and soldered to male coax connector to suit.

When construction is complete, and component locations/wiring checked, bias pot R30 must first be adjusted so tht the output amplifier draws a quiescent current of about 100mA. This may be done by measuring the curent drain from the 12V supply with S1 in the TX position and S2 in the DSB position. (R20 should be adjusted as described in Operation below.) Provided that no wiring fault exists, output amplifier current is many times greater than current drawn by other parts of the transmitter which may be ignored for this adjustment.

The VFO tuning range is adjusted as follows: With C1 set at full mesh, C4 is adjusted so that the VFO generates 3.500 MHz. It should be found that when C1 is at minimum C, the frequency is about 3.7 MHz. If greater range is required, C2 may be increased to the next higher value (180 or 220pF). If, for some reason, C4 does not bring about the required frequency as described above, C3 may



be changed to correct the problem. 82pF would raise the frequency and 180pF would lower it.

L3 is brought to resonance by unbalancing the bal mod with R20 and peaking C24 for maximum output as indicated on M1. This adjustment should be done at about mid-band (3.6 MHz).

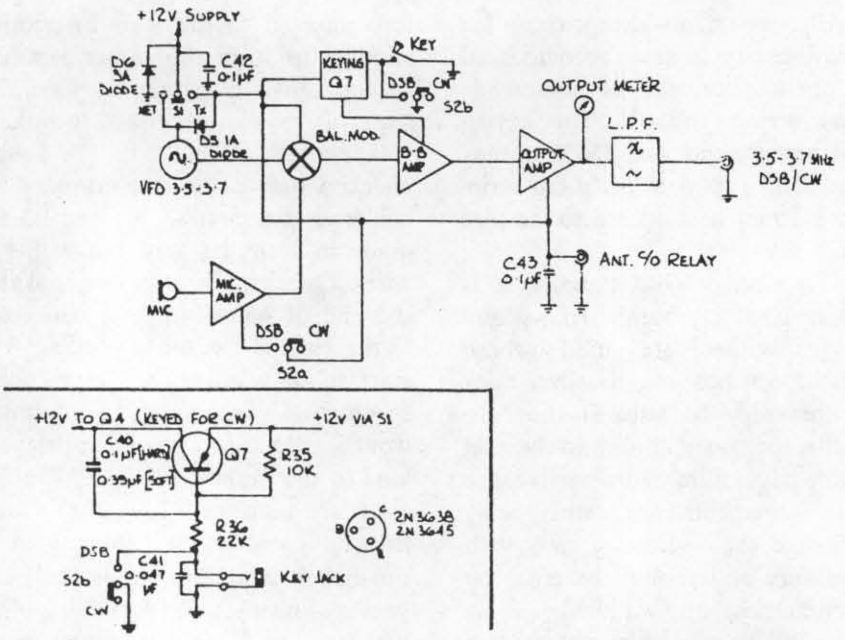
Feel the heatsinks of Q5 and Q6 occasionally to make sure that they are not running too hot to touch. If they do get too hot after some minutes of keyed CW operation, reduce the quiescent bias current.

Operation: To operate DSB, S2 is placed in the DSB position and the carrier bal pot R20 is adjusted for a null, as indicated on M1. A more precise null can be obtained by listening to the signal on the station receiver. Whilst speaking in a normal voice, mic gain pot R16 is advanced until M1 flicks up to about 3 on a scale of 10. If an oscilloscope is available, the DSB output waveform can be viewed and R16 adjusted to the point where flat- topping just occurs, then backed off slightly from that point. The signal should sound clean with a minimum of splatter when it is checked on the station receiver. The operator will have to wear headphones during this set-up to avoid audio feedback problems. Better still - have another person listen to the signal and adjust R16 to a point where maximum undistorted output is obtained.

Incidentally, AM operation is possible by inserting an appropriate level of carrier by careful adjustment of R20.

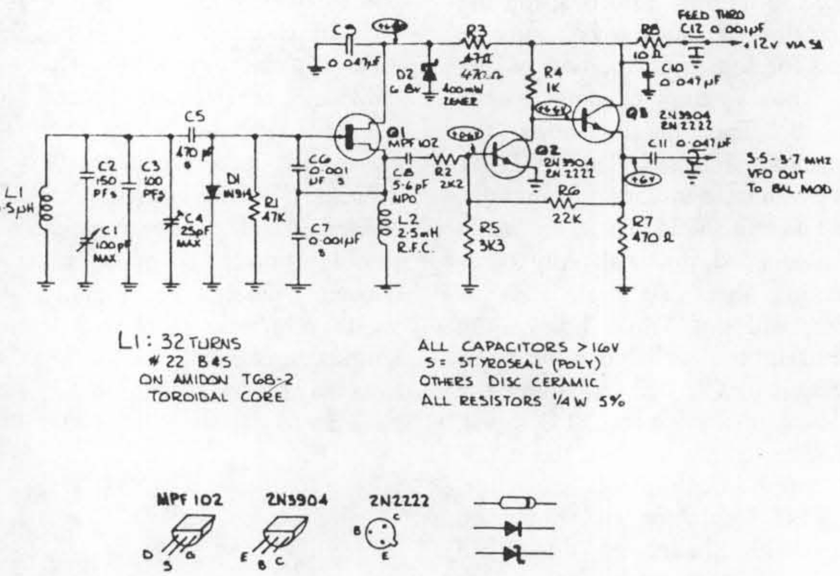
To operate CW, S2 is placed into the CW position and bal pot R20 is adjusted out of the null position to set the output level required between zero and one watt.

Conclusion: Although 1 W may be considered a very low level of power, it is posible to work stations far and wide, and interstate QSOs should be obtained. Later, if desired, a linear amplifier can be added as an 'afterburner'. Details of two amplifiers

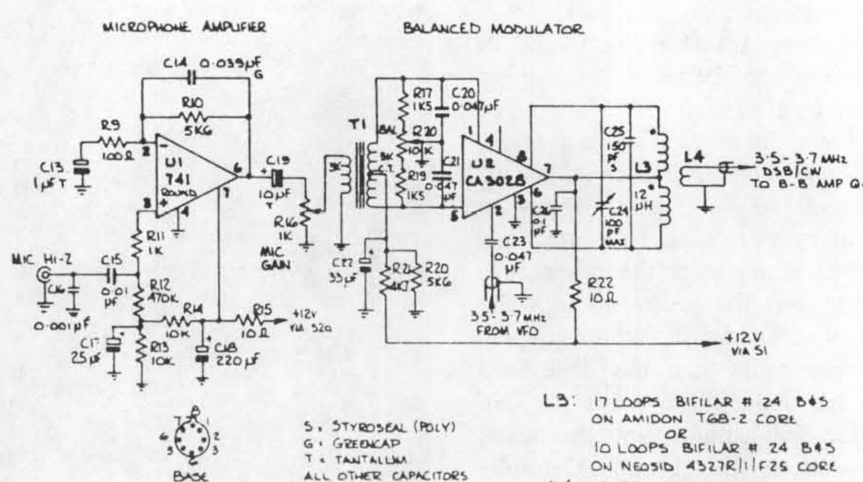


Keying Circuit.

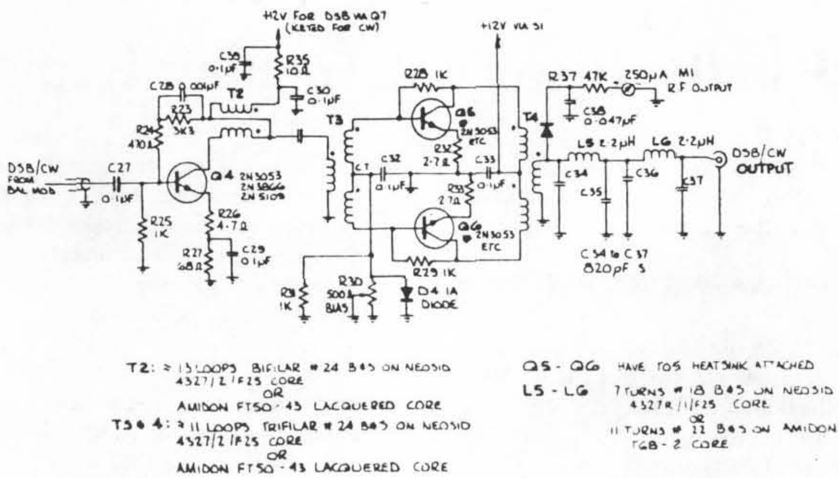
Block Diagram showing Interconnections.



VFO.



Microphone Amplifier and Balanced Modulator



Output Amplifier.

have been published and the author can supply information on these if required.

Send an SASE with two stamps (or equivalent IRCs) please, to the author for a copy of the PWB artwork, component location diagrams and a list of parts and parts sources.

PARTS LIST

Component Where Used

Capacitors:
5.6pF NPO >63 V..................C8
25pF max. variable trimmer.......C4
100pF max. variable..............C1
100pF max. compression trimmer...C24
100pF styro/poly >63 V...........C3
150pF " " " C2, C25
470pF " " " C5
820pF " " " C34, C35, C36, C37
0.001uF " " " C6, C7
0.001uF cer. >63V...............C16, C28
0.001uF feedthru................C12
0.01uF cer. >63V.................C15
0.039uF Greencap................C14
0.047uF cer. >63V................C9, C10, C11, C20, C21, C23, C38, C41
0.1uF cer. >63V..................C26, C27, C29, C30, C31, C32, C33, C39, C40, C42, C43
1uF tantalum > 16V...............C13
10uF tant. >16V..................C19
25uf tant. or elect. >16V........C17
33uF " " " C22
220uF elect. >16V................C18

Resistors:
2.7 ohm 1/4 W, 5%................R32, R33
4.7 ohm " " R26
10 ohm " " R8, R35, R15, R22
68 ohm " " R27
100 ohm " " R9
470 ohm " " R3, R7, R24
500 ohm trimpot..................R30
1K ohm linpot....................R16
1K ohm, 1/4W, 5%.................R14, R11, R25, R28, R29, R31
1.5K ohm " " R17, R19
2.2K ohm " " R2
3.3K ohm " " R5, R23
4.7K ohm " " R21
5.6K ohm " " R10, R20
10K ohm " " R13, R14, R35
10K ohm linpot...................R20
22K ohm, 1/4W, 5%................R6, R36
47K ohm " " R1, R37
470K ohm " " R12

Transistors:
2N3904/2N222.....................Q2, Q3
2N3053/2N3866/2N5109.............Q4, Q5, Q6
2N3638/2N3645....................Q7
MPF102...........................Q1

Diodes:
1N914/1N4148.....................D1, D3
1A diode >200V...................D4, D5
3A diode >200V...................D6
6.8V, 400mW zener................D2

Integrated Circuits:
741 round, if possible
(or socketed D.I.L.).........U1
CA3028(A)........................U2

Transformers/Inductors:
3K:3K ct, (Dick Smith #M0222)....T1
T2-4: (see text) 3 x Amidon FT50-43 or Neosid 4327(R)/2/F25 cores req.
L1: (see text) Amidon T68-2 core req.
L2: 2.5mH RFC
L3/L4: (see text) Amidon T68-2 or Neosid 4327R/1/F25 core req.
L5, L6: (see text) 2 x Amidon T68-2 or Neosid 4327R/1/F25 cores req.

Hardware:
Case, PWB material, switches S1 (single pole, 3-pos. center off), S2 (two pole 2-pos. DPDT). mic. jack, key jack, coax antenna connector, antenna, c/o relay connector, 7-tag strip, spacers, screws, nuts, wire, RG-174 min. coax (1m), meter M1 (edgewise, cal. 0-10, 250uA), knobs, vernier dial (if req), etc.

Call For Writers

Please send an SASE to Paula Franke WB9TBU for a copy of the QRP ARCI Writer's Guidelines. Current manuscript needs are for homebrew topics (anyone have any HW-9 mods?) for the January issue and antenna and "spring cleaning" and winter damage repair articles for the April issue. DXpedition articles (whether to another country or portable expeditions stateside) are needed for the June issue. October's theme will be contesting and "winterizing your station". Filler items are always needed.

The Quarterly welcomes articles on all aspects of low power communications: equipment construction and modification, antenna experimentation, operating practice and 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 when possible.

Send contributions to the consulting editors or to the general editor via modem [312-946-2198], IBM (clone) floppy disk (WordStar, WordPerfect or Microsoft Word), or typed double space. Editors will select and edit material to space limitations.

The Spirit of QRP in the History of Amateur Radio

by Chris Hethorn, KM8X

BEGINNING OF WIRELESS

Marconi and other pioneers had been transmitting Morse code since 1895 using spark gap transmitters. The first spark gap transmitters generated radio frequency waves by using a battery, induction coil, a switch, and a pair of metal plates with a spark gap between them. When the switch is closed small sparks would jump between the metal plates and energy would be sent into space. A few telegraph companies owned, and held patent rights to, all wireless equipment. The public at large knew little or nothing about about wireless before 1905, except what they read in the newspapers and magazines.

HOME RADIO STATION

In 1905, Hugo Gernsbach opened the field of radio to private, rather than commercial communications, by marketing the first home wireless telegraph, called TELIMCO. The complete transmitter and receiver sold for $10 and were capable of two-way communications over distances up to one mile. It was due to the ambition and foresight of Hugo Gernsbach that amateur radio had its beginning.

EARLY AMATEUR BOOKS

Between the years of 1905 and 1908 the number of amateur radio operators grew very slowly. The first books on wireless theory and construction helped popularize amateur radio. Amateurs began to build their own equipment, in many cases more effective than the typical commercial station.

FIRST AMATEUR ORGANIZATION

Hugo Gernsbach formed the first amateur radio organization in 1909, called the Wireless Association of America. He published a magazine called Modern Electric, enlisting 30,000 subscribers in two years.

INCREASING INTERFERENCE

By the end of 1909 the number of amateur radio operators grew to 10,000; and the problem of interference with commercial stations became increasingly worse. If government and commercial stations were to survive, some kind of legislation over amateurs was needed. The Marconi Company supported amateurs in 1909 to defeat a Bill in Congress that would have limited amateur activities. Bills were again introduced to Congress in 1910 and 1911 that would have limited amateurs so severely that it would have been impossible for them to operate at all. Amateurs banded together for the first time and defeated both Bills.

RADIO ACT OF 1912

In 1912 Great Britain held the London Conference where they made frequency allocations for various services, including amateurs. This opened the door for the US Congress, which then passed a Bill patterned after the London Conference, called the Radio Act of 1912. It limited amateur communications to 200 meters and below (frequencies above 1.5 MHz). It also formed the Department of Commerce, which thereafter controlled amateur licensing.

According to the best scientific knowledge at the time, long distance communication on 200 meters and below was absolutely impossible and the amateur allocations were deemed commercially worthless.

Regulation Fifteen of this act provided that:

" No private or commercial station not engaged in the transaction of bonafide commercial business by radio communication or experimentation in connection with the development and manufacture of radio apparatus for commercial purpose shall use transmitting wavelength exceeding two hundred meters, or transformer input exceeding one kilowatt: except by special authorization of the Secretary of Commerce contained in the license of the station."

The Radio Act of 1912 was planned to destroy amateur radio, but in fact it set the stage for what in the years to come would prove to be the greatest contribution to radio that amateurs have made.

FORMATION OF THE AMERICAN RADIO RELAY LEAGUE

The second national amateur organization, the ARRL was formed in 1914. It was organized to establish routes for amateur radio communicaton, to serve the public interest, and act as the official spokesman of amateurs on further regulations.

AMATEURS IN WORLD WAR I

When the U.S. entered WW I in April of 1917, all licensed amateur stations were ordered off the air. The military was faced with a critical shortage of radio officers, instructors and operators. The ARRL quickly recruited amateurs and, within three weeks, 500 highly skilled amateurs joined the U.S. Signal Corps. This proved to be a God-send to the military, since the amateur contingent represented about 95% of all military radio personnel.

LIFTING OF THE TRANSMITTING BAN

After the end of WW I amateur communication was still banned by law, and the U.S.Government was reluctant to give up the ban.Hiram Percy Maxim, president and co-founder of the ARRL, called a directors meeting, then traveled to Washington, D.C. After considerable time and negotiating effort, he convinced Congress to lift the ban. In Oc-

continued page 25

MOuSeFET TRANSMITTERS

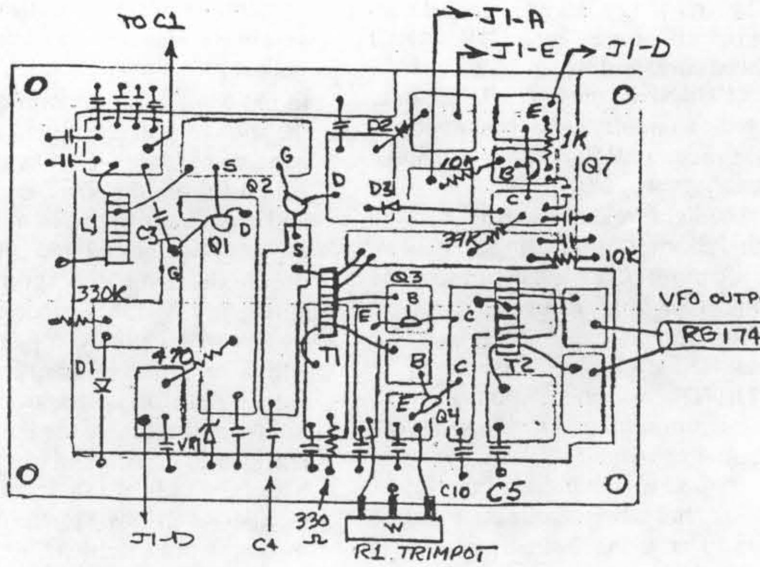
by Mike Masterson KA2HZA
7 Hudson Rd.
Bud Lake. NJ 07828

At Dayton, Mike Masterson KA2HZA gave a presentation to the group, explaining how he had gone about designing his innovative MOSFET QRP amplifiers.

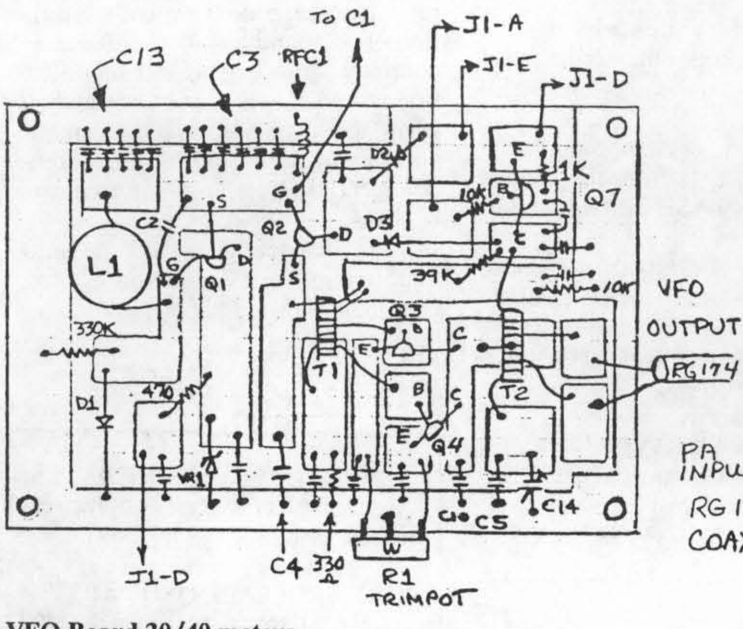
Using his 80 meter homebrew receiver and MOSFET rig, we had some nice QSOs from the hotel room.

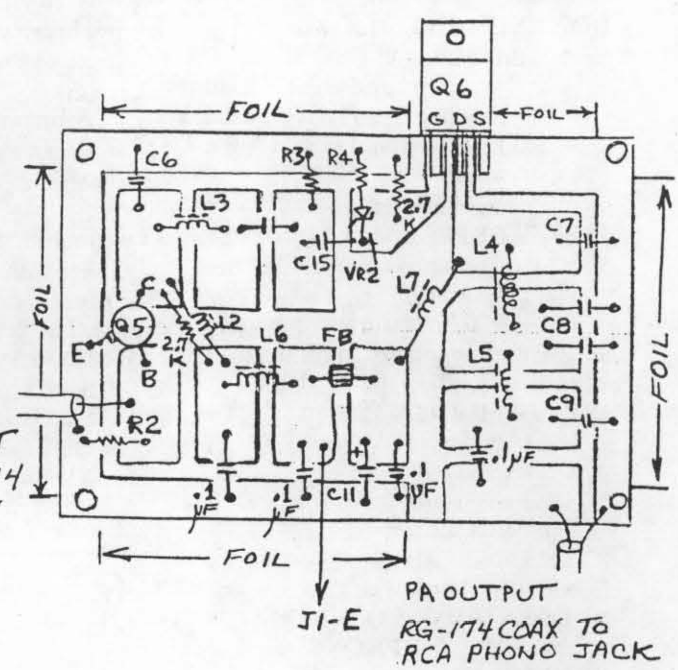
He also provided us with updated information on his circuits, corrections to the QST article, and the circuit layout information below. These MOSFET rigs are an excellent innovation and worthy of study by home-brewers.

NOTE: All unmarked capacitors are .1uF ceramic. Refer to article (Dec. 1986) for parts information.



VFO Board 80 Meters
(same notes per 30/40 M VFO)

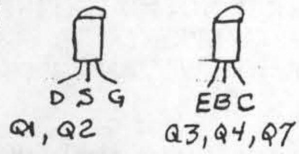




VFO Board 30/40 meters

1) Single sided epoxy glass 2.2" x 3.3"

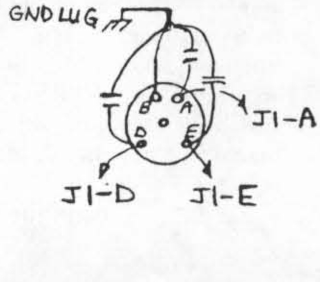
2)



CAUTION! Observe transistor manufacturer's pin-out.

3) Use a stiff solid wire to C1

J1 Wiring (amphenol 126-011 or equivalent)



P.A. Board 30/40/80 Meters

1) Double sided epoxy glass 2" x 3" x .1" thick.

2) Copper foil wraparounds (or plate-thrus) where shown.

CONTESTING

conducted by Red Reynolds K5VOL
835 Surryse Rd.
Lake Zurich, IL 60047

The following rules are general contest rules to be used for all QRP ARCI contests and sprints:

EXCHANGE: *member*: RST, state/ province/ country, ARCI number

non-member: RST, state/ province/ country, power out.

(****homebrew sprints:** RST suffixed with 'HB' or 'C' indicating homebrew or commercial equipment. If homebrew gear is used (receiver, transmitter, or transceiver), use 'HB' on all RST exchanges.******)

POINTS: member: 5 points

non-member, different continent: 4 points

non-member: 2 points

**homebrew sprints: if station worked is using homebrew, add 5 points (i.e.: non-member using homebrew: 2 + 5 = 7 points)

MULT: s/p/c total all bands

the same station may be worked on more than one band for points and s/p/c credit.

BONUS POINTS for homebrew sprints, spring and fall QSO parties:

+ 200 for each band HB TX used
+ 300 for each band HB RX used
+ 500 for each band HB TCVR used
(max. of 500/band)

POWER SUPPLY MULTIPLIER:

x 1.0 commercial power
x 1.5 battery
x 2.0 solar/natural, or battery charged only by solar or natural power within 48 preceding the contest.

POWER MULTIPLIER:

x 0: over 5 watts (check log)
x 2: 4 to 5 watts
x 4: 3 to 4 watts
x 6: 2 to 3 watts
x 8: 1 to 2 watts
x10: less than 1 watt

SUGGESTED FREQUENCIES:

	CW	PHONE
160M	1810	
80M	3560, 3710	3985
40M	7040, 7110	7285
20M	14060	14285
15M	21060, 21110	21285
10M	28060, 28110	28885
6M	50060	50385

SCORING:

SCORE = POINTS x SPC x PWR MULT x PWR SUPPLY MULT + BONUS

Entry may be as all-band entry, or as single band entry, competing against own class of entry. Certificates to the top ten scores over-all, and to the top score in each band for single-band competitors. Certificates will be issued to the top score in each s/p/c and class in which two or more entries are received. Single band entries apply only to the homebrew sprints and the spring and fall QSO parties.

Entry includes a copy of the logs and a separate summary sheet. All entries must be post-marked 30 days following the end of the contest. Late entries will be counted as check-logs. Members indicate their membership number on all logs. Members and non-members indicate their input or output power for each entry. The highest output power level used will determine the power multiplier. Output power is considered as 1/2 of the input power.

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

A summary sheet and sample log sheets are available from the contest manager for an SASE with one unit of postage.

Include an SASE with one unit of postage with the entry for a copy of the contest results. Results will be published in the next issue of the QRP ARCI Quarterly.

Send entries to:
Red Reynolds K5VOL
QRP ARCI Contest Chairman
835 Surryse Road
Lake Zurich, IL 60047 USA

The contest activities of the past should be up to date as you read this. The dismal showing in the July Homebrew sprint is largely a result of the only notice appearing back in January. This should not discourage members from entering. Once the announcements are back on track, things should pick up. K9PNG won the only certificate this time, since the contest manager is not eligible for contest certificates.

continued page 25

HOMEBREW BONUS POINTS - QRP ARCI Contest / Sprints HOMEBREW DEFINITION

In the Homebrew sprints and the spring and fall QSO parties, bonus points are allowed for homebrew equipment. homebrew for bonus points includes transmitters, receivers and transceivers only.

For the purposes of qualifying for bonus point status, the equipment must meet one of the following criteria to be considered 'homebrew':

1. Completely home constructed gear, original design or a copy of another's design and NOT a kit.

2. 'Kits' which do not include, or have available, a step- by-step construction manual (i.e. not a Heathkit).

3. Kits (such as Heathkit) or commercial gear that contains a major modification to improve, or alter significantly, its performance. Examples include redesigned front-ends, alteration of one band for another band, or complete repackaging and modification involving a change in use such as home-based to portability. Cosmetic changes such as adding dial lights, commercial filters and larger control knobs do not qualify.

The final decision as to homebrew qualification rests with the contest chairman.

UPCOMING CONTEST DATES:

General Contest Rules apply to each of these contests.

QRP ARCI FALL QSO PARTY:
1200Z October 17 through 2400Z October 18, 1987 (24 hours maximum)

QRP ARCI HOLIDAY SPIRITS HOMEBREW SPRINT - CW:
December 13, 1987, 2000Z through 2400Z

QRP ARCI WINTER FIRESIDE SPRINT - PHONE:
January 10, 1988, 2000Z through 2400Z

SPRING 1987 Results

CALL	SCORE	PWR	BANDS	RIG	ANTENNA
ARIZONA					
KE7XN	29,164	4.5	4	Argosy	Inv V
ALABAMA					
KA4LKH	83,160	.9 B	3	TT515	Quad/Loop
ALASKA					
KL7BDK	30,192	5 S	2	- - -	Quad
CALIFORNIA					
W6SKQ	188,268	2.4	3	TT515	SkelCone/Beam
W6SIY	132,352	3.9	3	TT Delta	MiniQuad/DP
WI6M	113,880	4 B	3	Argosy	Beam
KA6SOC	110,460	1 B	3	HW-8	- - -
W6SGJ	83,594	5	3	TS930	Beam
NX6M	69,564	1.9	3	TS130/HW8	Vertical
K1EDA/6	57,400	2	3	TT509	Dipole
K6XO	12,104	5	3	- - -	- - -
N6NMI	10,005	4 B	2	TT509	- - -
W6PRI	3,600	.9	1	- - -	- - -
WF6D	1,846	5	3	IC735	Skel Cone
WT6A	1,472	3	1	- - -	- - -
COLORADO					
KR0U	156,020	.9 S	2	HW-9	Vertical
CONNECTICUT					
KH6CP/1	802,200	.94B	5	TT515	Longwire
WB1EEU	19,000	1	2	Corsair	Mini Quad
DELAWARE					
WB2IPX	2,850	5	4	- - -	- - -
FLORIDA					
K4KJP	329,380	.8 S	3	TT Omni	Dipole/Beam
AA4W	199,998	3.5 B	3	HW-9	InvV/Ph Vert
GEORGIA					
N4HLU	6,188	4	3	- - -	- - -
WA4PFG	4,256	3	3	Cent-21	Zepp
HAWAII					
KH6ITS	70,389	3 B	3	HW-9	Vertical
AH6EK	20,320	5	2	- - -	- - -
IDAHO					
NJ7M	56,016	4.5	3	TT509	Zepp/G5RV
ILLINOIS					
WB9TBU	187,920	3	4	Argosy	Dipole/Loop
W9PNE	117,290	.8	4	IC720A	Sloper/Beam
NF9X	93,240	.8	2	- - -	- - -
K9IFO	81,360	2.8	3	FT107	Dipole/Beam
WA9QMO	14,478	3	2	FT101B	G5RV
WD9IWP	4,896	2 B	3	- - -	- - -
K5VOL	3,720	.5	1	Homebrew	Longwire
INDIANA					
K9VCM	105,592	5	4	TS520	Dipole
KA9JKK	7,200	5	4	Argosy	MiniQuad/Loop
KA9NZI	4,704	1.5 B	2	HW-8	Dipole
IOWA					
KA0HIB	83,640	2.5	1	TT509	- - -
KANSAS					
W0UY	31,020	4	3	HW-9	Vertical
LOUISIANA					
NO6W	28,665	4.8 B	2	HW-9	Dipole
MARYLAND					
K3TKS	303,024	1.5	4	TT509	Loop/DP/Vert
KB3WK	8,800	5	3	- - -	- - -
WA3GYW	5,280	2 B	3	HW-8	Dipole
MASSACHUSETTS					
KZ1L	195,360	1 B	4	- - -	- - -
KB1MJ	49,680	3	3	Homebrew	- - -
N1BXC	17,928	5	4	HW-9	Zepp
K1KDJ	11,232	3.5 B	3	TT509	- - -
W1XH	9,280	5	4	- - -	- - -
NM7N/1	3,015	5 B	2	Argosy-2	Hustler
MICHIGAN					
AC8W	599,820	1	5	IC735	Dipole/Beam
N8CGW	522,900	1 B	5	TT Omni-C	Loop/Vertical
N8CQA	427,488	2	5	TR4C	Quad/Vert/G5RV
K8DD	111,600	.9	5	TT515	Beam/Longwire
K8KIR	78,408	2.5 B	3	Argosy	Dipole/Beam
KD8FR	52,224	3	4	- - -	- - -
WB8UUJ	44,164	1.9 B	2	TT509	Sloper/Longwire
MINNESOTA					
W0NGB	24,120	3	3	HW-8	Vertical/Beam
MISSISSIPPI					
NF5Y	710,360	.9 S	4	TT515	Loop/Beam
NEBRASKA					
KA0TWA	680	5	1	Cent-21	Zepp
NEW JERSEY					
AA2U	503,250	.9	5	TT509/IC730	Dipole/Loop
KD2JC	229,284	3	4	HW-9	Dipole/Beam
N4EL	164,670	3	4	TT515	Zepp
K2JT	153,900	1 B	4	TT515	Dipole
N2GZL	90.032	2	3	- - -	- - -
W2JEK	9,216	1.9 B	3	HW-8	Dipole/GP
KA2MKU	1,098	5	5	HW-9	Dipole/Loop
NEW MEXICO					
W5TTE	381,680	.75B	4	TT505	Loop
NM5S	31,104	5	4	HW-8	Dipole
NEW YORK					
W2PFS	248,940	2 B	3	TT509	Dipole
N2GGW	208,560	.8 B	3	HW-8	Dipole
W2YQA	107,625	.9 B	4	HW-8	Longwire
W2UYQ	95,550	.75	3	TS940S	Loop
N2UN	30,456	2.5 B	1	Homebrew	- - -
W2WSS	4,400	5	2	Argosy	- - -
NEW HAMPSHIRE					
KN1H	597,080	1 S	5	Argosy	Zepp
W1FMR	26,640	5	4	Argosy	Loop
NEVADA					
W6JHQ/7	32,240	4 S	3	Argosy	Hustler

Spring 1987 ...

OHIO						
NN8B	428,184	1.9	B	3	Argosy	Vert/G5RV
WB8ZWW	252,180	1.8	B	4	Argosy	Inv Vee
N8GJR	237,915	.5	B	4	SB104/Cent22	Zepp/G5RV/PV
N8HOB	30,800	1.9		2	HW-8	Dipole/Inv V
W8DYF	1,998	5		2	Argosy	Beam/Loop
OKLAHOMA						
WD5GLO	156,300	2.5		3	TT509	Inv V/Beam
W5MED	8,960	2		2	HW-8	- - -
OREGON						
W7LNG	19,776	2		3	Homebrew	Beam
PENNSYLVANIA						
W3TS	666,360	.9	S	6	Homebrew	Dipole/Zepp
W3FAF	154,752	1.7		4	TS130V	Dipole/Beam
RHODE ISLAND						
KA9HAO	96,280	.95	S	2	TT515	Vert/RandomW
KU7I	34,800	3.5	B	4	TS130SE	Dipole
SOUTH CAROLINA						
K4ADI	67,470	5		4	TT509	Dipole/Beam
SOUTH DAKOTA						
W0RSP	5,076	5		2	- - -	- - -
TENNESSEE						
KV4B	148,656	1.8	B	2	Argosy	InvV/Beam
NU4B	29,808	1.5		2	HW-8	Beam
TEXAS						
W5LXS	607,200	.5	S	4	TT515	Sloper/Beam
WB5FKC	507,520	1	S	4	Homebrew	InvV/G5RV
WA5ZKL	177,600	.9	B	4	Argosy	Loop
W5QJM	87,296	2		3	TT515	Inv Vee
W5XE	67,860	2.5		3	FT757	Phased Vert
WD5ICQ	65,016	4	B	3	- - -	- - -
UTAH						
NN7T	37,830	5		2	- - -	- - -
VERMONT						
NG1G	142,220	4		3	HW-9	Loop
VIRGINIA						
K7YHA	206,244	1.9	B	3	TT509/TS130V	Sloper/Beam
W4OEL	200,200	1.9		4	TT515	Sloper/Beam
K4JM	78,064	5		3	TS120	Dipole/Hertz
W4FOA	49,392	2.5		3	TT515	Vert/Longwire
KJ4TK	3,380	4		3	FT980	Hustler
WASHINGTON						
KV7X	338,430	1	B	4	IC730	Vertical
NM7M	167,444	5		3	Corsair	Quad/Dipole
K7WA	636	5		1	IC735	Dipole
WEST VIRGINIA						
N8HSG	98,136	2	B	4	TT505	Zepp/Vertical
KB8AOB	1,536	1.5	B	1	Homebrew/XTAL	Dipole
WISCONSIN						
KA9UAL	4,875	.9	B	2	HW-8	Sloper
ALBERTA						
VE5BLY	3,910	5		1	- - -	- - -
BRITISH COLUMBIA						
VE7EKS	3,300	2		1	HW-8	- - -
NEW BRUNSWICK						
VE1NH	35,568	3		3	TT509	Longwire
ONTARIO						
VE3DRB	180,744	1.8		3	Homebrew	Gnd Pl
VE3KKO	101,724	3.5		2	Argosy	DP/Beam
VE3OOL	73,476	3		4	TT509	DP/Beam
VE3EFC	17,424	2.5		2	HW-8	Zepp
SASKATCHEWAN						
VE5VA	138,800	1		1	FT-101	- - -
CZECHOSLOVAKIA						
OK1DKW	40,880	.95		5	Homebrew	Vee/8JK
ENGLAND						
G3XJS	4,554	3		1	- - -	- - -
G4EBO	1,584	3		1	Century22	Longwire
G4JFN	1,554	3		1	TS130V	Beam
JAPAN						
JH4UYB	40	5		1	TS930S	Beam
MEXICO						
XE2IOF	120,400	2	S	3	- - -	- - -
XE2VKR	80,934	3	B	-	- - -	- - -

B=BATTERY S=SOLAR

1987 HOOTOWL SPRINT

CALL	SCORE	PWR	BANDS	RIG	ANTENNA
CALIFORNIA					
W6SIY	500	3.9	1	TT Delta	Dipole
ILLINOIS					
WB9TBU	30,000	1.5	3	TT Argosy	Loop/Dipole
WD9IWP	16,875	.9	3	HW-8	Inv Vee
K5VOL	10,080	1	2	TT509	Longwire
INDIANA					
KC9UR	9,760	1.9 B	2	TT505	Vertical
MICHIGAN					
KD8FR	720	3	1	- - -	- - -
OHIO					
N8GJR	44,200	.9 B	3	Century22	Zepp/Vertical
TEXAS					
WB5FKC	8,360	.5 B	1	HB XCVR	Phased Vee's
UTAH					
KK7C	20,650	.9 B	3	HW-8	Loop
WASHINGTON					
NM7M	375	5	2	TTCorsair	Dipole

B=Battery

1987 JULY HOMEBREW SPRINT

CALL	SCORE	PWR	BANDS	RIG	ANTENNA
ILLINOIS					
K5VOL	720	.7 B	40M	HB RX/TX	Dipole
K9PNG	140	1	40M	TT 515	Longwire

IDEA EXCHANGE

conducted by D.A. "Mike" Michael W3TS
Box 593 Church Lane
Halifax, PA 17032-0593

Switchable RF Amp for the TenTec Digital Argosy

The Argosy II is a very good QRP/QRO xcvr, but when I use mine on 80 and 40 meters it seemed to be more sensitive than really needed causing the AGC to pop on attack and a higher than necesary background noise. Most signals were well over S9 and my normal background noise was above S4. I was looking for a way to reduce the Argosy II sensitivity about 10 dB.

At first I thought of adding an attenuator pad, but that does not help the dynamic range or reduce the internal noise from the RF amp stage. After looking at the schematic of the RF/MIXER BOARD #80784-D, I thought of turning off the RF AMP Q2 in RX only (it needs to be on for TX or no output results as it is a TX pre-driver stage). Turning off Q2 makes a great attenuator - it was too good - signals were very weak.

Next thought was to reduce the amplification of Q2. So I clipped off one end of C12 (.01), the emitter bypass in the Q2 emitter circuit. That worked very well, it reduced the gain about 16dB on Rx and TX. I experimented a bit using my step attenuator and an external xtal calibrator as a signal generator and by putting a 100 ohm resistor (1/4 watt) in series with the grounded end of C12 I had a gain reduction of 10dB, which I found to be the best compromise between gain reduction and sensitivity loss. This causes a 10dB reduction on all bands.

Now for a way to have full gain on TX and switchable gain on RX. I don't have a noise blanker so I used the noise blanker switch as my RF GAIN reduciton switch. I tried a diode and a transistor as a switching element. The diode showed a slight loss over the transistor in the TX mode, so I stayed with the transistor (the transistor also requires less "on" current). By using "sterring" diodes and hooking one from the +T line to the switching transistor, I regained full output in TX. Hooking the other sterring diode to the +R line thru the noise blanker switch gave me switchable RF gain on RX.

Figure 1 shows the final circuit. The noise blanker switch cable #24 is hooked up to the circuit, I didn't have a small mating connector, so I used 18 AWG solid copper wire as pins and soldered smaller 24 AWG stranded hook-up wires on to reach to the transistor circuit which was built ugly-style on top of the RF/MIXER board near Q2 and C12, with the grounded end of C12 pulled up out of the board and the control transistors emitter pushed into the C12 ground hole.

The result is very pleasing, with reduced internal noise from the RF AMP and an improved AGC action because not all signals are S9 and over and an ANT. background noise of less than S1. Also improved was the DYNAMIC range and the crystal filter rejection because the mixer sees 10dB less signal.

A Few Other Digital Argosy Improvements -

I have added a 220 ohm 1/4 watt resistor across the ANT. plug #33 on the RF/MIXER board. This cuts down the AM station BCI that I was having on 80M CW. (I live one mile from a 1KW AM station.) This helps, I believe, because the RX ANT circuit is not shunted with much resistance and a peak voltage from out of band high power TX's can cause some intermod in D1 and D2. (Maybe D1 and D2 should be PIN diodes - but I had good luck with the simple shunt resistor.)

Also, a hiss reduction can be had by shunting C17 (.01) on the IF-AF board #80785-D with another .01 (or change C17 to a .02) and shunt R35 (100k) with a 470 pf. This improves the high frequency roll off of the audio preamp stage.

Impedance Measurements

Writing in QEX (Jan. 87) Cliff Appel WB6AWM/5 described difficulties in obtaining reliable RF impedance measurements. Those of you having similar questions are referred to his letter. Keith Clark W6SIY has sent us the following comments which may be of interest to many other QRPers:

"I've concluded from my own experiments and extensive reading that RF measurements in general, and antenna measurements in particular, are subject to an unusually large number of potential error sources. Stray impedance terms and inductive or capacitive coupling can easily occur due to the test instruments and their leads. Any "reference" impedance must be evaluated for how well they approximate ideal ones.

"Carbon composition resistors are generally recommended for RF measurements in the Ham literature, although carbon film and metal film resistors are becoming more commonly available. The 1985 ARRL Handbook gives conflicting information on film resistors: page 26-20 says they are non-inductive while page 35- 3 says they can be highly inductive. Certainly, wire-wound resistors are to be avoided. Similarly, carbon composition potentiometers should be used for any variable test resistors, not wire-wound ones which may be more readily available in low resistance values. Generally, disc ceramic capacitors and air core inductors are recommended through the HF range of 1.8 to 30 MHz. Commonly available variable capacitors are suitable for variable reactance test components.

"Wiring is of extreme importance in RF measurements. Any antenna wiring, feedline connections, switches, variable capacitor bearings, etc. must have secure, low-resistance connections. Test wiring cannot be layed out in a haphazard manner with clip leads running everywhere. Short, thick connections become more and more important as the frequency increases. The 1985 ARRL Handbook has a chart showing inductance of straight wires (page 2-13). It shows an inductance of 0.32 uH for a 10 inch length of #20 wire. This is 56 ohms inductive reactance at 28 MHz, quite a large error compared to a 50 ohm antenna! So, just because wiring is a small fraction of a wavelength long, we cannot assume its effect is negligible.

"The noise bridge has several factors in its favor. First, as a bridge circuit, the measurement is made at a null condition which results in (theoretically) no loading effects by the measurement instrument. This is a full null down to 0 Vrms which is much easier to observe than a partial null or minimum voltage. Noise bridge circuitry is low cost for commercial units, or simple to build and calibrate by a home constructor. Care in bridge layout symmetry will balance out stray coupling inductance and capacitance so the bridge be accurate up through 30 MHz. In making antenna measurements, the wide-band low-power output of a noise bridge will not cause any radiated interference either within or outside the amateur bands. A 10 VRMS RF sine wave from a signal generator could put two watts output into a 50 ohm antenna. Finally, a receiver with accurate frequency calibration is more commonly available to amateurs than an accurately calibrated signal generator or frequency counter."

Baluns

On the subject of baluns, we've heard from Paul Schaffenberger 7J6CAM:

"I've used coil forms from one to two inches in diameter and wire size from #16 to #20. It's best to use unenameled copper wire, but hook-up wire works OK also. I generally try to start out with too many turns and work my way backwards. Twenty turns of #18 copper wire on a one inch form is a good starting point for 40 meters. You can check SWR in the various bands to find out where you are resonant. In addition to pill bottles, the tubes from "pump" toothpaste containers also make great coil forms.

"I'll be retiring from the military in the 1990-91 time frame and want to spend a lot of time working QRP club issues. I plan on putting up three 50 foot push-ups in my yard to experiment with antennas of all fashions."

Double Balanced Mixers

In the January Quarterly, Fred W5QJM wrote asking is any one was interested in going in with him to order a batch of DBMs. Well, he writes to tell me this is not necessary, that you can buy as many as you need from Communications Concepts, Inc. Fred writes:

"I've found a source for the SBL-1 mixer in single-lot quantities that won't eat your lunch. They and other hard-to- find components are available from:

Communications Concepts, Inc.
2648 North Aragon Avenue
Dayton, Ohio 45420
(513)220-967

"CCI, whose ads run in HAM RADIO, sells SBL-1's for $6.50 plus shipping. They also have good prices on a few trimmer caps, etc. Their catalogue is free for the asking by letter or phone, and it is well worth having around. Since that's the case, I'm directing all home brewers to CCI for SBL-1's"

More On Fast Draw Resonant Circuits

I have used the fast draw resonant circuit hint many times, but I did not sit down and figure out why it worked out. Well, Rock W9SCH was interested in it enough to check it out further. Rock writes:

"The Fast Draw Resonant Circuit hint fascinated me since I am always on the lookout for useful approximations. Just for kicks, I made a set of calculations for various bands from 10 to 160 meters and find the results remarkably consistent, giving close to +6% error in each case. For such an estimate, this is interesting - PLENTY CLOSE ENOUGH FOR MOST HAM USES!

"There's gotta be a good theoretical reason for this: If we take that grand-old "wireless" formula (corrected for microhenrys and picofarads) λ meters $= 1.89\sqrt{LC}$, and solve it for $\sqrt{LC}$, we get: $\sqrt{LC} = \frac{\lambda \text{ meters}}{1.89}$. Now if we call $\sqrt{LC}$ either microhenrys or picofarads (numerically equal to each other) and call 1.89 "about equal to two", we get the relationship you suggest.

And when we that:

$$\frac{(2-1.89)}{1.89} \times 100$$

comes out to be 5.8%, or about 6%, we see how and why it works.

"But when talking of wavelengths, we ought to recall that the common designations for our various bands (40 meters, 80 meters, etc.) no longer accurately apply. Our common HF bands thus are:

80 M = 75 to 85.7 M
40 M = 41 to 42.8 M
30 M = about 29.6 M
20 M = 20.9 to 21.43 M
15 M = 13.99 to 14.2 M
10 M = 10.1 to 10.7 M

These discrepancies had best be accounted for when calculating or else things can get out of hand."

Thanks Rock for the inside story on why that holds out. I use this approximation to give a quick check (that I can do in my head) on my calculations that are done on a pocket calculator. Therefore, I am not after the most accurate answer and if I use this in a "Mac-Gyver" situation, I will not have the exact calculated parts and will probably be using variable caps or slug tuned forms so I can tweak out the 6% error. Anyway, I find it the most handy approximation I have ever come across.

Estimating Coil Inductance

I am still on the lookout for a way to guesstimate the inductance of a coil. Rock sends a bit of info on the coil winding formula:

"Incidentally, rummaging around in the same old 1920-ish Wireless Incunabulum that contained $\lambda = 1.884 \cdot \sqrt{LC}$, I uncovered another useful formula for the inductance of a single-layer solenoidal coil:

$$L = \frac{25 D^2 N^2}{1000(1 + D/2)}$$

where L is the inductance in microhenrys, D is the diameter in inches and l the winding length in inches. (Note: I call this the "TWO-BIT FORMULA" for obvious reasons.) And I find it easier to remember than the formula found in the current ARRL Handbook."

Thanks again, Rock, for some very useful info. Please keep sending in your handy formulas and tid-bits that make homebrewing more fun than "number crunching".

WC4Y Solar Powered Station

Rod Nowakowski WC4Y writes to describe his solar powered station:

"I operate WC4Y on solar power exclusively. The set-up is ultra-simple: an ARCO #2000, 33 watt solar panel (1.75 amps), mounted on an aluminum window awning, provides a 12 volt charge to a deep cycle marine battery. An SCI automatic sequencer mounted in line controls the charge and blocks return flow of current when sunlight is not present. For safety's sake, the battery is located just outside the shack, connected to the rigs with the factory supplied mobile power cords. This system has operated flawlessly since December 1983.

"Although the location of the solar panel on the west side of the house limits the reception of direct sunlight to four or five hours a day, it has maintained ample operating capacity in the battery. The station consists of two rigs: an Argosy 525 II and a Kenwood 120S. Maximum input power is 200 watts for the 120S, minimum 10 watts on low power for the Argosy. operating time ranges from five to ten hours a week. Total cost of the system is shown below:

Arco panel	$230*
SCI charge regulator	$35
marine battery	$65
total	$330

*discounted price

"Assuming a ten year life for the system, the cost is not unreasonable, at $33 annually or $2.75 monthly. Hopefully, the components will last longer.

"For portable QRP operation, the ARCO "Genesis" solar panel and a small ni-cad or other sealed battery, readily available at most hamfests, is very suitable. The "Genesis" panel is rated at 14.5 volts, .35 amps, 5 watts. I obtained mine from Specs, Inc. for $65, postage included.

"Considering the advantages of solar power (no line noise or voltage spikes, and complete independence of the local power company), it is well worth the cost. Also, it's a great conversation starter for QSOs.

"Two excellent sources of information and solar modules are:

Real Goods Trading Company, publishers of the Alternate Energy Sourcebook, at 308 East Perkins St., Ukiah, CA 95482. (707)468-9214

Specs, Inc., P.O. Box 155, Montrose, CA 91020. (818)248-4444 A free technical newsletter is published periodically."

QRPing the ICOM IC-730

Jerry NR5A/0 writes to explain a procedure he learned about from Jay KV7X:

1. Remove screws and take off the top cover.
2. Locate main circuit board (top view 7-1 page 23 in IC-730 manual).
3. Find the 100-50 watt switch located above the ICOM name on the circuit board.
4. Flip the switch to the 50 watt position.
5. Turn drive control down (fully CCW)
6. Locate pot 149 (transmit 10W ADJ) also on the main circuit board.
7. Turn pot 149 all the way down.
8. Put top cover back on rig and go for it!

"According to Jay, this gives a range of 1.015 watts to 10 watts output. All I did was steps 1, 2, 3, 4, and 8 and I get a range of 2 to 60 watts out. I checked the manual out, spent an hour at least trying to find something about this in it and there is nothing mentioned. I think it should be passed around for other QRPers running the 730."

QRP With the Kenwood TS-430

James also sent along information on using the Kenwood TS- 430 on QRP:

"For CW-QRP, adjust the CARrier control for the desired RF output. My 430 can be adjusted anywhere from 100 to under 1 watt of RF.

"After long periods of operation or band changes, the power level may vary and can be corrected by readjusting CARrier level again.

"For SSB, the MICrophone gain will have to be adjusted for the desired RF output on voice peaks. The PROcessor, whether in/out, will change the RF output.

"For AM, CARrier and MICrophone levels are adjusted so that the unmodulated carrier is around 2/3 of a fully modulated carrier. This can also be monitored on the ammeter (IC) on the 430."

Inexpensive Antenna Insulators

Finally, Rock suggests that, if you have trouble finding antenna insulators, to visit your local farm store and check out the electric fence insulators. They are quite strong and have a very good price. I have been using some called 'Red Snappers' which are red colored strain insulators, similar to the Radio Shack #270-1518 (but much cheaper) to hold up my 160 meter 'T' antenna for the last 4 years without a failure.

CB Mods?

From James G. Coote WB6AAM, I have received a few suggestions:

James suggests that maybe CB sets could be converted to the 24.9 MHz band or just retuned a bit and used as AM rigs to loan to new Novices. Has anyone done any simple mods or retuning that could be done by Novices?

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.

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

COVER STORY

RANDY RAND AA2U

Those of you who worked the Spring QSO Party will recall the potent 750mw signal of Randy Rand AA2U. I listened to him run a string of western stations as though he were running a KW; he owned the frequency! Yes, 40 was good that morning, but so was Randy! Randy's involvement in QRP and ARCI goes back to 1977, with his number in the 3000's. Randy's present station includes an Argonaut 509, a TenTec 405 amplifier, and ICOM 730 adjustable from 3 W down to 75 mW. The 2 M rig is an ICOM 271. Randy's commitment to QRP is evidenced by the BIRD 4410 Wattmeter in the background.

Randy holds a 4 band DXCC-QRP with 82 countries confirmed on 80M. He also holds QRP-WAS and has achieved 150,000,000 miles/watt!! Randy also has numerous trans-atlantic QRP QSOs in the milliwatts. As you can see in the cover pix, he earned Ade Weiss' QRP DXCC #51 as well as the ARRL "clean sweep" award for the 50th Sweepstakes -- QRP of course!

So, how does he do it? Listen closely; Randy's antennas are horizontal and vertical loops, dipoles and a half wave vertical. His operating advice is thus:

1. Listen, spend a lot of time monitoring and learning the nature of the band.

2. Put yourself in the other guy's shoes: Am I sending too fast? Are my letters and words evenly spaced? Am I using a clear pattern, ie: RST, QTH and name? If asked to repeat, always repeat in the same format and order.

3. Learn the sound of the DX staion. There are many clues which will become apparent with time and listening.

4. Put up the best antenna that you can.

Randy's future goals include completing his 5 band DXCC, 5 Band WAS, DXCC milliwatt, the Golden Jubilee award and some 160M work, having built the KN1H 160M Transverter. Sounds like a full in-basket to me, but he's up to it. How about a run at the Fall QSO Party Championship?

NAANY Almost Got My Goat

by Mary Lou Brown NM7N

In spite of solar minimum conditions, 1986 turned out to be a fun year for DXing. In 1985, the Western Washington DX Club printed, in their Totem Tabloid, the rules and requirements for the NAANY AWARD, Nightmare Alex's Alpha Numeric Year Award. Nightmare Alex, K7ZR, is the editor of the WWDXC's monthly newsletter, the Totem Tabloid. After reading about the award, the OM, NM7M, put out the challenge, in his WSN QRP Notes, to the QRPers to take part.

Before proceding further, I'd like to give a brief rundown on the rules for the NAANY. Taking the last number in a call sign and the first letter after that number, there are 260 combinations possible (for each number, 0-9, there are 26 letters, A-Z). The object of the award is to work 250 of the possible combinations in one calendar year. Only DX contacts not in one's continent count. For us, that rules out KL7's, VE's OX, FP, Central America and most of the Caribbean. Once I started, I encountered a problem: how to score calls like KB6CBD/KH2 or AH8/JJ1TZK. Nightmare Alex informed me that they would be a 6C and a 1T.

Since I enjoy chasing DX, working on the award sounded like a fun thing to do. Also, since I am a firm believer in the wonders of QRP, I decided to go for it using only QRP, 5 watts or less output, and CW. So, starting January 1, 1986, I started searching for "NAANYs" to fill in the chart I had made. At first it was pretty easy as almost every DX station worked was a "keeper". The only hard part was that I had to fight off the OM for the use of the quad as he was also working on the NAANY. By the end of January, I was well on my way with 70 contacts (15 different countries). Another 86 were added in February for a total of 156 contacts. Matters were most encouraging. By the middle of March, when I left for an eight week trip, I had 174 NAANYs completed. During the trip I had very little air time and only a Hustler whip, so made no progress, just three more. After my flying start, I essentially ground to a halt for two months. The OM was way ahead of me by the time I returned home.

I did not have much air time during May, so added ony nine more (total 186). Things were starting to get pretty tough. It was hard to find alpha-numeric combinations to fit the blanks on my score sheet. Things dribbled along during the summer with lots of time outs for hiking, gardening, company, Field Day, hamfest, etc. No NAANYs were added in June, 12 in July, and seven in August (total 205). It was really getting difficult and I only had four months to get the final 45 needed (10.5 per month). The rate conditions were going, things looked pretty grim. The OM only had a handful to go!

September was a bust, no NAANYs as I was busy with contests, hamfests, and traveling. Now I needed to get 15 each of the remaining months of the year. In spite of entering three contests, October turned out to be a very good month as I picked up 33! The rise in solar flux starting the 16th of October and continuing into the first week of November was a life saver! It accounted for 23 of the October contacts and five of the needed final 12. Having the solar flux in the upper 80's and 90's was great after so long a time in the 60's and 70's. It was also good that the magnetic field was fairly quiet. I found such a combination of conditions to be helpful when trying to contact Europe.

Starting in December, only one more NAANY was needed. With each day I became more anxious, but finally on December 7th, when checking out 15 meters, I heard YV5HMH, the only signal on the band. He was only 539, but being desperate I tried anyway and got him! I think he must have ben desperate too and listened very carefully and came up with a 529 signal report. It all took 11 months, 6 days, 17 hours and 47 minutes. Considering I had been away and pretty much off the air for about four months during the year, I felt pretty good and ready for the Martini with six onions and six olives the OM had ready for me.

Of the 250 stations worked for the award, 34% were from Asia, 22% from Oceania, 27% from Europe and 17% from South America. One African station, D44BC, was worked. A total of 68 different countries from the DXCC list were worked. There were also several other countries that were new to me, but did not count for the award. The number 9 seemed to be the hardest to fill, as I had seven blanks in the 9 column at the end and one blank each in 5, 8, and 0.

The main strategy used in my quest was the "hunt and pounce" technique. This involved prowling the bands looking for needed stations calling "CQ" or engaged in QSOs I could tail-end. Calling "CQ" myself was practically useless as it tended to raise only JA's that I didn't need. Actually, that approach produced no NAANYs.

In answering a "CQ", one hopes the rest of the world is also not waiting to pounce. If a pile-up does occur, a QRPer has very little chance sitting in the middle of the pile-up. For this situation two approaches were used: try to send during the cracks when everyone else stops briefly, or working the edges of the pile-up. For the former, there is usually only time to drop one's call and omit the /QRP.

Fred Turpin, K6MDJ, presented the special NAANY award to Bob NM7M and Mary Lou NM7N Brown. Bob stayed home but Mary Lou was on hand to accept the award at Dayton '87. President Les Shattuck WB2IPX appears in the background. Photo by Tom Root WB8UUJ.

Occasionally, just sending QRP in a crack can produce a contact, as the desired station may come back "QRP only". It's surprising how many kilowatt stations think they are QRP! Usually when operating QRP, I send a little slower as my signal may be hard to copy, but when slipping into a crack of a pile-up, sending a little faster seems to help. Working the ends of the pile-up is a lot of fun.

It is a good idea to study the pile-up and see where the DX station is picking up signals. Some stations systematically work their way up from the low end to the high end and back down. Other stations are more erratic, picking off stations at the ends, or middle with no particular pattern. If the station is working a pattern, one can jump ahead a bit and hope he picks you up. Operating in the middle is rarely productive, as a QRP signal is lost in the QRM. A weak signal stands out much better at the ends where the QRM is much less.

Having luck on your side is also a help. Answering the first "CQ" of a coveted DX staion just getting on the air frequently produces a QSO. Hearing the wall-to-wall QRM when you finish makes one feel pretty good. "Crying QRP tears" (sending one's call/QRP) sometimes produces a result when a station is going QRT. Most stations seem to want to give the QRPers a break. Notes on the QSL cards show that DX stations are impressed with one's QRP efforts and respond with cards better than if one is operating QRO.

Band conditions also greatly affect one's progress. During periods of low solar flux, the less the magnetic activity the better. There will be times when flux is very low that you can hear DX stations, but they can't hear you. If you listen a bit and read the mail, you will note that they have big antennas and are running a lot of power. The stations they work are also running a fair amount of power and have antennas with a lot of gain. As the flux picks up, providing the magnetic activity stays low, one's chances pick up.

Generally, for me to reach Europe from Western Washington, the flux had to be 75 or above. If the A index

continued page 25

NET NEWS

conducted by Danny Gingell K3TKS
3052 Fairland Road,
Silver Spring, MD 20904

While most of us are aware of the existance of the ARCI QRP NETS, I wonder how many of us actually participate in this activity of the club. I actually have a very good idea of the actual numbers since I am the individual who has accepted the position of Net QNI RECORDKEEPER. I have just recently completed the BIG BOOK. I now have a 3 inch Notebook containing over 250 pages. One for each member who has participated on the nets in the past with any regularity. (Five or more QNI). I am very favorably impressed by the results that I have seen. I would like to encourage each of you to QNI whenever you can. I assure you that we are not just looking for more numbers to put on the records. We want all of you to know what pleasure can be had by regular participation on the Nets. I feel that we have really developed some keen friendships and had a lot of good fun on the nets in the past and am looking forward to continuing the same in the future. I would like to take this opportunity to extend my vote of thanks (TKS) to each and everyone of you who have acted as NCS or ANCS or even just helped with the nets this year. We have tried to keep them as informal as possible and will continue to do so in the future. We want to make everyone feel welcome on the ARCI QRP NETS. That includes the occasional QRO who checks in to see what it is all about. I have heard some very favorable comments from some of the "BIG GUNS" about us. Lets keep those good feelings. I would like to remind each of you that we no longer wait for you to apply for a QNI AWARD. I will refer those eligible for a QNI Award to our Awards Manager who will make sure you get your free Net Wallpaper. Due to the fact that there is evidence of omissions in some of my records, I would like to invite any who have not received a net QNI AWARD and who believe that they should have, to drop me a line. Please include a large S.A.S.E. and, if possible, the log data for your check-in's. I promise to look into each as promptly as possible. Of course, If you guys flood me with requests and information, you might be enlisted as helpers.

We have included an update of the net activity for the 1987 QRP ARCI QNI CONTEST. I have not shown the scores in these figures, just the total number of check-in's for each member.

I will leave the details of the awards to our award manager.The contest rules are actually quite simple. Just check-in to as many nets as often as you can. Extra points will be awarded to Eastern division stations who QNI Western Nets and vice versa. For example a 3 land station will receive Bonus points for each QNI to TCN, GSN or WSN. A 6 land station will receive bonus points for each QNI to NEN, SEN, or GLN.

We hope that each of you will try to join us on the nets this coming year. We are here to serve you. We even try to bring you a bit of News from time to time, although I must admit it has not always been what you wanted to hear or on time. Yes, we even manage to pass a message along once in a while.

Fear not, the Nets are for fun not work. I had the pleasure of a nice long QSO with my new Twofer Xmtr right after net today.

We encourage using the nets to try out that new homebrew.

TKS QNI CU ON NET ES QRP DX TU

De K3TKS/ W1FMR/ K2JT/ W5LXS/ W6RCP/ NM7M/ NJ7M

The QRP Amateur Radio Club International

QRP QNI 100 HONOR ROLL

July 2, 1987

CALLSIGN	TOTAL	NAME	STATE
K3TKS	598	DANNY GINGELL	MARYLAND
W6RCP	517	JIM HOLME	0OREGON
W1FMR	341	JIM FITTON	MASS.
NM7M	335	BOB BROWN	WASHINGTON
NJ7M	273	CHUCK LINDSAY	IDAHO
K8IF	246	THOM DAVIS	MICHIGAN
K4AHK	218	BILL HARDING	VIRGINIA
W6JHQ	212	TOM BROWN	CALIFORNIA
WB2IPX	169	LES SHATTUCK	VIRGINIA
W5LXS	169	ROGER ROSE	TEXAS
K6MDJ	168	FRED TURPIN	CALIFORNIA
WN6F	156	BRIAN GREER	CALIFORNIA
WA9WZV/4	150	GARY BEAM	FLORIDA
W5QJM	147	FRED BONIVITA	TEXAS
KV7X	147	JAY STURDIVANT	WASHINGTON
K5BOT	146	ED POPP	TEXAS
N6GA	130	CAM HARTFORD	CALIFORNIA
W3TS	124	MIKE MICHAEL	PENN.
W6SKQ	120	BOB SPIDELL	CALIFORNIA
WB8ZWW	106	WAYNE MATSON	OHIO
XE2IOF/NW6F	106	JAKE JACOBS	MEXICO/CA.
W6SIY	105	KEITH CLARK	CALIFORNIA
N7IS	101	GEORGE BOWMAN	WASHINGTON
KH6CP/1	100	ZACHARY LAU	CONN.
KD6OQ	98	JOE KNOWLES	CALIFORNIA
WB7BIV	88	BOB JOINER	OREGON
KA6SOC	86	SUE LUDEMANN	CALIFORNIA
WD9EGW	85	CHUCK KUHN	ILLINOIS
WB1ESN	84	DOUG CRITTENDON	MASS.
KZ3I	82	BILL SLABONIK	ALASKA
K5V0L	82	RED REYNOLDS	ILLINOIS
WD4LOO	81	ED LAPPI	N.CAROLINA
WS2L (WB2IVX)	79	BOB HAZELTON	N YORK
WF6D	79	BILL YOUNG	CALIFORNIA
WA6FLN	79	ALEX PODOVINNIKOFF	CALIF
W5TTE	78	ED DE BUVITZ	NEW MEXICO
K2JT	70	JOE MEAD	NEW JERSEY

Spirit of QRP...

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tober, 1919 the Navy Department lifted the ban and amateurs were back on the airwaves, 200 meters and below.

THE AUDION

During WWI a few amateurs had worked with a fairly new discovery in electronics, the "Audion" (vacuum tube). They knew that a vacuum tube operating with a few watts of power could outperform spark gap transmitters of one thousand watts. In order to use the audion in transmitters, receiving equipment with better selectivity had to be designed. The continuous-wave (CW) operation of the audion used 1% of the bandwidth required for spark transmissions, which reduced interference immensely.

FAMOUS AMATEURS

Edwin Armstrong was responsible for the discovery of regeneration, superheterodyne and frequency modulation receiving circuits, for which he was awarded the Medal of Honor of the Institute of Radio Engineers in 1918.

John L. Reinartz designed the famous Reinartz shortwave receiver, which was used by amateurs in the 1920's.

Frank Conrad designed and built the first commercial broadcasting station.

Since there were no transmitting tubes available to amateurs until 1921, some built their own. Then in 1921, RCA and GE announced three transmitting tubes in 5,50,and 250 watt versions, at prices of $8, $30 and $110 respectively.

FIRST TRANSATLANTIC RECEPTION

The autumn of 1923 was recorded as the highest point in all of amateur radio, Frenchman Leon Deloy, 8AB, visited the U.S. to learn all he could about American amateurs. He purchased equipment and returned to France. On November 25, 1923 Deloy was ready. He sent a telegram to the ARRL stating he would start transmitting on 100 meters (3.0 MHz) at 9pm. The first night several American amateurs heard him, but Deloy couldn't hear the American amateurs' signals. The second night was no better, but on the evening of November 27th, he copied answers to his transmissions from John Reinartz, W1XAM, and Fred Schnell, W1MO. Deloy answered their calls with the phrase, " This is a fine day!" and signed off.

" We did it !" was the cry of amateurs around the world. Using the shortest wavelengths ever, we had communicated with each other across the Atlantic. During the next year new records were set almost daily. One American amateur accomplished this feat using a 5 watt tube, effectively ushering in the era of QRP communications. The first two-way voice contact followed soon thereafter.

By 1924 16,000 American amateurs were linking the world by radio, and 10,000 mile contacts were being made routinely. The governments of the United States, Canada, France and Italy asked amateurs to help with a series of tests to further research on the use of these formerly "useless" wavelengths.

NEW FREQUENCIES

With pressure being put on these newly discovered shortwave frequencies by an increasing number of government and commercial stations, the ARRL began negotiations with the Department of Commerce for permission to use still higher frequencies. In August of 1924, amateurs received the following frequencies: 75-80 meters (3.75-4.0 MHz), 40-43 meters (7.0-7.5 MHz), 20-23 meters (13-15 MHz), and 4-5 meters (60-75 MHz). Only CW communication could be used on these frequencies, which signalled the death of the spark gap transmitters.

For twenty years the most prominent scientists had believed that long distance propagation of wavelengths shorter than 200 meters was totally impossible or impractical. This makes what amateurs accomplished all the more remarkable, and shows how the spirit of QRP operation was one of the forces that opened up the era of shortwave communications that we enjoy as radio amateurs.

What new frontiers await the QRP'ers of today?

NAANY...

continued from p. 23

was above 10, the flux had to be in the 80's and 90's. To work Europe when the flux was below 75, the magnetic field had to be quiet (A = 7 or less). Of course, there was an occasional exception to the rule, so it doesn't hurt to try even if conditions are poor.

During these times of low solar flux it is uncommon to work stations which are using just a vertical or dipole antenna. If the station has a big beam or monster quad, it is much more likely to hear a QRP station. It also matters what kind of antenna you have. The more gain, the better your chance of making the contact. Under present band conditions, a QRPer just can't survive chasing a lot of DX with a compromise antenna.

Now that you have the scoop on the NAANY, starting next January I expect to hear a lot of QRPers chasing DX and trying to complete the NAANY. Just be patient and don't let NAANY get your goat.

Contests...

continued from p. 16

On a positive note, a new supply of contest certificates has been obtained and these have been sent to the award winners. Next year (1988), the requirements for receiving a contest award will be tightened up, making it more difficult to obtain, but also more meaningful for those obtaining one.

For the gang that prefers a one-band entry, four contests now have a single band entry. Check the Fall QSO Party and new Holiday Spirits sprint for this change. The same four activities contain bonus points for the use of homebrew gear. The homebrew sprints also indicate the use of homebuilt equipment in the exchange, with bonus points for working a homebrewer.

Note that in the future, except for the Hoot Owl Sprint, all contest activites fall on the second full weekend of the month in which they occur. Also, the Hoot Owl Sprint will move to a more reasonable LOCAL time.

I will see all of you QRPers in the October party and December sprint. It will be interesting to see what the single-banders do.

BOARD OF DIRECTORS ELECTION

The April 1987 issue of the Quarterly requested nominations for the elections of members of the Board of Directors to replace three members whose terms expire on December 31, 1987. Nominations closed on August 1 and there are seven nominees for those positions. Their biographical data follows, taking the nominees in alphabetical order.

Ray Colbert, W5XE, has been licensed since 1956 and received his Extra Class license in 1968. Ray joined the U.S. Air Force in 1959 and served there for a number of years before taking up other positions with the Federal Government in the field of radio communications. As a result of his experience, he is a member of the Society of Wireless Pioneers. He has been an active CW operator since the early '60s and started QRP operations in 1976. He has been active on TCN, participated in a number of QRP ARCI contests as well as Field Day operations. He hopes to bring this operating experience as well as his technical background and skills to bear on projects and activities which will be coming before the Board in the future.

John Collins, KN1H, has been licensed in 1977 and holds an Extra Class license. John has operated at QRP levels from the beginning and he joined QRP ARCI in 1981 after stumbling into one of our QSO parties. Since then he had pursued low-power operation with homebrew gear at the milliwatt level as well as working with QRP above and below the HF bands, on 160M and VHF. Presently, John is seeking re-election to the Board of Directors and hopes to encourage more home-brew activity, both in building equipment and having home-brew contests. In addition, with the growth of QRP ARCI, he would like to encourage forming local or regional QRP clubs.

Ed DeBuvitz, W5TTE, has been an amateur radio operator for over thirty years and received his Extra Class license in 1983. Ed's professional career has been in writing and radio broadcasting. He started QRPing in the early '70s and has been active in contesting and working toward QRP ARCI awards. As one devoted to communications, Ed would like to see more of it within our Club to maintain our enthusiasm for QRPing and lead to greater participation in our activities. Also, he would like to see a system of bonus credits in our contests which would ameliorate the disadvantages that some operators suffer because they lack the space or resources for beam antennas.

Paula Franke, WB9TBU, was first licensed in 1976 and holds an Extra Class license. Paula is currently self-employed as a writer for TV, newspapers and magazines; in addition, she teaches courses in these subjects at Governors State University. She has been a Director and past Secretary of the Joliet Amateur Radio Society and currently is President of that organization. Paula is a member of the Michigan QRP Club, the G-QRP Club and YLRL. At the present time, she writes a monthly QRP column for the Radiosporting magazine and serves as an assistant to the Editor of our QRP Quarterly. While she has been an active QRPer since first being licensed, she joined QRP ARCI thanks to her introduction to the Club at the '86 Dayton Hamvention. As a Director, she would like to encourage new QRP ARCI publications such as paperback books on QRP operating, antennas, propagation and collections of selected articles from back issues of the Quarterly.

Carol Kirk, KA5GIS/1, has been licensed for eight years and now holds an Advanced Class license. While she joined QRP ARCI in 1984, she has ben active in QRP ARCI contests as well as operating at a QRP power level in the ARRL Sweepstakes. In addition, she has been involved in QRP Net activities, in spite of frequent moves around the country because of her husband's employment, and she has also operated using digital modes at the QRP level. With her interests in QRP operation, she hopes to foster more QRP activity in the ham community if elected to the Board.

Robert Reynolds, K5VOL, has been licensed since 1959 and holds an Extra Class license. "Red", as he's called, has been a member of the QRP ARCI since 1978 and currently serves on the Board of Directors. Among his other affiliations are the Michigan QRP Club, the G-QRP CLub, QCWA and ARRL; other of his amateur radio activities include serving as volunteer examiner (VE) as well as home-brewing QRP rigs and working in the 1-watt range in QRP contests and Field Day. Currently, Red has taken on the responsibilities of Contest Manager for the Club. If re-elected to the Board, Red hopes to encourage continued growth of the Club as well as increased participation in its activities, contests and awards program.

Les Shattuck, WB2IPX, was first licensed in 1963 and has been a member of QRP ARCI since 1978. Currently, Les is completing a term as President of the QRP ARCI. Earlier, he served as Vice-President. Les works in the field of electronics and has been active as a QRPer, earning WAS/QRP, WAC/QRP and DXCC/QRP (Milliwatt Trophy #63) as well as QNI-100 endorsements for NEN, SEN and TCN. With 4 years experience as an officer, Les indicates that if he is elected to the Board, he can provide a sound base of Club procedure and knowledge to support the new officers of the Club in the times ahead.

Editorial deadlines are Jan. 25, Apr. 25, Aug.1 and Nov. 1. 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 an SASE if you wish material to be returned or when requesting a reply from officers or authors.

The QRP Candy Store

Operated for QRP ARCI by Bob Spidell, W6SKQ 45020 N. Camolin Ave., Lancaster, CA. 93534

Logo T-shirts: $7 plus pp. These are quality American made shirts by "Russell." A white, 50/50 poly/cotton blend that shrinks less than 1%. They're not too full and have good tail length. S: 34-36, M: 38-40, L: 42-44, XL: 46

Logo Ball Caps: $6 plus pp. Choose solid white with black screened 3¾" logo or solid black with white screened logo. High quality caps with "sharp" screening. Adjustable, one size fits all.

Cloisonne logo pins: $4 plus pp. The "cloisonné" process produces jewelry of quality. One inch copy of our logo diestruck in brass and buffed out, then hand filled with crimson blue procelain/enamel and rebuffed. Military clutch back only.

Logo stickers: These stickers are peeloff type, available white or clear acetate, both printed in black with the 1 1/8" oval logo. A good way to draw attention to QRP by their presence on your QSLs, clear copies add a finishing touch to home brew gear.

Frequency chart: $3.50 plus pp*. Handsome 13 color, 16"x20" masterpiece by printer/ham, Robert Rover, KB6DYM. Spectrum from sound through Gamma Rays in high resolution printing with details from 300 kHz through 3 GHz. Sharp imprinting of QRP logo, Club net schedules and QRP Frequencies. *This chart can not be mailed separately, we will only mail it together with boxed shirts and caps.

Logo stationery: $6 plus pp. The letterhead accepts your computer generated custom header. Envelopes will take your personal return address labels or stamp. Crisp resolution on white 50# ragbond in raised black thermography. Count: 25 letterhead, 25 blank second sheets and 25 matching envelopes.

VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE

VOTE*VOTE*VOTE*VOTE*VOTE

*** BALLOTS ARE DUE DECEMBER 1, 1987 ***

Clip and mail to: Bob Brown NM7M, Secretary/Treasurer
504 Channel View Drive
Anacortes, Washington 98221

VOTE FOR THREE CANDIDATES

- [ ] Ray Colbert W5XE
- [ ] John Collins KN1H
- [ ] Ed DeBuvitz W5TTE
- [ ] Paula Franke WB9TBU
- [ ] Carol Kirk KA5GIS/1
- [ ] Robert Reynolds K5VOL
- [ ] Les Shattuck WB2IPX

VOTE*VOTE*VOTE*VOTE*VOTE

VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE*VOTE* VOTE*VOTE*VOTE*VOTE

New Member / Renewal Data Sheet

Call Handle Recommended by
Age Occupation
License Class Held since Other calls
Rig TX RX Ant
Bands most used (rank in order of use:
160 80
40 30 20 15 12 10
6 2 VHF/UHF

Please circle your interests and elaborate if desired on separate sheet. Thanks!
Rag Chewing DXing Contests Traffic Award
Homebrew Experimenting CW SSB RTTY
ATV Packet VHF/UHF Satellite Other:_____

Do you plan to participate in club activities? Y/N
Would you like to be a club officer/director? Y/N
Do you have access to duplication equipment? Y/N
Are you interested in our award program? Y/N
Have you applied for any of the club awards? Y/N
Are you in favor of QRP calling frequencies? Y/N
Are you in favor of member QSO parties? Y/N
Would you help write for the *Quarterly?* *Y/N*

What subjects?
What awards/achievements have you won with QRP?
Why do you run low power?

[ ] Renew for _______ years. (U.S. $10, DX $12)
[ ] New Member _______ years. (U.S. $11, DX $13)
[ ] Change of Address
[ ] Change of Call/New Call _______

Name:____________________ Address:____________________
City:__________ State/Country:__________ Postal Code:__________
Amount enclosed_______ QRP ARCI #_______ Call_______

PLEASE MAKE YOUR CHECK OR MONEY ORDER PAYABLE TO:
QRP Amateur Radio Club, International
* * * * * PLEASE DO NOT SEND CASH * * * * *

Bill Harding, K4AHK
10923 Carters Oak Way
Burke, VA 22015

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QRP NET SCHEDULE 1987

NET	QRG	NCS	DAY/HR UTC
TCN*	14060	W5LXS	SUNDAY 2300
SEN**	7030	K3TKS	+WED. 0100
GSN	3560	W5LXS	+THURS. 0200
GLN	3560	K2JT	+THURS. 0200
WSN-80	3558	NM7M W6RCP	+SAT. 0400
NEN	7040	W1FMR	SATURDAY 1300
WSN-40	7040	NM7M W6RCP	SATURDAY 1700

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

** If conditions on 7030KHz are poor, QSY to 3535KHz at 0130 UTC.

Please note that 3535KHz is the Michigan QRP Club Net Frequency at 0200 UTC.(NCS = K8JRO)

+ Evening of the day before of W/VE.

GSN40 7040 W5LXS +THURSDAY 0100
Experimental trial Net to evaluate conditions, QNI credit to GSN

WSN40-SSB 7285 NJ7M WEDNESDAY 2000
Provisional Net, not yet sanctioned for awards.

INFO on the VEQRP Net: Sundays at 1900Z on 14.060, NCS is Moe Lynn VE6BLY (10644 146th St., Edmonton, AB T5N 3A7).

QRP DXTU

Danny Gingell, K3TKS
QRP ARCI NETWORK MANAGER

PUBLISHER'S NOTE:To insure every subscriber receives every issue, we have set up a system to send missing issues from here. We expect the *Quarterly* to go out on a regular schedule now, so if you do not receive your copy by the end of the month in which the issue is dated (i.e. January, April, July and October), drop a card to us and we will forward a copy to you first class.

RENEWALS: Renewals should not be send to the Publisher. When we receive your renewal we have to forward it to K4AHK. That additional handling could cause you to receive your issue late. All renewals should go directly to Bill Harding, K4AHK, 10923 Carters Oak Way, Burke, Virginia 22015.

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