QRP Quarterly

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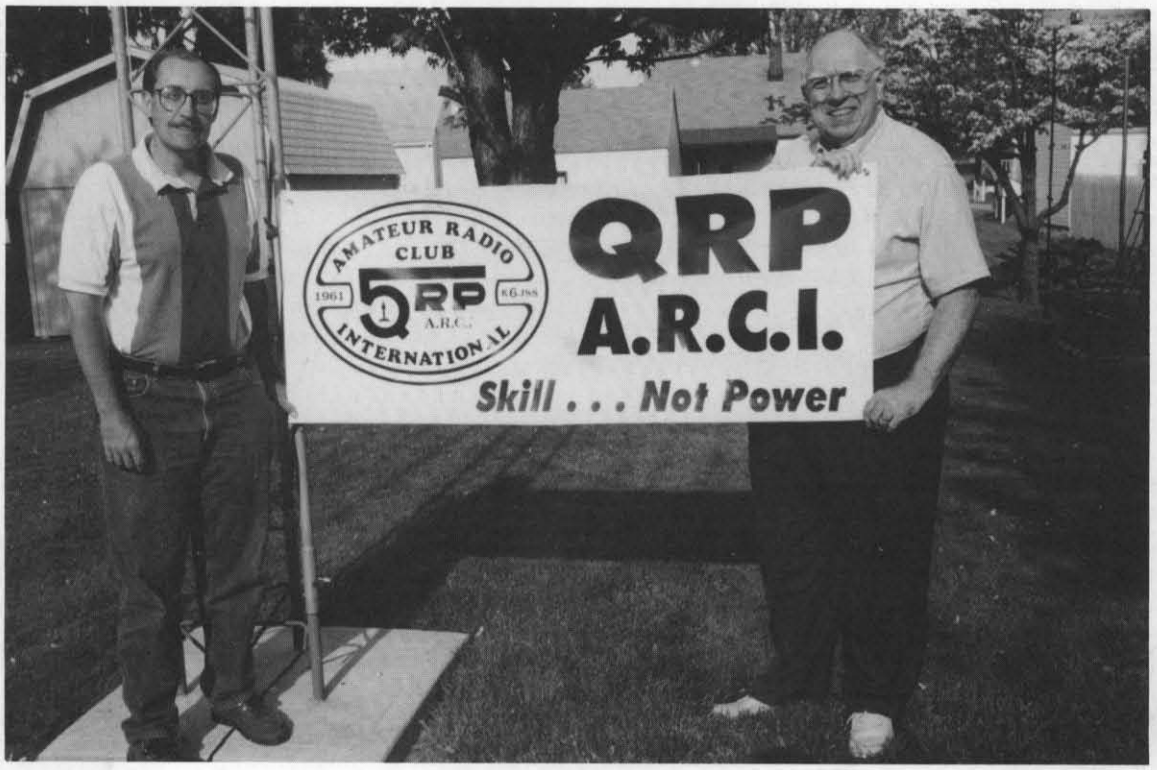

QRP ARCI Secretary-Treasurer Myron N8DHT (right) and fellow QRPer Randy KD8JN display one of the new all-vinyl Club banners that are available for use by members throughout the world for hamfests, field days, mall shows, etc. The 2'x5' banners are available on loan from each of the Club's three Regional Directors, the President and the Secretary-Treasurer.

From the President
Club Changes; Call for Nominations

As most of you know, in March, Les Shattuck WN2V resigned as QRP-ARCI President. As Vice-President, I took the office of Acting president, up receipt of Les' letter (3/13/95). Realizing that many problems needed to be resolved prior to our annual meeting in Dayton, the following steps were taken:

1. The Board of Directors consisted of three active members (WA8MCQ, K3TKS and KI6DS), all other terms had expired and no elections had been called to fill vacancies. As an interim solution, W1FMR, WB9TBU and K8DD had been called to fill vacancies through 12/31/95. This gave us the minimum number of Directors, required in the By-Laws.
2. The By-Laws were modified to allow the Club to function in an efficient and practical fashion. The number of Directors was changed to six, with three members being regional (East, Central and West, per ARRL divisions) and three being at-large members.
3. The By-Laws were modified to allow the President, in emergency situations, to appoint BOD members to fill vacancies, for the completion of their term.
4. The By-Laws were updated to reflect the annual meeting as taking place at Dayton Hamvention. Additionally, the election language was clarified and simplified, specifying how and when elections will be called.

On Saturday, 29 April 1995, the BOD met and approved the above changes to the By-Laws. I was elected President and Mike Czuhajewski WA8MCQ was elected to be the Vice President, both for a term of two years (Mike will also be a Director through 12/31/95). Area representatives through 12/31/95 will be: Eastern–WA8MCQ; Central–K8DD; Western–KI6DS. These gentlemen will serve as "lightning rods" for input from the membership and the local/area clubs within their areas.

We have banners available for local/regional swaps, they are described on the front cover of this issue, and are available from the three area reps, Myron, or myself. QRP-ARCI wants to have a presence at more than just Dayton! If you would be willing to host a booth or program session at a local/regional swap, please let us know. You can have a banner, membership information and, if necessary, financial support for the booth, program costs, etc. The banners will be at both HamCom in Houston in June and in California.

Obviously, lots has happened in the past few months and more changes are on the way. We will be changing the terms of office for BOD members and also the schedule for elections. We will call for nominations to the BOD in this issue of the QQ, with the slate of candidates and ballots to be printed in the October 1995 QQ. Terms for the 1995 BOD will be: two members for two years, two members for four years, and two members for six years. Elections will be held every two years for two seats. After the 1995 elections, all directors will serve a four-year term. All the details of this election procedure have not been resolved, but will be in place prior to the 10/95 elections.

The purpose of these changes is to streamline the Club's operations and make the Club more responsive to the needs/desires of the membership and through them, assist the local/regional clubs in whatever way we can. The future looks brought and the path ahead is a lot clearer. With your assistance and help, we can make the QRP-ARCI *THE* national organization we all knew it could be in the first place.

72/73, Buck N8CQA
President, QRP-ARCI

New Editor Joins the Quarterly Staff

Hello from sagebrush country USA, home of the Biggest Little City in the World, Reno, Nevada.

Before I say anything about me, I would like to pay tribute to Paula Franke, WB9TBU, for the years of hard work and dedication she has given to the QRP ARCI, it's quarterly journal and amateur radio overall. Thank you from all of us.

You may be wondering how I became the replacement for Paula. It all started on the Internet QRP reflector, qrp-l. Michael Czuhajewski, WA8MCQ, asked for people to help the QRP ARCI. I said "I'm willing to do whatever is needed Mike"! From there it went to Buck Switzer, N8CQA, the then acting president. Before accepting the position I talked with Paula and received her assurance that she would be there to help me as needed.

I became licensed in 1953 as WN6JXO. Soon it was W6JXO. Along with a home-brew 6ag7 rig on 40 meters, I ran two watts of AM on 10 meters. In 1954 I went into the US Army and was stationed in Germany where I held the call of DL4RF. I used some army ten watt FM rigs on 10 meters and talked to many of my friends in California. Then it was back to civilian life, get married, (had our 37th while I was in Dayton!), have babies and try to get by. We moved to Idaho in 1975 where I became N7CRV and then KU7Y. In 1986 we moved to Nevada. I now work for The Desert Research Institute as a Field Technician II where I am involved with the Cloud Seeding program. Carol and I have three children and five grand children.

I enjoy chasing DX, rag chewing and contesting all with QRP. I also like building and playing with antennas. In my pick-up truck I have a TS130S and am usually on 40 meters near 7040 while driving to and from work. In the house I have a NorCal 40a, MFJ 9040, TS930AT and a little Tuna Tin II somewhere in a box! And sitting on the bench waiting to be built is an Oak Hills WM-1, a little antenna tuner from Kanga and a broad band pre amp from the Ten Tec booth at Dayton.

We need to know what you want to see in the Journal. You can send your comments to Larry East, W1HUE, using the Post Office or you can send them via the Internet to those of us who have that service. My E-Mail address is ku7y@sage.dri.edu. No matter which way you do it, please let us know how we are doing.

72, Monte "Ron" Stark

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A Multiband Modular Amateur Station Based on the Rick Campbell R2/T2 modules

by John Seboldt, K0JD
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This is my approach to using the marvelous single-signal direct-conversion R2 receiver design in a multiband, modular amateur station. [1] [2] My CW station has been built and operating for some time; the setup that includes the T2 phasing SSB exciter is proposed only.

Here is my currently-operating CW-only setup:

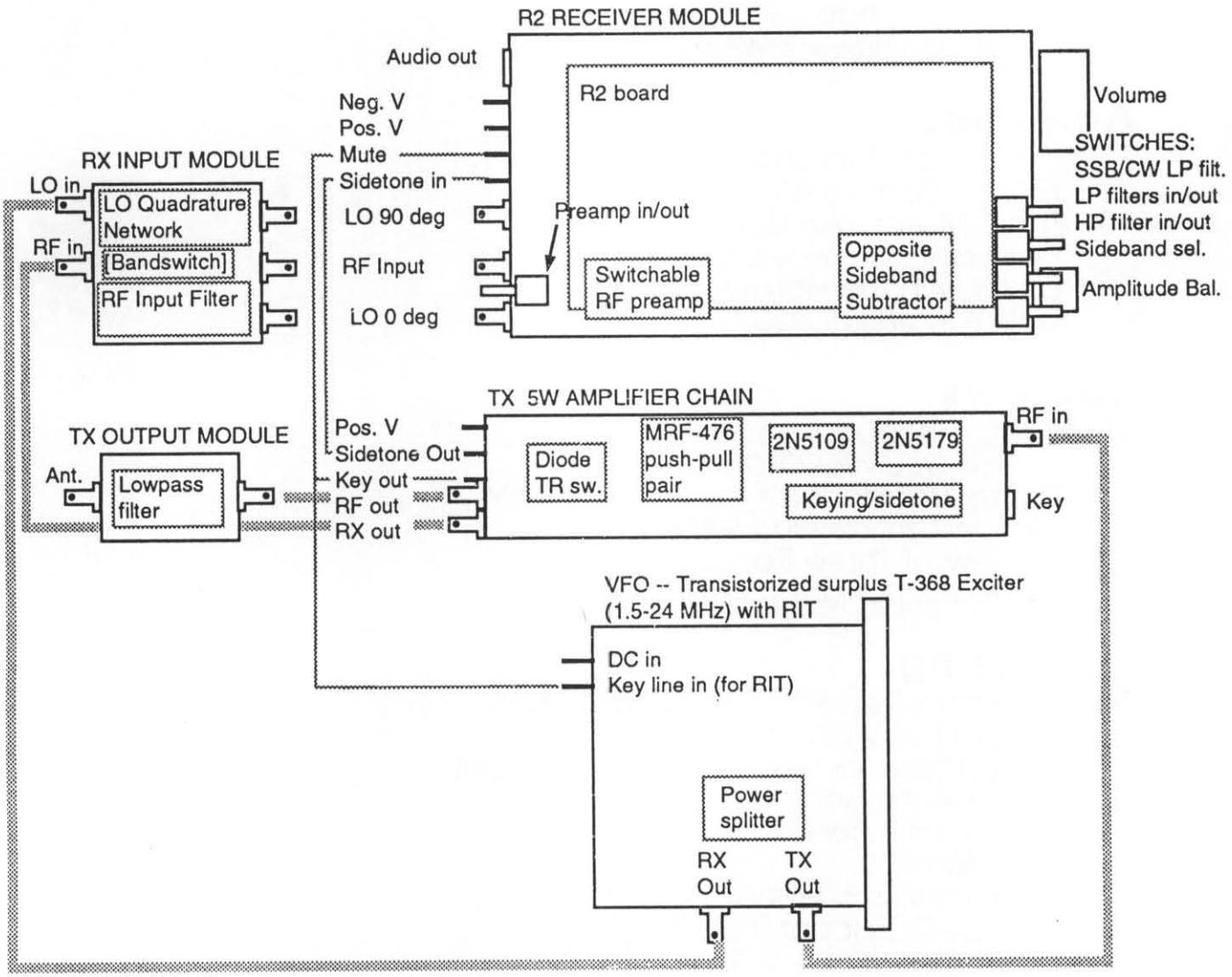

Figure 1

Most boxes are made from double-sided PC board material. The BNC jacks are a special PC board type that I found cheap at my local surplus house. They mount with 4 ground pins and a center conductor pin, saving space.

A more elegant way to interconnect the modules -- low-level RF and DC -- is available from Mouser Electronics. [3] They stock a mixed-contact D-subminiature connector system in various configurations. There are small built-in pins for DC lines, and larger contacts (snap-in options) for 50 or 75 ohm ohm coaxial, high voltage, or high current contacts.

One is the size of a DB-15 connector (I hope I'm guessing right!), with 5 small pins (built-in) and 2 larger contacts (snap-in options). Other options: 3 large contacts in a DB-15 size; 5 large contacts in a DB-25 size; 3 large and 12 small in a DB-25; or 8 large in a DB-37 size.

The modification of the surplus Collins T-368 exciter is a separately documented project in itself! This unit is available from Fair Radio Sales [4] from time to time for about $45. The basic PTO is 1.5-3 MHz, with multipliers to 3-6, 6-12, and 12-24 MHz with a mechanical digital dial. Once transistorized, it is the most stable analog VFO I have ever used, mostly because it is built so heavily. Others may wish to use various combinations of homebrew VFO's and multipliers, especially for portable use!

INPUT MODULES

The BNC connectors on both the input module and the R2 are on a standard 3/4 inch center to center spacing. A set of male-to-male BNC adapters remains "resident" on the R2.

The band modules can be for single bands or for as many bands as you can fit in with proper bandswitching. I currently have a 40 and 20 meter module that switches filters and phasing networks with one 4PDT slide switch.

Another single-band unit covers 15 meters; the input network retunes to 17 meters with a tweak of the trimmers, and opposite sideband rejection is much less but quite tolerable on such an uncrowded band.

Rick's suggested "pi" phasing network in the R2 article is by far the easiest to deal with. However, his suggestion to use a ferrite bead for the splitter network seems a bit skimpy. I used FT-37-43 toroids for some assurance they're good down to 80 or 160 meters. I used one common splitter for the two phasing networks in my 40/20 meter box:

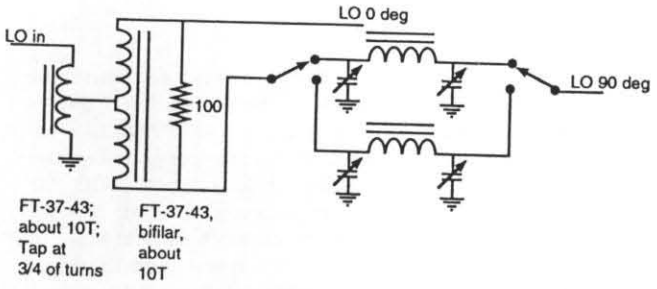

Figure 2

The input filters are standard 2-resonator bandpass filters found in various homebrew books. Some birdies I can hear on 20 meters might be attributable to leakage from VHF signals, so the precaution to use a 30-MHz lowpass filter seen in advanced designs is well grounded!

For VHF bands, you may wish to use a low-noise tuned preamp for the appropriate band. Better shielding between phasing network and input is probably advisable, or even separate boxes. And of course, the length of line in the two LO channels will more significantly affect the phasing as you go higher in frequency.

R2 RECEIVER MODULE

Rick's R1 article has some precautions for power connections. Because of the high gain on one board, any circulating ground currents generated by the output stage must be minimized. Therefore you don't just connect the DC negative lead to any old point on the chassis, but right to the point where the output transistors are grounded. If you go him one better, and return the SPEAKER ground lead to this point also, you get even more immunity to feedback. This means to insulate your output jack from chassis ground (easy with PC board boxes: simply scrape some copper away).

My box has a switchable broadband preamp added. I find no need for it on 40 meters and below, but it definitely is essential on 20 and above.

At first I used a Mini-Circuits MAR-6 MMIC amp [5] -- 3dB noise figure, 20 dB gain, 1 MHz-2 GHz bandwidth. It worked well, but that's a lot of gain, and its output 1 dB compression point is only 2.5 dBm. I had some SW broadcast interference on 20 meters, probably attributable to these factors.

I now use a 2N4416 grounded-gate stage which I think is a better choice for HF. I can't remember where I read these specs, but I believe it has about 4 dB noise figure, higher overload margin, and a more manageable 10 dB gain. [6]

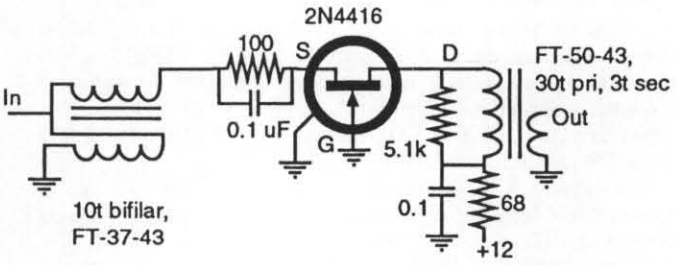

Figure 3

My amplitude balance pot is put on the front panel, because readjustment is required for each band. You will most often get adequate rejection of the opposite sideband with a quick null on a received signal. Best adjustment requires a steady carrier or VERY strong signal. Your phasing networks should only need to be adjusted once, unless you change your LO drive in some way.

If you hook things up as specified, you get UPPER sideband reception. Rick's suggested NE5532 sideband subtractor in the R2 article would then give you lower sideband. This circuit is built on a small piece of experimenter PC stock. I have only a trimpot on this board, set for 40 meters where I am likely to need it most at this point. You may wish to use a dual section pot for your front panel amplitude balance control so either sideband is easily adjustable.

I have switching for a CW and SSB lowpass filter -- and can switch them both out! It's an interesting hi-fi sound to hear signals above 3 kHz. My ears hear to 10 kHz or greater in my hi-fi headphones, serving as a mini spectrum analyzer. Strong shortwave broadcasters sound stunning this way!

Switching out the highpass filter is another possible option -- you have to cut some traces on the board to implement this. This is especially useful if you make this modification: change the highpass filter caps to 0.47 uF for better CW reception. It is not very sharp for QRM rejection, but helps eliminate low frequency noise. Because of the gentle slope, SSB reception is acceptable with the filter in -- and excellent with it switched out!

The capacitor in the mute circuit should be reduced to .03 uF if you want fast recovery for full break in CW. The 0.1 uF originally specified means a good half-second recovery time.

VFO

You need plenty of LO power to drive the diode mixers and overcome the loss in the splitters. The mixers need +7 dBm minimum. So once you split it for transmit and receive (3 dB loss), and then again for phasing (another -3 dB), you need at least +13 dBm out of your buffer. The mixers generate harmonics, and even prefer a square wave, so don't bother with the low-pass filtering featured in some buffer designs.

Any VFO you use needs a varicap for CW and/or RIT offset. See the Lewallen Optimized QRP Transceiver (1994 ARRL Handbook, QRP Classics) for a good basic circuit. I implemented it this way in my T-368 exciter:

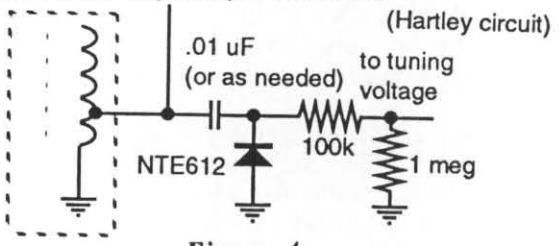

Figure 4

Pick the capacitor for the right RIT range for your needs. Mine had to be big because the PTO operates at 1.5-3 MHz. Also be creative on your varicap diode! The NTE612 is designed as a varicap. But many diodes will work as varicaps. Lewallen suggested a zener diode. Try some old rectifier diodes in your junk box -- something that is likely to have a larger PN junction than a fast switching diode.

Lewallen's RIT switching is also OK as far as it goes. However, you can get offset above and below your frequency just like the big rigs with this circuit:

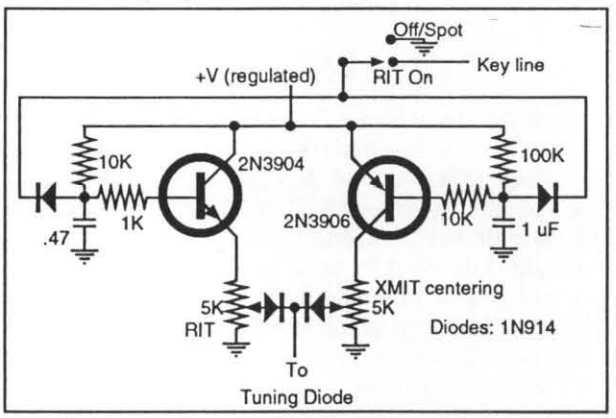

Figure 5

Pick the capacitors for the right delay for your needs. Remember that when you unkey, the VFO needs to stay at the transmit frequency long enough for the PA output to decay. You may or may not need these capacitors. The above values worked right for a homebrew 40 meter VFO; my T-368 setup did not need them. Don't ask me why.

The RIT pot is on your front panel, of course. Pamper yourself and use a 10-turn pot -- you won't regret it. The transmit centering can be an internal trimpot, or a front panel control. If you wish, add resistors on either end of the pot(s) to limit the tuning to the most linear part of the varicap's range. The SPDT switch removes RIT by keying the circuit. On CW, you would turn off RIT (switch to ground) to spot an incoming signal to zero beat, then turn on the RIT and adjust the RIT pot for your preferred beat note. (With experience and an ear for pitch, you don't need to do this every time). On SSB, of course, you normally tune with RIT off, and turn it on only as needed.

TRANSMIT CHAIN

Read the standard homebrew/QRP books for circuit specifics here. All keying circuits need to be a positive voltage that is pulled to ground to transmit. Stay linear if you want to eventually use the T2 for SSB, of course. My circuit evolved from the 160 meter transverter circuit found in the 1988 ARRL Handbook -- standard linear amps with feedback, a pair of push-pull transistors in the final.

Diode TR switching is the very best way to go. This is a broadband circuit, but you need 20 to 40 mA of total diode current -- a concern for portable operation. (I went as high as 60 mA to eliminate bleed through from a 50 kW AM broadcaster 5 miles away, thus the 120 ohm value. 330 ohms, 1/4 watt may be sufficient for many needs.) Two 1N914's handle 5 watts easily. Without the 22 uF capacitor, I found the TR switch opened up slightly too early on key-up, causing a short full-power spike. This didn't destroy the receiver, but did make for a lot of blown diodes.

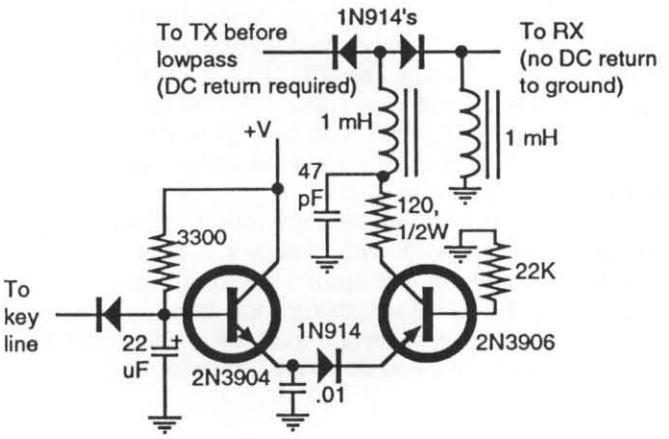

Figure 6

For lower current drain, you can always revert to the popular "pickoff" circuit -- back to back paralleled diodes (1N914 type) to limit the receiver output to 0.7 volt, a capacitor with 400 ohms reactance before your transmitter lowpass filter, and a series inductor to resonate with the pickoff capacitor at the receive frequency. Remember that the capacitor becomes part of the filter network on transmit, so subtract its value from the first shunt capacitor on the input of your lowpass filter. This is obviously frequency dependent, so put this in your appropriate transmit filter box. Another disadvantage: you might rob some of the dynamic range of which the R2 is capable.

TX OUTPUT MODULE

This is just a box with a lowpass filter of standard 50 ohm design for the various bands. Bandswitching is possible once again.

ADDING THE T2 EXCITER

My T2 exciter board is now built, but not yet in use. Rick's suggestions for station integration are made only with VHF mountaintopping in mind. To go a few steps further, here is my brainstorm to provide all modes available, and full QSK switching. Note that this is a PROPOSED, untried setup, perhaps with some details to be ironed out.

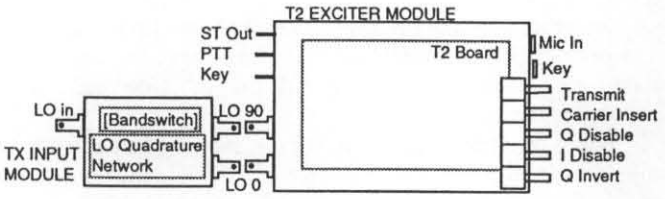

Figure 7

First, the physical layout. Again, you need a SEPARATE phasing network for transmit for best nulling in both transmit and receive. I propose an expansion of the "plug-on box" system.

Because TRANSMIT amplitude balancing is harder to do on the fly when changing bands, I am at a loss for the very best solution. My thoughts:

1. Use a 10-turn pot for amplitude balance on the front panel, and log the settings on a turns counter dial.

2. Incorporate a pre-set trimpot in the input module. Convenient connections are the question here. Here is where the Mouser D-subminiature mixed-contact connectors would really come in handy.

I would make everything switchable to get every mode possible, even if only just to say you can do it! Q INVERT would invert the audio phase (with a unity gain opamp inverter) coming into the channel that feeds the 90 degree mixer. (I think this will work -- engineers?) I DISABLE and Q DISABLE would break the audio inputs at X and Y on Rick's schematic -- or possibly at the input of the audio phase shift network. CARRIER INSERT would ground the key line, unbalancing the mixer that receives in-phase LO energy. (See switching circuits below.)

Here then would be your modes (check me, engineers!)

	Q INVERT	CARRIER	I DISABLE	Q DISABLE
SSB/CW	off USB, on LSB	off	enabled	enabled
SSB/carrier	off USB, on LSB	on	enabled	enabled
AM	n/a	on	enabled	disabled
PM (NBFM)	off	on	disabled	enabled

Below are proposed board interconnections. Only the DC control lines are shown; RF connections should be obvious.

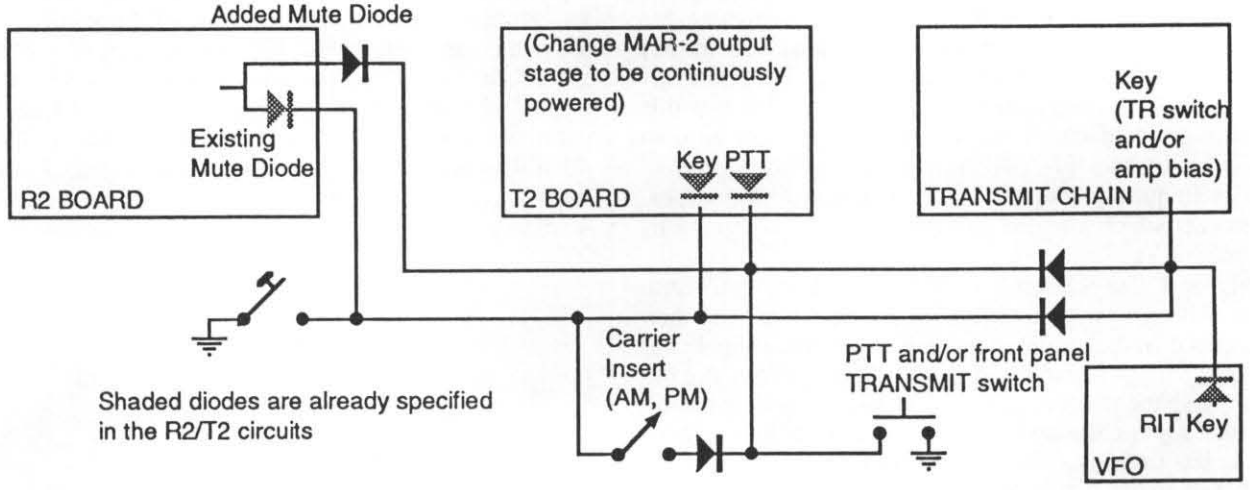

Figure 8

I hope all my diode isolating logic is correct! Strictly speaking, you may not need to key anything in your transmit chain but the TR switch. However, you will save idling current on receive (and heat!) in your linear amplifier stages if you key them and/or remove bias.

THE AUTHOR:

John Seboldt, KØJD, began hamming as WNØQXG some 26 years ago. Music, electronics, and ham radio grew side by side in his youth, leading to work in the broadcast industry while studying music at Luther College, Decorah, IA, and The University of Iowa, Iowa City. He now serves as music director at Church of the Annunciation, Minneapolis, and does as much soldering and CW ragchewing as he can.

NOTES:

[1] Rick Campbell, KK7B, "High-Performance Direct-Conversion Receivers", QST, August 1992 ("R1")

[2] Campbell, "High-Performance, Single-Signal Direct-Conversion Receivers", QST, January 1993 ("R2")

[3] Mouser Electronics, 2401 Highway 287 North, Mansfield, TX 76063-4827, tel. 1-800-346-6873

[4] Fair Radio Sales Co., PO Box 1105, 1016 E. Eureka St., Lima, OH 45802 tel 419-223-2196

[5] I found a little kit at a hamfest: the WBA-6 is available for $19.95 from Electronic Rainbow, 6254 LaPas Trail, Indianapolis, IN 46268, tel. 317-291-7262.

[6] Doug Demaw, W1FB, "A Diode-Switched Band-Pass Filter", QST, January 1991

Linear-Loaded Shortened Antennas

by John Stanford, NNØF
1327 Clark Ave.
Ames, IA 50010

The ARRL Antenna Book says commercial antenna manufacturers use "linear loading", but that amateurs generally haven't taken much advantage of these techniques. This stimulated my interest. But what *is* linear loading, anyway? I think I've found out some aspects of it, and decided to share what I've learned. One thing I found is that linear loading can significantly reduce the required length for resonant antennas. For example, it's easy to make a resonant antenna which is as much as 30-40% shorter than an ordinary dipole for a given band. The shorter overall lengths come from bending back some of the wire. The increased self-coupling lowers the resonance frequency. These ideas are applicable to short antennas for restricted space or portable use.

My experiments began after I happened across a short article which (ever so sketchily) described some experiments with linear loading. It was from a paper presented at an antenna symposium some years ago by J. Rashed and C. Tai ("A New Class of Wire Antennas", 1982 Internat. Symposium Digest, Ant. and Propagation, Vol. 2, IEEE). The article unfortunately didn't explain things as completely as I'd have liked, but it stimulated me to try some experiments of my own. Here's a summary of what I've learned so far.

I first did a number of experiments with the linear loaded monopoles, working over my old 48-radial ground system of electric fence wire. The 9-yr old wires are now rusting, but are still evidently a reasonably good ground system. My measurements include ground losses, but these are evidently low, since an ordinary quarter wave vertical measures within an ohm or so of the theoretical (perfect ground) 36 ohm value. I used an MFJ-204B Antenna Bridge and Optoelectronics frequency counter. Figure 1 is based on my measurements which are also consistent with values given by Rashed and Tai.

Figure 1 shows several simple wire antenna configurations. Also given are their resonant frequencies and their impedance (radiation resistance). The reference dipole has resonance frequency fo and resistance R = 72 ohms. The f/fo values give the effective reduced frequency of adding the linear loading in each case. That is, the 2-wire linear-loaded dipole has frequency lowered to about 0.67-0.7 that of the simple reference dipole of the same length. The 3-wire linear-loaded dipole has its frequency reduced to 0.55-0.6 of the simple dipole of the same length. These values will vary with conductor diameter and spacing.

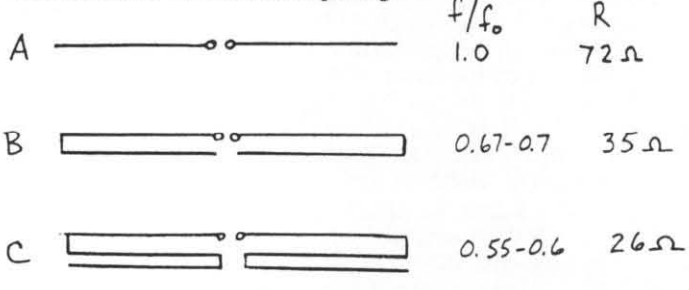

Figure 1

The 2-wire linear loaded dipole looks almost like a folded dipole, but unlike a folded dipole, is open in the middle of the side opposite where the feedline (o o) is attached. My measurements show that this antenna structure has resonance frequency lowered to about two-thirds that of the reference dipole, and R equal to about 35 ohms. A three-wire linear loaded dipole has even lower resonance frequency and R about 25-30 ohms.

Linear loaded monopoles (one half of the dipoles in Fig. 1, working against a radial ground plane) have similar resonant frequencies, but with only half the radiation resistance shown for the dipoles.

Based on these results, I next constructed a linear loaded dipole as in Fig. 1-B, using 24 feet of 1-inch ladder line (the black plastic kind widely available) for the dipole length. The system was hung by nylon fish line from a tree, about 4 feet from the tree at the top, and about 8 feet from the ground on the bottom end. It slanted at about a 60 degree angle to the ground. This antenna resonated at 12.8 MHz and had a resistance of about 35 ohms. After the resonance measurements, I fed it with, as is my custom, 1-inch ladder and open-wire line (a total of about 100 feet to my shack). For brevity I'll call this a vertical LLSD (linear loaded short dipole). A tuner resonated the system nicely on 20 and 30 m. On these bands the performance of the vertical LLSD seemed comparable to my 120-ft cf zepp at 30 feet above ground. In some directions where the horizontal 80 m zepp has nulls, such as towards Siberia, the vertical LLSD was definitely superior. This system also resonates on 17 m and 40 m; however, from listening to various signals I have the impression that this length LLSD is not as good on 17 and 40 m as the horizontal 80 m dipole.

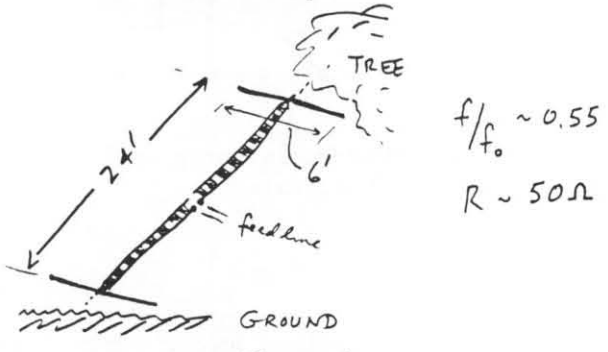

Figure 2

I also experimented with an even shorter resonant length by trying a LLSD with capacitance 'end-hats'. The hats, as expected, increased the radiation resistance and lowered the resonance frequency. Six-foot single wire 'hats' were used on each end of the previous 24-ft LLSD, as shown in Figure 2. The end wires were self-supporting springy copper-steel wire from old telephone lines. This antenna was supported in the same way as the previous vertical dipole, but the bottom end hat wire was only inches from the grass. This system resonated at 10.6 MHz with resistance of 50 ohms. If the

dipole section were lengthened slightly, by a foot or so, to about 25 feet, it should hit the 10.1 MHz band and be a good match for 50 ohm coax. It would be suitable for a restricted space, shortened 30 m antenna. Note that this antenna is only about half the length of a conventional dipole, needs no tuner, and has no losses due to traps. It does have the loss of the extra wire, but this is essentially negligible.

Any of the linear-loaded dipole antennas can be mounted either horizontally or vertically. The latter can be used for longer skip - beyond 600 miles or so - unless you have rather tall supports for horizontal antennas.

Finally, I'll mention that using different diameter conductors in linear loaded yields different results depending on whether the larger or small diameter conductor is fed. I tried a vertical ground plane antenna using a ten-foot piece of electrical conduit pipe (5/8 inch OD) and #12 copper house wire, as shown in Figure 3.

Note that this is not a folded monopole, which would have either A or B grounded. The two conductors were separated by 2 inches, using plastic spreaders held onto the pipe by stainless steel hose clamps. The two different diameter conductors make the antenna characteristics change, depending on how it's configured. With the antenna bridge connected to the larger diameter conductor (point A), and point B unconnected, the system resonated at 16.8 MHz with R = 35 ohms. With the bridge at B (the smaller conductor), and point A left unconnected, the resonance lowered to 12.4 MHz and R = 24 ohms.

The frequency can be adjusted by changing the overall system height, or for increasing the frequency, by reducing the length of the wire. Note that feeding the smaller conductor (point B in Figure 4) a 40 m resonant ground plane can be made with height only about half that of the usual required. The lengths can be scaled to determine a first-try attempt. Resonant lengths will, however, depend on the conductor diameters and spacing. The same ideas hold for a dipole, except that the lengths should be doubled and the resistance will be twice that of the ground plane. How about a shortened 40 m horizontal beam to enhance your QRP signal?!

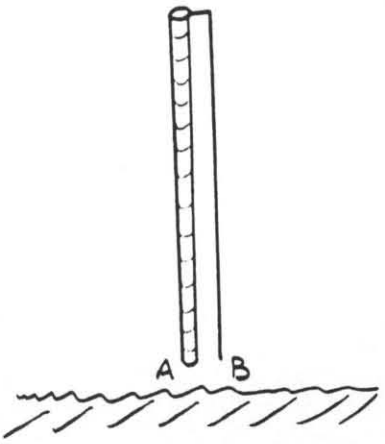

Figure 3

In summary, I've enjoyed experimenting with linear loaded antennas. They offer interesting possibilities for reduced size antennas. I hope you'll be stimulated to try a variation or two yourself. Have some fun experimenting and let the rest of us know what you find out!

John, NNØF

The Z-Match: An Update

by Charlie Lofgren, W6JJZ
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[W6JJZ provides us with yet another informative article on antenna tuners. Along with his latest improved design he also provides information on ways and means to check the performance of any tuner. -WB6TPU]

The Z-Match antenna tuner is again proving popular. This note provides some background on the design, presents an improved "single-coil" version, and describes two tests for checking the performance of any tuner.

The Z-Match is build around the multiband tank circuit that came into use around 1950 to reduce bandswitching chores in the tube rigs of the period. This circuit simultaneously tunes through two frequency ranges--for example, 3.5 to 10.5 Mhz and 10 to 30 MHz--to cover the full HF spectrum. During the 1950s, both Harvey Wells and World Radio Laboratories incorporated the multiband tank in commercially produced versions of the Z-Match, and Allen King, W1CJL, an engineer for Harvey Wells, described the Z-Match in QST (May 1955, pp. 11-13, 116-118).

The year before King's article appeared, R. W. Johnson, W6MUR, had described another version of the multiband tank circuit (QST, July 1954, pp. 25-28, 122). The "standard" multiband tank uses two inductors. Johnson showed how to achieve similar results with a single inductor tapped at its midpoint. Although not incorporated in the Z-Match at the time (at least not in any published design that's come to my attention), Johnson's circuit provides the basis for the "single-coil" Z- Matches that have appeared in recent years. (The "single-coil" label is a slight misnomer, however, because the Z-Match also includes one or more output links.)

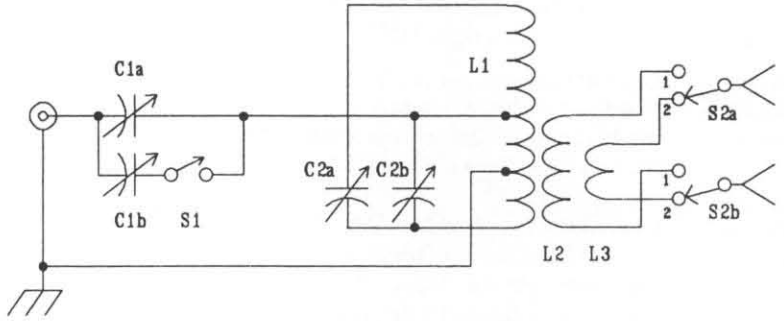
Drawing on articles from Australia and New Zealand, Bill Orr, W6SAI, reported on the single-coil circuit in CQ Magazine in August 1993, pp. 50-53, and gave other details in later columns. In its Winter 1994 issue, pp. 99-102, Communications Quarterly reprinted an article on the circuit by T.J. Seed, ZL3QQ, that had originally appeared in Break-In for March 1992. Meanwhile, in the ARRL Antenna Compendium, vol. 3, pp. 191-195, I reviewed King's Z-Match circuit from 1955 along with some ways to increase its matching range and described still another version of the single-coil circuit (not the one described in the present note).

Whether in its classic form as described by King or in the recent single-coil versions, the Z-Match essentially acts as an L-network. This can be seen by referring to Fig 1. The input capacitor, C1, functions as the series arm of the L-network. The tank circuit formed by C2 and L1 serves as the parallel or shunt arm of the network. In operation, the tank circuit is detuned on the high frequency side of resonance, thereby presenting an inductive reactance between the output side of C1 and ground. In a "normal" L-network having its shunt arm on the output side, the load would appear in parallel across the shunt element. Here output instead is taken through an output link. (For the full evolution of the circuit in this regard, see my Antenna Compendium article, referenced above.)

One problem with Z-Matches is limited matching range. In Fig 1, the option of switching in additional capacitance at C1 extends the range, particularly on the lower bands. Similarly, the two output links considerably broaden the impedance range.

Another problem in Z-Match design is that efficiency tends to fall off unless the output link or links are tightly coupled to the tank coil. In the circuit in Fig 1, the necessary tight coupling is achieved by interwinding the turns of the output links between the turns of L1. The toroid core helps, too. The availability of a separate high impedance output link, with more turns, serves the same purpose.

A third problem with the Z-Match is that the output balance may deteriorate under some load conditions, particularly high impedance loads--and this is more likely with the tight coupling necessary for best efficiency. Output balance can be improved in the single-coil Z-Match by changing the ground point on the tank coil. This too has been done in the circuit in Fig 1.



AN IMPROVED "SINGLE-COIL" Z-MATCH, 3.5-30 MHz
Ground point on L1 altered to improve output balance.
Two output links for high and low impedance output.
Charlie Lofgren, W6JJZ, 11/12/94; 1/3/95; 2/1/95

Components in Fig. 1 are as follows:

C1 and C2: 330 pf per section or greater.
L1: 24 turns enameled wire on a T-130-6 or T-200-6 core, tapped at 6 and 12 turns from the bottom; or 22 turns enameled wire on a T-157-6 core, tapped at 5 and 11 turns from the bottom.
L2: 10 turns enameled wire, interwound between the turns of L1, with 5 turns on each side of the ground tap on L1. (This is the high impedance link.)
L3: 4 turns enameled wire, also interwound between the turns of L1, with 2 turns on each side of the ground tap on L1. (This is the low impedance link.)

S2
Pos # 1: High Imp Output
Pos # 2: Low Imp Output

The result may be thought of as a "semi-balanced" circuit. The links are symmetrical around the ground point on L1, but some imbalance remains in the tank circuit itself. Aside from improving output balance and altering the settings of C1 and C2 at which a match occurs, the change in the ground point on the coil does not affect the operation of the circuit. In most instances with "real life" antennas and open feed systems, the circuit in Fig 1 results in feedline currents that are balanced to within 1 dB (current on one side of the line versus current on the other side).

Other published single-coil designs tap the line from C1 into the tank coil L2 at various and differing points. The fact is that any tap point on L2 for the connection to C1 is a compromise, given the wide range of likely operating conditions and frequencies. Tests show that using the center tap on L1, where one section of C2 is also tapped into L1, is about as good a compromise as you will find.

The dual section capacitor at C1 can be replaced with a single section capacitor and a switched padder capacitor (silver mica, 300 pf. or more, depending on the value of C1 itself). Both C1 and C2 float above ground. At QRO, this would require insulated shaft couplings, at least at C2. At QRP levels, insulated knobs suffice. Match the wire size for L1 to the core actually used--no. 18 for a T-200 core, no. 22 or 24 for the smaller cores. Select a wire size for the links that allows interwinding between the turns of L1. For QRP levels, any of the cores indicated above are more than adequate, as are small toggle switches at S1 and S2.

In adjusting the Z-Match, keep these two points in mind:

(1) In cases where you can get a match with both links, use the high impedance link. This loads the tank circuit more heavily, and may produce significantly better efficiency (up to a dB or so, depending on the composition of the load that the tuner sees).

(2) In cases where you can tune 30 meters and sometimes 20 meters at both the low capacitance end of C2 (the high end of the low frequency range) and the high capacitance end (the low end of the high frequency range), use the low capacitance setting. This gives a lower C/L ratio and again better efficiency.

No special instructions are necessary otherwise for adjustment, except to note that the tuning of C2 can be quite sharp. Initial peaking on receiver noise often simplifies adjustment.

For checking this or any other tuner, a couple of simple test devices are worthwhile. One is an "antenna simulator." This device is especially useful for making comparisons between various tuners (or tuner/balun combinations). The simulator consists of a pair of resistors of equal value whose total resistance approximates the expected feedpoint impedance at the tuner. (Several pair allow checking a range of impedances.) Connect the two resistors in series across the balanced output terminals on the tuner, and connect the junction of the two to the ground lug on the tuner. This *roughly* simulates an antenna system consisting of a balanced horizontal antenna over ground (such as a center-fed zepp or G5RV) and its feed line. To check the output balance of the tuner looking into the resulting feedpoint impedance, use an RF probe to measure the voltage drop across each resistor to ground while feeding a small amount of RF into the tuner (having adjusted it for a match). If the currents on each side are equal, the voltage drops across the resistors will be equal.

For this test, very little RF is necessary. If the RF probe is used in conjunction with a sensitive digital FET voltmeter, I find that the output from an MFJ Antenna SWR Analyzer is adequate. Using the SWR analyzer also allows easy checking over a wide frequency range.

The other test device is a current probe to use in checking performance with an actual antenna. It consists of 20 to 30 turns of enameled wire on an FT-50-61 or FT-84-61 core, with the two ends of the winding going to the voltage probe (again connected to a sensitive digital voltmeter). When RF current passes along a wire run through the middle of the core, RF voltage appears across the winding on the core. Simply slip the current probe over one side of the feedline and then the other side to check relative current on the two sides. For a "classier" current probe, permanently fix the core around one side of a short section of feedline that has clips on each of the section's four end wires (two at each end of the section). Inserting the section between the end of the actual feedline and the tuner is then a snap, as is reversing the probe from one side of the line to the other.

This arrangement will not give the absolute readings obtainable with a calibrated RF ammeter. It is quite adequate, however, to for checking relative current and relative current balance on open-wire feed systems. But keep in mind that current at a particular point on a feedline will vary with frequency, as the length of the antenna and feedline varies in terms of wavelength. This means that readings taken at different frequencies are not comparable. Remember, too, to keep the power into the line LOW when you run the test. Again, the output of an MFJ Antenna SWR Analyzer is adequate when a sensitive voltmeter is used with the probe.

A final word about feedline (im)balance: It is true that current imbalance may produce some feedline radiation, but this is still radiation. What is more serious is that imbalance may be accompanied by other unwanted effects. (For example, it may be a symptom that part of the antenna system is functioning as an end-fed wire worked against ground, with RF current also flowing into a lossy ground system, where it warms the worms rather than radiating).

So imbalance is worth minimizing. But at QRP levels, "RF in the shack" generally isn't a problem, and in most real-world situations there has to be substantial imbalance (perhaps several dB or more) before the station at the other end begins to tell the difference.

Transistorizing the T-368 Exciter– An experimenter's notes...

by John Seboldt KØJD
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[John, KØJD provides an excellent blow by blow description of his method of transistorizing a surplus Collins T-368 exciter to provide a versatile VFO for HF use. -WB6TPU]

This project uses the existing tuned circuits, physical structure, and some existing wiring of the exciter from the old Collins military T-368 transmitter as the basis of a solid-state VFO/multiplier for most of the HF region of interest to amateurs.

If you're not acquainted with this old tube unit from the 50's (?), it has a 1.5-3 MHz PTO, a mechanical digital readout, and doubler stages to cover 1.5-3, 3-6, 6-12, and 12-24 MHz (they say 12-20, but the dial reads to 24; probably reflects the ratings of the companion PA). It measures about 10" wide by 9" high by 11" deep, so it's not small, and as I received it there was no enclosure for the whole assembly -- no problem for less critical applications like HF, but probably best to add shielding (I haven't yet for HF QRP!). It's built like a tank, and the tuned circuits in the multipliers track the PTO in typically elegant Collins fashion.

I got it from Fair Radio Sales, the famous surplus dealer, for $35 about 5 years ago without the output tube. (plus $10 extra for a copy of part of the manual/schematic). One of my correspondents informs me that they now run $45 without the output tube.

What I have arrived at is subject to improvement, because I'm an experimenter that reads amateur literature, but not an engineer who does everything right! Tell me how to do it better, and I'll improve it.

Even so, this work has given me an incredibly stable VFO for the home station that covers a wide range, complete with receiver and transmitter offset pots on the front panel. It's not a unit for backpacking, because of its solid, heavy construction. But that weight and bulk is part of what assures mechanical stability, and the sheer size of the insulated PTO assembly, plus the fact that the components were designed for the higher RF currents of the tube circuit, means that once you solid state the thing, you have rock-like stability that you would probably need an oven-crystal-referenced synthesizer to duplicate (and even then, I dunno! Haven't used one.) There's even a thermostat-controlled oven you can hook up around the PTO tuned circuits!

Of course, the thing tunes pretty fast on the higher bands, but the gearing is so good that there is no backlash. The offset pots can help you zero in if your hand isn't too steady!

Not everything is step-by-step here, like a QST article, just a guideline. My sources for circuit concepts and building blocks:

ARRL Handbook
QRP Classics (ARRL)
W1FB's Design Notebook (ARRL)
Feb. 1989 QST, Hints and Kinks, page 45-46,
"Transistorizing Surplus VFOs"

And, of course, a copy of T-368 manual pages and schematic relating to exciter. I paid extra to Fair Radio Sales for this. I'll save you the bucks ($10 for about 12 pages!) if you want.

THE PTO

Suggestions for transistorizing the PTO were made in Feb. 1989 QST "Hints and Kinks", using 2 40673 dual-gate MOSFETs. (The NTE222 is a currently-available substitute for the discontinued 40673). Read this for some precautions about turning the PTO too far beyond its range, and damaging the internal slugs. I think it will go more than 50 kHz beyond, so you have some slop for recalibration. Also, they warn not to open the PTO sealed inductor can if you can avoid it -- the hermetic seal is one key to super-stability!

I didn't take this circuit straight, wishing instead to use the kind of precautions used in W7ZOI's oscillator from the "High Performance Communications Receiver" in the ARRL Handbook and many others. I used a regulated 6 volt bus for the oscillator, and the full 12 volt bus for the buffer.

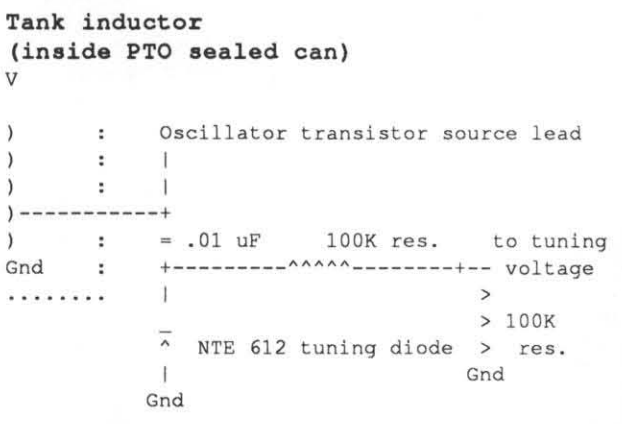
Removing the PTO takes some care — you have to loosen not only the mounting screws, but the hex set screws on the PTO shaft gear. I suggest you set things at 3 MHz at the top end of the band, so you know where to reset things. All the electrical connections unplug, and all these wires are re-used, also the feedthrough capacitors attached to an angled metal piece under the PTO. All the circuitry outside the tank circuit is on a small sub-chassis under the tube sockets.

The 4 DC wires to the PTO can be used for: buffer V+ (full 12V), oscillator V+ (regulated down to 6 volts or so with an external 3-terminal regulator attached to the back of the multiplier tuning unit), tuning diode voltage, and ground. At the feedthrough capacitors under the PTO, you have convenient points to solder your connections.

I used a plastic VHF JFET for the oscillator (NTE312 or other similar device). I took a 100 ohm resistor from V+ (after the existing RF choke) to drain; hooked drain to the original plate pin so the original 200 pF interstage coupling capacitor would couple to the next stage; hooked the gate to the original tube grid connection; and hooked the source to the original cathode connection. A 1N914 diode went from gate to ground (cathode grounded).

The buffer came straight from the QST article above, a pretty standard amplifier circuit. Some details of my memory are fuzzy on the DC feed question, but just follow standard amplifier topology and you're fine. It hooks to the original plate pin, through the original 100 pF output capacitor, and out the output cable. Later I changed the coupling capacitor to .01 uF.

Add a tuning diode setup from the oscillator source/ inductor tap to ground. At this writing, I use the following interim circuit:



The 100K resistor to ground IS important -- without it you'll have very slow recovery when you change tuning voltage!

This gave me a tuning range of 7 kHz at the 3 MHz end of the PTO when I tested it before re-installation. I thought this would be too much by the time it was multiplied to the highest band, but I was going to compensate at the control voltage end.

Re-installation of the PTO IS a bit tricky! That gear is like 2 little gears attached to each other, with springs. This is to take up any backlash. You have to turn the one gear so the springs are compressed, hold them in place with a screwdriver until you get them meshed with the gearing from the dial!

However, I didn't discover till I put things together that the tuning range at the bottom end (near the 3.5 and 7 MHz ham bands) was substantially lower! At 80 meters, I have barely enough to get an 800 Hz CW offset, and a little slop. At 40 meters, I even have only about +- 2 kHz.

I am now awaiting the arrival of the NTE618 tuning diode, designed for AM radio tuning service (440 pF at 1 volt!) This, of course, will probably be too much, but all you do is reduce the size of the .01 uF capacitor into the pF range until the tuning range is reasonable. I will probably shoot for no more than 2 kHz total tuning range at 1.75 MHz, which will multiply to 4 kHz at 3.5 MHz, 8 kHz at 7 MHz, and 16 kHz at 14 MHz. A little much on the top band, but I have pots that have SPDT pull-on switches, and I could use this to put in a resistor from the bottom end of the pot to ground, thus reducing the tuning range.

I DID use a MOSFET as the output buffer stage, but instead of using the unit's original 200 pF output coupling capacitor, I used .01 uF. I don't know if things would work better with an output transformer like the W7ZOI circuit -- I chose capacitor coupling because the next stage would be a high impedance JFET gate.

And, of course, you have to handle those MOSFETS with all due electrostatic precautions -- wrist strap, etc. And if you fiddle with surrounding circuity, you CAN STILL blow them with static! Have spares handy -- about $4 a shot!

MULTIPLIER STAGES

I was on my own on the multiplier stages. Obviously JFETs were the best choice, to provide high impedance loads to the tuned circuits that were designed for tube grids. I used the NTE312 again.

Here, I just wired the gate to the grid pin of each stage (with a 47K resistor to ground), the drain to the plate pin, and the source to chassis ground. Clip the existing grid resistors to ground. Actually, the first stage had its gate (and associated resistor) going directly to the BNC connector from the VFO (J101).

The plate supply wire was used, with its decoupling networks (1K series resistor and .01 uF capacitor to ground) . However, 1K is way too high for the transistor circuit. I replaced them with something in the range of 68 to 100 ohms. Unfortunately, they are on the bottom of the multiplier assembly! It's not too hard to remove, though -- four Phillips screws from the top of the unit. Getting it back in takes some coordination though -- you have to get the mechanical couplings to the tuning dial and bandswitch correct! I got lots of practice by taking it in and out many times!

The first stage works as a buffer on the low band, and a doubler above that. The low band switches in a load resistor instead of the tuned circuit -- R106, 10K (on the bottom again!). This obviously needs to be lower. I plugged in different resistors (in the 3300 ohm range, can't remember) across this resistor, until the output at S101, pin 8 was the same on bands 1 and 2.

The second multiplier stage had a wierd low-frequency modulation of the output at around 50 kHz, but I cured it with a series RC network from gate to ground, in parallel with the gate resistor: 2200 ohms and .1 microfarad. Don't know why it worked -- it simulated the fact that when I bridged the gate lead to ground with my hand/fingers, it went away! It worked! In retrospect, it might be a self-oscillation tracking above or below the PTO at about 50 kHz. Maybe a source resistor of about 20 ohms would cure it. You try!

Check for a reasonably uniform output across each band. If any adjustments of the tracking tuned circuits are to be made, you should probably go for uniformity of output, not maximum output at a particular frequency.

OUTPUT AMPLIFIER

In the area of the IPA (intermediate power amplifier, another word for "driver") tube, I built a broadband buffer stage just like in the W7ZOI VFO: another dual-gate MOSFET (40673/NTE222) WITH the specified ferrite toroid output transformer. Rip out the relay K101, intended to switch between this exciter and an external one for FSK. The input comes right off S101, section 2, rear, pin 12.

There is a set of tuned circuits for the output of the original IPA. I tried using them as a tuned load with the above circuit, and they reduced output substantially. So I just went with the broadband amp.

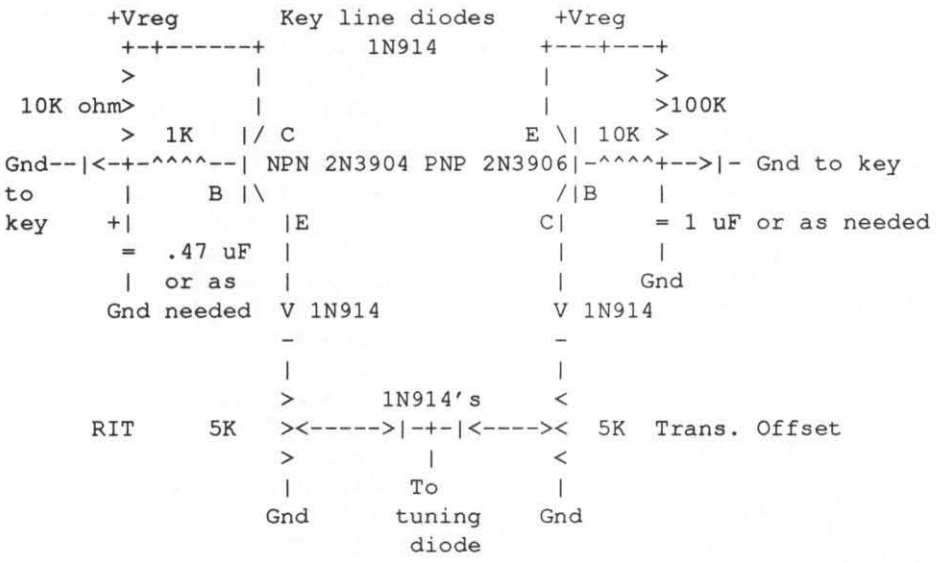
This gives me an output of about 3V peak to peak into 50 ohms on the lower 3 bands, and 2V p/p on the highest -- still plenty to drive your average diode mixer at +7 dBm. Actually, the output stage clips the waveform on the lower bands, I think -- but this serves to equalize the output on the bands. Diode ring mixers would rather have a square wave, anyway, and my CW transmitter has output filtering, so waveform purity is not a concern. If it is for you, I guess you can put in a low pass filter for each band, using the switch section S101 rear (rewired) to pick them.

There are two nice BNC connectors on angled brackets -- one is the official output, the other was the input for that other FSK exciter. I mounted both of them on the top, with plenty of room for a quick and dirty splitter circuit (direct to the receiver, a pot to attenuate the signal for the transmitter).

This is a goodly amount of output for a diode mixer. It effectively drives my Campbell R2 receiver and a companion transmitting strip -- the R2 directly, the transmitter via a drive pot. Later, I may build his T2 phasing SSB exciter, requiring even more splitting and phasing! So, in case of losses, I have "in reserve" on a small bit of circuit board an extra broadband output amplifier based on a 2N3866 (from DeMaw's "W1FB's Design Notebook"), with adjustable gain (pot in place of the emitter resistor). Maximum output is about 200 millwatts or more! Enough?!

OFFSET TUNING -- TRANSMIT AND RECEIVE!

I have two pots (found matching knobs at a local surplus house!) and a switch added to the front panel, and a transistor switching arrangement (built on the pot terminals) to select the correct pot when the transmitter is keyed. Works well with full QSK. I used 10-turn pots of 2K ohms value -- you can use probably use this value up to say 10K with no problems. Nice fine tuning!



The capacitors were needed in a homebuilt 40 meter VFO to hold the VFO at transmit frequency until CW waveform has gone to zero. I'm not using them in the T368 and I can't hear any frequency shift on the trailing edge. Dunno why, you tell me!

Not shown is a SPDT switch that attaches the key lines either to the system keying line, or directly to ground. When grounded, you RX and TX on the same frequency for SSB or for spotting a CW signal to zero beat. When in the other position, you have receive offset for proper CW beat, or for RX tuning in SSB.

CONCLUSION

Clear as mud? Well, I'll be damned if I'm going to ASCII the whole schematic! Hope this gives enough info to start with, and we can all share questions as we go along.

QRP Mini-Review

Loop De Loop

by Bob Gobrick VO1DRB/WA6ERB
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What's a ham to do when faced with the dilemma of apartment living with no hope of an outside antenna. No, let me rephrase that to add to the severity of the situation—What is a QRPer ham to do when faced with that dilemma. QRPers know the importance of a good antenna in getting their pint size signals out and about. During a recent work assignment move, I ventured into this "no antenna" challenge by trying all the standard QRPer tricks–stringing wire dipoles around the ceiling, hanging back-to-back mobile whips in dipole form off my balcony and running random wires out the window at night. None of these solutions were satisfactory and all were a compromise in one form or another. Something better was needed!

Enter the MFJ Super Hi-Q Loop antenna. The word "enter" is used loosely here since the first challenge was trying to find this rare back-ordered antenna to purchase. After many phone calls I was able to find the only ham store in North America that had one in stock and I bought it (I won't tell my secret on how I achieved this though).

The unit arrived at my doorstep in one large box. The only assembly involved attaching a bracket for the mounting configuration desired - horizontal or vertical. I chose to horizontally mount my antenna on a 5 foot mast which in turn was affixed to my concrete balcony rail with drain pipe strapping. As a further mounting hint, a 4 foot section of this mast was permanently mounted on the balcony rail and the antenna was then attached to a one foot stub section that swaged on to the 4 foot section. This makes for easy removal (the neighbors don't always believe my story that the MFJ loop is actually a bird feeder) and an easy way to take the loop with you for those QRP Afield contests. Coax was attached to the antenna. At the operating end, the antenna and my QRP rig coax was connected via SO-239 jacks to the supplied remote tuning box. Finally, the supplied 12 volt wall cube power supply was plugged in and Bingo—on the air.

The antenna performed fabulously. Was I surprised? Well no, since I forgot to mention that I already had been using an older 14-30 Mhz AEA Isoloop antenna before the MFJ arrived and I expected good results. The antenna design basis is similar for both units. But my old AEA unit did not cover 30 meters—my FAVORITE band. The MFJ Super Hi-Q Loop and the new AEA Isoloop both cover from 10-30 Mhz so it was a matter of just picking the "right" antenna for my needs. Now if you ask "Was I surprised in comparing my new MFJ Super Hi-Q loop against my older Isoloop", I would say yes. I feel the MFJ Super Hi-Q Loop is a better antenna than the AEA Isoloop. Here are some of the reasons why:

•**Control box:** The MFJ comes with a remote control unit that has a built in cross-needle SWR wattmeter. I like this meter because it not only lets you see when the SWR "dips" at the resonant frequency your tuning for, but it also gives you the output power at that point. You can select two scales 0 - 300 and 0 - 30 watts, with the 30 watt scale showing 5 watts at mid scale—nice for QRP work. The standard AEA unit only has control switches and no meter (AEA does offer an optional non-metered automatic tuner, but the price is quite high for this feature). This is a disadvantage for the AEA unit in that you need an SWR meter to effectively operate the mini-loop. QRP "plus" for MFJ.

•**Control Motor Power:** Both these antennas use small motors to drive the antenna mounted tuning variable capacitor. The MFJ uses a DC motor and the AEA a stepping motor. I will describe their operation later on in the Tuning section. The AEA Isoloop requires a 4 wire control cable, in addition to the antenna coax cable. The MFJ runs it's DC control voltage through the antenna coax (same principal used to power many VHF/UHF mast mounted preamps). Having only one cable run for the MFJ loop versus two for the AEA is a big plus. The less cables that need to be run around an apartment building the better. QRP "plus" for MFJ.

•**Tuning:** Both units require precise tuning techniques in order for the antenna to operate at maximum efficiency (efficiency in an antenna is something every QRPer strives for). The tuning for both units is done remotely at the controller box, and it is the exact resonance of the variable capacitor with the loop inductance that achieves this maximum efficiency. It should be pointed out that "tweaking" the SWR with an additional manual or rig mounted antenna tuner does not achieve this frequency resonant point efficiency (no "fooling" the rig's SWR with this antenna).

Both units have their quirks in getting to this resonant frequency. The MFJ Super Hi-Q loop control box uses, in addition to the dual needle SWR meter, a "quick tune" option that works fairly well when the antenna has a pronounced "dip" at the resonant frequency. Even 5 watts from my QRP rig was sufficient to activate the circuitry. Basically the controller looks for the SWR "dip" and then turns off the motor at this dip (actually just past the dip point). The user is then prompted to fine tune the "dip". As I mentioned this feature works fairly well.

Fine tuning using the MFJ "up" and "down" fine tuning push buttons is a "learned" skill. The fine tuning in the MFJ has to do with the torque of the DC motor and the backlash spring tension on the capacitor shaft. Basically you want the motor to turn as slow as possible so you can "capture" the low point of the "dip". The fine tuning sends a DC pulse to the motor. A too small voltage pulse and the motor won't turn since it has to overcome the start-up inertia (there is an adjustment for this pulse level). Once the "start" pulse voltage is found the motor turns but when you want to stop (disconnecting voltage) the motor does not come to a dead stop. It "winds" down a little. So you basically get a "feel" for when to release the fine tuning push button.

The AEA Isoloop tunes differently and has its own user learning curve. As mentioned, the AEA unit uses a stepping motor to drive it's variable tuning capacitor. The AEA controller uses two sets of controls—directional (up-down) switches and speed controls. The speed controls adjust the

number of positive or negative voltage pulses that are sent to the stepping motor and the directional switches determine the polarity of the pulse. Tuning is also a "learned" experience of continually adjusting the speed (migrating to as slow a speed as you can endure) as you toggle the directional switches. The stepper motor seems to always overshoot the "dip" so it takes practice in hitting the target. By the way it is essential that you slow the speed down as you approach the dip since the resonant point is very sharp.

QRP "draw" for both units when it comes to tuning.

•**Construction:** Both units seem sturdily built. I will say that the newer AEA 10-30 Isoloop design is a step above their older 14- 30 Isoloop. The MFJ unit is lighter that the newer AEA unit by a noticeable amount. The weight is in the housing. It appears that AEA uses the structure of the housing to support the antenna on the mast, where MFJ uses a sturdy light weight aluminum plate for it's mounting structure. The MFJ housing just provides weather protection. I was not fond of the earlier AEA case and even though the new case is much sturdier I did notice a stress crack at one of the bolt down points at a store model of the newer unit. Bottom line is I prefer the MFJ construction because it is lighter (easier to put on and take off the mast) and it has a better mounting bracket. Time will tell on this one. A QRP "plus" for the MFJ unit for my needs.

•**Price:** MFJ is the QRP "plus" winner here, although both units are pricey. The price gap really opens up when you add AEA's optional IT-1 Automatic Tuner (I don't recommend this option since I feel you always need to fine tune the antenna depending on the weather conditions outside). - Loop Tidbits: In the head-to-head advertising war between these two great ham companies, AEA claims that unlike a DC motor their stepping motor generates no RF noise. True, but MFJ uses the DC generated RF noise too it's advantage by letting the user know when you approach resonance by listening for the "peaking" of this noise. This works super for trying to find resonance on a quiet band or just casually tuning your rig for listening to the "new" Radio Moscow.

Another construction tidbit—MFJ uses a rounded aluminum conductor loop welded to the capacitor where AEA uses a flexible iridited aluminum band for it's loop section. I'm not sure who's advertising side to pick on this but it just seems to me that the rounded element is a more efficient radiator. Granted it may be easier getting the new AEA, with its flexible loop, through an attic ceiling access.

So what's the bottom line for the QRPer stuck in a "no antenna" housing situation. Well I don't think my case is very unique—my MFJ Super Hi-Q Loop is mounted on a third story apartment balcony and I work everyone I hear (Europe and Africa included)—yes, with QRP power of 5 watts. Are these antennas great or what? Furthermore, the High Q design of both antennas minimize TVI and RFI related problems with my apartment neighbours. Are these antennas worth the price? That's for you to judge. In my situation it was either a dismal QRP operation or a section winner in a recent QRP contest (so what if I was the only station in my section to enter ;-)

No more excuses for low power and inefficient antennas hampering your QRP fun. With 5 watts and a mini-loop antenna the only thing left for improvement is your QRP operating skill...and that's another story.

Summary Report on the 40m "F" Beacon

Mike Pulley, WB4ZKA
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[This article describes the activities of WB4ZKA and others to track down and locate the elusive "F" Beacon utilizing the Internet as a liasion channel. -WB6TPU]

First, thanks to all who have helped in the first ever DF hunt (not to be confused with the Fox Hunt) on the qrp-l Internet list! The project seemed to spark lots of interest among list members.

IN SEARCH OF THE ELUSIVE "F" BEACON

We have no definitive answer, but most of the evidence suggests the "F" beacon may come from the former Soviet Union. The beacon appears to be directed in a very narrow beam across the U.S. West, or perhaps a broad beam that covers the northern Pacific with very little overlap into North America.

The "F" beacon on or about 7039.5 has only been heard in a diagonal NW to SE tract extending through coastal WA and OR, all of CA, and parts of NV, UT, and AZ. The states bordering this tract were CO and TX, neither of which could hear it. The strongest signal strength is in Portland, OR and Seattle, WA. No reports from Mexico or Central America were received, but Brazil in South America cannot hear the beacon, so the tract doesn't propagate that far. The FCC field office in Ferndale, WA reports known "F" beacons on other frequencies emanating from cities within the former Soviet Union. The FCC did not hear the 7039.5 beacon on the nights they monitored, though.

Bill, WK6V, characterized the CW as "very sloppy code", sometimes not sending proper "F"s. It misses dits and dahs here and there. This kind of behavior implies an unsophisticated keyer like a coding wheel or continuous loop paper tape.

I've received some rogue data, which I'm trying to justify. Two hams hear the beacon very well in Portland, but a third ham in Portland and Laura in nearby Burnaby hear nothing. Three or more hams hear it in the L.A. area, but another ham does not. Most of the observations indicate the strongest signal is NW of CA, but one ham DFed it to the SE. I can explain this data away, but only at the risk of missing something significant.

While investigating the "F" beacon, hams on this list also discovered two other beacons -- transmitting "C" and "S" -- on the same frequency with the same characteristics. I suspect all three are related.

Various SWL books mention the "single letter beacons". Their purpose remains unknown, but the books speculate that the beacons are for propagation, navigation, or some obscure secret message transmissions involving interactions

of beacons from different frequencies. Personally, I lean toward the propagation beacon theory.

If this conclusion is true, the West Coast can use the beacon to predict propagation into Eastern Europe.

THE INTERNET AS A DFING NETWORK

The Internet is an ideal place to track on-the-air radio curiosities like beacons. In only two weeks, we have collected observations from 26 hams representing 5 countries and 14 states and provinces. We exchanged clues with the FCC and the ARRL, too, and uncovered a few other leads to follow if we want. The result is a pretty good composite picture of the "F" beacon in a very short time.

The key to keeping the S/N ratio high is to handle the bulk of the DFing correspondence on email. Just good netiquette.

"F" BEACON OBSERVATIONS

The beacon was heard by...

Seattle, WA	Stephen, KC7AVB/aa (Very strong signals.)
Portland, OR	Lowell, <callsign unknown>
Portland, OR	Ed, KI7KW
Aptos, CA	Eric, WA6HHQ (DF along 285-300 or 105-120 degrees)
Palo Alto, CA	Rich, KO6CL (Can hear it when band open to WA/OR)
San Mateo, CA	Bil, KD6JUI
Fremont, CA	Mont, KM6WT ("...weak...not strong enough to move the s meter")
L.A. area, CA	Clark, WA3JPG
L.A. area, CA	Paul, N6HCS
L.A. area, CA	Bill, WK6V (Reading S-7 in early mornings, S-3 at night from 120-130 degrees from Harbor City, CA.)
Ben Lomond, CA	Peter, AB6WM (S-7, 1505Z, located 122W-37N)
Sun Valley, NV	Ron, KU7Y (very weak... about 229 at 0717Z)
SLC, UT	Dave, K7BWZ (weak)
Phoenix, AZ	Mike, WB4ZKA

The beacon was not heard by...

Burnaby, BC	Laura, VE7LDH (near Vancouver)
Portland, OR	Dave, KC7GQQ (** Does not fit the pattern. **)
L.A. area, CA	Bart, WB6HQK (** Does not fit the pattern. **)
Austin, TX	Chuck, K5FO
Ft. Collins, CO	Michael, AAØUB
Hawaii	Jeff, NH6IL
Rock Hill, MO	Jim, NØOCT
Newton Square, PA	Pete, WA3NNA
Wilkes Barre, PA	Rich, K7YHA
Blacksburg, VA	Ranson, NZ4I
ONTARIO	Glen, VE3DNL
Sao Paulo, BRAZIL	Tom, <callsign pending>

FCC FIELD OFFICE REPORT

Stephen Lee, KC7AVB/aa contacted the FCC monitoring station in Ferndale, WA about the beacon. Here's Stephen's account.

"They listened for several evenings and didn't hear the beacon on 7039.5 KHz. They have heard the "F" on other frequencies at other times. The primary source is Petropovlsk, Russia. Another location which transmits an "F" beacon is Vladivostok, also in Russia. I say Russia rather generically...haven't quite caught up with the boundary changes yet, or the spelling."

THE ARRL MONITORING SYSTEM

John Hennessee, KJ4KB, at the ARRL told me that the ARRL has a Monitoring System (MS) headed by Jay Mabey, NUØX, that reports non-amateur intruders in the amateur bands to the FCC. I gather from John's email that the ARRL MS has already received reports of this "F" beacon.

THE "C" BEACON

Dirk Sibie, PA3GNR, in The Netherlands reported another beacon clearly sending the character "C" on the same frequency and the same speed as the "F" beacon. He says it must be a strong signal for his indoor antenna to receive it so clearly.

Greg Mossop, GØDUB, confirmed the "C" beacon. The signal is readable nearly 24 hours a day in the British Isles, stronger at night.

Tom van Ewijck (callsign pending) in Sao Paulo, Brazil also hears the "C" beacon at local nighttime.

THE "S" BEACON

Glen, VE3DNL on the western edge of Lake Ontario reported hearing a faint "S" beacon on the same frequency. The signal was, "so close to the noise level, that I couldn't tell if it was transmitting continuously, or was fading. Heard it around 0300Z and later, 0400Z. I'd guess it was about 5 WPM."

Greg, GØDUB, observed a similar "S" beacon about 100kHz lower which is much louder during the daytime in the Isles. Probably related but not the same beacon.

NEW HOME FOR THE INTERNET QRP FORUM

Attention QRPers with Internet access--at Dayton this year I heard the QRP forum (available through a mailing list) would be moving to a new home, with many improvements over the old one. It's finally here! This message from K5FO announced it--

Date: Fri, 19 May 1995 00:39:31 -0500
From: adams@chuck.dallas.sgi.com (chuck adams)
To: qrp-l@netcom.com
Subject: NEW SERVER for QRP-L

Well, it's is finally here. A new server for this list. Starting Friday, May 19th, 1995, and during the weekend, whenever you get this message, you should move over and start posting there.

Here are just a few reasons for doing so:

1. The new server will be faster than the old one.
2. The new server will also have all the archives from the beginning from the previous server **[think.com]** and this server **(netcom.com)**.
3. You will be able to get the archives via email, ftp, or www.
4. New schematics in both postscript and upon demand HPGL will be posted there. Things like the NN1G Mark I, etc.
5. PostScript forms for ARCI contests, awards applications, and ASCII files for the FCC exams, and numerous other data files.
6. You will now be able to get DAILY-DIGESTS!!! For those that dial into their internet provider and download mail, this will be a great cost benefit and it will also bring back a number of individuals that have unsubscribed during the past two years or so.
7. Hopefully, within a short period of time, the headers from mail from the server will start with [QRP-L], thus those with mail filters can key on this and save them to a specific file and/or directory.

The mail server will be running **ListProc 6.0c**, not **majordomo**, but I think you will like the new one much better.

When you subscribe, you will get instructions on how to get the digests, ftp, etc. Additional information will be posted as directories, files, etc. become finalized or change. Remember, this is dynamic and changes will be made as some reorganization takes place as we continue to grow.

To subscribe, send email to
LISTSERV@LEHIGH.EDU

In the body of the message put
SUBSCRIBE QRP-L Your_Name Your_Call

An example would be
SUBSCRIBE QRP-L John Doe K5FJZ

After the server gets your message you will get back a welcome message and additional information. Be sure to save it, if you can. If you lose it, there will be postings periodically later on how to get it again.

You will want to unsubscribe from **netcom.com** by sending a message to **listserv@netcom.com** with **unsubscribe QRP-L** in the body. Our many thanks to Mike, N1IST, for his support of this group and the hard work that went into it.

[rest of K5FO message deleted]

The best part of the new home is that QRP-L will once again have the daily digests available! Some people get their e-mail from services that charge by the message--the daily digest bundles a large number of messages into a single one, cutting those charges. While the digest was available when the list was at **think.com**, it never materialized at **netcom.com**. When the list left **think.com** and the digest function was lost, a substantial portion of the subscribers turned themselves into former subscribers.

Another wonderful feature, which was not available in as much detail on the other systems, is a complete list of subscribers. While the other would give you the e-mail addresses of everyone (unless some were "concealed"), this one will give you the addresses as well as name and call signs. (Those are given when you sign up.) I've lost track of how many times I wanted to send e-mail to someone who I know is on the list but didn't have their address written down, and had to wait and wait until they posted something so I could get it!

If you have an e-mail account, you might want to look into subscribing to the QRP forum--it's a lot of fun and there's a lot of good QRP info!

--WA8MCQ

IDEA EXCHANGE

Technical Tidbits for the QRPer

WA8MCQ
Michael A. Czuhajewski
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Severn, MD 21144

Packet:
WA8MCQ@WB3FFV.MD
E-mail:
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IN THIS EDITION OF THE IDEA EXCHANGE:

BOUNTY FROM BATTERIES, **N2CX**
FIXES FOR THE OHR CLASSIC, **ND3P**
LED INDICATOR FOR MFJ RIT, **NA5N**
WIRING PHONE JACKS FOR MONO/STEREO HEADPHONES, **W1HUE**
THOUGHTS ON VFO DRIFT, **N2CX**
A SIMPLE CAPACITOR TESTER, **KB4ZGC**
TUNED AUDIO TRANSFORMER IN 35 MM FILM CANISTER, **W3GY**
GOOD SOURCE OF USED METERS, **KB4ZGC**
MIZUHO/AEA QRP RIG EXTERNAL POWER MOD, **WD8DAS**
VCR FERRITE BINOCULAR CORES AS POWER SPLITTERS, **N0OCT**
TURNING "WORTHLESS" METAL COLLARS INTO DIALS, **KI6DS/WA8MCQ**
CURING VHF INTERFERENCE IN TEC-TEC ARGONAUTS, **W1HUE**
MISC NE4040 NOTES, **WA8MCQ**
ZENER DIODE PROTECTION FOR RIGS, **N1OOQ**
QRP ON THE INTERNET, **WA8MCQ**

BOUNTY FROM BATTERIES

The Energizer Bunny just keeps on going and going and going, and so does Joe Everhart, N2CX of Brooklawn, NJ, with Joes Quickie #14 (received via e-mail, from jeverhart@cayman.vf.ge.com)--I'm always looking for "something for nothing". These days a fashionable name for this is "recycling". One of the things I do is to disassemble the ubiquitous, dead 9-volt rectangular batteries. They usually have a strong steel outer wrapper that can be carefully pried apart to reveal the guts. Most of the battery is unusable and should be properly disposed of, preferably in a battery recycling container. In the South Jersey area, they can usually be found in schools, firehouses and government offices. Practices in other areas may vary.

The salvageable part of the battery is the connector on top. It has two round clips on a plastic or fiber insulating plate. There is one female and one male clip that will mate with clips on other 9-volt'ers. All you have to do is cut off the connecting leads to the old battery pack and solder on a couple of wires (easiest with fiber insulation; don't overheat the clips on plastic insulators). I prefer red and black leads to denote positive and negative, respectively.

Carefully note the polarity. As a CONNECTOR, the female clip is negative and the male is positive. Note that some batteries have + and - signs stamped into the insulating plate. Since they came from a BATTERY, they are just opposite what you need for a battery CONNECTOR. After soldering on the wires, I like to clean the connector up with a little alcohol and protect/insulate the back of the clips with a little RTV. Presto - a free battery connector!

While performing these dissections, I noticed that there are generally two types of internal 9-volt battery construction. Carbon-zinc and most alkaline batteries use a "stacked brick" structure. There are six 1.5-volt flat rectangular cells stacked one atop another and surrounded by some sort of plastic covering, or just a wax coating. Electrical connection between cells is by virtue of their being held end-to-end. Connections to the connector is via two metal strips pressed onto the ends of the stack of cells and insulated by pieces of cardboard.

The second type of construction I have found only in Mallory Duracell brand alkaline batteries. They have a bundle of six 1.5 volt cylindrical cells, bound together and interconnected by pressed-together metal strips and cardboard insulators. When you pry off the outer metal jacket, the whole thing just kind of disassembles itself. Well, "who cares?", you ask. Homebrewers, that's who! These cells are slightly smaller than AAA cells and great for somebody building miniature rigs with

teeny-tiny battery packs.

Obviously, you can get 9 volts worth in the 9-volt battery form factor. If you are powering 5-volt electronics you can probably get by with three of these mini-cells to give you 4.5 volts. And a 12-volt powerhouse can be built using eight cells. The best part is that by stripping a 9 volt alkaline battery you can get cells that are even smaller than the AAA size and they cost less, too. Of course when you strip batteries to get the cells, use new ones. Old ones will have worn-out innards. And the internal cells don't have hermetic sealing. After a while their electrolyte may tend to leak out. This will surely be corrosive to electronic components and may pose unknown risks to humans. Check them frequently and dispose of them when they show signs of deterioration.

Now you can not only miniaturize your QRP rig, but the battery pack too!

--DE N2CX

FIXES FOR THE OHR CLASSIC

*From **ND3P, Scott McLellan** of Cyberspace (swm@holawa.att.com), some fixes for the OHR Classic. (This item, like some in the past and many to come, was passed on to me via e-mail, making it very easy for everyone involved. Although diagrams often have to be sent via snail mail, depending on whether I have the same software as a contributor, having the text e-mailed really speeds up the process. My thanks to Scott and everyone else who can do it.)*

Here are a few notes on changes I made to the OHR Classic. I bought it because of recommendations by other owners on the Internet and since it provided coverage on two of my favorite bands: 20 and 40. Aside from the case being somewhat larger than I wanted, the performance of the Classic is excellent. The quality of the kit instructions and parts made it a joy to put together.

As usual, though, I few things I didn't like: key clicks, alignment problems, and widely different output power levels between 20 and 40 meter bands. I also added the ability to "zero beat" the received signal against the sidetone generator.

KEY CLICKS: Paul, AA4XX, posted a note on the Internet about the Classic having a key click problem. He indicated that the timing of the receive, transmit, RIT, and key line voltages were incorrect, causing the key click at key-up. Well, I tried listening to my Classic on another receiver and, yes, there was a click, changing somewhat with RIT settings. I traced the problem down to the timing and shape of the VFO offset control voltage (RIT and transmit offset) applied to D106 (VVC) on the oscillator board. See FIG. 1.

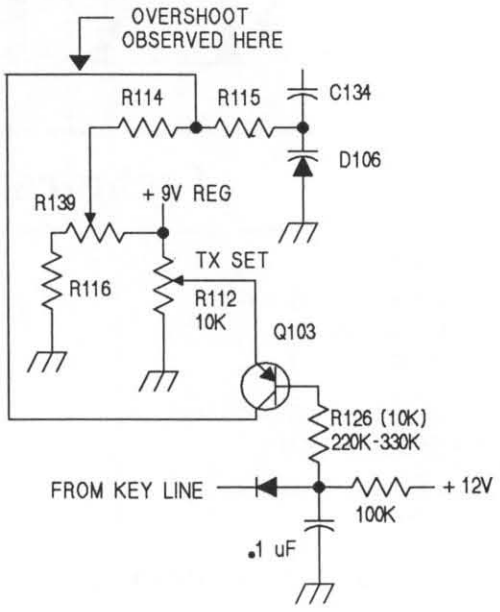

FIGURE 1

During receive, the control voltage applied to D106 is determined by RIT potentiometer R130. During transmit, Q103 turns on (saturated) making the control voltage to D106 set by transmit offset potentiometer R112. That's the way it should work. But, as I found using a four-trace scope, the delay from key-up to end of the transmitted carrier was about 5 ms, while Q103 was turning off in less than 2 ms! Thus, the VFO was switching from the transmitter offset back to the receiver offset before the transmitter stopped transmitting. Moreover, the change in VFO frequency was aggravated by a slewing of the emitter voltage of Q103 as C144 was recharging while Q103 was turned on, making a two volt spike in the control voltage for 2 ms until Q103 turned off. This complicated the problem.

The problem arises from R126 being so low (10k) that the current through the base of Q103 was much greater than the current in the collector thereof. The excessive base current pulls the emitter voltage of Q103 down during transmit and rebounds with the charging of C144 after key-up. Thus, while Q103 is saturated, the change in emitter voltage changes the collector voltage of Q103 and causes the key click during key-up.

The solution is changing R126 from 10k to 220k to 330k or more. The resistor value is not critical but if greater than 470k I noticed that the turn-off time was a little too long, especially for high speed CW. There is still some (less than 0.1 volt) bobble on the emitter of Q103 during transmit and immediately thereafter, but Q103 does not turn-off until a few milliseconds after the

transmitter stops. This greatly suppressed any key clicks I was hearing.

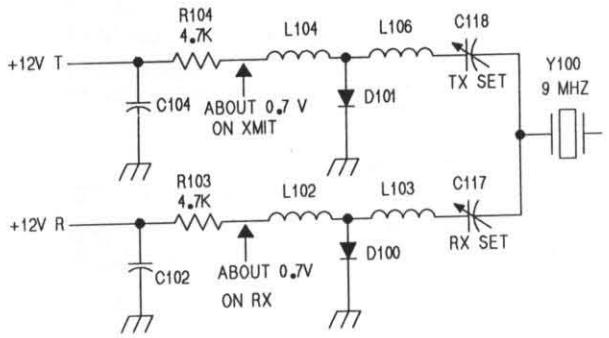

FIGURE 2

ALIGNMENT PROBLEMS: I found I had a lot of interaction between the transmit and receive frequency settings for the 9 MHz oscillator. Adjusting C118 (transmit set, FIG. 2) affected the receive setting for the oscillator. When I measured the voltage applied to D100 during receive, the voltage was not 0.7 volts or so, as I would expect, but about 0.3 volts. During transmit, the voltage across D101 was 0.1 volts! Using a 'scope, I found that there was enough RF current from the oscillator Q100 that the switching diodes D100 and D101 were going into reverse bias during part of the oscillation cycle! Since I have a particularly active crystal oscillator the current in the crystal exceeded the DC current supplied to the diodes by R103 and R104 (4K7). The solution was either to greatly reduce the value of R103 and R104 or change diodes D100 and D101 from 1N4148 (switching diodes) to PIN diodes. I chose to replace the diodes with PIN diodes, such as 1N5767s. Now the bias is 0.7 volts and no interaction occurs between the different capacitor settings.

OUTPUT POWER: When I set the output power of the Classic to 5 watts on 40 meters, the output on 20 was a watt or so as measured on the OHR wattmeter. I got a small increase in power on 20 for the same setting by replacing Q300 on the T/R board with a 2N5770. Now I get 1.25 watts on 20 when the output power is set for 5 watts on 40. Not much of an improvement but someone else may get a better result. A 2N5179 may work as well.

ZERO BEAT: There has been a recent flurry of Internet mail concerning a way to zero beat a received signal so you are within the passband of the calling/called station. One way to do this is to selectively turn on the sidetone oscillator during receive and "zero beat" the received signal against the sidetone oscillator. This feature is simple to add to the Classic without removing the RX board. See FIG. 3.

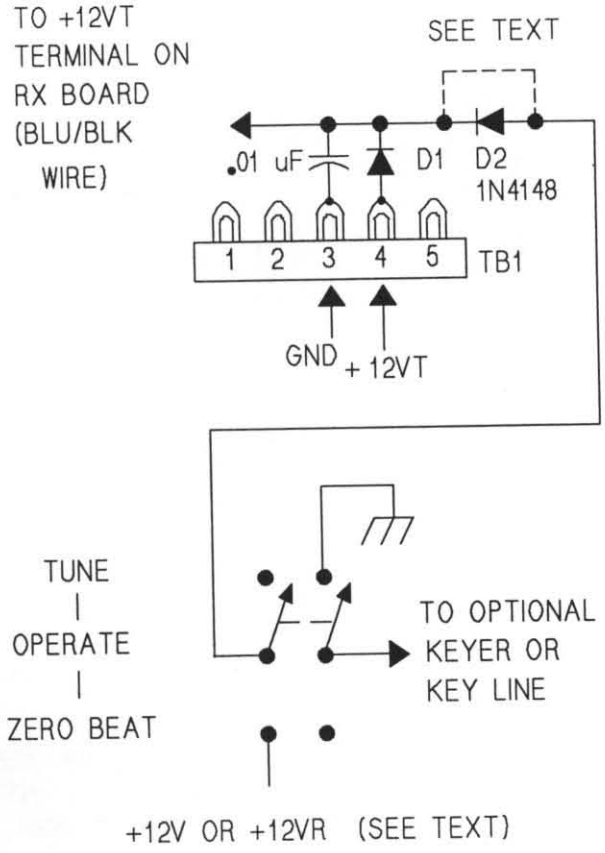

FIGURE 3

Simply move the blue/black wire between the RX board (+12VT) and TB1 pin 4 to the circuitry added to TB1. Change the TUNE/OPERATE switch to a double pole, double-throw momentary-off-momentary toggle switch, such as one from Mountain Switch (Mouser 10TA775). Twelve volts for the sidetone oscillator during zero beat comes from the OHR optional keyer I installed (giving continuous +12) so the diode D2 is unnecessary; if you use the +12VR for the power, the diode is necessary. The advantage of using a momentary switch also eliminates the undesirable possibility of having the TUNE/OPERATE switch in TUNE when the rig is turned on.

All in all, the Classic is an excellent rig. While it is still a little large and draws a bit of current in receive (300 mA or so), it is good enough for traveling and makes a good rig for the home QTH or for vacation.

--DE ND3P

LED INDICATOR FOR MFJ RIT

From ***Paul Harden, NA5N*** *of Cyberspace (pharden@aoc.nrao.edu), an LED circuit to tell you when the RIT is turned on in an MFJ QRP rig, but which has other uses as well.*

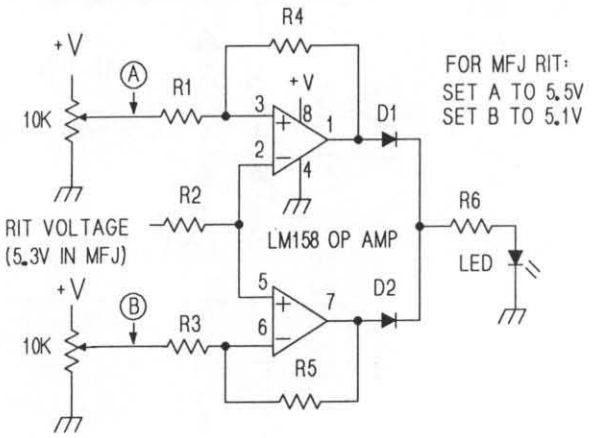

FIGURE 4

COMPONENTS: R1--R3, 10K; R4--R5, 100K to 1 MEG; R6, about 2K for +V = +12V; D1, D2, 1N918 or similar ; U1, LM158 8-pin, single supply, dual op amp; LED: your choice

This circuit was built for the MFJ rigs, but could easily be applied to anything. In the MFJ, the RIT voltage is +5.3V with no offset, and varies +/- 0.7V or so from one RIT extreme to the other. The circuit uses a low power single supply 8-pin IC op amp, the LM158, as a window comparator. The pot on R1 is set for +5.5v and applied to IC pin 3 and the RIT voltage to pin 2. When the RIT voltage is above 5.5V, pin 1 output goes from 0V to approximately +V (whatever supply voltage is used).

The pot on R3 is set for +5.1V and applied to IC pin 6. When RIT voltage is less than 5.1V, output pin 7 will go from 0v to about +V. Diodes D1-D2 form an "OR" gate, such that when either op amp output goes to +V, one of the diodes will pass the current to illuminate the LED.

None of the values shown are critical. Virtually any pot value can be used, since it's just a voltage divider to provide any voltage you want between gnd and +V. (However, values lower than 10K will draw more current from your precious NiCads!). One could argue whether R1 and R3 are really necessary. R4 and R5 just clamp the open loop gain of the op amps to something so the outputs don't chatter with noise. In fact, if you find a problem with false triggering, place 0.1uF or greater caps on the pot wipers to ground.

The only real caution is to make sure the input (RIT) voltage never exceeds +V. In the case of the MFJ's, +V can be either the +10v REF supply or the nominal +12V main supply line. (I used the +10V). In the MFJ, this circuit draws under 1mA with the LED off, and about 3mA with it on. In operation, with the RIT control at the center detent position, the LED will be off.

As soon as you move the RIT control (depending upon how tight you set the two pots) the LED will illuminate. With the LED OFF (no RIT), the LED will illuminate when you transmit, since the RIT is shifted 700Hz on XMIT to generate the sidetone. Since sidetone switching comes off the key line, the RIT LED will show the actual dits and dahs while the XMIT will show the QSK setting.

This circuit can be used to monitor anything ... battery voltage, AGC, SWR voltage, anything you want to monitor and have an LED illuminate when an upper or lower limit is exceeded. If you swap the polarity of the op amp inputs (the - and + inputs) it will operate in reverse - the LED will be ON when the input voltage is within the window set by the two pots.

--DE NA5N

WIRING PHONE JACKS FOR MONO/STEREO HEADPHONES

From our ***Features Editor, Larry East, W1HUE,*** *the answer to the eternal question of whether to use a stereo or mono phone jack in that new rig--* Maybe this little trick is already known to every other homebrewer/modifier in the world, but I just recently ran across it (such things are a continual reminder that one is not as clever as one thinks). So here goes:

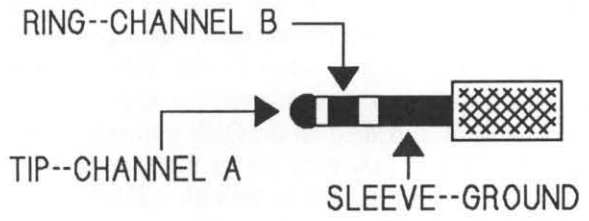

FIGURE 5A--Normal wiring.

To wire a stereo phone jack so that it can be used with either stereo or mono headphones, ground the connection that goes to the ring (behind the tip) of the stereo phone plug and DO NOT ground the connection that goes to the phone plug sleeve (this will require

insulating the jack from metal panels). See figures 5A and 5B. This way, the two phones of a stereo headset will be put in series and the sleeve of a mono plug will be grounded as required.

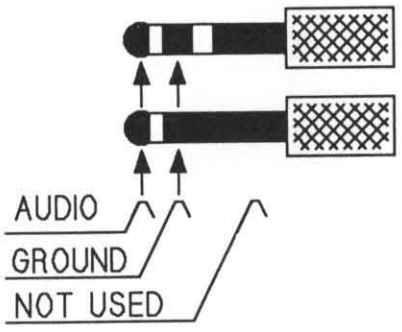

FIGURE 5B--Modified wiring.

--DE W1HUE

THOUGHTS ON VFO DRIFT

A non-Quickie from ***Joe Everhart, N2CX*** *(jeverhart@cayman.VF.GE.COM) posted to the QRP mailing list (QRP-L@netcom.com) in answer to questions on VFO drift from someone who had built one "ugly style"--*

Don't despair getting a stable VFO. Unfortunately, when you construct them ugly style lots of things can conspire against you. First of all, slight mechanical instabilities can magnify temperature drift tendencies. Ugly style construction is not by any stretch mechanically rigid. This means that small temperature changes can affect component to component spacing that will cause stray capacitance to vary with temperature and time and goodness knows what else. When you consider that 7 Hertz at 7 MHz is 1 part per million, it seems reasonable that very slight mechanical changes can have large effects on frequency stability.

Secondly, the circuits are usually open to circulating air currents in the room. This makes VFO components react differently to changes in air temperature--ones with more mass change temperature more slowly than lighter ones, so they will change value at different rates. This usually makes temperature drift randomly.

Another possible source of drift results from soldering the components. They take a LOOOONG time to stabilize after soldering. I think Doug Demaw, W1FB, recommended letting everything settle out for 15 minutes or more after soldering any components before measuring drift. Yet another drift source was mentioned on QRP-L a few months ago. If you have a JFET VFO, you likely have a high speed switching diode like a 1N914 from its gate to ground. These diodes have transparent bodies, and can be light sensitive! Let light fall on it and the frequency can shift. Inductors can be causes for serious instability. Ceramic coil forms are probably the best for VFO use, but their size is often prohibitive. And, of course coils with powdered iron cores have temperature sensitivity due to the characteristics of the cores. No matter what kind of core or form you use, the windings must be mechanically stable. The very best ceramic coil forms have grooves in them to keep the turns in place. With other forms, Q-dope or Duco cement can help keep things rigid.

Another tip has been recommended by **Wes Hayward, W7ZOI**. He recommends with toroids that you make sure the turns have relaxed into their final shape before captivating them with Q-dope. To do this, boil them briefly after winding. This heating and cooling action expands the copper then allows it to shrink into place on the core. [And **Denton Bramwell, K7OWJ**, told me he likes to use a handheld hair dryer on the entire VFO; quick and easy, no mess, and it gives the entire assembly the treatment, not just the coil. --WA8MCQ] The idea of a draft-proof, light-tight case helped stabilize a W7EL rig I built on 40 meters. Originally I built it with a metal mesh top to its case. This allowed both random air currents and room lighting to impinge on the VFO circuitry. I made several test runs with constant room temperature, measuring a drift of about 2 KHz per half-hour. I measured the frequency every minute and plotted the results. It was not unusual to see a jump of 100 Hz between measurements, superimposed on the drift curve. After reading about the light-sensitive diode business, I added a solid piece of double-sided pc board to the top of the VFO compartment. Drift was reduced to less than 1 KHz per half-hour with no abrupt changes in the minute-to-minute measurements. Not spectacular, but much more stable.

--DE N2CX

A SIMPLE CAPACITOR TESTER

Here's a simple capacitor tester for checking low value units, from ***J. Frank Brumbaugh, KB4ZGC*** *of Salinas, PR*--Although a lot of hams have a digital multimeter with capacitance measurement capability, those who do not might want to build this simple RF bridge. It is calibrated with known values of capacitance. As shown, the mid-scale capacity on the low range is 100 pF and the mid-scale on the high range is 470 pF. Simply connect the unknown capacitor to the "Cunk" terminals and tune the pot for a null on

the meter. Make a calibration dial for the pot by connecting various known values of capacitance..

Q1 is a general purpose NPN transistor, such as 2N3904, 2N2222, etc. The meter can be anything from 50 to 200 microamps. The crystal Y1 was 7.2 MHz in the one I built. Practically any surplus microprocessor crystal can be used. The frequency is not at all critical--use whatever is handy. This bridge will measure capacitance from a few to a few thousand pF, the range of capacitance most homebrewers use. None of the parts are critical, and almost anything will work. However, the 100 and 470 pF caps in the bridge should be stable types, such as mica, NPO ceramic, or plastic film. Stable caps in these two locations maintain accuracy.

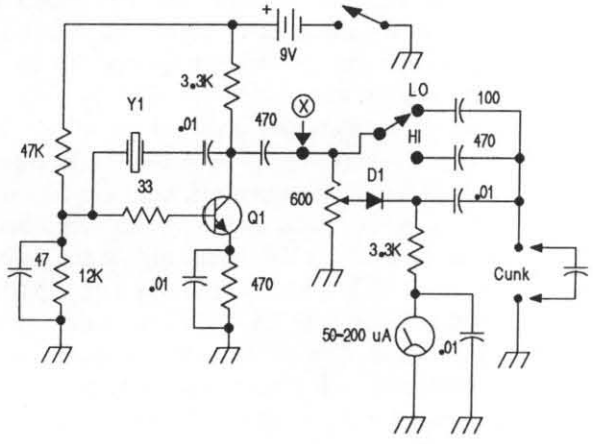

FIGURE 6

No LED is included but can be added if wanted. The 600 ohm pot could be any linear pot from 500 to 1000 ohms, but if a crystal greater than about 10 MHz is used it might be advisable to insulate the body of the pot from ground. (It also might not make much difference.) The 3.3K resistor in series with the meter is for a 200 microamp meter, and should be increased for a more sensitive unit.

Point X in Fig 6 is the RF input to the bridge. You can use the oscillator shown there if you want, but a somewhat simpler oscillator/RF bridge generator is show in Figure 7. Instead of using the circuitry to the left of point X in Figure 6, connect the output of Fig 7 there. This reduces the parts count but requires a 78L05 regulator and draws more current. This oscillator will work with crystals from slightly below 1 MHz to slightly above 13 MHz. It is probably the simplest and cheapest crystal oscillator to build and always works.

--DE KB4ZGC

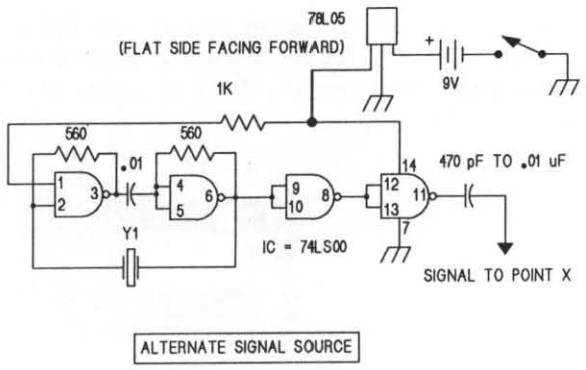

FIGURE 7

TUNED AUDIO TRANSFORMER IN 35 MM FILM CANISTER

From ***Raymond Zettler, W3GY*** *of Washington, DC*--Empty 35 mm film canisters have found many applications in my shack. The most useful is an enclosure for an audio isolation transformer from Radio Shack (1:1 ratio, impedance range 600 to 900 ohms, 300 Hz to 5 KHz, part # 273-1374). For CW use the windings can be tuned with small parallel capacitors to produce resonance at the desired frequency.

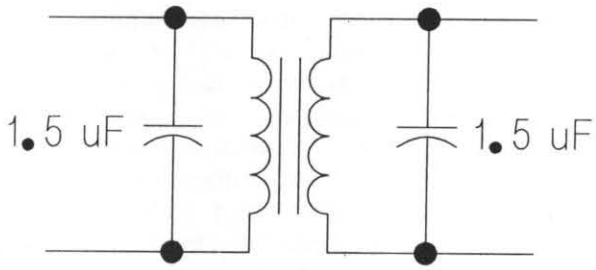

FIGURE 8

My measurements showed an increase of about 6 dB from tuning both windings. In my case I had to use two small ceramic capacitors in parallel. (Experiment with the values to get resonance at the frequency you prefer.)

This circuit works very well in eliminating noise that was louder than the sidetone in my set up every time the key was pressed. The transformers are kept from moving around in the canister by inserting several cotton balls. The canister is long enough to use a phono jack on the lid and a 1/4" phone jack on the other end. This scheme also seems to reduce AC hum.

The canisters are also used to make adapters for the stereo jack to accept the plug from a bug or iambic keyer. Another use is an adapter to key the output of an audio oscillator.

--DE W3GY

GOOD SOURCE OF USED METERS

*More from **KB4ZGC**--*Here's an excellent source for meters--good d'Arsonval movements, 2 to 4 inches in diameter, round and square, all well known brands such as Simpson, Weston, Marion, etc--surplus, most from military and industrial equipment, a bit dusty, and one may have a chipped case. Some are hermetically sealed, most are not. For $10 (plus shipping) you can get five assorted meters (but no choice) from Fair Radio Sales, P O Box 1105, Lima, OH 45802. (It also happens that $10 is their minimum order.)

I've purchased four such meter "grab bags" from them over the past few years. In every case at least one, but usually two, have 100 microampere movements, and the rest have been 1 mA meters. Some may have internal shunts or multipliers, but I always take them apart to check unless REALLY hermetically sealed. Scales usually bear little resemblance to meter movements. I got an old transconductance tube tester (plus 2 at 100 uA and 2 at 1 mA) with the last batch. It contained a selenium rectifier since it originally measured AC. I merely shorted it out with a piece of wire, and the movement proved to be 93 uA full scale.

My field strength meter is a hermetically sealed 100 uA job with jeweled bearings! The ruby bearing is 1/8" diameter. Talk about quality! It is from some TV station equipment; the scale is in uV and modulation to 30%. It was in the latest batch of meters from Fair.

-- DE KB4ZGC

MIZUHO/AEA QRP RIG EXTERNAL POWER MOD

*This power supply modification for the Mizuho QRP rigs was written by **Steve Johnston, WD8DAS,** and allows you to use a 12V source for the external power input. Doug Faunt, N6TQS, found it on a local packet radio mod server, contacted WD8DAS for corrections, and posted it to the Internet QRP mailing list, QRP-L@NETCOM.COM. (The Mizuho handheld QRP CW/SSB rigs are available for several bands; the 6 and 10 meter versions were also sold in this country at one time by AEA as the "DX Handy". This modification is applicable to all Mizuho/AEA models, and appears here with permission of the author.)*

Modification of the AEA DX Handy Radios (Models MX-6S and MX-28S) for Operation from External 12 volt Power:

1. Remove the four black screws and plastic washers holding the front panel to the radio frame. Remove the front cover by gently pulling it away from the radio frame. Watch out for the wires going to the speaker and microphone.

2. Remove the OPTION switch by unscrewing the tiny black screws mounting it to the bottom panel. Cut the white wire that goes up from the switch to the top of the board, and unsolder or cut the resistor going from the switch to the grounded transformer can nearby. The removal of the OPTION switch makes room for the installation of the ten volt regulator.

3. Locate a 7810 three-terminal regulator and bend its heatsink to fit against the bottom panel while the regulator sits parallel to the front panel. This means that the heatsink will have a 90 degree bend. Attach the heatsink to the bottom panel, either with a tiny machine screw and nut, or by loosening the other hardware on the bottom panel, and slipping the heatsink between the layers of sheet metal. Retighten the other hardware. I found that some versions of the 10 volt positive regulator come with a very thin heatsink that makes this sort of installation possible. The usual 7810 regulator heatsink is too thick, and screw/nut mounting is the only way.

4. Locate the orange wire running from the center pin of the external power jack (with diode installed) to the power switch. Cut this wire where it passes the new regulator, and solder the end from the power jack to the INPUT terminal of the regulator.

5. Install a diode (1N4003 or higher) on the OUTPUT terminal of the new regulator, anode toward the regulator (arrow pointing away from regulator, in other words). Now attach the other end of the orange wire (going to the power switch) to the cathode of the new diode.

6. Nothing need be attached to the GROUND pin of the regulator if the heatsink is grounded well. If in doubt, add a wire from the GROUND pin of the regulator to the spot where the OPTION resistor was grounded to the transformer can.

How it works... The old diode on the center pin of the power jack protects against accidental application of reverse polarity. The incoming 12v goes to the regulator and is dropped to 10v. The new diode drops the 10v down to 9.3 volts (ideal for the radio), and blocks drainage of the internal batteries by the new regulator.

--DE WD8DAS

VCR FERRITE BINOCULAR CORES AS POWER SPLITTERS

Jim Smith, N0OCT (jimn0oct@aol.com) *recently started up a little discussion on use of these ferrite cores from VCRs and TV sets on the Internet QRP mailing list (QRP-L@netcom.com). You can often find them near the antenna terminals of junked units, where they act as 4:1 baluns on the input, and he thought they might be useful for QRP at HF. Here's his final report, via e-mail--*

This is the schematic for a homebrew power splitter from the **Rick Campbell (KK7B)** article on the R2 Single Signal Direct Conversion Receiver (January 1993 QST). T1 is 4 turns through a ferrite type 43 bead, tapped 3 turns above ground. T2 is two bifilar turns through the same type of material. R1 is 100 ohms. This power splitter should have 50 ohm feed, and will deliver 50 ohm output. Equal power to each output terminal is delivered if they are terminated in equal impedances/resistances.

I looked at the power combiner (which is a power splitter wired in reverse) provided with the R2 kit (available from Kanga Products US). It is very small, wound on a binocular core and packaged on a DIP. At roughly the same time, I was dismantling an old VCR for parts. At the balanced antenna input, there was a ferrite binocular core that was larger than the one in the R2 kit.

Now, most ferrites cannot be discriminated from other ferrites on looks alone. Type 43 however, does look different. It has a shiny, sparkly appearance whereas most others are a dull dark grey. I wound a few turns around this core, and checked the inductance with my trusty Autek RF analyzer. The core seemed to yield results that would indicate it was close to type 43 material.

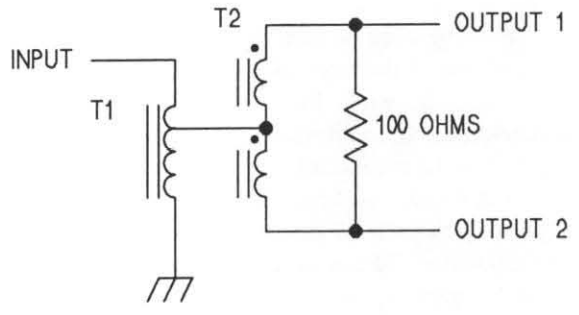

FIGURE 9

Therefore, I wound the above power splitter on it. One side of the core has the four-turn autotransformer, and the other side has the bifilar turns. Going one step further, I decided to mount this beastie on an old 8-pin DIP socket. I pushed some clipped component leads into the sockets and soldered them in place at each corner. To the top two of these leads I soldered the leads to T1. Pin "1" was the grounded lead. To the other two corners (pins "4" and "8") I soldered the output from T2 as well as R1. Now I have a homebrew version of that nice power splitter/combiner enclosed with the R2 kit.

What do I do with it? Well, first I tried some experiments to determine how well it provided balanced power output with changing impedances. Across each output I placed a 48 ohm (marked as 47 ohms, but measured as 48) resistor to ground. Using an 'OXO' transmitter as a signal source (300 mW) through a 15 dB pad (10 mW), I measured 1.4 Vpp across each resistor for 5 mW at each output port. Paralleling one 48 ohm resistor with a 22 ohm resistor (yielding 15 ohms) and then measuring, the power output was 8 mW. The power output at the remaining 48 ohm resistor was 2 mW, for a sum total of 10 mW. So, impedance balance is important for proper power division.

The interesting part of this experiment is that the voltages across the differing resistances were equal (1 Vpp)! To further test this phenomenon, I replaced the two parallel resistors with a 100 ohm resistor. Again, the power sum of the two ports was the same (10 mW), with 3 mW across the 100 ohm resistor and 7 mW across the 48 ohm resistor. Also, the voltages were the same for each port: 1.6 Vpp.

Therefore, it may be helpful to think of this little beastie as an equal amplitude voltage splitter. Whatever the impedance of the output ports, the voltages should be the same. This set-up was not tested with loads, which could yield different results.

This splitter/combiner appears to be low loss (at QRP levels), and provides power outputs that are ratios of the input power. An approximate equation to determine the voltages across the loads at the outputs of T2 would be:

$$V^2 = \frac{\text{INPUT POWER}}{Z1 + Z2}$$

Where Z1 and Z2 are the loads at the output ports of the splitter.

The presentation of equal impedances to the output ports will result in equal output power at each. While

there are many other uses to which this little "junque" may be put, if you have an application that needs a power splitter (phasing receivers) or power combiner (transmitters), look in the back of a dead VCR for a binocular balun ferrite!

--DE N0OCT

TURNING "WORTHLESS" METAL COLLARS INTO DIALS

Credit for this idea goes to **Doug Hendricks, KI6DS,** editor of QRPp (journal of the NorCal QRP Club). At Dayton this year he gave me a little brass collar he paid a dime for, and gave me a Homebrewer Test: What would I make of it? (See Fig 10.) I got partial credit for saying I'd drill out the 3/16" hole to 1/4" to fit a shaft and find the missing set screws, but flunked the quiz. The rest of the answer: drill and tap two holes in the face, and mount a round piece of metal to make a dial, which is easier and better looking than soldering a pointer to the collar.

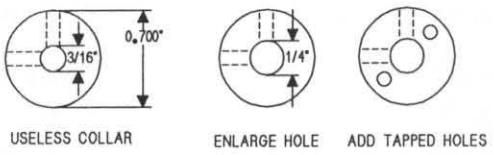

FIGURE 10

Here are some of my comments on his idea--

This particular collar was 1/4" thick, about 0.7" diameter, with a 3/16" hole, but the principles apply to any large collar which has holes for set screws but a hole which is too small for a standard 1/4" shaft. After you drill out the hole to 1/4", drill two small holes in the face and tap them for a suitable screw, such as 4-40 or 2-56, whatever will fit easily. (Don't forget to use a center punch before drilling.) They don't have to be perfectly spaced, but you do need to keep away from the set screw holes.

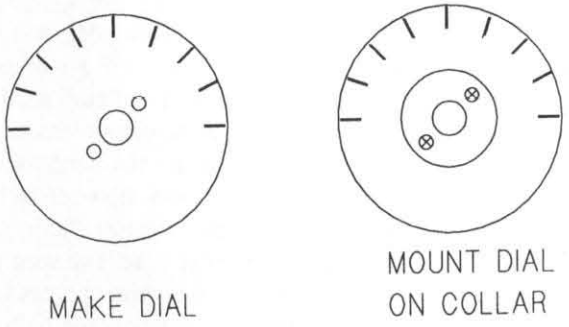

FIGURE 11

Cut out a round piece of aluminum for the skirt of the dial, of any convenient diameter, and drill holes for the shaft and screws. Mount it to the collar, slide over the shaft, tighten the set screws, and you're all set. There are a couple of ways to mount the dial on your rig. You can put it on the outside just behind the knob, with a pointer scribed on the panel, or put it behind the panel and cut a window so you can see the dial. (An advantage of doing it that way is that the dial doesn't need to be perfectly round, and imperfections will be hidden behind the panel.)

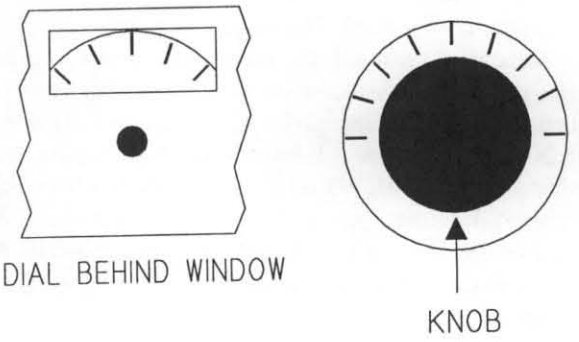

FIGURE 12

This can be done with a direct drive shaft, or one of those variable capacitors which have a reduction drive built into the 1/4" shaft. In that case, put the collar on the slow-moving part of the shaft. If you mount the dial with the knob right in front of it, be sure to leave enough space between them so they don't bind. (Fig. 12.)

If you see any "worthless" collars with odd sized holes, don't throw them away--they can be easily turned into something useful. (Doug can be contacted at dh@deneb.csustan.edu.)

--DE WA8MCQ, KI6DS

CURING VHF INTERFERENCE IN TEC-TEC ARGONAUTS

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

I fired up my trusty old Argonaut 509 on 20 meters for the first time in several months and heard nothing but noise between 14 MHz and about 14.1 MHz! The noise disappeared when I disconnected the antenna (a 5

band trapped vertical), but the same antenna connected to my FT-301 produced NO excessive noise. Other bands on the 509 were OK -- just the low end of 20 was noisy. So, I set about looking for bad solder connections, etc. in the 509 front end; I even removed the input protection diodes and performed a complete re-alignment. No change in the noise! Figuring that maybe the problem was caused by a local AM broadcast station (the noise did sound a bit like splatter), I installed a crude filter to attenuate signals below about 2.5 MHz at the receiver input. The noise was still there! I did some more looking around in the rig, but could not find anything amiss. Then I just happened to connect my LOW pass filter between the rig and antenna -- presto! The noise was gone!

As near as I can tell, the problem is caused by a new high power FM broadcast transmitter located on a hill about 4 miles from me. Why it only effects the low end of 20, I don't know. I have since had reports from other Argonaut 505/509 owners that they too have been bothered by high power VHF TV/FM stations. It's possible the 515 model does not have the problem since it does not use a dual-gate MOSFET mixer as do the earlier models.

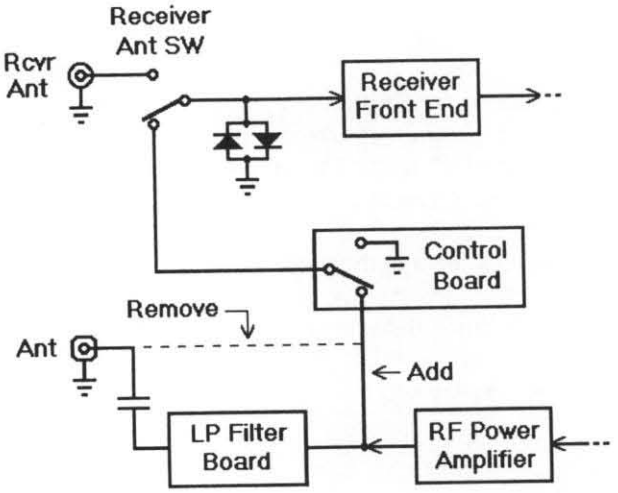

FIGURE 13

My solution to the problem was to do some minor rewiring to use the transmitter output filter as a low-pass filter for the receiver input. Normally the receiver input is connected directly to the antenna connector. Although a 9 MHz filter and "peaking" circuit are located at the receiver's RF amplifier input, strong VHF signals apparently still get into the RF amplifier and/or mixer.

The change is easy to make in the 509; simply remove the wire going from the output antenna connector to the control board connector and replace it with a piece of RG-174 from the control board connector to the end of the low pass filter connected to the final amplifier (NOT the antenna end!). The RG-174 can be snaked under the IF board, then behind the final amplifier board and connected to the final amplifier board connector; be sure to ground the shield at both ends. The resulting circuit will (or should!) be as shown in figure 13.

Making the change in an Argonaut 505 is a little more complex since the relay on the control board actually switches the antenna connector between the LP filter output and the receiver input, rather than just grounding the receiver input on transmit. The best approach would probably be to use the arrangement shown in the figure; that is, rewire the relay to ground the receiver input during transmit. I am not too familiar with the physical layout of the 505, but I don't believe that this should be too difficult.

If you run into VHF interference problems in your Argonaut and don't want to make any internal changes to the rig, you can always use an external low pass filter.

--DE W1HUE

MISC NE4040 NOTES

W6TOY complained that his NE4040 transceiver (originally a New England QRP Club kit project, also featured in the Nov 1994 QST) was very hard of hearing and he let me look it over. I checked it against my own, using a crystal oscillator, and it was indeed much worse. After some troubleshooting, involving signal injection, etc, I discovered the problem: the 4 MHz output of the first NE602 goes through a 22 uH molded choke on its way to the crystal filter. For some reason the choke was open, and only a very small amount of signal was leaking through it. It had no visible evidence of damage.

I wound 20 turns of #28 wire on an FT37-61 core and verified that it was about 22 uH, as my winding chart indicated. (I also checked the Q at 4 MHz, and it was about 120.) After I soldered it in, the rig worked much better and had a great deal more audio output. My HP 403C AC voltmeter told me that the output was still about 8 dB less than my rig, indicating the need for a little more work, but the volume was now entirely adequate. The moral: Don't put absolute faith in molded chokes, since they can open up--and I've seen it many times. (The same also goes for various types of resistors other than carbon composition types; again, I've seen many of them open over the years, although they

looked perfectly normal.)

The NE4040 uses 3 polystyrene capacitors in the VFO. All 3 in mine eventually failed, one at a time, and I replaced them with silver micas. I didn't have the rig mounted in a box yet, and it just flopped around on the workbench, with lots of wires connecting it to the outside world. As a result, the caps got a certain amount of physical abuse, and they eventually opened up--the leads separated from the foil internally, and when wiggling the bodies I could easily see the leads moving in relation to the plastic body. Moral--treat polystyrene caps gently and with respect--don't physically abuse them too much. (Jim Reid, KD3S, told me he has had numerous problems with poly caps over the years.)

And while we're at it, I've also seen ceramic disc caps fail internally, going open without leaving any visible signs. The moral--any component which has leads on it has a connection (welded, soldered, crimped, etc) between those leads and the active elements, and those connections can fail and open up. Never make the assumption that certain types of components never open up or go bad; when troubleshooting, give everything the evil eye and trust nothing--you could save yourself a lot of grief and time.

--DE WA8MCQ

ZENER DIODE PROTECTION FOR RIGS

There was a bit of discussion on the QRP forum on Internet recently about using diodes to protect rigs from accidentally applying power with reversed polarity. ***Tom Randolph, N1OOQ*** *(randolph@est.enet.dec.com) passed along this improvement to the traditional upside-down diode--*"Even better than a diode across the power supply, use a Zener rated a few volts above your supply voltage [as shown in Figure 14].

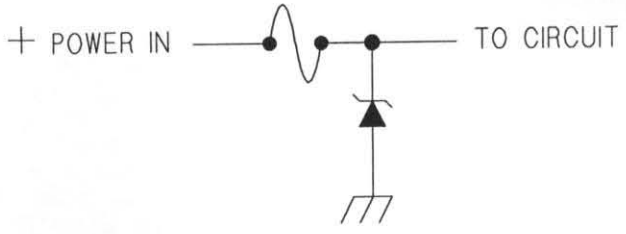

FIGURE 14

"If you reverse polarity, the fuse blows; if you over-voltage, the fuse blows; if something goes seriously wrong inside the radio, the fuse blows--pretty much idiot proof. A 15 or 16V Zener that can handle the rated fuse current should do it. Don't wire it in until you're finished building and debugging the radio! I blew FOUR fuses last time by accidently shorting the supply rail!"

(If polarity is reversed, the diode conducts and blows the fuse. If polarity is correct but the voltage is too high, the Zener voltage of the diode is exceeded, it breaks down and goes into "Zener mode", limiting the voltage applied to the rig to the Zener value. But since there is no current limiting resistor, the current through the diode will be heavy for a brief instant, blowing the fuse right away. --WA8MCQ)

--DE N1OOQ

ERRATA: A couple errors crept into the column last issue because I didn't keep a close enough eye on the computers when I transferred things between different machines. In the W1HUE antenna article on page 38: left column, third line from the bottom should read "ten foot long piece of 1/2 inch copper pipe", and the 4th line from the top in the next column should read "top-loaded 1/4 wave vertical." If any substantial errors creep into the column, let me know and I'll print corrections.

QRP ON THE INTERNET NOW AT LEHIGH.EDU

Don't forget about the QRP forum on Internet. Those of you who have an e-mail account can sign up for it (no charge unless you use an on-line service which charges for Internet messages or charges by the byte for incoming mail), and join in on the fun! If you've read about it before and want to subscribe now, please note the new address: it has moved to **lehigh.edu** as of 19 May 1995. To subscribe, send e-mail to

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subscribe QRP-L Mike Czuhajewski WA8MCQ

That's your name, not your e-mail address, which the system gets from your header. The name and call go into the data base, for a really useful function that the other hosts didn't have in as much detail--you can request a list of all the people on the list, and it will give you their e-mail addresses, ***and*** names ***and*** calls. There is also a daily digest function available. When you subscribe, you will get a "welcome" message explaining all this and more.

THE FINE PRINT: Have a tip for building, troubleshooting, etc? Send it here, or send it to any of the other QRP journals, but send it somewhere and let the other QRPers know about it. Scribble it down, put it on disk, send it via e-mail, do it any way you want, and get the fame and eternal glory of being published in the QRP Press!

--QRP--

Members' News

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Changing times at the 'Quarterly'

All kinds of changes are in the wind at QRP ARCI, and experience tells us that that's a good thing.

Beginning with October edition of "QRP Quarterly," **Monte "Ron" Stark, KU7Y,** of Sun Valley, Nev., is set to step in as editor, taking the reigns from longtime editor **Paula Franke, WB9TBU.**

KI6SN
. . .Richard Fisher

To Paula's great credit, for well more than a year she has held down the position even though no longer having the time, energy or desire to head the magazine. Everyone who appreciates this publication owes her a great debt of gratitude.

In the meantime, Ron has been burning midnight oil doing the tremendous amount of legwork necessary to take on such an ambitious and time consuming job.

As of this writing, dozens of e-mail messages and telephone calls have been passed between Ron and "Quarterly" staff members. If planning is any indication, coming issues of the magazine are going to be better than ever.

The success of "QRP Quarterly" is based in great part on the contribution of the QRP ARCI membership — and that's where *you* come in.

Members' News is an excellent example of members at work. It's a place to share your challenges, successes and — yes — horror stories with the huddled QRP masses.

The addresses at the head of this column is all you need to make the connection. Here's hoping to hear from you soon.

— R. E. F.

QRP success in Canada

Garry Brisbane, VE3REP, writes from Ajax, Ontario, Canada, that there is a "merry band of QRPers up here in the frozen north.

"The Durham Region QRP Club, **VE3QDR,** was formed about two years ago by about six of us to get 'back to the basics,' CW operating and homebrewing.

"We meet monthly at a local college — about 20 miles north of Toronto — in the electronics lab.

"We entered Field Day 1993, and came in fourth overall in Canada. Field Day 1994 saw us take the No. 1 spot. We ran 3A with nine operators.

"Overall, we had the 14th highest score for battery-operated stations in the U.S., and Canada. As a club project, about six of us built NN1G's 40/40 (QRP CW transceiver), and it was great to have at our disposal the lab's test equipment for alignment, etc.

"We invite check-ins on our CW net, Wednesday night, 3.535 MHz at 0100 UTC. Our local goal for Field Day '95 is to repeat as the No. 1 club in Canada, and to be in the top five for battery operation in North America. A few more CW operators would be nice."

'QRP Plus' headed for Club-dom?

"How about a new club called 'QRP Plus Club?,' for owners of the popular CW-SSB QRP transceiver, asks **Dick Swanson, N5JWL,** of San Antonio, Tex. Dick says he made contact with **"Mike" Michaels, W3TS,** in the last Winter Fireside SSB Sprint contest in January while he was using a QRP Plus and his rig "really sounded great with two watts PEP."

Accessorizing — QRP style

J. Frank Brumbaugh, KB4ZGC, writes from Salinas, Puerto Rico that "although I've been licensed since 1949, aside from a 10-year span when I let my license lapse, and have never owned a beam nor run more than 100 watts, I've always preferred the 25 to 50-watt level, feeling this was plenty for a ragchewer like myself.

From KB4ZGC's log

W3FPN (Florida)
March 29: Conditions very poor

PA6EWE (Holland)
March 30: Called him after he signed with a U.S. radio amateur

AA2NU (New York)
March 30: His RS(T), 5-4; my RS(T), 2-2

W1KY (New York)
March 30: His RS(T), 5-8; My RS(T) 5-6. He's running 800 watts to a quad at 50 feet, yet signal reports are only 2 S-units apart.

GD0PLT (Isle of Man)
April 18: Called him in a pile-up!

W3VR (Florida)
April 25: Nice chat

"I've recently been interested in QRP — my QRO rig is a Ten-Tec Scout — and when MFJ came out with the 9420 QRP 20-meter CW/SSB rig, I ordered one from AES on Jan. 9, this year.

"It took over three months to get it, and when it came it had two screws missing on the right side of the cabinet! MFJ sent me replacements. Someone was in a hurry!

"I immediately tried it out and . . . it seemed to be a well-engineered rig, in the main. However, the audio output chip seemed to want to 'motorboat' on signal peaks."

Frank said he made some modifications, and also installed the CW adaptor, which gave him difficulty in getting the headers plugged in. He also found the hole in the adapter board unfavorably offset to allow access to the VFO inductor. "I had to take two bites with a pair of (wire cutters) so I could reach the VFO slug. I also added a pair of LEDs on the panel in series with a 2.7k switched by the CW/SSB pushbutton switch on the rear deck.

"The LED draws three milliamperes, and now I can tell at a glance whether I'm set up for CW or SSB. I have incorporated my 9420 into a portable, integrated 20 meter ham station with a handle on top — power supply with speaker, phone jacks, battery input when away from AC, a front firing speaker, and a suppressed zero 10-15 volt DC meter switchable to read 0-3 amperes. Above this is an MFJ-971 dual needle antenna tuner; above this is the 9420 rig; and above this is an accessory module which contains a 20-watt dummy load switchable to the output from the 9420

and a wattmeter which indicates power to either the dummy load or to the antenna tuner.

"A crystal marker generator with the 25kHz output loosely coupled to the dummy load; a 'poor man's keyer,' using six TTL chips built on a Radio Shack 276-150 PC board; and a slightly modified Ramsey AF-1 switched capacitor filter," are also part of the package.

"I also included a 24-hour LCD clock on the panel for UTC. On the rear are spare RCA jacks providing 12, 9 and 5 volts DC for accessories. A field strength meter in its own tiny box is separate but sits on top.

"My only antenna is 33 feet of wire slanting down from 15 feet to 7 feet from the ground. I have no DC ground — I use quarter wave wires along the baseboard to provide an RF ground. With this poor antenna, I decided to really handicap myself and truly see what the 9420 would do on the air, despite the very poor propagation conditions. I decided to use SSB, a whole 8 watts PEP when tuned up!"

Entries from Frank's log accompany his dispatch.

"I really can recommend the Ramsey AF-1 filter! It has selectable center filter frequency — I hate 750 Hz; prefer 500 Hz tones — and four bandwidths: 750, 500, 250 and 100 Hz. To give it a real workout, I searched for a noise-covered CW signal, gradually hauling it up until it was all by itself in the middle of the 100 Hz passband, amplified by the LM380 amp in the filter. And no ringing, nor did the 9420 drift, either.

"The filter skirts are almost 'brick wall' — nothing at all 150 Hz to either side. And, if an SSB signal is strong enough, it *can* be read on the 750 Hz bandpass, which readily gets rid of the slop-over of signals on both sides. The filter kit costs $35.95, plus shipping and handling. It has all the board-mounted controls and connectors, plus a bridge in the power input so it can be operated from 12 volts AC or DC without regard to polarity.

"I sawed off the rear portion of the board, eliminating the power circuit and IN and OUT connectors, and replaced the board-mounted switches and controls with panel-mounted controls, etc.

"Ramsey has the filter center pot on the panel. This I replaced with a trim pot internal. I used a DPDT toggle switch in place of the pushbutton switch to turn power on and bypass the filter. I also replaced the two pushbutton switches which selected the four passbands with a double pole/four position wafer switch. These two pushbuttons had to be manipulated in a difficult-to-remember 'this in; this out; both in; this out; this in; both out — which explains my use of a wafer switch. It uses a pair of MR8 SCF chips in the filter, and an LM380 CW amplifier. Partly I cut the PC board down so I could fit it in on spacers atop my keyer in the accessory unit.

"I have a few more adjustments to make and then I can button the ham station up and concentrate on operating. I am waiting for an intermittent to show up again — the GAIN pot on the 9420, although panel-mounted, has its terminals soldered through the PC board, a practice I loathe. One has, apparently, a bad solder joint. I'll have to remove the panel to get my soldering pencil in beneath the PC board — a job I am not exactly anticipating with avid fervor!

"I love the challenge of QRP, despite my lousy antenna, and probably my Scout will gather dust — at least for awhile."

QRP's magic: Seeing is believing

Bill Jones, KD7S, writes from Sanger, Calif., that he "attended a large — or at least for this area — hamfest (in May) and took my portable rig along (featured in April 1995's Members' News).

"I arrived Friday night around 5 p.m. and set up a small tent. A 40-meter dipole was strung in some trees and within 15 minutes I was calling 'CQ QRP' on 7.040 MHz.

"I operated for a couple hours and added several calls to the logbook. At times there were as many as two dozen people looking over my shoulder.

"Most spectators had never seen QRP in operation and were amazed at how effective it was. One burly gentleman professed to be an avid DXer, and while he thought my rig was 'real cute,' (he thought) there really wasn't much you could do with a toy radio like mine.

"I wasn't about to let him get away with a comment like that, so I switched over to 20 meters and was relieved to hear a number of fairly strong, watery signals near the bottom of the band.

"On the second call I snagged **ES1WN,** August in Estonia. He gave me a 549 and remarked that the two-watter was doing a fine job. 'Mr. Big Gun' shook his head and walked away. He came back a little later and caught the tail end of my contact with a **KH6** on Maui.

"While I doubt he will swap his 4CX1000s for a pair of 2N3553s, I believe he gained a degree of respect for 'toy radios.'

"Thank God for gray line propagation."

The 'Goodie Giveaway'

Everyone sending an item to Members' News is in the running for our quarterly "Goodie Givewaway," featuring items of interest to QRPers.

This month's prize comes compliments of new QRP ARCI Vice President **Mike Czuhajewski, WA8MCQ,** of Severn, Md., who sent us two **Mini-Circuits Ultra-Rel TFM-2 double balanced mixers,** tested and "exceeding minimum specifications for local oscillator/RF isolation." In the QRP building world, these parts are called to duty in many, many applications.

This quarter's winner: **Garry Brisbane, VE3REP,** of Ajax, Ontario, Canada.

A tip of the ol' QRP hat and "72" to Garry for his dispatch from VE3-land.

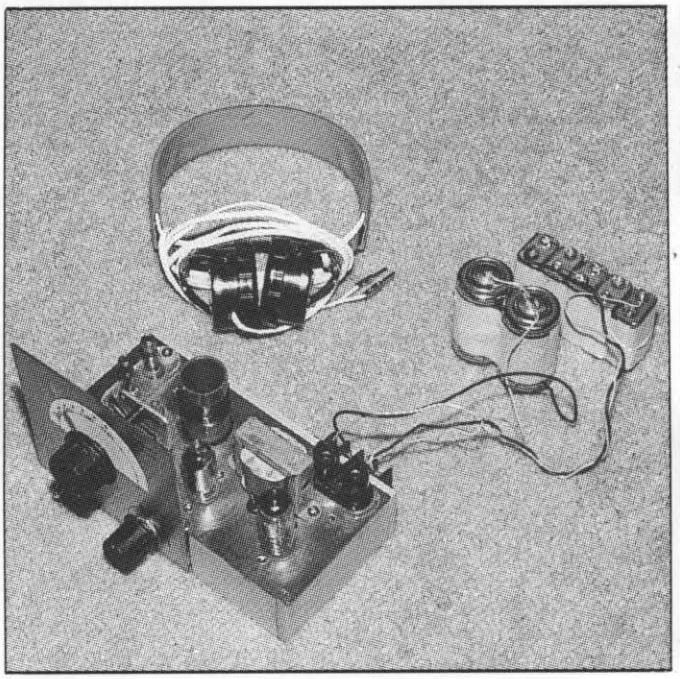
There's an open invitation to all club members to send pictures, letters, postcards or e-mail for the next MN.

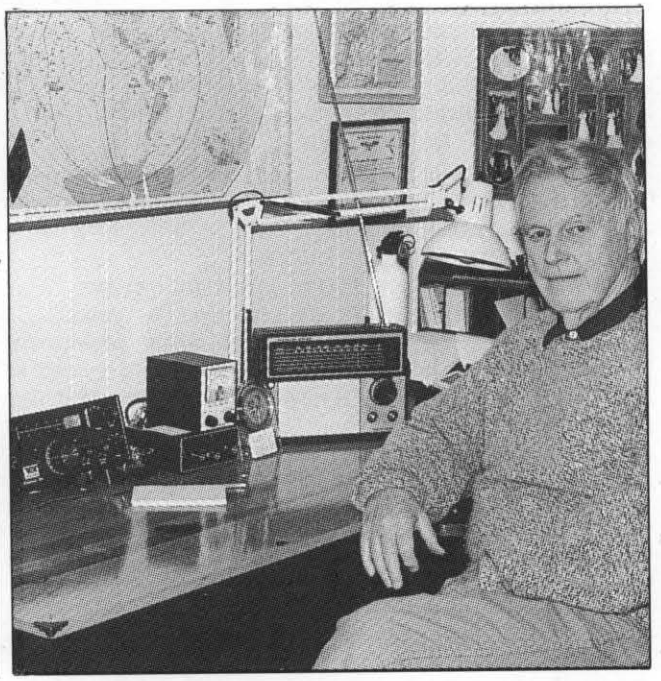
Everyone sending an item for publication has their name thrown into a hat for a random drawing. Each quarter the hat is emptied, so chances are pretty good for coming up a winner.

There are lots more goodies in the grab bag. Please keep in touch!

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

Members' News Gallery





Dick McIntyre, K4BNI, of Bayse, Va., writes that "the little receiver in the picture (left) is a copy of one I built in the late 1930s. It's a two 1.5-volt tube 40 meter receiver which surprisingly works very well. I could ham with it no problem." Dick also sent along a shot of himself at his QRP station taken on his 75th birthday.

Dick Swanson, N5JWL, of San Antonio, Tex., says he's been getting the most out of his Mizuho MX-215 15 meter QRP hand-talkie. He uses the rigs both in his shack, left, and mobile, right. The photograph from the car shows the rig sitting in a homemade wooden holder fixed between the two seats.

QRP WISDOM FROM UNCLE BRUCE

QRP, REALLY!

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WHAT'S NEW

The QRP Quarterly has a new editor. We're breaking him in this issue and he'll be at the helm after that. Welcome, **Monte Stark, KU7Y**, to the fun filled and frenzied world of the QRP Quarterly.

The QRP ARCI also has a new Vice-President -- **Mike Czuhajewski, WA8MCQ**, probably more familiar to you as the host of the Idea Exchange column, and author of many articles, graciously accepted the appointment at the annual Board of Director's bash at Dayton. I can speak for Mike's enthusiasm for QRP and the ARCI, and since we shared the car ride to and from Dayton, I can tell you this man's idea of vice is two Diet Cokes in a row.

Still more ARCI news -- We have a new President! **Buck Switzer, N8CQA**, is now formally the QRP ARCI president, converted from "interim" status at the same BOD bash. Buck promises studied change.

One of the changes coming from this year's BOD meeting is club banners. These will be available to members that want to set up a QRP-ARCI table at their local hamfest. Details should appear elsewhere in this issue, but in essence, you'll get the banner by mail and return it the same way when you're through. These banners, if you'll use them, will go a long way toward improving the visibility of the ARCI and QRP.

And now, back to our regularly scheduled programming...

DAYTON AND THE SINGLE HAM

It's mid-May, now, and another Dayton is in the history books. Funny thing about Dayton -- they held the first Hamvention there when I was just a kid living about 200 miles away. I got there the first time only 5 years ago when I was definitely NOT a kid, and lived 2500 miles away! Ain't that something?

If you haven't been, I would recommend you sell everything and go, at least once. It is an experience that defies description. I've been three times now, and each time I've walked through the swap meet I've been in total awe of the things I see for sale. I think I saw every piece of "S - Line" equipment Collins ever made (and probably a few they didn't) out there this year. I saw a couple of near mint HRO-60's, too, and if they're there next year at least one of them will have a new home! My three personalities were in seventh heaven: his comments about direct conversion vs superhet radios a couple of issues back notwithstanding, "Mr. Nostalgia" found an HW-7; "Mr. Curious" bought an MFJ HF loop antenna; and "Mr. Build-it" bought a bunch of parts. They'll report on these purchases as time goes bye-bye!

And, lest I forget, the QRP activities alone may be worth the entire trip. The QRP-ARCI, along with most of the major regional QRP clubs congregate at the Days Inn South for several days of fun in the rain (well, this year it was mostly in the sun, but that's Dayton). I don't know the exact number of QRPers that stayed there, but if you whistled CQ going down the hall you'd probably get an answer. Among those obviously in attendance were all your club officers less one, many of the QRP Quarterly staffers, Ernie (W8MVN), the NORCAL QRP Group, the NE QRP group, the Michigan QRP Group, the St Louis QRP Group, the GQRP Group, and, of course, our manufacturers.

Every evening the QRP Hospitalilty suite began to sound like a contest in progress as Bruce Williams of MXM Industries and Dick Szakonyi of S&S Engineering turned their speaker volume to the sky and serenaded us with the sound of live 40 meter CW. Their radios turned in excellent performances in spite of obvious antennas limitations.

MXM, S&S, OHR, and NORCAL all had new equipment to show off: MXM introduced their "Emergenceiver", superhet receiver with a 3 watt output crystal controlled transmitter. The unit fits on a board about 2 inches square. Its size is perfect for casual use while camping and hiking, and for use in the event of an emergency. It will be kitted by MXM in cooperation with HAMBREW magazine.

S&S was showing the "TAC1 80 meter transceiver with a tuning knob!" It was the QRP Quarterly's cover girl last issue, and coincidentally that was the issue being given away at our booth. I think the rig is just great as is, but you know QRPers, they've got to add their 2 milliwatts to everything -- one of the most popular questions heard was when is the (you plug in the band) version going to be ready! Hey, let 'em catch their breath folks.

OHR was showing off their NEW four band

transceiver. A very nice looking design about the size on an HW-9. Dick's taking orders now. Attractively priced, too.

There were bargains to be found both in the hospitality suite and out at the flea market. At the flea market one fellow bought a real clean Ten Tec Argonaut 515, yes a 515, for $325.00. YES, $325.00. In the hospitality suite the G-QRP folks had a small selection of Russian and British telegraph keys for sale, and NORCAL was doing a land office business in memberships and Cascade orders. The Cascade is their new rig for 75 meter and 20 meter SSB. Oh, and on Friday evening Ernie brought a scale model of his fabulous loop antenna system. If you've been in any of our contests you've heard Ernie's signal pounding in almost everywhere.

If you're planning to go to Dayton, or even just thinking about it, please, please, contact our Secretary/Treasurer, Myron Koyle, N8DHT, and make your reservations to stay with the QRP-ARCI group. Last year I made my room reservation from my carphone ON THE WAY to Dayton -- I was lucky, and got a room in a hice hotel, close to the QRP doings. I used the ARCI's service this year and saved over $30.00 per night. That paid for all of the HW-7! I believe Myron is accepting reservations even as I write this, and you won't actually have to decide until next year -- kind of like no payments 'til next year -- like the TV ads.

CONTESTS and ACTIVITY PERIODS

We've all come across contests on "our ham bands". Some of us join in, enjoying the frantic pace, the crowded conditions, and the noise. Then again, some of us seek solace in staring at froth in a glass and wait impatiently, grumbling all along, about those @#%&**@#'s who are ruining your radio fun single handedly. Please believe me when I say, I know -- I've been in both camps. What's the attraction? Why do people enter contests? What are the benefits of contesting?

Contesting goes back to man's earliest days, when getting enough to eat was a real test. Early hunters compared their skills via contests. Early gatherers compared their skills by gathering bigger roots, nuts, and berries. As mankind progressed so did his contests. Knights contested with each other during the Middle Ages. Farmers still contest with each other at fairs. Our sporting events -- football, baseball (what's baseball?), basketball, etc -- are all modern forms of the contest.

The point of most modern ham radio contests is to see who has the best station, or the best operating skills. Do contests have any other real value? I once was a commited contester, and I probably should have been commited to a nice warm, quiet place where I could do no one harm.

It started simply enough, I had set up a new station, at my new QTH in The Netherlands, and I wanted to get on the air one afternoon to try it out. There was a contest going on, and it was everywhere I tuned; I think it was a CQ - WPX test. Nevertheless, I decided to get on and "make a few contacts -- just to see how the new station was working."

Well the new station was working pretty well because I didn't quit until about 170 QSOs later. I worked over 70 DXCC countries that weekend. I also had a real good idea of my station's performance and where it could be improved -- and improve it I did, over the next 3 years. I contested the whole time, and loved every minute. I made a total of about 8,000 QSOs from that QTH in three years -- over 6,000 of them were in contests.

Later, after I returned to the real world (an apartment in California) I gave up the life of an "industrial strength" contester; but the concept of the contest as a quick and easy way to test station performance stuck with me. I began to use contests in a more selective fashion. No longer did I "rush to compete" simply because THE CONTEST was there. Instead, I now had a mission -- a purpose to my contesting, so to speak. Contests are often annoying -- but when used as a real world test of rig AND operator ability -- they are to be recommended. And although our QRP contests are getting more like the real thing all the time, most of them are still pretty casual. Try one -- you'll learn a lot about yourself and your station.

A couple more points about contests before I move on. One particularly nice feature of contests is the playing field is relatively level. That means that everyone experiences the same operating conditions and therefore the effects of poor propagation apply to all, equally. But after the last QRP-ARCI sponsored contest, cyberspace (The QRP List on the Internet) was filled with numerous, self-serving messages about how propagation conditions conspired to keep individual scores down. Really? A conspiracy by the ionosphere against QRP operators? WOW! Do these whiners really believe they would have had better band conditions operating QRO?

Horse-puckey! In the real world, football for instance, you gets to play in whatever the weather brung! Football does not cancel or delay games because the field's muddy or one of the stars has a hang nail. If you didn't do as well as you thought you should, don't whine about it in public, instead, sit down at home and figure out how you can do better next time, and JUST DO IT.

Another point. We keep saying we want to attract Novice and Technician Class license holders to our

ranks. Why then, in our contests, do we, all operate in the General Class portion of the band? Oh yes, I know, you looked around up there a couple of times in the last contest and you didn't hear anything. I know, I did, and I didn't hear anything either. But there must have been someone up there because I know guys who worked 'em. My point, and I've sent a letter to our contest chairman, Cam Hartford, is this -- let's have one contest or QSO party each year for the Novices and Technicians, and let's hold it in their band segment! Seem reasonable?

OTHER ISSUES

Code speed. Some inquisitive chap posted an Internet message a month or so back asking what code speed he should be using in contests. I watched in utter amazement as the others who populate that list chimed in with the relative merits of 18 wpm vs 22 wpm vs 13 wpm. It seemed that the poor fellow was going to get every answer but the correct one. Please, join with me in a moment of silent thought. Isn't the purpose of our hobby communication?

Does not communication imply an exchange of information between at least TWO people? Well then, if I spoke only French and you spoke only German, how well would we communicate? Let me clarify this still further. In a contest what you really want the other guy to copy your information the first time, so you can keep on keeping on.... Wouldn't the best speed for each of you to use be the one at which you can each reliably copy the other information? What speed it this, is it 13, 18, or 22 wpm? Unhuh. Try slowing down to his speed -- it almost never fails. Don't let your ego get in the way of good operating practice.

I often tell this story of some Russian operators I used to work when I was living in The Netherlands. They were such good operators that you almost never had to ask them to QRS (send more slowly). It didn't seem to matter at what speed they were sending CQ. If you answered at 5 wpm they came back at 5 wpm. How many times do you think they had to ask for a repeat? Instead of wasting valuable operating time on their egos they concentrated on their real objective -- making more QSOs.

Portable Antenna Mounts. Remember I said there were a couple of vendors at the QRP hospitality suite with live on the air demos? I looked at how each of these gentlemen supported his antenna. Bruce Williams, of MXM Industries, usually uses a 3 inch diameter piece of PVC pipe slipped over a short piece of pipe welded to a steel plate and placed under one tire of his car. Dick Szakonyi of S&S Engineering used to use an antenna mounted on his truck. This year Dick had a tripod field antenna mount he bought surplus. Bruce Williams had his PVC pipe strapped to a guard rail.

Well, these installations started me thinking about how I was going to mount the MFJ Loop I bought. I designed all manner of support structures in my head until one Sunday morning I went off to a photographic swap meet. There I found a pair of semi-heavy duty light stands (or background roll stands) that looked more than sturdy enough for the application. They are made of 1.25 inch OD aluminum tube, and consist of a tripod base and an adjustable center pole. They're perfect -- in fact one of them is holding the MFJ loop even as I write this. The other will be used to hold a portable vertical. The nice part of this is I only paid $40.00 for the pair, and I can still use them for their original intended purpose! There are photographic swap meets held in nearly every major city at least once every couple of months. You can find out about them by watching the local classifieds for announcements, or by asking at your local camera store, or by purchasing a copy of SHUTTERBUG NEWS -- they print a monthly list of shows.

Visiting QRPers Several months ago several other local QRPers hosted a fun evening with Jim, N0OCT, who had come to our town for a conference. We met at a local restaurant and had coffee and lots of fun QRP talk. A short while after that we hosted a visit from Ed Hare, KA1CV, from League headquarters. Ed is famous, or infamous, for having his photo in QRP Classics holding his modified HW-8. Another fun filled evening. Ed brought along his HW-8, now back in original form, AND the original Tuna-Tin 2 to show us.

So? I think it would be a nice idea if we created a list of QRPers who are willing to meet out of town visitors to their area. It isn't expensive -- might cost you a cup of coffee -- but the rewards you reap from meeting other QRPers, famous or not, will more than compensate your time and effort. I propose to collect this list and see it gets published in each QRP Quarterly. What I'd like from you is simply your name, address, and call. If you have an email address put it in. I'm not going to ask for phone numbers yet, maybe later. For now we'll make do with postcards and email. Also, if there are more than one of you in an area willing to participate, make sure you have established lines of communication among yourselves, so if a potential visitor contacts one of you you can coordinate the visit with the others. Drop me a postcard with your information and we'll get started.

THE LAST WORD

"Please, I pray thee, eat the sides" says the menu in one of my favorite restaurants. Please, I pray thee, check out my article in the July 1995 QST, where I tell all about how to score big using "Stealth" antennas!

--QRP--

EQUIPMENT MODIFICATION

DIGITAL READOUT FOR THE HEATHKIT HW-9

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wa8mcq@wb3v.md (packet)

Riding back from Dayton 1990 with K3TKS (Danny Gingell) at the wheel, I had a long discussion with WB4GOR, George, about an article in the Spring 1990 issue of SPRAT (#62), the GQRP Club quarterly. It was by another George (Scholtes), LX1BK, and used an NE602 with a 10 MHz crystal to convert the HW-9 VFO signal down to the vicinity of 4 MHz to be read by a tiny frequency counter module placed on the front panel. George was really smitten with the idea, and we both set out to build one. Being cheapskates, we abandoned the idea of buying the counter module and decided to use our regular counters. (The original placed the counter module where the selectivity slide switch was located.)

The HW-9 VFO can't be read directly with a counter since it's at an "odd" frequency and tunes backward, to boot--it goes down from 6.0 to 5.75 MHz as you tune up from the bottom of the band. One answer, which is this circuit, is a crystal controlled converter with the output tuned to the difference between the two signals, and that tunes in the right direction.

A sample of the VFO signal is tapped off, run through the high impedance of a FET so it doesn't load it down, and then into an NE602 for the conversion. The NE602 oscillates at 10 MHz; with the VFO dial at 0, it's output is 6.000 MHz, and they mix to produce an output to the counter at 4.000 MHz. Tuning up in the band, the VFO drops to 5.750 at the top of the dial (250), and the counter output rises to 4.250. Ignore the "4", which is the same regardless of band, and you have direct frequency readout of KHz.

There are other outputs from the NE602 as well, such as 16 MHz, but the 4 MHz tuned circuit between it and the counter insures that only that one gets to the counter.

According to the article, the FC117 counter module, available in the US (at the time, at least) from Radiokit, can be wired up such that it counts up to 3.999 MHz and then starts again at 0 at 4.000 MHz. In other words, as the HW-9 is tuned from 0 to 250 on the dial, that digital display would read from 0 to 250. On my regular counter I get a display of 4.000 at the lower edge, since it has no provision to blank out the MHz digit. You could cover it up or just ignore it, which would quickly become second nature.

CIRCUIT DETAILS AND CHANGES

The LX1BK circuit (Fig 1) used a BF245 FET, but George and I used MPF102s with no problem. Instead of the original T50-2 toroid, with 50 and 10 turns, we used T68-2's which were on hand and easier to wind, and trimmed a few turns to keep about the same inductance; we used 46 turns for the primary, and left the original 10 on the secondary. (The precise ratio isn't too important here, since we're only interested in getting out sufficient signal to drive a counter.) Using #26 wire I was able to get all 46 turns on the T68-2. With the T50-2 it will be necessary to go to #28 to get 50.

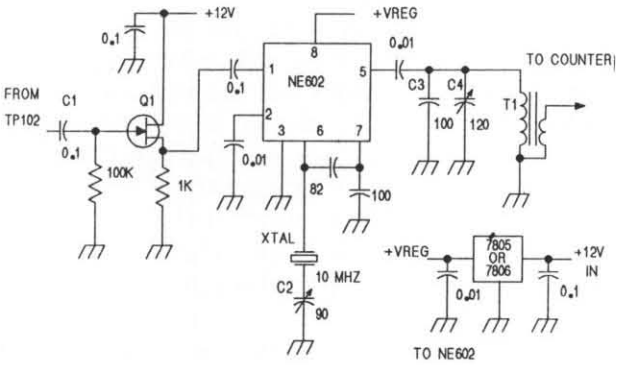

FIGURE 1--COUNTER CONVERTER

Values for C3 and C4 on the schematic are from the original; we both used what we had on hand; George used only a mica trimmer of a few hundred pf from Radio Shack, and I used a 150 pf mica trimmer with 68 pf in parallel. The precise values aren't critical, as

long as the tuned circuit is capable of resonating between 4 and 4.25 MHz.

For the voltage regulator, George used the original 7805 and mine has a 7806. Don't go higher than 6 volts or you could blow the NE602. (The 7805 is widely available, both in stores and on scrap computer circuit boards.) For crystals, I used an HC-6/U at 10.0000 MHz, and he used a 10 MHz microprocessor crystal, and both of us easily zeroed them to WWV.

You may want to experiment with C2 to get your crystal to zero properly. I used a 33 pf NP0 in parallel with a 45 pf ceramic trimmer, and it worked well. George started with a 60 pf trimmer, but adjustment was very touchy since the capacitance swing was so wide; he put 47 pf in series with it, which narrowed the range and made it easier to adjust. Again, experiment as necessary to find what's right for your particular crystal.

WHAT CRYSTAL FREQUENCY TO USE?

Do you have to use a 10 MHz crystal? No, any crystal for a "whole megahertz" frequency can be used. I could have used the 9.000 or 12.000 MHz rocks I had, but decided against it. Those would give displays starting at 3.000 or 6.000 instead of 4.000, but that doesn't matter since we're just interested in the KHz, and the MHz digit is ignored. You would have to adjust the values in the tuned circuit to resonate at the new frequency, but that's trivial.

But using the original value of 10 MHz has advantages. Computer crystals are cheap and widely available, and that's a common value. It's also simpler to adjust. With 10 MHz, you can zero beat directly against WWV for calibration. If you have the accessory band pack you can even tune in WWV at 10 MHz on the HW-9 itself, eliminating the need for a second receiver.

With other frequencies, you would have to adjust your counter to WWV and then adjust the crystal with the counter, adding a bit of potential error. I tried various methods of coupling enough 10 MHz energy from the NE602 into my counter to get a stable reading but everything pulled the frequency, so I gave up. The WWV method is so much simpler. (You may have trouble getting enough signal from the converter to be audible over WWV; temporarily clip a lead onto the antenna line and place it near the NE602.)

TUNING T1

T1 must be tuned for maximum output, to insure that the counter has enough signal to operate properly. The best way is to set the HW-9 VFO to mid scale, putting the output of the converter at 4125 KHz, tune that in on a receiver and adjust C4 for maximum signal. For a ham band-only receiver, set the HW-9 dial to 0, which puts the output at 4.000 MHz, listen to it at the high end of 75 meters and tune for maximum. Since it's now peaked at one end of the range, tune the HW-9 to 250 and see if the counter still operates properly. If not, tweak the cap slightly until it does, then go back to 0 on the dial and make sure it still works.

There's also a quick and dirty method--set the VFO to mid range, and vary the cap until the counter stops working. Turn it in the opposite direction until it works and then stops again, then set it in the middle of the two points. Not very elegant, but effective!

CONNECTING IT UP

The input of the converter, C1, is connected to TP102. That's a test point terminal on the oscillator circuit board of the HW-9 (the one on top), about an inch behind the tuning capacitor shield. (See figure 2.) Electrically, TP102 is past VFO buffer Q106 and the VFO filter, just before first mixer Q107. (Fig 3.) You could mount the entire converter inside the HW-9 and run the 4 MHz line out to the external counter, or mount the FET near TP102 and run its output outside to a box with the NE602 circuitry.

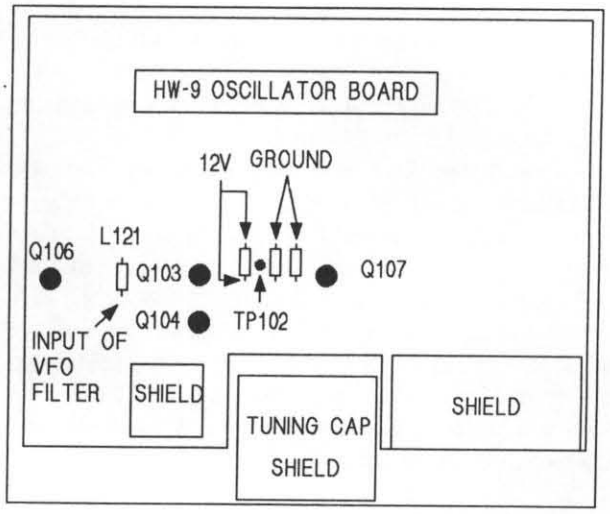

FIGURE 2--CONNECTING TO THE HW-9

An easy way to get signals out of the HW-9 without drilling holes is to run a piece of RG-174 coax through one of the three adjustment holes in the rear panel. These are meter zero, mute delay, and sidetone level. With the cable filling one of them, you would have to remove the cover to make that adjustment; they are seldom done so this is only a minor inconvenience. (Keep this idea in mind if you ever need to run anything

in or out of the HW-9 without mutilating the chassis.)

Here's how NOT to do it--run a piece of coax directly from TP102 outside the HW-9 to the converter input. I originally built the complete circuit in a box, including the FET, and used a couple of feet of RG-174 to connect it. It worked well when receiving, but then I made the mistake of trying to transmit--the little sucker sapped all the strength out of the rig and it couldn't send for naught--no power left! The HW-9 didn't like the additional capacitance to ground that the cable provided. Solution: don't put RG-174 at the output of the VFO filter.

The original SPRAT circuit worked because everything was inside the HW-9, with a wire directly from C1 to TP102 and no cable to load down the circuit. As a minimum, you must put the FET and associated parts inside the rig, near TP102 somewhere. There is plenty of room on the top of the circuit board near TP102 to stick a little scrap of unetched PCB material with the circuit built "ugly style". You could then run the output of the FET outside the HW-9 to the NE602 part of the circuit--that's what I ended up doing and it worked well, even using clip leads. The output of the FET is a fairly low impedance, and the cable shouldn't load it down significantly.

The best way would be to build the entire circuit on a tiny scrap of PCB material and keep it all inside the HW-9; you won't have to worry about an extra box or power and ground wires. (Sorry, no PCB patterns available! If anyone wants to develop one and share it, we'll be happy to print it.)

I noticed that there was still a slight but noticeable reduction in power when I connected C1 directly to TP102, even with the FET mounted near it. Using a diode detector on a dummy load, the power went from 3.95 watts (40 meters) to 3.83 watts. I moved the FET back to the input of the VFO filter, tacking it onto the hot side of L121. (See Fig 3.) The reduction was less--from 3.95 to 3.91 watts. Use whichever connection point you prefer. (Later tests with C1 at TP102 showed less reduction, about the same as at L121.)

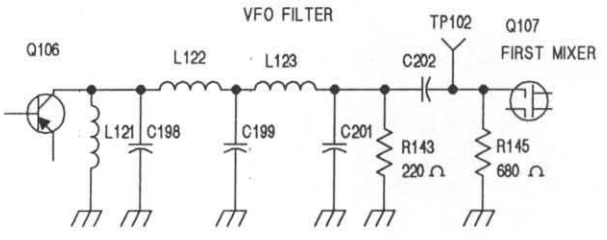

FIGURE 3--HW-9 VFO FILTER

POWER AND GROUND

Going back to figure 2, there's a wire jumper with a ferrite bead just to the left of TP102. You can tack a lead onto either end of the wire to pick up power. The HW-9 has 3 different 12 volt lines--one which is present only in receive, one only in transmit, and this one, which is there all the time. For ground, go to R148 and C203, which are between TP102 and Q107. You can pick up ground from either one--use the leads toward the rear of the board (the side away from the cutout for the VFO cap).

RIT AND XMIT

The frequency displayed in receive will be dependent on the setting of the RIT knob, since that varies the VFO. The transmit display will be the same as the frequency shown in receive when the RIT is at the center detent. In actual practice there will probably be a slight difference between the two, which is dependant on the Transmit Return Adjustment (page 79 of the HW-9 manual). To do that, you connect a voltmeter to a certain point and adjust a pot until the voltage is the same in transmit and receive. However, I found that it's rather touchy and difficult to get the voltages (and thus the frequencies) precisely the same.

OPERATION

The resolution you get will depend on your counter and how you have it configured. You could settle for readout to the kilohertz, to 100 Hz, or even more. As a practical matter, the 100 Hz readout is probably more than adequate, since the HW-9 is not a precision instrument in the first place. And since this is a counter display, not a digitally commanded display like the "big rigs" use, there will be a slight lag between moving the dial and the display settling on the new frequency. The lag will depend on the gating period of the counter.

MISCELLANEOUS

There you have it--a nice, simple converter with widely available parts to let you use an existing frequency counter with your HW-9. Since the tuning dial is analog, calibration is always a problem. A frequency standard is a good solution, but even with multiple signals (25 or 10 KHz) they can be a bit tedious and only give limited resolution. Since so many people already have counters anyhow, why not assign them the extra duty of reading out your HW-9 frequency to the nearest KHz (or better)? Enjoy.

--QRP--

QRP DXCC Honor Roll – It CAN be Done!

by Daniel P. Walker, WG5G
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I have condensed ten years of life from the operator's end of a low power station and present the following as its summary.

Equipment and antennas started with an HW-9 transceiver and a five- band vertical. Later, an HQ-1 mini-quad was added and with this combination, DXCC was achieved. The mini-quad was also the first casualty of many as a result of our unpredictable Texas weather. Its destruction actually turned out to be a blessing though, because it was replaced with a TH2 two element tri-band Yagi. I then obtained my current rig, a Kenwood TS-130V with outboard VFO.

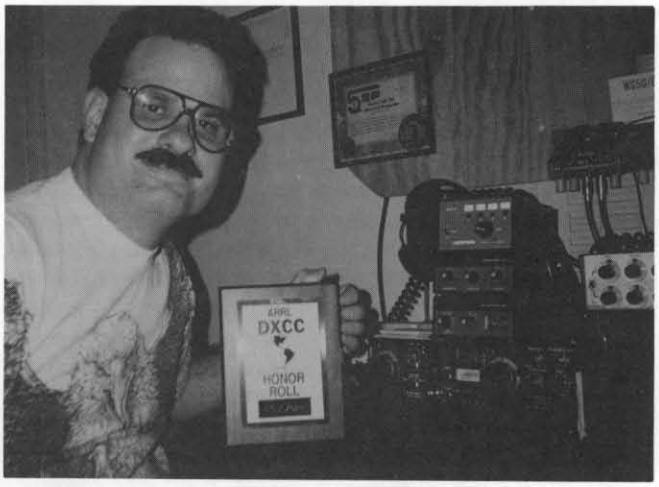
While this combination took my country count up to 250, it was not until I went to a two element quad that I reached the 300 country level.

Approximately four years ago I moved into a new QTH located on top of a ridge running north and south. This enabled me to install a 50-foot tower. (All antennas at the old QTH were approximately 30 feet above the ground.) The first antenna was a three element quad, while the station remained the same. Since that antenna was also knocked down by mother nature, I am now using a four element Quad at 50 feet with dual driven element on a 35 foot boom.

I have used a vertical and dipoles here with good results, especially on 40M, the latter of which enabled me to break some decent pileups.

There have, of course, been many disappointments during my years of QRP DXing. The lowest point came during the XY0RR operation. I must have had him all to myself five times during the operation, and still couldn't get him! For example, he was on 15M CW calling CQ with no takers and he couldn't hear me. Also on the last evening of the operation he was about 5x7 on 15M SSB with no takers and again he couldn't hear me. I don't think anyone put more effort into that operation than I did. On the upside, the following morning, after missing the XY0, I came across a large pileup on 15M CW, mostly east coast. All I could hear on the DX frequency was "up" by a policeman. Well, I knew that a 3B7 was supposed to be on, but had put all my time into the XY0. I knew that Texas has a great longpath opening into 3B7-land at that time of morning, so I turned the beam and there he was -- S9 + 20 (3B8CF/3B7)!

He was working the eastern USA and JA's and the pileup was at least 20kHz wide. I heard a particularly loud W3 station on the outside of the pileup calling him. The 3B7 came back to the W3 so I just dropped my call in once when the 3B7 signed, and bang! "WG5G/QRP DE 3B8CF/3B7 559". The best part of any pileup is listening to the howl after you've worked the DX and all those KW's are still calling!



The author proudly displays his DXCC Honor Roll plaque.

While there have been many thrills, one in particular stands out. Yoland, FR5AI was signing FR5AI/T on Tromlin Island. It came down to the last morning of his operation and I was really frustrated. I missed him on a VK DX net a couple of nights earlier because he had no copy.

Then I had a sked with him the following night and he didn't show. So, about 6:00 AM I got on 20M CW local. I had only 3 hours of sleep because I had been waiting on him till 3:00 AM the night before. And then, instantly, I heard his fist and got the "DX fever". He was in QSO with a stateside station at the bottom end of 20M CW. As soon as he signed, bedlam broke loose. I knew something the pileup didn't -- Yoland moves when a big pileup develops. I went looking for his fist and found him about 6 kHz up in QSO. He signed and I dropped my call in again --" WG5G/QRP DE FR5AI/T 559". As soon as we signed, the mob scene was back upon him. I never heard him again that morning, and needless to say, I couldn't go back to sleep. (Amazing how a new country perks you up!)

The most frustrating thing for me is the lack of acknowledgement of what can be done with QRP power -- both by the ARRL and the ham community in general. Just how long did it take the majority of KW DXers to make the honor roll? Looking back, I didn't even have WAC QRP until August, 1986, and didn't make DXCC until May, 1987. In my recollection it took a total of ten years, from start to finish, to achieve the Honor Roll. To set the record straight, I worked five countries on DX nets, and out of 321, most were on CW, with a total on CW of 303. All of my DXCC Honor Roll contacts have been made at QRP power levels.

I have demonstrated that making the DXCC Honor Roll running QRP and moderate antennas is certainly possible -- but it takes time, effort and dedication. On the other hand, making it "the hard way" gives one a great deal of satisfaction!

Review of Three Popular QRP Kits

by Preston Douglas, WJ2V
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I find that my hamming activity goes in cycles. Sometimes I can go for months with very little activity, and other times I am very active, reading and operating. Recently I found my rekindled interest in radio centered once again around QRP and "homebrewing"–whatever the latter means. My QRP rigs were broken, old, worn out and just plain not fun anymore.

I had no interest in going back to DC receivers. I wanted one of the new superhet transceivers with automatic T/R switching, and I wanted to build my own. I needed a rig for each HF band, and I figured it would add to the fun if I built a different kit for each band. So far I am up and running on 20, 30, and 40 meters. I thought it would be useful to those who follow to tell what I think of the three commercial kits that I have built to date.

The kits are:

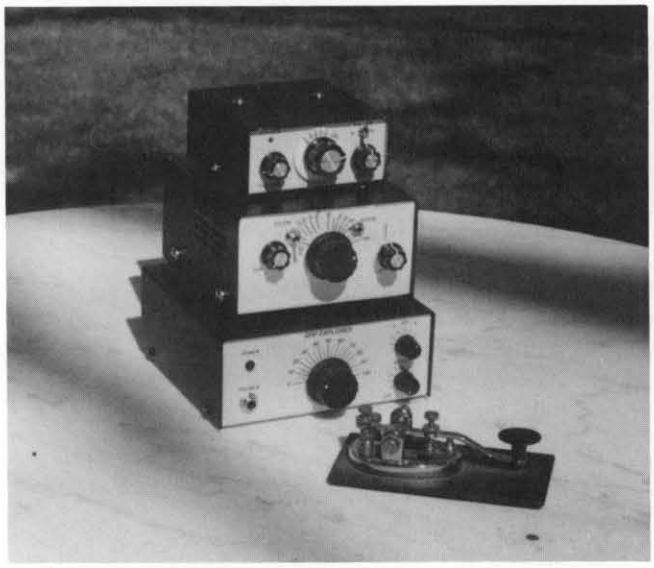
- QRP30 by RadioKit, PO Box 973, Pelham, NH 03076. Price: $99.95 including shipping.
- NW80/20 for 40M by Dan's Small Parts and Kits, current address unknown. Price: $99.95 plus shipping.
- Explorer for 20M by Oak Hills Research, 20879 Madison St., Big Rapids, MI 49307. Price: $129.95 plus shipping (occasionally on sale for $119.95).

I have now finished all three, and they are on the air. I'll describe what I like and don't like about them. But first, let me say that all of the rigs have superhet receivers with four pole crystal filters, narrow audio filters (some not switchable), RIT, automatic T/R switching, and are CW only. The QRP30 and Explorer have AGC, the NW80/20 does not. Versions of all three kits are generally available for the band of your choice. All are variations of Rick Littlefield's original NE602 transceiver, described in the January 1989 issue of the late lamented Ham Radio magazine.

QRP30

The Radiokit QRP30 is without doubt the best performing transceiver in the group. It has a clean superhet receiver with a good switchable audio filter; it puts out a solid 5 Watts, and it will push a small speaker very well. It comes with a tiny 3 in. x 4 in. x 1.5 in. silk screened and drilled case which makes for a very good looking, palm sized radio.

I like operating this radio very much. It is the original Littlefield design, except that the extra four pole crystal filter has been left off (not needed for this kind of rig anyway), and it has the semi-QSK relay Littlefield used. I am enough of a CW op to dislike relay semi-QSK. As a matter of fact, "semi-QSK" is an oxymoron. It isn't QSK unless you can hear the receiver between dits, period. Anyway, that's the only real operating fault. This is the radio for a backpacker or traveler as it is a complete station in a tiny box.



Here are the three rigs stacked for size comparison with my J-38. The Explorer is on the bottom, the NW80/20 is in the middle and the little QRP30 is on top.

Now for the bad part; the instructions are just plain terrible! They are contradictory, disorderly, confusing, and they are not commercial quality. Add that to the incredibly small size of the radio (an advantage, once built), and the consequent crowding on the single circuit board, and you have a builder's nightmare–even for a ham with good construction skills.

In addition, the circuit board isn't silk screened and the parts overlays are not to scale. You have to make your own overlays and/or study the schematic as you install each resistor! Worse yet, Radiokit has no repair service [this may be in the process of changing --W1HUE]. So, if it doesn't work, and you don't know one of those ham gurus who can fix anything, you bought yourself a two pound paperweight! Too bad, though, because a better manual and a little mod for full QSK and this would be THE radio. I love mine, and I wish my others were anywhere near this small. And I hardly notice that bloody relay, honest.

In RadioKit's defense, I should mention that they started out supplying circuit boards and bag-of-parts kits for published projects as a convenience to hams. However, now that Radiokit has had the QRPxx series on the market for some time as a complete kit, including drilled and labeled case, they ought to be doing better. They have had this kit in various similar forms since 1989. They need to get their manual onto a word processor so it can be corrected/updated as data comes in from customers. And, very important, they need to find a technician willing to repair these little rigs when they fail to work. Meantime, if you are an Extra (and I don't mean just license class) homebrewer from way back, this kit is an amazing buy at $99.95. But if you are not very skilled (and I mean VERY) you'd better pass on this one.

NW80/20

The NW80/20 is the best all around rig in the group. It isn't quite as small as the QRP30, but it is still very "packable". It's a little on the heavy side, though; I'd guess it's about three pounds. It is a neat implementation of the Littlefield design with high speed solid state QSK added in place of relay T/R. It puts out 5 Watts and more (adjustable), is very stable, and will produce ear splitting speaker volume.

The only thing missing is AGC, which I do not miss, and you probably won't either. The construction is smooth and the manual is superb. I really enjoyed building this kit because the instructions include testing of each subcircuit as you go, so you really know it is safe to move on to the next module. Everything fits on one silk screened circuit board, except the audio filter, which is built on a tiny board that fits on a post above the main board. This rig should work when you finish it. If it doesn't, Dan will [or would -- W1HUE] fix it for you for a modest fee. That is really important to me, as I hate the risk of my hard-earned money plus the hours building, only to have a dead rig -- don't you? The cabinet is not drilled or silk screened, so you will have to do your own metal wrestling, but it will be for a rig you already know works. That's a pretty good motivator. I have this rig on 40M, and I trust it enough to leave my Yaesu off on this band, permanently.

Negatives? None. This is my clear winner in the class. Price is $99.95 plus shipping. Do not buy the stripped version ($70), as too many options are missing, and the savings would not be worthwhile.

Dan's current status seems to be a big mystery; hopefully he will re-surface soon and continue to make his kits available.

Explorer

This is a marvelous kit for the beginner, and I enjoyed building it in a single weekend ("get away from me, kids, I'm busy"). The result is a fine, solid QRP rig. The solid state QSK is perfect, and this radio has a permanent, non-switchable narrow CW filter. It has a good non-thumping AGC. Shortcomings are few. The cabinet is a little too big; it measures a substantial 6 in. x 6 in. x 3 in. Of course, the big roomy case makes the building much easier. I like to have a full 5 Watts of transmitter power for casual QRP work, and this rig produces only about 1.5 to 2 Watts.

I also like to listen to the speaker of a radio, unless I am hunkering down to serious work, and this radio won't push a speaker. I have an outboard amplified speaker, but that isn't very portable. I have a Radio Shack audio amplifier kit (available for about $10) that I really ought to build and put inside the Explorer. I also have a Curtis Keyer board in the "to build" pile. They will both fit easily inside, and that would make this a heck-of-a portable station.

Minor gripes aside, this radio comes in a big beautiful pre-drilled silk screened cabinet, and even the coils are pre-wound. The circuit board is beautiful work, silk screened and solder masked.

For a beginner, or a ham who just hates coil winding, this is the kit to buy. Oak Hills Research has done a fine job on this kit, and it is the right choice for many kit builders who just want to "put together" a QRP rig. This is the other rig that comes with a bench service (available, again, at a modest extra fee), so you don't have to worry much about failing. On this kit, though, you probably won't need it.

I Thought I'd Died and Gone to Heaven *or Ecstasy in the Hardware Store*

by Joe Everhart, N2CX
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Brooklawn, NJ 08030

In one of my "Joe's Quickies" in Mike C's "Idea Exchange", I asked for a source of aluminum to use for making homebrew chassis. I was looking for a place that carried aluminum sheets, rods and square stock, that had some variety and was willing to sell in small quantities at a reasonable price.

Well, I FOUND ONE!! I'm so impressed, that I just had to write about the place. I don't expect that many readers will ever come to South Jersey to visit my local supplier, but I suspect that, if you look around, you'll find a similar store near where you live.

Most commercial distributors of metal are not too willing to deal with private parties, particularly when they are homebrewers who only want small quantities of metal in relatively small pieces. Some small machine shops will sell you scrap, particularly if you know someone who works there, but that's not always an available option. Another potential source is scrap metal dealers, but they are kind of hit and miss. I asked around where I work among folks who I knew were home hobbyists, both hams and others. One day one of them said: "oh yeah, I know where to go. Try Fazzio's." So I asked where this place was; the answer was less than helpful. And since it was in the next county, my phone book didn't list it.

I asked around some more and another ham knew the street address. Directory Assistance gave me their phone number so I was finally able to get directions. Would you believe the place is called "Joseph Fazzio, Inc. Building Materials"? Sound's like something out of either Happy Days or the Muppet Show. And it's located way out in the boondocks. Even with directions it took a careful look at a map to locate just where they were.

When I found them and got to look the place over, I was so excited I thought I'd died and gone to heaven! (Isn't it strange what excites some folks?) It's not for the faint of heart. You have to go in there knowing just about what you want. There's not an army of "can-I-help-you-sir" folks prowling the aisles. And take along some money. The prices are downright great, but... when you see all the goodies that you could use, it's tough to keep yourself under control.

Outside it's a largish building surrounded by orchards and farmland. When you get near, you know that you are definitely out of the city and well past the suburbs. As you approach, you can see a two-story cement block building and a large metal-roofed structure that looks like it could be a lumberyard.

The parking lot is NOT filled with Stanzas or Corollas, but Chevy S-10s and Dodge RAMs. The parking lot was so full on a Saturday morning that I couldn't even drive in. There was even a large truck from the one of the nearby scrap dealers. (I'm not sure whether he was making a pickup or a delivery.) The country road in front of the place was lined for 100 yards or so in front of the property with more pickups! These farm and country folks know where to go to get material they need. Hardware mega-stores just don't cut the mustard.

Fazzio's has almost anything you'd expect to find in a good hardware store and much more. Outside are farm supplies like fencing, rope and apparently salvaged farm equipment and supplies. Inside is a crowded store with several clerks at a large counter. Most of the place is "serve yourself". You just go anywhere you want to and carry what you need up to the front to pay for it. Signs strategically warning that shoplifting will not be tolerated. Anybody who would shoplift there deserves harsh punishment!

There are hand tools galore - probably 20 or 30 different kinds of files - round, square, flat, oval, half round, etc. from needle file size to really big bastards (a little file humor!). There's even an assortment of file handles! I got one for a needle file for 10 cents and another for a full size file for 25 cents. I saw at least a dozen different types of tin snips. And there are enough different wire brushes to make Fuller jealous.

They have a very good selection of soldering tools and supplies - including a one pound can of "Nokorode" rosin flux for $2.50 (my local hardware store gets $6.75 for the identical item). Of course most of the soldering stuff is for a scale much larger that PC boards or QRP projects. But if I want a hundred Watt iron to solder up some hardline connectors or a PC board chassis, I now know where to go.

There are power tools of all descriptions. A good selection, but they are priced like a regular hardware store. I didn't see any real bargains. On the other hand, they had some power tools whose function I couldn't even fathom.

There are cartons of deck screws, wood screws, nails and other common construction items all priced by the pound, and reasonably at that. There's also caulk, adhesives, paint and other related stuff.

And that's just the front room. The back room (larger than the footprint of my house) has barrels and shelves and cartons absolutely chock full of hardware. Machine screws from 6-32 to Patton tank size. And along with them, corresponding washers, lock-washers and nuts. The smaller stuff is loose in trays or other containers, while the larger stuff is in barrels and on shelves, still greased for preservation. There are pulleys, and gears and fasteners and springs and all kinds of mechanical parts.

I saw barrels of various sizes of threaded rods. Again, this stuff is all priced by the pound! I suspect that this bounty is the result of years of careful salvage operations and taking advantage of "recycling" business opportunities.

Then there's the loft. It's somewhat larger than the back room. You climb a set of open stairs with a sign at the top warning that small children should no climb them unattended. That's great advice because a tyke could easily get lost up there. When you get up there, it's a pack rat's delight. There are row after row of metal racks with what looks like widely varied salvaged or surplus material. There are timers and motors and breaker panels and circuit breakers and fuses.

Wow, the breakers and fuses range form a few Amps to several hundred Amps. And lots of wire and cable. In a cursory look I saw several different kinds of coax (I'll have to go back and look more carefully), ordinary 300 ohm twinlead, shielded twinlead, more household and commercial electrical wire, several kinds of heater cable, plenum rated wire, fire alarm cable, multiconductor cable, twisted pair, telephone cable and on, and on, and on. The cable was all in reels, with a per pound price marked on each reel. I got a 500 foot reel of 14 gage stranded wire for $11.25 - 9 lbs of wire at $1.25 per pound! I didn't examine everything but I also saw many reels of plastic tubing and some Teflon and shrink tubing. Again, all on reels with a per pound price.

I've saved the best for last. Off to the side of the building with the hardware store and the loft, is the building that looks like a lumberyard. It's a warehouse full of metal stock. There are huge shelves of an almost unimaginable variety of metal. I saw iron and steel, galvanized iron, I believe some brass and copper, and lots of aluminum. There are all shapes and sizes of the metal: there are 4x8 foot sheets, large and small blocks and shelves chock full of angle stock and bar stock, round, square and rectangular. In the very back is an area with scrap material (roughly) organized on shelves. When I saw this, I was sure I'd entered the pearly gates!

I was most interested in the area with aluminum, so I'll describe that. There were sheets and plates of almost any size from a few inches square to several feet square of 0.026, 0.040, 0.062, 0.125, 0.25 in. and larger stock. There were rods and square stock from 1/8 inch or more in lengths of inches to feet.

And there were folks like me pawing over the piles like ants, looking for pieces that just fit their needs.

When I had gathered a fair sized collection of material, I was met at the door by a friendly older gent who said: "Looks like you got about 6 pound there, son." Sure enough, when he put it on the scales (they have scales for anything from pounds to tons), it weighed just over 6 pounds. He wrote me up an invoice, which I then took into the hardware store and paid $1.50 a pound for the aluminum. Let me tell you, 6 pounds of 0.040 aluminum sheets will make a lot of QRP rig boxes!

Anyway that's the place. If you're ever in the area look them up. And if you're not, ask around -- you might find another great place just like it in your neck of the woods.

Contests

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

Life at the bottom of the sunspot cycle has its rewards. Bear with me a few moments while I try to think of a few...

One is that the rougher the conditions, the harder QRPers seem to try. It is in our nature. The perseverance and skill we have acquired in digging out those weak signals seem to make us even more determined when the signals are weaker due to the rotten propagation.

A good example was the Spring QSO Party, when the Sun God was in a very bad mood. We had 15 more entries than a year ago, when the conditions were equally lousy, and the average score of the top 10 scorers was almost 80,000 points higher. Conditions might have been bad, but the QRPers were up to it.

Read on:

FIRST AND FOREMOST, THE BANDS WERE AWFUL - KI6PR; SOLAR FLUX IN LOW 70S + THUNDERSTORMS + MAN-MADE QRN = POOR CONTEST RESULTS - K3WWP; SEEMS MY LIL' SIGNAL WOULDN'T CROSS THE BIG MISSISSIPPI - AE4CA; I BROKE A CARDINAL RULE BY MAKING ANTENNA MODIFICATIONS THE DAY BEFORE THE CONTEST - AA4XX; PRETTY GOOD ACTIVITY. TOO BAD ABOUT 15 AND 10. - K8HVT; CAUGHT UP WITH HP1AC IN THE LAST MINUTES OF THE TEST, IT WOULDN'T HAVE BEEN THE SAME WITHOUT HIM! - KB2JE; FIRST QRP CONTEST, LOTS OF FUN, I'M HOOKED - KA3WMJ; SUNAY MORNING CHECK OF WWV, READY TO THROW IN THE TOWEL...THEN HEAR WN2V 5 OVER ON 40 METERS, I'M READY TO GO AGAIN! - KB5YVT; GREAT TIME - JUST GOT 505 BACK FROM TENTEC AND IT'S LIKE NEW - KF7ET; NOISY BANDS, BUT HAD FUN ANYWAY - KJ5MG; THE ONLY STATION I HEARD AND DIDN'T WORK WAS ERNIE, W8MVN, AND EVEN HE WAS WEAK - KU7Y; NOISE, 12 HRS OF THUNDERSTORMS WITH ICE - KN8QC; WISH I HAD AMTOR TO ANSWER THE GUY ON 14.060! - KW3U; A DISASTER. 40 M WAS THE ONLY BAND WORTH WORKING - N3CZB; ACHIEVED NUMBER ONE GOAL - HAD A BLAST - N4ROA; HAD A FUN TIME, AND THAT IS WHAT IT IS ALL ABOUT. BRING ON FIELD DAY! - NØOCT; MY FIRST ARCI CONTEST - WOW, AM DEFINITELY HOOKED! - NØRXX; MANY QRPERS SCARED OF BY SOLAR DISTURBANCE - TOO BAD SINCE I COULD HAVE WORKED MORE - VO1DRB; FINISHED THE NEOPHYTE ABOUT 0000Z APRIL 9.... 5 YEARS IS A RECORD TIME FOR ASSEMBLING A NEOPHYTE! - W6SIY; FB QRP OPERATORS WITH GOOD EARS MADE THE CONTEST FUN! - W8KUX; PROPAGATION HERE IN MIDWEST, YUKKY! - W9ETU; WAS HOPING FOR AURORA ON 6 METERS! - WX7R; NEW BEAM WORKED LIKE A CHAMP - TNX MOSELY! - WR4I.

Speaking of WR4I, I need to correct Dennis' score in the Fall 1994 QSO Party. I reported his score as 15,116 points, where it should have been 151,116. It moves Dennis up several places in the competitive state of Virginia. My apologies for the slip of the digit. If any other contesters find errors in either the contest listings or the certificates (yes, they are slowly dribbling out of my printer) please let me know so I can set them right. Meanwhile, I hope to see you in the Summer Homebrew or the Fall QSO Party.

One final note concerning res. If you detect a discrepancy between the rules for a contest as published in the QQ and as published in another radio magazine, be assured that the rules published here are the correct ones. Hope to have this cleared up soon.

Vy 72/73, Cam

1995 QRP ARCI SPRING QSO PARTY

TOP TEN

N4ROA	791,210
K8HVT	300,328
WAØRPI	287,042
W4XD	286,062
K8NQC	274,456
W8MVN	259,161
WD9CTB	258,587
AA7KF	248,136
KB2JE	225,197
W3FAF	208,278

SINGLE BAND

10 M	VO1DRB	40,572
40 M	W8MVN	259,161
80 M	WJ2V	1,980

HI/LO BAND

HI BAND	NONE!	
LO BAND	K8NQC	274,456

TEAM COMPETITION

Team milliSOTA	W3FAF, AAØVQ, WAØSWD, WAØRPI	558,124
YAHOOs	KJ5IP, K5ZTY, KB5YVT	238,469

SPRING QSO PARTY 1995								
			SPC		BANDS			
CALL	SCORE	POINTS		POWER		TIME	RIG	ANTENNA
ALBERTA								
VE6GK	3,920	56	10	5	A-2	1	IC 751	YAGI, INV VEE
ARIZONA								
KB7BEJ	49,140	180	39	5	A-3	4	SCOUT 555	5BTV VERT
CALIFORNIA								
KI6PR	127,939	373	49	5	A-2	23	OMNI-V	SKELTON CONE
KO6KA	12,821	122	15	3	A-3	15	ARGO 509	DIPOLES, DELTA
N6GA	4,480	80	8	2	A-2	2	SIERRA	YAGI, DIPOLE
NU6U	3,900	65	6	1	40M	7	ARGO II	102" ZEPP @30'
W6SIY	140	7	2	0.25	40M	3	TUNA TIN, NEOPHYTE	DIPOLE @ 18 FT
COLORADO								
NØIBT	29,925	171	25	5	A-2	8	TS-830	DIPOLE
KI6SN/Ø	28,980	207	20		40M	5	NORCAL 40	INV VEE
WOØQ	27,209	169	23	5	A-2	4	FT 1000	QUAD, VERT
KIØG	4,760	68	10	2	40M	5	NORCAL 40A	G5RV
CONNECTICUT								
K8HVT	300,328	692	62	5	A-5	14	TS-940/930	A3 YAGI, ZEPP
KV1M	119,434	449	38	5	L-3	17	TS-430	G5RV, INV VEE, 80M VERT
NM1J	52,500	300	25	5	A-3	10	NC40A, ARGO 515	YAGI, INV VEE, 40M QUAD
NN1G	8,910	81	11	0.9	L-2	2	40-40, 80-40	WINDOM
FLORIDA								
WB2QAP	39,277	181	31	5	A-2	5	QRP PLUS	MFJ 1796 VERT
K4KJP	17,220	123	20	2	A-3	3.5	ARGO 509, HB W7EL	DIPOLE, KT34
AA4XO	12,152	124	14	5	40M	8	HB RX AND TX	TRAP DIPOLE
W3GF	4,620	60	11	5	40M	1.5	2 TUBES HB	DIPOLE
GEORGIA								
KE2WB	126,665	385	47	5	A-3	7	HW-9, HB TCVR	G5RV
AE4CA	69,776	356	28	5	L-2	20	FT-840	80M LOOP, 40M DIPOLE
IOWA								
NØRXX	9,086	118	11	5	A-2	3	ARGO 556	DIPOLE
IDAHO								
KF7ET	5,600	80	10	5	40M	5	ARGO 505	INV VEE
ILLINOIS								
N9MDK	28,560	170	24	5	A-2	3	??	??
W9CUN	16,912	151	16	5	40M	5	TT DELTA	40M HORIZ LOOP @ 8 FT
N9ZBR	10,094	103	1414	5	A-2	3	??	??
W9ETU	3,720	54	10	2	A-2	4	HW-8	VERT, DELTA LOOP
INDIANA								
WD9CTB	258,587	697	53	3	A-3	19	TS-940	40M LOOP, VERT
K9DZE	30,420	169	18	0.9	40M	10	NE 40-40	QTR WAVE SLOPER
N9DD	29,520	164	18	0.95	40M	4	NORCAL 40A	80M DIPOLE
KANSAS								
WBØSMZ	8,645	95	13	3.5	20M	5	HB 3.5W TX	TRIBANDER
KENTUCKY								
N4LH	450	15	3	0.025	40M	0.5	W1FB MIGHTY MITE	HF5V, 80M DELTA LOOP
MASSACHUSETTS								
AA1MR	58,443	363	23	5	40M	19.5	HW-101	DIPOLE @ 25 FT
KZ1L	25,921	161	23	4	A-3	3	??	G5RV, DELTA BEAM
MARYLAND								
W8KUX	187,859	571	47	3	A-3	14	ARGO 509	VERT, CF ZEPP
K3TKS	100,800	315	32	0.9	L-2	10	ARGO 509, QRP+	80M HORIZ LOOP
W6TOY/3	16,464	147	16	3	40M	6	ARGO 509	WIRE - APT WINDOW TO TREE
WA4KAC	12,705	121	15	2	40M	5	NORCAL 40A	ATTIC LOOP
WA3GYW	9,009	99	13	2	A-3	2	HW-8	DIPOLES
MAINE								

W1XN	59,073	291	29	5	A-3	14	??	??
MICHIGAN								
AC8W	27,972	222	18	2	40M	3.5	NORCAL 40A	HF6V VERT
K8CV	16,240	116	20	5	A-3	3	ARGO 515	??
AL7EV	1,813	37	7	5	40M	2	ARK-4	DIPOLE
MINNESOTA								
WAØRPI	287,042	707	58	5	A-6	18	IC 737	DELTA LOOPS
W3FAF	208,278	551	54	5	A-6	12	TS-130V	TA33, DIPOLES
AAØVQ	35,420	161	22	0.9	A-6	??	??	??
WAØSWD	27,384	163	24	5	A-3	6	SB-101	40M LOOP
MISSOURI								
KGØTW	102,564	407	36	5	A-2	22	TS-430	DIPOLE
NØOCT	7,200	80	9	0.9	40M	3	40-40	SLOPING DIPOLE
NORTH CAROLINA								
AA4XX	189,080	652	29	0.9	L-2	17.5	FT-757	DIPOLE, WIRE BEAM
WA4NID	2,576	46	8	2	A-2	3	NORCAL SIERRA	LEW MCCOY DIPOLE
NEWFOUNDLAND								
VO1DRB	40,572	252	23	5	20M	18	ARGOSY	MFJ LOOP
NW HAMPSHIRE								
KN1H	19,360	121	16	0.9	L-2	4	TT OMNI	DIPOLE
NEW JERSEY								
KB2JE	225,197	607	53	4	A-3	11	QRP +, IC 765	G5RV
K2JT	64,925	371	25	5	40M	7	OMNI D	G5RV
KE2XA	28,980	138	30	3	A-2	10	QRP PLUS	G5RV @ 10'
K2QJ	18,942	82	33	5	A-2	5	TS 930	ZEPP, TRIBANDER
W2JEK	17,640	126	20	2	A-3	3.5	ARGO 505	20GP, 40 DIPOLE, 80 HERTZ
N2CX	14,112	112	18	2	A-4	4	ARGO 509, NC 40A	HF-6VX, 40M DIPOLE
N2JOC	9,408	112	12	4	A-3	7	OMNI 6	DIPOLE, LOOP
KE2KW	5,740	82	10	5	A-2	6	OHR SPIRIT, CENT 21	TRAP INV VEE
NEW MEXICO								
KN5S	13,804	116	17	5	A-2	3	HB TCVR	VERT, DIPOLE
NEVADA								
KU7Y	3,920	49	8	0.95	40M	??	NORCAL 40A	G5RV
NEW YORK								
N2KPY	30,030	195	22	5	A-3	3.5	??	??
W2QYA	18,750	125	15	0.9	A-3	6	HW-8	100 MTR MARCONI
N2TWW	3,780	60	9	5	A-2	1.5	ARGO II	G5RV
WJ2V	1,980	33	6	0.6	80M	1	NN1G MK2	??
OHIO								
K8NQC	274,456	754	52	5	L-2	12	HW-8, TS-930	LOOP, DIPOLE, INV L
W8MVN	259,161	903	41	5	40M	17	ARK-40	DELTA LOOPS
AA8EE	23,072	206	16	5	40M	7	TT CENTURY 21	DIPOLE, VERT
KB8GAE	12,348	126	14	5	L-2	4	K9AY, NW80	80 M ZEPP
WBØIQK	4,620	60	11	4	A-2	1.5	ARGO 560	R7 VERT
OKLAHOMA								
KJ5MG	66,885	273	35	4	A-2	15	HB TX, HB S-HET RX	80M DIPOLE
ONTARIO								
VA3CSJ	8,372	92	13	5	A-2	??	??	??
OREGON								
AA7KF	248,136	633	56	5	A-3	11	TS-940	LAZY H
WX7R	22,330	145	22	4	A-2	4.5	IC 735	LONG WIRES
W7LNG	2,590	74	5	5	40M	4	TS-850	40M GP
PENNSYLVANIA								
K3WWP	127,120	454	40	5	A-5	13	HB 6Y6 FINAL	RANDOM WIRE, VERT DIPOLE
W3TS	78,880	232	34	0.9	A-6	?	HB TCVR	YAGI, INV VEES, 160M TEE
WA3YON	44,415	235	27	4	A-3	6	TEN-TEC SCOUT	VERT, DIPOLE, QUAD
K7YHA	35,308	194	26	5	A-3	3	TS-130V	DIPOLES, TH7DX
WA3SRE	22,344	152	21	5	40M	10	ARGO 515	LOOP @ 30 FT
KW3U	16,506	131	18	5	A-3	4	IC-725	80/40 DIPOLE

KA3WMJ	13,734	109	18	5	L-2	16	TS-450	R7 VERTICAL
N3CZB	1,554	37	6	4	A-2	5	CENTURY 21	INDOOR LOOP
N3DQU	7,735	85	13	3	40M	13	HB TX, T-KIT DC RX	TRAP VERT @ 25 FT
QUEBEC								
VE2BLX	10,248	120	12	5	40M	6.5	IC-735	LONG WIRE
RHODE ISLAND								
WA1OFT	16,891	127	19	4	A-3	6	HW-9	R5 VERT, 70' WIRE
KA9HAO	9,790	89	11	0.8	40M	2.5	ARGO 515	G5RV
TEXAS								
KB5YVT	134,596	418	46	5	A-5	7	??	??
K5ZTY	95,760	266	36	1	A-4	20	HW-8	140' DIPOE
AB5WB	27,846	221	18	5	A-2	5	FT-757	INV VEES
W5MHY	17,440	109	16	0.9	20M	10	NN1G	INDOOR DIPOLE
AA5BK	14,616	116	18	5	40M	6	OHR SPIRIT	80M DELTA LOOP
KJ5IP	8,113	61	19	5	A-4	9	TS 450	DIPOLE @50 FT
UTAH								
KK7C	5,740	82	10	4	A-2	2	ARGO 509	WINDOM
WJ7H	3,087	63	7	5	40M	4	QRP PLUS	G5RV
VIRGINIA								
N4ROA	791,210	1270	89	5	A-3	23	TENTEC OMNI C	A4S, INV "L"
W4XD	286,062	834	49	5	A-3	13	CUBIC ASTRO 103	G5RV
WR4I	127,764	468	39	5	A-3	10	QRP PLUS, ARGO 509	PRO67, G5RV, HF9X
K4JM	73,486	362	29	5	A-3	??	TS-520	DIPOLE, LW
N3OS	40,600	290	20	3	40M	6	HB 12BY7 FINAL	MINI-QUAD
KD4PUP	2,793	57	7	5	40M	1.5	MFJ 9040	MOBILE WHIP
WISCONSIN								
W9MSE	80,598	303	38	5	A-2	4	??	??
W9CBE	21,903	149	21	5	A-3	??	??	??
DX STATIONS								
PANAMA								
HP1AC	80,920	289	40	5	A-3	11	K9AY, TS-430	TA33JR, LONG WIRE
TURKEY								
TA2ZO	26,537	223	17	4	A-2	13	OMNI-6, SCOUT 555	HALF-SQUARES, OMNI LOOP

Fall QSO Party Rules

Date/Time:
Oct. 14, 1995, 1200Z through Oct. 15, 2400Z

Exchange:
Member - RST, State/Province/Country, ARCI Number
Non-Member - RST, State/Province/Country, Power Out

QSO Points:
Member = 5 Points
Non-Member, Different Continent = 4 Points
Non-Member, Same Continent = 2 Points

Multiplier:
SPC (State/Province/Country) total for all bands.
The same station may be worked on more than one band for QSO points and SPC credit.

Power Multiplier:
0 - 250 MW = X 15; 250 MW - 1 Watt = X 10
1 W - 5 W = X 7; Over 5 W = X 1.

Suggested Frequencies:

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

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

Entry may be an All-Band, Single Band, Hi-Band (20M, 15M, 10M and 6M) or Lo-Band (160M, 80M and 40M). Certificates to the top 10 scores, to the top score in each Single-band, Lo-band and Hi-band class, and to the top score in each class in each SPC. The contest manager reserves the right to recognize special significant entries with a certificate award.

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

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

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

Send an SASE for a summary and sample log sheets. Include an SASE with your entry for a copy of the results. Results will be published in the next available issue of the QRP ARCI Quarterly.

The final decision on all maters concerning the contests rests with the contest manager.

Entries are welcome via E-Mail to CamQRP@aol.com, or by mail to: Cam Hartford, N6GA
1959 Bridgeport Ave.
Claremont, CA 91711

Summer Daze SSB Sprint

Date/Time:
August 6, 1995 12 Noon to 8:00 PM, Local Time
Operate any 4 of the 8 hour period. Mark on & off times.
Exchange:
Member - RS, State/Province/Country, ARCI Number
Non-Member - RS, State/Province/Country, Power Out
QSO Points:
Member = 5 Points
Non-Member, Different Continent = 4 Points
Non-Member, Same Continent = 2 Points
Multiplier:
SPC (State/Province/Country) total for all bands.
The same station may be worked on more than one band for QSO points and SPC credit.
Power Multiplier: (Power Output)
0 - 250 MW (0 - 500 MW PEP SSB) = X 15;
250 MW - 1 Watt (500 MW - 2 Watts PEP SSB) = X 10;
1 W - 5 W (2 - 10 Watts PEP SSB) = X 7;
Over 5 W (Over 10 W PEP SSB) = X 1.
Bonus Points: (Apply for each band)
+2000 HB Transmitter Used
+3000 HB Receiver Used
+5000 HB Transceiver Used
Homebrew Definition: If you made it, it's homebrew.
Suggested Frequencies:

160 Meters	1810 KHz	15 Meters	21060 KHz
80 Meters	3865 KHz	10 Meters	28060 KHz
40 Meters	7285 KHz	6 Meter	50128 KHz
20 Meter	14285 KHz		

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

Entry may be an All-Band, Single Band, Hi-Band(20M, 15M, 10M and 6M) or Lo-Band (160M, 80M and 40M). Certificates to the top three scores, to the top score in each Single-band, Lo-band and Hi-band class, and to the top score in each class in each SPC. The contest manager reserves the right to recognize special significant entries with a certificate award.

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

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

Include a description of homebrew equipment, commercial equipment, and antennas used with each entry. Homebrew bonus points may not be claimed if a description is not included with the entry.

Send an SASE for a summary and sample log sheets. Include an SASE with your entry for a copy of the results. Results will be published in the next available issue of the QRP ARCI Quarterly.

The final decision on all matters concerning the contests rests with the contest manager.
Send entries via E-Mail to CamQRP@aol.com, or by mail to: Cam Hartford, N6GA
1959 Bridgeport Ave.
Claremont, CA 91711

New Member/Renewal Data Sheet

Full Name_____ Call_____ QRP #_____

Mailing Address_____

City_____State/Country_____ Post Code_____

❑ New Address? ❑ New Call?

USA

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

DX

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

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