QRP Quarterly

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October 1999 Volume XXXVII Number 4

ARRL President helps out at Dayton ARCI Booth

The cover photo this month was taken at the Dayton ARCI booth. Shown (L-R) are Rod Stafford, W6ROD; Ed Hare, W1RFI and Leonard Young, KS4RN.

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

The QRP ARCI is a non-profit organization dedicated to increasing world-wide enjoyment of QRP operation and experimentation, and to the formation and promotion of local and regional QRP Clubs throughout the world.

The QRP-ARCI TOY STORE

QRP-ARCI Coffee Mug

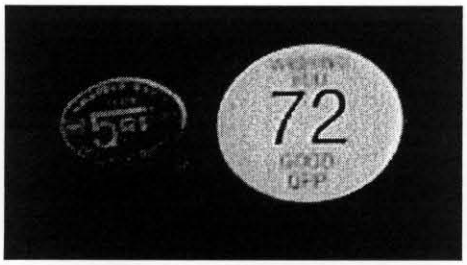
This is the **official** coffee mug used by top QRP Fox Hunters, contesters and casual operators found near the normal QRP Frequencies. Kelly Green on White and the Logo on both sides. (Coffee, tea or milk not included.)

New for 1999!

These new QRP-ARCI patches are fully stitched, black on white. They measure 3-9/16" wide X 2-1/2" high oval, and can either be ironed on, or sewn on the finest evening

Mouse Pads

The QRP-ARCI mouse pad has been tested under rigorous conditions. It excels at high-speed clicking and browsing. Blue logo on a champagne background. Mouse and browsers not included.



These attractive blue and brass (on left) and white (on right) metal pins have a tie-tac pin and clasp on the back to allow attaching to hats, badges, clothing and equipment. The White 72 pins say "WISHING YOU 72 GOOD QRP"

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From the Editor

Mary Cherry, NA6E Sierra Sunset Drive, Sacramento, CA 95828-5304 email: mcherry@calweb.com

I wont bore you with a long dissertation on how happy and thrilled I am to be taking over the Managing Editor's position from Ron, KU7Y. I really am tho!

You'll find 2 new superb columns in this edition. Rich Arland, K7SZ, will be doing "Profiles in QRP, - Bitten by the Bug: and Joe Everhart, N2CX, will be doing "Test Topics . . and More". Jim Hale, KJ5TF, will be regaling us with interesting news as the new Milliwatting Editor. I also plan on perpetuating the fine tradition of a guest editorial begun by Ron Stark and George Heron. This issue's will be a "farewell" from Ron.

Hope you enjoy reading the Quarterly as much as the staff enjoyed putting it together for you.

Guest Editorial

Here it is, time for another issue of the Quarterly. Time sure seems to fly when we are having fun. Lots of new things going on around the old homestead this time. The first thing I'll mention is that we now have a new Managing Editor for the Quarterly. She is Mary Cherry, NA6E and I'm sure that she will do a much better job than me! I encourage everyone to drop her a note of welcome. Nothing worse than working hard and not hearing from anyone!

The other exciting news is that Carol and I have made the decision to go full time RVing. I will retire in June of 2001 and off we will go! The place is for sale and will even include the tower and C4SXL if someone wants it. In thinking about this, the only thing I keep seeing that I'll really miss is that tower/antenna! Can you believe that Carol doesn't see it that way?

We bought a 30 foot 5th wheel trailer and will pull it with our Dodge diesel pick up. I have already installed is a new FT100 radio with the little automatic antenna mounted on the ladder! To make sure that our priorities were in the right place, the shake down trip was to Ft. Tuthill! From the RV I worked Mr. QRP, Jim Cates, WA6GER while he was operating the original Tuna Tin II as W1AW/7. Many others were also worked showing that the basic set up will be OK.

I also had fun operating that little TT II rig as W1AW/7. Not only did I get to do that but I also got to met Ed Hare, W1RFI and watch him get that little rig working right. Ed is a very nice fellow and a true QRPer.

Which brings up another subject. What is a "true" QRPer? What is "real" QRP? What kind of radio or antenna can you use and still be a "pure" QRPer? What is the spirit of QRP?

The internet reflector, QRP-L seems to bring out many opinions on this every now and then. But folks, the bottom line is that QRP is defined as using 5w output or less. It doesn't matter what kind of radio you use. It doesn't matter what kind of antenna you use. It doesn't matter what kind of key or keyer you use. It doesn't matter if you use SSB or FM or any other mode. (OK, so most places have agreed to call 10w output QRP for SSB but not all. Long story there too, but the bottom line is if you are entering a contest or working toward an award, be sure what the power level is in the sponsors eye!).

To tell someone that they are not "pure" or infer that somehow their signal isn't worthy of responding to just because they use a fancy rig turned down to QRP levels or because they have a stack of yagi's running from 200' down to 60' just doesn't make sense!

When we talk about 40 meters we have a wide choice of rigs. From the very simple to some that are very good. But what happens when we get to 160m? The list just isn't going take long to read, is it? And can you imagine spending two full nights doing a contest with a little NE602 rig trying to get that station in-between two 60 over 9 stations only 10 kHz apart? That's just not a picture I want to put myself in!

Or how about when someone asks you to move to another band? How are you going to do that in 2 to 5 seconds? How are you going to handle that local up the street 3 blocks using SSB at a full 1500 watts only a few kHz away from where you want to be?

The new K2 from Elecraft is the only kit radio that I know of that has many of the features necessary for a good multi band radio. Time alone will tell how it will hold up to hard contesting but my gut feeling is that it will do well. More info on this radio can be had at: http://www.elecraft.com or call them at (831) 662-8345.

But even the K2 will surely be considered by some to violate some kind of QRP "rules". After all, it has many, many features that the "big" radios have and the receiver specifications are right there with the "big boys"!

And why would anyone not think that one should have or use a good antenna? Sometimes I find it hard to understand people. For example, I fully support someone setting a goal of working DXCC while using only an indoor antenna and running less than 1 watt. But I would not support the idea that everyone had to only use indoor antennas and never run more than 1 watt!

I'll also never understand why a handful of people whined about the SSB power level for QRP! These misguided souls spend far too much time and energy trying to show that SSB and CW could be made equal! All the nifty math used to "prove" that 10 watts of SSB would do the same job as 5 watts of CW! Of course that doesn't work out in the real world and the SSB crowd is quick to point out how much harder it is to work QRP SSB than QRP CW!

Now if you want WAS QRP SSB from the QRP ARCI you can run 10w PEP output. But if you want the award to come from the ARRL you must only run 5 watts PEP output! Life would have been so much simpler if QRP was just QRP and not QRP for CW and 2xQRP for SSB! Big case of squeaky wheel me thinks.

I have enjoyed working with the great crew that makes the Quarterly happen. Look at the back covers of a few issues and please take the time to let all those folks on the "staff" know how much you appreciate their efforts. A great deal of time and energy goes into each issue of the Quarterly and NONE of it could happen without the whole staff. It is impossible to thank them enough for all they have done!

I also want to thank everyone for their support over the years and I know you will now give that support Mary. I really feel that she will do a much better job than I did.

What am I going to do with my time? Well, I started taking banjo lessons again and I am almost done with the banjo that I built. Plus I plan to be on the air much more that in the past. If you hear me please give me a call.

de Ron, KU7Y

About the Cover

Ed Hare, W1RFI, who was the keynote speaker at the FDIM/Dayton QRP banquet this year, brought Rod Stafford, W6ROD, ARRL President by the QRP ARCI booth to meet some of the folks there. During the visit, he was induced to pose handing out ARP ARCI literature to passersby. Rod was heard to remark that he wished everybody would operate QRP and added (in jest) that he then could break the pileups with his KW!! (He was smiling when he said it).

Jim, W4QO

IDEA EXCHANGE

Technical tidbits for the QRPer

Mike Czuhajewski WA8MCQ 7945 Citadel Drive, Severn, MD 21144 wa8mcq@erols.com

In this edition of the Idea Exchange:

UP YOUR FREQUENCY

Number 31 in the unending series of Technical Quickies from ***Joe Everhart N2CX*** *of Brooklawn NJ, one of the guiding lights of the NJ QRP Club*—I was recently looking for a relatively simple and stable local oscillator for use with a low-end direct conversion receiver. Ideally it would be able to cover the popular QRP frequencies at the low ends of 80 and 40 meters with better stability than is often found in the most basic receivers. After all, using a direct conversion receiver is rather limiting as it is, so there's no sense in making things even worse with "drifty" tuning.

An article in SPRAT included two things of interest. First was use of a color burst (3.58 MHz) ceramic resonator in a VXO configuration. This gave coverage over the low end of 80 meters with stability a step above common VFO's. In addition, 40 meter coverage was added by using an NE602 as a frequency doubler. Now I'd done this 10 years ago in a digital clock circuit but had not coupled it with a VXO. The combo fits the bill quite well. (Although I call the device an NE602, the manufacturer now offers only a replacement device, the SA612. For our purpose they are basically identical.)

Using the '602 as a combined oscillator and frequency doubler is covered in their Application Note AN1983 "Crystal Oscillators and Frequency Multipliers Using the NE602." See the notes at the end of this piece for info on getting the app note.

Briefly, you can see how this works in Figure 1. The oscillator portion of the device drives one mixer input port directly *[which is not accessable from the outside]* and an external capacitor couples some of the fundamental frequency energy to the other input port. *[Note that the other port has a differential input; in this case, it is being used with an unbalanced input, with one side grounded for RF by a capacitor.]* The mixer performs a mathematical multiplication of the oscillator frequency resulting in an output at twice the input frequency. So if the oscillator is on 80 meters at, say, 3.56 MHz, the mixer outputs 7.12 MHz on the 40 meter band. There is a little feed-through of the fundamental frequency, but the AN1983 notes that, even without tuning, the double-frequency output is stronger by 10 dB. A simple tuned circuit can clean things up even more.

The final circuit is in Figure 2. The 3.58 MHz resonator and associated components on pins 6 and 7 of the IC form a "crystal Colpitts" oscillator. C1 is a 140 pF poly-film variable capacitor rescued from an old transistor radio. It easily tunes from 3.5 to 3.58 MHz. Output level drops above 3.58 so perhaps a parallel capacitor could be added to limit the upper end tuning. A 27 to 68 pF capacitor couples the 80 meter energy to one side of the external mixer port on pin 1 while the other side of the port input, pin 2, is bypassed to ground by a 0.1 uF capacitor.

Forty meter energy is extracted from pin 4 and cleaned up by an IF transformer can resonated by a 100 pF capacitor. The can is Mouser part 42IF124, intended for 10.7 MHz IF use. You could use a toroid and trimmer capacitor but the IF can/fixed capacitor combo is cheaper.

Since this parallel tuned circuit is high impedance, a two-stage amplifier is used to buffer the 40 meter signal and boost its power level. With the components shown, there is sufficient drive for one of the popular double-balanced ring diode mixers such as the MiniCircuits Labs SBL-1. The buffer amplifier circuit schematic was shamelessly lifted from the Oner VFO board I got from Kanga Kits.

To operate on 80 meters instead of 40, simply move the 10K amplifier input resistor from the IF can to the oscillator output at pin 7. A simple switch can be added externally for band selection.

There are lots of ways to modify this circuit for other uses:

1. First a use that's not really a modification. You can use the circuit to drive a QRP transmitter and enjoy the benefits of tunability and frequency stability.

2. If you really want to, you could configure the oscillator as a true VFO. Using the doubler should help enhance frequency stability by virtue of the mixer's buffering action. (And a number of authors have touted the value of not building a transmitter with the VFO at the output frequency.)

3. The oscillator can be configured as a real VXO [with a crystal instead of a ceramic resonator] with probably better frequency stability but at the sacrifice of a smaller tuning range. Using a series choke and even paralleled crystals should widen tuning.

4. Additional '602's can be added (per the app note) to get 20 meter or 10 meter operation.

5. Let your imagination go wild! This circuit begs to be transformed!

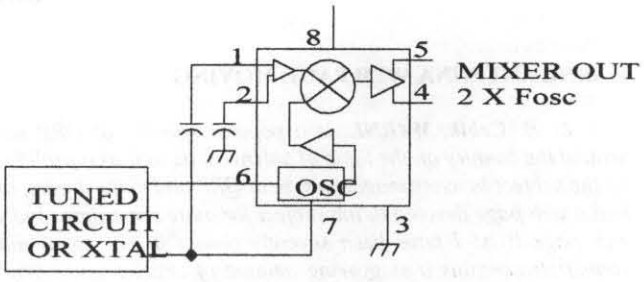


Figure 1—Basic oscillator/doubler. IC is NE-602, 612, SA-602, 612; all are essentially identical. Note differential inputs and outputs.

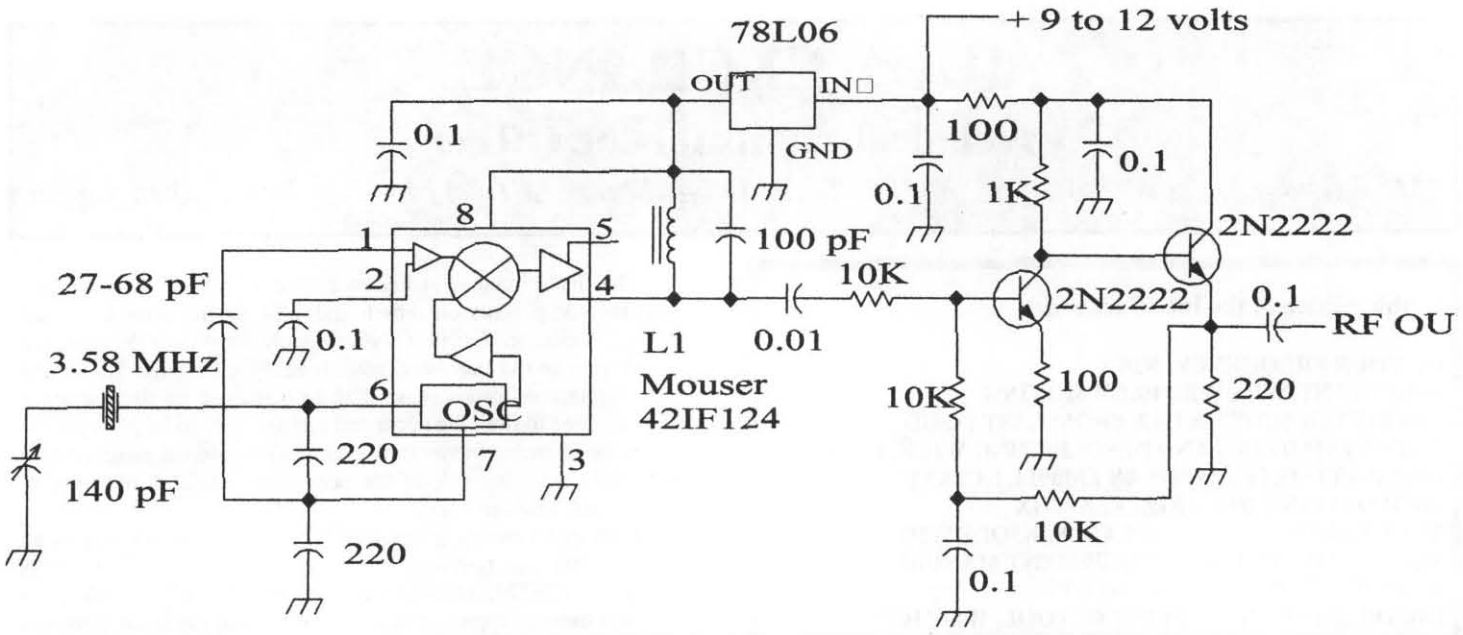


Figure 2—Practical oscillator/doubler using an NE-602 (or NE-612, SA-602 or SA-612, which may be used interchangeably).

Application notes and data sheets can be gotten from Phillips Semiconductor or downloaded easily from their web site at

http://www-us.semiconductors.com/pip/NE602AD

[You can also try.../NE612AD, which is similar to the 602. WA8MCQ]

When you bring the page up, there is an area on the left hand side to click for Application Notes or click on "data" to get the full data sheet. You must have the free Adobe Acrobat (tm) PDF reader to download the files, but if you don't have this reader, you can download it, too!

There are lots of neat app notes on all sorts of IC's but the three that deal with the 602/612 are:

—AN1983 Crystal Oscillators and Frequency Multipliers Using the NE602

—AN1981 New low-power single sideband circuits

—AN1982 Applying the oscillator of the SA602 in low-power mixer applications

[When I checked the web page I found that the format had been revised a bit since he described it and things didn't match up exactly, but you can find your way around it easily enough. The URL had also changed slightly since then; the one above is the current version. — WA8MCQ]

—DE N2CX

W4RNL ANTENNA WEB PAGE MOVING

***L. B. Cebik, W4RNL**, is a popular speaker at QRP seminars around the country on the topic of antennas, as well as a prolific writer on the subject in many magazines, both QRP and main stream, and has had a web page devoted to the subject for quite some time. And what a web page it is! I have been severely remiss in not mentioning this sooner. It contains a staggering amount of articles and essays on a wide variety of antenna topics and is well worth looking into. Beware—you could spend several months reading and digesting it all! (Not surprisingly, L. B. was inducted into the QRP Hall of Fame this year.)*

L. B. recently announced that he is moving his web page to another address. Here's his announcement, copied from QRP-L—

Cat is out of the bag. With retirement, I shall be moving my site. Actually, I already have, but have not tested every item in the collection. The new URL will be easier to remember:

http://www.cebik.com

It is a .com because I am not an .org, .edu, and certainly not a .gov. But the data will remain accessible, except that you will pass through a main page on the way to the index page--called "Tales and Technicals" on the main page. You can likely bypass the main page if you want to type **http://www.cebik.com/radio.html** but that is almost as long as the old URL.

I shall keep the old site until about Dec. 1, 1999. If I can, I shall update the 2 in parallel until closure. But the new site will take priority if time presses. I hope the move does not inconvenience anyone too much, replacing the link URL data on various pages. But like all renters, one wants a home of one's own someday.

—DE W4RNL

REPRINTED SCHEMATICS FROM LAST ISSUE

For the July issue we experimented with sending all of our material to the printer in raw form and having their staff do the final formatting and layout work (which we normally do with desktop publishing software). There is a charge for this service, but it did have the potential to reduce a lot of the workload on the QRP Quarterly staff.

Since this was the first (and only) time we did this, there were some glitches in translating my drawing files onto the printed page. (My drawings were done with a PC, and output as Windows metafiles or .WMF format, while the printer uses a Mac system.) This could probably be worked out in time. However, due to a variety of problems, KU7Y has decreed that we will go back to doing our own layout. This allows us more control, as well as eliminating some additional delay.

There were several drawings in the Idea Exchange that I felt should be reprinted here since the originals were not as easy to read as I'd like. These include two of the schematics from the W7ZOI item, the W4LJD audio generator, and those from the KD1JV audio amplifier sidetone circuit. (Both of his drawings also ended up with the same caption for some reason.) Figure numbers are the same as those used originally.

Figure 1

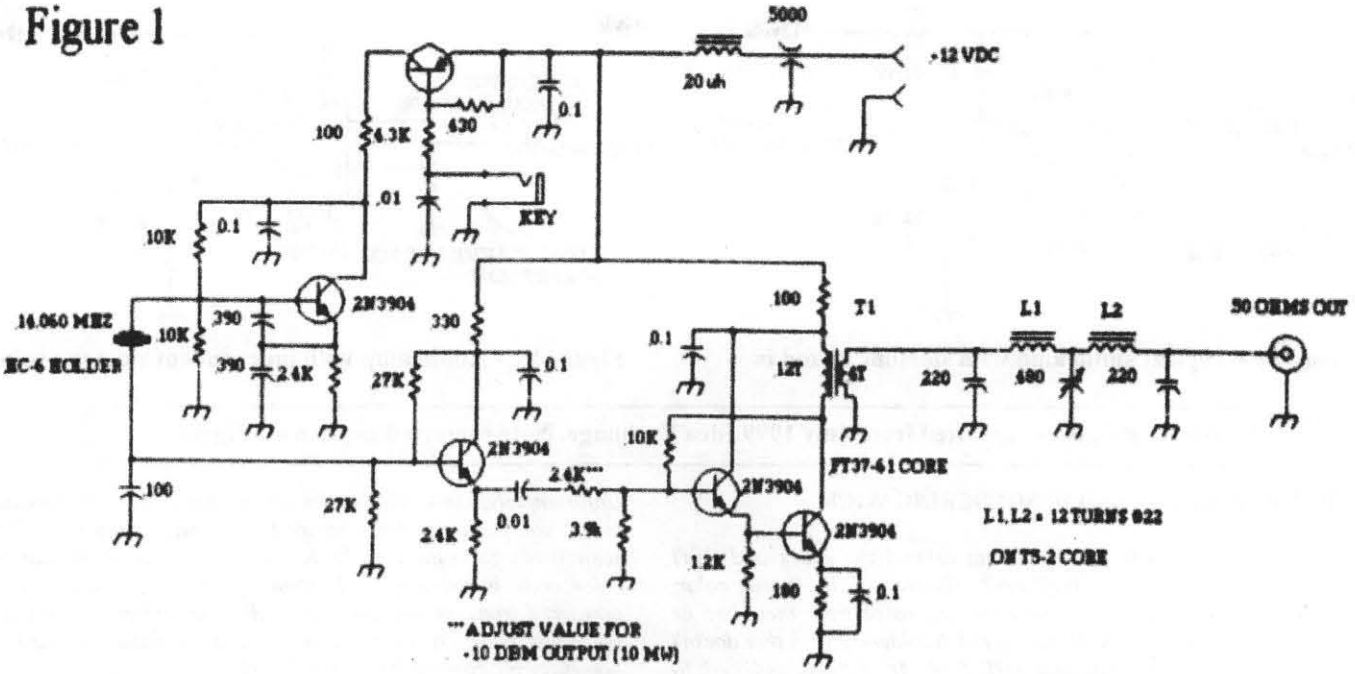
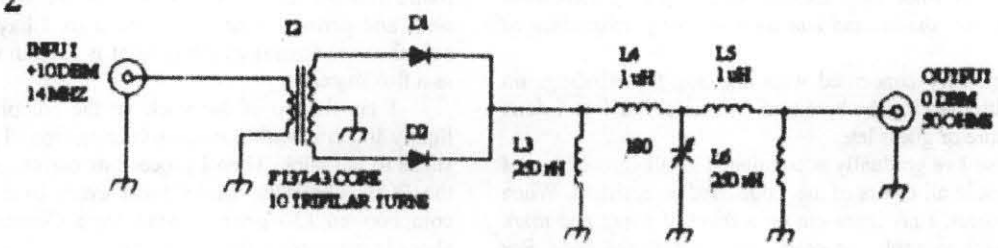


Figure 2



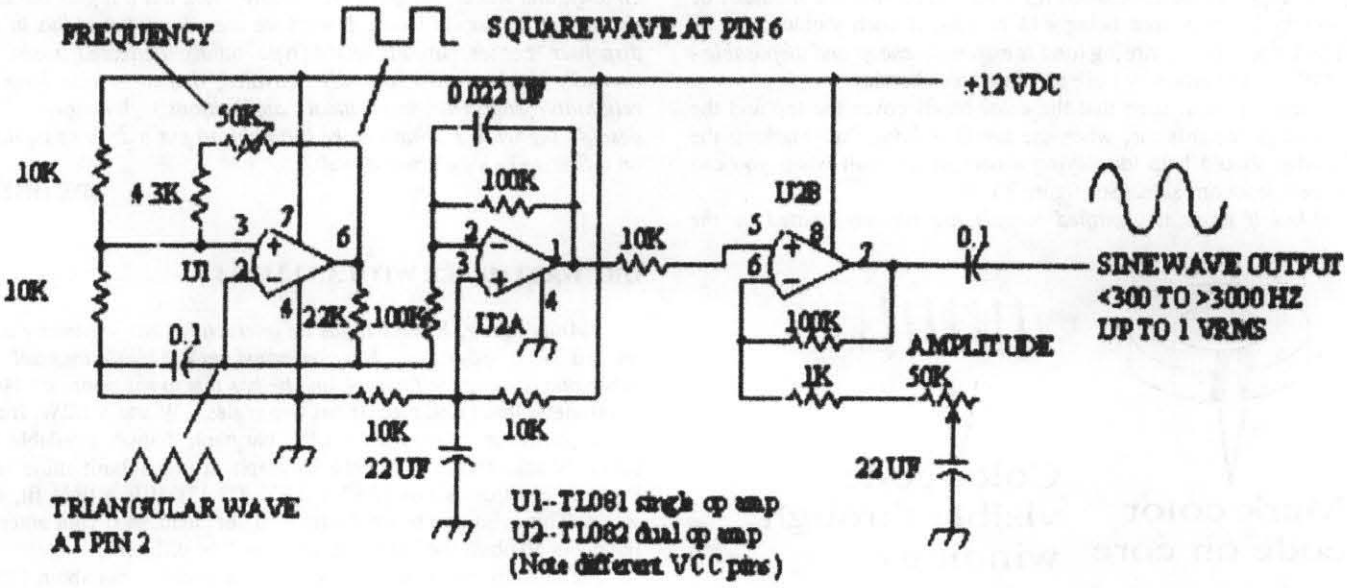


Figure 10 - audio generator from W4LJD

Figures reprinted from the July 1999 Idea Exchange. Note—figure numbers above are those used in that issue.

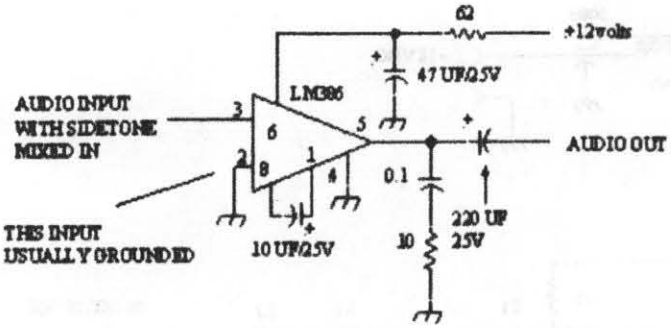


Figure 14—Typical audio amp with sidetone mixed in

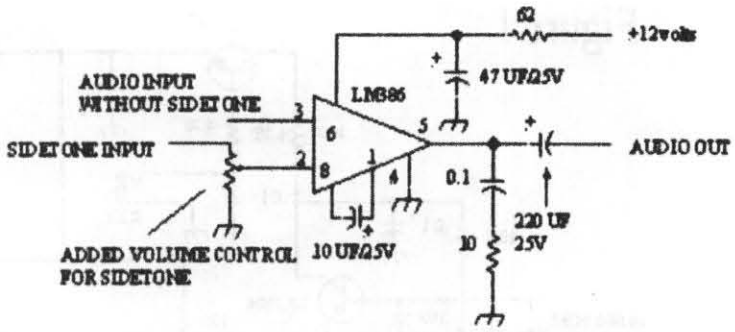


Figure 15 - Audio amp with independent sidetone volume

Additional figures reprinted from July 1999 Idea Exchange. Note corrected caption on Figure 15.

TOROID MARKING AND DESOLDERING WICK

Have some ferrite toroids sitting around the shack and don't know what type material they are? They're all the same color, regardless of material, and if they get separated from their bag or labels, you have a problem. Have any old desoldering wick that doesn't work too well? ***Arjen Raateland, OH2ZAZ*** *(Arjen.Raateland@vyh.fi) posted these two tips to QRP-L. The first won't help identify those cores if you lose track of what they are, but does help keep them from becoming unidentifiable; the second can improve the performance of old, dried out wick.*

I've never been very concerned with marking the windings on toroids but rather with marking the bare toroid material itself, so I don't need to worry, measure or guess later.

For this purpose I've gradually accumulated small cans of model builder's enamel paint in all colors of the code used on resistors. When I buy a quantity of cores, I lay them out on a sheet of paper and mark them using a toothpick to apply the colors for the material code. For example, #43 material would have yellow and orange. I paint only on one side and read the code when it's towards me, so there shouldn't be any ambiguity of a core being #43 or #34, if such would exist. A toothpick doesn't need rinsing [*and is extremely cheap and disposable --WA8MCQ]*, so that's why I use it rather than a brush.

I mark toroids such that the color bands cover the top and the outside edge towards me, when the toroid is lying flat. Marking the outer edge should help identifying a core in a circuit when you can only see it from one side. (See figure 3.)

[And if those unidentified toroids are already coated by the manufacturer with some color and you positively know that they are ferrites and not powdered iron, you still have a problem since color codes on ferrites are essentially meaningless unless you know who the manufacturer was, since there is no standardization in the industry. Unfortunately, even color codes on powdered irons are meaningless unless you positively know where they came from, a topic I covered some time ago in the Idea Exchange. Again, there is no standardized color code industry wide. Fortunately, though, virtually all of the powdered irons we use come from Amidon and/or Micrometals, and the color code on them has become a de facto standard for the homebrewing community. —WA8MCQ]

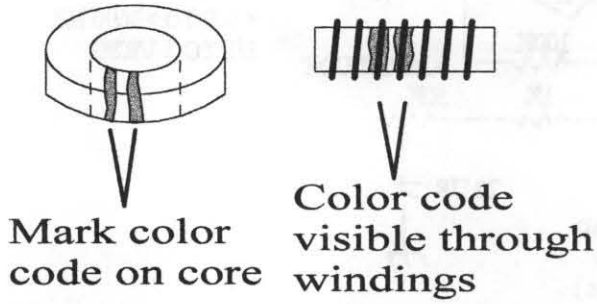


Figure 3—Marking color codes on ferrite toroids (which are all the same color regardless of material)

My other subject, desoldering wick (or braid), refers to a trick I found to make some old wick work better. It didn't pick up solder very well, and perhaps it had never done so. I have a small tin with solid colophonium (rosin) which is what is used in the core of 'radio' solder as a flux material.

I lay the tip of the wick on the colophonium surface and just lightly touch it with the hot soldering iron. This melts a little, which sticks to the wick. Then I proceed as normal, wicking the solder from the PCB. The wick works great every time now. My small tin of colophonium (20 grams) came from Conrad Electronic which has shops in many countries in Europe.

[WA8MCQ comments: Desoldering wick contains some flux already, and works fine if it's reasonably fresh, but if it gets old it may not pick up solder very well. At work we use a lot of liquid flux in small dispenser bottles, usually RMA type--mildly activated rosin. (We normally don't use RA, or fully activated, due to certain long term reliability concerns in critical applications.) Whenever I use desoldering wick, I always make it a habit to put a drop of liquid flux on it first, to be sure it works well.]

--DE OH2ZAZ

QRP WATTMETER WITH AN LM3914

Andy Meng, KC8KFI*, has an interesting little wattmeter circuit on his web page, at* ***http://www.qsl.net/kc8kfi/wattm.html****. The schematic is shown in figure 4, and he has this to say about it:* Here is a wattmeter that I designed. It has two scales, 1W and 3 1/2W. It is not linear, however. It uses a 10 LED bargraph display available from Radio Shack, and an LM3914 bargraph driver. I built mine into a Pomona Electronics box (0.9" x 2.25" x 1.1"). It is a tight fit, but it works. This is built to be used with a 50 ohm load, so if your antenna is not about 50 ohms the indicated power will be different.

The wattmeter draws about 6 mA on receive, but about 125 mA with all LED's lit! The resistors can be changed for lower current draw, but mine is pretty tightly built and I don't look forward to taking it out. I don't recommend running this on a 9V battery, because it draws a lot of current in this circuit. When the battery starts to die, the indicated power changes quite a bit.

[WA8MCQ note: I pointed out to him that he was operating the LM3914 in bargraph mode, which lights up an increasing number of LED's as the input voltage rises. I suggested that he could reduce the

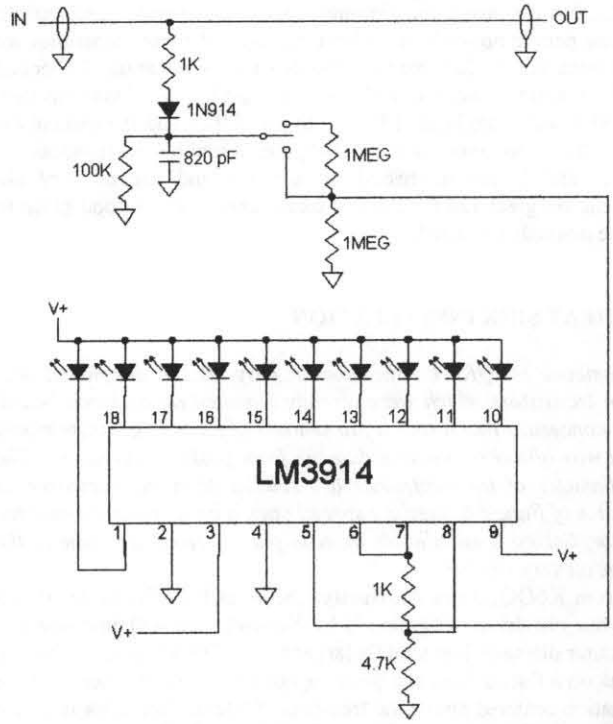


Figure 4—Simple wattmeter using LM-3914 LED driver. Upper switch position is the high power range, and the lower position is the low range. The driver is in bargraph mode when pin 9 is tied to +V, or dot mode if pin 9 is left open. (KC8KFI drawing, from his web page.)

LED number	High power mode	Low power mode
	Volts p-p/power	Volts p-p/power
1	5/60 mW	3/20 mW
2	9/200 mW	4.5/50 mW
3	13/420 mW	6/90 mW
4	16/640 mW	8/160 mW
5	19/900 mW	10/250 mW
6	21/1.1 W	11.5/330 mW
7	24/1.44 W	13/420 mW
8	26/1.69 W	14.5/530 mW
9	28/2 W	16/640 mW
10	[not given]	17.5/770 mW

Figure 5—Peak to peak RF voltages and corresponding power levels (at 50 ohms) for various numbers of LEDs lit on the wattmeter, with a supply voltage of 12V. (The web page also includes this information for supplies of 7.5 and 6 volts; calibration changes when supply voltage is changed.)

current draw by going to dot mode, in which only one LED is lit at a time. Pin 9 is the mode control. Connecting it to the supply voltage as done here puts it in bargraph mode, while leaving pin 9 open puts it in dot mode. With increasing input voltage, a single point of light steps across the display in dot mode, drawing much less current. Selection of mode depends on personal taste as well as whether or not current draw is a concern. If this circuit is to be used with battery power but you still prefer bargraph mode over dot mode, put a switch in series with the power lead to turn it off when not needed.

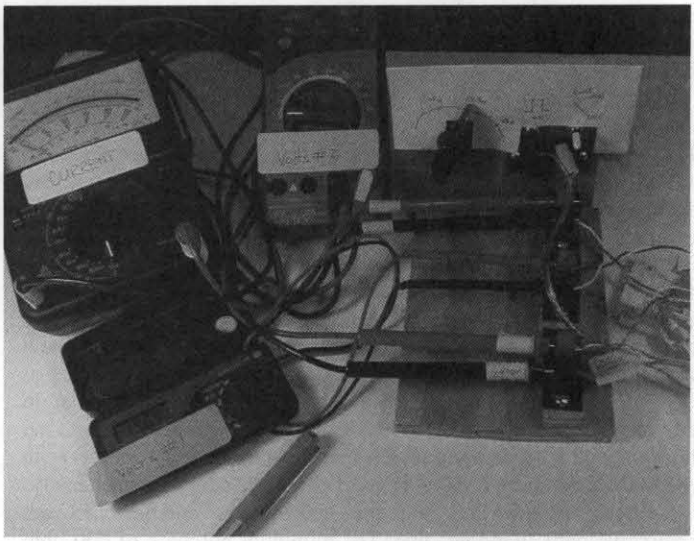
The table of figure 5 shows the calibration of his unit, with a 50 ohm load, and using a 12 volt power supply, for both high and low power settings. His web page also gives the calibration info for his unit with 7.5 and 6 volts. Since the calibration does change with power supply voltage, anyone duplicating this circuit might want to put a voltage regulator on the LM-3914 to guarantee consistent results.]

—DE KC8KFI

PROTOTYPING ORGANIZER - Eliminate Your Rat's Nest

*From **Sam Billingsley, AE4GX** of the North George (NOGA) QRP Club, forwarded by W4QO*--Recently I have been doing a lot of prototype circuits where I had to check multiple voltages points, current points and vary some of the input voltages. I needed temporary and switched voltages at some points. Like most of you I would wind up with a dozen or more alligator clips going between the power sources, test meters and various controls. The rat's nest was not only difficult to follow but prone to bad readings, if lucky, or disaster if you shorted or clipped an alligator to the wrong place because of a poor view. I have partially solved this to date and plan for further improvements.

The photo shows the organizer in place with the test meters, power supplies and prototyping board circuit. The power can be turned on/off using a push button or toggle switch. The voltage can be varied via pot. The meters are attached to the prototyping board via inexpensive two spring-loaded terminal posts (probably designed for speakers or power). The meter cables can be laced together and moved almost completely out of the way of the target of interest, the experimental circuit on the prototyping board.



Maybe these will generate some ideas. For other ideas check out the NOGA QRP club web page at **http://www.qsl.net/nogaqrp/**

WA8MCQ note--Sam also has a personal web page at **http://ae4gx.home.mindspring.com/**

—DE AE4GX

TRUE LADDER LINE AVAILABLE

*Long time QRPer **Fred Bonavita** of San Antonio was once known as **W5QJM**, but now holds the interesting vanity call of **K5QLF**. (Dedicated CW operators will appreciate the significance of that! For the benefit of those who "don't get it," QLF was once facetiously suggested as a Q-signal for "can you send with your left foot?")*

In the August 1999 issue of the Peanut Whistle (St. Louis QRP Society), he reported on the availability of 600 ohm open wire transmission line. (SLQS was founded as a local QRP and homebrew group in 1987. They feel now, as then, that the QRP world is well-served by QRP-ARCI, NorCal, Michigan QRP, etc, and choose not to compete. They do not accept members from outside their area or accept outside subscribers to the Peanut Whistle. But they do allow me to share some of their technical goodies with the rest of the QRP community.)

At first I thought my eyes were playing tricks on me but closer examination showed I was reading it correctly. Someone actually was advertising genuine ladder line for sale. Another look revealed it to be 600 ohm line complete with air dielectric between the wires. For an unreconstructed user of balanced line instead of coax, this was wonderful news indeed.

Last time I found true ladder line was about 15 years ago when Saxton was selling a 450 ohm version that started life as television twinlead but which soon found favor with the balanced feedline crowd in the ham community. After that source dried up and was replaced with so called "windowed" line and/or plain TV twinlead, I jointed the roll-your-own school of making ladder line, but even that has fallen on hard times.

For one thing, ceramic spreaders, which have a nostalgic factor in addition to being very effective, are all but impossible to find. Fair Radio Sales sold them for a quarter apiece a few years ago, but they were missing from the last two editions of Fair's catalogue. And while cutting and drilling wax impregnated wood dowels or strips of PVC pipe works, it's just not the same.

So it's easy to see why I was happy to find a new source of commercially made ladder line, and 600 ohm line to boot. Genuine ladder line is just that: Spreaders resembling rungs in a ladder hold the wires a given distance apart, and the dielectric is air. So-called "windowed" balanced line is not true ladder line, but it is about the only thing available. The gauge of the wires and the distances between them determine impedance. (See the ARRL Antenna Book, 16th edition, page 24-15.)

This 600 ohm line is the work of Mike Maloney, AC5P, and is sold through Gary Gompf, W7FG. Both are from Bartlesville, Oklahoma. Gary is well known in amateur circles as a major source of hard-to-find and out-of-print manuals for receivers, transmitters, transceivers, etc. In addition to ladder line, Mike and Gary have an assortment of doublet antennas fed with 600 ohm line.

The line is lightweight and easy to manage. The spreaders are of ultraviolet-ray resistant tubing, and the line is 26 strand, number 16 insulated wire. Mike says his line and spreaders have been in service six years with no deterioration noted. One important factor Mike and Gary emphasize is that their ladder line and antennas are splice-free.

My ladder line replaced some "windowed" 300 ohm line that, in turn, had replaced "windowed" 450 ohm line. It went up with no problems, and it feeds my doublet. I am able to tune my doublet with my ZM-2 Z-Match by EMTECH and Ten-Tec Model 254 tuner easily.

Prices of the line and the antenna/line combinations are competitive with "window" line. The minimum purchase of 600 ohm line is 50 feet for $23 plus $6 shipping.

Details can be found at **www.w7fg.com** or by calling Gary at 1-800-807-6146. (Anyone who has been around amateur radio any length of time should get a grin from that number.)

—DE K5QLF

SOURCE FOR OLD HAM EQUIPMENT MANUALS

This was mentioned in passing in the item above from Fred Bonavita, but it's worth mentioning again in a separate paragraph to make sure people notice it. This isn't exactly QRP, but sometimes we need to work on an older ham rig and don't have a manual. I checked the web page in the last item and glanced at the listing of manuals they have, and it was quite large. I looked to see if they had the manual for my first "real" receiver back in 1966, the venerable RME-4350A—they did, and I was impressed. Restoration and use of very old equipment are great fun for a lot of hams, and here's a good place to get those manuals you need.

EASY HEAT SINK INSTALLATION

Someone on QRP-L asked for an easy way to put finned heat sinks on transistors which were already mounted on a circuit board. He was concerned that it took a fair amount of force to get them mated up, and was afraid of possible damage from pushing too hard. (The inner diameter of the heat sinks are smaller than the transistor as shown at A of Figure 6; they are spread open a bit and pushed over the transistor. Spring tension holds them in place) Here are some of the answers, all very similar:

From **K6QQ, John Moriarity,** shown at B of Figure 6: If you check your nut driver set (mine is by Xcelite), you will find one that has an outer diameter just slightly larger than a TO-5 transistor. Put the heat sink on a flat surface, and push the nut driver into it. Then hold the combination centered above the transistor. Slide the heat sink from the nut driver onto the transistor. Been doin' it for some 30 years.

From **Jim Lyons, VE2KN**: Obtain a drill bit just larger than the transistor and force the heat sink onto the shank. Then slide it off the drill bit onto the transistor; very easy and reliable, especially if done BEFORE inserting the transistor onto the board. [This is about the same but uses a different tool to spread the heat sink apart.]

Finally, from **Bob Shaw VE3SUY** as shown in Figure 6C: I found that the heat sinks go on very easily by placing a small Marette on top of the transistor and pushing the heatsink over the top of the Marette, expanding the heatsink, continue pushing it onto the transistor, and removing the Marette. The cone shape works very well. [WA8MCQ note--I presume Marette is a trade name; the item is what we call a "wire nut" or a small twist-on connector for joining a pair of wires, especially when doing house wiring.]

INEXPENSIVE BNC MOUNTING TOOL

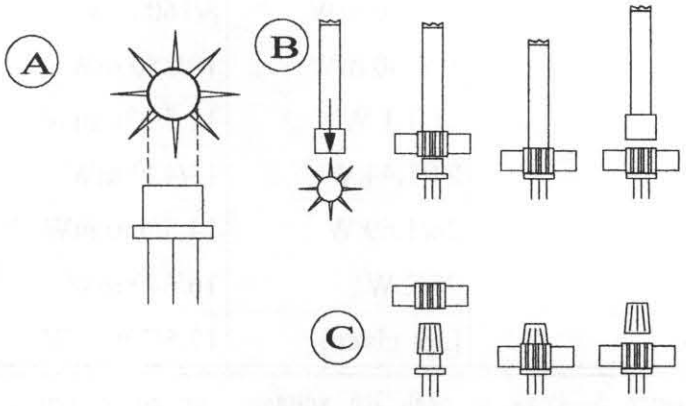


Figure 6—Using a nut driver or wire nut to install a finned heat sink on a transistor.

I use BNC connectors for just about everything at home, and the advantages are many. There are two different types of sockets; just like the popular SO-239 UHF socket, one has a square flange and 4 holes for screws (and in some cases the holes are tapped). Unfortunately, to mount this type you have to drill 4 extra holes and scrounge up 4 screws, nuts and washers—a bit of a pain. The other style is much easier to use, requiring only a single hole to pass the socket itself, and is secured with a large nut. (A quick check of the junk box shows that the single hole BNC socket outnumbers the 4-screw type by about 25 to 1 at my house!)

The threaded portion of the body of the single hole mount socket is actually a D shape, with a flat on one side. If you punch a D hole in your chassis, the chassis itself acts as a wrench and holds the socket while you tighten the nut. Those who have ever looked up chassis punch prices know why most people opt to simply drill a round hole! The price difference between a D punch and a drill bit is staggering. Even if you don't have a large enough drill and have to buy a T-handle reamer to enlarge the holes to accept the BNC, it's still much cheaper.

With a round hole in the chassis, you need to hold the socket as the nut is tightened. The socket itself has nothing to grab onto except for the two bayonet studs on the sides, and that's not easy or convenient with a pair of pliers. Gripping the round barrel with pliers is out of the question, since it could be crushed or scarred. Mouser has a tool to hold the socket while the nut is tightened, shown in figure 7. It fits over the business end and holds the studs. We've had one at work for quite a few years and it works very well. I thought it was a bit pricey at $7 when I first saw it several years ago; current price is about $20. (Although apparently not listed in the index, you can find it on one of the pages in the BNC section, mixed in with the connectors and hardware.)

But at home I've been using a much cheaper tool for years that

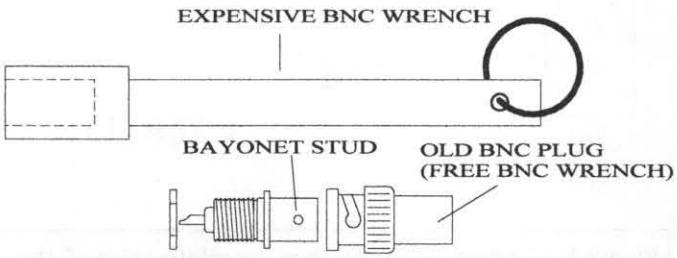


Figure 7—BNC wrench and inexpensive alternative

works just as well—an old, beat up BNC plug! What could be better for holding the bayonet studs than the very thing that was designed to do it every day? Simply mate the plug to the socket, then hold the knurled part with a pair of pliers. The curved jaws inside slip-joint pliers are good, and a pair of curved jaw Vise Grips is even better since they lock in place. It doesn't matter if the plug gets chewed up a bit by the pliers, since it's just an old, scrap plug that has outlived it's usefullness as a connector.

It doesn't even matter if the center pin is in place, since all the plug has to do is hold the studs, and it doesn't have to bright and shiny, either; an old, tarnished plug works just fine. Just snip one off any old, beat up BNC cable assembly laying around. Look around the shack and see if you can find one that you'd never trust to carry any signals, or pick one up at the next hamfest. You should be able to find junk cables very cheaply or even free.

One word of caution with single hole mount BNC sockets, which applies to both the expensive and free tools—don't use the Five Hundred Pound Gorilla method of tightening them. It is possible to snap off the studs if you apply too much pressure; been there, done that, said the bad words, but you learn quick after the first time.

—DE WA8MCQ

THE DRAINPIPE SPECIAL ANTENNA

***Leighton Smart, GW0LBI**, who holds membership number 1 in the GW QRP club, passed along along this antenna tip for people who must have a low profile antenna*—I've used low profile antennas ever since I got my amateur license ten years ago. Most of them have been wire antennas, such as dipoles and long wire antennas which in the main do not attract too much attention from neighbors and passers-by. However, apart from indoor antennas, the ultimate in low profile RF radiators must be the plain old rain guttering of the house.

About four years ago, in a fit of curiosity, I ran a length of wire from the station antenna tuner through a hole in the window frame and up the front wall of my house, fixing it to the aluminum guttering above. I live in a semi-detached property, with the guttering shared by both ourselves and next door. The down pipe is on my side, falling to a length of around 20 feet, while the guttering itself runs for around 50 feet or so along the front of the two houses.

My down lead therefore fed the top of the "antenna" roughly in the center, while the downpipe acted as a second vertical element. The guttering and downpipe are firmly bolted to masonry, which although "earthy" nevertheless separate the antenna from ground.

The impedance? No idea at all. All I knew was that the tuning dip was very sharp indeed, but nevertheless I could load it up for 40M with an SWR of 1:1.1 with a bit of careful effort. As luck would have it, I did this on Sunday during one of the major contests, and gave the antenna a whirl during the evening on the 40M band.

With just 5 watts available from my station I didn't expect miracles from this antenna; in fact if I contacted anybody at all I'd have considered it miraculous! However, I hadn't reckoned for the amazing ears of contest operators. (Is it that they really have good ears, or do they just WANT to work you because there's a contest?) Within a matter of minutes I'd worked a string of US stations, receiving the inevitable (but highly suspect) 599 reports. Despite this I was astounded that I'd actually crossed the Atlantic with QRP power radiated from a drainpipe!

Things were to prove even more exciting later, with Turkey being worked, as well as the Canary Islands, plus a few European countries, and even Uruguay! Thus, in a matter of an hour or so, I'd cracked 5 of the 6 continents with nothing more than the rain guttering as an aerial and 5 watts output of CW.

As the evening wore on I reduced power gradually, calling US stations in particular, and still making contacts with the USA with as little as 0.5W! On more normal days, ie with no contests, the antenna proved a worthy tool for everyday contacts with stations closer to home, and was used mainly as a standby antenna for 40M. It also tuned up for 30 and 20, but I didn't use these bands at all at that time. Perhaps I should have experimented a bit more on those bands, but I've always been more of an LF operator than HF.

As more and more builders switch to plastic guttering, it may be that the end is nigh for these ready-made antennas, but fear not, all is not lost! If you live in a house without one of these built-in antennas, simply run a thin wire up your drainpipe and across your guttering—it'll have less capacitance than guttering I know, but why not give it a try?

Update: I've recently reconnected the guttering, and found that of all the bands, it works best on 15 meters. In just two days I'd contacted stations in Texas, the Canary Islands and Slovenia, all with 5 watts of CW. I'm leaving it connected so that when conditions really pick up I'll be able to really put it through it's paces.

[WA8MCQ comments—aluminum gutters are not continuous pieces of metal, but rather made up of several pieces. Contuinity between the sections could be a problem in some cases. Having just had new gutters put on my house I found out that many contractors in the US now use aluminum coil stock rather than the relateivly short, preformed gutter sections you might find in a home improvement store.

A special machine pulls a long strip of alumium sheet off the coil and forms it into custom length gutter segments. As a result, individual gutter sections tend to be longer, resulting in fewer joints that could problems.]

—DE GW0LBI

INTERESTING NEW COMPONENTS:

—CUSTOM OSCILLATOR CANS
—TWO DOLLAR MIXER

CUSTOM OSCILLATOR CANS

Just about everyone is familiar with crystal oscillator cans. Housed in packages similar in size to IC's, they provide a crystal controlled signal source for circuit timing, etc, for just a few dollars. A wide variety of frequencies is available off the shelf, and a very few even fall within ham bands. Some QRP projects have taken advantage of the latter, such as the New Jersey Club's very successful revival of the venerable Fireball transmitter. (They took the original one step farther by adding a divider IC to the oscillator module so it could be used on lower bands as well as operating it's 28.322 MHz oscillator can straight through.)

Unfortunately, it isn't always easy to find contacts while operating QRP CW in a phone band and it's better if you can do it on the regular CW frequencies. If someone wanted, they could contact a manufacturer and have a can made up for a custom frequency. Although the NJ QRP folks used an off-the-shelf frequency that happens to fall in the 10M band, the original Fireball transmitter used a custom oscillator for 28.060 MHz. And earlier this year, someone on the QRP-L forum offered to make a group buy of custom 28.060 cans if enough people were interested to make the minimum order of 100. (Enough were, and I got 5 of them myself, and the price was competitive with off the shelf cans.)

Still, there is a limited number of standard frequencies available from the catalogs, and there might be times when you wished you had some other frequency available, such as one in a ham band, without having to custom order a large quantity from the factory. Now, thanks to Epson, we can get any frequency we want from 1 MHz to at least 55 MHz and over 100 MHz in some cases, depending on the specifc version. Best of all, this is at a price about the same as the standard frequencies.

Someone mentioned on QRP-L that a new product is available in the DigiKey catalog, the Epson model SG-8002 one-time programmable oscillator, using PLL technology. You select from options to make a part number, specify the frequency you want, DigiKey takes a "blank" device off the shelf, pops it into a programming device provided by Epson, and enters your frequency. Voila—a custom frequency oscillator can for about the same price as a standard value! (Once it is programmed, it can't be changed.) The catalog says that these are non-cancelable and non-returnable, so be careful when you order.

These devices come in the same general type of packages as other oscillator cans, and are available in several styles; three are surface mount, and two are though-hole (regular leads). The latter are arguably the easiest ones to use, and also the cheapest, at $3.33 in single quantities. Power supply options include 5V CMOS, 5V TTL and 3.3V CMOS.

If you have a fairly new DigiKey catalog, these would be worth looking into if you want a quick signal source of any frequency you specify.

—DE WA8MCQ

TWO DOLLAR MIXER

Last year, in the July issue, I mentioned a new mixer from MiniCircuits, the ADE2-ASK. While it is not exceptionally low priced, a little over $4 each, it does have a very small footprint and a very low height, which appealed to me as perfect for really tiny circuits. (I still haven't gotten around to building the transceiver in a Zippo lighter that I've been talking about for 2 years, but haven't abandoned the idea. Rex Harper, W1REX, beat me to actually building one—he put a Pixie into his, which I saw at Dayton in 1998, but I hope to get something a bit more sophisticated in mine. Needless to say, it will depend very heavily on surface mount parts.)

MiniCircuits recently introduced a new addition to their ADE series, the ADE-1. It covers 0.5 to 500 MHz and is a Level 7 mixer, requiring +7 dBm of LO drive. (That's the most commonly used drive level, at least in homebrew projects, and is the same as the popular SBL-1.) The price is listed at $1.99 each. There's some confusion whether that is for quantities of 1-99 or 10-49; their ads in the trade journals indicate the latter, while the data sheet for the ADE-1 shows the former. Either way, this is a decidedly inexpensive mixer and should be very attractive to homebrewers.

I had a drawing in the July 1998 issue to show the relative size of the ADE-2ASK compared to the SBL-1 and the TUF/TFM series. Figure 8 is an updated drawing which includes the ADE-1. The footprint is the same, but the height is 4 mm instead of 3.

I've frequently heard it said that MiniCircuits will waive the minimum order amount (which is either $50 or $100) on sales to radio amateurs. I have never tested that myself; at the time of my order last year it was a $50 minimum, and I pooled orders with local hams to go

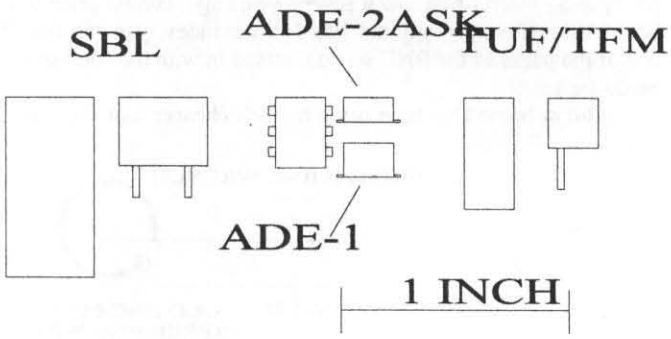


Figure 8—Updated drawing showing relative size of the MiniCircits ADE mixer series. The ADE-1 has been added to the drawing. (Drawing is somewhat larger than actual size.)

above that.

One reason for the low price is the package. It's a surface mount unit in an inexpensive, open-on-the-bottom plastic package; you don't always need a metal package, and in many applications the cheaper plastic one is perfectly fine. You don't always need the shielding or mechanical protection that the metal provides, and it's probably safe to say that a lot of noncritical homebrew projects require neither.

You do have to be a bit careful in soldering the things, since they have tiny little metal tabs for leads, set in the plastic body. I'd use a small tip, and keep the dwell time of the iron as low as possible, to keep the plastic from melting around the lead. And being a tiny surface mount device may make it more difficult for some to work with. But at least you don't have to worry about solder melting on the internal connections if you keep the soldering iron on a bit too long; the wires are spot-welded to the terminals.

If you want to see the data sheet on the ADE-1, you can check the MiniCircuits web page at

www.minicircuits.com

and then click on **"What's New," "New products," "frequency mixer"** (not any of the others with the word "mixer" in them), **"level 7"**--not level 3, which contains the ADE-1L, a lower drive unit that costs $3.95, and finally click on **ADE-1**. You will need the Adobe PDF reader to view it, but that's freeware and widely available. In fact, most web sites that have documents in PDF format will let you download the software right there. (The full-blown software to encode documents in PDF is most definitely not free.)

You can also download a lot of good information from the *MiniCircuits web site, tailored to users of their products. From the* main page, look under **"application notes."** Topics include general info, mixers, limiters, directional couplers, attenuators, power splitters and combiners, etc.

The bottom line--the ADE-1 is a small, inexpensive device in an open plastic package, with electrical specifications that make it suitable for a lot of noncritical homebrew uses. Depending on your application, and if the mechanical considerations are not a problem for you, this could be an attractive device.

—DE WA8MCQ

QRP-L, THE "QRP DAILY"

Chuck Adams, known to most as **K5FO**, recently changed his call to **K7QO** in preparation for an upcoming move to Arizona, and the new call will take a while to get used to. And a well known call it is; in 1993 he created QRP-L, the Internet QRP discussion forum (mail reflector) and it's still going strong, with several dozen QRP postings every day *(that is NO exaggeration, as anyone on QRP-L knows!)* and now about 3000 subscribers. Chuck is also one of the major players on QRP-L and acts as the guiding light.

Although it's not a traditional club in the sense of a group of people who meet physically, it has become the largest, most active QRP "club" in the US. If interested in details of subscribing to it (which is free, of course), ask me via e-mail (wa8mcq@erols.com) and I'll tell all, including some alternate ways of reading it that DON'T clutter up your inbox with 50 to 100 additional messages each day. (The Daily Digest is a big help, but the HTML Archives are an absolute lifesaver!) By the way, since it is a mail reflector, you do NOT have to have full blown Internet access to participate in QRP-L; just an e-mail account, such as juno.com, will do. (Although the HTML archives do require full Internet access, the daily digest is sent via e-mail.)

THE FINE PRINT

You know the routine: if you have something you'd like to share with the QRP community, write it up and e-mail it or stuff it in an envelope and send it to Severn. If you prefer, post it to QRP-L first so more people can enjoy it, and put me down on the CC line so I don't miss it. Don't worry too much about drawings, spelling, etc—that's all my job—just send it in!

—qrp

Direct Solar Powered Radio Operating

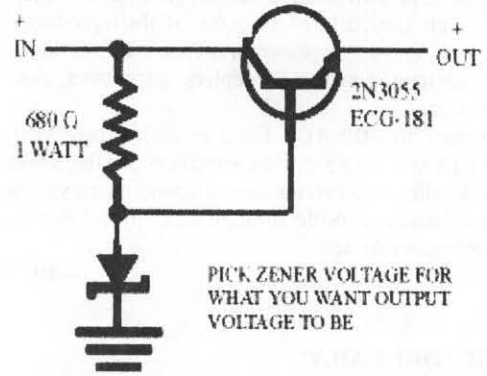
by: Wes Spence, AC5K *ac5k@ih2000.net*

Some years ago (back during the Arab oil embargo I think), there was a bonus class added to the scoring of the ARRL Field Day called "Natural Power". I have enjoyed seeing some very interesting methods of generating power for amateur radio use that started with that bonus. The one method that I feel never really followed the spirit or the purpose of the natural power bonus is where a battery is (supposedly) discharged and recharged using a solar panel. The panel is left on the battery and they are both used to power a small station and the bonus is claimed after the five QSOs are made. I feel the solar battery method is lame.

The readers might be interested in my method of *direct* solar power. I have provided many Field Day groups with a true natural power bonus running a QRP station *directly* off of a solar panel. QRPers have always been involved with 'home-brewed' radio gear. If you have ever felt the thrill of making contacts on a radio that you built, you will really love home-brewed power!

To briefly describe my system, I use a large panel of about 55 Watts, a simple pass transistor regulator that I built in a 35mm film case (see diagram), and monitor the output using an expanded scale voltmeter that I built. I usually use a Ten-Tec Argosy as the radio, but even with the bulb behind the meter removed, it is a bit of a power hog. My simple method is to start with the radio in the QRP position and the drive control at minimum. I turn the power up to the point that the voltmeter starts dipping and then decrease the power a bit to minimize chirp. This is not perfect, but in the true nature of Field Day, perfect is not the point. With reasonable sun, the Argosy, and my inefficient regulator, my power usually is about 1 to 1.5 Watts out before the voltage drop becomes excessive. The fun comes when you realize you have plugged into the sun with no batteries involved! If you are doing this for the Field Day bonus, start with the solar QRP station at *the beginning* of the contest and work the easy loud signals. The five QSOs required for the bonus will be a piece of cake.

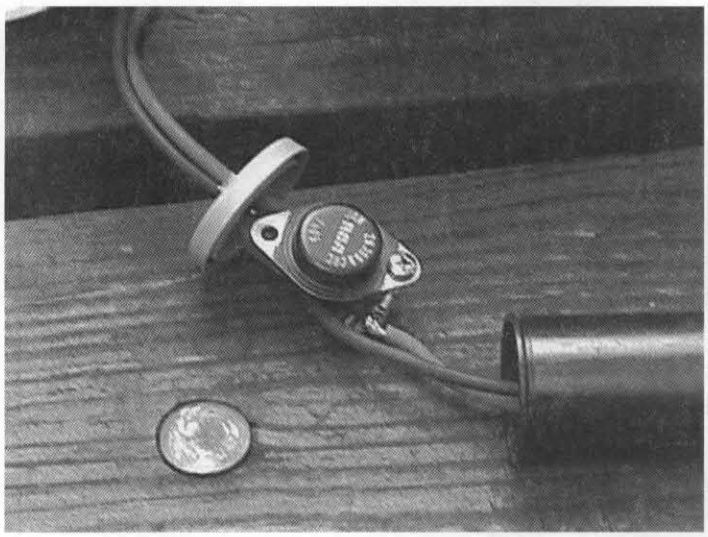
AC5K SOLAR REGULARTOR



Although I have made many contacts with my direct solar system, there are many improvements planned. I have already built a new DSW-20 rig from Small Wonder Labs that is much more efficient that the Argosy (but only one band). The regulator, however, is where most of the power is lost. I will be doing experiments with some of the switching type regulators that are made by National Semiconductor that Zack, W1VT told me about in the near future. They are only slightly more complex that what I am using now, and the specs say that we can expect 90% efficiency! I would be somewhat surprised if my pass transistor regulator is 50% efficient. Plans are to do a second article when I get the switching regulator running. In the mean time, give this simple method a try. You will be thrilled how easy and fun it is.

72, Wes, AC5K

"CLOSE UP OF THE REGULATOR"



'DIRECT SOLAR SET-UP"

Bitten by the Bug

By Rich Arland, K7SZ *email: k7sz@epix.net*

QRP and QRPers never cease to amaze me. Having been in the low power business for over 30 years, I am still excited when I see the wonder on a new QRPer's face as they make contacts using 5 watts or less RF power. What a thrill! It's even more satisfying when that newcomer happens to be a good friend *and* neighbor.

We moved into our new house in south Wilkes-Barre, Pennsylvania in October of 1988. In keeping with my usual conservative approach to ham radio, the first antenna erected was a sloper in the back yard. My theory is this: a systematic "low profile" approach to introducing ham radio into a neighborhood is a lot easier and less confrontational than erecting a 90 foot tower and 7 element beam! After a year of using the sloper, I erected a Butternut HF-6V vertical with 30 buried ground radials in the side yard. This is when I met Dave, my neighbor from across the street.

As I was trenching the sod and laying the radials in place, Dave wandered over and inquired about what I was doing. He had heard of ham radio and, like most people, thought it was akin to citizens band. After a short conversation, he was helping me bury some radials! I found out that he was an electronics engineer who worked at the Tobyhanna Army Depot designing fault isolation software for the military.

Of course, I invited Dave inside and gave him a tour of the shack and the radio gear. I even managed a contact or two using SSB (there is nothing worse for a non-ham than to stand around while someone completes a CW QSO) and Dave was suitably impressed. Dave left the house with a basic understanding of ham radio and low power communications. The seed was planted.

Dave became a steady visitor to the shack and my backyard (more antennas to erect, you know). I found out one fact about Dave: he might be an engineer (yes, he *can* recognize a train two out of three times) but he was a "doer". He likes to get his hands dirty and actually get down in the trenches and work! Not only did he understand the theory of what was going on he could solder and troubleshoot a project or circuit. Man, what won't they invent next! Whenever I needed help on an antenna project, Dave was there.

Several months went by and Dave started bringing his wife, Jennifer, over to the shack on occasion. Soon, I loaned them a book: "Now You're Talking", since they were both interested in obtaining their licenses. Dave even interested the minister of their church and several members of the congregation in starting a licensing class. I am proud to say that I was one of the VE s that presided over that test session. Both Dave and Jen obtained their licenses. Dave became a Tech Plus (N3PBV) and Jen got her Novice (KB43ATG). The weekend they took their tests coincided with the CW WW DX SSB contest, so guess where we went after the test session? They each made some contacts during the contest using my callsign. Nothing like a little contest action to heighten the anticipation of the arrival of their licenses.

This is about the time that things took on a life of their own. Dave, being quite an accomplished scrounger, ended up with a Kenwood TS-830 and a Heath HW-101 for his station. He managed to find an old Kenwood HT and an Icom 2 meter FM rig for mobile work. Often I'd hear him on 2 meters but never on HF. I finally asked him about this and his reply indicated that he didn't want to use the HF rigs because they put out too much RF power! (What can I say? God make 'em and they find me!) . Imagine that....an HF rig that put out too much power! I guess the QRP bug nibbled on Dave early on in his ham radio career.

Besides, he didn't have an HF antenna erected yet, and he had some ideas on incorporating a "stealth" antenna design when he re-roofed his house next summer.

The following spring, Dave did re-roof his house. He had modeled several antennas on ELNEC that could be added *beneath* the shingles and vinyl siding which would give him 40-10 meter HF coverage. Of course, this meant that he had to use QRP power levels to prevent high voltage RF from heating the structure and possibly causing a fire! As a "house warming" present I gave Dave my first NorCal-40 transceiver, which I had modified to cover the 40 meter Novice CW band. You'd thought I'd handed him a new FT-1000D! To say that Dave was ecstatic was an understatement. Now he could get on HF in fine style with a stealth antenna system and a real QRP rig. Life is good!

During this time period, Dave changed jobs, quitting the Depot and going to work for a New Jersey company that designed automated diagnostic software and hardware. He didn't have a lot of time for ham radio, but he soon became involved with the then defunct Wilkes-University amateur radio club. Since Dave was an alumni of Wilkes-U, and he knew many of the people "in the right places" it wasn't long before new life was breathed into the club and a licensing class organized. Four of the students received their Novice or Tech licenses.

This set the stage for Field Day 1999, the first at Wilkes-University. Oh, did I mention that this was a total QRP effort? Dave wouldn't have it any other way. While there were only a total of five us that turned out for FD, we drew a lot of attention. The president of the university and his wife came by to check out our operation. Many of the incoming freshmen on their orientation stopped by (a great plug for the Wilkes-U engineering division, I might add), several professors from the engineering and computer science departments strolled by and two local papers covered our participation in the annual emergency test. Not only did we put forth a positive showing for ham radio, we made sure that everyone that stopped knew that we were using low power to communicate with our ham radio brethren.

What's on the horizon? Well, Dave managed to get permission to move the entire Wilkes-U ham station from the 5th floor cubby hole down into a corner office suite (with windows!) and relocate all the antenna coax and controlling hardware into the new "shack". I am the trustee for the Wilkes-U license (we will be applying for a vanity call: N3WU, shortly) so next year at FD (and at various QRP events) you should hear us on the air from beautiful down town Wilkes-Barre. There will be ongoing licensing classes held twice a year on campus for students and interested individuals. And, since Dave has a very close tie with the electrical engineering department at Wilkes, he has been extolling the virtues of ham radio and QRP to one and all. The result? One of the projects that 3rd and 4th year electrical engineering students will participate in is the building and operating of a QRP transceiver kit. In order to operate the radio you have to have a license, huh? Could it be that we will be getting some new blood (young blood at that) into this hobby? If I know Dave, it is a certainty.

Just last week (the end of July) Dave and his son, John, went on a week long camping trip with the Boy Scouts. Dave borrowed my MFJ

10 meter SSB rig and battery power supply. In addition he took his Nor-Cal-40 and his dual band 144/440 FM rig and associated antennas. With all this gear set up, he proceeded to promote ham radio and QRP during the camping trip. The young scouts were fascinated (gee, can't do this on the internet!) as Dave worked a slew of SSB contacts on 10 meters. Several of the counselors and scouts are now going to study for their ham license. Good job, Dave!

The point of this article is to show what can be done with a little bit of time and the desire to share our hobby with others. All too often we get wrapped up in the "techno-nerdy" stuff and forget the human angle. DXing, contesting, rag chewing and homebrewing are fine, but it is **PEOPLE** who make this hobby what it is. Without people the hobby dies. Ham radio is about communicating. If we take the time to communicate what our hobby is about to non-hams, we will get "converts" and the our ranks will grow. Without a doubt, Dave was attracted to the ham radio hobby because it fit into his career. He understands electronics, so for him, the transition into the radio hobby was an easy one. What I find exciting is that fact that he also understands the concepts and spirit of QRP. You don't need hundreds or thousands of watts of raw RF power to make things happen. Thankfully Dave is an outspoken advocate of low power communications and I am proud to call him "friend".

Rich , K7SZ

(Editors Note: This "Profiles in QRP" column will now be a regular feature of the Quarterly.. de NA6E)

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VERTICALS WITHOUT VERTIGO - Part 2

Ten Questions You Always Wanted to Pose to Your Vertical, But Were Afraid to Ask

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This is the second installment of a three-part series on vertical antennas based on a talk given by L. B. Cebik, W4RNL, at the "Four Days In May" symposium held in conjunction with the 1999 Dayton Hamvention. Part 1 appeared in the July 1999 ***QRP Quarterly*** *and presented 10 questions regarding vertical antennas, and answered the first four. In this installment, questions 5, 6 and 7 are answered.*

5. What makes a vertical either a monopole or a dipole?

Having spent a good bit of time clearing away problematic ideas that get in the way of understanding verticals, let's make some positive progress. One of the most confusing questions we can get our hands on is when a vertical is a monopole and when it is a dipole.

The question is not difficult if the antenna wire is 1/4λ long or shorter. A quarter wavelength wire fed at its end in free space presents an impossible situation that has no resemblance to a real antenna, like one we might stick in the ground. It always wants some form of completion, whether as a real or a simulated ground plane, so that we can feed it at or near a current maximum.

The problem that boggles our minds is when the vertical antenna element is longer than 1/4λ. We can in fact have vertical monopoles that are anywhere from 1/4λ to at least 5/8λ long. We can also have vertical dipoles that range from short (1/3λ to 3/8λ long) to well over the standard 1/2λ length.

The way to figure out which is which lies in the feedpoint and system: where are you feeding the antenna and how. As to positions, we have roughly two choices. We can feed the antenna at the lower end or we can feed it in the middle. (The upper end is theoretically available as a feedpoint, but somewhat inconvenient except in some nearly vertical sloper designs.)

Our choices as to the method of feed are also a pair. We can feed the antenna at a point at or near a current maximum. We may also feed the antenna at a voltage maximum. We are accustomed to matching a high-current, low voltage, low impedance source to a low impedance antenna feedpoint. We think of such points as the base of a vertical monopole or the center or near center of a dipole. Voltage feeding involves the use of high-Q tank circuits with the power coupled in and the antenna attached at or near the "hot" end of the tank.

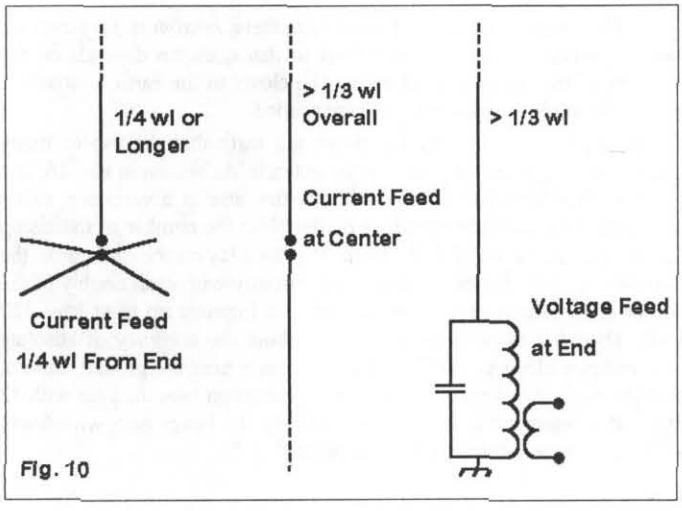


Fig. 10

The sketch in **Fig. 11**, shows the current magnitude along both the vertical and each of the (4) radials for a sample 1/4λ monopole with ground plane. The current in the radials at the junction is 0.25 of the source value of 1.0. Note the current peaks in the radials near the junction of elements.

The middle case of **Fig. 10** is clear enough on its own. The antenna is current fed for lengths between 1/3λ and nearly 3/4λ. Because the antenna is balanced about a current maximum at its center, it requires no ground radials to establish that balance.

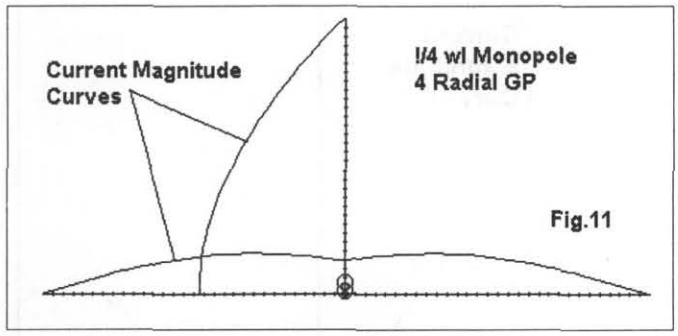


Fig.11

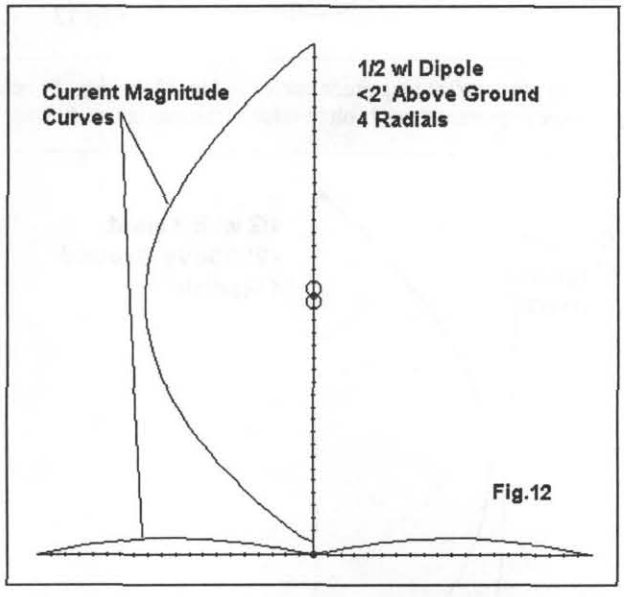
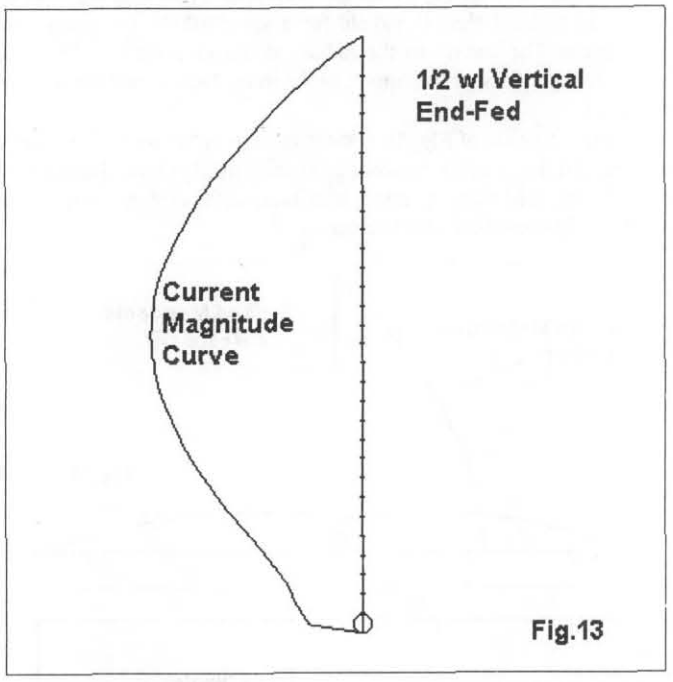


Fig.12

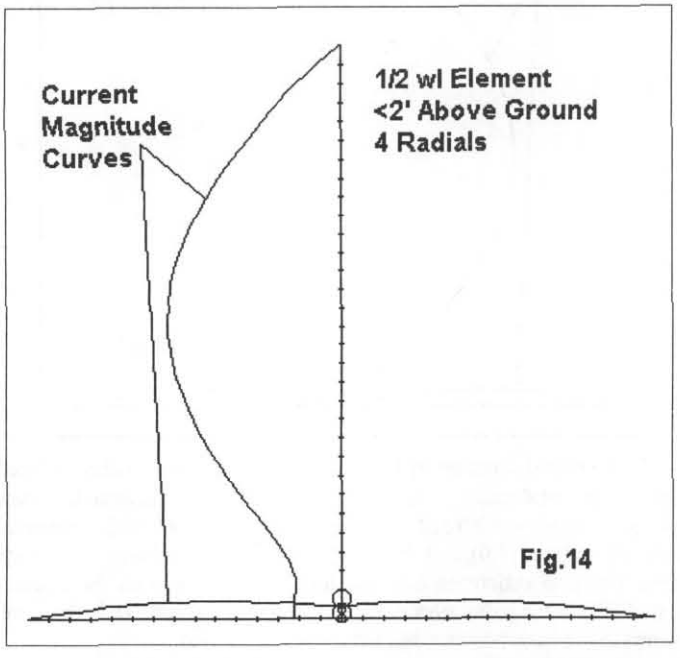
In the model sketched in **Fig. 12**, the 1/2λ antenna has been placed over a system of 4 radials, each 1/4λ long. The current magnitude curves reveal that the current in each radial never rises above 0.1 of the current at the antenna source (1.0), and the current peaks about mid-way down each radial. The gain difference between this little model, with the antenna about 2' above the radial system, is less than 0.25 dB relative to the same antenna in the same position, but with no radial system.

The last case in **Fig. 10** strikes many as similar to the first, since the feedpoint is at the base. However, the tank circuit makes this a voltage-fed antenna, and the current maximum is at roughly the center of the antenna. For proper operation, the antenna requires no radials, but does demand a good RF ground return to the source. If we do lay down a radial system, it is not for propagation, but for the enhancement of the RF ground of the tank circuit. Of course, the link for the low-impedance feeder system could be replaced by a tap on the main coil.

With the end of a 1/2λ antenna at the same position above ground as the model used in **Fig. 12**, the antenna shows the same gain, within about 0.1 dB, as the center fed version. **Fig. 13** shows the current magnitude distribution along the element, with its peak at the center of the antenna, almost identically to the magnitude pattern of the center-fed version. As an end fed antenna, the feedpoint impedance is high: about 1400Ω resistance and 4000Ω reactance. However, before we leave our 1/2λ vertical, let's perform one more experiment.



Compare the current magnitude curves of **Fig. 13** and **Fig. 14** below. Shape is more important than absolute value of the maximum shown.

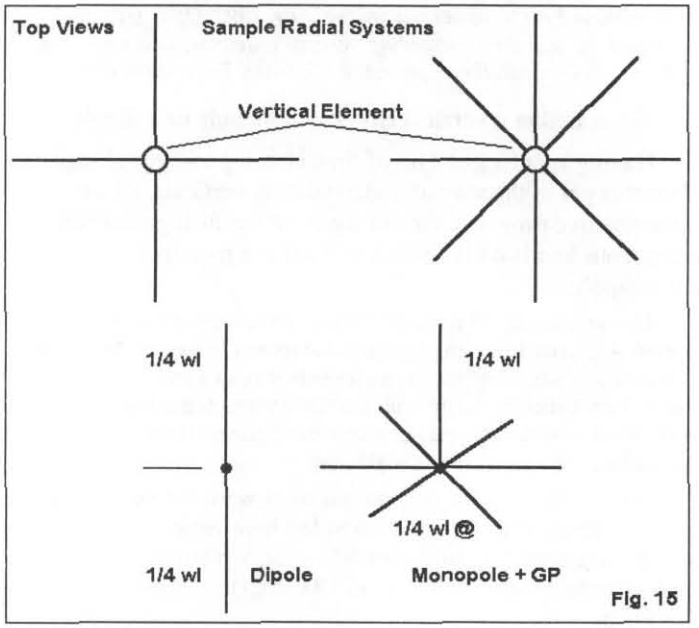


In **Fig. 14**, the 1/2λ element was placed above 4 radials and fed against them. The result was similar to that of the 1/2λ center-fed element placed above the same radial set. Gain differences are less than 0.1 dB, and the maximum current region remains at the element center. The source impedance is high, and the current in the radials reaches about 0.1 of the value at the vertical element center.

This exercise is not designed to show that radials do not help, since we used only four. However, it does demonstrate that the end-fed 1/2λ element remains exactly what it is whether or not placed above and fed against radials.

6. What is a ground plane?

One of the enduring misnomers of all antenna work is the phrase "ground plane." We cannot get rid of it (in the way that we can simply stop using the term "counterpoise"). However, we can do as much as possible to eliminate drawing some of the wrong conclusions that abound.



Let's first treat the "plane" part of the phrase. As revealed in **Fig. 15**, the typical plane consists of a symmetrical arrangement of spokes extending from one side of the feedpoint, where the other side is essentially a vertical element. For the common 1/4λ vertical antenna, the plane spokes are also approximately 1/4λ long. Almost any number of spokes may be used so long as we arrange them symmetrically.

The lower half of **Fig. 15** shows the function of the plane: to replace the radiating lower half of a vertical dipole with a structure that 1) lets the assembly be resonant on some desired frequency, 2) permits the feedpoint at the element-plane junction to be a current-feed point, and 3) eliminates radiation from the plane by cancellation. That is, radiation from one plane spoke is cancelled by radiation from one or more spokes in the assembly. Hence, we may in fact use an odd number of radial spokes to make up the plane, and as few as three will preserve the circular vertical pattern that we prize.

a. How many radials do I need to achieve maximum performance from my vertical + plane? The answer to that question depends on the proximity of the antenna to the earth. The closer to the earth – including being in the earth – the more radials are needed.

However, it is not very far above the earth that the use of many radials instead of a few fails to help the antenna. As shown in **Fig. 16**, at a height of 10' (about 0.07λ at 7 MHz) for the base of a vertical + radial plane, performance is not enhanced by doubling the number of radials up to 32 from an initial set of 4. When those radials lay on the earth, as in the lower curve, performance increases continuously with each doubly of the number of radials. And it would continue to improve up to at least 120 radials. (Because there is some question about the accuracy of absolute value values yielded by NEC models for planes near the ground, but not about the accuracy of performance trends, the graph uses the gain with 32 radials as a reference in both cases, showing the lesser gain with fewer radials. 0 dB is an arbitrary reference point.)[6]

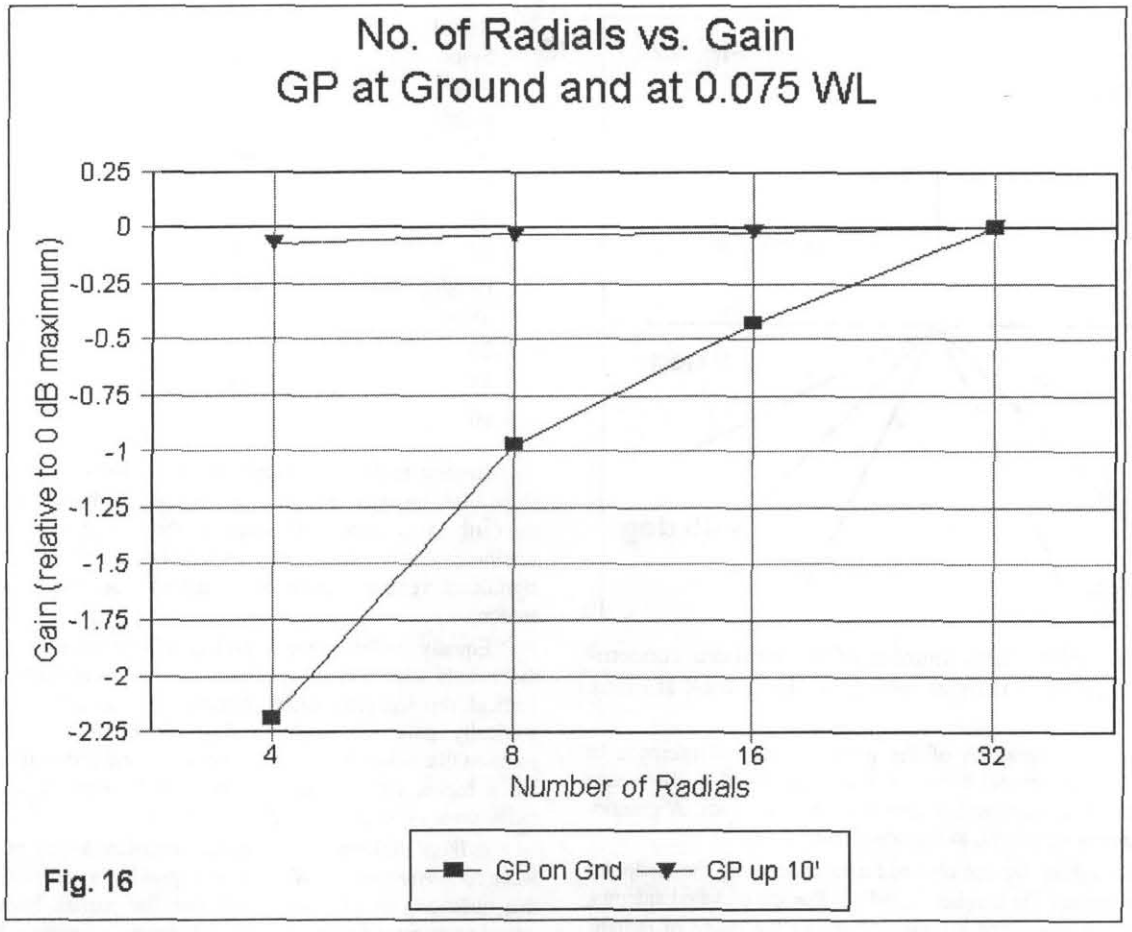

No. of Radials vs. Gain
GP at Ground and at 0.075 WL
Gain (relative to 0 dB maximum)
0.25
0
-0.25
-0.5
-0.75
-1
-1.25
-1.5
-1.75
-2
-2.25
4
8
16
32
Number of Radials
GP on Gnd
GP up 10'

Fig. 16

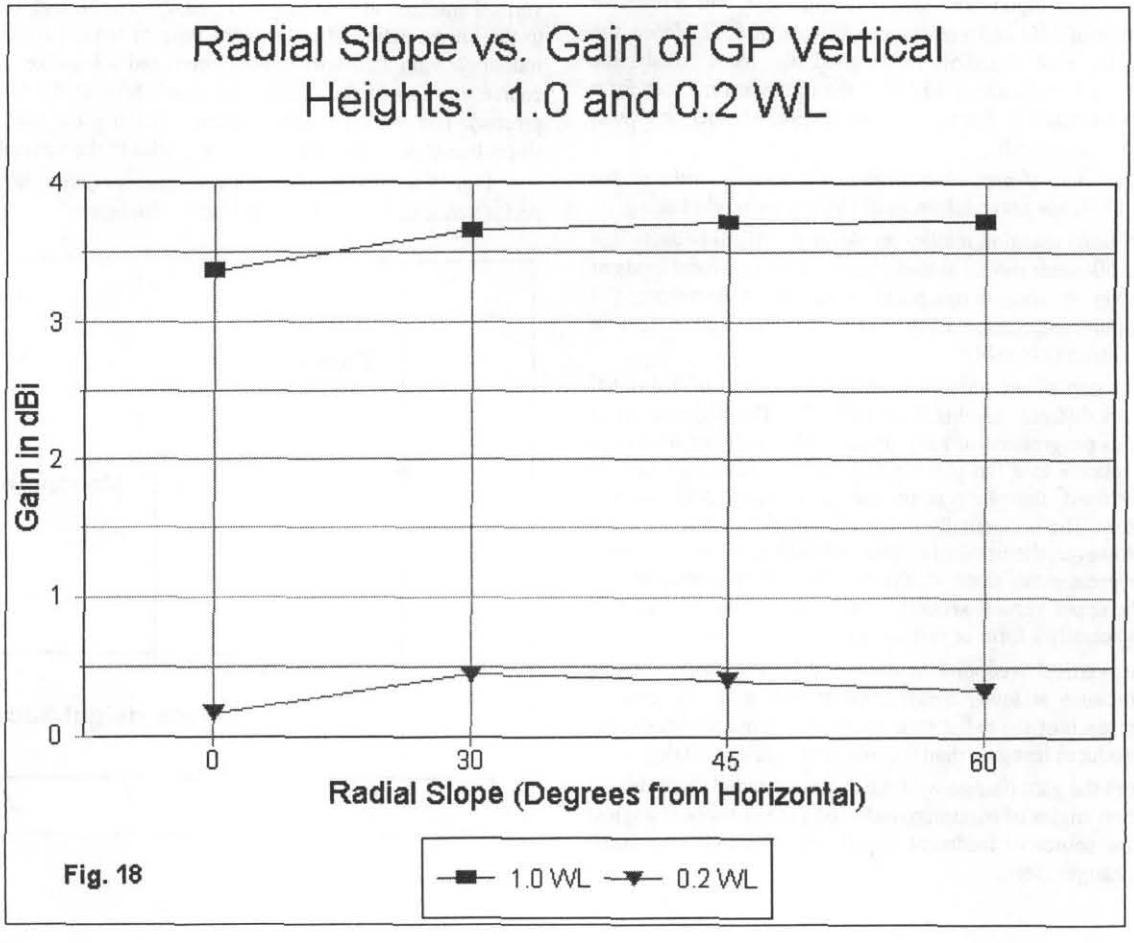
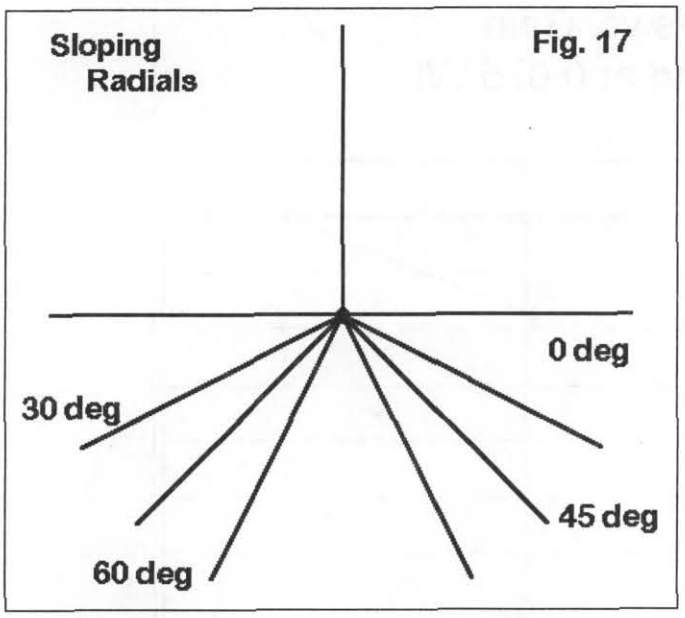

Radial Slope vs. Gain of GP Vertical
Heights: 1.0 and 0.2 WL
Gain in dBi
4
3
2
1
0
0
30
45
60
Radial Slope (Degrees from Horizontal)
1.0 WL
0.2 WL

Fig. 18



There are actually a large number of subquestions concerning the radial plane of a vertical monopole. Let's look at them, one at a time.

Notice that this description of the plane makes no reference to ground. In fact, one can model the antenna just described in free space with no theoretical problems rearing their troublesome heads. A ground-plane vertical requires no ground to operate perfectly well.[5]

To the graphed gain, we can also add data concerning the feedpoint impedance as we change the number of radials. For the elevated antenna, source impedance changes by less than 1Ω across the range of radials. With surface radials, the impedance changes considerable, with a resistive component variation of 24Ω and a reactance variation of 65Ω. Hence, the received wisdom for earthed radials holds good: the more radials, the better up to about 120, with about 30 being the minimum number for a long-term, serious installation. For an elevated system, whether on a pole, tower, or roof, 4 to 8 is enough.

b. What difference, if any, does sloping the radials make to the installation? **Fig 17** shows several degrees of sloping we might use.

The sloping-radial question implies an elevated vertical because it is difficult to slope 160-meter radials at a 45-degree angle into most kinds of ground. The answer involves two aspects of antenna performance: the gain and the feedpoint impedance. Each answer is partially dependent on the height of the antenna assembly

Fig. 18 gives part of the answer in terms of the gain of a 4-radial vertical at two very different heights: 1.0λ and 0.2λ. The higher antenna shows a continuous progression of gain increase (although just barely) as the radial angle relative to a flat plane parallel to the earth continues to increase. When sloped, the plane is no longer a purely non-radiating symmetrical system. The horizontally polarized radiation is balanced and self-canceling. However, the vertically polarized radiation – which grows significantly the greater the slope to the radials – simply adds to the radiation from the upper vertical section. In short, a rooftop vertical with sloping radials is actually a form of vertical dipole.

0.2λ for the vertical feedpoint is about the lowest height for this modeling test, because at lower heights, the radials drag the ground. However, the approach of the radial ends toward the ground with steeper slopes actually produces less gain than the max gain angle of 30 degrees.

Not only does the gain change with the degree of radial slope, but so too do the elevation angles of maximum radiation (TO or take-off angles) and, of course, the source or feedpoint impedance. The following small table makes the changes clear.

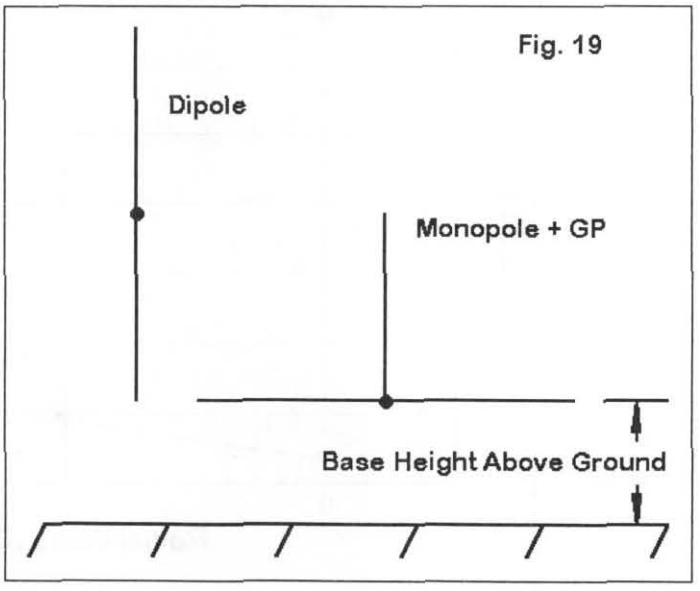
Radial Slope degrees	TO angle degrees	Feedpoint Z (Resistance) Ohms
Height: 1λ		
0	26	21.3
30	27	41.3
45	28	49.7
60	28	55.9
Height: 0.2λ		
0	15	19.4
30	17	43.1
45	18	56.3
60	18	68.6

Evident is the more rapid rise in the source resistance as the radial slope angle increases for the antenna whose radials more closely approach the earth. At a slope of 60 degrees, the 0.2λ base height of a 40-meter version of this antenna places the radial tips within 2' of the ground with significant vertically polarized radiation from the lower portion of the antenna.

Equally evident is the small but definite increase in take-off angle as the radials approach the position where the antenna would become a vertical dipole. This latter phenomenon occurs because the growing vertically polarized radiation from the bottom wires comes from a position that is lower than the upper wire, and this portion of the radiation has a higher take-off angle. The overall elevation angle of maximum radiation is a composite of the two angles.

c. What differences, if any, does absolute height of the antenna base make to performance? We can only provide a sample modeling test for this question, so the answer will only be partial. However, the results reveal an interesting facet of vertical antenna operation. I placed 40-meter vertical antennas at base heights of 10, 20, and 30 feet. (Base height refers to the lowest extent of the antenna wire or wires.) I used both a vertical monopole with an 8-wire radial system and a full-size vertical dipole. Of course, the top of the dipole was much high (1/4λ higher, to be more precise). The models for the vertical + radial plane used a plane with no slope, that is, with the radials at right angles to the vertical element.

Fig. 19 shows the basic test configuration, with the results in several performance categories tabulated below the figure



Base Height feet	Gain dBi	T-O Angle degrees	Feedpoint Resistance Ohms
A. Vertical Dipole			
10	0.22	16	79.5
20	0.34	15	70.8
30	0.28	14	68.5
B. Vertical Monopole with Radial Plane			
10	0.20	22	26.0
20	0.27	18	21.8
30	0.18	16	19.8

There is little to choose between any of the antennas or configurations with respect to gain. The maximum gain differential is 0.16 dB. The vertical dipoles exhibit a lower elevation angle of maximum radiation for each height because their feedpoints are always 1/4λ higher than those of the monopoles in this test. As with all of our test models, the higher the vertical antenna base from the ground, the lower the feedpoint resistance. The low value of the feedpoint resistance may surprise some folks, since we are often told that the inherent resonant resistance at the feedpoint of a vertical monopole is 36Ω. It is not. Above about 20' in height, the feedpoint resistance will fluctuate periodically for this antenna between 20 and 22 Ω. The antenna is modeled with a 2" diameter aluminum tube and 0.25" aluminum radials.[7]

More significant is the peak gain within each antenna type at the 20' base height. In fact, the peak for the monopole occurs at a slight higher height than 20' and drops more rapidly when the antenna is placed 10' higher. Why the gain exhibits this behavior becomes clear from **Fig. 20**.

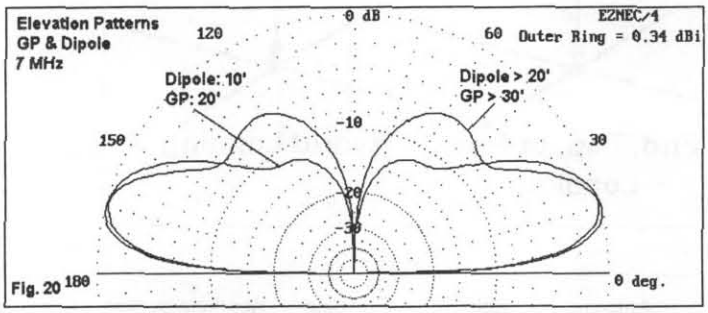


Fig. 20

The pattern of a vertical antenna at a low height shows a single lobe when viewed with respect to the field elevation. Notice that the antenna is relatively insensitive to radiation coming from higher elevation angles. As we increase the height of the vertical, a second lobe emerges at a higher elevation angle. This lobe peaks in the vicinity of a 60-degree elevation angle – too high for the reception of almost anything except atmospheric noise.

Those who use vertical antennas by choice rather than the necessities of a particular antenna site often select them knowing that the gain will not compete with a horizontally polarized antenna they might use instead. However, the signal-to-noise ratio is often improved because atmospherics received from high elevation angles are reduced. Some of that reception advantage disappears if we place the antenna too high, and the second lobe of the elevation pattern achieves full development.

There is a counterweight to this facet of vertical antenna behavior that is especially apt to urban, suburban, and wooded locations. I cannot demonstrate it with a model, but only from the collective experience of many vertical users, including myself. The phenomenon is the dreaded "RF-eating shrubbery." In the open fields of America's great farming states, a ground-mounted vertical has its best home, with nothing but open fields for many wavelengths in any direction. In crowded locations, the presence of significant structures – both natural and man-made – appears to prevent a ground-mounted vertical from achieving its full performance potential. Therefore, the elevated location of a vertical monopole – for example, a rooftop – becomes a better location. The higher location is especially apt to the compact, multi-band vertical monopoles produced by many commercial companies.

A second reason for elevating a vertical antenna is the presence of nearby noise sources such as machinery and other instruments that create RF from sparks. Much of this noise is vertically polarized, but hugs the ground in a surface wave. Elevating a vertical can often, but not always, reduce the noise level from these sources. Since noise sources can be very complex, the tactic is not universally successful, but it is worth a try in noisy urban areas.

d. What makes a monopole's radial plane a ground plane? A ground plane, then, is simply the completion of the monopole, in effect making it a dipole with a lower half that yields little or no radiation. It only becomes a ground plane when in close proximity to or contact with the earth itself. As the numerous examples have shown, one effect of contact with the earth is a higher feedpoint impedance value, which most analysts have traditionally interpreted as being the sum of the antenna's natural impedance and something called ground losses.

There may be a better way to think about the ground than as a loss-center. This view gives us no idea of how the losses occur. We think of the ground as a big resistor spread out over some amorphous surface area. The picture, of course, makes no sense whatever.

A better way to think about the earth's surface is as a large area that is a semiconductor. A semiconductor is defined in solid state electronics as a material with neither the high conductivity of the best metals nor the low conductivity of the best insulators. What is in between is a broad territory.

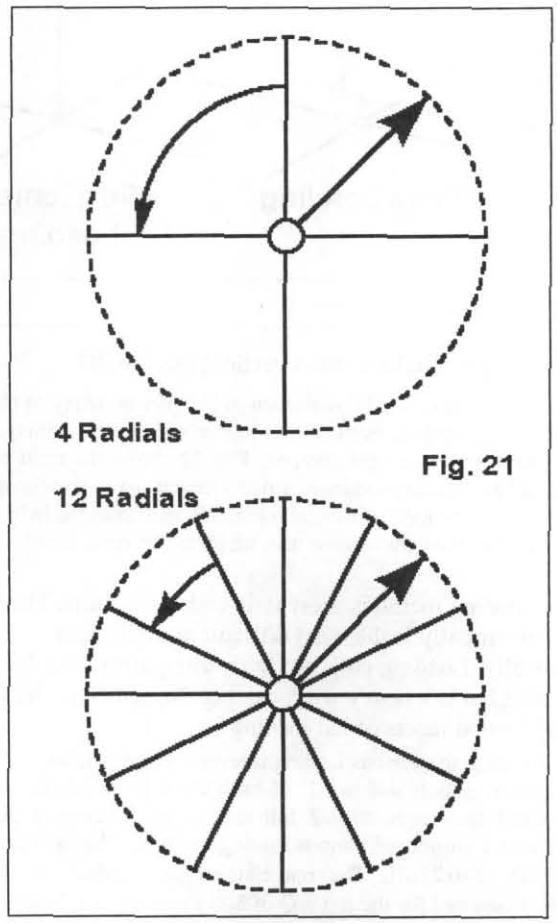


Fig. 21

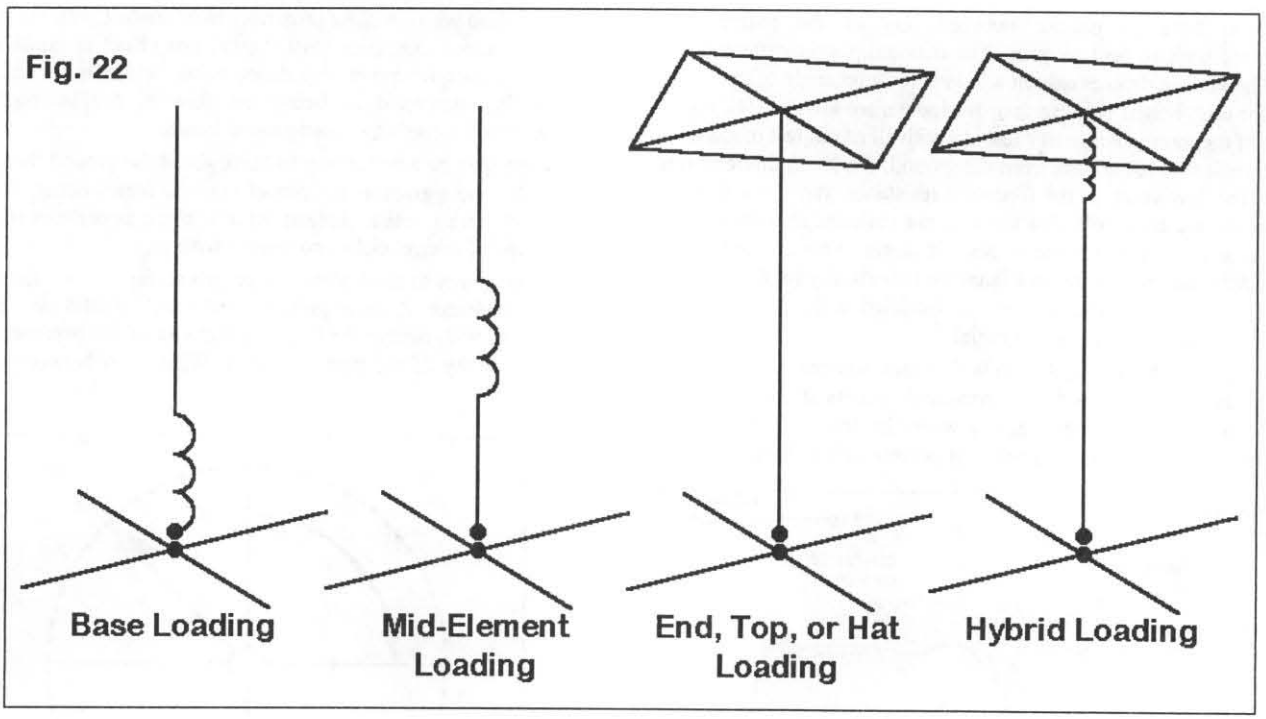
Placing a monopole with a radial plane in the air sets it into a very effective insulating medium. Under these conditions, the fields from the individual radials combine to yield a net of no field at all – assuming a symmetrical radial pattern. If we place the same radial plane in the earth, we cannot talk about fields until we examine all of the conducting material making up the plane. We may insulate the radials, but that does

not change anything, except in the local area of the insulation: the radial current yields a field that instantly becomes a current in the adjacent conducting medium. Because soil may be composed of particles, some of which conduct and some of which insulate, the overall situation of a surface radial plane is a mix of fields and currents, both of which are detectable and measurable.

What forms the plane of a vertical monopole when the radials are in the earth is the entire region about the monopole, as suggested in **Fig. 21**.

The outline of the region is only a dotted line, because the region has an indefinite boundary. The radial lengths actually show little modeled difference in performance over a 25% change in length, whereas the length of the vertical in air is critical to resonance. Likewise, the lengths of radials that are away from the earth also have a much more marked affect on resonance. Burial of the radials is unnecessary for the earth itself to become part of the plane, since radials very close to the ground show the same effects.

Increasing the number of radials in the earth increases the role of high conductivity material in forming the radial plane of the antenna. This shows up not only as increased gain, but as well in a tighter correlation in the feedpoint impedances between the free space and the at-ground versions of the same structure.



7. How can we make a short vertical work well?

For the 40-meter band down through 160 meters, many of us cannot erect a full-size vertical, even of the quarter wavelength variety. So we look for ways to shorten the antenna. **Fig. 22** shows the most common methods: a base-loading inductor, a mid-element loading inductor, a top hat, and a hybrid of inductance and a hot. We shall skip the hybrid, since it should be reserved for mobile use, when the antenna length is super-short.

The loading methods present us with a dilemma. The best method electrically is the most difficult to implement mechanically. Loading coils are fairly straightforward, but the top-loading hat is a heavy wind-catcher. Nonetheless, let's look quickly at some facets of hat loading.

To examine the various loading schemes, I took a full-size 40-meter radial-plane monopole within 0.1' of earth using 16 radials for the test. I then reduced the height to 1/2 full size without changing the radial system. Next, I introduced various loading methods. The base load called for 282.2Ω or 6.28μH. The mid-element load called for 456Ω or 10.15μH. I assumed for the test a Q of 300 as an achievable intermediate range value. The top-hat consisted of four 0.25" diameter spokes, each 9.1' long. In the table below, the gain is relativized to a value of 0 dB for the full-size monopole, since absolute gain figures for near-earth monopoles have not been fully validated.

Antenna	Relative Gain dB	TO Angle degrees	Resonant Source Impedance Ω
Full-size	0.00	26	38.8
Base-loaded	-3.03	28	18.5
Mid-el. load	-1.52	28	21.3
Hat-loaded	-0.47	27	24.7

The table should contain no surprises, relative to preconceptions we tend to hold about vertical antennas. However, the difference in relative gain between the base-loaded and the mid-element-loaded monopoles ought to have taken us by surprise. Free space models and models of dipoles using center-loading compared to mid-element loading show far less differential in gain, in fact, too small a differential to make a difference in use. Because mid-element coils have a much higher resistive loss for the same Q, due to the necessity of using larger values of inductive reactance, the overall losses tend to nearly equalize with those of a center-load antenna.

What produces the differential in gain between the base-loaded and the mid-element-loaded monopoles is the proximity of the loading system to the earth and to the right angle plane. Mutual coupling between parts or (or segments of, in models) the main element and the radials differs between the two cases far more than with a linear dipole using center-loading or mid-element-loading inductive reactances. It is thus sound for mobile whips to place loading coils as high as possible.

The higher gain and source impedance of the hat-loaded model relative to the other forms of loading is clearly apparent. What is less well understood is that a hat may be composed of any number of spokes and that these spokes may be used alone or with a perimeter wire connecting their tips. **Fig. 23** shows the results of a study I did with a 3 MHz monopole and hats of both types. Since the effective length of a spoke + perimeter wire is the length of the spoke plus approximately half the length of the wire connecting two tips, the spoke length of the perimeter system starts and remains shorter than using spokes alone. The two systems converge at about 60 spokes or so, beyond which, the radials simulate a solid disc.

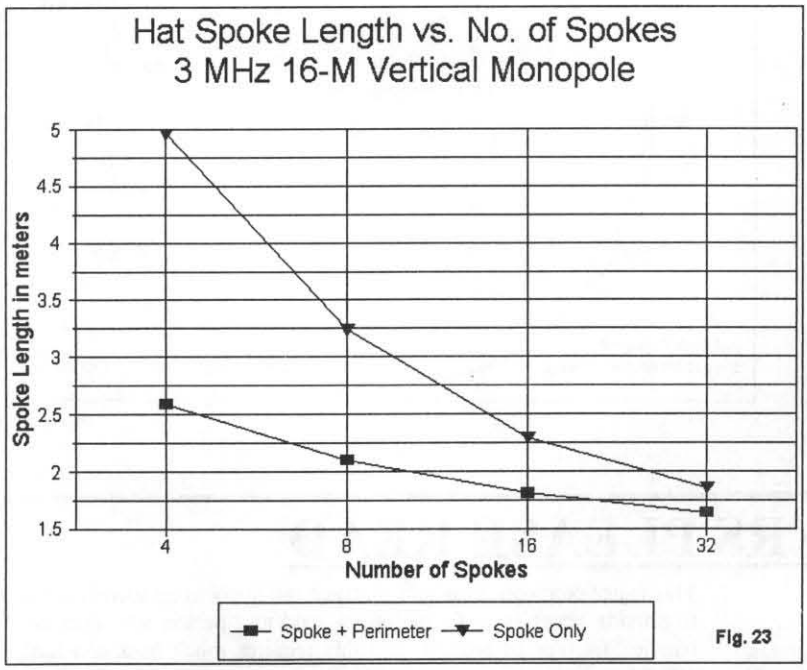
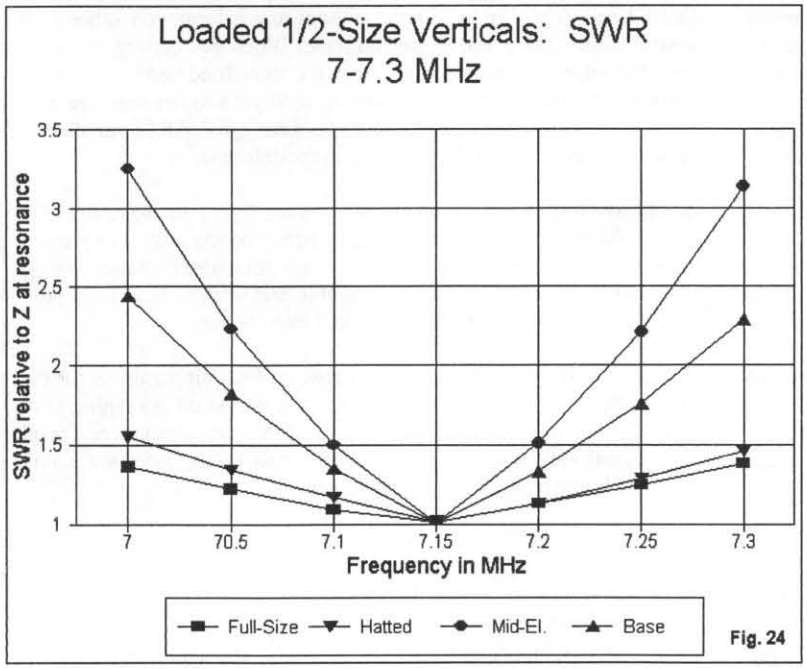


Fig. 24 shows modeled SWR sweeps across 40 meters for the antennas earlier tabulated. Each curve is referenced to the antenna's resonant impedance at 7.15 MHz. Of course, the full-size antenna shows the broadest SWR curve, followed closely and desirably by the curve for the top-hat model.



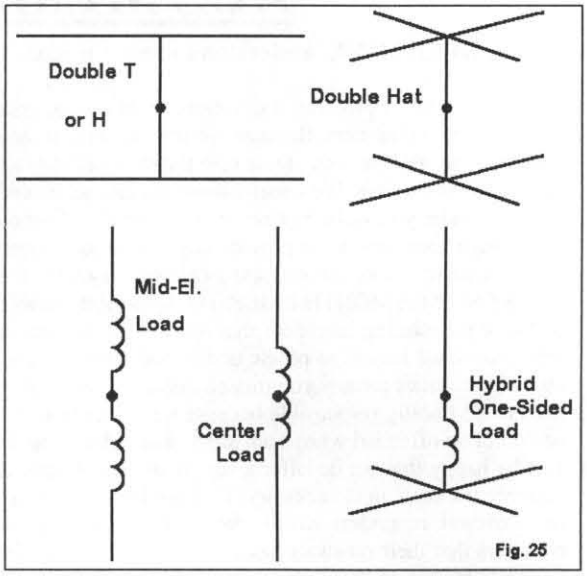
I have on other occasions already warned you to be ready for surprises, for example, in connection with verticals over different soil types. Here is another case. The narrowest operating bandwidth of the collection occurs with the mid-element-loaded model, not the base-loaded model, despite the reputation of mid-element-loading for providing a wider operating bandwidth than base loading.

Every radial-plane vertical monopole placed close to or on the earth holds the potential for surprises, including the surprise of working quite well. The worst case of our collection, the base-loaded model, is down by only 3 dB relative to a full size monopole, which amounts to just about 1/2 S-unit.

We encounter similar surprises when analyzing shortened vertical dipoles. We can still obtain very usable performance from a vertical dipole as small as 25% full length. The trick is to minimize losses in both the loading assembly and in the connections associated with low-impedance terminals.

Fig. 25 shows several methods of loading a vertical dipole. Evident are the familiar center and mid-element loading systems that we have already noted. Also at the bottom of the sketch is the Moxon short-radial-plus-reactance system, which has come in for debate. All of these systems are quite usable, even if proponents of various systems cannot fully agree on their relative merits.

The top systems are examples of double hats, one on each end of the dipole, which remains center-fed. Shortening elements by equal amounts at both ends through the use of hats having any number of radials is a tried and true technique for either vertical or horizontal dipoles. It deserves a bit more attention.



As an experiment, I designed a 7 MHz vertical dipole about 1/4 normal length: 17.5' long, composed of 1.25" diameter aluminum, which might be a typical ham installation. The base of the antenna was 4.5' above ground, with the top at 22' up, a workable assembly for most sites. Then, I modeled four different ways of loading the antenna:

1. Center loading inductor: 1201Ω or 27.3μH, with a 4-Ω series resistance for a Q of 300.

2. Mid-element loads at about halfway between the center feedpoint and the ends, each 1096Ω or 24.9μH, with a series resistance of 3.65Ω for a Q of 300.

3. Top and bottom hat loads composed of four spokes, each 9.35' long, and a perimeter wire, with all aluminum hat assembly wires 0.125" in diameter.

4. Top and bottom "Tee" wires of 0.125" diameter aluminum, each wire 46.6' long.

The results are in the table, with the gain of each antenna version referenced to a value of 0 dB for the double-Tee model.

Antenna	Relative Gain dB	TO Angle degrees	Feedpoint Z R +/- jX Ω
Center load	-2.3	26	11.6 - j 0.1
Mid-el. load	-2.1	26	18.0 + j 0.1
4-spoke hat	-0.3	27	28.2 - j 0.3
Double-Tee	0.0	27	26.9 + j 0.4

The inductively loaded versions of the antenna are significantly down in gain from the hatted versions. Most of the loss is in the inductors of finite Q. If truly lossless inductors could be used, the total spread of gain would amount to about 0.5 dB. However, the center-load antenna impedance would be about 7.5Ω, while the mid-element-loaded version would be about 18Ω. The higher feedpoint impedances shown in the chart reflect the losses in the inductors.

Between the hatted versions there is little to choose except the most convenient installation method for a particular site. As shown in **Fig. 26**, the gain difference reflects a slight ovalizing of the double-Tee pattern in the direction of the wire ends. (The very slight departure from a circular pattern also shows up in a single Tee monopole over a ground plane. A full 1/4λ monopole over a 16-radial plane at ground level, incidentally, shows about the same gain and take-off angle as these slightly elevated vertical dipoles.) Other end-loading arrangements are possible. These samples simply demonstrate the feasibility of the technique.

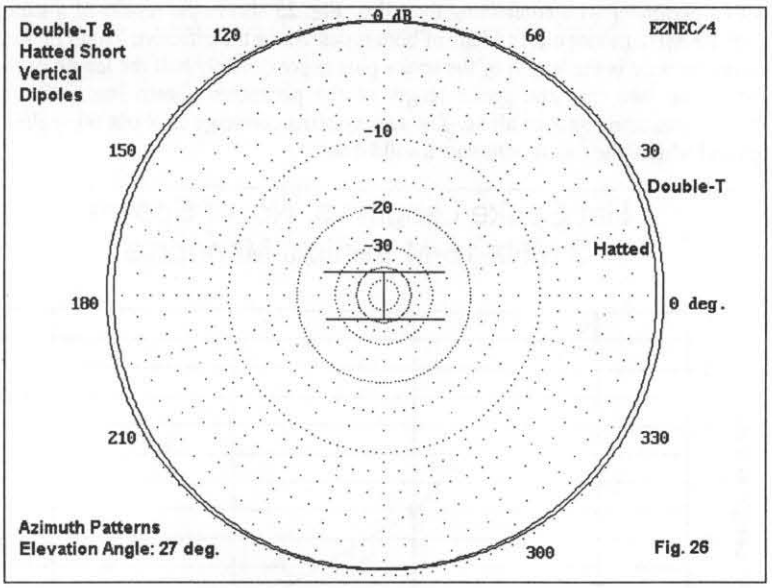


Fig. 26

Edited by W1HUE

ALL MEMBERS PLEASE READ

Please, EVERYONE, understand these 4 points.

1. The QRP ARCI provides a wonderful publication, great programs, and is run by volunteers. Because we operate with somewhat limited resources, we ask that you please take the responsibility to renew your subscriptions on time. We usually show the last scheduled issue to be received under your subscription, in the form of a date, on your mailing label. Please renew, or provide any change of address, before or by this date to assure uninterrupted delivery. (I must receive all data by the first of the MONTH PRIOR TO AN ISSUE MONTH to assure updating the mailing labels for that issue.) We lose money when we send individual issues, so please understand when we ask you to purchase back issues for any you missed due to lapse in subscription. We need to be fiscally responsible because we want our club to continue, so do not be offended when I am strict about observing the deadlines. Just be happy that we do offer a supply of back issues, and improve your record keeping if necessary. I do not have time to send out routine renewal reminders to all members individually, or to inform members that their renewals have been received, and this would be a financial burden to the club as well. So let's all support our club by keeping our own subscriptions current.

2. Another way you can support the club is to follow these rules for filling out the forms for new memberships or renewals: PLEASE INDICATE CLEARLY if the application is for NEW MEMBERSHIP OR RENEWAL, write legibly or type, and provide your QRP ARCI Membership Number if you have one.

3. This last point applies to all correspondence directed to ANY of the officers, committee chairpeople, or staff of the club. When writing by postal mail, or by email, or whatever method, PLEASE ALWAYS SUPPLY COMPLETE INFORMATION so that your request can be handled directly, and send the correspondence to the proper person. This is just common sense and courtesy, but many times members fail to provide necessary information, or send to a person who does not handle that type of request, and this requires much back-and-forth effort from one officer to the other. OK I know it may be difficult to direct a request to the correct person, as we have so many chiefs! But please try! THIS IS AN IMPORTANT EXAMPLE: If you are making a request for a missing issue of the QRP Quarterly, check with ME as I handle the records regarding subscriptions and if warranted, I will arrange for our Super Back Issues Guy (K3TKS) to send you one. Do not just send Danny a note without any information other than your callsign saying you missed an issue! When you correspond, send your full address so that we can check the records nd verify we have it correct. That may prevent us having to send yet another message asking you to verify something. And use your QRP ARCI number to make it easier for me to look you up in the database.

4. The volunteers who serve as officers are trying to make the club successful at serving the needs of members, and the only way we can hope to be effective is for YOU to share your ideas, praise, gripes, and inspiration with us. We are available and want to hear from you! Let's work together to make QRP ARCI even better.

A couple of unnumbered extras. As always, I solicit materials for the QRP ARCI Web Site: member news, information on upcoming contests, or anything else you think may be of interest to members. I need your input! Hey you can visit the QRP ARCI Toy Store via a link from the home page, at www.qrparci.org

Have Fun With QRP.

Dave WA4NID
QRP ARCI Membership Chair, and Web Site Manager

THE QRP HALL OF FAME FOR 1999

Mike Czuhajewski WA8MCQ 7945 Citadel Drive, Severn, MD 21144 wa8mcq@erols.com

The QRP ARCI is pleased to announce the 1999 inductees into the QRP Hall of Fame. They are, in alphabetical order:

Dave Benson, NN1G
L. B. Cebik, W4RNL
Paul Harden, NA5N

Dave Benson, NN1G

Dave is well known as the proprietor of Small Wonder Labs (SWL), but he's not just a QRP vendor. He's been a true friend of the QRP community for years and years, with several rig designs and articles under his belt, including some in QST, and is an excellent design engineer. One of his most well known designs is the NE 4040, a simple superhet transceiver that he designed as a New England QRP Club kit several years back. It eventually appeared in QST, and he still produces it through SWL, as well as several other rigs of his own design, including QRP SSB radios.

Dave played a key part in the QRP-L "Elmer 101" group-learning project by providing the rigs, a variation of the 4040. (The idea behind the online Elmer project was for people to order and build a specified kit, ask questions as they went, help each other with problems, discuss the operation of the various circuits, etc.). Having his design chosen for the project is silent testimony to his skills as a designer.

Some comments made by the late Bob Gobrick, N0EB, in his nomination letter--"Dave Benson, NN1G, is one of the pioneers of the modern day QRP movement. If this movement can be marked by one notable cornerstone it is the QRP club kit. Dave has been a major contributor to some of these great kit designs and he has tirelessly worked to keep QRP building and design alive for the next generation of ham radio operators. First notice of Dave's work appeared in the 1992 issue of the QRP Quarterly while he was serving as technical editor. Dave published a simple and reproducible 20-meter superhet transceiver design. Although not kitted by the club, it became an instant hit as commercial printed circuit boards and then parts kits became available. What is now dubbed the NN1G Superhet Transceiver later appeared in the ARRL Handbook as a featured QRP rig.

"In addition to Dave's contribution to the QRP kit building world, Dave has been a very popular speaker at the QRP ARCI "Four Days in May" QRP Symposium and others around the country. Many of Dave's talks extend the state-of-the-art on QRP designs for all. And yes, Dave still finds time to operate QRP and even sponsor the ever-popular 1998 New England QRP Afield contest."

L. B. Cebik, W4RNL

L. B. is the unquestioned antenna guru on the QRP-L and the GQRP-L e-mail reflectors. His expertise is unrivalled, and he has an excellent web page with a huge amount of material on the subject. He's been a popular speaker at QRP seminars around the country for several years. Those who've met him in person know wthat a true gentleman he is, and a fascinating person to talk with.

Some people have asked me privately if he's really a "QRPer" and not just an antenna expert. (Asking what a "real QRPer" is, is always certain to generate a lot of responses and a very long discussion!) My reply is that there are few things more important to QRPers than antennas, and he's always giving us a lot of information on them in QRP journals, seminars and mailing lists. And here's the clincher--I have a piece of paper at home salvaged from my days back in Michigan, from 1970, a partial listing of the subscribers, payments, expiration dates, etc for the Milliwatt (National Journal of QRP), back in the days when I was associated with it--and his name is there as a subscriber!

Bob Tellefsen, N6WG, said in his nominating letter, "He provides an outstanding educational service for those of us interested in antennas beyond the limp piece of wet string. With his prolific writings, it's getting to the point of, 'If you don't know, go look. LB probably has written about it.' "

And Doug Hendricks, KI6DS, has this to say in his letter--"He has been a speaker several times at Dayton, and was one of the first speakers chosen for Atlanticon. He contributes to G-QRP and QRP-L on an almost daily basis, and writes for several publications, including CQC, QRPp, QQ, Sprat, QST, and others. L.B. is one of the most respected QRPers that I know. He is always willing to help, and he takes great pains to explain things in a nice, polite way. L.B. has been a major contributor to QRP for many years. He is one of the "quiet ones" a "Jim Cates" type of guy who certainly deserves to be inducted into the QRP Hall of Fame."

Paul Harden, NA5N

Paul appeared on the QRP scene several years ago and has been making a big splash ever since. He's spawned rigs, contests and fun operating events, and contributed huge amounts of info to QRP-L. He wrote an invaluable reference book, "QRP Handbook for Homebrewers" and dozens of articles, and has deluged us with a huge amount of fascinating information about solar behavior and its effect on radio communications. He's also an accomplished artist/illustrator, as anyone who reads QRPp (from NorCal) knows. He does excellent drawings for them; sometimes a picture is worth more than a thousand words.

Here are some of the things that Doug Hendricks, KI6DS, had to say in his nominating letter. "He has been a featured speaker at every major QRP forum in the United States. Pacificon, Ft. Tuthill, Hamcom, Atlanticon, and Dayton have all seen him speak to standing room audiences. His topics of troubleshooting and solar data are both extremely well done. He has been a contributor to QRPp for the past 4 years, writing many, many articles, doing illustrations, and his "QRP Hints and Kinks" column is one of the first things many subscribers turn to when they receive their copy of QRPp. Paul's ability to illustrate complex things with his artwork is legendary.

"Paul Harden is a true QRPer. He has elmered hundreds of guys who have struggled with building a qrp rig. He does this quietly, without fanfare. He promotes QRP every day, he is a wonderful QRP speaker, he loves to operate QRP in contests, and he believes in having fun. I think that Paul is probably one of the most recognizable names in QRP today and for the past several years. He has made QRP what it is today. He deserves to be in the Hall of Fame. "

Anyone who's ever met him knows his contagious enthusiasm for QRP. Paul is well on his way to becoming a "QRP national treasure" and a household word in the QRP community.

Our congratulations go out to all of the inductees for 1999. All are truly worthy of the honor

--qrp--

Test Topics ... and More

Joe Everhart, N2CX *email: n2cx@voicenet.com*

Hi gang! Welcome to what I hope will be a regular feature of the QRP Quarterly. As the title says, it's about testing. But the "and More" means that it will take a liberal view of the topic. While the focus will be on test equipment and techniques, there may be related subjects I want to share with you.

This introductory segment will tell you what I intend the column to be and to solicit feedback on whether you think that it will be of use to you.

Though my daytime job is in the electronics industry this column is not intended for just the heavyweight "techies." Naturally there will be a some solid technical information and correctness, but I intend it to appeal to the casual radio amateur hobbyist who wants to learn more about how things work and how to check them out. The intention is to give enough detailed info that readers will really understand what is going on as well as how to do it. So in addition to lots of "what's" there will be "whys" and "how's" as well.

Those of you familiar with amateur radio and, particularly, QRP literature and the qrp-l e-mail reflector, know that there are a whole bunch of talented folks who graciously share their knowledge and experience with their fellow hams. I will coerce ...err... encourage some of these people to contribute information on their areas of expertise from time to time for inclusion in "Test Topics." Naturally they will be given full credit for their contributions. If you have ideas for something else you'd like to see, please drop me a line and I will consider your suggestions. See the end of the column for my snail-mail and e-mail addresses.

Some ideas I have for columns to come are:

- Explanation of how test equipment works.
- How are accuracy and precision related and how is calibration related to them?
- When do you need perfection and just what is "good enough?"
- How to go about picking the appropriate type of test equipment for a given purpose.
- How accuracy, precision, and calibration are related and what that mean to the average ham.
- How to go about troubleshooting your ham gear when it doesn't work.
- How to debug you latest construction project.
- Test points and built-in test for your homebrew projects.
- Using checklists troubleshooting trees .
- What equipment do I need for a good test bench?
- What T/E should I take to Field Day?
- Which type of test equipment is best suited for a given situation?
- Comparisons of different makes of T/EIf I run across some interesting info printed elsewhere I will pass along reference info. If this is in the form of a book or magazine, I will point you in the right direction to avoid copyright violations. Often the references will be on the Internet. I will provide URLs, but cannot reprint info for those without web access except with permission.
- Whatever else comes to mind at deadline time!

Regular features of TTAM will be:

• DESIGNED FOR TEST

A series of inexpensive test devices that you can build yourself. They will range from simple designs for do-it-yourself builders with only a schematic diagram to complete for test equipment projects with more complete construction and usage info. The goal is that they will all be inexpensive, generally between $25 and $50 **and** if they use any "odd-ball" parts, sources for those parts will be given.

• STIMULUS AND RESPONSE

This segment will feature an "Ask Abby" question and answer format. I will solicit test-related questions and attempt to answer those that should have wide interest for QRP Quarterly readers. See the end of this article for info on how to contact me to ask a question!

• COMING TO TERMS

CTT will discuss terminology related to electronic and radio amateur testing so that readers will have a common understanding.

What is testing? OK, so much for introduction, here's a little philosophy ... Testing is a part of all of our daily activities. As children we all learn to test our parents to see what we are and are not allowed to do! (And our children often test our patience.) In school and in many other things in life we are tested formally to determine our knowledge and abilities. When we (reluctantly) take our cars to a garage for repair, the first thing done is to test it to see exactly what is wrong an what needs adjusted or replaced.

All of the above examples have a common feature - there is some tentative action taken and the results of that action are observed. It's what a biologist might call stimulus and response. In some way or other most of the testing we do is based on that principle. I think you can understand how they apply to the examples above.

In the electronics realm, the idea of stimulus and response is what testing is all about. One kinda trivial example is measuring voltage in a simple circuit. The stimulus is the power you apply to the circuit under test. The response is the voltage values you measure with a voltmeter.

At the other extreme of complexity is testing a transmitter for RF power output and off-frequency spurious outputs. Here you stimulate the transmitter by powering it and keying. The power output response of RF power output can be measured with a simple RF power meter, but the transmitter's spurious outputs need a more sophisticated device such as a wavemeter or spectrum analyzer.

The second example brings up another point worth considering - there is usually more than one piece of equipment or technique that can be used to test. An important part of testing is deciding which method or gear is appropriate. The RF power meter is a great tool to use to check your output power and is likely what you will use day-to-day. But it does not tell the whole story. To be sure that the transmitter meets FCC requirements when you first build a transmitter it is a good idea to measure not only the total power out, but also to check that any unwanted outputs are sufficiently suppressed. You don't do this every time you operate the transmitter. It's only necessary when you first build it or when you suspect faulty operation.

DESIGNED FOR TEST

Before we get to this issue's project, I must tout a neat project designed by Glen Leinweber, VE3DNL. It is a simple crystal-controlled frequency calibrator. Running off a single 9-volt battery its circuitry is

contained on a small pc board measuring about 1-1/2 inches square. Its outputs are taken from a digital frequency divider and are at harmonics of 40, 20, 10 and 5 kHz, which allow for receiver frequency checking across the HF bands.

The project is being offered by the Ft Smith, AR QRP Club as a club kit and is sold for a paltry $10 plus $2 for shipping and handling. To order one send a check or money order to

Jay Bromley W5JAY
9505 Bryn Mawr Circle
Ft Smith, AR 72908-9276
Email: w5jay@alltel.net

And a blurb on the calibrator can be found on the Norcal web page at: http://www.fix.net/~jparker/norcal/marker/marker.htm.

This calibrator is a very handy way of checking receiver dial calibration as is but (and you knew there was a but coming, didn't you?) I think a small addition can make it even more useful.

With no antenna connected to the receiver, the calibrator's output signal is quite noticeable. However when an antenna is connected, the steady note produced by the calibrator's harmonics can be masked on a crowded band. A simple way of making the calibrator signal distinctive is shamelessly stolen from a similar calibrator that Ten Tec sold as an accessory to their older analog transceivers. They simply turned the calibration signal on and off a couple of times a second. So the signal you hear in your receiver has the familiar "beep-beep-beep" cadence of a telephone misdial. (Actually the telco calls it "reorder busy".)

A very simple timer circuit can be added between the VE3DNL calibrator and its 9-volt battery to give it this on-off modulation. The timer circuit is called the CALFINDER. Its schematic and connection to the calibrator are shown in Figure 1. A common 555 timer connected as an astable multivibrator. Timing is controlled by resistors R1, R2 and C1. The values shown produce an output square wave whose frequency is about 2 Hz. The output signal from this timer is then used as the power to the calibrator modulating its output.

Note that the calibrator is connected to the + power lead and the – power connection is through the 555 output pin. This somewhat unorthodox connection has a reason. While the 555 can supply positive voltage from its output (called *sourcing*) there is/can be a voltage drop of over a volt with this method. When the output pin is used to switch to ground (called *sinking*) the voltage drop is only a couple of tenths of a volt. The choice of which way to go is obvious!

No pc board is provided or needed for this one-chip circuit. I built my prototype on a piece of perforated board wring point-to-point to the components. Nothing at all is critical in the layout or components. The only "tweak" you may want to try is changing the timer output frequency. Making C1 larger will slow it down and decreasing it will increase the frequency proportionately.

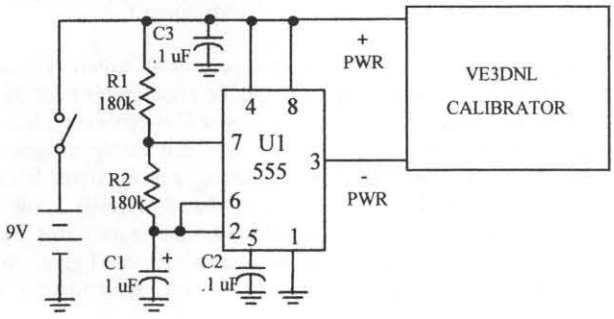


Figure 1- CALFINDER circuit and connections

To check the CALFINDER out after you build it (dare I say *test* it?) simply connect an analog voltmeter between the 55's pin 3 and ground. You should be able to watch the needle swing up and **down at** a couple hertz rate. If the meter has lots of damping you may only see it swing upward and "jiggle." And if you use a digital meter, you will see the output voltage bounce around some average value between 0 and 9 volts.

COMING TO TERMS

Gee that's a neat title! Wish it were original, but I stole it from William Safire, a New York Times editor and author who writes on words, their meaning and where they come from. That's what I intend to do with this section. Each installment will discuss a topic related to testing in the amateur radio sense, giving my interpretation of what it means.

This time around I want to talk about troubleshooting and debugging. They really are related though they are really two distinct aspects of the same thing. They involve testing a circuit or piece of equipment that doesn't perform as expected.

In my mind the difference between the two activities comes from whether or not the object of your attention ever worked in the first place. If it did at one time, then you are troubleshooting. If it never did you are debugging. A couple of examples can help show the difference.

Let's say you have been using a commercial transceiver for several years and notice one day that it is not transmitting. The steps you take to find out why it is no longer working is troubleshooting. You can have pretty good confidence when you find the problem and fix it that the item will once again work as expected. This is what a service tech or auto mechanic does to fix something brought to them for repair.

On the other hand if you build a "from scratch" homebrew project or kit and it doesn't work, what you do to find out why and fix the problem is debugging. Debugging involves a lot more head scratching to first of all determine whether or not you know just how well the equipment should work, figuring out why it doesn't, then correcting the problem. Along the way you just may find that it never will actually work the way you first expected - particularly if the equipment design is shaky in the first place.

So in summary, debugging is what you do to a piece of gear that has never worked and troubleshooting is what you to restore equipment to its previous state of correct operation. Naturally there are gray areas between these two distinctions, but I think you get the idea.

STIMULUS AND RESPONSE

Since this is the first column, obviously there are no questions to answer. However, I need the stimulus of inputs so that I can provide my response! Please send you questions to me at:

Joe Everhart, N2CX
214 NJ Rd
Brooklawn, NJ 08030
Email: n2cx@voicenet.com

I will attempt to answer all questions submitted for this column. Those that are deemed to be of most widespread interest will be reproduced in future columns. Please don't feel that your questions are dumb - very few really are! Ask away and you may be surprised that what you think is trivial might really be something that lots of guys wonder about but are too reluctant to mention.

Joe, N2CX

Still QRP Really!

QRP WISDOM FROM UNCLE BRUCE

Bruce Muscolino, W6TOY/3
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Silver Spring, MD 20916-9333
W6toy@erols.com

Hello there, it's the old curmudgeon again! I'm getting stronger by the day now, and it has infused a bit more energy in my column! I have been busy for the last two months with an exercise program that left me feeling joint aches and pains for the first 6 weeks, but lately I feel I almost have it licked. A cane and walking unaided can't be too far away! I sure hope so because I really want to attend the memorial Black Cat Tuna Tin 2 event over the Halloween weekend, and Dayton next year! There is a separate announcement for the Tuna Tin 2 event buried elsewhere in this issue!

An Apology

Rich Fisher is a hard working newspaper journalist out in Riverside California. You also know him from his labor of love columns in QRP Quarterly and in WorldRadio. I may have unfairly put an end to the QRP Quarterly columns and I want to apologize to Rich, and to you, for doing that. Rich started a recent column in WorldRadio with an announcement for "yet another QRPicon" conference, this one Celticon, to be held in Ireland. I interpreted Rich's piece as saying that the "... icon's" were the first QRP conferences. Unfortunately Bob Gobrick had just passed away and I took Rich's column as a slap at Bob and FDIM. It wasn't so, but before it was over Rich had resigned his QRP ARCI column.

FDIM was the first QRP Conference ever held, as far as I know. It was started by Bob Gobrick and myself at Dayton in 1995. We called it Four Days in May, because unlike others we thought it would be presumptuous of us to call it the Hamvention! Later QRP Conferences have been named after the Hamfests they are held at, or had their names copied and slightly changed to protect the innocent!

FDIM stands on its own record. FDIM is a tribute to Bob Gobrick and his organizational powers. The memory of FDIM is secure in the minds of any who have worked on it. Rich's column was simply trying to take off on the more recent habit of calling QRP Conferences "... icon's". I am sorry I did not read it that way. Rich, all I can ask is you accept my apology.

QRP Myths

Let's look at a few of the myths that seem to be spreading in our hobby and see what we can make of them. ***Myth number 1 is*** "My computer can access all the information I'll ever need on anything". ***Myth number 2 is*** "I can't operate my rig until everything is absolutely perfect and I have a few friends around for moral support", and ***Myth number 3*** goes something like "I can't operate until I first make sure my station adheres to QRP standards."

Ridiculous on the surface, isn't it. We all are thinking, breathing human beings, aren't we? Yet why do I see more questions asking the QRP list for information ranging from medical advice to computer help? The medical advice issue is especially strange. I don't know how many, if any, real Medical Doctors inhabit the list but I do know one thing, not a one of them would risk giving medical advice over the Internet, or even over the phone to a stranger! The threat of a malpractice suit is too high.

Myth The First

But, I digress. Let's look at the myths in order. The first goes "My computer can access all the information I'll ever need on need on anything." A sort of hard thing to swallow for those of us who were in the industry back when Al was a teen-ager, but Al Gore invented the information age just for you and me. I don't know how he did it, and he sure was silent about it while he was in Vietnam, but he says it's so and who am I to disagree? The idea behind his invention was to eliminate the need for any of us to ever read a book again. The home computer, not yet invented when he invented the Internet, would bring it all into our homes for us! I guess you could say he was responsible for Bill Gates too!

Anyhow, the way it is supposed to work is you can surf the net and find information on anything. I agree with this part of his idea. However, what is the quality of the information you find, and are you able to judge that? Libraries, a dirty word for an outdated concept, are filled with books of all types; sort of a printed Internet. You have some assurances of the quality of the information because the book is there, and a publisher somewhere spent money on it! Don't discount the profit motive!

Back in the dark ages, when I went to school, I couldn't tell whether the writers were BSing me or not. I probably still can't tell by reading, but over the years I have gained experience in a few things and learned a lot about more things still. The knowledge and experience background gives me a perspective from which to evaluate what I read and hear. When something strange comes along I can say, "wait a minute here, something doesn't sound right!" I think this is very important to everything we do from selecting a future QRP radio to buying tires.

So, what has the Internet brought to us? Confusion. Depending on what you've read and what sites you've surfed to, you are mostly getting an opinion of the issue you are researching. An opinion? Yes, we all think we are experts, even yours truly, but in fact what most of us have is a collection of hearsay and personal experience backing up our pronouncements on any topic from what to eat to how to build up a ham station!

Can you learn anything? Sure. There are sites where you can learn the code and sites where you can learn the theory. If you inhabit them often enough you can even pass the test for your ham license. But, do they make you an experienced operator? I think not. I'm sorry to say that observation plus experience have shown me that the only way to gain experience with that radio is to actually get on and operate it. You will soon learn what works for you and what doesn't.

Consider this. I like to think of myself as an expert on photography. After all I have worked as a magazine photographer for 35 years, off and on, and have managed a professional film-processing lab. I even wrote one of the very first successful film-processing programs way back in 1982. It has been in daily use running a professional lab's processing machines for 18 years now! But what do I really know? What works for me and has worked for me for 40 some years. - Just that those I have worked for liked what I did! So what advice can I give? 40 years of opinions and collected hearsay! What has worked for me. Will it work for you? I don't know...

The message is simple. If you jump into the Internet and surf

around blindly you will end up with very little sound information. Acquisition of knowledge takes a lot of reading and even more reflecting on what you have read. It comes very slowly!

Myth The Second

The second myth goes sort of like this "I can't operate my QRP rig until everything is perfect and I have some friends around for moral support". In a way this is true. You should have everything working in some order and a friend is nice to have to help out, but these things are not a necessity. I know todays solid state radios are touchier about the loads they look at than the good old 6L6's and 6146's that a lot of us started with. They would stand mismatches for at least a short period while we learned what to do! Why the 6146 in my DX35 lasted almost a month with too high grid drive before it went flat! Heath fixed the problem by changing the circuitry, but that's another story. They gave me a free 6146 too.

What do you need to get on the air? A license, a working radio, a reasonable antenna, and someone who can hear you! Everything else is extra, and usually comes with experience. Now I have noticed, from reading newbie posts on the QRP-L list that not everyone thinks of today's crop of QRP rigs as small investments. They think they have bought the Queen Mary. Radio is an expensive hobby, always was and always will be. The designers of modern QRP radios can be proud of what they have brought to the party, but it won't change the facts!

OK, you've got the license, you've got the working radio, and you've got the antenna. I won't go into detail about the antenna. Just try to be sure its long and outside. Indoor antennas work, but they take a little extra effort. Now what do you do next? Listen to the radio. Sounds simple, but lets see what it tells us? It tells us the receiver portion is working. From this we can infer that at least the transmitter's VFO is working (I'm presuming a transceiver here). If the transmitter's VFO is working, and presuming your radio is a straightforward design, there's a pretty good chance the rest is working too.

Now listening also tells us something about our antenna performance too. We listen, sometimes for a few days, and we start to build a catalog in our heads of what stations we hear and how loud they are. Not specific stations but what call districts we hear and when. This is important information. It sort of defines our antenna's coverage area. Later on we will know what we can easily work and what represents DX to our station!

So, now let's call someone. What, where are the friends for moral support? Do you really need them? I know when I got my Novice license I was so hopped up I didn't want to wait for any friends to come over (and that's presuming I had any out in rural Ohio)! I just fired up the radio, took a deep breath, and called someone I thought might hear me. Surprise, surprise, he came back! I had my first QSO and first new state all in one, he was in Pennsylvania and I was in Ohio! I will never forget the thrill of hearing my call coming out of the receiver. **I WAS A HAM!**

Of course I know that all of you are not the 'great rugged individualist' that I am. You need some moral support so call one of your friends and ask him to listen for you. Discounting the effects of close in radiation, he should still hear you, if a bit weakly if he's in the same town. If he does, thank him and call someone else -- who wants to talk to friends all the time! Believe me, its not that hard. Your fist may be ugly, your signal may be weak, but those will all improve after number one. Trust me.

Myth The Third

And let's put away the last myth of this session, "I can't operate until I first make sure my station adheres to QRP standards." What, exactly, are QRP standards? Who set them? As far as I know there aren't any except running 5 watts or less for awards and contests. QRP means lower your power. Nothing more, nothing less. You could be lowering your power from 1 KW to 100 watts. You could be lowering your power from 100 watts to 5 watts. You can constantly run between 5 and 10 watts, and still be QRP!

But I thought I had to know my output power to the milliwatt so I could be sure I was running less than 5 watts. Why? Is Riley Hollingsworth going to revoke your license for running 5.01 watts? No. The legal limit in the United States is quite a lot higher than 5 watts. Riley is doing a damned good job at the FCC, but he enforces the laws, not hearsay! Assist him in any way you can, but don't worry if you are running 10 watts instead of 5.

So, when is 5 watts important? When you are in QRP contests, when you are trying for QRP awards, and when your ego insists on it. Often it is easier by far to run 10 watts and work stations. You are still fulfilling the spirit of QRP; you've reduced your power and consequently reduced QRM a bit. That's good.

While I'm at it I want to take just another moment of your time to ask you to look at the economics of your hobby. Look at what you have. This is not an exercise in dumbing you down; it's a thinking exercise. You have a QRP radio, it cost you maybe $150. Yes, I know, some of you have big radios too, but lets stay with the QRP rig. You have a computer, because everybody knows you can't run your rig without it, and how would you read the QRP list or surf the Internet. And you have some sort of device to inspire your radio to put out a signal. Some of us use straight keys, some of us use $500+ paddles. Anyhow, you have, again counting the QRP rig only, anywhere from $150 to $2000 invested in your QRP station. I don't know about you, but I think a pretty good used Yaesu FT1000MP could be had for $2000, and it works all bands, phone and cw, and at any power level from 5 watts to overt 100 watts. Are you practicing false economy?

I see messages praising a particular brand of paddle (it sold for over $500 when it was being built by the designer, and now Vibroplex is coming out with a clone that sells for as much or more). Is it worth it? I don't know, how much is your ego worth? Will a Chevy get you to the store as well as a Ferrari? I know, yes, but the Chevy isn't as much fun to drive. But then you don't have near as much to worry about when it comes to dings in the door! This is not a commercial, but I have a set of Bencher paddles I have owned since 1979. They seem to work awfully well for me. Back when I started racing sports cars the mechanic who was my mentor used to say "learn to drive what you have, anyone can drive a good racecar!"

And your computer. Seriously, do you really need it? For almost 70 years the ARRL has published its Radio Amateurs Handbook. It started somewhere around $2.00 and the 1999 edition sold for $39.95. It is a great bargain. I even used it while I was in school as an EE student. Add to it a couple of subscriptions to, say QST, QRP Quarterly, and QRPp, and you are pretty well set to learn whatever you need to know about ham radio. Oh, I forgot, you've got to get on the air and talk to other hams too, but that should come naturally when you don't spend three hours a day staring at the computer screen!

Yes, I know the computer is a family affair, but I'm talking about ham radio here. Leave the computer in the family room and the radio in the radio room. They'll both be happier!

Until next time, get on the air. Build up your self-confidence. Work a new one, a new country, a new state, even a new station; you'll be better for it.

Bruce, W6TOY/3

An RX Noise Bridge - Part 2

by Rich Daily, KA80KH PO Box 236, Beverly, NJ 08010 email: ka8okh@som-uky.campusew.net

In Part 1 (July '99), we looked at the theory behind the RX noise bridge, and described how to use it to align a tuner. This time we'll discuss several other uses for this handy little instrument.

Determine Antenna impedance (adjusting your dipole without QRM'ing the world)

We touched on the process of trimming a dipole for resonance in part 1, but let's take a closer look at the process. Resonance is the point where the capacitive and inductive reactance's of the antenna cancel, leaving essentially the feedpoint resistance. By using our receiver and noise bridge, we can determine whether our dipole is too long or too short.

Now before we go any further, it should be pointed out that for direct measurements, the noise bridge needs to be located at the antenna feedpoint. Obviously this is not entirely practical for 99% of us. Why can't we just hook the noise bridge to the end of the feedline in the shack, and run a short jumper to the receiver? Well, it can be done, and accurate measurements can be taken of the antenna this way, but it requires a bit of mathematical finagling (that's my scientific term for head scratching, pencil pushing, and calculator pounding). We will look deeper into this problem later, but for simplicity's sake, let's assume that we can magically float ourselves and the noise bridge up to the antenna feedpoint to make our measurements. This will give us a clear picture of what the noise bridge is doing for us.

Also for simplicity, I'll assume that we are using a well-known commercial noise bridge, the Palomar RX-100. There are slight differences between different brands when it comes to operating, useful range of measurement, and accuracy, and this will be dealt with in later installments. Suffice it to say that they are all good units.

Now, let's adjust our dipole for resonance at say, 7.040 MHz. So we start by using a total length of wire cut using the ubiquitous 468/f formula. This gives us roughly 66.5 feet of wire. Now I don't know about you, but I've never cut a dipole to resonance on the first try. The height above ground, natural obstructions, and other things all play havoc on the resonant point of the antenna. So we have to determine whether the dipole is too short or too long. At this point it would be very enticing to just blast a carrier out from the transmitter at the desired frequency, sweep the knob up and down the band, watch the SWR for a null, and trim accordingly. Folks, I can't emphasize enough how wasteful, rude, not to mention illegal this can be. It tells you absolutely nothing about your antenna impedance, only that your feedline/antenna system is presenting an agreeable load at the connection point in the shack. We want to know the resonant point of the *antenna*, and the noise bridge will tell us just that (and other things), without QRM'ing the world.

With the noise bridge placed at the feedpoint, and the receiver connected through any convenient length of feedline, set the receive frequency for 7.040. Now adjust the bridge by alternately turning the R and X controls until we find the noise null in the receiver. Now look at the settings on the bridge, particularly the X dial. It is telling us what the reactance of the dipole is at 7.040, and if it is capacitive or inductive. The R dial is showing the dipole's resistance at this frequency. So for resonance, we want to find the point where the X dial reads zero. If the X reading is pointed to the Xc side of the dial, the bridge is compensating for capacitive reactance of the dipole. Capacitive reactance means our antenna is resonant at a frequency higher than 7.040 - it's too short. Add equal lengths of wire to the dipole until nulling of the bridge results in an X reading of zero.

Likewise, if the X dial shows Xl, our antenna is showing inductive reactance, which means it is too long. Trim equal lengths from both sides of the dipole until the X dial reads zero. When you have adjusted the dipole for zero reactance at 7.040, you can read the feedpoint resistance directly from the R dial.

Determine coaxial cable impedance

"My coax is 50 Ohms, it says so right on the insulation". Well, you might be surprised how much your 25-year-old Belden RG-8 has changed over the years. There is a not-too-complicated method to measure the characteristic impedance of our coaxial cable, using a RX noise bridge. This is described in Jerry Sevick's Transmission Line transformer" book, Chap. 12. Actually, he uses a resistance bridge, signal source and detector, but the RX noise bridge method I'll describe here is a little easier, and you should have at least half of the test equipment already in your shack.

You'll also need a 50 Ohm load to attach to the bridge. A 50 Ohm 1/4 W carbon resistor in a PL-259 will work ok. Also required is a 250 Ohm, non-inductive variable load. Since you'll probably be testing a cable with ends on it, I suggest putting this in a PL-259 as well. Follow UHF soldering techniques to minimize stray capacitance or inductance. Lastly, you'll need your receiver. Recommended working frequency can be anywhere from 10 to 20 MHz. I use 30M when the band is quiet.

To start, connect the 50 Ohm load to the "unknown" terminal of the bridge. Null the R and X knobs on the bridge for the least noise from the receiver. Remove the 50 Ohm load. This is the only time we'll adjust the X setting. *Do not change it*. The R dial should read 50 Ohms. Now attach your cable to the "unknown" terminal. Attach the 250 Ohm variable load to the other end of the cable. Now alternately adjust the R knob on the bridge, and the 250 Ohm variable load for the deepest null or least noise from the receiver. This null should be as deep as the one found with the 50 Ohm load. After finding the null, you can read the cable impedance off of the noise bridge R dial, or measuring the value of the variable load with an Ohmmeter. If the reading is not what you expected, or you were unable to deeply null the bridge, then something is not right with the cable. This test will work with *any* length of cable, even as short as a foot or so.

Why does this work? Because a cable that is terminated with a resistance equal to it's impedance looks like a pure resistance to the RX noise bridge. If it's terminated with any other value, it will appear reactive to the bridge.

Determine electrical length of a coaxial cable

A lot of antenna system designs require the use of quarter or half wave electrical lengths of feedline for purposes of phasing, or to null out unwanted out of band energy coming into the receiver, as might be experienced in a multi-transmitter field day setup. The ability to cut 1/4 or 1/2 wavelengths of feedline to a particular frequency can be very useful, and the RX noise bridge can help us do this.

Let's cut a 1/4 wavelength coax for 7.040. Start by shorting the

unknown terminal of the noise bridge. Set the receiver to 7.040, and then adjust the bridge for a null. The X and R dials should read zero at this point.

Next we need to determine *roughly* the length of our 1/4 wavelength coax. We can find this by the following formula - L = (246/f) * V. Where V is the velocity factor of the coax, f is frequency in MHz (7.040), and l is the length in feet. Actual velocity factors vary depending on quality and condition of the cable, so I've found that adding in several inches is a good idea. Cut a piece of coax to this length.

Next connect this coax to the unknown terminal of the bridge. Now begin trimming the coax in small increments until the null is present on 7.040 MHz. To cut a 1/2 wavelength line for 7.040, just double the measurement in the formula above, and trim the coax for null, but short the end of the coax after each cut. When trimming, it's a good idea to tune the receiver to find the current null. That way you can track how much to trim off at a time.

Why does this work? Because an open-ended cable that is a multiple of 1/4 wavelength long appears as a short to the bridge. Thus we see the same null as when we shorted the unknown terminal. Likewise, a cable that is a multiple of 1/2 wavelength long exhibits the same resistance at each end. Since we shorted the far end of the cable, the bridge sees a short at the unknown terminal.

Testing balun transformers

A balun transformer can exhibit varying characteristics at different frequencies. Let's test a 1:1 balun (50 to 50 Ohm). Connect the noise bridge to the input of the balun, and connect a non-inductive 50 Ohm load to the antenna side of the transformer, taking care to keep leads as short as possible. At several frequencies, check to see that the bridge indicates an X of zero, and a resistance of 50 Ohms. If so, the balun is doing its job. The procedure is similar for a 4:1 balun; just substitute a 200 Ohm (50*4) resistor. The bridge R dial should read close to 50 Ohms in both cases.

What have we learned so far?

If you've followed along this far, you've learned that an RX noise bridge is basically a Wheatstone bridge, with the addition of a noise generator and variable controls to compensate for, or null out, the resistance and reactance of the load that is attached to it. With it, we can adjust our tuners and trim antennas without unwanted transmissions and QRM. We can also determine the characteristic impedance of our antenna and/or feedline, as well as it's electrical length. We can be sure that our balun transformers are doing what they are supposed to do. In the process, we built up non-inductive loads of various values. Don't throw them away! Mark their values and put them in a box with the noise bridge. You can use them for the measurements described above, as well as to check the calibration of your bridge.

The RX noise bridge gives us a much clearer picture of what our antennas are doing for us. Next time, we'll compare various commercial and homebrew noise bridge designs, and have a look at the problem of getting accurate measurements in the shack, instead of at the feedpoint of the antenna.

Rich, KA8OKH

Hams On Wheels: Working Mobiles in The Florida QSO Party

Jim Gooch, NA3V *Huntingdon,PA* *email: Gooch@Juniata.edu*

As we get older, the thermal regulator chip in our brain begins to malfunction. One solution is long, wooly underwear. Another is to work or retire in the south. Plenty of chilled-out hams now live in the Sunbelt states that stretch from southern California to Virginia. Some nifty QSO parties originate there, such as the FL, GA, NC, TX, TN, and VA parties, several of which have a QRP entry category.

My job keeps me in long underwear country, but at least I can bask in the sun-warmed RF beamed up from the south. In early 1999, I operated QRP in the NC and VA QSO parties. While totaling scores, I noted that many of my county multipliers were with mobile stations. It dawned on me that the best way to rake in the counties – and pad my score – is to nail those mobile stations whenever they cross a county line. Say that you work W4XYZ/M in county A. Later you stumble onto the same mobile and work it in county F. After the QSO party you peek at your log and a road atlas and see that W4XYZ/M must have crossed counties B, C, D, and E, between A and F, and you missed them all! Since most mobiles like to operate from the boonies, the counties you missed are likely missed for good. Veteran contesters and county hunters, of course, knew that all along.

When the Florida QSO Party rolled around, April 24-25, 1999, I was on the lookout for hams on wheels. Bob Patten, N4BP, had posted his intention on QRP-L of mobiling through 21 counties. The Florida QSO Party (FQP) Web site listed the calls and itineraries of several other mobilers, and it displayed a map of Florida's 67 counties, which I printed out and taped next to my TS-570. The first day of the contest kicked off at 1600Z. At 1601 I heard N4BP's CQ on 20M CW, with the identifier BRO, indicating that he had just hit the road from his Broward County QTH north of Miami. I called and he came right back to my 5 Watts. A minute later I worked Ed Palagyi, KN4Y, just leaving his QTH in Gulf County.

Kevin, K4PG and Bob, N4BP ready to begin their journey.

Those two QSOs set the tone of the contest. At first, over half of my QSOs were with fixed stations, primarily on 20M CW. By the second day, I had run through most of the fixed stations, so I focused on mobiles for contacts and new counties. The six or seven mobiles I tried to track had fairly predictable routines. Each would cross into a new county every 30 to 45 minutes, pull off the road and call CQ, usually on the same frequency. It would work the resulting pileup as long as it lasted, typically 15 to 20 minutes, and head for the next county. Once I had worked a mobile twice, a glance at the map and clock gave a good idea of where and when it would pop up next. For example, part of my April 25 log records new county contacts with KN4Y at 1529, 1559, 1625, and 1717 UTC, and N4BP at 1528, 1602, 1658, and1735 UTC. QSOs with other mobile stations were sandwiched between. Naturally, things aren't always that predictable. Mobiles go through big counties and small, hit heavy traffic, get lost, and make pit stops! The QRP op at the other end, unless pumped on adrenaline, is apt to snooze through an occasional county, or take time off to do the chores (I did both).

When the FQP came to an end, I had worked 59 of the 67 counties on 20M CW, 19 with KN4Y, 19 different ones with N4BP and another dozen or so with other mobiles. If I had stuck only with fixed stations, my count would have been only 25 counties. 'Nuff said!

What's it like at the mobile end of the QSO? Bob, N4BP, and Ed, KN4Y, are experienced mobile ops who have trekked across Florida in previous contests. In the 1999 QSO party, they went on two-day jaunts accompanied by a sidekick/driver, fellow ham, K4PG, with N4BP, and the XYL with KN4Y. N4BP cruised the highways in a Nissan Sentra with a Hustler mag-mounted on the trunk. His rig was an IC-706 MKII and he used a notebook computer for logging. KN4Y operated from a GMC van with a modified Spider antenna on top operated his IC-725. Both ran QRO to make as many contacts as possible. The GMC provided a good omnidirectional ground plane. Propagation from the rear-mounted antenna on the Sentra, however, favored the front of the vehicle, which wasn't so good, said Bob, when he was trying to make contacts on his southward return.

N4BP's odyssey took him north through the lake-dotted counties of central Florida to Volusia County, two-thirds of the way up the peninsula. Late Saturday afternoon found Bob and K4PG driving back and forth on I-75 near Ocala, unable to spot the hotel where they intended to stay overnight. Then K4PG pulled out a cell phone (tsk! tsk!) and dialed the hotel for directions. N4BP tallied 84 QSOs from the county they were lost in – experienced contesters are tough to distract. On the return leg they angled to the southwest through the Gulf coast counties, then turned east skirting the everglades to the home QTH, finishing with 870 QSOs in the bag. At the same time, KN4Y was meandering eastward through the thinly-populated piney-wood counties just south of the Georgia border, almost to the Atlantic coast, and then back to the Gulf coast in a 25-county loop, winding up with 726 QSOs. The expedition went smoothly with Ed, but that hasn't always been the case. In an earlier FQP he parked by a road in Union County and was busily working stations, when his car was approached by two hulking policemen with, as he said, "enough firepower to start a war." He was transmitting from the grounds of the state maximum-security prison! Luckily, one of the cops had a novice license, so Ed was only shooed off with a warning. Now when KN4Y works Union County, he keeps moving!

So, fellow QRPers, keep a sharp ear out for the mobile stations in the state QSO parties. There's a good chance you'll be heard – N4BP repeatedly copied WD3P's one Watt from MD. As a bonus, don't forget there is plenty of "internal DX" within the U.S. – counties with scarcely more ham activity than Mali or Mongolia. If you hanker for a QSO with gator-infested Lafayette Co., FL, or craggy Craig County, VA, or swampy Tyrrell County, NC, jump right into the state QSO party. Some CQing mobiler may be passing though.

Edited by W1HUE

Adventures in Milliwatting

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I started working on the WAS award 1/31/99 using the Worked All States Total Points (WASTP) idea from Bob White, WO3B. He has been inspiring his readers in the ARCI QRP Quarterly for years. I'm one of those inspired by him and other hams he has been writing about.

A few QRP'ers from QRP-L, ARQRP, and IAQRP have contacted me and we've made schedules for milliwatt contacts. Up until very recently I had only been making contacts by random. But now that I'm on the last few states I've started making skeds.

On the last day of August I made a sked with a IAQRP'er in Davenport, IA. On 40M at 8PM central time we started at 4w, I got a 599 and at 150mW I got a 569. But with the QRN/M he lost me when I tried 70mW. So the new state of IA "cost" me 150mW. Glad to have it, but pretty fat. At that point my WASTP reached 1.947 watts for 46 states. At an average of 0.0423w per state I was pushing 2 watts –ouch.

The next sked was September 1st with a ham in Oklahoma. My only contact before with OK was a hefty 500mW! That 1/2 watt contact really put my "WASTP" up there". So this sked was vital, and we had to bring it way down. We made first contact at 23:34z and 4 watts, my report was 579, so I dropped to 200mW and I'm still 559! Down again to 40mW & I'm given a 449. Down to 14mW & 339, & then bottomed out at 5 milliwatts and my RST was 229 at 23:41Z. I tried 2mW but no copy. Back to "QRO", 4 watts and we finished the QSO and I thanked him. He said he had fun too. I know I did! He was using a homebrew rig, and that's even sweeter. My power for one state went from 500mW to 5mW in 7 minutes!

My new WASTP is a much more reasonable 1.452w for 46 states and the state average is now 0.0315w. My goal is to work all states with under 1000mW/1w before the end of 1999. I still have not worked 4 states at all. KS, KY, NE, and WY. Hellooooo. . . . The following states are kind of hefty and I might be able to bring down the power on them. It's the only way I'm ever going to get my WASTP below 1w. AR 50mW, CT 45mW, IA 150mW, ME 60mW, MI 70mW, MS 70mW, MT 40mW, RI 100mW, SD 70mW, TX 50mW, UT 40mW, VT 50mW, and WV 50mW.

My equipment is the QRP+, and OHR WM-2 in-line for mW power read out. A two element quad at 70 feet on 15 and 10 meters, a half square wire antenna for 20 meters, and dipoles on 40 and 80 meters. I've got all bands covered from 160 - 10M.

I know there are those who say my 1st contact with OK at 4w IS my power for OK. I understand this and respect that. But for the purposes of this milliwatt experiment I hope they understand the reasons I do it the way I do. Playing "QRP Limbo" is a FUN thing to do in the QRP hobby. It's exciting for sender and receiver if both are into it. I've involved QRO CW ops and if they are into it at all, they have a ball!

For those who want to maintain the 1st contact power IS the final power concept, may I suggest starting at 500mW. I bet you can WAS with 1/2 watt really easy. No re-setting your power at all. Set it at 500mW and forget it. That would be a worth while WAS effort!

ARCI offers its QRP WAS in steps and endorsements. You don't have to have all 50 States before getting the basic award. You then add endorsements till you have all 50. Helps maintain QRP motivation. Contact the ARCI awards manager Steve, N4EUK at radioham@erols.com.

Remember, nobody should have to strain to make a 5w QRP or 5mW QRPp QSO. If conditions don't allow it, run your power up and make it comfortable. In these past few months I've come to understand that when nature gives us good propagation, it may be way better than we thought! If 5w is Q5 or better, then drop to 1w. If 1w is still Q5, you know what to do next!

Most of my mW success has come from contests. I find that contest stations often have very good hearing. Nice antennas, and they are coming from all directions, so for sure I can find a path somewhere. I start calling at the high end of the band I'm on. For example. on 15M CW the "hot" DX stations with big pileups are normally found in the lowest end around 21.025, below in the extra section, and 21.025 - 21.040 MHz. By starting with the "lesser" DX stations from 21.050 and above I find lesser pileups and have a chance to call in the clear. If I can do that I adjust my power low down, like 30mW and try. If that doesn't work, I raise it until I make the QSO. Then try the same thing with every other DX station calling in the clear.

The ARRL and CQ contests are the biggies. But don't forget to tune around during some of the lesser known ones. You just might work all Germany with milliwatts if the band decides that's the day its going to be hot propagation. For QRP/QRPp WAS the ARRL CW Sweepstakes Nov. 6 - 8 is a big one for everyone to try with no more than 500mW. And from there go down. You could work all states with 500mW in one weekend. Or at least most of them. And the FISTS test on October 9th is another one for WAS.

Nov 27th and 28th the CQWW DX CW test is a BIG ONE. Work those lonely DX stations with mW. Everyone can do it!! My contest list for the rest of 1999 is below.

Best of 73's, 72's and sometimes 71's! Jim, KJ5TF

October		November		December;	
2&3	Ca QSO Party	6&7	Ukrainian DX cw/ssb	4&5	EA DX CW
9	FISTS Fall Sprint	6-8	ARRL Sweepstakes CW	5	ARCI Holiday Spirits Homebrew Sprint
9&10	ARCI QSO Party	13&14	OK/OM DX CW	11&12	ARRL 10M cw/ssb
9&10	Pa QSO Party	20&21	LZ DX CW	12	Colorado Snowshoe Run
16&17	Worked All Germany cw/ssb	20	LI/NJ QRP Doghouse Sprint	18&19	Croation DX CW
		27&28	CQWW DX CW		
17	RSGB 21/28mHz cw				
17&18	IL QSO Party				

QRP DX with Indoor Antennas

Dave Gauding, NF0R *email: nf0r@slacc.com*

QRP DX with indoor antennas? Absolutely! I've managed DXCC-QRP, and WAS-QRP and more recently WAS-2xQRP, all with an indoor antenna. There are 104 countries in the log on QRP (Mixed) and 145 (Mixed) with up to 50W. That's the maximum output available from a Ten-Tec Argosy II transceiver. My motivation slowly fell off after working 100 countries. I finally quit chasing DX in earnest in 1990 after concluding the time and expense required for getting the QSL cards was getting out of hand.

All countries were worked on an "Aluminum Cloud Antenna" mounted in the attic. My design for was published in the August 1988 issue of **73 Magazine**. At that time, 50+ countries had been worked.

The DXCC-QRP undertaking turned out to be a great long-term project. WAS-2xQRP was a much more relaxed quest. That informal effort had accumulated 49 states by the early nineties. I got sidetracked by portable antenna experiments soon after that. It took until a couple of years ago to get North Dakota logged from indoors.

The "ACA" is similar to the indoor center-fed Zepp described by N0RC in a recent QRP-L posting. My version has an unusual design feature that will be detailed a little farther along. Mounted in a small attic and viewed from above, these specialized tuned doublets look like a letter "Z" typeface. The feedpoint is positioned to take advantage of the longer diagonal dimension. Fortunately, that span has always been close to 36-ft. in our townhouse attics.

Classic G5RV dimensions work well for 10-80M. One caution! The twinlead feedline is actually part of the antenna and it radiates. This can be a TVI generator for non-cable users in densely occupied locations. Two possible remedies (but not cure-alls) are twinax or a shielded-balanced feedline. The latter can be assembled from two identical runs of coax (any impedance). RG-6 (quad-shielded type) is excellent and can be obtained gratis from some cable providers. I let the shields float though some users will want to ground them at the bases and then to the tuner.

Incidentally, both shielded feedline alternatives are very quiet. Besides TVI reduction that becomes a desirable feature where concentrated vertically polarized man-made noise is present, i.e. apartments, co-ops, condos, power lines, cable drops, etc. However, choosing a shielded feedline means the physical length of the antenna must be longer to be truly effective on the lowest frequency of interest. By formula that means about 133-ft. for a 10-80M half-wave radiator instead of the compact 102-ft. flattop of the G5RV design.

The main radiating section of the ACA is fabricated from 18-in. (or 12-in.) heavy-duty aluminum kitchen foil. Its central location favors the high current point. In my installations, this fragile section has always been 16.5-ft. either side of center (which favors 20M), but may vary. The foil must be reinforced so that it can be transported easily to the attic and maneuvered into place. Adding 3/4-in. masking tape in the right places makes that possible.

Begin by turning the top edge of the foil up to a 90-degree angle using a straightedge. Then fold the foil over a light suspension line. No-stretch braided nylon fishing line works well or use kite-string. Tape the foil closed and add extra tape reinforcements where the line enters/exits the folded edge. Next, add vertical reinforcements every 1-in. on one side of the foil. Extend these tapes across to the other side slightly to strengthen the folded edge. Finish by taping the lower edge.

The reinforced center section can be rolled into two loose coils about 12-18-in. in diameter. There's no weight involved so unrolling and installing as a shallow inverted-vee (for maximum feedpoint height) is easy. The twinlead feedline (approx. 17.5in.) is attached with alligator clips at the corners of the reinforced foil, either top or bottom. Small hook-eyes can serve as center and end supports.

The 10-80M radiator is extended by clip-on wires (approx. 17-ft.) to complete the "Z" configuration. Position the extensions to take advantage of roof height where possible. Avoid metal ducts and electrical wiring when convenient to do so but don't call off an installation simply because they are near-by.

The aluminum foil sections separated by only a few inches will overlap when installed as an inverted-vee. This can be overcome by folding the foil out of the way at the feedpoint or by trimming in place. If available height is a problem due to roof pitch, the end of the foil section can rest on non-conductive materials including wood or insulation.

An 18-in. wide foil section provides up to fifty square feet of capture area! Accordingly the antenna seems to hear well and the additional capacitance helps loading on any design band. My installations were never higher than 30-ft. (or lower than 25-ft). in four different locations. We bought a real house in late 1998, so indoor operating will be on hold for a few years.

To recap: in cooperative attic locations, cut foil sections to 16.5-ft and add clip-on extensions to 17-ft. Add twinlead feedline to 17.5-ft. Note that the feedline can be extended as necessary to reach the tuner and that all components will tolerate bending into reasonable shapes. An entirely foil radiator cut to formula can be a very good performer in a traditional straight-line installation. Finally, re-scaling the ACA to a half-size (10-40M) or even quarter-size (10-20M) is easy to do.

I worked most of my DXCC countries on 20M, followed by 15M, and then 30M. DX on 40CW from indoors was very rare at 5W and hardly ever occurred outside of the Caribbean. I did not chase DX on 10M due to TVI when using twinlead. That prompted conversion to a shielded-balanced feedline but the change came too late in the solar cycle to be consistently helpful.

My ACA was used routinely with one-watt output. It provided First Place on 20M in the 1988 ARCI Spring QSO Party running 900 milliwatts. I learned well after the fact that score was a new club record for the band and it stood for several years.

Such results should spark a little more confidence in the capabilities of non-standard antennas in general. With this in mind, indoor operators including QRPers really should make a decision to either get on the air or worry about the inadequacies of their antenna. Pick one only!

I was a "cliffdweller" for my first eighteen years of hamming. If a new indoor design was published during that period I made a point to read the article and occasionally tried the antenna. But, I always came back to the ACA because it worked best for me.

Indoor antennas come with a built-in attenuator. That usually means the bands open later and close earlier for DX. However, giving up a lofty beam or that extended double-Zepp in the back yard might not be as awful as you imagine in dB's! If not an ACA put up a regular center-fed doublet or feed something against ground (random wire, slinky, window screen, sliding door frame, rain gutter, roof flashing, etc.) and just go for it! Attitude is everything when it comes to indoor antennas. After accepting that it's a case of go-with-what-you-got everything soon comes into perspective. Good luck!

Edited by W1HUE

Target 2001, the Tuna Tin 2 Clone

Bruce Muscolino, W6TOY/3

Using a printed circuit board to build your projects leads to a much nicer looking product. One that looks much more professional and is easier to troubleshoot. And you can easily make one right there at home. I have several projects that have survived 20 or more years that were built on homebrewed printed circuit boards.

Making them was pretty simple, too. I simply covered the board surfaces with several layers of masking tape, drew the layout, and cut out the areas I wanted to etch with a very sharp X-acto knife, and introduced the board to PC etchant solution I bought at Radio Shack! I was able to even heat up the etch solution by floating the tray in another tray of hot water to speed things up.

Integrated Circuits can be used, though they do use a pretty fine pitch for the lead spacing, but I think rub down circuit elements are available. Radio Shack used to sell a selection, and they may be available through other suppliers, check your Mouser catalogs.

In short, making ONE printed circuit board for my own use was a very simple affair. Instructions can be found anywhere. QST, I believe, once published a several part series on home made PC boards. The problem comes when you want a really professional look or you want to make a lot of copies of the same PC board! Enter Printed Circuit Board software. This review covers one of several we will be reviewing, Target 2001.

Target 2001

Target 2001 is a professional quality PC layout program that was recently introduced on the web. The copy I used was very preliminary. Several key features were not you ready, and there were bugs in the symbol graphics. By the time you read this they may be fixed and the system easier to use. I got mine from the manufacturer's web site **http://www.ibfriedrich.com**

For a simple project like the Tuna Tin 2 clone the program was adequate. I only bothered the manufacturer a few times for help. The Tuna Tin 2 Clone I laid out used nothing but what was available on screen! It was almost a connect-the-dots affair once I had learned a few simple commands.

Target Commands

Target commands can be accessed either from drop down menus or by way of hot keys. I mostly used the following 'hot keys' in the layout:

'I' - brings up the information screen.
'O' - brings up the options screens.
'1' - puts Target in the Pad Placement mode
'2' - puts Target in the Track Drawing mode
'Z' - puts Target in the Pad Move mode.

A more complex board would undoubtedly be made easier by using other options. A better understanding of the vocabulary of printed circuit fabrication would also have been of assistance. A 'Help' file would have been of great use. I was never able to work out how to load the various auxiliary files containing circuit elements, and they also would have been of help.

The system output is a file that can be sent via email to several printed circuit vendors for fabrication. You can also print the board layout on transparency material and send it to FAR Circuits, or photo-etch your own boards at home!

Printed circuit layout and manufacture is like almost any other technology, the first step to understanding the system is to learn the vocabulary! I admit that one reason I laid out the board the way I did was learning the vocabulary was a bit beyond the time I had available!

I evolved a simple method that met my needs for the simple board I made. Your mileage may vary. The method I used was to 'drop' the pads, 'drag' them around until I was happy, and connect them up using the traces.

PC pads are placed by selecting the pad placement function, the '1' key, and then pressing the mouse button to place the pad where you want it. Seems simple enough, doesn't it? But, how do you know where the pad should go, after all, you have a large screen available! This is where planning and the ruler scale come into use.

Pressing the "O" key after pressing any other function key brings up a set-up screen where you can specify dimensions, pad type, trace width or Grid spacing. The dimension set-up screen is also available from the Window menu; the others are context sensitive and are available after you press the appropriate key. Selecting inches will change the measurement scale at the bottom of the screen. After you have set the measurement system to inches, close the Options menu and select GRID from the 'View' menu.

Board layout

To figure out where the pad goes I use the schematic; its placement is not an exact science. I generally try to put B+ and Ground on opposite sides of the board. And I pick a suitable starting place by consulting the schematic and estimating final board size.

The points to be careful of when laying out a printed circuit board are component spacing and crossovers. You want to eliminate any possible circuit crossovers and you want to place the components with enough space around them so they can easily be inserted and removed if necessary.

I usually build a breadboard of my circuits using perfboard. If it looks right on top, and does not require on-board jumpers, it will usually work. Of course once in a while you just cannot remove all crossovers, sometimes they are a necessity, but you can surely leave sufficient room for components!

The Tuna Tin 2

I didn't want to build another Tuna Can copy of Doug DeMaw's design; I wanted a simple transmitter that could be mounted inside a receiver to make a complete station to play around with. For that I decided to re-layout the Tuna Tin 2 in a more conventional form so it could be mounted in a variety of boxes. The whole thing took only a couple of days working part time. Of course I had to start, stop, and erase parts several times. I made two abortive attempts before I finally understood enough of the system to get going. I will show you several

layouts of the Tuna Tin 2 from first to last, along with a photo of the perfboard prototype I finally ended up with! The circuit board layouts are shown as I made them, and reversed as they would be etched. They are enlarged to about 200% of actual size. Actual boards for those who want them will probably be made available.

As I said, I do my layouts from the schematic. I work from the top of the boards. Once I have laid out a working board I just 'flip' it using Target's print option to view it from the copper trace side. Building a perfboard breadboard allows me to work out component spacing problems and see if my design works properly!

Figure 1 shows the completed printed circuit board actual size. **Figure 2** is the Tuna Tin 2 schematic; note that the Radio Shack chokes referred to have been changed out for more modern components. **Figure 3** *is the component layout and* **Figure 4** *is the parts list.*

I had my first contact with the rig this afternoon. I worked Joel, K1QM up in Massachusetts. Certainly not a Miles per Watt candidate, only about 350 miles away, but the thrill of my mighty 1/2 watt was *there all the time. It was a very satisfying* QSO..

Target 2001 as reviewed was very useful but only a glimpse of what it can and will be. I will be trying a more complex board for the next issue. Target's technical support, especially Mr. Uwe Schneider, *was of great help in doing this review.*

Bruce, W6TOY/3

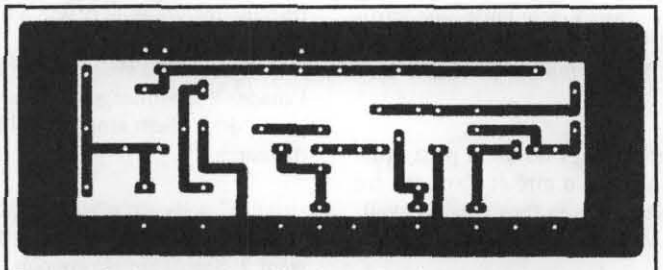


Figure 1: the completed printed circuit board actual size.

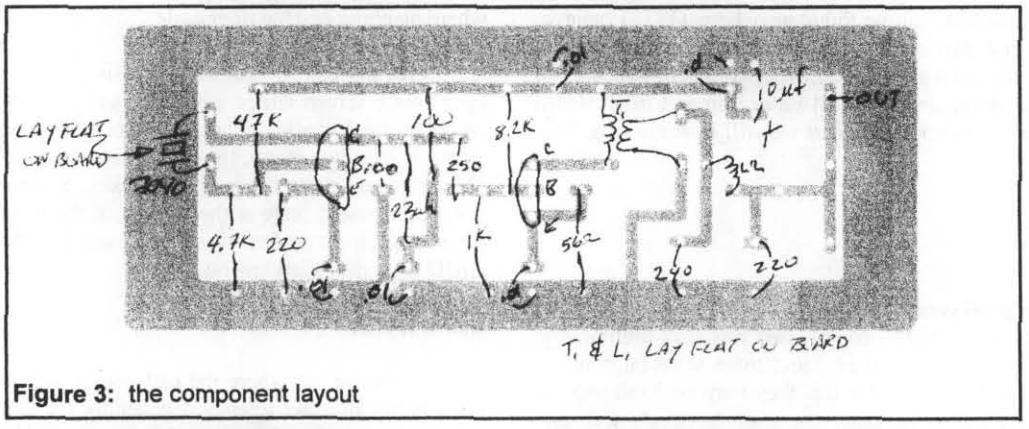


Figure 3: the component layout

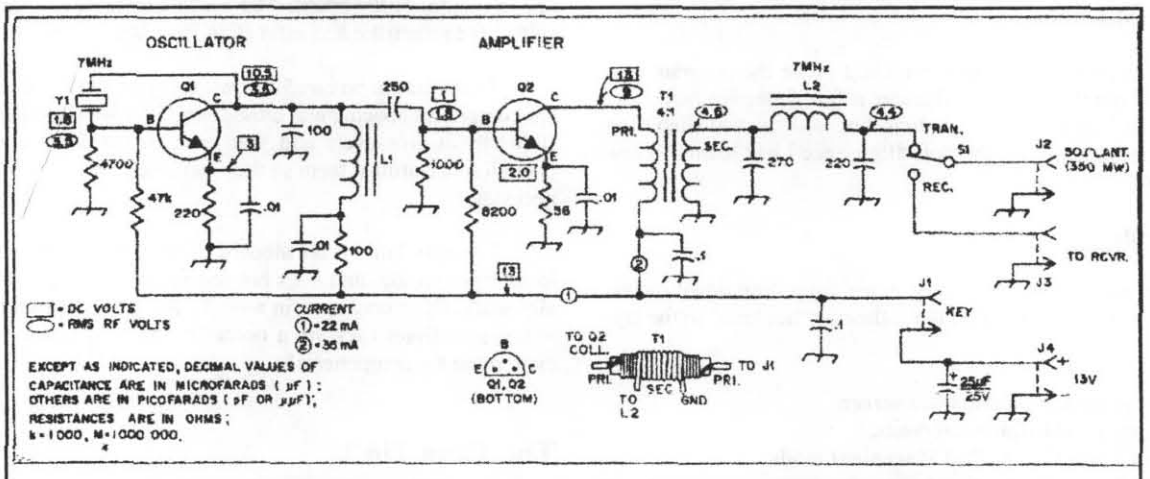


Fig. 1 – Schematic diagram of the two-transistor QRP rig. Capacitors are disk ceramic. Resistors are 1/2-watt composition. The polarized capacitor is electrolytic. See parts list for data on other components.

J1 – Single-hole-mount phone jack. Must be insulated from ground. Mount on tuna tin (Archer 274-346).

J2, J3, J4 – Single-hole-mount phono jack (mount on tuna tin).

L1 – Modified Archer 273-101 rf choke (see text).

L2 – Modified Archer 273-101 rf choke (see text).

Q1, Q2 – Archer 276-1617 npn silicon transistor. Equivalent to 2N2222A type.

S1 – Antenna changeover switch. Miniature spdt toggle (see text).

T1 – 4:1 broadband transformer. Modified Archer 273-102 100-µH rf choke. Primary has 50 turns, secondary has 25 turns (see text).

Y1 – Fundamental crystal, 7 MHz (International Crystal Co. type GP or equiv.).

Figure 2: the Tuna Tin 2 schematic; note that the Radio Shack chokes referred to have been changed out for more modern components.

Figure 4: Tuna Tin 2 Parts List

Resistors (all 0.1 watt 5 % carbon Film)
1 - 4.7 K ohm
1 - 47 K ohm
1 - 220 ohm
1 - 100 ohm
1 - 1 K ohm
1 - 8.2 K ohm
1 - 56 ohm

Capacitors (all monolithic)
2 - 0.01 mF
2 - 0.1 mF
1 - 100 pF
1 - 270 pF

Capacitors (Silver Mica or monolithic, watch voltage rating)
1 - 240 pF
1 - 220 pF

Capacitor (Electrolytic)
1 - 10 uF @ 25 VWDC

Other
1 - 22 uHy RF Choke
1 - 4 :1 Transformer (T1) 16 Turn primary and 4 Turn secondary on a FT-37-43 core
1 - Output Coil (L2) - 19 Turns #26 wire on a T-37-2 core
1 - SPST toggle switch
3 - Phono Jacks

News Release

ARRL Hosts QRP ARCI for a Black Cat Halloween Special Event

(*August 6, 1999 -- Newington, CT*) On October 30 and 31, 1999 the American Radio Relay League will host the QRP Amateur Radio Club International for a "Black Cat" QRP on-the-air party for all QRPers. For two days, W1AW/QRP will be on the air using the original Tuna Tin 2 transmitter designed and built by Doug DeMaw, W1FB! The "Black Cat" theme was chosen to tie the Tuna Tin 2 to Halloween, for a night of ghostly fun that QRPers can talk about for years.

The Tuna Tin 2, so called because it used a common tuna fish tin for a chassis and two 2N2222 transistors was introduced to the world in May, 1976 in a QST feature article by Doug DeMaw. For many hams, it served both as their first QRP experience, and their first building experience.

Even though it disappeared under mysterious circumstances from the ARRL Lab, it was later rediscovered at a hamfest over 100 miles away from ARRL HQ. Rescued from an ignominious end under that hamfest table by Ed Hare, W1RFI, a well-known QRPer who works in the ARRL Lab, it was restored to full operation in June of 1999 by Bruce Muscolino W6TOY/3. It is still in use today! Over this summer, it has had a short but exciting career, on the air from W1AW and W1RFI, traveling to various distant locations and hamfests to let others see the "real deal!" Now it comes home to rest up for this fall's operating event.

The original Tuna Tin 2 operation will be on 40 meters for the entire period. Late night operation will be directed toward working as many DX stations as can be heard! (QRP DX includes many parts of the United States as well as overseas hams.) You don't have to be using QRP to work the Tuna Tin 2, just listen around 7040 kHz for W1AW/QRP and give us a call! Additional Tuna Tin 2 replicas will be operating on 10.160 and 14.060 MHz, to give all the best chance to participate in this QRP extravaganza.

Certificates and special QSL cards will be issued to commemorate this ARRL/ARCI special event. Hams are welcome to stop by W1AW over the event weekend to see the original Tuna Tin 2. Operating time may be limited, but those who wish to operate the original Tuna Tin 2 should be able to make a few contacts. Please set aside some time Halloween weekend to work W1AW/QRP, and each other for a weekend of informal QRP fun! Contact Bruce Muscolino, W6TOY (w6toy@erols.com) or Ed Hare, W1RFI (w1rfi@arrl.org) for more details.

Bruce, W6TOY/3

The St. Louis Vertical, Radial and Express

Fallacies and Facts

by Ade Weiss, W0RSP *email: aweiss@usd.edu*

The St. Louis Vertical is one of those concepts that "catch on" because it satisfies a well-defined need. QRP operation is attractive for many reasons. Among these, the prevalence of mini-rigs and gel cells automatically leads to the widespread interest in operating portable from an unlimited number of locations. One major problem is confronted in most forms of portable QRP operation -- how to manage to put up a good antenna. A fortunate historical convergence has solved this problem -- the appearance of the cheap Black Widow fishing pole at about $1.25 per foot of altitude, computer ribbon (sometimes cheap at flea-markets -- luck of the draw), and the St. Louis Vertical concept. Vern Wright's (W6MMA) improvement on the Black Widow base and his addition of the loading coil completed the marriage of the three and corrected the conceptual flaws in the original designs.

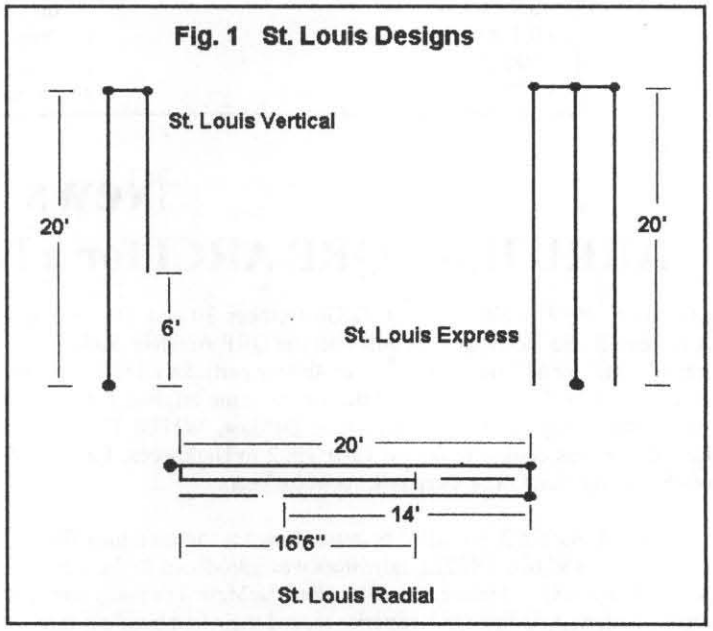
However, some fallacies from the early stages of development of the St. Louis Vertical, the St. Louis Express, and St. Louis Radial persist. Many new QRP'rs do not have the knowledge to evaluate antenna designs and sort out the imaginary from the real. This can cause them frustration, aggravation, and finally, despair. If the flawed antenna design was their only chance of getting on the air and it failed, their future as QRP'rs is in jeopardy. Newcomers naturally have to believe what they see in print. If the article said that the antenna matches on all bands with a 1.5:1 SWR or better and works well on the air, then it must be the newcomer's fault that his didn't work. Unfortunately, a huge stack of antenna articles has been published with no more validating data than the author's claim that "it works fine on the air" and other such subjective observations. The recent dummy load contest that threaded on the QRP-L back in June provides insight into the conclusiveness of that "it works fine" kind of "scientific data".

In this context, I'm reminded of Rocky's (W9SCH) articles about the "Rock-Loop" and other miniaturized antennas -- he claimed he worked a lot of stations, even some DX, and indeed he did. His best design, in my opinion, was his "Bedspring" antenna. He saved time on his visits to the cabin in upper MI (or was it WI?) by tuning up the bed rather than going outside and erecting an antenna. I never did get the details straight about the feed-system -- was it center-fed on the perimeter of the bedspring, and which side -- short or long, or corner-fed, or a true center-fed right smack in the middle of the bed (topside or from the bottom)? With coax, twinlead, ladder-line, or single wire? Then too, was it a king-size, regular, or double bed? And could he operate when Fran was taking a nap? Scientific data definitely was lacking about this antenna. But did it work? It sure did. In February of 1988, I was in a cabin in Florida with 300-ft of wire up 90-ft, working EU DX on 80 and 40 with pile-ups on me! One night I checked out 3560, and sure enough, W9SCH was in QSO, so I waited and tailgated. We had a 25 minute QSO, during which he noted that he was using his Bedspring Special. He was 559 but solid copy. The thing worked. Would I ever try it, or recommend it to a QRP newcomer? Well ..... would you?

This reminds me of some of my own Novice-days efforts -- like the vertical made from two 3.5-ft TV antenna elements butted to make a 7-ft vertical, with aluminum pie-plates at the center and top for loading (just like in the pictures), fed by a 25-ft hunk of nondescript coax, center-conductor only, thru a Heath AC-1 tuner. It worked, in a manner of speaking. When I got to operate an Elmer's Gotham vertical for an hour, it became painfully clear that mine actually didn't work. To make a long story short, an incredible variety of radiators have worked for QRP'rs -- gutters, chain link fences, flagpoles, metal sheds, 2m yagis, metal deck railings, storm windows, two Dodges centered as a dipole (really!) bedsprings etc. The point should be clear. Just about any piece of metal will radiate -- the questions are: "how well?" and "compared to what?"

How do the St. Louis Vertical, Radials, and Express measure up? In each, a significant length reduction is sought on 40 meters (and a bit less on 30 meters) by using the unfed parallel wires of either twinlead or computer ribbon as folded back sections of wire to replace the missing linear section of a quarter wave radiator or radial (see Fig. 1). This amounts to a 40% reduction on 40 meters and 20% on 30 meters.

Fig. 1 St. Louis Designs



In general, antenna efficiency drops excessively when the reduction exceeds 30%. The vertical case has been studied extensively, beginning back in the 1970's with Jerry Sevick's classic series of papers in QST and Paul Leel's classic book on vertical antennas. Sevick's experimental data showed two important points: the efficiency of a ground-mounted shortened vertical (1) is directly related to the number of radials in the ground system and (2) the method of replacing the missing portion of the radiator. The substitution of an inductor (adds loss resistance) for the missing portion was found to be considerably inferior to capacitive top-loading with a large dimension capacity-hat in general, and especially when the reduction factor was high. He demonstrated that even very short verticals with large capacity hats could be as efficient as full-size verticals as long as a very large number of radials (120) were under the vertical. In theory, as the radiator length is reduced, the radiation resistance drops. As a result, system loss resistances become an increasingly larger percentage of the total resistance seen by the feedline. So, more of the power is dissipated in loss resistances.

Let's briefly consider the major loss resistance for the ground-mounted vertical. Over a perfect metal ground plane, loss due to absorption of RF power in the dirt under the antenna is totally eliminated. The radiation resistance is 36 ohms - half the 72 ohms of a dipole. Any losses would be due to ohmic resistances related to radiator diameter, corrosion of connectors, and other "mechanical" factors. The perfect ground condition is approximated by a very large number of radials (120 or more). As the number of radials decreases, the ground loss resistance increases. In practical terms, for example, mounting a quarter wave vertical on the ground with no radials will produce a radiation resistance of anywhere from 65-90 Ohms, depending on soil quality, environment etc. As noted, the quarter wave vertical radiation resistance

should be around 36 Ohms. As radials are added, the radiation resistance will continue to drop from the no-radial figure until, with around 16 radials, it will measure at about 42 Ohms. The difference between this last figure and the 65-90 Ohms no-radial resistance is loss resistance, which dissipates a percentage of the input power. Note that with 16 radials, about 6 0hms of loss resistance is still present. For the ground-mounted vertical, then, more radials are better -- up to a point of practically diminishing returns in terms of the signal's radiated strength at a distant location. In a permanent installation, go for a lot of radials. Use copper wire (NOT steel) -- insulated if the radials lay on the grass, and bare if buried beneath the surface. Obviously, portable operation places practical constraints on the number of radials. The typical four-radial installation using four strips of computer ribbon under the ground-mounted St. Louis Vertical does help a tad (see later discussion).

The second class of verticals are mounted at some distance above ground. Raising the elevated vertical and radials off the ground by some amount (depending on the frequency of operation) changes the whole picture. Sitting on the dirt, radials are not "resonant" at any frequency as would be defined by their electrical length. As they are raised, coupling into dirt decreases drastically as a function of height (i.e., the distance from the adjacent lossy dirt "conductor" increases) and they exhibit the same behavior as when a resonant dipole is raised off the dirt -- in other words, radial "resonance" increasingly becomes a function of electrical length and height, and the radiator and radials become a resonant antenna.

This relation may puzzle newcomers, so a brief digression may help. In theory, the resonant frequency of an antenna (or radial) is defined by its electrical length in free space, which is the physical length multiplied by the velocity factor of the conductor, a fractional value. Solid copper wire without insulation usually exhibits a V.F. of around 0.95. The V.F. of the same piece of wire surrounded by foam or other dielectric in a piece of coax can drop to 0.66 (when used as a feedline surrounded by a mesh shield). Formulas usually incorporate the V.F. as part of the length calculation, so you don't have to worry about it. However, when the radiator is put in a real environment, two RF waves and the distance they travel (i.e., the time of travel) have to be considered in determining resonance: (1) the wave that develops on the wire as the r.f. current fed into it travels to the wire's end; and (2), the wave that reflects from the ground beneath (and other nearby conductors), travels thru the plane of the wire, and induces an RF current in it. Except at one precise height above ground which produces a time of travel exactly twice that needed for the travel of the input RF current to the end of the antenna for a half-cycle, the two waves are always "out of phase", i.e., the reflected wave arrives out of sync with the next half-cycle input wave. Thus, in practice, there is always a phase difference. It is stated in several ways. Here, "reactance" is the term that is used. The reactance is either positive (i.e., one wave gets there before the other) or negative, and is given as an "imaginary" term. The combination of the radiation resistance of an antenna and the reactance is stated as, for example, Z=36-j21.5 ohms. The radiation resistance (which includes loss resistances) is the first number (36), and the amount of phase difference is given with the "j", or "-j21.5". When "j" is negative, the antenna is too short; when it is "+", the antenna is too long. Another way of saying this is: when "j" is negative, the resonant frequency is higher than that at which this impedance is measured, and vice verse. By definition, the resonant frequency is the combination of frequency and length at which no reactance appears.

To return to the elevated vertical case, a large number of radials are not needed. Four resonant radials at right angles to each other (so that their radiation is cancelled) are all that is needed to make the vertical efficient. The radials can be horizontal or sloped, but sloping can have a significant influence on resonance if the ends are brought close to ground (see later discussion).

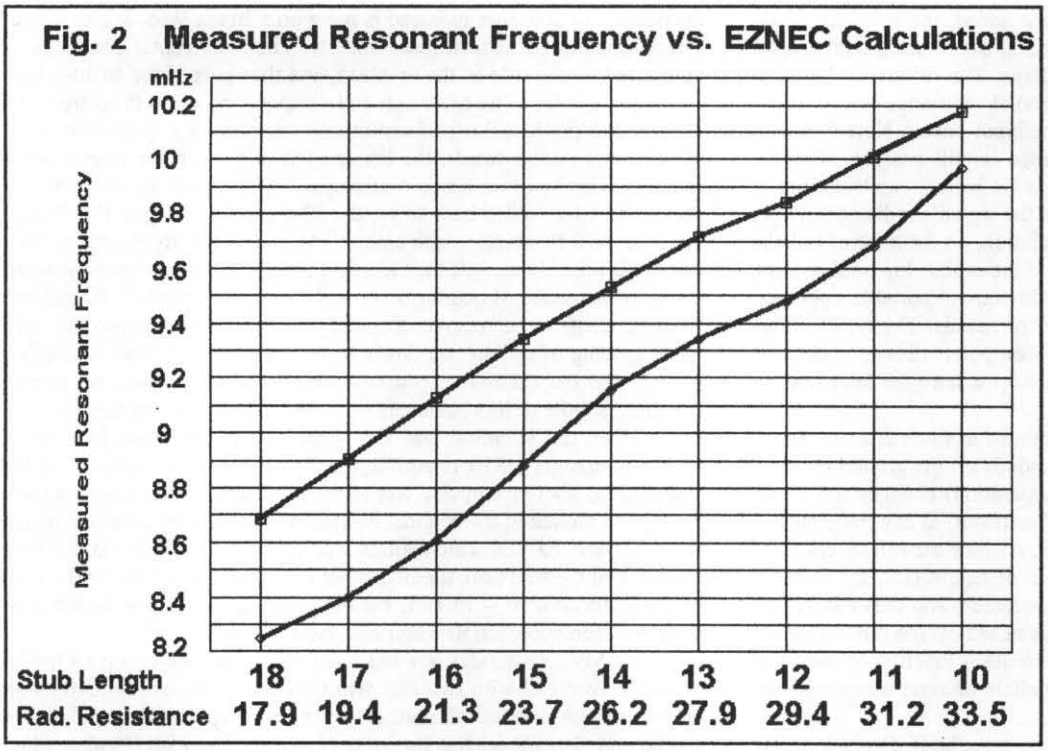
First, the physical details of the St. Louis Vertical are fairly simple (see Fig. 1). For the radiator of the original St. Louis vertical, a 20-ft piece of 300-ohm twinlead is hung on a Black Widow and wound a few times to stabilize it mechanically. The coax center conductor is connected to one side of the twinlead, and the leads of the twinlead are shorted at the top. The other side is left open, and cut 6-ft up from the coax end to produce 34-ft of continuous wire, about a quarter wave on 40 meters. In other words, the linear 34-ft of a 40 meter quarter wave radiator is broken into a two sections, a 20-ft vertical section with the remaining 14-ft folded back to yield a 20-ft physical length. For 40 meters, the 20-ft resulting length amounts to a 40% length reduction. Two questions arise. First, will the electrical length of the arrangement replicate a linear (unbent) quarter wave and thus be resonant on 40 meters? Second, what is the relative efficiency of the method, given the very close spacing of the up and down wires and resultant mutual coupling effects, and the excessive reduction ratio? As it turns out, the second question is more or less irrelevant because of the answer to the first.

When my attention was first drawn to the problem by a letter from a distraught QRP'r regarding the St. Louis Express's failure at his installation, my first impulse was to model it in EZNEC. That led back in steps to modeling the original design. A combination of actual measurements and EZNEC calculations was employed to arrive at the conclusion that the fold back method is not a simple issue of the total length of the radiator wire -- in fact, the electrical length of the folded wire does not even approach its linear electrical length.

My first model ignored the implications of trying to model 300-ohm twinlead with two #20 wires spaced 0.375-in (.0313-ft) with an 180-degree reversal (1 segment connecting up and down wires) at the far end. The model was placed over excellent ground (local conductivity = 30). Ground-mounted (0.04-ft) with four 34.5-ft radials, this model showed an impedance of Z=11.7-j346 ohms on 7 mHz. 40 meters, in short, is very far below this vertical's resonant frequency. Next, severely non-linear effects were noted as the frequency and stub-length were changed in search of resonant points. Now, EZNEC accurately models a twinlead folded dipole with 180-degree reversals in direction, but this involves a continuous loop of conductor. The SLV radiator is not. So, I expanded the wire spacing in steps until fairly linear results occurred at a conductor spacing of 6-in.

The next question was whether the EZNEC model with spacing set to 6-in was simulating a real radiator's behavior. A not especially lab-grade setup was used for making actual measurements. A 20-ft section of 300-ohm twinlead was hung from a branch, with test equipment on a bench about 16-in off the ground. Sixteen 8-ft radials were arranged more or less symmetrically (actually, less is closer to the truth) around the base. The environment had its shortcomings. My '66 Tempest was 8-ft away, and two 30 meter SLV's (unterminated) roughly 10- and 15-ft away. All three objects were close enough to mutually couple into the test vertical and skew the results. Nonetheless, measurements were then taken at 1-ft decrements in the stub (down conductor) length. At 6-in up (19.5-ft stub), resonance occurred at 8.517mHz, the low end of the radiator's range, 1.5mHz above 40 meters. The stub lengths were then calculated with the EZNEC model and correlated as shown in Figure 2. The roughly 500kHz difference in frequency could be attributable to any number of causes -- perhaps I should have moved the '66 Tempest out into the alley. Next time. But the measurements showed a decently linear tracking of EZNEC model with 6" spacing and the actual twinlead setup.

The issue of the exaggerated non-linearity's originally seen in EZNEC was puzzling. As can be seen in Figure 2, the EZNEC curve still exhibits some non-linearity. It occurred to me that the 1-ft decrements could simply have jumped across those critical points where the non-linearity showed up. So, another test was performed, this time with 0.5-ft decrements between stub lengths of 13-ft and 10-ft. Sure enough, something was happening between 7-ft and 8.5-ft up. The problem with cutting big 1-ft or 6-in chunks off the stub is that a lot of possibly critical points are bypassed. But the twinlead was swiss cheese by now and there was no chance of decrementing in 1-in cuts! However, I was satisfied with determining that EZNEC was seeing something real. As Roy W7EL (designer of EZNEC) commented with a big smile after explain-



ing an apparent error in cardiod pattern calculations, "EZNEC doesn't lie!" Of course, the 6-in cuts, my test environment, and the considerable loss-resistance in the test setup undoubtedly obscured the finer points of what was happening. But EZNEC was working in a purely scientific environment, a real luxury.

The next question occurred naturally -- "how long does the twinlead have to be to reach down to 40 meters?" This provided an opportunity to verify that the EZNEC model was related to the real world radiator. EZNEC suggested a 24.5-ft radiator with a 20.5-ft stub. This was tried in the same imperfect environment and setup and zeroed in at 7.272mHz with the 20.5-ft stub and 7.412mHz with a 19.5-ft stub. The total wire lengths correspond to 45-ft and 44-ft respectively to produce 40 meter resonance with the group of 8-ft radials. Obviously, the assumption that the electrical length of the folded radiator is the same as its linear equivalent is false. At another stage of test measurements, substituting seven 24-ft radials produced a significant downward shift in frequency. With a 13-ft stub length and 20-ft radiator, resonance over the 8-ft radials occurred at 9.713mHz. This dropped to 9.357mHz with the seven 24-ft radials, a shift of roughly 350kHz. So, putting seven 34-ft radials under the 40 meter 24.5-ft radiator very likely would pull resonance down to the desired range, probably permitting a shortening of the stub somewhat. EZNEC suggests that the latter step is a highly desirable change. The radiation resistance decreases as the stub length increases (see Figure 2, bottom). With the stub at 18-ft and radiator at 20-ft, the radiation resistance calculates as 17.9 ohms, rising to 33.5-ohms at 10-ft stub length. At nearly full stub length and Z=17.9 ohms, system losses will be very dominant, severely cutting the efficiency of the vertical. For example, in the test setup, the measured resistance was around 38 ohms vs. the calculated 17.9 ohms. At a stub length of 14-ft, it was 46 ohms vs. 26.2 ohms. That is a lot of loss resistance! Both the measurements and EZNEC suggest that the stub length should be less than 50% of the radiator length. This parameter would force an even longer radiator for 40 meter resonance.

Finally, a question about the effect of folding back the radiator into the stub position arose. The EZNEC folded model (twelve 8-ft radials) with 20-ft radiator and 10-ft stub resonated at 9.97mHz with an impedance of Z=33.5 ohms (no reactance at resonance). The stub was rotated into the horizontal position (perpendicular to the radiator) as in an Inverted-L. The resonant frequency dropped to 8.89mHz (Z=39.8), or about 1mHz downward. At 60-degrees to the radiator, it dropped another 100kHz to 8.8mHz (Z=46.9). As a single linear radiator, resonant frequency was 8.78mHz (Z=46.9). In short, folding the radiator back onto itself is not a particularly efficient or effective method of length reduction. Folding back the radiator wipes out a very significant portion of the linear electrical length of the radiator. Finally, four 24-ft radials (approximately resonant) were substituted for the twelve 8-ft radials under the radiator at a height of 2-ft. The linear radiator exhibited a resonant frequency of 8.07mHz and an impedance Z=40.6 ohms. In contrast, the folded SLV radiator exhibited a resonant frequency of 8.71mHz and an impedance Z=24.36 ohms. The difference in impedances underscores the efficiency problem with the folded SLV radiator at resonance.

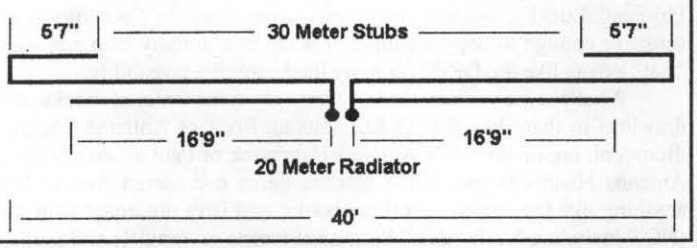
The St. Louis Radial applies the same fold-back method, but makes use of multi-conductor computer ribbon (or other "flat" ribbon media) to produce radial wires for a series of bands. (This is another historical convergence resulting in a marriage made in heaven -- even two-conductor flat radials are very difficult to kink and quite easy to roll up. Mine have been rolled and unrolled a bunch of times, and at the home QTH, a bunch sit on the gravel and stones of the driveway and are driven over regularly. Amazingly durable stuff.) For the 20-10 meter radials, one conductor is cut to an actual quarter wave length for each band by snipping out an inch or so at the 16-ft 6-in point for 20 meters, and so on. For 40 meters, one conductor is shorted to a second conductor at the far end, and the second conductor snipped to produce the 34-ft wire length, the same strategy used in the SLV folded radiator (see Fig. 1). The results are the same.

(NOTE: Incidentally, computer ribbon can be a pain when one attempts to strip the insulation from each single #28 conductor. My first sets of radials were meticulously stripped with a knife and the project took a long time. As I looked at the ribbon about to be stripped for a second ribbon radial, I lighted up my pipe to aid in the contemplation process. Without even thinking about it and before I flipped the Zippo lid closed, I grabbed the end of the ribbon and burned off 3/4" of insulation from the whole thing. The insulation melts and then burns, but if the torching process is stopped short of ignition, it is a quite simple matter of crimping the melted plastic with the thumbnail and fingers and sliding it off. They can be allowed to cool just a bit before this step. A residue of plastic remained on some of the conductors, so both steel wool and the knife were tried to produce a shiny surface. Both worked, although steel wool took more time. Soldering the ends then was a piece of cake. I should award myself a "Bright Idea" certificate for this discovery!)

The folded back 40 meter conductor (20-ft ribbon length, #28 conductors) was modeled as a 40-ft dipole (two 20-ft radials center fed) in the horizontal position at various heights above ground (20-ft to 55-ft). With stub lengths of 13-ft at each end, resonance ranged from 8.92 to 8.97mHz, and from 8.05 to 8.12mHz with 14-ft stubs. The lowest resonant frequency was far above 40 meters. Next, a 20 meter conductor was added to each side of the dipole and produced considerable detuning interaction with the folded "40 meter" element especially since the ends (20 meter conductors and 40 meter stubs) overlapped considerably. Since 30 meters seemed within range of the folded stub arrange-

ment, some fiddling led to the combination of a 16-ft 10-in 20 meter

Fig. 3 30/20 Meter SLV Stub Dipole



conductor and a 5-ft 7-in fold back stub for 30 meters (see Figure 3).

With this configuration at a height of 40-ft, resonances were obtained at 10.105 (Z=66.2-j0.85) and 14.035mHz (Z=50.6+j0.22). Dropping the antenna dropped the resonant frequency as expected due to coupling into ground. Interestingly, at 40-ft, it exhibited some gain (0.9dB) over a comparable 20 meter dipole. In the final analysis, the 30 meter reduction ratio was about 20% and resulted in a slight drop in gain (0.75dB) relative to a dipole at the same height.

As far as using the fold back strategy in elevated radials is concerned, height above ground and radial orientation relative to horizontal are important considerations. For example, with four 24.5-ft radials under a resonant vertical, the resonant frequency shifts from 9.175mHz at 0.01-ft height to 9.4mHz at 15-ft above ground. While the electrical length determines the actual resonant frequency, close proximity to other conductors (including poor conductors like dirt and great conductors like a '66 Tempest) causes mutual coupling, which introduces reactance to the impedance and thus detunes the radial. Sloping the four radials at 30-degrees below horizon, which puts the ends at about 2.8-ft above ground, shifts the resonant frequency back to 9.175mHz. In short, the elevated radial vertical is a tuned system. The same thing happens to it as happens to a dipole at 15-ft when the ends are dropped to 2.8-ft.

How much height changes a vertical from ground-mounted to elevated? This depends primarily upon a combination of the frequency of operation and soil quality under the system. As soil quality decreases, system height must increase to achieve a given level of efficiency. For 20-10 meters, it appears that around 5-ft is enough over good ground (a guess after EZNEC modeling). How many elevated radials are needed? Actually, only two. Remember that a quarter wave vertical is basically a half wave dipole which has been lowered close to ground, and one side rotated upward to the vertical position. Current flow between the two halves, one of which is now a radial, is the same as in a 90-degree Inverted-V laid on its side. In this situation, the radial will radiate and distort the horizontal radiation pattern. If a second in-line radial is added, radiation from the two radials cancels, leaving only the radiation from the vertical half. The same concept is used for "T" top-loading -- which is nothing other than our two radial vertical flipped over on its head, with the feedpoint transferred to the bottom end of the vertical radiator. In theory, one should be able to get by with a W6MMA SLV mounted on top of a wooden fence with two radials stretched out along the fence. However, we customarily use four radials because no one believes that just two in-line radials work. A chain link fence won't be resonant, but tuning the W6MMA SLV to least reactance on the frequency of operation will probably allow it to radiate efficiently.

One common misconception introduced by the use of ribbon for radials must be cleared up. The radiated wave from a vertical is three-dimensional (half spherical) and covers 360-degrees. The energy at every point in this field is different from every other point in terms of its angular relationship, and magnitudes are different except for points on a circle drawn around the vertical at some distance and elevation. The current developed in a radial exhibits an angle relative to its angular position. So, looking at the vertical from above, the current in a radial at 2 o'clock is different from the current in a radial at 3 o'clock because of the different phase angle. But, every radial wire that is at the 2 o'clock angle carries the same current. The total current that would appear on one radial wire is simply split among whatever number of wires is positioned at that angle. In practical terms, this means that the number of conductors in a hunk of ribbon does not actually equal the number of radials. For example, suppose that a 20-conductor ribbon is split into four parts or "bundles" each containing five conductors of the same length. How many radials are under the antenna? Closely spaced and almost exactly parallel, each bundle equals one radial because of the identical angle of the currents, which are induced in the conductors. This is easily demonstrated in the field.

Measurements were made with a center-loaded W6MMA SLV tuned to 10.110mHz over ribbon radials consisting of seven bundles of 2- and 3-wires cut from 20-conductor ribbon. The radiation resistance measured 86-ohms with all seven grouped as a single bundle; it measured 72-ohms when three bundles were spread to form four radials; and the radiation resistance then dropped to 50-ohms with all seven fanned around the base. Next, the seven bundles were replaced with twenty separate-wire "non-resonant" 8-ft radials fanned around the base. The radiation resistance measured around 40-ohms. Note that the seven bundles contained 20 conductors but did not have the same effect as the much shorter 20 separate wires. In fact, the seven bundles functioned as seven single wires. Reconnecting them along with the 20 wires brought the resistance down to around 36-ohms. Note also that, although the twenty 8-ft radials were seriously non-resonant at 10.110 (quarter wave = 24.5-ft), they nonetheless did what radials are meant to do. Lying on the ground, radials are simply not resonant, nor need they be. The number is what matters, not the length. In practice, a ground-mounted vertical should be tuned to resonance over its actual ground plane. Usually the same tuning "works" in other settings as long as the same ground plane is under the vertical. Minor readjustment is all that is usually needed for purists.

The St. Louis Express uses a 3-conductor ribbon for the radiator. The three conductors are shorted at the top, and the feedline is connected to the center conductor. As with the bundled radials example, this represents two, not three, conductors, and the total radiator length is not 60-ft but 40-ft -- the 20-ft center conductor plus the parallel outer 20-ft conductors. The Express was modeled over four 34.5-ft radials at various heights. In no case was it remotely resonant in any ham band. The feedpoint impedances were such that matching to 50-ohm coax (or twinlead at that) below 21mHz seems impossible -- unless very lossy coax and/or a lossy ATU is used to absorb most of the power. Varying the height between 3-in to 10-ft above ground had no significant effect. At a 3-in height, the following base impedances were calculated by EZNEC: 7mHz, Z=12+j79 ohms; 10.1 MHz, 38.9+j585 ohms; 14 MHz, Z=152-j1246 ohms; 18.07 MHz, Z=115-j61 ohms; 21 MHz, Z=370+j305 ohms. The resonant frequency was found at 18.5mHz (Z=80.4 ohms), which equates to a 1.6 SWR (50-ohm coax) with the 34.5-ft radials. Examination of the current distribution seems to suggest that the St. Louis Express functions as a 7/8-wave or one-wave vertical at this frequency. If the SLX "loads" and "works" on any other frequency, the relevant questions are: "where is the power being absorbed?" and "compared to what?"

In closing, Vern Wright's conversion of the original St. Louis Vertical to the classic inductively center-loaded shortened vertical produced a genuine antenna. Replacing the folded back stub method with an adjustable loading coil, and moving the loading coil from the base to several feet up the radiator permits resonating the antenna below its natural resonant frequency as determined by overall length, and also improves the vertical's efficiency. Both improvements are long recognized and demonstrably real methods of operating a vertical below its resonant length. The only change I made to Vern's arrangement was to move the coil to the end of the second Black Widow section, up 7-ft, to include even more of the large current field below the loading coil. The W6MMA St. Louis vertical employs no magic and makes no exotic claims. It is a plain vanilla quarter wave vertical, shortened and inductively loaded on the 80/40/30 meter bands. As the directions note, run-

ning a 16-ft 8-in 20 meter radiator right up from the base along side the main radiator, coil, and topside section of the radiator o provide multi-band operation just will not work. The coil has to be shunted and a second topside radiator cut for the 16-ft 8-in total 20 meter length (30/40/80 meter topside radiator disconnected). The formula lengths are close enough, but the purist can prune by the inch. The W6MMA SLV thus requires separate topside radiators to produce an actual quarter wave radiator for each higher band. This is not a problem. The collection of topside radiators can be taped into place quickly, and an alligator clip from the top of the coil connected to whichever band is desired.

Does the W6MMA St. Louis Vertical really work? No better or worse than any other quarter wave vertical or inductively loaded shortened quarter wave vertical does, all else being equal. The original design and the St. Louis Express, quite simply put, are not equals, and in fact, not even in the same league. How does it stack up against a commercial multi-band trap or stub loaded HyGain quarter wave vertical? Well, they use nice large diameter aluminum tubing for the radiator instead of flattened copper coax braid and/or heavy (#10 - #16) copper wire, and either inductive or stub-loading. Perhaps they are a little more than equal, but probably not enough to produce a noticeable difference in signal strength.

How does it stack up against a GAP or any of the other exotic designs touted as 600% superior to a plain old quarter wave vertical like the W6MMA SLV? So far I haven't seen any tables of data or graphs of field strength measurements to prove all those wild claims. As an Elmer once told me: "there ain't no free lunch included among the Laws of Physics." Luckily, modern receivers -- even those in QRP rigs -- are sensitive enough to copy a couple of watts to a dummy load and make "fun" events like the QRP-L dummy load contest a possibility.

What's a newcomer to do? First, get some antenna books with drawings in them like the ARRL Antenna Book or Antenna Compendium Vol. nn, or W6SAI's Antenna Handbook or Paul's Lee's Vertical Antenna Handbook etc. If the antenna being considered doesn't look anything like the antennas in those books, and isn't presented with data (NOT including SWR "data" because it means nothing!!!) and perhaps graphs, just don't try it. The safest bet is a classic dipole, fed either with low-loss coax (never RG-174U!) or balanced feedline (twinlead, window line etc.) up as high as you can get it. End fed resonant and random wires, often worked against a quarter wave "counterpoise" wire are also safe bets. A standard quarter wave vertical like the W6MMA SLV or Hy-Gain trap etc will work as well as attention to the radial system and local ground conductivity allows. But if the antenna being described sounds too good to be true, it probably is. There ain't no free lunch with antennas.

FDIM 2000 - A Call for Papers

IMPORTANT - PLEASE READ!

Although Dayton is still months away, now is the time to start mixing those creative juices. We've now had four very successful years with the FDIM Symposium at the Dayton Hamvention. The Thursday of Hamvention week, we gather some of the best minds in QRP for an 8-hour symposium on QRP topics.

Please consider sharing your talent and experience at FDIM 2000 by giving a talk and writing it up for publication in the FDIM 2000 Proceedings. The topics are wide open. It can be your latest construction project or techniques; an antenna project; operating techniques or experiences – you name it. All that is required is for you to present the talk at the FDIM 2000 Technical Symposium at Dayton on Thursday, May 18, 2000. In addition, we will want you to document your subject for publication in the FDIM 2000 Proceedings and also for the possible publication in the QRP Quarterly.

There are only eight time slots available, so it won't be possible to use every idea. If interested, please send a short description (one paragraph) of your proposed talk to me by January 1, 2000. You may send them by e-mail or U S Mail.

FDIM Symposium feedback needed

It has been suggested to me that we have two tracks next year. One would be for experienced hams and be technically geared to that level. The second track would be for the novice to amateur radio. There we could focus on some basic issues. These could include but not be limited to: what are the basic items of test equipment needed for the shack & how to use them; construction & soldering techniques; antenna building and launching; operating; the list is open.

If we are going to do this, we need to determine the interest level. How many of you would want two different symposiums on that Thursday? Which one would you attend? What topics are of interest to you? Please let me know via e-mail or US mail. As with all other items, the decision of the judges is final. In this case, you are the judges.

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QRP CLUBHOUSE

Jim Stafford, W4QO email: w4qo@amsat.org

Welcome to the **QRP Clubhouse**. What's the secret password? Why, "**QRP**", of course. Thank you for your response to the last issue's Clubhouse column. As I have said many times, the real strength of QRPing lies with the local/regional clubs. There is so much activity that I observe; it would take many pages to report all the happenings. If your club/group is doing something, let me know. Some clubs do not have regular newsletters but if you do, send me one so I can glean some news. If you don't have a newsletter, by all means use this column to "drum up" new members in your area or alert your group to some upcoming event.

NorCal - Most everyone is a member of this fine group or catches up with the news via Jerry (WA6OWR) Parker's great club web page: www.fix.net/~jparker/norcal.html. I caught up with Jerry at HamCom in Dallas in early June. He is a nice guy who truly enjoys QRP activities and does what he can to help everyone else enjoy it more as well. This fall quarter brings up the Norcal sponsored, you guessed it, **Pacificon - October 15/16/17 at the Sheraton Hotel in Concord, CA**. An all-star lineup of QRP speakers will be giving us their latest thinking and there are some very unique building events. I'll be seeing you there.

JARL QRP CLUB News as reported by correspondent: Hideyu Yoshimura, JA8CSL who brings us information that the club has undertaken a major project in the form of a Club Standard Transceiver. This project started as an item in the club news one year ago. Since then, the club's mailing list has been full of messages concerning the project. JH1ARY took his position as project leader in 1998 September and designed unique block diagrams for the club standard TRX. By the end of the year, JG3ADQ and JG1WAD became sub-leaders. The specifications for the club standard TRX is 17 m band (18 MHz), CW/SSB mode. The transmitting part is being designed by JG3ADQ (http://member.nifty.ne.jp/jg3adq/), and the receiving part is being designed by JG1EAD(http://member.nifty.ne.jp/jg1ead/). JG6DFK introduced a PIC for frequency counter. "Fujiyama" has become the name of the TRX. The future schedule calls for the production of kits by October and a full kit with extensive manual by January 2000. Expected price of one kit will be 20,000 yen without shipping fee, but the kit will be available only to Japanese hams for the moment. (Ed. comment: Sure hope others the world over will be able to partake of this exciting project!) Check out the web site for the JARL QRP Club at: http://www.infoseed.co.jp/qrp/.

Western FLA QRP Club - Steve Cohen, N3OIE, and some others in West FLA have held at least two meetings of their new club. Steve, along with Mike Maiorana, KU4QO (another of those neat Quaker Oats callsigns!) have been meeting at the Tampa Amateur Radio Club clubhouse on the second Saturday of each month. They have gone with that time proven approach of NO officers + NO dues + NO bylaws = NO BOREDOM! Amazing how anyone could have fun without organization, but it works. At their first meeting in July, they had almost 20 in attendance. Having no officers, their biggest problem was keeping people QUIET, so everyone was just talking away showing off their latest projects. Mike showed off his Desert Ratt Regen. Mac, KF4KSM, brought an SW-40 and NC-20. Out of town visitor, Jeff Greer, WD4ET, from Jax (that's Jacksonville for you non-Floridians) brought his partially assembled K-2 and the crowd was "wowed" to say the least. For pix of the action, check out the club website at: www.qsl.net/westfla and see for yourself. With the weather cooling down up north, we expect Steve and the gang will see some "snowbirds" for their upcoming meetings. Send Steve email for details: sdcohen@gte.net and join the QRP fun in West Florida.

AR QRP Club - Hot off the press from the very active AR club and their September Newsletter, we find all kinds of exciting news. For one thing, they have almost passed 300 members! Congrats to this group which now boasts members from as far away as China, along with some from 40 different states. One of their members had a nice article in QST for August. It challenges all of us to get going in Milli-Watting. In it, Jim, KJ5TF, and many others are going to work alls states with a total power of 1 watt. Now that is not using 1 watt to work each state. It is using the power for each state added together to total ONE watt. This means an average of 20 mw per state. If you use 30 mw to work a state, you need to balance it by using 10 mw to work another. Of course, for Jim this should be no problem as he recently used 1 mw to work Seattle and in the process picked up the popular QRP ARCI award of at least "1000 miles/watt". His number for the Seattle QSO? 1.6 MILLION miles/watt and the award hangs on his wall right now. Congrats Jim! The AR Club is really active with their nets as well. Check them out on Monday evening at 7:30 CDT on 3.560 or on Wednesday on 7.042 MHz. The club also has the Millennium Challenge, but that will have to wait for another issue of the Clubhouse. Can't wait - check out their website (see www.qrparci.org under Clubs) or drop Bob, N9ZZ, AR QRP #1 a note at: n9zz@centuryinter.net

IOWA QRP Club - The Iowa Club has all kinds of things going on, almost too numerous to mention as they say. I note from the newsletter they sent me (other clubs have sent theirs as well and yours is most welcomed in electronic or hard copy format) that they were active at the Des Moines hamfest in April. This was followed by an even bigger blast at the Sioux City Hambree in August. Ade Weiss, W0RSP, was in attendance much to the enjoyment of all. Ade brought his HW-8 and worked at the table wet up by the club. Larry, WB0RMT, Paul, KB0JIT, and Jerry, WB0T, brought out complete QRP stations. A luncheon on Saturday followed a Friday night Build-It party at which everyone built a NJ Fireball! John Burnley, NU0V, (burnley-ia@worldnet.att.net) tries his best as President of the IA QRP Club to keep everyone under control. I know, John, it's tough, isn't it? <grin> The club newsletter is available on their website: http://zeus.ia.net/~spinner/W0FMS/IowaQRP

Picowatts/Giganews - I am getting so much news from you all that we should be back to **two** pages in the next issue. In the meantime, I will mention some short news items in my final few lines. You'll find more exhaustive info on these remaining three clubs in the new **Club** pages on the QRP ARCI website (http:www.qrparci.org). ~~The **Eastern PA QRP Club** had a great Field Day showing. In addition to the food (first priority), Ron Polityka <wb3aal@talon.net> reports they had a good score thanks to their "killer" antenna. ~~The **NoGaQRP Club** had a jam-packed meeting in August with over 20 in attendance. The meetings are regularly held at Tech America (11 AM) on the first Saturday of even numbered months in Atlanta. The meeting did not break up till after 2 PM. However, the next meeting will be an outside event at a park on October 2 and will be a "Run for the Kudzu" after the famous Colorado QRP Club's Run for the Trees. Keep an eye on the club web site: www.qsl.net/nogaqrp for details on club meetings and also on their **new kit project: the NoGaPiG**. ~~Wisconsin sports the new **Cheesehead QRP Club** - Brian, NA9K <kcieslak@execpc.com>, reports that this contest oriented club obtained NQ9RP for the DX contest this past summer. They were also at Radio Expo in Grays Lake, Ill. in September. Drop Brian a note to get more info. News of the Cheesehead Club was also on the ARCI **Upfront News** page for a few weeks. Yours can be too. Just send it along. Deadline for next QRP Clubhouse column is November 10. Please send along your news for the first quarter of 2000! Until then: **QRP IS THE WORD!**

The NOGAPIG – North Georgia Power Indicator/Guard

Sam Billingsley, AE4GX *Phil Specht, K4PQC* *Bob Confrey, WA1EDJ/4*

email: sbillingsley@usaninc.com

Introduction

This article describes a North Georgia (NOGA) QRP Club project currently in progress. We expect to have it available as a kit by early November 1999. For the latest information on the kit's availability, check the NOGA web page at http://www.qsl.net/nogaqrp/.

Are you a candidate for the NOGAPIG? Maybe so if you have ever been in one of these situations:

- Did you ever BBQ a rig by connecting it to the battery backwards?
- Ever short the power lead in the rig while adjusting something and smoked the leads or blew your last fuse?
- In the heat of a "To The Field" contest forgot to check your gell cell voltage and missed a QSO because of marginal power?
- Have you even jury-rigged you gear to a power source of questionable specifications (told by your buddy it's OK) only to have an over voltage condition smoke some key parts?

If you answered yes to any of the above then the NOGAPIG can help save your fun and pocket book.

Features and Functionality

- **Auto healing fuses.** Eliminate the need to carry spare fuses under typical circumstances. Using PolySwitch devices from Raychem. Various current options available. If this feature is not desired conventional one-time fuses have be used simply by placing the wire leads to the external fuse at the points the PolySwitch (about the size of a 100v capacitor) is normally located.
- **No voltage drop penalty for reverse voltage protection.** Saving those precious fractions of volts in the field.
- **Custom settable low voltage detection point.** Letting the user determine his/she own minimums for operating batteries. Simple two resistor ratio to set. We elected to use discrete resistors for the kit for reliability. Solder pads are etched for user pot to be installed as a personal option.
- **Over voltage protection.** Detection and protection against overvoltage (>15v) using an SCR device.
- **Minimal Current used for monitoring function.** CMOS Opamp and low current zener to limit normal current drain to less than 4 mA.
- **Very small PC board footprint.** The unit is about 1" X 1.5". The board can be mounted in individual pieces of gear or placed in an enclosure and used generically for multiple rigs (not necessarily simultaneously).
- **No exotic parts.** The unit uses common currently produced components. Every component is priced at less than a dollar.

Theory of Operation

The "North Georgia Power Indicator/Guard" (NOGAPIG) consists of three basic components: (1) A reusable fuse device, (2) a low voltage monitoring circuit and (3) a reverse voltage and over voltage protection circuit.

A reusable fuse device

Typically when QRPers are in the field they are using tried and true gear and so normal operation is expected and usually occurs. The most common problem occurring in this situation is a power lead short and this can be the result of a one-time "dropping" the old screwdriver to the rarer case of wiring/component shorts caused by gear movement, shocks or other events that over time can cause something to short or cause excessive current. The reusable fuse used in the unit is a "PolySwitch" made by Raychem. It was designed for the cell-phone industry and transportation where popping a one-time fuse is not desirable because of safety reasons. The fuse- like device will hold closed at the rated current and open at about 200% of rated hold value. This is not unlike normal one-time fuses so concerns about speed of operation and percentage of over current are negated. Once opened because of excess current the PolySwitch will cool back down and reestablish the closed (continuity) state. If the fault is not cleared, the device will remain open.

So, no more fuses or "no fuse" situations that lead the QRPer in the field to get frustrated.

Low voltage-monitoring circuit

The low voltage is the heart and reason of this device. Typically QRPers are in the field and are forced to carry test meters to permanently or periodically check the battery condition. This device constantly checks for the battery condition getting to the point of marginal operation for the rig or a dangerously low discharge point for the battery type. This is being accomplished for about 4mA of battery current. When the low voltage (user selected) value is reached an LED will light to attract the operator's eye and appropriate action can be taken. In any event, the operator gets the maximum out of the battery and the discharge is limited to safe values if the battery is taken out of service at the time of low voltage indication.

Reverse voltage Protection

The reverse voltage should not occur in the field using batteries "if" the user has taken precautions like "keyed" power leads and known battery units. But we all know folks that routinely used alligator clips, right?

This problem sometimes occurs in temporary situations. For example, hams visiting others and using borrowed power gear. The most common problem is getting in a hurry and "clipping" power leads to the wrong points thus blowing the gear in the blink of an eye. Protection is accomplished via 6amp diode behind the PolySwitch in a shunt configuration thus not affecting normal voltage unless reverse voltage exists.

Over voltage Protection

The over voltage condition should not occur in the field using gell cells or similar batteries but could occur with solar or automobile alternator powered devices. This could also occur if a power supply regulator fails or the supply is simply above the expected voltage. In these cases the SCR will crowbar the PolySwitch thus protecting the equipment. The unit has been tested up to 24 volts without failing.

NOGAPIG Production

The kits are expected to be available for shipment by early November 1999—depending on availability of parts and board production schedules. NOGA members will prepare the parts kits, documentation and mail packages. The PC boards will be produced by a nationally recognized Company specializing in small volume runs for amateur radio related groups.

The NOGAPIG schematic is shown in Figure 1. The prototype has been built into an Altoids box (original huh?) to illustrate it's size and flexibility. Figure 2 shows a close-up view of the prototype circuit board. Note the capacitor looking component just above the 8-pin IC. That's the PolySwitch resettable fuse device. The one shown is rated at 1.1A operation and opens at 2A. The larger 2A device is about the size

of a quarter but still looks like a molded cap. Note the two cables entering from the left (rear) wall. This unit was built using the standard power cabling used at this station. You could use power connectors of your choice to customize your unit to your needs. The 8-pin IC you see is the voltage comparator. The various resistors and zeners are located around this component. The test switch and LED are attached to the board by small gauge stranded insulated hookup wire.

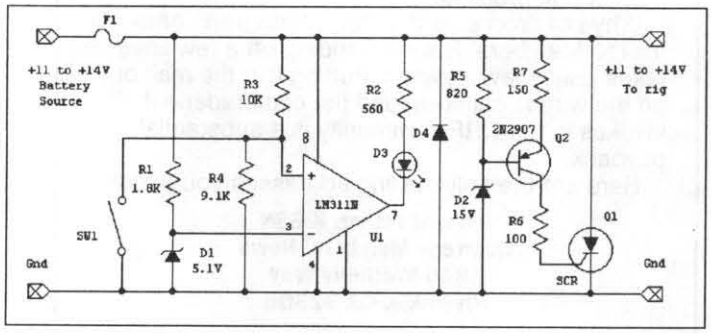


Figure 1. NOGAPIG schematic

Parts List

D1	1N5231B 5.1V Zener	R5	820 Ohm 1/8W
D2	1N4744A 15.0V Zener	R6	100 Ohm 1/8 W
D3	Yellow LED	R7	150 Ohm 1/8W
D4	6A axial diode	Q1	MCR218-2 SCR
R1	1.8K Ohm 1/8W	Q2	2N2907A
R2	560 Ohm 1/8W	U1	LM311N
R3	10K Ohm 1/8 W	F1	RXE-110-ND
R4	9.1K Ohm 1/8 W	SW1	SPST push button

Well, the object of kitting something is to make something of value that is reproducible by hams with a wide range of skills. Now notice, if you will, the NOGAPIG takes about the left third of the board and other components are located to the right. These are possible future NOGA offerings to provide a more complete QRP accessory that encompasses a full range of needs for field use with low-end QRP rigs.

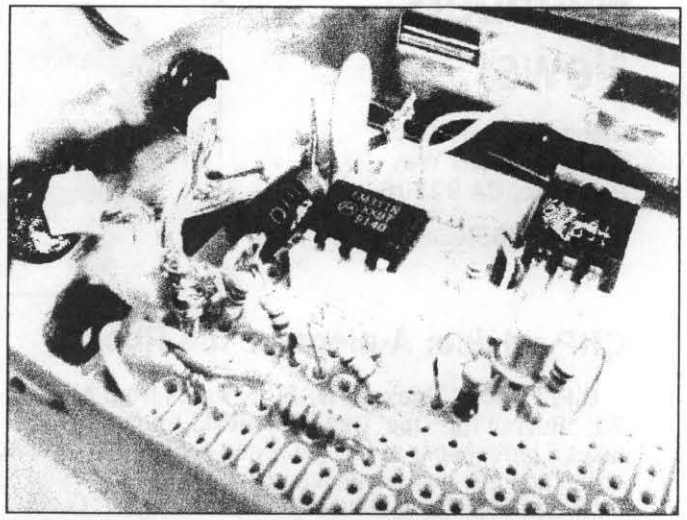


Figure 2. Close-up view of the prototype power monitor.

NOGAPIG Tri-Pack (Optional Capability)

To enhance the usability of this unit with simple QRP rigs two optional PC board sections will be included (without parts). These two sections will contain a drop-in capability for using one of the popular 8-pin keyer chips and a passive AF and Hiss filter for headphone enhancement. If both these sections are populated with components, then the sidetone from the keyer chip can be routed to the headphone connection. The keyer section will include space and pads for an optional reed relay to be added to the keyer output. Initially these sections will be documented with description and schematic for optional use by the NOGAPIG owner. If there is sufficient interest, possible kitting and distribution can be considered.

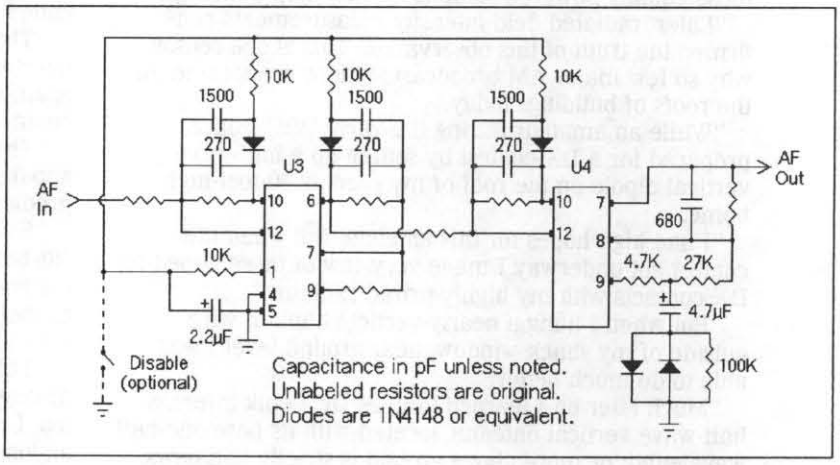
Edited by W1HUE

Correction: QRP PLUS Modifications, Part I

(January 1997 QRP Quarterly, page 37)

Larry East, W1HUE *Idaho Falls, ID* *email: w1hue@arrl.net*

It has been brought to my attention that there is an error in Figure 3 of my article "Modifications and Enhancements for the QRP PLUS Transceiver (Part I...)" that appeared in the January, 1997 issue of the **ARCI QRP Quarterly**. The figure shows my modification to reduce the high frequency roll-off of the analog SCAF prefilter for SCAF bandwidths less than 1µs. Unfortunately, the circuit as originally shown will not work – audio output will be lost completely at bandwidth settings below 1µs! The problem is that the diode and 10K resistor shown on the output of U3 were on the wrong side of the capacitors – the diode should connect to U3 pin 6 rather than pin 7. The correct configuration is shown in the figure at right.



Thanks to Bill Lazure, W2EM (formerly N2TPA) and Brian Kassel, W5VBO for bringing this problem to my attention. I am a bit amazed, however, that it took over two years for someone to inform me that the circuit would not work as shown in the article! ☺

Members' News

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QRP advice: A piece of the Rock

C.F. "Rock" Rockey, W9SCH, writes from Albany, WI: "Hurrah for **'Doc' Cebik, W4RNL!** Apparently it takes a philosopher to recognize and acclaim the simple, cheap and effective vertical antenna again.

"We are fortunate to have him among us. Dr. Cebik and I share two interests in common — vertical antenna and philosophy.

"Dr. Cebik teaches it professionally at university-level but I do enjoy reading it informally — another hobby of mine.

"So I think I'd thoroughly enjoy attending 'The Doc's' lectures upon either of his specialties.

"But on to vertical antennas: from the viewpoint of the less well-situated amateur, one of these will radiate well while yet requiring neither height nor complexity — nor a fat wallet.

"And its low angle of radiation will put your signal 'way out there — where you want it — with no need for an expensive tower or rotator. If you can't have a beam, a vertical is your next-best electromagnetic tool for QRP-DX work.

"Perhaps some, I hope, relevant 'examples from life' might be of interest here:

Back in the early '20s, when both radio and myself were in our youth, every AM-broadcast engineer strove to install his transmitter and antenna atop a tall building. This was the current 'hot' theory then. But it took only a few years of AM broadcasting experience to show that those stations, whose antennas were sited at ground-level had both a greater primary service area — out of their 'fading radius' as we say today — and these also seemed to receive more reports from distant listeners than did those equally-powered stations located atop buildings.

"Later, radiated field intensity measurements confirmed the truth of this observation. This is one reason why so few major AM broadcast stations are located on the roofs of buildings today.

"While an amateur during the 'dirty '30s,' I once prepared for a DX-contest by setting up a half-wave vertical dipole on the roof of my parents 30-foot-high home.

"I had high hopes for this antenna. But when the contest got underway I made very few of those hoped-for DX contacts with my highly-prized radiator.

"But when I hung a nearly-vertical hunk of wire outside of my shack window, near ground level I was able to do much better.

"Much later on I learned that, as Dr. Cebik infers, a half-wave vertical antenna, located with its base one-half wavelength or more above ground is strictly bad news.

"I puts too much of its radiated energy into those all-but-useless high angle lobes. Thirty feet is just about one half-wavelength for 20 meters, as we recall.

"At this height and higher, secondary (useless) high angle lobes begin to predominate the radiation pattern, robbing much of the zip from the main, low angle waves.

"Recently I have again been trying out my small homebrew three-foot-square loop antenna. I normally operate with this loop's plane set vertically upon my operating cabinet, centering it seven feet above ground level.

"When conditions are reasonable, I am able to complete European contacts with this small indoor loop quite regularly at QRP, or near-QRP power level upon the prime DX bands.

"But when I set the loop-plane at the same height — but horizontally — most contacts become more difficult and DX results poor.

"This would be expected if we assume that Dr. Cebik's theoretical E-plane geometrically parallels the loop plane.

"This again seems to confirm that vertical seems definitely superior to horizontal polarization when it originates at low antenna heights (in wavelengths) above ground — as Dr. Cebik explains. Incidentally, it's a real electromagnetic adventure to pursue long range work with a small indoor loop. Try it if you don't believe it.

"My favorite particular type of vertical wire antenna is one that originated back in the mid-'20s when it was often called an 'up and outer' antenna.

"This simple but effective radiator consists of a vertical quarter wavelength (or near that length) wire, worked against a single horizontal wire —dare I call it a counterpoise? — of equal length.

"This antenna's observed near omni-directivity and apparent low angle of radiation, is very close to that predicted for a 'classical' vertical radiator.

"Even though situated close to the ground at W9SCH (its base is about two feet up and it is supported closely to my frame house), its DX performance closely approaches that of my 80-meter, center fed 'zepp' antenna, which is located about 30-feet above ground.

"This simple 'up and outer' antenna, a great favorite among DXers of past years, remains a favorite of mine, too. I recommend it (when used with a good tuner) for anyone who cannot have a 'beam' but still wishes to enjoy some DX work — this I have no wish nor need for a 'beam' at W9SCH).

"Viva vertical antennas and viva W4RNL."

Keeping in QRP contact

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

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

Here are the only mailing addresses you need:

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

(e-mail: KI6SN@aol.com)

Review: The New LDG DWM-4 Digital Wattmeter Kit

Jeff M. Gold, AC4HF *Cookeville, TN* *email: JGold@tntech.edu*

I believe that LDG has once again come up with a winning kit. The new LDG kit is based on a digital Wattmeter design that was published in a July 1999 **QST** article. It is a microprocessor-controlled system that covers the HF, VHF and UHF bands. This little gem uses a system approach to monitor both power output and SWR for up to 4 rigs in any combinations of bands. The system consists of a main unit with the microprocessor and then a sensor unit that connects to each rig you want to monitor. My system has the main unit and one sensor for HF and one for VHF. The display allows you to control which sensor monitors which band and whether you want the display to be a bargraph or numeric output.

The kit is at the very top of my list with regards to quality of parts. The board is a work of art. It is very clearly silk-screened and the parts holes are in the exact location so that when you place the part on the board it fits perfectly. The board has plated through holes and is solder-masked. The solder masking is also at the very top of my list for being well thought out. The solder pads are very small, but allow easy soldering. This solder masking makes it very hard to end up with a solder bridge. The manual is also very well done. It is clear and easy to follow. There are step-by-step instructions and you check off each step as you complete it. The manual has you install parts by how far they stand off the board. I really like this approach. It makes it much easier to get the parts flat against the board and have the project look nice when you have completed it.

I would rank this kit as easy to build. There are not all that many parts. The board is not very densely packed and the silk-screen and directions are both clear. The parts come in seperate packages. I found no need to seperate out resistors and such before building. There are only a few values of each. You will need to use an Ohmmeter for the resistors. The resistors are 1/8 Watt and that makes it very hard to check the color code at my age even with my magnifying glasses on. It is also easier to take an extra minute to check rather than having to desolder parts later. There is no external wiring. The jacks solder right onto the board. There are pre-assembled ribbon connectors to connect the display and the controls. Even the switch and pushbuttons plug into a board and you just solder them to the board after they are installed in the case. This also makes it much easier to build and saves a bunch of time at the end of the project. There is one torroid to wind for the HF sensor. The LCD board comes pre-assembled. I will repeat that this is a very easy kit to build successfully.

The kit went together in about 2-3 hours as advertised. I have to admit I never clock building a kit. There were absolutely no surprises. The kit went together easily and was a pleasure to build. The instructions have you build your sensors before powering on the main unit. I ended up taking a break between the main unit and the two sensors. I like to know that what I have built works correctly before going on to other steps. I hooked up the 12 Volts to the main unit and turned the power switch on. I expected some lights and such to start flashing or some other indication that there was life in the unit. No smoke, but no visible means of determining whether the project was up and running. Next, I took drastic measures. I got out the manual and actually read it. Right there in plain sight, in straight English it said I needed to adjust R25 on the main board to get the LCD level correct. About 15 seconds later the unit was doing everything it was suppose to at this point. The same thing happened with the HF sensor. You would think I had learned my lesson. No indication it was working until I read the instructions and adjusted the unit's balancing capacitor. All in all, everything worked 100% as designed first time up.

Calibration of the main unit is done by having a known 100-Watt output signal and a 1:1 dummy load. There are two variable resistors for each of the four possible sensor positions. You feed it 100 Watts forward and adjust the digital output to read 100 Watts. Next you reverse the mini-stereo jack leads and do the same thing for the reverse reading. The manual suggests borrowing a very exact meter and calibrating against it. I plan to do that very soon.

The functions of the meter are accessible by using the menu and select push buttons. You can have either bar or numeric readout. You also can set the HF to either high or low power output levels.

I enjoyed building the kit and recommend it to anyone who is looking for something different to build. I look forward to many years of use. I have had very good success with both my LDG autotuner and my LDG QRP autotuner. Looking forward to seeing what pops up next in their accessory line.

The kit sells for about $90 with one sensor but no enclosures, or about $140 with enclosures included. (These prices do not include shipping.) It is available from:

LDG Electronics, 1445 Parran Road, St. Leonard, MD 20685
Phone: 410-586-2177 Fax: 410-586-8475
E-mail: ldg@ldgelectronics.com
URL: http://www.ldgelectronics.com/index.html

Specifications:

- Board Size: 3.5 x 4.0 inches
- Enclosure: 6.0 x 4.0 x 2.0 inches
- Sensor Size: 4.0 x 2.0 x 1.5 inches
- Connections: SO-239
- HF Power Ranges: 15, 150 Watts
- VHF/UHF Power Range: 150 Watts
- Power Requirement: 11 to 14 Volts DC, 75mA
- Measures peak or average power
- Bargraph or numeric readout
- LED and relay variable alarm system, 1:1 to 30:1
- Built-in error checking firmware
- Upgradable firmware
- Kit builds in 2 to 3 hours average

Edited by W1HUE

The "Jouster" - The Official KnightLites' 20 Meter Antenna

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Email: WJ4P@mindspring.com

Randy is a member of the "KnightLights" – an enthusiastic group of QRPers that originated in the Southeast United States but now has members worldwide. The name of the group has its origins in a comment on a QSL card received by one of its members: "Your rig puts out less power than my night-light, but my night-light doesn't reach past the bathroom!" –W1HUE

As the result of some casual reading recently, I was impressed by "stretched antenna" theory and the thought of how it could be applied to a vertical antenna for field day intrigued me. (See the reference listed at the end of this article.) After all, wouldn't it be nice to be able to tramp into the woods with an antenna that wouldn't be hard to erect and be effective as well? Generally speaking, vertical antennas for twenty meters are easy to erect, but require an excellent ground plane to operate efficiently. A little gain would also be nice if that could be attained, right? Oh, and if possible, how about making it very broad-banded too, please!

A little "stretched antenna" theory first. Normally, the legs of a dipole are considered as lumped values, that is to say, one value for inductance, one for capacitance, and one for resistance. Another way to consider each leg of the dipole is to look at it as three 30-degree circuit sections of inductance, capacitance and resistance. Adding a capacitor to each section to offset the inductance effectively shortens the antenna in relation to frequency. This then forces you to add additional sections to return the antenna to resonance, thus "stretching" the antenna. Currents now flow differently in the antenna, distributing the current flow over more of the conductor, giving it an effect similar to a collinear, but without sidelobes. The stretched antenna has no sidelobes, only the one main lobe! Also, the impedance of the antenna increases as it is stretched. This becomes an advantage when related to a vertical's feed point impedance and ground losses. All this stretching does something else. The Q of the antenna is lowered considerably, making this one of the widest bandwidth antennas I have ever seen. The lowered Q also makes this antenna not at all fussy about its environment. This characteristic allows the stretched antenna to not be de-tuned or affected by nearby metal or conductors.

Another fact about stretched antennas is that the longer you make them the more gain you can get because the more focused the antenna pattern becomes. This directivity will be at right angles to the wire. Stretching an antenna more requires the use of smaller capacitors and adds more sections. For example, keeping to a 5.5-foot wire section, a 3-dB gain antenna for 20 meters can be made 66 feet long (12 sections) using 43pF capacitors. The feed point impedance on this longer antenna will be about 550 Ohms.

The higher impedance feed point (hundreds of Ohms) of a stretched vertical antenna becomes an advantage since it has the opportunity to be more efficient close to the ground. It will work well with a moderate ground system instead of needing a fully conductive ground plane to work against like the pedestrian quarter-wave vertical with a feed-point impedance of 35 Ohms or so.

So, now we have a design that has an efficient feed point impedance for mounting near the ground, and about 1 dB of gain from a radiation pattern that is void of both sidelobes and high angle radiation and reception. And of course, let's not forget the wide bandwidth! I will now describe my method for building this antenna.

The Jouster's radiating element is composed of six sections of 5.5 ft. pieces of *insulated* wire joined by 68 pF capacitors. I made my capacitors from printed circuit board stock, which also doubled as the insulators and strain relief's. Each capacitor is a piece of PCB 1 in. x 3-7/16 in. Other PCB stock might have different characteristics so these dimensions may vary just a bit. I empirically determined these dimensions with a capacitance meter and then cut them all out on a shear. You will need six of these capacitors. The exact value of these capacitors is not super critical. Don't agonize over a picofarad either way.

Each capacitor is drilled with a one-eighth inch hole centered vertically and approximately one-half to three-quarters of an inch from each end in the long dimension (see Figure 1). Each hole is then deburred by hand using a very large drill bit that also bevels the edge of the hole on each side. You will see why this bevel is important in a moment. Assembling the radiating element then proceeds with taking the end of a section of wire and feeding a few inches of it through one side of the PCB capacitor and then soldering it to the center of the other side of the PCB capacitor. Using insulated wire keeps the wire from contacting the other side of the PCB capacitor, shorting it out and removing its capacitance properties. After soldering the wire end to the center of the PCB capacitor, push the wire flat, pulling any excess wire back through the hole and then flatten it again on the other side against the PCB. The wire makes a right angle bend through the PCB and now has formed a sort of strain relief. The bevel assists in keeping the edge of the PCB from cutting into the wire. Connecting the second wire to the capacitor means pushing the wire through the PCB in the opposite direction from the first wire and following the soldering directions again. You will use five capacitors to connect the six sections of wire. The last capacitor is used at the feed point end of the radiator. I added a few inches of wire on the other side of this capacitor to connect to the matching network. The total length of the radiating element is approximately 33 feet. Where you solder the wire to the capacitors will determine its exact length. This is also not a critical dimension.

I sprayed my capacitors with a conformal coating that we use at work to waterproof them after I assembled the antenna. I recommend that you do something to keep water from becoming a conductor across the edges of the capacitors and shorting them out. A bit of spray paint should do the trick.

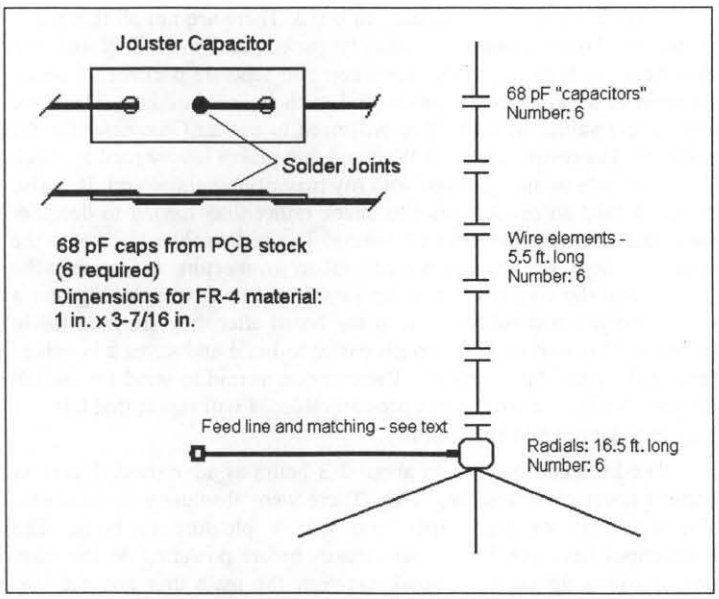

Figure 1. Complete antenna and capacitor detail.

The radiating element can be suspended from your favorite "skyhook" such as a string over a branch of a tree, etc. or attached to a vertical pole. At Field Day this year, we used both methods and both

The radiating element can be suspended from your favorite "skyhook" such as a string over a branch of a tree, etc. or attached to a vertical pole. At Field Day this year, we used both methods and both worked very well. Anxious to try it out, we had a great experience the night before Field Day. The campsite had a forest of nice trees, so we just shot a string into the trees and pulled it up. Using a 4:1 Unun, six quarter-wave radials and 50 Ohm coax we proceeded to work Serbia, Israel, and several other stations using 5 Watts that evening.

A radial system of six quarter-wave (16.5 ft.) wires seems to be enough of a ground plane for this antenna. The feed point is approximately 200 Ohms. While testing the antenna in the back yard, I initially fed it with 450-Ohm ladder line, and also 300-Ohm twin lead. I then experimented with an "L" tuner and 50 Ohm coax. Finally, I tried out the Unun and coax arrangement. The antenna worked fine using all four methods. With a "high" impedance feed point there are many efficient options for feeding the radiator.

This antenna may be used on the higher bands above 20 meters, acting like a random or long wire for those bands. Because of the series capacitors, it will not work on the lower bands. Feeding the antenna with ladder line or a tuner at the base would allow you to load the antenna on the higher bands.

Backpackers take note! This entire antenna will roll up into a very small wad of wire. I just wind the wire around the feed point capacitor and then fold in the next capacitor and keep winding. The radiating element rolls up into a wad that fits in the palm of my hand. The same can be said for the radials. How you feed the antenna will determine your size and weight for the entire arrangement.

At home in the back yard, this antenna was very obviously a low angle radiator. Comparisons with a horizontal wire antenna and a commercial vertical antenna were very interesting, revealing that this antenna is a good performer. Most times the Jouster was better than the commercial vertical. Depending on the location of the station, the horizontal wire was better as you would expect from a different antenna pattern. The expected patterns of the Jouster and a standard 1/4-wave vertical are shown in Figure 2.

So how did this antenna do for Field Day, you may ask? Our QRP Field Day outings are very laid back with emphasis on fun and the adventure of a new site every year. We operated at times very hard and other times hardly at all. But one thing was apparent: with a few exceptions for some very strong stations with no "ears"(probably due to generator noise), if we could hear them, we could work them.

Another opportunity to use the Jouster in the field came during the ARS bumblebee contest. We trekked to the end of Topsail Beach and set up just off the water with a 20 meter dipole at 30 feet, fed with ladder line, and the Jouster hung on a self supporting pole. The side by side comparison was very convincing! We spent most of the time using the Jouster due to its obvious edge in performance.

The KnightLites are considering making this a kit project containing the capacitors and Unun components. If you are interested in this, please feel free to email me.

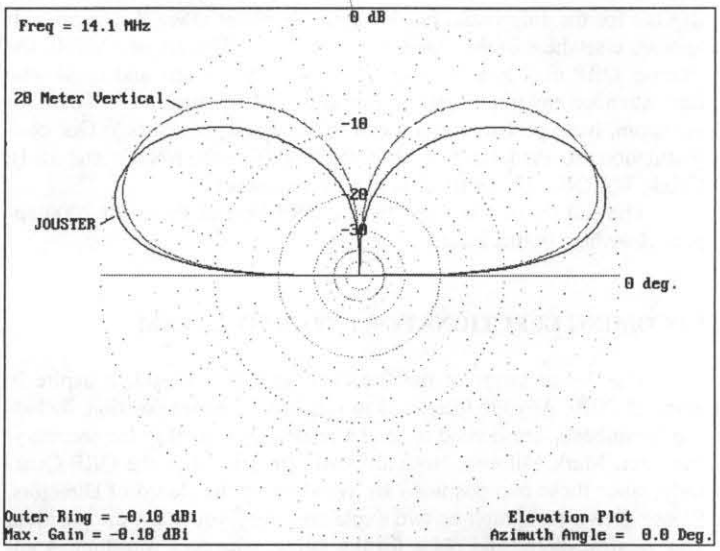

Figure 2. EZNEC model comparisons of Jouster and standard 1/4-wave 20M verticals over average ground.

My thanks to Paul Stroud, AA4XX, for the EZNEC plots and additional testing.

Reference: "Loaded Wire Aerials" by F. J. H. Charman, B.E.M., G6CJ, **Communications Quarterly**, Spring 1999.

Edited by W1HUE

Ramblings of a Displaced Cajun

Joel, KE1LA (ex WA5CVM) in Maine *email: hamjoe@juno.com*

Hi y'all. Once upon a time a young Cajun lad got his ham ticket and ñbarked upon his ham career. Umteen years later the Cajun lad found hisself with a QRP rig. He called CQ till his key could do it on its own. No one answered this brave young lad and he started checking this and that to find the problem.

Finally his neighbor took pity on him and asked him to bring the QRP rig over to his house. So the young Cajun toted his QRP rig over and his neighbor hooked it up to his four element quad, which was up 50ft, and commenced to communicate with Europe and everyone else they heard. "Seems like u got a 'lack of an antenna' problem" said his neighbor.

So the young Cajun lad went home and made hisself a three element quad out of bamboo and TV mast. He put the antenna just over his roof and started working people on his little QRP radio. He worked all states and all continents and just a whole bunch of people, now that he had a good antenna to radiate his two Watts of power.

This thrilled the young Cajun lad so much he took his QRP rig and joined a Benedictine Monastery in Arkansas, visited a monastery in Missouri and married a good lookin' red head that was also visiting the monastery. She was sumthin' – made him an offer he couldn't refuse, she did. ÑCourse the Cajun lad ended up in Maine where his red headed beauty was a professor at a university.

Don't make no sense, you say ... makes better sense than using low power and a poor antenna. Remember, connected to every QRP rig that makes consistent strong signal contacts is a good efficient antenna – an' that's the truth – more or less.

Notes from the President

Mike Czuhajewski, WA8MCQ 7945 Citadel Drive, Severn, MD 21144 wa8mcq@erols.com

QRP HALL OF FAME FOR 1999

The inductees into the QRP Hall of Fame for this year were announced at Dayton, and most of the QRP community knows who they are by now--but not from reading it here! We apologize for the late appearance of the announcement in the QRP Quarterly. It was submitted in time for the July issue, but inexplicably never made it into print. It appears elsewhere in this issue. (Those of you who are on QRP-L, the Internet QRP mail forum, have already seen the article and those who have attended any major QRP events after Dayton, such as Ft. Tuthill or Hamcom, have probably met some of the latest inductees.) Our congratulations to Paul Harden, NA5N; Dave Benson, NN1G; and L. B. Cebik, W4RNL. All are truly worthy of the honor!

The call for nominations for the QRP Hall of Fame for 2000 appear elsewhere in this issue.

UPCOMING ELECTIONS FOR EXECUTIVE TEAM

The 3-year terms of the President and Vice President expire in April of 2000. Anyone interested in running for either position, including incumbents, are invited to send a resume by e-mail to the secretary/treasurer, Mark Milburn. No ballots will be printed in the QRP Quarterly, since these two positions are voted on by the Board of Directors. Please give a paragraph or two explaining why you want the position, your qualifications, and plans for the future, whatever you think is appropriate. The Board will consider these when making their decision.

In addition to being an active member of the club, i.e., paying annual dues and receiving the QRP Quarterly, candidates must also have an active e-mail account. All internal QRP ARCI business has been conducted through that medium for several years, and it is an essential tool for all officers and board members.

No formal deadline for receipt of nominations has been set yet, but one will be announced in the January issue.

UPCOMING ELECTIONS FOR 3 DIRECTOR SLOTS

Board of Director positions are for 4 years and we have three that expire in April 2000. If interested in applying, please see the announcement elsewhere in this issue.

QRP SOCIETY OF CENTRAL PA INACTIVE

Robert Wicks, W3HAH, informed me that the QRP Society of Central Pennsylvania is in an inactive state due to lack of participation. He also said that their bylaws have a provision stating that they are to give their remaining treasury to another radio organization when their club is no longer viable. They decided to designate the QRP ARCI as the recipient, and asked that we mention this in the QRP Quarterly. Although I'm always saddened to see a local QRP club become inactive or even disband, we do appreciate the donation.

QRP QUARTERLY INDEX AVAILABLE

An index of the QRP Quarterly back through 1995 is available at our web page, www.qrparci.org. We also have an additional index covering the same period in a different format, produced by Chuck Boblenz, AD6GI, which we hope to add to the web page later after some data translation issues are worked out. For those who do not have Worldwide Web access, a printed copy of the 26 page AD6GI index can be obtained for a nominal cost to cover expenses. Contact me for details. (His index is actually two lists, one indexed by title and the other by author.)

PLANS FOR ATLANTICON 2000

The New Jersey QRP Club is already working on plans for their follow-up to the hugely successful Atlanticon QRP gathering that was held in Baltimore this spring, in conjunction with the ARRL MD State Convention (AKA the Timonium hamfest). For 2000, they will be holding the event in Philadelphia, which will be more convenient for the NJ QRP folks. For those who missed it this year I highly recommend that you make it to the next one! Between Dayton, Atlanticon, Pacificon, Fort Tuthill, Hamcom, etc, the QRP community has an ever-growing list of QRP seminars around the country. It's now possible for just about everyone to attend at least one world class QRP event within a reasonable distance of home instead of having to trek across the country. Times have never been better for QRP!

--qrp--

Back Issues of QRP Quarterly Available

George "Danny" Gingell, K3TKS, is now handling sales of back issues of the QRP Quarterly for the club. He currently has copies of all issues back to January 1995 and a few assorted 1993 and 1994 issues. Back issues are $3.00 each plus shipping. Four issues can be shipped Priority Mail in the US for $3.00. Please contact Danny before ordering to make sure he has the issues that you need. He can be reached as follows:

G. Danny Gingell, K3TKS
3052 Fairland Road
Silver Spring, MD 20904

email: K3TKS@abs.net

QRP ARCI 2000
Notes from Quaker Oats

by Jim Stafford, W4QO Vice President email: w4qo@amsat.org

First there was VE7QO and I. At least, that's all I knew of with the Quaker Oats callsign. Then my local club president applied for W0QO. Pretty soon everyone on the repeater was calling me Jeff. He assured me that he liked my call and since he was moving to Colorado, he looked for a 1x2 that he liked! Well, he moved to Colorado and people started calling me Jim again. Next I ran into Mike Maiorana, KU4QO, when he was speaking at the Huntsville Hamfest last year. He spoke on his effort in the Elmer 101 project.

The Quaker Oats callsign gets a lot of respectability due to Mike's untiring effort. I've run into a couple more Quaker Oatses over the years but was totally surprised to hear from Chuck Adams that he is no longer K5FO but K7QO. Holy Cow! Will this never end? What next WA8QO? Or KI6QO? KU7QO? Oh well, they say this is/might be some kind of flattery, I suppose. Bring 'em on!

I'm not sure what all this has to do with the title of my column this quarter, but it reminds us that everything changes. You can either wait for it, get run over by it, or you can make it happen. I really feel that QRP is in the forefront of change in the ham radio world. I suspect that FISTs feel they are, AMSAT feels it is, QCWA feels it is, etc. But I feel QRP and the QRP-ARCI is right in the middle of what can save ham radio. Please let me assure everyone that this club is not in competition with any other club, organization, or group in this. We need every club, every group, and every person working together. We sincerely want to nurture any local/regional/national effort that brings more fun to the QRP arena.

Along this line, I feel that in looking ahead there is no more significant effort that our club can do than to be sure you and your club are getting any help you need to enlarge the pool of QRP operators/builders. To this end, the club has recently clarified the direction we want to take in supporting you at your local hamfest. We have a package of materials/supplies/back issues of QQ that we will ship you. From the proceeds of sales, you can pay for your club hamfest table and keep other funds to help in your expenses. We only ask that you try to get as much publicity for QRP as you possibly can. Somewhere in there, we hope to get some renewals and new members as well as help you get the same. Check out the web site for details or drop our Club Pack coordinator, Hank Kohl, K8DD, k8dd@tir.com an email for details.

Second, I see Publicity or whatever you call it as a key to keeping QRP activity high. We in QRP ARCI have tried to put some effort into this area in the past, but it has not worked out all that well. This brings me to one of my points - if we are to change, we need your help. If you would like to do something in this arena, contact me.

This could be like Joe and Barbara Spencer, KK5NA/KK5QA. I met them at HamCom in June at the NorTex QRP table that they and Doc Drake, K5TB, had set up in partnership with QRP ARCI. They did a great job at the hamfest and the QRP activities were top notched including the BBQ on Friday night. After the hamfest, Joe said that he and Barbara were thinking about going around to other hamfests to promote QRP. They have done this. I'm not sure how many hamfests they have been to, but like they say, "Every little bit helps".

Other areas you might help in - plague coordination for contests, announcements in various ham journals, keeping an eye on "top ten" winners in the QRP category of contests - sending an application blank if they are not a member, and the list goes on. You probably have ideas like this.

Third, I believe there is a lot more than can be done on the web. I have been working with Dave, WA4NID, to improve the club web site. There are many great QRP sites around. I have some ideas that I have not seen on any of them. For example, we ran a page on the club site (www.qrparci.org) after Field Day where you could post your "soapbox" right after the event. That page is now available for review on the club site. I can see lots of things like this.

We are making the web site work in a "distributed mode." In this, we have used some club members to keep some of the pages on their server. We merely link to that page from our site. We are trying to have a uniform "look and feel" to the whole thing and it is working well. Check out WD8RIF's page that he maintains on his site with the QQ Index. If you would like to host a page of our web site or maintain some of it, drop me a line. You can do this from the comfort of your den, so to speak.

A related point - if you haven't been by the club site lately, check it out. We now have an Upfront News page where you can get your latest info out there. It might just be a spot to get a link to your club site where the action is detailed. Again, drop me some news.

Fourth, I believe that QQ can continue to improve. It will be tough after what Ron Stark, KU7QO (I mean, KU7Y) has done over the past 4 years, but with Mary Cherry, NA6E, at the helm, I am sure we will find a way to make it even better. I also feel that there just might be room for some other publications from the club. In fact, one has been brewing in my mind for a year or so. W4DU, AA7QU, and others have been encouraging me in this. If you have ideas, suggestions, or a book you would like to write, let's talk.

Fifth, **FDIM 2000** is going to be bigger and better than ever. You can help. There are at least 20 folks required to make it happen and you can be one. Have you heard about the possibility of a dual track for next year. A beginner/tutorial track and a "professional" track. Some speakers would be the same but others would be different. Just for thought but a way to build that excitement for more folks.

Is this a bold new thrust for 2000? Perhaps not bold, but it can keep the flames going. I think QRP is where the **THRILL** in ham radio is for 2000 and with your help, we can set some more folks on fire or at least throw gasoline on their simmering excitement!

Email or 770-993-9500 **LET'S TALK!**

Jim, W4QO

Call for Board of Director Nominations

Mike Czuhajewski, WA8MCQ *7945 Citadel Drive, Severn, MD 21144* *wa8mcq@erols.com*

The QRP ARCI has 6 Board of Director positions, which are for terms of 4 years. Three of them expire in April of 2000 and we'll have elections soon. We'll get to that further down the page, after a recap of the recent history of the Board of Directors.

Things gradually got into a confused state several years ago, so we wiped the slate clean in 1996 and started afresh. At that time, elections for directors had not been held for a good while and we were "running on fumes" with almost no one left on an un-expired tour of duty, although there were appointees filling some positions. (We also had 11 Director positions, a holdover from days past but not really necessary. President N8CQA reduced it to a more realistic 6 that year.)

The elections in early 1996 filled all 6 slots on the streamlined Board, with the additional 3 candidates being placed on a waiting list to serve out any terms that might become vacant before expiration. As it turned out, not only did all 3 alternates move up to fill un-expired positions, they in turn moved on for various reasons and were replaced with others to fill out their terms! Those additional candidates were KA3YJG, WA8LCZ and WA4NID.

To balance things out and get the cycle going smoothly, three of those 1996 positions were for the full 4 years, to expire in 2000, and the other three were for two years, running until 1998. That way, one half of the board would be elected every two years, giving us regular elections but sparing us the administrative burden of doing it every single year.

As reported in the April 1996 issue, the following were elected to 4 year terms expiring in 2000: KI6DS, K3TKS, and W4QO. Elected to 2-year terms to expire in 1998 were KT3A, K8DD and the late N0EB. In 1998 those expiring positions were uncontested so the three incumbents--who had all placed their hats in the ring again--were declared elected with no ballots being printed. Those terms expire in 2002.

As a result of a number of resignations from the BoD over the years, we currently have the following members: expiring in 2000 are K3TKS, as well as WJ2V and KU7Y, the latter two having been appointed to fill out the remainder of others' terms. Expiring in 2002 are KT3A, K8DD, and K7QO (nee K5FO), who was appointed to fill the remaining term of the late N0EB.

WANT TO BE ON THE BOARD?

Anyone interested in running for one of the expiring Director positions, including incumbents, should send a brief resume by e-mail to the secretary/treasurer, Mark Milburn, kq0i@arrl.net. Send a paragraph or two telling why you want to be on the Board and include your qualifications, plans, and whatever you feel is appropriate. These will be published in the January issue along with a ballot, and the membership will vote. Results will be reported in the April 2000 issue, with the new terms starting on the first of that month. Since the deadline for the January QRP Quarterly is mid November, you have a limited amount of time to respond. (If this October issue comes out late we'll try to make allowances to give interested people sufficient time to respond, although we can't push the deadline by too much without throwing the January issue off schedule.)

If you do express interest in being on the ballot, you will receive confirmation from Mark. If you don't hear back from him shortly, please assume that he did not get it and send it again. We want to make sure that no one is denied a spot on the ballot because e-mail wasn't received.

Qualifications: Candidates must be active members, i.e., current subscribers to the QRP Quarterly. They must also have an active e-mail account, since all internal QRP ARCI business is conducted through that medium.

Don't forget, the deadline for getting your name on the ballot in the January issue is the middle of November. Send your resumes by e-mail to KQ0I, and make sure he sends a confirmation.

— DE WA8MCQ

QRP Hall of Fame for 2000

Mike Czuhajewski, WA8MCQ *7945 Citadel Drive, Severn, MD 21144* *wa8mcq@erols.com*

It's that time again--we are now accepting nominations for possible inductions into the QRP Hall of Fame in 2000. (I hereby certify the QRP Hall of Fame as Year 2000 Compliant.) If you feel someone has had a significant impact on the QRP community through outstanding accomplishments (technical, operating, organizational, etc), it's time to nominate them for this honor. As usual, you have until the end of January to get your write-ups to me, WA8MCQ, via mail or e-mail. The nominations will be collected and sent to the voters, we'll take a week or so to discuss them before voting, and the inductees (if any) will be announced at Dayton. (A 2/3 vote is required for induction.)

The voting body consists of the Board of Directors, President and Vice President. For the last 3 years we gave the QRP HoF members the option of voting if they wished, and several of them accepted. That option will be extended to selected members of the HoF this year, based on their past participation.

Nominations may be submitted by anyone, whether a member of the QRP ARCI or not. Similarly, membership is not required for someone to receive the honor, since this is an award to recognize those who have made great contributions to the QRP community, not just to the QRP ARCI.

If submitting a nomination, you must do more than simply toss out a name. We need to have a few paragraphs giving some details of the accomplishments, telling us why the person is worthy of being in the QRP Hall of Fame. Don't count on all of the voters knowing everything about your favorite QRP hero; you think they are worthy of the honor and it's your duty to convince us. In the past, it was not unusual to see comments to the effect that since someone didn't bother to write more than a line or two, then the nominee must not be very worthy of getting the vote.

While we have no list of specific requirements to meet for induction, we do have some guidelines. In general, nominees should be someone who has made significant contributions to QRP in one or more areas, and preferably things benefiting a large number of people. Long-term contributions carry more weight than limited, short term ones. Nominees have a much better chance of induction if they have been actively serving the QRP community for an extended period of time, ie, several years. Naturally, the nomination letters should only include information on achievements that are related to QRP.

Send all nominations to me, WA8MCQ ; my USPS and e-mail addresses can be found elsewhere in this issue. Important: all inputs must be acknowledged by me! If you do not hear back from me in a short time, please assume that I never received it, and let me know. I'd hate to see someone lose out on the chance to be inducted because a letter or e-mail never got through.

As always, each nominee is judged on his/her merits; this is not a competition to choose the top two or three or whatever. There are no quotas and no limits. If the voters don't feel any nominees truly deserve the honor this time around, none will be inducted simply for the sake of having someone to announce at Dayton. On the other hand, if there are a dozen nominees and all are judged worthy, all will be inducted. (And we get a quantity discount on the plaques!)

The following, in alphabetical order, are the current QRP Hall of Fame members. Do not nominate them!

Chuck Adams, K7QO
Brice Anderson, W9PNE
Dave Benson, NN1G
Wayne Burdick, N6KR
George Burt, GM3OXX
Jim Cates, WA6GER
L. B. Cebik, W4RNL
Tom Davis, K8IF
Doug DeMaw, W1FB (silent key)
Rev. George Dobbs, G3RJV
Paul Harden, NA5N
Wes Hayward, W7ZOI
Doug Hendricks, KI6DS
Roy Lewallen, W7EL
Rick Littlefield, K1BQT
Dick Pascoe, G0BPS
Randy Rand, AA2U
C. F. Rockey, W9SCH
Gus Taylor, G8PG
Adrian Weiss, W0RSP

Remember, if there is someone you feel is deserving of being inducted into the QRP Hall of Fame, you have until the end of January to submit a nominating letter to me.

— DE WA8MCQ

Do you want to write a Review?

By Larry East, W1HUE

Have you just purchased a new gadget, rig or kit that you would like to tell the QRP world about? Then write a review and send it to the QRP Quarterly! Reviews are handled by our Special Features Editor, Larry East, W1HUE (see back cover for his address). We have no strict guidelines for reviews, but we do ask that you include the manufacturer's basic technical specs and any results of technical tests that you have performed. If you are not sure about some aspects of the device that you are reviewing, don't guess; ask the manufacturer for clarification. (We reserve the right to also contact the manufacturer for additional details or clarification.) Please try to be as objective as possible; tell about the good as well as the bad features. Larry prefers to receive articles in machine readable form as ASCII text files on PC format floppy disks or as email attachments. If you want to send word processor files, Larry can handle MS Word 6/7, WordPerfect 5/6 and "Rich Text File" (RTF) formats (please don't do any fancy formatting or embed graphics within WP files). Figures (drawings and photographs) can be supplied as "hard copy" (good quality B&W or color prints for photographs) or as digitized images (GIF, TIFF, PhotoCD, PCX or bitmap files). If you want your disks, drawings, etc., returned, please enclose an SASE with sufficient postage.

DE W1HUE

Contest Corner

Joe Gervais, AB7TT Email: vole@primenet.com

Contents

Upcoming Contests:

QRP ARCI Fall QSO Party	Oct. 23-24
Zombie Shuffle	(late Oct)
Holiday Spirits Homebrew Sprint	Dec. 5
CQC Snowshoe Sprint	(Dec)
MI QRP Club CW Contest	(early Jan)
Winter Fireside SSB Sprint	Jan. 9

Dates shown in parenthesis are tentative, check with the contest sponsor as the contest month approaches for actual dates/schedules.

Thoughts from the Contest Critter

The dog days of summer have passed here in the northern hemisphere, and in its place we now have the contest frenzy of autumn. In addition to a fine lineup of QRP club events, we also have the monster contests such as the ARRL Sweepstakes (CW and SSB), CQ Worldwide DX Contest (also CW and SSB), and others. More contesting that you can shake a keyer at. What does that mean for QRPers? A perfect chance to not only have fun and sharpen your skills, but promote QRP as well! Get in those contests and **submit your log**! Let everyone know that we QRPers are not only on the air, but working everyone we can hear and having a great time doing it! Not just CW either. Wouldn't it be great to see the SSB Sweepstakes results chock full of QRPers? With the sun spots hopefully helping out, 5W will sound like a kilowatt with a decent antenna on the right bands. All we need to do is be there, radiate, enjoy, and submit a little paperwork to show our colors.

In the last issue, I mentioned my intention to eliminate the schedule conflict between the Fall QSO Party and Pacificon. The Fall QSO Party is now scheduled for the weekend **after** Pacificon (see dates above). No longer will QRPers have to choose between one of the largest QRP contests of the year and one of the finest QRP gatherings on the planet. We can finally have our cake and eat it too! I ran the new date past the collective minds of QRP-L and it was agreed the new date was good. So we'd better hear a whole herd of west coast QRPers on the air this year! ;-)

You know what really impressed me as I was processing the logs for this issue? How so many of us submit our logs, knowing we'll never win but wanting to share our results and show our support. It takes time and effort to submit those logs, and every one of them is appreciated. Entries with five contacts. Or even one contact. Guess that's what I like so much about QRP (and QRPers) - we know the fun and reward is in the operating itself, the way ham radio was meant to be enjoyed. Not that any of us would mind winning of course. ;-)

Enough of my jabbering. Let's get on with the results and announcements! Hope to work you on the bands soon!

Cheers de AB7TT, Joe, QRP ARCI Contest Critter

Milliwatt Field Day Results

A good showing of QRPers during ARRL's Field Day this year. I'm ashamed to say I was trapped in the office, so wasn't able to join in the fun this time. But I was able to live vicariously through the logs and soapbox comments of the rest of you. Hey, I'll take what I can get! Of the 16 logs received, NOUR and W3TS duked it out for 1st place overall, though W3TS snuck into the Milliwatt category for a win there. KJ5TF came in with the hardcore milliwatt entry of 70mW max (he used 40-50mW for most of his contacts). WQ2RP took the lead in the Club class, while N4ROA and his High Knob Hooters grabbed the win in the Group category, chased closely by the crews of K2WNY and N3EPA.

mW Field Day Results (*) = Multi-op

Callsign	QTH	QSOs	Mode(s)	Power	Score	Club/Group	#Ops
N0UR	MN	680	CW, Phone	5W	6,500		1
W3TS	PA	371	CW	1W	5,565		1
WQ2RP(*)	NJ	291	CW, Phone	5W	4,575	NJ QRP Club	10
N4ROA(*)	VA	404	CW	5W	4,040	High Knob Hooters	4
K2WNY (*)	NY	376	CW, Phone	5W	3,855		2
N1EI(*)	CT	255	CW, Phone	5W	3,015	Natchaug ARC	20
N3EPA(*)	PA	318	CW, Phone	5W	2,825	Eastern PA QRP Club	???
AE4EC	NC	143	CW	5W	2,445		1
KH6AN (*)	HI	121	CW	5W	1,815	Hi QRP Club	8
AE4GX(*)	GA	158	CW, Phone	5W	1,630	N. Georgia QRP Club	4
W1XV (*)	ME	124	CW, Phone	5W	1,440		2
W3MWY	MD	89	CW	5W	1,335		1
KB3AAG	PA	164	Phone	5W	820		1
N3YVC	PA	54	CW	2.5W	810		1
K3CHP	MD	76	CW, Phone	5W	490		1
KJ5TF	AR	49	CW	70mW	480		1

mW Field Day Soapbox

W1XV & WA1UKV - Very casual and laid back affair. We used a TT Scout along with ... a 100 ft. longwire or a Cushcraft R5. We were right next to the ocean! ...What a blast it was using 5W ... received many compliments on phone when we announced that we were QRP! The idea was to have fun and we did!

AE4EC - Decided to go it alone at site of my choice just to see what I could do alone. ...Rigs were the TT Argosy at 5W, the SW40+ at 2.5W and the NorCal-20 at about 5W. Antenna was the Carolina Windom ... highest point about 45 ft. My goal was to try to contact 200 stations, but I never quite made it as at 69 years of age I had to get some sleep by 2AM.

W3TS - HB superhet xcvr at 1W, 130 ft tuned doublet up 50 ft. Reservoir parking lot, Halifax, PA.

KB3AAG & N3YVC - I operated an Index QRP++ at 5W. All antennas were wire, a dipole and a "super loop" at about 20 ft. Bill operated CW only, 2.5W with an MFJ rig and a dipole about 15 ft. up. We nearly cooked in the heat in the daytime and thought we were going to freeze in the middle of the night! We had never done it before, but decided it is the most fun one can have with clothes on!

N1EI - The 6M Sterba curtain worked real well on 15M!

N3EPA (Eastern PA QRP CLUB) - We had a ball, this was the 1st outing for the club.

KJ5TF - QRP+, btry pwr via solar, 20M ant is a half square, 15/10M are 2 ele quad. Operated in my shack.

AE4GX (North Georgia QRP Club) - The State of Georgia has been behind 12 inches of rain for the year, so of course, it all had to come down Field Day weekend. The good news, the solar flux has returned and the bands were hot--20M was good all night! The bad news was a tremendous soaking rain in Monroe, that forced us to operate for only half of the time as we did last year.

N0UR - I ran solo 1-op 1B Battery. Rig: IC 735 @ 5W to G5RV, battery/solar powered. I did my best ever FD...

Hootowl Sprint Results

The 1999 Hootowl Sprint was dogged by very rough conditions for most of the intrepid night owls who took part. The fickle whims of propagation played favorites though, with N4ROA raking in 270 QSO points and even getting called by a VK7, while others struggled all night for a handful of QSOs. N4ROA nabbed the overall top spot, as well as top multiband entry. K9PX took 1st Place in the 40M single band category, while K8NWD bagged 1st Place on 20M. In the Milliwatt category, K5DP and his 900mW pulled out a 1st Place finish as well. NQ9RP (club call of the QRP Cheeseheads of WI, operated by N9AW) nabbed contacts on 5 bands, making him the most band-prolific QRPer of the bunch. Congrats to everyone! We'll work on ordering better propagation next time. ;-)

Hootowl Sprint Results (*) = Multi-op

Callsign	QTH	QSO Pts	SPCs	Power	Score	Bands
N4ROA	VA	270	38	5W	71,820	15/20/40M
N2CQ	NJ	234	34	5W	55,692	20/40/80M
K1QM	MA	241	28	4W	47,236	20/40M
NQ9RP	WI	198	34	5W	47,124	10/15/20/40/80M
K9PX	IN	228	24	5W	38,304	40M
WA3WSJ	PA	186	29	5W	37,758	15/20/40M
NA3V	PA	196	25	5W	34,300	20/40/80M
WA8RXI	MI	189	20	4W	26,460	40M
N9MDK	IL	127	22	3W	19,558	20/40M
K8NWD	MI	104	17	5W	12,376	20M
K8ZAA	MI	88	15	5W	9,240	20M
W2JEK	NJ	92	12	3W	7,728	20/40M
KB2PLW	NY	96	11	4W	7,392	40M
K5DP	OK	72	10	900mW	7,200	20M
KB0EVM	FL	63	16	4W	7,056	20M
K7TQ	ID	72	13	5W	6,552	15/20/40/80M
W5WO	TX	55	11	800mW	6,050	20M
KQ0I	IA	64	11	5W	4,928	20M
WA4SQM	GA	48	12	4W	4,032	20/40M
K5EYE	TX	50	10	4W	3,500	20M
WB7OEM	WA	45	9	5W	2,835	20/40M
K4KJP	FL	40	8	5W	2,240	20M
KI8AF	MI	44	7	5W	2,156	20M
N6WG	CA	40	5	900mW	2,000	40M
W7ILW	AZ	32	5	500mW	1,600	20M
W2QYA	NY	25	5	900mW	1,250	40M
VE6QSL	AB	30	5	5W	1,050	20/40M
AL7FS	AK	36	3	4W	399	40M

Hootowl Sprint Soapbox

N6WG - Sure was a bummer evening, only 14 Q's for 4 hours work. I worked almost everything I heard, too, even though I only ran 900 mw. ...Rig was K2 at 900mw, and antennas were horizontal delta loop 12 ft high, inverted vee up 35 ft at center, and two vertically-polarized full-wave loops in phase. I needed them all, too :-).

KQ0I - OK, I admit it ... I chickened out. When the thunder began shaking the house, I just pulled the plug. Later the storm passed, but I just never got back to it. Good to hear all those member numbers, and the exchanges were a pleasure. Sure some good ops in QRP-ARCI.

WA8RXI - Had some nasty QRN due to approaching storms. But, got in there for about 3 Hrs of contest fun!

N4ROA - Very enjoyable 4 hrs, even had VK7CW call me.

K1QM - Great contest. The ARCI members get out there!

K8NWD - Couldn't work the whole contest due to family activities *but did get the last two hours in. Band conditions were good and the* K2 really performed well. PS - I ate all the pizza. :-)

NA3V - Ears are still ringing from 40m QRM & QRN! Nice contest.

N9MDK - 40M had bad QRN, 20 with poor prop, but it was a hoot!

K5EYE - I didn't hear anyone on 40M - nice group on 20M - these Hootowl sprints are a hoot!

W2JEK - Highlight was being called by UR5EAV, also working G4APO.

KI8AF - First CW sprint I'd entered and didn't know what to expect. I could only operate for one hour but was delighted in the courtesy and patience of the ops I made contact with. ...Guess I'm hooked now!

KB0EVM - First QRP contest. Lots of fun. Lucky to hear a PA0 and OM3 during the contest. Thanks for the patience and help from all.

KB2PLW - It was a great deal of fun.

Summer Homebrew Sprint Results

As usual the Homebrew Sprint proved to be a favorite, and as usual there was some confusion over scoring. :-) You get to apply the HB bonus for **each band** you use a HB rig on. So if you used a Sierra built of your own hand and made contacts with it on four bands, the 5000 pt bonus for HB Xcvr would be added four times. I was able to establish that three of you had used a HB rig on multiple bands but had only given yourselves credit for one band. Others had used a HB rig on only one band and used a commercial rig on others, and had correctly given themselves the one-band bonus. Next time a HB Sprint rolls around, I'll do my best to clarify that (probably via a custom HB Sprint Summary Sheet).

The results were interesting. K5ZTY ran away with the event, taking 1st Place overall despite his 20M Single Band entry. Must be that legendary TX Ionosphere Control Unit. :-) W3BBO took the Multiband category in a very tight race, while W3DP handily swept the *40M Single Band* race. A crafty Top 5 *Overall* finisher was N1EI and his mighty 240mW, who used his OHR-500 to maximize his per-band HB bonus and his FB delta loop antennas to get the RF out. Naturally N1EI bagged 1st Place in the Milliwatt category, chased by AB5UA and his 900mW 20M Single Band entry. I'm also pleased to report that the ever-patient HP1AC took top honors in the High Band and DX categories. Other notable (and appreciated) DX entries included G4EDG and AL7FS. Good to see so many "built it myself" rigs on the air!

Summer Homebrew Sprint Results (*) = Multi-op

Callsign	QTH	QSO Pts	SPCs	Power	Score	HB	Band(s)
K5ZTY	TX	256	32	5W	62,344	Xcvr	20M
W3BBO	PA	177	22	2W	37,258	Xcvr	20/40M
NA3V	PA	174	22	5W	36,796	Xcvr	20/40/80M
N0UR	MN	111	17	3W	33,209	Xcvr	40/20/15/10M
N1EI	CT	68	12	240mW	32,240	Xcvr	15/20/40/80M
W3DP	PA	202	17	5W	29,038	Xcvr	40M
KA1TQM	CT	83	13	1W	25,790	Xcvr	20/40/80M
AB5UA	OK	114	18	900mW	25,520	Xcvr	20M
AA1MY	NY	168	16	2.2W	23,816	Xcvr	40M
AC4QX	NC	165	16	5W	23,480	Xcvr	40M
N5RV	TX	129	19	3W	22,157	Xcvr	20M
K1QM	MA	145	21	4W	21,315	N/A	15/20/40M
K2JT	VT	57	8	3W	18,192	Xcvr	20/40/80M
HP1AC	Panama	113	22	5W	17,402	N/A	10/15/20M
WA2BQI	NY	121	20	4W	16,940	N/A	20/40M
G4EDG	UK	124	17	5W	16,756	Xmtr	20M
KB3WK	MD	89	13	5W	13,099	Xcvr	20M
N7GS	MT	83	11	2W	11,391	Xcvr	20M
W2JEK	NJ	25	5	3W	10,875	Xcvr	20/40M
W2KBF	NJ	74	10	5W	10,180	Xcvr	40M
K4AGT	AL	67	10	5W	9,690	Xcvr	20M
N3XRV	MD	64	10	200mW	9,600	N/A	20/40M

KF2PH	NY	61	18	5W	9,572	Xcvr	40M
AL7FS	AK	68	9	2.9W	9,284	Xcvr	20M
NW7DX	WA	51	8	5W	8,304	Xcvr	20M
WT9S	IL	50	7	1.5W	7,450	Xcvr	40M
WB4JJJ	VA	37	7	5W	6,813	Xcvr	20M
KG5LO	MI	31	5	950mW	6,550	Xcvr	20M
WA2OOD	CO	32	6	2W	6,344	Xcvr	20M
N6WG	CA	47	4	4.9W	6,316	Xcvr	40M
KE5TC	OK	30	6	2W	6,261	Xcvr	20M
KM1Z	VT	27	5	2W	5,945	Xcvr	40M
W6SIY	CA	17	1	250mW	5,255	Xcvr	40M
KC7MZT	MT	5	1	5W	5,035	Xcvr	40M
W7DRA	WA	5	1	5W	2,005	Xmtr	20M
N4ROA	VA	32	7	4W	1,568	N/A	20M
W3MWY	MD	105	14	3W	1,470	N/A	40M
N0IBT	CO	32	6	5W	1,344	N/A	20M
KQ0I	IA	22	5	5W	770	N/A	20M

Summer Homebrew Sprint Soapbox

WT9S - I had a blast, just wish I could have worked the whole thing.

N3XRV - Used the HW9 throttled back to 200mW on the WM-1, and a folded dipole laying on the roof of the house. Made about half the contacts by calling CQ, heard but couldn't work HP1AC and AL7FS.

KA1TQM - First attempt at 1W. Had a great time. Thanks NN1G!

KG5LO - This is a real simple entry, only 7 QSO's in just over one hour. Conditions were rough here. As always, it is a lot of fun even when you can't work it all. I especially like these HB sprints.

WB4JJJ - Well, not much activity on 20 here during the HB sprint...band was pretty slow after the first 30 minutes. But managed a few contacts....

KQ0I - Man, I'm ashamed to send this one in! Somehow I got it in my mind that the Sprint was from 6 PM to 10 PM, so when I sat down to tune up and read the instructions again, there was only an hour left. ... We'll get 'em next time. (You can tell I'm a Cubs fan).

AL7FS - The day started off very poorly and I finally walked away for a break from the noise. Only 3 QSOs the first hour ... Thanks go to all who took the time to work me. It made my day.

W6SIY - Band conditions were rough with lots of QRM on the Neophyte (no filtering) and static crashes from nearby thunderstorms. I didn't hear any stations outside of CA. I mostly had to call CQ due to my xtal control without vxo.

N6WG - This was fun, even if the 40m band was a bit thin during the day out here. My particular compliments to W6SIY who was contesting on 40m with 250 mw! Also to K7TQ who stuck with me during a particularly bad period of low signals until we made a successful exchange.

K5ZTY - 20M was strange today. Signals popped up out of the noise then just disappeared. Didn't make as many Q's as I would have liked but as always had fun in the QRP contests.

WA2OOD - Operated from friend's house (still in Colorado Springs). Ran off batteries and switcher supply (in boost mode to give constant 13.7V). First contest for the DSW-20. I'm not a contest-type, but this could change the way I look at things! It was fun!

W7DRA - Vy hard - xmtr drifted and rx drifted!

N1EI - Most of the activity seemed to be on 40M.

K2JT - QTH: Winhall VT. (Stratton Mtn). Very poor antenna installation from a great location. Bats came out at 0100Z every night! Set-up was outside on a deck.

W3DP - Another great sprint. Good condx low QRN and very little QRO QRM.

K1QM - Clearly 20/15M were poor. Too bad. I wanted to do "High Bands" mode.

N7GS - I heard far more than I worked - the band was up and down rapidly, east coast was very weak.

N0IBT - Dismal conditions.

AB5UA - Toughest conditions in the last 3 years. Still had fun, running 900mW. I chased G4EDG all afternoon, and got him in the last minute!

KE5TC - I'm just a casual QRP contester having fun and trying to improve my CW skills. Just sending this in so you will have an idea of the activity on the air for the contest.

W3BBO - Just finished building the Sierra with 20/40M modules, very fun event, thanks.

N4ROA - Worked on finishing my K2 and answered a few CQ's.

WA2BQI - Nice contest, good condx. Lots of members on!

Fall QSO Party Announcement

Date/Time: Oct. 23 1200Z to Oct. 24 2400Z. CW only, 6M thru 160M. Operate a maximum of 24 hours of the 36-hour period.

Exchange: RST, SPC (State/Province/Country), and ARCI number. Non-members send power out.

Categories: All-Band, Single Band, High Bands, Low Bands, DX, Multi-Op, Portable.

Suggested Frequencies: Near QRP calling freqs.

QSO Points: Member = 5pts, Non-Member Diff. Continent = 4 pts, Non-Member Same Continent = 2 pts.

Multipliers:

- SPC Totals (for each band, count each SPC once per band).
- Power: <250mW = X15, 250mW-<1W = X10, 1W-5W = X7, >5W = X1.

Score: QSO pts total X SPC total (all bands) X Power Multi.

Team Competition:

Teams may be formed of between 2-5 members, and will compete as a separate category in addition to individual entries of team members. The team captain **must submit a team roster to the contest manager prior to the event.** Team score will be the sum of individual scores of the team members.

Log Submission:

Entries are due within 30 days after the contest. Include a **summary of your results**, callsign(s) of op(s), ARCI member number (if applicable), station location and description, power used on each band, and total time spent on the air. Entries exceeding 100 QSOs include a dupe sheet. The highest output power used will determine the power multiplier. Output power is considered half input power.

Entries via email are welcome in **ASCII-text format** to <vole@primenet.com>. Mail paper logs to Joe Gervais AB7TT, ATTN: Fall QSO Party, PO Box 322, Peoria, AZ 85380-0322.

All decisions of the Contest Critter are final, though if you have extra pizza I'm always listening. ;-)

Holiday Spirits Homebrew Sprint Announcement

Date/Time: Dec. 5, 2000-2400Z. CW only, 6M thru 160M.

Exchange: RST, SPC (State/Province/Country), and ARCI number. Non-members send power out.

Categories: All-Band, Single Band, High Bands, Low Bands, DX, Portable.

Suggested Frequencies: Near QRP calling freqs.

QSO Points: Member = 5pts, Non-Member Diff. Continent = 4 pts, Non-Member Same Continent = 2 pts.

Multipliers:

- SPC Totals (for each band, count each SPC once per band).
- Power: <250mW = X15, 250mW-<1W = X10, 1W-5W = X7, >5W = X1.

HB Bonus Points:

- Bonus points for using HB gear apply to **each band** on which you make a QSO with HB gear.
- +2000 pts for HB transmitter, +3000 pts for HB receiver +5000 pts for HB transceiver.

Example: Sierra makes QSOs on 4 bands = 20,000 bonus pts.

Homebrew Definition: If you built it, it's HB.

Score:

(QSO pts X SPC total (all bands) X Power multi) + Bonus pts.

Log Submission:

Entries are due within 30 days after the contest. Include a summary of your results, **rigs used,** callsign, ARCI member number (if applicable), station location and description, power used on each band. The highest output power used will determine the power multiplier. Output power is considered half input power.

Entries via email are welcome in **ASCII-text format** to <vole@primenet.com>. Mail paper logs to Joe Gervais AB7TT, ATTN: HB Sprint, PO Box 322, Peoria, AZ 85380-0322.

All decisions of the Contest Critter are final.

Care and Feeding of Your Contest Critter

Being able to serve the QRP community has always been a pleasure, but as fun as it can be it still boils down to work. Late night deadlines, data entry, log verification, balky printers, you name it. While I have no complaints, there are a few reminders I'd like to mention for those of you who may be new to contesting.

• **Please ensure you've used enough postage**. As much as I enjoy a visit to the city post office *cough cough* ;-) it can get to be a bit of a hassle to drive down, collect and pay for logs that have postage due. I wouldn't mention it but it's happened more than once already.

• **Avoid multiple logs in a single envelope**. Whether it's logs for different contests you've entered, or logs for different (non-Multi-op) people in the same contest, doing so increases the chances that the Contest Critter is going to miss one of them, or not find the stray until results for the earlier contest have already been printed. I try my best not to let this happen, but it can.

• **Provide basic scoring info**. We Critters do our best to serve, but few things are more disheartening than opening an unscored, raw log lacking even a basic QSO and SPC count. I've always processed them and will continue to do so, but please at **least** count up your QSOs and unique SPCs per band. It makes a huge difference. Either that or include a coupon for pizza. I'm reasonable, after all. :-)

Again, it's an honor to serve the QRP community and I have no complaints, but following these steps will help smooth out the late nights and keep your Critter happy and healthy. :-) Thanks folks!

AWARDS

1000 Mile Per Watt Records

by Steve Slavsky, N4EUK Awards Manager email: radioham@erols.com

Over the past several months, I have received numerous requests asking for the 1000 mile per watt records for the various bands. I posted this information to QRP-L in May, but that is now outdated. Here are the records as of August 20,1999.

As you can see, some of the bands have records that are begging to be broken; others will be more of a challenge. Now is the time to go after 18 MHz and 24 MHz. As the sunspot count goes higher, you should be able to make those milliwatt contacts with the high mileage numbers.

Since I took over the position of Awards Manager in January, I have been proud to issue 47 new 1000 mile per watt awards, several of which were to the "receiving" station. When you send in your application, I encourage you to apply for an award for the ham on the other end of the QSO. Not only will it give them a greater appreciation of QRP; hopefully it will show them that you don't need a kilowatt, a hundred watts or even 10 watts to conduct reliable long distance communications.

I have also issued 15 WAS, 2 WAC, 2 DXCC and 3 QRP 25 awards during the period January 1, 1999 through August 20, 1999. These awards are out there waiting for you to claim them. Please look at the procedures and application forms posted on the QRP ARCI homepage at http://www.qrparci.org for details.

One area that will speed along your award application is the inclusion of some type of contact verification. This can take the form of a copy of a QSL card, e-mail from the other ham confirming the contact or any other written method. Applications for the 1000 mile per watt award that have no form of verification will be returned unprocessed. For WAS, WAC and DXCC, a log of contacts and verification by two other hams that you have the required proofs of contact on hand is all we need. Please also make sure to make your checks out to me, Steve Slavsky, rather than QRP ARCI.

Please, always feel free to e-mail me if you have any questions at all about the program or the awards process.

BAND	NR	TO	POWER	WITH	POWER	MI	MI/WATT	MDE	DATE
1.8 MHz	#244	G3VWK	20 MW	GW4AEC	10MW	133	13,300	SSB	710525
3.5 MHz	#1122	AA2U	613 uW	CH9ASJ	QRO	522	851,549	CW	880203
7 MHz	#1481	AA4XX	221 uW	KA3WTF	5	452	2,045,249	CW	951226
10 MHz	#914	AA2U	480 uW	KW9O	QRO	774	1,612,5000	CW	841005
14 MHz	#979	AA2U	80 uW	N4RM	QRO	1,294	16,175,000	CW	840714
18 MHz	#1298	K4TWJ	250 MW	VK6HG	QRO	11,045	44,180	CW	920416
21 MHz	#1455	G0IFK	39.9 uW	K1RM	5	3,217	80,626,566	CW	910519
24 MHz	#1256	JL1FXW	2	A35QC	QRO	4,889	2,445	SSB	900731
28 MHz	#1178	K7IRK	6 uW	WA6YPE	QRP	1,310	218,333,333	CW	891025
50 MHz	#1149	JO1XW	0.05 uW	JH1MBQ	4	6.71	134,200,000	AM	890503
144	#1177	OK1DK	160 NW	OK1OFK	QRO	14	87,500,000	SSB	870620
1296	#894	KF4JU	150 uW	W4ODW	QRO	346	2,306,670	CW	840429
10 GHz	#879	VK4ZS	1 MW	VK4ZNC	1 MW	124	124,000	FM	780414

Everyone is invited to check the QRP ARCI web pages at http://www.qrparci.org/

Currently the following things, and more, can be found on the web site: instructions on how to join, schedules of nets and contests, a list of who to contact with input or questions, tables of contents of recent issues of the **QRP Quarterly**, information on the **QRP ARCI** operating awards program, and instructions on how to order back issues of the **QRP Quarterly**. There is a radiolinks page to help you find some other QRP and radio-related web sites. I invite YOUR input, especially with ideas for improvements, additional links, and NEWS that you wish to share with members via the web site. Plans are in place for providing more forms for applications for awards, more info on operating events, and some history of the club. Thanks!

Dave, WA4NID, QRP ARCI Webmeister

QRP AMATEUR RADIO CLUB INTERNATIONAL

Application form for the QRP ARCI 1,000-miles-per-watt award

Mail to:

QRP ARCI AWARDS MANAGER
Steve Slavsky, N4EUK
12405 Kings Lake Drive
Reston, VA 20191-1611

N4EUK BOOKKEEPING AREA:

AWARD NR: _____ BAND ____ MHz NR: ____
MODE _____ NR: ____
AWARD DATE: _____

DATE OF APPLICATION: _____. CALL: _____

EMAIL ADDRESS: _____

BAND: _____ MHZ. MODE (CIRCLE ONE): CW SSB FM RTTY MIXED

OTHER MODE: _____. PAYMENT ($2 US): CASH MO CHECK or 3 IRC'S

AMOUNT: _____ US DOLLARS. DATE OF QSO: _____ (990203 for February 3, 1999)

FIRST STATION CALL: _____ PWR: _____ (if known)

QTH: _____ (City, State/Country)

LAT: _____ LONG: _____ (in decimal degrees)

QRP STATION CALL: _____ PWR: _____

QTH: _____ (City, State/Country)

LAT: _____ LONG: _____ (in decimal degrees)

POWER LEVEL: _____ WATTS. MILES: _____ MILES

MILES PER WATT: _____ MILES/WATT

MAIL CERTIFICATE TO: _____

_____

_____

_____

1. Please make out all checks to Steve Slavsky.
2. Photocopy QSL(s) with form, do not send original QSL cards.
3. Include $2(US funds) per award, separate forms please for each.

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

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

CALL: _____

AWARD NR: _____

DATE: _____

BAND: _____ MHZ MIXED

MODE: CW SSB FM RTTY MIXED

PAYMENT: CASH MO CHECK IRCS (3) _____ AMOUNT: _____ US DOLLARS

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Due to space limitations, articles should be concise. Where appropriate, they should be illustrated with publishable photos and/or drawings.

Full articles should go to any of the volunteer editors for review. Information for columns should be sent directly to the column editor. See the back cover for addresses. Submit technical and feature articles with a printed copy and a copy on disk (if possible). ASCII text is preferred. Photos and drawings should be camera-ready or .tif format. Other formats can be used with prior approval.

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(With thanks to **L.B. Cebik** for all his help)

de Mary, NA6E

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