QRP Quarterly

Journal of the QRP Amateur Radio Club, International
January 1995 Volume XXXIII Number 1

What's inside the S&S Engineering ARK4?
Turn to page 36 to find out!

Inside This Month:

New Technical Editor

I'd like to take this opportunity to introduce myself as the new technical editor of the QRP Quarterly. My name is Ray Anderson and the callsign is WB6TPU. I know it will be a challenge to equal the fine job that Dave Benson has done over the past couple of years, but I intend to give it a good try.

A short description of my background is probably in order. I've been licensed since 1964. I currently hold an Advanced class license and have also been professionaly involved in radio in one way or another since 1971.

My ham activities have included lots of project design and building. On the operating side, I've been known to be found running CW or SSB on the low bands, playing with 6 meter AM and operating FM and packet on 2 meters as well as 450 FM from the mobile. Professionaly, I started out maintaining comm-nav gear for the Navy and have been involved with commercial spread spectrum satellite communications for about twelve years as a circuit design engineer. Presently I am involved in doing computer simulations of high-speed digital computer circuits.

I'd like to encourage any of the Quarterly's regular contributors as well as budding new authors to write up your latest and greatest project and send them in. I am able to accept your articles in just about any format from handwritten to electronic. I personally prefer to have the articles in electronic format, but anything that is legible is just fine.

Paper hardcopies and disks (3.5" DOS format preferred) can be mailed to: Ray Anderson WB6TPU
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Santa Cruz, California 95062

If you have internet access feel free to e-mail your input to:
rander@netcom.com
or anonymous ftp to: ftp.netcom.com/pub/rander/uploads

Once I receive your article, I'll work with you to make the final printed result something you will be proud to have your name attached to! So warm up those soldering irons and word processors and let the world know what you are up to.

Nominations for QRP Hall of Fame

As announced in the October issue, we are accepting nominations for 1995 inductions into the QRP Hall of Fame. This is an honor bestowed for outstanding accomplishments with QRP and/or on behalf of the QRP community. For more details, see the announcement in the last issue.

Someone asked me once if only individuals could be inducted–they were thinking of nominating a company which had made lots of QRP rigs and had a substantial and long lasting impact on QRP over the years. As far as I know, there is nothing in the rules against nominating any company, group, whatever, as long as they or it have made significant contributions to QRP. In fact, it seems like an excellent idea!

If you wish to submit someone for this honor, please send a nominating letter to N8DHT, the Secretary/Treasurer. Be sure to include some specific facts and details to support the nomination. Letters must be received before March 1, 1995. The nominees will be voted on by the Officers and Board of Directors, with results to be announced at Dayton in April. As we said in October, there is no minimum or maximum number of people who must be inducted, it's up to you!

—WA8MCQ

Note from WB9TBU

Many of you have been aware that for several years, my husband's health had been steadily declining, and I had put aside many of my outside activities so as to be able to spend as much time as possible with Wally. He fought the good fight, and lived many years longer than the doctors had predicted, but shortly before 9 a.m. on Sept. 22, the battle was finished. The end, itself, was swift and I am grateful that circumstances were such that I happened to be at home so he didn't die alone.

Obviously, things are difficult for me at this time but, thanks to everyone who has offered support and comfort, I am managing to make the first steps into this new phase of my life.

The Uniden HR-2600— Great Radio Becomes Greater QRP Radio

by Ken Dreckman, WK9C
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For about a year I had been thinking about buying a ten meter rig for the car and found a gem of a radio in the Uniden HR-2600. The radio runs all modes, USB, LSB, AM, CW, and FM with ten watts out on the AM and FM modes and a strong twenty five watts PEP on SSB and CW modes. The HR-2600 has a clean look with twenty front panel buttons and knobs for the controls and features a back lit LCD display for the Band, Frequency, RF Power, Modulation, SWR, and SWR Calibrate functions.

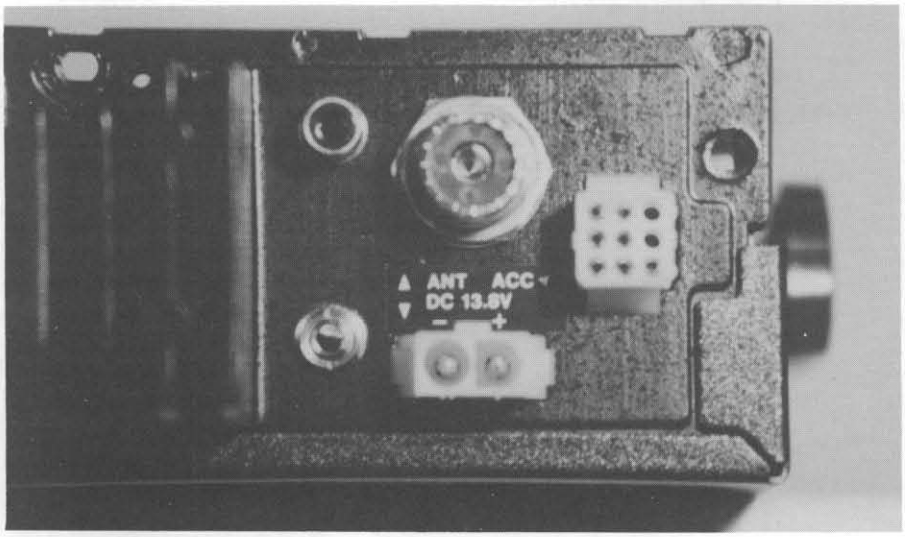
The radio comes new with an up-down microphone, mobile mounting bracket and screws, fused power cable and a basic but adequate operators manual with schematic. The HR-2600 and its older brother the HR-2510 can both be found at hamfests and in the weekly trading publications selling for as low as $125 to as high as $175 for a clean radio. I bought my radio from Amateur Electronic Supply. The $199 price was worth it to get the one year factory warranty and a clean, new, boxed radio.

HR-2600 front panel; 20 controls and backlit LCD display.

NEW CONNECTORS

The HR-2600 has a 12 volt power plug, an SO-239 connector and a Molex type jack located on the rear heatsink panel. For casual SSB and CW operation the radio is fine as is from the factory. All keyer and external speaker/headphone connections must be made through this Molex type plug. To more suit my needs for my keyer/paddle combination and existing plugs, I drilled two 1/4" holes through the soft aluminum rear panel/ heatsink and mounted an RCA jack for my keyer and a mono 1/8" phono jack for headphones.

The connections are all made by clipping the wires from the Molex jack and soldering them to the RCA and phono jacks. Both work well and make operation a lot easier by eliminating the tangle of loose wires hanging from the back of the radio. There is plenty of room under the hood and the wiring and pin-out for the Molex jack is well documented in the owners manual for those wishing to modify it. You may want to let the warranty expire before performing surgery on your radio. I do not know how understanding Uniden is toward hams and modifications done to products under warranty.



Rear panel with 9-pin Molex type plug, 2-pin power plug, SO-239, RCA jack and mono 1/8" phono jack.

GOING QRP

To lower the factory power output settings for the different modes down to QRP levels requires removing the four screws that fasten the top of the radio and gently lifting off the top. Notice the clean layout and easy access to the wiring for the Molex connector. Uniden did not skimp on the power transistor either; a Motorola MRF 477 device capable of 40 watts output and of drawing 7 amps without failure!

Locate variable resistor number 4 (VR4) on the board in the corner near the SO-239 connector. VR4 is the CW power adjustment. Now locate VR8 near the front of the radio and behind the SWR

SET control on the front panel. VR8 is the AM and FM carrier power adjustment. With your radio turned on and wattmeter and dummy load connected, switch to the AM or FM mode and depress the TX button on the front panel or the microphone push to talk button. This will put the radio into transmit.

Gently turn VR8, the AM/FM carrier adjustment, counter clockwise from a 10 watt factory setting until a 5 watt reading, or the power output you want for the AM and FM modes is displayed on your wattmeter. Release the front panel TX button.

Set the front panel switch to CW mode. Connect your key or just ground the wire on the Molex plug that controls the CW transmit. Go to the CW adjustment, VR4 and gently rotate it counter clockwise to lower the CW power from the factory setting of 25 watts to the QRP level of 5 watts or to the level of your choice.

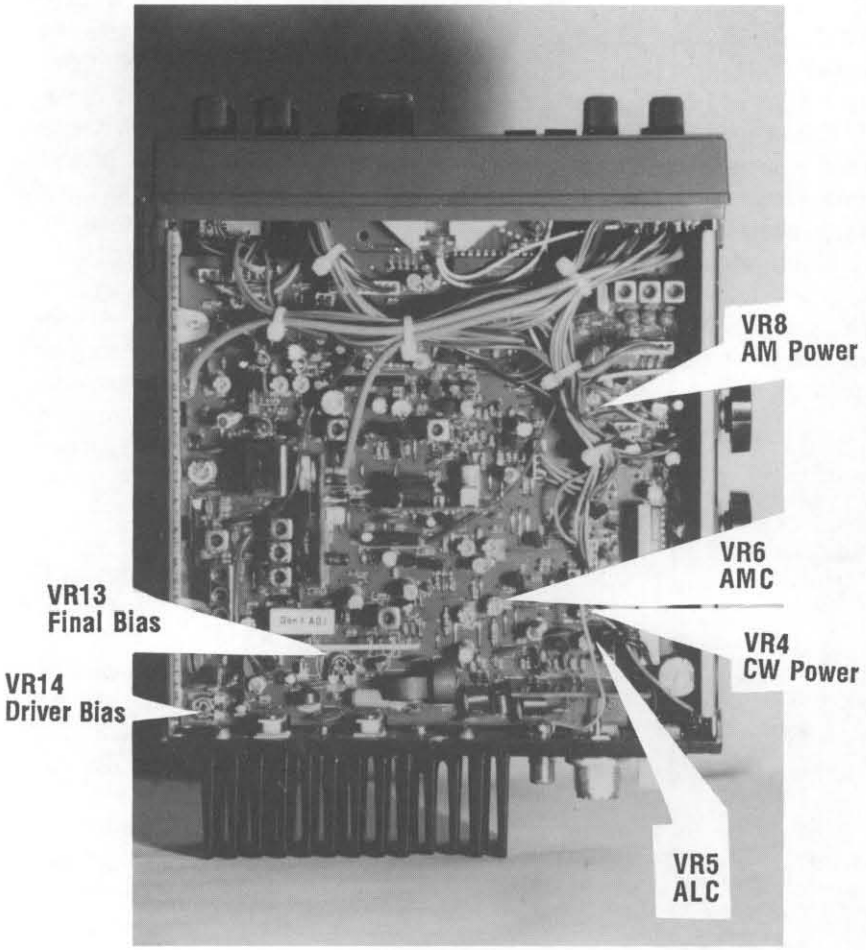
There is some interaction between these two adjustments and you will have to go back and forth several times to adjust both AM/FM and CW power to finalize the two.

QRP FOR SSB, TOO

Now locate VR5, the ALC adjustment. This is factory set to limit power output to 25 watts PEP on SSB mode. If you wish to set the ALC, (Automatic Limiting Control) to limit your SSB peak envelope power to 10 watts or less for QRP operation, you must have a peak reading wattmeter.

Switch to USB mode and speak into the microphone in a strong voice without shouting. You will see peaks of 25 watts reading on your meter. Rotate VR5, the ALC control clockwise to reduce the power to peak readings of 10 watts on your wattmeter. Go back over all your adjustments and reconfirm all power levels are QRP.

While inside the radio you will see other adjustments that may tempt you for tweeking. Leave these alone! They are factory set to optimum levels and to attempt adjustment will only de-tune your factory tuned radio! Replace the cover and four screws. You now have a QRP, all mode, PLL synthesized, ten meter radio that is screaming to work the next QRP-ARCI contest!



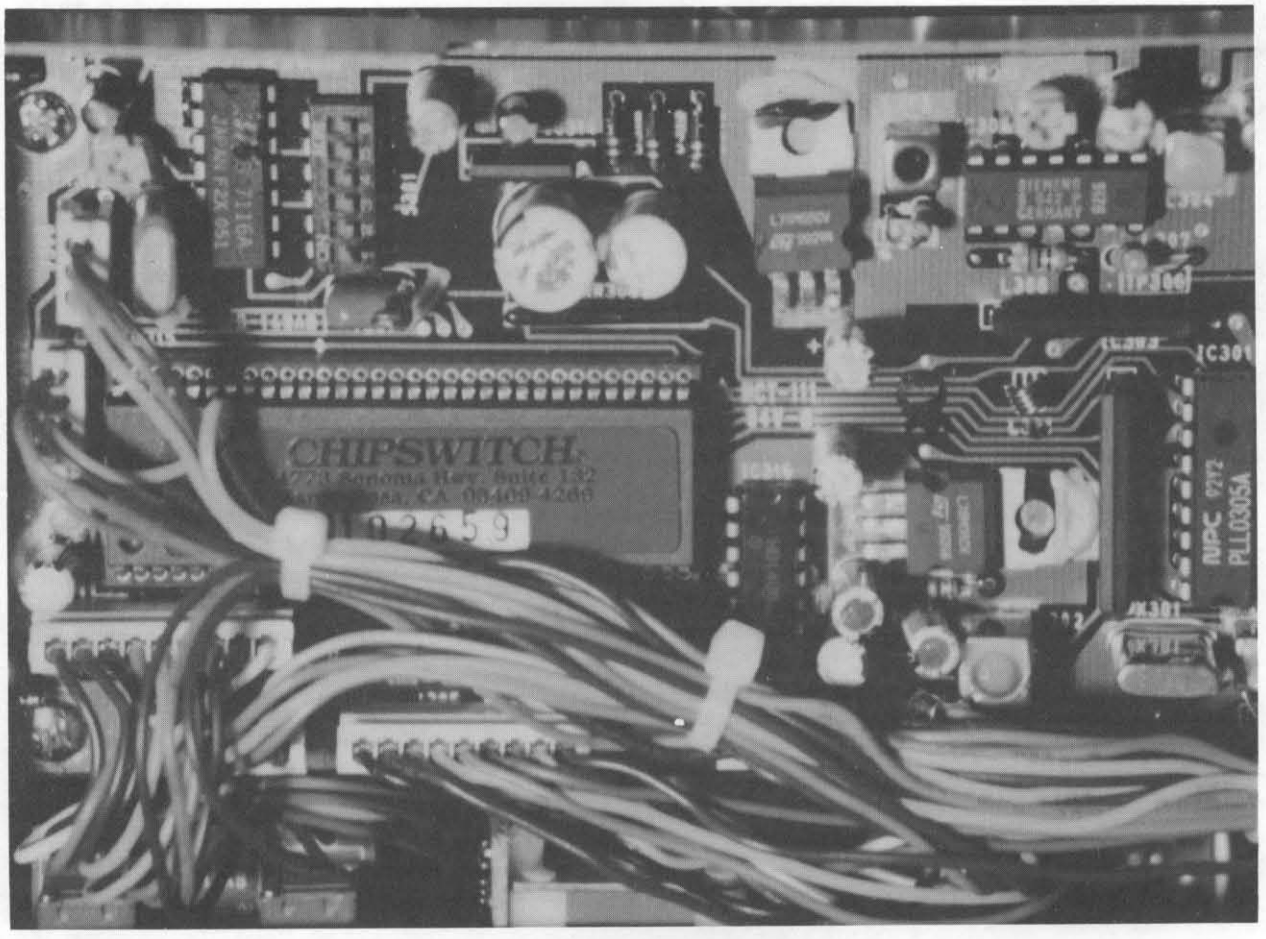
Uniden HR-2600 with top cover removed.

UPGRADE WITH A NEW CHIP

To this point, the modifications you have made to the radio have cost you a few dollars for the jacks and maybe an hour or two of your time. The radio is still the same and can be returned to its previous factory settings by just turning back the same adjustments you made. The Chipswitch modification is a replacement microchip that is installed in place of the factory microprocessor chip now in your radio and will give your HR-2510 or HR-2600 a whole host of new and useful features. With the Chipswitch microchip you will have the addition of 30 memory channels that will retain frequency, split offset, and subaudible tones for repeater operations. You will also add programmable scan and seek functions, programmable microphone buttons, split frequency operation, programmable transmitter timeout, programmable transmit frequency range, and the addition of the 12 meter ham band!

Yes that's right, with the Chipswitch microprocessor you also add the 12 meter band to your radio! The procedure is too detailed to describe in its entirety here but the modification goes something like this: The main microprocessor chip located on the Phased Locked Loop circuit board is removed and a socket with the new Chipswitch microprocessor is soldered in it's place. Several surface mount components on the PLL board are changed to allow the expanded frequency of operations. Using an RF sweep generator and service monitor, the receive front end and transmit bandpass filters are tuned to now include the 12 meter band as well as the 10 meter band.

The foil circuit traces on the PLL board are very thin and delicate and the surface



**Closeup of the PLL board with the Chipswitch chip and socket.
Notice the delicate traces and close placement of parts.
The six-position DIP switch above the Chipswitch is for selecting PL tones when in repeater mode.**

mount components are close and are in the critical PLL circuits. Unless you have a professional vacuum desoldering station, and I'm not talking about the "basting bulb" type either, the removal and placement of the components should be left to a competent technician with the necessary equipment.

I had my Chipswitch microprocessor and alignment done by the Chipswitch service technician, Mr. Derrell Adams. Derrell is in Salt Lake City, Utah and prefers direct telephone contact to answer any questions. Please call Derrell if you are interested in the Chipswitch microprocessor modification. If you want to try the procedure yourself, the Chipswitch chip with instructions is available from both the Chipswitch company as well as from Derrell for around $49 plus shipping.

So how does my HR-2600 work with the new Chipswitch modifications? It behaves just like a full featured rig! There have been no surprises, no lockup or PLL problems with my radio. It performs as it did before the modification with more features and the best part of all, the 12 meter band. The Chipswitch microprocessor does exactly what it is promised to do. It is easy to program and the manual sent with the Chipswitch is written clearly and is easy to understand. Without hesitation I would recommend the Chipswitch modification to any owner of the Uniden HR-2510 or 2600 series radios.

For more information, please contact:

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Amateur Electronic Supply, Inc.,
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Zero Beat–Hitting them "Dead ON!"

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Additional comments by:
Bob Bobrick, WA6ERB/VO1DRB
(70466.1405@compuserve.com)

A few weeks ago I participated in a QRP event where I noticed two very interesting phenomena. Every single QRPer that I contacted met me exactly on my frequency. Almost every one of them was using home brew, or kit built, equipment. On the other hand, the majority of those using commercial rigs made me appreciate the RIT feature of my QRP transceiver. Many were more than 500 Hz away, and some greater than 1kHz. OK, maybe they forgot to reset their RIT.

When I mentioned this observation on an Internet list about QRP, one of the fraternity gave many reasons why QRP operators can be so accurate. It all comes down to "attention to details," in both the construction and the operation of our equipment. I mentioned to the Internet group very briefly how I set up my Oak Hills Research Spirit 40M transceiver to make zero beating easy, and a couple of people quickly asked for more details. Now, if we're already so good at this, why would some people want more details? Two reasons come to mind. QRP rigs are getting a little more complex than they were a few years ago, and we are also seeing an increase in QRP and home brew enthusiasts.

One of the nicest things to happen to CW QRP radios in recent years is the "single signal receiver." *[Although direct conversion receivers can be single signal if they are of the phasing type--and most are not--you'll generally see single signal reception in superhets. And just because a receiver is a superhet does NOT automatically mean that it has single signal reception, but that's another story. --WA8MCQ]* It's a real joy to hear a signal pop up out of the noise at a pleasing pitch, and to hear only as much of the signal as we need. No more zeeeeeeuuuououououuueeeeerrrp double wide signals as we tune a broad BFO over both sides of zero beat.

The bad news is that it makes aligning a single signal rig a bit more picky. It's not that hard; we just have to pay attention to details. Here's a method that I've found successful. While there are a few details that are specific to the Oak Hills Research Spirit, the procedure is general enough to apply to many of today's superhet, RIT equipped, single signal QRP transceivers.

First, put a dummy load on the rig you're tuning. You don't want to do most of this work into your normal antenna.

STEP 1. Start with the VFO, of course. For best results, use a frequency counter and adjust the appropriate inductor and capacitor until you reach the range you expect. In some rigs you may have a lot of fun adding or removing turns from toroid inductors to get you in the ball park.

I've found that a reasonable substitute for the frequency meter is an accurately aligned general communications receiver that has a digital readout. Simply use a short wire antenna from that receiver, and lay it near your VFO. Direct connections are rarely needed.

STEP 2. Get the RIT circuit under control. Make sure that when you go to transmit mode the VFO doesn't wander off to some unintended frequency. Center the RIT control and use either your key or a "Tune" switch if you have it. The desired result is no VFO frequency change. On the OHR rigs, this is adjusted by a potentiometer labeled TX SET in the RIT circuit.

STEP 3. Some alignment procedures take you to the BFO next, but I like to do the sidetone oscillator instead. The typical 800 hertz tone is a little to high for me, so I like to set the sidetone between 700 and 750. OK, how do you do that without either a tuning fork or a musician's perfect pitch? How about that code practice program you have on the computer? Set it for a 750 hz note and tune your sidetone oscillator to match.

STEP 4. Now's the time for the BFO. The idea here is to tune the BFO, and possibly a companion audio filter, to produce an audio peak at the same frequency you chose for the sidetone oscillator. You will need some "pitch memory" for this. Key the rig (into the dummy load, of course) long enough to get used to the sidetone frequency. Then attach a good receiving antenna and look for a reasonable signal. Tune the BFO to peak that signal at the same frequency as the sidetone. You may have to switch back and forth between the dummy load and your antenna a couple of times to get this one adjusted well. Once done though, you have the hard part behind you.

STEP 5. Let's tune the transmitter next. Even with rigs that use a common BFO, and shared bandpass filters, there are usually fine adjustments to make for the transmitter oscillator. You need to have at least another receiver and an external signal to use for reference. Again, we are going to need to switch between an antenna and a dummy load, so any setup you have to make this easier will help. Using your antenna, find a solid signal and tune for the maximum volume. If the BFO adjustment was right, max volume should be at the same frequency as your sidetone.

Now, find that same signal on a general communication receiver, or another radio of known accuracy. Tune the general communication receiver to achieve the same pitch you hear with the QRP rig. Switch to your dummy load. Key the QRP transmitter and adjust its

transmitter oscillator to produce the same pitch as the reference signal on the communications receiver.

BINGO! Everything should be just right. The loudest point for a received signal on your QRP rig will be offset from the center of the received carrier by the frequency you like, let's say 750 hertz. The sidetone sounds at 750 hertz. And, your transmit frequency is nicely centered on the received signal. You are at zero beat, and the other guy doesn't have to search for you.

Oh yes, make sure you are setup on the same side of center as your reference signal. That's usually on the higher side. If not, go back to step 4 and readjust the BFO.

Here's one last trick. The real reference point in all of this is the sidetone oscillator. If you tune the received signal to exactly the same frequency as the sidetone oscillator, you have it made. How easy is that to do? Most of us can get pretty close. Musicians will claim deadly accuracy. Then there are the "pitch challenged," like me, who can't easily select the right frequency every time. So, I put a simple little mod on my OHR Spirit. The modification adds a "spot" switch which let's me key the sidetone oscillator while in receive mode. Now, it's real easy. Find the signal. Get close to the right frequency. Press the "spot" switch and fine tune the received signal to the sidetone.

This is a very simple mod. The oscillator is normally enabled by a "transmit" voltage to the base of Q25. Lift the supply end of R171 and wire in a double pole momentary push-button switch that will let you apply "receive" voltage from the TR circuitry.

At first, it sounds like a tedious procedure. However, once you've worked it through, you'll find it easy. Take your time and pay attention to the details. Then sit back and enjoy how easy it is to be exactly where that calling station is listening. That's one more reason he has for coming back to you. You made it easy for him too.

73, Bob Easton - N2IPY

Comments by Bob, VO1DRB/WA6ERB:

Good job on the zero-beat article. I used a lot of the info in it to zero beat my OHR Classic yesterday so it's right on the money for the most part. I do have some suggestions on a few parts of it:

Step 3: - Most rigs don't let you change sidetone frequency unless you get into the circuits. Since OHR doesn't describe their circuit I just left the tone the way it was until I get some time to read up on which components fix the freq in the oscillator.

- A lot of these sidetone circuits don't put out a nice clean sine wave so listening for the tone may be a problem on the next step - ie a lot of simple designs use a sawtooth generated sidetone with lots of harmonics.

- I think there are two ways to match audio tones and I'm assuming that you are using two speakers next to each other - one from the tone generator and one from your rig. The first way is what I call the musicians way by listening to the two tones one at a time until they "match" to your ear. I think this is the way you try to do it when you match a cw signal to your "tune" position sidetone when you want to zero beat someone - sort of by ear.

The second way is to compare two continuous tones and listen for the heterodyning (or synchronization - not sure what is the right term) and listen for the one cycle per second difference of the tones as they synchronize with each other - this is the way a lot of commercial rigs set the synthesizer with WWV tones.

For this section I think you were referring to the second method I described. Get a continuous tone from your tone generator and beat against your sidetone as you change values of resistors (or pot) so the sidetone circuit matches what you want to hear (ie 750 Hz). Maybe the key to this exercise is to leave the sidetone alone but check to see what freq it was designed for with the tone generator.

Step 4. This is good but it may have a "gotcha". It may be wise to check (using an audio generator) to see where your cascaded audio filter is set for. If it is a narrow filter with a center frequency different than your sidetone then things go astray. (I know because I have one of those Timewave DSP filters and the center freqs they pick are different than my sidetone so I can never monitor it during breakin since the DSP "filters" it out.) To get the best use out of your rigs selectivity you want to get the signal within the IF and AF bandpasses and centered on the offset as best you can. This may mean changing the audio filter circuit components if it differs a lot from what you "like" to hear.

The bottom line here is maybe you do want to set the BFO before you play with the sidetone and settle for an easier sidetone fix even though it's not at the audio freq you like to receive at.

Step 5. Good, and I agree that the best way to do this step is with another rig. But again this is complicated in the fact that the two rigs may have different CW offsets so in this case you want to compare your received signal with the sidetone and zero beat the audio with the continuous tone "beating" method described above.

The sidetone spot switch is the real way to zerobeat another station. Back in the days of the "separates" like the Drake Twins that was the order of the day if you were not slaving VFO's.

73 72 Bob VO1DRB/WA6ERB
-QRP-

Peak Power Modification for the OHR WM-1 QRP Wattmeter

by Larry East, W1HUE
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After several months of procrastination, I finally ordered a WM-1 Wattmeter kit (the fact it was on sale helped!). It went together like a breeze; now I don't have to use a DVM, RF probe and calculator to determine the output power of my QRP rigs! In case you are not familiar with this great little gadget, it is a direct reading wattmeter available as either a kit or fully assembled from Oak Hills Research and some dealers. It has three power ranges: 100 milliwatts, 1 Watt and 10 Watts full scale – perfect for QRP work!

My one complaint: it does not have a "peak" mode for use with SSB. (Well, none of my other watt/SWR meters do either, for that matter.) Noting that there was an unused operational amplifier (U2-B) available in the WM-1, it occurred to me that it should be possible to use it to implement a "peak reading" circuit.

At this point, I should point out that I have never seen the schematic of a peak-reading Watt/SWR meter, so I can only guess how one might work. I do know, however, that the term "peak envelope power" as applied to a SSB transmitter is a bit misleading; the quantity that we want to measure is in reality the peak average power over short speech intervals. It seemed logical to me that this could be determined by using a "sample and hold" circuit following the diode rectifier in a standard Watt/SWR meter. Such a circuit is easily implemented with a single op-amp.

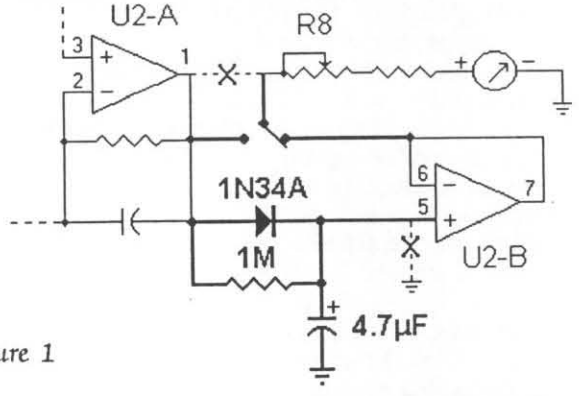

figure 1

After some experimenting, I came up with the simple modification shown in Figure 1. The circuit works as follows: The DC output of U2-A charges a capacitor through a 1N34A diode, and U2-B is now used as a high input impedance voltage follower. A one megohm resistor supplies the (primary) discharge path for the capacitor. The discharge path is to the output of U2-A rather than ground so that the voltage drop across the diode (only a few millivolts when the capacitor is fully charged) will not affect the final output of U2-B.

A SPDT switch connects the meter to the output of U2-A for "normal" power readings, or to the output of U2-B for "peak" power readings. In the "peak" mode, the meter will follow the peak average power over short time intervals and slowly return to zero when the source of RF is removed. The "averaging" time is determined by a variety of factors; the mechanical characteristics of the meter, the resistance of the diode and output impedance of U2-A (both nonlinear functions of current) and the RC time constant at the input of U2-B. The time for the meter reading to return to zero is determined by the RC time constant of the 4.7 uF capacitor and one megohm resistor at the input of U2-B.

The ability of the meter to indicate "peak average power" is heavily influenced by the value of the storage capacitor at the input of U2-B. In order to determine the proper capacitance, I ran a series of tests by recording short one-syllable words and playing them back through the microphone input of my TenTec 505 connected to a 52 ohm dummy load through the WM-1. A calibrated oscilloscope was used to monitor the transmitter output. I adjusted the recorder playback level so that the WM-1 read three Watts output in "peak" mode with a storage capacitor value of 4.7 uF. The scope indicated a maximum peak-to-peak RF voltage of approximately 36 V, corresponding to a peak power level of approximately three Watts; Power = (Vpp)^2/(8R). *[That's equal to Vpeak^2/2R and VRMS^2/R. –WA8MCQ]*

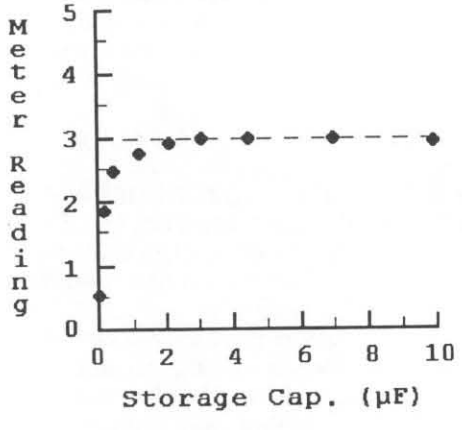

figure 2

I then used clip leads to connect various other capacitors to determine the effect on the meter reading. Typical test results are shown in Figure 2. These tests indicated that at least 3 uF is required for the meter to properly indicate SSB "peak" power. For values greater than 10 uF the meter reading actually decreased slightly, probably due to the RC time constant of the diode series resistance and the storage capacitor. I settled on a capacitor value of 4.7 uF, but any value in the range 3.3 - 6.8 uF will work. All tests were made using

a 1N34A diode; other diode types might yield different results. Modifying the output circuit of the WM-1 as shown in Figure 1 is not difficult, although it does require that some minor surgery be performed on the PC board. I also made two other simple WM-1 modifications which you might find useful: I added a "power on" indicator and provisions for external DC power.

I found that many small LED's will operate satisfactorily at 1 to 2 mA, and installed one on the front panel of the WM-1 connected through a 4.7K resistor to pin 4 of rotary switch S2. Since a maximum of 4 mA is drawn by the WM-1 during operation, you don't want to use a current-hungry pilot lamp that will quickly kill the internal 9V battery!

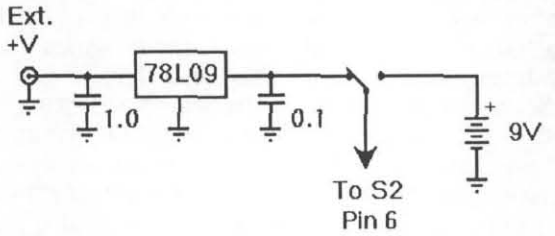

figure 3

In order to allow use of an external source of DC power, I added a 2.5 mm DC power jack and SPDT switch on the back panel above the battery holder. I used an LM78L09 voltage regulator, as shown in Figure 3, to allow any source of DC between about 11 V and 24 V capable of supplying at least 10 mA to be used. The voltage regulator and two bypass capacitors were mounted "spider web" style on the back of the power jack.

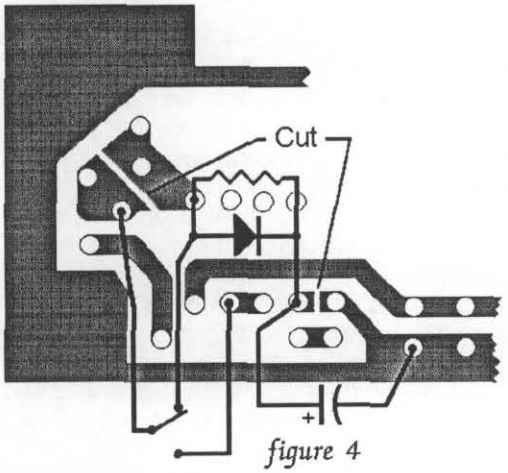

figure 4

The "peak power" modification can be made as follows:

1. Unsolder the wires from the RF connectors on the rear panel.

2. Remove the meter from the front panel.

3. Remove the five screws holding the PC board, and carefully remove the board. If you want more room to work, you can also remove the rotary switches from the front panel and disconnect the wire from the battery holder.

4. Find the solder pad on the bottom of the PC board to which pin 1 of U2-A, R10, C5 and two pins of R8 are soldered. Refer to Figure 4 and the pictorial drawings in the WM-1 manual for help.

5. With a small sharp knife (X-Acto, etc.), carefully cut a slot in this solder pad to isolate R8 from the other components, as shown in Figure 4. Use an ohmmeter to make sure it is isolated.

6. Solder a 2.5 inch piece of small gauge insulated wire between the part of this pad to which the two pins of R8 are connected and the center pin of a miniature SPDT switch. Be careful not to create any solder bridges on the PC board.

7. Find the pad to which pin 5 of U2-B is connected; carefully cut the PC trace to the adjacent pad as shown in Figure 4. Again, check your work with an ohmmeter.

8. Solder a 1N34A diode and one megohm resistor (on the bottom side of the board) between pin 1 of U2-A and the now-isolated pin 5 of U2-B. Make sure the components do not touch any other solder pads and that the cathode end of the diode is connected to pin 5 of U2-B.

9. Solder a small 4.7 uF capacitor between pin 5 of U2-B and a convenient grounding point (I used a small molded tantalum). Things will be pretty congested at pin 5 of U2-B, so be extra careful not to create any solder bridges. Also make sure that the capacitor will clear the bottom of the cabinet when the PC board is re-installed and that its wires do not touch any other solder pads.

10. Solder a 2.5 inch length of insulated wire to pin 6 (or 7) of U2-B and one of the outer pins of the SPDT switch used in step 6 above.

11. Solder another 2.5 inch length of insulated wire between pin 1 of U2-A and the other outside pin of the SPDT switch.

12. Drill a mounting hole for the SPDT switch on the front panel between the two rotary switches and below the lettering just below the meter. If you want to add an LED "on" indicator, drill a mounting hole for it below the hole for the SPDT switch. Also drill the appropriate mounting holes on the rear panel if you are adding an external power connector and switch.

13. Remount the front panel rotary switches, if removed, and mount the LED if you are adding one. Re-install the circuit board and mount the SPDT switch in the hole on the front panel.

14. If you installed an LED, connect its anode through a 4.7K resistor to pin 4 of S2. A convenient grounding point for the cathode is the small tab on the frame of S1.

15. If you are adding an external power connector, install it, a SPDT switch, LM78L09, etc. on the rear panel (see Figure 3).

16. Re-install the meter (watch the polarity). You now have a peak-reading QRP wattmeter!

This modification does not affect meter calibration, but you should go through the calibration procedure in the manual anyway since you might have moved one of the pots while handling the PC board. Check the difference in meter readings when switching between "normal" and "peak" while operating SSB – you will be amazed.

The WM-1 is available from Oak Hills Research, 20879 Madison Street, Big Rapids, MI 49307.

(Edited by WA8MCQ during the transition between NN1G and WB6TPU; I get the blame for any errors in this article. –WA8MCQ)

QRP

The Portable Random Wire Vertical

by David F. Gauding, NFØR
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The Portable Random Wire Vertical is a multi-band antenna for the QRP enthusiast! This antenna was designed to cover 10M through 40M, be free-standing and quickly installed/removed by one person. It's just a random wire going straight up.....but an "RWV" meets the requirements and makes those contacts!

THE FEED SYSTEM

The key to this multi-band design is a transmatch based feed system. The line is a 28' run of RG-58 with one major difference! While it's connected to an unbalanced output with a PL-259, the shield is allowed to float at the antenna's feed point. This method allows the braid to serve as a tunable counterpoise within a limited range. It apparently provides an adequate rf ground at modest input powers.

The coax is terminated in a small alligator clip. The line should be waterproofed after first tinning the stranded center conductor to prevent wicking. A hose clamp positioned about 3" above the base serves as a feed point. The T-match, Z-match or L-match may be used interchangeably in this application.

THE RADIATOR

The radiator for a basic RWV is 33 1/2' of graduated antenna tubing. The outside diameters are 1 1/4", 1 1/8", 1", 7/8", 3/4" and 5/8". The overall length was chosen to achieve a full quarter-wave on 40M. With hose clamps in place the antenna collapses to less than 6 1/2'. This size fits the interior of mid-size cars and most compact sedans.

Heavy-duty type 6061-T6 extruded aluminum tubing in .058 wall is recommended. This grade is very strong, flexes in windy conditions but will not take a set. Other grades of tempered aluminum are probably suitable but have not been fully researched.

Slot across the top of each section with a fine tooth hacksaw blade to a depth about the same as the tubing diameter. Slotting produces an excellent compression joint but leaves sharp burrs on the tubing. The burrs may be eliminated using a round metal file and the surface finished with steel wool.

Any metal chips left behind must be removed before the radiator is assembled. This will prevent scoring of the aluminum and possible jamming when the close tolerance sections are assembled. A cloth attached to the end of a stiff cord and pulled through the tube works well for the interiors.

Circle sections two through five with a permanent marking pen, six inches from the un-slotted end. This serves as an important visual warning to stop extending a section prior to re-tightening the hose clamp. Those desiring absolute maximum height may use less overlap but for structural integrity not less than two and one-half tubing diameters.

The radiator is now ready to be assembled. The stainless steel hose clamps are installed at the feed point and at the top of the first five sections. Recommended sizes are: 38 mm (2), 32 mm (1), 25 mm (1) and 22 mm (2), all with standard 5/16" heavy-duty hexagonal screw heads and wide clamping bands. Position the clamps on the tubing so the screws can be reached from the same side of the mast. A guying ring is added at the 6' level as discussed in the following sections.

THE MOUNTING SYSTEM

The collapsed radiator is socketed in a heavy-duty 1-1/4" diameter rubber crutch tip which insulates metal from the earth. The crutch tip is tightly pinned to the ground with a screwdriver passed through a drilled center hole.

Select a screwdriver handle with a minimum shaft length of 6". The handle should fit snugly inside the base tube. A Phillips-type head is preferred for easy insertion into the earth by hand pressure alone. The completed radiator is then pressed firmly into the socket. This mounting system supports the nested tubing while the guys are being attached and expedites installation by one operator.

THE GUYING SYSTEM

The three point guying system is connected to a 1 1/8" inside diameter steel or brass washer installed between the first and second sections. Drill three equidistant holes in the washer to accept small S-hooks as described below.

The correct guy length for a basic RWV is 9'. Select 1/8" or 3/16" diameter solid plastic clothesline with a stranded nylon core. This line is strong, will not stretch or unravel and contains no metal to absorb RF.

The guys should be carefully attached to 1 1/4" or 1 5/8" steel S-hooks with securely locked knots. S-hooks are available in hardware or variety stores. Check to insure they will pass the largest screwdriver being used as a guying stake. A hook used at the guying ring is closed on one side with a pliers. The open side of that hook is attached to the guying washer. A hook on the earth end of a guy is pressed closed on both sides.

The earth end of each guy is held in place with a 6" or longer screwdriver set at a forty-five degree angle. A sharp Phillips-type head is again recommended for easy insertion in hard earth. After several practice sessions a new user will have little trouble setting the nested antenna perfectly straight.

The guys should be taut but need not be overly tight. The three-point system coupled with a pinned base is remarkably stable, even in windy conditions. The basic RWV antenna and guying system has unintentionally survived 30 mph storm gusts in portable use without difficulty.

EXTENDING AND LOWERING THE ANTENNA

The fully assembled radiator weighs just under six pounds and is very manageable. Antenna installation takes one experienced person an unhurried five to seven minutes! Lowering the antenna is the reverse of the installation procedure and takes less than two minutes.

Erecting the antenna normally requires working with the hands slightly above shoulder height. The clamping pressure required is not excessive but increases in proportion to the number of extended sections. A short, wide-blade screwdriver can be used to adjust the hose clamps. However, it is more convenient and efficient to use a nut driver.

Begin by loosening the hose clamp holding the smallest section in place. Extend that section to the safety ring marked at the 5 1/2' level and re-tighten the clamp. Repeat for each section until the tubing is fully extended to 33 1/2'. Finally, attach the coax to the feed point and tune-up.

OTHER LOGISTICS

All RWV accessories will store conveniently in a small package. Consider a military surplus .50 caliber ammunition box or similar heavy-duty container which can also function as a small foot stand. Depending on your stature a few extra inches of height can make it more comfortable physically while working on the antenna. Wear a pair of inexpensive cotton gloves when handling the radiator. This will help keep the black aluminum residue off hands and clothing until the tubing weathers.

FREQUENT QUESTIONS

Can an RWV be used at home? If it works in the field a good portable design will certainly do just as well in a back yard! Several RWV's have been erected temporarily at friend's homes. This is usually to demonstrate the system but on occasion to help assess the reaction of neighbors to a low profile vertical antenna. An RWV was attached to a chimney over six years ago and continues to serve well in that installation.

Will a RWV work on 80 meters? It will work but just barely! Only an eighth wave is available on that band using the basic radiator. Reasonable 80M performance is attainable with the addition of a top-hat. A "quick & dirty" method utilizes three 30' lengths of #22 gauge stranded insulated wire. Clamp the tinned wire ends under a hose clamp at the end of the top section. Attach light fishing line to the wires and bring down at a 45 degree angle. Fasten the fishing lines to the ground with additional screwdrivers.

Can a few more tubing sections be safely added to the standard mounting? Placing one .058 wall 1/2" diameter tubing section on top brings the antenna to almost 40'. That's a realistic limit without additional guying! For a more robust antenna with improved height potential begin with larger diameter tubing at the base of the radiator.

What else can be done with all that tubing? The RWV will support a lightweight inverted vee, center-fed doublet or inverted-L flat-top up where the wire can do some good. With the addition of radials it can also be the basis for a simple portable ground plane. For directionality and gain use two radiators as phased verticals or a half-square antenna. Three radiators can serve as a classic bobtail curtain on 40M!

Can I use shorter tubing sections to aid in transport or installation? Efficient 40M operation was a primary design goal. That requirement dictated the dimensions for a true quarter-wave radiator on 40M without coils or traps. The length of the individual tubing sections is not critical.

What happens to performance with longer or shorter feedlines? Other feedline lengths up to 50' have been substituted with no significant changes noted in performance characteristics on 10M through 40M. The 28' run of RG-58 was actually chosen at random from coax already on hand. Since it seems to work well there has been no serious investigation to date into feedline alternatives. A longer shield braid appears to provide a better artificial ground, particularly on 80M, but at the expense of increased feedline losses.

What about higher operating powers? The basic antenna and feed system load easily and have handled 100 watts input during informal tests. No unusual SWR changes or coax heating were observed. The impedance is non-critical in this application so either 50 ohm or 72 ohm coax may be used. It should be noted that the shielded feedline tends to keep stray rf out of the station at all power levels.

Does the RWV require any maintenance? During installation the friction between sliding tubing sections (.009 clearance) assures good electrical contact at all times. The withdrawal warnings on each section will have to be remarked periodically. Check the feedline waterproofing and locked knots occasionally. At least annually: disassemble the radiator, clean the tubing and wipe each section with a cloth lightly sprayed with WD-40. At the same time a little lubricant should be placed on the hose clamp screws.

How else can this design concept be utilized? Replace the aluminum radiator with a wire! It should be at least a quarter-wave length on the lowest operating frequency. Ideally, the wire should hang straight down from an insulated support or tree branch. Backpacking hams can exchange the RG-58 for RG-174 to reduce weight but should anticipate additional feedline losses.

WHAT'S THE BOTTOM LINE?

The RWV is a compromise design and not particularly efficient electrically. Nevertheless, in eight years of active use this simple portable antenna has consistently worked states, provinces and DX from 10M to 40M. Any 33 1/2' vertically polarized antenna in the clear and resonant is going to make contacts, even when running QRP!

CLOSING COMMENTS

With this design the QRP portable enthusiast has wide latitude in choosing operating locations. It's a major advance from being totally dependent upon trees or other supports when utilizing otherwise excellent wire antennas. The self-supporting radiator and accessories are relatively light thus easily carried from a vehicle to nearby picnic benches or campsites. Finally, the convenience with which a single operator can install a RWV means more air time is available when running portable.

Just for fun, put the receiver on line before extending the radiator. Then tune a weak CW signal and listen for that inevitable increase in signal strength. Height is still everything when it comes to antennas!

Good luck and have fun in the field with your own RWV! Hope to catch you QRP portable soon!

QRP

QRP in Cyberspace

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Comments on QRP on the Information Superhighway–and that doesn't mean checking your mail with a Commodore 64 and 300 baud modem!

Just a reminder for those of you with e-mail or Internet access, there is a QRP discussion group available. It was originated by Chuck Adams, K5FO, by a suggestion on one of the ham radio newsgroups and run for some time by Bruce Walker, WT1M at Thinking Machines (think.com). It recently moved over to netcom.com, when Thinking Machines started downsizing their company, but is still alive and well, under the guidance of N1IST, Mike Ardai.

A FREE QRP SUBSCRIPTION

To subscribe to the QRP mailing list, send an e-mail message to LISTSERV@netcom.com

Note that there is no "E" at the end of LISTSERV. (Capital letters were used here to draw attention to the spelling of the critical word and make no difference to the system; either upper or lower case letters may be used in addresses, but there are other places on Internet where things ARE case sensitive, such as UNIX commands, file and directory names, etc. Yes, it does get confusing.) The subject line is unimportant and will be ignored; for the text just say

```
subscribe QRP-L
```

Don't include any comments or notes to the system operator, since they will be ignored; anything sent to LISTSERV is handled strictly by the computer. You should soon start receiving lots of e-mails in your mailbox, addressed to the QRP group. To make your own posting to the mailing list, address it to

```
QRP-L@netcom.com
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Past articles in the QRP press said to send e-mail to MAJORDOMO@think.com to subscribe, but that is no longer a valid address.

In the October Quarterly the new address was inadvertently broken up at the end of a line with a hyphen, but don't hyphenate it; use LISTSERV, not LIST-SERV.

On a mailing list, every posting is forwarded to all subscribers as an individual e-mail message. This means you will receive a lot of e-mail, and this causes problems for some people due to the sheer bulk of messages and/or the fact that some have to pay for each message received, or log onto the system at work where the boss can see them spending a lot of time on unofficial mail.

While the list was at think.com there was also a digest every few days. It contained the text of all recent postings, bundled into a single e-mail message and was very convenient. By subscribing to the digest instead of the mailing list, you received only a few e-mails per week but still saw everything posted to the list. Unfortunately, this service is not currently available on netcom.com and many people have unsubscribed because of that. (There are pseudo-digests available via anonymous FTP, covered a bit later on.) In November of 1994, N1IST mentioned that a digest may be made available by netcom.com in early 1995. Stay tuned...

QRP FROM THE PAST

Although think.com no longer hosts the QRP list, it still has much of the older data (as of late November 1994). If you have Internet FTP capability, you might want to do an anonymous FTP over to think.com and dig down into the pub/radio/ham/qrp directory. (Unlike DOS, UNIX uses forward slashes for subdirectories.) You'll see a further subdirectory called archives, which contains compilations of everything on the mailing list through the summer of 1994 (when it moved over to netcom.com).

(An anonymous FTP is one in which you do not need to have an account on a computer to access the files. Log in with user name of "anonymous", and for a password enter your e-mail address:

```
LOGIN: anonymous
PASSWORD: wa8mcq@hambbs.wb3ffv.ampr.org
```

Since you're just a guest on another system, not a registered user, some restrictions will apply but you can still access many files, usually found in the pub (short for public) directory.)

Note--the .Z at the end of the filenames means they are stored in Unix compressed format; before downloading them to your host (using the command "get"), issue the command "binary" (to which the system replies TYPE SET TO I) or you'll never be able to uncompress them into readable text. Some FTP sites are already in binary mode when you log on, and others must be toggled. The Unix operating system is case-sensitive, so be sure you type in the file names exactly as you see them on the screen. For instance, "QRP1234.Z" is not the same as "QRP1234.z" or "qrp1234.Z". Once the file has been downloaded to your host machine, uncompress it with the UNIX "uncompress" routine. For example,

```
uncompress QRP1234.Z
```

and after a few moments you'll have a new file on your machine with the same name but no .Z suffix. It's now in ASCII, waiting for you to download to your terminal.

I originally included a list of some common UNIX commands which may be helpful for the beginner, but later decided against it after talking to AB4EL (who reviewed this article). People on Internet have a wide variety of operating systems, shells, front ends, etc, so the best thing is to learn what works for you, on your system. (For instance, the system I use at work gives what appears to be a regular UNIX prompt. Steve told me that a number of the commands I use regularly are actually not valid UNIX commands at all; it turns out that when my system sees certain things it translates them into the proper UNIX command before passing them on.)

MORE QRP TREASURES

Another source of QRP list archives, and current ones to boot, is SunSITE.unc.edu. Again, do an anonymous FTP and dig down into pub/academic/agriculture/agronomy

No kidding, that's where the QRP info is! As soon as you hit that subdirectory you'll see a name familiar to the QRP list, Steve Modena, AB4EL, who "owns" it. You'll see both DAILY.QRP and 3DAY.QRP, current files which he updates on a daily basis. And then if you dig further down from that subdirectory into ham/QRP, you'll find a lot more QRP archives, up to the present. You'll also see that he has imported most or all of the archives from think.com. (There is no .Z on

these files--they are already in ASCII and do not need to be uncompressed.)

Steve reported that the system at SunSITE was getting bogged down from the vast amount of traffic on it, and that he is now posting the DAILY.QRP and 3DAY.QRP files to ftp.Cybernetics.net as well. That system only holds the files he updates daily; it does not hold any archives, and he has no plans to add them. (The reason is simple enough--he is allowed all the free disk space he needs at SunSITE, while his account at Cybernetics.net is a personal one and he has to pay for disk storage space above 5 megabytes.)

If all you want are the current files, use Cybernetics; it may be easier to get into. From the main directory, look under pub/users/ab4el. (Don't capitalize any of that--file and directory names are case sensitive.) The BA files in his subdirectory are from the BoatAnchors mailing list, which may also be of interest to some of you--that's really old equipment.

LET'S DO E-MAIL!

My own packet and e-mail addresses are at the top of the article. Feel free to use them, but if you don't get a response from me in a reasonable time, send another. Not all the mail I send out gets delivered, and some mail sent to me doesn't make it this far. Whether on packet or e-mail, never put absolute trust in the ability of the systems to deliver, since they aren't absolutely foolproof. (And with the explosion of Internet use, things can only get worse.)

OTHER HAM FORUMS

While you're at it, you might also want to look into the rec.radio.amateur area on USENET (which is also available through Internet). The subdivisions are homebrew, antenna, equipment (info on commercial rigs), policy, space, digital, and the ever popular "miscellaneous". (There may be some others which my particular host doesn't carry.) If you read through these discussion groups long enough you'll see quite a few famous call signs, and a lot of good material. AB4EL says that antenna, homebrew and digital are archived at SunSITE also.

Between the USENET ham areas and the QRP list, I've seen W7EL, WØRSP, KH6CP/1, GQRPers Rev. George Dobbs, Dick Pascoe, David Stockton, and a host of other familiar calls and names seen in QST and the QRP journals. You're in good company here!

For those who remember my posting several months ago on the QRP list about writing a major, definitive article about QRP on the Internet, this is not it! I gave up on that long ago–that's something best left to the Internet experts, and I know I'm not one of them! (For some basics on Internet, check out the 4 part QST series which ended with the December 1994 issue.) My thanks to Steve Modena, AB4EL, for reviewing this article and helping me keep my foot most of the way out of my mouth.

–DE WA8MCQ

User Review of the QRP PLUS HF Transceiver

by Pete Meier WK8S
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I'm not an experienced reviewer but I thought my notes might be of interest to the Quarterly readers. Since the late 70's I have owned, used or built a considerable number of radios, many of which were QRP rigs. Until now, though, I have never found a radio that came close to meeting my criteria for "the perfect QRP Rig". Maybe the QRP PLUS is not the perfect rig but it comes closer than any other radio I have owned, regardless of price.

Bruce Franklin, KG7CR of Index Laboratories in Gig Harbor, Wash., designed this one right! It's not surprising to discover that Bruce works in the Medical Equipment field after seeing the precision design and layout of this radio. Every detail inside and out denotes quality, not only in design but in component choice.

The QRP PLUS is small–5.5 x 4 x 6.25 inches, housing five quality PC boards uniquely stacked in a vertical plane to conserve space. It weighs five pounds, due mostly to its sturdy 1/8 in. aluminum case. It operates at 12 Volts consuming only about 1 A on transmit and a mere 140 mA on receive.

This CW/SSB transceiver is an all-band (that's right, 160-10 meters!) microprocessor-driven superhet that uses upconverting to an IF of 50 mHz. A nice surprise is general coverage receive between those two bands, for those times when the ham bands are quiet. Selectivity is provided by a 6 pole crystal ladder filter of 2.4 kHz bandwidth and a unique digital SCAF (Switched Capacitor Audio Filter). This SCAF can be varied from 2.4 kHz down to 100 Hz in 100 Hz steps. You view the bandwidth setting or frequency on the 0.5 inch LCD readout.

The front panel is neatly laid out with buttons or switches for RIT/SPLIT, BANDWIDTH, REVerse for viewing the VFO in SPLIT or RIT modes, 20DB for strong signal attenuation, FAST for faster VFO tuning, VOLume, and MEMory. The 20 memories are used for band switching as well as storage. It's S meter also shows relative output power, which is adjustable up to about 5 watts from the rear panel. The rear also contain jacks for the KEY, MICrophone, PADDLES, ANTenna, RECVR (receive antenna) PADDLES, POWER and a FUSE. An iambic keyer is built into the software, with it's speed set from the front panel.

How do I like it and does it work? Obviously, I love it. The receiver is very sensitive, yet has a low noise floor. The VFO tunes smoothly and slowly enough for fine tuning. The CW is QSK with smooth and quiet switching. Although this rig is designed for CW it offers nice sounding SSB using a standard FM handheld mic.

But what makes this rig a real winner is the Digital SCAF, allowing you to choose just the right filtering bandwidth for conditions. It really cuts the interference. You can actually copy a cw signal at the 100hz setting with no ringing. It really works. I've had plenty of DX including a nice report from South America on SSB with 3 watts, but the QRP PLUS really shines when running CW. The sidetone is a pleasant sounding sine wave and the QSK (full break-in) is well implemented. Sometimes, however, I like a change and the general coverage receive is a real bonus. I love to listen to the BBC when I'm too pooped to participate. All in all the QRP PLUS is an American-made winner.

The QRP PLUS is available from: Index Laboratories 9318 Randall Dr. NW Gig Harbor, WA 98332 (206) 851-5725

(Edited by WA8MCQ during the transition between NN1G and WB6TPU; I get the blame for any errors. –WA8MCQ)

"It Seems to Me..."

by Byron Weaver, WU2J
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A BIT OF HISTORY

Decades ago, during my college days, a very good friend of mine always made a point of showing his hands to fellow students when somebody would inquire as to his major. "Look at those hands," (they were small) he would say. He was a Pre-Med student determined to be a Gynecologist one day. A very bright student, he didn't fare well in either semester of Physics he was required to complete. He perpetually complained that physics shouldn't be part of his necessary curriculum. Some engineering students felt they, too, shouldn't be forced to take a language or two semesters in the history of western civilization. Students with majors in these fields always obtained the best grades and the rest of us just thought we would never need to use such knowledge in our desired careers. Unfortunately, these subjects were never dropped and were just part of the "ticket" that would distinguish a college grad from those with a less formal education.

Surely, as a QRPer, you may already understand the direction of this article. It is the background of the Technician Class license. The history of this License should be a foreward part of any manual intended for a newcomer in amateur radio, *lest it will be forgotten.*

In the electronics industry, the word "technician" normally relates to specialist able to solder, build things from schematics, thoroughly evaluate and test an electronic apparatus, and in many instances, even design many simple products and circuits. When used today as a name for a class of amateur radio license, it just doesn't appear to fit. New amateurs and people unfamilar with amateur radio can appreciate the terms: Novice, General, Advanced, and Extra, but "Technician" tends to stand out as something special indicating a certain expertise. It sounds more impressive than "General Class"!

When the Technidan Class was first introduced in 1951, it required a supervised FCC examination and granted an amateur operating privileges above 220 MHz only! It was intended for the vhf/uhf experimenter with technical expertise. Amateurs that would design their own equipment and antennas to investigate and possibly pioneer new frontiers with minimum"distance" communications ability.

In 1954, both Novice and Technician Class licenses were permitted to be administered by mail, an action supported by the ARRL. The Novice license was only valid for one year, non-renewable. It was a successful "stepping-stone" license intended for amateur radio introduction and upgrade as individuals became more code pro£icient and technically competent.

Code requirements of 5 wpm (a few actual seconds between letters) made it easy to become an amateur if you could just memorize those letters and numbers. It was part of the "ticket" that distinguished hams apart from those with a less formal education!

The Novice always had respect from amateurs with higher class licenses as they knew he'd be struggling during his year's period to upgrade. On the other hand, the Technician developed a reputation as a "no-coder" or a "freeloader" and to some, "a cry baby." However, the Technician Class grew stronger by leaps and bounds. They wanted to operate, not experiment. They wanted to communicate farther distances but not upgrade to a higher degree of license. Later, they managed to gain 6 meters and soon afterwards a portion of 2 meters as the ARRL again seemed to succumb to their voices in quantity. By the end of 1962, the Technicians were seeking voice privileges on 10 meters, far from the original intent of this license. In effect, they wanted a degree with almost no prerequisites. Once again, with the League's support, they extended downwards, this time to hf DX (l0m). There was an uproar from many amateurs who felt this class continually upgraded by doing zero.

It appears that far too often the League's influence has been overlooked and forgotten in time. Sure, there were times when their year-end financial statements indicated they were struggling a little. Some of us actually felt sorry for the League and donated money to a particular fund drive. Maybe we were naive in those days by believing the League could only do good for our hobby. Sometimes it takes many years to see the gravity of a particular decision. Sometimes we can underestimate a ruling because of the manner in which a press can influence our judgment and thinking. It's all too easy to become a captive and gullible reader alone in your corner of a room.

It should be very obvious to you now that the "No-Code License" was in the financial interest of all U.S. amateur radio publications and the suppliers of amateur radio equipment. Long term it has to be detrimental to our hobby. It is the "beginning of the end." If we carefully diagnose the history of the Technician License we may easily conclude a decision was most likely reached years ago.

Perhaps we have overlooked the "numbers aspect" of the move. We know there were around 550,000 holders of amateur radio licenses when the vote was taken at the ARRL. I would guess the League had in the realm of 130,000 US members at the time. We know many of these members were opposed to the "no-code", maybe in the realm of 45%! That would suggest only 13% of all U.S. license holders supported the measure. If the FCC really had a sincere interest in a democratic system of voting, they would have mailed a ballot to every license

holder! Government money is wasted on thousands of more ridiculous programs. We can be absolutely positive if we had democratic representation this measure would have been overwelmingly defeated.

If my figures are close to correct, we can conclude the League represents only 23% of the amateurs in this country. That is a very optimistic figure. To require the other 77% of license holders to become League members in order to vote would be an injustice. In my opinion, this ruling possibly represented a stacked deck of cards (business interests) and hindsight shows it perhaps unfair. Whatever happened to one citizen (amateur), ONE VOTE?

Florida must be the "ham capital" of America. There are clubs with nearly 800 members (Tampa), 325 members (Melbourne), and perhaps even larger clubs in Jacksonville, Palm Beach, Orlando, Ft. Meyers, Miami, etc. These clubs are populated by retired senior citizens who were not given the opportunity to vote. And, I am confident their votes would have been a big negative. Few seniors on social security bother with costly subscriptions. *CQ* & *QST* magazines are available at libraries in Florida and can be "checked out" for a two week period. What we needed was for individuals at each club to have a signature list available for signing "those opposed". But, why should such be necessary in a democratic country?

By the way, there are so many hams in Florida that our Congressional representatives maintain an exclusive mailing list just for radio amateurs. So many big beam antennas that the electric company was forced to bury their wires since there was no space for the telephone poles (hee-hee). Shucks, now that I think about it, I'd be willing to bet our representatives would be very concerned if they knew that the majority of amateurs had been denied a formal and proper voting on a matter of such significance.

Back to another aspect of the numbers. The past decision to give Novices a lengthy license means the League could stand to benefit from a quantity of low-level technical votes in the future. The addition of the most "laid-back" group, the "no-coders", again enhance their position for lower level (no CW) support in the future. (History proves it!) And, you ask, why does the ARRL write in their July *QST* editorial that amateur radio is changing?

Can't you get angry and determined to fight for our interests? Have you become so passive you prefer to only whisper your grievances? Ever think of forming an alliance of all U.S. QRP Clubs and advising the FCC that you are not represented by the ARRL? Send them a copy of the Quarterly (or whatever) free so they know of our existence. Secure the votes (if needed) from non-ARRL members at nationwide clubs on a petition. What can you lose? Automatically, the QRP Alliance would be the second largest *amateur radio* organization in the USA *to address the FCC*. Nothing ventured is nothing gained.

Don't think small, there exists over 400,000 votes up for grabs at present day figures. Nothing in our By-Laws states an amateur must operate QRP (if not claiming to be). There sure are a lot of radio amateurs out there desiring to BE ABLE TO VOTE. You can be certain if they came up through the ranks with CW, they won't vote CB. We have a silent MAJORITY.

As an individual QRPer you probably think this is all wind and no storm. Wrong. QRP is already organized with many clubs, right? Take a vote at your next meeting if you do not have a Newsletter.

If you have a publication print a ballot in it. Next, each Club send their results to the ARCI (a central meeting place with a 33 year history) for publication. Example:

CLUB	FOR	AGAINST
Florida Old Coots QRP Club.		
Michigan QRP Club		
St. Louis QRP Society		
NorCal QRP Club		
NE QRP Club.....		
Northwest QRP Club.....		
ETC. QRP Clubs.....		

See, all those newly created QRP Clubs *do* "have their virtues". End it, or make it! Stand up and be counted. Vote your own mind or forever take the "lumps" and remain silent!

As a cheerful finale, I must conclude with the exploits of my XYL. Christine, AC4RU, always enjoys chatting with women at the various hamfests we attend. She doesn't really care if the women she meets are amateurs or not, and usually remarks that so-and-so was very nice, or very friendly, etc. Yet, her unintended survey reveals many of the women she now meets have the No-Code License. Chris was never in favor of this license having earned her Extra ticket by coming up via the prerequisites without any support from this OM. This is typical of many other QRP womean we can be proud to have as members. Christine also feels it's great if a wife really enjoys amateur radio. However, I thought you would be interested to know that because of her newly obtained fact finding efforts, she has dubbed this new license (are you ready to hear it?), the "Housewife's License". It is the only way she refers to it in our conversations. Personally, I find this name a definite improvement and much more appropriate than something as silly and misleading as the "No-Code Technician Class License". It has good and proud meaning. Anyway, since many of you have talked with Chris during her Dayton visits, I thought I'd prepare you for the next time. So, please, if she asks you if you have the "Housewife's License", it's not to belittle you, but to forever remind the ARRL and FCC of their outstanding accomplishment.

–B.C. Weaver, WU2J (No, I'm not seeking a position or title, I've already had my share, made my life).

QRP, REALLY!

by Bruce Muscolino, W6TOY
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FEEDBACK!

Hot diggity! I had a comment on my first column! Someone asked if I had a $9,200 antenna? It took me a couple of minutes to figure out what he meant, but then I remembered my advice on how to spend your ham radio dollar. Of course I don't have a $9200 antenna – where I live I'm happy to have a 92¢ antenna. I'd bet it's also a fair guess that most of you don't have a $9,200 antenna either. But once upon a time, I did have the opportunity to listen to a receiver hooked to a Broadcast Station tower.

The station wasn't on the air at the time, but I'd swear we could hear everything else that was. I don't know how much antenna $9,200 buys, but I'd bet you'd be happy with it! I'd intended to devote this column to what to look for in QRP radios you might be tempted to buy, but over the last couple of weeks I've had so much fun on the air that I thought I'd better share some of it with you. Then we'll get back to equipment selection.

A NEW NAME

After a lot of careful thought, I decided I didn't like the column name I liked so much, and I'm going to change it! From now on, until I change my mind again, this column will be called "QRP, REALLY!"

A QRP MYTH

Traditional wisdom says you shouldn't try QRP operation unless you have a good antenna. In one of his QRP Notebooks, Doug DeMaw even says only a masochist would try to operate QRP using a marginal antenna. Shucks, I was just trying to be a good ham; you know, advance the frontier of the radio art and all that. I've run QRP with marginal antennas for over 20 years now, and I'll compare my QSL collection to his anytime!

What is a good antenna? On the low bands, dipoles and end fed wires at least 100 feet long fit the description. On the high bands, beams, of course. And you can't beat a vertical for equally poor radiation in all directions at all times! Hogwash, and I apologize to the hogs!

A good antenna is one that radiates enough of your signal to get to the other guy's antenna. Radio, especially QRP radio, is a cooperative art! Auto racers tell you they won by going just slow enough to be first across the finish line. QRPers use just enough power to reach the other guy's antenna!

During the whole time I've had a ham license I've only had outdoor antennas twice: when I was first licensed as K8BAL, in Ohio, and later, in The Netherlands as PA3AIC. In Ohio I used a 137 foot Windom; in the Netherlands, I had multi-band trap verticals and a sloping inverted vee. The rest of the time I've used marginal antennas.

About 1976 I got an itch to get back on the low bands. This was the Mother of All Itches; it had to be scratched. If I had been prudent I would have just bought a house and put up a dipole. Instead, I had a long talk with myself. Hams, I reasoned, were responsible for much of the development in radio's history. It was a sacred duty, to find a way to get on the low bands with an invisible antenna. I diligently did my research, and considered a number of alternatives ranging from a flagpole to a mobile whip.

The result of my research hung on my living room drapes for the best part of a year. It was a helically loaded dipole. The worst part of that antenna was listening to my then girl-friend laugh. The best part was 46 states and several countries on 40 and 15 meters.

Ok, I admit, when I first started I used a TS-520. But soon I was using an Argonaut.

A year or two later I carried the TS-520 to Maryland for Christmas. I was only going to listen, but the signals on 40 got the best of me, and I proceeded to work guys up and down the East coast using 30 feet of wire laying on the floor. When I lived in the Netherlands, I built a helically wound dipole out of a couple of CB whips, hung it in my attic, and worked all continents over a two week period using the ARRL's WARC transmitter running about 5 watts output.

Hmmm, you say, but the sunspots were pretty high then, weren't they? Yes, they were, but they aren't now, are they? Yet over the last two weeks I made over 100 contacts using a piece of number 26 magnet wire running through an aluminum window frame and up into a near-by tree. Most of those contacts were made in contests; 50 in the Pennsylvania State QSO party, and 40 in the QRP-ARCI's Fall CW QSO Party.

What else did I work? Hungary, in the middle of the afternoon on 20, and San Andreas Island, off the coast of Colombia, another afternoon. South Dakota (two way QRP) and California in the evening on 40. All the contacts were made using CW. The equipment used included a New England QRP Club NE-4040 running about 1.5 watts output, a prototype 40 meter transceiver by MXM Industries, running 3 watts output, and Old Faithful, my Kenwood TS-130V running between 3 and 10 watts output.

So what's the point of all this babble? If your forebears and mine had listened to the rumors about rain, we'd still be living in caves in the south of France, and we wouldn't be worried about QRP.

Thankfully, at least my forebears weren't afraid of catching a cold and so instead of a cave, I live in a condo in Maryland. I didn't say anything about smarts, I just said they weren't afraid of getting wet.

I think It's wonderful if you have the room for a full size 160 meter dipole in your back yard. I don't, I haven't for many years, and I don't plan on it soon. I just looked around where I lived and found a ham's solution to a ham's problem.

You can too. It can be done. I did it. You can do it. Quit worrying about how, JUST DO IT!

QRP EQUIPMENT

Buy it, or build it, great adventure awaits you as a QRP operator. Today's QRP enthusiast is confronted with a veritable smorgasbord of equipment to choose from – rigs of every size, shape, and description await your attention, and your money. Which one will return the most operating pleasure for your investment of time and money?

I want to take a little time to arm you with enough information to intelligently pick and choose among the alternatives. It's very important to me, at this point to state that I'm not in bed with any QRP manufacturer.

One of my oldest and very best friends in this world is a QRP kit manufacturer, Bruce Williams of MXM Industries, but we've been friends long enough to respect each other's honesty and integrity. Let me say, once and for all, I'll call a bad radio a bad radio no matter how it finds its way onto my operating table. However, I will try to be tactful.

WHAT TO LOOK FOR

Performance is the most important factor in equipment choice. This is especially true with QRP because you're spotting the rest of the world at least 2 S-units. Face it, spending your money on a radio you can't make contacts with makes no sense unless you're an SWL, and then you might not want some QRP radios as a door stop.

Selectivity:

In my book selectivity is probably the most important receiver quality. Yes, I hear you sensitivity fans screaming "if you can't hear 'em, what good is the radio?" Well, what good is a radio that hears 'em but can't separate 'em? Since the early days of QRP there have been two competing receiver design traditions: direct conversion and superhet.

Back when much of the pioneering QRP work was getting done, direct conversion receivers had some distinct advantages over their more complex superhet cousins. They were easy to build and get operating, and many of the parts and techniques we take for granted today weren't available then. The Cohn crystal filter used in almost every current superhet design hadn't been developed yet, and the least expensive crystal filter cost as much as many homebrew QRP transceivers.

Remember also that at this time QRP was more or less consigned to the "vacation/portable/curiosity" category. Direct Conversion technology offers another advantage. Transceive operation is possible without mixers. You heard me, "NO NASTY MIXERS TO ALIGN!" One VFO generates the transmit signal and mixes received signal to audio. I wish superhets were that simple to build – but their advantages out weigh their warts.

Let me refresh your memory about the superhet's number one advantage: SINGLE SIGNAL reception. Is this an important feature? In a word, YES. Single Signal reception makes it possible to hear each signal once, and only once, and only on one side of zero beat.

Does this make for more comfortable operating? It sorta depends on how you operate, but more than likely, YES. Your operating preferences will help you make the decision. If you get on the air a couple of times a month and make one or two contacts, single signal reception is probably not a big item. If you're going to use your QRP radio along the trail, as you follow the footsteps of John Muir, again, probably not. BUT, if you're going to regularly spend several hours at a time operating, trust me, SINGLE SIGNAL is the only way to keep your ears attached to your head. It's bad enough there are 300 stations trying to cover up the guy you want to work – imagine having to listen to each one of them twice! This is the single, largest, problem with Direct Conversion technology–you hear the signal on both sides as you tune through zero beat.

SUPERHET = SINGLE SIGNAL ?

Something Bruce knows but didn't mention here is a fact many people may not be aware of: a superhet receiver is not single signal simply because it IS a superhet; the two are NOT synonymous. Nor do all direct conversion receivers hear a signal on both sides of zero beat.

The phasing DC receiver gives single signal reception, but at a cost of increased complexity. Good examples are the R2 by **Rick Campbell, KK7B,** QST for January 1993, and "A New Breed of Receiver" by **Gary Breed, K9AY,** in the January 1988 QST.

As for superhets, they CAN, and usually do, have single signal reception but this is because they have sharp IF filters which cut off the signal on the other side of zero beat. You can make them hear on both sides if you want (and turn them into the functional equivalent of a non-phasing DC receiver). If your "big rig" has an IF shift control you can prove this to yourself. Move it off dead center and go to either side. At one extreme you'll find that you can hear signals on either side of zero with equal strength. If you have one of the newer rigs like the Kenwood TS-450S which lets you select filters for both IFs from the front panel, independent of mode, go to CW or SSB and open it up to the widest possible filter combination (which I think is 6 or 12 KHz). That does it, too.

And just in case that doesn't really convince you, you can try it on one of your QRP superhet rigs. I took my NE4040 (from the New England QRP Club's 72 magazine and also QST for November 1994), and disabled the crystal filter by temporarily jumping around the two crystals. (I used a 0.01 uF ceramic cap to do it, since the input and output sides of the filter both go straight to NE602 pins, and must be isolated from each other at DC; that's pin 5 of U1, the RF mixer and pin 2 of U3, the product detector/BFO.)

Sure enough, its superhet receiver could hear equally well on both sides of zero with the filter bypassed. The trick to single signal reception is having a sharp filter in the IF and proper adjustment of the filter passband with respect to the IF. Mess with the passband, or simply bypass the filter, and you will lose the single signal reception that we all take for granted in modern-day superhets. *–WA8MCQ*

Sensitivity:

No, this is not a therapy session for your rig. The guys who were complaining a few paragraphs back about being able to hear 'em have a valid point. If you can't hear 'em, you can't work 'em; this is true whether your running 1000

watts or 1000 milliwatts. Some people think since QRP radios are often physically small, it's OK for their performance to be small too. The corollary to that idea says since you probably won't work 'em, you don't really need to hear 'em.

CRAP! That's pure unadulterated rubbish! There is absolutely no reason to put up with poor performance because the package is small or because the radio is only used occasionally. A well designed superhet also ensures no one stage will have excessive gain. Since the conversion gain of most mixers is low, often even negative, direct conversion receivers have to make up the missing gain at audio.

This means that if you bump the radio while you're listening to it you'll hear it, just like you'll hear the bearings in the tuning capacitor squeak or your fingers drumming on the table-top. Just what you need while trying to copy your signal report from that RST 119 DX station on the low end of 80! It also means the audio stage will probably oscillate, too.

Audio Power Output:

Personally, I don't like using a speaker. Headphones help me concentrate and also keep my neighbors from wondering what new strain of termites moved into the building. Even so, I don't understand why almost every QRP radio I've used had to have its audio gain darn near wide open. There are simply too many good, inexpensive, stable audio power amplifier chips around to put up with this.

Oh yes, I've heard the "reduced battery drain" bleat, but I'm too old for that. I'd bet 99% of all QRP radios used today are hooked to power supplies or Gel-Cell batteries over 99% of the time. I don't mind reasonable compromises in equipment that was truly designed for portable operation; just bring me a copy of your campground receipt.

Transmitters:

You might have noticed by now that almost all of my remarks have been about receivers. This is not because of IYCHEYCWE (If you can't hear 'em... etc.), but because most QRP transmitters I've used have been more than up to the task at hand. Probably the most important performance factors in QRP transmitter design are STABILITY, STABILITY, and STABILITY.

Never forget, you ain't rare, and no one wants to chase your signal up and down the band just for a report. Other qualities to look for might include reasonable output power, and seamless break-in keying. Reasonable power output could be one milliwatt, if that's your bag, or 5 watts, if you want to take the "A Train".

I'm kind of in favor of adjustable power output. Adjustable from the front (or rear) panel, that is. It doesn't seem like too much of a problem to incorporate, but almost no one does it.

Break-in keying? Until a few weeks ago I thought transmit/receive switches were perfectly OK. Then, after a weekend of using a radio with superlative QSK, I tried to answer a DX station without using the transmit/receive switch on my beloved TS-130V.

Maybe I've been converted, who knows.

WHERE TO FIND THAT RADIO

Now you know what I think is important in a radio. Where do you find that radio and how do you know you've found it? I've looked at a lot of radios in my time, both new and used, and I haven't seen one yet with "This is IT!" engraved on the front panel. I've seen some ads that say it, but ads don't work other stations, radios do – it's their job.

Kits, Projects, and
Things That Can Go Bump in the Night–

There are as many reasons to build your own QRP equipment as there are stars in the sky. Potential cost saving is certainly one; and the satisfaction of working the world with what was just a pile of parts last week is another; and the possibility of being able to build exactly what you want, either through design, or design modification is in there too.

Whatever your personal motivation to build is, it is clear that building equipment is making a comeback in ham radio, and QRP is leading the way. The kit market place is divided into two groups: kit manufacturers, and club projects.

Kit manufacturers are in business to make money selling kits. They hope and pray their kits will pay for food, clothing, shelter, and a couple of beers each week down at the VFW. They have a vested interest in selling you a kit that will work as advertised the first time out of the box. Some of them offer an "I'll make it work" warranty for a small fee, plus, of course the parts you fried. This is the kind of help you should look for in a first kit.

Club projects:

While it almost seems like there's a "form a radio club, sell a radio kit" conspiracy getting started out there, there really are some interesting club project radio kits being offered these days. My experience with them has been mixed. One problem I've faced has been availability. Putting a kit together for sale involves a lot of financial risk, and the designers want to hedge their risk by either preselling a quantity of kits, or placing a minimal order for their first (and maybe only) production run. I almost always seem to be on the waiting list for the second production run, though I've always gotten a radio. One point in favor of the club projects I've bought has been their parts quality and their manuals, but then I've not bought them all.

BUYING

Buying equipment, new or used, can also be an attractive alternative. It's certainly one of the fastest routes to getting going with QRP, but it has a down side – it can cost a lot of money.

All of the major QRP equipment manufacturers sell by mail order, and some also sell through dealers. Some ham stores have a selection of QRP equipment ready on their shelves – just put the money down and you're on the air. If your local dealer does not carry QRP equipment, try looking at local hamfests – they're often a source of good new and used equipment.

While not all ham radio stores carry new QRP equipment, some may have a selection of used equipment in stock. The most commonly found new equipment will prob-

ably be by MFJ or TEN-TEC. MFJ has been building QRP transceivers for the last 5 or so years, and many of their products have received reasonable reviews in the amateur press.

USED EQUIPMENT

Buying used can save you precious dollars. The selection of used equipment will always vary, both at ham stores and at hamfests. The most commonly seen used equipment is from HEATHKIT and TEN-TEC, but keep in mind that YAESU and KENWOOD both imported semi-QRP radios in the early to mid 1970's. While they were in business, HEATHKIT manufactured three of the most popular radios in QRP history. All three of them are considered classics, though some may be more classic than others. The HEATHKIT's are the "Hot Water" radios, the HW-7, HW-8, and HW-9. They offered performance ranging from acceptable to very good, at affordable prices.

If I were going to purchase my first QRP radio from this series, I'd try to find a clean HW-8 or HW-9. The HW-8, even using direct conversion technology, was a real improvement over the HW-7, and the HW-9 offered superhet reception.

The best known TEN-TEC radios are the ARGONAUTS. There were three of them, the 505, the 509, and the 515. They were all five band radios offering both CW and SSB operation. The 505 and the 509 often sell for between $250 and $350, depending on condition, the seller, and how badly you drool. The 515 comes in at the high end of that range. These are solid radios, and are much in demand both here and overseas.

KENWOOD and YAESU have both offered QRP equipment on the US and European market. These radios were actually built for the Japanese Novice market where the maximum power output is only 10 watts. They first began to appear in the United States in the late 1970's.

KENWOOD first brought in the TS-120V, followed by the TS-130V, the only difference being WARC band coverage. These radios are identical in every respect with their big brothers, except they don't have the monster heat sinks on the back or the oversized power supply along side. YAESU brought in the FT-301S, the FT-7, and the FT-7B. While I don't have any personal operating experience with the QRP YAESU's, I have heard them, and worked them, and their owners seem happy.

OTHER KENWOOD QRP

There are also a couple lesser known QRP Kenwoods which were sold in the US. Both are quad-band, all-mode rigs (CW, SSB, FM with adapter).

The TS-660 covers 15, 12, 10 and 6 meters (a real "Sunspot Special"!), while the newer TS-670 covers 40, 15, 10 and 6.

I have one of the latter, which was sold for a few years in the eighties, and had a chance to play with one of the former. The TS-660 bears a passing resemblance to the TS-120S and TS-130S, while the TS-670 looks like a junior TS-430S or TS-440S. Both are a nominal 10 watts output. *–WA8MCQ*

Although I'm not positive about this, I don't think the Japanese Novice rules have changed, so there may be some small chance that the major manufacturers still offer radios with two different output power ratings.

Yes, this does imply you might be able to purchase QRP versions or the IC-781, or TS-950, or whatever, but please don't ask me how. Anytime you buy used equipment there is risk. Does the equipment work? How did the previous owner treat it? Has it been modified, and who modified it? If was built from a kit, who built it? Buying from an established store offers the advantage of having the equipment demonstrated before you put your money down.

Also, a store may offer a warranty. At a hamfest, you should ask the seller to demonstrate the equipment, even if it means waiting a few days and going to his shack. Some hamfests have tables where you can have equipment checked out before investing your hard earned money. Dayton, for example, offers this service, and I think it's a great idea – one which many hamfests might copy.

ANOTHER WAY

Did you know you can use the rig you already have? At least you can get a taste of QRP operation with most rigs simply by turning down the carrier control.

Unless you're going to enter a contest, you'll get a taste of QRP operation, even at the 10 to 20 watt level. There have a number of excellent articles in QRP Quarterly (and other magazines) on how to reduce the output power of many rigs to real QRP levels. If there's enough interest I'll dig some of them up and we'll see about getting some reprints made.

AND NOW FOR A WORD FROM YOUR SPONSORS

Ever notice, when you read QRP columns in other magazines, they almost never list the same group of manufacturers? One time it's this group and the next time another. What's going on? Is the QRP kit business that volatile? Are companies going in and out of business every other month?

I think NOT.

I think the manufacturers are too busy buying baskets to hide their light under, and consequently they don't have the money to spend on press releases. They certainly don't seem to overwhelm us with advertising in this QRP journal. Sometimes you'd think they don't want to sell anything. But a manufacturer of QRP products not only read my first column, he took the time to send me an information package. I want to personally thank S&S Engineering for the kind note and the data.

You can bet they'll be on any list of manufacturers I publish. And the rest of you manufacturers, listen up – if you want to be sure you're on every writer's list of sources, take the time to send them some information. Don't count on all of us having extensive libraries or unlimited resources to track you down. Twenty-nine cents may bring you a sale!

Oh, and dear readers – when writing manufacturers for information, please send along a self-addressed stamped envelope. It's a courtesy. QRP

IDEA EXCHANGE

Technical Tidbits for the QRPer

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IN THIS EDITION OF THE IDEA EXCHANGE:

GOOD, CHEAP SCHEMATIC PROGRAM

Starting with the October issue, I've been using a program on my home computer to draw and print schematics for the column. It's called KeyCAD Complete, from Softkey of Boca Raton, FL. I got it at Office Depot, a chain of office supply superstores, a bargain at about $20. It runs on the IBM PC and higher, with DOS 3.0 or later and 640K RAM. I use my Epson 9 pin dot matrix printer, but it also works with lasers and others. Since I'd already been using Tango Schematic at work the learning curve wasn't too bad–it has much of the same look and feel. It does like to crash sometimes, but I think that may be due to my not having enough memory on my old '286 computer. (They say "mouse recommended"–I'd add the word "highly" to that.)

You may notice a similarity between the style of drawings here and some of the ones in QRPp, from the NorCal QRP Club. That's no accident, since Doug Henricks (KI6DS) is the one who recommended it to me, and I really appreciate it. I'd been looking for a good, inexpensive schematic program for a while.

It even comes with some symbol libraries, although I've modified and added to the electronics library quite a bit. (KeyCAD isn't limited to schematics; you can make drawings of anything you like.) If you need a good drawing program, for schematics or anything else, you might want to give this one a try. (And if you don't like the style or selection of electronic components, I'll be more than glad to let you have a copy of my modified library.)

–DE WA8MCQ

TWO METER ANTENNA

From a name and call that have appeared many times over the years in the ham press, **J. Frank Brumbaugh, KB4ZGC,** currently of Salinas, PR:

I've been licensed since 1949, thought I knew rather a lot about antennas, but what I've stumbled onto with this 2 meter antenna has me shaking my head. Perhaps some reader can explain why it works so well. I give up.

My Alinco DJ-160T with duck, and with quarter wave whip, usually cannot break squelch on the only 2M repeater within range. I cobbled up a folded dipole 31 inches long of 300 ohm twinlead, fed it through a cable TV balun from my handheld as shown.

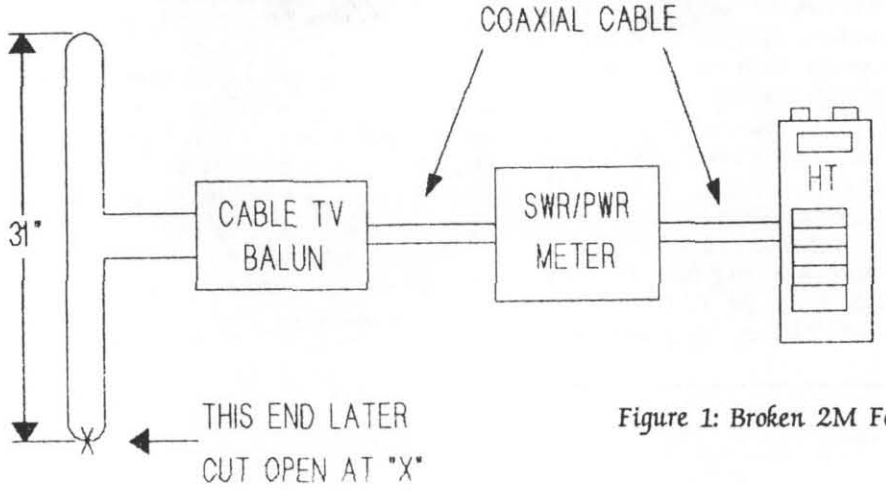


Figure 1: Broken 2M Folded Dipole

The antenna was fastened inside the cement block wall of my apartment, using hot glue. SWR was 5:1–not good! I decided to change it to an ordinary dipole and cut off a quarter inch from the bottom end, leaving the two wires open. Then, for no obvious reason, I checked it for SWR and power. SWR was 1.1:1; power was over 2 watts at 7.2VDC and over 4W with 13.8V. Results were identical with various lengths and types of cable between the handheld and meter–1 foot and 3 feet of RG-8X and 5 1/2 feet of RG-59.

I never did clip off the other end to make an ordinary dipole out of the original twinlead folded dipole. Having decided I didn't know nearly as much about antennas as I thought I did, I quit while I was ahead–almost perfect SWR, and I have no trouble accessing the repeater.

The lengths and types of coax used were what I had handy, and not by design. Apparently, they make little or no difference as shown by my measurements.

I have an MFJ-247 which only goes to 30 MHz, not a 249, so I could not check the resulting antenna for resonance but it must be close, and must still be broadbanded, similar to the original, intact folded dipole.

I'm not going to give this 2M antenna a fancy name–I don't even know what to call it, anyhow, because while I can tell what the dipole portion should do by itself, what is that long wire attached to one end and folded back just 3/8" from the dipole portion doing? I can't explain why I didn't also chop 1/4" off the top end before measuring the results–I had intended to, but now I'm very glad I didn't! I hope that someone will explain just what is going on with E and I distribution in this antenna; I wouldn't even try!

–DE KB4ZGC

MORE TWO METER ANTENNA NOTES

From **Herman Belderok, WVØR** of Topeka, KS–Some additional comments on "Joes Quickie #10" (N2CX) notes published in the July 1994 Idea Exchange, page 29:

I have used the 2M ground plane Joe described since the late sixties with a few additional features. For Field Day, emergency preparedness and for Civil Air Patrol (they operate adjacent to the two meter band) I mounted a bracket on the connector as Joe suggests, and carry four lengths of approximately five feet aluminum tubing, each necked down at one end to allow quick assembly into a twenty four foot high mast. When assembled the third tube up from the ground has an eye bolt through the tube to provide a tie point for the three small diameter nylon guys. Three tent stakes take care of the other ends. This permits me to operate in the clear space without the need to find trees or other sky hooks.

One CAUTION: watch out for overhead power lines! But then, as we all know, for best results one should operate far away from ALL man-made objects.

My previous variation was to solder a lug to the tip of the vertical radiating element. Then tie a short length of fish line to it to form an insulator, and tie this to some light rope and loop it over a branch. This arrangement suspends the ground plane in the proper orientation with no fuss or bother.

Another variation which I have constructed is to solder four female pin sockets from an old connector to four lugs and mount them permanently to the SO-239 as described by Joe. Then I soldered a mating male pin to one end of each of the four ground plane elements. Assembly is quick. Just stick the male pins into the female sockets, and the antenna is ready!

Here is some data which may be of some interest. If all element lengths are adjusted for L = 234/Freq (feet) or L = 2808/Freq (inches), where Freq is in MHz, then the impedance at the ground plane feed point is:

Angle	Impedance	SWR (degrees)	(ohms)
0	18.3	-J59.3	6.79
10	24.5	-J42.8	3.76
20	31.5	-J26.1	2.19
30	39.0	-J9.6	1.39
40	46.9	+J6.1	1.15
50	54.8	+J20.7	1.50
60	62.4	+J33.9	1.89
70	71.9	+J69.9	3.18
80	77.4	+J130	6.44

The angle is the amount of degrees the radials are bent down from the horizontal. As can be seen, any angle from 30 to 50 degrees will give a "good" impedance match.

For the purists, one of many possible "perfect" match configurations is obtained when the elements are bent down 49 degrees and the vertical element is shortened from the formula value by three percent (ie, multiplied by 0.97). The antenna should then exhibit an impedance of 51.4 -J0.1 for an SWR of 1.03.

–DE WVØR

NEW TYPE OF ANTENNA WIRE

From **Bob Melville, K3WRV,** just down the road in Lothian, MD:

I've recently discovered a new type of light, strong, flexible antenna wire called Baygard™. Known generically as "poly wire," Baygard consists of three strands of fine gauge aluminum wire, about #24, interwoven with two strands of vinyl and one strand of Fiberglas™. It is nearly as flex-

ible as test probe wire, is quite kink resistant, and is advertised as non-stretch.

It is sold for use on farms as portable electric fencing, that is, temporary or semi-permanent fencing which a farmer may move on a daily or weekly basis. A 200 meter spool weighs about a pound and costs about $17 at your local farm supply store. It can be spliced simply by tying a knot. The only drawback is that it's definitely not invisible–the plastic strands are yellow and black. Although Baygard is the only brand I know of, there may be others.

I find Baygard especially useful for portable work. I carry a 100 foot length wrapped on a small cardboard mailing tube. When I want to put up a quick antenna, I strip off a few feet to give some slack and, using the remainder of the spool as a heave, toss it over an appropriate tree limb. It throws easier than a rock on a string and with much less tangling. Once over the limb, the wire on the spool unrolls until the spool hits the ground. Then I tie the wire off at the spool with a clove hitch and either tie it to a low branch or pull it form the other end of the wire, with the spool attached, back off the ground into the tree. I have connected the free end directly to my antenna tuner, but find it works better to tie it with an overhand knot to a stake or low twig and then to the tuner to relieve the strain.

I haven't bothered with insulators. Although they would probably make the antenna more efficient, they add mechanical complexity, would make it harder to throw the thing into the tree, and would eliminate the ability to use random lengths. To take the antenna down, I simply disconnect the free end, let the spool drop to the ground, and roll it up! With the 2.5 watts from my Argonaut, I haven't had any trouble making contacts, even on SSB. (I've run over 100 watts into Baygard without any apparent problems.) I tried a 250 foot piece of Baygard as a long wire in a semi-permanent installation. After 18 months, which included 2 winters with a couple ice storms and lots of wind, a few of the aluminum strands were broken, but the antenna still worked well and didn't appear to have stretched. A similar installation using 17 gauge aluminum wire stretched substantially and broke during the first winter.

–DE K3WRV

CHECKING TOROIDS ON THE RUN

From **Mike Silva, KK6GM** of Cyberspace, USA; adapted from his item on the QRP forum on Internet (used with permission):

Someone recently said, in part, "Just a note to add to the recent dialog on the Internet QRP forum about winding cores. Someone mentioned difficulty in finding cores in Hawaii, and I believe he said a dealer there had a box full of mixed cores of all sorts (mongrels, apparently) with it being up to the purchaser to figure out what's what. Just a reminder to never trust the color code on a core unless you positively KNOW who made it or know where it came from." So true! There are LOTS of switching-supply ferrite toroids out there marked with "wrong" colors (I know, I own some!). *[And I've mentioned this in the column before. –WA8MCQ]*

Nowadays when I am toroid-hunting I take along a length of wire and my inductance meter. I'll wind 5 or 10 turns on a core and compare the inductance with a little card I made up for the standard types I'm interested in. It's not terribly accurate, but it doesn't have to be to differentiate between, say, a permeability of 10 and one of 1000. If you have a portable freq. counter you could wire up an oscillator run off a 9V battery and check cores that way. *[And handheld LCR meters are fairly inexpensive nowadays, around $100 for basic models. –WA8MCQ]*

Just put some values for known cores, eg, T50-2, etc, on a piece of paper so you're not trying to do inductance and turns calculations while the seller watches intently. Truth to tell, I use a spreadsheet. And, no, I haven't saved enough money to make it financially worthwhile, but that's not the real point, is it?

–DE KK6GM

ALTERNATIVE TO SUCRETS BOX

Dick McIntyre, K4BNI of Basye, VA, sends along a tip about small metal boxes for tiny rigs:

One of my all-time favorites was the Li'l Sucre pair by Don Kelly, KA5UOS, a transmitter and matching receiver described in two issues of the Quarterly several years back, in Sucrets boxes. Dick writes, "In addition to the Sucrets box, there is another box that is available in Food Lion chains and probably other sources. It is a 3.75 X 2.25 X 0.5 inch box used to package Altoids, 'The Original Celebrated Curiously Strong Peppermints'. The box is a hinged metal container, made in England."

–DE K4BNI

ANOTHER CAUSE OF VFO INSTABILITY: THE FREQ COUNTER

Another tip from **Bob Melville, K3WRV**; he called me up recently and asked for some help with VFO instability. It had been running somewhere in the ball park, but suddenly went haywire, with a signal in the upper HF range according to his counter, wildly unstable, and covering several MHz when the circuit was tuned. He had

tried just about everything, with no luck, and wanted some more suggestions. A few days later he wrote me with the results:

"Thanks for your time on the phone, troubleshooting my NN1G oscillator circuit. I tried everything you suggested, with no luck. [Checking for bad solder joints, hairline PCB cracks, components with internal open circuits, etc.] I rebuilt the thing on perf board with new parts but the original coil–still no luck. I changed the point where I was coupling the counter and suddenly I was back in the ball park, but the circuit seemed to drift a lot–several MHz over a few minutes.

I became suspicious of the counter at that point, and tried counting the signal from my 2M HT–no reading, but not too surprising for a hamfest bargain that I'd never tried that high. Next I tried coupling my grid dip meter, which also seemed very unstable, 500 KHz drift in a few minutes. At that point I charged the counter batteries for an hour, and voila!–everything was back where it should have been, and stable, too!

I'd used the counter quite a bit over the past few days–it's an old Optoelectronics AC-DC portable, which has an internal 50 mA constant current charging circuit built in. I suspect that even with the wall charger connected the counter draws more than 50 mA and the batteries drained down. (My whole workbench, including the charger, is controlled by a switch which is off when I'm not working there.) The moral: make sure you always have a good power source on your counter, and whenever it gives erratic or unstable results don't forget to make sure the counter itself is operating normally. You just might need a charge (or new batteries).

I would be interested in info on final amp transistor selection–2N3053, 2N3553, RCA 4013, 2SC799, what have you; what are the pros and cons of each? It might also be neat to have a list of rules of thumb, "what everybody knows", and list of useful books. (I always thought the ARRL Handbook was the bible until I got Solid State Design for the Radio Amateur and W1FB's Design Notebook.) *–DE K3WRV*

YAESU FT-7 CW OFFSET FIX

From **Byron Weaver, WU2J** of Palm Bay, FL:

Phil Salas, AD5X, wrote some comprehensive mods for this unit and I do agree the FT-7 is a nice transceiver. My XYL and I did have a small problem with it several years ago. She (AC4RU) was in the French Alps due to illness in her family and had taken an Argo 509, key, 230V power supply, plus a 20M dipole so we could maintain daily skeds. I have three 509's and an FT-7 (although most haven't been used in several years) and decided to use the higher powered FT-7 initially to work Christine.

She heard me the first day and said she came back for some time but conditions were poor and a "no go". Next day, I copied her well (low end of 20M SSB portion of the band, which is usually vacant) as she called me on CW. I answered her call many times with the FT-7 and she never heard me. Day 3 had the same result and she panicked and telephoned to Florida afterwards.

Later, I switched to an Argo and all was well thereafter. Much later I corrected the problem with the FT-7. Do any of you think you know what was wrong? (Excluding the old-timers, of course.) Well, the FT-7 is offset about 700 Hz, about the same as the Argos, but in the opposite direction! I removed C415 which shunts the trimmer cap of the CW crystal oscillator and moved the frequency up so its offset corresponded to my Argos. (See page 14 of the July 1994 QRP Quarterly; it's the fixed cap below the crystal.) It was only a minor change, but helpful for us.

[WA8MCQ comments: People usually have no trouble working each other on CW because most rigs have their CW offset in the same direction. Unfortunately, sometimes someone has a rig with the offset on the other side. For an excellent demonstration, take an HW-7, HW-8 or other direct conversion receiver which can hear signals on either side of zero beat. Tune to someone from the low end and give them a call, then tune them from the high side and give another call. Unless they are using a wide filter, they'll only hear one of those calls; if their receiver is wide enough, they'll hear one call at their frequency and the other much farther away. (Maybe this explains why we sometimes hear two people talking to each other a KHz or two apart.)

As the review of some rig with a direct conversion receiver said once, you can hear signals on both sides of zero beat but people trying out the rig quickly learn which side results in contacts and which doesn't. When you try out a new rig for the first time, hook up a pair of dummy loads and try talking to yourself on one of your other rigs and make sure the offsets are both on the same side. –WA8MCQ]

–DE WU2J

SPEAKER/KEYER SWITCH BOX FROM RADIO SHACK

From **Mike Robinson, KGØOT** of Cyberspace (miker@cc.com), a recent posting to the QRP mailer list:

I found a cute solution to my "multiple QRP rigs, single keyer and amplified speaker" problem. I was getting tired of switching them from rig to rig in order to change bands. While rummaging through one of my 'useful junk' boxes, I re-found an A/V source switcher that I bought from Radio Shack long ago. (I think it was around $10 but don't hold me to it.) It's a small box with 4 push buttons on the front. On the back are 4 triplets of input and 1 triplet of output. Each triplet consists of RCA phono jacks for Audio Left, Audio Right, and Video.

I connected my keyer and amplified speaker to the Audio Left and Right of the single output source triplet, and connected each rig I want to one of the 4 selectable triplets, making sure the key and speaker line are coordinated.

The video bus has a 75 ohm resistor shunted across each video jack when that button is in the "off" position, so don't use the video for the keyer line. I noticed the rig keying up when unselected. If I find I need the video bus I'll pull the resistors.

–DE KGØOT

160M ANTENNAS FOR SMALL CITY LOTS

From **Buck Switzer, N8CQA** of Marysville, MI:

At 1.8 MHz a 1/2 wave dipole is 260 feet long, a quarter wave sloper is 130' and a half-square is 260' X 130'! However, it is possible to bend a 160 meter antenna into your lot. Antenna wire need NOT be entirely straight; avoid 90 degree bends, make it fit, then make it work. Here are a few choices–

1. End-fed (not random) wire: Wire should be at least 130' long. Run from the back of the tuner to the end insulator (minimum of 2 radials). Get it as high as you can and as straight as possible. Should work on all bands with tuner. Make sure you have a GOOD ground/ground plane to work against. RF is in the shack.

2. Inverted L: Fed outside the shack with balun or dipole center connector. Wire should be 130–135 feet long. From feed point, run vertically as high as possible, with the balance of wire as straight as possible. Trim to desired resonant frequency. Use with tuner for all bands. Requires a minimum of 2 radials from the feed point.

3. Twin lead Marconi: 85% twin lead, 15% wire. A single band antenna using the folded dipole technique to provide a reasonable resistive load to the transmitter (suspend like an inverted L). The feed point is near ground level with 2 or more radials. Vertical portion as high as possible, horizontal portion as straight as possible. The twin lead segment is 110' long with both wires soldered to a 20' long piece of #14 or heavier wire which is trimmed to the desired resonant frequency. No tuner is needed.

4. 1/4 wave sloper: Feed high on a tower, tie off near ground level. These wonderful antennas are worth the trouble it takes to get one working. They never resonate where they should, depending on the beams on the tower for top loading. Start with 130' of wire and trim to desired frequency. There is some directivity in the direction the sloper is pointed.

5. Loaded towers: Gamma matching or otherwise loading a tower can result in a very successful transmit antenna. Loading your existing tower for 160 or 80 meters is a complex task which requires a separate article. Lots of radials are needed but can work great.

There are other antennas that can be squeezed into a small lot, but these should get you started. Due to the vertical orientation of most of the above suggestions, your next project will be a receive antenna to lower the noise level. More to come on that subject.

Suggested reading:

1. "Easy-Up Antennas for Radio Listeners and Hams"; Edward M. Noll, W3FQJ; MFJ-38

2. "Wire Antennas for Radio Amateurs"; Wm. Orr, W6SAI; Stuart Cowan, W2LX; Radio Publications, Inc 93-877

"W1FBs Antenna Notebook"; Doug DeMaw, W1FB; ARRL #2618

–DE N8CQA

JOES QUICKIE #12– GETTING THE POWER OUT

From Joe Everhart, N2CX of Brooklawn, the latest in his series of Technical Quickies:

One of the reasons simple QRP rigs have proliferated in the last 10 years or so is the use of a very simple output tuning network. Based on the venerable pi-net, it is very simple to use, needs no tuning and provides at least a little harmonic suppression. W7ZOI, W7EL, W1FB, our own WA8MCQ, the Two-fer, the Ramsey rigs and many others all use the simple "quarter-wave" lumped constant output network.

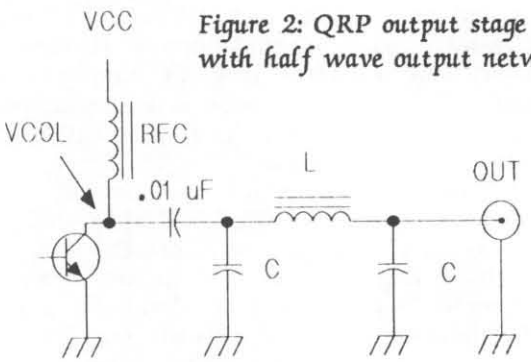


Figure 2: QRP output stage with half wave output network

It is simply a pi network low pass filter with a loaded Q of unity. Wow, what a mouthful! It's hardly necessary, but Figure 2 shows the circuit. It has a loaded Q of one since each element in it has a reactance equal to the characteristic impedance it is used with. And, since it looks like a quarter wave transmission line at its design frequency, it reflects its load impedance around its characteristic impedance.

This impedance transformation can be calculated by the simple formula ZC = ZO^2/ZL. For example, with a 50 ohm network and a 50 ohm load, the collector sees 50 ohms. A 100 ohm load will be reflected back as 25 ohms and a 25 ohm load will be seen as 100 ohms at the collector. (The decoupling choke–RFC in Fig 2– must have a high enough impedance that it can be neglected, and it usually does.)

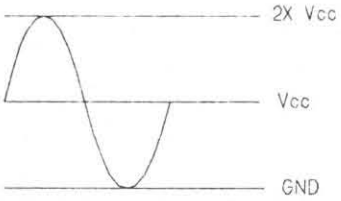


Figure 3: voltage waveform at collector (VCOL) with single frequency sine wave

Why is this important? Well, it is because the impedance presented to the collector determines the output power that the transistor supplies. Because of "flywheel action" of the decoupling network and output filter, the total collector voltage swing is twice the DC supply voltage, as shown in Figure 3. Output power can be calculated from the familiar formula, P = V^2/R, where P is the power delivered to the load, V is the RMS voltage and R is the load resistance reflected back to the collector. At the collector,

V(RMS) = V(P-P) / (2 * SQRT (2))
[or, RMS = peak-to peak divided by 2.828. –MCQ]
and V(P-P) = 2 * Vcc.

Substituting back gives power output as
Po = Vcc^2/ (2 * R)

Since the quarter wave pi network filter reflects 50 ohms back to the collector when impedance matched, we can see that the power output with a 12 volts supply is then

Po = 12^2 / (2 * 50) = 1.44 watts.

Correspondingly, for other common DC voltages,

Voltage	Matched power
13.8V	1.9 watts
14.4	2.1
15	2.3
18	3.2

You can usually recognize the quarter wave network by noting equal capacitor values at collector and load and reactances of 50 ohms near the operating frequency. If two such sections are cascaded, the two inductors and end capacitors are equal and the middle capacitor is twice a big as those at the ends. Two cascaded sections form a half wave network. In this case the network transforms the impedance twice, giving a collector impedance exactly equal to the load impedance. As another plus, it gives better harmonic rejection.

For the circuit of Figure 2, typical values are:

Band	L	C
80M	2.5 uH	560 pF
40	1.12	240
30	0.98	220
20	0.68	150

From the above, you can see that the matched power output is defined by the power supply voltage and collector load impedance. Naturally, to provide maximum power the transistor must be capable of driving the load presented to it and losses must be minimized. Furthermore, if any claim is made for more power than the theoretical matched value above, the following may be true:

1. More power may be present but it is NOT at the desired frequency. It may be harmonics or spurious outputs. No wonder you get 1:1 SWR with a dummy load but not with an antenna, even when you use a tuner.
2. The supply voltage may need to be raised above the usual 12 volts.
3. The output network may not be a simple quarter wave pi net or measurements may not have been made under impedance matched conditions. If the network reflects back an impedance of less than 50 ohms, the output power can be increased.
4. Even with a quarter wave network, power can be increased by using an impedance step down transformer. Using a simple bifilar would 4:1 step down transformer (as in the K1BQT rigs), the collector impedance is 12.5 ohms, so output power can be quadrupled as long as the transistor is capable of supplying enough power. *[And that's how commercial rigs get 100 watts from a 13.8 volt supply–the collector impedance is much lower than even 12.5 ohms, and is matched up to the 50 ohms of the filters with a transformer with an even greater ratio than 4:1. –MCQ]*

Armed with the above you can look at QRP transmitter circuits and estimate their maximum output power. Then you can judge just how credible the articles author or manufacturers advertising claims are!

–DE N2CX

LOW CURRENT OPERATION OF LEDS

From frequent QRP Quarterly contributor **Larry East, W1HUE** of Idaho Falls, ID:

Have you ever decided against using LED indicators on battery powered equipment because they draw too much current? Did you know that many small LED's emit plenty of light when operated at only 1-2 mA? Well, I didn't until I tried it! In fact, some of the newer "high output" devices will operate on as little as 0.5 mA. Red LED's generally emit the most light for a given current, but some green ones are still usable at low current. But not all LED devices are created equal; the circuit below can be used to determine which ones are usable at low current.

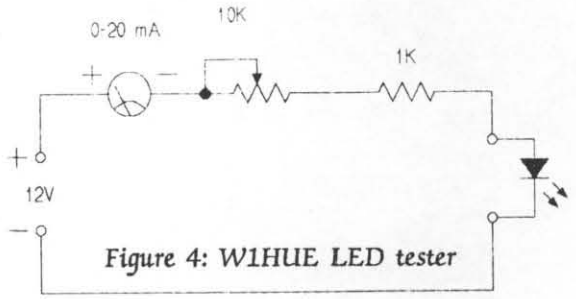


Figure 4: W1HUE LED tester

The 1K resistor limits the current to about 10 mA – a safe value for most LED's. If a current meter is not available, you can measure the voltage drop across the 1K resistor and calculate the current.

–DE W1HUE

NORCAL 40 MODS

From **W5QJM, Fred Bonavita** of San Antonio, TX:

Builders of the popular and highly successful NorCal 40 and/or NorCal 30 transceivers sponsored by the Northern California QRP Club may be interested in the following.

QRPp, the club's quarterly newsletter, has published many modifications to the original version. Some errors have crept into these mods, however, and as of Nov. 1 corrections have not appeared in print. The corrections, as supplied by the authors of the mods, are:

1) **Bob Warmke, W6CYX**, writing in the March 1994 issue of QRPp, offers several mods, including a 30 meter version. The parts list for the low pass filter in the transmitter output omits the new value for C46, the center capacitor, for 30 meters. The value is 430 pF.

The mod also flies in the face of tradition in two ways not explained in the text: There are different values for the outboard capacitors and for the two coils in the low pass filter. Most other designs for half wave, low pass filters call for the coils to have the same number of turns and for the outboard caps to have the same value.

In response to an inquiry, Bob explains: "The reason for the different values on C45 and C47 as well as L7 and L8 is that I arrived at these values by trial and error for best performance.

"I use an MRF237 as Q7 (available from RF Parts in QST advertisements), and the output power on 30 meters is in the four to five watt range. At these levels, the output impedance of Q7 is very low (about 10-15 ohms). Using the same values at C45/C47 and L7/L8 assumes a 50 ohm in- and 50 ohm output," he said.

Those ordering from RF parts need to be aware the company has a service charge on orders of less than $25.

2) **Bob Lai, KM6QP,** writing in the June 1994 issue of QRPp, offers an interesting-looking RF amplifier for the receive side of the NorCal rig, but the schematic showed no point at which the Vcc should be connected. A letter to Bob produced the following correction (figure 5).

Parts list, from QRPp–

C1, C2– 2-24 pF air trimmers (the same as used in the NorCal 40)

C3, C4– 0.01 uF disc

L1– 18 turns #26 enamelled wire on T37-2 (red core)

L2– 15 uH choke Q1– 2N4093

[I redrew the schematic; the value of 67K is what the original had, probably a typo, but probably not critical. The point marked as VCC here was originally designated as OUTPUT TO C1 ON NC40, and the actual output line was not shown. –WA8MCQ]

I hope these corrections to the mods help builders of this rig. I'd be interested in hearing from club members who have other mods for the NorCal that might not have appeared in print.

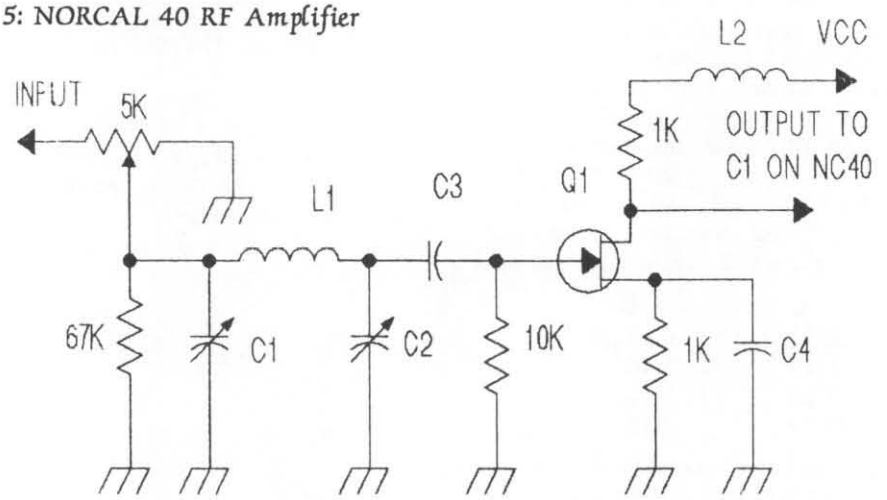
–DE W5QJM

THE FINE PRINT

The NorCal newsletter "QRPp" (which you really should be getting, you know–get details from Jim Cates, WA6GER, or just take a leap of faith and send him $5 to get it for a year) recently started a column similar to the Idea Exchange, with little technical tidbits for their readers. You now have two places to read them, and two places to send them. Send your ideas to whichever you prefer; we don't care where they go as long as they get published for the QRP community, but do send them to someone! 73 and Queue Our Pea DE WA8MCQ

QRP

Figure 5: NORCAL 40 RF Amplifier



Members' News

Richard Fisher, KI6SN
1940 Wetherly St.
Riverside, CA 92506

To all who contributed in '94

Last year was truly banner for Members' News. Through the support of lots of QRP ARCI members this column has grown and grown. And your achievements, experiences and stories have made the reading more interesting than ever.

KI6SN
. . .Richard Fisher

The accolades are richly deserved by all who contributed. Your letters, photos and cards are the fuels that make this QRP engine run, and I want to thank you all for making my job at the Quarterly so enjoyable and easy.

Here are the people who helped make MN such a tremendous success in 1994: **W1FMR, Jim Fitton; N2CX, Joe Everhart; N2HZB, Art Ekahn; WA2IPZ, Charlie Stackhouse; WB3HLH, Tom Calantonio; K4BNI, Dick McIntyre; N4LTA, Pat Bunn; N5JWL, Dick Swanson; WB5LXZ, James B. Geer; KC5NG, Dean Hemphill; KJ5TF, Jim Hale; KD6JUI, Bil Paul; W7BD, Bob Leinau; WA8MCQ, Mike Czuhajewski; KB8N, Paul Schaffenberger; KB8U, Russ Dwarshuis; N9HBH, Dan Levit; N9JCV, Bruce Williams; WA9PWP, Paul R. Goemans; W9SCH, C.F. Rock Rockey; N0BQW, Dave Heintzleman; NN0F, John Stanford; GW0LBI, Leighton Smart; KF0N, Larry Wilson; N0OKS, Mark W. Kachel.**

Fortunately, there is room for everyone in MN, and here's an open invitation to QRP ARCI members everywhere to join in spreading the news about your low power activities.

Hope to see you in the Quarterly this year.

— R. E. F.

Raising a little QRP 'cane'

Steve Nealon, K0GXZ, of Crestwood, Mo., has found an interesting way to get active on 30 meter QRP.

"I was sitting in the shack wondering if I could load my four-footed cane on 30 meters," he writes.

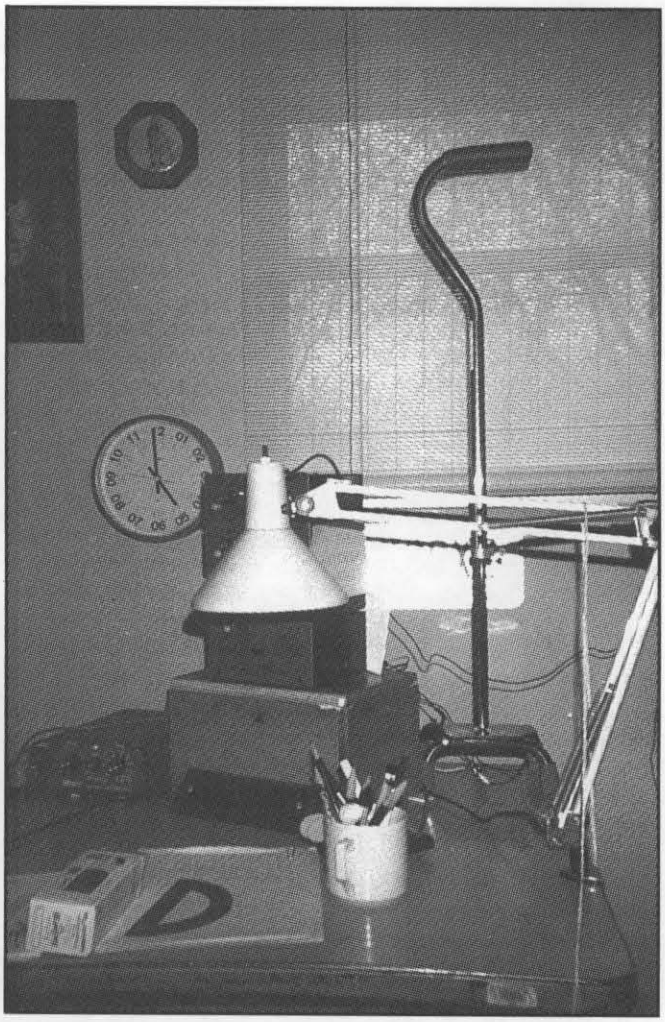
"I stood the cane on the table next to the rig and connected it to the tuner output using a piece of wire and an alligator clip connected to the plate holding the four rubber-tipped feet.

"The cane loaded pretty well, so I called 'CQ.'

"Running five watts out to my cane I worked Windsor, Colo. My RST was 549."

Steve says that subsequent contacts included a 579 from Haledon, N.J., and a 569 from Minneapolis — both two-way QRP QSOs.

"After that, the novelty wore off so I went back to my regular antenna. My QTH is Crestwood, Mo., in St. Louis County," Steve says. "I have since tried to load my wheelchair, but I have had no luck so far."



Steve Nealon, K0GXZ, Crestwood, Mo., loaded his four-footed cane on 30 meters to operate a little QRP. Contacts included a 579 from Haledon, N.J., and a 569 from Minneapolis — both two-way QRP.

QRP with a Bobtail Curtain, Down East

Joel Denison, WA5CVM, writes that he now lives in Farmington, Me., but is "still WA5CVM. Confusing, yes?"

But his operations previously in the Bayou Country did produce an appetite for QRP DX and Miles-Per-Watt challenges that have carried north into New England.

Here's Joel's story:

"While in Louisiana, I worked all states, all continents, and got the 1,000 Miles-Per-Watt certificates for 20, 15, and 10 meters on SSB and CW. Back then I had a three element quad antenna and Argonaut 509. With that quad antenna I could jump into pile ups and beat the high power guys.

"Now I am in Farmington, and I have no quad and an Icom 735. I have wire antennas up for 40, 30 and 20 meters. The 20 meter antenna is a vertical dipole and works fine. I had a 40 meter loop that is now an inverted V and instead of a vertical dipole on 30 meters — which worked great — I have half of a Bobtail Curtain (modified).

"The Bobtail Curtain is a wire antenna. I have both ends tied to trees and the vertical elements are simply wires hanging down with a rock tied to the the end of the wire — a short piece of string lets the rock 'just rest' on the ground.

"Also, instead of voltage feeding the antenna, I found it more convenient to current feed one of the vertical elements — at the top of the element — and tune out any mismatch with my MFJ tuner. There's no TVI this way.

"Both vertical elements — yes, I know there should be three vertical elements, but this is where 'modified' comes in — are coming down through tree branches and the half wave horizontal wire is weaved through the trees, *and it works great!*

"I have a pipeline into Europe even with the lousy band

conditions. The antenna — the half I'm using — compares to the quad I used on 20 meters back in Louisiana. At the 100 watt level I have worked every DX station I've called so far. Yes, I've called more than one."

Joel writes that he is now start experimenting with the antenna at the five watt level, with great success. He snagged **YL1XX** in Latvia on the first call at 10.103 MHz, receiving an RST of 579. Next he got **ON8RD** in Belgium, receiving a 419 RST.

". . . It has worked better than the loop — except that the loop is quieter — and about as good as a two element loop I played with for a while in Louisiana.

"I have plans for putting up another 'half' Bobtail Curtain on 40 meters and expect great results. The big problem is that I have only one tree to hold up one vertical end. I will have to get a pole that is about 31 feet tall and anchor it somewhere in the yard. The yard is not very big.

"The reason for all this wire? I want to get my 1,000-Miles-Per-Watt certificate on 40 and 30 meters and the loop wasn't doing it. The Bobtail Curtain looks like it will do fine.

"I think the Bobtail Curtain — even half a Curtain — is worth trying and that current feeding the antenna seems to work fine. This should be a good QRP antenna."

QRP + SSB + Mobile = Great Fun

"We had to take a trip to Denver," writes **B.C. Weaver, WU2J,** of Palm Bay Fla., "and decided to rent a compact Mitsubishi Gallant. It was 2,000 miles one way, and I thought QRP SSB might occupy some time when the XYL drove.

"I bought a Tandy CB Trunk Mount (321-908) antenna the day before leaving and rewound the loading coil for 17 meters.

"Only about 48-inches high, two screws held it to the trunk lid. A homebrew three-watt SSB transceiver and the Mizuho MX-17S were packed.

"Over a dozen QSOs were made, some lasting over one hour.

"**GI0TIC** (Northern Ireland) was worked in a pile-up as conditions weren't too good. A three-way all mobile QSO was lengthy with **KB9MX/0** and **N5IOS (Nebraska and New Mexico)**.

"**KS9C** (Norman Hester of Cross Plains, Wisc.) recorded me and played me back as he was analyzing SSB rigs on a spectrum analyzer. 'Oh, boy, oh boy," he exclaimed after criticizing others, 'excellent — you were also S-9 on your last transmission.' He was in Wisconsin. QRP SSB mobile works!"

B.C. offers some tips on noise reduction: "First you must pull the panel loose next to the rear window defogger and disconnect the hot side of the defogger! A rig can plug into the cigar lighter and rest comfortably in the glove compartment.

"I never used the Mizuho noise blanker before, but you'll need it with a Gallant! It works super against the ignition noise — not needed in the Mercedes!

"The Mizuho also has a little RIT — this, plus the noise blanker, is not available on the new SSB unit from MFJ. No noise blanker on the Index Labs rig, either.

"J-Com in the USA offered the Mizuho one-band, two-watt rigs until they went out of business, but few know that Waters & Stanton offer these rigs (80, 40, and 20 meters) which can be shipped anywhere and purchased by VISA card."

B.C. says Waters & Stanton's mailing address is 22 Main Rd., Hockley, Essex, England.

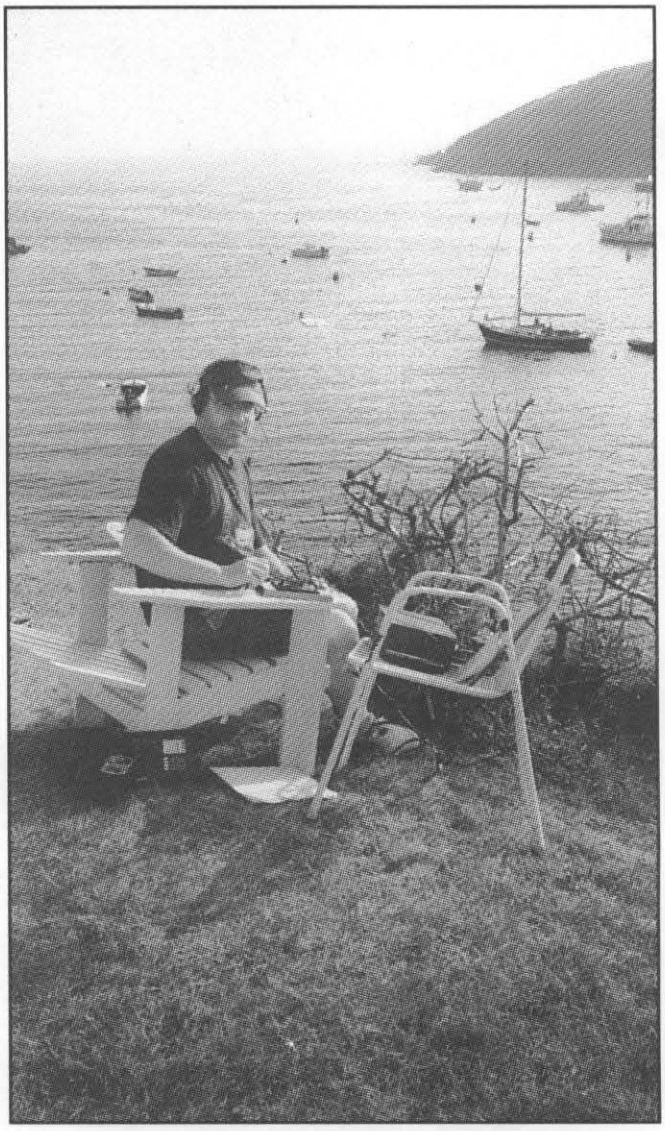
"They're the smallest units on the market and the price can be cheap, depending on currency fluctuations."

QRP island hopping

During a vacation last July, **Howard Mintz, WA1CFX,** of Jamaica Plain, Mass., set up a portable QRP station on Monhegan Island about 11 miles off the coast of Maine.

"It is listed as NA-137 in the Iota category," Howard writes.

"The station was operated just for a few hours in the early evening of July 7. My first QRP-portable consisted of an HW-8, dipole, hand-key (J-38), and two lantern batteries.



Howard Mintz, WA1CFX, of Jamaica Plain, Mass., operates QRP with an HW-8 and three-foot-high dipole while on vacation on Monhegan Island about 11 miles off the coast of Maine.

"The dipole was centered in a bush in front of me about three feet off the ground.

"Despite a technical problem with a piece of coax, I had a couple of successful QSOs. Received on 579. Next time I'll bring a meter," he said.

"The experience really added adventure to my vacation. I'll set up a station again on Monhegan next year."

The Goodie Giveaway

It wasn't too many years ago that the QRP world was buzzing about a two-part article in *QST* magazine featuring a project that combined both performance and simplicity into one QRP transceiver package.

Today, what has become to be known as the Gary Breed, K9AY Transceiver, is in wide use across the country and the world.

What made its design so appealing was the chip technology incorporated into this five watt superhet transceiver. Initially designed for 15 meters, the circuit has been tweaked and

modified to cover just about all HF bands.

Pat Bunn, N4LTA, — a great friend to QRPers and owner of the South Carolina-based 624 Kits — has kindly donated a **set of chips for the K9AY transceiver,** that when added to the other garden-variety parts needed for the rig, will yield a very fine unit.

The K9AY chip collection is this quarter's Goodie Giveaway item, and will be mailed to our winner, **Bob Hartley, K2QJ,** of Kendall Park, N.J.

A QRP salute to Bob and to all who took the time and effort to send along dispatches for this edition.

If you'd like to get in on the fun, send a card, letter or photograph with your QRP news to the address at the head of this column. It's that simple. Your name goes into a hat for the quarter's giveaway. Hope to hear from you soon.

QRP: Into the gutter

"After on-the-air contacts," writes **Craig LaBarge, WB3GCK,** from Phoenixville, Pa., "I get lots of requests for the details of my unusual antenna." He's been using the "WB3GCK Downspout Antenna" for more than a year, and has written a paper about the system after getting lots of requests for details on its operation.

"After years of trying to come up with a good way to get on the HF bands from my little townhouse — without attracting a lot of attention from my neighbors — I started experimenting with using my aluminum rain gutter downspout for an antenna," Craig writes.

"The results have been surprisingly good. In fact, it has turned out to be the ultimate low profile antenna!

"I use my downspout like a random wire antenna, using a commercial transmatch. A piece of No. 22 stranded hookup wire runs from the transmatch to the downspout and is attached with a sheet metal screw. The downspout has a vertical run of approximately 16 feet, connecting the horizontal rain gutter which is about 16 feet long across the front of the house. Including the feed wire into the shack, the total length is in the neighborhood of 42 feet; over a quarter wavelength for 40 meters and almost a half-wave for 30 meters.

"The house is made of brick, so the entire system is isolated from ground.

"With the downspout behaving essentially like an end-fed wire, it really helps to work this type of antenna against a good ground. Fortunately, my basement operating position is only a few feet away from where the water supply pipe enters the house. I used a piece of one-half inch copper pipe as a ground bus between my operating position and the incoming water pipe. A short braid strap connects the ground stud on the transmatch to the copper ground bus.

"For good measure, I attached counterpoise wires to the ground stud of the transmatch; one each for 40, 30, 20 and 15 meters. The counterpoise wires are made from garden variety stranded hookup wire cut to a quarter wavelength. I just run these wires around the shack — hiding them under the rug. Operation on the 80 meter band has been successful using just the ground bus.

"How well does it work? During the first few months of operation, I worked 42 states — all with five watts or less. I've also worked a handful of DX stations (though I'm more of a casual rag chewer than a DX-chaser).

"The length of the 'antenna' is somewhat short for 80 meters, but performance on that band has been a big surprise. Signal reports on 30 and 40 meters — my primary bands — have been consistently good. In fact, the downspout has now become my main antenna."

Craig offers a few cautionary notes on using rainspouts as antennas:

Connections. Make sure there is solid electrical continuity between the various sections of your downspout and gutter. Craig's are fastened with pop rivets — "not the greatest for RF work, but they appear to be doing the job."

Watch your power. "I wouldn't recommend running a kilowatt into your rainspout. Ham radio is fun, but not worth burning down your house."

Isolation. Make sure your downspout and gutter are isolated from ground.

Clearance. Be sure people and pets won't come in contact with the "antenna" while you're transmitting. "This isn't too much of a problem at QRP power levels, but be careful."

"So, if you find your HF antenna options are limited by either space or legal restrictions," Craig writes, "take a look at the outside of your house. There might just be a free multiband antenna hanging out there!"

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 or photograph to Members' News? Jotting down a few lines takes only a few minutes. Putting it in the mail is painless, and the camaraderie it invokes in the QRP community is a substantial payback.

Here's the only mailing address you need:

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

QRP adventure in Tuvalu

Dave Beckman, W5MHY, of Pearland, Tex., writes that "sometimes it takes a major jolt to move one to action. At least that's the way it was with me and QRP. I had purchased all the QRP publications, joined QRP ARCI and G-QRP, tinkered with a few pieces of equipment — but never got anything on the air.

"The jolt came when my wife and I received a phone call from our son, who is serving in the Peace Corps on the South Pacific island of Tuvalu, to announce his engagement — and, he asked, could we attend his wedding in Tuvalu?

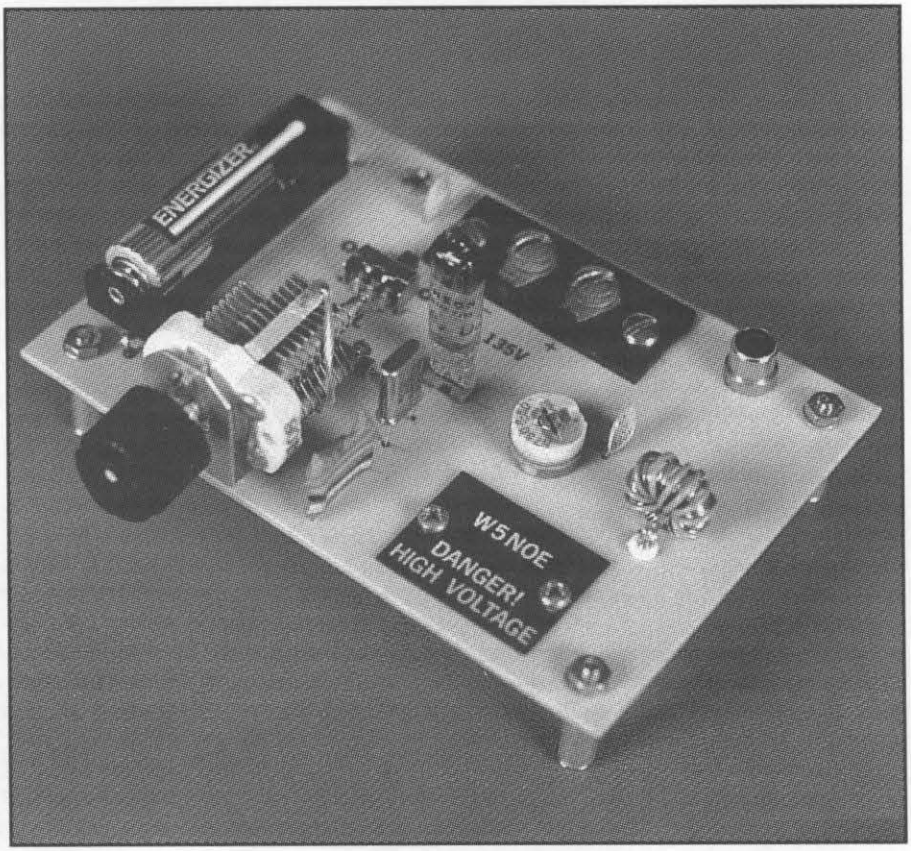
"After the initial shock of the announcement passed, I began to formulate some plans to take a QRP rig along. The ARRL provided application information, and my son helped expedite the process in Tuvalu so that my permit and temporary call, **T20DB,** were received well ahead of our departure date of Sept. 5, 1994.

"The QRP rig I chose to build was the NN1G Mark II, 20 meter version (conveniently a summer special price from Dan's Small Parts); a W3TS-designed transmatch; and, as ideas from W1FB, the SWR bridge from Design Notebook (pages 173-75) and a balanced-feed dipole made from Radio Shack speaker wire.

"I also intended to include an active audio filter, but had some problems with it so left it at home; it turns out I didn't need it anyway. I ran a final 'integrated test' two days before our departure and snagged **Pete Peters, W9DOW,** (Markesan, Wisc.) as my first QRP QSO.

"The measured output power was 1.25 watts, and the dipole was strung across the garage about three feet above the floor. I was impressed — and encouraged.

"All the station equipment and accessories fit into a briefcase which I hand-carried to Tuvalu. I was asked to open the case by airport security, then was passed quickly through when I showed them the operating permit.



The subminiature QF478 tube is the heart of a 100 milliwatt QRP transmitter beautifully designed and constructed by Dave Anthony, W5NOE, of Columbus, Tex. On air operations have been gratifying, with one contact good for 13,500-miles-per-watt, Dave says.

"After we arrived, the antenna was strung from a palm tree to the top of the house, about 20 feet up, and the rig was connected to commercial power through a 240/120 travel voltage converter.

"The wedding ceremonies and feasts left little time for hamming — they *really* celebrate — and then not always when the band was in good condition.

"Most of the time 20 meters sounded fairly empty, quite unlike the usual situation stateside. It rained fairly frequently, but there seemed to be no lightning accompanying the rain, so QRN was never a problem. I learned that the best opportunity to get a QSO comes from patiently waiting until the loudest signal on the band completes a QSO and then immediately giving him a call.

"Once the connection was made, other stations heard my 'exotic' call and listened for me. Unfortunately, the one day things were going well I had to QRT to attend another ceremony.

I was pleased with my QRP adventure during our week on the island. I completed six solid QSOs in about six hours of actual on-the-air time, including stations from the United States, New Zealand, Australia, and Ecuador. The rig functioned flawlessly with no instability or drift. And everyone I contacted was surprised that one watt could do so well.

"We had a wonderful experience, gained a beautiful daughter-in-law, and became convinced never to underestimate the power of QRP!"

Going portable for the fall 'Party'

Bob Hartley, K2QJ, reports from Kendall Park, N.J. that he "spent several days near Pensacola, Fla.," and operated "Portable 4" during the QRP ARCI Fall QSO Party.

"Had a lot of of fun with my HW-9 station I brought from New Jersey. The Curtis Keyer I installed in the HW-9 worked fine and saved toting a separate keyer," he says.

"An inverted V portable 40 meter dipole fed with twin lead to the Heathkit QRP tuner worked on 40, 30 and 20 meters."

Little tubes, and big QRP fun

Dave Anthony, W5NOE, of Columbus, Tex., says that "in the dim past — 1948 to be precise — I began work for Raytheon, famous for its filamentary subminiature tubes for hearing aids.

"Part of my job was developing a tiny triode version for the Navy. Imagine my surprise when the bottom of the junk box yielded a couple of long-forgotten lab samples of the **QF478.**

"So, what does the good QRPer do in a situation like this?" Dave asks. "He patches together a little rig.

"My plans took shape rapidly. Yes, I'd have no problems recalling how to tip a plate tank. Matching to a dipole would still be second nature.

"But wait, vacuum tubes needed *high* voltage! To make a long story short, the junk box came to the rescue and provided the makings for a power supply. What I had really forgotten, though, was the amount of power dissipated by a simple bleeder resistor or the 'nip' from an inadvertent brush with the DC line.

"With 100 milliwatts output I was ready to try the new rig on 20 meters. Answering CQs quickly yielded QSOs with Hummelstown, Pa., and Buffalo, N.Y. — the latter for 13,500 miles per watt.

"Yes, the little QF478 is alive and well. It'll be some while before my glass friend is ready to depart for that 'Golden Socket in the Sky.' "

Items for the Members' News column should be sent to Richard Fisher, KI6SN, 1940 Wetherly St., Riverside, CA 92506. Photographs — either black and white or color — are welcomed. Please include a self addressed, stamped envelope if you would like pictures returned.

Contests

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

What a difference a few sunspots make! The Fall '94 contest outstripped the Spring '94 in just about every category. Most of the comments in the Soapbox echo the fact that conditions were distinctly better. More participants and higher scores were the result. As an example, the average score for the Top Ten in the Spring contest was 233,120, whereas the Fall Top Ten average was over 610,000! We're still at the bottom of the cycle, but we sure can hope for little bursts like this one during the upcoming contest weekends!

Byron, WA8LCZ makes a good suggestion—he checks 10 and 15 meters at the top of every hour. If more of us did this, he contends, we would add some good multipliers on what otherwise sound like dead bands. This is also a good practice with regard to the Novice bands. There are budding QRPers there, but few of us take the time to go up and check around the Novice frequencies. I know, I am also guilty.

Hopefully this issue of the QQ has arrived in your mailbox before the weekend of January 15, when the revamped Winter Fireside SSB Sprint is to be run. Please note the changed date and format, as detailed elsewhere in this column. I decided to make the changes after the October QQ went to press, so this announcement may come a day late and a dollar short, however I did publish the changes on Internet and Packet. The change was made to give participants the opportunity to use whatever bands they chose, especially those who are on 80 Meters and need more nighttime hours. The rolling format, like in the Hootowl, should give plenty of overlap from one end of the country to the other.

The Spring '93 QSO party results, as assembled by Dave Little, AF5U, are the last of the old contests. From here, upward and onward. Thanks to Dave for his timely help.

1994 QRP ARCI Fall Contest Results

TOP TEN

AA7KF	843,024
N4ROA	781,536
KB2JE	692,664
WAØRPI	670,124
WØMHS/7	578,550
WD9CTB	551 ,544
N8CQA	543,520
W7BD	506,345
KH6CP/I	474,488
K3WWP	459,130

SINGLE BAND

20 M	W7MPZ	249,228
40 M	W8MVN	356,832
80 M	AA4XX	8,900

HI/LO BAND

HI BAND	N4BP	435,883
LO BAND	W1MK	318,920

TEAM COMPETITION

AA4XX TEAM	AA4XX, WA3LUH, KR4DR	365,780
INTERNET	KIØG, K5FO, KS4ET	55,765

REVISED RULES
WINTER FIRESIDE SSB SPRINT

Date/Time: January 15, 1995 12 Noon to 8:00 PM, Local Time
Operate any 4 hours of the 8 hour period. Clearly mark on and off times in your log.
Revised suggested operating frequencies: 80M - 3.865 MHz 6M - 50.128 MHz

Exchanges and scoring will remain the same as previously published.

Soapbox from Fall '94:

I worked 8 different QRP ARCI Directors/Comittee Chairmen/Staff Members! That's called putting your fist where your mouth is. - W7BD. Hard to operate during the day due to bright sun and blue skies - N4ROA. I sure would love to have a location/antenna like W8MVN must have... - K3WWP. Spent most of the weekend digging hole and pouring concrete for new tower base. Wait till next Spring's QSO party... - N4BP. Condx were a bit better than Spring Contest! - K8DD. Fantastic condx...worked VK6, best DX. - W8MVN. An unassembled TH7 in the basement does nothing to increase your score... - K7YHA. Conditions and activity were pretty good. The only problem was a couple of ear challenged RTTY ops who let their frogs bellow out their mating calls near 14.060. - KE2WB. Great time - good propagation. - W2JEK. Great turnout for a FB contest! - N9DD. 20 meters is bedlam. Boy do I miss 10! - WX7R. Very poor condx! QSB. - W6RCP. Operating time cut short - had to replace line to septic tank - buried 75' of ground wire with it. - W9FHA. My first QRP test, very enjoyable. - W5MHY. Tricky trying to read my Internet mail while in the middle of a qso. - WA8MCQ. Couldn't believe I made the first 30 QSOs using a 3 ft. whip inside! - WR41. All time low contacts per hour - yuk! - W1HUE. I have worked a lot of contests over the last 55 years but never took the time to send in the results. - K6VV *(Glad you chose us for your first one! - Cam)* My first contest since FD 1963. . . Hopefully it won't be 31 years until my next... - AB5QE *(Ditto)* Great to hear the QRP frequencies active with new ARCI members and contest regulars... - KF7MD. Best contact of the contest for me was working Dan, N4ROA (in VA) on 80 meters! Antenna here is horizontal loop @ 25 ft., which in theory radiates straight up. What were you using, Dan? - N6GA.

CONTEST RULES

Date/time:
April 8, 1995 - 1200Z through April 9 - 2400Z

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

QSO Points:
Member = 5 Points
Non-Member, Different Continent = 4 Points
Non-Member, Same Continent = 2 Points
Multiplier - SPC (State/Province/Country) Total all bands.
The same station may be worked on more than one band for QSO Points and SPC credit.

Team Competition:
Team competition of teams consisting of 2 to 5 members will be a separate category apart from individual entries. Team members will be listed as individuals and the team score will be the total of the member's scores. Team entry will be all-band only. The team captain must send a list of its members to the contest manager postmarked at least one day prior to the QSO party. Certificate awarded to the highest scoring team

Power Multiplier:
Ø-1 watt out = x 10; 1-5 watts out = x 7

Suggested Frequencies:

	CW	Novice
160 M	1810 kHz	
80 M	3560 kHz	3710 kHz
40 M	7040 kHz	7110 kHz
20 M	14060 kHz	
15 M	21060 kHz	21110 kHz
10 M	28060 kHz	28110 kHz
6 M	50060 kHz	

CALLING:
"CQ QRP, CQ QRP, CQ QRP DE N6GA, N6GA, QRP TEST K"

SCORE = POINTS * SPC * POWER MULTIPLIER

SPRING QRP ARCI CW QSO PARTY

Entry may be an all-band, a single band, "HI-band" (20m, 15M, I0M, AND 6M) or as a "LO-band" (160M, 80M, AND 40M). All entries will compete against other entries in their own class of entry only. Certificates to the top 10 scores and to the top score in each single band, LO-band, and HI-band.

Certificates for the top score in each class in each SPC. The contest manager reserves the right to recognize special significant entries with a certificate award.

Entry includes a copy of the logs and a separate summary sheet. Include duplicate check sheets with entries of 100 QSO's or more. Indicate the total time-on-air, including time spent listening. All entries must include a complete, legible, name, call, and address. All entries must be received within 30 days following the contest. Late entries will be counted as check logs. Members indicate their QRP ARCI member number on all logs. Members and non-members indicate their input or output power for each entry and band. The highest power level used will determine the power multiplier. Output power is considered as 1/2 of the input power. During the QSO party, a maximum of 24 hours may be operated within the 36 hour time period.

Include a description of homebrew equipment, commercial equipment, and antennas used with each entry. A summary sheet and sample log sheets are available from the contest manager for an SASE with one unit of postage. Include an SASE with one unit of postage in the entry for a copy of the contest results. Results will be published in the next available issue of the QRP ARCI Quarterly. The final decision on all matters concerning the contests rests with the contest manager.

Send Entries To:
Cam Hartford N6GA
1959 Bridgeport Ave.
Claremont, CA 91711

FALL 1994 QSO PARTY

CALL	SCORE	POINTS	SPC	POWER	BANDS	TIME	RIG	ANTENNA
ALBERTA								
VE6BIR	144,746	422	49	3	A-3	6	ARGO 509	YAGI, DIPOLE
VE6GK	53,816	248	31	5	20M	4	IC 751A	YAGI
ARIZONA								
N7JXS	199,899	501	57	5	A-3	8	FT 757	YAGI, VERTICAL
CALIFORNIA								
N6GA *	157,465	409	55	5	A-4	6	HW-9, TRITON 4	YAGI, LOOP
KI6SN	5,824	104	8	11	40M	3	NORCAL 40	G5RV
AA6UL	5,734	63	7	5	A-2	2	OHR CLASSIC, FT890	INV VEE
N6KM	3,843	61	9	5	40M	2	QRP+	MULTI-BAND DIPOLE
K6VV	2,744	49	8	4	A-3	2	TS 530	VERTICAL
W6SIY	1,360	34	4	0.25	40M	4	TUN TIN 2 /HB RX	DIPOLE
COLORADO								
KF7MD	257,420	422	61	0.9	A-4	15	TS 680, HB SUPERHET	VEE, LOOP, DIPOLE
NØIBT	151,368	408	53	5	A-3	15	TS 830	DIPOLE
KIØG	22,240	139	16	1	20M	5	MODIFIED TWO-FER	YAGI
CONNECTICUT								
KH6CP/1	474,488	916	74	4	A-5	21	HW-9	LOOP, DIPOLE, VERTICAL
NN1G	35,500	142	25	0.9	L-2	4	80-40, 40-40	WINDOM
NM1J	22,650	151	12	0.9	40M	4	ARGO 515	INVERTED VEE
FLORIDA								
N4BP	435,883	853	73	5	H-3	9	TS 130V	YAGI @ 20 FT
W7MPZ	249,228	845	46	4	20M	18	?	?
WB2QAP	57,330	234	35	3	A-3	13	QRP+	MFJ VERTICAL
K2QJ	49,434	214	33	4	A-2	6	HW-9	40M DIPOLE
K4KJP	2,632	47	8	1.5	40M	2	OHRSPRINT	SLOPING DIPOLE
GEORGIA								
KE2WB	295,120	620	68	5	A-4	12	HW-9	G5RV
KN4QV	144,228	404	51	5	A-3	5	?	?
IOWA								
WBØDBG	50,820	242	30	3	A-3	?	ARGO 505	75' END FED WIRE
WØPFR	16,940	121	20	5	20M	3	ARGO II	INDOOR LOOP
IDAHO								
W1HUE	13,720	98	14	0.9	40M	5	ARGO 509	VERTICAL
KF7ET	3,192	47	8	5	40M	2	ARGO 505 / IC 735	INV VEE
ILLINOIS								
W9CUN	35,532	188	27	5	L-2	4	DELTA 580	DIPOLE, LOOP, VERT
W9NPJ	27,475	157	25	5	A-3	4	FT 890	CENTER FED ZEPP
NF9X	16,950	113	15	0.8	20M	4	TS 130V	DELTA LOOP
INDIANA								
WD9CTB	551,544	938	84	3	A-4	20	ARGO 509	VERT, LOOP, ZEPP
N9DD	185,024	472	56	2	A-3	12	NN1G, TS520	80M DIPOLE
W9FHA	27,370	170	23	5	40M	2	OHR QRP CLASSIC	DOUBLE ZEPP
N6CXB	9,345	89	15	1	L-2	3	SB 104	140' VEE
MASSACHUSETTS								
W1MK	318,920	670	68	5	L-2	?	IC 765, IC 740	4 EL 6P 40 AND 80
MARYLAND								
K3TKS	444,210	663	67	0.9	A-4	15	ARGO 509	80M HORIZ. LOOP
W6TOY	24,206	182	19	3	40M	?	40-40, MXM, TS130	SUPER STEALTH WIRE
WA8MCQ	15,120	120	18	4	A-2	4	TS 430	DELTA LOOP
W3HVN	12,852	102	18	5	A-4	4	OMNI-D	VERTICAL
MAINE								
WW1P	7,770	74	15	3	A-3	3	HW-8	INVERTED VEE
MICHIGAN								
N8CQA	543,520	632	86	1	A-6	16	?	?
WA8LCZ	393,183	711	79	5	A-3	24	TS 450	R7 VERTICAL
K8DD	391,220	631	62	0.9	A-6	12	TS-50	YAGI / VERT / DIPOLES
MINNESOTA								
WAØRPI	670,124	1052	91	5	A-4	20	IC 735	DELTA LOOPS
WAØSWD	14,553	99	21	3	20M	2	MFJ 9020	40M LOOP
MISSOURI								
WØGWT	165,942	439	54	5	A-4	14	IC 735	VERT / SLINKEYS
AAØNB	74,865	345	31	5	20M	7	?	?
NØIZZ	47,712	213	32	5	A-3	7	TS 520	ZEPP
WAØOUI	8,820	90	14	3	20M	4	HB SUPERHET TCVR	20M DOUBLET
MISSISSIPPI								
N5ODV	48,314	203	34	5	A-3	5	?	?
NORTH CAROLINA								
KR4DR	352,200	587	60	1	A-3	13	FT 747	DIPOLES, YAGI
KS4ET	27,125	155	25	5	A-4	6	TS 450, NC40	80M DIPOLE
AD4PM	24,360	145	24	5	A-2	16	MFJ 9040, 9020	GAP VERTICAL
KQ4IY	20,433	139	21	7	A-3	3	?	?
AC4QX	16,380	156	15	5	40M	4	ARK-4	G5RV
AA4XX	8,900	85	4	1	80M	2	FT 747	DIPOLE
WA3ULH	4,680	52	9	1	A-2	1	FT 747	DIPOLE, YAGI
NORTH DAKOTA								
WEØQ	62,524	308	29	3	20M	3	HW-8	VERTICAL
NEWFOUNDLAND								
VO1DRB	185,227	563	47	5	20M	22	OHR CLASSIC	MFJ LOOP
NEW HAMPSHIRE								
KN1H	150,150	385	39	0.7	L-3	7	SMALL WONDERS, OMNI	DIPOLE
NO1E	7,920	66	12	0.9	A-2	2	FT 707	VERTICAL, ZEPP
NEW JERSEY								
KB2JE	692,664	1064	93	4	A-4	17	IC 765	G5RV
KF2HC	231,000	490	60	4	A-4	8	?	?
W2JEK	138,180	329	42	0.9	A-5	7	ARGO 505, 160 - LCK	DIPOLE, HERTZ, GP,MARCONI
K2JT	85,680	340	36	5	L-3	4	OMNI A	G5RV
NEW MEXICO								
AB5OU	94,514	314	43	4	A-3	7	?	DIPOLE / ZEPP
KN5S	20,636	134	22	5	20M	2	HB 11 BAND TCVR	DIPOLE
AB5QE	8,680	62	14	0.3	20M	7	NN1G	DIPOLE
NEW YORK								
N2LSK	364,875	695	75	5	A-4	13	FT575 / CENT 22	VERTICAL
N2KPY	191,436	516	53	5	A-3	9	ARGO 509	YAGI
W2QYA	115,050	295	39	0.9	A-4	11	HW-8	MARCONI
W2FB	34,230	163	30	5	A-3	4	OMNI A	ZEPP / YAGI
N2IPY	2,464	32	11	5	40M	6	OHR SPIRIT	INV VEE
OHIO								
W8MVN	356,832	1062	48	4	40M	21	ARK 40	DELTAS @ 70'
WA8RJF	346,311	717	69	4	A-5	17	IC 735	LONG WIRE, YAGI
KB8GAE	135,450	430	45	5	A-3	6	K9AY, TS440	80M ZEPP, VERT
WA8HQO	99,120	295	48	5	A-4	13	ARGO II	ISO LOOP, RANDOM WIRE
WBØIQK	47,740	220	31	4	A-2	11	ARGO 556, HW8	VERTICAL
OKLAHOMA								
W7BD	506,345	851	85	4	A-4	23	TT DELTA	TRAP VEE DIPOLE
ONTARIO								
VE3BHW	9,282	102	13	5	A-3	3	TRITON IV	80M DIPOLE, INV VEE
VE3KQN	199,950	465	43	0.9	A-3	?	?	?
VA3CSJ	9,758	82	17	5	H-2	4	?	?
OREGON								
AA7KF	843,024	1158	104	5	A-4	13	TS 940	LAZY H, YAGI, DIPOLE
WX7R	131,054	407	46	4	H-2	12	IC 735, MFJ 9015	LONG WIRES
W6RCP	56,980	220	37	5	A-3	4	ARGO 515	40M DELTA LOOP
PENNSYLVANIA								
K3WWP	459,130	937	70	5	A-4	23	6Y6 FINAL	RANDOM WIRE / VERT
K7YHA	389,018	751	74	5	A-6	16	TS 130V	DIPOLES
W3TS	109,900	314	35	0.9	L-3	4	PARAGON	160 TEE, 80 & 40 INV VEE
NE3I	96,320	320	43	5	A-4	4	TS 440	ATTIC BENT DIPOLES
N3CZB	11,662	98	17	4	A-3	12	CENTURY 21	INDOOR LOOPS
W3MY	2,450	50	7	1	A-3	1	HW-8	RANDOM WIRE
QUEBEC								
VE2ABO	28,756	158	26	4	A-3	5	HW-9	YAGI / LOOP / INV VEE
RHODE ISLAND								
WA1OFT	17,780	127	20	4	L-2	5	HW-9	DIPOLES @ 25'
SOUTH CAROLINA								
WN2V	7,938	81	14	5	40M	2	FT 747	40M DBL EXT ZEPP
TEXAS								
KB5YVT	74,382	322	33	3	A-3	?	HW-8 / FT 890	YAGI
KC5DRB	39,872	178	32	4	A-3	4	HW-8	G5RV
W5MHY	27,400	137	20	1	20M	10	NN1G	DIPOLE
K5FO	6,400	64	10	0.9	40M	2	SIERRA	GROUND PLANE
UTAH								
WØMHS/7	578,550	950	87	4	A-5	13	?	160M LOOP
K6XO	337,428	618	78	5	A-4	7	?	?
VIGINIA								
N4ROA	781,536	1163	96	5	A-4	20	OMNI C	160M INV "L", YAGI
W4XD	312,582	687	65	5	A-3	12	ASTRO 103	G5RV
K3SS	232,407	527	63	5	A-4	18	FT 757	DIPOLE @ 35'
KC4AUF	108,170	373	29	0.9	40M	17	TS 850	DELTA LOOP
K4JM	68,362	257	38	5	A-2	4	TS 520	DIPOLE, LONG WIRE
K4GEL	21,315	145	21	5	A-2	3	2 X K9AY	LOOP, QUAD
WR4I	15,116	514	42	3	A-4	16	HY-PWR, 9020, ARGO2	3 FT WHIP, G5RV
VERMONT								
NW1S	99,120	354	40	3	A-3	4	?	?
WISCONSIN								
W9MSE	382,690	710	77	5	A-4	12	TS 440	VERTICAL / DIPOLE
KB9W	2,548	52	7	3	20M	1	TS 930	YAGI
WEST VIRGINIA								
WF8X	256,200	600	61	5	A-4	11	TS 430, TS 120V	R7 VERT, G5RV
DX STATIONS								
HOLLAND								
PA3ELD	2,184	39	8	5	20M	5	TS 850	ROTARY DIPOLE
PANAMA								
HP1AC	175,497	411	61	5	A-3	7	TS430, K9AY,K1BQT	LONG WIRE, YAGI

* Contest mgr not eligible for Certificate

1993 ARCI SPRING QSO PARTY-MULTIBAND 160-6 METERS

CALL	SPC	'Q' PTS	SPC x	PWR x	SCORE	RIG(S)	ANT(S)	CLUB
NY4N	AL	851	78	7	464646	NO INFO	NO INFO	
W4DGH	AL	117	15	7	12285	ARGO 2	YAGI	
N0IBT	CO	182	25	7	31850	TS830S	DIPOLE	
KH6CP/1	CT	761	76	7	404852	515, HB 20M	DIPOLE	
NN1G	CT	429	51	7	153153	HB TS130	80M WINDOM	
N4BP	FL	1322	108	7	*999432*	TS130V	TH7DXX @ 20'	
N4FNG	FL	440	56	7	172480	OMNI 5 HB	3 EL & ZEPP	
WA4IAR	GA	188	35	7	46060	OMNI A	DIPOLE CL33	
W1HUE	ID	140	30	7	29400	509	VERT	
W9CUN	IL	227	33	7	52437	NO INFO	LOOP-GAP-DIP	
W9NJP	IL	221	28	7	43316	FT890	ZEPP	
W9FHA	IN	216	27	7	40824	HB	ZEPP	
W5TVW	LA	562	42	10	236040	HW-8	LW VERT	
KA1UEH	MA	56	12	7	4704	HW9	DIPOLE	
WA3GYW	MD	25	5	7	875	HW-8	DIPOLE	
KA1SSU	ME	51	17	7	6069	TS520	LW	
WA1WPR	ME	56	12	7	4704	HW-9	DIPOLE	
N8CQA	MI	288	44	7	88704	HW-9	4 EL @ 50'	
WA0RPI/7	MN	148	26	7	26936	HW-9	INV VEE	
AA0EN	MO	492	67	7	230748	HB	TA-33 @ 47'	
N0IZZ	MO	280	42	7	82320	NO INFO	NO INFO	
KN1H	NH	417	46	10	191820	OMNI	DIPOLE	
N2CQ	NJ	261	33	7	60291	FT101 MFJ20	NO INFO	
W2JEK	NJ	215	21	7	31605	2-FER OHR40	DIP/ VERT	
W5TTE	NM	559	63	7	246519	NO INFO	NO INFO	ROADRUNNERS
K5ON	NM	402	55	7	154770	NO INFO	NO INFO	ROADRUNNERS
WA2VEZ	NY	613	69	10	422970	509	VERT	
W2QYA	NY	446	54	10	240840	HW-8	MARCONI	
WB2QAP	NY	330	36	10	118800	ARGO -2	INV VEE 3-EL	
KG2H	NY	303	43	7	91203	TS690	DIPOLE	
WN2V	NY	83	16	7	9296	HW-9	VERT	
K8NQC	OH	1124	106	7	834008	NO INFO	R5 DIP 60'	
WA8RJF	OH	666	71	10	472860	IC735	LW & 3-EL	
NZ8J	OH	541	82	7	310534	NO INFO	NO INFO	
WB0IQK/8	OH	376	47	7	123704	HW-8	VERT	
W7BD	OK	722	66	7	333564	MFJ20/DELTA	DIPOLE	
W7LNG	OR	198	37	7	51282	TS850S	VERT & 3 EL	
W3TS	PA	586	65	10	380900	HB XCVR	BM STUCK	MILLIWATTERS
K3WWP	PA	322	35	7	78890	TUBE & R71A	LW	
KT3A	PA	145	20	7	20300	IC726	VERT	
WB3BBT	PA	76	19	10	14440	HW-9	LW	
K7YHA	PA	119	15	5	8925	FT890 PM3A	C WINDOM	
VE2XLT	PQ	117	17	7	13923	IC-728	WINDOM	
KP4DDB	PR	832	94	7	547456	ARGO-2	YAGI	
WA1OFT	RI	550	61	7	234850	HW-9	VERT DIPOLE	
KA9HAO	RI	269	27	10	72630	515	G5RV	
AC4HF	TN	218	32	10	69760	HW-9	NO INFO	
W4XD	VA	846	81	7	479682	SWAN -102BX	G5RV & HITwr	
N4ROA	VA	597	61	10	364170	HW-8	2 EL QUAD	
K4JM	VA	618	78	7	337428	CORSAIR 2	135' LW	
WF8X	WV	710	73	7	362810	TS120V	G5RV	
N8MUU	WV	409	47	7	134561	ARGO-2 TS50S	DIP/ VERT	

93 ARCI SPRING QSO-HIGH BANDS ONLY (20-15-10)

BANDS	CALL	'Q' PTS	SPC x	PWR x	SCORE	RIG	ANTENNA(s)
20, 15, 10	*N4BP*	1322	108	7	999432	TS130V	TH7DXX @ 20'
20, 15, 10	WA4VQD	486	60	7	204120	TS440S	3 EL
20, 15	N0IBT	182	25	7	31850	TS830S	DIPOLE
20, 15	N6WMF	130	19	7	17290	HB20, IC701	INV L @ 40'
20, 15	W4DGH	117	15	7	12285	ARGO 2	YAGI
20, 15	KF5FF	63	10	7	4410	HW101	2EL 20M
20, 15	N7HID	56	10	7	3920	HW9	3 EL
20, 15	K3WRV	33	7	7	1617	509 & 2B	DBL ZEPP

93 ARCI SPRING QSO PARTY SINGLE BAND

BAND	CALL	SPC	'Q' PTS	SPC x	PWR x	SCORE	RIG(S)	ANTENNA(S)
160	GW0LBI	WALES	82	13	7	7462	FT747G	60M LW/RADIALS
40	W8MVN	OH	698	36	7	175896	HB DELTA	LOOP @ 80'
40	VE2BLX	QU	286	19	7	38038	IC735	LW
40	WA3SRE	PA	168	17	10	28560	515	LOOP
40	KD4GLC	KY	151	17	10	25670	TS850S	DIPOLE @ 40'
40	N01E	NH	155	11	10	17050	FT-707	G5RV
40	W3DP	PA	144	14	7	14112	TS440S	G5RV
40	N9DD	IN	127	13	7	11557	HW-7	CF ZEPP
40	N6GU	NY	99	10	7	6930	HW9	HF6V
40	N2GU	NY	99	10	7	6930	HW-9	HF6V
40	W9ETU	IL	68	10	7	4760	W7EL	D. LOOP 40M
40	N2JGU	NY	37	5	7	1295	UGLY WKENDER	no info
20	KC5NG	TX	176	27	7	33264	TS850S	HF6V
20	W07T	AZ	180	25	7	31500	OHR 509	DIPOLE HF6V
20	NM1J	CT	191	22	7	29414	515	1/2 SQ @ 35'
20	PY7FNE	BRAZIL	196	21	7	28812	HW9	INV VEE
20	NU6U	CA	148	21	7	21756	MFJ9020	G5RV @ 25'
20	K5WX	TX	125	17	7	14875	PM3 HR1680	DIPOLE
20	W9KV	CO	155	10	7	10850	NO INFO	no info
20	PY7FNE	BRAZIL	36	21	7	5292	HW-9	INV VEE
20	W1JSM/VP9	BERMUDA	45	7	7	2205	MFJ20	VERT 10'
20	N3CZB	PA	15	3	7	315	CENTURY 21	HEL VERT 3RD FLOOR
15	WX7R	OR	252	34	7	59976	MFJ9015 IC735	LW
15	N5ODV	MS	175	20	7	24500	MFJ9015	12 EL CURTAIN
15	KD2IX	NY	108	13	7	9828	IC725	DIPOLE
15	WA3INC	NY	91	11	7	7007	TS940S	VERT
15	N6KM	CA	68	13	7	6188	SWAN-102BX	DIPOLE
15	HC1CK	ECUADOR	54	8	7	3024	NO INFO	no info
15	K5SN	TX	50	8	7	2800	HW8	ROOF VERT

1993 SPRING QRP ARCI QSO PARTY

Top Ten

1	N4BP	999,432
2	K8NQC	834,008
3	KP4DDB	547,456
4	W4XD	479,682
5	WA8RJF	472,860
6	NY4N	464,646
7	WA2VEZ	422,970
8	KH6CP/1	404,852
9	W3TS	380,900
10	N4ROA	364,170

Top Single Band Ops

160	GW0LBI	7,462
40	W8MVN	175,896
20	KC5NG	33,264
15	WX7R	59,976

Top High Band Op

20-10 N4BP 999,432

Top USA QRP Team

'New Mexico Roadrunners'

W5TTE & K5ON 401,289

SUMMER DAZE SSB SPRINT, 1994									
STATE				SPC		BANDS			
	CALL	SCORE	POINTS		POWER		TIME	RIG	ANTENNA
***	**********								
BC	VE7JO	5588	29	3	5	80M	2	HB SSB TCVR	?
BC	VE7QK	5578	33	2	4	80M	1.5	HB EPIPHYTE	INV VEE
NJ	N2MNN	3528	56	9	10	80M	4	SCOUT 555	40M VERT LOOP
MO	KE4CBB	3290	47	8	5	40M	2	TS 430	DIPOLE
KY	AC4ZH	2583	41	9	10	40M	2	IC 725	INVERTED VEE
OK	W7BD	2331	37	9	10	40, 20	3	DELTA	TRAP DIPOLE
VT	N2FBK	2107	43	7	5	80M	4	ARGO 509	G5RV
AR	N5SAN	1806	43	6	5	40M	2	FT 747	650 FT ZEPP
KY	WD4FXX	665	19	5	10	40M	3	ARGO II	LONG WIRE
KS	KGØBZ	525	20	3	5	40, 20	1	ARGO II	YAGI
GA	ND4D	420	60	3	10	40M	2	HW-100	DIPOLE
IL	W9NBG	75	6	1	0.5	6M	4	?	?
CA	NU6U	70	10	1	5	40M	1	ARGO II	102' ZEPP

1994 SUMMER DAZE SSB SPRINT

Conditions for the Summer Daze SSB Sprint were not as good as the January SSB affair, but we still had a good representation. Here are some of the observations: 1st contest ever, 1st qrp one, too. We need a whole QRP band! - N2FBK. Poor condx here in Burns Flat. Every QSO a prize catch. - W7BD. *(Sorry to have to work you cross-mode, Bob, but you couldn't copy me on SSB - Ed.)* Not much action. -WD4FXX. Man! This was tough!! - KGØBZ. This was more of a PR opportunity than a contest, but still had fun. - NU6U

W9NBG used 6 Meters exclusively, which had been cooking up until the weekend of the contest. Tom suggests we change the suggested SSB frequency to 50.1285, near the 6 Meter calling frequency. There is no one around 50.885, and his score would have been zero if he had used it. We will make the change, Tom.

Please note that the time and format of the Winter Fireside SSB Sprint has been changed. Details elsewhere in this column.

Colorado QRP Club Winter QSO Party

Date/Time: Feb. 19,1995 1800 - 2359 UTC

Exchange: RS(T), State/Province/Country, Name, and Member # if CQC member, power output if not

Suggested frequencies
CW 1825, 3560, 3710, 7040, 7110, 14060, 21060, 21110, 28060, 28110
SSB 1825, 3985, 7285, 14285, 21385, 28385
- No contacts on 30, 18 and 12 meters allowed

Classes: Single Band, Multi-band, Novice/Tech

QSO Points:
CW- CQC member 6 pts, non-member 4 pts
SSB- CQC member 3 pts, non-member 2 pts

Multiplier: States/Provinces/Countries worked. The same station may be worked on different bands for additional QSO points and multipliers. Contacts on the same band using a different mode counts for QSO points, but not as an additional multiplier.

Names: Total of names from Name sheet. One name per letter of the alphabet. Name must be same as Callbook or QSL card.

Score: Total Score = QSO Points x Multipliers x Names

Power: Stations must use 5 watts or less output, CW or SSB. There are no power multipliers.

Awards: TO BE DETERMINED, highest score in each class

For sample Log, and Name sheets, send SASE one unit postage to:
Jim-KAØJJK-CQC Contest; P.O. Box 31575; Aurora, CO 80041-0575

QRP REVIEW–
The S&S Engineering ARK4

by Michael A. Czuhajewski WA8MCQ
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That's not a typo–that's the ARK4, not the ARK40 which I reviewed in the January 1994 issue. Dick Szakonyi, KA3ZOW of S&S Engineering, along with wife Kathy, N3SAD, has been hitting lots of hamfests showing off the new ARK4, along with its big brother, the ARK40. Around here, Dick usually has his rigs on the air in the tailgating area with a Hustler mobile antenna or homemade rotary loaded dipole made from aluminum tubing, while Kathy "mans" a static display inside one of the buildings.

While the synthesized ARK40 has received very good reviews, Dick felt that some people might like to have a less expensive, smaller version and yet retain its outstanding frequency stability. He's done that quite well, and the newest QRP addition to his product line is a neat little rig.

Dick likes to describe the ARK40 as the Cadillac and the ARK4 as the Chevrolet. "They'll both get you where you want to go on 40 meters, it's up to you which one suits your purposes better." Both are synthesized (the basis for the S&S slogan "Precisely QRP"), and just as stable as a crystal oscillator. I wouldn't call the ARK4 a stripped down ARK40, since that's not really true; it was designed pretty much from the ground up with many of the same features and circuitry of the big brother, but with an eye to reduced cost while still retaining good performance. For example, the receiver starts out with a bandpass filter, while the ARK40 had that plus a low pass filter as well.

BASIC SPECS

The rig covers 7000 to 7150 KHz, using a slide switch for the 70XX/71XX selection and two 10-position, digital-dial switches activated by push buttons to select the last 2 digits. (It's the same tuning method used on the ARK40.) Basic tuning is in synthesized 1 KHz steps; fine tuning, if you have that option installed, is analog, done with a voltage controlled variable crystal oscillator. The steps between the 1 KHz points are approximately, but not exactly, 100 HZ. The control is a pot, but it has detents so frequencies are repeatable. Receiver sensitivity is specified at 0.3 uV for a 10 dB signal plus noise to noise ratio, which is more than adequate for 40 meters. Reception is single signal, due to the crystal filter, and you can add an optional audio filter as well.

TRANSMITTER

Power output is nominally 3 to 4 watts with a 12 volt supply. I measured the output on a Hewlett Packard spectrum analyzer and found all harmonics and spurious products to be down at least 36 dB, which was the level of the second harmonic. Other signals were over 40 dB below the carrier. There was a bit of a spur around 3.5 MHz, which actually turned out to be a pair of spurs–one fixed around the IF frequency of 3.579 MHz, and the other somewhere below that, depending on the frequency setting. Both of those were also over 40 dB below the carrier, well within FCC specs.

Regrettably, since I'm a milliwatter, the ARK4 does not contain a power level control–you're stuck with the full power. Dick reports that it would be easy enough to modify your rig slightly to add it. (The ARK40 has one, but it's a trimmer pot on a circuit board and hard to get to. A panel mounted control would be nice.)

WANT JUST THE TRANSMITTER?

If all you want is the transmitter, you can get that by itself–synthesized QRP for $100! There will be a second BNC connector on the rear, to go your receiver. You get the same audio chain as the full TX/RX unit, since something has to amplify the sidetone oscillator. What you do with that audio is up to you–it comes out on a rear panel jack, to patch into your receiver or run to an amplified speaker.

One drawback of getting the transmitter alone is that there is no SPOT switch; about the only way you could set your frequency is to guess what frequency the other station is on (hoping your receiver has good calibration) and then send a series of dits on the air while punching the buttons until you get on frequency. (I suspect few people would get just the transmitter, though.)

One more thing–you really should get the fine tune option, whether you get the transmitter only or TX/RX; on receive you can tune between 1 KHz points with the RIT, but you would be stuck with transmitting at discrete 1 KHz spots across the band–you couldn't zero beat someone without the fine tune option.

BUILDING IT

Sorry, I wimped out again, like I did with the ARK40–I played with several assembled units Dick provided, so I can't report on the kit building aspects of it. You'll have to read other peoples reviews for that, but their comments are usually quite positive. (Actually, Dick gave me two options–he said he'd give me a kit to build, test and keep forever, or else send an assembled ARK4 to play with and return. It was very tempting–a free QRP rig!–but I wisely chose to just take the loaner; otherwise I'd never get it built and tested before the next sunspot peak!)

One really neat thing about it, from a construction viewpoint, is that it's a "wireless" radio. I don't count PCB jumpers as wires (I don't even know if it has any–I was too lazy to check), just wires from the board to switches, pots, jacks, etc. Not that there's anything wrong with that, but it would be nicer if you didn't have to worry about them, and with the ARK4 you don't. Everything mounts on the circuit board–switches, pots, jacks, even the BNC (hurray!) antenna

connector. Not only easier to build, but you don't have to worry about flexing wires repeatedly and breaking them.

The PCB is top notch, glass epoxy, silk screened, and all coils and transformers are prewound. Jeff Gold, AC4HF, said "There is no question in my mind that the ARK4 is at the very top of the class as far as building...."

SYNTHESIS AND TRADEOFFS

This rig has the same push button tuning method as the ARK40. I'm afraid that's still fairly controversial; most people don't like the idea since it's not as convenient as an analog tuning knob. Lots of people who actually own the rigs say they get used to it after a while, though. And while it's not particularly convenient for tuning slowly across the band, it's really great if you have to be on a certain frequency.

In my review of the ARK40 I reported that N6GA, in his earlier WorldRadio review, said it's a unanimous criticism of the rig, and everyone I talked with up to that time agreed. Unfortunately, it still runs heavily against it, but as I said of the ARK40, I think it's an acceptable tradeoff for the stability, repeatability and accuracy of synthesis. (As I said in the last review, he could have used a single, rotary knob but adding a shaft encoder, logic and display would drive up the price even further, cutting into potential sales.)

I must say I really like the fine tuning KNOB on the ARK4, though–that helps a lot, and should satisfy a lot of people. While it is just a small compromise, it does give the radio a much better feel, and without cutting into the overall accuracy and resettability.

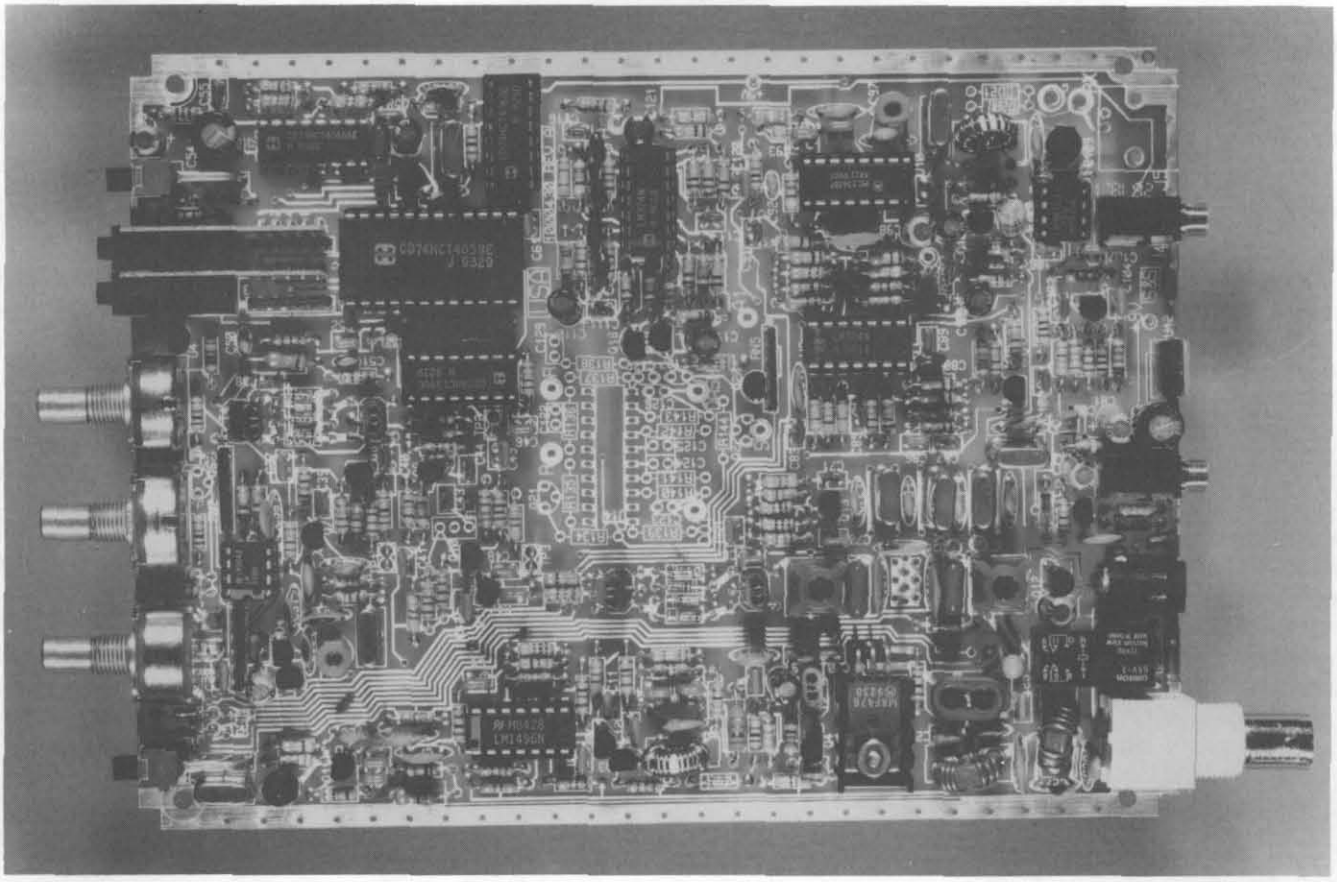
KEYING NOTES

One thing I really like about the ARK4 is the pair of keying jacks on the rear. The ARK40 only has a single jack; if you have the keyer module installed, you're locked into using it–the lone jack is used for the paddle and you couldn't connect a straight key, bug, contest keyer, CW keyboard, etc without resorting to heroic measures. (For example, I let WA4KAC use the ARK40 Dick loaned me to review. Walt doesn't like keyers and wanted to use his straight key, so I hooked some RG-174 coax to the keying terminals on the PCB and ran it out through the center hole of the key jack.)

The ARK4 has an optional Curtis keyer module just like the '40, but you can simultaneously connect both a paddle for the keyer and a straight key to control the rig directly–installing the keyer doesn't preclude using other devices. Adding the second jack was a great idea, perhaps as a result of the comment I made in my review of the ARK40.

Once again, Dick uses a keying relay to achieve QSK (break-in) operation. It sounds like the same one in the '40–a bit noisy, although not objectionable if using headphones. (By the way, the ARK4 is intended for headphone operation only. This simplifies things a bit and helps hold down the cost; a lot of people, myself included, feel that serious CW work should only be done on phones, anyhow.)

The way to get around the mini-machine gun on the operating table is easy enough if you don't like it and don't mind giving up full QSK. It would be simple to add a few parts to give a slight time delay before the relay drops back into receive, and that sort of T/R circuit has been published quite a few places over the years. I'm surprised no one has written up a mod like that for the ARK40/ARK4 yet.



ARK4/ARK40 DIFFERENCES

Here's some info from their flyer–"The ARK4 and ARK40 are both high quality, low cost QRP transceivers with synthesized transmitters and superhet, single signal receivers [also synthesized]. The ARK40 is sold as a complete kit. The ARK4 is available in several different versions...so you buy as little or as much as you want or can afford at any time...."

Here are some specific differences, with ARK4 followed by ARK40:

- •Synthesized to 1 KHz, with fine tuning between steps done by VCXO with a knob with 11 detents, vs. synthesized to 100 Hz. (The ARK4 has essentially the same resolution. Although the steps between the 1 KHz points aren't exactly 100 Hz, they are repeatable due to the detents.)
- •Headphones or external [amplified] speaker required, vs. speaker built in (with rear panel jack for external unit).
- •One PCB and no wiring, vs. two boards and some wiring needed.
- •Weight 25 ounces (with all possible options) vs. 4 pounds.
- •150 mA vs. 400 mA in receive. (Both take about 1.1A in transmit.)

Dick reports that the ARK4 will not be available for other bands. He says, "Sorry, there will be no ARK2 or ARK3. It just so happens that the crystals required for the IF for 40 meters are used in all FM receivers and TVs, so they are readily available and relatively inexpensive. But this happy circumstance does not occur for the other bands."

PRICING

The flyer says "Get on the air for only $99.95", which gets you the basic transmitter kit. That's nice from a marketing viewpoint, a good eye catching phrase, but I prefer to think of it as a $200 radio from which you can delete things if you don't want them, instead of a "$100" radio that ends up costing twice as much when you get all the good options. (I hate buying cars for the same reason.) For a full blown transceiver, count on spending about that for a fully loaded unit with all the "necessary" options (plus another $40 for the keyer, which I consider a "true" option). You can also get it fully assembled and tested, again with all options except keyer, for $270.

So how does the pricing go? $100 for just the transmitter with 1 KHz tuning, with the fine tuning as an option ($13). I'd go for the extra money, otherwise you can't zero beat everyone precisely when transmitting. The receiver option is another $50, and you can add RIT for $7, audio filter for $10, case for $40. The bare bones TX/RX package is $145 (no fine tuning, RIT, case, etc), TX/RX with all options except case and keyer is $170, and $200 for everything but the keyer. Consult the flyer for details, and bring your accountant along.

I suspect most people would go with the $200 package, since that's pretty much the complete rig with everything that people would expect in a QRP radio. (All prices were rounded to the nearest dollar.)

Back to that "case"–it's rather expensive, at $40 a la carte or $30 in the package deal, but it's rugged and nice, and makes it look more professional than most anything you could scrounge up at home, and certainly enhances resale value. Dick says it's "an extruded aluminum base with a vinyl coated slip-on steel cover." By the way, the "case" includes punched and silk screened front and rear panels. Don't forget that all switches and connectors are mounted on the PCB–if you go with your own case you'll have to make your own panels, with precisely positioned holes and slots. Either that or put the connectors and controls anywhere you want on the panels and run wires to the holes on the PCB (ughhh). The extra money for the case looks like a good investment all around.

PERFORMANCE

I didn't get a chance to transmit with the rig, due to antenna problems, but loaned it out to two local QRPers who made many contacts with it. I can't comment too much on some of the quirks since the several units I tested over a period of time were all marked as prototypes, each with varying numbers of mods performed on them. The earlier ones did have some problems with the audio chain, but Dick has made mods along the way, in that and other areas. I have never heard anything but positive comments on his service and support.

There are a few birdies, which is not surprising in a synthesized rig; a few are rather loud, but most can be heard only with antenna disconnected. WA4KAC also reported significant distortion in the audio when the filter was switched in, and he was using the prototype which had all current mods at the time.

There is a 10 KHz whine audible at a very low level even with the volume turned all the way down, and several people have noted that. I originally believed this was caused by problems with the audio design, but decided it wasn't after some experiments and tests. I later decided it might be a result of the synthesis process and proximity of so many components on a single board.

There is a quirk in the fine tuning and RIT. Tuning between the 1 KHz points is done by rubbering a crystal oscillator; for fine tuning, this is done with a pot which has 11 detents. The RIT also tunes the same oscillator, with a continuously variable pot. There are times when they conflict with each other; there are certain circumstances where one of the pots will only change the frequency over part of its rotation, and then no further change for the rest of the way. This is an unfortunate consequence of the way both pots control the same oscillator with a varying DC voltage level. After the control voltage reaches the maximum possible, the other pot can't force it any higher.

A KIT THAT WORKS!

The ARK4 comes with the standard S&S guarantee that it will work as specified if you built it according to the instructions and didn't modify or abuse it. The manual says, "If it's our fault, we'll fix it at no charge to you (except one-way postage). If it's your fault, we'll fix it for less than $25.00....S&S Engineering will make your transceiver work and may charge you all or part of $24.99."

RANDOM COMMENTS FROM WA4KAC

Some additional comments from Walt Thomas, of Laurel, MD, to whom I loaned one for a while–

"The case is considerably lower than the ARK40, at only 1 1/2" high. I liked the tuning better than the ARK40, as it's a bit easier to "scan the band", though I would prefer only a center-detent control for the fine tuning.

"I operated the ARK4 in several sessions over two summer months using a gel cell and my attic loop. Reports ranged from 449 to 589 from stations in the Northeast and Midwest. I heard several European and South American stations but was unsuccessful in working them–the 40 meter band was down compared to last year when I tested the ARK40.

"The sensitivity seems adequate, though I had to operate with the volume control cranked up higher than the ARK40. The crystal filter seems better than the one in the ARK40–I could hear no signals on the opposite side of zero beat. The ARK4 uses a 3.579 MHz IF compared to 12.3 MHz in the ARK40. My NorCal 40, with no IF amplifier, has a quieter receiver. I noted birdies at 7.000 MHz (S9), 7.020 (weak), and 7.045 (S9+). Also, the audio filter on the unit I was given was unusable; it distorted the signal severely when switched in.

"I measured the output power into a 50 ohm dummy load with peak voltage detector at 4.8 watts over 7000 to 7030 KHz, dropping to 4.2 watts at 7150. This was using the gel cell, which showed 12.2 VDC, key down.

"The unit is physically small enough for portable operation, probably even backpacking, but the current drain, specified as 150 mA in receive and 1.1 amp in transmit, is a bit tough for a small gel cell like mine."

SOME COMMENTS FROM THE INTERNET QRP LIST

"Dick acknowledges some problems, but that little rig is tough and stable... ...the push button scheme, while it may be annoying, is actually quite good once you get used to it. QUICK QSY! Imagine if you had to hit the button 10 times to make the next digit roll over! I thought the receiver was pretty good myself, and the rig's built like a brick outhouse. My guess is that if you dropped it 100 feet, it'd dent the pavement..." –Scott Rosenfeld, NF3I

"I've been very impressed with the after-sale service from S&S. Upgrades and fixes are sent out to owners of the kits from S&S without the kit owners having to request them. Even Heath in its prime required you to ask for the mod kits. This level of service, coupled with some of the best quality components and boards available in the kit market, make me a happy customer of S&S." –Jim Johns, KAØIQT

IN THE NUTSHELL ON THE BOTTOM LINE

The ARK4 is a really neat, little rig. I like to describe it as a "QRP Modem", since that's about the size and shape of it. With its form factor (1.5" high if you tear off the rubber feet) and reasonable weight it should be pretty handy for portable use. The frequency synthesis gives it unsurpassed stability, accuracy and repeatability (and the push button tuning makes it almost impossible to "bump the dial" and lose someone!). Power and sensitivity are both more than adequate for a heckuva lot of QRP QSOs. Great manual, great service from the company, high quality rig throughout.

The ARK4 and other goodies are available from S&S Engineering, 14102 Brown Road, Smithsburg, MD 21783; phone (301) 416-0661, FAX (301) 416-0963.

New Member/Renewal Data Sheet

Full Name_____ Call_____ QRP #_____

Mailing Address_____

City_____State/Country_____ Post Code_____

❑ New Address? ❑ New Call?

USA

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

DX

❑ New Member, £7
❑ Renewal, £6
Check or MO in British pounds
payable to "G-QRP" or "R. Pascoe GØBPS"
Mail to: Dick Pascoe, GØBPS
Seaview House
Crete Road East
Folkestone, Kent CT18 7EG
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December 3	Holiday Spirits HB

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